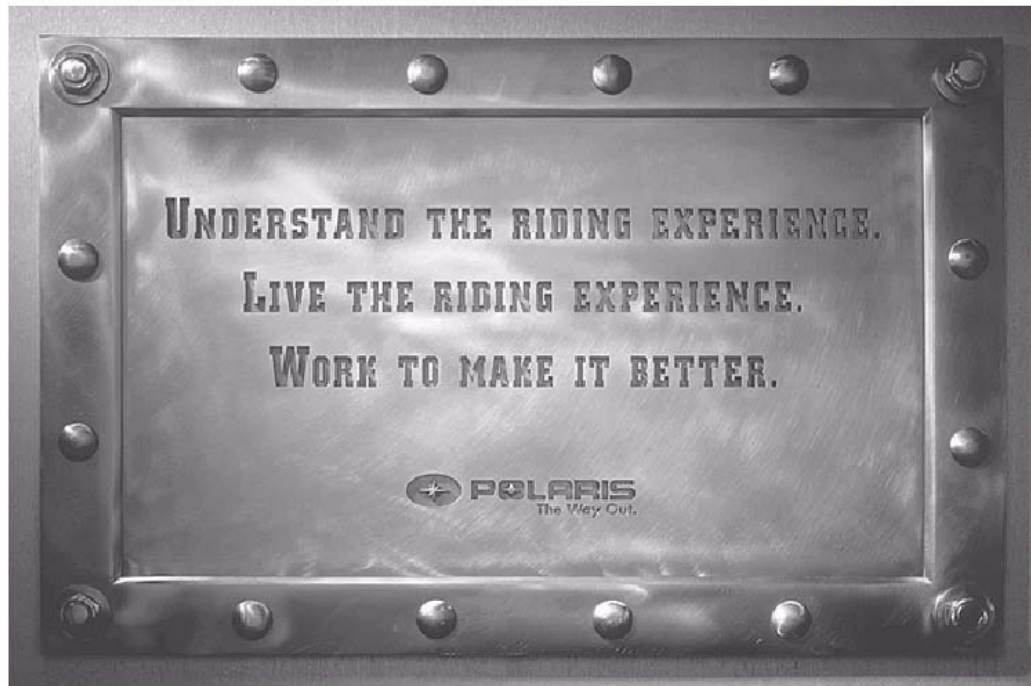




POLARIS
The Way Out.®



2008 *RANGER RZR* SERVICE MANUAL

FOREWORD

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 service procedures before starting the work. Certain procedures require the use of special tools. Use only the proper tools as specified.

Comments or suggestions about this manual may be directed to: Service Publications Dept. @ Polaris Sales Inc. 2100 Hwy 55 Medina Minnesota 55340.

2008 Service Manual PN 9921278

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UNDERSTANDING MANUAL 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 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 PRODUCTS MENTIONED IN THIS MANUAL:

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RydeFX, Registered Trademark of ArvinMeritor

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GENERAL INFORMATION

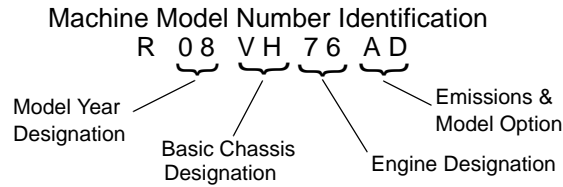
MODEL INFORMATION 1.2
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GENERAL INFORMATION

MODEL INFORMATION

Model Identification

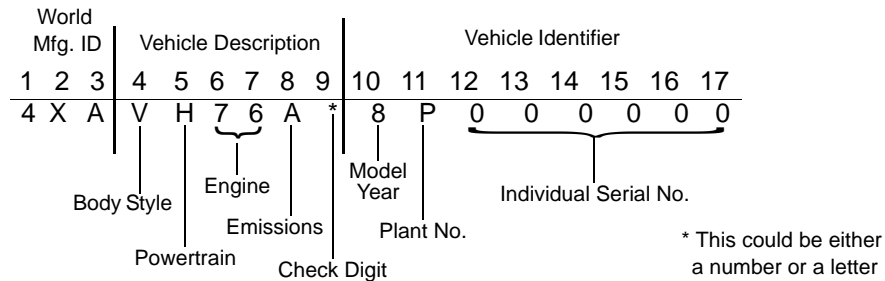
The machine model number must be used with any correspondence regarding warranty or service.



Engine Designation Number

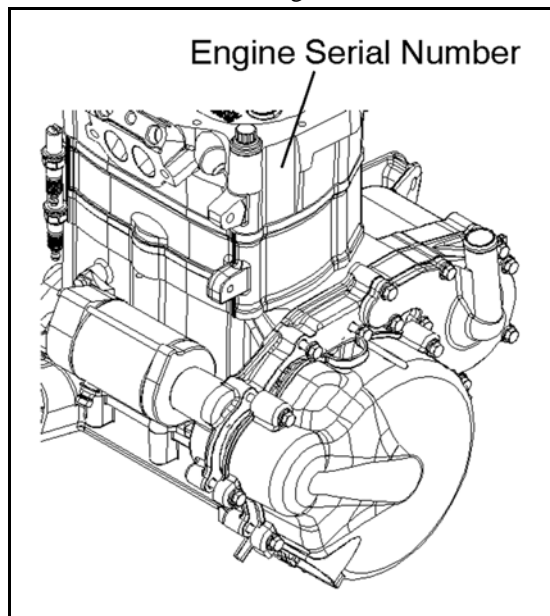
EH076OLE021 Twin Cylinder, Liquid Cooled, OHV 4 Stroke, Electric Start

VIN Identification



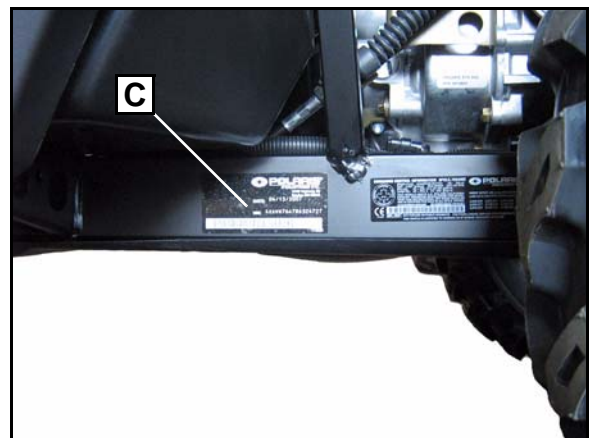
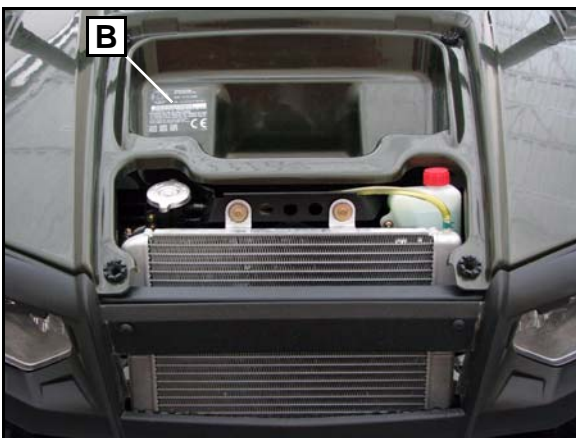
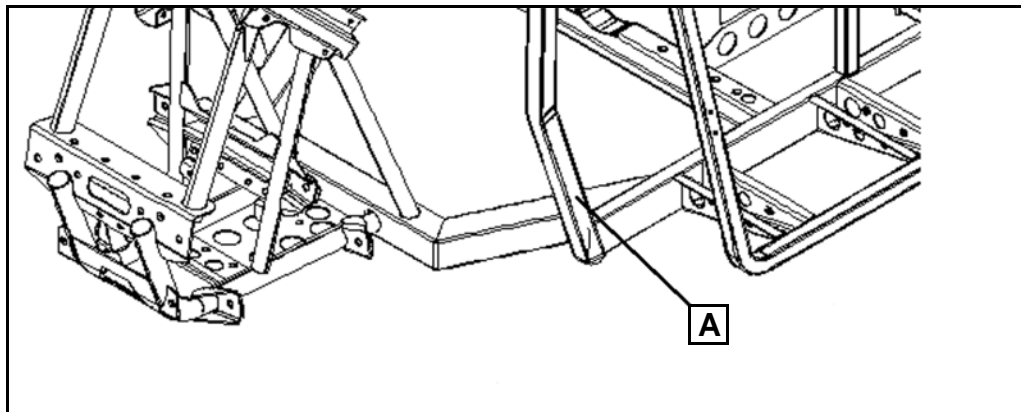
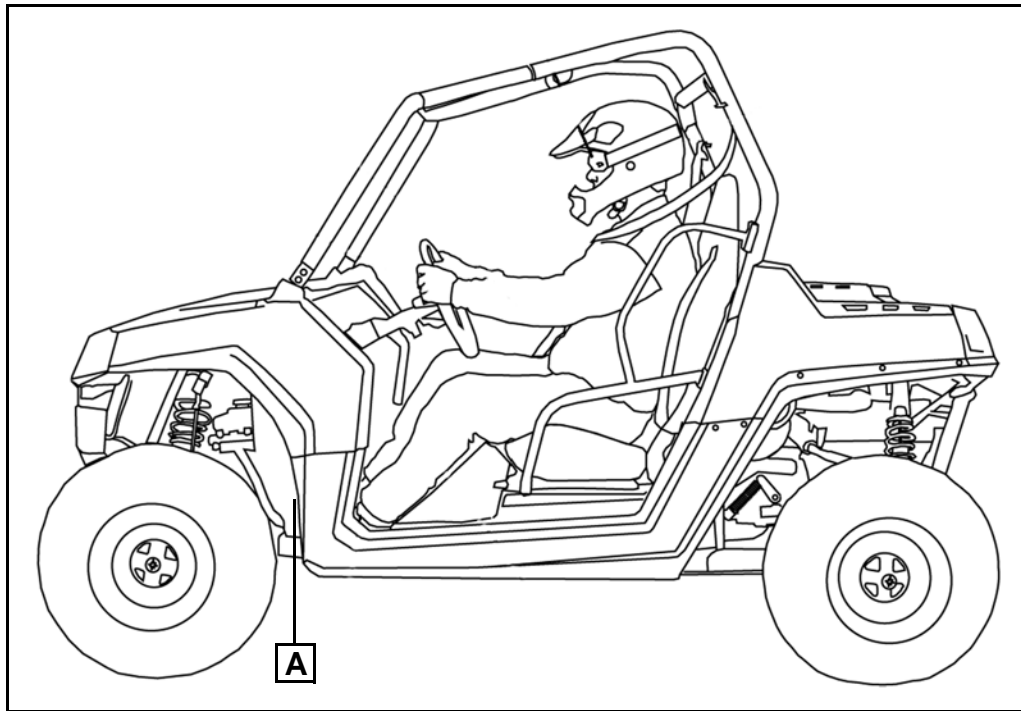
Engine Serial Number Location

Whenever corresponding about an engine, be sure to refer to the engine model number and serial number. This information can be found on the sticker applied to the cylinder head on the side of engine.



Unit Serial Number (VIN) Location

The machine model number and serial number (VIN) are important for vehicle identification. The VIN number (A) is stamped on a portion of the LH frame rail close to the front wheel. The model and VIN numbers are also located on a sticker under the hood (B) or on the lower frame rail in front of the LH rear tire (C).



GENERAL INFORMATION

GENERAL SPECIFICATIONS

MODEL: 2008 RANGER RZR
MODEL NUMBER: R08VH76AD, AG
ENGINE MODEL: EH076OLE021

Category	Dimension / Capacity
Length	102 in. / 259 cm
Width	50 in. / 127 cm
Height	68.5 in. / 174 cm
Wheel Base	77 in. / 196 cm
Ground Clearance	10 in. / 25.4 cm
Dry Weight	945 lbs. / 429 kg
Gross Vehicle Weight	1727 lbs. / 783 kg
Front Storage Capacity	25 lbs. / 11.3 kg
Cargo Box Dimension	42 in. x 22 in. / 107 cm x 56 cm
Cargo Box Capacity	300 lbs. / 136 kg
Maximum Weight Capacity (Payload)	740 lbs. / 336.4 kg (Includes rider(s), cargo, and accessories)
Hitch Towing Capacity	1500 lbs. / 680 kg
Hitch Tongue Capacity	150 lbs. / 68 kg



TOP



SIDE



REAR



MODEL: 2008 RANGER RZR
MODEL NUMBER: R08VH76AD, AG
ENGINE MODEL: EH076OLE021

Engine	
Platform	Polaris Domestic Twin Cylinder, Liquid Cooled, 4-Stroke
Engine Model Number	EH076OLE021
Engine Displacement	760cc
Number of Cylinders	2
Bore & Stroke (mm)	80 x 76.5 mm
Compression Ratio	10:1
Compression Pressure	150-200 psi
Engine Idle Speed	1150 ± 100 RPM
Engine Max Operating RPM	6500 ± 200 RPM
Lubrication	Pressurized Wet Sump
Oil Requirements	0W-40
Oil Capacity	2 qts. / 1.9 liters
Coolant Capacity	4.8 qts. / 4.5 liters
Overheat Warning	Instrument Cluster Indicator
Exhaust System	Single Pipe / Silencer
Fuel System	
Fuel System Type	Bosch Electronic Fuel Injection
Fuel Delivery	Electronic Fuel Pump (in tank)
Fuel Pressure	39 psi
Fuel Filters	See Chapter 4
Fuel Capacity / Requirement	7 gal. (26.5 liters) 87 Octane (minimum)
Electrical	
Alternator Max Output	500 watts @ 3000 RPM
Lights: Main Headlights	2 - Dual Beam 55 watts / Halogen
Tail / Brake	2 - 27 watts
Worklights	2 - 13 watts
Starting System	Electric Start
Ignition System	Bosch EFI (ECU Controlled)
Ignition Timing	13° BTDC @ 1200 RPM
Spark plug / Gap	Champion RC7YC3 / .035 in. (0.9 mm)
Battery	Yuasa YTX20HL / 18 Amp Hr. / 310 CCA / 12 Volt
Instrument Type	Analog Speedometer with Multifunction LCD
DC Outlet	Standard 12 V
Relays	EFI / Fan
Circuit Breaker	Fan Motor: 20 Amp
Fuses	Chassis: 20 Amp EFI: 15 Amp Lights: 15 Amp Accessory: 15 Amp Speedo/ECU: 5 Amp

Drivetrain	
Transmission Type	Polaris Automatic PVT
Gear Ratio: Front / Rear	
High	3.14:1
Low	8.71:1
Rev	5.94:1
Drive Ratio - Front	3.82:1
Drive Ratio - Final	3.70:1
Shift Type	In Line Shift - H / L / N / R / P
Front Gearcase Oil Requirements	Polaris Demand Drive LT Premium Fluid 6.75 oz. (200 ml)
Transmission Oil Requirements Main Gearcase	Polaris High Performance AGL 24 oz. (710 ml)
Transmission Oil Requirements Transfer Case	Polaris High Performance AGL 14 oz. (414 ml)
Rear Gearcase Oil Requirements	Polaris Premium ADF 18 oz. (532 ml)
Belt	3211113
Steering / Suspension	
Front Suspension	Independent Double A-arm
Front Travel	9 in. / 23 cm
Rear Suspension	Independent Double A-arm
Rear Travel	9.5 in. / 24 cm
Shock Preload Adjustment Front / Rear	Cam Adjustment
Toe Out	1/8-1/4 in. / 3-6.35 mm
Wheels / Brakes	
Front Wheel Size	12 x 6 / 10 gauge
Front Tire Size	Maxxis / 25 x 8 R12
Rear Wheel Size	12 x 8 / 10 gauge
Rear Tire Size	Maxxis / 25 x 10 R12
Tire Air Pressure - Front / Rear	8 psi (55 kPa)
Brake - Front / Rear	Foot Actuated - 4 Wheel Hydraulic Disc
Brake Fluid	DOT 4

CLUTCH CHART

Altitude		Shift Weight	Drive Spring	Driven Spring
Meters (Feet)	0-1500 (0-5000)	20-62 (5631700)	Blue/Red (7043199)	Red or Yellow (3234452)
	1500-3700 (5000 - 12000)	20-58 (5631216)	Blue/Red (7043199)	Red or Yellow (3234452)

GENERAL INFORMATION

VEHICLE INFORMATION

Publication Numbers

Model	Model No.	Owner's Manual PN	Parts Manual PN
2008 RANGER RZR, Red	R08VH76AD	9921181	9921207
2008 RANGER RZR, Green	R08VH76AG	9921181	9921207

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

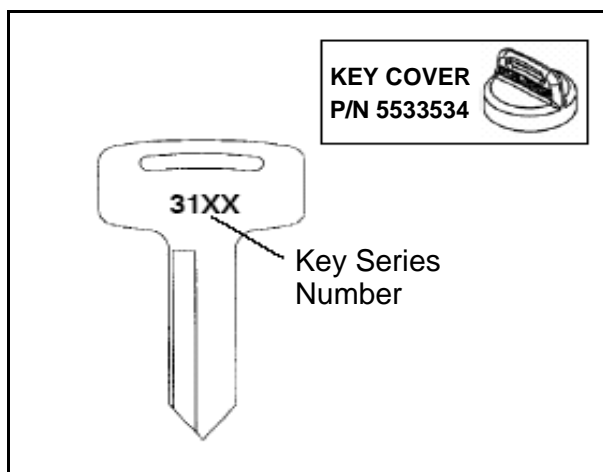
NOTE: Polaris factory publications can be found at www.polarisindustries.com or purchased from www.purepolaris.com.

Paint Codes

Painted Part	Color Description	Polaris Number
Frame / Bumpers / Racks	Gloss Black	P-067
Frame / Bumpers / Racks	Matte Black	P-458
Plastic - Hood / Dash / Fenders	Indy Red	P-293
Plastic - Hood / Dash / Fenders	Sage Brush Green Metallic	P-498

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

SPECIAL TOOLS

Special tools may be required while servicing this vehicle. Some of the tools listed or depicted are mandatory, while other tools maybe 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, SPX Corporation, by phone at 1-800-328-6657 or on-line at <http://polaris.spx.com/>.

MISC. SPECIFICATIONS AND CHARTS

Conversion Table

Unit of Measure	Multiplied by	Converts to
ft. lbs.	x 12	= in. lbs.
in. lbs.	x .0833	= ft. lbs.
ft. lbs.	x 1.356	= Nm
in. lbs.	x .0115	= kg-m
Nm	x .7376	= ft.lbs.
kg-m	x 7.233	= ft. lbs.
kg-m	x 86.796	= in. lbs.
kg-m	x 10	= Nm
in.	x 25.4	=mm
mm	x .03937	= in.
in.	x 2.54	= cm
mile (mi.)	x 1.6	= km
km	x .6214	= mile (mi.)
Ounces (oz)	x 28.35	= Grams (g)
Fluid Ounces (fl. oz.)	x 29.57	= Cubic Centimeters (cc)
Cubic Centimeters (cc)	x .03381	= Fluid Ounces (fl. oz.)
Grams (g)	x 0.035	= Ounces (oz)
lb.	x .454	= kg
kg	x 2.2046	= lb.
Cubic inches (cu in)	x 16.387	= Cubic centimeters (cc)
Cubic centimeters (cc)	x 0.061	= Cubic inches (cu in)
Imperial pints (Imp pt)	x 0.568	= Liters (l)
Liters (l)	x 1.76	= Imperial pints (Imp pt)
Imperial quarts (Imp qt)	x 1.137	= Liters (l)
Liters (l)	x 0.88	= Imperial quarts (Imp qt)
Imperial quarts (Imp qt)	x 1.201	= US quarts (US qt)
US quarts (US qt)	x 0.833	= Imperial quarts (Imp qt)
US quarts (US qt)	x 0.946	= Liters (l)
Liters (l)	x 1.057	= US quarts (US qt)
US gallons (US gal)	x 3.785	=Liters (l)
Liters (l)	x 0.264	= US gallons (US gal)
Pounds - force per square inch (psi)	x 6.895	= Kilopascals (kPa)
Kilopascals (kPa)	x 0.145	= Pounds - force per square inch (psi)
Kilopascals (kPa)	x 0.01	= Kilograms - force per square cm
Kilograms - force per square cm	x 98.1	= Kilopascals (kPa)
$\pi (3.14) \times R^2 \times H$ (height)		= Cylinder Volume

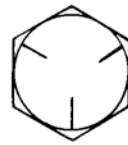
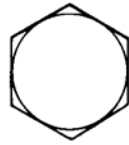
$^{\circ}\text{C to }^{\circ}\text{F: } \frac{9}{5}(\text{C} + 32) = \text{F}$

$^{\circ}\text{F to }^{\circ}\text{C: } \frac{5}{9}(\text{F} - 32) = \text{C}$

GENERAL INFORMATION

Standard Torque Specifications

The following torque specifications are to be used only as a general guideline. There are exceptions in the steering, suspension, and engine areas. Always consult the exploded views or each manual section for torque values of fasteners before using standard torque.



Bolt Size	Threads/In	Grade 2	Grade 5	Grade 8
Torque in. lbs. (Nm)				
#10	- 24	27 (3.1)	43 (5.0)	60 (6.9)
#10	- 32	31 (3.6)	49 (5.6)	68 (7.8)
Torque 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

6 x 1.0	72-78 In. lbs.
8 x 1.25	14-18 ft. lbs.
10 x 1.25	26-30 ft. lbs.

*To convert ft. lbs. to Nm multiply foot pounds by 1.382

*To convert Nm to ft. lbs. multiply Nm by .7376.

SPECIFIC TORQUE VALUES OF FASTENERS

Refer to exploded views in the appropriate section.

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 1/8-12	1 3/64
#10-24	24	1 1/4-7	1 7/64
#10-32	21	1 1/4-12	1 11/64
#12-24	17	1 1/2-6	1 11/32
#12-28	4.6mm	1 1/2-12	1 27/64
1/4-20	7	1 3/4-5	1 9/16
1/4-28	3	1 3/4-12	1 43/64
5/16-18	F	2-4 1/2	1 25/32
5/16-24	I	2-12	1 59/64
3/8-16	O	2 1/4-4 1/2	2 1/32
3/8-24	Q	2 1/2-4	2 1/4
7/16-14	U	2 3/4-4	2 1/2
7/16-20	25/64	3-4	2 3/4

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

Decimal Equivalents

1/64	.....	.0156	
1/32	.....	.0312	... 1 mm = .0394"
3/64	.....	.0469	
	1/16	.....	.0625
5/64	.....	.0781	... 2 mm = .0787"
	3/32	.....	.0938
7/64	.....	.1094	... 3 mm = .1181"
	1/8	.....	.1250
9/64	.....	.1406	
	5/32	.....	.1563
11/64	.....	.1719	... 4 mm = .1575"
	3/16	.....	.1875
13/64	.....	.2031	... 5 mm = .1969"
	7/32	.....	.2188
15/64	.....	.2344	... 6 mm = .2362"
	1/4	.....	.25
17/64	.....	.2656	... 7 mm = .2756"
	9/32	.....	.2813
19/64	.....	.2969	
	5/16	.....	.3125
21/64	.....	.3281	... 8 mm = .3150"
	11/32	.....	.3438
23/64	.....	.3594	... 9 mm = .3543"
	3/8	.....	.375
25/64	.....	.3906	... 10 mm = .3937"
	13/32	.....	.4063
27/64	.....	.4219	... 11 mm = .4331"
	7/16	.....	.4375
29/64	.....	.4531	
	15/32	.....	.4688
31/64	.....	.4844	... 12 mm = .4724"
	1/2	.....	.5
33/64	.....	.5156	... 13 mm = .5118
	17/32	.....	.5313
35/64	.....	.5469	... 14 mm = .5512"
	9/16	.....	.5625
37/64	.....	.5781	... 15 mm = .5906"
	19/32	.....	.5938
39/64	.....	.6094	
	5/8	.....	.625
41/64	.....	.6406	... 16 mm = .6299"
	21/32	.....	.6563
43/64	.....	.6719	... 17 mm = .6693"
	11/16	.....	.6875
45/64	.....	.7031	... 18 mm = .7087"
	23/32	.....	.7188
47/64	.....	.7344	... 19 mm = .7480"
	3/4	.....	.75
49/64	.....	.7656	
	25/32	.....	.7813
51/64	.....	.7969	... 20 mm = .7874"
	13/16	.....	.8125
53/64	.....	.8281	... 21 mm = .8268"
	27/32	.....	.8438
55/64	.....	.8594	... 22 mm = .8661"
	7/8	.....	.875
57/64	.....	.8906	... 23 mm = .9055"
	29/32	.....	.9063
59/64	.....	.9219	
	15/16	.....	.9375
61/64	.....	.9531	... 24 mm = .9449"
	31/32	.....	.9688
63/64	.....	.9844	... 25 mm = .9843
	1	.....	1.0

GENERAL INFORMATION

Glossary of Terms

ABDC: After bottom dead center.

ACV: Alternating current voltage.

Alternator: Electrical generator producing voltage alternating current.

ATDC: After top dead center.

BBDC: Before bottom dead center.

BDC: Bottom dead center.

BTDC: Before top dead center.

CC: Cubic centimeters.

Center Distance: Distance between center of crankshaft and center of driven clutch shaft.

Chain Pitch: Distance between chain link pins (No. 35 = 3/8" or 1 cm). Polaris measures chain length in number of pitches.

CI: Cubic inches.

Clutch Buttons: Plastic bushings which aid rotation of the movable sheave in the drive and driven clutch.

Clutch Offset: Drive and driven clutches are offset so that drive belt will stay nearly straight as it moves along the clutch face.

Clutch Weights: Three levers in the drive clutch which relative to their weight, profile and engine RPM cause the drive clutch to close and grip the drive belt.

Crankshaft Run-Out: Run-out or "bend" of crankshaft measured with a dial indicator while crankshaft is supported between centers on V blocks or resting in crankcase. Measure at various points especially at PTO.

DCV: Direct current voltage

CVT: Centrifugal Variable Transmission (Drive Clutch System)

DCV: Direct current voltage.

Dial Bore Gauge: A cylinder measuring instrument which uses a dial indicator. Good for showing taper and out-of-round in the cylinder bore.

Electrical Open: Open circuit. An electrical circuit which isn't complete.

Electrical Short: Short circuit. An electrical circuit which is completed before the current reaches the intended load. (i.e. a bare wire touching the chassis).

End Seals: Rubber seals at each end of the crankshaft.

Engagement RPM: Engine RPM at which the drive clutch engages to make contact with the drive belt.

ft.: Foot/feet.

Foot Pound: Ft. lb. A force of one pound at the end of a lever one foot in length, applied in a rotational direction.

g: Gram. Unit of weight in the metric system.

gal.: Gallon.

ID: Inside diameter.

in.: Inch/inches.

Inch Pound: In. lb. 12 in. lbs. = 1 ft. lb.

kg/cm²: Kilograms per square centimeter.

kg-m: Kilogram meters.

Kilogram/meter: A force of one kilogram at the end of a lever one meter in length, applied in a rotational direction.

l or ltr: Liter.

lbs/in²: Pounds per square inch.

Left or Right Side: Always referred to based on normal operating position of the driver.

m: Meter/meters.

Mag: Magneto.

Magnetic Induction: As a conductor (coil) is moved through a magnetic field, a voltage will be generated in the windings. Mechanical energy is converted to electrical energy in the stator.

mi.: Mile/miles.

mm: Millimeter. Unit of length in the metric system. 1 mm = approximately .040".

Nm: Newton meters.

OD: Outside diameter.

Ohm: The unit of electrical resistance opposing current flow.

oz.: Ounce/ounces.

Piston Clearance: Total distance between piston and cylinder wall.

psi.: Pounds per square inch.

PTO: Power take off.

PVT: Polaris Variable Transmission (Drive Clutch system)

qt.: Quart/quarts.

Regulator: Voltage regulator. Regulates battery charging system output at approx. 14.5 DCV as engine RPM increases.

Reservoir Tank: The fill tank in the liquid cooling system.

Resistance: In the mechanical sense, friction or load. In the electrical sense, ohms, resulting in energy conversion to heat.

RPM: Revolutions per minute.

Seized Piston: Galling of the sides of a piston. Usually there is a transfer of aluminum from the piston onto the cylinder wall.

Possible causes: 1) improper lubrication; 2) excessive temperatures; 3) insufficient piston clearance; 4) stuck piston rings.

Stator Plate: The plate mounted under the flywheel supporting the battery charging coils.

TDC: Top dead center. Piston's most outward travel from crankshaft.

Volt: The unit of measure for electrical pressure of electromotive force. Measured by a voltmeter in parallel with the circuit.

Watt: Unit of electrical power. Watts = amperes x volts.

WOT: Wide open throttle.

CHAPTER 2

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 Pure Polaris parts 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
<p>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.</p>

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 2.9.
▶ 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	-	Pre-Ride	-	Inspect; clean often; replace as needed
Coolant Level	-	Daily	-	Check level daily, change coolant every 2 years
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	25 H	Monthly	250 (400)	Check terminals; clean; test
▶ Front Gearcase Oil (Demand Drive Fluid LT)	25 H	Monthly	250 (400)	Inspect level; change yearly
▶ Rear Gearcase Oil (ATV Angle Drive Fluid)	25 H	Monthly	250 (400)	Inspect level; change yearly
▶ Transmission - Main (AGL Gearcase Lubricant)	25 H	Monthly	250 (400)	Inspect level; change yearly
▶ Transmission - Transfer (AGL Gearcase Lubricant)	25 H	Monthly	250 (400)	Inspect level; change yearly
▶ E Engine Breather Filter (if equipped)	25 H	Monthly	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 at one month

▶ 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.

50 - 300 Hour Maintenance Interval

Item	Maintenance Interval (whichever comes first)			Remarks
	Hours	Calendar	Miles (KM)	
■ E Throttle Cable / Throttle Pedal	50 H	6 M	300 (500)	Inspect; adjust; lubricate; replace if necessary
E Throttle Body Air Intake Ducts / Flange	50 H	6 M	300 (500)	Inspect ducts for proper sealing / air leaks
▶ General Lubrication	50 H	3 M	500 (800)	Lubricate all fittings, pivots, cables, etc.
▶ Shift Linkage	50 H	6 M	500 (800)	Inspect, lubricate, adjust
■ Steering	50 H	6 M	500 (800)	Lubricate
▶ Front Suspension	50 H	6 M	500 (800)	Lubricate
▶ Rear Suspension	50 H	6 M	500 (800)	Lubricate
▶ Cooling System	50 H	6 M	500 (800)	Inspect coolant strength seasonally; pressure test system yearly
■ E Fuel System	100 H	12 M	600 (1000)	Check for leaks at tank cap, fuel line, fuel pump, and fuel rail. Replace lines every two years.
■ E Spark Plug	100 H	12 M	600 (1000)	Inspect; replace as needed
▶ E Engine Oil & Filter Change	100 H	6 M	1000 (1600)	Perform a break-in oil change at 25 hours or one month / always replace oil filter when changing engine oil
▶ Drive Belt	100 H	12 M	1000 (1600)	Inspect; replace as needed
▶ Radiator	100 H	12 M	1000 (1600)	Inspect; clean external surfaces
▶ Cooling Hoses	100 H	12 M	1000 (1600)	Inspect for leaks
▶ Engine Assembly Mounts	100 H	12 M	1000 (1600)	Inspect, torque to specification
▶ Exhaust Muffler / Pipe	100 H	12 M	1000 (1600)	Inspect
▶ 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
■ Brake Fluid	200 H	24 M	2000 (3200)	Change every two years (DOT 4)
▶ Spark Arrestor	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.

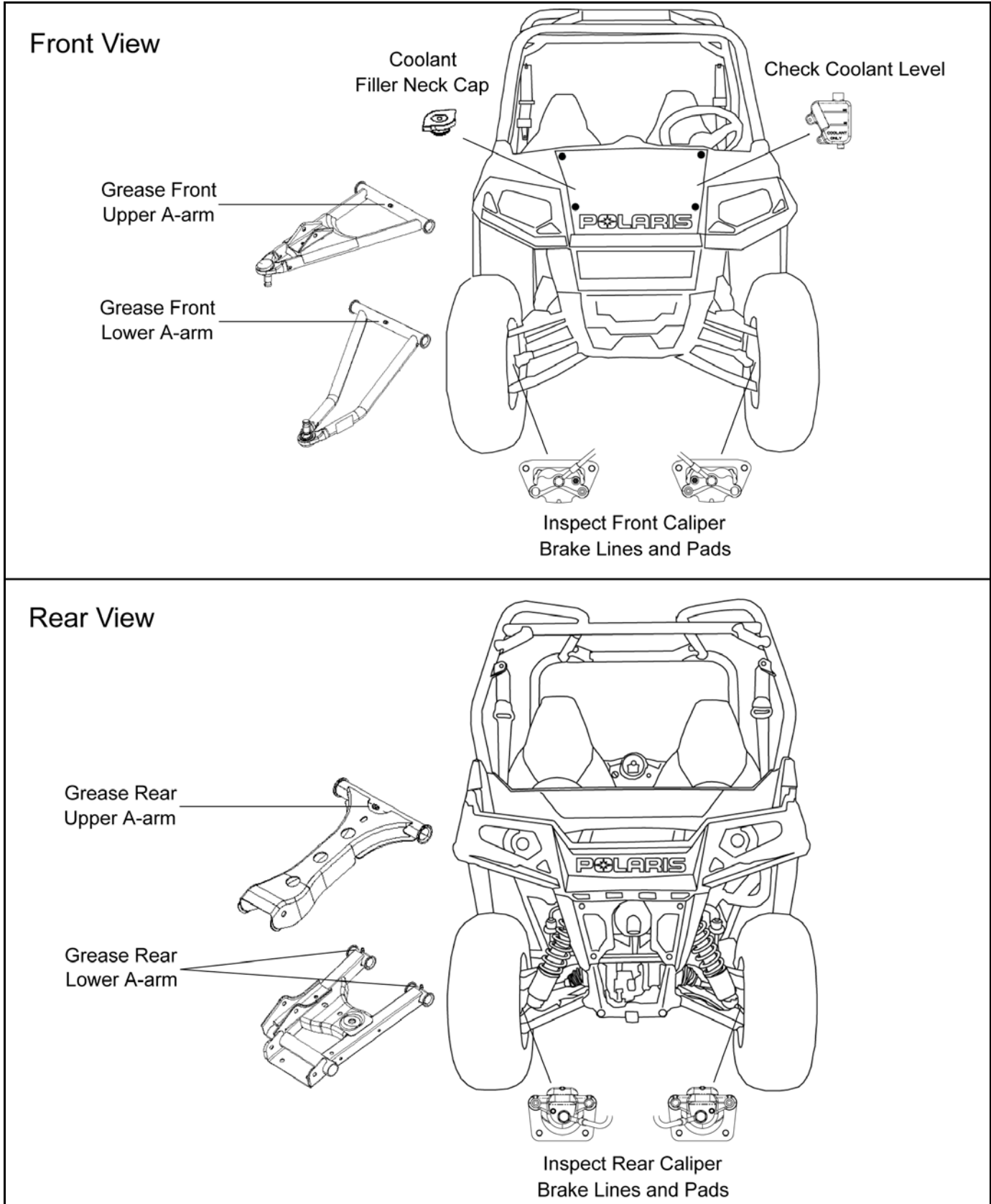
E Emission Control System Service (California)

■ Have an authorized Polaris dealer perform these services.

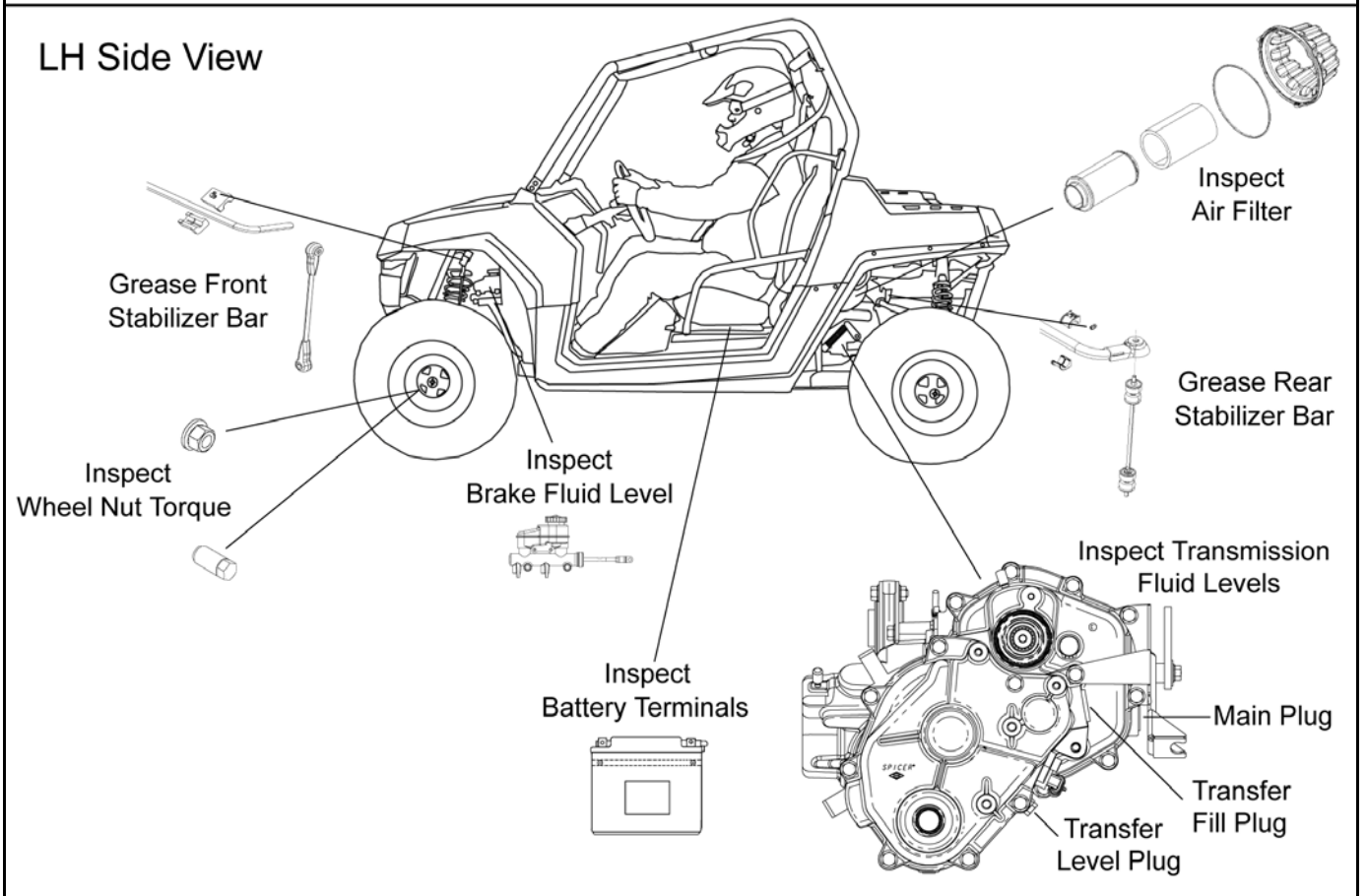
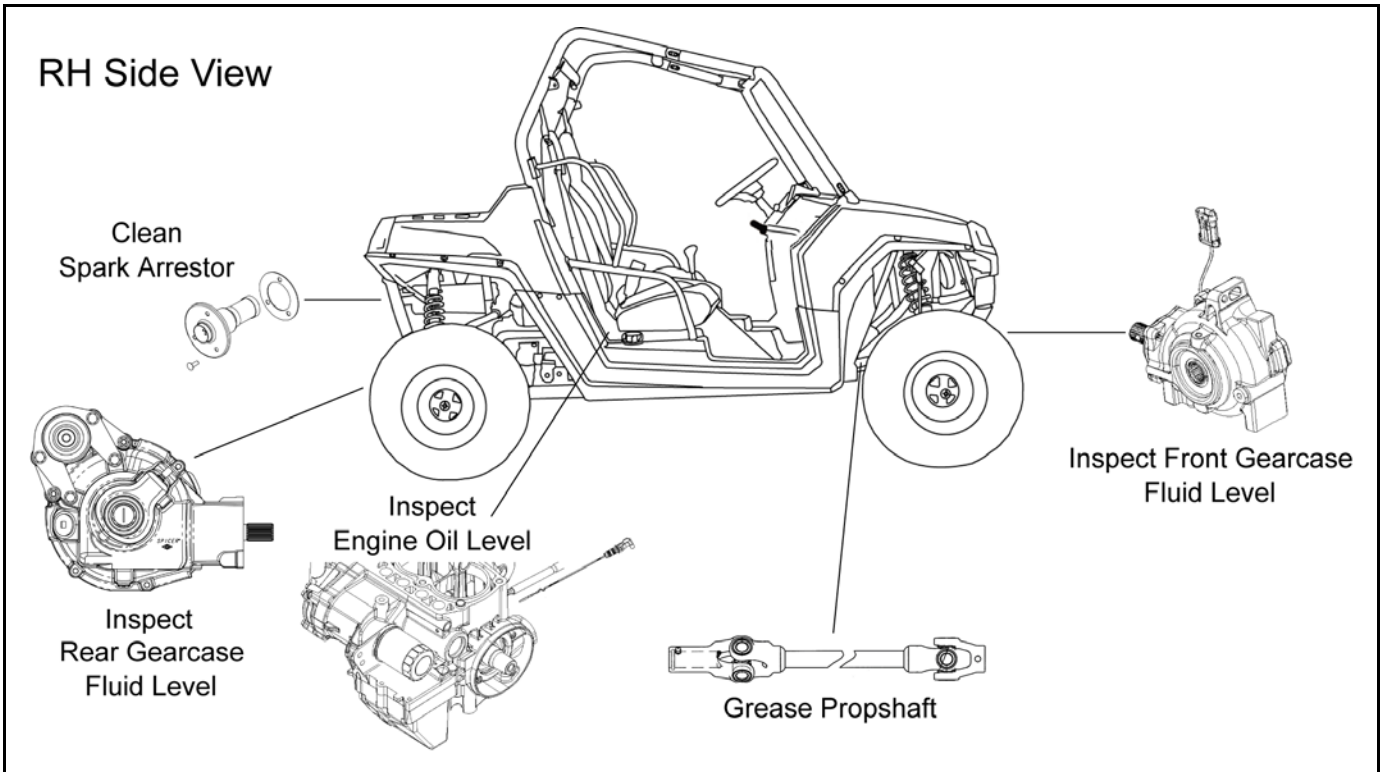
MAINTENANCE

COMPONENT INSPECTION / SERVICE LOCATIONS

Front and Rear View



RH and LH Side Views



MAINTENANCE

LUBRICANTS / SERVICE PRODUCTS

Polaris Lubricants, Maintenance and Service Products

Part No.	Description
Engine Lubricant	
2870791	Fogging Oil (12 oz. Aerosol)
2871281	Premium 4-Cycle Synthetic 0W-40 Engine Oil (Quart) (12 Count)
2871844	Premium 4-Cycle Synthetic 0W-40 Engine Oil (Gallon) (4 Count)
2871567	Premium 4-Cycle Synthetic 0W-40 Engine Oil (16 Gallon) (4-Cycle)
Gearcase / Transmission Lubricants	
2873602	AGL - Synthetic ATV Gearcase Lubricant (1 Qt.) (12 Count)
2873603	AGL - Synthetic ATV Gearcase Lubricant (1 Gal.) (4 Count)
2873604	AGL - Synthetic ATV Gearcase Lubricant (2.5 Gal.) (2 Count)
2871653	ATV Angle Drive Fluid (8 oz.) (12 Count)
2872276	ATV Angle Drive Fluid (2.5 Gal) (2 Count)
2871654	Premium Demand Drive Fluid LT (1 Qt.) (12 Count)
2870465	Oil Pump for 1 Gallon Jug
Grease / Specialized Lubricants	
2871312	Grease Gun Kit
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)
2871329	Dielectric Grease (Nyogel™)
Coolant	
2871323	60/40 Coolant (Gallon) (6 Count)
2871534	60/40 Coolant (Quart) (12 Count)

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

Part No.	Description
Additives / Sealants / Thread Locking Agents / Misc.	
2870585	Loctite™ Primer N, Aerosol, 25 g
2871956	Loctite™ Thread Sealant 565 (50 ml.) (6 Count)
2871949	Loctite™ Threadlock 242 (50 ml.) (10 Count)
2871950	Loctite™ Threadlock 242 (6 ml.) (12 Count)
2871951	Loctite™ Threadlock 262 (50 ml.) (10 Count)
2871952	Loctite™ Threadlock 262 (6 ml.) (12 Count)
2871953	Loctite™ Threadlock 271 (6 ml.) (12 Count)
2871954	Loctite™ Threadlock 271 (36 ml.) (6 Count)
2870584	Loctite™ 680-Retaining Compound (10 ml.)
2870587	Loctite™ 518 Gasket Eliminator / Flange Sealant (50 ml.) (10 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 (5oz.)
2872893	Engine Degreaser (12oz.) (12 Count)

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 REFERENCES

Item	Ref.	Rec. Lube / Fluid	Method	Frequency*
Engine Oil	Page 2.7	Premium 4-Cycle Synthetic 0W-40 (PN 2871281)	Add oil to proper level on dipstick.	Change after 25 hrs, and then 6 months or 100 hours thereafter; Change more often in extremely dirty conditions, or short trip cold weather operation.
Engine Coolant	Page 2.6	Polaris Antifreeze 60/40 (PN 2871534)	Fill recovery bottle between MAX and MIN lines.	Fill as required. Change coolant every 2 years.
Brake Fluid	Page 2.7	DOT 4 (PN 2872189)	Fill reservoir between MAX and MIN lines.	Fill as required. Change brake fluid every 2 years.
Transmission (Main Gearcase)	Page 2.7	AGL Synthetic Gearcase Lubricant (PN 2873602)	Add lube to bottom of fill plug threads. 24 oz. (710 ml)	Change annually***
Transmission (Transfer Case)	Page 2.7	AGL Synthetic Gearcase Lubricant (PN 2873602)	Add lube to bottom of level check plug threads. 14 oz. (414 ml)	Change annually***
Front Gearcase	Page 2.7	Premium Demand Drive Fluid LT (PN 2876251)	Drain completely and add specified quantity of lube. 6.75 oz. (200 ml)	Change annually***
Rear Gearcase	Page 2.7	ATV Angle Drive Fluid (PN 2871653)	Add lube to bottom of fill plug threads. 18 oz. (532 ml)	Change annually***
Prop Shaft	Page 2.7	Polaris Premium U-Joint Lube (PN 2871551)	Locate fitting and grease with grease gun.	Semi-annually**
Control Arm Pivot Bushings, FT / RR	Page 2.6	Polaris Premium All Season Grease (PN 2871423)	Locate grease fittings on the upper and lower A-arms of the front and rear suspension and grease with grease gun. (4) Front A-arms (6) Rear A-arms	Semi-annually**
Stabilizer Bar Bushings, FT / RR	Page 2.7	Polaris Premium All Season Grease (PN 2871423)	Locate grease fittings on the front and rear stabilizer bars and grease with grease gun. (2) Front Stabilizer Bar (2) Rear Stabilizer Bar	Semi-annually**

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

**Semi-annually or 50 hours of operation (refer to Maintenance Schedule for additional information)

***Annually or 100 hours of operation (refer to Maintenance Schedule for additional information)

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 to proper level
- All brakes - check operation and adjustment
- Throttle - check for free operation and closing
- Headlights/Taillights/Brakelights/Worklights - also check operation of all indicator lights and switches
- Engine stop 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 front and rear suspension components for wear or damage.

Frame, Nuts, Bolts, and Fasteners

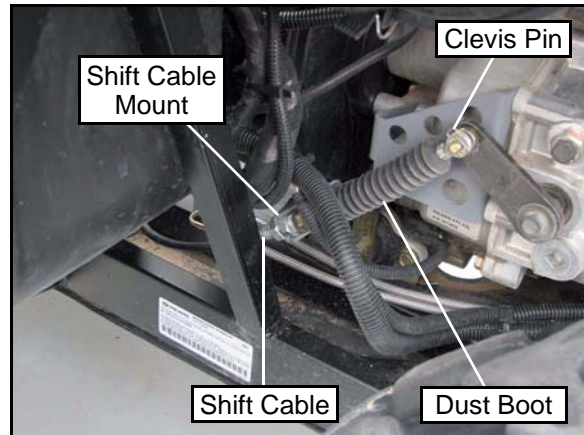
Periodically inspect the torque of all fasteners in accordance with the maintenance schedule. Check that all cotter pins are in place. Refer to specific fastener torques listed in each chapter.

Shift Cable Inspection / Adjustment

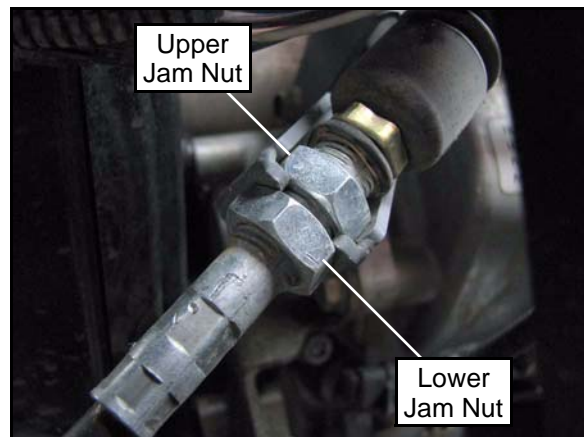
Shift cable adjustment may be necessary if symptoms include:

- No AWD or gear position display on instrument cluster
- Ratcheting noise on deceleration
- Inability to engage into a gear
- Excessive gear clash (noise)
- Gear selector moving out of desired range

1. Locate the shift cable in the rear LH wheel well area.



2. Inspect shift cable, clevis pin, pivot bushings, and dust boot. Replace if worn or damaged.
3. If adjustment is required, loosen the lower jam nut and pull the cable out of the mount to move the upper jam nut.



4. Adjust the shift cable so there is the same amount of cable travel when shifting slightly past the detents of HIGH (H) gear and PARK (P).
5. Thread the upper or lower jam nut as required to obtain proper cable adjustment.

NOTE: This procedure may require a few attempts to obtain the proper adjustment.

- Once the proper adjustment is obtained, place the shift cable and upper jam nut into the mount. Tighten the lower jam nut against the mount.
- Start engine and shift through all gears to ensure the shift cable is properly adjusted. If transmission still ratchets after cable adjustment, the transmission will require service.

- Be sure fuel line is routed properly.

IMPORTANT: Make sure line is not kinked or pinched.

- Replace fuel line every two years.

Fuel Pump / Fuel Filters

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

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.

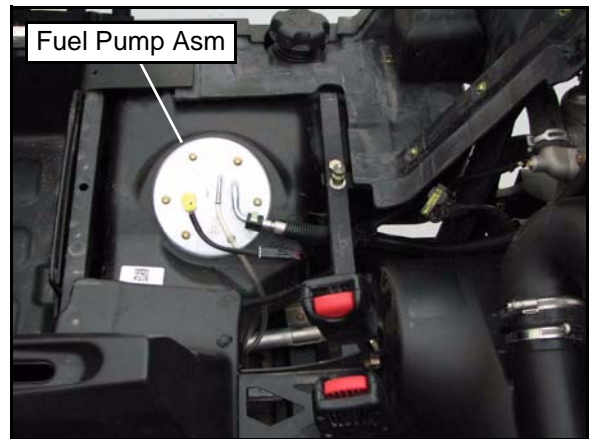
Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.

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.

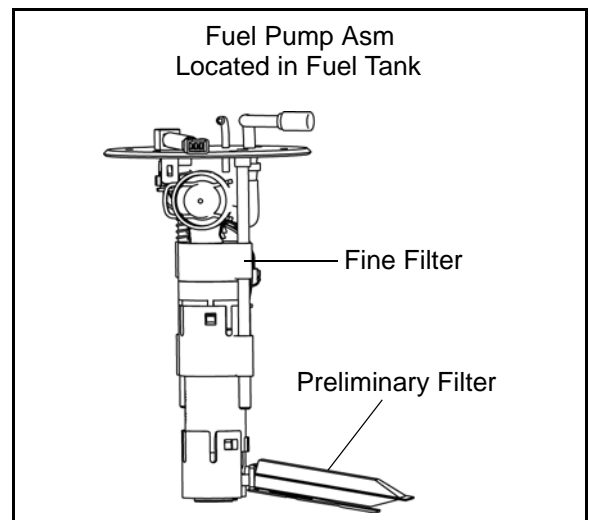
If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.

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

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



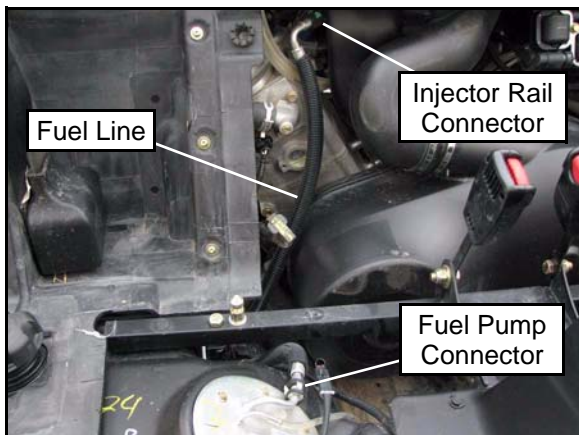
NOTE: Neither filter is serviceable.



NOTE: For all other information related to the EFI System, refer to Chapter 4.

Fuel Line

- Check the quick-connect fuel line for signs of wear, deterioration, damage or leakage. Replace if necessary.



Vent Lines

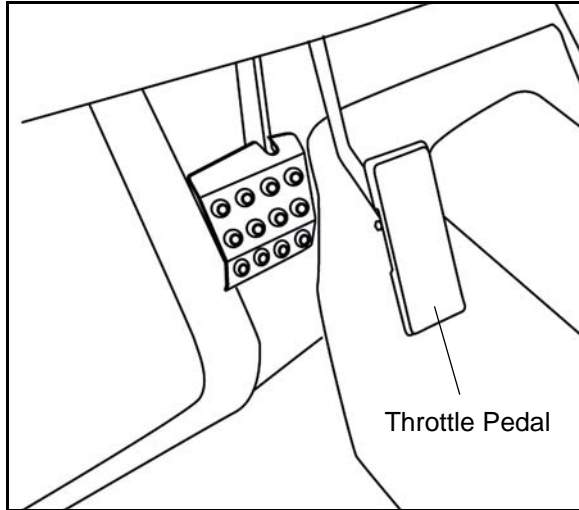
- Check fuel tank, front gear case, rear gear case and transmission vent lines for signs of wear, deterioration, damage or leakage. Replace every two years.
- Be sure vent lines are routed properly and secured with cable ties.

IMPORTANT: Ensure lines are not kinked or pinched.

MAINTENANCE

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. Also, the throttle may not open fully. If the throttle pedal has no play, the throttle 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

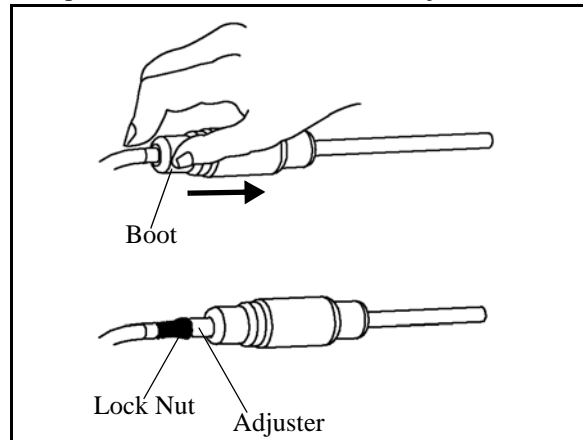
1. Place the transmission in the P (Park) position.
2. Start the engine, and warm it up thoroughly.
3. Measure the distance the throttle pedal moves before the engine begins to pick up speed. Free play should be 1/16" - 1/8" (1.5 - 3 mm).

Adjustment

1. Remove the seat and rear service panel.
2. Locate the throttle cable adjuster just above the PVT cover.



3. Squeeze the end of the rubber boot and slide it far enough to expose the end of the inline cable adjuster.



4. Loosen the adjuster lock nut.
5. Rotate the boot to turn the adjuster until 1/16" to 1/8" (1.5 - 3 mm) of freeplay is achieved at the throttle pedal.

NOTE: While adjusting, lightly flip the throttle pedal up and down.

6. Tighten the lock nut.
7. Squeeze the end of the rubber boot and slide it over the cable adjuster to its original position.

Air Filter Service

It is recommended that the air filter be inspected as part of pre-ride inspection. When riding in extremely dusty conditions, apply grease to the seal under the air box cap. In extremely dusty conditions, air filter replacement will be required more often.

The filter should be inspected using the following procedure.

Removal

1. The air box is located just above the rear LH wheel in the wheel well area.
2. Unlatch the (2) clips and remove the air box cap. Inspect the seal. It should adhere tightly to the cover and seal all the way around.

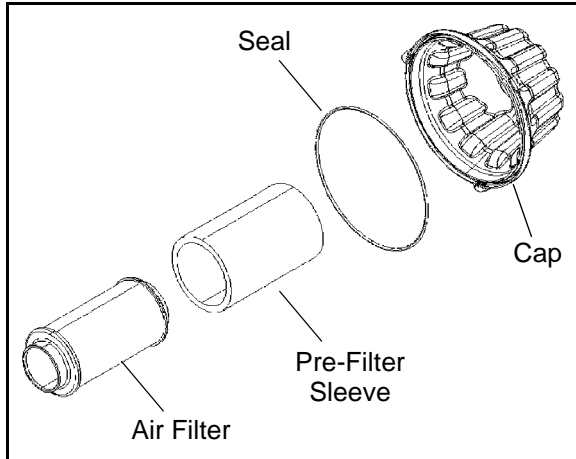


3. Remove air filter assembly and remove the pre-filter sleeve.
4. Inspect the main air filter element and replace if necessary.
Do not clean the main filter, the filter should be replaced.

NOTE: If the filter has been soaked with fuel or oil it must be replaced.

5. Wash pre-filter in warm soapy water and allow it to air dry.

NOTE: If unable to clean the pre-filter, replace it.

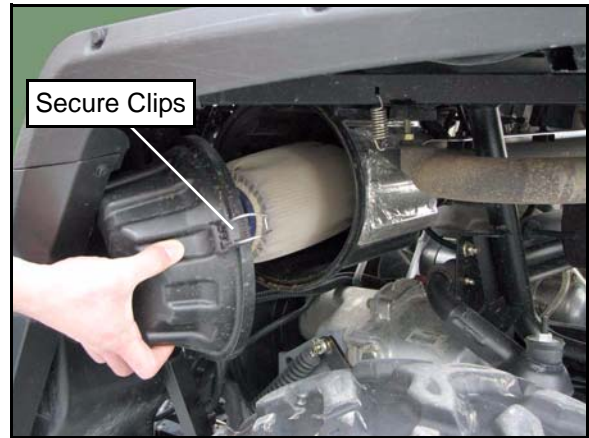


Installation

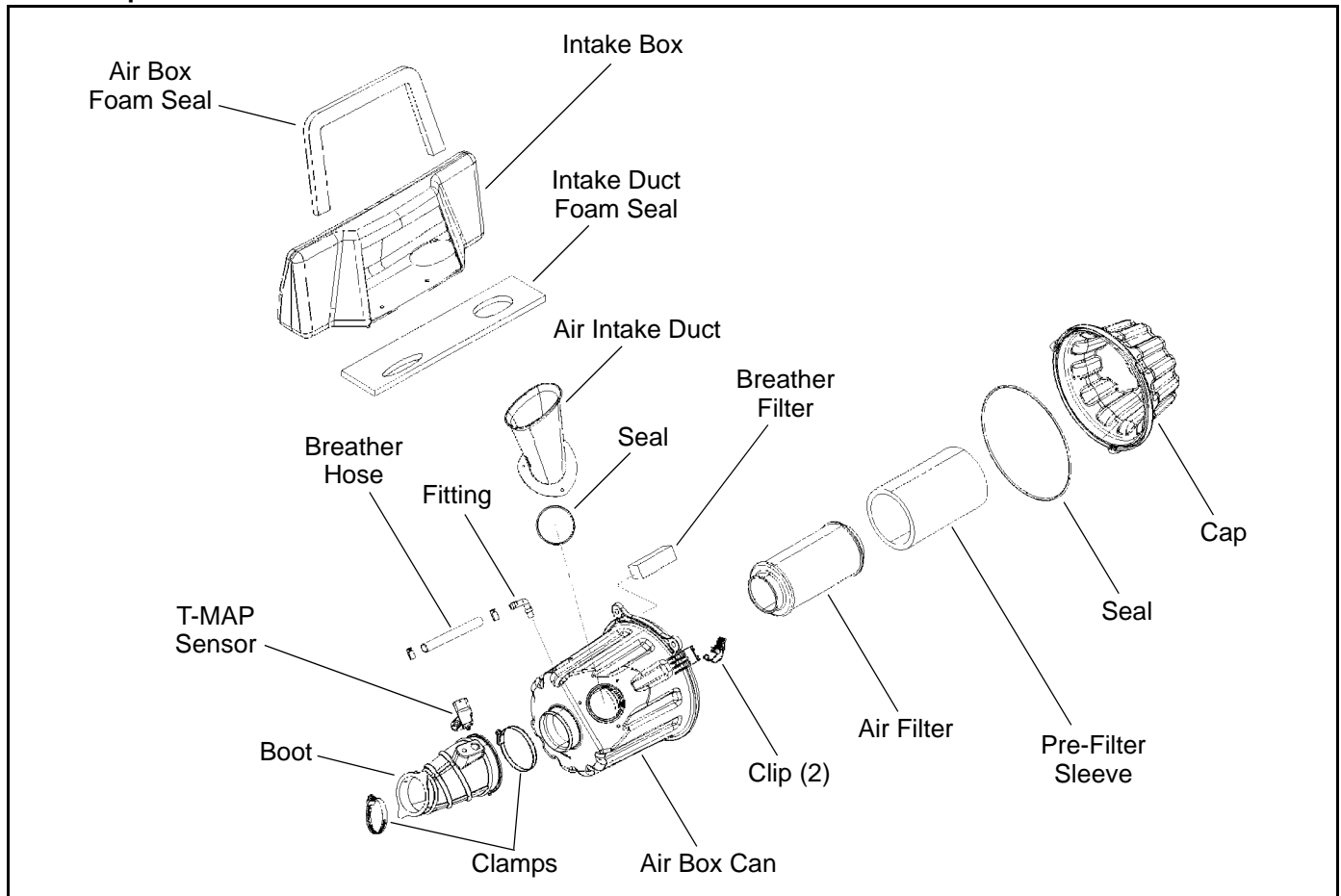
1. Clean the air box thoroughly.
2. Install a new or clean pre-filter over the main air filter element.
3. Reinstall the filter into the air box. Be sure the filter fits tightly in the air box.

NOTE: Apply a small amount of general purpose grease to the sealing edges of the filter and the air box cap seal before installing.

4. Install air box cap and secure with clips.



NOTE: Service more frequently if vehicle is operated in wet conditions or at high throttle openings for extended periods.

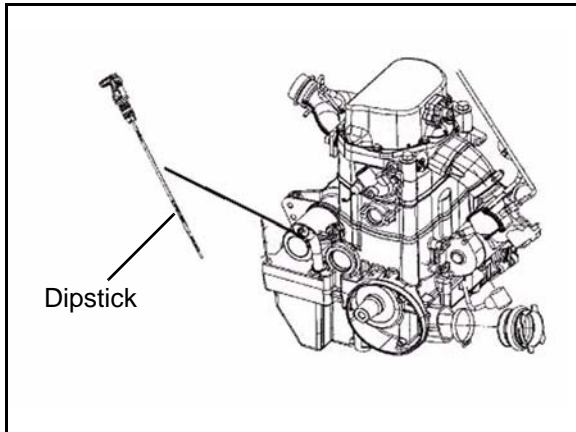


MAINTENANCE

ENGINE

Engine Oil Level

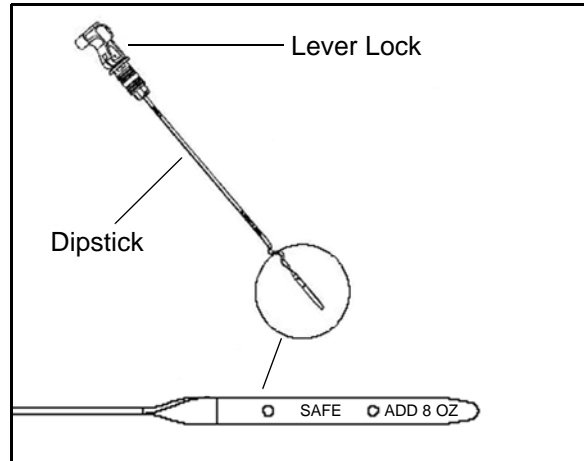
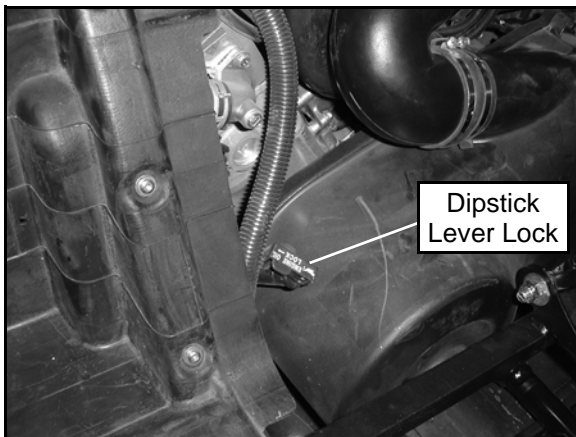
The twin cylinder engine is a wet-sump engine, meaning the oil is contained in the bottom of the crankcase. To check the oil level follow the procedure listed below.



1. Position vehicle on a level surface.
2. Place the transmission in PARK (P).
3. Be sure the machine has sat for awhile before removing the dipstick.

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

4. Remove both seats and the rear service panel.
5. Stop engine and lift the lever lock. Remove dipstick and wipe dry with a clean cloth.

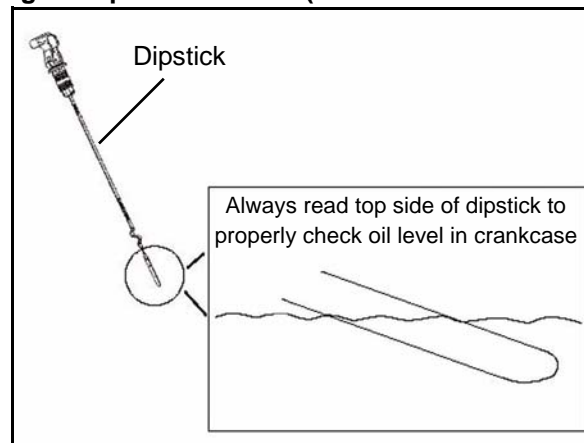


6. Reinstall the dipstick completely, but do not lock it.

NOTE: Make certain the dipstick is inserted all the way into the filler tube to keep the angle and depth of dipstick consistent.

7. Remove the dipstick and check the oil level. Maintain the oil level 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.

8. Reinstall the dipstick and seat the lever lock.

Engine Oil and Filter Service

Always change engine oil and filter at the intervals outlined in the Periodic Maintenance Chart. Always change the oil filter whenever changing the engine oil.

⚠ WARNING

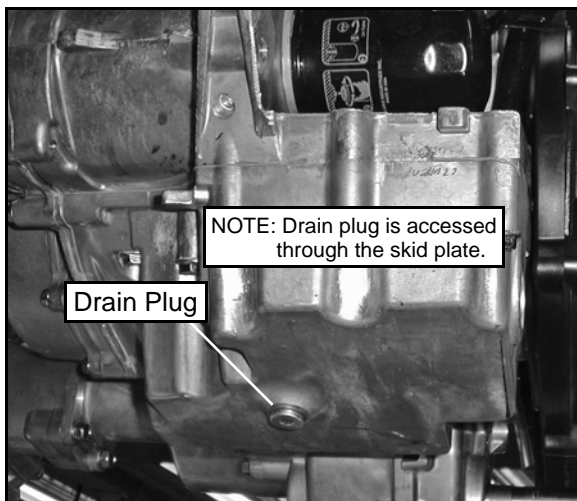
Personal injury can occur when handling used oil. Hot oil can cause burns or skin damage.

Recommended Engine Oil:

**Premium 4-Cycle Synthetic OW-40
(PN 2871281) (Quart)**

**Ambient Temperature Range
-40° F to 120° F**

1. Position vehicle on a level surface.
2. Place the transmission in PARK (P).
3. Start the engine. Allow it to idle for two to three minutes until warm. Stop the engine.
4. Clean area around oil drain plug at bottom of engine.



⚠ CAUTION

Oil may be hot. Do not allow hot oil to come into contact with skin, as serious burns may result.

5. Place a drain pan beneath engine crankcase and remove the drain plug.
6. Allow oil to drain completely.
7. Replace the sealing washer on drain plug.

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

8. Reinstall drain plug and torque to **16 ft. lbs. (22 Nm)**.
9. Remove both seats and rear service panel.
10. Place shop towels beneath oil filter. Using Oil Filter Wrench (PV-43527) and a 3/8" extension, turn the oil filter counter-clockwise to remove it.



11. Using a clean dry cloth, clean filter sealing surface on the crankcase.
12. Lubricate O-ring on new filter with a film of fresh engine oil. Check to make sure the O-ring is in good condition.
13. Install new filter and turn by hand until filter gasket contacts the sealing surface, then turn an additional 1/2 turn.
14. Remove dipstick and fill sump with 2 quarts (1.9 l) of Polaris Premium 4-Cycle Synthetic Oil (PN 2871281).

**Crankcase Drain Plug Torque:
16 ft. lbs. (22 Nm)**

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

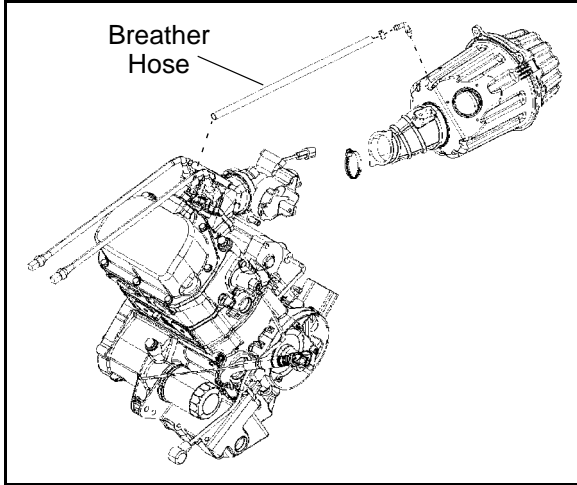
**Oil Filter Wrench:
(PV-43527)**

15. Verify the transmission is still positioned in PARK (P).
16. Start the engine and let it idle for one to two minutes.
17. Stop the engine and inspect for leaks.
18. Re-check the oil level on the dipstick and add oil as necessary to bring the level to the upper mark on the dipstick.
19. Dispose of used oil and oil filter properly.

MAINTENANCE

Engine Breather Hose Inspection

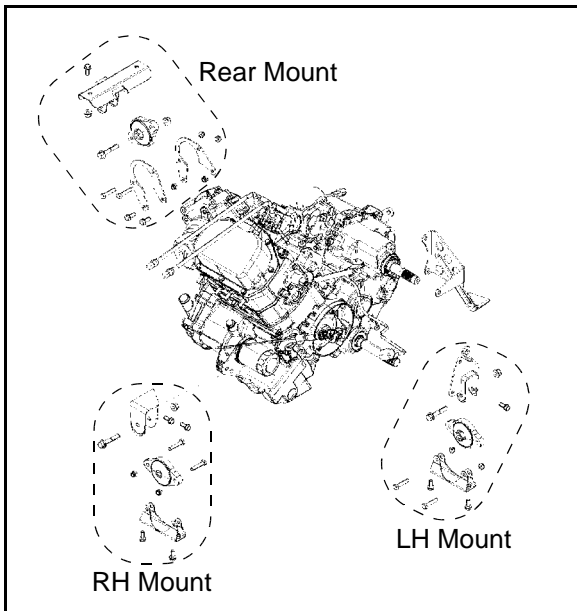
The engine is equipped with a breather hose. Inspect the breather hose for possible kinks or wear. The hose is form fitted for a proper fit. Follow the breather hose from the side of the airbox to the engine valve cover.



NOTE: Make sure line is not kinked or pinched.

Engine and Transmission Mount Locations

Periodically inspect engine and transmission mounts for cracks or damage.



Compression and Leakdown Test

NOTE: This engine does NOT have decompression components. Compression readings will vary in proportion to cranking speed during the test.

A smooth idle generally indicates good compression. Low engine compression is rarely a factor in running condition problems above idle speed.

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: 150-200 PSI**

**Cylinder Leakdown
Service Limit 15%**

(Inspect for cause if test exceeds 15%)

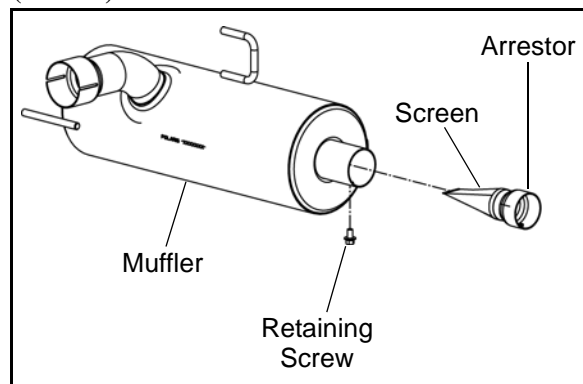
Exhaust - Spark Arrestor

! WARNING

Do not clean spark arrestor immediately after the engine has been run, as the exhaust system becomes very hot. Serious burns could result from contact with the exhaust components. Allow components to cool sufficiently before proceeding. Wear eye protection and gloves. Never run the engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness or death in a very short time.

Periodically clean the spark arrestor to remove accumulated carbon.

1. Remove the retaining screw and remove the arrestor from the end of the muffler.
2. Use a non-synthetic brush to clean the arrestor screen. A synthetic brush may melt if components are warm.
3. Inspect the screen for wear and damage. Replace if needed.
4. Reinstall the arrestor and torque the screw to **5-7 ft. lbs. (7-9 Nm)**.



TRANSMISSION AND GEARCASES

Transmission / Gearcase Specification Chart

GEARCASE	LUBRICANT	CAPACITY	FILL PLUG TORQUE	DRAIN / LEVEL CHECK PLUG TORQUE
Transmission (Main Gearcase)	AGL - Synthetic ATV Gearcase Lubricant	24 oz. (710 ml)	40-50 ft. lbs. (54-68 Nm)	30-45 in. lbs. (3-5 Nm)
Transmission (Transfer Case)	AGL - Synthetic ATV Gearcase Lubricant	14 oz. (414 ml)	40-50 ft. lbs. (54-68 Nm)	30-45 in. lbs. (3-5 Nm)
Front Gearcase	Premium Demand Drive Fluid LT	6.75 oz. (200 ml)	8-10 ft. lbs. (11-14 Nm)	8-10 ft. lbs. (11-14 Nm)
Rear Gearcase	ATV Angle Drive Fluid	18 oz. (532 ml)	40-50 ft. lbs. (54-68 Nm)	30-45 in. lbs. (3-5 Nm)

Transmission Lubrication

NOTE: It is important to follow the transmission and gearcase maintenance intervals described in the Periodic Maintenance Chart. Regular fluid level inspections on these components should be performed as well.

Transmission Specifications

Specified Lubricant:
AGL Synthetic Gearcase Lubricant
(PN 2873602)

Approximate Capacity at Change:
Main Gearcase - 24 oz. (710 ml)
Transfer Case - 14 oz. (414 ml)

Drain / Level Plug Torque:
30-45 in. lbs. (3-5 Nm)

Fill Plug Torque:
40-50 ft. lbs. (54-68 Nm)

Transfer Case - Lubricant Level Check:

1. Position vehicle on a level surface.
2. Remove the fill plug.
3. Remove the level check plug.
4. Add the recommended fluid through the fill plug hole until it begins to flow out the level check plug hole.



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

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

5. Reinstall the level check plug and torque to **30-45 in. lbs. (3-5 Nm)**.
6. Reinstall the fill plug and torque to **40-50 ft. lbs. (54-68 Nm)**.

MAINTENANCE

Main Gearcase - Lubricant Level Check:

The fill plug is located on the side of the gearcase just below the shift lever bell crank. Maintain the fluid level even with the bottom of the fill plug hole.

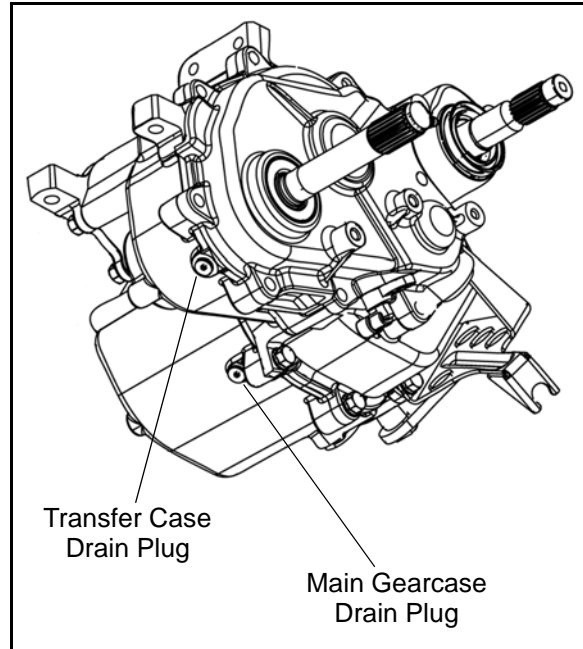
1. Position vehicle on a level surface.
2. Remove the fill plug.
3. Check the fluid level.



4. If fluid level is not at fill plug hole, add the recommended fluid as needed.
5. Reinstall the fill plug and torque to **40-50 ft. lbs. (54-68 Nm)**.

Transmission Lubricant Change:

The lubricant change procedure is relatively the same for the main gearcase and the transfer case. To minimize confusion, perform the lubricant change on only one gearcase at a time. Access the drain plugs through the drain holes in the skid plate.



Transfer Case Lubricant Change:

1. Remove the fill plug and the level check plug (refer to "Transfer Case - Lubricant Level Check").
2. Place a drain pan under the transfer case drain plug.
3. Remove the drain plug and allow to drain completely.
4. Clean the drain plug.
5. Reinstall the drain plug with a new o-ring and torque to **30-45 in. lbs. (3-5 Nm)**.
6. Add the recommended fluid through the fill plug hole until it begins to flow out the check plug hole. Do not overfill.
7. Reinstall the level check plug and torque to **30-45 in. lbs. (3-5 Nm)**.
8. Reinstall the fill plug and torque to **40-50 ft. lbs. (54-68 Nm)**.

Main Gearcase Lubricant Change:

9. Remove the fill plug (refer to "Main Gearcase - Lubricant Level Check").
10. Place a drain pan under the main gearcase drain plug.
11. Remove the drain plug and allow to drain completely.
12. Clean the drain plug.
13. Reinstall the drain plug with a new o-ring and torque to **30-45 in. lbs. (3-5 Nm)**.
14. Add the recommended fluid through the fill plug hole. Maintain the fluid level at the bottom of the fill plug hole when filling the Main Gearcase. Do not overfill.
15. Reinstall the fill plug and torque to **40-50 ft. lbs. (54-68 Nm)**.
16. Check for leaks. Discard the used lubricant properly.

Front Gearcase Lubrication

The front 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 fluid.
- Check vent hose to be sure it is routed properly and unobstructed.

Front Gearcase Specifications

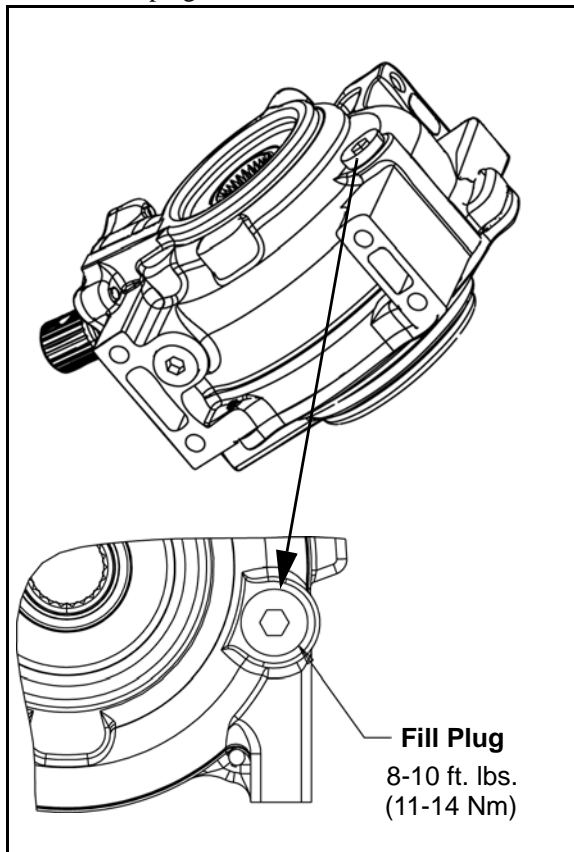
Specified Lubricant:
Premium Demand Drive Fluid LT
(PN 2876251)

Capacity: 6.75 oz. (200 ml)

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

Lubricant Level Check:

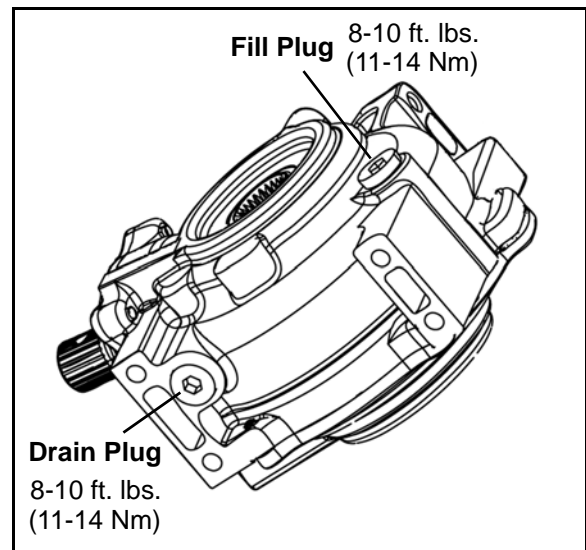
The fill plug is located on the bottom right side of the front gearcase. Maintain the lubricant level even with the bottom threads of the fill plug hole.



1. Position vehicle on a level surface.
2. Remove the fill plug and check the fluid level.
3. Add the recommended fluid as needed.
4. Reinstall the fill plug and torque to **8-10 ft. lbs. (11-14 Nm)**.

Lubricant Change:

The drain plug is located on the bottom of the gearcase.



1. Remove the fill plug.
2. Place a drain pan under the drain plug.
3. Remove the drain plug and allow fluid to drain completely.
4. Clean the drain plug. Inspect the O-ring and replace if damaged.
5. Reinstall the drain plug; torque to **8-10 ft. lbs. (11-14 Nm)**.
6. Add the recommended fluid. Maintain the lubricant level even with the bottom threads of the fill plug hole.
7. Reinstall the fill plug; torque to **8-10 ft. lbs. (11-14 Nm)**.
8. Check for leaks. Discard the used lubricant properly.

MAINTENANCE

Rear Gearcase Lubrication

Rear Gearcase Specifications

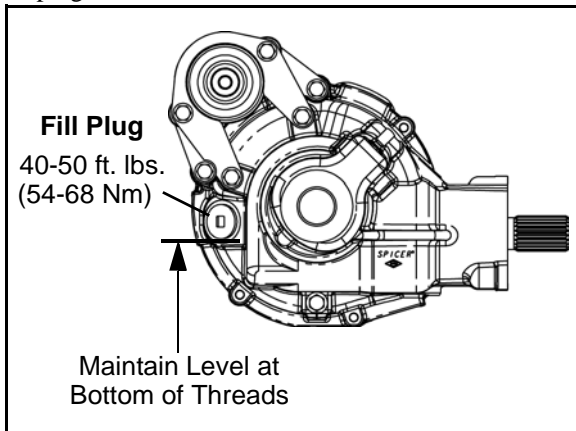
Specified Lubricant:
ATV Angle Drive Fluid (PN 2871653)

Capacity: 18 oz. (532 ml)

Fill Plug Torque: 40-50 ft. lbs. (54-68 Nm)
Drain Plug Torque: 30-45 in. lbs. (3-5 Nm)

Lubricant Level Check:

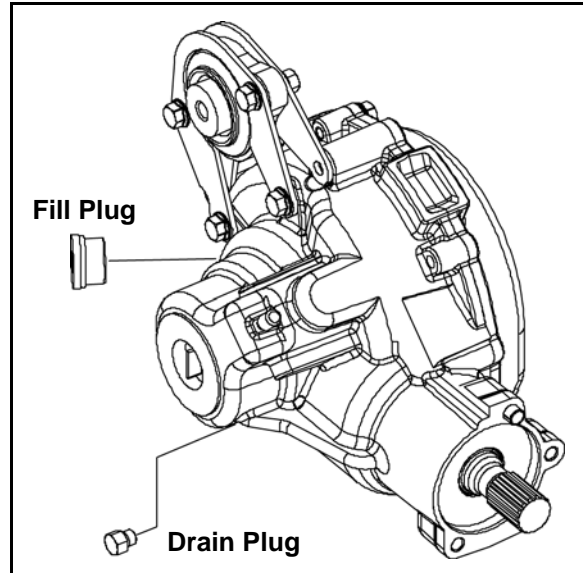
The fill plug is located on the right side of the rear gearcase. Maintain the fluid level even with the bottom of the threads of the fill plug hole.



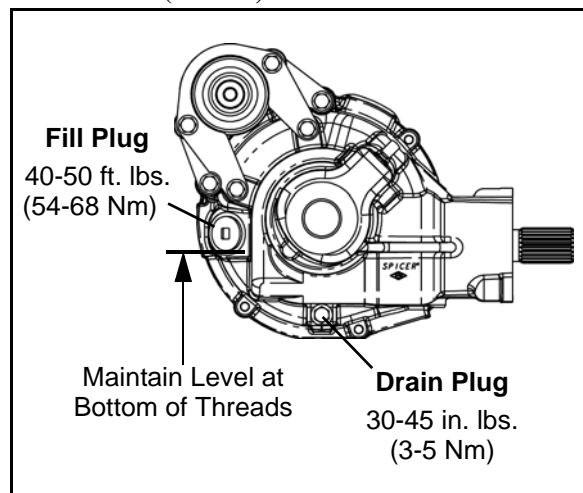
1. Position the vehicle on a level surface.
2. Remove the fill plug and check the fluid level. The lubricant level should be even with the bottom of the threads of the fill plug hole.
3. Add the recommended lubricant as needed.
4. Reinstall the fill plug and torque to **40-50 ft. lbs. (54-68 Nm)**

Lubricant Change:

The drain plug is located on the bottom right side of the rear gearcase.



1. Remove the fill plug.
2. Place a drain pan under the drain plug.
3. Remove the drain plug and allow the lubricant to drain completely.
4. Clean the drain plug.
5. Reinstall the drain plug with new O-ring and torque to **30-45 in. lbs. (3-5 Nm)**.



6. Add the recommended lubricant. Maintain the fluid level even with the bottom threads of the fill plug hole.
7. Reinstall the fill plug and torque to **40-50 ft. lbs. (54-68 Nm)**.
8. Check for leaks. Discard used lubricant properly.

COOLING SYSTEM

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.

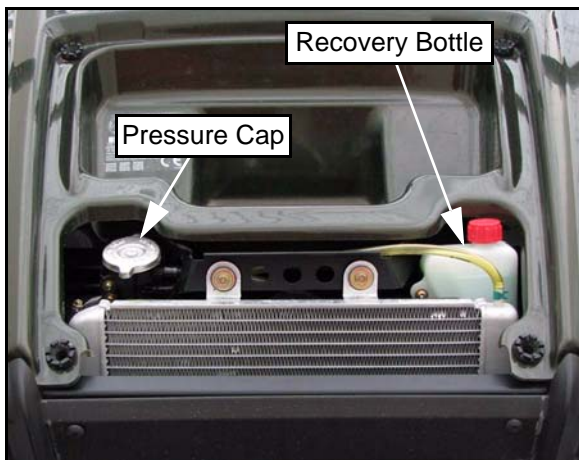
NOTE: Some coolant level drop on new machines is normal as the system is purging itself of trapped air. Observe coolant levels often during the break-in period.

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

Polaris Premium 60/40 is already premixed and ready to use. Do not dilute with water.

Coolant Level Inspection

The pressure cap and recovery bottle are located under the front hood of the vehicle. The coolant level must be maintained between the minimum and maximum levels indicated on the recovery bottle.




With the engine at operating temperature, the coolant level should be between the upper and lower marks on the coolant recovery bottle. If not, perform the following procedure.

1. Position the vehicle on a level surface.
2. Remove the hood by lifting it straight up from the front cab to allow the inserts to disengage from the grommets.
3. View the coolant level in the recovery bottle.

4. If the coolant level is below the MIN line, inspect the coolant level in the radiator.

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.

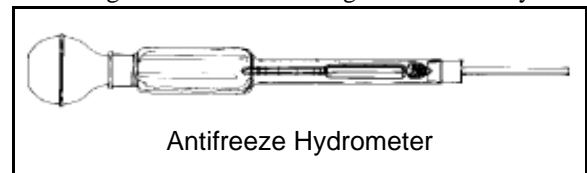
5. Remove the pressure cap. Using a funnel, add coolant to the top of the filler neck.
6. Reinstall the pressure cap.

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

7. Remove recovery bottle cap and add coolant using a funnel.
8. Fill recovery bottle to MAX level with Polaris 60/40 premix Anti Freeze/Coolant or 50/50 or 60/40 mixture of antifreeze and distilled water as required for freeze protection in your area.
9. Reinstall the recovery bottle cap.
10. If coolant was required, start engine and check for leaks. Make sure radiator fins are clean to prevent overheating.

Coolant Strength / Type

Test the strength of the coolant using an antifreeze hydrometer.



- A 50/50 or 60/40 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.

Polaris 60/40 Anti-Freeze / Coolant
(PN 2871323)

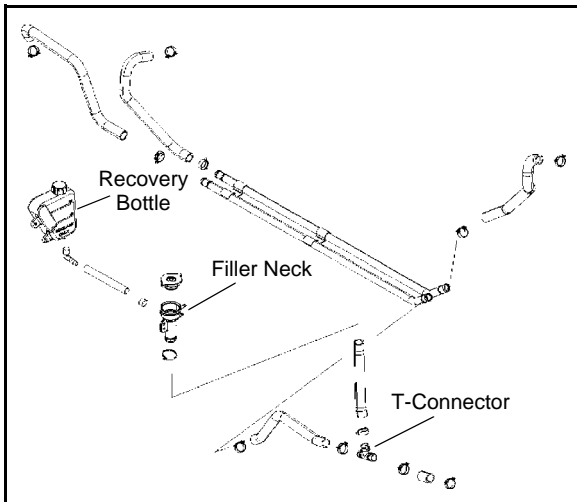
MAINTENANCE

Cooling System Pressure Test

Refer to Chapter 3 for cooling system pressure test procedure.

Cooling System Hoses

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



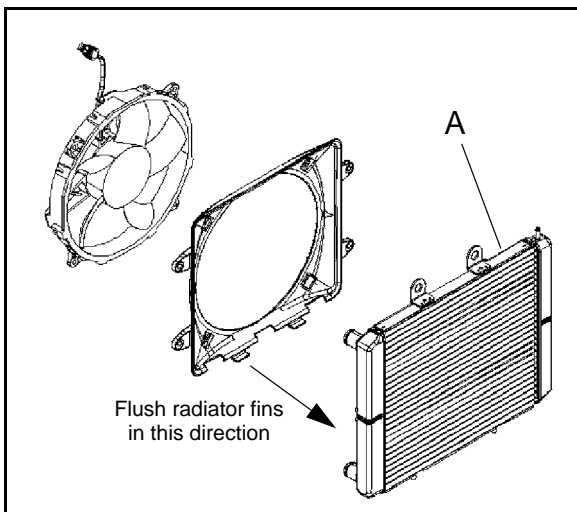
2. Check tightness of all hose clamps.

CAUTION

Do not over-tighten hose clamps at radiator, or radiator fitting may distort, causing a restriction to coolant flow. Radiator hose clamp torque is 36 in. lbs. (4 Nm).

Radiator

1. Check radiator (A) 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 / Radiator Removal

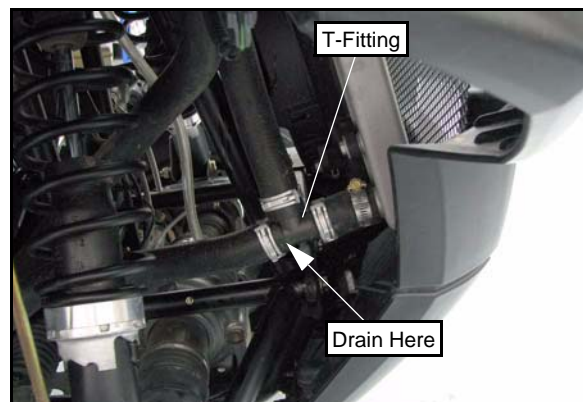
Coolant Drain

1. Remove the front hood.

WARNING

Never drain the coolant when the engine and radiator are warm or hot. Hot coolant can cause severe burns. Allow engine and radiator to cool.

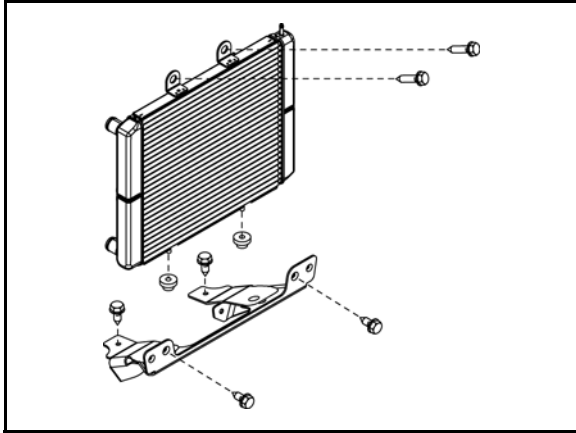
2. Slowly remove the pressure cap to relieve any cooling system pressure.
3. Place a suitable drain pan underneath the T-fitting on the front RH side of the vehicle.
4. Drain the coolant from the radiator by removing the lower engine inlet hose from the T-fitting. Properly dispose of the coolant.



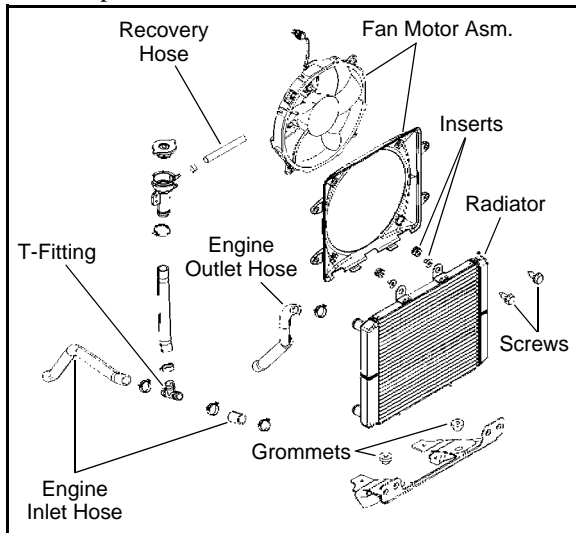
5. Allow coolant to completely drain.

Radiator Removal

1. Remove the front bumper (see Chapter 5).
2. Remove the upper engine outlet hose and recovery hose from the top of the radiator.
3. Remove the (2) upper radiator retaining bolts and the (4) bolts retaining the lower radiator mount bracket. Remove the bracket from the frame.



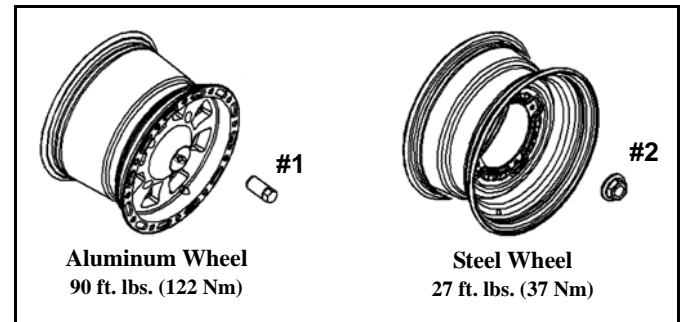
4. Disconnect the fan motor and remove the radiator from the vehicle. Take care not to damage the cooling fins.
5. Reverse procedure for installation.



FINAL DRIVE / WHEEL AND TIRE

Wheel, Hub, and Spindle Torque Table

Item	Nut Type	Specification
Aluminum Wheels (Cast)	Lug Nut #1	90 ft. lbs. (122 Nm)
Steel Wheels (Black / Camo)	Flange Nut #2	27 ft. lbs. (37 Nm)
Hub Retaining Nuts (Front & Rear)	-	80 ft. lbs. (108 Nm)



NOTE: Do not lubricate the stud or the lug nut.

Wheel Removal

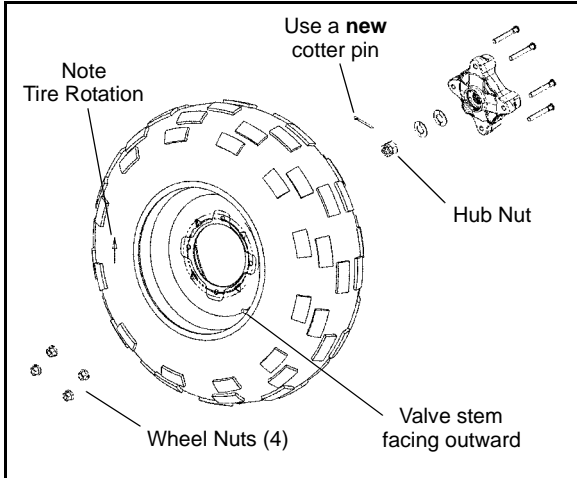
1. Position the vehicle on a level surface.
2. Place the transmission in PARK (P) and stop the engine.
3. Loosen the wheel nuts slightly. If wheel hub removal is required, remove the cotter pin and loosen the hub nut slightly.
4. Elevate the appropriate side of the vehicle by placing a suitable stand under the frame.
5. Remove the wheel nuts and remove the wheel.
6. If hub removal is required, remove the hub nut and washers.

Wheel Installation

1. Verify the transmission is still in PARK (P).
2. Install the wheel hub, washers, and hub nut, if previously removed.
3. 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.
4. Attach the wheel nuts and finger tighten them.

MAINTENANCE

- Carefully lower the vehicle to the ground.
- Torque the wheel nuts and/or hub nut to the proper torque specification listed in the torque table at the beginning of this section.
- If hub nut was removed, install a new cotter pin after the hub nut has been tightened.



CAUTION

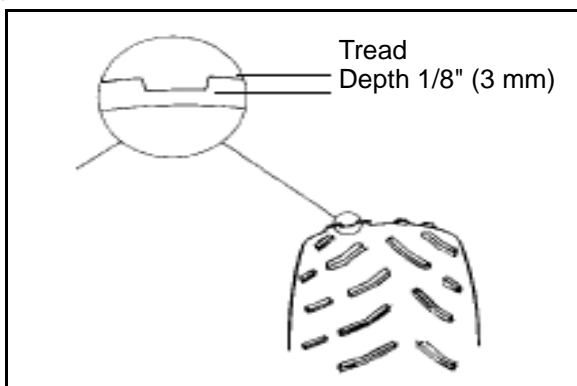
If wheels are improperly installed it could affect vehicle handling and tire wear. On vehicles with tapered rear wheel nuts, make sure tapered end of nut goes into taper on wheel.

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

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



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 cm) or less.

Tire Pressure

CAUTION

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

Tire Pressure Inspection (Cold)

Front	Rear
8 psi (55 kPa)	8 (55 kPa)

Drive Shaft Boot Inspection

Inspect the front and rear drive shaft boots for damage, tears, wear, or leaking grease. If the rubber boots exhibit any of these symptoms, replace the boot(s). Refer to Chapter 7 for drive shaft boot replacement.



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

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.

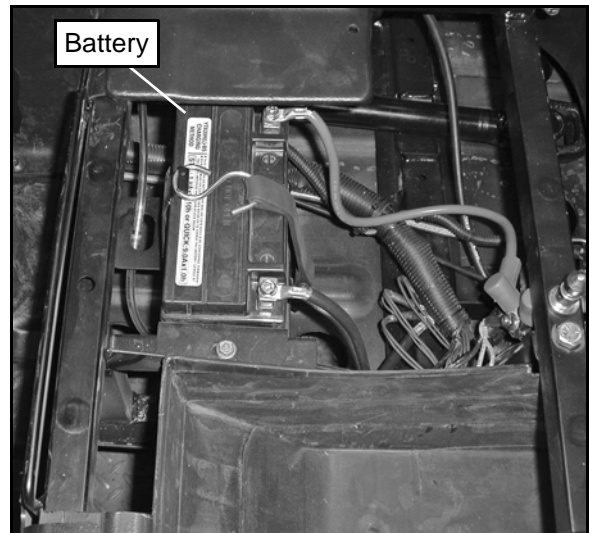
Eyes: Flush with water for 15 minutes and get prompt medical attention.

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 Removal

1. Remove the driver's seat to access the battery.



2. Disconnect the black (negative) battery cable.
3. Disconnect the red (positive) battery cable.
4. Remove the rubber strap and lift the battery out of the vehicle.

⚠ CAUTION

To reduce the chance of sparks: Whenever removing the battery, disconnect the black (negative) cable first. When reinstalling the battery, install the black (negative) cable last.

Battery Installation

IMPORTANT: 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 procedure before installing the battery.

1. Ensure the battery is fully charged.
2. Place the battery in the battery holder and secure with rubber strap.
3. Coat the terminals with dielectric grease or petroleum jelly.
4. Connect and tighten the red (positive) cable first.
5. Connect and tighten the black (negative) cable last.
6. Verify that cables are properly routed and reinstall the driver's seat.

MAINTENANCE

Battery Off Season 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 (Sealed Battery)

The sealed battery is already filled with electrolyte and has been sealed at the factory. Never pry the sealing strip off or add any type of fluid to this battery.

The single most important thing about maintaining a sealed battery is to keep it fully charged. Since the battery is sealed and the sealing strip cannot be removed, you must use a voltmeter or multimeter to measure the DC voltage at the battery terminals.

1. Check the battery voltage with a voltmeter or multimeter. The battery voltage should read 12.8 VDC or higher.
2. If the voltage is less than 12.8 volts, charge the battery at 1.2 amps or less until battery voltage is 12.8 VDC or greater.

NOTE: When using an automatic charger, refer to the charger manufacturer's instructions for battery charging directions. When using a constant current charger, follow the guidelines in the following table:

STATE OF CHARGE	VOLTAGE	ACTION	CHARGE TIME
100%	12.8 - 13 VDC	None, check again in 3 months	None Required
75% - 100%	12.5 - 12.8 VDC	May need slight charge, check again in 3 months	3 - 6 hrs
50% - 75%	12.0 - 12.5 VDC	Needs Charge	5 - 11 hrs
25% - 50%	11.5 - 12.0 VDC	Needs Charge	At least 13 hrs, verify state of charge
0% - 25%	11.5 VDC or less	Needs Charge with desulfating charger	At least 20 hrs

Spark Plug Service

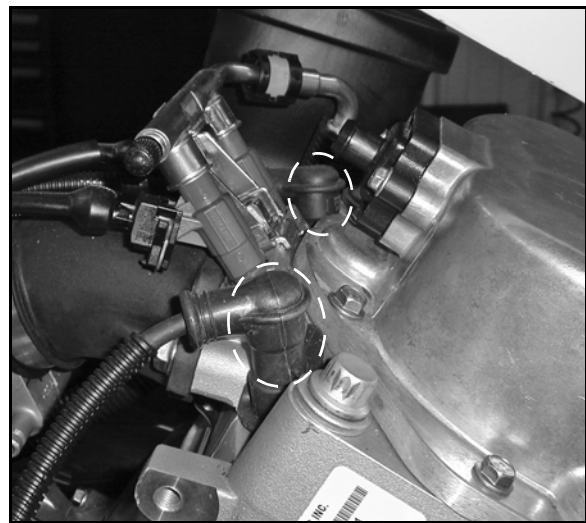
1. Remove both driver and passenger seats.
2. Remove the rear service panel.



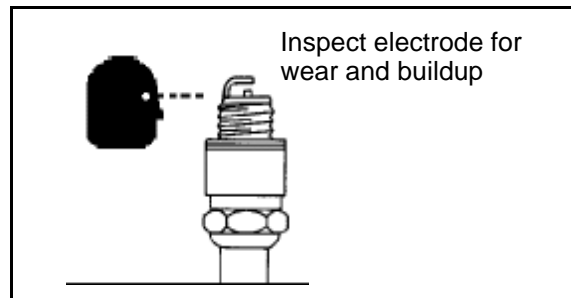
WARNING

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

3. The PTO side spark plug can be accessed with the service panel removed. The MAG side spark plug can be accessed through the rear RH wheel well area.
4. Remove both spark plug caps.

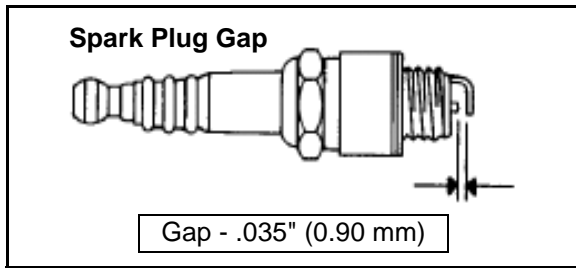


5. Clean plug area so no dirt and debris can fall into engine when plugs are removed.
6. Remove spark plugs.
7. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.



8. Clean with electrical contact cleaner or a glass bead spark plug cleaner only. **CAUTION:** A wire brush or coated abrasive should not be used.

- Measure gap with a wire gauge. Refer to specifications in the following illustration for proper spark plug type and gap. Adjust gap if necessary by carefully bending the side electrode.



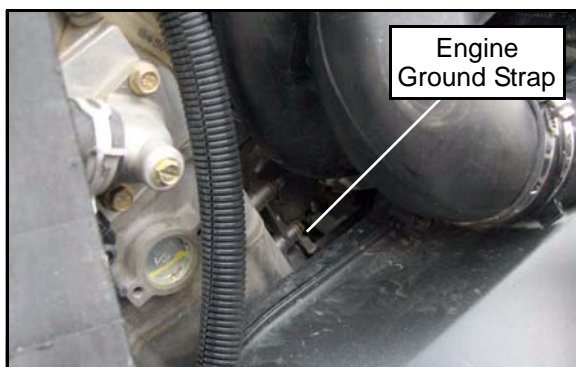
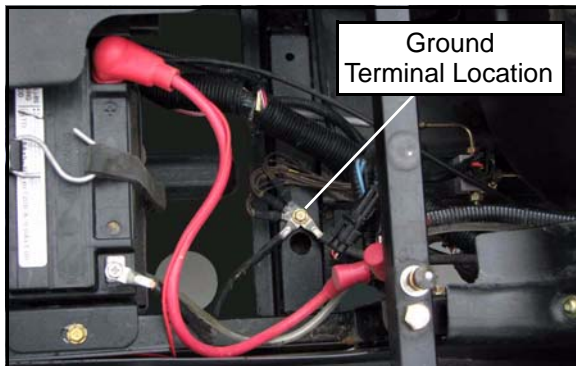
- If necessary, replace spark plug with proper type. **CAUTION:** Severe engine damage may occur if the incorrect spark plug is used.
- Apply anti-seize compound to the spark plug threads.
- Install spark plug and torque to specification.

**Recommended Spark Plug:
Champion RC7YC3**

**Spark Plug Torque:
18 ft. lbs. (24 Nm)**

Engine To Frame Ground

Inspect engine ground cable connection. Be sure it is clean and tight. The ground cable runs from the engine starter motor to the ground terminal location under the driver's seat near the battery.



STEERING AND SUSPENSION

Steering Inspection

The steering components should be checked periodically for loose fasteners, worn tie rod ends, ball joints, 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 the 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.

⚠ 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.

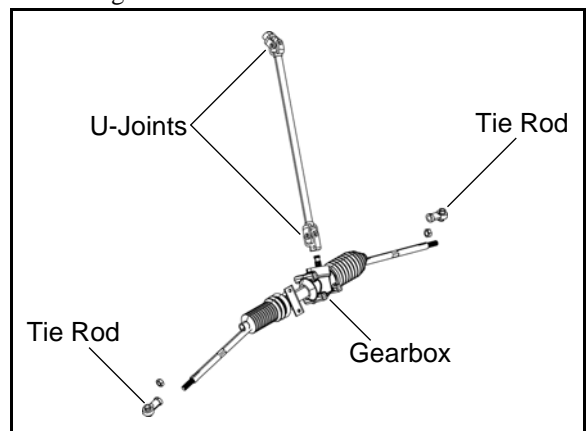
Use only genuine Polaris replacement parts.

Steering Wheel Freeplay

Check the steering wheel for specified freeplay and operation.

- Position the vehicle on level ground.
- Lightly turn the steering wheel left and right.
- There should be 0.8"-1.0" (20-25 mm) of freeplay.
- If there is excessive freeplay or the steering feels rough, inspect the following components.

- Tie Rod Ends
- Steering Shaft U-Joints
- Steering Gearbox



MAINTENANCE

Steering Inspection / Tie Rod Ends and Hubs

- To check for play in the tie rod end, grasp the steering tie rod and pull in all directions feeling for movement.



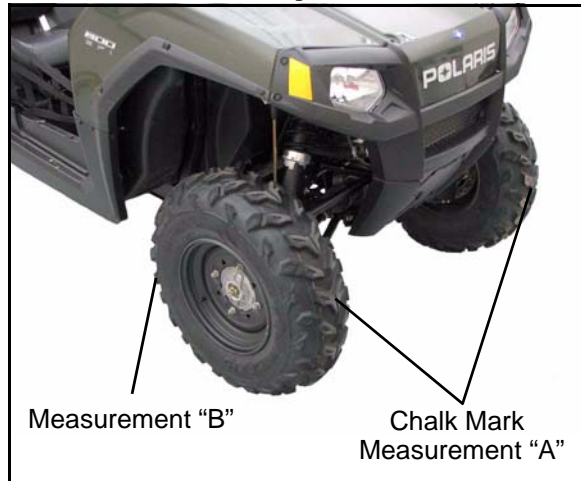
- Elevate front end of machine so front wheels are off the ground. Check for any looseness in front hub and wheel assembly by grasping the tire firmly at top and bottom first, and then at front and rear. Try to move the wheel and hub by pushing inward and pulling outward.



- If abnormal movement is detected, inspect the hub and wheel assembly to determine the cause (possible loose wheel nuts or loose front hub components).
- Refer to Chapter 7 “Final Drive” for front hub service procedures.

Toe Alignment Inspection

1. Place machine on a smooth level surface.
2. Set steering wheel in a straight ahead position and secure the steering wheel in this position.
3. 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 that the height of both marks be equally positioned in order to get an accurate measurement.


4. Measure the distance between the marks and record the measurement. Call this measurement “A”.
5. Rotate the tires 180° by moving vehicle forward or backward. Position chalk marks facing rearward, even with the hub/axle center line.
6. 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” (.3 to .6 cm) toe out. This means the measurement at the front of the tire (A) is 1/8” to 1/4” (.3 to .6 cm) wider than the measurement at the rear (B).

Wheel Toe-Out:
(A) - (B) = 1/8 - 1/4" (.3 to .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.


NOTE: Be sure steering wheel is straight ahead before determining which tie rod(s) need 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 ends of the tie rod.
- Shorten or lengthen the tie rod until alignment is as required to achieve the proper toe setting as specified in **Toe Alignment Inspection**.
- **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.

 = T

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

Suspension Spring Preload Adjustment

The front and rear shock absorber springs are adjustable by rotating the adjustment cam to change spring tension preload.

 **WARNING**

Uneven adjustment may cause poor handling of the vehicle, which could result in an accident and serious injury or death. Always adjust both the left and right spring preloads equally.

Suspension Spring Adjustment

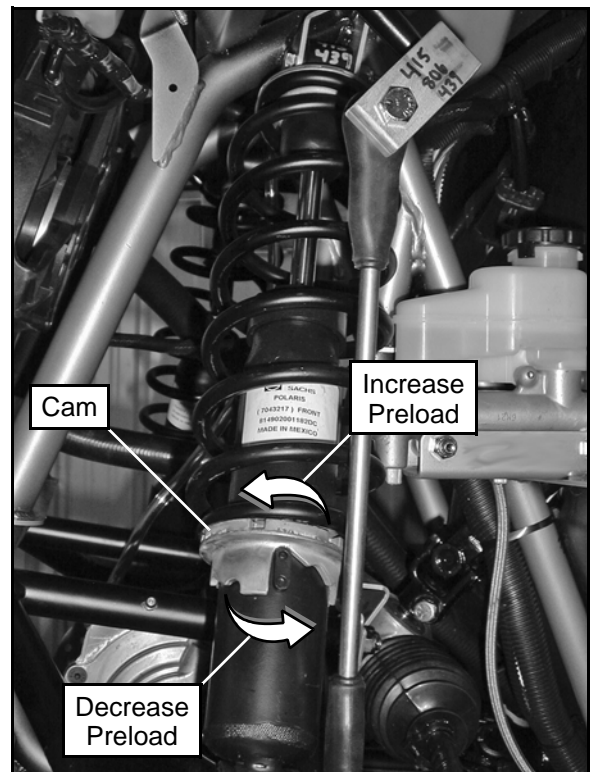
1. Position the vehicle on a level surface.
2. Stop the engine.
3. Raise and safely support the front or rear of the vehicle off the ground to allow the suspension to fully extend.

NOTE: The tires should not be touching the ground.

4. To adjust the suspension, use the adjustment cam located near the bottom of the shock.

Shock Spanner Wrench
(PN 2870872)

5. Rotate the adjustment cam clockwise to increase spring tension or counter-clockwise to decrease spring tension.



6. Each notch of the adjustment will add 6% - 8% more preload to the spring over the primary position.

MAINTENANCE

BRAKE SYSTEM

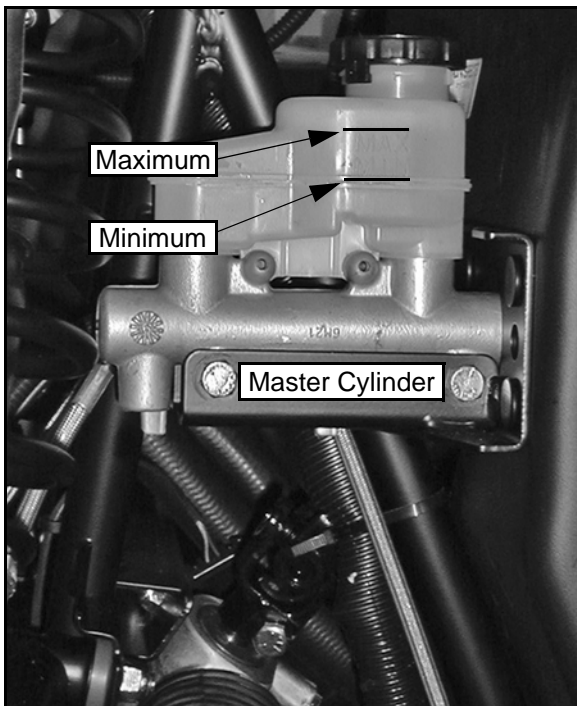
Brake Fluid Inspection

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.

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.

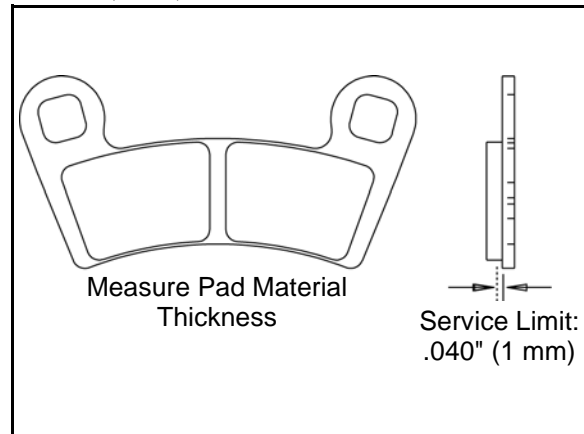
The brake fluid master cylinder reservoir can be accessed through the left front wheel well.

1. Position the vehicle on a level surface.
2. Place the transmission in PARK (P).
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.

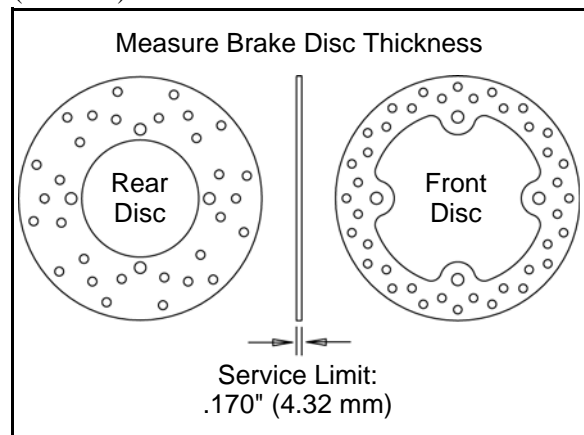


Brake Pad / Disc Inspection

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 .040" (1 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 .170" (4.32 mm).



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.

CHAPTER 3

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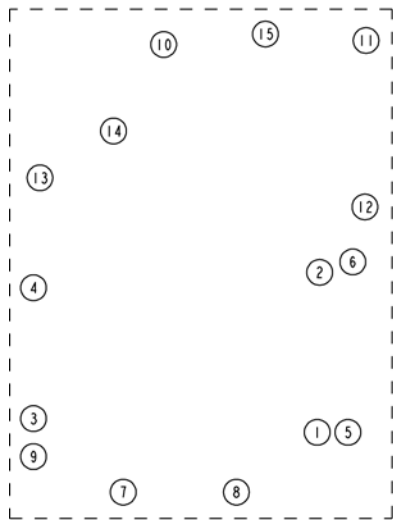
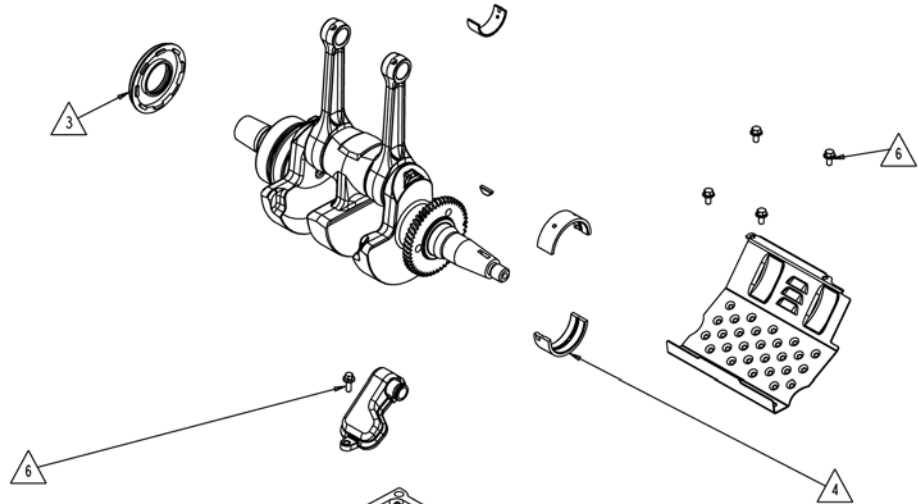
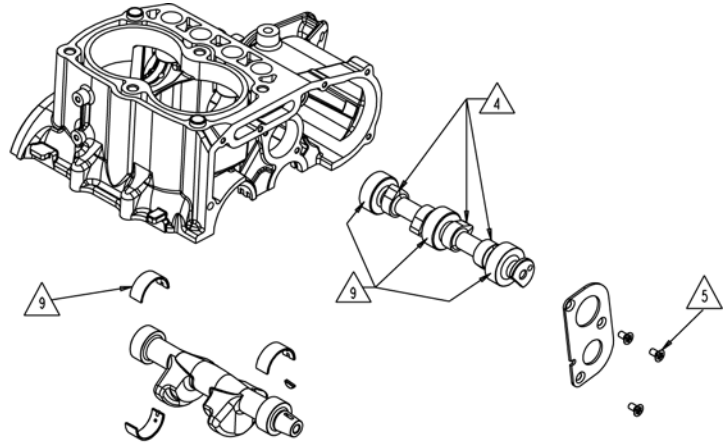
ENGINE

ENGINE SPECIFICATIONS

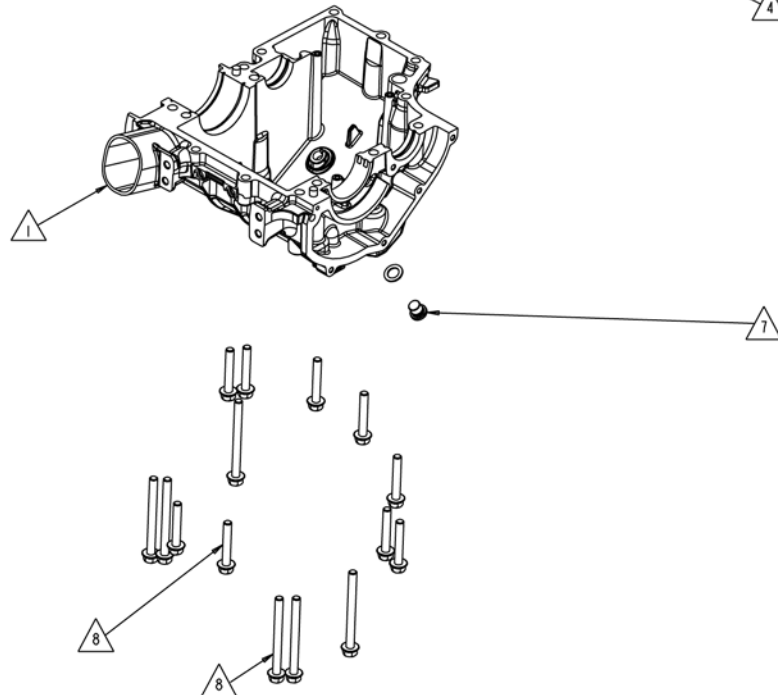
Crankcase Exploded Views

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 98 ± 10 IN-LBS.
- 6 TORQUE TO 60 ± 6 IN-LBS.
- 7 TORQUE TO 192 ± 24 IN-LBS.
- 8 TORQUE TO 22 ± 2 FT-LBS. TORQUE CASE BOLTS IN SEQUENCE SHOWN.
- 9 LUBRICATE WITH ENGINE OIL



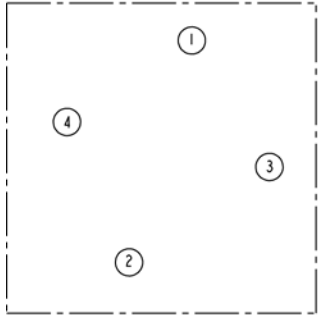
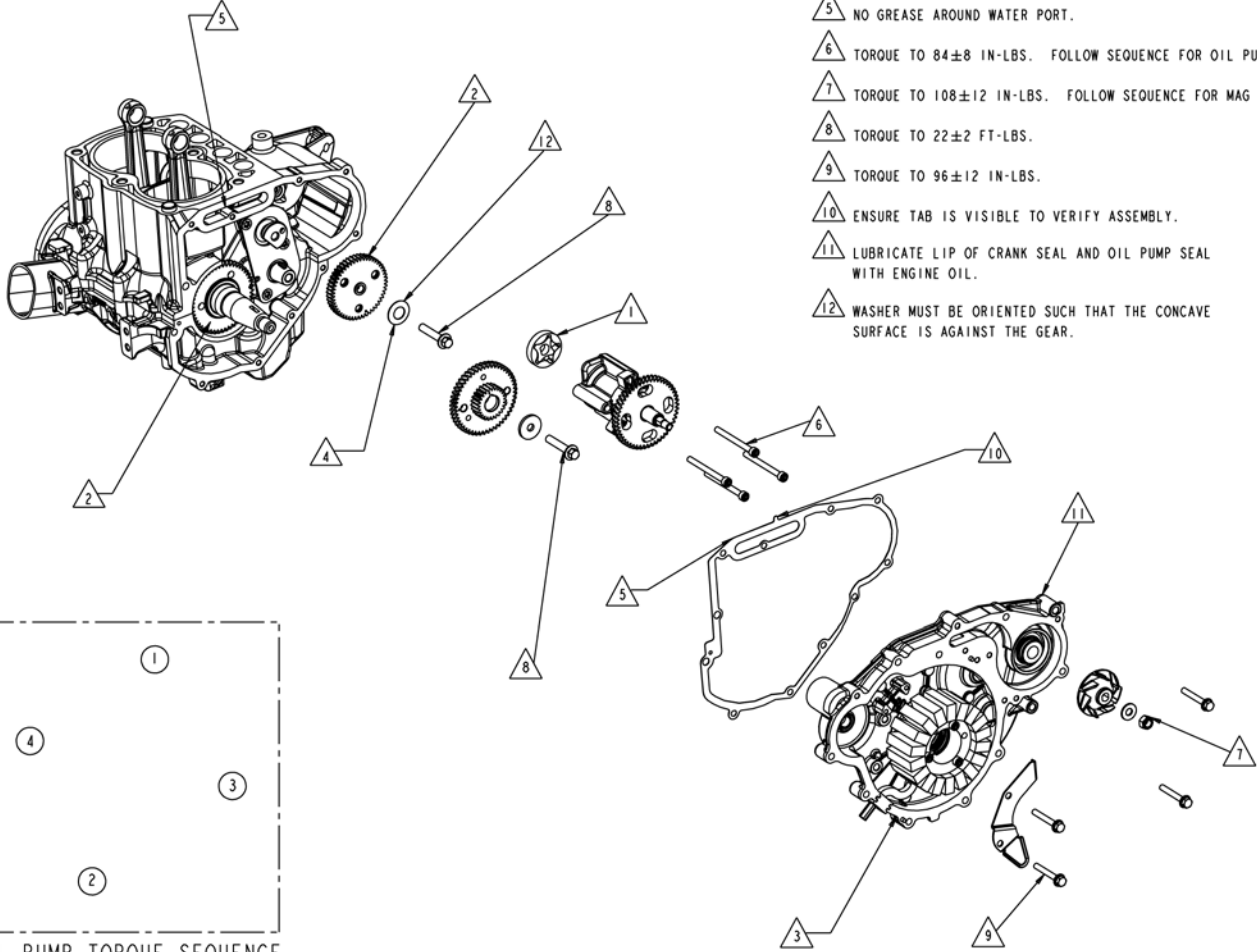
CASE TORQUE SEQUENCE:



Oil Pump / Water Pump / Engine Cover Exploded View

NOTES:

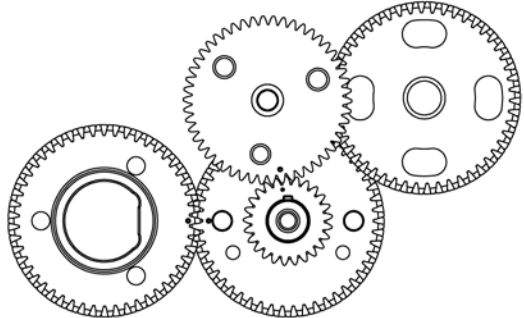
- 1 LUBRICATE WITH ENGINE OIL.
- 2 ALIGN GEARS TO GEAR TIMING VIEW BELOW.
- 3 APPLY CORROSION RESISTING GREASE TO STATOR GROMMET AREA.
- 4 APPLY LITHIUM GREASE BETWEEN WASHER AND SPLIT GEAR.
- 5 NO GREASE AROUND WATER PORT.
- 6 TORQUE TO 84±8 IN-LBS. FOLLOW SEQUENCE FOR OIL PUMP.
- 7 TORQUE TO 108±12 IN-LBS. FOLLOW SEQUENCE FOR MAG COVER
- 8 TORQUE TO 22±2 FT-LBS.
- 9 TORQUE TO 96±12 IN-LBS.
- 10 ENSURE TAB IS VISIBLE TO VERIFY ASSEMBLY.
- 11 LUBRICATE LIP OF CRANK SEAL AND OIL PUMP SEAL WITH ENGINE OIL.
- 12 WASHER MUST BE ORIENTED SUCH THAT THE CONCAVE SURFACE IS AGAINST THE GEAR.



OIL PUMP TORQUE SEQUENCE



MAG COVER TORQUE SEQUENCE



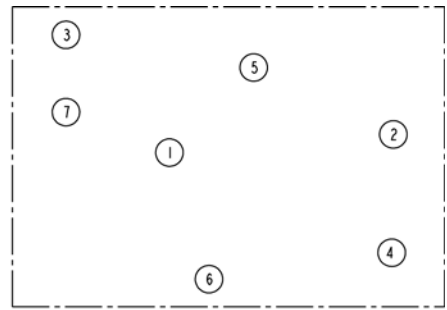
GEAR TIMING AT TDC (MAG CYLINDER)

ENGINE

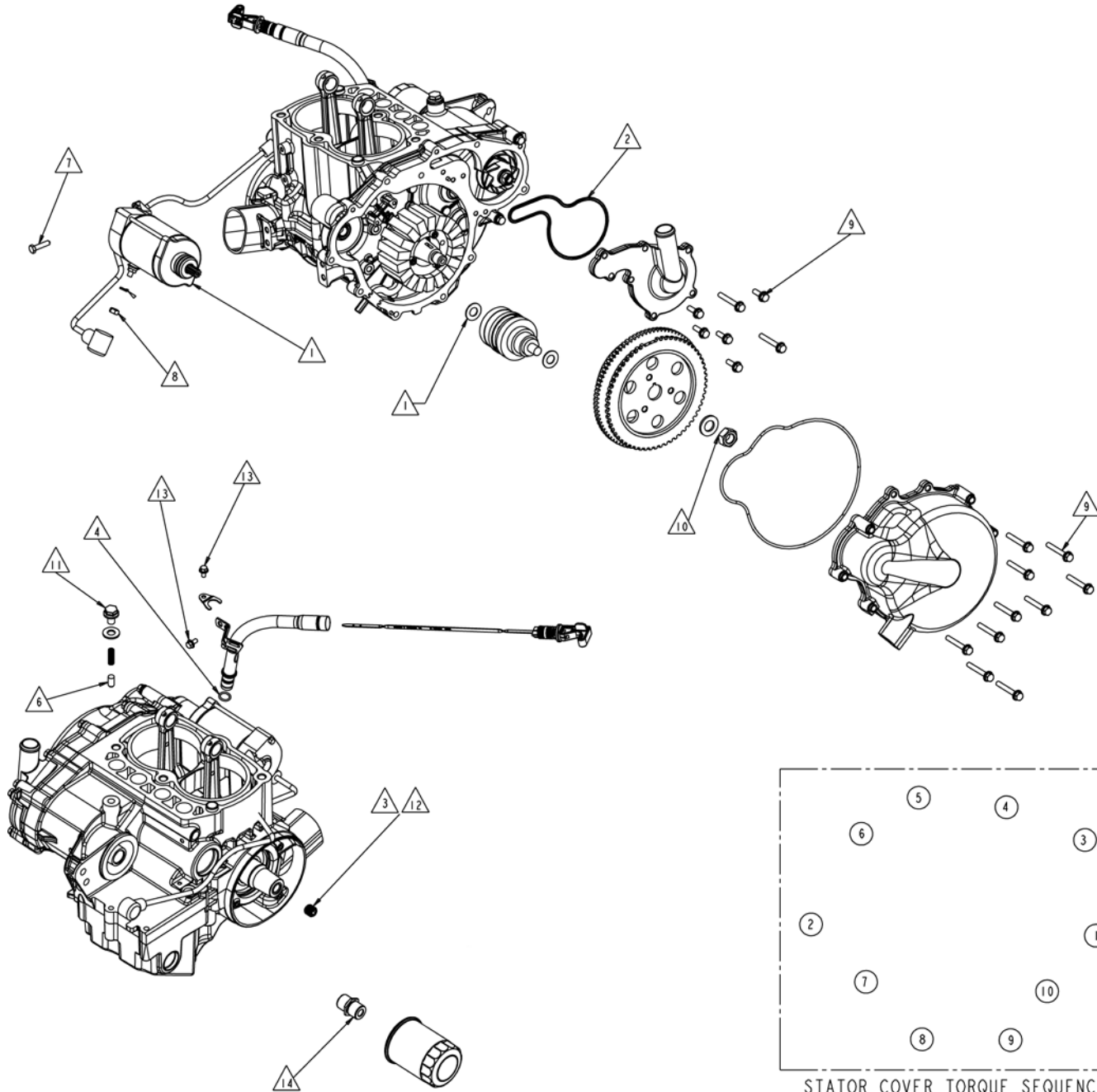
Stator Cover / Starter / Water Pump Oil Filter / Pressure Relief / Exploded View

NOTES:

- ▲1 APPLY GREASE.
- ▲2 NO OIL OR GREASE ON O-RING
- ▲3 APPLY LOCTITE PIPE SEALANT TO PLUG.
- ▲4 LUBRICATE WITH ENGINE OIL.
- ▲5 LUBRICATE OIL FILTER GASKET WITH ENGINE OIL.
- ▲6 INSTALL PRESSURE RELIEF DOWEL WITH CHAMFER SIDE DOWN.
- ▲7 TORQUE TO 84 ± 8 IN-LBS, UPPER BOLT FIRST ON STARTER, FOLLOWED BY LOWER BOLT.
- ▲8 TORQUE TO 57 ± 3 IN-LBS.
- ▲9 TORQUE TO 96 ± 12 IN-LBS. TORQUE WATER PUMP AND STATOR COVERS IN SEQUENCES SHOWN.
- ▲10 TORQUE TO 65 ± 7 FT-LBS.
- ▲11 TORQUE TO 22 ± 2 FT-LBS.
- ▲12 TORQUE TO 144 ± 12 IN-LBS.
- ▲13 TORQUE TO 50 ± 5 IN-LBS.
- ▲14 TORQUE TO 35 ± 4 FT-LBS.



