



**POLARIS**  
The Way Out.®

# 2005 SPORTSMAN 700 EFI 2005 SPORTSMAN 800 EFI

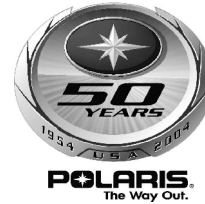
SERVICE MANUAL

PN 9919820





**POLARIS**  
The Way Out.



## **2005 SPORTSMAN 700/800 EFI SERVICE MANUAL**

### Foreword

This 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.

This manual includes procedures for maintenance operations, component identification and unit repair, along with service specifications for Polaris Sportsman 700/800 EFI ATVs. Comments or suggestions about this manual may be directed to: Service Publications Dept. @ Polaris Sales Inc. 2100 Hwy 55 Medina Minnesota 55340.

Some Polaris factory manuals can be downloaded from [www.polarisindustries.com](http://www.polarisindustries.com) or purchased from [www.purepolaris.com](http://www.purepolaris.com) or contact your nearest Polaris dealer.

### **2005 Sportsman 700/800 EFI ATV Service Manual (PN 9919820)**

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## UNDERSTANDING SAFETY LABELS AND INSTRUCTIONS

Throughout these instructions, important information is brought to your attention by the following symbols:



The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

### **DANGER**

Failure to follow DANGER instructions will result in severe injury or death to the operator, bystander or person inspecting or servicing the ATV.

### **WARNING**

Failure to follow WARNING instructions could result in severe injury or death to the operator, bystander or person inspecting or servicing the ATV.

### **CAUTION:**

A CAUTION indicates special precautions that must be taken to avoid personal injury, or ATV or property damage.

### **NOTE:**

A NOTE provides key information to clarify instructions.


## Trademarks


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 **GENERAL** **1**


 **MAINTENANCE** **2**

 **ENGINE** **3**

 **ELECTRONIC FUEL INJECTION** **4**

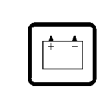
 **BODY AND STEERING** **5**

 **CLUTCHING** **6**

 **FINAL DRIVE** **7**

 **TRANSMISSION** **8**

 **BRAKES** **9**

 **ELECTRICAL** **10**



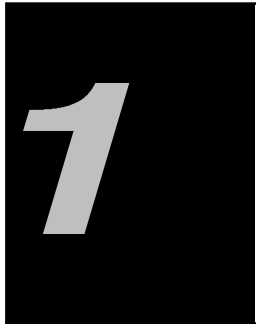


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# CHAPTER 1

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# GENERAL

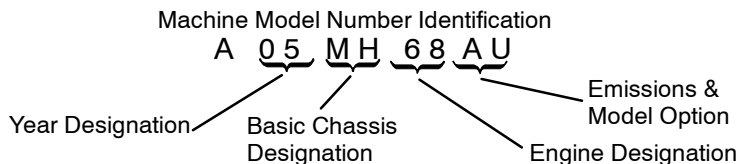


Model Identification .....	1.2
Serial Number Location .....	1.2
2005 Sportsman EFI Dimensions .....	1.3
Specifications - Sportsman EFI .....	1.4-1.5
Publication Numbers .....	1.6
Paint Codes .....	1.6
Replacement Keys .....	1.6
Standard Torque Specifications .....	1.6
Special Tools .....	1.7-1.10
Torque Table .....	1.11
Conversion Table .....	1.12
Tap Drill Charts .....	1.13
Decimal Equivalent Chart .....	1.13
Glossary of Terms .....	1.14



### MODEL IDENTIFICATION

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



### ENGINE DESIGNATION NUMBERS

EH068OLE ..... Twin cylinder, Liquid Cooled, 4 Stroke, Electric Start  
 EH076OLE ..... Twin cylinder, Liquid Cooled, 4 Stroke, Electric Start

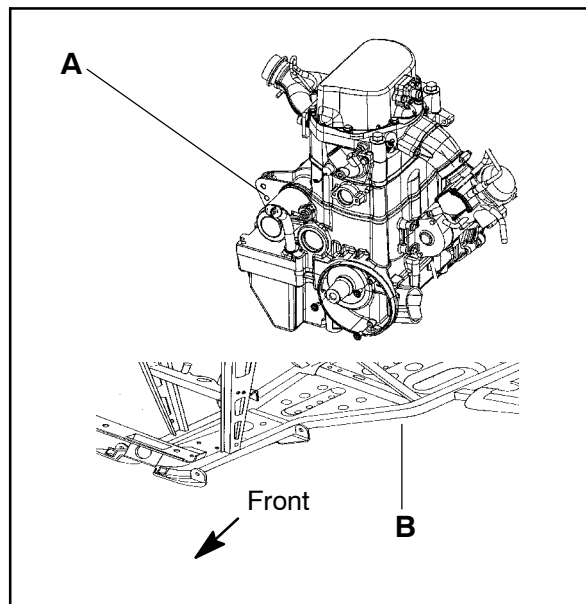
### VIN IDENTIFICATION

World Mfg. ID			Vehicle Description						Vehicle Identifier							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4	X	A	M	H	6	8	A	*	4	P	0	0	0	0	0	0
			Body Style	Powertrain	Engine	Emissions	Check Digit	Model Year	Plant No.	Individual Serial No.						

\* This could be either a number or a letter

### ENGINE SERIAL NUMBER LOCATION

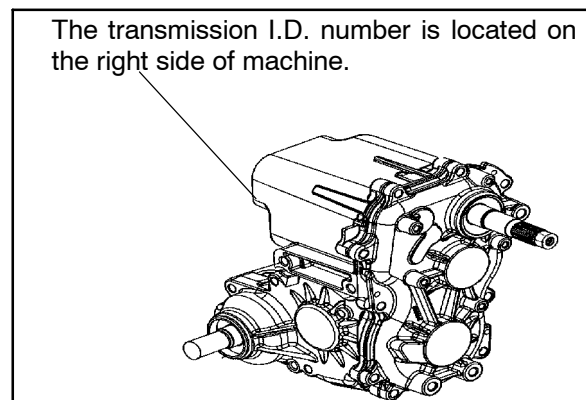
Be sure to refer to the engine model number and serial number whenever corresponding about an engine. This information can be found on the sticker applied to the top side of the crankcase (A). An additional number is stamped on the side of the crankcase beneath the cylinder coolant elbow.



### MACHINE MODEL NUMBER AND SERIAL NUMBER LOCATION

The machine model number and serial number are important for vehicle identification. The machine serial number is stamped on the lower left side of the frame tube.(B)

### TRANSMISSION I.D. NUMBER LOCATION





## GENERAL INFORMATION



**MODEL: ..... 2005 SPORTSMAN 700 EFI**  
**MODEL NUMBER: . A05MH68AU**  
**ENGINE MODEL: .. EH068OLE22**

Category	Dimension / Capacity
Length	83 in./205.74 cm
Width	48 in./116.8 cm
Height	48 in./119.4 cm
Seat Height	34 in./86.4 cm
Wheel Base	50.75 in./128.9 cm
Dry Weight	770 lbs./326.6 kg
Gross Vehicle Weight	1220 lbs. / 553 kg
Front Rack Capacity	100 lbs./45.4 kg
Rear Rack Capacity	200 lbs./90.7 kg
Towing Capacity	1500 lbs./454 kg
Hitch Tongue Capacity	150 lbs./68 kg
Body Style	Spirit



**MODEL: ..... 2005 SPORTSMAN 800 EFI**  
**MODEL NUMBER: . A05MH86AU**  
**ENGINE MODEL: .. EH076OLE011**

Category	Dimension / Capacity
Length	83 in./205.74 cm
Width	48 in./116.8 cm
Height	48 in./119.4 cm
Seat Height	34 in./86.4 cm
Wheel Base	50.75 in./128.9 cm
Dry Weight	770 lbs./326.6 kg
Gross Vehicle Weight	1220 lbs. / 553 kg
Front Rack Capacity	100 lbs./45.4 kg
Rear Rack Capacity	200 lbs./90.7 kg
Towing Capacity	1500 lbs./454 kg
Hitch Tongue Capacity	150 lbs./68 kg
Body Style	Spirit





# GENERAL INFORMATION

**MODEL:** ..... **2005 SPORTSMAN 700 EFI**  
**MODEL NUMBER:** . **A05MH68AU**  
**ENGINE MODEL:** .. **EH068OLE**

Engine	
Platform	Polaris Twin Cylinder
Engine Model Number	EH0680LE022
Engine Displacement	683cc
Number of Cylinders	2
Bore & Stroke (mm)	80 x 68 mm
Compression Ratio	9.78:1
Compression Pressure	150-170 psi
Engine Idle Speed	1150 ± 100 RPM
Engine Max Operating Rpm	6500 Rpm ± 200 Rpm
Cooling System / Capacity	Liquid - 3.2 qt / 3 ltr
Overheat Warning	HOT on Instrument Cluster
Lubrication	Pressurized Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 2 qt. / 1.9 ltr
Exhaust System	Single Pipe
Fuel System	
Fuel System	Electronic Fuel Injection (EFI)
Fuel Pump (in tank assembly)	25L per hour at 39 PSI
Fuel Filter(s)	30 Micron in Tank (not replaceable) 10 Micron In Line (replaceable)
Fuel Injector(s)	Bosch
EFI Controller	Bosch MSE 1.1 ECU
Fuel Capacity / Requirement	4.13 gal US / 15.6 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	500 w @ 6000 RPM
Lights : Pod	50 watts
Grill	Two x 27 watts
Brake	8.26 watts
Tail	26.9 watts
Ignition System	DC/CDI Ignition
Operating RPM	6000 RPM
Ignition Timing	13° BTDC @ 1200 RPM
Spark plug / Gap	RC7YC/ .035 in. / 0.9 mm
Battery / Model / Amp Hr	Lead Acid / 30 Amp Hr
Circuit Breakers	Fan 20 amp - Harness 20 amp Fuel pump/ECU 15 amp Instrument Cluster / Voltage Regulator 6 amp
Starting	Electric
Instrument Cluster	LCD

Drivetrain	
Transmission Type	Drumshift - H/L/N/Rev/Park
Transmission Capacity	15 oz. / 450m
Rear Gearcase Capacity	5 oz. / 150ml
Front Gearcase Capacity	5 oz. / 150ml
Gear Ratio :	Low 7.49:1 Rev 5.11:1 High 2.70:1 Front Drive 3.82:1 Rear Drive 3.10:1
Clutch Type	PVT w/EBS
Belt	3211091
Steering / Suspension	
Front Suspension / Shock	A-arm / MacPherson Strut
Front Travel	8.2 in. / 21 cm
Rear Suspension / Shock	Progressive Rate Independent /Two x 2" Coil-over Shock
Rear Travel	9.5 in. / 24.13 cm
Ground Clearance	11.25 in. / 28.6 cm
Shock Preload Adjustment Front / Rear	Front - Non Adjustable. Rear - Ratchet Style- Std.
Turning Radius	76 in. / 193 cm unloaded
Toe Out	0 - 1/16 in / .0 - .159 mm
Wheels / Brakes	
Wheel Size / Pattern - Front	Steel 25x8-12 / 4-156 (205/80R-12)
Wheel Size / Pattern - Rear	Steel 25x11-12 / 4-156 (270/60R-12)
Front Tire Size	25x8-12
Rear Tire Size	25x11-12
Recommended Air Pressure F / R	5 psi Front 5 psi Rear
Brake - Front	Dual Hydraulic Disc
Brake - Rear	Dual Hydraulic Disc

## CLUTCH CHART

EBS Models have no helix/spring adjustment

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	20-56 (5631215)	Blu/Green (7041157)	White (3234199)	60-56-40 (3234208)
	1800-3700 (6000-12000)	20-54 (5631214)	Blu/Green (7041157)	White (3234199)	60-56-40 (3234208)



# GENERAL INFORMATION



**MODEL: . . . . . 2005 SPORTSMAN 800 EFI**

**MODEL NUMBER: . A05MH76AU/AW**

**ENGINE MODEL: .. EH076OLE**

Engine	
Platform	Polaris Twin Cylinder
Engine Model Number	EH076OLE011
Engine Displacement	760cc
Number of Cylinders	2
Bore & Stroke (mm)	80 x 68 mm
Compression Ratio	10:1
Compression Pressure	150-200 psi
Engine Idle Speed	1150 ± 100 RPM
Engine Max Operating Rpm	6500 Rpm ± 200 Rpm
Cooling System / Capacity	Liquid - 3.2 qt / 3 ltr
Overheat Warning	HOT on Instrument Cluster
Lubrication	Pressurized Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 2 qt. / 1.9 ltr
Exhaust System	Dual Pipe / Silencer
Fuel System	
Fuel System	Electronic Fuel Injection (EFI)
Fuel Pump (in tank assembly)	25L per hour at 39 PSI
Fuel Filter(s)	30 Micron in Tank (not replaceable) 10 Micron In Line (replaceable)
Fuel Injector(s)	Bosch
EFI Controller	Bosch MSE 1.1 ECU
Fuel Capacity / Requirement	4.13 gal US / 15.6 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	500 w @ 6000 RPM
Lights : Pod	50 watts
Grill	Two x 27 watts
Brake	8.26 watts
Tail	26.9 watts
Ignition System	DC/CDI Ignition
Operating RPM	6000 RPM
Ignition Timing	13° BTDC @ 1200 RPM
Spark plug / Gap	RC7YC/ .035 in. / 0.9 mm
Battery / Model / Amp Hr	Lead Acid / 30 Amp Hr
Circuit Breakers	Fan 20 amp - Harness 20 amp Fuel pump/ECU 15 amp Instrument Cluster / Voltage Regulator 6 amp
Starting	Electric
Instrument Cluster	LCD

Drivetrain	
Transmission Type	Drumshift - H/L/N/Rev/Park
Transmission Capacity	15 oz. / 450m
Rear Gearcase Capacity	5 oz. / 150ml
Front Gearcase Capacity	5 oz. / 150ml
Gear Ratio :	Low 7.49:1 Rev 5.11:1 High 2.70:1 Front Drive 3.82:1 Rear Drive 3.10:1
Clutch Type	PVT w/EBS
Belt	3211106
Steering / Suspension	
Front Suspension / Shock	A-arm / MacPherson Strut
Front Travel	6.7 in. / 17.02 cm
Rear Suspension / Shock	Progressive Rate Independent /Two x 2" Coil-over Shock
Rear Travel	9.5 in. / 24.13 cm
Ground Clearance	11.25 in. / 28.6 cm
Shock Preload Adjustment Front / Rear	Front - Non Adjustable. Rear - Ratchet Style- Std.
Turning Radius	76 in. / 193 cm unloaded
Toe Out	0 - 1/16 in / .0 - .159 mm
Wheels / Brakes	
Wheel Size / Pattern - Front	Cast Alum. 26x8-12 / 4-156 (205/80R-12)
Wheel Size / Pattern - Rear	Cast Alum. 26x11-12 / 4-156 (270/60R-12)
Front Tire Size	26x8-12
Rear Tire Size	26x11-12
Recommended Air Pressure F / R	5 psi Front 5 psi Rear
Brake - Front	Dual Hydraulic Disc
Brake - Rear	Dual Hydraulic Disc

## CLUTCH CHART

EBS Models have no helix/spring adjustment

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	20-60 (5631689)	Blu/Green (7041157)	3234233	3234234
	1800-3700 (6000-12000)	20-58 (5631216)	Blu/Green (7041157)	3234233	3234234



### PUBLICATION NUMBERS

Year	Model	Model No.	Owner's Manual PN	Parts Manual PN	Parts Micro Fiche PN
2005	Sportsman 700 EFI	A05MH68AU	9919426	9919427	9919428
2005	Sportsman 800 EFI	A05MH76AU	9917720	9917721	9917722

\*When ordering service parts be sure to use the correct parts manual.

**NOTE:** Some Polaris factory publications can be found at [www.polarisindustries.com](http://www.polarisindustries.com) or purchased from [www.purepolaris.com](http://www.purepolaris.com).

### PAINT CODES

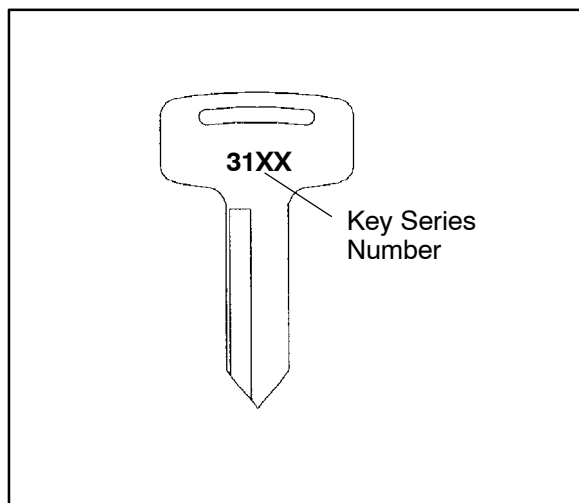
PAINTED PART	COLOR DESCRIPTION	DITZLER NUMBER	POLARIS NUMBER
Frame	Black	9440	P-067

FRAME COLOR - (All) P067 Medium Gloss Black 9440 / 8520147.

Order direct at [www.polarisdealers.com](http://www.polarisdealers.com) (dealers only). Mix as directed.

### 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. **Should both keys become lost, ignition switch replacement is required.**



Series #	Part Number
20	4010278
21	4010278
22	4010321
23	4010321
27	4010321
28	4010321
31	4110141
32	4110148
67	4010278
68	4010278

### 700 ENGINE COLD WEATHER FROST PLUG HEATER

Frost Plug Heater for Sportsman 700/800 - (PN 2873069)

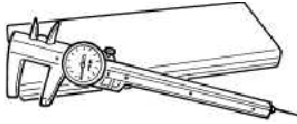




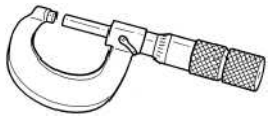
**SPECIAL TOOLS**

Special Tools maybe required while servicing your machine. Some of the tools listed are mandatory and other tools maybe substituted with a similar tool, if available. Polaris recommends the use of Polaris special tools when servicing any Polaris product.

**Standard Tools and Engine Tools**



PU-45432 - Caliper or A Basic Caliper



Basic Micrometer



2871043 - Flywheel Puller



2870773 - C-Clip Install Tool



2870386 - Piston Pin Puller



2871445 - Piston Pin Puller Adapter

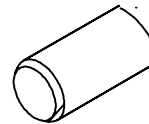
**Standard Tools and Engine Tools**



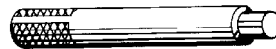
PV-43527 Oil Filter Wrench



2870390 - Piston Support Block



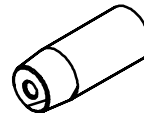
PA-44995 - Water Pump Mechanical Seal Install Tool



PU-45543 - Universal Driver Handle



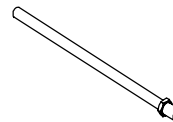
PA-45483 - Main Seal Installer



PA-45658 - Main Crank Seal Saver



PA-45401 - Water Pump Seal Saver

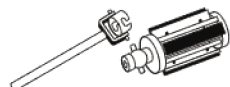


PU-45778 - Oil Pump Priming Tool

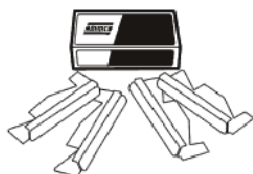


## SPECIAL TOOLS

### Standard Tools and Engine Tools



2870303 - Hone Kit



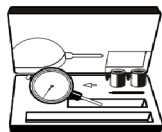
2870305 - Stone Replacement Kit



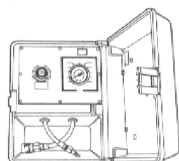
2870588 - Hone Oil (12 oz.)



2200634 - Valve Seat Reconditioning Kit

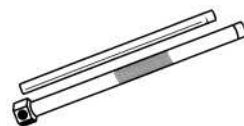


2870459 - Dial Indicator



PV-35667-A - Cylinder Leak down Tester

### Clutch (PVT) Tools



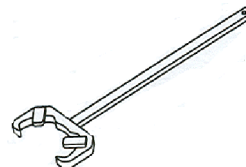
2870506 - Drive Clutch Puller



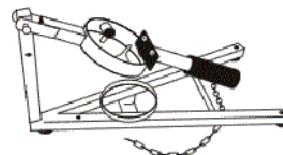
2870913 - Driven Clutch Puller



2872292 - EBS Clutch Align Tool



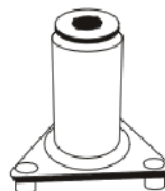
9914177-A - Drive Clutch Holding Tool



8700220 - Clutch Compression Tool



2871358 - Clutch Hold Fixture



2870341 - Drive Clutch Spider Removal Tool



**Clutch (PVT) Tools**



2871025 - Clutch Bushing Replace Tool Kit



2870910 - Roll Pin Tool



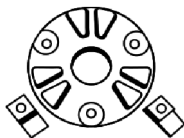
2871226 - Clutch Bushing Replacement Kit



2201379 - EBS Bushing Replacement Kit



2870338 - Spider Nut Socket



2871358 - Clutch Holding Fixture

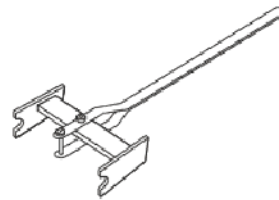
**Suspension Tools**



2870871 - ATV Ball Joint Tool Kit



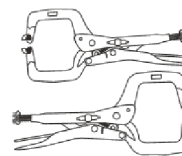
2871071 - Shock Body Holding Tool



2870623 - Shock Spring Compressor



2871572 - Strut Rod Wrench



2871573 & 2871574 - Strut Spring Compressor



8700225 & 8700226 - CV Boot Clamp Pliers



**Suspension Tools**



2870872 - Shock Spanner Wrench

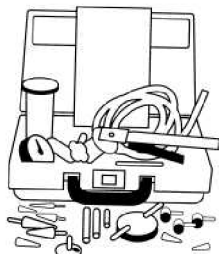


2872608 - Roll Pin Removal Tool



2871351 - Shock IFP Depth Tool

**Fuel & Brake Systems**

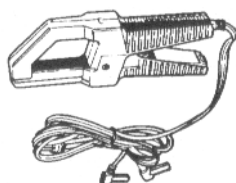


2870975 - Mity Vac

**Electrical Tools**



PV-43568 -Fluke 77 Multimeter

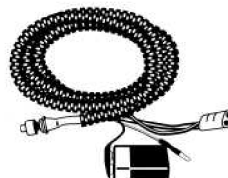


PV-39617 - Current Clamp

**Electrical Tools**



2870630 - Timing Light



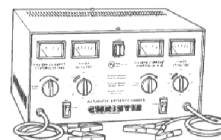
2871745 -Static Timing Light Harness



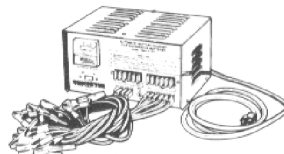
2460761 - Hall Sensor Probe Harness



PV-39991 - Peak Reading Adapter



PV-37453 - Christie Se-Sulfating Multi-Battery Charger



PV-63070 - Christie Multi-Battery Charger



2870836 - Battery Hydrometer



8712500 - Tachometer



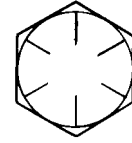
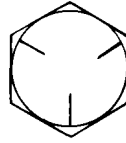
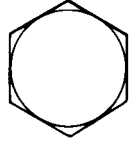
PV-39951-A - Tachometer





## STANDARD TORQUE SPECIFICATIONS

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



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

**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) x R <sup>2</sup> x H (height)		= Cylinder Volume

°C to °F:  $9 (°C + 40) \div 5 - 40 = °F$

°F to °C:  $5 (°F + 40) \div 9 - 40 = °C$



**SAE TAP DRILL SIZES**

Thread Size/Drill Size		Thread Size/Drill Size	
#0-80	3/64	1/2-13	27/64
#1-64	53	1/2-20	29/64
#1-72	53	9/16-12	31/64
#2-56	51	9/16-18	33/64
#2-64	50	5/8-11	17/32
#3-48	5/64	5/8-18	37/64
#3-56	45	3/4-10	21/32
#4-40	43	3/4-16	11/16
#4-48	42	7/8-9	49/64
#5-40	38	7/8-14	13/16
#5-44	37	1-8	7/8
#6-32	36	1-12	59/64
#6-40	33	1 1/8-7	63/64
#8-32	29	1 1/8-12	1 3/64
#8-36	29	1 1/4-7	1 7/64
#10-24	24	1 1/4-12	1 11/64
#10-32	21	1 1/2-6	1 11/32
#12-24	17	1 1/2-12	1 27/64
#12-28	4.6mm	1 3/4-5	1 9/16
1/4-20	7	1 3/4-12	1 43/64
1/4-28	3	2-4 1/2	1 25/32
5/16-18	F	2-12	1 59/64
5/16-24	I	2 1/4-4 1/2	2 1/32
3/8-16	O	2 1/2-4	2 1/4
3/8-24	Q	2 3/4-4	2 1/2
7/16-14	U	3-4	2 3/4
7/16-20	25/64		

**METRIC TAP DRILL SIZES**

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

**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	4 mm = .1575"
11/64	.1719	
3/16	.1875	5 mm = .1969"
13/64	.2031	
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	8 mm = .3150"
21/64	.3281	
11/32	.3438	9 mm = .3543"
23/64	.3594	
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	12 mm = .4724"
31/64	.4844	
1/2	.5	13 mm = .5118
33/64	.5156	
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	16 mm = .6299"
41/64	.6406	
21/32	.6563	17 mm = .6693"
43/64	.6719	
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	20 mm = .7874"
51/64	.7969	
13/16	.8125	21 mm = .8268"
53/64	.8281	
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	24 mm = .9449"
61/64	.9531	
31/32	.9688	25 mm = .9843
63/64	.9844	
1	1.0	



## 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.

**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.

**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/cm<sup>2</sup>:** 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.

**Left 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. 1mm = 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.

**qt.:** Quart/quarts.

**RPM:** Revolutions per minute.

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

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

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

**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.

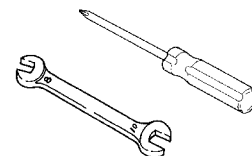
**WOT:** Wide open throttle.



# CHAPTER 2

## MAINTENANCE

Periodic Maintenance Chart .....	2.2-2.5
Component Locations .....	2.6
Lubricant and Maintenance Product Numbers	2.7
Special Tools .....	2.8
Lubrication Charts .....	2.9-2.10
Front & Rear Gearcase Lubrication .....	2.11-2.12
Transmission Lubrication .....	2.13
Throttle Cable Adjustment .....	2.14
Transmission Linkage Inspection .....	2.15
Fuel System .....	2.15
Compression Test .....	2.15-2.16
Battery Maintenance .....	2.16-2.17
Ignition .....	2.17
Coolant System Maintenance .....	2.18-2.20
Radiator Screen Removal .....	2.20
Air Filter Service .....	2.20-2.21
Air Box Sediment Tube Service .....	2.21
Breather Filter .....	2.21-2.22
PVT Drying & PVT Drain Plug .....	2.22
Oil Change/Filter .....	2.23-2.24
Steering and Toe Alignment .....	2.25-2.27
Exhaust System Maintenance .....	2.27-2.28
Brake System Service .....	2.28-2.29
Suspension Service .....	2.29-2.30
Controls .....	2.30
Wheel/Tire -Removal/Installation/Inspection .	2.31-2.32
Warn® Winch Operation .....	2.33-2.34
Cleaning and Storage .....	2.35-2.36
800 EFI Exhaust Canister Maintenance .....	2.36



# 2



## **PERIODIC MAINTENANCE CHART**

Careful periodic maintenance will help keep your vehicle in the safest, most reliable condition. Inspection, adjustment and lubrication of important components are explained in the periodic maintenance chart.

Inspect, clean, lubricate, adjust and replace parts as necessary. When inspection reveals the need for replacement parts, use genuine Polaris 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.

### **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** --If vehicle is subjected to severe use, decrease interval by 50%  
*(Severe Use is defined as frequent vehicle immersion in mud, water or sand, racing or race-style high rpm use, prolonged low speed - heavy load operation or extended idle. More preventative maintenance is required under these conditions. Fluid changes, cable, chain and chassis lubrication are required more frequently. For engine oil, short trip cold weather riding also constitutes severe use. Pay special attention to oil level. A rising oil level in cold weather can indicate contaminants collecting in the oil sump or crankcase. Change oil immediately and monitor level. If oil level begins to rise, discontinue use and determine cause.)*

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

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

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



**MAINTENANCE AND LUBRICATION**

**Periodic Maintenance Chart**

Item	Maintenance Interval (whichever comes first)			Remarks
	Hours	Calendar	Miles (Km)	
■ Steering	-	Pre-Ride	-	Make adjustments as needed. See Pre-Ride Checklist on Page 1.7.
▶ Front suspension	-	Pre-Ride	-	
▶ Rear suspension	-	Pre-Ride	-	
Tires	-	Pre-Ride	-	
▶ Brake fluid level	-	Pre-Ride	-	
▶ Brake lever travel	-	Pre-Ride	-	
Brake systems	-	Pre-Ride	-	
Wheels/fasteners	-	Pre-Ride	-	
Frame fasteners	-	Pre-Ride	-	
▶ E Engine oil level	-	Pre-Ride	-	
▶ E Air filter, pre-filter	-	Daily	-	Inspect; clean often
▶ E Air box sediment tube	-	Daily	-	Drain deposits when visible
Coolant (if applicable)	-	Daily	-	Check level daily, change coolant every 2 years
Headlamp/tail lamp	-	Daily	-	Check operation; apply dielectric grease if replacing
▶ E Air filter, main element	-	Weekly	-	Inspect; replace as needed
Recoil housing (if applicable)	-	Weekly	-	Drain water as needed, check often if operating in wet conditions
▶ ■ Brake pad wear	10 H	Monthly	60 (100)	Inspect periodically
Battery	20 H	Monthly	125 (200)	Check terminals; clean; test
▶ Front gearcase oil (if equipped)	25 H	Monthly	155 (250)	Inspect level; change yearly
▶ Middle gearcase oil (if equipped)	25 H	Monthly	155 (250)	Inspect level; change yearly
▶ Rear gearcase oil (if equipped)	25 H	Monthly	155 (250)	Inspect level; change yearly
▶ Transmission oil	25 H	Monthly	155 (250)	Inspect level; change yearly

▶ 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 AND LUBRICATION****Periodic Maintenance Chart**

Item		Maintenance Interval (whichever comes first)			Remarks
		Hours	Calendar	Miles (Km)	
▶ E	Engine breather filter (if equipped)	25 H	Monthly	155 (250)	Inspect; replace if necessary
▶ E	Engine oil change (break-in)	25 H	1 M	155 (250)	Perform a break-in oil change at one month
▶	General lubrication	50 H	3 M	310 (500)	Lubricate all fittings, pivots, cables, etc.
	Shift Linkage	50 H	6 M	310 (500)	Inspect, lubricate, adjust
■	Steering	50 H	6 M	310 (500)	Lubricate
▶	Front suspension	50 H	6 M	310 (500)	Lubricate
▶	Rear suspension	50 H	6 M	310 (500)	Lubricate
■ E	Throttle Cable/ ETC Switch	50 H	6 M	310 (500)	Inspect; adjust; lubricate; replace if necessary
E	Air intake ducts/ flange	50 H	6 M	310 (500)	Inspect ducts for proper sealing/air leaks
	Drive belt	50 H	6 M	310 (500)	Inspect; adjust; replace as needed
	Cooling system (if applicable)	50 H	6 M	310 (500)	Inspect coolant strength seasonally; pressure test system yearly
▶ E	Engine oil change	100 H	6 M	620 (1000)	Perform a break-in oil change at 25 hours/one month
▶ E	Oil filter change	100 H	6 M	620 (1000)	Replace with oil change
▶ E	Oil tank vent hose	100 H	12 M	620 (1000)	Inspect routing, condition
■ E	Valve clearance	100 H	12 M	620 (1000)	Inspect;

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

E Emission Control System Service (California)

■ Have an authorized Polaris dealer perform these services.



**MAINTENANCE AND LUBRICATION**

**Periodic Maintenance Chart**

	Item	Maintenance Interval (whichever comes first)			Remarks
		Hours	Calendar	Miles (Km)	
■ E	Fuel system	100 H	12 M	620 (1000)	Check for leaks at tank cap, lines, fuel pump, filter, pump, injectors; replace lines every two years
■ E	Fuel filter	100 H	12 M	620 (1000)	Replace yearly
▶	Radiator (if applicable)	100 H	12 M	620 (1000)	Inspect; clean external surfaces
▶	Cooling hoses (if applicable)	100 H	12 M	620 (1000)	Inspect for leaks
▶	Engine mounts	100 H	12 M	620 (1000)	Inspect
	Exhaust muffler/ pipe	100 H	12 M	620 (1000)	Inspect
■ E	Spark plug	100 H	12 M	620 (1000)	Inspect; replace as needed
■ E	Ignition Timing	100 H	12 M	620 (1000)	Inspect
▶	Wiring	100 H	12 M	620 (1000)	Inspect for wear, routing, security; apply dielectric grease to connectors subjected to water, mud, etc.
■	Clutches (drive and driven)	100 H	12 M	620 (1000)	Inspect; clean; replace worn parts
■	Front wheel bearings	100 H	12 M	1000 (1600)	Inspect; replace as needed
■	Brake fluid	200 H	24 M	1240 (2000)	Change every two years
	Spark arrestor	300 H	36 M	1860 (3000)	Clean out
E	Idle speed	-			Adjust as needed
■	Toe adjustment	-			Inspect periodically; adjust when parts are replaced
▶ ■	Auxiliary brake	-			Inspect daily; adjust as needed
	Headlight aim	-			Adjust as needed

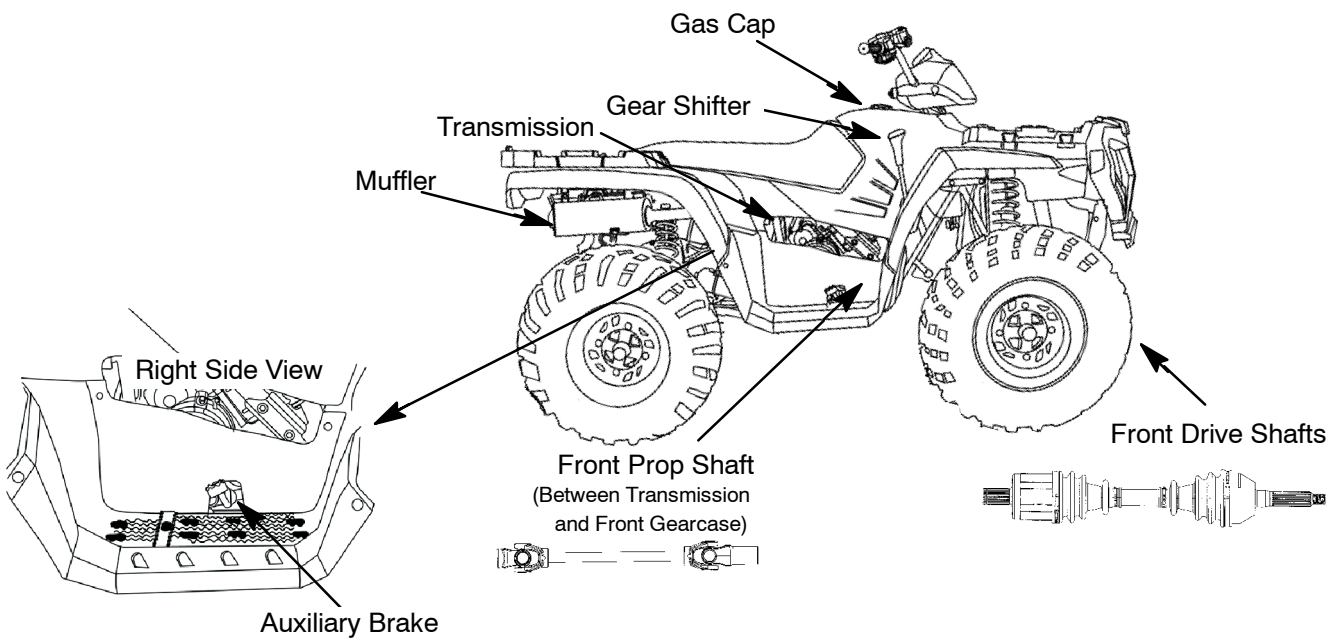
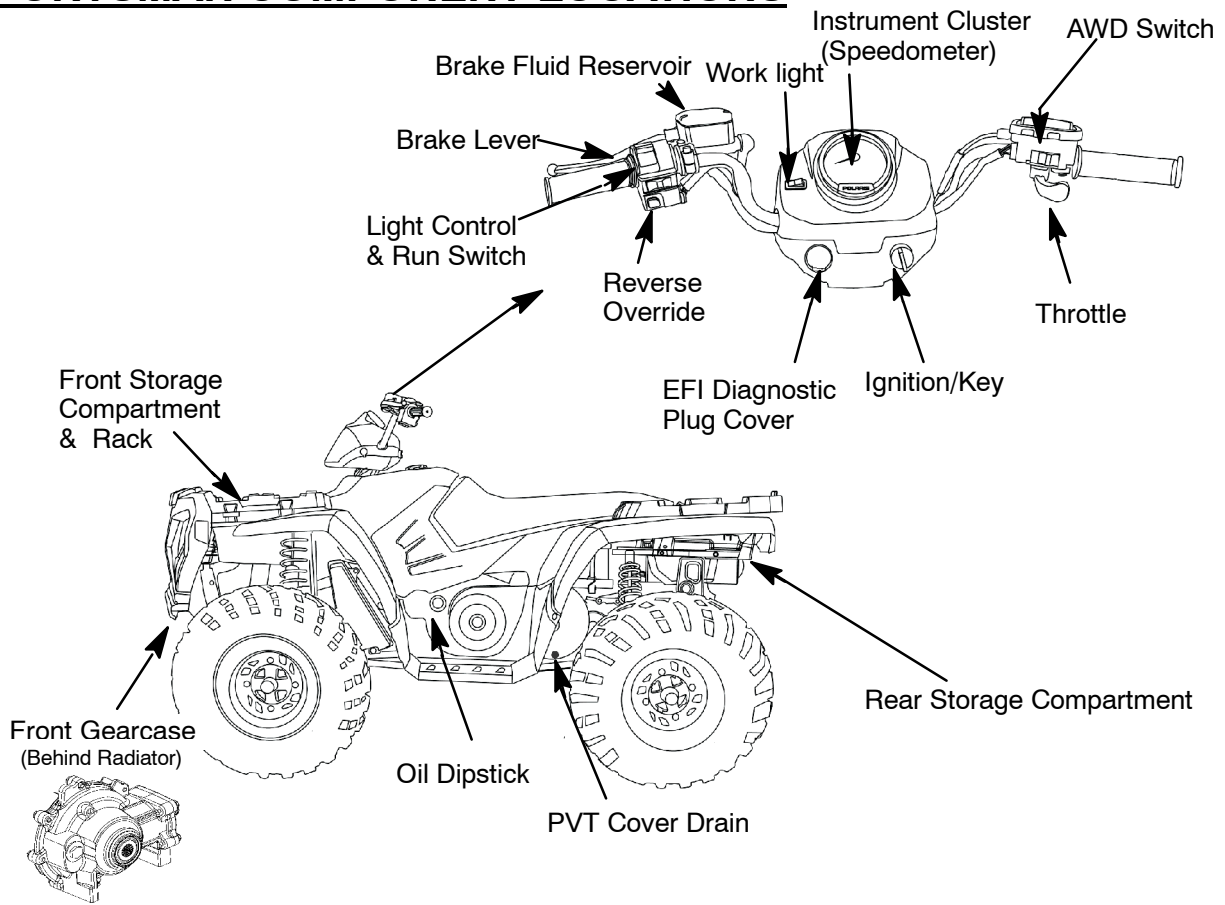
▶ Perform these procedures more often for vehicles subjected to severe use.

E Emission Control System Service (California)

■ Have an authorized Polaris dealer perform these services.



**SPORTSMAN COMPONENT LOCATIONS**





**POLARIS LUBRICANTS/FLUIDS FOR SPORTSMAN MODELS**

*Pure Polaris Lubricants and Maintenance Kits can be purchased at your local Polaris dealer.*



**Premium Fuel Stabilizer**

- Significantly reduces gum and varnish formation
- Formulated for 2-cycle and 4-cycle Polaris engines

**2870652** 16 oz.  
12 per case  
**2872280** 2.5 gallon  
2 per case



**Premium Antifreeze**

- Formulated specifically for Polaris ATV high-performance cooling systems
- Protects against corrosion, gel formation and hard water deposits

**2871534** Quart  
**2871323** Gallon



**Demand Drive Hub Fluid**

- Ensures positive engagement, release and corrosion protection of Polaris ATV Demand Drive Hubs

**2871654** 8 oz. Bottle  
12 per case  
**2872277** 2.5 Gallon  
2 per case



**Premium-4 Synthetic 4 Cycle Oil (0W-40)**

- Extremely shear-stable for extended lubricant life at high RPM
- Durable additives keep engine components clean and running efficiently
- Excellent high temperature operation protection
- Protects during cold temperature start-up

**2871281** Quart 12 per case  
**2871844** Gallon 4 per case  
**2871567** 16 Gallon  
**2871818** 55 Gallon



**ATV ANGLE DRIVE FLUID**

- Extreme pressure, anti-wear, high-viscosity film lubrication for maximum protection of Polaris ATV gear drive

**2871653** 8 oz. Bottle  
12 per case  
**2872276** 2.5 Gallon  
2 per case



**Engine Storage Kit**

- This kit includes everything you need for proper off-season storage of your ATV:
  - 12 oz. of Polaris Rust Preventative Fogging Oil (aerosol)
  - 12 oz. of Polaris Fuel Stabilizer
  - 12 oz. of Polaris Multi-Purpose Lubricant (aerosol)
  - 3 oz. of All Season Grease

**2859064**



**Carbon Clean Fuel Treatment**

- Patented additive displaces moisture
- Excellent fuel stabilizer for storage
- Formulated for 2-cycle and 4-cycle Polaris engines
- 1 ounce treats 1 gallon of fuel

**2871326** 12 oz.  
12 per case



**Revival Detailing Kit**

- Includes: Restore Swirl and Scuff Eliminator, Reflect Professional Final Finish Wax, Renew Vinyl and Rubber Protectant, foam applicator and buffing cloth
- Products also available separately

**2872195** Revival/Detailing Kit

**2872192** Restore Swirl and Scuff Eliminator **12 oz.**

**2872193** Reflect Professional Final Wax System **12 oz.**

**2872194** Renew Vinyl and Rubber Protectant **12 oz.**



**Grease Gun Kit**

- All steel construction
- Custom hose and fittings
- Includes 3 oz. all-season grease cartridge
- Complete with standard zerk fitting, needle zerk fitting and flush nipple fitting adapters

**2871312** 4 per case



**2859066 - Sportsman 600/700 Maintenance Kit**

- Oil Filter & 2 Qts. of 0W-40 oil
- Drive Belt
- PVT Cover Seal
- Spark Plug
- Instruction Sheet



**2202166 - Sportsman 600/700 Oil Change Kit**

- Oil Filter & 2 Qts. of 0W-40 oil
- Instruction Sheet



**ATV Maintenance Kit**

- This kit includes everything you need to change your drive train fluids and keep your fuel system clean:
  - Quart of AGL Oil
  - 12 oz. of Carbon Clean
  - 8 oz. of Angle Drive Fluid
  - 8 oz. of Demand Drive Hub Fluid
  - 3 oz. of All Season Grease

**2859062**

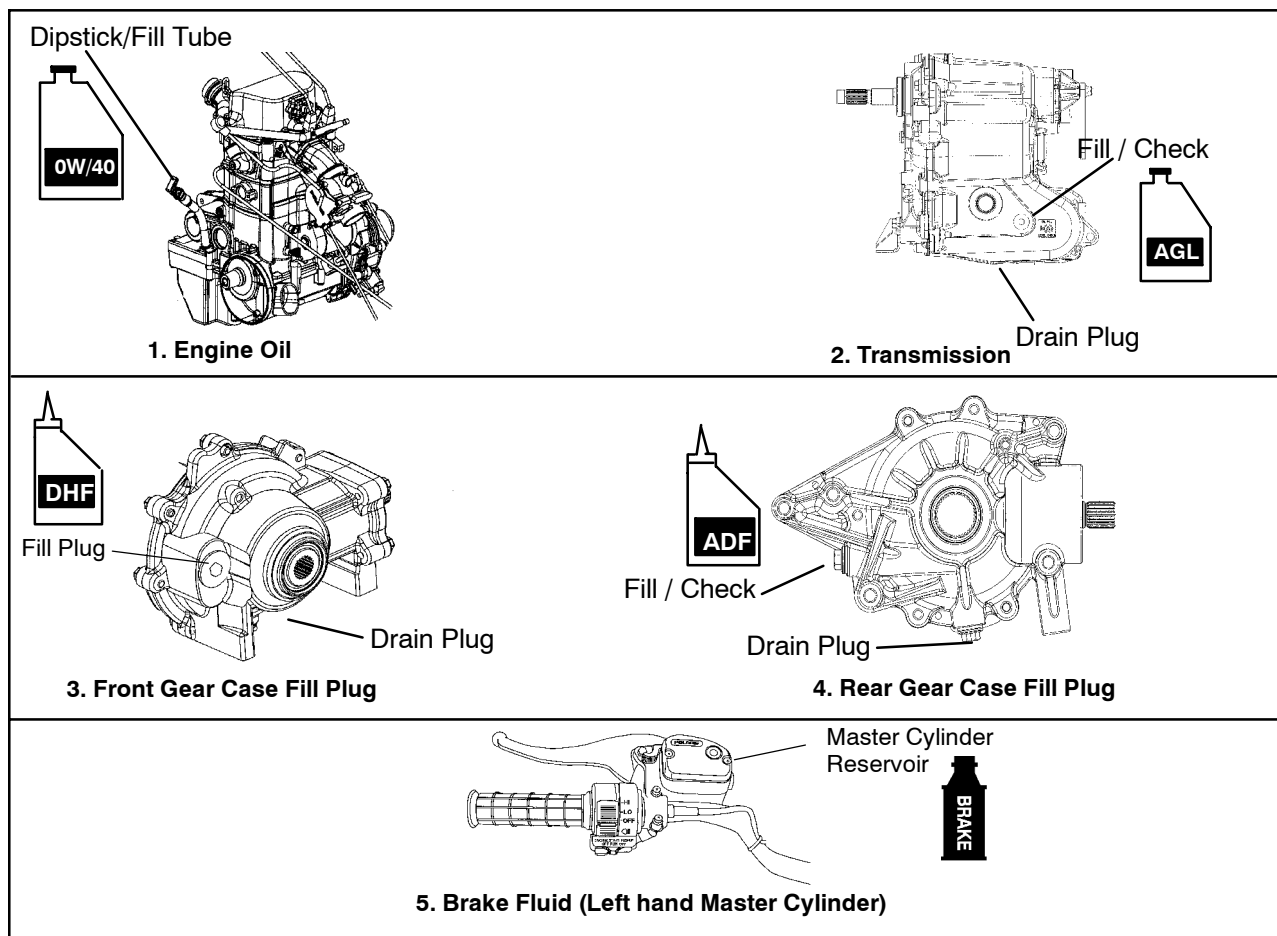
**SPECIAL TOOLS**

PART NUMBER	TOOL DESCRIPTION	CHAPTER TOOL USED IN
PV-43527	Oil Filter Wrench	2,3
2870872	Shock Spanner Wrench	2, 5
8712100 or 8712500	Tachometer	2,10
2200634	Valve Seat Reconditioning Kit	3
PU-45257	Valve Spring Compressor	3
PU-45652	Valve Pressure Hose	3
2871043	Flywheel Puller	3
2870390	Piston Support Block	3
PU-45497-2	Cam Gear Tooth Alignment Tool	3
PU-45497-1	Cam Gear Spring Installation Kit (3 Tapered Pins)	3
PU-45498	Cam Spanner Wrench	3
PU-45838	Gear Holder	3
PA-44995	Water Pump Mechanical Seal Installer	3
PU-45543	Universal Drive Handle	3
PU-45483	Main Seal Installer	3
PU-45658	Main Crankshaft Seal Saver	3
PA-45401	Water Pump Seal Saver	3
PU-45778	Oil System Priming Tool	3
2870975	Mity Vac™ Pressure Test Tool	3, 9
PU-43506	Fuel Pressure Test Kit	4
PU-47082	Throttle Position Sensor Tester	4
2870871	Ball Joint Replacement Tool	5
2870623	Shock Absorber Spring Compression Tool	5
2871572	Strut Rod Wrench	5
2871573	LH Strut Spring Compressor	5
2871574	RH Strut Spring Compressor	5
2870506	Clutch Puller	6
9314177	Clutch Holding Wrench	6
2871358	Clutch Holding Fixture	6
2870341	Drive Clutch Spider Removal and Install Tool	6
2870913	Driven Clutch Puller	6
2870910	Roller Pin Tool	6
2871226	Clutch Bushing Replacement Tool Kit	6
2870386	Piston Pin Puller	6
2872292	EBS Clutch Alignment Tool	6
PU-47086 and 8700220	Clutch Compression Tool	6
2871025	Clutch Bushing Replacement Tool Kit	6
2872608	Roller Pin Removal Tool	7
8700226	CV Boot Clamp Pliers	7
PV-43568	Fluke™ 77 Digital Multimeter	10
2870630	Timing Light	10
2870836	Battery Hydrometer	10

\*Special Tools Can be ordered through SPX Corporation ([www.polaris.spx.com](http://www.polaris.spx.com))



**LUBRICATION**



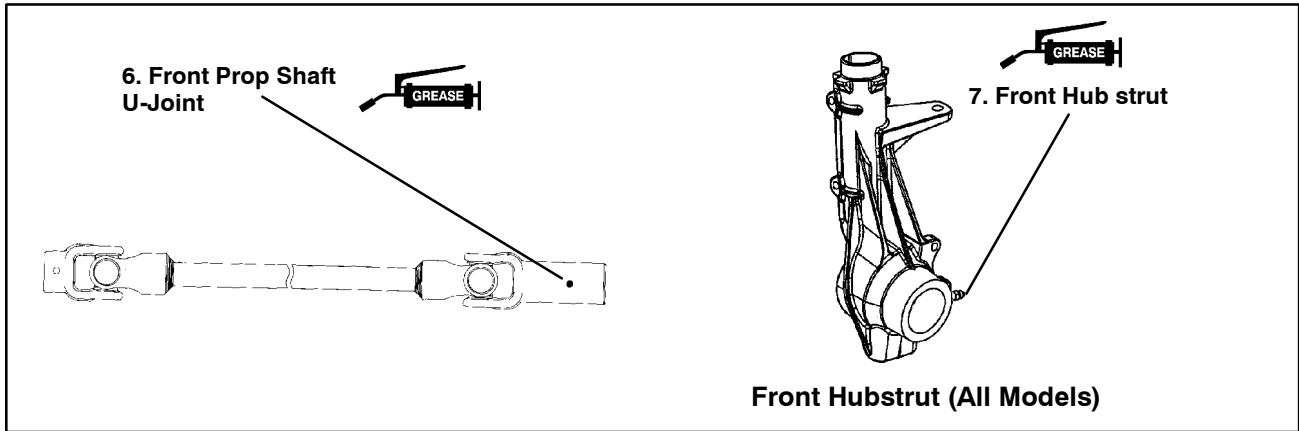
\* More often under severe use, such as operated in water or under severe loads.

- ① Semi-annually or 50 hours of operation (refer to Maintenance Schedule for additional information)  
More often under severe conditions (operating in water or hauling heavy loads)
- ② Annually or 100 hours of operation (refer to Maintenance Schedule for additional information)  
More often under severe conditions (operating in water or hauling heavy loads)
- ③ Grease conforming to NLGI No. 2, such as Polaris Premium All Season Grease, Conoco Superlube M or Mobilegrease Special

III. #	Item	Lube Rec.	Method	Frequency*
1.	Engine Oil	Polaris 0W-40 Synthetic	Check dipstick and add to proper level.	Change after 1st month, 6 months or 100 hours thereafter; Change more often (25-50 hours) in extremely dirty conditions, or short trip cold weather operation.
2.	Transmission	Polaris AGL Gear-case Lubricant	Add lube to bottom of fill hole.	Change annually ②
3.	Front Gear Case	Premium Demand Drive Hub Fluid	Drain completely. Add lube to specified quantity.	Change annually ②
4.	Rear Gear Case	ATV Angle Drive Fluid	Drain completely. Add lube to specified quantity.	Change annually ②
5.	Brake Fluid	Polaris Dot 3 Brake Fluid	Fill master cylinder reservoir to indicated level inside reservoir.	As required. Change fluid every 2 years



**LUBRICATION, CONT.**



III. #	Item	Lube Rec.	Method	Frequency*
6.	Front Prop Shaft	Polaris U-Joint Grease <sup>③</sup>	Locate grease fitting and grease with grease gun.	Semi-annually <sup>①</sup>
7.	Front Hub strut	Polaris All Season Grease <sup>③</sup>	Locate fitting and grease	Semi-annually <sup>①</sup>

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

<sup>①</sup> Semi-annually or 50 hours of operation (refer to Maintenance Schedule for additional information)  
More often under severe conditions (operating in water or hauling heavy loads)

<sup>②</sup> Annually or 100 hours of operation (refer to Maintenance Schedule for additional information)  
More often under severe conditions (operating in water or hauling heavy loads)

<sup>③</sup> Grease conforming to NLGI No. 2, such as Polaris Premium All Season Grease, Conoco Superlube M or Mobilegrease Special





**FRONT GEARCASE LUBRICATION**

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

- Be sure vehicle is level before proceeding and in PARK.
- Check vent hose to be sure it is routed properly and unobstructed.
- The correct front gearcase lubricant to use is Polaris Premium Demand Hub Fluid.

**FRONT GEARCASE SPECIFICATIONS**

*Specified Lubricant:*

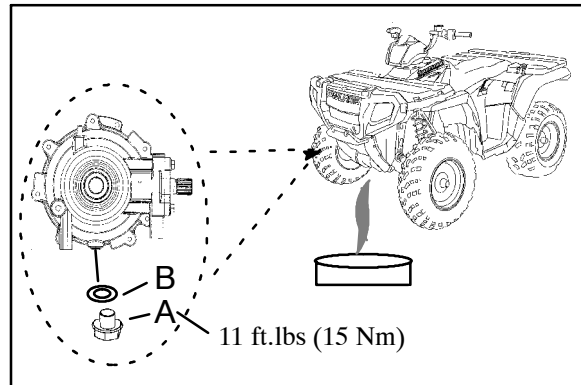
Premium Demand Drive Hub Fluid  
(PN 2871654)

*Capacity:* . . . . .5.0 Oz. (150 ml.)

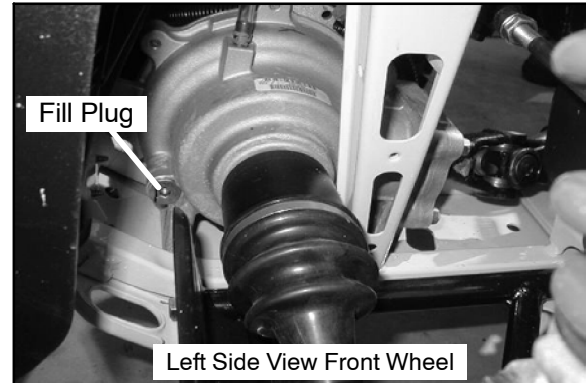
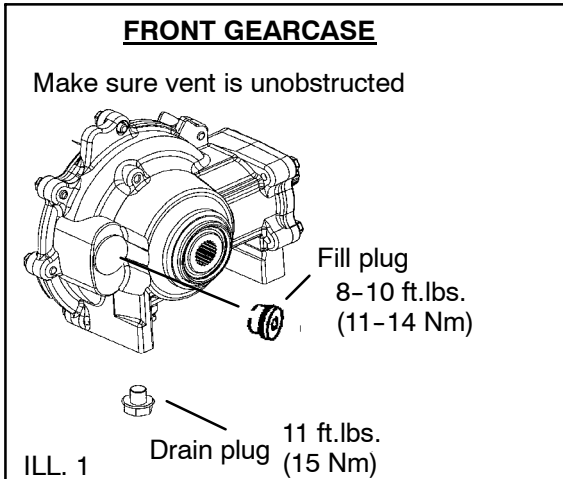
*Fill Plug Torque:* 8-10 ft.lbs. (11-14 Nm)

*Drain Plug Torque:* 11 ft. lbs. (15 Nm)

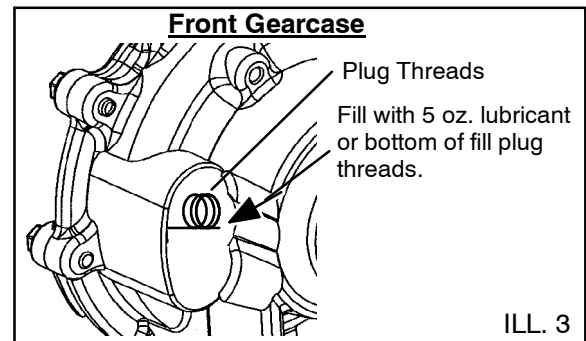
**To change gearcase lubricant:**



1. Remove gearcase drain plug (A) (11 mm) located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch and discard used oil properly.
2. Clean and reinstall drain plug (A) using a new sealing washer Toque to 11 ft.lbs. (15 Nm).



3. Remove fill plug (8 mm hex). Check the O-ring.
4. Fill with the recommended fluid amount (5 oz.) or to the bottom of the fill plug hole threads. (See ILL. 3).



**To check the lubricant level:**

The front and rear gearcase lubricant level *cannot be checked* with a dipstick. The gearcase must be drained and re-filled with the proper amount of lubricant or be filled to the bottom of the fill plug hole threads. Refer to procedures.

5. Install / torque fill plug and check for leaks.



# **REAR GEARCASE** **LUBRICATION**

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

- Be sure vehicle is level and in Park before proceeding.
- Check vent hose to be sure it is routed properly and unobstructed.
- The correct rear gearcase lubricant to use is Polaris ATV Angle Drive Fluid.

### **REAR GEARCASE SPECIFICATIONS**

*Specified Lubricant:*  
ATV Angle Drive Fluid (PN 2871653)

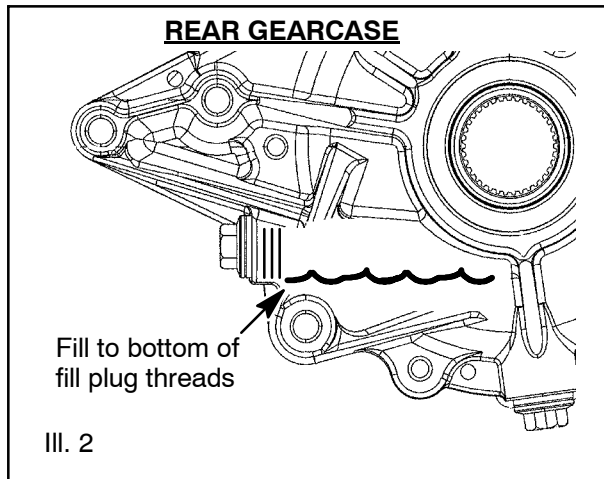
*Capacity:*                    5 Oz. (150 ml.)

*Drain Plug / Fill Plug Torque:*

14 ft. lbs. (19.4 Nm)

### **To Check Lubricant Level:**

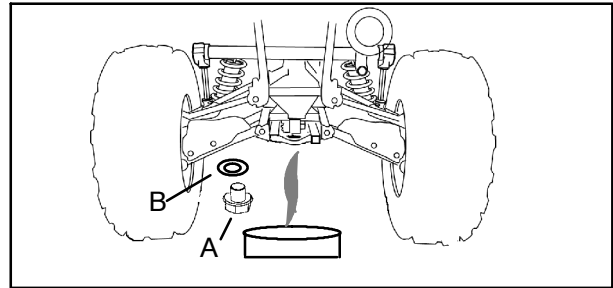
Place the ATV on a level surface and in Park. The rear gearcase fluid level should be level with the bottom of the fill plug threads. Refer to the bottom illustration 2.



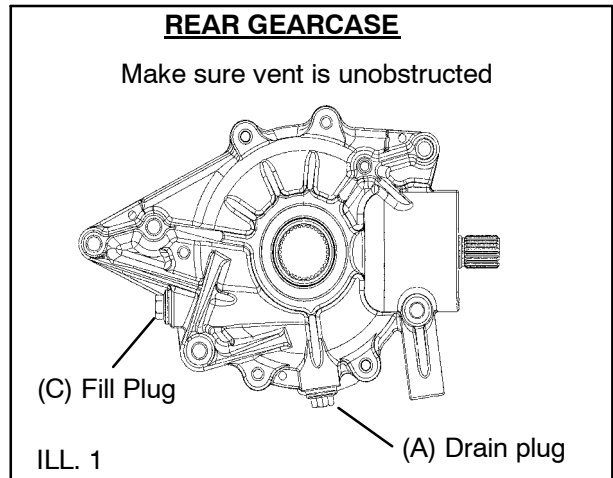
### **To Change Lubricant:**

1. Remove gearcase drain plug located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch

and discard used oil properly.



2. Clean and reinstall drain plug (A) using a new sealing washer (B).
3. Remove fill plug (C).
4. Fill with the recommended fluid amount or fill to the bottom of the fill plug hole threads.
5. Install fill plug and check for leaks.





## TRANSMISSION LUBRICATION

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

- Be sure the vehicle is level before proceeding.
- Check vent hose to be sure it is not kinked or obstructed.
- Follow instructions to check / change transmission lubricant.

### To check the level:

1. Remove fill plug from the back of the transmission and visually inspect the oil level. Level is correct when it reaches the bottom of the fill hole as shown at below.

### To change lubricant:

1. Remove transmission drain plug to drain the oil. Catch and discard used oil properly.
2. Clean and reinstall the drain plug. Torque to specification.
3. Remove fill plug.
4. Add 15 oz. of Polaris AGL Gearcase Lubricant or fill to top of the fill plug hole threads.
5. Check for leaks.
6. Reinstall fill plug and torque to 10-14 ft.lbs. (14-19 Nm).

### TRANSMISSION SPECIFICATIONS

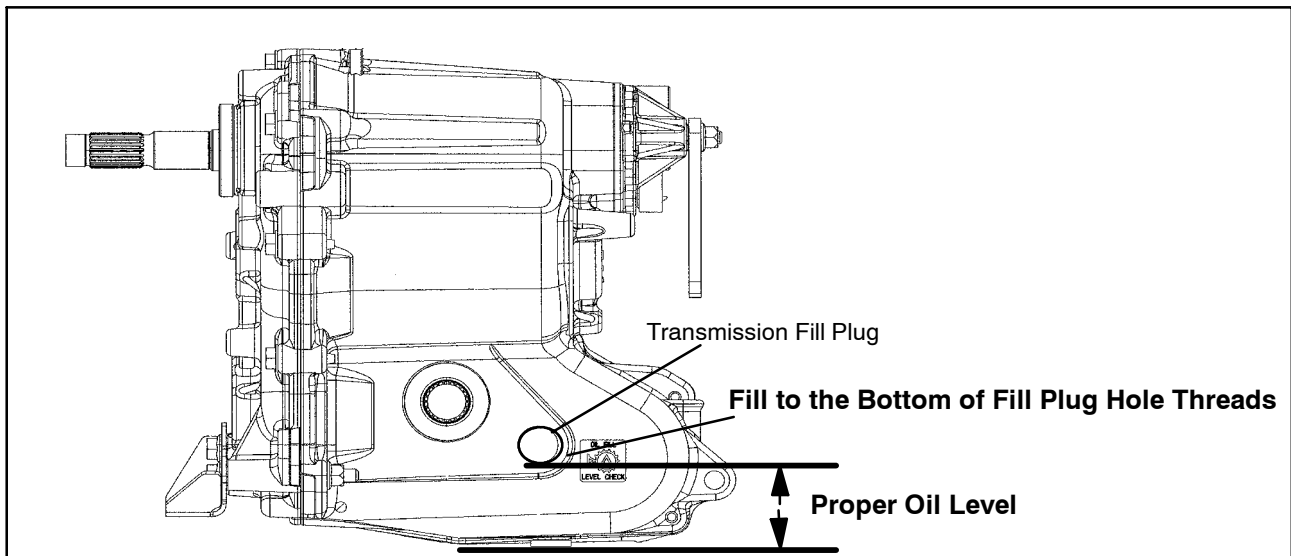
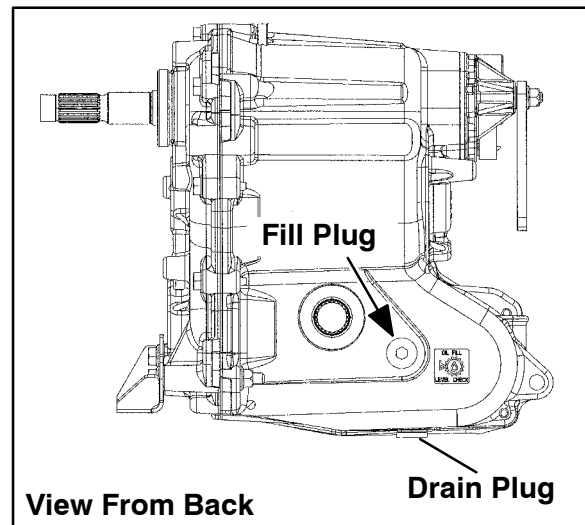
*Specified Lubricant:*

**Polaris AGL Gearcase Lubricant  
(PN 2873603) (gal.) (PN 2873602) (12oz.)**

*Capacity: 15 oz. (450 ml.)*

*Drain Plug / Fill Plug Torque:*

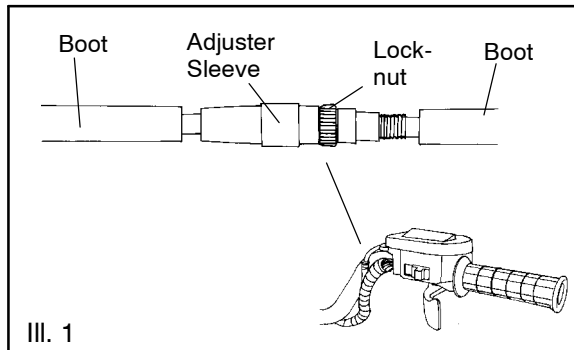
**10-14 ft. lbs. (14-19 Nm)**



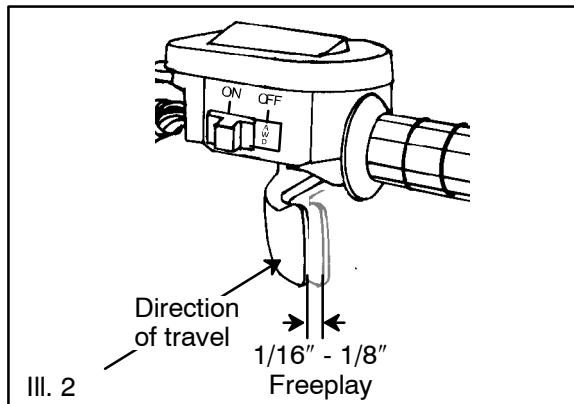


# THROTTLE CABLE / ELECTRONIC THROTTLE CONTROL (ETC SWITCH) ADJUSTMENT

1. Slide boot off throttle cable adjuster and jam nut.
2. Place shift selector in neutral and set parking brake.
3. Loosen lock nut on in-line cable adjuster (III. 1).



4. Turn adjuster until 1/16" to 1/8" freeplay is achieved at thumb lever. (III. 2). After making adjustments, quickly actuate the thumb lever several times and reverify freeplay.



5. Tighten lock nut securely and slide boot completely in place to ensure a water-tight seal.
6. Turn handlebars from left to right through the entire turning range. If idle speed increases, check for proper cable routing. If cable is routed properly and in good condition, repeat adjustment procedure.

# THROTTLE INSPECTION

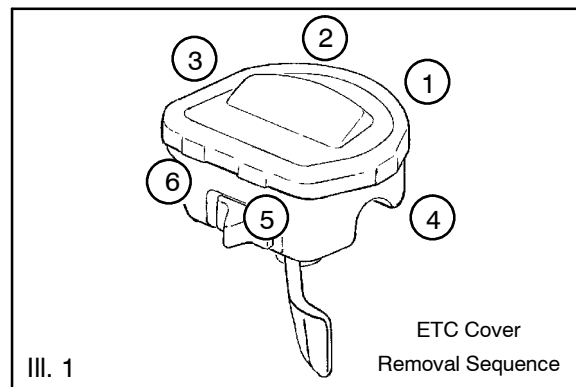
Check for smooth throttle opening and closing in all handlebar positions. Throttle lever operation should be smooth and lever must return freely without binding.

1. Place the gear selector in neutral.
2. Set parking brake.
3. Start the engine and let it idle.
4. Turn handlebars from full right to full left. If idle speed increases at any point in the turning range, inspect throttle cable routing and condition. Adjust cable tension as needed until lock-to-lock turning can be accomplished with no rise in engine rpm.
5. Replace the throttle cable if worn, kinked, or damaged.

### To remove the ETC cover:

1. Use a medium flat blade screwdriver and insert blade into the pocket of the cover starting on the #1 position.
2. Twist screwdriver slightly while lifting on the cover to release snap.
3. Repeat procedure at the other five locations as shown.

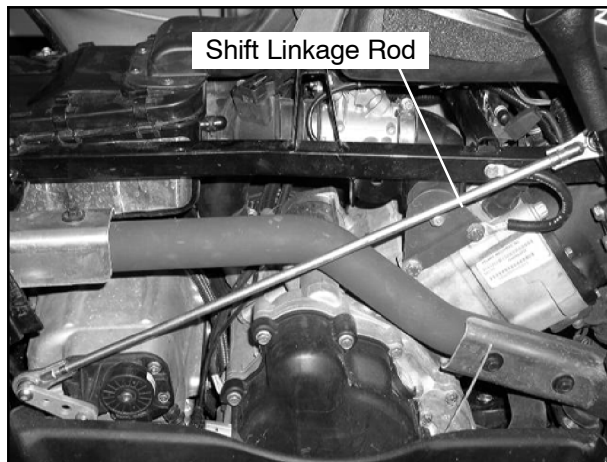
**NOTE:** Do not attempt to remove cover until all latch points are released.



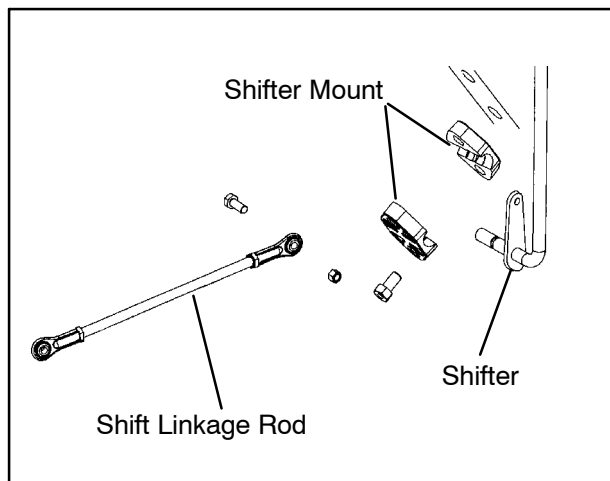


## SHIFT LINKAGE INSPECTION

**NOTE:** Shift rod is preset at time of manufacture.



1. Inspect shift linkage tie rod ends, clevis pins, and pivot bushings and replace if worn or damaged. Lubricate the tie rod ends with a light aerosol lubricant or grease.
2. Note orientation of tie rod end studs with the ends that are up down (vertical). Remove both rod end bolts from transmission bell crank.



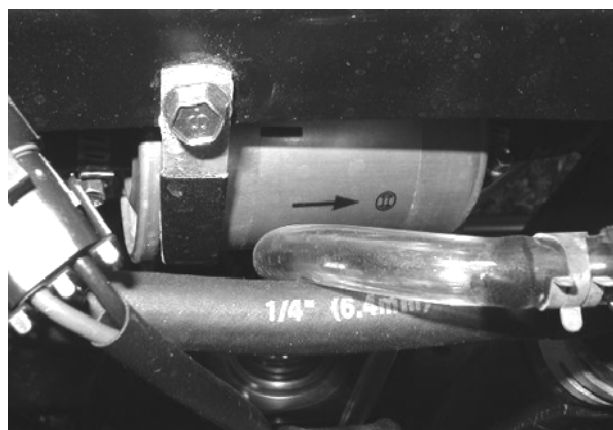
## VENT LINES

Check fuel tank, oil tank, carburetor, battery 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. **CAUTION:** Make sure lines are not kinked or pinched.

## FUEL FILTER

The fuel filter should be replaced in accordance with the Periodic Maintenance Chart.



1. Relieve the pressure on the fuel rail. (See Ch. 4)
2. Remove line clamps at both ends of the filter.
3. Remove fuel lines from filter.
4. Install new filter with arrow pointed in direction of fuel flow.
5. Install clamps on fuel line.
6. Start engine and inspect for leaks.

## COMPRESSION TEST

**NOTE:** This engine does NOT have decompression components. Compression readings will vary in proportion to cranking speed during the test. Average compression (measured) is about **150-200 psi** during a compression test.

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



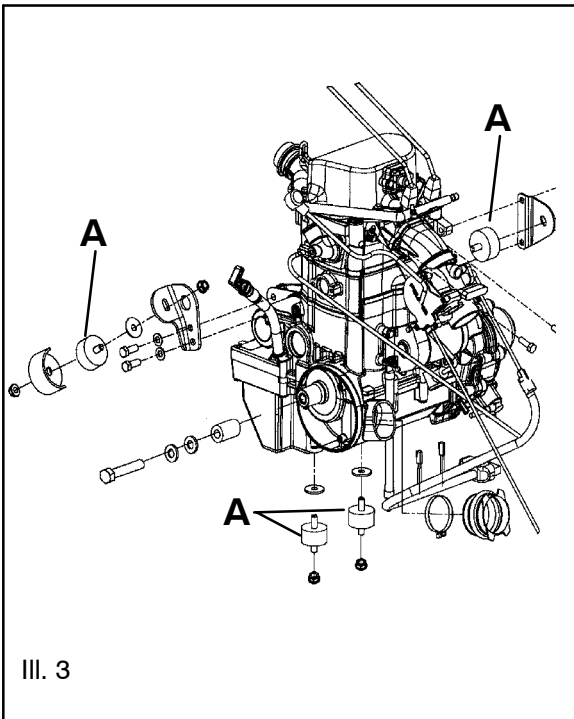
A cylinder leakdown test is the best indication of engine condition. Follow manufacturer's instructions to perform a cylinder leakage test. (Never use high pressure leakage testers, as crankshaft seals may dislodge and leak).

<b>Cylinder Compression</b>	
<b>Standard: 150-200 PSI</b>	
<b>Cylinder Leakdown</b>	
<b>Service Limit</b>	<b>15 %</b>
<b>(Inspect for cause if leakage exceeds 15%)</b>	

### ENGINE MOUNTS

Inspect rubber engine mounts (A) for cracks or damage. (III.3)

Check engine fasteners and ensure they are tight.



### BATTERY MAINTENANCE

## ! 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.

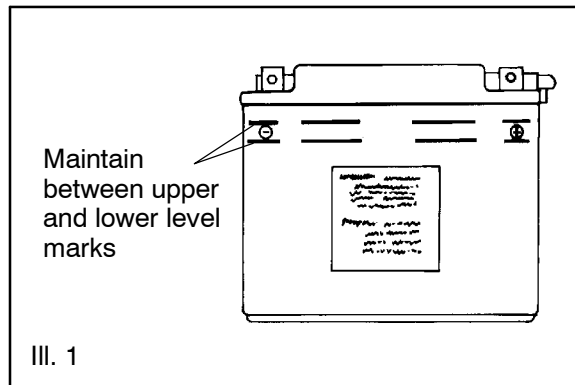
**Eyes:** Flush with water for 15 minutes and get prompt medical attention.

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: 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. (Refer to battery video PN 9917987)**

The battery is located under the seat.

Inspect the battery fluid level. When the electrolyte nears the lower level, remove the battery and **add distilled water only** to the upper level line. (III.1)





## To remove the battery:

1. Disconnect holder strap and remove cover.
2. Disconnect battery negative (-) (black) cable first, followed by the positive (+) (red) cable.



### CAUTION

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

3. Disconnect the vent hose.
4. Remove the battery.
5. (**Conventional Batteries Only**) Remove the filler caps and add *distilled water only* as needed to bring each cell to the proper level. Do not overfill the battery. Fully recharge after filling.



Use only distilled water. Tap water contains minerals which are harmful to a battery.



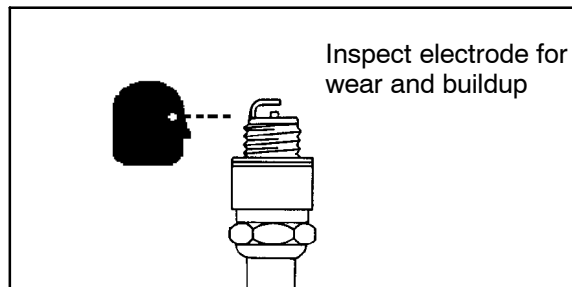
Do not allow cleaning solution or tap water to enter the battery, as it will shorten the life of the battery.

6. Reinstall the battery caps.
7. 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.
8. Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable.
9. Reattach vent hose making sure it is properly routed and not kinked or pinched.
10. Coat terminals and bolt threads with Dielectric Grease (PN 2871329).
11. Reinstall battery cover and holder strap.

## SPARK PLUG

1. Clean plug area so no dirt and debris can fall into engine when plug is removed. Remove spark plug high tension lead.
2. Remove spark plug.
3. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or

erosion of the electrodes.



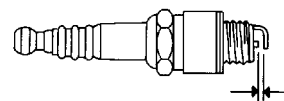
4. Clean with electrical contact cleaner or a glass bead spark plug cleaner only. **CAUTION:** A wire brush or coated abrasive should not be used.
5. Measure gap with a wire gauge. Refer to specifications for proper spark plug type and gap. Adjust gap if necessary by bending the side electrode carefully. (Illustration below)
6. If necessary, replace spark plug with proper type. **CAUTION:** Severe engine damage may occur if the incorrect spark plug is used.
7. Apply a small amount of anti-seize compound to the spark plug threads.
8. Install spark plug and torque to specification.

### Recommended Spark Plug:

Refer to Specifications Chapter 1

**Spark Plug Torque:  
18 Ft. Lbs. (24 Nm)**

### Spark Plug Gap



.036" (0.9 mm)

## IGNITION TIMING

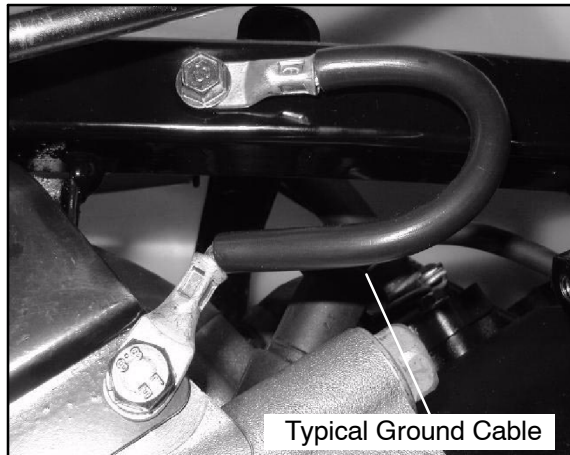
Refer to Chapter 10 for ignition timing procedures.





## ENGINE-TO-FRAME GROUND

Inspect engine-to-frame ground cable connection. Be sure it is clean and tight.



## LIQUID COOLING SYSTEM OVERVIEW

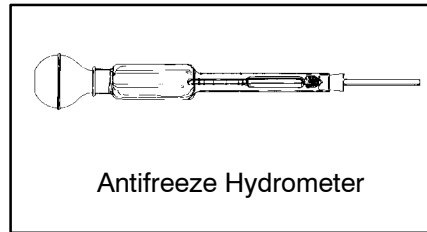
The engine coolant level is controlled or maintained by the recovery system. The recovery system components are the recovery bottle, radiator filler neck, radiator pressure cap and connecting hose.

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

- 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.
- Overheating of engine could occur if air is not fully purged from system.
- Polaris Premium 60/40 anti-freeze is premixed and ready to use. Do not dilute with water.

## 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. Tap water contains minerals and impurities which build up in the system. Do not add straight antifreeze or straight water to the system. Straight water or antifreeze may cause the system to freeze, corrode, or overheat.

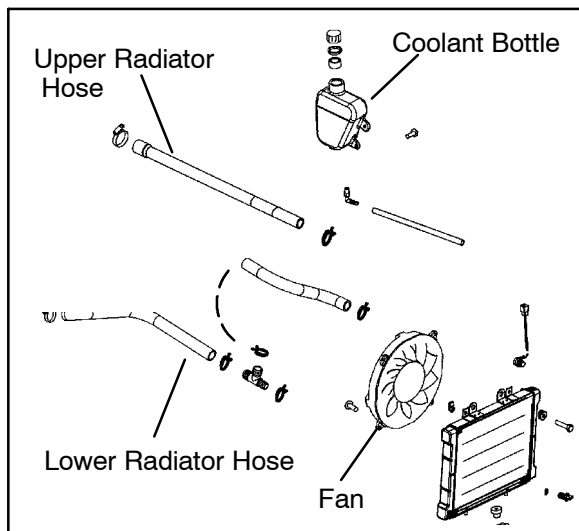
**Polaris 60/40 Anti-Freeze / Coolant  
(PN 2871323)**





## COOLING SYSTEM HOSES

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



1. Check tightness of all hose clamps.
2. Do not over-tighten hose clamps at radiator or radiator fitting may distort, causing a restriction or leak. Radiator hose clamp torque is 36 in. lbs. (4 Nm).

## RADIATOR

1. Check radiator external air flow passages for restrictions or damage.
2. Carefully straighten any bent radiator fins.
3. Remove any obstructions with compressed air or low pressure water.

## COOLING SYSTEM PRESSURE TEST

Refer to Chapter 3 for pressure test procedures.

## COOLANT LEVEL INSPECTION

### ⚠ WARNING

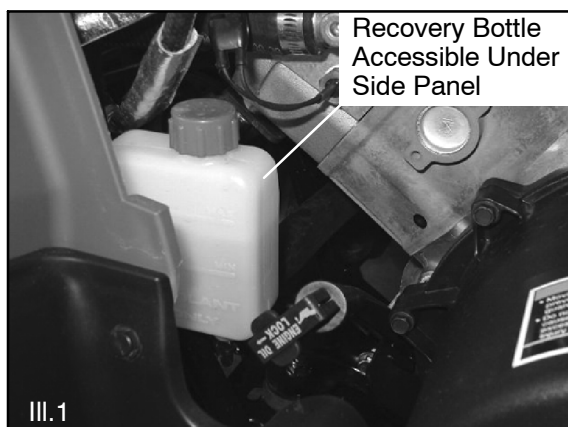
Never remove the radiator pressure cap when the engine is warm or hot. Escaping steam and fluid can cause severe burns. The engine must be allowed to cool before removing the pressure cap.

The recovery bottle, located on the left side of the machine, must be maintained between the minimum and maximum levels indicated. (Ill.1)

With the engine at operating temperature, the coolant level should be between the upper and lower marks on the coolant reservoir. If it is not:

1. Remove reservoir cap. Verify the inner splash cap vent hole is clear and open.
2. Fill reservoir to upper mark with Polaris Premium 60/40 Anti Freeze / Coolant (PN 2871323) or a mixture of antifreeze and distilled water as required for freeze protection in your area.
3. Reinstall cap.

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



## RADIATOR COOLANT LEVEL INSPECTION

### ⚠ WARNING

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

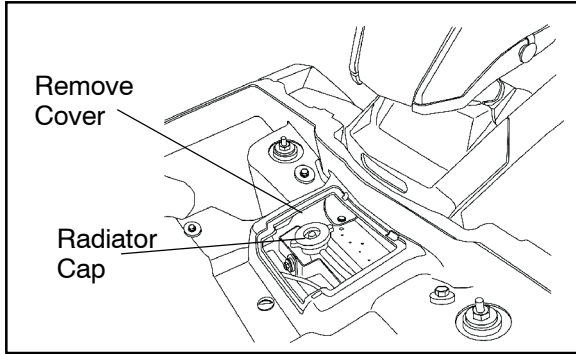
**NOTE:** This procedure is only required if the cooling system has been drained for maintenance and/or repair. However, if the recovery bottle has run dry, or if overheating is evident, the level in the radiator should be inspected via the radiator cap first and coolant added if necessary.

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



## To access the radiator pressure cap:

Remove the four screws securing front rack. Turn handle bars full left or right to provide more clearance. Remove front cover by placing your fingers under the front of the cover and pulling upward.



## RADIATOR SCREEN REMOVAL

1. Pull out slightly on the top of the radiator screen.
2. With the top free, pull out on the bottom of the screen to remove the screen.
3. To install the screen, simply press the tabs on the screen back into the mounting grommets. Be sure the screen is securely in place.

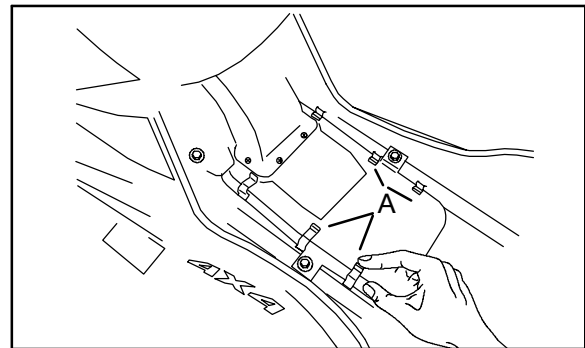


## AIR FILTER/PRE-FILTER SERVICE

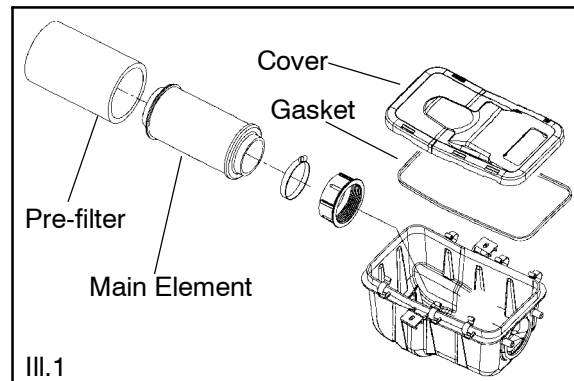
It is recommended that the air filter and pre filter be replaced annually. When riding in extremely dusty conditions, replacement is required more often.

The pre filter should be cleaned before each ride using the following procedure:

1. Lift up on the rear of the seat.
2. Pull the seat back and free of the tabs. **NOTE:** When reinstalling seat, make sure the slots in the seat engage the tabs in the fuel tank.
3. Remove clips (A) from air box cover and remove cover. Inspect the gasket. It should adhere tightly to the cover and seal all the way around.



4. Loosen clamp and remove air filter assembly.



### Cleaning:

5. Slip the pre-filter element off of main element. Clean the pre filter with high flash point solvent, followed by hot soapy water.
6. Rinse and dry thoroughly.
7. Inspect element for tears or damage.
8. Apply foam filter oil or clean engine oil and squeeze until excess oil is removed.

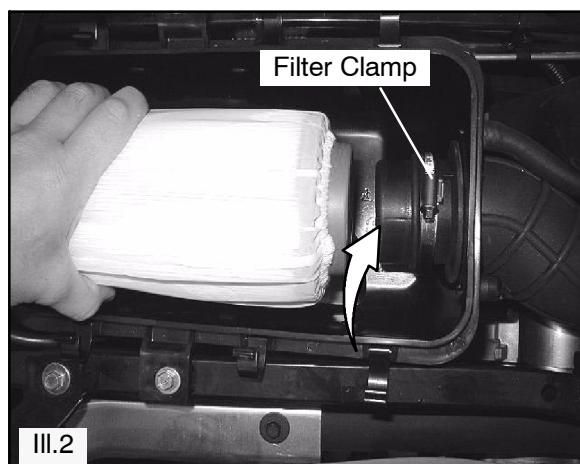


9. Inspect main filter and replace if necessary. If the filter has been soaked with fuel or oil it must be replaced.

**Installation:**

10. Reinstall pre-filter element over main filter. Be sure the element covers entire surface of main filter without folds, creases, or gaps.
11. Reinstall filter on main filter mount. Place filter clamp over the assembly and tighten.

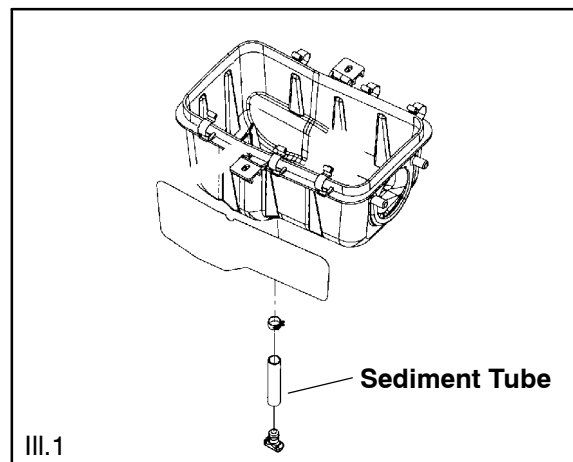
**NOTE:** Apply a small amount of general purpose grease to the sealing edges of the filter before reinstalling.



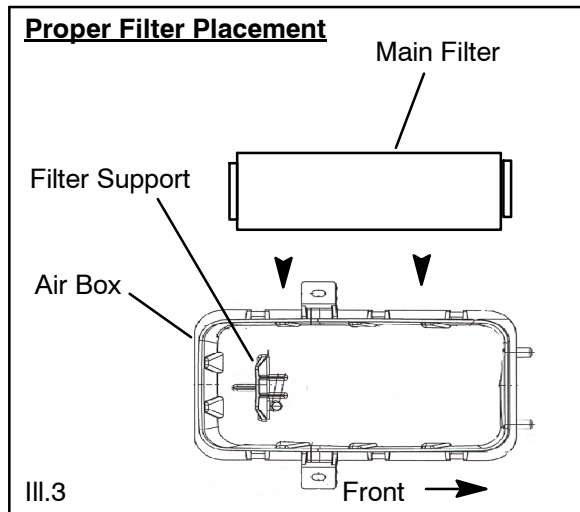
## AIR BOX SEDIMENT TUBE

Periodically check the air box drain tube located toward the rear of the machine. Drain whenever deposits are visible in the clear tube.

1. Remove drain plug from end of sediment tube.
2. Drain tube.
3. Reinstall drain plug.



**NOTE:** The sediment tube will require more frequent service if the vehicle is operated in wet conditions or at high throttle openings for extended periods.



**NOTE:** The air filter should rest on the filter support. Proper placement of the air filter is important to prevent rattles and air leaks. See Illustration above.

12. Install air box cover and secure with clips.



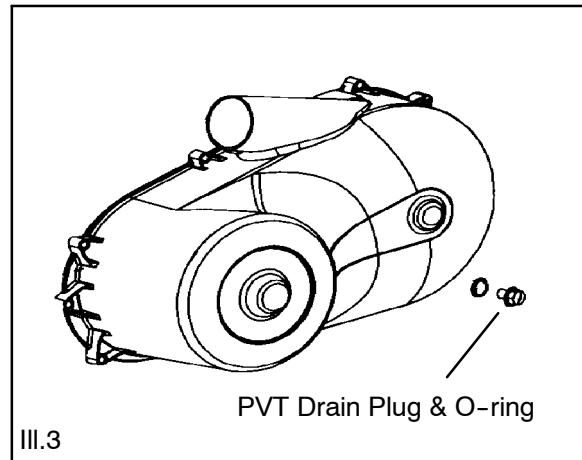
### BREATHER HOSE

1. Be sure breather line is routed properly and secured in place. **CAUTION:** Make sure lines are not kinked or pinched.

### PVT DRYING & PVT DRAIN PLUG

**NOTE:** If operating the ATV in or through water, be sure to check the PVT cover and other components for water ingestion. The ATV should be checked immediately.

1. To release any water that maybe trapped in the PVT cover, simply remove the PVT drain plug and O-ring located on the bottom of the PVT cover and let the water drain out. The PVT drain plug is shown below.

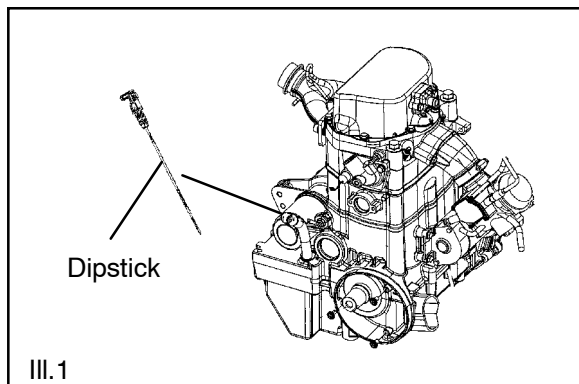


2. To further expel water from the cover and to dry out the PVT system, shift the transmission to neutral and rev engine slightly to expel the moisture and air-dry the belt and clutches. Allow engine RPM to settle to idle speed, shift transmission to lowest available range and test for belt slippage. Operate ATV in lowest available range for a short period of time until PVT system is dry.

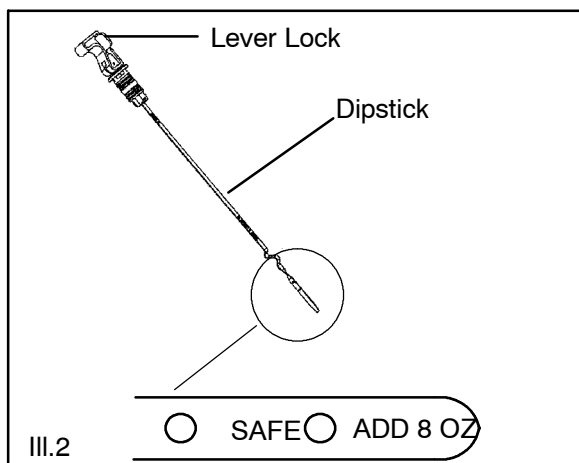
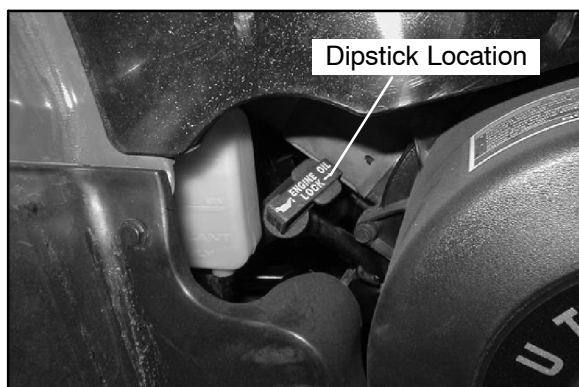


## **ENGINE OIL LEVEL**

The 700 engine is a wet-sump engine, meaning the oil is contained in the bottom of the crankcase. To check the oil level:



1. Set machine on a level surface.
2. Be sure the machine has sat for awhile before removing the dipstick. Do not run the machine and then check the dipstick.
3. Unlock the lever lock. (III. 2) Remove dipstick and wipe dry with a clean cloth.

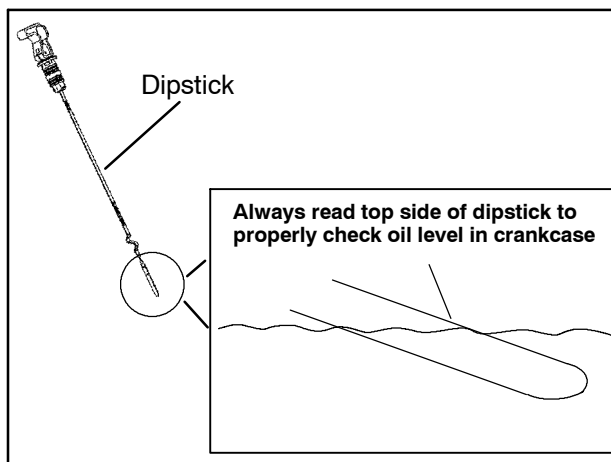


4. Reinstall dipstick and push it into place. Do not lock the dipstick.

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

5. Remove dipstick and check to see that the oil level is in the normal 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)

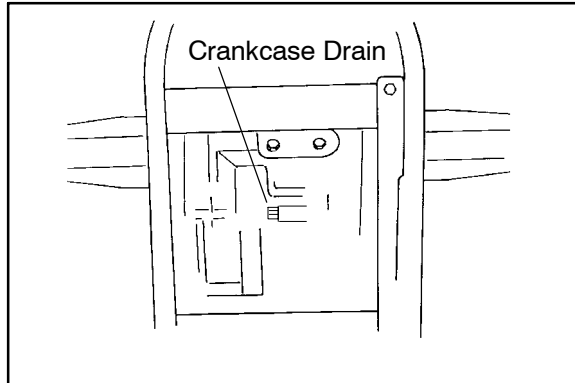


**NOTE:** A rising oil level between checks in cool weather driving can indicate contaminants such as gas or moisture collecting in the crankcase. If the oil level is over the full mark, change the oil immediately.



## OIL AND FILTER CHANGE

1. Place vehicle on a level surface.
2. Run engine two to three minutes until warm. Stop engine.
3. Clean area around drain plug at bottom of oil engine.
4. Place a drain pan beneath crankcase and remove drain plug.



Engine Oil Drain Plug - Bottom View

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



5. Allow oil to drain completely.
6. Replace the sealing washer on drain plug.  
**NOTE:** The sealing surfaces on drain plug and oil tank should be clean and free of burrs, nicks or scratches.
7. Reinstall drain plug and torque to  $192 \pm 24$  in. lbs. ( $21.7 \pm 2.7$  Nm).

8. Place shop towels beneath oil filter. Using Oil Filter Wrench (PV-43527), turn filter counterclockwise to remove.
9. Using a clean dry cloth, clean filter sealing surface on crankcase.
10. Lubricate O-ring on new filter with a film of fresh engine oil. Check to make sure the O-ring is in good condition.
11. Install new filter and turn by hand until filter gasket contacts the sealing surface, then turn an additional 1/2 turn.
12. Remove dipstick and fill sump with 2 quarts (1.9 l) of Polaris Premium 4 Synthetic Oil (PN 2871281).

**Recommended Engine Oil**  
**Polaris Premium 4 All Season Synthetic,**  
**0W-40 (PN 2871281)**

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

**Crankcase Drain Plug Torque:**  
 **$192 \pm 24$  in. lbs. ( $21.7 \pm 2.7$  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)**

13. Place gear selector in neutral and set parking brake.
14. Start the engine and let it idle for one to two minutes. Stop the engine and inspect for leaks.
15. Re-check the oil level on the dipstick and add oil as necessary to bring the level to the upper mark on the dipstick.
16. Dispose of used filter and oil properly.



## STEERING

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

Replace any worn or damaged steering components. Steering should move freely through entire range of travel without binding. Check routing of all cables, hoses, and wiring to be sure the steering mechanism is not restricted or limited. **NOTE:** Whenever steering components are replaced, check front end alignment. Use only genuine Polaris parts.

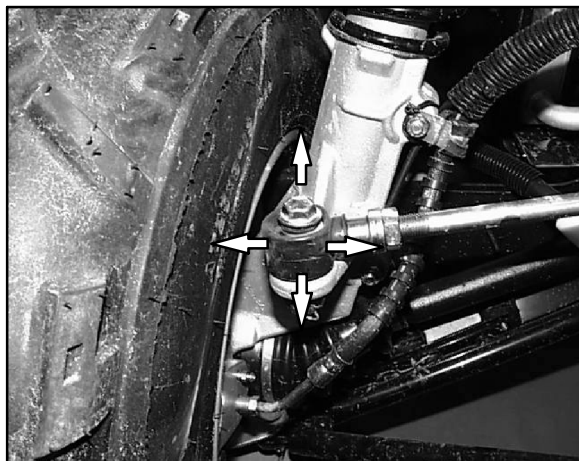
### ⚠ WARNING

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

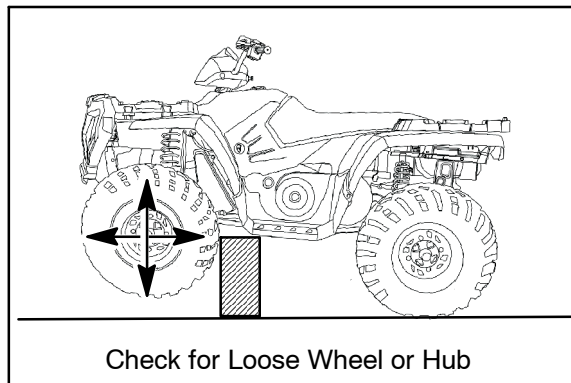
One of two methods can be used to measure toe alignment. The string method and the chalk method. If adjustment is required, refer to following pages for procedure.

## TIE ROD END / STEERING INSPECTION

- To check for play in the tie rod end, grasp the steering tie rod, pull in all directions feeling for movement.
- Repeat inspection for inner tie rod end on steering post.



- Replace any worn steering components. Steering should move freely through entire range of travel without binding.
- Elevate front end of machine so front wheels are off the ground. Check for any looseness in front hub / wheel assembly by grasping the tire firmly at top and bottom first, and then at front and rear. Try to move the wheel and hub by pushing inward and pulling outward.
- If abnormal movement is detected, inspect the hub and wheel assembly to determine the cause ( possible loose wheel nuts or loose front hub components).



- Refer to the Body/Steering Chapter 5 or Final Drive Chapter 7 for service procedures.

## CAMBER AND CASTER

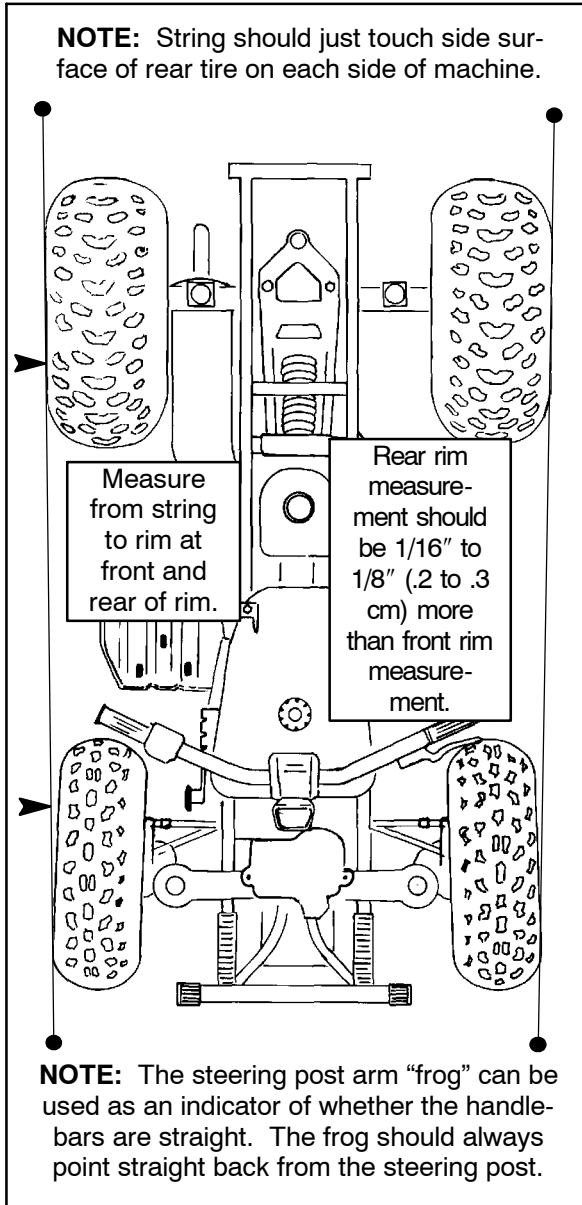
The camber and caster are non-adjustable.





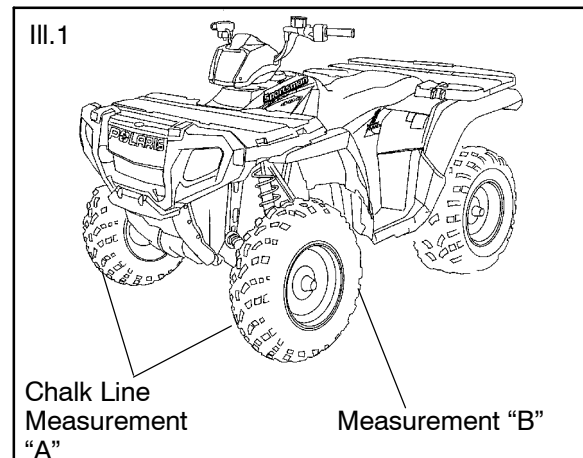
# WHEEL ALIGNMENT METHOD 1: STRAIGHTEDGE OR STRING

Be sure to keep handlebars centered. See notes below.



# WHEEL ALIGNMENT METHOD 2: CHALK

1. Place machine on a smooth level surface.
2. Set handlebars in a straight ahead position and secure handlebars in this position. **NOTE:** The steering arm "frog" can be used as an indicator of whether the handlebars are straight. The frog should always point straight back from the steering post.
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 centerline.
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).



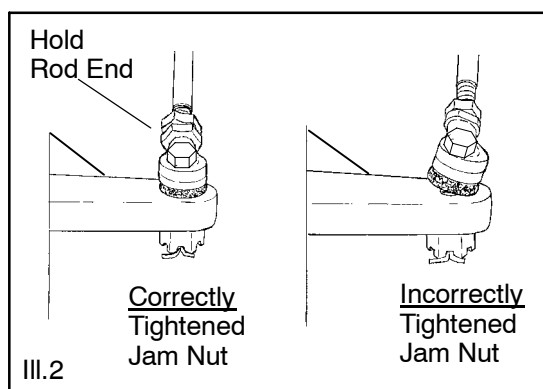




## TOE ALIGNMENT ADJUSTMENT

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 handlebars are 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.



III.2

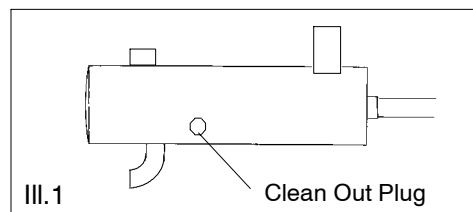
### To adjust toe alignment:

- Hold tie rod end to keep it from rotating.
- Loosen jam nuts at both end of the tie rod.
- Shorten or lengthen the tie rod until alignment is as required to achieve the proper toe setting as specified in Method 1 or Method 2.
- **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. See illustration 2.
- After alignment is complete, torque jam nuts to 12-14 ft. lbs. (16-19 Nm).

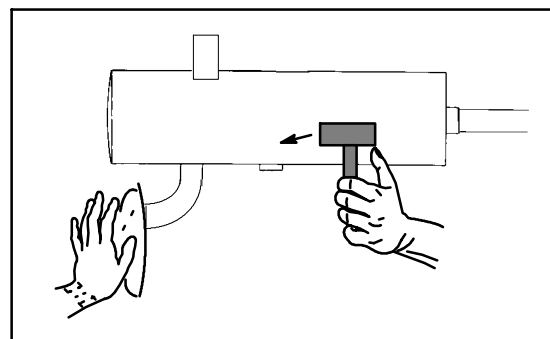
## EXHAUST PIPE

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

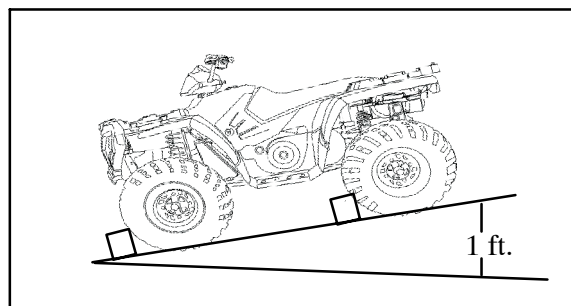
1. Remove the clean out plugs located on the bottom of the muffler as shown in illustration 1.



2. Place the transmission in neutral and start the engine. Purge accumulated carbon from the system by momentarily revving the engine several times.
3. If some carbon is expelled, cover the exhaust outlet and rap on the pipe around the clean out plugs while revving the engine several more times.



4. If particles are still suspected to be in the muffler, back the machine onto an incline so the rear of the machine is one foot higher than the front. Set the hand brake and block the wheels. Make sure the machine is in neutral and repeat Steps 2 and 3. **SEE WARNING**
5. If particles are still suspected to be in the muffler, drive the machine onto the incline so the front of the machine is one foot higher than the rear. Set the hand brake and block the wheels. Make sure the machine is in neutral and repeat Steps 2 and 3. **SEE WARNING**



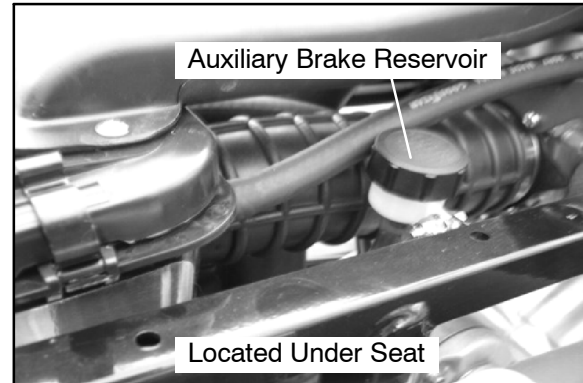
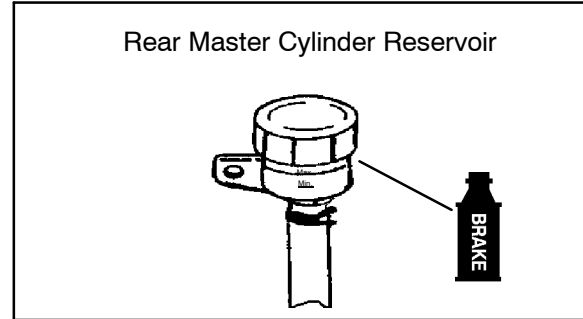


6. Repeat Steps 2 through 5 until no more particles are expelled when the engine is revved.
7. Stop the engine and allow the arrestor to cool.
8. Reinstall the clean out plugs.

## ⚠ WARNING

- Do not perform clean out immediately after the engine has been run, as the exhaust system becomes very hot. Serious burns could result from contact with exhaust components.
- To reduce fire hazard, make sure that there are no combustible materials in the area when purging the spark arrestor.
- Wear eye protection.
- Do not stand behind or in front of the vehicle while purging the carbon from the spark arrestor.
- Never run the engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas.
- Do not go under the machine while it is inclined. Set the hand brake and block the wheels to prevent roll back.

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

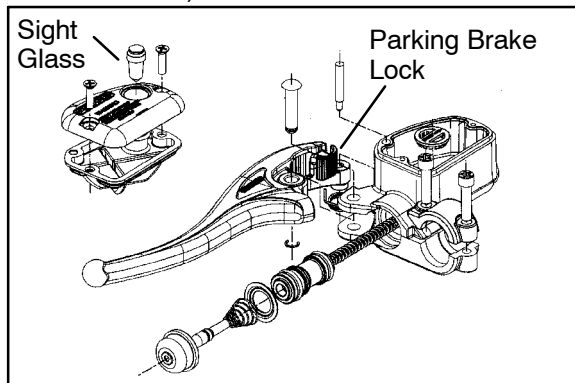


- Check brake system for fluid leaks.
- Check brake for excessive travel or spongy feel.
- Check friction pads for wear, damage or looseness.
- Check surface condition of the disc.
- Inspect thickness of brake pad friction material.

## BRAKE SYSTEM INSPECTION

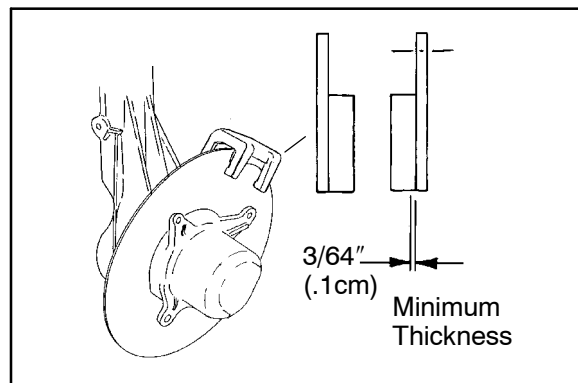
The following checks are recommended to keep the brake system in good operating condition. Service life of brake system components depends on operating conditions. Inspect brakes in accordance with the maintenance schedule and before each ride.

- Keep fluid level in the master cylinder reservoir to the indicated level inside reservoir.
- Use Polaris DOT 3 Brake Fluid (PN 2870990).



## BRAKE PAD INSPECTION

Pads should be changed when the friction material is worn to 3/64" (.1 cm), or about the thickness of a dime.



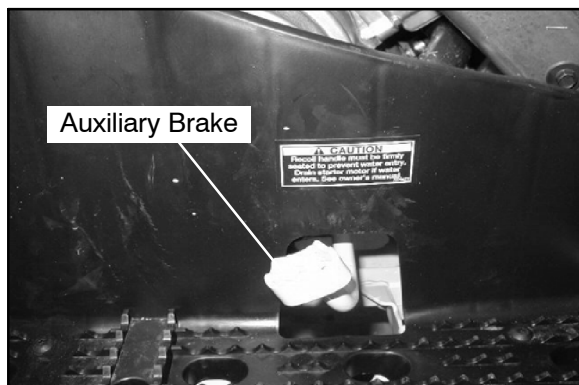


## **HOSE/FITTING INSPECTION**

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

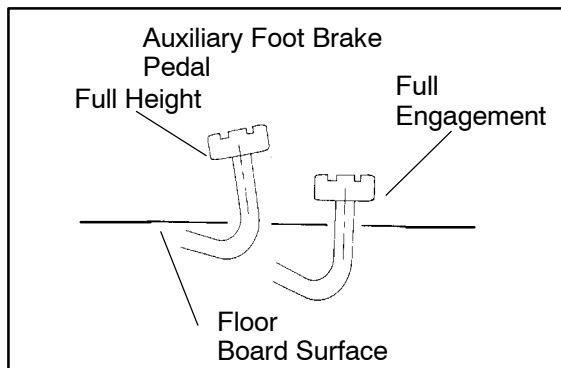
## **AUXILIARY BRAKE TESTING**

The auxiliary brake should be checked for proper function.



Support the rear wheels off the ground.

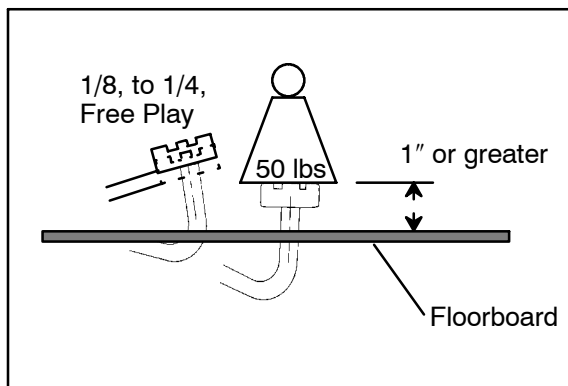
While turning the rear wheels by hand, apply the auxiliary foot brake. This brake should not stop the wheels from turning until the lever is half way between its rest position and bottoming on the footrest.



## **AUXILIARY BRAKE ADJUSTMENT (HYDRAULIC)**

Use the following procedure to inspect the hydraulic auxiliary (foot) brake system and adjust or bleed if necessary:

First, check foot brake effectiveness by applying 50 lb. (approx.) downward force on the pedal. The top of the pedal should be at least 1 inch, (25.4mm) above the surface of the footrest.



If less than one inch, two things must be examined:

### **Free Play:**

**Free play of the brake pedal should be 1/8 - 1/4 inch (3.2 - 6.35 mm).**

If free play is excessive, inspect pedal, linkage, and master cylinder for wear or damage and replace any parts as needed.

### **Bleeding:**

If free play is correct and brake pedal travel is still excessive, air may be trapped somewhere in the system. Bleed the hydraulic auxiliary brake system in a conventional manner, following the procedure outlined in Brake Chapter 9.

## **SUSPENSION: SPRING PRELOAD ADJUSTMENT**

Operator weight and vehicle loading affect suspension spring preload requirements. Adjust as necessary.

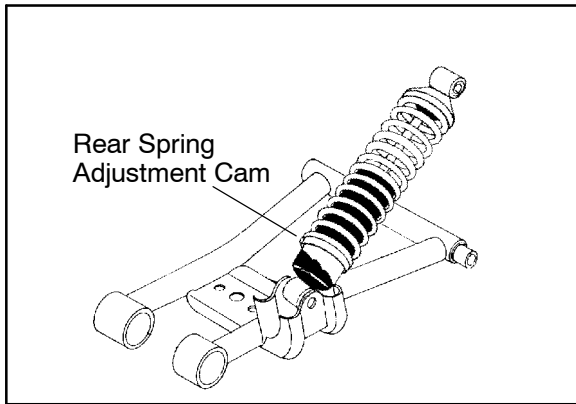
**Shock Spanner Wrench**  
(PN 2870872)



## FRONT SUSPENSION

- Compress and release front suspension. Damping should be smooth throughout the range of travel.
- Check all front suspension components for wear or damage.
- Inspect front strut cartridges for leakage.

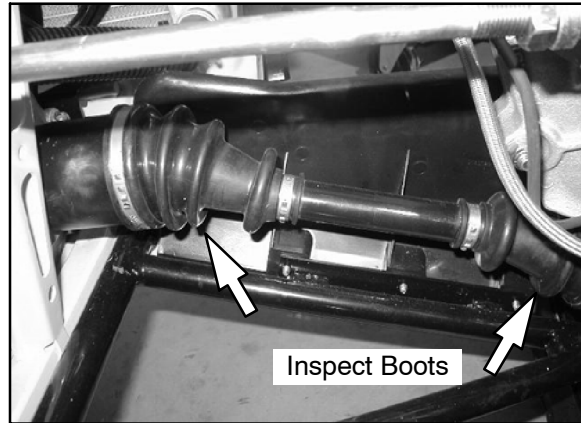
## REAR SUSPENSION



- Compress and release rear suspension. Damping should be smooth throughout the range of travel.
- Check all rear suspension components for wear or damage.
- Inspect shock for leakage.

## CV SHAFT BOOT INSPECTION

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



## CONTROLS

Check controls for proper operation, positioning and adjustment.



Brake control and switch must be positioned to allow brake lever to travel throughout entire range without contacting switch body.



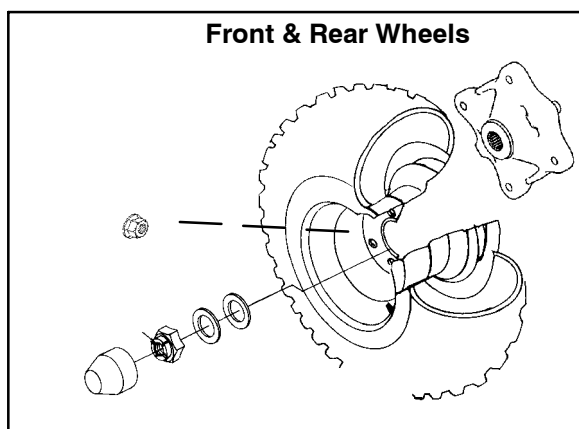
## WHEELS

Inspect all wheels for runout or damage. Check wheel nuts and ensure they are tight. Do not over tighten the wheel nuts.

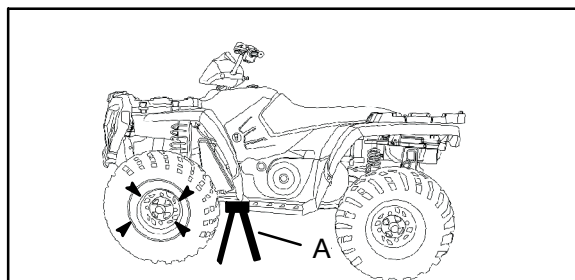
## WHEEL, HUB, TORQUE

Item	Specification
Steel - Front Wheel Nuts	30 Ft. Lbs. (41 Nm)
Steel - Rear Wheel Nuts	30 Ft. Lbs. (41Nm)
Aluminum Front Wheel Nuts	<b>90 Ft. Lbs. (122 Nm)</b>
Aluminum Rear Wheel Nuts	<b>90 Ft. Lbs. (122 Nm)</b>
Front Hub Retaining Nut	70 ft.lbs. (90 Nm)
Rear Hub Retaining Nut	80 Ft. Lbs. (108 Nm)

## WHEEL REMOVAL: FRONT OR REAR



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



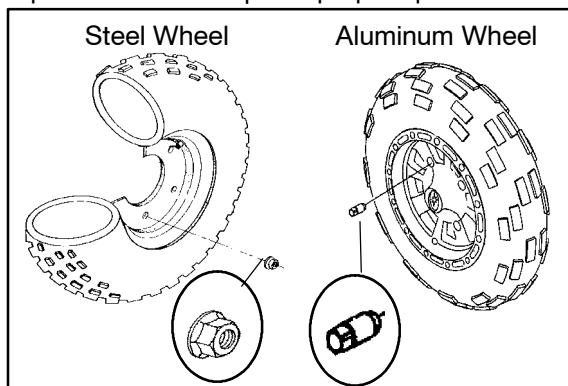
4. Remove the wheel nuts and remove the wheel.

## WHEEL INSTALLATION

1. With the transmission in gear and the parking brake locked, place the wheel in the correct position on the wheel hub. Be sure the valve stem is toward the outside and rotation arrows on the tire point toward forward rotation.
2. Attach the wheel nuts and finger tighten them.
3. Lower the vehicle to the ground.
4. Securely tighten the wheel nuts to the proper torque listed in the table.

### **CAUTION:**

Improperly installed wheels 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. Torque to proper specification.



## TIRE PRESSURE

### **CAUTION:**

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

Tire Pressure Inspection (PSI - Cold)	
Front	Rear
5	5

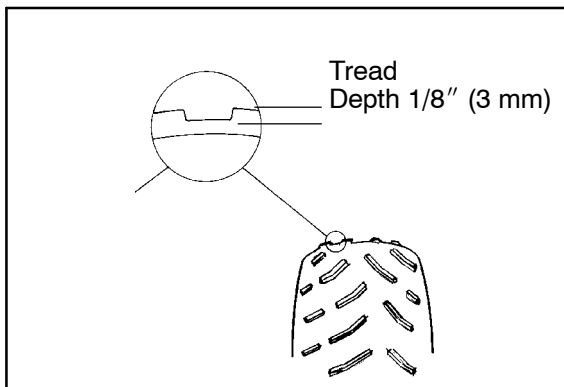


## TIRE INSPECTION

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

### Tire Tread Depth

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



**▲ WARNING**

Operating an ATV with worn tires will increase the possibility of the vehicle skidding and possible loss of control.

Worn tires can cause an accident.

