

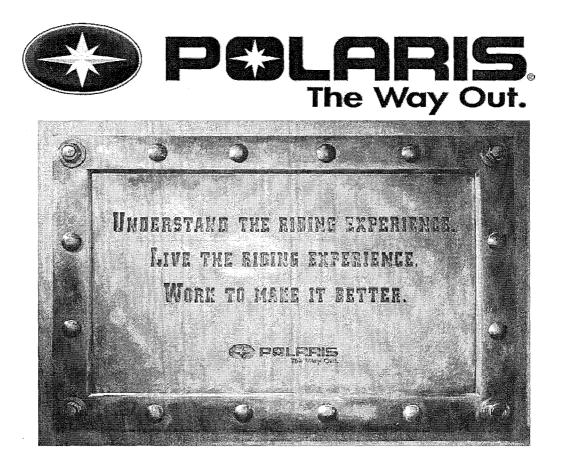
2011 RANGER RZR XP 900

SERVICE MANUAL PN 9923144



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2011 RANGER RZR XP 900 SERVICE MANUAL

FOREWORD

The information printed within this publication includes the latest product information at time of print. The most recent version of this Service Manual is available in electronic format at <u>www.polarisdealers.com</u>.

This Service Manual is designed primarily for use by certified Polaris Master Service Dealer[®] technicians in a properly equipped shop and should be kept available for reference. All references to left and right side of the vehicle are from the operator's perspective when seated in a normal riding position.

Some procedures outlined in this manual require a sound knowledge of mechanical theory, tool use, and shop procedures in order to perform the work safely and correctly. Technicians should read the text and be familiar with the service procedures before starting any repair. Certain procedures require the use of special tools. Use only the proper tools as specified. If you have any doubt as to your ability to perform any of the procedures outlined in this Service Manual, contact an authorized dealer for service.

We value your input and appreciate any assistance you can provide in helping make these publications more useful. Please provide any feedback you may have regarding this manual. Authorized dealers can submit feedback using 'Ask Polaris'. Click on 'Ask Polaris', and then click on 'Publications Question'.

Consumers, please provide your feedback in writing to: Polaris Industries Inc. ATTN: Service Publications Department, 2100 Hwy 55, Medina, MN 55340.

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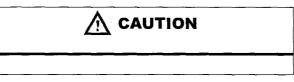
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UNDERSTANDING MANUAL SAFETY LABELS AND DIRECTIONS

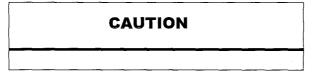
Throughout this manual, important information is brought to your attention by the following symbols:



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



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



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

NOTE:

NOTE provides key information by clarifying instructions.

IMPORTANT:

IMPORTANT provides key reminders during disassembly, assembly and inspection of components.

TRADEMARKS

POLARIS ACKNOWLEDGES THE FOLLOWING PRODUCTS MENTIONED IN THIS MANUAL:

Loctite, Registered Trademark of the Loctite Corporation

Nyogel, Trademark of Wm. F. Nye Co.

Fluke, Registered Trademark of John Fluke Mfg. Co.

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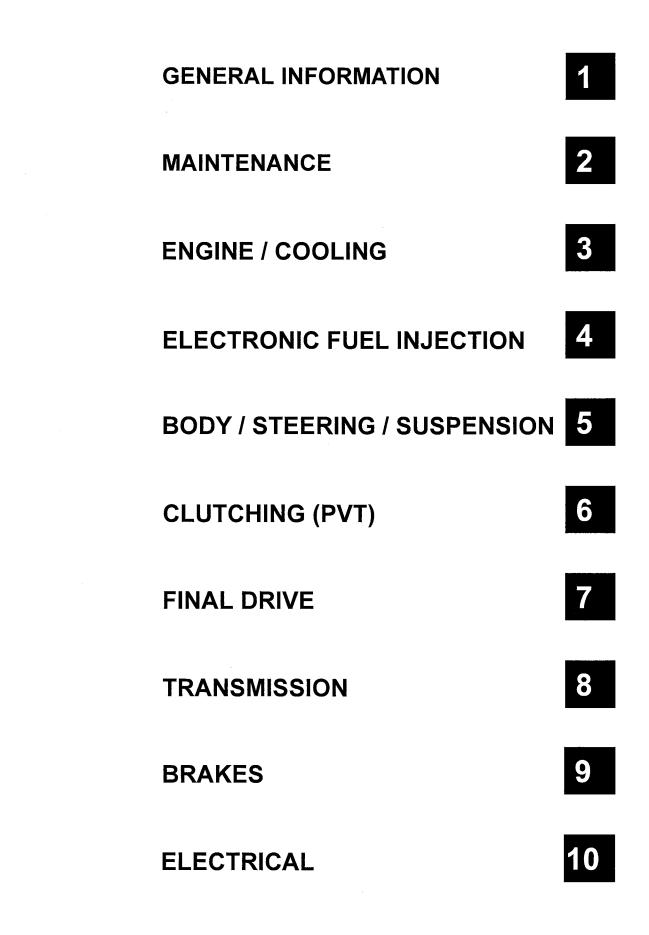
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Some Polaris factory publications can be downloaded from www.polarisindustries.com, purchased from www.purepolaris.com or by contacting the nearest Polaris dealer.



GENERAL INFORMATION

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CHAPTER 1 GENERAL INFORMATION

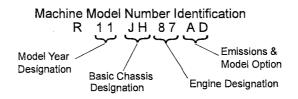
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GENERAL INFORMATION

MODEL INFORMATION

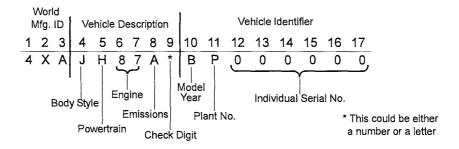
Model Identification

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



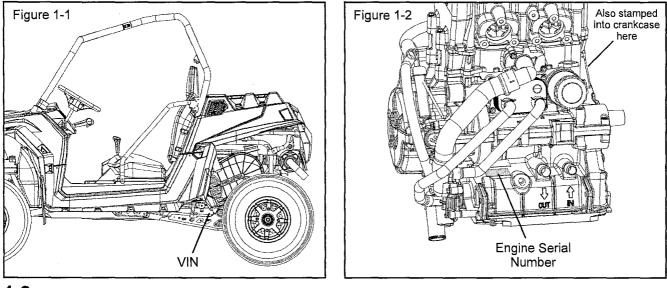
Engine Designation Number

VIN Identification



Vehicle and Engine Serial Number Location

Whenever corresponding about a Polaris ORV, refer to the vehicle identification number (VIN) and the engine serial number. The VIN can be found stamped on a portion of the left rear frame rail, behind the lower shock mounting location (see Figure 1-1). The engine serial number can be found on a decal applied to the crankcase, on the front side of the engine (see Figure 1-2).



VEHICLE INFORMATION

Publication Numbers

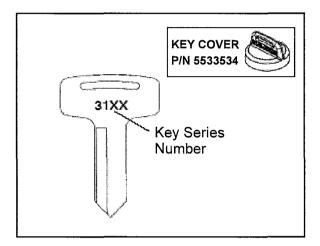
Model	Model No.	Owner's Manual	Parts Manual
2011 RANGER RZR XP 900	R11JH87AA, AD	9922978	9922979

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

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

Replacement Keys

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



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

SPECIAL TOOLS

Special tools may be required while servicing this vehicle. Some of the tools listed or depicted are mandatory, while other tools maybe substituted with a similar tool, if available. Polaris recommends the use of Polaris Special Tools when servicing any Polaris product. Dealers may order special tools through Polaris' official tool supplier, SPX Corporation, by phone at 1-800-328-6657 or on-line at http://polaris.spx.com/.

GENERAL SPECIFICATIONS

MODEL: 2011 RANGER RZR XP 900 MODEL NUMBER: R11JH87AA, AD ENGINE NUMBER: 1204098

Category	Dimension / Capacity
Length	108.4 in. / 275 cm
Width	64 in. / 162.5 cm
Height	73 in. / 185 cm
Wheel Base	81.4 in. / 207 cm
Ground Clearance	13 in. / 33 cm
Dry Weight	1190 lbs. / 540 kg
Gross Vehicle Weight	1930 lbs. / 875 kg
Cargo Box Capacity	300 lbs. / 136 kg
Maximum Weight Capacity (Payload)	740 lbs. / 335.6 kg (Includes driver, passenger, cargo and accessories)
Hitch Towing Capacity	This vehicle is not equipped with a hitch for towing loads. Do not use
Hitch Tongue Capacity	this vehicle for towing. Do not modify the vehicle by adding a hitch.







GENERAL INFORMATION

MODEL: 2011 RANGER RZR XP 900

MODEL NUMBER: R11JH87AA, AD ENGINE NUMBER: 1204098

E	Engine			
	4-Stroke DOHC Twin Cylinder,			
Platform	Liquid Cooled, Electric Start			
Engine Number	1204098 - ES087OLE011			
Engine Displacement	875cc			
Number of Cylinders	2			
Bore & Stroke (mm)	93 x 64.4 mm			
Compression Ratio	10.5:1			
Engine Idle Speed	1250 ± 100 RPM			
Engine Max Operating RPM	8750 RPM			
Lubrication	Dry Sump			
Oil Requirements	PS-4 Plus Synthetic			
Oil Capacity	3.5 qts. / 3.3 liters			
Coolant Capacity	4.9 qts. / 4.6 liters			
Overheat Warning	Instrument Cluster Indicator			
Exhaust System	Dual Headpipe / Single Silencer			
Fuel	System			
Fuel System Type	Bosch M17 EFI			
Fuel Delivery	Electronic Fuel Pump (in tank)			
Fuel Pressure	43.5 ± 2 psi (300 ± 14 kPa)			
Fuel Filters	See Chapter 4			
First Oracity (Demission of	7.25 gal. (27.4 liters)			
Fuel Capacity / Requirement	87 Octane (minimum)			
Electrical				
Alternator Max Output	750 Watts @ 3000 RPM			
Headlights	2 - Dual Beam LED:			
Tail / Brake	Low 27 Watts; High 40 Watts			
	2 - 6 Watts / 2 - 27 Watts			
Starting System	Electric Start			
Ignition System	Bosch M17 (ECU Controlled)			
Spark Plug / Gap	RG4YCX / 0.03 in. (0.75 mm)			
Battery	Deka ETX30L / 30 AH 365 CCA / 12 Volt			
Instrument Type	Multifunction Instrument Cluster			
DC Outlet	Standard 12 Volt			
Polovo	Chassis / EFI / Fan			
Relays	Fuel Pump / EPS (OPT)			
Circuit Breaker	20 Amp: Fan Motor			
Fuses (Fuse/Relay Box)	10 Amp: Drive 10 Amp: Fuel Pump 20 Amp: Lights 20 Amp: EFI 20 Amp: Accessory			
Fuses (Power Fuse Holder)	30 Amp: EFI 30 Amp: Chassis 30 Amp: EPS (OPT)			

Drive	etrain		
Transmission Type	Polaris Automatic PVT		
Drive Ratio - Front	3.82:1		
Drive Ratio - Final	3.53:1		
Shift Type	In Line Shift - H / L / N / R / P		
Front Gearcase Fluid Type / Capacity	Polaris Demand Drive Plus 6.75 oz. (200 ml)		
Transmission Fluid Type / Capacity	Polaris AGL Plus 44 oz. (1300 ml)		
Clutching (PVT) Type	Drive: Polaris, Basic, Non-Braking Bearing		
	Driven: Team Roller Dampened		
Clutching (PVT) Center-to-Center Distance	10.5 in. (26.7 cm)		
PVT Drive Belt	3211142		
Steering / Suspension			
Front Suspension / Shock	Independent Dual A-arm FOX™ 2.0 Piggyback		
Front Travel	13.5 in. / 34.3 cm		
Rear Suspension / Shock	Independent Trailing Arm FOX™ 2.0 Piggyback		
Rear Travel	14 in. / 35.6 cm		
Shock Preload Adjustment Front / Rear	Threaded Spanner Wrench Adjustment		
Toe Out	1/8 - 3/16 in. (3.2 - 4.8 mm)		
Wheels	/ Brakes		
Front Wheel Size Front Tire Type / Size	12 x 6 / Cast Aluminum ITP "900XCT" / 27 x 9 R12		
Rear Wheel Size Rear Tire Type / Size	12 x 8 / Cast Aluminum ITP "900XCT" / 27 x 12 R12		
Tire Air Pressure	Front: 12 psi (82.7 kPa) Rear: 14 psi (96.5 kPa)		
Brake - Front / Rear	Foot Actuated - 4 Wheel Hydraulic Disc		
Brake Fluid	DOT 4		

CLUTCH CHART

Altitude		Shift Weight	Drive Spring	Driven Spring
	0-1500	25-60 (1322969)	Blue / Yellow	Red
(0-5000) Meters		26-59 (1322981)	(7043766)	(3234452)
(Feet)	1500-3700	26-56 (1322979)	Blue / Yellow	Red
(5000 - 12000)		26-55 (1322982)	(7043766)	(3234452)

MISC. SPECIFICATIONS AND CHARTS

Conversion Table

Unit of Measure	Multiplied by	Converts to
ft. lbs.	x 12	= in. lbs.
in. lbs.	x .0833	= ft. lbs.
ft. lbs.	x 1.356	= Nm
in. lbs.	x .0115	= kg-m
Nm	x .7376	= ft.lbs.
kg-m	x 7.233	= ft. lbs.
kg-m	x 86.796	= in. lbs.
kg-m	x 10	= Nm
in.	x 25.4	=mm
mm	x .03937	= in.
in.	x 2.54	= cm
mile (mi.)	x 1.6	= km
km	x .6214	= mile (mi.)
Ounces (oz)	x 28.35	= Grams (g)
Fluid Ounces (fl. oz.)	x 29.57	= Cubic Centimeters (cc)
Cubic Centimeters (cc)	x .03381	= Fluid Ounces (fl. oz.)
Grams (g)	x 0.035	= Ounces (oz)
lb.	x .454	= kg
kg	x 2.2046	= lb.
Cubic inches (cu in)	x 16.387	= Cubic centimeters (cc)
Cubic centimeters (cc)	x 0.061	= Cubic inches (cu in)
Imperial pints (Imp pt)	x 0.568	= Liters (I)
Liters (I)	x 1.76	= Imperial pints (Imp pt)
Imperial quarts (Imp qt)	x 1.137	= Liters (I)
Liters (I)	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 (I)
Liters (I)	x 1.057	= US quarts (US qt)
US gallons (US gal)	x 3.785	=Liters (I)
Liters (I)	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)
π (3.14) x R ² x H (height)		= Cylinder Volume

°C to °F: ^{9/5}(°C + 32) = °F °F to °C: ^{5/9}(°F - 32) = °C

Standard Torque Specifications

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

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Bolt Size	Threads/In	Grade 2	Grade 5	Grade 8
		T <u>orque in. Ibs. (Nm)</u>		
#10 -	24	. 27 (3.1)	. 43 (5.0)	60 (6.9)
#10 -	32	. 31 (3.6)	. 49 (5.6)	68 (7.8)
		<u>Torque ft. lbs. (Nm)*</u>		
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 -		. 55 (76)		

Metric

6 x 1.072-78 In. lbs.8 x 1.2514-18 ft. lbs.10 x 1.2526-30 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.

GENERAL INFORMATION

SAE Tap / Drill Sizes

Thread Size/E	Drill Size	Thread Size/D	rill 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 #5-40	42 38	7/8-9	49/64
#5-44	38 37	7/8-14	13/16
#6-32	36	1-8	7/8
#6-40	33	1-12	59/64
#8-32	29	1 1/8-7	63/64
#8-36	29	1 1/8-12	1 3/64
#10-24	24	1 1/4-7	1 7/64
#10-32	21	1 1/4-12	1 11/64
#12-24	17	1 1/2-6	1 11/32
#12-28	4.6mm	1 1/2-12	1 27/64
1/4-20	7	1 3/4-5	1 9/16
1/4-28 5/16-18	3 F	1 3/4-12	1 43/64
5/16-24		2-4 1/2	1 25/32
3/8-16	0		
3/8-24	Q	2-12	1 59/64
7/16-14	Ŭ	2 1/4-4 1/2	2 1/32
7/16-20	25/64	2 1/2-4	2 1/4
,	,	2 3/4-4	2 1/2
		3-4	2 3/4

Metric Tap / Drill Sizes

Tap Size	Drill Size	Decimal Equiva- Ient	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		1 mm = .0394"
3/64	.0469 .0625	
1/16		2 mm = .0787″
3/32	.0938	
7/64	.1094	3 mm = .1181″
1/8 1250 9/64	.1406	
5/32		4 mm = .1575"
11/64	.1719	F
3/16	.1875	5 mm = .1969″
7/32	.2188	
15/64	.2344	6 mm = .2362"
1/4	2656	7 mm = .2756″
9/32	.2813	.2,00
19/64	.2969	0
5/16	.3125	8 mm = .3150″
11/32	.3438	9 mm = .3543″
23/64	.3594	
3/8375 25/64	3906	10 mm = .3937″
13/32	.4063	10 1111 - 10001
27/64		11 mm = .4331"
7/16	.4375 .4531	
15/32	.4688	12 mm = .4724″
31/64	.4844	10
1/2	.5156	13 mm = .5118
17/32	.5313	
35/64		14 mm = .5512″
9/16	.5625 .5781	15 mm = .5906″
19/32	.5938	10 1111 - 10000
39/64		10 0000//
5/8625 41/64		16 mm = .6299″
21/32		17 mm = .6693″
43/64		
11/16		18 mm = .7087"
23/32	.7188	
47/64	.7344	19 mm = .7480"
3/475 49/64	.7656	
25/32	.7813	20 mm = .7874″
51/64		01 0000"
13/16 53/64		21 mm = .8268"
27/32	.8438	
55/64	.8594	22 mm = .8661″
7/8875 57/64	8906	23 mm = .9055″
29/32	.9063	20 1111 - 10000
59/64	.9219	04 mm 0440"
15/16 61/64	.9375	24 mm = .9449"
31/32		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. CI: Cubic inches.

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

Clutch Offset: Drive and driven clutches are offset so that drive belt will stay nearly straight as it moves along the clutch face. Clutch Weights: Three levers in the drive clutch which relative to their weight, profile and engine RPM cause the drive clutch to close and grip the drive belt.

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

DCV: Direct current voltage

CVT: Centrifugal Variable Transmission (Drive Clutch System)

DCV: Direct current voltage.

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

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

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

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

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

ft.: Foot/feet.

Foot Pound: Ft. lb. A force of one pound at the end of a lever one foot in length, applied in a rotational direction. g: Gram. Unit of weight in the metric system.

gal.: Gallon.

ID: Inside diameter.

in.: Inch/inches.

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

kg/cm²: Kilograms per square centimeter.

kg-m: Kilogram meters.

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

l or ltr: Liter.

Ibs/in²: Pounds per square inch.

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

m: Meter/meters.

Mag: Magneto.

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

mi.: Mile/miles.

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

Nm: Newton meters.

OD: Outside diameter.

Ohm: The unit of electrical resistance opposing current flow.

oz.: Ounce/ounces.

Piston Clearance: Total distance between piston and cylinder wall.

psi.: Pounds per square inch.

PTO: Power take off.

PVT: Polaris Variable Transmission (Drive Clutch system)

qt.: Quart/quarts.

Regulator: Voltage regulator. Regulates battery charging system output at approx. 14.5 DCV as engine RPM increases. Reservoir Tank: The fill tank in the liquid cooling system.

Resistance: In the mechanical sense, friction or load. In the electrical sense, ohms, resulting in energy conversion to heat. **RPM:** Revolutions per minute.

Seized Piston: Galling of the sides of a piston. Usually there is a transfer of aluminum from the piston onto the cylinder wall. **Possible causes:** 1) improper lubrication; 2) excessive temperatures; 3) insufficient piston clearance; 4) stuck piston rings. Stator Plate: The plate mounted under the flywheel supporting the battery charging coils.

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

Volt: The unit of measure for electrical pressure of electromotive force. Measured by a voltmeter in parallel with the circuit. Watt: Unit of electrical power. Watts = amperes x volts.

WOT: Wide open throttle.

NOTES

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MAINTENANCE CHAPTER 2 MAINTENANCE

PERIODIC MAINTENANCE CHART
BREAK-IN PERIOD / MAINTENANCE CHART KEY
PRE-RIDE - 50 HOUR MAINTENANCE INTERVAL
50 - 500 HOUR MAINTENANCE INTERVAL
MAINTENANCE QUICK REFERENCE
MAINTENANCE QUICK REFERENCE, CONTINUED
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LUBRICANTS / SERVICE PRODUCTS
GENERAL VEHICLE INSPECTION AND MAINTENANCE
PRE-RIDE / DAILY INSPECTION
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FUEL SYSTEM AND AIR INTAKE 2.11
FUEL TANK VENT LINE AND FILTER
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INTAKE BAFFLE BOX DRAIN INSPECTION
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COOLING SYSTEM PRESSURE TEST / HOSES
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TIRE PRESSURE
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PERIODIC MAINTENANCE CHART

Periodic Maintenance Overview

Inspection, adjustment and lubrication of important components are explained in the periodic maintenance chart.

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

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

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

Severe Use Definition

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

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

Break-In Period

The break-in period consists of the first 25 hours of operation. Careful treatment of a new engine and drive components will result in more efficient performance and longer life for these components.

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

Maintenance Chart Key

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

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

- **•** = SEVERE USE ITEM: See information provided above.
- E = Emission Control System Service (California).

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

A WARNING

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

Pre-Ride -	50 Hour	Maintenance	Interval

ltem			Maintenance Interval (whichever comes first)		Demonitor
	item		Calendar	Miles (KM)	Remarks
-	Steering	-	Pre-Ride	-	
	Front Suspension	-	Pre-Ride	-	
	Rear Suspension	-	Pre-Ride	-	
	Tires	-	Pre-Ride	-	
	Brake Fluid Level	-	Pre-Ride	-	Inspect or adjust as needed.
[Brake Pedal Travel	-	Pre-Ride	. -	See Pre-Ride Checklist on Page 2.10.
}	Brake System	-	Pre-Ride	-	_
	Wheels / Fasteners	-	Pre-Ride	-	
	Frame Fasteners	-	Pre-Ride	-	
Ε	Engine Oil Level	-	Pre-Ride	_	
Е	Engine Intake Pre-Filter	-	Daily	-	Inspect and clean often
	PVT Intake Pre-Filter	-	Daily	-	Inspect and clean often
	Coolant Level	-	Daily	-	Check level daily
	Head Lights / Tail Lights	-	Daily	-	Check operation
) 	Brake Pad Wear	10 H	Monthly	100 (160)	Inspect periodically
► E	Engine Oil & Filter Change (Break-In)	25 H	1 M	-	Perform a break-in oil and filter change at 25 hours or one month; perform every 50 hours or 6 months thereafter
► E	Air Filter	25 H	Monthly	250 (400)	Inspect; replace as needed
	Battery	25 H	Monthly	250 (400)	Check terminals; clean; test
•	Front Gearcase Lubricant (Demand Drive Plus)	25 H	Monthly	250 (400)	Inspect level; add lubricant if needed
•	Transmission Lubricant (AGL Gearcase Lubricant)	25 H	Monthly	250 (400)	Inspect level; add lubricant if needed
► E	Engine Breather Filter (if equipped)	25 H	Monthly	250 (400)	Inspect; replace if necessary
•	General Lubrication	50 H	3 M	500 (800)	Lubricate all fittings, pivots, cables, etc.
E	Throttle Cable / Throttle Pedal	50 H	6 M	300 (500)	Inspect; adjust; replace if necessary
E	Throttle Body Intake Boots	50 H	6 M	300 (500)	Inspect ducts for proper sealing / air leaks
	Shift Linkage	50 H	6 M	500 (800)	Inspect; adjust as needed
►	Front Suspension	50 H	6 M	500 (800)	Lubricate
►	Rear Suspension	50 H	6 M	500 (800)	Lubricate

▶ 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.

2.4

50 - 500 Hour Maintenance Interval

ltem		Maintenance Interval (whichever comes first)			Remarks	
		Hours	Calendar	Miles (KM)		
	Cooling System	50 H	6 M	500 (800)	Inspect coolant strength seasonally; pressure test system yearly	
•	Engine Oil Change	50 H	6 M	1000 (1600)	Perform a break-in oil change at 25 hours or one month	
►	Engine Oil Filter Change	50 H	6 M	1000 (1600)	Replace oil filter during engine oil change	
•	Front Gearcase Lubricant (Demand Drive Plus)	-	12 M	2500 (4000)	Change lubricant	
•	Transmission Lubricant (AGL Gearcase Lubricant)	-	12 M	2500 (4000)	Change lubricant	
E	Fuel System	100 H	12 M	1000 (1600)	Check for leaks at fill cap, fuel line / rail, and fuel pump.	
E	Spark Plug Inspection	100 H	12 M	1000 (1600)	Inspect; replace as needed; torque to specification	
►	Radiator	100 H	12 M	1000 (1600)	Inspect; clean external surfaces	
►	Cooling Hoses	100 H	12 M	1000 (1600)	Inspect for leaks; pressure test system	
►	Engine Mounts	100 H	12 M	1000 (1600)	Inspect, torque to specification	
	Exhaust Silencer / Pipe	100 H	12 M	1000 (1600)	Inspect	
•	Wiring	100 H	12 M	1000 (1600)	Inspect for wear, routing, security; apply dielectric grease to connectors subjected to water, mud, etc.	
	Clutches (Drive and Driven)	100 H	12 M	1000 (1600)	Inspect; clean; replace worn parts	
	Drive Belt	100 H	12 M	1000 (1600)	Inspect; replace as needed	
	Front Wheel Bearings	100 H	12 M	1000 (1600)	Inspect; replace as needed	
•	Shocks	100 H	-		Visually inspect shock seals	
•	Coolant	-	24 M	-	Replace coolant	
	Brake Fluid	200 H	24 M	2000 (3200)	Change every two years (DOT 4)	
	Spark Arrestor	200 H	24 M	2000 (3200)	Clean out	
E	Valve Clearance	200 H	-	2000 (3200)	Inspect; adjust as needed	
► ■	Shocks	200 H	24 M	-	Change shock oil and seals	
∎ E	Spark Plug Replacement	500 H	36 M	5000 (8000)	Replace; torque to specification	
	Toe Adjustment	-			Inspect periodically; adjust when parts are replaced	
	Headlight Aim		-		Adjust as needed	

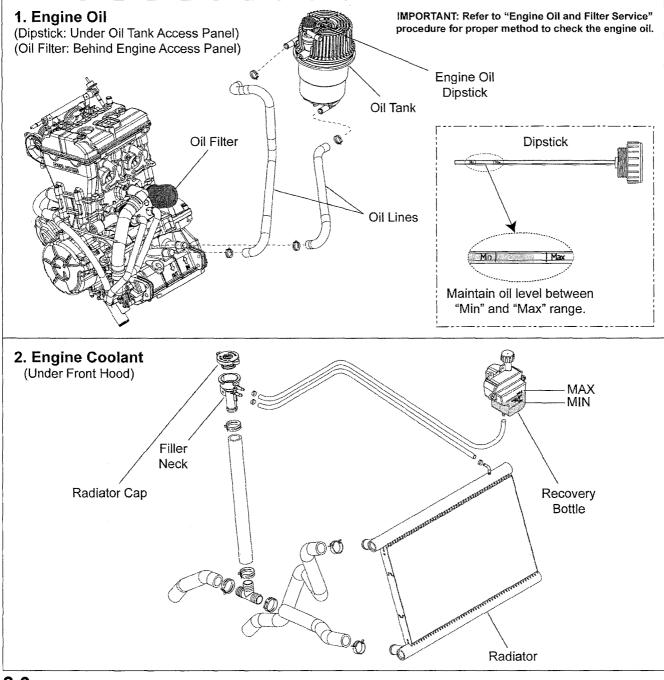
▶ Perform these procedures more often for vehicles subjected to severe use.

- E Emission Control System Service (California)
- Have an authorized Polaris dealer perform these services.

Maintenance Quick Reference

111. #	ltem	Lube Rec.	Method	Frequency*
1	Engine Oil	Polaris PS-4 Plus Performance Synthetic 4-Cycle Engine Oil	Add oil to proper level on dipstick	Perform a break-in oil and filter change at 25 hrs or one month; perform every 50 hrs thereafter
2	Engine Coolant	Polaris 60/40 Coolant	Maintain coolant level in coolant reservoir bottle.	Check level daily; change coolant every two years

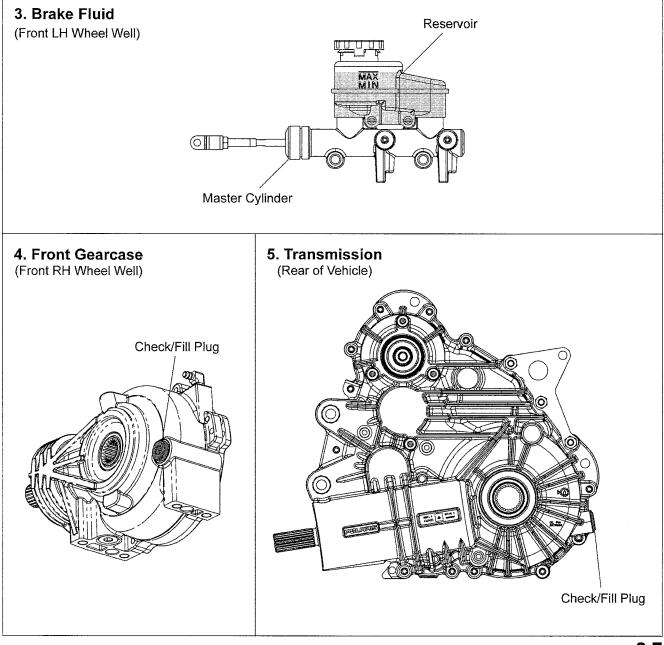
* More often under severe use, such as operated in water or under severe loads.



Maintenance Quick Reference, Continued.....

III. #	ltem	Lube Rec.	Method	Frequency*	
3	Brake Fluid	Polaris DOT 4 Brake Fluid	Maintain fluid level between "MAX and "MIN" lines on the master cylinder reservoir	Check level during pre-ride inspection; change fluid every two years	
4	Front Gearcase	Polaris Demand Drive Plus	Add lubricant until it is visible at the fill hole threads	Check level every 25 hours or 250 mi (400 km); Change fluid	
5	Transmission	Polaris AGL Plus Gearcase Lubricant	Add lubricant until it is visible at the fill hole threads	yearly or every 2500 mi. (4000 km), whichever comes first	

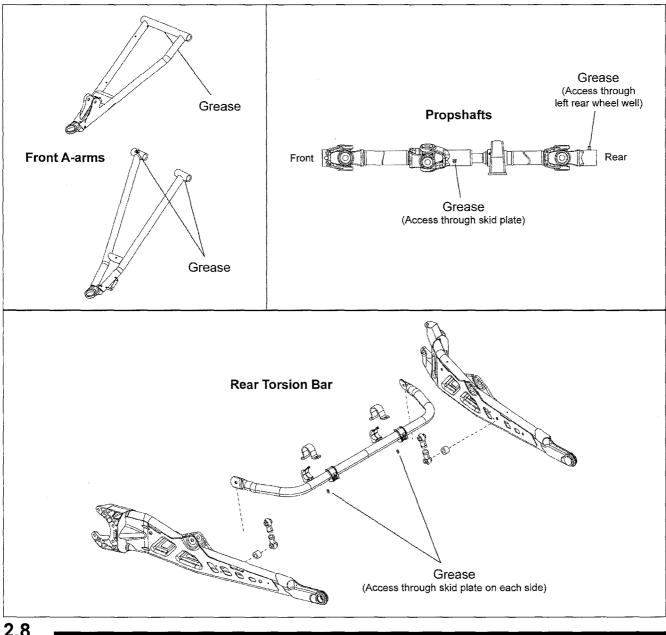
* More often under severe use, such as operated in water or under severe loads.



Grease Lubrication Points

There are grease fittings at each front A-arm pivot point, each rear torsion bar bushing and on the front propshaft yokes. Apply grease until all traces of water have been purged out at each of these areas.

ltem	Method	Recommended Lube	Frequency	
Propshaft Yokes	Grease middle and rear fittings	Polaris Premium U-Joint Grease	Grease fittings every 500 miles	
Front A-arm Pivot Bushings	Grease 3 fittings on each side of the vehicle	Polaris All Season Grease	(800 km); Grease before log periods of storage, and afte	
Rear Torsion Bar Bushings	Grease 2 fittings through the skid plate access holes on each side of the vehicle	Polaris All Season Grease	thoroughly washing or submerging the vehicle	



LUBRICANTS / SERVICE PRODUCTS

Polaris Lubricants, Maintenance and Service Products

Part No.	Description		
Engine Lubricant			
2870791	Fogging Oil (12 oz. Aerosol)		
2876244	PS-4 Plus Synthetic 4-Cycle Engine Oil (Quart)		
2876245	PS-4 Plus Synthetic 4-Cycle Engine Oil (Gallon)		
Gea	arcase / Transmission Lubricants		
2878068	AGL Plus Gearcase Lubricant (1 Qt.) (12 Count)		
2878069	AGL Plus Gearcase Lubricant (1 Gal.) (4 Count)		
2878070	AGL Plus Gearcase Lubricant (2.5 Gal.) (2 Count)		
2877922	Demand Drive Plus (Quart)		
2877923	Demand Drive Plus (2.5 Gallon)		
2870465	Oil Pump for 1 Gallon Jug		
G	irease / Specialized Lubricants		
2871312	Grease Gun Kit		
2871322	Premium All Season Grease (3 oz. cartridge) (24 Count)		
2871423	Premium All Season Grease (14 oz. cartridge) (10 Count)		
2871460	Starter Drive Grease (12 Count)		
2871515	Premium U-Joint Lube (3 oz.) (24 Count)		
2871551	Premium U-Joint Lube (14 oz.) (10 Count)		
2871329	Dielectric Grease (Nyogel™)		
	Coolant		
2871323	60/40 Coolant (Gallon) (6 Count)		
2871534	60/40 Coolant (Quart) (12 Count)		

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

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

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

GENERAL VEHICLE INSPECTION AND MAINTENANCE

Pre-Ride / Daily Inspection

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

- Engine Oil Check for proper level on dipstick located in oil tank (refer to "Engine Oil Level" procedure)
- Tires check condition and pressures
- Fuel tank fill to proper level
- All brakes check operation and fluid level
- Throttle check for free operation and closing
- Headlights/Taillights/Brakelights also check operation of all indicator lights, instrument cluster and switches
- Ignition switch check for proper function
- Wheels check for tightness of wheel nuts and axle nuts; check to be sure axle nuts are secured by cotter pins
- Engine Intake Pre-Filter Inspect pre-filter and clean with soapy water and compressed air if necessary
- PVT Intake Pre-Filter Inspect pre-filter and clean with soapy water and compressed air if necessary
- Steering check for free operation noting any unusual looseness in any area
- Loose parts visually inspect vehicle for any damaged or loose nuts, bolts or fasteners
- Engine coolant check for proper level at the recovery bottle
- Drive Shaft Boots Inspect inner and outer boots for tears or damage on both front and rear drive shafts
- Check all front and rear suspension components for wear or damage.

Frame, Nuts, Bolts, and Fasteners

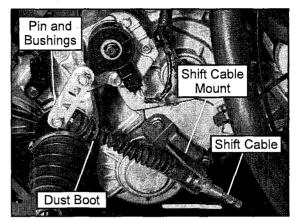
Periodically inspect the torque of all fasteners in accordance with the maintenance schedule. Check that all cotter pins are in place. Refer to specific fastener torques listed in each chapter.

Shift Cable Inspection / Adjustment

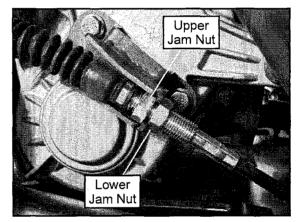
Shift cable adjustment may be necessary if symptoms include:

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

- 1. Locate the shift cable attached to the transmission case in the right rear wheel well area.
- 2. Inspect shift cable, clevis pin, pivot bushings, and dust boot. Replace if worn or damaged.



3. If adjustment is required, loosen the lower jam nut and pull the cable out of the mount to move the upper jam nut.



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

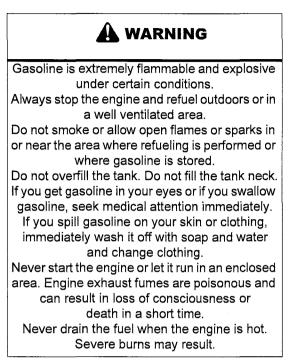
NOTE: This procedure may require a few attempts to obtain the proper adjustment.

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

2.10

FUEL SYSTEM AND AIR INTAKE

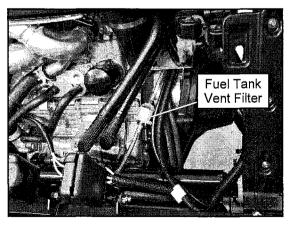
Fuel System



Fuel Tank Vent Line and Filter

Symptoms of a restricted fuel tank vent include the following: collapsing fuel tank, engine miss or hesitation, loss of engine performance or high exhaust temperatures.

- 1. Remove the seats and the engine service panel.
- 2. Locate and inspect the in-line filter. Note the direction of the arrow on the filter if removed.



3. If there is debris visible in the filter, replace it.

NOTE: Be sure to install the filter in the orientation shown in the previous photo.

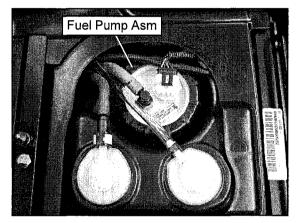
- 4. Check the fuel tank vent line for signs of wear, deterioration or damage. Replace vent line if necessary.
- 5. Be sure the vent line is routed properly and secured with cable tie(s).

IMPORTANT: Make sure vent line is not kinked or pinched.