WATER PUMP COVER TORQUE SEQUENCE

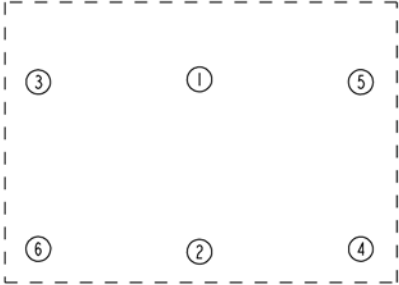


STATOR COVER TORQUE SEQUENCE

Cylinder / Cylinder Head / Piston Exploded View

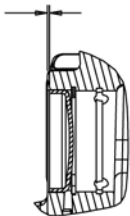
NOTES:

- ① LUBRICATE WITH ENGINE OIL.
- ② LUBRICATE THREADS WITH ENGINE OIL. TORQUE TO 15±2 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).
- 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 25-50mm 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 22±2 FT-LBS.
- ⑨ ENSURE TABS ARE VISIBLE TO VERIFY ASSEMBLY.

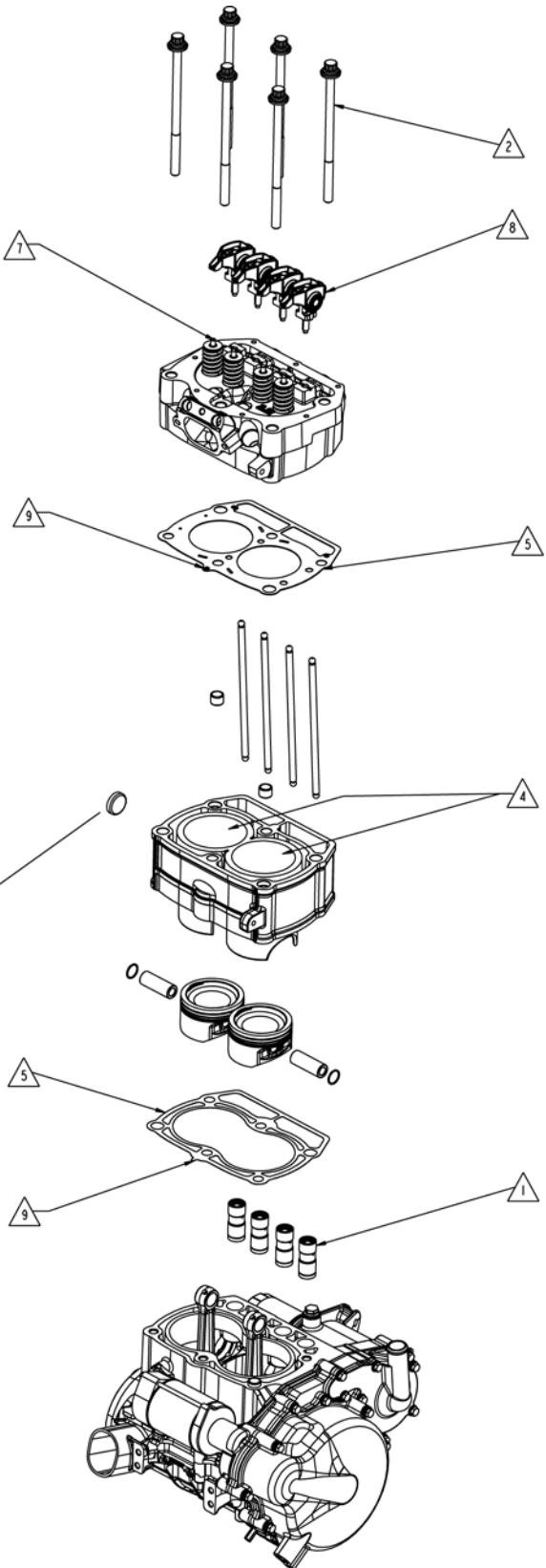


HEAD BOLT TORQUE SEQUENCE:

⑥ 1.5 MAX.



EXPANSION PLUG DETAIL

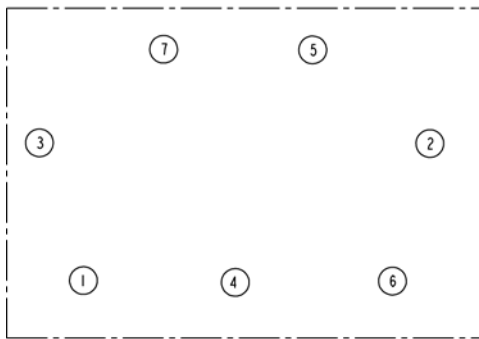


ENGINE

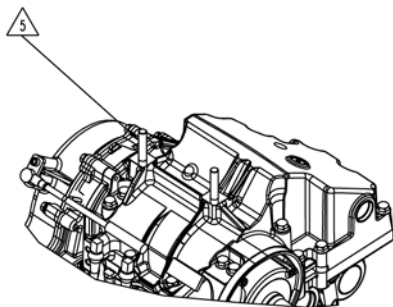
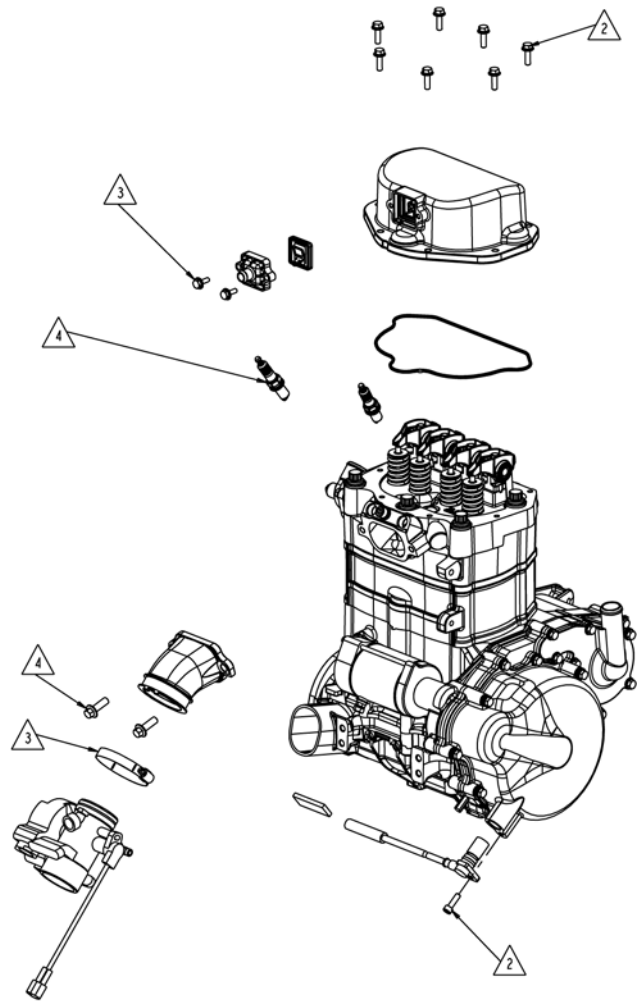
Engine EFI Sensors / Valve Cover / General Component Exploded View

NOTES:

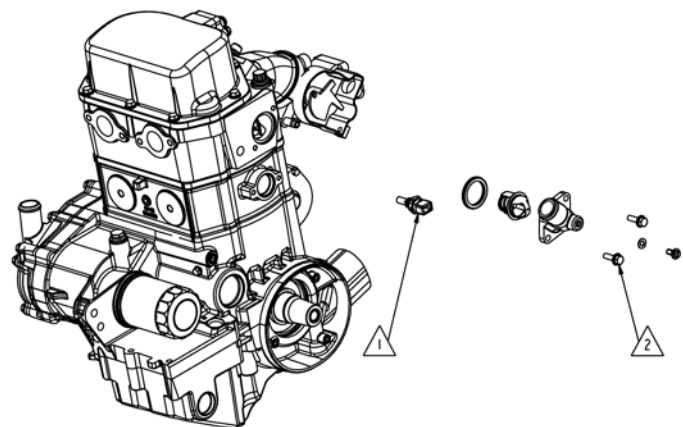
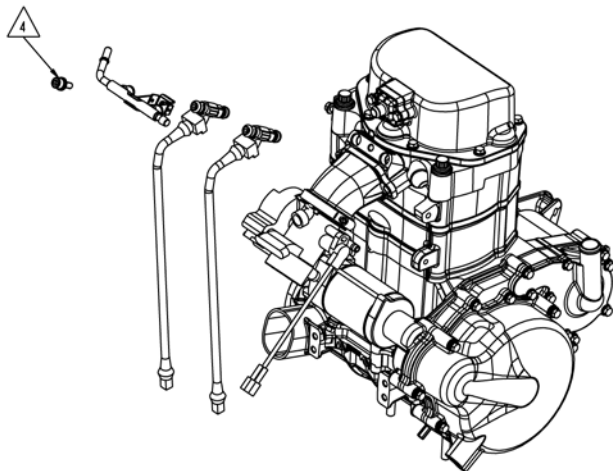
- ① TORQUE TO 200 ± 20 IN-LBS.
- ② TORQUE TO 84 ± 8 IN-LBS. VALVE COVER TO BE TORQUED IN SEQUENCE SHOWN.
- ③ TORQUE TO 20 ± 5 IN-LBS.
- ④ TORQUE TO 216 ± 24 IN-LBS.
- ⑤ TORQUE TO 120 IN-LBS.



VALVE COVER TORQUE SEQUENCE

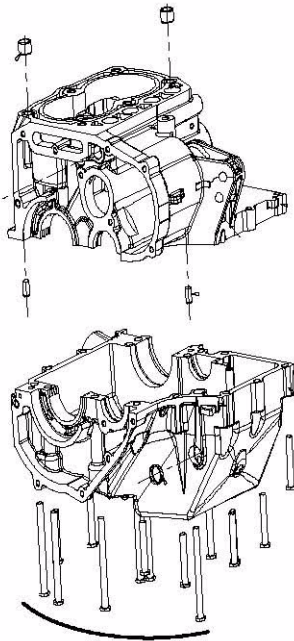


NOTE: See Chapter 4 for more information on the EFI System

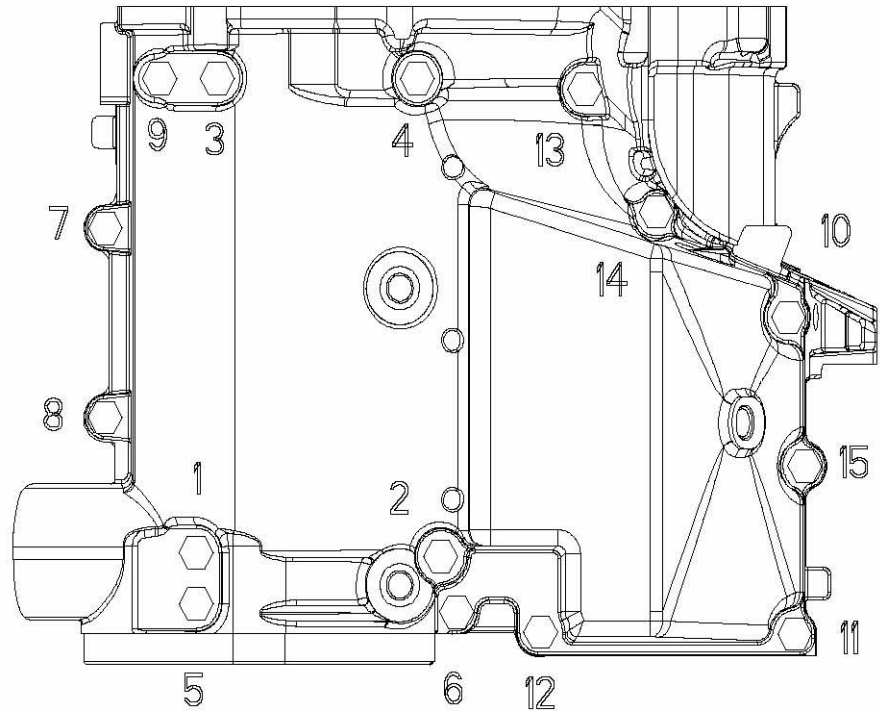


Engine Fastener Torque Patterns

Crankcase Bolt Tighten Sequence

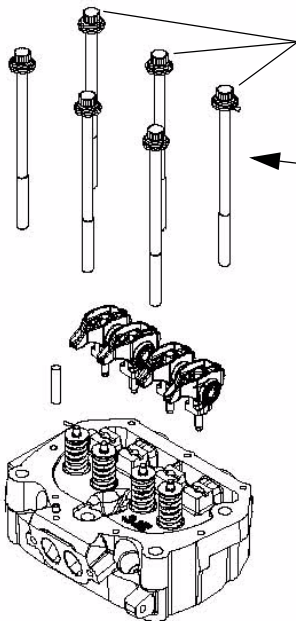


22 ± 2 ft. lbs. (30 ± 3 Nm)



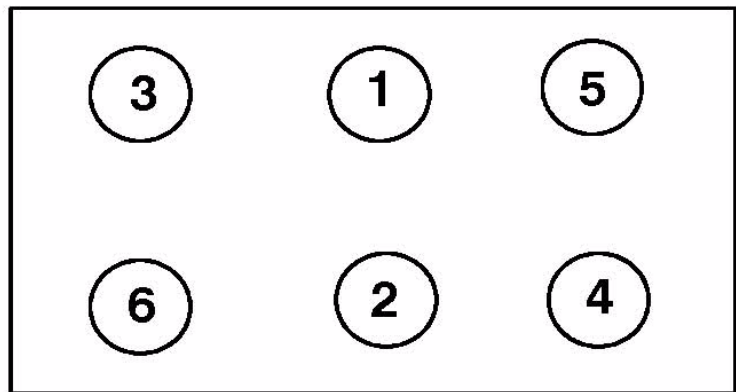
3

Cylinder Head Bolt Tighten Sequence



Lubricate threads and between washer and underside of bolt with engine oil. Torque in sequence to spec provided, allow the gasket to set for 1 minute, then tighten in sequence 90° (1/4 turn).

35 ± 4 ft. lbs.
(47.5 ± 5.5 Nm) + 90° (1/4 turn)



ENGINE

Torque Specifications

Engine Torque Specifications

Fastener	Size	in. lbs. (Nm)	ft. lbs. (Nm)
Camshaft Gear	8 mm		22 ± 2 (30 ± 3)
Camshaft Thrust Plate	6 mm	115 ± 12 (13 ± 1.35)	9.5 ± 1 (13 ± 1.35)
Throttle Body Adaptor Bolts	8 mm	216 ± 24 (24.5 ± 2.7)	18 ± 2 (24.5 ± 2.7)
Counterbalance Gear	8 mm		22 ± 2 (30 ± 3)
Crankcase Bolts	8 mm		* 22 ± 2 (30 ± 3)
Crankcase Breather	5 mm	20 ± 5 (2.5 ± 0.55)	-
Cylinder Head Bolts	11 mm		* 35 ± 4 (47.5 ± 5.5)
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 ± 3 (10.85 ± 0.35)	-
Oil Baffle Weldment	5 mm	60 ± 6 (6.8 ± 0.68)	-
Oil Drain Bolt (Crankcase)	12 mm	192 ± 24 (21.7 ± 2.7)	16 ± (21.7)
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	22 ± 2 (30 ± 3)	-
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	96 ± 3 (10.85 ± 0.35)	-
Stator Housing	6 mm	* 96 ± 3 (10.85 ± 0.35)	-
Temperature Switch	3/8 NPT		17 ± 2 (23 ± 3)
Thermostat Housing	6 mm	84 ± 8 (9.5 ± 0.9)	-
Timing Plug	3/4-16		7 - 9 (10 - 12)
Trigger Coil/Stator Wire Holddown	5 mm	* 96 ± 3 (10.85 ± 0.35)	-
Water Pump Housing Cover	6 mm	* 96 ± 3 (10.85 ± 0.35)	-
Water Pump Impeller Nut	8 mm	108 ± 3 (12 ± 0.35)	-

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

800 EFI Engine Service Specifications

Cylinder Head - Engine Specifications

Main Component: Cylinder Head		EH076OLE021
Camshaft	Cam Lobe Height - Intake / Exhaust	1.3334" (33.8674 mm)
	Camshaft Journal Outer Diameter - Mag	1.654" ± 0.00039" (42 ± 0.010 mm)
	Camshaft Journal Outer Diameter - Center	1.634" ± 0.00039" (41.50 ± 0.010 mm)
	Camshaft Journal Outer Diameter - PTO	1.614" ± 0.00039" (41 ± 0.010 mm)
	Camshaft Journal Bore Inner Diameter - Mag	1.656" ± 0.00039" (42.07 ± 0.010 mm)
	Camshaft Journal Bore Inner Diameter - Center	1.637" ± 0.00039" (41.58 ± 0.010 mm)
	Camshaft Journal Bore Inner Diameter - PTO	1.617" ± 0.00039" (41.07 ± 0.010 mm)
	Camshaft Oil Clearance	0.00276" ± 0.00079" (0.07 ± 0.02 mm)
	Camshaft End Play	0.0167" ± 0.0098" (0.425 ± 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" ± 0.00787" - 0.0039" (1.20 ± 0.20 - 0.10mm)
	Valve Seat - Contacting Width - Exhaust	0.0591" ± 0.00787" - 0.0039" (1.50 ± 0.20 - 0.10 mm)
	Valve Seat Angle	45.5° ± 0.255°
Valve Guide	Valve Guide Inner diameter	0.2367" ± 0.00029" (6.012 ± 0.007 mm)
	Valve Guide Protrusion Above Head	0.807" ± 0.0039" (20.50 ± 0.01 mm)
Valve	Valve Margin Thickness - Intake	Standard: 0.79" (20.06 mm) Max- 0.98" (24.89 mm) Min.- 0.59" (14.98 mm)
	Valve Margin Thickness - Exhaust	Standard: 0.80" (20.32 mm) Max- 1.0" (25.4 mm) Min.- 0.60" (15.24 mm)
	Valve Stem Diameter - Intake	0.2356" ± 0.00039" (5.985 ± 0.01 mm)
	Valve Stem Diameter - Exhaust	0.2351" ± 0.00039" (5.972 ± 0.01 mm)
	Valve Stem Oil Clearance - Intake	0.00228" ± 0.00098" (0.058 ± 0.025 mm)
	Valve Stem Oil Clearance - Exhaust	0.00275" ± 0.00098" (0.0870 ± 0.025mm)
	Valve Stem Overall Length - Intake	4.51" ± 0.01476" (114.5550 ± 0.375 mm)
	Valve Stem Overall Length - Exhaust	4.5453" ± .01496" (115.45 ± 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		EH076OLE021
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	.0015" ± .00059" (.040 ± .015mm)
Lifter	Lifter Outer Diameter Standard	0.84245" ± 0.00025" (21.39 8 ± 0.00635 mm)
	Lifter Block Bore	0.8438" ± 0.00062" (21.4322 ± 0.0157 mm)
Piston	Piston - Standard	3.14803" ± .00028" (79.960 ± .007mm)
	Piston Standard Inner Diameter of Piston Pin Bore	0.70902" ± .00012" (18.009 ± 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" ± 0.00024" (0.012 ± 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		EH076OLE021	
Piston Ring	Installed Gap	Top Ring - Standard	0.0059±0.138" (0.15 ± 0.35mm)
		Top Ring - Limit	> 15% Leakdown
		Second Ring - Standard	0.0098 ± 0.197" (0.25 ± 0.50mm)
		Second Ring - Limit	> 15% Leakdown
		Oil Ring - Standard	0.0196±0.00984" (0.50 ± 0.25mm)
		Oil Ring - Limit	> 15% Leakdown
	Ring to Groove Clearance	Top Ring - Standard	0.0024" ± 0.0008" (0.060 ± 0.020 mm)
		Top Ring - Limit	> 15% Leakdown
		Second Ring - Standard	0.0028" ± 0.0008" (0.070 ± 0.020 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		0.0098"±0.00039" (0.025 ±0.010mm)
	Connecting Rod Big End Side Clearance		0.01181"±0.00591" (0.030 ±0.015mm)
	Connecting Rod Big End Radial Clearance		0.0015"±0.00006" (0.0038 ±0.0015mm)
Crankshaft	Crankshaft Runout Limit		0.00236" (0.060mm)

Special Tools

Part Number	Tool Description
PV-43527	OIL FILTER WRENCH
2200634	VALVE SEAT RECONDITIONING KIT
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

ENGINE

ENGINE COOLING SYSTEM

Cooling System Specifications

Condition	Specification
Thermostat Open	180° F (82° C)
Thermostat Full Open Lift	6 mm at 203° F (95° C)
Thermostat Closed	171° F (77° C)
System Capacity	4.8 Quarts (4.5 liters)
Pressure Cap Relief	13 PSI

Polaris Premium Antifreeze
2871534 - Quart
2871323 - Gallon

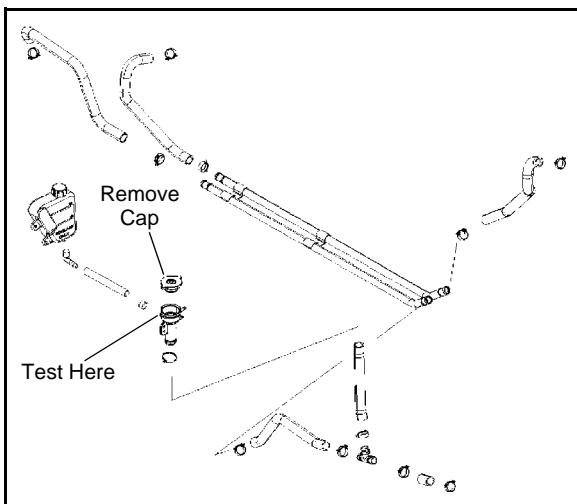
Recommended Coolant

Use only high quality antifreeze/coolant mixed with distilled water in a 50/50 or 60/40 ratio, depending on freeze protection required in your area.

CAUTION: 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. Polaris Premium 60/40 Antifreeze/Coolant is recommended for use in all cooling systems and comes pre-mixed, ready to use.

Cooling System Pressure Test

1. Remove the front hood.
2. Remove pressure cap and pressure test the cooling system using a commercially available pressure tester.



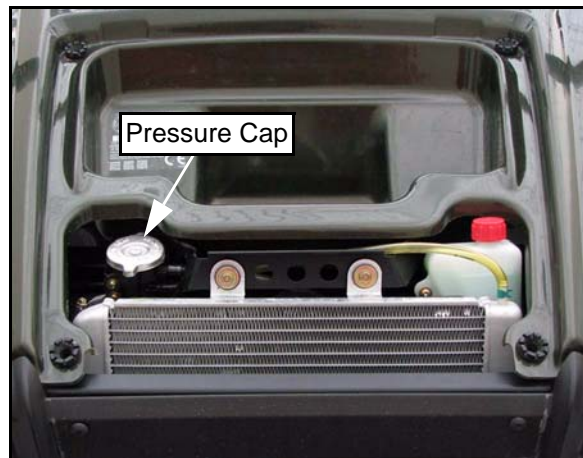
3. The system must maintain 10 psi for five minutes or longer. If pressure loss is evident within five minutes, check the radiator, hoses, clamps and water pump seals for leakage.

Pressure Cap Test

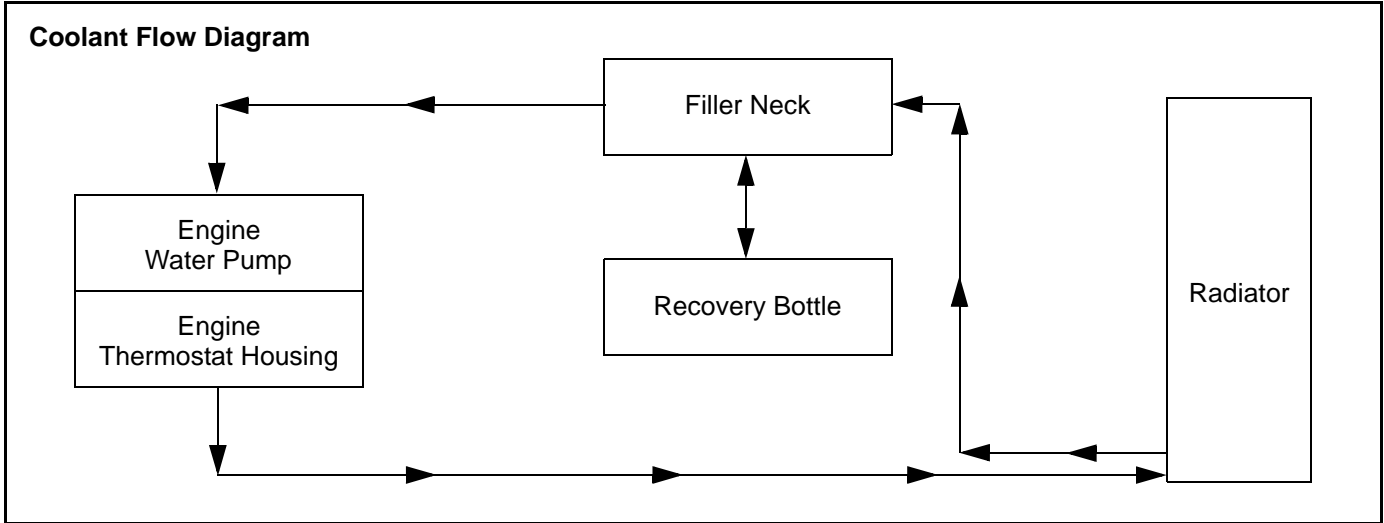
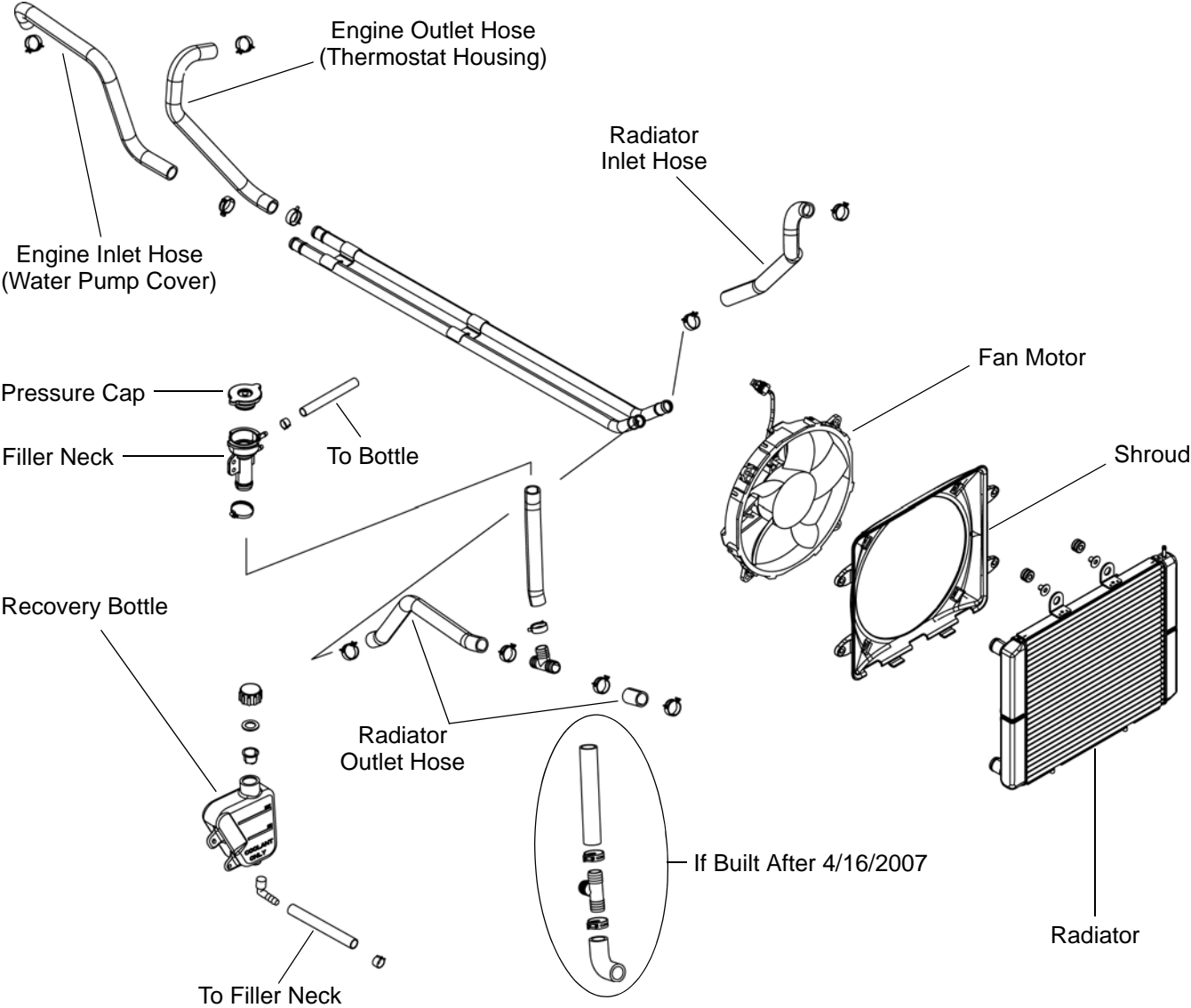


Never remove pressure cap when engine is warm or hot. The cooling system is under pressure and serious burns may result. Allow the engine and cooling system to cool before servicing.

1. Remove pressure cap and test cap using a commercially available pressure cap tester.
2. The pressure cap relief pressure is 13 psi. Replace cap if it does not meet this specification.



Cooling System Exploded View



ENGINE

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.

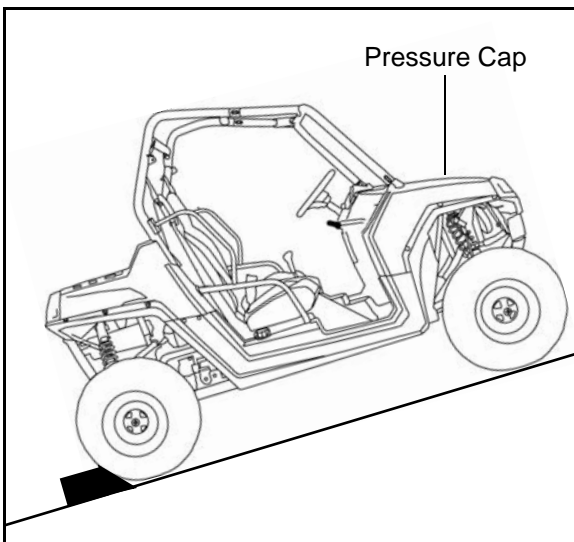
⚠ CAUTION

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

NOTE: 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 reservoir tank.

NOTE: Use this procedure when a unit overheats and no apparent leaks in the cooling system are found.

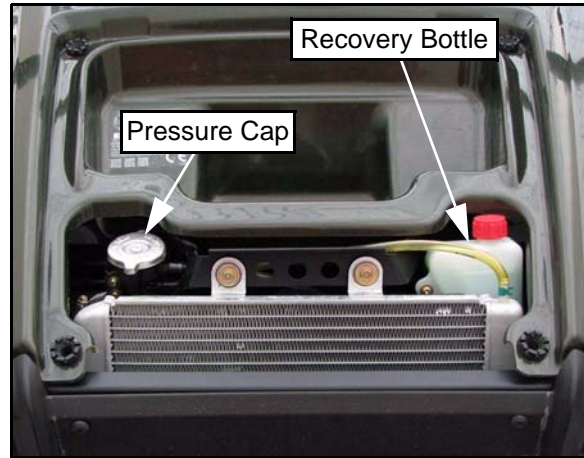
1. Drive the vehicle onto a slight incline and use properly weight rated ramps. If an incline is not available, slightly elevate the front of the vehicle.
2. Place the vehicle in Park and block the rear wheels.



⚠ CAUTION

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

3. Remove pressure cap and top off coolant.
4. Remove recovery bottle cap and fill bottle to the full line.




5. Leave the cap off of the radiator to allow any possible air to escape.
6. Start the engine and let it idle for 5-10 minutes or until the thermostat opens and allows coolant to flow through the system.
7. Slightly loosen the bleed screw (C) on the thermostat cover 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.



8. Tighten the bleed screw to 70 ± 10 in.lbs. (8 ± 1.13 Nm) on the thermostat housing and properly install the pressure cap.
9. Squeeze the coolant lines by hand to help purge the system of air.

NOTE: If there is air in the system you will see air bubbles forming through the radiator filler neck.



- Add Polaris Premium Antifreeze to the radiator filler neck if the level goes down. If no bubbles are seen at the filler neck, the system should be purged of air

 WARNING
<p>Be sure to install the pressure cap before shutting off the engine. Coolant may spit out of the radiator.</p>

- Stop the engine and let cool, top off the radiator filler neck with coolant. If you hear or see a “glug” at the filler neck, or there is a dropping of the coolant level, indicating that coolant has been pulled into the system; Fill the recovery bottle only after you have completely filled the cooling system at the radiator filler neck.
- Repeat this procedure, if overheating still occurs.

GENERAL ENGINE SERVICE

Engine Lubrication Specifications

 = 
<p>Capacity - Approximately 2 U.S. Quarts (1.9 L) Oil Type - Polaris Premium 0W-40 Synthetic Filter Wrench - PV-43527 or equivalent - Oil Pressure Specification - 27-35 psi @ 6000 RPM, Polaris 0W-40 Synthetic, Engine at operating temperature.</p>

3

Accessible Engine Components

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

- Starter Motor / Drive
- Cylinder Head
- Cylinder
- Piston / Rings
- Rocker Arms
- Water Pump

The following components require engine removal for service:

- Flywheel
- Alternator (Stator)
- Counterbalance Shaft or Bearings
- Gear Train Components
- Camshaft
- Oil Pump / Oil Pump Drive Gear
- Connecting Rod
- Crankshaft
- Crankshaft Main Bearings
- Crankcase

Oil Pressure Test

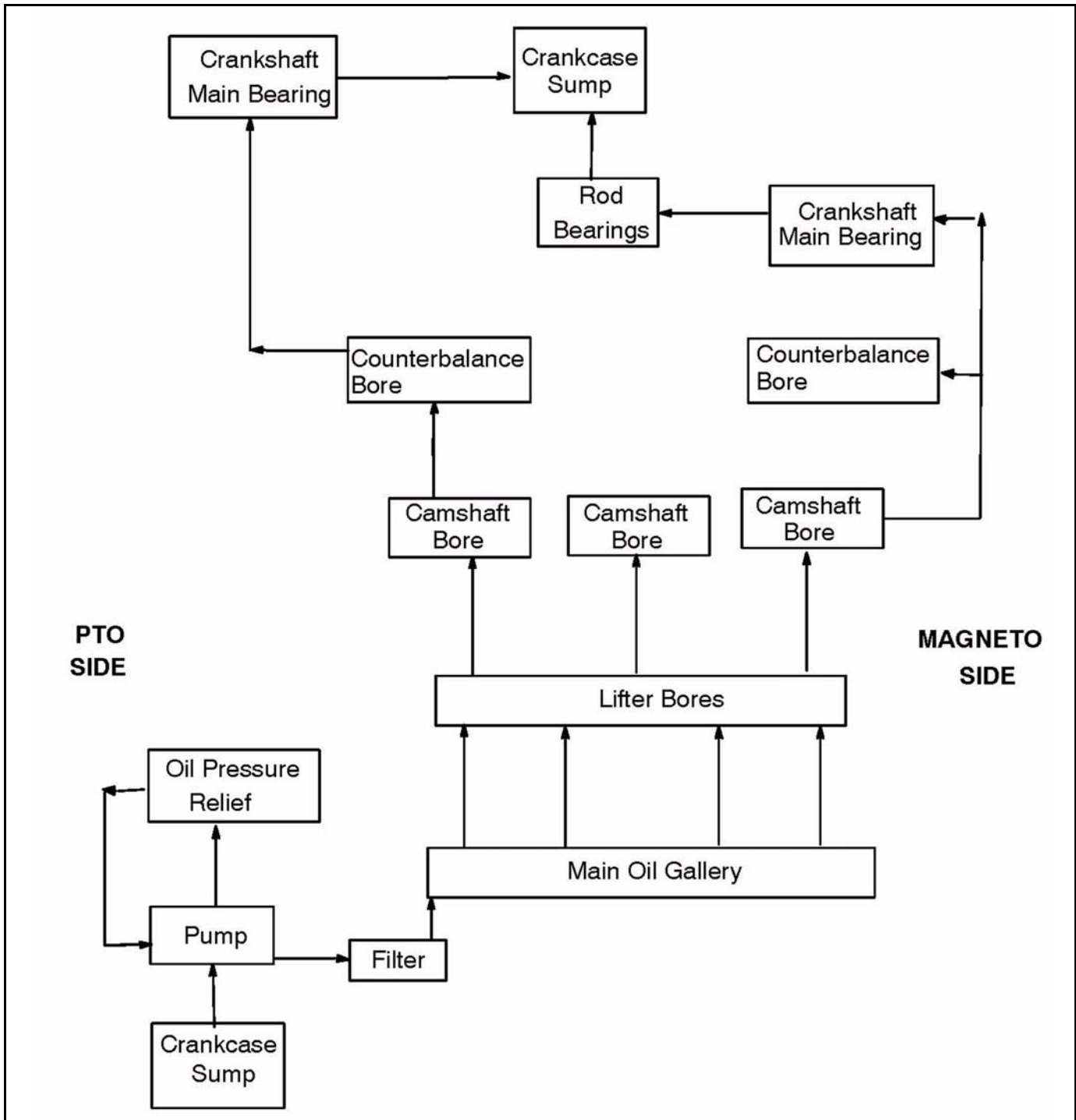
- Remove blind plug/sender from left side of crankcase.
- Insert a 1/8 NPT oil pressure gauge adaptor into the crankcase and attach the gauge.
- Start engine and allow it to reach operating temperature, monitoring gauge indicator.

<p>Oil Pressure at Idle: 6 psi Oil Pressure at 6000 RPM (Engine Hot): Minimum: 27 psi Standard: 31 psi Maximum: 35 psi</p>

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Oil Flow Chart

This chart describes the flow of oil through the 800 EFI 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 to 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. The oil pressure switch is fed off the main oil galley.



Engine Removal

Because of its design configuration, Polaris recommends removing the engine, transmission, and rear gearcase as one assembly. Use the following procedure when engine removal is required.

IMPORTANT: Some engine repair procedures can be performed without removing the RZR engine assembly from the vehicle. Refer to “Accessible Engine Components” on Page 3.15 for further information.

NOTE: The use of an overhead or portable engine hoist is the only recommended method for removing and installing the engine / transmission / rear gearcase assembly.

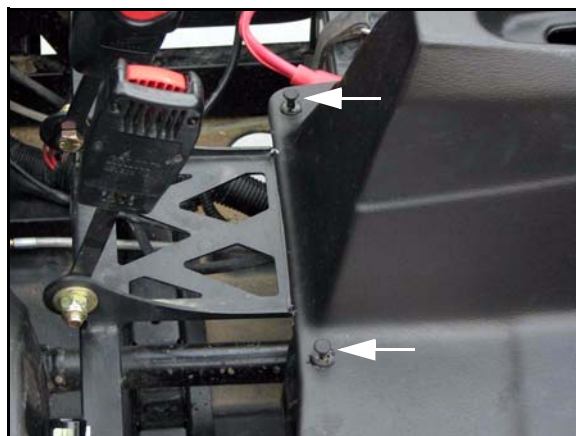
NOTE: Have an assistant help guide the engine in and out of the vehicle while using an engine hoist to prevent personal injury or damage to vehicle components.

⚠ WARNING

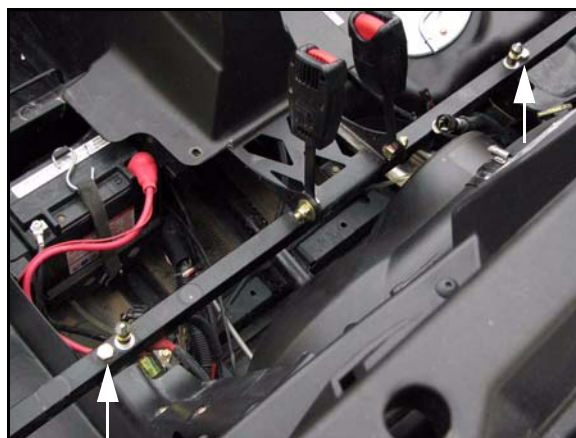
Always wear safety glasses and proper shop clothing when performing the procedures in this manual. Failing to do so may lead to possible injury or death.

1. If vehicle was recently operated, allow it to cool down before attempting to perform any work.
2. Clean work area.
3. Thoroughly clean the engine and chassis.
4. Drain appropriate lubricant(s):
 - If servicing the engine, drain engine oil.
 - If servicing the transmission, drain the lubricant from the main gearcase and transfer case.
 - If servicing the rear gearcase, drain the gearcase lubricant.
5. Remove the driver and passenger seats (see Chapter 5).
6. Disconnect (-) negative battery cable.
7. Remove the rear service panel (see Chapter 5).

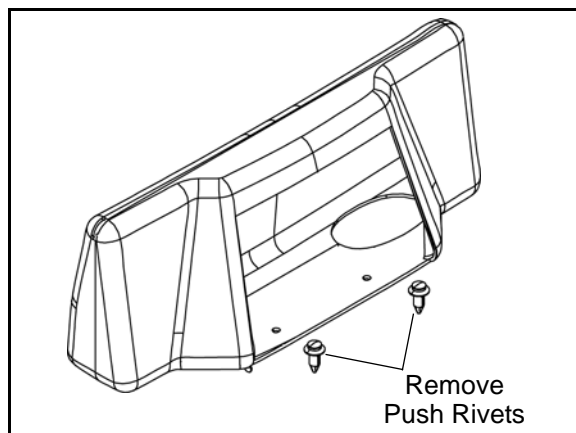
8. Remove the (2) push rivets from the rear of the center console.



9. Remove the (2) fasteners from the rear seat base and remove the assembly from the vehicle.

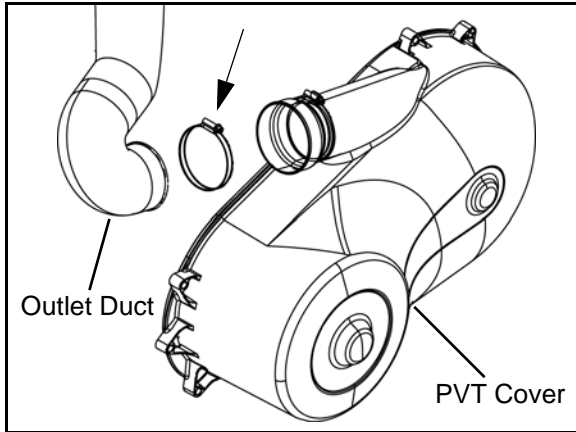


10. Remove the rear plastic bumper, rear cargo box and box supports from the vehicle (see Chapter 5).
11. Remove the (2) push rivets and remove the intake box from the vehicle.

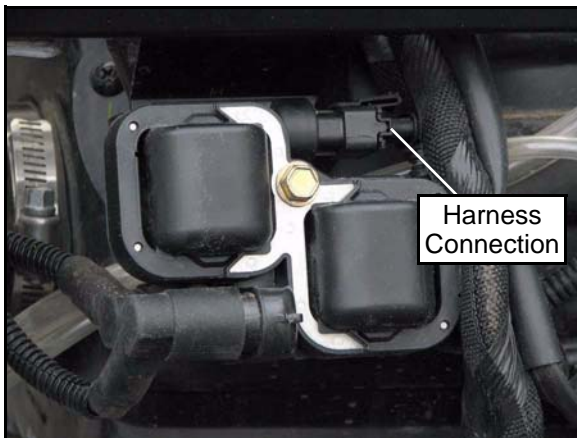


ENGINE

12. Elevate the rear of the vehicle off the ground using a suitable ATV lift and remove both rear wheels.
13. Remove all exhaust components from vehicle and engine.
14. Loosen the hose clamp attaching the outlet duct to the PVT cover. Leave the duct attached to the upper frame support.

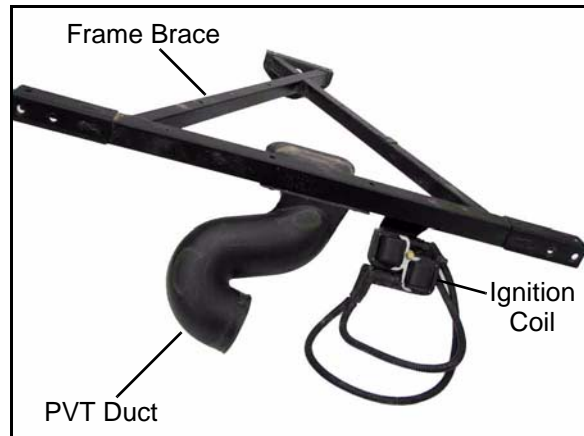


15. Remove the (8) screws that retain the PVT cover and remove cover.
16. Remove the high tension leads from the spark plugs and disconnect the ignition coil harness.

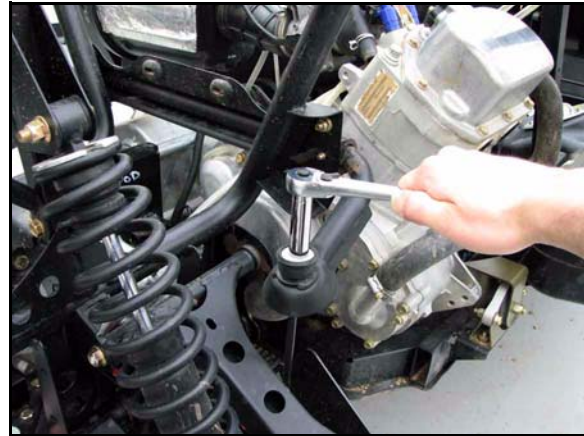


17. Remove the vent lines from the upper bolt-in frame brace and plug vent lines to prevent fluid leakage during removal.

18. Remove the (6) fasteners retaining the upper bolt-in frame brace and remove it from the vehicle with the ignition coil and PVT duct attached.



19. Remove the upper nut and grommet from the stabilizer bar linkage on both sides of the vehicle.

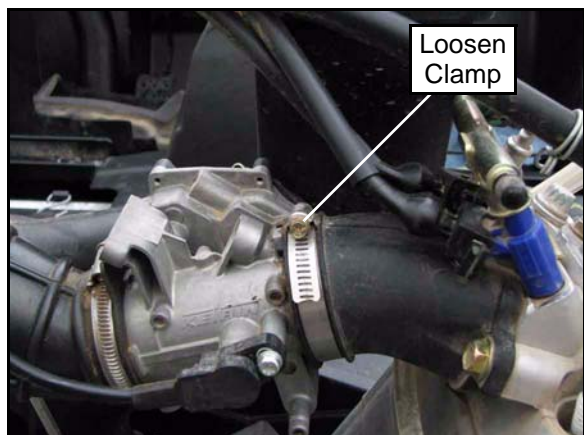


20. Remove the (4) fasteners retaining the stabilizer bar and bracket and remove the assembly from the vehicle.



21. Remove the engine breather hose from the valve cover.

22. Loosen the hose clamp between the throttle body and intake adaptor.



23. Disconnect the T-MAP and TPS harnesses (see photo).



24. Remove the remaining bolt attaching the airbox to the frame (see photo).

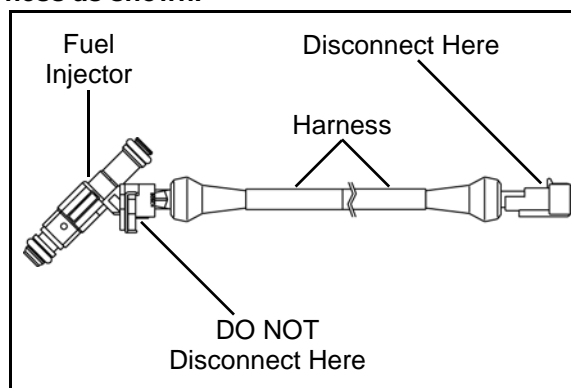


25. Remove the airbox and throttle body from the vehicle as an assembly. Take care in not allowing the throttle cable to bend excessively or kink. Carefully place the assembly on the floor next to the vehicle. Insert a shop towel into the engine intake adaptor to prevent dirt from entering the engine.

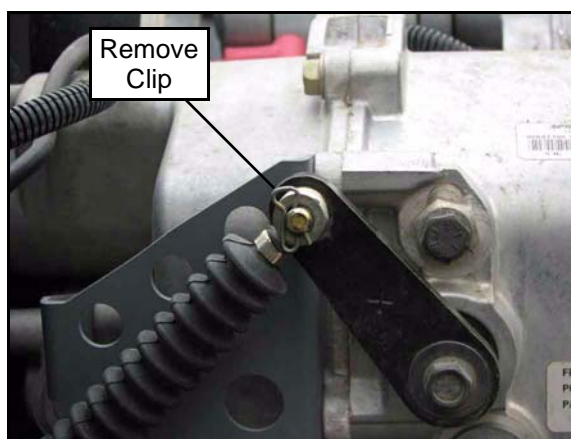
NOTE: Ensure throttle cable is not being excessively bent or kinked while removed from the vehicle.

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

NOTE: The Bosch harness connector and locking spring is bonded to the fuel injectors with an epoxy mix. 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 by disconnecting at the end of the harness as shown.

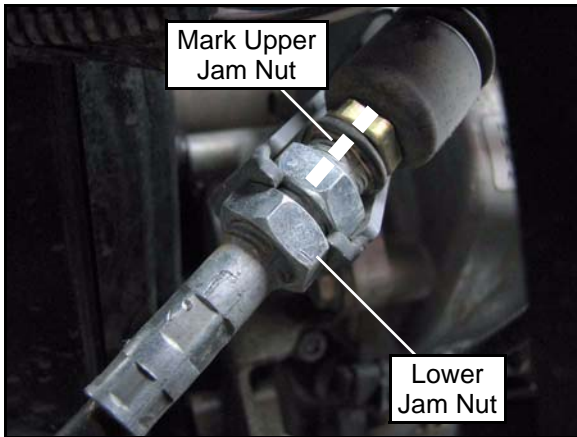


27. Disconnect the fuel line from the fuel injector rail.
28. Disconnect the shift cable from the transmission bell crank.



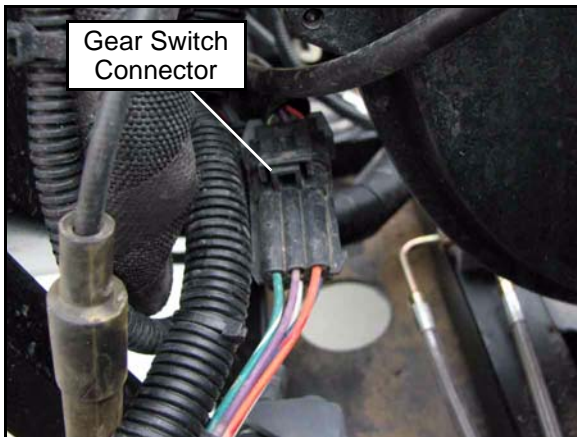
ENGINE

29. Mark the upper jam nut and loosen the lower jam nut. Pull the shift cable out of the mount.

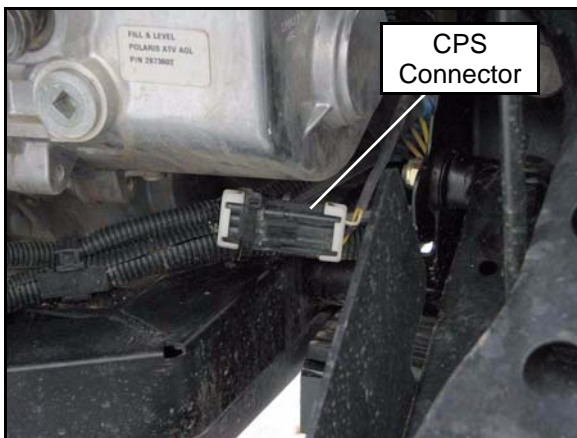


NOTE: If the upper jam nut is moved, shift cable adjustment will be required during engine installation (see Chapter 2 "Shift Cable Inspection / Adjustment").

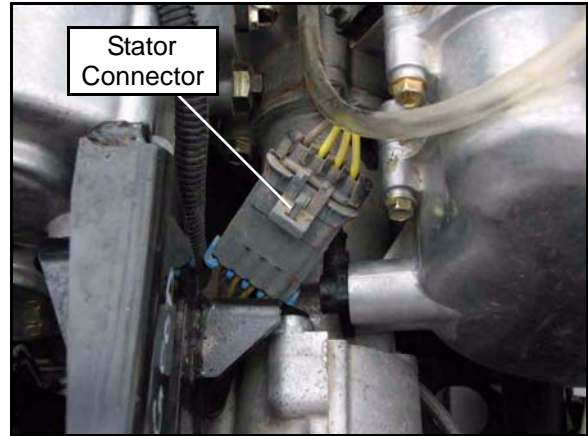
30. Disconnect the transmission gear indicator switch harness.



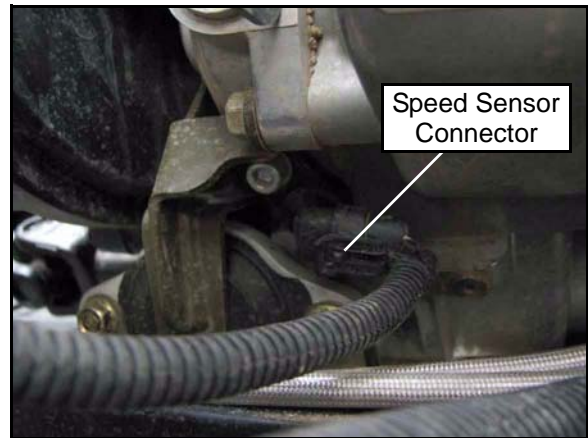
31. Disconnect the CPS harness.



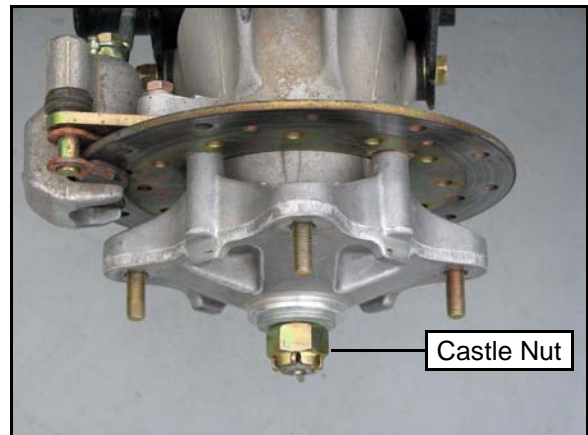
32. Disconnect the stator / alternator harness.



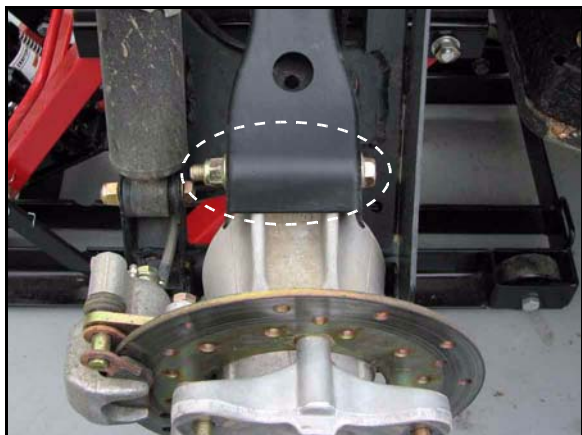
33. Disconnect the transmission speed sensor harness.



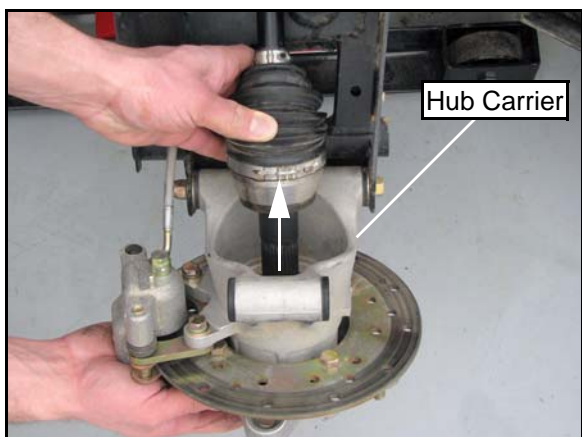
34. Remove the castle nuts from both rear wheel hubs.



35. Remove the through-bolt that attaches the upper A-arm to the rear hub on both sides of the vehicle.



36. Pivot the A-arms upward and rear hub carriers downward and remove the drive shafts from the hub carriers.

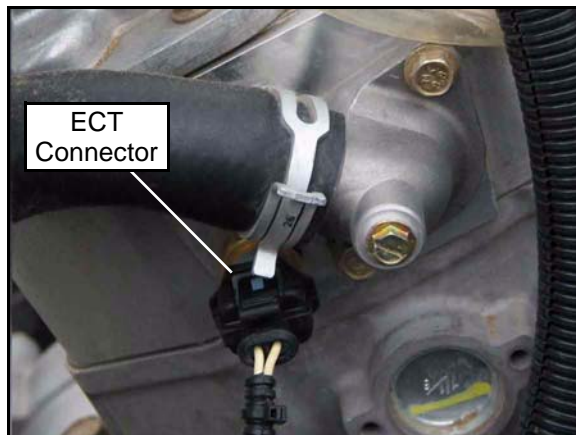


37. Grasp the rear drive shafts and pull sharply outward on the shafts to disengage them from the rear gearcase.



NOTE: Clean area around drive shaft orifices on both sides of rear gearcase and cover orifices using duct tape. This will prevent the lubricant from leaking out during removal.

38. Disconnect the engine coolant temperature (ECT) sensor harness.



39. Loosen the hose clamp and remove the lower coolant hose from the water pump cover inlet and drain coolant into a suitable container.



40. Remove the filler neck pressure cap to relieve the cooling system vacuum.

NOTE: Use a portable wet-vac or syphon to prevent any coolant from spilling.

41. Remove the upper coolant hose from the thermostat housing outlet to relieve any coolant vacuum created in the engine. Allow engine coolant to completely drain. Properly dispose of the engine coolant / antifreeze.

42. Remove the (+) positive battery cable from the starter motor terminal and (-) negative battery cable from the starter motor engine mount.

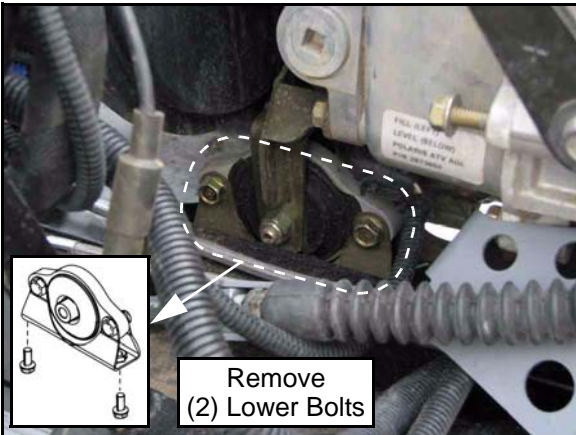
43. Remove the outer PVT cover.

ENGINE

44. Remove RH engine mount fastener.



45. Remove the (2) lower bolts that retain the LH transmission mount to the frame.

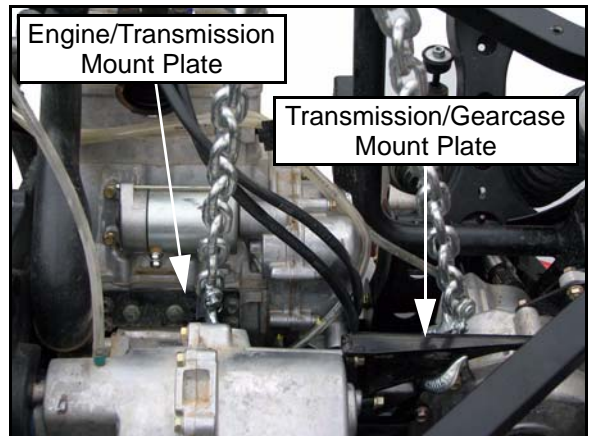
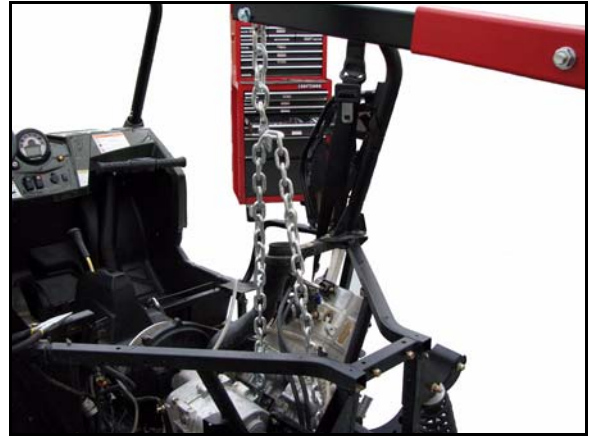


46. Remove the (2) rear gearcase mount bracket fasteners and mount bolt and remove bracket from vehicle.



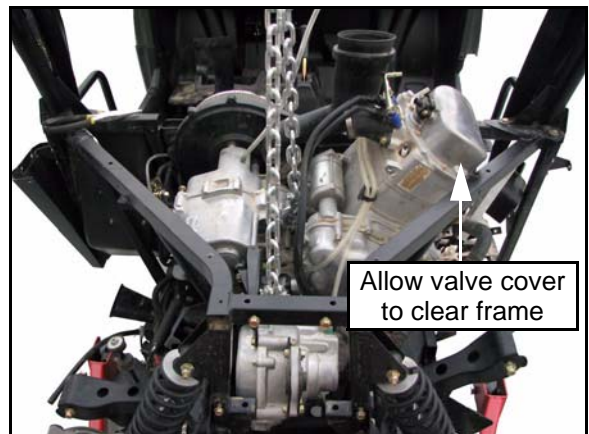
NOTE: The use of an overhead or portable engine hoist is the only recommended method for removing and installing the engine / transmission / rear gearcase assembly.

47. Using an engine hoist, hook a chain between the engine / transmission mounting plate and the transmission / rear gearcase mounting plate.



NOTE: Have an assistant help guide the engine in and out of the vehicle while using an engine hoist to prevent personal injury or damage to vehicle components.

48. Lift the front portion of the assembly out first to allow the engine valve cover to clear the vehicle frame.



49. Remove propshaft from the transmission output shaft.
50. Then move assembly towards the front of the vehicle while lifting it out to allow the rear gearcase to clear the rear portion of the frame.
51. Then lift assembly high enough to clear vehicle frame and completely remove it from the vehicle to a work bench.



Engine / Transmission Separation

Once the engine / transmission / rear gearcase assembly has been removed from the vehicle, the engine and transmission will need to be separated to allow engine servicing. Use the following procedure to separate the engine from the assembly.

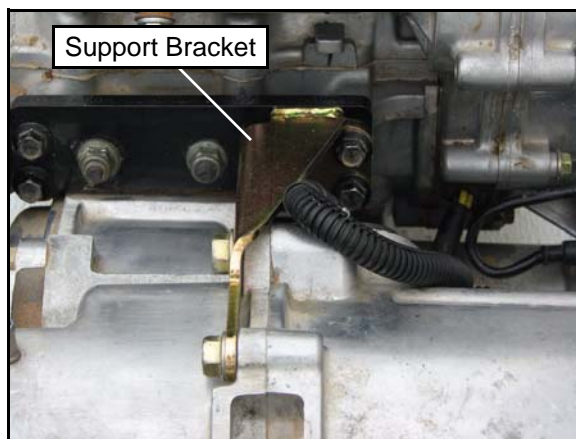
1. Remove the drive belt, drive clutch and driven clutch (see Chapter 6).
2. Remove the (6) fasteners retaining the inner clutch cover to the engine and transmission.



3. Remove only the (4) outer fasteners retaining the engine to the transmission bracket.



NOTE: Vehicles manufactured on or after 5/21/07, will be assembled with an added support bracket mounted between the engine and transmission.



4. Tilt the assembly up and remove the remaining (2) nuts that retain the transmission to the engine.

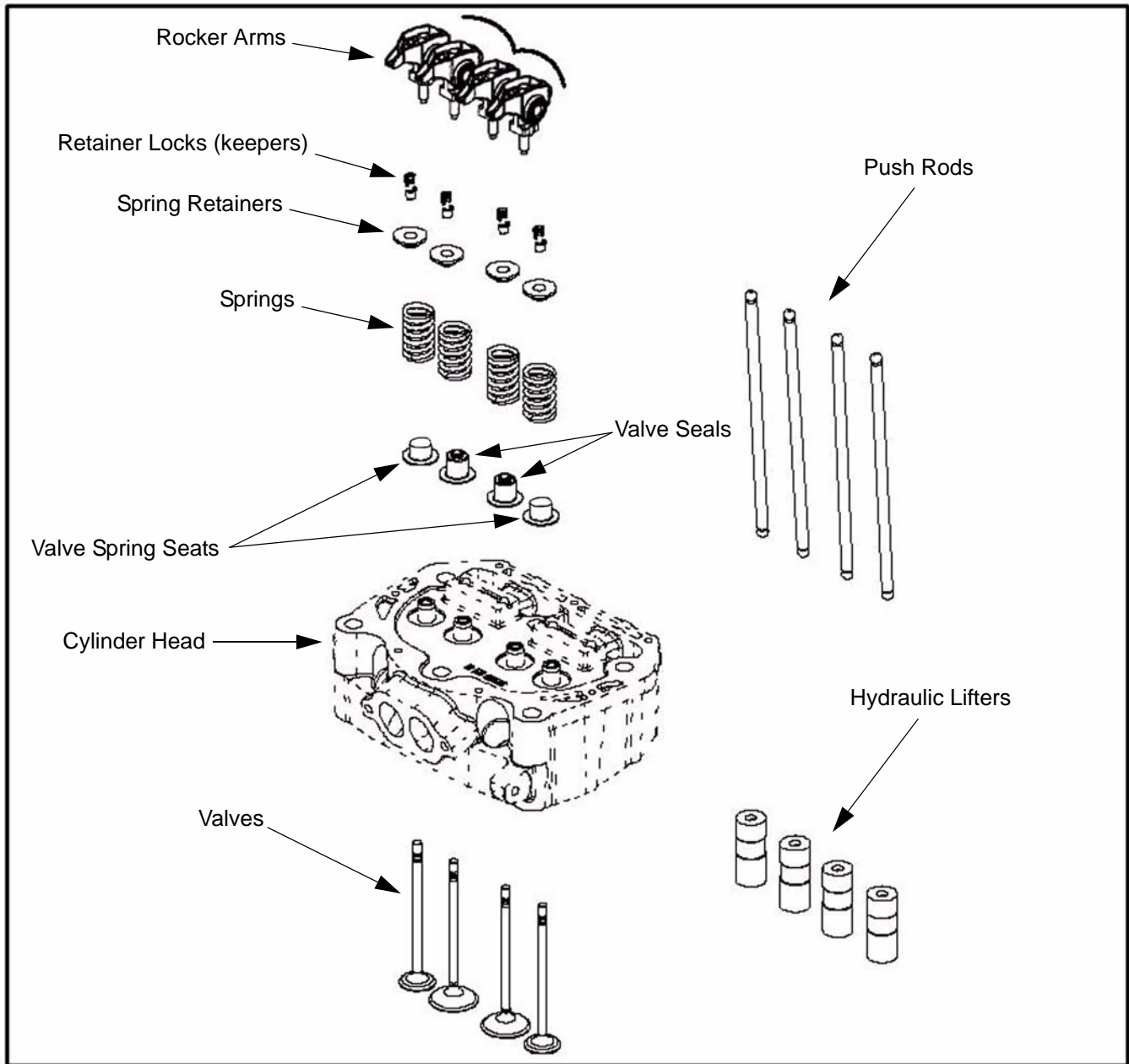


5. Carefully separate the engine and perform the required service (see "Engine Disassembly and Inspection").

ENGINE

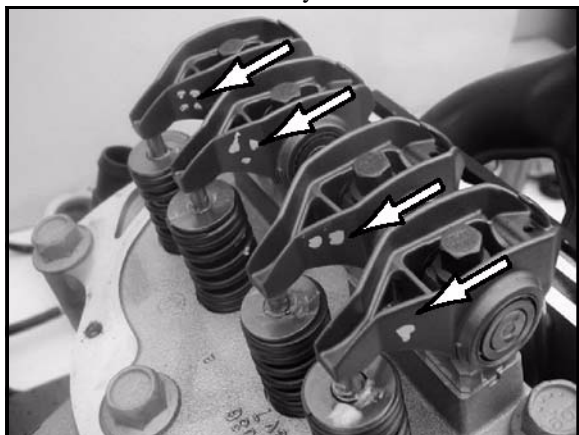
ENGINE DISASSEMBLY AND INSPECTION

Cylinder Head Assembly Exploded View



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

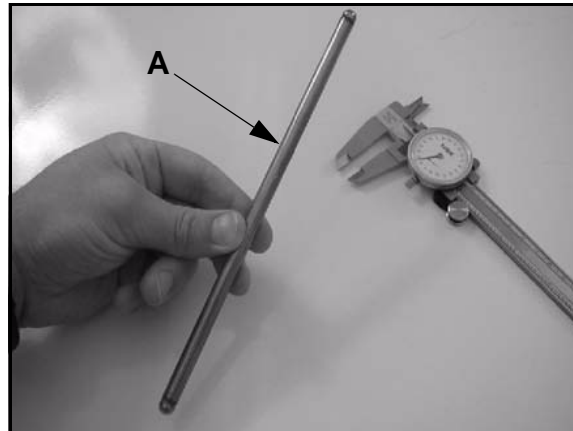
1. Clean push rods (A) in a suitable solvent. Blow dry push rods with compressed air.
2. Use compressed air to confirm the oil passage is clear in the center of the push rod.

⚠ 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.

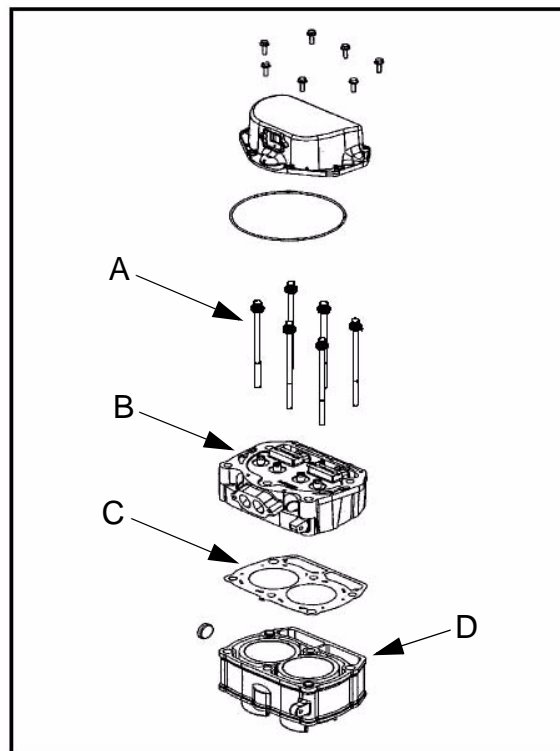
5. If the push rod (A) is visibly bent, it should be replaced.



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 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).



ENGINE

Cylinder Head Inspection

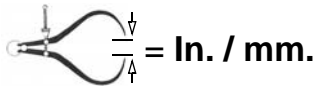
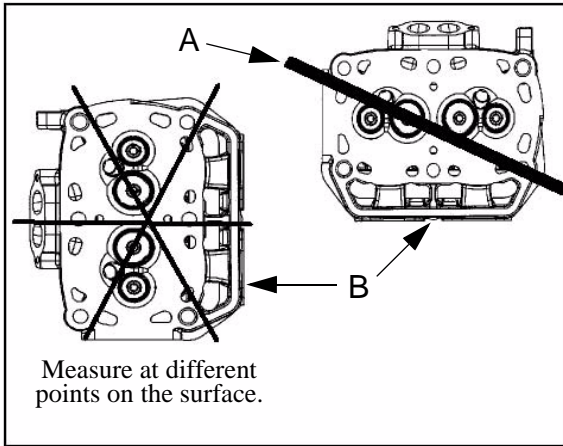
Thoroughly clean cylinder head surface to remove all traces of gasket material and carbon.

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.

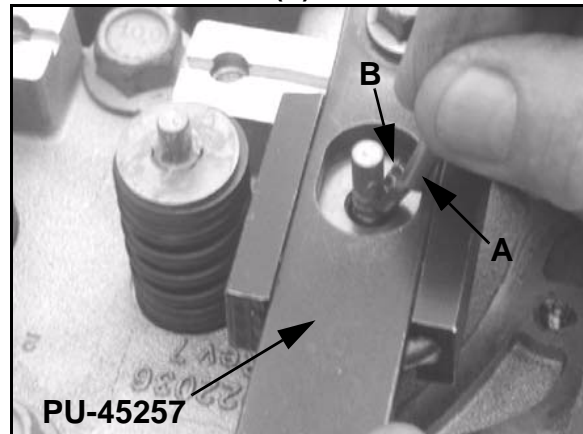
In some cases the valve train can be serviced while the cylinder head is still on the engine. Keep all parts in order with respect to their location in the cylinder head.

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 from the hose at anytime until reassembly is completed.
2. 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).

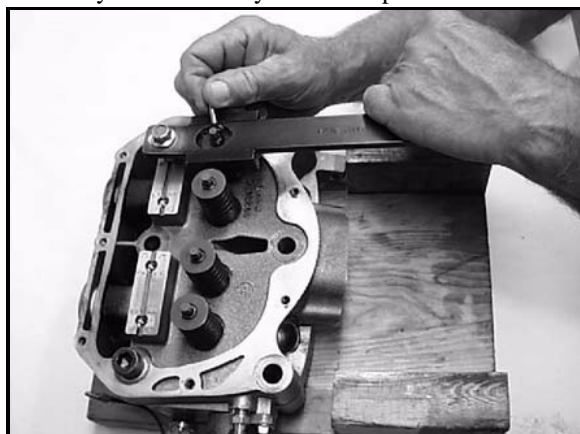


NOTE: To prevent damage to the valve seals, do not compress the valve spring more than is needed to remove the valve keepers.

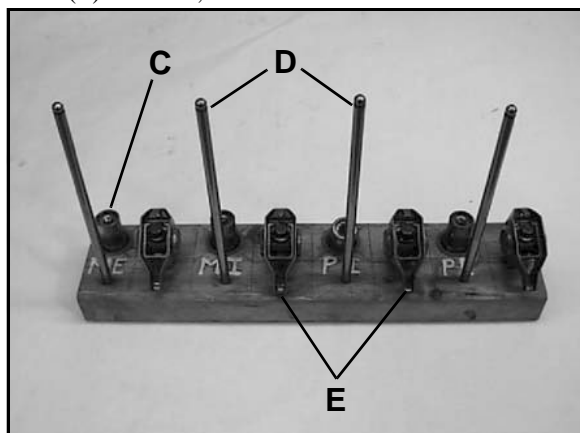
3. Remove spring retainer and spring.
4. The valve seals are now serviceable.

Cylinder Head Disassembly

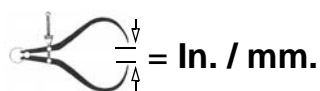
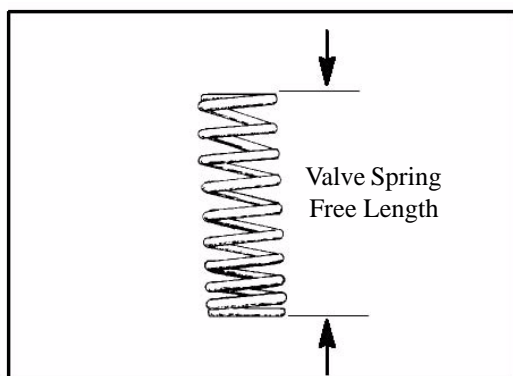
- Carefully remove the cylinder components.



- 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.

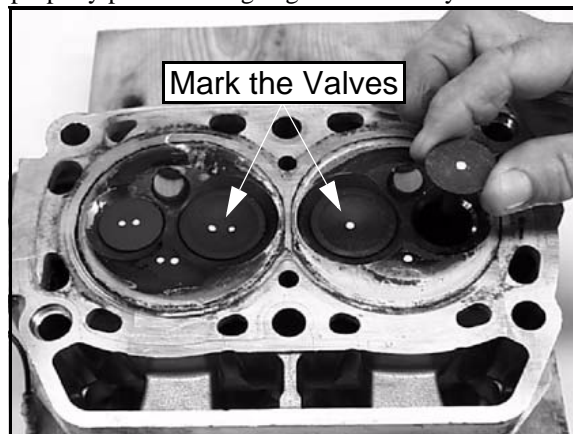


**Valve Spring Free Length:
Std: 1.735" (44.069 mm)**

- 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.

- 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.

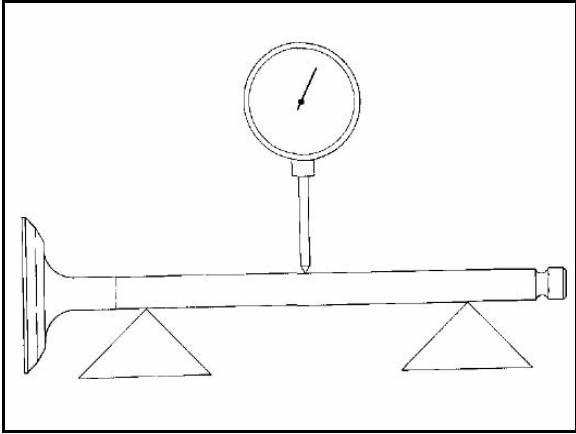


3

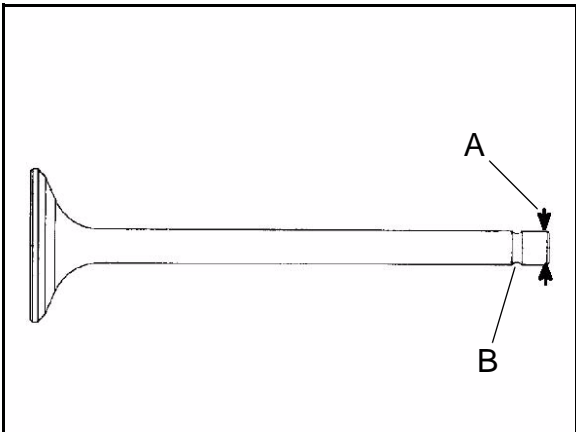
ENGINE

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.



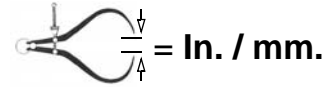
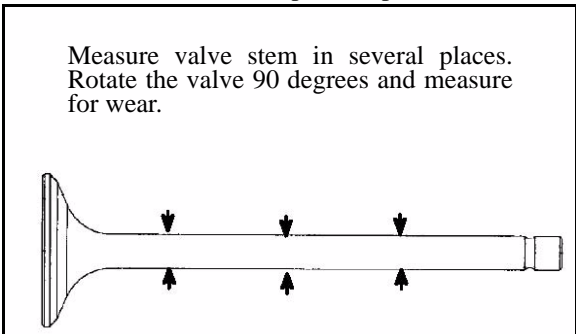
3. Check end of valve stem for flaring, pitting, wear or damage (A).



4. Inspect split keeper groove for wear or flaring of the keeper seat area (B).

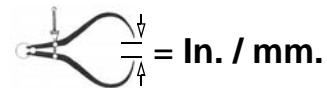
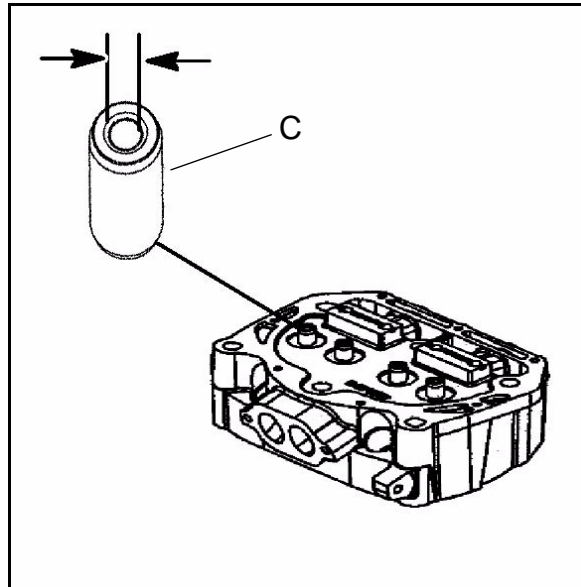
NOTE: The valves can be re-faced or end ground, if necessary. They must be replaced if extensively worn, burnt, bent, or damaged.

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



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

6. 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.



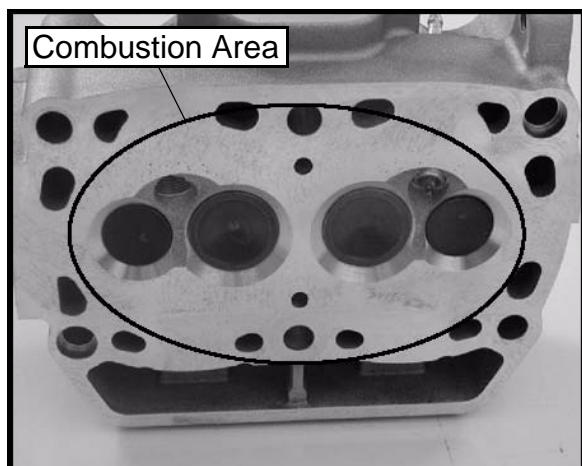
Valve Guide I.D.:
0.23672" + 0.000295"
(6.0617 + 0.0075 mm)

7. Subtract valve stem measurement from the valve guide measurement to obtain stem to guide clearance. **NOTE:** The valve guides cannot be replaced. Be sure to measure each guide and valve combination individually.

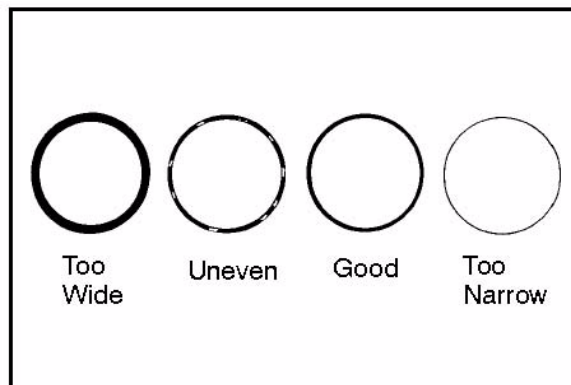
Combustion Chamber

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.



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.



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

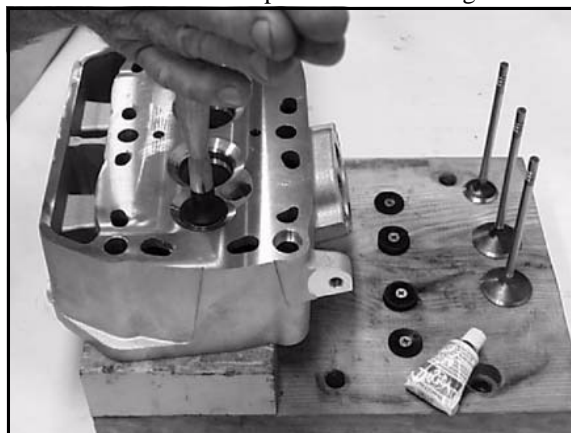
Wear eye protection or a face shield during cylinder head disassembly and reassembly.

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 Cylinder Head Reconditioning Kit (PN 2200634). Abrasive stone seat reconditioning equipment can also be used. Keep all valves in order with their respective seat.

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.



ENGINE

4. Inspect the cut area of the seat:

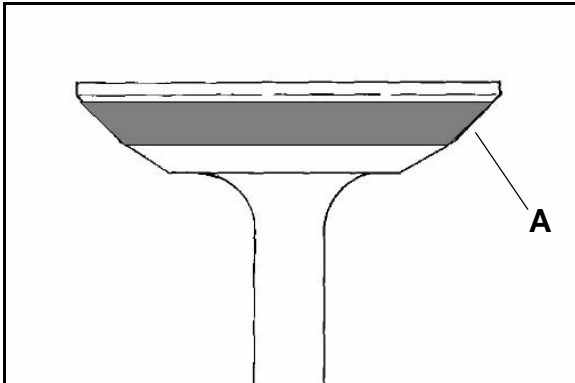
* If the contact area is less than 75% of the circumference of the seat, rotate the pilot 180° and make another light cut.

* 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.

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.

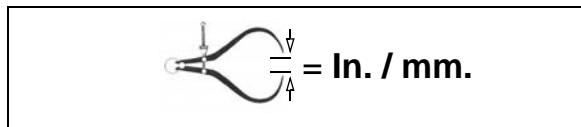
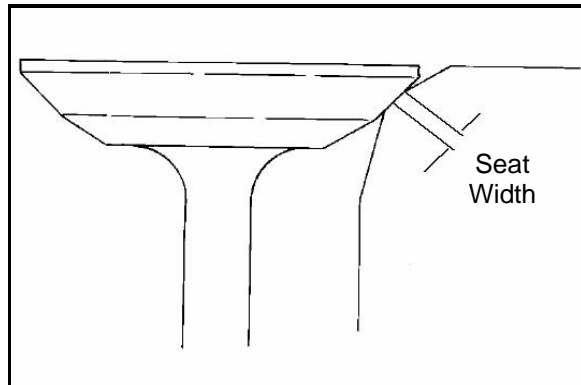
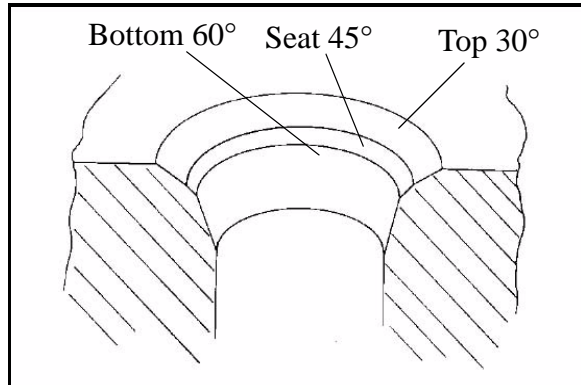
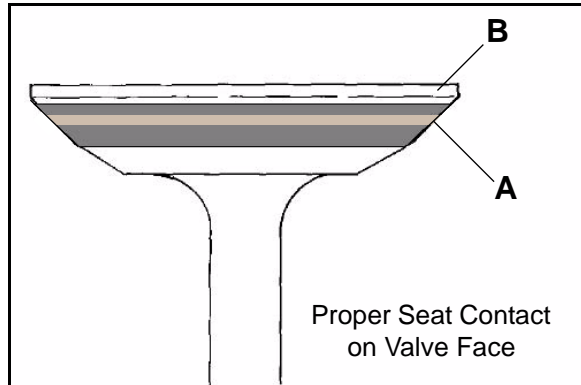
* If the indicated seat contact is at the top edge of the valve face and contacts the margin area (B) it is too high on the valve face. Use the 30° cutter to lower the valve seat.

* 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: .028" (.7 mm)
Limit: .055" (1.4 mm)
Exhaust Std: .0391 (1.0 mm)
Limit: .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.



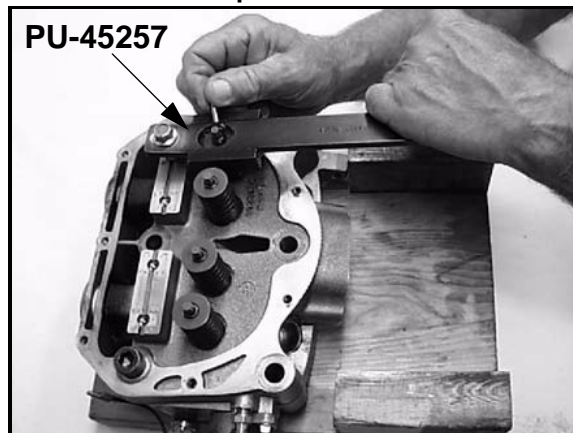
11. Rotate the valve rapidly back and forth until the cut sounds smooth. Lift the valve slightly off of the seat, rotate 1/4 turn, and repeat the lapping process. Do this four to five times until the valve is fully seated, and repeat process for the other valve(s).
12. Thoroughly clean cylinder head 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 0W-40 Synthetic 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.



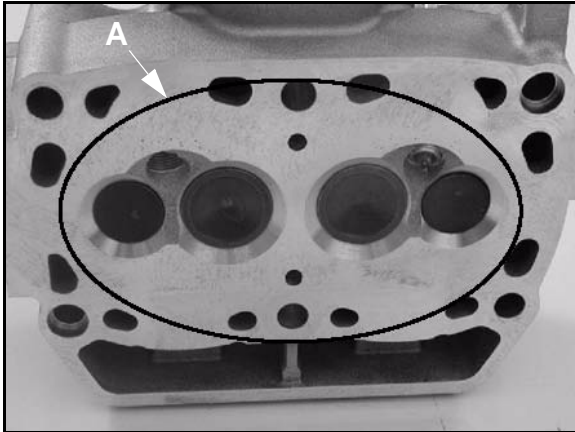
7. Repeat procedure for remaining valves. When all valves are installed, tap lightly with soft faced hammer on the end of the valves to seat the split keepers.

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

ENGINE

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).

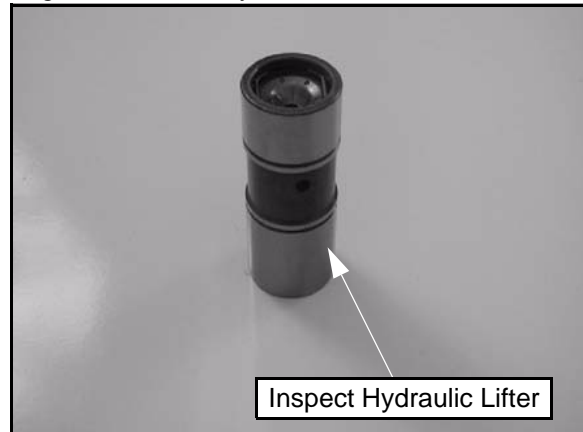


Valve Lifter Removal / Inspection

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 circlip (A). 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.

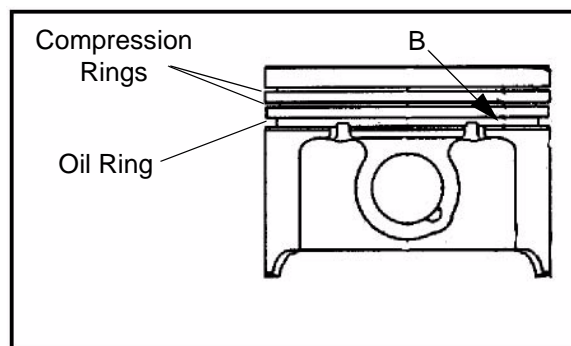


4. Repeat procedure for second ring.
5. Remove the oil control ring.

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:

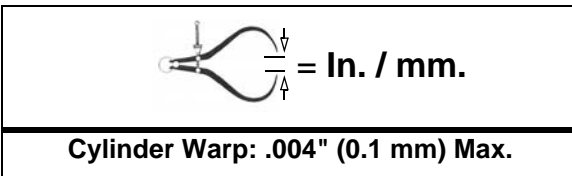
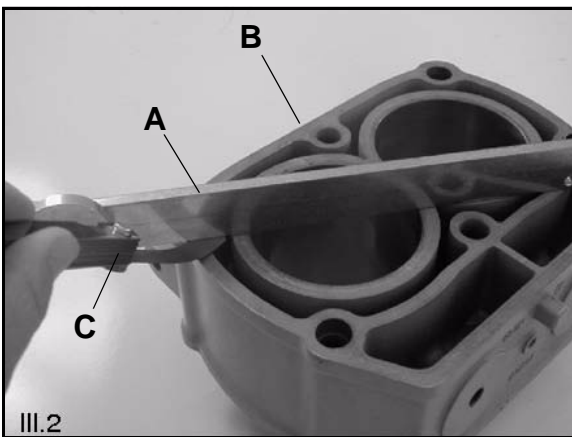
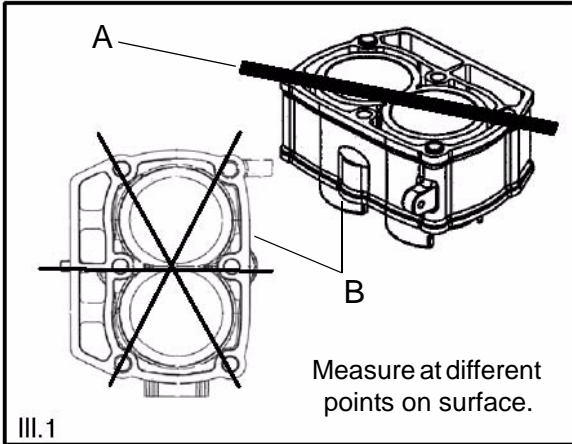
- A) Remove the top rail first followed by the bottom rail.
- B) Remove the expander.



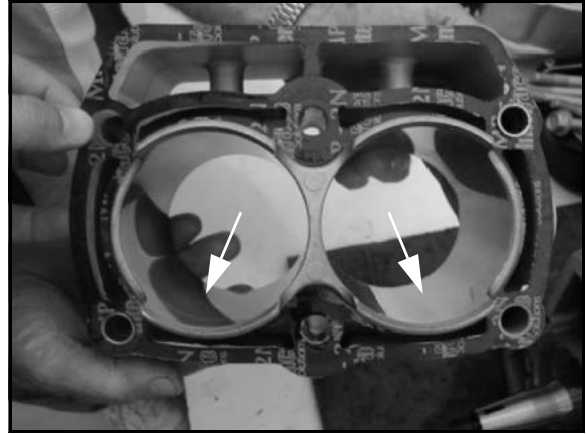
ENGINE

Cylinder Inspection

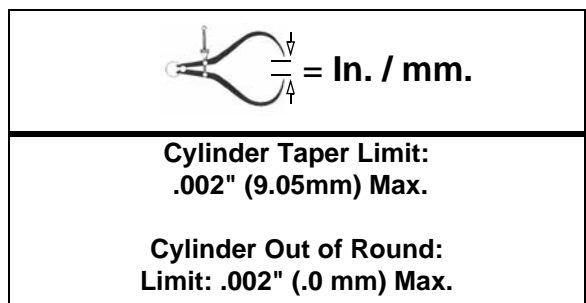
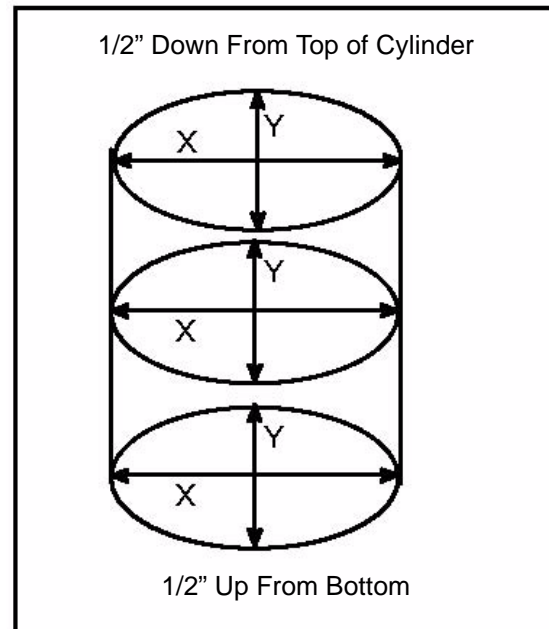
1. Remove all gasket material from the cylinder sealing surfaces.
2. Inspect the top of the cylinder (B) for warp using a straight edge (A) and feeler gauge (C). Refer to Ill. 1 and Ill. 2.



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 .002", the cylinder must be replaced.



**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

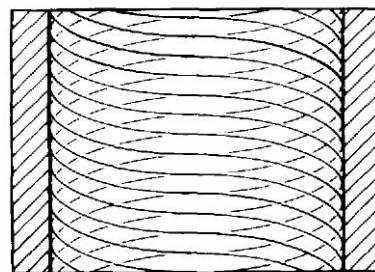
A hone which will straighten as well as remove material from the cylinder is very important. Using a common spring loaded glaze breaker for honing is not advised for nicasil cylinders. Polaris recommends using a rigid hone or arbor honing machine. Cylinders may be wet or dry honed depending upon the hone manufacturer's recommendations. Wet honing removes more material faster and leaves a more distinct pattern in the bore.

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 de-glazed, 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

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.

Cleaning the Cylinder After Honing

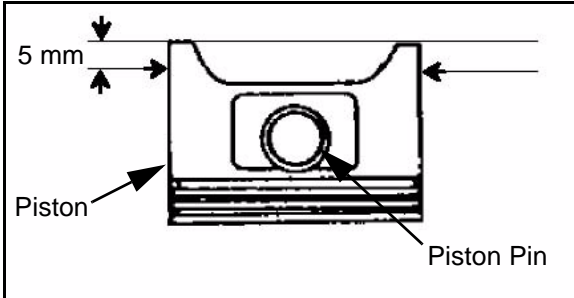
It is very important that the cylinder be thoroughly cleaned after honing to remove all grit material. Wash the cylinder in a solvent, then in hot, soapy water. Pay close attention to areas where the cylinder sleeve meets the aluminum casting (transfer port area). Use electrical contact cleaner if necessary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

ENGINE

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 measurement obtained in Step 5.

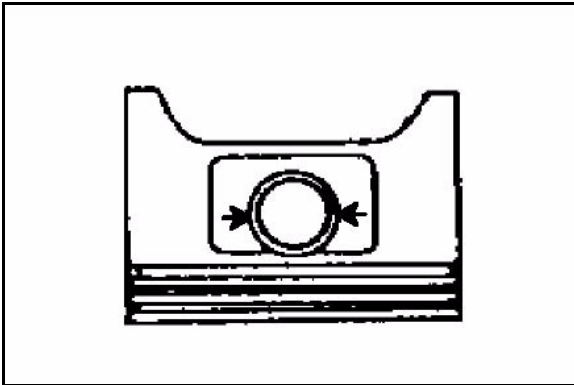


Piston to Cylinder Clearance:
See “800 EFI Engine Service Specifications” on page 3.9

Piston O.D.:
See “800 EFI Engine Service Specifications” on page 3.9

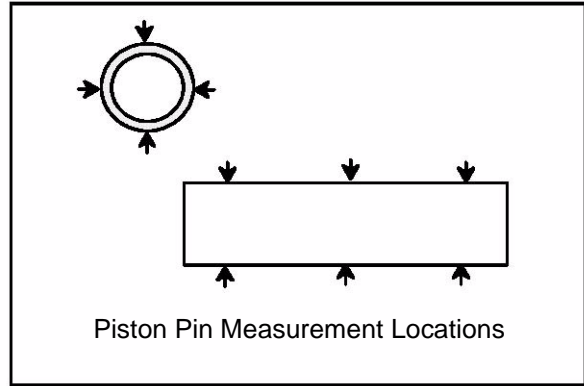
Piston / Rod Inspection

1. Measure piston pin bore.



Piston Pin Bore:
See “800 EFI Engine Service Specifications” on page 3.9

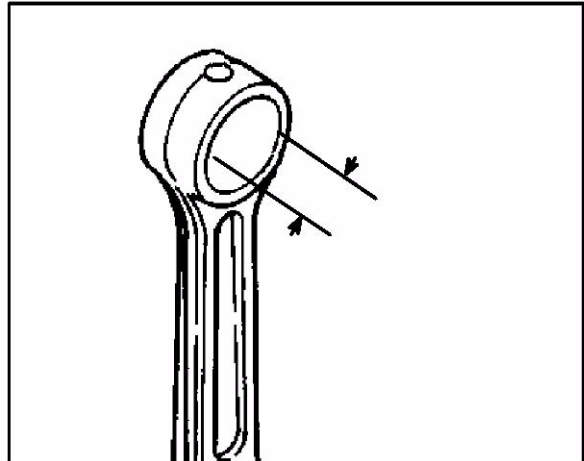
2. Measure piston pin O.D. Replace piston and/or piston pin if out of tolerance.



Piston Pin Measurement Locations

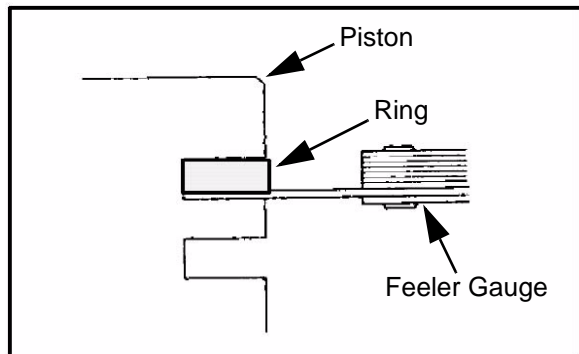
Piston Pin O.D.:
See “800 EFI Engine Service Specifications” on page 3.9

3. Measure connecting rod small end ID.



Connecting Rod Small End I.D.:
See “800 EFI Engine Service Specifications” on page 3.9

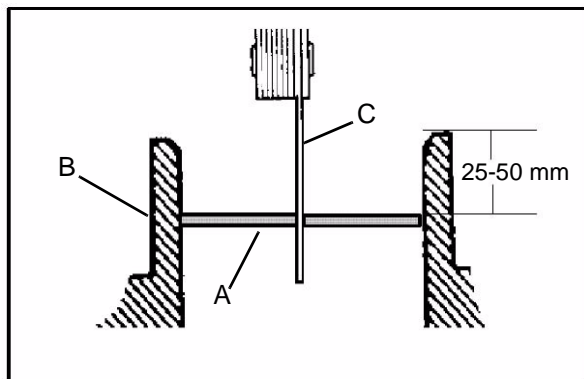
4. Measure piston ring to groove clearance by placing the ring in the ring land and measuring with a thickness gauge. Replace piston and rings if ring-to-groove clearance exceeds service limits.



See "800 EFI Engine Service Specifications" on page 3.9

Piston Ring Installed Gap

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



Piston Ring Installed Gap
See "800 EFI Engine Service Specifications" on 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.

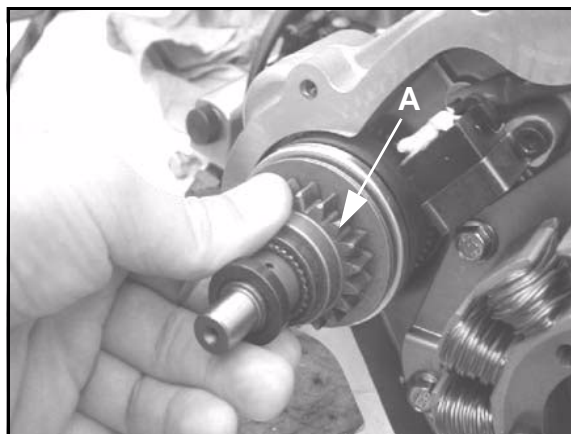
NOTE: Always check piston ring installed gap after re-boring a cylinder or when installing new rings. A re-bored cylinder should always be scrubbed thoroughly with hot soapy water, rinsed, and dried completely. Wipe cylinder bore with oil immediately to remove residue and prevent rust.

Starter Drive Bendix Removal / Inspection

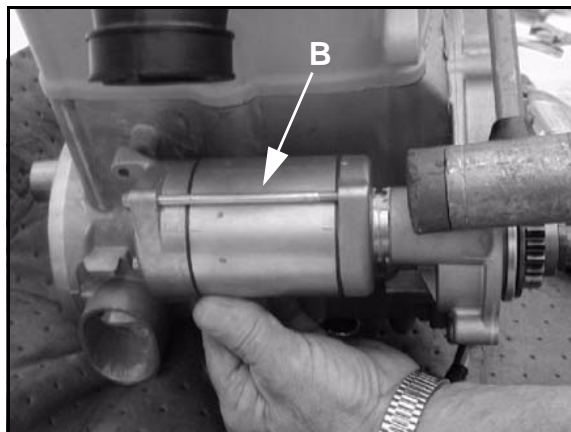
1. Remove stator housing bolts and remove housing.
2. Remove the flywheel nut and washer. Install Flywheel Puller (PN 2871043) and remove flywheel.

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.

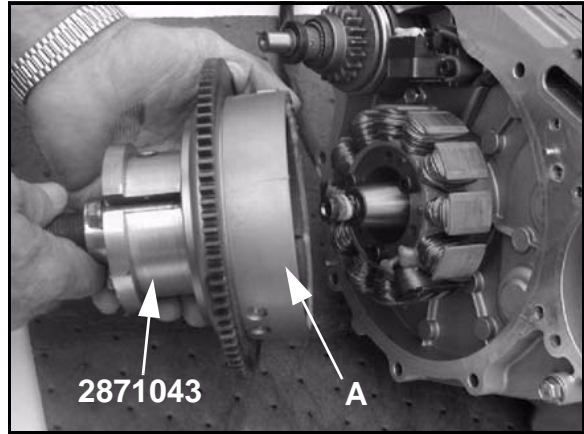
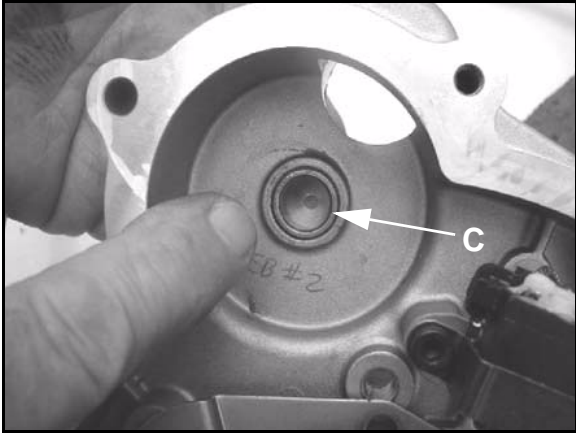


4. Inspect the thrust washer for wear or damage and replace if necessary.
5. After the bendix is removed, remove the two bolts retaining the starter. Tap on the starter assembly (B) with a soft faced mallet to loosen the starter from the crankcase.



ENGINE

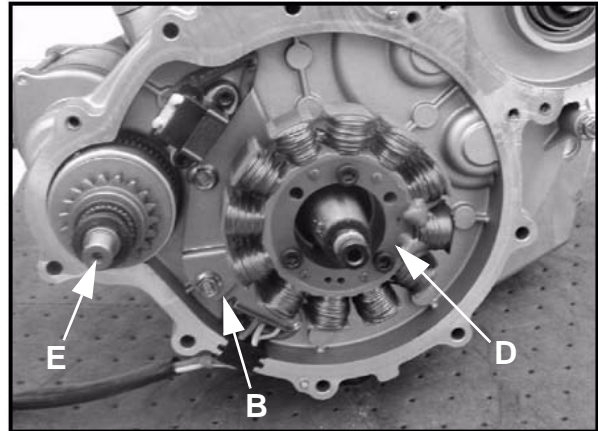
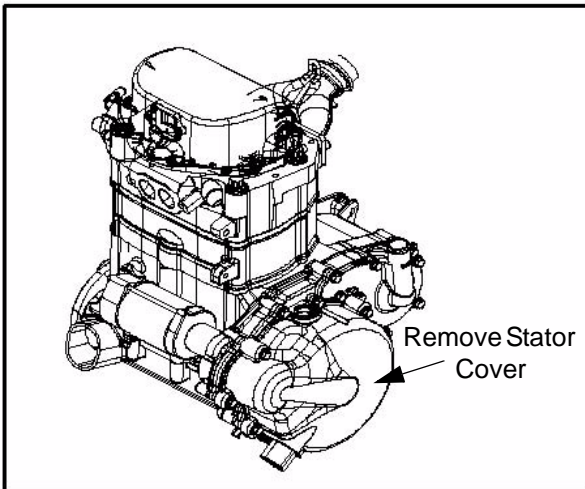
6. Inspect gear teeth on starter drive (A). Replace starter drive if gear teeth are cracked, worn, or broken.
7. Inspect the bendix bushing (C) in the mag cover for wear. Replace as needed.



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.

Flywheel / Stator Removal / Inspection

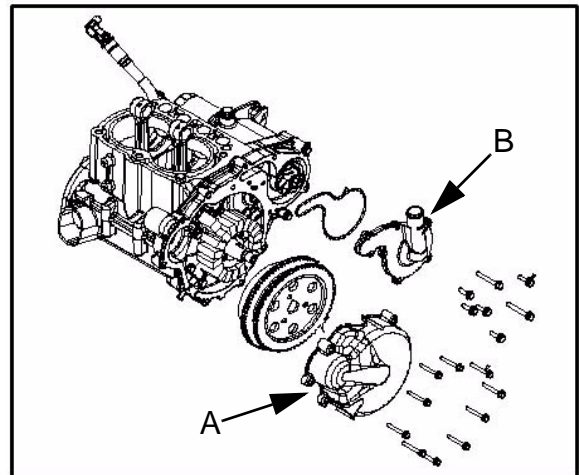
1. Remove stator housing bolts and remove housing.



5. Remove the bendix (E) if necessary.

Engine Crankcase Disassembly / Inspection

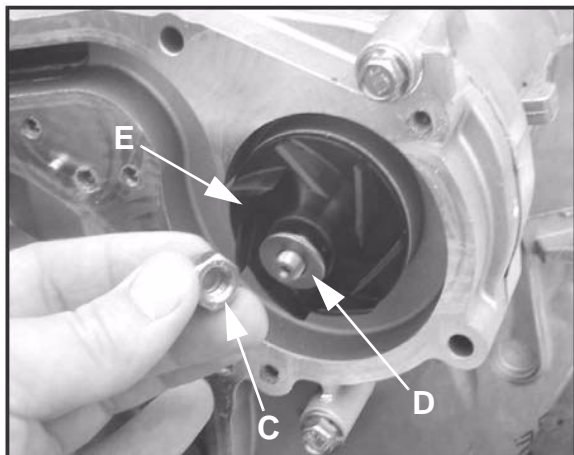
1. Remove the stator cover (A) and water pump cover (B).



CAUTION

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

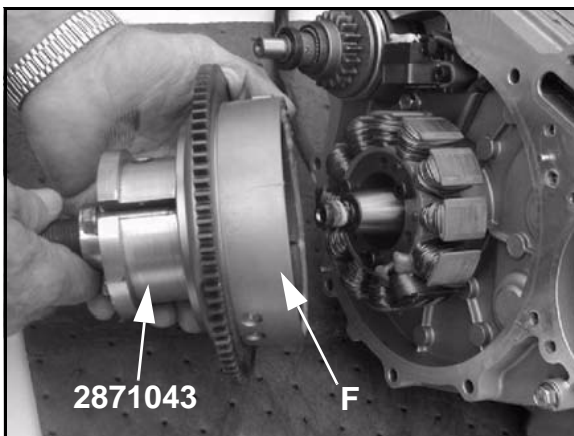
- Remove the nylok nut (C), washer (D), and water pump impeller (E). Remove part of the water pump seal behind the impeller.



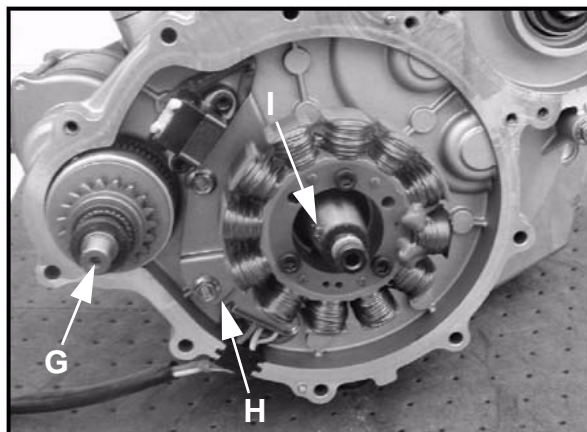
- Remove flywheel nut and washer.
- Install Flywheel Puller (PN 2871043) and remove flywheel (F).

⚠ CAUTION

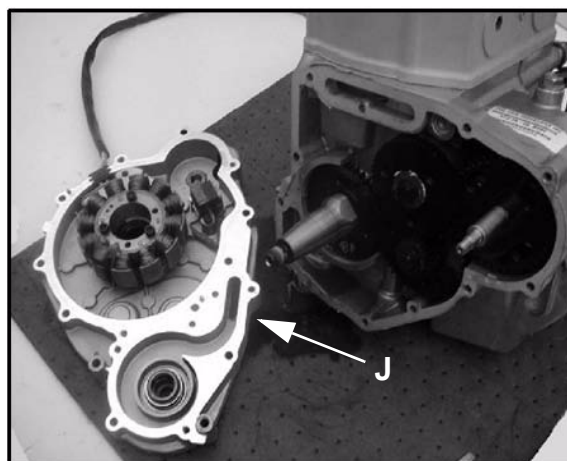
Do not thread the puller bolts into the flywheel more than 1/4, or stator coils may be damaged.



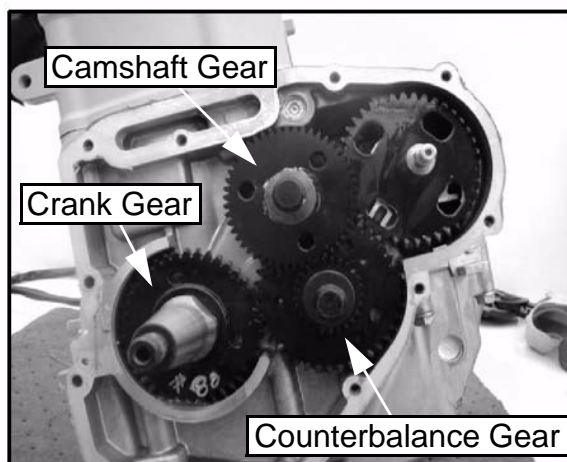
- Remove the starter bendix (G), wire holddown plate (H), and the woodruff key (I) from the crankshaft. The stator does not have to be removed at this point.



- 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.

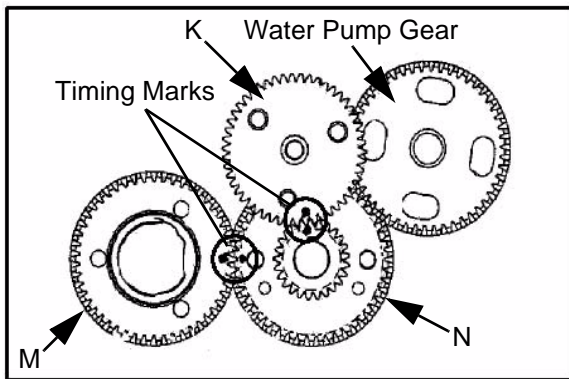


- Note the positions of the gears in the photo.



ENGINE

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

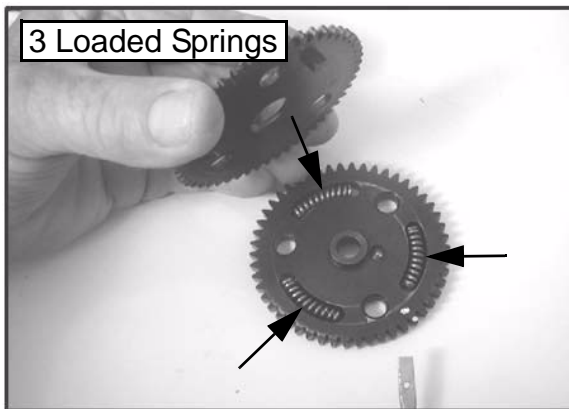


NOTE: If replacing one of the gears, it is recommended that all of the gears be replaced. A gear kit is available.

9. Use the Cam Gear Tooth Alignment Tool (PU-45497-2) (O) to align 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 as shown.

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.



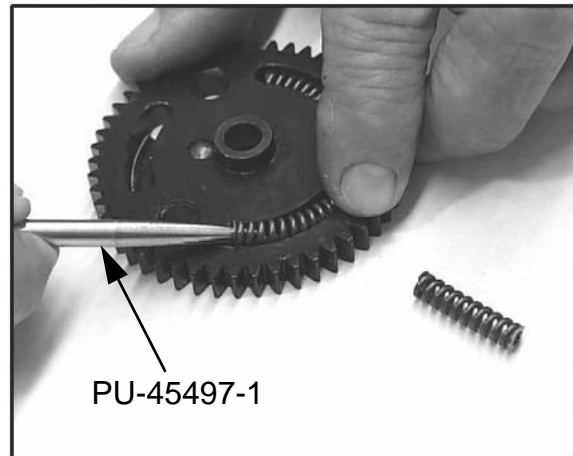
11. The cam gear assembly contains three loaded springs. To open the cam gear assembly:

- 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.

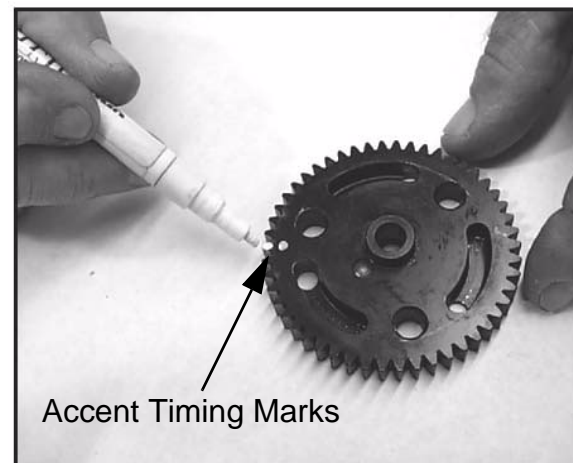
CAUTION

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.

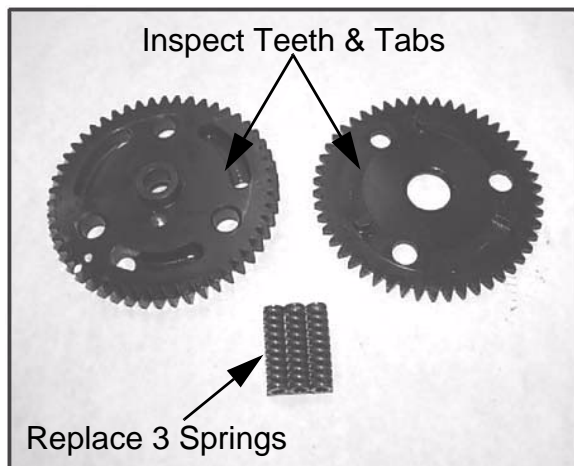
12. Remove all three springs using one of the tapered pins from the Tapered Pins (PU-45497-1).



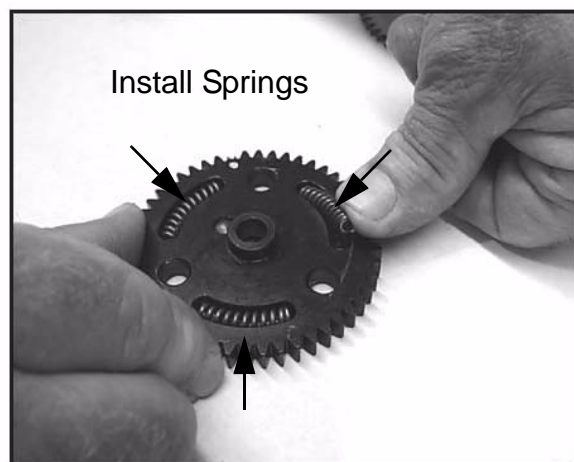
13. With a white marking pen, accent the timing mark on the gear that contains the springs.



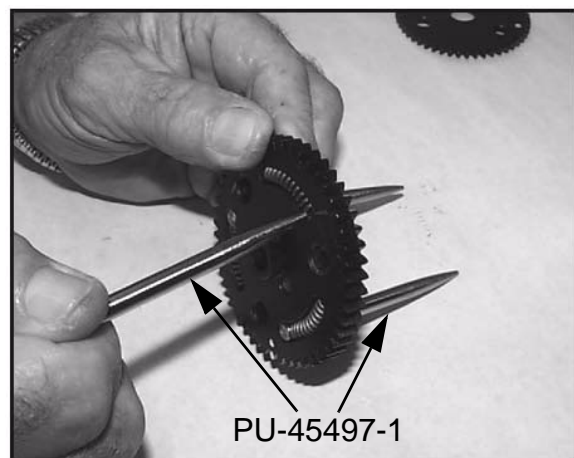
14. Inspect the gear teeth and the three tabs on the gears for wear.



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.

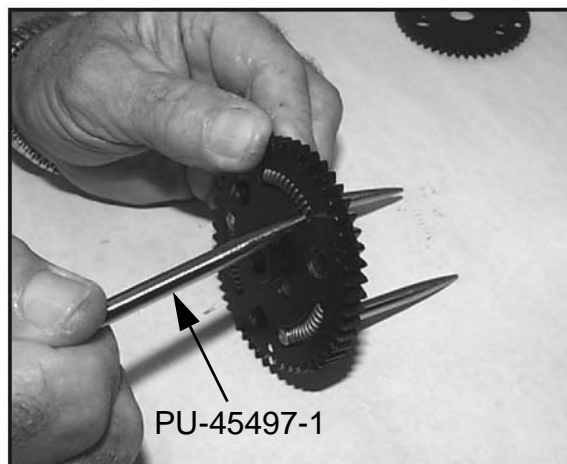


To Assemble:

- Hold the spring with one finger.
- Start the pointed end of the tapered pin into the cam gear hole. Slowly push the 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.

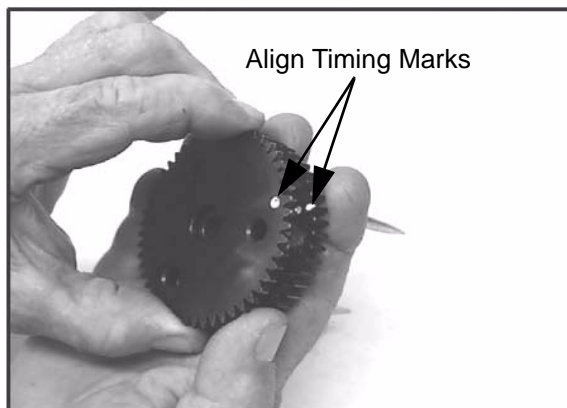
NOTE: Do not remove the tapered pins at this time.

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.



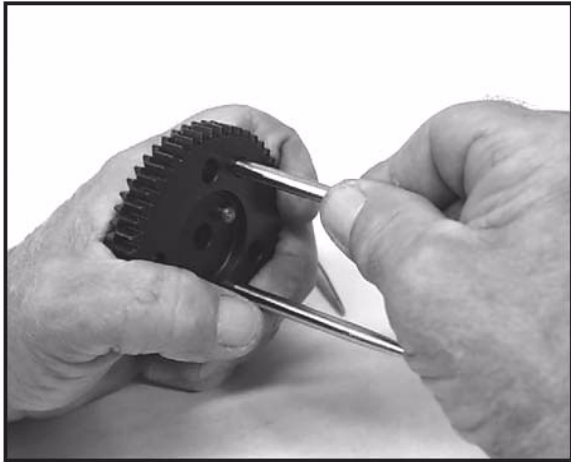
**Cam Gear Spring Installation Tool Kit:
(PU-45497)
Tapered Pins:
(PU-45497-1)
Cam Gear Tooth Align Tool:
(PU-45497-2)**

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



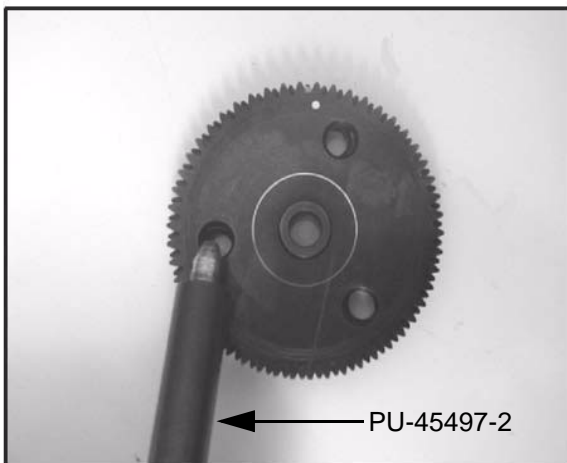
ENGINE

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.



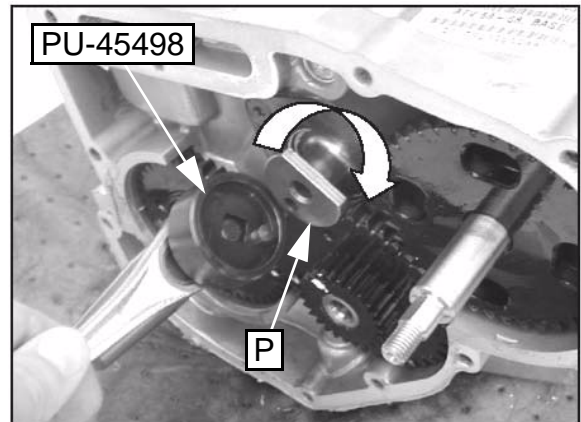
20. After the tapered pins are removed, be sure the cam gear assembly is held together tightly. Place the cam gear assembly on a flat surface. Use the Cam Gear Tooth Alignment Tool (PU-45497-2) to align the teeth of the cam gears, as shown in the picture.

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



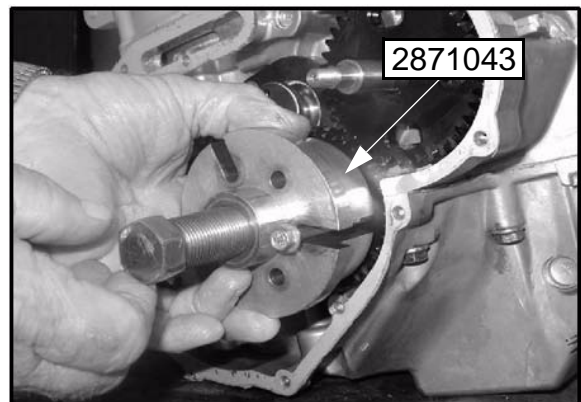
NOTE: For ease of installing the Cam Gear Alignment Tool (PU-45497-2), use a twisting motion when pushing down on the tool.

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.

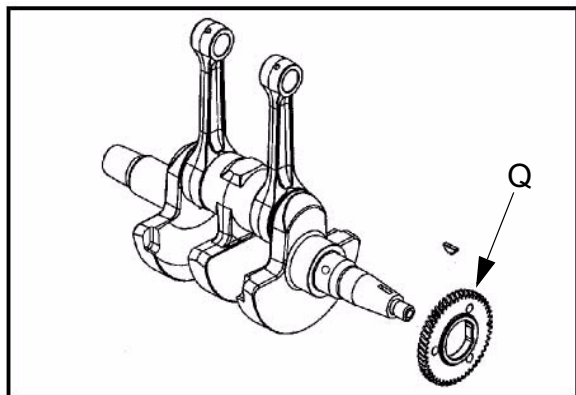


NOTE: This Cam Spanner Wrench (PU-45498) is only needed to rotate the camshaft when the entire valve train is assembled. If the rocker arms are removed, the cam-shaft can be turned by hand.

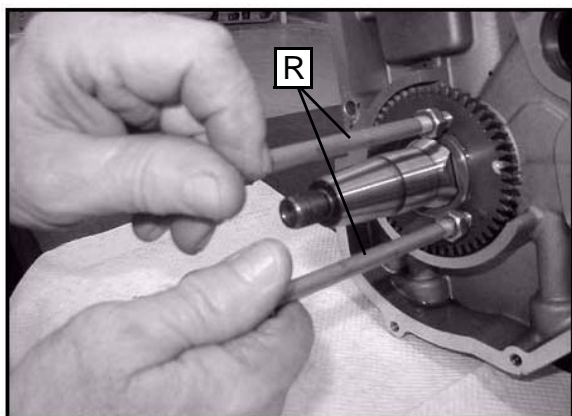
22. Remove the bolt and nut from the balance shaft gear. Try to remove the balance shaft gear. If the gear does not come off manually, use the Flywheel Puller (PN 2871043) to remove the balance shaft gear.



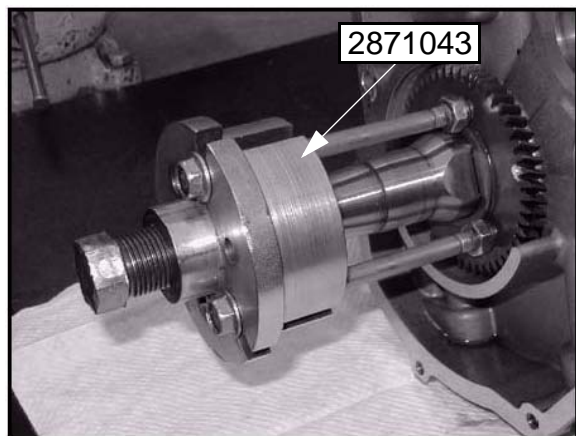
23. Inspect the crankshaft gear (Q) for broken or worn teeth. If the crankshaft gear does not need to be replaced, it does not need to be removed. If the crankshaft gear is damaged, remove the crankshaft gear with the Flywheel Puller (PN 2871043).



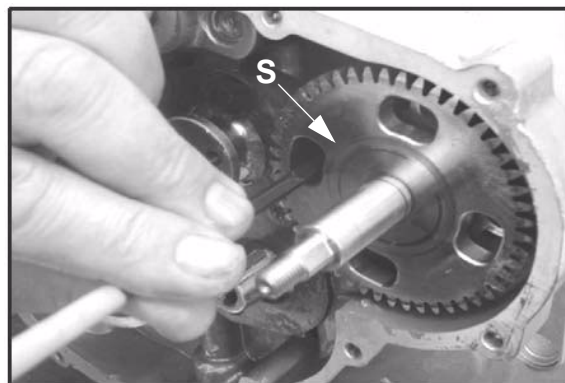
24. Install the two puller bolts (R). Tighten the puller bolts up so that the bolts are at equal length.



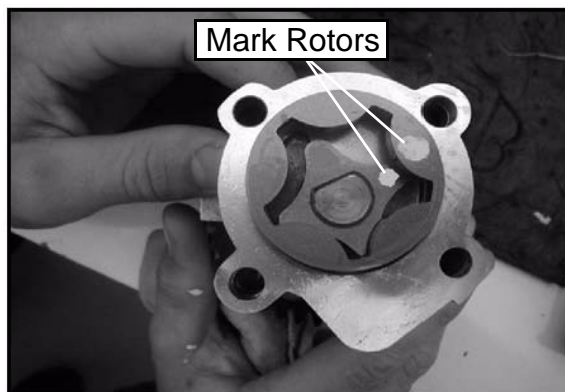
25. Install the Flywheel Puller (PN 2871043) and remove the crankshaft gear, if needed.



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.

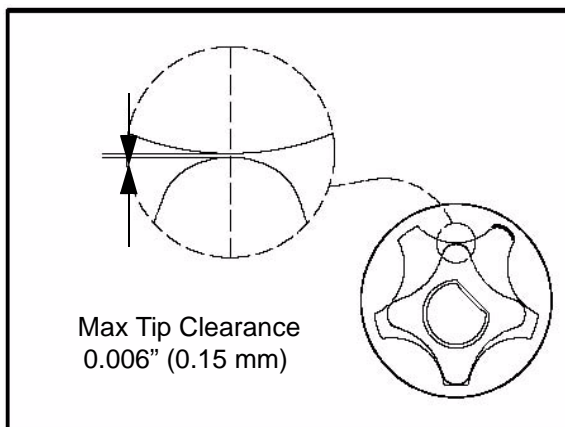


27. Inspect the oil pump rotors for wear. Mark the rotors with a white pen to ensure upon reassembly that the correct sides of the rotors are installed and mesh with the same edges as previously installed.



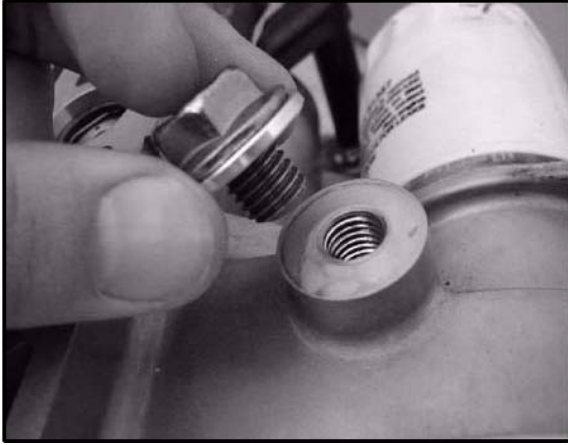
NOTE: If replacing the old rotors, new replacement rotors will fit into the original oil/water pump housing.

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).**

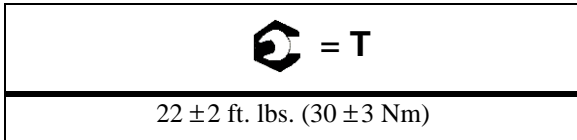
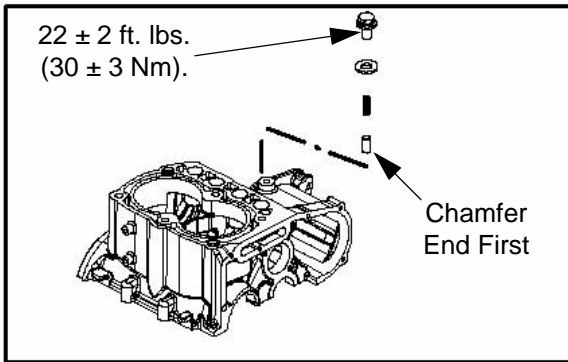


ENGINE

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.