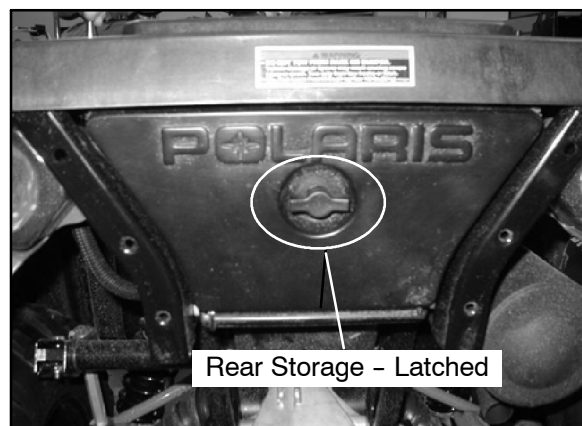
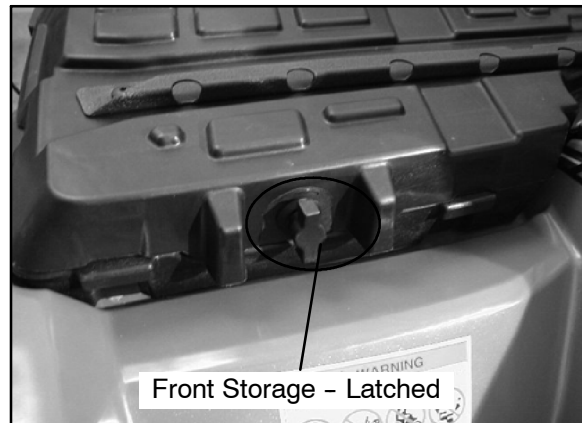
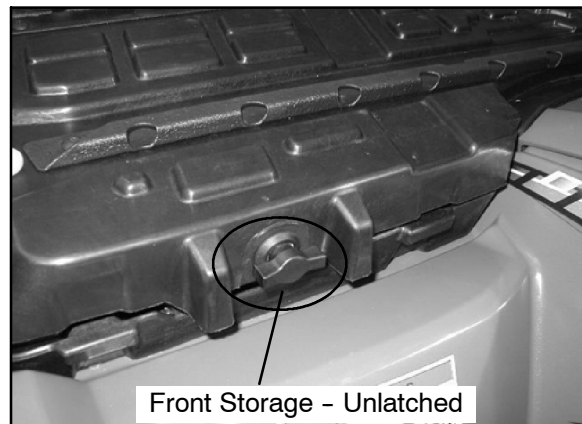
Always replace tires when the tread depth measures 1/8" (.3 cm) or less.

## FRAME, NUTS, BOLTS, 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.

## FRONT / REAR STORAGE COMPARTMENTS

The front and rear storage compartments are easily accessible. To open the front compartment turn the latch handle to the horizontal position on both sides. To close the storage compartment turn the latch handles to the vertical position.



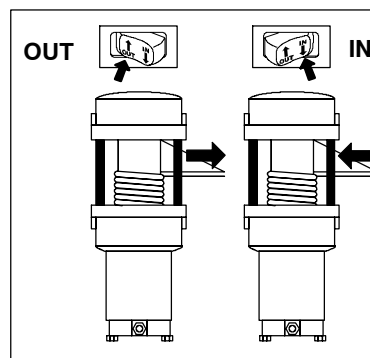
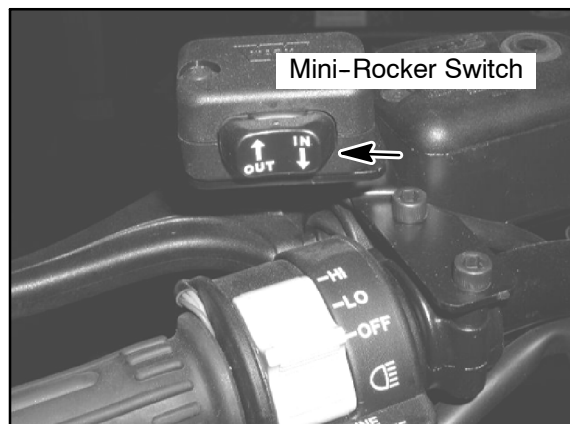


## **WARN® WINCH OPERATION (If Equipped)**

This information is for Sportsman models equipped with a 2500 lb. (2.5ci) Warn® Winch in the front.



The mini-rocker (IN/OUT) control controls the direction of the cable for the winch. **IN** pulls the cable into the winch and **OUT** feeds the cable out of the winch.



### **Winch Handlebar Controls**

The winch is located in the front bumper area.

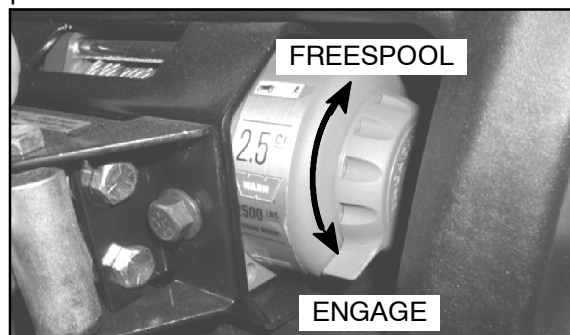


### **Winch Control**

The winch control located on the side of the winch gives the operator easy access to switch between **ENGAGED** and **FREESPOOL**.

When the winch is **ENGAGED**, the winch only allows the cable to be pulled **IN** or released **OUT** via the mini-rocker switch on the handlebar.

When the winch is **FREESPOOL**, the winch allows the cable to be pulled out freely. **NOTE:** The switch on the handlebar does not have to be in the **OUT** position.







## Winch Wire Locations

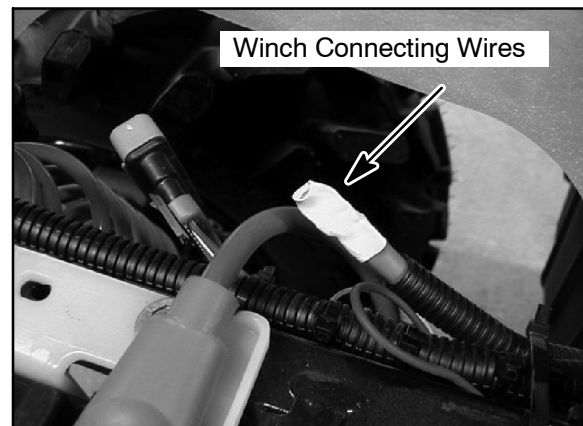
The winch wires can be located under the front cab area. Locate the wires, remove the cap and hook up to winch the Blue and Yellow (6 Ga.) wires to the winch. Refer to the installation instructions for more details.



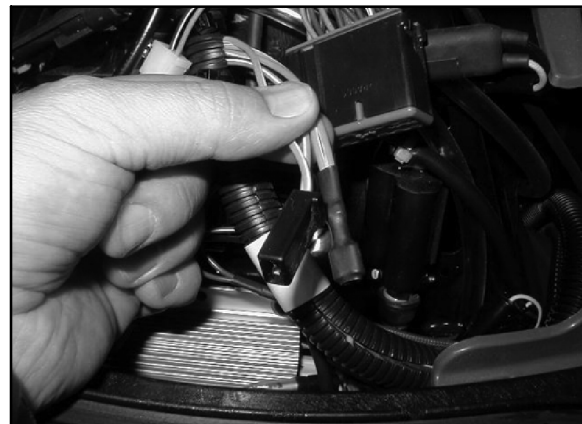
or



The Red wire (6 Ga.) with the yellow crimp cover is located under the left rear fender next to the starter solenoid. The red wire connects to the battery.



The Orange/White wires are located under the front cover (under headlight pod). The Orange/White wires supply the control power to the winch.







## CLEANING & STORAGE OF ATV

### Cleaning the ATV

Keeping your ATV clean will not only improve its appearance but it can also extend the life of various components. With a few precautions, your ATV can be cleaned much like an automobile.

### Washing the ATV

The best and safest way to clean your ATV is with a garden hose and a pail of mild soap and water. Use a professional type washing mitt, cleaning the upper body first and the lower parts last. Rinse with water frequently and dry with a chamois to prevent water spots. **NOTE:** If warning and safety labels are damaged, contact your a Polaris dealer for free replacement.

Polaris does not recommend the use of a high pressure type car wash system for washing the ATV. If a high pressure system is used, exercise extreme care to avoid water damage to the wheel bearings, transmission seals, body panels, brakes and warning labels. **NOTE:** Grease all zerk fittings immediately after washing, and allow the vehicle to run for a while to evaporate any water that may have entered the engine or exhaust system.

### Waxing the ATV

Your ATV can be waxed with any non-abrasive automotive paste wax. Avoid the use of harsh cleaners since they can scratch the body finish. Polaris offers a detailing kit for your ATV, see Page 2.7.

**CAUTION:** *Certain products, including insect repellants and chemicals, will damage plastic surfaces. Use caution when using these products near plastic surfaces.*

### Storage Tips

See Page 2.7 for the part numbers of Polaris products.

**CAUTION:** *Starting the engine during the storage period will disturb the protective film created by fogging and damage could occur. Never start the engine during the storage period.*

### Clean the Exterior

Make necessary repairs and then clean the ATV thoroughly with mild soap and warm water to remove all dirt and grime. Don't use harsh detergents or high pressure washers. Some detergents deteriorate rubber parts. Use dish soap type cleaners only. High pressure washers may force water past seals.

### Stabilize the Fuel

Fill the fuel tank. Add Polaris Carbon Clean Fuel Treatment or Polaris Fuel Stabilizer. Follow the instructions on the container for the recommended amount. (Carbon clean will also reduce the possibility of bacterial growth in the fuel system.) Allow 15-20 minutes of operation for the stabilizer to disperse through the fuel in the tank and carburetor. Turn the fuel valve off and drain the carburetor bowl.

### Oil and Filter

Warm the engine and change the oil and filter. Follow the procedure in this chapter for proper oil change.

### Air Filter / Air Box

Inspect and clean or replace the pre-cleaner and air filter. Clean the air box and drain the sediment tube.

### Breather Filter

Inspect and clean or replace the breather filter.

### Fluid Levels

Inspect the following fluid levels and change if necessary: front gearcase; transmission; brake fluid (change every two years or as required if fluid looks dark or contaminated).

### Drain the Recoil Housing

Remove the recoil housing drain plug and drain any moisture.

### Storage Tips

Polaris offers storage kits for you ATV, see Page 2.7 for the part numbers of Polaris products.

### Fog the Engine

Use Polaris Fogging Oil, following the instructions as directed.

If you choose not to use Polaris Fogging Oil, perform the following procedure.

1. Treat the fuel system with Polaris Carbon Clean. Turn fuel petcock to 'OFF'.
2. To eliminate any fuel remaining in the carburetor, run the engine until it stops. If Polaris fuel system additive is not used, fuel tank, fuel lines, and carburetor should be completely drained of gasoline.
3. To access the plug hole, use a section of clear 1/4" hose and a small plastic squeeze bottle filled with the pre-measured amount of oil.
4. Remove the spark plug(s). Rotate the piston to BDC and pour approximately two ounces of Polaris oil into the cylinder.

**NOTE:** Do this carefully! If you miss the plug hole, oil will drain from the spark plug cavity into the hole at the front of the cylinder head, and appear to be an oil leak.





5. Apply dielectric grease to the inside of the spark plug cap and install the cap onto the plug.
6. Turn the engine over several times to ensure coverage of piston rings, cylinder walls and crankshaft bearings.
7. Treat the fuel system with Polaris Carbon Clean.
8. If Polaris fuel system additive is not used, fuel tank, fuel lines, and carburetor should be completely drained of gasoline. To eliminate any fuel remaining in the carburetor, run the engine until it stops.

### Lubricate

Inspect all cables and lubricate with Polaris Cable Lubricant. Follow lubrication guidelines in the maintenance section of the service or owner's manual to completely grease and lubricate the entire vehicle with Polaris Premium All Season Grease.

### Storage Tips

#### Battery Storage

Remove the battery from the vehicle and ensure that it's fully charged before placing it in storage. See Chapter 10 for instructions.

#### Engine Anti-Freeze

Test engine coolant strength and change if necessary. Coolant should be replaced every two years. See Page 2.18 for the proper test procedure.

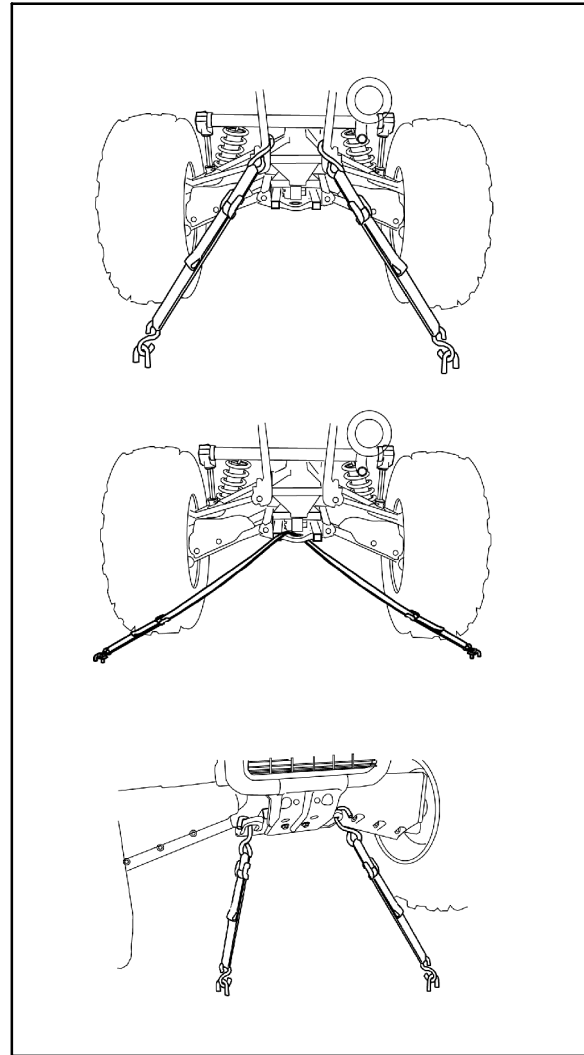
#### Storage Area/Covers

Set the tire pressure and safely support the ATV with the tires 1-2" off the ground. Be sure the storage area is well ventilated, and cover the machine with a genuine Polaris ATV cover. **NOTE:** Do not use plastic or coated materials. They do not allow enough ventilation to prevent condensation, and may promote corrosion and oxidation.

### Transporting the ATV

Follow these procedures when transporting the vehicle.

1. Turn off the engine and remove the key to prevent loss during transporting.
2. Always place the transmission in park and lock the parking brake.
3. Turn the fuel valve off.
4. Be sure the fuel cap, oil cap and seat are installed correctly.
5. Always tie the frame of the ATV to the transporting unit securely using suitable straps or rope.



### 800 EFI Exhaust Canister Maintenance

The exhaust canisters on Polaris 800 EFIs are ceramic coated. To maintain a beautiful finish and prevent corrosion, periodic maintenance is required.

**DO NOT use caustic chemicals to clean, as they may damage the finish.**

1. Wash any accumulated mud or debris from the canisters with a soft brush and soapy water.
2. Use a cleaner, such as HPC HiPerWash™ to clean away any remaining grime, salts or oils.
3. If the canisters are stained from oils or other fluids, use fine steel wool with HPC Liquid Buff™ Cleaner and Polish to remove the stain.
4. After removing the stains, polish using Liquid Buff and a soft cloth.

Repeat this procedure as often as desired to maintain the canister's finish.

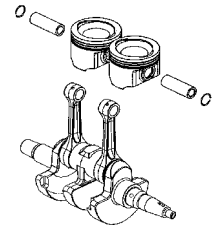


# CHAPTER 3

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## ENGINE

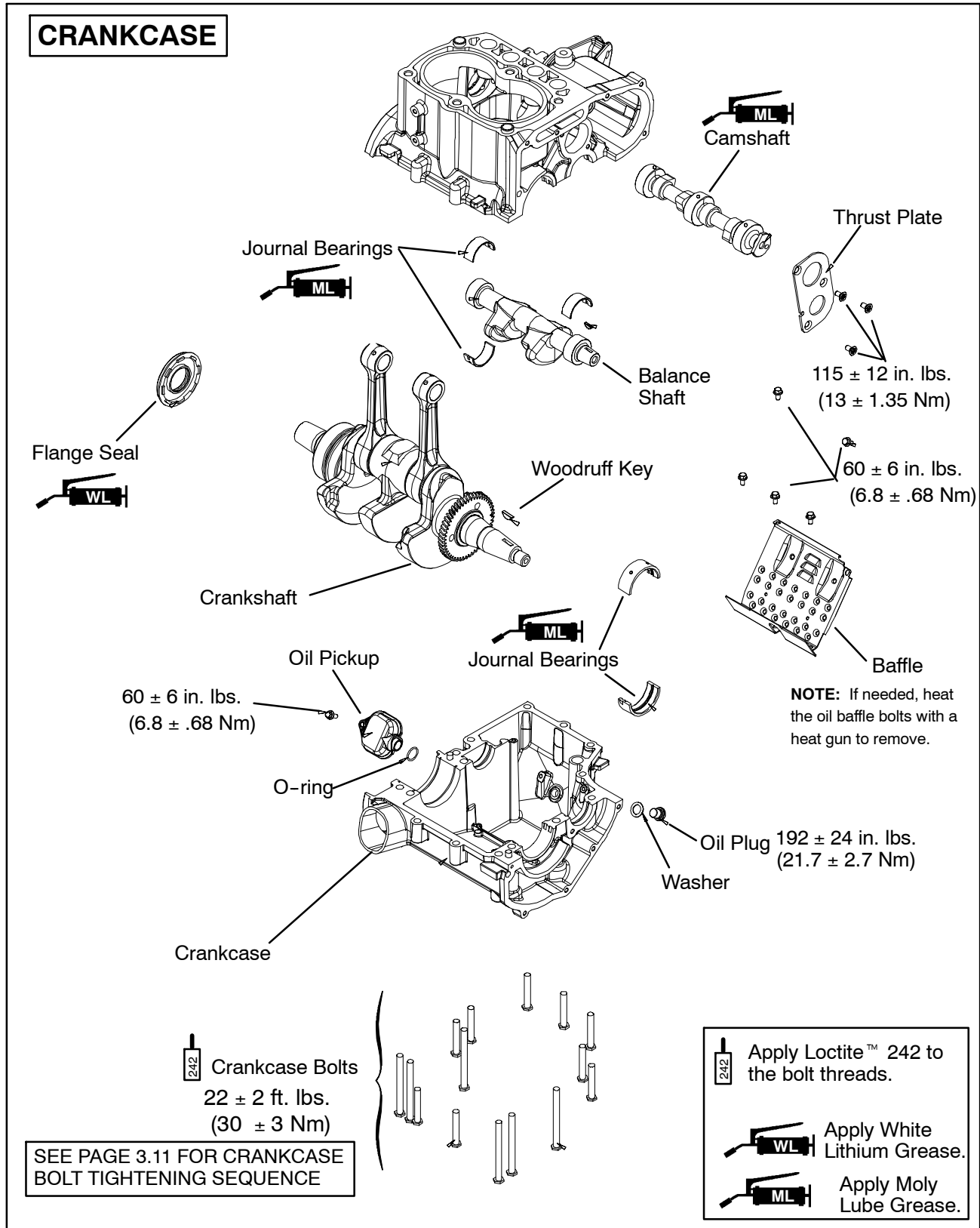
Engine Exploded Views .....	3.2-3.7
Exhaust System View / Notes .....	3.8
Special Tools .....	3.9
Piston Identification .....	3.9
Torque Specifications .....	3.10
Engine Fastener Torque Patterns .....	3.11
Engine Service Data .....	3.12-3.14
Cooling System Specifications .....	3.15
Cooling System Test .....	3.15
Engine Removal/Installation .....	3.16-3.17
Engine Installation Notes .....	3.17-3.18
Cylinder Honing .....	3.19
Oil Flow .....	3.20
Rocker Arm/Pushrod Inspection .....	3.21
Cylinder Head Disassembly/Inspection .....	3.21-3.23
Valve Inspection .....	3.24
Combustion Chamber .....	3.25
Valve Seat Reconditioning .....	3.25-3.27
Cylinder Head Assembly .....	3.27
Valve Sealing Test .....	3.28
Valve Train Exploded View .....	3.28
Engine Head Reassembly .....	3.29-3.30
Cylinder Removal .....	3.31
Valve Lifter Removal/Inspection .....	3.31
Piston Removal .....	3.31-3.32
Cylinder Inspection .....	3.32-3.33
Piston/Rod/Ring Service .....	3.33-3.35
Starter Bendix Removal/Inspection .....	3.36
Flywheel/Stator Removal/Inspection .....	3.37
Flywheel/Stator Installation .....	3.37-3.38
Engine Crankcase Disassembly/Inspection .....	3.38-3.46
Camshaft Inspection .....	3.47
Engine Crankcase Assembly .....	3.47-3.58
Troubleshooting .....	3.59-3.60
4-Stroke Coolant System Bleeding Procedure ..	3.61





**ENGINE EXPLODED VIEW**

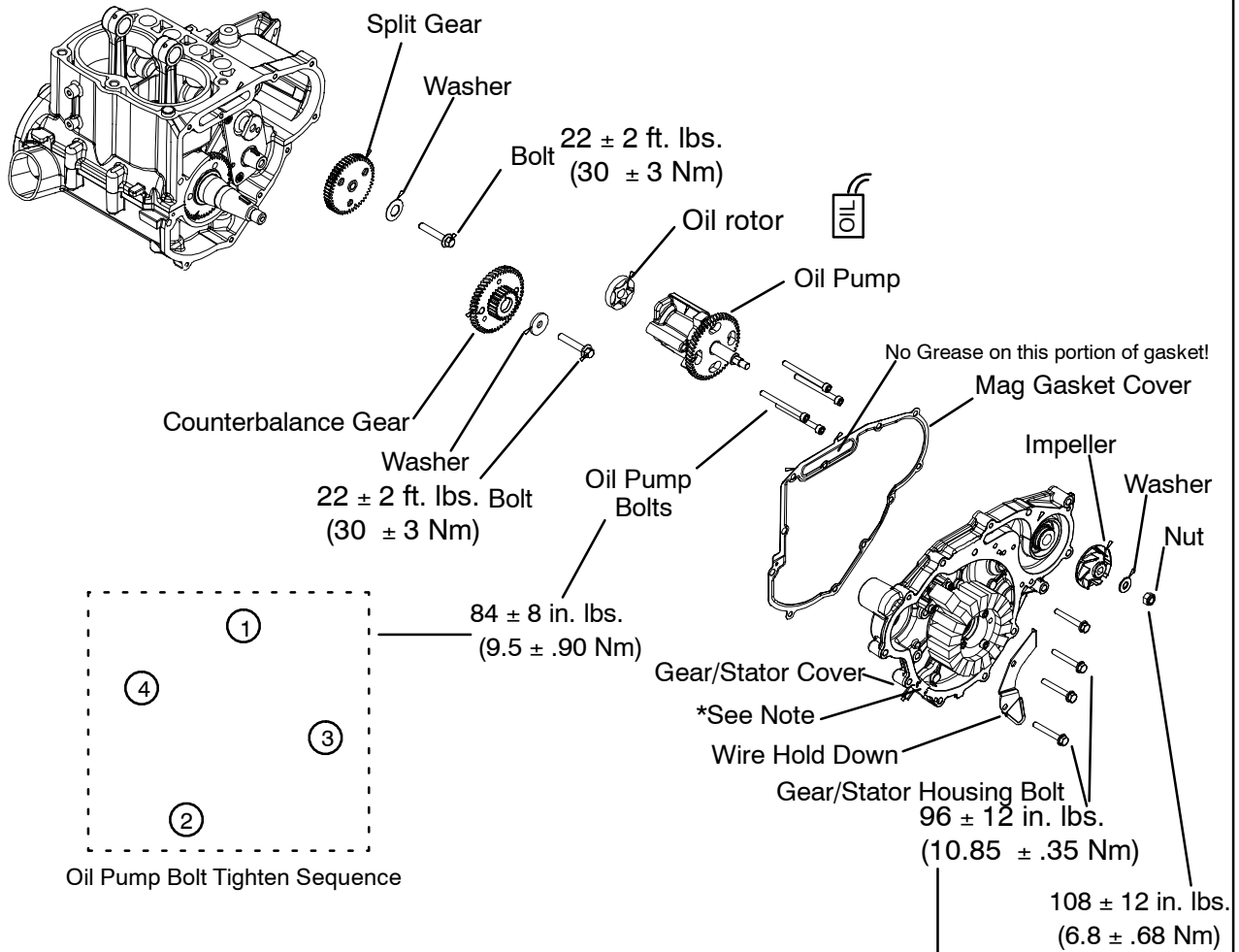
**CRANKCASE**





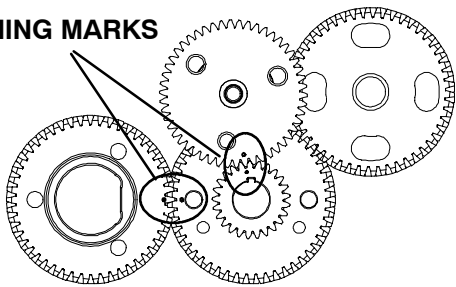
# ENGINE EXPLODED VIEW

## MAG SIDE

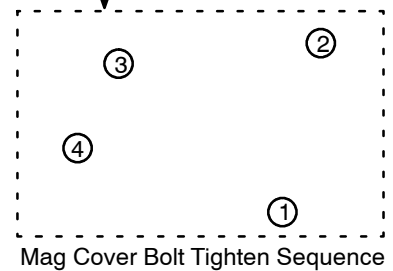



\*NOTE: Apply Corrosion Resistant Grease to Stator Grommet Area


### TIMING MARKS



GEAR TIMING AT TDC



 Apply Polaris 0W-40 oil to component.

 Apply White Lithium Grease.

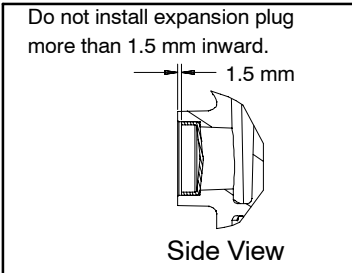




# ENGINE EXPLODED VIEW

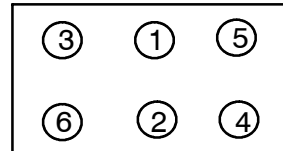
## TOP END

- 1 Lubricate threads and between washers and underside of bolt heads with engine oil. Torque in sequence provided.
- 2 Apply Moly Lube grease to valve tips.
- 3 Gasket free of oil. Verify tabs are visible.
- 4 Apply thin film of 0W-40 to 25-55 mm of cylinder bore.
- 5 Apply 0W-40 to piston pin or pin bore.
- 6 Apply 0W-40 to lifters.

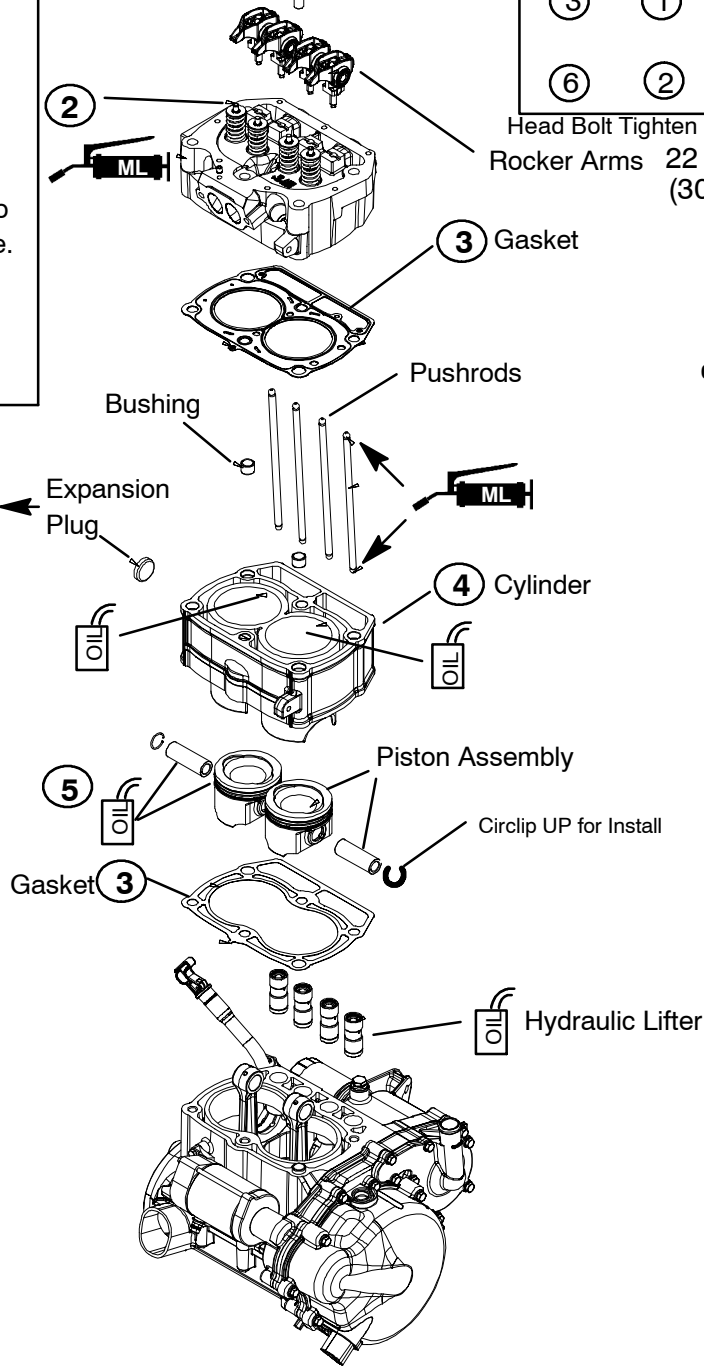


Head Bolts  
 (Each Bolt Threads)

1 Initial:  $15 \pm 2$  ft. lbs. ( $20.3 \pm 2.7$  Nm) to seat gasket and back off 5 turns. Re-torque to  $35 \pm 4$  ft. lbs. ( $47.5 \pm 5.5$  Nm). Finalize sequence by tightening an additional  $90^\circ$  (1/4 turn)



Head Bolt Tighten Sequence  
 Rocker Arms  $22 \pm 2$  ft. lbs. ( $30 \pm 3$  Nm)



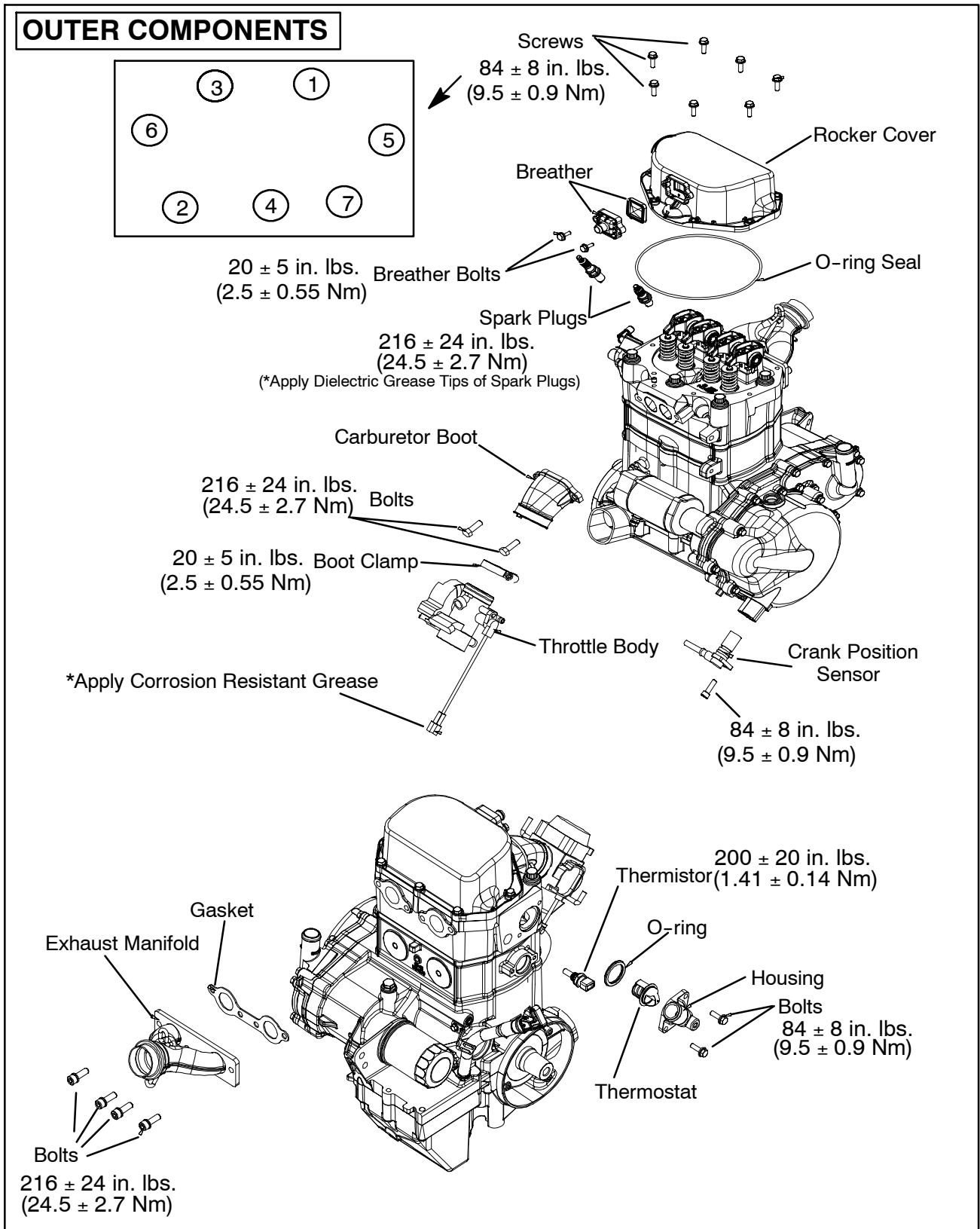
- Apply Polaris 0W-40 oil.
- Apply Moly Lube Grease.





# ENGINE EXPLODED VIEW

## OUTER COMPONENTS

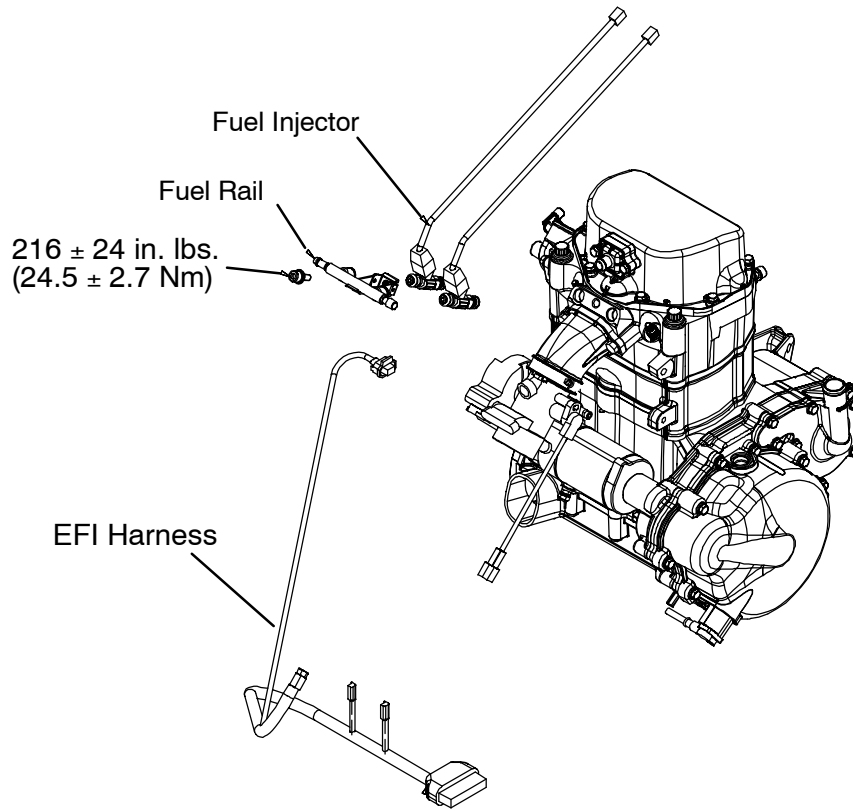






## ENGINE EXPLODED VIEW

### ELECTRICAL COMPONENTS



**NOTE:** See Chapter 4 for more information the EFI system.



## EXHAUST SYSTEM

### NOTE: Silencer Removal

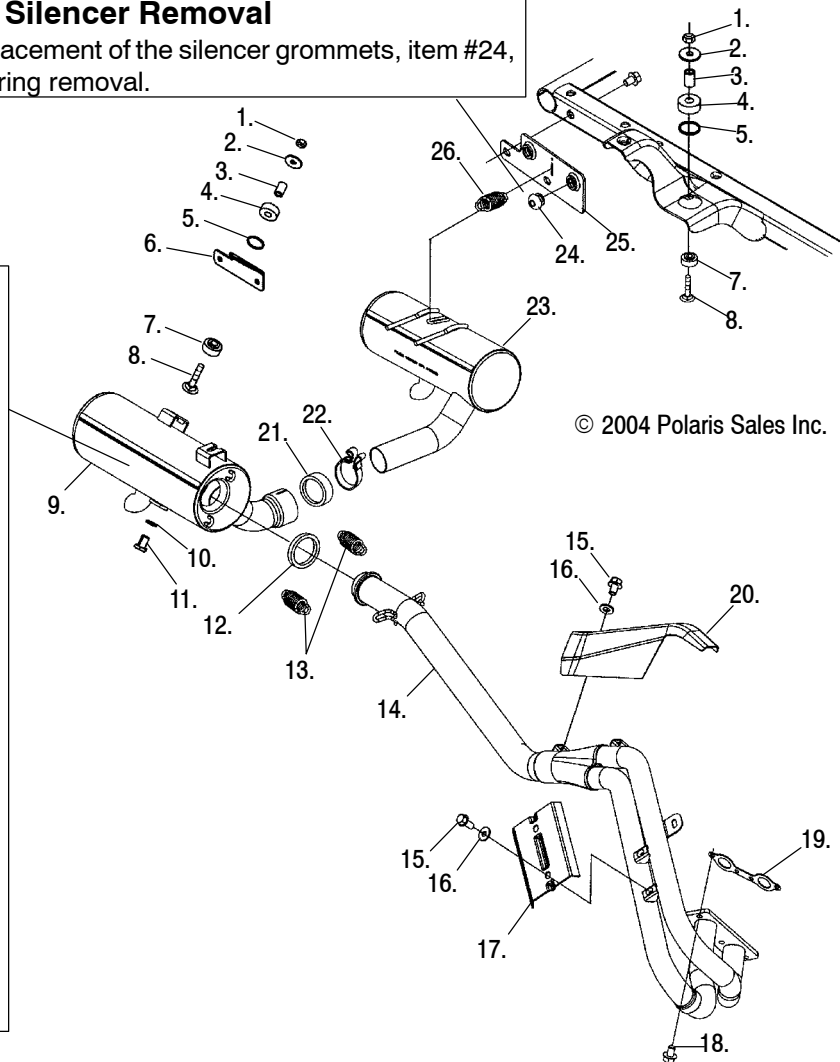
Silencer removal requires replacement of the silencer grommets, item #24, as they become damaged during removal.

### 800 EFI Exhaust Canister Maintenance

The exhaust canisters on Polaris 800 EFIs are ceramic coated. To maintain a beautiful finish and prevent corrosion, periodic maintenance is required. ***DO NOT use caustic chemicals to clean, as they may damage the finish.***

1. Wash any accumulated mud or debris from the canisters with a soft brush and soapy water.
2. Use a cleaner, such as HPC HiPerWash™ to clean away any remaining grime, salts or oils.
3. If the canisters are stained from oils or other fluids, use fine steel wool with HPC Liquid Buff™ Cleaner and Polish to remove the stain.
4. After removing the stains, polish using Liquid Buff and a soft cloth.

Repeat this procedure as often as desired to maintain the canister's finish.



Ref. Qty.	Description	Ref. Qty.	Description
1.	2 Nut, Nylok	14.	1 Exhaust, Pipe, Dual, Black
2.	2 Washer	15.	4 Screw
3.	2 Bushing	16.	4 Washer
4.	2 Washer, Rubber	17.	1 Shield, Heat, Dual
5.	2 Bushing	18.	4 Screw
6.	1 Bracket, Silencer, Frame	19.	1 Gasket
7.	2 Dampener, Vibration	20.	1 Shield, Heat, Exhaust, Top
8.	2 Bolt	21.	1 Seal, Exhaust
9.	1 Exhaust, Silencer, RH	22.	1 Clamp, Exhaust
10.	1 Washer, Clean Out	23.	1 Exhaust, Silencer, LH
11.	1 Bolt	24.	2 Grommet, Silencer, Mount
12.	1 Seal, Exhaust Socket	25.	1 Bracket, Silencer, Mount
13.	2 Spring	26.	1 Spring



## **SPECIAL TOOLS**

<b>PART NUMBER</b>	<b>TOOL DESCRIPTION</b>
<b>PV-43527</b>	Oil Filter Wrench
<b>2200634</b>	Valve Seat Reconditioning Kit
<b>PU-45257</b>	Valve Spring Compressor
<b>PU-45652</b>	Valve Pressure Hose
<b>2871043</b>	Flywheel Puller
<b>2870390</b>	Piston Support Block
<b>PU-45497-2</b>	Cam Gear Tooth Alignment Tool
<b>PU-45497-1</b>	Cam Gear Spring Installation Kit (Tapered Pins)
<b>PU-45498</b>	Cam Spanner Wrench
<b>PU-45838</b>	Gear Holder
<b>PA-44995</b>	Water Pump Mechanical Seal Installer
<b>PU-45543</b>	Universal Driver Handle
<b>PU-45483</b>	Main Seal Installer
<b>PU-45658</b>	Main Crankshaft Seal Saver
<b>PA-45401</b>	Water Pump Seal Saver
<b>2870975</b>	Mity Vac™ Pressure Test Tool
<b>PU-45778</b>	Oil System Priming Tool

## **ACCESSIBLE COMPONENTS**

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

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

The following components require engine removal for service:

- Counterbalance Shaft or Bearing(s)
- Connecting Rod
- Crankshaft
- Crankshaft Main Bearings
- Crankcase

## **PISTON IDENTIFICATION**

Four stroke engine rings have a rectangular profile. See text on Page 3.29 for ring installation. Use the information below to identify pistons and rings.

**NOTE:** The pistons have no directional identification marks. New pistons are non-directional.

<b>Engine Model No.</b>	<b>Piston Diameter</b>	<b>Standard Piston Identification</b>
EH076OLE	80 mm	None
EH068OLE	80 mm	None





## TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS			
Fastener	Size	<u>700/800</u> in. Lbs. (Nm)	<u>700/800</u> ft.lbs. (Nm)
Camshaft Gear	8 mm	-	22 ± 2 (30 ± 3)
Camshaft Thrust Plate	6 mm	115 ± 12 (13 ± 1.35)	-
Carburetor Adaptor Bolts	8 mm	216 ± 24 (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)	-
Flywheel	14 mm	-	65 ± 7 (88 ± 9.50)
Magneto Cover	6 mm	*96 ± 12 (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)	-
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)	-
Starter Motor	6 mm	*84 ± 8 (9.5 ± 0.9)	-
Stator Assembly	6 mm	96 ± 12 (10.85 ± 1.35)	-
Stator Housing	6 mm	*96 ± 12 (10.85 ± 1.35)	-
Temperature Switch	3/8 PT	-	25 ± 3 (34 ± 4)
Thermostat Housing	6 mm	84 ± 8 (9.5 ± 0.9)	-
Timing Plug	3/4-16	-	7-9 (10-12 Nm)
Trigger Coil/Stator Wire Holddown	5 mm	*96 ± 12 (10.85 ± 1.35)	-
Water Pump Housing Cover	6 mm	*96 ± 12 (10.85 ± 1.35)	-
Water Pump Impeller Nut	8 mm	108 ± 12 (12 ± 1.35)	-

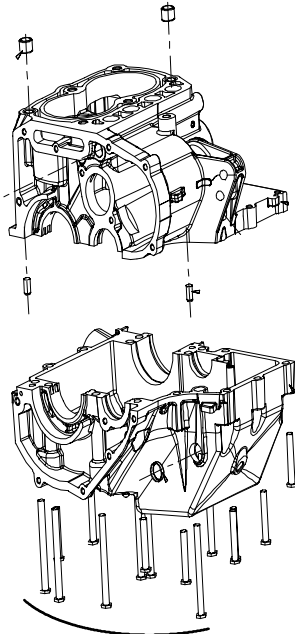
\* See exploded views for notes or torque sequences.



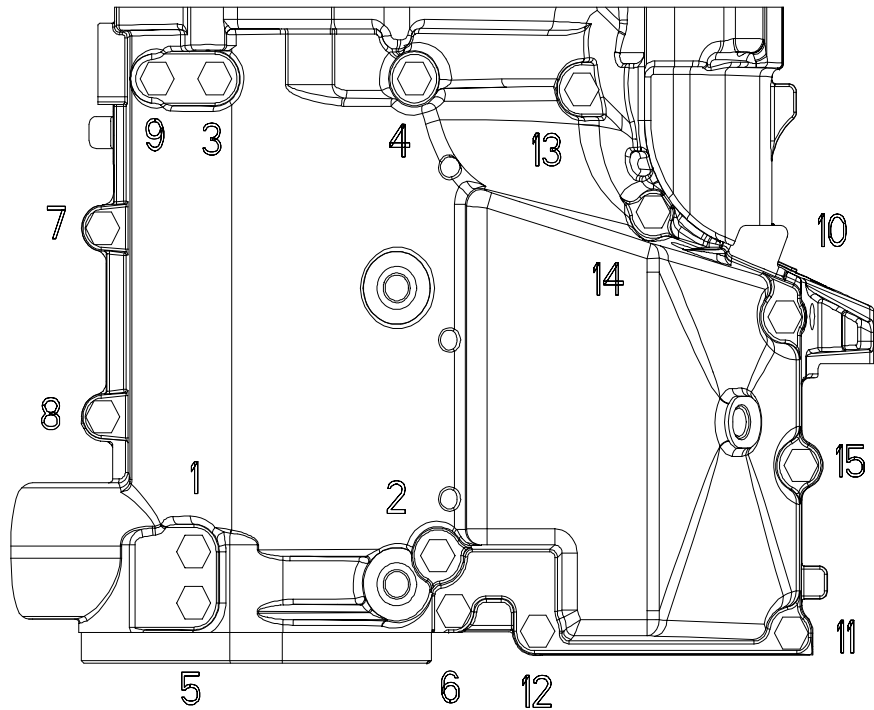
# ENGINE FASTENER TORQUE PATTERNS

Tighten cylinder head/cylinder base, and crankcase fasteners in the following sequence outlined below.

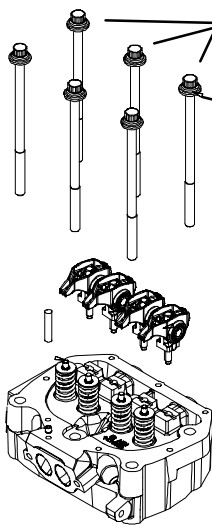
## CRANKCASE BOLT TIGHTEN SEQUENCE



22 ± 2 ft. lbs.  
(30 ± 3 Nm)

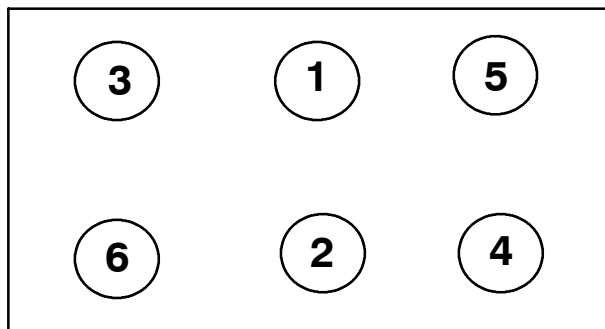


## CYLINDER HEAD BOLT TIGHTEN SEQUENCE



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. + 90° (1/4 turn)  
(47.5 ± 5.5 Nm)





## 700/800 EFI ENGINE SERVICE DATA

**Cylinder Head / Valve				EFI Engine No. - EH680OLE / EH780OLE
Camshaft	Cam lobe height	In	Std	1.3334" (33.8674 mm)
		Ex	Std	1.3334" (33.8674 mm)
	Camshaft journal OD	Mag		1.654" ± 0.00039" (42 ± 0.010 mm)
		Center		1.634" ± 0.00039" (41.50 ± 0.010 mm)
		PTO		1.614" ± 0.00039" (41 ± 0.010 mm)
	Camshaft journal bore ID	Mag		1.656" ± 0.00039" (42.07 ± 0.010 mm)
		Center		1.637" ± 0.00039" (41.58 ± 0.010 mm)
		PTO		1.617" ± 0.00039" (41.07 ± 0.010 mm)
	Camshaft Oil clearance		Std	0.00276" ± 0.00079" (0.07 ± 0.02 mm)
	End Play			0.0167" ± 0.0098" (0.425 ± 0.25 mm)
Counter Balance	End Play			0.005" (0.127 mm)
Cylinder Head	Surface warpage limit			0.00394" (0.1 mm)
	Standard height			3.478" (88.35 mm)
Valve Seat	Contacting width	In	Std	0.0472" + 0.00787" - 0.0039" (1.20 + 0.20 - 0.10 mm)
			Ex	0.0591" + 0.00787" - 0.0039" (1.50 + 0.20 - 0.10 mm)
	Seat Angle		Std	45.5 ± 0.25°
	Valve Guide	Inner diameter		
Protrusion above head			0.807" ± 0.0039" (20.50 ± 0.01 mm)	
Valve	Margin Thickness	In	Std	0.79" (20.06mm)
				Max- 0.98" (24.89mm) Min- 0.59" (14.98mm)
		Ex	Std	0.80" (3.488 mm)
				Max- 1.0" (25.4mm) Min- 0.60" (15.24mm)
	Stem diameter		In	0.2356" ± 0.00039" (5.985 ± 0.01 mm)
			Ex	0.2351" ± 0.00039" (5.972 ± 0.01 mm)
	Stem oil clearance	Std	In	0.00228" ± 0.00098" (0.058 ± 0.025 mm)
			Ex	0.00275" ± 0.00098" (0.0870 ± 0.025mm)
	Overall length		In	4.51" ± 0.01476" (114.5550 ± 0.375 mm)
			Ex	4.5453" ± .01496" (115.45 ± 0.38 mm)
Valve Spring	Overall length		Free Length	1.735" (46.069 mm)
			Installed Height	Intake - 1.4638" (37.18 mm) Exhaust - 1.4736" (37.43 mm)

\*\*denotes cylinder head with bronze valve guide

**700/800 EFI ENGINE SERVICE DATA**

Cylinder / Piston / Connecting Rod		EFI Engine No. EH680OLE	EFI Engine No. EH780OLE
Cylinder	Surface warpage limit (mating with cylinder head)	0.004" (0.10 mm)	Same
	Cylinder bore	Std 3.1495" (80 mm)	Same
	Taper limit	0.00031" (0.008 mm)	Same
	Out of round limit	0.00030" (0.0075 mm)	Same
	Piston clearance	Std .040" ± .015" (.041 ± .016 mm)	Same
	Boring limit	N/A	N/A
Lifter	Outer Diameter	Std 0.84245" ± 0.00025" (21.39 8± 0.00635 mm)	Same
	Block Bore	Std 0.8438" ± 0.00062" (21.4322 ± 0.0157 mm)	Same
Piston		Std 3.1477" ± .000121" (79.954± .003mm)	3.14803" ± .00028" (79.960 ± .007 mm)
	Standard inner diameter of piston pin bore	0.78789" ± .00009" (20.0125 ± 0.003 mm)	0.70902" ± .00012" (18.009 ± 0.003 mm)
Piston Pin	Outer diameter	0.7874" - 0.7872" (20 - 19.995 mm)	0.70866" - 0.70846" (18 - 17.995 mm)
	Standard clearance-piston pin to pin bore	0.00059" ± 0.0002" (0.015 ± 0.005 mm)	0.00047" ± 0.00024" (0.012 ± 0.006 mm)
	Degree of fit	Piston pin must be a push (by hand) fit at 68° F (20° C)	Same



## 700/800 EFI ENGINE SERVICE DATA

Cylinder / Piston / Connecting Rod				EFI Engine No. EH680OLE	EFI Engine No. EH780OLE
Piston Ring	Piston ring installed gap	Top ring	Std	0.0059- 0.0138" (0.15 ± 0.35 mm)	0.0059 - 0.0138" (0.15 ± 0.35 mm)
			Limit	> 15% Leakdown	> 15% Leakdown
		Second ring	Std	0.0098 - 0.0197" (0.25 ± 0.50 mm)	0.0098 - 0.0197" (0.25 ± 0.50 mm)
			Limit	> 15% Leakdown	> 15% Leakdown
		Oil ring	Std	0.0196" ± .00984" (0.50 ± 0.25 mm)	0.0196" ± .00984" (0.50 ± 0.25 mm)
			Limit	> 15% Leakdown	> 15% Leakdown
	Standard clearance piston ring to ring groove	Top ring	Std	0.0024" ± 0.0008" (0.060 ± 0.020 mm)	0.0024" ± 0.0008" (0.060 ± 0.020 mm)
			Limit	> 15% Leakdown	> 15% Leakdown
Second ring		Std	0.0028" ± 0.0008" (0.070 ± 0.020 mm)	0.0028" ± 0.0008" (0.070 ± 0.020 mm)	
		Limit	> 15% Leakdown	> 15% Leakdown	
Connecting Rod	Connecting rod small end ID			.789 - .78841" (20.030 - 20.015 mm)	.7096" ± 0.0003 (18.023± .008 mm)
	Connecting rod small end radial clearance		Std	0.00098" ± 0.00039" (0.025 ± 0.010 mm)	Same
	Connecting rod big end side clearance		Limit	0.01181" ± 0.00591" (0.30 ± 0.15 mm)	Same
	Connecting rod big end radial clearance		Limit	0.00015" ± 0.00006" (0.0038 ± 0.0015 mm)	Same
	Crankshaft runout limit			0.00236" (0.060 mm)	Same

KEY - Std: Standard; OS: Oversize; ID: Inner Diameter; OD: Outer Diameter; Mag: Magneto Side; PTO: Power Take Off Side



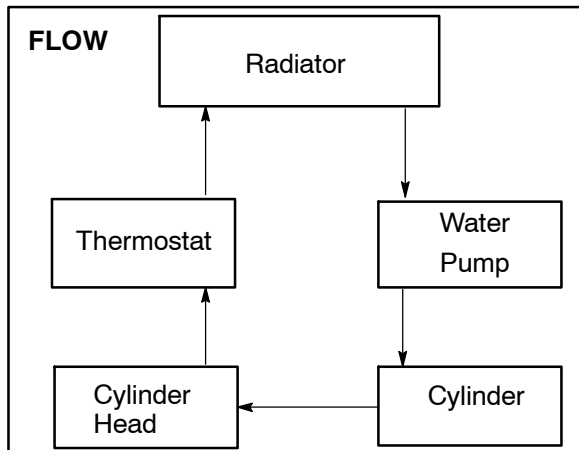


# COOLING SYSTEM SPECIFICATIONS

Condition	Approx. Reading (Min-Max)	Temperature
Hot Light On	178Ω - 190Ω	215° F (102° C)
Fan Off	296Ω - 316Ω	180° F (82° C)
Fan On	236Ω - 251Ω	195° F (91° C)
System Capacity	2.25 Quarts (2.13L)	
Radiator Cap Relief Pressure	13 PSI	

### 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

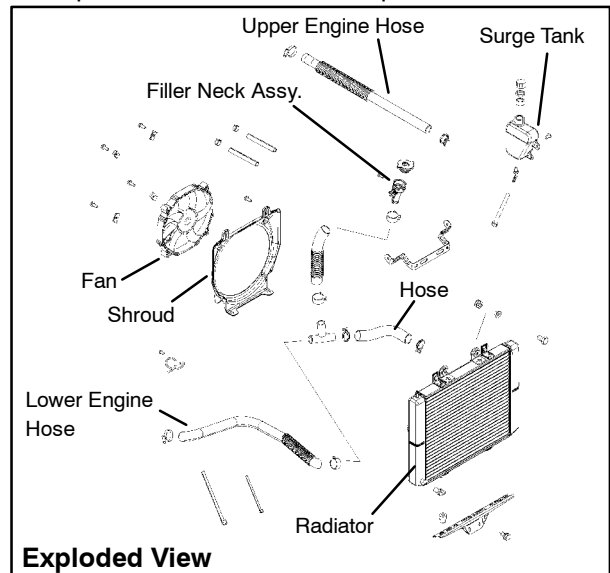
### WARNING

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

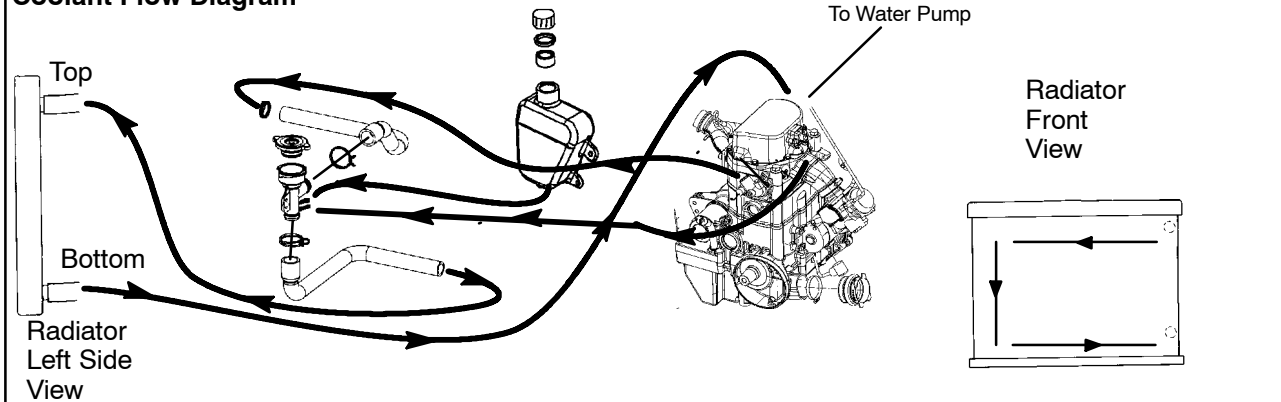
1. Remove front cover.
2. Remove recovery bottle hose from coolant filler neck.
3. Connect a Mity Vac™ (PN 2870975) to the filler neck nipple and pressurize system to 10 psi. The system must retain 10 psi for five minutes or longer. If pressure loss is evident within five minutes, check the radiator, hoses, clamps and water pump seals for leakage.

### Radiator Cap Pressure Test

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



### Coolant Flow Diagram



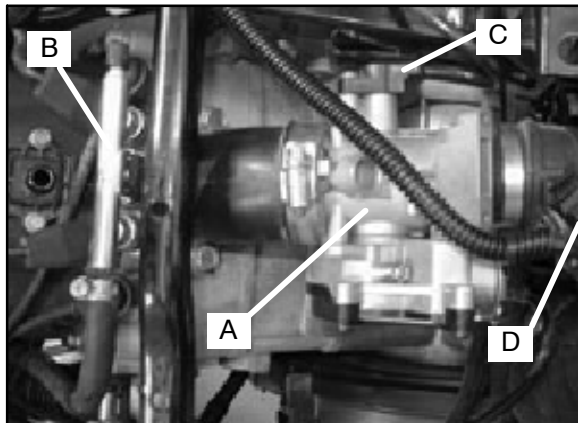


## ENGINE REMOVE & INSTALL

### ⚠ WARNING

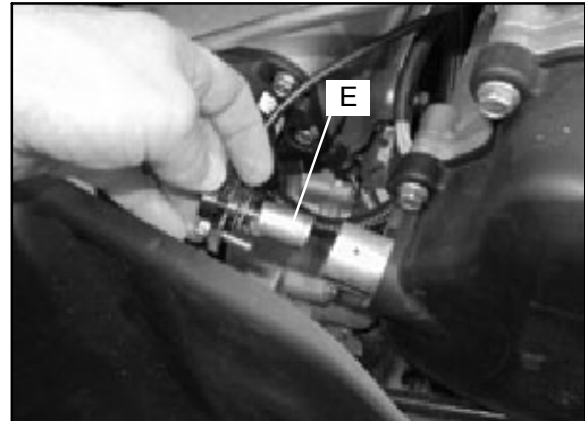
Always wear safety glasses and proper shop clothing when performing the procedures in this manual. Failing to do so may lead to possible injury or death.

1. Clean work area.
2. Thoroughly clean the ATV engine and chassis.
3. Disconnect battery negative (-) cable.
4. Remove the following parts as required:
  - Seat
  - Left and Right Side Covers (Refer to Chapter 5)
  - Fuel Tank Cover / Front Cab (Refer to Chapter 5)
  - Fuel Tank (Refer to Chapter 4)
5. Remove springs from exhaust pipe and remove pipe.
6. Drain coolant and engine oil.
7. Remove air pre-cleaner and duct.
8. Remove airbox.
9. Disconnect the throttle body sensor (C) and the T-map sensor (D). Remove throttle body (A). Insert a shop towel into the engine intake to prevent dirt from entering the intake port.
10. Relieve the fuel pressure in the fuel rail (refer to Chapter 4, "FUEL INJECTION") for proper procedure. Carefully remove the fuel rail (B) and injectors.

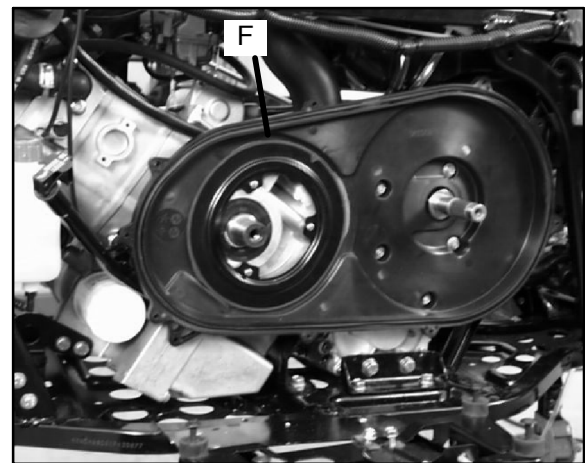


11. Disconnect spark plug high tension leads.

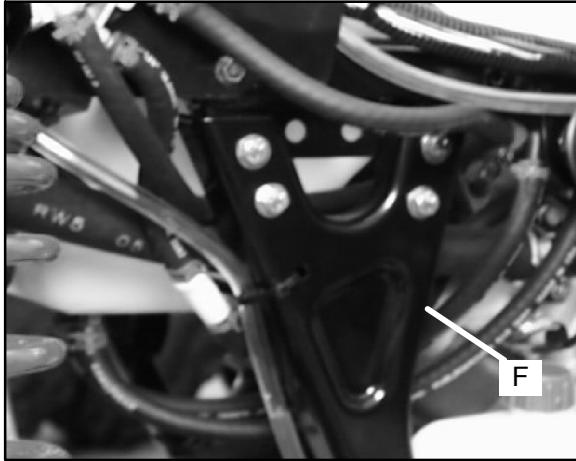
12. Remove the crank position sensor (E) located on the mag cover.



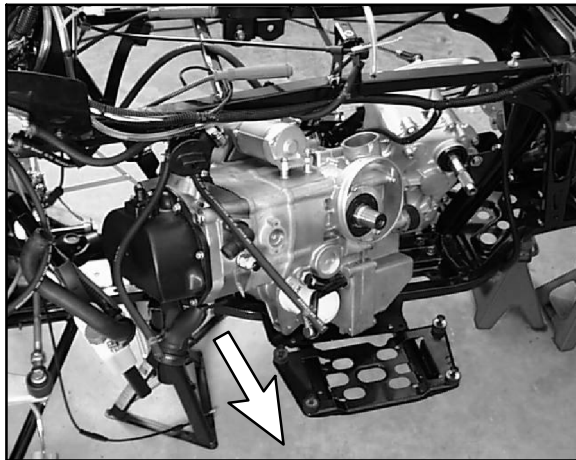
13. Remove the air breather line .



14. Disconnect the coolant hoses. Properly dispose of any antifreeze from the engine or hoses.
15. Refer to PVT System Chapter 6 to remove outer clutch cover, drive belt, drive clutch, driven clutch, and inner cover (F).
16. When removing starter cables, note and mark ground cable and positive(+) cable mounting angle and locations . Remove cables.
17. Remove transmission linkage rod from gear selector and secure out of the way.
18. Disconnect coolant temperature sensor wire located on the cylinder.
19. Remove engine to chassis ground cable.
20. Remove all engine mount nuts and / or engine mount plates. Remove the frame brace (F) from the front left side of the frame.



21. Remove the engine from the left side of the frame.



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

22. For engine installation, reverse procedures.

2. Adjust clutch offset, alignment, and belt deflection. (Chapter 6)
3. Clean clutch sheaves thoroughly and inspect inlet and outlet ducts for proper routing and sealing. (Chapter 6)

#### **Transmission**

1. Inspect transmission operation and adjust linkage if necessary. Refer to Chapter 2 and Chapter 8.

#### **Exhaust**

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

#### **Bleed Cooling System**

**NOTE:** This cooling system contains vent lines to help purge trapped air during filling. Refer to Page 3.15 for hose routing. Bleeding generally should not be necessary.

1. Remove radiator cap and slowly add coolant to the bottom of filler neck.
2. Fill coolant reservoir tank to full mark.
3. Install radiator cap and gently squeeze coolant hoses to force any trapped air out of system.
4. Again, remove radiator cap and slowly add coolant to the bottom of fill neck if needed.
5. Start engine and observe coolant level in the radiator. Allow air to purge and top off as necessary. Reinstall radiator cap and bring engine to operating temperature. After engine is cool, check level in reservoir tank and add coolant if necessary.

**NOTE:** Should the reservoir tank become empty, it will be necessary to refill at the radiator and repeat the bleeding procedure.

## **ENGINE INSTALLATION NOTES**

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

#### **General Items**

1. Install previously removed components using new gaskets, seals, and fasteners where applicable.
2. Perform regular checks on fluid levels, controls, and all important areas on the vehicle as outlined in the daily pre-ride inspection checklist (refer to Chapter 2 or the Owner's Manual).

#### **PVT System**

1. Adjust center distance of drive and driven clutch. (Chapter 6)



## Engine Break In Period

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

### CAUTION

Use only Polaris 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 reservoir level indicated on dipstick. Add oil if necessary.



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 areas on the vehicle.
6. Pull only light loads during initial break in.
7. Change break in oil and filter at 20 hours or 200 miles.



## CYLINDER HONE SELECTION AND HONING PROCEDURE

### 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.

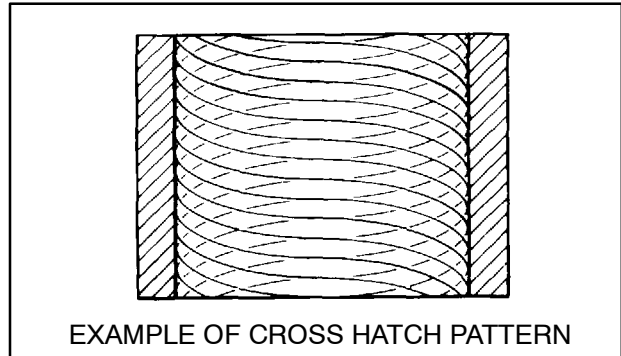
Cylinders may be wet or dry honed depending upon the hone manufacturer's recommendations. Wet honing removes more material faster and leaves a more distinct pattern in the bore.

## 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 deglazed, and to check for correct cross-hatch.  
**NOTE: Do not allow cylinder to heat up during honing.**
- After honing has been completed, inspect cylinder for thinning or peeling.

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



### **IMPORTANT: Clean 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. Use electrical contact cleaner if necessary to clean these areas. Rinse thoroughly, dry with compressed air, and oil the bore immediately with Polaris 4 Cycle Lubricant to prevent the formation of surface rust.

## ENGINE LUBRICATION

**Oil Type** - Polaris Premium 0W-40 Synthetic (PN 2871281)

**Capacity** - Approximately 2 U.S. Quarts (1.9 l)

**Filter** - (PN 2540086)

**Filter Wrench** - PV-43527 or equivalent

**Oil Pressure Specification** - 35-39 PSI @ 5500 RPM, Polaris 0W-40 Synthetic, Engine at operating temperature.

**NOTE:** See Chapter 1 for oil change kit part numbers.

## OIL PRESSURE TEST

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

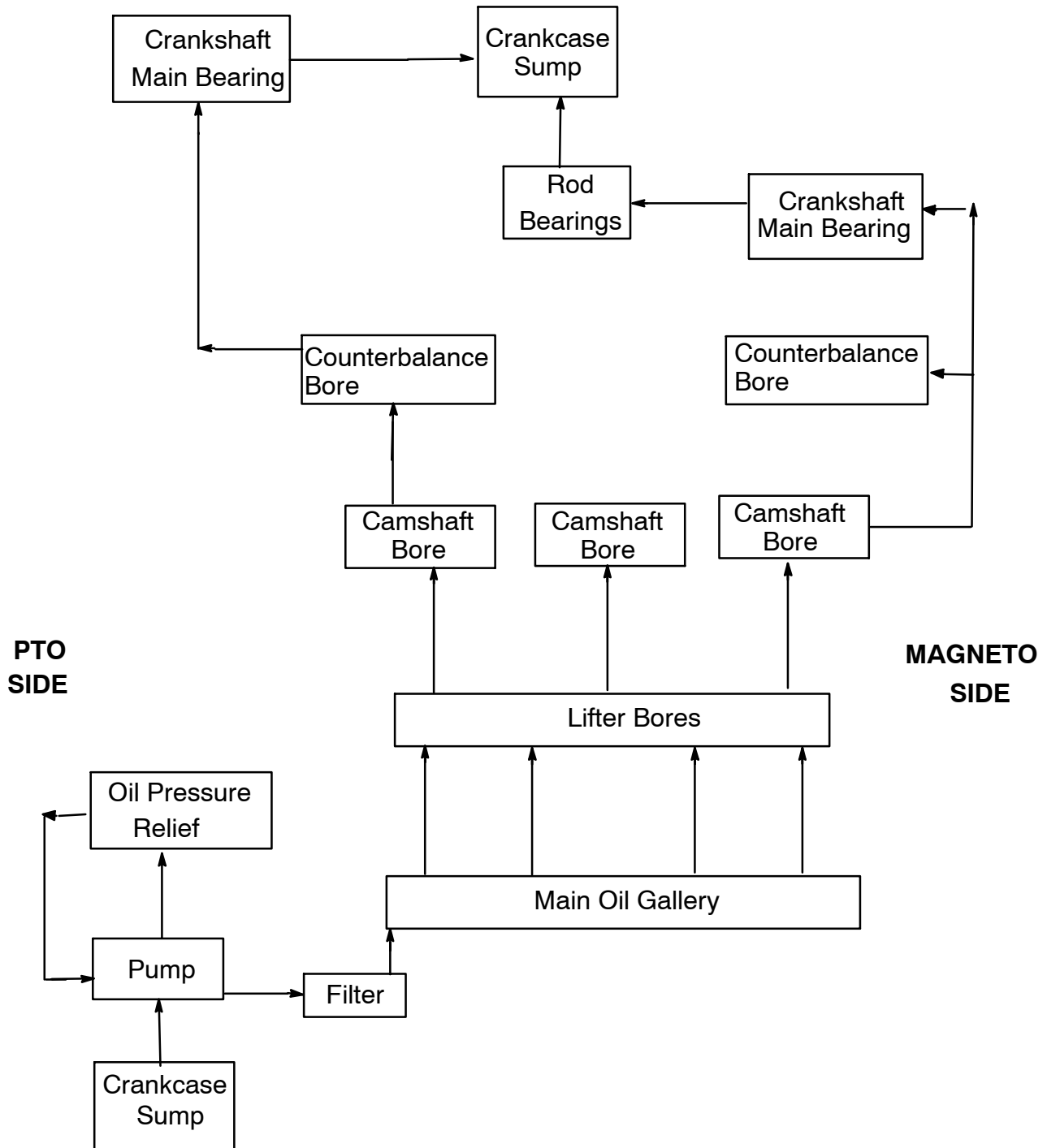
**NOTE:** Use only Polaris Premium 0W-40 Synthetic Engine Lubricant.

**Oil Pressure at 5500 RPM (Engine Hot):**  
**Standard: 39 PSI**  
**Minimum: 35 PSI**



## OIL FLOW

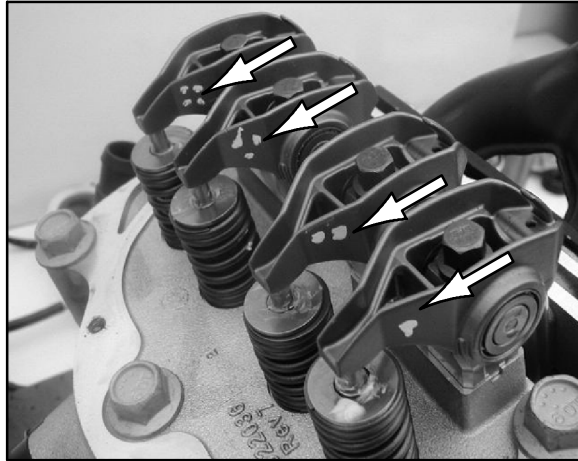
This chart describes the flow of oil through the 600/700/800 engine. Beginning in the crankcase sump, the oil is drawn through an oil galley to the feed side of the oil pump. The oil is then pumped through the oil filter. If the oil filter is obstructed, a bypass valve contained in the filter allows oil to bypass the filter element. At this point, the oil is supplied to the main oil galley through a crankcase passage. Oil is then diverted three ways from the main oil galley, with the first path entering the camshaft bores, onto the rear balance shaft journal and then draining back into the crankcase sump. The second oil path from the main oil galley feeds the lifter bores and then drains back 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.





## ROCKER ARM INSPECTION

1. Mark or tag rocker arms in order of disassembly to keep them in order for reassembly.



2. 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.

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

## PUSH ROD INSPECTION

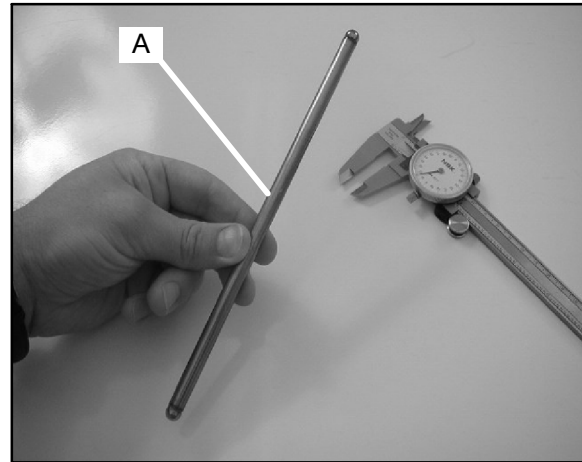
1. Clean push rods (A) in a suitable solvent. Blow dry push rods with compressed air.
2. Use compressed air to confirm the oil passage is clear in the center of the push rod.

**⚠ WARNING**

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

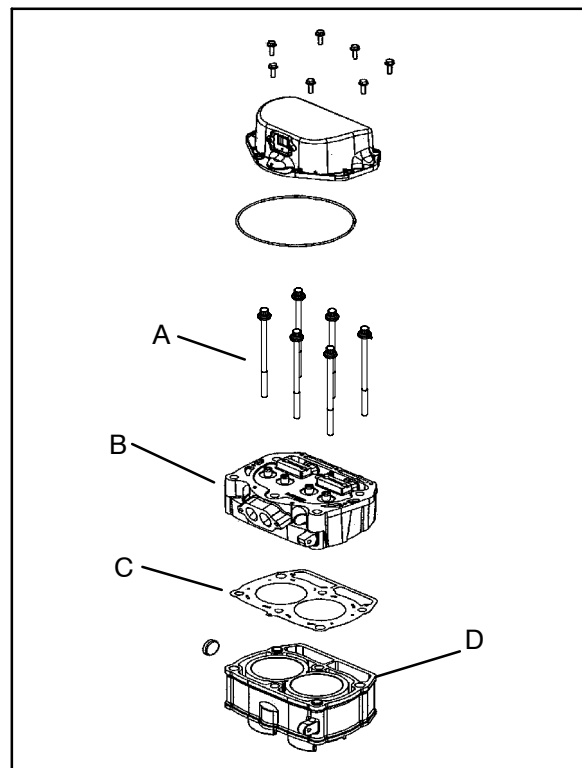
3. Check the ends of the push rods (A) for nicks, grooves, roughness or excessive wear.
4. The push rods (A) can be visually checked for straightness while they are installed in the engine by rotating them with the valve closed. Push rods can also be checked with a dial indicator or rolled across a flat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

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



## CYLINDER HEAD REMOVAL

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).





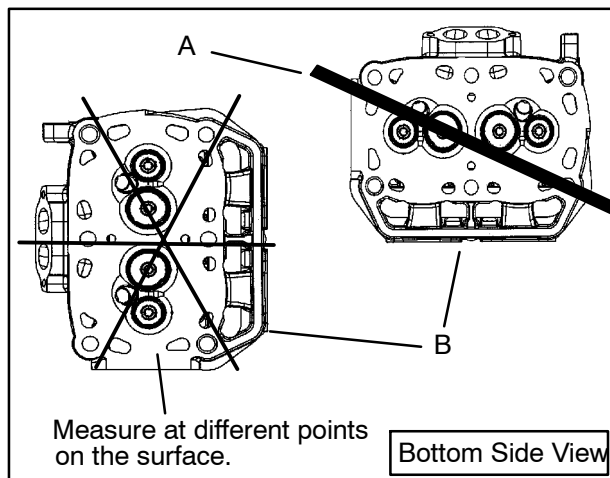
## CYLINDER HEAD INSPECTION

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

**CAUTION:** Use care not to damage sealing surface.

## CYLINDER HEAD WARPAGE

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



**Cylinder Head Warpage Limit:**

**004" (.1016 mm) Max.**

## CYLINDER HEAD DISASSEMBLY

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

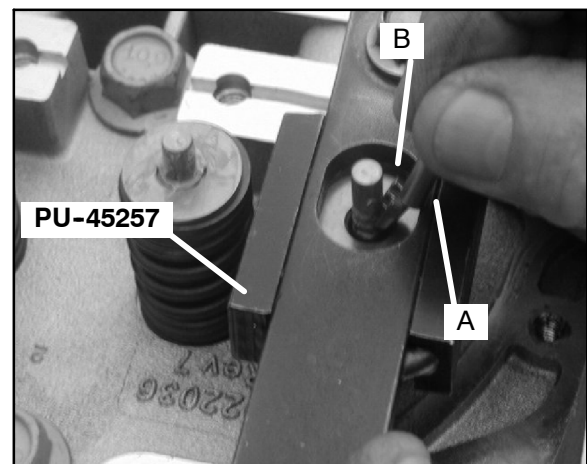
### Valve Train Servicing

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. 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).



**Valve Spring Compressor:**

**(PU-45257)**

**Valve Pressure Hose:**

**(PU-45652)**

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

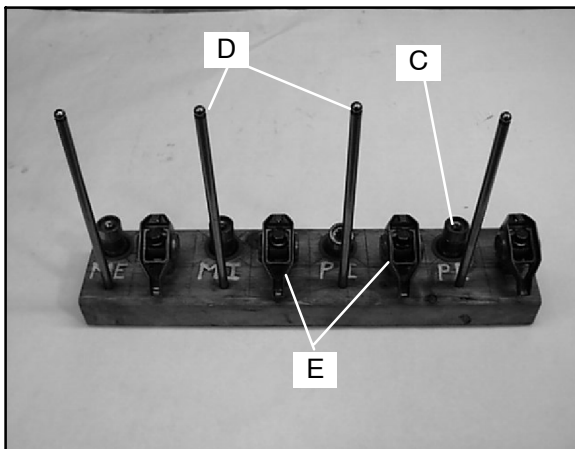
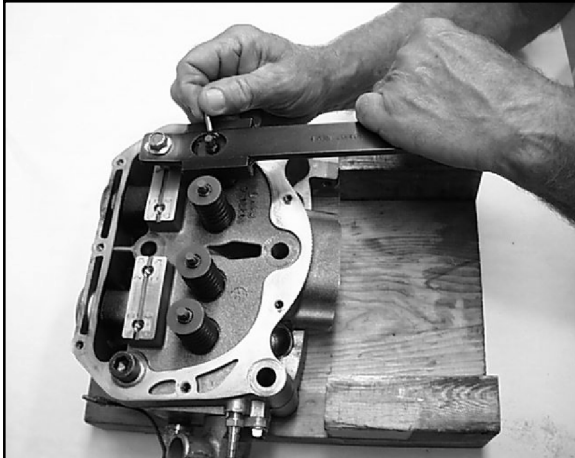
3. Remove spring retainer and spring.
4. The valve seals are now serviceable.



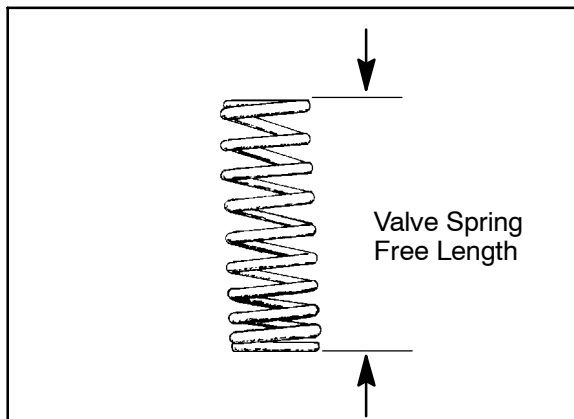


### CYLINDER HEAD DISASSEMBLY, CONT.

**NOTE:** Carefully remove the cylinder components. Place the hydraulic lifters (C), pushrods (D), and rocker arms (E) in a safe, clean area.



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

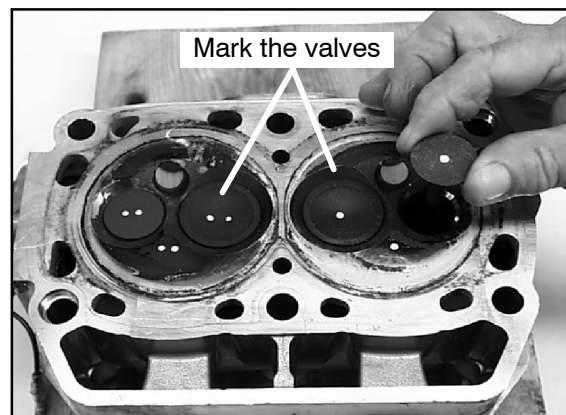


**Valve Spring Length:**  
**Std: 1.735" (44.069 mm)**

- 6. 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.



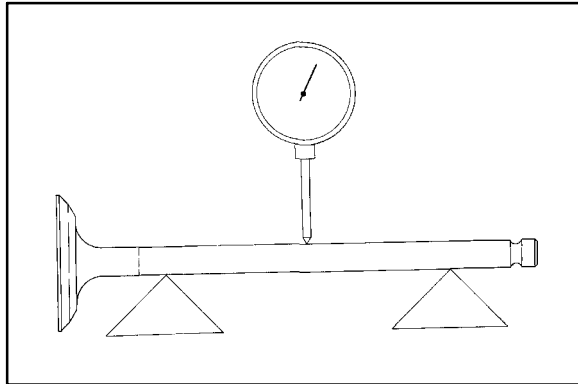
- 7. Mark the valves with a white pen. Remove the valves from the cylinder head. This will ensure that the valves are properly placed during engine reassembly.



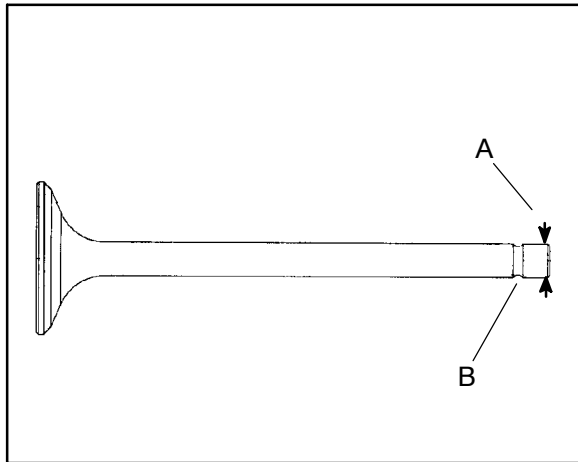


## VALVE INSPECTION

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).



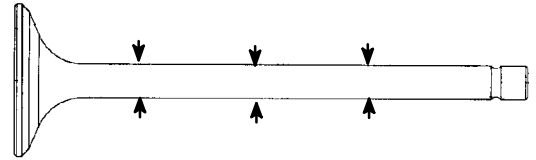
4. Inspect split keeper groove for wear or flaring of the keeper seat area (B). **NOTE:** The valves can be re-faced or end ground, if necessary. They must be replaced if extensively worn, burnt, bent, or damaged.
5. Measure diameter of valve stem with a micrometer in three places, then rotate 90 degrees and measure again (six measurements total). Compare to specifications.

### Valve Stem Diameter:

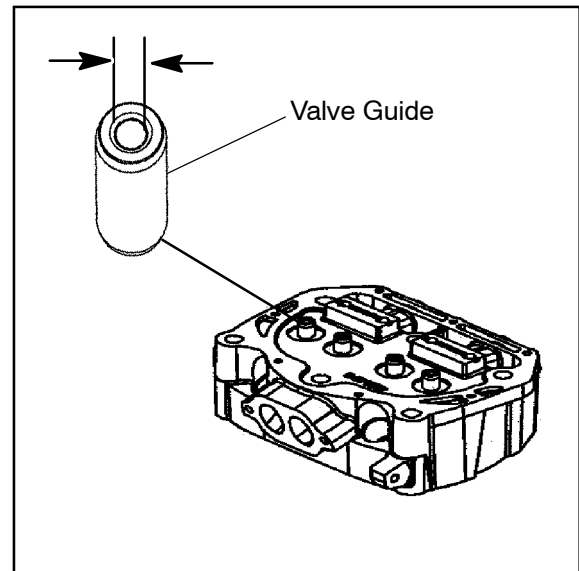
Intake:  $0.2356'' \pm 0.00039''$   
( $5.985 \pm 0.01$  mm)

Exhaust:  $0.2351'' \pm 0.00039''$   
( $5.972 \pm 0.01$  mm)

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



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



### Valve Guide I.D.:

$0.23672'' \pm 0.000295''$   
( $6.0617 \pm 0.0075$  mm)

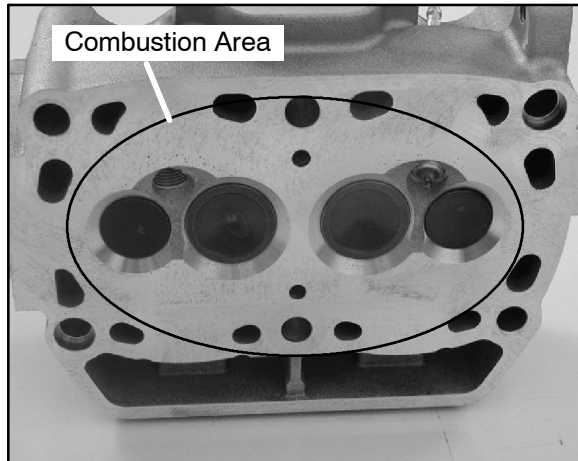
7. Subtract valve stem measurement from the valve guide measurement to obtain stem to guide clearance. **NOTE: The valve guides cannot be replaced.** Be sure to measure each guide and valve combination individually.



## **COMBUSTION CHAMBER**

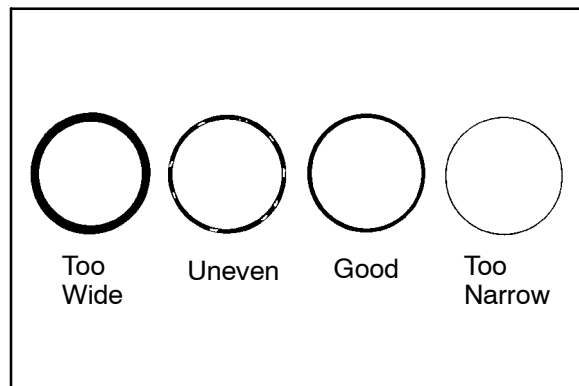
1. Clean all accumulated carbon deposits from combustion chamber and valve seat area with carbon cleaner and a soft plastic scraper.

**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.



seat reconditioning equipment can also be used. Keep all valves in order with their respective seat.

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



1. Install pilot into valve guide.

## **VALVE SEAT RECONDITIONING**

### **Cylinder Head 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.

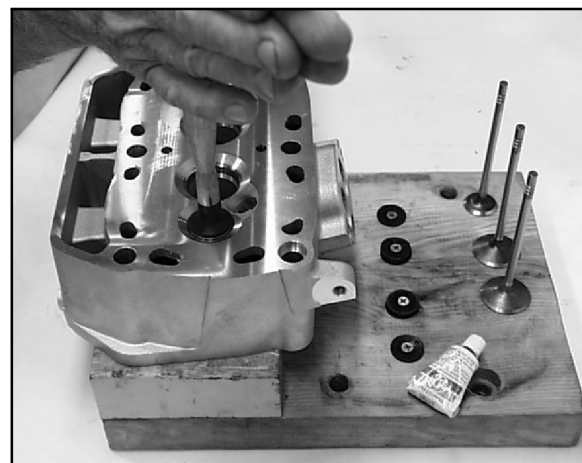
### **▲ WARNING**

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

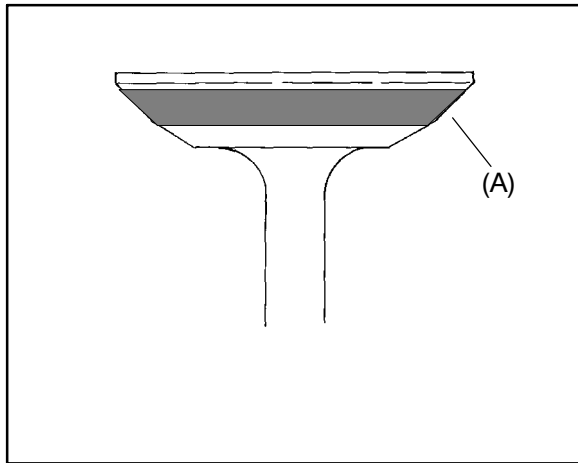


2. Apply cutting oil to valve seat and cutter.
3. Place 46° cutter on the pilot and make a light cut.
4. Inspect the cut area of the seat:
  - If the contact area is less than 75% of the circumference of the seat, rotate the pilot 180° and make another light cut.
  - If the cutter now contacts the uncut portion of the seat, check the pilot. Look for burrs, nicks, or runout. If the pilot is bent it must be replaced.



**VALVE SEAT RECONDITIONING CONT'D**

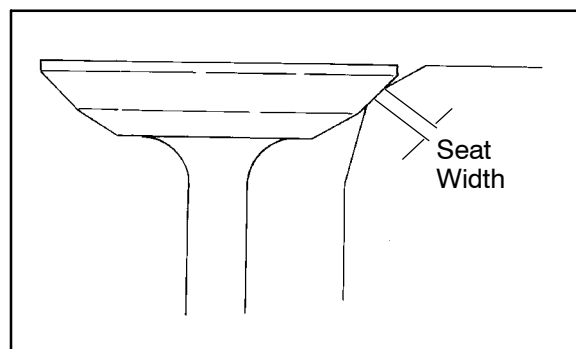
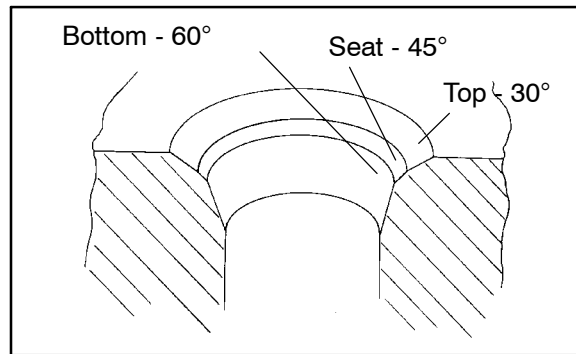
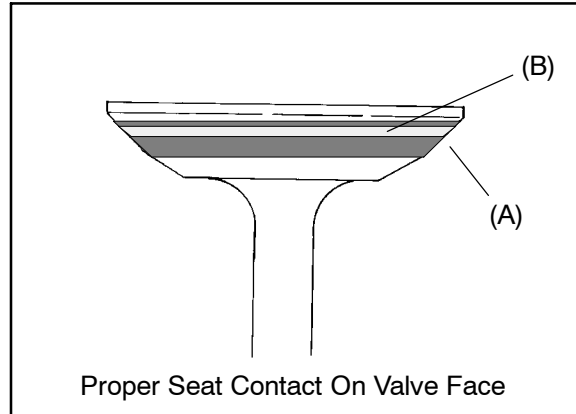
- If the contact area of the cutter is in the same place, the valve guide is distorted from improper installation.
  - If the contact area of the initial cut is greater than 75%, continue to cut the seat until all pits are removed and a new seat surface is evident. **NOTE:** Remove only the amount of 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. (B)



**Valve Seat Width:**

**Intake Std: .028" (.7 mm)**  
**Limit: .055" (1.4 mm)**

**Exhaust Std: .039" (1.0 mm)**  
**Limit: .071" (1.8 mm)**

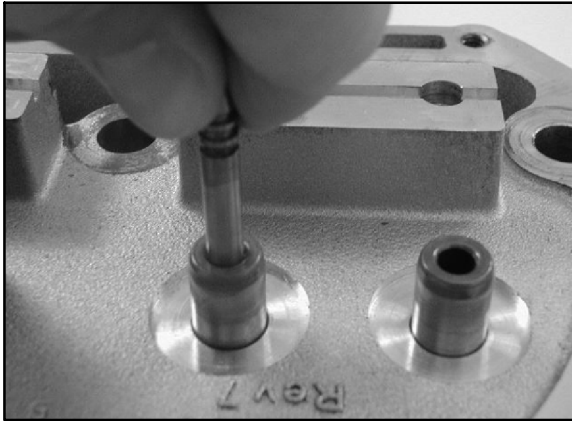
**VALVE SEAT RECONDITIONING CONT'D**

8. Clean all filings from the area with hot soapy water, rinse, and dry with compressed air.

**⚠ WARNING**

Wear eye protection or a face shield when working with compressed air during cylinder head disassembly and reassembly.

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.

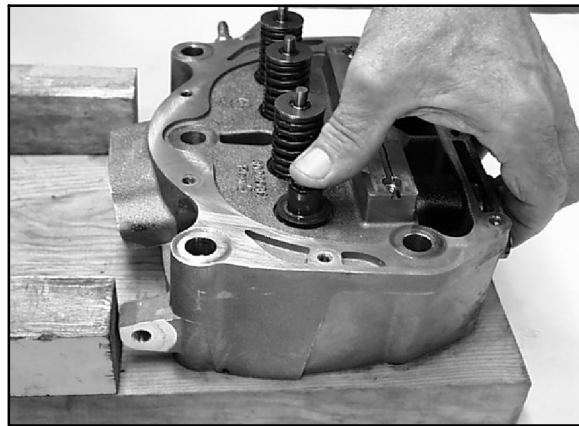
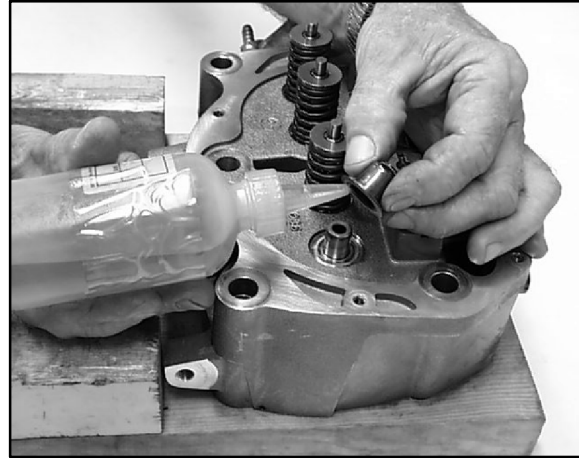


11. Rotate the valve rapidly back and forth until the cut sounds smooth. Lift the valve slightly off of the seat, rotate 1/4 turn, and repeat the lapping process. Do this four to five times until the valve is fully seated, and repeat process for the other valve(s).
12. Thoroughly clean cylinder head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

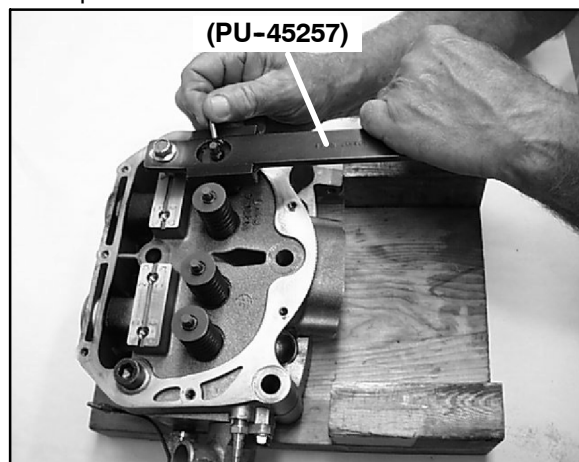
**CYLINDER HEAD REASSEMBLY**

**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 parts magnet can aid in installation of the keepers.

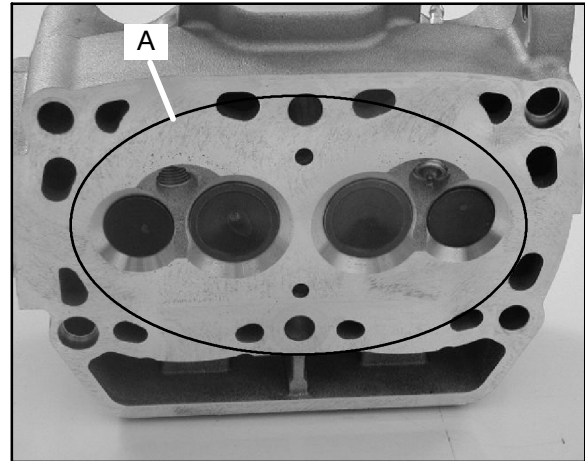


7. Repeat procedure for remaining valves. When all valves are installed, tap lightly with soft faced hammer on the end of the valves to seat the split keepers. **NOTE:** To prevent damage to the valve seals, do not compress the valve spring more than necessary to install the keepers.

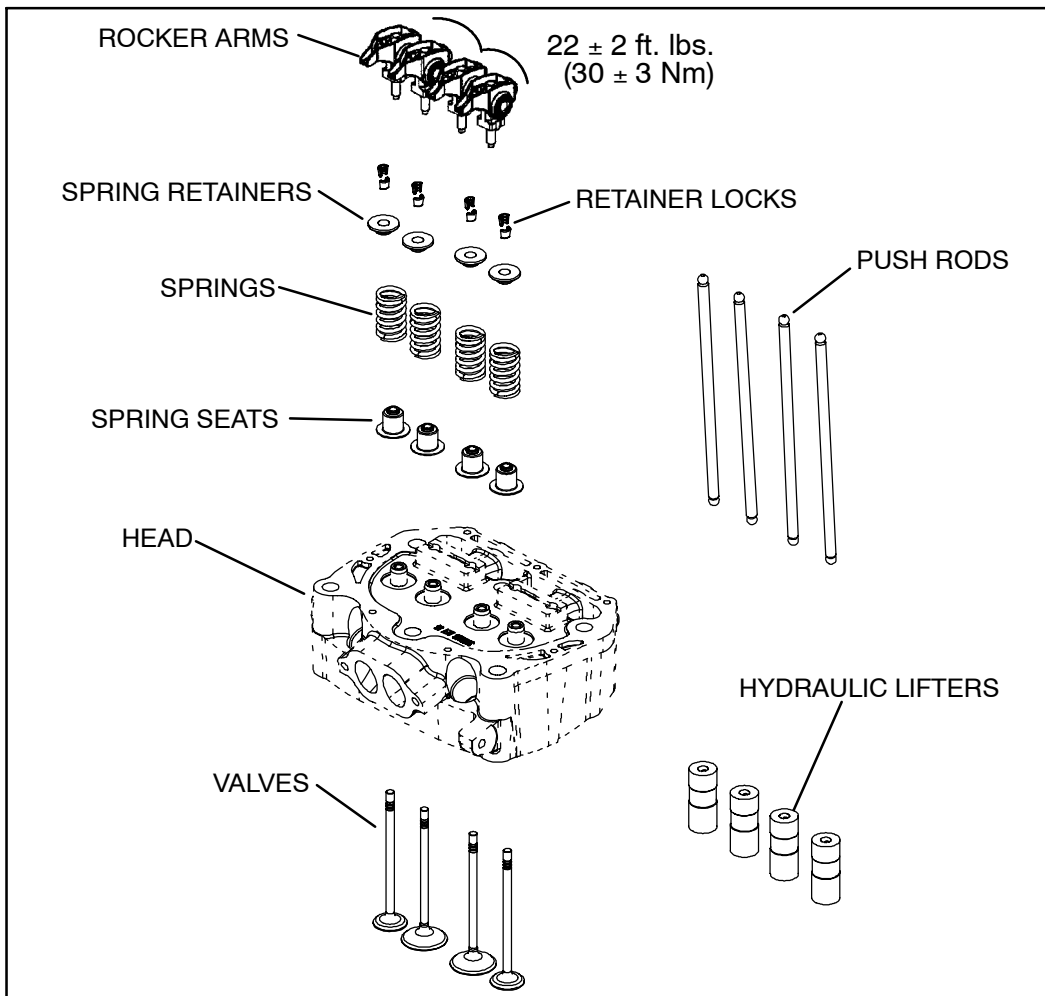


## VALVE SEALING TEST

1. Clean and dry the combustion chamber area (A). Refer to Page 3.25 for cleaning tips.
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.



## VALVE TRAIN EXPLODED VIEW

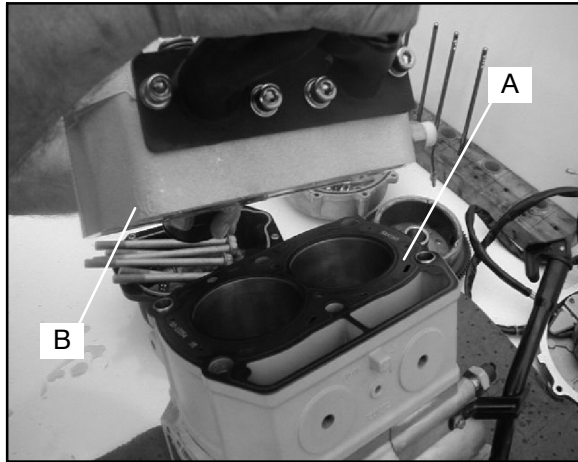




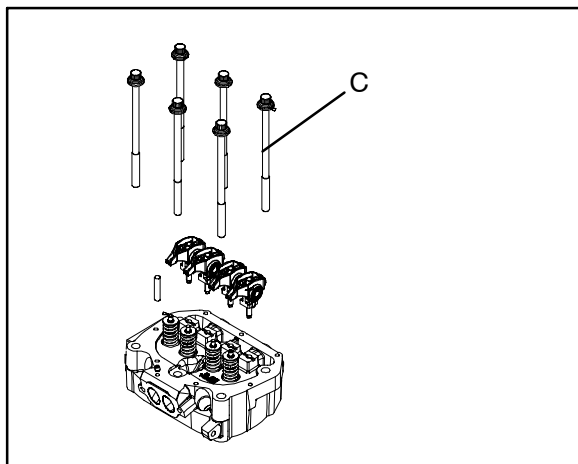
# ENGINE HEAD REASSEMBLY

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).

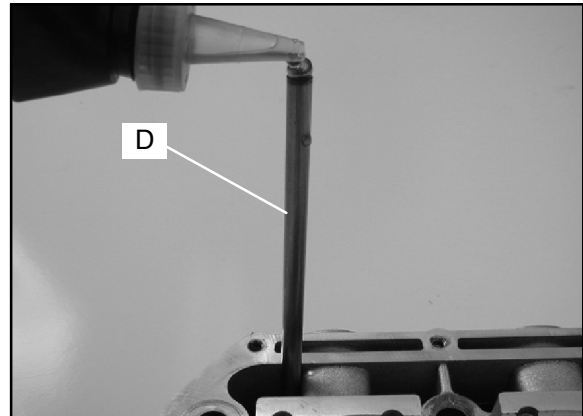


2. Install cylinder head on cylinder.
3. Lubricate threads and top of washers underside of bolt head with engine oil. Install head bolts (C). Torque to  $35 \pm 4$  ft. lbs. ( $47.5 \pm 5.5$  Nm) in sequence provided (Pg.3.11). Allow the gasket to set for 1 minute at this torque, then turn bolts  $90^\circ$  ( $1/4$  turn) in sequence. Refer to Page 3.11 for tightening sequence.

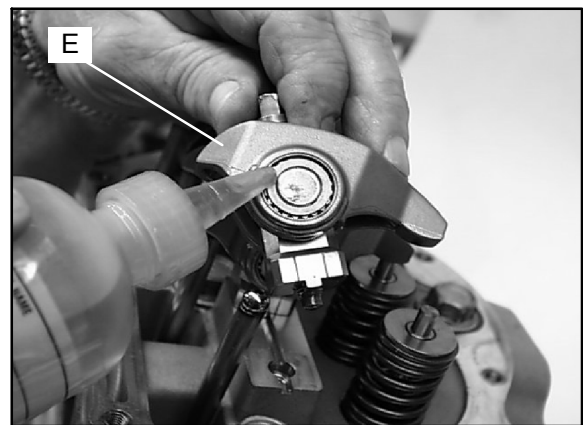


**Cylinder Head Bolt Torque:**  
 $35 \pm 4$  ft. lbs. - Allow to set for 1 min.  
 $(47.5 \pm 5.5$  Nm)  
 Then turn additional  $90^\circ$  ( $1/4$  turn)  
 \*Torque Bolts In Sequence (Pg. 3.11)

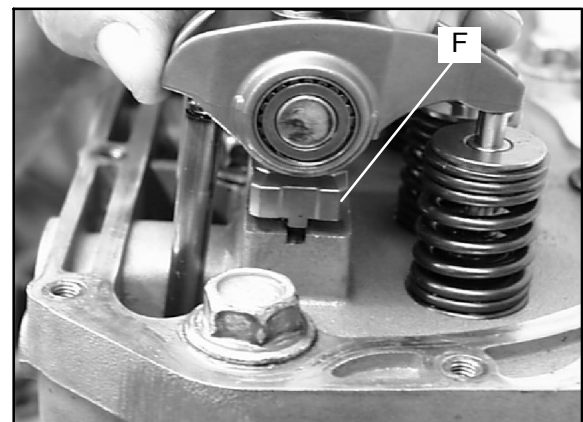
4. Lubricate push rods (D) and install into lifters.



5. Lubricate rockers (E) with engine oil.



6. Verify pushrods are engaged in lifters.
7. Install rockers. Be sure that tab of fulcrum (F) is seated in head stand-off. Torque bolts to  $22 \pm 2$  ft. lbs. ( $30 \pm 3$  Nm).



**Rocker Arm Bolt Torque:**  
 $22 \pm 2$  ft. lbs.  
 $(30 \pm 3$  Nm)

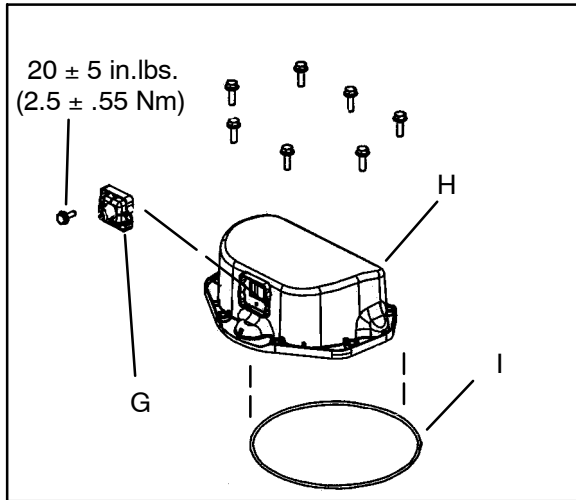


**ENGINE HEAD REASSEMBLY CONT'D**

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  $20 \pm 5$  in. lbs. ( $2.5 \pm 0.55$  Nm).

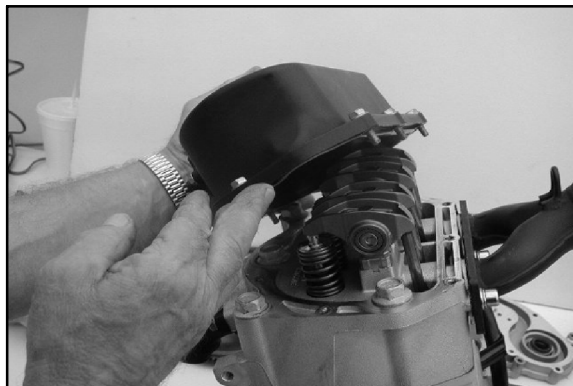
**NOTE:** When applying RTV, do not get any RTV inside the reed assembly.

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



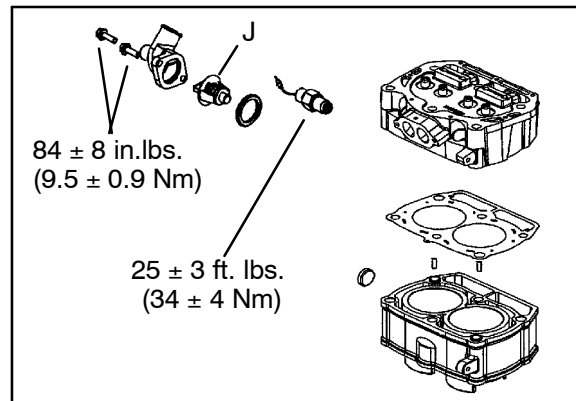
**REMINDER:** Before assembly, clean the bolts and bolt holes with Primer N (PN 2870585) to remove any debris. This will ensure proper sealing when installing bolts.

10. Install rocker cover. Torque bolts to  $84 \pm 8$  in. lbs. ( $9.5 \pm 0.9$  Nm). See Page 3.6 for proper torque sequence.



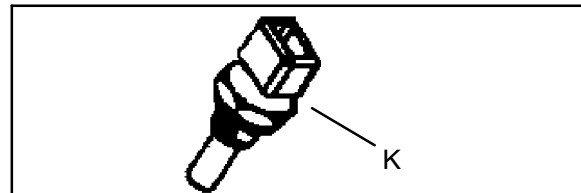
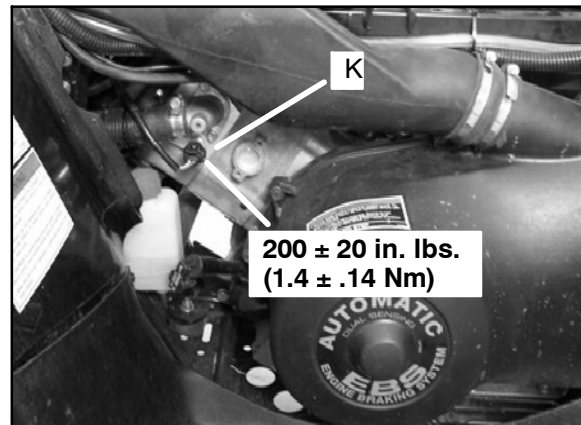
**Rocker Cover Bolt Torque:**  
 $84 \pm 8$  in. lbs. ( $9.5 \pm 0.9$  Nm)  
 \*Torque In Proper Sequence (Pg. 3.6)

11. Install thermostat (J), new O-ring, and thermostat housing. Torque thermostat housing bolts to  $84 \pm 8$  in. lbs. ( $9.5 \pm 0.9$  Nm).



**Thermostat Housing Bolt Torque:**  
 $84 \pm 8$  in. lbs. ( $9.5 \pm 0.9$  Nm)

12. Install temperature sender (K) and torque to  $200 \pm 20$  in. lbs. ( $1.4 \pm .14$  Nm).



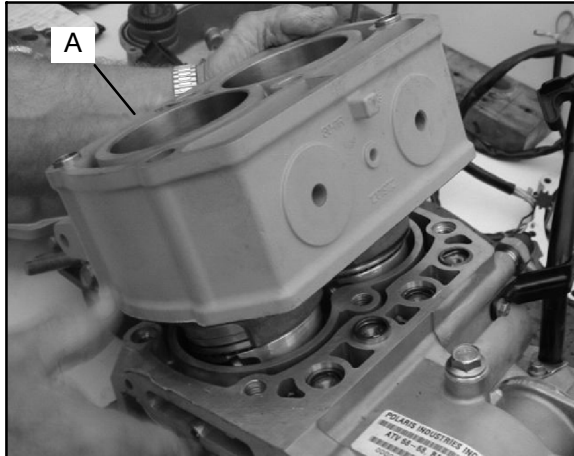
**Temperature Sender Torque:**  
 $200 \pm 20$  in. lbs. ( $1.4 \pm .14$  Nm)



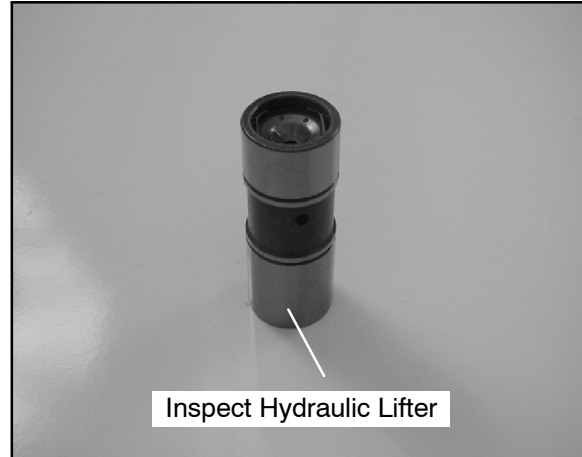


## **CYLINDER REMOVAL**

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).



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.

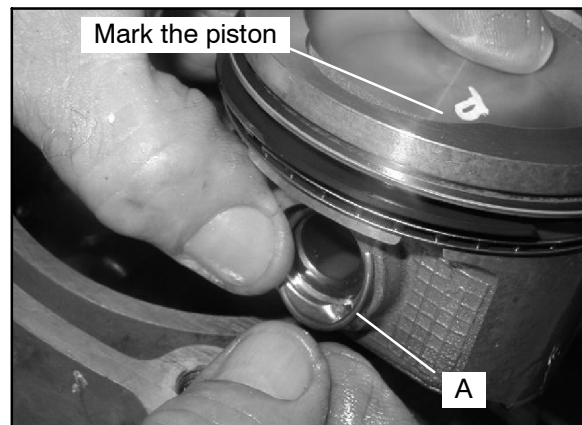
## **VALVE LIFTER REMOVAL/INSPECTION**

1. Remove the valve lifter's 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.



## **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.

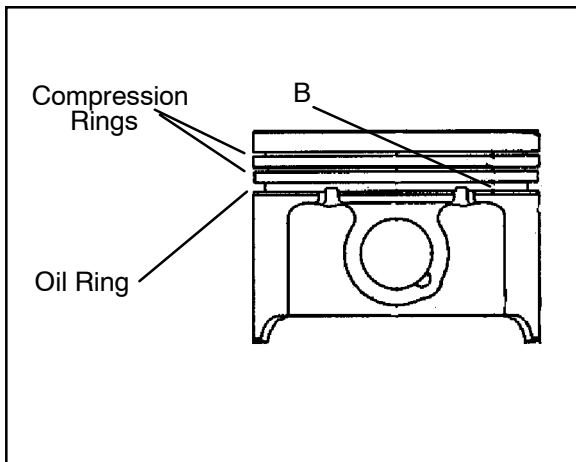
**\*By hand:** Placing both thumbs as shown, spread the ring open and push up on the opposite side. Do not scratch the ring lands.



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

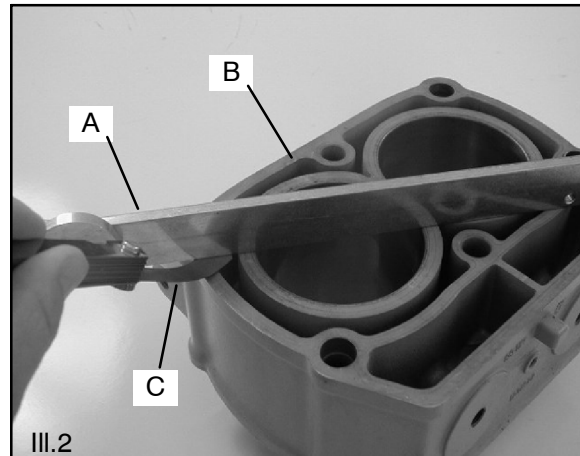
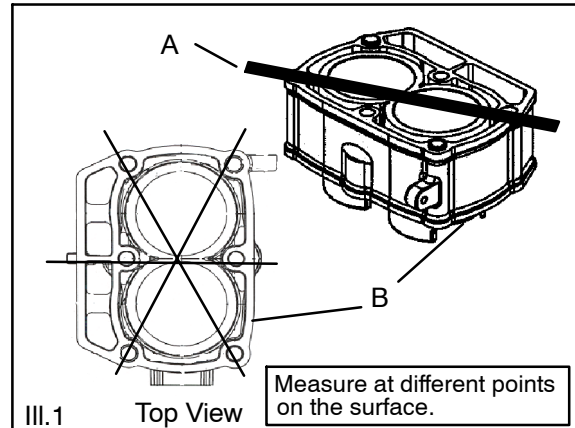
The oil control ring is a three piece design consisting of a top and bottom steel rail and a center expander section. The top rail has a locating tab on the end which fits into a notch (B) in the upper oil ring land of the piston. To Remove:

- a) Remove the top rail first followed by the bottom rail.
- b) Remove the expander.



## CYLINDER INSPECTION

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

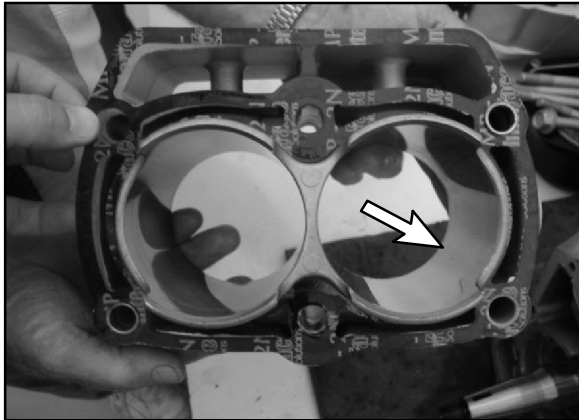


**Cylinder Warpage.**

**.004" (0.1 mm) Max.**



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

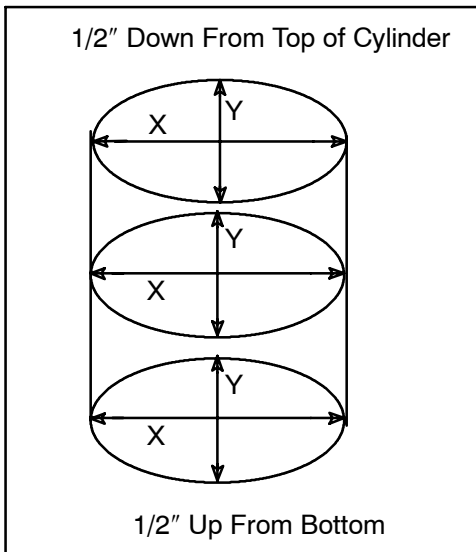


5. Record measurements. If cylinder is tapered or out of round beyond .002, the cylinder must be replaced.

**Cylinder Taper**  
 Limit: .002" (.05mm)Max.  
**Cylinder Out of Round**  
 Limit: .002" (.05mm)Max.

**Standard Bore Size (Both Cylinders):**  
 Sportsman 700 / 800 : 3.1496" (80 mm)

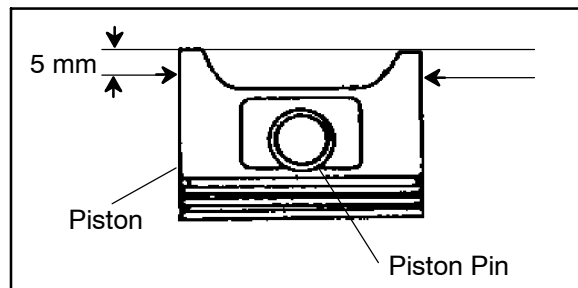
4. Inspect cylinder for taper and out of round with a telescoping gauge or a dial bore gauge. Measure in two different directions, front to back and side to side, on three different levels (1/2" down from top, in the middle, and 1/2" up from bottom).



## **PISTON-TO-CYLINDER CLEARANCE**

Measure piston outside diameter at a point 5 mm 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**

**Refer To Engine Service Data**  
 Pg. 3.12 - 3.14

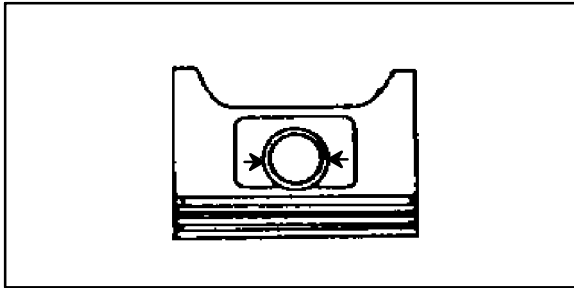
**Piston O.D.**

**Refer To Engine Service Data**  
 Pg. 3.12 - 3.14



## **PISTON/ROD INSPECTION**

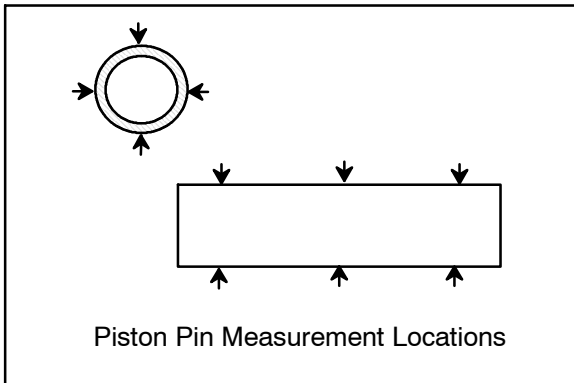
1. Measure piston pin bore.