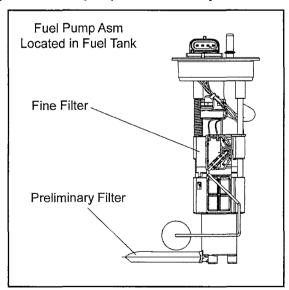
Fuel Pump / Fuel Filters

The fuel pump assembly is located in the fuel tank under the passenger seat.

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



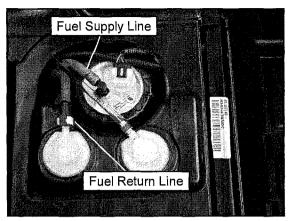
NOTE: Neither filter is servicable individually. Must replace the fuel pump as an assembly.



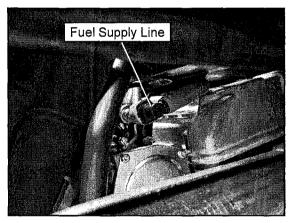
NOTE: Refer to Chapter 4 for fuel pump replacement and all other information related to the EFI System.

Fuel Lines

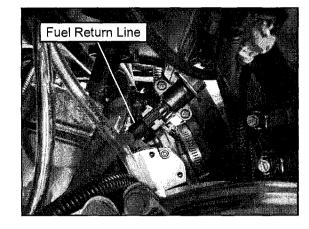
1. Check both quick-connect fuel lines at the fuel tank for signs of wear, deterioration, damage or leakage. Replace line(s) if necessary.



2. Locate the fuel supply fitting through the right rear wheel well on the upper right side of the engine. Check the line and quick-connect fitting for signs of wear, deterioration, damage or leakage. Replace line if necessary.



3. Locate the fuel return fitting through the left rear wheel well on the upper left side of the engine. Check the line and quick-connect fitting for signs of wear, deterioration, damage or leakage. Replace line if necessary.

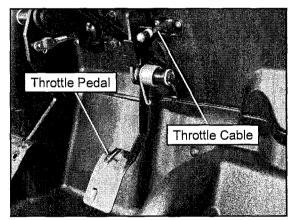


4. Be sure fuel lines are routed and retained properly.

IMPORTANT: Make sure lines are not kinked or pinched.

Throttle Pedal Inspection

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



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

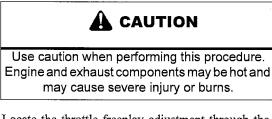
Throttle Freeplay Adjustment

Inspection

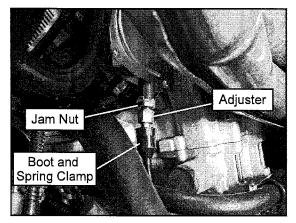
- 1. Place the transmission in PARK.
- 2. Start the engine, and warm it up thoroughly.
- Measure the distance the throttle pedal moves before the engine begins to pick up speed. Freeplay should be 1/16" 1/8" (1.5 3 mm).

Adjustment

1. Allow the engine and exhaust system to cool before attempting to perform this procedure.



- 2. Locate the throttle freeplay adjustment through the right rear wheel well, behind the exhaust header pipe.
- 3. Slide back the cable adjuster boot and spring clamp.



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

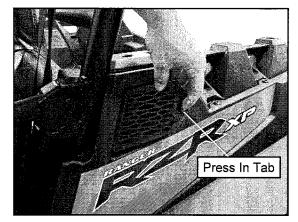
NOTE: While adjusting, lightly move the throttle pedal in and out.

- 5. Apply Thread Sealant with Teflon[®] to the adjuster threads.
- 6. Re-tighten the jam nut after final adjustment is made.
- 7. Slide the cable adjuster boot over the cable adjuster to its original position and reinstall the spring clamp.

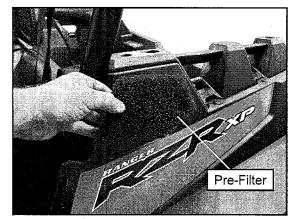
Engine Intake Pre-Filter Service

It is recommended that the engine intake pre-filter be inspected daily. The filter should be inspected using the following procedure:

- 1. The engine intake pre-filter is located just above the left rear wheel fender.
- 2. Press in on the intake grill cover tab to access the pre-filter.



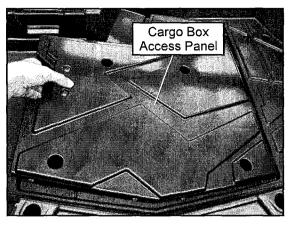
3. Inspect the pre-filter. If necessary, clean with soapy water and dry with compressed air.



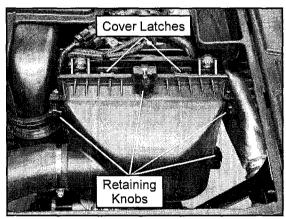
Air Filter Service

Inspect the air filter at the intervals outlined in the Periodic Maintenance Chart. In extremely dusty conditions, air filter replacement will be required more often.

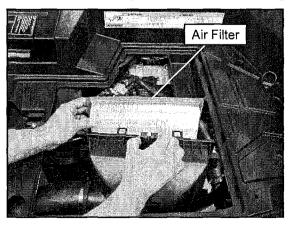
1. Remove the cargo box access panel.



2. Loosen the (5) air box cover retaining knobs and rotate them away from the cover. Release the (2) cover latches.



3. Pull the cover rearward just far enough to remove the air filter. It is not necessary to remove cover from hinges.



4. Inspect the air box for oil or water deposits. Wipe away any deposits with a clean shop towel.

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

5. Inspect the air filter and replace if necessary.

IMPORTANT: DO NOT attempt to clean the air filter.

6. Place the air filter into the air box and reinstall the air box cover.

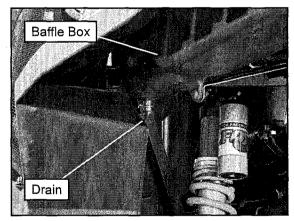
NOTE: Be sure the lower tabs on the air box cover are properly engaged into the airbox.

- 7. Engage the cover latches and tighten the retaining knobs.
- 8. Reinstall the cargo box access panel.

Intake Baffle Box Drain Inspection

It is recommended that the intake baffle box drain be inspected daily.

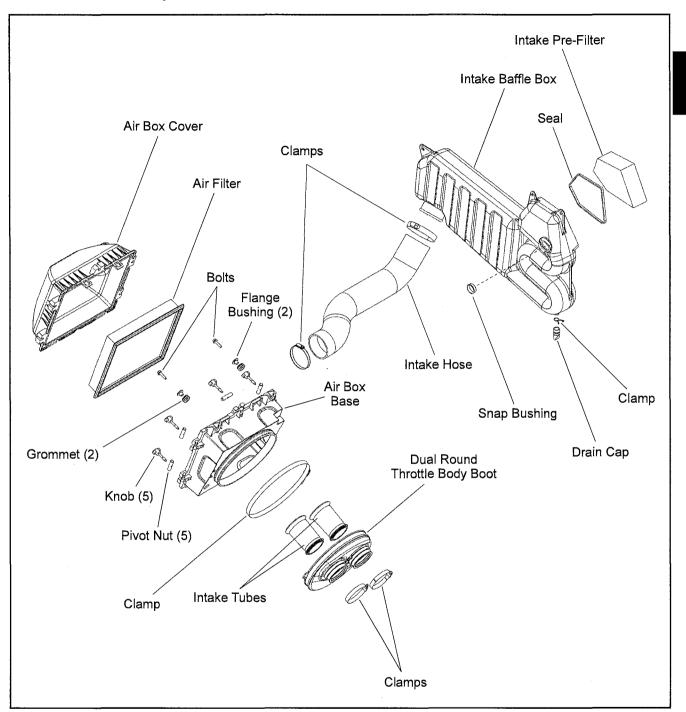
1. Access the intake baffle box drain through the left rear wheel well.



2. Check the drain to ensure it is not plugged with debris so it can drain properly. If needed, remove the drain from the baffle box during inspection.

2.14

Air Box / Air Filter Exploded View



ENGINE

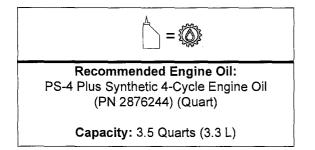
Engine Oil Level

The *RANGER* RZR XP engine has a dry-sump design, meaning the engine oil is contained within a remote oil tank. To check the oil level follow the procedure listed below:

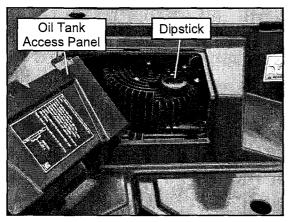
IMPORTANT: Always check the oil level when the engine is cold. If the engine is hot when the oil level is checked, the level will appear to be overfull.

Access the oil tank dipstick through the oil tank access panel located in the left front corner of the cargo box.

Polaris recommends the use of PS-4 Plus Synthetic 4-Cycle Engine Oil.

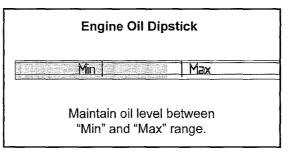


- 1. Position vehicle on a level surface and place the transmission in PARK.
- 2. Start the engine and allow it to idle for 30 seconds.
- 3. Stop the engine and wait 15 seconds.
- 4. Remove the oil tank access panel. Remove the dipstick from the oil tank and wipe it dry with a clean cloth.



5. Reinstall the dipstick completely (fully threaded). Remove the dipstick and check the oil level.

6. Add the recommended oil as necessary to bring the level near the "Max" mark on the dipstick. Do not overfill.



7. When finished, reinstall dipstick and oil tank access panel.

Engine Oil and Filter Change

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

The oil tank drain plug is located on the bottom of the oil tank. Access the drain plug through the left rear wheel well.

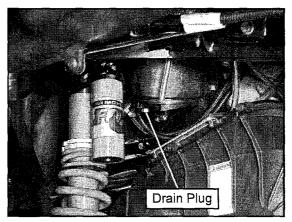
The crankcase drain plug is located on the bottom of the crankcase. Access the drain plug through the skid plate access hole located directly under the crankcase.

- 1. Position vehicle on a level surface and place the transmission in PARK.
- 2. Clean area around the oil tank and crankcase drain plugs.

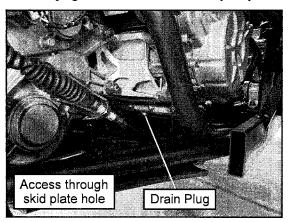
A CAUTION

Use caution when performing this procedure. Do not allow hot engine oil to come into contact with skin, as serious burns may result.

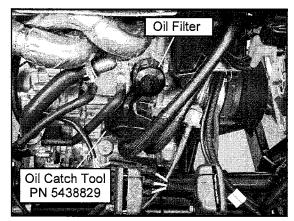
3. Place a drain pan under the oil tank and remove the drain plug. Allow the oil to drain completely.



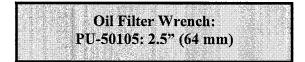
4. Place a drain pan under the engine crankcase and remove the drain plug. Allow the oil to drain completely.



- 5. Remove the seats and engine service panel to access the oil filter.
- 6. Locate the Oil Catch Tool (PN 5438829) in the tool kit. Position the tool below the oil filter to catch the oil when the filter is removed.



7. Using Oil Filter Wrench (PU-50105), turn the oil filter counter-clockwise to remove it.



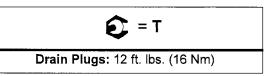
- 8. Using a clean dry cloth, clean the filter sealing surface on the engine crankcase.
- 9. Lubricate the O-ring on the new oil filter with a film of fresh engine oil. Check to make sure the O-ring is in good condition. Install it by hand until the O-ring contacts the sealing surface, then turn an additional 1/2 turn.



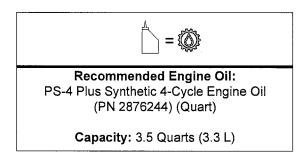
10. Replace the sealing washer on drain plug.

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

11. Reinstall the oil tank and engine crankcase drain plugs. Torque drain plugs to specification.



12. Remove the engine oil dipstick (see "Engine Oil Level"). Fill the oil tank with 3.5 quarts (3.3 L) of recommended engine oil.

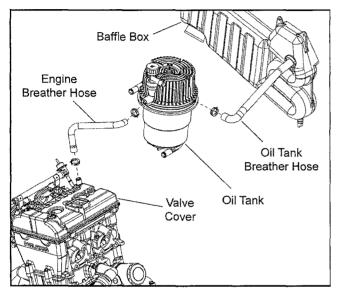


- 13. Verify the transmission is still in PARK.
- 14. Start the engine and allow it to idle for 30 seconds.
- 15. Stop the engine and inspect for leaks. Wait at least 15 seconds before removing the dipstick.
- 16. Remove the dipstick from the oil tank and wipe it dry with a clean cloth.
- 17. Reinstall the dipstick completely (fully threaded). Remove the dipstick and check the oil level.
- 18. Add the recommended oil as necessary to bring the level near the "Max" mark on the dipstick. Do not overfill.
- 19. When finished, reinstall dipstick and oil tank access panel.
- 20. Dispose of used oil and filter properly.

Engine / Oil Tank Breather Hose Inspection

The engine and oil tank are equipped with a breather hose. Inspect the breather hoses for possible kinks or wear. The hoses are form fitted for proper fit.

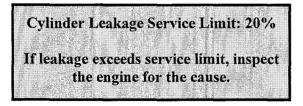
- Engine Breather Hose: Follow the breather hose from the top of the valve cover to the side of the oil tank.
- Oil Tank Breather Hose: Follow the breather hose from the top of the oil tank to the side of the air intake baffle box.



NOTE: Make sure hoses are not kinked or pinched.

Engine Cylinder Leakdown Test

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

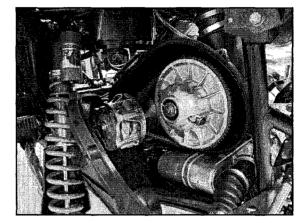


Valve Clearance Inspection

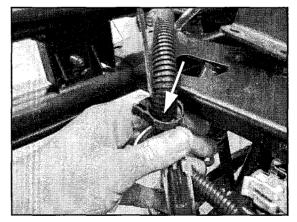
IMPORTANT: Valve clearance inspection should be performed on a cold engine, at room temperature.

- 1. Remove the seats and engine service panel.
- 2. Disconnect the negative (-) battery cable.
- 3. Remove the rear bumper and cargo box as an assembly (see Chapter 5).
- 4. Remove the (8) screws that retain the outer clutch cover.
- 5. Maneuver the outer clutch cover for drive clutch access.

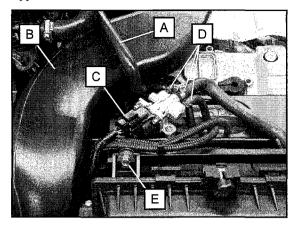
NOTE: Removal of left rear wheel or left rear shock is NOT necessary to perform this procedure.



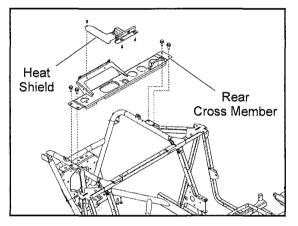
6. Remove the wire harness from the routing clip on the rear cross member.



7. Remove the breather hose (A) from the valve cover, remove the PVT outlet duct (B), remove the harness from the IAC valve (C), remove the (3) hoses (D) from the IAC valve and remove the (2) screws (E) that mount the air box to the upper frame cross member.

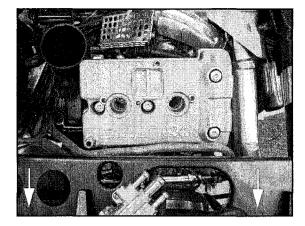


- 8. Remove the spark plug wires from the engine.
- 9. Remove the (3) push rivets that retain the heat shield to the frame cross members. Remove the heat shield.

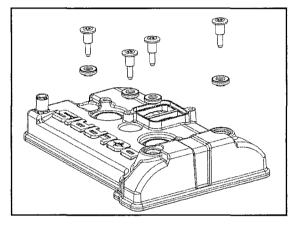


10. Support the oil tank in position prior to removing the rear cross member.

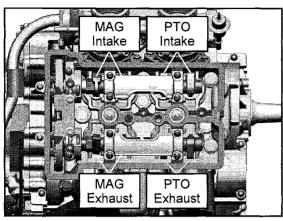
11. Remove the (4) bolts that attach the rear cross member to the vehicle frame. Raise and slide the cross member towards the rear of the vehicle to gain access to valve cover as shown below.



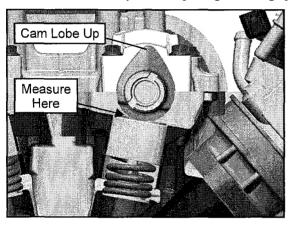
12. Remove the (4) T40 bolts retaining the valve cover.



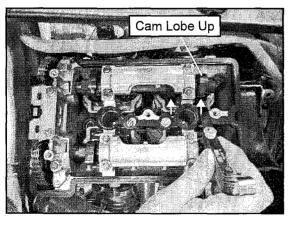
13. The engine will need to be rotated (4) times to inspect all (8) valve clearances. Two valves can be measured at each camshaft lobe position.



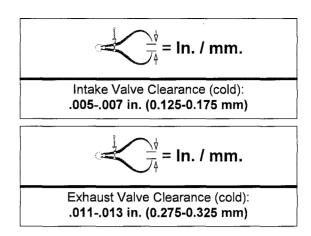
14. Rotate the drive clutch counter-clockwise until the cam lobes above the valves you are inspecting are facing up.



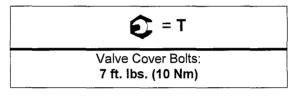
15. Measure the valve clearance using a feeler gauge.



16. If the valve clearance is out of specification, proceed to "Valve Clearance Adjustment" (see Chapter 3).

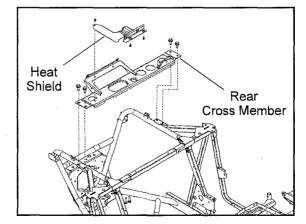


- 17. Repeat steps 14-16 until all (8) valves have been inspected.
- 18. Inspect the valve cover seal and replace if necessary.
- 19. Install valve cover and the (4) T40 bolts. Torque bolts to specification.



20. Slide rear cross member back into position and install the (4) self tapping mounting bolts. Be sure oil tank mounting bracket is correctly supporting the oil tank.

21. Install the heat shield and the (3) push rivets.

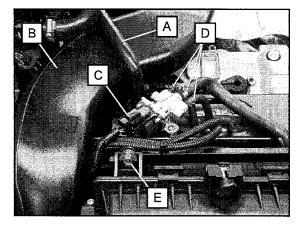


22. Install the spark plug wires. Ensure wires are pushed down all the way so they engage onto the spark plugs.

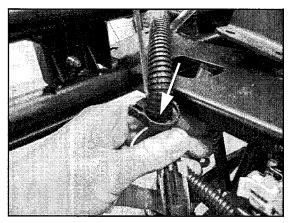
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IMPORTANT: The engine will misfire if the spark plug wires are installed incorrectly. The spark plug wires are marked with PTO and MAG and should be installed to the corresponding cylinder.

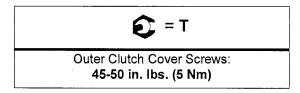
23. Install the breather hose (A) to the valve cover, install the PVT outlet duct (B), install the harness onto the IAC valve (C), install the (3) hoses (D) onto the IAC valve and install the (2) screws (E) that mount the air box to the upper frame cross member.



24. Install the wire harness back into the routing clip on the rear cross member.

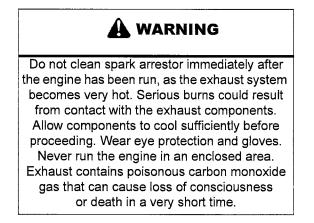


25. Install outer clutch cover and (8) retaining screws.



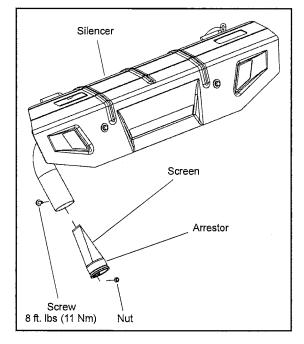
- 26. Connect the negative (-) battery cable to the battery.
- 27. Start the engine to ensure proper operation.
- 28. Reinstall the rear bumper and cargo box assembly (see Chapter 5). Reinstall the engine service panel and seats.

Exhaust - Spark Arrestor



Periodically clean spark arrestor to remove accumulated carbon.

- 1. Remove the retaining screw and nut.
- 2. Remove the spark arrestor from the end of the silencer.
- 3. Use a non-synthetic brush to clean the arrestor screen. A synthetic brush may melt if components are warm. If necessary, blow debris from screen with compressed air.
- 4. Inspect the screen for wear and damage. Replace if needed.
- 5. Reinstall the arrestor and torque the retaining screw to 8 ft. lbs. (11 Nm).



TRANSMISSION AND FRONT GEARCASE

Specification Chart

Gearcase	Lubricant	Capacity	Fill / Drain Plug Torque
Transmission	AGL Plus Gearcase Lubricant	44 oz. (1300 ml)	10-14 ft. lbs. (14-19 Nm)
Front Gearcase	Demand Drive Plus	6.75 oz. (200 ml)	8-10 ft. lbs. (11-14 Nm)

Transmission Lubrication

NOTE: It is important to follow the transmission maintenance intervals described in the Periodic Maintenance Chart. Regular lubricant level inspections should be performed as well.

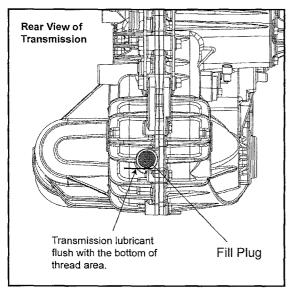
The transmission lubricant level should be checked and changed in accordance with the maintenance schedule.

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

Transmission Lubricant Level Check

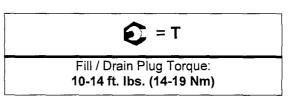
The fill plug is located on the rear portion of the transmission gearcase. Access the fill plug at the rear of the vehicle. Maintain lubricant level even with the bottom of the fill plug hole.

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



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

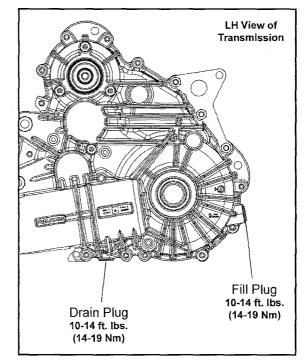
4. Reinstall the fill plug and torque to specification.



Transmission Lubricant Change

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

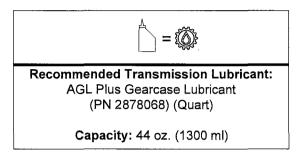
- 1. Remove the fill plug (refer to "Transmission Lubricant Level Check").
- 2. Place a drain pan under the transmission drain plug.
- 3. Remove drain plug and allow lubricant to drain completely.



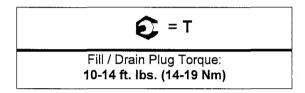
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- 4. Clean the drain plug magnetic surface.
- 5. Reinstall drain plug with a new O-ring and torque to specification.
- 6. Add the recommended amount of lubricant through the fill plug hole. Maintain the lubricant level at the bottom of the fill plug hole when filling the transmission. Do not overfill.



7. Reinstall fill plug with a new O-ring and torque to specification.



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

Front Gearcase Lubrication

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

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

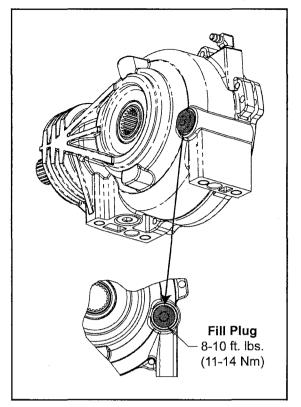
- Be sure vehicle is positioned on a level surface when checking or changing the fluid.
- Check vent hose to be sure it is routed properly and unobstructed.

Front Gearcase Fluid Level Check

The fill plug is located on the bottom right side of the front gearcase. Access the fill plug through the right front wheel well. Maintain fluid level even with the bottom of the fill plug hole.

1. Position vehicle on a level surface.

2. Remove the fill plug and check the fluid level.



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

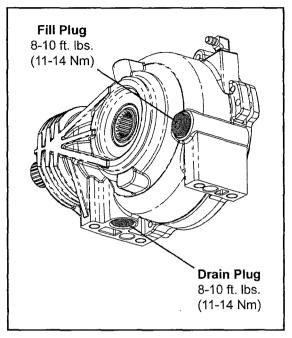
Front Gearcase Fluid Change:

The drain plug is located on the bottom of the front gearcase. Access the drain plug through the access hole in the frame underneath the front gearcase.

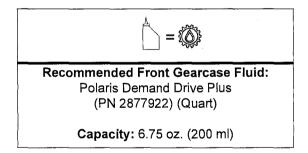
- 1. Remove the fill plug (refer to "Front Gearcase Fluid Level Check").
- 2. Place a drain pan under the front gearcase drain plug.

MAINTENANCE

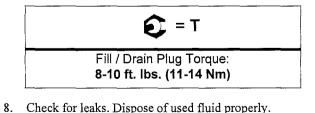
3. Remove the drain plug and allow fluid to drain completely.



- 4. Clean the drain plug magnetic surface.
- 5. Reinstall drain plug with a new O-ring and torque to specification.
- 6. Add the recommended amount of fluid through the fill hole. Maintain the fluid level even with the bottom threads of the fill plug hole.



7. Reinstall fill plug with a new O-ring and torque to specification.



COOLING SYSTEM

Cooling System Overview

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

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

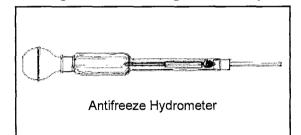
NOTE: Some coolant level drop on new machines is normal as the system is purging itself of trapped air. Observe coolant levels often during the break-in period.

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

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

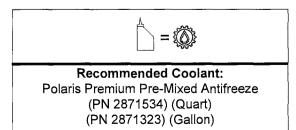
Coolant Strength

Test the strength of the coolant using an antifreeze hydrometer.



• A 50/50 or 60/40 mixture of antifreeze and distilled water will provide the optimum cooling, corrosion protection, and antifreeze protection.

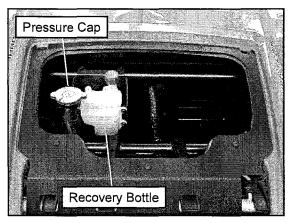
- Do not use tap water, straight antifreeze, or straight water in the system. Tap water contains minerals and impurities which build up in the system.
- Straight water or antifreeze may cause the system to freeze, corrode, or overheat.



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Coolant Level Inspection

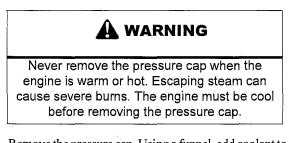
The pressure cap and recovery bottle are located under the front hood of the vehicle. The coolant level must be maintained between the minimum and maximum levels indicated on the recovery bottle.



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

- 1. Position the vehicle on a level surface.
- 2. Remove the front hood.
- 3. View the coolant level in the recovery bottle.
- 4. If the coolant level is below the MIN line, inspect the coolant level in the radiator.

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



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

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

7. Remove recovery bottle cap and add coolant using a funnel.

8. Fill recovery bottle to MAX level with recommended coolant or 50/50 or 60/40 mixture of antifreeze and distilled water as required for freeze protection in your area.



Recommended Coolant: Polaris Premium Pre-Mixed Antifreeze (PN 2871534) (Quart) (PN 2871323) (Gallon)

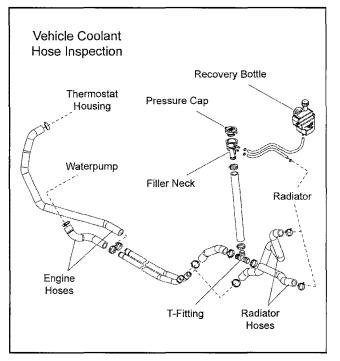
- 9. Reinstall the recovery bottle cap.
- 10. If coolant was required, start engine and check for leaks. Make sure radiator fins are clean to prevent overheating.

Cooling System Pressure Test

Refer to cooling system pressure test procedures provided in Chapter 3 "Engine / Cooling".

Cooling System Hoses

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

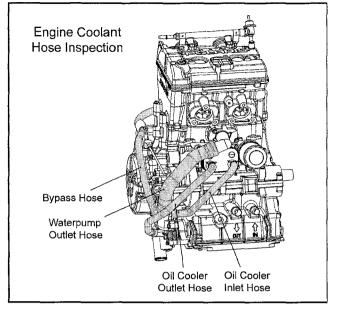


2. Check tightness and condition of all hose spring clamps. Replace if necessary.

ecommended

MAINTENANCE

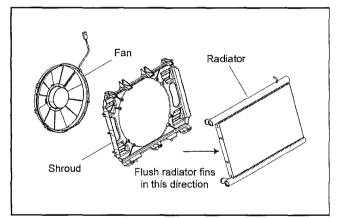
3. Inspect all engine hoses for cracks, deterioration, abrasion or leaks. Replace if necessary.



4. Check tightness and condition of all hose spring clamps. Replace if necessary.

Radiator Inspection / Cleaning

1. Check radiator air passages for restrictions or damage.



2. Carefully straighten any bent radiator fins.

2.26

3. Remove any obstructions with compressed air or low pressure water.

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

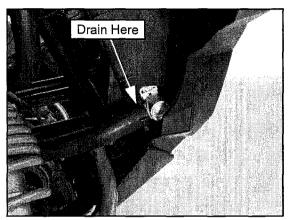
Coolant Drain / Fill

1. Remove the front hood.

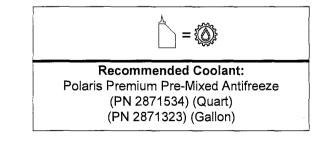


Never drain the coolant when the engine and radiator are warm or hot. Hot coolant can cause severe burns. Allow engine and radiator to cool.

- 2. Slowly remove the pressure cap to relieve any cooling system pressure.
- 3. Place a suitable drain pan underneath the radiator fitting on the front right side of the vehicle.
- 4. Drain the coolant from the radiator by removing the lower coolant hose from the radiator as shown.



- 5. Allow coolant to drain completely. Properly dispose of the used coolant.
- 6. Reinstall coolant hose and reposition the spring clamp.
- 7. Remove the pressure cap. Using a funnel, add the recommended coolant to the top of the filler neck and fill the recovery bottle to the MAX level.
- 8. Refer to "Cooling System Bleeding Procedure" provided in Chapter 3.



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<u>PVT / FINAL DRIVE / WHEEL AND TIRE</u>

Drive Clutch / Driven Clutch / Belt Service

Refer to Chapter 6 "Clutching (PVT)" for service and removal procedures.

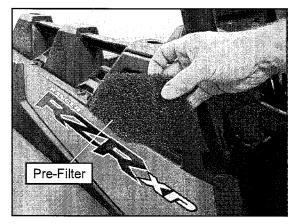
PVT Intake Pre-Filter Service

It is recommended that the PVT intake pre-filter be inspected daily. The filter should be inspected using the following procedure:

- 1. The PVT intake pre-filter is located just above the right rear wheel fender.
- 2. Press in on the intake grill cover tab to access the pre-filter.



3. Inspect the pre-filter. If necessary, clean with soapy water and dry with compressed air.

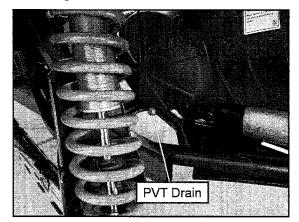


PVT Drying

NOTE: After operating in water, the vehicle's PVT system should be checked immediately. Use the following instructions to dry it out before operating.

The PVT drain plug is located at the bottom of the outer clutch cover. Access the drain plug through the left rear wheel well.

1. Using a flat blade screwdriver, remove the PVT drain plug and O-ring from the outer clutch cover.



- 2. Allow the water to drain out completely.
- 3. Reinstall the drain plug and O-ring.
- 4. Place the transmission in PARK, apply the brake and start the engine.
- 5. Apply varying throttle for 10-15 seconds to expel the moisture and air-dry the belt and clutches.

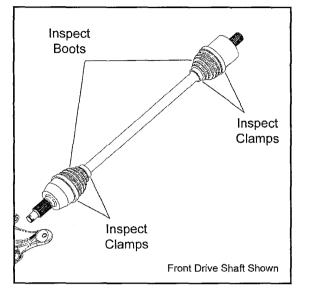
NOTE: Do not hold the throttle pedal wide open for more than 5 seconds.

- 6. Allow the engine RPM to return to idle, then shift the transmission into low gear.
- 7. Test the PVT system for belt slippage. If the belt slips, repeat the process or remove the outer clutch cover to inspect the PVT system (see Chapter 6 "Clutching (PVT)" for service and removal procedures).

IMPORTANT: If the vehicle has ingested a large amount of water into the PVT system and has not been operated for a period of time, be sure to check the PVT system components for water damage. 2

Drive Shaft Boot Inspection

Inspect the front and rear drive shaft boots for damage, tears, wear or leaking grease. If the boots exhibit any of these symptoms, they should be replaced. Check to see the boot clamps are properly positioned. Refer to Chapter 7 for drive shaft boot replacement.



Wheel and Hub Torque Table

ltem	Specification
Wheel Nuts (Cast Aluminum Wheels)	30 ft. lbs. (41 Nm) + 90° (1/4 turn)
Hub Retaining Nuts (Front and Rear)	80 ft. lbs. (108 Nm)

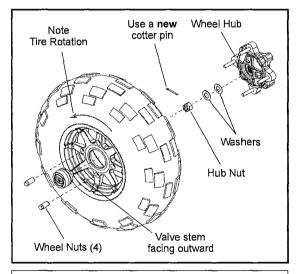
NOTE: Do not lubricate the stud or the lug nut.

Wheel Removal

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

Wheel Installation

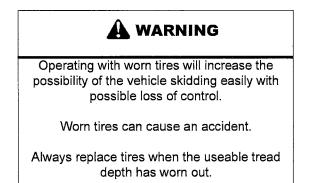
- 1. Verify the transmission is still in PARK.
- 2. Place the wheel in the correct position on the wheel hub. Be sure the valve stem is toward the outside and rotation arrows on the tire point toward forward rotation.
- 3. Attach the wheel nuts and finger tighten them.
- 4. Carefully lower the vehicle to the ground.
- 5. Torque the wheel nuts and/or hub nut to the proper torque specification (see "Wheel and Hub Torque Table").
- 6. If hub nut was removed, install a new cotter pin after the hub nut has been tightened. If the holes do not line up, turn the hub nut counter-clockwise until the cotter pin can be installed.



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

Tire Inspection

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



Tire Pressure

Remove the valve stem cap and check tire pressure using the tire pressure gauge included in the vehicle's tool kit.

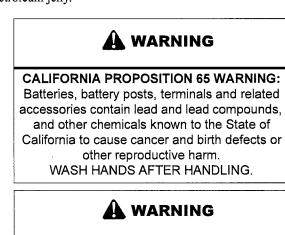
Maintain proper tire pressure. Refer to the warning tire pressure decal applied to the vehicle.

Tire Pressure Inspection (Cold)	
Front Rear	
12 psi (82.7 kPa)	14 psi (96.5 kPa)

ELECTRICAL AND IGNITION SYSTEM

Battery Maintenance

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



Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Antidote:

External: Flush with water.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

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

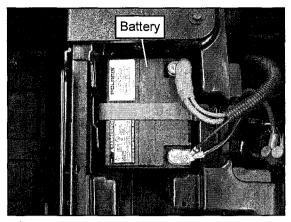
Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries. KEEP OUT OF REACH OF CHILDREN.

NOTE: Batteries must be fully charged before use or battery life will be reduced by 10-30% of full potential. Charge battery according to "Charging Procedure" provided in Chapter 10. Do not use the vehicle's stator/alternator to charge a new battery. 2

MAINTENANCE

Battery Removal

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

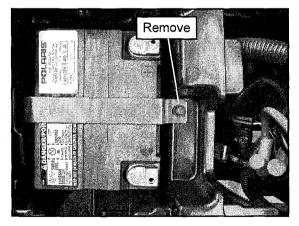


- 2. Disconnect the black (negative) battery cables.
- 3. Disconnect the red (positive) battery cables.



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

4. Remove the hold-down strap and lift the battery out of the vehicle.



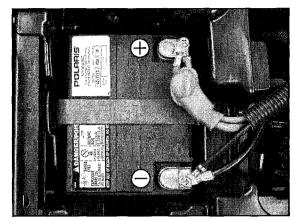
Battery Installation

IMPORTANT: Using a new battery that has not been fully charged can damage the battery and result in a shorter life. It can also hinder vehicle performance. Follow the battery charging procedure in Chapter 10 "Electrical" before installing the battery.

1. Ensure the battery is fully charged.

2.30

- 2. Place the battery in the battery holder and secure with holddown strap.
- 3. Coat the terminals with dielectric grease or petroleum jelly.
- 4. Connect and tighten the red (positive) cables first.
- 5. Connect and tighten the black (negative) cables last.



6. Verify that cables are properly routed and reinstall the driver's seat.

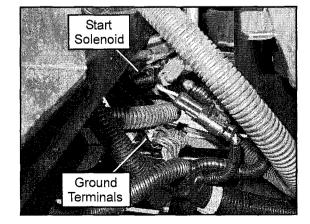
Battery Charging / Off Season Storage

Refer to Chapter 10 "Electrical" for charging and off season storage procedures.

Engine / Chassis Electrical Ground

Inspect the ground cable connections. Remove ground terminals and clean if necessary.

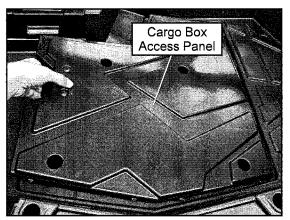
- 1. Remove the driver's seat and locate the start solenoid behind the battery box.
- 2. Inspect the ground terminals located below the solenoid. Be sure they are clean and tight.