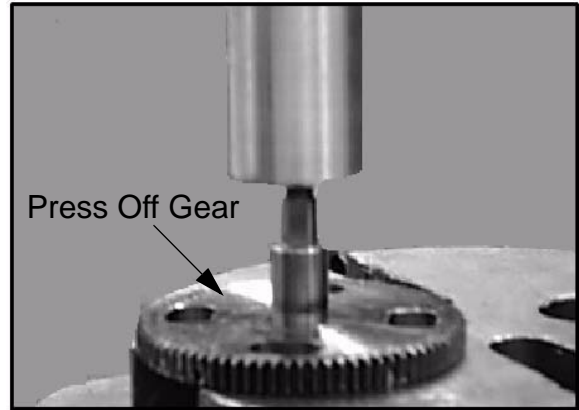


30. Reinstall the valve (dowel chamfered end first). Install the spring, washer, and bolt. Torque to specification .



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.

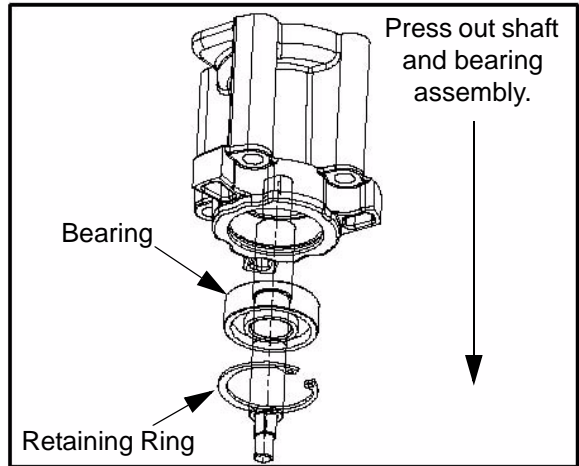
31. Carefully press the gear off the assembly while supporting the housing assembly.



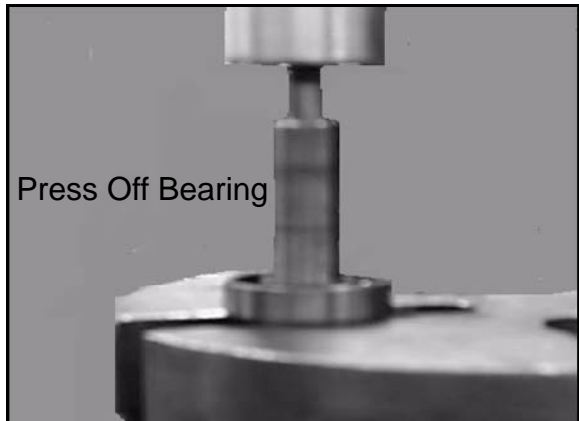
CAUTION

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

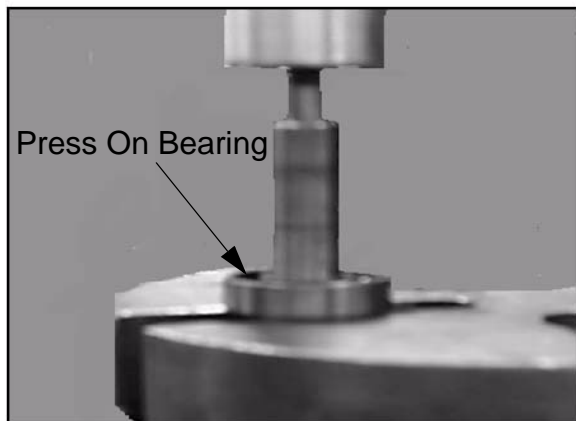
32. Remove the snap ring from the assembly. Place the housing in a support and press out the bearing/shaft assembly.



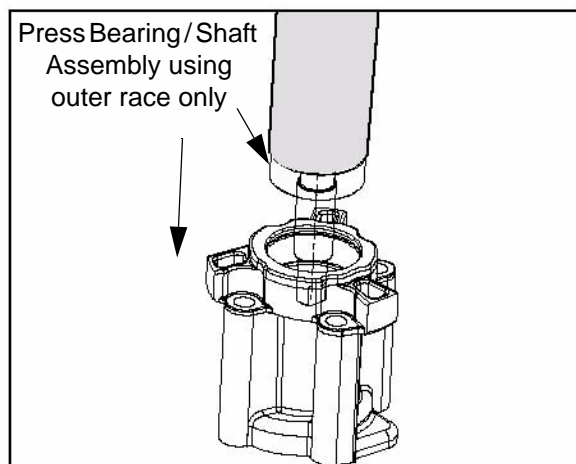
33. Place the shaft in a press to remove the bearing.



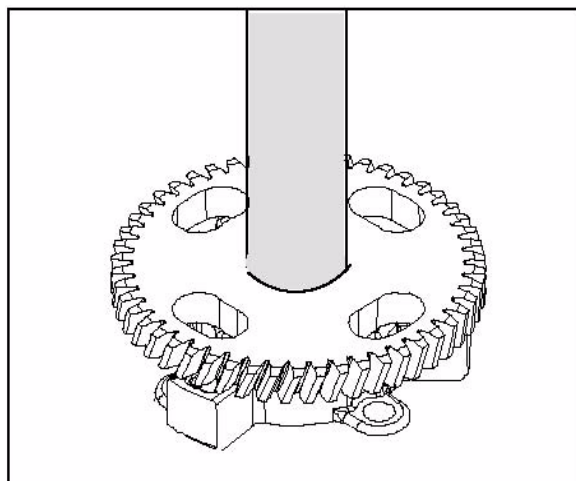
34. Press shaft into the new bearing..



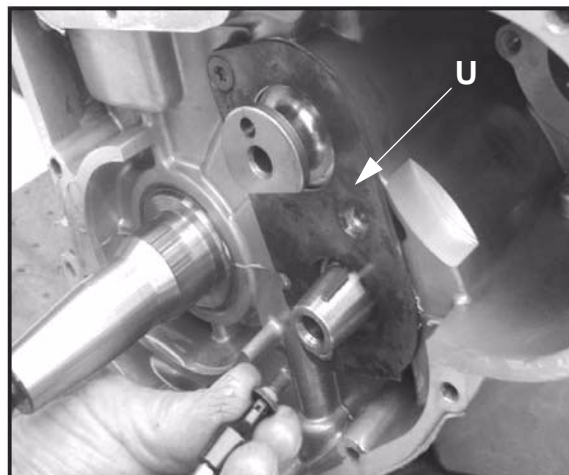
35. Press the bearing/shaft assembly using the bearing's outer race. Do not use the shaft to press the assembly into the housing, as bearing damage may result. Install retaining ring.



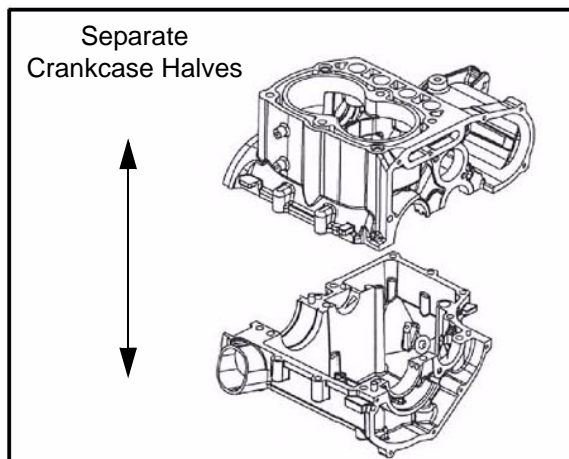
36. Press gear onto shaft while supporting the housing.



37. Remove thrust plate (U).



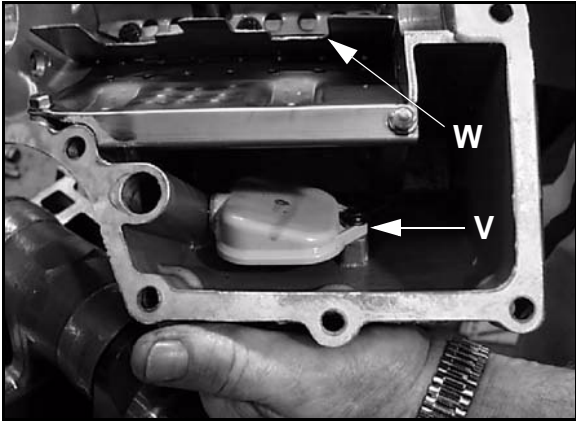
38. Remove PTO end engine mount. Remove crankcase bolts. Tap on the reinforced areas on the cases using soft hammer. Carefully separate the two crankcase halves.



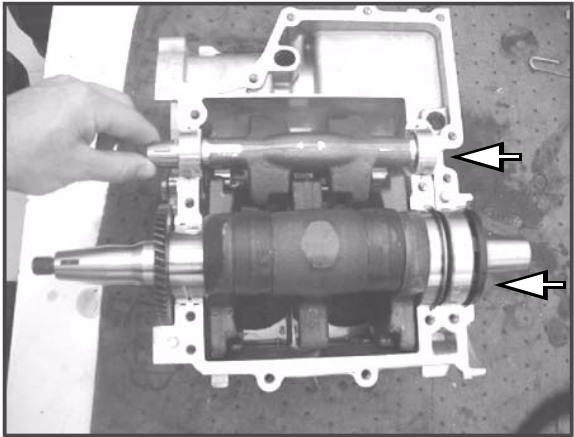
NOTE: Only remove the oil baffle if the baffle is damaged. When removing the oil baffle bolts, use a heat gun to heat the bolts and loosen the Loctite™. This will prevent any possible damage to the bolts or to the crankcase casting.

ENGINE

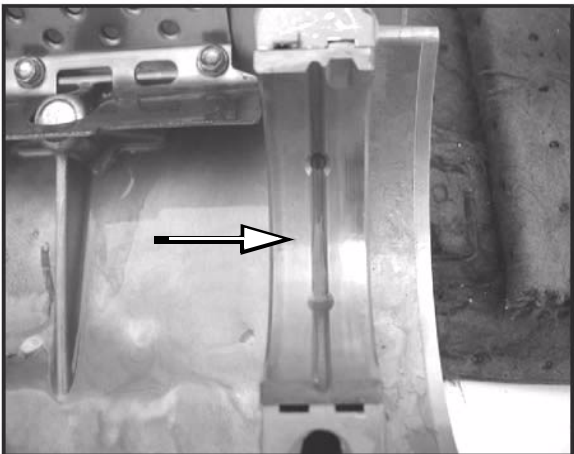
39. Remove and clean oil pick up (V) and oil baffle weldment (W).



40. Remove balance shaft and crankshaft.

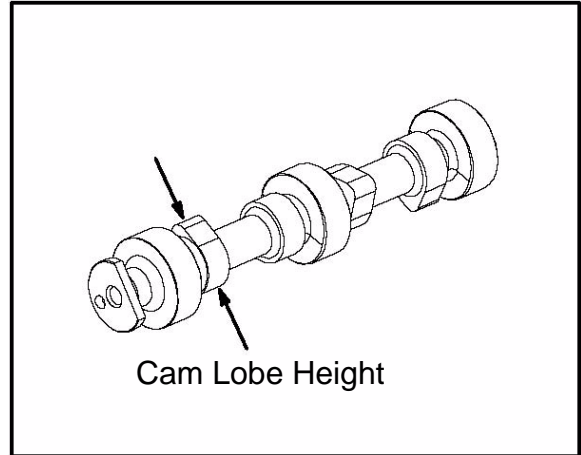


41. Remove and inspect crankshaft main journal bearings for abnormal wear. **It is recommended to replace the bearings anytime the engine is disassembled.**



Camshaft Inspection

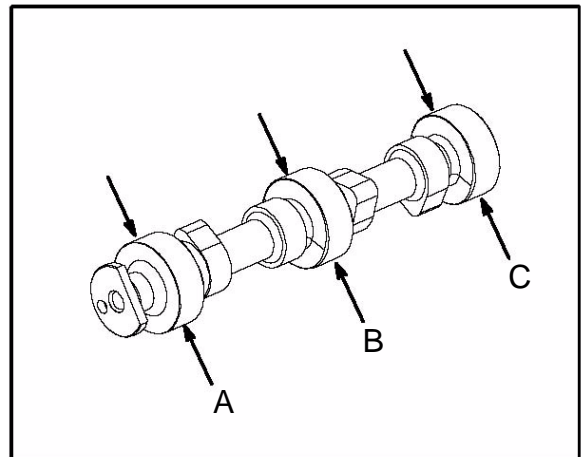
1. Thoroughly clean the cam shaft.
2. Visually inspect each cam lobe for wear, chafing or damage.
3. Measure height of each cam lobe using a micrometer. Compare to specification.



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

**Cam Lobe Height
(Intake & Exhaust):
Std: 1.3334" (33.8674 mm)**

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

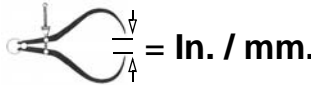


$\frac{\text{In.}}{\text{mm.}}$

Camshaft Journal O.D. :

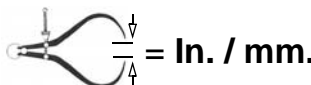
A. (Mag): 1.654" \pm .00039" (42 \pm .010 mm)
 B. (Ctr.): 1.634" \pm .00039" (41.50 \pm .010 mm)
 C. (PTO): 1.614" \pm .00039" (41 \pm .010 mm)

5. Measure ID of camshaft journal bores.



Camshaft Journal Bore I.D.:
(Mag): 1.656" ± 0.00039" (42.07 ± 0.010 mm)
(Ctr.) 1.637" ± 0.00039" (41.58 ± 0.010 mm)
(PTO) 1.617" ± 0.00039" (41.07 ± 0.010 mm)

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



Calculated Camshaft Oil Clearance:
Std: 0.0027" (.070mm)
Limit: .0039" (.10 mm)

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

NOTE: Replace engine block if camshaft journal bores are damaged or worn excessively.

ENGINE REASSEMBLY

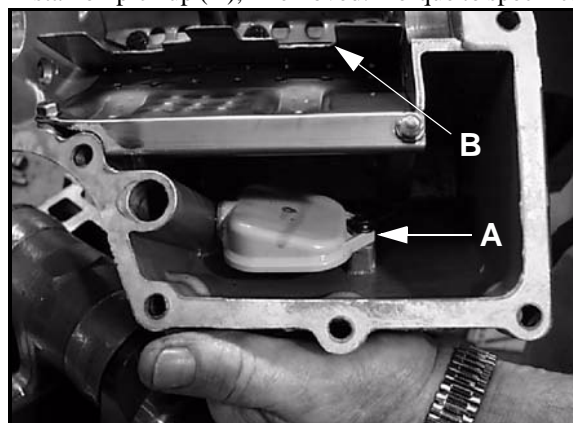
Crankcase Reassembly

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 the bolts and bolt holes with Primer N (PN 2870585) to remove any debris. This will ensure proper sealing when installing bolts.

1. Install oil pick up (A), if removed. Torque to specification.

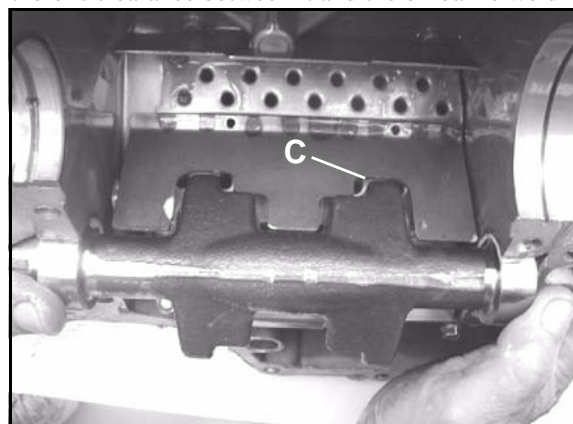


2. Install oil baffle weldment (B). Torque bolts to specification.

 = T

Oil Baffle Weldment & Oil Pick Up Bolt Torque:
60 ± 6 in. lbs. (6.8 ± 0.68 Nm)

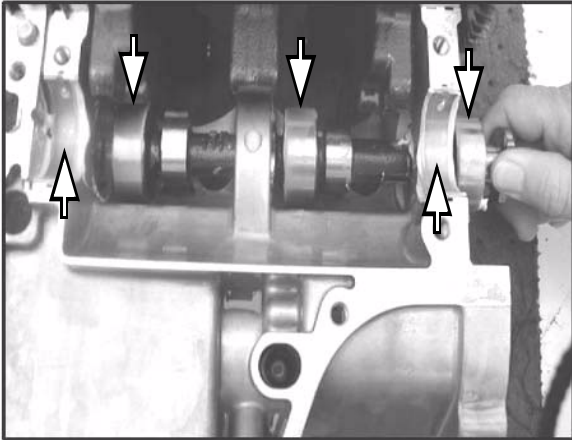
3. Install the balance shaft. Inspect balance shaft clearance (C) in both gearcase halves. Rotate balance shaft to ensure there is clearance between it and the oil baffle weldment.



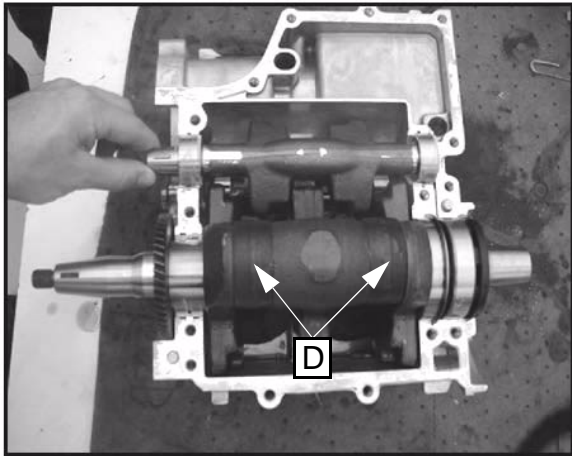
ENGINE

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.

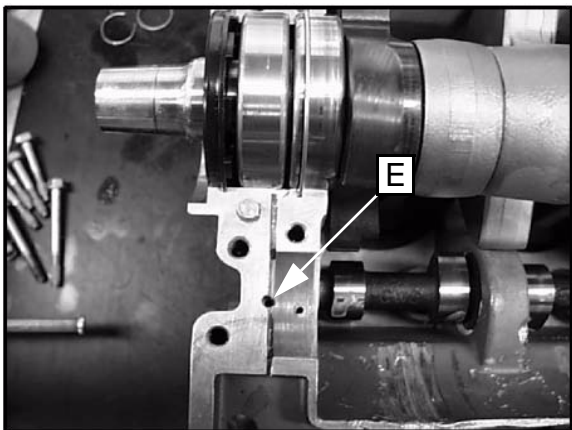


5. Install crankshaft assembly and apply engine oil to crank pins and rods (D). Apply assembly lube to the main journals and bearings.




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

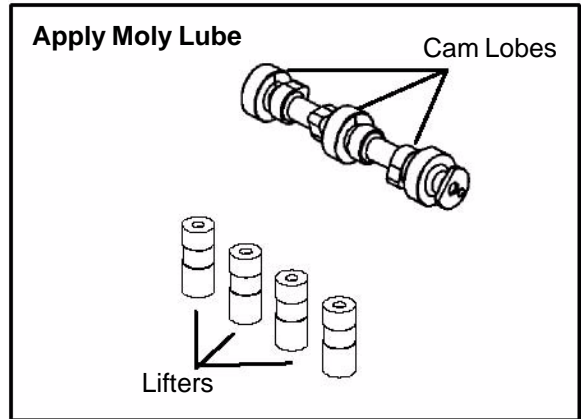
NOTE: Do not apply sealant to cam relief hole (E).



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.

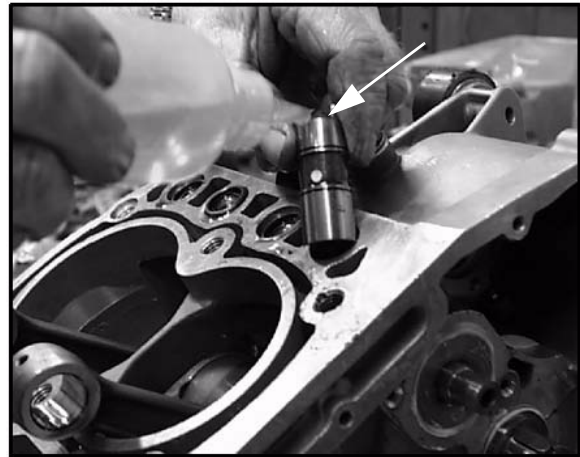

Crankcase Bolt Torque: 22 + 2 ft. lbs. (30 + 3 Nm) Torque in sequence

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

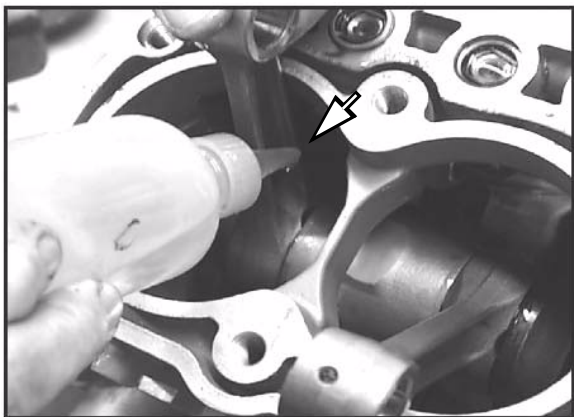


9. Lubricate lifters with engine oil and install in the original order as removed in disassembly. Apply Lubricant or Moly Lube to the ends of the lifters.

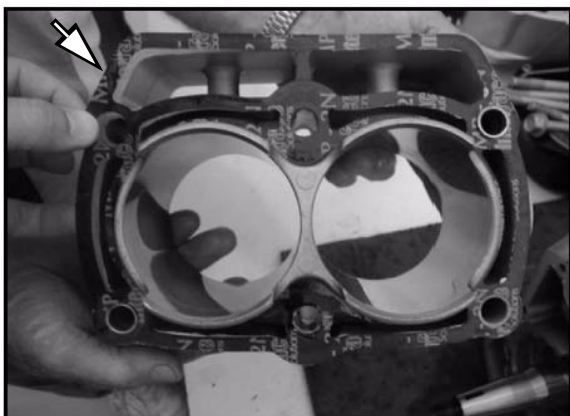
NOTE: Always replace the camshaft and lifters as a set.



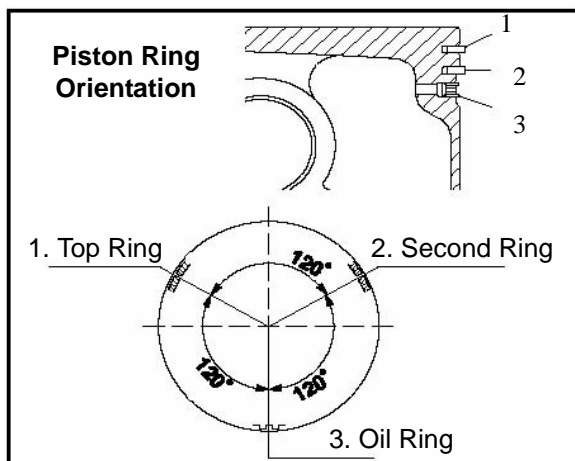
10. Lubricate connecting rods with 0W-40 engine oil.



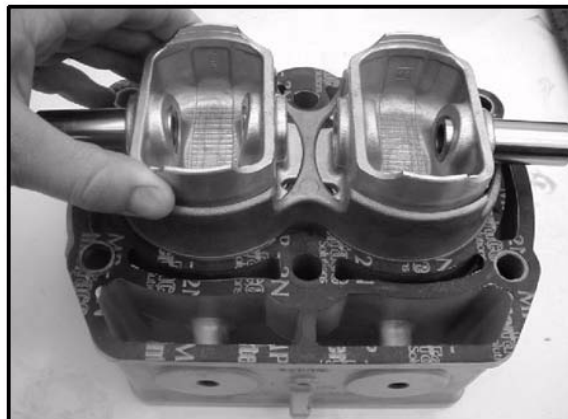
11. Install new cylinder gasket on crankcase. Align gasket on the dowel pins for proper gasket alignment.



12. Orientate the piston rings on the piston before installation into the cylinders. Set the gaps of the rings every 120° (See Illustration Below).

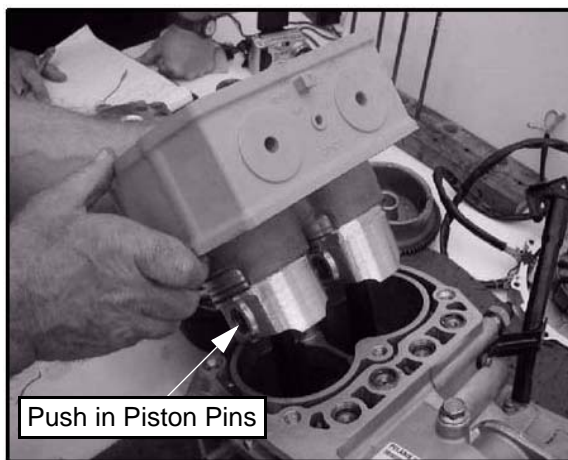


13. Install piston assemblies into cylinder aligning the piston pin holes, to ensure proper alignment of the pistons to the connecting rods upon assembly. Partially install the piston pins into the pistons.

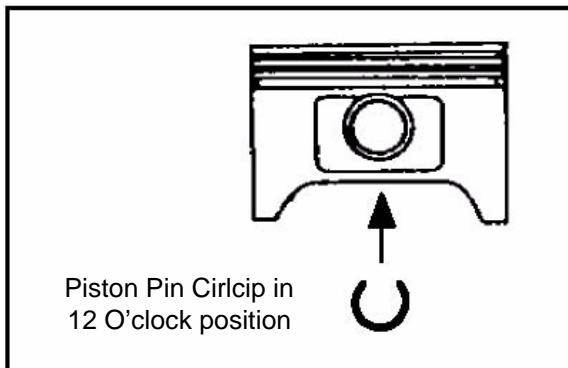


NOTE: To help align the pistons, slide a rod that is close to the same diameter as the wrist pin holes to properly align them in the cylinder.

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

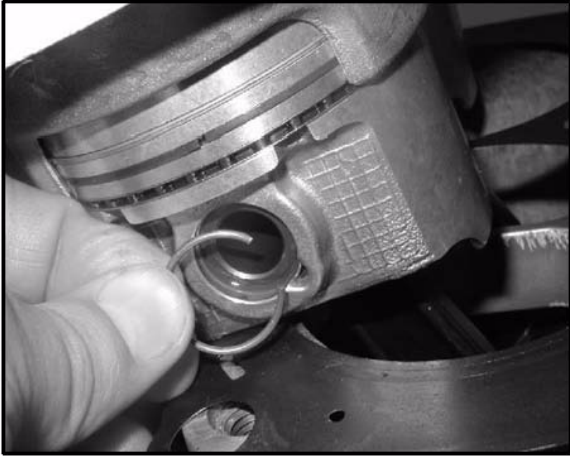


15. Install the piston pin circlips. The circlip ends should be installed at the 12 O'clock position.



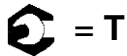
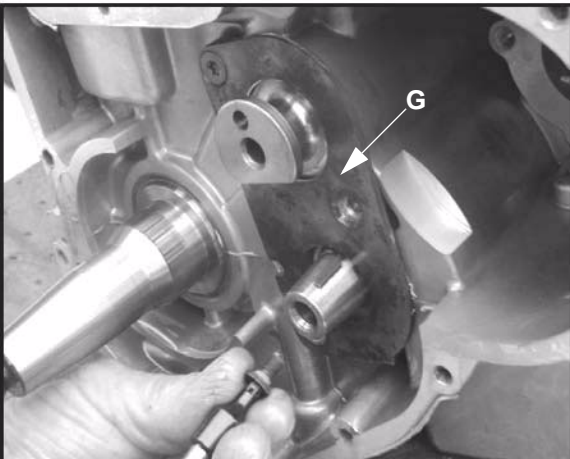
ENGINE

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



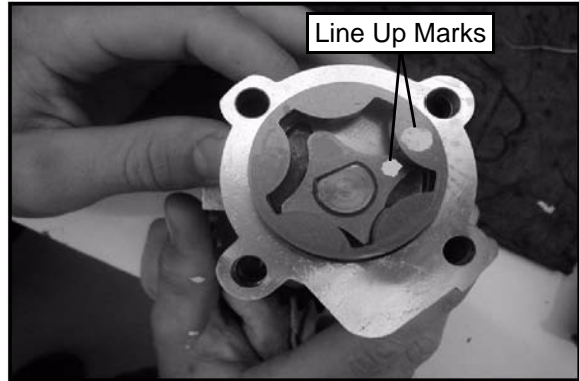
16. Install camshaft thrust plate (G) with new bolts. Torque bolts to specification.

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



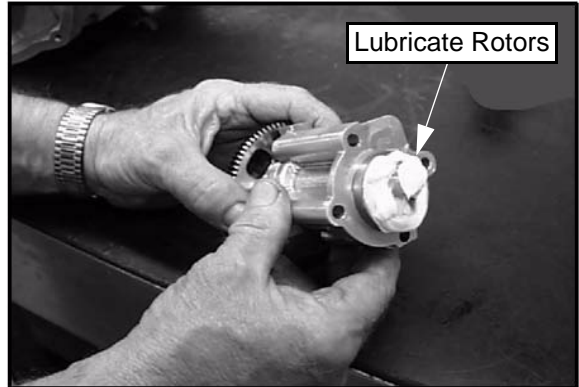
Thrust Plate Screw Torque:
115 ± 12 in.lbs. (13 ± 1.35 Nm)

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



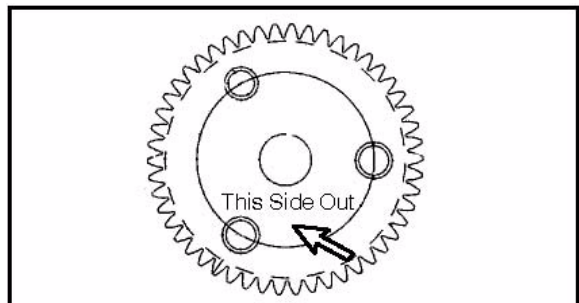
18. Apply assembly lube or oil to the rotors on the oil pump shaft.

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



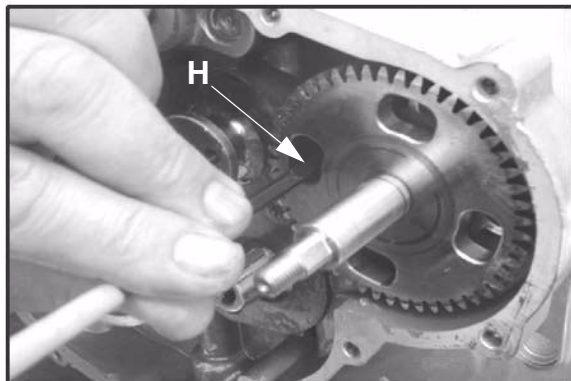
19. Align the bolt holes and install oil pump assembly into crankcase. Rotate the rotors in the housing during installation, as this checks for binding if new rotors are used.

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 Primer N (PN 2870585) 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.



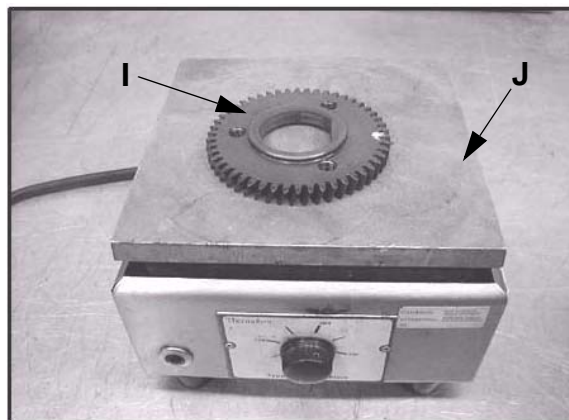
NOTE: Occasionally spin the oil pump when installing bolts to check for binding of the rotors.


 = T
Oil Pump Bolt Torque: 84 ± 8 in.lbs. (9.50 ± 0.90 Nm) * Torque in Sequence

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



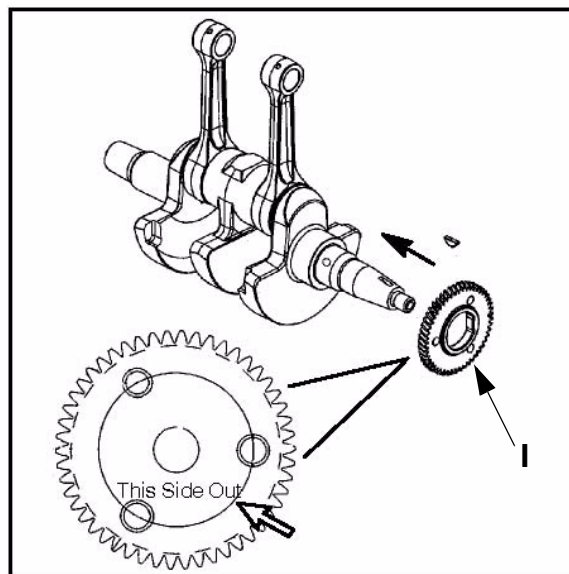
22. Before installing the crankshaft gear (I), heat the crankshaft gear to 250° F (121° C) on a hot plate (J).



 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.

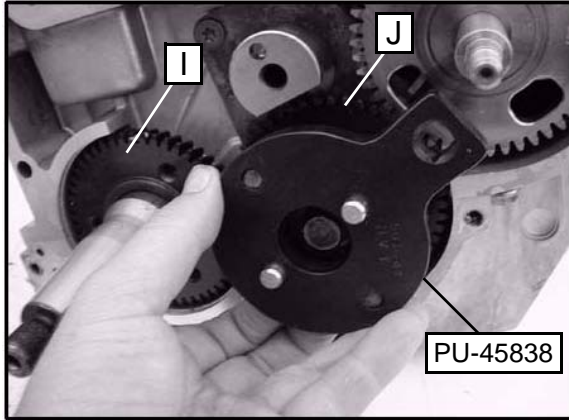
23. Use extreme caution when removing the crankshaft gear from the hot plate. Use a pair of pliers and leather gloves when handling the crankshaft gear.
24. Install the crankshaft gear (I) onto the crankshaft.


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.



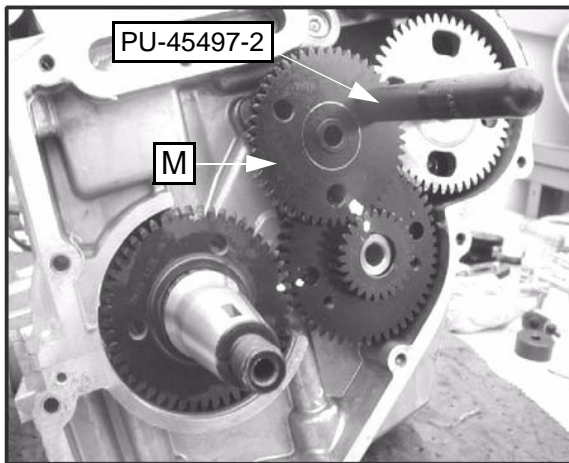
ENGINE

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.



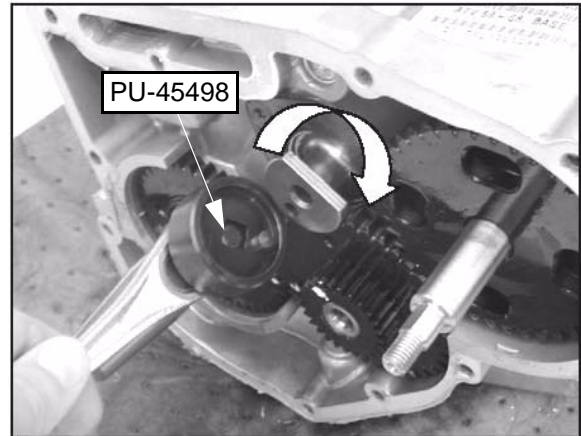
 = T
 Balance Shaft Gear Bolt Torque:
22 ± 2 ft. lbs. (30 ± 3 Nm)

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.



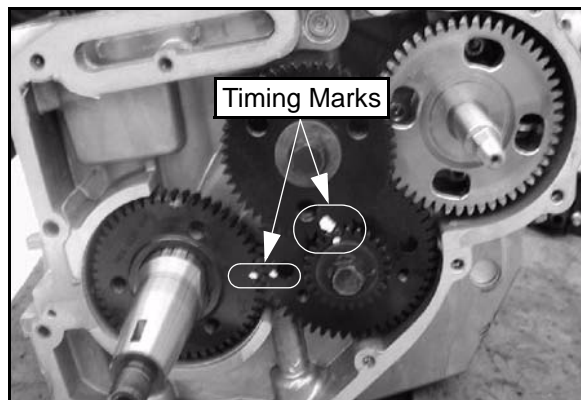
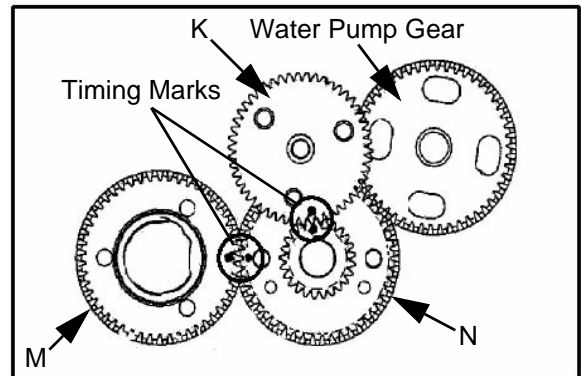
NOTE: If the timing mark on the camshaft gear does not align properly, remove the camshaft gear and tool. Use the Cam Spanner Wrench (PU-45498) to rotate the cam to the proper position.


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



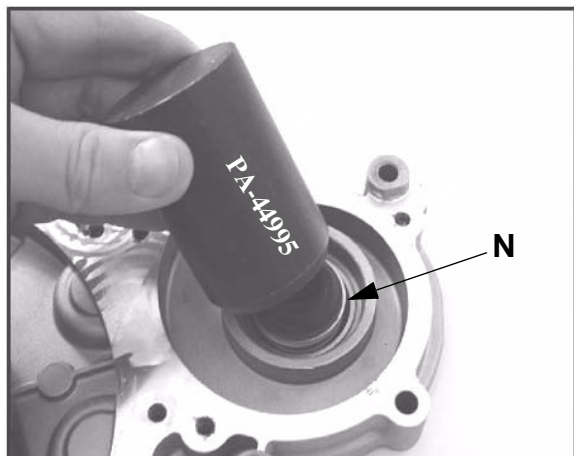
27. Reinstall the camshaft gear; so the timing marks are properly aligned. Install the washer and bolt. Torque to specification.

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



 = T
 Counterbalance Gear and Camshaft
 Gear Bolt Torque:
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.

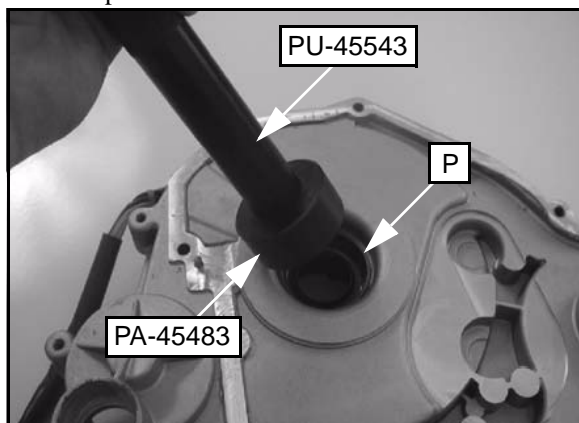


IMPORTANT: Due to seal design and construction, seals **MUST** be installed **DRY** (no lubricant) during assembly. Use of lubricants (oil, soapy water, etc.) will not allow the seal to wear-in and seal properly. Do not touch seal surface or allow seal surface to come in contact with contaminants during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

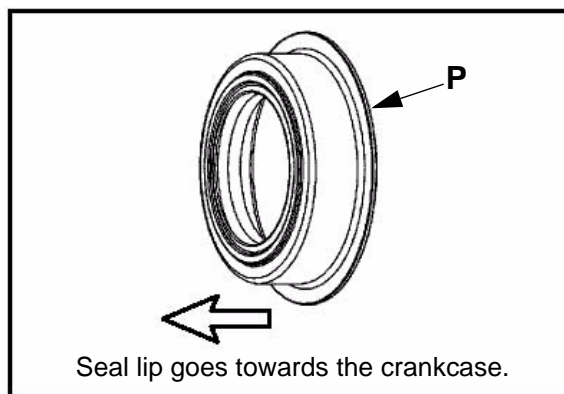
NOTE: To remove the water pump seal, the gear/ stator housing must be removed. The water pump seal cannot be removed or installed with the gear/ stator housing attached to the engine. Shaft damage will occur.

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.

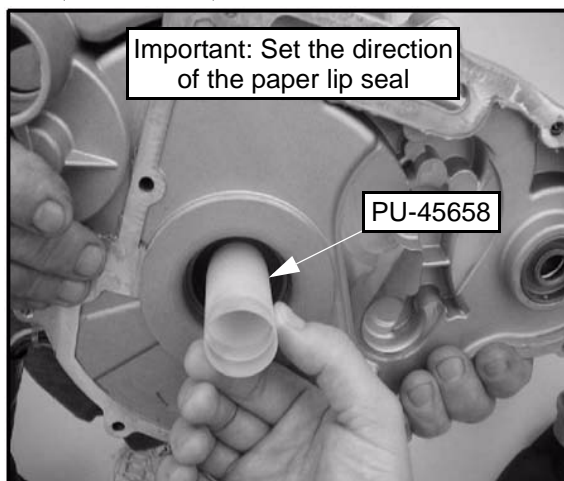
29. Install a new crankshaft seal (P) into the gear/stator housing cover. Use the Universal Driver Handle (PU-45543) and the Main Seal Installer (PA-45483) to seat the crankshaft seal into place.



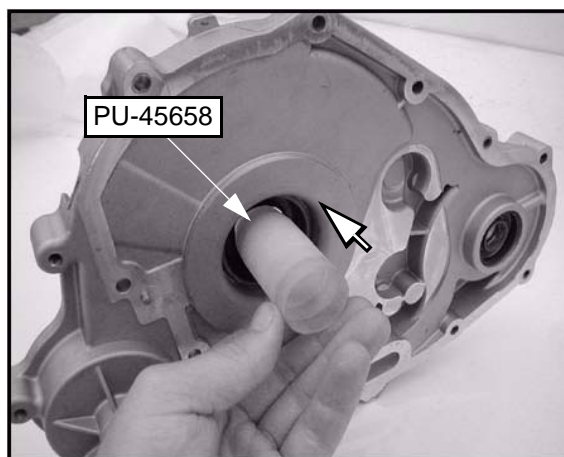
NOTE: Install the crankshaft seal (P) with the seal lip facing out (towards the crankcase).



30. Once the 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.

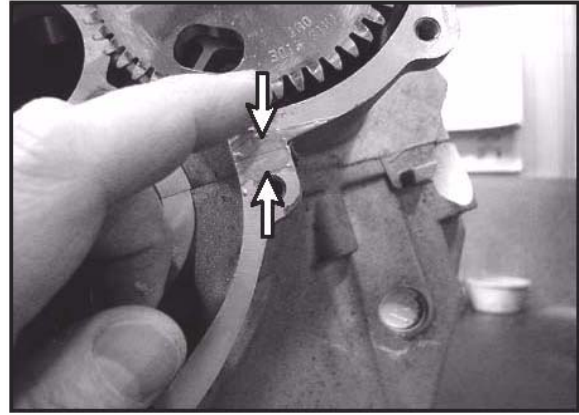
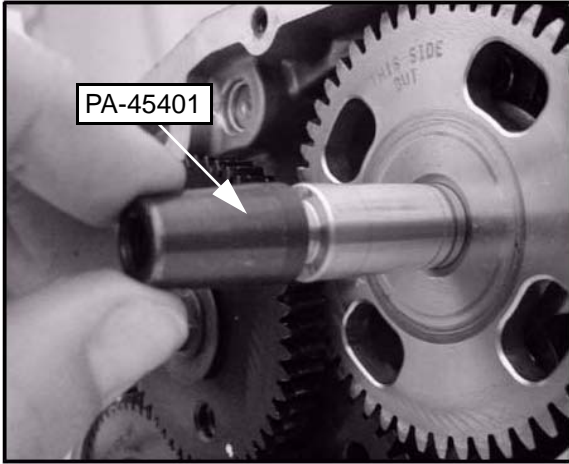


31. Carefully install the tapered end of the Crankshaft Seal Protection Tool (PA-45658) through the paper side of the crankshaft seal (Back to Front). Leave the seal protector installed in the crankshaft seal. Check the crankshaft seal lips to verify they have not been rolled or damaged.



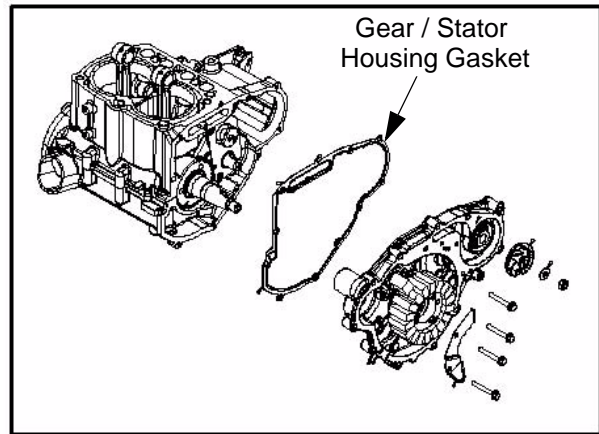
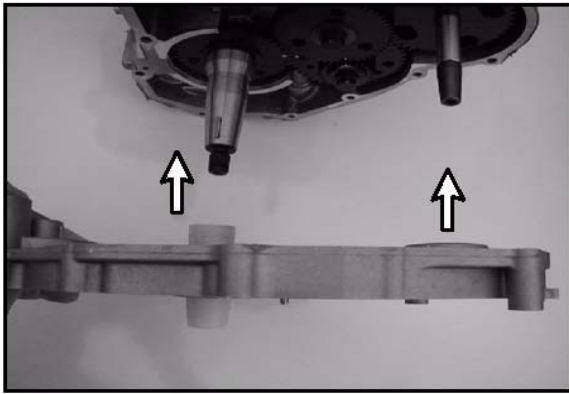
ENGINE

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



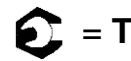
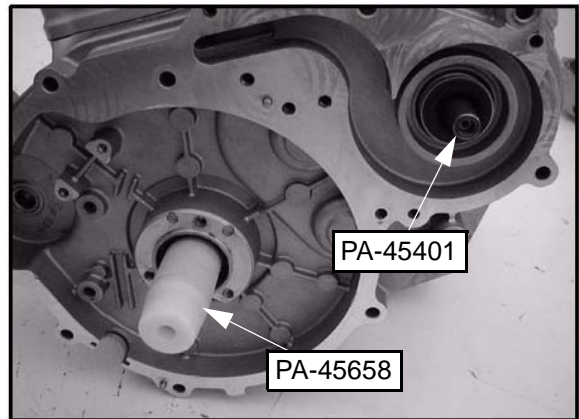
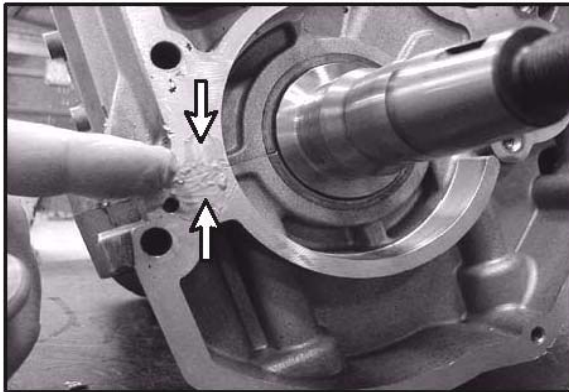
35. Install the gear/stator housing gasket onto the crankcase.

33. Install a NEW gasket to the gear/stator housing cover and crankcase. With the tools installed, carefully place the gear/stator housing cover over the protection tools.



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.

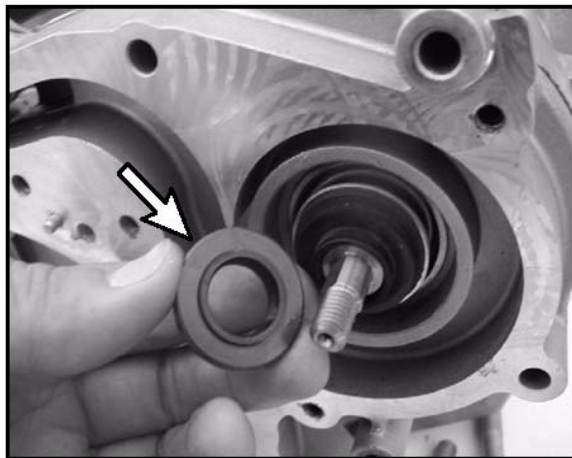
34. Apply Crankcase Sealant (PN 2871557) to the outside edges of the crankcase halves (see arrows), where the crankcases mate (see the following photos). This helps to prevent coolant leakage.



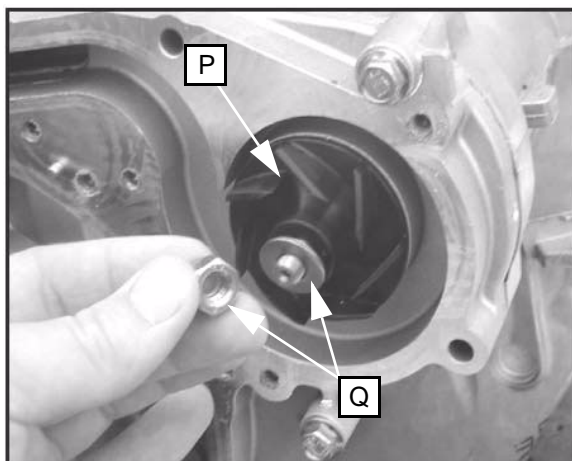
Gear/Stator Housing Bolt Torque:
96 ± 3 in. lbs. (10.85 ± 0.35 Nm)
 *Torque in proper sequence


NOTE: Before assembly, clean the bolts and bolt holes with Primer N (PN 2870585) to remove any debris. This will ensure proper sealing when installing bolts.

37. Install shaft seal with ceramic surface facing inward.

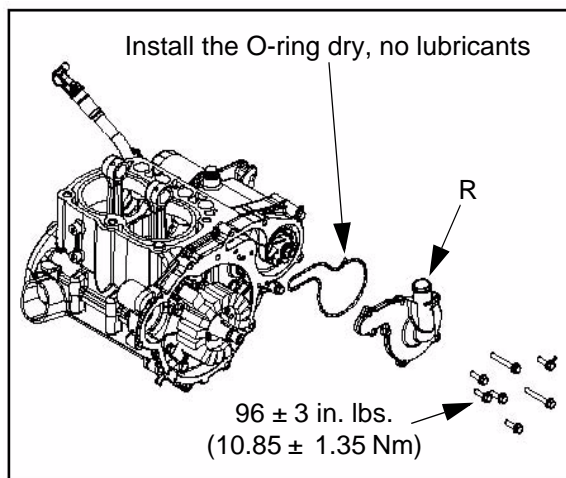



38. Install water pump impeller (P). **Secure the impeller with the washer and a new nylok nut (Q).** Torque the nut to specification.



 = T
Water Pump Impeller Nut Torque: 108 ± 6 in. lbs. (6.8 ± 0.68 Nm)

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



 = T
Water Pump Housing Bolt Torque: 96 ± 3 in. lbs. (10.85 ± 0.35 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.



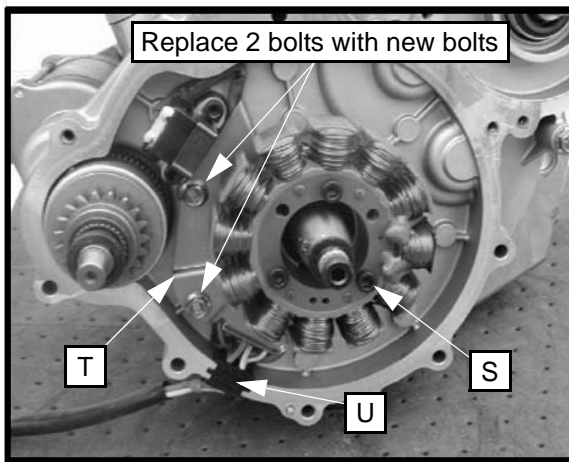
ENGINE


Flywheel / Stator Installation

NOTE: Before assembly, clean the bolts and bolt holes with Primer N (PN 2870585) to remove any debris. This will ensure proper sealing when installing bolts.

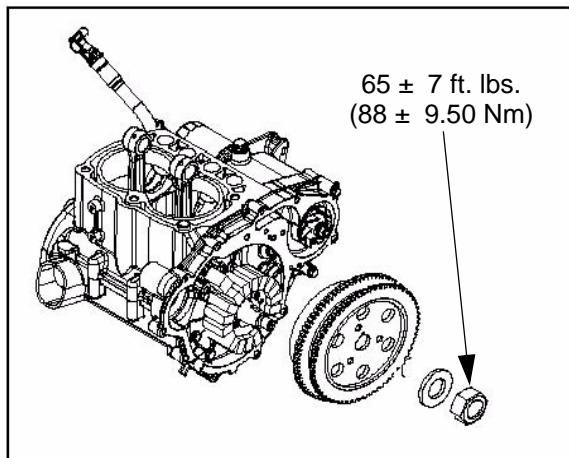
1. Install stator assembly (S) and bolts. Torque bolts to specification.
2. Install the wire hold down bracket (T). Install two new wire hold down bolts. New bolts contain patch-lock. Torque bolts to specification, following the proper bolt torque sequence. Coat the stator wire grommet (U) with Nyogel™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


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



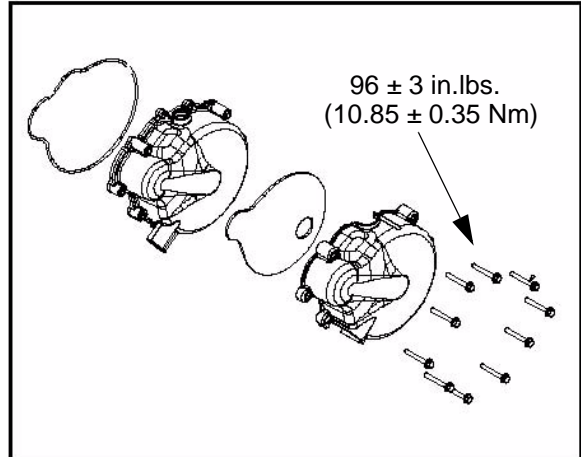
 = T
Stator Assembly Bolt Torque: 96 ± 3 in.lbs. (10.85 ± 0.35 Nm)


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



 = T
Flywheel Nut Torque 65 ± 7 ft.lbs. (88 ± 9.50 Nm)

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

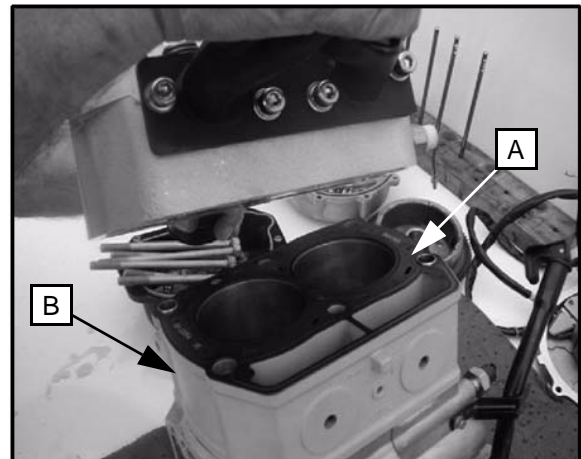


 = T
Stator Housing Bolt Torque: 96 ± 3 in. lbs. (10.85 ± 0.35 Nm)

Cylinder Head Reassembly

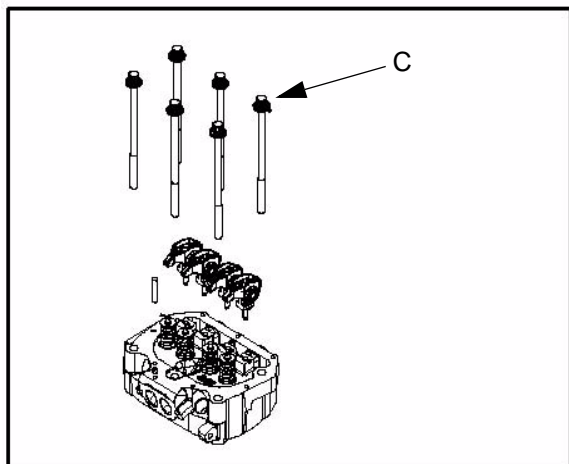
NOTE: Before reassembly, clean the bolts and bolt holes with Primer N (PN 2870585) to remove any debris. This will ensure proper sealing when installing bolts.

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



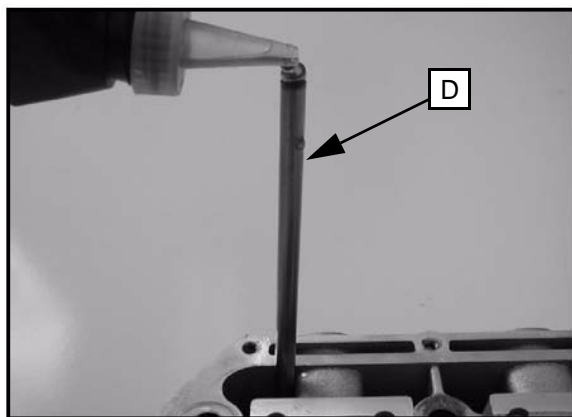
2. Install cylinder head on cylinder.

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

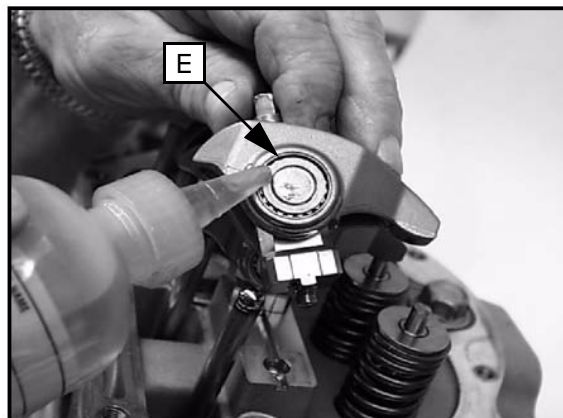


Cylinder Head Bolt Torque:
Initial setting: 35±4 ft. lbs. (47.5 ±5.5 Nm)
Allow to set for 1 minute, then turn additional 90° (1/4 turn)
***Torque Bolts In Sequence**

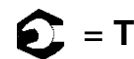
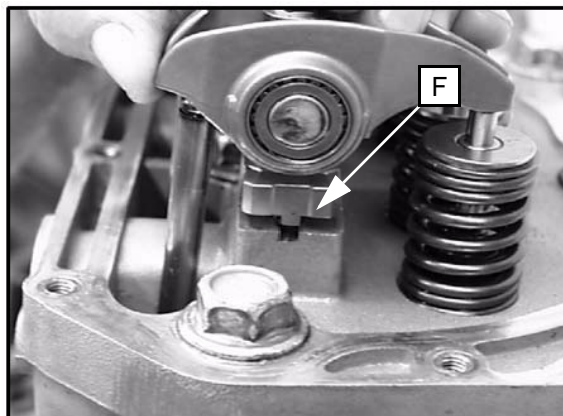
- Lubricate push rods (D) and install into lifters.



- Lubricate rockers (E) with engine oil.



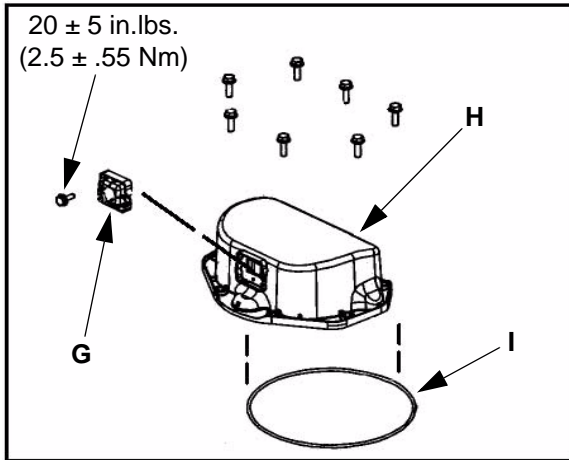
- Verify pushrods are engaged in lifters.
- Install rockers. Be sure that tab of fulcrum (F) is seated in head stand-off. Torque bolts to specification.




Rocker Arm Bolt Torque
22 + 2 ft. lbs. (30 ±3 Nm)

ENGINE

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



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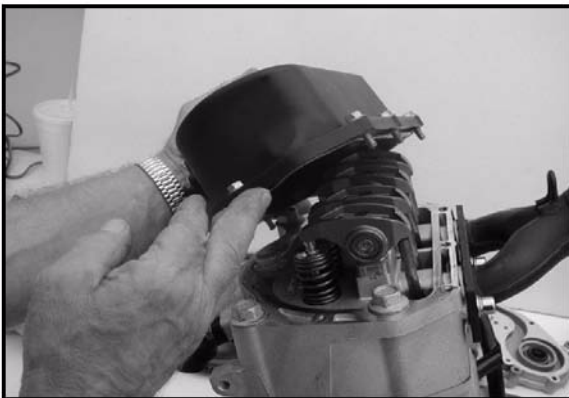
Breather Bolt Torque:
20 ± 5 in. lbs. (2.5±0.55 Nm)


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 the bolts and bolt holes with Primer N (PN 2870585) to remove any debris. This will ensure proper sealing when installing bolts.

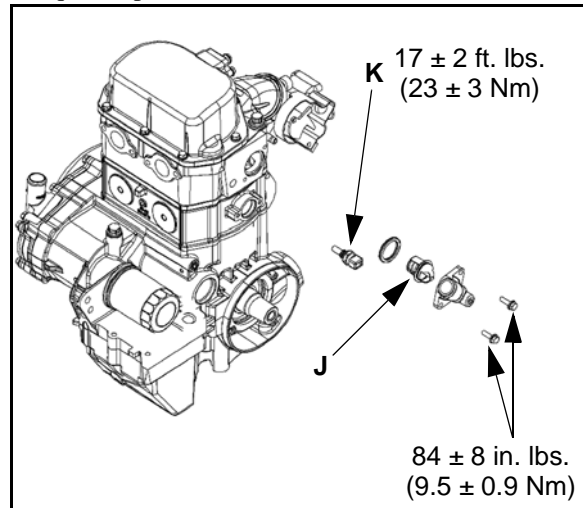
10. Install rocker cover. Torque bolts in sequence to specification.




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Rocker Cover Bolt Torque:
84 ± 8 in.lbs. (9.5 ± 0.9 Nm)

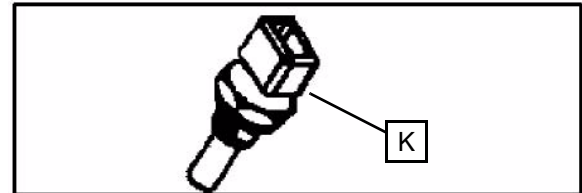
11. Install thermostat (J), new O-ring, and thermostat housing. Torque to specification.




 = T

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

12. Install temperature sender (K) and torque to specification.



 = T

Temperature Sender Torque:
17 ± 2 ft.lbs. (23 ± 3 Nm)

Oil Pump Priming

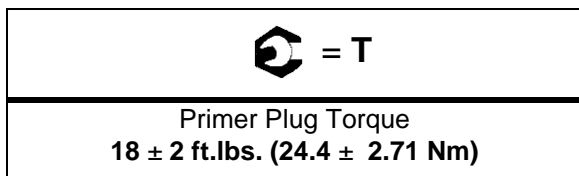
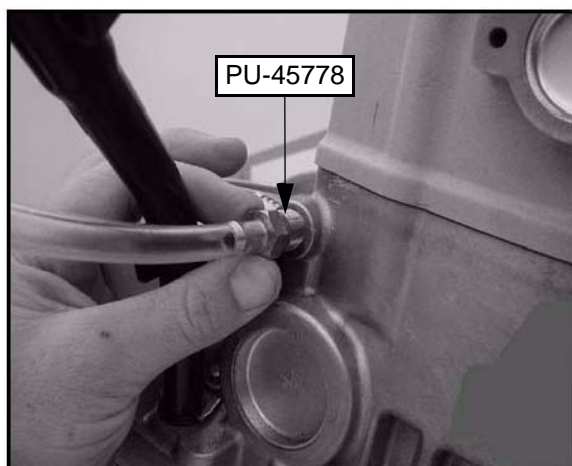
CAUTION

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 installation, the engine must be properly primed with Polaris 0W-40 Synthetic Oil (PN 2871281). Fill the oil filter three-quarters full with Polaris 0W-40 Synthetic Oil (PN 2871281). 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 0W-40 into the adapter or until resistance is felt. Remove the adapter. Apply sealant to the plug threads. Install the plug and torque to specification.



ENGINE INSTALLATION

Engine Assembly and Installation

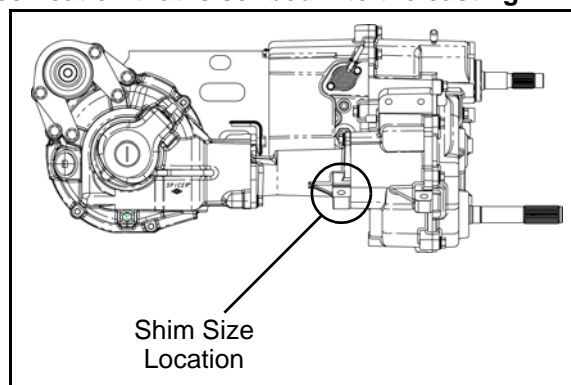
Use the following procedure to reinstall the engine assembly.

Assemble the engine to the transmission on a work bench prior to installation.

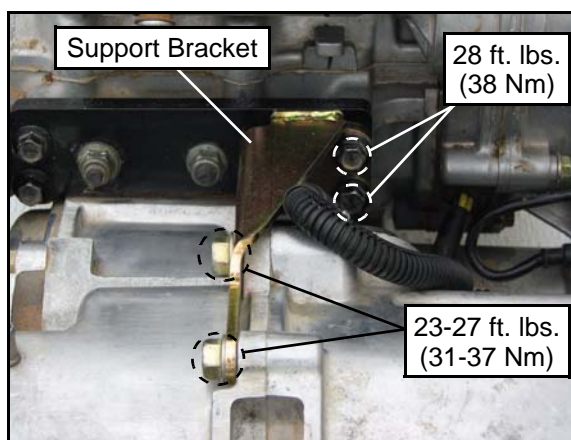
1. Support the transmission / rear gearcase assembly while setting the engine in place.

NOTE: A small number of vehicles were manufactured with shims placed between the rear transmission casting ear and the engine crankcase. Be sure to use the same amount of shims upon reassembly.

If shims were present upon disassembly but have since been misplaced, look near the rear transmission casting ear for the shim thickness specification that is scribed into the casting.

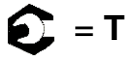
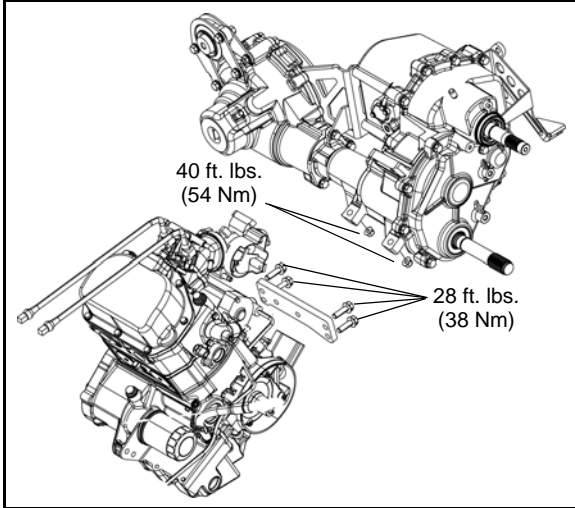


NOTE: Vehicles manufactured on or after 5/21/07, will be assembled with an added support bracket mounted between the engine and transmission. Refer to the following image for torque specifications. Snug the rear gearcase fasteners first, followed by the engine fasteners.



ENGINE

2. Lightly tighten all fasteners evenly to eliminate any gaps that may be present in the mounting areas.
3. Torque fasteners to specification using a 2 part sequence.
 - Torque fasteners to half of the specified torque value
 - Then torque fasteners to the full specified torque value



Engine / Transmission Mounting Fasteners

- (2) Lower 3/8" Nuts: 40 ft. lbs. (54 Nm)
- (4) Outer M8 Bolts: 28 ft. lbs. (38 Nm)

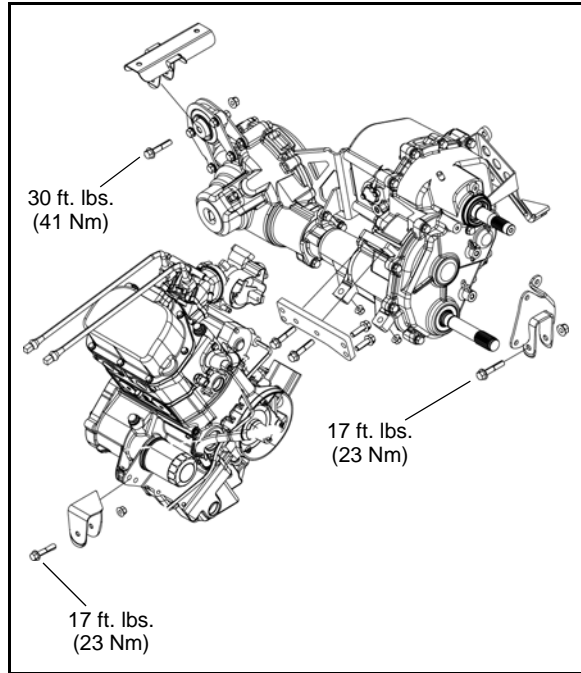
Install drive clutch, driven clutch, and belt. Torque to specification (see Chapter 6).

- Clean clutch sheaves thoroughly and inspect inlet and outlet ducts for proper routing and sealing.

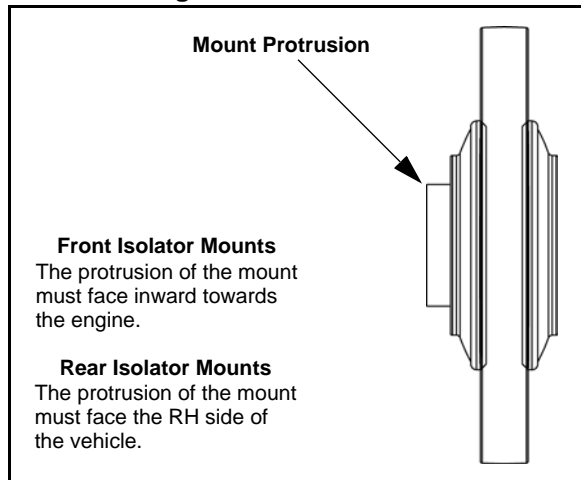
To install engine assembly, reverse the "Engine Removal" procedure detailed earlier in this Chapter.

- Properly route all electrical harnesses for engine assembly installation. Check for any possible rubbing points of electrical wires.
- Carefully set the engine assembly into the vehicle while installing the propshaft.

- Install engine / transmission / rear gearcase mounting hardware and torque to specification.



NOTE: If isolator mounts were removed or replaced, use the following illustration to ensure proper orientation during installation.



- Replace exhaust gaskets. Seal connections with high temp silicone sealant. Check to be sure all exhaust springs are in good condition.
- Inspect transmission operation and adjust linkage if necessary (see Chapter 2 "Shift Linkage Adjustment").
- Checks fluid levels: engine oil, transmission lubricant, and rear gearcase lubricant.
- Bleed cooling system as described in this Chapter under "Cooling System Bleeding Procedure."

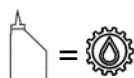
Engine Break-In Period

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.

CAUTION

Use only Polaris Premium 0-40W All Season synthetic oil or 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.
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.



Capacity - Approximately 2 U.S. Quarts (1.9 l)
Oil Type - Polaris Premium 0W-40 Synthetic
Filter Wrench - PV-43527 or equivalent
- Oil Pressure Specification -
27-35 psi @ 6000 RPM, Polaris 0W-40
Synthetic, Engine at operating temperature.

ENGINE

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

- Restricted fuel supply
- Low compression
- Crankcase breather restricted

Engine Idles But Will Not Accelerate

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

- 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 or kill 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 (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

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)

CHAPTER 4

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ELECTRONIC FUEL INJECTION

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.

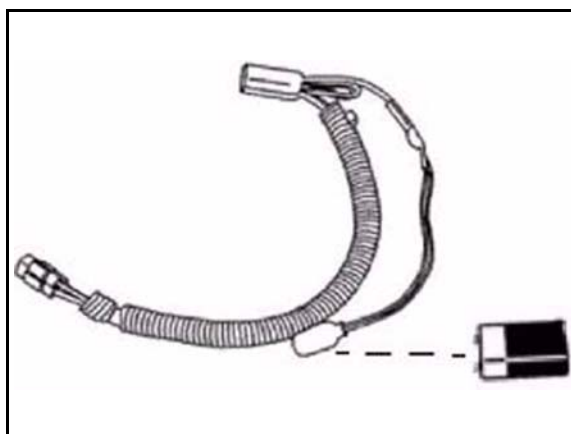
Special Tools

PART NUMBER	TOOL DESCRIPTION
PU-47082	Throttle Position Sensor Tester
4010264	TPS Tester Regulator
PU-47315	Throttle Body Adjustment Screwdriver (small "D" shape)
PU-43506-A	Fuel Pressure Gauge Kit
PU-47063	Digital Wrench™ Diagnostic Software (Includes most recent version of software and a serial number)
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
	PU-47468 Digital Wrench™ SmartLink Module

IMPORTANT: For the most recent information on Digital Wrench™ software and file set downloads please visit the website: www.polaris.diagsys.com

Throttle Position Sensor Tester - PU-47082

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

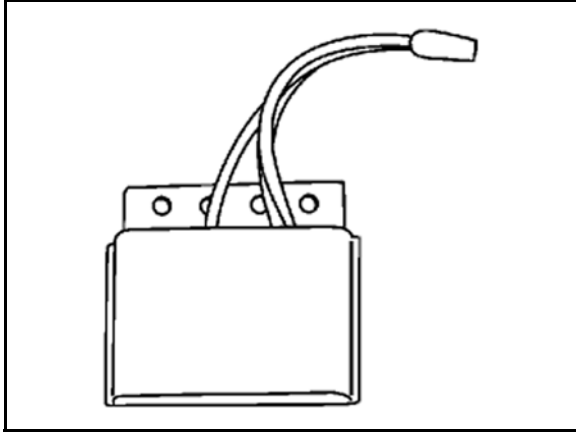


NOTE: Voltage Regulator 4010264 is required if using TPS harness PU-47082. If your dealership sells Polaris snowmobiles, you may already have this regulator from TPS tool PN 2201519. If you do not have this regulator, you must order one from SPX at 1-800-328-6657.

ELECTRONIC FUEL INJECTION

TPS Tester Regulator - 4010264

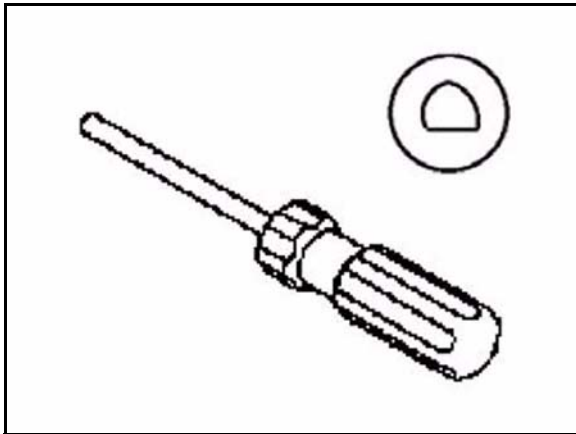
This tester regulator regulates the 9 volt battery voltage to a 5 volt input, required when using the TPS harness PU-47082.



NOTE: If your dealership sells Polaris snowmobiles, you may already have this regulator from TPS tool PN 2201519. If you do not have this regulator, you must order one from SPX at 1-800-328-6657.

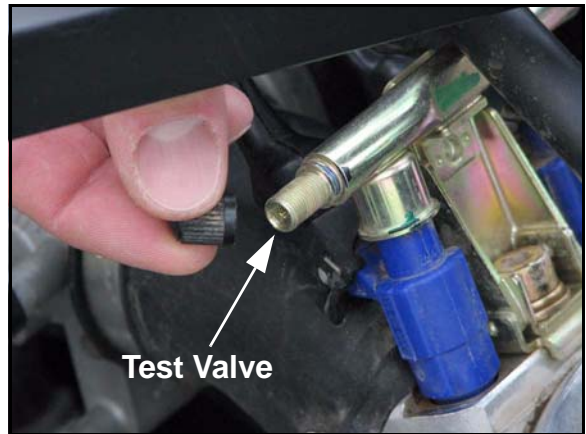
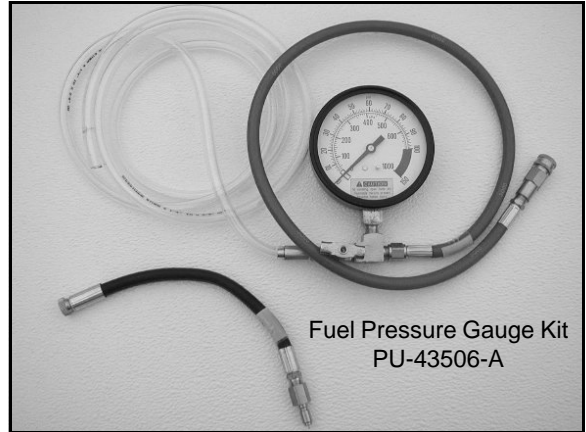
Throttle Body Adjustment Screwdriver - PU-47315

This tool has a special 'D' shaped end for adjusting the throttle stop screw during a TPS initialization procedure.



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, the pressure must be relieved. The pressure adapter has an integrated relief valve. Connect to the test valve and release the pressure.



4

ELECTRONIC FUEL INJECTION

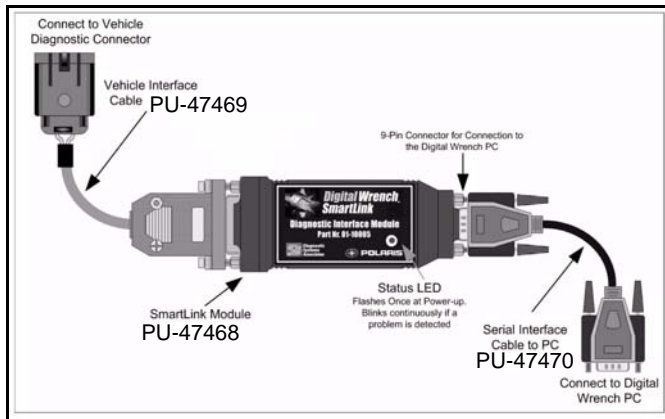
Digital Wrench™ Diagnostic Software - PU-47063

This dealer-only software installs on laptop computers equipped with a CD drive and serial port connection, 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

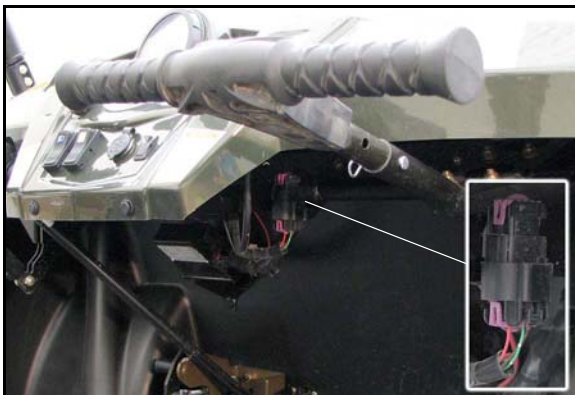
Digital Wrench™ SmartLink Module Kit - PU-47471

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 SPX at (1-800-328-6657) or <http://polaris.spx.com>



Digital Wrench™ - Diagnostic Connector

Located under the dash and accessible from the passenger side.



Digital Wrench™ - Download Website

Located at: www.polaris.diagsys.com



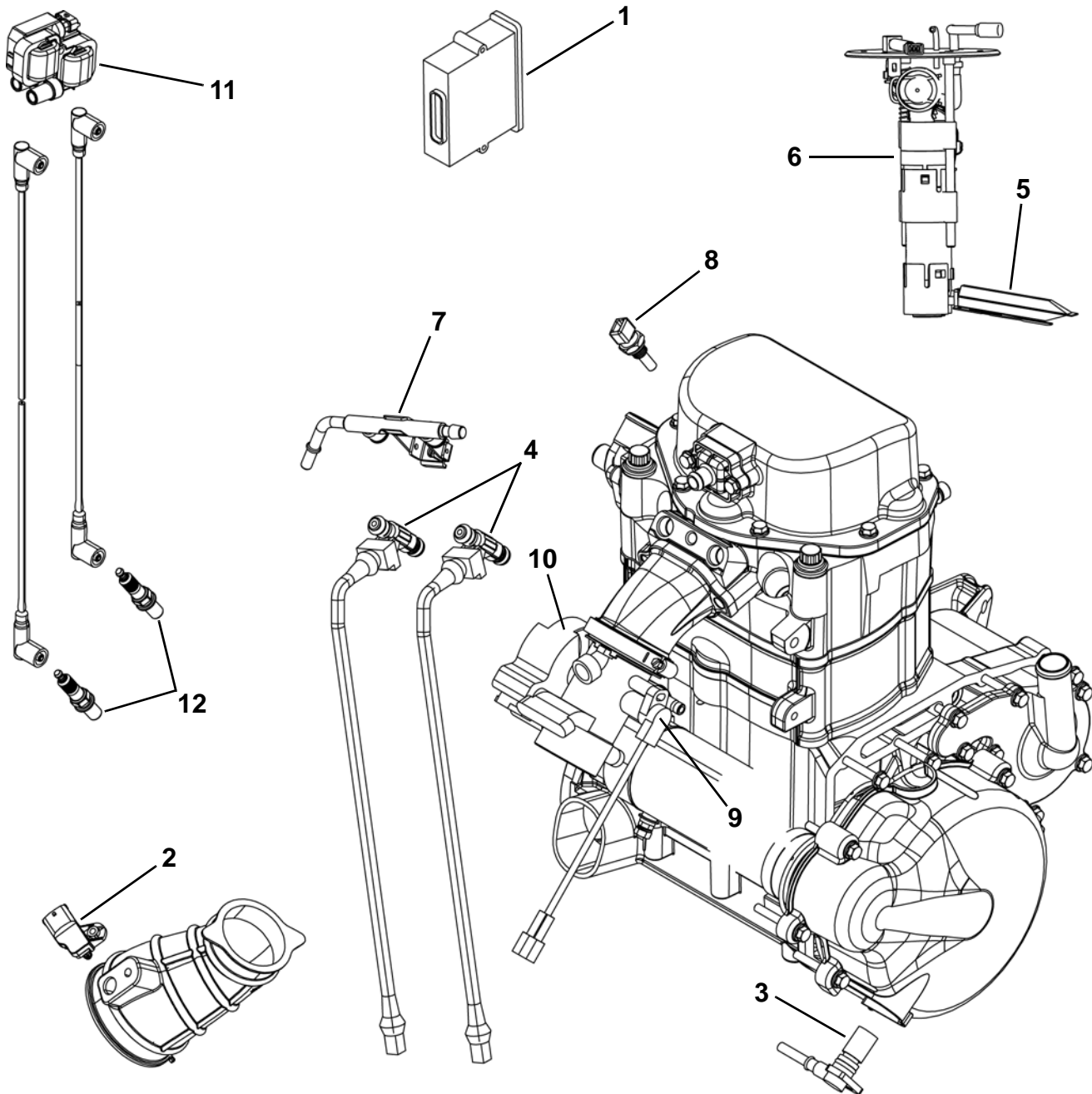
Service Notes

- 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 Polaris *RANGER* RZR EFI of the same model 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 (red) cable to positive (+) battery terminal first, followed by negative (black) 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.

ELECTRONIC FUEL INJECTION

EFI System Exploded View

1. Electronic Control Unit (ECU)
2. Intake Air Temperature / Manifold Air Pressure Sensor (T-BAP)
3. Crankshaft Position Sensor (CPS)
4. Fuel Injectors
5. Fuel Filter
6. Fuel Pump / Regulator / Gauge Sender Asm. (Located in tank as an assembly)
7. Fuel Rail
8. Engine Coolant Sensor (ECT)
9. Throttle Position Sensor (TPS)
10. Throttle Body
11. Ignition Coil
12. Spark Plugs



EFI System Component Locations

1. Electronic Control Unit (ECU)

- Located behind the driver's seat next to the seat belt assembly and just above the voltage regulator.



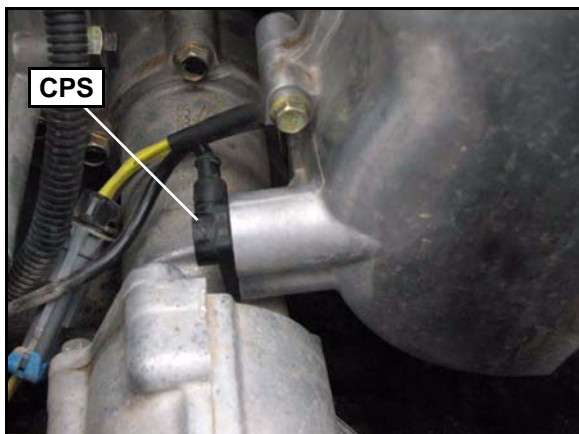
2. Temperature and Barometric Air Pressure Sensor (T-BAP)

- Located in the rubber intake boot between the air box and throttle body.



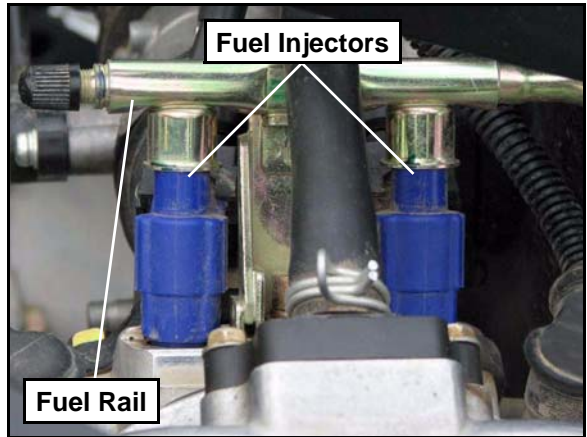
3. Crankshaft Position Sensor (CPS)

- Located in the magneto cover between the engine and transmission.



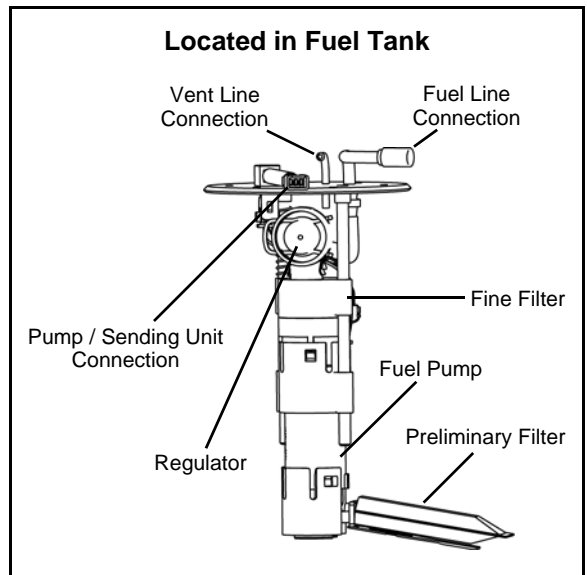
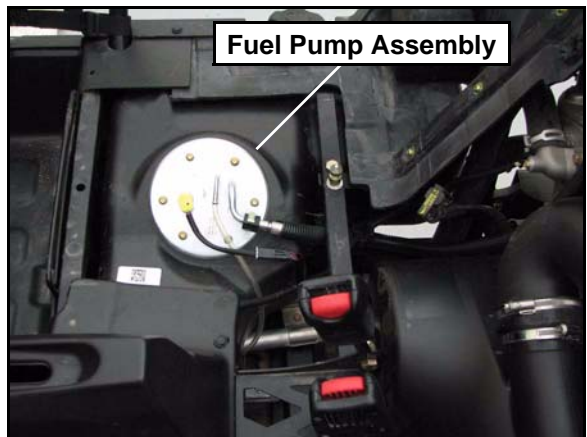
4. Fuel Injectors / Fuel Rail

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



5. Fuel Pump / Regulator / Fuel Gauge Sender Assembly

- Located under the passenger seat and in the fuel tank as a complete assembly.



ELECTRONIC FUEL INJECTION

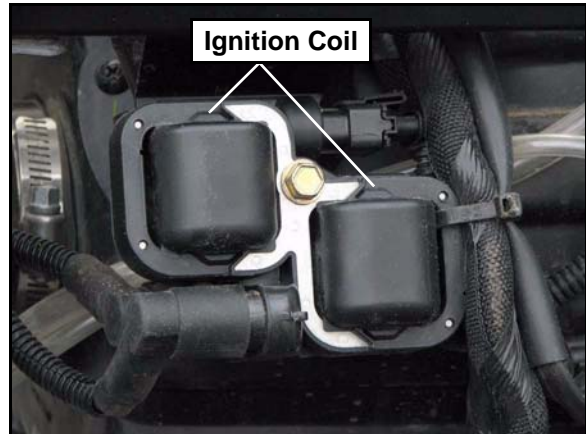
6. Throttle Body

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



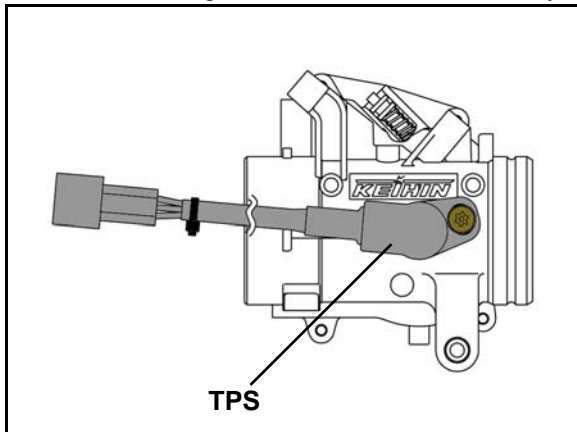
9. Ignition Coil

- Located behind the driver's seat and rear service panel just above the PVT cover.



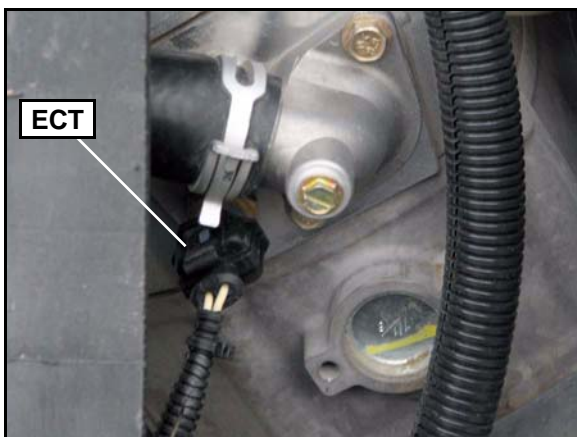
7. Throttle Position Sensor (TPS)

- Located on the right-hand side of the throttle body.



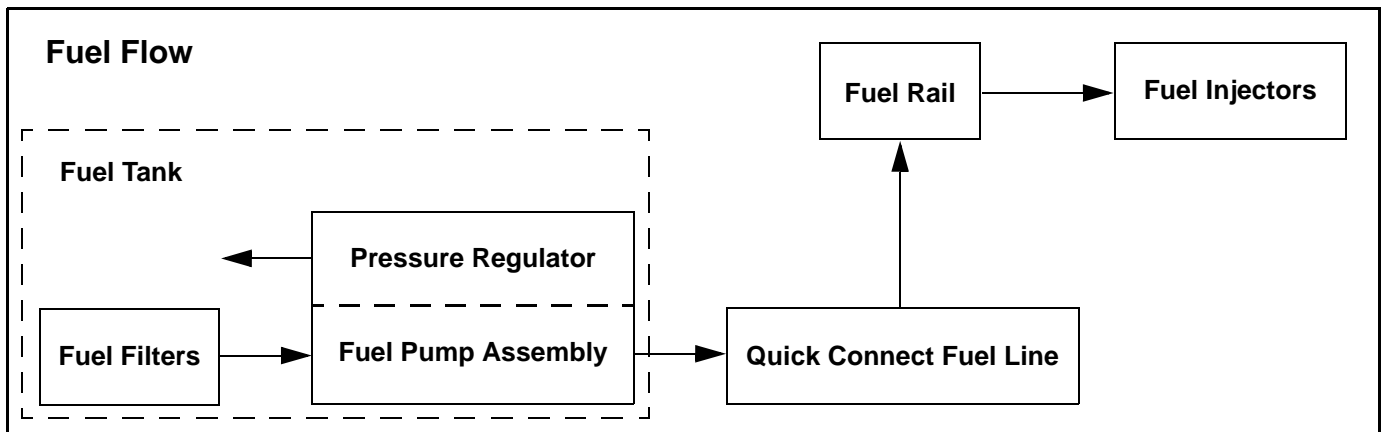
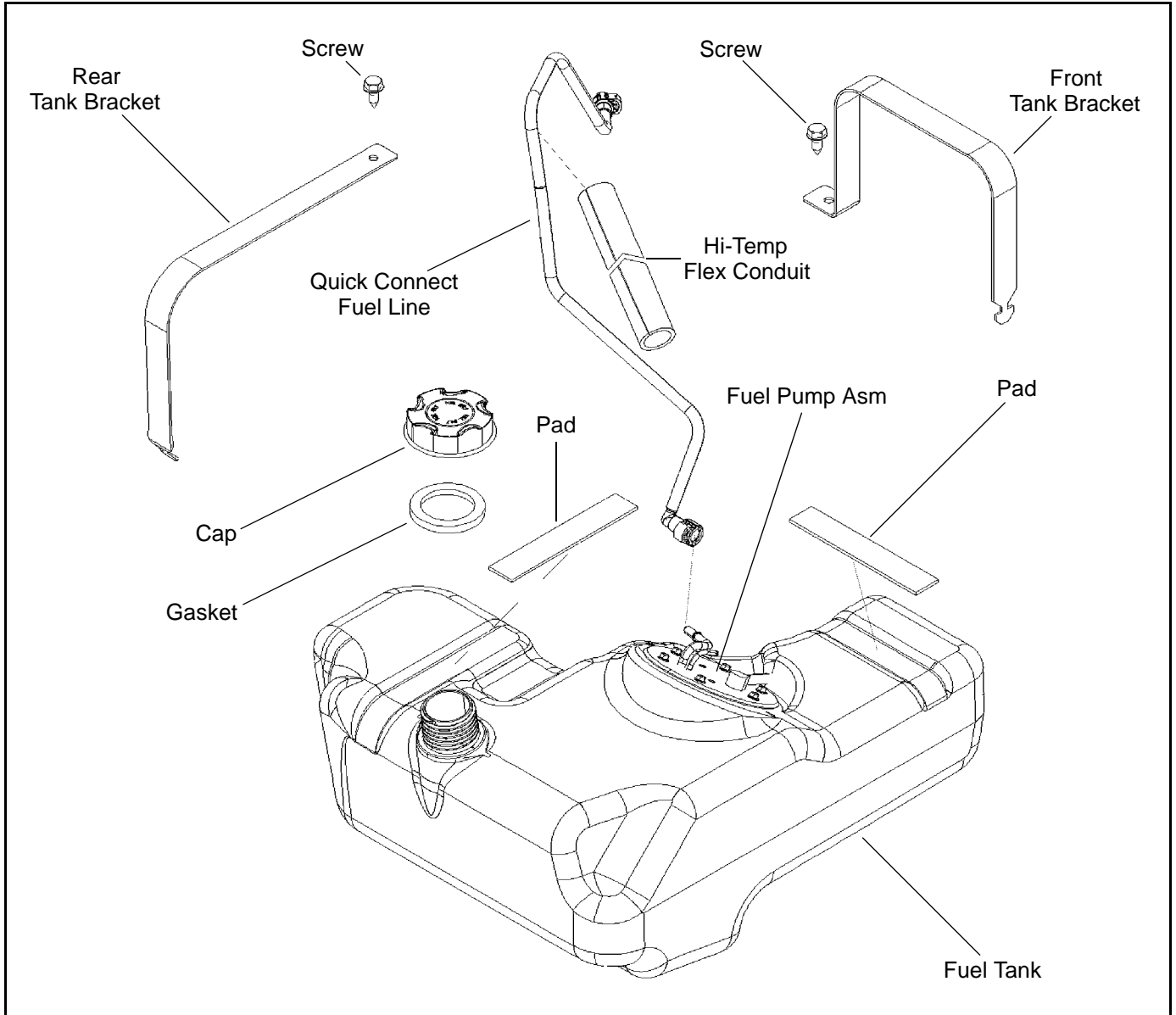
8. Engine Coolant Temperature Sensor (ECT)

- Located in the cylinder head next to the thermostat housing. The sensor can be accessed with the driver and passenger seats and rear service panel removed.



FUEL TANK

Exploded View

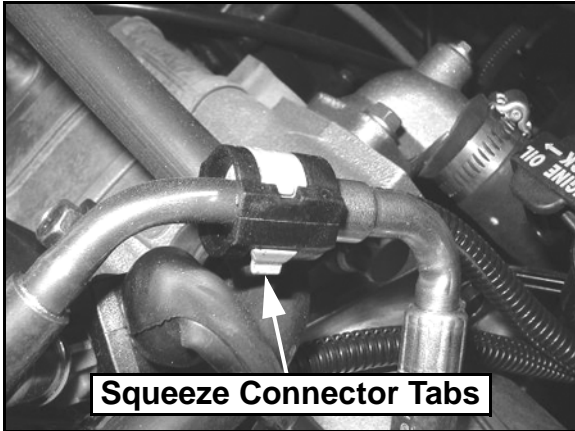


ELECTRONIC FUEL INJECTION

Fuel Lines - Quick Connect

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

1. Place a shop towel around the fuel line to catch any dripping fuel. Squeeze the connector tabs together and push the locking slide back.



2. Pull on the fuel line for removal.
3. To install the line, verify the connector and fuel tank nipple are clean and free of debris.
4. Snap the fuel line back over the nipple and slide the locking mechanism back into place. Verify the connector tabs snap back into place.

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
- 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)
- Intake Air Temperature and Barometric Air Pressure Sensor (T-BAP)
- 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 component of the system is the Bosch Engine 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 and in-line fuel filter. The in-tank fuel pressure regulator maintains a system operating pressure of 39 psi and returns any excess fuel to 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 can range from 1.5-8.0 milliseconds depending on fuel requirements. The controlled injection of the fuel occurs each crankshaft revolution, or twice for each 4-stroke cycle. One-half the total amount of fuel needed for one firing of a cylinder is injected during each injection. When the intake valve opens, the fuel/air mixture is drawn into the combustion chamber, ignited and burned.

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), throttle position, engine coolant temperature, air temperature, intake manifold air 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 initiating the “Blink Code” sequence 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, a rev-limiting feature is programmed into the ECU. If the maximum RPM limit (6500) is exceeded, the ECU suppresses the injection signals, cutting off the fuel flow. This process repeats itself in rapid succession, limiting operation to the preset maximum.

The ECU controls the amount of fuel being injected and the ignition timing by monitoring the primary sensor signals for air temperature, barometric air pressure, engine temperature, speed (RPM), and throttle position (load). 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).

ELECTRONIC FUEL INJECTION

RANGER RZR 800 EFI RPM Limit:

Hard Limit - Injector suppression occurs

- High: 6500
- Low: 6500
- Neutral: 6500
- Reverse: 6500
- Park: 6500

Soft Limit - Timing suppression occurs

- High: 6375
- Low: 6375
- Neutral: 6375
- Reverse: 6375
- Park: 6375

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.

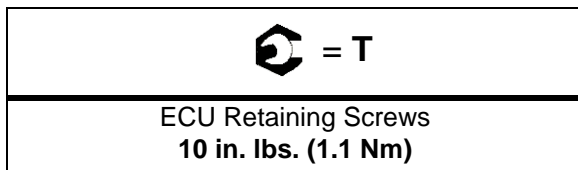
All operating and control functions within the ECU are pre-set. No internal servicing or readjustment may be performed. If a problem is encountered, and you determine the ECU to be faulty, contact the Polaris Service Department for specific handling instructions. Do not replace the ECU without factory 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 re-initialized (see TPS Initialization for procedure if required).

For the purpose of troubleshooting, a known-good ECU from another Polaris **RANGER** RZR EFI of the same model may be used without system or engine component damage.

ECU Replacement

1. Remove the (2) 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.



TEMPERATURE AND BAROMETRIC AIR PRESSURE SENSOR (T-BAP)

Operation Overview

Mounted in the throttle body intake boot, the T-BAP sensor performs two functions in one unit.



Air passing through the intake is measured by the T-BAP and relayed to the ECU. These signals, comprised of separate air temperature and barometric air pressure readings, are processed by the ECU and compared to its programming for determining the fuel and ignition requirements during operation.

T-BAP Test

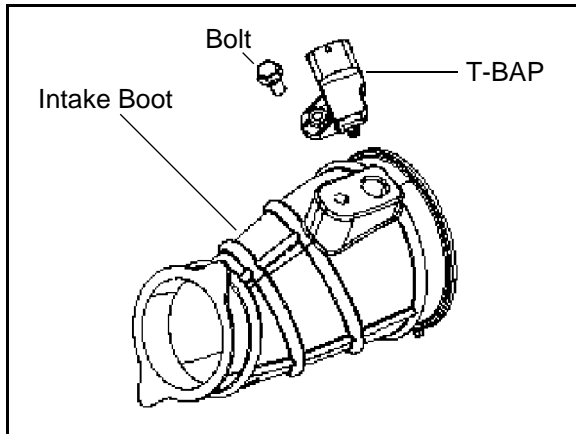
The T-BAP sensor is a non-serviceable item. If it is faulty, it must be replaced.

IMPORTANT: The T-BAP sensor requires a 5 VDC input to operate, therefore the T-BAP sensor should only be tested using the Digital Wrench™ Diagnostic Software (dealer only). Refer to the EFI Diagnostic Software Manual for more information.


T-BAP Replacement

1. Disconnect sensor from engine harness.
2. Using a 3/8" wrench, remove the retaining bolt and remove the sensor from the intake boot.

3. Install new sensor using a light coating of oil on the o-ring to aid installation.



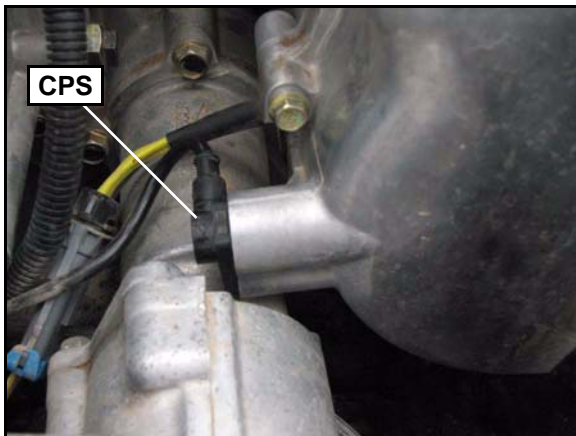
4. Torque the T-BAP retaining bolt to specification.

 = T
T-BAP Retaining Bolt Torque: 29 in. lbs. (3.3 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.



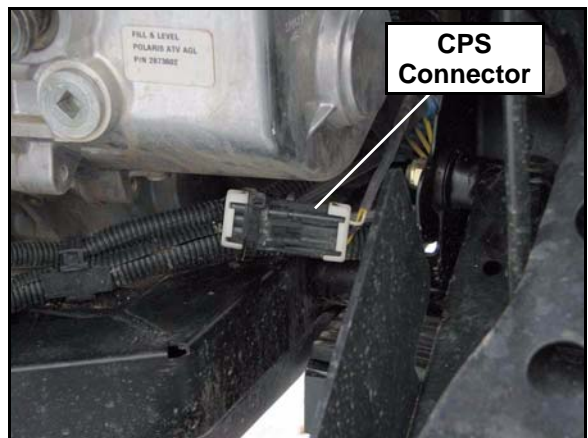
A ferromagnetic 60-tooth ring gear with two consecutive teeth missing is mounted on the flywheel. The inductive speed sensor is mounted 1.0 ± 0.26 mm (0.059 ± 0.010 in.) away from the ring gear. During rotation, an AC pulse is created within the sensor for each passing tooth. The ECU calculates engine speed from the time interval between the consecutive pulses.

The two-tooth gap creates an “interrupt” input signal, corresponding to specific crankshaft position for PTO cylinder. 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 quit running.

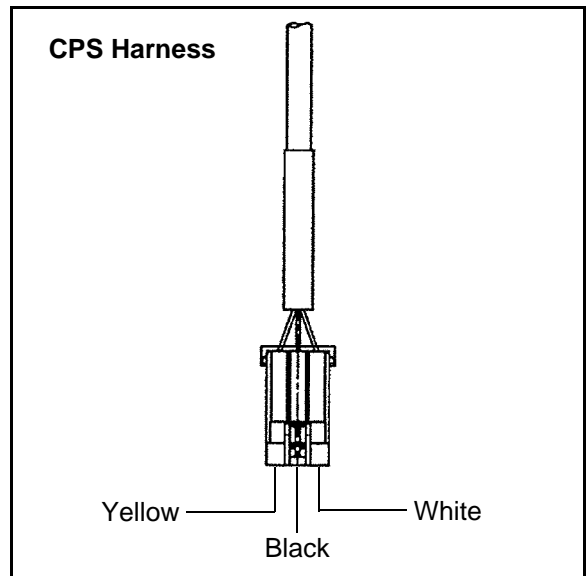
CPS Test

The CPS is a sealed, non-serviceable assembly. If fault code diagnosis indicates a problem within this sensor, test as follows:

1. Disconnect CPS (3-wire) harness connector on the left-hand side of the vehicle located below the transmission.



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 ($20^\circ\text{C} / 68^\circ\text{F}$) should be obtained.



CPS Resistance Specification: $560\Omega \pm 10\%$ ($20^\circ\text{C}, 68^\circ\text{F}$)
--

ELECTRONIC FUEL INJECTION

- 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.
- If the resistance is incorrect, follow the "CPS Replacement" procedure.

CPS Replacement

Removal

- Safely support the rear of the vehicle off the ground and remove the left-hand rear tire.

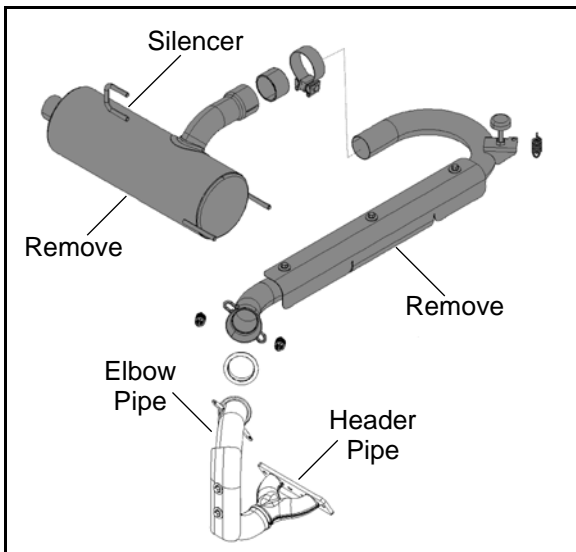


Serious injury may result if machine tips or falls. Be sure the vehicle is secure before beginning this service procedure.

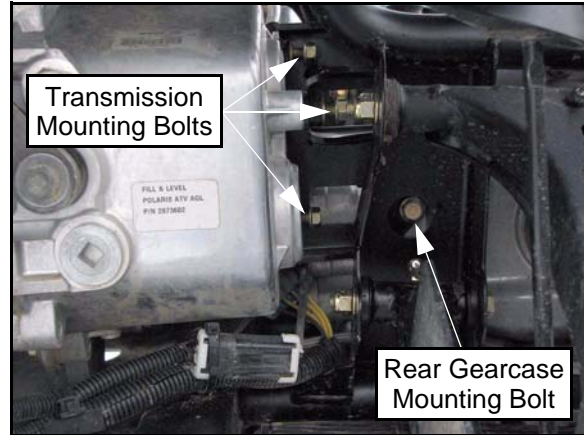
- If not done already; disconnect the CPS harness connector (see illustration under "CPS Test").

IMPORTANT: In order to remove the CPS, the rear portion of the exhaust system and the mounting bracket between the transmission and rear gearcase will need to be removed.

- Remove the exhaust pipe between the elbow pipe and the exhaust silencer. Remove the exhaust silencer.



- Remove the (3) bolts retaining the front portion of the mounting bracket to the transmission. Retain the bolts, washers, and spacers for installation.
- Remove the bottom bolt that attaches the bracket to the rear gearcase through the hole in the frame support as shown.



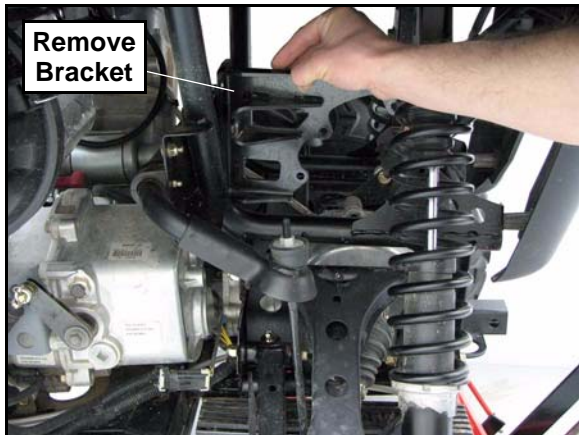
- Remove the (2) remaining fasteners that attach the bracket to the side of the rear gearcase.



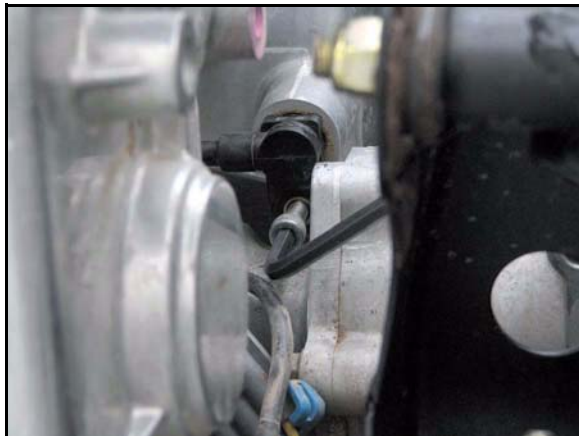
- Remove the bolt from the bracket at the front of the rear gearcase.



- Lift the mounting bracket straight up and out from the vehicle.



- Using a 5 mm hex wrench, remove the CPS retaining bolt and remove the sensor from the magneto housing.



- Install new sensor using a light coating of oil on the o-ring to aid installation.
- Torque the CPS retaining bolt to specification.

= T
CPS Retaining Bolt Torque: 25 in. lbs. (2.8 Nm)

Installation

IMPORTANT: When reinstalling the transmission to rear gearcase mount bracket, it is extremely important to torque all (7) fasteners to specification. Refer to the following procedure.

NOTE: Special tool (PA-48873) will be required to torque the mounting bracket fasteners when the transmission and rear gearcase are installed in the vehicle.

**Special Tool
PA-48873**

RIGHT

WRONG

This tool is specifically designed to access the critical transmission to rear gearcase mounting bracket bolts on the *RANGER RZR* when the transmission and rear gearcase are installed in the vehicle. This tool allows for proper torque to be applied to 1/2" SAE hex head cap screws with limited wrench access. When used at a 90° angle with a torque wrench, no torque multiplier is necessary.

- Clean bolt threads with solvent and allow them to dry. Coat the circumference of the first 4 threads of the bolts with Loctite before installing the bolts.
- Reinstall mounting bracket and hand tighten the (7) bolts.
- Torque ALL mounting bracket bolts to specification.

= T
Mount Bracket Bolt Torque: 23-27 ft. lbs. (31-37 Nm)

ELECTRONIC FUEL INJECTION

- Using special tool (PA-48873), torque the (3) bolts that retain the front portion of the mounting bracket to the transmission.

Upper Transmission Bolt



Middle Transmission Bolt



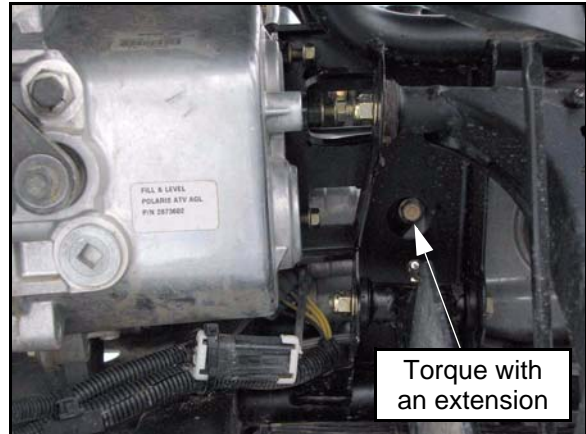
Bottom Transmission Bolt



- Remove the special tool and attach an extension to the torque wrench. Torque the bottom bolt that attaches the bracket to the rear gearcase through the hole in the frame support.

Bottom Rear Gearcase Bolt

NOTE: Special Tool is not required for this torque.



- Using special tool (PA-48873), torque the upper (2) bolts retaining the mounting bracket to the rear gearcase. Place the torque wrench through the rear exhaust silencer opening to gain access to the bolts.

Middle Rear Gearcase Bolt



Upper Rear Gearcase Bolt



7. Torque the remaining bolt that attaches the bracket to the front side of the rear gearcase.

Front Rear Gearcase Bolt



NOTE: A multi-directional torque wrench is required in this application because of the limited access to this bolt. Check with the manufacturer of your torque wrench to see if it can be used to tighten left-hand threaded bolts.

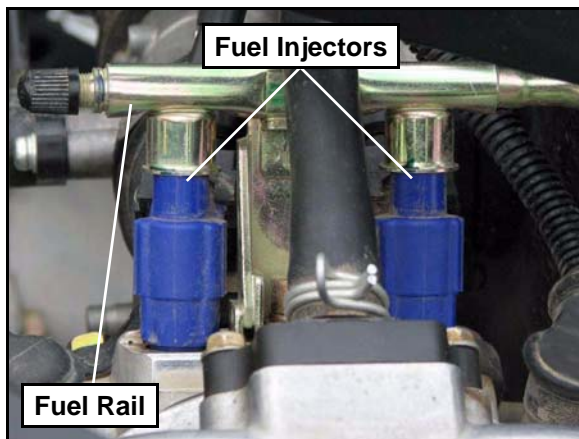
ELECTRONIC FUEL INJECTION

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. Replaceable 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 voltage is present at the injector. At the proper instant, the ECU completes the ground circuit, energizing the injector. 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 (see inset) contains a series of calibrated openings which directs the fuel into the intake port in a cone-shaped spray pattern.

The injector is opened and closed once for each crankshaft revolution, however only one-half the total amount of fuel needed for one firing is injected during each opening. 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 from 1.5-8 milliseconds depending on the speed and load requirements of the engine.

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.

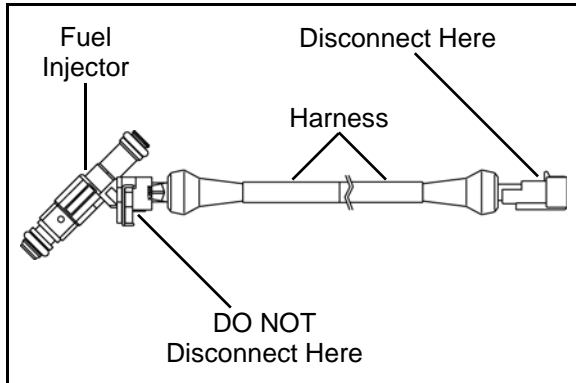
If an injector is not operating, it can indicate either a bad injector, or a wiring/electrical connection problem. Check as follows:

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.

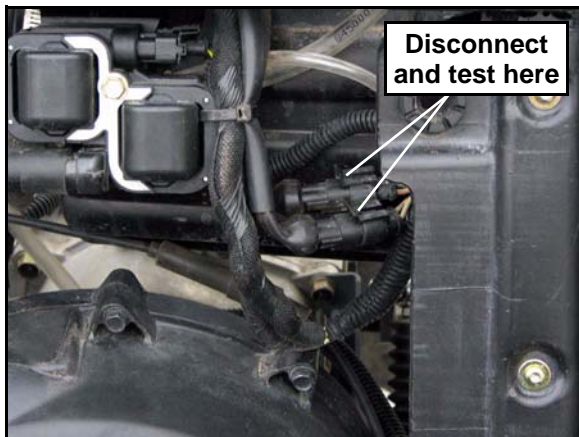
Injector problems due to dirt or clogging are unlikely due to the design of the injectors, the high fuel pressure, the use of filters and the detergent additives in the gasoline. Symptoms that could be caused by dirty/clogged injectors include rough idle, hesitation/stumble during acceleration, or triggering 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 Injector Test

NOTE: The Bosch harness connector and locking spring is bonded to the fuel injectors with an epoxy mix. **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 by disconnecting at the end of the harness as shown in this procedure.



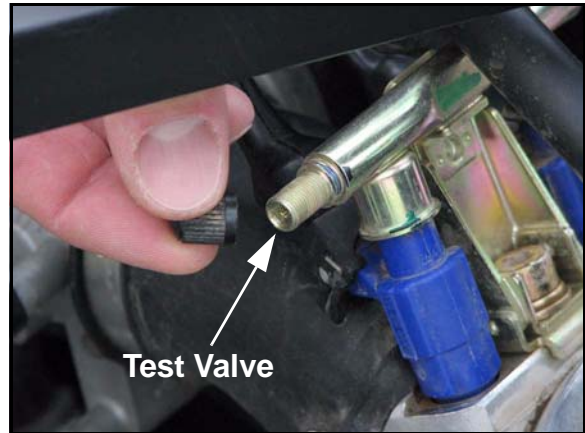
The fuel injectors are non-serviceable. If fault code diagnosis indicates a problem with either injector, test the resistance of the fuel injector(s) by measuring between the two harness pin terminals:



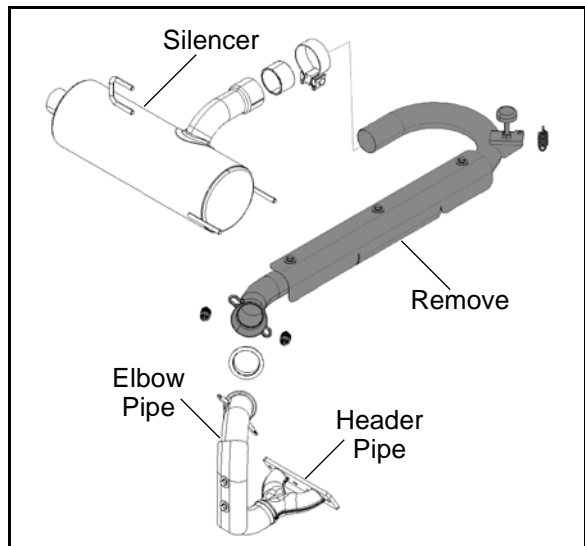
Fuel Injector Resistance Specification:
13.8Ω - 15.2Ω

Fuel Injector Replacement

1. Be sure the engine has cooled enough to work on.
2. Depressurize the fuel system by connecting the Fuel Pressure Gauge Kit PU-43506-A to the test valve at the end of the fuel rail and properly drain the fuel into a suitable container.



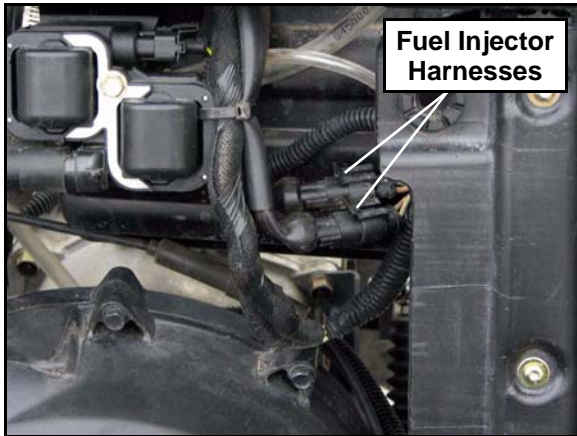
3. Remove the exhaust pipe between the exhaust silencer and the elbow pipe to allow better access to the fuel injector rail.



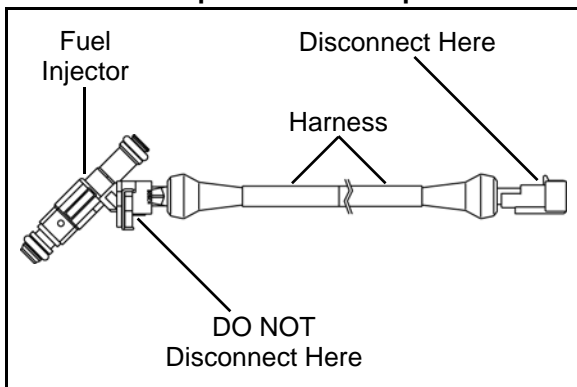
4. Remove the engine breather hose from the valve cover.
5. Remove both driver and passenger seats and remove the rear service panel.

ELECTRONIC FUEL INJECTION

6. Disconnect the harness for the fuel injector(s) located next to the ignition coil. Cut the plastic tie strap and push the harness for the fuel injector(s) up over the air box to allow fuel injector removal.

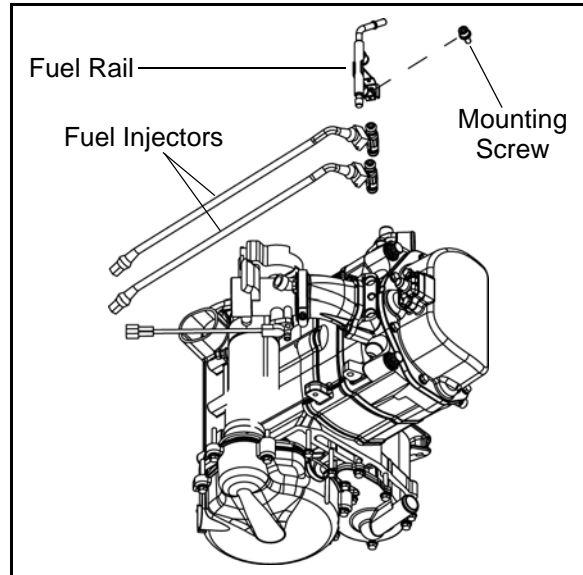


NOTE: The Bosch harness connector and locking spring is bonded to the fuel injectors with an epoxy mix. **DO NOT** attempt to disconnect the Bosch connector from the fuel injectors. Damage will occur to the injector and/or harness if attempting to separate at that location. Separate the fuel injector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



7. Thoroughly clean the area around the fuel injectors including the throttle body manifold.

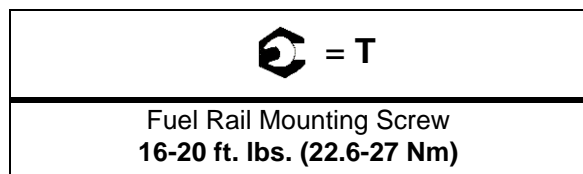
8. Using a 6mm hex wrench, loosen the fuel rail mounting screw from the cylinder head. Carefully pull the rail away from the injectors and remove the injector(s) from the cylinder head along with the harness.



9. Reverse the previous procedures to install the new injector(s) and reassemble.

IMPORTANT: The PTO Fuel Injector Harness wires are Red/Black and White. The MAG Fuel Injector Harness wires are Red/Black and White/Black.

10. Lubricate O-rings lightly with oil to aid installation. Torque the fuel rail mounting screw to specification.

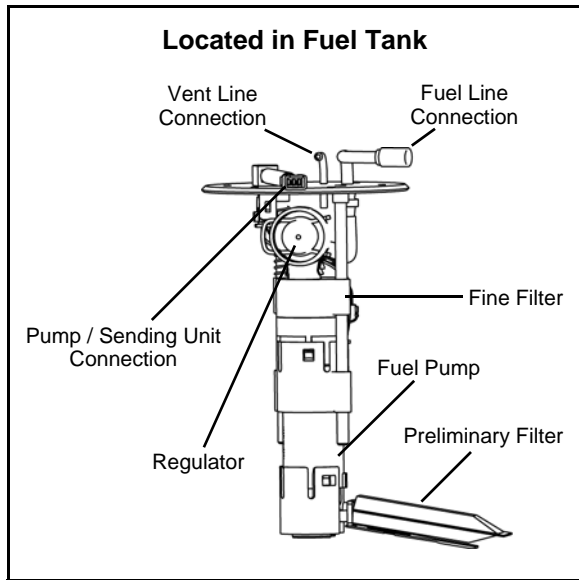
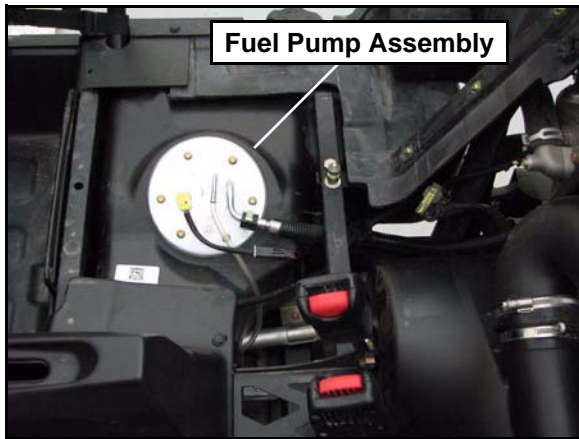


FUEL PUMP

Operation Overview

NOTE: All EFI units utilize quick connect lines.

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 25 liters per hour at 39 psi 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 go on, but will 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 between the Purple and Brown wires (see chapter 10 for further details). If out of specification, replace the fuel pump assembly.

NOTE: See the "Electronic Parts Catalog" for fuel pump availability. It may be possible that the fuel tank assembly must be replaced.

Fuel Sender Resistance Specifications:
Full: 90Ω
Empty: 5Ω

Fuel Pump Test

The fuel pump assembly may be a serviceable item on some vehicles.

NOTE: See the "Electronic Parts Catalog" for fuel pump availability. It may be possible that the fuel tank assembly must be replaced.

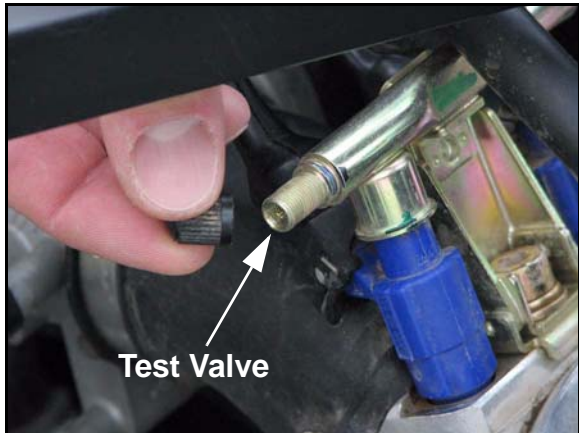
If a fuel delivery problem is suspected, make certain the fuel pump filters are not plugged, that the pump is being activated through the ECU, all electrical connections are properly secured, the fuses are good, and a minimum of 7.0 volts is being supplied. If during starting the battery voltage drops below 7.0 volts, the ECU will fail to operate the system.

⚠ WARNING

Check the fuel test valve for any possible fuel seepage after performing any tests or procedures. 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.

ELECTRONIC FUEL INJECTION

1. Remove the cap from the fuel test valve.



2. Connect the pressure hose of the Polaris pressure tester (PU-43506-A) to the test valve on the fuel rail. Route the clear hose into a portable gasoline container or the equipment fuel tank.

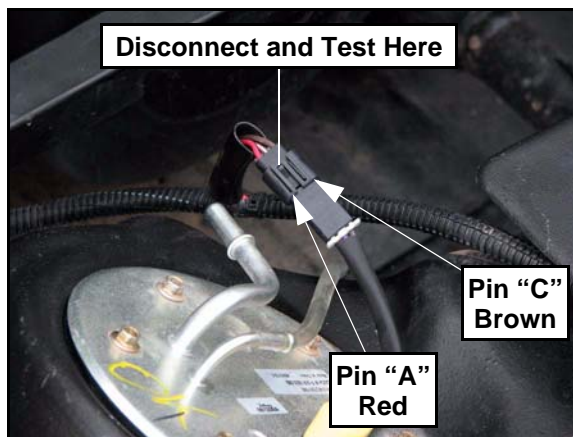


3. Turn on the key switch to activate the pump and check the system pressure on the gauge. If system pressure of 39 psi \pm 3 is observed, the ignition switch, ECU, fuel pump, and pressure regulator are working properly. Turn the key switch off and depress the valve button on the tester to relieve the system pressure.

Normal Fuel Pressure: 39 psi. \pm 3

NOTE: If the fuel pressure is out of specification, replace the fuel pump assembly. See the "Electronic Parts Catalog" for fuel pump availability. It may be possible that the fuel tank assembly must be replaced.

4. If the pump did not activate (Step 3), disconnect the harness connector from the fuel pump. Connect a DC voltmeter across terminals "A" and "C" in the plug on the vehicle harness side. 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.

5. If the reading is between 7 and 14 volts, turn key switch off and connect an ohmmeter between the terminals "A" and "C" in the plug on the pump harness side to check for continuity within the fuel pump.

NOTE: If there was no continuity between the pump terminals, replace the fuel pump assembly. See the "Electronic Parts Catalog" for fuel pump availability. It may be possible that the fuel tank assembly must be replaced.

6. If voltage at the plug was within the specified range, and there was continuity across the pump terminals, reconnect the plug to the pump, making sure you have clean connections. Turn on the key switch and listen for the pump to activate.

NOTE: If the pump starts, repeat steps 1, 2 and 3 to verify correct pressure.

7. 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. See the "Electronic Parts Catalog" for fuel pump availability. It may be possible that the fuel tank assembly must be replaced.

Fuel Tank / Fuel Pump Replacement

IMPORTANT: Syphon as much fuel from the tank as possible before attempting to remove it from the vehicle.

⚠ 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: The fuel pump assembly may be a serviceable item on some vehicles. See the “Electronic Parts Catalog” for fuel pump availability. It may be possible that the fuel tank assembly must be replaced.

If replacing only the fuel pump assembly, refer to “Fuel Pump Removal / Installation” within this section. If replacing the fuel tank, follow the procedure below.

1. Remove the driver and passenger seats along with the rear service panel.
2. Disconnect the negative battery cable from the battery located under the driver’s seat.
3. Bleed off fuel pressure at the test valve using the Fuel Pressure Gauge Kit (PU-43506-A).
4. While holding a shop towel over the fuel line connector, disconnect the quick connect fuel line from the fuel pump.

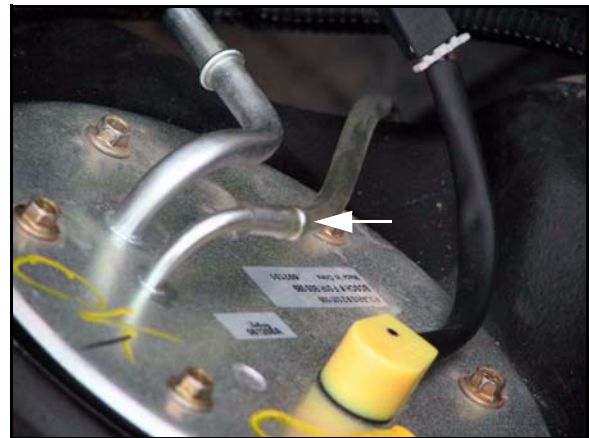


NOTE: A small amount of fuel may come out of the fuel line or tank. Properly drain fuel into a suitable container.

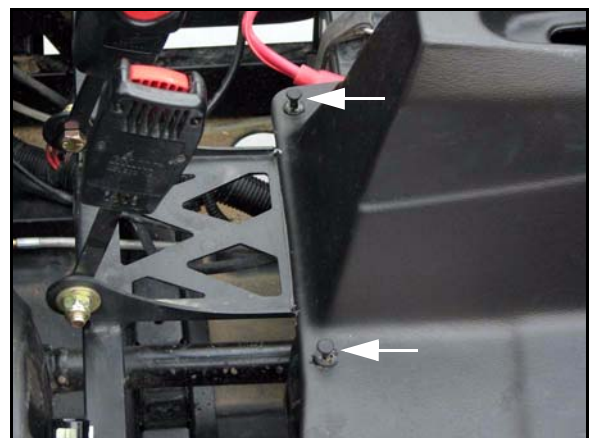
5. Disconnect the fuel pump electrical harness.