**Piston Pin Bore:**

**Refer To Engine Service  
Data  
Pg. 3.12 - 3.14**

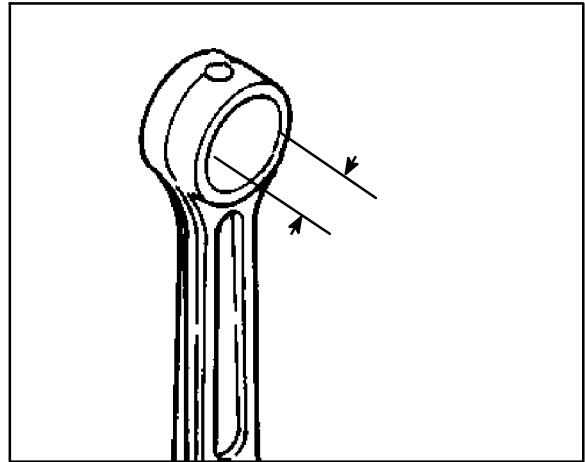
2. Measure piston pin O.D. Replace piston and/or piston pin if out of tolerance.



**Piston Pin O.D.**

**Refer To Engine Service Data  
Pg. 3.12 - 3.14**

3. Measure connecting rod small end I.D.

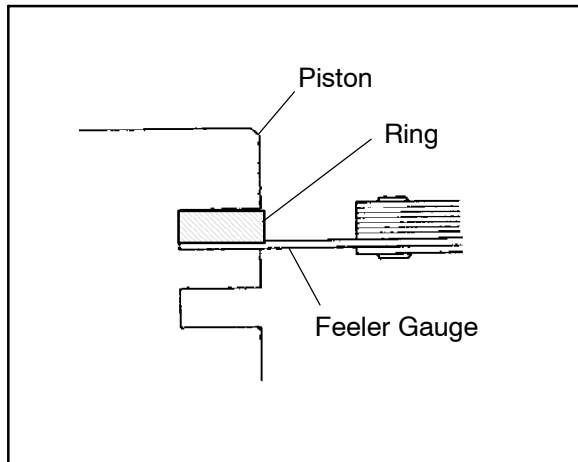


**Connecting Rod Small End I.D.**

**Refer To Engine Service Data  
Pg. 3.12 - 3.14**



- 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.



#### Piston Ring-to-Ring Groove Clearance

Refer To Engine Service Data  
Pg. 3.12 - 3.14

#### Piston Ring Installed Gap

Refer To Engine Service Data  
Pg. 3.12 - 3.14

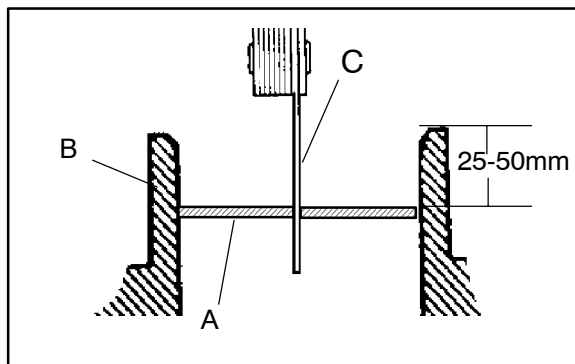
**NOTE:** Ring should be installed with the mark facing upward.

- Measure installed gap with a feeler gauge (C) at both the top and bottom of the cylinder. **REMINDER:** A difference in end gap indicates cylinder taper. The cylinder should be measured for excessive taper and out of round.
- 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.

## PISTON RING INSTALLED GAP

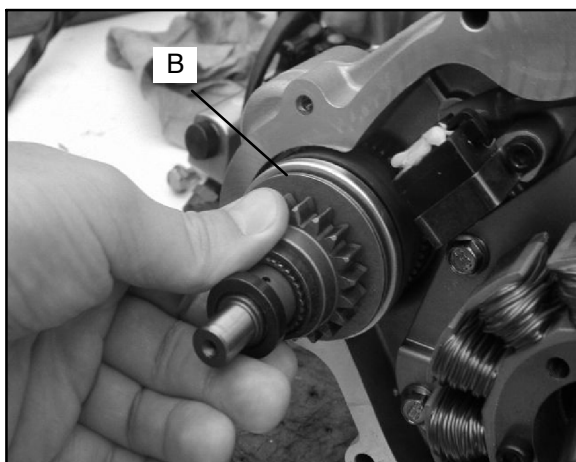
- Place each piston ring (A) inside cylinder (B) using piston to push ring squarely into place as shown. (See next page)



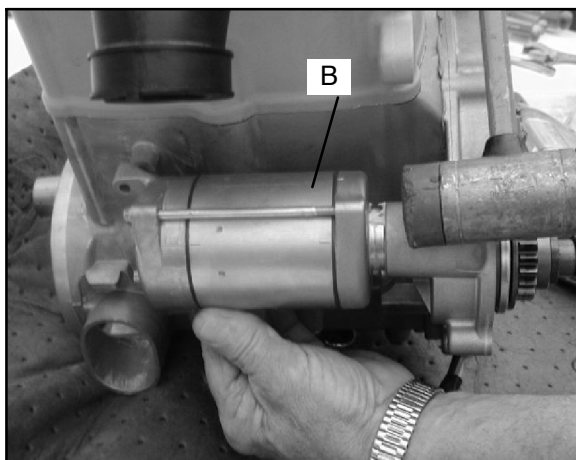


## STARTER DRIVE/BENDIX REMOVAL/INSPECTION

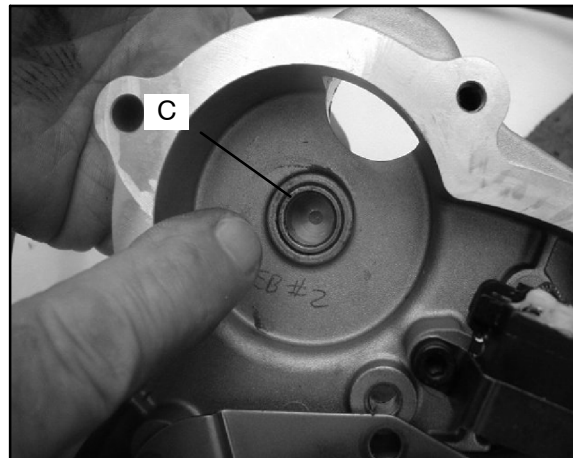
1. Remove stator housing bolts and remove housing.
2. Remove the flywheel nut and washer. Install Flywheel Puller (PN 2871043) and remove flywheel. **CAUTION:** Do not thread the puller bolts into the flywheel more than 1/4" or stator coils may be damaged.
3. Remove starter bendix assembly (A). Note 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, tap on the starter assembly with a soft faced mallet to loosen the starter from the crankcase.



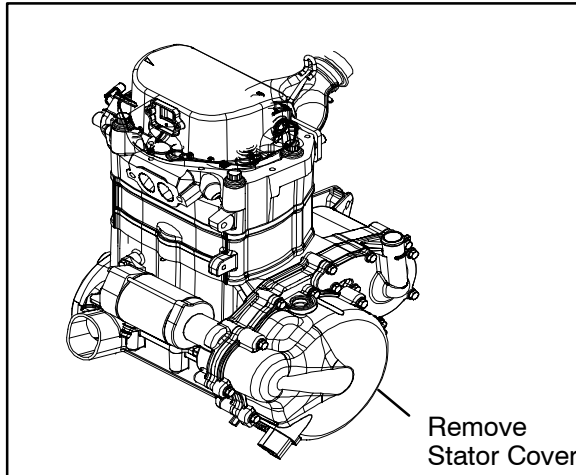
6. Inspect gear teeth on starter drive (B). Replace starter drive if gear teeth are cracked, worn, or broken.
7. Inspect the bendix bushing (C) in the mag cover for wear. Replace as needed.



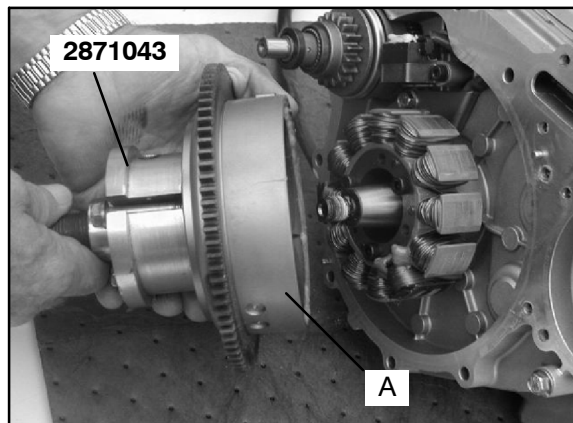


## FLYWHEEL/STATOR REMOVAL/INSPECTION

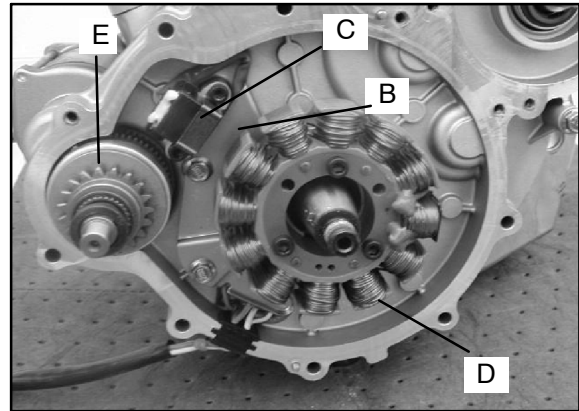
1. Remove stator housing bolts and remove housing.



2. Remove flywheel nut and washer.
3. Install Flywheel Puller (PN 2871043) and remove flywheel (A). **CAUTION:** Do not thread the puller bolts into the flywheel more than 1/4" or stator coils may be damaged.



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

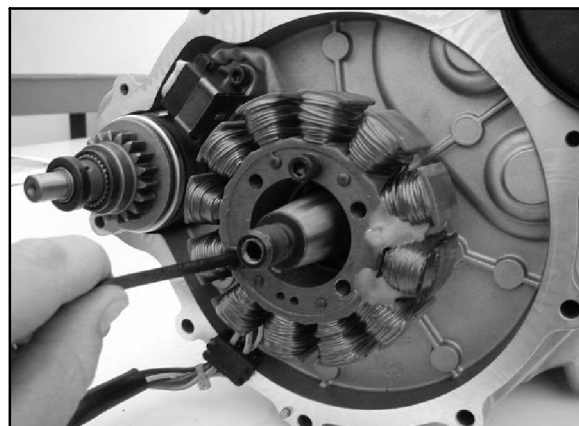


5. Remove the bendix (E) if necessary.

## 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. Carefully install the stator and trigger coil to the gear/stator housing cover. **Do not tap on the stator or the gear stator housing cover.** This may cause a leak in between the gear/stator housing cover and the crankcase.
2. Properly place the stator wires under the wire holddown and install the bolts. Inspect the bolts, if new bolts are needed, replace them with new bolts. The new bolts contain patch lock, so Loctite™ is not needed on the new bolts. Torque bolts to  $96 \pm 12$  in.lbs. ( $10.85 \pm 0.35$  Nm).



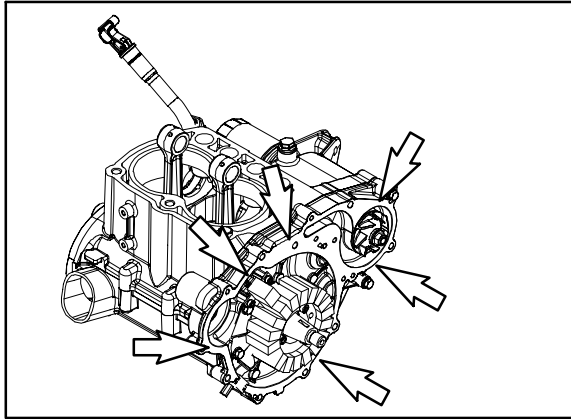
3. Install the starter bendix if removed.
4. Install woodruff key. Install the flywheel. Install the flywheel washer and nut. Torque the flywheel nut to  $65 \pm 7$  ft.lbs. ( $88 \pm 9.50$  Nm)



**Flywheel Nut Torque:**  
**65 ± 7 ft. lbs. (88 ± 9.50 Nm)**

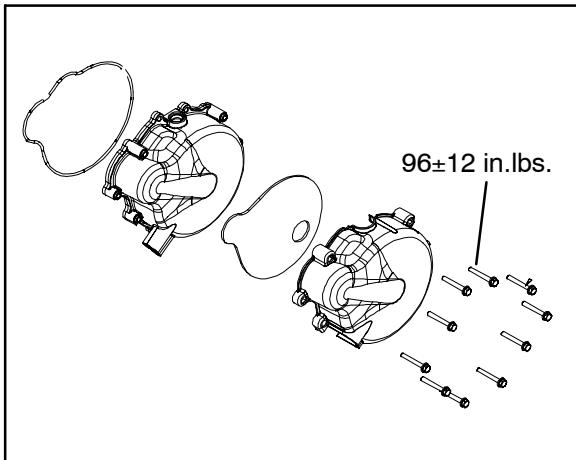
**Stator Housing Bolt Torque:**  
**96 ± 12 in.lbs. (1.85 ± 1.35 Nm)**  
**\*Torque Bolts In Sequence 3.4)**

5. Inspect the mating surface around the gear/stator housing cover and the crankcase for oil seepage. If there is seepage between the mating surfaces, then the gear/stator housing cover must be resealed. Clean the gearcase surfaces and reseat with a new gasket. Refer to the Lower Engine Disassembly section and the Lower Engine Assembly section for details. Inspect the areas pointed out in the illustration for possible oil seepage.



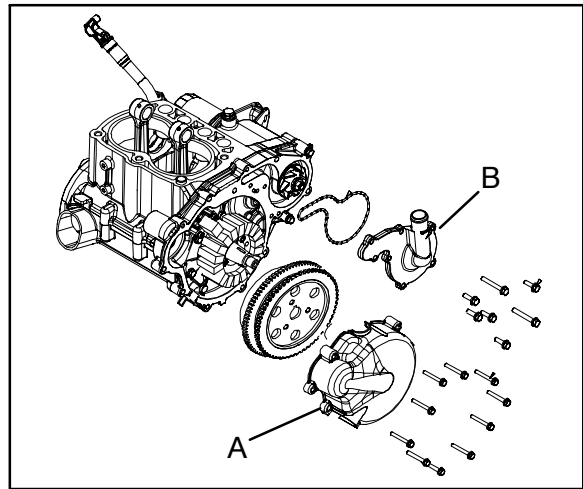
**FLYWHEEL/STATOR INSTALLATION**

6. Install stator housing with new O-rings. Torque the bolts to 96 ± 12 in. lbs. (1.85 ± 1.35 Nm). Follow bolt torque sequence on Pg. 3.4.

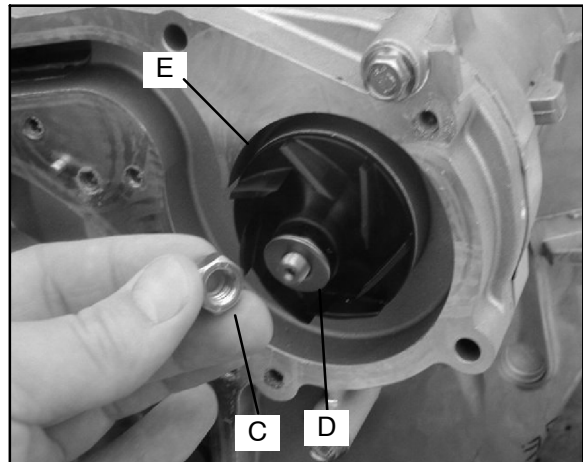


**ENGINE CRANKCASE**  
**DISASSEMBLY/INSPECTION**

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



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

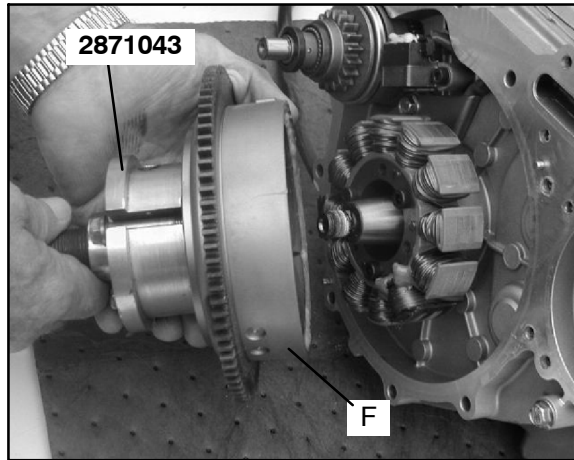


3. Remove flywheel nut and washer.

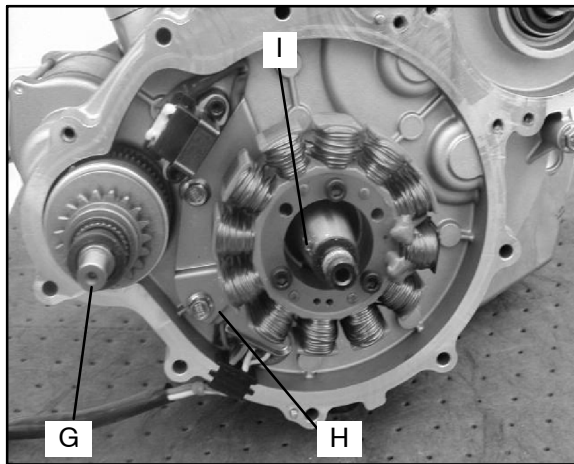




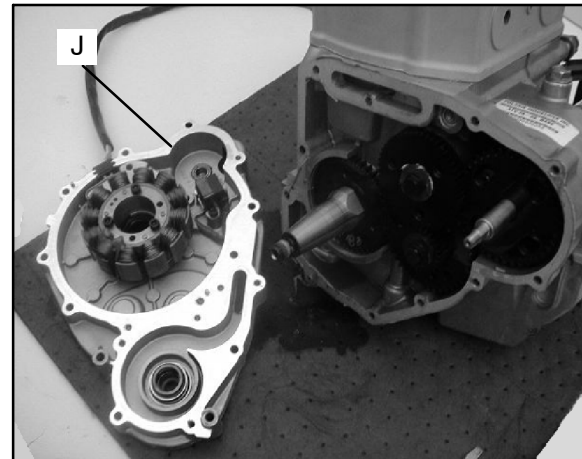
4. Install Flywheel Puller (PN 2871043) and remove flywheel (F). **CAUTION:** Do not thread the puller bolts into the flywheel more than 1/4" or stator coils may be damaged.



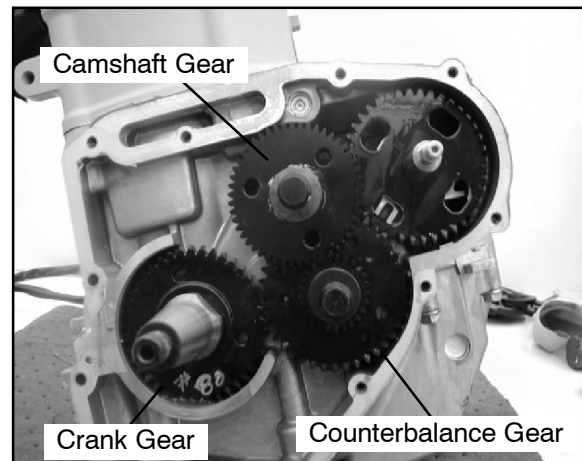
5. Remove the starter bendix (G), wire holddown plate (H), and the woodruff key (I) from the crankshaft. The stator does not have to be removed at this point.



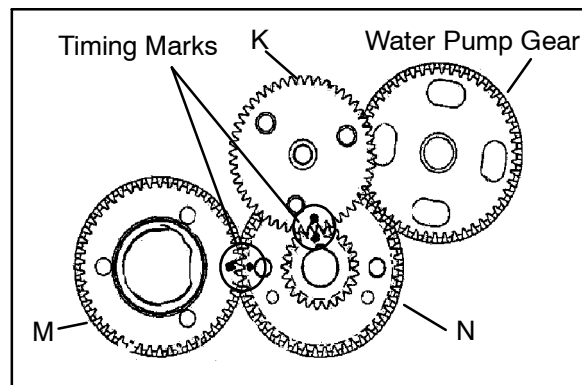
6. Remove the gear/stator housing bolts and remove the gear/stator housing cover (J) and gasket from the crankcase. Be sure to catch the excess oil from the crankcase.



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



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

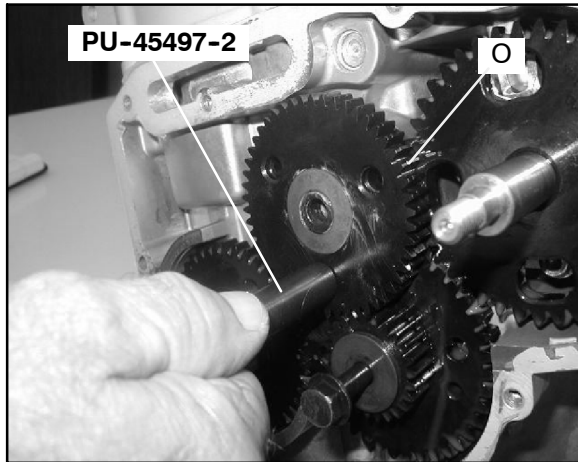




**NOTE:** If replacing one of the gears, it is recommended that all of the gears be replaced. A gear kit is available in the parts book.

**Cam Gear Removal**

- 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.

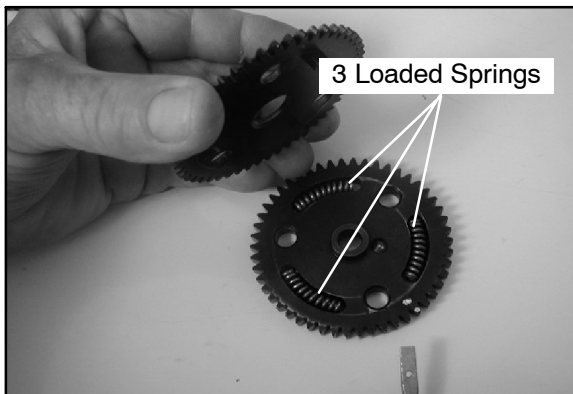


**NOTE:** Install the Cam Gear Tooth Alignment Tool (PU-45497-2) into the assembly hole counter clockwise from the timing mark as shown.

**Cam Gear Alignment Tool:**  
(PU-45497-2)

**Cam Gear Disassembly**

- 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.

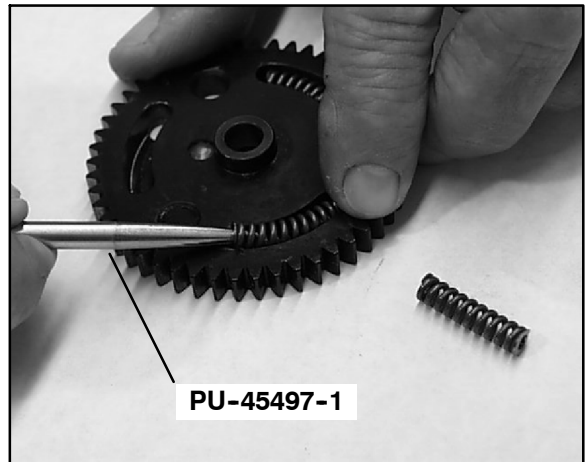


- The cam gear assembly contains three loaded springs. To open the cam gear assembly:
  - Place the cam gear on a flat surface with the timing mark side facing up.
  - While holding both gears together, lightly work a small flathead screwdriver between the two gears.
  - Remove the top gear. The springs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

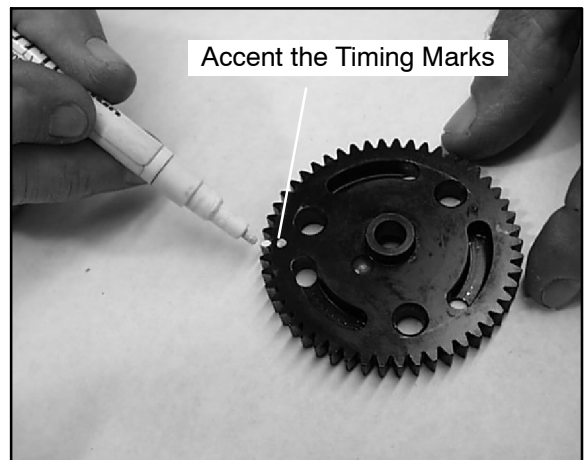
**CAUTION:**

**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.**

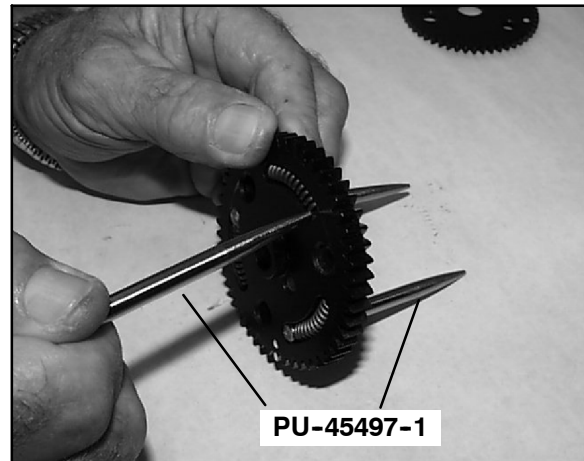
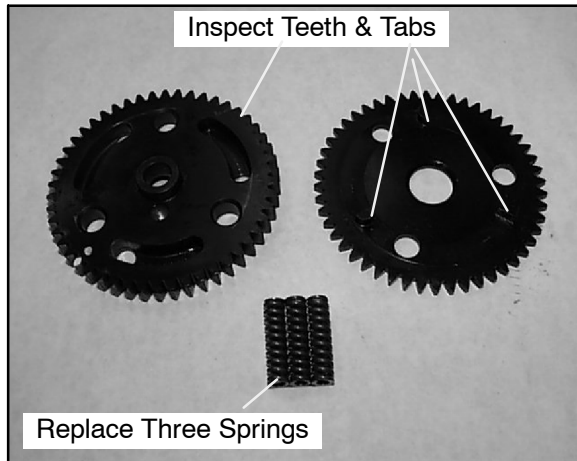
- Remove all three springs using one of the tapered pins from the Tapered Pins (PU-45497-1).



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

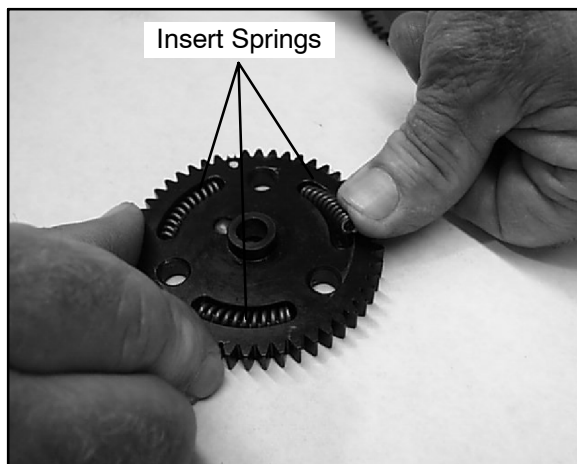


- Inspect the gear teeth and the three tabs on the gears for wear.



### Cam Gear Reassembly

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



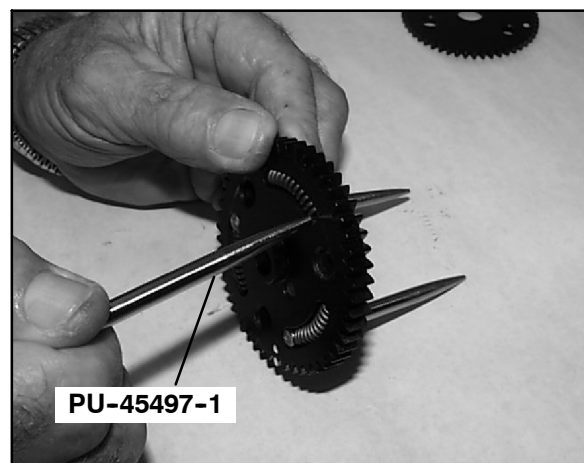
16. Insert the pointed dowels from the Tapered Pins (PU-45497-1) into the cam gear.

To assemble:

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



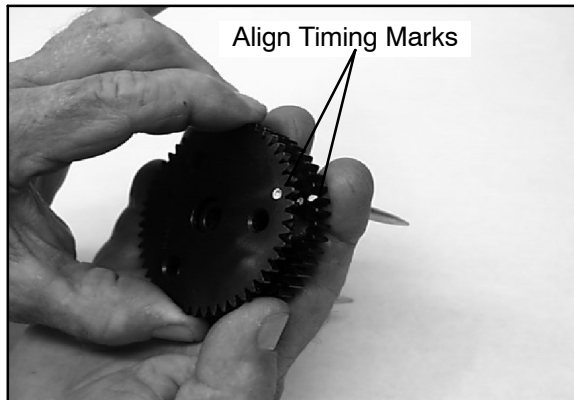


**Cam Gear Spring Installation Tool Kit:  
(PU-45497)**

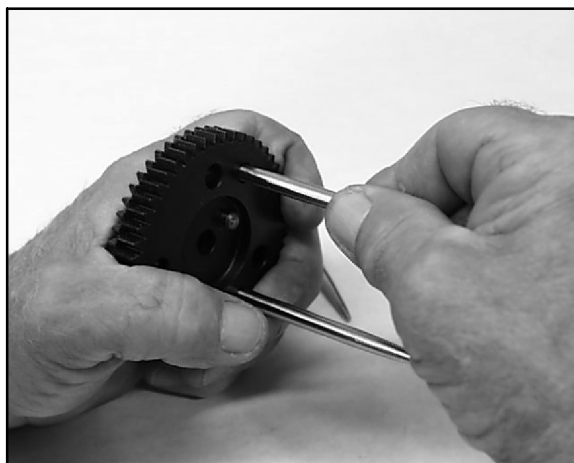
**Tapered Pins:  
(PU-45497-1)**

**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.



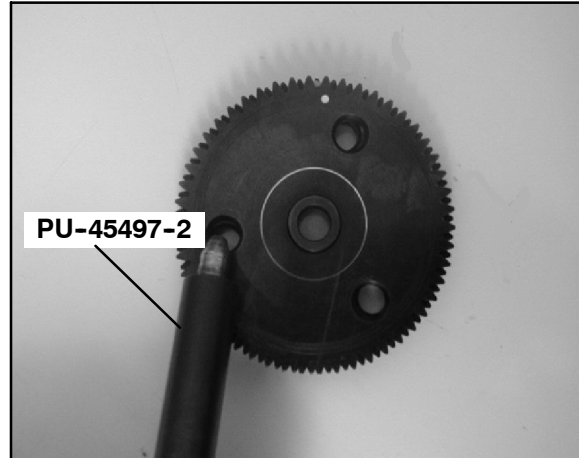
19. Once the gears are pressed together, firmly hold the gears together with one hand. Carefully remove the Tapered Pins (PU-45497-1) by pulling them out one at a time with the other hand.



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)

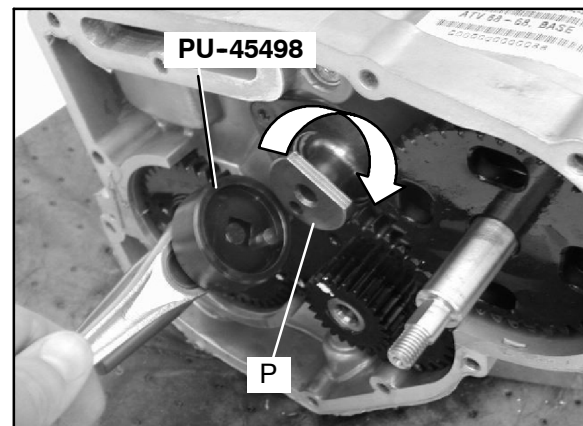
(R) to align the teeth of the cam gears, as shown in the picture.

**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) (R), 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.

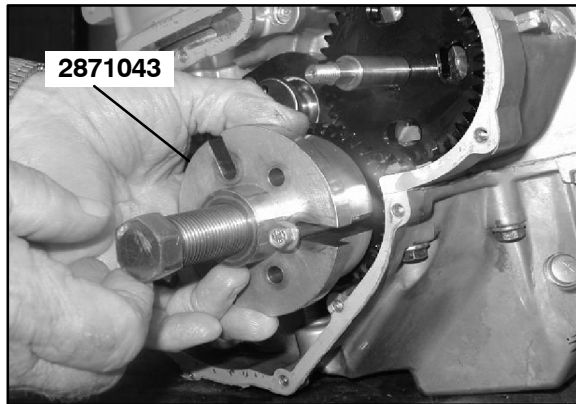


**NOTE:** This Cam Spanner Wrench (PU-45498) is only needed to rotate the camshaft when the entire valve train is assembled. If the rocker arms are removed, the cam-shaft can be turned by hand.

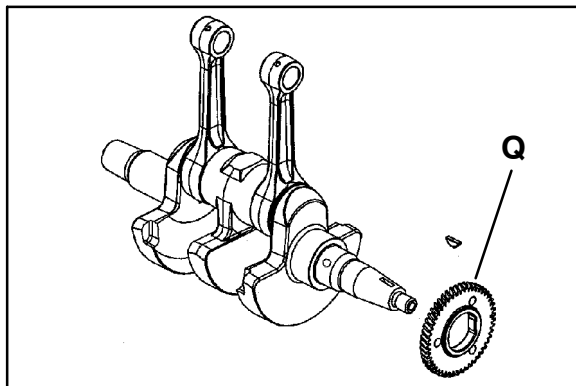
22. Remove the bolt and nut from the balance shaft gear. Try to remove the balance shaft gear. If the gear does not come off manually, use the Flywheel Puller (PN 2871043) to remove the



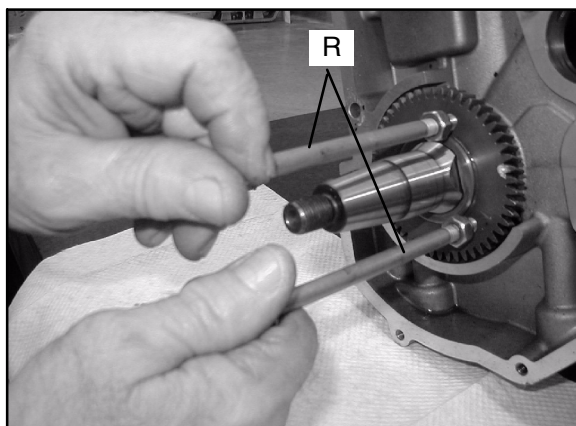
balance shaft gear.



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.

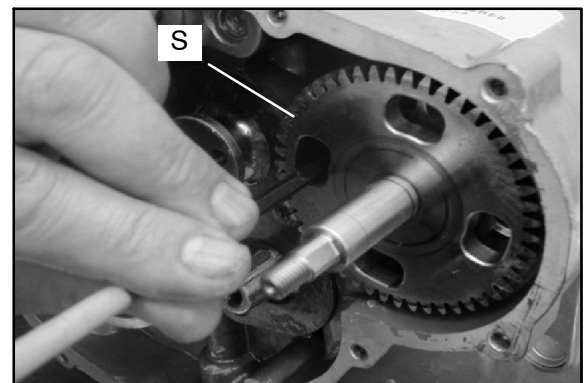


25. Install the Flywheel Puller (PN 2871043) and remove the crankshaft gear, if needed.

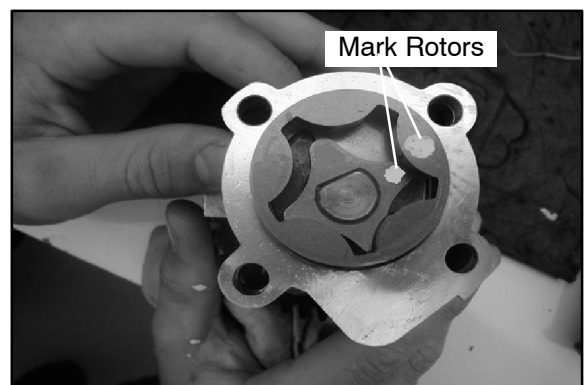


### Water/Oil Pump Removal/Disassembly

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.



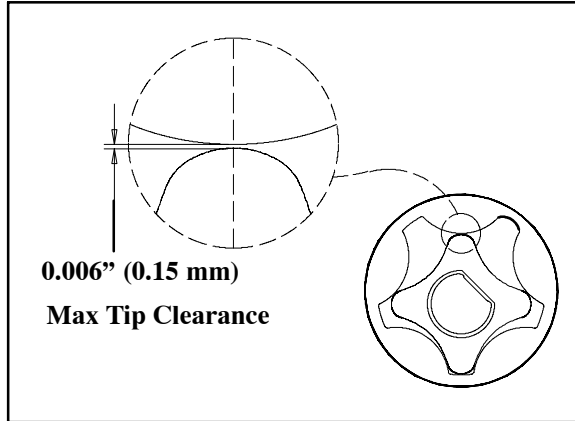
**NOTE:** If replacing the old rotors, new replacement rotors will fit into the old oil/water pump housing.



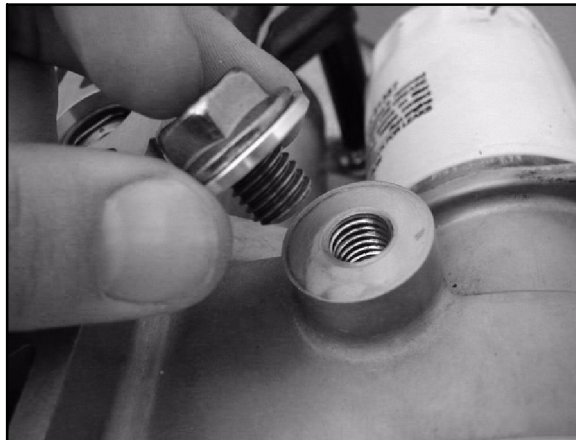


## Oil Rotor Clearance

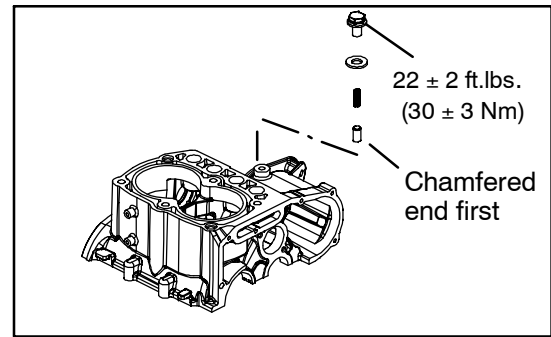
28. Use a feeler gauge to measure the clearance between the two rotors. Measure the gap between the two rotor tips as shown below. The clearance should not exceed 0.006" (0.15 mm).



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



30. Reinstall the valve (dowel chamfered end first). Install the spring, washer, and bolt. Torque the bolt to 22 ± 2 ft. lbs. (30 ± 3 Nm).

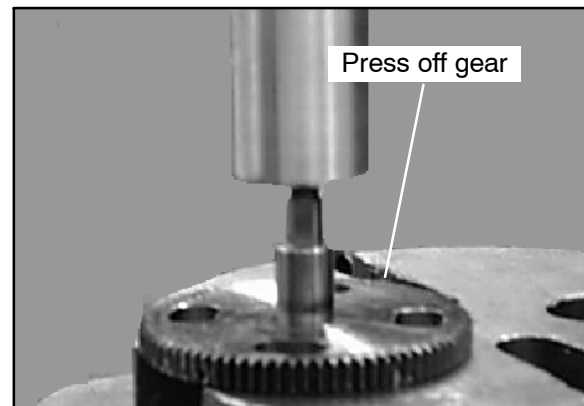


**NOTE:** Be sure to place the tapered end of the valve (dowel) in first. If the valve is installed incorrectly, oil pressure and oil priming problems will occur.

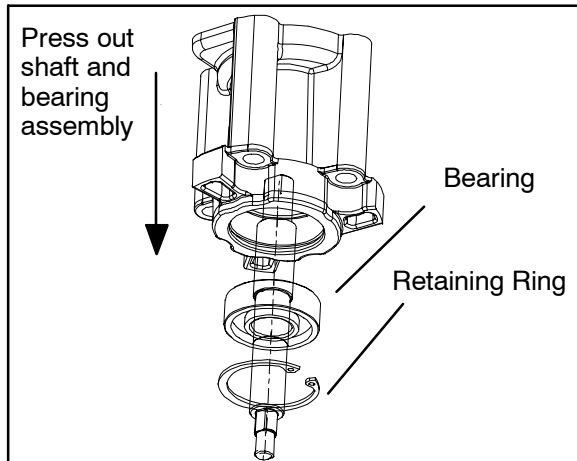
## DISASSEMBLY OF WATER/OIL PUMP SHAFT

**⚠ WARNING** Wear appropriate safety gear during this procedure. Protective gloves, clothing and eyewear are required.

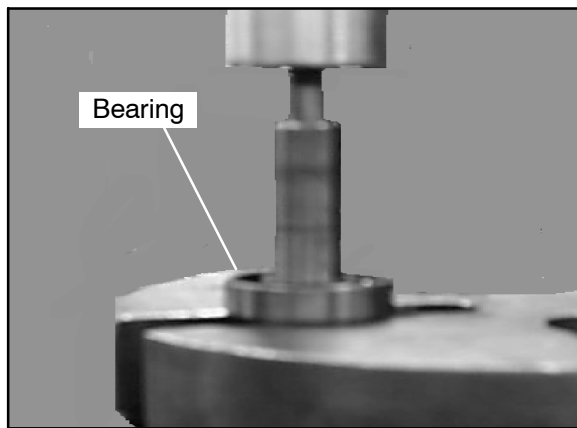
31. Carefully press the gear off the assembly while supporting the housing assembly.



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

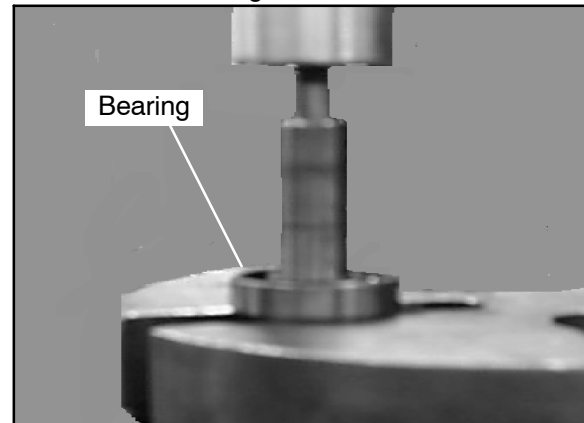


33. Place the shaft in a press to remove the bearing.

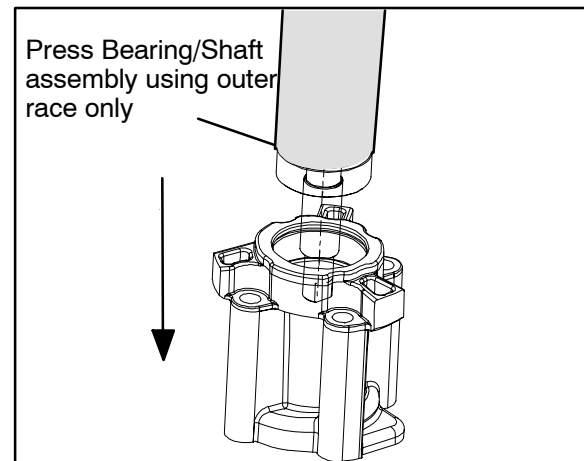


### WATER/OIL PUMP REASSEMBLY

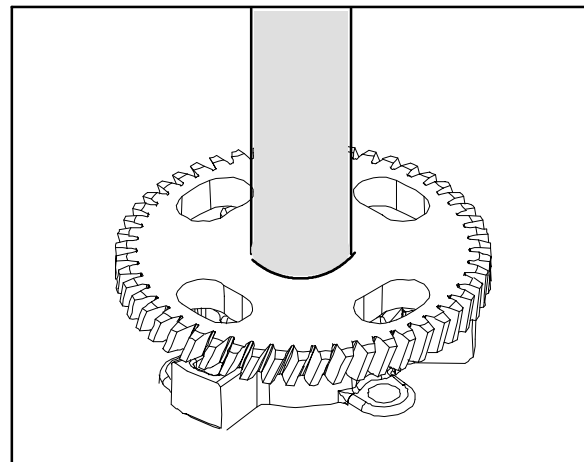
34. Press new bearing onto the shaft.



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.



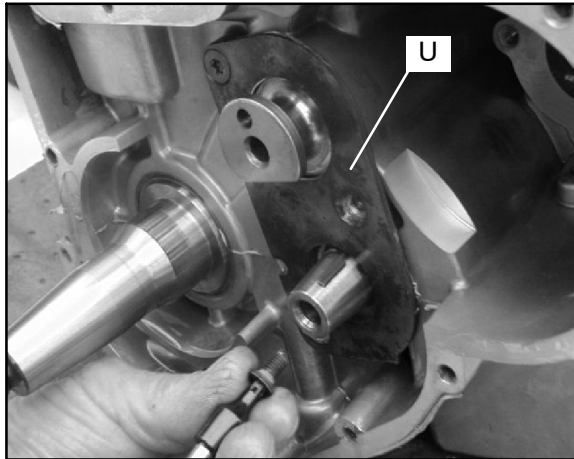
36. Press gear onto shaft while supporting the housing.



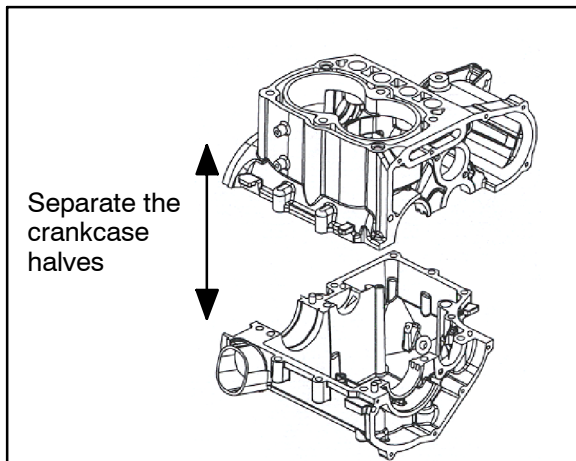


**CRANKCASE DISASSEMBLY CONT'D**

37. Remove thrust plate (U).

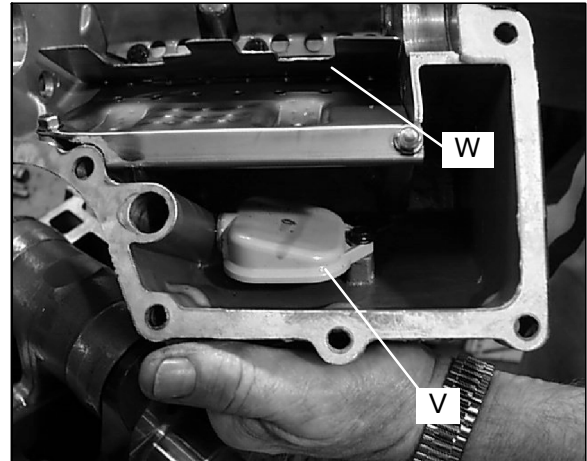


38. Remove PTO end engine mount. Remove crankcase bolts. Tap on the reinforced areas on the cases using soft hammer. Carefully separate the two crankcase halves.

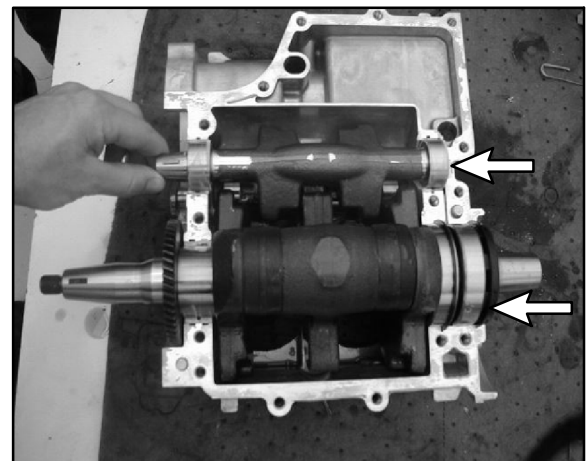


**NOTE:** Only remove the oil baffle if the baffle is damaged. When removing the oil baffle bolts, use a heat gun to heat the bolts and loosen the Loctite™. This will prevent any possible damage to the bolts or to the crankcase casting.

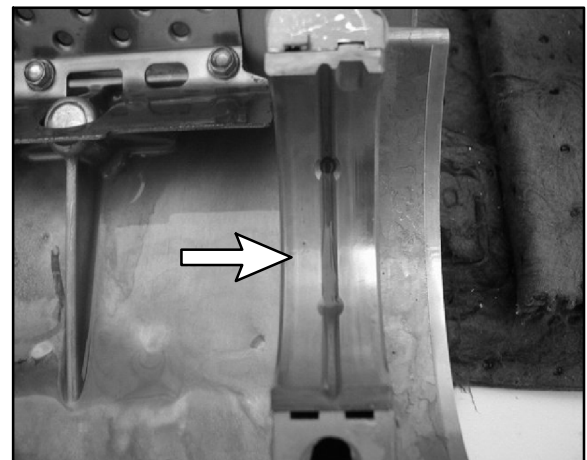
39. Remove and clean oil pick up (V) and oil baffle weldment (W).



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.**

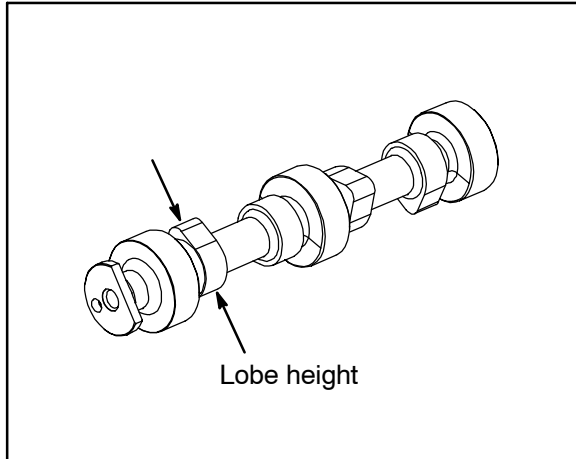






## CAMSHAFT INSPECTION

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

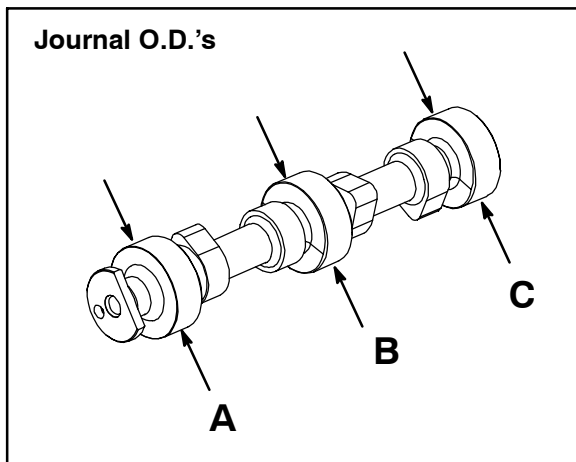


3. Measure height of each cam lobe using a micrometer. Compare to specifications.

**Cam Lobe Height (Intake & Exhaust):**

**Std: 1.3334"**  
**(33.8674 mm)**

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

**Camshaft Journal O.D. :**

- A. (Mag): 1.654" ± .00039" (42 ± .010 mm)**  
**B. (Ctr.): 1.634" ± .00039" (41.50 ± .010 mm)**  
**C. (PTO): 1.614" ± .00039" (41 ± .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 specifications.

**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.

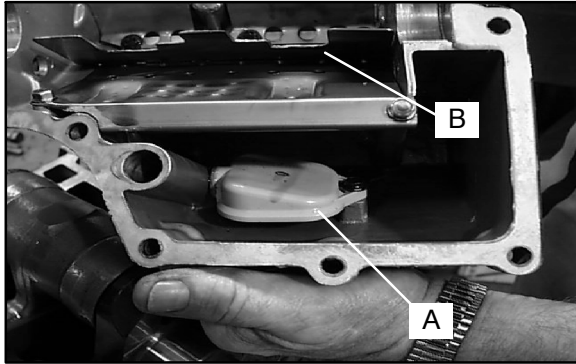
## ENGINE CRANKCASE REASSEMBLY

**WARNING:** 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 Steps 45-46 in this section to properly prime the engine and to help aid proper engine break in.

**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 bolt to  $60 \pm 6$  in. lbs. ( $6.8 \pm 0.68$  Nm).



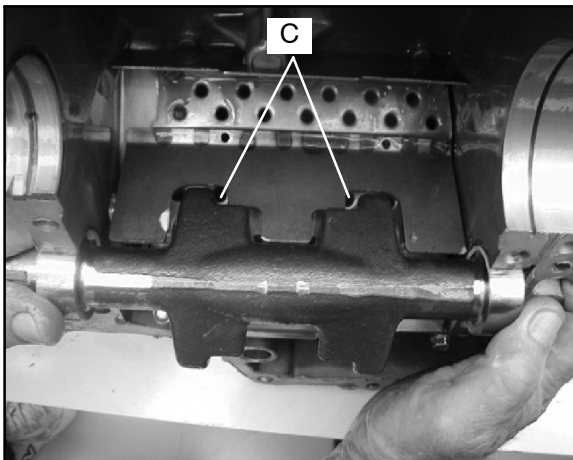
2. Install oil baffle weldment (B). Torque bolts to  $60 \pm 6$  in. lbs. ( $6.8 \pm 0.68$  Nm).

**Oil Baffle Weldment & Oil Pick Up-  
Bolt Torque:**

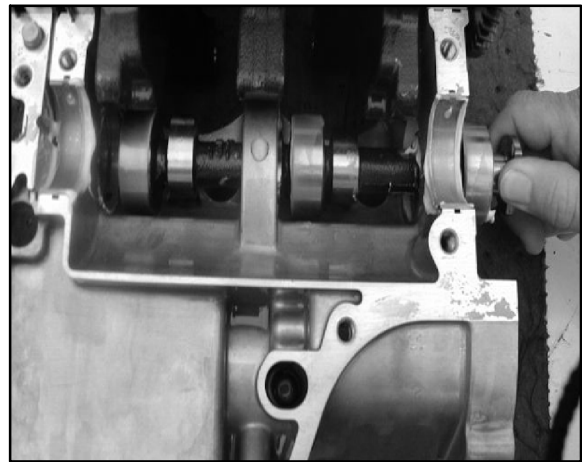
**$60 \pm 6$  in. lbs. ( $6.8-0.68$  Nm)**

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

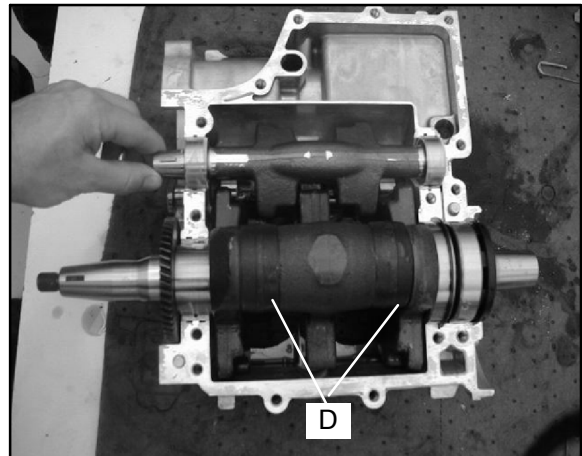
**NOTE:** Always install new balance shaft bearings.



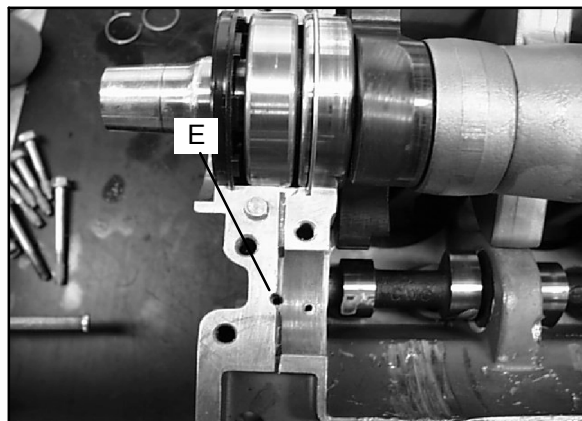
4. Apply Moly Lube Grease to cam journals and balance shaft bearing surfaces of the MAG case half. Install cam and balance shafts.



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



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



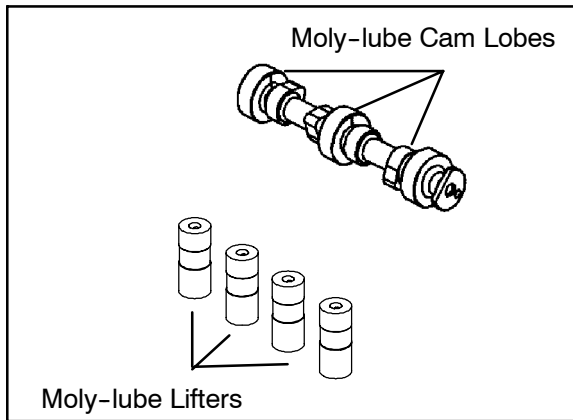
**NOTE:** Do not apply sealant to cam relief hole (E).



- 7. Assemble the crankcase halves. Apply LocTite™ 242 (PN 2871949) to the threads and pipe sealant to the bolt flanges. Torque bolts to  $22 \pm 2$  ft. lbs. ( $30 \pm 3$  Nm) following torque pattern on Page 3.11.

**Crankcase Bolt Torque:**  
 $22 \pm 2$  ft. lbs. ( $30 \pm 3$  Nm)  
 \*Torque in Proper Sequence (Pg. 311)

- 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 Lubriplate or Moly Lube to the ends of the lifters.

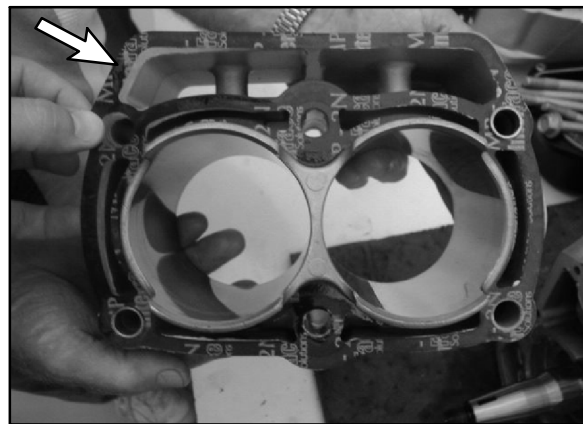
**NOTE:** Always replace the camshaft and lifters as a set.



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

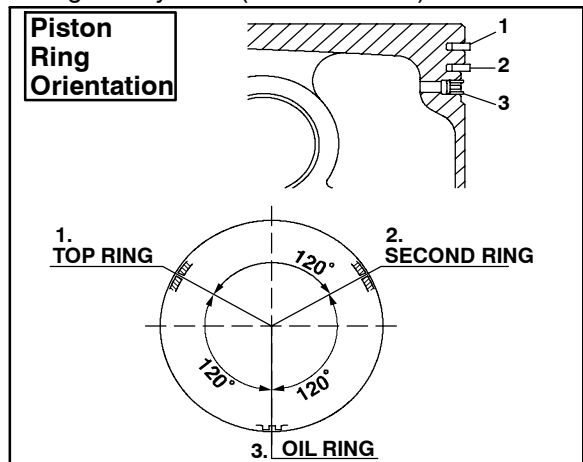


- 11. Install new cylinder gasket on crankcase. Align gasket on the dowel pins for proper gasket alignment.



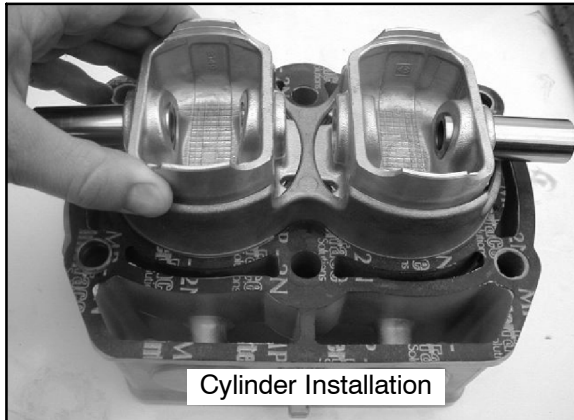
**NOTE:** Gasket must be installed dry. Do not use sealers or lubricants to hold in place during installation.

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





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.



Cylinder Installation

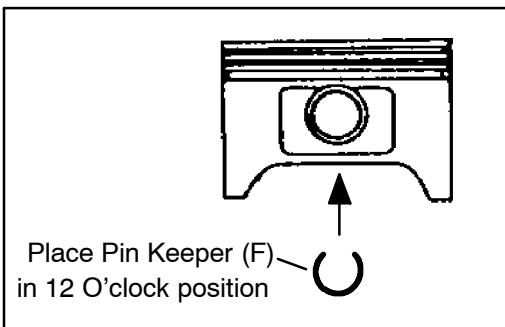
**NOTE:** To help align the pistons, slide a rod that is close to the same diameter as the wrist pin holes to properly align them in the cylinder.

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

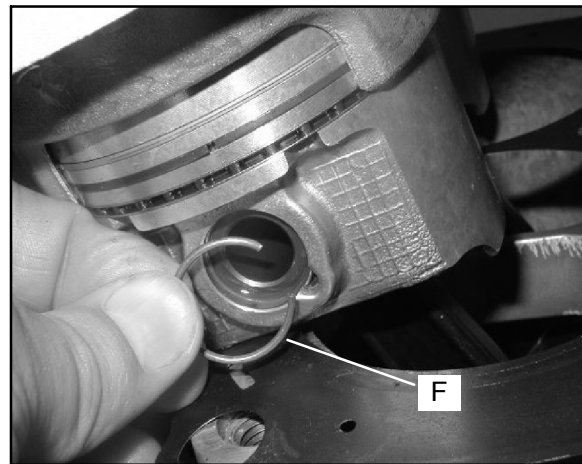


Push in Piston Pins

15. Install the piston pin keepers (F). The pin keeper ends should be installed at the 12 O'clock position.



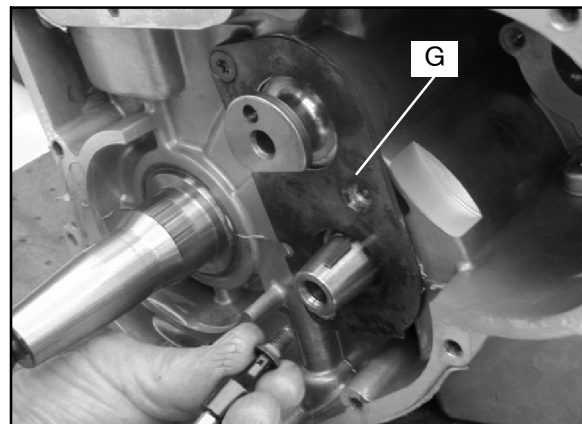
**NOTE:** While installing in piston pins, cover all engine passages. The clip could fall into the engine during installation.



F

16. Install camshaft thrust plate (G) with new bolts. Torque bolts to 115 ± 12 in.lbs. (13 ± 1.35 Nm).

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



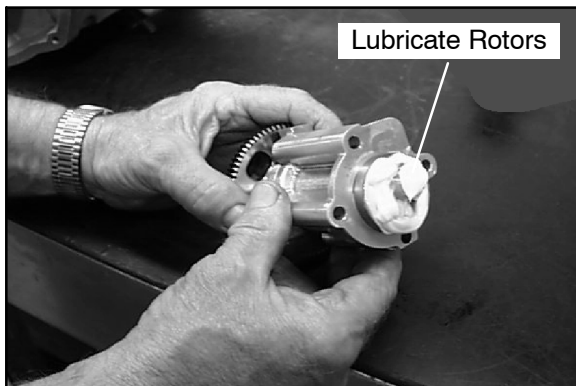
G

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



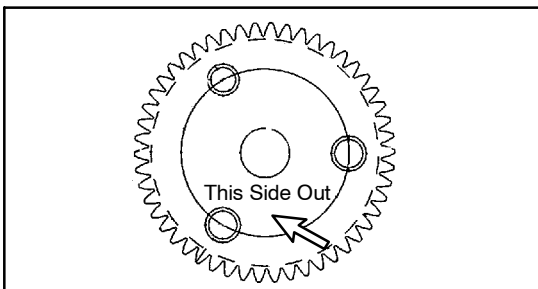
18. Apply moly lube, lubriplate, or oil to the rotors on the oil pump shaft.

**NOTE:** The application of oil or lubriplate 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.

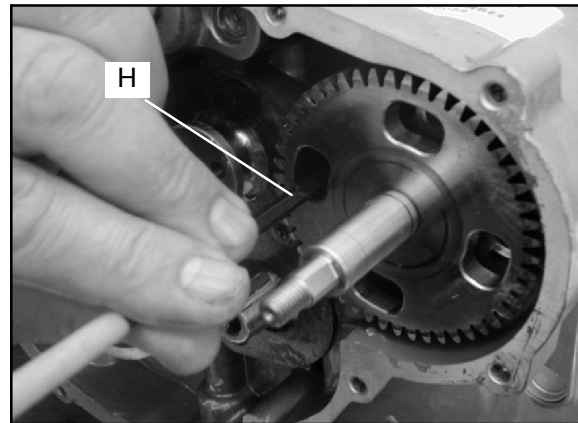
**NOTE:** For assembly of the gears, the cam gear and the crankshaft gear are stamped with "This Side Out." This indicates the side of the gear that faces outward or away from the case.



**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  $84 \pm 8$  in.lbs. ( $9.50 \pm 0.90$  Nm) and follow the torque sequence on Pg. 3.3.

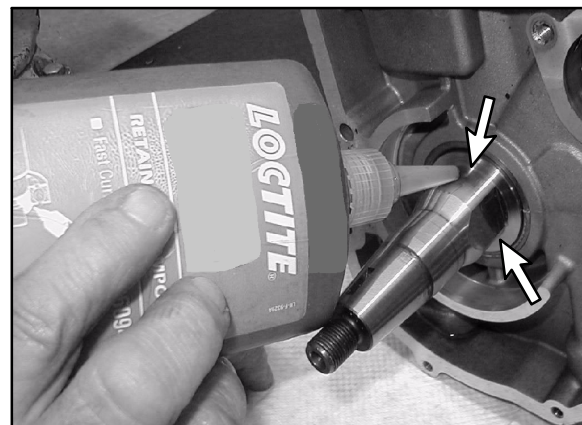
**NOTE:** Occasionally spin the oil pump when installing bolts to check for binding of the rotors.



**Oil Pump Bolt Torque:**  
 $84 \pm 8$  in.lbs. ( $9.50 \pm 0.90$  Nm)

**\*Torque in Proper Sequence (Pg. 3.3)**

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

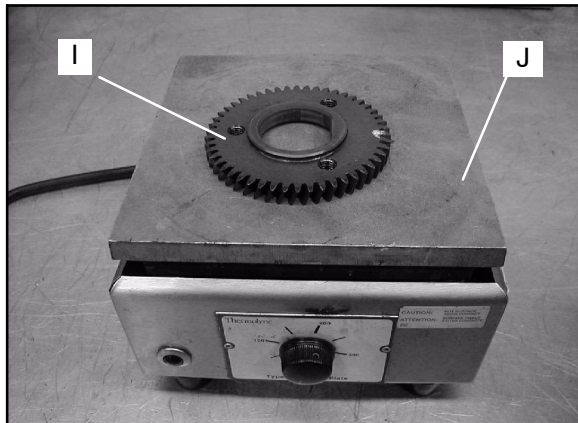


22. Before installing the crankshaft gear (I), heat the crankshaft gear to  $250^{\circ}$  F ( $121^{\circ}$  C) on a hot plate





(J).



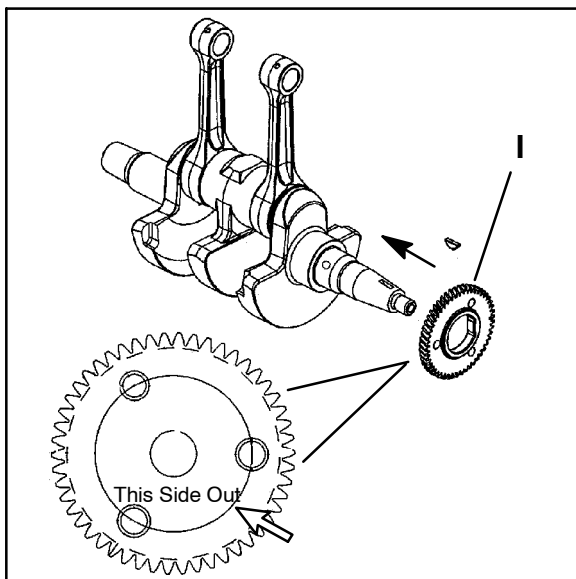
**CAUTION:**

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

23. Use extreme caution when removing the crankshaft gear from the hot plate. Use a pair of pliers and leather gloves when handling the crankshaft gear.

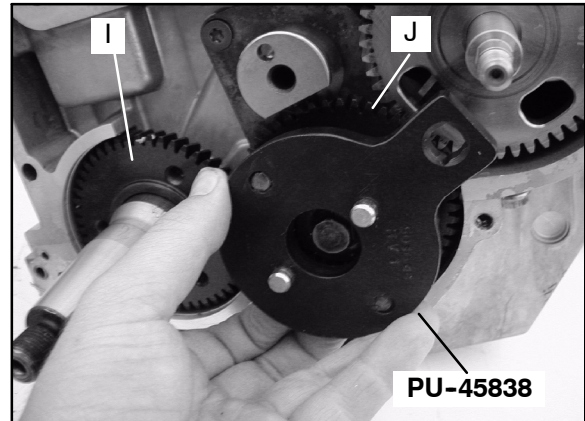
24. Install the crankshaft gear (I) onto the crankshaft.

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



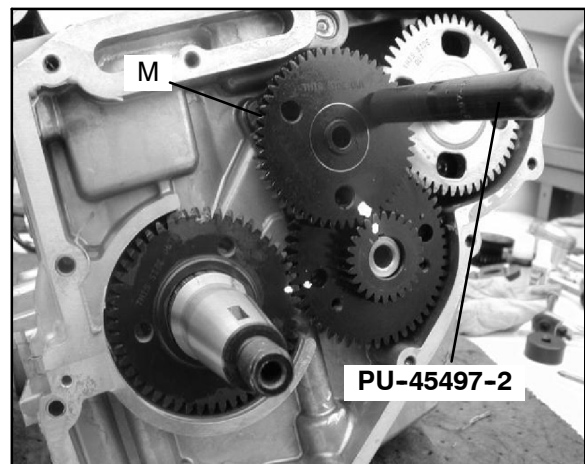
25. Install counter balance shaft gear (J) with new key, aligning timing marks with crankshaft gear

(I). Install washer and bolt. Use the Gear Holder (PU-45838). Torque to  $22 \pm 2$  ft. lbs. ( $30 \pm 3$  Nm).



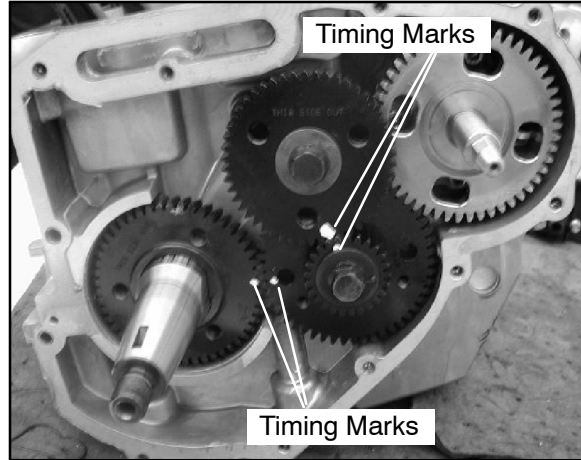
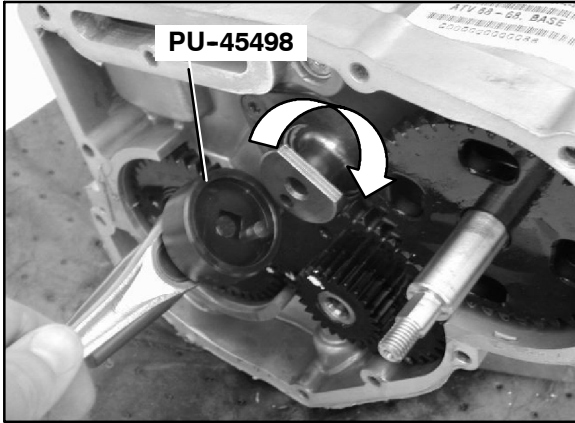
**Balance Shaft Gear Bolt Torque:**  
 $22 \pm 2$  ft.lbs. ( $30 \pm 3$  Nm)

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.

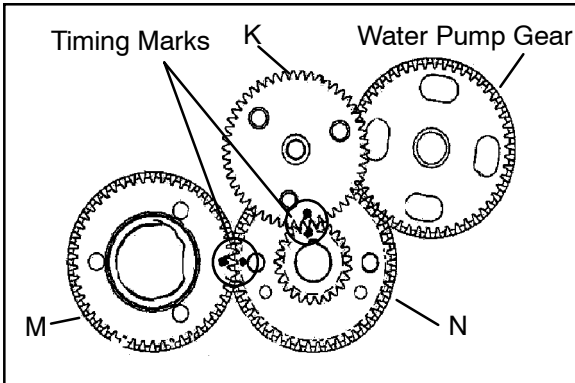
**NOTE:** Cam Spanner Wrench (PU-45498) is only needed to rotate the camshaft when the entire valve train is assembled.



27. Reinstall the camshaft gear; so the timing marks are properly aligned. Install the washer and bolt. Torque to  $22 \pm 2$  ft. lbs. ( $30 \pm 3$  Nm).

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

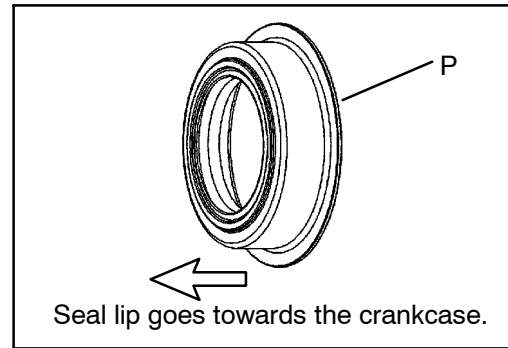
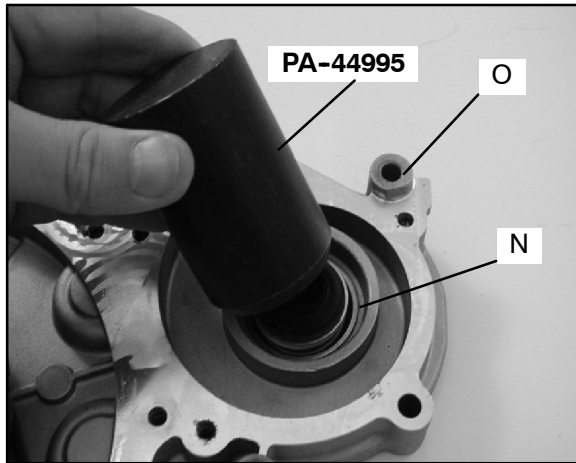
**Counterbalance Gear and Camshaft Gear Bolt Torque:**  
 $22 \pm 2$  ft. lbs. ( $30 \pm 3$  Nm)



**GEAR/STATOR HOUSING SEAL REPLACEMENT**

**IMPORTANT:** Due to seal design and construction, these 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.

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 (O). Use the Water Pump Mechanical Seal Installer (**PA-44995**) to properly install the seal to the correct depth in the cover.

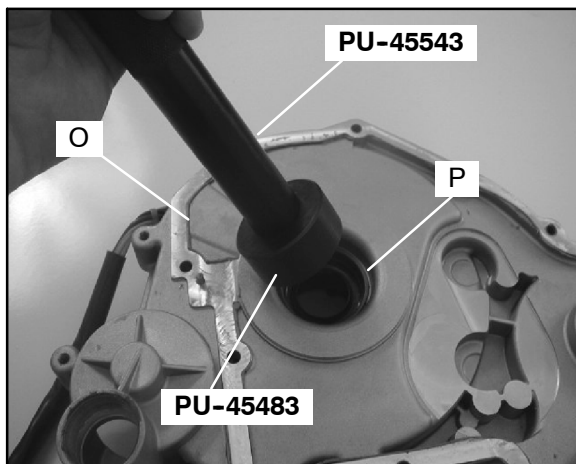
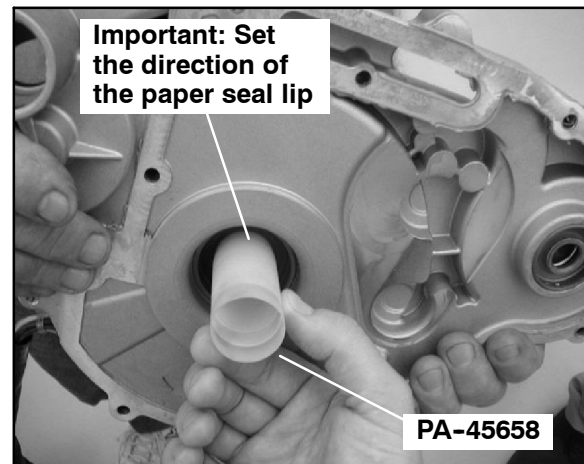


**NOTE:** To remove the water pump seal, the gear/stator housing must be removed. The water pump seal cannot be removed or installed with the gear/stator housing attached to the engine. Shaft damage will occur.

**NOTE:** Install the waterpump 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 (O). Use the Universal Driver Handle (PU-45543) and the Main Seal Installer (PU-45483) to seat the crankshaft seal into place.

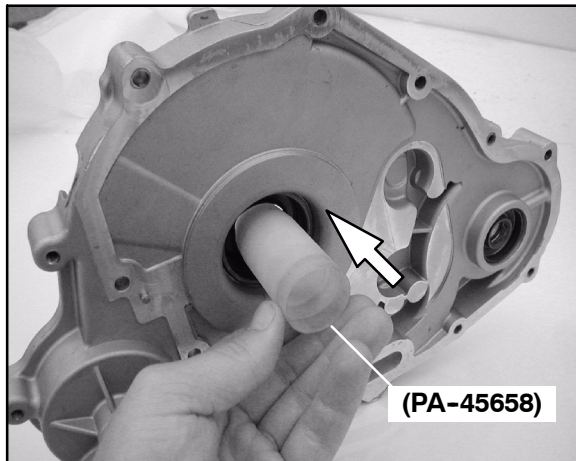
30. Once the crankshaft seal is installed into the gear/stator housing cover, set the direction of the paper lip by sliding the Main Crankshaft Seal Saver (PA-45658) into the crankshaft seal from the rubber lipped side to the paper lip side. (Back to Front) Remove the tool.



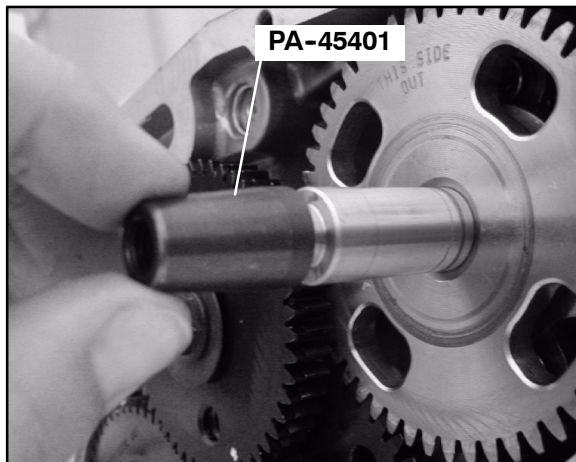
31. **Carefully** install the tapered end of the Crankshaft Seal Protection Tool (PA-45658) through the paper side of the crankshaft seal. (Back to Front) Leave the seal protector installed in the crankshaft seal. Check the crankshaft seal lips to verify they have not been rolled or damaged.

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

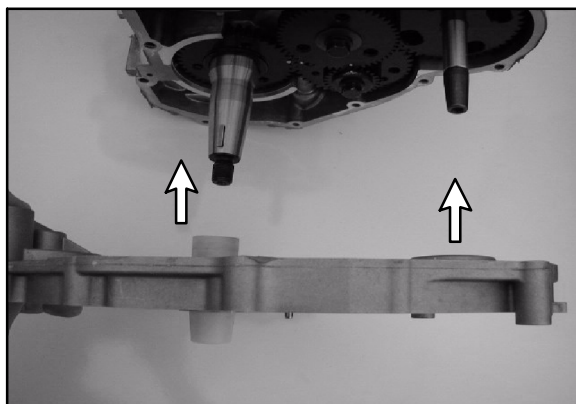




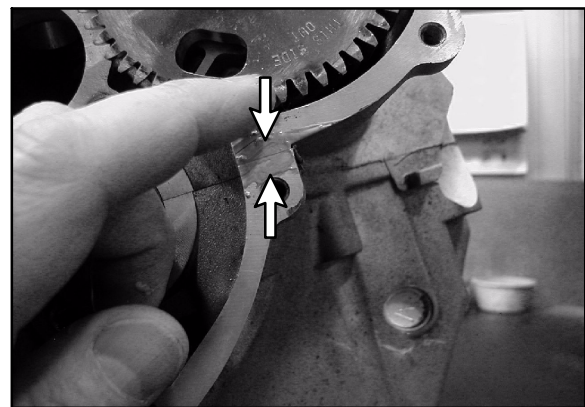
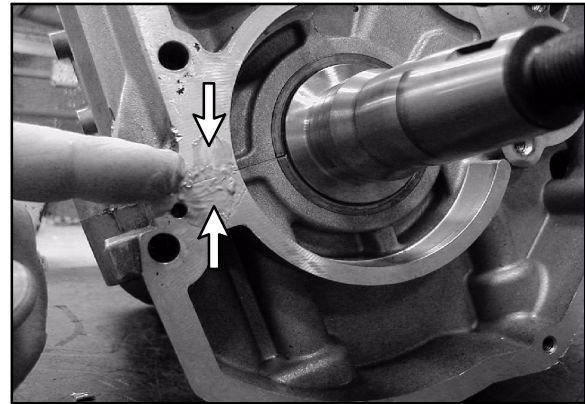
32. Before installing the gear/stator housing cover, install the Water Pump Seal Saver (PA-45401) onto the water pump shaft.



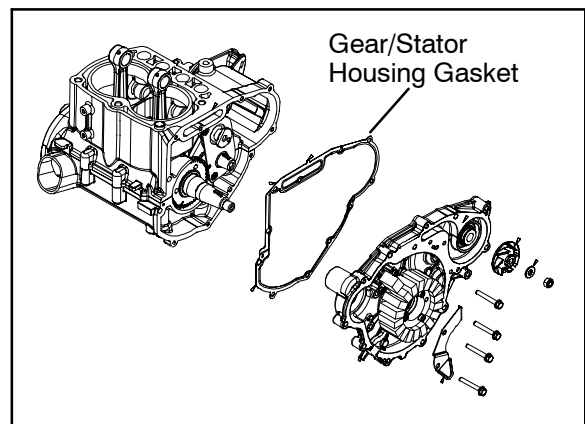
33. Install the new gasket to the gear/stator housing cover and crankcase. With the tools installed, carefully place the gear/stator housing cover over the protection tools. **NOTE:** New gasket is not shown in the picture.



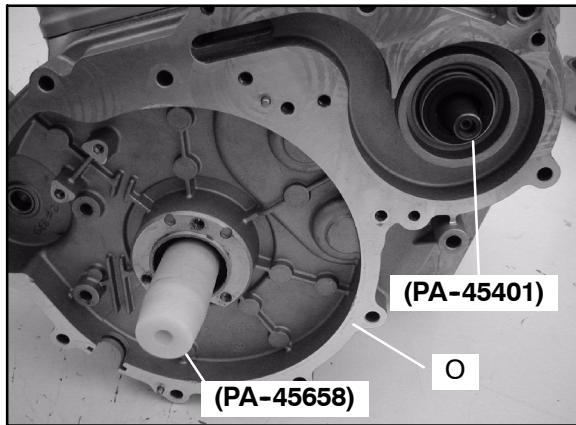
34. Apply Crankcase Sealant (PN 2871557) to the outside edges of the crankcase halves (See arrows), where the crankcases mate. (See photos below.) This helps to prevent coolant leakage.



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



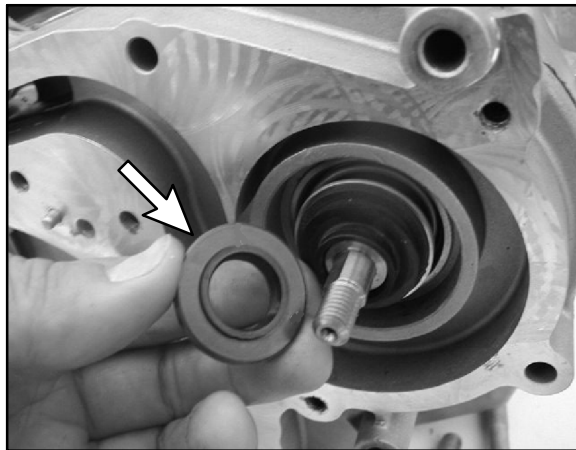
36. Secure the gear/stator housing cover (O) to the crankcase with the cover bolts. Torque bolts to  $96 \pm 12$  in.lbs. ( $10.85 \pm 0.35$  Nm) in proper tightening sequence (see Pg. 3.3). Remove seal protectors from the shaft ends once secure.



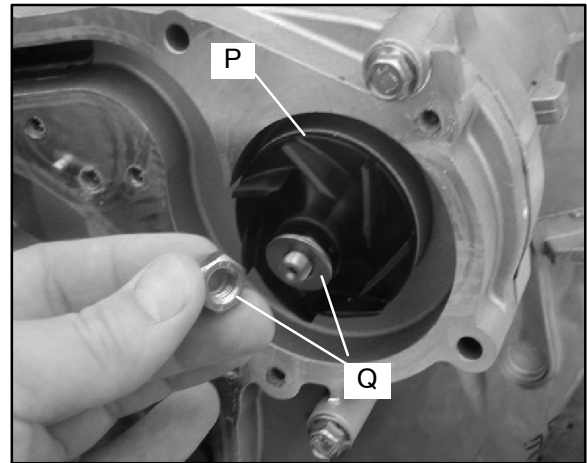
**Gear/Stator Housing Bolt Torque:**  
 $96 \pm 12$  in. lbs. ( $10.85 \pm 0.35$  Nm)  
 \*Torque in Proper Sequence (Pg. 3.3)

**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.

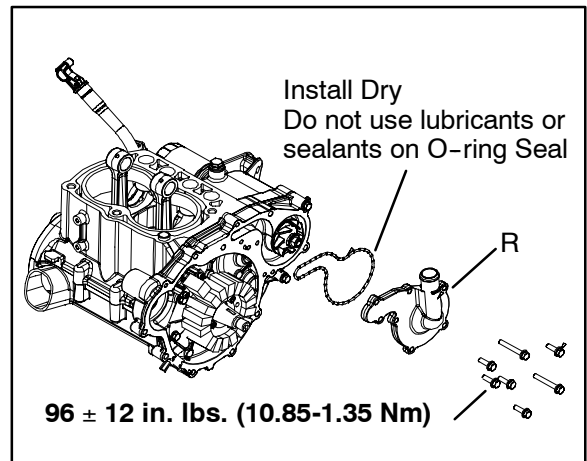


38. Install water pump impeller (P). **Secure the impeller with the washer and a new nylok nut (Q).** Torque the nut to specification.



**Water Pump Impeller Nut Torque:**  
 $108 \pm 12$  in. lbs. ( $6.8 \pm 0.68$  Nm)

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

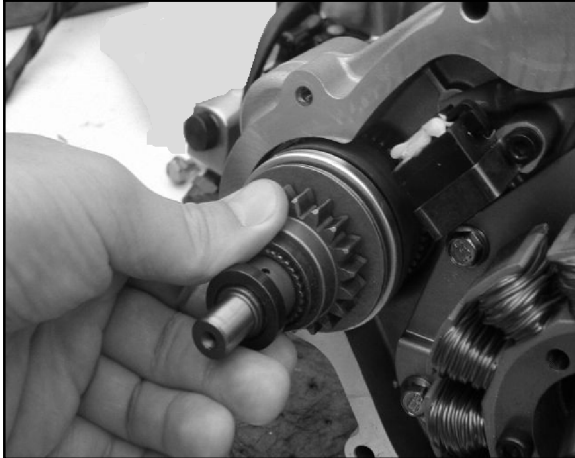


**Water Pump Housing Bolt Torque:**  
 $96 \pm 12$  in. lbs. ( $10.85-1.35$  Nm)  
 \*Torque Bolts in Proper Sequence (Pg. 3.4)



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

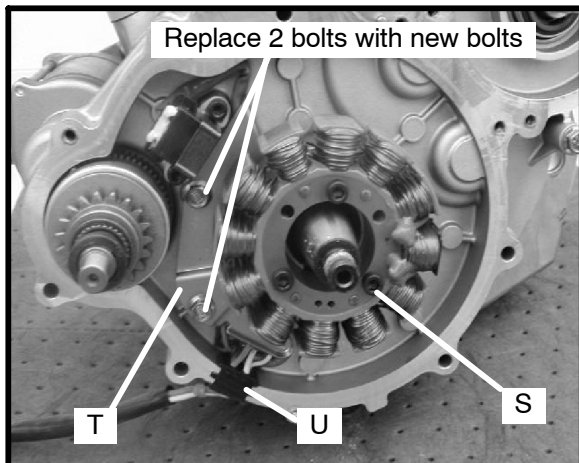
**NOTE:** There are thrust washers on both sides of starter drive.



41. Install stator assembly (S) and bolts. Torque bolts to  $96 \pm 12$  in.lbs. ( $10.85 \pm 0.35$  Nm).

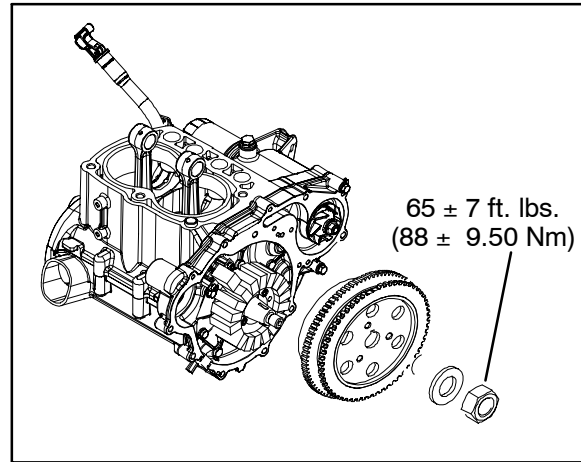
42. Install the the wire hold down bracket (T). Install two new wire hold down bolts. New bolts contain patch-lock. Torque bolts to  $96 \pm 12$  in.lbs. ( $10.85 \pm 0.35$  Nm) and follow the proper bolt torque sequence on Pg. 3.3). Coat the stator wire grommet (U) with Nyogel™ Grease (PN 2871329).

**NOTE:** Be sure the stator wires are routed properly under the wire hold down bracket.



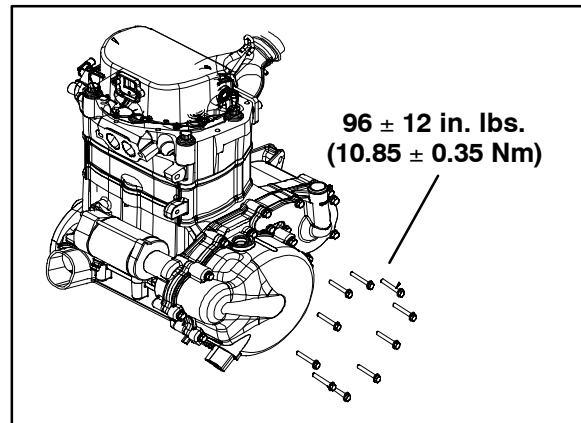
**Stator Assembly Bolt Torque:**  
 $96 \pm 12$  in.lbs. ( $10.85 \pm 0.35$  Nm)

43. Install the flywheel, washer, nut, and key. Torque flywheel nut to  $65 \pm 7$  ft. lbs. ( $88 \pm 9.50$  Nm).



**Flywheel Nut Torque:**  
 $65 \pm 7$  ft. lbs. ( $88 \pm 9.50$  Nm)

44. Install stator housing with new O-rings. Torque the bolts to  $96 \pm 12$  in.lbs. ( $10.85 \pm 0.35$  Nm) and follow proper bolt torque sequence Pg. 3.4.



**Stator Housing Bolt Torque:**  
 $96 \pm 12$  in. lbs. ( $10.85 \pm 0.35$  Nm)  
 \*Torque in Proper Sequence (Pg. 3.4)

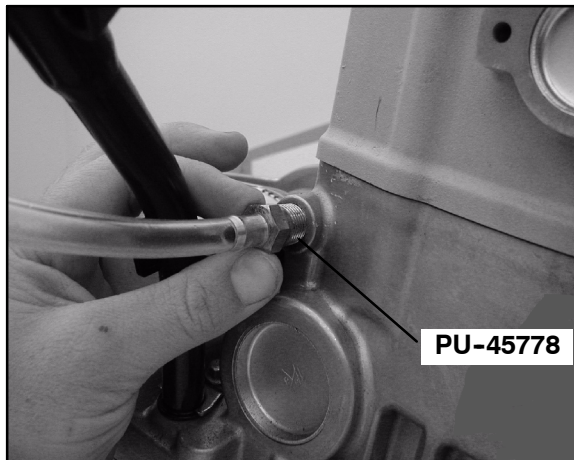


45. After the engine is completely assembled and ready for installation, the engine must be properly primed with Polaris 0W-40 Synthetic Oil (PN 2871281). Fill the oil filter three-quarters full with Polaris 0W-40 Synthetic Oil (PN 2871281). Let the oil soak into the filter for 8-10 minutes. Install the filter onto the engine.



**WARNING:** 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.

46. Remove primer plug from the engine. Install the Oil System Priming Adapter (PU-45778) into the oil plug hole. Push 3-5 oz. (approx.) of Polaris 0W-40 into the adapter until resistance is felt. Remove the adapter. Apply pipe dope or Teflon tape to the plug threads. Install the plug and torque to  $216 \pm 24$  in.lbs. ( $24.4 \pm 2.71$  Nm).



**Oil System Priming Adapter:  
(PU-45778)**



## **TROUBLESHOOTING**

### **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, stator, or ETC switch)
- ETC switch mis-adjusted
- 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 carburetor pilot system
- Low compression
- Crankcase breather restricted

### **Engine Idles But Will Not Rev Up**

- Spark plug fouled/weak spark
- Broken throttle cable
- Obstruction in air intake
- Air box removed (reinstall all intake components)
- Incorrect or restricted carburetor jetting
- ETC switch limiting speed
- Reverse speed limiter limiting speed
- 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





## TROUBLESHOOTING, CONT

### **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

### **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**

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

- Air leaks in intake
- Lean condition

## COOLING SYSTEM TROUBLESHOOTING

### **Overheating**

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





## BLEEDING PROCEDURE FOR 4-STROKE COOLING SYSTEMS

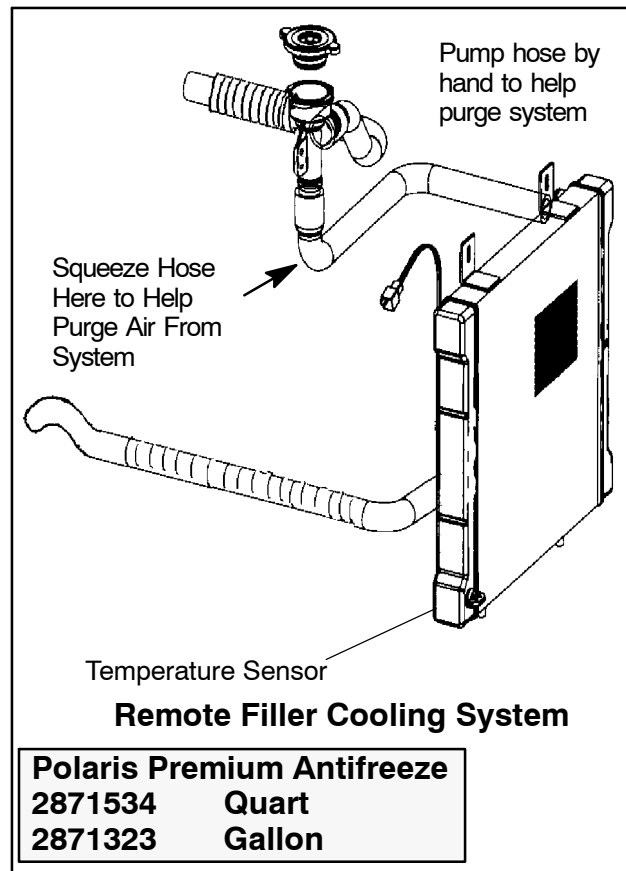
Use this procedure when a unit overheats and no apparent leaks in the cooling system are found.

**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.

1. Park Machine on a flat surface. Remove radiator cap and top off coolant. Leave the cap off of the radiator. Start and idle machine for 5-10 minutes until steam is visible in the radiator cap area.
2. Stop the engine and let cool for a few minutes or until a “glug” is seen at the filler neck or there is a dropping of the coolant level, indicating that coolant has been pulled into the system.

**Important Tips:** *Slowly squeezing the hose after the bend below the filler neck will aid in purging the system of air. Pump the hose using your hand several times as shown in the diagram. Elevating the rear of the ATV with a floor jack (rear tires 4-6, off the ground) also aids the purging of air from the system.*

3. Always add coolant to the radiator **first**, filling to the top of the neck to replace air that has been purged from the system. Fill the reservoir only after you have completely filled the cooling system at the radiator filler neck.
4. Repeat Steps 1 and 2 four or five times or until no more coolant is pulled into the system.
5. In some instances, Steps 1 and 2 may have to be performed with the radiator cap **on** to prevent coolant loss.
6. To test, install the radiator cap and idle machine until fan comes on. Make sure the fan comes on before the hot light.







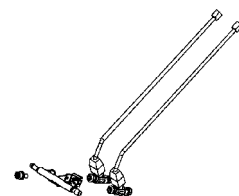


# **CHAPTER 4**

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# **FUEL INJECTION**

Special Tools .....	4.2
Service Notes .....	4.3
EFI System Exploded View .....	4.4-4.5
Fuel Tank Exploded View .....	4.6
Electronic Fuel Injection System .....	4.7
Operation Overview .....	4.7
Initial Start/Priming Procedure .....	4.7
Electronic Control Unit .....	4.8
Service .....	4.8
Replacement .....	4.8
Fuel Pump/Tank Assembly .....	4.9
Test .....	4.9-4.10
Replacement .....	4.10-4.11
Fuel Pressure Regulator .....	4.11
Test .....	4.11
Replacement .....	4.11
Fuel Filters .....	4.11
Service .....	4.11
Replacement .....	4.12
Fuel Injectors .....	4.12
Service .....	4.13
Replacement .....	4.13
Crankshaft Position Sensor .....	4.13
Test .....	4.13
Replacement .....	4.13
Temperature / Barometric Air Pressure Sensor .....	4.14
Test (Refer to Diagnostic Software) .....	4.14
Replacement .....	4.14
Throttle Position Sensor .....	4.14
Test .....	4.14
Replacement .....	4.15
TPS Initialization .....	4.15-4.16
Engine Temperature Sensor .....	4.16
Test (Refer to Diagnostic Software) .....	4.16
Replacement .....	4.16
Diagnostics using “Blink Codes” .....	4.17
Troubleshooting .....	4.18



# **4**

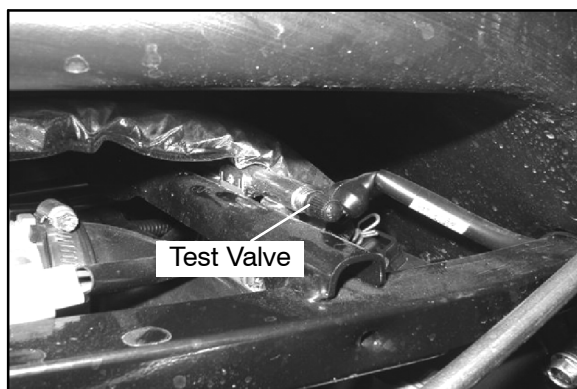
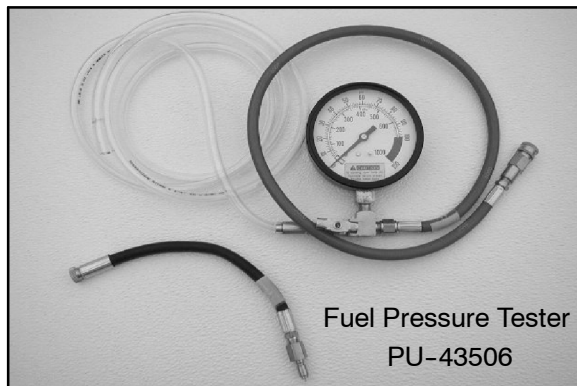


## SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
PU-47063	Polaris EFI Diagnostic Software
PU-43506	Fuel Pressure Test Kit
PU-47082	Throttle Position Sensor Tester

### Fuel Pressure Sender - PU-43506

**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.



### Polaris EFI 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.

### Throttle Position Sensor Tester - PU-47082

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

#### ⚠ 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.



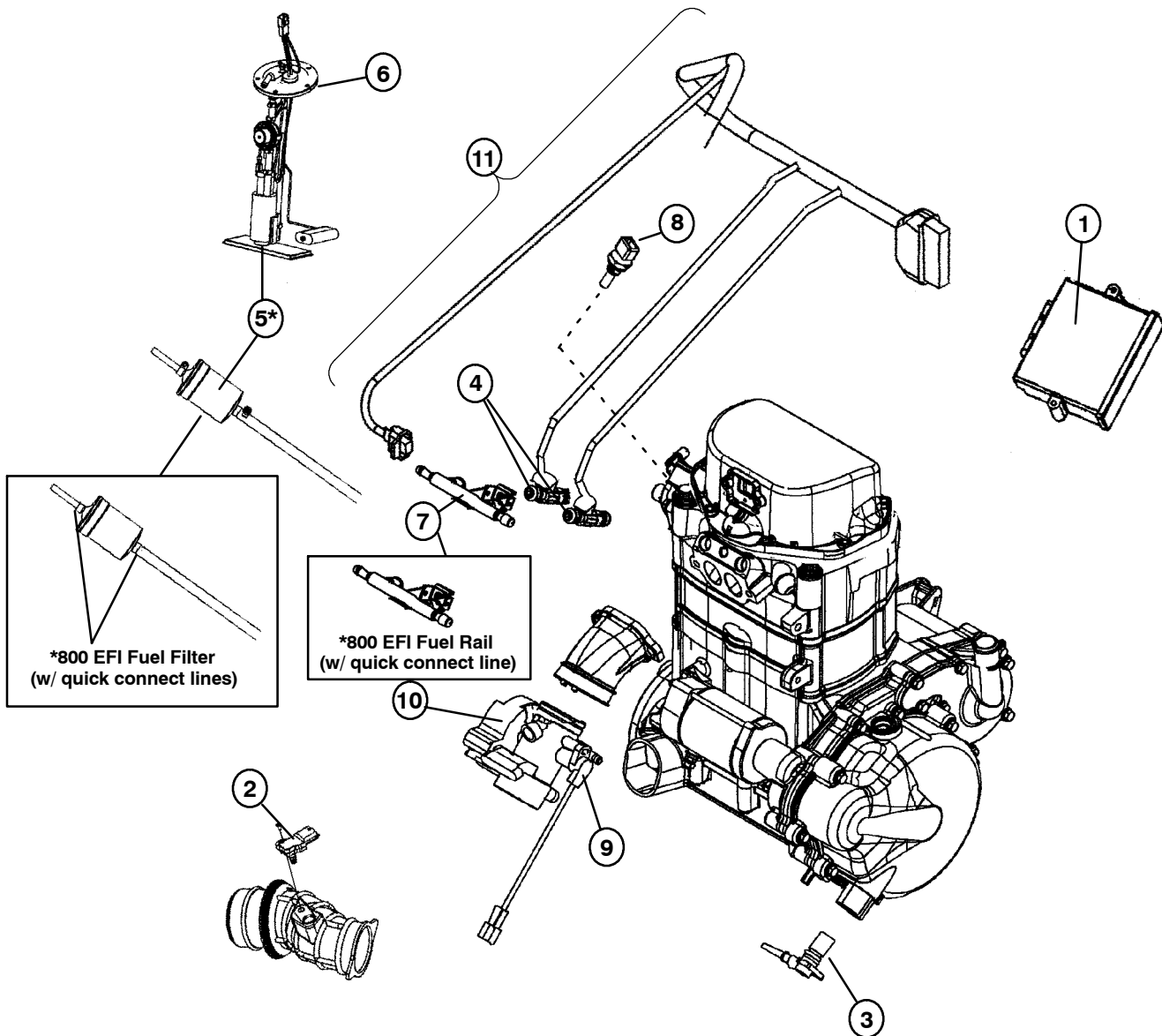
### Service Notes:

- **For more convenient and accurate testing of EFI components, it is recommended dealers utilize the Polaris 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 ATV EFI may be used without damaging system or engine components.
- Always depressurize the fuel system through the fuel rail test valve before disconnecting or servicing any EFI system components.
- Never attempt to service any fuel system component while engine is running or ignition switch is "on."
- Cleanliness is essential and must be maintained at all times when servicing or working on the EFI system. Dirt, even in small quantities, can cause significant problems.
- Do not use compressed air if the system is open. Cover any parts removed and wrap any open joints with plastic if they will remain open for any length of time. New parts should be removed from their protective packaging just prior to installation.
- Clean any connector before opening to prevent dirt from entering the system.
- Although every precaution has been taken to prevent water intrusion failure, avoid direct water or spray contact with system components.
- Do not disconnect or reconnect the wiring harness connector to the control unit or any individual components with the ignition "on." This can send a damaging voltage spike through the ECU
- Do not allow the battery cables to touch opposing terminals. When connecting battery cables attach the positive (+) cable to positive (+) battery terminal first, followed by negative (-) cable to negative (-) battery terminal.
- Never start the engine when the cables are loose or poorly connected to the battery terminals.
- Never disconnect battery while engine is running.
- Never use a quick-start battery charger 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 ATV.



**EFI SYSTEM EXPLODED VIEW**

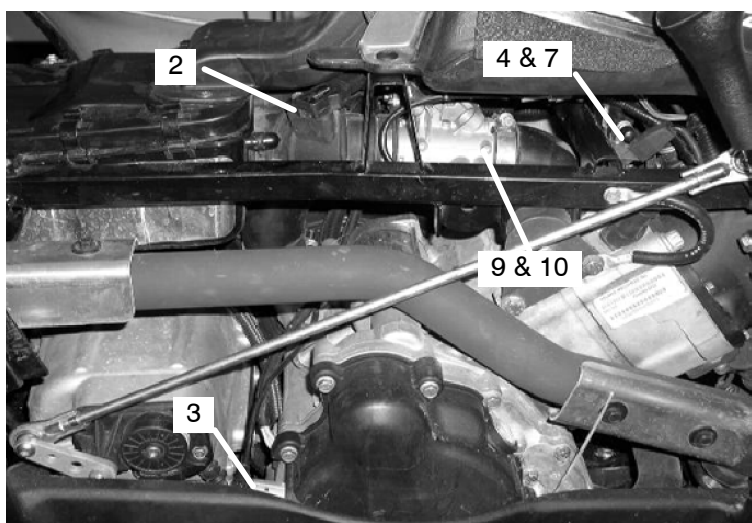
1. Electronic Control Unit (ECU)
2. Intake Air Temperature and Barometric Air Pressure Sensor (T-BAP)
3. Crankshaft Position Sensor (CPS)
4. Fuel Injectors
5. Fuel Filter(s)
6. Fuel Pump / Regulator / Gauge Sender Assembly (located in tank as an assembly)
7. Fuel Rail ( 800 EFI utilizes quick connect couplings)
8. Engine Coolant Temperature Sensor
9. Throttle Position Sensor (TPS)
10. Throttle Body
11. Wire Harness ( Integrated into main harness assembly)





## EFI SYSTEM COMPONENT LOCATIONS

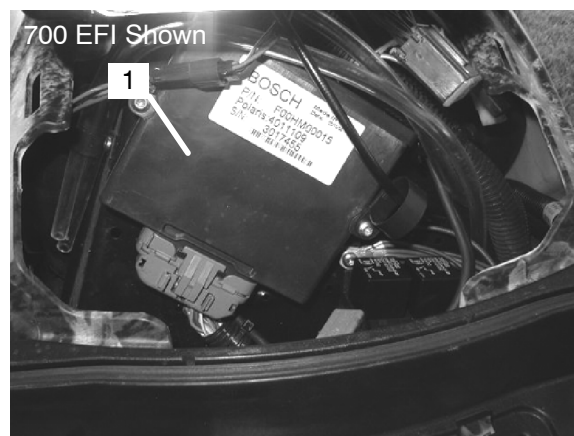
1. Electronic Control Unit (ECU)
2. Intake Air Temperature and Barometric Air Pressure Sensor (T-BAP)
3. Crankshaft Position Sensor (CPS)
4. Fuel Injectors
5. 2 Fuel Filters (1 located in tank, 1 under front cab cover not pictured)
6. Fuel Pump / Regulator / Gauge Sender Assembly (located In tank as an assembly)
7. Fuel Rail
8. Engine Coolant Temperature Sensor
9. Throttle Position Sensor (TPS)
10. Throttle Body
11. Wire Harness Assembly



Left Side of ATV (Side Panel Removed)



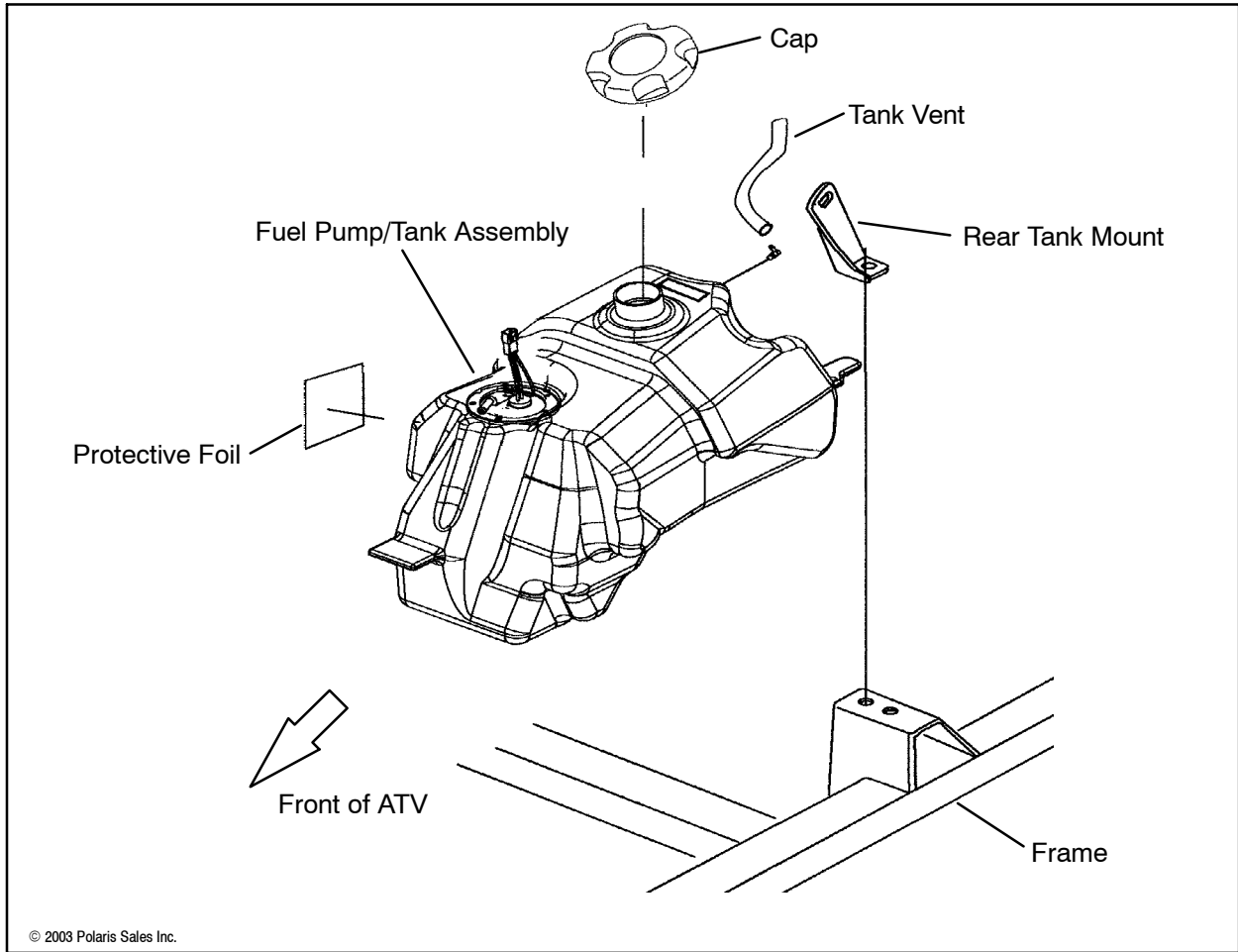
Right Side of ATV (Side Panel Removed)



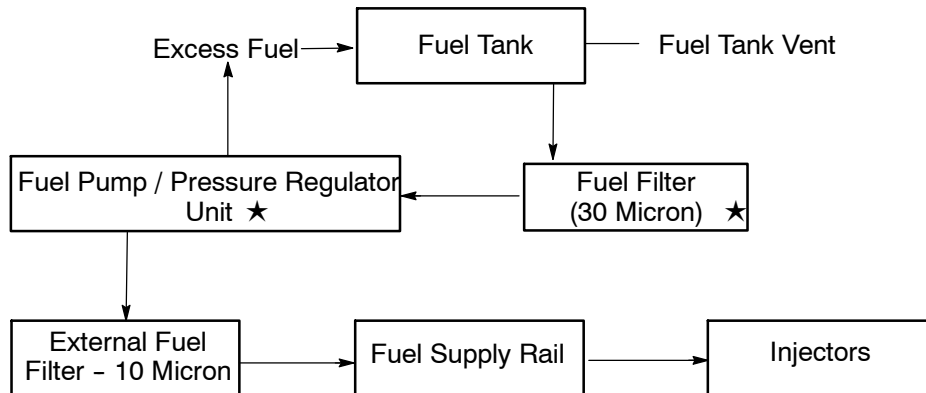
Front of ATV (Front Rack & Panel Removed)



# FUEL TANK ASSEMBLY



## FUEL FLOW



★ Located in Fuel Tank



# ELECTRONIC FUEL INJECTION SYSTEM OVERVIEW

### General

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

- Fuel Pump
- Fuel Rail
- Fuel Line(s)
- Fuel Filter(s)
- Fuel Injectors
- Pressure Regulator
- Throttle Body / Intake Manifold
- Engine Control Unit (ECU)
- Ignition Coils
- Coolant Temperature Sensor
- Throttle Position Sensor (TPS)
- Crankshaft Position Sensor (CPS)
- Intake Air Temperature and Barometric Air Pressure Sensor (T-BAP)
- Wire Harness Assembly
- Check Engine Light (MIL)

### 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.

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 STARTING/PRIMING 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.

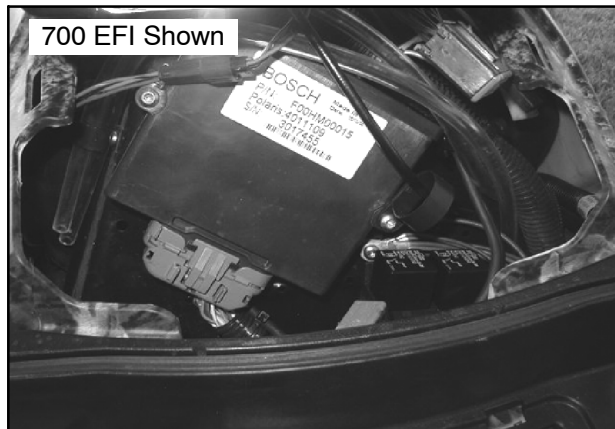
**NOTE: Accurate testing of EFI components is recommended utilizing the Polaris Diagnostic Software (dealer only).**





## ELECTRONIC CONTROL UNIT (ECU)

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 Malfunction Indicator Light (MIL) (Check Engine Light) on 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 access the stored fault code using a "blink code" diagnosis flashed out through the Instrument cluster. 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.

### **Sportsman 700 / 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: None

Low: 6300

Neutral: 6300

Reverse: 6300

Park: 6300

### **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 is altered, the TPS must be re-initialized.

For the purpose of troubleshooting, a known-good ECU from another Polaris ATV EFI 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, reapply a small amount of dielectric grease to the connector if desired. Tighten screws to 10 in. lbs (1.1 Nm).

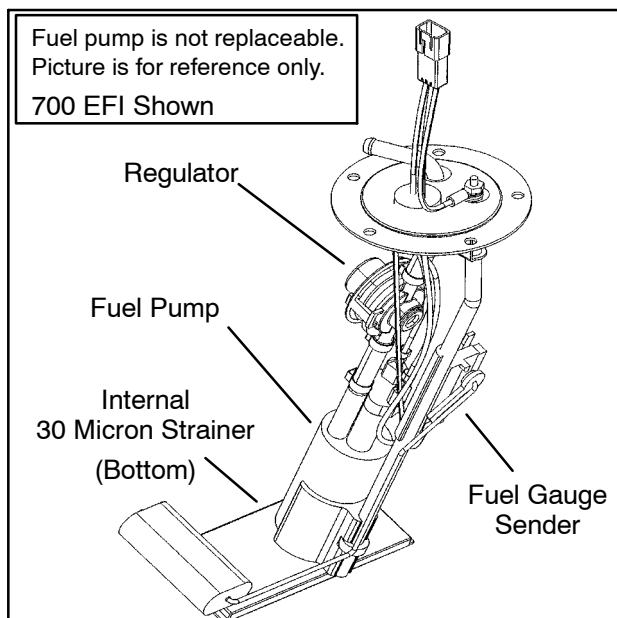




### FUEL PUMP ASSEMBLY

**NOTE:** 800 EFI fuel connections are quick-connect couplings vs 700 EFI connections.

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, regulator and fuel gauge sender. The pump is rated for a minimum output of 25 liters per hour at 39 psi and has a non-serviceable internal 30-micron filter. In addition, the pump has a replaceable 10-micron filter attached to the pump outlet, which is located under the strut mount.



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, or
- 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.

**NOTE:** FUEL GAUGE SENDER TEST - To test fuel gauge sender function, refer to Chapter 10 in this service manual.

### FUEL PUMP TEST

The fuel pump/tank assembly is non-serviceable and must be replaced if determined to be faulty. If a fuel delivery problem is suspected, make certain the 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, a reduction of fuel pressure may occur resulting in a lean starting condition. If required, testing of the fuel pump and circuitry may be conducted.

#### CAUTION:

**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.**



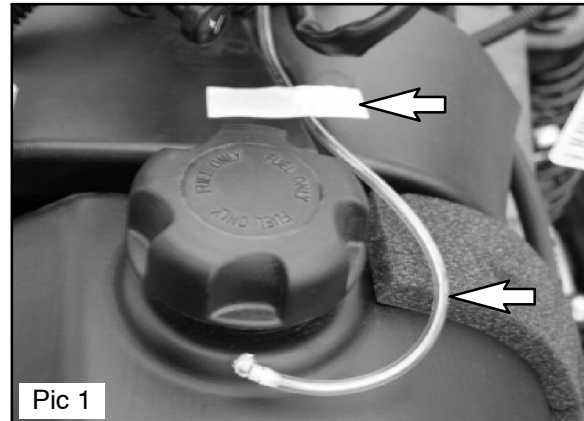
1. Remove the fuel test valve cap. Connect the pressure hose of the Polaris pressure tester (PN PU-43506) to the test valve on the fuel rail. Route the clear hose into a portable gasoline container or the equipment fuel tank.





2. 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.
  - If the pressure is too high or too low, replace the fuel pump assembly.
3. If the pump did not activate (step 2), disconnect the plug from the fuel pump. Connect a DC voltmeter across terminals 'A' and 'C' in the plug, turn on the key switch and observe if a minimum of 7 volts is present. If voltage is between 7 and 14, turn key switch off and connect an ohmmeter between the terminals 'A' and 'C' on the pump to check for continuity.
  - If there was no continuity between the pump terminals, replace the fuel pump/tank assembly.
  - If the voltage was below 7 Vdc, test the battery, ignition switch, wiring harness, Load-shed/Relay, and ECU.
4. If voltage at the plug was good, and there was continuity across the pump terminals, reconnect the plug to the pump, making sure you have good, clean connections. Turn on the key switch and listen for the pump to activate.
  - If the pump starts, repeat steps 1 and 2 to verify correct pressure.
  - If the pump still does not operate, check for correct ECU operation by plugging in a known-good ECU.
  - If the pump still does not operate, replace the pump/tank assembly.

3. Remove the gas tank cover vent hose. Be sure to properly route the vent hose upon reassembly.



Pic 1

4. Remove the clamps on the PVT intake duct and remove the PVT duct.



### FUEL PUMP/TANK ASSEMBLY REPLACEMENT

**NOTE:** 800 EFI fuel connections are quick-connect couplings vs 700 EFI connections.

**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 cannot be replaced as an individual part, the entire fuel pump and fuel tank is replaced as an assembly. Refer to your parts book for the proper part number.

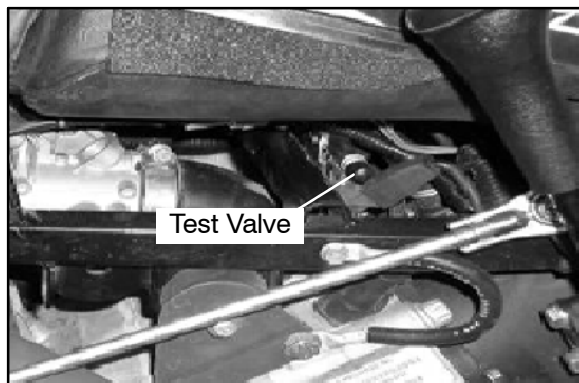
1. Disconnect the negative battery cable.
2. Remove the side panels and front cab assembly. Refer to "COVER PANEL REMOVAL" in Chapter 5 for details.

5. With all the body panels removed from the front of the ATV and the gas tank exposed, disconnect the pump wiring harness.