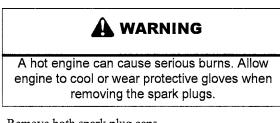


Spark Plug Service

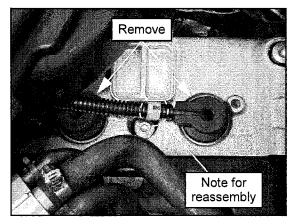
Inspect and replace the spark plugs at the intervals outlined in the Periodic Maintenance Chart.

1. Remove the cargo box access panel.





2. Remove both spark plug caps.

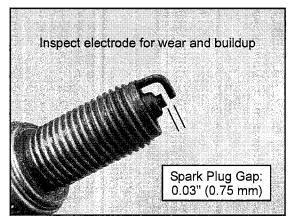


- 3. Clean out plug wells with compressed air to remove any loose dirt or debris.
- 4. Rinse plug wells with water and dry with compressed air.

NOTE: Spark plug wells have drain holes built into the cylinder head to allow water to drain out.

5. Remove spark plugs using a 5/8" spark plug socket with an extension.

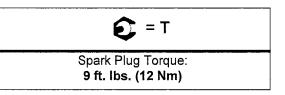
6. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.



- 7. Clean with electrical contact cleaner or a glass bead spark plug cleaner only. **CAUTION:** A wire brush or coated abrasive should not be used.
- 8. Measure gap with a wire gauge. Adjust gap if necessary by carefully bending the side electrode.
- 9. If necessary, replace spark plug with proper type. CAUTION: Severe engine damage may occur if the incorrect spark plug is used.



- 10. Apply anti-seize compound to the spark plug threads.
- 11. Install spark plugs and torque to specification.



- 12. Install the plug caps to the appropriate cylinder by referencing the MAG and PTO spark plug wire decals. Ensure wires are pushed down all the way so they engage onto the spark plugs.
- 13. Reinstall the cargo box access panel.

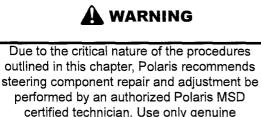
STEERING

Steering Inspection

The steering components should be checked periodically for loose fasteners, worn tie rod ends, ball joints, and damage. Also check to make sure all cotter pins are in place. If cotter pins are removed, they must be replaced. Always use new cotter pins.

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

NOTE: Whenever steering components are replaced, check front end alignment.

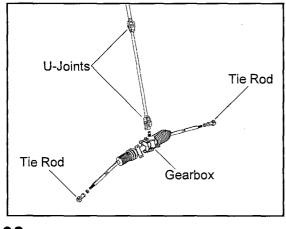


Polaris replacement parts.

Steering Wheel Freeplay

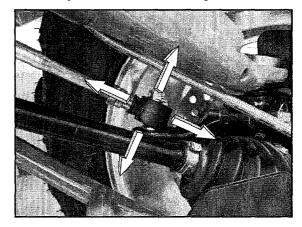
Check the steering wheel for specified freeplay and operation.

- 1. Position the vehicle on level ground.
- 2. Lightly turn the steering wheel left and right.
- 3. There should be 0.8"-1.0" (20-25 mm) of freeplay.
- 4. If there is excessive freeplay or the steering feels rough, inspect the following components.
 - Tie Rod Ends
 - · Steering Shaft U-Joints
 - Steering Gearbox



Tie Rod End / Wheel Hub Inspection

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



- Replace any worn steering components. Steering should move freely through entire range of travel without binding.
- Elevate front end of machine so front wheels are off the ground. Check for any looseness in front wheel/hub assembly by grasping the tire firmly at top and bottom first, and then at front and rear. Try to move the wheel and hub by pushing inward and pulling outward.



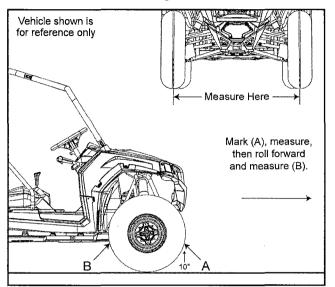
- If abnormal movement is detected, inspect the hub and wheel assembly to determine the cause (loose wheel nuts or loose front hub nut).
- Refer to Chapter 7 "Final Drive" for front hub service procedures.



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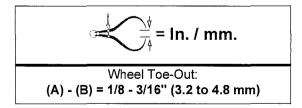
Wheel Toe Alignment Inspection

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



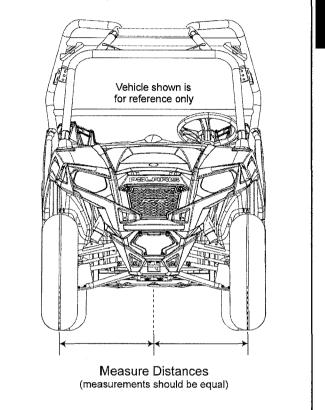
NOTE: It is important the height of both marks be equally positioned to get an accurate measurement.

- 3. Measure the distance between the marks and record the measurement. Call this measurement "A".
- 4. Rotate the tires 180° by moving the vehicle forward. Position chalk marks facing rearward, even with the hub/ axle center line.
- 5. Again measure the distance between the marks and record. Call this measurement "B". Subtract measurement "B" from measurement "A". The difference between measurements "A" and "B" is the vehicle toe alignment. The recommended vehicle toe tolerance is 1/8", to 3/16", (3.2 to 4.8 mm) toe out. This means the measurement at the front of the tire (A) is 1/8", to 3/16", (3.2 to 4.8 mm) wider than the measurement at the rear (B).

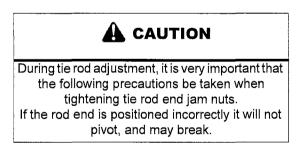


Wheel Toe Adjustment

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



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



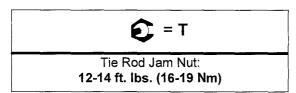
To adjust toe alignment:

- Hold tie rod end to keep it from rotating.
- Loosen jam nuts at both end of the tie rod.
- Shorten or lengthen the tie rod until alignment is as required to achieve the proper toe setting as specified in "Wheel Toe Alignment".

2

MAINTENANCE

- **IMPORTANT:** When tightening the tie rod end jam nuts, the rod ends must be held parallel to prevent rod end damage and premature wear. Damage may not be immediately apparent if done incorrectly.
- After alignment is complete, torque jam nuts to specification.



SUSPENSION (FOX™)

Spring Preload Adjustment

The front and rear shocks have a spring preload adjustment. Suspension spring preload may be adjusted to suit different riding conditions or vehicle payloads.



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

Spring Preload Adjustment - Factory Setting

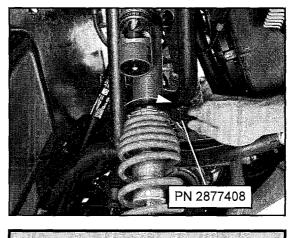
Front	Rear
7.625 in. (19.37 cm)	3.625 in. (9.21 cm)

NOTE: Refer to the shock illustrations within this procedure for spring preload measurement location.

The factory preload setting is appropriate for nearly all riding conditions. Since this vehicle is equipped with full skid plates, adjustment is not necessary.

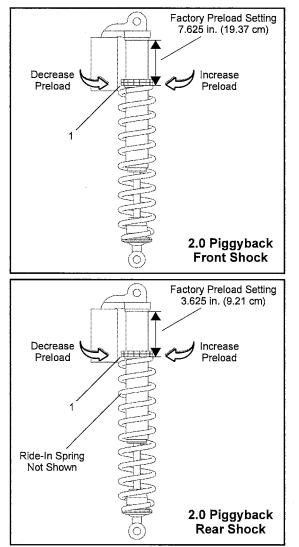
If desired, the spring preload setting may be adjusted to maintain vehicle clearance height when carrying loads.

- 1. Raise and safely support the front or rear of the vehicle off the ground to allow the suspension to fully extend.
- 2. Loosen the upper jam nut adjustment ring using the spanner wrench (PN 2877408) included in the vehicle's tool kit.



Shock Spanner Wrench: (PN 2877408)

3. Turn the lower adjustment ring (1) clockwise to increase preload or counter-clockwise to decrease preload.



IMPORTANT: DO NOT increase the spring preload by more than one inch (25.4 mm) over the factory setting.

Once you have obtained the correct preload, hold the lower 4. adjustment ring while tightening the upper adjustment ring to lock them in place.

IMPORTANT: Always return the spring preload to the factory setting after the load is removed from the vehicle. The increased suspension height will negatively impact vehicle stability when operating without a load.

Shock Compression Adjustment

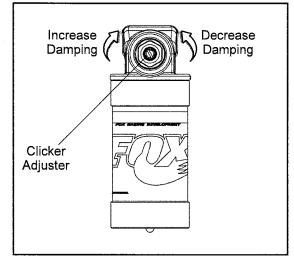
The compression damping adjustment is located on top of the shock 'Piggyback' reservoir of each shock.

Use a flat blade screwdriver to make damping adjustments.

NOTE: When the adjuster screw is turned clockwise until it stops, the damping is in the fully closed position.

Turn the clicker clockwise to increase compression damping. Turn the clicker counter-clockwise to decrease compression damping.

NOTE: The factory setting is 10 clicks from closed. Refer to the "Compression Adjustment Table" below.



Compression Adjustment Table

Setting	Compression Damping
Softest	18 clicks from closed
Factory	10 clicks from closed
Firmest	2 clicks from closed

MAINTENANCE

BRAKE SYSTEM

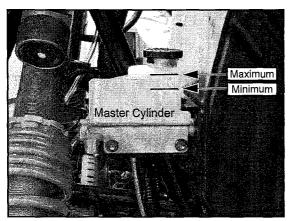
Brake Fluid Inspection

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

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

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

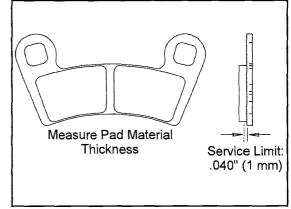
- 1. Position the vehicle on a level surface.
- 2. Place the transmission in PARK.
- 3. View the brake fluid level in the reservoir. The level should be between the MAX and MIN level lines.



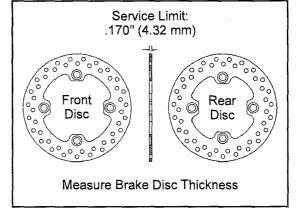
- 4. If the fluid level is lower than the MIN level line, add brake fluid until it reaches the MAX level line.
- 5. Install the reservoir cap and apply the brake pedal forcefully for a few seconds and check for fluid leakage around the master cylinder fittings and the brake caliper fittings.

Brake Pad / Disc Inspection

- 1. Check the brake pads for wear, damage, or looseness.
- 2. Inspect the brake pad wear surface for excessive wear.
- 3. Pads should be changed when the friction material is worn to .040" (1 mm).



- 4. Check surface condition of the brake discs.
- 5. Measure the thickness of the front and rear brake discs.
- 6. The disc(s) should be replaced if thickness is less than .170" (4.32 mm).



Brake Hose and Fitting Inspection

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

MAINTENANCE

2

- 2.37

MAINTENANCE LOG

Service Date	Hours / Miles (km)	Service Performed / Comments	Dealer / Technician
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NOTES

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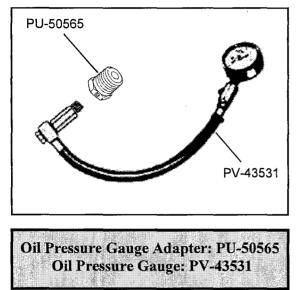
ENGINE / COOLING CHAPTER 3 ENGINE / COOLING

GENERAL INFORMATION
SPECIAL TOOLS
ENGINE LUBRICATION SPECIFICATIONS
OIL PRESSURE TEST
ENGINE OIL FLOW CHART
ENGINE SERVICE SPECIFICATIONS
ENGINE DETAIL - TORQUE VALUES / SEQUENCES / ASSEMBLY NOTES
ENGINE COOLING SYSTEM 3.13
COOLING SYSTEM SPECIFICATIONS
COOLING SYSTEM PRESSURE TEST / PRESSURE CAP TEST
RADIATOR REMOVAL / INSTALLATION
THERMOSTAT REPLACEMENT
COOLING SYSTEM EXPLODED VIEW
COOLING SYSTEM BLEEDING PROCEDURE
WATER PUMP REMOVAL / INSTALLATION
WATER PUMP SERVICE
ENGINE SERVICE
ACCESSIBLE ENGINE COMPONENTS
TOP-END SERVICE (ENGINE IN CHASSIS)
ENGINE REMOVAL
ENGINE INSTALLATION
ENGINE MOUNTING AND TORQUE VALUES
ENGINE BREAK-IN PERIOD / LUBRICATION SPECIFICATIONS
ENGINE DISASSEMBLY / INSPECTION - TOP END
VALVE COVER REMOVAL
CAMSHAFT REMOVAL
CAMSHAFT SPROCKET INSPECTION
CAMSHAFT / CAMSHAFT BORE INSPECTION
CYLINDER HEAD REMOVAL
CYLINDER HEAD INSPECTION / WARP INSPECTION
CYLINDER HEAD DISASSEMBLY
VALVE INSPECTION
COMBUSTION CHAMBER CLEANING
VALVE SEAT RECONDITIONING
ENGINE DISASSEMBLY / INSPECTION - LOWER END
STATOR COVER REMOVAL / INSPECTION
WATER PUMP HOUSING REMOVAL
FLYWHEEL REMOVAL
STARTER ONE-WAY CLUTCH INSPECTION / DISASSEMBLY
STARTER ONE-WAY CLUTCH ASSEMBLY
CRANKCASE DISASSEMBLY / INSPECTION
BALANCE SHAFT REMOVAL / INSPECTION
CRANKSHAFT REMOVAL / INSPECTION
CRANKCASE INSPECTION.
CYLINDER / PISTON REMOVAL.
CYLINDER INSPECTION
PISTON DISASSEMBLY / INSPECTION
PISTON DISASSEMBLET INSPECTION
PISTON RING REMOVAL
PISTON RING TO GROOVE CLEARANCE INSPECTION
PISTON RING INSTALLED GAP

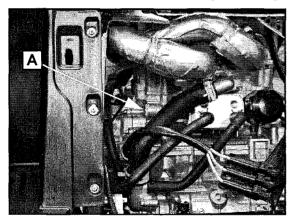
ENGINE / COOLING

Oil Pressure Test

1. Attach the Oil Pressure Gauge Adapter (PU-50565) to the Oil Pressure Gauge (PV-43531).



- 2. Remove the seats and engine service panel.
- 3. Clean the area around the main oil gallery plug (A), located in the upper crankcase on the MAG side of the engine.
- 4. Remove the plug (A) and insert the oil pressure adapter.



5. Start engine and allow it to reach operating temperature, monitoring gauge indication.

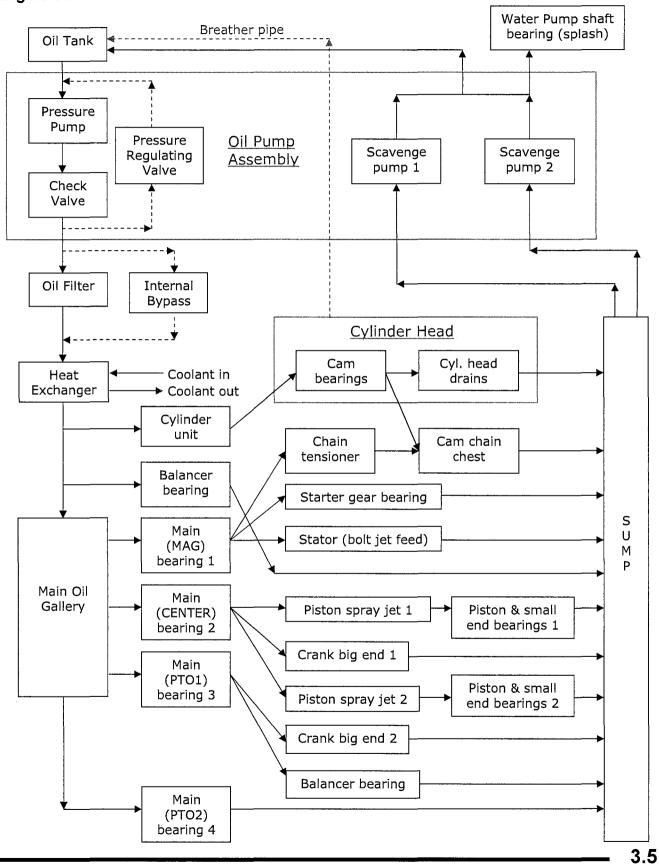
NOTE: Test results are based on the use of the recommended engine oil (Polaris PS-4 Plus) at operating temperature, and may vary considerably if any other oil is used or if engine is not up to temperature.

Oil Pressure Specification (Engine Hot): Minimum @ 1200 RPM: 10 PSI Minimum @ 7000 RPM: 40 PSI

6. Upon assembly, torque the crankcase gallery plug to specification.



Crankcase Gallery Plug: 11 ft. lbs. (15 Nm)



Engine Oil Flow Chart

ENGINE SERVICE SPECIFICATIONS

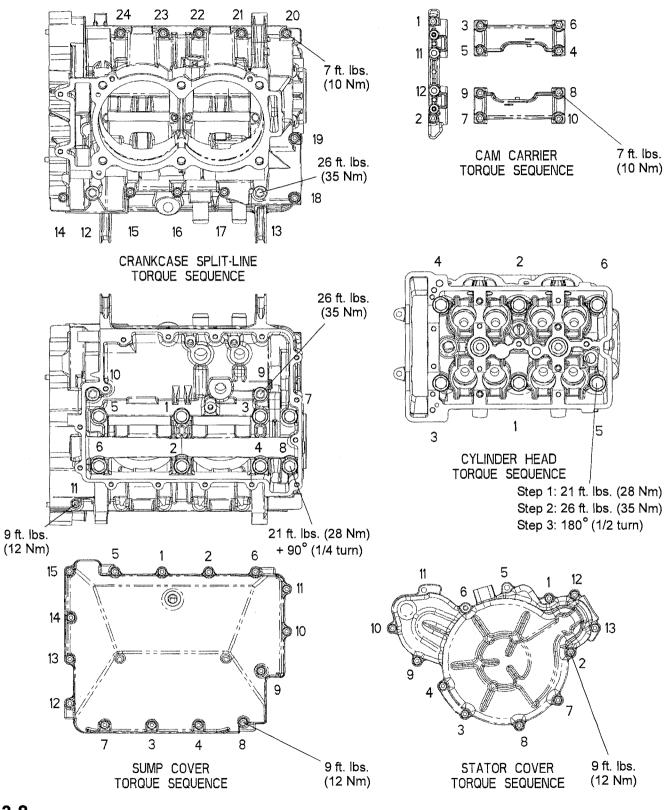
Engine Specifications - ES087OLE011

	CAMSHAFT / CYLINDER HEAD / CYL	INDER (IN. / MM)
	Cam Lobe Height - Intake (Standard)	0.9499" ± 0.0015" (24.13 ± 0.04 mm)
	Cam Lobe Height - Intake (Service Limit)	0.9464" (24.04 mm)
	Cam Lobe Height - Exhaust (Standard)	0.9251" ± 0.0015" (23.50 ± 0.04 mm)
Camshaft	Cam Lobe Height - Exhaust (Service Limit)	0.9216" (23.41 mm)
	Camshaft Journal O.D All (Standard)	0.9036" - 0.9045" (22.954 - 22.975 mm)
	Camshaft Journal O.D All (Service Limit)	0.9033" (22.944 mm)
	Camshaft Journal Bore I.D All (Standard)	0.9055" - 0.9063" (23.000 - 23.021 mm)
	Camshaft Journal Bore I.D All (Service Limit)	0.9072" (23.044 mm)
	Camshaft Oil Clearance (Standard)	0.0009" - 0.0026" (0.025 - 0.067 mm)
	Camshaft Oil Clearance (Service Limit)	0.0039" (0.1 mm)
	Camshaft End Play (Standard)	0.0049" - 0.0108" (0.125 - 0.275 mm)
	Camshaft End Play (Service Limit)	0.0157" (0.4 mm)
	Cylinder Head - Surface Warp Limit	0.0039" (0.1 mm)
Cylinder Head	Cylinder Head - Standard Height	4.682" ± 0.0019" (118.93 ± 0.05 mm)
	Valve Seat - Contacting Width - Intake (Standard)	0.0393" ± 0.0039" (1.0 ± 0.10 mm)
	Valve Seat - Contacting Width - Intake (Service Limit)	0.0551" (1.4 mm)
Valve Seat	Valve Seat - Contacting Width - Exhaust (Standard)	0.0590" ± 0.0039" (1.5 ± 0.10 mm)
	Valve Seat - Contacting Width - Exhaust (Service Limit)	0.0748" (1.9 mm)
	Valve Seat Angles	$30.0^{\circ} \pm 1.5^{\circ} / 45.0^{\circ} \pm 0.5^{\circ} / 60.0^{\circ} \pm 1.5^{\circ}$
Valve Guide	Valve Guide Inner Diameter	0.2165" - 0.2171" (5.500 - 5.515 mm)
	Valve Lash (Cold) - Intake	0.005" - 0.007" (0.125 - 0.175 mm)
	Valve Lash (Cold) - Exhaust	0.011" - 0.013" (0.275 - 0.325 mm)
	Valve Stem Diameter - Intake	0.2155" - 0.2161" (5.475 - 5.490 mm)
37.1	Valve Stem Diameter - Exhaust	0.2147" - 0.2153" (5.455 - 5.470 mm)
Valve	Valve Stem Oil Clearance - Intake	0.0003" - 0.0015" (0.010 - 0.040 mm)
	Valve Stem Oil Clearance - Exhaust	0.0011" - 0.0023" (0.030 - 0.060 mm)
	Valve Stem Overall Length - Intake	3.7704" (95.77 mm)
	Valve Stem Overall Length - Exhaust	3.8023" (96.58 mm)
Malar O da	Valve Spring Free Length (Standard)	1.7263" (43.85 mm)
Valve Spring	Valve Spring Free Length (Service Limit)	1.6830" (42.75 mm)
	Cylinder - Surface Warp Limit (mating with cylinder head)	0.002" (0.05 mm)
- ··· ·	Cylinder Bore - Standard	3.6614" ± 0.0003" (93 mm ± 0.008 mm)
Cylinder	Cylinder Out of Round Limit	0.001" (0.025 mm)
	Cylinder Taper Limit	0.001" (0.025 mm)
	Cylinder to Piston Clearance	0.0009"0019" (.025050 mm)

	Piston - Standard O.D Measured 90 degrees to pin, 0.39 in. (10 mm) up from piston skirt. See text.		3.6597 ± .0003" (92.959 ± .008 mm)
Piston	Piston Pin Bore I.D. (Standard)		0.7877" - 0.7881" (20.009 - 20.018 mm)
	· · · · · · · · · · · · · · · · · · ·		0.7893" (20.05 mm)
	Piston Pin O.D.	(Standard)	0.7873" - 0.7875" (20.000 - 20.005 mm)
Piston Pin	Piston Pin O.D.	(Service Limit)	0.7866" (19.98 mm)
		Top Ring (Standard)	0.010" - 0.014" (0.25 - 0.35 mm)
		Top Ring (Service Limit)	0.0196" (0.5 mm)
			<i>S/N < 00517</i> : 0.014" - 0.020" (0.35 - 0.50 mm)
	Installed	Second Ring (Standard)	<i>S/N > 00516</i> : 0.039" - 0.045" (1.00 - 1.15 mm)
	Gap		<i>S/N < 00517:</i> 0.028" (0.70 mm)
Piston Ring		Second Ring (Service Limit)	<i>S/N > 00516</i> : 0.053" (1.35 mm)
		Oil Control Rails (Standard)	0.008" - 0.028" (0.20 - 0.70 mm)
		Oil Control Rails (Service Limit)	0.0354" (0.9 mm)
		Top Ring (Standard)	
	Ring to Groove Clearance	Second Ring (Standard)	- 0.0007" - 0.0023" (0.020 - 0.060 mm)
		Service Limit	0.0047" (0.12 mm)
	Connecting Rod	Small End I.D. (Standard)	0.7879" - 0.7885" (20.015 - 20.030 mm)
	Connecting Rod	Small End I.D. (Service Limit)	0.7897" (20.06 mm)
Connecting Rod	1 - Marking	Connecting Rod Big End Bore I.D.	1.7318" - 1.7321" (43.989 - 43.996 mm)
	2 - Marking	Connecting Rod Big End Bore I.D.	1.7321" - 1.7323" (43.996 - 44.003 mm)
	3 - Marking	Connecting Rod Big End Bore I.D.	1.7323" - 1.7326" (44.003 - 44.010 mm)
	B - Marking	Main Journal O.D. (Standard)	1.6144" - 1.6147" (41.006 - 41.014 mm)
	G - Marking	Main Journal O.D. (Standard)	1.6140" - 1.6143" (40.998 - 41.005 mm)
	Y - Marking	Main Journal O.D. (Standard)	1.6137" - 1.6140" (40.990 - 40.997 mm)
	Main Journal O.	D. (Service Limit)	1.6129" (40.970 mm)
	B - Marking	Rod Journal O.D. (Standard)	1.6118" - 1.6122" (40.942 - 40.950 mm)
rankshaft	G - Marking	Rod Journal O.D. (Standard)	1.6115" - 1.6118" (40.934 - 40.941 mm)
	Y - Marking	Rod Journal O.D. (Standard)	1.6112" - 1.6115" (40.926 - 40.933 mm)
	Rod Journal O.D. (Service Limit)		1.6104" (40.906 mm)
	Crankshaft Runo	out Limit (PTO and MAG)	Less than 0.001" (0.025 mm)
	Auxiliary Sproch	ket Installed Depth	4.9527" ± 0.0078" (125.8 ± 0.2 mm)
	A - Marking	Bearing Journal O.D. (Standard)	1.4950" - 1.4953" (37.974 - 37.982 mm)
alance Shaft	B - Marking	Bearing Journal O.D. (Standard)	1.4947" - 1.4950" (37.966 - 37.974 mm)

ENGINE DETAIL - TORQUE VALUES / SEQUENCES / ASSEMBLY NOTES

Main Engine Components - Torque Specification and Sequence



Balance Shaft / Connecting Rods / Crankcase / Crankshaft / Pistons

FAS	TENER TORQUE TABLE
\triangle	10.00±1.00 N-m
	6.00±2.00 N-m
\land	8.00±1.00 N-m
D	28.00 <u>+</u> 3.00 N-m
Æ	2.00±2.00 N-m
F	35.00±2.00 N-m
6	100.00±10.00 N-m
A	22.50±2.50 N-m
K	40.00±4.00 N-m
\square	4.00±2.00 N-m
\square	15.00±2.00 N-m
\square	120.00±12.00 N-m

3

FASTENER TORQUE TABLE A 10.00±1.00 N-m B 16.00±2.00 N-m C $3.00±1.00$ N-m C $3.00±1.00$ N-m C $3.00±1.00$ N-m C $3.00±1.00$ N-m C $10.00±2.00$ N-m C $35.00±2.00$ N-m G $100.00±10.00$ N-m A $27.50±2.50$ N-m A $40.00±4.00$ N-m
14.00±2.00 N-m N 15.00±2.00 N-m N 120.00±12.00 N-m
NOTES: APPLY ENGINE OIL TO INTERNAL BEARING SURFACE. APPLY OIL TO PISTON PIN/BORE. CLEAN MATING SURFACES, SEAL MATING SURFACES WITH SEALANT. SEALANT MUST NOT BLOCK OIL PASSAGES. CAC CLEAN MATING SURFACES, SEAL MATING SURFACES WITH SEALANT. SEALANT MUST NOT BLOCK OIL PASSAGES. CAC TORQUE IN SEQUENCE PER CRANKCASE SPLIT-LINE VIEW. CORQUE IN SEQUENCE PER CRANKCASE SPLIT-LINE VIEW. CAC TORQUE THAT OIL DEFLECTOR IS PROPERLY POSITIONED IN UPPER CRANKCASE.

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Cylinder / Oil Cooler / Oil Filter / Oil Pump / Oil Sump / Water Pump

FASTENER TORQUE TABLE	
A 10.00±1.00 N-m	
B 16.00±2.00 N-m	
C 8.00±1.00 N-m	$\frac{1}{10000000000000000000000000000000000$
28.00±3.00 N-m	
<u>E</u> 12.00±2.00 N-m <u>F</u> 35.00±2.00 N-m	
100.00±10.00 N-m	
H 22.50±2.50 N-m	
40.00±4.00 N-m	
14.00±2.00 N-m	
M 15.00±2.00 N-m	
N 120.00±12.00 N-m	
3	
\triangle	
- and	
NOTES:	
LUBRICATE SEAL WITH ENG PRIOR TO FILTER INSTALL	ATION.
INSURE TAB IS VISIBLE T	
^	
APPLY ENGINE OIL TO OUT	
TORQUE IN SEQUENCE SHOW	IN IN OIL SUMP COVER VIEW.
APPLY ENGINE OIL TO TEN	ISIONER BORE PRIOR TO ASSEMBLY. S IN PLACE PRIOR TO TOROUING.
6 INSURE O-RING SEALS ARE	h
^	INDER BORES PRIOR TO ASSEMBLY.
3.10	

ENGINE / COOLING

Camshafts / Cylinder Head / Flywheel / Idler Gears / Stator Cover

FAS	TENER TORQUE TABLE
\triangle	10.00±1.00 N-m
ß	16.00±2.00 N-m
\land	8.00±1.00 N-m
\bigtriangleup	28.00±3.00 N-m
E	12.00±2.00 N-m
F	35.00±2.00 N-m
G	100.00±10.00 N∘m
\square	22.50±2.50 N-m
	40.00±4.00 N-m
\square	14.00±2.00 N-m
M	19.00±2.00 N-m
\square	120.00±±12.00 N-m

NOTES:

The sequence shown in stator cover view.

THE MOUNTING SURFACE ON BOTH THE CRANKSHAFT AND FLYWHEEL SHOULD BE FREE FROM OIL OR GREASE.

TORQUE IN SEQUENCE SHOWN FOR CYLINDER HEAD. STEP 1: TORQUE IN SEQUENCE TO 28.0±3.0 N·m STEP 2: TORQUE IN SEQUENCETO 35.0±3.5 N·m STEP 3: TORQUE IN SEQUENCE TO 180 DEGREES.

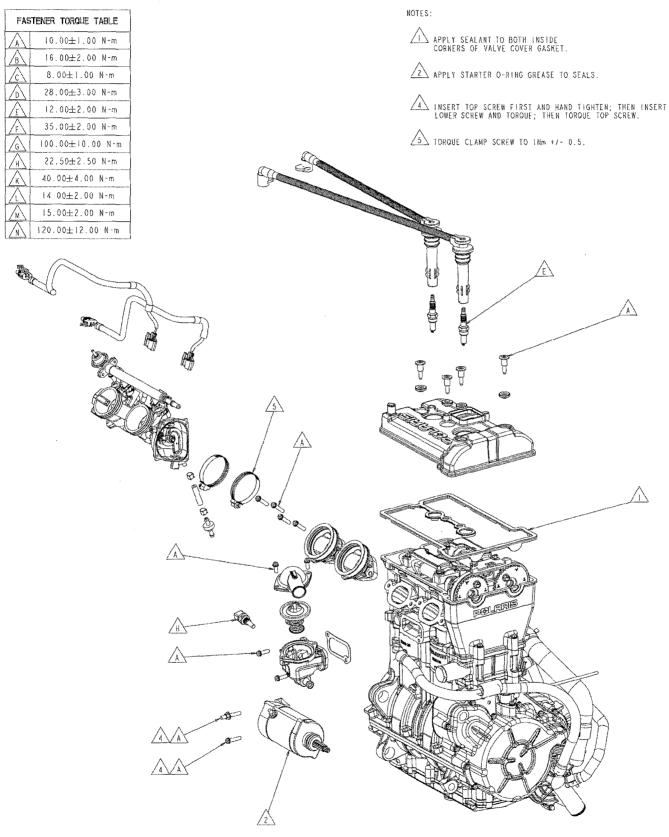
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/4\

ENGINE / COOLING

Spark Plugs / Starter / Thermostat Housing / Throttle Body / Valve Cover



ENGINE COOLING SYSTEM

Cooling System Specifications

Condition	Coolant Temperature °F (°C)
Room Temperature	68° F (20° C)
Thermostat Open	180° F (82° C)
Fan Off	192° F (89° C)
Fan On	198° F (92° C)
Thermostat Full Open Lift	203° F (95° C)
Engine Temperature Overheat Indicator	233°F (112°C)
Engine Protection Ignition Misfire	236°F (113°C)
Engine Protection Shutdown	257°F (125°C)

ltem	Specification
Cooling System Capacity	4.9 qts. (4.6 l)
Pressure Cap Relief	13 PSI

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Recommended Coolant

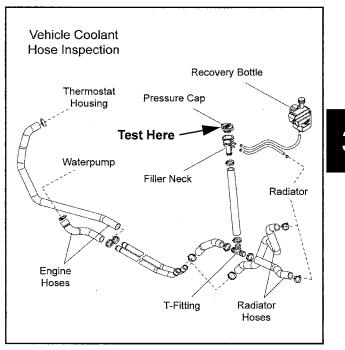
Use only high quality antifreeze/coolant mixed with distilled water in a 50/50 or 60/40 ratio, depending on freeze protection required in your area.

CAUTION: Using tap water in the cooling system will lead to a buildup of deposits which may restrict coolant flow and reduce heat dissipation, resulting in possible engine damage. Polaris Premium 60/40 Antifreeze/Coolant is recommended for use in all cooling systems and comes pre-mixed, ready to use.

Cooling System Pressure Test

1. Remove the hood from the front cab.

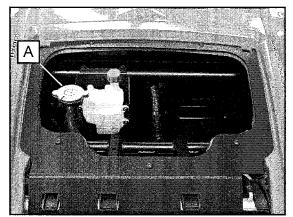
Never remove pressure cap when engine is warm or hot. The cooling system is under pressure and serious burns may result. Allow the engine to cool before servicing. 2. Remove pressure cap and pressure test the cooling system using a commercially available pressure tester.



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

Pressure Cap Test

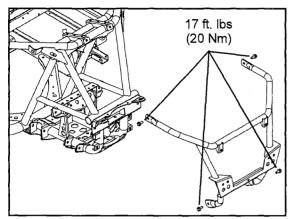
- 1. Remove the hood from the front cab (see "WARNING" under "Cooling System Pressure Test").
- 2. Remove pressure cap (A) and test using a pressure cap tester (commercially available).



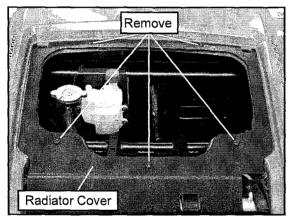
3. The pressure cap relief pressure is 13 psi. Replace cap if it does not meet this specification.

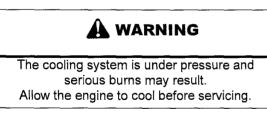
Radiator Removal / Installation

- 1. Remove the hood and front bumper (see Chapter 5).
- 2. Remove the (4) fasteners that secure the front bumper support to the main frame.

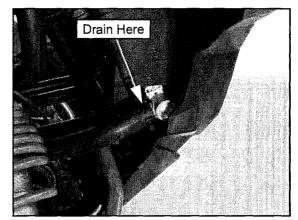


3. Remove the (5) fasteners that secure the upper radiator cover to the front cab. Remove the upper radiator cover.

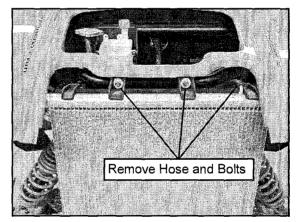




4. Drain radiator by removing lower radiator hose. Be sure to catch and dispose of coolant properly.

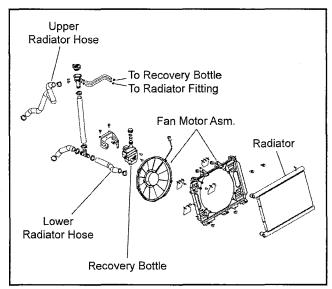


- 5. Disconnect cooling fan electrical connector.
- 6. Remove the upper radiator hose from the radiator.
- Disconnect the small radiator bypass hose and remove the (2) upper radiator support bolts.



- 8. Lift radiator up to disengage it from its lower mounting points. Tilt top of radiator outward and remove the radiator from the vehicle.
- 9. Separate the fan motor assembly from the radiator. Inspect fan blades for damage.

10. Reverse this procedure for installation. Be sure to properly fill and bleed cooling system as outlined in this chapter.

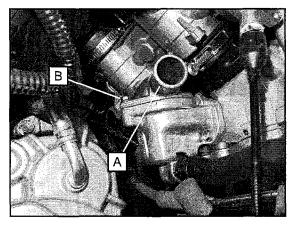


Thermostat Replacement

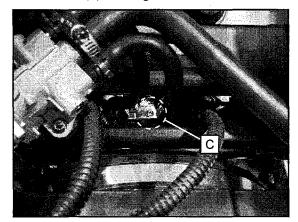
1. Remove the hood from the front cab.

The cooling system is under pressure and serious burns may result. Allow the engine to cool before servicing.

- 2. Remove the pressure cap to relieve any system pressure (see "Pressure Cap Test").
- 3. Drain coolant to a level below the thermostat housing.
- 4. Remove upper coolant hose from thermostat housing (A).
- 5. Remove the rear bolt (B) retaining the thermostat cover.



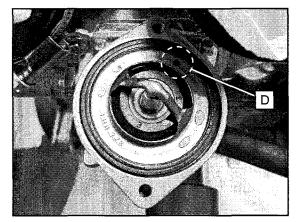
- 6. Remove the cargo box access panel.
- 7. Using an 8 mm swivel socket and long extension, remove the front bolt (C) retaining the thermostat cover.



8. Lift the cover from the housing and remove the thermostat.

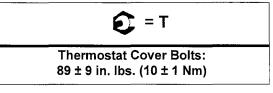
NOTE: Thermostat has a pop-off relief to allow the bypass system to operate until thermostat opens.

9. Install a new thermostat with the bleed hole (D) positioned closest to the engine.



NOTE: Image shown above is with engine removed for clarity.