6. Remove the fuel tank vent hose.

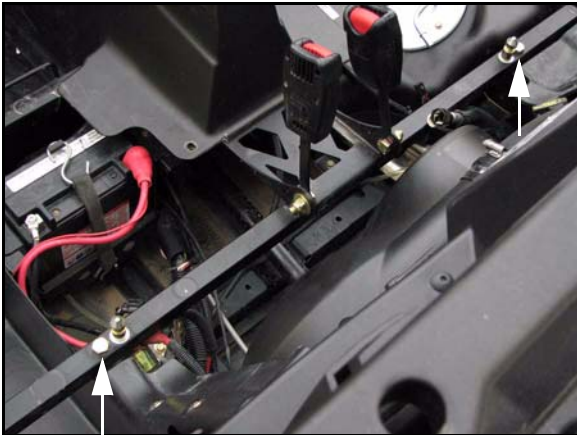


7. Remove the (2) push rivets from the rear of the center console.

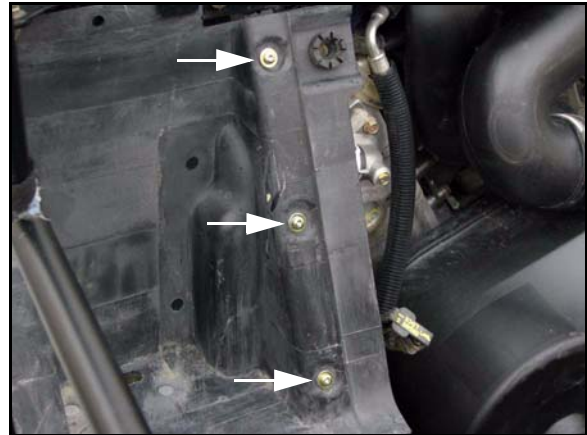


ELECTRONIC FUEL INJECTION

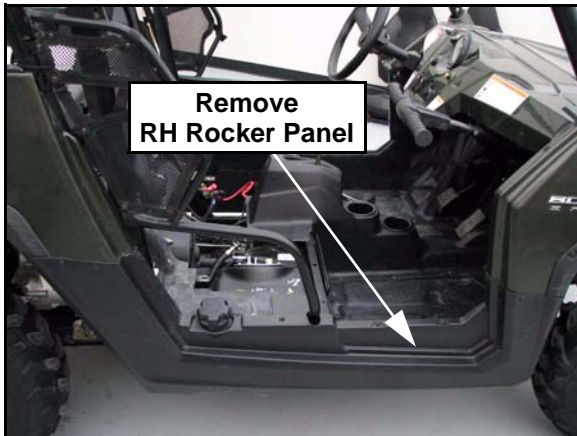
8. Remove the (2) fasteners from the rear seat base and remove the assembly from the vehicle.



11. Remove the (3) Torx fasteners from the rear RH fender well and remove the fender well from the vehicle.



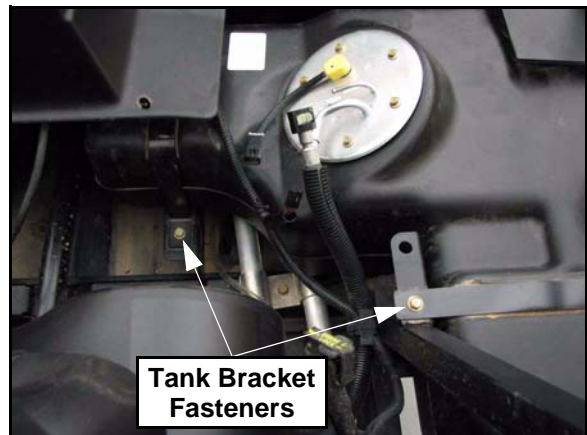
9. Remove the (11) push rivets and (4) Torx screws retaining the RH rocker panel and remove panel from the vehicle.



NOTE: Lift fender well up over the fuel tank filler neck and out from the vehicle.

IMPORTANT: Take care not to place any excessive force on the filler neck

12. Remove the (2) tank bracket fasteners that retain the fuel tank in the chassis.



10. Remove the lower bolt retaining the seat belt mechanism near the rear RH portion of the fuel tank. Once removed, place the mechanism in the rear cargo box to keep it out of the way.

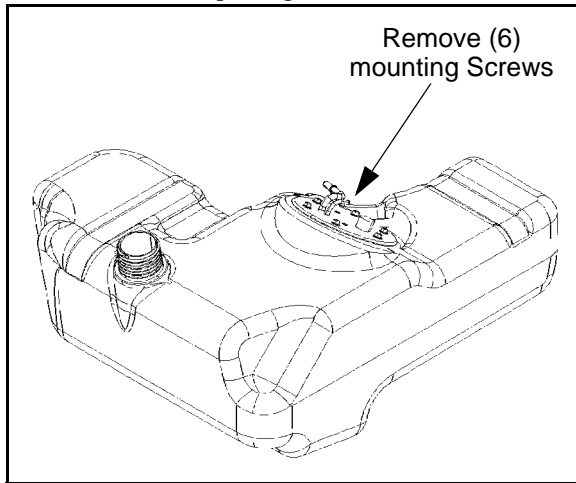


13. Lift the rear of the fuel tank up first and carefully pull it out from the vehicle.

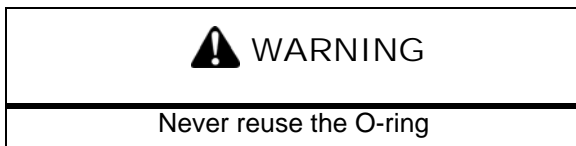


Fuel Pump Removal / Installation

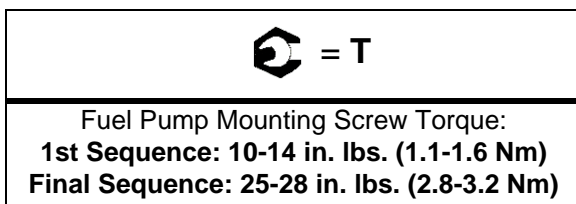
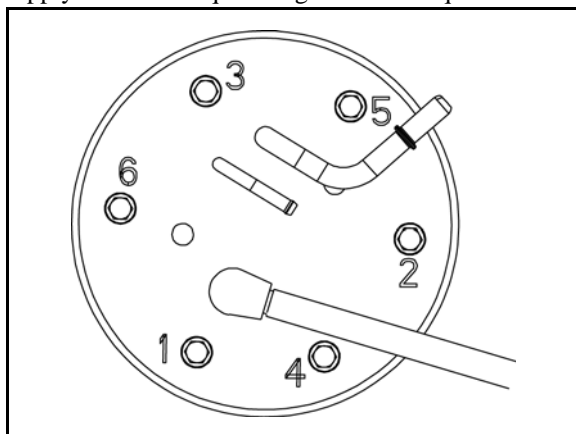
1. Remove the (6) mounting screws and carefully remove the fuel pump from the tank. Take care not to damage the fuel sender float or fuel pick-up screen.



2. Replace O-ring on fuel pump assembly.



3. Clean the tank's mating surface with Isopropyl Alcohol.
4. Carefully install the fuel pump into the tank. Take care not to damage the fuel sender float or fuel pick-up screen.
5. Install and hand tighten the mounting screws.
6. Torque screws to specification following the sequence show in the illustration below.
7. Apply the final torque using the same sequence.



Fuel Tank Installation

1. Carefully reinstall the fuel tank assembly.
2. Reinstall the (2) tank brackets and fasteners.
3. Reinstall the rear RH fender well and secure with fasteners.
4. Reinstall the seat belt mechanism and secure the lower bolt.
5. Reinstall the RH rocker panel and all (15) fasteners.
6. Reinstall the rear seat base and secure with the (2) fasteners.
7. Reinstall the push rivets into the rear of the center console.
8. Install the fuel line and vent hose and verify they are secure.
9. Reconnect the fuel pump electrical harness.
10. Reconnect the negative battery cable. Test the fuel pump by turning on the key and listening for the pump to activate.
11. Finally, install the rear service panel along with the driver and passenger seats.

FUEL PRESSURE REGULATOR

Operation Overview

The fuel pressure regulator maintains the required operating system pressure of 39 psi + 3psi. 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 Pressure Regulator Test

Refer to the "Fuel Pump Test" procedure.

See "Fuel Pump Test" on page 4.21.

Fuel Pressure Regulator Replacement

The pressure regulator is a sealed, non-serviceable assembly. If it is faulty, the fuel pump assembly must be replaced. Refer to the "Fuel Pump Removal / Installation" procedure.

NOTE: See the "Electronic Parts Catalog" for fuel pump availability. It may be possible that the fuel tank assembly must be replaced.

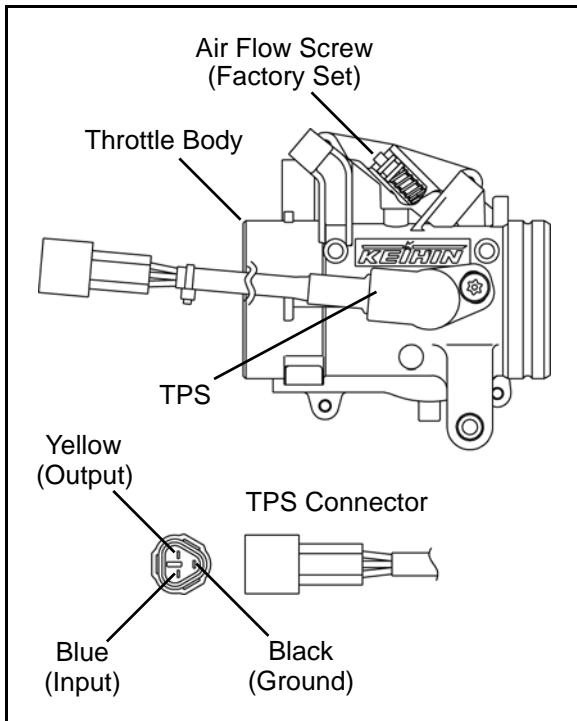
ELECTRONIC FUEL INJECTION

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.



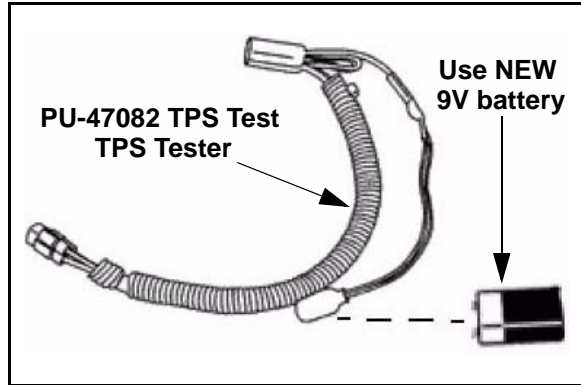
NOTE: The correct position of the TPS is established and set at the factory. Do not loosen the TPS or alter the mounting position. If the TPS is repositioned, replaced or loosened it must be recalibrated by performing "TPS Initialization."

TPS Test Procedure

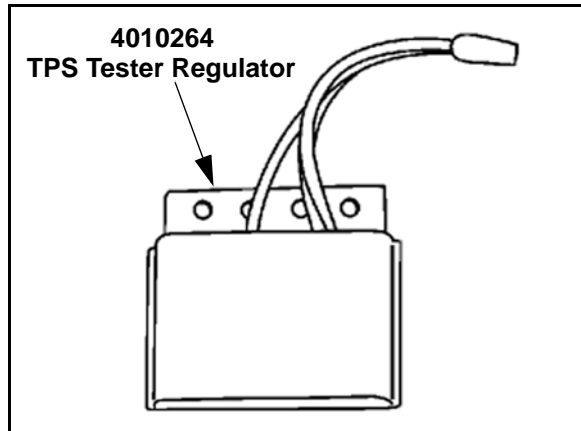
The throttle position sensor (TPS) is a non-serviceable item. If it is faulty, it must be replaced. It can be tested using the following method:

NOTE: Before proceeding with any of the following measurements or tests, it's extremely important to verify the throttle body bore is clean of any carbon build-up. Remove the intake boot and inspect the throttle body bore. If required, remove the throttle body and clean the bore using carburetor cleaner.

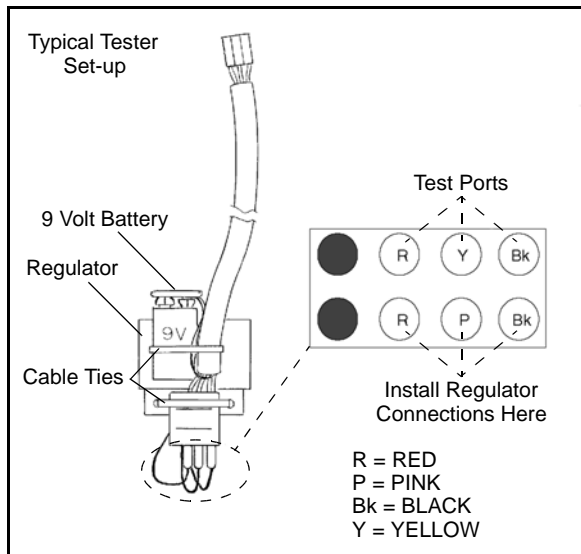
Set up the TPS Tester (PU-47082), according to the instructions that accompanied the tester. Make sure that the 9 volt battery is new.



As mentioned in the instructions included with the tester, be sure the TPS tester is set up along with the TPS Tester Regulator (4010264).



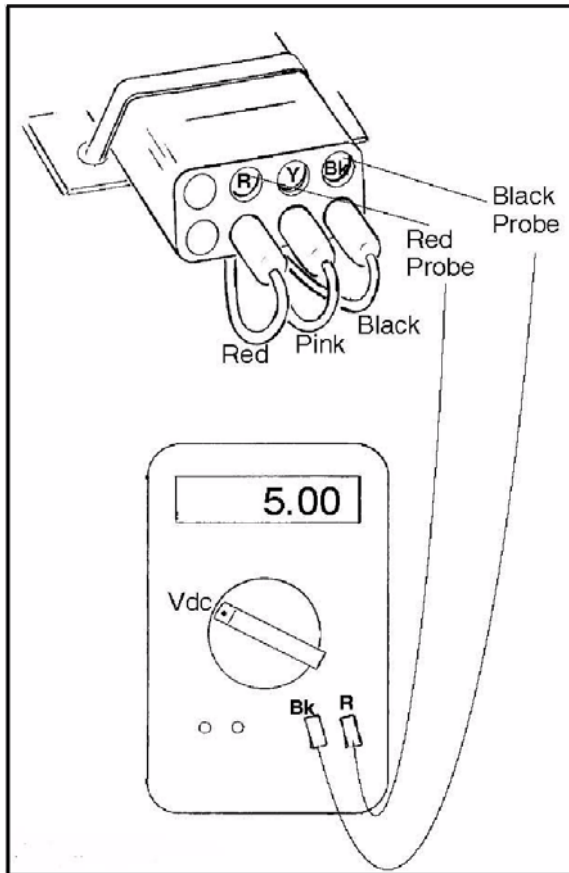
NOTE: If your dealership sells Polaris snowmobiles, you may already have this regulator from TPS tool PN 2201519. If you do not have this regulator, you must order one from SPX at 1-800-328-6657.



Verify TPS Tester Reference Voltage

A 5 volt reference voltage from the harness is required for the TPS test to be accurate. Refer to the instructions provided with the TPS Test Adapter Harness (PU-47082) or follow the bullet point steps to check reference voltage.

- **Harness Test:** Insert black voltmeter probe into the “Bk” test port.
- Connect the red meter probe into the “R” port and verify the voltage is 4.99-5.01 Vdc. If this reading is low, verify the 9 volt battery is good or try a new 9 volt battery.



IMPORTANT: Always use a fresh 9 volt battery.

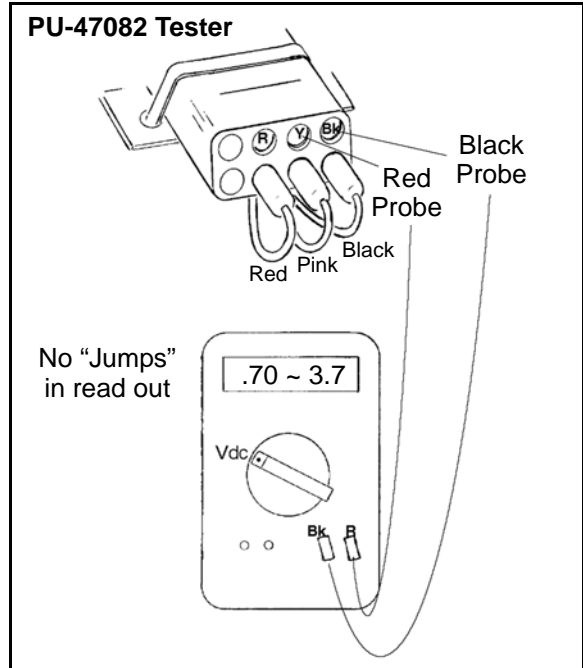
Test Procedure

1. Disconnect the vehicle harness from the TPS.

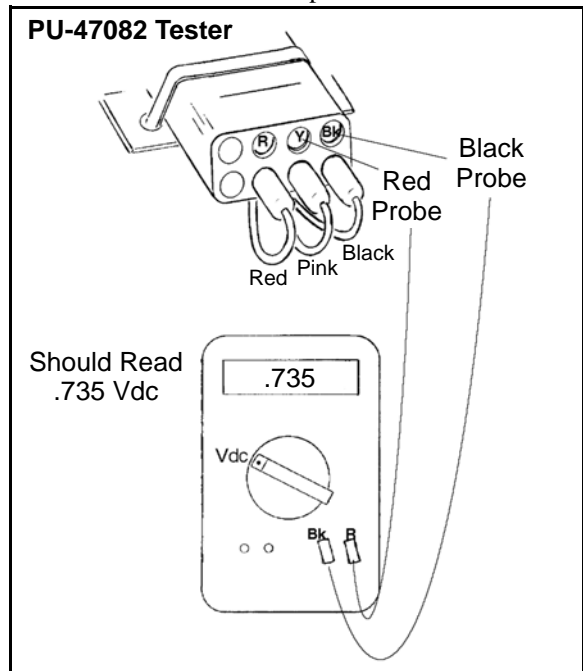
NOTE: To allow better access to the TPS harness connection, remove the exhaust pipe and exhaust silencer.

2. Plug the TPS tester harness in the TPS harness.
3. Connect the red volt meter test probe in yellow test port and black volt meter test probe in the black test port and set the meter to read VDC.

4. Move the throttle open and closed slowly while reading the display. The voltage should increase and decrease smoothly with no “jumps” when the throttle is applied.



5. If voltage varies with throttle movement, continue on to the next step and measure the idle air flow reading. If the sensor did not function correctly, replace it.
6. With voltmeter still attached to the TPS Test Adapter Harness (PU-47082) as shown below, the voltmeter should read $.735 \pm .01$ volts at idle position.



7. If the voltage does not read within the specification, “TPS Initialization” will need to be performed.

ELECTRONIC FUEL INJECTION

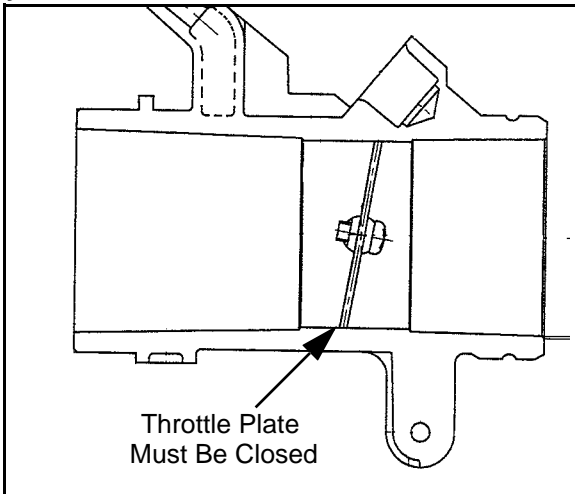
TPS Initialization

NOTE: The correct TPS position is established and set at the factory. Use this procedure only if the TPS was repositioned, replaced or loosened.

STEP 1

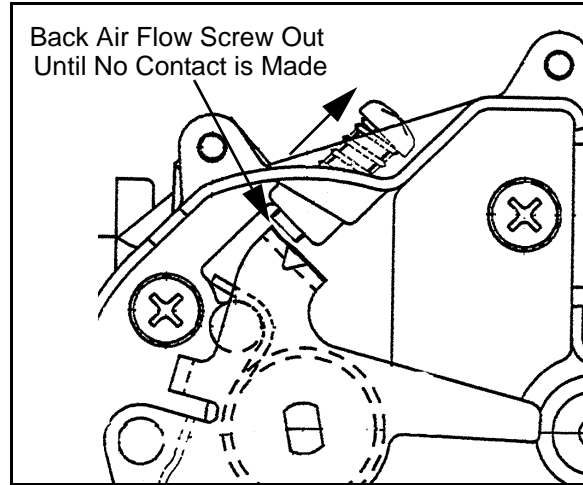
Establishing zero offset voltage: This step is crucial as it sets the TPS position using a fixed physical stop. This will insure that the correct offset voltage is reached once the correct throttle body flow is set.

NOTE: Before proceeding, it's extremely important to verify the throttle body bore is clean of any carbon build-up. Remove the intake boot and inspect the throttle body bore. If required, remove the throttle body and clean the bore.

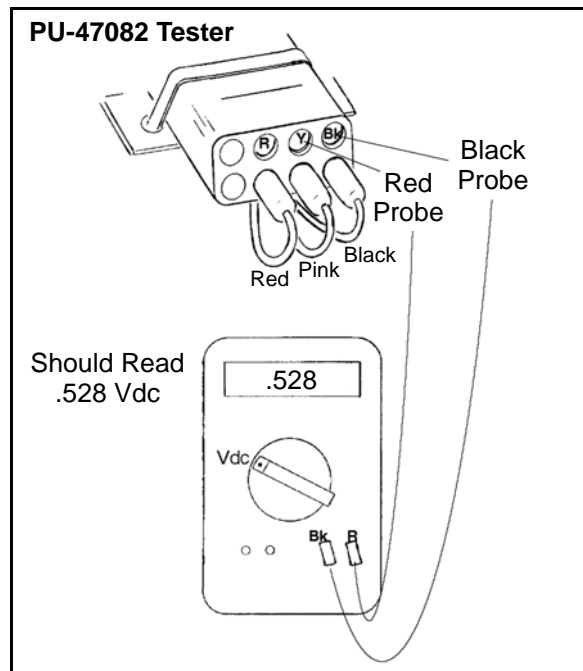


1. Stop the engine and leave the ignition key in the off position.
2. Remove the driver and passenger seats along with the rear service panel.
3. Remove the outlet duct from the PVT cover to access the throttle body.
4. Loosen the hose clamps that secure the throttle body in the intake boot and intake adaptor. This will allow you to rotate the throttle body to access the TPS or allow you to remove the throttle body to perform this procedure.
5. Remove the throttle body side cover and disconnect throttle cable from throttle cam.

6. Back out air flow screw until it no longer is in contact with throttle plate cam. The throttle plate should seal off throttle bore completely.



7. Open and close throttle plate a couple of times to ensure full throttle closing. Do not snap closed, as this could cause unnecessary throttle plate to throttle body interference and/or damage.
8. Assemble the TPS Tester Harness (PU-47082) according to the instructions. Refer to "TPS Test Procedure" for proper tester set-up. Verify that the 9 volt battery is new.
9. Disconnect the vehicle harness from the TPS.
10. Plug the TPS tester harness in the TPS harness.
11. Using a voltmeter check the voltage output of the TPS. It should read $.528 \pm .01$ volts.

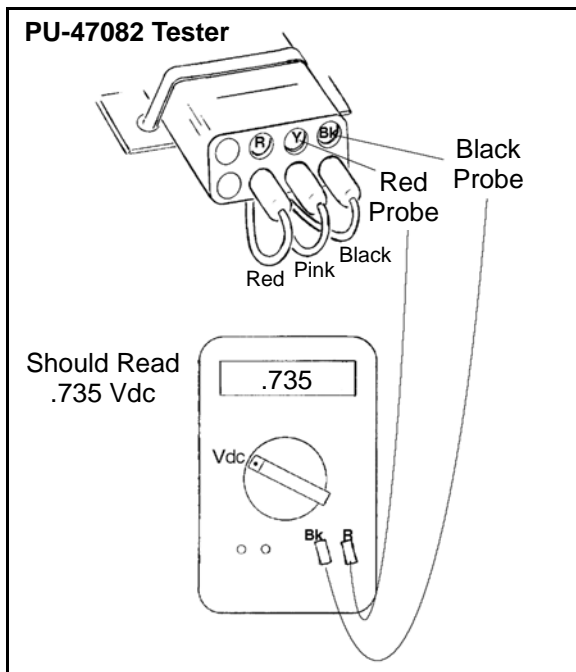
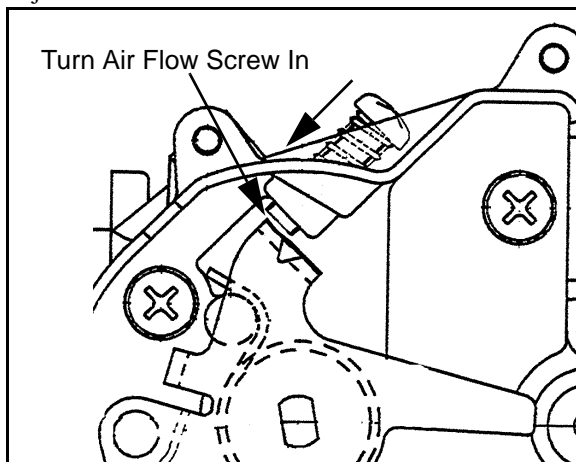


12. If it does not read $.528 \pm .01$ volts, loosen the screw holding the TPS to the throttle body. Rotate TPS until voltmeter reads $.528 \pm .01$ volts.
13. Retighten TPS mounting screw, and verify the voltage did not change. If changed, repeat the previous steps.

STEP 2

Establishing correct flow: Now that the zero offset voltage has been set, you can now set the throttle body to the correct air flow value.

1. With the voltmeter still attached to the TPS Tester Harness (PU-47082), turn in the air flow adjustment screw until the voltmeter reads $.735 \pm .01$ volts. The throttle body is now adjusted to the correct flow value.

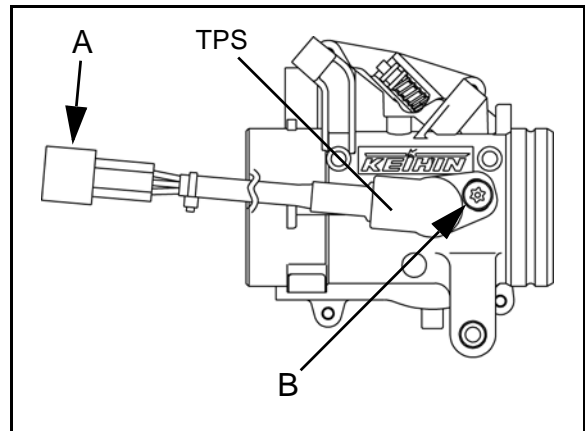


2. Reconnect the TPS harness lead
3. Reinstall throttle cable on throttle cam and install cover. Adjust cable freeplay.

TPS Replacement

NOTE: The correct position of the TPS is established and set at the factory. Do not loosen the TPS or alter the mounting position. If the TPS is repositioned, replaced or loosened it must be recalibrated by performing "TPS Initialization."

1. If the vehicle is completely assembled, remove the exhaust pipe and exhaust silencer from the vehicle to gain access to the throttle body and TPS.
2. Disconnect the TPS harness connection (A).



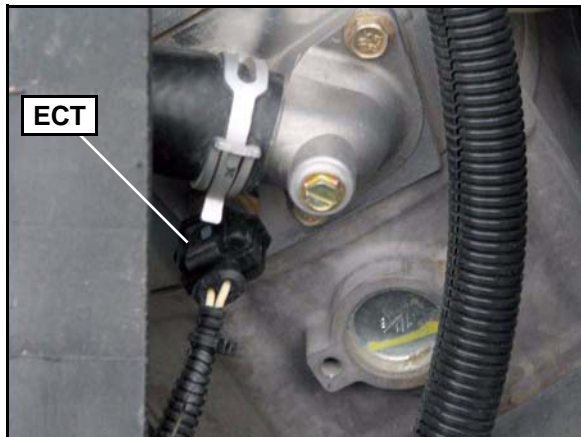
3. Remove the retaining screw (B) and replace the sensor.
4. Refer to "TPS Initialization" for setting the TPS voltage.

ELECTRONIC FUEL INJECTION

ENGINE COOLANT TEMPERATURE SENSOR (ECT)

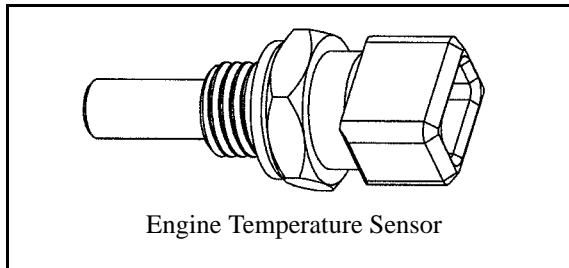
Operation Overview

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. If for any reason the engine temperature sensor circuit is interrupted, the fan will default to “ON”.

ECT Sensor Test



To quickly rule out other components and wiring related to the ETS, disconnect the harness from the ETS. The fan should turn on and ‘HOT’ should indicate on the instrument cluster. This indicates all other components are working properly.


Refer to Chapter 10 for ECT testing. Polaris dealers can also test the sensor by using the Digital Wrench™ Diagnostic Software (dealer only). Refer to the Digital Wrench™ User Guide for more information.

ECT Sensor Resistance Readings

Temperature ° F (° C)	Resistance
68 ° F (20 ° C)	2.5 kΩ ± 6%
212 ° F (100 ° C)	0.186 kΩ ± 2%

ECT Sensor Replacement

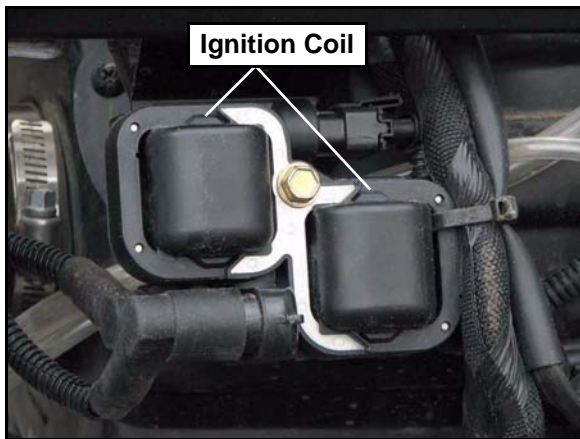
1. Drain coolant to level below sensor.
2. Disconnect sensor from engine harness.
3. Using a wrench, remove and replace the sensor, applying a light coating of thread sealant to aid installation.
4. Torque the sensor to **17 ft. lbs. (23 Nm)**.

 = T
ECT Retaining Bolt Torque: 17 ft. lbs. (23 Nm)

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 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 for PTO cylinder. 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.



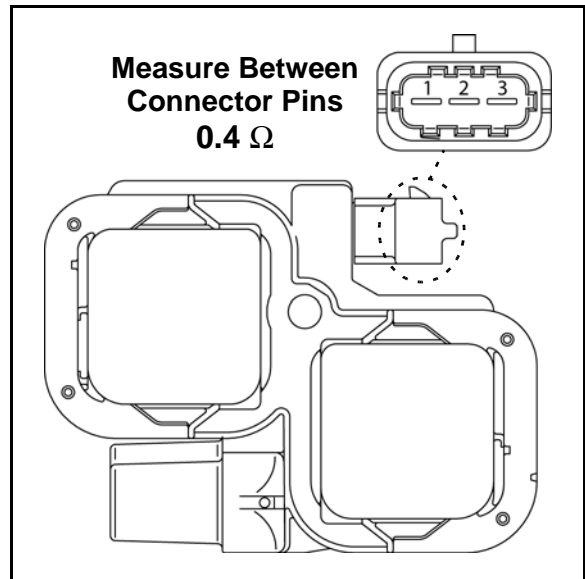
Ignition Coil Tests

The ignition coil can be tested by using an ohm meter. Use the following illustration and specification table to test the ignition coil.

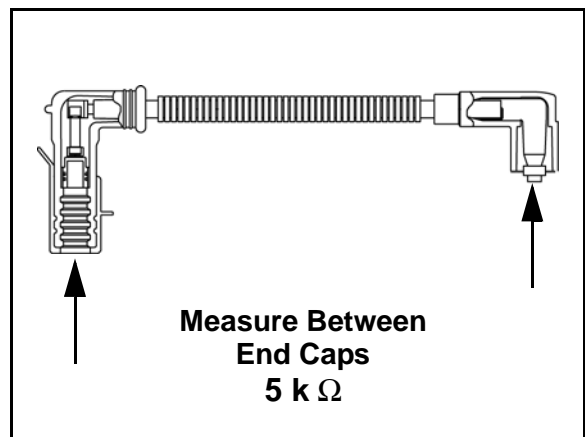
Ignition Coil Resistance Readings

Test	Pin Connection	Resistance
Primary	Between 1 & 2 Between 3 & 2	0.4 Ω
Secondary	Between High Tension Lead Ends	5 k Ω

Primary Test



Secondary Test



Ignition Coil / HT Lead Replacement

1. Remove the driver and passenger seats.
2. Remove the rear service panel to access the ignition coil.
3. Disconnect the ignition coil harness and remove the high tension leads from the coil.
4. Remove the fastener retaining the ignition coil and remove the coil from the vehicle. If replacing the high tension lead(s), remove the other end of the lead(s) from the spark plug.
5. Install the new ignition coil and/or high tension lead(s).

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**Ignition Coil Retaining Bolt Torque:
75 in. lbs. (8.5 Nm)**

ELECTRONIC FUEL INJECTION

GENERAL TROUBLESHOOTING

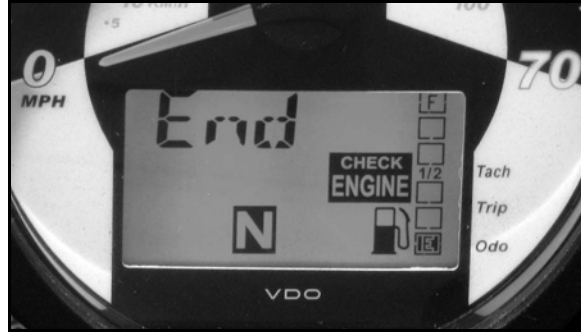
Diagnostic “Blink Codes”

NOTE: The EFI diagnostic mode is intended to quickly view the cause of the “Check Engine” light.

To recall blink codes (fail codes) from the ECU:

1. Verify the key switch is off and the transmission is in neutral with the parking brake applied.
2. Turn the key switch ON and OFF 3 times within 5 seconds and leave the key switch in the ON position on the third turn. The word “Wait” will appear as the ECU searches for blink codes.

3. Any “blink codes” stored in the ECU will display a numerical “blink code”, one at a time, in numerical order, on the instrument cluster display.
4. The word “End” and/or the number “61” will display after all of the codes have been displayed or if no codes are present.



NOTE: To clear codes manually, disconnect the positive battery lead for 20 seconds.

DIAGNOSTIC “BLINK CODES” CHART

SAE CODE	BLINK CODE	NAME	CHECK ENGINE
P0335	21	Loss of Synchronization	Yes
P0122	22	TPS: Open or Short Circuit to Ground	Yes
P0123	22	TPS: Short Circuit to Battery	Yes
P0601	23	RAM Error: Defective ECU	Yes
P0914	25	Transmission Input: Invalid Gear	Yes
P0113	41	Intake Air Temp Sensor: Open or Short Circuit to +Sensor Voltage (ECU)	Yes
P0112	41	Intake Air Temp Sensor: Short Circuit to Ground	Yes
P0117	42	Engine Temperature Sensor Circuit: Short To Ground	Yes
P0118	42	Engine Temperature Sensor Circuit: Open or Short to Battery	Yes
P0107	45	Barometric Pressure Sensor: Circuit Low Input	Yes
P0108	46	Barometric Pressure Sensor: Circuit High Input	Yes
P1260	51	Injector 1: Open Load	Yes
P0261	51	Injector 1: Short Circuit to Ground	Yes
P0262	51	Injector 1: Short Circuit to Battery	Yes
P1263	52	Injector 2: Open Load	Yes
P0264	52	Injector 2: Short Circuit to Ground	Yes
P0265	52	Injector 2: Short Circuit to Battery	Yes
P0655	54	Engine Temperature Lamp: Open Load	Yes
P1657	54	Engine Temperature Lamp: Short Circuit to Ground	Yes
P1658	54	Engine Temperature Lamp: Short Circuit to Battery	Yes
P1651	55	Diagnostic Lamp: Open Load	Yes
P1652	55	Diagnostic Lamp: Short Circuit to Ground	Yes
P1653	55	Diagnostic Lamp: Short Circuit To Battery	Yes
P1231	56	Pump Relay: Open Load	Yes
P1232	56	Pump Relay: Short Circuit to Ground	Yes
P1233	56	Pump Relay: Short Circuit to Battery	Yes

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

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

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

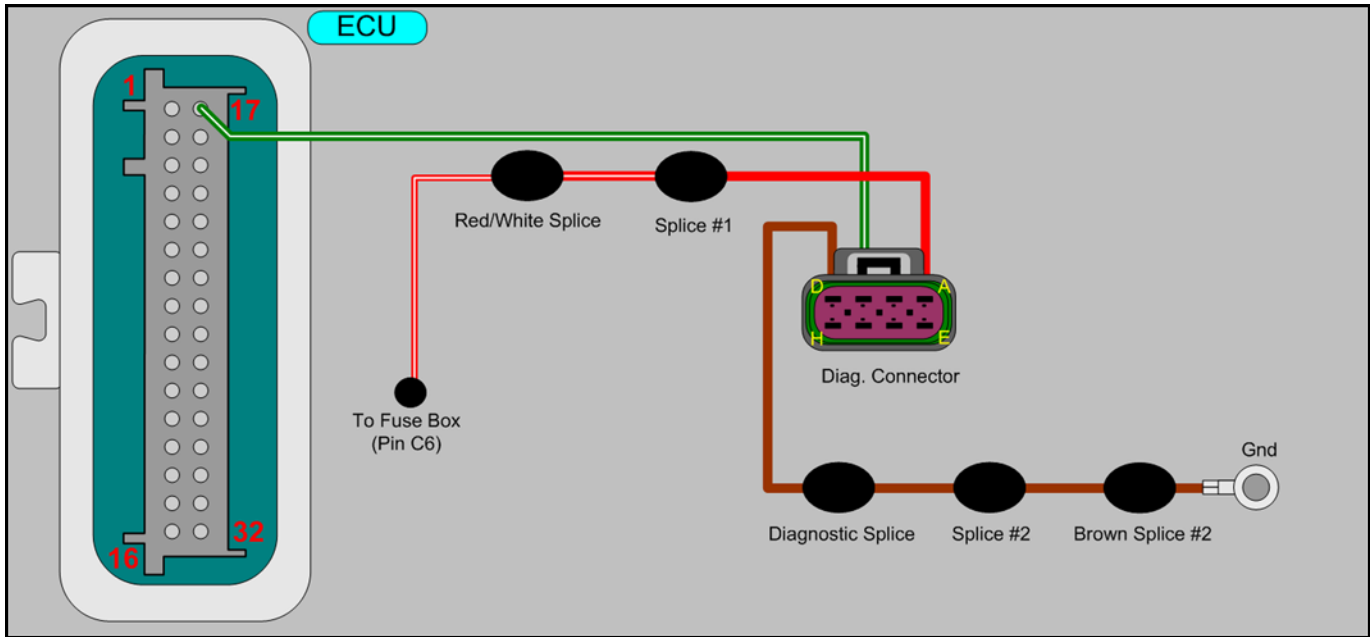
Symptom: Erratic Idle

- 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)

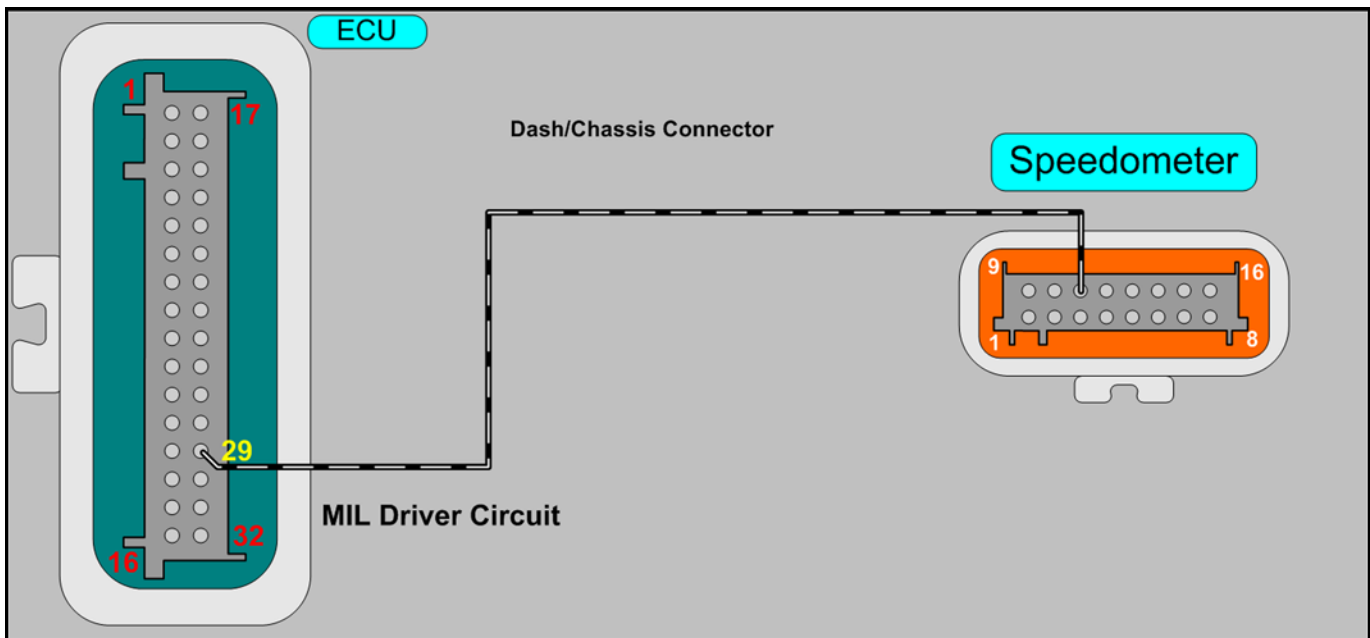
ELECTRONIC FUEL INJECTION

EFI SYSTEM BREAKOUT DIAGRAMS

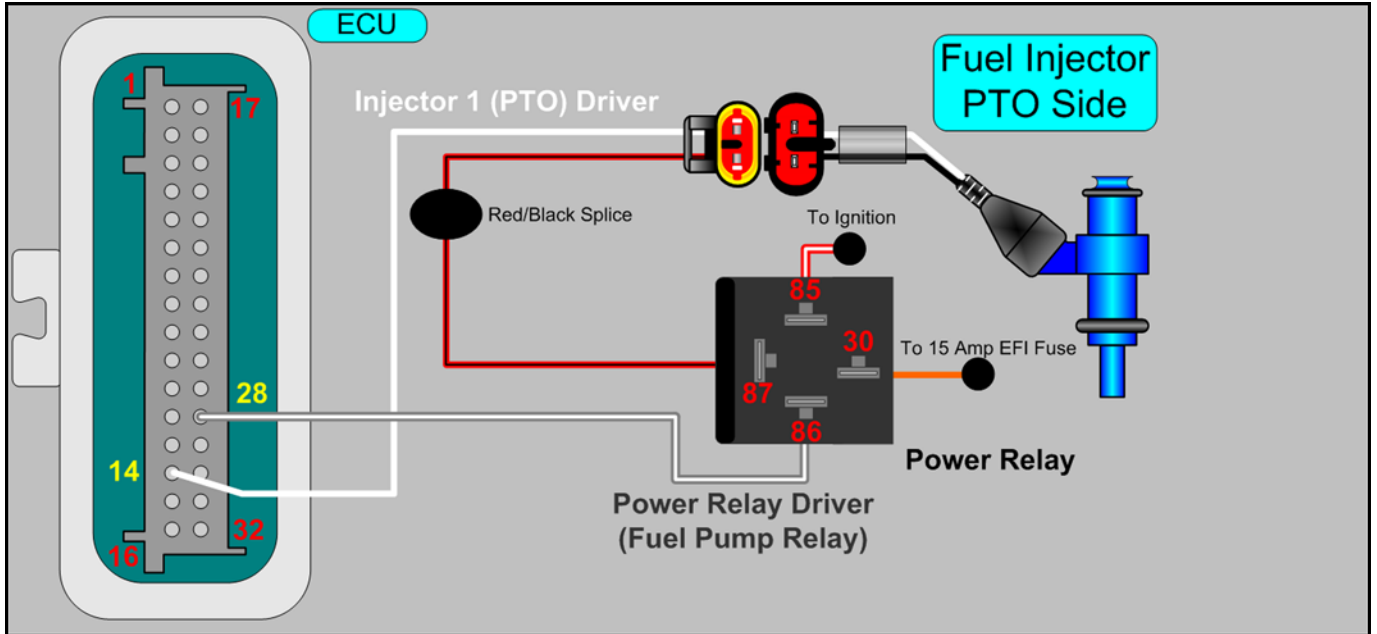
Diagnostic Connector Circuit



Malfunction Indicator Lamp (MIL) Circuit

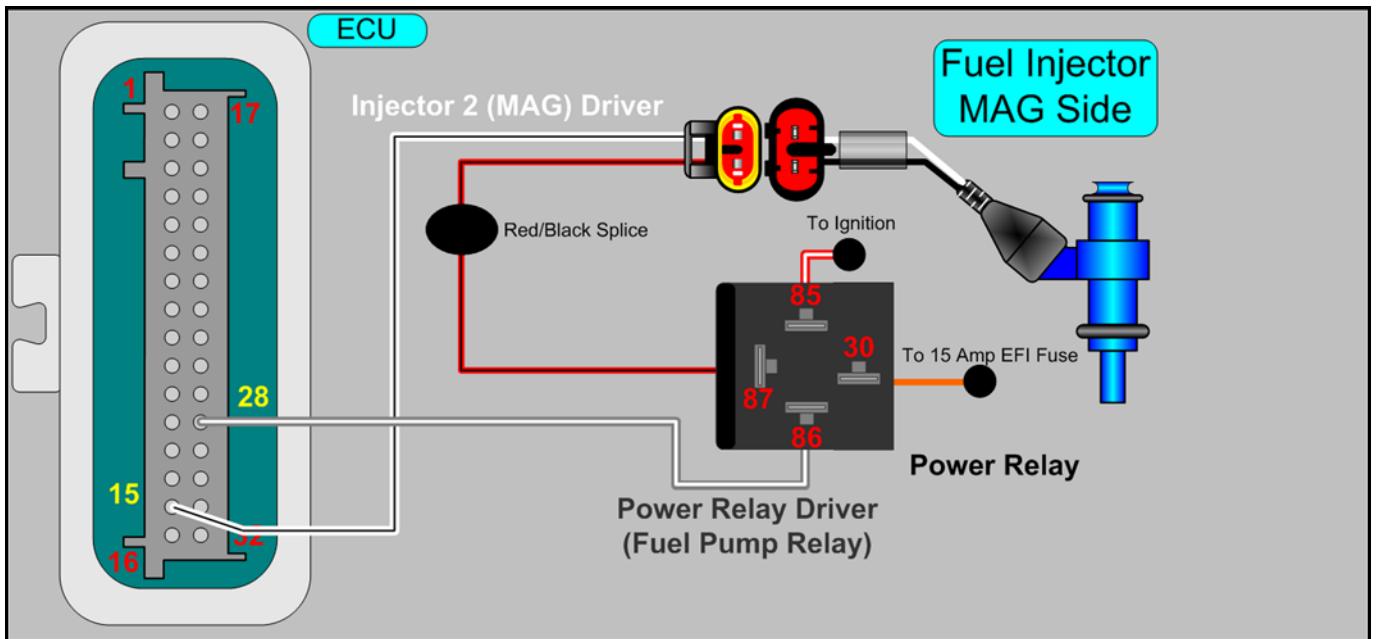


Fuel Injector (PTO) Circuit



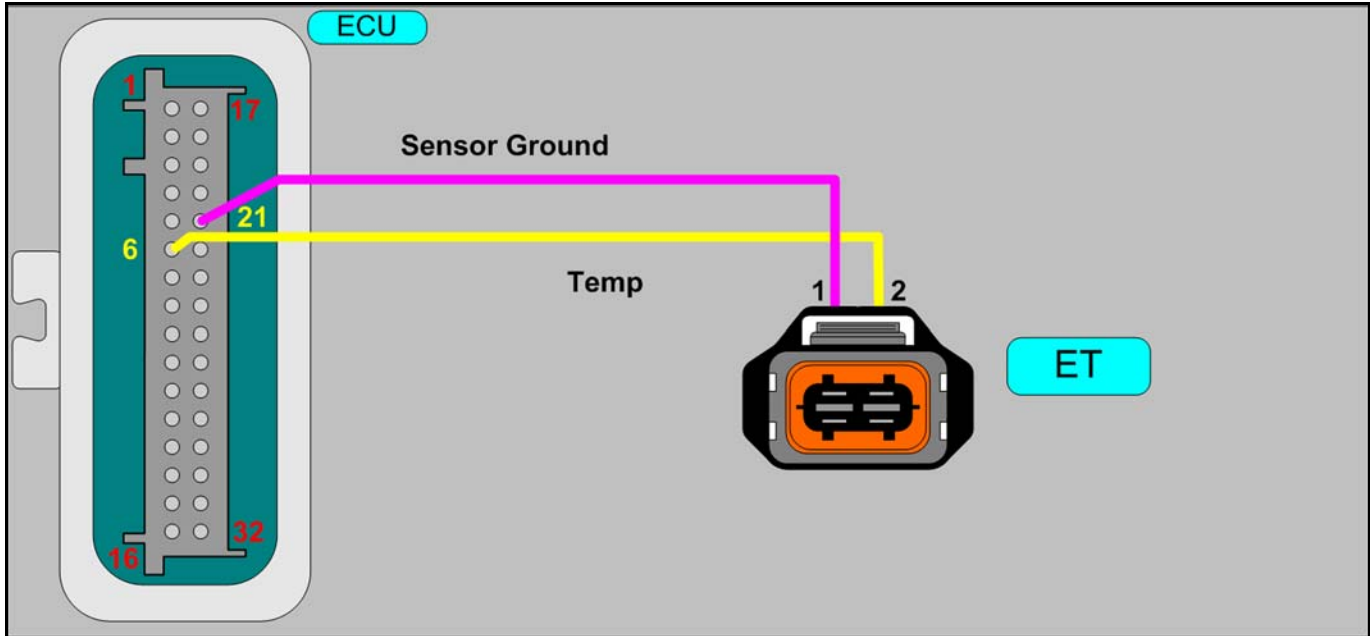
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Fuel Injector (MAG) Circuit

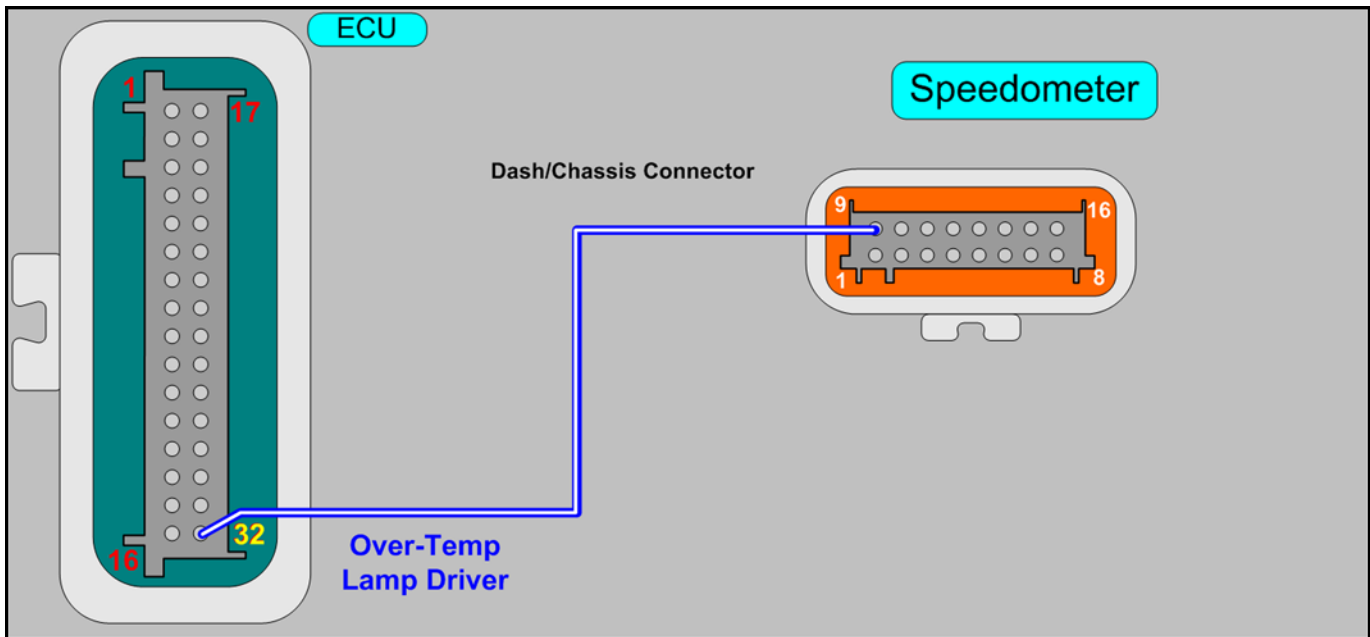


ELECTRONIC FUEL INJECTION

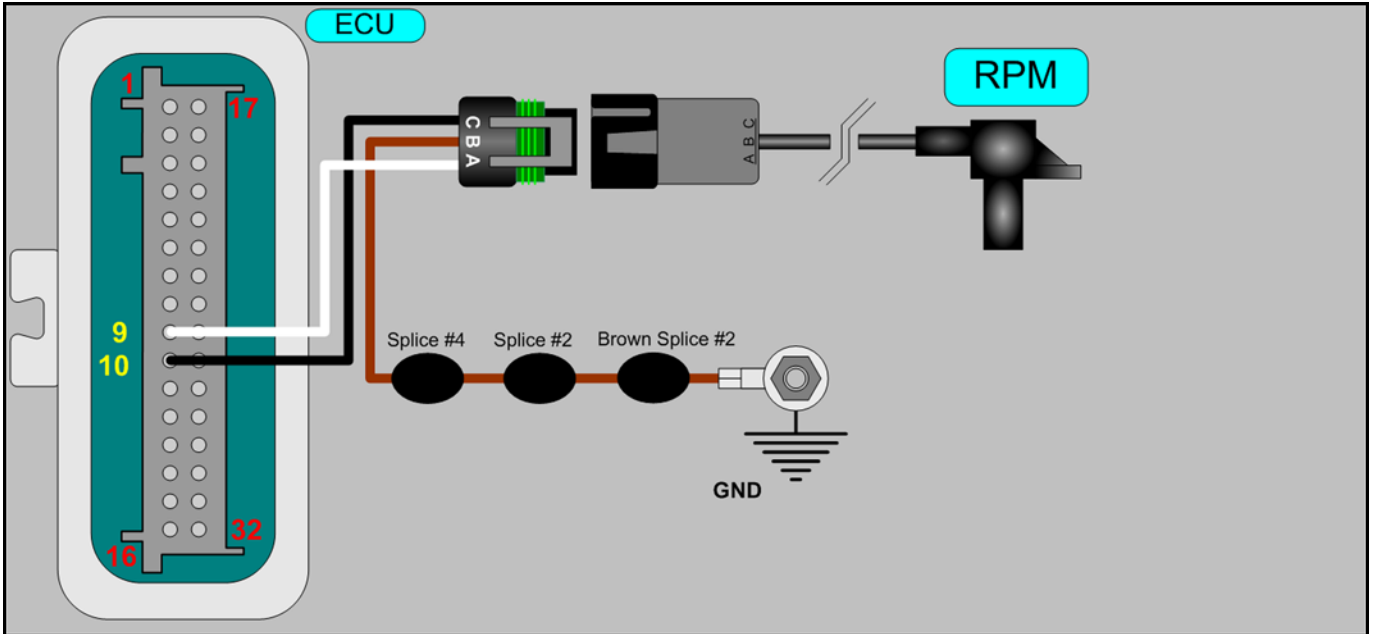
Engine Coolant Temperature Sensor (ECT) Circuit



Engine Overheat Lamp Driver Circuit

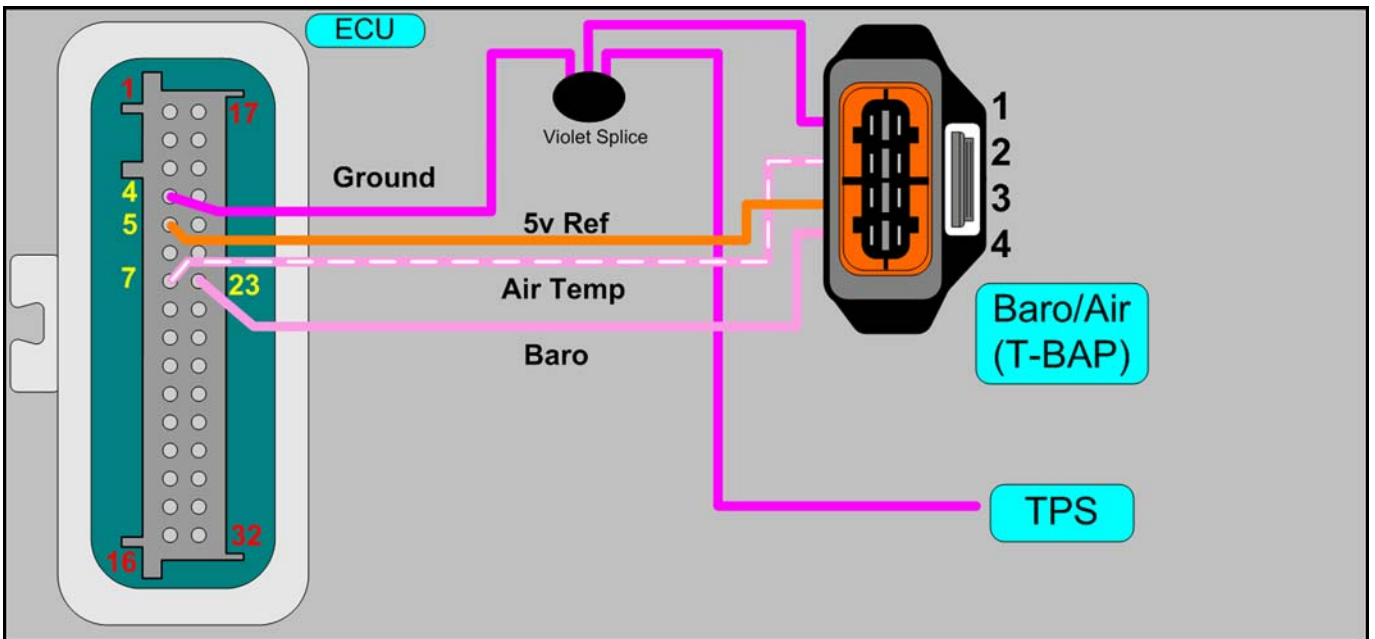


Crankshaft Position Sensor (CPS) Circuit



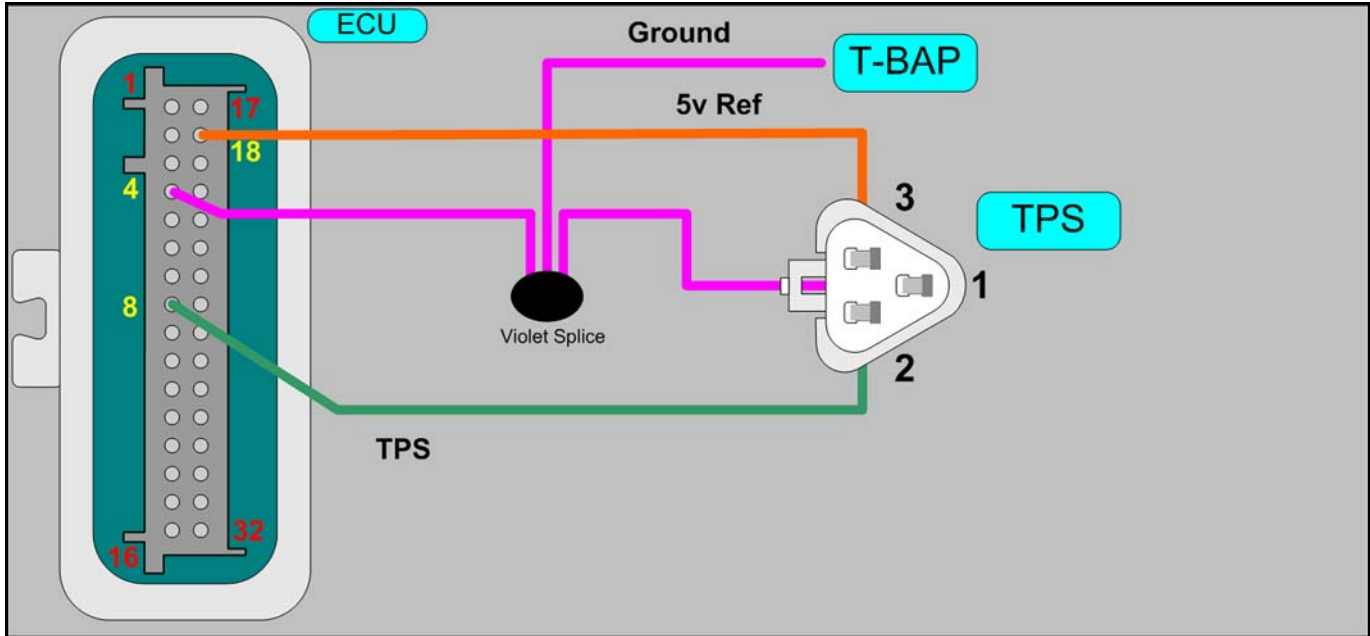
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Air Temperature and Barometric Air Pressure Sensor (T-BAP) Circuit

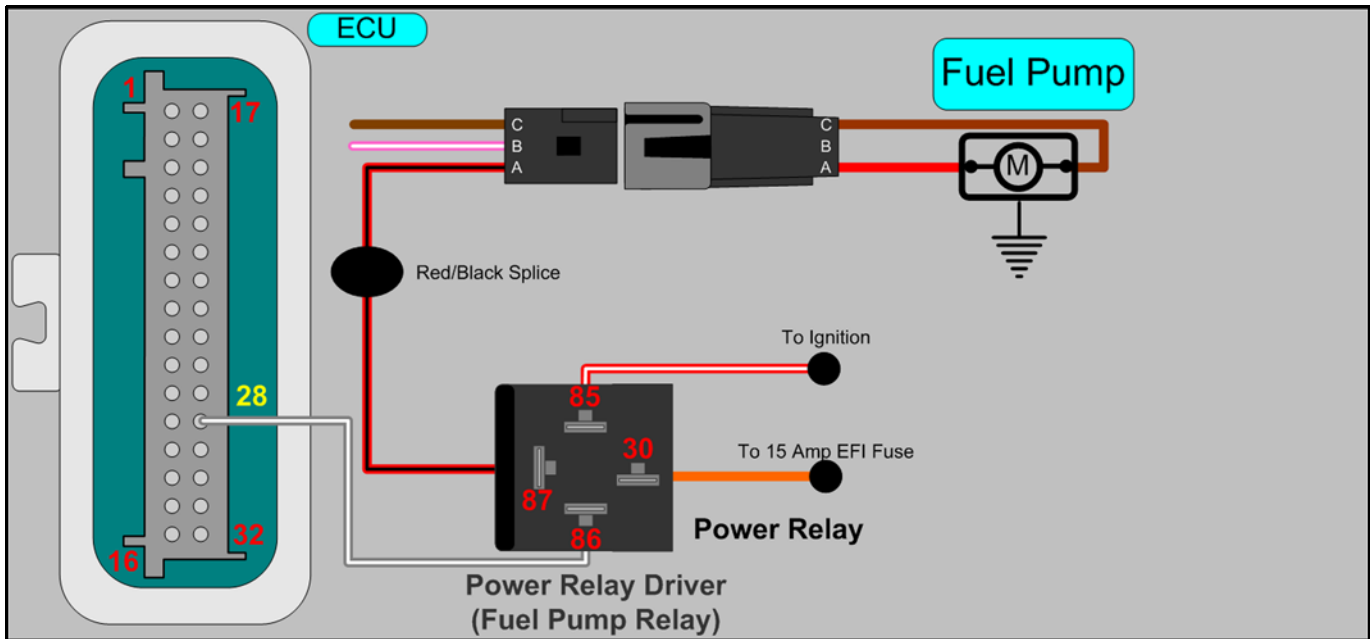


ELECTRONIC FUEL INJECTION

Throttle Position Sensor (TPS) Circuit



Fuel Pump Circuit



CHAPTER 5

BODY / STEERING / SUSPENSION

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BODY / STEERING / SUSPENSION

TORQUE SPECIFICATIONS

ITEM	TORQUE VALUE ft.lbs. (Nm)
Front LH / RH Upper A-Arm Bolt	37 ft. lbs. (50 Nm)
Front LH / RH Lower A-Arm Bolt	37 ft. lbs. (50 Nm)
Rear LH / RH Upper Control Arm Bolt	37 ft. lbs. (50 Nm)
Rear LH / RH Lower Control Arm Bolts	37 ft. lbs. (50 Nm)
Lower LH / RH Rear Bearing Carrier	37 ft. lbs. (50 Nm)
Upper LH / RH Rear Bearing Carrier	37 ft. lbs. (50 Nm)
Outer Tie Rod to Bearing Housing	42.5 ft. lbs. (58 Nm)
Front Ball Joint Pinch Bolts	17 ft. lbs. (23 Nm)
Front Upper / Lower Shock Bolt	27-33 ft. lbs. (37-45 Nm)
Rear Upper / Lower Shock Bolt	27-33 ft. lbs. (37-45 Nm)
Front Wheel Hub Castle Nut	80 ft. lbs. (108 Nm)
Rear Wheel Hub Castle Nut	80 ft. lbs. (108 Nm)
Wheel Nuts (Cast Rims) Wheel Nuts (Steel Rims)	90 ft. lbs. (122 Nm) 27 ft. lbs. (37 Nm)
Tie Rod End Jam Nut	12-14 ft. lbs. (17-19 Nm)
Seat Belt to Seat Base	40 ft. lbs. (54 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 Box	30 ft. lbs. (41 Nm)
Steering Box	17 ft. lbs. (23 Nm)

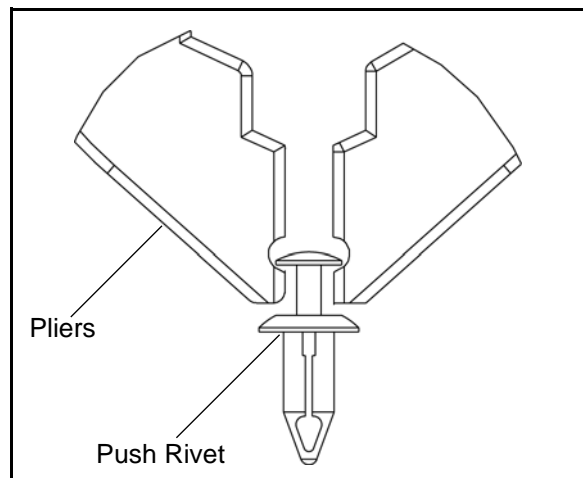
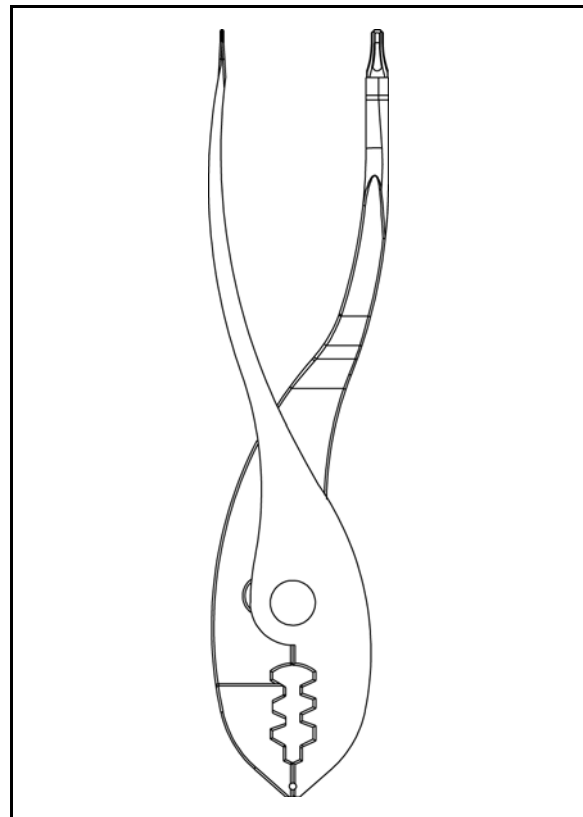
NOTE: Refer to exploded views throughout this chapter for more torque specifications, component identification, and location of components.

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Shock Spanner Wrench	2870872
Shock Spring Compressor Tool	2870623
Multi-Function Pliers	2876389

Multi-Function Pliers

Included in the tool kit, the multi-function pliers is designed to remove the plastic push rivets used to fasten body components.

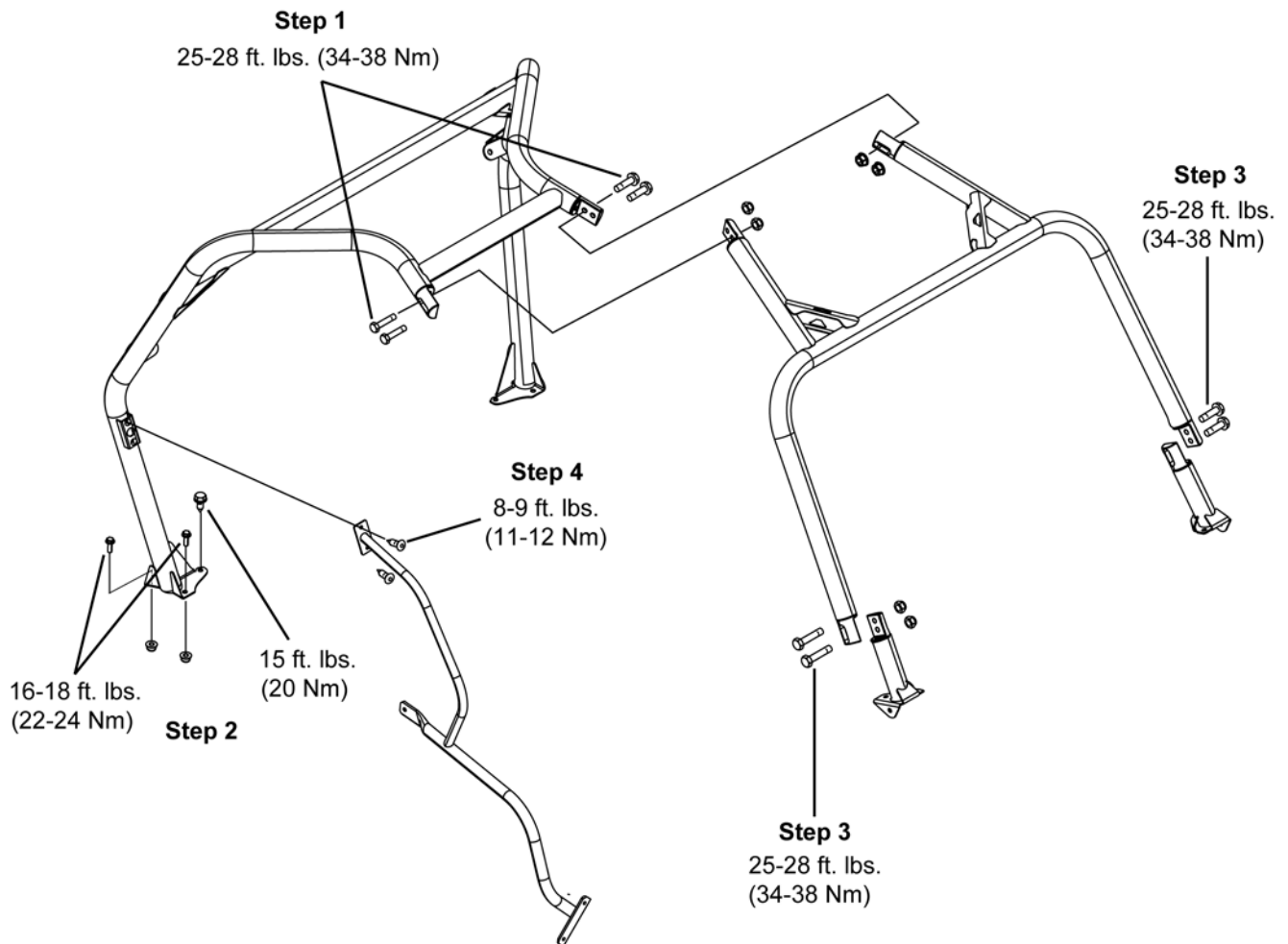


CAB FRAME

Assembly / Removal

NOTE: Finger tighten all components until cab frame is completely assembled on vehicle, then tighten to specifications listed.

1. Assemble the rear cab frame and the front cab frame at the coupler joints and secure with four (3/8-16 x 1 1/4) screws and (3/8-16 Nyloc) nuts. Tighten screws to 25-28 ft. lbs. (34-38 Nm).
2. Place the assembled cab frame onto the vehicle and align the rear mount holes. Fasten the rear cab frame brackets to vehicle with four (5/16-18) bolts and (5/16-18) nuts. Tighten bolts to 16-18 ft. lbs. (22-24 Nm). Fasten the two tap screws to the rear inner portion of the bracket on each side. Tighten tap screws to 15 ft. lbs. (20 Nm).
3. Fasten the front of the cab frame to the base brackets and secure with four (3/8-16 x 1 1/4) screws and (3/8-16 Nyloc) nuts. Tighten screws to 25-28 ft. lbs. (34-38 Nm).
4. Attach the cab frame to the side bars mounted on vehicle. Tighten screws to 8-9 ft. lbs. (11-12 Nm).
5. To remove the cab frame, reverse the assembly procedure (steps 1-4).

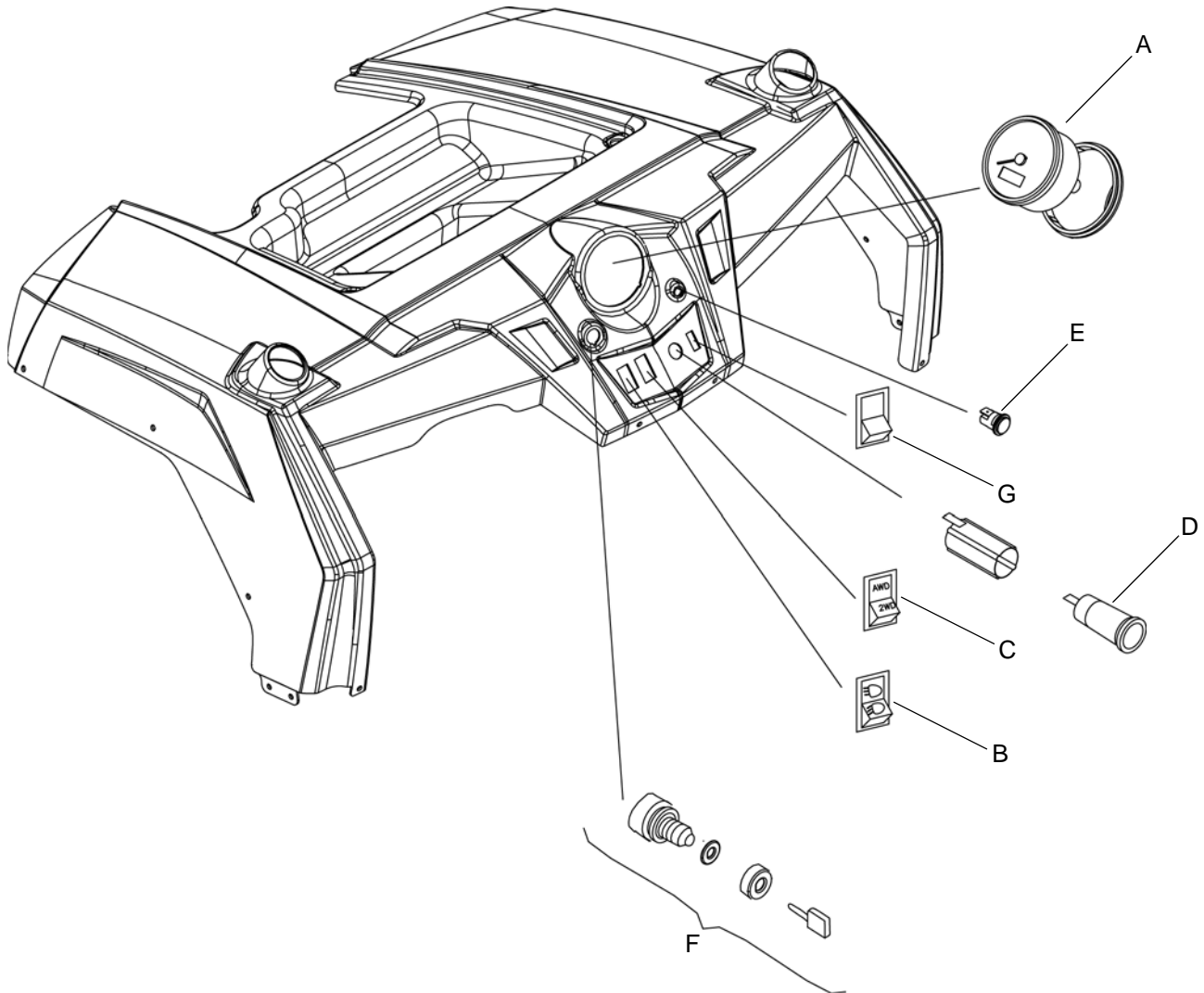


BODY / STEERING / SUSPENSION

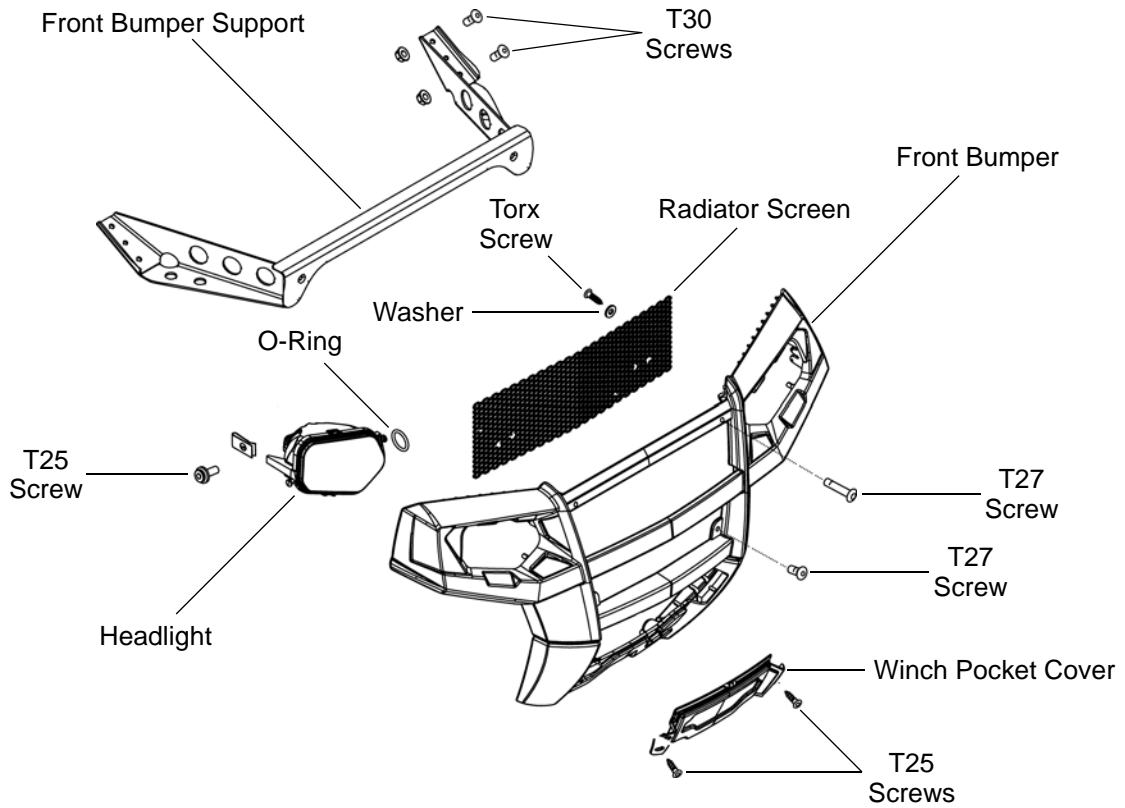
BODY EXPLODED VIEWS

Dash Instruments / Controls

- A. Instrument Cluster (Speedo)
- B. Headlight Switch
- C. 2WD/AWD Switch
- D. 12 Volt Accessory Receptacle
- E. Speedometer "Mode" Button
- F. Key Switch
- G. Work Light Switch

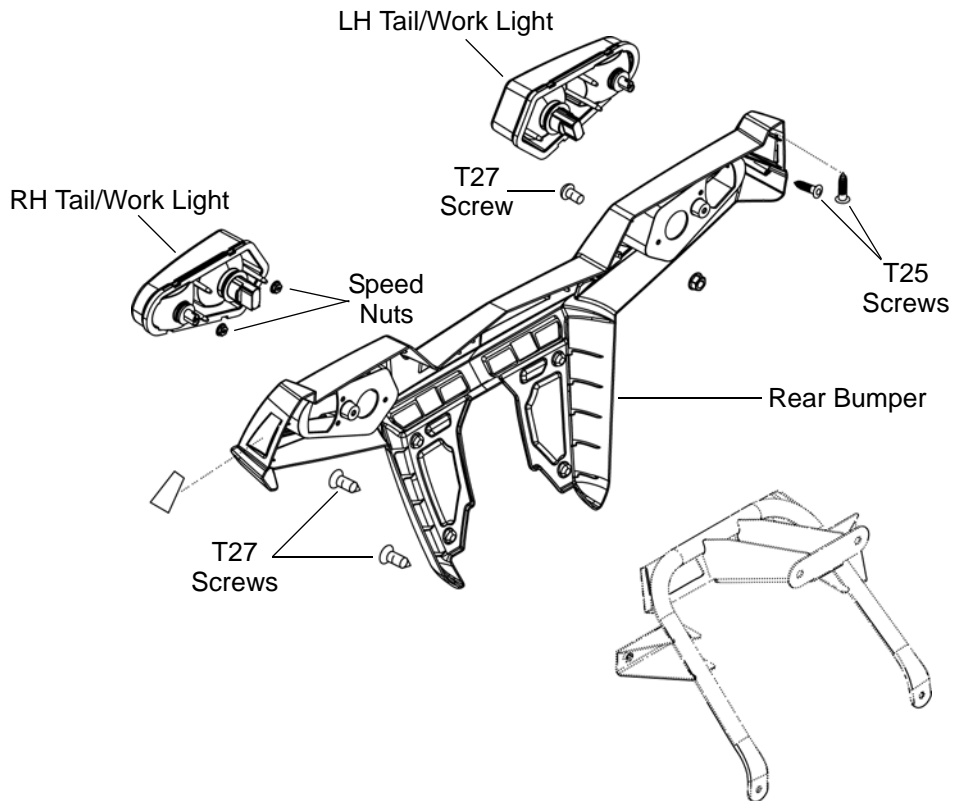


Front Bumper



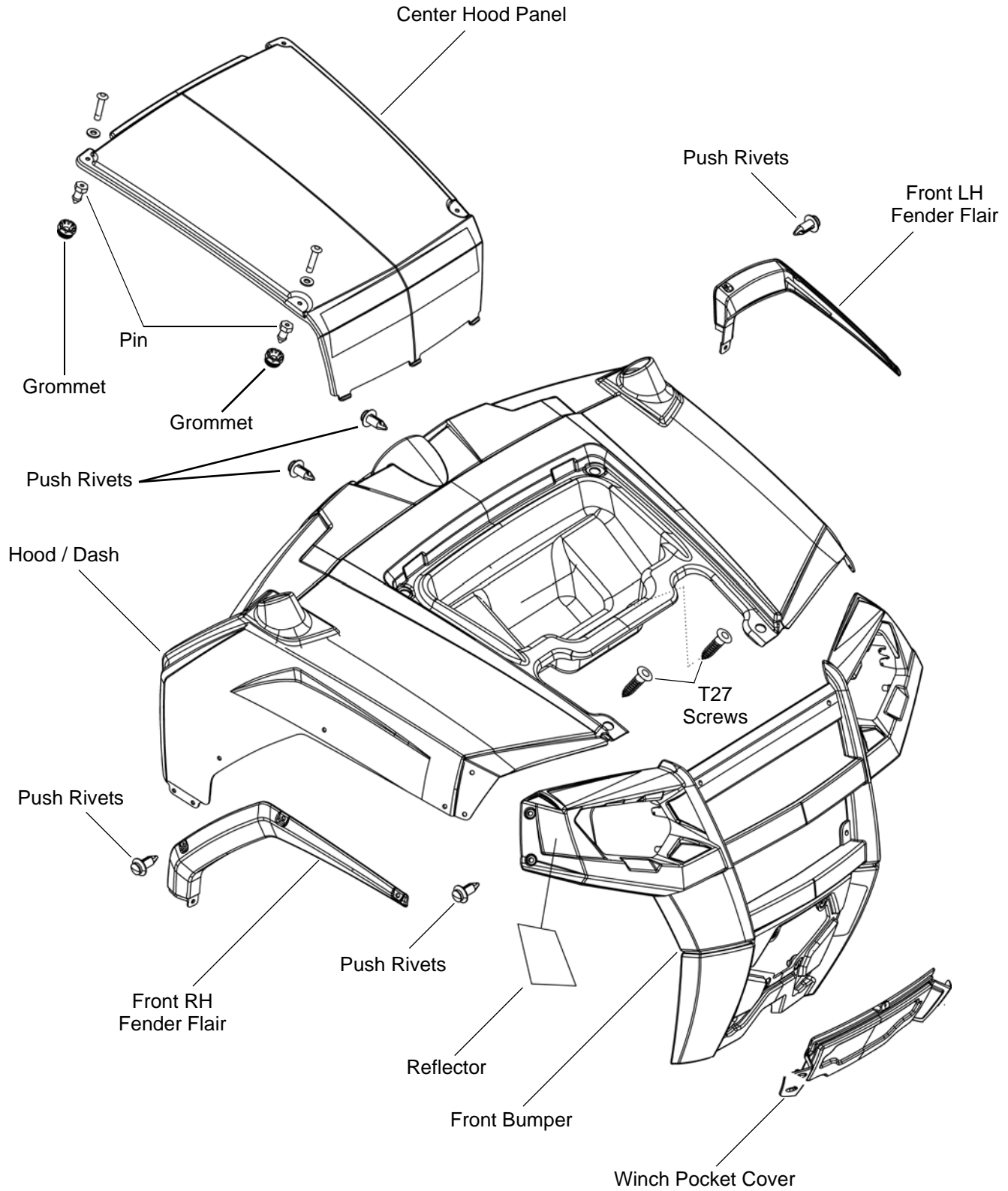
5

Rear Bumper

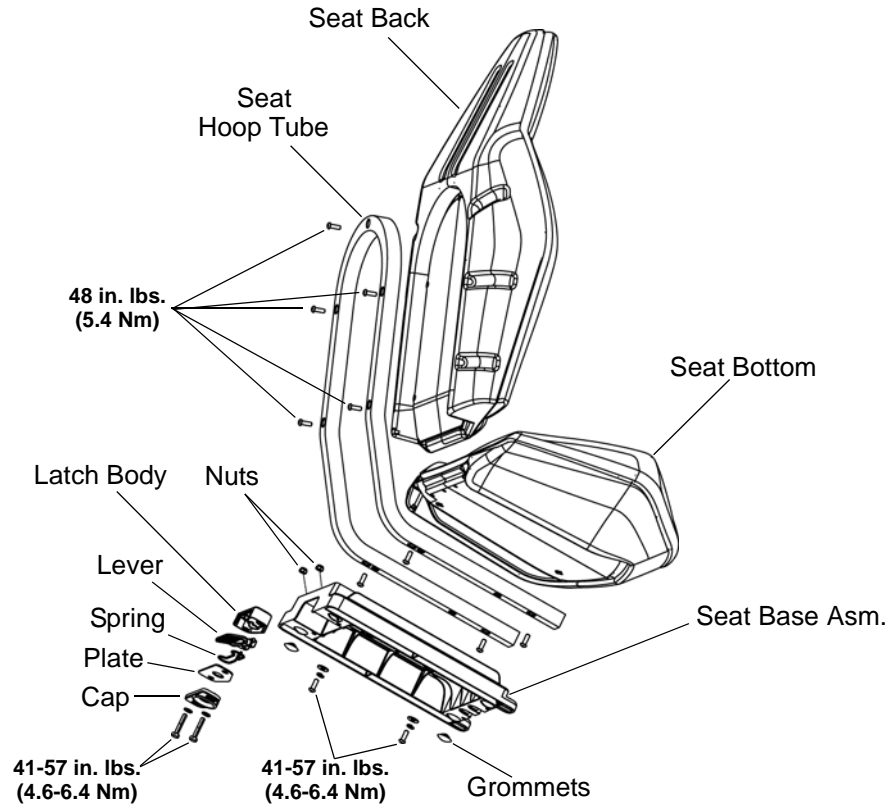


BODY / STEERING / SUSPENSION

Hood / Front Body Work

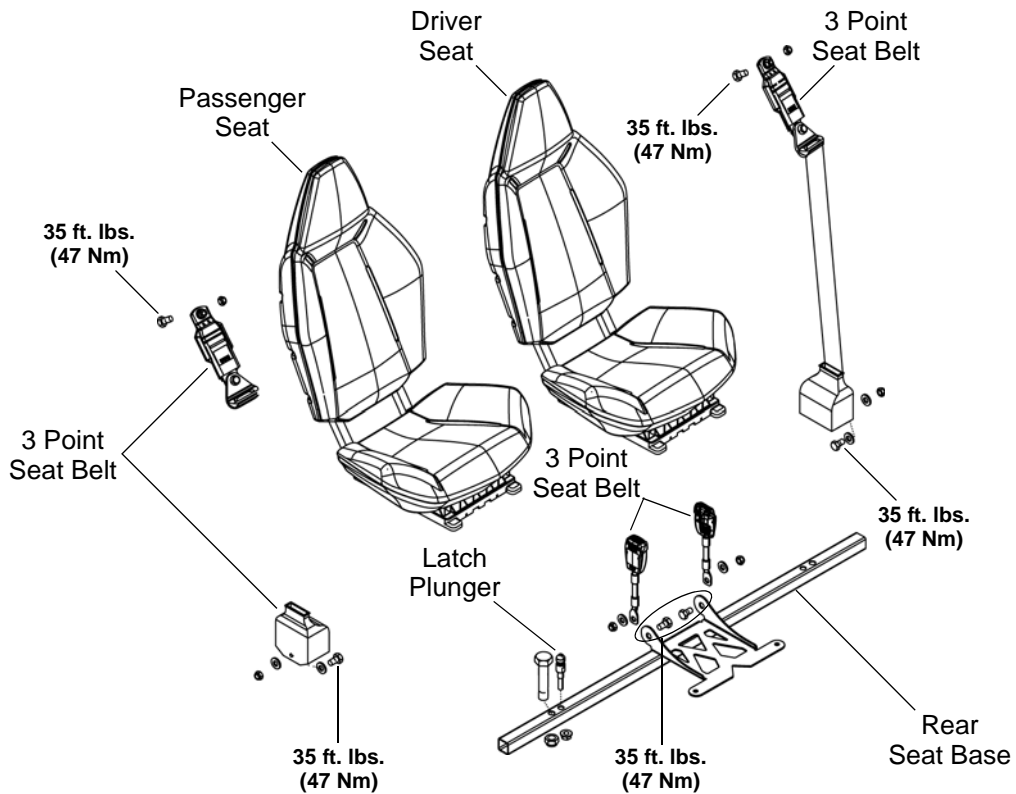


Seat Assembly



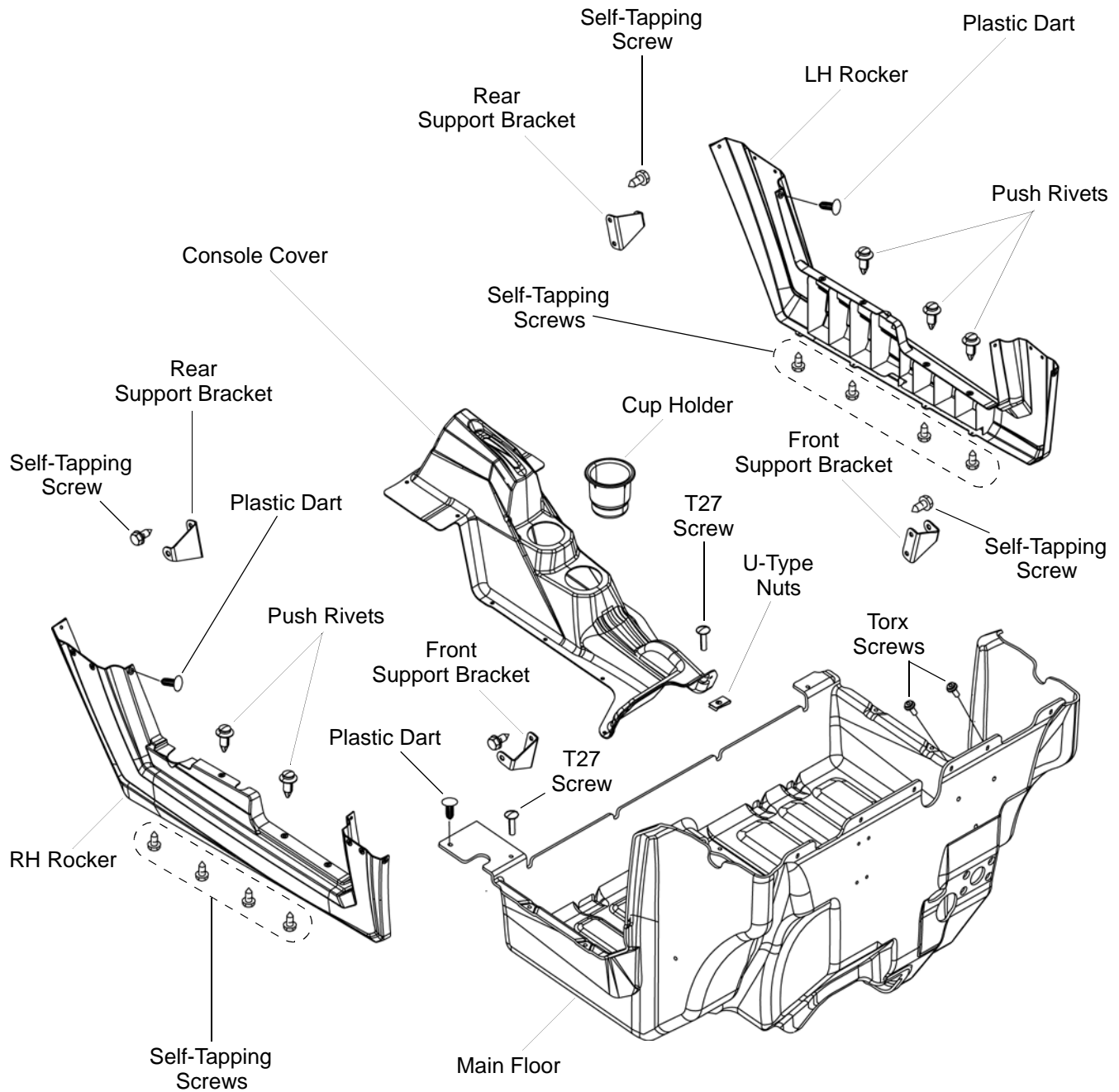
5

Seat Belts / Mounting

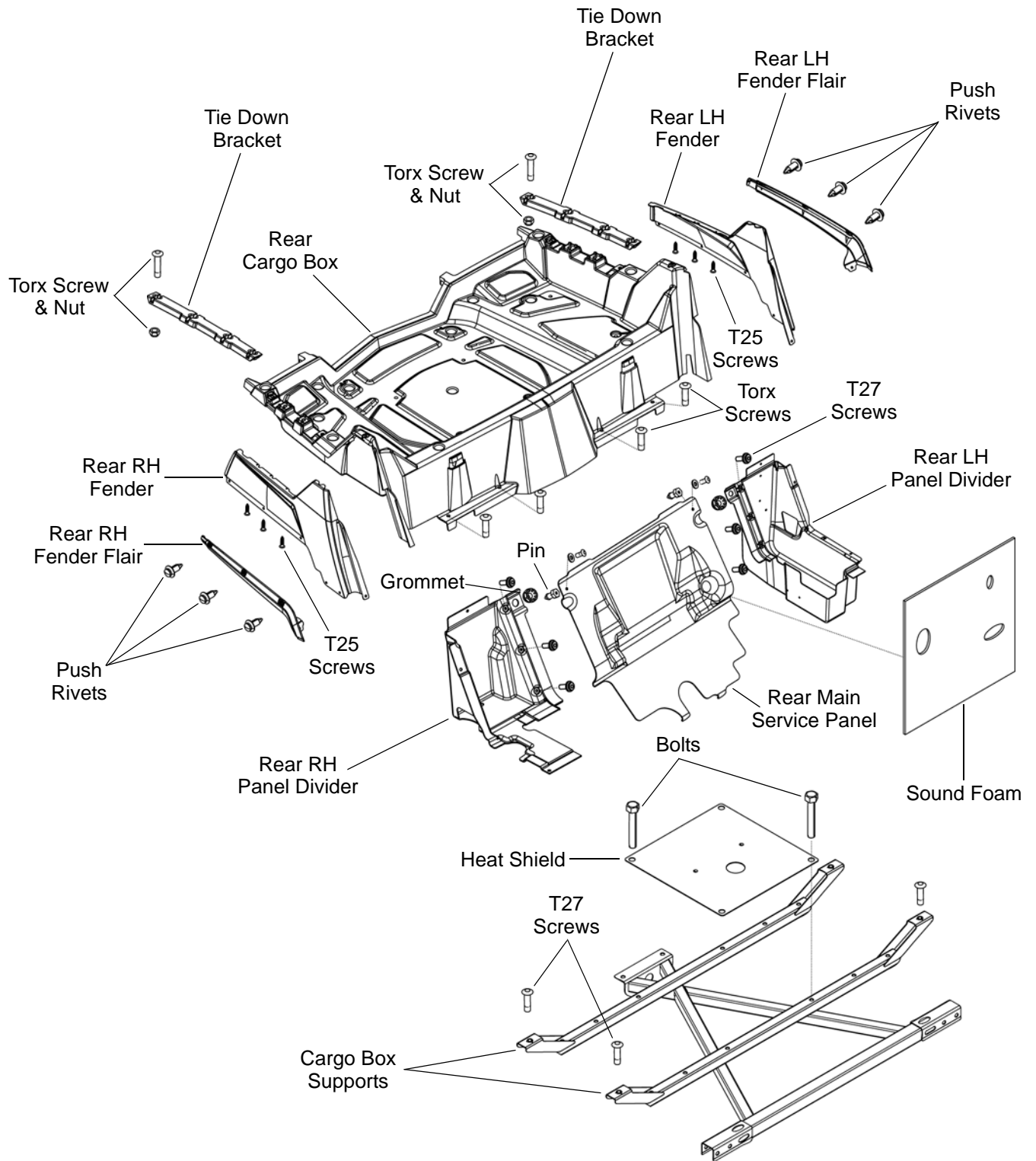


BODY / STEERING / SUSPENSION

Floor / Rocker Panels



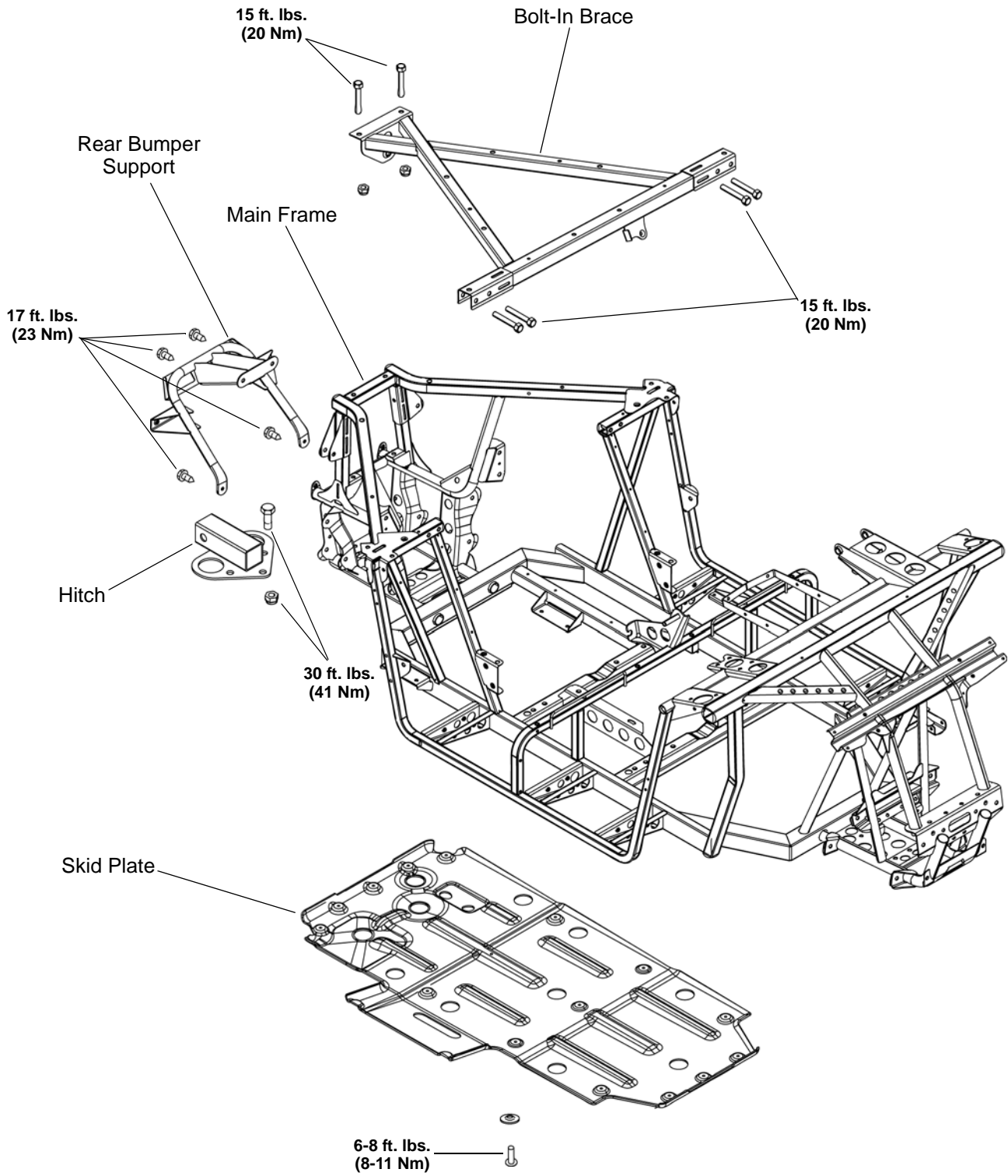
Rear Cargo Box / Fenders



5

BODY / STEERING / SUSPENSION

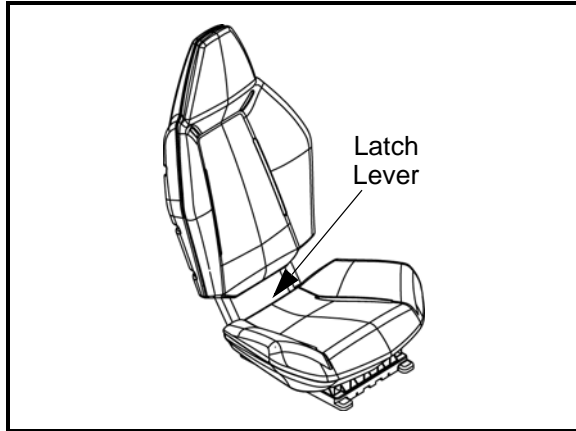
Chassis / Main Frame



BODY COMPONENT REMOVAL

Seats

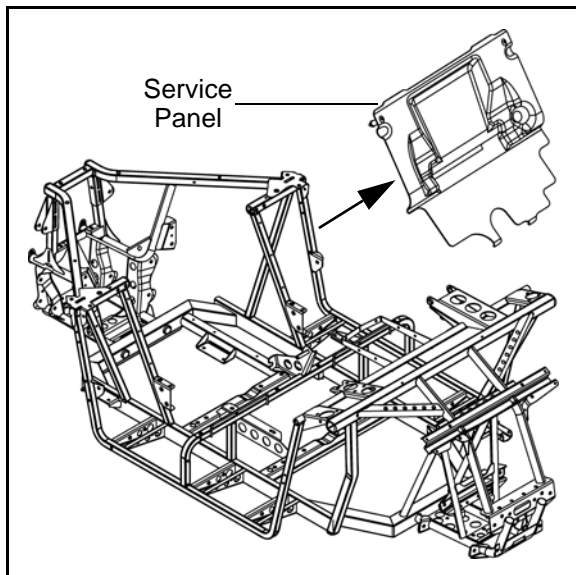
1. To remove the driver or passenger seat, lift upward on the latch lever located behind the seat bottom.



2. Lift upward and forward on the seat while lifting up on the latch lever and remove the seat from the vehicle.

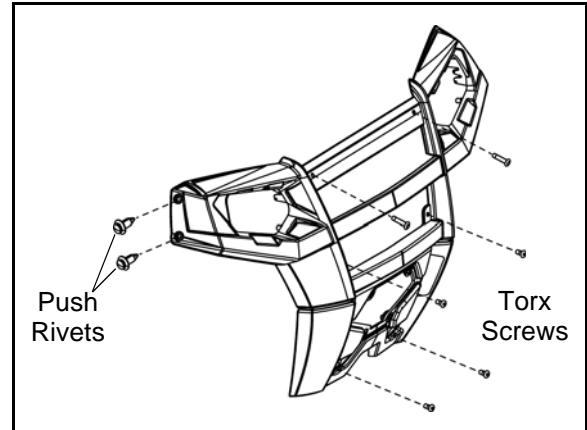
Rear Service Panel

1. Remove driver and passenger seats.
2. To remove the service panel, pull panel towards the front of the vehicle to disengage the upper latch pins from the grommets.



Front Bumper

1. Remove the (4) push rivets from the sides of the front bumper.

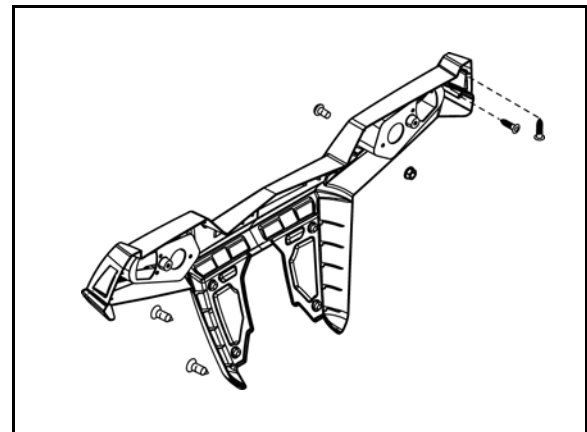


2. Remove the (6) Torx screws retaining the upper, middle and lower portion of the bumper.
3. Disconnect the front head lamp connectors and remove the front bumper from the vehicle.

5

Rear Bumper

1. Remove the (4) Torx screws retaining the upper portion of the rear bumper to the cargo box.



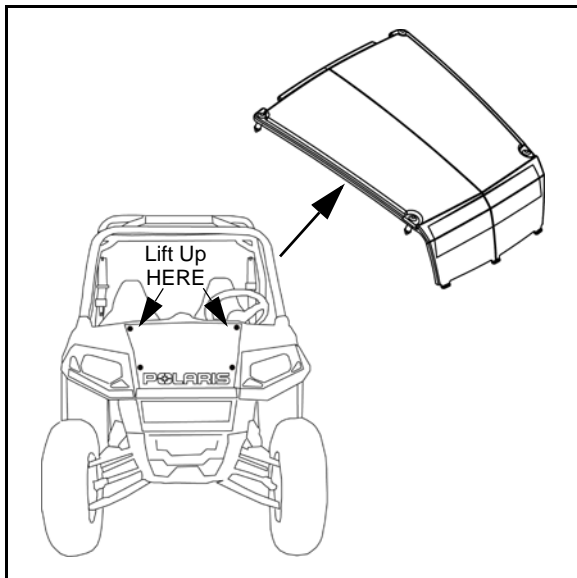
2. Remove the (4) Torx screws retaining the lower portion of the rear bumper to the frame.
3. Remove the (2) fasteners retaining the middle portion of the rear bumper to the cargo box.

BODY / STEERING / SUSPENSION

Hood and Front Body Work

Hood Removal

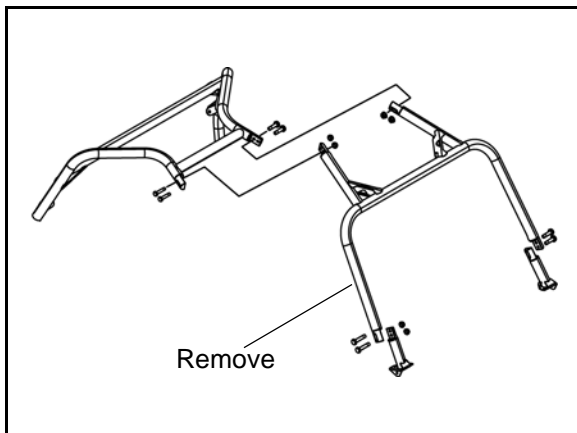
1. To remove the hood, lift up on the rear portion of the hood to disengage the pins from the grommets.



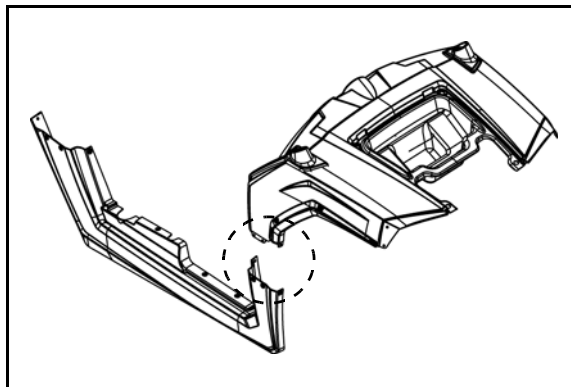
2. Tilt the hood back to disengage the front tabs and remove the hood from the vehicle.

Front Body / Dash Removal

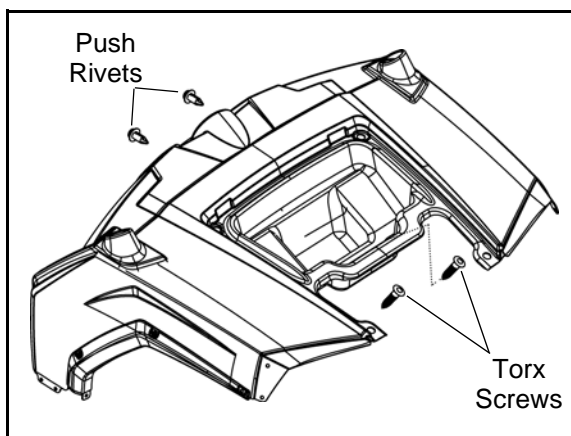
1. Remove the hood as previously described.
2. Remove the front bumper (see "BODY COMPONENT REMOVAL - Front Bumper").
3. Remove the front portion of the cab frame assembly to allow dash removal. Refer to "CAB FRAME - Assembly / Removal" for assembly torque specifications.



4. Remove the (8) push rivets that attach the dash assembly to the rocker panels on each side.

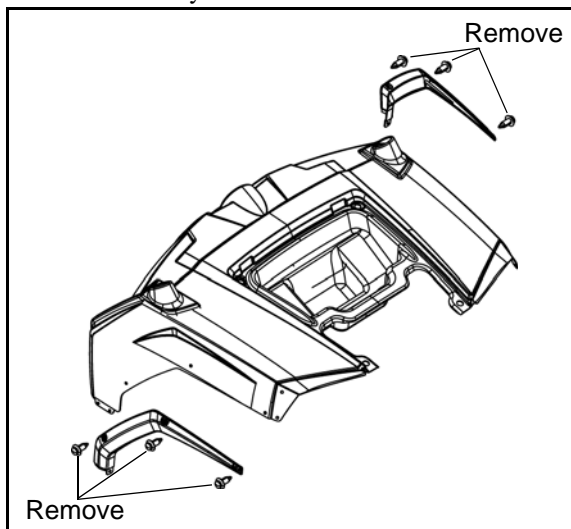


5. Remove the (2) Torx screws and (2) push rivets that retain the front and rear portions of the dash assembly and remove the dash assembly from the vehicle.



Front Fender Flair Removal

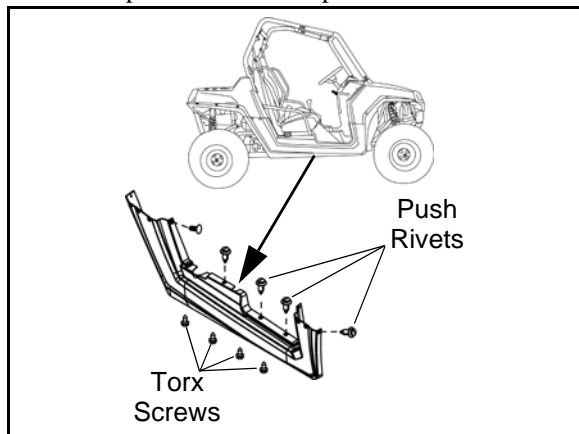
1. If dash is installed, remove the (2) push rivets that attach the lower portion of the fender flair to the rocker panels.
2. Remove the (6) push rivets and remove fender flairs from the dash assembly.



Rocker Panels, Console and Floor

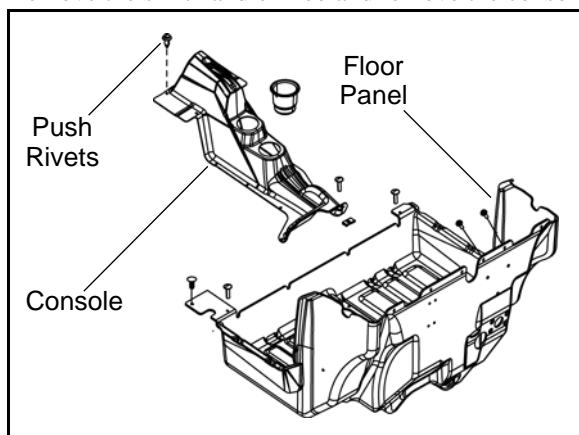
Rocker Panel Removal

1. Remove the (11) push rivets and (4) Torx screws from the RH rocker panel and remove panel from the vehicle. Remove the (12) push rivets and (4) Torx screws from the LH rocker panel and remove panel from the vehicle.



Console and Floor Panel Removal

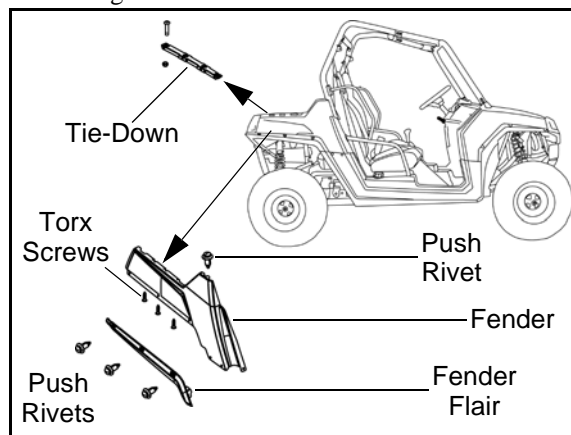
1. Remove both rocker panels as previously described.
2. Remove the front body / dash (see "BODY COMPONENT REMOVAL - Front Body / Dash Removal").
3. Remove the (2) push rivets from the rear portion of the console and remove the (9) Torx screws retaining the console to the floor panel.
4. Remove the shift handle knob and remove the console.



5. Remove the (6) Torx screws from the upper front portion of the floor panel.
6. Remove the (4) fasteners retaining the foot pedal bracket. Disconnect the brake and throttle cables from the pedals and remove pedals from the vehicle.
7. Remove the (3) push rivets retaining the fuse box.
8. Remove the (2) push rivets retaining the rear fender wells to the floor panel.
9. Remove steering shaft and remove floor panel from the vehicle.

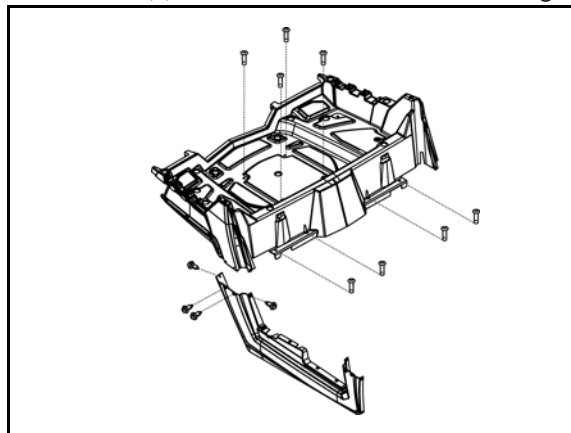
Rear Fender, Flair and Tie Down Removal

1. Remove the rear bumper (see "BODY COMPONENT REMOVAL - Rear Bumper").
2. Remove the (8) push rivets that retain the rear portion of the rocker panels to the rear fenders.
3. Remove the (3) push rivets and remove the fender flair from the rear fender.
4. Remove the (3) Torx screws from the bottom side of the fender and the upper push rivet from the top side. Remove the fender from the vehicle.
5. Remove the (4) fasteners that retain the tie-down brackets to the cargo box and remove from vehicle.



Cargo Box Assembly Removal

1. Remove the seats and rear service panel (see "Seats" and "Rear Service Panel").
2. Remove the (4) Torx screws retaining the lower portion of the rear bumper to the frame (see "Rear Bumper").
3. Remove the (4) screws from the middle of the cargo box.

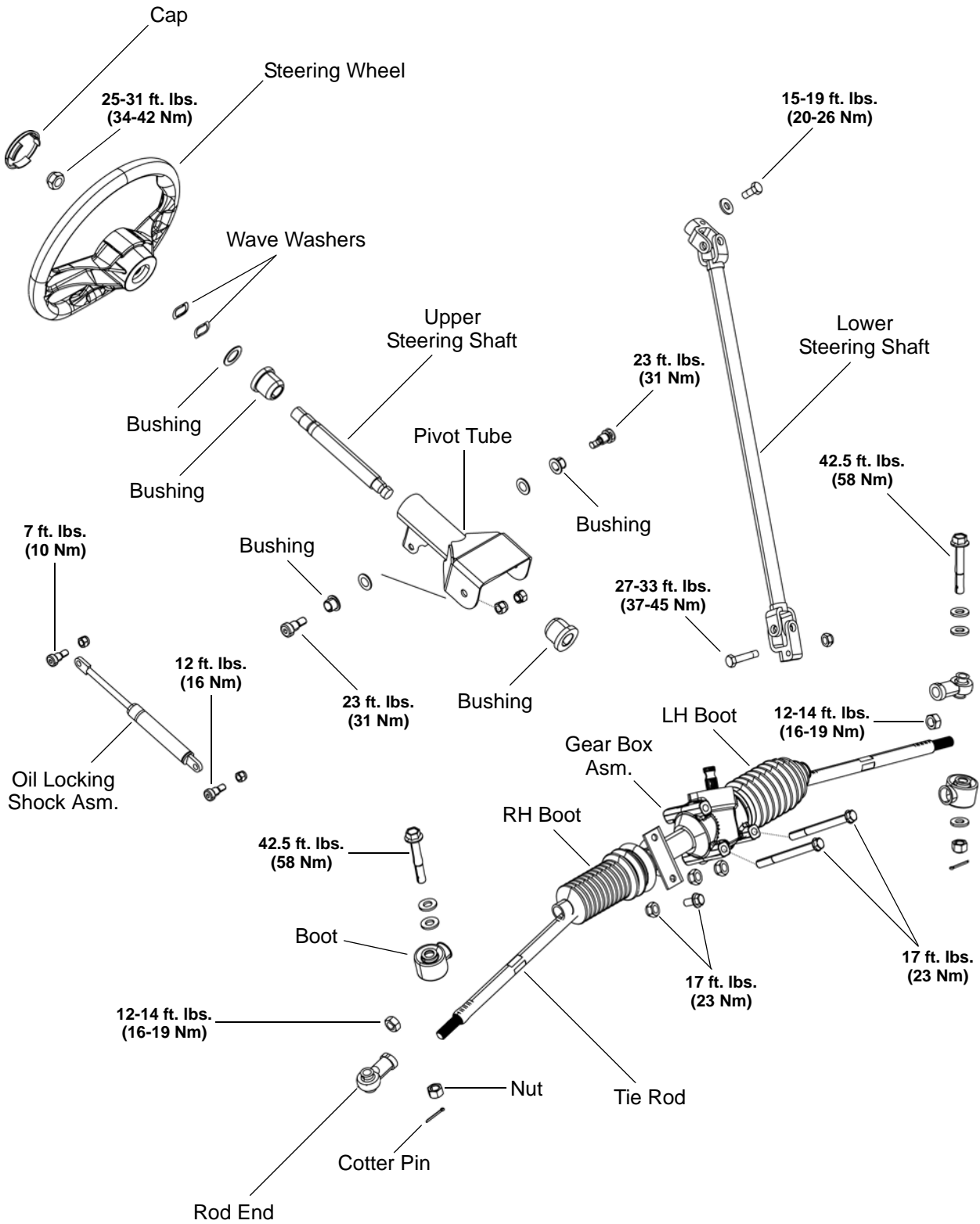


4. Remove the (4) Torx screws that attach the front portion of the cargo box to the frame.
5. Remove the (8) push rivets that attach the rocker panels to the cargo box on each side.
6. Cut the panduit strap, disconnect taillight/worklight wire connections and remove the box assembly from the vehicle.

BODY / STEERING / SUSPENSION

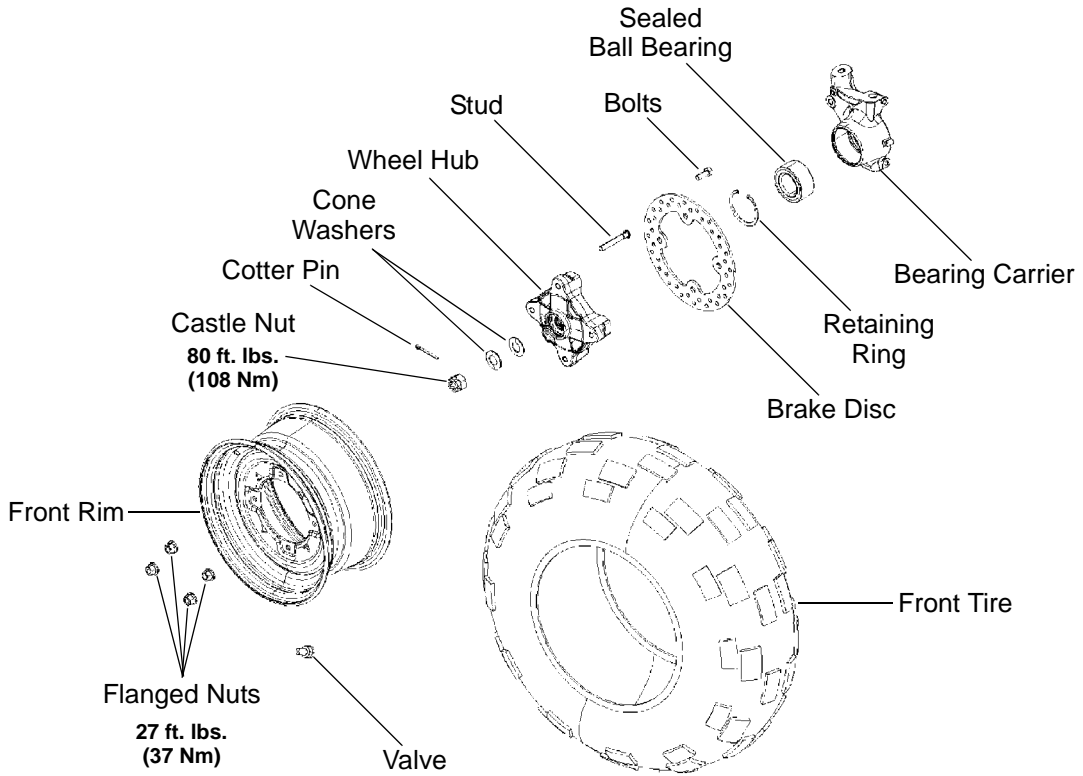
STEERING ASSEMBLY

Exploded View



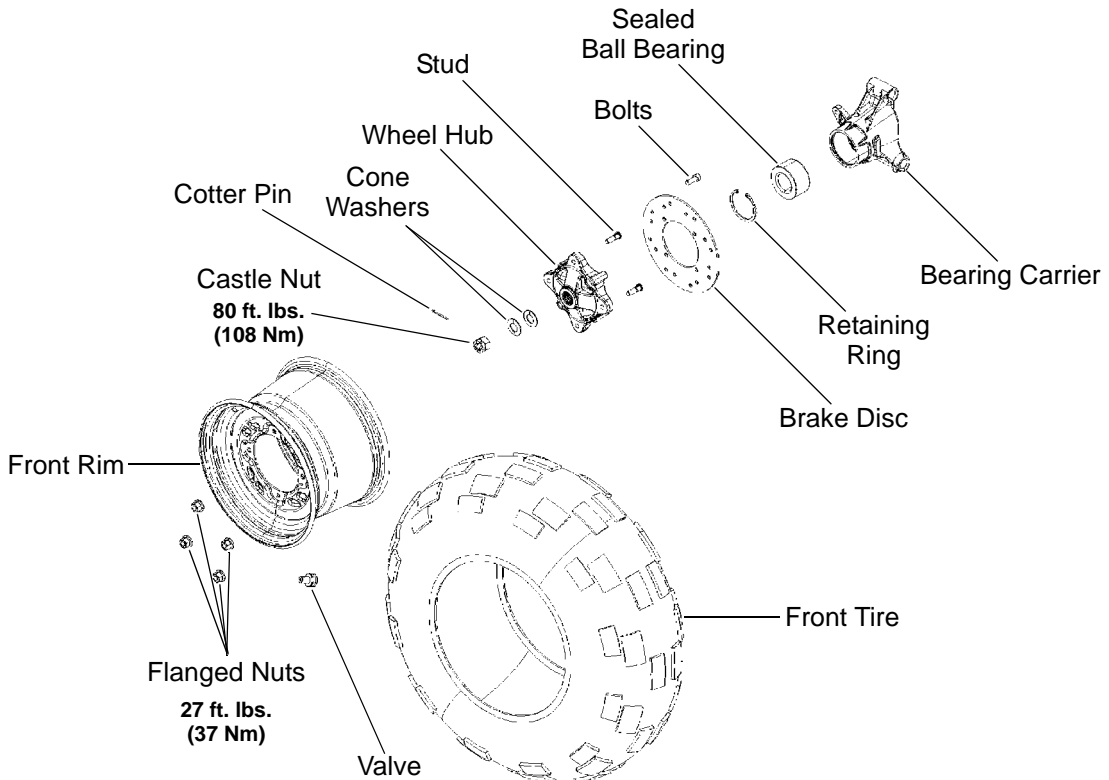
WHEEL HUBS

Front Hub Exploded View



5

Rear Hub Exploded View



BODY / STEERING / SUSPENSION

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 upper ball joint pinch bolt (B) from the front bearing carrier.
4. 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.
5. Remove the front bumper to allow A-arm bolt removal.
6. Loosen and remove the upper A-arm through-bolt fastener (C) and remove the upper A-arm from the vehicle.
7. Examine A-arm bushings and pivot tube (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.

8. If not replacing the A-arm, thoroughly clean the A-arm and pivot tube.
9. Install new ball joint into A-arm. Refer to “Ball Joint Replacement” section.
10. Insert new A-arm bushings and pivot tube into new A-arm.
11. Install new upper A-arm assembly onto vehicle frame. Torque new bolt to **37 ft. lbs. (50 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 **17 ft. lbs. (23 Nm)**.
13. Attach shock to A-arm with spacer (D) and fastener (A) (see “FRONT STABILIZER BAR - Exploded View”). Torque lower shock bolt to **27-33 ft. lbs. (37-45 Nm)**.
14. Remove the lower ball joint pinch bolt (E) from the front bearing carrier.

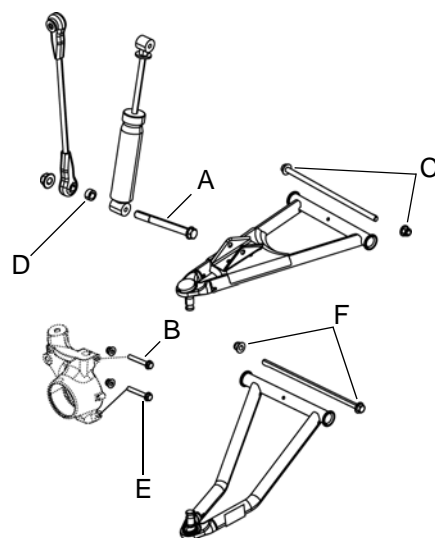
15. Using a soft face hammer, tap on bearing carrier to loosen the lower A-arm ball joint end while pushing downward on the lower A-arm. Completely remove the ball joint end from the bearing carrier.
16. Loosen and remove the lower A-arm through-bolt fastener (F) and remove the lower A-arm from the vehicle.
17. Examine A-arm bushings and pivot tube (see “Exploded View”). Replace if worn. Discard hardware.
18. If not replacing the A-arm, thoroughly clean the A-arm and pivot tube.
19. Install new ball joint into A-arm. Refer to “Ball Joint Replacement” section.
20. Insert new A-arm bushings and pivot tube into new A-arm.
21. Install new lower A-arm assembly onto vehicle frame. Torque new bolt to **37 ft. lbs. (50 Nm)**.
22. Insert lower A-arm ball joint end into the bearing carrier. Install the lower ball joint pinch bolt (E) into the bearing carrier and torque bolt to **17 ft. lbs. (23 Nm)**.

WARNING

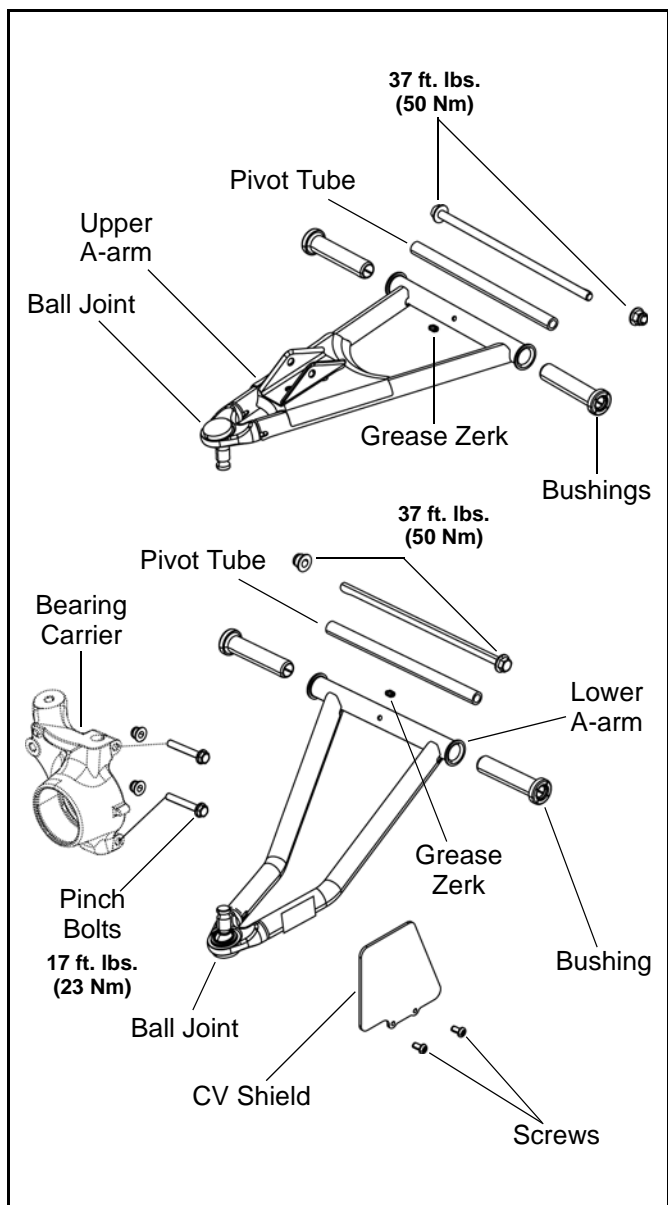
Upon A-arm installation completion, test vehicle at low speeds before putting into service.

**Upper / Lower A-arm Bolt Torque:
37 ft. lbs. (50 Nm)**

**Ball Joint Pinch Bolt Torque:
17 ft. lbs. (23 Nm)**



Exploded View

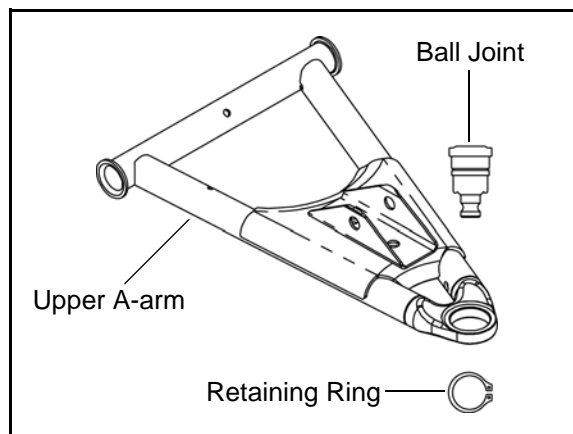


BALL JOINT SERVICE

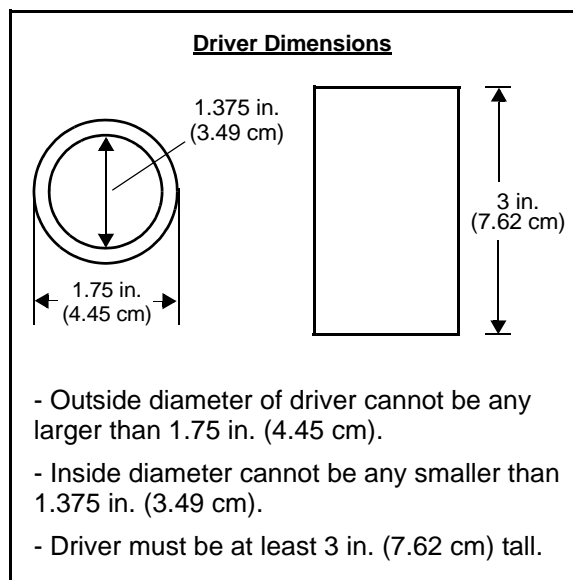
Removal

IMPORTANT: Do not reuse a ball joint if it has been removed for any reason. If removed, it must be replaced. Use this removal procedure only when replacing the ball joint.