**WARNING:** Wear safety goggles while performing this procedure, failure to do so could result in serious injuries.



6. Relieve the fuel pressure at the fuel test valve.



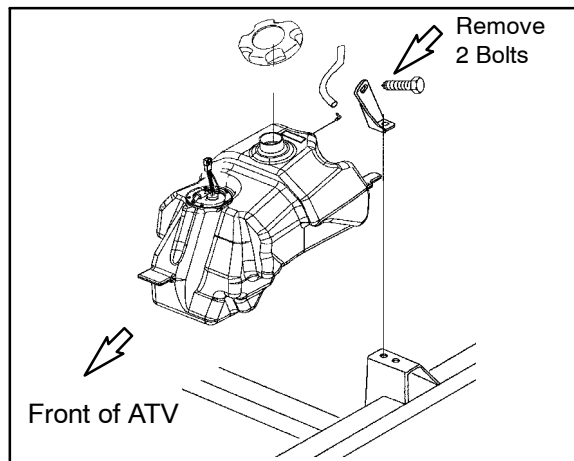
7. Loosen the fuel tank hose and pull the fuel line from the tank. **NOTE:** A small amount of fuel may come out of the fuel line or tank. Plug the fuel line and tank inlet or use a shop towel during removal.

### CAUTION:

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.



8. Remove the air box cover and remove the two gas tank mounting bolts at the rear of the gas tank.



9. Carefully pull the fuel tank out of the frame. Keep the fuel tank horizontal during removal, this will keep the fuel in the tank from spilling out the top inlet.

### Fuel Pump/Tank Installation

1. Reinstall the pump/tank assembly.
2. Reconnect the sender wiring harness and route the harness properly. Install the fuel line and tighten the fuel line clamp.
3. Reinstall the two fuel tank mounting bolts at back of tank.
4. Reinstall the PVT intake duct, gas tank vent line, front cab assembly, and side panels.

**NOTE:** Properly route the gas tank vent line, use tape to secure the vent line in place. (See Pic 1).

5. Reconnect the negative battery cable. Test the sender for proper operation.

## FUEL PRESSURE REGULATOR

The fuel pressure regulator maintains the required operating system pressure of 39 psi  $\pm$  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.

### FUEL PRESSURE REGULATOR REPLACEMENT

The regulator is a sealed, non-serviceable assembly. If it is faulty, the pump assembly must be replaced. Refer to the Fuel Pump/Tank Assembly Replacement procedure.

### FUEL FILTERS

**NOTE:** 800 EFI fuel connections are quick-connect couplings vs 700 EFI connections.

EFI Engines use a non-serviceable, high-volume, high-pressure, 30-micron internal fuel pump filter and a replaceable 10-micron, in-line fuel filter.



### FUEL FILTER SERVICE

In line filter replacement is recommended every 2 years of operation or more frequently under extremely dusty, dirty conditions. Use only the specified filter, and install it according to the directional arrows. **DO NOT** use an aftermarket filter, as operating performance and safety can be affected.

### FUEL FILTER REPLACEMENT

**To replace the filter:**

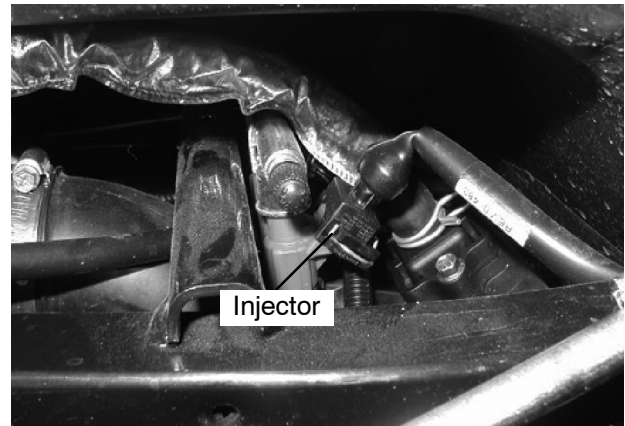
1. Relieve system pressure through the test valve in the fuel rail before servicing.
2. Loosen clamps and slide hose off the filter ends.
3. Install new filter with arrow pointing to the fuel line connected to the injector rail.

**NOTE:** When replacing the fuel filter, wet the interior of the new filter with gasoline before installation to ensure high pump pressure doesn't tear the filtering material.

### FUEL INJECTORS

**NOTE:** 800 EFI fuel connections are quick-connect couplings vs 700 EFI connections.

The fuel injectors mount into the intake manifold, and the fuel rail attaches to them at the top end. Replaceable O-Rings on both ends of the injector prevent external fuel leakage 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 start-up times.

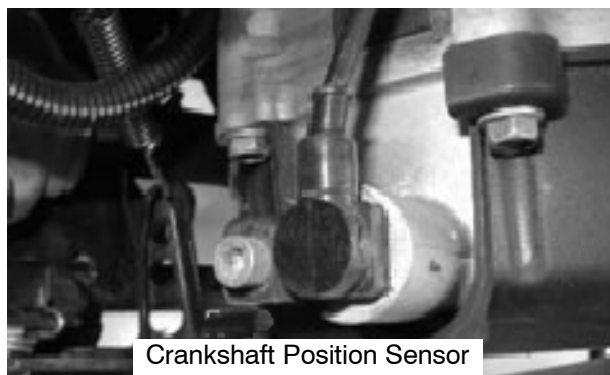
Injector problems due to dirt or clogging are unlikely due to the design of the injectors, the high fuel pressure, the use of filters and the detergent additives in the gasoline. Symptoms that could be caused by dirty/clogged injectors include rough idle, hesitation/stumble during acceleration, or triggering of fault codes related to fuel delivery. Injector clogging is usually caused by a buildup of deposits on the deflector plate, restricting the flow of fuel and 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 REPLACEMENT

1. Engine must be cool. Depressurize fuel system through test valve in fuel rail.
2. Remove the front fender assembly and fuel tank.
3. Thoroughly clean the area around and including the throttle body/manifold and the injectors.
4. Disconnect the fuel injector harness(s) at the ECU.
5. Remove the fuel rail mounting screw and carefully loosen / pull the rail away from the injectors.
6. Reverse the procedures to install the new injector(s) and reassemble. Use new O-rings any time an injector is removed (new replacement injectors include new O-rings). Lubricate O-rings lightly with oil to aid installation. Torque the fuel rail mounting screw to 16-20 ft. lbs. (22.6-27 Nm).

### CRANKSHAFT POSITION SENSOR (CPS)

The engine speed sensor is essential to engine operation, constantly monitoring the rotational speed (RPM) 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  $1.0 \pm 0.26$  mm ( $0.059 \pm 0.010$  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.





### CRANKSHAFT POSITION SENSOR TEST

The crankshaft position sensor is a sealed, non-serviceable assembly. If fault code diagnosis indicates a problem within this area, test and correct as follows:

1. Disconnect main harness connector from ECU.
2. Connect an ohmmeter between the pin terminals. A resistance value of  $560 \Omega \pm 10\%$  at room temperature ( $20^{\circ} \text{C}$ ,  $68^{\circ} \text{F}$ ) should be obtained. If resistance is correct, check the mounting, air gap, toothed ring gear (damage, runout, etc.), and flywheel key.
3. Disconnect speed sensor connector from wiring harness. (the connector with one heavy black lead) Viewing the connector with dual aligning rails on top, test resistance between the terminals. A reading of  $560 \Omega \pm 10\%$  should again be obtained.

**NOTE:** If the resistance is incorrect, remove the screw securing the sensor to the mounting bracket and replace the sensor. If the resistance in step 2 was incorrect, but the resistance of the sensor alone was correct, test the main harness circuit between the sensor connector terminals and the corresponding pin terminals in the main connector. Correct any observed problem, reconnect the sensor, and perform step 2 again.

### CRANKSHAFT POSITION SENSOR REPLACEMENT

1. Disconnect sensor harness connector.
2. Using a 6mm hex wrench, remove the retaining bolt and replace the sensor, using a light coating of oil on the o-ring to aid installation.



3. Torque the retaining bolt to 25 in. lbs. (2.8 Nm)

### TEMPERATURE and BAROMETRIC AIR PRESSURE SENSOR (T-BAP)

Mounted on the throttle body intake, the temperature and barometric air pressure sensor (T-BAP) 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.

### TEMPERATURE AND BAROMETRIC AIR PRESSURE SENSOR TEST

The temperature and barometric air pressure sensor (T-BAP) is a non-serviceable item. If it is faulty, it must be replaced. *This sensor requires a 5 Vdc input to operate, therefore the T-BAP sensor should only be tested using the Polaris Diagnostic Software (dealer only). Refer to the EFI Diagnostic Software Manual for more information.*

### TEMPERATURE AND BAROMETRIC AIR PRESSURE SENSOR REPLACEMENT

1. Disconnect sensor from engine harness.
2. Using a 10mm wrench, remove the retaining bolt and replace the sensor, using a light coating of oil on the o-ring to aid installation.
3. Torque the retaining bolt to 29 in. lbs. (3.3 Nm)



## THROTTLE POSITION SENSOR (TPS)

The throttle position sensor (TPS) is used to indicate throttle plate angle to the ECU.

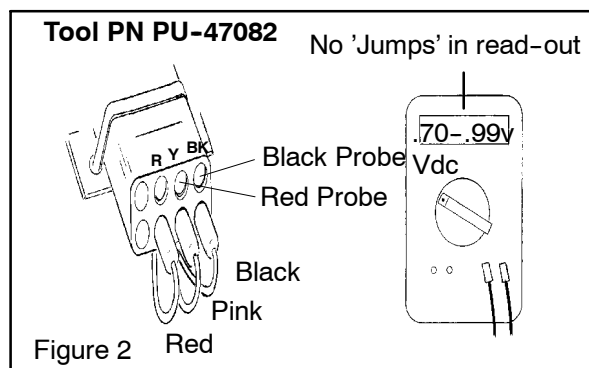
Mounted on the throttle body and operated directly off the end of the throttle shaft, the TPS works like a rheostat, varying the voltage signal to the ECU in direct correlation to the angle of the throttle plate. This signal is processed by the ECU and compared to the internal pre-programmed maps to 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.

### THROTTLE POSITION SENSOR TEST

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:

- Set up the TPS voltage check tool, PN PU-47082, according to the instructions. Make sure that the 9 volt battery has a minimum of 6 volts. **Figure 2.**



- With the test leads connected and the meter set, move the throttle open and closed slowly while reading the display. The voltage should increase smoothly with no 'jumps' or decreases when the throttle is applied.
- If the sensor does not function correctly, replace it.

### THROTTLE POSITION SENSOR REPLACEMENT

**The correct position of the TPS is established and set at the factory. If the TPS is repositioned, replaced or loosened it must be recalibrated.**

- Remove the front fender assembly and fuel tank.
- Disconnect sensor from the harness.
- Loosen and rotate the throttle body to gain access to the retaining screw.
- Remove the retaining screw and replace the sensor.
- Refer to "TPS Initialization" for setting the TPS voltage.

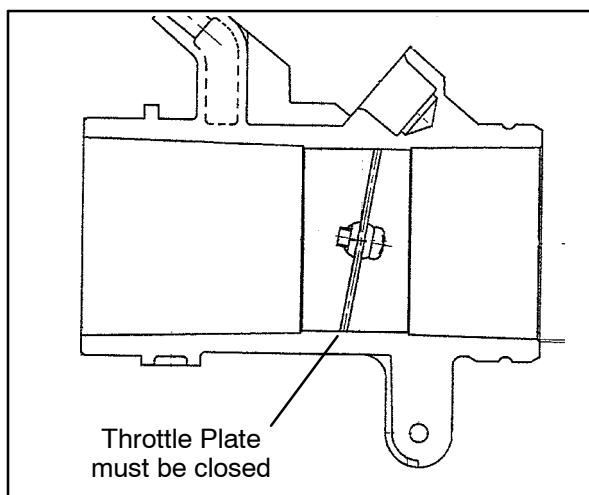
### THROTTLE POSITION SENSOR INITIALIZATION

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

This set procedure can be accomplished with the throttle body attached to the engine. This procedure is meant to allow the TPS flow and idle offset voltage to be correctly set without the use of a flow bench. No steps can be eliminated.

#### Step 1

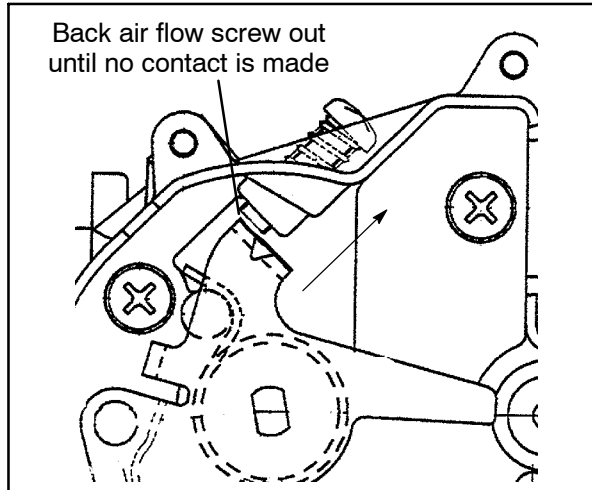
**Establishing zero offset voltage:** This step is crucial as it sets the TPS position using a fixed physical stop. This will insure that the correct offset voltage is reached once the correct throttle body flow is set.



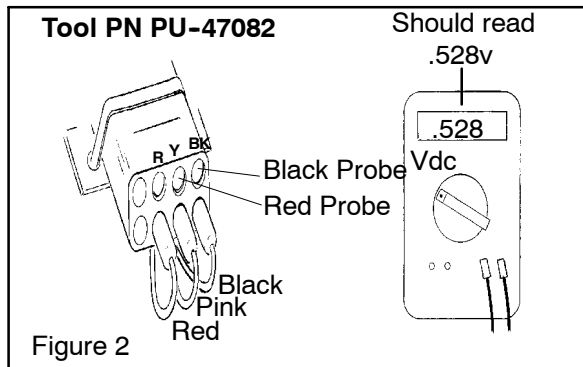
- Remove cover and disconnect throttle cable from throttle cam.



- With engine off, 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.



- 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.
- Set up the TPS voltage check tool PN PU-47082 according to the instructions. Verify that the 9 volt battery has a minimum of 6 volts. **Figure 2.**

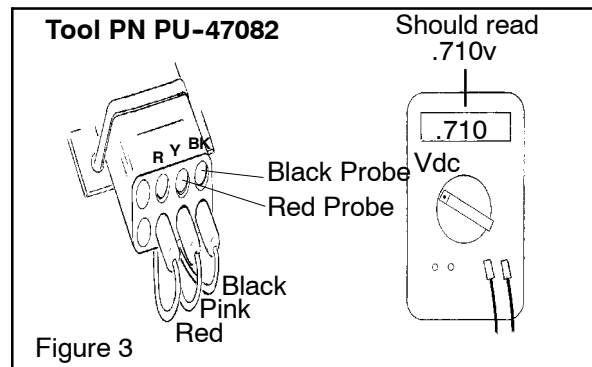
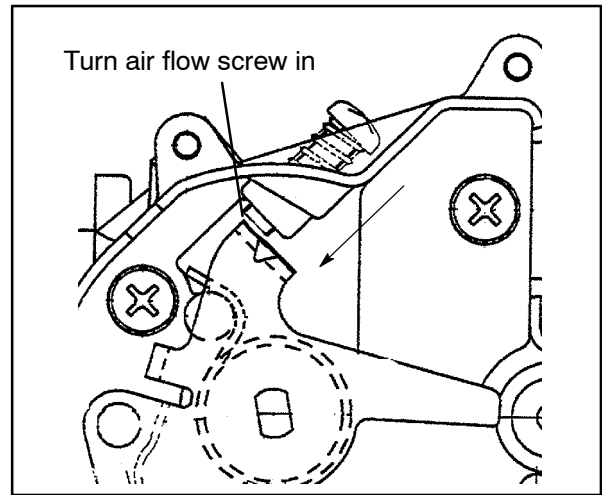


- Using a voltmeter attached to tool PN PU-47082 check the voltage output of the TPS. It should read **.528 ± .01 volts.**
- If it does not read **.528 ± .01** volts, loosen the screw holding the TPS to the throttle body. Rotate TPS until voltmeter reads **.528 ± .01** volts.
- Retighten TPS mounting screw, and verify the voltage did not change.

## 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.

- With voltmeter still attached to tool PN PU-47082, turn the air flow adjustment screw until the voltmeter reads **.710 ± .01** volts. The throttle body is now adjusted to the correct flow value **Figure 3.**



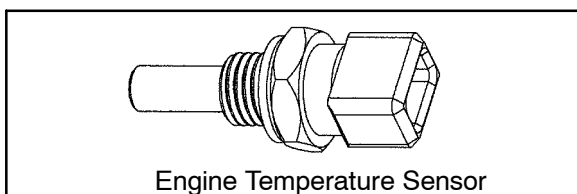
- Reconnect the TPS harness lead
- Reinstall throttle cable on throttle cam and install cover. Adjust cable freeplay.





## **ENGINE TEMPERATURE SENSOR**

Mounted on the cylinder, 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.



Engine Temperature Sensor

Refer to Chapter 10 for testing. Standard resistance readings according to temperature:

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

Coolant passes through the cylinder and by the sensor probe, creating 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'.



### **ENGINE TEMPERATURE SENSOR TEST**

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

### **ENGINE TEMPERATURE SENSOR REPLACEMENT**

1. Disconnect sensor from engine harness.
2. Using a wrench, remove and replace the sensor, applying a light coating of thread sealant to aid installation.
3. Torque the sensor to 18.5 ft. lbs. (25 Nm)



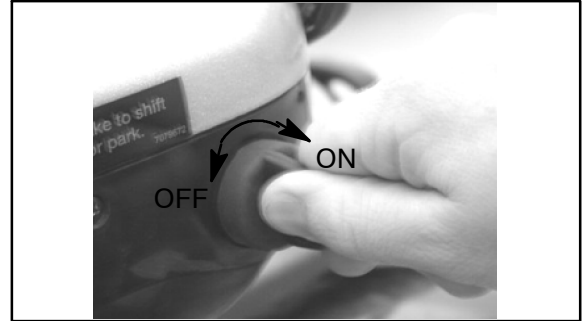


## **DIAGNOSTICS USING “BLINK CODES”**

To enable the blink codes, **turn the ignition from 'off' to 'on' 3 times, leaving it 'on' the 3rd time, within 5 seconds.**

Any “blink codes” stored in the ECU will display, one at a time, in numerical order. The word END will display after all codes have been transmitted.

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



**NOTE:** See Chapter 10 for more details.

## **DIAGNOSTIC “BLINK CODES” CHART**

<b>SAE Code</b>	<b>Blink Code</b>	<b>Name</b>	<b>MIL On?</b>
P0335	21	Loss of Synchronization	Yes
P0122	22	TPS Circuit: Open or Short to Ground	Yes
P0123	22	TPS Circuit: Short to Battery	Yes
P0601	23	RAM Error: Defective ECU	Yes
P0113	41	Air Temp Sensor: Open or Short Circuit to Sensor Voltage (ECU)	Yes
P0112	41	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
P1480	58	Cooling Fan: Open Load	Yes
P1481	58	Cooling Fan: Short Circuit to Ground	Yes
P1482	58	Cooling Fan: Short Circuit to Battery	Yes
--	61	End of Diagnostic Check	--



### 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

**Idle Too High (If greater than 1300 RPM when engine is warm)**

- Throttle stop screw set incorrect
- Throttle cable sticking, improperly adjusted, routed incorrectly

**Idle Too Low (If less than 900 RPM when engine is warm)**

- Plugged air filter
- Leaking injector (rich condition)
- Belt dragging
- Throttle stop screw set incorrect

#### Erratic Idle

- Throttle cable incorrectly adjusted
- Air leaks, dirty injector
- TPS damaged or adjusted incorrectly
- 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)



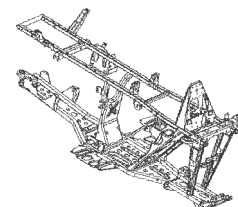




# CHAPTER 5

## BODY AND STEERING

- Torque Specifications and Special Tools ..... 5.2
- Cover/Panel Removal ..... 5.2-5.3
- Side Panel Removal ..... 5.3
- Front Cover Removal ..... 5.4
- Footwell Removal/Install ..... 5.4
- Front Storage Removal/Install ..... 5.5-5.7
- Rear Rack Removal/Install ..... 5.7-5.8
- Front Cab Removal/Install ..... 5.8
- Rear Cab Removal/Install ..... 5.9
- Rear Storage Removal/Install ..... 5.9
- Radiator Screen Removal ..... 5.10
- Body Assembly, Exploded View ..... 5.11-5.12
- Headlight Pod Exploded View ..... 5.13
- Handlebar Block Installation Procedure ..... 5.14
- Steering Assembly, Exploded View ..... 5.15
- A-Arm Replacement ..... 5.16
- Rear Suspension Assembly ..... 5.17
- Strut Assembly Exploded View ..... 5.18
- Front Strut Cartridge Replacement ..... 5.19
- Front Strut Ball Joint Replacement ..... 5.19-5.20
- Steering Post Assembly ..... 5.20
- Decal Replacement ..... 5.20





**TORQUE SPECIFICATIONS**

COMPONENT	FT. LBS. (IN.LBS.)	NM
Front Hub Nut	70	95
Front A-Arm Attaching Bolt	30	41
Front A-Arm Ball Joint Stud Nut	25	35
Handlebar Adjuster Block	11-13	15-18
Master Cylinder Clamp Bolts	(45-55)	5.2-6.3
Rear Shock Bolt (Upper)	30	41
Rear Shock Bolt (Lower)	30	41
Rear Wheel Hub Nut	80	108
Upper Stabilizer Support Nuts	17	27
Upper Control Arm Mounting Bolt	35	48
Lower Wheel Bearing Carrier Bolt	30	41
Strut Rod Retaining Nut (Top)	15	21
Strut Casting Pinch Bolt	15	21
Tie Rod End Jam Nut	12-14	17-19
Tie Rod End Castle Nut	40-45	54-61
Tie Rod End Attaching Bolt	25-30	35-41

**NOTE:** Refer to exploded views throughout this chapter for identification and location of components.

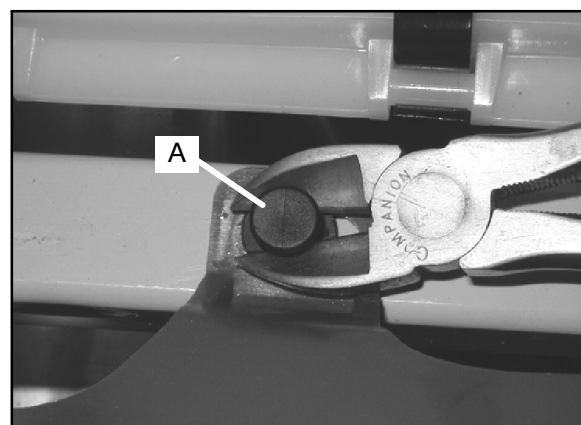
**SPECIAL TOOLS**

PART NUMBER	TOOL DESCRIPTION
2870871	Ball Joint Replacement Tool
2870872	Shock Spanner Wrench
2870623	Shock Absorber Spring Compression Tool
2871572	Strut Rod Wrench
2871573	LH Strut Spring Compressor
2871574	RH Strut Spring Compressor
7052069	Charging Needle
2200421	Gas Shock Recharging Kit
2871352	Shock Rod Holding Tool
2871199	Seal Sleeve Installation Tool Kit
2870872	Shock Spanner Wrench
2871351	Fox™ Shock IFP Depth Tool

**PLASTIC INSERT REMOVAL / INSTALLATION**

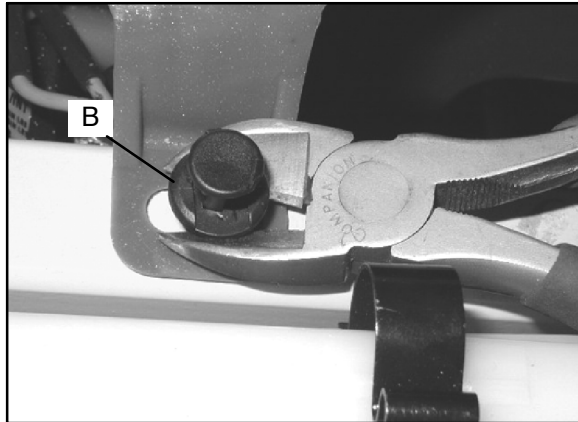
Some Polaris ATVs use a two piece plastic insert in place of a metal screw. The plastic inserts are easy to remove and install.

1. Use a pair of diagonal side cutters to lift the plastic insert (A) until you feel some slight pressure or lift the insert approximately 1/4" (6.35 mm). Apply just enough pressure on the side cutters to lift up on the insert. **DO NOT** apply too much pressure on the side cutters, or damage to the insert will occur.

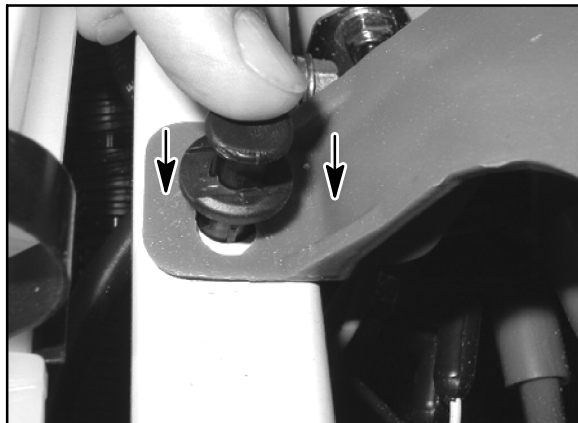




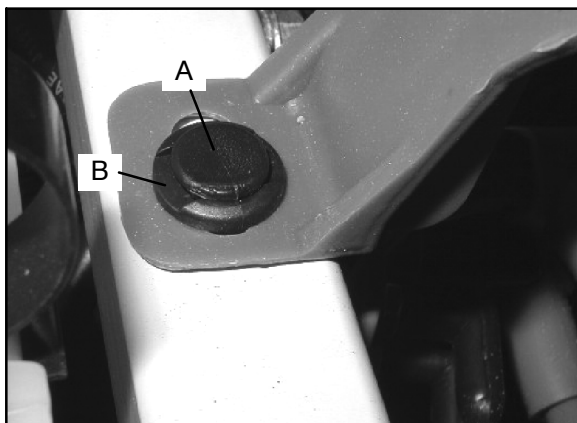
- Next, use the diagonal side cutters under outside insert (B) to completely remove the assembly.  
**NOTE:** The inside insert (A) will still be installed in the outside insert (B)



- To install the inserts, press outside insert (B) into the hole. Press inside insert (A) until it snaps into place.  
**NOTE:** The outside insert (B) should be flush surface after installation.



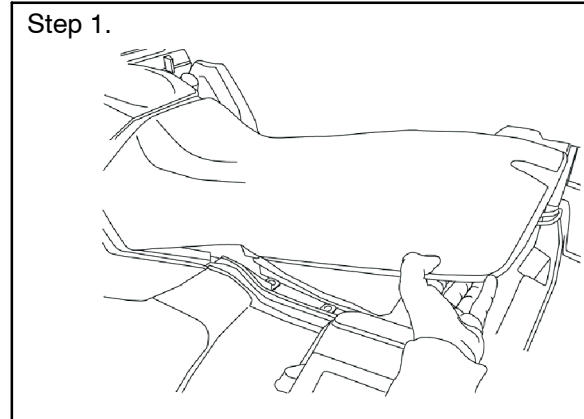
The inside insert (A) should be flush with the top of the outside insert (B).



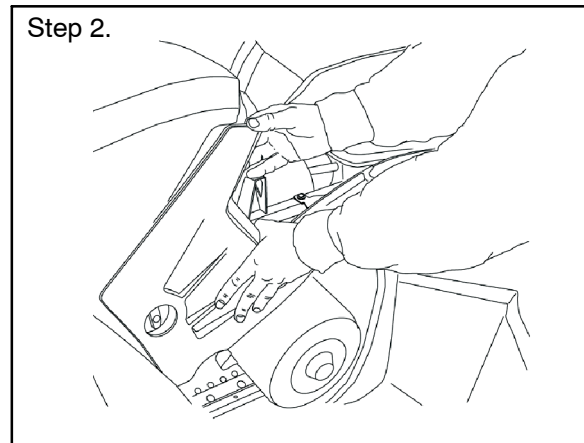
## **SIDE PANEL REMOVAL**

Side panel removal is quick and easy, use the following instructions for removal and installation.

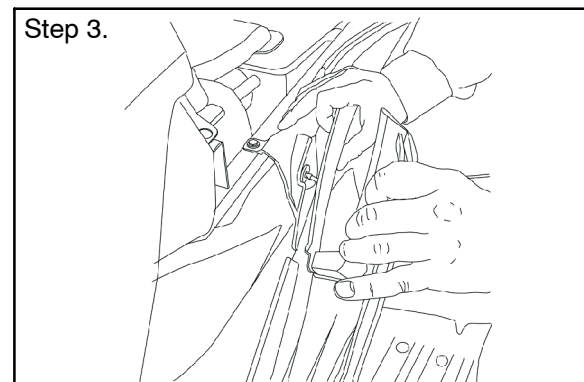
- Remove seat by releasing the latch and lifting up on the seat.



- Grasp the rear of the side panel near the rear cab. With a firm motion, pull the panel outward to disengage the side panel from the grommet. Pull the panel downward and rearward to remove it from the ATV.



- Reinstall the side panel by reversing the removal procedure.



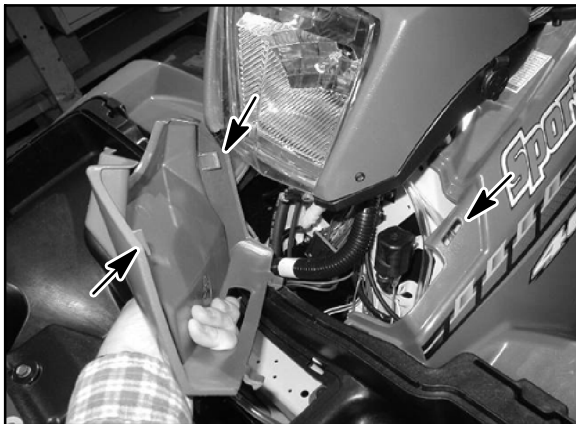


## **FRONT COVER REMOVAL / INSTALLATION**

1. Open the front storage compartment.
2. Pull up and outward on the front cover to remove the cover.



3. To install the front cover, insert the tabs of the front cover into the inserts of the cab. Make sure the tabs are aligned with the slots. Then press the rear tabs into the slots.

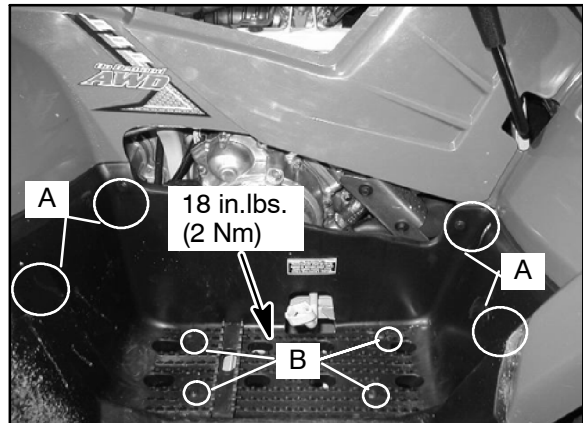


## **FOOT WELL REMOVAL / INSTALLATION**

1. Remove the four plastic inserts (A) that secure the wheel well to the front and rear cabs. (See "PLASTIC INSERT REMOVAL / INSTALLATION" for help).



2. Remove the four screws (B) from the bottom of the foot well. Remove the footwell.



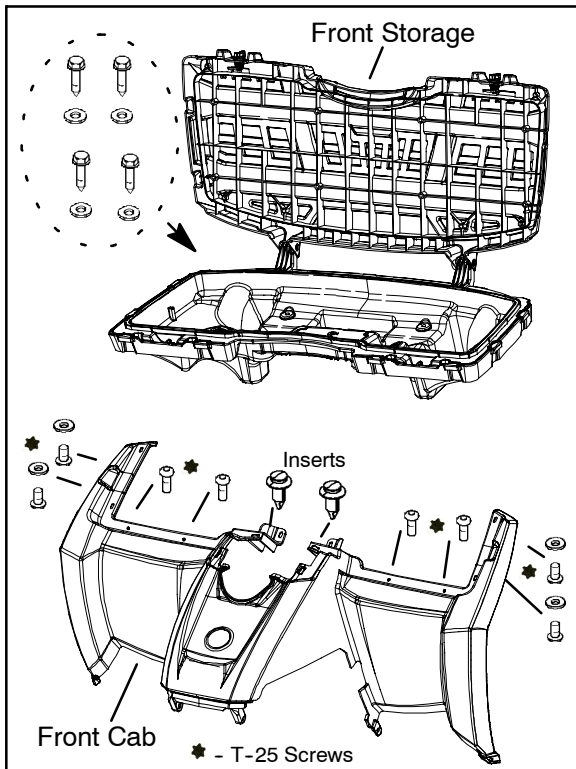
3. Reverse the removal procedures to install the foot well. Be sure to properly align the the cab ends into the foot wells upon reassembly.



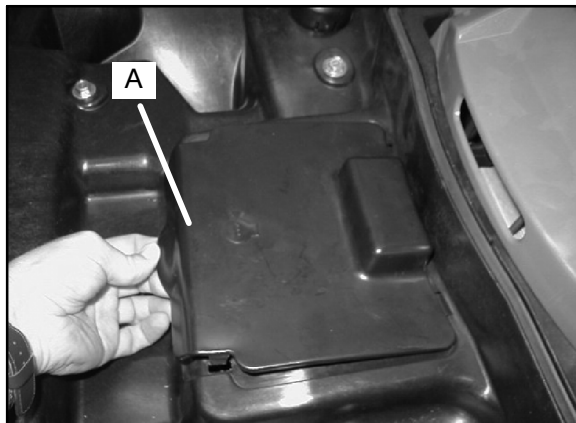




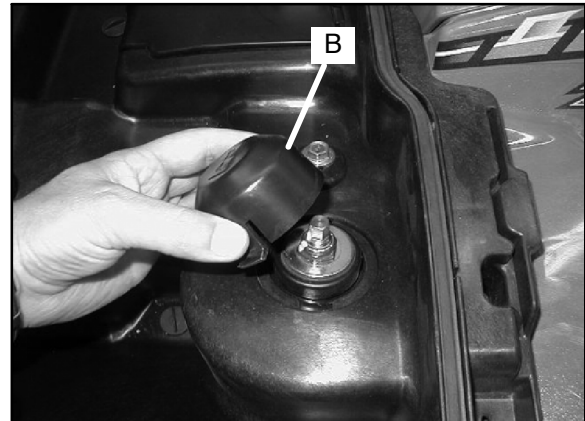
## **FRONT STORAGE REMOVAL**



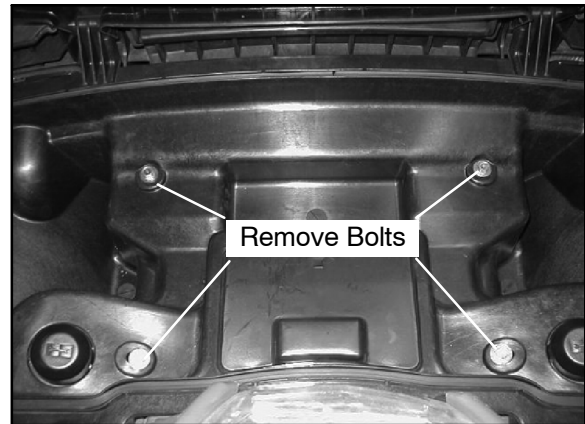
1. Remove the front radiator cap cover (A) by lifting upward on the cover.



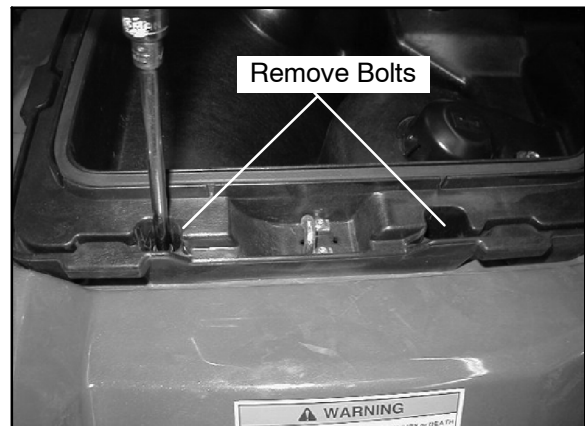
2. Remove the strut tower caps (B). Squeeze the caps inward and lift up to remove.



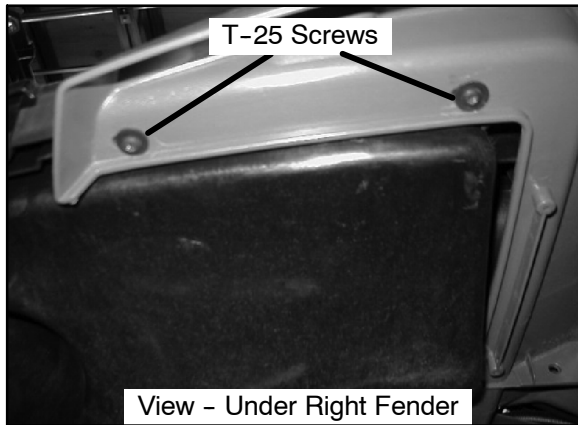
3. Remove the four bolts that secure the storage rack to the frame.



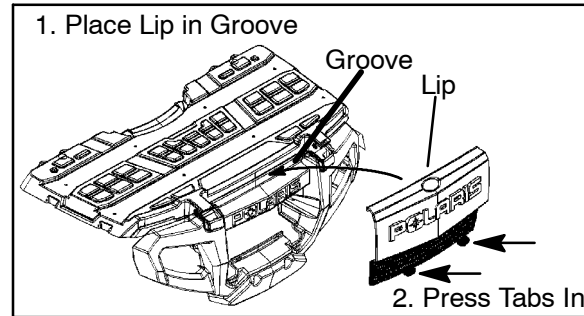
4. Remove the two (T25) screws that secure the storage box to the front fender well areas (each side).



5. Remove the two (T25) screws that secure the outside of the storage box to the front fenders (each side).



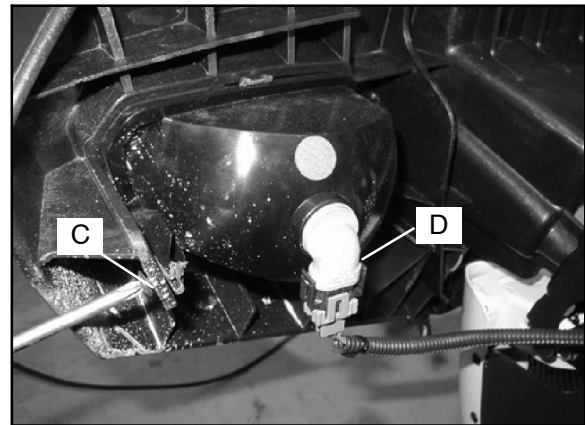
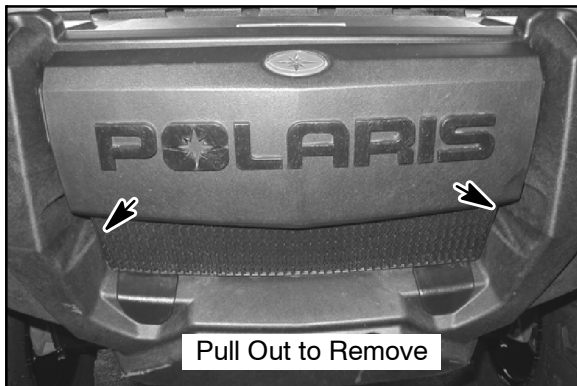
the groove in the rack, then press in the bottom of the cover until the notches snap into place.



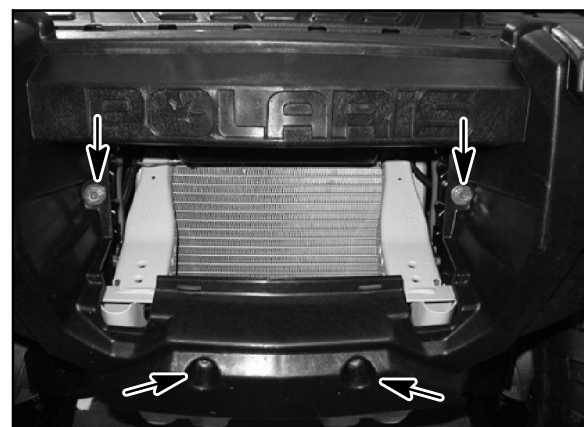
**Winch Installation Area**

6. Remove the front cover piece by lifting up on sides of the two locking tabs as shown. Pull the tabs out of the notches and lift up on the cover piece.

7. Remove the front headlights (C) or simply disconnect the electric connector (D) before removing the front plastic bumper.



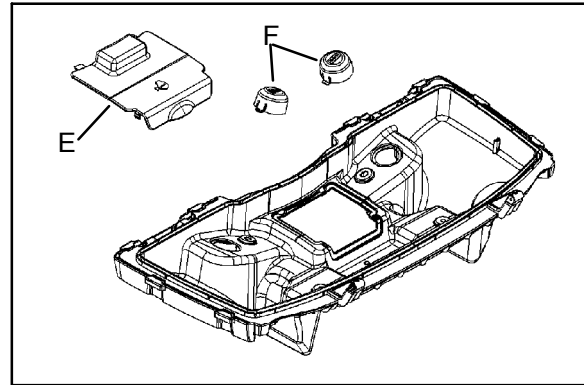
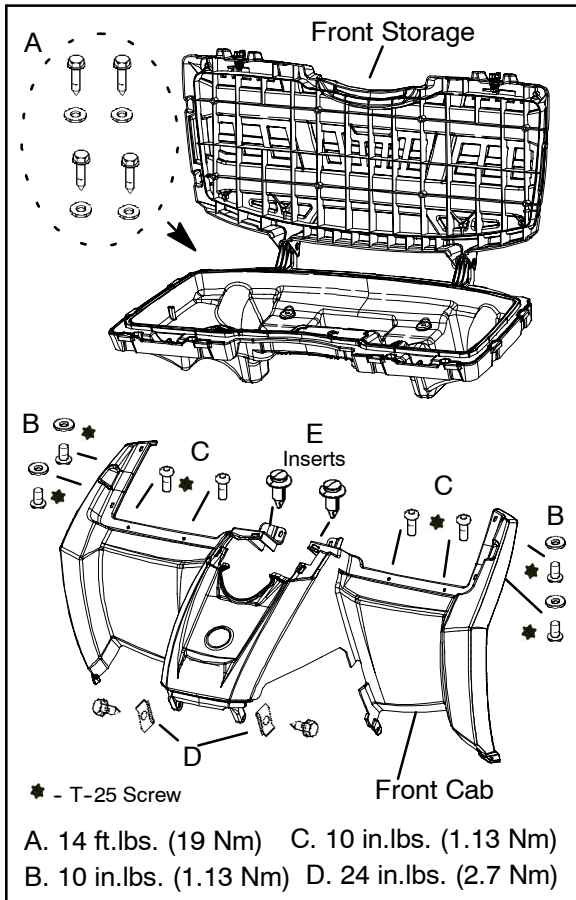
8. Remove the remaining bolts and screws that secure the front bumper section to the frame.



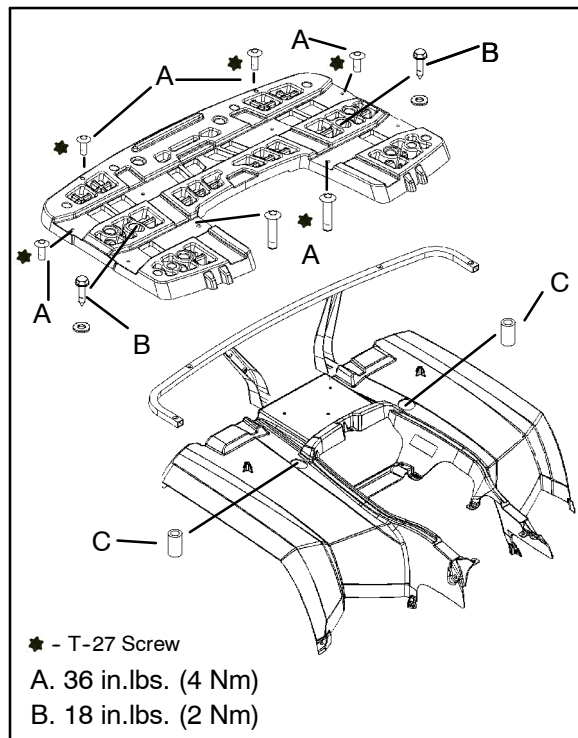
To install the front cover place top lip of the cover into



## **FRONT STORAGE INSTALLATION**



## **REAR RACK REMOVAL/ INSTALLATION**



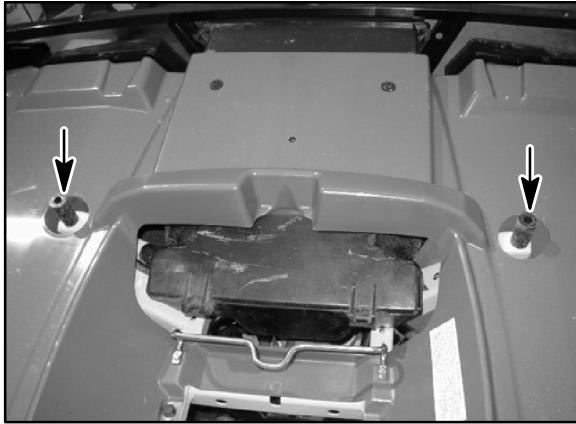
1. Place the front storage rack onto the frame.
2. Install the four bolts (A) into the inside of the compartment hand tight.
3. Install the four screws and washers (B) (T-25) under the fender area (2 each side).
4. Install the four screws (C) (T-25) into the front fender area of the storage box (2 each side).
5. Install the two screws (D) into the rear area of the cab (if removed).
6. Install the two plastic inserts (E) into the front cab (if removed).
7. Torque all bolts and screws according to the illustration.
8. Install the front radiator cap cover (E) and shock tower covers (F).

1. Remove the six (A) T27 screws and two bolts (B) that secure the rear rack to the rear cab and frame.
2. Lift the rear rack from the ATV. Remove the two rack spacers (C).

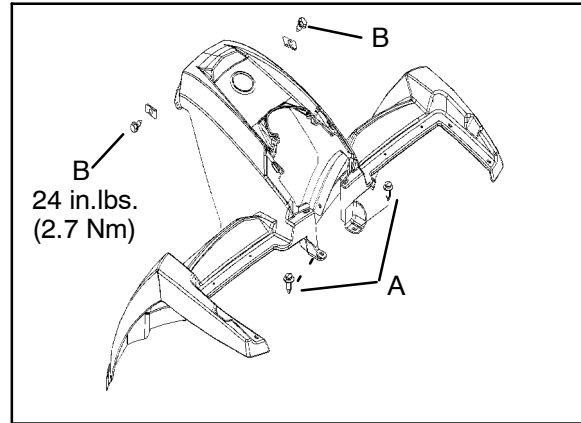


**Rear Rack Installation**

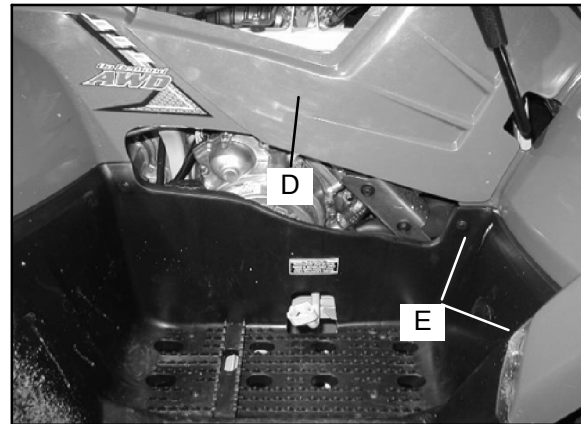
- Place spacers on frame.



- Install rear rack onto rear frame and cab.
- Install the two bolts (B) and six (A) T-27 screws. Torque the bolts (A) to 18 in.lbs. (2 Nm) and six T-27 screws to 36 in.lbs. (4 Nm). Refer to the illustration for torque values.

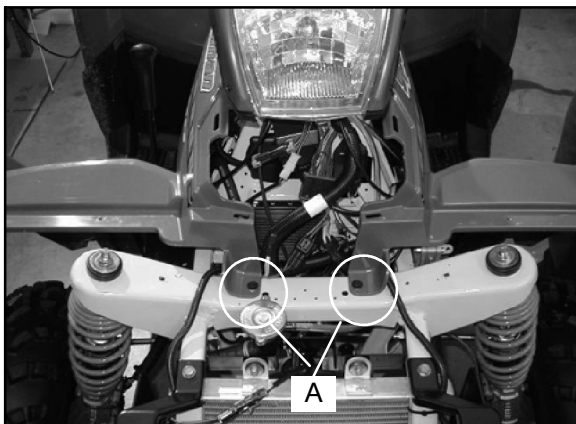


- Remove the side panels (D), refer to the “SIDE PANEL REMOVAL” section.
- Remove the plastic inserts (E) that secure the front of the foot wells to the front cab.



**FRONT CAB/FENDER  
REMOVAL/INSTALLATION**

- Follow the “FRONT RACK / BUMPER REMOVAL” section to begin removal of the front cab, rack, and bumper.
- Remove the plastic inserts (A) that secure the front cab to the upper strut support.



- Remove the two screws (B) that secure the front cab to the frame in the fuel tank mount area.

- Remove the fuel cap and place a clean lint free shop towel into the tank neck to keep any debris from falling into the tank.
- The front cab should now slide back over the fuel tank and fuel tank neck.

**NOTE:** When removing the front cab use caution so the plastic cab does not scratch or get caught on other components.

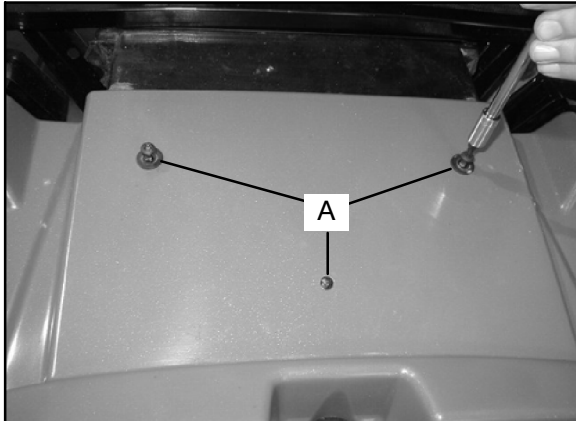
- Reverse the removal steps for installation. Torque two front cab to frame screws to 24 in.lbs. (2.7 Nm).



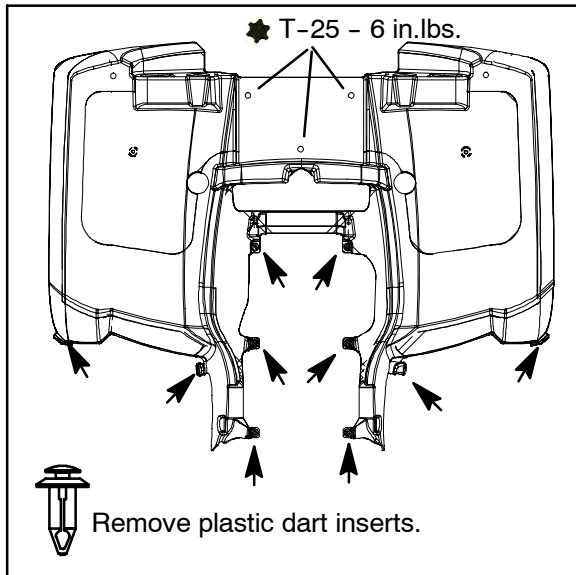


## **REAR CAB / FENDER REMOVAL / INSTALLATION**

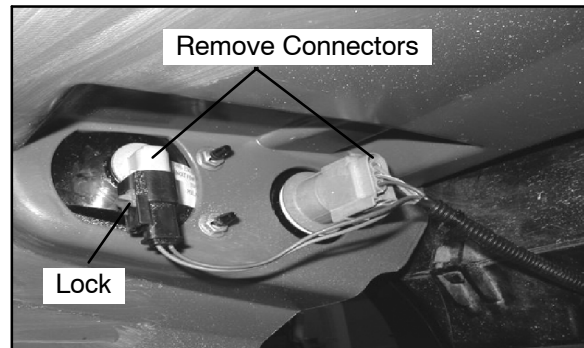
1. Follow the ““REAR RACK REMOVAL”” procedure to remove the rear rack.
2. Remove the three screws (A) (T-25) that secure the rear cab to the storage container.



3. Remove the ten plastic inserts that secure the rear cab to the frame and plastic.



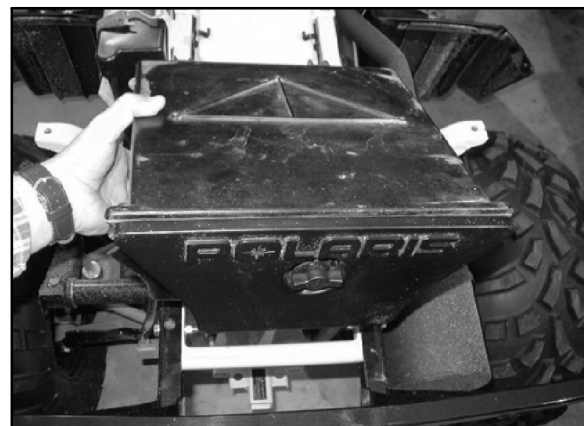
4. Disconnect the rear lights by pulling the locks on each side and removing the connectors. Lift the rear cab from the frame.



5. Reverse the removal steps for installation.

## **REAR STORAGE REMOVAL/INSTALLATION**

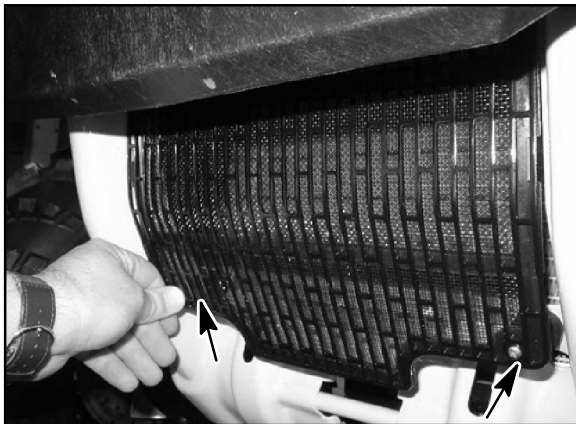
1. Follow the “REAR RACK REMOVAL” and “REAR CAB REMOVAL” procedure to remove the rear storage compartment. After the rear cab is removed the storage compartment comes out.
2. Remove the two plastic inserts that hold the rear storage compartment in place.
3. For installation, reverse the removal steps.
4. Torque the 3 T-25 screws that hold the rear storage to the rear cab to 6 in. lbs. (0.70 Nm).





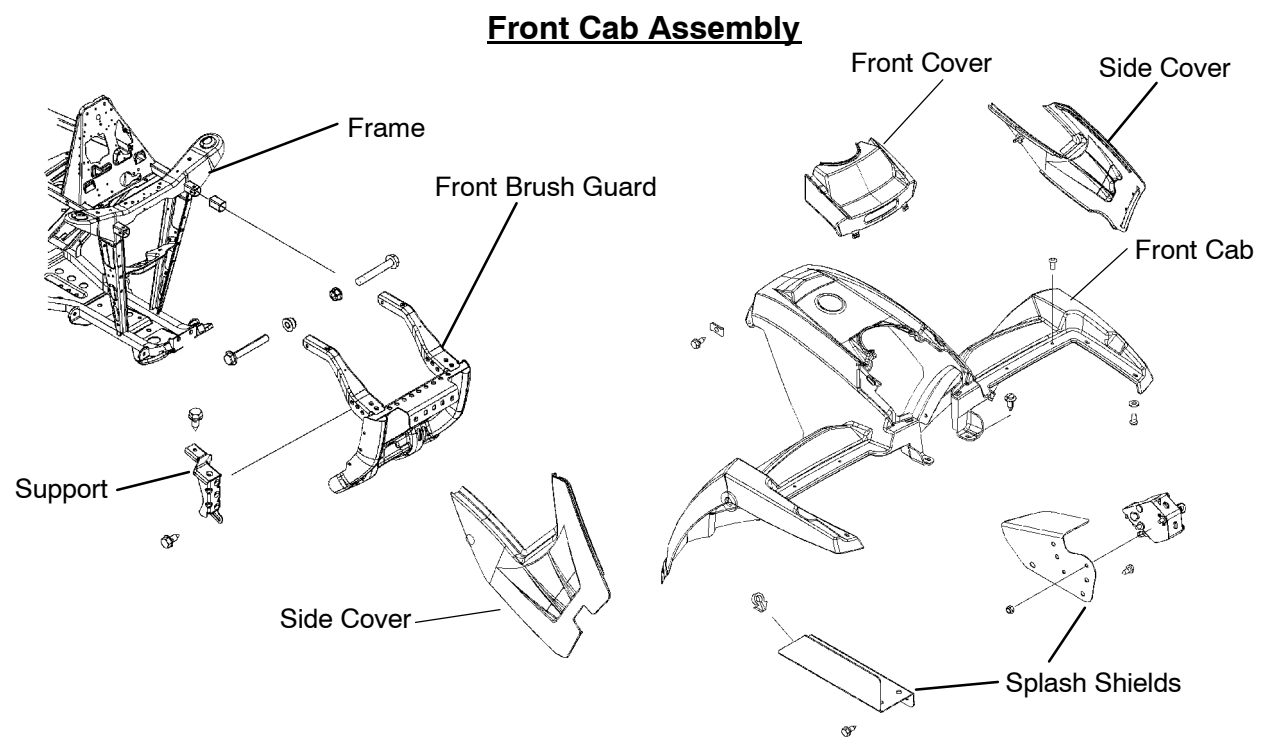
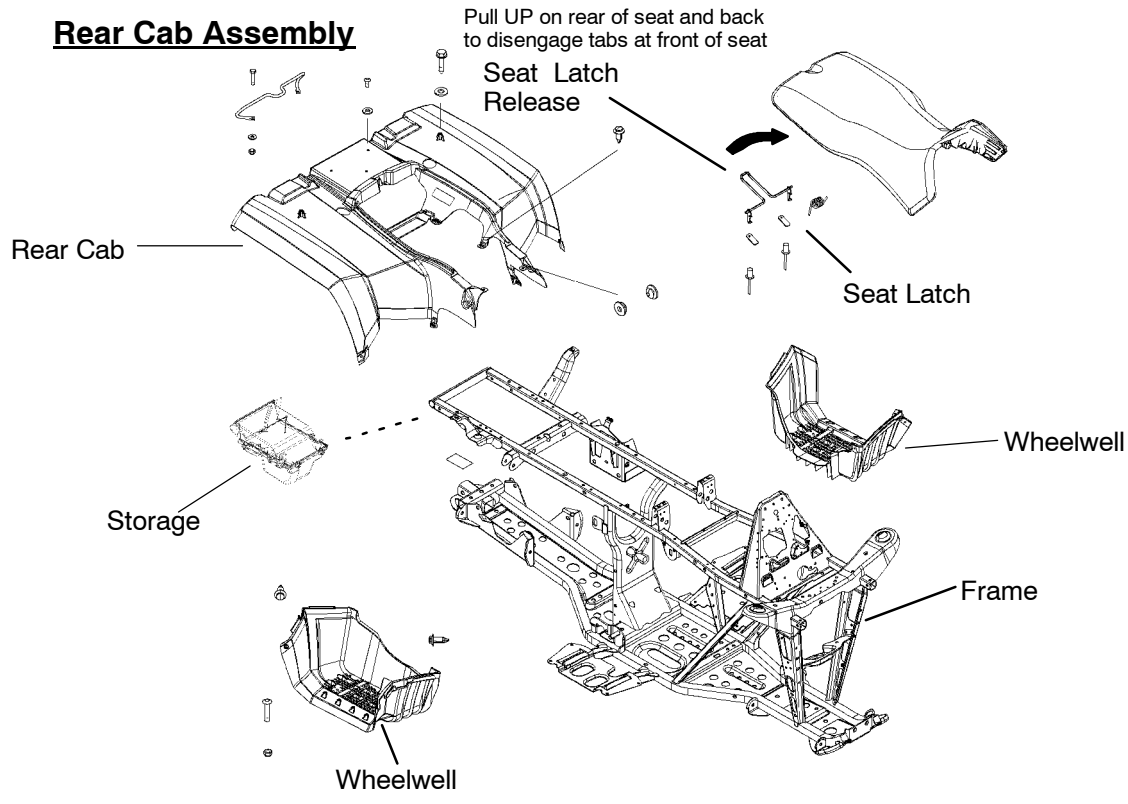
## **RADIATOR SCREEN** **REMOVAL**

1. Pull out slightly on the top of the radiator screen.
2. With the top free, pull out on the bottom of the screen to remove the screen.
3. To install the screen, simply press the tabs on the screen back into the mounting grommets. Be sure the screen is securely in place.



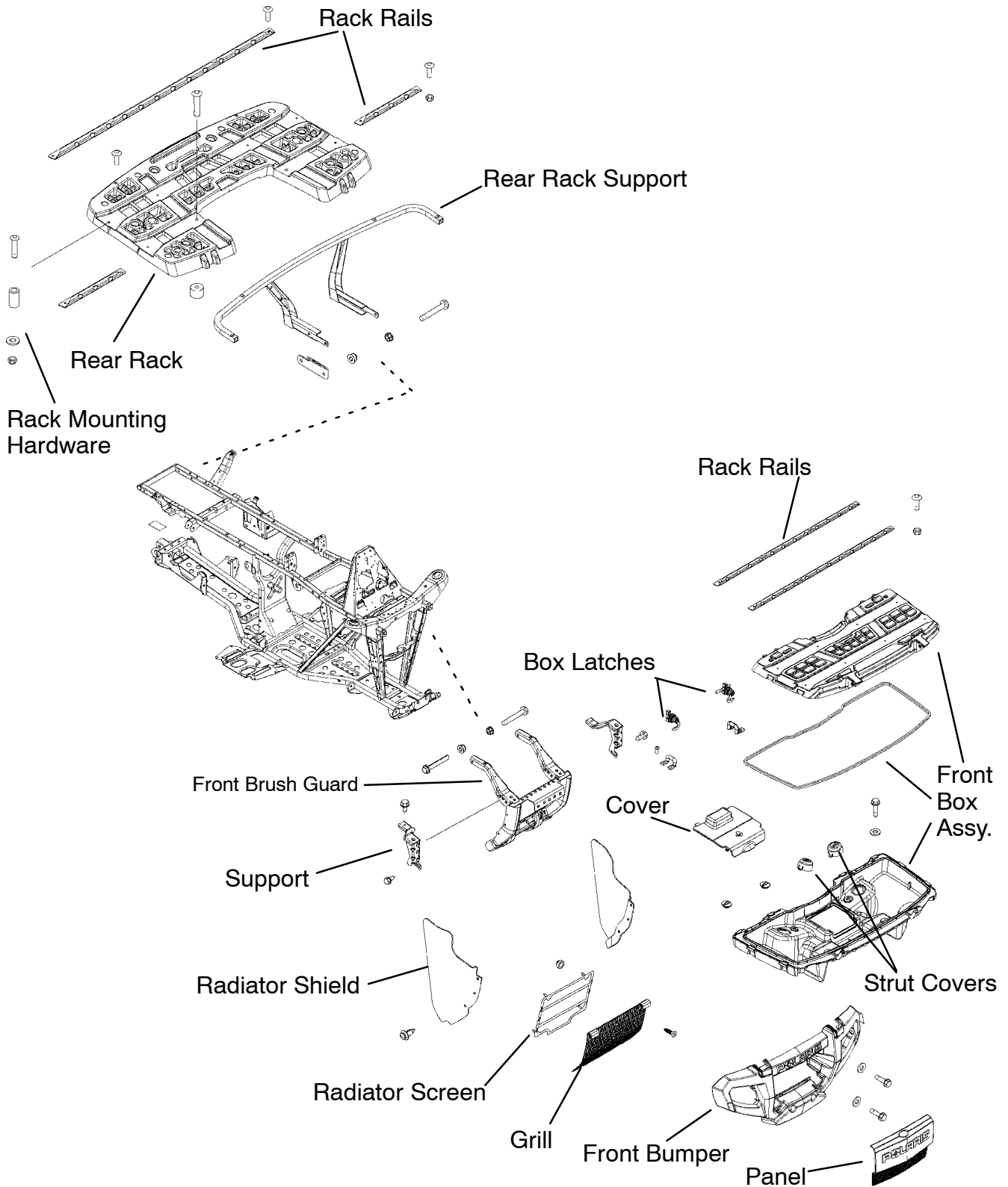


# **BODY ASSEMBLY EXPLODED VIEW**





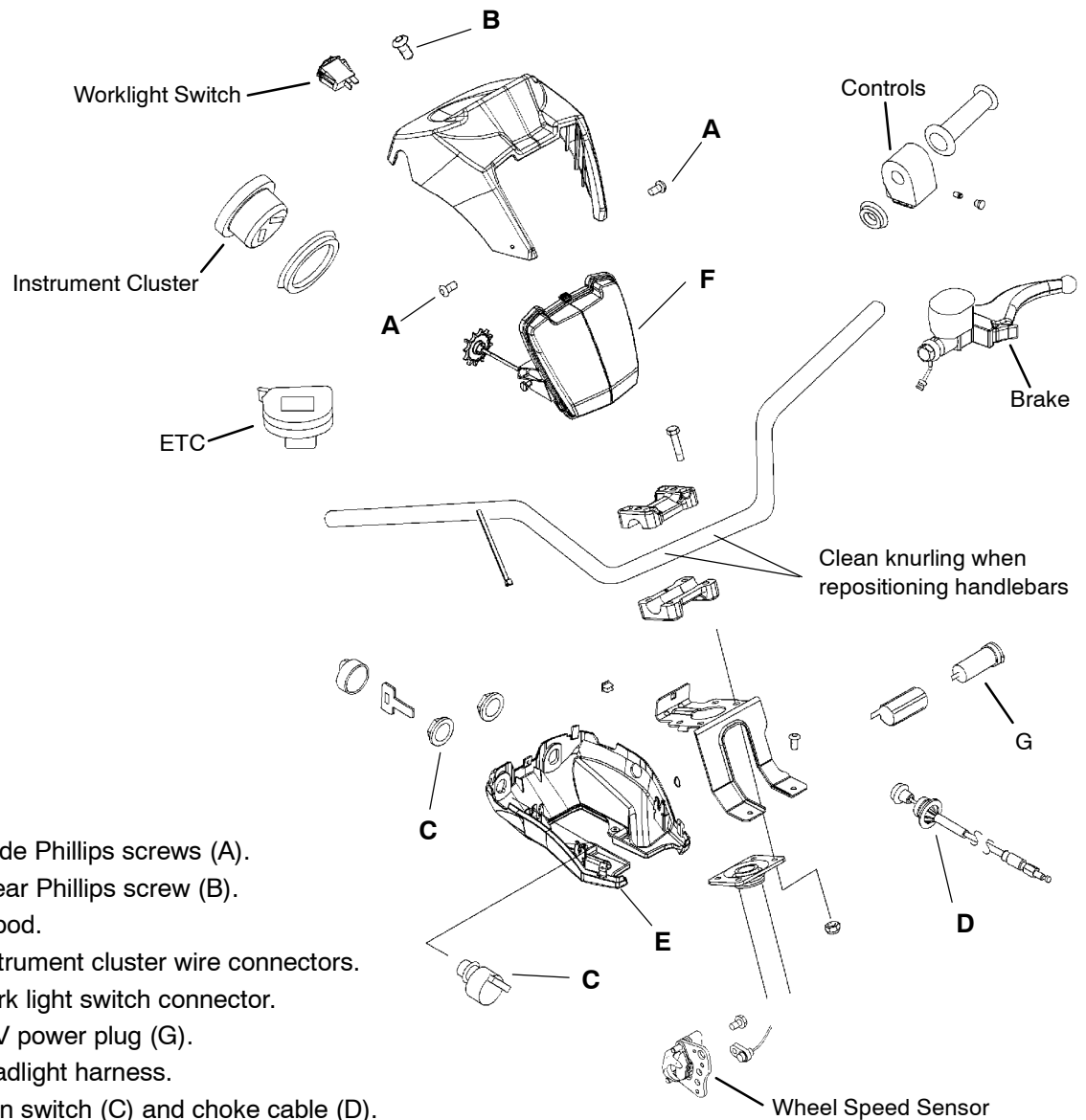
# BODY RACK EXPLODED VIEW







## HEADLIGHT POD EXPLODED VIEW



### Disassembly

- Remove two side Phillips screws (A).
- Remove one rear Phillips screw (B).
- Lift top half of pod.
- Disconnect instrument cluster wire connectors.
- Disconnect work light switch connector.
- Disconnect 12V power plug (G).
- Disconnect headlight harness.
- Remove ignition switch (C) and choke cable (D).
- Remove headlight (F) with adjuster.
- Remove two screws securing bottom half of pod (E).

### Assembly

- Install bottom of pod onto handlebar and secure to brackets.
- Install key switch, choke cable, and headlight.
- Connect 12V power outlet (where applicable)
- Connect headlight.
- Connect instrument cluster connectors to instrument cluster.
- Install top of pod onto bottom half, making sure interlocking tabs mate properly.
- Install two side Phillips screws.
- Install one rear Phillips screw.
- To adjust headlight, refer to procedure outlined in Chapter 2.
- To apply decals, refer to Page 5.20.

**\*NOTE:** To install handlebars, follow the handlebar block torque procedure on the next page.

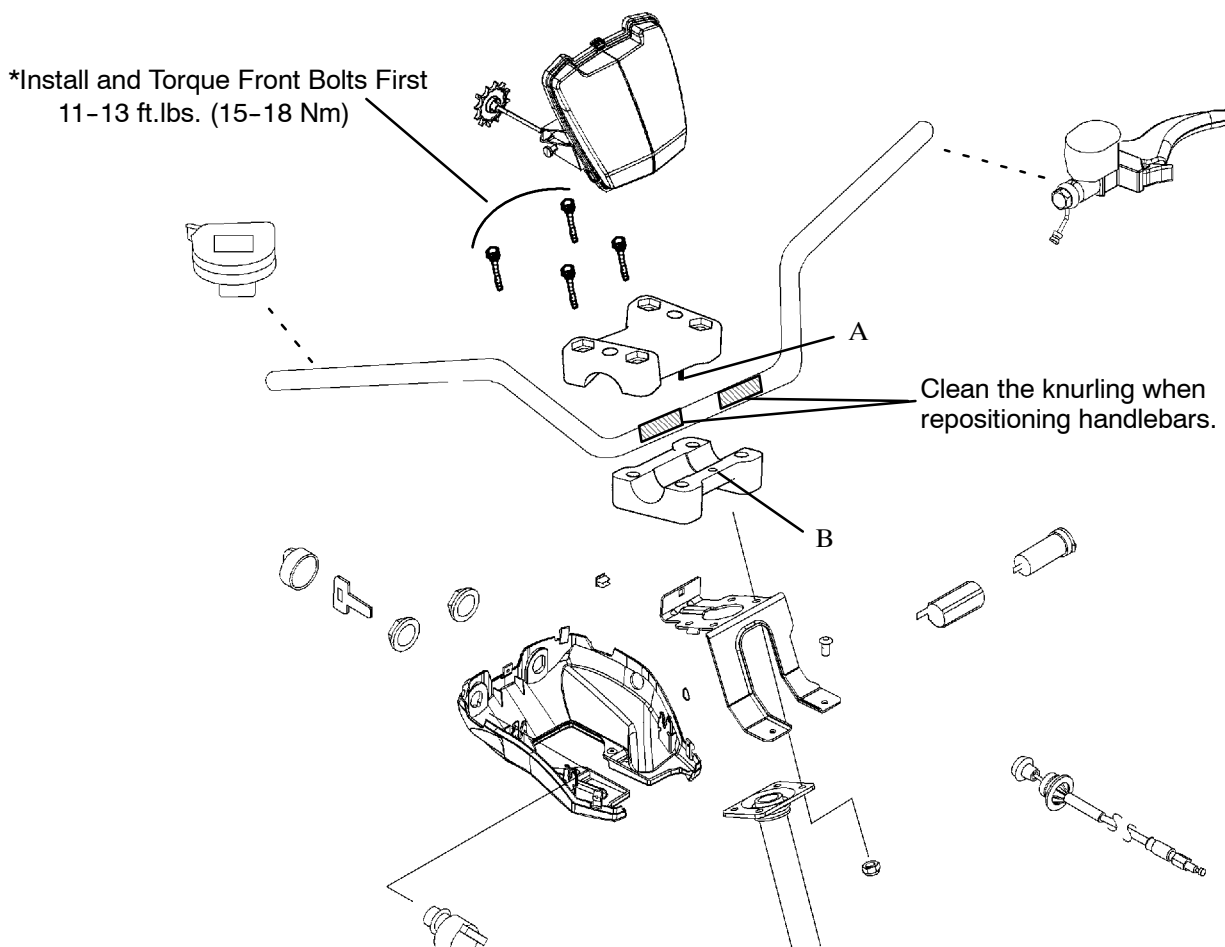
**\*NOTE:** Refer to Chapter 10 for more information on headlight pod components.



## **HANDLEBAR BLOCK INSTALLATION PROCEDURE**

1. The pin (A) on the bottom side of the top handlebar block faces down and to the front of the ATV.
2. The bottom handle bar block has a side with 3 holes, the side with 3 holes faces up and to the front of the ATV.
3. Align the pin (A) in the top block with the middle hole (B) in the bottom block for proper installation. The pin (A) and middle hole (B) should face the front of the ATV.
4. Install the pin side bolts first and evenly tighten the bolts down. Evenly torque the 2 front bolts to 11-13 ft.lbs.(15-18 Nm).
5. Install the rear bolts and tighten evenly. Evenly torque the 2 rear bolts to 11-13 ft.lbs. (15-18 Nm).

**NOTE:** There will be a slight gap on the backside of the blocks after the procedure is performed.

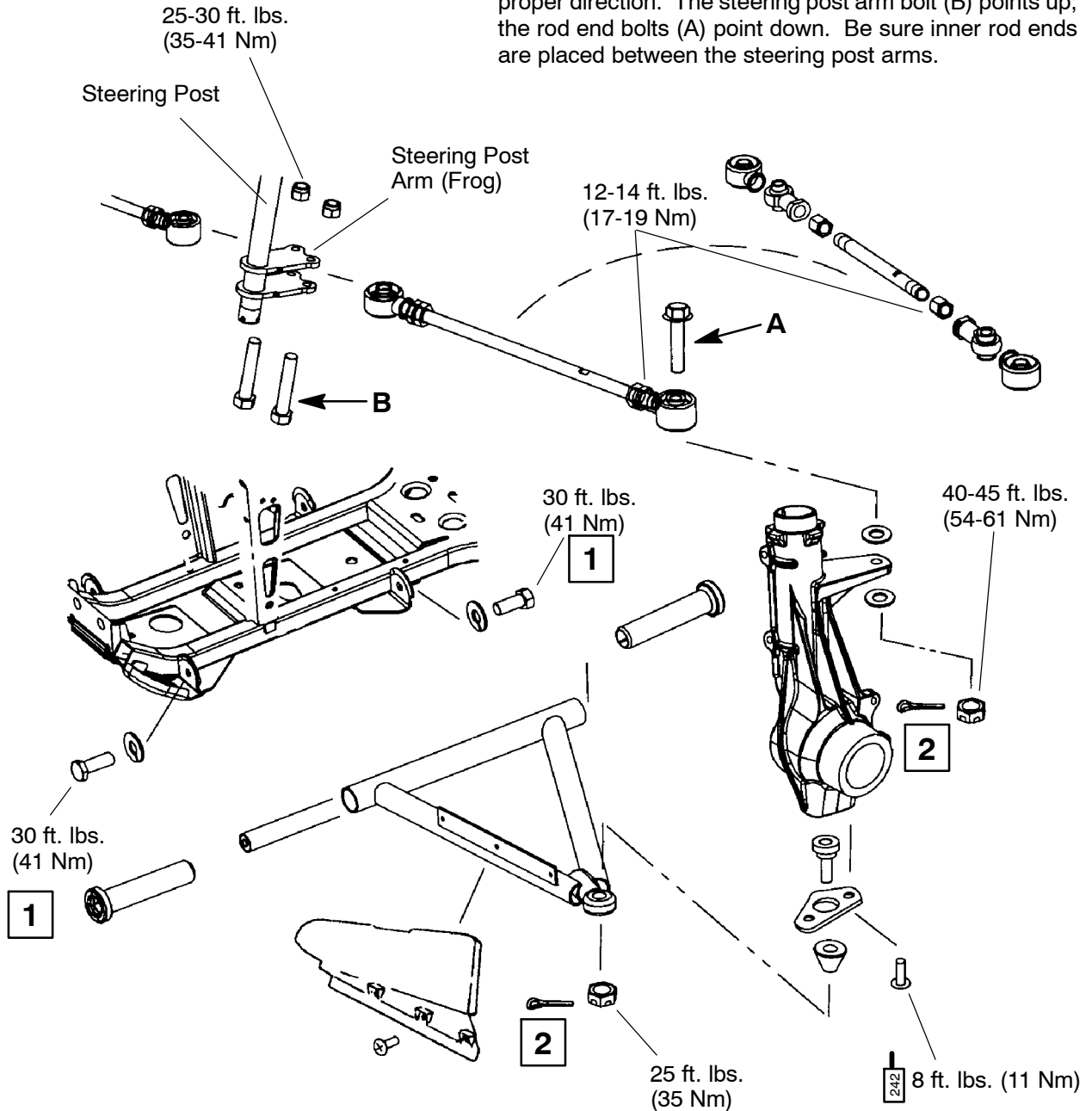




# **STEERING/A-ARM EXPLODED VIEW**

**NOTE:**

To avoid damage to tie rods and other steering components, be sure to install tie rod end bolts in the proper direction. The steering post arm bolt (B) points up; the rod end bolts (A) point down. Be sure inner rod ends are placed between the steering post arms.



**1** Always use new bolts upon reassembly

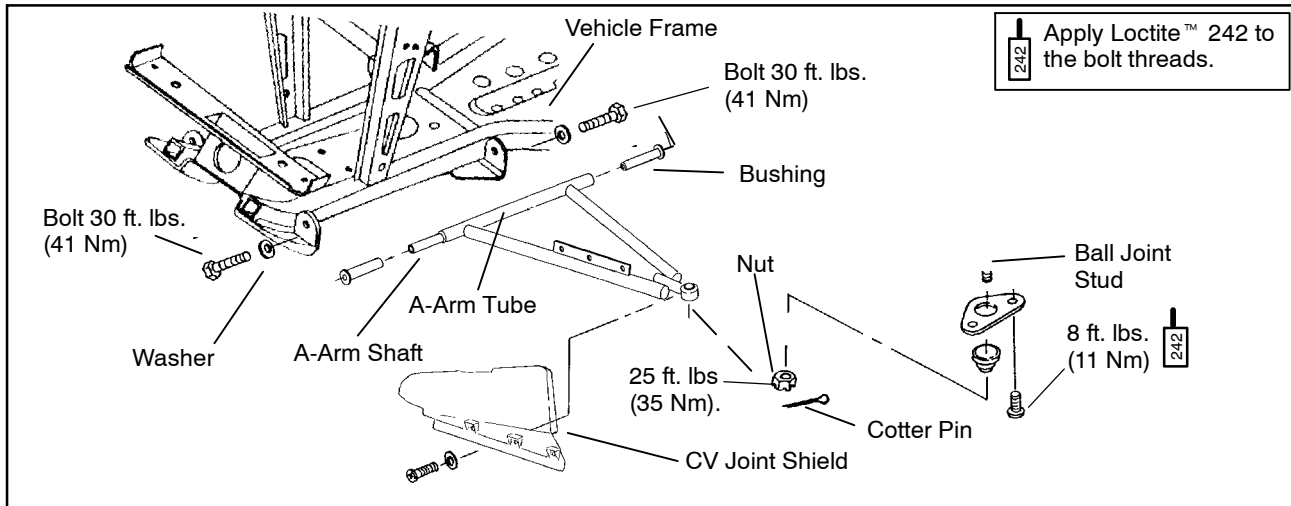
**2** Always use new cotter pins upon reassembly. Install with open end toward rear of machine.

**242** Apply Loctite™ 242 to the bolt threads.



## **A-ARM REPLACEMENT**

1. Elevate and safely support vehicle with weight removed from front wheel(s).
2. Remove cotter pin from ball joint stud at wheel end of A-arm and loosen nut until it is flush with end of stud.
3. Using a soft face hammer, tap nut to loosen A-arm from bolt. Remove nut and A-arm from hub strut assembly.
4. Loosen two bolts on A-arm tube by alternating each about 1/3 of the way until A-arm can be removed.
5. Examine A-arm shaft. Replace if worn. Discard hardware.
6. Insert A-arm shaft into new A-arm.
7. Install CV joint shields.



8. Install new A-arm assembly onto vehicle frame. Torque new bolts to 30 ft. lbs. (41.4 Nm).

**▲ WARNING**

The locking features on the existing bolts were destroyed during removal. **DO NOT** reuse old bolts. Serious injury or death could result if fasteners come loose during operation.

9. Attach A-arm to hub strut assembly. Tighten ball joint nut to 25 ft. lbs. (35 Nm). If cotter pin holes are not aligned, tighten nut slightly to align. Install a new cotter pin with open ends toward rear of machine. Bend both ends in opposite directions around nut.

**▲ WARNING**

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

**A-arm Attaching Bolt Torque:**

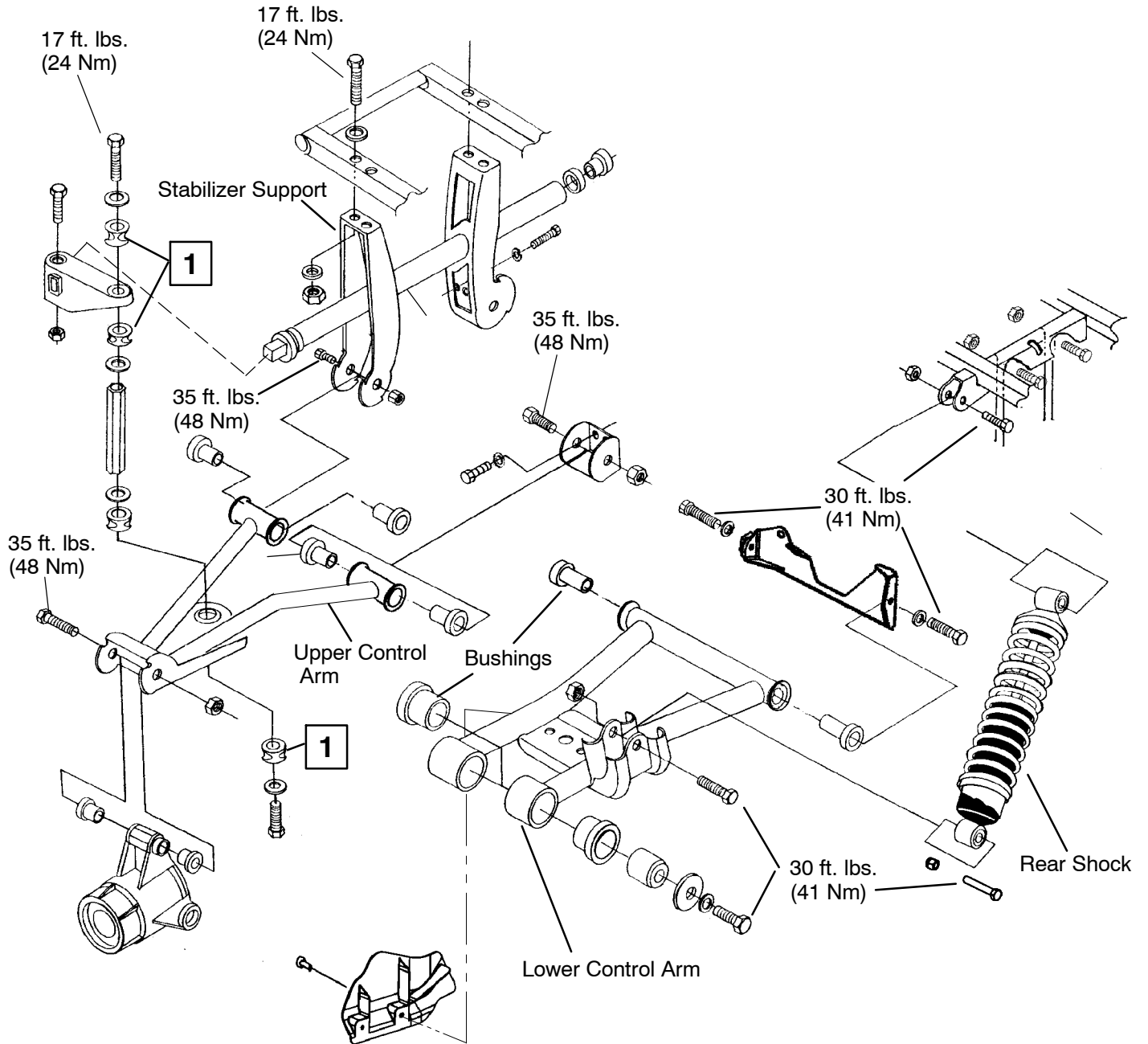
**30 ft. lbs. (41 Nm)**

**Ball Joint Stud Nut Torque:**

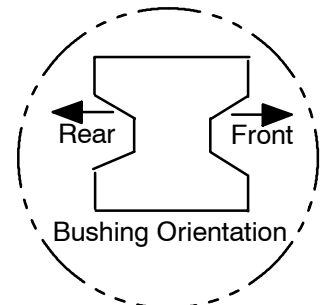
**25 ft. lbs. (35 Nm)**



# REAR SUSPENSION ASSEMBLY

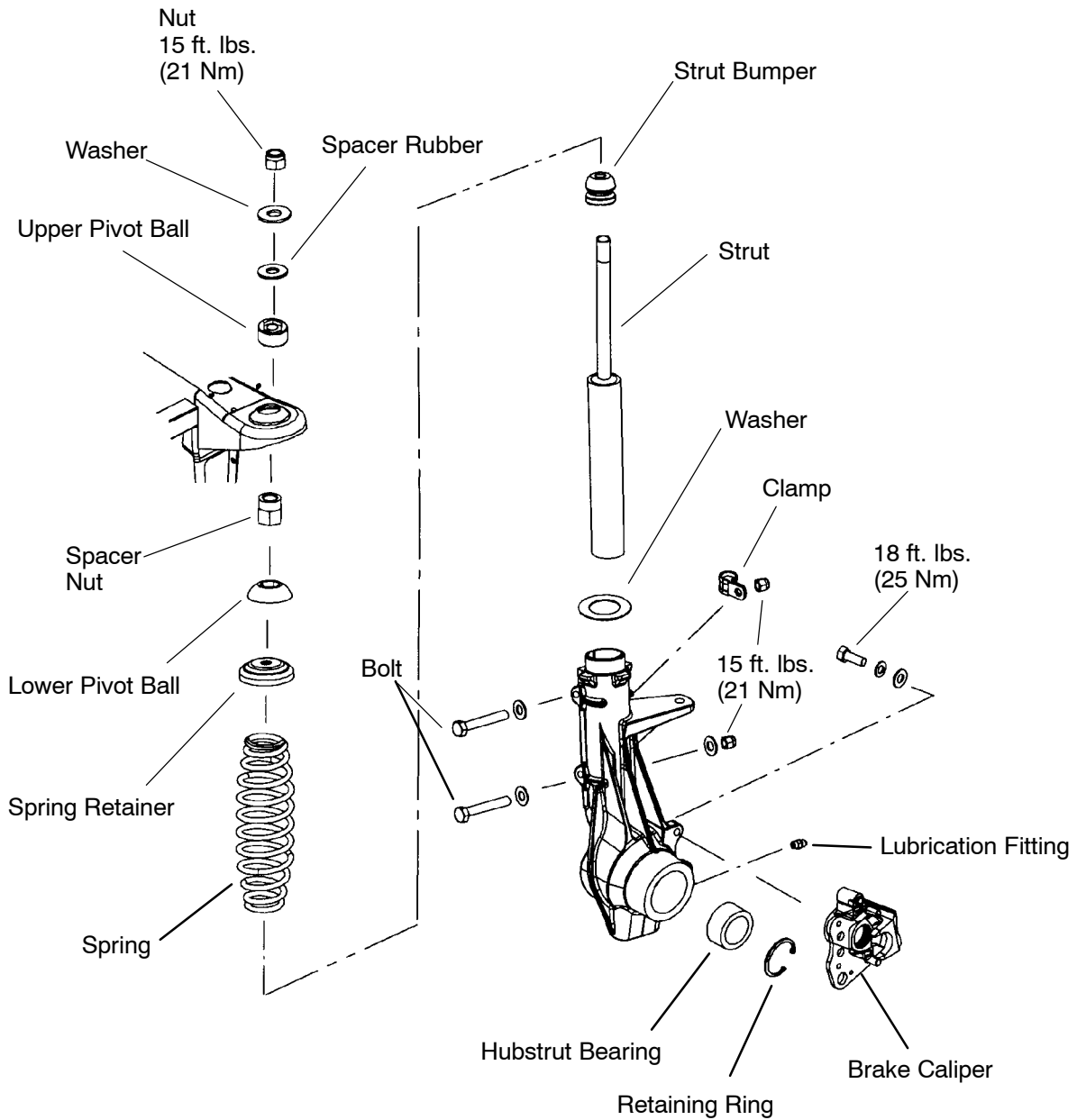


**1** Orientate Bushings Correctly





# STRUT ASSEMBLY



**NOTE:** Grease fitting location. Check lubrication guide for recommended service intervals.



## **FRONT STRUT CARTRIDGE REPLACEMENT**

REFER TO ILLUSTRATION ON PAGE

### 5.18

1. Hold strut rod and remove top nut.
2. Remove upper strut pivot assembly.

**Strut Rod Wrench (PN 2871572)**  
**Strut Spring Compressor Tools (PN 2871573) and (PN 2871574)**

3. Compress spring using strut spring compressor tools and remove the spacer nut.
4. Remove coil spring and collapse strut cartridge.
5. Remove two pinch bolts from strut casting.
6. Remove strut cartridge.
7. Install cartridge until bottomed in strut casting.
8. Install pinch bolts with wire clamp(s). Torque pinch bolts to 15 ft. lbs. (21 Nm).
9. Reassemble spring and top pivot assembly. Be sure all parts are installed properly and seated fully.
10. Torque strut rod nut to specification. Do not over torque the nut.

**Strut Rod Nut Torque**  
**15 ft. lbs. (21 Nm)**

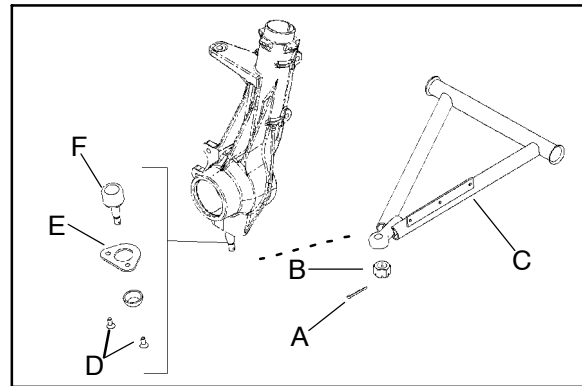
## **BALL JOINT REPLACEMENT.**

**NOTE:** Refer to the illustration on the previous page for this procedure.

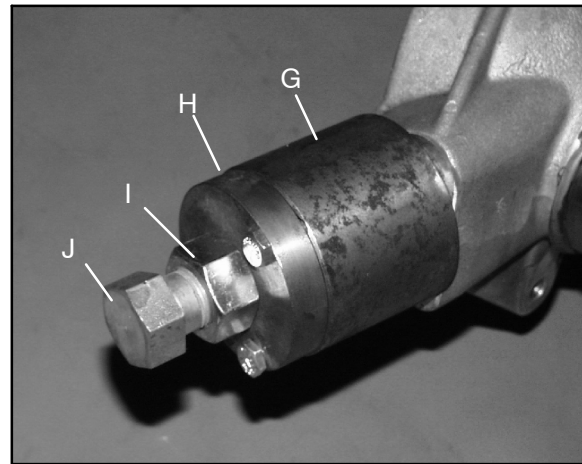
1. Loosen front wheel nuts slightly.
2. Elevate and safely support machine under footrest/frame area.

**CAUTION:** Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure.

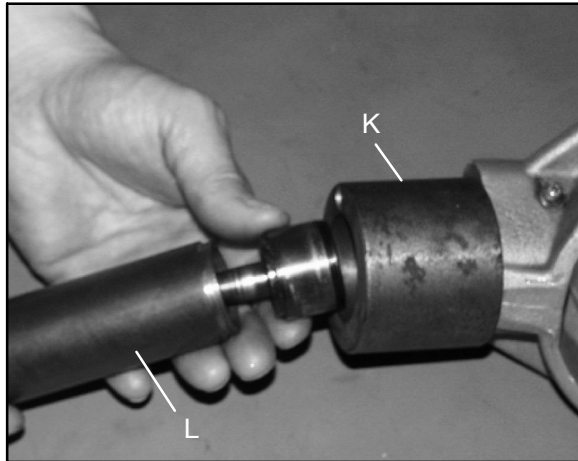
3. Remove wheel nuts and wheels.



4. Remove cotter pin (A) from ball joint castle nut (B).
5. Remove castle nut (B) and separate A-arm (C) from ball joint stud.
6. Remove screws (D) and ball joint retaining plate (E).
7. Use the Ball Joint Replacement Tool (PN 2870871), remove ball joint (F) from strut housing. Refer to photos at right.



- Install puller guide (G) with extension cap (H).
- Apply grease to extension cap and threads of puller bolt to ease removal.
- Thread bolt (J) with nut (I) onto ball joint stud as shown.
- Apply heat to ease removal.
- Hold bolt (J) and turn nut (I) clockwise until ball joint is removed from strut housing.



8. **To install new ball joint:**
  - Remove extension cap and attach puller guide using short bolts provided in the kit.
  - Insert new ball joint (K) into driver (L).
  - Slide ball joint/driver assembly into guide.
  - Apply heat to ease installation.
  - Drive new joint into strut housing until fully seated.
9. Apply Loctite™ 242 (PN 2871949) to threads of retaining plate screws or install new screws with pre-applied locking agent. Torque screws to 8 ft. lbs. (11 Nm).
10. Install A-arm on ball joint and torque castle nut to 25 ft. lbs. (35 Nm).
11. Reinstall cotter pin with open ends toward rear of machine.

## **DECAL REPLACEMENT**

Plastic polyethylene material must be “flame treated” prior to installing a decal to ensure good adhesion. The flame treating procedure can often be used to reduce or eliminate the whitish stress marks that are sometimes left after a fender or cab is bent, flexed, or damaged.

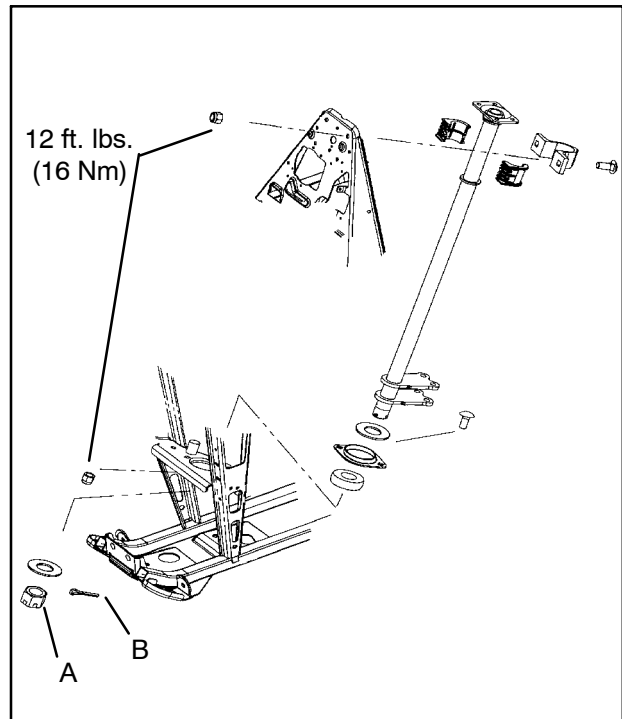
### **▲ WARNING**

**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.

### **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. Keep the torch moving to prevent damage.
2. Apply the decal.

## **STEERING POST ASSEMBLY**



1. Hand tighten steering post slotted nut (A).
2. Align the cotter pin hole on the steering post slotted nut (A).
3. Install the cotter pin (B). Bend both ends of the cotter pin around the slotted nut (A) in opposite directions.
4. Check the steering, the handle bars must move freely and easily from full left to full right without binding.





# CHAPTER 6 CLUTCHING

Drive Clutch Exploded View ..... 6.2

PVT Sealing and Ducting Components ..... 6.2

EBS System Exploded View ..... 6.3

Special Tools, Supplies & Torques ..... 6.4

PVT Operation Overview ..... 6.4

PVT Maintenance/Inspection/Drying ..... 6.5

PVT Overheating/Diagnosis ..... 6.6

PVT Disassembly ..... 6.7

PVT Assembly/Inspection ..... 6.8

Drive Clutch Spring Specifications ..... 6.9

Shift Weights/Inspection ..... 6.10-6.11

700 Drive Clutch Disassembly/Inspection .... 6.11-6.15

700 Drive Clutch Reassembly ..... 6.15-6.16

Drive Belt Removal/Inspection ..... 6.16

Drive Belt Installation ..... 6.17

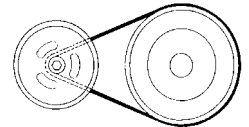
Clutch Alignment/Offset ..... 6.18

Drive Clutch Bushing Service ..... 6.19-6.20

Driven Clutch Service ..... 6.21-6.26

Driven Clutch Exploded View ..... 6.27

Troubleshooting ..... 6.28-6.29

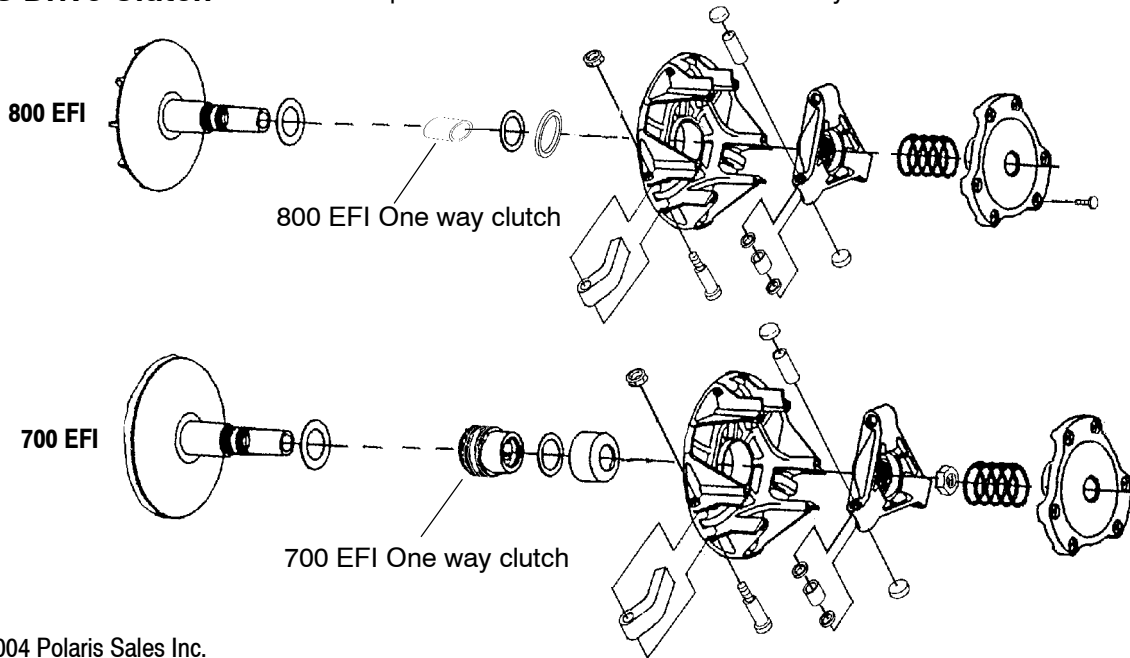




## **700 / 800 DRIVE CLUTCH EXPLODED VIEW**

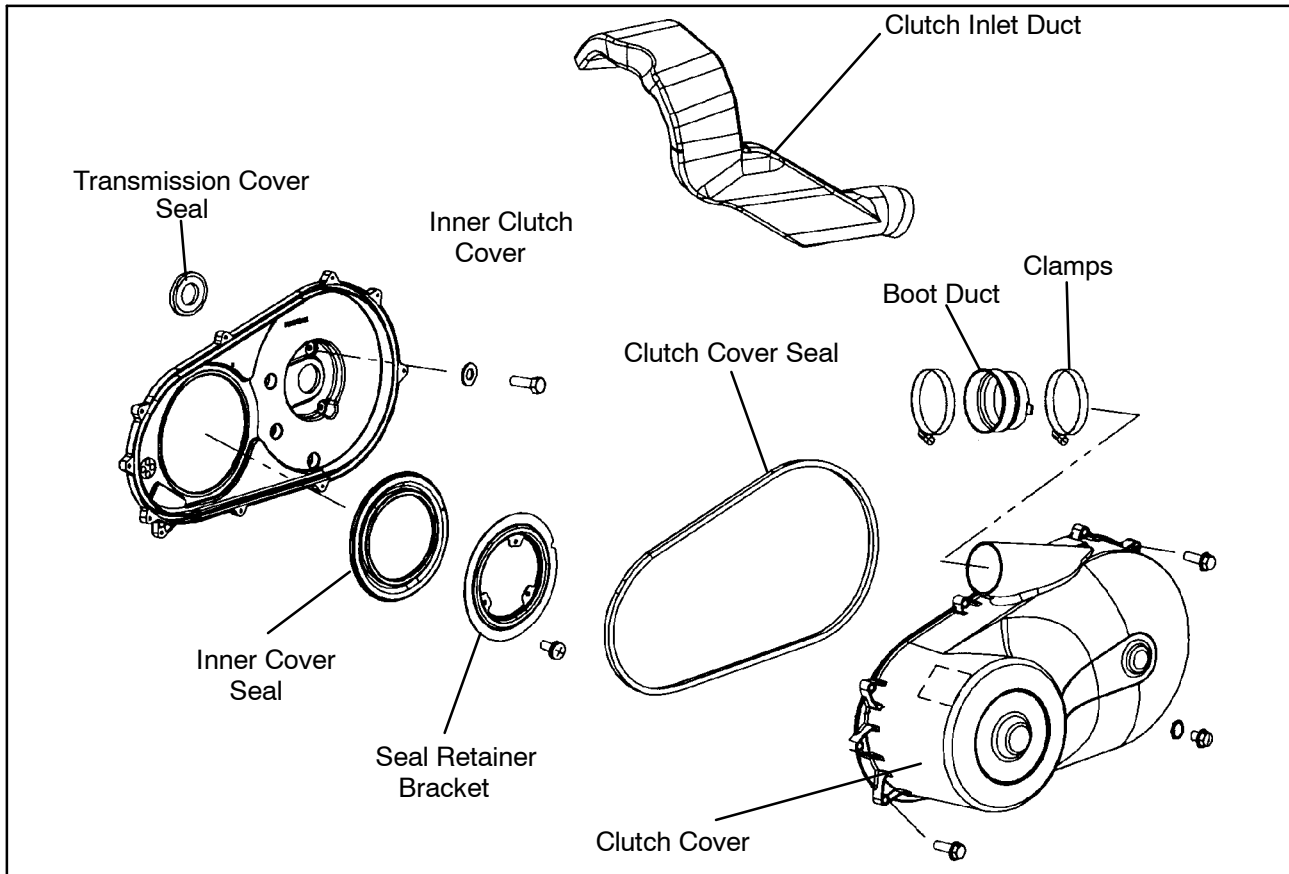
### **EBS Drive Clutch**

Mark with permanent marker before disassembly to maintain clutch balance



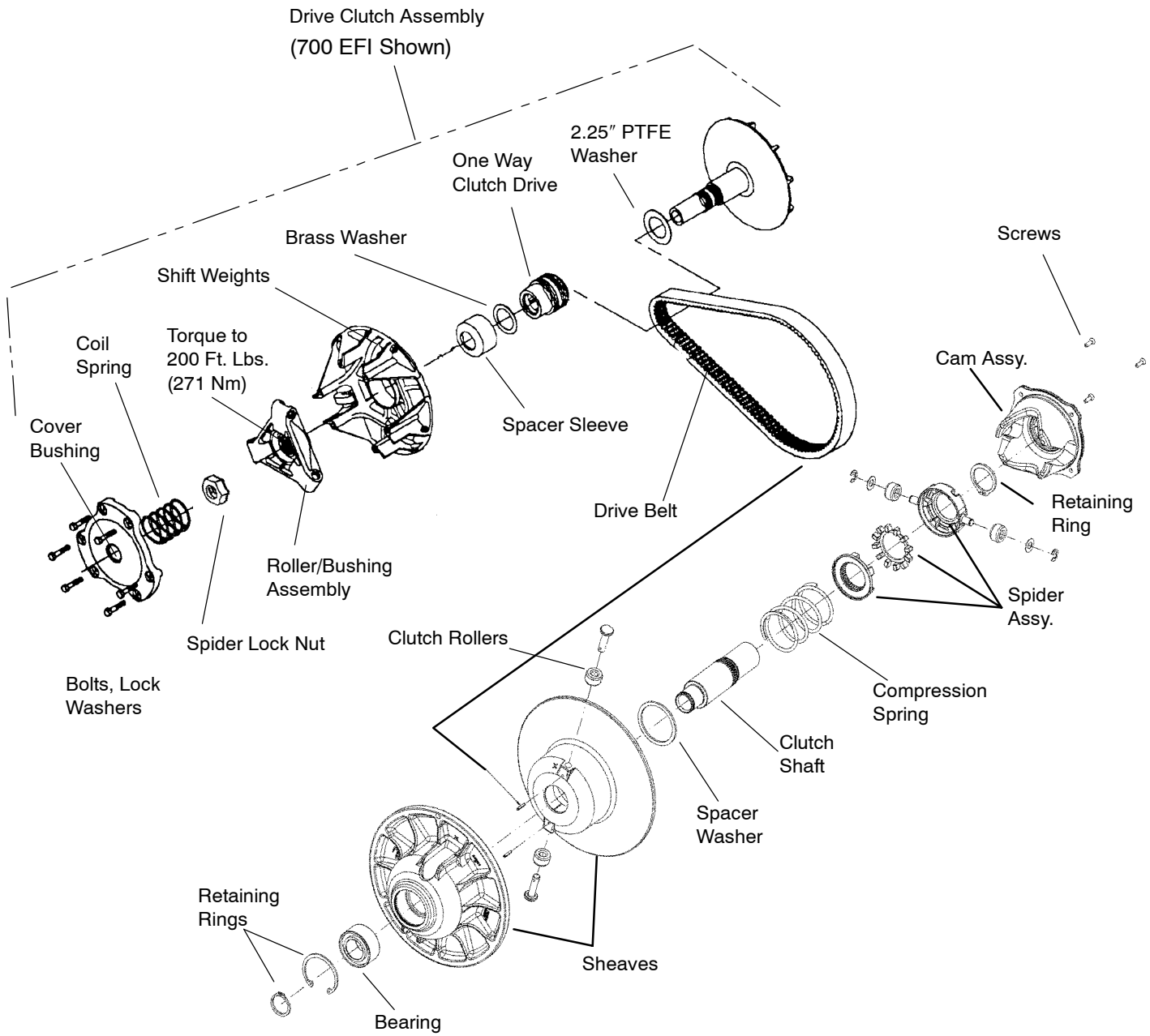
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## **PVT SEALING AND DUCTING COMPONENTS**





**ENGINE BRAKING SYSTEM (EBS) EXPLODED VIEW**





## SPECIAL SERVICE TOOLS AND SUPPLIES


TOOL DESCRIPTION	PART NUMBER
Clutch Puller	2870506
Clutch Holding Wrench	9314177
Clutch Holding Fixture	2871358
Spider Nut Socket	2870338
Drive Clutch Spider Removal and Install Tool	2870341
Driven Clutch Puller	2870913
Roller Pin Tool	2870910
Clutch Bushing Replacement Tool Kit	2871226
Piston Pin Puller	2870386
EBS Clutch Alignment Tool	2872292
EBS Bushing Replacement Kit	2201379
Driven Clutch Compression Tool	PU-47086
Std. Clutch Compression Tool	8700220
Clutch Bushing Replacement Tool Kit	2871025
800 EFI Drive Clutch Bushing Replacement Tool	PA-47336

## PVT SYSTEM FASTENER TORQUES

PVT COMPONENT	TORQUE VALUE
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)
Drive Clutch Spider EBS Clutch	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 OPERATION OVERVIEW

### ⚠ 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; and 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 a Polaris ATV, 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.



## DRIVEN CLUTCH OPERATION CONT'D

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 MAINTENANCE/INSPECTION

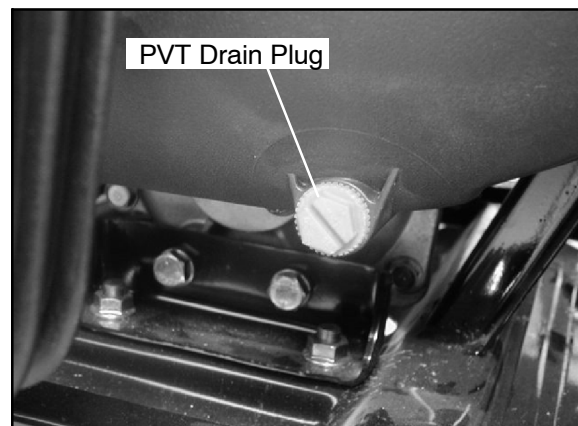
Under normal operation the PVT system will provide years of trouble free operation. Periodic inspection and maintenance is required to keep the system operating at peak performance. The following list of items should be inspected and maintained to ensure maximum performance and service life of PVT components. Refer to the troubleshooting checklist at the end of this chapter for more information.

1. **Drive to Driven Clutch Offset, Belt Width.** See Page-6.16-6.18
2. **Drive and Driven Clutch Rollers and Bushings, Drive Clutch Shift Weights and Pins, Drive Clutch Spider Rollers and Roller Pins, Drive and Driven Clutch Springs.** See Pages 6.11-6.12
3. **Sheave Faces.** Clean and inspect for wear.
4. **PVT System Sealing.** Refer to appropriate illustrations and photos. 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. This also will prevent water and other contaminants from entering the PVT area. A sealed PVT is especially critical on units subjected to frequent water foraging.

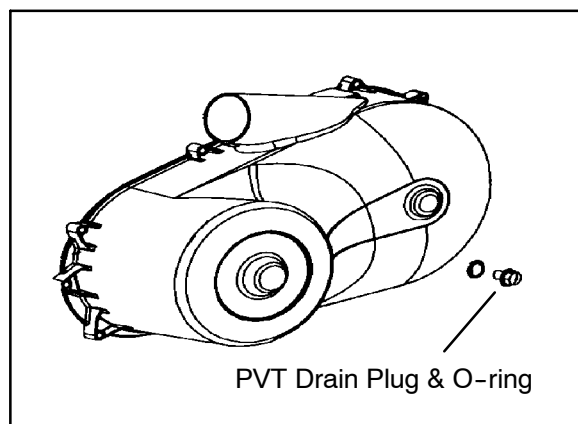
## PVT DRYING

**Special Tool NOTE:** If operating the ATV through water, be sure to check the PVT cover and other ATV components for water ingestion. The ATV should be checked immediately. Refer to Owner's Manual for Safe Riding Tips.



To drain any water that may be trapped inside the PVT cover, simply remove the PVT drain plug and O-ring located on the bottom of the PVT cover and let the water drain out. The PVT drain plug is shown below.

To further expel water in the PVT cover and to dry out the PVT system, shift the transmission to neutral and rev engine slightly to expel the moisture. This will also air-dry the belt and clutches. Allow engine RPM to settle to idle speed, shift transmission to lowest available range and test for belt slippage. Repeat as needed. Operate ATV in lowest available range for a short period of time until PVT system is dry.





## **PVT 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 ATV should be operated in LOW RANGE when pulling or plowing heavy loads, or if extended low speed operation is anticipated.

<b>GENERAL RANGE OPERATION GUIDELINES:</b>	<b>Low Range:</b> Heavy pulling, basic operational speeds less than 7 MPH, riding through rough terrain (swamps, mountains, etc.), low ground speeds.
	<b>High Range:</b> High ground speeds, speeds above 7 MPH.
<b>Diagnosis of Clutch Drive Belt &amp; Cover Related Issues:</b>	
<b>Possible Causes</b>	<b>Solutions/What to do</b>
Loading the ATV into a pickup or tall trailer when in high range.	Shift transmission to low range during loading of the ATV to prevent belt burning.
Starting out going up a steep incline.	When starting out on an incline, use low range, or dismount the ATV after first applying the park brake and perform the "K" turn.
Driving at low RPM or low ground speed (at approximately 3-7 MPH).	Drive at higher speed or use Low Range. The use of Low Range is highly recommended for cooler PVT operating temperatures and longer component life.
Insufficient warm-up of ATVs 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. Continuous operation at the point of engagement (initial vehicle movement) increases PVT temperatures and component wear.
Towing/Pushing at low RPM/low ground speed.	Use Low Range only.
Plowing snow, dirt, etc./utility use.	Use Low Range only.
Stuck in mud or snow.	Shift the transmission to Low Range, carefully use fast, aggressive throttle application to engage clutch. <b>Warning: Excessive throttle may cause loss of control and vehicle overturn.</b>
Climbing over large objects from a stopped position.	Shift the transmission to Low Range, carefully use fast, aggressive, throttle application to engage clutch. <b>Warning: Excessive throttle may cause loss of control and vehicle overturn.</b>
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 <b>3/4 throttle</b> . Engage transmission in the lowest possible range and test for belt slippage Repeat several times as required. <b>During this procedure, the throttle should not be held at the full position for more than 10 seconds.</b> PVT seals should be inspected for damage if repeated leaking occurs.
Clutch malfunction.	Inspection/repair of clutch components should be performed by a certified Polaris MSD technician.



## **PVT DISASSEMBLY**

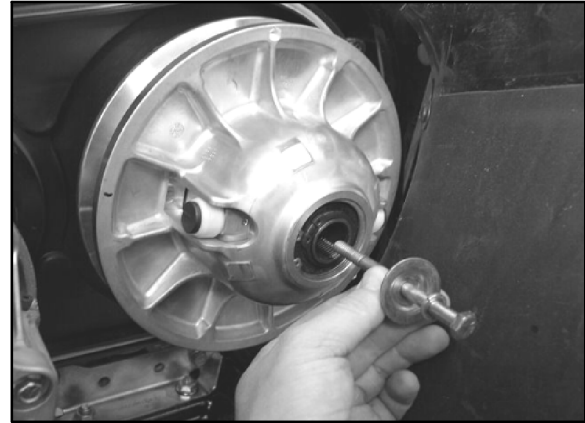
**NOTE:** Some fasteners and procedures will vary. Refer to the appropriate parts manual for proper fasteners and fastener placement.

1. Remove seat.
2. Remove or loosen rear cab fasteners as necessary to gain access to PVT outer cover.
3. Remove PVT air outlet duct hose.
4. Remove outer cover screws. Refer to Page 6.2.
5. Mark the drive belt direction of rotation and remove drive belt. See Page 6.16 for drive belt removal.
6. Remove drive clutch retaining bolt and remove drive clutch using puller.



**Drive Clutch Puller (PN 2870506)  
Clutch Holding Wrench (PN 9314177)**

7. Remove driven clutch retaining bolt and driven clutch. Use puller if necessary.



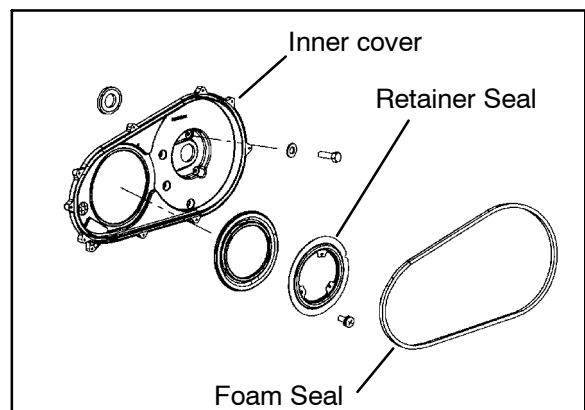
**Driven Clutch Puller (PN 2870913)**

8. Remove driven clutch offset spacers from the transmission input shaft. **NOTE:** Remember to keep spacers in order for proper clutch offset on reassembly.



Offset  
Spacer

9. Remove cover screws and retainer plate.



Inner cover

Retainer Seal

Foam Seal

10. Remove inner cover retaining bolts at rear of cover.
11. Remove cover along with foam seal on back of cover or shaft.

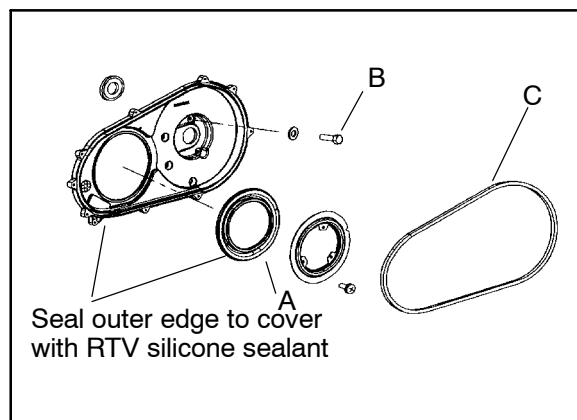


## PVT ASSEMBLY/INSPECTION

1. Inspect PVT inner cover-to-engine seal. Replace if cracked or damaged. Align the alignment mark on the cover with the mark on the engine seal.



2. Place a new seal on transmission input shaft.
3. Apply RTV silicone sealant to outside edge of inner cover-to-engine seal, to ensure a water tight fit between the seal and the cover on engine side. 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 cover bolts (B) to specification.

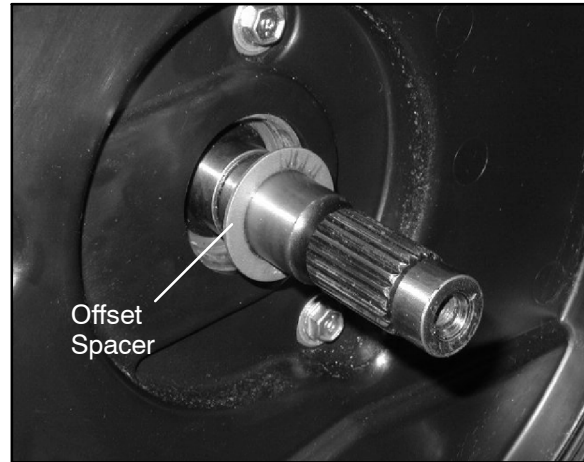


**Inner Cover Bolt Torque (Rear):**  
12 ft. lbs. (16.6 Nm)

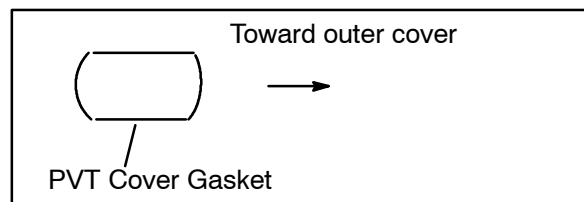
**Driven Clutch Retaining Bolt Torque:**  
17 ft. lbs. (23.5 Nm)

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

7. Install clutch offset spacer(s) 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 rotation. If a new belt is installed, install so numbers can be easily read.
14. Only replace PVT outer cover rubber gasket if it is damaged. Place the gasket with the narrow side out (C).



15. Reinstall PVT outer cover and secure with screws.
16. Reinstall rear cab assembly, panel and seat.





# DRIVE CLUTCH SPRING SPECIFICATIONS

The drive clutch spring has two primary functions:

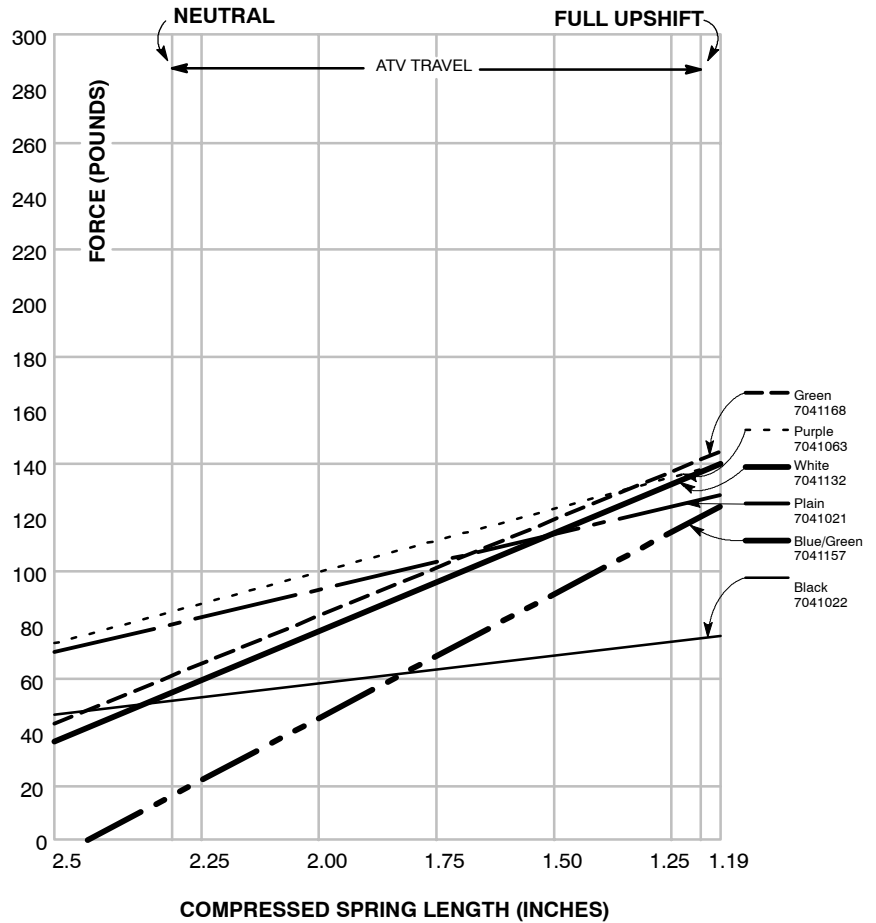
- Controls clutch engagement RPM.** The springs which have a higher rate when the clutch is in neutral will increase clutch engagement RPM.
- Controls the rate at which the drive belt moves upward in the drive clutch sheaves.** This is referred to as drive clutch upshift.