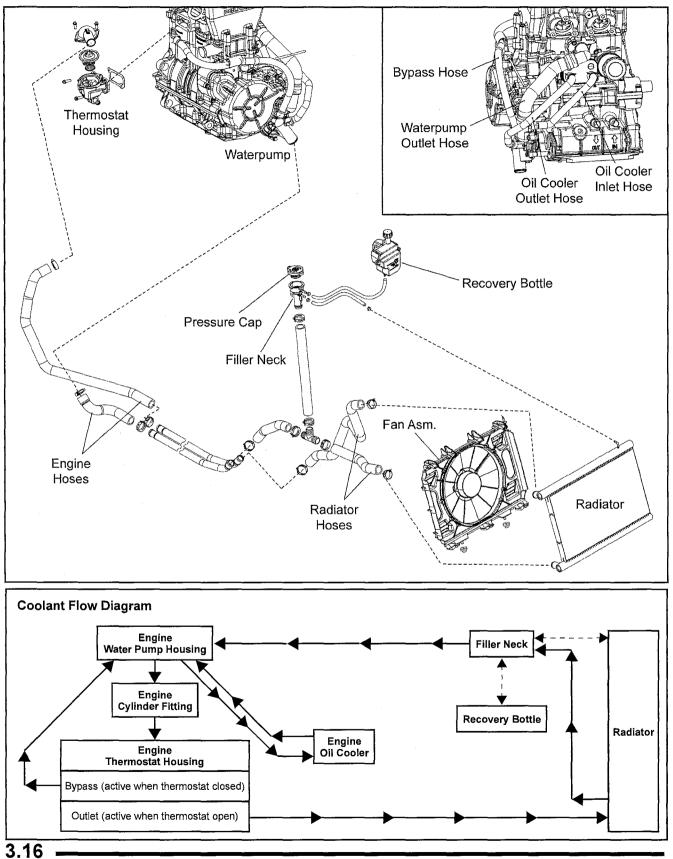
10. Reverse this procedure for installation. Torque thermostat cover bolts to specification.

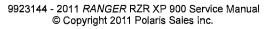


11. Be sure to properly fill and bleed cooling system as outlined in this chapter.

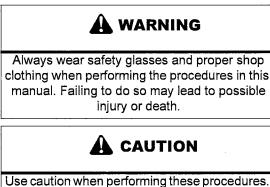
ENGINE / COOLING

Cooling System Exploded View





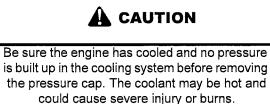
Cooling System Bleeding Procedure



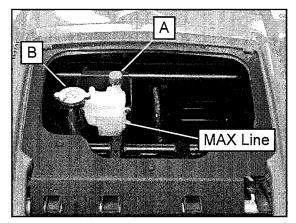
Use caution when performing these procedures. Coolant may be hot and may cause severe injury or burns.

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

1. Allow engine and cooling system to cool down.

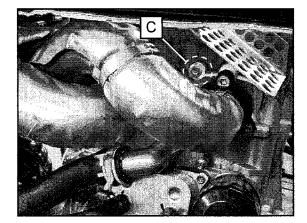


- 2. Remove the hood.
- 3. Remove the recovery bottle cap (A) and fill the bottle to the MAX line.

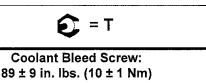


- 4. Remove the pressure cap (B) and add the necessary amount of Polaris Premium Antifreeze to the radiator filler neck.
- 5. Remove the seats and engine service panel to access the coolant bleed screw.

6. Open the bleed screw (C) to allow any trapped air to escape. Close the bleed screw once a steady stream of coolant begins to drain out.



7. Tighten the bleed screw to specification, top off coolant and properly install the pressure cap.



- 8. Start the engine and allow it to idle until the coolant fan has cycled two times.
- 9. Allow engine and cooling system to completely cool down (see CAUTION).
- 10. Remove the pressure cap. Add the necessary amount of Polaris Premium Antifreeze to the radiator filler neck.
- 11. Open the bleed screw to allow any trapped air to escape. Close the bleed screw once a steady stream of coolant begins to drain out.
- 12. Tighten the bleed screw to specification, top off coolant and properly install the pressure cap.

- 13. Fill the recovery bottle to the MAX line.
- 14. Reinstall the hood.
- 15. Reinstall the seats and engine service panel.

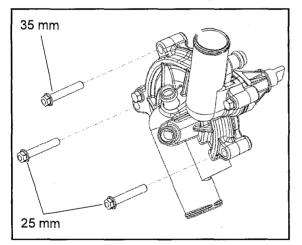
ENGINE / COOLING

Water Pump Removal

1. Allow engine and cooling system to cool down.

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

- 2. Remove both seats and the engine service panel.
- 3. Disconnect the (-) negative battery cable.
- 4. Remove all debris and thoroughly clean water pump area and RH side of engine block.
- 5. Remove the hood.
- 6. Remove the pressure cap from the filler neck.
- 7. Drain cooling system as outlined in this chapter.
- 8. Elevate the rear of the vehicle off the ground using a suitable ATV lift and remove the right rear wheel.
- 9. Remove the right rear shock lower mounting bolt. Discard the nut. Swing and support right rear shock rearward to gain access to water pump area.
- 10. Remove the (5) coolant hoses that are attached to the water pump. Note location and routing for installation. Be sure to catch and dispose of coolant properly.
- 11. Remove the (3) bolts holding the water pump to the engine block. Make note of different bolt lengths for installation.



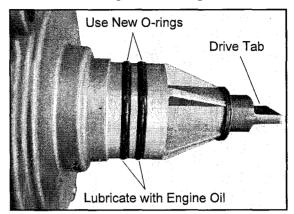
- 12. Remove water pump from engine by gently twisting and rocking the water pump housing while pulling outward.
- 13. Maneuver water pump downward and remove it through the access hole in the skid plate.
- 14. Plug the water pump drive access hole in the engine block with a clean shop towel.

Water Pump Installation

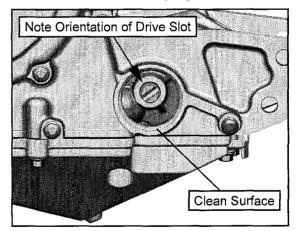
1. Replace the (2) sealing O-rings on the water pump housing.

NOTE: Do not reuse the water pump O-rings. Always use NEW O-rings each time the water pump is removed.

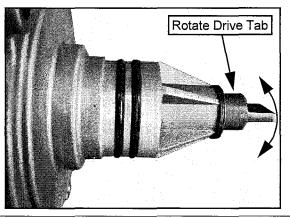
2. Lubricate new O-rings with fresh engine oil.



- 3. Remove the shop towel from the water pump drive access hole in the engine block.
- 4. Clean the O-ring sealing surface in the engine block using a clean shop towel.
- 5. Use a shop light to illuminate the water pump drive access hole in engine crankcase.
- 6. Note orientation of the water pump drive slot.

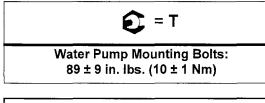


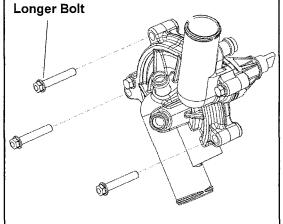
7. Rotate water pump drive tab so it matches the angle of the drive slot in the engine.



The water pump drive tab and slot must be aligned properly during installation. Severe engine or water pump damage will occur if the tab and slot are not in alignment during water pump installation.

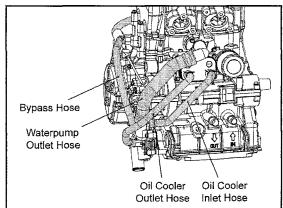
- 8. Maneuver water pump up through the access hole in the skid plate on the RH side of the vehicle.
- 9. Slide water pump into engine crankcase.
- 10. Be sure water pump is fully seated and the drive tab and slot are properly engaged.
- 11. Install the (3) water pump mounting bolts and torque to specification.





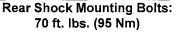
NOTE: The top bolt is longer than the lower bolts.

12. Install the (5) coolant hoses that attach to the water pump. Be sure orientation and routing are correct.

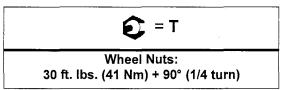


- 13. Install the right rear lower shock bolt and new nut. Torque mounting bolt to specification.





14. Install the right rear wheel. Torque wheel nuts to specification.



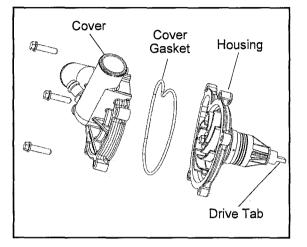
- 15. Connect the (-) negative battery cable.
- 16. Fill and bleed cooling system as outlined in this chapter.
- 17. Install hood, engine service panel and seats (Chapter 5).

ENGINE / COOLING

Water Pump Service

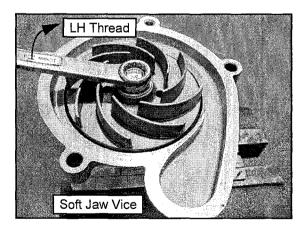
NOTE: The water pump cover gasket can be replaced while the water pump housing is still installed in the engine.

- 1. Remove water pump assembly as outlined in this chapter.
- 2. Remove the (3) bolts retaining the water pump cover to the water pump housing. Discard water pump cover gasket.



- 3. Place the water pump drive tab vertically into a soft jaw vice.
- 4. Remove the bolt and washer retaining the water pump impeller to the shaft. Inspect impeller veins for damage, replace water pump housing assembly if needed.

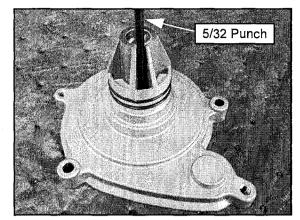
NOTE: The water pump impeller bolt is left hand thread (reverse thread).



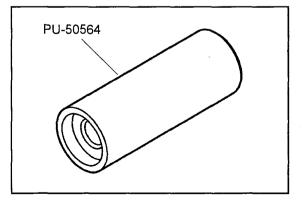
- 5. Remove impeller from water pump shaft.
- 6. Using an appropriate arbor press, properly support the water pump housing and press out the water pump shaft from the impeller side.

7. Extract the mechanical seal and the oil seal from the water pump housing.

NOTE: A 5/32 diameter punch will fit in the lubrication slot to aid in the removal of the oil seal. Be sure not to damage the water pump shaft bearing surface.

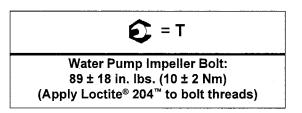


- 8. Inspect the water pump shaft bore for excessive wear or damage. Replace water pump housing assembly if necessary.
- 9. Clean and inspect water pump shaft for excessive wear or damage. Replace water pump housing assembly if necessary, as shaft can not be purchased separately.
- 10. Thoroughly clean mechanical seal and oil seal bores.
- 11. Install a NEW oil seal into the water pump housing until fully seated.
- 12. Fully install the water pump shaft and (2) washers into the housing.
- 13. Place water pump drive tab vertically into soft jaw vice as previously shown in this procedure.
- 14. Install a NEW mechanical seal into the water pump housing using special tool PU-50564. Press the new mechanical seal in until it is flush with the water pump housing.

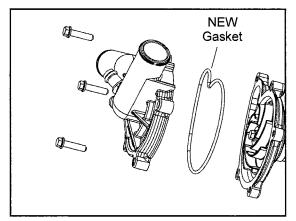


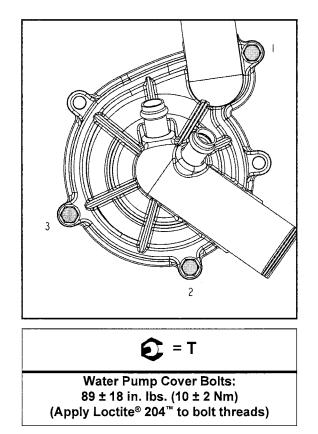
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- 15. Rotate water pump shaft after seal installation to verify free movement.
- 16. Place impeller onto the water pump shaft.
- 17. Apply Loctite[®] 204[™] to the threads of the impeller bolt. Install washer and impeller bolt and torque to specification.

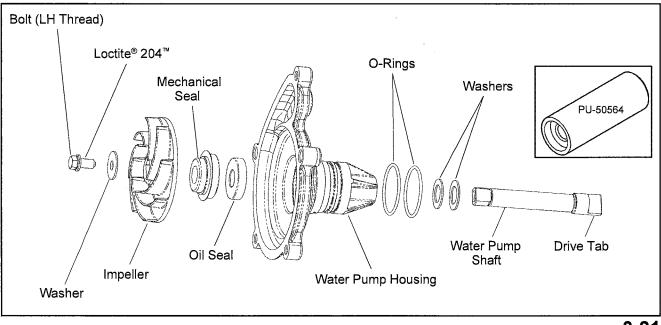


- 18. Clean water pump cover and housing gasket surfaces.
- 19. Install a new water pump cover gasket.
- 20. Install the water pump cover and (3) retaining bolts. Torque bolts in sequence to specification.





- 21. Install (2) new water pump (O-rings) and lubricate them with fresh engine oil.
- 22. Install water pump assembly into engine as shown in the "Water Pump Installation" procedure.



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ENGINE SERVICE

Accessible Engine Components

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

- Camshaft(s)
- Camshaft Sprocket(s)
- Cylinder Head
- Flywheel
- Oil Cooler
- Starter Motor / Idler Gear Asm
- Stator (Alternator)
- Thermostat
- Valve Cover
- Water Pump

The following components require engine removal for service:

- Camshaft Timing Chain
- Connecting Rod(s)
- Counterbalance Shaft / Bearings
- Crankcase
- Crankshaft / Main Bearings
- Crankshaft Seal (PTO)
- Cylinder
- Oil Pump / Oil Pump Sprocket or Chain
- Piston / Rings

Top-End Service (Engine in Chassis)

Some top-end engine components can be serviced while the engine is mounted in the chassis.

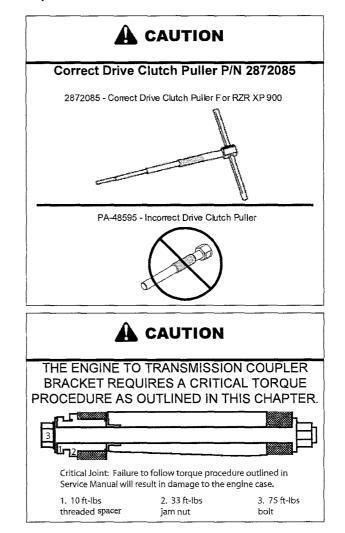
To service the top-end of the engine refer to the "Valve Clearance Inspection" procedure in Chapter 2, which provides detailed steps to access the valve cover.

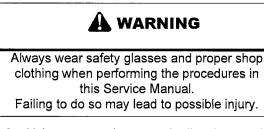
Engine Removal

IMPORTANT: Some engine repair procedures can be performed without removing the engine assembly from the vehicle. Refer to "Accessible Engine Components" for further information.

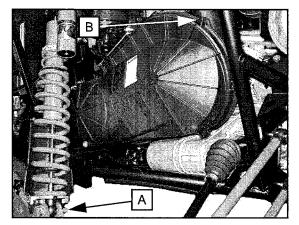
NOTE: The use of an overhead or portable engine hoist is the only recommended method for removing and installing the engine.

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





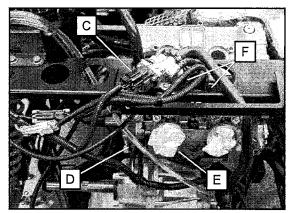
- 1. If vehicle was recently operated, allow it to cool down before attempting to perform any work.
- 2. Thoroughly clean the engine and chassis.
- 3. Drain the engine oil and coolant prior to engine removal (see Chapter 2).
- 4. Remove the seats, console cover and engine service panel (see Chapter 5).
- 5. Disconnect the (-) negative battery cable from the battery.
- 6. Remove the rear bumper and cargo box as an assembly (see Chapter 5).
- 7. Remove the air box assembly (see Chapter 4 "ECT Sensor Replacement").
- 8. Elevate the rear of the vehicle off the ground using a suitable lift and remove the left rear wheel.
- 9. Remove lower mounting bolt (A) from the left rear shock and discard the nut. Install a new nut upon assembly.
- 10. Remove the outer clutch cover screws (B) and remove the cover from the vehicle.



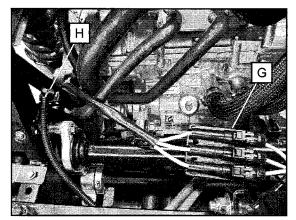
11. Remove the drive belt, drive clutch, driven clutch, inner clutch cover and clutch outlet duct (see Chapter 6).

IMPORTANT: Be sure to use the correct Drive Clutch Puller (PN 2872085) to prevent damage to crankshaft.

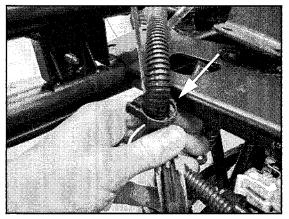
12. Disconnect the IAC valve (C), MAQS (D), ECT sensor (E), fuel injector harness leads (F) and ignition coil harness lead.



- 3
- 13. Disconnect the stator harness (G) and CPS harness (H) connections. Remove the connectors attached to the vehicle frame and engine mount to prevent from damaging them upon engine removal.



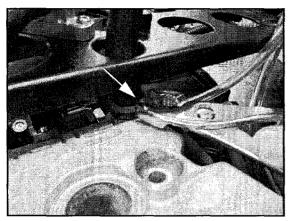
- 14. Remove (+) positive cable from the starter motor.
- 15. Remove (-) negative cable from the starter mounting bolt.
- 16. Remove the wire harness from the routing clip on the rear cross member.



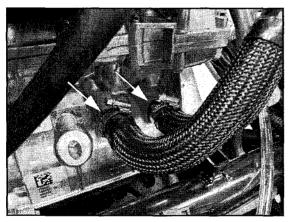
- 17. Disconnect fuel lines and remove throttle body assembly (see Chapter 4). Make note of line routing for installation.
- 18. Remove spark plug wires from the engine.

IMPORTANT: The spark plug wires are marked with MAG and PTO. Note during installation procedure.

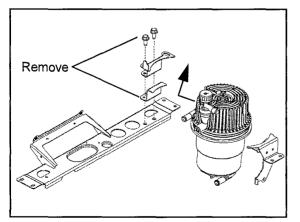
19. Remove the breather hose from the valve cover.



20. Disconnect the oil lines at the engine crankcase. Make note of routing and orientation.

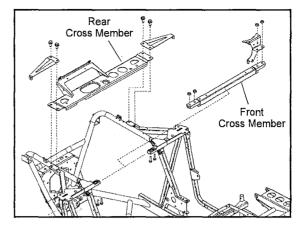


21. Remove the (2) bolts that secure the rear oil tank bracket to the rear cross member. Remove oil tank from the vehicle.

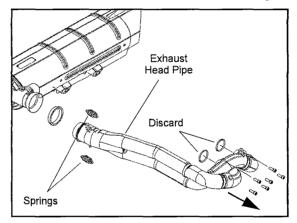


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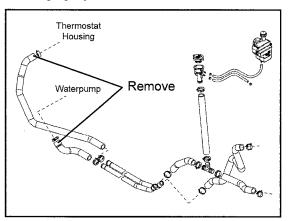
22. Remove the push rivet that attaches the heat shield to the rear cross member. Remove the (8) bolts and (4) nuts that attach the front and rear cross member to the vehicle frame.



23. Remove the (6) fasteners that attach the exhaust head pipe to the engine. Remove the (2) exhaust springs that attach the head pipe to the muffler. Remove exhaust head pipe towards the front of the vehicle. Discard exhaust gaskets.



24. Place a suitable drain pan under the vehicle and remove the(2) coolant hoses from the engine. Dispose of engine coolant properly.



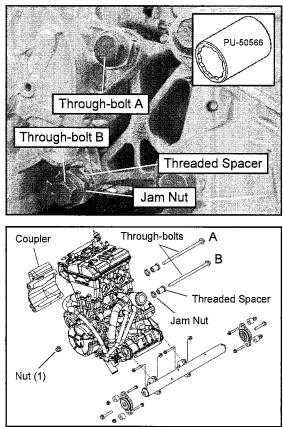
25. Use an overhead or portable engine hoist and suitable engine straps to secure the engine in its current position.



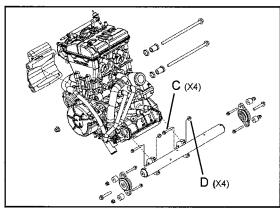
NOTE: Through bolt (A) threads into the engine case. Through bolt (B) threads into a nut on the RH side of the engine.

- 26. To remove through-bolt (A): Hold the threaded spacer firmly in position with a 1 1/8" or 28 mm open-end wrench. The threaded spacer must not rotate while removing the through-bolt. Loosen and remove through-bolt (A) from the LH side of the vehicle. Discard the through-bolt.
- 27. To remove through-bolt (B): Hold through-bolt (B) firmly in position with an open ended wrench from the LH side of the engine. From the RH side of the engine, remove the nut that secures through-bolt (B). Be sure that through-bolt (B) does not rotate while removing the nut from the RH side of the engine. Remove the through bolt from the LH side of the vehicle after the nut has been removed. Discard the through-bolt and nut.

28. Using special tool PU-50566, loosen the inner jam nuts and remove the threaded spacers from the engine case.



29. Remove the (4) front engine mounting bolts (C) and nuts (D).

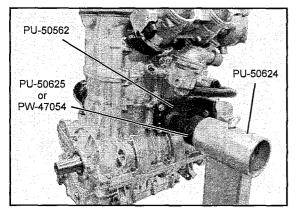


30. With the help of an assistant and the engine hoist, raise the engine vertically out of the vehicle frame.

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

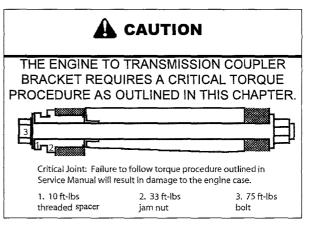
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- 31. Remove the starter motor bolts and starter motor from the engine.
- 32. Install the engine stand adapter (PU-50562) onto the engine where the starter motor was located.
- 33. Select the proper engine stand sleeve adapter and install it onto the engine stand adapter.
 - Sleeve adapter for a 2" bore engine stand: (PU-50625)
 - Sleeve adapter for a 2.375" bore engine stand: (PW-47054)
- 34. Place engine onto the engine stand (PU- 50624) for service.

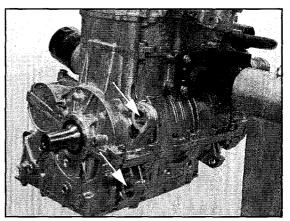


Engine Installation

Use the following procedure to reinstall the engine assembly.

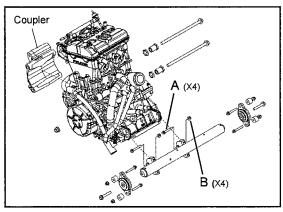


1. Clean all dirt and debris out of the rear engine mount threads.



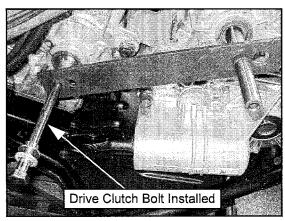
- 2. Attach engine with suitable lifting straps to an overhead or portable engine hoist.
- 3. Remove the engine stand adapter plate and install the starter motor back onto engine.
- 4. Use the overhead or portable engine hoist and suitable engine straps to lower the engine into the vehicle frame.

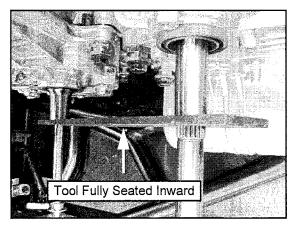
NOTE: Have an assistant help guide the engine in and out of the vehicle while using an engine hoist to prevent personal injury or damage to vehicle components. 5. Align both the front and rear engine mounting locations. Install the (4) front engine mounting bolts (A) and nuts (B) by hand.



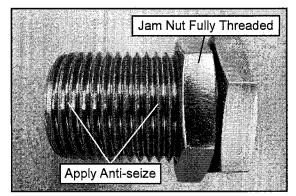
IMPORTANT: DO NOT torque fasteners at this time.

- 6. Align rear engine mounting holes with the transmission coupler mounting holes.
- 7. Install the Clutch Center Distance Tool (PU-50658) onto the crankshaft and transmission input shaft to properly position the clutch center distance. The pictures below show the tool (PU-50658) properly installed.

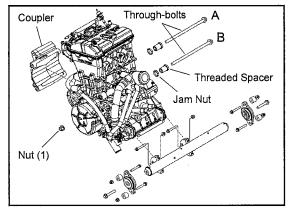




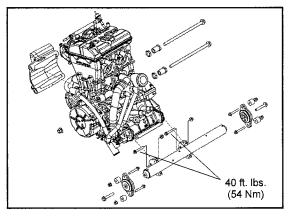
8. Apply anti-seize to the threaded spacers and fully thread the inner jam nuts onto the threaded spacers.

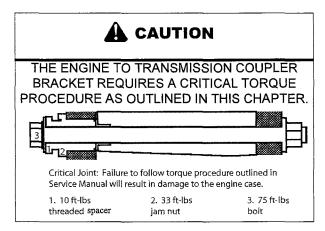


- 9. Install threaded spacers into the engine crankcase by hand approximately 3 turns.
- 10. Install new engine through-bolts and nut. Loosely assemble by hand.
- 11. Lightly tighten both threaded spacers by hand. Be sure inner jam nuts are fully threaded onto the threaded spacers.



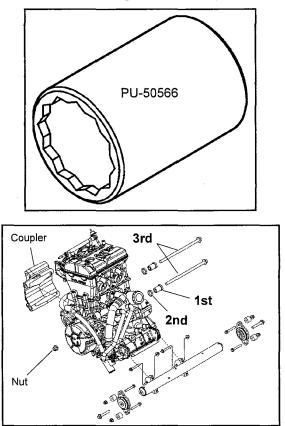
12. Torque the (4) front engine mount fasteners to 40 ft. lbs. (54 Nm).

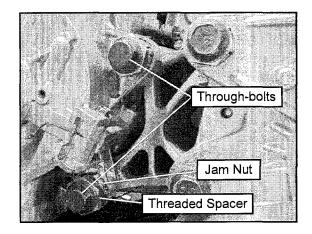




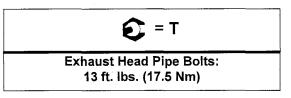
- 13. Using special tool PU-50566 and a proper torque wrench, torque the threaded spacer to 10 ft. lbs. (14 Nm).
- 14. Using special tool PU-50566 and a proper torque wrench, torque the inner jam nut to 33 ft. lbs. (45 Nm).
- 15. Torque the (2) new through-bolts and new nut to 75 ft. lbs. (102 Nm).

IMPORTANT: Hold the threaded spacer firmly in position while tightening the top through-bolt.

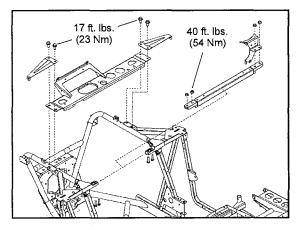




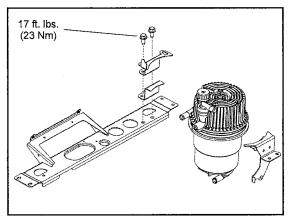
- 16. Remove the lifting straps and overhead or portable engine hoist.
- 17. Install the (2) coolant hoses onto the engine.
- Replace exhaust gaskets (seals). Install exhaust head pipe. Install the (6) fasteners that attach the exhaust head pipe to the engine and torque to specification.



- 19. Install the (2) exhaust springs that attach the head pipe to the muffler.
- 20. Install both front and rear cross members onto the vehicle frame. Torque fasteners to specifications provided in the illustration below.



21. Install the oil tank and oil tank bracket. Torque fasteners to specification.

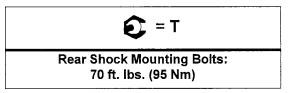


- 22. Connect the oil lines to the engine crankcase and tighten oil hose clamps.
- 23. Install the breather hose to the valve cover.
- 24. Install the spark plug wires to the appropriate cylinder by referencing the MAG and PTO spark plug wire decals.

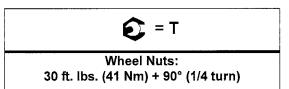
IMPORTANT: Ensure plug wires caps are pushed down all the way so they engage onto the spark plugs.

- 25. Install the throttle body assembly and connect fuel lines as outlined in the EFI Chapter (see Chapter 4).
- 26. Secure wire harness in the routing clip on the rear cross member.
- 27. Install (+) positive cable to the starter motor.
- 28. Install (-) negative cable to the starter motor mounting bolt.
- 29. Connect the stator harness and CPS harness. Attach the connectors to the vehicle frame and engine mount.
- 30. Properly route and connect the harness leads for the IAC valve, MAQS, ECT sensor, fuel injectors and ignition coil.
- 31. Install the air box assembly as outlined in the EFI Chapter (see Chapter 4 "ECT Sensor Replacement").
- 32. Install the inner clutch cover, drive clutch, driven clutch, drive belt, outer clutch cover and clutch outlet duct (see Chapter 6).

33. Install the left rear shock lower mounting bolt and new nut. Torque to specification.



34. Install the left rear wheel and torque wheel nuts to specification.

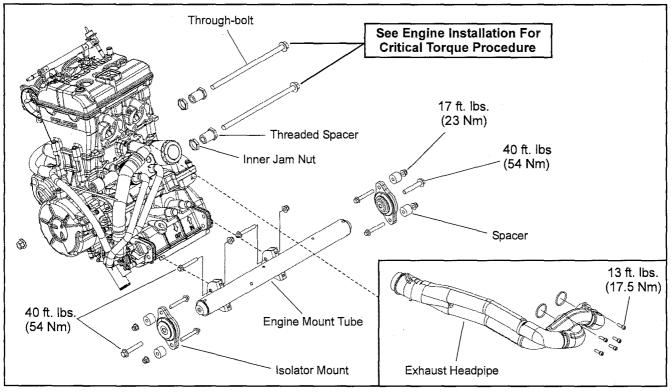


35. Install the rear bumper and cargo box as an assembly (see Chapter 5).

NOTE: Be sure to connect the oil tank vent hose, engine intake hose and clutch air intake hose to the rear cargo box asm upon installation.

- 36. Connect the (-) negative battery cable.
- 37. Remove the pressure cap and fill the cooling system through the filler neck with properly mixed anti-freeze / coolant.
- 38. If engine and oil tank were completely drained, add approximately 3.5 quarts (3.3 L) of Polaris PS-4 Plus Synthetic Engine Oil to the oil tank.
- 39. Install a new oil filter. Lubricate the seal with engine oil prior to installation (see Chapter 2 "Maintenance").
- 40. Follow the "Cooling System Bleeding Procedure" as outlined in this chapter.
- 41. Install engine service panel and both seats (see Chapter 5).
- 42. Start engine and check for any oil or coolant leaks.
- 43. Check the engine oil level (see Chapter 2).
- 44. Refer customer to "Engine Break-In Period" upon returning vehicle to customer.

Engine Mounting and Torque Values



Engine Break-In Period

The break-in period consists of the first 25 hours of operation, or the time it takes to use 15 gallons (57 liters) of fuel. Careful treatment of a new engine and drive components will result in more efficient performance and longer life for these components.



Use only Polaris PS-4 PLUS Synthetic Engine Oil. 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 fuel which has a minimum pump octane number of 87 = (R+M)/2.
- 2. Refer to Chapter 2, "Engine Oil Level". Check oil level indicated on oil tank 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 bolt torques.
- 6. Change oil and oil filter after break-in period at 25 hours.

Engine Lubrication Specifications

Oil Capacity	Approx. 3.5 Quarts (3.3 L)		
Oil Filter Wrench	PU-50105 or 2.5" (64 mm)		
Oil Type	Polaris PS-4 Plus Synthetic Engine Oil		
Oil Pressure Minimum Specification (using Polaris PS-4 Plus at operating temperature)	10 PSI @ 1200 RPM		
	40 PSI @ 7000 RPM		

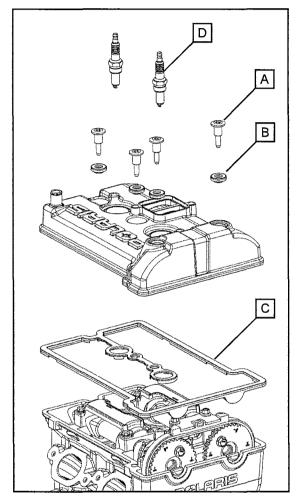
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ENGINE DISASSEMBLY / INSPECTION - TOP END

Valve Cover Removal

NOTE: The valve cover can be removed with the engine installed in the chassis.

1. Remove the (4) valve cover shoulder bolts (A) and isolators (B) using a T40 driver.

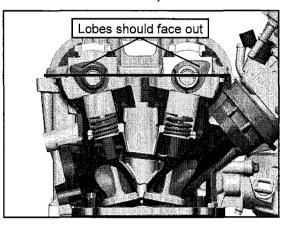


- 2. Replace isolators (B) and valve cover seal (C) if oil leaks are evident.
- 3. Remove the spark plugs (D). Stuff spark plug holes with shop towels to prevent anything from falling into the combustion chamber.

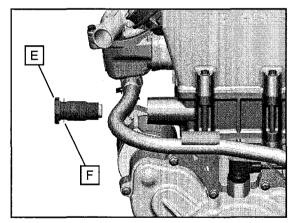
Camshaft Removal

NOTE: The camshafts can be removed with the engine installed in the chassis.

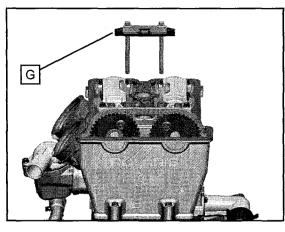
 Rotate the engine so the PTO cylinder is at Top Dead Center (TDC) to relieve most of the valve spring pressure. The camshaft lobes should face out and the slots on the end of the camshafts should line up.



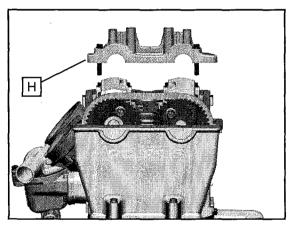
2. Remove the hydraulic cam chain tensioner (E) from the cylinder. Note the sealing washer (F) for reassembly.



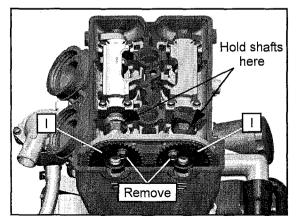
3. Remove the (2) bolts retaining the fixed cam chain guide (G) and remove the assembly from the engine.



4. Remove the remaining (2) bolts that retain the front camshaft carrier (H) and carefully lift the carrier off the camshafts.

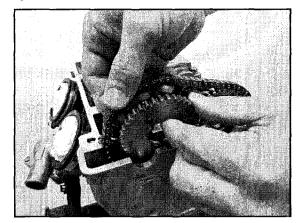


5. Hold camshafts with a 13/16" (21mm) open-end wrench, and remove the top bolt from the camshaft sprockets (I).

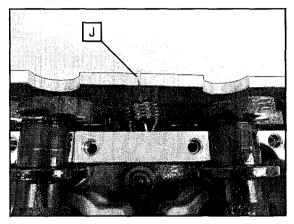


6. Rotate the engine using the flywheel and remove the remaining bolt from each camshaft sprocket (I).

7. Lift the chain and sprockets off the camshafts to allow each sprocket to be removed.

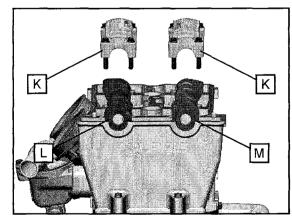


8. Using a paperclip (J) or other tool, hold the cam chain up.



NOTE: The crankcase has a built-in lower guide to prevent the chain from falling off the crankshaft.

9. Evenly loosen the (4) bolts retaining each rear camshaft carrier (K) and carefully lift the carriers off the camshafts.

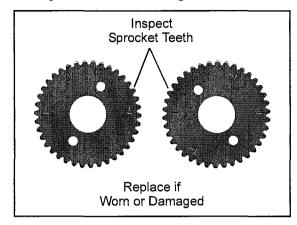


10. Mark the intake (L) and exhaust (M) camshafts to ensure proper assembly.

11. Carefully remove the camshafts from the cylinder head.

Camshaft Sprocket Inspection

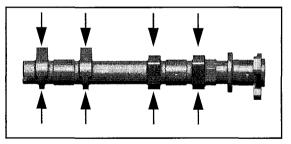
Inspect cam sprocket teeth for wear or damage. Replace timing chain and sprockets if worn or damaged.



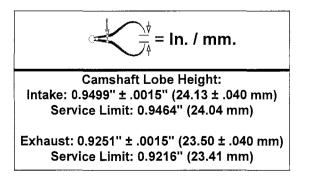
Camshaft / Camshaft Bore Inspection

Inspect all main journals and cam lobes as described below and compare to specifications. Replace camshaft(s) or cylinder head if worn beyond service limit or if any surface is pitted or damaged.

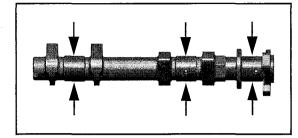
- 1. Visually inspect each cam lobe for wear or damage.
- 2. Measure the height of each cam lobe from the base circle to highest point on the lobe using a micrometer. Compare to specification.



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

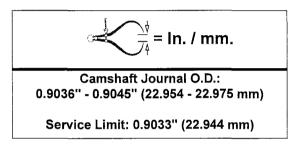


- 3. Visually inspect each camshaft journal for scoring, wear or damage.
- 4. Measure the diameter of the camshaft journals using a micrometer. Compare to specification.