1. The A-arm must be removed to perform this procedure (see "FRONT A-ARMS - Removal / Replacement").

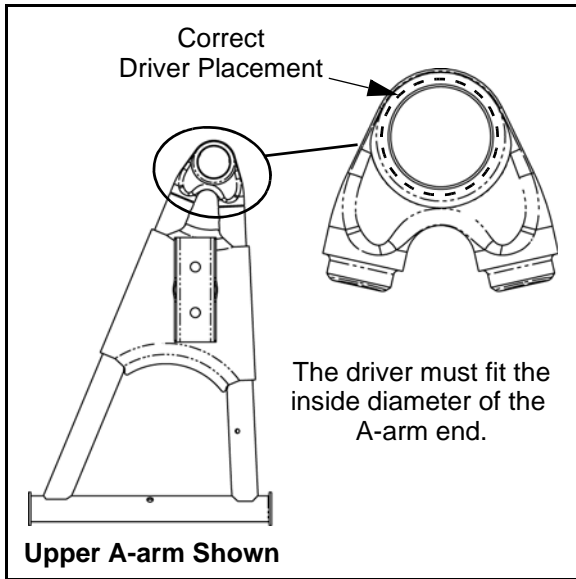


2. Remove the retaining ring from the ball joint.
3. A driver must be used for the removal of the ball joint. Use the dimensions below to fabricate or locate the correct size driver to use in the following process.

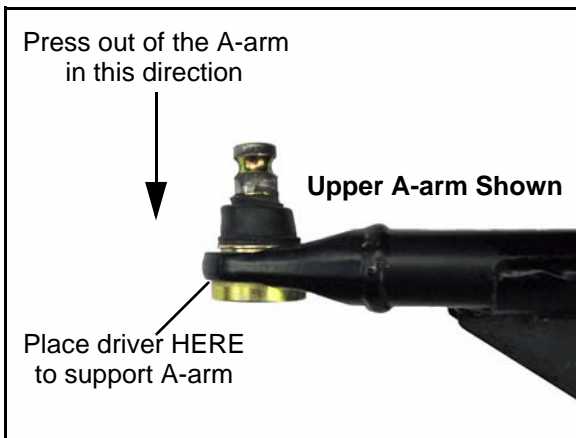


BODY / STEERING / SUSPENSION

4. Use a press and correct size driver to remove the ball joint from the A-arm.

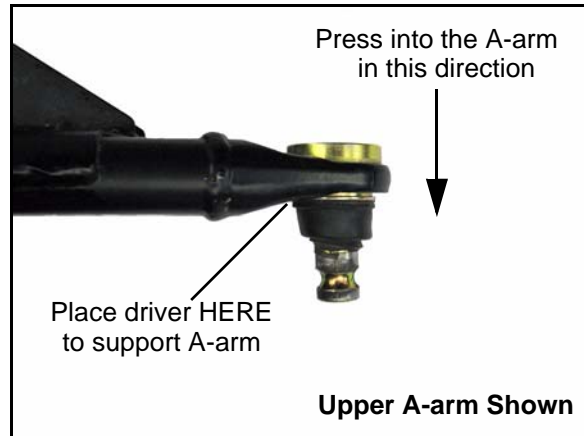


NOTE: The driver must fit the ball joint housing in the A-arm. This will allow the ball joint to be properly pressed out of the A-arm without damaging the A-arm.

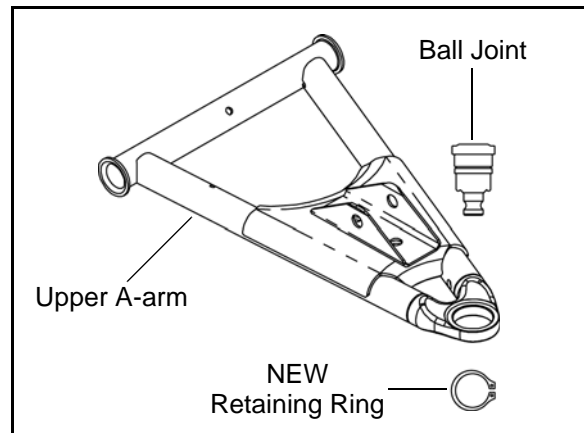


Installation

1. Place the A-arm in the correct position for ball joint installation. Face the A-arm end flat on top of the driver. Carefully drive the ball joint into place until the ball joint is properly seated.



2. After the new ball joint is installed into the A-arm, install a NEW retaining ring.



3. Reinstall the A-arm (see "FRONT A-ARMS - Removal / Replacement").
4. Repeat the ball joint service procedure for any additional A-arm ball joint replacements.

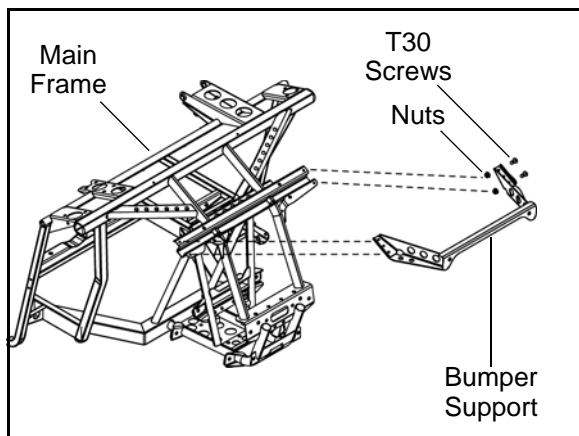
FRONT STABILIZER BAR

Sway Bar Linkage Removal

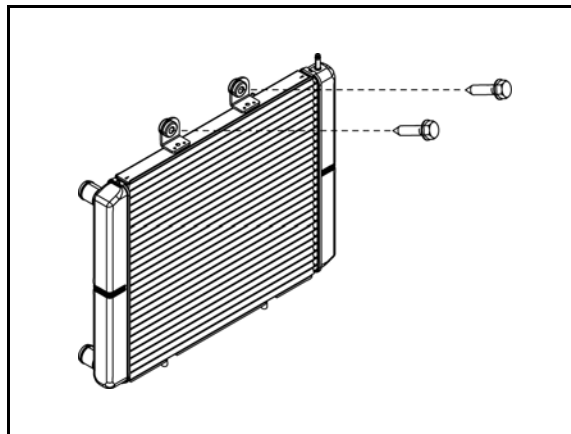
1. Elevate and safely support the front of the vehicle off the ground.
2. Remove the lower shock mounting fasteners and spacers from both upper A-arms on each side of the vehicle (see "Exploded View" on page 5.20).
3. Remove the bolts that attach the upper portion of the linkages to the sway bar clamps and remove the linkages from the vehicle (see "Exploded View" on page 5.20).
4. Inspect the linkage assemblies for signs of excessive wear or damage. Replace linkage assembly if damaged.
5. Reverse the procedure for installation. Torque the linkage fasteners to **27-33 ft. lbs. (37-45 Nm)**.

Stabilizer Bar Removal

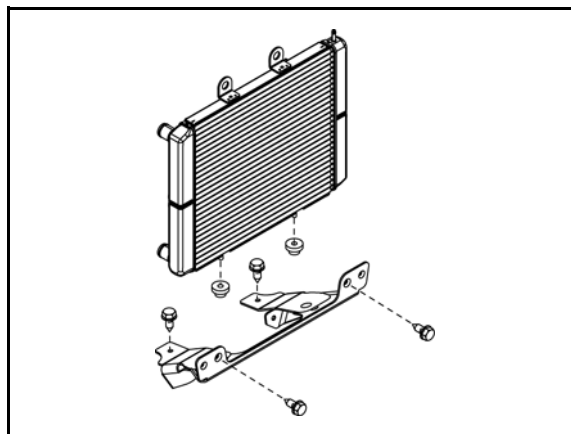
1. If stabilizer bar linkages are installed, remove the bolts that attach the upper portion of the linkages to the sway bar clamps (see "Exploded View" on page 5.20).
2. Remove the front bumper (see "BODY COMPONENT REMOVAL - Front Bumper").
3. Remove the (4) T30 Torx fasteners retaining the front bumper support to the frame.



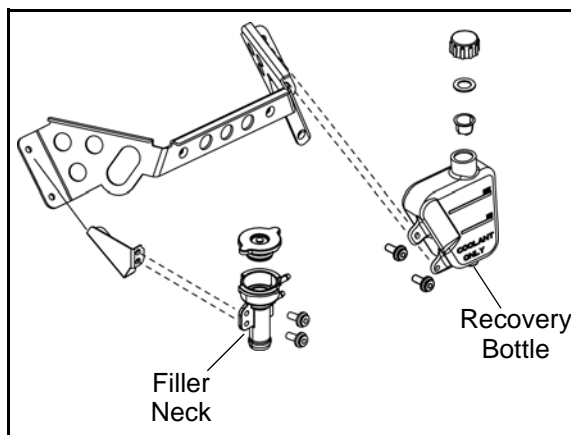
4. Remove the (2) upper radiator retaining bolts.



5. Remove the (4) bolts retaining the lower radiator mount bracket and remove the bracket from the frame.

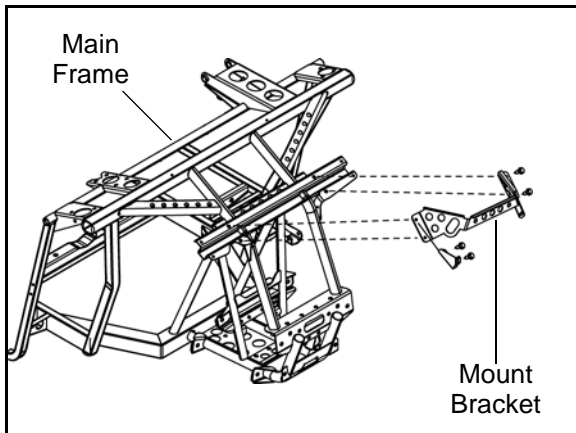


6. Allow radiator to sag down to allow access to recovery bottle retaining screws and filler neck retaining screws.
7. Remove both sets of retaining screws and allow the recovery bottle and filler neck to hang down to access the (4) bolts retaining the upper radiator mount bracket.



BODY / STEERING / SUSPENSION

- Remove the (4) bolts retaining the upper radiator mount bracket and remove the bracket from the frame.

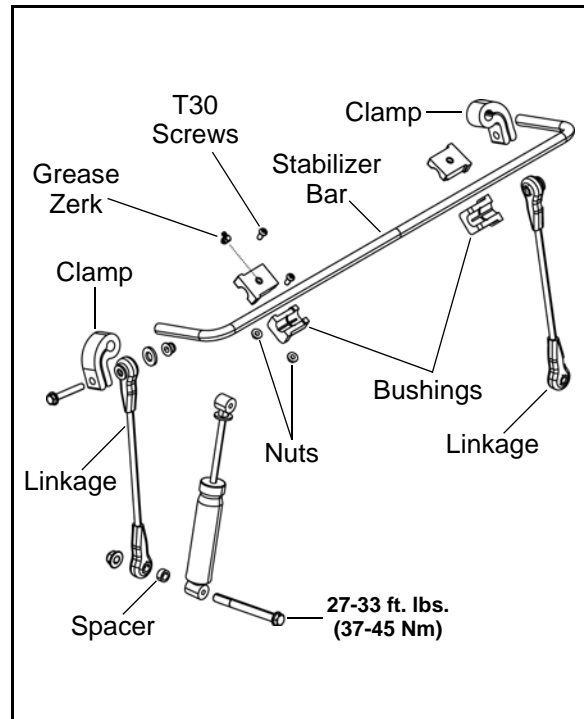


- Lift up on the stabilizer bar and remove it from the vehicle.



- Inspect the stabilizer bar for straightness. Inspect the bushings and replace if needed.
- Reverse the procedure for installation. Torque the linkage fasteners to 27-33 ft. lbs. (37-45 Nm).

Exploded View



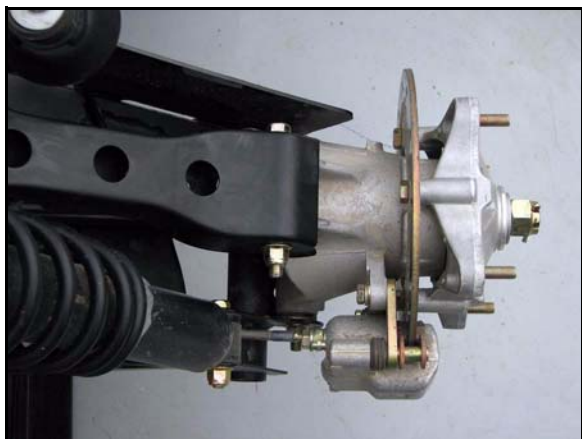
REAR A-ARMS

Removal

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.

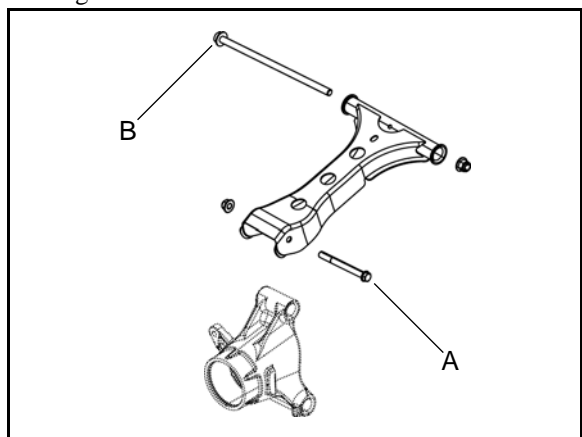
NOTE: Use the exploded view in this section as a reference during the procedure (see page 5.22).

1. Elevate and safely support the rear of the vehicle off the ground.
2. Remove the wheel nuts, and rear wheel.



Upper A-arm Removal

3. Remove the fastener (A) attaching the upper A-arm to the bearing carrier.



4. Remove the fastener (B) 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" on page 5.22). Replace if worn. Discard hardware.

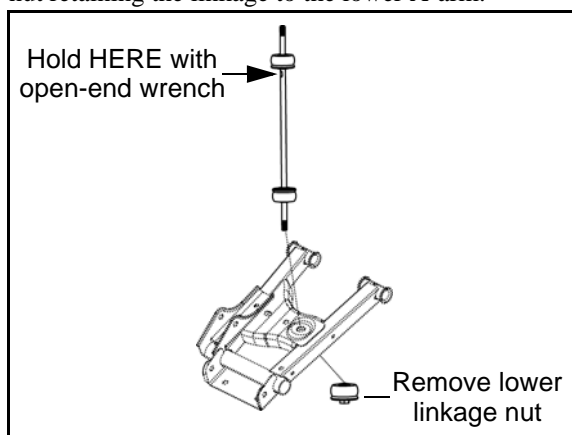
WARNING

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.

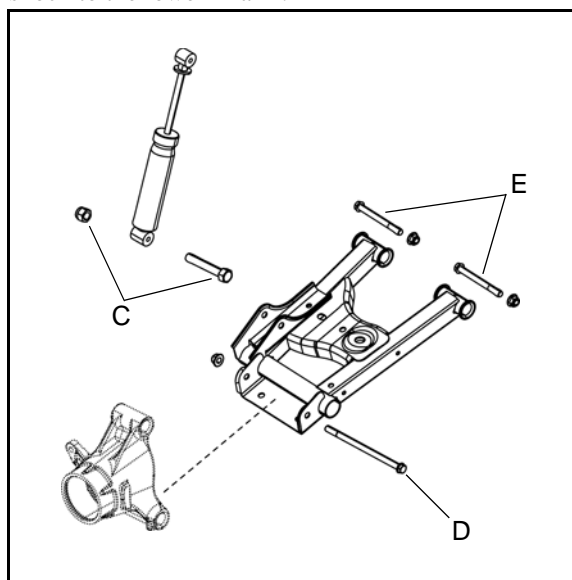
6. If not replacing the A-arm, thoroughly clean the a-arm and pivot tubes.
7. Insert new A-arm bushings and pivot tubes into new A-arm.

Lower A-arm Removal

8. While holding the stabilizer bar linkage, remove the lower nut retaining the linkage to the lower A-arm.



9. Remove the fastener (C) retaining the lower portion of the shock to the lower A-arm.



10. Remove the fastener (D) attaching the lower A-arm to the bearing carrier.

BODY / STEERING / SUSPENSION

11. Remove the (2) fasteners (E) attaching the lower A-arm to the frame and remove the lower A-arm from the vehicle (see previous illustration).
12. Examine A-arm and bearing carrier bushings and pivot tubes (see "Exploded View"). Replace if worn. Discard hardware.
13. If not replacing the A-arm, thoroughly clean the a-arm and pivot tubes.
14. Insert new A-arm bushings and pivot tubes into the new A-arm.

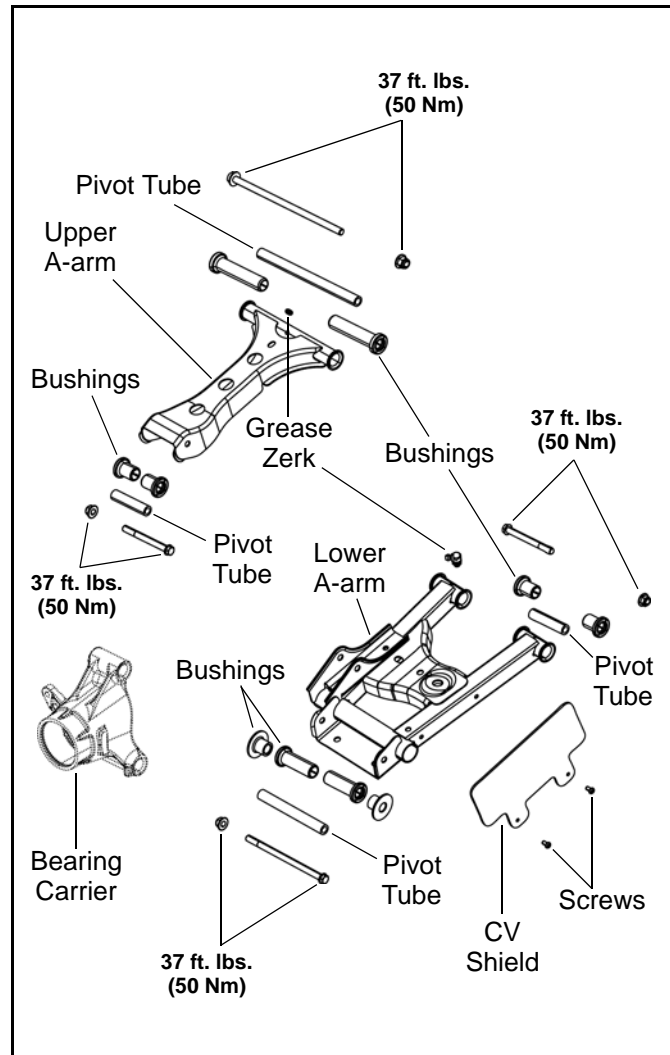
Installation

1. Install lower A-arm assembly onto vehicle frame. Torque new fasteners to **37 ft. lbs. (50 Nm)**.
2. Attach lower A-arm to bearing carrier. Torque new fastener to **37 ft. lbs. (50 Nm)**.
3. Route brake line on top of the lower A-arm and between lower shock mounting tabs.
4. Reinstall the lower portion of the shock to the lower A-arm. Torque shock fastener to **27-33 ft. lbs. (37-45 Nm)**.
5. Install upper A-arm assembly onto vehicle frame. Torque new fastener to **37 ft. lbs. (50 Nm)**.
6. Attach upper A-arm to bearing carrier. Torque new fastener to **37 ft. lbs. (50 Nm)**.
7. Install wheel and torque wheel nuts to specification.

WARNING

Upon A-arm installation completion, test vehicle at low speeds before putting into service.

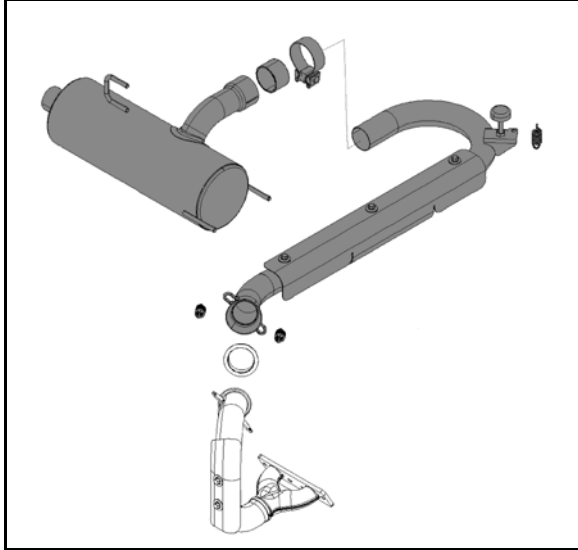
Exploded View



REAR STABILIZER BAR

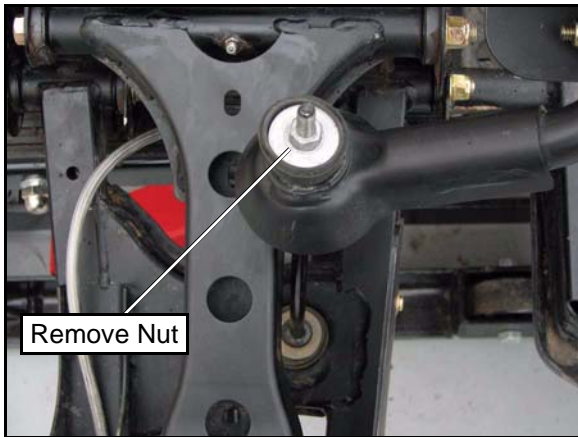
Removal / Installation

1. Remove the exhaust pipe and exhaust silencer from the vehicle.



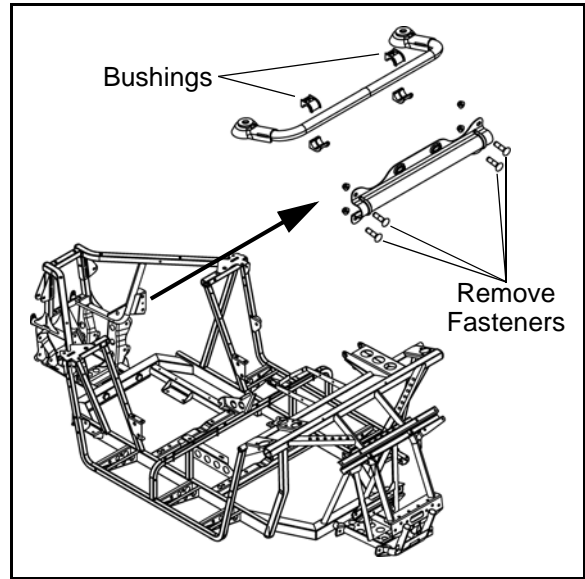
NOTE: The exhaust silencer can be removed through the side of the vehicle after the exhaust pipe is detached from the header pipe.

2. Remove the retaining nut from the upper portion of the stabilizer bar linkage bushing on each side of the vehicle.



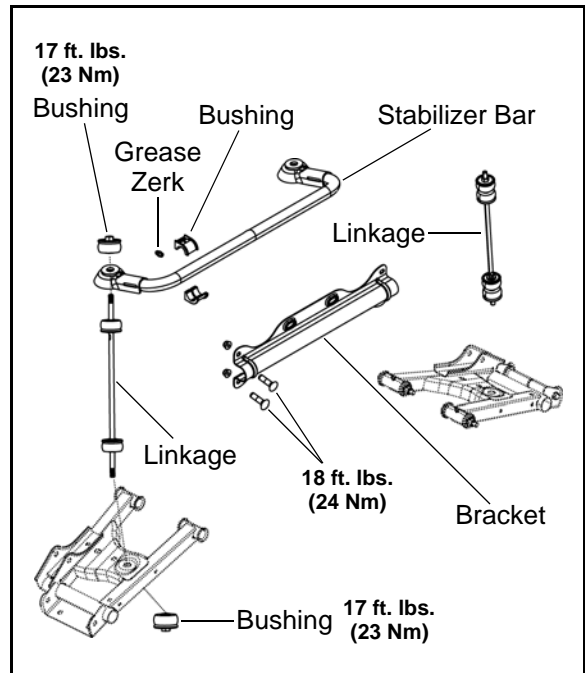
3. Remove the (4) fasteners retaining the stabilizer bar bracket to the frame.

4. Remove the stabilizer bar and bracket from the frame as an assembly.



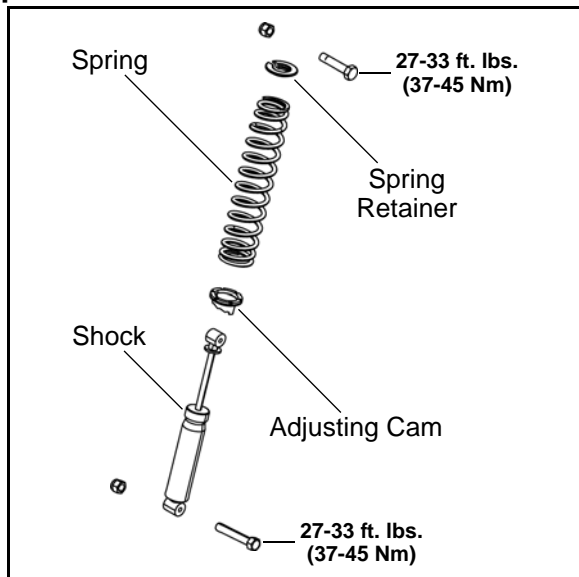
5. Inspect the stabilizer bar for straightness. Inspect the bushings and replace if needed.
6. Inspect the rubber bushings on the linkage rod and replace if needed.
7. Reverse the procedure for installation. Torque the stabilizer bolts to **18 ft. lbs. (24 Nm)**.

5



SHOCKS / SPRINGS

Exploded View

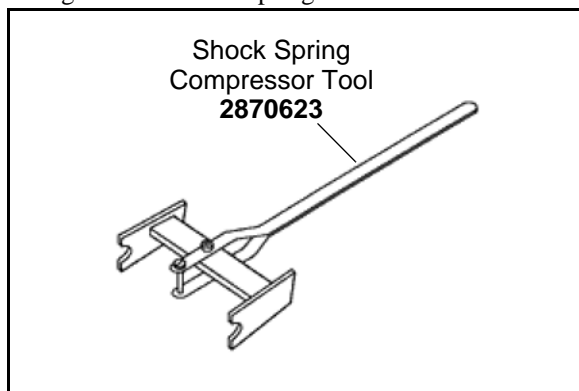


Shock Removal / Installation

1. Elevate the vehicle off the ground to relieve the suspension load.
2. Remove the upper and lower fasteners retaining the shock and remove the shock from the vehicle.
3. Reverse the procedure to reinstall the shock. Torque new fasteners to **27-33 ft. lbs. (37-45 Nm)**.

Shock Replacement

1. Using a spring compressor, compress the shock spring far enough to remove the spring retainer.



2. Remove the spring and adjusting cam from the existing shock and install components onto the new shock.
3. Compress the shock spring and install the spring retainer.
4. Reinstall the shock onto the vehicle and torque new fasteners to **27-33 ft. lbs. (37-45 Nm)**.

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.

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.

CHAPTER 6

CLUTCHING

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CLUTCHING

SPECIAL TOOLS AND SUPPLIES

TOOL DESCRIPTION	PART NUMBER
Drive Clutch Puller (Short)	PA-48595
Clutch Holding Wrench	9314177
Clutch Holding Fixture	2871358
Spider Nut Socket	2870338
Drive Clutch Spider Removal and Installation Tool	2870341
Roller Pin Tool	2870910
Clutch Bushing Replacement Tool Kit	2871226
Piston Pin Puller	2870386
Clutch Compression Tool	8700220
Clutch Bushing Replacement Tool Kit	2871025

SPECIAL SUPPLIES	PART NUMBER
Loctite™ 680	2870584
RTV Silicone Sealer	8560054

TORQUE SPECIFICATIONS

PVT System Fastener Torques

ITEM	TORQUE VALUE ft. lbs. (Nm)
Drive Clutch Retaining Bolt	40 ft. lbs. (54 Nm)
Driven Clutch Retaining Bolt	17 ft. lbs. (23 Nm)
PVT Inner Cover Bolts	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 Spider Lock Nut (Plastic)	15 ft. lbs. (20.3 Nm)
Drive Clutch Cover Plate	90 in. lbs. (10 Nm)

PVT SYSTEM OVERVIEW

General Operation

WARNING

All PVT maintenance or repairs should be performed only 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 the development of the Polaris vehicle, 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 hours 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.**
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 the appropriate illustration(s) 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, use Low gear. Shift transmission to Low during loading of the vehicle to prevent belt burning.
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 warm-up of vehicles 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 or 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.	Clutch component inspection should be performed by a Polaris MSD certified technician.
Poor engine performance.	Fouled spark plugs, foreign material in fuel tank, restricted fuel lines, or faulty fuel pump may cause symptoms similar to clutching malfunction.
GENERAL RANGE OPERATION GUIDELINES:	Low: Heavy pulling, basic operational speeds less than 7 MPH, riding through rough terrain (swamps, mountains, ect.), or low ground speeds.
	High: High ground speeds, or speeds above 7 MPH.

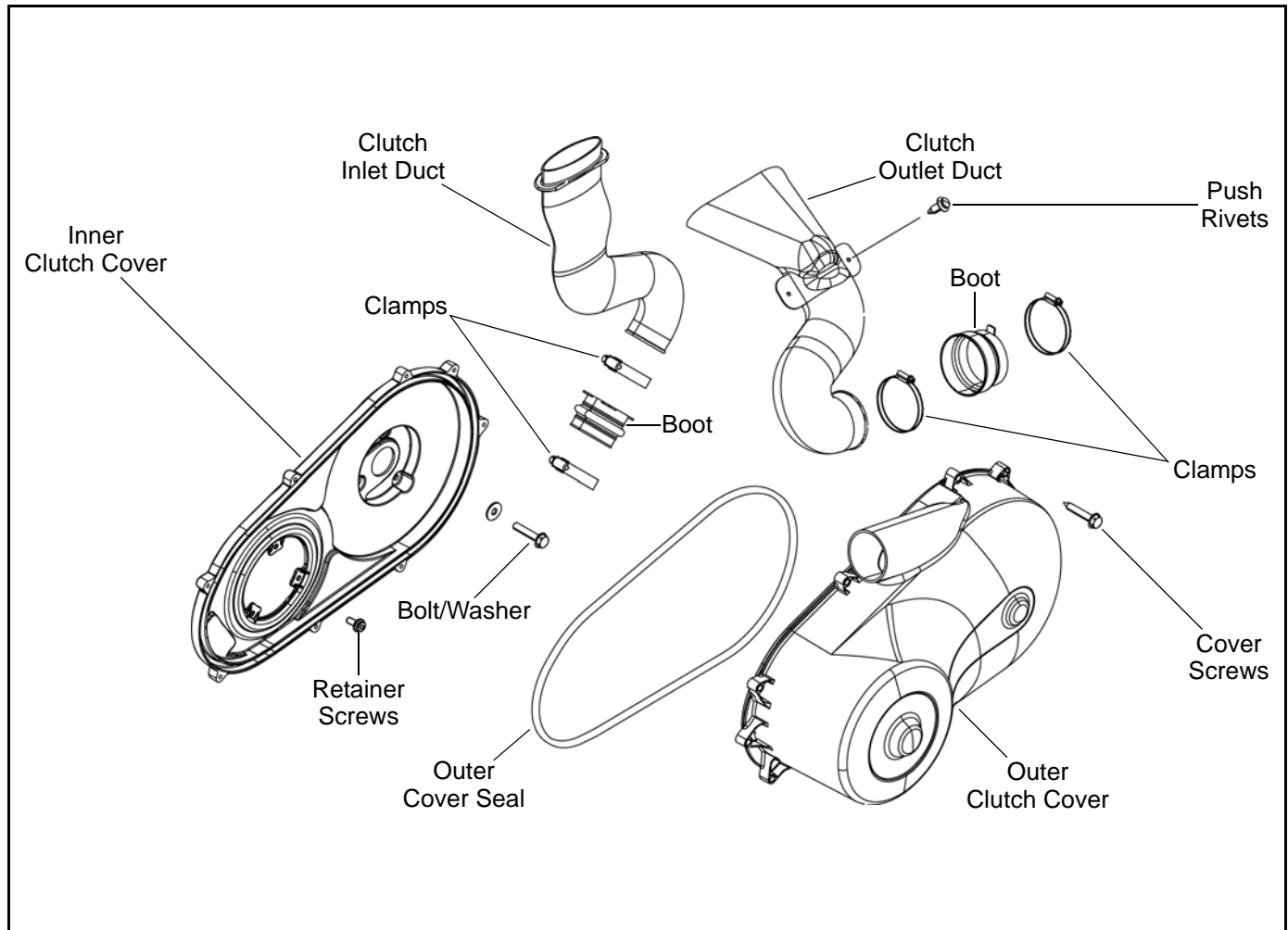
Operating in Low Gear

“Low” gear should be used when pulling heavy loads, riding through rough terrain, or when basic operational ground speeds are less than 7 MPH. Use “High” gear when basic operational ground speeds are more than 7 MPH.

IMPORTANT: Using “High” for heavy loads, hilly terrain, or in wet, muddy conditions will increase the chance of drive belt burning.

PVT SYSTEM SERVICE

PVT Sealing and Ducting Components

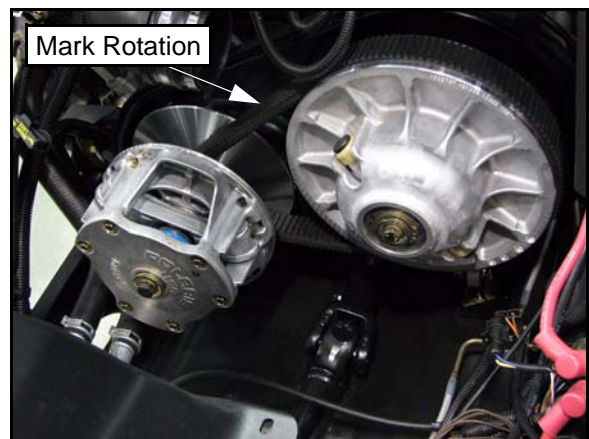


6

Disassembly

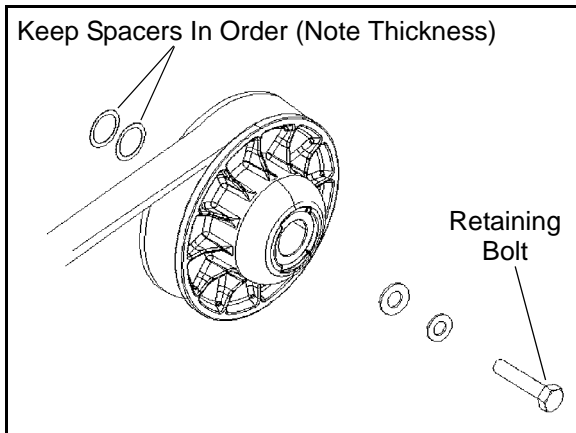
Some fasteners and procedures will vary. Refer to the appropriate parts manual for proper fasteners and fastener placement.

1. Remove driver and passenger seats (see Chapter 5).
2. Remove the rear service panel to gain access to the outer clutch cover (see Chapter 5).
3. Remove the (2) push rivets and (2) fasteners retaining the rear seat base, and remove the seat base from vehicle to allow clutch cover removal.
4. Loosen the hose clamp on the clutch outlet duct.
5. Remove outer clutch cover screws and remove the clutch cover.
6. Mark the drive belt direction of rotation and remove drive belt (see "DRIVE BELT - Belt Removal").
7. Remove the driven clutch retaining bolt and driven clutch.

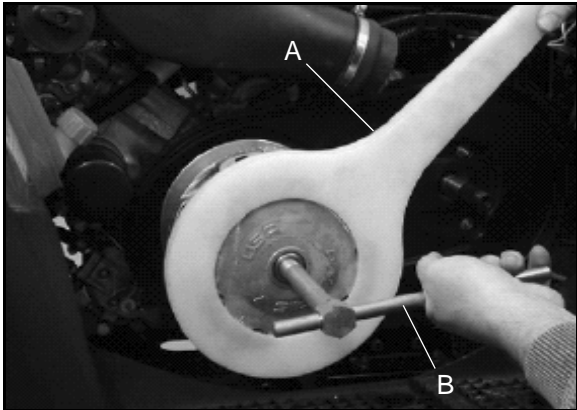


CLUTCHING

8. Remove driven clutch offset spacers from the transmission input shaft.



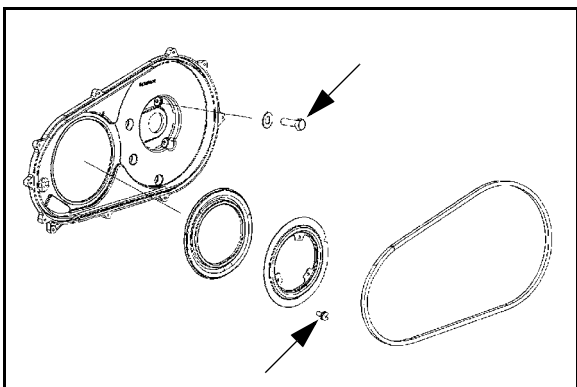
9. Install the Drive Clutch Holder (PN 9314177) (A).
10. Remove drive clutch retaining bolt and remove drive clutch using the Drive Clutch Puller (PA-48595) (B).



Drive Clutch Puller (PA-48595)

Drive Clutch Holder (9314177)

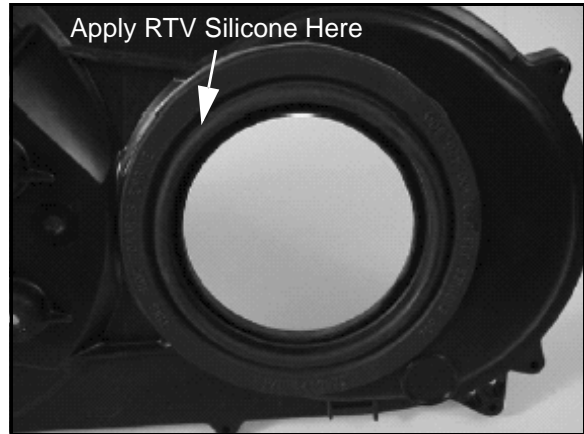
11. Remove the screws that attach the inner clutch cover to the engine and transmission.



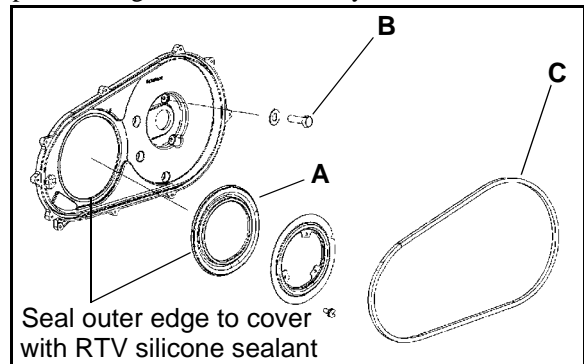
12. Remove the cover along with foam seal on back of cover or shaft.

Assembly

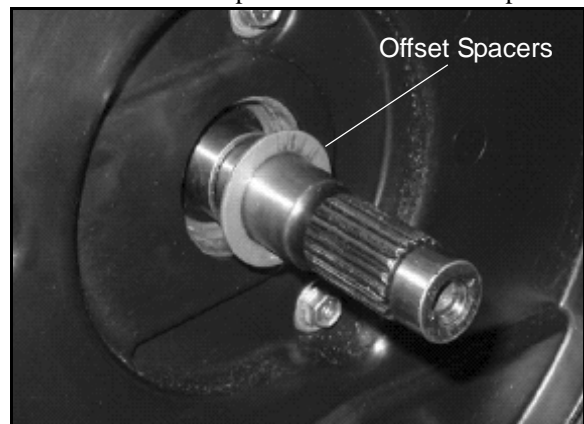
1. Inspect inner clutch cover-to-engine seal. Replace if cracked or damaged.
2. Place a new foam seal on transmission input shaft.
3. Apply RTV silicone sealant to outside edge of inner clutch cover-to-engine seal, to ensure a water tight fit between the seal and the cover. Surfaces must be clean to ensure adhesion of silicone sealant.



4. Reinstall cover and tighten rear cover bolts just enough to hold it in place.
5. Fit lip of inner cover seal (A) to engine. Install seal retainer plate and tighten screws securely.



6. Torque rear inner clutch cover bolts (B) to specification.
7. Install clutch offset spacers on transmission input shaft.



8. 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.
11. Clean end of taper on crankshaft and the taper bore inside drive clutch.
12. Install drive clutch and torque retaining bolt to specification.
13. Reinstall drive belt noting direction of belt rotation (see "DRIVE BELT - Belt Installation"). If a new belt is installed, install so numbers can be easily read.
14. Replace outer clutch cover rubber gasket with the narrow side out.
15. Reinstall outer clutch cover and secure with screws. Torque to **45-50 in. lbs. (5-5.6 Nm)**.
16. Install the clutch cover outlet duct and tighten the clamps.



Inner Cover Bolt Torque (Rear):
12 ft. lbs. (16.6 Nm)

Outer Cover Bolt Torque:
45-50 in. lbs. (5-5.6 Nm)

Driven Clutch Retaining Bolt Torque:
17 ft. lbs. (23.5 Nm)

Drive Clutch Retaining Bolt Torque:
40 ft. lbs. (55 Nm)

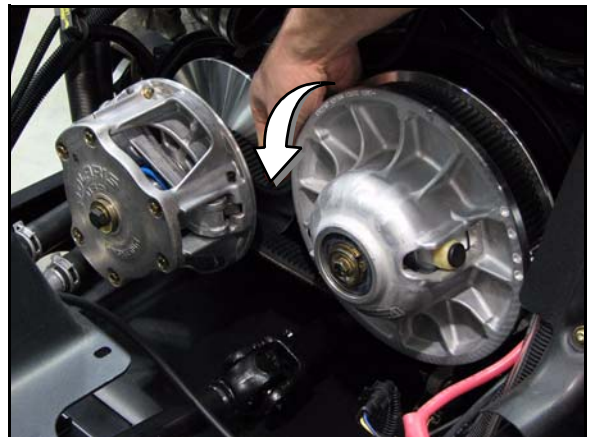
DRIVE BELT

Belt Removal

1. Remove outer clutch cover as described in PVT 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 the part number can be easily read.

3. To remove drive belt, place the transmission in "Park" and push down on the belt firmly to open the clutch sheaves.

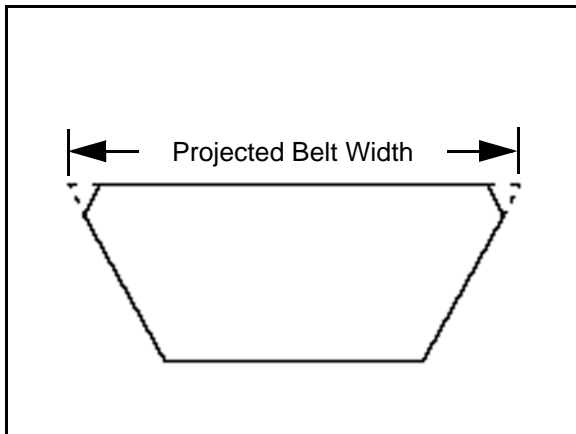


4. Then lift upward on the belt while pulling it out and down over the driven clutch outer sheave.



CLUTCHING

Belt Inspection



Belt Width
New: 1.188" (3.02 cm)
Wear Limit: 1.157 (2.94 cm)

1. Measure belt width and replace if worn severely.
 - The top edges have been trimmed on some drive belts. It will be necessary to project the side profiles and measure from corner to corner.
 - Place a straight edge on each side of the drive belt.
 - Place another straight edge on top of belt.
 - Measure the distance where the side straight edges intersect the top.
2. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Replace if necessary.
3. 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.

Belt Outer Circumference
New: 40.89" (103.85 cm)
Wear Limit: 41.08" (104.34 cm)

4. Measure belt length with a tape measure around the outer circumference of the belt.
5. Replace belt if worn past the wear limit. 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 position belt in the same position as when removed or so part number is easily read.

1. Loop belt over the drive clutch and over top of the 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.

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.

DRIVE CLUTCH SERVICE

Spring Specifications

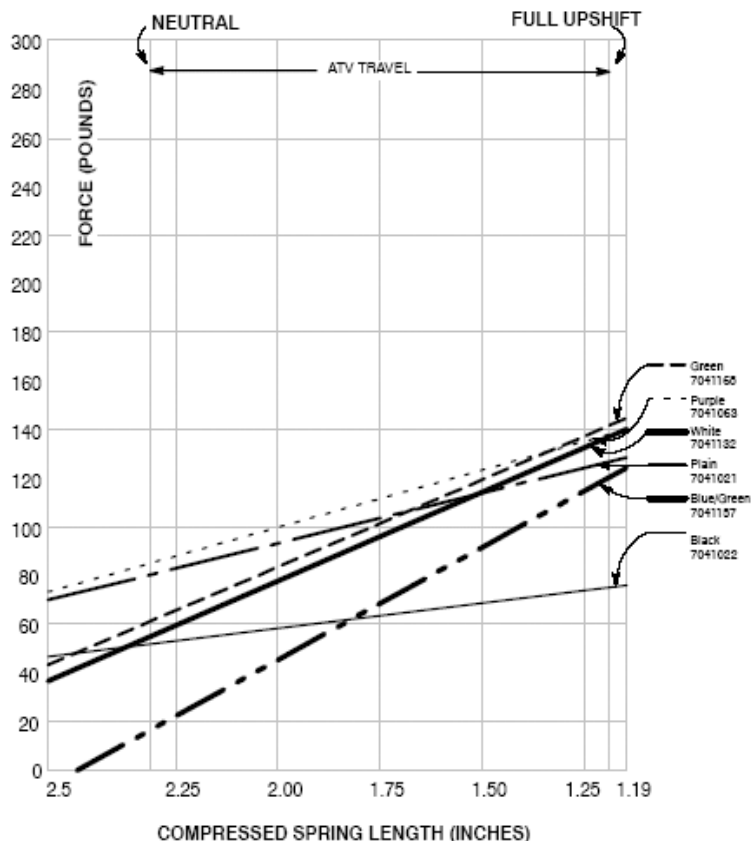
The drive clutch spring has two primary functions:

1. To control clutch engagement RPM. The springs which have a higher rate when the clutch is in neutral will increase clutch engagement RPM.
2. To control the rate at which the drive belt moves upward in the drive clutch sheaves. This is referred to as drive clutch upshift.

There are other components which control upshift, but the spring is one of the primary components in insuring optimum performance. It is very important that the spring is of the correct design and is in good condition.

CAUTION

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.



6

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 as shown. Refer to the spring specification chart for specific free length measurements and tolerances. Also check to see that spring coils are parallel to one another. Distortion of the spring indicates stress fatigue, requiring replacement.



Primary Clutch Springs

Secondary Clutch Springs

PART NUMBER	COLOR CODE	WIRE DIAMETER	FREE LENGTH ± .125"	PART NUMBER	DESCRIPTION
7041021	Plain	.157"	4.38"	3234199	White/Yellow
7041022	Black	.140"	4.25"		
7041063	Purple	.168"	4.37"		
7041132	White	.177"	2.92"		
7041168	Green	.177"	3.05"		
7041157	Blue/Green	.177"	2.53"		
7042202	Blue/Gray	.187"	2.55"		

CLUTCHING

Shift Weights

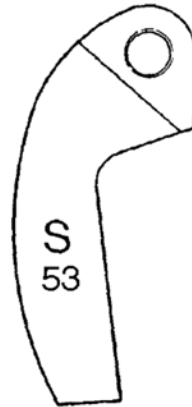
Shown below are the shift weights which have been designed for the PVT system. These shift weights have many factors designed into them for controlling engagement RPM and shifting patterns. Shift weights should not be changed or altered without first having a thorough understanding of their positioning and the effects they may have on belt to sheave clearance, clutch balance and shifting pattern.



PN 5630514
48 gr



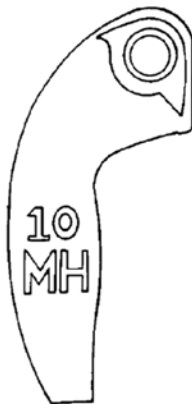
PN 5630515
45 gr



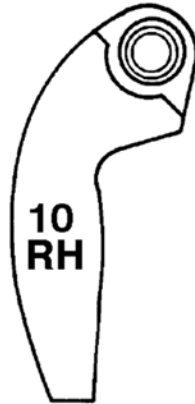
PN 5630095
53 gr



PN 5630509
55 gr



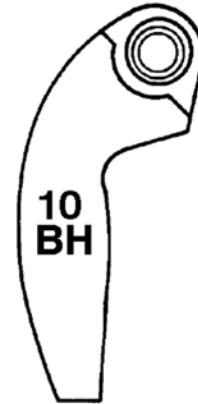
PN 5630513
50.5 gr



PN 5630709
44 gr



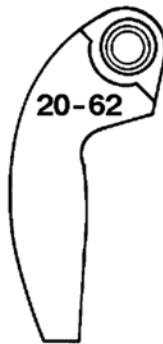
PN 5630710
46 gr



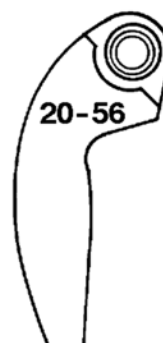
PN 5630711
47gr



PN 5631698
20-60 gr

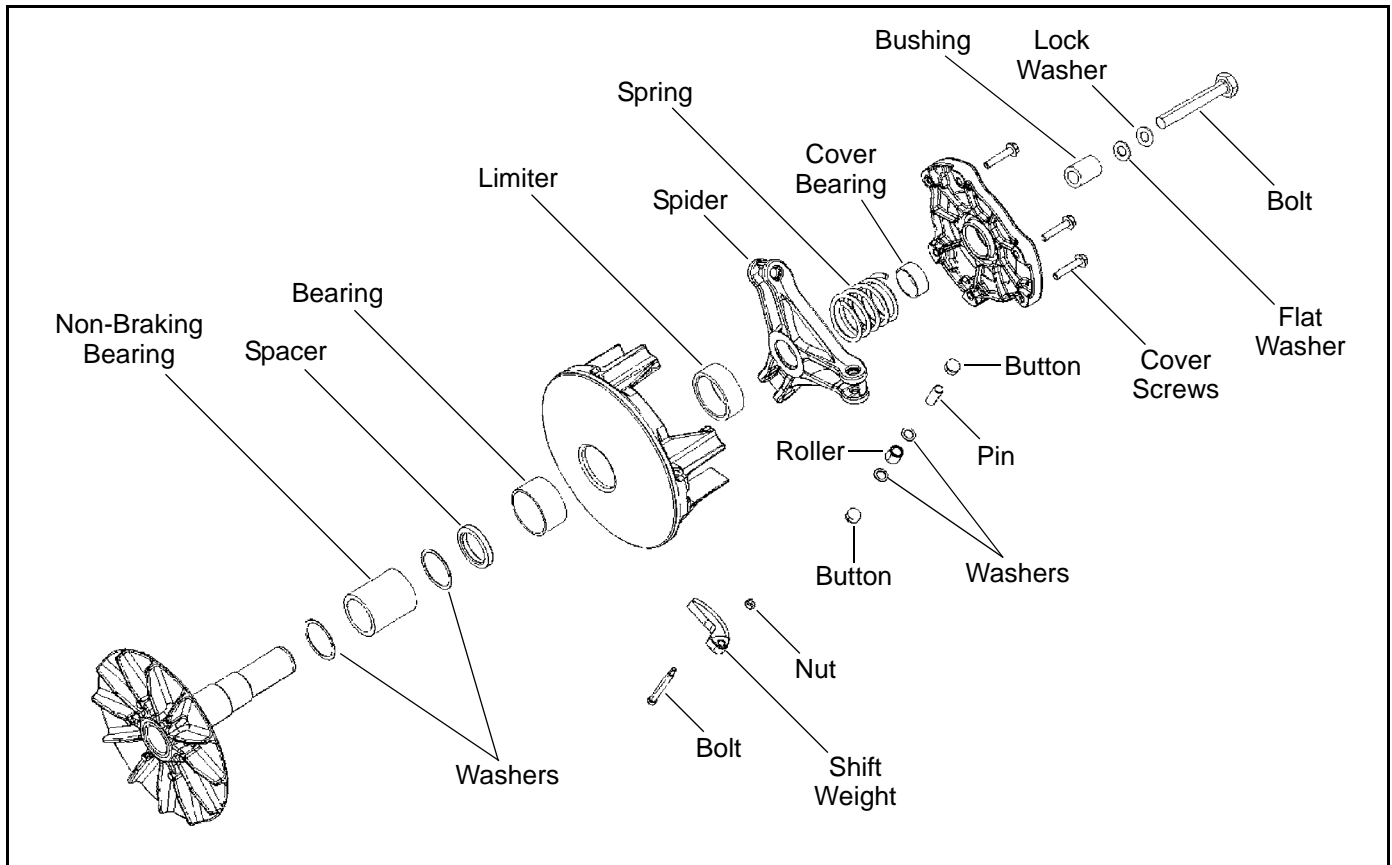


PN 5631700
20-62 gr



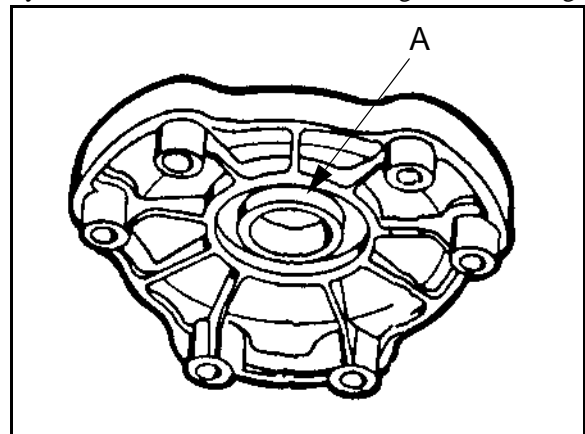
PN 5631215
20-56 gr

Exploded View



Clutch Disassembly

- 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.
- Remove cover bolts evenly in a cross pattern and remove cover plate.
- 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.

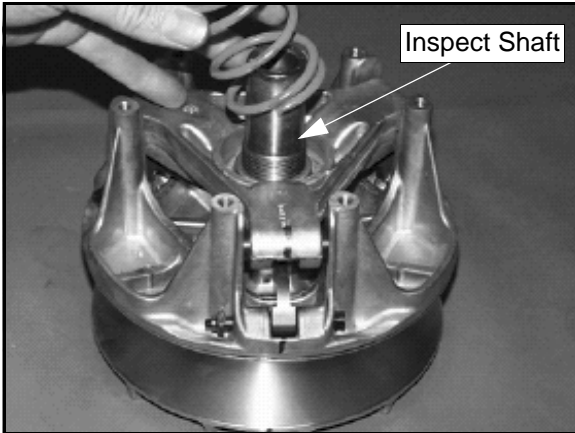


Cover Bushing Inspection:
 Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

- Remove cover bolts evenly in a cross pattern and remove cover plate.

CLUTCHING

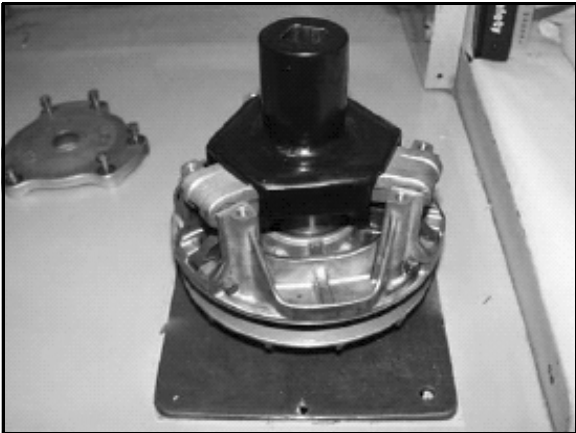
4. Inspect area on shaft where bushing rides for wear, galling, nicks, or scratches. Replace clutch assembly if worn or damaged.



5. Remove and inspect the clutch spring. See “Drive Clutch Spring Specifications” for spring inspection.

Spider Removal

1. Remove the limiter nut using the Clutch Spider Nut Socket (PN 2870338).
2. Install clutch in holding fixture (PN 2871358) and loosen the spider (counterclockwise) using Clutch Spider Removal Tool (PN 2870341).

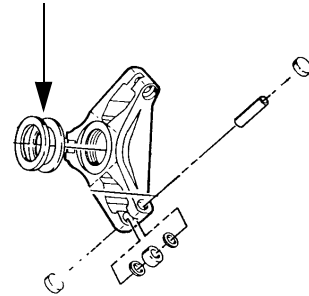


**Clutch Holding Fixture:
(PN 2871358)**

**Spider Removal Tool:
(PN 2870341)**

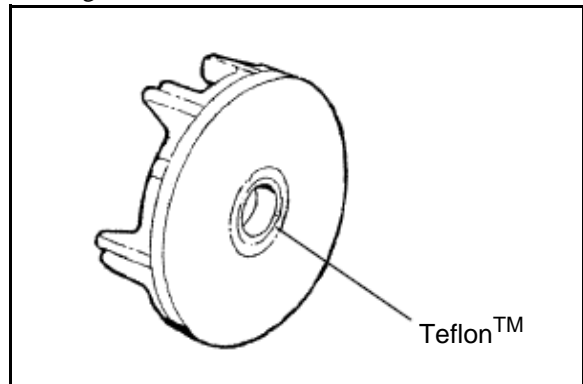
NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. Be sure to note the number and thickness of these washers.

To maintain proper clutch balance and belt-to-sheave clearance, be sure to reinstall original quantity and thickness washers



Moveable Sheave Bushing Inspection

3. Inspect the Teflon™ coating on the moveable sheave bushing.

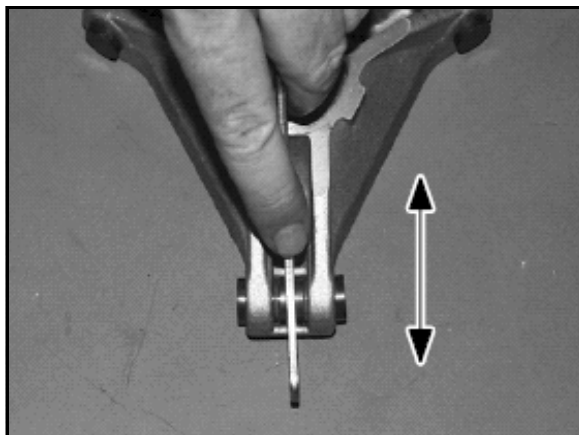


Moveable Sheave Bushing Inspection:

Replace the cover bushing if more brass than Teflon is visible on the bushing. Refer to bushing replacement in this chapter.

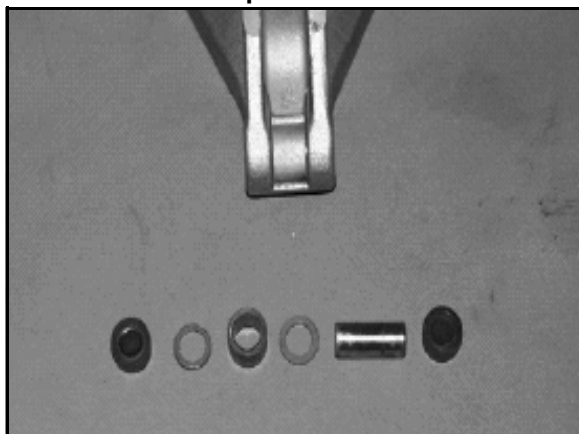
Roller, Pin, and Thrust Washer Inspection

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.



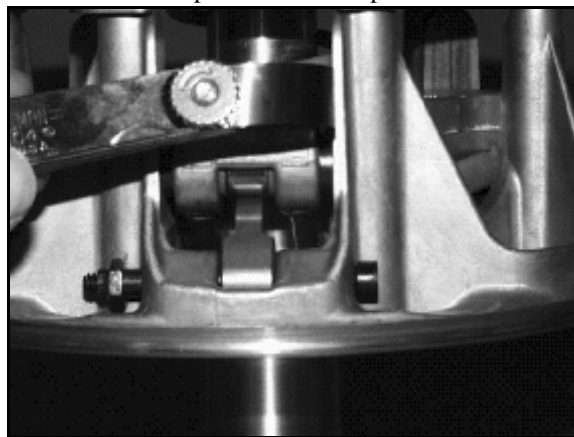
2. Rubber backed buttons can be used in all *RANGER* clutches if the hollow roller pin is changed to the solid roller pin.

NOTE: The rubber side of the button is positioned toward the solid roller pin.



Button To Tower Clearance Inspection

1. Inspect for any clearance between spider button to tower. If clearance exists, replace all buttons and inspect surface of towers. See "Spider Removal" procedure.



**Button to Tower Clearance:
000-.001"**

2. Inspect sheave surfaces. Replace the entire clutch if worn, damaged or cracked.

Shift Weight Inspection

WARNING

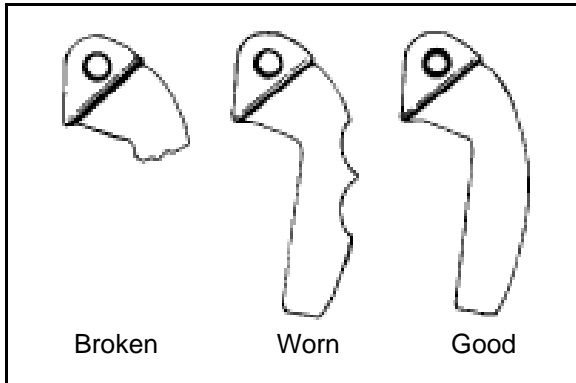
The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly!

1. If clutch is not disassembled, inspect as shown, using a clutch holding tool to compress the moveable sheave. The contact surface of the weight should be smooth and free of dents or gall marks.



CLUTCHING

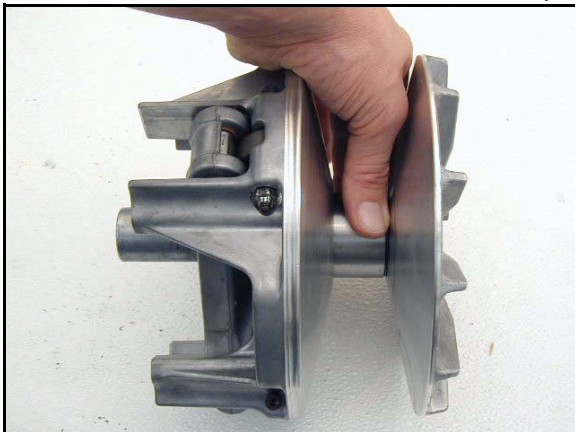
- Remove shift weight bolts and weights. Inspect as shown. The contact surface of the weight should be smooth and free of dents or gall marks. Inspect the weight pivot bore and pivot bolts for wear or galling. If weights or bolts are worn or broken, replace in sets of three with new bolts.



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".

Bearing Inspection

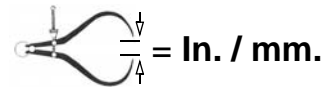
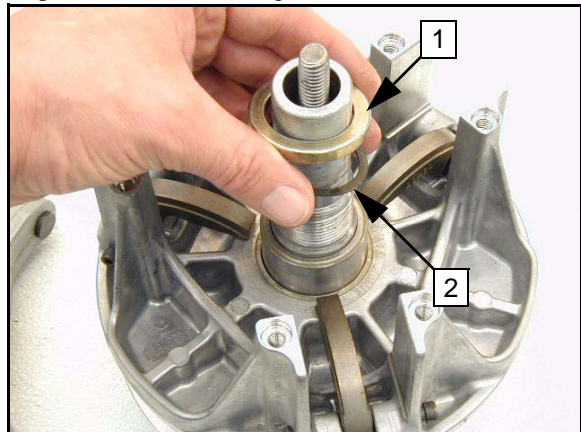
- Rotate non-braking clutch bearing in both clockwise and counter-clockwise directions. The non-braking bearing should rotate both directions on the shaft with only a slight amount of drag.
- Verify there is no binding or rough spots. If problems are noted in either direction, continue with disassembly.



Clutch Inspection

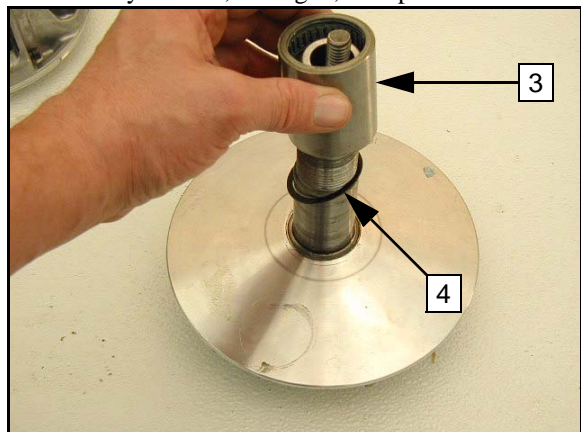
NOTE: Remove cover, spring, and spider following instructions for drive clutch removal, then proceed as follows:

- Remove the moveable sheave spacer sleeve (1) and the thrust washer (2). Visually inspect the washer for damage.
- Measure the thickness and compare to specification. Replace if worn or damaged.

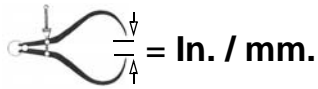


Thrust Washer Thickness
Standard: .030" (.76mm)
Service Limit: .025" (.64mm)

- Remove the moveable clutch sheave.
- Lift bearing (3) and thrust washer (4) off shaft. Replace as an assembly if worn, damaged, or if problems were noted.

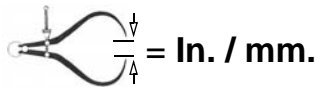


- Inspect surface of shaft for pitting, grooves, or damage. Measure the outside diameter and compare to specifications. Replace the drive clutch assembly if shaft is worn or damaged.



Shaft Diameter:
Standard: 1.3745 - 1.375 (
Service Limit: 1.3730"

- Visually inspect PTFE thrust washer for damage. Measure the thickness and compare to specification. Replace if worn or damaged.



PTFE Washer Thickness
Standard: .030" (.76mm)
Service Limit: .025" (.64mm)

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 replacement
in this chapter.

CLUTCHING

Bushing Service

IMPORTANT: Special Tools Required

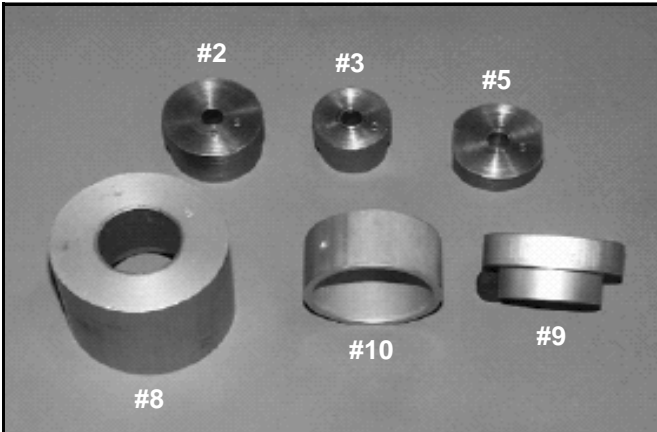
EBS Clutch Bushing Tool Kit - 2201379

Item	Qty.	Part Description	Part #
A, B	1	EBS Puller Tool	5132027
C	1	EBS Puller Nut	5132501
D	1	EBS Main Adapter	5132029
E	1	EBS Bushing Removal Tool	5132028
--	1	Instructions	9915111

Additional Special Tools

Qty.	Part Description	Part #
1	Clutch Bushing Replacement Tool Kit	2871226
1	Piston Pin Puller	2870386

*Clutch Bushing Replacement Tool Kit (PN 2871226)



Item	Qty.	Part Description	Part #
#2	1	P-90 Drive/Driven Clutch Bushing Install Tool	5020628
#3	1	Drive Clutch Cover Bushing Removal/ Installation Tool (all clutches)	5020629
#5	1	P-90 Driven Clutch Cover Bushing Removal Tool	5020631
#8	1	Main Puller Adapter	5020632
#9	1	Adapter Reducer	5010279
#10	1	Number Two Puller Adapter	5020633

NOTE: Bushings are installed at the factory using Loctite™ 609. 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

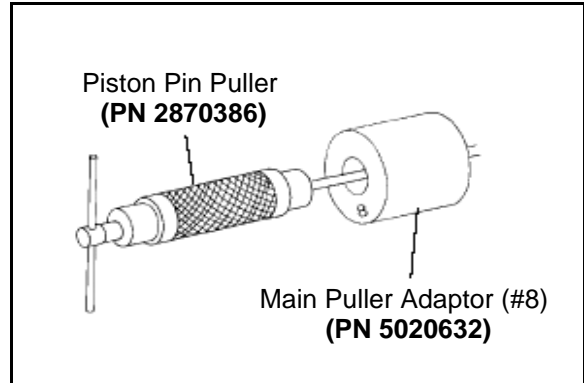
Clutch components will be hot! In order to avoid serious burns, wear insulated gloves during the removal process.

Moveable Sheave - Bushing Removal

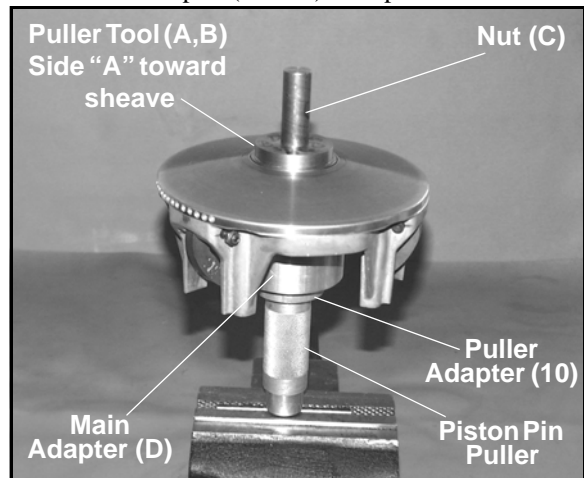
1. Remove clutch as outlined previously in this chapter.
2. Install handle end of the Piston Pin Puller (PN 2870386) securely into bench vise and lightly grease puller threads.

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.



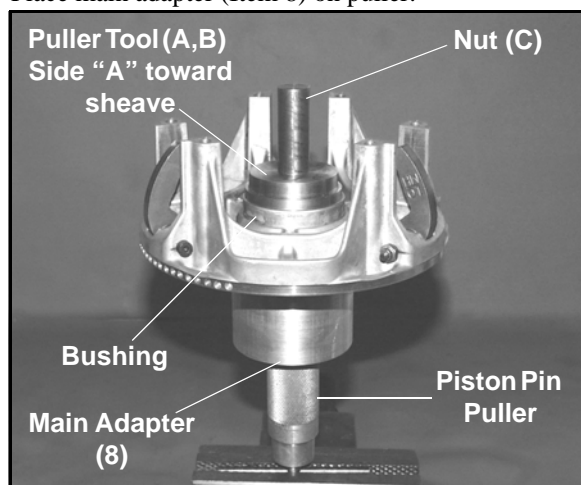
6. With towers pointing toward the vise, slide sheave onto puller rod.
7. Install removal tool (Item A, B) into center of sheave with "A side" toward sheave.

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 counterclockwise 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

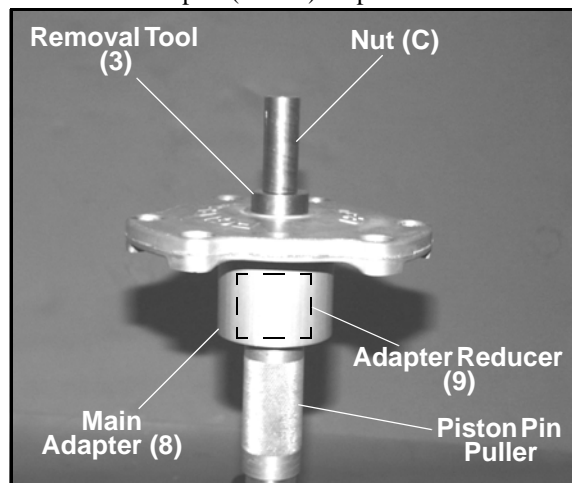
1. Place main adapter (Item 8) on puller.



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 counterclockwise, 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 counterclockwise 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 counterclockwise on puller rod until bushing is seated.
6. Remove nut from puller rod. Take installation tool and clutch cover off rod.

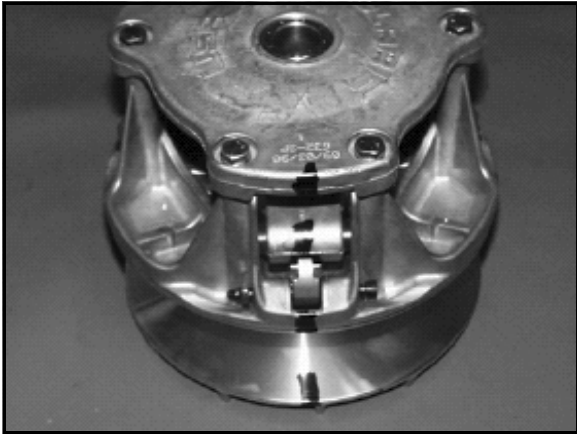
CLUTCHING

Clutch Assembly

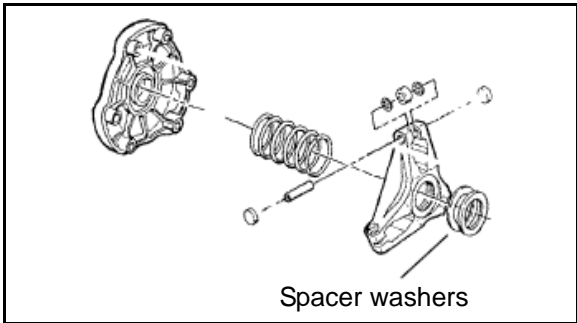
NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. The Teflon bushings are self-lubricating.

 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 moveable sheave onto fixed sheave.
2. Install spider spacers. Use same quantity and thickness as were removed.




3. Compress spider buttons for each tower and install spider, making sure that “X”, or the marks that were made earlier, on spider aligns with “X”, or the marks that were made earlier, in 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.

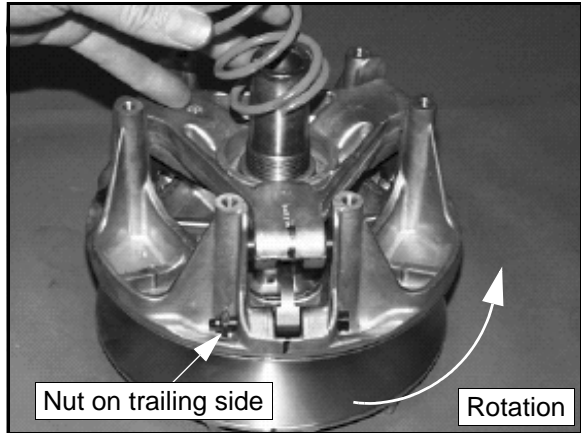
 = T
Spider Torque: 200 ft. lbs. (271 Nm)

 CAUTION
Be sure the spider spacer washers are fully seated in the recessed area in the spider. Any misalignment will alter clutch balance. Inverting the clutch while initially tightening the spider will help position the washers.


5. Install limiter nut on top of spider using the Clutch Spider Nut Socket (PN 2870338). Torque to specification.

 = T
Spider Nut Torque: 15 ft. lbs. (20 Nm)

6. Install shift weights using new lock nuts on the bolts.



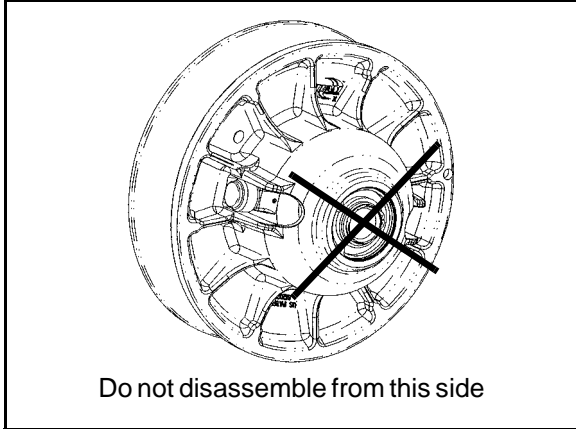
7. Reinstall clutch spring.
8. Reinstall cover, aligning “X” mark with other marks.
9. Torque cover bolts evenly to specification.

 = T
Cover Screw Torque: 90 in. lbs. (10.4 Nm)

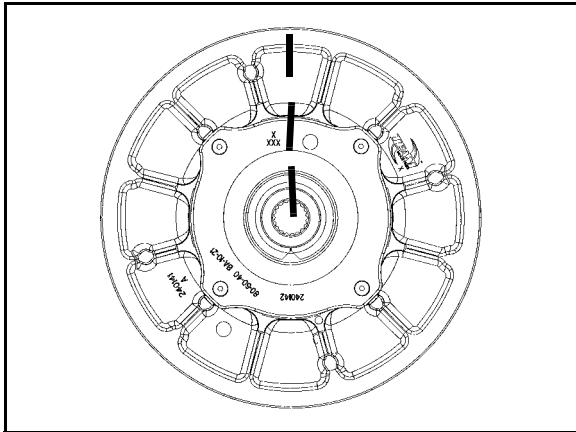
DRIVEN CLUTCH SERVICE

Clutch Disassembly

1. Remove driven clutch from the transmission input shaft. Do not attempt disassembly of the driven clutch from the outside snap ring. The driven clutch must be disassembled from the helix side.



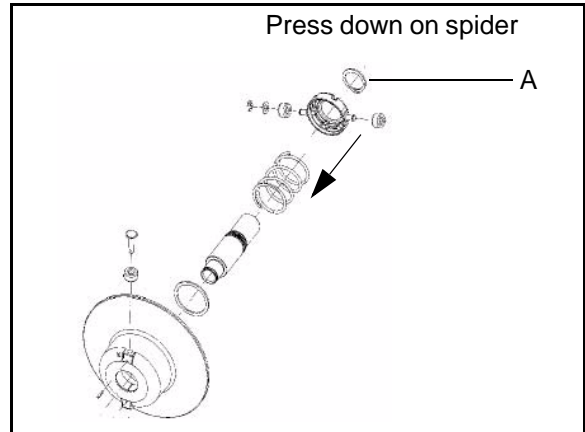
2. It is important to mark the position of the shaft, cam cover, and sheave before disassembly or use the X's on the components for reference. This will aid in reassembly and helps to maintain clutch balance after reassembly.



3. Remove the four torx screws that secure the cam (helix) assembly using a T25 torx driver.

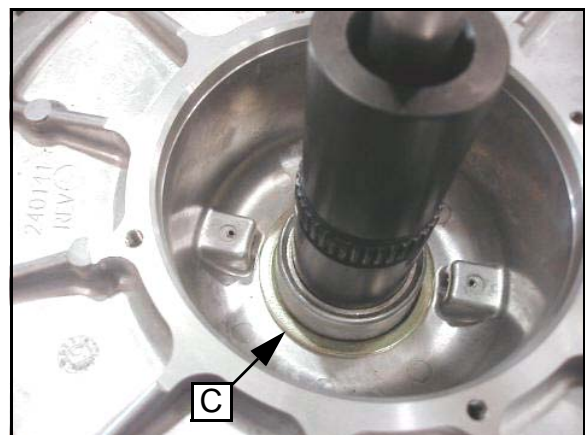
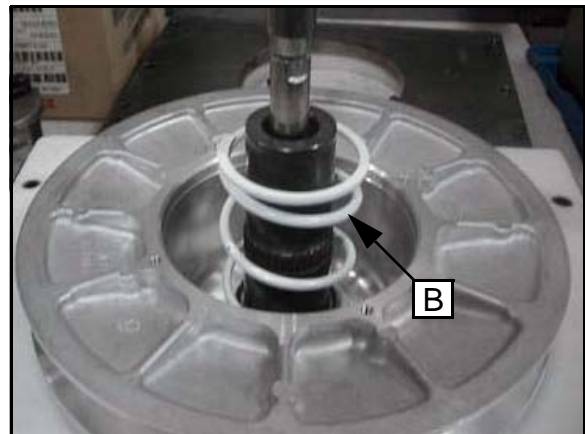


4. Place the clutch into the Clutch Compression Tool PN 8700220. Using Compression Extensions PN PS-45909, press down on top of the spider assembly, compressing the spider onto the shaft. Remove snap ring (A) and slowly release the assembly.



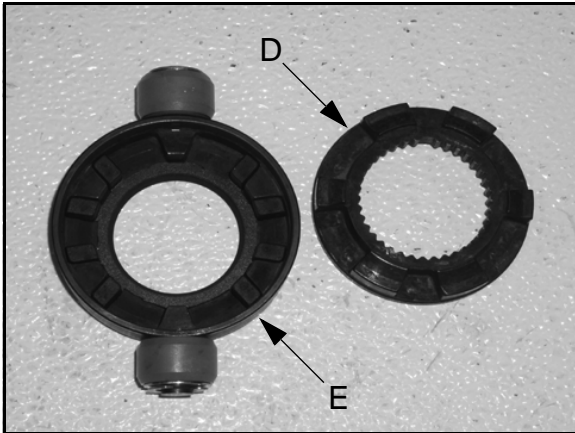
5. Remove the spider assembly, spring (B), and spacer washer (C).

NOTE: Spring is compression only and has no torsional wind.

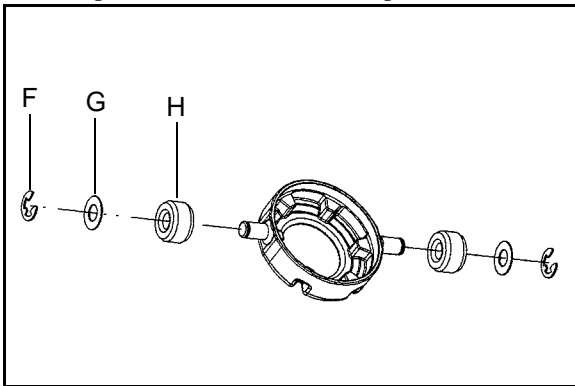


CLUTCHING

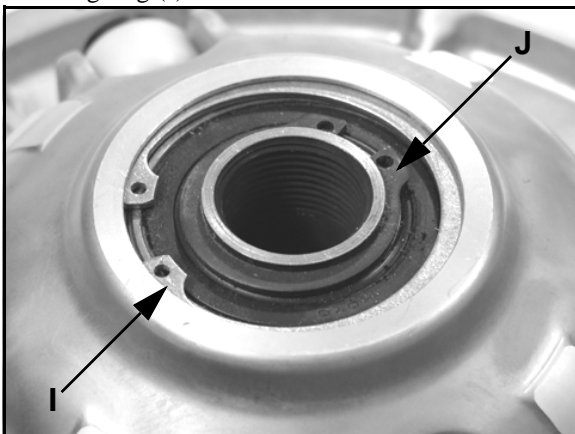
6. Remove the inside spider plate (D) and spider dampener (E). Inspect the spider dampener (E) for wear and replace if needed.



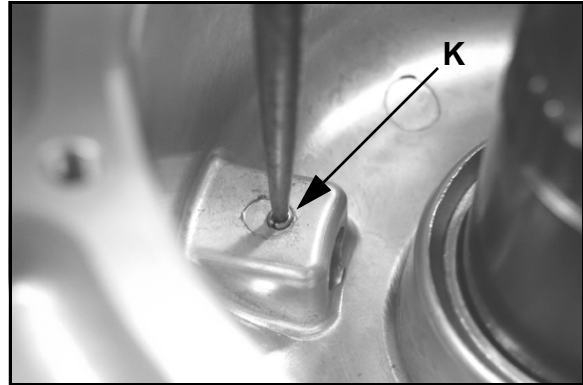
7. Remove the E-clips (F), washers (G), and the clutch rollers (H). Inspect the rollers for wear; replace if worn.



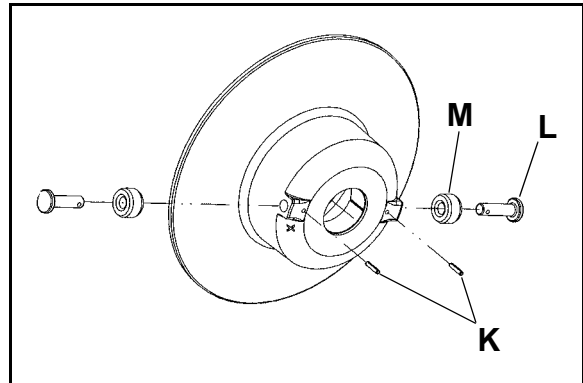
8. Remove the clutch assembly from the holding tool. Remove the large outer retaining ring (I) and the inner retaining ring (J).



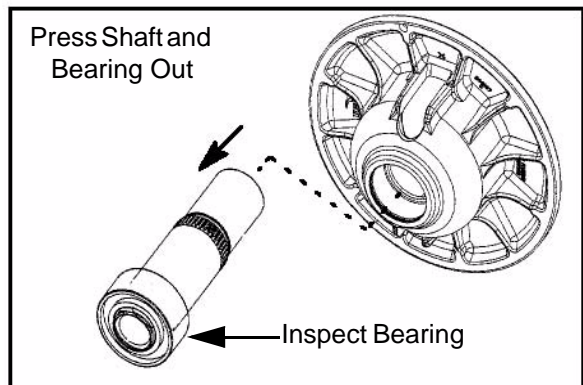
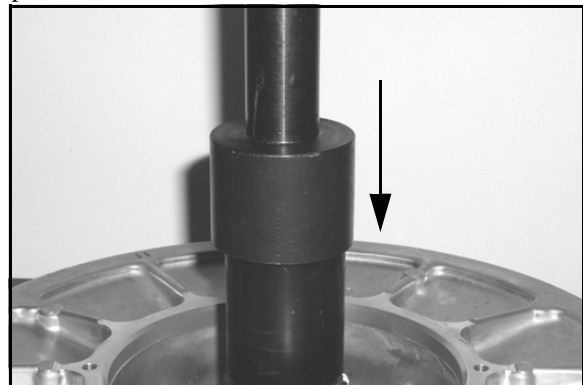
9. Press out the spring pins (K) in the inner sheave.



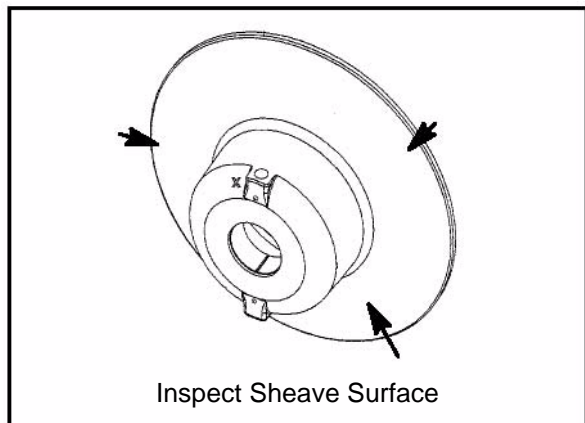
10. Pull out the clutch roller pins (L) and rollers (M).



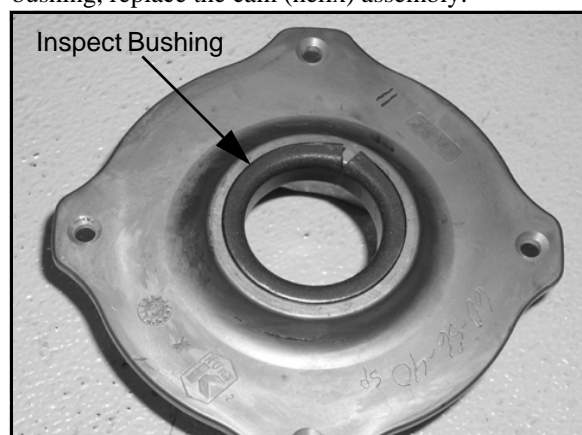
11. Press the shaft and bearing out of the outer sheave using a press.



12. Inspect the bearing for wear. Spin the bearing, if the bearing does not spin smoothly, replace it. To remove the bearing, press the bearing off the shaft.



13. Inspect the cam (helix) assembly bushing for wear. If the bushing is worn or the shaft does not fit snug into the bushing, replace the cam (helix) assembly.



Bushing Service

IMPORTANT: Special Tools Required

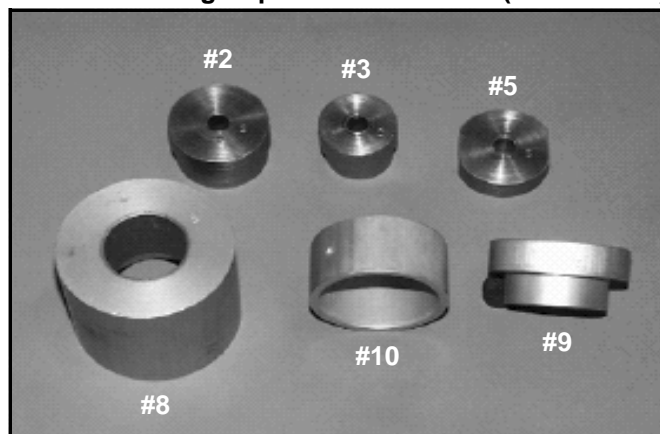
EBS Clutch Bushing Tool Kit - 2201379

Item	Qty.	Part Description	Part #
A, B	1	EBS Puller Tool	5132027
C	1	EBS Puller Nut	5132501
D	1	EBS Main Adapter	5132029
E	1	EBS Bushing Removal Tool	5132028
--	1	Instructions	9915111

Additional Special Tools

Qty.	Part Description	Part #
1	Clutch Bushing Replacement Tool Kit	2871226
1	Piston Pin Puller	2870386

*Clutch Bushing Replacement Tool Kit (PN 2871226)



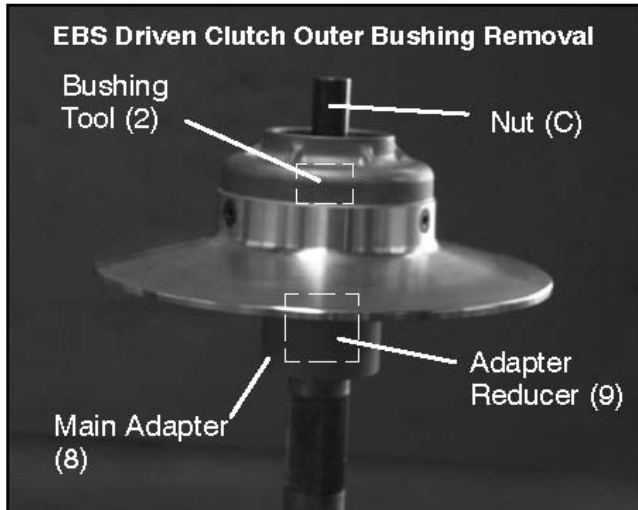
Item	Qty.	Part Description	Part #
#2	1	P-90 Drive/Driven Clutch Bushing Install Tool	5020628
#3	1	Drive Clutch Cover Bushing Removal/Installation Tool (all clutches)	5020629
#5	1	P-90 Driven Clutch Cover Bushing Removal Tool	5020631
#8	1	Main Puller Adapter	5020632
#9	1	Adapter Reducer	5010279
#10	1	Number Two Puller Adapter	5020633

NOTE: Bushings are installed at the factory using Loctite™ 609. 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.

CLUTCHING

Clutch Bushing Removal

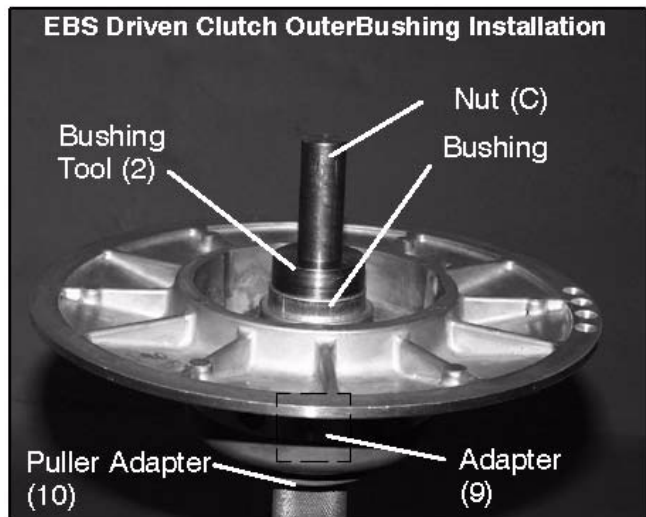
1. Install main puller adapter (Item 8) onto puller.
2. Install adapter reducer (Item 9).
3. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.
4. Flip sheave over so bushing faces downward and install onto puller.
5. Install bushing tool (Item 2).



6. Install left hand nut (C) and spacer onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
7. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.
8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove adapters from puller.
10. Remove bushing and removal tool from adapters. Discard bushing.

Clutch Bushing Installation

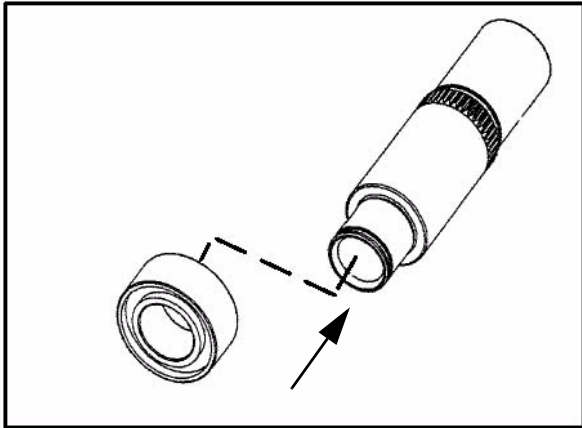
1. Install puller adapter (Item 10) onto puller.
2. Install adapter (Item 9) onto puller.



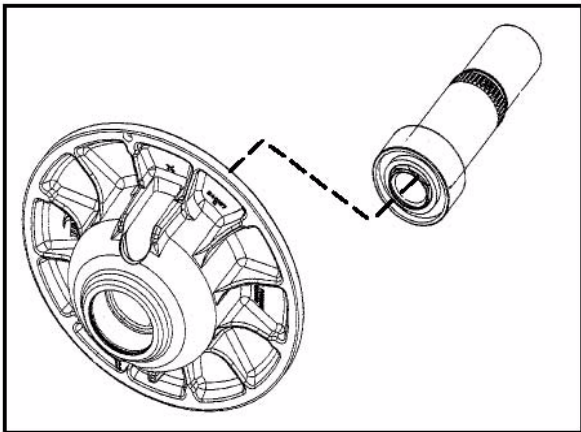
3. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
4. Install sheave face down on puller.
5. Install new bushing on installation tool (Item 2) and install assembly into sheave.
6. Install left hand thread nut (C) onto puller rod and hand tighten against installation tool.
7. Turn clutch sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.
8. Remove nut (C) from puller rod and set aside.
9. Remove installation tool and clutch sheave from puller.

Clutch Assembly

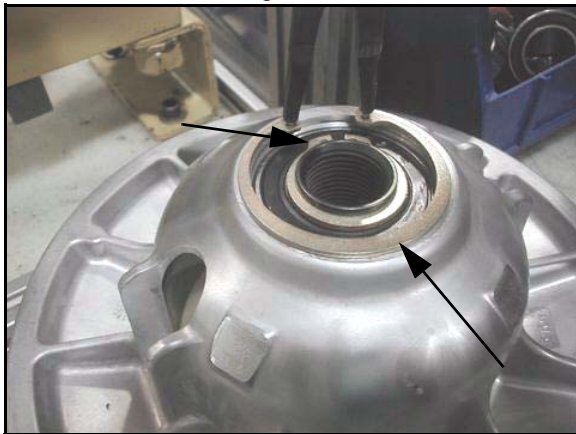
1. Install a new bearing onto the output shaft using a press.



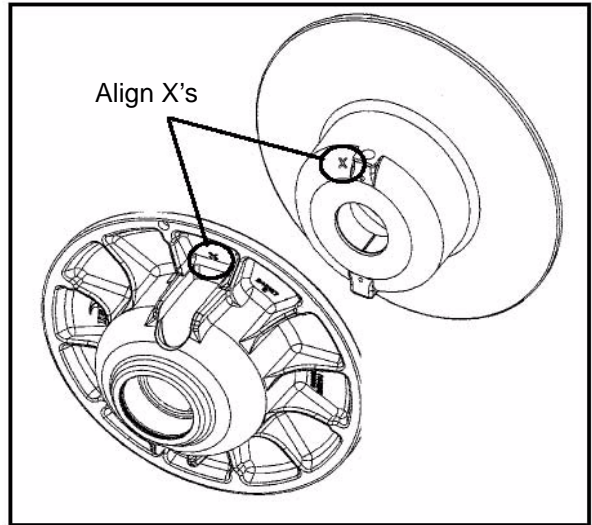
2. Install the shaft/bearing into the outer sheave.



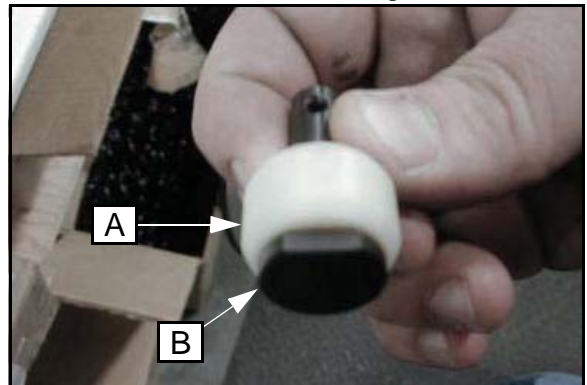
3. Install the small and large retaining rings into the outer sheave above the bearing.



4. Line up the "X" on the moveable sheave with the "X" on the stationary sheave or use the marks previously used. Put the sheaves together.

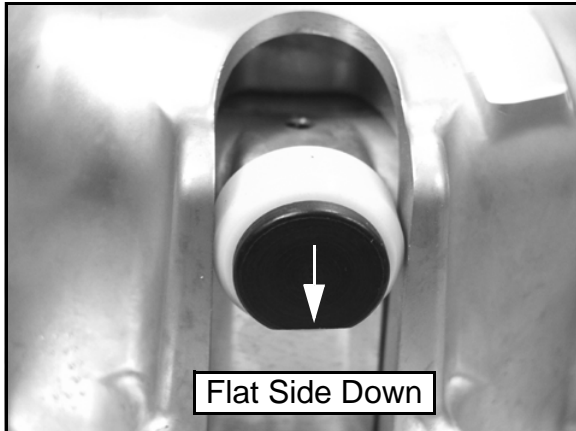


5. Install the roller (A) onto the roller pin (B) on both sides.

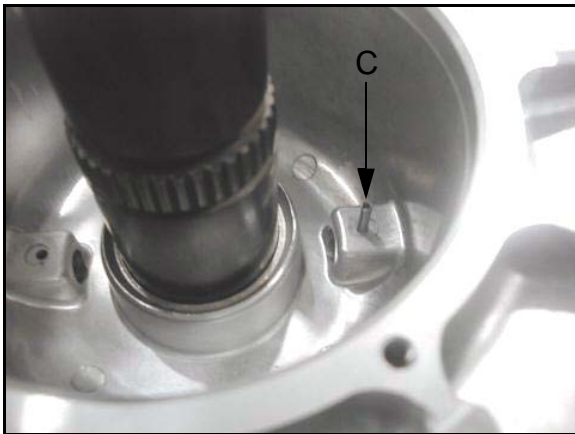


CLUTCHING

6. Install the roller pin into the sheave assembly on both sides. The flat side of the roller pin faces downward when the shaft side is laying flat on the bench.



7. Install the spring pins (C) to secure the roller pins. Install until flush with sheave surface.



8. Install the spacer washer.

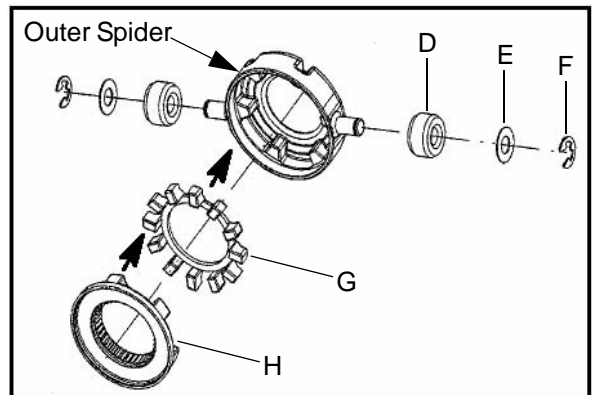


9. Install the spring over the shaft.

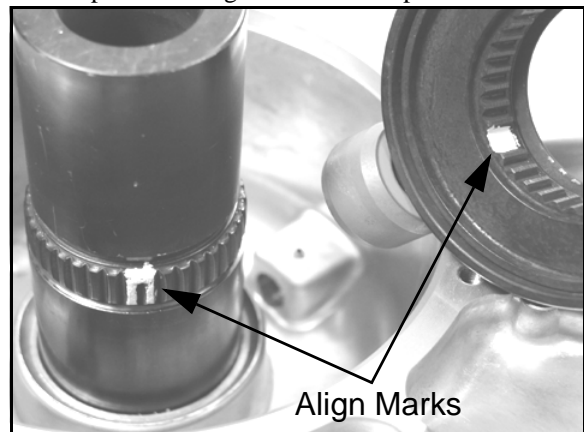


10. Install the clutch rollers (D) onto each side of the outside spider. Install the washers (E) and E-clips (F) to secure the rollers. The rollers should spin freely.

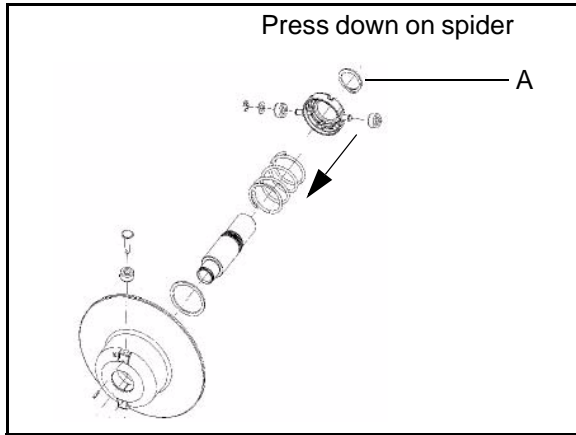
11. Install the spider dampener (G) inside the outer spider and install the inside spider plate (H).



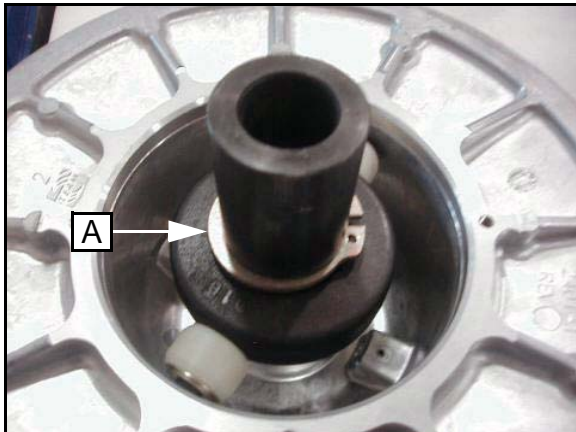
12. Install the spider assembly onto the shaft with the retaining ring on top of the spider. **NOTE:** Use the marks previously made to align the skip tooth spider, or use the "X" on top of the spider and align it with the skip tooth on the shaft.



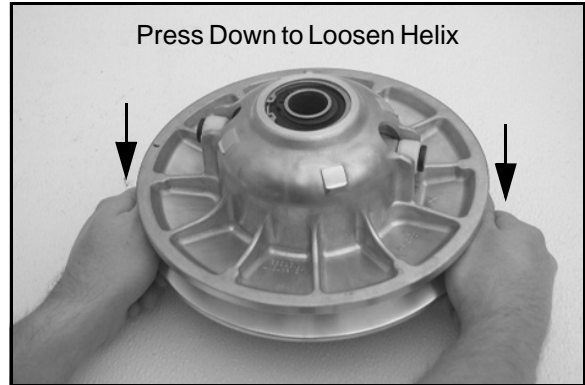
13. Place the clutch into Clutch Compression Tool PN 8700220. Using Compression Extensions PN PS-45909, press down on the top of the spider assembly, pushing the spider onto the shaft.



14. Slowly compress the spider into place. If the spider appears to bind while compressing, stop and make sure the skip tooth on the shaft and the spider are aligned. Once the spider passes the retaining ring notch on the shaft, install the retaining ring (A).



15. Install the cam (helix) assembly over the shaft. Line up the "X" on the cam, "X" on spider, and "X" on the stationary sheave or use the marks previously made before disassembly. **NOTE:** If the cam assembly (helix) is difficult to install, be sure the sheaves are aligned. To align the sheaves place the clutch assembly on a flat surface with the cam assembly (helix) side down. Press down on the moveable sheave belt face with both hands and the helix will release.



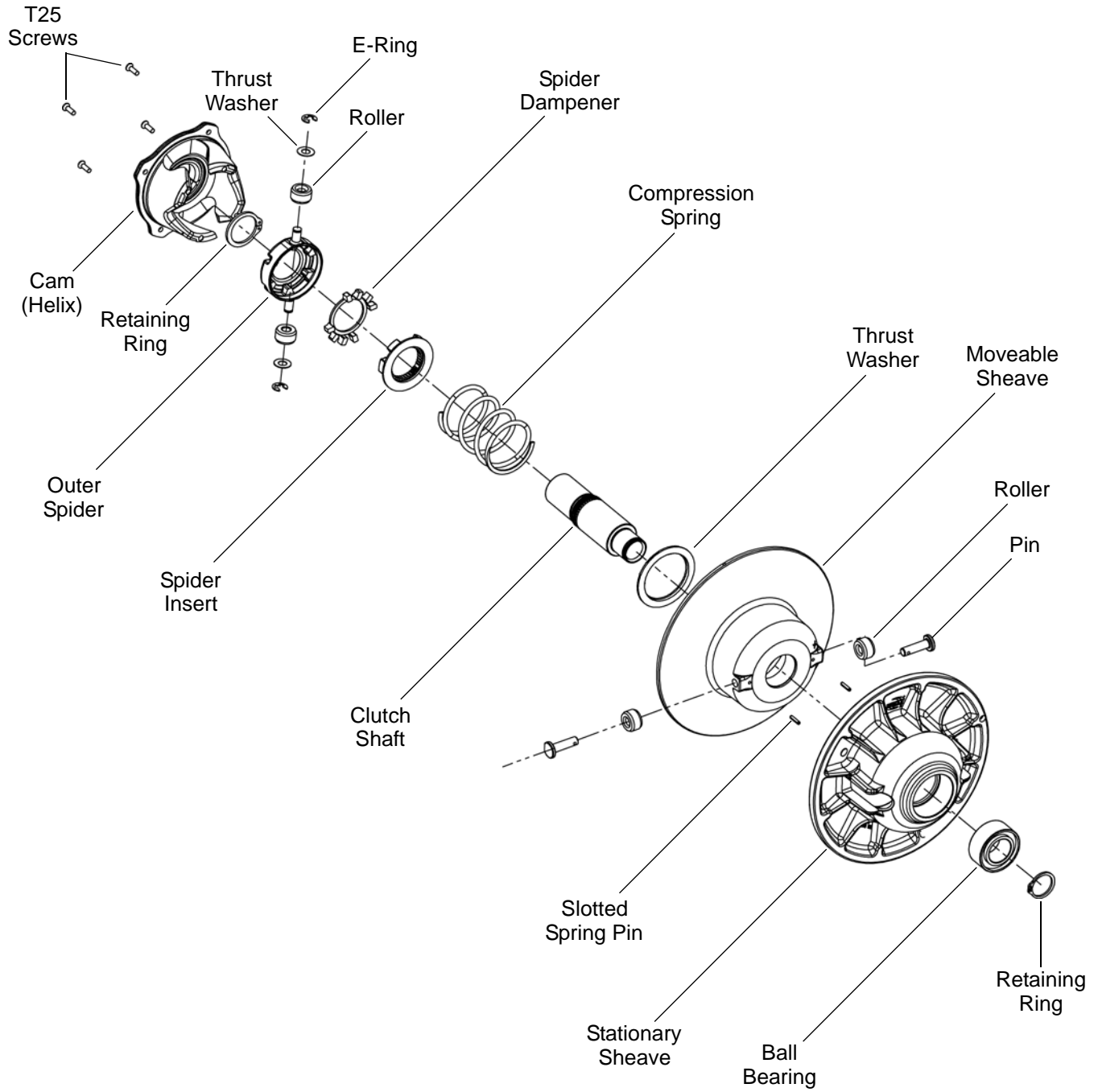
16. Use a T25 torx driver to install the four torx screws and torque to specification.



T25 Torx:
42-52 in. lbs. (4.75 - 5.88 Nm)

CLUTCHING

Exploded View



TROUBLESHOOTING

Situation	Probable Cause	Remedy
Engine RPM below specified operating range, although engine is properly tuned.	<ul style="list-style-type: none"> -Wrong or broken drive clutch spring. -Drive clutch shift weight too heavy. -Driven clutch spring broken or installed in wrong helix location. 	<ul style="list-style-type: none"> -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.	<ul style="list-style-type: none"> -Drive clutch binding. -Belt worn unevenly - thin / burnt spots. -Driven clutch malfunction. -Sheave face grooved. 	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> -Incorrect drive clutch spring (too high spring rate). -Drive clutch shift weights incorrect for application (too light). -Drive clutch binding. -Driven clutch binding. -Converter sheaves greasy; belt slippage. 	<ul style="list-style-type: none"> -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.	<ul style="list-style-type: none"> -Drive belt worn too narrow. -Excessive belt / sheave clearance with new belt. 	<ul style="list-style-type: none"> -Replace belt. -Perform belt / sheave clearance adjustment with shim washers beneath spider.
Drive belt turns over	<ul style="list-style-type: none"> -Wrong belt for application. 	<ul style="list-style-type: none"> -Replace with correct belt.
Belt burnt, thin spots	<ul style="list-style-type: none"> -Abuse (continued throttle application when vehicle is stationary, excess load) -Dragging brake -Slow, easy clutch engagement 	<ul style="list-style-type: none"> -Caution operator to operate machine within guidelines. -Inspect brake system. -Fast, effective use of throttle for efficient engagement.

CLUTCHING

Troubleshooting, Continued.....

Situation	Probable Cause	Remedy
PVT cover overheating (melting)	<ul style="list-style-type: none"> -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. 	<ul style="list-style-type: none"> -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	<ul style="list-style-type: none"> -Cover seals or ducts leaking -Operator error 	<ul style="list-style-type: none"> -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	<ul style="list-style-type: none"> -Belt worn out -Water ingestion -Belt contaminated with oil or grease 	<ul style="list-style-type: none"> -Replace belt. -Inspect and seal PVT system. -Inspect and clean.
PVT noise	<ul style="list-style-type: none"> -Belt worn or separated, thin spots, loose belt -Broken or worn clutch components, cover hitting clutches 	<ul style="list-style-type: none"> -Replace belt. -Inspect and repair as necessary.
Engagement erratic or stabby	<ul style="list-style-type: none"> -Thin spots on belt, worn belt -Drive clutch bushings stick 	<ul style="list-style-type: none"> -Replace belt. Refer to belt burnt troubleshooting and instruct operator. -Inspect and repair clutches.

CHAPTER 7

FINAL DRIVE

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FINAL DRIVE

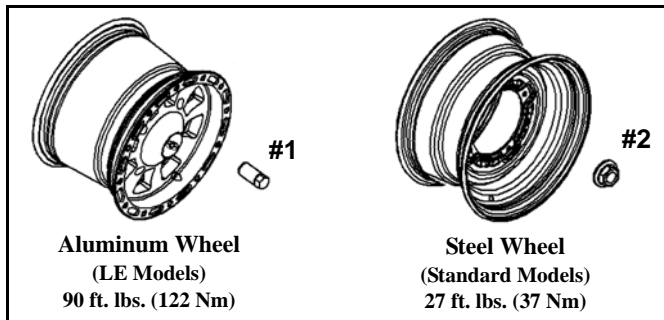
SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2872608	Roller Pin Removal Tool
8700226	CV Boot Clamp Pliers (earless type)

TORQUE SPECIFICATIONS

Wheel, Hub, and Spindle Torque Table

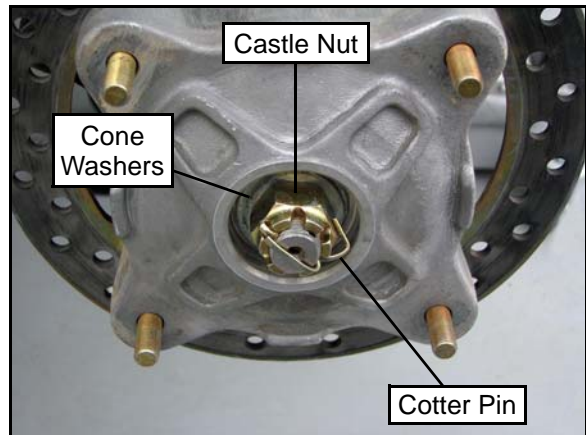
ITEM	NUT TYPE	SPECIFICATION
Aluminum Wheels (Cast)	Lug Nut (1)	90 ft. lbs. (122 Nm)
Steel Wheels (Black / Camo)	Flange Nut (2)	27 ft. lbs. (37 Nm)
Front Hub Castle Nut	-	80 ft. lbs. (108 Nm)
Rear Hub Castle Nut	-	80 ft. lbs. (108 Nm)



- 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.



- Remove the (4) wheel nuts and remove the front wheel.
- 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.



- Remove the steering tie rod end fastener from the front bearing carrier.



FRONT BEARING CARRIER

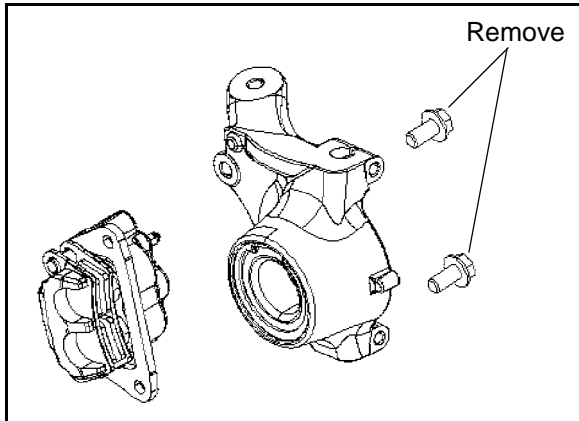
Bearing Carrier Inspection / Removal

- Elevate front of vehicle and safely support machine under the frame area.

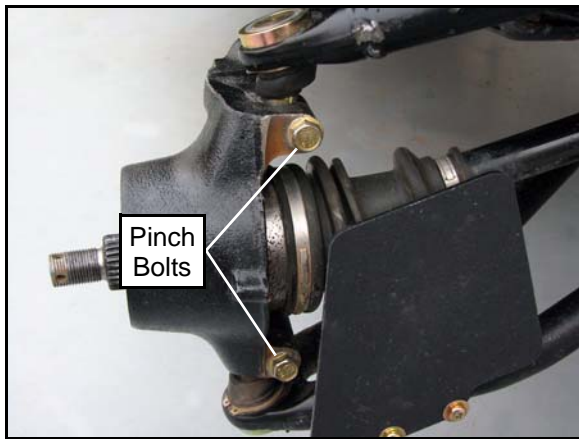
⚠ CAUTION

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.

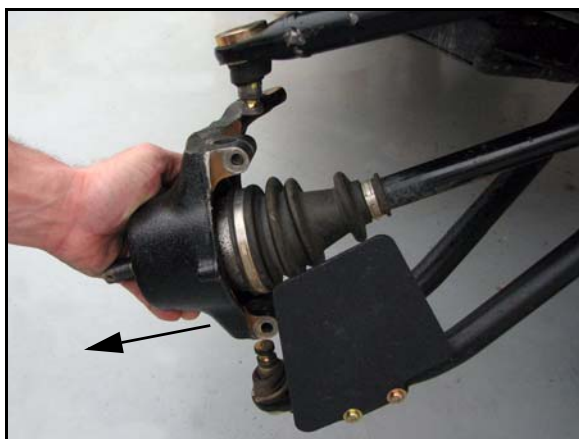
- Remove the two brake caliper mounting bolts.
CAUTION: Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.



- Remove the front wheel hub assembly.
- Remove the upper and lower ball joint pinch bolts.



- Using a soft faced hammer, lightly tap on the bearing carrier while removing the upper and lower ball joint ends.
- Remove the bearing carrier from the front drive shaft.



- Rotate bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion.

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.

- Replace bearing if moisture, dirt, corrosion, or roughness is evident.

Bearing Replacement

Bearing Removal

- Remove outer snap ring.



- From the back side of the bearing carrier, tap on the outer bearing race with a drift punch in the reliefs as shown.



- 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.
- Inspect the bearing carrier housing for scratches, wear or damage. Replace front bearing carrier if damaged.

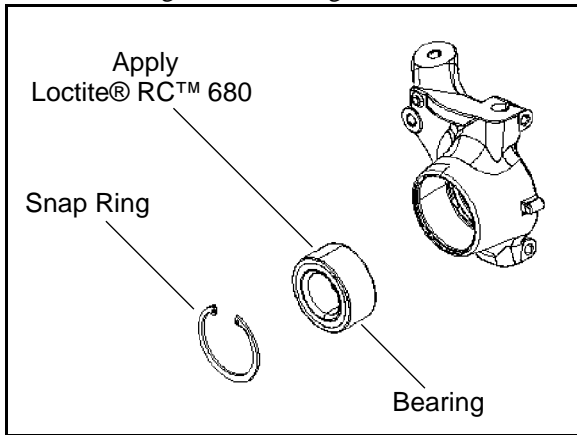
FINAL DRIVE

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.
6. Support the bottom of the bearing carrier housing.

 **CAUTION**
Use an arbor and press only on the outer race, otherwise bearing damage may occur.

7. Apply **Loctite® RC™ 680** to the outer circumference of the new bearing race and carefully press the new bearing into the bearing carrier housing.

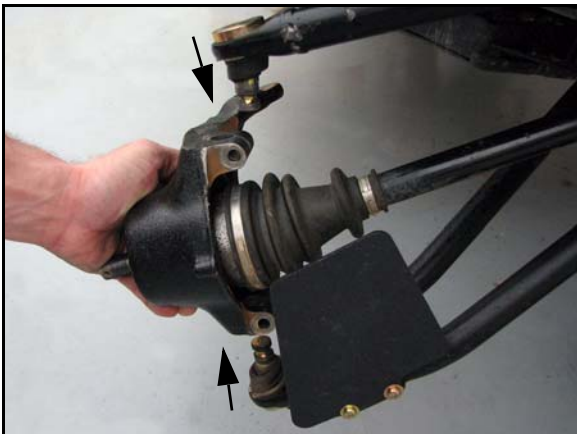


NOTE: Use care to not allow any of the Loctite® compound to get in the bearing.

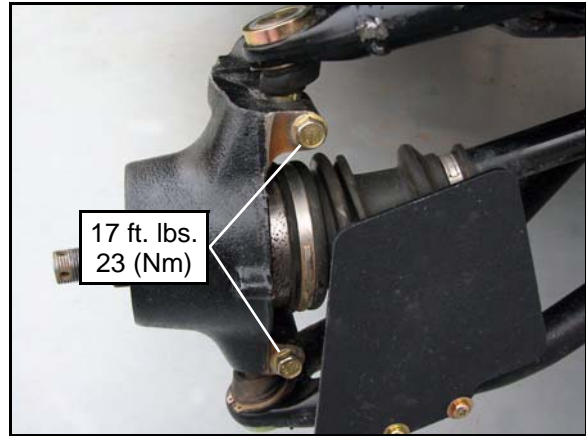
8. Wipe the housing clean of any excess compound and install the snap ring.


Bearing Carrier Installation

1. Install drive shaft axle through the backside of the bearing carrier.
2. Install the upper and lower ball joint ends into the front bearing carrier.



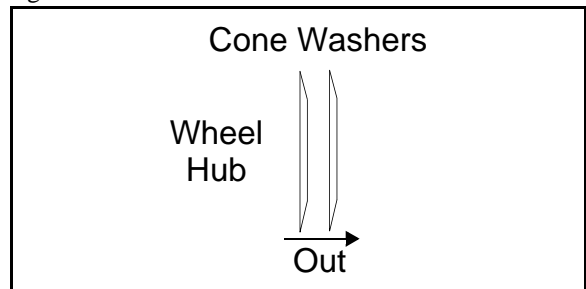
3. Install pinch bolts and torque to **17 ft. lbs. (23 Nm)**.



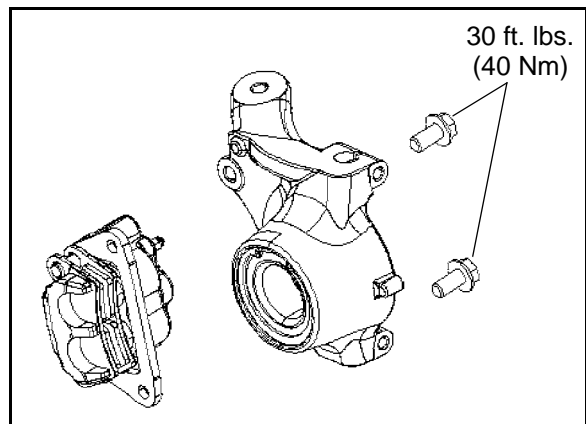
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Pinch Bolt Torque:
17 ft. lbs. (23 Nm)

4. Apply grease to drive shaft axle splines.
5. Install front wheel hub assembly, cone washers, and hand tighten the castle nut. Install washers with domed side out.




6. Install brake caliper mounting bolts and torque to **30 ft. lbs. (40 Nm)**.



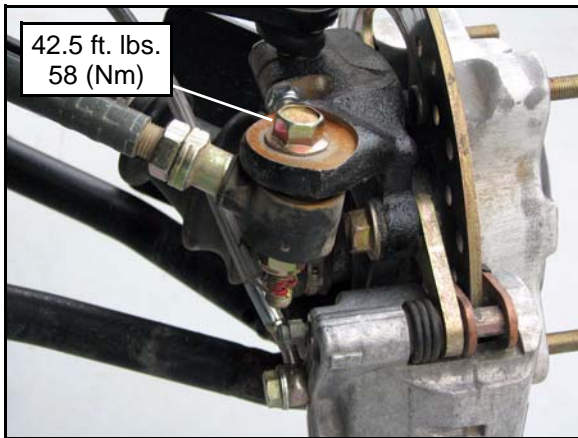
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Front Caliper Mounting Bolt Torque:
30 ft. lbs. (40 Nm)

 **CAUTION**

New bolts have a pre-applied locking agent which is destroyed upon removal. Always use new brake caliper mounting bolts upon assembly.

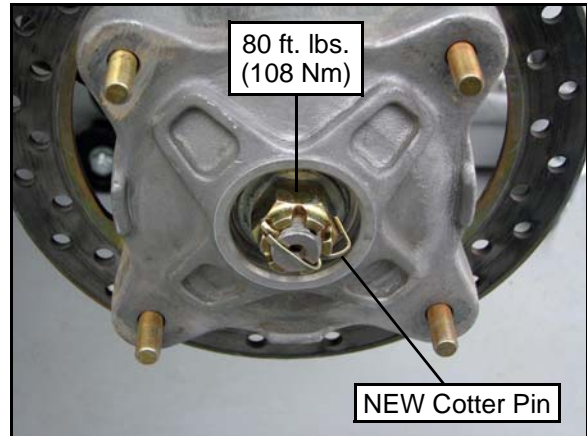
7. Install the steering tie rod end onto the front bearing carrier and torque fastener to **42.5 ft. lbs. (58 Nm)**.




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Tie Rod End Fastener Torque:
42.5 ft. lbs. (58 Nm)


Torque wheel hub nut to **80 ft. lbs. (108 Nm)** and install a **NEW** cotter pin. Tighten nut slightly if necessary to align cotter pin holes.



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Wheel Hub Castle Nut Torque:
80 ft. lbs. (108 Nm)

8. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.

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Wheel Nut Torque:
Steel Wheels: 27 ft. lbs. (37 Nm)
Aluminum Wheels: 90 ft. lbs. (122 Nm)

9. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around end of spindle in different directions.

FINAL DRIVE

FRONT DRIVE SHAFT

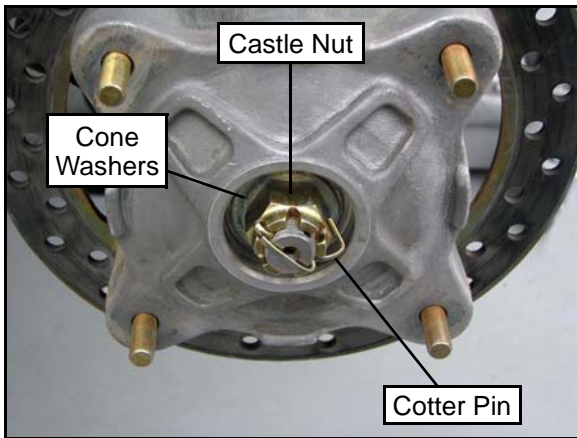
Drive Shaft Removal

1. Elevate front of vehicle and safely support machine under the frame area.

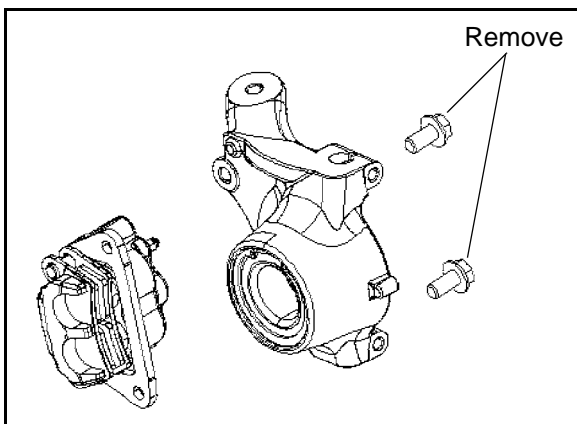


Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Remove the (4) wheel nuts and remove the front wheel.
3. 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.

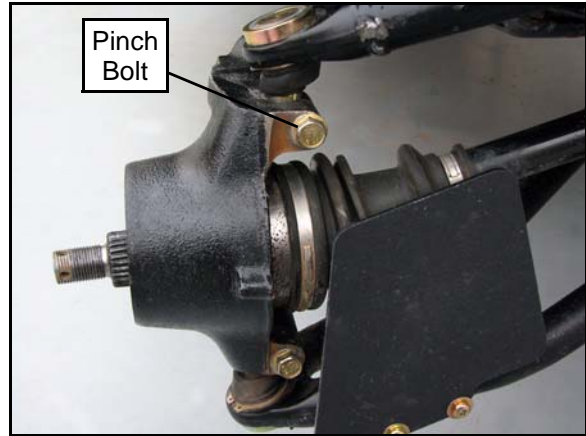


4. Remove the two brake caliper mounting bolts. **CAUTION:** Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.



5. Remove the front wheel hub assembly.

6. Remove the upper ball joint pinch bolt.



7. Using a soft faced hammer, lightly tap on the bearing carrier while removing the upper ball joint end.
8. Remove the drive shaft from the front bearing carrier.



9. With a short, sharp jerk, remove drive shaft from the front gearcase.



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.

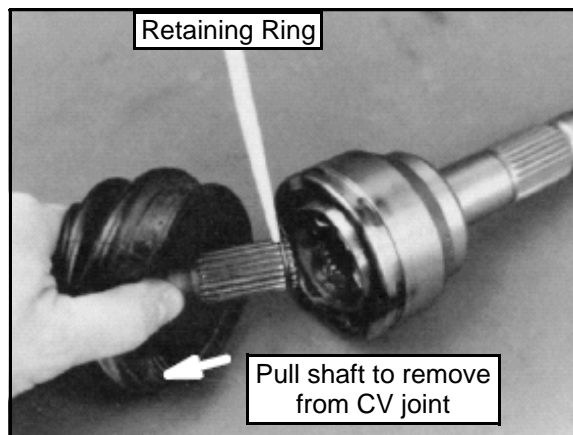
CV Joint / Boot Replacement

1. Remove clamps from rubber boot using the proper boot clamp pliers.

**CV Boot Clamp Pliers:
Earless Type - 8700226**

2. Remove the large end of the boot from the CV joint and slide the boot back.
3. Separate the outer wheel end of the CV joint assembly from the axle shaft by pulling the shaft sharply outward, away from the CV joint.

4. It may be necessary to tap the CV joint assembly outward with a soft faced hammer.



5. Remove the small clamp and boot from the drive shaft.

NOTE: If the vehicle has been operated with a damaged boot, the CV joint grease may be contaminated. Inspect the grease carefully for contamination and clean the joint thoroughly if necessary.

6. Refer to information below or **Figure 7-8** for grease capacity requirements.

Boot Replacement Grease Requirement:

Grease Service Kits

PN 1350059 - 20g

PN 1350046 - 30g

PN 1350047 - 50g

Inner Plunging Joint:

Boot replacement only - 45g

Boot replacement w/joint cleaning - 90g

Outer CV Joint:

Boot replacement only - 45g

Boot replacement w/joint cleaning - 90g

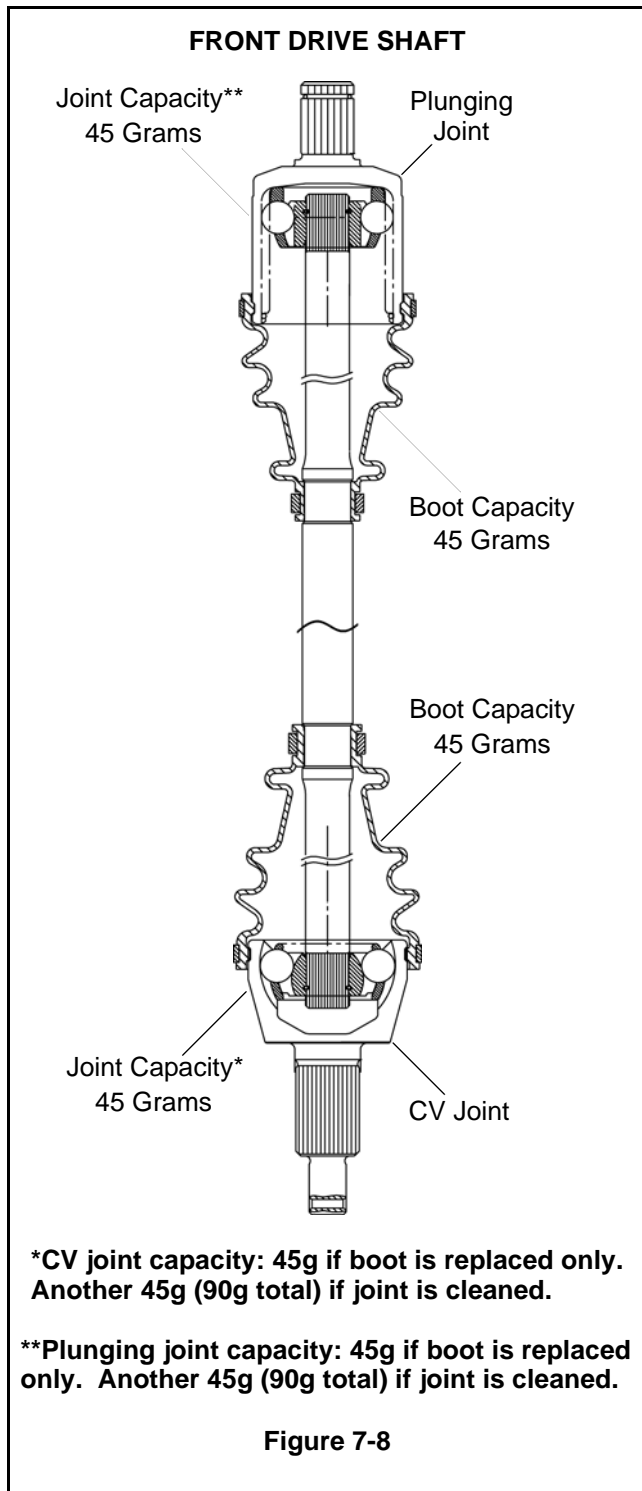
7. Before installing the new boot, remove all grease from the boot area and shaft.

NOTE: It is very important to use the correct type and quantity of grease by using the grease contained in the boot kit. DO NOT use a substitute grease and DO NOT overfill or under fill the CV joint.

8. Slide the new clamp and boot (small end first) over the splined shaft, then slide (tap) the CV joint into the splines of the axle. Install small boot clamp.

FINAL DRIVE

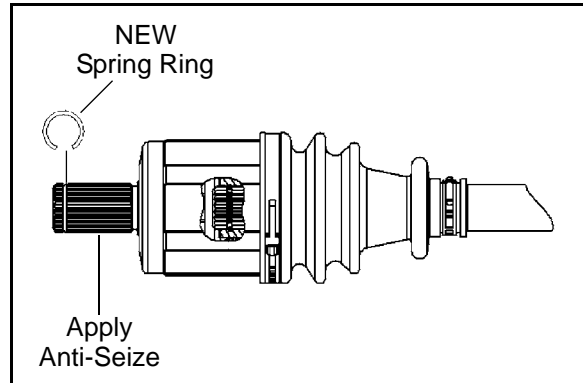
9. Add grease through large end of boot.
10. Position large end of boot on CV joint, purge excess air by partially compressing axle into CV bell. Lift one edge of boot to let out excess air. Secure the CV boot with clamp.