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 stress the coil spring is subject to during operation, it should always be inspected for tolerance limits during any clutch diagnosis or repair.

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 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 component failure.

**Measuring Spring Length:** 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

PART NUMBER	COLOR CODE	WIRE DIAMETER	FREE LENGTH ±.125"	PART NUMBER	DESCRIPTION
7041021	Plain	.157"	4.38"	3234199	White
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"		

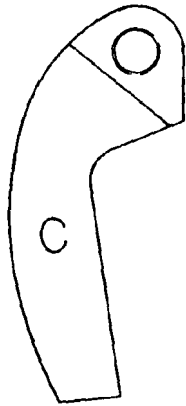
## Secondary Clutch Springs



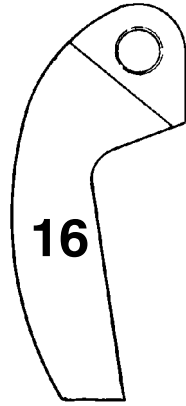


## **SHIFT WEIGHTS**

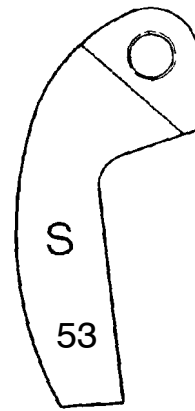
Shown below are optional shift weights which may be used in the PVT system. These shift weights have many different factors designed into them for controlling engagement RPM and shifting patterns. Shift weights should not be changed or altered without first having a thorough understanding the effects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



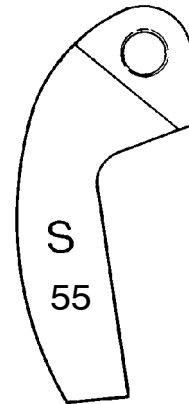
**PN 5630418**  
50 gr



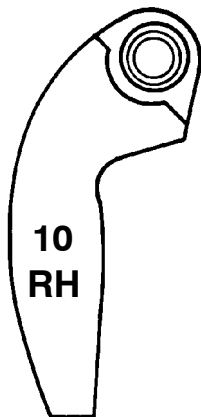
**PN 5630279**  
43 gr



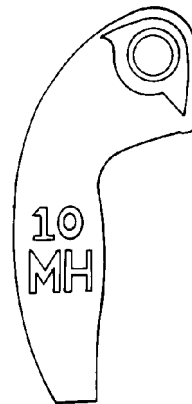
**PN 5630095**  
53 gr



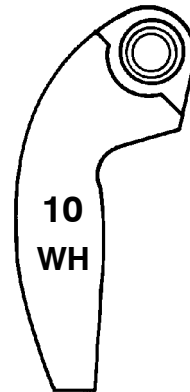
**PN 5630509**  
55 gr



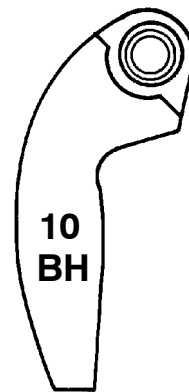
**PN 5630709**  
44 gr



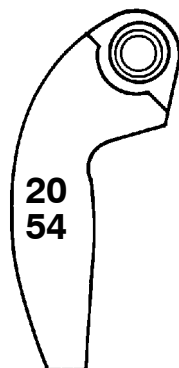
**PN 5630513**  
50.5 gr



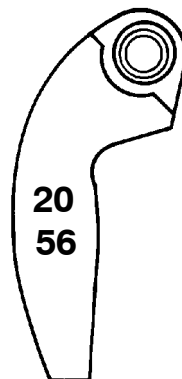
**PN 5630710**  
46 gr



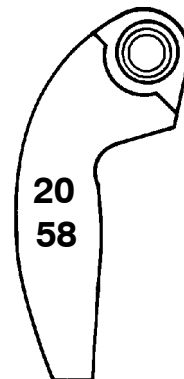
**PN 5630711**  
47gr



**PN 5631214**  
54 gr



**PN 5631215**  
56 gr



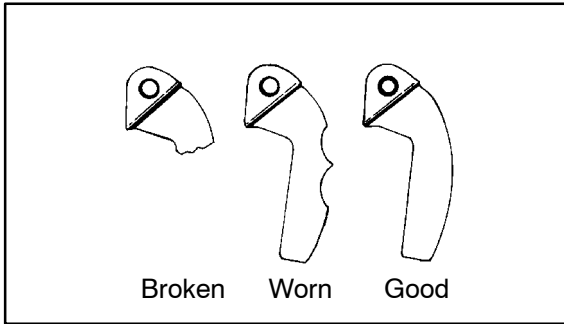
**PN 5631216**  
58 gr





## SHIFT WEIGHT INSPECTION

1. 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. Remove shift weight bolts and weights.



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 inspection, Page 6.13.

### ▲ WARNING

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

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 system, it is absolutely essential that no attempt at disassembly or repair be made without factory authorized special tools and service procedures.**

## 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 Page 6.12.

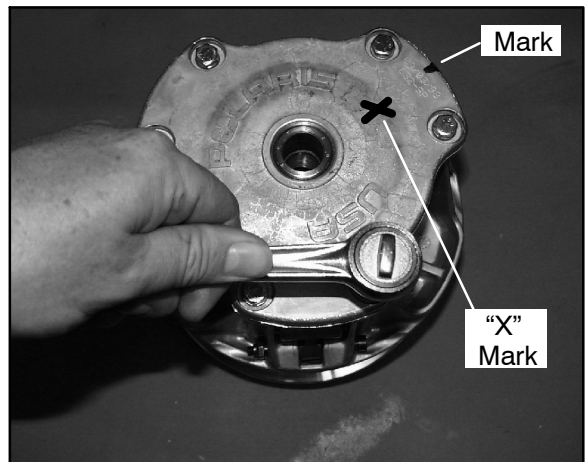


**Button to Tower Clearance:  
.000 - .001"**

2. Inspect sheave surfaces. Replace the *entire clutch as an assembly* if worn, damaged or cracked.

## DRIVE CLUTCH DISASSEMBLY

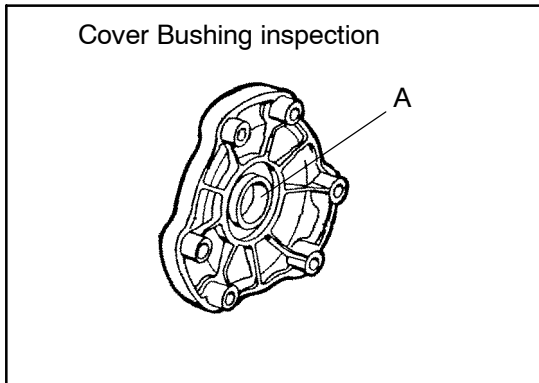
1. Using a permanent marker, mark the cover, spider, and moveable and stationary sheaves for reference, as the previous X's may not have been in alignment before disassembly.





## DRIVE CLUTCH DISASSEMBLY CONT'D

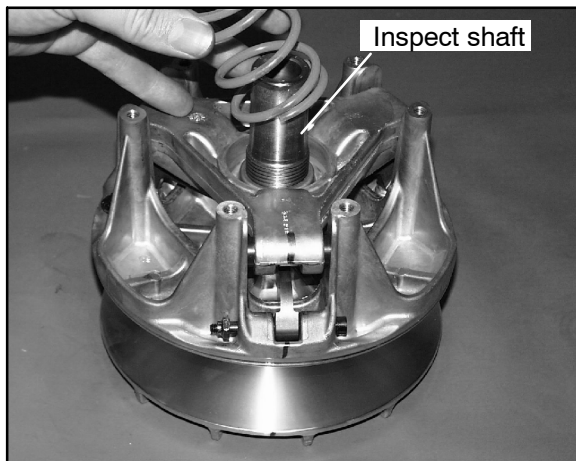
- Remove cover bolts evenly in a cross pattern and remove cover plate.
- Inspect cover bushing (A). The outer cover bushing is manufactured with a Teflon™ coating. Wear is determined by the amount of Teflon™ remaining on the bushing.



### Cover Bushing Inspection:

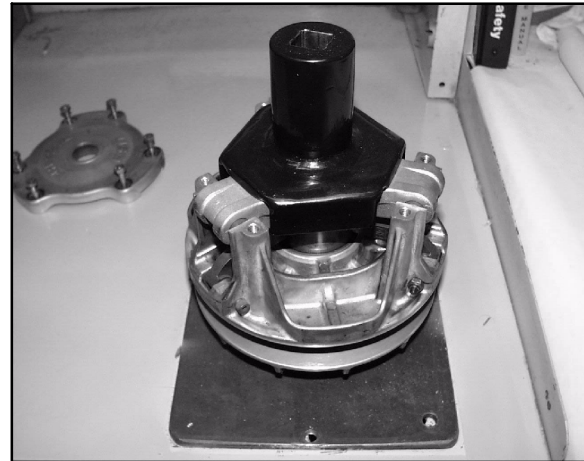
Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

- Inspect area on shaft where bushing rides for wear, galling, nicks, or scratches. Replace clutch assembly if worn or damaged.
- Remove and inspect spring. (See Page 6.9)



## SPIDER REMOVAL

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

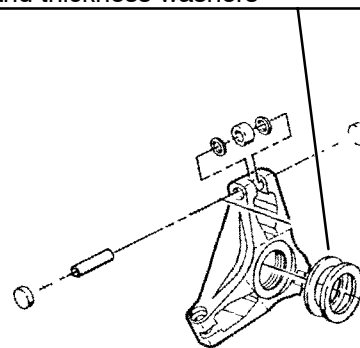


Clutch Holding Fixture:  
(PN 2871358)

Spider Removal Tool:  
(PN 2870341)

**Special Tool 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.

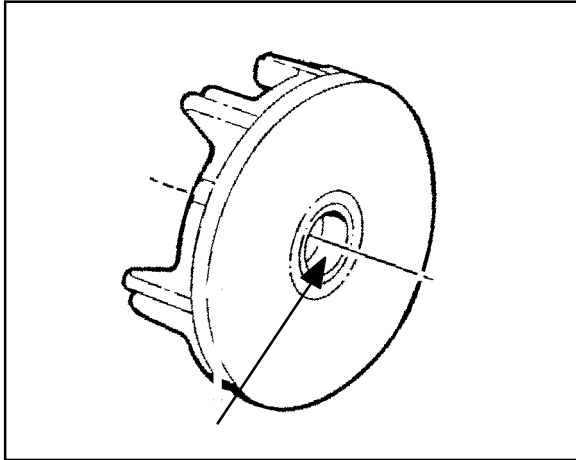
To maintain proper clutch balance and belt-to-sheave clearance, be sure to reinstall original quantity and thickness washers





## Moveable Sheave Bushing Inspection

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

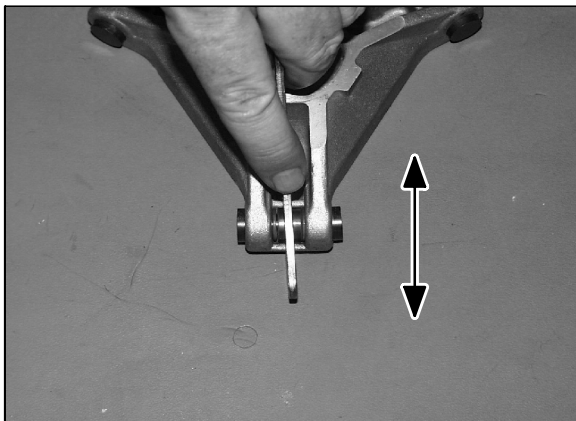


### Moveable Sheave Bushing Inspection:

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

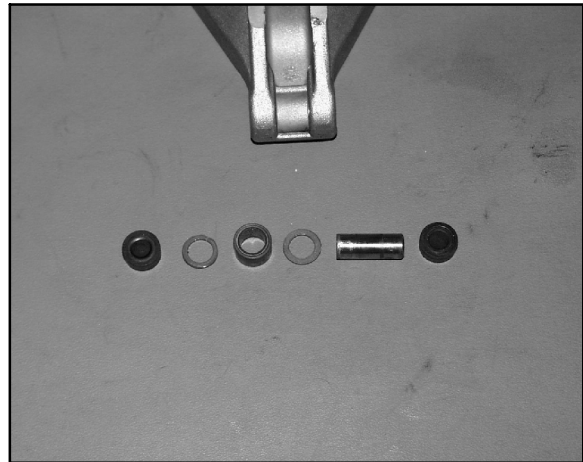
## Roller, Pin and Thrust Washer Inspection

- 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.



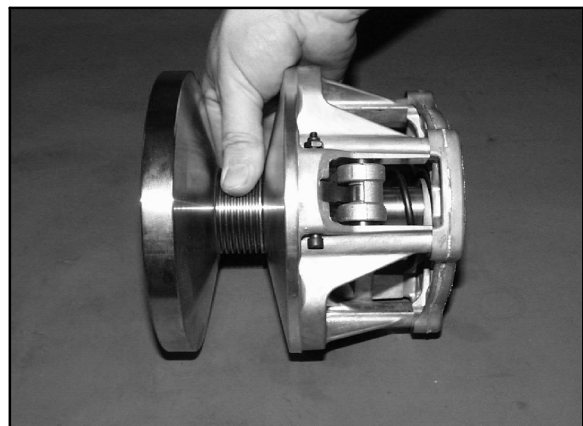
- Rubber backed buttons can and should be used in all ATV clutches *if the hollow roller pin is changed to a solid roller pin*. **NOTE:** The rubber side of the

button is positioned toward the solid roller pin. It is recommended to switch all buttons to the rubber version during service (if needed).



## ONE-WAY CLUTCH INSPECTION (DRIVE CLUTCH)

- Rotate one-way clutch clockwise (as viewed from the cover plate side). The clutch should rotate on the shaft with only slight amount of drag. Verify there is no binding or rough spots. When rotated counterclockwise, the clutch should lock to the shaft without slipping. If problems are noted in either direction, continue with disassembly.

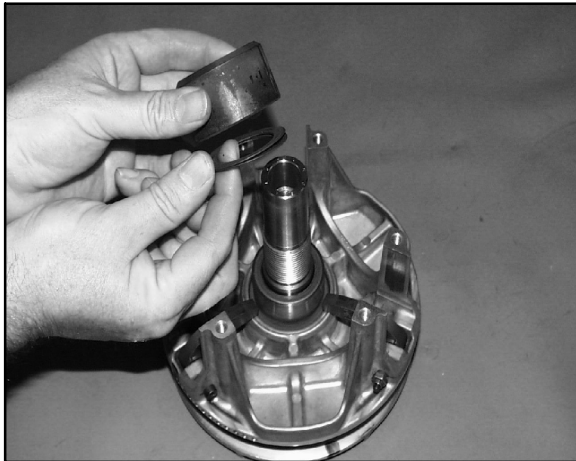


## DRIVE CLUTCH INSPECTION

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

- Remove moveable sheave spacer sleeve and the thrust washer. 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)**

- Lift one-way clutch 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"**

- Remove 2 1/2" PTFE washer from shaft. Visually inspect the 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 on the moveable sheave bushing. Inspect BOTH sheaves for signs of wear, grooving or cracking. Clean surfaces with a 3M™ 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.**





## DRIVE CLUTCH REASSEMBLY CONT'D

2. Install moveable sheave onto fixed sheave.
3. Install spider spacers. Use same quantity and thickness as were removed.
4. 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 on the moveable sheave.
5. Torque spider to specification using the holding fixture and spider tool. Torque with smooth motion to avoid damage to the stationary sheave. Refer to Page 6.3 for torque specification.

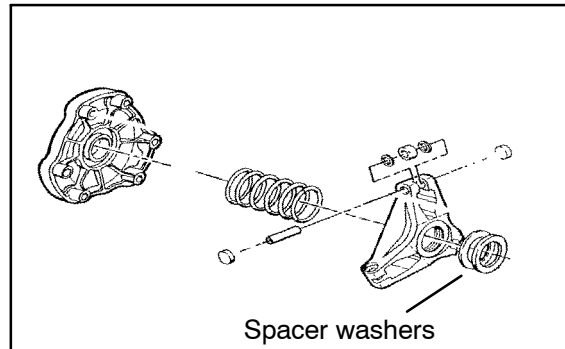
### CAUTION:

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

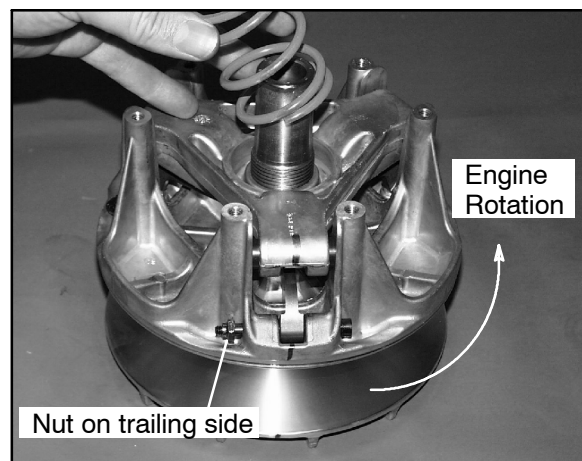
## DRIVE CLUTCH REASSEMBLY

**Special Tool 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. **Do not apply oil or grease to the bushings.**

1. Reassemble drive clutch in the following sequence. Be sure the "X", or the marks that were made earlier, are aligned during each phase of assembly.
  - a) "X", or the marks that were made earlier on cover
  - b) X on spider, making sure spacer washers are installed underneath spider and positioned properly in recess.
  - c) "X", or the marks that were made earlier under weight



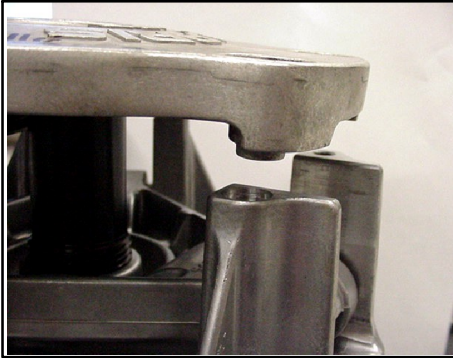
6. Install limiter nut on top of spider using the Clutch Spider Nut Socket (PN 2870338). Torque to 15 ft. lbs. Reinstall shift weights using new lock nuts on the bolts.
7. Reinstall clutch spring.







8. Reinstall cover, aligning bosses on the tower and cover. Torque cover bolts evenly to specification

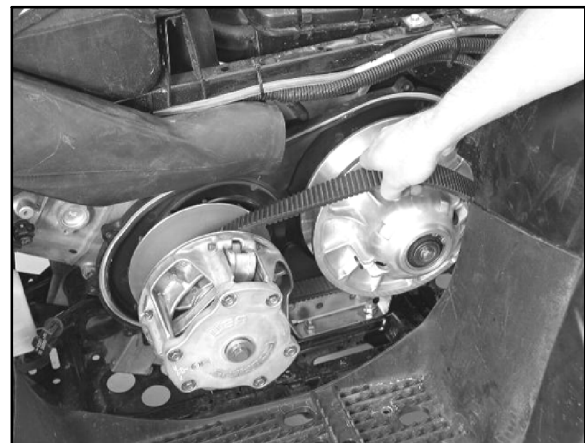
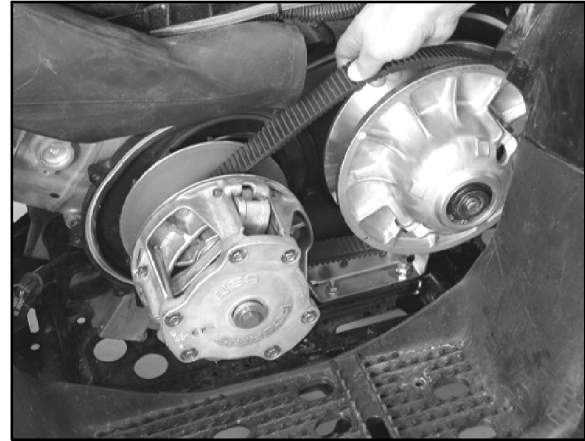


**Spider Torque:**  
200 ft. lbs. (271 Nm)

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

## DRIVE BELT REMOVAL/INSPECTION

1. Remove outer PVT cover as described in PVT Disassembly.
2. Mark drive belt direction of rotation so that it can be installed in the same direction. **NOTE:** Normally positioned so part numbers are easily read.
3. To remove drive belt, apply brake, pull upward and rearward on belt to open driven clutch sheaves, pull out and down on belt to slip over the driven clutch outer sheave.



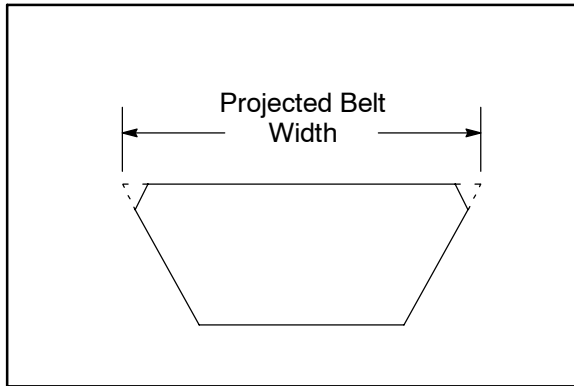
**Special Tool NOTE:** When reinstalling the belt with the drive clutch and driven clutch already removed follow these steps:

- Install the driven clutch.
  - Install the belt onto the driven clutch.
  - Loop the drive clutch through the belt.
  - Install the drive clutch onto the crankshaft.
4. Measure belt width and replace if worn. Generally, belts should be replaced if clutches can no longer be adjusted to provide proper belt deflection.
    - 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, as shown in the illustration.

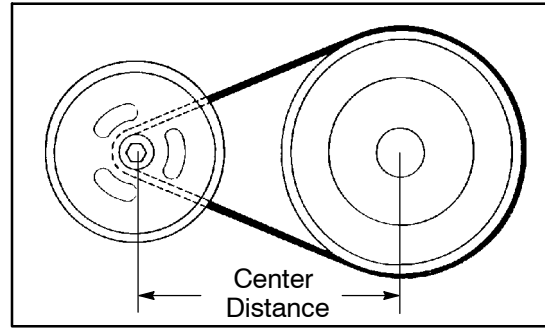


**Belt Width:**

**New 1.174 - 1.188" (2.98-3.02 cm)**

**Wear Limit 1.125" (2.86 cm)**

- Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Replace if necessary.
- 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 continuously in one spot.
- Measure belt length with a tape measure around the outer circumference of the belt. Belts which measure longer than nominal length may require driven shimming or engine adjustment for a longer center distance to obtain proper belt deflection. Belts which measure shorter than nominal length may require driven shimming or a shorter center distance. *Remember, proper belt deflection is the desired goal - not a specific center distance.*
- Replace belt if worn past the service limit. Belts with thin spots, burn marks, etc., should be replaced to eliminate noise, vibration, or erratic PVT operation. See Troubleshooting Chart at the end of this chapter for possible causes.



**Clutch Center Distance -**  
**10" +.1 / -.05 (254 +2.5 / -1.3mm)**  
**Belt Nominal Length - 40.875" ± 3/16**  
**(103.8 cm ± .48 cm)**

## DRIVE BELT INSTALLATION

**Special Tool NOTE:** Be sure to position belt so part number is easily read. Verify new belt is seated properly in the clutches before operating the ATV.

- Loop belt over drive and over top of driven sheave.
- While pushing down on top of belt, turn the back or moveable driven sheave clockwise.

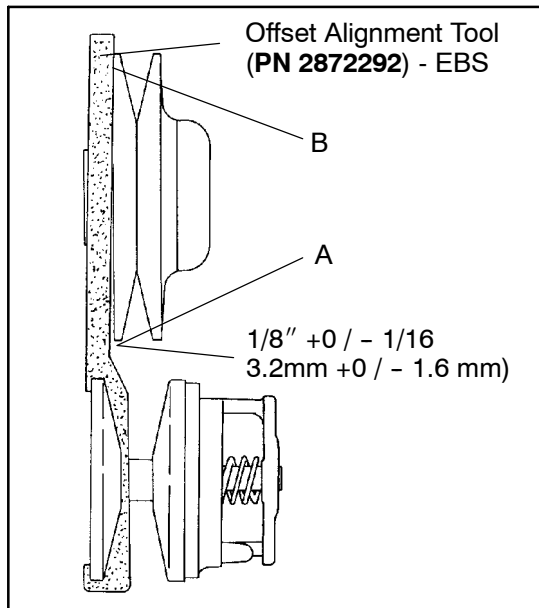


- The belt then should be able to be pushed down into and between the sheaves.
- Install clutch cover temporarily. Verify engine is in PARK. Start engine and raise engine RPM enough to engage the clutch, rotating the belt and seating it in the clutches. Remove clutch cover and verify belt is seated properly before final cover installation.



## CLUTCH ALIGNMENT

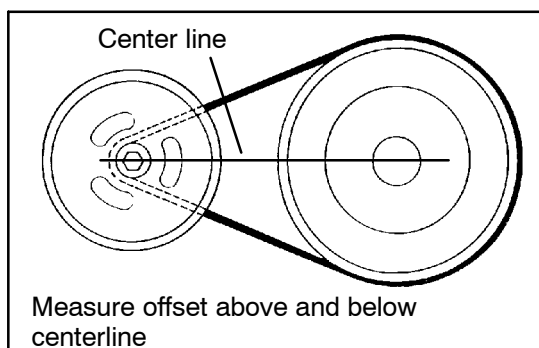
1. Remove belt and install the Clutch Offset Alignment Tool (PN 2872292) as shown.



2. With tool touching rear of driven clutch inner sheave, the distance at point "A" should be 1/8".

**Special Tool NOTE:** If the distance is greater than 1/8" or less than 1/16", clutch alignment must be adjusted as follows:

3. Remove drive and driven clutch. See PVT Disassembly, Pages 6.7-6.8.
4. Remove PVT inner cover.
5. Loosen all engine mounts. Move front of engine to the right or left slightly until alignment is correct.
6. Tighten engine mounts and verify alignment is correct.
7. Measure belt deflection and measure offset both **above and below** shaft centerlines. Adjust if necessary.



**Special Tool NOTE:** On some models, minor adjustments can be made by adding shims between the frame and front lower left engine mount to increase the distance at point "A". If a shim is present, it can be removed to decrease the distance at point "A".

**Shim Kit (PN 2200126)**

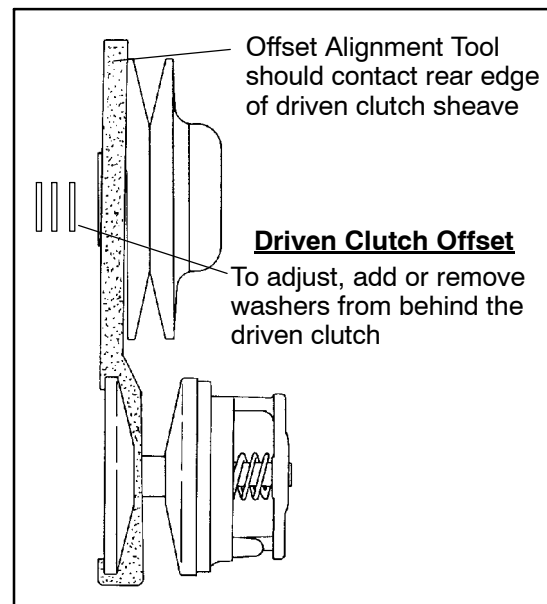
## CLUTCH OFFSET

**Important:** Inspect clutch alignment and center distance before adjusting offset.

Offset is correct when rear of tool contacts rear of inner sheave with driven clutch pushed completely inward on shaft and bolt torqued. Adjust offset by adding or removing spacer washers between back of driven clutch and spacer.

**Spacer Washer (PN 7556401)**

1. Install offset alignment tool as shown. Remember to measure above and below the shaft centerlines.





## **EBS DRIVE CLUTCH BUSHING SERVICE**

### **SPECIAL TOOL REQUIREMENTS - EBS CLUTCH BUSHING REMOVAL AND INSTALLATION**

**Tool Kit PN 2201379** - contents of this kit include:

<u>Item</u>	<u>Qty</u>	<u>Part Description</u>	<u>Part No</u>
A/B	1	EBS Puller Tool	<b>5132027</b>
C	1	EBS Puller Nut	<b>5132501</b>
D	1	EBS Main Adapter	<b>5132029</b>
E	1	EBS Bushing Removal Tool	<b>5132028</b>
	1	Instructions	<b>9915111</b>

**Also required:**

**Bushing Replacement Kit (PN 2871226)**

**Piston Pin Puller (PN 2870386)**

**OPTIONAL KIT - PN 2871025 - Includes the  
above listed tools and is for all clutches.**

**Special Tool NOTE:** Sportsman 800 EFI Drive  
Clutch requires Bushing Removal Tool  
PA-47336. Order from Polaris tool supplier SPX  
1-800-328-6657.

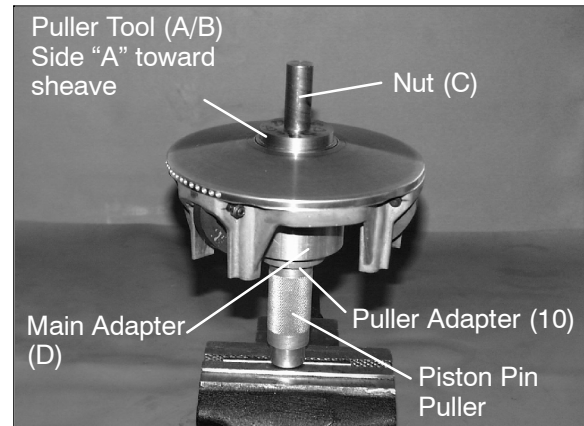
## **REMOVAL AND INSTALLATION INSTRUCTIONS**

**Special Tool 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.

### **EBS Drive Clutch Moveable Sheave Bushing Removal**

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



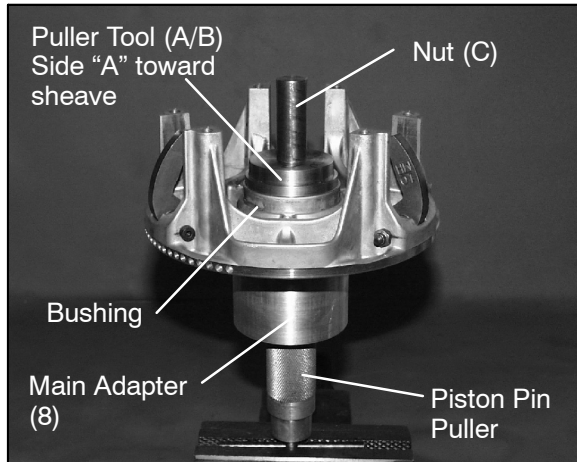
6. With towers pointing toward the vise, slide sheave onto puller rod.
7. Install removal tool (Item A/B) into center of sheave with "A side" toward sheave. **800 EFI Clutch - Use Bushing Tool PA-47336.**
8. Install nut (C) onto end of puller rod and hand tighten. Turn puller barrel to increase tension 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.





## EBS Drive Moveable Bushing Installation

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

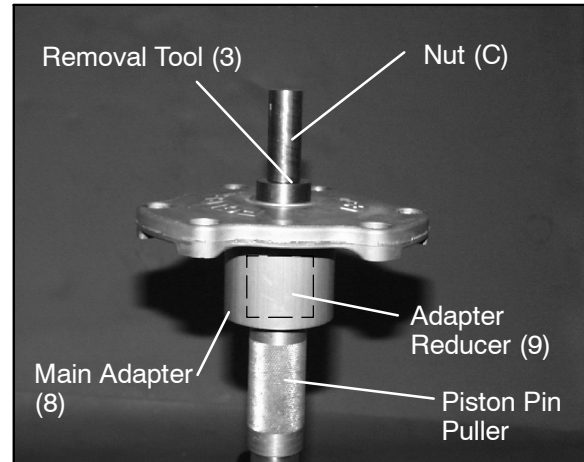


**EBS Drive Clutch Moveable Sheave Bushing Installation**

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. **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.

## EBS Drive Clutch Cover Bushing Removal

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



**EBS Drive Clutch Cover Bushing Removal**

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.

## EBS Drive Clutch Cover Bushing Installation

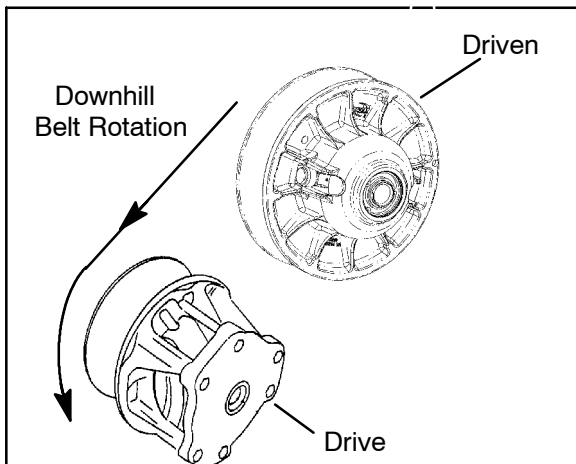
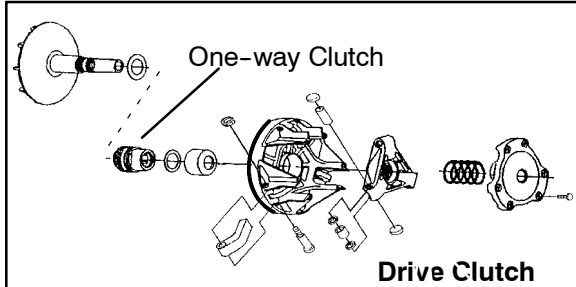
1. Apply Loctite™ 609 evenly to bushing bore in cover.
2. Working from inside of cover, insert new bushing and bushing installation tool into center of clutch cover.
3. With main adapter on puller, insert cover onto puller rod, placing outside of cover toward vise.
4. Install nut on rod and hand tighten. 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.



# **EBS DRIVEN CLUTCH DISASSEMBLY/INSPECTION -**

## **EBS Driven Clutch Operation**

This EBS driven clutch provides the same engine braking abilities as the earlier EBS driven clutch.

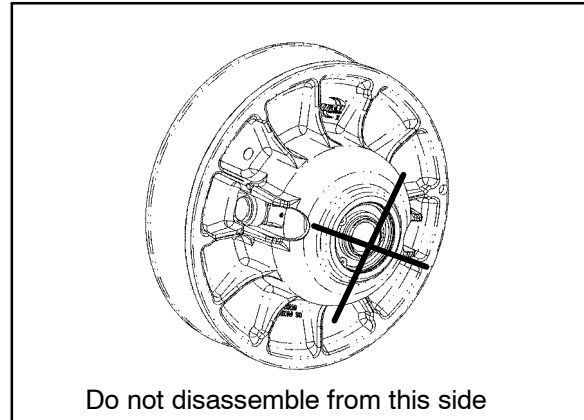


When the ATV is moving downhill the drive train turns the driven clutch, belt, and one way clutch in the direction of engine rotation. When the one-way clutch (see exploded view of drive clutch) exceeds the drive clutch rotational speed, the one-way clutch locks to the drive clutch shaft and engine braking occurs. Essentially the driven clutch has become the “driving” clutch. The spider assembly with the two rollers, that is fixed to the transmission shaft rotates in the pockets of the sheave, allowing the stationary sheave to rotate with the moveable sheave as the rollers move to the other side of the ramp, providing instant EBS braking. Engine braking (EBS) continues until the drive clutch speed exceeds the one-way clutch speed, or until the throttle is applied and the engine reaches clutch engagement speed, lifting the belt off of the one-way clutch.

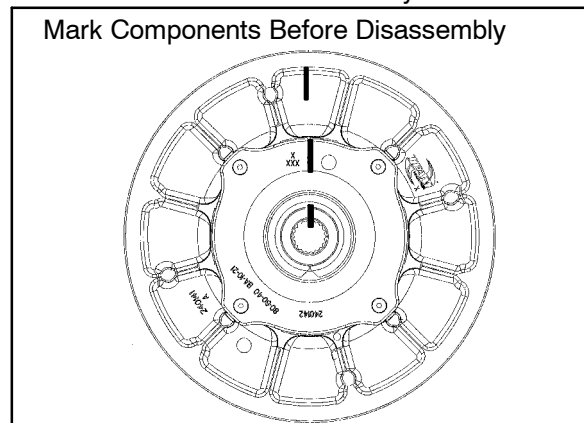
**CAUTION:** The driven clutch must be disassembled from the helix end to reduce spring pressure. Review all information below before proceeding.

## **DRIVEN DISASSEMBLY/ASSEMBLY**

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.



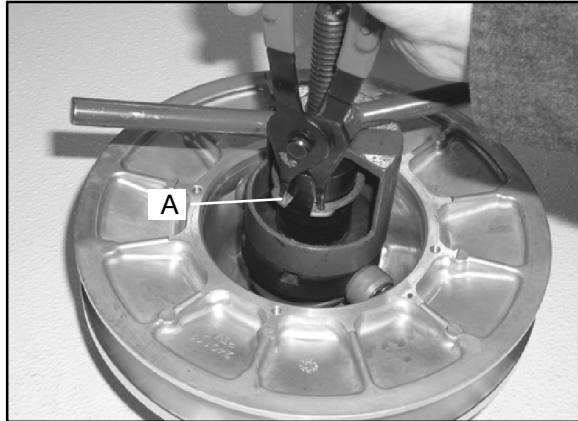
3. Remove the four torx screws that secure the cam assembly (helix) using a T25 torx.



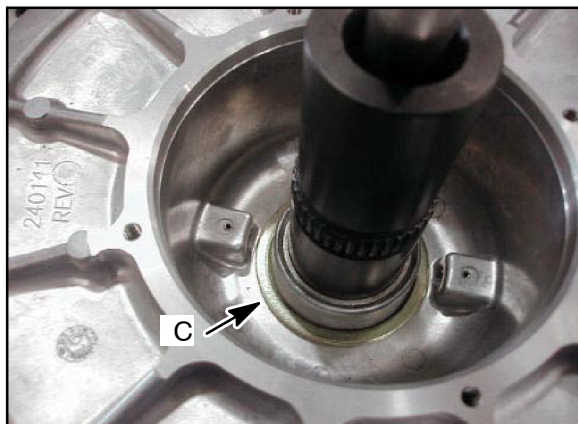
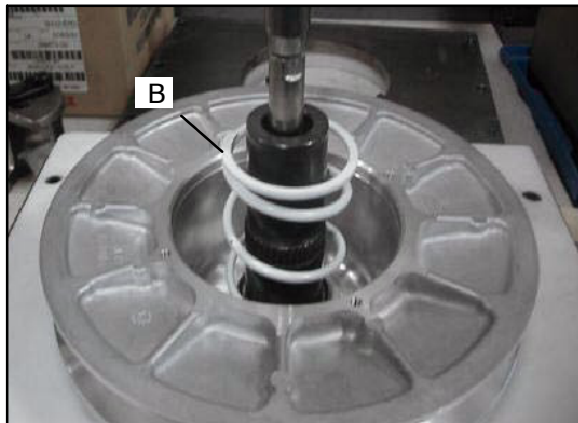
4. Place the driven assembly into the Clutch Holding Tool (PU-47086). Install the compression



cylinder of the holding tool on top of the spider assembly and retaining ring. Install the clutch holding tool handle and slowly compress the spider onto the shaft. Push helix inward. Remove snap ring (A).

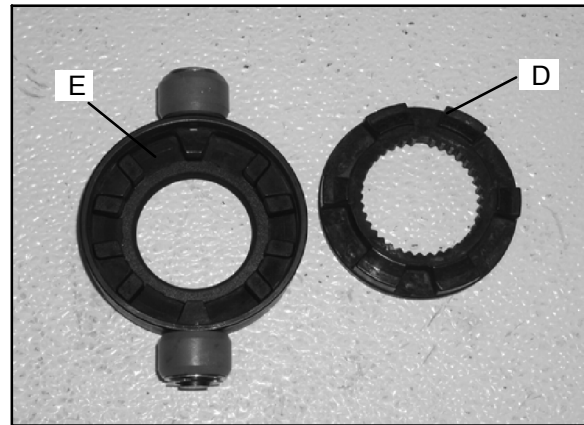


- Remove the spider assembly, spring (B), and spacer washer (C). **NOTE:** The spring is a compression spring only and has no torsional wind

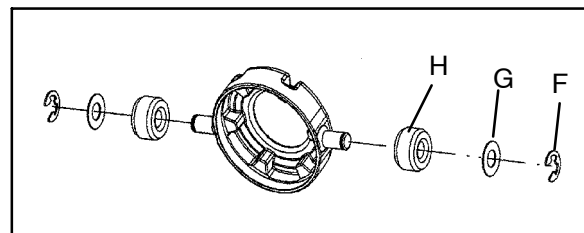


## SPIDER DISASSEMBLY

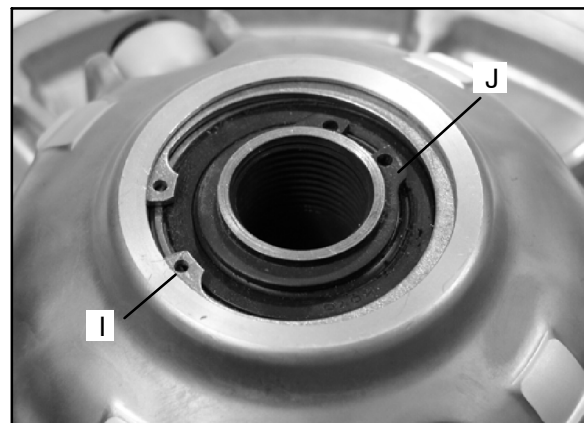
- Remove the inside spider plate (D) and spider dampener (E). Inspect the spider dampener (E) for wear and replaced if needed.



- Remove the E-clip (F), washer (G), and the clutch rollers (H). Inspect the rollers for wear replace if worn.



- Remove the clutch assembly from the holding tool. Remove the large outer retaining ring (I) and the inner retaining ring (J).

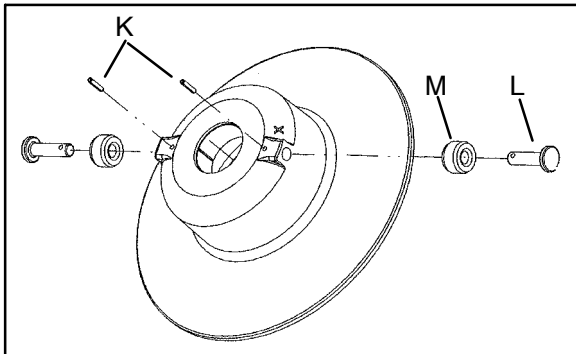
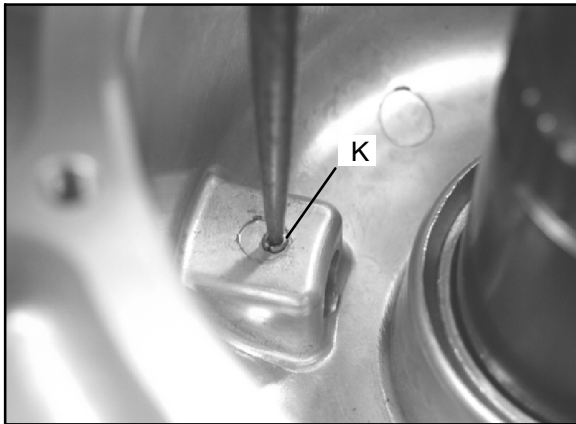




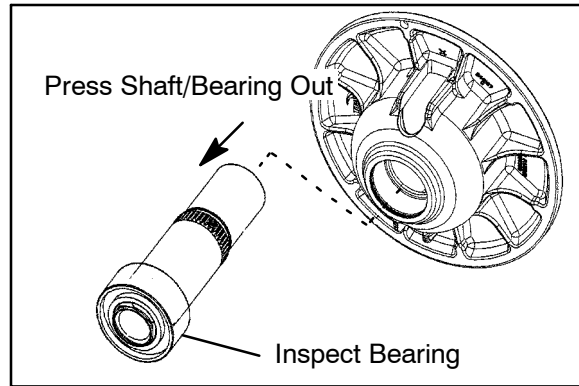
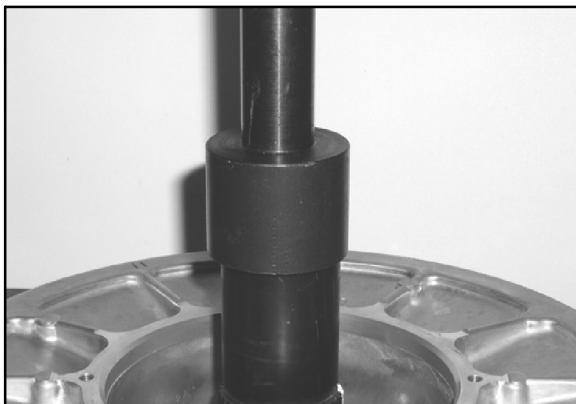


## CLUTCH ROLLER REMOVAL

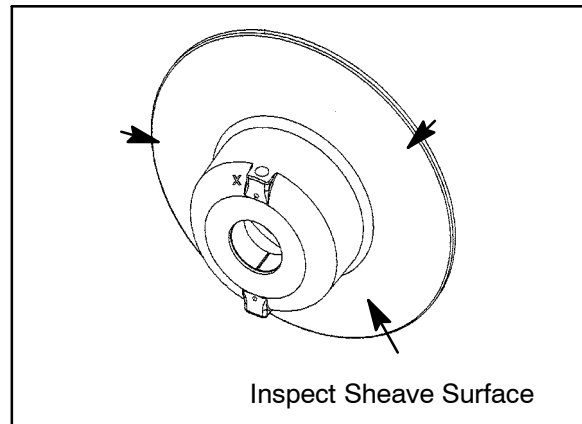
9. Press out the spring pins (K) in the inner sheave.
10. Pull out the clutch roller pins (L) and rollers (M).



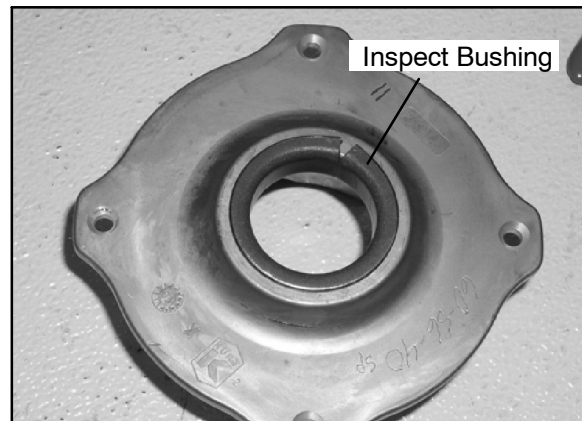
11. Press the shaft and bearing out of the outer sheave using a press.



12. Inspect the bearing for wear. Spin the bearing, if the bearing does not spin smoothly replace as needed. To remove the bearing, simply press the bearing from the shaft.
13. Inspect BOTH sheaves for signs of wear, grooving or cracking. Clean surfaces with a 3M™ pad if needed



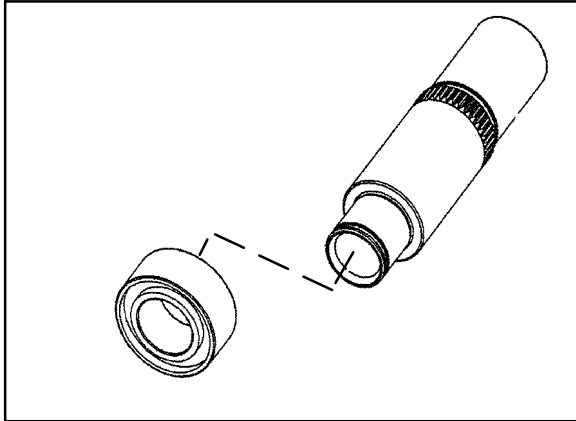
14. Inspect the cam assembly (helix) bushing for wear. If the bushing is worn or the shaft does not fit snug into the bushing, replace the cam assembly (cover).



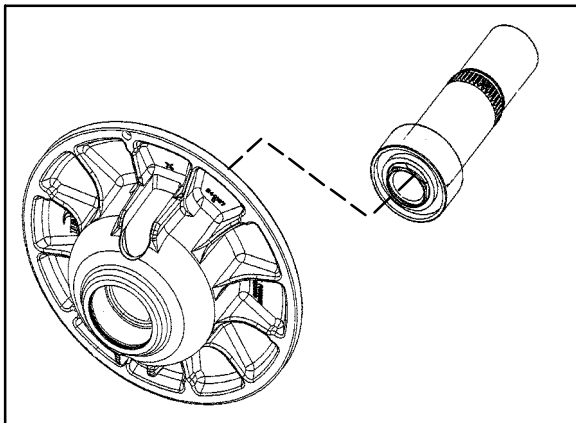


## EBS DRIVEN CLUTCH REASSEMBLY

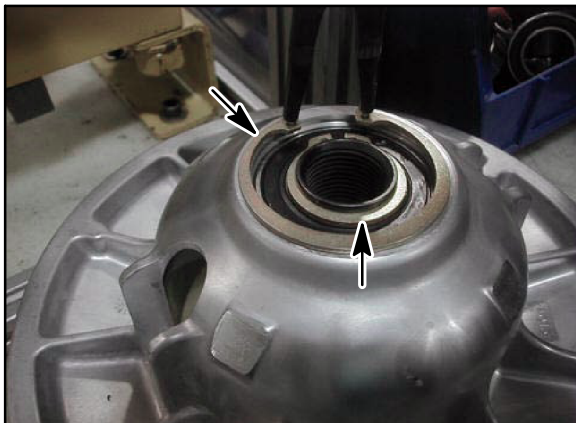
1. Press the bearing onto the output shaft using a press.



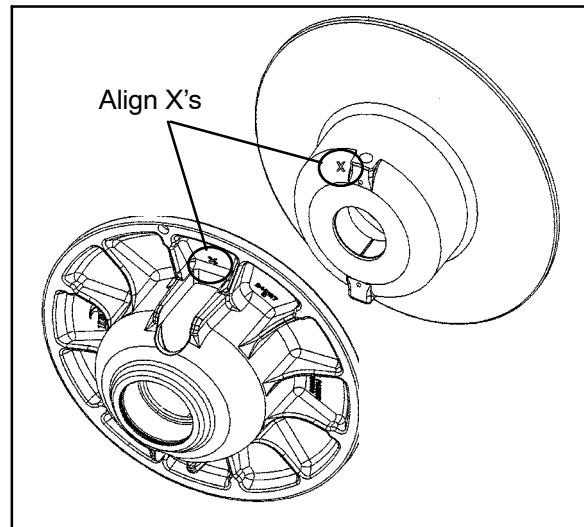
2. Install the shaft/bearing into the outer sheave.



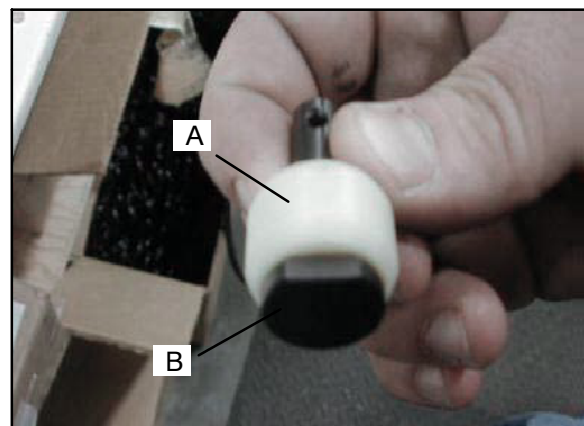
3. Install the small and large retaining rings into the outer sheave above the bearing.



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.



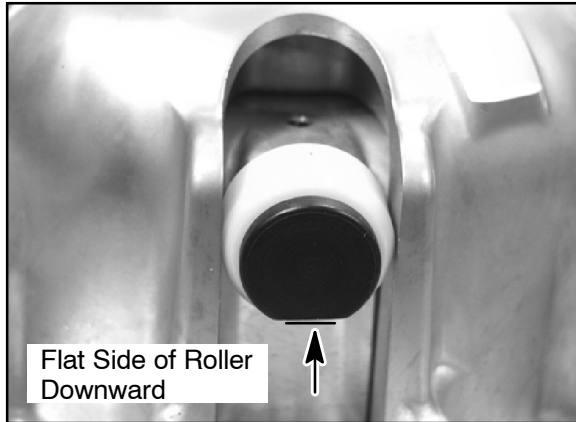
5. Install the roller (A) onto the roller pin (B). (Both Sides)



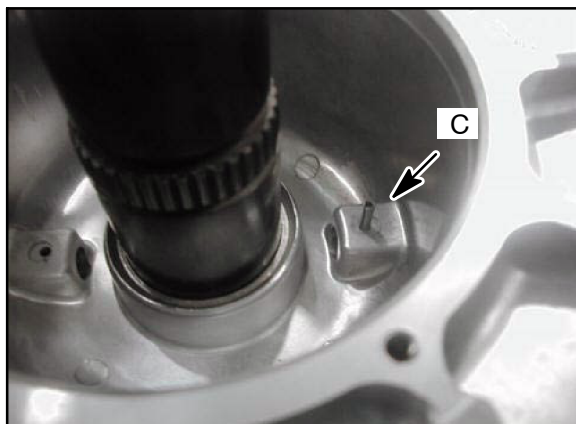




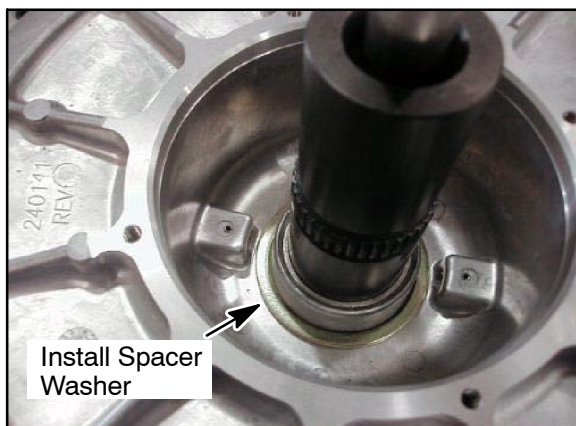
6. Install the roller pin into the sheave assembly. (Both sides). The flat side of the roller pin faces downward when the shaft side is laying flat on the bench.



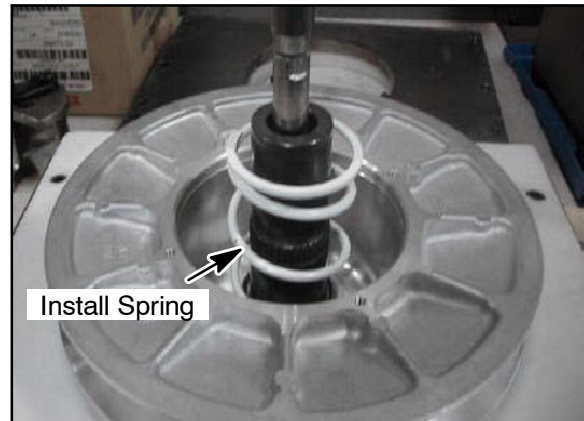
7. Install the spring pins (C) to secure the roller pins. Install until flush with sheave surface.



8. Install the spacer washer.

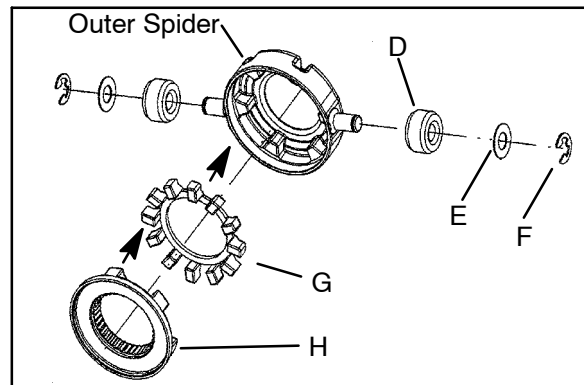


9. Install the spring over the shaft.

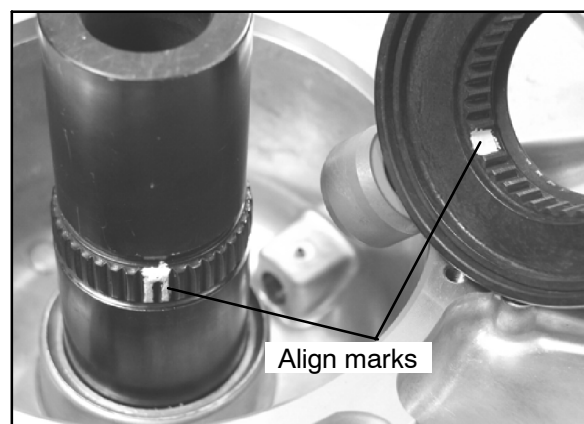


10. Install the clutch rollers (D) onto each side of the outside spider. Install the washers (E) and E-clips (F) to secure the rollers. Spin the roller, the rollers should spin freely.

11. Install the spider dampener (G) inside the outer spider and install the inside spider plate (H).

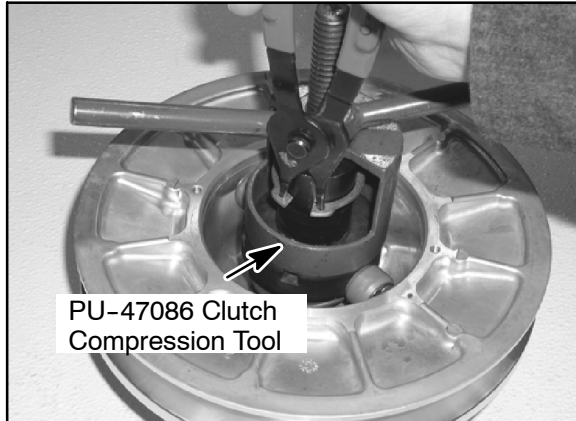


12. Install the clutch assembly into the Clutch Holding Tool (PU-47086). Install the spider assembly onto the shaft with the retaining ring on top of the spider. **NOTE:** Use the marks previously made to align the skip tooth spider, or use the "X" on top of the spider and aligning it with the skip tooth on the shaft.

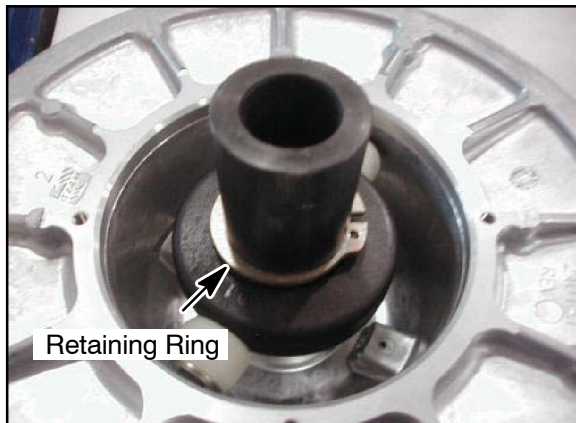




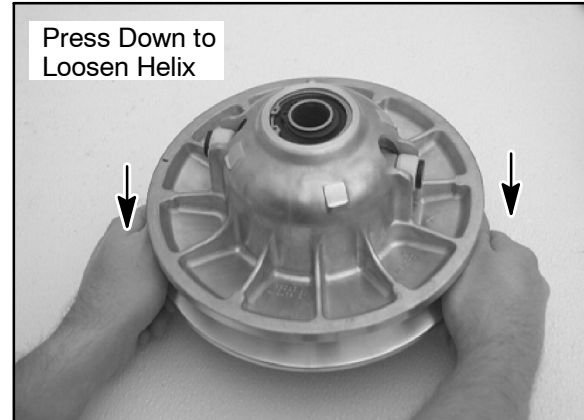
13. Install the compression cylinder of the holding tool on top of the spider assembly and retaining ring. Install the clutch holding tool handle and slowly compress the spider onto the shaft. Align the marks on the spider with the skip tooth on the shaft.



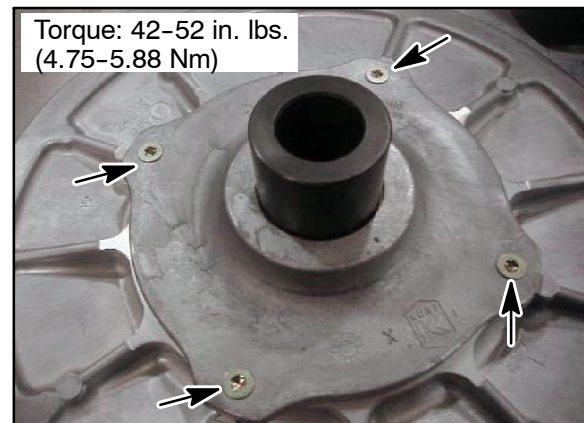
14. Slowly compress the spider into place. If the spider appears to bind while compressing, stop and make sure the skip tooth on the shaft and the spider are aligned. Once the spider passes the retaining ring notch on the shaft, install the retaining ring.



15. Install the cam assembly (helix) 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.



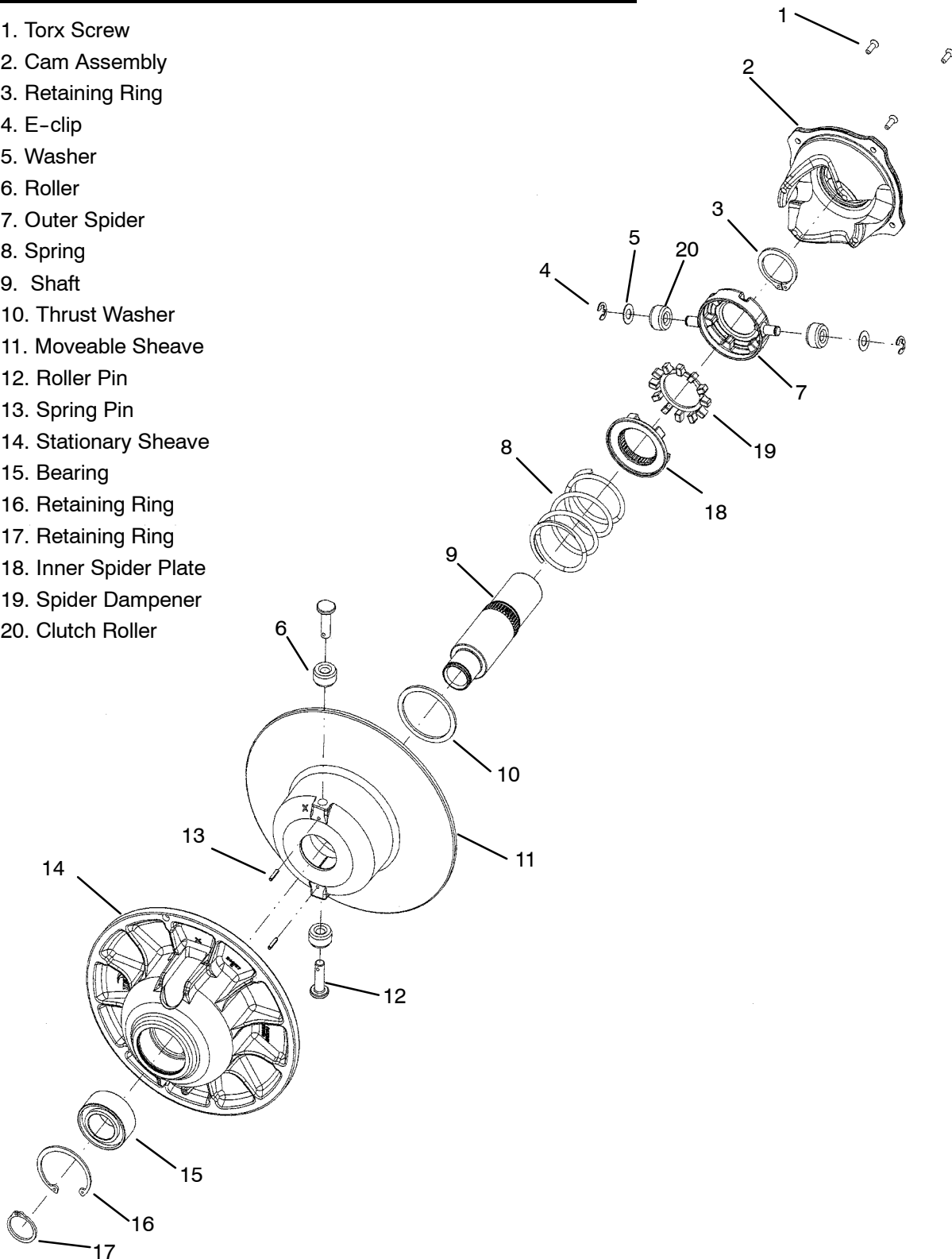
16. Use a T25 torx to install the four torx screws and torque to 42-52 in. lbs. (4.75 - 5.88 Nm) in a star pattern.





### EBS DRIVEN CLUTCH EXPLODED VIEW

- 1. Torx Screw
- 2. Cam Assembly
- 3. Retaining Ring
- 4. E-clip
- 5. Washer
- 6. Roller
- 7. Outer Spider
- 8. Spring
- 9. Shaft
- 10. Thrust Washer
- 11. Moveable Sheave
- 12. Roller Pin
- 13. Spring Pin
- 14. Stationary Sheave
- 15. Bearing
- 16. Retaining Ring
- 17. Retaining Ring
- 18. Inner Spider Plate
- 19. Spider Dampener
- 20. Clutch Roller





## TROUBLESHOOTING

Situation	Probable Cause	Remedy
Engine RPM below specified operating range although engine is properly tuned.	<ul style="list-style-type: none"> <li>-Wrong or broken drive clutch spring.</li> <li>-Drive clutch shift weight too heavy.</li> <li>-Driven clutch spring broken or installed wrong .</li> </ul>	<ul style="list-style-type: none"> <li>-Replace with recommended spring.</li> <li>-Install correct shift weight kit to match engine application.</li> <li>-Replace spring; refer to proper installation location.</li> </ul>
Erratic engine operating RPM during acceleration or load variations.	<ul style="list-style-type: none"> <li>-Drive clutch binding.</li> <li>-Belt worn unevenly - thin/burnt spots</li> <li>-Driven clutch malfunction.</li> <li>-Sheave face grooved.</li> </ul>	<ul style="list-style-type: none"> <li>a. Disassemble drive clutch; inspect shift weights for wear and free operation.</li> <li>b. Clean and polish stationary shaft hub; reassemble clutch without spring to determine problem area.</li> <li>Replace belt</li> <li>a. Replace ramp buttons.</li> <li>b. Inspect movable sheave for excessive bushing clearance/ replace.</li> <li>-Replace the clutch.</li> </ul>
Engine RPM above specified operating range.	<ul style="list-style-type: none"> <li>-Incorrect drive clutch spring (too high spring rate).</li> <li>-Drive clutch shift weights incorrect for application (too light).</li> <li>-Drive clutch binding.</li> <li>-Driven clutch binding.</li> <li>-Converter sheaves greasy; belt slippage.</li> </ul>	<ul style="list-style-type: none"> <li>-Install correct recommended spring.</li> <li>-Install correct recommended shift weights.</li> <li>-Disassemble and clean clutch, inspecting shift weights and rollers. Reassemble without the spring and move sheaves through entire range to further determine probable cause.</li> <li>-Disassemble, clean, and inspect driven clutch, noting worn sheave bushing and ramp buttons and helix spring location.</li> <li>-Clean sheaves with denatured alcohol or brake cleaner, install new belt.</li> </ul>
Harsh drive clutch engagement.	<ul style="list-style-type: none"> <li>-Drive belt worn too narrow.</li> <li>-Excessive belt/sheave clearance with new belt.</li> </ul>	<ul style="list-style-type: none"> <li>-Replace belt.</li> <li>-Perform belt/sheave clearance adjustment with shim washers beneath spider.</li> </ul>
Drive belt turns over	<ul style="list-style-type: none"> <li>-Wrong belt for application.</li> <li>-Clutch alignment out of spec.</li> <li>-Engine mount broken or loose.</li> </ul>	<ul style="list-style-type: none"> <li>-Replace with correct belt.</li> <li>-Adjust alignment offset.</li> <li>-Inspect/adjust or replace.</li> </ul>
PVT cover overheating (melting)	<ul style="list-style-type: none"> <li>-Plugged air intake or outlet</li> <li>-Belt slippage due to water, oil, grease, etc., rubbing on cover</li> <li>-Clutches or weight being applied to cover while in operation</li> <li>-Use of High vs. low range</li> </ul>	<ul style="list-style-type: none"> <li>-Clear obstruction.</li> <li>-Inspect system. Clean , repair or replace as necessary. Seal PVT system ducts.</li> <li>-Remove weight. Inform operator.</li> <li>-Instruct operator on guidelines for operation in proper driving range for different terrain as outlined in Owner's Safety and Maintenance Manual.</li> </ul>
Water ingestion	<ul style="list-style-type: none"> <li>-Cover seals or ducts leaking</li> <li>-Operator error</li> </ul>	<ul style="list-style-type: none"> <li>-Find leak and repair as necessary.</li> <li>-Instruct operator on guidelines for operation in wet terrain as outlined in Owner's Safety and Maintenance Manual.</li> </ul>



Belt slippage	<ul style="list-style-type: none"><li>-Belt worn out</li><li>-Water ingestion</li><li>-Belt contaminated with oil or grease</li></ul>	<ul style="list-style-type: none"><li>-Replace belt.</li><li>-Inspect and seal PVT system.</li><li>-Inspect and clean.</li></ul>
Belt burnt, thin spots	<ul style="list-style-type: none"><li>-Abuse (continued throttle application when vehicle is stationary, excess load)</li><li>-Dragging brake</li><li>-Slow, easy clutch engagement</li></ul>	<ul style="list-style-type: none"><li>-Caution operator to operate machine within guidelines.</li><li>-Vehicle operated with park brake on. Inspect brake system.</li><li>-Instruct firm, effective use of throttle for efficient engagement.</li></ul>
PVT noise	<ul style="list-style-type: none"><li>-Belt worn or separated, thin spots, loose belt</li><li>-Broken or worn clutch components, cover hitting clutches</li></ul>	<ul style="list-style-type: none"><li>-Replace belt.</li><li>-Inspect and repair as necessary.</li></ul>
Engagement erratic or stabby	<ul style="list-style-type: none"><li>-Thin spots on belt, worn belt</li><li>-Drive clutch bushings stick</li></ul>	<ul style="list-style-type: none"><li>-Replace belt. Refer to belt burnt troubleshooting and instruct operator.</li><li>-Inspect and repair clutches.</li></ul>





# CHAPTER 7

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## FINAL DRIVE

Final Drive Torque Specifications . . . . . 7.1

AWD Front Axle Remove/Install . . . . . 7.2-7.3

AWD Front CV Joint Boot Replace. . . . . 7.4-7.5

AWD Front Drive Axle Exploded View . 7.15

Front Hub Disass./Assemble . . . . . 7.5

AWD Front Prop Shaft Removal . . . . . 7.6

U-Joint Disassemble/Assemble . . . . . 7.6-7.7

Drive Axle / Propshaft Exploded View . 7.8

AWD Front Gearcase Operation . . . . . 7.9

AWD Front Gearcase Service . . . . . 7.9-7.17

Rear Hub Remove/Install . . . . . 7.19-7.20

Rear Hub Disassembly/Assembly . . . . . 7.21-7.22

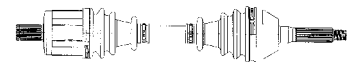
Rear Drive Shaft Removal . . . . . 7.22

Driveshaft / CV Joint Tips . . . . . 7.22

Rear Driveshaft Installation . . . . . 7.23

Rear Driveshaft Service . . . . . 7.24-7.26

Rear Gearcase Service . . . . . 7.26-7.30





## WHEEL AND HUB TORQUE TABLE

COMPONENT	FT. LBS. (IN.LBS.)	NM
F/R <b>Steel</b> Wheel Nuts	30	41
F/R <b>Aluminum</b> Wheel Nuts	90	122
Front Hub Nut	70	95
Rear Hub Nut	80	109

**CAUTION:** Locking nuts, and bolts with preapplied locking agent should be replaced if removed. The self-locking properties of the nut or bolt are reduced or destroyed during removal.

## SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2872608	Roller Pin Removal Tool
8700226	CV Boot Clamp Pliers
2870772	1 3/4" Straight Wrench

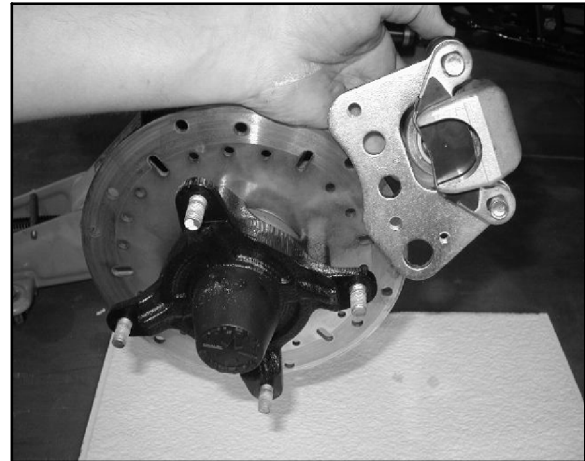
## FRONT DRIVE AXLE REMOVAL

1. Set the ATV in park. Remove hub dust cap.
2. Remove cotter pin.
3. Loosen the hub retaining nut.
4. Loosen - but do not remove - the wheel nuts.
5. Safely lift and support the front of the ATV.

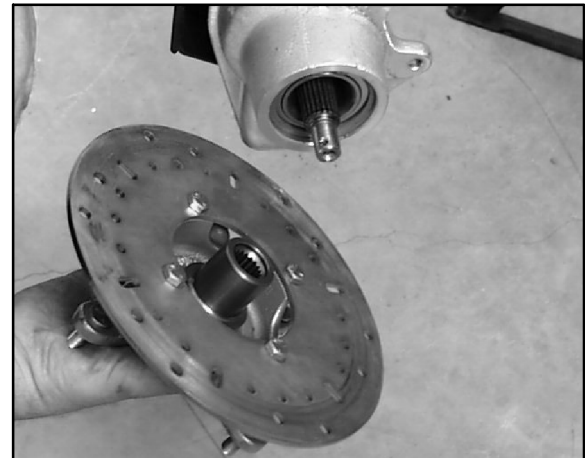
**CAUTION:**

*Serious injury could occur if machine tips or falls.*

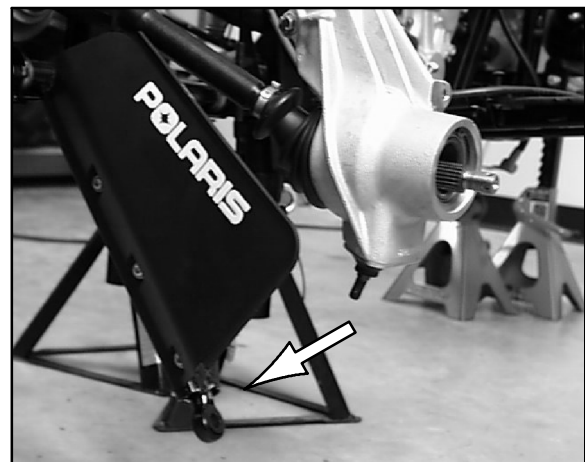
6. Remove wheel.
7. Remove the two brake caliper attaching bolts.  
**CAUTION:** Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.



8. Remove hub.

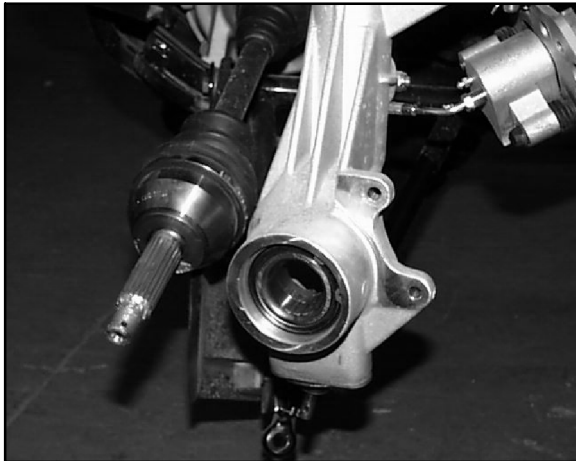


9. Remove cotter pin and nut from lower A-arm ball joint. Remove lower A-arm from ball joint.

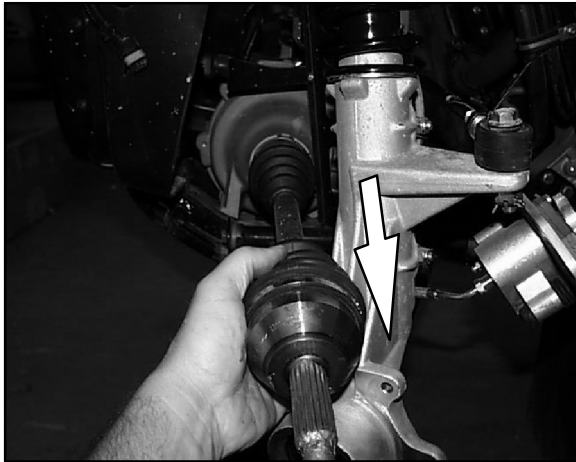


10. Pull strut assembly out while pivoting front drive shaft downward until it clears strut assembly.



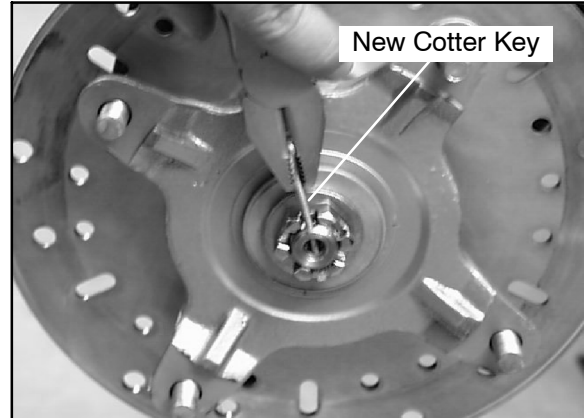


11. With short, sharp jerks, remove drive shaft from front gearcase.



## FRONT DRIVE AXLE INSTALLATION

1. Install new spring ring on drive shaft. Apply an anti-seize compound to splines. Align splines of drive shaft with front gearcase and install by lightly tapping on drive shaft with rubber faced hammer.
2. Install drive shaft in strut.
3. Install lower ball joint, torque nut to 25 ft. lbs. (34.5 Nm) and install new cotter pin.
4. Install hub and tighten hub nut to 70 ft. lbs. (95 Nm).

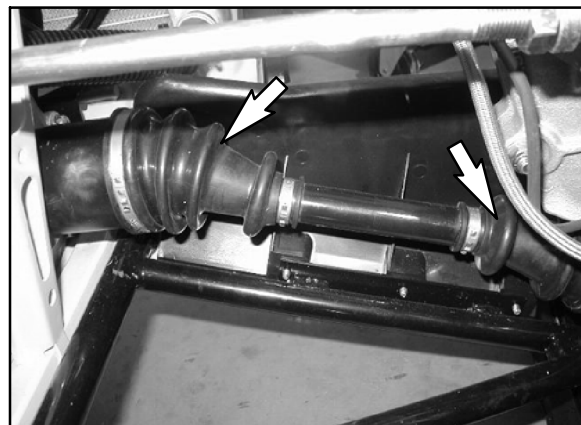


**Front Hub Retaining Nut Torque**

**70 ft. lbs. (95 Nm)**

## DRIVE SHAFT (CV) BOOT INSPECTION

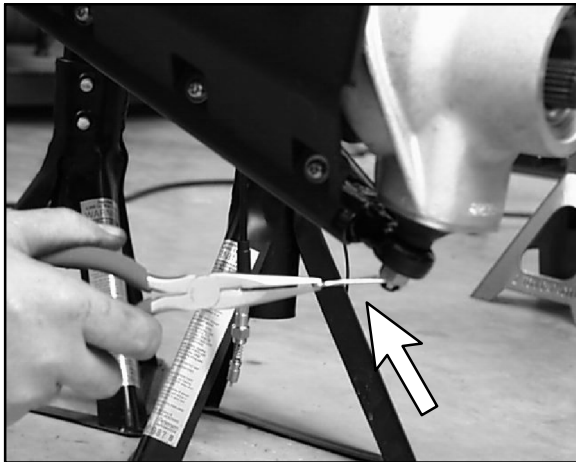
Check the front and rear driveshaft cv boots for any tears or leaking grease. If the driveshaft boot loses all of the grease cv joint failure will occur.





## FRONT DRIVE SHAFT CV JOINT BOOT REPLACEMENT

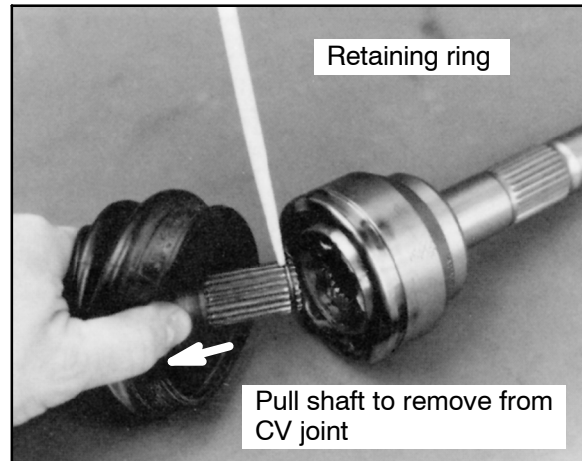
1. Remove wheel, brake caliper and wheel hub. Refer to Front Drive Axle Removal Page 7.2 for procedure.
2. Remove cotter pin and castle nut from A-arm ball joint.



3. Disconnect A-arm from ball joint using a tie rod fork.



4. Slide strut off end of drive shaft and tie it up out of the way of the shaft.
5. Remove clamps from rubber boot using the proper boot clamp pliers.
6. Remove the large end of the boot from the CV joint, slide the boot back and separate the wheel spindle and CV joint assembly from the axle shaft by pulling the shaft sharply outward, away from the CV joint. It may be necessary to tap the CV joint assembly outward with a soft faced hammer.



7. Remove small clamp and boot from driveshaft.  
**NOTE:** If the ATV 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. Front drive axle CV boot replacement requires 3.5 oz. of grease.

8. 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. Use only the grease contained in the boot kit. DO NOT use a substitute grease and DO NOT overfill or underfill the CV joint.

**CV Joint Grease -3.5 oz. (Refer to parts manual for boot kit)**

**CV Boot Clamp Pliers:  
Earless Type (PN 8700226)**

**Boot replacement with complete CV joint cleaning requires the entire 3.5 oz. of grease.**

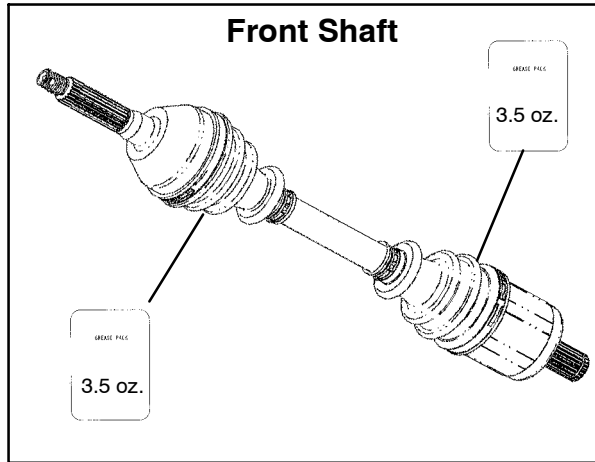
9. Slide the new clamp and boot (small end first) over the splined shaft, then slide (tap) the CV joint into the splines of the axle.
10. Add grease through large end of boot.
11. Install a new boot onto the axle shaft and fill the CV joint and boot with the correct type and amount of grease.
12. While 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 axle. CARE MUST



BE TAKEN TO AVOID DAMAGE TO THE NEWLY INSTALLED BOOT.



13. Install the small clamp on the boot.



### FRONT HUB DISASSEMBLY

1. Remove outer snap ring.



2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.



**NOTE:** Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.

3. Inspect the bearing.

**NOTE:** Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

4. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.

### FRONT HUB ASSEMBLY

1. Support bottom of hubstrut housing.
2. Start bearing in housing.
3. Press bearing into place until outer race bottoms on housing.

**CAUTION:**

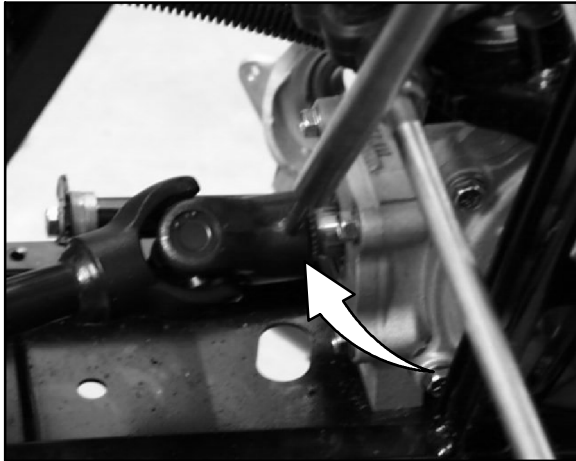
When using an arbor press be sure to press only on the outer race, as bearing damage may occur.

4. Install snap ring into groove.



## **FRONT PROP SHAFT REMOVAL**

1. Using Roll Pin Removal Tool (PN 2872608), remove the roll pin from prop shaft at rear of housing. Slide prop shaft back and away from front housing. Pull sharply forward to remove from transmission shaft.



**Roll Pin Remover Tool (PN 2872608)**

**NOTE:** If removing front housing, use roll pin removal tool to remove the pins from both front drive axles.

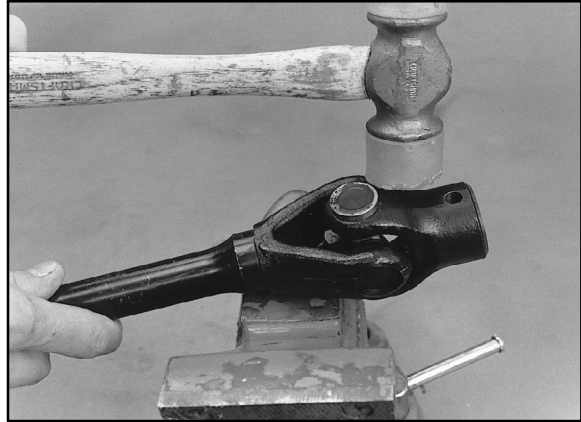
## **U-JOINT DISASSEMBLY**



**CAUTION:** Always wear eye protection.

1. Remove internal or external snap ring from all bearing caps.

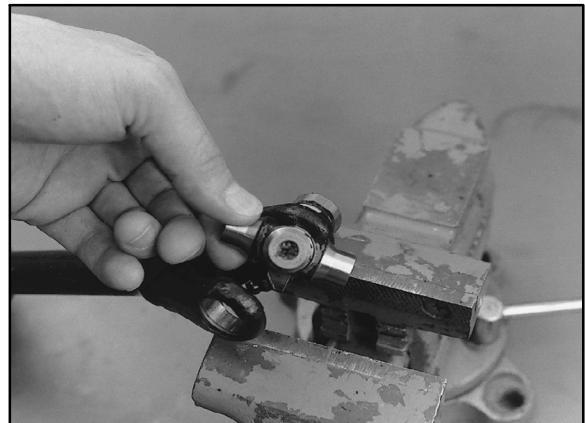
**NOTE:** If yoke or bearing is removed, cross bearing must be replaced. Note orientation of grease fitting and mark inner and outer yoke for correct re-positioning during installation.



2. Support inner yoke as shown and drive outer yoke down (bearing cap out) with a soft face hammer.



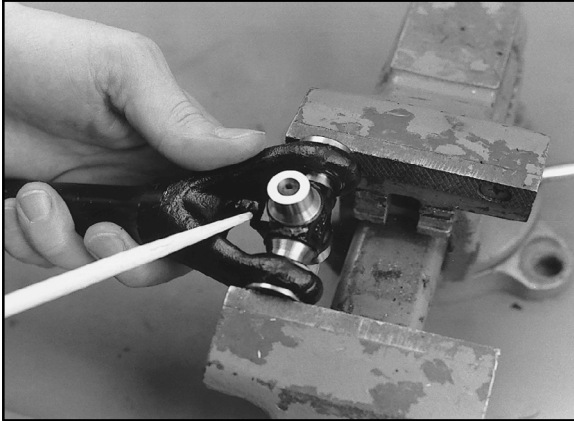
3. Support U-joint in vise as shown and drive inner yoke down to remove remaining bearing caps.



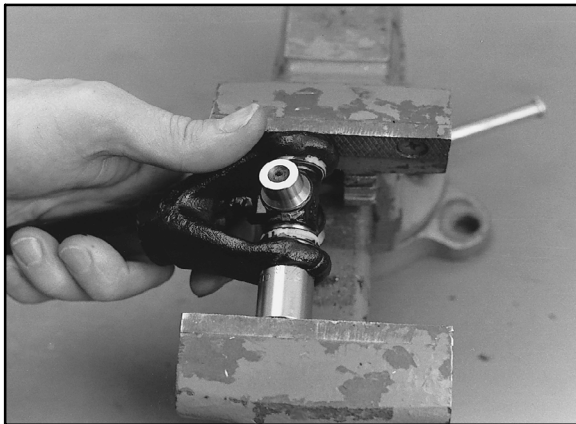


4. Force U-joint cross to one side and lift out of inner yoke.

## **U-JOINT ASSEMBLY**



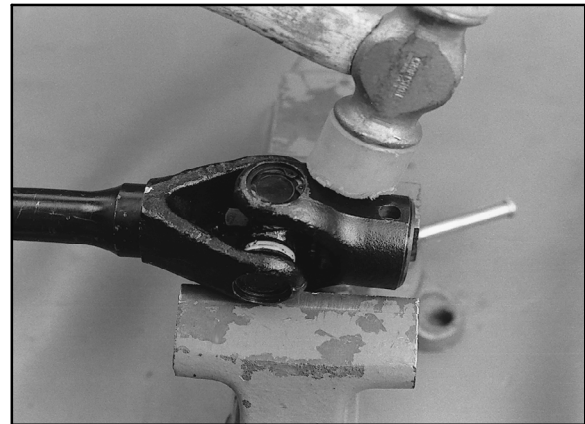
1. Install new bearing caps in yoke by hand. Carefully install U-joint cross with grease fitting properly positioned inward toward center of shaft. Take care not to dislodge needle bearings upon installation of cross joint. Tighten vise to force bearing caps in.



2. Using a suitable arbor, fully seat bearing cap in one side. Continually check for free movement of bearing cross as bearing caps are assembled.
3. Install snap ring to contain bearing cap just installed. Repeat procedure for other side.



4. Install outer yoke, aligning marks made before disassembly.
5. Repeat Steps 1-3 to install bearing caps on outer yoke.



6. Seat all bearing caps against snap rings by supporting cross shaft and tapping on each corner as shown.
7. When installation is complete, yokes must pivot freely in all directions without binding. If the joint is stiff or binding, tap the yoke lightly to center the joint until it pivots freely in all directions.

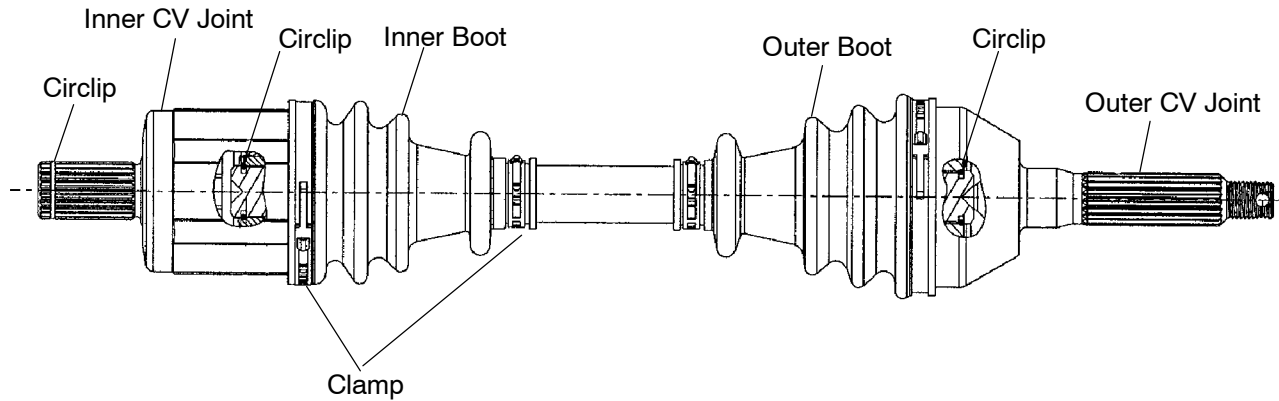




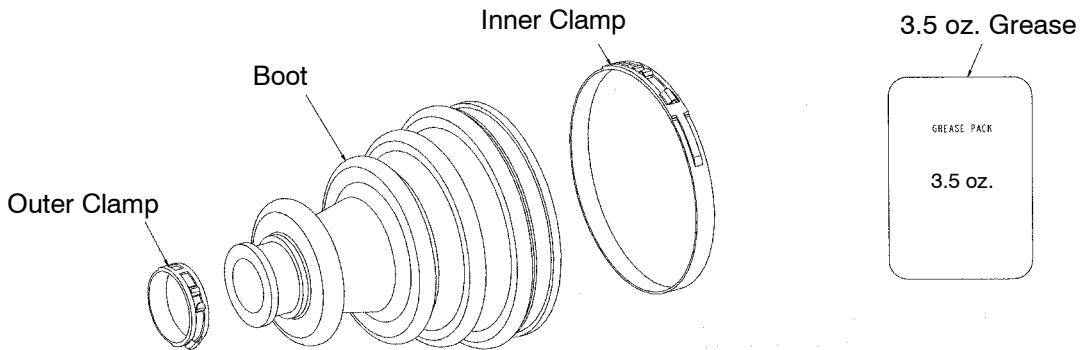
**AWD FRONT DRIVE AXLE EXPLODED VIEW**

**NOTE:** Refer to your parts manual for the proper replacement parts.

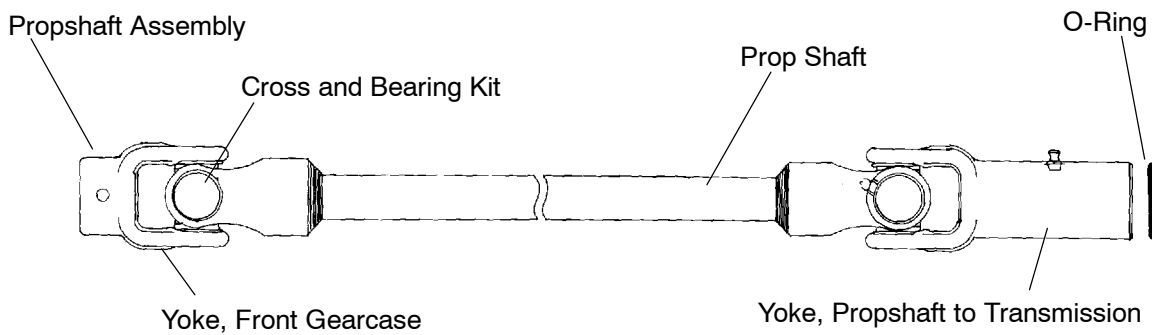
**Front Drive Axle Components**



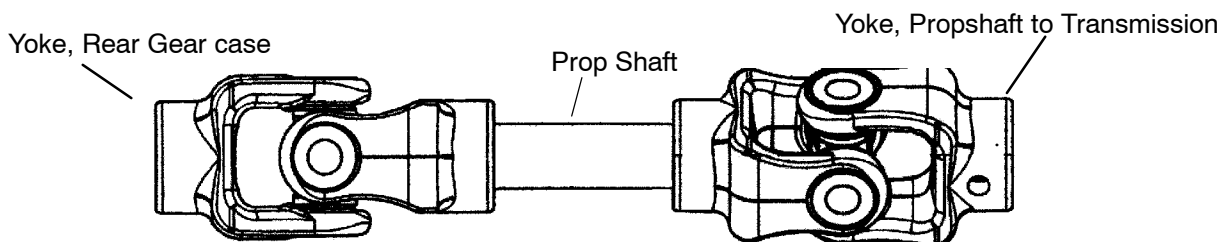
**Front Drive Boot Replacement Kits**



**Front Prop Shaft Components**



**Rear Prop Shaft Components**





# FRONT GEARCASE OPERATION - CENTRALIZED HILLIARD)

**Engaging Front Gearcase:** 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, the AWD remains while the front gearcase is moving, it will not disengage until the rear wheels regain traction.

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.

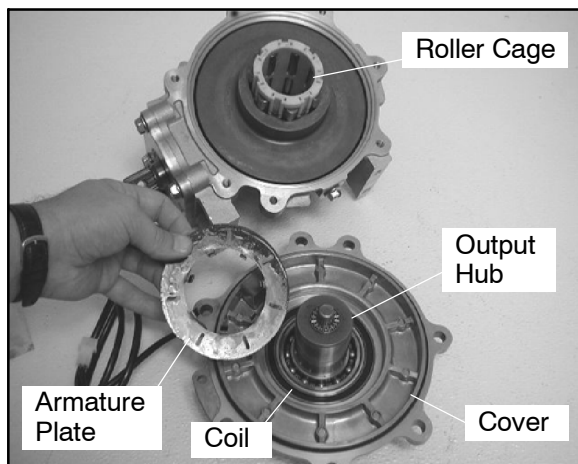
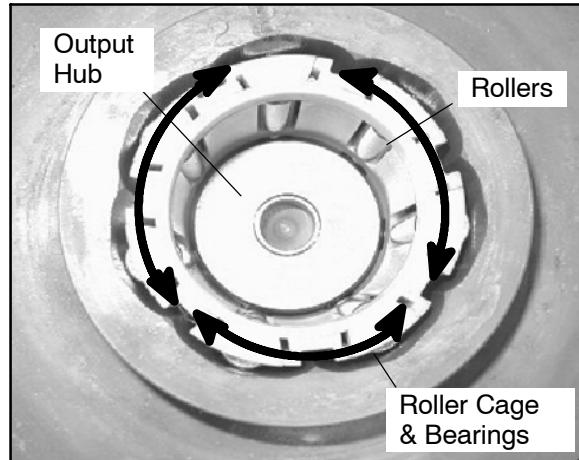
**CAUTION:** Switching to AWD while the rear wheels are spinning may cause severe drive shaft and gearcase damage. Always switch to AWD while the rear wheels have traction or are at rest.

**Normal Operation:** With the AWD switch off the vehicle drives only the rear wheels (2 wheel drive). When the AWD switch is activated it engages the Hilliard, locking both front axles into All Wheel Drive.

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 Hub for AWD Engagement



**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 next loss of traction.

## FRONT GEARCASE REMOVAL

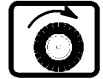
1. Stop engine, place machine in Park and set parking brake.
2. Loosen right front wheel nuts slightly.
3. Elevate and support machine under footrest/frame area.

**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 and installing bearings and seals.

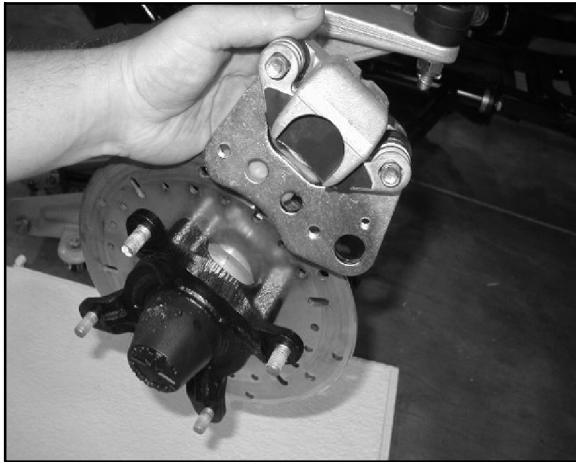
4. Remove right wheel nuts and wheel.
5. Remove the front brake caliper and suspend the safely suspend the brake caliper from the frame

**4x4 Engagement:** When the AWD switch is activated, a 12 VDC current charges the central coil which creates a magnetic field. This magnetic field attracts an armature plate keyed to a roller cage that contains 14 rollers and roller cam. The difference in rpm by input shaft and front axles the forces the rollers up the external cam. The rollers engage themselves to the output hubs that link both front axles, resulting



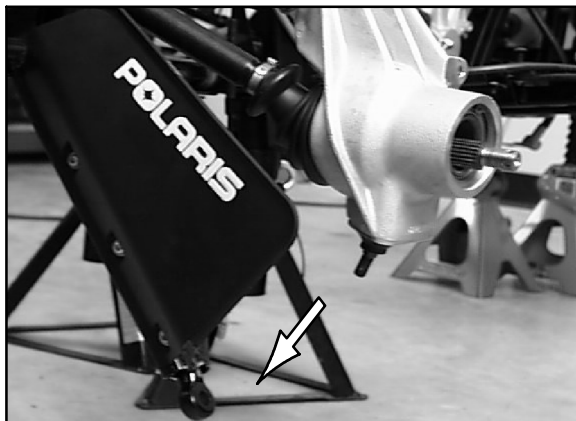


with a piece of wire.



**CAUTION:** Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.

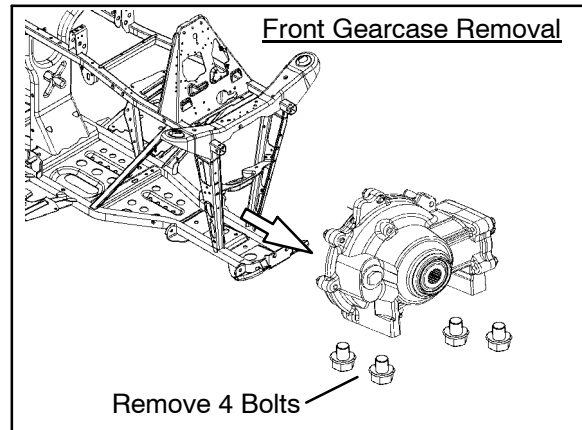
6. Remove the front hub from the drive shaft.
7. Remove cotter pin, lower ball joint nut and A-arm from ball joint.



8. Pull the hub and strut assembly out and pull the drive-shaft out of the hub.

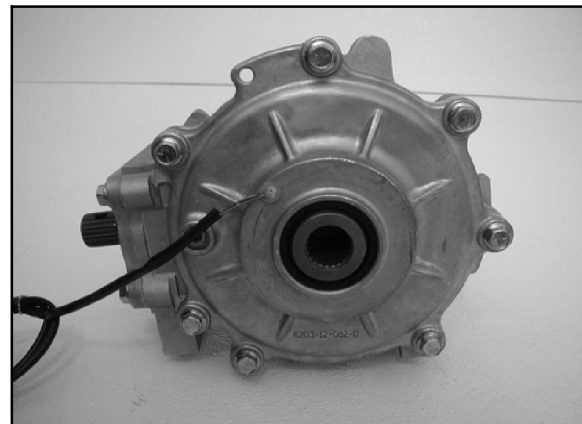


9. Pull both driveshafts from the front gearcase. Replace the circlip on the driveshaft end for reassembly.
10. Remove the roller pin from the front prop shaft. Use the Roller Pin Removal Tool (PN 2872608).
11. Remove bolts securing bottom of housing to frame. Bolts are accessible through the skid plate. Remove vent line. Remove the front gearcase from right side of frame.



## FRONT GEARCASE DISASSEMBLY/INSPECTION

1. Drain and properly dispose of used oil. Remove any metal particles from the drain plug magnet.
2. Remove bolts and output shaft cover.



**Front Gearcase Coil Resistance:  
22.8-25.2 Ohms**

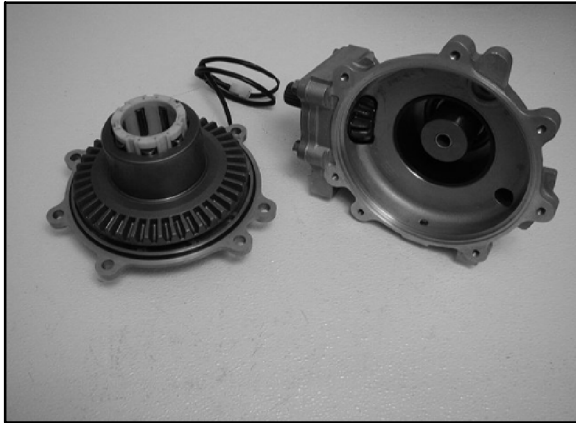




### Gearcase Coil Resistance

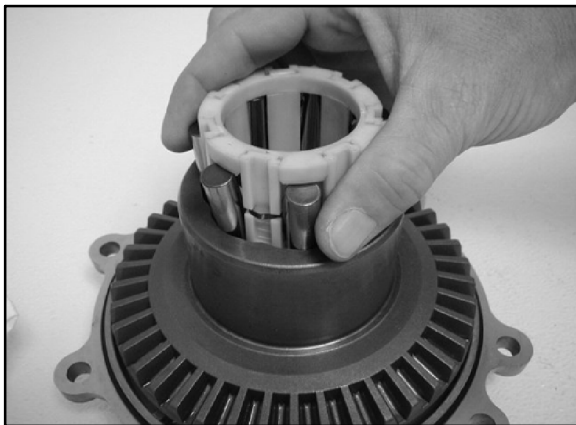
**NOTE:** To test the gearcase coils resistance, use the coil harness. The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.

3. Remove output shaft assembly.

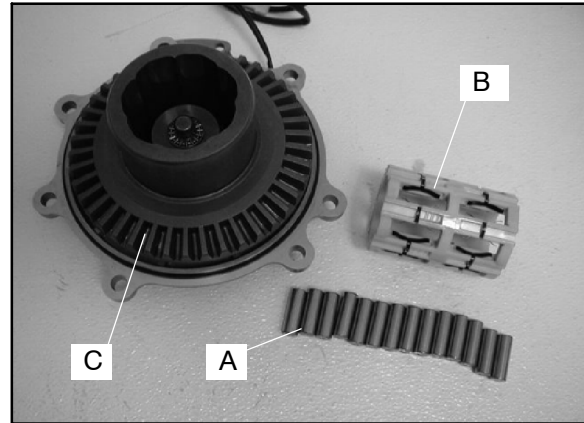


**NOTE:** Be careful not to misplace the thrust bearing located between the two output shafts.

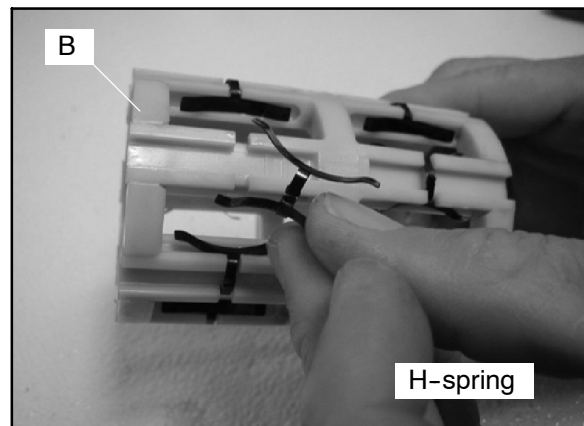
4. Clean all parts and inspect spacers for wear. Inspect ring gear for chipped, broken, or missing teeth.
5. Remove the roll cage assembly, rollers, and H-springs.



6. Thoroughly clean all parts. Inspect the rollers (A) for nicks and scratches. The rollers must slide up and down freely within the roller cage surfaces (B).
7. Inspect the ring gear (C) for consistent wear patterns. The surfaces should be free of nicks and scratches.



8. Inspect roll cage (B) sliding surface. This surface must be clean and free of nicks, burrs or scratches. Remove and inspect the H-springs.

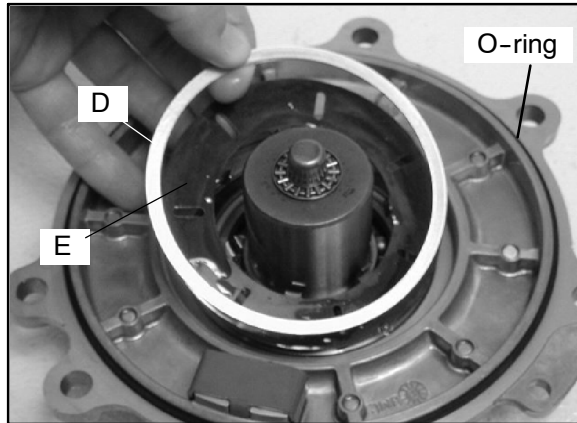


9. Use a flat head screwdriver to remove the retaining clip from the output cover.

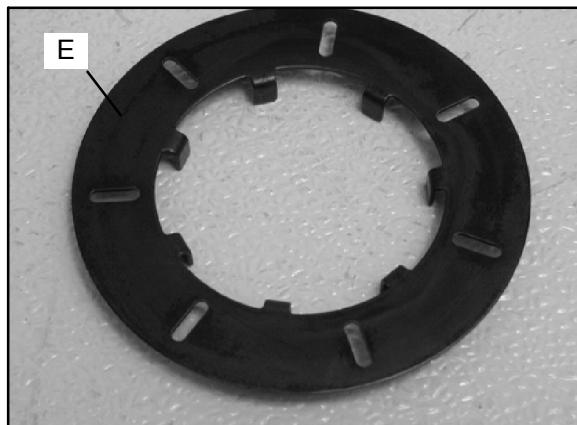




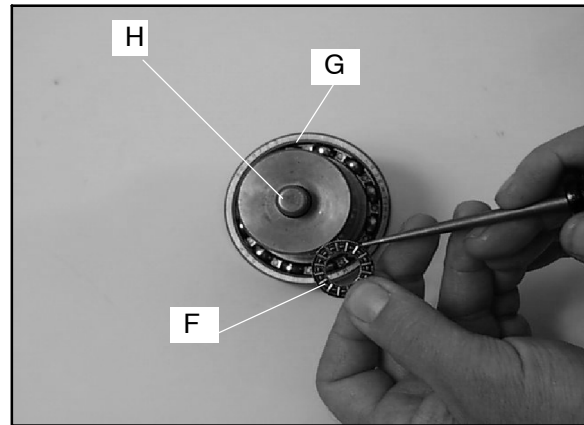
10. Remove the spacer washer (D), armature plate (E), and rubber O-ring from the output cover.



11. Inspect the armature plate (E) for a consistent wear pattern. Uneven wear of the armature plate (E) indicates a warped plate, which may cause intermittent operation. **NOTE:** See "FRONT GEARCASE DIAGNOSIS" later in this chapter for more details.

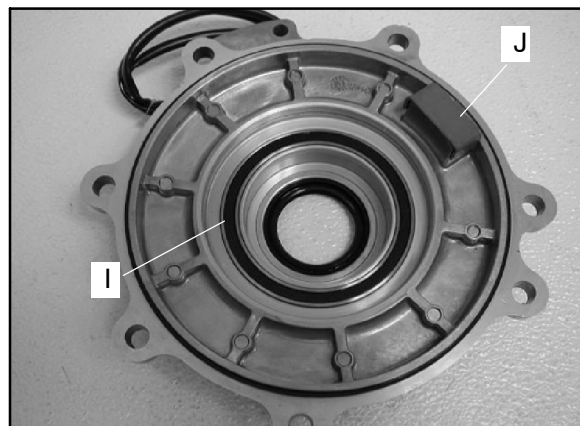


12. Remove the output hub (G) from the cover. Remove the thrust bearing (F) from the output hub (G). Inspect the thrust bearing (F) and the dowel (H).

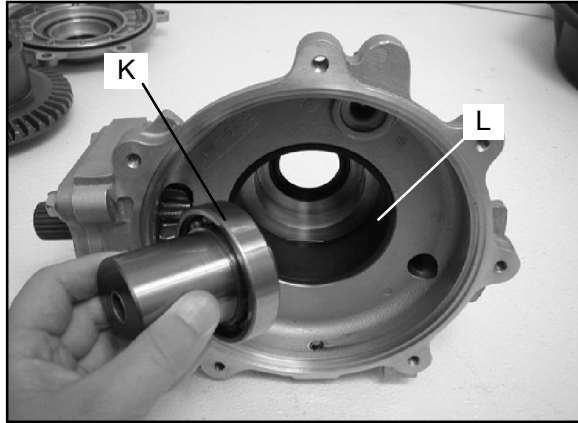


13. Inspect the magnetic coil (I) in the output housing. **NOTE:** See "FRONT GEARCASE DIAGNOSIS" later in this chapter for more details on the coil.

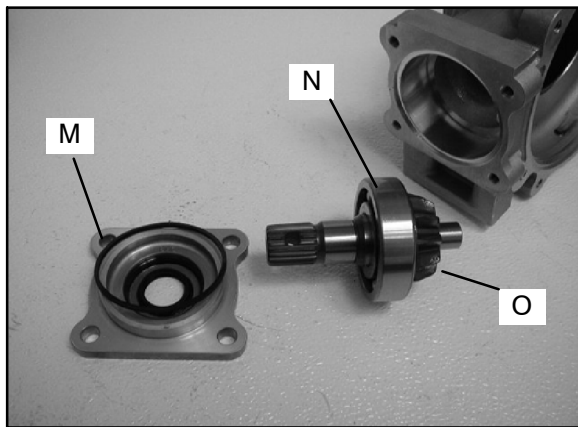
14. Inspect the back lash pad (J) for excessive wear. **NOTE:** The backlash for the centralized hilliard is set at the factory. **No adjustment is required, unless the front cover needs to be replaced, or the back lash pad screw is removed.** See the "FRONT GEARCASE ASSEMBLY" procedure later in this chapter for details on backlash setting.



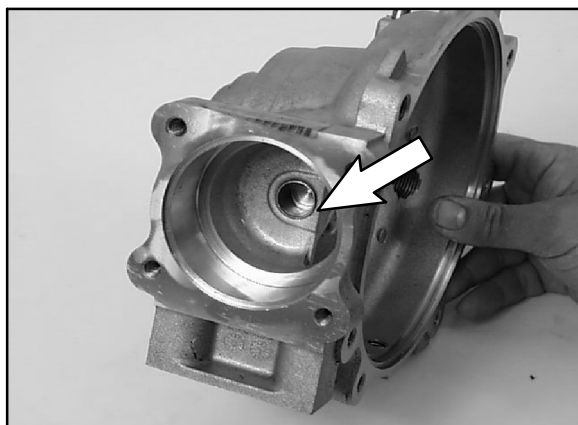
15. Remove the other output hub (K) from the main gearcase. Inspect the inner bearing (L) for wear. If there is excessive wear, replace bearing as needed.



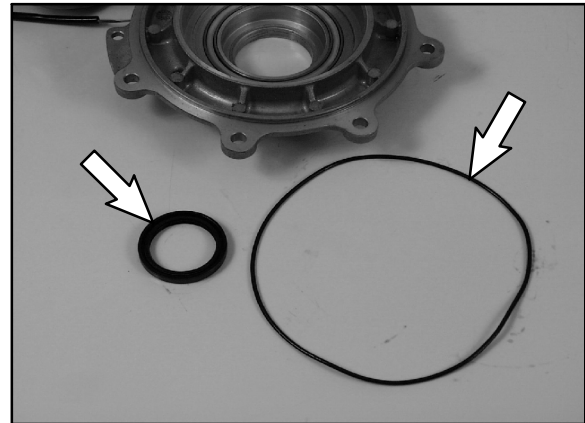
16. Remove the input cover (M), bearing (N), and the pinion gear (O). Inspect the pinion gear (O) for chipped, broken, or missing teeth. Replace the input cover O-ring.



17. Inspect the output shaft bushing. Replace as needed. Clean the inside surfaces of both gearcase halves.



18. Remove and replace the O-rings and seals from the assembly.

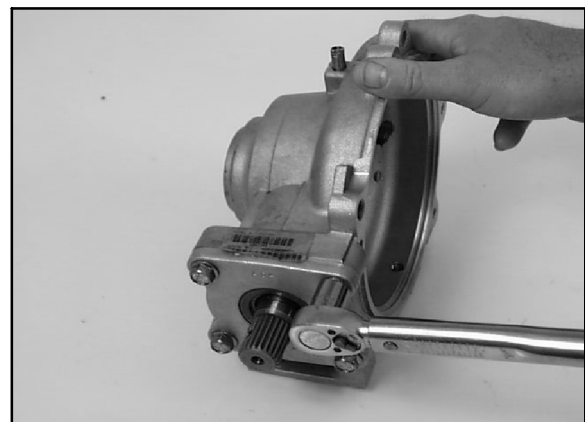


## **FRONT GEARCASE REASSEMBLY/INSPECTION**

1. Replace all O-rings, seals, and worn components.
2. Press the pinion shaft seal into the pinion cover, until the seal is flush with the sealing surface.
3. Inspect bearings on output and pinion shafts. To replace, press new bearing on to shaft.

**NOTE:** Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement side to side.

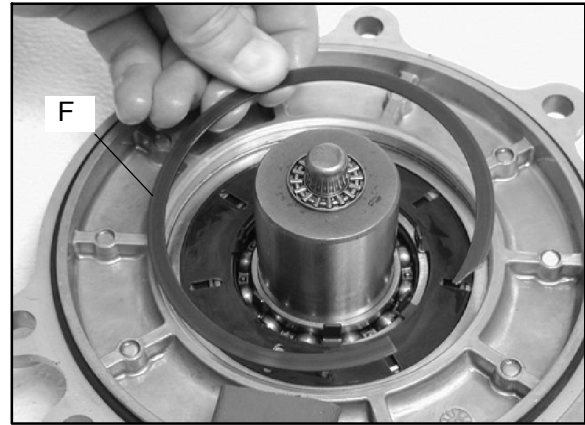
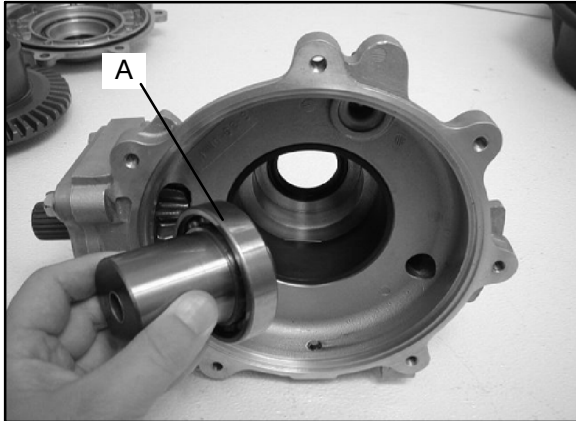
4. Install pinion shaft, bearing, and input cover with new o-ring and torque bolts to 14 ft. lbs (19 Nm).



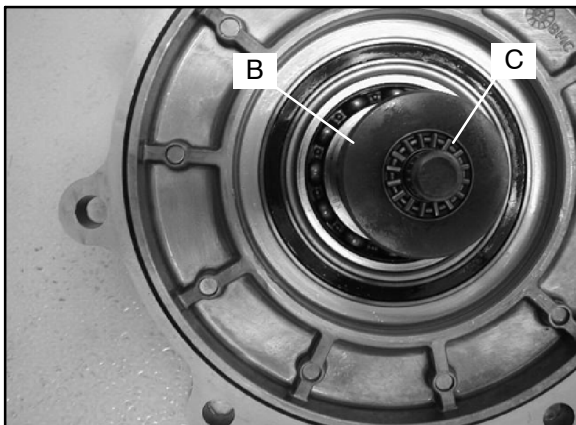
**Input Cover Bolts Torque:**  
**14 ft. lbs. (19 Nm)**



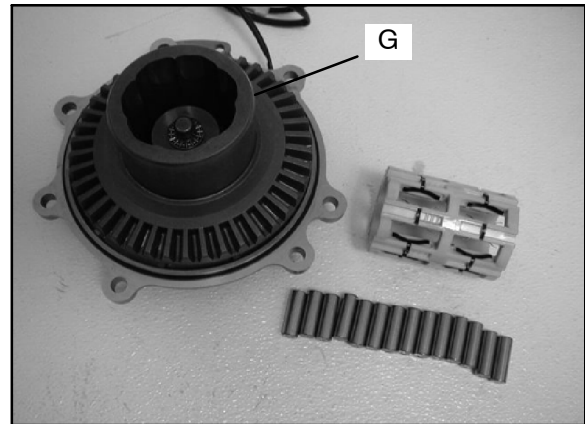
5. Install the output hub (A) into the gearcase housing. The output hub should spin freely.



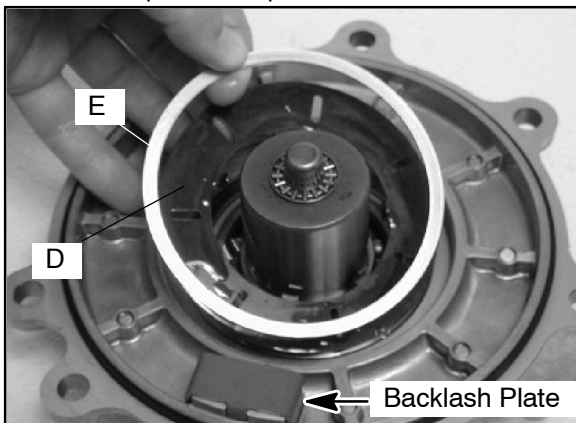
6. Install the other output hub (B) and thrust bearing (C) into the output cover. Apply a small amount of grease onto the thrust bearing.



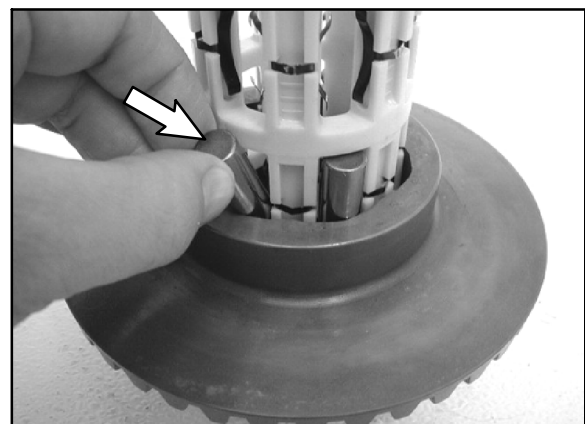
9. Install the ring gear onto the output hub on the output cover.



7. Install the armature plate (D) and spacer washer (E) into the output cover. **NOTE:** Be sure backlash plate is in place.



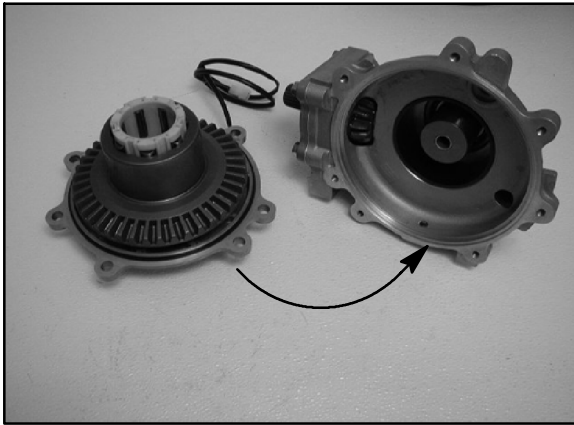
10. Install the rollers and roll cage into the ring gear. Insert the rollers as the roll cage is installed.