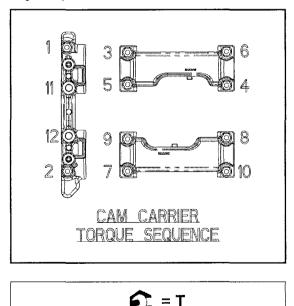


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NOTE: Replace camshafts if damaged or if any part is worn past the service limit.

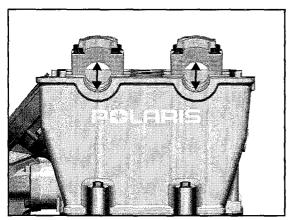


5. Temporarily install the camshaft carriers to measure the camshaft bore. Torque bolts in sequence to specification. Replace cylinder head if worn.

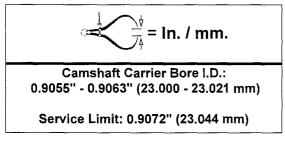


Camshaft Carrier Bolts: 89 ± 9 in. lbs. (10 ± 1 Nm)

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NOTE: Replace cylinder head if camshaft journal bores are damaged or if worn past the service limit.



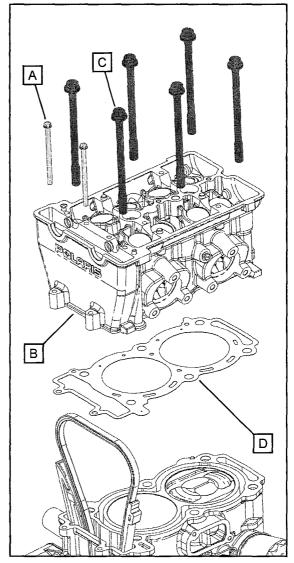
6. Calculate oil clearance by subtracting camshaft journal O.D.s from camshaft carrier bore I.D.s. Compare to specification.

Cylinder Head Removal

NOTE: The cylinder head can be serviced with the engine installed in the chassis.

- 1. Remove the (2) outer M6 bolts (A) that retain the cylinder head (B) to the cylinder.
- 2. Loosen the (6) cylinder head bolts (C) evenly 1/8 turn at a time until all are loose.
- 3. Remove and discard the cylinder head bolts (C).
- 4. Tap cylinder head lightly with a soft faced hammer until loose.

- 5. Tap only in reinforced areas or on thick parts of the cylinder head casting.
- 6. Remove the cylinder head (B) and head gasket (D).



IMPORTANT: Once the cylinder head is removed, nothing retains the cylinder to the engine. DO NOT rotate the engine without using the Cylinder Holding & Camshaft Timing Plate (PU-50563). Refer to "Cylinder / Piston Removal".

Cylinder Head Inspection

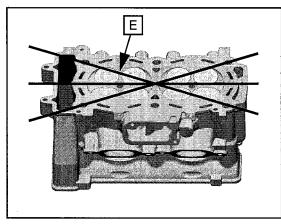
Thoroughly clean cylinder head surface to remove all traces of gasket material and carbon.

CAUTION

Use care not to damage gasket sealing surface. All gasket surfaces must be clean, dry and free of any oil or grease upon assembly. Clean sealing surfaces with rubbing alcohol or electrical contact cleaner. Do not touch sealing surfaces of the new head gasket.

Cylinder Head Warp Inspection

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



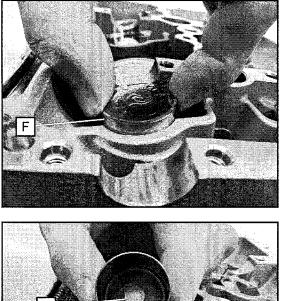
Cylinder Head Disassembly

A WARNING

Wear eye protection during cylinder head disassembly and reassembly or when working with the valve springs.

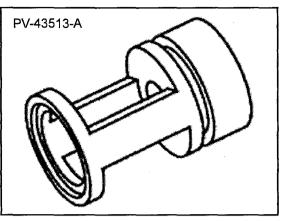
IMPORTANT: Keep mated parts together and in order with respect to their location in the cylinder head for assembly purposes. It is important to install cylinder head components back in the same location. Mark each component or place them in an organized rack as you remove them.

- 3
- 1. Remove the valve bucket (F) and adjustment shim (G) from the cylinder head.

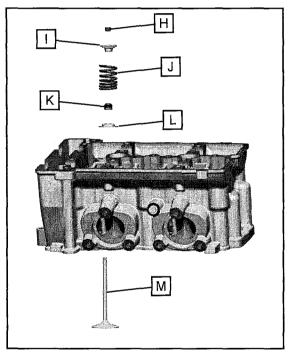




2. Compress the valve spring by hand using valve spring compressor adapter (PV-43513-A).



3. Push down on the spring and remove the split keepers (H).

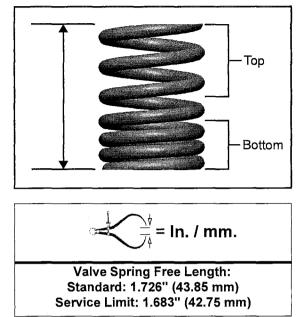


- 4. Slowly release valve spring pressure and remove the compressor adapter.
- 5. Remove the valve retainer (I), valve spring (J), valve stem seal (K) and valve spring seat (L). Discard the valve seal.

NOTE: Replace valve seals whenever cylinder head is disassembled. Hardened, cracked or worn seals will cause excessive oil consumption.

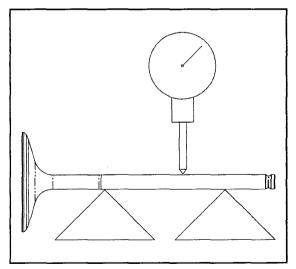
- 6. Lift up the cylinder head and push the valve (M) out, keeping it in order for reassembly in the same valve guide.
- 7. Repeat the previous steps to remove the remaining valves.

- 8. Clean the combustion chamber and head gasket surface.
- 9. Measure the free length of each valve spring with a Vernier caliper and compare to specification.

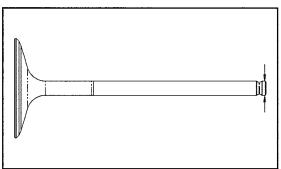


Valve Inspection

- 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.



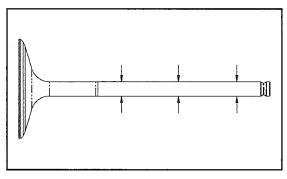
3. Check the end of the valve stem for flaring, pitting, wear or damage.

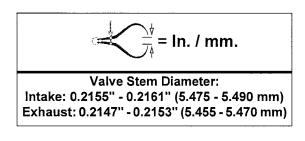


4. Inspect split keeper groove for wear or flaring in the keeper seat area.

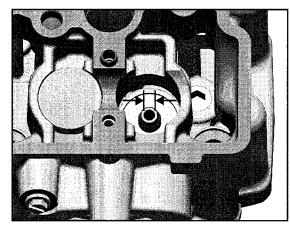
NOTE: The valves can be re-faced or end ground, if necessary. They must be replaced if extensively worn, burnt, bent or damaged.

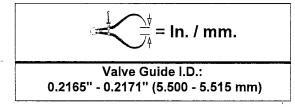
5. Measure diameter of valve stem with a micrometer in three places, then rotate 90° and measure again (take six measurements total). Compare to specifications.





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.

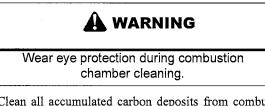




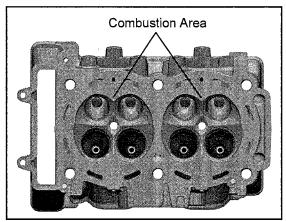
7. Be sure to measure each guide and valve combination individually.

NOTE: The valve guides cannot be replaced.

Combustion Chamber Cleaning



1. Clean all accumulated carbon deposits from combustion chambers and valve seat area.



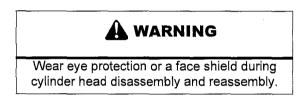
NOTE: Carbon Clean Fuel Treatment (2871326) can be used to help remove carbon deposits.

IMPORTANT: Do not use a metal scraper, a coarse wire brush or abrasive cleaners to clean the cylinder head. Damage may result.

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

Valve Seat Reconditioning

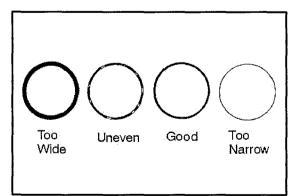
Valve seat reconditioning should be performed by a technician proficient in cylinder head reconditioning techniques. Reconditioning techniques vary, so follow the instructions provided by the valve reconditioning equipment manufacturer. Do not grind seats more than necessary to provide proper seat surface, width, and contact point on valve face.



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.*

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.



Renewing Valve Seats

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

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

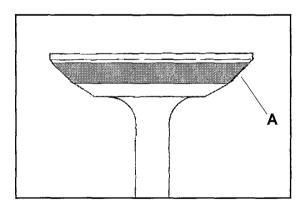
* If the cutter now contacts the uncut portion of the seat, check the pilot. Look for burrs, nicks, or runout. If the pilot is bent it must be replaced.

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

* If the contact area of the initial cut is greater than 75%, continue to cut the seat until all pits are removed and a new seat surface is evident.

NOTE: Remove only the amount of material necessary to repair the seat surface.

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



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

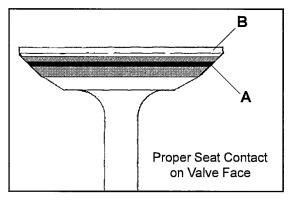
* If the indicated seat contact is at the top edge of the valve face and contacts the margin area (B) it is too high on the valve face. Use the 30° cutter to lower the valve seat.

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

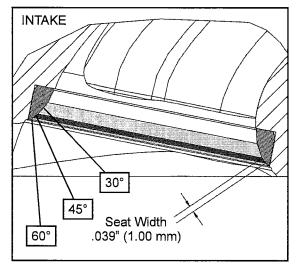
* If the seat is too wide or uneven, use both top and bottom cutters to narrow the seat.

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

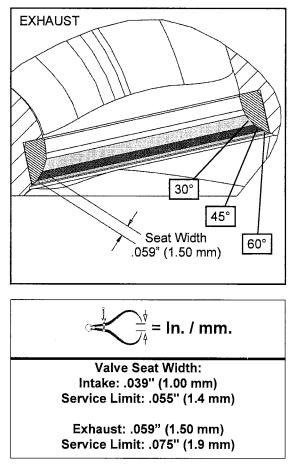
NOTE: When using an interference angle, the seat contact point on the valve will be very narrow, and is a normal condition. Look for an even and continuous contact point all the way around the valve face (A).



Intake Seat Cutter Diameter: 1.567 in. (39.80 mm)



Exhaust Seat Cutter Diameter: 1.364 in. (34.65 mm)



- 8. Clean all filings from the area with hot soapy water. Rinse and dry with compressed air.
- 9. Lubricate 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 if an interference angle reconditioning method is used.

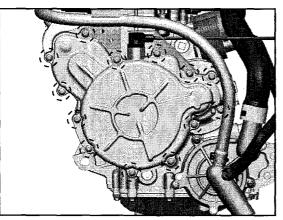
- 10. Insert the valve into its respective guide and lap using a lapping tool or a section of fuel line connected to the valve stem.
- 11. Rotate the valve rapidly back and forth until the cut sounds smooth. Lift the valve slightly off of the seat, rotate 1/4 turn, and repeat the lapping process. Do 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.

ENGINE DISASSEMBLY / INSPECTION - LOWER END

Stator Cover Removal / Inspection

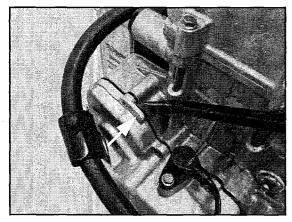
NOTE: The stator cover can be removed with the engine installed in the chassis.

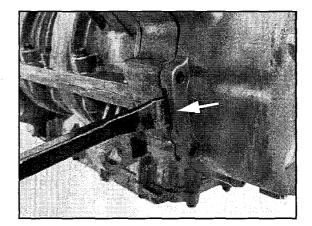
1. Remove the (13) screws retaining the stator cover.



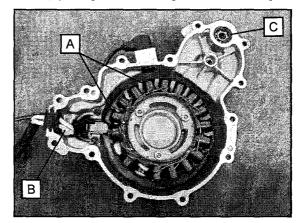
The flywheel contains powerful magnets. Use caution when removing and installing the stator cover. DO NOT place fingers between cover and crankcase at any time during the removal / installation process or injury could result.

2. Carefully pry the stator cover off the engine using the two pry areas as shown below.





3. Inspect the condition of the stator windings (A) and output wires (B). If replacement is required, refer to Chapter 10.

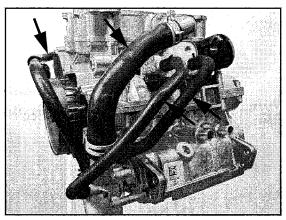


- 4. Inspect the ball bearing (C) that supports the starter motor shaft.
- 5. If bearing replacement is required, remove the retaining ring and heat the stator cover around the bearing evenly with a heat gun. Tap cover on a soft work surface to remove the bearing from the housing. A blind bearing puller can also be used. Replace bearing if removed.

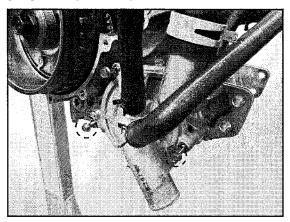
Water Pump Housing Removal

NOTE: The water pump housing can be serviced with the engine installed in the chassis (see ENGINE COOLING SYSTEM - Water Pump Removal).

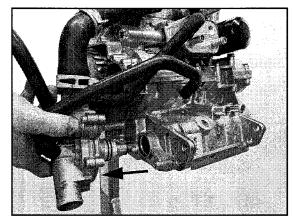
1. Remove the coolant lines from the thermostat housing, cylinder inlet and oil cooler. Leave them all attached to the water pump housing.



2. Remove the (3) long gold colored bolts retaining the water pump housing to the engine.



3. Remove the water pump assembly from the engine by using a twisting motion as you pull out on the housing.

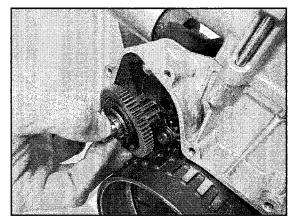


4. If water pump service is required (impeller or mechanical seal), refer to "ENGINE COOLING SYSTEM".

Flywheel Removal

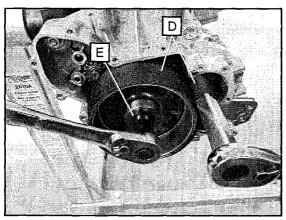
NOTE: The flywheel can be serviced with the engine installed in the chassis.

- 1. Remove the stator cover assembly.
- 2. Remove the starter torque limit gear as an assembly.

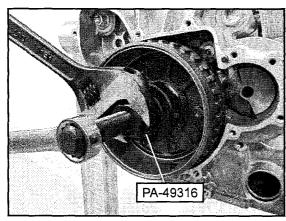


3. Inspect gear teeth for damage. Inspect fit of shaft inside gear and replace gear assembly is clearance is excessive. Inspect the shaft and bearing surfaces in the crankcase and stator cover for excessive wear.

4. Using a commercially available strap wrench (D), hold the flywheel and remove the flywheel retaining bolt (E).



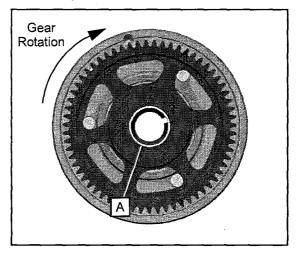
- 5. Fully install Flywheel Puller (PA-49316) on the threads of the flywheel (left hand thread turn flywheel puller counterclockwise to install).
- 6. Hold puller body and tighten the center bolt to remove the flywheel.



Starter One-Way Clutch Inspection

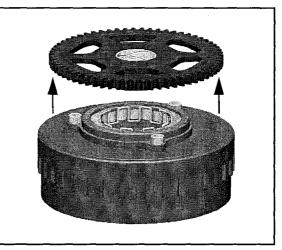
NOTE: The starter one-way clutch can be serviced with the engine installed in the chassis.

- 1. Remove the stator cover and flywheel (see "Stator Cover Removal / Inspection" and "Flywheel Removal").
- 2. Place flywheel on a work bench with the one-way clutch facing up. Grasp clutch gear and rotate clockwise. It should turn smoothly without binding.
- 3. Rotate one-way gear counterclockwise. The gear should immediately lock in position and not slip.
- 4. Inspect the one-way gear bushing (A) for wear or galling. If service is required, refer to "Starter One-Way Clutch Disassembly".

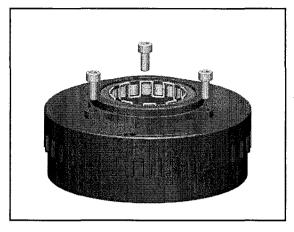


Starter One-Way Clutch Disassembly

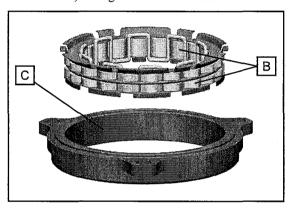
1. Lift up to remove starter one-way gear.



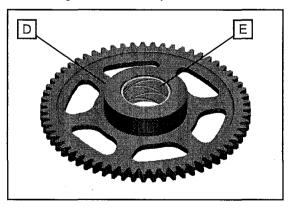
2. Remove the (3) one-way clutch retaining screws.



3. Remove the one-way clutch and inspect both sides of drive rollers (B). Inspect the roller contact surface (C) inside the hub for wear, damage or uneven surface.

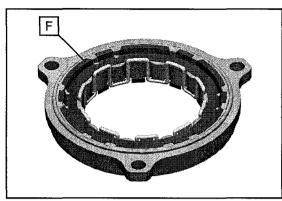


4. Inspect drive surface of starter gear (D) and bushing (E) for wear, damage or uneven surface. If any starter one-way clutch component is worn or damaged, replace the clutch and starter gear as an assembly.



Starter One-Way Clutch Assembly

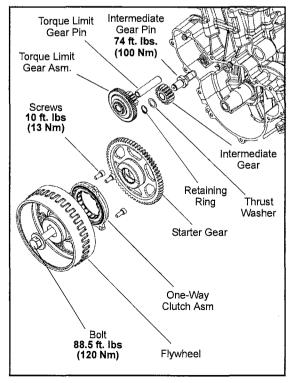
1. Install one-way clutch in clutch hub with flange of clutch (F) engaged in recess.



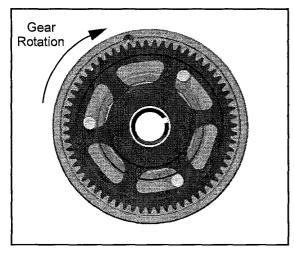
- 2. Clean screw threads in flywheel to remove all oil or grease.
- 3. Place one-way clutch on flywheel and install the (3) screws. Torque screws to specification.

One-Way Clutch Retaining Screws: 106 ± 18 in. lbs. (12 ± 2 Nm)

4. Reassemble starter one-way clutch and gear using the following illustration.

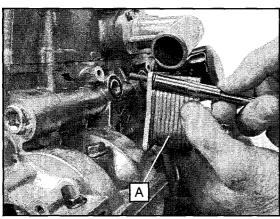


- 5. If starter gear was replaced, replace the intermediate gear and inspect the torque limit gear.
- 6. After assembly, be sure the starter gear rotates in the clockwise direction only.

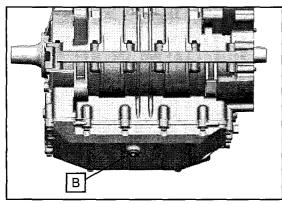


Crankcase Disassembly / Inspection

1. Remove the oil cooler (A) from the crankcase.



2. Remove the crankcase drain plug (B) to drain any oil remaining in the engine.

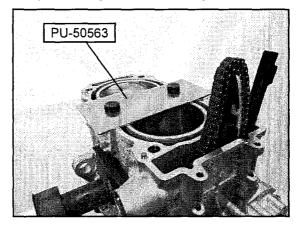




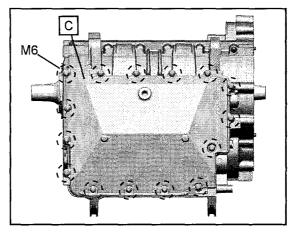
3. Locate the Oil Catch Tool (PN 5438829) in the vehicle's tool kit. Position the tool below the oil filter to catch the oil when the filter is removed. Remove the oil filter.



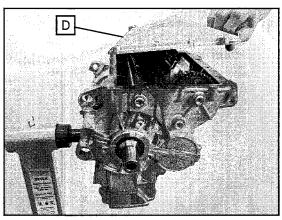
4. Install the Cylinder Holding & Camshaft Timing Plate (PU-50563) onto the cylinder. The cylinder holding tool retains the cylinder and pistons when the engine is rotated.



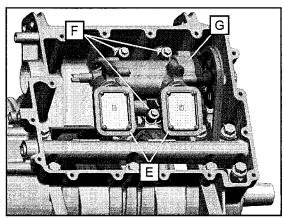
- 5. Rotate the engine to access the crankcase sump cover.
- 6. Remove the (15) M6 bolts retaining the sump cover (C) to the crankcase.



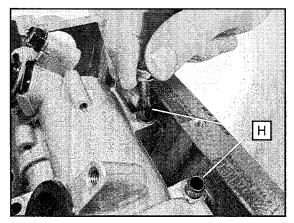
7. Remove the sump cover (D) from the crankcase.



- 8. Remove and clean oil pump pick-ups (E).
- 9. Remove the (3) bolts (F) that retain the oil pump (G) to the crankcase.

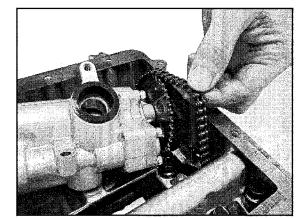


10. Use one of the oil pump retaining bolts or a pen magnet to extract the dowel pins (H) from the oil pump. Doing so allows for oil pump removal without having to remove the pump drive sprocket.

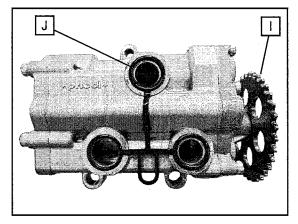


NOTE: If unable to extract the dowel pins from the oil pump, the oil pump sprocket must be removed. Access the sprocket bolt by removing the case plug.

11. Lift the oil pump drive chain and remove the oil pump.

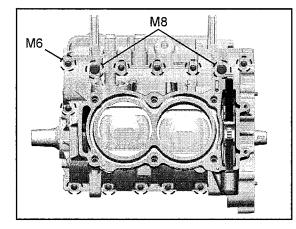


12. Visually inspect the oil pump and drive sprocket (I) for wear or damage. Replace oil pump drive chain and sprocket if worn or damaged. If any part of the oil pump is damaged, the entire assembly must be replaced. Replace the oil pump seal (J) during crankcase assembly.



NOTE: Oil pump assembly is non-serviceable

- 13. Rotate the engine so the cylinder is facing up.
- 14. Remove the (11) M6 and (2) M8 upper crankcase bolts.

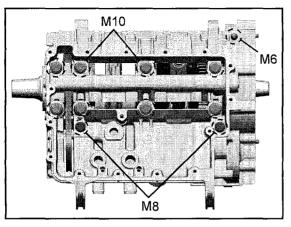


15. Rotate the engine so the cylinder is facing down.

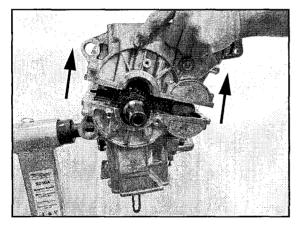
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16. Remove the (8) M10, (2) M8 and (1) M6 lower crankcase bolts. Discard the (8) M10 bolts.

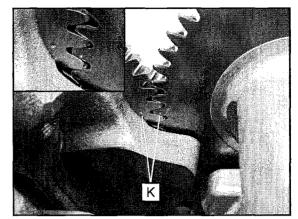


17. Tap on the lower crankcase in reinforced areas with a soft faced hammer to loosen. Carefully lift up and remove the lower crankcase half.

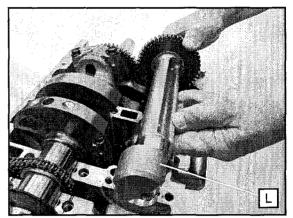


Balance Shaft Removal / Inspection

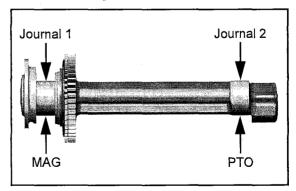
- 1. Perform "Crankcase Disassembly / Inspection" procedure.
- 2. Note timing marks (K) on balance shaft and crankshaft drive gears. Shafts must be properly timed upon assembly.



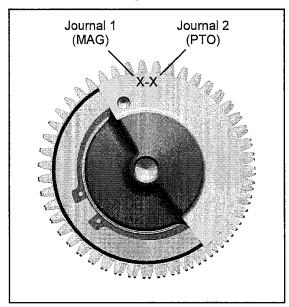
3. Carefully rotate the balance shaft (L) and remove it from the crankcase.



- 4. Inspect the balance shaft gear teeth for damage.
- 5. Measure each bearing journal in two locations, 90 degrees apart. Replace balance shaft if either journal is worn below the service limit specification.



6. Refer to the two letters stamped onto the MAG end of the balance shaft. The first letter represents Journal 1 (MAG) end. The second letter represents Journal 2 (PTO) end.



7. Use the table below to see if the balance shaft bearing journals are within specification. If worn past the service limit, replace the balance shaft assembly.

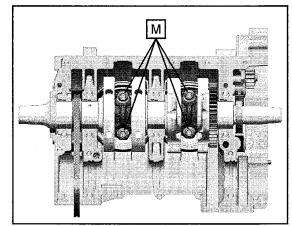
Balance Shaft Bearing Journal Diameters				
	A	В		
Standard	1.4950-1.4953 in. (37.974-37.982 mm)	1.4947-1.4950 in. (37.966-37.974 mm)		
Service Limit	1.4941 in. (37.951 mm)			

8. Whether installing a new balance shaft or re-installing the original, refer to the bearing selection chart provided in the "Balance Shaft Bearing Selection" procedure in this chapter.

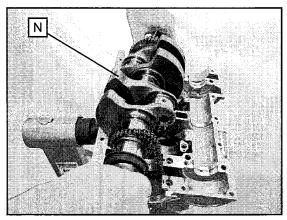
Crankshaft Removal / Inspection

- 1. Perform "Crankcase Disassembly / Inspection" procedure.
- 2. Perform "Balance Shaft Removal / Inspection" procedure.
- 3. For ease of assembly, mark each connecting rod and end cap.

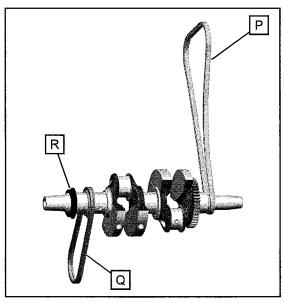
 Loosen, remove and discard the (4) connecting rod bolts (M). Remove the end caps from the crankshaft.



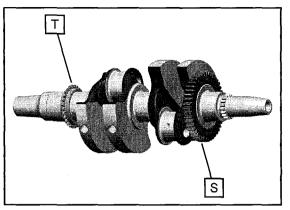
- 3
- 5. Carefully lift the crankshaft (N) out of the crankcase.



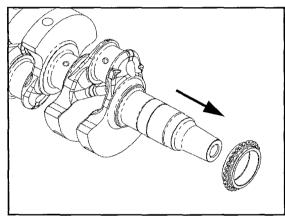
6. Remove the cam chain (P), oil pump drive chain (Q) and PTO main seal (R) from the crankshaft.



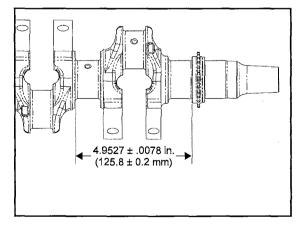
7. Inspect the crankshaft gear (S) and auxiliary sprocket (T) for broken or worn teeth.

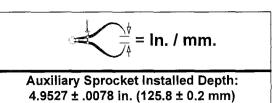


- 8. If the crankshaft gear (S) is damaged, the crankshaft assembly must be replaced.
- 9. If the auxiliary sprocket (T) is damaged, remove the sprocket with a 3-jaw puller.

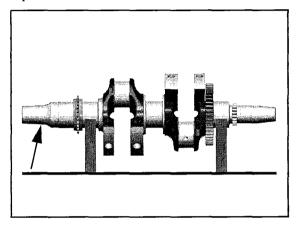


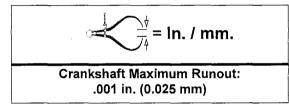
10. Using an arbor press, install new sprocket in any orientation to the depth shown in the following illustration.





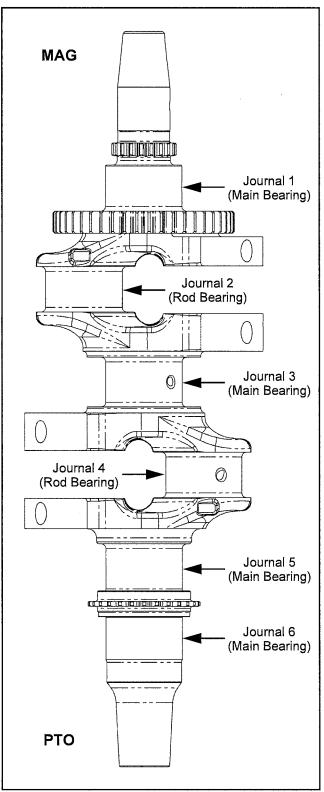
11. Support crankshaft on V-blocks or on-centers in a crankshaft stand or lathe. Measure crankshaft runout and replace if runout exceeds maximum listed below.



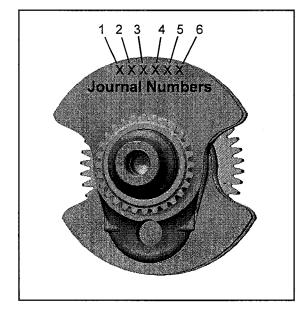


12. Visually inspect surface of crankshaft main and connecting rod journals. Replace crankshaft if any journal is scratched or pitted.

13. Measure each main journal and connecting rod journal in two locations, 90 degrees apart. Replace crankshaft if any journal is worn below the service limit specification.



14. Refer to the six letters stamped onto the PTO end of the crankshaft.



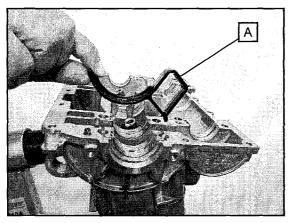
15. Use the table below to see if the crankshaft bearing journals are within specification. If worn past the service limit, replace the crankshaft assembly.

Crank	shaft Bearing J	ournal Diameters
	B	
Main	Standard	1.6144 - 1.6147 in. (41.006 - 41.014 mm)
Bearing	Service Limit	1.6129 in. (40.970 mm)
Conn Rod	Standard	1 6118 - 1 6122 in. (40.942 - 40.950 mm)
Bearing	Service Limit	1.6104 in. (40.906 mm)
	G	•
Main	Standard	1.6140 - 1.6143 in. (40.998 - 41.005 mm)
Bearing	Service Limit	1.6129 in. (40.970 mm)
Conn Rod Bearing	Standard	1.6115 - 1.6118 in. (40.934 - 40.941 mm)
	Service Limit	1.6104 in. (40.906 mm)
	γ	
Main Bearing	Standard	1.6137 - 1.6140 in. (40.990 - 40.997 mm)
	Service Limit	1.6129 in. (40.970 mm)
Conn Rod Bearing	Standard	1.6112 - 1.6115 in. (40.926 - 40.933 mm)
	Service Limit	1.6104 in. (40.906 mm)

16. Whether installing a new crankshaft or re-installing the original, refer to the bearing selection chart provided in the "Crankshaft Main Bearing Selection" and "Connecting Rod Bearing Selection" procedure in this chapter.

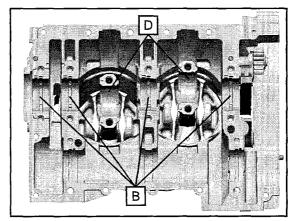
Crankcase Inspection

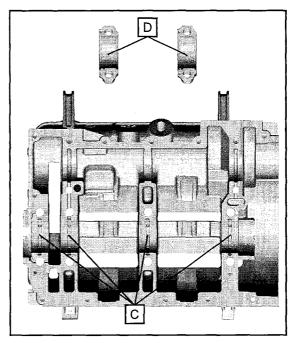
1. Remove the oil drain diverter (A) from the upper crankcase.



- 2. Remove all traces of crankcase sealer from the crankcase mating surfaces. Inspect the surfaces closely for nicks, burrs or damage.
- 3. Be sure alignment pins are in place where used.
- 4. Be sure oil passages are clean and free of any cleaning solvent (see "Engine Oil Flow Chart").

 Remove and discard the plain bearings located in the upper crankcase (B), lower crankcase (C) and connecting rods (D). Replace the crankcase assembly if a bearing bore is galled or if bearing inserts have rotated in the case.Refer to bearing selection procedures upon assembly.





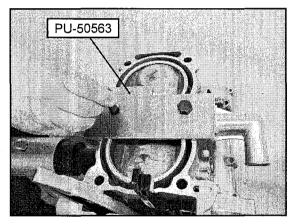
IMPORTANT: Always replace plain bearings when the crankcase or connecting rods have been disassembled. Refer to "Bearing Selection Chart".

Cylinder / Piston Removal

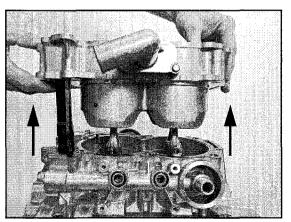
CAUTION

Pistons must be removed from the cylinders with the connecting rods attached. DO NOT attempt to service the cylinder or pistons without disassembling the crankcase. Although you can remove the cylinder and pistons without disassembly, you will not be able to reassemble the engine because of the unique cylinder skirt and crankcase design.

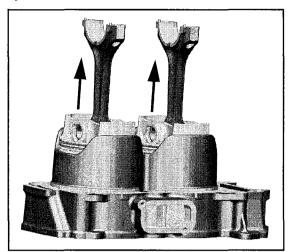
- 1. Perform "ENGINE DISASSEMBLY / INSPECTION -TOP END" and the "ENGINE DISASSEMBLY / INSPECTION - LOWER END" procedures.
- 2. Rotate the engine so the cylinder is facing up.
- 3. Remove the Cylinder Holding & Camshaft Timing Plate (PU-50563) from the cylinder.



4. Carefully lift the cylinder and pistons from the upper crankcase.



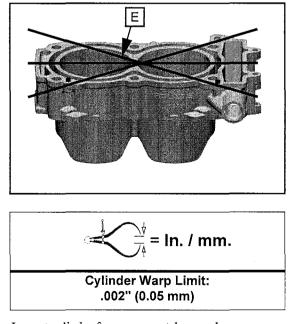
5. Remove the piston / connecting rod assemblies from the cylinder.



NOTE: If the pistons are to be reused, mark the pistons so they are reassembled in the same cylinder bore and direction from which they were removed (MAG / PTO).

Cylinder Inspection

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

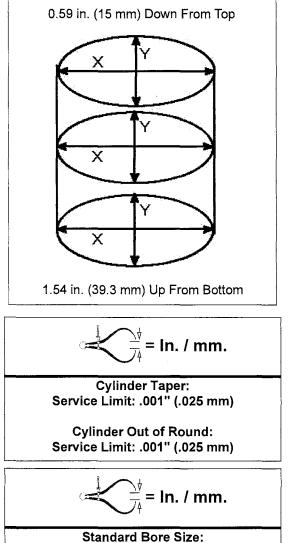


2. Inspect cylinder for wear, scratches, or damage.

3

IMPORTANT: DO NOT hone the cylinders or attempt to repair a damaged cylinder by honing.

- 3. Inspect taper and out of round with a dial bore gauge.
- 4. Inspect cylinder for taper and out of round with a dial bore gauge. Measure in two different directions (front to back and side to side), on three levels (0.5 in. down from top, the middle, and 0.5 in. up from bottom). Record measurements. If cylinder is tapered or out of round beyond .001", the cylinder must be replaced.

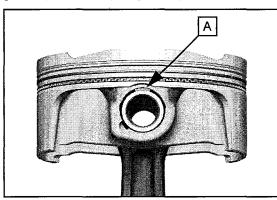


3.6614" ± .0003" (93 mm ± .008 mm)

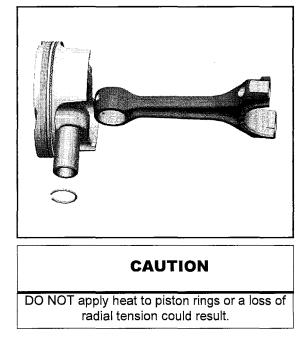
Piston Disassembly / Inspection

NOTE: New pistons are directional (intake vs. exhaust), but can be placed in either cylinder.

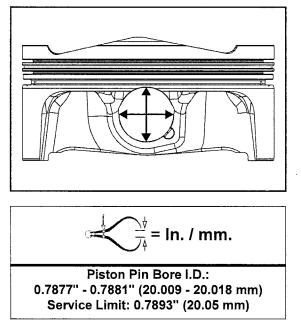
1. Note location of the piston circlip gap (A) at the top (12:00 position) or bottom (6:00 position).



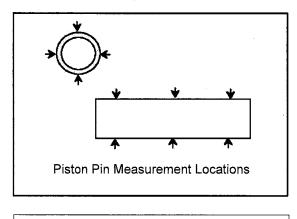
2. Remove piston circlip and push piston pin out of piston. If necessary, heat the crown of the piston slightly with a heat gun if pin cannot be removed by hand. Discard circlips.



 Measure piston pin bore I.D. in two directions (90° apart). Replace piston and piston pin if out of specification.



4. Measure piston pin O.D. in two directions (90° apart) at three locations on the length. Replace piston and piston pin if out of specification.



$$\overrightarrow{}$$
 $\overrightarrow{}$ = In. / mm.