11. Repeat this procedure to service the inner CV plunging joint.

Drive Shaft Installation

1. Install new spring ring on 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.



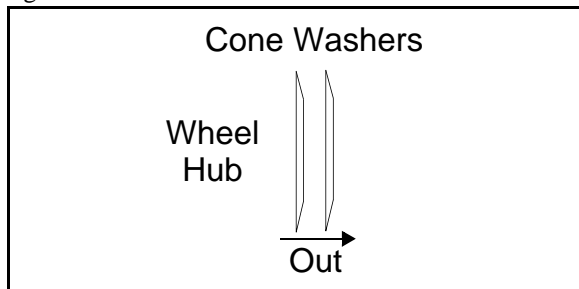
4. Install the upper ball joint end into the front bearing carrier.

5. Install the upper pinch bolt and torque to **17 ft. lbs. (23 Nm)**.

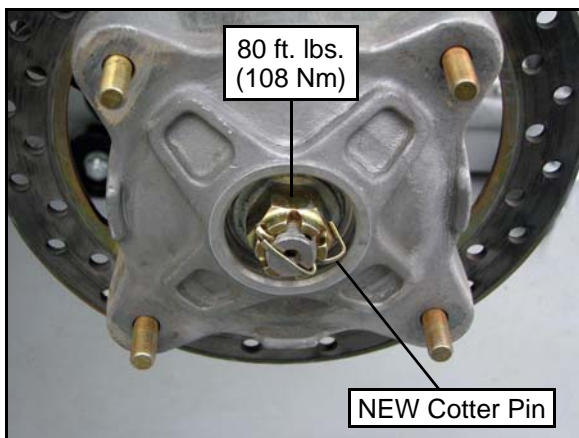



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Pinch Bolt Torque: 17 ft. lbs. (23 Nm)

6. Apply grease to drive shaft axle splines.
7. Install front wheel hub assembly, cone washers, and hand tighten the castle nut. Install washers with domed side out.

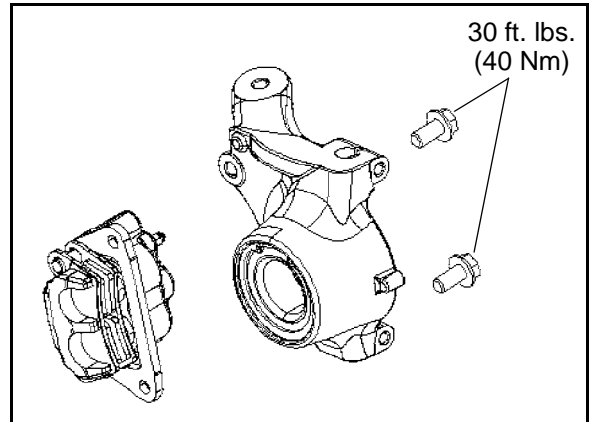



Torque wheel hub nut to **80 ft. lbs. (108 Nm)** and install a **NEW** cotter pin. Tighten nut slightly if necessary to align cotter pin holes.




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Wheel Hub Castle Nut Torque: 80 ft. lbs. (108 Nm)


Install brake caliper mounting bolts and torque to **30 ft. lbs. (40 Nm)**.



 = T
Front Caliper Mounting Bolt Torque: 30 ft. lbs. (40 Nm)

 CAUTION
New bolts have a pre-applied locking agent which is destroyed upon removal. Always use new brake caliper mounting bolts upon assembly.

8. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.

 = T
Wheel Nut Torque: Steel Wheels: 27 ft. lbs. (37 Nm) Aluminum Wheels: 90 ft. lbs. (122 Nm)

9. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around end of spindle in different directions.

FINAL DRIVE

PROPSHAFT SERVICE

Removal / Installation

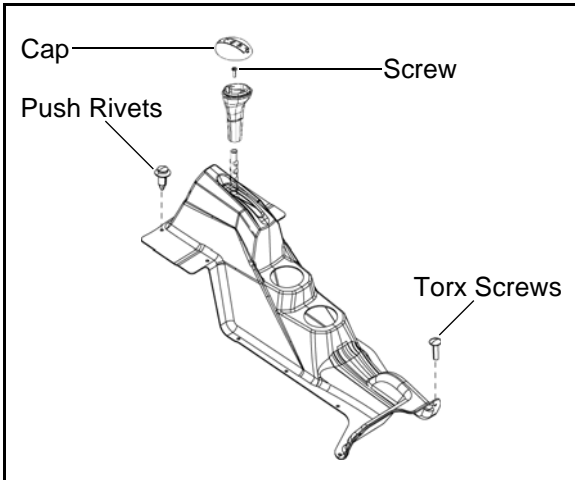
1. Locate the propshaft roll pin and use the Roll Pin Removal Tool (PN 2872608), to remove the roll pin.

NOTE: Front wheel can be removed to gain better access to the propshaft roll pin.



Roll Pin Removal Tool (PN 2872608)

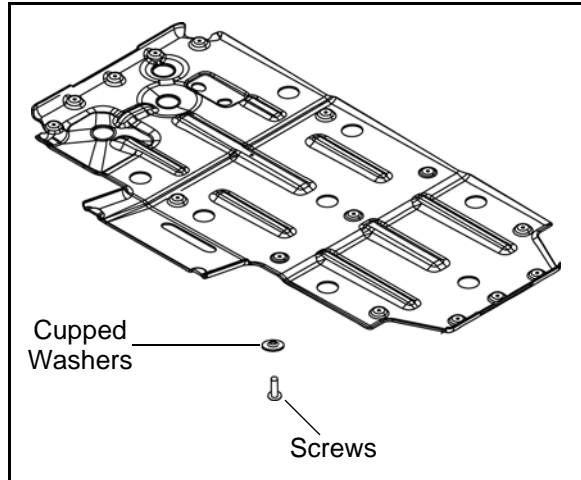
2. Remove the gear selector cap and remove the retaining screw.
3. Remove the push rivets and Torx screws retaining center console to access the propshaft.



4. Slide prop shaft back far enough to remove it from the front gearcase input shaft.
5. Pull sharply forward to remove it from transmission shaft.

NOTE: You may have to loosen the front gearcase mounting bolts to allow for propshaft removal.

6. Remove the fasteners retaining the plastic skid plate and remove the skid plate from the vehicle.



7. Remove the propshaft from the vehicle.
8. Reverse removal steps to reinstall propshaft. Use a NEW Roll Pin (Spring Pin) upon reassembly.

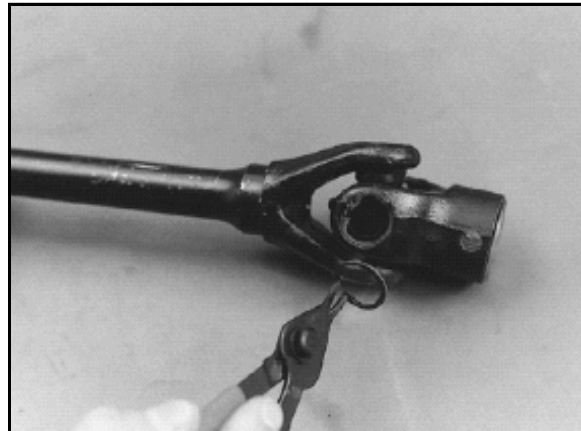
PROPSHAFT U-JOINT SERVICE

Disassembly

1. Remove internal or external snap ring from bearing caps.

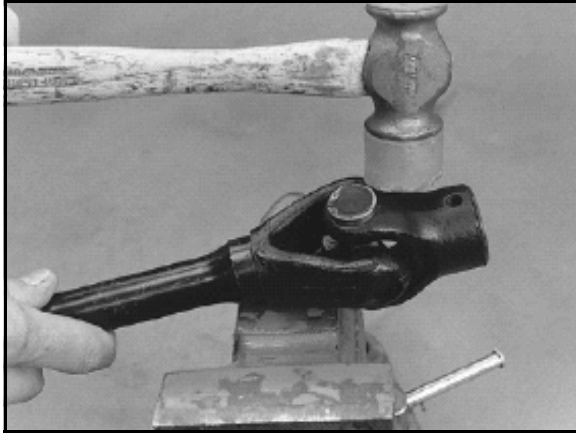
CAUTION

Always wear eye protection.

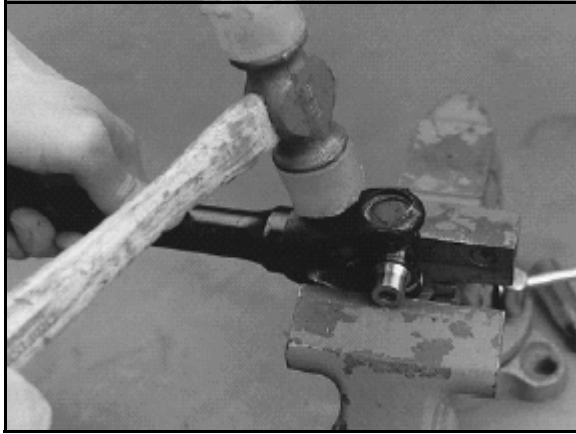


NOTE: If yoke or bearing is removed, cross bearing must be replaced. Note orientation of grease fitting and mark inner and outer yoke for correct repositioning during installation.

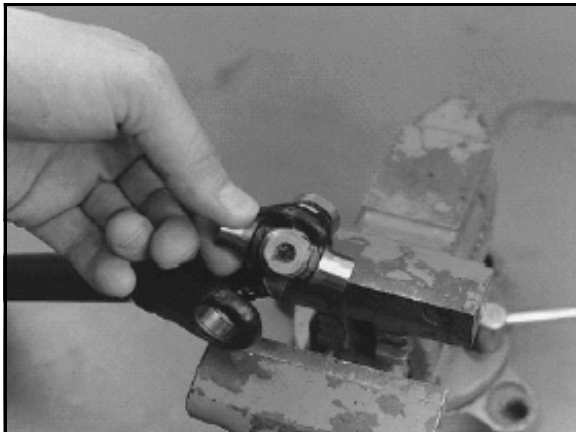
- Support inner yoke as shown and drive outer yoke down (bearing cap out) with a soft face hammer.



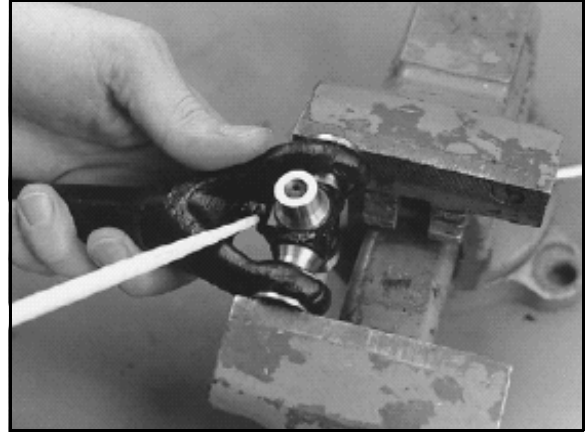
- Support U-joint in vise as shown and drive inner yoke down to remove remaining bearing caps.



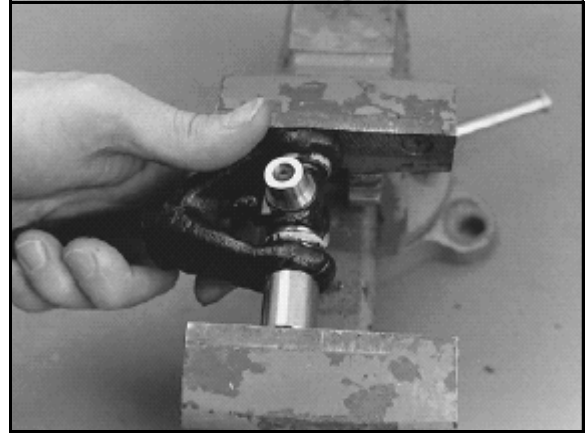
- Force U-joint cross to one side and lift out of inner yoke.



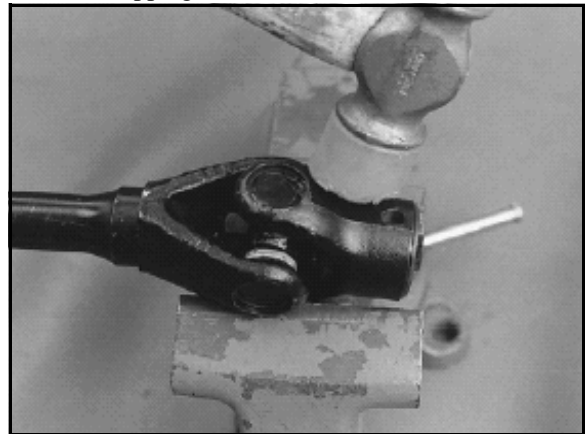
- Tighten vise to force bearing caps in.



- Using a suitable arbor, fully seat the bearing cap in one side. Continually check for free movement of bearing cross as bearing caps are assembled.



- Install snap ring to contain bearing cap just installed. Repeat procedure for other side.
- Install outer yoke, aligning marks made at disassembly and repeat Steps 1-3 to install bearing caps on outer yoke.
- Seat all bearing caps against snap rings by supporting cross shaft and tapping on each corner as shown.



- 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.

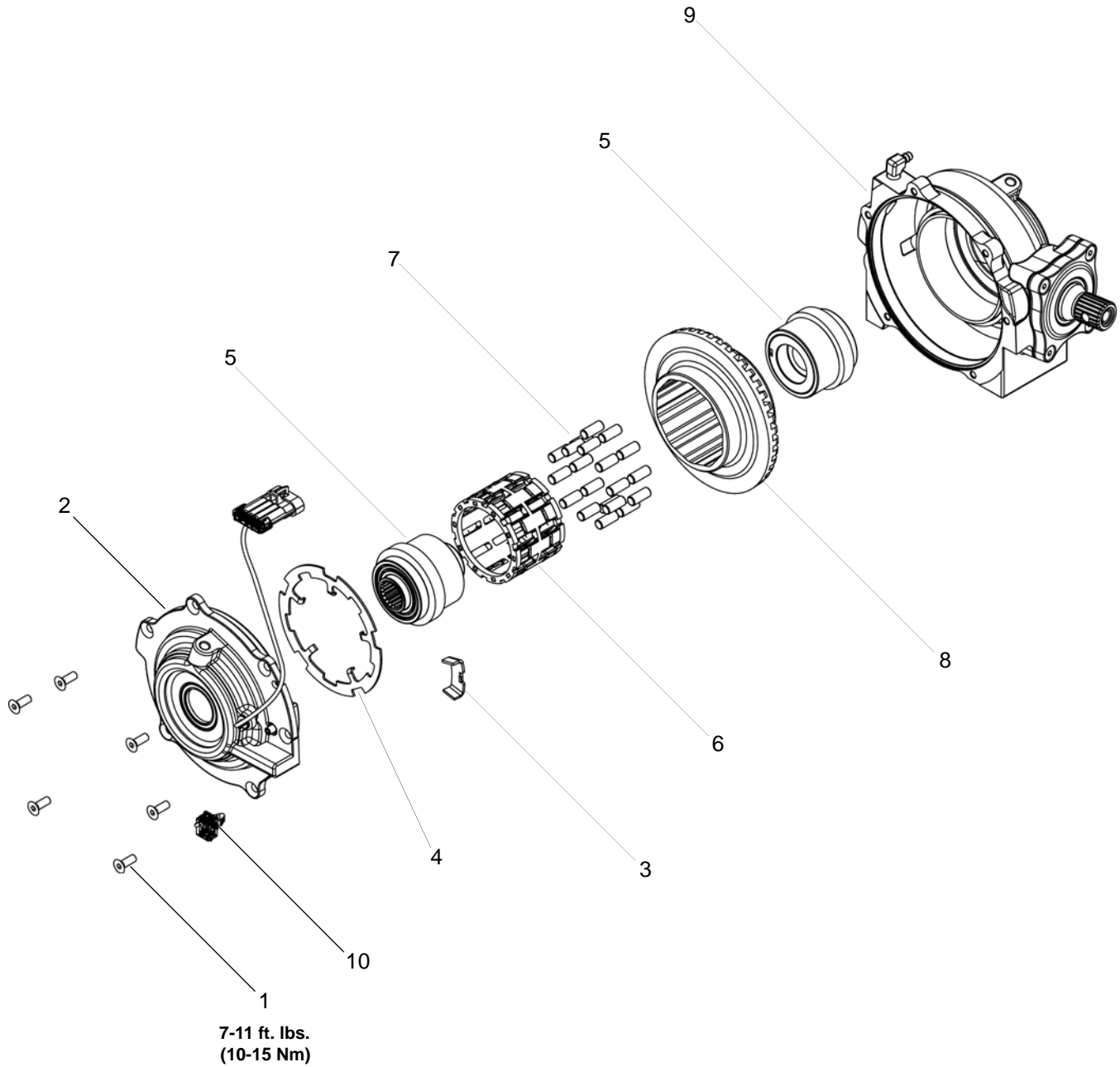
Assembly

- 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.

FINAL DRIVE

FRONT GEARCASE / CENTRALIZED HILLIARD

Centralized Hilliard Exploded View




REF#	DESCRIPTION	QTY	REF#	DESCRIPTION	QTY
1	Cover Screws	6	6	Roll Cage Assembly with H-Springs	1
2	Cover Plate Assembly	1	7	Rollers	20
3	Thrust Plate	1	8	Clutch Housing / Ring Gear	1
4	Armature Plate	1	9	Gearcase Housing	1
5	Output Hub Assembly	2	10	Wire Harness Retainer	1

All Wheel Drive Operation

Front Gearcase Engagement: The AWD switch may be turned on or off while the vehicle is moving. Initially, the vehicle's electronic system will not enable the AWD until the engine RPM is below 3100. Once enabled, AWD will remain engaged until the rear wheels regain traction and the propshaft speed matches the front axle speed .


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.

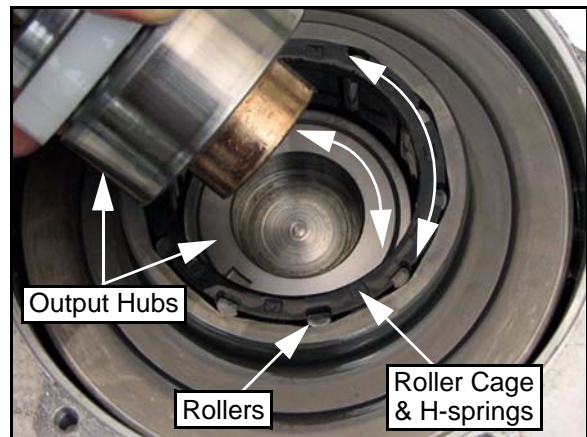
Normal Operation: With the AWD switch off the vehicle drives only the rear wheels (2 wheel drive). When the AWD switch is activated it electronically activates the Hilliard Clutch, and enables the front wheels to provide driving torque when needed.

4x4 Engagement: When the AWD switch is turned on, a 12 Vdc current charges the hub coil and creates a magnetic field. This magnetic field attracts an armature plate keyed to a roller cage that contains 20 rollers. The difference in rpm between the input shaft (propshaft) and the front axles, forces the rollers into the external cam of the Hilliard clutch assembly. The rollers are forced inward to engage themselves to the output hubs that link directly to both front axles, resulting in True All Wheel Drive.

 **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 clutch damage could result.

Roller cage and roller's rotate inward and grip the output hubs for AWD engagement.



Mechanical Disengagement: As the front and rear wheels gain traction, rotating very close to the same speed, the front wheels "overdrive" the output hubs and the rollers are forced outward, disengaging the AWD. The vehicle is now back to rear wheel drive until the rear wheels lose traction again.

FINAL DRIVE

AWD Diagnosis

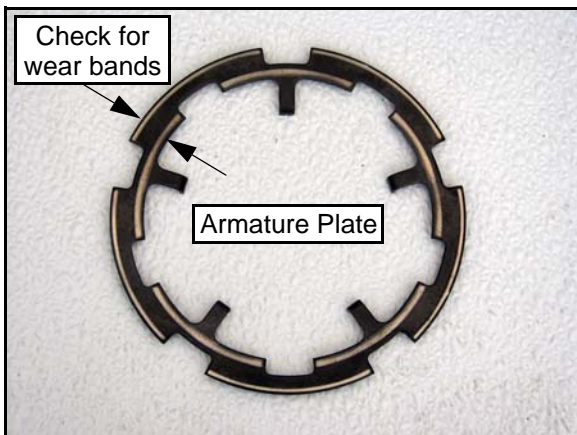
Symptom: AWD Will Not Engage

1. Check the gearcase coil resistance. To test the coil resistance, measure between the Grey and Brown/White wires. The measurement should be within specification.

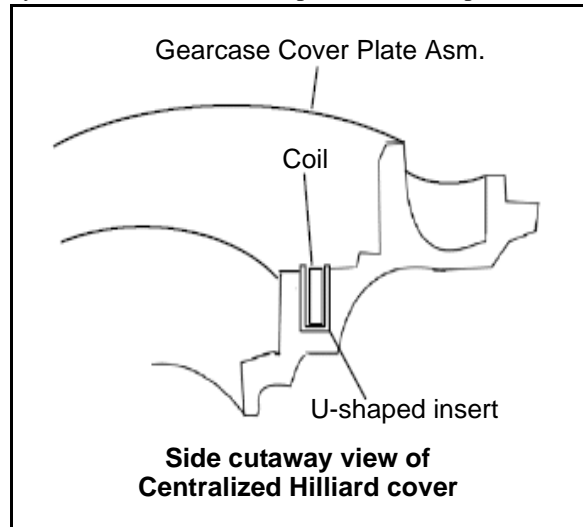


Front Gearcase Coil Resistance:
21.6 - 26.4 Ohms

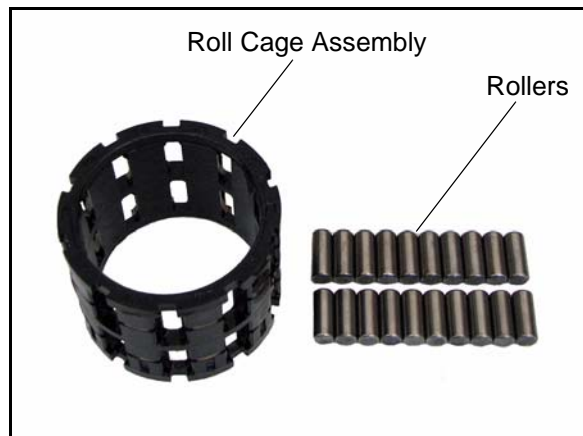
2. Turn the ignition and AWD switches on and place gear selector in High or Low gear. Check for minimum battery voltage at the Gray and Brown/White chassis wires that power the coil. A minimum of 11 Vdc should be present.
3. If electrical tests are within specification, remove gearcase (see "Gearcase Removal") and inspect components.
4. Inspect the 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. See the following illustrations:



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.



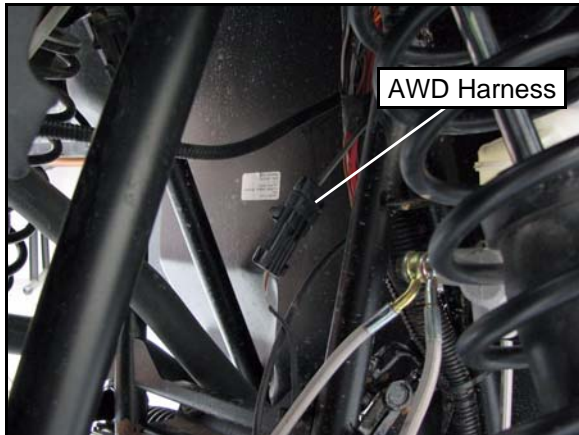
6. Inspect the rollers for nicks and scratches. The rollers must slide up, down, in and out freely within the roll cage sliding surfaces and H-springs.



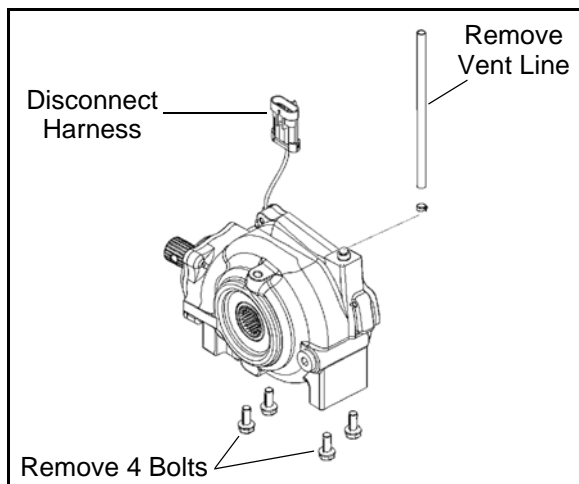
7. Inspect the roll cage assembly for cracks or excessive wear. If damaged, replace the roll cage assembly.

Gearcase Removal

1. Stop engine and place gear selector in Park.
2. Refer to “FRONT DRIVE SHAFT - Drive Shaft Removal” and remove both front drive shafts from the front gearcase.
3. Remove the propshaft (see “PROPSHAFT SERVICE”).
4. Disconnect the wire harness above the front gearcase and remove the harness from the retaining dart.



5. Remove the vent line from the front gearcase.
6. Remove the (4) bolts securing the front gearcase to frame.

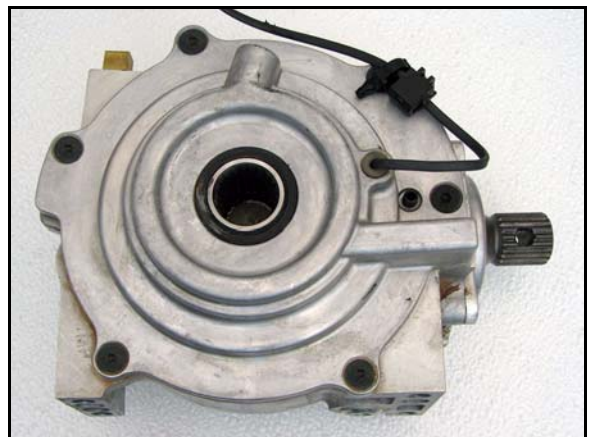


7. Remove the gearcase from the front LH wheel well area and slide it between the upper and lower A-arm.

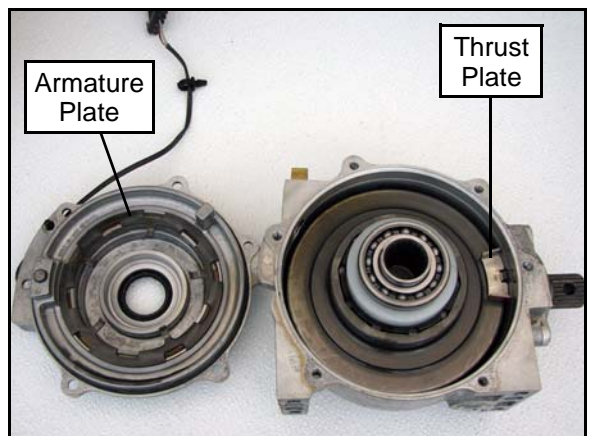


Gearcase Disassembly / Inspection

1. Drain and properly dispose of gearcase fluid. Remove any metal particles from the drain plug magnet.
2. Remove the (6) cover screws and remove the cover plate.



3. Check the gearcase coil resistance (see “AWD Diagnosis”). The resistance value should meet the specification.
4. Remove and inspect the armature plate and thrust plate. Refer to “AWD Diagnosis” for detailed inspection process.



FINAL DRIVE

NOTE: The backlash for the centralized hilliard is set at the factory. No adjustment is required unless the cover plate assembly is replaced, or the backlash adjustment screw is removed. See the "Backlash Adjustment" procedure later in this chapter for details on backlash setting.

5. Remove the LH output hub assembly from the clutch housing.



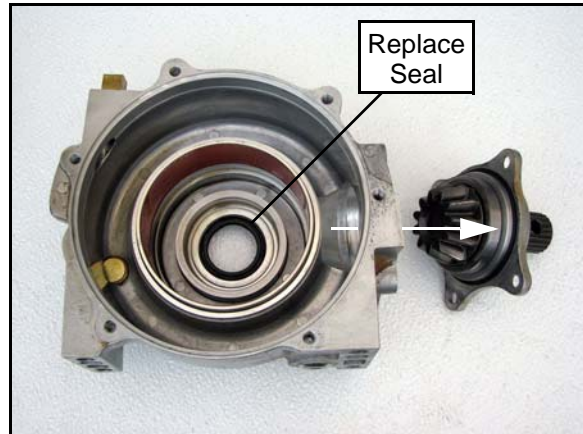
6. Remove the clutch housing from the gearcase housing.



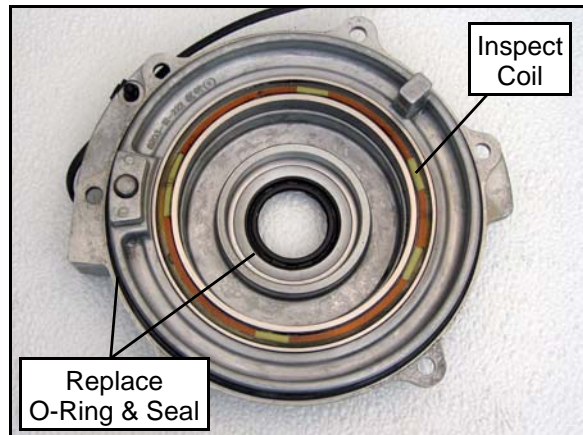
7. Remove the RH output hub assembly from the gearcase housing.



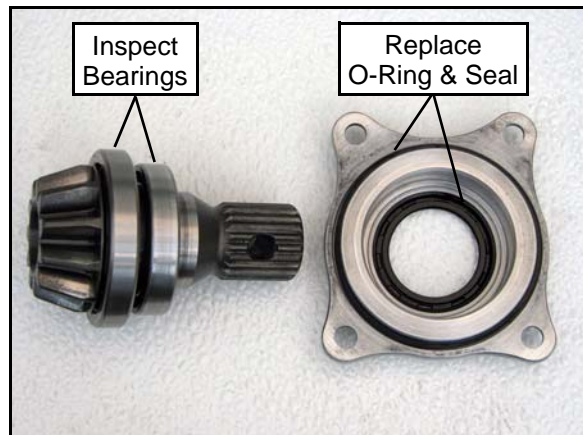
8. Remove the (4) screws retaining the pinion shaft assembly and remove the assembly from the gearcase housing. Inspect and clean the gearcase housing and replace the seal.



9. Clean and inspect all parts. Check for excessive wear or damage.
10. Inspect the coil located in the cover plate assembly. Refer to "AWD Diagnosis" for detailed inspection process. Replace the cover plate seal and O-ring.



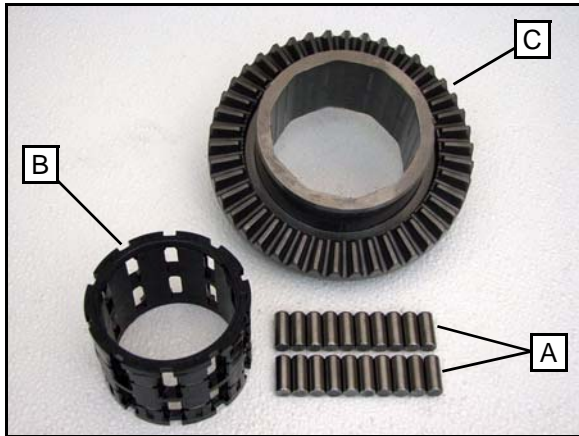
11. Disassemble the pinion shaft assembly. Inspect the bearings and replace if needed. Replace the pinion cover seal and O-ring.



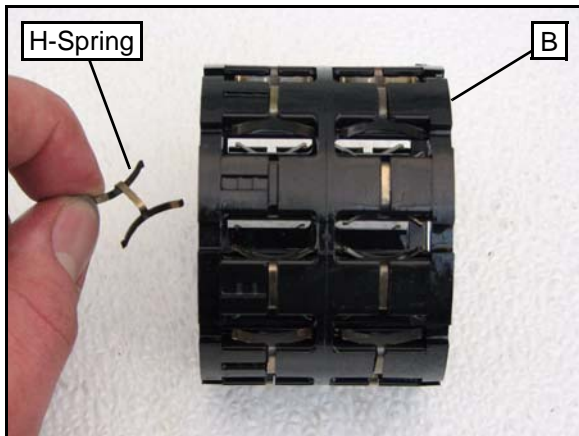
- Remove the roll cage assembly and rollers from the clutch housing. Use a shop towel to cover the housing in order to retain all the rollers.

NOTE: Rollers are spring loaded. Take care not to allow them to fall out or lose them upon removal of the roll cage.

- 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 sliding surfaces and H-springs.

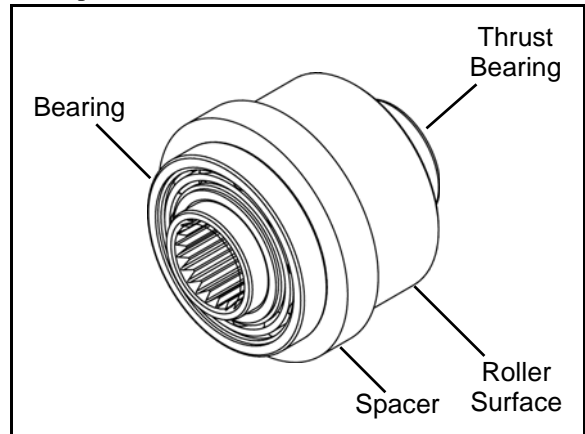


- Inspect the roll cage assembly (B) sliding surfaces and H-springs. The sliding surfaces must be clean and free of nicks, burrs or scratches. If damaged, replace the roll cage assembly.



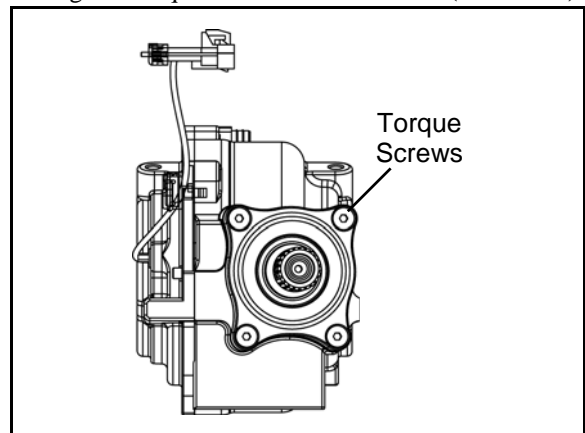
- Inspect clutch housing ring gear (C) for a consistent wear pattern. Inspect the ring gear for chipped, broken, or missing teeth.

- Inspect both output hub assemblies. Inspect the bearings and replace if needed.



Gearcase Assembly / Inspection

- As mentioned during gearcase disassembly section, replace all O-rings, seals, and worn components.
- Press the pinion shaft seal into the pinion cover, until the seal is flush with the sealing surface.
- If bearing replacement was required, press new bearings on to the pinion shaft assembly.
- Install pinion shaft, bearings, and pinion cover with new O-ring and torque screws to **7-11 ft. lbs. (10-15 Nm)**.



Pinion Cover Screw Torque:

7-11 ft. lbs. (10-15 Nm)

FINAL DRIVE

5. Carefully install the rollers into the roll cage assembly while installing the assembly into the clutch housing.

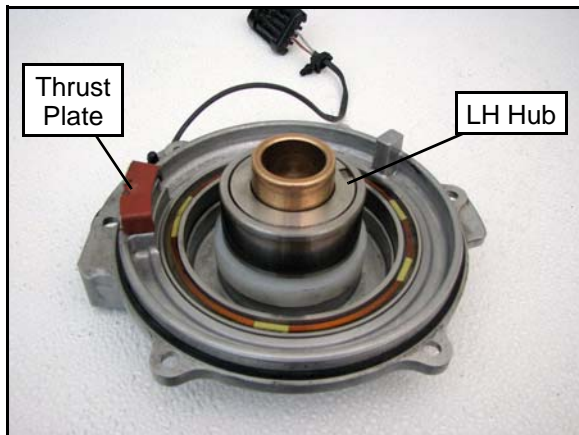


IMPORTANT: To ensure gearcase is assembled properly, assemble the gearcase components starting with the cover plate and build upward.

6. Install a new O-ring on the cover plate assembly.

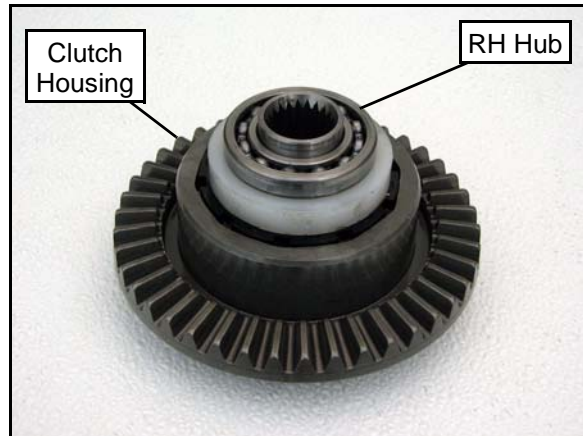
NOTE: Be sure the square O-ring is placed flat on the cover surface. If the O-ring is twisted fluid leakage may occur.

7. Carefully install the LH output hub assembly with the thrust bearing into the cover plate. Take care not to damage the new cover plate seal while installing the output hub.



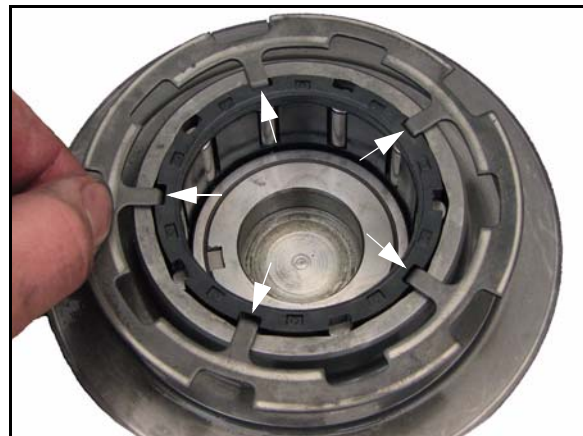
8. Place the thrust plate onto the adjuster button located in the cover plate assembly using a light film of grease to hold it in place.

9. Install the RH output hub into the clutch housing assembly.



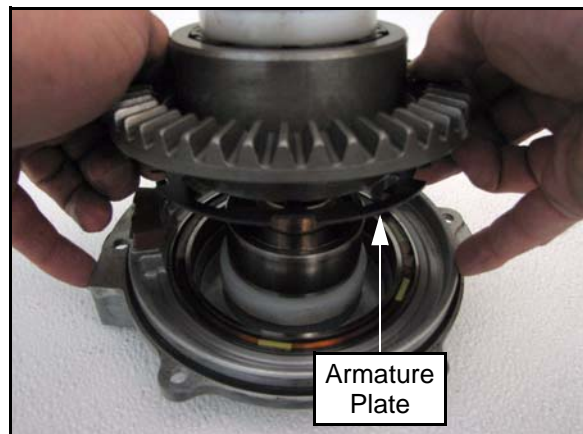
10. While holding the hub in the clutch housing, flip the clutch housing over and install the armature plate. Engage the tabs into the slots in the roll cage assembly.

NOTE: Be sure armature plate tabs are placed into the slots on roll cage (see reference photo).



11. While holding the hub in the clutch housing and the armature plate in the roll cage, flip the clutch housing assembly over and set it on the cover plate.

NOTE: Be sure to hold armature plate in place until the housing is completely resting on the cover plate.

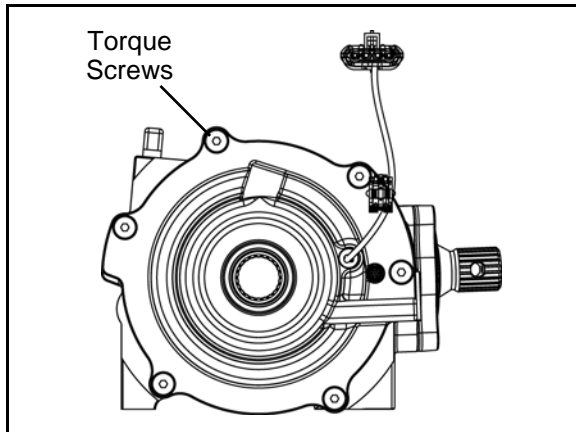


- Line up the gearcase housing with the cover plate assembly. Set the gearcase housing on top of the assembled cover plate. Take care not to damage the new seal when installing the gearcase housing.

NOTE: Rotate the input shaft while setting the gearcase housing in place.



- While holding the gearcase together, flip it over and install the cover plate screws. Torque screws to **7-11 ft. lbs. (10-15 Nm)**.



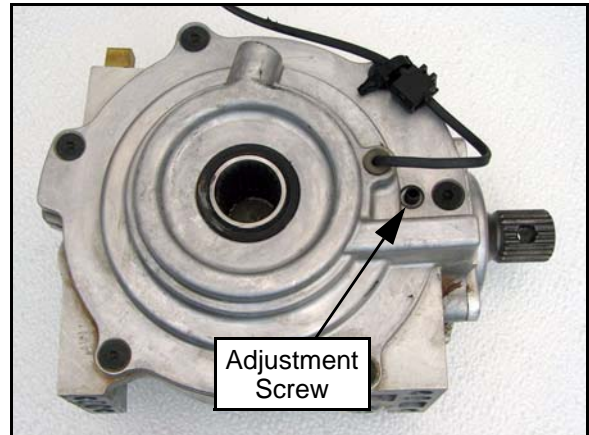
**Cover Plate Screw Torque:
7-11 ft. lbs. (10-15 Nm)**

Backlash Thrust Plate Adjustment

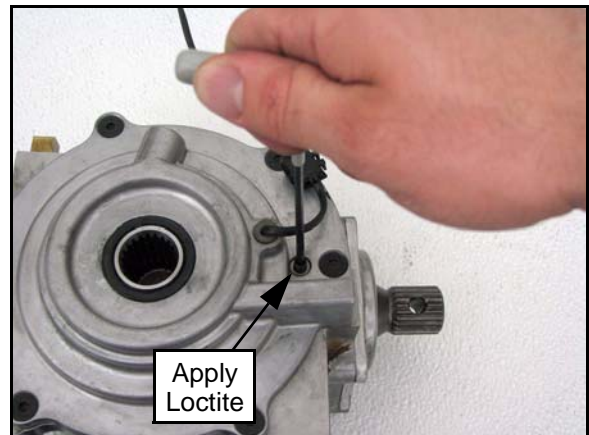
NOTE: Ring gear backlash is set from the factory. No adjustment is required unless the cover plate, ring gear/clutch housing, or pinion gear assembly is replaced. Adjustment is also required if the thrust plate adjustment screw is removed.

- Lay the gearcase on its side with the cover plate facing up.

NOTE: The backlash adjustment screw is held in place with Loctite. Use a heat gun to loosen the Loctite on the screw.



- Using a hex wrench, turn the backlash screw out 3-4 turns. Re-apply red Loctite onto the bottom of the screw threads.



- Tighten the adjustment screw until it is lightly seated or until it bottoms out.

FINAL DRIVE

4. Set the gearcase upright.
5. Back the adjustment screw out while rotating the pinion shaft. The pinion shaft should rotate freely during four complete rotations. The four pinion shaft rotations ensures that the ring gear completes one full rotation.



6. If a tight spot is felt during rotation, loosen the backlash adjustment screw further and repeat pinion shaft rotation. Repeat this procedure until the pinion shaft rotates smoothly four complete times (1 revolution of ring gear).

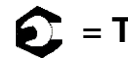
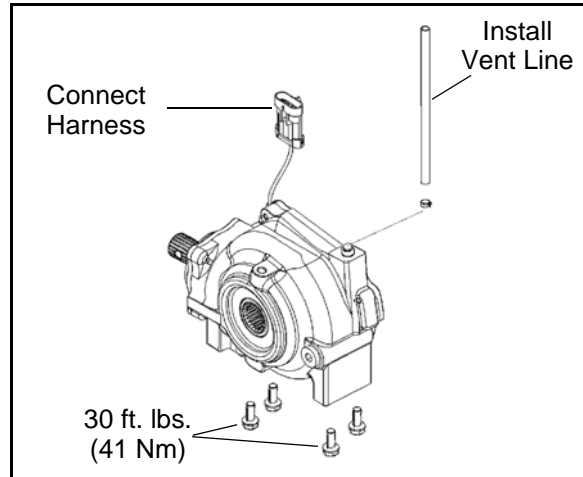
Gearcase Installation

1. Install the gearcase back into the vehicle through the LH wheel well area, between the upper and lower A-arms.



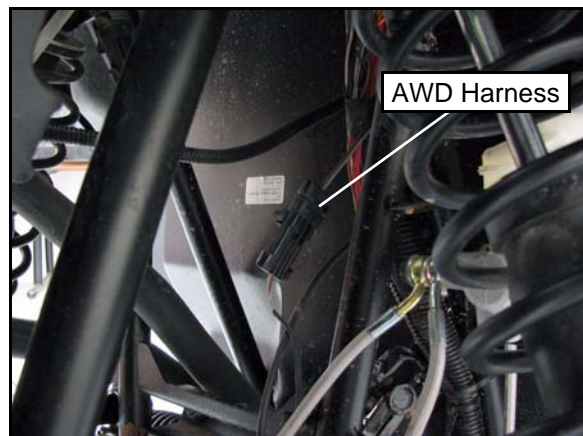
2. Install the propshaft assembly onto the front gearcase input shaft. Use a NEW spring pin in the front propshaft.
3. Install the (4) bolts that secure the front gearcase to the frame and torque to **30 ft. lbs. (41 Nm)**.

4. Install the vent line.



Front Gearcase Mounting Bolt Torque:
30 ft. lbs. (41 Nm)

5. Connect the AWD wire harness.



6. Refer to "FRONT DRIVE SHAFT - Drive Shaft Installation" and install both front drive shafts into the front gearcase.
7. Add the proper lubricant to the front gearcase. Refer to Chapter 2 for fluid fill and change information.

**Premium Demand Drive Fluid LT
(PN 2876251)**

**Front Housing Capacity
6.75 fl. oz. (200 ml)**

REAR BEARING CARRIER

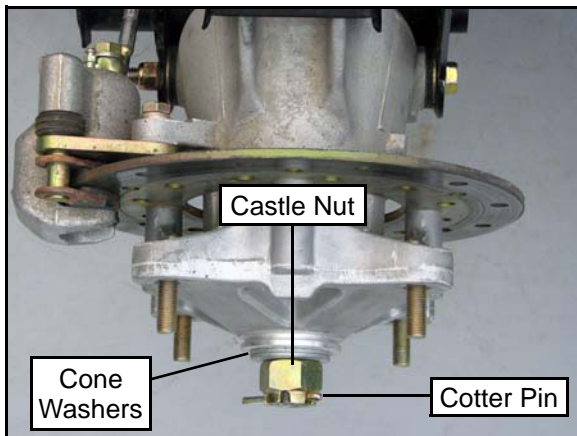
Bearing Carrier Inspection / Removal

1. Elevate rear of vehicle and safely support machine under the frame area.

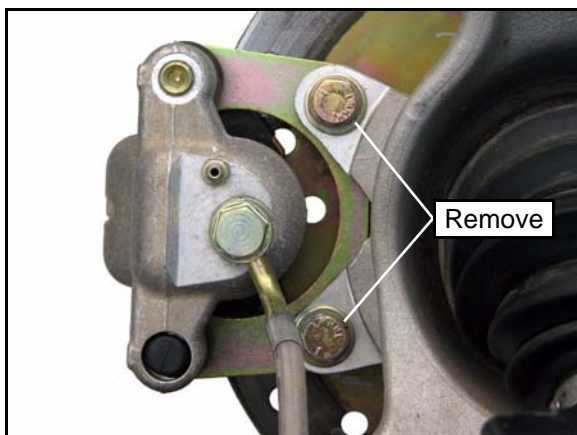
⚠ CAUTION

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.

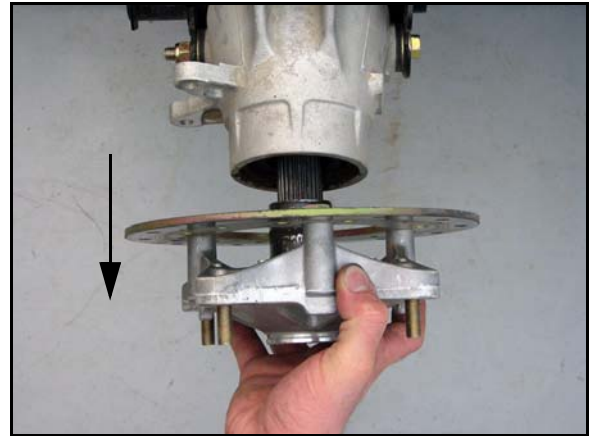
2. Check bearings for side play by grasping the top and bottom of the tire firmly and checking for movement. The tire should rotate smoothly without binding or rough spots.
3. Remove the (4) wheel nuts and remove the rear wheel.
4. Remove the cotter pin and loosen the rear wheel hub castle nut. Remove the nut, and (2) cone washers from the rear wheel hub assembly.



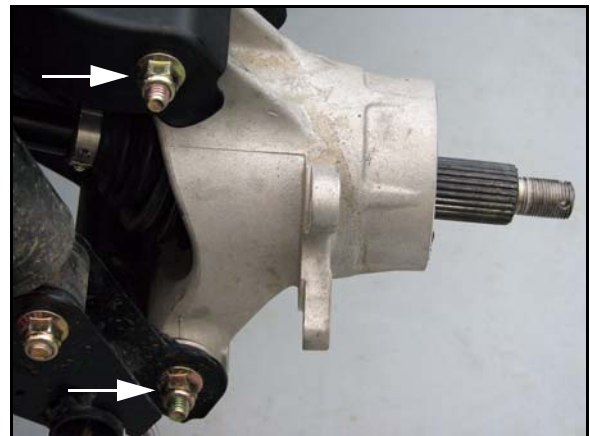
5. Remove the two brake caliper attaching bolts. **CAUTION:** Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.



6. Remove the rear wheel hub assembly.

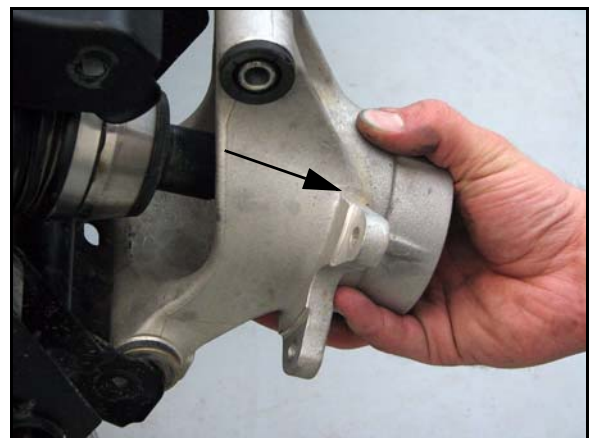


7. Remove the bolts that attach the rear bearing carrier to the upper and lower A-arms.



7

8. Remove the bearing carrier from the rear drive shaft.



9. Rotate bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion.

FINAL DRIVE

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.

10. Replace bearing if moisture, dirt, corrosion, or roughness is evident.

Bearing Replacement

Bearing Removal

1. Remove outer snap ring.



2. From the back side of the bearing carrier, tap on the outer bearing race with a drift punch in the reliefs as shown.



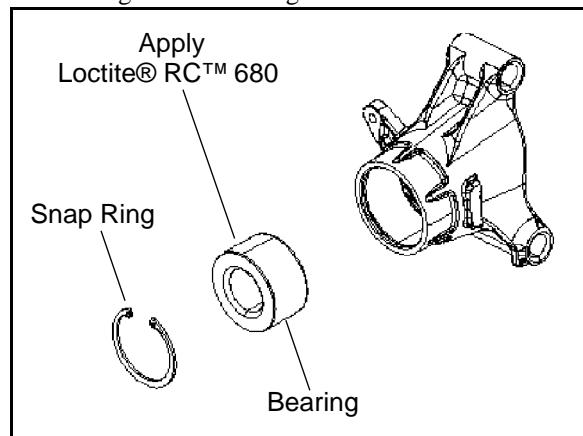
3. Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.
4. Inspect the bearing carrier housing for scratches, wear or damage. Replace rear bearing carrier if damaged.

Bearing Installation

5. Thoroughly clean the rear bearing carrier housing and the outer race on the new bearing. Be sure that all oil residue has been removed from each surface.
6. Support the bottom of the bearing carrier housing.



7. Apply **Loctite® RC™ 680** to the outer circumference of the new bearing race and carefully press the new bearing into the bearing carrier housing.

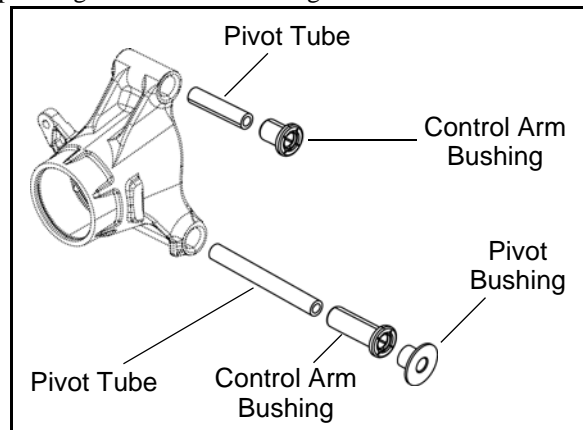


NOTE: Use care to not allow any of the Loctite® compound to get in the bearing.

8. Wipe the housing clean of any excess compound and install the snap ring.

Bearing Carrier Bushing Replacement

Check bearing carrier bushings and pivot tubes for excessive wear or damage. If replacement is required, slide pivot tubes out and remove bushings with a drift punch. Install new bushings by pressing them into the bearing carrier.

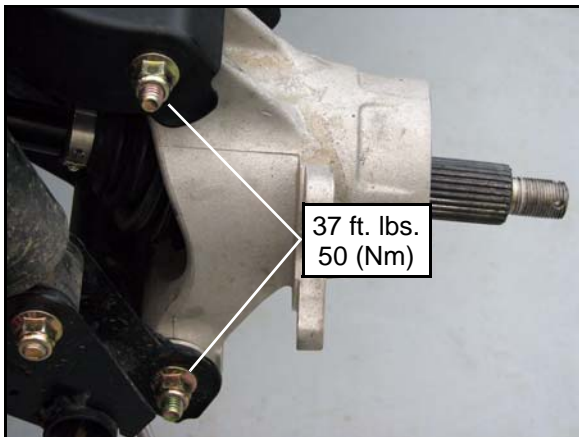



Bearing Carrier Installation

1. Install drive shaft axle through the backside of the bearing carrier. Be sure bushings and pivot tubes are installed.



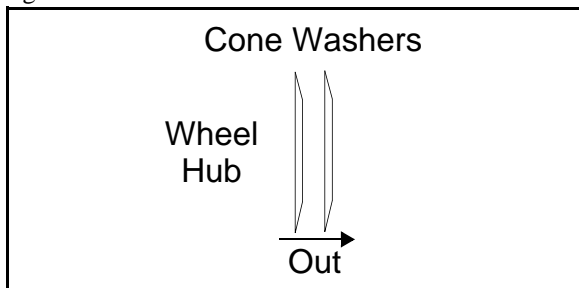
2. Install the fasteners that attach the rear bearing carrier to the upper and lower A-arms. Torque bolts to **37 ft. lbs. (50 Nm)**.



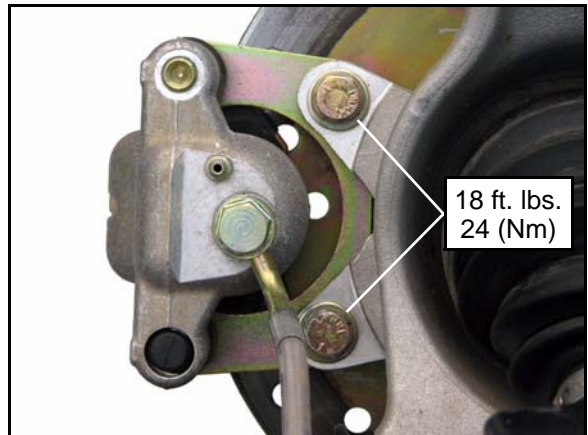
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Rear Bearing Carrier Bolt Torque:
37 ft. lbs. (50 Nm)

3. Apply grease to drive shaft axle splines.
4. Install rear wheel hub assembly, cone washers, and hand tighten the castle nut. Install washers with domed side out.




5. Install brake caliper mounting bolts and torque to **18 ft. lbs. (24 Nm)**.



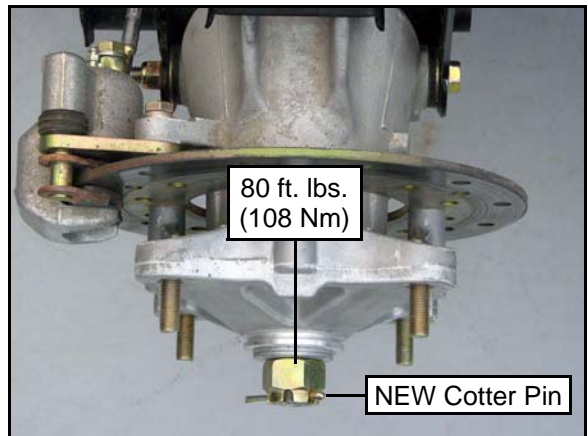
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Rear Caliper Mounting Bolt Torque:
18 ft. lbs. (24 Nm)

 **CAUTION**

New bolts have a pre-applied locking agent which is destroyed upon removal. Always use new brake caliper mounting bolts upon assembly.

6. Torque wheel hub nut to **80 ft. lbs. (108 Nm)** and install a **NEW** cotter pin. Tighten nut slightly if necessary to align cotter pin holes.

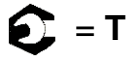


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Wheel Hub Castle Nut Torque:
80 ft. lbs. (108 Nm)

FINAL DRIVE

7. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.



Wheel Nut Torque:
Steel Wheels: 27 ft. lbs. (37 Nm)
Aluminum Wheels: 90 ft. lbs. (122 Nm)

8. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around end of spindle in different directions.

REAR DRIVE SHAFT

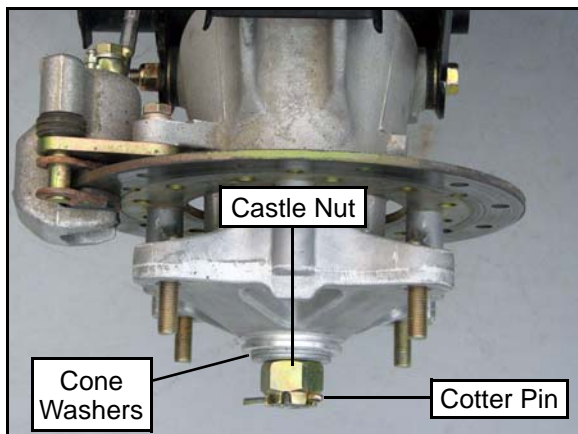
Removal

1. Elevate rear of vehicle and safely support machine under the frame area.

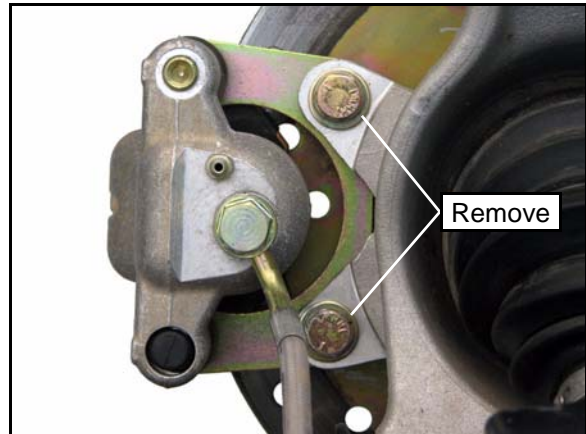


CAUTION
Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

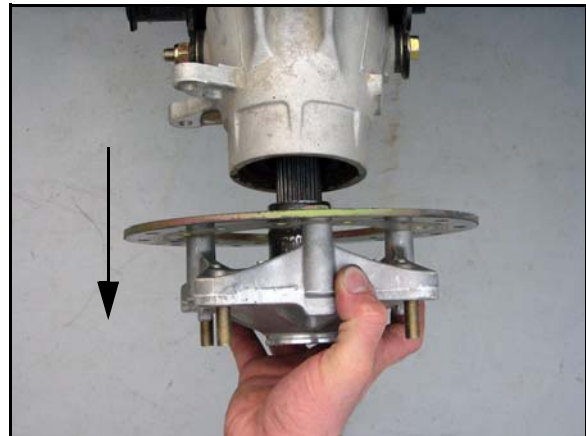
2. Remove the (4) wheel nuts and remove the rear wheel.
3. Remove the cotter pin and loosen the rear wheel hub castle nut. Remove the nut, and (2) cone washers from the rear wheel hub assembly.



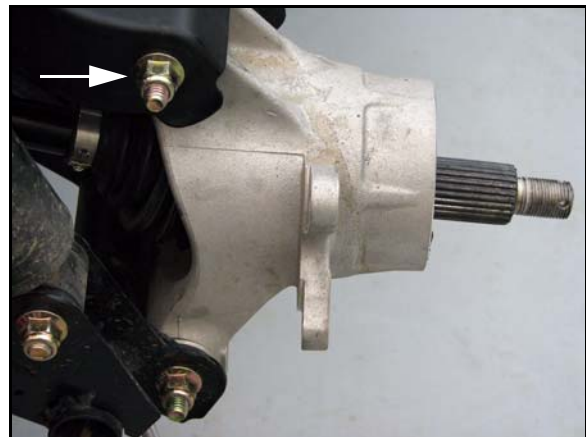
4. Remove the two brake caliper attaching bolts. **CAUTION:** Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.



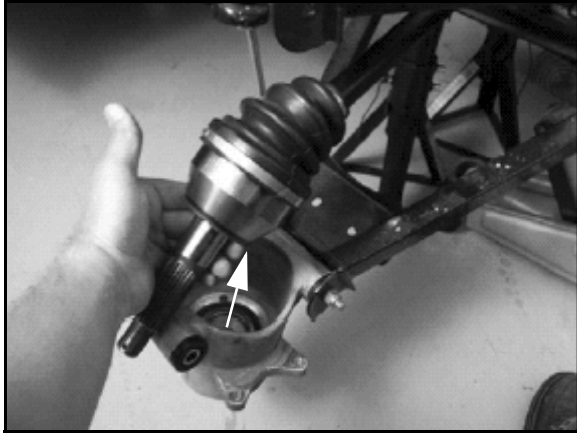
5. Remove the rear wheel hub assembly.



6. Remove the bolt that attaches the rear bearing carrier to the upper A-arm.

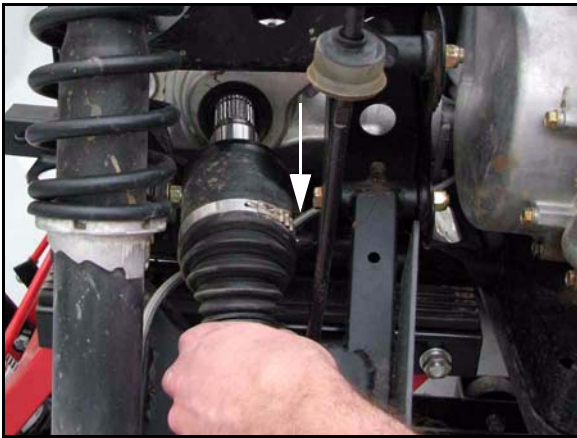


- Slide the rear drive shaft out of the bearing carrier by pulling the bearing carrier assembly outward and tipping it down to remove the shaft.



- Grasp the rear drive shaft and pull sharply outward on the shaft to disengage it from the rear gearcase.

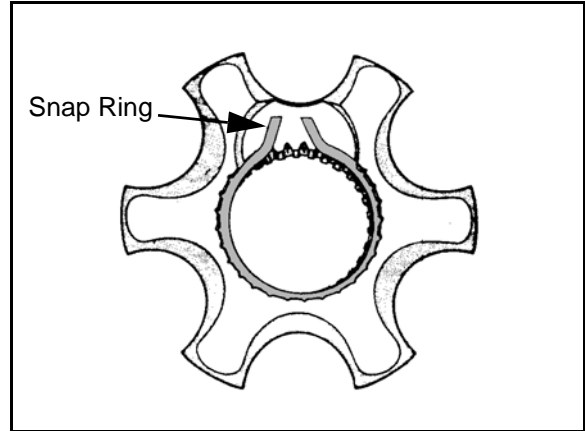
NOTE: Take care when removing to prevent damaging the seal.



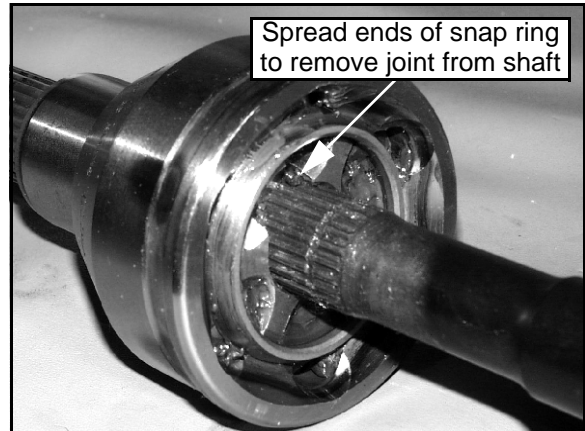
- Inspect the axle splines and CV boots for any damage.

Outer CV Joint / Boot Replacement

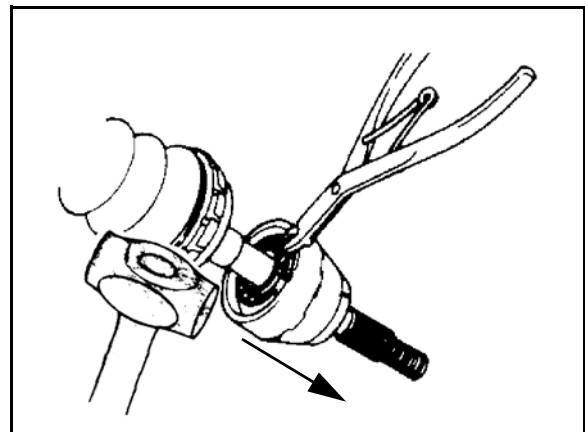
- Place the drive shaft in a soft-jawed vise.
- Using side cutters, cut away and discard the boot clamps.
- Slide the boot down the shaft and wipe the grease away from the face of the joint to access the snap ring located in the recess of CV joint.



- Hold open the snap ring using a snap ring pliers or duckbill pliers.



- While holding the snap ring open, strike the outer housing with a soft faced hammer to drive the joint off the shaft. If the joint refused to budge, a brass drift can be used against the face of the inner race to drive the joint off.



7

FINAL DRIVE

6. Remove boot from the shaft.

CAUTION

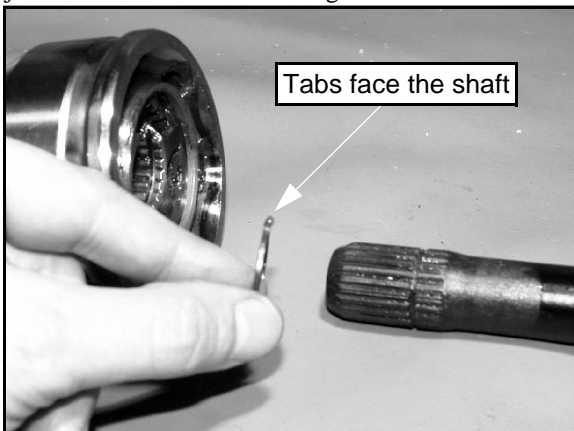
Complete disassembly of the CV joint is NOT recommended. The internal components are a precision fit and develop their own characteristic wear patterns. Intermixing the internal components could result in looseness, binding, and/or premature failure of the joint.

IMPORTANT: If the grease in the joint is obviously contaminated with water and/or dirt, the joint should be replaced.

7. 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.
8. 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.

9. Clean the splines on the end of the shaft and apply a light coat of grease prior to reassembly.
10. If required, place a new snap ring in the groove of the CV joint inner hub with tabs facing the shaft as shown.



11. Before you assemble the CV joint, slide the new clamp and new boot onto the splined shaft.
12. If a new joint is being installed, grease it with the special CV joint grease provided in the 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: The amount of grease that's provided is pre-measured, so use all the grease.

13. Refer to information below or **Figure 7-28** at the end of this section for grease capacity requirements.

Boot Replacement Grease Requirement:

Grease Service Kits

PN 1350059 - 20g

PN 1350046 - 30g

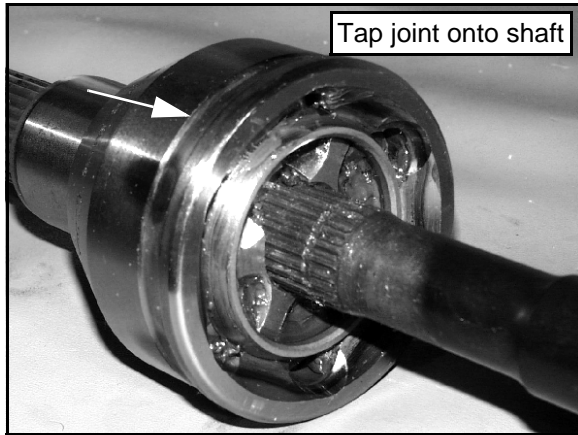
PN 1350047 - 50g

Outer CV Joint:

Boot replacement only - 30g

Boot replacement w/joint cleaning - 60g

- Slide the joint onto the shaft splines while holding the snap ring in the face of the inner race open. Push or tap the joint onto the drive shaft until it “clicks” into place. Pull on the joint to make sure it is securely locked in place.



- Remove excess grease from the CV joint's external surfaces.
- 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, then slide the clamps into place.
- Tighten the large clamp using an appropriate clamp pliers.
- 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 its correct location on the shaft.



- Install the small clamp on the boot and tighten using an appropriate clamp pliers.

⚠ CAUTION

Be careful not to cut through the bridge of the clamp when tightening.

Inner Plunging Joint / Boot Replacement

- Place the drive shaft in a soft-jawed vise.
- Using a side cutters, cut away and discard the boot clamps.
- Slide the boot down the shaft and wipe the grease away from the face of the joint.
- Using a soft-faced hammer, or brass drift, strike the inner race of the joint to drive the joint off the shaft.



IMPORTANT: Hammer on inner race only!

- Make sure the circlip is still on the shaft and not left in the joint.



- Remove the boot from the shaft.

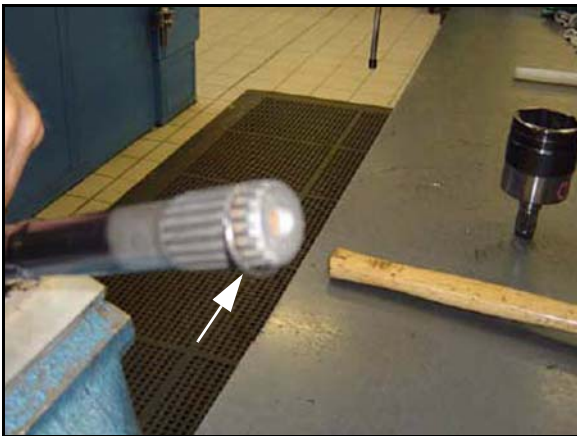
⚠ CAUTION

Complete disassembly of the plunging joint is NOT recommended. The internal components are a 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.

FINAL DRIVE

IMPORTANT: If the grease in the joint is obviously contaminated with water and/or dirt, the joint should be replaced.

7. 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.
8. Visually inspect the joint for damage. Replace if needed.
9. Slide the boot clamp and boot (small end first) onto the drive shaft and position the boot in its groove machined in the shaft.
10. Install a NEW circlip on the end of the shaft.



⚠ 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: The amount of grease that's provided is pre-measured, so use all the grease.

11. Refer to information below or **Figure 7-28** at the end of this section for grease capacity requirements.

Boot Replacement Grease Requirement:

Grease Service Kits

- PN 1350059 - 20g
- PN 1350046 - 30g
- PN 1350047 - 50g

Inner Plunging Joint:

- Boot replacement only - 40g
- Boot replacement w/joint cleaning - 80g

12. Grease the inner and outer joint races. Fully compress the joint and push the drive shaft firmly into the inner race.
13. Align the circlip with the lead-in chamfer.



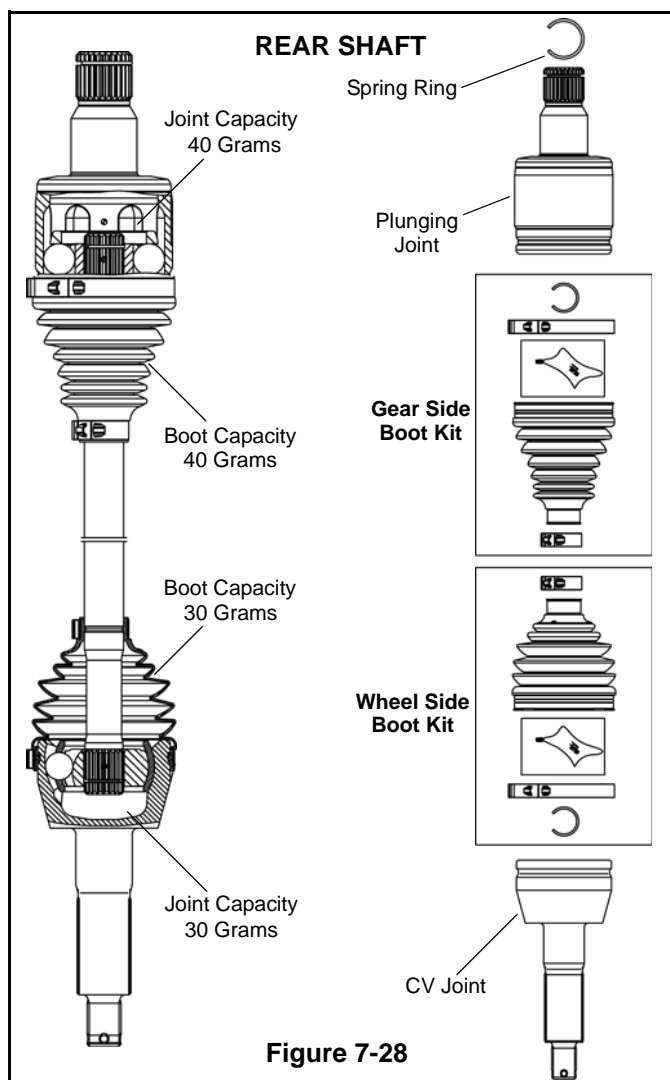
14. Use a soft-faced hammer to assemble the shaft into the inner race until you reach the end of the splines.



15. Pull on the joint to test that the circlip is seated and that the joint is securely fastened to the shaft.

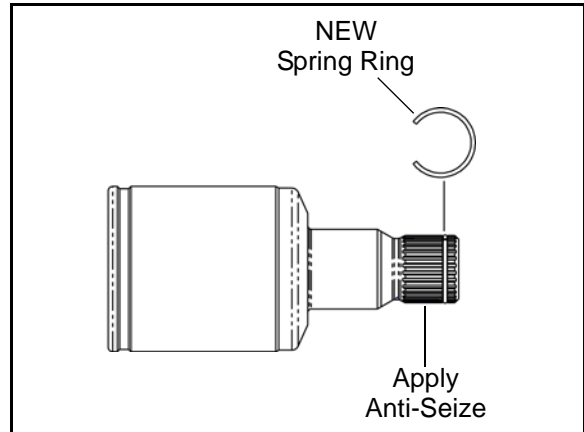


16. Add any remaining grease to the boot.
17. Pull the boot over the joint and position the boot lips into the grooves on the joint housing and shaft. Make sure the boot is not dimpled or collapsed.
18. Tighten the small clamp using an appropriate clamp pliers.
19. Pull out on the drive shaft to center the 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 the air pressure in the boot.
20. Position the boot lip in its groove in the outer race and secure with a boot clamp.



Installation

1. Install new spring ring on drive shaft. Apply anti-seize compound to splines.

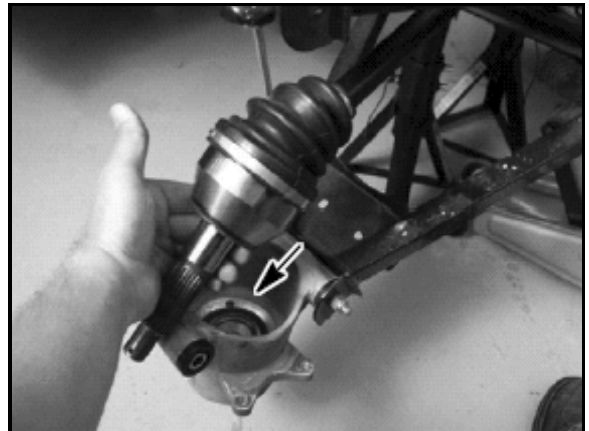


2. Align splines of drive shaft with rear gearcase and reinstall the drive shaft. Use a rubber mallet to tap on the outboard end of the drive shaft if necessary.

NOTE: Take care when installing the drive shaft to prevent damaging the seal.

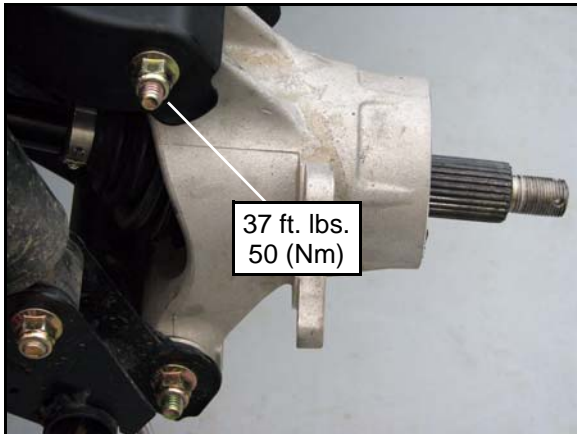



3. Slide the rear drive shaft into the rear bearing carrier.



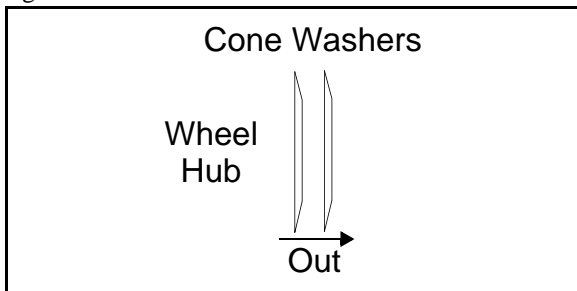
FINAL DRIVE

- Lift bearing carrier into place and install the bolt attaching the bearing carrier to the upper A-arm. Torque fastener to **37 ft. lbs. (50 Nm)**.

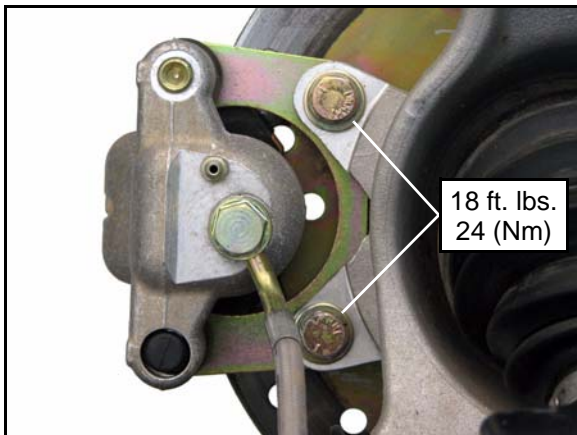



 = T
Rear Bearing Carrier Bolt Torque: 37 ft. lbs. (50 Nm)


- Apply grease to drive shaft axle splines.
- Install rear wheel hub assembly, cone washers, and hand tighten the castle nut. Install washers with domed side out.



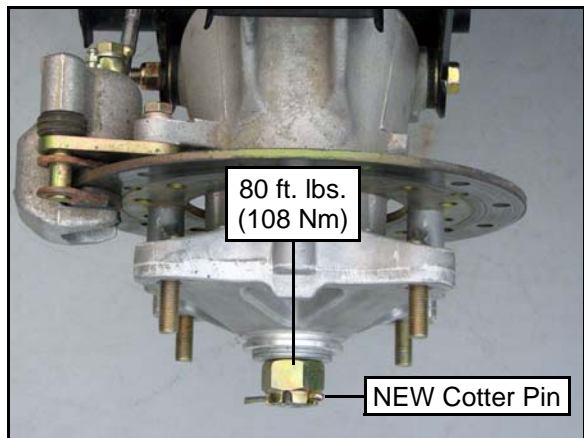
- Install brake caliper mounting bolts and torque to **18 ft. lbs. (24 Nm)**.




 = T
Rear Caliper Mounting Bolt Torque: 18 ft. lbs. (24 Nm)


 CAUTION
New bolts have a pre-applied locking agent which is destroyed upon removal. Always use new brake caliper mounting bolts upon assembly.

- Torque wheel hub nut to **80 ft. lbs. (108 Nm)** and install a **NEW** cotter pin. Tighten nut slightly if necessary to align cotter pin holes.



 = T
Wheel Hub Castle Nut Torque: 80 ft. lbs. (108 Nm)

- Install wheel and (4) wheel nuts. Torque wheel nuts to specification.

 = T
Wheel Nut Torque: Steel Wheels: 27 ft. lbs. (37 Nm) Aluminum Wheels: 90 ft. lbs. (122 Nm)

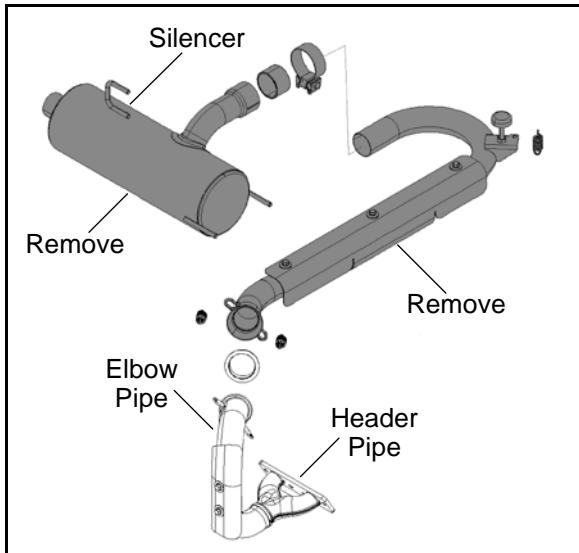
REAR GEARCASE

Gearcase Removal

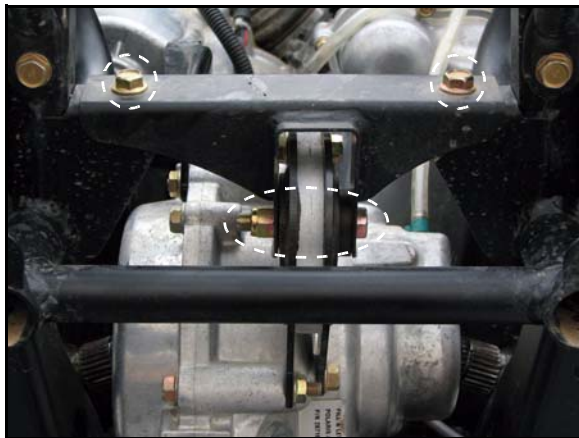
1. Drain the fluid from the rear gearcase.
2. Remove the rear drive shafts from each side of the rear gearcase.

See "REAR DRIVE SHAFT" on page 7.24

3. Remove the exhaust pipe and exhaust silencer to allow for gearcase removal.

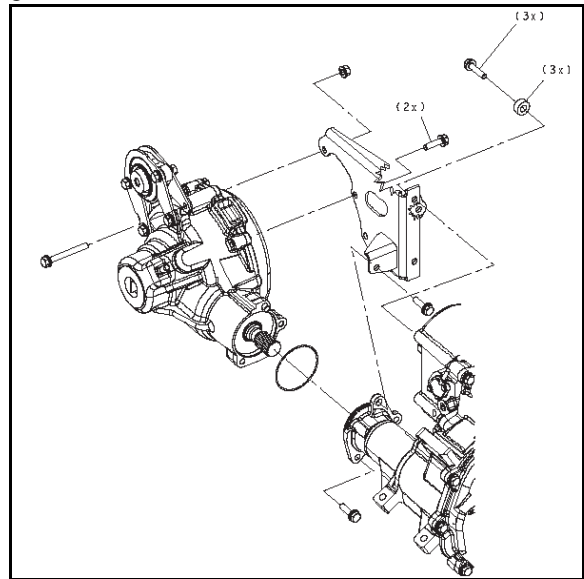


4. Remove the (2) rear gearcase mount bracket fasteners and mount bolt and remove bracket from vehicle.

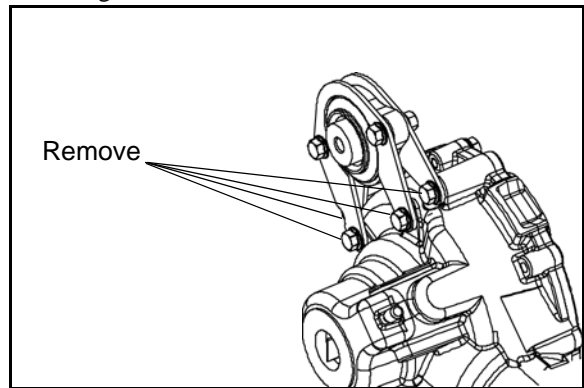


NOTE: Some vehicles will require the bolt to be removed from the receiver hitch to gain enough clearance to remove the rear gearcase.

5. Remove the fasteners and bracket that secure the rear gearcase to the transmission.



6. Remove the (4) fasteners and remove the rear mount from the rear gearcase.



7. Pull the rear gearcase towards the rear of the vehicle to disengage it from the transmission.

NOTE: If the splined coupler doesn't slide off the input shaft on the rear gearcase, use a screwdriver to hold back the coupler while pulling the rear gearcase back further to disengage it.

8. Remove the vent line and lift the rear gearcase upward and on its side to remove it from the vehicle.

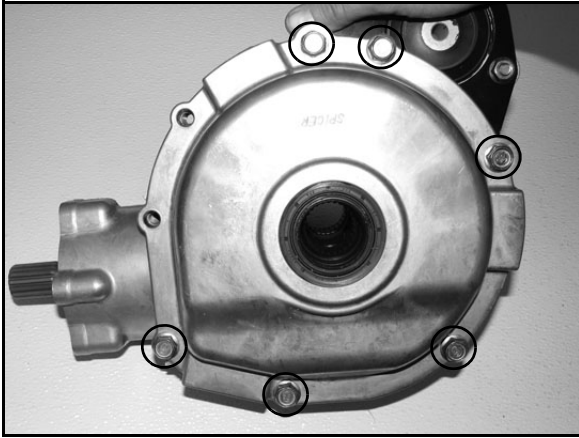
FINAL DRIVE

Gearcase Disassembly

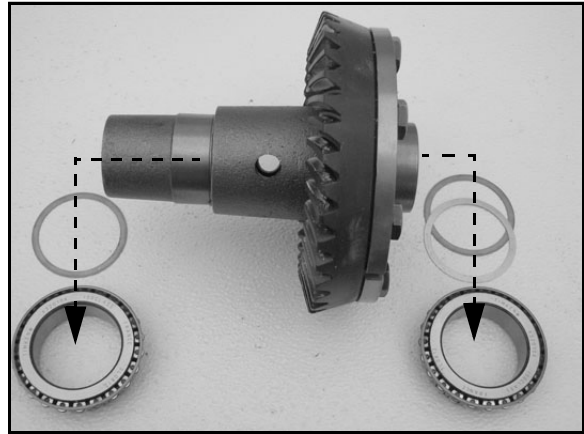
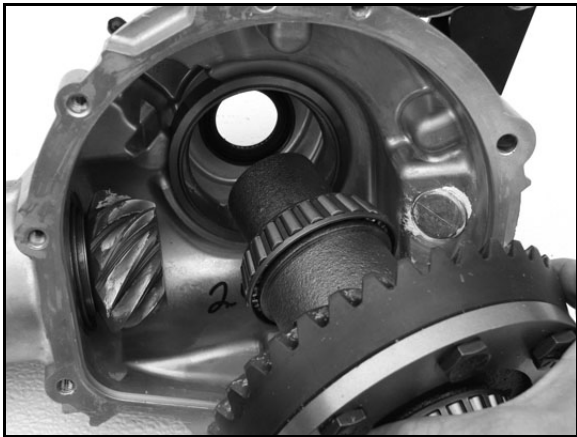
IMPORTANT: Due to the manufacturing process, the pinion and ring gear assembly are **NOT** intended to be disassembled and replaced.

Pinion and ring gear shimming information is **NOT** provided. The components are matched at the factory which requires special OEM tooling in order to properly assemble and shim the gears. In the event damage to the gears or housing requires replacement, the entire assembly must be replaced.

1. Drain and properly dispose of used gearcase fluid.
2. Remove the remaining cover screws from the rear gearcase.

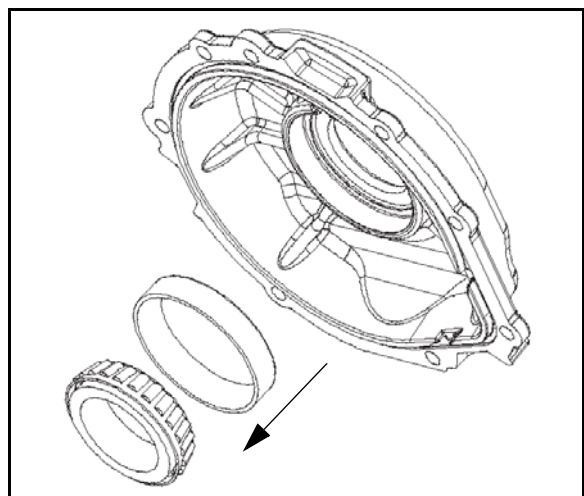
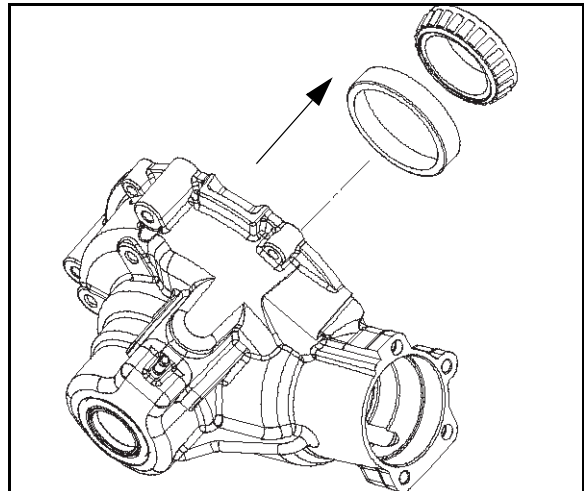


3. Remove the ring gear/axle spool assembly. The bearings are a slip-fit and will slide off the axle spool.

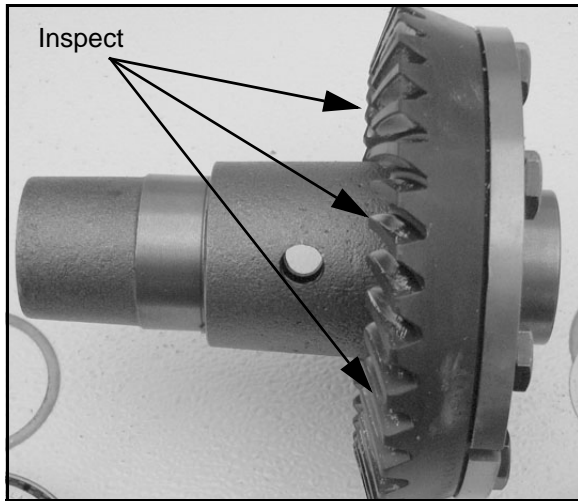


NOTE: Record the thickness of the shim pack located under each bearing. Keep the shims together for reassembly.

4. Inspect each axle spool bearing and race for signs of wear or damage. Replace races if required using standard bearing puller tools.

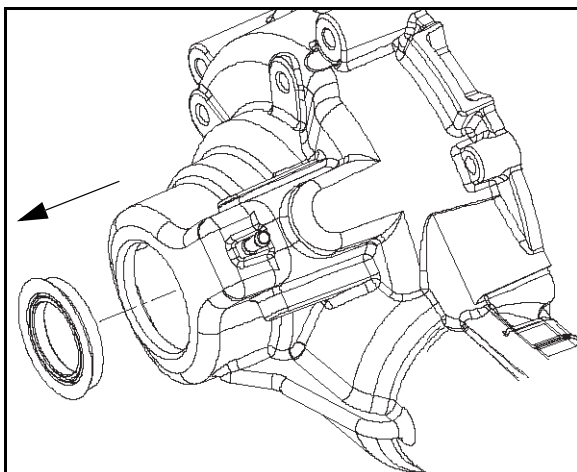
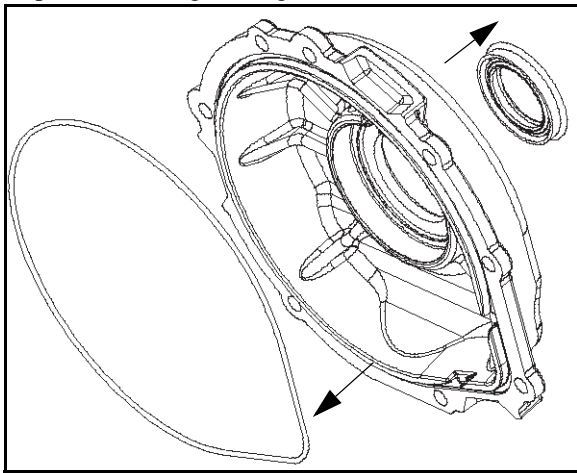


5. Inspect the ring gear teeth for chipped, worn, or broken teeth. If damaged, replace the ring gear and pinion gear as a set.

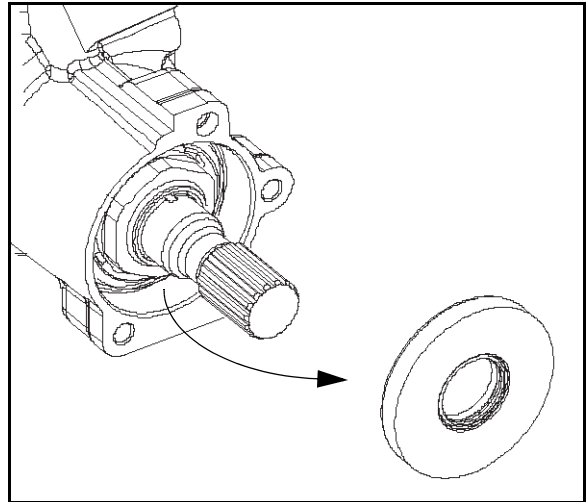


NOTE: In the event damage to the gears or housing requires replacement, the entire assembly must be replaced.

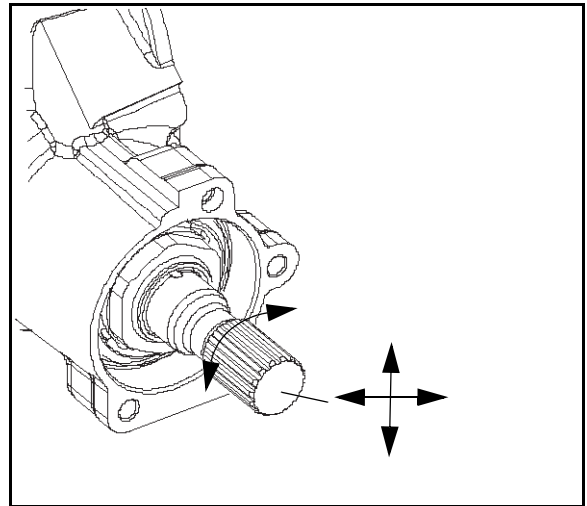
6. Remove the seals from each side of the gearcase housing. Replace the o-ring in the gearcase cover.



7. Remove the input shaft seal using a seal puller or other suitable method.



8. Inspect the input shaft by rotating the assembly in the gearcase housing while checking for any looseness or roughness. Inspect the pinion gear teeth for chipped, worn, or broken teeth. If damaged, replace the ring gear and pinion gear as a set.

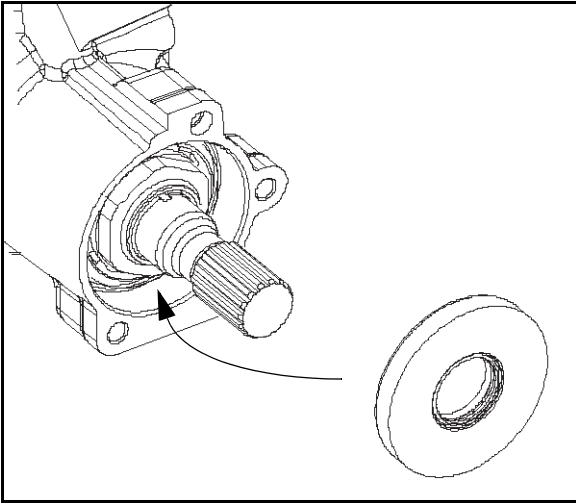


NOTE: In the event damage to the gears, pinion bearings or housing requires replacement, the entire assembly must be replaced.

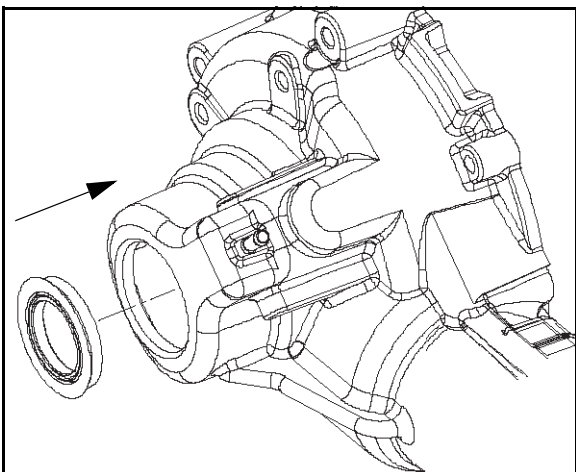
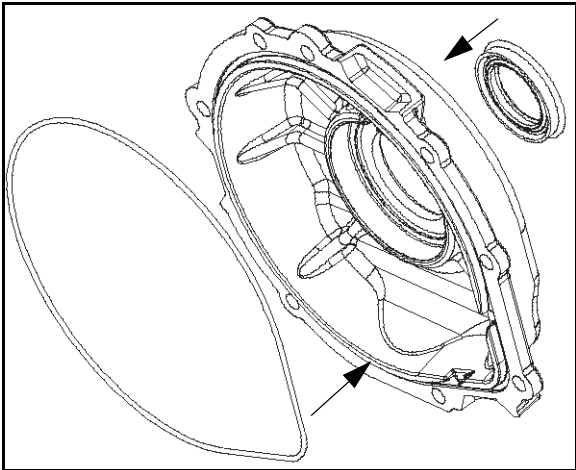
FINAL DRIVE

Gearcase Assembly

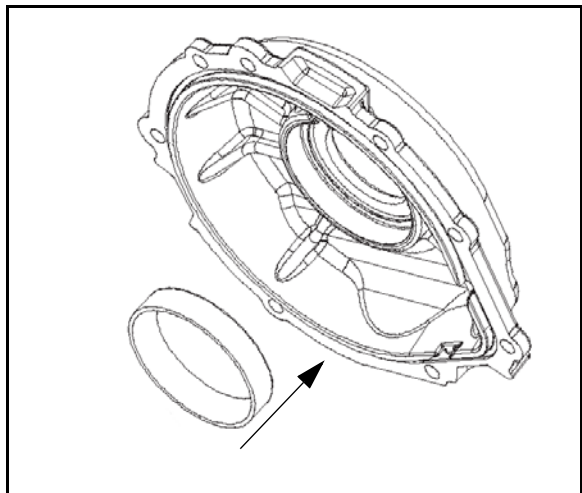
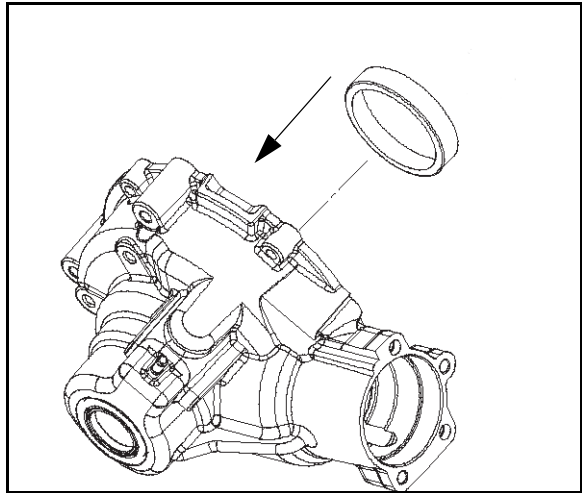
1. Install a new input shaft seal using a standard seal installer or other suitable method.



2. Install new seals on each side of the gearcase housing using a standard seal installer or other suitable method. Install a new o-ring in the gearcase cover.



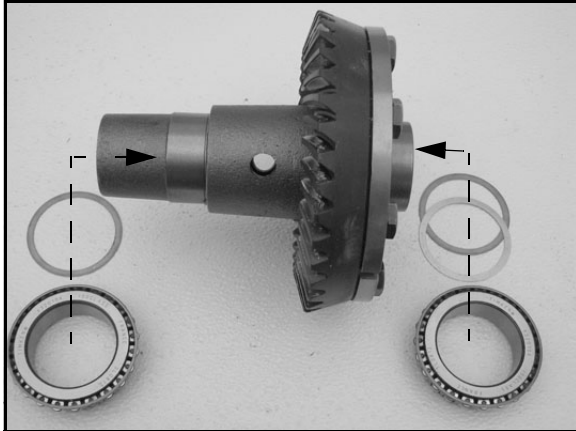
3. If removed, install each axle spool bearing race using standard bearing installation tools and a shop press.



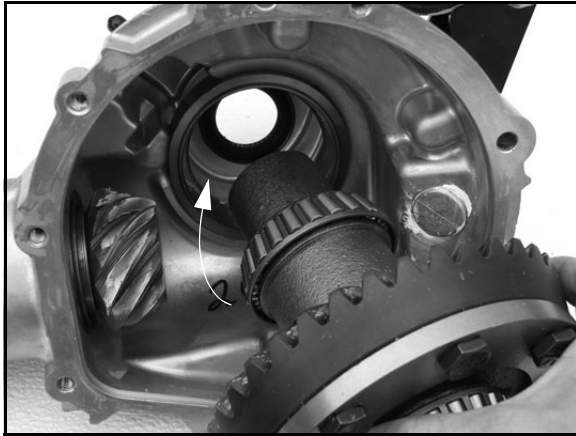
WARNING

Wear the appropriate safety equipment while installing bearing races to reduce the risk of injury.

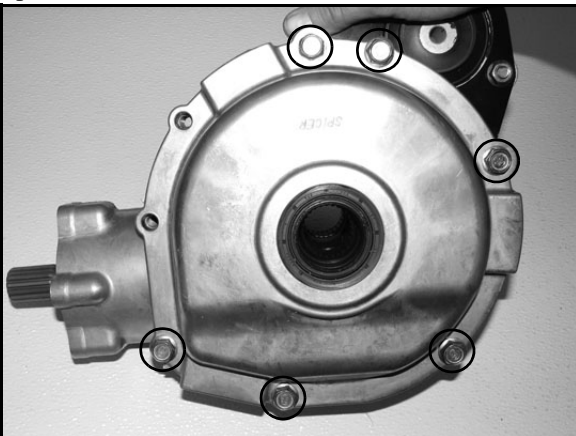
4. Install the shim(s) previously removed onto the appropriate sides of the axle spool. Install the bearings. The bearings are a slip-fit and will slide onto the axle spool.



5. Install the ring gear/axle spool assembly into the housing.



6. Install the gearcase cover. Verify the o-ring is in position. Install the cover screws onto the rear gearcase. Torque to specification.



Cover Screw Torque:
23-27 ft. lbs. (31-37 Nm)

Gearcase Installation

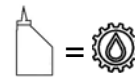
1. Install the rear gearcase by reversing the procedure listed under "REAR GEARCASE - Gearcase Removal" at the beginning of this section.

IMPORTANT: When reinstalling the transmission to rear gearcase mount bracket, it is extremely important to torque all (7) fasteners to specification. Refer to the "Installation" procedure listed on page 4.15.

NOTE: Special tool (PA-48873) will be required to torque the mounting bracket fasteners when the transmission and rear gearcase are installed in the vehicle. Refer to the "Installation" procedure listed on page 4.15.

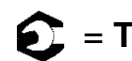


2. Add Polaris ATV Angle Drive Fluid to rear gearcase. Refer to maintenance information in Chapter 2 for more details. Torque drain and fill plugs to specification.



Rear Gearcase Capacity:

18 fl. oz. (532 ml)
or to bottom of fill plug hole threads
See Chapter 2

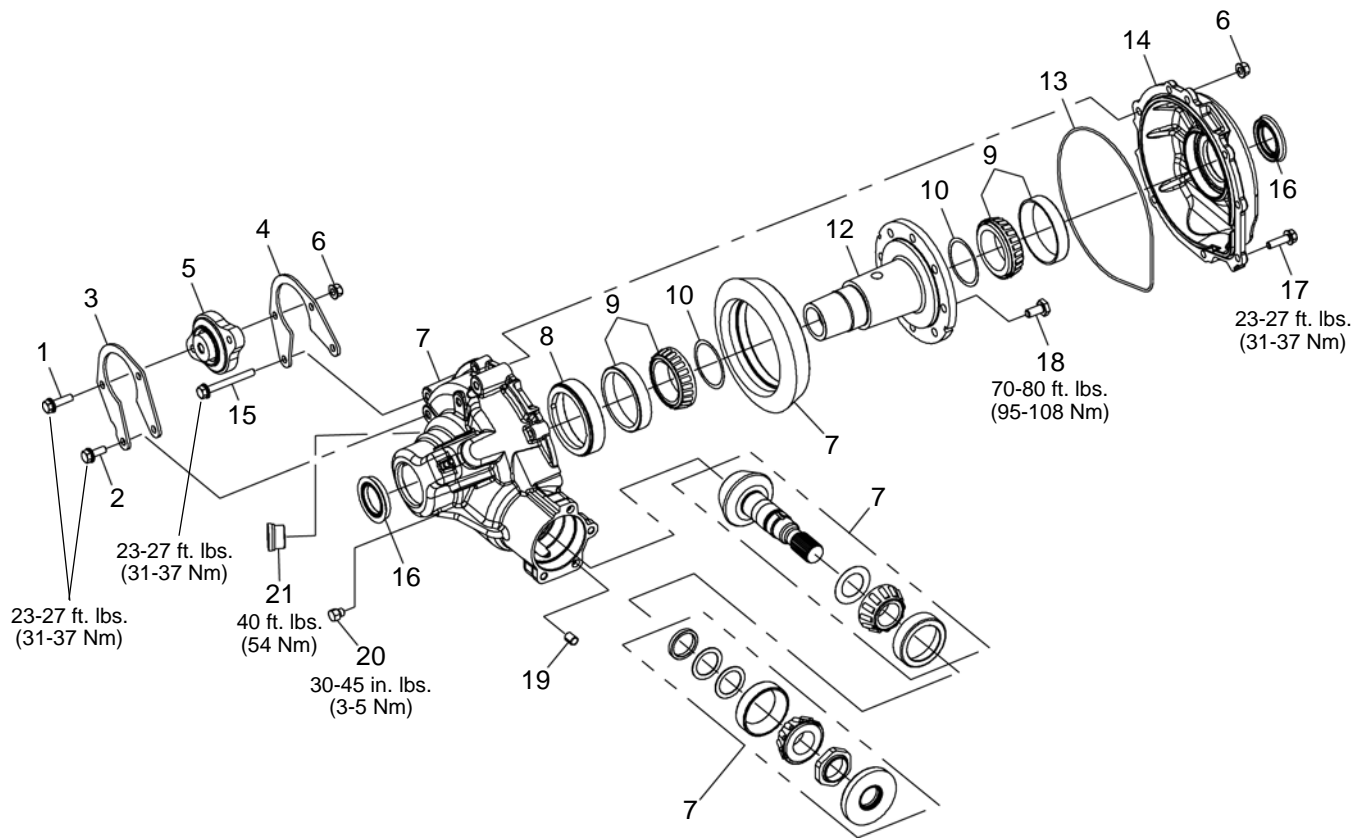


Drain / Fill Plug Torque:

Drain Plug - 30-45 in.lbs. (3-5 Nm)
Fill Plug - 40 ft.lbs. (54 Nm)

FINAL DRIVE

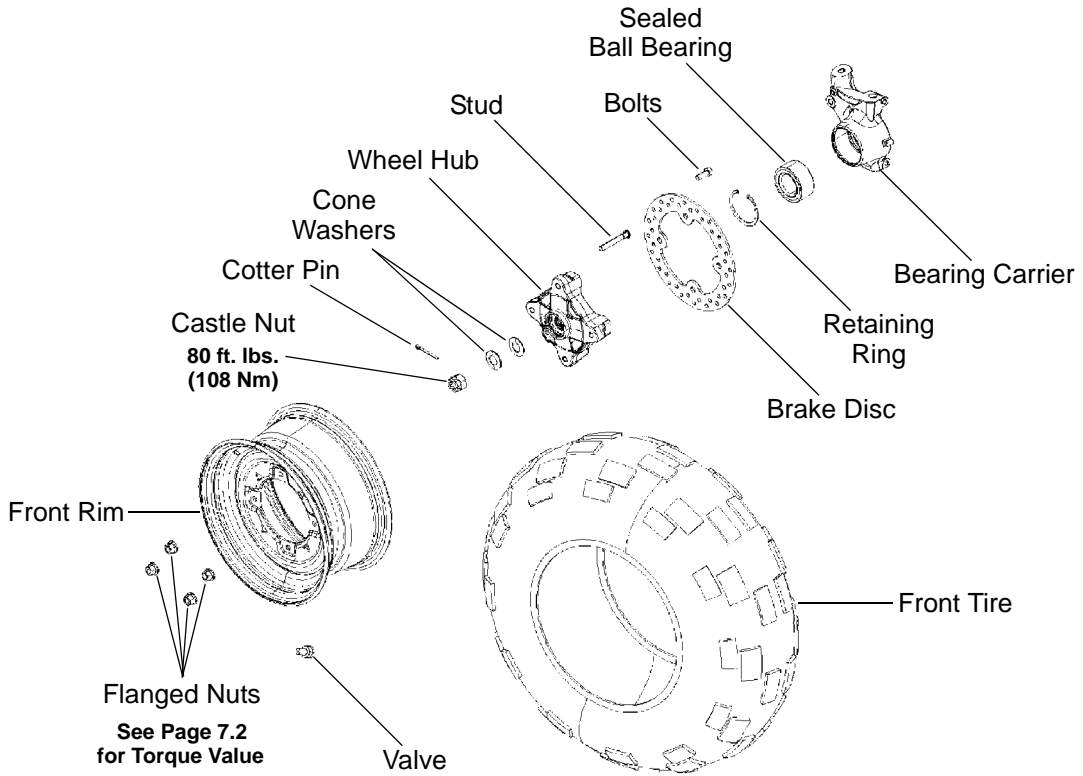
Gearcase Exploded View



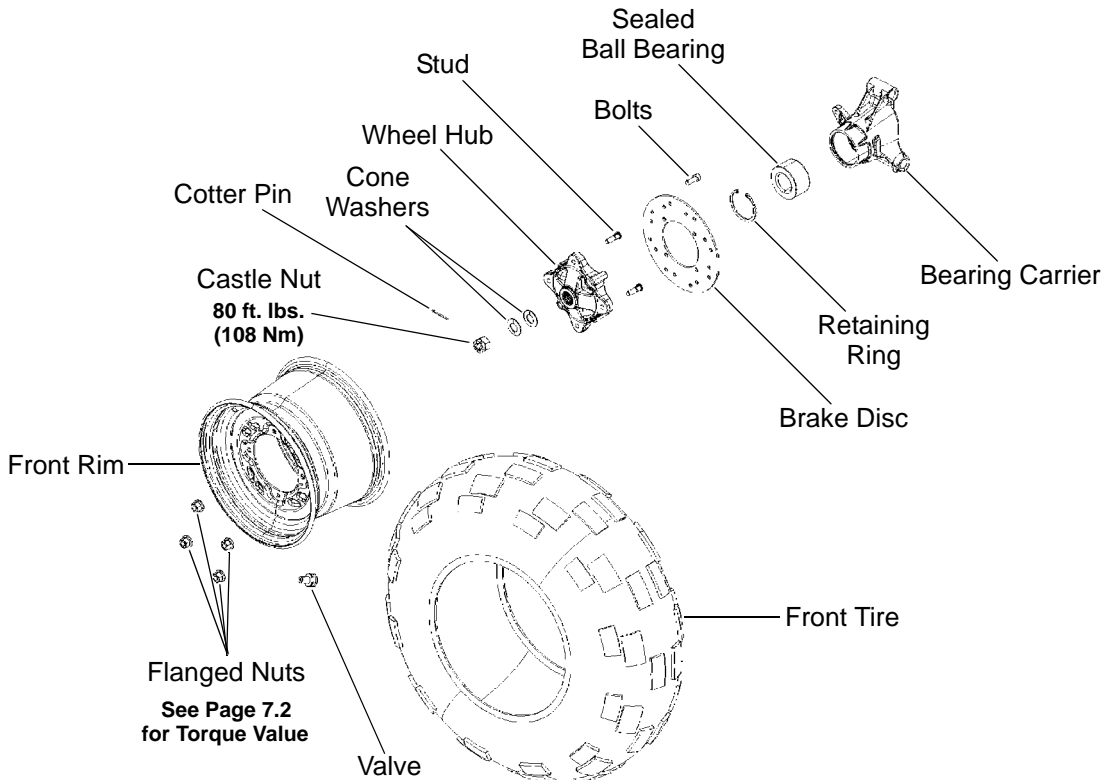
REF#	DESCRIPTION	QTY	REF#	DESCRIPTION	QTY
1	Screw	2	12	Axle, Spool	1
2	Screw	2	13	O-Ring	1
3	Bracket, Rear Mount, RH	1	14	Housing, Rear, LH	1
4	Bracket, Rear Mount, LH	1	15	Screw, Flange Head	2
5	Mount, Rear	1	16	Seal, Oil	2
6	Nut, Flanged	4	17	Screw, Flange Head	4
7	Assembly, Rear Housing, RH	1	18	Screw	8
8	Bearing Retainer Ring	1	19	Dowel	2
9	Assembly, Tapered Roller Bearing	2	20	Plug, Drain w/O-Ring	1
10	Shim	2	21	Plug, Fill w/O-Ring	1
11	Assembly, Gear and Pinion	1			

WHEEL HUBS

Front Hub Exploded View



Rear Hub Exploded View



CHAPTER 8

TRANSMISSION

TORQUES / SPECIFICATIONS 8.2

SHIFT LEVER 8.2

 REMOVAL 8.2

 INSTALLATION 8.2

 SHIFT CABLE INSPECTION / ADJUSTMENT. 8.3

TRANSMISSION SERVICE. 8.4

 TRANSMISSION REMOVAL / SERVICE NOTES 8.4

 TRANSFER CASE DISASSEMBLY 8.4

 TRANSFER CASE REASSEMBLY 8.7

 TRANSMISSION SHIFT HOUSING DISASSEMBLY 8.9

 TRANSMISSION SHIFT HOUSING REASSEMBLY 8.14

TROUBLESHOOTING. 8.19

 TROUBLESHOOTING CHECKLIST. 8.19

TRANSMISSION EXPLODED VIEWS 8.20

 SHIFT HOUSING / TRANSFER CASE EXPLODED VIEW 8.20



TRANSMISSION

TORQUES / SPECIFICATIONS

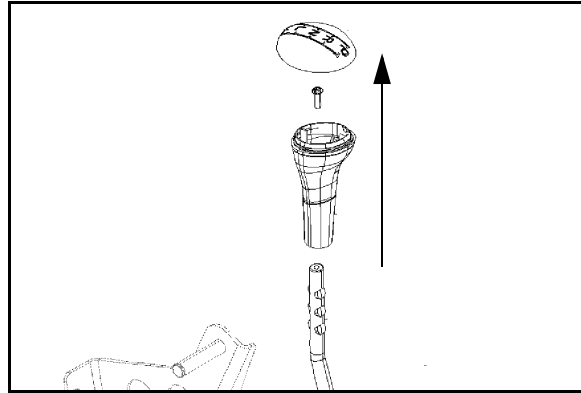
Maintain and check/change these items in accordance with the maintenance schedule in Chapter 2 or during service repairs.

ITEM	TORQUE VALUE
Transmission Fill Plugs	40-50 ft. lbs.(54-67 Nm)
Transmission Drain / Level Plugs	30-45 in. lbs.(0.2-0.3 Nm)
Transmission Case Screws	23-27 ft. lbs. (31-36 Nm)
Shift Lever Screw	15-20 ft. lbs. (20-27 Nm)
Detent Sleeve Screw	40-45 ft. lbs.(54-61 Nm)
Detent Adjustment Screw	23-27 ft. lbs. (31-36 Nm)
Drain Plugs / Check Plug	30-45 in. lbs.(0.2-0.3 Nm)
Speed Sensor Screw	130-155 in. lbs.(0.9-1.09 Nm)
Position Sensor Screw	25-40 in. lbs.(0.17-0.28 Nm)
Park Flange Screws	130-155 in. lbs.(0.9-1.09 Nm)
Transmission Isolator Mounting Screws	23-27 ft. lbs. (31-36 Nm)
Transmission Lubricant Capacity	AGL PN 2873602 24 oz. (710 ml)
Transfer Case Lubricant Capacity	AGL PN 2873602 14 oz. (414 ml)
Rear Carrier Lubricant Capacity	ADF PN 2871653 18 oz. (532 ml)

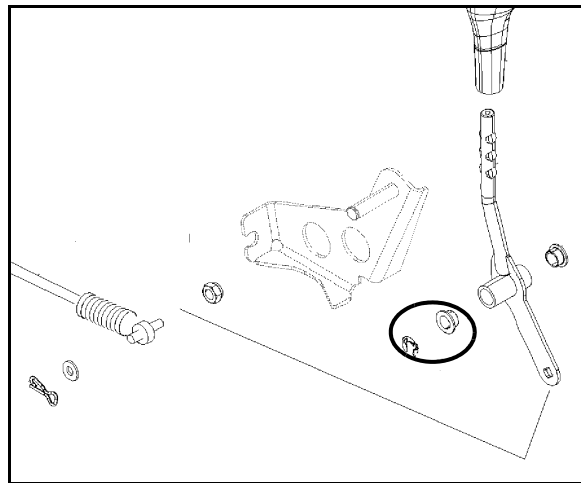
SHIFT LEVER

Removal

1. Pry the shift lever cover using a suitable tool and remove the screw. Pull knob off the shifter.




2. Refer to Chapter 5 for console cover removal.
3. Disconnect cable from shifter.
4. Remove the clip attaching the gear selector to the machine frame.



5. Lift the gear shift selector out of mounting bracket and away from frame.

Installation

1. Perform the steps in reverse order to install the gear shift selector. (shifter, cable, console, shift knob)
2. Tighten the shift cable nut to specification.

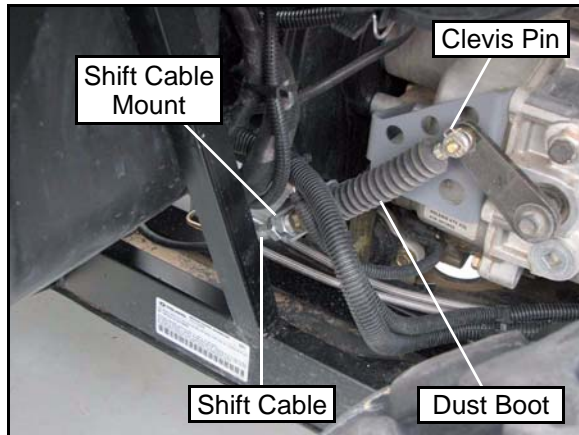
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Shift Cable Nut Torque: 130-155 in. lbs. (14.7-17.5 Nm)

Shift Cable Inspection / Adjustment

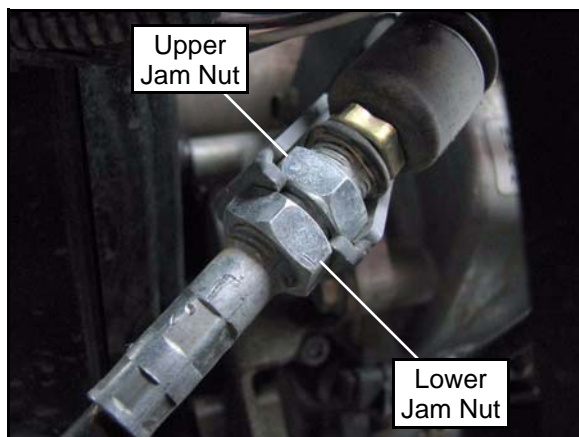
Shift cable adjustment may be necessary if symptoms include:

- No AWD or gear position display on instrument cluster
- Ratcheting noise on deceleration
- Inability to engage a gear
- Excessive gear clash (noise)
- Gear selector moving out of desired range

1. Locate the shift cable in the rear LH wheel well area.



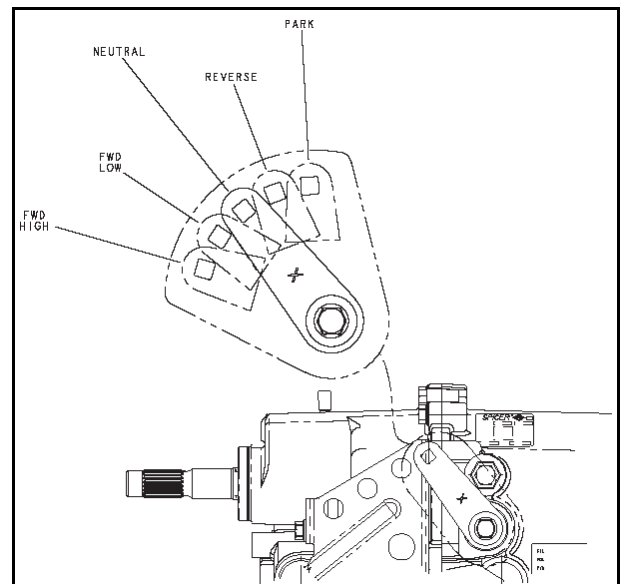
2. Inspect shift cable, clevis pin, pivot bushings, and dust boot. Replace if worn or damaged.
3. If adjustment is required, loosen the lower jam nut and pull the cable out of the mount to move the upper jam nut.



4. Adjust the shift cable so there is the same amount of cable travel when shifting slightly past the detents of HIGH (H) gear and PARK (P).
5. Thread the upper or lower jam nut as required to obtain proper cable adjustment.

NOTE: This procedure may require a few attempts to obtain the proper adjustment.

6. Once the proper adjustment is obtained, place the shift cable and upper jam nut into the mount. Tighten the lower jam nut against the mount.
7. Start engine and shift through all gears to ensure the shift cable is properly adjusted. If transmission still ratchets after cable adjustment, check the CVT system for belt movement at idle. If difficulty shifting persists, the transmission may require service.



TRANSMISSION

TRANSMISSION SERVICE

Transmission Removal / Service Notes

The engine, transmission and rear differential are bolted together as a unit. Removal of the transmission is not possible without removing the engine and differential.

The shift housing cannot be removed without first disassembling the transfer case.

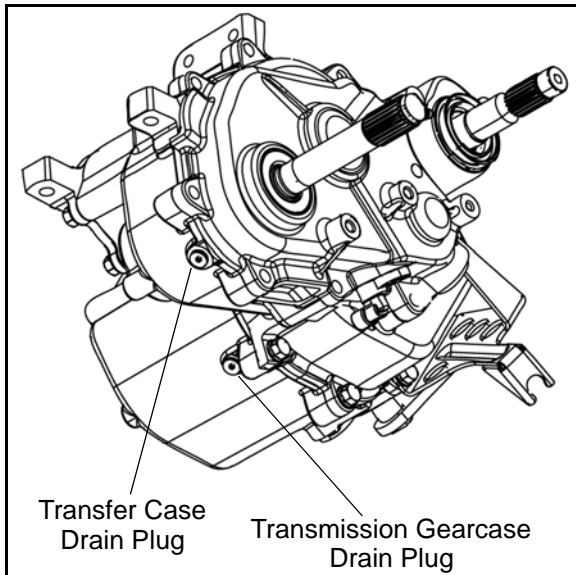
NOTE: Refer to the "Engine Removal" section in Chapter 3 to remove the engine and drivetrain.

Transfer Case Disassembly

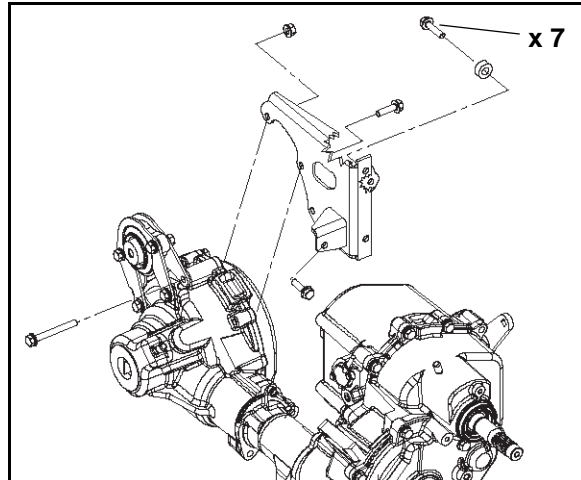
IMPORTANT: Shift housing repairs are not possible without performing transfer case disassembly. Read and understand all instructions before beginning disassembly.

NOTE: Exploded views are located at the end of this chapter for additional information.

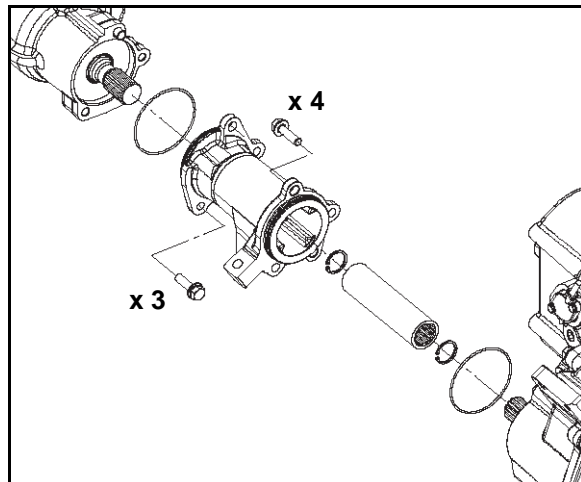
1. Place the transmission in neutral position.
2. Drain both the transfer case and transmission case halves.



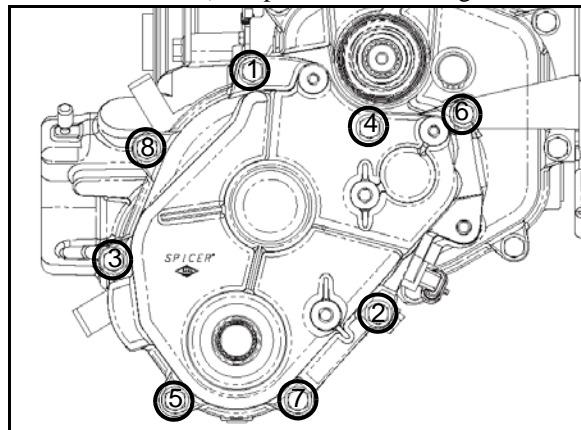
3. Remove the (7) bolts retaining the transmission support bracket.



4. Remove the connector tube bolts securing the rear gear case and transmission transfer case.

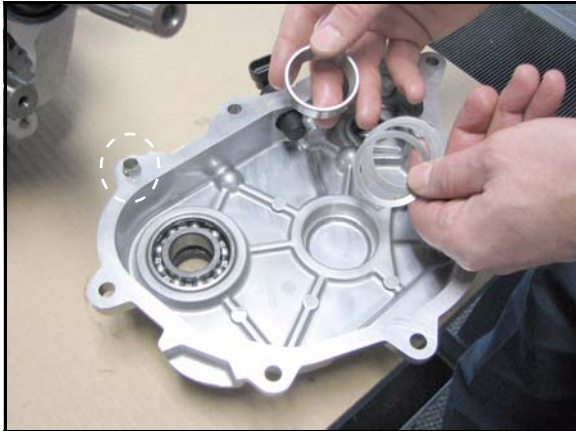


5. Inspect the driveshaft splines for wear and the O-rings for damage. Replace if found to be worn or damaged.
6. Remove the LH front isolator mount bracket. Refer to Chapter 3.
7. Remove the screws from the transfer case cover and remove the cover (note position of the longest screw #4).

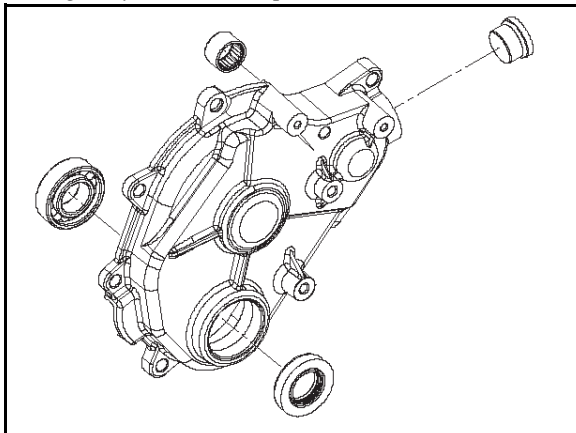


- After removing the cover, remove the intermediate shaft bearing cup and shims from the cover. Bearing cup is a slip-fit. Note and record the number and thickness of shims and set aside. Also note the two alignment dowels (circle) in the cover for installation.

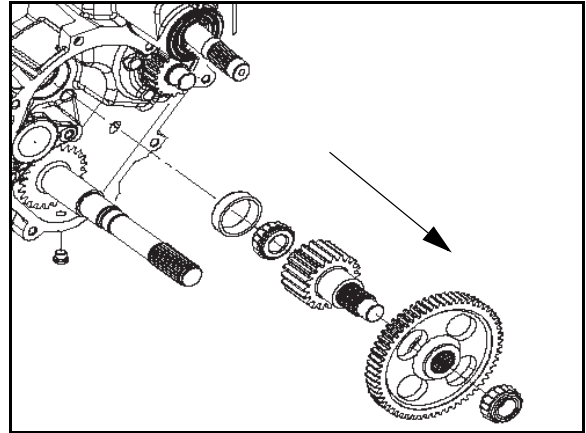
NOTE: Record the number and thickness of shims for reassembly.



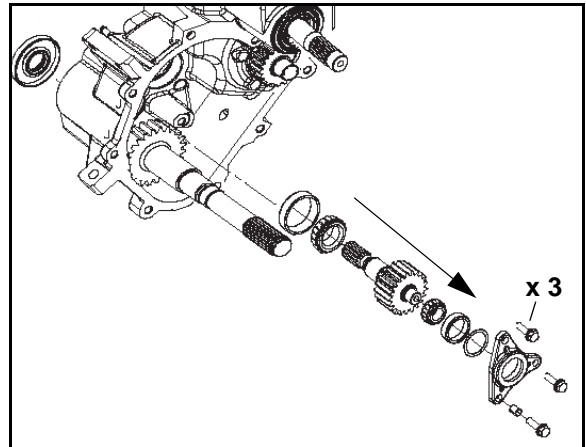
- Disassemble the cover as required, replacing components that are failed or worn. Check bearings for wear or damage and replace as needed using a press and standard bearing removal tools. *Discard removed bearings as they become damaged by the removal process.*



- Remove the intermediate pinion shaft assembly from the housing. Check bearings and gear teeth for wear or damage and replace as needed. The shaft can be disassembled as shown using a press and standard bearing removal tools.



- Disassemble the output pinion shaft assembly by removing the retaining screws on the bearing cup/bracket assembly. Replace the output shaft seal. The output pinion shaft can be disassembled as shown using a press and standard bearing removal tools.

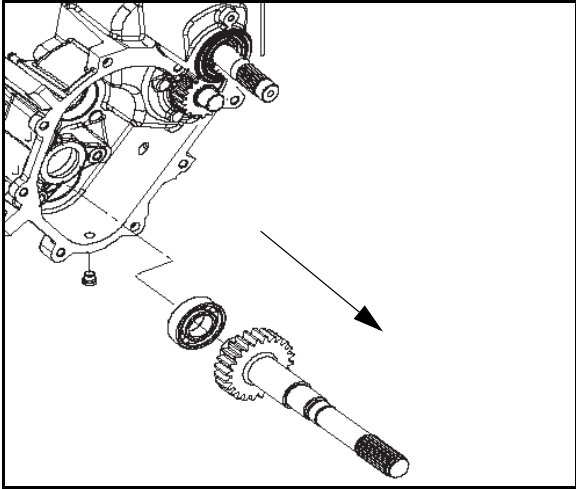


- Output shaft bearing cup is a slip-fit. Remove, note and record the number and thickness of shims and set aside. Note the alignment dowels (circled) in the cover for installation.