8. Install the retaining ring (F) into the output cover. Be sure the retaining ring is properly seated into the cover.

11. Install the output cover assembly onto the main gearcase.

**NOTE:** Be sure armature plate tabs are placed into the slots on roll cage. (See Reference Photo)



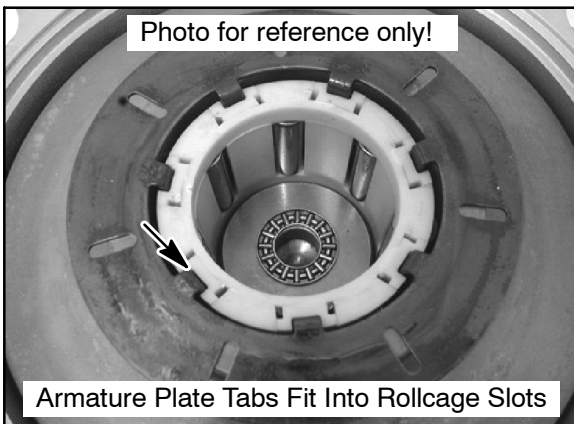
### Cover Bolts Torque

14 ft. lbs. (19 Nm)

13. Install new seals into the gearcase housing and gearcase housing cover.

### Back Lash Pad (Thrust Pad) Adjustment

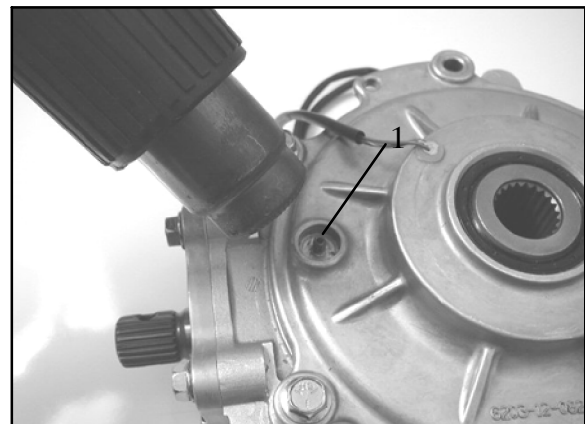
14. Lay the gearcase on the side with the output cover facing up.
15. The backlash screw is loctited into place. Use a heat gun to lightly heat up the loctite on the screw (1).



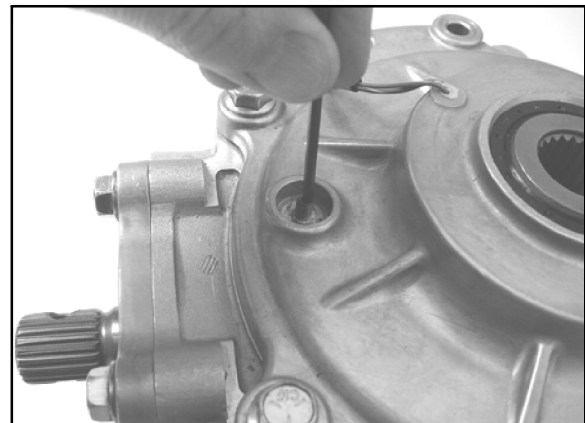
**NOTE:** This photo is for reference only, the armature plate is actually installed in the output cover.

12. Install output cover with new O-ring and torque bolts to 14 ft. lbs. (19 Nm).

**NOTE:** Be sure the square O-ring is placed flat on the cover surface, if the O-ring is twisted fluid leakage may occur.



16. Using a hex wrench, turn the back-lash screw out 3-4 turns. Re-apply red loctite onto the bottom screw threads.

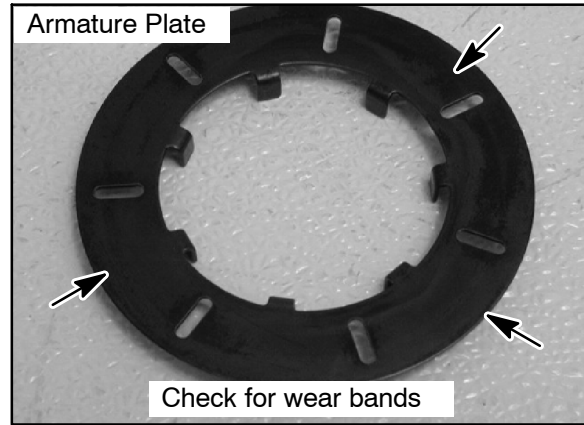


17. Turn the screw in until it is lightly seated, then turn the screw out 1/4 turn.
18. Set the gearcase upright. Rotate the pinion shaft at least 4 times. This ensures the ring gear completes one full rotation.



19. If a tight spot is felt during rotation, loosen the backlash screw another 1/8 turn. Perform the previous step again. Repeat this procedure until the pinion shaft rotates smoothly 4 times (1 revolution of ring gear).

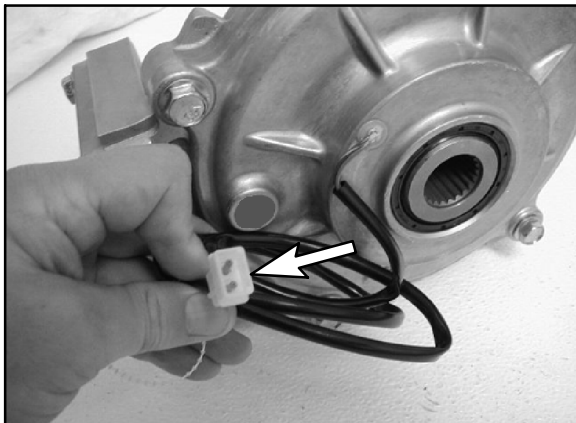
band of wear is present (or if there is wear between the two bands, inspect the coil area as indicated in Step 4. A band with an interrupted wear mark may indicate a warped plate, which may cause intermittent operation. See Illustration 1.



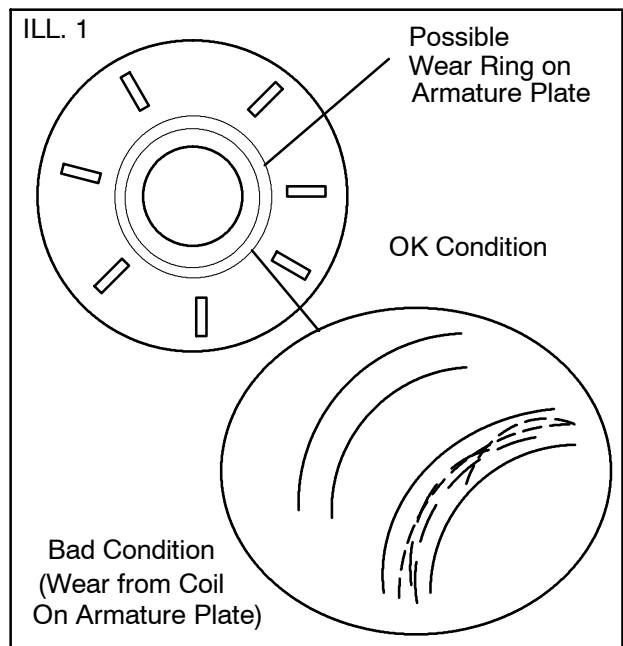
## FRONT GEARCASE DIAGNOSIS

### Symptom: AWD Will Not Engage.

1. Check the gearcase coil resistance. To test the gearcase coil resistance, use the coil harness (Grey & Brown/White). The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.
2. Check the minimum battery voltage at the wire (Grey & Brown/White) that feeds the hub coil wire. There should be a minimum of **11.80-12.0 Volts** present for proper operation.



3. Inspect the armature plate for a consistent wear pattern. There should be one or two distinct wear bands (one band inside the other). If only one

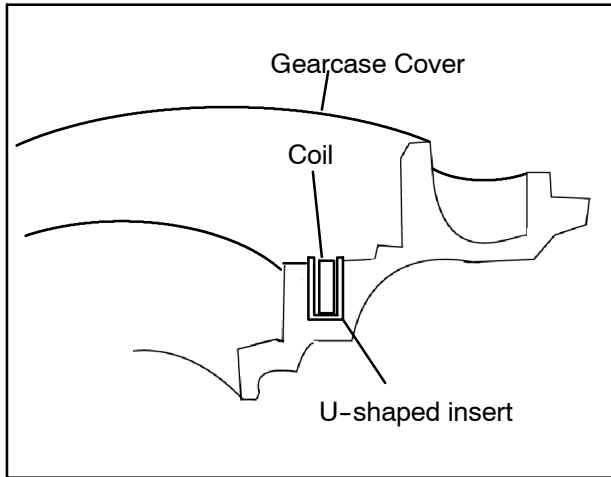


4. Check to make sure the coil is seated in the U-shaped insert that is pressed into the gearcase cover. The top of the coil should be seated below the U-shaped insert. The U-shaped insert controls the pole gap. If the top of the coil is above the surface of the U-shaped insert it raises the armature 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 the cause order a new Plate Cover Assembly (PN



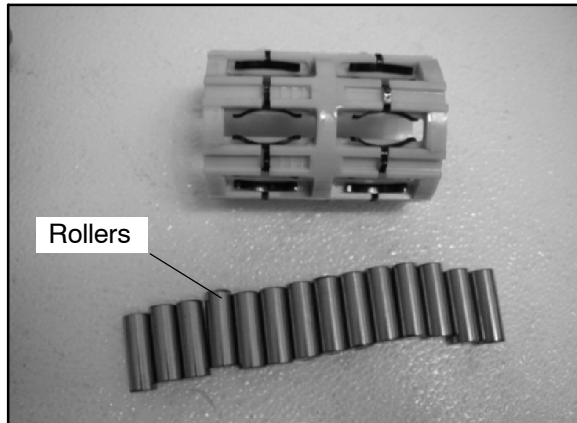


3233952).



Side Cutaway View of Centralized Hilliard Cover

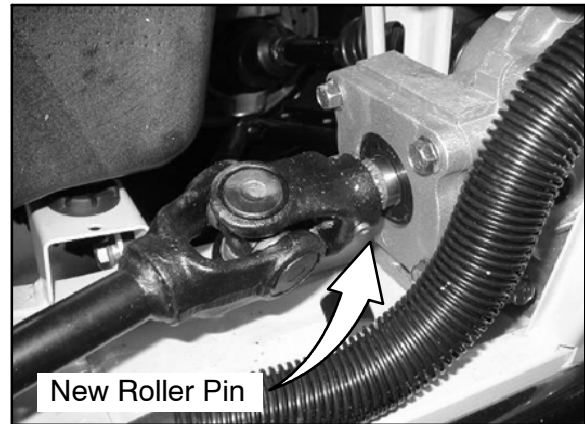
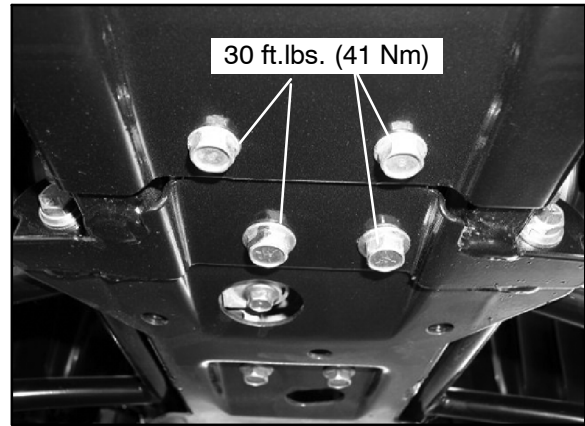
- 5. Inspect the rollers for nicks and scratches. The rollers must slide up and down and in and out freely within the roll cage sliding surfaces.



Rollers

## FRONT HOUSING INSTALLATION

- 1. To install gearcase, reverse removal procedure. Use new spring pin in front prop shaft.
- 2. Torque mounting bolts to **30 ft.lbs. (41 Nm)**.



- 3. Add the proper lubricant to the front gearcase. Check drain plug for proper torque. Refer to Chapter 2 for fluid fill and change information.

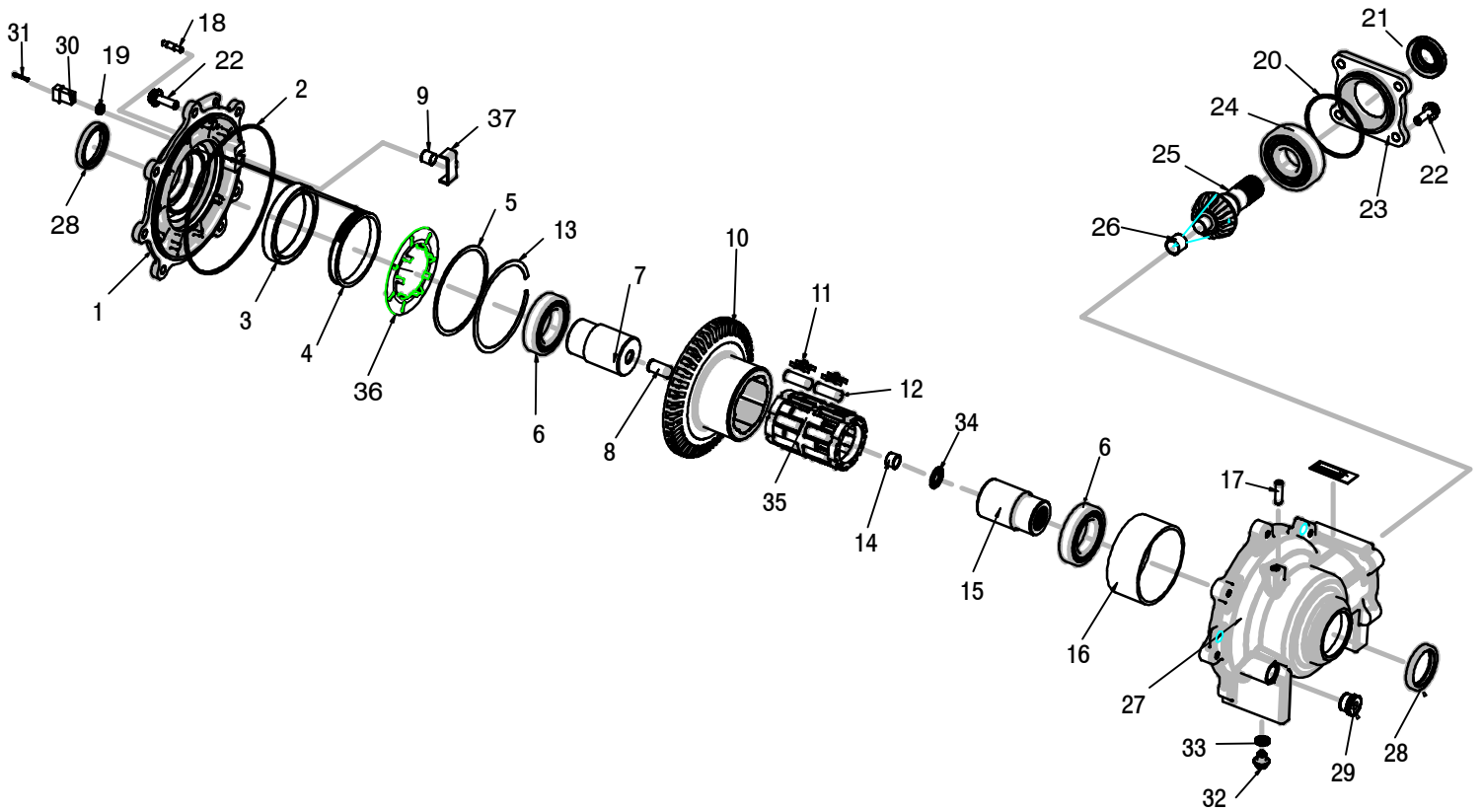
**Premium Front Hub Fluid  
(PN 2871654)**

**Front Housing Capacity  
5.0 fl. oz. (148 ml)**

**Front Housing Mount Bolt Torque:  
30 ft.lbs. (41 Nm)**



**FRONT GEARCASE - CENTRALIZED HILLIARD EXPLODED VIEW**



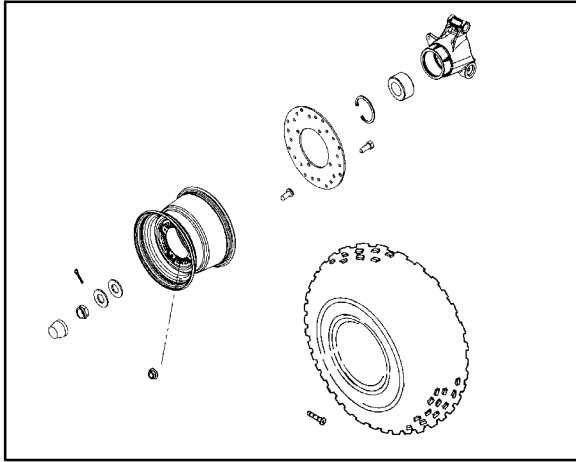
Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Mid Gearcase	20.	1	O-Ring
1.	1	Cover, Output	21.	1	Seal
2.	1	O-Ring	22.	11	Kit, Bolt
3.	1	Insert	23.	1	Cover, Input
4.	1	Coil	24.	1	Bearing, Roller Ball
5.	1	Kit, Shim Set (Incl. Shims)	25.	1	Shaft, Pinion, 11T
6.	2	Bearing, Roller Ball	26.	1	Bushing
7.	1	Hub, Race/Output, Male	27.	1	Gearcase, LH
8.	1	Pin, Dowel	28.	2	Seal, Oil
9.	1	Dowel	29.	1	Plug, Oil Fill
10.	1	Clutch Housing/Ring Gear	30.	4	N/A
11.	1	Spring	31.	4	N/A
12.	14	Kit, Roll	32.	1	Plug, Oil Drain
13.	2	Retaining Ring	33.	1	Washer
14.	1	Bushing	34.	1	Bearing, Needle, Roller Thrust
15.	1	Hub, Race/Output, Female	35.	1	Roll Cage, Aluminum
16.	1	Bushing	36.	1	Plate Armature
17.	1	Vent	37.	1	Back Lash Plate
18.	1	N/A			
19.	1	N/A			





## REAR HUB REMOVAL

1. Place the ATV in Park and lock the parking brake. Remove rear hub cap.

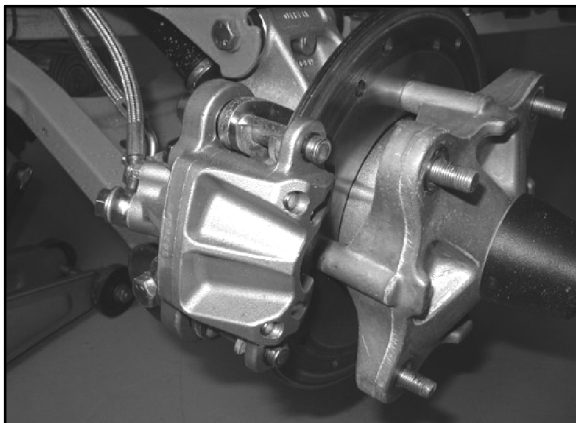


2. Remove cotter pin.
3. Loosen the hub retaining nut.
4. Loosen the wheel nuts.
5. Safely support the rear of the ATV.

**CAUTION:**

**Secure the machine. Serious injury could occur if machine tips or falls.**

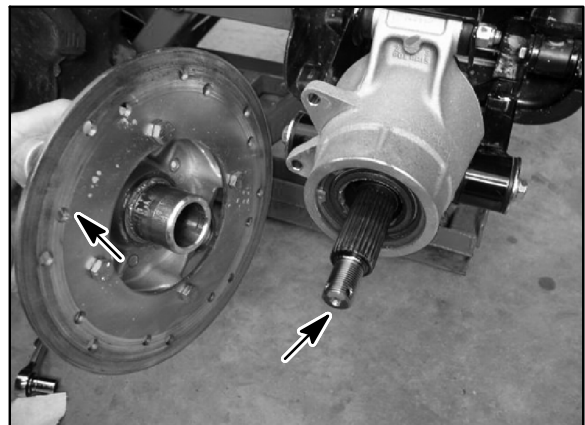
6. Remove wheel nuts and wheel.
7. Remove the rear brake caliper and safely suspend the caliper from the frame with a piece of wire.



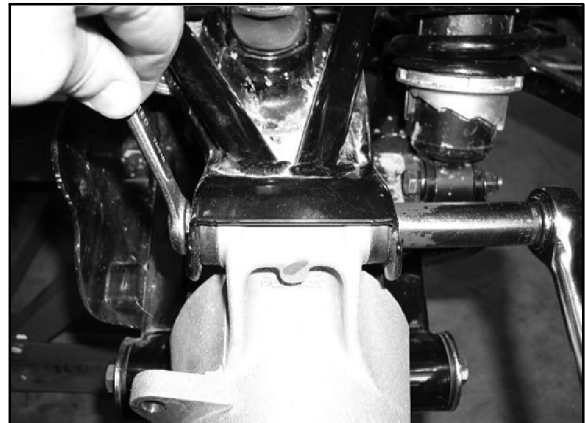
8. Remove hub nut, domed washer and flat washer.



9. Remove hub.

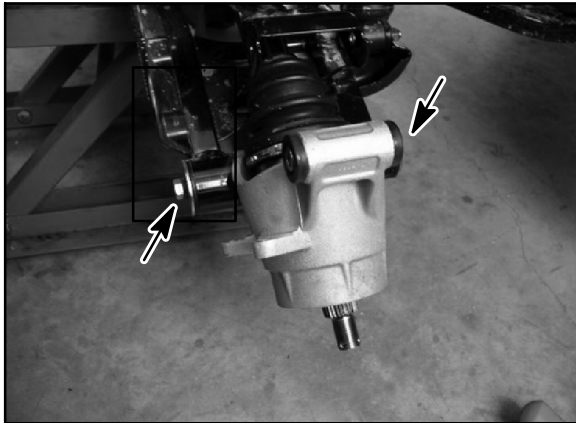


10. Remove upper control arm bolt as shown.





11. Remove both lower control arm bolts.



12. Remove bearing carrier.

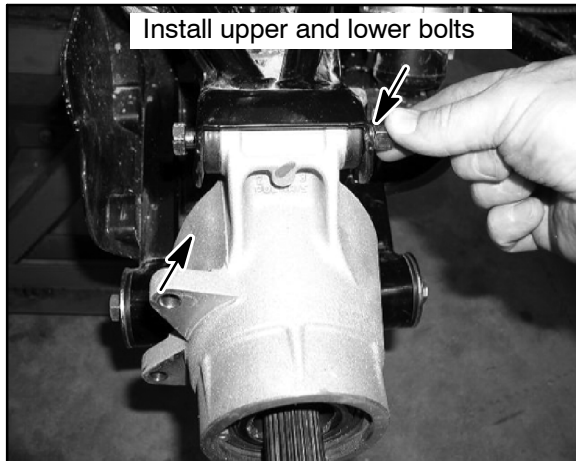


**Rear Hub Nut Torque:  
80 ft. lbs. (109 Nm)**

**Rear Wheel Nut Torque:  
Refer to Page 7.2**

## REAR HUB INSTALLATION

1. Insert bearing carrier on drive shaft.
2. Align bottom of carrier housing and lower control arm. Grease and slide lower control arm bushings into place, securing corner housing.



**Lower Control Arm Bolt Torque:  
40 ft. lbs. (54 Nm)**

**Upper Control Arm Bolt Torque:  
35 ft. lbs. (48 Nm)**

5. Pull drive shaft outward and install hub onto driveshaft splines.
6. Install cone washers with domed side facing outward.
7. Install retainer nut, wheel and wheel nuts.
8. Remove jackstand and torque axle nut and wheel nuts.
9. Install a new cotter pin. Tighten nut slightly to align holes if required.



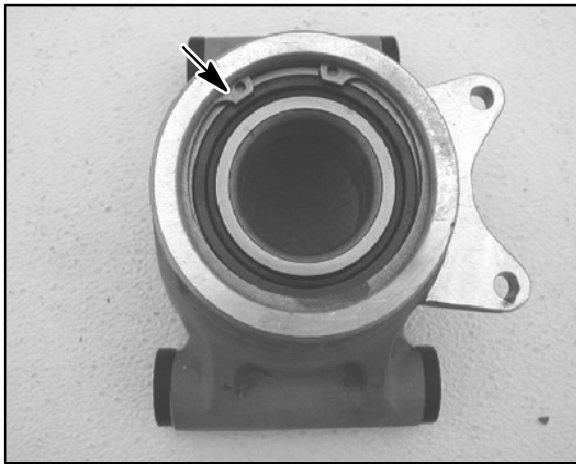
10. Install hub cap.

3. Install and torque both lower control arm bolts.
4. Lift bearing carrier until top aligns with upper control arm. Install and torque upper control arm bolt and torque to specification.

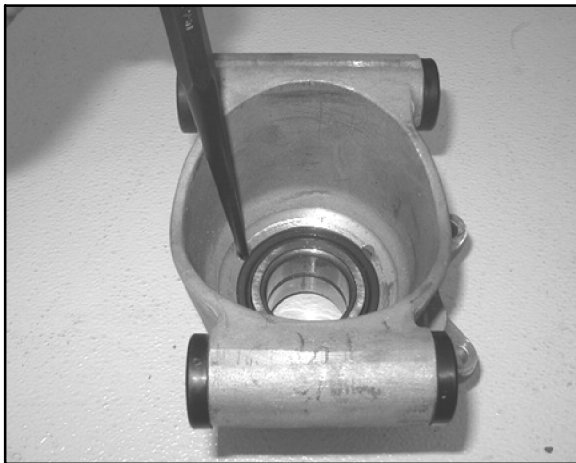


## REAR HUB DISASSEMBLY

1. Remove outer snap ring.



2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.



**NOTE:** Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.

3. Inspect bearing.

**NOTE:** Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

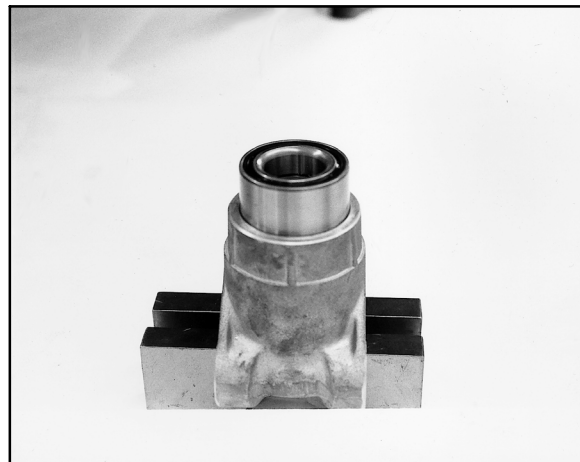
4. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.

## REAR HUB ASSEMBLY

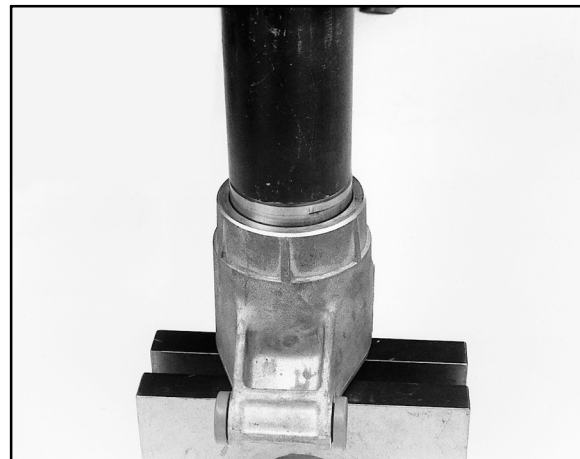
1. Support bottom of bearing carrier housing.



2. Start bearing in housing.



3. Press bearing into place until outer race bottoms on housing.





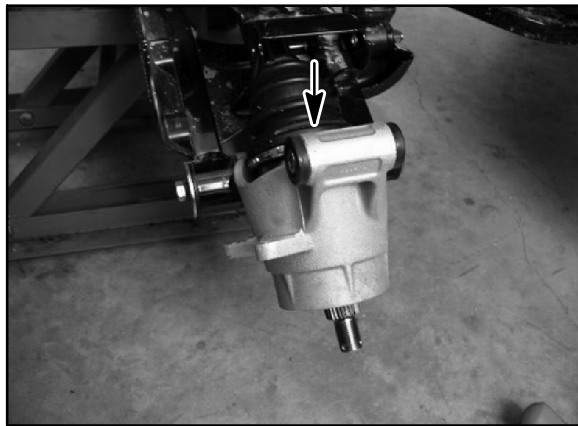
**CAUTION:**

*Use an arbor press only on the outer race, as bearing damage may occur.*

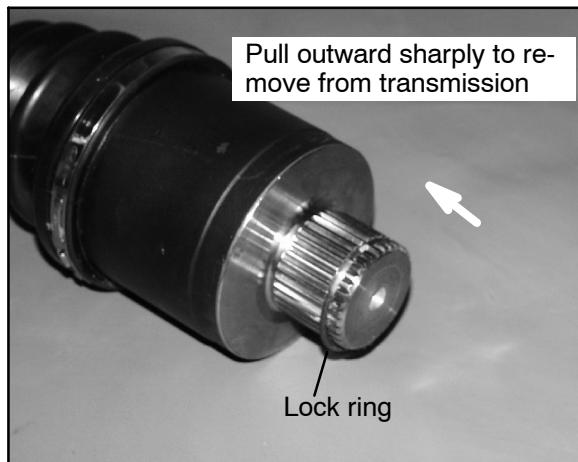
4. Install snap ring into groove.

**REAR DRIVE SHAFT REMOVAL**

1. Remove rear hub and bearing carrier. (See Pages 7.19).
2. Tip hub outward and remove shaft from hub.



3. Pull sharply outward to remove shaft from transmission. Install a new lock ring upon assembly.



**DRIVESHAFT AND CV JOINT HANDLING TIPS**

Care should be exercised during driveshaft removal or when servicing CV joints. Driveshaft components are precision parts.

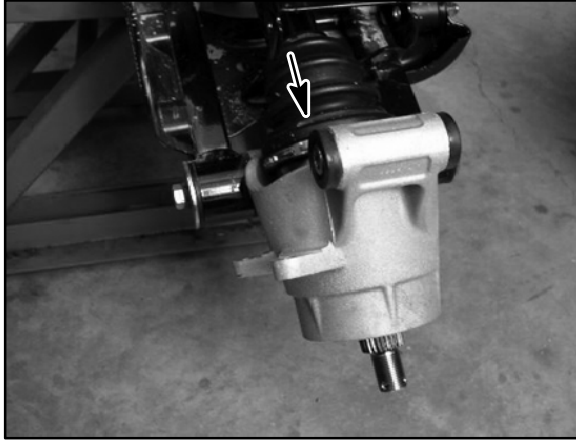
Cleanliness and following these instructions is very important to ensure proper shaft function and a normal service life.

- The complete driveshaft and joint should be handled by getting hold of the interconnecting shaft to avoid disassembly or potential damage to the driveshaft 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 driveshaft 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.

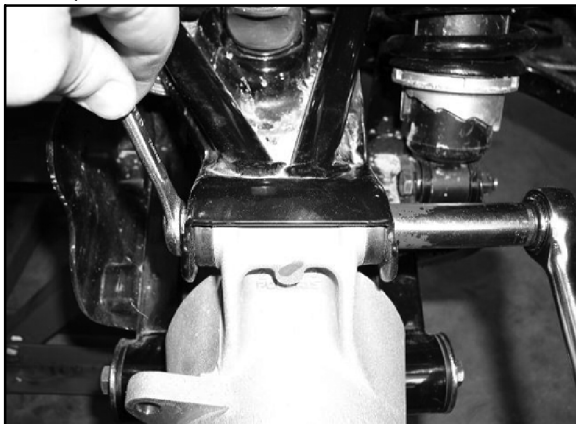


## **REAR DRIVE SHAFT INSTALLATION**

1. Slide shaft assembly into bearing carrier hub.



2. Apply anti-seize compound to splines of shaft.
3. Install a new lock ring and install the shaft.
4. Lift bearing carrier into place and install bolt to upper control arm. Torque bolt to 35 ft. lbs. (48 Nm).

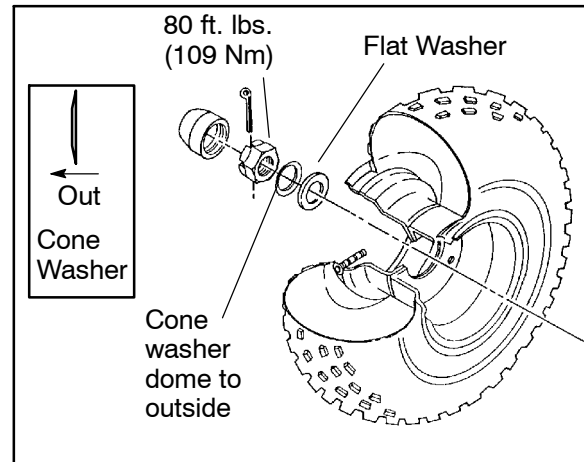


5. Install hub, flat washer, domed washer (domed side out) and nut. Torque center hub nut to 80 ft. lbs. (109 Nm). Install new cotter pin and hub cap.

**Rear Hub Nut Torque:**

**80 ft. lbs. (109 Nm)**

6. Install rear wheel and torque wheel nuts to specification.



**Rear Wheel Nut Torque:**

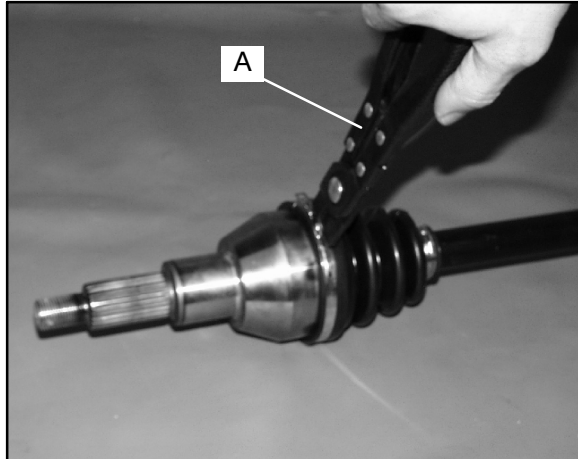
**Refer to Page 7.2**

7. Grease all fittings thoroughly with Premium U-Joint Lubricant (PN 2871551).

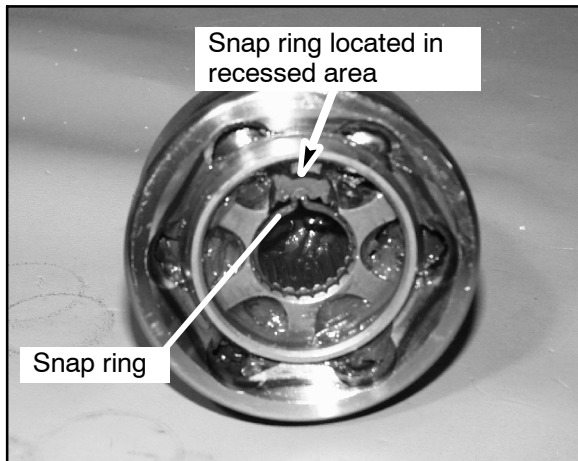


## REAR DRIVE SHAFT SERVICE

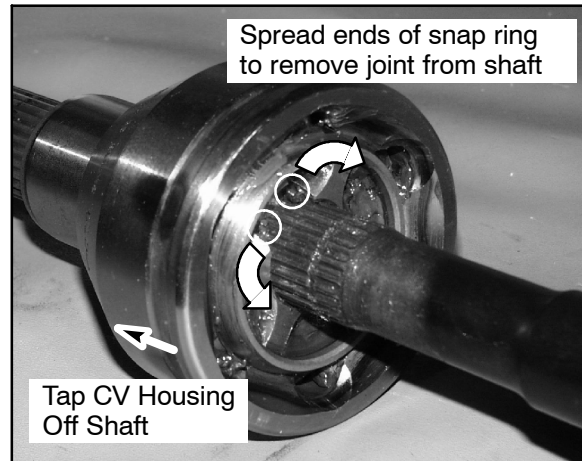
1. Remove clamps from rubber boot(s) using the CV Boot Clamp Pliers (PN 8700226) (A).



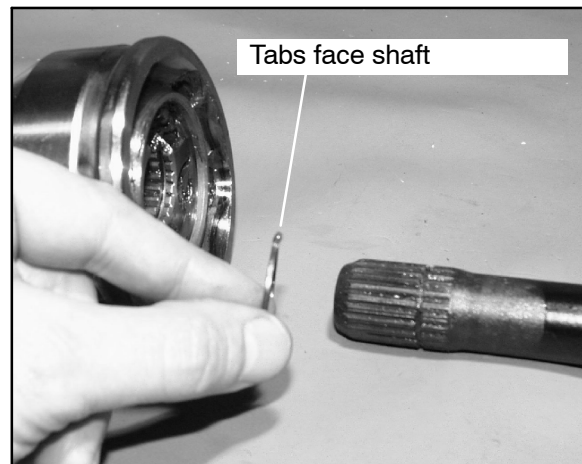
2. **NOTE:** Photo below is shown without shaft for clarity. Wipe grease away from recess in CV joint inner hub to locate snap ring.



3. Open the snap ring using a snap ring pliers or small needle nose pliers. Tap CV housing off shaft with a soft faced hammer while holding snap ring open.

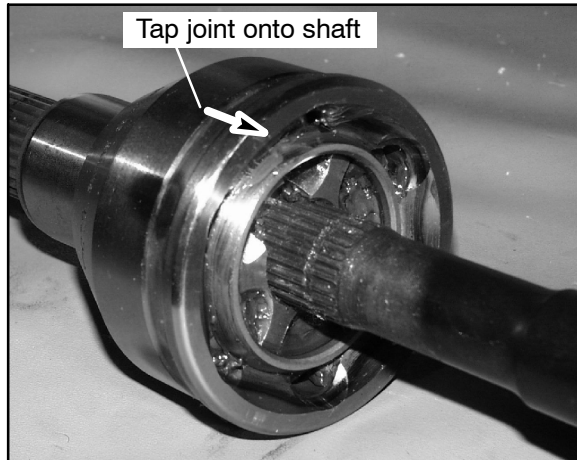


4. Place a new snap ring in the groove of the CV joint inner hub, with tabs facing the shaft as shown.

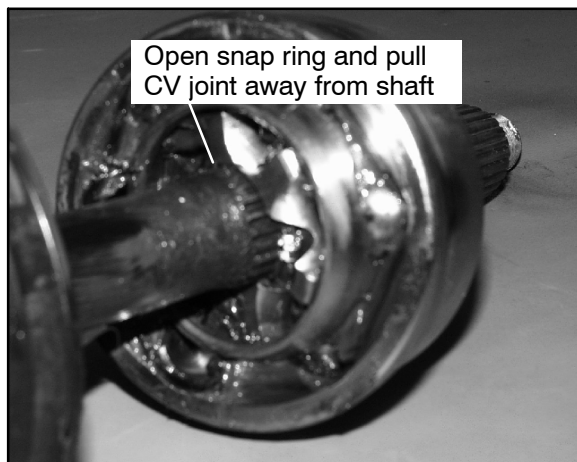




5. Refit CV joint on interconnecting shaft by tapping with a plastic hammer on the joint housing. Take care not to damage threads on the outboard CV joint. The joint is fully assembled when the snap ring is located in the groove on the interconnecting shaft.



6. Install and tighten large boot clamp with boot clamp pliers.
7. Remove excess grease from the CV joint's external surfaces and position joint boot over housing, making sure boot is seated in groove. Position clamp over boot end and make sure clamp tabs are located in slots. **Note:** Before tightening boot clamp on inboard joint, make sure any air pressure which may have built up in joint boot has been released. The air should be released after the plunging joint has been centered properly. Tighten boot clamp using boot clamp pliers.



### (Boot Replacement)

1. Remove CV joint from end of shaft.
2. Remove boot from shaft.

**NOTE:** When replacing a damaged boot, check the grease for contamination by rubbing it between two fingers. A gritty feeling indicates contamination. If the grease is not contaminated, the boot can be replaced without cleaning the CV joint. Use the recommended amount of grease for *boot replacement* only (see below). Proceed to Boot Installation.

### (CV JOINT CLEANING / REPLACEMENT)

3. Thoroughly clean and dry the CV joint and inspect ball tracks and cages for wear, cracks or other damage.

**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.



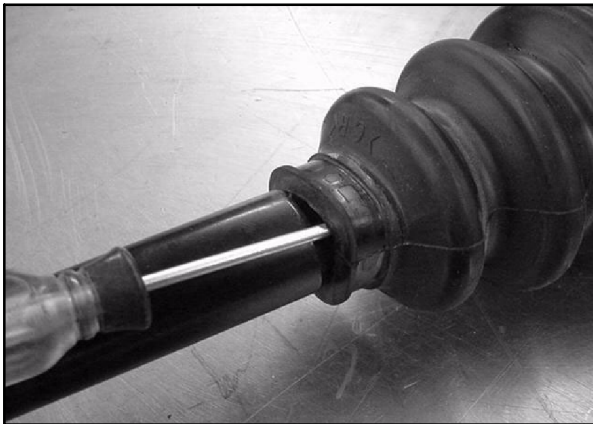
4. Add the recommended amount of grease for *CV joint cleaning* to the joint as shown below. Be sure grease penetrates all parts of the joint.





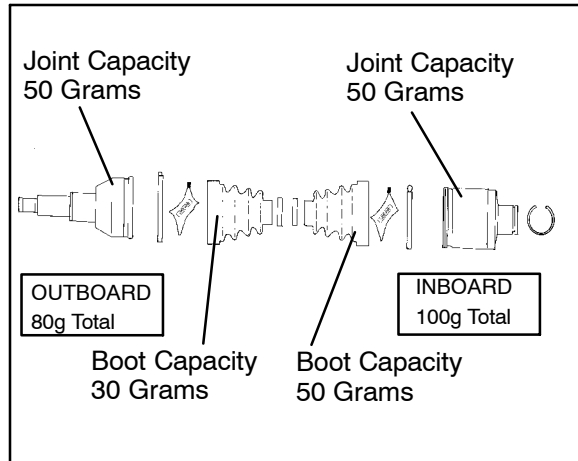
## (BOOT INSTALLATION)

5. 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.
6. Add grease through large end of boot.
7. Install a new boot onto the axle shaft and fill the CV joint and boot with the correct type and amount of grease.
8. 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 axle. **CARE MUST BE TAKEN TO AVOID DAMAGE TO THE NEWLY INSTALLED BOOT.**



9. Install the small clamp on the boot.
10. Be sure to use only the Constant Velocity Joint grease supplied with boot service kit. IF CV JOINT WAS CLEANED, add the recommended amount of grease to the joint *in addition* to the grease pack supplied with boot kit.

**NOTE:** CV Joint Grease Capacity:



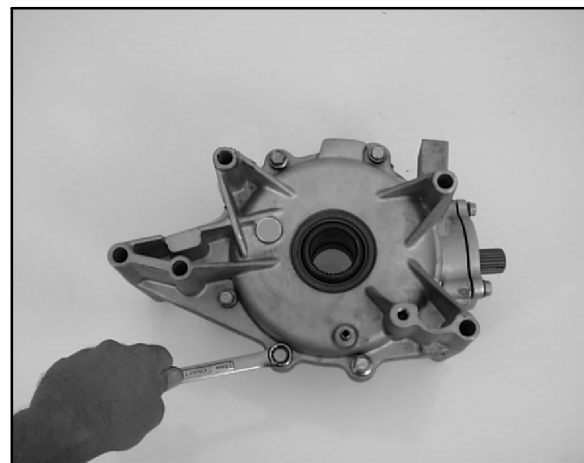
**CV Joint Grease - 30g PN 1350046  
50g PN 1350047**

Outboard joint - 30g if boot is replaced only. Another 50g (80 total) if joint is cleaned.

Inboard joint - 50g if boot is replaced only. Another 50g (100 total) if joint is cleaned.

## REAR GEARCASE DISASSEMBLY

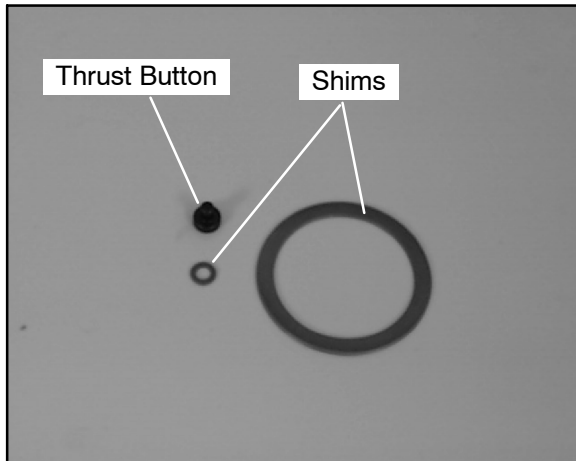
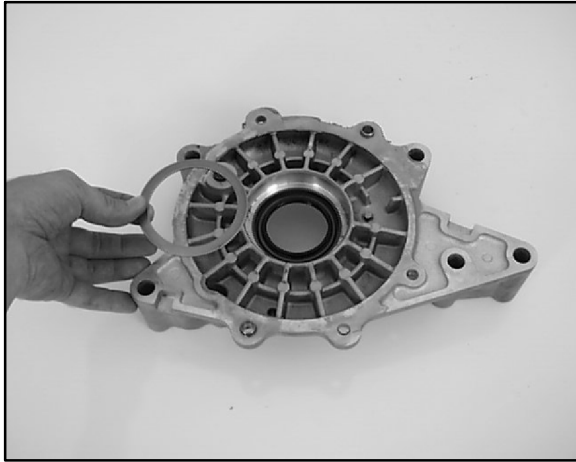
1. Drain and properly dispose of used oil.
2. Remove the gearcase housing cover bolts and the gearcase housing cover.



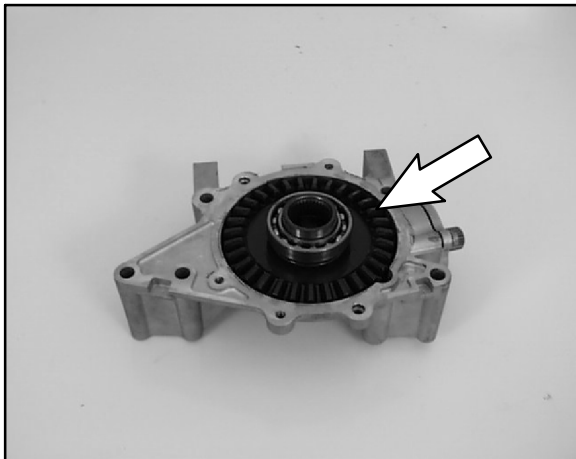




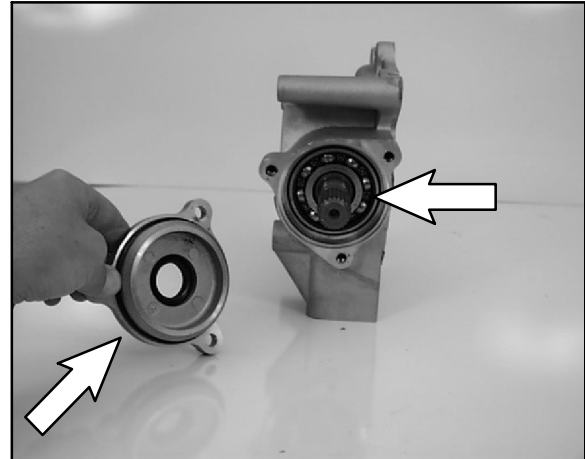
3. Remove the shim, thrust button, and thrust button shim from the gearcase.



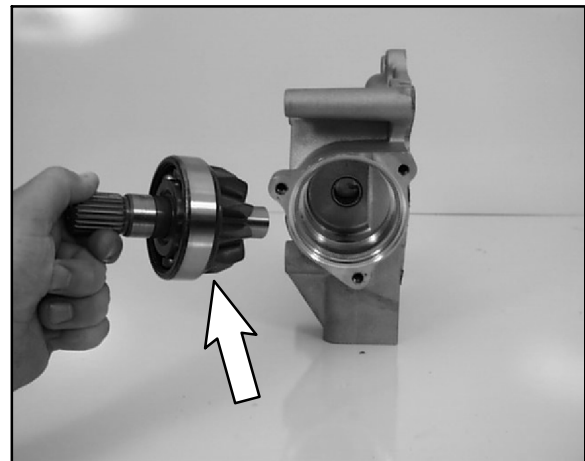
4. Remove rear bevel gear from the gearcase housing cover.



5. Inspect the ring gear for abnormal wear, broken, or chipped teeth. Spin the bearing to check the ball bearings for smoothness. Replace the bearing if needed.
6. Remove the input shaft cover and the pinion shaft from the gearcase housing. See next page.



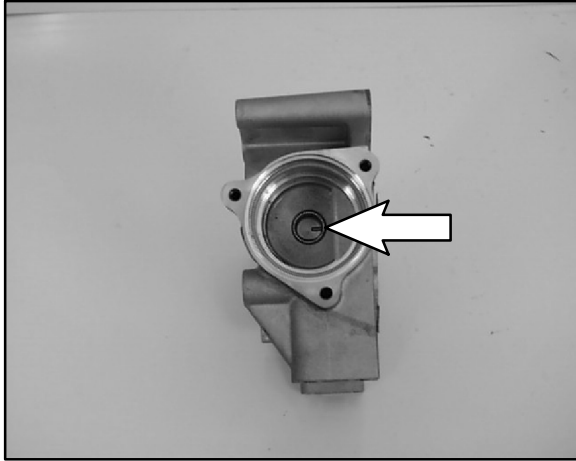
7. Inspect the ring gear for abnormal wear, broken, or chipped teeth. Spin the bearing to check the ball bearings for smoothness. Replace the bearing if needed.



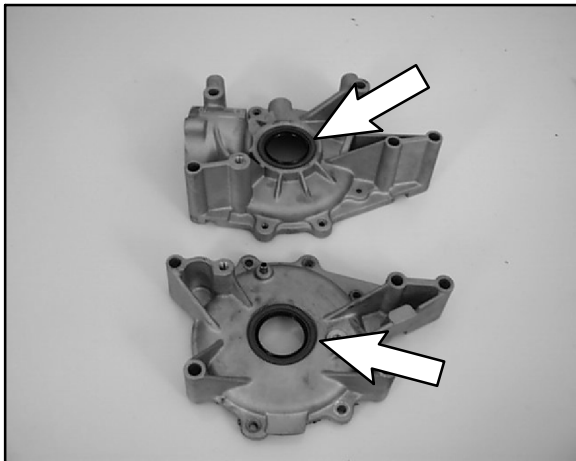


## REAR GEARCASE REASSEMBLY

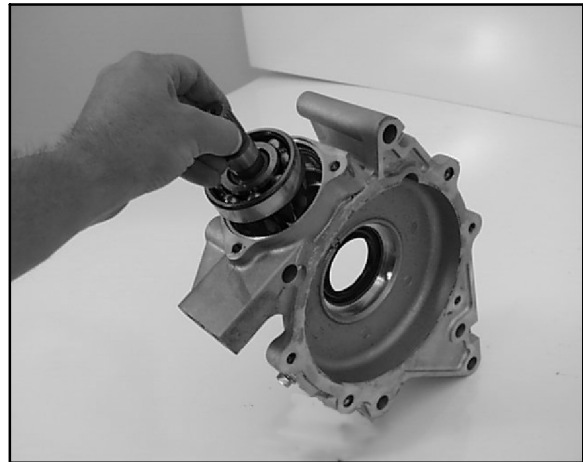
1. Inspect the pinion shaft bushing for wear.



2. Replace all O-rings, seals, and worn components.

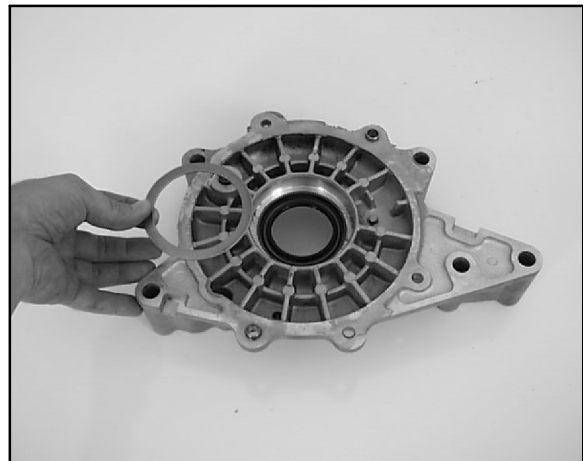


3. Install the pinion shaft into the gearcase housing. Install the pinion shaft cover and torque the cover bolts to 25 ft. lbs. (34 Nm).



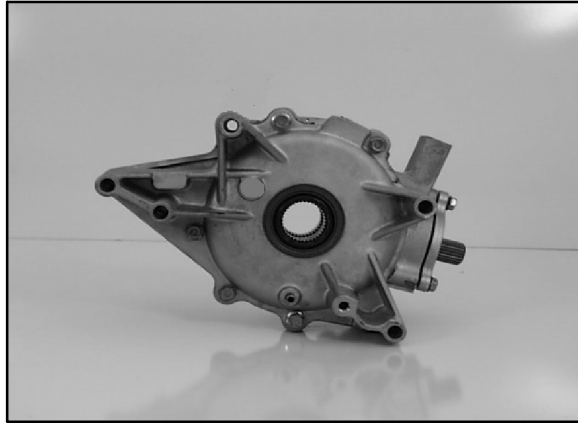
**Pinion Shaft Cover Bolt Torque:  
25 ft. lbs. (34 Nm)**

4. Install the original shim(s), thrust button, and thrust button shims into the gearcase cover.



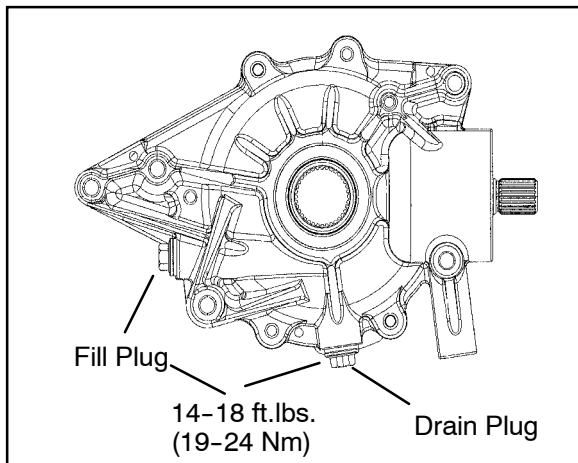


5. Apply Crankcase Sealant (PN 2871557) to surface of case and install cover bolts. Install the gearcase cover onto the gearcase housing. Torque the cover bolts to 25 ft. lbs. in a criss cross pattern.



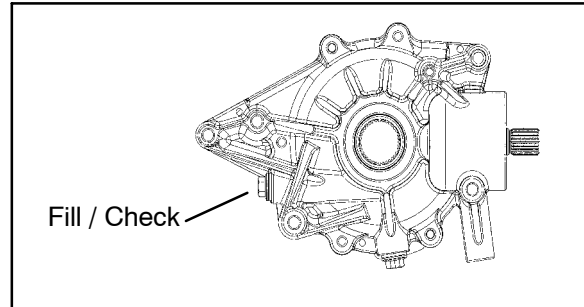
**Gearcase Cover Bolt Torque:**  
**25 ft. lbs. (34 Nm)**

6. Install the drain plug and fill plug. Replace the drain plug washers to ensure proper sealing after filling.



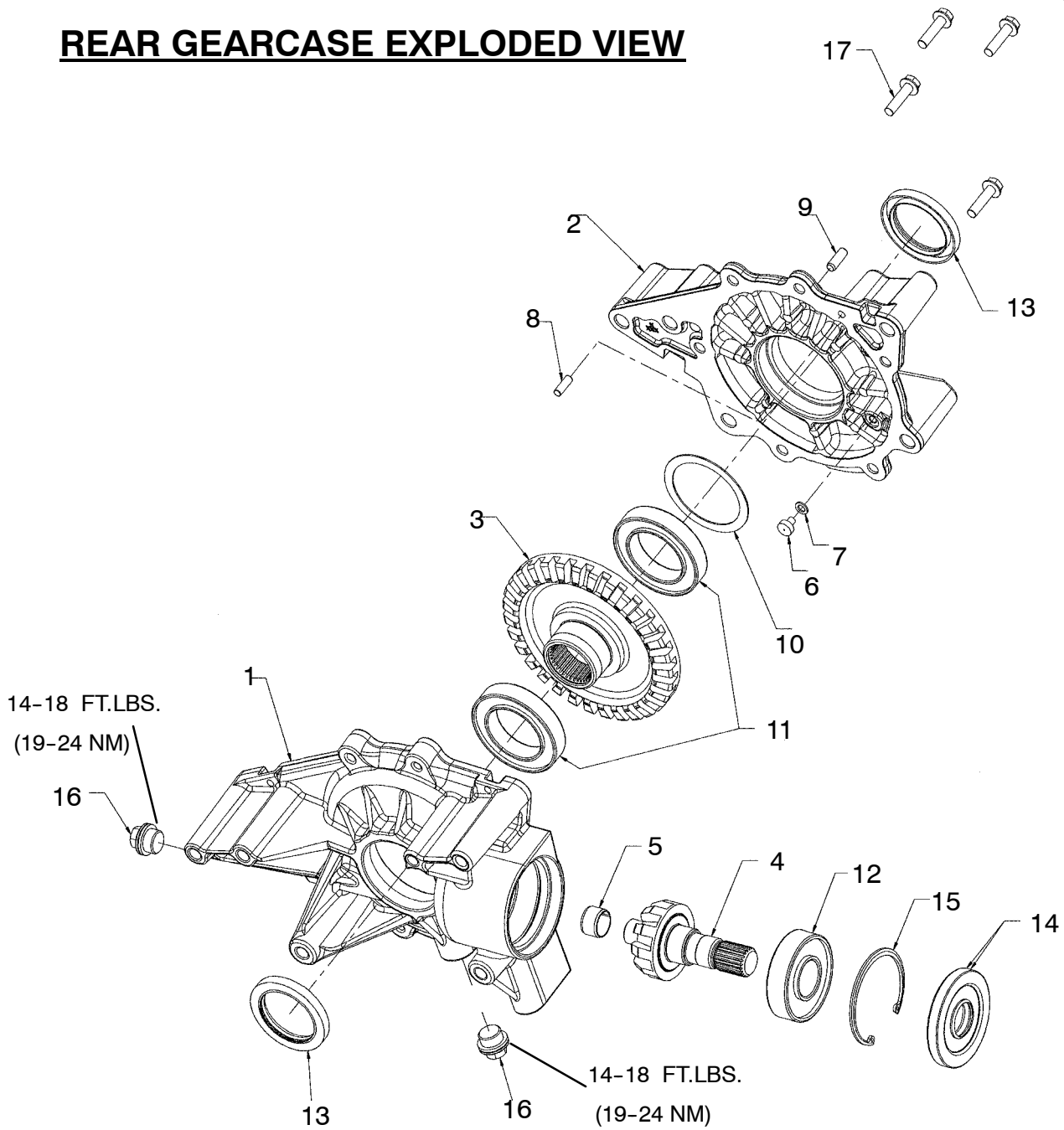
## **REAR GEARCASE INSTALLATION**

1. To install the rear gearcase, reverse the removal procedures.
2. Torque the installation bolts and nuts to the torques specified.
3. Refill the rear gearcase with **5 oz. (150 ml)** of Polaris Premium Gearcase Lubricant (PN 2871653). Torque the fill plug to 14-18 ft. lbs. (19-24 Nm).





**REAR GEARCASE EXPLODED VIEW**



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Rear Gearcase	11.	2	Ball Bearing
1.	1	RH Gearcase	12.	1	Ball Bearing
2.	1	LH Cover	13.	2	Triple Lip Seal
3.	1	31T Straight Bevel Gear	14.	1	Triple Lip Seal
4.	1	10T Straight Bevel Pinion	15.	1	Retaining Ring
5.	1	Bushing	16.	2	Plug
6.	1	Thrust Button	17.	6	Bolts
7.	1	Shim			
8.	1	Dowel Pin			
9.	1	Vent			
10.	1	Shim			



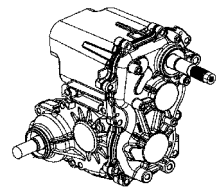
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# CHAPTER 8

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# TRANSMISSION

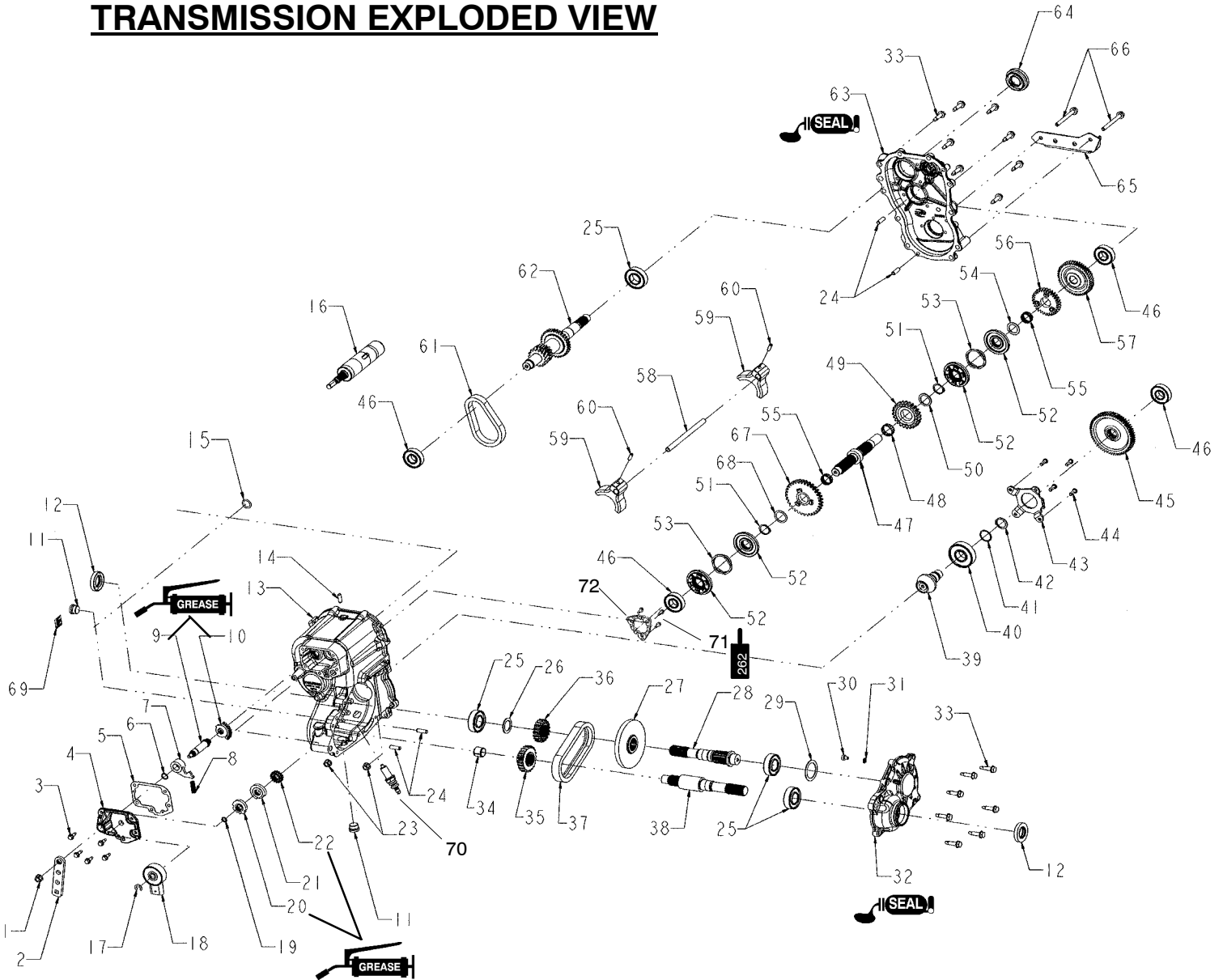
Transmission, Exploded View .....	8.2-8.5
Torque Specifications/Lubrication .....	8.5
Gear Shift Selector Removal .....	8.5
Transmission Removal .....	8.6-8.7
Transmission Installation .....	8.7-8.8
Transmission Disassembly .....	8.8-8.13
Transmission Reassembly .....	8.13-8.18



# 8




**TRANSMISSION EXPLODED VIEW**



**TORQUE SPECIFICATIONS**

Item	Torque
1	12-18 ft.lbs. (16-24 Nm)
3	7-9 ft.lbs. (9.5-12 Nm)
23	15-19 ft.lbs. (20-26 Nm)
33	27-34 ft.lbs. (37-46 Nm)
39	6-12 ft.lbs. (8-16 Nm)
70	14-18 ft.lbs. (19-24 Nm)
71	6-12 ft.lbs. (8-16 Nm)
11	10-14 ft. lbs. (14-19 Nm)

**FOR REASSEMBLY**

 Apply White Lithium Based Grease.  
 Apply Polaris Crankcase Sealant  
 Apply Loctite™ 262 to the bolt threads.

**TRANSMISSION EXPLODED VIEW, CONT.**

Ref.	Qty.	Description	Ref.	Qty.	Description
			35.	1	22T Sprocket
1.	1	Nut	36.	1	19T Sprocket
2.	1	Shift Drum Bellcrank	37.	1	Silent Chain
3.	5	Sector Cover Screws	38.	1	Front Main Output Shaft
4.	1	Sector Cover	39.	1	10T Spiral Pinion Shaft
5.	1	Sector Cover Gasket	40.	1	Ball Bearing
6.	1	O-ring	41.	1	Spacer
7.	1	Detent Pawl	42.	1	Retaining Ring
8.	1	Compression Spring	43.	1	Bearing Center Drive Cover
9.	1	Shift Shaft	44.	4	Torx Screws
10.	1	31T Sector Gear	45.	1	60T Mid Output Helical Gear
11.	2	Hollow Hex Plug	46.	4	Ball Bearing
12.	2	Triple Lip Seal	47.	1	Reverse Shaft
13.	1	Gearcase	48.	1	Needle Cage Bearing
14.	1	Vent Tube	49.	1	24T 6 Face Sprocket
15.	1	O-ring	50.	1	Washer
16.	1	Shift Drum	51.	2	External Retaining Ring
17.	1	External Retaining Ring	52.	4	6 Face Engagement Dog
18.	1	6-Pin Switch	53.	2	Wave Spring
19.	1	O-ring	54.	1	Washer
20.	1	Detent Star	55.	2	Needle Cage Bearing
21.	1	Lockout Disc	56.	1	30T 6 Face Gear
22.	1	16T Sector Gear	57.	1	47T Mid Output Helical Gear
23.	2	Lock Nut	58.	1	Shift Shaft Rail
24.	4	Dowel Pin	59.	2	Shift Fork
25.	4	Ball Bearing	60.	2	Dowel Pin
26.	1	Thrust Washer	61.	1	Silent Chain
27.	1	31T Spiral Gear	62.	1	Input Shaft Assy.
28.	1	Output Shaft	63.	1	LH Main Cover
29.	1	Shim	64.	1	Dual Lip Seal
30.	1	Thrust Button	65.	1	Transmission Mount Bracket
31.	1	Shim	66.	2	Hex Screw
32.	1	Output Cover	67.	1	33T 6 Face Gear
33.	15	Screw	68.	1	Washer
34.	1	Plain Bearing	69.	1	Label
			70.	1	Park Lock
			71.	1	Bolts
			72.	1	Park Plate



**TRANSMISSION INFORMATION**

**TORQUE SPECIFICATIONS**

COMPONENT	FT. LBS. (IN.LBS.)	NM
Transmission Case Bolts	27-34	37-46
Oil Deflector Screws	(16-30)	2-3.3
Shift Cover Bolt	6-12	8-16
Bell Crank Nut	12-18	16-24
Trans. Drain Plug / Fill Plug	10-14	14-19
Trans. Mounting Bolts	25	34.5
Snorkel Lock Screw	8-12	11-16

**LUBRICATION**

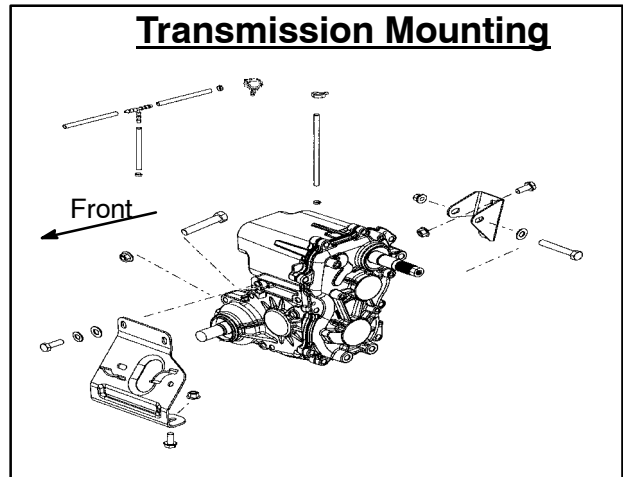
Refer to maintenance section for transmission lubricant type and capacity.

**GEAR SELECTOR REMOVAL**

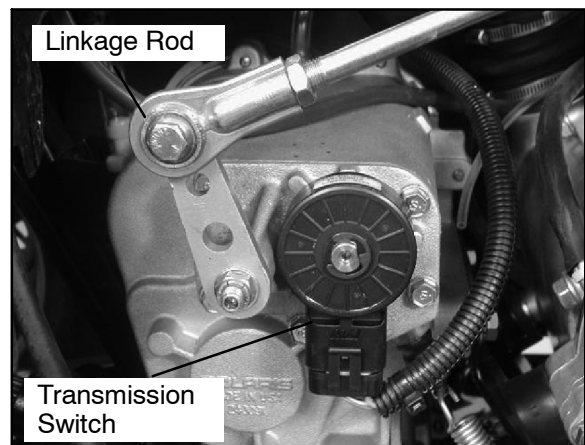
1. Disconnect linkage rod from gear selector handle.
2. Remove two bolts attaching gear selector mount to machine frame.
3. Lift gear selector out of mounting bracket and away from frame.

**TRANSMISSION REMOVAL**

1. Remove seat, rear rack, rear cab, air box, and exhaust system, and right footwell (if required for access).



2. Disconnect transmission vent line.
3. Drain transmission lubricant.
4. Disconnect shift linkage rod end from transmission bellcrank.



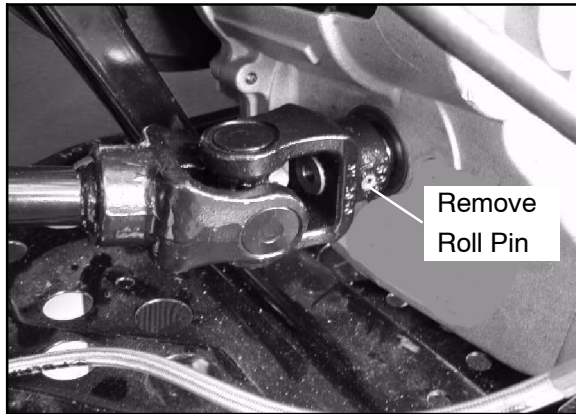
5. Disconnect gear position switch harness.



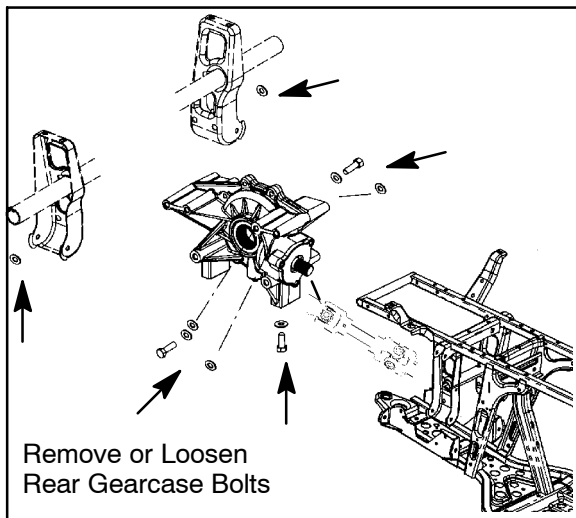




6. Remove auxiliary brake mounting bracket from frame and secure out of way for transmission removal.
7. Remove PVT outer cover, both drive and driven clutch, and inner PVT cover (refer to Clutch Chapter 6).
8. Use the Roll Pin Removal Tool (**PN 2872608**) to remove the roll pins from the front prop shaft and the rear prop shaft. Remove the front propshaft.



9. Loosen or remove the bolts that secure the rear gearcase. Move the rear gearcase back just enough to slide the rear propshaft from the transmission shaft.



10. Remove the park lock spring.



11. Remove left side transmission bracket, rear bracket, and lower right bracket bolt.
12. Remove front transmission-to-engine mount bolts. See illustration.
13. Remove transmission from right side of frame.

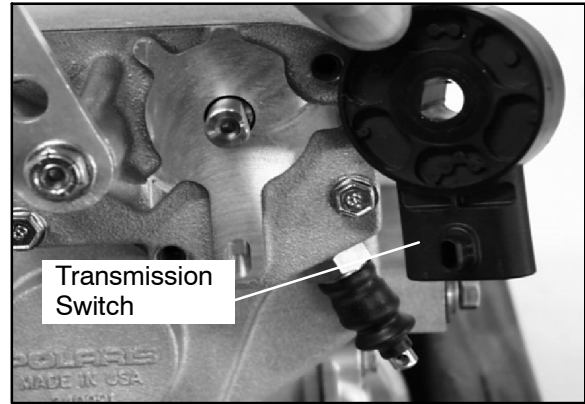
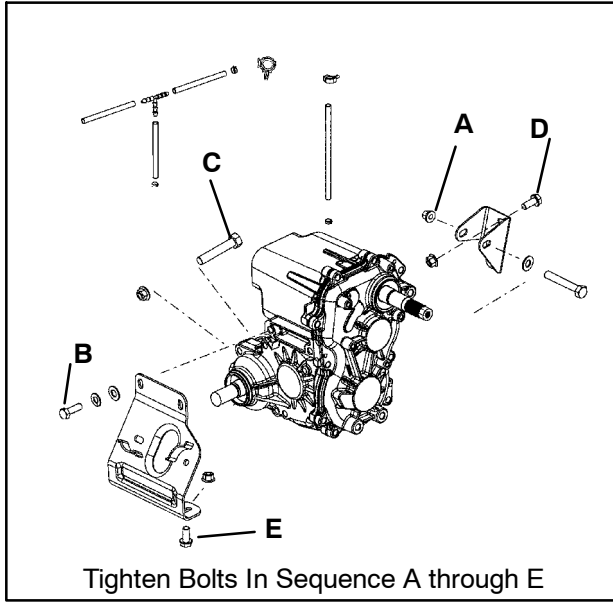
## TRANSMISSION INSTALLATION

1. Install transmission from right side of vehicle.
2. Align rear output shaft to rear propshaft yoke and roll pin hole.
3. Slide rear output shaft into propshaft yoke.
4. Position transmission in frame.
5. Install front propshaft and roll pin.
6. Loosely install left side and rear mounting brackets.
7. Loosely install lower right bracket bolt.
8. Loosely install front mounting bolts.
9. Tighten mounting fasteners in order A-F as shown.

**NOTE:** Align clutches as outlined in Clutch Chapter 6.

**Transmission Mounting  
Bolts Torque**

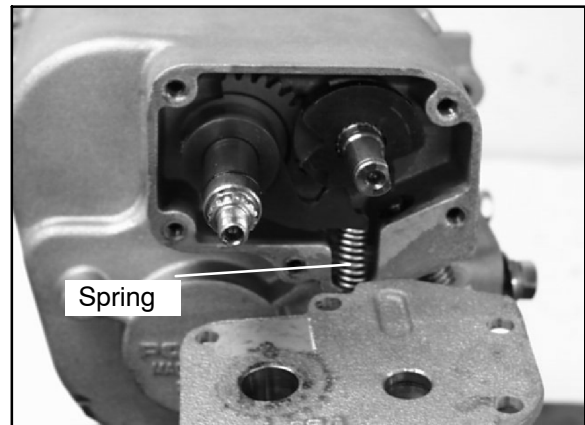
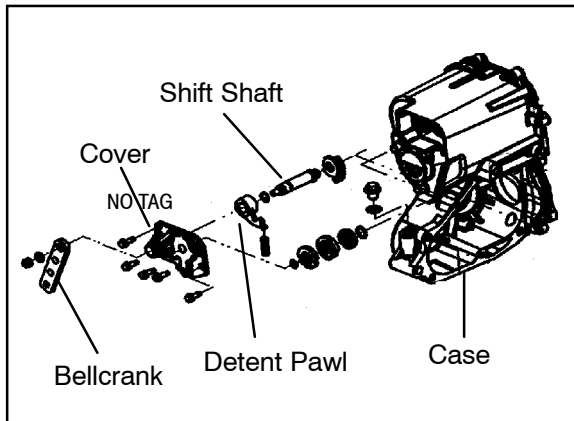
**25 ft. lbs. (34.5 Nm)**



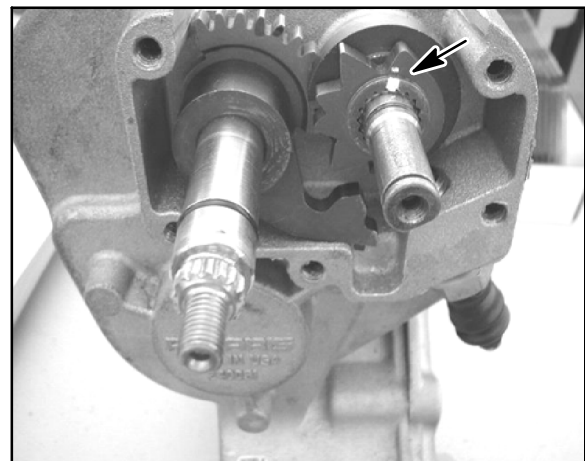
4. Remove the five bolts that secure the cover. Remove the detent spring.

## TRANSMISSION DISASSEMBLY

1. Place the bellcrank in neutral position.



5. Mark the detent gear with a white pen. Remove the detent gear from the case.

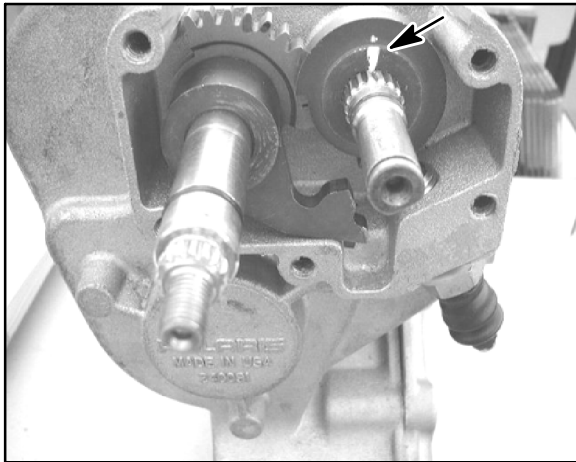


2. Remove the nut, and washer that secure the bell crank. Remove the bellcrank.
3. Remove the e-clip and then remove the transmission switch.



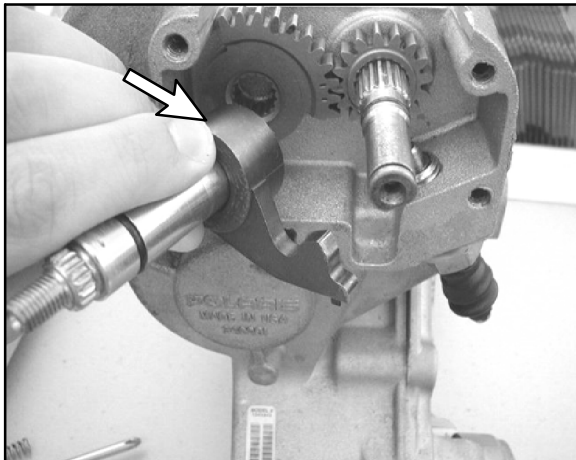
**NOTE:** It may be helpful to place a mark just above the keyed spline. Note the raised edge on the detent gear for reassembly.

6. Mark the shift lockout disc, this will indicate which side of the disc faces outward during assembly. Remove the shift lockout disc.

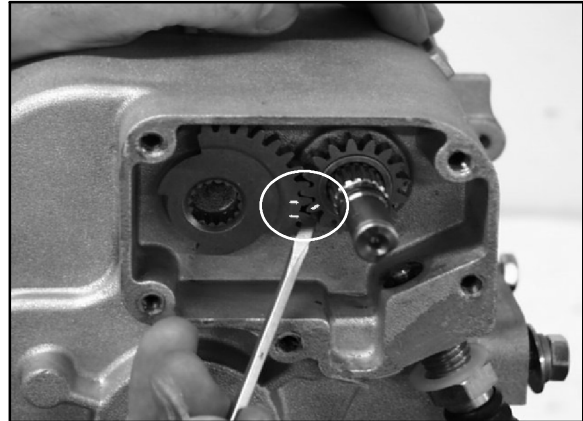


**NOTE:** It may be helpful to place a mark just above the keyed spline. Note the raised edge on the detent gear for reassembly.

7. Remove the shift shaft and detent lever.

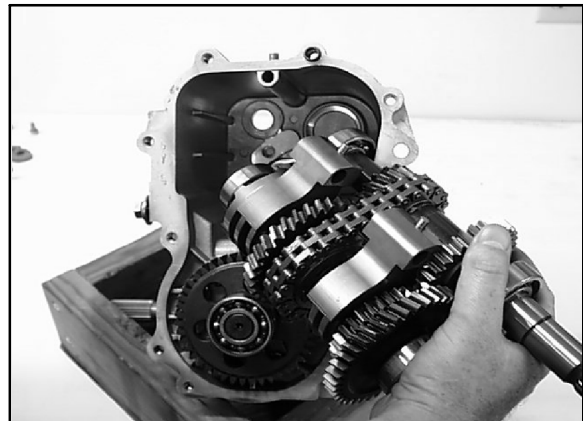


8. Note the timing marks on the shift gears. Remove the shift gears from the case.

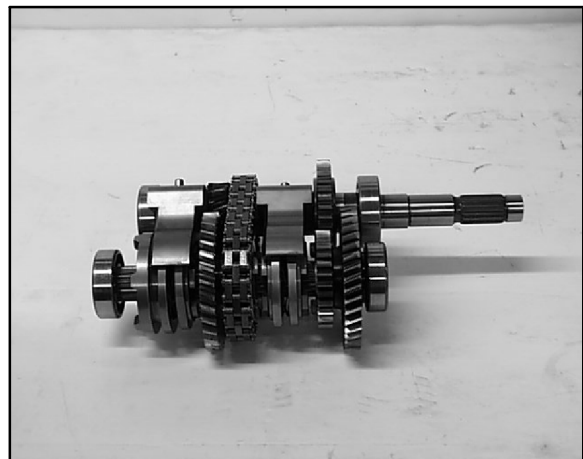


**NOTE:** You may have to tap the shift drum from the backside of the case to aid in removal.

9. Remove the upper gear cluster and shift forks. You may need to move the assembly back and forth to aid in removal.

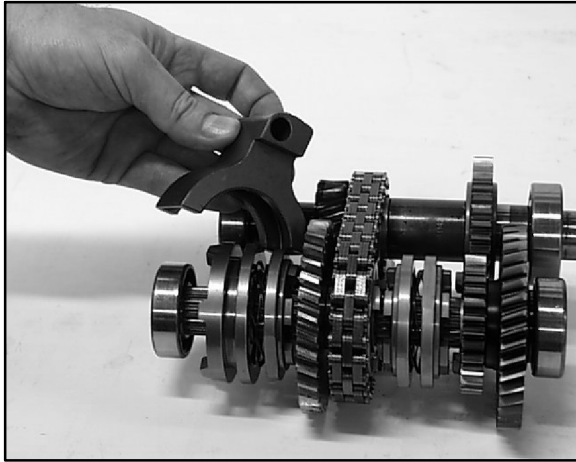


10. Set the upper gear cluster on a flat surface and inspect the components.





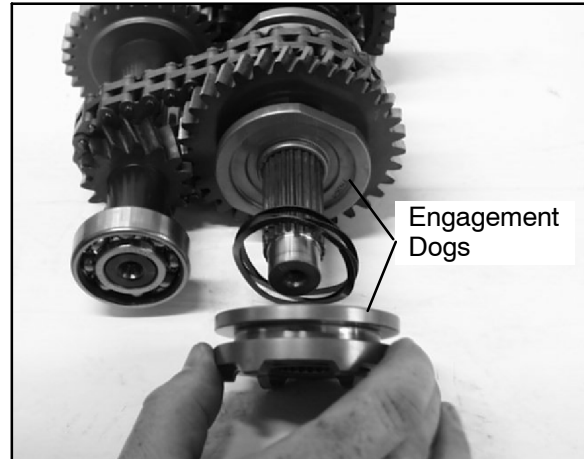
11. Remove the shift forks from the assembly. Note the correct position of each fork.



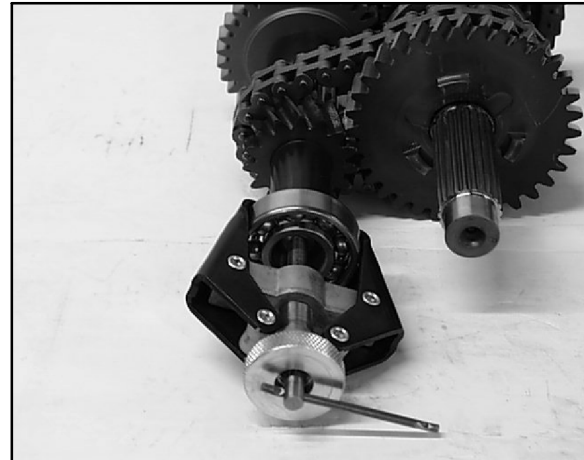
12. Remove the bearing from the reverse shaft using a puller.



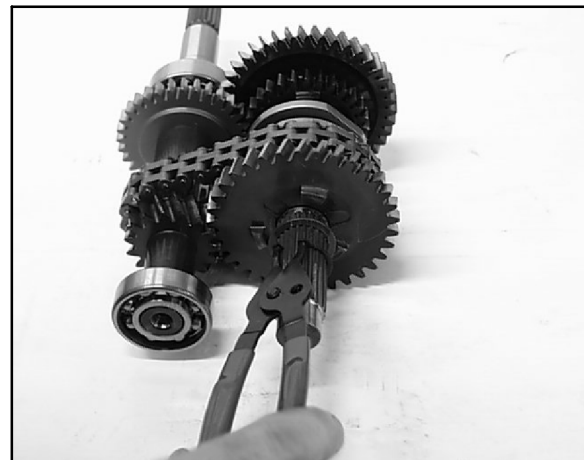
13. Remove the park lock engagement dog. Remove the wave spring and reverse engagement dog.



14. Remove the bearing from the input shaft with a puller.

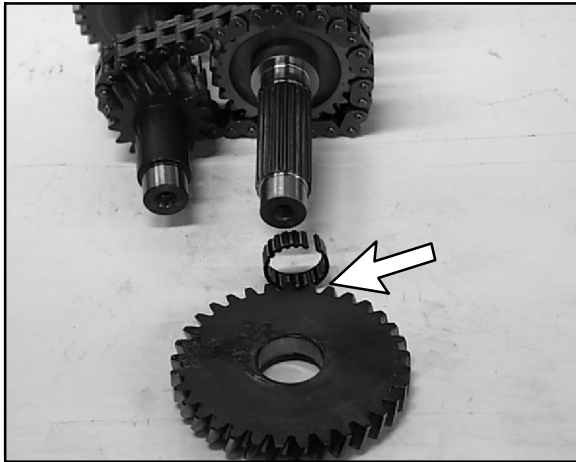


15. Remove the snap ring and washer from the reverse shaft.

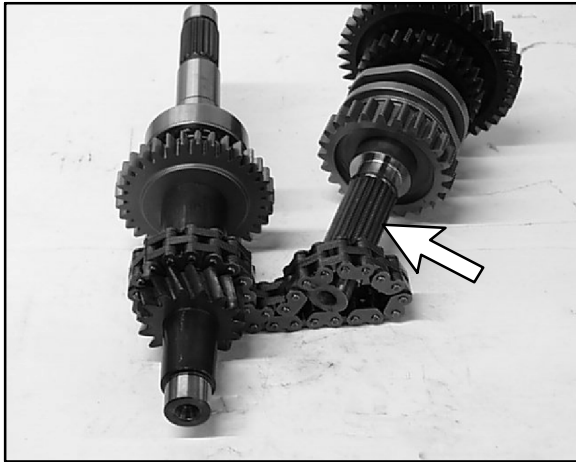




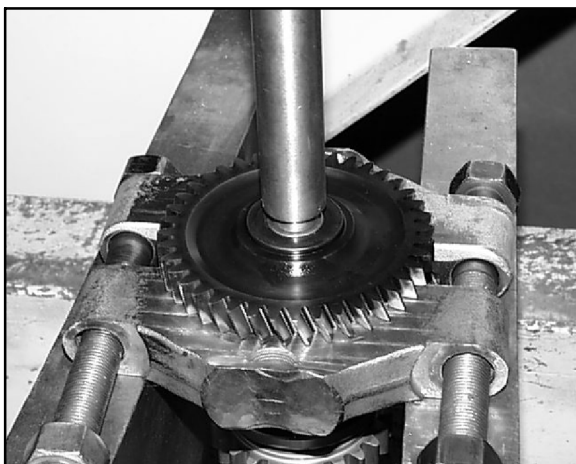
16. Remove low gear (33T) and the needle bearing.



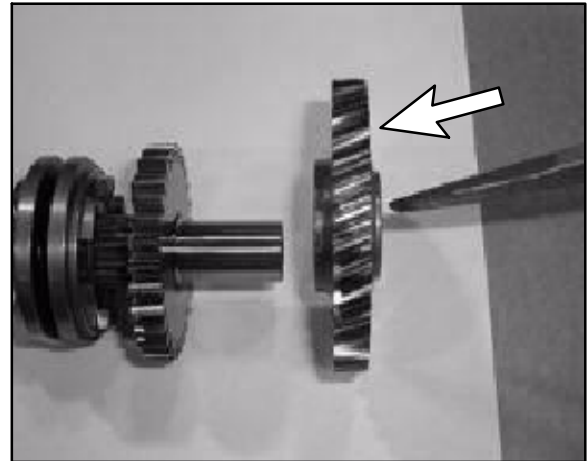
17. Remove the reverse gear shaft.



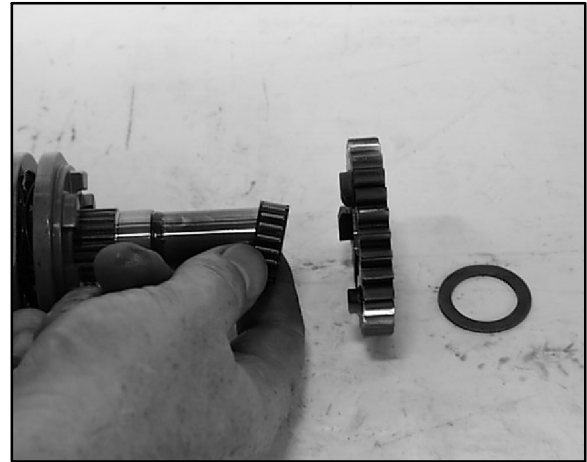
18. Remove the rest of the bearings from the shafts.  
19. Use a press to remove the gear from the shaft.



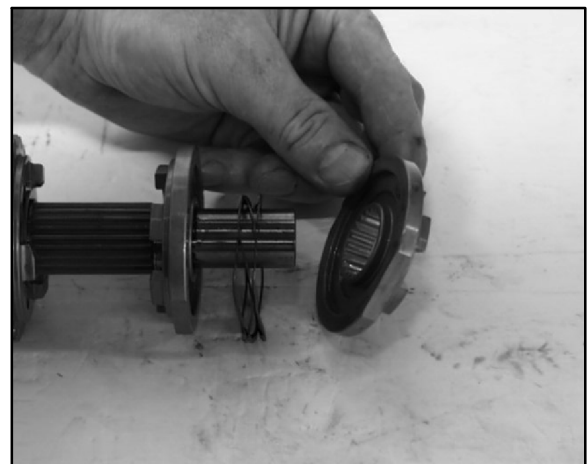
20. Make note of the direction of the gear and hub location.



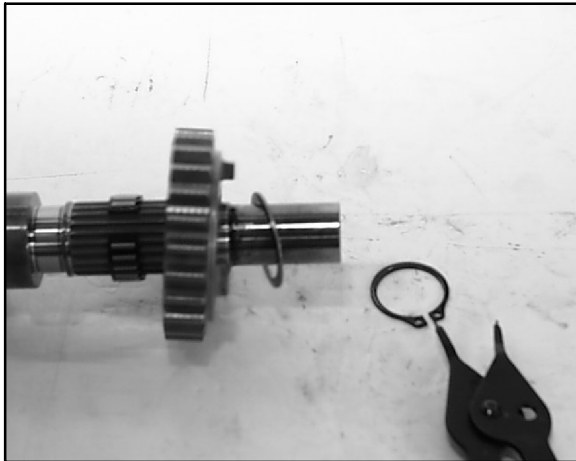
21. Remove the gear, split bearing, and washer from the reverse shaft.



22. Slide off the shift dogs and wave springs.

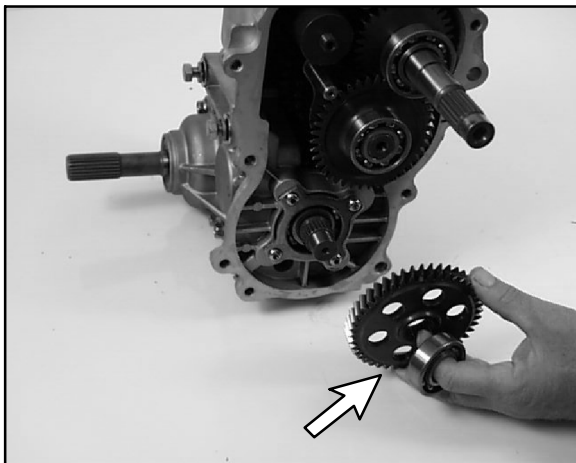
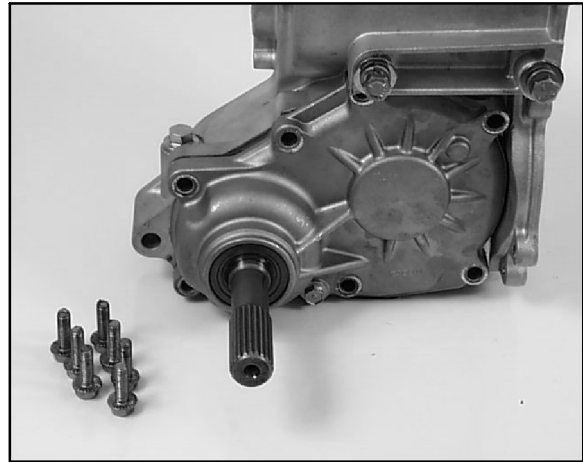


23. Remove the snap ring, washer, gear, and split bearing.

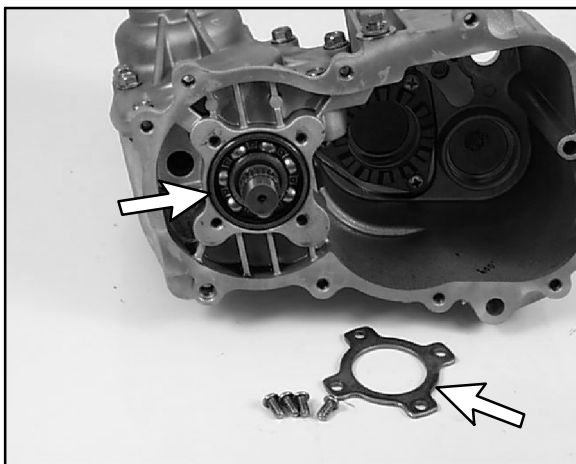


24. Remove bearing and the helical gear.

26. Remove the front housing cover screws.



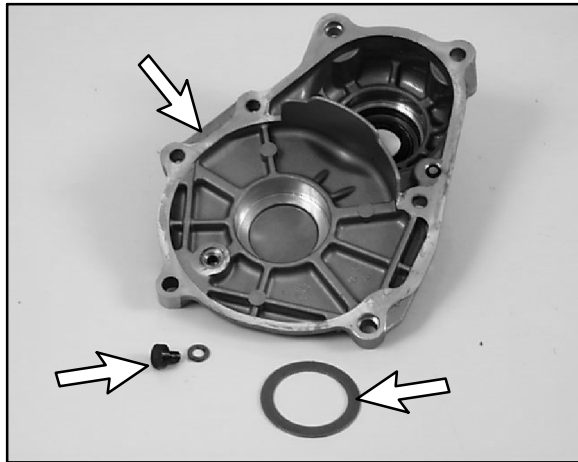
25. Remove the pinion shaft retainer plate and the pinion shaft.



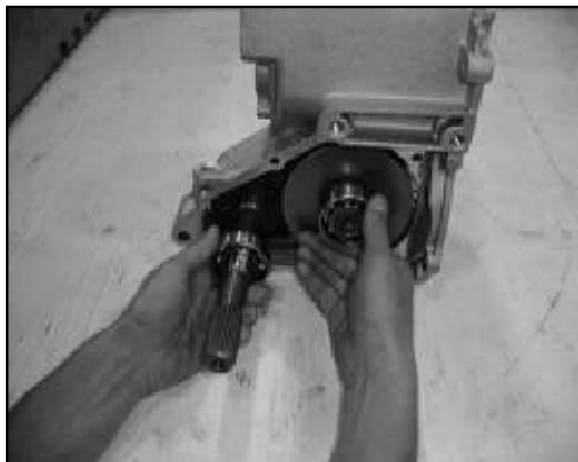




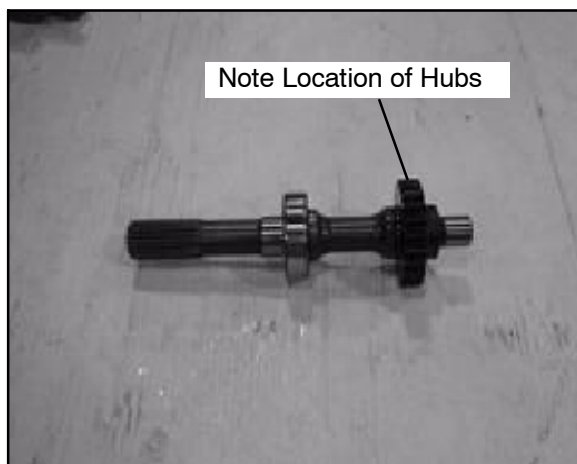
27. Remove the front housing cover, shim, thrust button, and thrust button shim.



28. Remove the shafts as an assembly.



29. Remove the silent chain from the assembly for shaft inspection.



30. Clean all components in a parts washer and inspect for wear.

31. Inspect engagement dogs of gears and replace if edges are rounded.
32. Inspect gear teeth for wear, cracks, chips or broken teeth. Note the location of the hubs on the gear.
33. Remove seals from transmission case.

**IMPORTANT:** New seals should be installed after the transmission is completely assembled.

34. Inspect bearings for smooth operation. Check for excessive play between inner and outer race.

## TRANSMISSION REASSEMBLY

1. Reinstall the chain onto the front output shaft and rear output shaft.

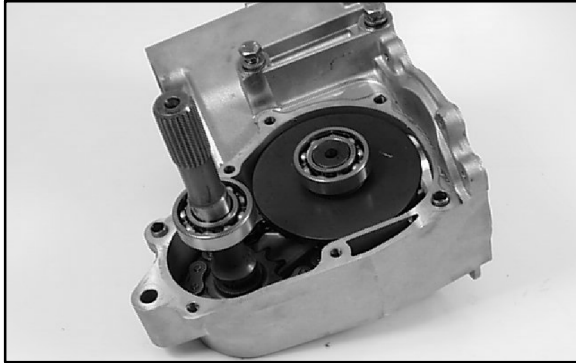


2. Install front and rear output shafts into the case.



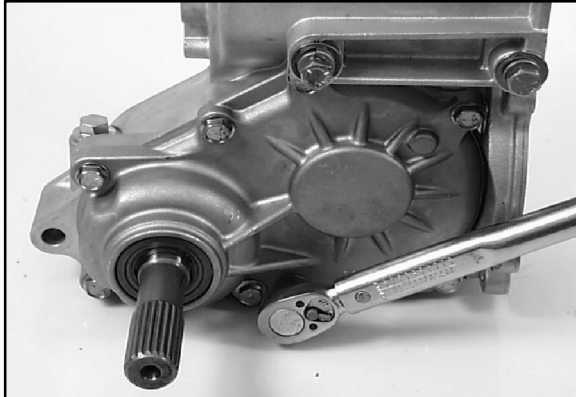


3. Before installing the cover make sure the sealing surfaces are clean and dry, and shafts are fully seated in the transmission case. Apply Crankcase Sealant (PN 2871557) to the mating surfaces.



**Crankcase Sealant  
(PN 2871557)**

4. Reinstall the thrust button shim, thrust button, and other shims into the cover. Reinstall cover and torque bolts in a criss-cross pattern in 3 steps to 27-34 ft. lbs. (36.50-46 Nm).

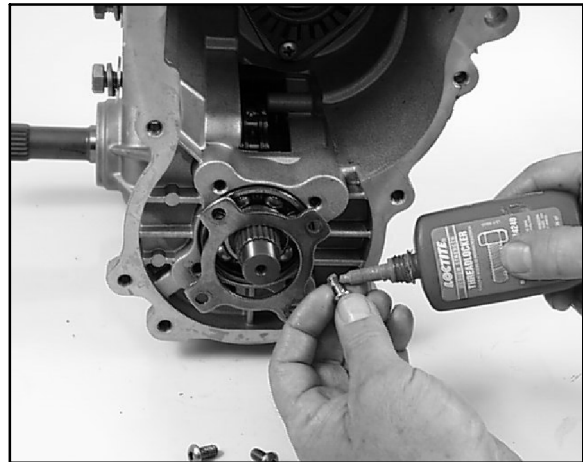


**NOTE:** Make sure that the case locating pins (knock pipes) are in place.

**Front Cover Bolt Torque:  
27-34 ft. lbs. (36.50-46 Nm)**

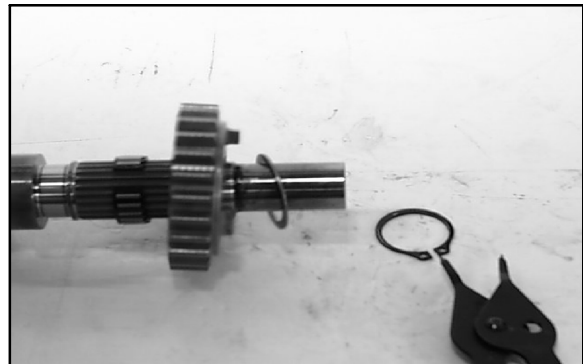
5. Install new front and rear output shaft seals. Apply grease to the seal lips. Cover the splines of the shaft to protect the seal lips during installation.
6. Install pinion shaft with bearing.
7. Install retainer plate with flat side toward bearing.

8. Apply Loctite™ 262 (Red) (PN 2871951) to screw threads and torque screws to 6-12 ft. lbs. (8-16 Nm).



**Pinion Retainer Plate  
Bolt Torque:  
6-12 ft. lbs. (8-16 Nm)**

9. Install the a new needle bearing, the 24T reverse sprocket, washer, and a new snap ring. Install the shift dogs and wave spring. Install the washer, a new needle bearing and the high gear. Install the press fit gear and ball bearing.

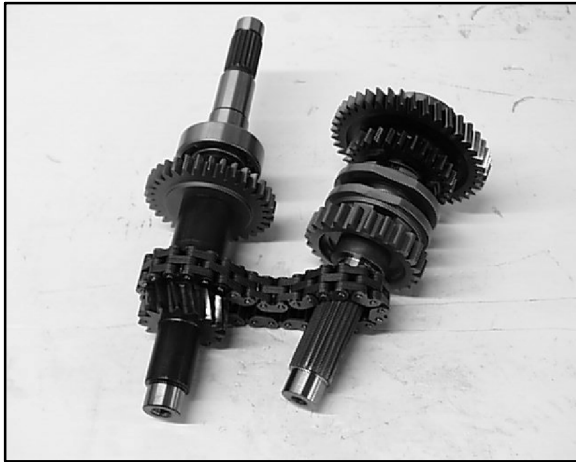




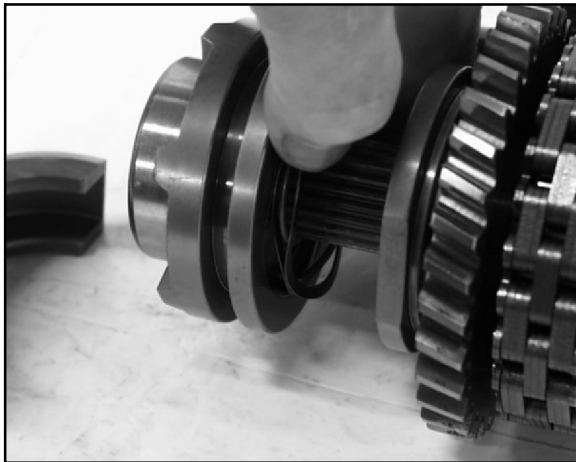


**NOTE:** Install a new snap ring at this time. When installing the new snap ring, open the the snap ring just far enough to go over the shaft, to avoid stressing the snap ring. If the snap ring is over-stressed, it could come off the shaft and cause internal damage to the transmission.

- Slide the reverse shaft assembly through the silent chain.



- Install a new needle bearing, the low gear, the thrustwasher and the snap ring. Use of a new snap ring is recommended.
- Install the engagement dogs, wave springs, and bearing.



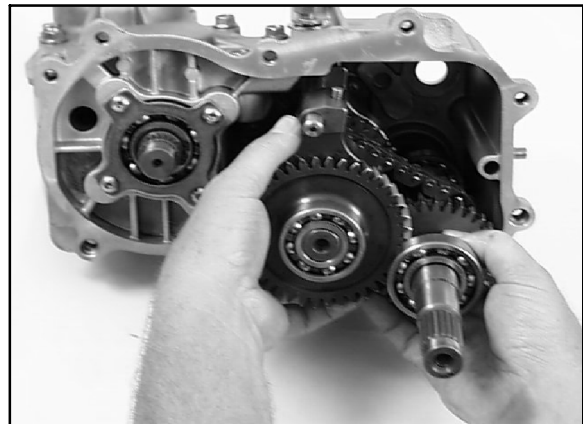
- Install the ball bearing onto the end of the input shaft.
- As the engagement dogs are installed onto the shaft, place the wave springs into the spring groove. Keep the spring in place while the fork is being installed on the shaft and while placing the shafts into the case.



**NOTE:** Use caution when installing the fork, as the spring can easily fall out.

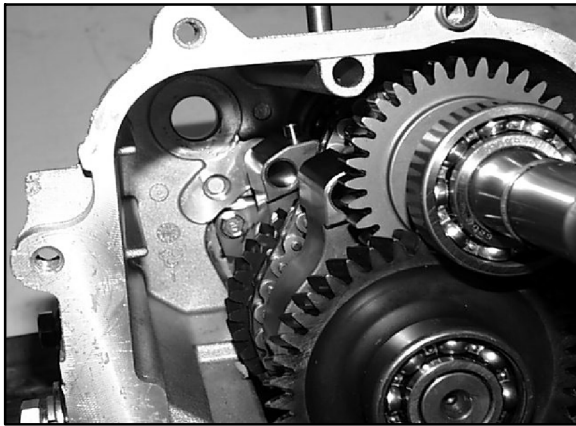
**NOTE:** Installing the shift rail will aid in keeping the shift forks, shift dogs, and the springs in place.

- Carefully install the shaft assembly and gear cluster as a unit into their respective bearing case recesses. Tap with a soft face hammer to seat shaft assemblies.

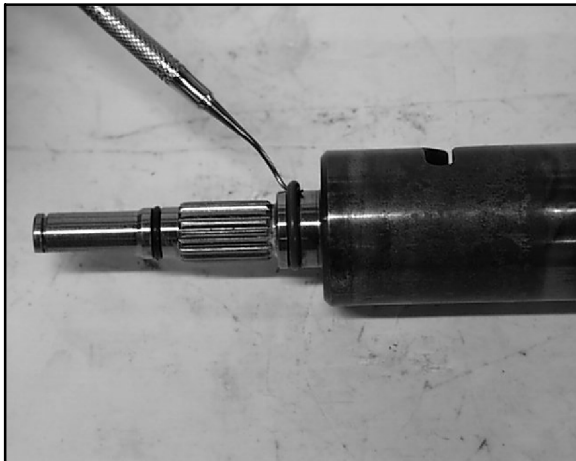




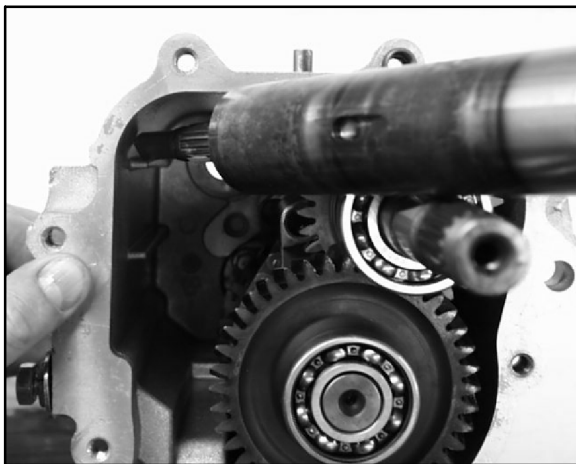
16. Position the shift forks up and so the the pins point toward the 9 o'clock position, before installing the shift drum assembly.



17. Replace and grease the O-rings on the shift drum before installation.

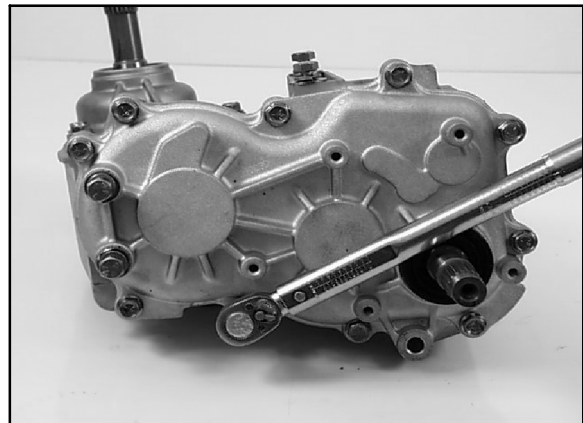


18. Install the shift drum into the case.



**NOTE:** Make sure shift shaft pins are properly positioned in the slot on selector arms.

19. Lift the shift rail slightly and rotate the rail/fork assembly so it meshes with the tracks on the shiftdrum. Be sure the wave springs are properly in place and that the shift rail is seated into the pocket on the backside of the case.
20. Install the helical gear and bearing onto the pinion shaft.
21. Clean the mating surfaces of the case and cover. Apply Crankcase Sealant (**PN 2871557**) to the mating surfaces. Be sure the locating pins (knock pipes) are in place. Reinstall cover, LH mounting bracket and torque bolts in a criss-cross pattern in 3 steps to 27-34 ft. lbs. (36.50-46 Nm).



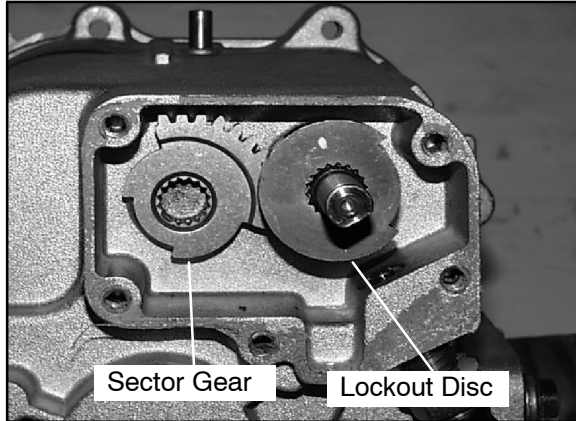
**Front Cover Bolt Torque:  
27-34 ft. lbs. (36.50-46 Nm)**

22. Grease the seal lips of the input shaft seal. Apply electricians tape or somehow cover the splines of the shaft to protect the seal lips during installation. Install new input shaft seal.
23. Install drain plug with a new sealing washer. Torque drain plug to 14-18 ft. lbs. (19-24 Nm).

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

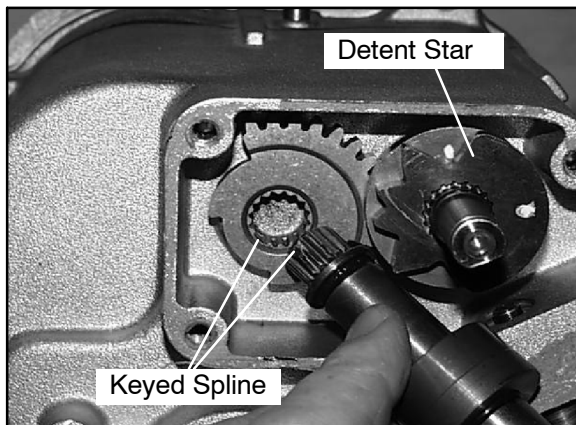


24. Place a small amount of grease (PN 2871551) into the pocket before installing the sector gear. Install the shift gear (16T) on the shift drum shaft. Install the sector gear in the bushing pocket on the left side. Aligning the timing marks on the gears.

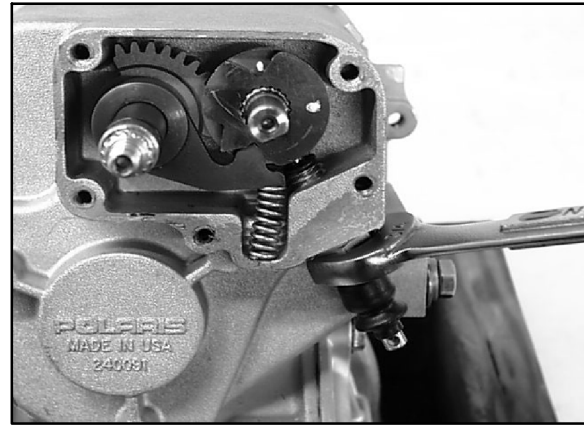


**NOTE:** Note the location of the skip tooth on the splines. Apply a light coating of grease on the gear teeth.

25. Install the lockout disc. Use the white marks that were previously applied for reference.
26. Install the shift shaft and the detent star. Note the keyed spline on the end of the shaft.

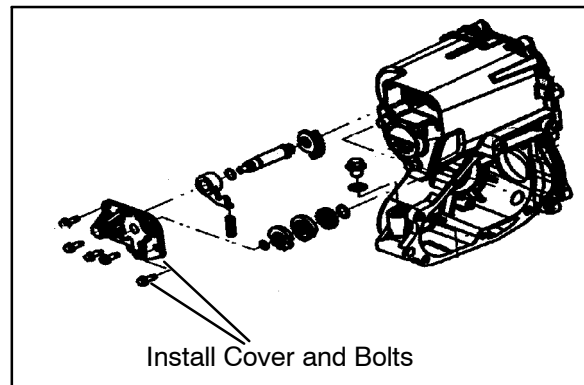


27. Install the detent pawl and spring. Install a new o-ring onto the shift shaft after the detent pawl is assembled to the shaft. Place a small amount of grease on the small O-ring on the shift shaft and on the detent star. Grease the o-ring on the end of the shift drum.

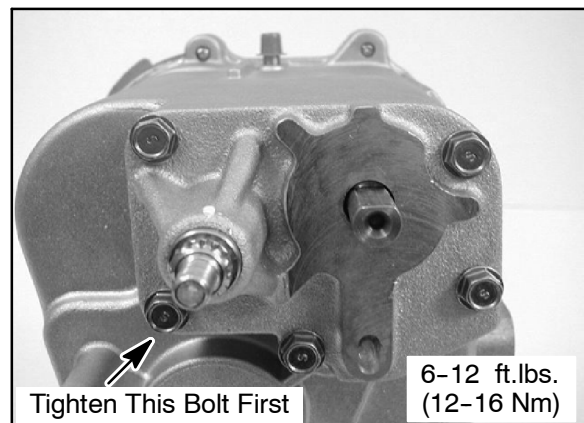


28. Install the park lockout assembly. Torque park lockout to 12 - 14 ft. lbs. (16-19 Nm).

29. Apply Crankcase Sealant (PN 2871557) onto the cover and case mating surfaces. Install the cover and hand tighten all of the bolts.



30. Tighten the bolt shown below first. This helps to align the cover and shafts to ensure smoother and precise shifting. Torque the bolt to 6-12 ft. lbs. (12-16 Nm).



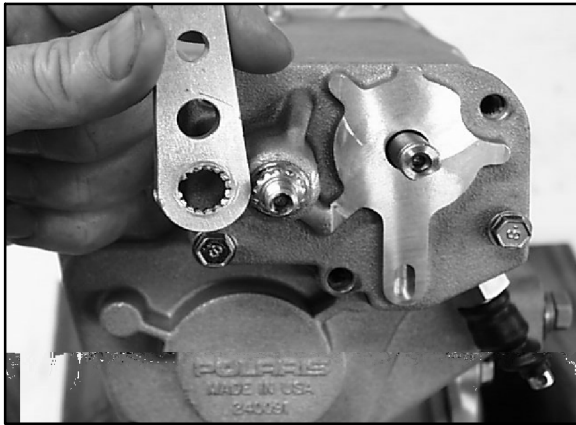


31. Torque the remaining bolts to 6-12 ft.lbs. (12-16 Nm).

**Cover Bolt Torque:**

**6-12 ft. lbs. (12-16 Nm)**

32. Install a new bellcrank onto the shift shaft. Note the keyed spline on the bellcrank and shaft. Install the washer and nut. Torque the bellcrank nut to 12-18 ft. lbs. (16-24 Nm).



**Bellcrank Nut Torque:**

**12-18 ft. lbs. (16-24 Nm)**

33. Install the shift switch. Install the retaining clip. Hook up the switch harness and reconnect the lockout plunger spring.



**NOTE:** Rotate the bellcrank to line the flat side of the switch up to the flat side of the shaft.

34. Install transmission and add Polaris AGL Gearcase Lubricant (**PN 2873602**) in the recommended amount. Refer to Maintenance Chapter 2 for more information.



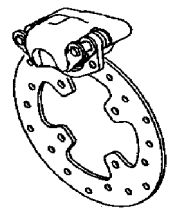


# **CHAPTER 9**

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## **BRAKES**

Special Tools/Specifications/Torques .....	9.2
Brake System Components .....	9.3
Rear Caliper Exploded View .....	9.4
Front Caliper Exploded View .....	9.4
Rear Auxiliary Master Cylinder Exploded View ..	9.5
Brake System Service Notes .....	9.5
Brake Noise Troubleshooting .....	9.5
Hydraulic Brake System Overview .....	9.6-9.7
Hydraulic Caliper Bleeding .....	9.7
Brake Bleeding / Fluid Change .....	9.7-9.9
Master Cylinder Removal .....	9.9
Master Cylinder Installation .....	9.9-9.10
Front Pad Removal .....	9.10-9.11
Front Pad Assembly .....	9.12-9.13
Brake Burnishing .....	9.13
Front Disc Inspection .....	9.13
Front Disc Removal/Replacement .....	9.13-9.14
Front Caliper Removal .....	9.14
Front Caliper Disassembly .....	9.14-9.15
Front Caliper Inspection .....	9.15
Front Caliper Reassembly .....	9.15-9.16
Front Caliper Installation .....	9.17
Rear Pad Removal .....	9.17-9.18
Rear Pad Installation .....	9.18
Rear Caliper Removal/Inspection .....	9.19-9.20
Rear Caliper Reassembly .....	9.20-9.21
Rear Disc Inspection .....	9.21
Rear (Auxiliary) Brake Remove/Install .....	9.22
Troubleshooting .....	9.23





**SPECIAL TOOLS**

PART NUMBER	TOOL DESCRIPTION
2870975	Mity Vac™ Pressure Test Tool

**SPECIFICATIONS**

Front Brake Caliper		
Item	Standard	Service Limit
Brake Pad Thickness	.298" / 7.6mm	.180" / 4.6mm
Brake Disc Thickness	.150-.165" / 3.81-4.19mm	.140" / 3.556mm
Brake Disc Thickness Variance Between Measurements	-	.002" / .051mm
Brake Disc Runout	-	.010" / .254mm

Rear Axle Brake Caliper		
Item	Standard	Service Limit
Brake Pad Thickness	.318" / 7.6mm	.180" / 4.6mm
Brake Disc Thickness	.150-.165" / 3.81-4.19mm	.140" / 3.56mm
Brake Disc Thickness Variance Between Measurements	-	.002" / .051mm
Brake Disc Runout	-	.010" / .254mm

Master Cylinder I.D. - Front	.750"
Master Cylinder I.D. - Aux. Rear	.500"

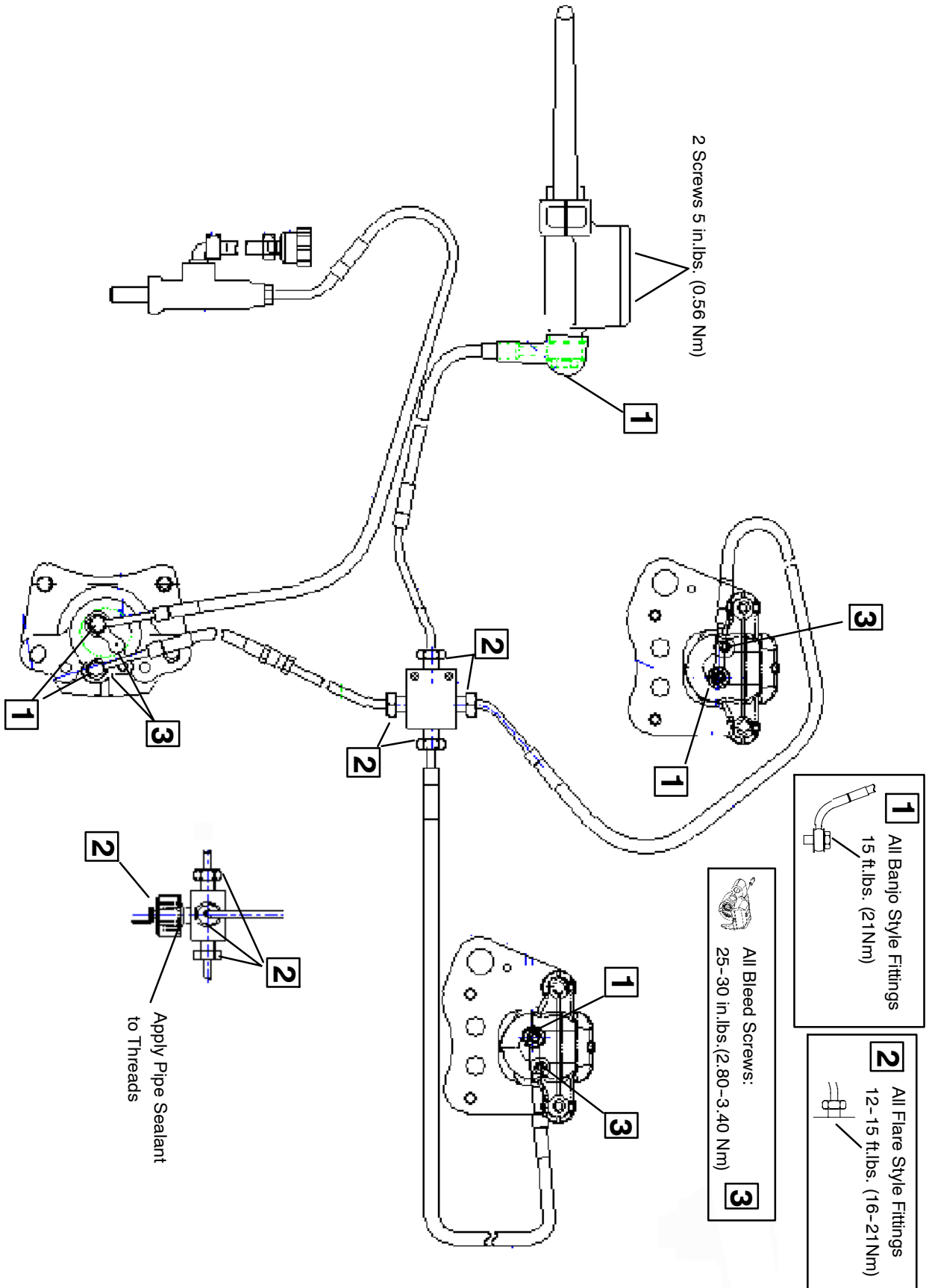
**TORQUE SPECIFICATIONS**

Item	Torque (ft. lbs. except where noted*)	Torque (Nm)
Front/Rear Caliper Mounting Bolts	18.0	24
Handlebar Master Cylinder Clamp Bolts	*25 in. lbs.	3.0
Hand Master Cylinder Reservoir Cover Bolt	*5 in. lbs.	0.56
Brake Line Banjo Bolt	15.0	21
Front Brake Disc Bolts	18.0	24

**NOTE:** Refer to the tightening procedures in this chapter when torquing the bolts. Some special procedures are used when torquing certain bolts and fasteners.