Piston Pin O.D.: 0.7873" - 0.7875" (20.000 - 20.005 mm) Service Limit: 0.7866" (19.98 mm)

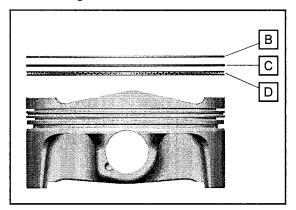
Piston Ring Removal

1. Carefully remove top compression ring (B) by hand or using a ring removal pliers.

CAUTION

DO NOT expand the ring more than necessary to remove it from the piston or the ring may break or lose radial tension.

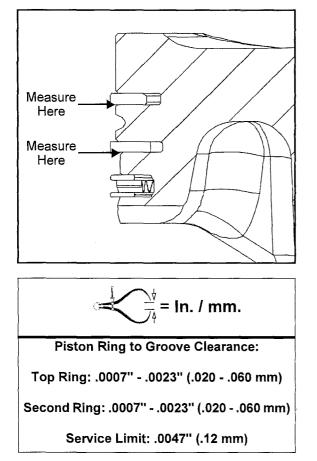
- **Piston ring pliers:** Carefully expand ring and lift it off the piston.
- By hand: Placing both thumbs on the ring ends, spread the ring open and push up on opposite side. Do not scratch ring lands.



- 2. Repeat procedure for second compression ring (C).
- 3. The oil control ring (D) is a three piece design consisting of a top and bottom steel rail and a center expander section. Remove top rail first, then bottom rail, then the expander.

Piston Ring to Groove Clearance Inspection

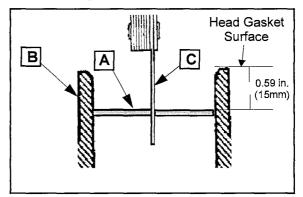
1. Measure piston ring to groove clearance by placing the ring in the ring land and measuring with a thickness (feeler) gauge. Replace piston and rings if ring-to-groove clearance exceeds service limits.



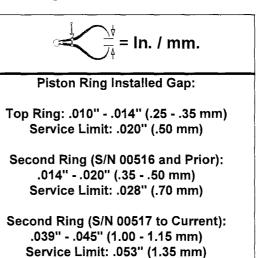
Piston Ring Installed Gap

- 1. Place each piston ring (A) inside the cylinder (B). Use the piston to push the ring squarely into cylinder, as shown below.
- 2. Measure installed gap with a feeler gauge (C) at both the top and bottom of the cylinder.

IMPORTANT: A difference between top and bottom end gap measurements is a general indication of cylinder taper (wear). The cylinder should be measured for taper and out of round.



3. If the installed gap measurement exceeds the service limit, replace the rings.



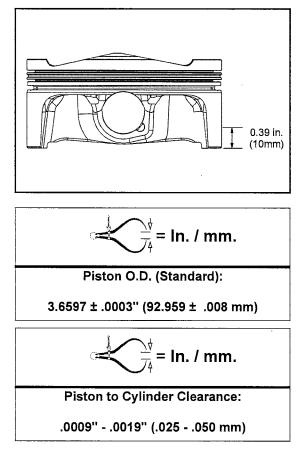
Oil Control Rails: .008" - .028" (.20 - .70 mm) Service Limit: .035" (.90 mm)

NOTE: Always check piston ring installed gap when installing new rings and/or a new cylinder.

Piston-to-Cylinder Clearance

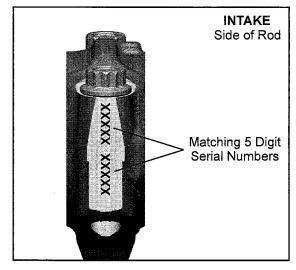
Measure piston outside diameter at a point 10 mm up from the bottom of the piston, at a right angle to piston pin bore.

Subtract measurement from maximum measurement obtained in Step 4 of "Cylinder Inspection" procedure.

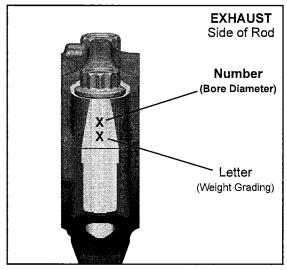


Connecting Rod Inspection

1. The 5 digit numbers stamped onto the intake side of the connecting rod are serial numbers used to match the rod stem with the rod cap.

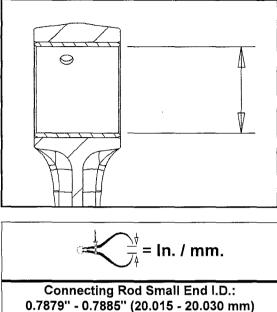


2. The number and letter stamped onto the exhaust side of the connecting rod represent the bore diameter and weight grading of the connecting rod.



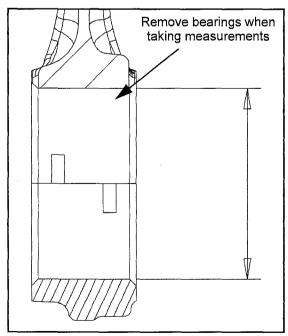
3. Inspect the small end and big end of connecting rod (and matching rod cap) for damage, galling of surface or pitting.

4. Measure small end I.D. in two directions as shown. Record measurements and compare to specifications. Replace connecting rod if worn past the service limit specification.

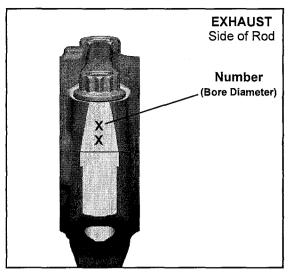


.7879" - 0.7885" (20.015 - 20.030 mm) Service Limit: 0.7897" (20.06 mm)

- 5. Install matching rod cap on connecting rod (without bearings) and install the bolts.
- 6. Tighten bolts snug, then torque to 13 ft. lbs. (18 Nm).
- 7. Using a dial bore gauge, measure big end I.D. in two directions shown. Record measurements and compare to specifications.



8. Refer to the number stamped onto the exhaust side of the connecting rod. This number represents the bore diameter.



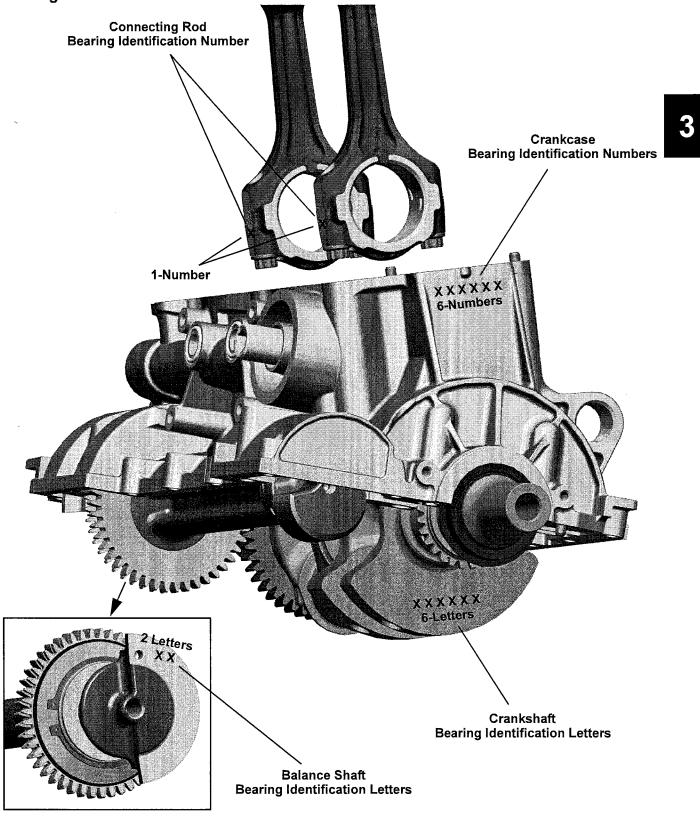
9. The table below lists the big end bore diameter specifications.

Connecting Rod Big End Bore Diameters				
1	2	3		
1.7318-1.7321 in. (43.989-43.996 mm)	1.7321-1.7323 in. (43.996-44.003 mm)	1.7323-1.7326 in. (44.003-44.010 mm)		

10. Whether using new connecting rods or re-installing the original ones, refer to the bearing selection chart provided in the "Connecting Rod Bearing Selection" procedure in this chapter.

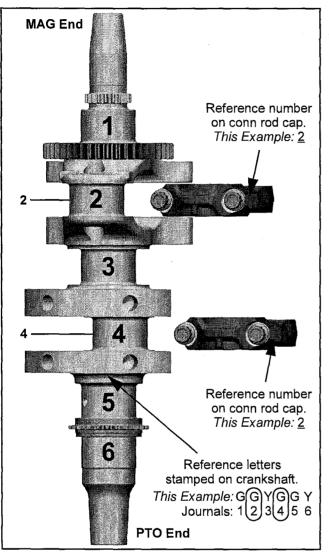
ENGINE ASSEMBLY - LOWER END

Bearing Selection Identification Letters and Numbers



Connecting Rod Bearing Selection

In order to select the proper bearing for the connecting rods, you must reference the number on each connecting rod and match that up with the rod journal letters on the crankshaft.



In this example, you would use the number $\underline{2}$ as the connecting rod code. You would use letters \underline{G} and \underline{G} as the crankshaft codes (crank journals 2 and 4).

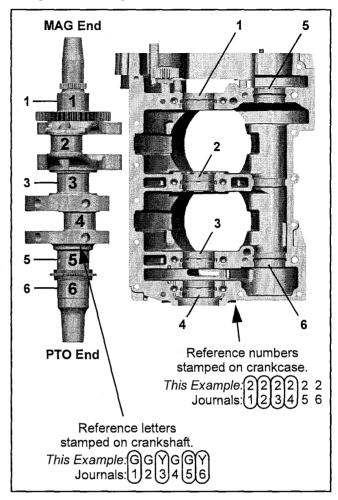
Based off the bearing selection chart, you would use: <u>Green</u> bearing for each connecting rod

Bearing Selection Chart - Rod Bearings										
		Cra	ankshaft							
	Code	В	G	Y						
Rod	1	White	Blue	Green						
Roa	2	Blue	Green	Yellow						
	3	Green	Yellow	Yellow						

3.58 -

Crankshaft Main Bearing Selection

In order to select the proper main bearings for the crankshaft, you must reference the six numbers on the crankcase and match that up with the main journal letters on the crankshaft.



In this example, you would use the number $\underline{2}$ as the crankcase codes (case journals 1, 2, 3, 4). You would use letters \underline{G} , \underline{Y} , \underline{G} , \underline{Y} as the crankshaft codes (crank journals 1, 3, 5 and 6).

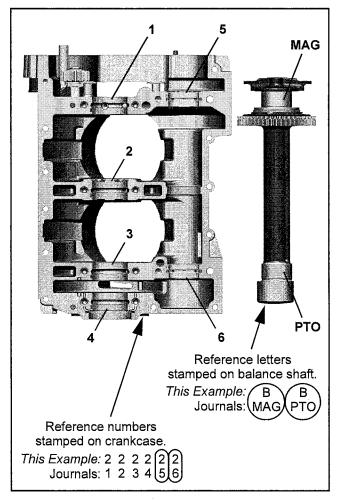
Based off the bearing selection chart, you would use: <u>Green</u> bearing for Main #1 <u>Yellow</u> bearing for Main #2 <u>Green</u> bearing for Main #3 <u>Yellow</u> bearing for Main #4

Bearing Selection Chart - Main Bearings															
	Crankshaft														
	Code	В	G	Y											
C	1	White	Blue	Green											
Case	2	Blue	Green	Yellow											
	3	Green	Yellow	Red											

3

Balance Shaft Bearing Selection

In order to select the proper balance shaft bearings, you must reference the six numbers on the crankcase and match that up with the MAG and PTO journals on the balance shaft.



In this example, you would use the number $\underline{2}$ as the crankcase codes (case journals 5, 6). You would use letters \underline{B} , \underline{B} , as the balance shaft codes (balance shaft journals MAG, PTO).

Based off the bearing selection chart, you would use: <u>Green</u> bearing for MAG <u>Green</u> bearing for PTO

Bearing Selection Chart - Balance Shaft Bearings															
	Balance Shaft														
	Code	А	В	N/A											
Case	1	White	Blue	N/A											
	2	Blue	Green	N/A											

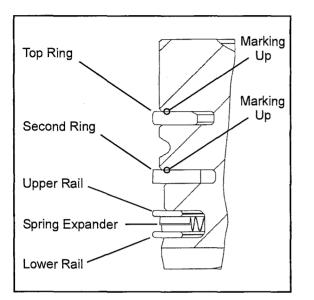
Upper Crankcase Preparation

IMPORTANT: Always replace plain bearings when the crankcase or connecting rods have been disassembled. Refer to bearing selection procedures.

- 1. Remove all traces of crankcase sealer from the crankcase mating surfaces. Inspect the surfaces closely for nicks, burrs or damage.
- 2. Clean bolt hole threads to remove any oil or crankcase sealant.
- 3. Inspect crankcase bearing bores. Replace the crankcase assembly if a bearing bore is galled or if bearing inserts have rotated in the case.
- 4. Be sure alignment pins are in place where used.
- 5. Refer to "Oil Flow Chart" at the beginning of this chapter and trace the oil paths through the crankcase and cylinder.
- 6. Flush all oil passages with solvent and then warm soapy water. Rinse with clear, warm water and dry with compressed air.
- 7. Be sure passages are clean and dry before assembling the upper crankcase.

Piston Ring Installation

NOTE: Apply clean engine oil to all ring surfaces and ring lands upon installation. Always check piston ring installed gap before rings are installed on piston (see "Piston Ring Installed Gap"). Clean accumulated carbon from piston ring grooves and oil ring lube holes if piston has been in service.

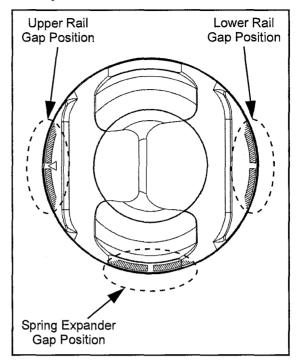


1. Place oil control ring expander in oil ring groove. Rotate expander in groove until butt ends are on PTO side of piston (see illustration below).

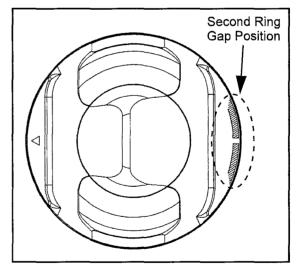
IMPORTANT: Ends must butt squarely together and must not overlap.

2. Install lower rail with end gap positioned on the intake side of piston.

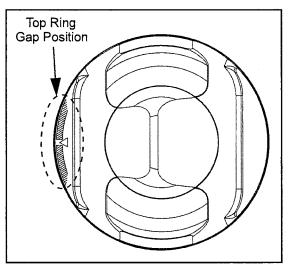
3. Install upper rail with end gap positioned on the exhaust side of piston.



4. Install second ring with marking facing top of piston. Rotate ring to position the end gap toward intake side of piston as shown below.



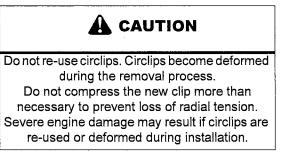
5. Install top ring with mark facing top of piston. Rotate ring to position the end gap toward exhaust side of piston as shown below.



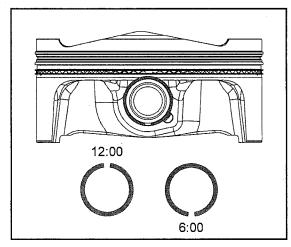
6. Be sure top and second rings rotate freely in their grooves and do not bind when compressed by hand.

Piston / Connecting Rod Assembly

1. Lubricate connecting rod small end, piston pin bore and piston pin with engine oil.



2. Install a new circlip on one side of piston with gap at the top (12:00 position) or bottom (6:00 position).



IMPORTANT: Never re-use a piston pin circlip.

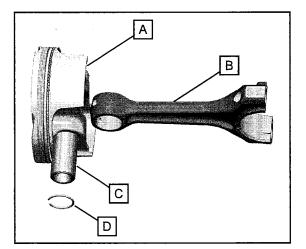
NOTE: If reinstalling the original connecting rods, orientate the rods the same as when removed. If new connecting rods are being installed, they can be installed either way (there is no piston pin offset in the rod), however it is recommended they be installed with rods facing the same direction.

3. Place piston (A) on connecting rod (B). Push piston pin (C) through rod and piston until it seats against the installed circlip.

IMPORTANT: Do not tap on pin or cause any sideways force to connecting rod. Warm piston crown with a heat gun if pin cannot be installed by hand, or use a piston pin installation tool.

CAUTION

DO NOT apply heat to piston rings or a loss of radial tension could result.



4. Install the remaining circlip (D) with gap at the top (12:00 position) or bottom (6:00 position). Push the piston pin in both directions to make sure the clips are properly seated in the groove.

3

Cylinder / Piston Installation

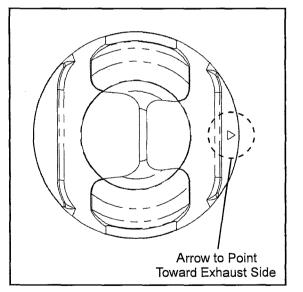
CAUTION

Pistons must be installed into the cylinders with the connecting rods attached. DO NOT attempt to service the cylinder or pistons without disassembling the crankcase. Although you can remove the cylinder and pistons without disassembly, you will not be able to reassemble the engine because of the unique cylinder skirt and crankcase design.

NOTE: If the pistons are being reused, reassemble in the same cylinder bore and direction from which they were removed (MAG / PTO).

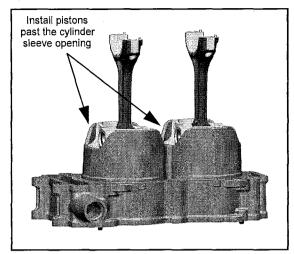
NOTE: New pistons are directional (intake vs. exhaust), but can be placed in either cylinder.

- 1. Apply clean engine oil to each piston assembly, cylinder bore and bottom tapered portion of each cylinder sleeve.
- 2. Verify that all ring end gaps are correctly located on each piston (see "Piston Ring Installation").
- 3. Note the piston orientation mark (arrow) located on top of the piston. Arrow should point toward the exhaust side.



NOTE: Orientation arrow is also located on the bottom side of piston as an additional reference.

4. Carefully compress the piston rings with your fingers and install the piston / connecting rod assemblies into the cylinder from the bottom side.

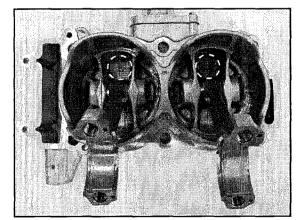


NOTE: Use a slight front to back rocking motion until all rings are captive in cylinder and past the cylinder sleeve opening.

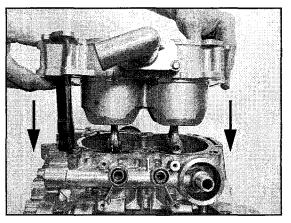
- 5. Rotate the engine so the crankcase to cylinder mounting surface is facing up.
- 6. Clean base gasket sealing surface on cylinder and crankcase to remove all oil and grease.

NOTE: Base gasket and surfaces must be DRY and oil free. Use care upon assembly to keep oil away.

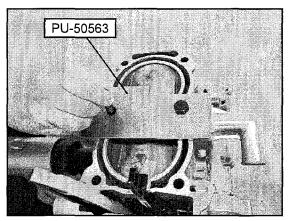
- 7. Reinstall dowel pins in crankcase if previously removed.
- 8. Install a new cylinder base gasket.
- 9. Verify piston orientation (arrow pointing toward exhaust) one last time prior to installation.



10. Carefully place the cylinder and pistons into the upper crankcase.



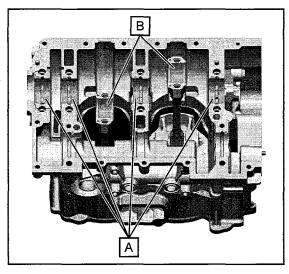
11. Install the Cylinder Holding & Camshaft Timing Plate (PU-50563) onto the cylinder. The cylinder holding tool retains the cylinder and pistons when the engine is rotated.



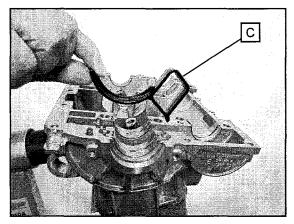
Crankshaft Installation

IMPORTANT: Whether installing a new crankshaft or re-installing the original, refer to the bearing selection charts (see "Crankshaft Main Bearing Selection" and "Connecting Rod Bearing Selection" procedures in this chapter).

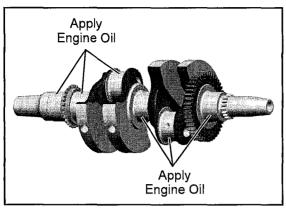
- 1. Rotate the engine so the cylinder is facing down.
- 2. Clean the bearing bore surfaces of upper crankcase (main bearings), connecting rods, and connecting rod caps.
- 3. Align tab of new main bearing (A) with the slot in main bearing bore of crankcase. Press bearing insert firmly into place. Repeat for all main bearings.
- 4. Align tab of new connecting rod bearings (B) with the slot in the connecting rod stem and connecting rod end cap. Press bearing insert firmly into place. Repeat for the other connecting rod.



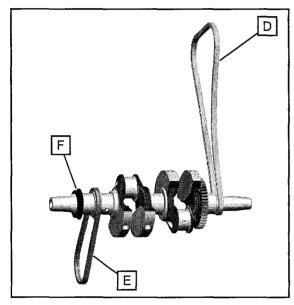
5. Install the oil drain diverter (C) into the upper crankcase.



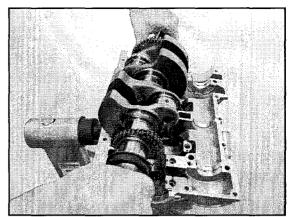
6. Apply Polaris PS-4 Plus engine oil to each main and rod bearing journal of crankshaft.



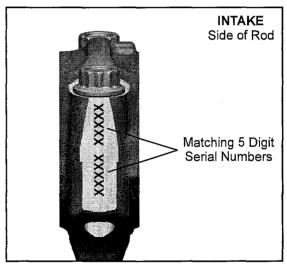
- 7. Loop cam chain (D) and oil pump drive chain (E) over crankshaft sprockets.
- 8. Apply Polaris PS-4 Plus engine oil to the new crankshaft oil seal (F) and install the seal on the PTO end of the crankshaft.



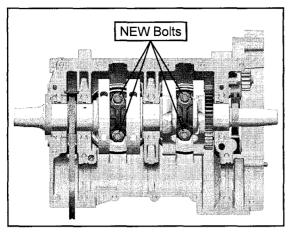
9. Carefully lower the crankshaft into upper crankcase. Guide connecting rods onto the rod journals of crankshaft as necessary.



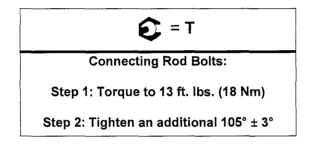
- 10. Adjust the PTO crankshaft seal so it rests properly in the upper crankcase.
- 11. Clean bolt hole threads in connecting rod to remove all oil.
- 12. Install matching rod cap on connecting rod with 5 digit serial number stampings aligned.



13. Install new bolts and tighten evenly until snug.



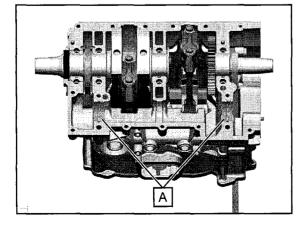
14. Torque connecting rod bolts to specification.



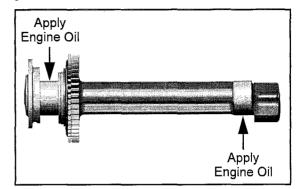
Balance Shaft Installation

IMPORTANT: Whether installing a new balance shaft or re-installing the original, refer to bearing selection chart (see "Balance Shaft Bearing Selection" procedure in this chapter).

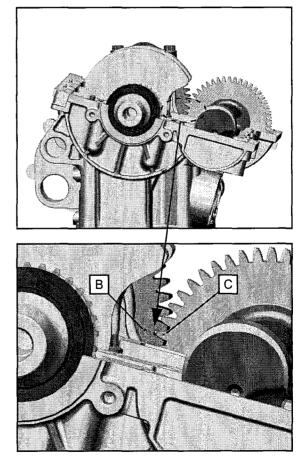
- 1. Clean the upper crankcase balance shaft bearing bore surfaces.
- 2. Align tab of new balance shaft bearings (A) with the slot in each bearing bore of crankcase. Press bearing insert firmly into place.



- 3. Rotate the crankshaft until the alignment dot (B) on the crankshaft MAG end gear is visible.
- 4. Apply Polaris PS-4 Plus engine oil to both balance shaft journals.



- 3
- 5. Install the balance shaft, placing the tooth with the alignment dot (C) in-line with the dot (B) on the crankshaft gear (see reference images below).



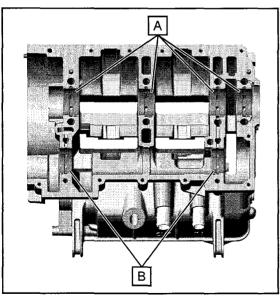
Lower Crankcase Preparation

IMPORTANT: Always replace plain bearings when the crankcase or connecting rods have been disassembled. Refer to bearing selection procedures.

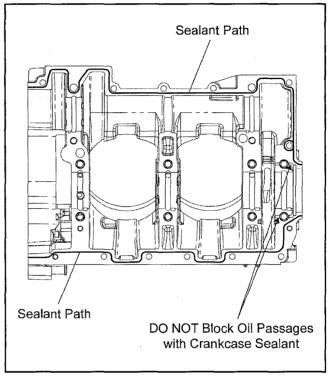
- 1. Remove all traces of crankcase sealant from the crankcase mating surfaces. Inspect the surfaces closely for nicks, burrs or damage.
- 2. Clean bolt hole threads to remove any oil or crankcase sealant.
- 3. Inspect crankcase bearing bores. Replace the crankcase assembly if a bearing bore is galled or if bearing inserts have rotated in the case.
- 4. Be sure alignment pins are in place where used.
- 5. Refer to "Oil Flow Chart" at the beginning of this chapter and trace the oil paths through the crankcase and cylinder.
- 6. Flush all oil passages with solvent and then warm soapy water. Rinse with clear, warm water and dry with compressed air.
- 7. Be sure passages are clean and dry before assembling the crankcase.

Crankcase Assembly

- 1. Check to be sure the PTO crankshaft seal is resting properly in the upper crankcase.
- 2. Align tab of new main bearings (A) and new balance shaft bearings (B) with the slot in each bearing bore of the lower crankcase. Press bearing inserts firmly into place.

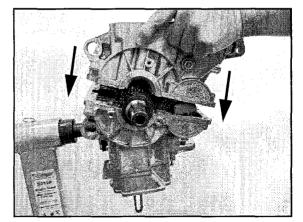


- 3. Apply Polaris PS-4 Plus engine oil to the new bearings installed in the lower crankcase half.
- 4. Clean crankcase mating surfaces to remove any oil.
- Apply a thin, continuous film of Crankcase Sealant (PN 2871557) to the upper crankcase mating surface as shown. Do not allow sealant to dry before assembly.



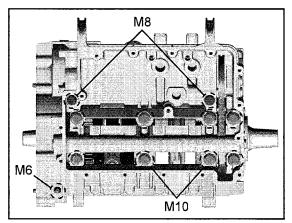
IMPORTANT: DO NOT block oil passages with crankcase sealant.

6. Carefully place lower crankcase on upper case, making sure the oil pump drive chain is fed through the lower crankcase.



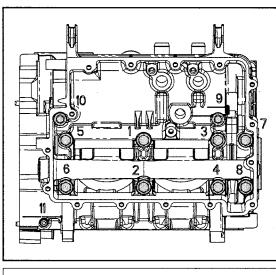
7. Tap lower crankcase with a rubber hammer to seat the case halves together.

- 8. Inspect crankcase mating surfaces to be sure they are joined properly. Investigate the cause of any gaps.
- 9. Install the (8) M10, (2) M8 and (1) M6 lower crankcase bolts. Tighten all bolts lightly by hand.



IMPORTANT: Install new M10 lower crankcase bolts.

10. Torque the lower crankcase bolts in sequence to specification. Repeat the sequence to verify final torque.



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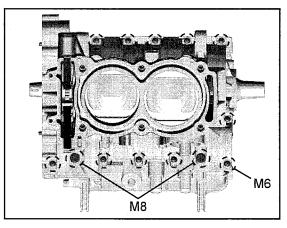
Lower Crankcase Bolts:

 $\frac{M10 \text{ Bolts:}}{\text{Step 1: 21 } \pm 2 \text{ ft. lbs. (28 } \pm 3 \text{ Nm})}$ Step 2: Tighten an additional 90° (1/4 turn)

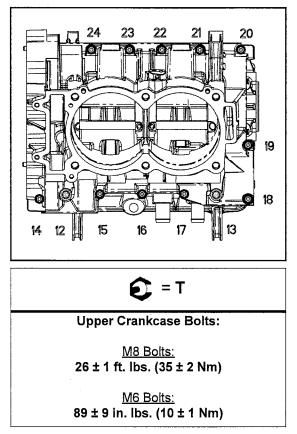
> <u>M8 Bolts:</u> 26 ± 1 ft. lbs. (35 ± 2 Nm)

<u>M6 Bolts:</u> 106 ± 18 in. lbs. (12 ± 2 Nm)

- 11. Rotate the engine so the cylinder is facing up.
- 12. Install the (11) M6 and (2) M8 upper crankcase bolts. Tighten all bolts lightly by hand.

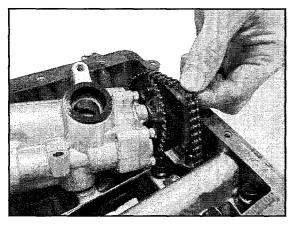


13. Torque the upper crankcase bolts in sequence to specification (start with #12). Repeat the sequence to verify final torque.

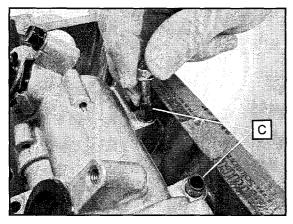


- 14. Rotate the engine so the cylinder is facing down.
- 15. Install a new seal on the oil pump.

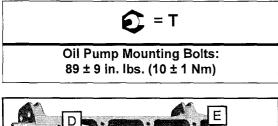
16. Lift the oil pump drive chain and install the oil pump.

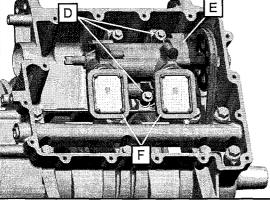


17. Install the dowel pins (C) into the oil pump mounting holes.

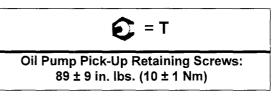


18. Install the (3) bolts (D) that retain the oil pump (E) to the crankcase. Torque mounting bolts to specification.





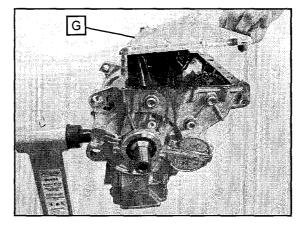
19. Reinstall oil pump pick-ups (F) if previously removed. Torque mounting screws to specification.



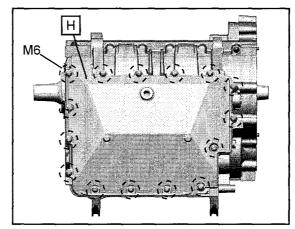
20. Clean the gasket sealing surfaces on oil sump cover and crankcase to remove old gasket material and any oil.

NOTE: Gasket surfaces must be DRY and oil free. Use care upon assembly to keep oil away.

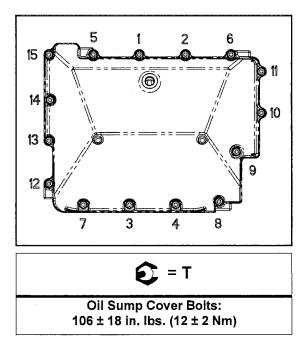
- 21. Install a new oil sump cover gasket.
- 22. Install the oil sump cover (G) onto the crankcase.



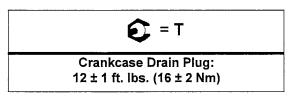
23. Install the (15) M6 bolts that retain the oil sump cover (H) to the crankcase.



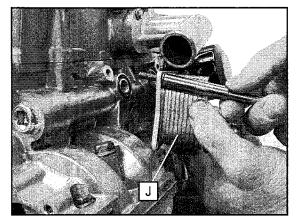
24. Torque the oil sump cover bolts in sequence to specification. Repeat the sequence to verify final torque.



25. Reinstall the crankcase drain plug if previously removed. Torque drain plug to specification.



26. Reinstall the oil cooler (J), if previously removed. Use new *O-rings* upon installation.

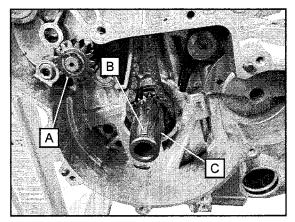


27. Proceed to "Flywheel Installation" and then "Cylinder Head Installation".

NOTE: Install the stator cover after the engine has been timed. You will need to reference the flywheel TDC mark during camshaft installation.

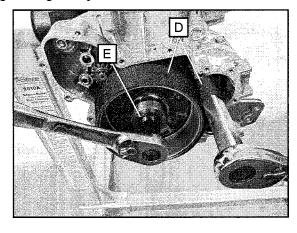
Flywheel Installation

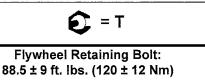
- 1. If intermediate gear (A) was removed, reinstall with a new retaining ring prior to flywheel installation.
- 2. If previously removed, reinstall the flywheel key (B).
- 3. Clean taper of crankshaft (C) to remove all oil or grease.



- 4. Clean flywheel taper to remove all oil or grease.
- 5. Align flywheel key-way with key and install the flywheel, seating it fully on taper.
- 6. Install the flywheel retaining bolt. Using a commercially available strap wrench (D), hold the flywheel and torque the flywheel retaining bolt (E) to specification.

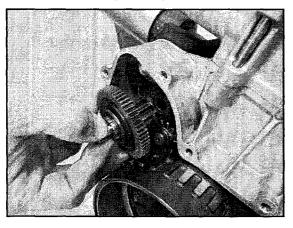
IMPORTANT: If the Cylinder Holding & Camshaft Timing Plate (PU-50563) is installed, remove it before tightening the flywheel.





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7. Install the starter torque limit gear as an assembly.

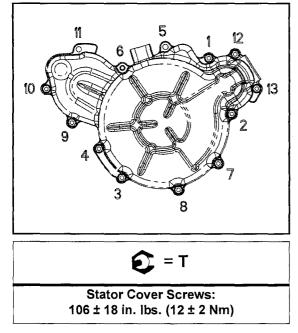


Stator Cover Installation

- 1. Apply gasket tack adhesive to help hold gasket in place during assembly.
- 2. Install a new stator cover gasket over alignment pins.

The flywheel contains powerful magnets. Use caution when removing and installing the stator cover. DO NOT place fingers between cover and crankcase at any time during the removal / installation process or injury could result.

3. Install stator cover and (13) screws. Torque screws in sequence to specification.



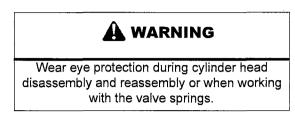


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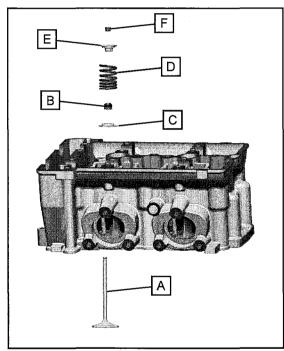
ENGINE ASSEMBLY - TOP END

Cylinder Head Assembly

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 Premium Starter Grease (2871460).
- 3. Install the valve (A) in the cylinder head, through the guide.

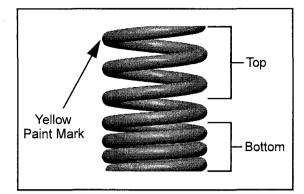


4. Carefully install a new valve seal (B) on the valve guide with a rotating motion. Push firmly until seated in retaining groove and square with the guide

IMPORTANT: Valve seals should be installed AFTER the valves are in the head to avoid valve seal damage.

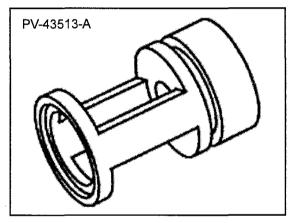
- 5. Dip the seat (C), valve spring (D) and retainer (E) in clean engine oil.
- 6. Install the valve spring seat (C).

7. Install the valve spring (D) with tightly spaced coils facing down toward the cylinder head.



NOTE: Valve springs to be installed with yellow paint mark facing up.

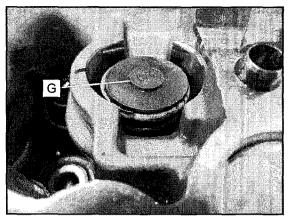
- 8. Place the valve retainer (E) on the spring.
- 9. Compress the valve spring by hand using valve spring compressor adapter (PV-43513-A). Compress spring only enough to allow split keeper installation.



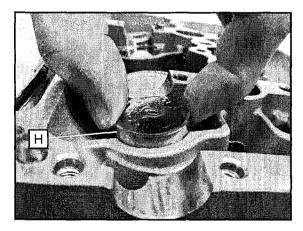
NOTE: To prevent damage to the valve seals, do not compress the valve spring more than necessary to install the keepers.

- 10. Install split keepers (F) with gap even on both sides.
- 11. Repeat this procedure for remaining valves.

12. Install the valve adjustment shim (G) and valve bucket (H) for each valve in the order they were removed.



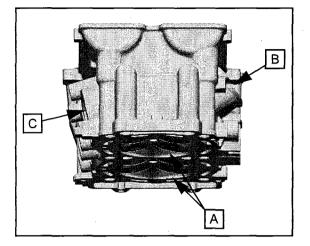
NOTE: Shim 240 is shown for reference only. Refer to "Valve Clearance Adjustment" procedure for proper shim selection.