TRANSMISSION

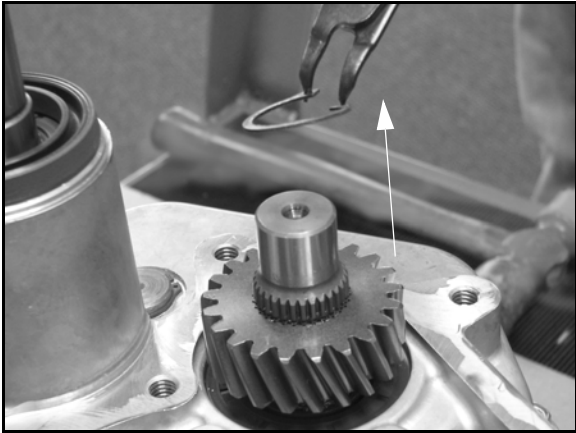
13. Remove the front output pinion shaft assembly. The shaft can be disassembled as shown using a press and standard bearing removal tools.



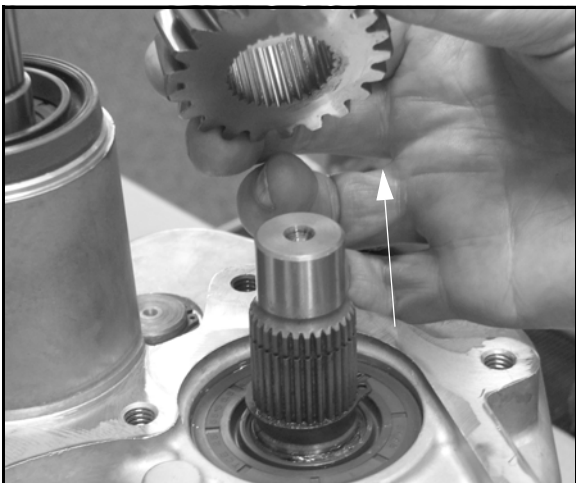
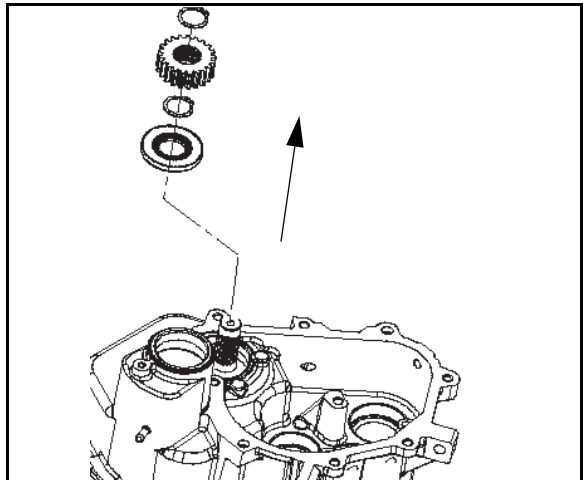
15. Remove the lower snap ring from under the gear.



14. Remove the upper snap ring from the top side of the 21T main pinion gear and remove the gear.

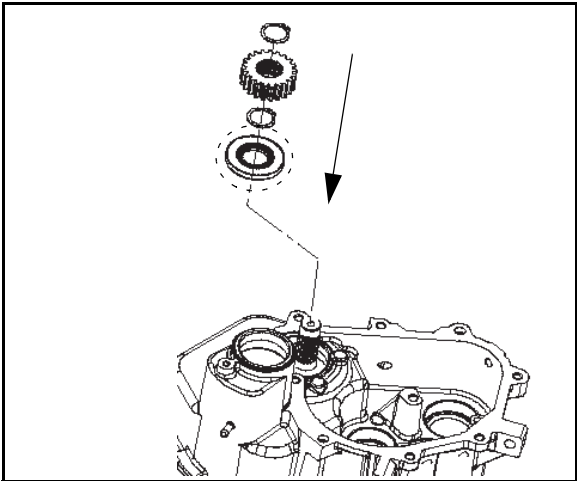


16. Remove the intermediate shaft seal using a seal puller or other suitable method.



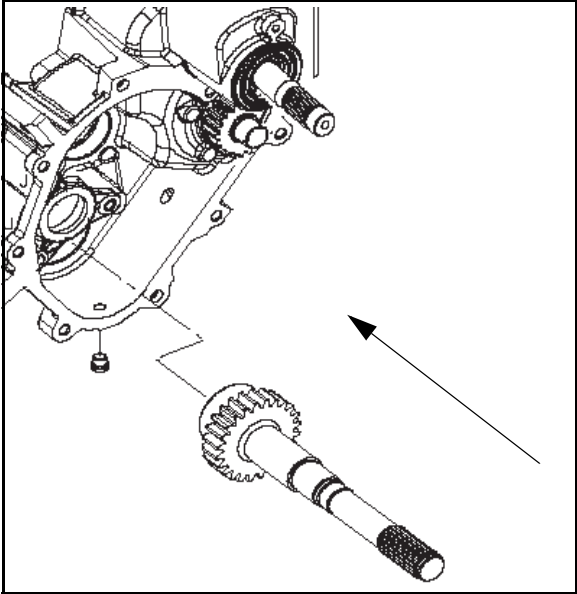
Transfer Case Reassembly

- 1. Install the intermediate shaft seal (circled) flush or slightly below the case. Install circlips and gear onto the input intermediate shaft as shown.

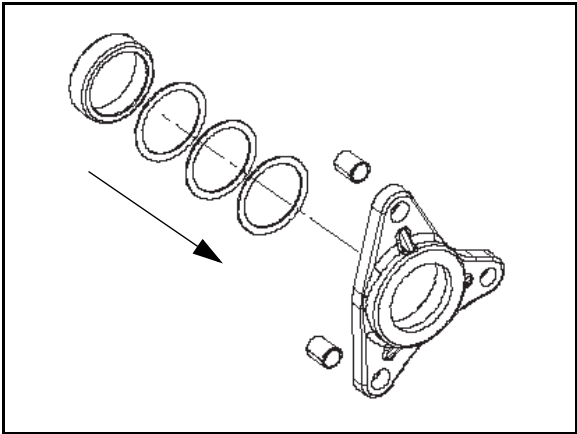


- 2. Install the front output pinion shaft assembly.

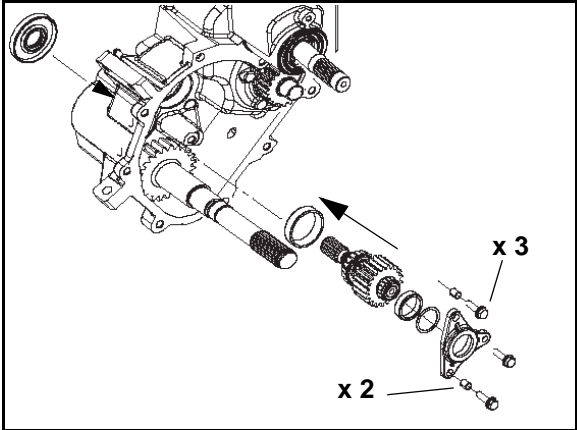
NOTE: Bearing is pressed onto the shaft




- 3. Install the shims, bearing cup and alignment dowels into the retaining bracket.



- 4. Install a new output shaft seal flush with the case. Install the output pinion shaft assembly and bearing cup/bracket assembly as shown. Verify the alignment dowels are seated. Torque the bracket screws evenly to specification.

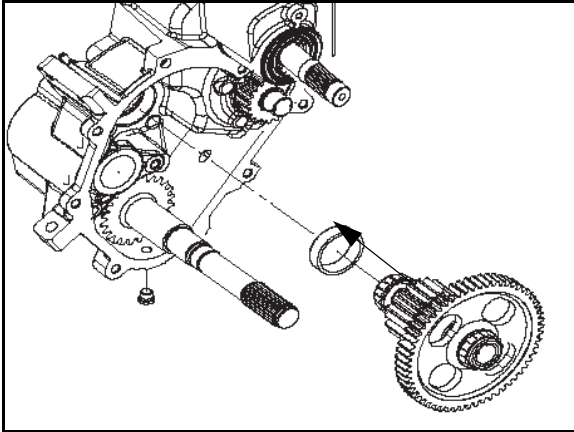


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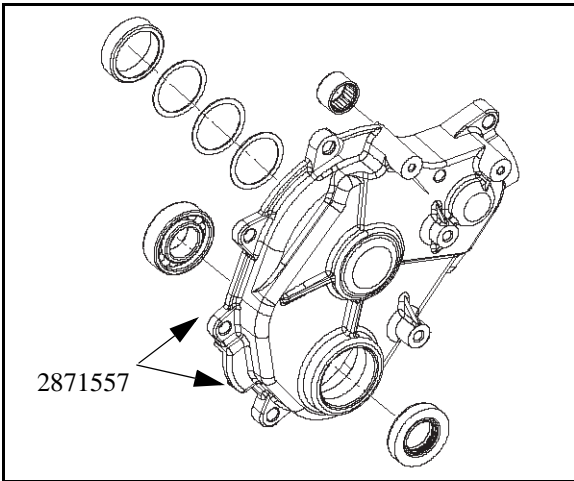
Output Pinion Shaft Bracket Screws:
23-27 ft. lbs. (31-37 Nm)

TRANSMISSION

5. Reinstall the intermediate pinion shaft assembly and bearing cup.

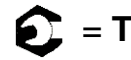
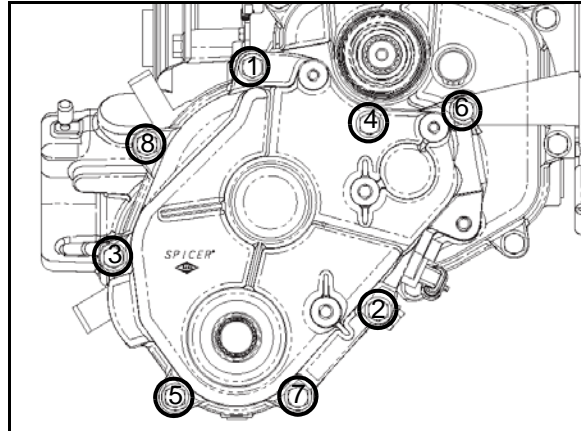


6. Assemble the transfer case cover using new components as required. Press in new bearings and a seal using standard installation tools. (needle bearing is installed round edge inward) Install a new shaft seal flush with the surface, the shims and bearing cup. Apply a thin coat of sealant to the mating surfaces. Apply lubricant to the seal lip.



**Apply Sealant PN 2871557
To Case Mating Surfaces**

7. Install the transfer case cover. Align the dowels (#1 & #7) and insert the cover screws (note position of the longest screw #4). Torque the screws evenly to specification in sequence as shown.

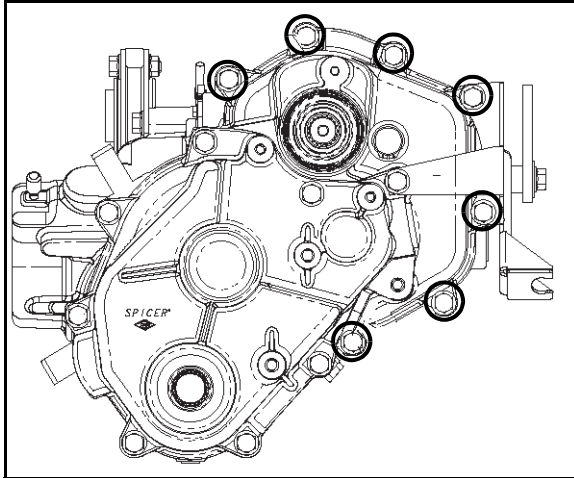


**Transfer Case Cover Screws:
23-27 ft. lbs. (31-37 Nm)**

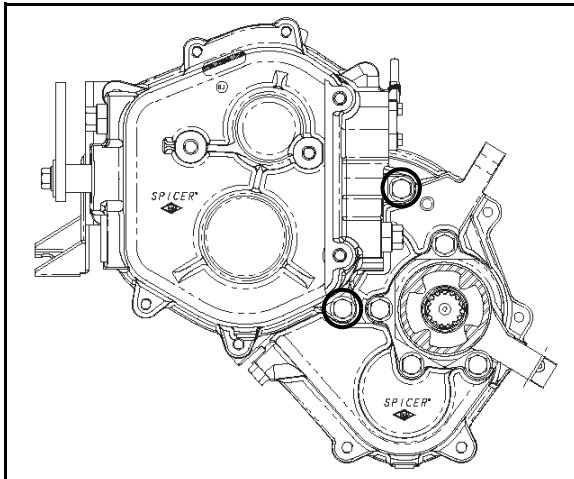
Transmission Shift Housing Disassembly

IMPORTANT: Shift housing repairs are not possible without performing transfer case disassembly. Read and understand all instructions before beginning disassembly.

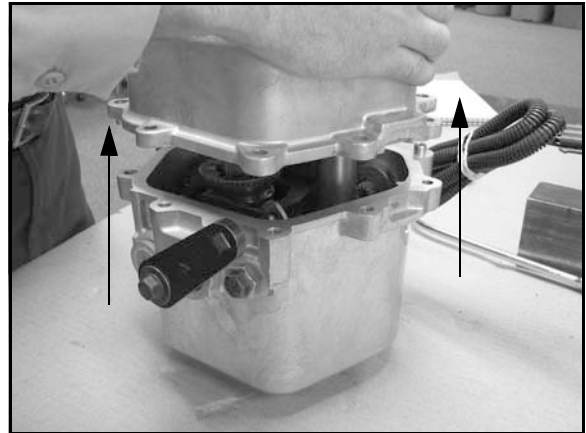
1. Verify transmission is in neutral. Remove the (7) shift housing case screws from the front of the transmission and (2) from the backside as shown.



NOTE: Shift cable bracket removal is required.

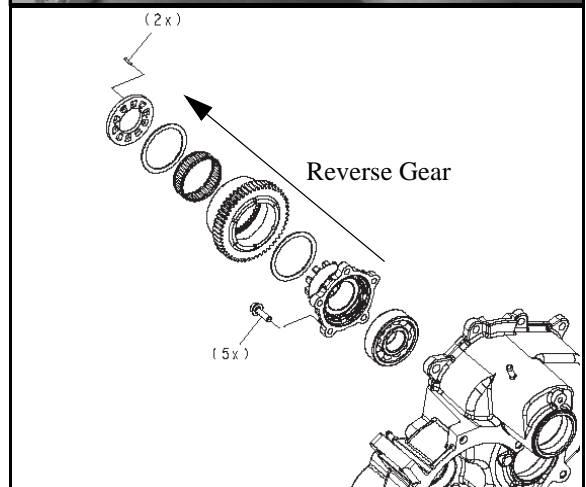


2. Place the transmission shift housing onto a flat surface as shown. Lift the transmission case half straight up and remove.



NOTE: Shaft components may “catch” during transmission case half disassembly. Work slowly and deliberately to avoid component loss or damage.

3. Using a suitable tool, pry the reverse retaining plate up from the (2) roll pins and remove the reverse clutch/gear assembly from the housing. Note the orientation of the (2) thrust washers (top / bottom of gear assembly) and needle bearing. Inspect these components and replace as required.

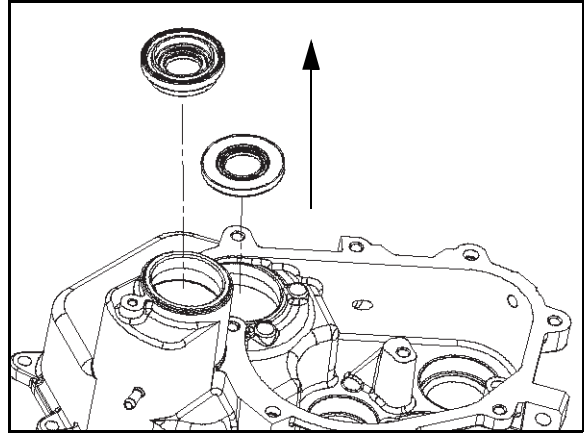


TRANSMISSION

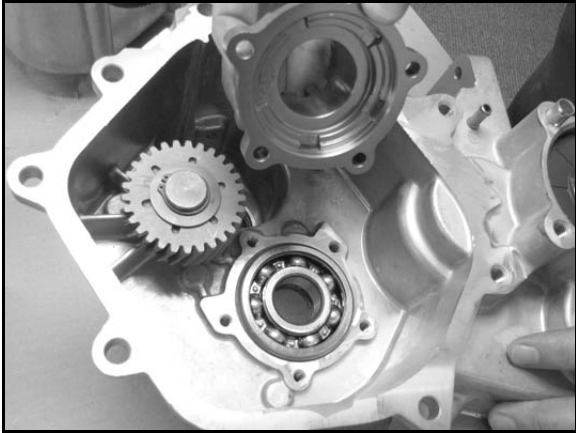
4. Remove the (5) screws retaining the park flange. Inspect the park flange dogs for wear or damage. Replace as required.



7. Remove the input shaft seal and clutch intermediate shaft seal using a seal puller or punch.



5. Inspect the shaft bearing. Use a standard bearing puller to remove the shaft bearing if required.

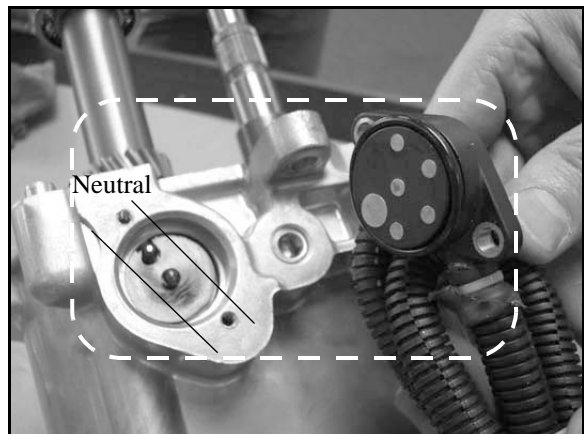
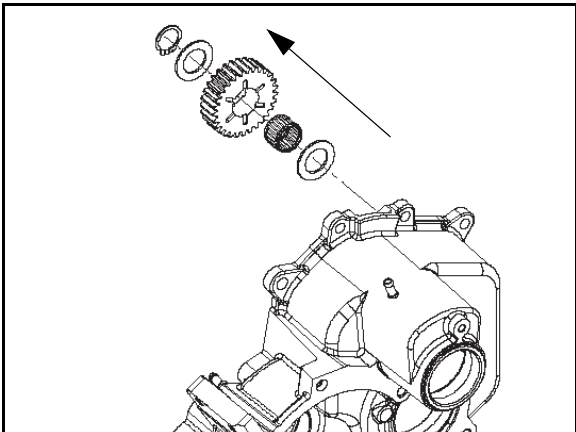


8. Remove the (2) screws that attach the shift switch to the shift housing. Inspect the O-ring, switch poles and spring pins for wear or damage. Replace parts as required.



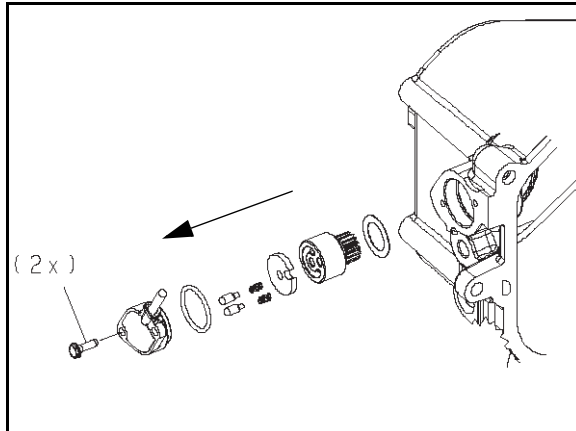
NOTE: Do not pull bearing from cases for inspection, as the removal process damages the bearing.

6. Remove the reverse idler snap ring, upper washer, gear, needle bearing, and lower washer from the idler shaft.



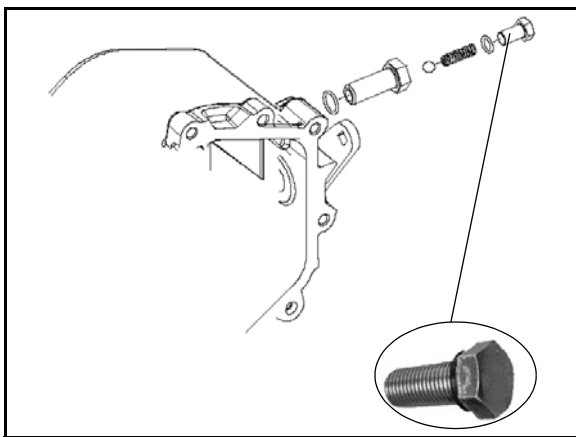
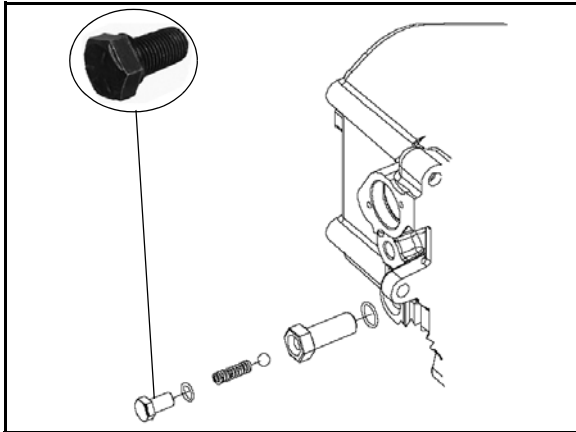
NOTE: The reverse idler shaft is a non-serviceable item and should not be pressed out of the housing.

9. Remove the plate, pins, springs, drum gear and thrust washer from the shift housing. Replace any worn or damaged components.



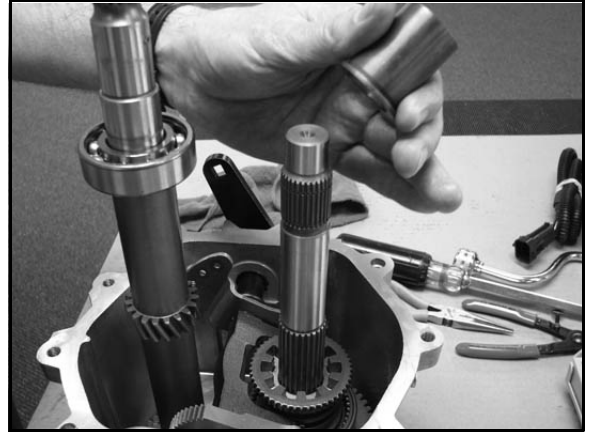
10. Remove the inner shift detent screws, springs, and balls from each side of the shift housing.

NOTE: The clutch yoke side uses the short, "black" detent screw and the gear selector side detent uses the longer, "silver" detent screw.

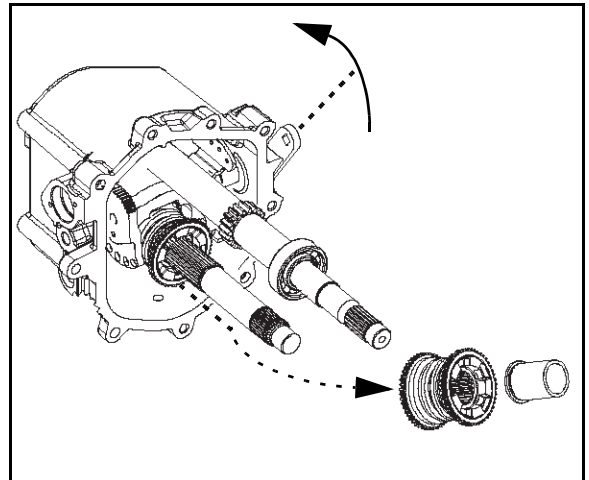


NOTE: Never remove the outer shift detent screw first. Removal of the outer screw will allow the detent ball and spring to fall into the shift housing.

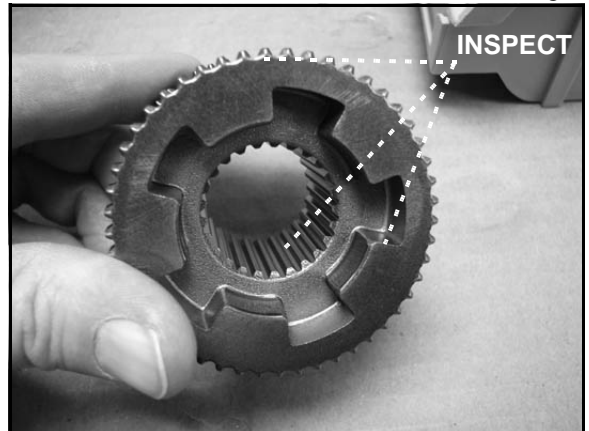
11. Remove the park flange sleeve from the clutch shaft.



12. Pull back fully on gear selector arm to bring shift collar up and disengage the shift collar from the clutch yoke. Lifting on the clutch shaft may aid in shift collar removal.



13. Inspect the inner and outer gear teeth and splines on both ends of the shift collar for excessive wear or damage.

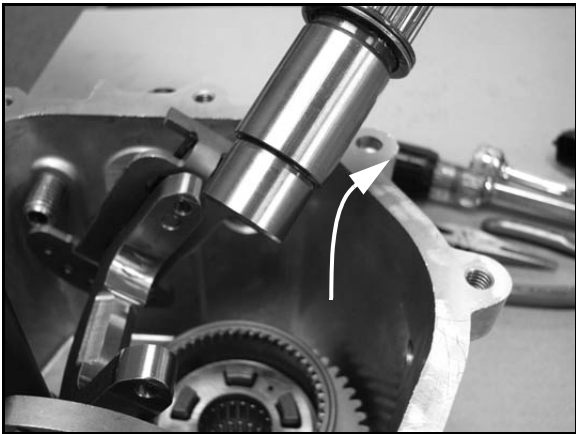


TRANSMISSION

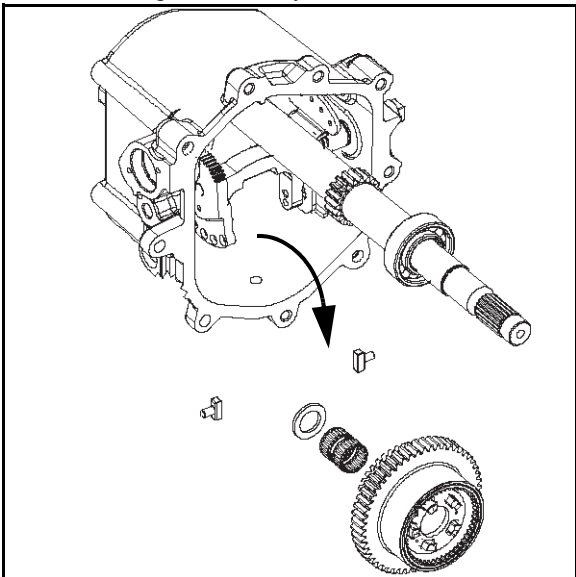
14. Remove the sliding shoes from the clutch yoke.



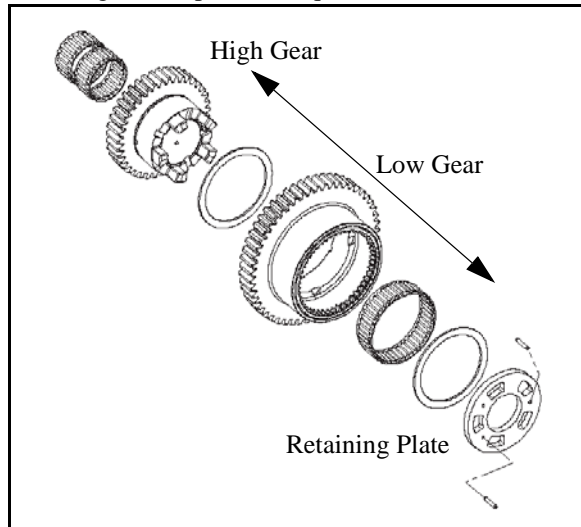
15. Remove the clutch shaft from the housing. Note that the forward gear assembly will remain in the housing.



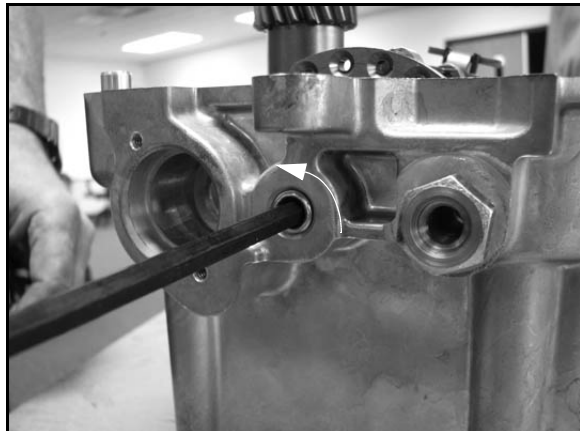
16. Remove the forward clutch gear assembly from the housing. Note the two needle bearings and washer on the bottom of the gear assembly.



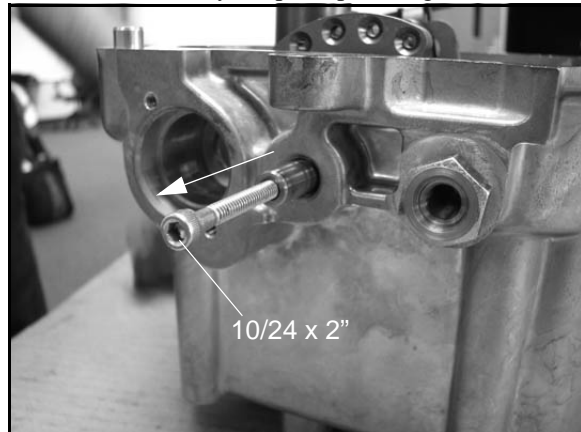
17. From the back side of the high gear assembly, separate the high and low gear assemblies by tapping the gear retaining plate from the roll pins using a brass punch. Note the order of disassembly on the entire gear assembly (plate, thrust washer, bearing, thrust washer). Inspect all parts for wear or damage and replace as required.



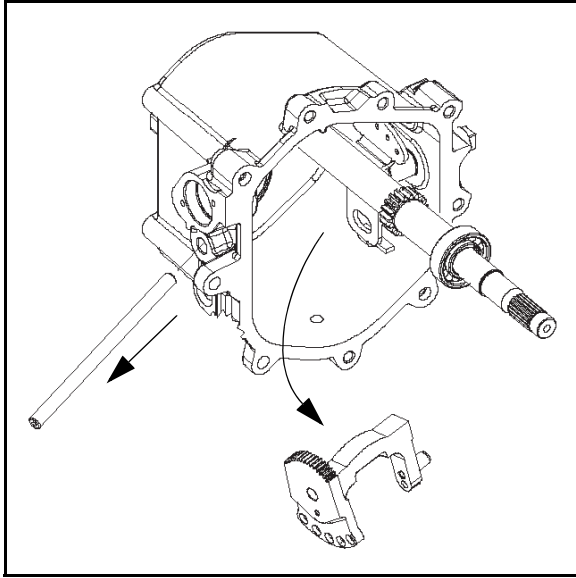
18. Remove the clutch yoke pivot pin set screw.



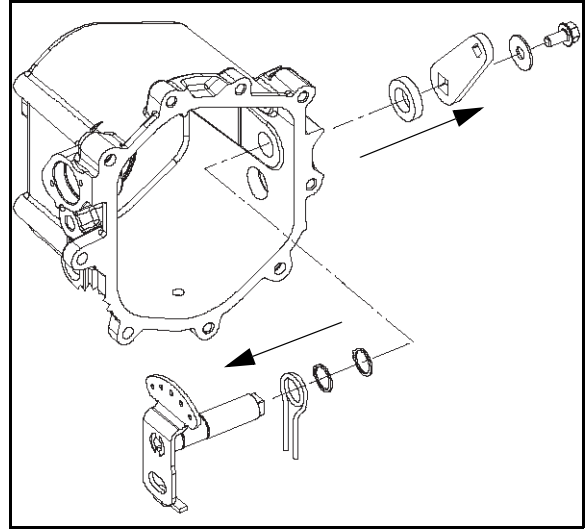
19. Remove the clutch yoke pivot pin using a 10/24 x 2" bolt.



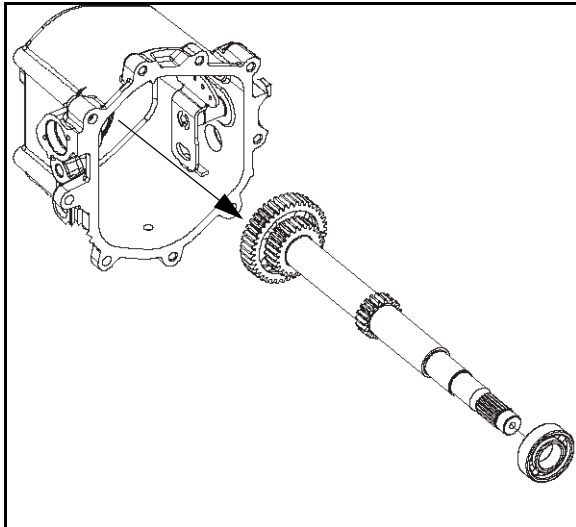
20. Remove the clutch yoke from the gear selector shaft and spring.



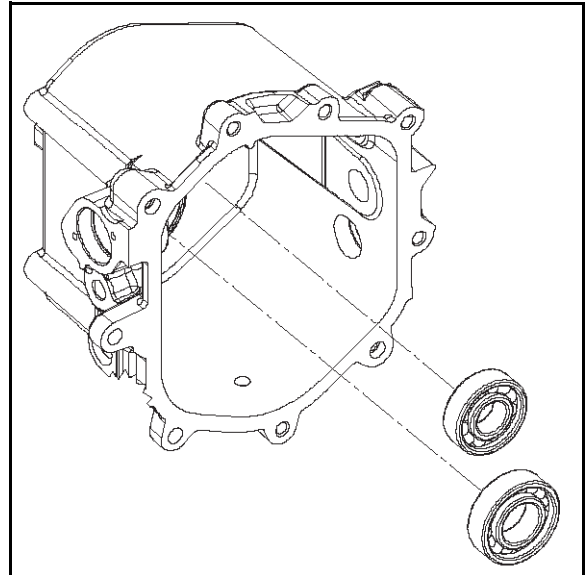
22. Remove the screw from the end of the gear selector shaft assembly and remove the assembly from the housing. Note the clips, spring and plate orientation.



21. Remove the transmission input shaft from the housing. Inspect the shaft bearing and replace if required using a shop press. Inspect the gears for damage and/or wear. Replace the shaft if required.



23. Inspect the gear selector shaft and housing for excessive wear or damage. Replace components as required.
24. Inspect and replace the case bearings if required.

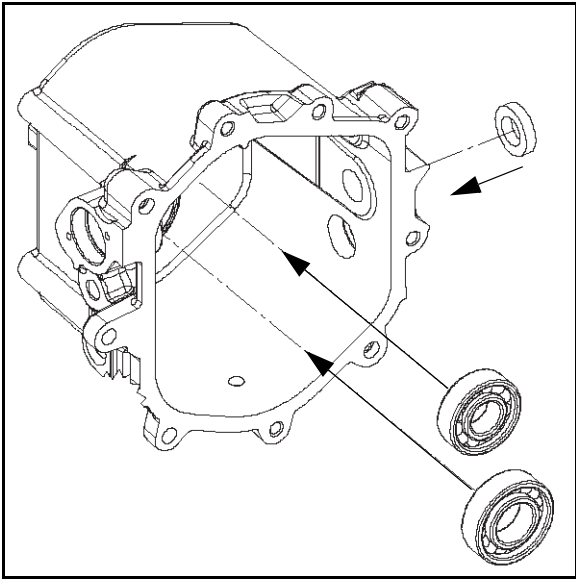


NOTE: Do not pull bearings from case for inspection, as the removal process damages the bearing.

TRANSMISSION

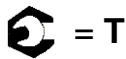
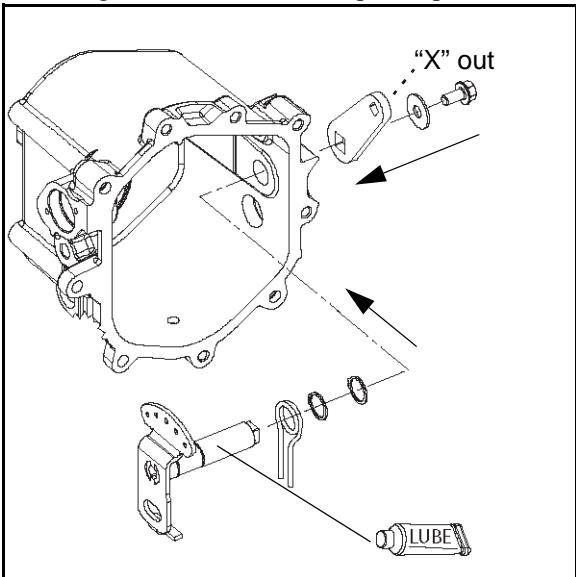
Transmission Shift Housing Reassembly

1. Install a new shift lever seal flush with the case. Apply lubricant to the seal lip. Press new bearings (if required) into the housing.



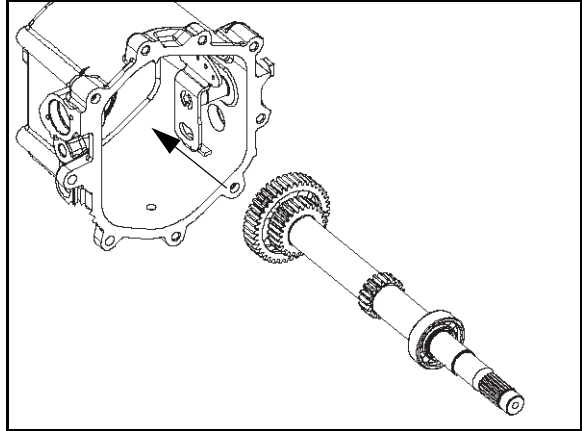
NOTE: Drive bearings and seals using the outer edge only.

2. Assemble the spring and clips onto the shaft as shown. Lubricate the shaft and install the assembly into the housing. Install the shift lever ("X" facing out) and screw onto the gear selector shaft. Torque to specification.

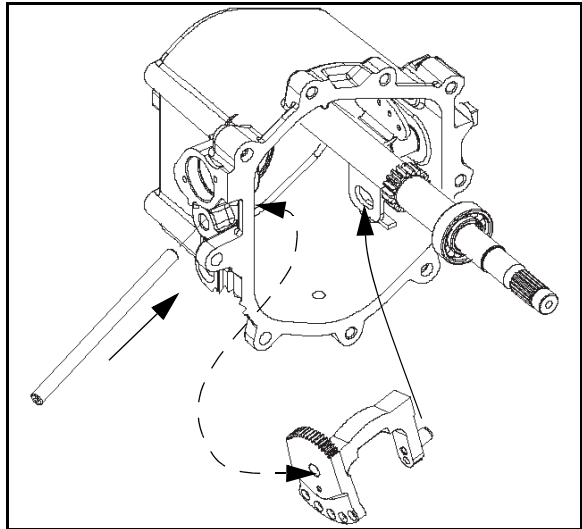


Shift Lever Screw Torque:
15-20 ft. lbs. (20 - 27 Nm)

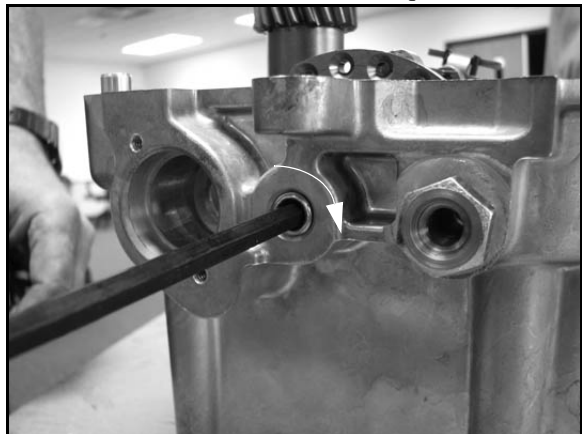
3. Install the input shaft assembly.



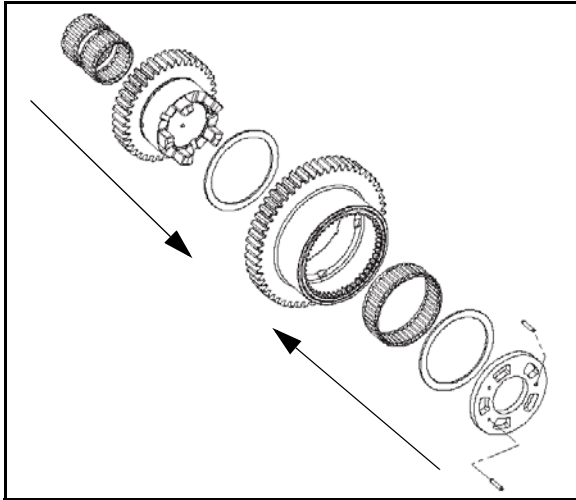
4. Install clutch yoke into the gear selector shaft and spring. Align the pivot pin holes and install clutch yoke pivot pin.



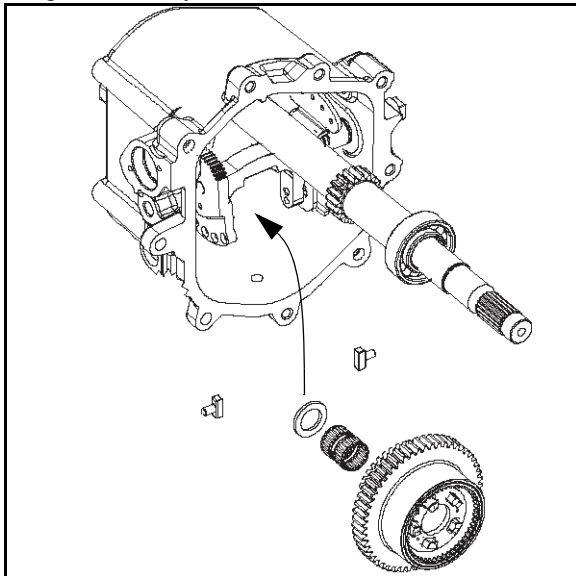
5. Apply sealant to the clutch yoke set screw threads and install flush with the case. Do not torque.



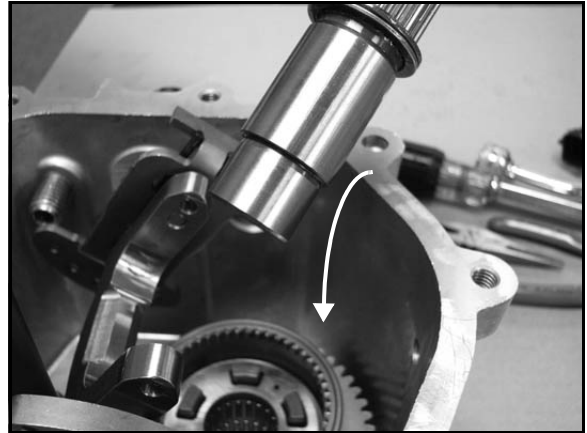
6. Assemble the high and low gear assemblies as shown. Complete the assembly by aligning the roll pin holes and tapping the roll pins through the retaining plate and into the high gear using a brass punch.



7. Install the forward clutch gear assembly into the housing. Note the two needle bearings and washer on the bottom of the gear assembly.



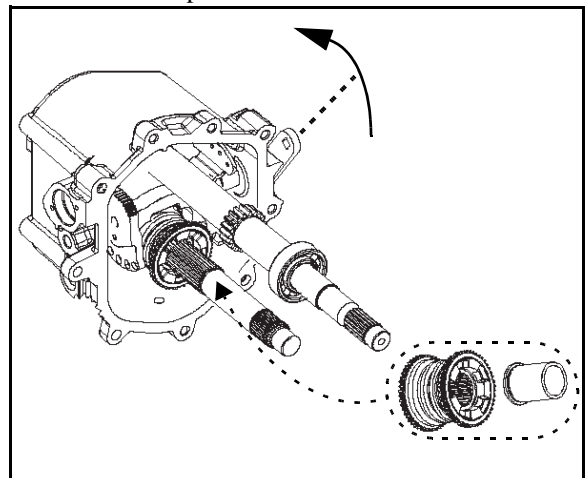
8. Install the clutch shaft into the housing. Note that the forward gear assembly is loose in the housing and that alignment of the shaft, gear assembly, thrust washer and bearing is necessary for shaft installation.



9. Install the sliding shoes onto the clutch yoke.



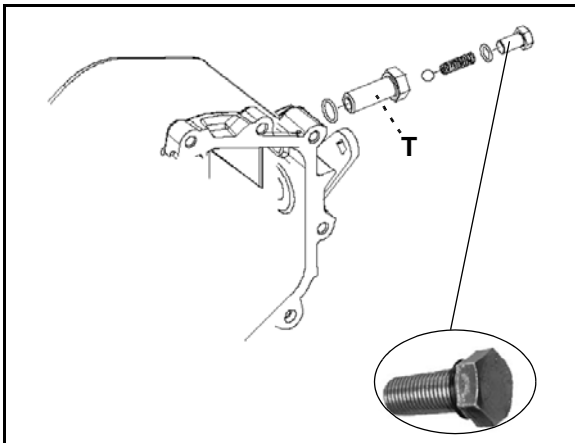
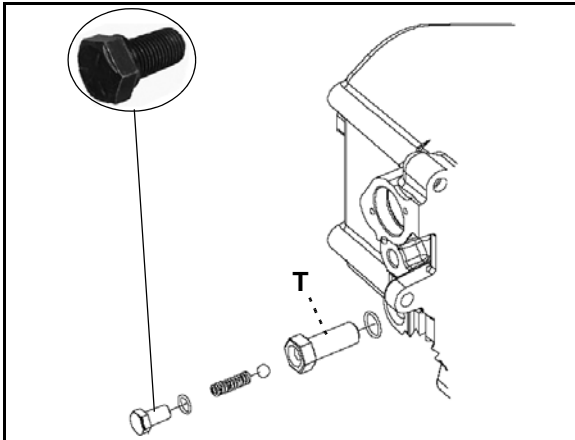
10. Install the shift collar onto the shaft. Pull back fully on gear selector arm to bring the shift yoke arms up and engage the shift shoes onto the center groove of the shift collar. Shifting the clutch shaft position may aid in shift collar installation. Install the park flange sleeve on top of the shift collar with the lip down as shown.



TRANSMISSION

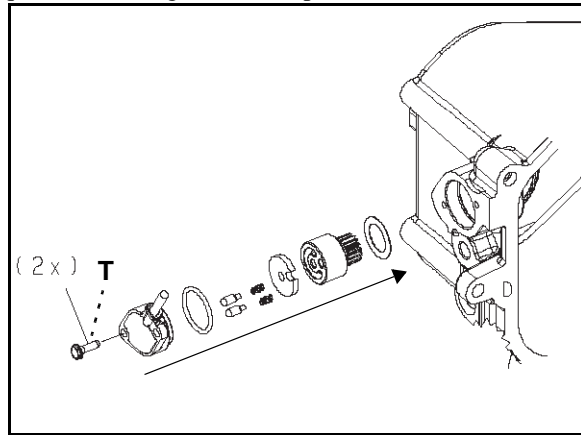
- Install the outer sleeve screws and inner shift detent screws, springs, and balls from each side of the shift housing. Use new o-rings anytime these screws are removed. Torque the outer sleeve screws to specification. **TURN INNER DETENT SCREWS ONLY UNTIL LIGHT SHIFTING RESISTANCE IS FELT AT THIS TIME. PLACE THE TRANSMISSION IN NEUTRAL.**

NOTE: The clutch yoke side uses the short, "black" detent screw and the gear selector side detent uses the longer, "silver" detent screw.

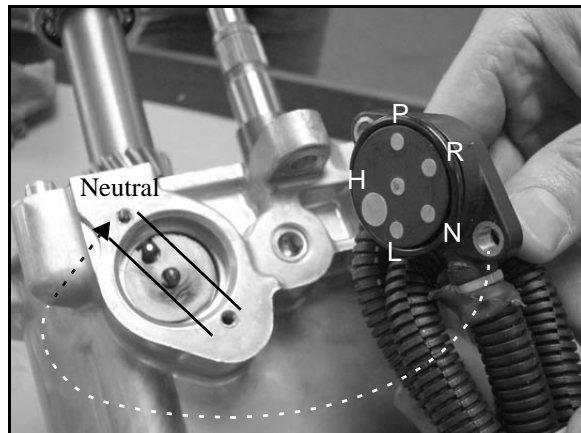


Detent (outer) Sleeve Screws:
40-45 ft. lbs. (54-61 Nm)

With the transmission in neutral, lubricate and install the thrust washer, drum gear, plate, springs, pins and the shift position sensor/o-ring assembly into the shift housing. Verify the shift drum pins are aligned as shown with the transmission in neutral. Torque the retaining screws to specification.

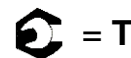


Apply Lubricant to shift drum components



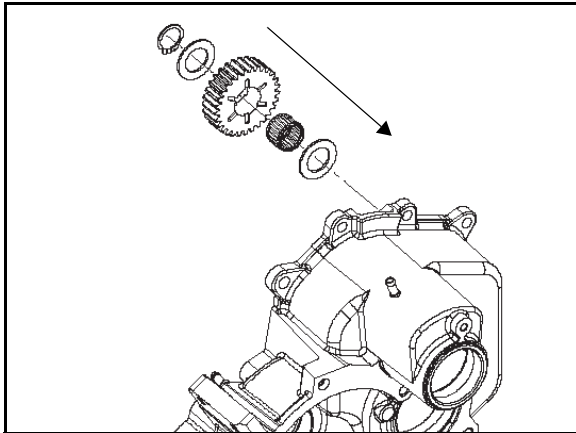
Shift Position Sensor Screws:
25-40 in. lbs. (2.8-4.5 Nm)

- Complete shift detent screw installation. Torque the inner screws to specification.

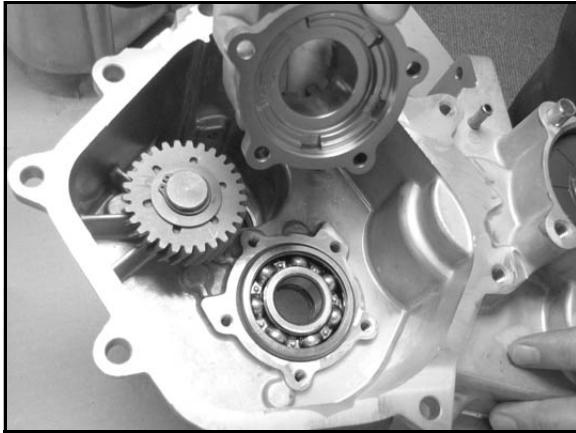


Shift Detent (inner) Screws:
23-27 ft. lbs. (31-36.6 Nm)

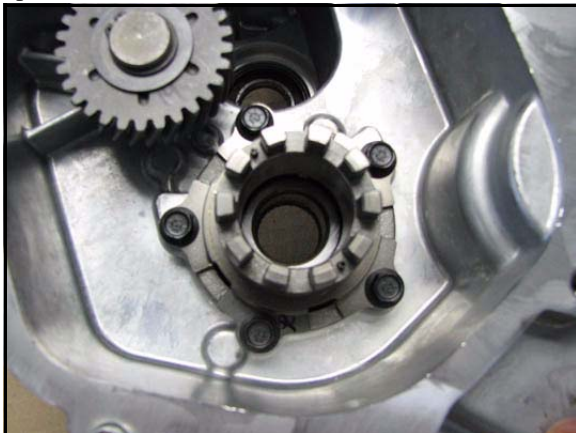
13. Install the reverse idler lower washer, needle bearing, gear, upper washer and snap ring onto the idler shaft of the transmission case half.



14. Install a new shaft bearing (if required).

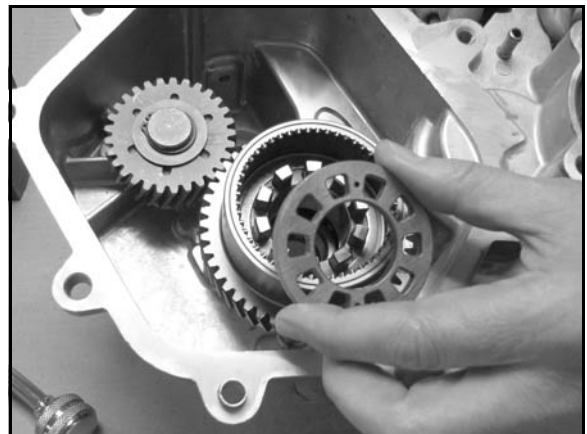
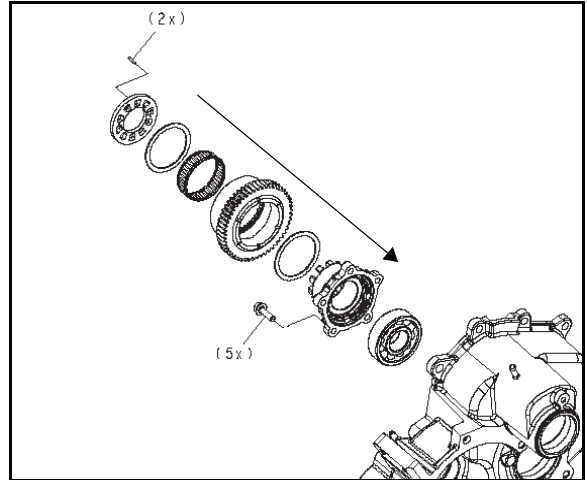


15. Install the park flange and torque the (5) screws to specification.

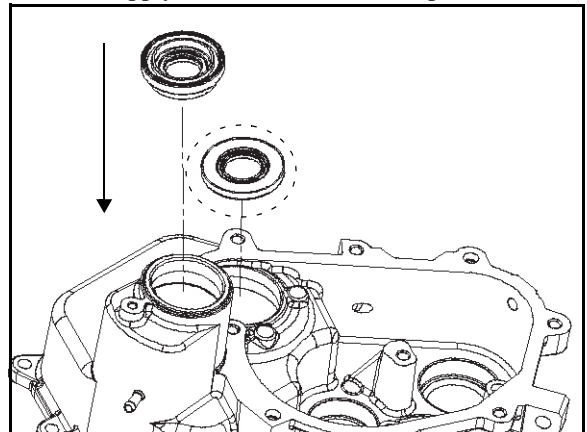


Park Flange Screws:
130-155 in. lbs. (14.6-17.5 Nm)

16. Install the reverse clutch/gear assembly onto the park flange. Note the orientation of the (2) thrust washers (top / bottom of gear assembly), and needle bearing. Complete the assembly by aligning the roll pin holes and tapping the roll pins through the retaining plate and into the reverse gear using a brass punch.

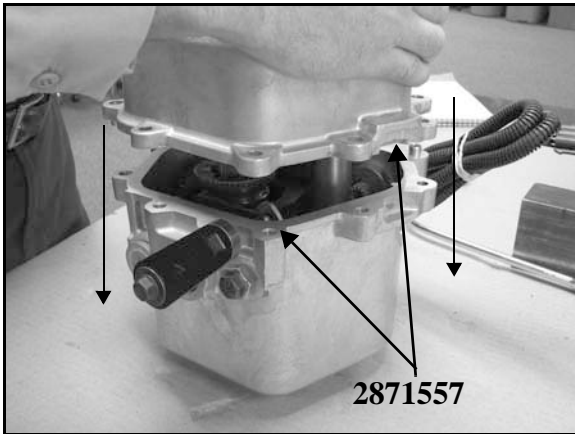


17. Install the input shaft seal and verify it is fully seated. Install the intermediate shaft seal (circled) flush or slightly below the case. Apply lubricant to both seal lips.



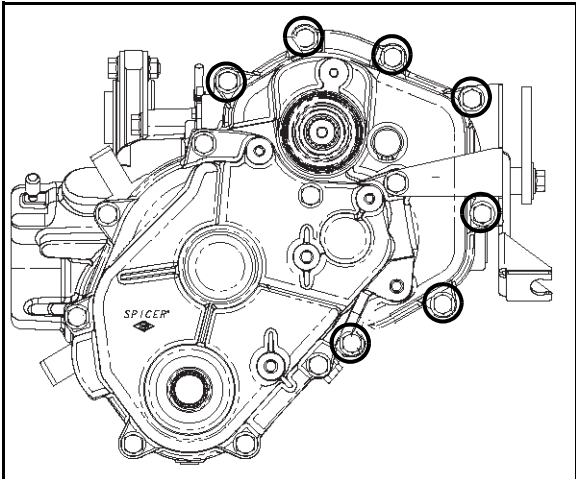
TRANSMISSION

18. Place the transmission shift housing onto a flat surface as shown. Apply a bead of crankcase sealant onto the mating surfaces. Align the dowels and install the transmission case half onto the shift housing while rotating the input shaft, using care not to damage the seal surfaces.



**Apply Sealant PN 2871557
To Case Mating Surfaces**

19. Install the shift cable bracket (7) shift housing case screws to the front of the transmission. Torque to specification.

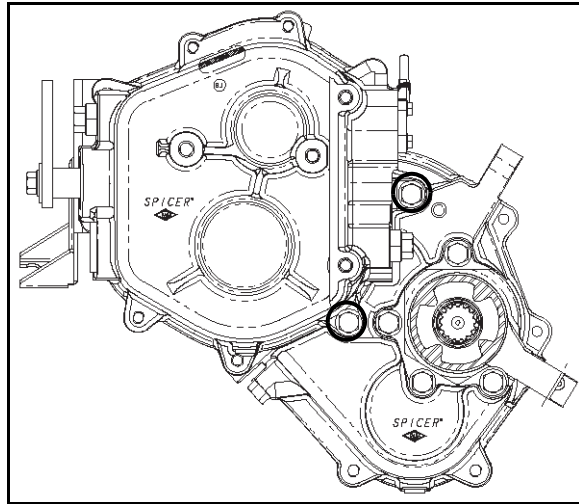


T = T

**Shift Housing Screws:
23-27 ft. lbs. (31-36.6 Nm)**

20. Install the (2) shift housing case screws to the backside as shown. Torque to specification.

NOTE: Shift cable bracket installation is required.



T = T

**Shift Housing Screws:
23-27 ft. lbs. (31-36.6 Nm)**

21. Proceed with transfer case reassembly.

See "Transfer Case Reassembly" on page 8.7

TROUBLESHOOTING

Troubleshooting Checklist

Check the following items when shifting difficulty is encountered:

- Idle speed adjustment
- PVT alignment
- Transmission oil type/quality
- Transmission torque stop adjustment (where applicable)
- Engine torque stop adjustment (where applicable)
- Drive belt deflection
- Loose fasteners on rod ends
- Loose fasteners on selector box
- 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

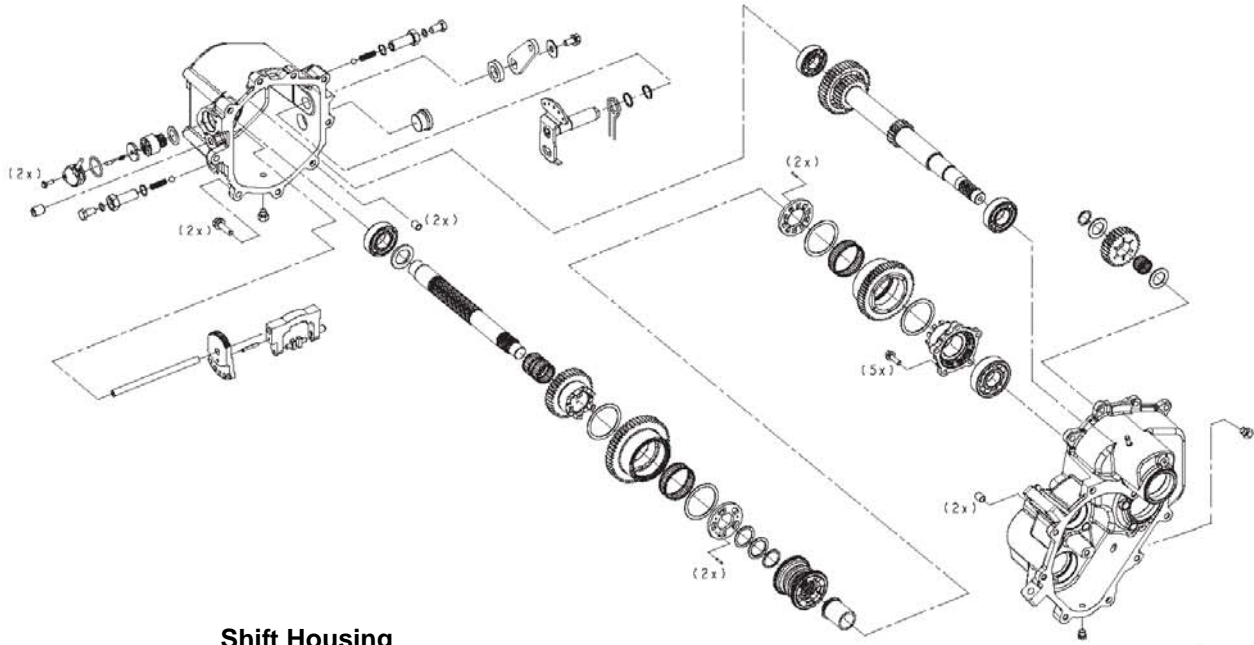
NOTE: To determine if shifting difficulty is caused by an internal transmission problem, isolate the transmission by disconnecting the shifter from transmission bellcrank. Verify the engine RPM is set to specification. Manually select each gear range at the transmission bellcrank, and test ride vehicle. 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

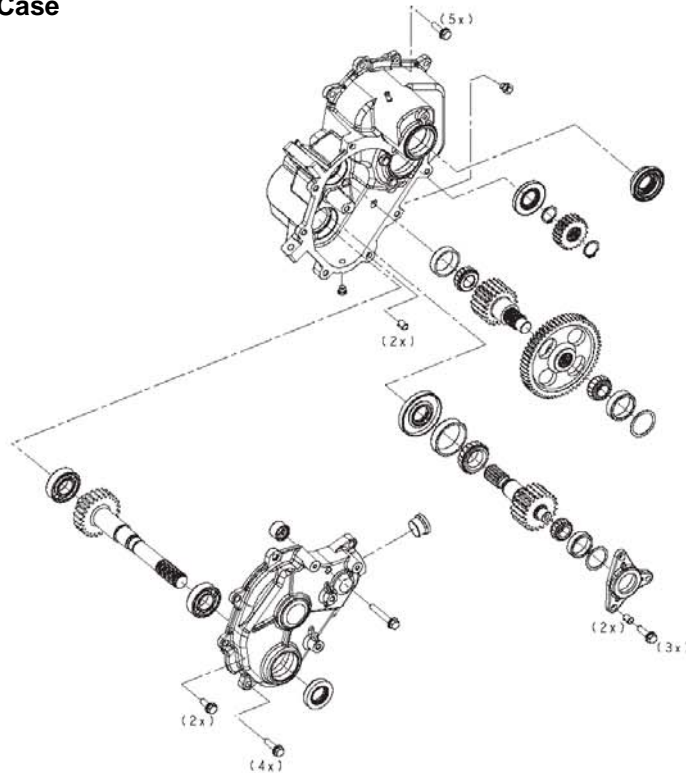
TRANSMISSION EXPLODED VIEWS

Shift Housing / Transfer Case Exploded View



Shift Housing

Transfer Case



CHAPTER 9

BRAKES

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BRAKES

GENERAL SPECIFICATIONS

FRONT BRAKE SYSTEM		
Item	Standard	Service Limit
Front Brake Pad Thickness	.300 ± .007" (7.62 ± .178 mm)	.180" (4.6 mm)
Front Brake Disc Thickness	.188" (4.76 mm)	.170" (4.32 mm)
Front Brake Disc Runout	-	.010" (.254mm)

REAR BRAKE SYSTEM		
Item	Standard	Service Limit
Rear Brake Pad Thickness	.298 ± .007" (7.57 ± .178 mm)	.180" (4.6 mm)
Rear Brake Disc Thickness	.188" (4.76 mm)	.170" (4.32 mm)
Rear Brake Disc Runout	-	.010" (.254 mm)

TORQUE SPECIFICATIONS

Item	Torque ft. lbs.	Torque Nm
Front Caliper Mounting Bolts	30	40
Rear Caliper Mounting Bolts	18	24
Brake Line Flare	12-15	16-20
Brake Line Banjo Bolts (Caliper Attachment)	15	20
Brake Line Banjo Bolt (Master Cylinder Attachment)	15	20
Front Brake Disc to Hub Bolts	28	38
Rear Brake Disc to Hub Bolts	28	38
Brake Switch	12-15	16-20
Master Cylinder to Frame	17	23
Brake Pedal Mounting Bracket to Frame	15	23

SPECIAL TOOLS

Part Number	Tool Description
2870975	Mity Vac™ Pressure Test Tool

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 (PN 2872113) 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

BRAKES

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.

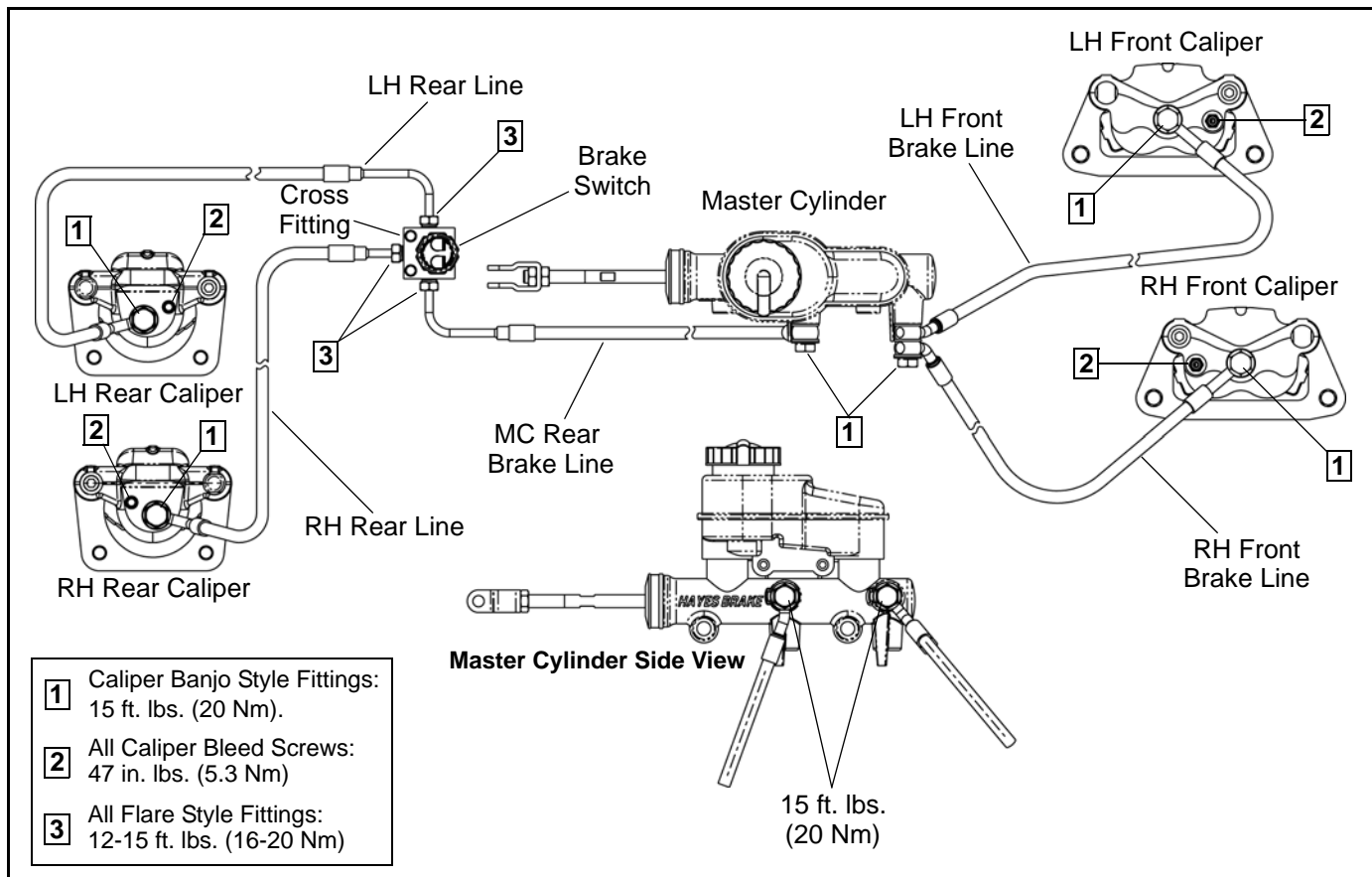
The friction applied to the brake pads will cause the pads to wear. As these pads wear, the piston within the caliper moves further outward and becomes self adjusting. Fluid from the reservoir fills the additional area created when the caliper piston moves outward.

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.

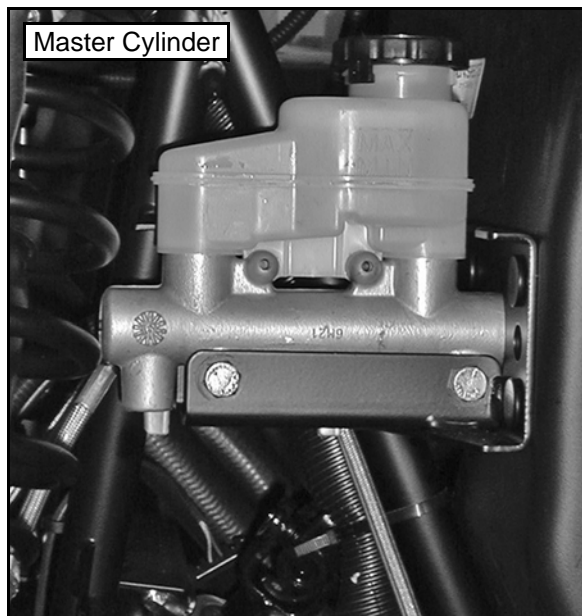
BRAKE SYSTEM EXPLODED VIEW



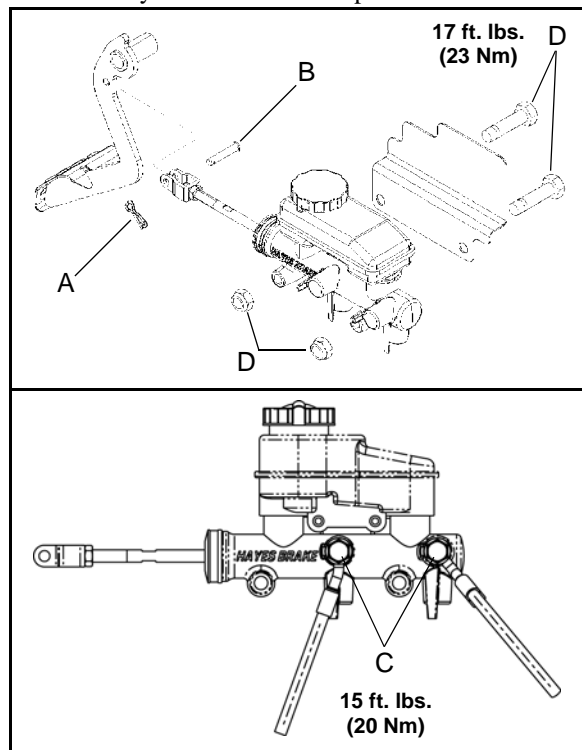
MASTER CYLINDER

Removal

1. Locate the master cylinder above the LH front tire in the wheel well area.



2. Remove the clip (A) from the clevis pin (B) that attaches the master cylinder to the brake pedal lever.



3. Place a container to catch brake fluid under the master cylinder brake line banjo bolts (C).



CAUTION

Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.

NOTE: Make note of front and rear brake line locations to master cylinder.

4. Loosen the brake line banjo bolts (C) and allow fluid to drain.

NOTE: Dispose of fluid properly. Do not re-use.

5. Remove the two mounting fasteners (D) that secure the master cylinder to the frame.

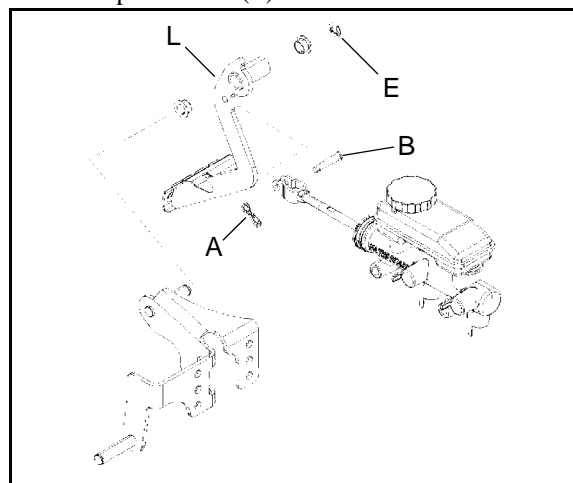
Installation

1. Reverse Steps 1-5 for master cylinder installation. **Refer to the torque specifications in the illustration.**
2. After installing the foot brake check pedal freeplay. Pedal freeplay should not exceed .090" (2.286 mm).

BRAKE PEDAL LEVER

Pedal Removal

1. Locate the brake pedal lever (L) and remove the master cylinder clevis pin (B) and clip (A).
2. Remove the E-ring (E) from the pedal mount and remove the brake pedal lever (L) from the vehicle.



Pedal Installation

1. Reverse "Removal" steps to install brake pedal lever. Brake pedal freeplay should not exceed .090" (2.28 mm).

**Brake Pedal Freeplay:
.090" (2.28 mm)**

BRAKES

BRAKE BLEEDING / FLUID CHANGE

NOTE: When bleeding the brakes or replacing the fluid always start with the furthest caliper from the master cylinder.

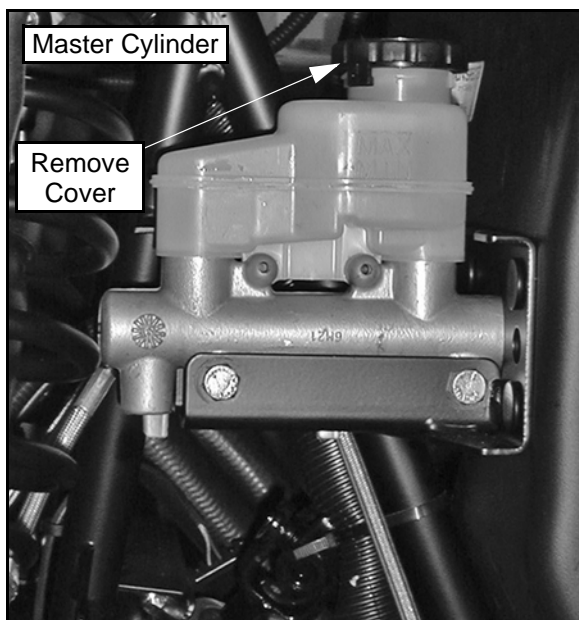
CAUTION

Always wear safety glasses.

CAUTION

Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces. This procedure should be used to change fluid or bleed brakes during regular maintenance.

1. Clean master cylinder reservoir cover thoroughly and remove the cover.



2. If changing fluid, remove old fluid from reservoir with a Mity Vac™ pump or similar tool.

Mity Vac™ (PN 2870975)

3. Add brake fluid to the indicated MAX level of reservoir.

**Polaris DOT 4 Brake Fluid
(P/N 2872189)**

4. Begin bleeding procedure with the caliper that is farthest from the master cylinder. Install a box end wrench on caliper bleeder screw. Attach a clean, clear hose to fitting and place the other end in a clean container. Be sure the hose fits tightly on fitting.
5. Have an assistant slowly pump foot pedal until pressure builds and holds.
6. Hold brake pedal on to maintain pedal pressure, and open bleeder screw. Close bleeder screw and release foot pedal.

NOTE: Do not release foot pedal before bleeder screw is tight or air may be drawn into master cylinder.

7. Repeat procedure until clean fluid appears in bleeder hose and all air has been purged. Add fluid as necessary to maintain level in reservoir.

CAUTION

Maintain at least 1/2" (1.27 cm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

8. Tighten bleeder screw securely and remove bleeder hose. Torque bleeder screw to **47 in. lbs. (5.3 Nm)**.
9. Repeat procedure Steps 5 - 8 for the remaining calipers.
10. Add brake fluid to MAX level inside reservoir.

Master Cylinder Fluid Level

Between the MIN and MAX line shown on the reservoir.

11. Install master cylinder reservoir cover.
12. 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).
13. Check brake system for fluid leaks.

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.

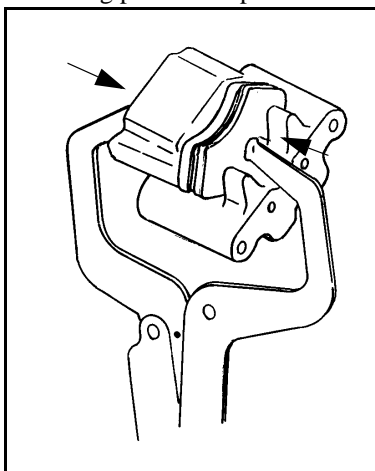
2. Remove the front wheel. Loosen pad adjuster screw 2-3 turns.



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 so 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.



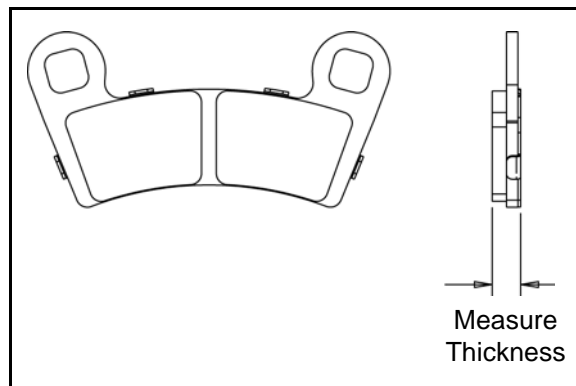
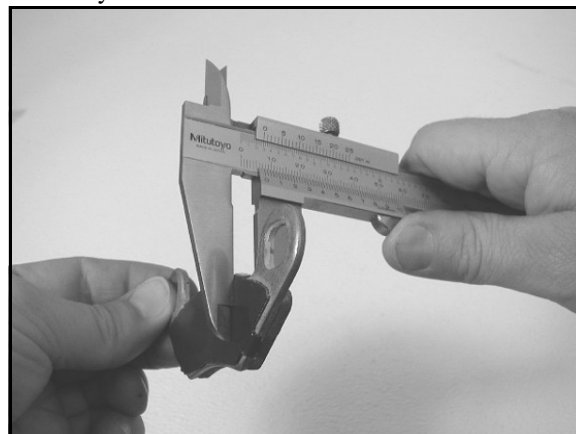
NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

5. Push mounting bracket inward and slip outer brake pad past edge. Then remove inner pad.



Pad Inspection

1. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



Front Brake Pad Thickness
New: .300" ± .007" (7.6 mm ± .178 mm)
Service Limit: .180" (4.6 mm)

BRAKES

Pad Assembly / Installation

1. Lubricate mounting bracket pins with a light film of Polaris Premium All Season Grease (PN 2871423), and install rubber dust boots.

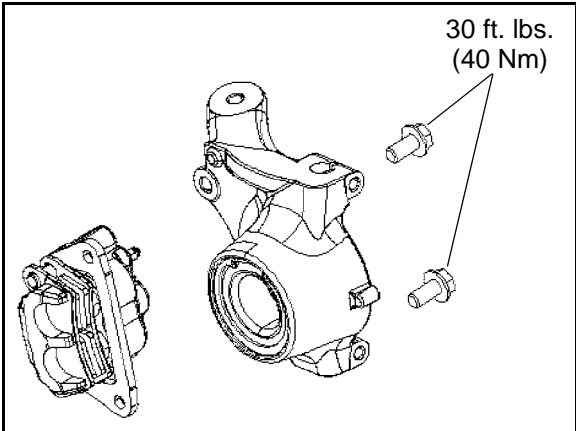


2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other.

⚠ 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.

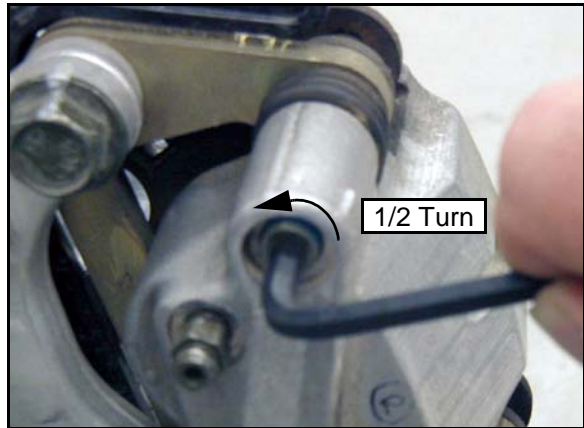


⚙ = T

Front Caliper Mount Bolt Torque:
30 ft. lbs. (40 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 adjustment 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.

⚙ = T

Front Wheel Nut Torque:
27 ft. lbs. (37 Nm)

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.

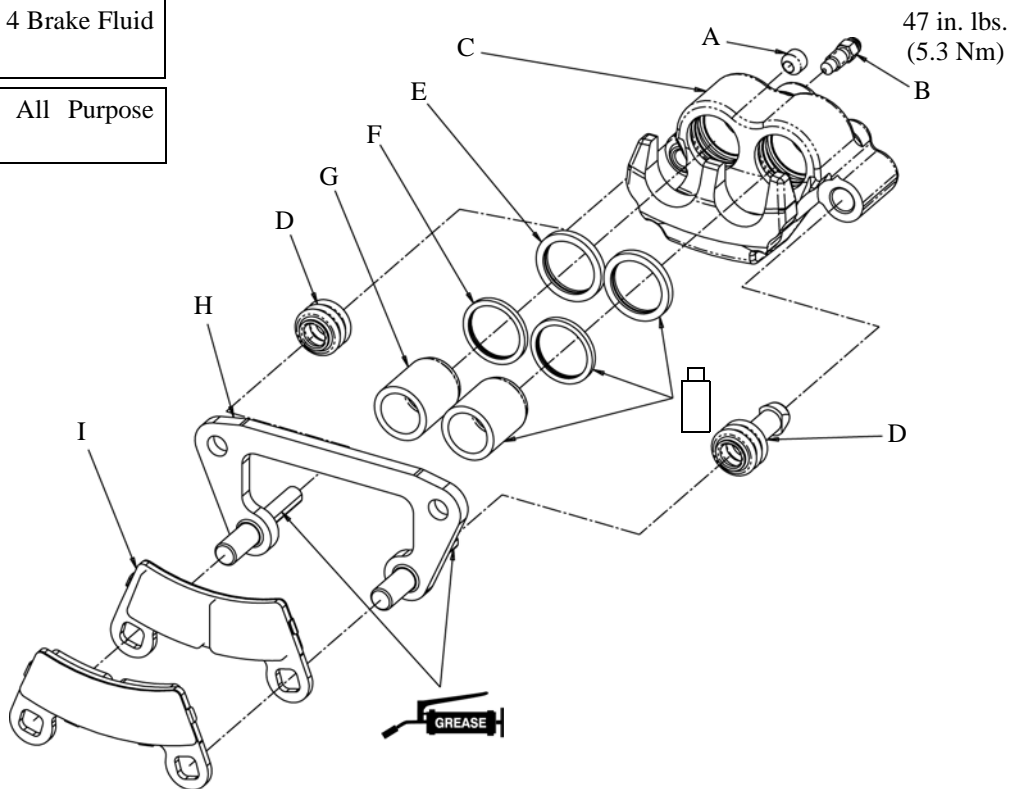
Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warping may result. Repeat this procedure 10 times.

FRONT CALIPER SERVICE

Caliper Exploded View

 Apply Polaris DOT 4 Brake Fluid to Component

 Apply Polaris All Purpose Grease



- A. Socket Set Screw
- B. Bleeder Screw
- C. Caliper Assy.
- D. Boot
- E. Square O-ring (thick)
- F. Square O-ring (thin)
- G. Piston
- H. Caliper Mount
- I. Brake Pads

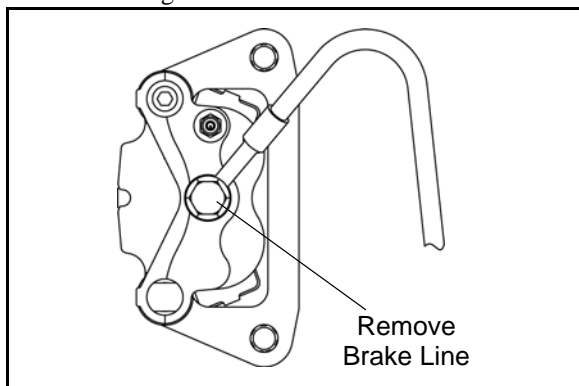
Caliper Removal

1. Elevate and safely support the front of the vehicle.
2. Remove the (4) wheel nuts and the front wheel.
5. Loosen brake pad adjustment set screw 2-3 turns to allow brake pad removal after the caliper is removed.

 **CAUTION**

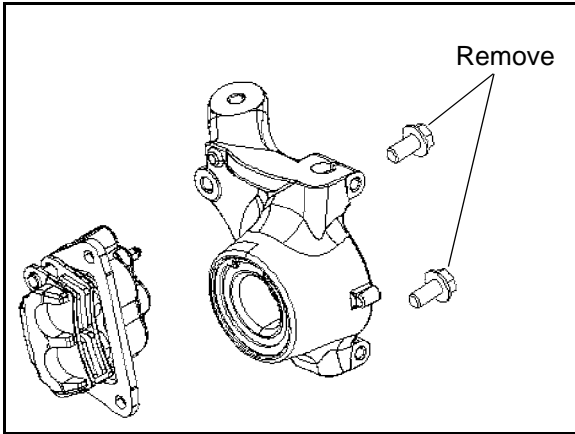
Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur.

3. Clean caliper area before removal.
4. Place a container below the caliper to catch brake fluid when removing the line. Remove brake line from caliper.

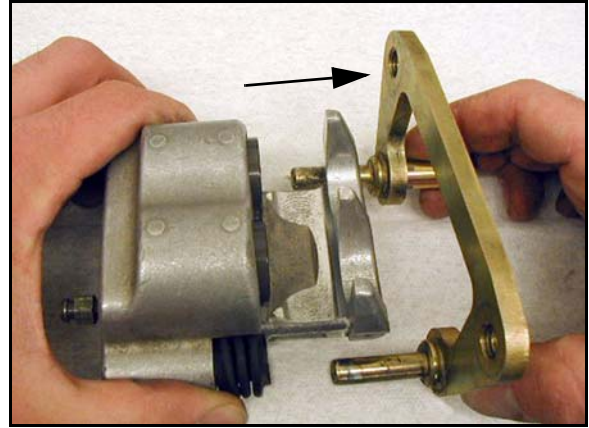


BRAKES

6. Remove the two caliper mounting bolts and remove the caliper assembly from the front hub.

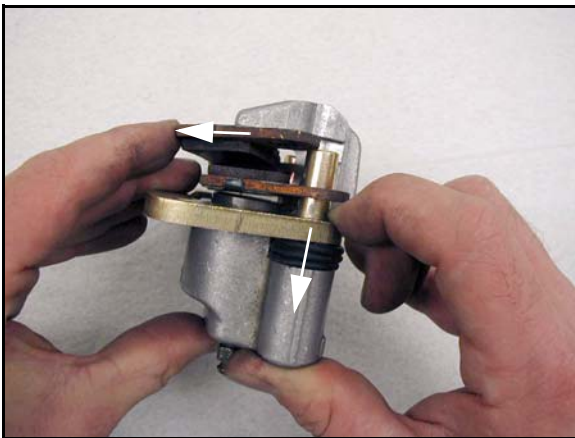


3. Remove mounting bracket, pin assembly and dust boot.



Caliper Disassembly

1. Push brake pad retainer pin inward and slip brake pads past the edge.



2. Remove both brake pads from the caliper.



4. Thoroughly clean the brake caliper before disassembly and prepare a clean work area to disassemble the caliper.
5. Use low pressure compressed air to remove the pistons from the caliper.

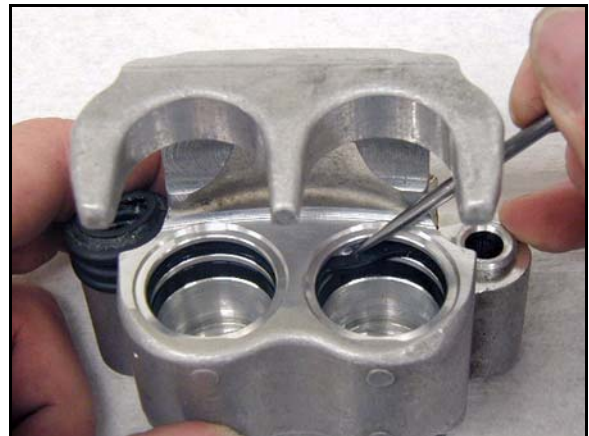
CAUTION

Use caution and always wear safety glasses when working with compressed air.

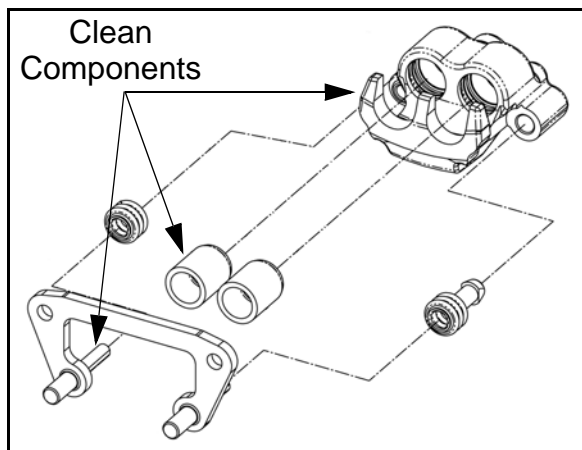
6. While holding the caliper and covering the pistons with a shop towel, carefully apply compressed air to the brake line inlet to force the pistons out from the caliper.

IMPORTANT: Do not remove the caliper pistons with a pliers. The piston sealing surfaces will become damaged if a pliers is used.

7. 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.



NOTE: Be sure to clean 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.



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

Caliper Piston Bore I.D.:
Std: 1.004" (25.5 mm)
Service Limit: 1.006" (25.55 mm)

- Inspect piston for nicks, scratches, pitting or wear. Measure piston diameter and replace if damaged or worn beyond service limit.



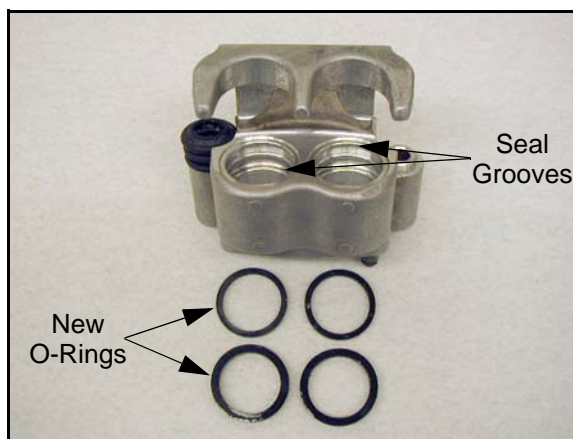
$= \text{In.} / \text{mm.}$

Caliper Piston O.D.:
Std: 1.002" (25.45 mm)
Service Limit: 1.000" (25.4 mm)

- Inspect the brake disc and pads as outlined in this chapter.

Caliper Assembly

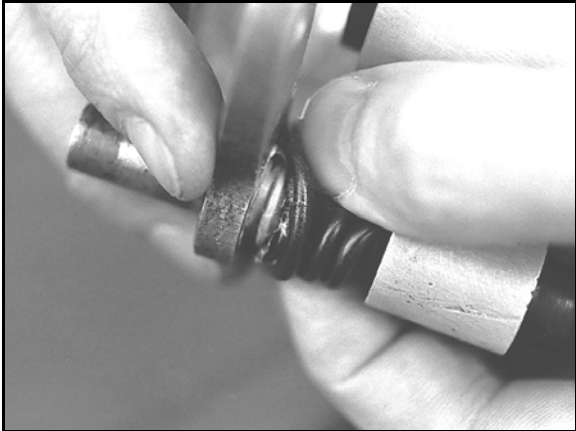
- Install new O-rings in the caliper body. Be sure the grooves are clean and free of residue or brakes may drag upon assembly.



- 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.

BRAKES

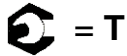
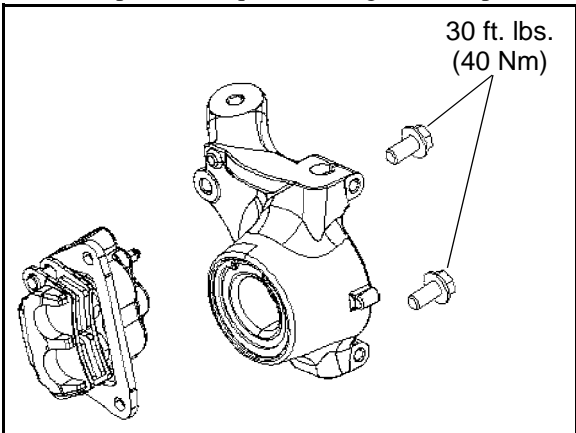
- Lubricate the mounting bracket pins with Polaris Premium All Season Grease (PN 2871423), and install the rubber dust seal boots.



- 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.

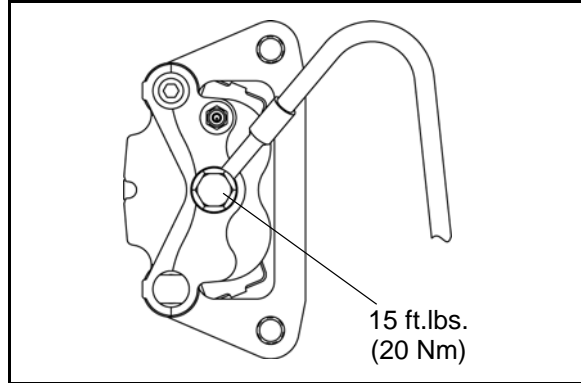
Caliper Installation

- Install caliper and torque mounting bolts to specification.



Front Caliper Mount Bolt Torque:
30 ft. lbs. (40 Nm)

- Install brake line and tighten securely with a line wrench. Torque the banjo bolt brake line(s) to the proper torque specification.



- Install the pad adjustment screw and turn until stationary pad contacts disc, then back off 1/2 turn.
- Perform brake bleeding procedure as outlined earlier in this chapter.
- Install wheel and torque wheel nuts to specification.



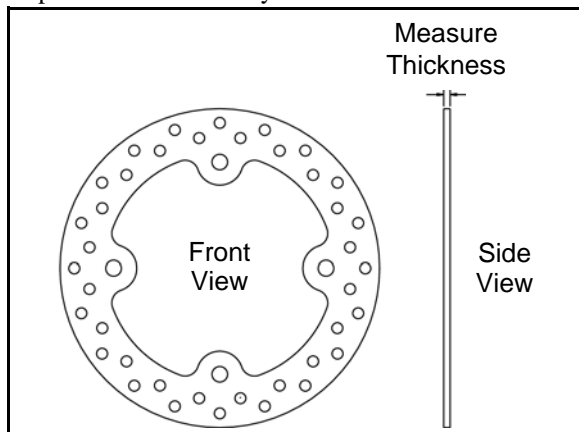
Front Wheel Nut Torque:
27 ft. lbs. (37 Nm)

NOTE: If new brake pads are installed, brake burnishing is recommended (see "FRONT BRAKE PADS - Brake Burnishing Procedure").

FRONT BRAKE DISC

Disc Inspection

1. Visually inspect disc for scoring, scratches, or gouges. Replace the disc if any deep scratches are evident.
2. Use a 0-1" micrometer and measure the disc thickness at eight different points around the pad contact surface. Replace disc if worn beyond service limit.



Brake Disc Thickness
New .188" (4.76 mm)
Service Limit .170" (4.32 mm)

Brake Disc Thickness Variance
Service Limit .002" (.051 mm)
difference between measurements

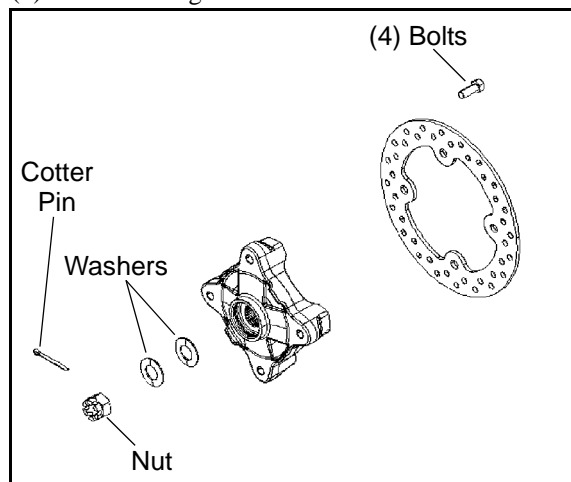
3. Mount a dial indicator and measure disc runout. Slowly rotate the disc and read total runout on the dial indicator. Replace the disc if runout exceeds specifications.

Brake Disc Runout
Service Limit .010" (.254 mm)

Disc Replacement

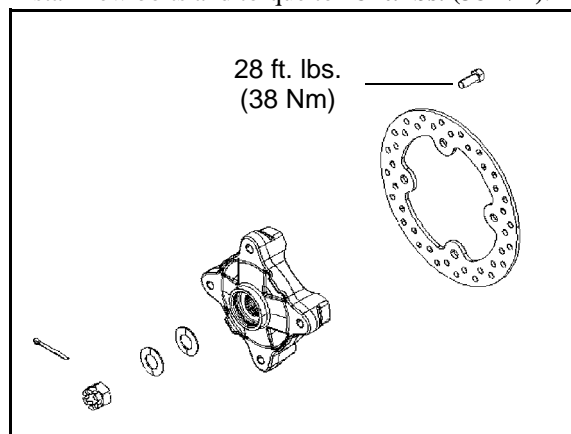
1. Remove front brake caliper (see "FRONT CALIPER SERVICE").
2. Remove wheel hub cotter pin, castle nut and washers.

3. Remove the 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.

5. Install new bolts and torque to **28 ft. lbs. (38 Nm)**.



CAUTION

Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

6. Install wheel hub assembly, washers, and castle nut. Torque castle nut to **80 ft. lbs. (108 Nm)** and install a new cotter pin.
7. Install front brake caliper (see "FRONT CALIPER SERVICE"). Follow the bleeding procedure outlined earlier in this chapter.
8. 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

REAR BRAKE PAD

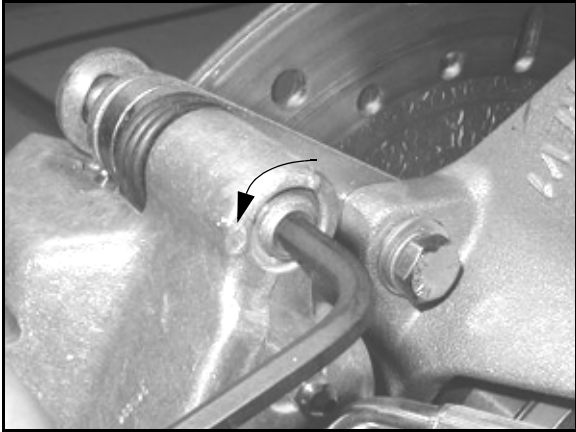
Pad Removal

1. Elevate and support rear of vehicle.

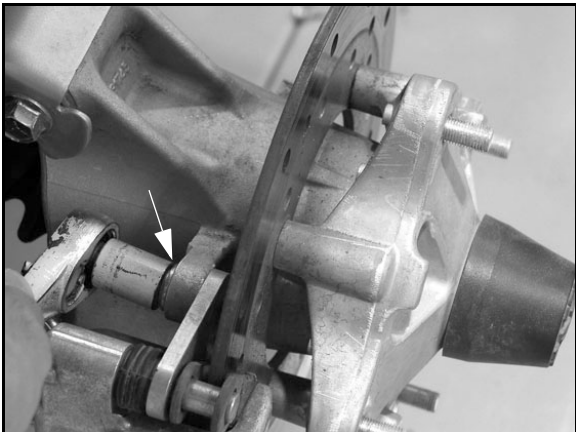
 CAUTION

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 rear wheel.
3. Loosen pad adjuster screw 2-3 turns.

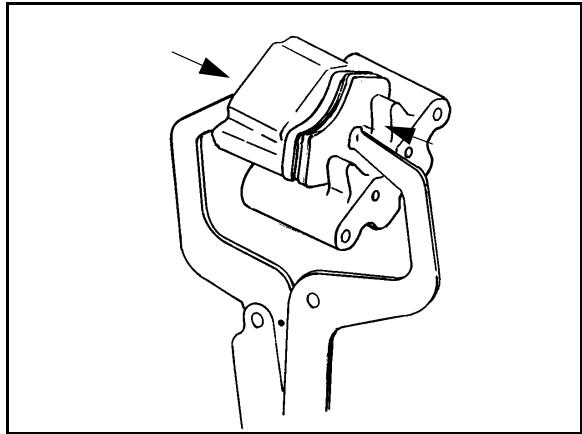


4. Remove the two caliper mounting bolts and lift caliper off the brake disc.



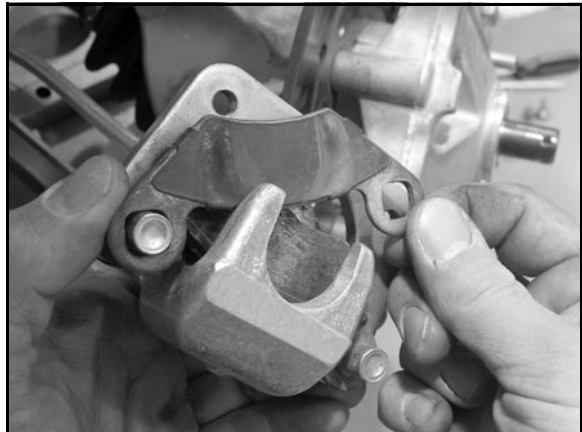
NOTE: When removing caliper, be careful not to damage brake line. Support caliper so as not to kink or bend brake line.

5. Push caliper piston into the caliper bore slowly using a C-clamp or locking pliers with pads installed.

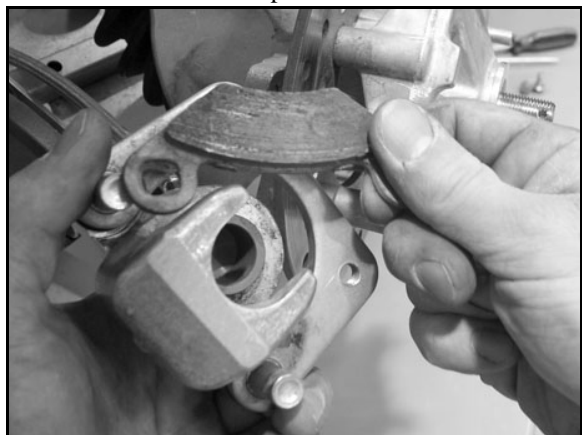


NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

6. Push caliper mounting bracket inward and slip outer brake pad past the edge to remove.

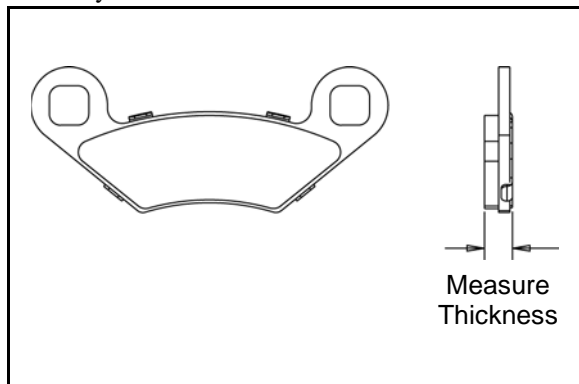


7. Remove the inner brake pad.



Pad Inspection

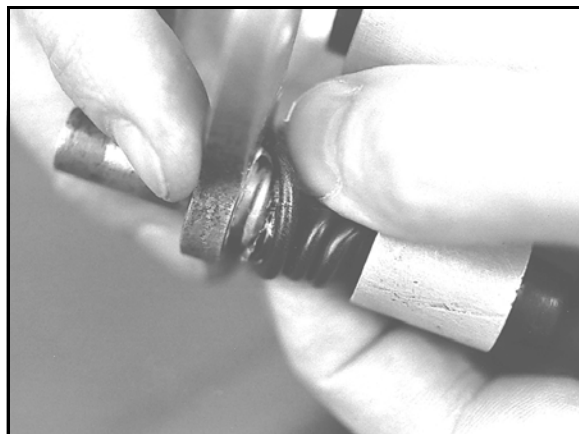
1. Clean the caliper with brake cleaner or alcohol.
2. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



Rear Brake Pad Thickness
 New **.298" ± .007" (7.57 mm ± .178 mm)**
 Service Limit **.180" (4.6 mm)**

Pad Assembly / Installation

1. Lubricate mounting bracket pins with a light film of Polaris Premium All Season Grease (PN 2871423), and install rubber dust boots.

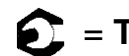
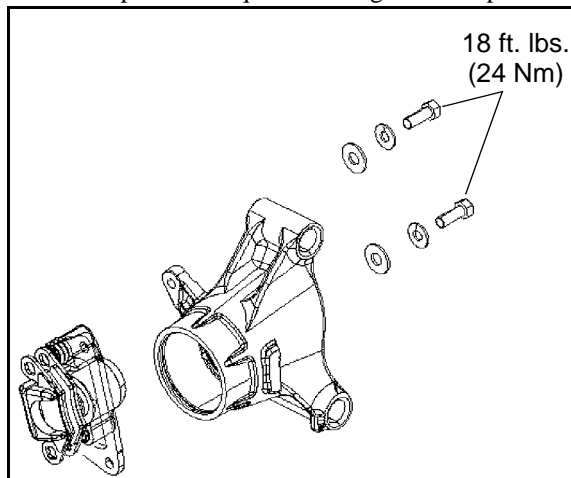


2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other.

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 and torque mounting bolts to specification.



Rear Caliper Mount Bolt Torque:
18 ft. lbs. (24 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 adjustment set screw and turn clockwise until the stationary pad contacts the disc, then back off 1/2 turn (counterclockwise).
6. Verify fluid level in reservoir is up to the MAX line inside reservoir and install reservoir cap.

Master Cylinder Fluid

Up to MAX line inside reservoir

7. Install wheel and torque wheel nuts.



Rear Wheel Nut Torque:
27 ft. lbs. (37 Nm)

Brake Burnishing Procedure

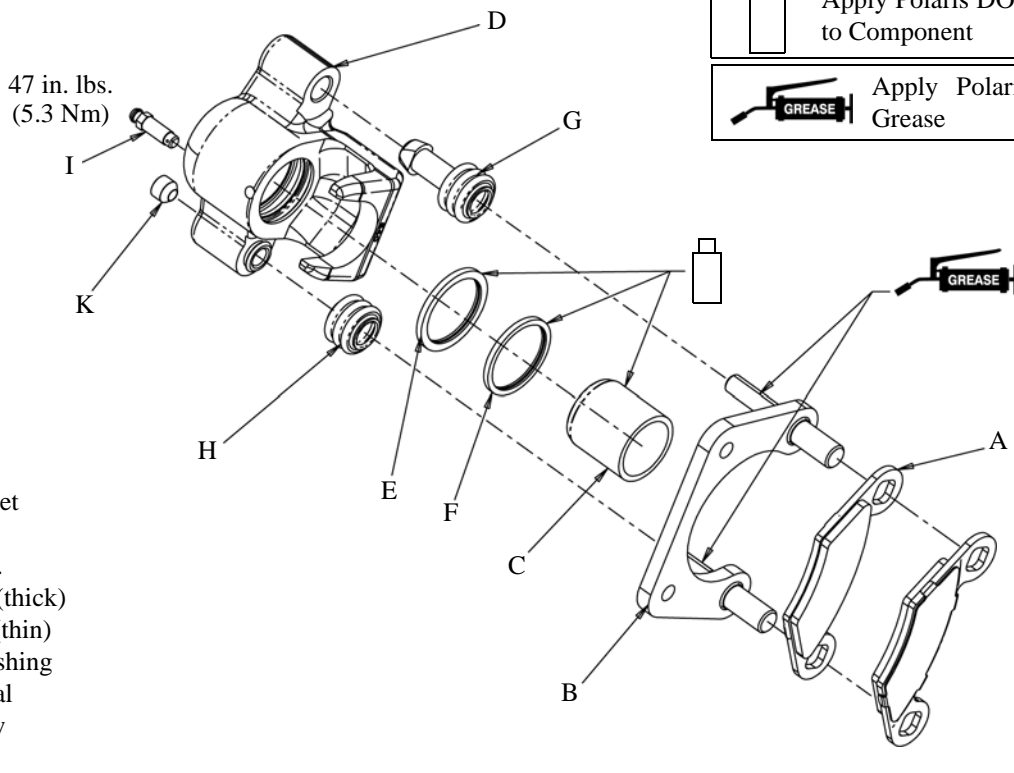
It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

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.

BRAKES

REAR CALIPER SERVICE

Caliper Exploded View



Caliper Removal

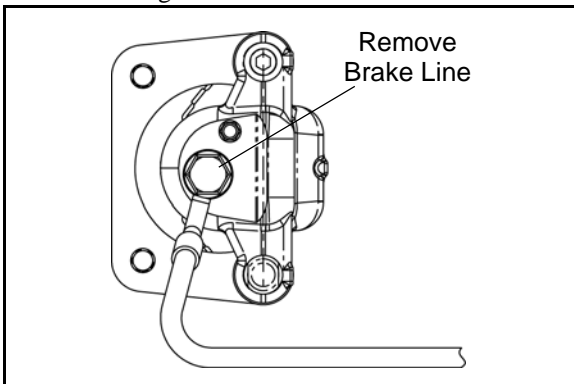
1. Elevate and safely support the rear of the vehicle.



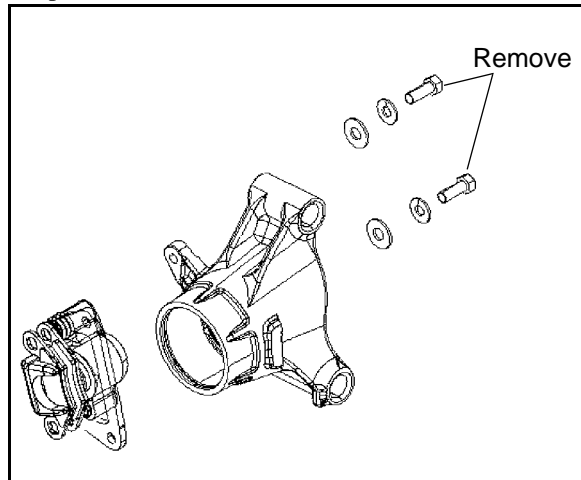
CAUTION

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur.

2. Remove the (4) wheel nuts and rear wheel.
3. Clean caliper area before removal.
4. Place a container below the caliper to catch the brake fluid when removing the line. Remove brake line from caliper.

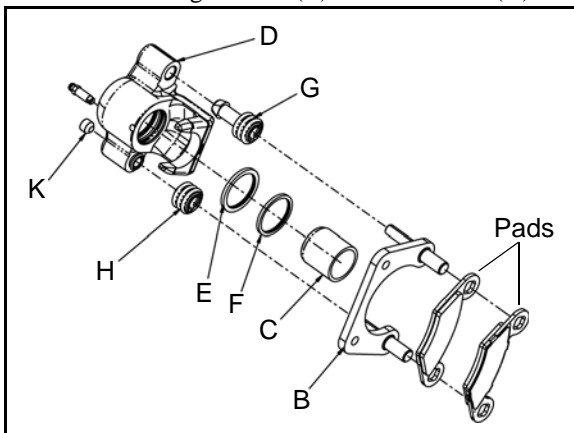


5. Loosen the brake pad adjustment set screw to allow brake pad removal after the caliper is removed.
6. Remove the two caliper mounting bolts and remove the caliper.

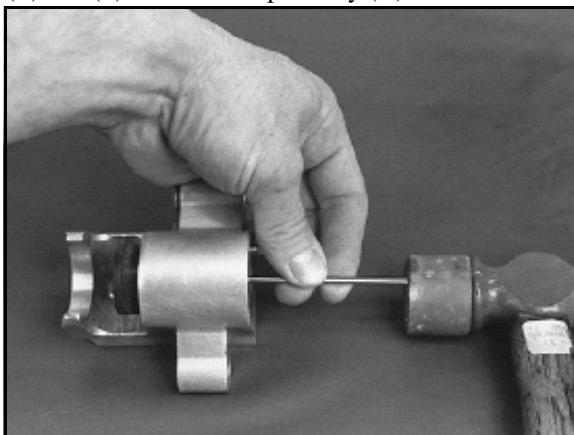


Caliper Disassembly

1. Remove brake pad adjustment set screw (K).
2. Push upper pad retainer pin inward and slip brake pads past the edge and remove from the caliper.
3. Remove mounting bracket (B) and dust boots (G) and (H).

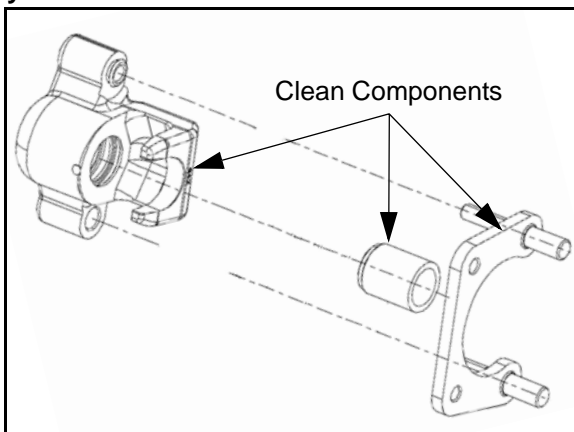


4. Using a hammer and a small punch, remove the piston (C) from the caliper body (D). Then remove the square O-rings (E) and (F) from the caliper body (D).



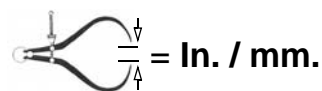
5. Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.

NOTE: Be sure to clean seal grooves in caliper body.



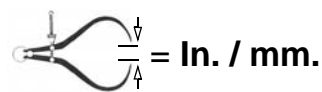
Caliper Inspection

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.



Rear Caliper Piston Bore I.D.
Standard: 1.191" (30.25 mm)
Service Limit: 1.192" (30.28 mm)

2. Inspect piston for nicks, scratches, wear or damage. Measure diameter and replace if damaged or worn beyond service limit.



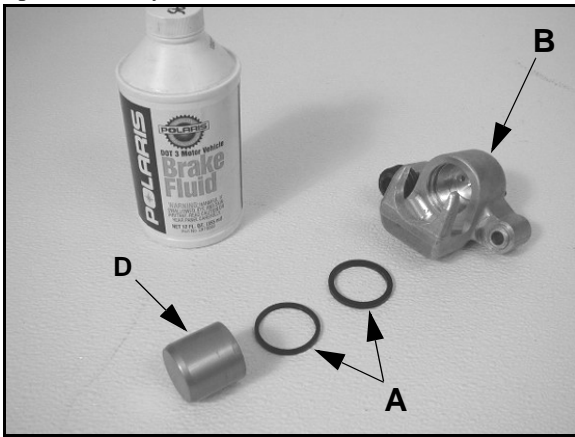
Rear Caliper Piston O.D.
Standard: 1.1875" (30.16 mm)
Service Limit: 1.186" (30.12 mm)

3. Inspect the brake disc and pads as outlined in this chapter.

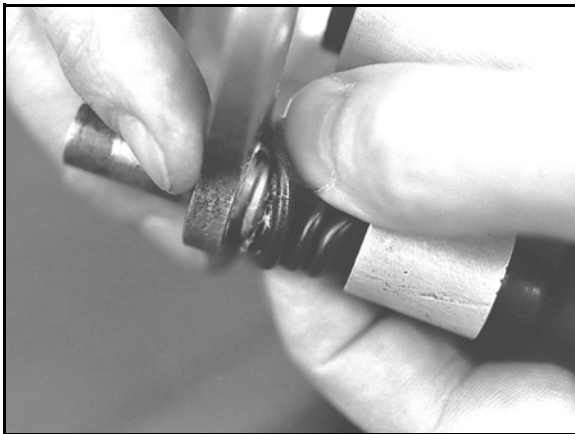
BRAKES

Caliper Assembly

1. Install new caliper seals (A) in the caliper body (B). Be sure groove is clean and free of residue or brakes may drag upon assembly.



2. Coat piston with clean Polaris DOT 4 Brake Fluid (PN 2872189). Install piston (D) 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 Polaris Premium All Season Grease (PN 2871423), and install the rubber dust seal boots.

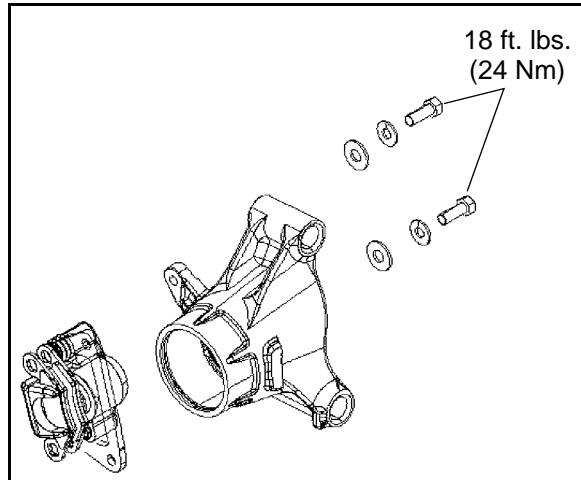


**Polaris Premium All Season Grease
(PN 2871423)**

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.

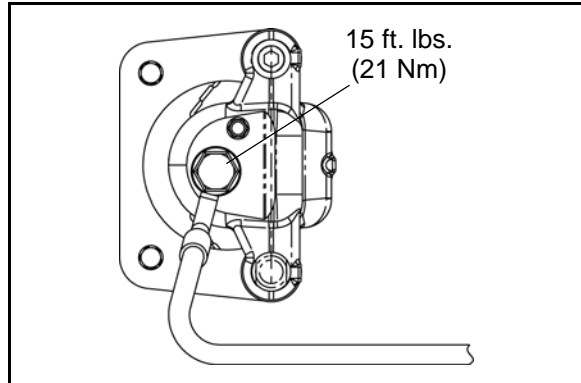
Caliper Installation

5. Install the rear caliper with the mounting bolts. Torque mounting bolts to **18 ft. lbs. (24 Nm)**.

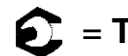


Rear Caliper Mount Bolt Torque:
18 ft. lbs. (24 Nm)

6. Install brake line banjo bolt and torque to specification.



7. Install the pad adjustment screw and turn until stationary pad contacts disc, then back off 1/2 turn.
8. Perform brake bleeding procedure as outlined earlier in this chapter.
9. Install wheel and torque wheel nuts to specification.



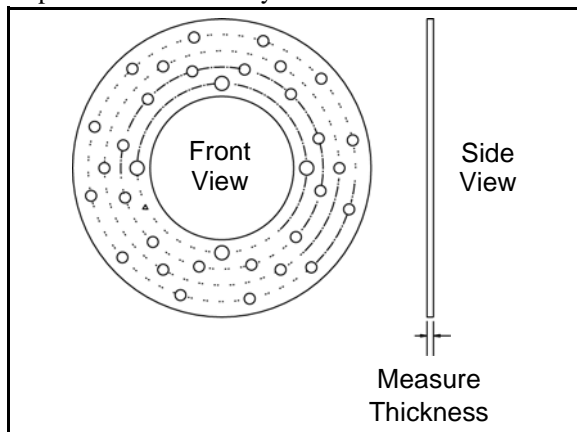
Rear Wheel Nut Torque:
27 ft. lbs. (37 Nm)

NOTE: If new brake pads are installed, brake burnishing is recommended (see "REAR BRAKE PADS - Brake Burnishing Procedure").

REAR BRAKE DISC

Disc Inspection

1. Visually inspect disc for scoring, scratches, or gouges. Replace the disc if any deep scratches are evident.
2. Use a 0-1" micrometer and measure the disc thickness at eight different points around the pad contact surface. Replace disc if worn beyond service limit.



Brake Disc Thickness
New: .188" (4.76 mm)
Service Limit: .170" (4.32 mm)

Brake Disc Thickness Variance
Service Limit .002" (.051 mm)
difference between measurements

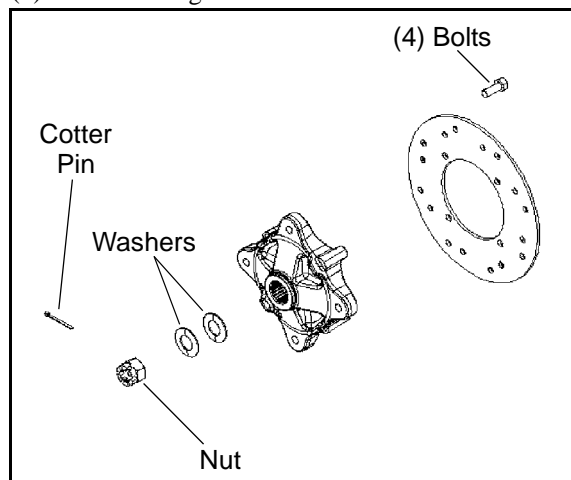
3. Mount a dial indicator and measure disc runout. Slowly rotate the disc and read total runout on the dial indicator. Replace the disc if runout exceeds specifications.

Brake Disc Runout
Service Limit .010" (.254 mm)

Disc Replacement

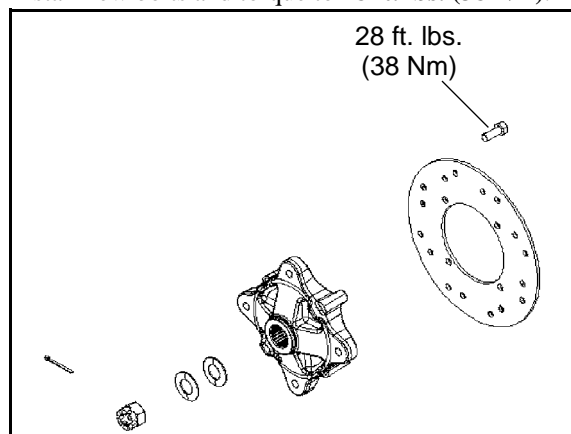
1. Remove rear brake caliper (see "REAR CALIPER SERVICE").
2. Remove wheel hub cotter pin, castle nut and washers.

3. Remove the 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.

5. Install new bolts and torque to **28 ft. lbs. (38 Nm)**.



CAUTION

Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

6. Install wheel hub assembly, washers, and castle nut. Torque castle nut to **80 ft. lbs. (108 Nm)** and install a new cotter pin.
7. Install rear brake caliper (see "REAR CALIPER SERVICE"). Follow the bleeding procedure outlined earlier in this chapter.
8. 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 or 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
- Brake pads dragging
- Brake caliper dragging

Pedal Vibration

- Disc damaged
- Disc worn (runout or thickness variance exceeds service limit)

Caliper Overheats (Brakes Drag)

- Compensating port plugged
- Pad clearance set incorrectly
- Brake pedal binding or unable to return fully
- 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 10

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GENERAL INFORMATION

Special Tools

Part Number	Tool Description
PV-43568	Fluke™ 77 Digital Multimeter
2870630	Timing Light
2870836	Battery Hydrometer
2460761	Hall Effect Sensor Probe Harness
2871745	Static Timing Light Harness
-	Digital Wrench™ (see Chapter 4)

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.

Under-Dash Components

The following switches and components can be accessed underneath the instrument / dash panel:

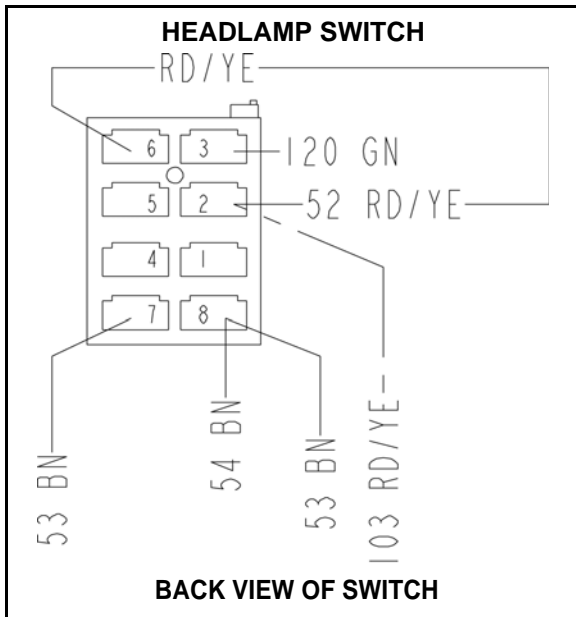
- Speedometer
- Speedometer Mode Switch
- Digital Wrench Diagnostic Connector
- Digital Wrench / ECU Reflash 9 Vdc Battery Plug
- AWD Switch
- Headlamp Switch
- 12 Vdc Accessory Power Point
- Ignition Switch
- Work Light Switch
- Fuse / Relay Panel

ELECTRICAL

SWITCHES / CONTROLS

Headlamp Switch

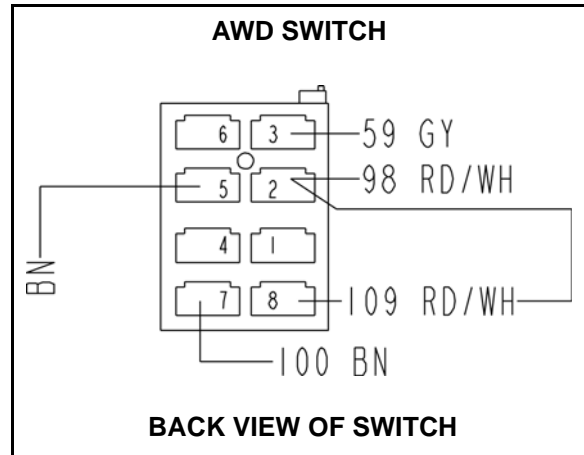
1. Disconnect the headlamp switch harness (Brown, Green, and Red/Yellow), by depressing the connector lock and pulling on the connector. Do not pull on the wiring.
2. Test the switch connections and check for continuity at the following pins as shown in the illustration.



	1	2	3	4	5	6	7	8
ON		X	X					X
OFF								
SWITCH BACK LIGHT						X	X	

AWD Switch

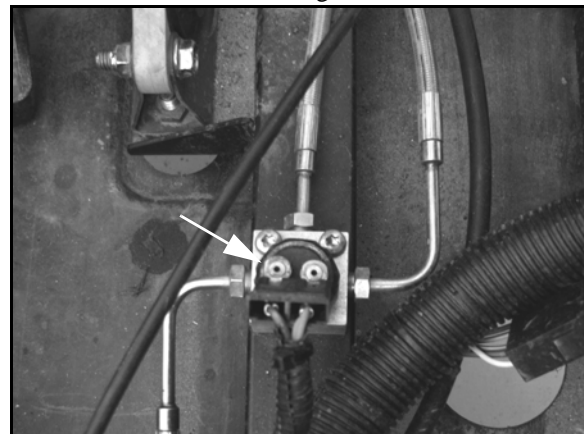
1. Disconnect the switch harness (Grey, Red/White, and Brown), by depressing the connector lock and pulling on the connector. Do not pull on the wiring.
2. Test the switch connections and check for continuity at the pins shown in the illustration.



	1	2	3	4	5	6	7	8
ON		X	X		X			
OFF								
SWITCH BACK LIGHT							X	X

Brake Light Switch

1. The brake light switch is located under the driver's seat along the lower frame. The brake pressure switch is installed into this cross fitting block.

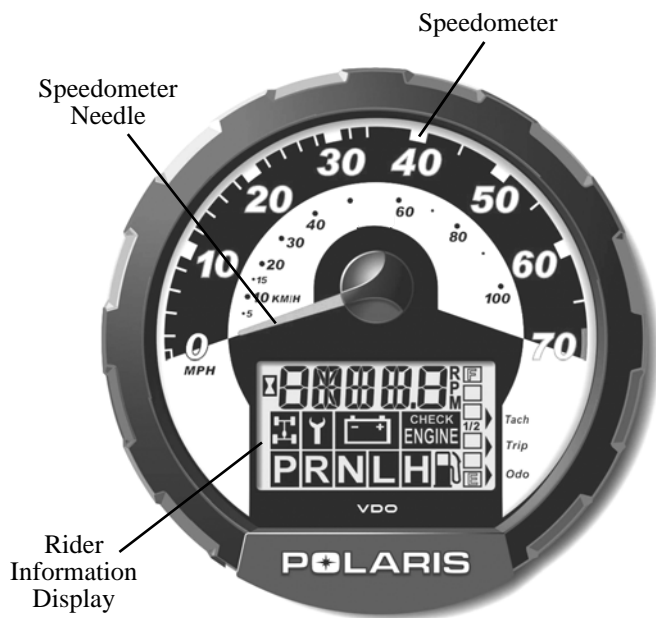


2. Disconnect wire harness from switch.
3. Connect an ohmmeter across switch contacts. Reading should be infinite (∞).
4. Apply foot brake and check for continuity between switch contacts. If there is no continuity or greater than .5 ohms resistance when the brake is applied with slight pressure, first clean the switch contacts and re-test. Replace switch if necessary.

INSTRUMENT CLUSTER

Overview

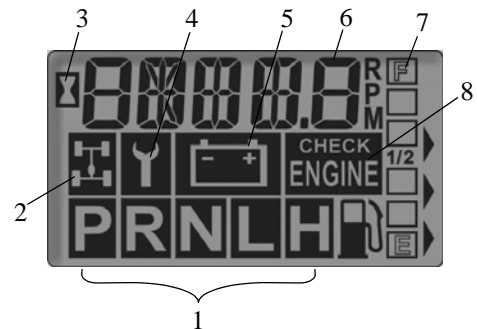
The instrument cluster senses vehicle speed from the right front wheel. The instrument cluster measures distance in miles as well as time, hours of operation and engine RPM.



Rider Information Display

The rider information display is located in the instrument cluster. All segments will light up for 2.5 seconds at start-up.

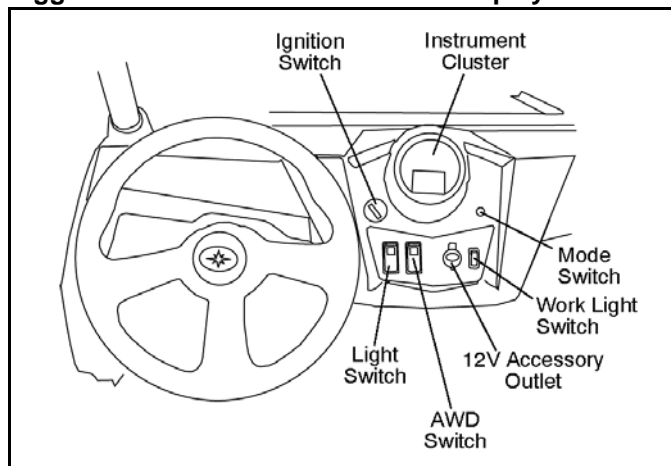
NOTE: If the instrument cluster fails to illuminate, a battery over-voltage may have occurred and the instrument cluster may have shut off to protect the electronic speedometer.



1. **Gear Indicator** - This indicator displays gear shifter position.
H = High Gear
L = Low Gear
N = Neutral
R = Reverse Gear
P = Park
2. **AWD Indicator** - This indicator illuminates when the AWD switch is in the AWD position.
3. **Engine Hour Display Indicator**
4. **Service Interval / Diagnostic Mode Indicator**
5. **Low Battery and 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 high electrical load (lights, cooling fan, accessories) is applied. Drive at a higher RPM or recharge the battery to clear the warning.
6. **Odometer/Tachometer/Tripmeter/ Hour Meter/Clock**
7. **Fuel Gauge** - The segments of the fuel gauge show the level of fuel in the fuel tank. When the last segment clears, a low fuel warning is activated. All segments will flash, FUEL will display in the LCD, and the speedometer needle will blink. Refuel immediately.
8. **Check Engine Warning Indicator** - This indicator serves two purposes. The word HOT displays if the engine overheats. It also appears if an EFI-related fault occurs. Do not operate the vehicle if this warning appears. Serious engine damage could result.

NOTE: In addition to showing vehicle speed, the speedometer needle flashes when a low fuel condition exists.

NOTE: Use the “Mode Button” shown below to toggle between Instrument Cluster display screens.



ELECTRICAL

Standard Display Modes

Use the mode button (location shown in the illustration on page 10.5) to toggle through the mode options.

Odometer Mode

The odometer records the miles or kilometers traveled by the vehicle.

Trip Meter Mode

The trip meter records the miles or kilometers traveled by the vehicle on each trip if it's reset before each trip. To reset the trip meter, select the trip meter mode. Press and hold the mode button until the display reads 0.

NOTE: In the Rider Information Display, the trip meter display contains a decimal point, but the odometer displays without a decimal point.

Hour Meter Mode

This mode logs the total hours the engine has been in operation.

Tachometer Mode

The engine RPM is displayed digitally.

NOTE: Small fluctuations in the RPM from day to day may be normal because of changes in humidity, temperature and elevation.

Clock Mode

The clock displays time in a 12-hour format. To reset the clock, see "Clock Screen" in the "Diagnostic Display Mode" section.

Diagnostic Display Mode

The wrench icon will display when the gauge is in the diagnostic mode. To exit the diagnostic mode, turn the key switch off and on. Any movement of the tires will also cause the gauge to exit the diagnostic mode.

To enter the diagnostics mode:

1. Turn the key switch off and wait 10 seconds.
2. Lock the parking brake.
3. Place the transmission in neutral.
4. Hold the mode button and turn the key switch to the "ON" position. Release the mode button as soon as the display is activated.
5. Use the mode button to toggle through the diagnostic screens.

Clock Screen



To reset the clock:

1. Enter the diagnostic mode.
2. Toggle to the clock screen.
3. Press and hold the mode button until the hour display flashes. Release the button.
4. Press and release the mode button once to advance the setting by one hour. Press and hold the mode button to advance the hours quickly.
5. When the desired hour is displayed, wait approximately four seconds, until the minute display flashes.
6. When the display stops flashing, the mode has been set.
7. Use the same procedure to reset the minutes.