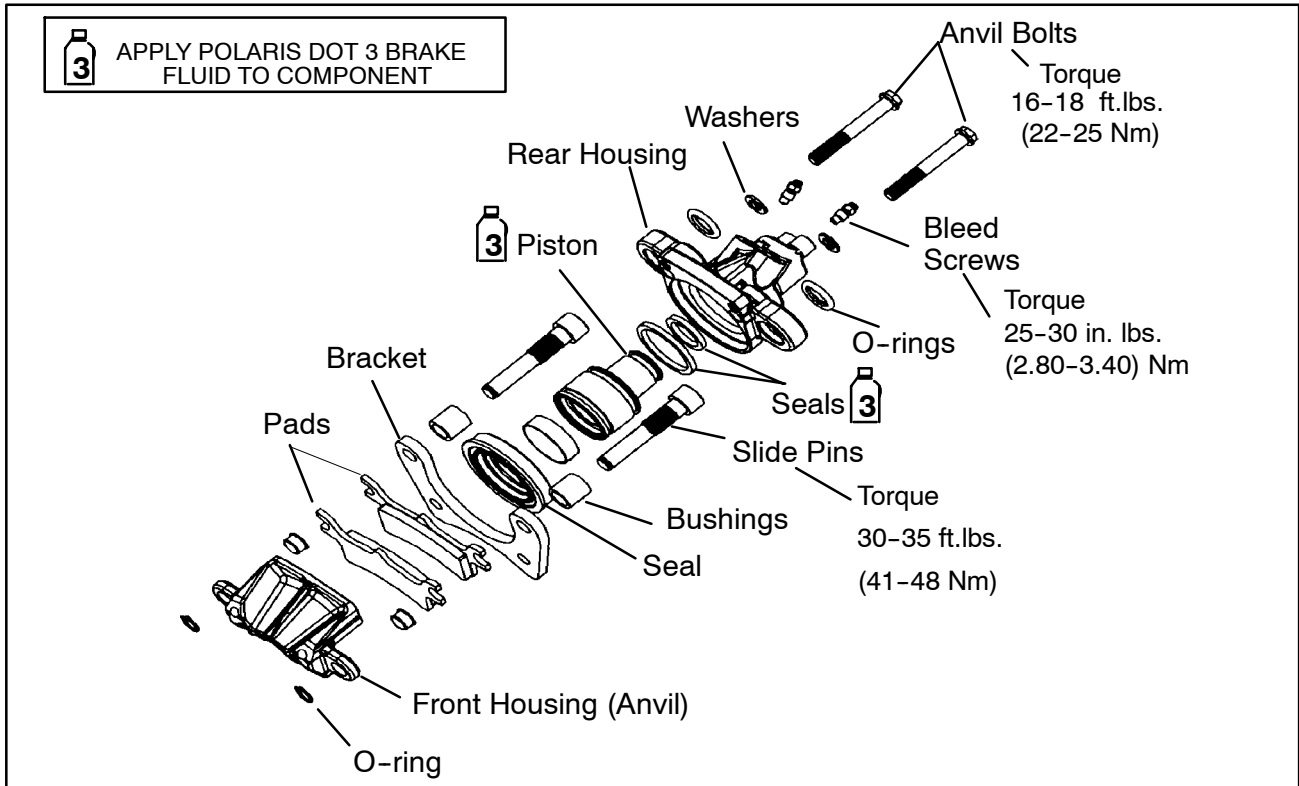


# BRAKE SYSTEM MAIN COMPONENTS

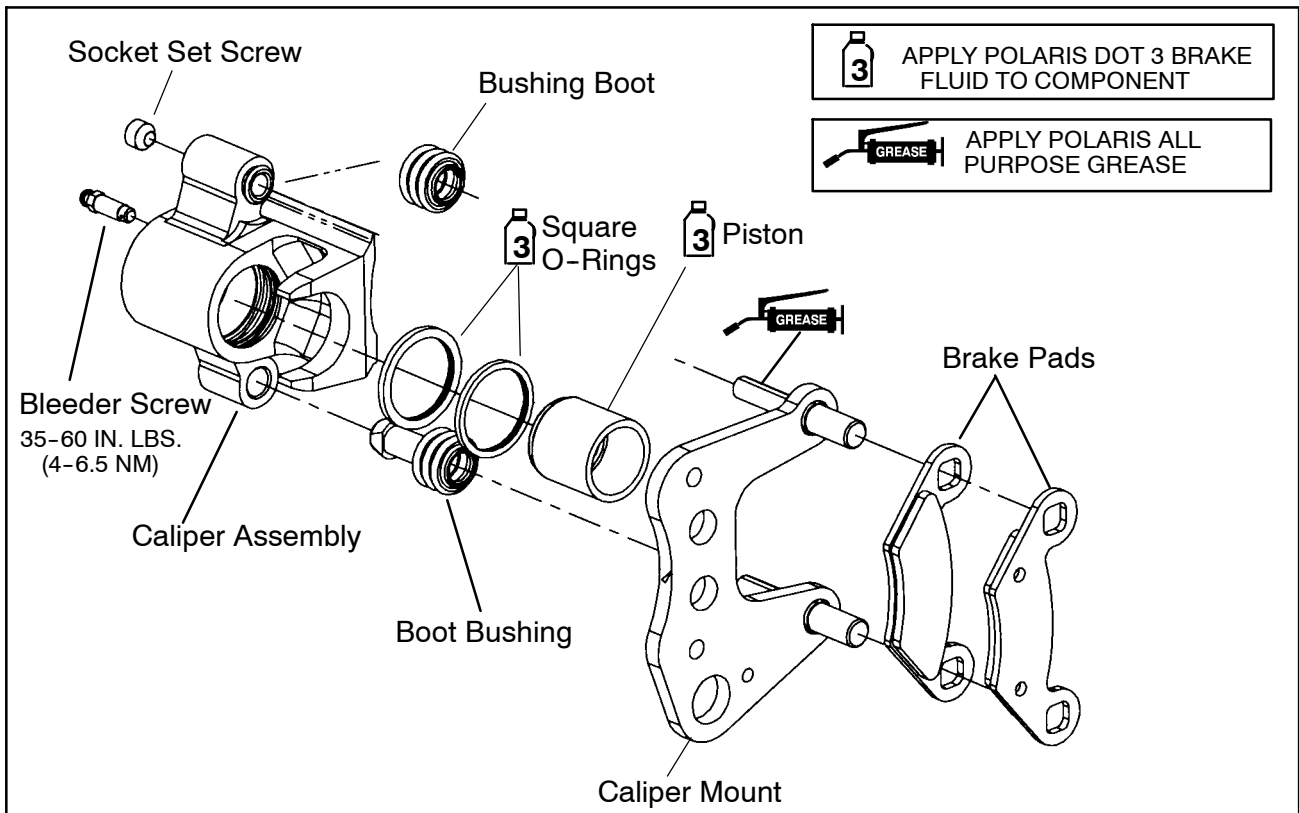




**REAR BRAKE CALIPER EXPLODED VIEW**



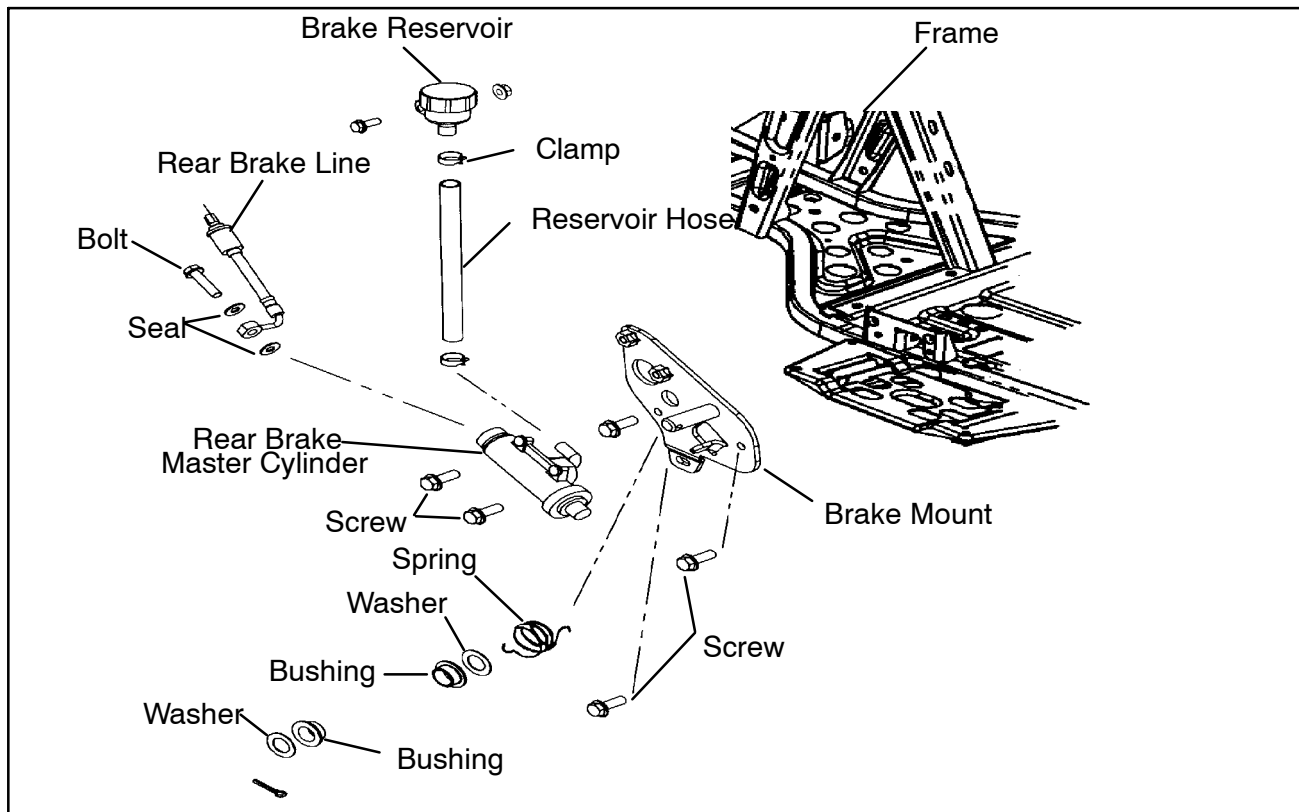
**FRONT BRAKE CALIPER EXPLODED VIEW**







## REAR AUXILIARY MASTER CYLINDER



### **BRAKE SYSTEM SERVICE NOTES**

Polaris disc brake systems are light weight, low maintenance and perform well in the conditions ATVs routinely encounter. However, 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.

- Perform a brake burnishing procedure after installing new pads to maximize 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 lever and 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.

#### **CAUTION:**

Use only DOT 3 brake fluid as an assembly aid for all procedures described in this chapter to prevent brake system contamination. DO NOT USE LUBRICANTS OF ANY KIND FOR ASSEMBLY, AS THEIR USE CAN CAUSE RUBBER COMPONENTS TO SWELL.

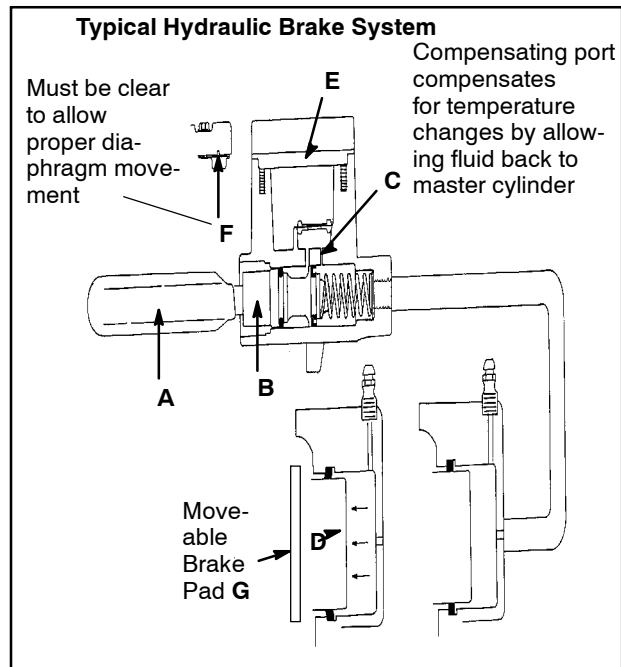
### **BRAKE NOISE TROUBLESHOOTING**

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 Brake Kleen™ or equivalent non-flammable aerosol brake cleaner. Remove pads and/or disc hub to clean imbedded material from disc or pads.
<u>Pad(s) dragging on disc (noise or premature pad wear)</u>	Adjust pad stop (front calipers) Check position of controls & switches.
Improper adjustment	Set to proper level
Insufficient lever or pedal clearance	Clean compensating port Inspect.
Master cylinder reservoir overfilled	Repair as necessary Clean piston(s) seal
Master cylinder compensating port restricted	Educate operator
Master cylinder piston not returning completely	
Caliper piston(s) not returning	
Operator error (riding the brake / park brake applied)	
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 (chain, axle, hub, disc or wheel)	If noise does not change when brake is applied check other sources. Inspect and repair as necessary
Wrong pad for conditions	Change to a softer or harder pad

## HYDRAULIC BRAKE SYSTEM OPERATION OVERVIEW



The Polaris disc brake system consists of the following components or assemblies: brake lever; master cylinder; hydraulic hose; brake calipers (slave cylinder); brake pads; and brake discs, which are secured to the drive line.

When the hand activated brake lever (A) is applied it contacts piston (B) within the master cylinder. As the master cylinder piston moves inward it closes a small opening (compensating port C) within the cylinder and starts to build pressure within the brake system. As the pressure within the system is increased, the piston (D) located in the brake caliper moves outward and applies pressure to the brake pad. This pad contacts the brake disc and moves the caliper in its floating bracket, pulling the stationary side pad into the brake disc. The resulting friction reduces brake disc and vehicle speed. As the lever pressure is increased, the braking affect is also increased.

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 (C) which is opened and closed by the master cylinder piston assembly. The port is open



when the lever is released and the master cylinder piston is outward. As the temperature within the hydraulic system changes, this port compensates for fluid expansion (heated fluid) or contraction (cooled fluid). During system service, be sure this port is open. 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!** Fill to 1/4" - 5/16" (.64 - .80 cm) from top of the cylinder.

This system also incorporates a diaphragm (E) as part of the cover gasket; and a vent port (F) located between the gasket and the cover. The combination diaphragm and vent allow for the air above the fluid to equalize pressure as the fluid expands or contracts. Make sure the vent is open and allowed to function. If the reservoir is over filled or the diaphragm vent is plugged the expanding fluid may build pressure in the brake system leading to brake failure.

When servicing Polaris ATV brake systems, use only Polaris DOT 3 Brake Fluid (PN 2870990).

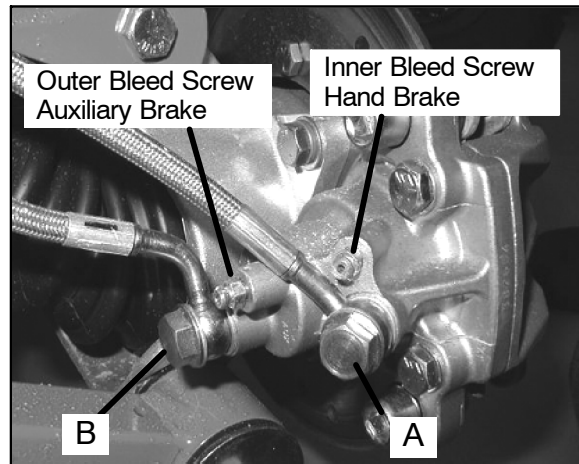
**WARNING:** Once a bottle is opened, use what is necessary and discard the rest in accordance with local laws. Do not store or use a partial bottle of brake fluid. Brake fluid is hygroscopic, meaning it rapidly absorbs moisture. This causes the boiling temperature of the brake fluid to drop, which can lead to brake fade and the possible loss of control.

## HYDRAULIC CALIPER BLEEDING

The front calipers a single piston conventional design. The rear caliper piston is a "T"-shaped, which allows both hand and foot brake to use the same caliper piston, but remain separated by seals. The hand brake system applies hydraulic pressure to both front calipers and only the *outer* diameter of the rear caliper pistons. The auxiliary (foot) brake applies pressure to the inner portion of the rear caliper pistons. Because the hand and foot brake hydraulic systems are separate, there are also two bleed screws - one for the outer fluid chamber (hand brake), and one for the inner fluid chamber (foot brake). The basic procedure for bleeding the brake system is the same as outlined on page 9.7 - 9.8, however, each system must be bled separately.

Hydraulic Auxiliary Brake inspection and adjustment is outlined in Chapter 2 beginning on Page 2.28.

**NOTE:** Uppermost (inner) bleed screw and brake line (A) is for hand brake system. Lower (outer) bleed screw and brake line (B) is for auxiliary (foot) brake system.



## BRAKE BLEEDING - FLUID CHANGE

**NOTE:** When bleeding the brakes or replacing the fluid, always start with the caliper farthest from the master cylinder.

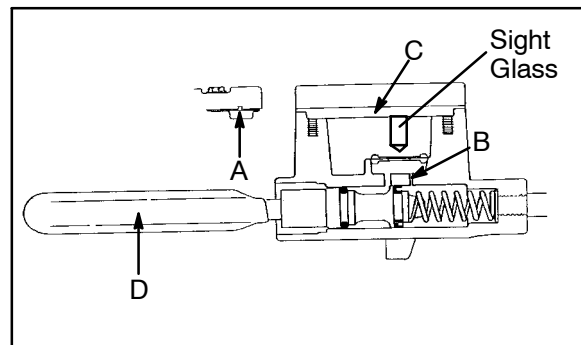
**CAUTION:**

*Always wear safety glasses during these procedures. Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.*

**NOTE:** Do not remove brake lever when reservoir fluid level is low.

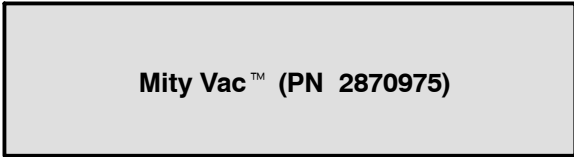
This procedure should be used to change fluid or bleed brakes during regular maintenance.

1. Clean reservoir cover thoroughly.
2. Remove screws, cover and diaphragm (C) from reservoir.
3. Inspect vent slots (A) in cover and remove any debris or blockage.

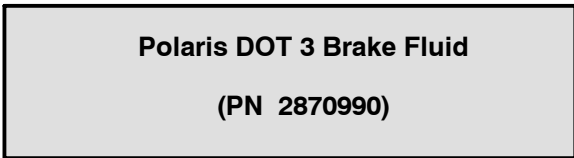




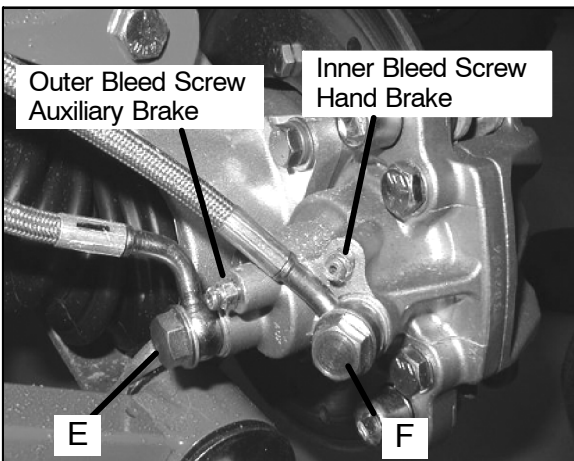
- If changing fluid, remove old fluid from reservoir with a Mity Vac™ pump or similar tool.



- Add brake fluid to the indicated MAX level inside reservoir.



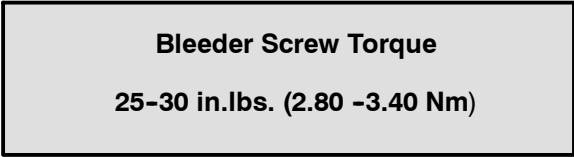
- Begin bleeding procedure with the caliper that is farthest from the master cylinder. Install a box end wrench on caliper bleeder screw. Attach a clean, clear hose to fitting and place the other end in a clean container. Be sure the hose fits tightly on fitting. (E) is Auxiliary Brake Line, (F) is Hand Brake Line.



## BRAKE BLEEDING CONT'D

**NOTE:** Fluid may be forced from supply port (B) when brake lever is pumped. Place diaphragm (C) in reservoir to prevent spills. Do not install cover. See Illustration above.

- Slowly* pump brake lever (D) until pressure builds and holds.
- While maintaining lever pressure, open bleeder screw. Close bleeder screw and release brake lever. **NOTE:** Do not release lever before bleeder screw is tight or air may be drawn into caliper.

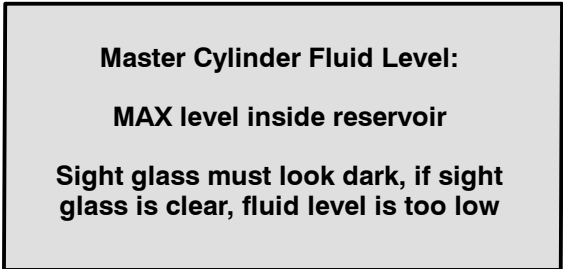


- Repeat procedure until clean fluid appears in bleeder hose and all air has been purged. Add fluid as necessary to maintain level in reservoir.

### CAUTION:

Maintain at least 1/2" (1.27 cm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

- Tighten bleeder screw securely and remove bleeder hose. Torque the bleeder screw to 25-30 in.lbs. (2.80 -3.40 Nm).
- Repeat procedure Steps 5-9 for the remaining caliper(s).
- Add Polaris Dot 3 Brake Fluid (PN 2870990) to MAX level inside reservoir.





13. Install diaphragm, cover and screws. Tighten screws to specification 5 in. lbs. (0.56 Nm).



**Reservoir Cover Torque -**  
**5 in. lbs. (.56 Nm)**

14. Field test machine at low speed before putting into service. Check for proper braking action and lever reserve. With lever firmly applied, lever reserve should be no less than 1/2" (1.3 cm) from handlebar.
15. Check brake system for fluid leaks and inspect all hoses and lines for wear or abrasion. Replace hose if wear or abrasion is found.

## MASTER CYLINDER REMOVAL

1. Clean master cylinder and reservoir assembly. Make sure you have a clean work area to disassemble brake components.



2. Place a shop towel under brake line connection at master cylinder. Loosen banjo bolt; remove bolt and sealing washers.

### **CAUTION:**

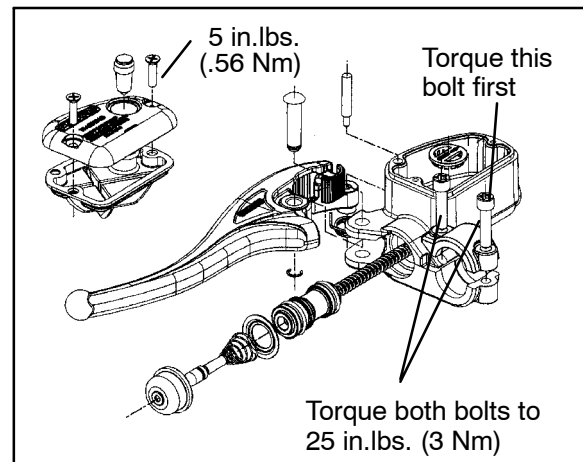
Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.

3. Remove master cylinder from handlebars.
4. Hold brake upright and continue to remove master cylinder. Cover brake line to avoid spillage.

## MASTER CYLINDER INSTALLATION

**Notice:** When replacing the brake master cylinder assembly or master cylinder parts, use the correct parts. There are different brake master cylinders for the different Polaris ATV models. Refer to your parts manual or guide for the correct parts. ***This master cylinder is not serviceable and is replaced as a unit.***

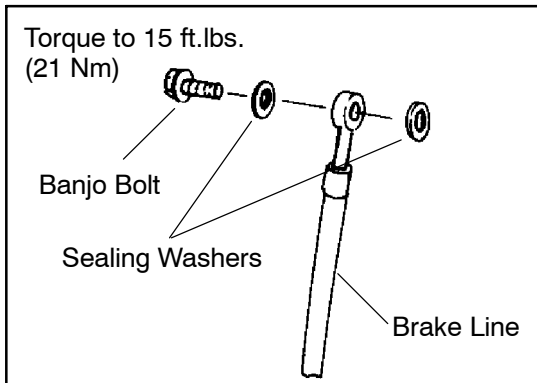
1. Install master cylinder on handlebars. Torque mounting bolts to 25 in. lbs. (3 Nm). Torque the inside bolt first as indicated in the illustration to the right.



**NOTE:** To speed up the brake bleeding procedure, the master cylinder can be purged of air before brake line is attached. Fill with DOT3 Brake Fluid (PN 2870990) and pump lever slowly two to three times with finger over the outlet end to purge master cylinder of air.



- Place new sealing washers on each side of banjo line and torque banjo bolt to specification.



**Hand Master Cylinder Clamp Bolt  
Torque 25 in. lbs. (3 Nm)**

**Brake Line Banjo Bolt Torque  
15 ft. lbs. (21 Nm)**

- Fill reservoir with DOT3 Brake Fluid (PN 2870990).



**Polaris DOT 3 Brake Fluid  
(PN 2870990)**

- Follow bleeding procedure on Pages 9.7-9.8. Check all connections for leaks and repair if necessary.

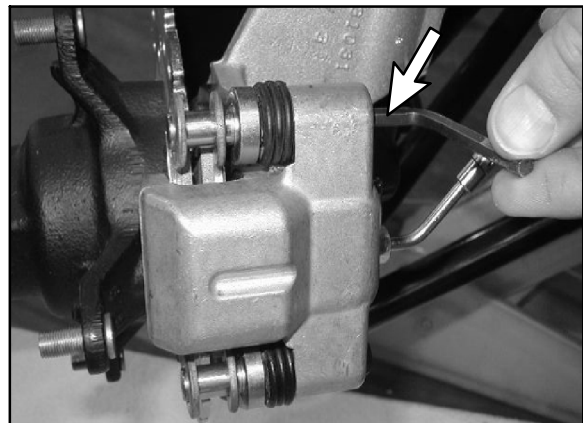
## FRONT PAD REMOVAL

- Elevate and support front of machine.

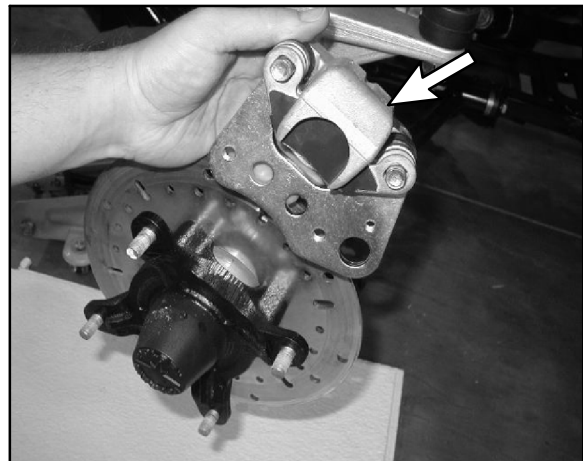
**CAUTION:**

*Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.*

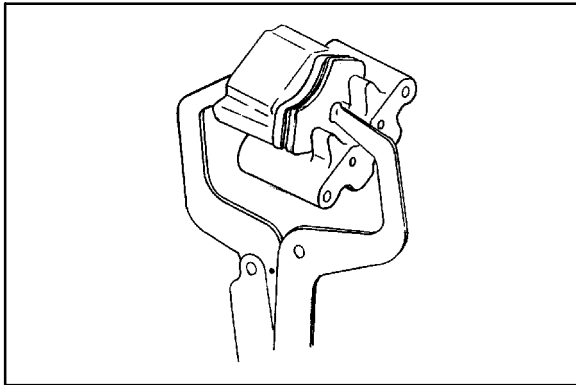
- Remove the front wheel. Loosen pad adjuster screw 2-3 turns.



- Remove caliper from mounting bracket.

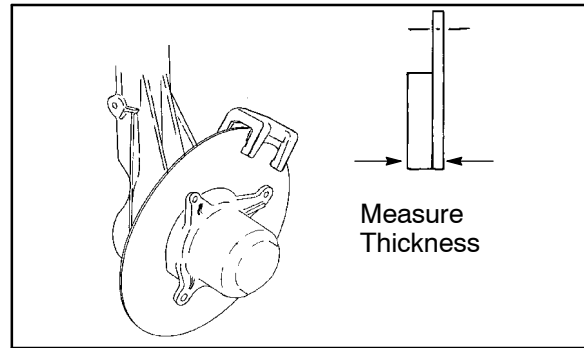


- Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.

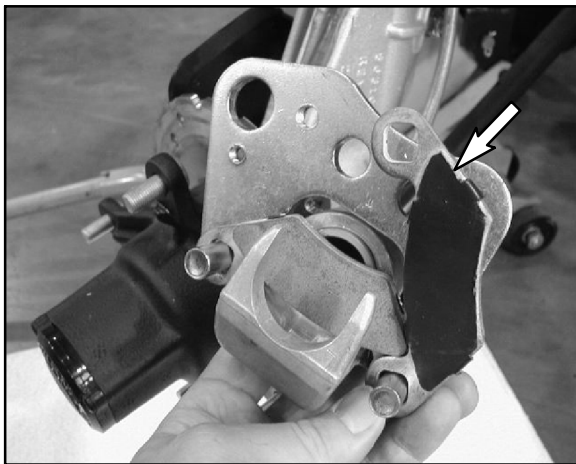


**NOTE:** Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

5. Push mounting bracket inward and slip outer brake pad past edge. Remove inner pad.



**Front Brake Pad Thickness**  
**New** .298" / 7.6 mm  
**Service Limit** .180" / 4.6 mm



6. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.





**FRONT PAD ASSEMBLY**

1. Lubricate mounting bracket pins with a light film of Polaris Premium All Season Grease, and install rubber dust boots.

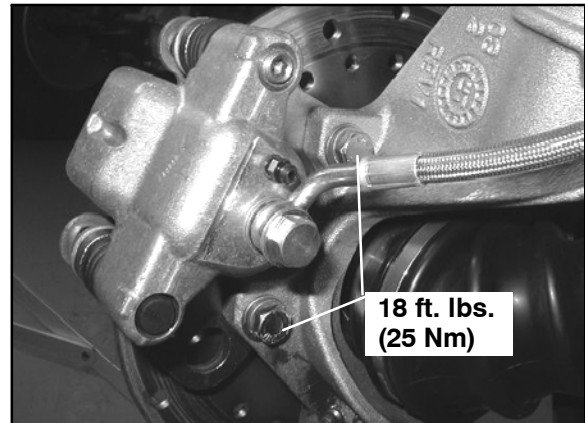


**Polaris Premium All Season Grease  
(PN 2871423)**

2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other. **WARNING:** If the brake pads are contaminated with grease, oil, or liquid soaked do not use the pads, use only new clean pads.

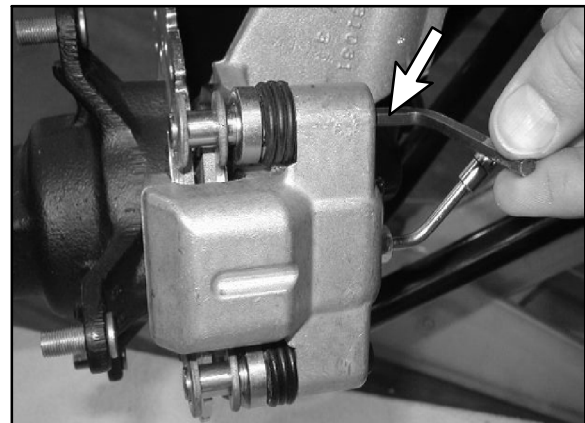


3. Install caliper on hub strut, and torque mounting bolts.



**Front Caliper Mounting Bolts  
Torque: 18 ft. lbs. (24Nm)**

4. Slowly pump the brake lever 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 adjuster 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 wheels and torque wheel nuts.

**Front Wheel Nut Torque:**

**See Page 7.2**

## **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 warpage may result. Repeat this procedure 10 times.

## **FRONT DISC INSPECTION**

1. Visually inspect the brake disc for nicks, scratches, or damage.
2. Measure the disc thickness at eight different points around the pad contact surface using a 0-1" micrometer. Replace disc if worn beyond service limit.



### **Brake Disc Thickness**

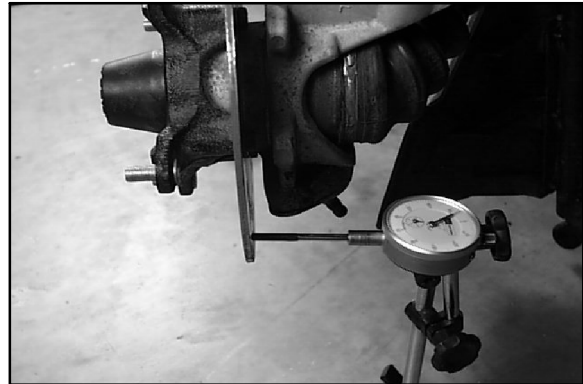
**New .150-.165" (3.810-4.19 mm)**

**Service Limit .140" / 3.556 mm**

### **Brake Disc Thickness Variance**

**Service Limit: .002" (.051 mm)  
difference between measurements.**

3. Mount dial indicator as shown to 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**

## **FRONT BRAKE DISC REMOVAL / REPLACEMENT**

**NOTE: To reduce the possibility of warpage, try removing the brake disc mounting bolts before applying heat to the bolts.**

1. Apply heat to the hub in the area of the brake disc mounting bolts to soften the bolt locking agent.



**18 ft. lbs. (24 Nm)**

new bolts have  
pre-applied  
locking agent.

2. Remove bolts and disc.
3. Clean mating surface of disc and hub.
4. Install disc on hub.
5. Install new bolts and tighten to specified torque.

### **Front Brake Disc Mounting Bolt Torque**

**18 ft. lbs. (24 Nm)**



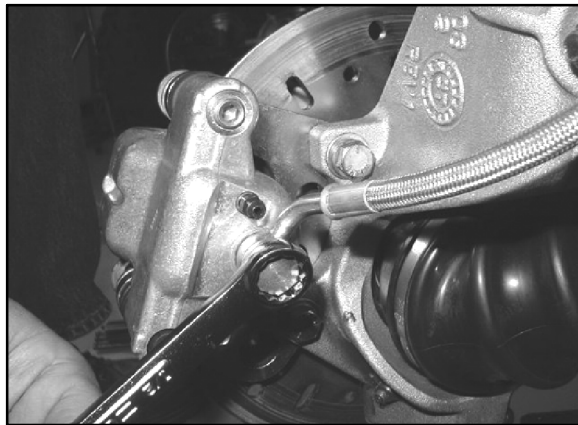
**CAUTION:** Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

## FRONT CALIPER REMOVAL

**CAUTION:**

*Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.*

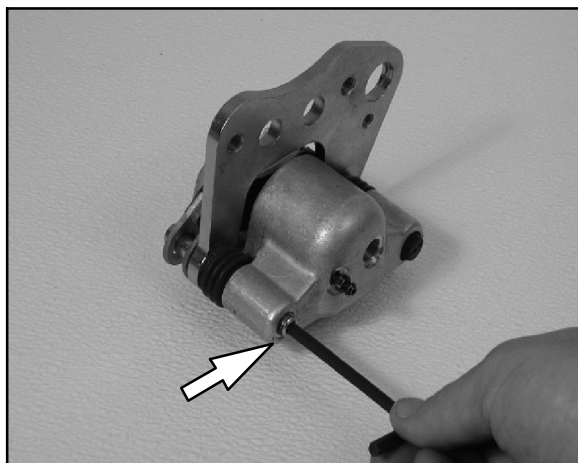
1. Using a line wrench, loosen and remove brake line to caliper. Place a container under caliper to catch fluid draining from brake line.



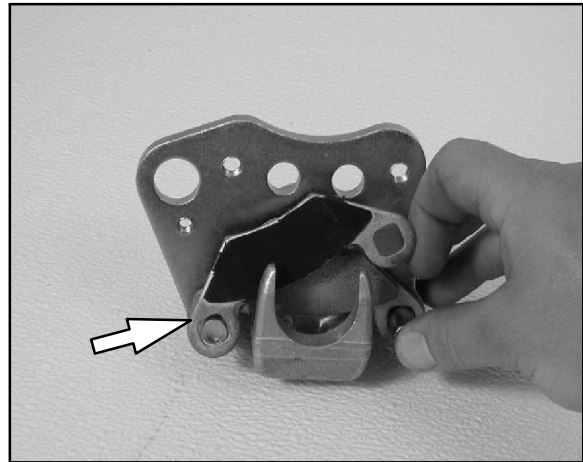
2. Remove the brake caliper mounting bolts.
3. Remove brake caliper and drain fluid into container. Do not reuse brake fluid.

## FRONT CALIPER DISASSEMBLY

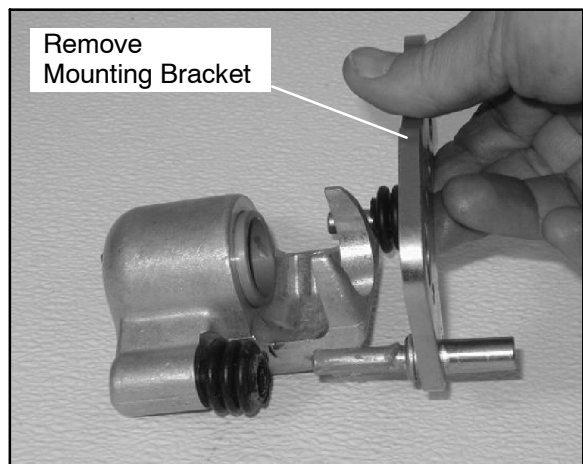
1. Remove brake pad adjuster screw.



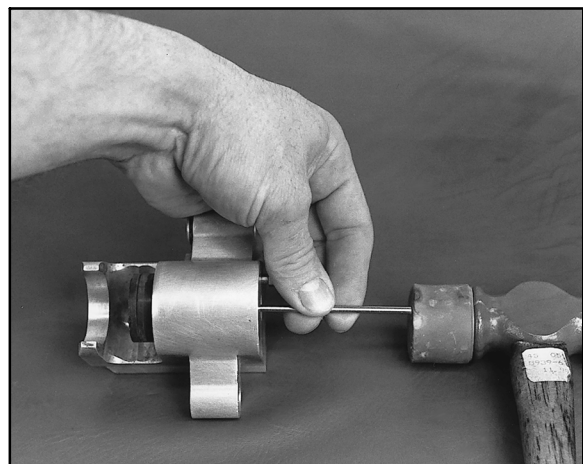
2. Push upper pad retainer pin inward and slip brake pads past edge.



3. Remove mounting bracket, pin assembly and dust boot.



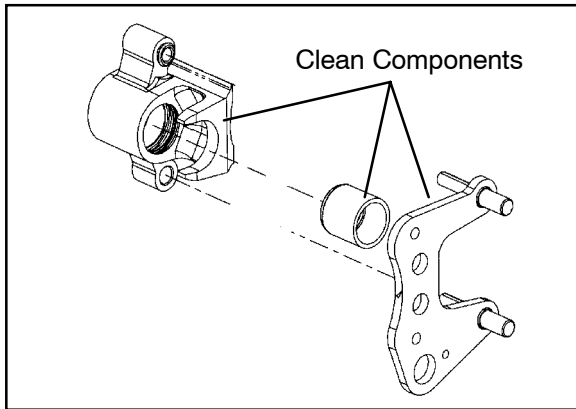
4. Remove piston, dust seal and piston seal.





- Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.

**NOTE:** Be sure to clean seal grooves in caliper body.



## FRONT CALIPER INSPECTION

- 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.

### Front Caliper Piston Bore I.D.

Std. 1.188" (30.2 mm)  
Service Limit 1.193" (30.30 mm)



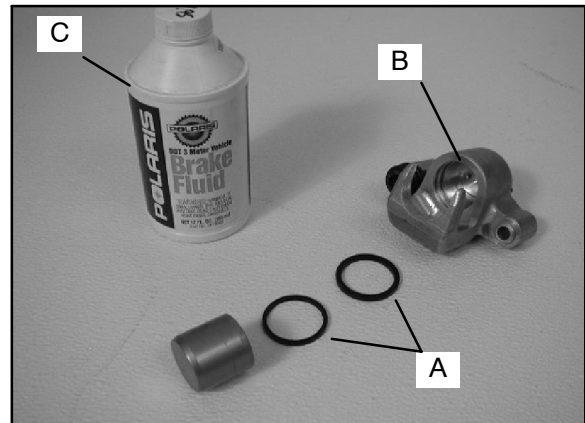
- Inspect piston for nicks, scratches, wear or damage. Measure diameter and replace if damaged or worn beyond service limit.



- Inspect the brake disc and pads as outlined for brake pad replacement this section. See Pages 9.10-9.11.

## FRONT CALIPER REASSEMBLY

- Install new O-rings (A) in the caliper body (B). Be sure groove is clean and free of residue or brakes may drag upon assembly.

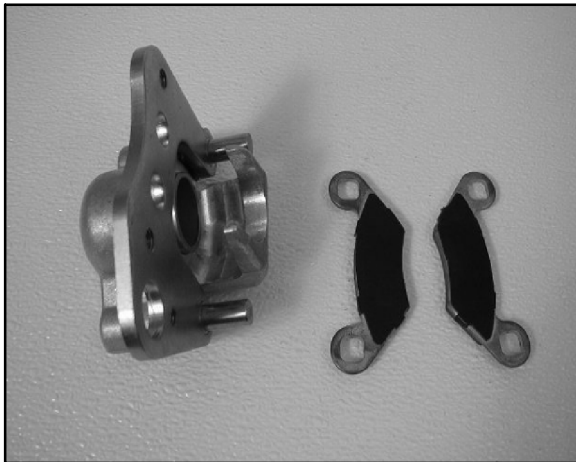


- Coat piston with clean Polaris DOT 3 Brake Fluid (PN 2870990) (C). Install piston (D) with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.
- Lubricate the mounting bracket pins with Polaris Premium All Season Grease, and install the rubber dust seal boots.



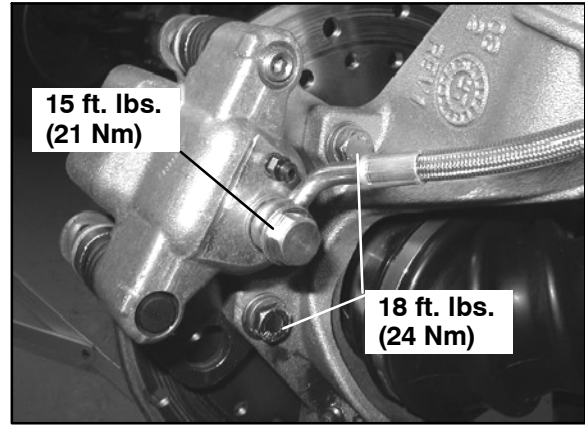
**Polaris Premium All Season Grease  
(PN 2871423)**

4. Compress the mounting bracket and make sure the dust seals are fully seated. Install the pads as shown on Page 9.10. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.



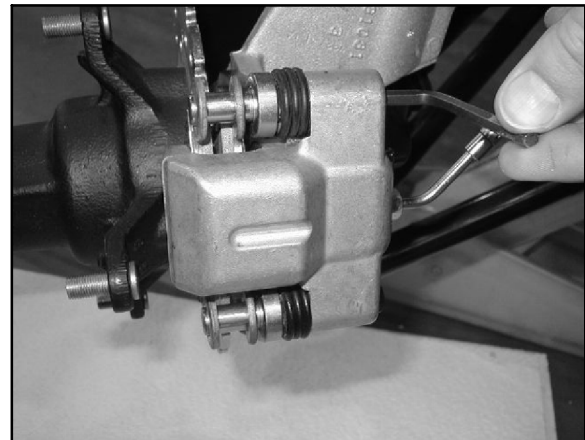
## **FRONT CALIPER INSTALLATION**

1. Install caliper on hub strut, and torque mounting bolts.



**Torque Specifications**  
**Front Caliper Mounting Bolt:**  
 18 ft. lbs. (24 Nm)  
**Front Banjo Bolt Brake Line:**  
 15 ft. lbs. (21 Nm)

2. Install brake line and tighten securely with a line wrench. Torque the banjo brake lines to the proper torque specification.
3. Install the adjuster screw and turn until stationary pad contacts disc, then back off 1/2 turn.



4. Follow brake bleeding procedure outlined on Pages 9.7-9.8.
5. Install wheels and torque wheel nuts to specification.

**Front Wheel Nut Torque:  
See Page 7.2**



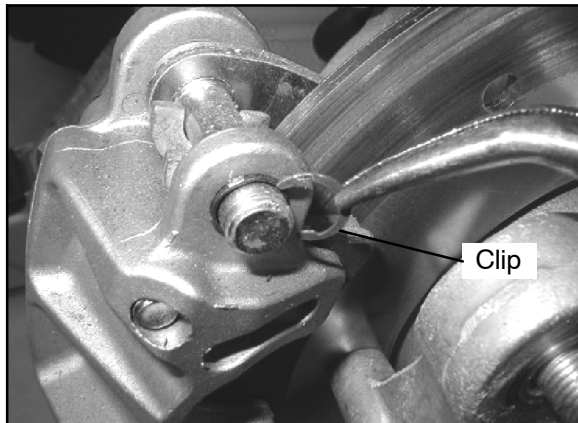
## **BRAKE BURNISHING PROCEDURE**

It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

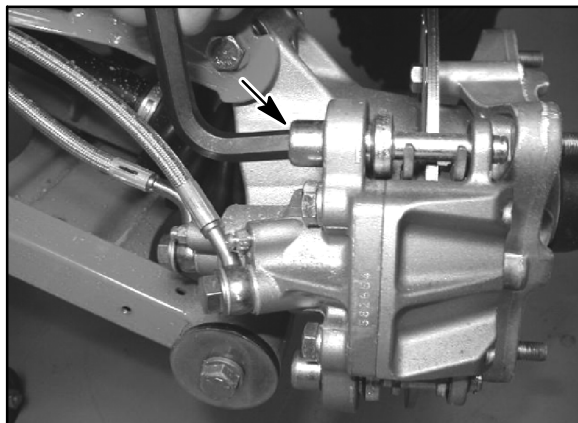
Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warpage may result. Repeat this procedure 10 times.

## **REAR BRAKE PAD REMOVAL**

1. Support the machine. Remove the rear tire.
2. Remove one of the slide pin clips from the slide bolt.

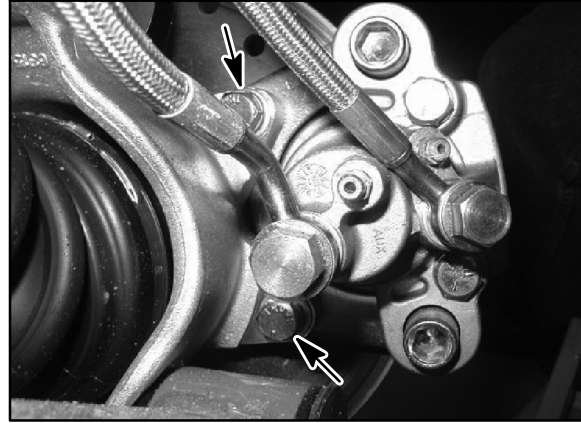


3. Loosen one of the slide pins with a hex wrench.



4. Remove caliper mounting bolts and lift caliper off of disc.

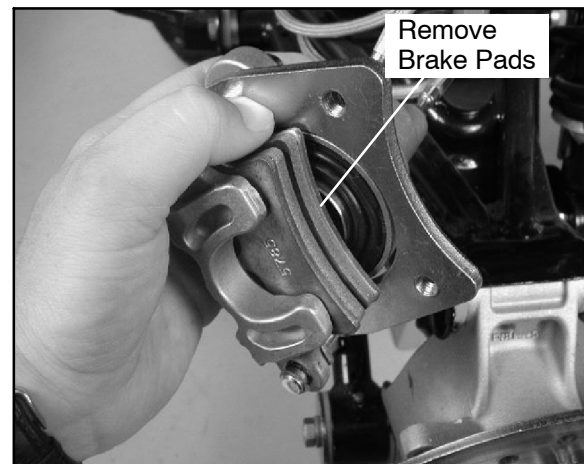
**NOTE:** When removing caliper, be careful not to damage brake line. Support caliper so as not to kink or bend brake line.



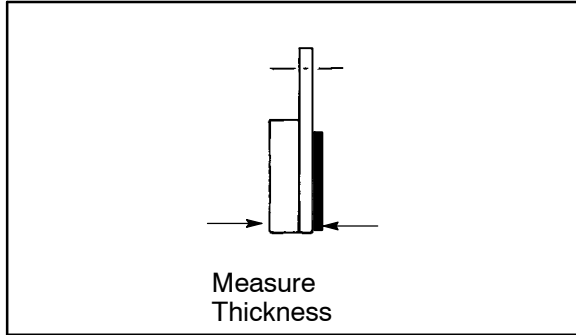
5. Push caliper pistons into caliper bore slowly with pads installed.

**NOTE:** Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

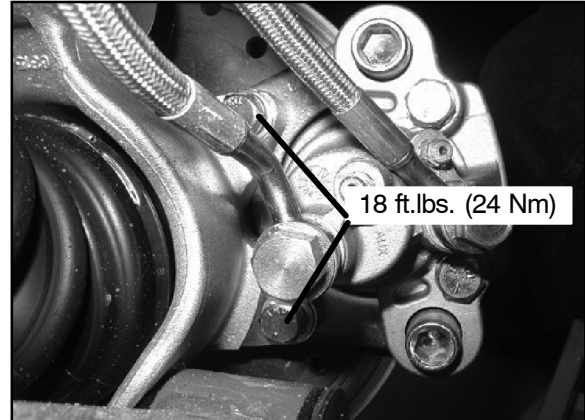
6. Remove the caliper slide pin and remove the brake pads from the caliper.



7. Clean the caliper with brake cleaner or alcohol.
8. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



**Rear Brake Pad Thickness**  
 New: .318" (8.0 mm)  
 Service Limit: .180" (4.6 mm)



**Torque Specifications:**  
**Rear Brake Caliper:**  
 18 ft. lbs. (24 Nm)  
**Caliper Slide Pin Torque:**  
 30-35 ft. lbs. (41 Nm-48 Nm)

## REAR BRAKE PAD INSTALLATION

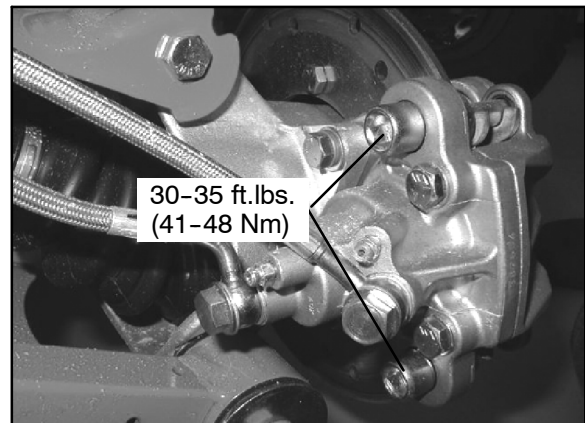
1. Install new brake pads in caliper body.

**WARNING:** If the brake pads are contaminated with grease, oil, or liquid soaked do not use the pads, use only new clean pads.



2. Install and tighten the slide pin with a hex wrench.
3. Install caliper and torque the mounting bolts.

4. Install the slide bolt snap ring. Torque the slide pin to 30-35 ft. lbs. (41 Nm-48 Nm).

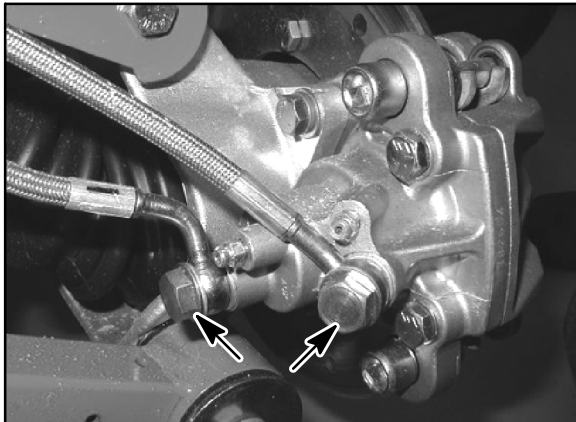


5. Slowly pump the brake lever until pressure has been built up. Maintain at least 1/2" (12.7 mm) of brake fluid in the reservoir to prevent air from entering the master cylinder.
6. It is recommended that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise. Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Repeat procedure 10 times.

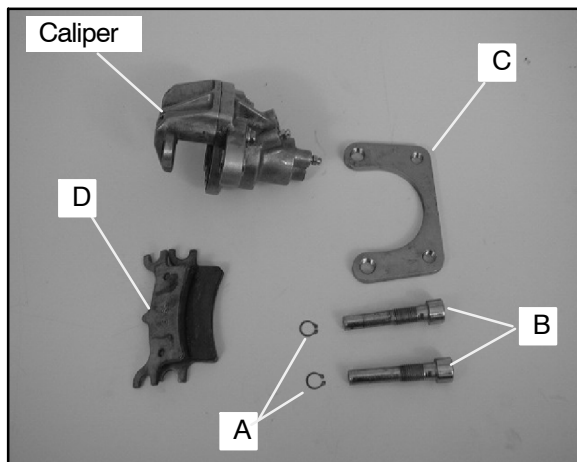


## **REAR CALIPER** **REMOVAL/INSPECTION**

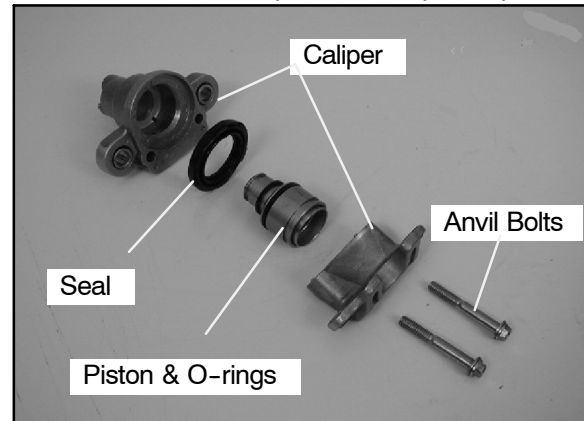
1. Clean caliper area before removal.
2. Using a flare nut wrench, remove hand brake (inner) and auxiliary brake (outer) lines. Place a container to catch brake fluid draining from brake lines.



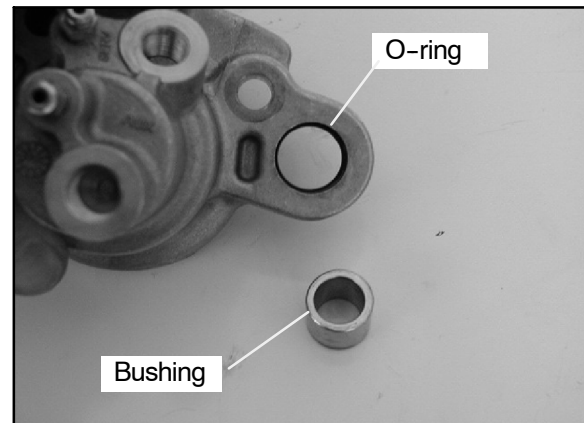
3. Remove the two caliper mounting bolts and the caliper.
4. Remove the slide bolt snap rings (A), the slide pins (B), the bracket pad (C), and the brake pads (D).



5. Remove the anvil bolts and separate caliper halves and remove pistons with piston pliers.

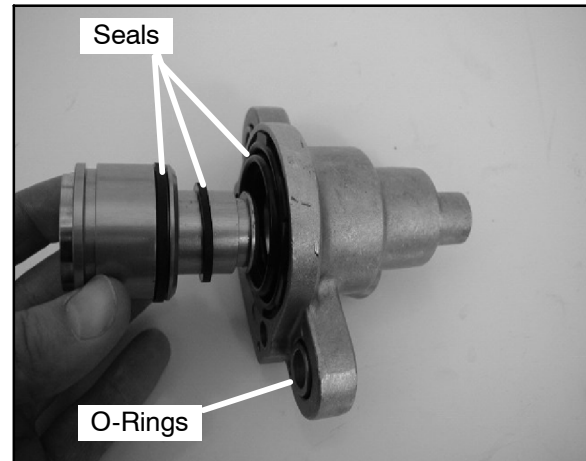
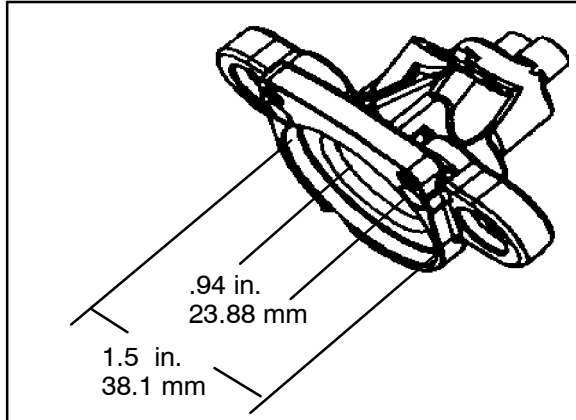


6. Remove seals and O-rings. Clean the O-ring grooves.
7. Clean disc, caliper body, and pistons with brake cleaner or alcohol.
8. Remove the slide bolt bushings. Inspect the bushings and O-rings and replace if necessary.



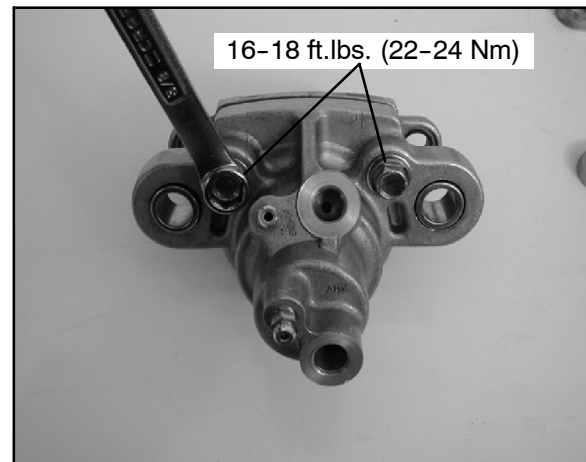
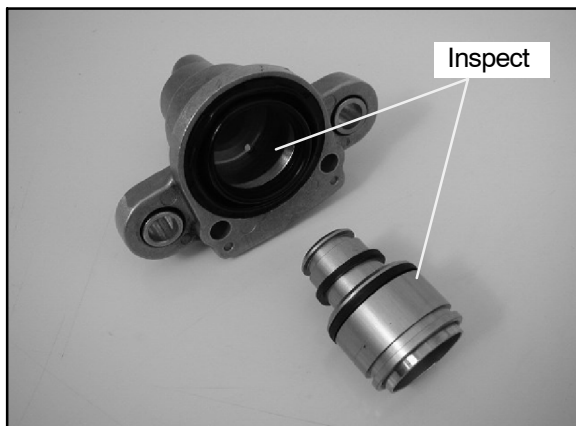
9. Measure the inside diameter of the rear caliper. The caliper body is a 2-step piston. The rear step is measured as well as the outside step.





10. Inspect caliper piston bore for scratches, severe corrosion, or galling and replace if necessary.

2. Carefully assemble caliper body, making sure O-rings are properly positioned in groove. Tighten the caliper anvil bolts and then torque the anvil bolts evenly to 16-18 ft. lbs. (22-24 Nm).



11. Inspect surface of caliper piston for nicks, scratches, or damage and replace if necessary.

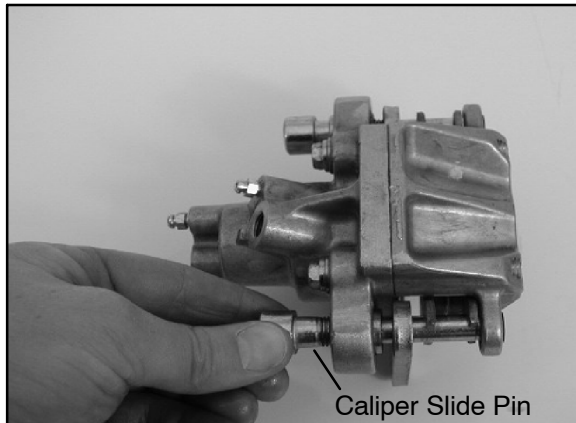
## **REAR CALIPER ASSEMBLY**

1. Install new O-rings in the slide bolt bushing holes. Be sure O-ring and seal grooves are thoroughly cleaned of all residue, or piston may bind in bore. Apply brake fluid to piston seals and install carefully with a twisting motion to ease assembly until fully seated.

**Caliper Anvil Bolt Torque:**  
**16-18 ft. lbs. (22-25 Nm)**

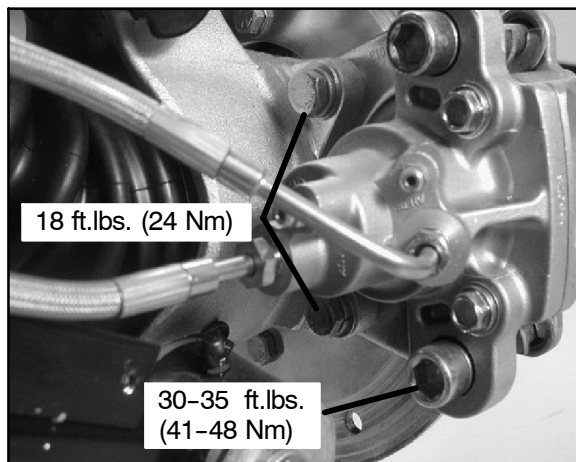
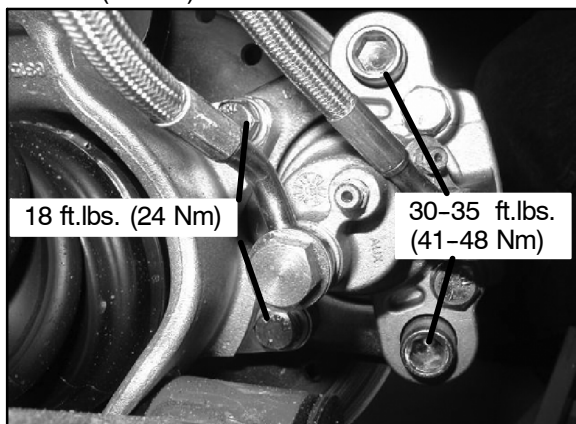
3. Install brake pads in caliper body with friction material facing each other. Install the slide pins and the slide pin retaining ring. Torque the slide pins to 30-35 ft.lbs. (41-48 Nm).  
**NOTE:** The slide pins can be torqued when installed on caliper mount also.





**Caliper Slide Pin Torque:  
30-35 ft. lbs. (41 Nm-48 Nm)**

- 4. Install caliper and torque mounting bolts to 18 ft.lbs (25 Nm).

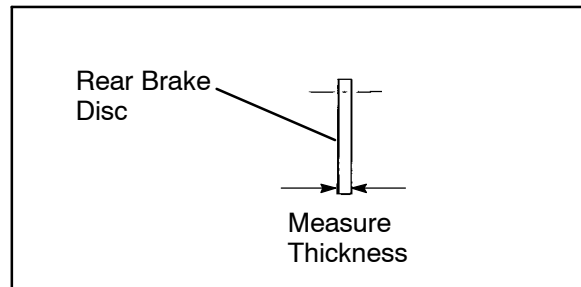


**Caliper Mounting Bolt Torque:  
18 ft. lbs. (24 Nm)**

- 5. Install brake line and tighten securely with a line wrench. Torque the brake lines to the proper torque specification.
- 6. Follow bleeding procedure outlined on Pages 9.6-9.7 of this section and refer to system overview and illustrations on Pages 9.2-9.3.
- 7. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when lever is released. If the brake drags, re-check assembly and installation.

## REAR BRAKE 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 disc thickness at 8 different points around perimeter of disc. Replace disc if worn beyond service limit.



**Brake Disc Thickness**  
New .150-.165" (3.81-4.19 mm)  
Service Limit .140" (3.556 mm)

**Brake Disc Thickness Variance**  
Service Limit .002" (.051 mm)  
difference between measurements

- 3. Mount dial indicator and measure disc runout. Replace the disc if runout exceeds specifications.

**Brake Disc Runout**  
Service Limit .010" / .254 mm



## **REAR (AUXILIARY) BRAKE REMOVAL / INSTALL**

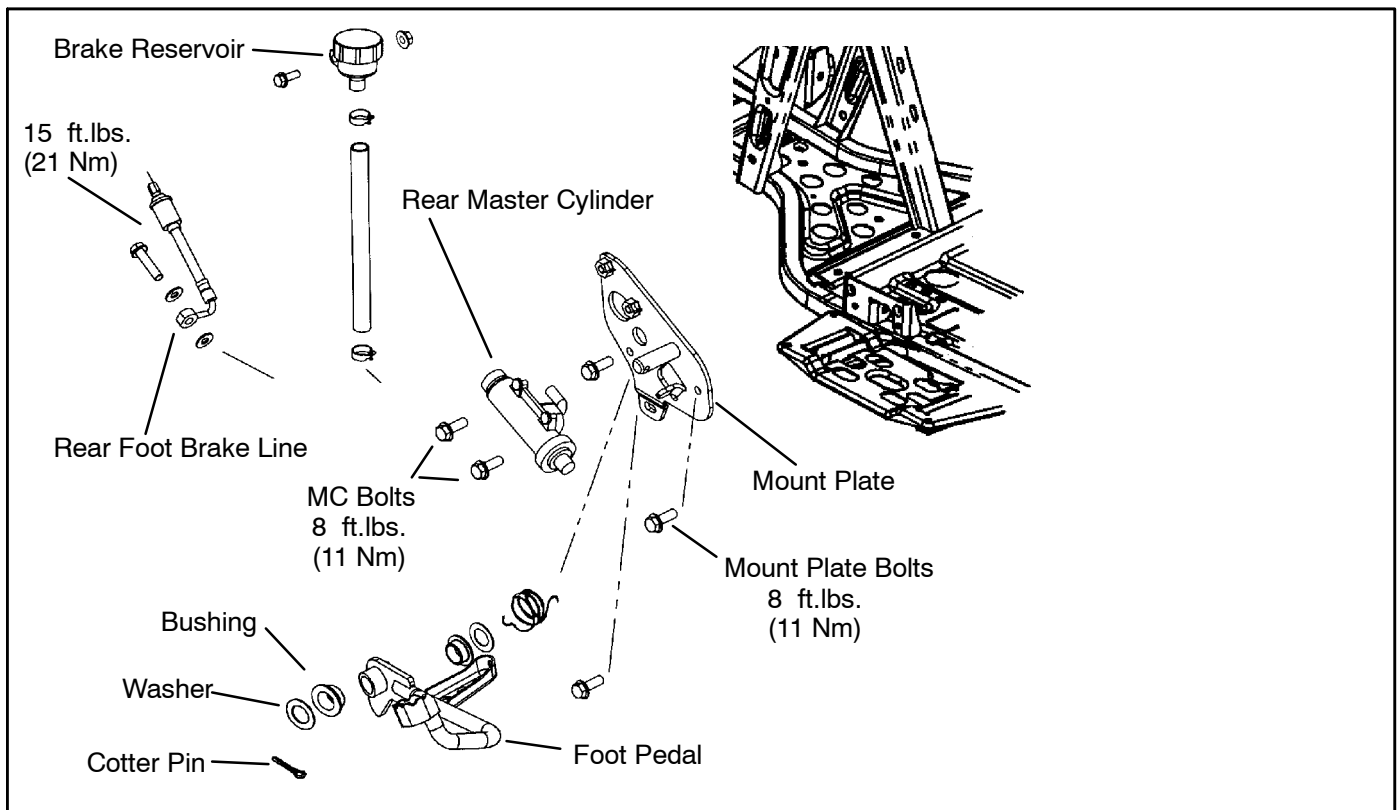
### **Brake Pedal Removal / Install**

1. To remove the brake pedal:
  - Remove the spring attached to the transmission park lock mechanism
  - Remove the cotter key
  - Remove the washers, bushings, and tension spring
2. Reverse the steps for installation, use a new cotter key during installation.

### **Rear Brake Master Cylinder Removal / Install**

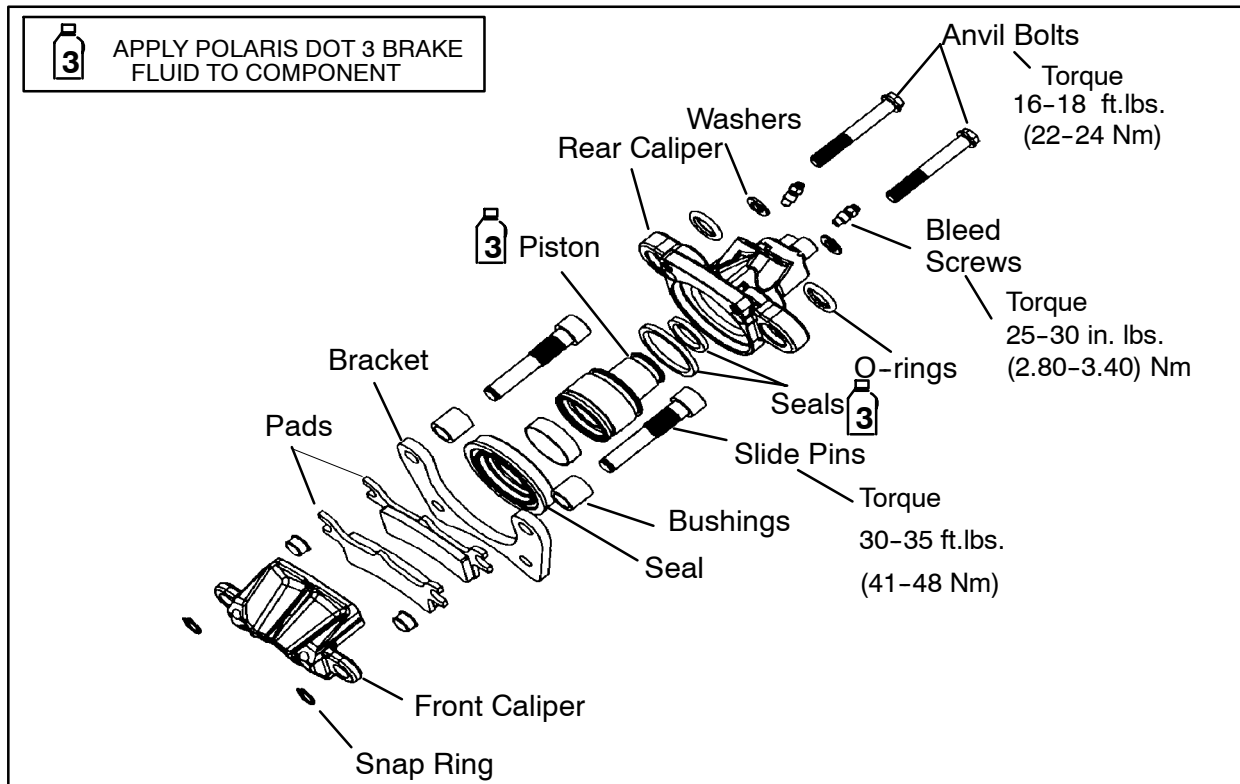
1. If necessary, remove the rear brake line from the master cylinder. Use a suitable container to catch the brake fluid. Dispose of brake fluid properly.
2. Remove the two bolts that secure the rear master cylinder to the brake mount plate. Replace parts as needed.
3. To install the rear brake master cylinder, mount the master cylinder to the mount plate and torque bolts to 8 ft.lbs. (11 Nm).
4. Reinstall the brake line and torque the banjo bolt to 15 ft.lbs. (21 Nm). If the rear brake line is the pipe fit style, torque the fitting to 12-15 ft. lbs. (16-20 Nm).

## **REAR AUXILIARY MASTER CYLINDER ASSEMBLY**





## REAR BRAKE CALIPER EXPLODED VIEW



## TROUBLESHOOTING

### Brakes Squeal

- Dirty/contaminated friction pads
- Improper alignment
- Worn disc
- Worn disc splines

### Poor Brake Performance

- Air in system
- Water in system (brake fluid contaminated)
- Caliper/disc misaligned
- Caliper dirty or damaged
- Brake line damaged or lining ruptured
- Worn disc and/or friction pads
- Incorrectly adjusted lever
- Incorrectly adjusted stationary pad
- Worn or damaged master cylinder or components
- Improper clearance between lever and switch

### Lever Vibration

- Disc damaged
- Disc worn (runout or thickness variance exceeds service limit)

### Caliper Overheats (Brakes Drag)

- Compensating port plugged

- Pad clearance set incorrectly
- Auxiliary brake pedal incorrectly adjusted
- Brake lever or pedal binding or unable to return fully
- Parking brake left on
- Residue build up under caliper seals
- Operator riding brakes

### Brakes Lock

- Alignment of caliper to disc.



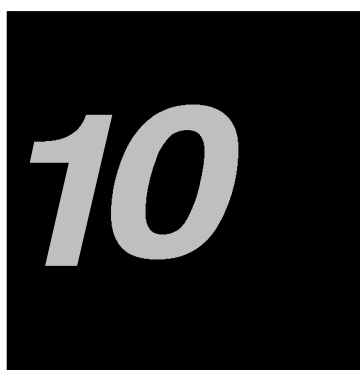
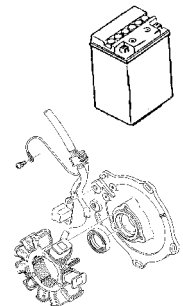


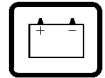
# *CHAPTER 10*

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# ***ELECTRICAL***

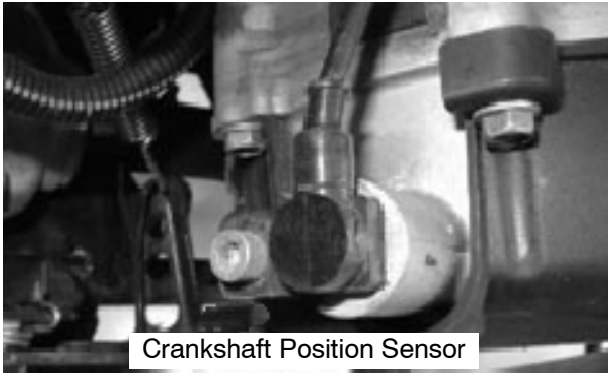
Crankshaft Position Sensor Gap .....	10.2
Gear Position Switch Test .....	10.2
Instrument Cluster Overview .....	10.3-10.7
Speedometer Removal/Installation .....	10.8
Speedometer Operation Troubleshooting .....	10.9-10.13
Coolant Sensor Tests .....	10.14
Fan Motor Tests .....	10.14
Fan Control Switch Tests .....	10.14
Electronic Throttle Circuit System Operation ....	10.15
Flywheel Identification .....	10.16
Ignition System Operation .....	10.16
Ignition Components .....	10.17
Ignition System Troubleshooting .....	10.18-10.19
Charging System Testing .....	10.19
Fan / ECU Relays .....	10.20
Charging System Testing Flow Chart .....	10.21
Battery Identification .....	10.22
Conventional Battery Activation/Service .....	10.22-10.23
Low Maint. Battery Activation/Service .....	10.24-10.28
Head Light/ Lamp / Switch Service .....	10.28-10.32
Work / Brake Light Lamp /Switch Service .....	10.32-10.34
Fuel Sender Test .....	10.34
Accessory Wire Connections .....	10.35
Winch Wiring Diagram .....	10.36
Starter System Troubleshooting .....	10.37
Starter Motor Service .....	10.37-10.43





## CRANKSHAFT POSITION SENSOR GAP

Measure trigger coil gap with a feeler gauge. The gap should be .059 inch (1.0 mm).



Crankshaft Position Sensor

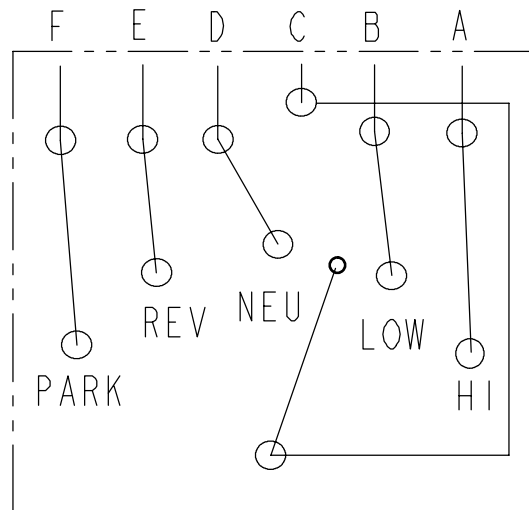
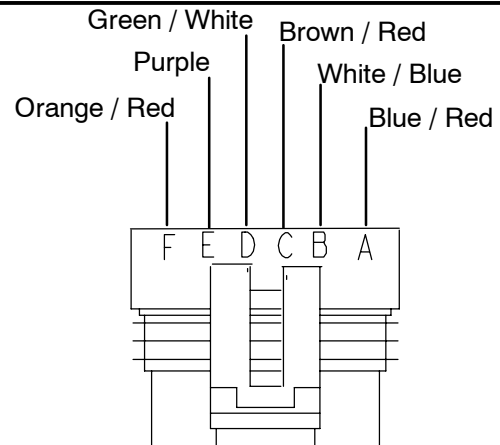
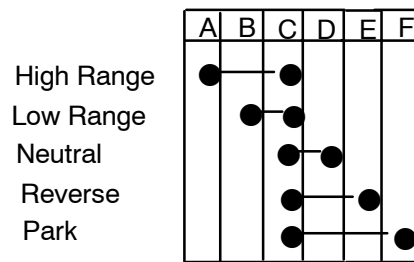
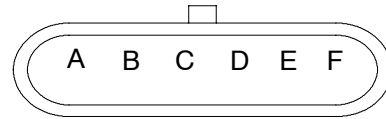
**Crankshaft Position Sensor Gap:**  
**.059" ± .010 inch**  
**(1.0 ± .26mm)**

## GEAR POSITION INDICATOR SWITCH TEST

**NOTE:** Also see "INSTRUMENT CLUSTER TROUBLESHOOTING" for gear switch resistance.

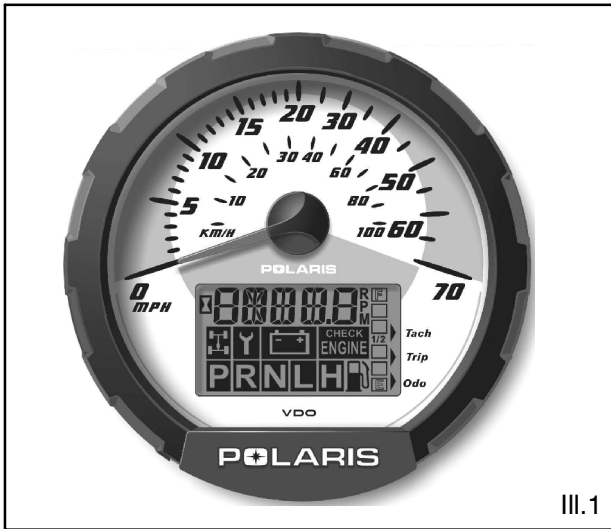
### TRANSMISSION SWITCH

High/Low/Neutral/Reverse/Park Switch

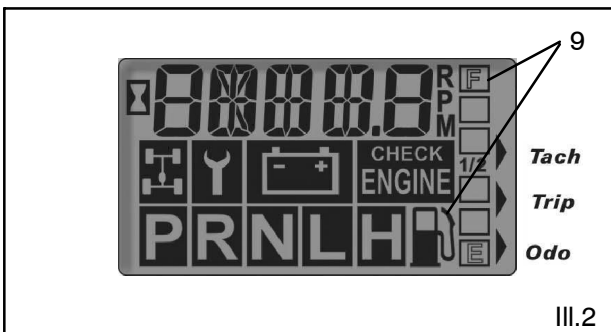




# INSTRUMENT CLUSTER OVERVIEW



Ill.1



Ill.2

### Introduction

#### Refer to Illustration 1:

The Polaris ATV Instrument Cluster is powered by battery voltage (12 VDC) and requires inputs from the engine RPM, transmission gear, and wheel speed sensor for proper operation. Two harnesses plug into the cluster head; one from the right front wheel speed sensor, and one from the vehicle main harness. A non-serviceable internal memory battery maintains odometer and hour meter data when the machine is not running. The illumination lamp inside the gauge is non-serviceable and is designed to last for the life of the unit. (A) The speedometer needle indicates speed from an electronic wheel speed sensor located on the right front brake caliper bracket and the needle also flashes during a warning condition. The speedometer needle indicates speed in MPH and KPH. **NOTE: A flashing needle could indicate a hot engine, low battery warning, or the No. 10 Pin could be grounded.** (B) The speedometer features numbers in Mile Per Hour (MPH) and Kilometers Per Hour (KPH). (C) The Rider Information Center performs a number of functions (See Illustration 2):

### 1. Odometer/Tachometer/Trip meter/Hour Meter

**\* Odometer** records the miles traveled by the ATV.  
**\*Tachometer** displays engine RPM. This feature will also display with the vehicle in motion **NOTE:** Small RPM fluctuations from day to day are normal because of changes in humidity, temperature, and elevation.  
**\*Trip meter** records the miles traveled by the ATV if reset before each trip or total miles to 999. To reset the trip meter, select the trip meter mode. Press and hold the mode button (override button) until the total changes to 0. **NOTE:** In the Rider Information Center, the trip meter display contains a decimal point, but the odometer displays without a decimal point.  
**\*Hour Meter** logs the total hours the engine has been in operation.

### 2. Programmable Service Interval/Diagnostic Mode

**\*Service Interval** - The purpose of the programmable service interval is to provide the consumer and the dealer with a convenient way to schedule routine maintenance. When the ATV leaves the factory, this feature is set at “50 hours”. When the first 50 hours of engine operation are finished the wrench icon will flash for 10 seconds each time the ATV is started as a reminder that ATV maintenance is due. **NOTE:** To reset the Service Interval, follow the directions on the on Page 10.5, “Setting New Service Interval”.

### 3. Check Engine Warning Indicator

The word HOT will display alpha numerically when the engine is overheating. Do not continue to operate the ATV if this warning appears. Refer to **Chapter 3 “Cooling System Troubleshooting”** for help with diagnosis of overheating.



### 4. High/Low Battery Voltage

This warning usually indicates that the ATV is being operated at an RPM too low to keep the battery charged. A low battery warning may also occur under normal operation if the machine is at idle and high electrical load (lights, cooling fan, accessories) is applied. Driving at a higher RPM or connecting a battery charger will usually clear the warning.



## 5. Engine Hour Display Indicator

Displays number of hours of engine operation.

## 6. AWD Indicator

Illuminates when the electrical portion of the AWD system is enabled.

## 7. Gear Indicator

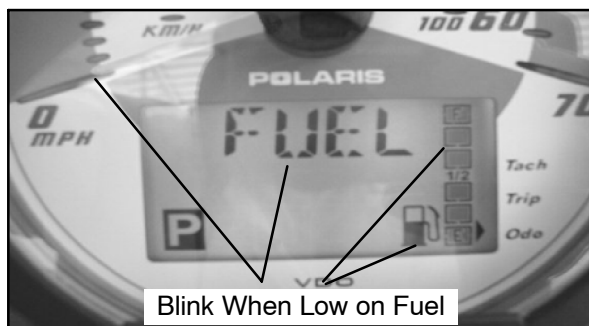
Specifies what position the shift lever and transmission are in. This area is blank if a fault occurs.

## 8. Mode Indicator

Indicates which modes are being utilized.

## 9. Fuel Gauge

The segments of the fuel gauge indicate the level of fuel in the fuel tank. When the last segment clears, a low fuel warning is activated. All related icons will flash, "FUEL" will display in the LCD, and the speedometer needle will blink. If riding, be sure to refuel immediately.



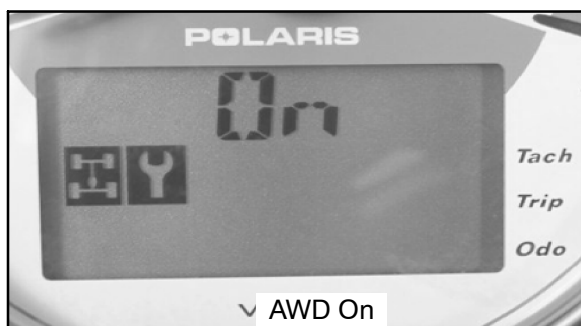
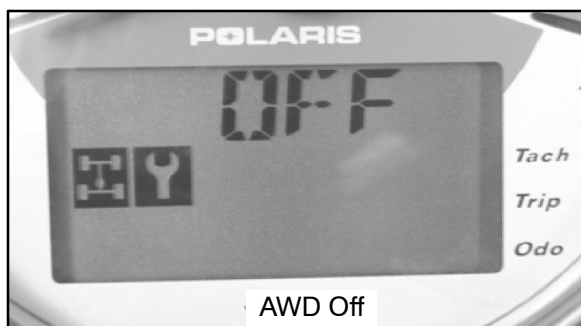
**Screen 1:** The first screen indicates battery voltage. Refer to Ill. 2.



**Screen 2: Tachometer** (Ill. 3) indicates engine rpm.



**Screen 3: AWD diagnostic screen.** This screen indicates whether or not current is flowing through the AWD coil on models with switchable AWD.



## DIAGNOSTIC MODE

**NOTE:** This gauge features auto shut-off protection if the voltage on the DC bus is excessive. This is usually the result of an open battery condition, and the gauge is designed to survive such an event.

**NOTE:** If the gauge will not indicate what gear it is in and will not allow AWD operation, AWD can still be enabled by holding in the mode/override button.

### To enter the diagnostics mode:

1. Turn the key switch off and wait 10 seconds.
2. Set the park brake and shift the transmission to neutral.
3. Hold the mode/reverse override button as you turn the key switch on.
4. Release the switch as soon as the display is activated.

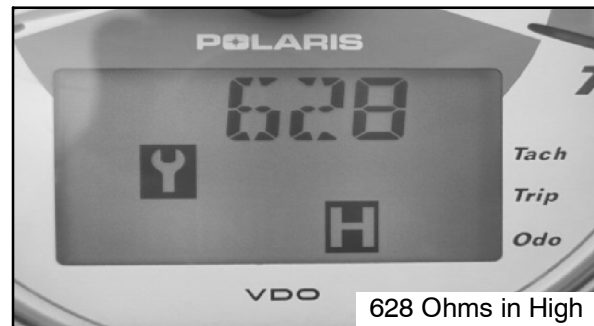
Use the mode/reverse override button to toggle through the diagnostic screens.

**NOTE:** The initial screen display refers to the software version installed on your ATV. This information is only displayed briefly.



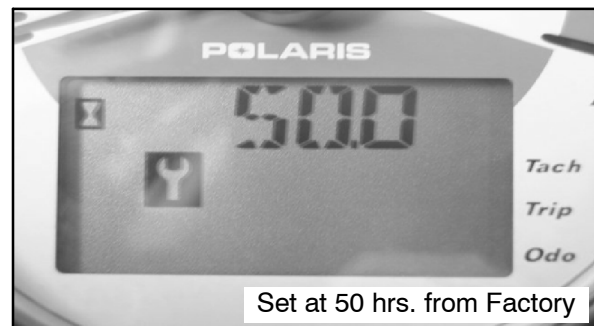


**Screen 4: Gear circuit diagnostic.** This screen displays the resistance value (in ohms) being read at the gear switch input of the gauge. **NOTE: 10-20% variance from these readings is within normal parameters.**



**Screen 5: Programmable service interval.** The purpose of the programmable service interval is to provide the consumer and dealer with a convenient reminder for routine maintenance. When the ATV leaves the factory, this feature is set at 50 hours.

Once the service interval mode is set with the hours when service is due, the hours of actual engine operation are subtracted from the set hours until 0 is reached. When the counter reaches 0, the wrench icon will flash quickly for 10 seconds each time the vehicle is started as a reminder that the periodic maintenance is due.



#### **SETTING A NEW SERVICE INTERVAL:**

##### **Setting Service Interval After Countdown (zero):**

1. While in the service interval mode, press and hold the mode/override button until the wrench icon flashes. When it begins to flash, release the button.
2. The setting will increase by one hour each time the button is pressed. Pressing and holding the button will allow the numbers to escalate much faster.
3. When the desired time increment is displayed, release the button and wait for the wrench to stop flashing. When the wrench stops blinking, your



service hours are set. (Next Page)

**NOTE:** If you scroll past the intended number, hold the button down until the count turns over to 0. You can then reset the number.

### Turn Service Interval OFF:

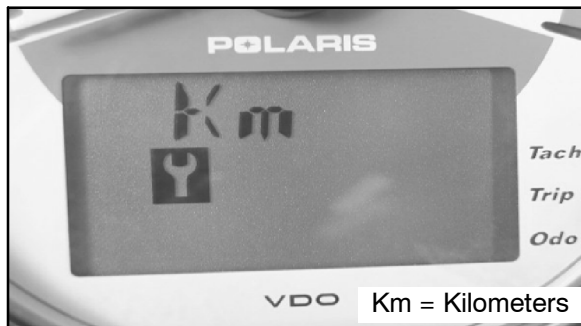
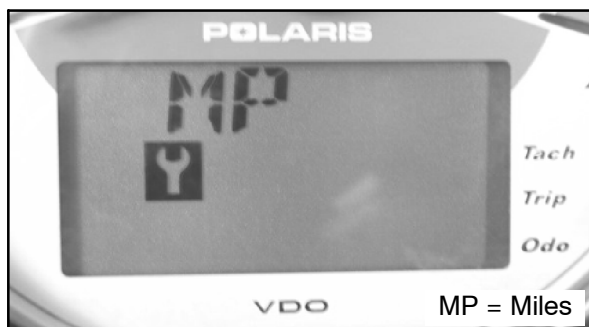
1. If the service interval is enabled (functioning) on your ATV and you wish to turn it off, toggle to the service interval mode.
2. Press and hold the mode button for approximately 7 seconds until the word *OFF* appears in the Rider Information Center. The service interval is now off.
3. To enable (turn on) the service interval mode, repeat the steps above in "Setting Service Interval After Countdown".

### Change Service Interval Time:

If you would like to change the service interval time, (for example change the interval from 50 hrs. to 55 hrs.). Follow the steps below:

1. While in the service interval mode, press and hold the mode button for approximately 7 seconds until the word *OFF* appears in the Rider Information Center.
2. Wait 5 seconds and then press the mode button in until the wrench icon flashes. Press the mode button again to set the desired service increment. Release the button and wait for the wrench icon to stop flashing. The new service interval is now set.

**Screen 6: Miles/Kilometers toggle,** The display in the trip meter and odometer can be changed to display either kilometers or miles. The current display mode will be shown as "KM" or "MP". To change, hold in the mode button until the letters flash, then press and release the button once. When the display stops flashing, the mode has been set.



**NOTE:** As long as you are in the diagnostic mode, the wrench icon will remain lit.

**NOTE:** To leave the diagnostic mode, turn the key switch off and on.

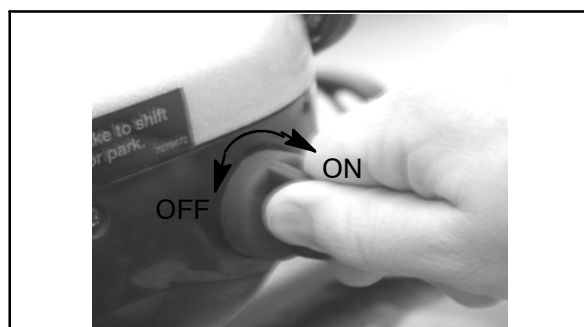
**NOTE:** Any movement of the tires will trigger the speedometer out of the diagnostic mode and into standard display mode.

## EFI DIAGNOSTIC MODE

**NOTE:** The EFI diagnostic mode is intended to quickly view fault codes stored in the EFI module. Polaris dealers are equipped with the proper diagnostic tools to further diagnose the blink code.

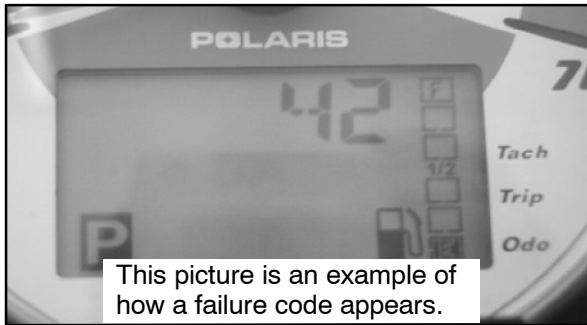
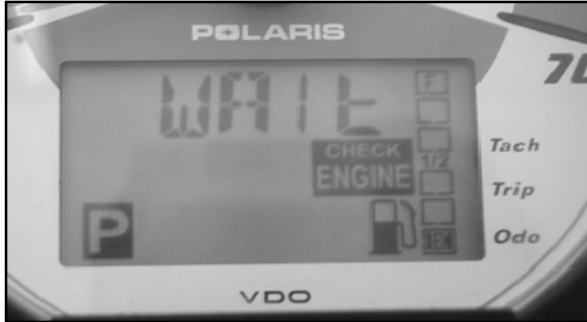
To download blink codes (failure codes) from you EFI module:

1. Be sure the ATV key switch is off and with the shifter is in Park.
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.

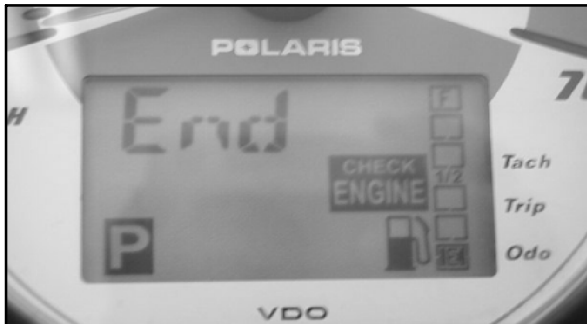




- 3. The word "Wait" will appear, the EFI module is now searching for blink codes. If any blink codes are stored they will display on the instrument cluster one at a time. **NOTE:** The check engine icon will flash during this mode.

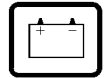


- 4. The word "End" will display after all of the codes have been displayed.



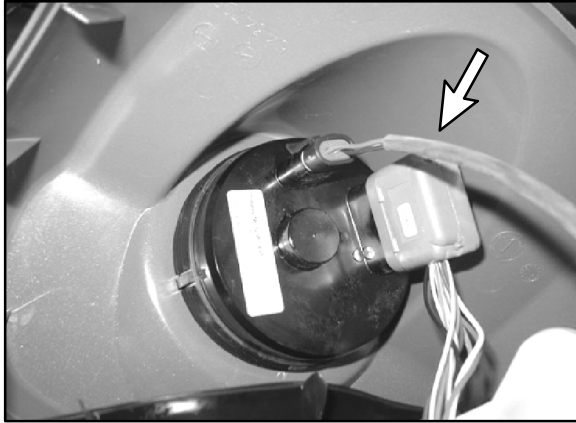
### Blink Code Identification Table

Blink Code	Failure Description	Blink Code	Failure Description
-	No RPM Signal	54	Engine Temp Lamp: Open Load
21	Loss of Synchronization	54	Engine Temp Lamp: Short Circuit to Ground
45	Barometric Pressure Sensor: Circuit Low Input	54	Engine Temp Lamp: Short Circuit to Battery
46	Barometric Pressure Sensor: Circuit High Input	55	Diag Lamp: Open Load
22	TPS: Open or Short Circuit to Ground	55	Diag Lamp: Short Circuit to Ground
22	TPS: Short Circuit to Battery	55	Diag Lamp: Short Circuit to Battery
23	RAM Error: Defective ECU	56	Pump Relay: Open Load
42	Engine Temp Sensor Circuit: Short to Ground	56	Pump Relay: Short Circuit to Ground
42	Engine Temp Sensor Circuit: Open or Short to Battery	56	Pump Relay: Short Circuit to Battery
51	Injector 1: Open Load	58	Cooling Fan: Open Load
51	Injector 1: Short Circuit to Ground	58	Cooling Fan: Short Circuit to Ground
51	Injector 1: Short Circuit to Battery	58	Cooling Fan: Short Circuit to Battery
52	Injector 2: Open Load	41	Intake Air Temp Sensor: Open or Short Circuit to +Sensor Voltage
52	Injector 2: Short Circuit to Ground	41	Intake Air Temp Sensor: Short Circuit to Ground
52	Injector 2: Short Circuit to Battery	61	END of Check

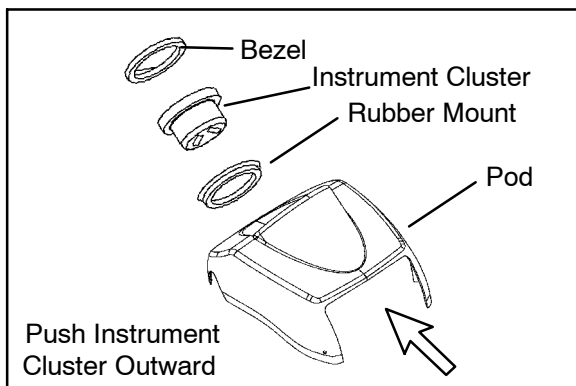
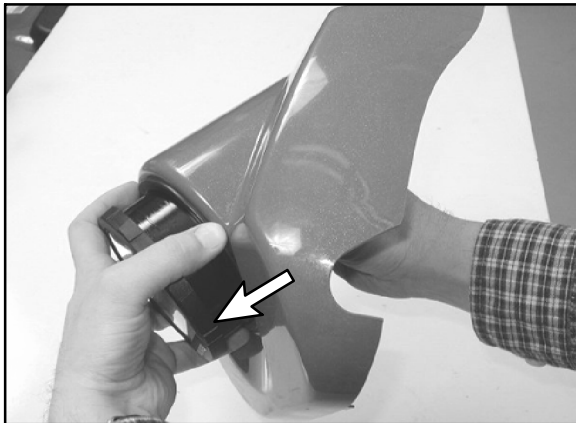


## **SPEEDOMETER REMOVAL**

1. Remove the three screws that secure the headlight pod cover and disconnect the wire connectors from the instrument cluster.



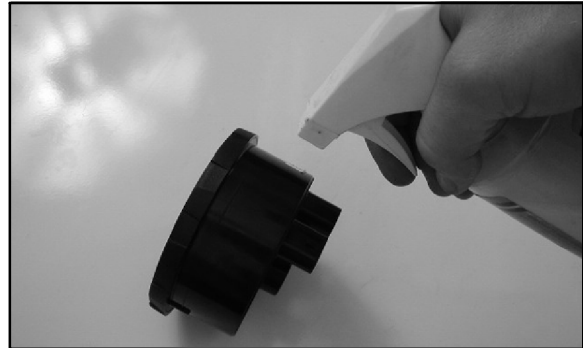
2. Push the instrument cluster out from the backside of the pod, while securely holding the pod.



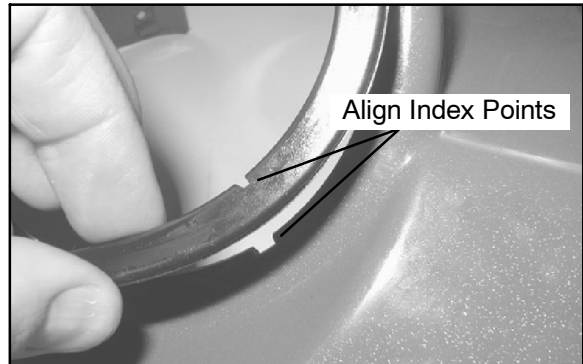
**NOTE:** Do not remove the rubber grommet in the pod. Only remove the rubber grommet if necessary. The bezel is a snap-on assembly and is a serviceable part.

## **SPEEDOMETER INSTALLATION**

1. Spray a soap and water mixture onto the outer surface area of the instrument cluster. This will help the instrument cluster slide into the pod assembly more easily.



2. Be sure the rubber grommet inside the pod is fully installed and that the indexing key is in the headlight pod keyway.



3. Hold the pod assembly securely and insert the instrument cluster into the pod assembly. Twist the instrument cluster gently in a clockwise motion to properly seat the instrument cluster into the pod assembly. Apply pressure on the bezel while pressing down on the instrument cluster.



**NOTE:** Do not allow alcohol or petroleum products to come in contact with the instrument cluster lens.



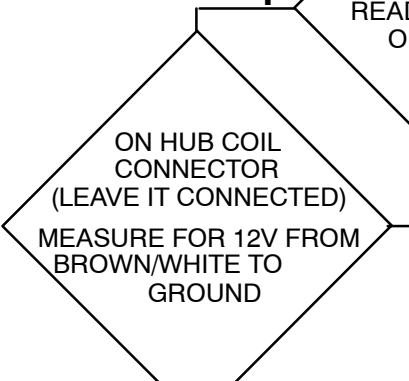
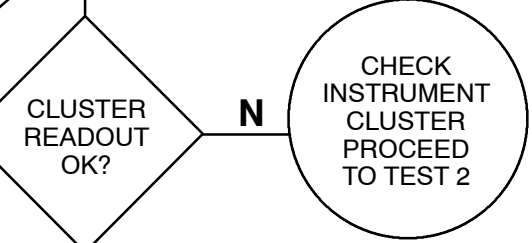
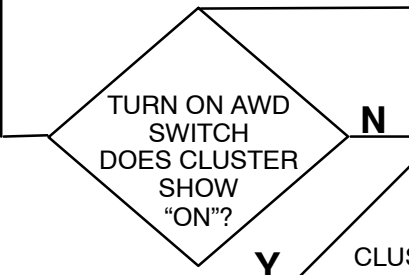
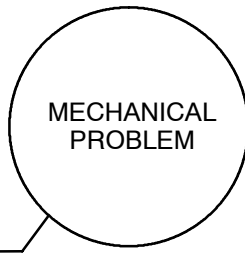
# SPEEDOMETER TROUBLESHOOTING

## TEST 1 - NO ALL WHEEL DRIVE

### START HERE - ENGINE OFF

- KEY SWITCH ON
- TRANSMISSION IN LOW
- AWD SWITCH ON
- INSTRUMENT CLUSTER IN DIAGNOSTIC MODE SET TO AWD DIAGNOSTIC SCREEN

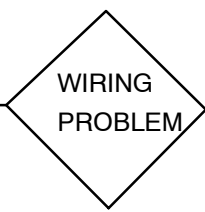
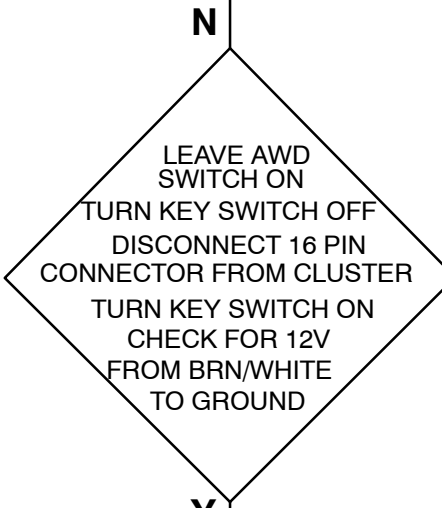
**Note:** If AWD icon comes on, instrument cluster is O.K. Proceed to mechanical tests (in Service Manual). Check the AWD icon on instrument cluster to verify it's operation. The AWD switch is directly powered by switched 12 volts (red/white). The gear switch only interfaces with the instrument cluster. To enable AWD, the cluster must be displaying low or high gear, or reverse gear with the override button pushed in.



NOT AN INSTRUMENT CLUSTER PROBLEM; CHECK AWD SWITCH AND WIRING

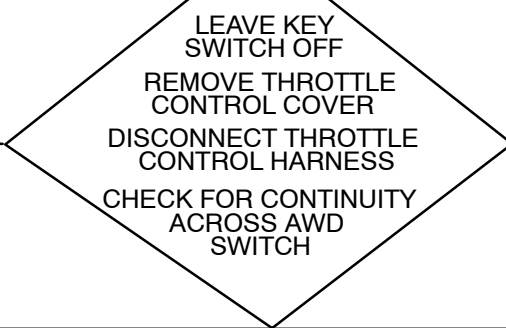
- ### 16 Pin Connector
1. Red- 12V Ignition Switch
  2. Red/White- 12V ETC and AWD Switch
  3. Grey/Orange- Mode/Override button
  4. Black- Ignition Kill
  5. Green- Diagnostic (Factory Use Only)
  6. Blue- Diagnostic (Factory Use Only)
  7. Yellow/Red- RPM Input
  8. Brown- Ground
  9. Blue White- Engine Overheat Switch
  10. N/C
  11. Black/White- Engine Check Light
  12. Purple/White- Fuel Sender (if equipped)
  13. Brown/Red- Trans Switch Ground
  14. White- Gear Shift Signal
  15. White/Blue- High Gear Signal
  16. Brown/White- AWD Coil

**Note:** Reversing polarity when connecting the battery or other DC power source will fail the AWD control and the instrument cluster. If the key switch and the AWD switch are turned on.

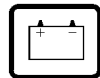


REPLACE INSTRUMENT CLUSTER

TURN KEY SWITCH OFF  
RECONNECT CLUSTER  
LEAVE HEADLIGHT POD DISASSEMBLED  
SHIFT TO LOW OR HIGH  
LEAVE AWD ON



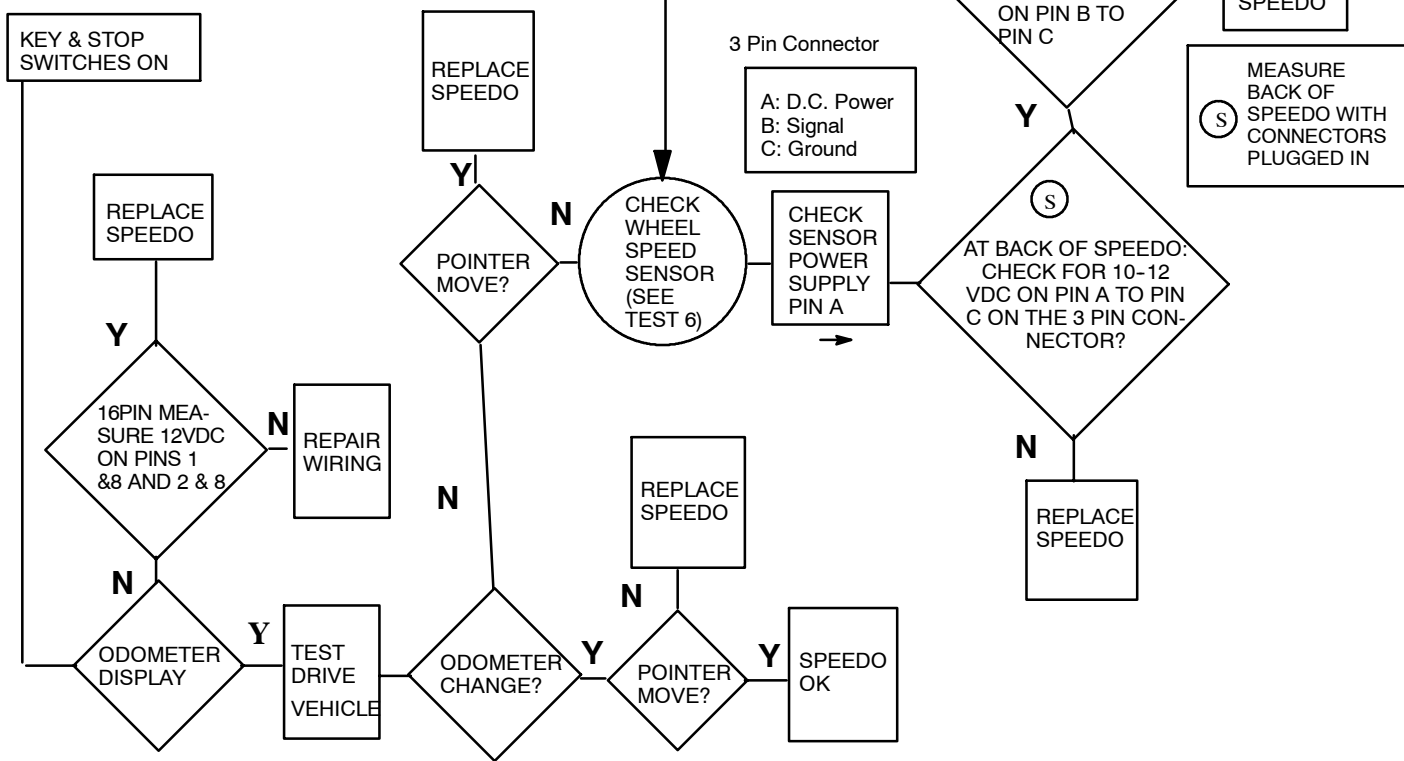
PROCEED TO MECHANICAL AWD COMPONENTS IF AWD PROBLEM PERSISTS.



**SPEEDOMETER TROUBLESHOOTING**

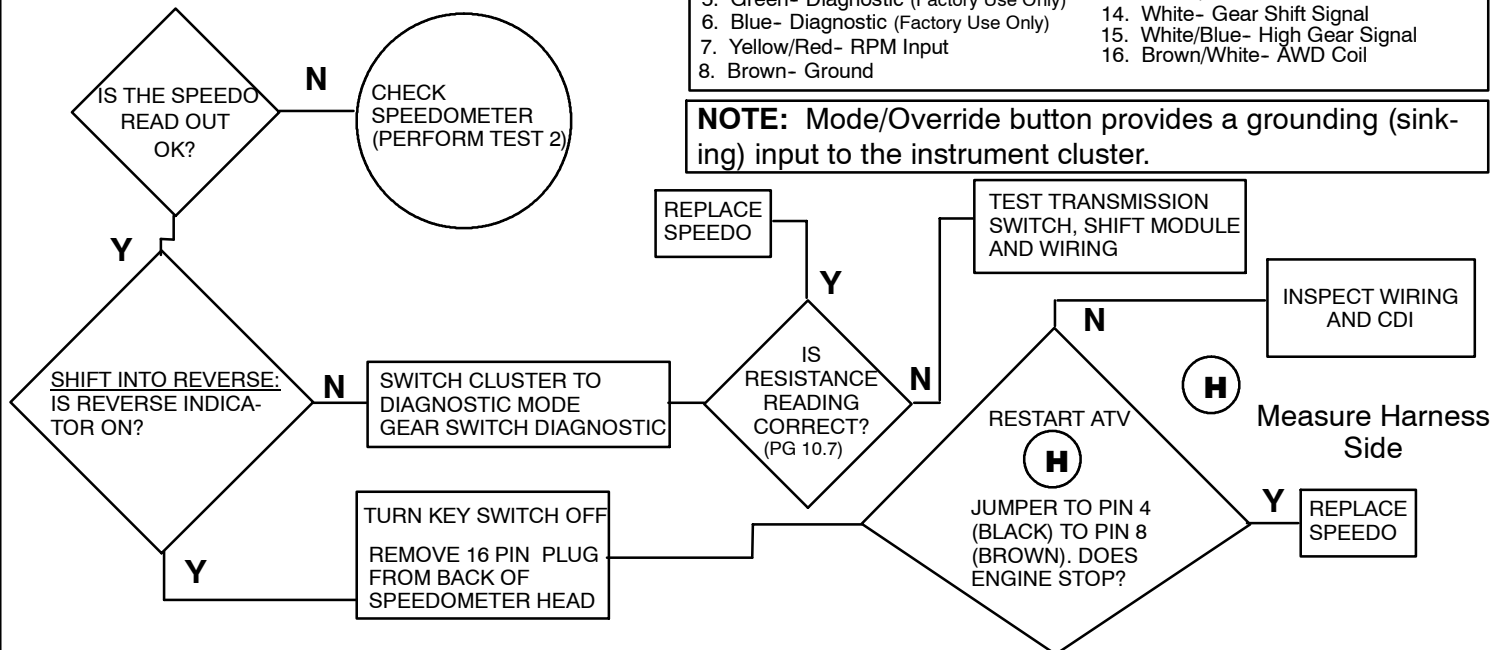
**TEST 2 - NO SPEEDOMETER AND/OR ODOMETER DISPLAY**

**START HERE**



**TEST 3 - NO REVERSE SPEED LIMIT  
(VEHICLE EXCEEDS 7-9 MPH IN REVERSE)**

**START HERE**



**16 Pin Connector**

- |   |   |
|---|---|
| 1. Red- 12V Ignition Switch             | 9. Blue White- Engine Overheat Switch       |
| 2. Red/White- 12V ETC and AWD Switch    | 10. N/C                                     |
| 3. Grey/Orange- Mode/Override button    | 11. Black/White- Engine Check Light         |
| 4. Black- Ignition Kill                 | 12. Purple/White- Fuel Sender (if equipped) |
| 5. Green- Diagnostic (Factory Use Only) | 13. Brown/Red- Trans Switch Ground          |
| 6. Blue- Diagnostic (Factory Use Only)  | 14. White- Gear Shift Signal                |
| 7. Yellow/Red- RPM Input                | 15. White/Blue- High Gear Signal            |
| 8. Brown- Ground                        | 16. Brown/White- AWD Coil                   |

**NOTE:** Mode/Override button provides a grounding (sinking) input to the instrument cluster.

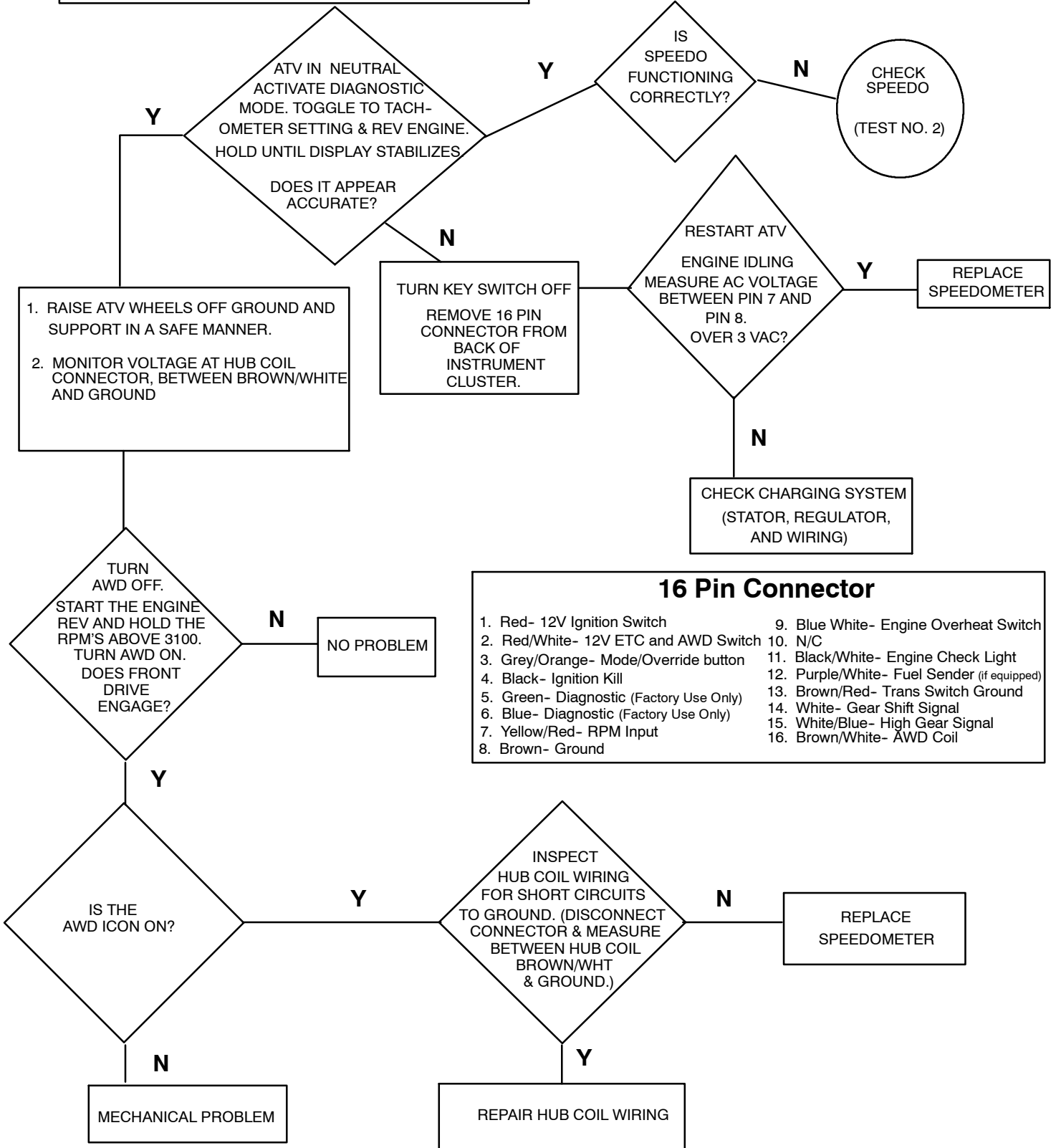


# SPEEDOMETER TROUBLESHOOTING

## TEST 4 - NO AWD HUB SAFETY LIMIT

**NOTE:** IF THE AWD ICON DOES NOT COME ON OR IF 12 VDC IS NOT REGISTERING AND AWD IS ENGAGING ABOVE 3100 RPM, IT MAY BE A MECHANICAL PROBLEM.