IMPORTANT: If any valve train components were replaced, refer to "Valve Clearance Adjustment" procedure prior to "Camshaft Installation / Timing" procedure.

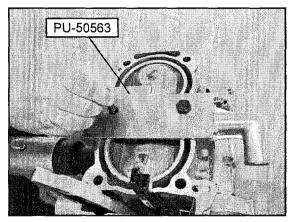
Valve Sealing Test

- 1. Clean and dry the combustion chamber area (A).
- 2. Pour a small amount of clean solvent into each intake port (B) and check for leakage around the valves. The valve seats should hold fluid with no seepage.
- 3. Repeat for exhaust valves by pouring fluid into each exhaust port (C).



Cylinder Head Installation

- 1. Rotate the engine so the cylinder is facing up.
- 2. Remove the Cylinder Holding & Camshaft Timing Plate (PU-50563) from the cylinder.

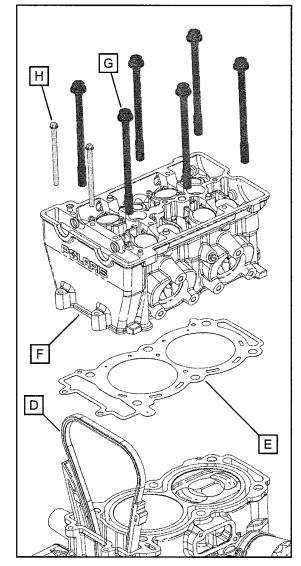


IMPORTANT: Once the cylinder head is removed, nothing retains the cylinder to the engine. DO NOT rotate the engine without using the Cylinder Holding & Camshaft Timing Plate (PU-50563).

3. Prepare cylinder head gasket sealing surfaces by cleaning thoroughly to remove all residue. The head gasket must be installed clean and dry, free from oil or grease.

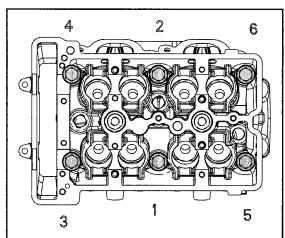
NOTE: Do not touch sealing surfaces of gasket.

- 4. Guide cam chain (D) through a new head gasket (E) and install the gasket on the cylinder, locating it on the alignment pins.
- 5. Carefully set the cylinder head (F) in place on alignment pins.
- 6. Install *new bolts* and finger tighten the (6) cylinder head bolts (G) evenly.
- 7. Install and finger tighten the (2) outer M6 bolts (H) evenly.



IMPORTANT: Install new cylinder head bolts.

8. Torque cylinder head bolts in sequence to specification.



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Cylinder Head Torque Procedure:

<u>Step 1</u>: Torque in Sequence 21 ft. lbs. (28 Nm)

<u>Step 2</u>: Torque in Sequence 26 ft. lbs. (35 Nm)

<u>Step 3</u>: Torque in Sequence Additional 180° (1/2 turn)

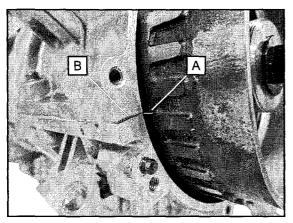
<u>Step 4</u>: Torque Outer M6 Head Bolts 89 ± 9 in. lbs. (10 \pm 1 Nm)

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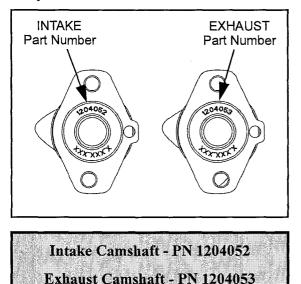
Camshaft Installation / Timing

IMPORTANT: If any valve train components were replaced, refer to "Valve Clearance Adjustment" procedure prior to "Camshaft Installation / Timing".

1. Rotate the engine until the flywheel Top Dead Center (TDC) mark (A) is aligned with crankcase parting line (B). This places the PTO cylinder at TDC for camshaft installation.

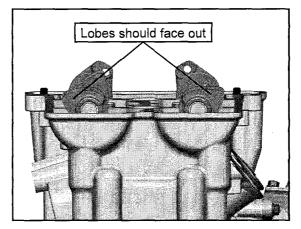


2. Reference the intake and exhaust markings made during disassembly. If installing new camshafts or if camshafts were not marked, you can reference the part number stamped on the end of the shafts.

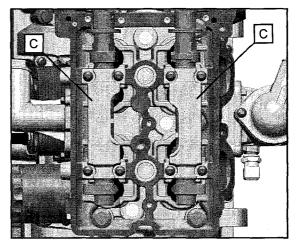


3. Lubricate all camshaft lobes and bearing journal surfaces with Polaris PS-4 Plus engine oil prior to installation.

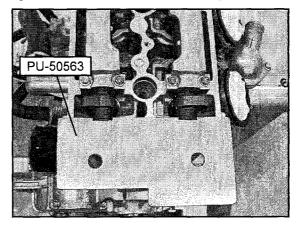
4. Carefully install the camshafts into the cylinder head. The PTO camshaft lobes should face out as shown.



- 5. Carefully install the rear camshaft carriers onto the camshafts. Carrier openings should face each other when installed properly.
- 6. Install the (4) bolts that retain each rear camshaft carrier (C) and tighten the bolts evenly until snug.

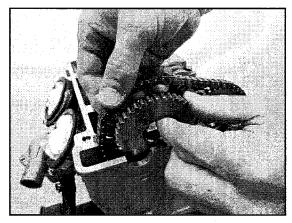


 Install the Cylinder Holding & Camshaft Timing Plate (PU-50563) into the end of camshafts as shown. Use a 13/16" open-end wrench to rotate camshafts slightly if needed.



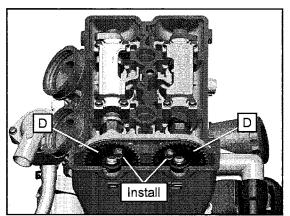
- 8. Verify TDC mark on flywheel is aligned with crankcase parting line.
- 9. Pull cam chain upward, making sure it is engaged with the drive sprocket on the crankshaft.
- 10. While lifting the cam chain up, engage the cam sprockets into the chain with the "I" and "E" marks facing out.
- 11. Install the sprockets onto the camshafts and align the sprocket marks with the valve cover gasket surface (see sprocket timing illustration).

IMPORTANT: Intake cam sprocket should have "I" marks aligned with gasket surface and the exhaust cam sprocket should have "E" marks aligned with gasket surface.



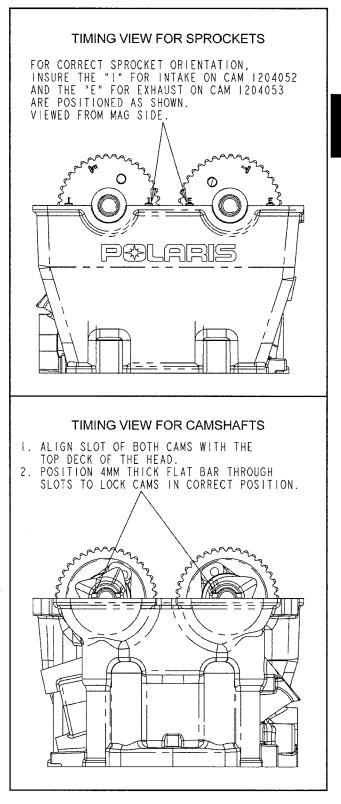
IMPORTANT: Install the exhaust cam sprocket first (opposite the cam chain tensioner) to ensure proper cam timing.

12. Use *new* camshaft sprocket retaining bolts upon assembly. Apply Loctite® 272[™] to bolt threads. Install the top bolt in each camshaft sprocket (D). Do not torque the bolts at this time.

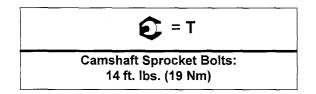


IMPORTANT: Use new sprocket retaining bolts upon assembly with Loctite® 272[™] applied to bolt threads.

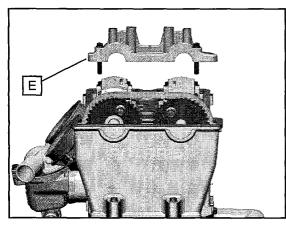
13. Verify cam timing is correct. Flywheel TDC mark should still be aligned with crankcase parting line and cam sprocket markings should line up as shown below.



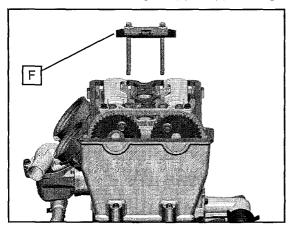
- 14. If timing marks are not aligned, remove sprockets and correct alignment.
- 15. Remove the Cylinder Holding & Camshaft Timing Plate (PU-50563) from the end of the camshafts.
- 16. Rotate the engine using the flywheel and install the remaining bolt in each camshaft sprocket. Torque the sprocket bolts to specification.



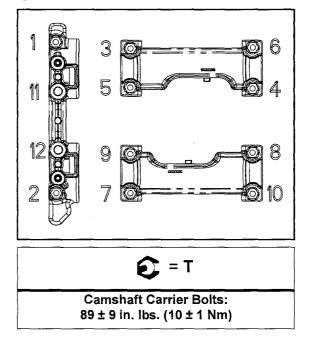
- 17. Rotate the engine using the flywheel and torque the remaining sprocket bolts to specification.
- 18. Install the front camshaft carrier (E) and (2) outer retaining bolts.



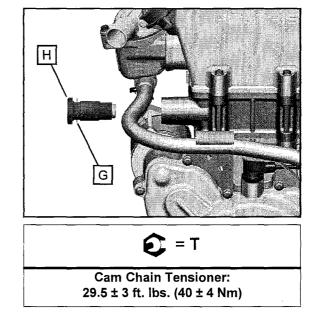
19. Install the fixed cam chain guide (F) and (2) retaining bolts.



20. Torque the camshaft carriers bolts in sequence to specification.

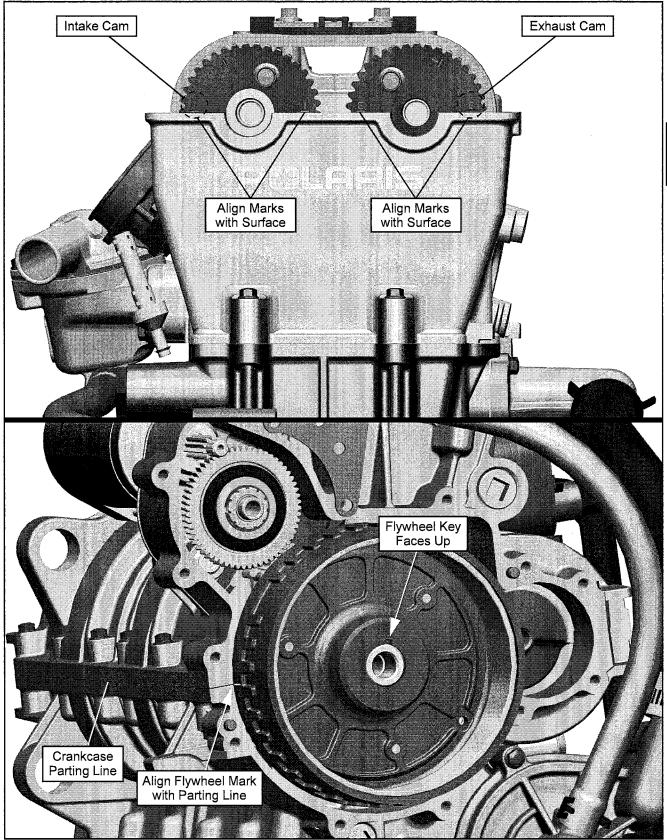


- 21. Apply Polaris PS-4 Plus engine oil to the cam chain tensioner bore prior to assembly. Insure the sealing washer (G) is in place.
- 22. Install the hydraulic cam chain tensioner (H) into the cylinder and torque to specification.



23. Rotate crankshaft through two revolutions and verify camshaft timing is correct.

Camshaft Timing - Quick Reference

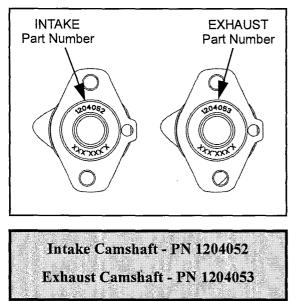


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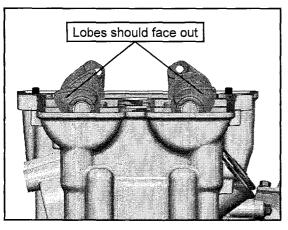
Valve Clearance Adjustment

IMPORTANT: Always inspect valve clearance prior to camshaft installation or final engine assembly.

1. Reference the camshaft intake and exhaust markings made during disassembly. If installing new camshafts or if camshafts were not marked, you can reference the part number stamped on the end of the shafts.

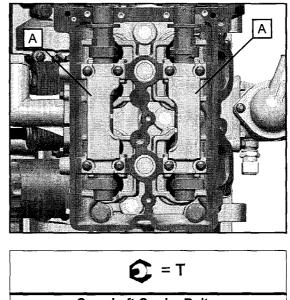


- 2. Lubricate the camshaft bearing journal surfaces with Polaris PS-4 Plus engine oil prior to installation.
- 3. Carefully install the camshafts into the cylinder head. The PTO camshaft lobes should face out as shown.



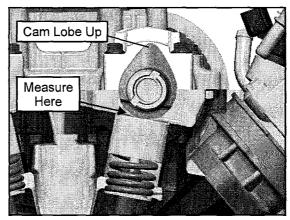
4. Carefully install the rear camshaft carriers onto the camshafts. Carrier openings should face each other when installed properly.

5. Install the (4) bolts that retain each rear camshaft carrier (A) and tighten the bolts evenly to specification.

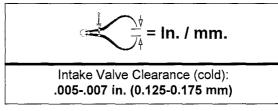


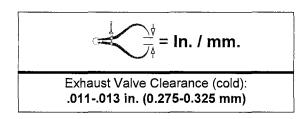
Camshaft Carrier Bolts: 89 ± 9 in. lbs. (10 ± 1 Nm)

6. Rotate the camshaft until the cam lobes above the valves you are inspecting are facing up.



- 7. Measure the valve clearance using a thickness (feeler) gauge. Record the measurement if clearance is out of specification.
- 8. Repeat steps 6 and 7 until all (8) valves have been inspected.

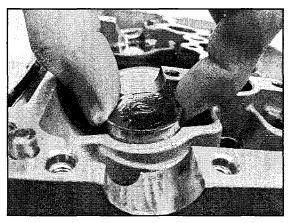




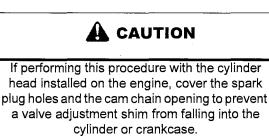
9. If any of the valve clearance measurements are out of specification, remove the camshaft carriers and camshafts and proceed with this procedure.

NOTE: If all valve clearance measurements are within specification, remove the camshaft carriers and proceed to "Camshaft Installation / Timing".

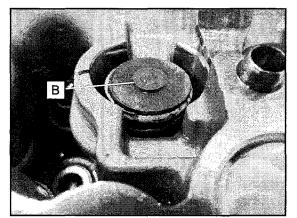
10. Remove the valve bucket from a valve that was out of specification.



IMPORTANT: Keep mated parts together and in order with respect to their location in the cylinder head for assembly purposes. Mark each component or place them in an organized rack as you remove them.



11. Record the 3 digit adjustment shim number (B).

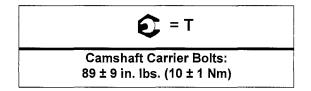


NOTE: Shim 240 is shown for reference only.

- 12. Reference the valve clearance measurement recorded for that valve, along with the 3-digit shim number.
- 13. Refer to the appropriate shim selection matrix (Intake or Exhaust) on the following pages and select the proper shim.
- 14. Install the new adjustment shim and valve bucket.

NOTE: Lubricate the outer portion of the valve bucket upon installation.

- 15. Repeat steps 10-14 until all necessary valves have been adjusted.
- 16. Reinstall the camshafts and camshaft carriers and tighten the bolts evenly to specification.



- 17. Measure and confirm that valve clearance is now within specification for each valve.
- 18. If valve clearance is not within specification, repeat this procedure.
- 19. If all valve clearance measurements are now within specification, remove the camshaft carriers and proceed to "Camshaft Installation / Timing".

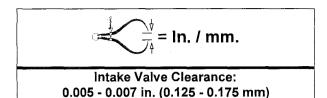
Intake Valve Lash - Shim Selection Matrix

Example:

- Installed shim is 240
- Measured clearance is 0.002 in. (0.06 mm)
- Replace 240 shim with 232 shim

Shim Thickness: Example 240 equals thickness of 2.40 mm

Part Number: 3022173-XXX (Xs represent 3 digits on shim)



Existing Valve Lash Shim Marking (3 digits on shim) Correct Valve Lash Shim Marking (3 digits on shim) 0.100-0.124 188 190 192 195 198 200 202 205 208 210 212 215 218 220 222 225 228 230 232 235 238 240 242 245 248 250 252 255 258 260 262 265 268 270 272 275 276 0 125.0.17 (Standard) 0.176-0.200 192 195 198 200 202 205 208 210 212 215 218 220 222 225 228 230 232 235 238 240 242 245 246 250 252 255 258 260 262 265 268 270 272 275 278 280 282 0.251-0.275 200 202 205 208 210 212 215 218 220 222 225 228 230 232 235 238 240 242 245 248 250 252 255 258 260 262 265 268 270 272 275 278 280 282 285 288 290 0.276-0.300 202 205 208 210 212 215 218 220 222 225 228 230 232 235 238 240 242 245 248 250 252 255 258 260 262 265 268 270 272 275 278 280 282 285 288 290 292 0.301-0.325 205 208 210 212 215 218 220 222 225 228 230 232 235 238 240 242 245 248 250 252 255 258 260 262 265 268 270 272 276 278 280 282 285 288 290 292 295 0.326-0.350 208 210 212 215 218 220 222 225 228 230 232 235 238 240 242 245 248 250 252 255 258 260 262 265 268 270 272 275 278 280 282 285 288 290 292 295 298 0.351-0.375 210 212 215 218 220 222 225 228 230 232 235 238 240 242 245 248 250 252 255 258 260 252 265 258 260 262 265 268 270 272 275 278 280 282 285 288 290 292 285 298 300 0 376-0 400 212 215 218 220 222 225 228 230 232 235 238 240 242 245 248 250 252 255 258 260 262 265 268 270 272 275 278 280 282 285 288 290 292 295 298 300

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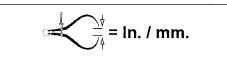
Exhaust Valve Lash - Shim Selection Matrix

Example:

- Installed shim is 240
- Measured clearance is 0.007 in. (0.18 mm)
- Replace 240 shim with 230 shim

Shim Thickness: Example 240 equals thickness of 2.40 mm

Part Number: 3022173-XXX (Xs represent 3 digits on shim)



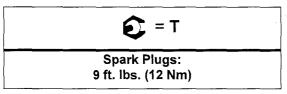
Exhaust Valve Clearance: 0.011 - 0.013 in. (0.275 - 0.325 mm)

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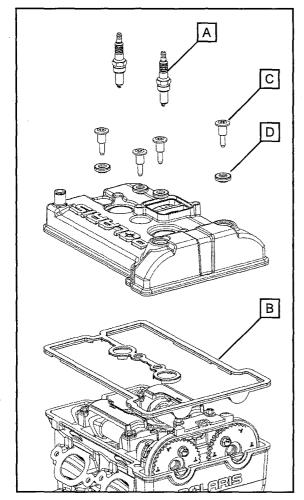
9923144 - 2011 RANGER RZR XP 900 Service Manual © Copyright 2011 Polaris Sales Inc.

Valve Cover Installation

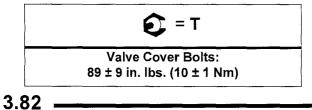
1. Install the spark plugs (A) and torque to specification.



- 2. Prepare valve cover sealing surfaces by cleaning thoroughly to remove all residue.
- 3. Install a new valve cover seal (B).
- 4. Install the (4) valve cover shoulder bolts (C) and isolators (D) using a T40 driver.



5. Torque valve cover bolts to specification.



TROUBLESHOOTING

Engine

Spark Plug Fouling

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

Engine Turns Over But Fails To Start

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

Engine Does Not Turn Over

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

Engine Runs But Will Not Idle

- · Restricted fuel supply
- Low compression
- Crankcase breather restricted

Engine Idles But Will Not Accelerate

- Spark plug fouled/weak spark
- Broken throttle cable
- Obstruction in air intake
- Air box removed (reinstall all intake components)
- Incorrect ignition timing
- · Restricted exhaust system
- Cam worn excessively

Engine Has Low Power

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

Piston Failure - Scoring

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

Excessive Smoke and Carbon Buildup

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

Piston Failure - Scoring

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

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Excessive Smoke and Carbon Buildup

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

Low Compression

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

Backfiring

- Fouled spark plug or incorrect plug or plug gap
- Intake system air leaks
- Exhaust system air leaks
- Valve sticking
- Ignition system faulty:
- Spark plug cap cracked / broken

Ignition coil faulty

Ignition or kill switch circuit faulty

Poor connections in ignition system

Ignition timing incorrect

Sheared flywheel key

Cooling System

Overheating

- Low coolant level
- Air in cooling system
- Wrong type/mix of coolant
- Faulty pressure cap or system leaks
- Restricted system (mud or debris in radiator fins causing restriction to air flow, passages blocked in radiator, lines, pump, or water jacket, accident damage)
- Lean mixture (vents, fuel pump or fuel valve)
- · Fuel pump output weak
- Electrical malfunction
- Water pump failure/ Loose impeller
- Thermistor failure
- Cooling fan inoperative or turning too slowly (perform current draw test)
- Low oil level
- Spark plug incorrect heat range
- · Faulty hot light circuit
- · Thermostat stuck closed or not opening completely
- Radiator is missing its internal diverter plate not allowing coolant to flow through entire radiator

Temperature Too Low

• Thermostat stuck open

Leak at Water Pump Weep Hole

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

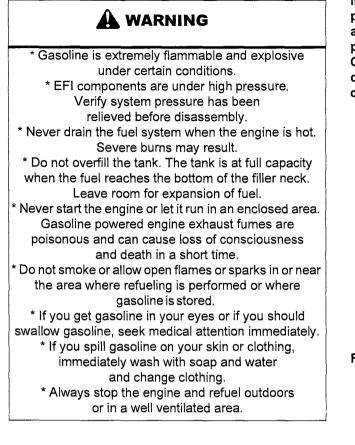
ELECTRONIC FUEL INJECTION

CHAPTER 4

ELECTRONIC FUEL INJECTION

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EFI SYSTEM ELECTRICAL OPERATION	

GENERAL INFORMATION

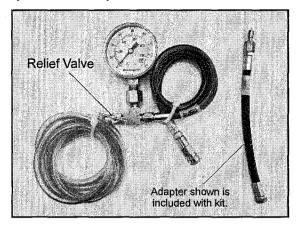


Special Tools

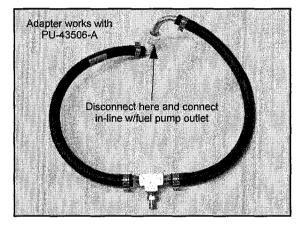
PART NUMBER	TOOL DESCRIPTION									
PU-43506-A	Fuel Pressure Gauge Kit									
PV-48656	Fuel Pressure Gauge Adapter									
PU-47063-A	Digital Wrench™ Diagnostic Softw (Includes most recent version of softw w/serial number, standard interface of and SmartLink Module Kit)									
PU-47471	Digital Wrench™ SmartLink Module Kit (PU-47470, PU-47469, PU-47468)									
	PU-47470	Digital Wrench™ PC Interface Cable								
	PU-47469	Digital Wrench™ Vehicle Interface Cable								
	PU-47468	Digital Wrench™ SmartLink Module								

Fuel Pressure Gauge Kit - PU-43506-A

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



Fuel Pressure Gauge Adapter - PV-48656



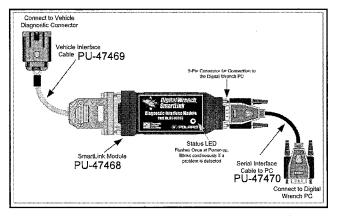
Digital Wrench[™] Diagnostic Software - PU-47063-A

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

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

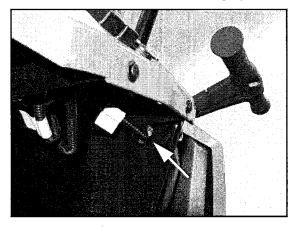
Digital Wrench™ SmartLink Module Kit - PU-47471

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



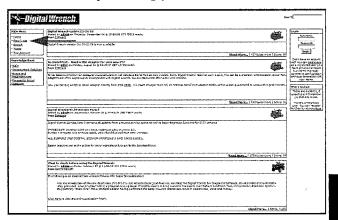
Digital Wrench™ - Diagnostic Connector

Located under the dash connected to a sealed plug.



Digital Wrench[™] - Download Website

Located at: www.polaris.diagsys.com



Download Digital Wrench[™] Updates:

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IMPORTANT: For the most recent information on Digital Wrench[™] software and update downloads please visit the website: <u>www.polaris.diagsys.com</u>

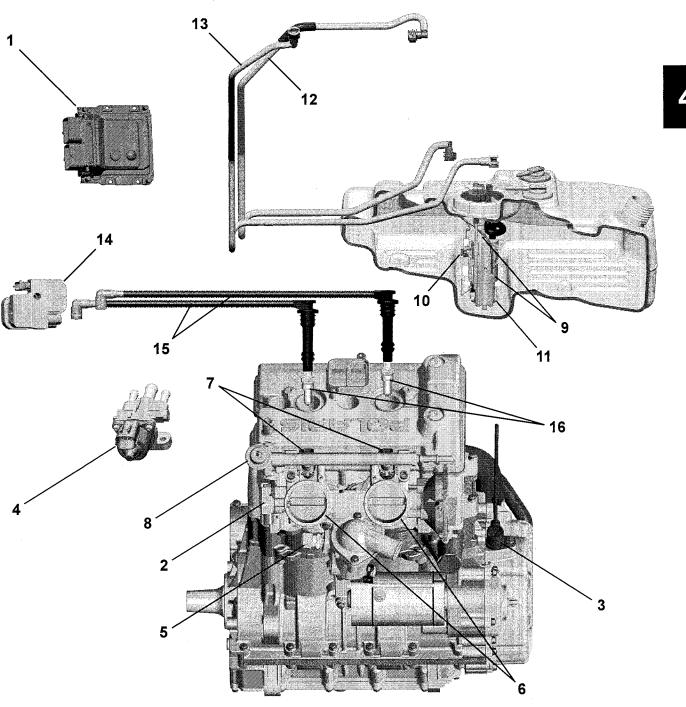
EFI Service Notes

- For more convenient and accurate testing of EFI components, it is recommended dealers utilize the Digital Wrench[™] Diagnostic Software (dealer only). Some testing may be done manually using the procedures provided in this chapter.
- 80% of all EFI problems are caused by wiring harness connections.
- For the purpose of troubleshooting difficult running issues, a known-good ECU from another *RANGER* RZR XP 900 of the same model and year may be used without damaging system or engine components.
- Never attempt to service any fuel system component while engine is running or ignition switch is "on."
- Cleanliness is essential and must be maintained at all times when servicing or working on the EFI system. Dirt, even in small quantities, can cause significant problems.
- Do not use compressed air if the system is open. Cover any parts removed and wrap any open joints with plastic if they will remain open for any length of time. New parts should be removed from their protective packaging just prior to installation.
- Clean any connector before opening to prevent dirt from entering the system.
- Although every precaution has been taken to prevent water intrusion failure, avoid direct water or spray contact with system components.
- Do not disconnect or reconnect the wiring harness connector to the control unit or any individual components with the ignition "on." This can send a damaging voltage spike through the ECU.
- Do not allow the battery cables to touch opposing terminals. When connecting battery cables attach the positive (red) cable to positive (+) battery terminal first, followed by negative (black) cable to negative (-) battery terminal.
- Never start the engine when the cables are loose or poorly connected to the battery terminals.
- Never disconnect battery while engine is running.
- Never use a battery boost-pack to start the engine.
- Do not charge battery with key switch "on."
- Always disconnect negative (-) battery cable lead before charging battery.
- Always unplug ECU from the wire harness before performing any welding on the unit.

EFI System Exploded View

- 1. Electronic Control Unit (ECU)
- 2. Manifold Air Quality Sensor (MAQS)
- 3. Crankshaft Position Sensor (CPS)
- 4. Idle Air Control Valve (IAC)
- 5. Engine Coolant Temperature Sensor (ECT)
- 6. Dual Throttle Body Assembly
- 7. Fuel Injectors
- 8. Fuel Rail / Regulator

- 9. Fuel Pump / Regulator
- 10. Fuel Level Sender
- 11. Fuel Filter
- 12. Fuel Supply Line
- 13. Fuel Return Line
- 14. Ignition Coil
- 15. Spark Plug Wires
- 16. Spark Plugs

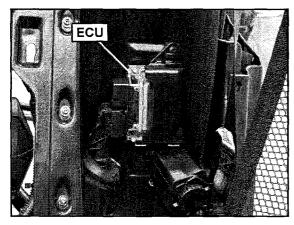


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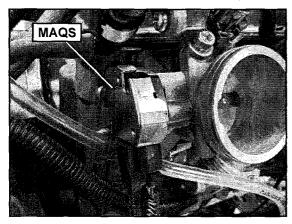
4.5

EFI System Component Locations

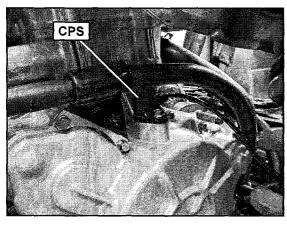
1. Electronic Control Unit (ECU) - Located behind the driver's seat.



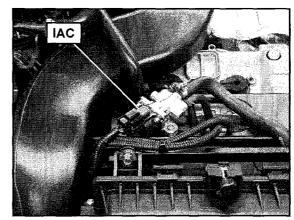
Manifold Air Quality Sensor (MAQS)
Located on the PTO end of the throttle body assembly.



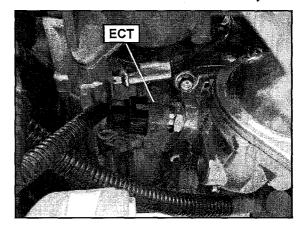
3. Crankshaft Position Sensor (CPS) - Located on top of the stator cover.



- 4. Idle Air Control Valve (IAC)
 - Located above the engine, underneath the cargo box access panel.

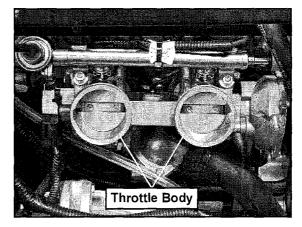


5. Engine Coolant Temperature Sensor (ECT)
- Located on the left side of the thermostat housing. The sensor can be accessed with the air box assembly removed.



6. Dual Throttle Body Assembly

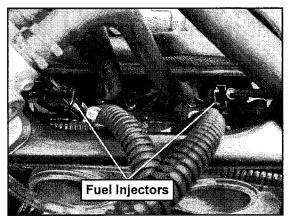
- Located between the air box assembly and rubber cylinder head adapters.



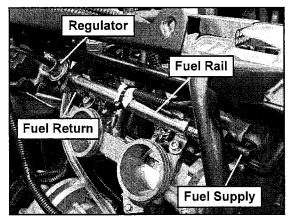
ELECTRONIC FUEL INJECTION

7. Fuel Injectors

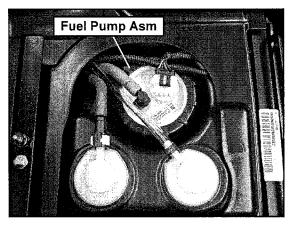
- Located on the top of the throttle body in the intake track, retained on top by the fuel rail.

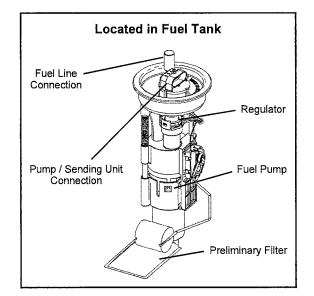


- 8. Fuel Rail / Regulator
 - Located on the throttle body, on top of the fuel injectors.

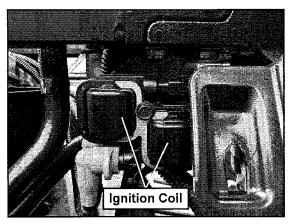


9. Fuel Pump / Regulator / Fuel Gauge Sender Assembly - Located under the passenger seat.





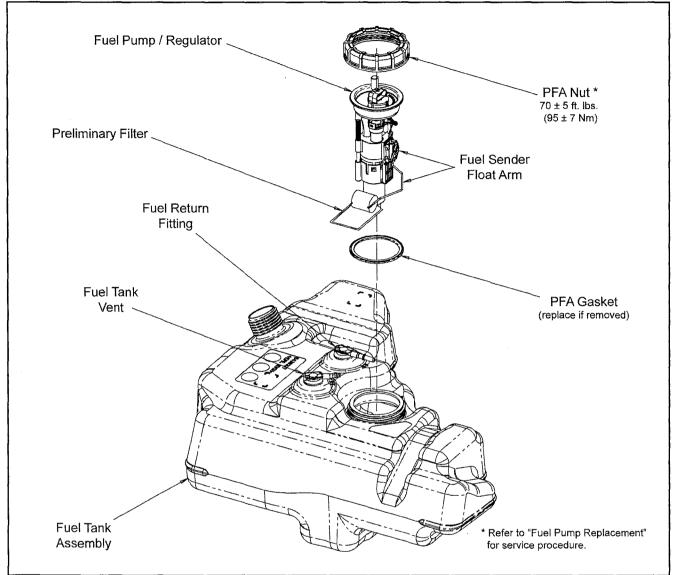
10. Ignition Coil / High Tension Leads
Located behind the engine service panel on the driver's side of the vehicle.

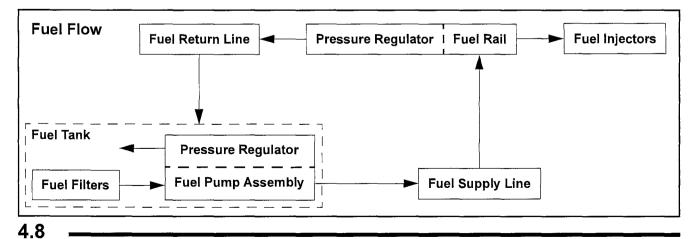


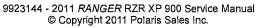
ELECTRONIC FUEL INJECTION

FUEL TANK

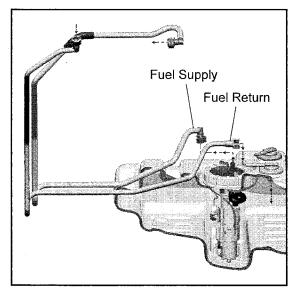
Exploded View





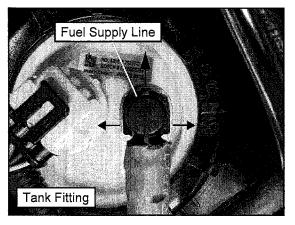


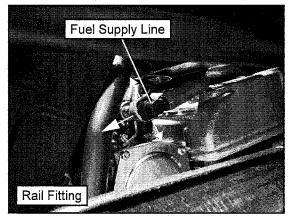
Fuel Lines - Quick Connect Fittings



Fuel Supply Line Removal

- 1. Place a shop towel around the fuel line to catch any dripping fuel.
- 2. If removing either end of supply line, pull open both tabs while moving the green connector out to release the line.

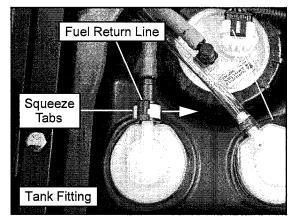


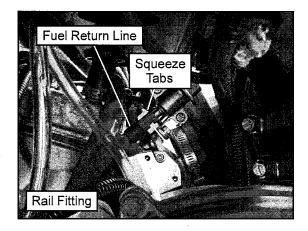


- 3. Pull on the fuel line for removal.
- 4. To install the line, verify the connections are clean and free of debris.
- 5. Place the fuel line back over the fitting and slide the green connector locking mechanism back into place. Verify the connector tabs snap back into place.
- 6. Be sure fuel line is routed and retained properly.

Fuel Return Line Removal

- 1. Place a shop towel around the fuel line to catch any dripping fuel.
- 2. If removing either end of return line, squeeze the connector tabs together and push the white locking slide back to release the line.

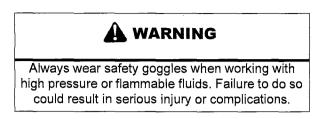




- 3. Pull on the fuel line for removal.
- 4. To install the line, verify the connections are clean and free of debris.
- 5. Place the fuel line back over the fitting and slide the white connector locking mechanism back into place. Verify the connector tabs snap back into place.
- 6. Be sure fuel line is routed and retained properly.

Fuel Tank Removal

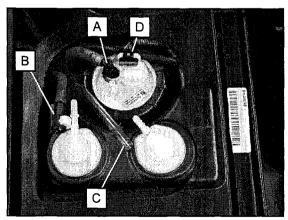
IMPORTANT: Syphon as much fuel from the tank as possible before attempting to remove it from the vehicle.



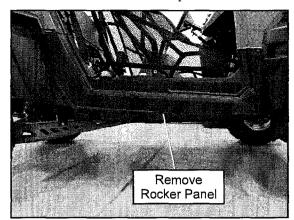
- 1. Remove the driver and passenger seats along with the engine service panel.
- 2. Disconnect the negative battery cable from the battery, located under the driver's seat.
- 3. While holding a shop towel over the fuel line connectors, disconnect the fuel supply line (A) from the pump and the fuel return line (B) from the tank (see "Fuel Lines Quick Connect Fittings" for specific removal procedures).