Battery Voltage Screen

View this screen to check battery voltage level.



Tachometer Screen

View the tachometer to check engine speed.



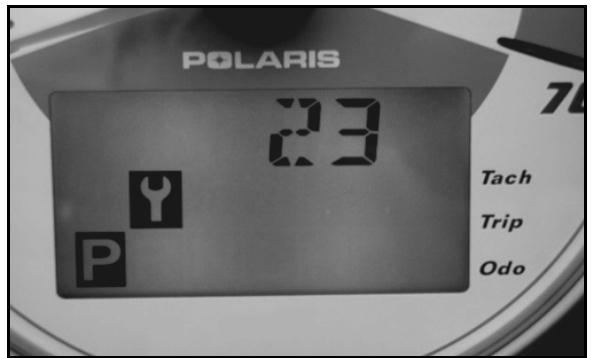
AWD Diagnostic Screen

The gauge indicates whether or not current is flowing through the AWD coil.



Gear Circuit Diagnostic Screen

This screen displays the resistance value (in ohms) being read at the gear switch input of the gauge.



NOTE: A 10 - 20% variance from these readings is within normal parameters.



ELECTRICAL

Programmable Service Interval

When the hours of engine operation equal the programmed service interval setting, the wrench icon will flash for 5 seconds each time the engine is started. When this feature is enabled, it provides a convenient reminder to perform routine maintenance.



NOTE: The service interval is programmed to 50 hours at the factory.

To enable or disable the service interval:

1. Enter the diagnostic mode.
2. Toggle to the service interval screen.
3. Press and hold the mode button for about seven (7) seconds, until either ON or OFF appears in the Rider Information Display, depending on your preference.



To reset the service interval:

1. Enter the diagnostic mode.
2. Toggle to the service interval screen.
3. Press and hold the mode button for 2-3 seconds, until the wrench icon flashes. Release the button.
4. Press and release the mode button once to advance the setting by one hour. Press and hold the mode button to advance the hours quickly.

NOTE: If you scroll past the intended number, press and hold the button until the hours cycle back to zero.

5. When the desired setting is displayed, wait until the wrench icon stops flashing. The new service interval is now programmed.

Miles / Kilometers Toggle

The display in the tripmeter and odometer can be changed to display either standard or metric units of measurement.

1. Enter the diagnostic mode.
2. Toggle to the screen that displays either kilometers (KM) or miles (MP).
3. Press and hold the mode button until the letters flash, then press and release the button once. When the display stops flashing, the mode has been set.



Viewing Diagnostic Codes

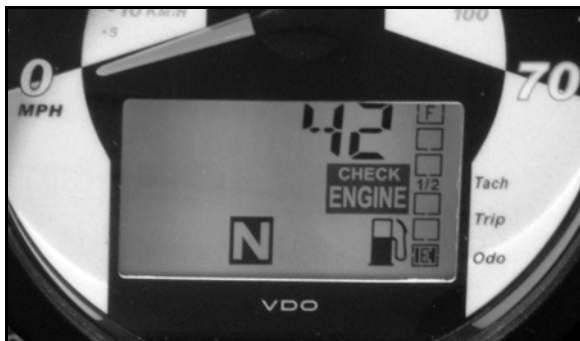
Use the following procedure to view diagnostic blink codes (failure codes) from the EFI module:

1. Engage the parking brake.
2. Stop the engine.
3. Turn the key switch to the ON position.

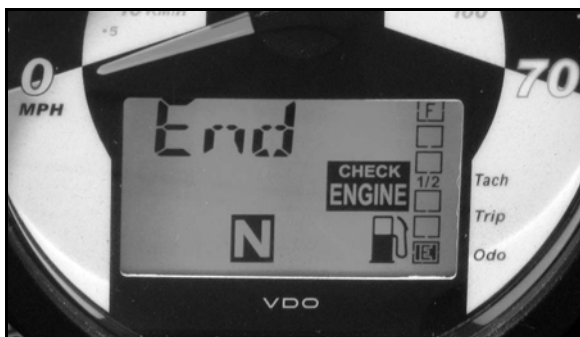
- Turn the key switch off and on three times in less than five seconds, then leave the switch on. The word "Wait" will appear on the screen along with a flashing "Check Engine" light.



- Any blink code numbers stored in the EFI module will display, one at a time, on the screen. Example below shows a Blink Code of "42".



- The number "61" and/or the word "End" displays after all codes have been transmitted.

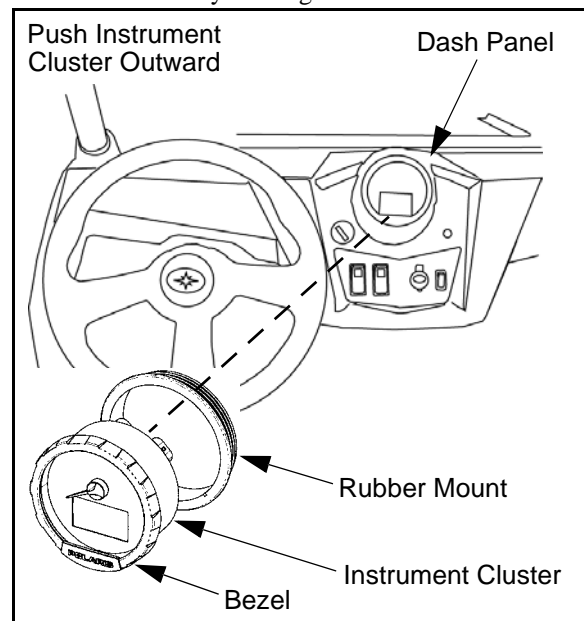


Instrument Cluster Removal

NOTE: Do not allow alcohol or petroleum products to come in contact with the instrument cluster lens.

- Disconnect the wire harness connectors from the back side of the instrument cluster.

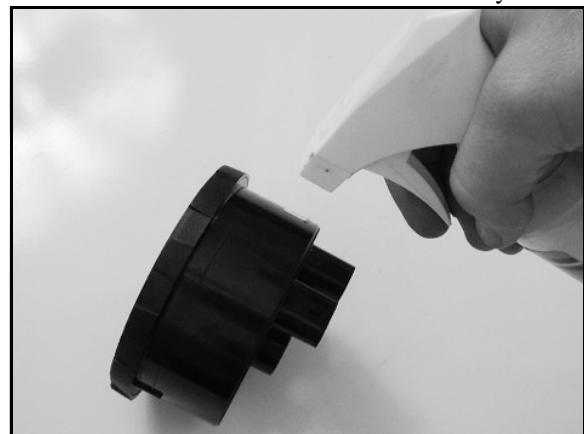
- Push the instrument cluster out from the back side of the dash while securely holding the dash and rubber mount.



NOTE: Do not remove the rubber mount from the dash panel. Only remove the rubber mount if necessary. The bezel is a snap-on assembly and is a serviceable part.

Instrument Cluster Installation

- 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.

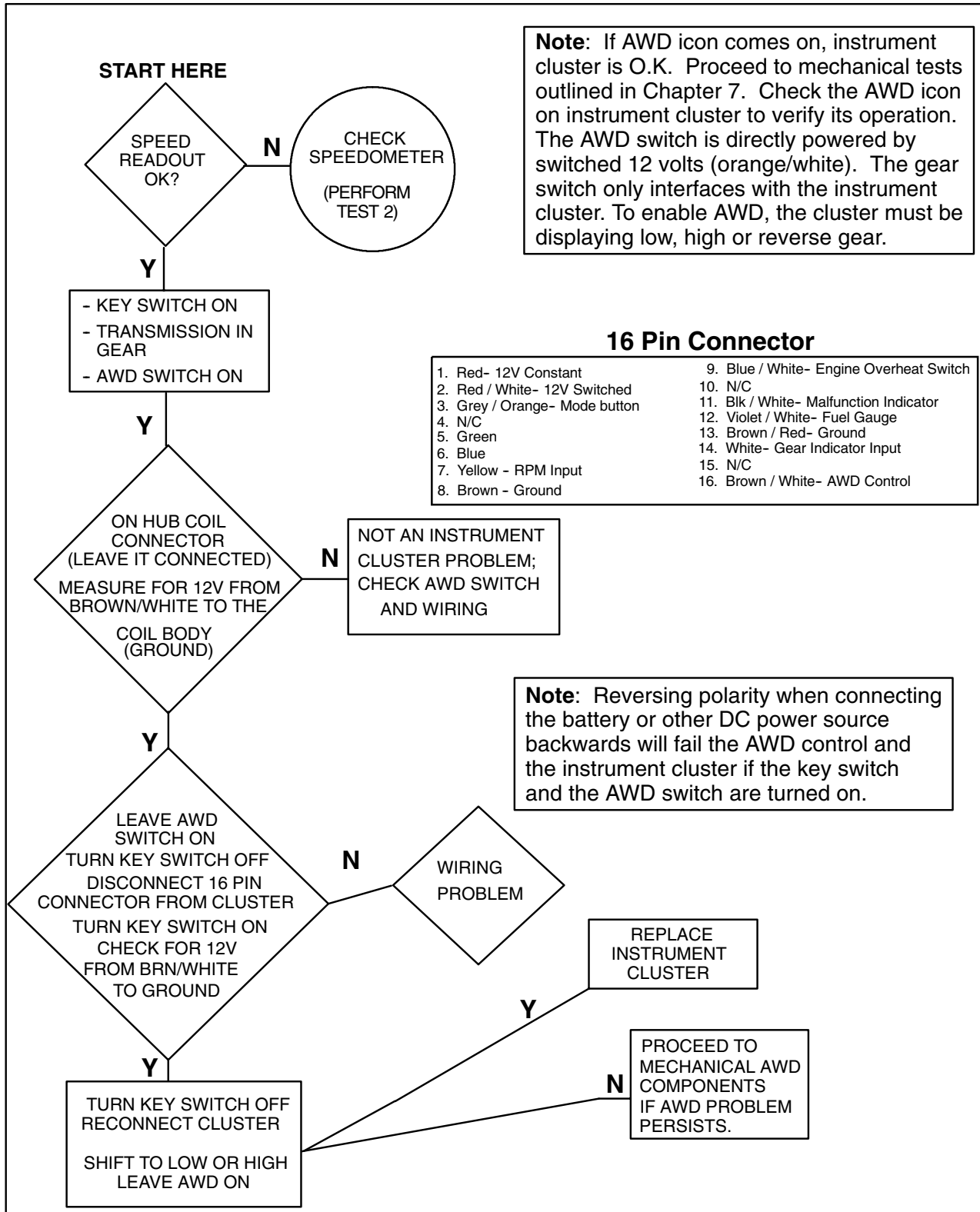


- Be sure the rubber mount inside the dash is fully installed and that the indexing key on the rubber mount is lined up with the keyway in the dash.
- Hold the dash securely and insert the instrument cluster into the dash. Twist the instrument cluster gently in a clockwise motion to properly seat the instrument cluster into the rubber mount. Apply pressure on the bezel while pressing down on the instrument cluster.

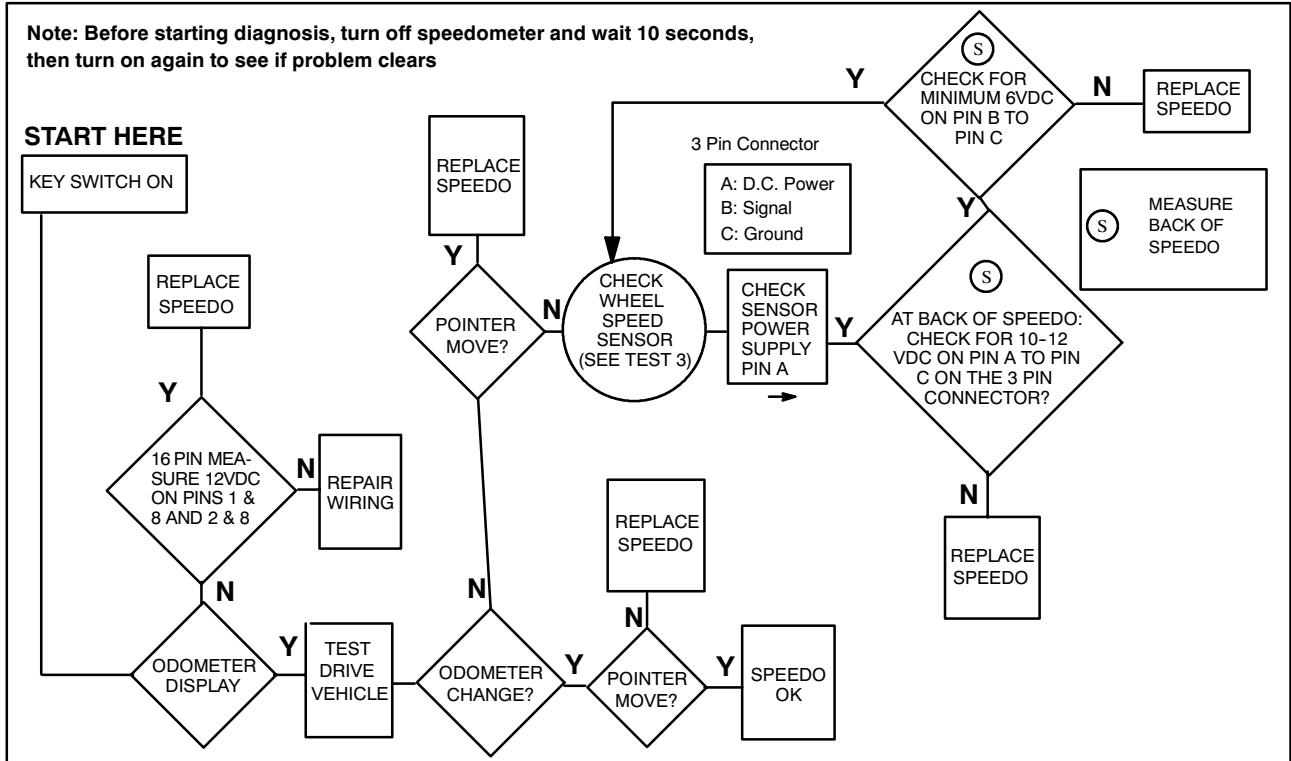
ELECTRICAL

INSTRUMENT CLUSTER TROUBLESHOOTING TESTS

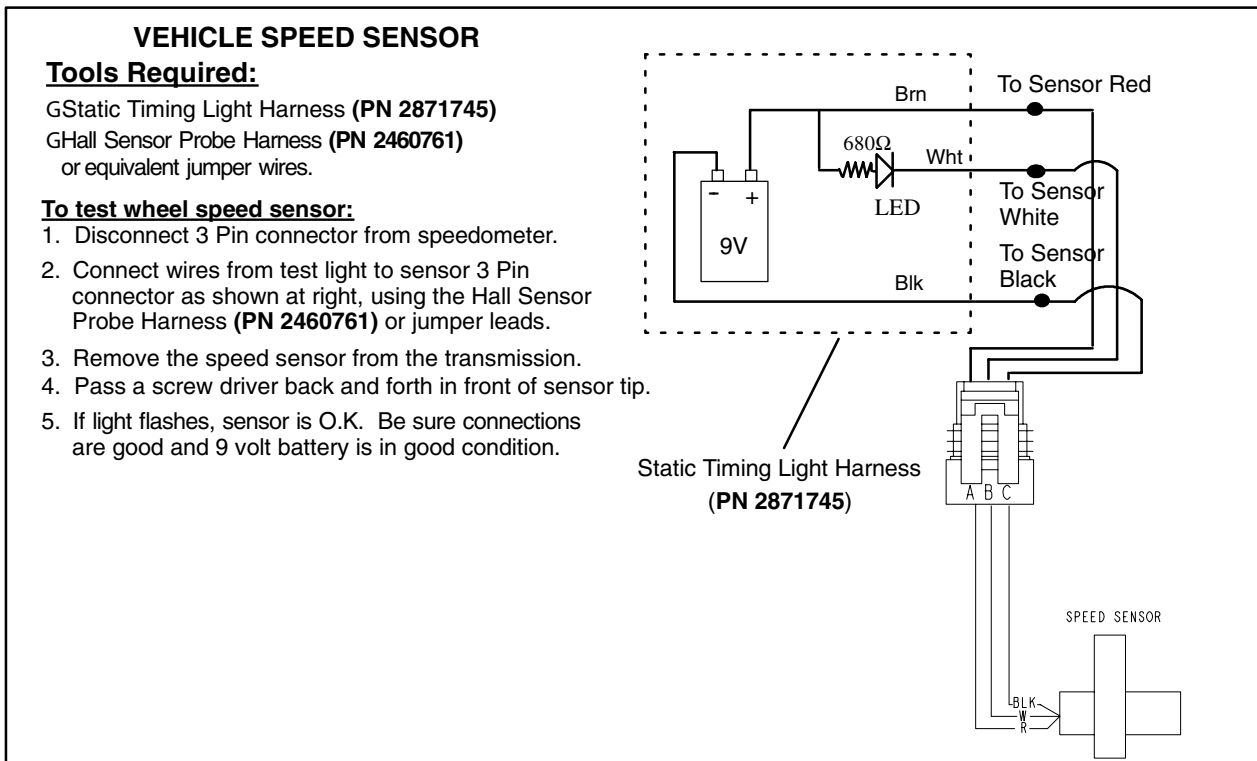
TEST 1 - No All Wheel Drive



TEST 2 - No Display

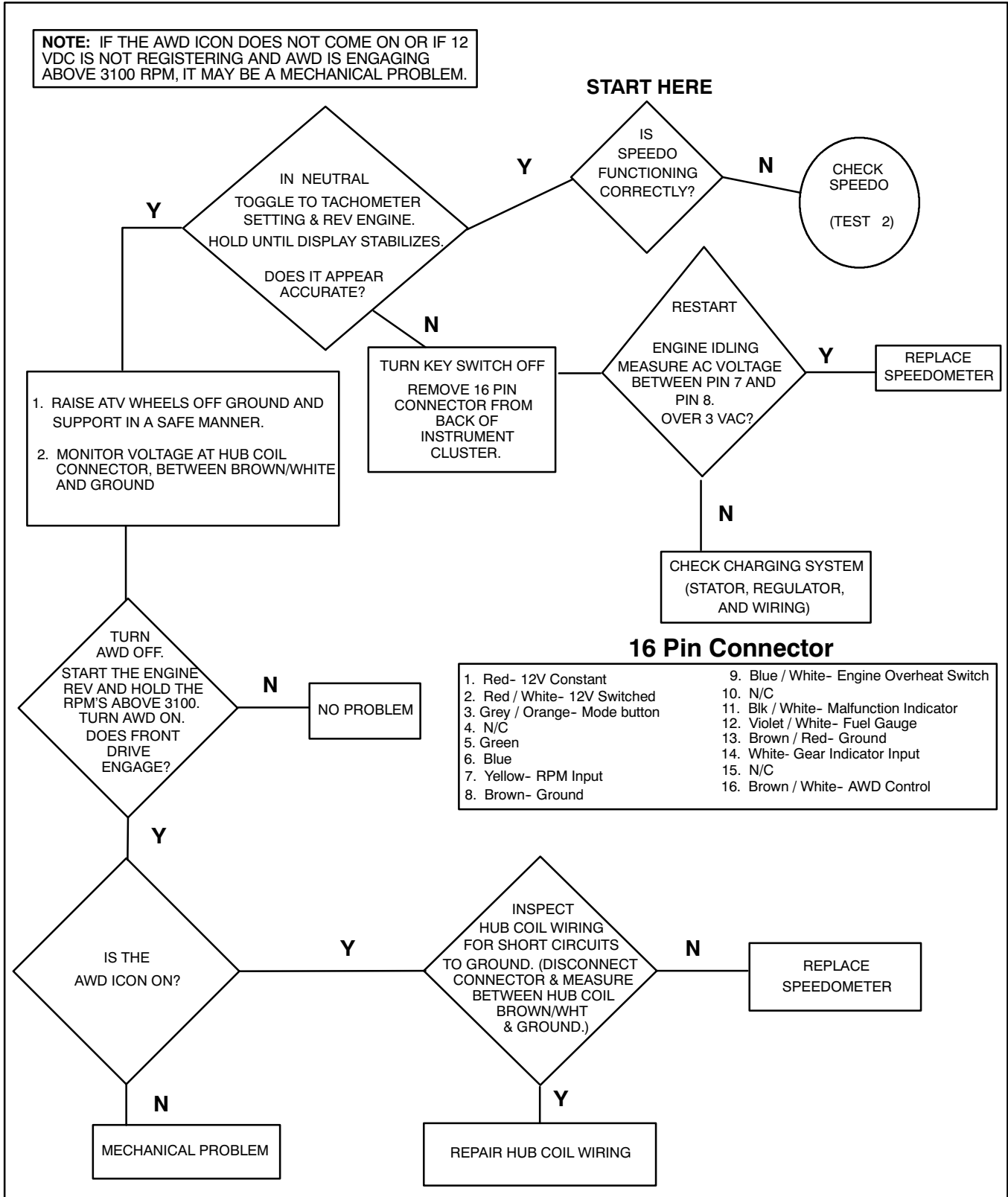


TEST 3 - Vehicle Speed Sensor

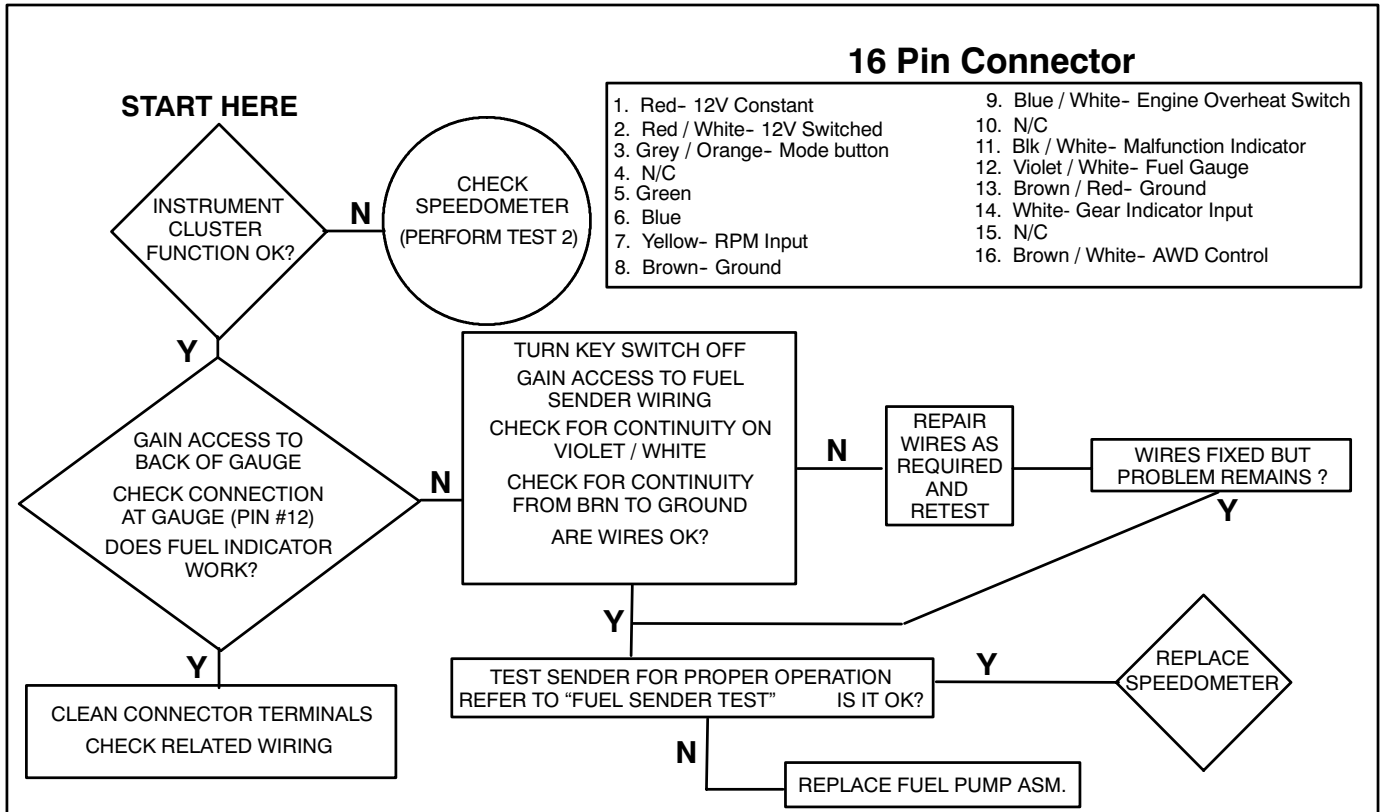


ELECTRICAL

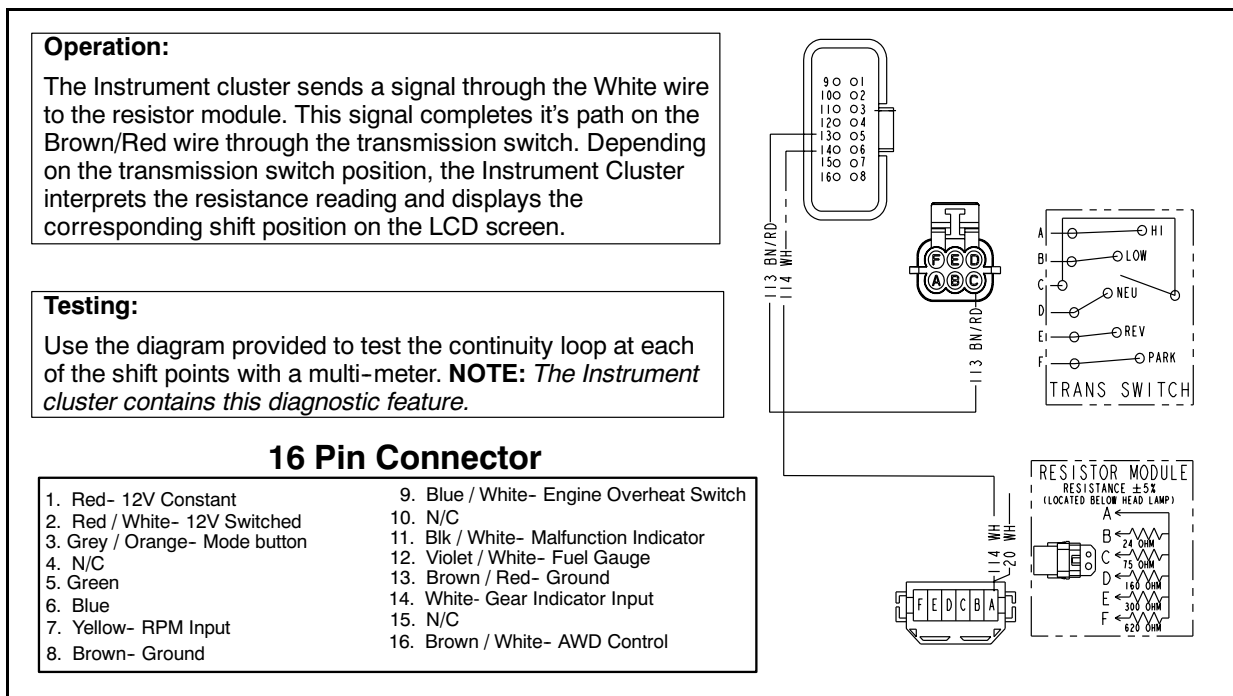
TEST 4 - No AWD Hub Safety Limiter



TEST 5 - Fuel Gauge Display Not Working



TEST 6 - Gear Indicator Not Working (Transmission Switch)



ELECTRICAL

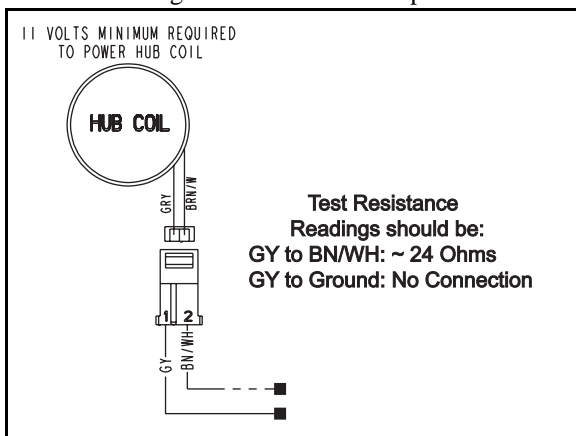
ALL WHEEL DRIVE COIL

Operation Overview

- When the AWD switch is “ON”, 12 VDC power is present at the hub coil.
- If the criteria is met, the instrument cluster provides a ground path at pin #16. 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:
 $24 \Omega \pm 5\%$

- Verify the wiring harness, wiring, connectors, connector pins and grounds are undamaged, clean and connect properly.
- Verify continuity of wire connections with a known good 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.

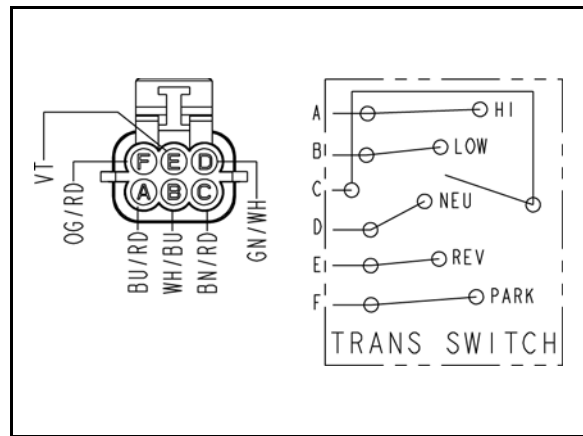
GEAR POSITION INDICATOR SWITCH

Test Diagram

Continuity Table

	A	B	C	D	E	F
HIGH	X		X			
LOW		X	X			
NEU			X	X		
REV			X		X	
PARK			X			X

NOTE: See “Instrument Cluster Troubleshooting” for additional switch circuit information.

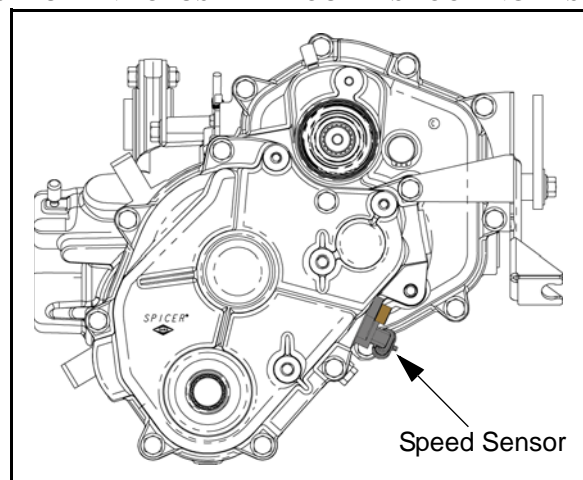


SPEED SENSOR

Location / Testing

The speed sensor is located in the transmission transfer case cover and can be accessed through the rear LH wheel well area.

To test the Speed Sensor, refer to “TEST 3” under INSTRUMENT CLUSTER TROUBLESHOOTING TESTS.

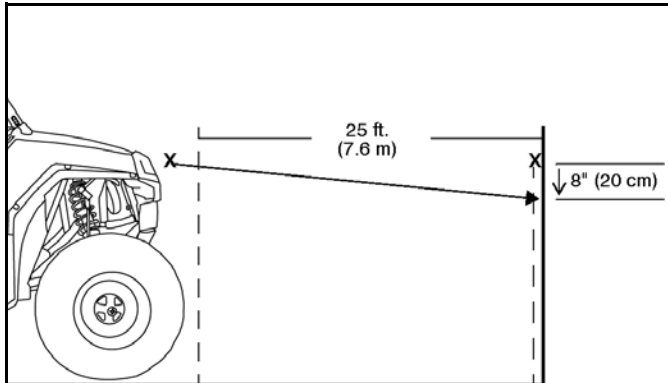


HEAD LIGHTS

Headlight Adjustment

The headlight beam is adjustable.

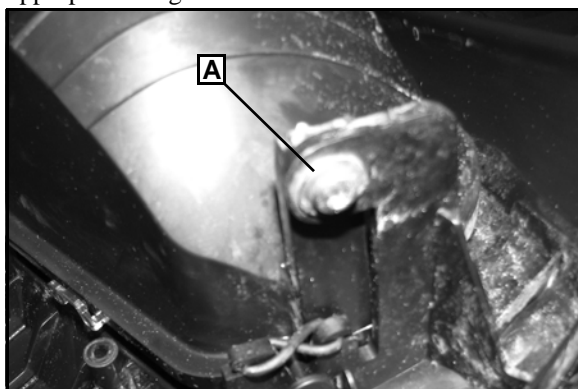
1. Place the vehicle on a level surface with the headlight approximately 25 ft. (7.6 m) from a wall.



2. Measure the distance from the floor to the center of the headlight and make a mark on the wall at the same height.
3. With the machine in Park, start the engine and turn the headlight switch to 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. Adjust the beam to the desired position by loosening the adjustment screw (A) and moving the lamp to the appropriate height.



6. Adjust the beam to desired position. 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.

Headlamp Bulb Replacement

1. Disconnect the headlamp bulb from the wiring harness. Be sure to pull on the connector, not on the wiring.
2. Turn the lamp counterclockwise to remove it.



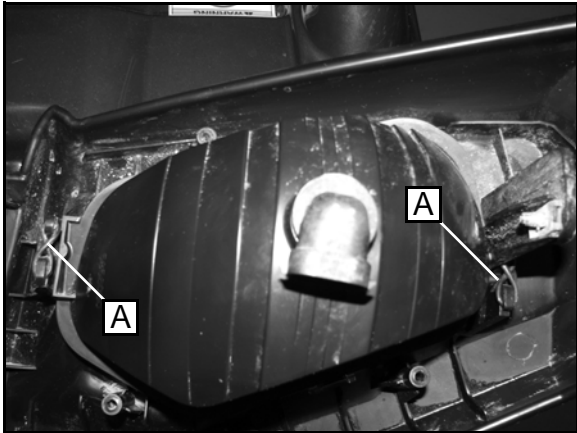
3. Insert new bulb. Reinstall the harness assembly into the headlight assembly.

NOTE: Make sure the tab on the lamp locates properly in the housing.

ELECTRICAL

Headlamp Housing Removal

1. Disconnect the headlamp from the wiring harness. Be sure to pull on the connector, not on the wiring.
2. Remove the O-rings (A) from the headlamp brackets on both sides of the headlamp.
3. Remove the headlamp from the front bumper.



Headlamp Housing Installation

1. To install the headlamp housing back into the front bumper.
2. Secure the headlamp housing with the rubber O-rings (A) on both sides of the headlamp.
3. Reconnect wire harness or re-insert bulb if previously removed.
4. Adjust headlights using the “Headlight Adjustment” procedure in this section.

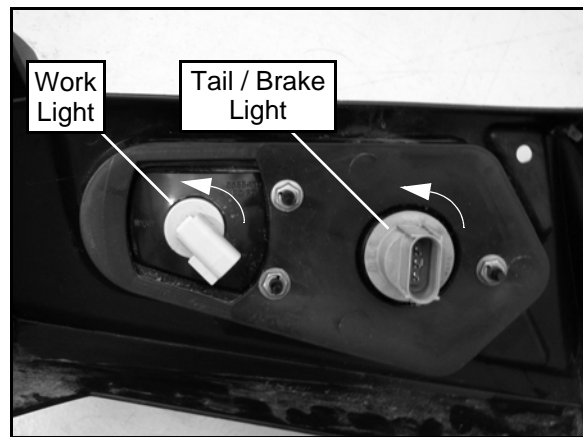
TAIL / BRAKE / WORK LIGHTS

Bulb Replacement

Before replacing the bulb, use a digital multi-meter to test the harness to ensure the lamp is receiving 12 volts and that a ground path is present.

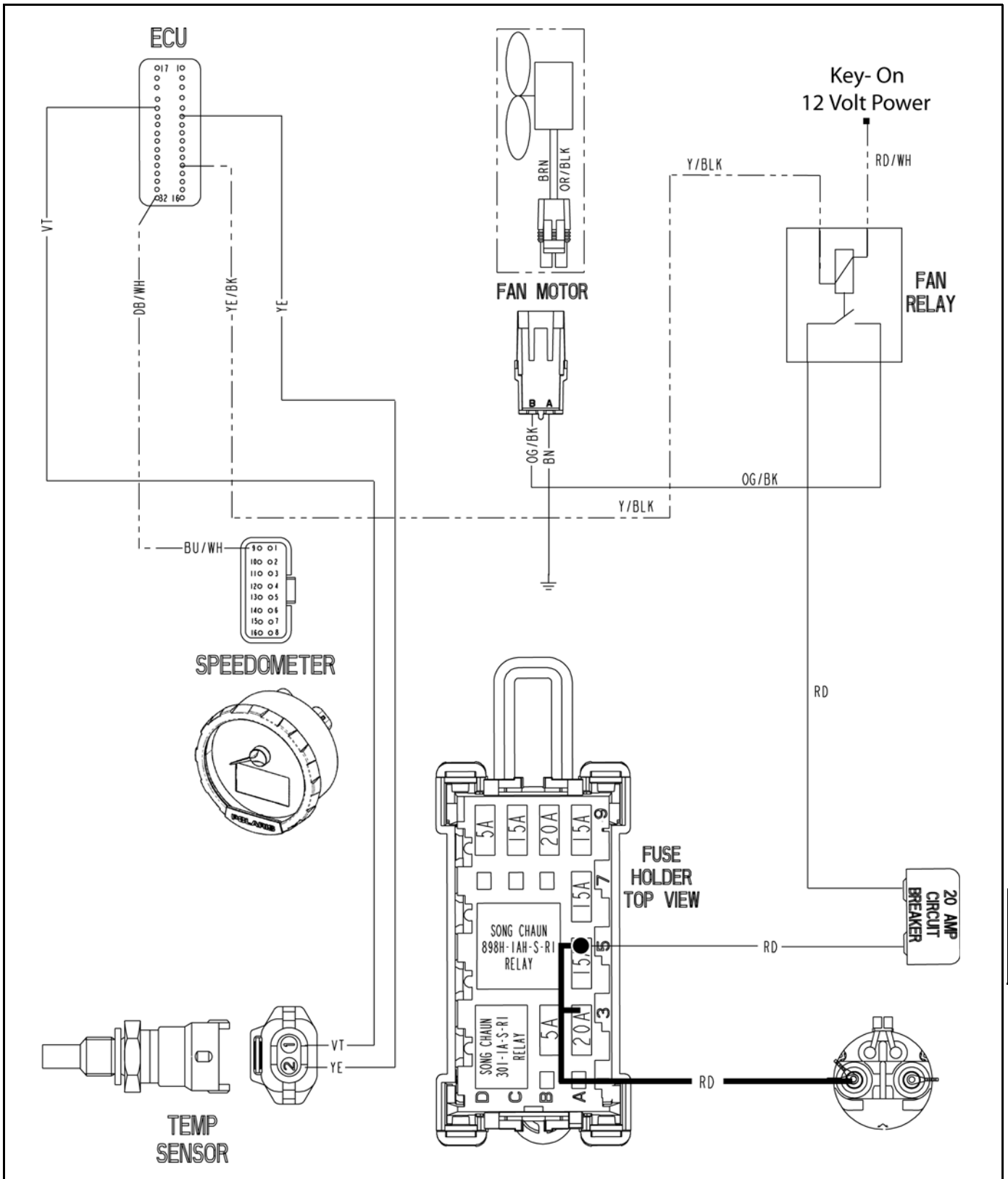
If a tail light, brake light, or work light does not work the bulb may need to be replaced.

1. Remove bulb by turning the rubber base 1/4 turn and pulling the bulb out. Replace it with recommended bulb. Apply Dielectric Grease (PN 2871329).
2. Test the tail light, brake light, and work light to verify it is working properly.



COOLING SYSTEM SCHEMATIC


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 Maintenance Chapter 2 for cooling system information.

Fan Control Circuit Bypass Test

1. Disconnect harness from coolant temperature sensor on engine cylinder head.
2. With the transmission in Park, turn the ignition key “ON”. The fan should start running.
3. If the fan does not run or runs slowly, check the fan motor wiring, ground, motor condition 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 ($68^{\circ}\text{F} = 20^{\circ}\text{C}$), disconnect the harness connector.
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 $\Omega \pm 6\%$
212 ° F (100 ° C)	0.186 $\Omega \pm 2\%$

NOTE: If the coolant temperature sensor or circuit malfunctions the radiator fan will default to 'ON'.

EFI DIAGNOSTICS

EFI Component Testing

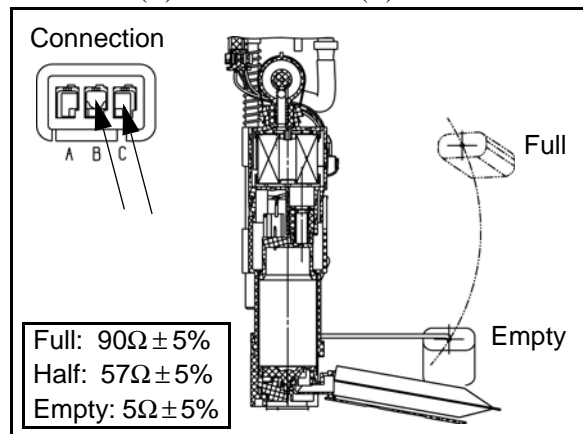
All EFI component information and diagnostic testing procedures are located in **Chapter 4**.

Refer to Chapter 4 “Electronic Fuel Injection System (EFI)” when diagnosing an EFI system or component.

FUEL SENDER

Testing

1. Drain the fuel from the fuel tank.
2. Carefully remove the fuel pump assembly from the fuel tank (see chapter 4).
3. Attach an ohm meter to the fuel sender harness Violet/White wire (B) and Brown wire (C).



4. Allow the sender float to sit in the **empty position** and compare to specification.

Fuel Sender - Empty: $5\Omega \pm 5\%$

5. Slowly lift the sender float to the **full position** and compare to specification.

Fuel Sender - Full: $90\Omega \pm 5\%$

6. If the readings are out of specification, or if the reading is 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).

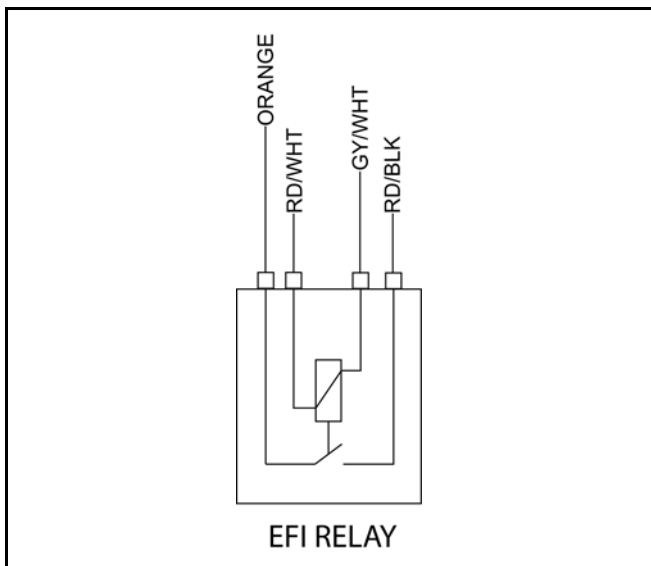
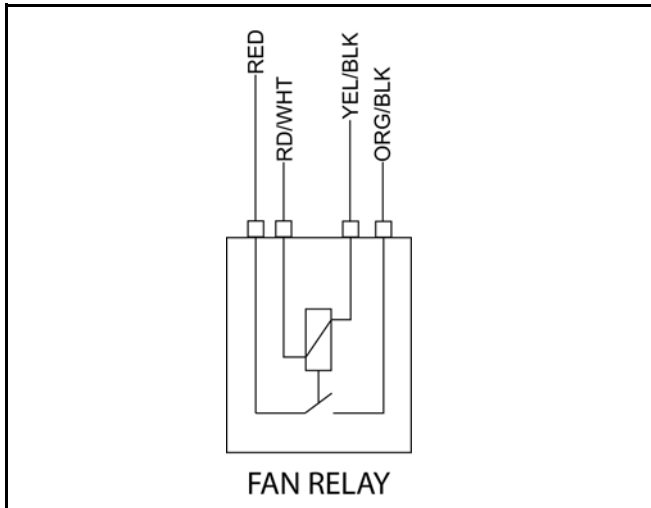
RELAYS

Operation

Located in the fuse box under the dash, the relays assist with component operation like the fan, fuel pump, and EFI system.

The fan relay, controlled by the ECU and Temp Sensor, operates the fan.

The EFI relay, controlled by the ECU, turns on power for components such as the fuel pump, injectors, and ignition coils.



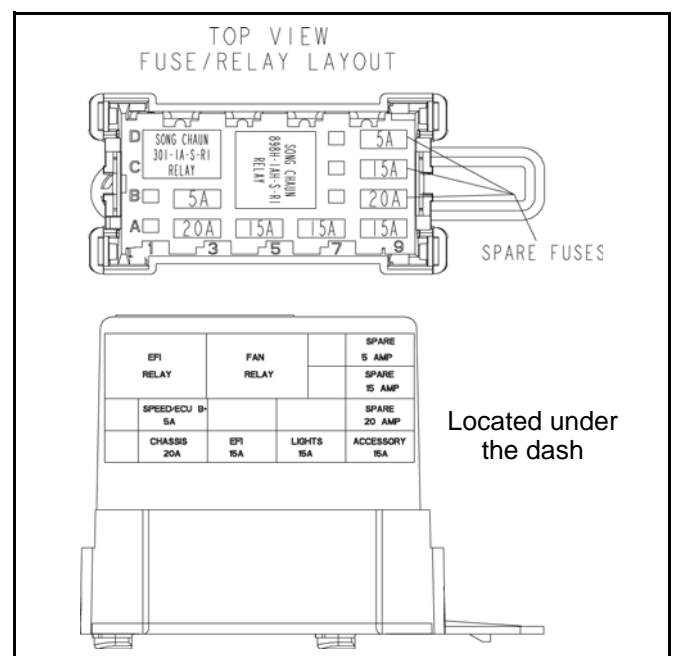
FAN RELAY

COLOR	FUNCTION
Red / White	Key-On battery power supply, switched on by key switch, enables power to relay.
Orange / Black	Fused 20-Amp power, switched by relay, provides power to Fan Motor.
Yellow / Black	ECU input to connect relay Fused 20-Amp power to Fan Motor output.
Red	Fused 20-Amp, constant battery power IN supply for EFI component operation.

EFI RELAY

COLOR	FUNCTION
Orange	Fused 15-amp, constant battery power IN supply for EFI component operation.
Red / White	Key-On battery power supply, switched on by key switch, enables power to relay.
Red / Black	EFI power output. Switched by relay when ECU sends a signal on the GRY/W wire, closing the relay. Supplies 15-amp power for ECU-controlled operation of EFI components.
Gray / White	ECU input to enable relay. The ECU supplies a ground which closes the relay, supplying power to run the fuel pump, injectors, etc.

FUSE BOX LAYOUT



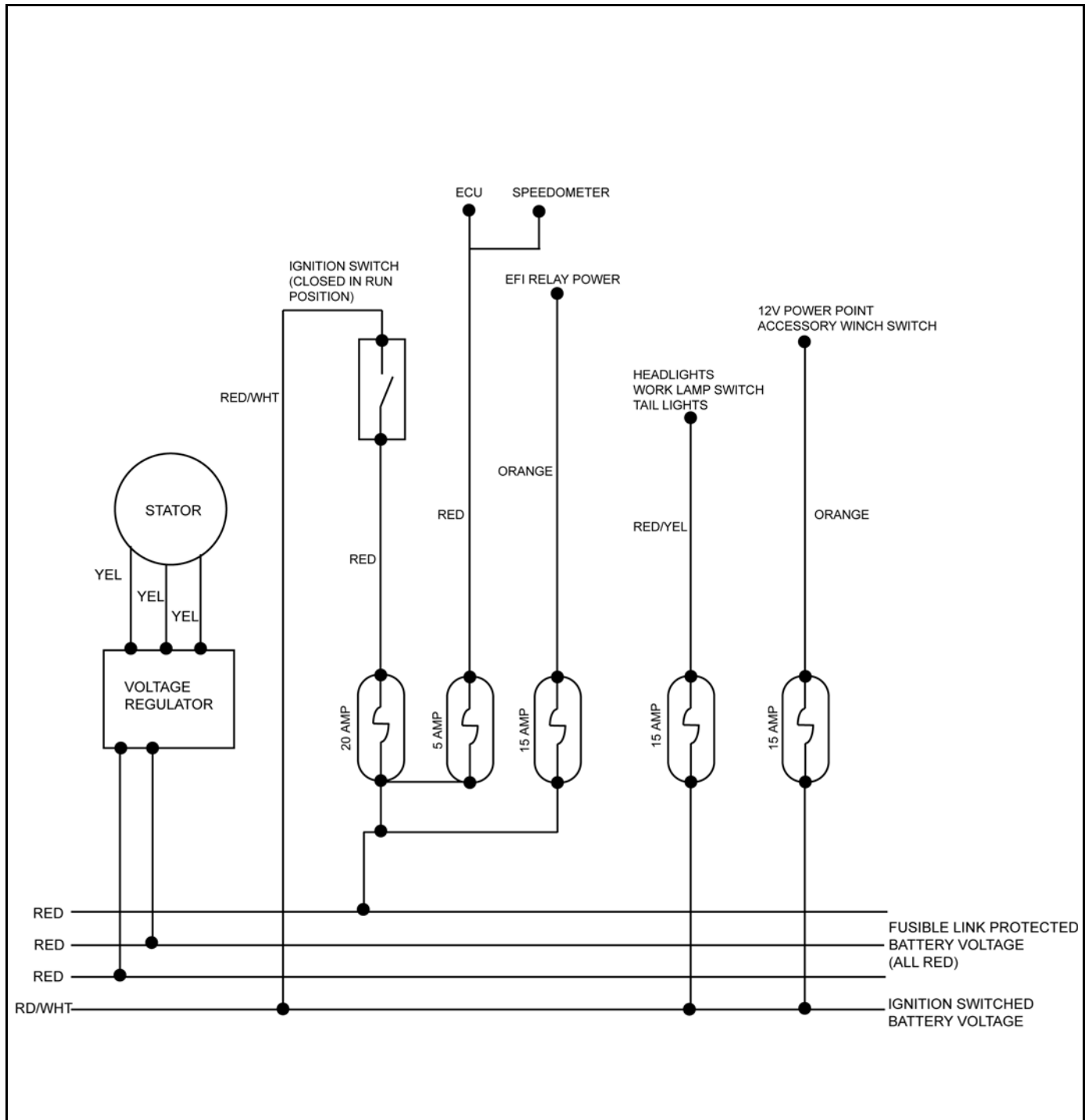
ELECTRICAL

FUSES / CIRCUIT BREAKER

Operation

Located in the fuse box under the dash, the fuse panel provides current protection for components such as the Instrument Cluster, ECU, EFI system, Chassis Power and Accessories.

A separate 20-amp circuit breaker protects the fan motor circuit (see wire diagram for details).



CHARGING SYSTEM

Alternator Output

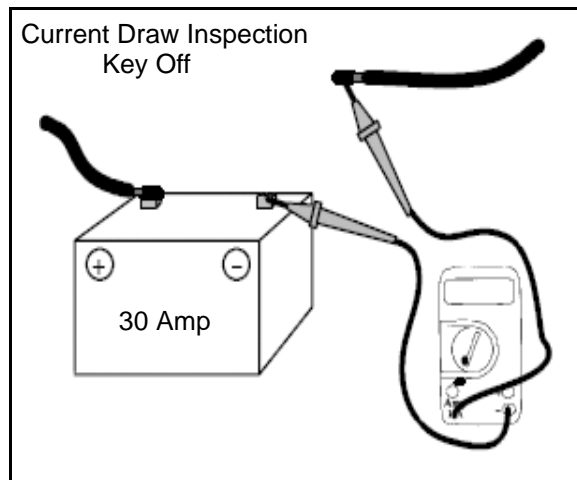
RPM	AMPS	VOLTS
2500	20	13.2 Vdc

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.

⚠ WARNING

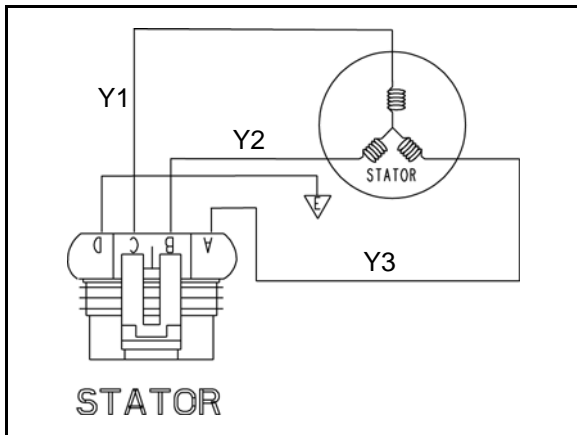
Never start the engine with an ammeter connected in series. Damage to the meter or meter fuse will result.
Do not run test for extended period of time.
Do not run test with high amperage accessories.

1. Connect a tachometer to the engine.
2. Using an inductive amperage metering device, (set to DC amps) connect to the negative battery cable.
3. With engine off and the key, kill switch, and lights in the ON position, the ammeter should read negative amps (battery discharge). Reverse meter lead if a positive reading is indicated.
4. Shift transmission into neutral with the park brake on and start the engine. With the engine running at idle, observe meter readings.
5. Increase engine RPM while observing ammeter and tachometer.
6. Note RPM at which the battery starts to charge (ammeter indication is positive).
7. With lights and other electrical loads off, the “break even” point should occur at approximately 1500 RPM or lower.
8. With the engine running, turn the lights on and engage parking brake lock to keep brake light on.
9. Repeat test, observing ammeter and tachometer. With lights on, charging should occur at or below 2000 RPM.

ELECTRICAL

Charging System Alternator Tests

Three tests can be performed using a multi-meter to determine the condition of the stator (alternator).



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: **0.19Ω ± 15%**

Test	Connect Meter Leads To:	Ohms Reading
Battery Charge Coil	Y1 to Y2	0.19Ω ± 15%
Battery Charge Coil	Y1 to Y3	0.19Ω ± 15%
Battery Charge Coil	Y2 to Y3	0.19Ω ± 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.

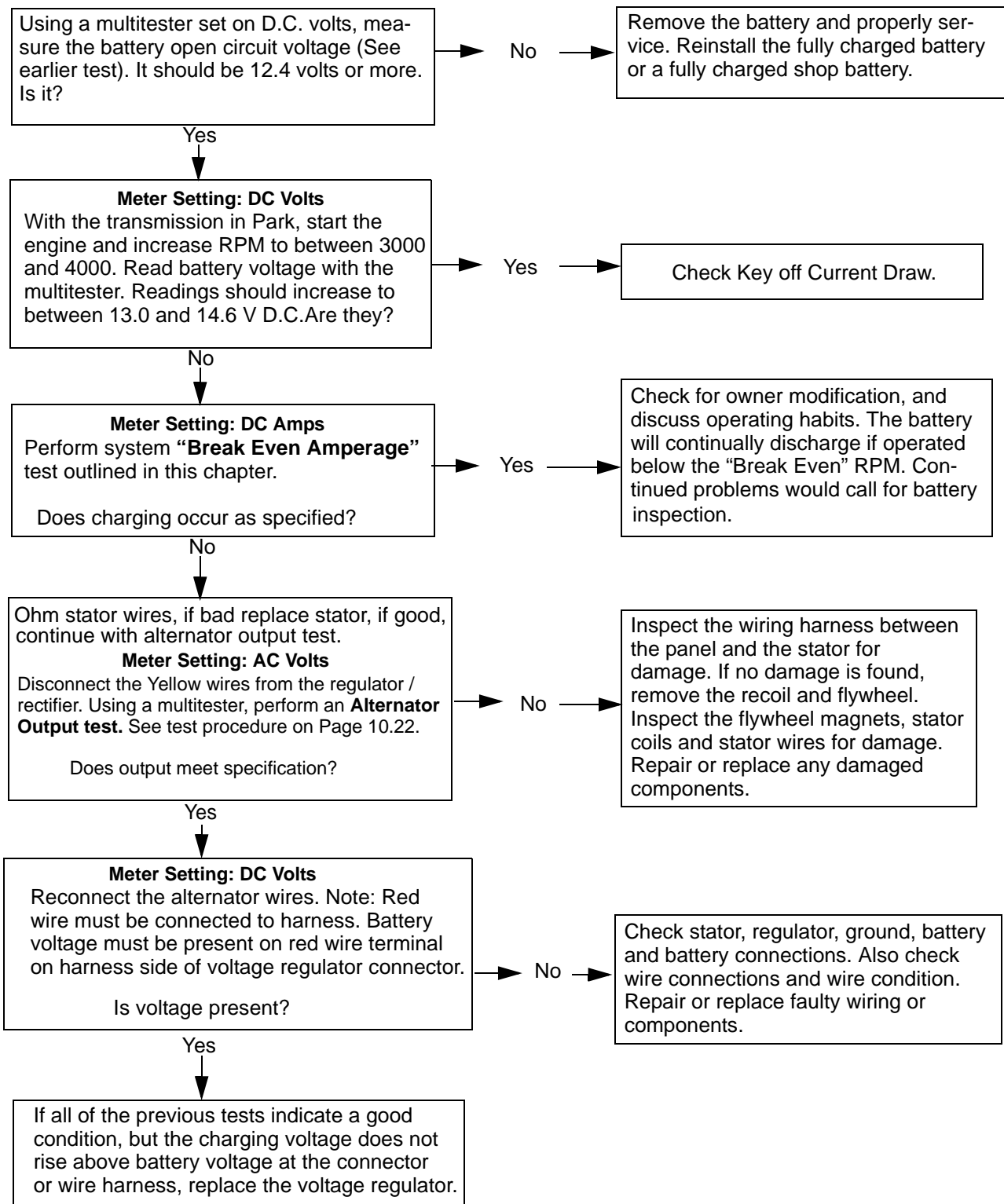
Example: The alternator current output reading should be approximately **18 VAC at 1300 RPM between each 'leg'**.

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	18 VAC ± 25 %
3000	42 VAC ± 25 %
5000	64 VAC ± 25 %

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.:



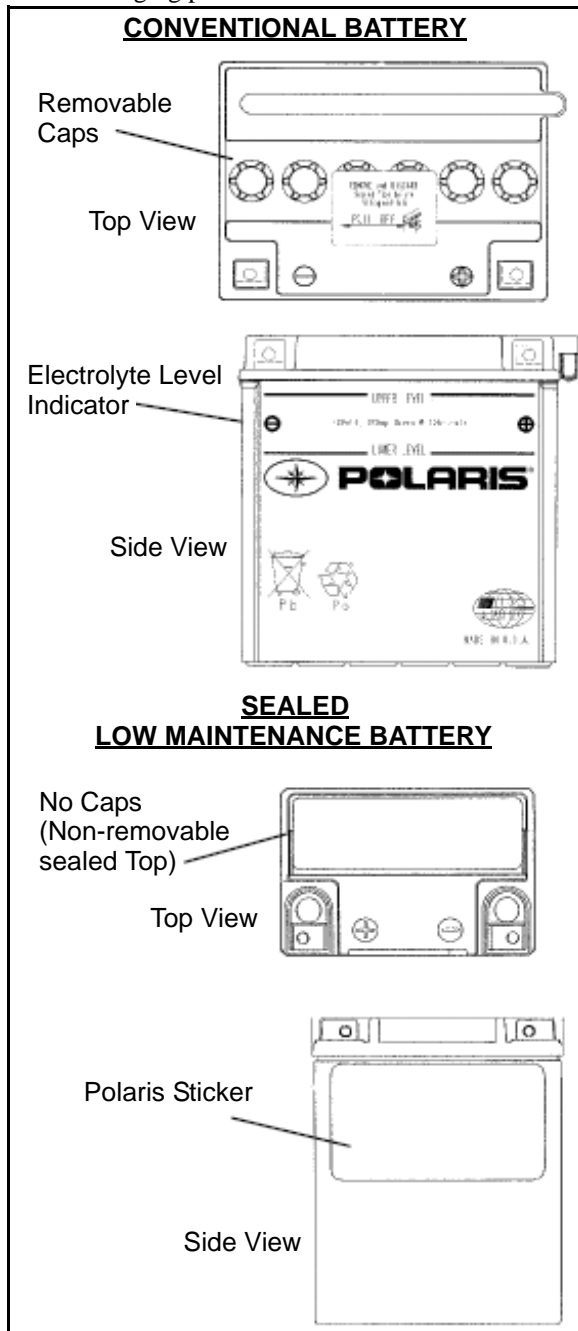
ELECTRICAL

BATTERY SERVICE

Battery Identification

IMPORTANT: Identify what type of battery you have installed in your vehicle. Different types of batteries require different service procedures. Proper servicing and upkeep of your battery is very important for maintaining long battery life.

Your vehicle may have a Conventional Battery or a Sealed Low Maintenance Battery. To identify which type of battery your vehicle has, refer to the illustration below and follow the correct service and charging procedures that follow in the manual.



CONVENTIONAL BATTERY

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 vent plug from vent fitting. Remove cell caps.
2. Fill battery with electrolyte to upper level marks on case.
3. Set battery aside to allow for acid absorption and stabilization for 30 minutes.

4. Add electrolyte to bring level back to upper level mark on case.

NOTE: This is the last time that electrolyte should be added. If the level becomes low after this point, add only distilled water.

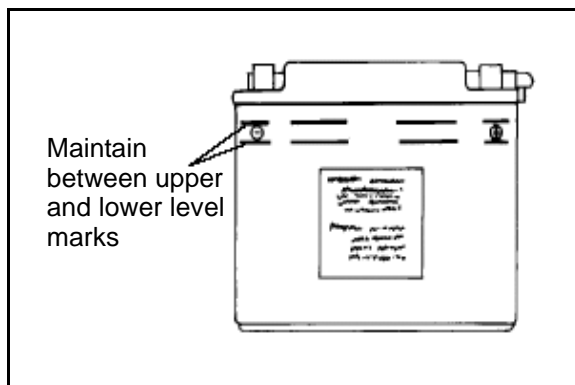
5. Charge battery at 1/10 of its amp/hour rating. Examples: 1/10 of 9 amp battery = .9 amp; 1/10 of 14 amp battery = 1.4 amp; 1/10 of 18 amp battery = 1.8 amp (recommended charging rates).
6. Check specific gravity of each cell with a hydrometer to assure each has a reading of 1.270 or higher.

Battery Inspection

Remove the driver's seat to access the battery.

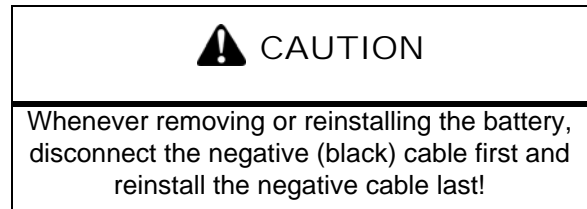


Inspect the battery fluid level. When the battery fluid nears the lower level, remove the battery and fill with distilled water only to the upper level line.





Battery Removal

1. Remove the battery holder strap.
2. Disconnect battery negative (-) (black) cable first, followed by the positive (+) (red) cable.



3. Remove the battery.
4. Remove the filler caps and add distilled water as needed to bring each cell to the proper level. Do not overfill.

 Refill using only distilled water. Tap water contains minerals which are harmful to a battery.

 Do not allow cleaning solution or tap water inside the battery. Battery life may be reduced.

5. Reinstall the battery caps.

Battery Installation

1. Clean battery cables and terminals with a stiff wire brush. Corrosion can be removed using a solution of one cup water and one tablespoon baking soda. Rinse well with clean water and dry thoroughly.
2. Route the cables correctly and reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable. Coat terminals and bolt threads with Nyogel™ Grease (PN 2871329).
3. 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. The vent tube 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.
4. Reinstall the holder strap.

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.

ELECTRICAL

OCV - Open Circuit Voltage Test

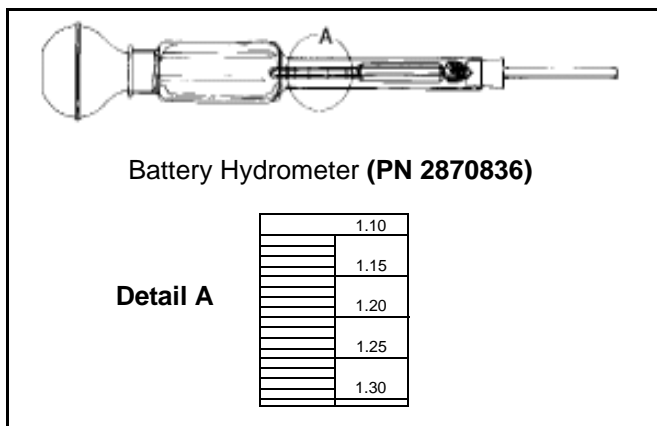
Battery voltage should be checked with a digital multimeter. Readings of 12.6 volts or less require further battery testing and charging. See the following charts and Load Test.

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	Conventional Lead-Acid	YuMicron™ Type
100% Charged	12.60 V	12.70 V
75% Charged	12.40 V	12.50 V
50% Charged	12.10 V	12.20 V
25% Charged	11.90 V	12.0 V
0% Charged	less than 11.80 V	less than 11.9 V

Specific Gravity Test

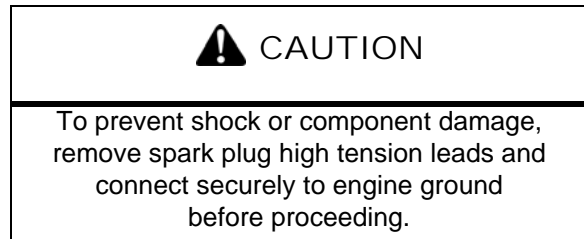
A tool such as a Battery Hydrometer (PN 2870836) can be used to measure electrolyte strength or specific gravity. As the battery goes through the charge/discharge cycle, the electrolyte goes from a heavy (more acidic) state at full charge to a light (more water) state when discharged. The hydrometer 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 .025 between the lowest and highest cell readings indicate a need to replace the battery.



SPECIFIC GRAVITY		
State of Charge*	Conventional Lead-Acid	YuMicron™ Type
100% Charged	1.265	1.275
75% Charged	1.210	1.225
50% Charged	1.160	1.175
25% Charged	1.120	1.135
0% Charged	less than 1.100	less than 1.115

* At 80° F
NOTE: Subtract .01 from the specific gravity reading at 40° F.

Load Test



NOTE: This test can only be performed on machines with electric starters. This test cannot be performed with an engine or starting system that is not working properly.

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. To perform this test, hook a multimeter to the battery in the same manner as was done in the OCV test. The reading should be 12.6 volts or greater. Engage the starter and observe the battery voltage while cranking the engine. Continue the test for 15 seconds. During cranking the observed voltage should not drop below 9.5 volts. If the beginning voltage is 12.6 volts or higher and the cranking voltage drops below 9.5 volts during the test, replace the battery.

Off Season Storage

To prevent battery damage during extended periods of non-use, the following basic battery maintenance items must be performed:

- Remove the battery from the vehicle and wash the case and battery tray with a mild solution of baking soda and water. Rinse thoroughly with fresh water after cleaning. **NOTE:** Do not get any of the baking soda into the battery or the acid will be neutralized.
- Using a wire brush, remove any corrosion from the cables and terminals.
- Make sure that the electrolyte is at the proper level. Add distilled water if necessary.
- Charge at a rate no greater than 1/10 of the battery's amp/hr capacity until the electrolyte's specific gravity reaches 1.270 or greater.
- Store the battery either in the machine with the cables disconnected, or store in a cool place.

NOTE: Recharge to full capacity every 30 to 60 days during a non-use period. If the battery is stored during the winter months, electrolyte will freeze at higher temperatures as the battery discharges. The chart below indicates freezing points by specific gravity.


Electrolyte Freezing Points	
Specific Gravity of Electrolyte	Freezing Point
1.265	-75° F
1.225	-35° F
1.200	-17° F
1.150	+5° F
1.100	+18° F
1.050	+27° F

Charging Procedure (Conventional)

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 with positive terminal toward the front. 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.

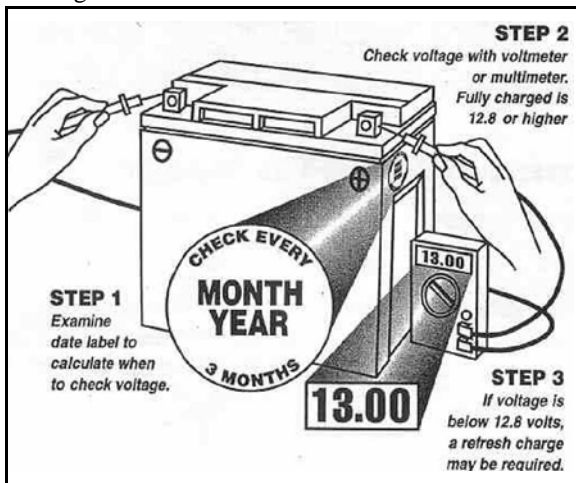
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LOW MAINTENANCE BATTERY

General Battery Information

NOTE: All Low Maintenance batteries are fully charged and tested at the factory before installation. Expected shelf life varies upon storage conditions. As a general rule before placing the battery into service, check the battery condition and charge accordingly.

1. Check the date label on the side of the battery to calculate when to check voltage. The battery should be checked every 3 months.
2. Check the voltage with a voltmeter or multimeter. A fully charged battery should be 12.8 V or higher.
3. If the voltage is below 12.8 V, the battery will need to be recharged.



Low Maintenance batteries are permanently sealed at the time of manufacture. The use of lead-calcium and AGM technology instead of lead-antimony allows the battery acid to be fully absorbed. For this reason, a Low Maintenance battery case is dark and the cell caps are not removable, since there is no need to check electrolyte level.

NOTE: New Batteries: 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.

NEVER attempt to add electrolyte or water to a Low Maintenance battery. Doing so will damage the case and shorten the life of the battery.

To service a Low Maintenance battery:

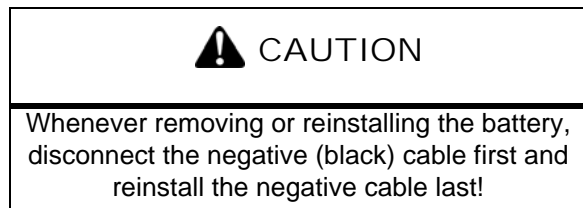
1. Remove battery from the vehicle.
2. Test battery with a voltage meter or load tester to determine battery condition. This will determine the length of time required to charge the battery to full capacity. Refer to capacity table.
3. Charge battery using a variable rate charger.

Battery Removal

1. Remove the driver's seat to access the battery and remove battery holder strap.



2. Disconnect battery negative (-) (black) cable first, followed by the positive (+) (red) cable.



3. Remove the battery.

Battery Installation

1. Clean battery cables and terminals with a stiff wire brush. Corrosion can be removed using a solution of one cup water and one tablespoon baking soda. Rinse well with clean water and dry thoroughly.
2. Route the cables correctly and reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable. Coat terminals and bolt threads with Nyogel™ Grease (PN 2871329).
3. Reinstall the holder strap.

Battery Testing

Whenever a service complaint is related to either the starting or charging systems, the battery should be checked first.

Following are two tests which can easily be made on a Sealed Low Maintenance battery to determine its condition: OCV Test and a Load Test.

OCV - Open Circuit Voltage Test

Battery voltage should be checked with a digital multimeter. Readings of 12.8 volts or less require further battery testing and charging. See charts and Load Test.

NOTE: Lead-acid batteries should be kept at or near a full charge as possible. 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.

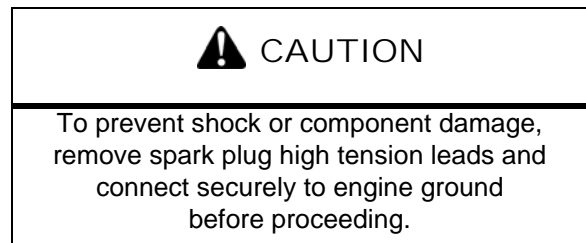
NOTE: Use a voltmeter or multimeter to test battery voltage.

OPEN CIRCUIT VOLTAGE		
State of Charge	Maintenance Free	YuMicron™ Type
100%	13.0 V	12.70 V
75% Charged	12.80 V	12.50 V
50% Charged	12.50 V	12.20 V
25% Charged	12.20 V	12.0 V
0% Charged	less than 12.0 V	less than 11.9 V

* At 80° F

NOTE: Subtract .01 from the specific gravity reading at 40° F.

Load Test



NOTE: This test can only be performed on machines with electric starters. This test cannot be performed with an engine or starting system that is not working properly.

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. To perform this test, hook a multimeter to the battery in the same manner as was done in the OCV test. The reading should be 12.6 volts or greater. Engage the starter and observe the battery voltage while cranking the engine. Continue the test for 15 seconds. During cranking the observed voltage should not drop below 9.5 volts. If the beginning voltage is 12.6 volts or higher and the cranking voltage drops below 9.5 volts during the test, replace the battery.

Off-Season Storage

To prevent battery damage during extended periods of non-use, the following basic battery maintenance items must be performed:

- Remove the battery from the machine and wash the case and battery tray with a mild solution of baking soda and water. Rinse thoroughly with fresh water after cleaning.
- Using a wire brush, remove any corrosion from the cables and terminals.
- Charge at a rate no greater than 1/10 of the battery's amp/hr capacity.
- Store the battery either in the machine with the cables disconnected, or store in a cool place.


NOTE: Stored batteries lose their charge at the rate of 1% per day. Recharge to full capacity every 30 to 60 days during a non-use period. If the battery is stored during the winter months, electrolyte will freeze at higher temperatures as the battery discharges.

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Charging Procedure (Low Maintenance)


If battery voltage is 12.8 V or less, the battery may need recharging. When using an automatic charger, refer to the charger manufacturer's instructions for recharging. When using a constant current charger, use the following guidelines for recharging.

NOTE: Always verify battery condition before and 1-2 hours after the end of charging.

 WARNING
An overheated battery could explode, causing severe injury or death. Always watch charging times carefully. Stop charging if the battery becomes very warm to the touch. Allow it to cool before resuming charging.

Battery Charging Reference Table

State of Charge	Voltage	Action	Charge Time
100%	12.8-13 V	None, check voltage at 3 mos. after manufacture date	None Required
75-100%	12.5-12.8 V	May need slight charge	3-6 hours
50-75%	12.0-12.5 V	Needs Charge	5-11 hours
25-50%	11.5-12.0 V	Needs Charge	At least 13 hours, verify state of charge
0-25%	11.5 V or less	Needs Charge	At least 20 hours

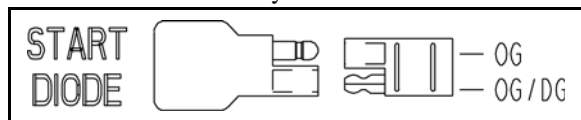
 WARNING
To avoid the possibility of sparks and explosion, connect positive (red) cable first and negative (black) cable last.

STARTING 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 kill switch
- Faulty Start Diode. Use a digital multi-meter to test diode operation. Unplug the diode from the harness under the dash and measure between the Orange and Orange/Green diode connections. Continuity should flow one direction only.



- 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 .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 on the starter system in this chapter.

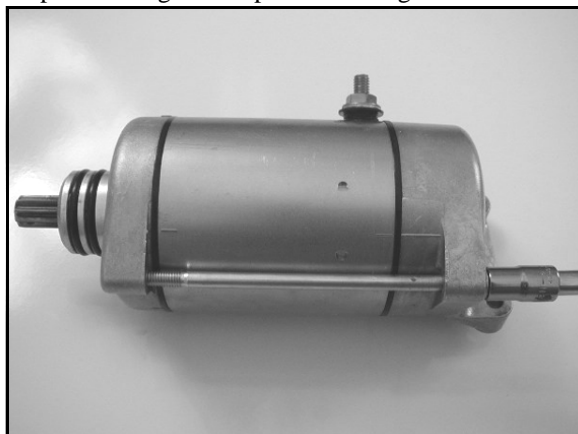
**Voltage should not exceed
.1 DC volts per connection**

Starter Motor Removal / Disassembly

NOTE: Use electrical contact cleaner to clean starter motor parts. Some solvents may leave a residue or damage internal parts and insulation.

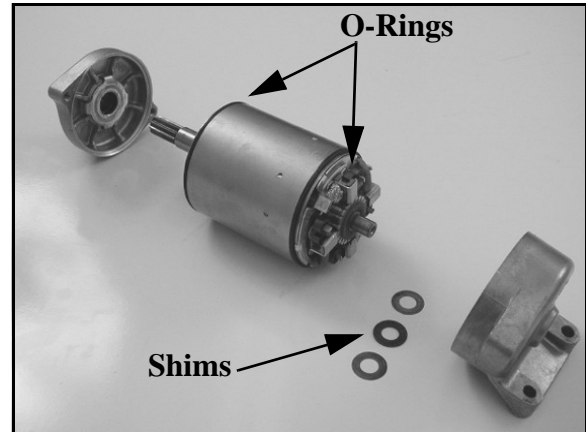


1. Remove the starter from the engine.
2. Remove the two bolts, washers, and sealing O-Rings. Inspect O-Rings and replace if damaged.



NOTE: Note the alignment marks on both ends of the starter motor casing. These marks must align during reassembly.

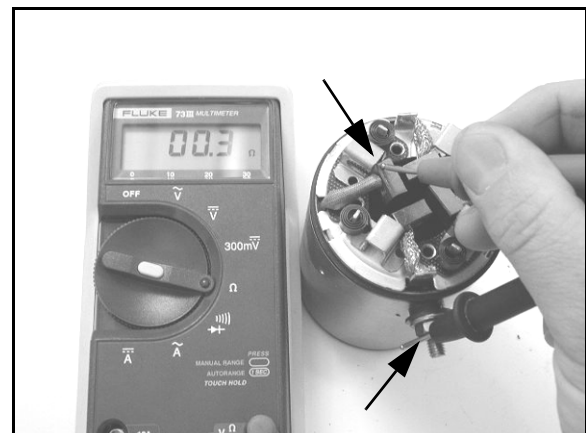
3. Remove the front bracket assembly and the rear bracket assembly. Remove the shims from the armature shaft and inspect the O-rings located on the armature housing.



NOTE: The shims will be replaced during reassembly.

Brush Inspection / Replacement

1. Measure resistance between starter input terminal and insulated brushes. The reading should be .3 ohms or less. Remember to subtract meter lead resistance.



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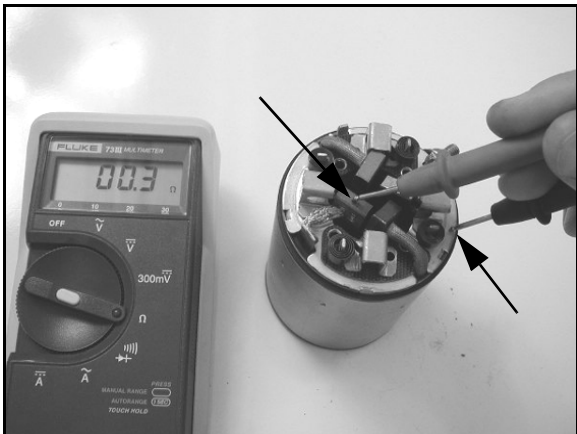
2. Measure resistance between insulated brush and starter housing. Reading should be infinite (OL). Inspect insulation on brush wires for damage and repair or replace as necessary.



3. Slide positive brush springs to the side, pull brushes out of their guides and remove brush plate. Slide brush end frame off end of starter.

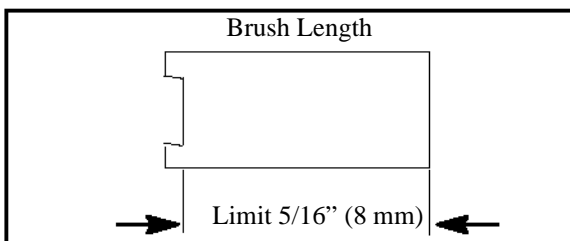
NOTE: The electrical input post must stay with the field coil housing.

4. Measure resistance between ground brush and brush plate. Resistance should be .3 ohms or less.



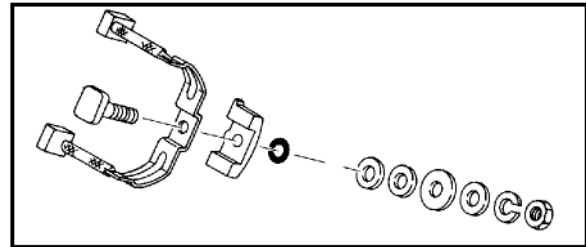
Brush Inspection

1. Measure length of each carbon brush. Replace brush assembly when worn to 5/16" (8 mm) or less. The brushes must slide freely in their holders.



Brush Replacement

1. Remove terminal nut with lock washer, flat washer, large phenolic washer, the small phenolic spacers, and sealing O-ring. Inspect O-ring and replace if damaged.



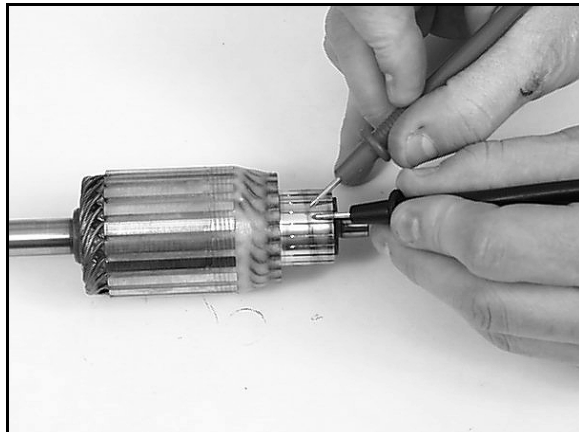
2. Slide positive brush springs to the side, pull brushes out of their guides and remove brush plate.

CAUTION

Some cleaning solvents may damage the insulation in the starter. Care should be exercised when selecting an appropriate solvent. If the commutator needs cleaning use only electrical contact cleaner.

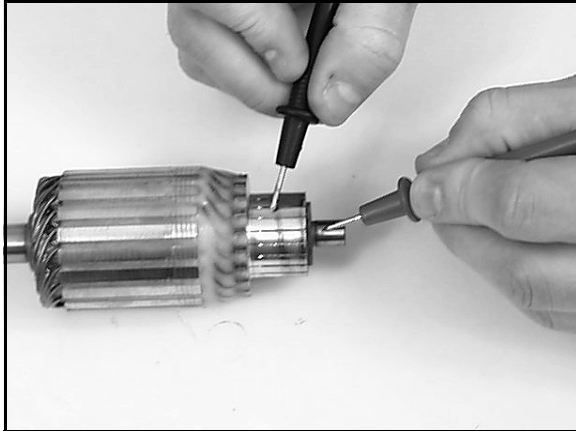
Armature Testing

1. Remove armature from starter casing. Note order of shims on drive end for reassembly.



2. Inspect surface of commutator. Replace if excessively worn or damaged.
3. Using a digital multimeter, measure the resistance between each of the commutator segments. The reading should be .3 ohms or less.

4. Measure the resistance between each commutator segment and the armature shaft. The reading should be infinite (no continuity).



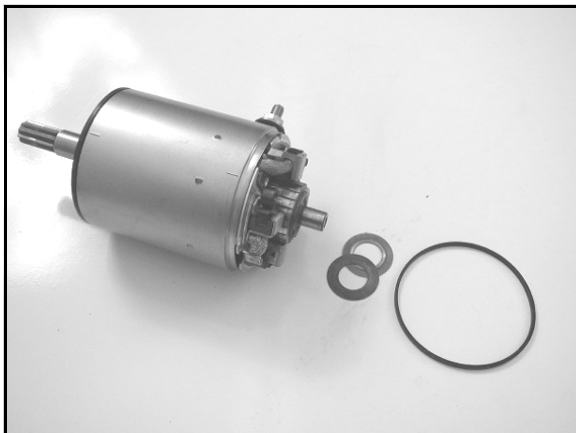
5. Check commutator bars for discoloration. Bars discolored in pairs indicate shorted coils, requiring replacement of the starter motor.
6. Place armature in a growler. Turn growler on and position a hacksaw blade or feeler gauge lengthwise 1/8" (.3 cm) above armature coil laminates. Rotate armature 360°. If hacksaw blade is drawn to armature on any pole, the armature is shorted and must be replaced.

CAUTION

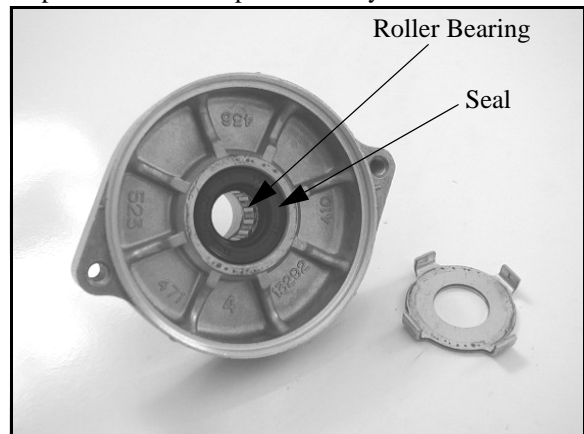
Use care when handling starter housing. Do not drop or strike the housing as magnet damage is possible. If magnets are damaged, starter must be replaced.

Starter Reassembly / Installation

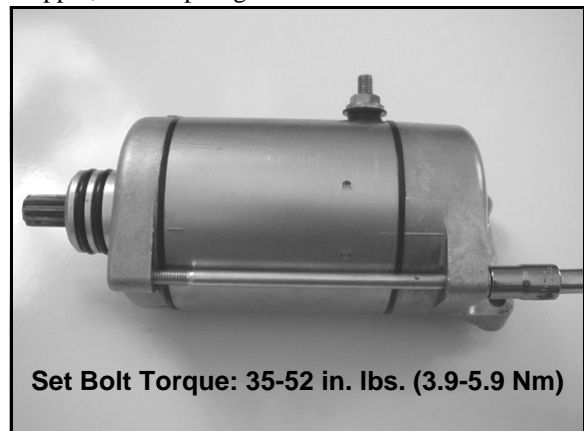
1. Install brush plate to field magnet housing aligning index tab.



2. Install O-ring, two small phenolic spacers, large phenolic washer, flat washer, lock washer, and terminal nut.
3. While holding brush springs away from brushes, push brushes back and hold in place.
4. Slide armature into field magnet housing. Release brushes.
5. Lightly grease the drive roller bearing and reinstall drive end frame on armature. Inspect seal for wear or damage. Replace drive end cap if necessary.



6. Be sure wire insulation is in place around positive brush wire and pushed completely into slot on phenolic plate.
7. Using Dielectric Grease (PN 2871329), lubricate brush end bushing and install shims.
8. Align brush plate and install cover and screws.
9. Lightly grease pinion shaft and install pinion, spring stopper, and snap ring.



10. Completely assemble starter motor and torque set bolts to 35 - 52 in. lbs. (3.9 - 5.9 Nm).
11. Install the starter onto the engine case. Hand tighten each of the starter bolts. **Torque the bottom bolt first to 9 ft.lbs. (12 Nm).** Then torque the top bolt to the same specification.

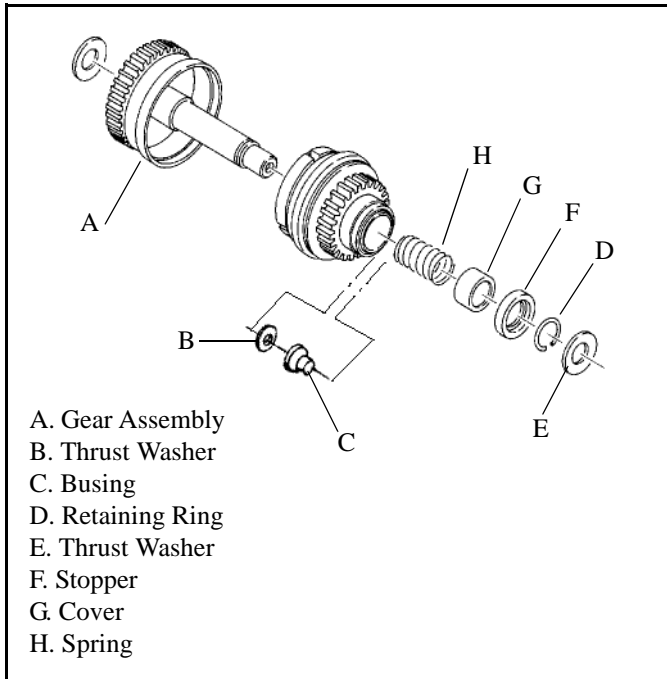
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NOTE: It is important to tighten the bottom starter bolt first (circle), as the bottom hole acts as a pilot hole to properly align the starter drive (bendix) with the flywheel. This helps to prevent binding and starter damage.



Starter Drive

If the garter spring is damaged, the overrun clutch may fail to return properly. Use either of the following methods to remove and install a new garter spring:

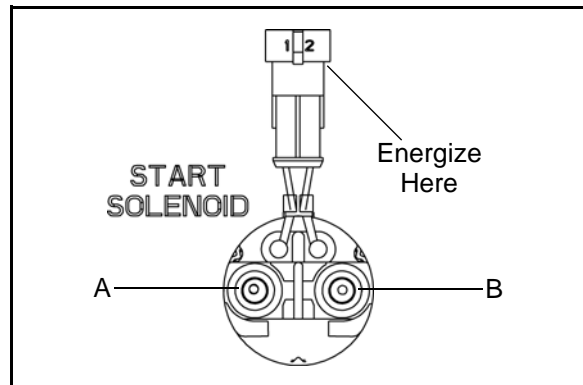


1. Screw the overrun clutch out to the engaged position on the pinion shaft assembly. Use a small piece of wire with the end bent in a hook and pick the old spring out of its channel. Slide it off the end of the shaft. Slide the new spring over the overrun clutch and into the spring groove. Make sure the spring is positioned between the shoe alignment pins and the back flange of the anti kick-out shoes.

2. Remove the retaining ring, thrust washer, spring retainers and clutch return spring. Screw the overrun clutch off the end of the pinion shaft. Remove the old spring and install a new one. Lightly grease the pinion shaft and reinstall the clutch, spring, retainers, end washer and lock ring in the reverse order. Make sure the end washer is positioned properly so that it will hold the lock ring in its groove.

Starter Solenoid Bench Test

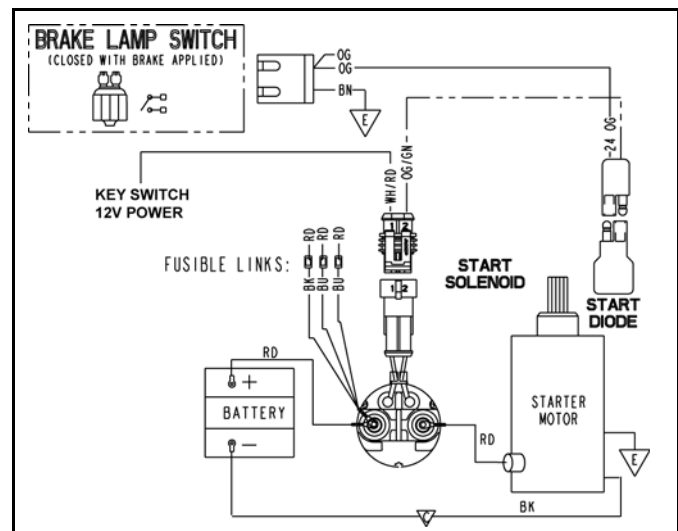
Test the start solenoid by powering the solenoid via the 2-wire connection. With the solenoid energized, resistance should read about $0.5\Omega \pm 10\%$ between terminal (A) and (B). If resistance measurement is out of specification, replace the starter solenoid.



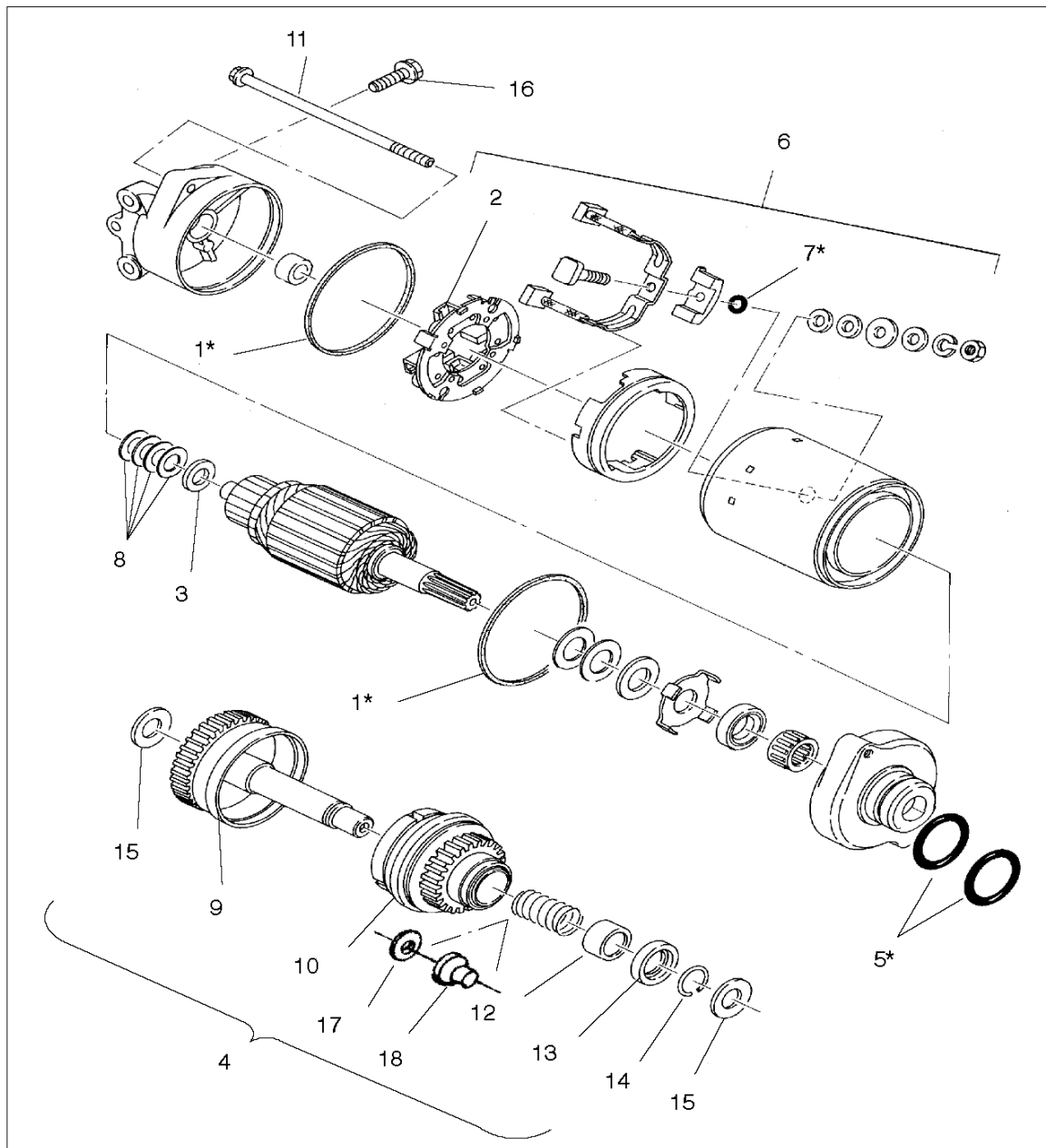
Starter Solenoid Operation

To energize the Starter Solenoid the following must occur:

- The brake must be applied to provide a ground path via the Orange / Green wire.
- The key switch must be turned to the “start” position to provide 12V power via the White / Red wire.
- Once the pull-in coil is energized, the solenoid provides a current path for 12V power to reach the starter motor.



Starter Exploded View



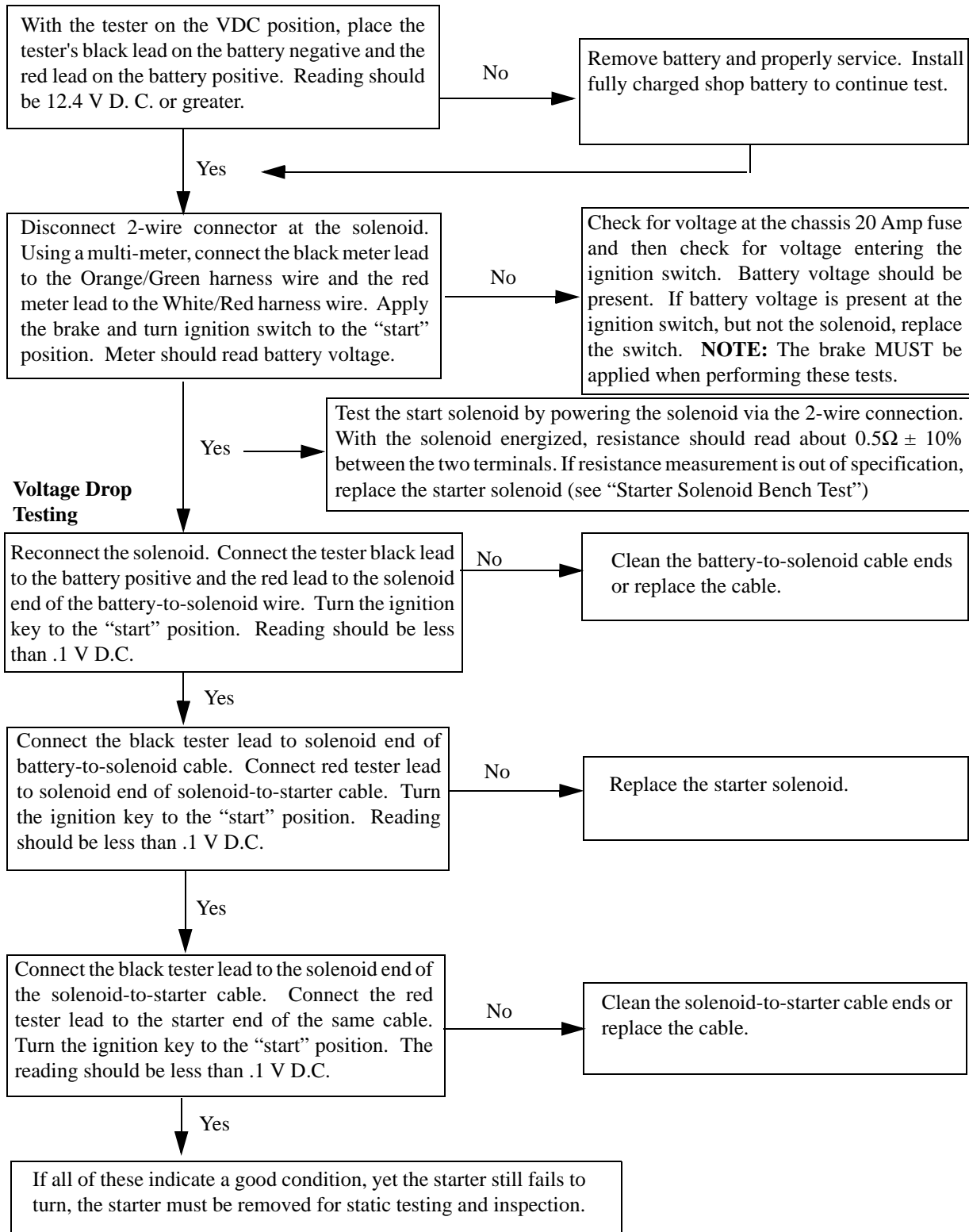
* Indicates - Do not reuse.
Replace with new parts.

1. Rubber Ring*	10. Gear Assembly
2. Brush Spring	11. Through Bolt
3. Thrust Washer	12. Cover
4. Gear Assembly	13. Stopper
5. O-Ring*	14. Snap Ring
6. Brush Complete	15. Washer
7. O-Ring*	16. Flange Bolt
8. Thrust Washer	17. Thrust Washer
9. Shaft Complete	18. Flange Bushing

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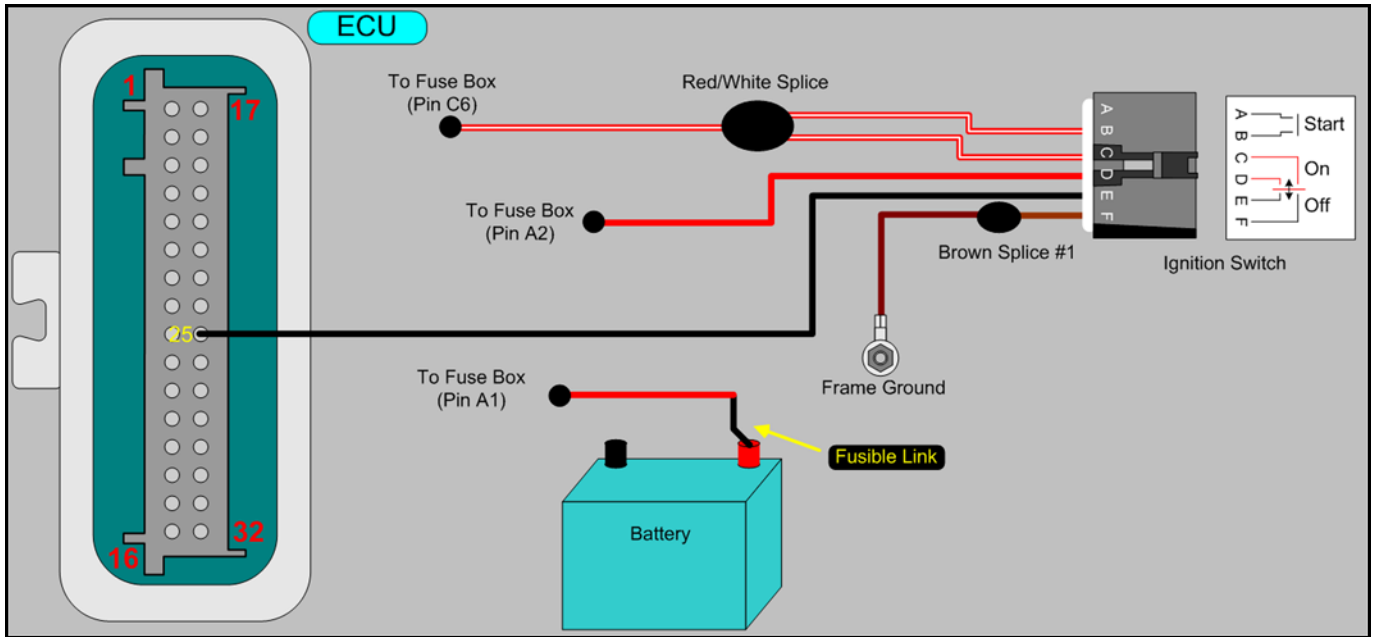
STARTING SYSTEM TESTING FLOW CHART

Condition: Starter fails to turn over the engine.

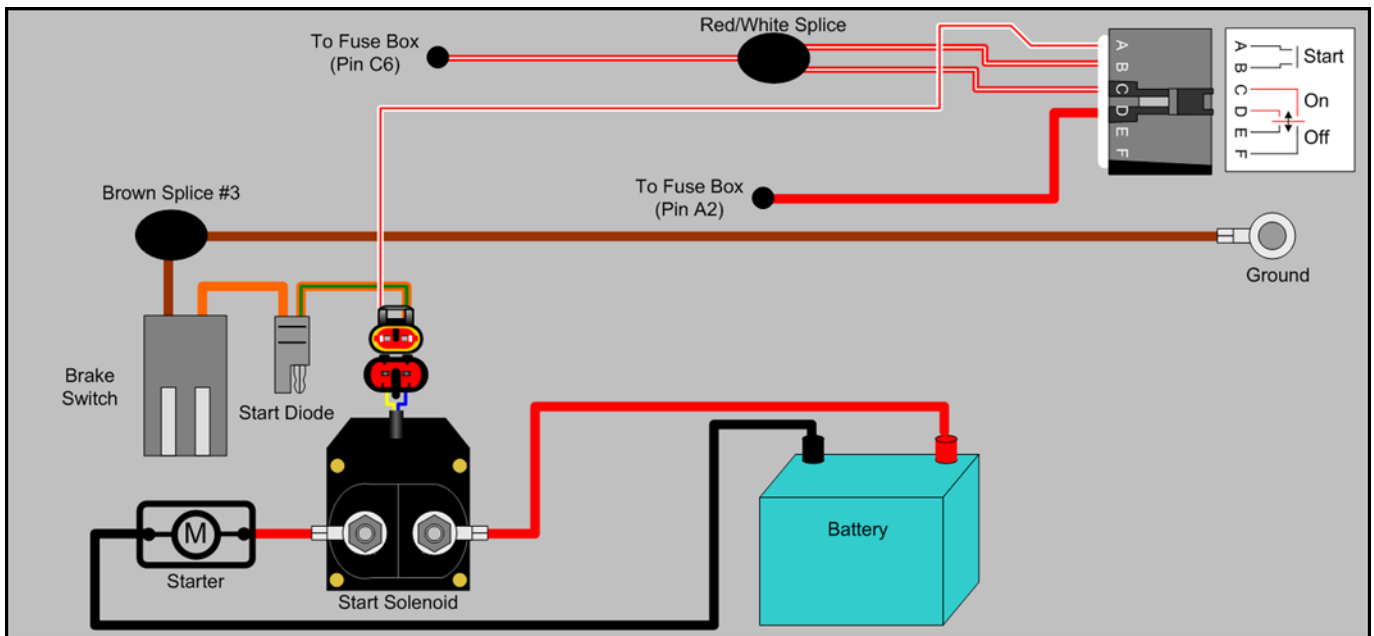


ELECTRICAL BREAKOUT DIAGRAMS

12V Key-On Power Circuit

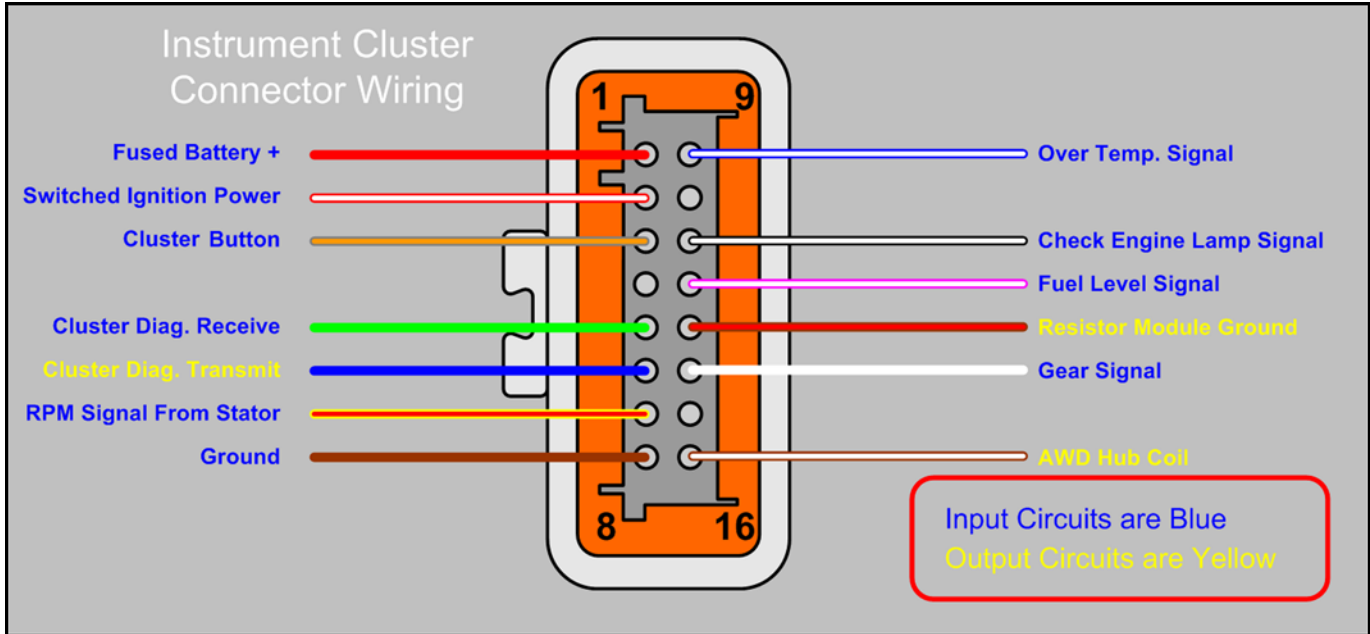


Starting System Circuit

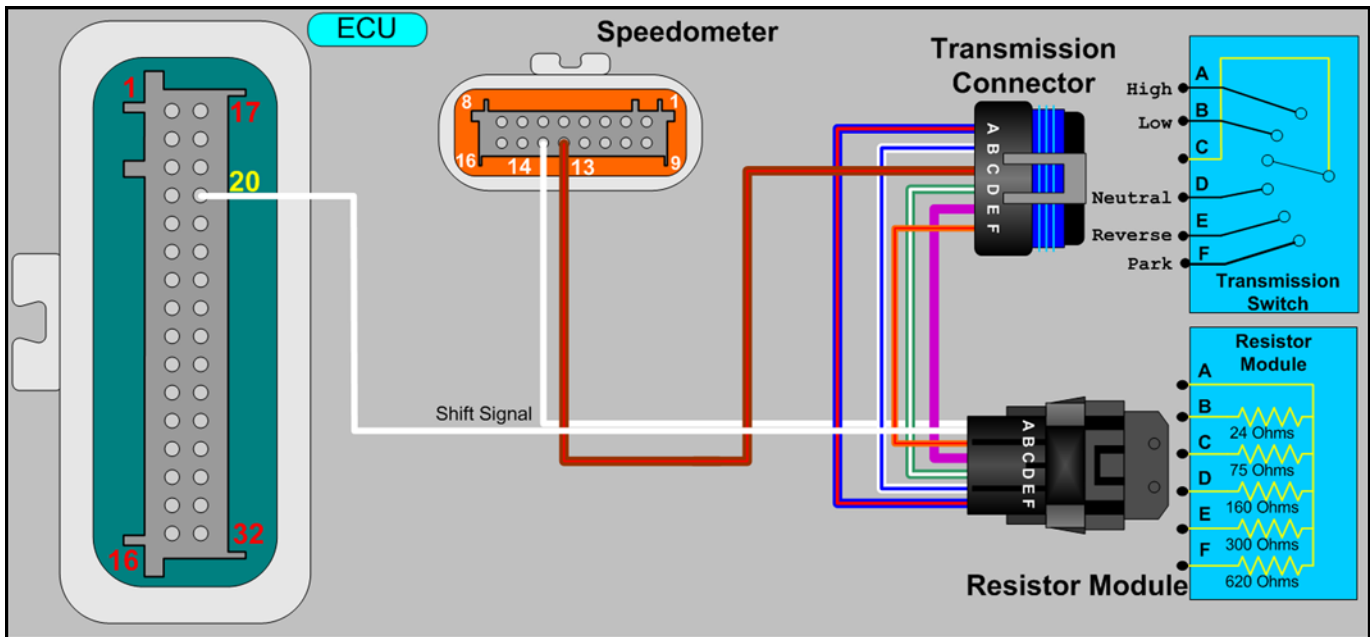


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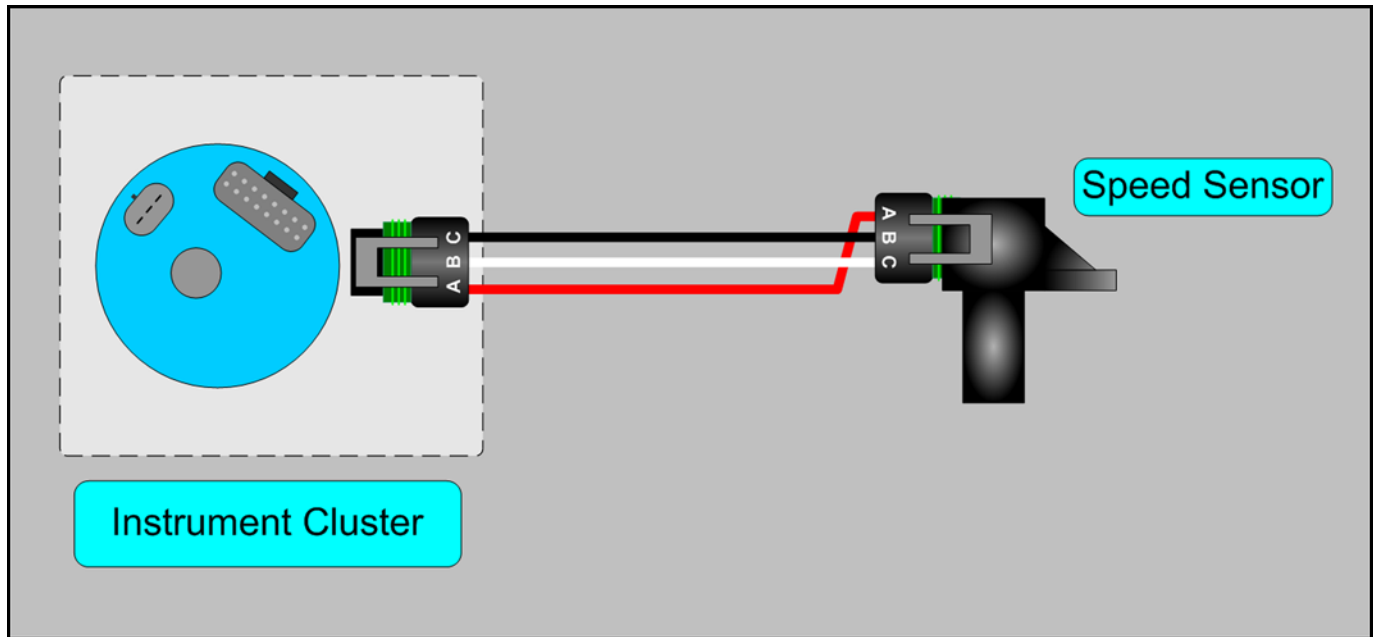
Instrument Cluster Circuit



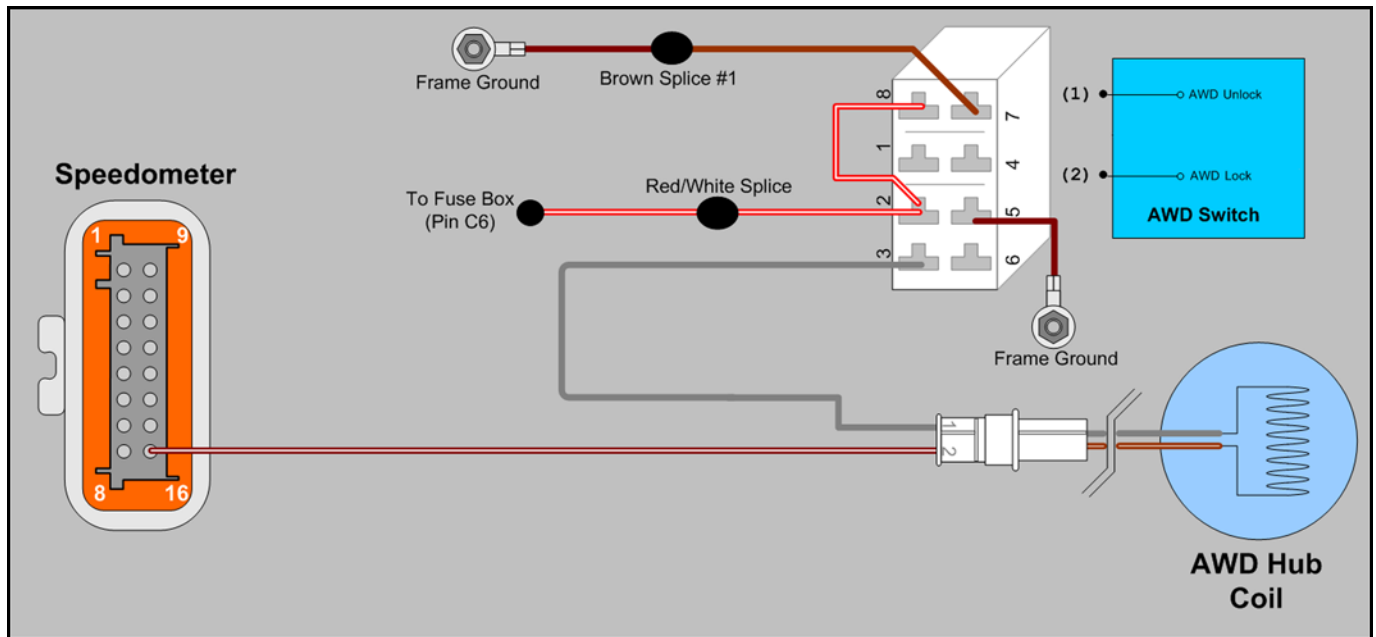
Transmission Switch Circuit



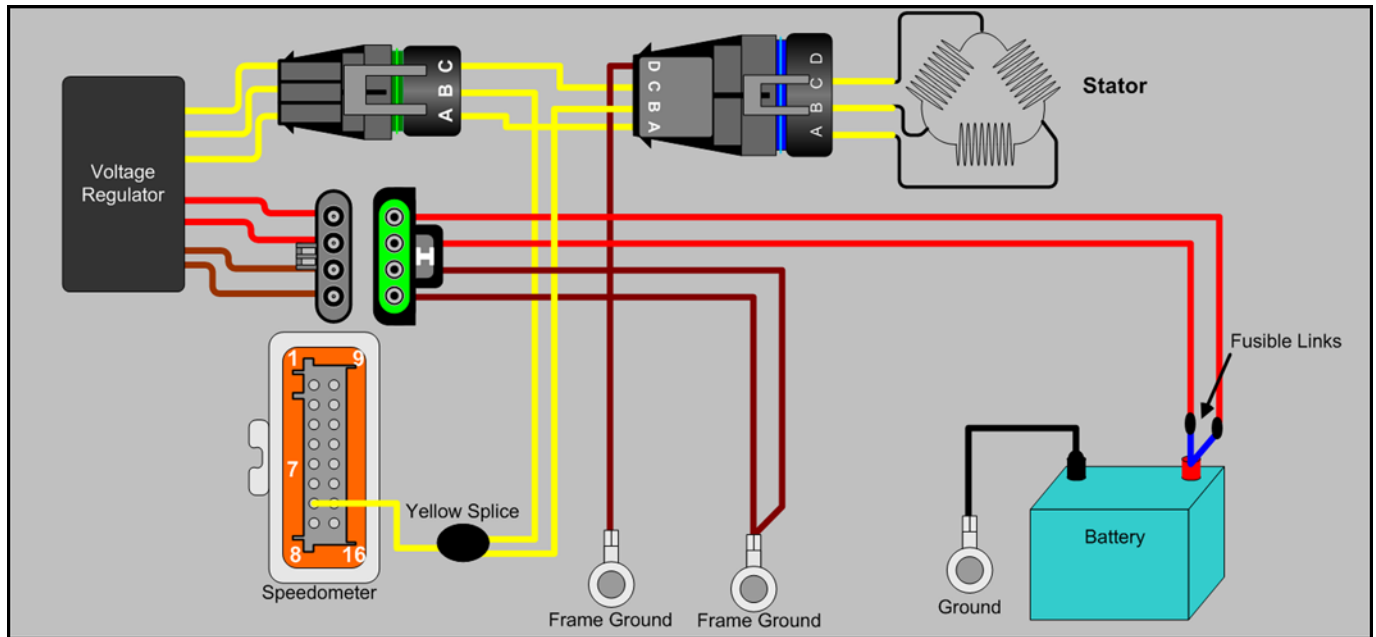
Wheel Speed Sensor Circuit



AWD Circuit



Charging System Circuit



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2008 RANGER RZR

2008 RANGER RZR (CHASSIS)
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REF #	COLOR	GAUGE	FROM CONNECTOR	TO CONNECTOR	CAVITY	SIGNAL VALUE
01	RED	20	ECU	1	RED SPICE	
02	RED/WHITE	18	ECU	2	RED/WHITE SPICE	
03	RED	18	ECU	3	RED SPICE	
04	VIOLET	20	ECU	4	VIOLET SPICE	
05	ORANGE	20	ECU	5	T-BAP	
06	YELLOW	20	ECU	6	TEMPERATURE SENSOR	
07	RED/WHITE	20	ECU	7	T-BAP	
08	PINK	20	ECU	8	T-BAP	
09	WHITE	20	ECU	9	CRANK POSITION SENSOR	
10	BLACK	20	ECU	10	CRANK POSITION SENSOR	
11	BLACK	20	ECU	11	CRANK POSITION SENSOR	
12	YELLOW/BLACK	20	ECU	12	FUSEBOX (RELAY)	
13	WHITE	18	ECU	14	PTO INJECTOR	
14	WHITE	18	ECU	15	MAG INJECTOR	
15	ORANGE/BLACK	18	ECU	16	START SOLENOID	
16	ORANGE/BLACK	18	ECU	17	DIAGNOSTIC	
17	GREEN/WHITE/5	18	ECU	18	TFS	
18	ORANGE	20	ECU	19	BROWN SPICE #2	
19	BROWN	18	ECU	20	RESISTOR	
20	WHITE	18	ECU	21	TEMPERATURE SENSOR	
21	VIOLET	20	ECU	22	BATTERY HOLDER	
22	RED/GRAY/5	18	ECU	23	T-BAP	
23	PINK	20	ECU	24	TEMPERATURE SENSOR	
24	ORANGE	20	ECU	25	START SOLENOID (6 AMP)	
25	BLACK	20	ECU	26	IGNITION SWITCH	
26	BLACK	20	ECU	27	IGNITION SWITCH	
27	BLACK	20	ECU	28	IGNITION SWITCH	
28	GRAY/WHITE	20	ECU	29	FUSEBOX (RELAY)	
29	BLACK/WHITE	20	ECU	30	SPEEDOMETER	
30	GREEN/WHITE/3	18	ECU	31	IGNITION COIL	
31	YELLOW/BROWN/3	18	ECU	32	IGNITION COIL	
32	BLUE/WHITE	20	ECU	33	SPEEDOMETER	
33	RED/BLACK	18	ECU	34	RED/BLACK SPICE	
34	ORANGE	18	FUSEBOX (15 AMP)	35	WINDUP SWITCH	
35	BROWN	18	FUSEBOX (15 AMP)	36	WINDUP SWITCH	
36	RED/BLACK	18	MAG INJECTOR	37	RED/BLACK SPICE	
37	RED/BLACK	18	MAG INJECTOR	38	RED/BLACK SPICE	
38	BROWN	18	CRANK POSITION SENSOR	39	SPICE #4	
39	BROWN	18	CRANK POSITION SENSOR	40	SPICE #2	
40	SHIELD/5	18	DIAGNOSTIC SPICE #2	41	DIAGNOSTIC SPICE	
41	SHIELD/5	18	DIAGNOSTIC SPICE #2	42	DIAGNOSTIC SPICE	
42	RED/WHITE/3	18	DIAGNOSTIC SPICE #1	43	DIAGNOSTIC SPICE	
43	RED/WHITE/3	18	DIAGNOSTIC SPICE #1	44	DIAGNOSTIC SPICE	
44	VIOLET	20	T-BAP	45	VIOLET SPICE	
45	VIOLET	20	T-BAP	46	VIOLET SPICE	
46	GREEN/WHITE	18	TRANSMISSION SWITCH	47	RESISTOR MODULE	
47	RED	18	FUSEBOX (3 AMP)	48	RED SPICE	
48	BROWN	14	VOLTAGE REGULATOR #1	49	FRAME GROUND	
49	BROWN	14	VOLTAGE REGULATOR #1	50	FRAME GROUND	
50	BROWN	14	VOLTAGE REGULATOR #1	51	DIAGNOSTIC	
51	BROWN	16	RH HEADLIGHT	52	DIAGNOSTIC	
52	RED/YELLOW	18	RH HEADLIGHT	53	DIAGNOSTIC	
53	BROWN	20	HEADLIGHT SWITCH	54	HEADLIGHT SWITCH	
54	BROWN	18	HEADLIGHT SWITCH	55	HEADLIGHT SWITCH	
55	WHITE/BLUE	18	TRANSMISSION SWITCH	56	RESISTOR MODULE	
56	BLUE/RED	18	TRANSMISSION SWITCH	57	RESISTOR MODULE	
57	RED/WHITE	18	TRANSMISSION SWITCH	58	RED/WHITE SPICE	
58	RED	12	FUSEBOX (15 AMP)	59	FUSEBOX	
59	GRAY	18	AND SWITCH	60	HUB COIL	
60	ORANGE/BLACK	16	FAN MOTOR	61	FUSEBOX (RELAY)	
61	ORANGE/BLACK	16	FAN MOTOR	62	FUSEBOX (RELAY)	
62	RED/WHITE	18	FUSEBOX (RELAY)	63	BROWN SPICE #3	
63	BROWN	16	12 VOLT RECEPTACLE	64	RED/BLACK SPICE	
64	RED/BLACK	16	FUSEBOX (RELAY)	65	RED/BLACK SPICE	
65	RED	16	FUSEBOX (RELAY)	66	20 AMP CIRCUIT BREAKER	
66	BROWN	20	SPEEDOMETER DIAGNOSTIC	67	BROWN SPICE #1	
67	BROWN	16	FRAME GROUND	68	BROWN SPICE #1	
68	RED/YELLOW	18	WORK LIGHT SWITCH	69	RED/YELLOW SPICE	
69	RED/BLACK	18	FUEL PUMP	70	RED/BLACK SPICE	
70	BROWN	18	FUEL PUMP	71	FRAME GROUND	
71	BLUE	18	WORK LIGHT SWITCH	72	BOX HARNESS	
72	RED/YELLOW	18	BOX HARNESS	73	RED/YELLOW SPICE	
73	BROWN	16	FUSE BLOCK (15 AMP)	74	FRAME GROUND	
74	RED/WHITE	16	FUSE BLOCK (15 AMP)	75	RED/WHITE SPICE	
75	RED/WHITE	16	FUSE BLOCK (15 AMP)	76	RED/WHITE SPICE	
76	BLUE	0.8	SOLENOID BATTERY +	77	18/14 SPICE	
77	BLUE	0.8	SOLENOID BATTERY +	78	18/14 SPICE	
78	BLUE	0.8	SOLENOID BATTERY +	79	18/14 SPICE	
79	ORANGE	16	FUSEBOX (15 AMP)	80	12 VOLT RECEPTACLE	
80	BLACK	1.0	SOLENOID BATTERY +	81	16/12 SPICE	
81	RED	12	FUSEBOX (RELAY)	82	20 AMP CIRCUIT BREAKER	
82	RED	14	VOLTAGE REGULATOR #1	83	18/14 SPICE	
83	RED	14	VOLTAGE REGULATOR #1	84	18/14 SPICE	
84	RED	14	VOLTAGE REGULATOR #1	85	18/14 SPICE	

REF #	COLOR	GAUGE	FROM CONNECTOR	TO CONNECTOR	CAVITY	SIGNAL VALUE
86	ORANGE	16	FUSEBOX (15 AMP)	A4	FUSEBOX (RELAY)	D3
87	RED	16	IGNITION SWITCH	A	FUSEBOX (20 AMP)	A2
88	RED	16	IGNITION SWITCH	A	FUSEBOX (20 AMP)	A2
89	RED/YELLOW	16	FUSEBOX (15 AMP)	A6	RED/YELLOW SPICE	
90	RED/YELLOW	16	IGNITION SWITCH	C	RED/YELLOW SPICE	
91	RED/WHITE	16	IGNITION SWITCH	C	RED/WHITE SPICE	
92	RED/WHITE	18	IGNITION SWITCH	D	RED/WHITE SPICE	
93	BROWN	16	FRAME GROUND	250R	BROWN SPICE #3	
94	BROWN	16	FRAME GROUND	250R	BROWN SPICE #2	
95	GRAY/ORANGE	20	SPEEDOMETER #1	3	MOMENTARY SWITCH	125F
96	RED/WHITE	18	AND SWITCH	2	RED/WHITE SPICE	
97	RED	18	AND SWITCH	7	BROWN SPICE #1	
98	BROWN	20	SPEEDOMETER #1	1	RED SPICE	
99	RED/WHITE	16	SPEEDOMETER #1	2	RED/YELLOW SPICE	
100	RED	20	SPEEDOMETER #1	2	RED/YELLOW SPICE	
101	RED	20	SPEEDOMETER #1	2	RED/YELLOW SPICE	
102	RED/WHITE	16	HEADLIGHT SWITCH	2	RED/WHITE SPICE	
103	RED/YELLOW	16	HEADLIGHT SWITCH	2	RED/YELLOW SPICE	
104	GREEN	20	SPEEDOMETER #1	5	SPEEDOMETER DIAGNOSTIC	2
105	BLUE	20	SPEEDOMETER #1	6	SPEEDOMETER DIAGNOSTIC	3
106	YELLOW	18	SPEEDOMETER #1	7	VOLTAGE REGULATOR	
107	BROWN	18	SPEEDOMETER #1	8	BROWN SPICE #2	
108	RED/WHITE	18	AND SWITCH	6	AND SWITCH	
109	RED/WHITE	20	MOMENTARY SWITCH	125F	BROWN SPICE #2	
110	BROWN	20	MOMENTARY SWITCH	125F	BROWN SPICE #2	
111	VIOLET/WHITE	20	SPEEDOMETER #1	12	FUEL PUMP	B
112	BROWN/RED	18	SPEEDOMETER #1	13	TRANSMISSION SWITCH	C
113	WHITE	18	SPEEDOMETER #1	14	RESISTOR	A
114	WHITE	18	SPEEDOMETER #1	14	RESISTOR	A
115	BROWN/WHITE	18	SPEEDOMETER #1	16	HUB COIL	C
116	ORANGE/RED	18	TRANSMISSION SWITCH	F	RESISTOR MODULE	B
117	VIOLET	18	TRANSMISSION SWITCH	E	RESISTOR MODULE	C
118	RED/WHITE	18	FUSEBOX (RELAY)	D1	RED/WHITE SPICE	
119	RED/WHITE	18	HEADLIGHT SWITCH	3	GREEN SPICE	
120	GREEN	16	HEADLIGHT SWITCH	3	GREEN SPICE	
121	WHITE/RED	18	IGNITION SWITCH	A	START SOLENOID	I
122	GREEN	16	RH HEADLIGHT	B	GREEN SPICE	
123	BROWN	14	FRAME GROUND	250R	BROWN SPICE #3	
124	BROWN	14	FRAME GROUND	250R	BROWN SPICE #3	
125	BROWN	14	FRAME GROUND	250R	BROWN SPICE #3	
126	BROWN	14	FRAME GROUND	250R	BROWN SPICE #3	
127	BROWN	14	FRAME GROUND	250R	BROWN SPICE #3	
128	BROWN	18	FRAME GROUND	250R	BOX HARNESS	
129	BROWN	18	FRAME GROUND	250R	BOX HARNESS	
130	BROWN	20	IGNITION SWITCH	F	BROWN SPICE #1	
131	YELLOW	14	VOLTAGE REGULATOR #2	B	VOLTAGE REGULATOR #2	D
132	YELLOW	14	VOLTAGE REGULATOR #2	C	STATOR	A
133	YELLOW	14	VOLTAGE REGULATOR #2	C	STATOR	B
134	BROWN	14	FRAME GROUND	250R	STATOR	D
135	BROWN	14	FRAME GROUND	250R	STATOR	D
136	BROWN	14	FRAME GROUND	250R	STATOR	D
137	BROWN	14	FRAME GROUND	250R	STATOR	D
138	RED	18	SPEEDOMETER #2	A	SPEED SENSOR	A
139	WHITE	18	SPEEDOMETER #2	B	SPEED SENSOR	C
140	BLACK	18	SPEEDOMETER #2	C	SPEED SENSOR	B
141	BLACK	18	SPEEDOMETER #2	C	SPEED SENSOR	B
142	BLACK	18	SPEEDOMETER #2	C	SPEED SENSOR	B
143	ORANGE	18	BRAKE LIGHT SENSOR		BOX HARNESS	B
144	ORANGE	18	BRAKE LIGHT SENSOR		BOX HARNESS	B
145	ORANGE	18	BRAKE LIGHT SENSOR		BOX HARNESS	B
146	ORANGE	18	BRAKE LIGHT SENSOR		BOX HARNESS	B
147	RED	12	16/12 SPICE		FUSEBOX	A1
148	RED	12	16/12 SPICE		FUSEBOX	A1
149	BROWN	20	BATTERY HOLDER		SPICE #2	
150	GREEN	16	LH HEADLIGHT	B	GREEN SPICE	
151	GREEN	16	LH HEADLIGHT	B	GREEN SPICE	
152	BROWN	16	LH HEADLIGHT	A	BROWN SPICE #1	
153	SHIELD/4	20	SPICE #2		SPICE #4	

CCT #	COLOR	GAUGE	FROM CONNECTOR	TO CONNECTOR	CAVITY
01	RED/YELLOW	18	CHASSIS HARNESS	A	RED/YELLOW SPICE
02	ORANGE	18	CHASSIS HARNESS	B	ORANGE SPICE
03	BROWN	18	CHASSIS HARNESS	C	BROWN SPICE
04	BROWN	18	CHASSIS HARNESS	D	BROWN SPICE
05	RED/YELLOW	18	RED/YELLOW SPICE		LH TAILLIGHT
06	RED/YELLOW	18	RED/YELLOW SPICE		RH TAILLIGHT
07	ORANGE	18	ORANGE SPICE		LH TAILLIGHT
08	ORANGE	18	ORANGE SPICE		RH TAILLIGHT
09	BLUE	18	BLUE SPICE		LH WORKLIGHT
10	BLUE	18	BLUE SPICE		RH WORKLIGHT
11	BROWN	18	BROWN SPICE		LH TAILLIGHT
12	BROWN	18	BROWN SPICE		RH TAILLIGHT
13	BROWN	18	BROWN SPICE		LH TAILLIGHT
14	BROWN	18	BROWN SPICE		RH TAILLIGHT