**START HERE**



### 16 Pin Connector

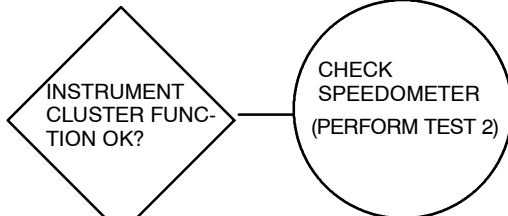
- |   |   |
|---|---|
| 1. Red- 12V Ignition Switch             | 9. Blue White- Engine Overheat Switch       |
| 2. Red/White- 12V ETC and AWD Switch    | 10. N/C                                     |
| 3. Grey/Orange- Mode/Override button    | 11. Black/White- Engine Check Light         |
| 4. Black- Ignition Kill                 | 12. Purple/White- Fuel Sender (if equipped) |
| 5. Green- Diagnostic (Factory Use Only) | 13. Brown/Red- Trans Switch Ground          |
| 6. Blue- Diagnostic (Factory Use Only)  | 14. White- Gear Shift Signal                |
| 7. Yellow/Red- RPM Input                | 15. White/Blue- High Gear Signal            |
| 8. Brown- Ground                        | 16. Brown/White- AWD Coil                   |



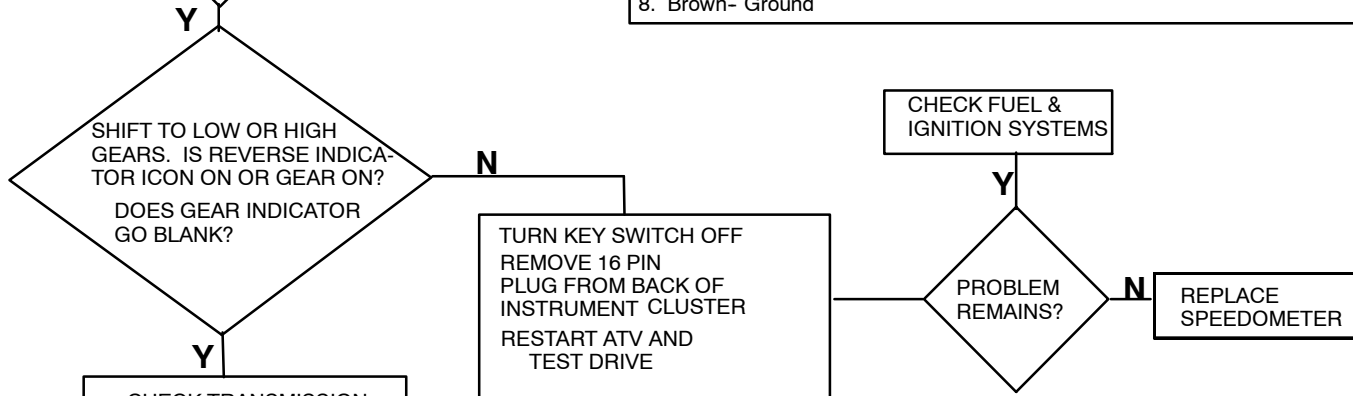
## SPEEDOMETER TROUBLESHOOTING

### TEST 5 REVERSE SPEED LIMITER ACTIVATED IN FORWARD GEAR (Engine loses spark when vehicle speed is above 7-9 mph.)

**START HERE**



16 Pin Connector	
1. Red- 12V Ignition Switch	9. Blue White- Engine Overheat Switch
2. Red/White- 12V ETC and AWD Switch	10. N/C
3. Grey/Orange- Mode/Override button	11. Black/White- Engine Check Light
4. Black- Ignition Kill	12. Purple/White- Fuel Sender (if equipped)
5. Green- Diagnostic (Factory Use Only)	13. Brown/Red- Trans Switch Ground
6. Blue- Diagnostic (Factory Use Only)	14. White- Gear Shift Signal
7. Yellow/Red- RPM Input	15. White/Blue- High Gear Signal
8. Brown- Ground	16. Brown/White- AWD Coil



**NOTE: OVERRIDE SWITCH PLAYS NO ROLE IN REVERSE GEAR OUTPUT**

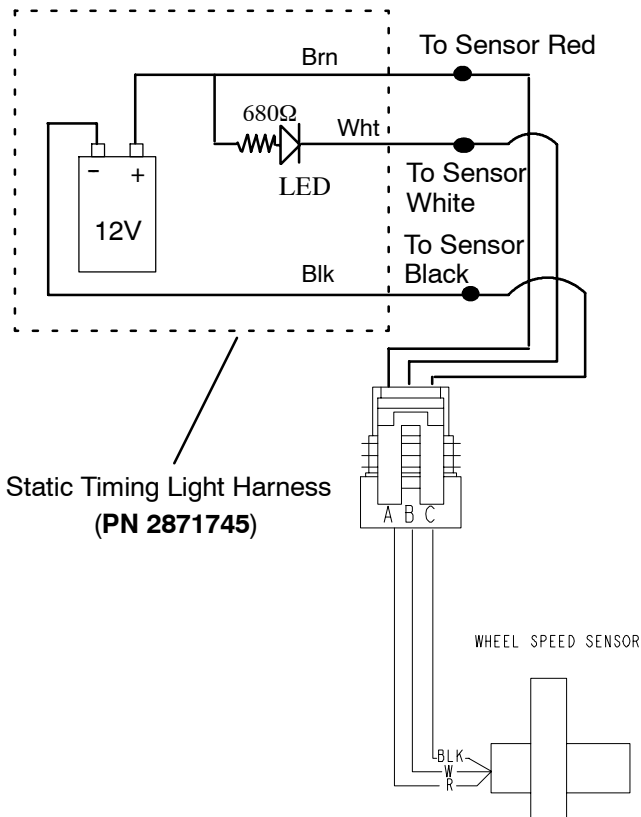
### TEST 6 WHEEL SPEED SENSOR

**Tools Required:**

- Static Timing Light Harness (PN 2871745)
- Hall Sensor Probe Harness (PN 2460761) or equivalent jumper wires.

**To test wheel speed sensor:**

1. Disconnect 3 Pin connector from speedometer.
2. Connect wires from test light to sensor 3 Pin connector as shown at right, using the Hall Sensor Probe Harness (PN 2460761) or jumper leads.
3. Elevate front right side of vehicle until tire is off the ground.
4. Slowly turn right front wheel while observing the test light.
5. If light flashes, sensor is O.K. Be sure connections are good and 9 volt battery is in good condition.



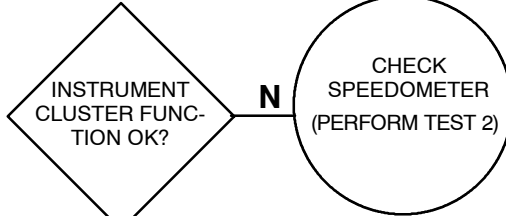




# SPEEDOMETER TROUBLESHOOTING

## TEST 7 FUEL GAUGE DISPLAY NOT WORKING

START HERE



### 16 Pin Connector

- |   |   |
|---|---|
| 1. Red- 12V Ignition Switch             | 9. Blue White- Engine Overheat Switch       |
| 2. Red/White- 12V ETC and AWD Switch    | 10. N/C                                     |
| 3. Grey/Orange- Mode/Override button    | 11. Black/White- Engine Check Light         |
| 4. Black- Ignition Kill                 | 12. Purple/White- Fuel Sender (if equipped) |
| 5. Green- Diagnostic (Factory Use Only) | 13. Brown/Red- Trans Switch Ground          |
| 6. Blue- Diagnostic (Factory Use Only)  | 14. White- Gear Shift Signal                |
| 7. Yellow/Red- RPM Input                | 15. White/Blue- High Gear Signal            |
| 8. Brown- Ground                        | 16. Brown/White- AWD Coil                   |

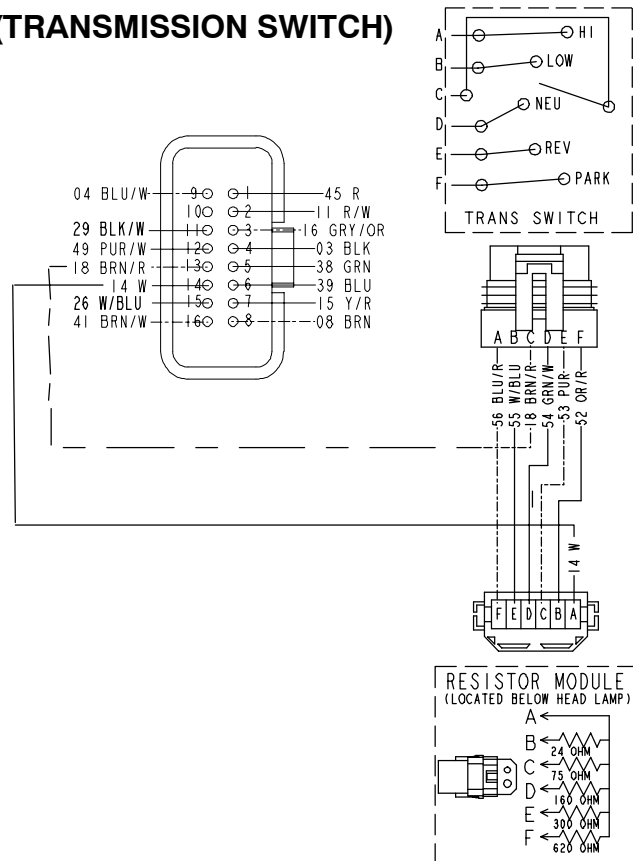
## TEST 8 SHIFT INDICATOR NOT WORKING (TRANSMISSION SWITCH)

### Operation:

The Instrument cluster sends a signal through the White wire to the resistor module. This signal completes its path on the Brown/Red wire through the transmission switch. Depending on the transmission switch position, the Instrument cluster interprets the resistance reading and displays the corresponding shift position in the LCD panel.

### Testing:

Use the diagram provided to test the continuity loop at each of the shift points with a multi-meter. **NOTE:** The Instrument cluster contains this diagnostic feature.



### 16 Pin Connector

1. Red- 12V Ignition Switch
2. Red/White- 12V ETC and AWD Switch
3. Grey/Orange- Mode/Override button
4. Black- Ignition Kill
5. Green- Diagnostic (Factory Use Only)
6. Blue- Diagnostic (Factory Use Only)
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. Black/White- Engine Check Light
12. Purple/White- Fuel Sender (if equipped)
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. White/Blue- High Gear Signal
16. Brown/White- AWD Coil



## **COOLANT TEMPERATURE SENSOR**

The coolant temperature sensor can be tested using an ohmmeter or voltmeter.

1. With the engine and temperature sensor at room temperature (68° F = 20° C), disconnect the harness connector.
2. With the meter in the ohms mode, place the meter leads onto the sensor contacts. One lead on Yellow wire and one lead on the Violet wire.
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 kΩ ± 6%
212°F (100°C)	0.186 kΩ ± 2%

**NOTE:** If the coolant temperature sensor or circuit malfunctions the radiator fan will default to 'ON'.

**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 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 page 10.20 for more information on Fan Relay 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.

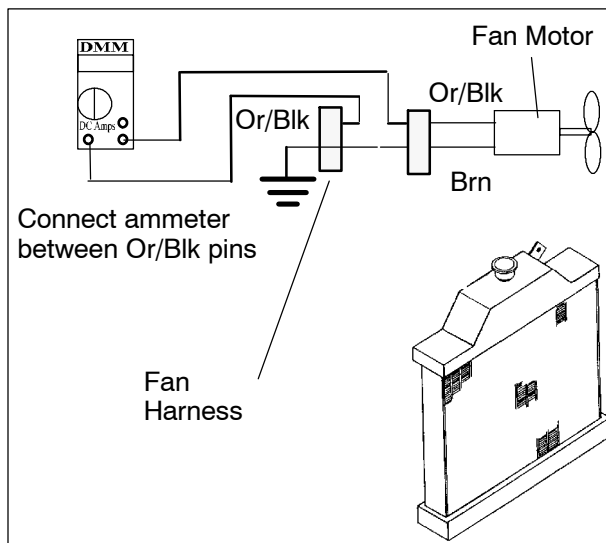
## **FAN CONTROL CIRCUIT BYPASS TEST**

1. Disconnect harness from coolant temperature sensor on engine.

2. With the ATV in "Park" and with the parking brake on, turn the ignition key (and engine stop switch) "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 (refer to 'Fan Motor Current Draw' this section). 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.

## **FAN MOTOR CURRENT DRAW**

A current draw test will provide a good indication of fan motor condition. A worn or damaged fan motor will draw more current, which causes a reduction in blade speed and reduced cooling.



1. Disconnect the harness from the coolant sensor.
2. Connect a DC ammeter in between the fan switch harness wires as shown.
3. Be sure fan blade is free to rotate.
4. Turn ignition key and engine stop switch to "ON" position. Read the current draw on ammeter with fan running.
5. If the fan motor draws more than 15 Amps, replace the motor.

**Fan Motor Current Draw:**  
**Should Be Less Than 15 Amps**

**NOTE:** This fan motor current draw specification only applies to Sportsman EFI models.



## ELECTRONIC THROTTLE CONTROL (ETC) SWITCH

The Electronic Throttle Control (ETC) system is designed to stop the engine of an ATV in the event of a mechanical problem with the throttle mechanism. The ETC switch is mounted independently of the throttle actuator lever inside the throttle block assembly. This is a normally closed switch, and is held in the open position (contacts are separated (as shown below) by throttle cable tension. The contacts are "open" during normal operation regardless of throttle lever position. In the event of a mechanical problem in the throttle mechanism (cable tension is lost), the switch contacts close, connecting the black wire to ground, which prevents ignition spark. This is the same as turning the key or engine stop switch "OFF".

**NOTE:** Test the ETC switch at the harness connector. *ETC will not activate unless there is throttle plate movement off of 'zero' detected by the ECU.* Adjust throttle cable freeplay (ETC switch) and make sure throttle mechanism is functioning properly before testing the switch. Refer to Maintenance Chapter 2 for cable adjustment procedure.

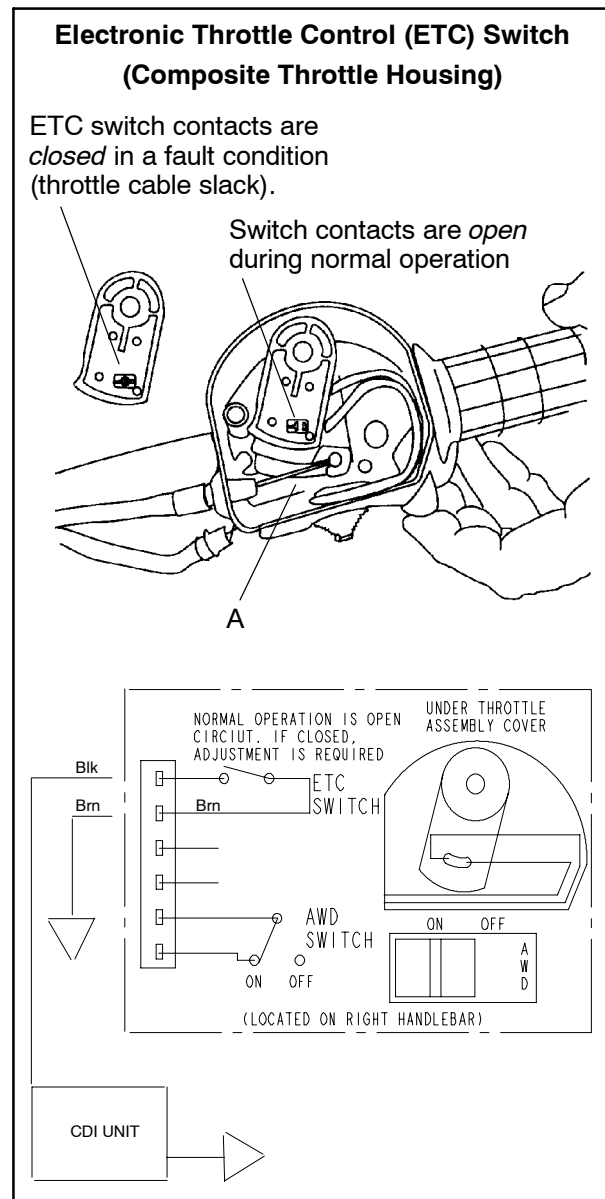
## ETC OPERATION TEST

Remove throttle block cover by carefully releasing all tabs around edge of cover.

Place transmission in neutral and apply parking brake.

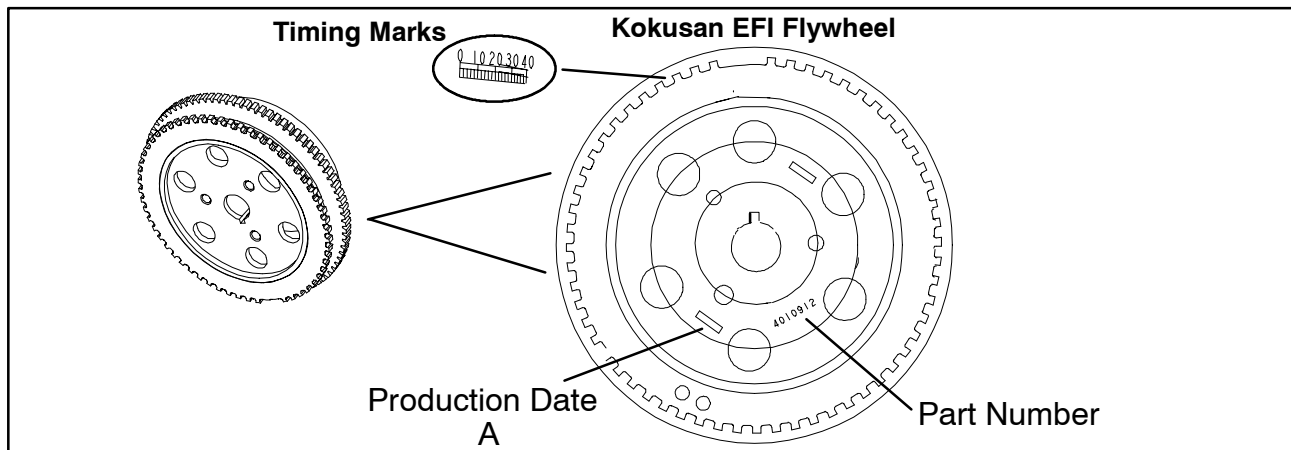
Start engine and open throttle lever slightly until engine RPM is just above idle speed.

Hold throttle cable with fingers at point "A" as shown below and release throttle lever. If the ETC system is functioning properly, the engine will lose spark and stop.





## **FLYWHEEL IDENTIFICATION**



### **Flywheel Identification Stamp Location**

The flywheel can be identified by the stamp mark in location A. Refer to "I.D." location in chart below. Do not use the cast mark to determine flywheel application.

<b>Engine Application</b>	<b>Cast</b>	<b>Stamp</b>	<b>Comment</b>
<b>Kokusan Flywheel</b>	4010912	NA	500 W

## **EFI - DC / CDI IGNITION**

The Sportsman EFI system has incorporated into its design a DC/ CDI ignition system.

Some of the advantages of DC ignition are:

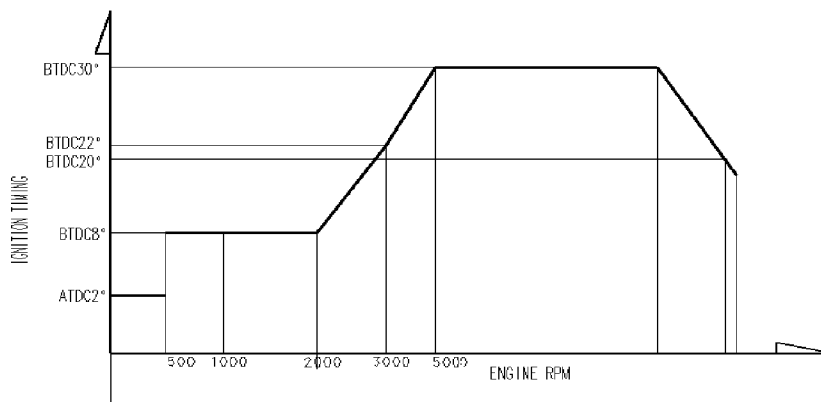
- Stronger, more consistent spark at low rpm for better performance
- Easier starts
- Simpler component design for ease of trouble shooting and maintenance

### **Operation Overview:**

The DC/CDI system relies on battery power for ignition. Instead of generating DC voltage via magnetic induction, a 12 volt DC current is supplied directly to the ECU from the battery. 12 volt DC current charges an internal capacitor to build up the initial ignition charge. An A/C signal from the Crank Shaft Position Sensor is processed by the ECU, which determines ignition timing by calculating from a point pre-determined in the crankshaft rotation. This signal releases the electrical charge which saturates the coil for ignition. DC/CDI systems have the ability to ignite with as little as 6 volts of power.

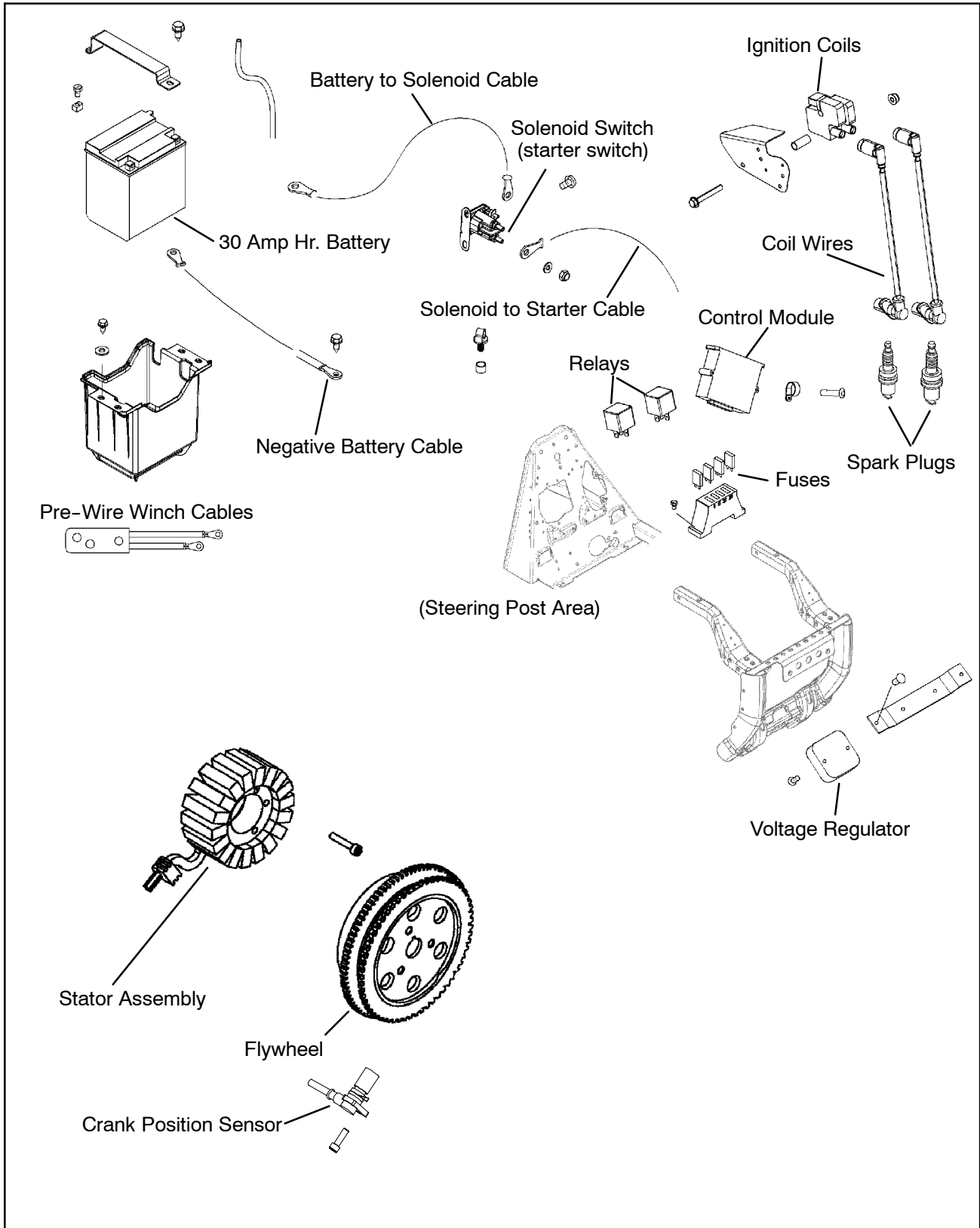
**NOTE:**

DC/CDI systems and components are not interchangeable with any other system. Timing curve shown is not indicative of EFI ignition operation.





# COMPONENTS OF EFI 500 WATT ALTERNATOR/IGNITION SYSTEM

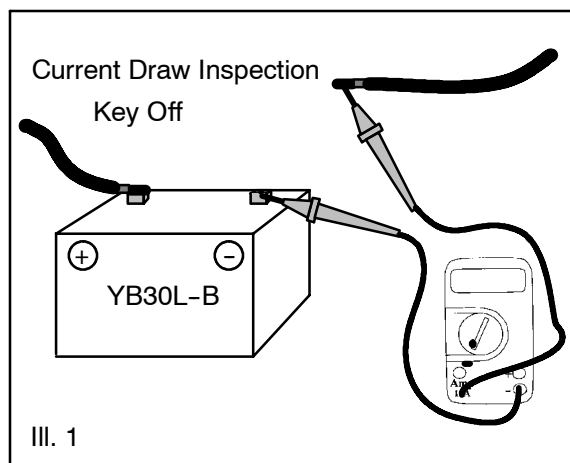




## IGNITION SYSTEM TROUBLESHOOTING

### No Spark, Weak or Intermittent Spark

- Spark plug gap incorrect
- Fouled spark plug
- Faulty spark plug cap or poor connection to high tension lead
- Related wiring loose, disconnected, shorted, or corroded
- Engine Stop switch or ignition switch faulty
- ETC switch misadjusted or faulty
- Wire harness or connections wet, corroded
- Poor ignition coil ground (e.g. coil mount loose or corroded)
- Incorrect wiring (inspect color coding in connectors etc)
- Faulty ignition coil winding (measure resistance of primary and secondary)
- Sheared flywheel key
- Flywheel loose or damaged
- Faulty ECU



**Current Draw - Key Off:  
Maximum of .01 DCA (10 mA)**

## 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.

Refer to Illustration 1 on the next page.



## 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.

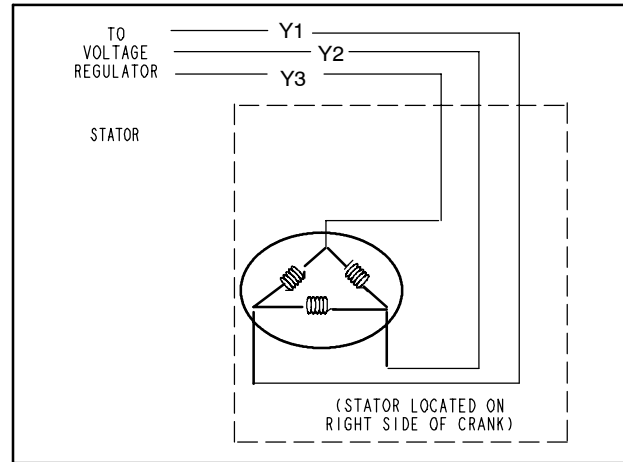
The “break even” point of the charging system is the point at which the alternator overcomes all system loads (lights, etc.) and begins to charge the battery. Depending on battery condition and system load, the break even point may vary slightly. The battery should be fully charged before performing 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 Park 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.

## ALTERNATOR OUTPUT TEST

Three tests can be performed using a multimeter 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 should measure  $0.19 \Omega \pm 15\%$ .

Test	Connect Meter Wires To:	Reading In Ohms
Charge Coil	Y1 to Y2	$0.19 \Omega \pm 15\%$
Charge Coil	Y1 to Y3	$0.19 \Omega \pm 15\%$
Charge Coil	Y2 to Y3	$0.19 \Omega \pm 15\%$
Charge Coil	Y1, Y2, or Y3 to Ground	Open (Infinity)

**NOTE:** If there are any significant variations in ohm’s 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 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.

**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 ATV 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 table below for approximate Voltage AC 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.

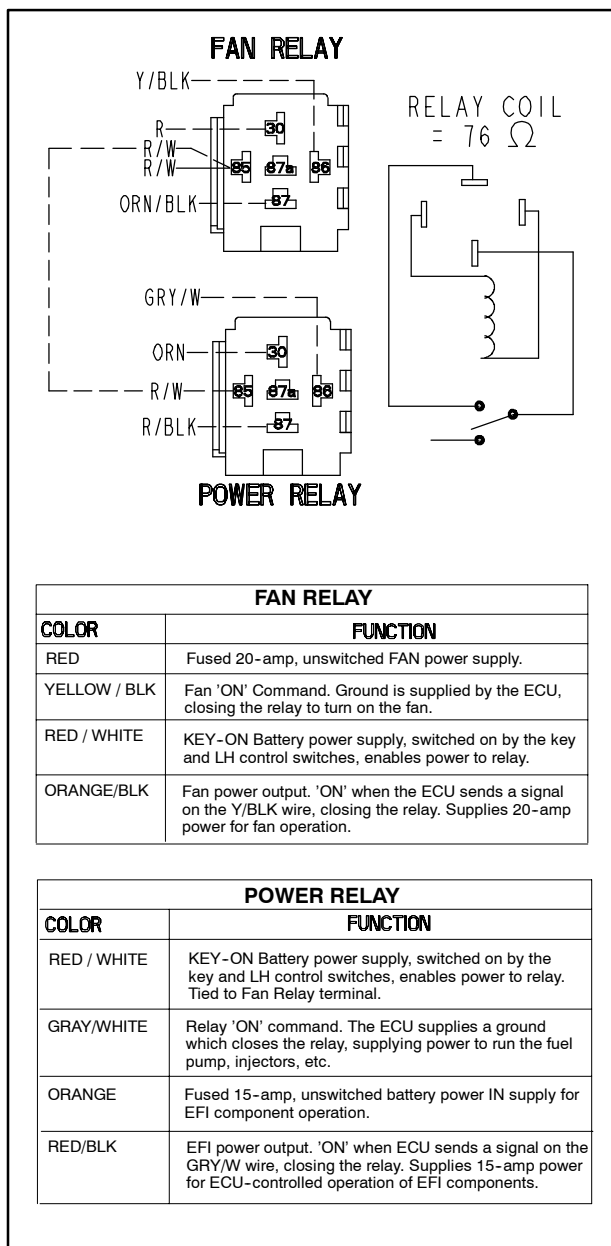
ATV RPM Reading	AC Voltage (Vac) Reading
1300	18 Vac ± 25 %
3000	42 Vac ± 25 %
5000	64 Vac ± 25 %

## RELAYS

These relays, located next to the ECU, assist with component operation such as the fan, fuel pump, etc.

The fan relay, controlled by the ECU, operates the fan.

The power relay, controlled by the ECU, turns on power for components such as the fuel pump, injectors, etc.

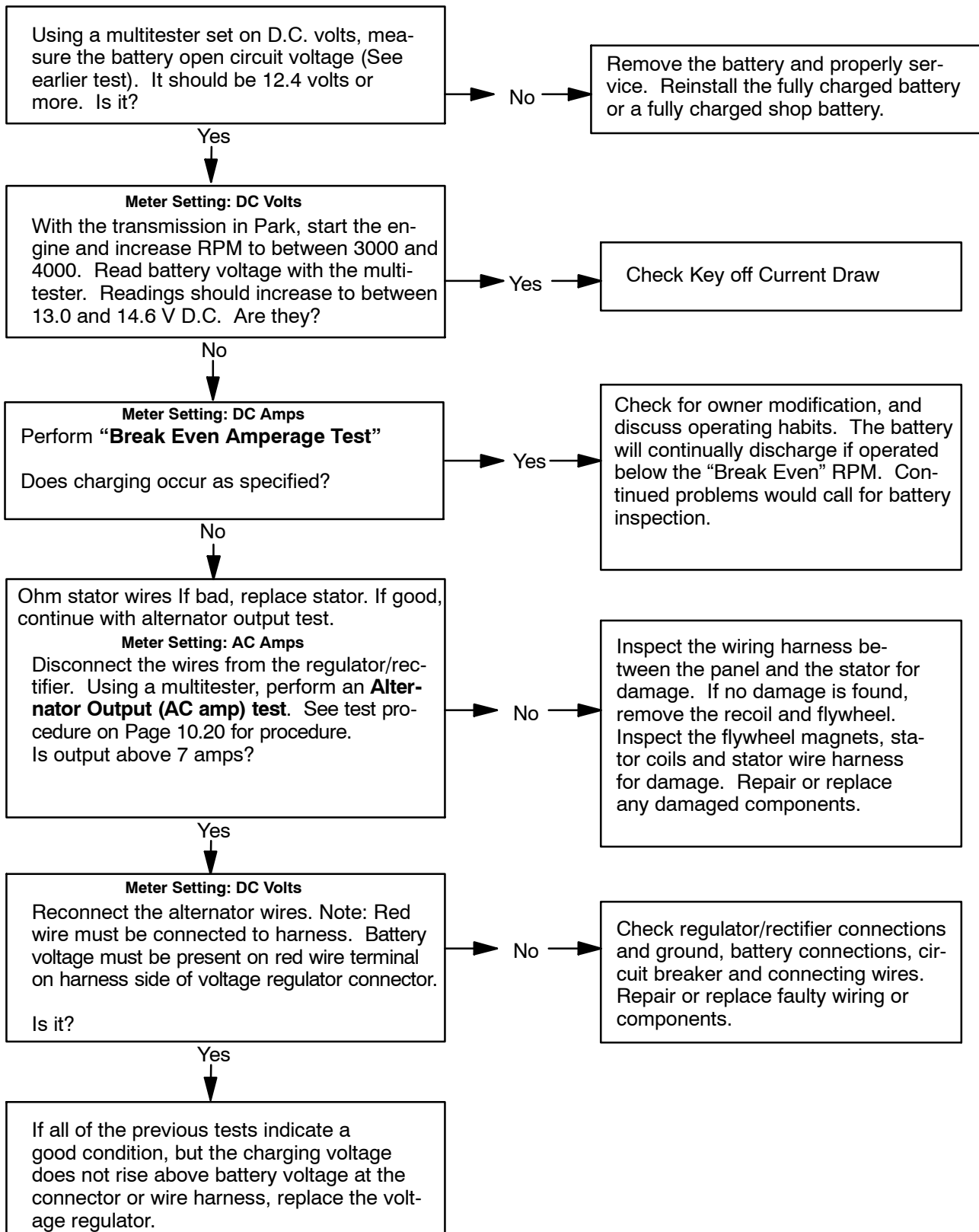






## CHARGING SYSTEM TESTING FLOW CHART

Whenever charging system problems are suspected, proceed with the following system check after verifying that all wires are in good condition, connected and not kinked or pinched.

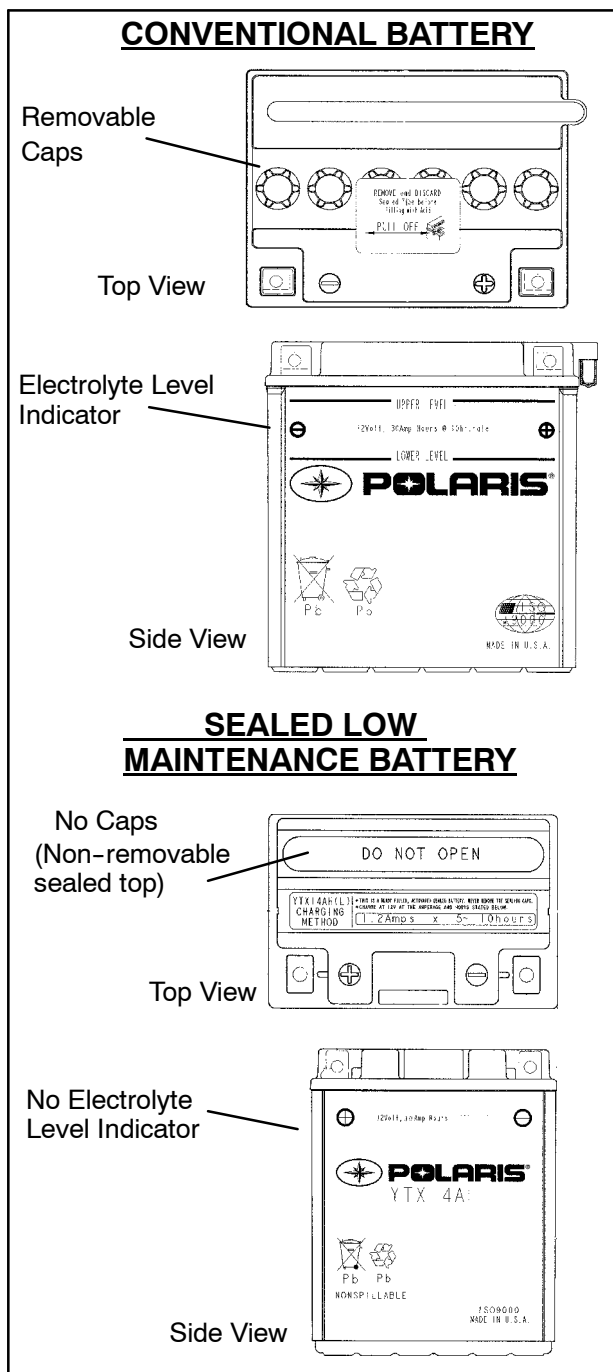




## BATTERY IDENTIFICATION

**NOTICE:** It is important to identify what type of battery you have installed in your ATV. Different types of batteries require different service procedures. Proper servicing and upkeep of your battery is very important for maintaining long battery life.

Your ATV may have a Conventional Battery or a Sealed Low Maintenance Battery. To identify which type of battery your ATV has, refer to the illustration below and follow the correct service and charging procedures that follow in the manual.



## BATTERY ACTIVATION (CONVENTIONAL)

### ▲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.



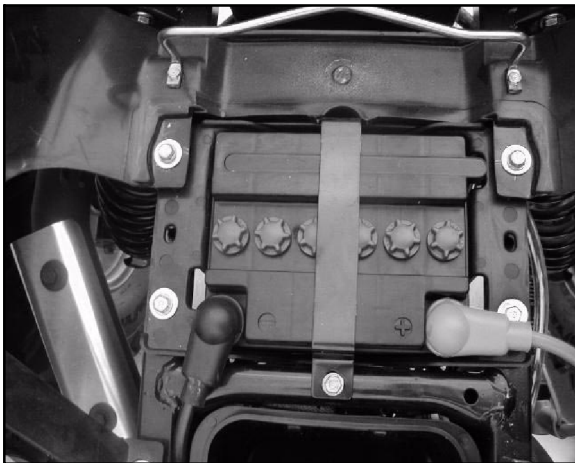
- Charge battery at 1/10 of its amp/hour rating. Examples: 1/10 of 9 amp battery = .9 amp; 1/10 of 14 amp battery = 1.4 amp; 1/10 of 18 amp battery = 1.8 amp (recommended charging rates).
- Check specific gravity of each cell with a hydrometer to assure each has a reading of 1.270 or higher.

## BATTERY TERMINALS/TERMINAL BOLTS

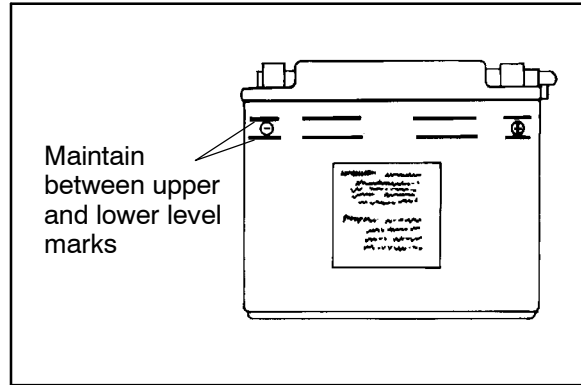
Use Polaris corrosion resistant Nyogel™ grease (PN 2871329) on battery bolts. See Battery Installation on Page 10.23.

## CONVENTIONAL BATTERY INSPECTION/REMOVAL

The battery is located under the seat.



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. To remove the battery:



- Disconnect holder strap and remove covers.
- Disconnect battery negative (-) (black) cable first, followed by the positive (+) (red) cable.

### CAUTION

Whenever removing or reinstalling the battery, disconnect the negative (black) cable first and reinstall the negative cable last!

- Remove the battery.
- Remove the filler caps and add **distilled water only** as needed to bring each cell to the proper level. Do not overfill the battery.

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.

- Reinstall the battery caps.

## CONVENTIONAL BATTERY INSTALLATION

- 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.
- Route the cables correctly.
- Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable. Coat terminals and bolt threads with Nyogel™ Grease (PN 2871329).
- 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.

- 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.

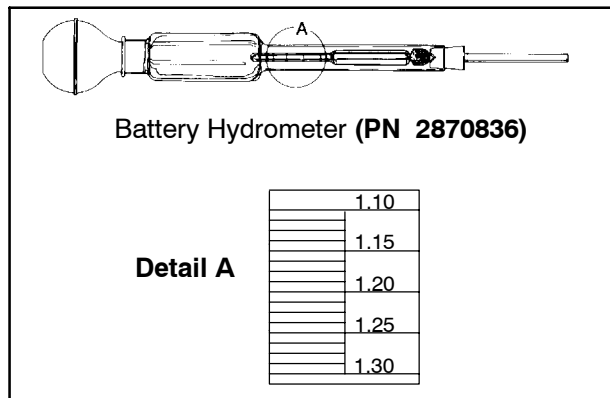
## **CONVENTIONAL BATTERY OCV - OPEN CIRCUIT VOLTAGE TEST**

Battery voltage should be checked with a digital multimeter. Readings of 12.6 volts or less require further battery testing and charging. See charts and Load Test on below.

**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.

## **CONVENTIONAL BATTERY 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.



OPEN CIRCUIT VOLTAGE		
State of charge	Conventional Lead-acid	Low Maintenance
100% Charged	12.60V	12.70V
75% Charged	12.40V	12.50V
50% Charged	12.10V	12.20V
25% Charged	11.90V	12.0V
0% Charged	less than 11.80V	less than 11.9V

SPECIFIC GRAVITY		
State of charge*	Conventional lead-acid	Low Maintenance
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**

**CAUTION:** *To prevent shock or component damage, remove spark plug high tension leads and connect securely to engine ground before proceeding.*

**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 with lots of 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 or knife, 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.

<b>Electrolyte Freezing Points</b>	
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**

1. Remove the battery from the ATV 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 (red) cable first and negative (black) 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.

## **LOW MAINTENANCE BATTERY**

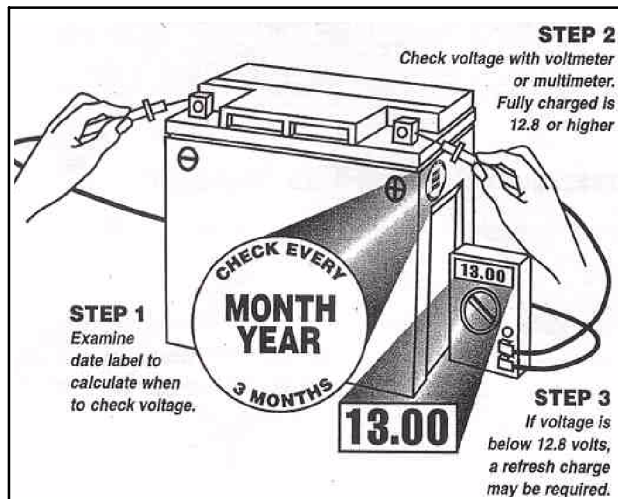
**NOTE: All Low Maintenance batteries are fully charged and tested at the factory before installation. Expected shelf life varies on storage conditions. As a general rule before placing the battery into service, check the battery condition and charge accordingly.**

### **Battery Check:**

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.



**New Batteries:** Batteries must be fully charged before use or battery life can be reduced by 10-30% of full potential. Charge battery for 3-5 hours using a variable rate charger. Do not use the alternator to charge a new battery. A high rate battery charger can cause battery damage.

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.

**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. Refer to the Battery Activation and Maintenance Video (PN 9917987) for proper instruction on servicing Low Maintenance batteries.

**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. (Refer to Battery Activation and Maintenance video PN 9917987)

**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. Refer to the Battery Maintenance Video (PN 9917987) for proper instruction on servicing Low Maintenance batteries.

## 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.

## LOW MAINTENANCE BATTERY CHARGING

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.

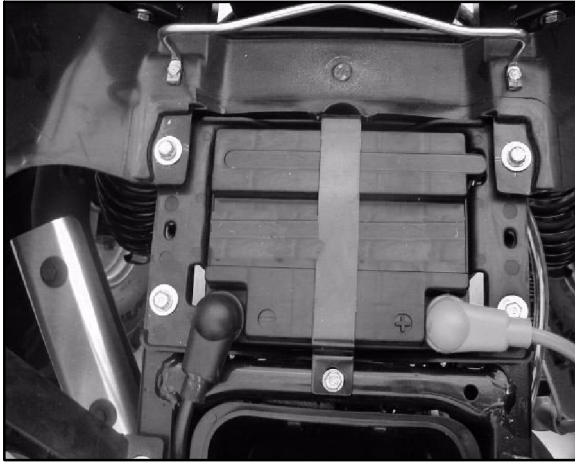
### Battery Charging Reference Table

State of Charge	Voltage	Action	Charge Time (*See note below)
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



## **LOW MAINTENANCE BATTERY INSPECTION/ REMOVAL**

The battery is located under the seat.



1. Remove the seat and Disconnect holder strap.
2. Disconnect battery negative (-) (black) cable first, followed by the positive (+) (red) cable.



### **CAUTION**

Whenever removing or reinstalling the battery, disconnect the negative (black) cable first and reinstall the negative cable last!

3. Remove the battery.

## **LOW MAINTENANCE 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.
3. Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable. Coat terminals and bolt threads with Nyogel™ Grease (PN 2871329).
4. Reinstall the holder strap.

## **LOW MAINTENANCE 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.

## **LOW MAINTENANCE BATTERY - 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 batter voltage.

OPEN CIRCUIT VOLTAGE		
State of charge	Maintenance Free	Low Maintenance
100%	13.0V	12.70V
75% Charged	12.80V	12.50V
50% Charged	12.50V	12.20V
25% Charged	12.20V	12.0V
0% Charged	less than 12.0V	less than 11.9V

\* At 80°F

**NOTE:** Subtract .01 from the specific gravity reading at 40° F.





## LOW MAINTENANCE BATTERY LOAD TEST

**CAUTION:** *To prevent shock or component damage, remove spark plug high tension leads and connect securely to engine ground before proceeding.*

**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.

## LOW MAINTENANCE 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 with lots of fresh water after cleaning.
- Using a wire brush or knife, remove any corrosion from the cables and terminals.
- Make sure that the electrolyte is at the proper level.
- 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:** 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. 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

## LOW MAINTENANCE BATTERY CHARGING PROCEDURE

1. Remove the battery from the ATV to prevent damage from leaking or spilled acid during charging.
2. Charge the battery with a variable rate charging output. 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 Nyogel™ Grease (PN 2871329).
4. Route cables so they are tucked away in front and behind battery.
5. Connect battery cables.

### **▲ WARNING**

*To avoid the possibility of sparks and explosion, connect positive (red) cable first and negative (black) cable last.*

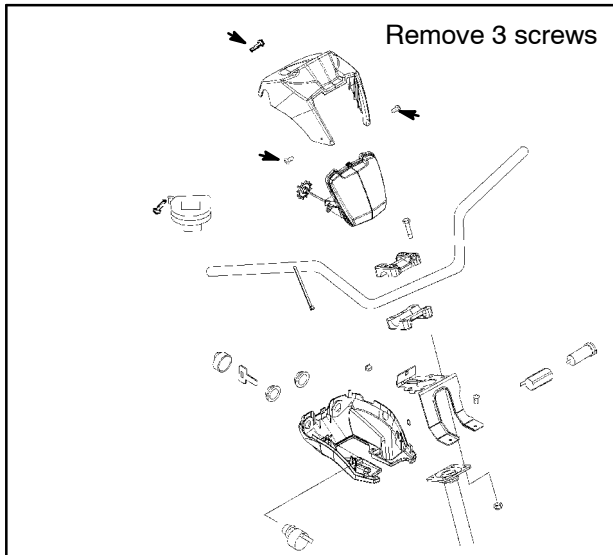
6. After connecting the battery cables, install the cover on the battery and attach the hold down strap.



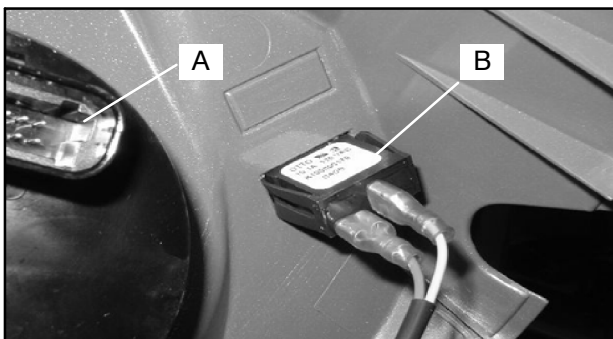


## **HIGH BEAM HEADLIGHT BULB REPLACEMENT**

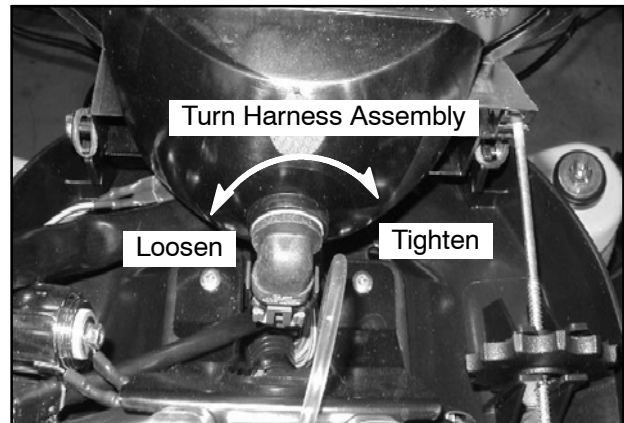
**CAUTION:** Do not service while headlight is hot. Serious burns may result. Protect lamp during install.



1. Remove three Phillips screws on the headlight pod.
2. Lift pod cover up.
3. Disconnect instrument cluster harness (A) and work light switch (B).

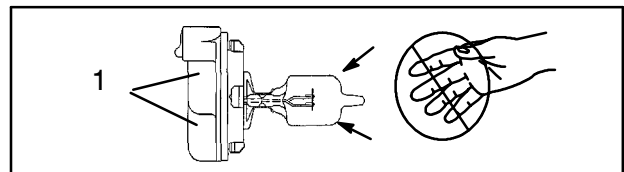


4. Turn the headlight lamp socket counter-clockwise and remove.

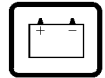


5. Carefully remove headlamp bulb from housing.
6. Remove the headlamp and replace with a new headlamp.

**NOTE:** Do not touch the lamp with bare fingers. Hold the plastic part (1) of the lamp. Oil from your skin leaves a residue, causing a hot spot that will shorten the life of the lamp.

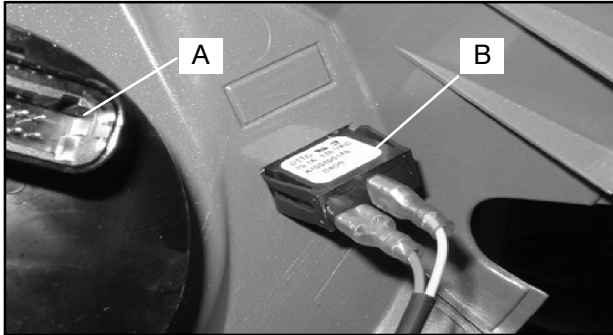


7. Install the new headlamp and harness assembly into the headlight assembly. Turn the headlight harness clockwise to secure the headlamp into place.

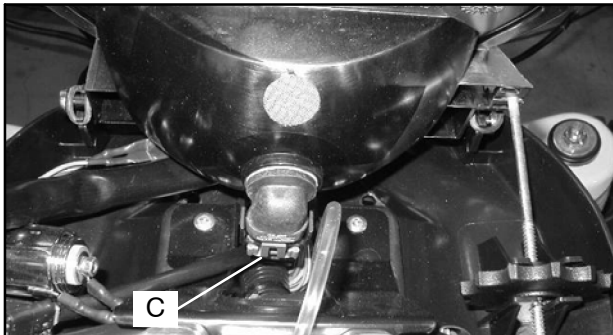


## HEADLIGHT HOUSING REPLACEMENT

1. Remove three Phillips screws on the headlight pod.
2. Disconnect instrument cluster harness (A) and work light switch (B).



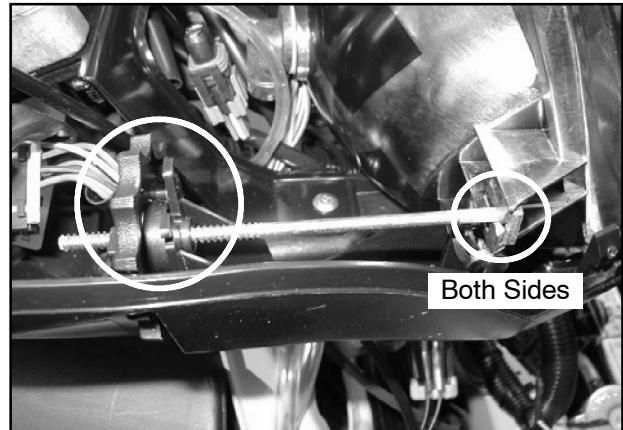
3. Unplug headlamp harness (C).



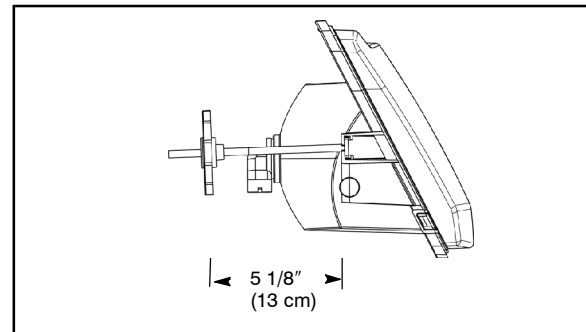
4. Remove O-Ring (D) from headlight pivot pins. (Both Sides)



5. Pull the headlight housing up to release from the locking tabs.



6. Lift the adjusting knob up to remove from the locking tabs.
7. Carefully pull the assembly up and out of pod.
8. Reverse the steps to install the new housing and reassemble the pod.



**NOTE:** The distance from the headlamp parting line to the end of the adjustment knob stop is 5 1/8, (13 cm). See illustration.

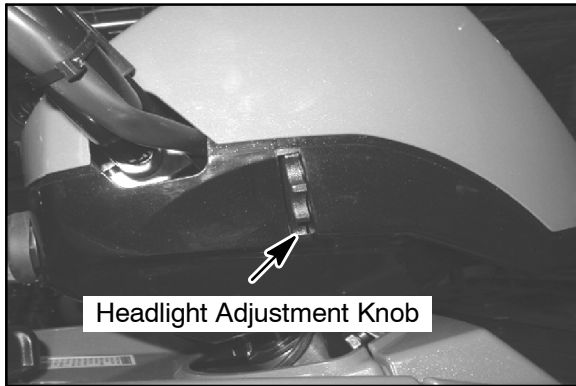
9. Adjust the headlight aim by turning the adjusting knob.



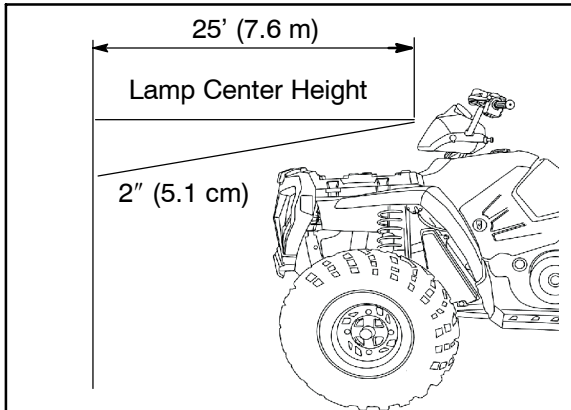
## **HIGH BEAM HEADLIGHT ADJUSTMENT**

The headlight beam can be adjusted to any position desired by turning the adjusting knob located on the bottom right side of the headlight pod.

Raise Headlight - Turn knob counter- counter-clockwise  
Lower Headlight - Turn knob clockwise

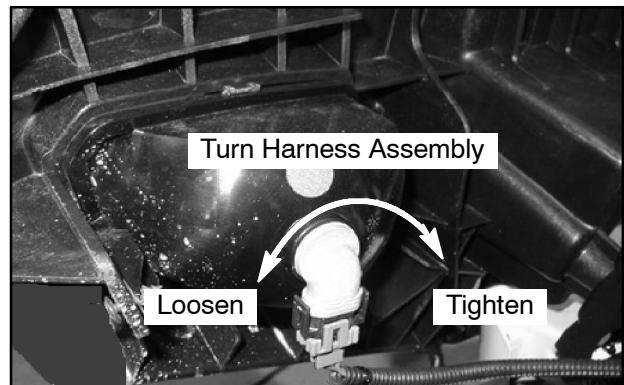


1. Place the vehicle on a level surface with the headlight approximately 25' (7.6 m) from a wall.

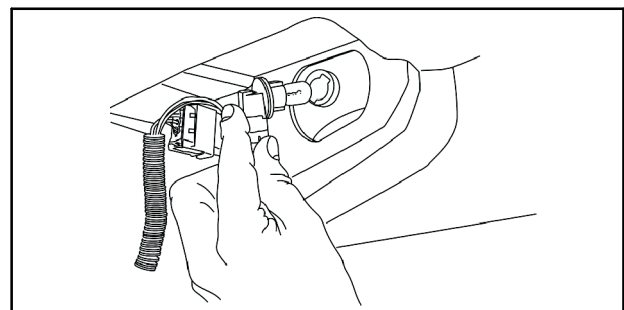


2. Measure the distance from the floor to the center of the headlight and make a mark on the wall at the same height.
3. Start the engine and turn the headlight switch to high beam.
4. Observe headlight aim. The most intense part of the headlight beam should be aimed 2" (5.1 cm) below the mark placed on the wall in Step 2  
**NOTE:** Rider weight must be included on the seat. On machines with separate low beam lights, the drop should be 8" (20.3 cm) in 25' from the center of the low beam lamp.
5. Adjust beam to desired position .

## **LOWER HEADLAMP REMOVAL/INSTALLATION**

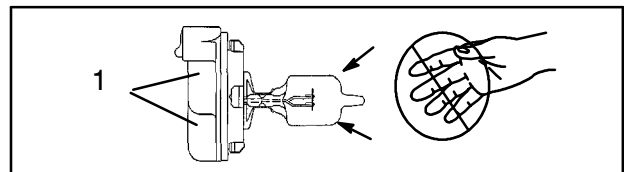


1. Turn the back of the headlamp harness in a counter-clockwise direction to loosen.
2. Pull the harness assembly out from the headlight assembly.



3. Remove the lamp and replace with a new headlamp.

**NOTE:** Do not touch the new lamp with bare fingers. Hold the plastic part (1) of the lamp. Oil from your skin leaves a residue, causing a hot spot that will shorten the life of the lamp.

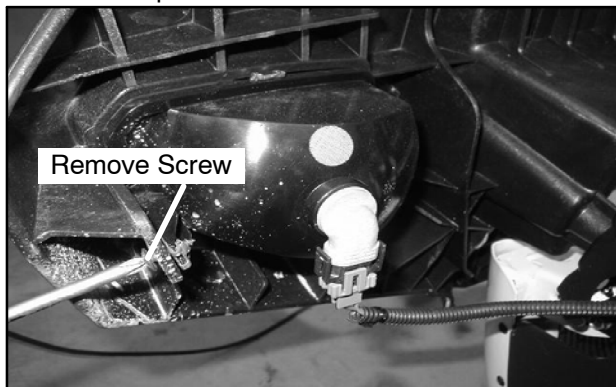


4. Install the harness assembly into the headlight assembly. Turn the headlight harness clockwise to secure the headlamp into place.



**Lower Headlamp Housing Removal (if required)**

- Remove the screw that secures the lower headlamp.



- Pull the headlamp out of the locking tab.

**LOW BEAM HEADLIGHT ADJUSTMENT**

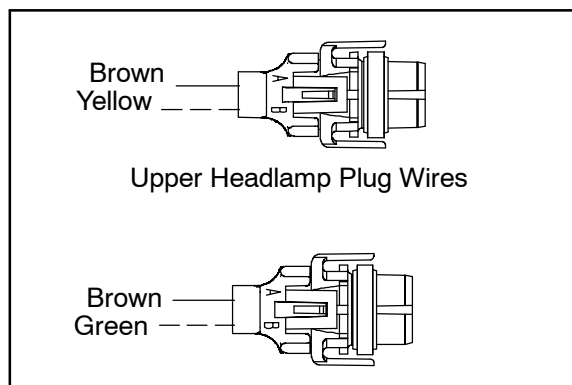
- The low beam can be adjusted slightly upward or downward.



- Loosen the phillips screw located at the rear of the headlamp.
- Tilt the headlamp upward or downward.
- Tighten the screw.

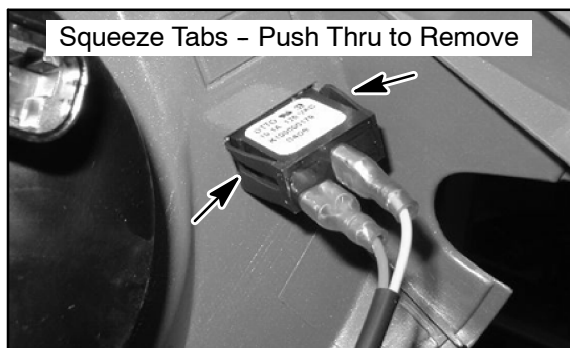
**HEADLAMP SWITCH TEST**

- Remove the headlight pod cover.
- Set meter to DC Volts and probe the headlamp plug wires (Brown and Yellow) at back of connector for 12 Volts.
- Turn ignition and headlight on. If there is no power, continue with checks to the harness and fuses.



**WORKLIGHT SWITCH**

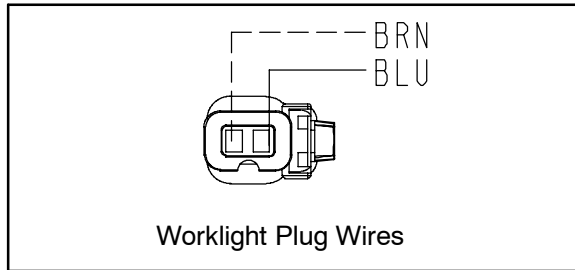
Remove the headlight pod cover to locate the switch wires. The switch snaps out by pushing in on the tabs on both sides of the switch.



If the rear work lights will not come on, check the following:

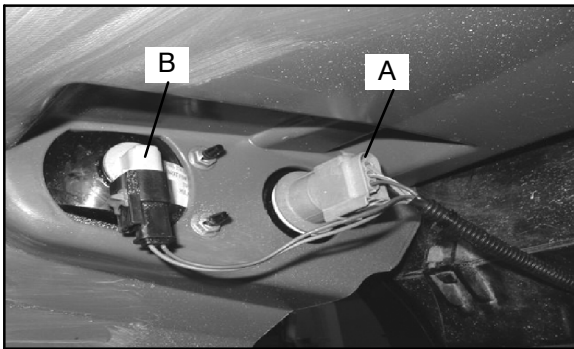


- Check for continuity between the switch contacts - Place meter leads between two contacts with switch in ON position.
- Probe the worklight plug wires at back of vehicle, there should be at least 12V at the plug.
- Check for 12 volt power at the blue wire.

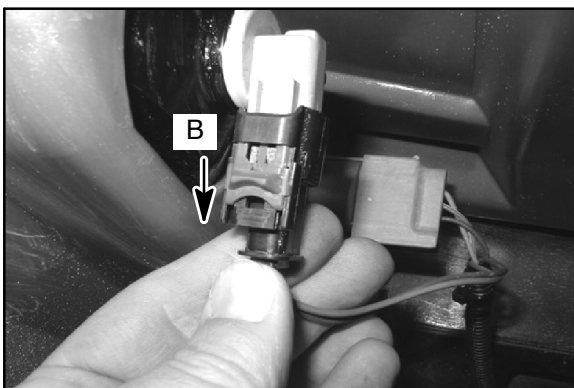


## **BRAKE LIGHT / WORK LIGHT REPLACEMENT**

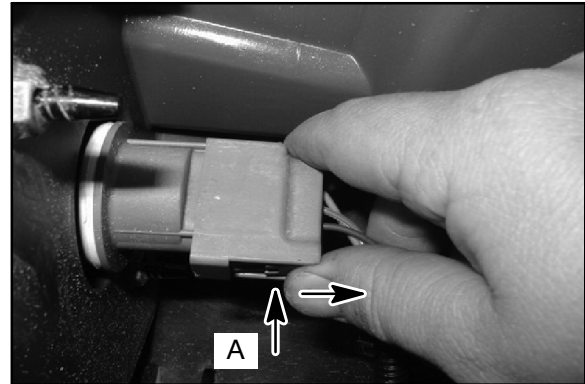
The brake light (A) and the work light (B) are both located in the rear tail lamp housing.



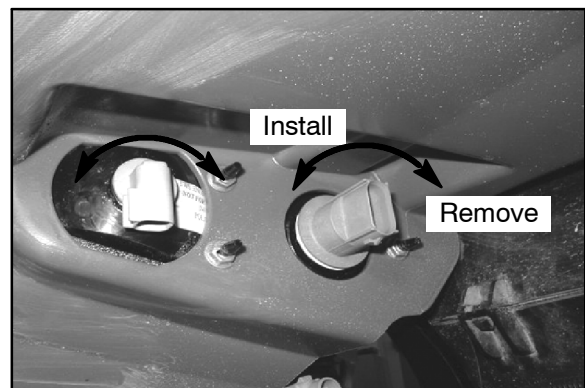
1. To remove the worklight electrical connector (B), pull down on the connector lock and pull the connector from the bulb assembly.



2. To remove the brake light electrical connector (B), press in on the tab on the connector to unlock the connector and pull the connector from the bulb assembly.



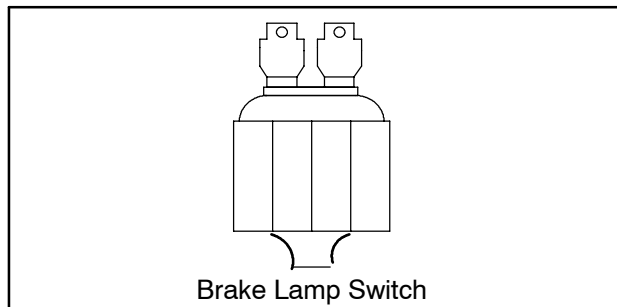
3. To remove either of the bulbs, turn the holder assembly counter-clockwise to remove and pull out. Turn the holder assembly clockwise to install. Refer to the parts manual for the correct bulb part number.





## BRAKE LIGHT SWITCH

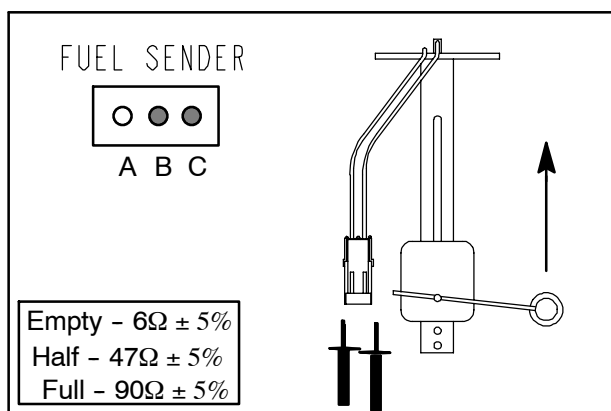
1. Remove the front cover.



2. Disconnect wire harness from switch.
3. Connect an ohmmeter across switch contacts. Reading should be infinite ( $\infty$ ).
4. Apply brake at handlebar lever and check for continuity between switch contacts. Replace switch if there is no continuity or greater than .5 ohms resistance when the brake is applied with slight pressure.

## FUEL SENDER TEST

1. Drain the fuel tank and remove it from the atv.
2. Set the fuel tank on a flat surface.
3. Hook up an ohm meter to the fuel sender harness Violet/White wire (B) and Brown wire (C).
4. With the sender float in the **empty position**, the meter should read **5 ohms**.
5. Slowly tilt invert the tank so that gravity moves the sender float to the **full position**, the meter should now read **90 ohms**.



6. If the readings are not **between 5 ohms and 90 ohms**, 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 exists, the sender assembly is faulty. Fuel pump assembly replacement is required.



# ACCESSORY WIRE CONNECTIONS

## Winch Installation

The 2005 Sportsman models have the main winch cables routed and installed from the factory. This enables quick installation.

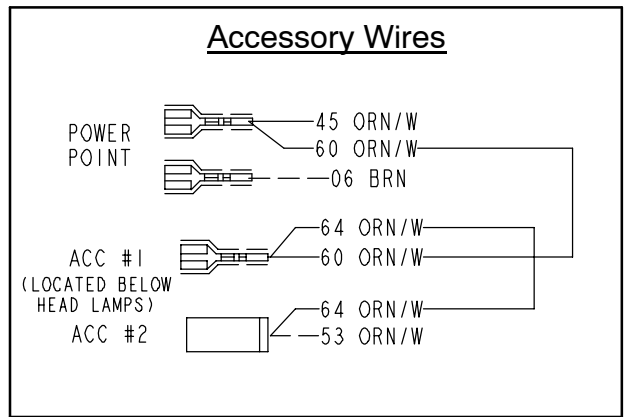
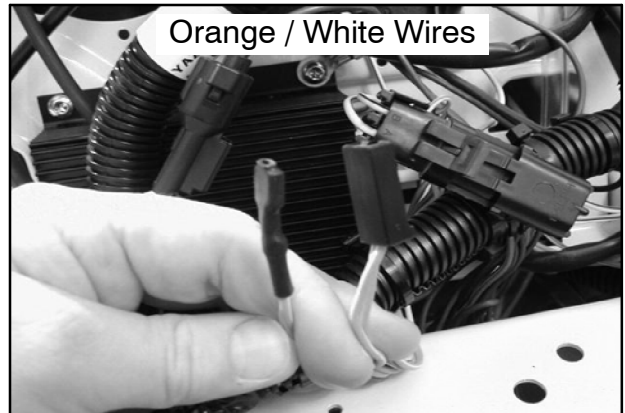
Refer to Chapter 2 for more information on winch installation and operation.

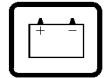
## Accessory Power Wires

The accessory power leads for all accessories are located under the front cover. The wires are 12 Volt wires and are Orange / White in color. To locate the wires, remove the front cover. The wires will be located in the main wire loom on the right side.

If you have trouble locating the Orange / White wires remove the left side panel and search under the front fender area.

**NOTE:** Refer to the accessory instructions for accessory hook-up and installation.





# BASIC WINCH WIRING - 2005 ATV MODELS

## 2005 ATV WINCH WIRING DIAGRAM

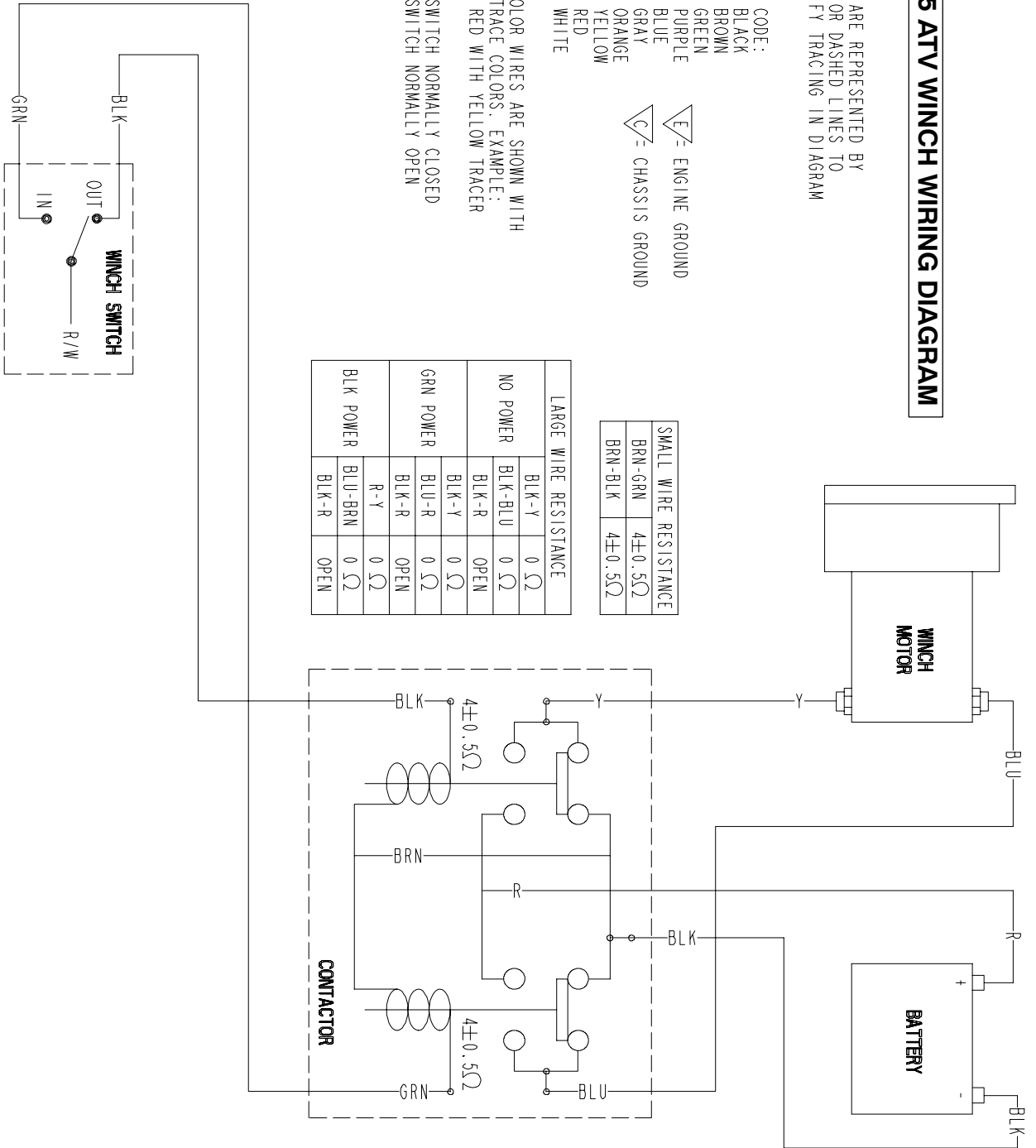
WIRES ARE REPRESENTED BY SOLID OR DASHED LINES TO SIMPLIFY TRACING IN DIAGRAM

- COLOR CODE:**  
 BLK = BLACK  
 BRN = BROWN  
 GRN = GREEN  
 PUR = PURPLE  
 BLU = BLUE  
 GRY = GRAY  
 OR = ORANGE  
 Y = YELLOW  
 R = RED  
 W = WHITE
- $\nabla$  = ENGINE GROUND  
 $\nabla$  = CHASSIS GROUND

TWO COLOR WIRES ARE SHOWN WITH MAIN/TRACE COLORS. EXAMPLE:  
 R/Y = RED WITH YELLOW TRACER  
 NC = SWITCH NORMALLY CLOSED  
 NO = SWITCH NORMALLY OPEN

SMALL WIRE RESISTANCE	
BRN-GRN	4±0.5Ω
BRN-BLK	4±0.5Ω

LARGE WIRE RESISTANCE	
NO POWER	BLK-Y 0 Ω
	BLK-BLU 0 Ω
	BLK-R OPEN
GRN POWER	BLK-Y 0 Ω
	BLU-R 0 Ω
	BLK-R OPEN
BLK POWER	R-Y 0 Ω
	BLU-BRN 0 Ω
	BLK-R OPEN







## **STARTER SYSTEM** **TROUBLESHOOTING**

### **Starter Motor Does Not Turn**

- 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 starter solenoid or starter motor.
- Engine problem - seized or binding (Can engine be rotated easily with recoil starter?)

### **Starter Motor Turns Over Slowly**

- Battery discharged - low specific gravity
- Excessive circuit resistance - poor connections (see Voltage Drop Test below)
- 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.

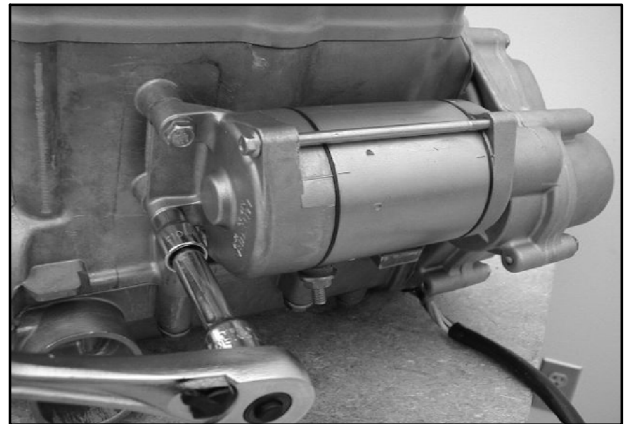
To perform the test, place the meter on DC volts and place the meter leads across the connection to be tested. Refer to the chart on 1.47 to perform voltage

drop tests on the starter system.

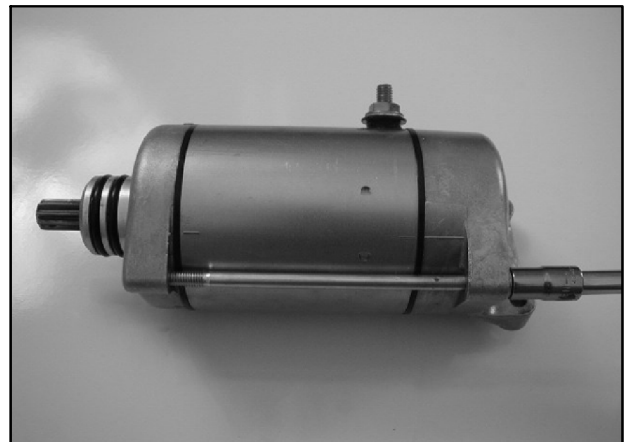
**Voltage should not exceed  
.1 DC volts per connection**

## **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.

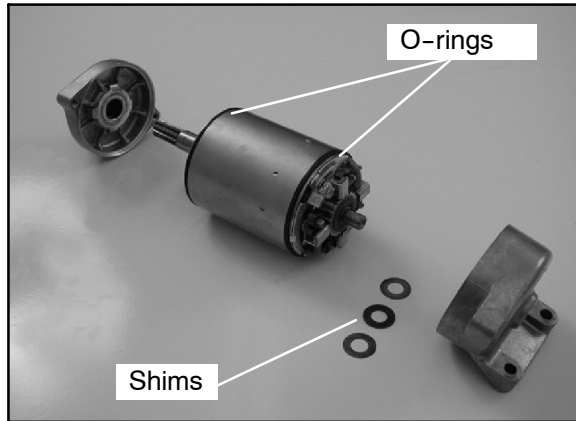
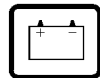


1. Remove the starter from the engine.
2. Remove the two bolts, washers, and sealing O-Rings. Inspect O-Rings and replace if damaged.



**NOTE:** Note the alignment marks on both ends of the starter motor casing. These marks must align during reassembly.

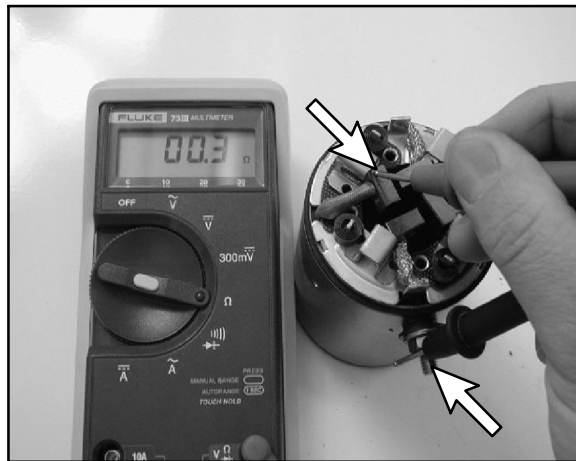
3. Remove the front bracket assembly and the rear bracket assembly. Remove the shims from the armature shaft and inspect the O-rings located on the armature housing.



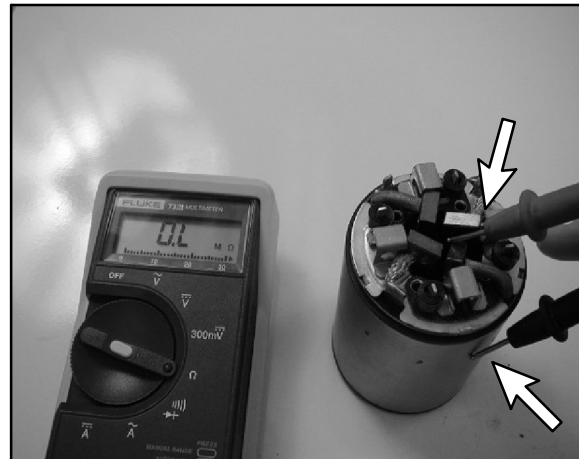
**NOTE:** The shims will be replaced during reassembly.

## **BRUSH** **INSPECTION/REPLACEMENT**

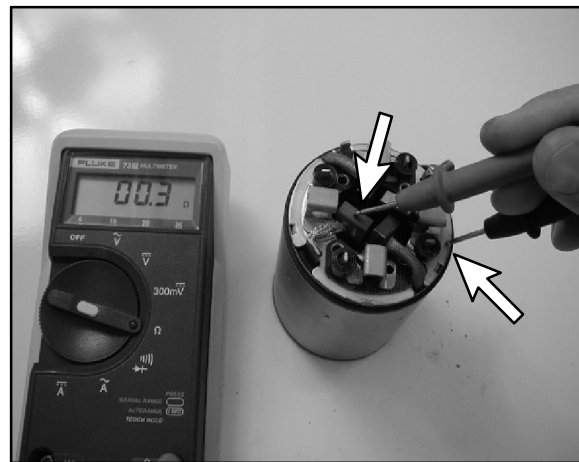
1. Measure resistance between starter input terminal and insulated brushes. The reading should be .3 ohms or less. Remember to subtract meter lead resistance.



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.

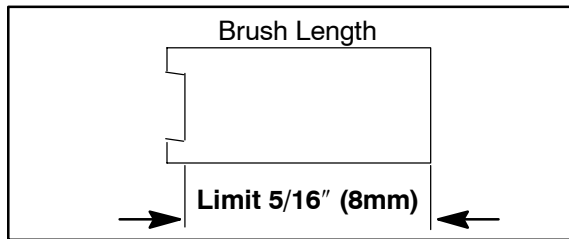


3. Slide positive brush springs to the side, pull brushes out of their guides and remove brush plate. Slide brush end frame off end of starter. **NOTE:** The electrical input post must stay with the field coil housing.
4. Measure resistance between ground brush and brush plate. Resistance should be .3 ohms or less.



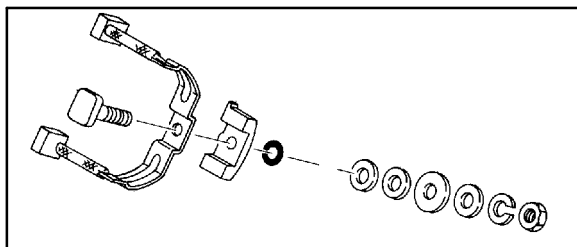
### **Inspection**

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.

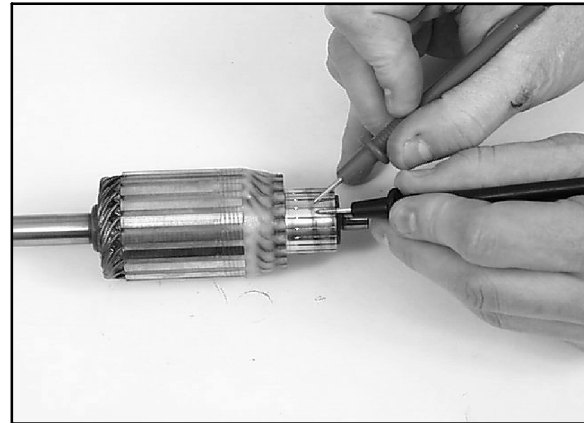
### Cleaning

**CAUTION:**

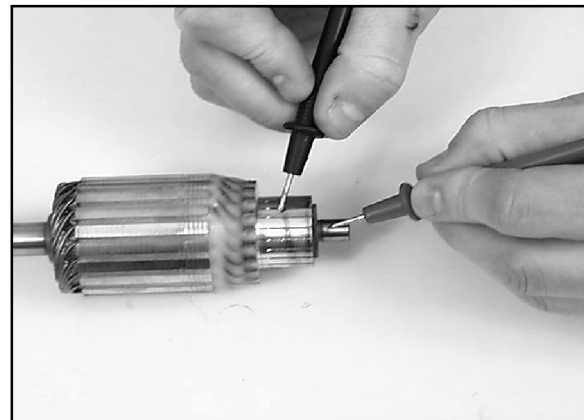
Some cleaning solvents may damage the insulation in the starter. Care should be exercised when selecting an appropriate solvent. If the commutator needs cleaning use only electrical contact cleaner.

## **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.



- 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:

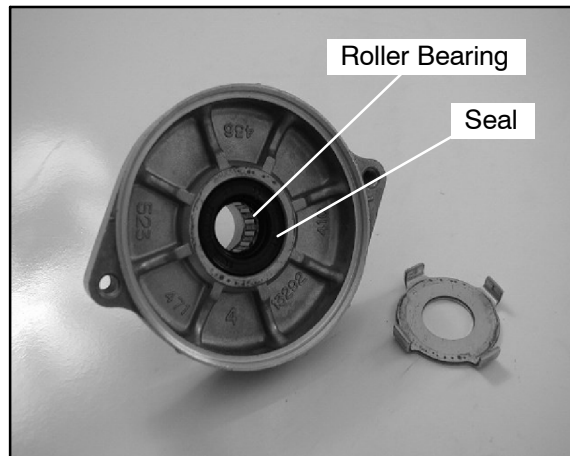
Use care when handling starter housing. Do not drop or strike the housing as magnet damage is possible. If magnets are damaged, starter must be replaced.

## STARTER REASSEMBLY/INSTALLATION

- Install brush plate to field magnet housing aligning index tab.



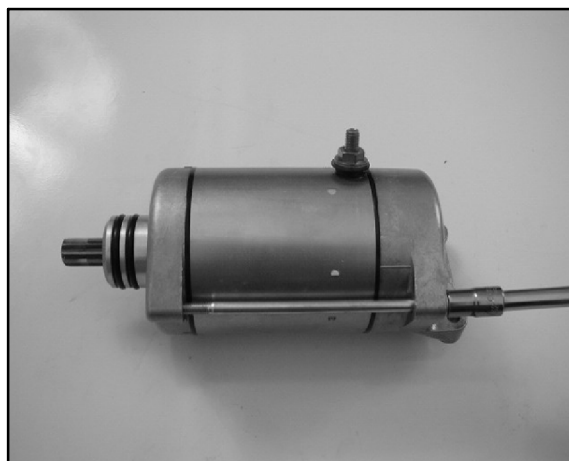
- Install O-ring, two small phenolic spacers, large phenolic washer, flat washer, lock washer, and terminal nut.
- While holding brush springs away from brushes, push brushes back and hold in place.
- Slide armature into field magnet housing. Release brushes.
- Lightly grease the drive roller bearing and reinstall drive end frame on armature. Inspect seal for wear or damage. Replace drive end cap if necessary.



- Be sure wire insulation is in place around positive brush wire and pushed completely into slot on phenolic plate.
- Using a non-petroleum grease, lubricate brush end bushing and install shims.

**Dielectric Grease (PN 2871329)**

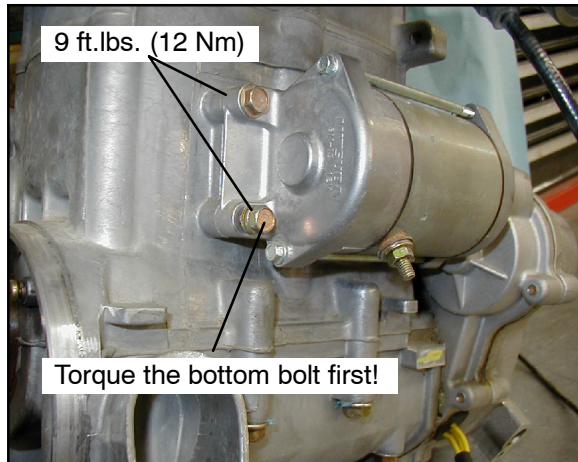
- Align brush plate and install cover and screws.
- Lightly grease pinion shaft and install pinion, spring stopper, and snap ring.



- 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.



**NOTE:** It is important to tighten the bottom starter bolt first, 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.



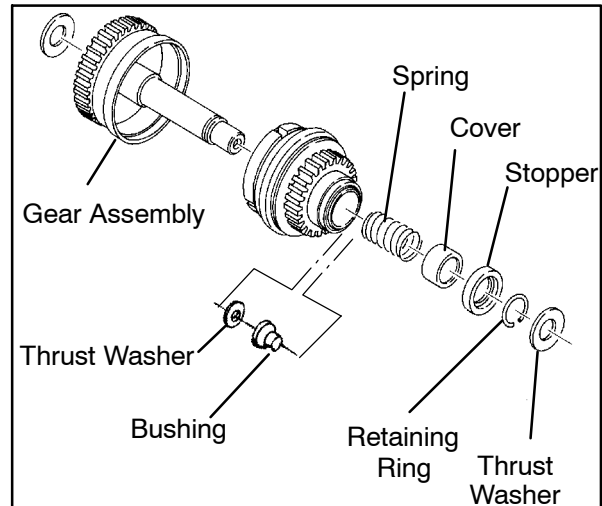
## **STARTER SOLENOID BENCH TEST**

To measure the resistance of the pull-in coil, connect one meter lead to the solenoid lead wire and the other to ground. The resistance should be 2.8-3.6 ohms. Refer to Electric Starter System Testing in this section to further test the solenoid.

## **STARTER DRIVE**

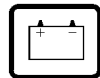
### **Pinion Gear - Anti Kick-out Shoe, Garter Spring Replacement**

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:

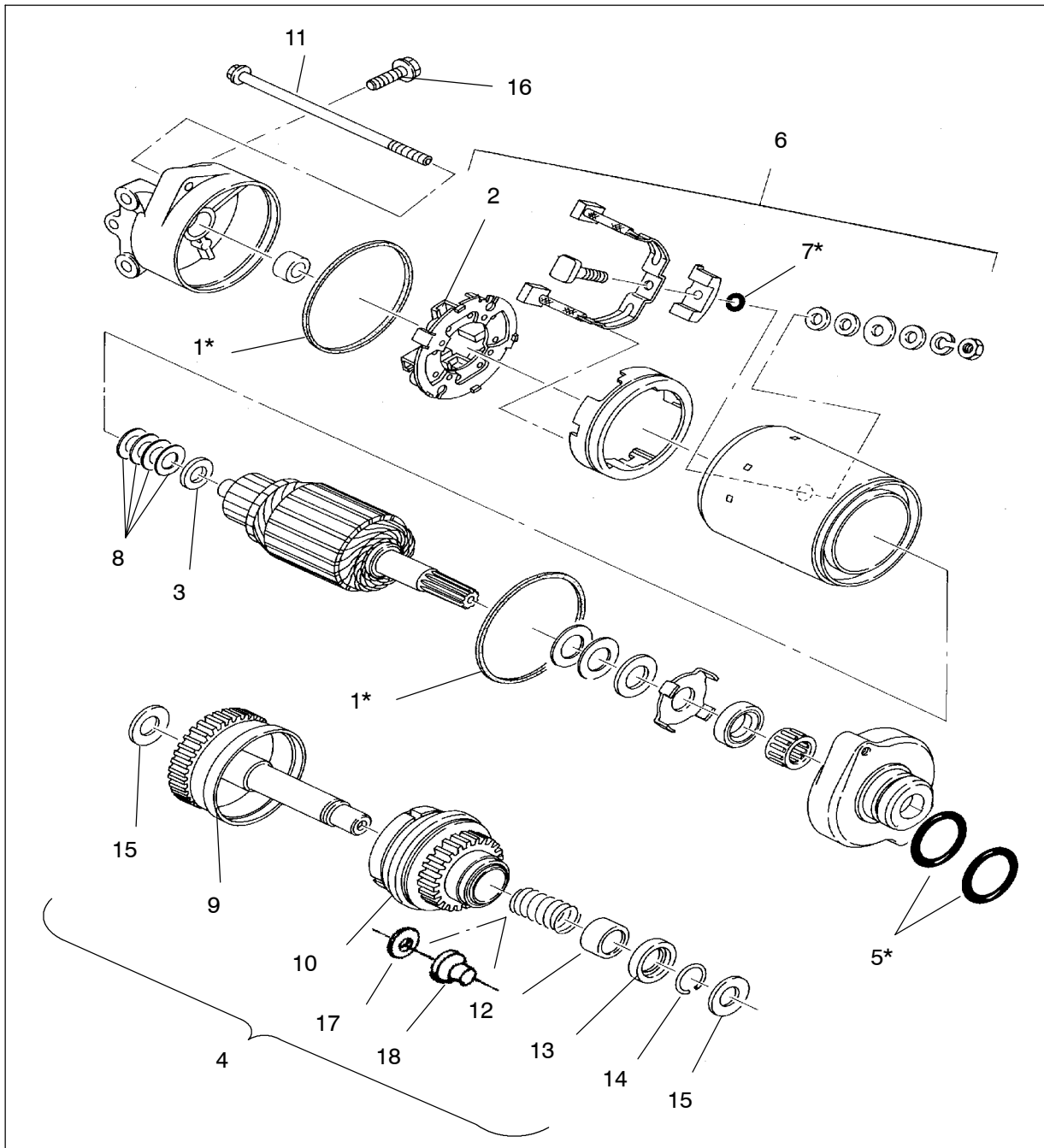


**Polaris Premium Starter Drive Grease**  
**(PN 2871460)**

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 that 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 ASSEMBLY**



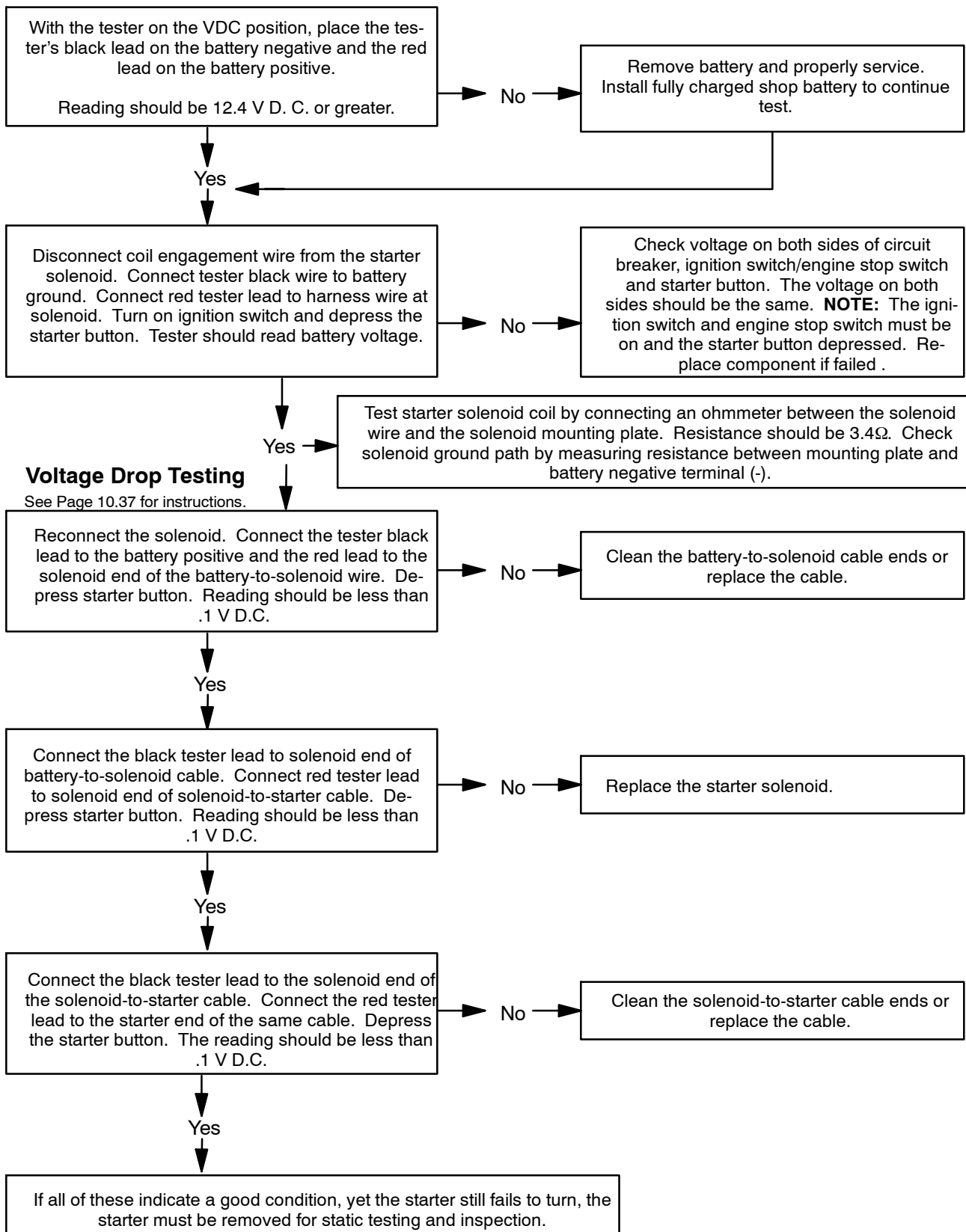
Ref.	Description	Ref.	Description
1.	Rubber Ring*	10.	Gear Assembly
2.	Brush Spring	11.	Though Bolt
3.	Thrust Washer	12.	Cover
4.	Gear Assembly	13.	Stopper
5.	O-Ring*	14.	Snap Ring
6.	Brush Complete	15.	Washer
7.	O-Ring*	16.	Flange Bolt
8.	Thrust Washer	17.	Thrust Washer
9.	Shaft Complete	18.	Flange Bushing

\*Do not reuse. Replace with new parts.



# STARTER SYSTEM TESTING FLOW CHART

Condition: Starter fails to turn motor. **NOTE:** Make sure engine crankshaft is free to turn before proceeding with dynamic testing of starter system. A digital multitester must be used for this test.











WIRING DIAGRAM 2005 SPORTSMAN 700/800 EFI

2005 SPORTSMAN EFI  
ATV-05-SPORTSMAN

PAGE 2 OF 2

WIRES ARE REPRESENTED BY  
SOLID OR DASHED LINES TO  
SIMPLIFY TRACING IN DIAGRAM

REF #	COLOR	GAUGE	WIRE TERMINATION TABLE FROM CONNECTOR	TO CONNECTOR
01	RED	20	ECU	SPLICE #4
02	RED/WHITE	20	ECU	SPLICE #2
03	YELLOW/BROWN/5	20	ECU	DIAGNOSTIC
04	VIOLET	20	ECU	SPLICE #3
05	ORANGE	20	ECU	T-RAP SENSOR
06	YELLOW	20	ECU	TEMP SENSOR
07	PINK/WHITE	20	ECU	T-RAP SENSOR
08	GREEN	20	ECU	TPS
09	WHITE/ORANGE	20	ECU	SPEED SENSOR
10	GRAY/ORANGE	20	ECU	SPEED SENSOR
12	YELLOW/BLACK	20	ECU	FAN RELAY
14	WHITE	20	ECU	FUEL INJECTOR PTO
15	WHITE/BLACK	20	ECU	FUEL INJECTOR MAG
17	GREEN/WHITE/5	20	ECU	DIAGNOSTIC
18	ORANGE	20	ECU	TPS
19	BROWN	20	ECU	SPLICE #2
21	VIOLET	20	ECU	TEMP SENSOR
22	RED/GRAY/5	20	ECU	BATTERY SPLICE
23	PINK	20	ECU	T-RAP SENSOR
25	BLACK	20	ECU	SPLICE #1
26	WHITE/BLUE	20	ECU	SPEEDOMETER
28	GRAY/WHITE	20	ECU	POWER RELAY
29	BLACK/WHITE	20	ECU	SPEEDOMETER
30	GREEN/WHITE/3	20	ECU	IGNITION COIL
31	YELLOW/BROWN/3	20	ECU	IGNITION COIL
32	BLUE/WHITE	20	ECU	SPEEDOMETER
33	RED/BLACK	20	FUEL INJECTOR PTO	SPLICE #2
34	RED	20	FUSE BLOCK	SPLICE #4
35	BROWN	20	SPLICE #1	SPLICE #5
36	RED/BLACK	20	FUEL INJECTOR MAG	SPLICE #2
37	RED/BLACK	20	SPLICE #2	SPLICE #6
38	BROWN	20	SPEED SENSOR	SPLICE #2
39	BLACK	20	IGNITION SWITCH	SPLICE #1
40	SHLD/5	20	DIAGNOSTIC	SPLICE #5
41	SHLD/3	20	SPLICE #5	-
42	RED/5	20	DIAGNOSTIC	SPLICE #4
43	RED/GRAY/3	20	IGNITION COIL	SPLICE #6
44	VIOLET	20	T-RAP SENSOR	SPLICE #3
45	VIOLET	20	TPS	SPLICE #3
46	GREEN/WHITE	20	TRANS SWITCH	RESISTOR MODULE
47	BROWN	16	HEADLIGHT POD ACC	SPLICE #1
48	BROWN	14	VOLTAGE REGULATOR	GROUND
49	BROWN	14	VOLTAGE REGULATOR	GROUND
50	BROWN	16	LH HEADLIGHT	SPLICE #2
51	BROWN	16	RH HEADLIGHT	SPLICE #2
52	BROWN	16	UPPER HEADLIGHT	SPLICE #1
53	BROWN	20	LH TAILLIGHT	SPLICE #2
54	BROWN	20	LH HANDLEBAR	SPLICE #1
55	WHITE/BLUE	20	TRANS SWITCH	RESISTOR MODULE
56	BLUE/RED	20	TRANS SWITCH	RESISTOR MODULE
57	BLACK	20	ETC & AWD SWITCH	SPLICE #1
58	BROWN	20	ETC & AWD SWITCH	SPLICE #1
59	GRAY	20	ETC & AWD SWITCH	HUB COIL
60	ORANGE/BLACK	16	FAN MOTOR	FAN RELAY
61	RED/WHITE	16	SPLICE #1	FUSE BLOCK
62	RED/WHITE	20	FAN RELAY	SPLICE #2
63	RED/WHITE	20	FAN RELAY	POWER RELAY
64	RED/BLACK	16	POWER RELAY	SPLICE #2
65	RED	16	FAN RELAY	20A CIRCUIT BREAKER
66	BROWN	20	SPEEDO DIAGNOSTIC	SPLICE #1
67	BROWN	16	GROUND	SPLICE #1
68	RED/WHITE	20	WORK LIGHT SWITCH	SPLICE #1
69	RED/BLACK	20	FUEL PUMP	SPLICE #2
70	BROWN	20	FUEL PUMP	SPLICE #1
71	BLUE	20	WORK LIGHT SWITCH	SPLICE #3
72	RED/WHITE	16	RH TAILLIGHT	SPLICE #2
73	BROWN	16	FAN MOTOR	GROUND
74	BLUE	16	RH WORKLIGHT	SPLICE #3
75	BLUE	16	LH WORKLIGHT	SPLICE #3
76	BLUE	16	SOLENOID BATTERY +	18/14 SPLICE
77	BLUE	16	SOLENOID BATTERY +	18/14 SPLICE
78	BROWN	16	SPLICE #1	SPLICE #1
79	ORANGE/WHITE	16	FUSE BLOCK	ACCESSORIES (SW POWER)
80	BLACK	16	SOLENOID BATTERY +	16/12 SPLICE
81	RED	12	FUSE BLOCK	16/12 SPLICE
82	RED	16	FUSE BLOCK	20A CIRCUIT BREAKER
83	RED	14	VOLTAGE REGULATOR	18/14 SPLICE
84	RED	14	VOLTAGE REGULATOR	18/14 SPLICE

REF #	COLOR	GAUGE	WIRE TERMINATION TABLE FROM CONNECTOR	TO CONNECTOR
85	RED/WHITE	16	FUSE BLOCK	SPLICE #2
86	ORANGE	16	BRAKE LIGHT SENSOR	RH TAILLIGHT
87	ORANGE	16	FUSE BLOCK	POWER RELAY
88	YELLOW	16	FUSE BLOCK	IGNITION SWITCH
89	ORANGE/WHITE	16	FUSE BLOCK	ACCESSORIES (SW POWER)
90	RED/BLACK	16	IGNITION SWITCH	LH HANDLEBAR
91	RED/BLACK	16	IGNITION SWITCH	LH HANDLEBAR
92	RED/WHITE	16	IGNITION SWITCH	SPLICE #1
93	RED/WHITE	16	IGNITION SWITCH	SPLICE #2
94	RED/WHITE	16	IGNITION SWITCH	SPLICE #2
95	BROWN	16	GROUND	SPLICE #2
96	RED/WHITE	16	LH TAILLIGHT	SPLICE #2
97	ORANGE/WHITE	16	HEADLIGHT POD ACC	ACCESSORIES (SW POWER)
98	RED/WHITE	20	ETC & AWD SWITCH	SPLICE #1
99	BROWN	20	START SOLENOID	FRAME GROUND
100	BROWN	20	LH HANDLEBAR	SPLICE #1
101	RED	20	SPEEDOMETER	FUSE BLOCK
102	RED/WHITE	20	SPEEDOMETER	SPLICE #1
103	GRAY/ORANGE	20	SPEEDOMETER	LH HANDLEBAR
104	BLACK	20	SPEEDOMETER	SPLICE #1
105	GREEN	20	SPEEDOMETER	SPEEDO DIAGNOSTIC
106	BLUE	20	SPEEDOMETER	SPEEDO DIAGNOSTIC
107	YELLOW/RED	20	SPEEDOMETER	ALTERNATOR
108	BROWN	20	SPEEDOMETER	FUEL PUMP
112	VIOLET/WHITE	20	SPEEDOMETER	SPLICE #1
113	BROWN/RED	20	SPEEDOMETER	TRANS SWITCH
114	WHITE	20	SPEEDOMETER	RESISTOR MODULE
116	BROWN/WHITE	20	SPEEDOMETER	HUB COIL
117	ORANGE/RED	20	TRANS SWITCH	RESISTOR MODULE
118	VIOLET	20	TRANS SWITCH	RESISTOR MODULE
119	YELLOW	20	LH HANDLEBAR	UPPER HEADLIGHT
120	GREEN	20	LH HANDLEBAR	SPLICE #2
121	ORANGE	20	BRAKE LIGHT SENSOR	LH TAILLIGHT
122	WHITE/RED	20	IGNITION SWITCH	START SOLENOID
123	GREEN	20	LH HEADLIGHT	SPLICE #2
124	GREEN	20	RH HEADLIGHT	SPLICE #2
125	BROWN	20	FRAME GROUND	SPLICE #3
126	BROWN	20	RH TAILLIGHT	SPLICE #3
127	BROWN	20	RH WORKLIGHT	SPLICE #3
128	BROWN	14	GROUND	FRAME GROUND
129	BROWN	14	GROUND	FRAME GROUND
130	BROWN	20	IGNITION SWITCH	SPLICE #1
131	BLACK	20	LH HANDLEBAR	SPLICE #1

## A

A-Arm Replacement, [5.16](#)  
Air Filter Service, [2.20](#)  
Alternator Output Test, [10.19](#)  
ATV Specifications, [1.3](#), [1.4](#), [1.5](#)  
Auxiliary Brake Removal, [9.22](#)

## B

Back Lash Pad Adjustment, [7.15](#)  
Battery Charging, [10.25](#), [10.26](#), [10.28](#)  
Battery Check Before Install, [10.25](#)  
Battery Installation, [10.23](#), [10.27](#)  
Battery Maintenance, [2.16](#), [10.25](#)  
Battery Service, [10.22](#), [10.23](#), [10.24](#), [10.25](#),  
[10.27](#), [10.28](#)  
Battery Storage, [2.36](#)  
Battery Terminal Bolts, [10.23](#)  
Battery Testing, [10.24](#), [10.27](#)  
Battery, Off Season Storage, [10.25](#), [10.28](#)  
Bleeding Procedure, 4-Stroke Cooling System,  
[3.61](#)  
Body Assembly Exploded View, [5.11](#)  
Body Rack Exploded View, [5.12](#)  
Brake Bleeding/Fluid Change, [9.7](#), [9.8](#), [9.13](#), [9.17](#)  
Brake Caliper Disassembly, Front, [9.14](#)  
Brake Caliper Exploded View, Front, [9.4](#)  
Brake Caliper Exploded View, Rear, [9.4](#), [9.23](#)  
Brake Caliper Inspection, Front, [9.15](#)  
Brake Caliper Installation, Front, [9.16](#)  
Brake Caliper Removal, Front, [9.14](#)  
Brake Caliper Removal/Inspection, Rear, [9.19](#)  
Brake Disc Inspection, Front, [9.13](#)  
Brake Disc Inspection, Rear, [9.21](#)  
Brake Disc Removal/Replacement, Front, [9.13](#)  
Brake Fluid Level, [2.28](#)  
Brake Hose/Fitting Inspection, [2.29](#)  
Brake Light Switch Testing, [10.34](#)  
Brake Light, Work Light, Replacement, [10.33](#)

Brake Master Cylinder Exploded View, Rear, [9.5](#),  
[9.22](#)  
Brake Noise, [9.5](#)  
Brake Pad Assembly, Front, [9.12](#)  
Brake Pad Inspection, [2.28](#)  
Brake Pad Installation, Rear, [9.18](#)  
Brake Pad Removal, Front, [9.10](#)  
Brake Pad Removal, Rear, [9.17](#)  
Brake System Inspection, [2.28](#)  
Brake System Main Components, [9.3](#)  
Brake System Operation, [9.6](#)  
Brake, Auxiliary, Hydraulic, [2.29](#)  
Brake, Auxiliary, Testing, [2.29](#)  
Breather Filter Maintenance, [2.21](#)  
Breather Hose Inspection, [2.22](#)  
Brush Replacement, Starter Motor, [10.39](#)

## C

Cam Gear Assembly, [3.41](#)  
Cam Gear Disassembly , [3.40](#)  
Cam Gear Removal, [3.40](#)  
Camber & Caster, [2.25](#)  
Camshaft Inspection, [3.47](#)  
Charging System Break Even Test, [10.19](#)  
Charging System Testing, [10.21](#)  
Cleaning the ATV, [2.35](#)  
Clutch Alignment, [6.18](#)  
Clutch Offset, [6.18](#)  
Cold Weather Heater Plug, [1.6](#)  
Combustion Chamber, [3.25](#)  
Compression Test, [2.15](#)  
Controls Inspection, [2.30](#)  
Coolant Level Inspection , [2.19](#)  
Coolant Strength, [2.18](#)  
Coolant Temperature Sensor, [10.14](#)  
Cooling System Hoses, [2.19](#)  
Cooling System Overview , [2.18](#)  
Cooling System Test, [2.19](#)  
Crank Position Sensor, [4.13](#)

Current Draw, [10.18](#)  
CV Joint Handling Tips, [7.22](#)  
CV Shaft Boot, Inspection, [2.30](#)  
Cylinder Head Assembly, [3.27](#)  
Cylinder Head Disassembly, [3.22](#), [3.23](#)  
Cylinder Head Inspection, [3.22](#)  
Cylinder Head Reconditioning, [3.25](#)  
Cylinder Head Removal, [3.21](#), [3.28](#)  
Cylinder Head Warpage, [3.22](#)  
Cylinder Honing, [3.19](#)  
Cylinder Inspection, [3.32](#)  
Cylinder Removal/Inspection, [3.31](#)

## D

Decal Replacement, [5.20](#)  
Decimal Equivalents, [1.13](#)  
Diagnostic Codes, [4.18](#)  
Diagnostic Mode, [10.4](#)  
Diagnostic Mode, Service Interval, [10.5](#)  
Drive Belt Installation, [6.17](#)  
Drive Belt Removal/Inspection, [6.16](#)  
Drive Clutch Assembly, [6.15](#)  
Drive Clutch Disassembly, [6.11](#), [6.12](#), [6.13](#)  
Drive Clutch Exploded View, [6.2](#)  
Drive Clutch Inspection, [6.11](#)  
Drive Clutch Operation, [6.4](#)  
Drive Shaft Boot Inspection, [7.3](#)  
Drive Shaft Boot Replacement, [7.4](#)  
Driven Clutch Assembly, [6.24](#)  
Driven Clutch Operation, [6.4](#), [6.5](#)  
Dual Hydraulic Caliper Bleeding, [9.7](#)

## E

EBS Drive Clutch Bushing Service, [6.19](#)  
EBS Drive Clutch Inspection, [6.13](#)  
EBS Driven Clutch Disassembly, [6.21](#)  
EBS Driven Clutch Disassembly, Late 2004, [6.27](#)  
EBS Exploded View, [6.3](#)

EBS Moveable Sheave Bushing Inspection, [6.14](#)  
EBS One Way Drive Clutch Inspection, [6.13](#)  
EFI Component Locations, [4.5](#)  
EFI Diagnostic Mode, [10.6](#)  
EFI System Exploded View, [4.4](#)  
EFI System Overview, [4.7](#)  
Electronic Control Unit, [4.8](#)  
Engine Accessible Components, [3.9](#)  
Engine Bottom End Disassembly, [3.31](#), [3.32](#), [3.34](#)  
Engine Bottom End Disassembly/Inspection, [3.47](#)  
Engine Break in Period, [3.18](#)  
Engine Designation Numbers, [1.2](#)  
Engine Exploded View, [3.2](#), [3.3](#), [3.4](#), [3.5](#), [3.6](#), [3.7](#)  
Engine Fogging, [2.35](#)  
Engine Head Assembly, [3.29](#), [3.30](#)  
Engine Lower Disassembly/Inspection, [3.38](#)  
Engine Lower Reassembly, [3.47](#)  
Engine Lubrication, [3.19](#)  
Engine Removal, [3.16](#)  
Engine Serial Number Location, [1.2](#)  
Engine Service Data, [3.12](#), [3.13](#), [3.14](#)  
Engine Temperature Sensor, [4.17](#)  
Engine to Frame Ground, [2.18](#)  
Engine Top End Disassembly, [3.21](#), [3.24](#), [3.28](#)  
ETC Operation Test, [10.15](#)  
ETC Switch Adjustment, [2.14](#)  
ETC Switch Testing, [10.15](#)  
Exhaust Canister Maintenance, [2.36](#)  
Exhaust System, Maintenance, [2.27](#)

## F

Fan Control Circuit Testing, [10.14](#)  
Fan Control Switch Bypass Test, [10.14](#)  
Fan Motor Current Draw Test, [10.14](#)  
Flywheel Identification, [10.16](#)  
Foot Well Removal / Install, [5.4](#)  
Frame, Nuts, Bolts, Fasteners, [2.32](#)  
Front / Rear Storage Compartment, [2.32](#)  
Front Axle Installation, [7.3](#)

Front Axle Removal, [7.2](#)  
Front Cab Removal / Installation, [5.8](#)  
Front Cover Removal / Install, [5.4](#)  
Front Drive Axle Exploded View, [7.8](#)  
Front Gearcase Assembly/Inspection, [7.13](#)  
Front Gearcase Diagnosis – Centralized Hilliard, [7.16](#)  
Front Gearcase Disassembly, [7.10](#)  
Front Gearcase Exploded View – Centralized Hilliard, [7.18](#)  
Front Gearcase Operation, [7.9](#)  
Front Hub Assembly, [7.5](#)  
Front Hub Disassembly, [7.5](#)  
Front Prop Shaft Removal, [7.6](#)  
Front Storage Installation, [5.7](#)  
Front Storage Removal, [5.5](#)  
Front Strut Assembly, [5.18](#)  
Front Strut Ball Joint Replacement, [5.19](#)  
Front Strut Weldment Replacement, [5.19](#)  
Fuel Filter, [4.12](#)  
Fuel Filter Maintenance, [2.15](#)  
Fuel Injector, [4.12](#)  
Fuel Pressure Regulator, [4.11](#)  
Fuel Pump Service, [4.9](#), [4.18](#)  
Fuel Sender, Test, [10.34](#), [10.35](#)  
Fuel Stabilizer, [2.35](#)  
Fuel Tank Assembly, Exploded View, [4.6](#)

## G

Gear Circuit Readings, Instrument Cluster, [10.5](#)  
Gear Position Switch Test, [10.2](#)  
Gear Shift Selector Removal, [8.4](#)  
Gearcase Assembly, Rear , [7.28](#)  
Gearcase Coil Resistance, Front, [7.11](#)  
Gearcase Disassembly, Rear , [7.26](#)  
Gearcase Exploded View, Rear , [7.30](#)  
Gearcase Installation, Front, [7.17](#)  
Gearcase Installation, Rear , [7.29](#)

Gearcase Lubrication, Front, [2.11](#)  
Gearcase Lubrication, Rear, [2.12](#)  
Gearcase Removal, Front, [7.9](#)  
Glossary of Terms, [1.14](#)

## H

Headlamp Service, [10.30](#), [10.31](#), [10.32](#)  
Headlamp Switch Testing, [10.32](#)  
Headlight Adjustment, [10.31](#), [10.32](#)  
High Engine Coolant Temperature, [10.3](#)  
High/Low Battery Voltage, [10.3](#)  
Honing to Oversize, [3.19](#)  
Hub Installation, Rear, [7.20](#)  
Hub Removal, Rear, [7.19](#)

## I

Ignition System Components, [10.17](#)  
Instrument Cluster Overview, [10.3](#)

## K

Keys, Replacement, [1.6](#)

## L

Load Test, [10.24](#), [10.28](#)  
Lubrication Charts, [2.9](#), [2.10](#)  
Lubrication, Transmission, [2.13](#), [8.4](#)

## M

Mag Cover Seal Replacement, [3.53](#)  
MAINTENANCE AND LUBRICATION, [2.3](#), [2.4](#), [2.5](#)  
Maintenance, ATV Component Location, [2.6](#)  
Master Cylinder Installation, [9.9](#)  
Master Cylinder Removal, [9.9](#)  
Model & Serial Number Location, [1.2](#)  
Model Identification, [1.2](#)

## O

Odometer, Tachometer, Trip Meter, [10.3](#)  
Oil / Water Pump Disassembly, [3.44](#)  
Oil Check , Engine, [2.23](#)  
Oil Filter Change, [2.24](#)  
Oil Flow, [3.20](#)  
Oil Pressure Test, [3.19](#)  
Oil Rotor Clearance, [3.44](#)

## P

Paint Codes, [1.6](#)  
Periodic Maintenance Chart, [2.3](#), [2.4](#), [2.5](#)  
Piston Identification, [3.9](#)  
Piston Removal, [3.31](#)  
Piston Ring Installed Gap, [3.35](#), [3.37](#)  
Piston to Cylinder Clearance, [3.33](#)  
Piston/Rod Inspection, [3.34](#)  
Plastic Insert Removal, [5.2](#)  
Programmable Service Interval, Diagnostic Mode, [10.3](#)  
Publication Numbers, [1.6](#)  
Push Rod Inspection, [3.21](#)  
PVT Assembly, [6.8](#)  
PVT Disassembly, [6.7](#)  
PVT Drying, [2.22](#), [6.5](#)  
PVT Maintenance, [6.5](#)  
PVT Operation, [6.4](#)  
PVT Overheating, [6.6](#)  
PVT System Sealing/Ducting Components, [6.2](#)  
PVT Troubleshooting, [6.28](#)

## R

Radiator Coolant Level Inspection, [2.19](#)  
Radiator Front Cover Removal, [2.20](#), [5.10](#)  
Radiator, Maintenance, [2.19](#)  
Rear Cab Removal / Installation, [5.9](#)  
Rear Caliper Assembly, [9.20](#)

Rear Drive Shaft Installation, [7.23](#)  
Rear Drive Shaft Removal, [7.22](#)  
Rear Drive Shaft Service, [7.24](#)  
Hub Assembly, Rear , [7.21](#)  
Hub Disassembly, Rear , [7.21](#)  
Rear Rack Removal / Installation, [5.7](#)  
Rear Storage Compartment Removal, [5.9](#)  
Rear Suspension Exploded View, [5.17](#)  
Rocker Arm Inspection, [3.21](#)

## S

Sediment Tube, Maintenance, [2.21](#)  
Shift Linkage Adjustment, [2.15](#)  
Shift Weights, [6.10](#)  
Side Panel Removal, [5.3](#)  
Solid State Relay, [10.20](#)  
Spark Plug Maintenance, [2.17](#)  
Special Tools, [1.7](#), [1.8](#), [2.8](#), [4.2](#), [5.2](#), [7.2](#), [9.2](#)  
Special Tools, Engine, [3.9](#)  
Special Tools, PVT, [6.4](#)  
Specifications, Brake, [9.2](#)  
Specifications, Cooling System, [3.15](#)  
Specifications, Drive Clutch Spring, [6.9](#)  
Specifications, Torque, Brakes, [9.2](#)  
Specifications, Torque, Engine, [3.10](#)  
Specifications, Torque, Final Drive, [7.2](#)  
Specifications, Torque, PVT, [6.4](#)  
Specifications, Torque, Standard, [1.11](#)  
Specifications, Torque, Steering, [5.2](#)  
Specifications, Torque, Suspension, [5.2](#)  
Specifications, Torque, Transmission, [8.4](#)  
Speedometer Installation, [10.8](#)  
Speedometer Troubleshooting, [10.9](#), [10.10](#), [10.11](#), [10.12](#), [10.13](#)  
Speedometer Removal, [10.8](#)  
Spider Disassembly, [6.22](#)  
Spider Removal, [6.12](#)  
Starter Assembly, [10.40](#), [10.42](#)  
Starter Disassembly, [10.37](#)

Starter Drive, [10.41](#)  
Starter Drive Removal/Inspection, [3.36](#)  
Starter Motor Armature Testing, [10.39](#)  
Starter Motor Brush Inspection/Replacement, [10.38](#)  
Starter Motor Cleaning, [10.39](#)  
Starter Solenoid Bench Test, [10.41](#)  
Starter System Test, [10.43](#)  
Stator Removal/Inspection, [3.37](#), [3.38](#)  
Steering Maintenance, [2.25](#)  
Steering Post Assembly, [5.20](#)  
ATV Cleaning & Storage , [2.35](#)  
Storage Tips, [2.35](#), [2.36](#)  
Suspension Preload Adjustment, [2.29](#)  
Suspension, Front, Inspection, [2.30](#)  
Suspension, Rear, Inspection, [2.30](#)

## T

Tap Drill Chart, [1.13](#)  
Temperature & Barometric Sensor (T-Bap), [4.14](#)  
Throttle Cable Adjustment, [2.14](#)  
Throttle Operation, [2.14](#)  
Throttle Position Sensor, [4.15](#)  
Tie Rod Inspection, [2.25](#)  
Tire Inspection, [2.32](#)  
Tire Pressure, [2.31](#)  
Tire Tread Depth, [2.32](#)  
Toe Alignment, [2.26](#), [2.27](#)  
Torque Patterns, Engine, [3.11](#)  
Transmission Disassembly, [8.6](#)  
Transmission I.D. Location, [1.2](#)  
Transmission Information, [8.4](#)  
Transmission Installation, [8.5](#)  
Transmission Reassembly, [8.11](#)  
Transmission Removal, [8.4](#)  
Transmission, Exploded View, [8.2](#), [8.3](#)  
Transporting the ATV, [2.36](#), [3.8](#)

Trigger Coil Gap, [10.2](#)  
Troubleshooting, Brakes, [9.23](#)  
Troubleshooting, Cooling System, [3.60](#)  
Troubleshooting, Engine, [3.59](#), [3.60](#)  
Troubleshooting, Fuel System, [4.19](#)  
Troubleshooting, Ignition System, [10.18](#)  
Troubleshooting, Spark Plug, [3.59](#)  
Troubleshooting, Starter System, [10.37](#)

## U

U-Joint Assembly, [7.7](#)  
U-Joint Disassembly, [7.6](#)  
Unit of Measure Conversion Table, [1.12](#)

## V

Valve Inspection, [3.24](#)  
Valve Lifter Removal/Inspection, [3.31](#)  
Valve Seal Testing, [3.28](#)  
Valve Seat Inspection, [3.25](#)  
Valve Seat Reconditioning, [3.25](#), [3.26](#), [3.27](#)  
Vent Line Maintenance, [2.15](#)  
VIN Identification, [1.2](#)  
Voltage Drop Test, [10.37](#)  
Voltage Test Open Circuit, [10.24](#), [10.27](#)

## W

Washing the ATV, [2.35](#)  
Water/Oil Pump Removal, [3.43](#)  
Waxing the ATV, [2.35](#)  
Wheel Inspection, [2.31](#)  
Wheel Installation, [2.31](#)  
Wheel Removal Front or Rear, [2.31](#)  
Wheel, Hub Torque, [2.31](#)  
Winch Operation, [2.33](#)  
Winch Wiring, [10.36](#)  
Worklight Switch, [10.32](#)

## Polaris Service Publications

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