NOTE: A small amount of fuel may come out of the fuel lines or pump fitting. Properly drain fuel into a suitable container.

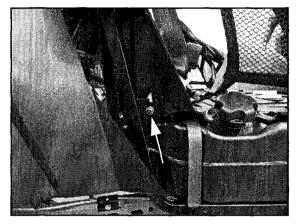
- 4. Remove the fuel tank vent line (C) from the tank fitting.
- 5. Disconnect the fuel pump electrical harness (D).



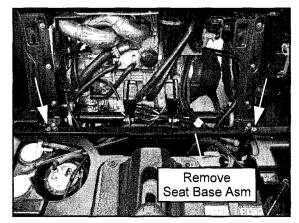
6. Remove the push rivets and Torx screws retaining the righthand rocker panel using the multi-function pliers and a T27 Torx driver. Remove the rocker panel from the vehicle.



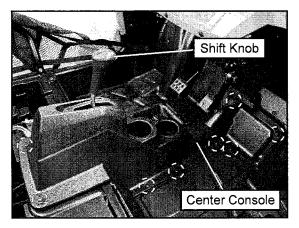
7. Remove the fastener retaining the seat belt mechanism to the frame near the right rear portion of the fuel tank. Once removed, place the mechanism in the rear cargo box to keep it out of the way.



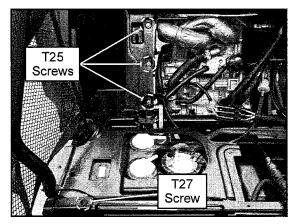
8. Remove the (2) bolts retaining the rear seat base assembly to the frame using a 5/8" socket. Remove the rear seat base assembly from the vehicle.



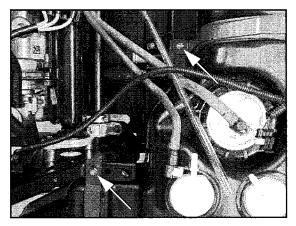
9. Remove the shift knob using a flat blade screwdriver and T25 Torx driver. Remove the screws retaining the center console using a T27 and T30 Torx driver. Remove the console from the vehicle.



10. Remove the Torx screws retaining the right rear fender well using a T25 and T27 Torx driver. Remove the fender well from the vehicle.

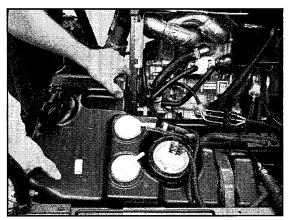


11. Remove the (2) tank bracket fasteners that retain the fuel tank in the chassis using a 3/8" socket. Swing the tank brackets clear of the fuel tank for removal.



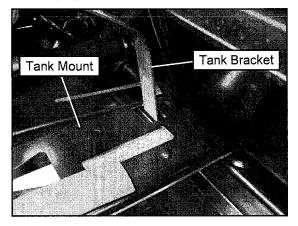
12. Lift the rear of the fuel tank up first.

13. Carefully pull the fuel tank out of the vehicle.



Fuel Tank Installation

1. Carefully reinstall the fuel tank assembly. Install the inner tank bracket with the fuel tank to ensure the bracket is inserted properly into the lower fuel tank mount as shown.



- 2. Reinstall the (2) fuel tank brackets and fasteners.
- 3. Reinstall the right rear fender well and secure with screws.
- 4. Reinstall the center console, shift knob and screws.
- 5. Reinstall the rear seat base assembly and secure with bolts.
- Reinstall the seat belt mechanism. Torque bolt to 40 ft. lbs. (54 Nm).
- 7. Reinstall the right-hand rocker panel and all previously removed fasteners.
- 8. Install the fuel lines, vent line and clamp. Verify the line connections are secure.
- 9. Reconnect the fuel pump electrical harness.
- 10. Reconnect the negative battery cable. Test the fuel pump by turning the ignition key on and listening for the pump to activate. Check the fuel line fittings for leaks.
- 11. Finally, install the engine service panel and both seats.

Principal Components

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

- Check Engine Light
- Crankshaft Position Sensor (CPS)
- Dual Throttle Body / Intake Adapter
- Engine Control Unit (ECU)
- Engine Coolant Temperature Sensor (ECT)
- Fuel Filter(s)
- Fuel Injectors
- Fuel Pressure Regulators
- Fuel Pump
- Fuel Rail
- Fuel Supply/Return Lines
- Idle Air Control Valve (IAC)
- Ignition Coil
- Manifold Air Quality Sensor (MAQS)
- Wire Harness Assembly

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 M17 Electronic Control Unit (ECU) which manages system operation, determining the best combination of fuel mixture and ignition timing for the current operating conditions.

An electric fuel pump is used to move fuel from the tank, through the fuel supply line, to the fuel rail. Fuel pressure regulators located in the tank and on the end of the fuel rail, maintain system operating pressure and return excess fuel back into the fuel tank. At the engine, fuel fed through the fuel rail supplies fuel to the injectors, which inject into the intake ports. The ECU controls the amount of fuel by varying the length of time that the injectors are "on." This range can vary depending on fuel requirements. The controlled injection of the fuel occurs every other crankshaft revolution, or once for each 4-stroke cycle. When the intake valve opens, the fuel/air mixture is drawn into the combustion chamber, ignited and burned. The ECU controls the amount of fuel being injected and the ignition timing by monitoring the primary sensor signals for intake air temperature, manifold absolute pressure (load), engine temperature, engine speed (RPM) and throttle position. These primary signals are compared to the programming in the ECU computer chip, and the ECU adjusts the fuel delivery and ignition timing based on these values.

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

During certain operating periods such as cold starts, warm up, acceleration, etc., a richer air / fuel ratio is automatically calculated by the ECU.

Initial Priming / Starting Procedure

NOTE: The injection system must be purged of all air prior to the initial start up, and / or any time the system has been disassembled.

If the EFI system is completely empty of fuel or has been disassembled and repaired:

- 1. Cycle the key switch from "OFF" to "ON" 6 times, waiting for approximately 3 seconds at each "ON" cycle to allow the fuel pump to cycle and shut down.
- 2. Once step 1 is completed, turn the key switch to "START" until the engine starts or 5 seconds has passed.
- 3. If the engine failed to start, repeat step 1 for 2 more cycles and attempt to start the engine.

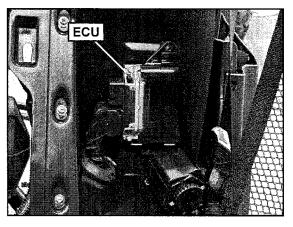
If the engine fails to start, a problem may still exist, and should be diagnosed.

NOTE: Accurate testing of EFI components is recommended utilizing the Digital Wrench[™] Diagnostic Software (dealer only).

ELECTRONIC CONTROL UNIT (ECU)

Operation Overview

The ECU is the brain or central processing computer of the entire EFI fuel/ignition management system. During operation, sensors continuously gather data which is relayed through the wiring harness to input circuits within the ECU. Signals to the ECU include: ignition power (on/off), intake air temperature, manifold absolute pressure (load), engine coolant temperature, crankshaft position and engine speed (RPM), throttle position and battery voltage. The ECU compares the input signals to the programmed maps in its memory and determines the appropriate fuel and ignition requirements for the immediate operating conditions. The ECU then sends output signals to set the injector duration and ignition timing.



During operation, the ECU continually performs a diagnostic check of itself, each of the sensors, and system performance. If a fault is detected, the ECU turns on the "Check Engine" light on the instrument cluster and stores the fault code in its fault memory. Depending on the significance or severity of the fault, normal operation may continue, or "Fail-Safe" operation (slowed speed, richer running) may be initiated. A technician can determine the cause of the "Check Engine" light by referencing the "Instrument Cluster Trouble Code Display" and "Diagnostic Trouble Code Table" or by using Digital WrenchTM. The ECU requires a minimum of 7.0 volts to operate. The memory in the ECU is operational the moment the battery cables are connected.

To prevent engine over-speed and possible failure, an RPM limiting feature is programmed into the ECU. If the maximum RPM limit is exceeded, the ECU suppresses the injection signals, cutting off the fuel flow and retards the ignition timing. This process repeats it self in rapid succession, limiting operation to the preset maximum.



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.

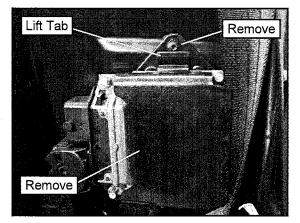
For the purpose of troubleshooting, a known-good ECU from another Polaris **RANGER RZR XP 900** of the same model may be used without system or engine component damage.

ECU Replacement

Although the need for ECU replacement is unlikely, a specific replacement procedure is required to ensure that all essential data contained within the original ECU is transferred to the replacement ECU.

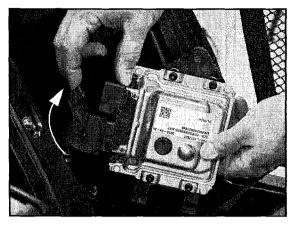
IMPORTANT: Refer to this procedure and carefully follow all instructions provided in Digital Wrench[™].

- 1. Carefully follow the ECU replacement instructions provided in Digital Wrench[™] to ensure that all essential data contained within the original ECU is transferred to the replacement ECU.
- 2. Remove the black plastic cover by lifting up on the tab. Remove the retaining screw that attaches the ECU to the left rear fender well.



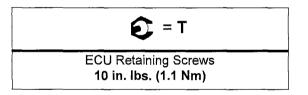
3. With the ignition turned off, disconnect the wire harness from the ECU. Lift the connector locking lever and rotate it up until the connector is free from the ECU.

NOTE: Upon removing the ECU connector, you should hear a "click" when the connector is fully open.



4. To install, reverse the procedure and tighten the mounting screws to specification.

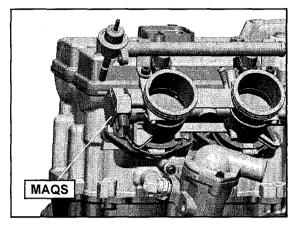
NOTE: Upon installing the ECU connector, you should hear a "click" when the connector is fully closed.



MANIFOLD AIR QUALITY SENSOR (MAQS)

Operation Overview

Mounted on the end of the dual throttle body assembly, the MAQS performs three functions in one unit. The MAQS detects intake air temperature, manifold absolute pressure and throttle position.



These sensor signals, comprised of separate intake air temperature, manifold absolute pressure readings and throttle plate position are processed by the ECU and compared to its programming for determining the fuel and ignition requirements during engine operation. The MAQS provides the ECU with engine load data.

MAQS Test / Replacement

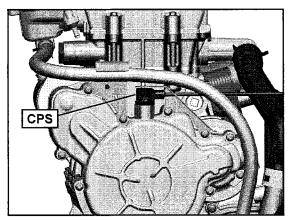
The MAQS is a non-serviceable item and can only be tested using Digital Wrench[™]. If the sensor is faulty, the dual throttle body assembly must be replaced. Refer to "Throttle Body Removal" procedure.

IMPORTANT: This sensor should only be tested using Digital Wrench™ Diagnostic Software (dealer only).

<u>CRANKSHAFT POSITION SENSOR</u> (CPS)

Operation Overview

Mounted on top of the stator cover, the crankshaft position sensor is essential to engine operation, constantly monitoring the rotational speed (RPM) and position of the crankshaft.



A ferromagnetic 35-tooth encoder ring with a missing tooth is built onto the flywheel. The inductive speed sensor is mounted 1.0 ± 0.26 mm (0.059 \pm 0.010 in.) away from the encoder ring. 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.

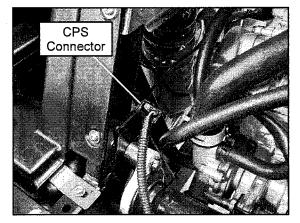
The encoder ring missing tooth creates an "interrupt" input signal, corresponding to specific crankshaft position. This signal serves as a reference for the control of ignition timing by the ECU. Synchronization of the CPS and crankshaft position takes place during the first two revolutions each time the engine is started. This sensor must be properly connected at all times. If the sensor fails or becomes disconnected for any reason, the engine will stop running.

CPS Test

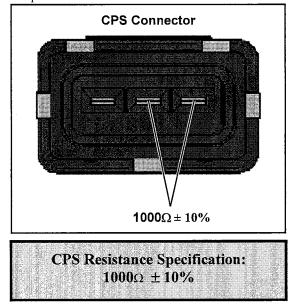
The CPS is a sealed, non-serviceable assembly. If fault code diagnosis indicates a problem with this sensor, test as follows:

1. Remove the seats and engine service panel to access the CPS harness connector.

2. Disconnect CPS harness connector attached to the righthand frame support, above the water pump housing.



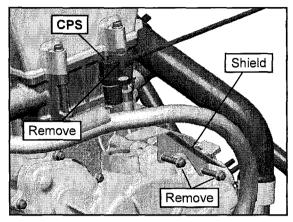
- 4
- 3. Connect an ohmmeter between the CPS pin terminals shown below. A resistance value of $1000\Omega \pm 10\%$ at room temperature should be obtained.



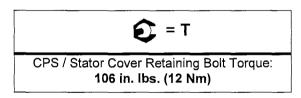
- 4. If the resistance is correct:
 - Test the main harness circuit between the sensor connector terminals and the corresponding pin terminals at the ECU (see wiring diagram).
 - Check the sensor mounting, air gap, flywheel encoder ring for damage or runout, and flywheel key. Follow the "CPS Replacement" procedure to inspect CPS and flywheel encoder ring for damage.
- 5. If the resistance is incorrect, follow the "CPS Replacement" procedure.

CPS Replacement

- 1. If not done already; disconnect the CPS harness connector (see "CPS Test").
- 2. Using an 8mm socket, remove the (2) bolts retaining the CPS heat shield and remove the shield.
- 3. Using an 8mm socket, remove the CPS retaining bolt and remove the sensor from the stator cover.



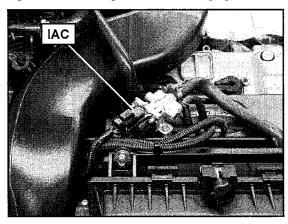
- 4. Install new sensor using a light coating of oil on the O-ring to aid installation.
- 5. Torque the CPS and heat shield retaining bolts to specification.



IDLE AIR CONTROL VALVE (IAC)

Operation Overview

The Idle Air Control (IAC) is used to stabilize the idle quality of the engine at cold start-up and after warm-up operations.

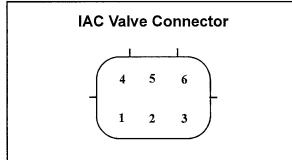


The IAC contains 1 stepper motor which receives varying voltage signal pulses from the ECU. These pulses determine the IAC plunger setting, thereby controlling the amount of air bypassing the closed throttle body plates for idle control. If the IAC is disconnected or inoperative, it will remain at it's last operated position.

IAC Test

The IAC is a non-serviceable item. If it is faulty, it must be replaced. It can be 'bench tested' using the following method:

Set your meter to read Ohms. Check the resistance values at each of the following pin locations of the IAC. If any of the readings are out of specification, replace the IAC.

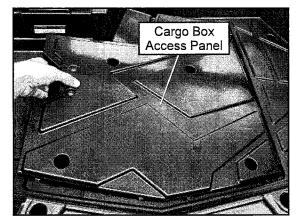


IAC Resistance Readings

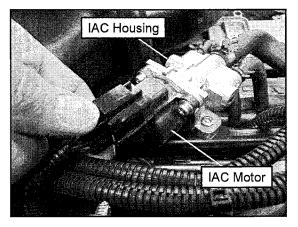
Pins	Resistance	Pins	Resistance
1 - 2	30 Ω ± 1.2 Ω	4 - 5	$30 \ \Omega \pm 1.2 \ \Omega$
2 - 3	$30\ \Omega \pm 1.2\ \Omega$	5 - 6	$30 \ \Omega \pm 1.2 \ \Omega$
1 - 3	$60 \ \Omega \pm 2.4 \ \Omega$	4 - 6	$60 \ \Omega \pm 2.4 \ \Omega$

IAC Replacement

1. Remove the cargo box access panel.

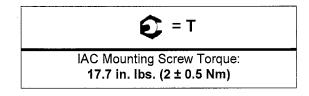


2. Locate the IAC valve above the engine and disconnect the vehicle harness from the IAC motor.



- 3. Remove the (3) Phillips-head mounting screws and remove the IAC motor from the IAC housing.
- 4. Install the new IAC motor and torque the mounting screws to specification.

NOTE: Make sure not to twist or pinch the IAC lines upon assembly.

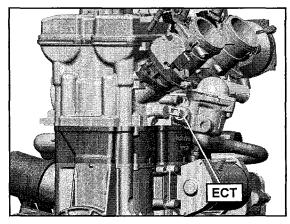


- 5. Reconnect the vehicle harness to the IAC motor.
- 6. Reinstall the cargo box access panel.

ENGINE COOLANT TEMPERATURE SENSOR (ECT)

Operation Overview

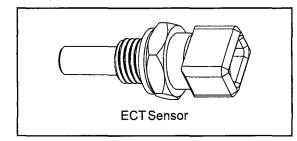
Mounted in the thermostat housing, the engine temperature sensor measures coolant temperature. The engine temperature sensor is a Negative Temperature Coefficient (NTC) type sensor, as the temperature increases the resistance decreases.



Coolant passes through the thermostat housing and by the sensor probe, varying a resistance reading which is relayed to the ECU. This signal is processed by the ECU and compared to its programming for determining the fuel and ignition requirements during operation. The ECU also uses this signal to determine when to activate the cooling fan during operation.

ECT Sensor Test

To quickly rule out other components and wiring related to the ECT, disconnect the harness from the ECT sensor and start the engine. After a few seconds, the fan should turn on and the "Check Engine" indicator should display on the instrument cluster. This indicates all other components are working properly.



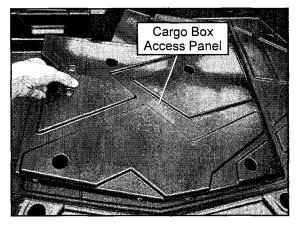
Refer to Chapter 10 for additional ECT sensor information. Polaris dealers can test the sensor by using Digital WrenchTM Diagnostic Software (dealer only).

ECT Sensor Resistance Readings

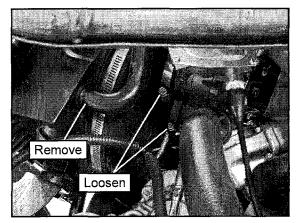
Temperature °F (°C)	Resistance
68 °F (20 °C)	$2.5 \text{ k}\Omega \pm 6\%$
86 °F (30 °C)	$1.7 \mathrm{k}\Omega \pm 6\%$
104 °F (40 °C)	$1.2 \text{ k}\Omega \pm 6\%$
122 °F (50 °C)	834 Ω ± 6%
140 °F (60 °C)	$596 \Omega \pm 6\%$
158 °F (70 °C)	$435 \Omega \pm 6\%$
176 °F (80 °C)	$323 \Omega \pm 6\%$
194 °F (90 °C)	243 Ω ± 6%
212 °F (100 °C)	186 Ω ± 6%

ECT Sensor Replacement

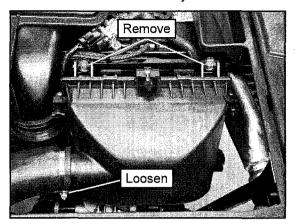
1. Remove the cargo box access panel.



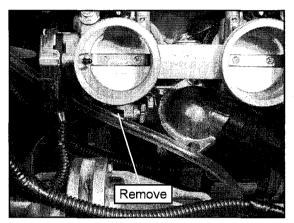
- 2. Be sure the engine has cooled enough to work on.
- 3. Remove the breather hose from the air box and loosen the hose clamps retaining the air box to the throttle body assembly.



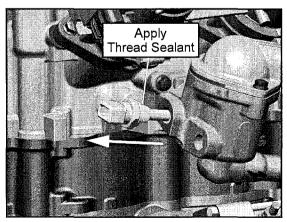
4. Remove the (2) screws retaining the air box assembly and loosen the hose clamp retaining the intake hose to the air box. Remove the air box assembly from the vehicle.



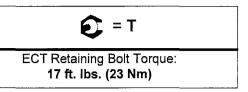
5. Disconnect the vehicle harness from the ECT sensor.



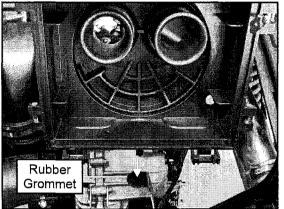
- 6. Drain the coolant so the level is below the sensor (see Chapter 2 "Coolant Drain / Fill").
- 7. Using a wrench, remove and replace the sensor, applying a light coating of thread sealant to aid installation.



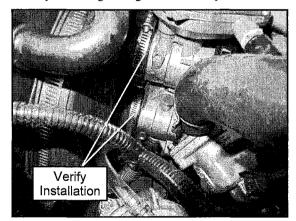
8. Torque the new ECT sensor to specification and connect the vehicle harness to the sensor.



- 9. Reinstall the air box assembly:
 - Be sure the lower air box post in placed properly into the rubber grommet.



• Be sure the air box boots fully seat onto the dual throttle body before tightening the hose clamps.

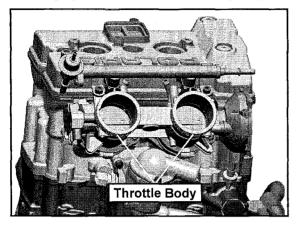


- 10. Reinstall the breather into the air box and tighten the hose clamps retaining the air box to the throttle body assembly.
- 11. Reinstall the (2) screws retaining the air box assembly.
- 12. Position the intake hose onto the air box and tighten the hose clamp.
- 13. Reinstall the cargo box access panel.
- 14. Add the required amount of coolant and bleed the system (see Chapter 3 "Cooling System Bleeding Procedure").

DUAL THROTTLE BODY ASSEMBLY

Operation Overview

Mounted to the cylinder head, the dual throttle body assembly provides the proper air/fuel ratio needed for engine operation.



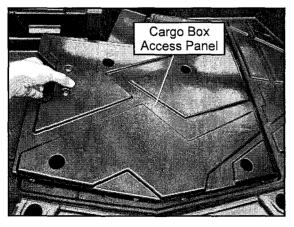
The throttle body assembly also includes the Manifold Air Quality Sensor (MAQS), which provides the ECU with intake air temperature, manifold absolute pressure and throttle position.

Throttle Body Service

The throttle body assembly is a non-serviceable component. However, the fuel rail and fuel injectors can be serviced separately (see "Fuel Injectors"). The Manifold Air Quality Sensor (MAQS) attached to the end of the throttle body is nonserviceable. If the sensor is faulty, the entire throttle body assembly must be replaced. Refer to "Throttle Body Removal" procedure.

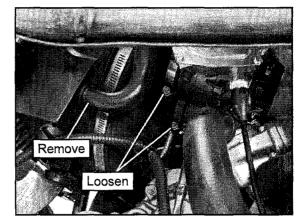
Throttle Body Removal

1. Remove the cargo box access panel.

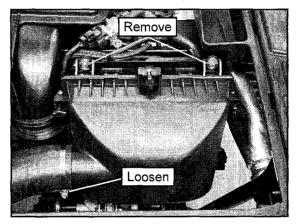


4.20

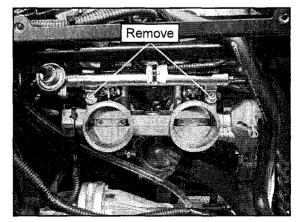
- 2. Be sure the engine has cooled enough to work on.
- 3. Remove the breather hose from the air box and loosen the hose clamps retaining the air box to the throttle body assembly.



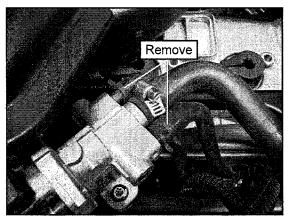
4. Remove the (2) screws retaining the air box assembly and loosen the hose clamp retaining the intake hose to the air box. Remove the air box assembly from the vehicle.



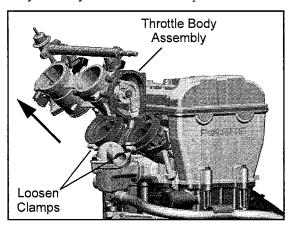
5. Remove the (2) screws that mount the fuel rail to the throttle body using a 5 mm Allen wrench.



6. Remove the (2) IAC valve hoses that are attached to the throttle body.



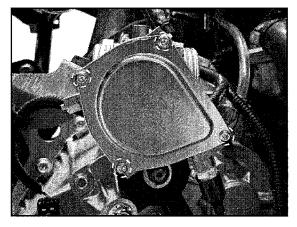
7. Loosen the (2) hose clamps that retain the dual throttle body assembly to the intake adapters. Carefully lift the throttle body assembly out of the intake adapters.



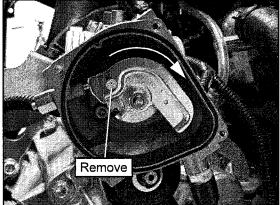
8. Lift the fuel rail and injectors out of the throttle body assembly taking care not to damage the fuel injector ends.

NOTE: It is not necessary to disconnect fuel lines or the injector harnesses to perform this procedure.

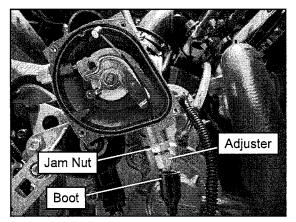
9. Remove the (4) screws retaining the throttle body cover plate using a T20 Torx driver. Remove the cover plate.



10. Rotate the throttle plate arm and remove the throttle cable end to allow for throttle cable removal.



11. Slide back the cable adjuster boot. Using a 14 mm wrench, loosen the jam nut. Using a 12 mm wrench, turn the adjuster in and count the number of turns it take to fully seat it. Note the number of turns so it can be set the same upon assembly.



- 12. Unscrew the throttle cable adjuster and jam nut from the throttle body. Remove the throttle body from the vehicle.
- 13. Reverse the previous steps to reinstall the throttle body.
- 14. Upon installation of the throttle cable, refer to Chapter 2 "Throttle Freeplay Adjustment". Torque the throttle body cover screws to specification.

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Throttle Body Cover Screws: 18 in. lbs. (2 Nm)

15. Upon installation of the fuel rail and injectors, lightly lubricate injector O-rings to aid installation. Torque the fuel rail mounting screws to specification.



Fuel Rail Mounting Screws: 44 in. lbs. (5 Nm)

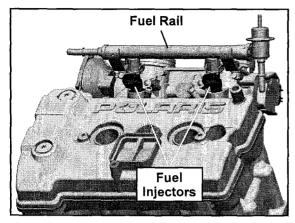
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FUEL INJECTORS

Operation Overview

The fuel injectors are mounted into the dual throttle body assembly, with the fuel rail retaining them from the top end. O-rings on both ends of the injector prevent external fuel leaks and also insulate the injectors from heat and vibration.



When the key switch is on, the fuel rail is pressurized, and the EFI relay provides voltage to the injectors. During engine operation, the ECU completes the ground circuit, energizing the injectors. The valve needle in each injector is opened electromagnetically, and the pressure in the fuel rail forces fuel down through the inside. The "director plate" at the tip of the injector contains a series of calibrated openings which directs the fuel into the intake port in a cone-shaped spray pattern.

The amount of fuel injected is controlled by the ECU and determined by the length of time the valve needle is held open, also referred to as the "injection duration" or "pulse width". It may vary in length depending on the speed and load requirements of the engine.

The ECU gathers fuel injection timing information from the Crankshaft Position Sensor (CPS) and the Manifold Air Quality Sensor (MAQS) to allow for sequential fuel injection.

Fuel Injector Troubleshooting

Injector problems typically fall into three general categorieselectrical, dirty / clogged, or leakage. An electrical problem usually causes one or both of the injectors to stop functioning. Several methods may be used to check if the injectors are operating.

- With the engine running at idle, feel for operational vibration, indicating that they are opening and closing.
- When temperatures prohibit touching, listen for a buzzing or clicking sound with a screwdriver or mechanic's stethoscope.
- Disconnect the electrical connector from an injector and listen for a change in idle performance (only running on one cylinder) or a change in injector noise or vibration.

NOTE: Do not apply voltage directly to the fuel injector(s). Excessive voltage will burn out the injector(s). Do not ground the injector(s) with the ignition on. Injector(s) will open/turn on if relay is energized.

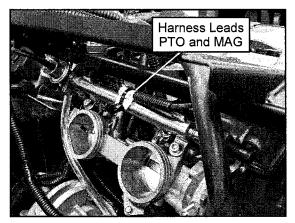
If an injector is not operating, it can indicate either a bad injector, or a wiring/electrical connection problem. Check as follows:

Injector leakage is very unlikely, but in rare instances it can be internal (past the tip of the valve needle), or external (weeping around the injector body). The loss of system pressure from the leakage can cause hot restart problems and longer cranking times.

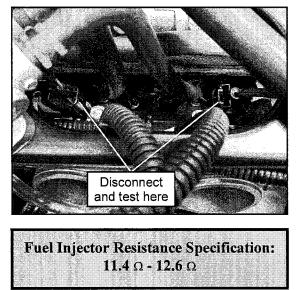
Injector problems due to dirt or clogging are unlikely due to the design of the injectors, the high fuel pressure, the use of filters and the detergent additives in the gasoline. Symptoms that could be caused by dirty/clogged injectors include rough idle, hesitation/stumble during acceleration, or triggering of fault codes related to fuel delivery. Injector clogging is usually caused by a buildup of deposits on the director plate, restricting the flow of fuel, resulting in a poor spray pattern. Some contributing factors to injector clogging include; dirty air filters, higher than normal operating temperatures, short operating intervals and dirty, incorrect, or poor quality fuel. Cleaning of clogged injectors is not recommended; they should be replaced. Additives and higher grades of fuel can be used as a preventative measure if clogging has been a problem.

Fuel Injector Test

IMPORTANT: Take note of PTO and MAG fuel injector harness connectors before disconnecting them. The harness leads are marked with PTO and MAG identifiers.



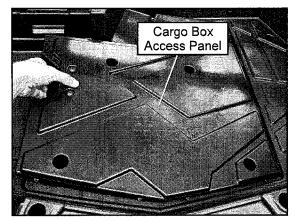
The fuel injectors are non-serviceable. If diagnosis indicates a problem with either injector, test the resistance of the fuel injector(s) by measuring between the two pin terminals:



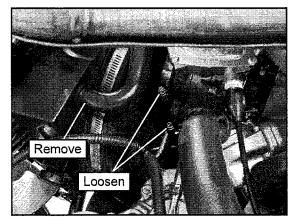
IMPORTANT: Be sure to connect the PTO harness lead to the PTO injector and the MAG harness lead to the MAG injector to ensure proper engine operation.

Fuel Injector Replacement

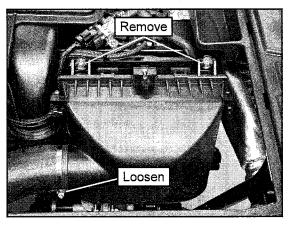
1. Remove the cargo box access panel.



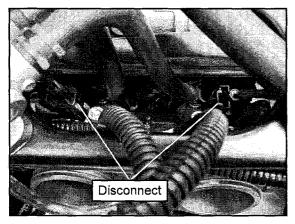
- 2. Be sure the engine has cooled enough to work on.
- 3. Remove the breather hose from the air box and loosen the hose clamps retaining the air box to the throttle body assembly.



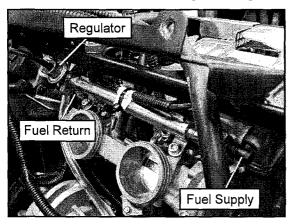
4. Remove the (2) screws retaining the air box assembly and loosen the hose clamp retaining the intake hose to the air box. Remove the air box assembly from the vehicle.



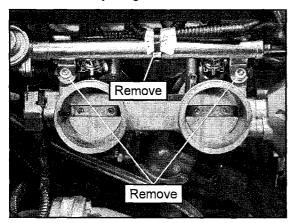
- 5. Remove the driver's seat and disconnect the negative battery cable.
- 6. Disconnect the fuel injector harness leads.



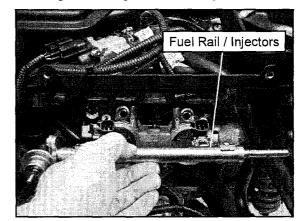
 Hold a shop towel over the fuel line fittings and remove the fuel return and supply lines from each end of the fuel rail. Remove the vent line from the fuel pressure regulator.



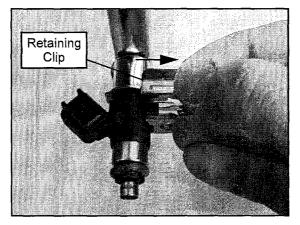
8. Remove the tie strap retaining the injector harness leads to the fuel rail. Remove the (2) screws that mount the fuel rail to the throttle body using a 5 mm Allen wrench.

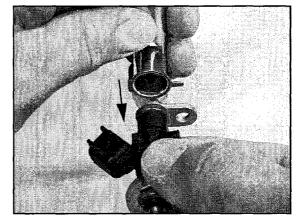


9. Carefully pull up on the fuel rail and injectors and remove them from the throttle body as an assembly. Take care not to damage the fuel injector ends during removal.



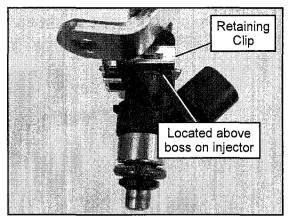
10. Pull out on the fuel injector retaining clip and pull the injector out of the fuel rail. Repeat on the other injector if removal is necessary.





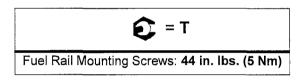
11. Upon installation of the new fuel injectors, lightly lubricate the injector O-rings to aid installation.

12. Install the new injector(s) into the fuel rail and reinstall the retaining clip.



NOTE: Be sure the retaining clip is positioned on the injector and fuel rail as shown above.

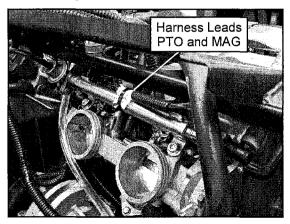
- 13. Thoroughly clean the area around the fuel injector ports on the throttle body.
- 14. Lightly lubricate the injector O-rings and reinstall the fuel rail / injector assembly into the throttle body.
- 15. Install the fuel rail mounting screws and torque to specification.



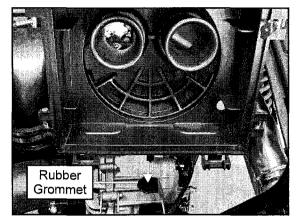
- 16. Reinstall the fuel lines and vent line to the fuel rail.
- 17. Connect the harness leads to the fuel injectors.

IMPORTANT: Be sure to connect the PTO harness lead to the PTO injector and the MAG harness lead to the MAG injector to ensure proper engine operation.

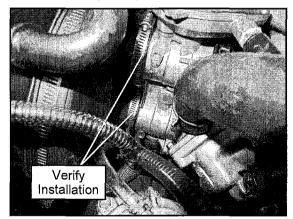
18. Use a tie strap to retain the harness leads to the fuel rail.



- 19. Reconnect the negative battery cable and reinstall the driver's seat.
- 20. Start the engine briefly and inspect the fuel rail and injectors for fuel leaks.
- 21. Reinstall the air box assembly:
 - Be sure the lower air box post is placed properly into the rubber grommet.



• Be sure the air box boots fully seat onto the dual throttle body before tightening the hose clamps.

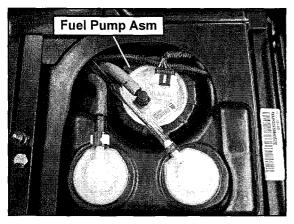


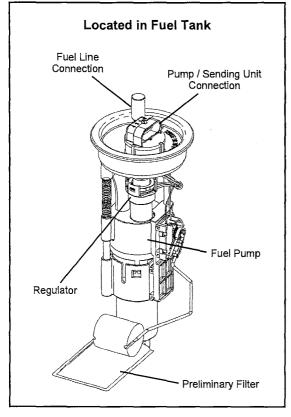
- 22. Reinstall the breather into the air box and tighten the hose clamps retaining the air box to the throttle body assembly.
- 23. Reinstall the (2) screws retaining the air box assembly.
- 24. Position the intake hose onto the air box and tighten the hose clamp.
- 25. Reinstall the cargo box access panel.

FUEL PUMP

Operation Overview

An electric fuel pump assembly is used to transfer fuel to the EFI system from inside the fuel tank. This assembly includes the fuel pump, fuel filters, regulator and fuel gauge sender. The pump is rated for a minimum output of 25 liters per hour at 43.5 ± 2 psi and has two non-serviceable fuel filters.





When the key switch is turned to "ON", the ECU activates the fuel pump, which pressurizes the system for start-up.

The ECU switches off the pump preventing the continued delivery of fuel in these instances:

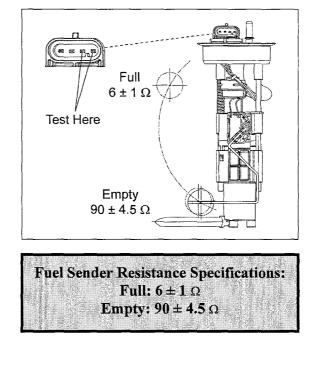
- If the key switch is not promptly turned to the "start" position.
- If the engine fails to start.
- If the engine is stopped with the key switch "on" (as in the case of an accident).

In these situations, the "check engine" light will go on, but will turn off after 4 cranking revolutions if system function is OK. Once the engine is running, the fuel pump remains on.

Fuel Sender Test

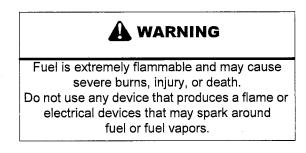
If the fuel gauge reading on the instrument cluster is not working, or if the display reading differs in large comparison to the fuel in the tank, perform a resistance test on the fuel sender.

Disconnect the fuel pump / sending unit connection and measure the resistance. If out of specification, replace the fuel pump assembly.

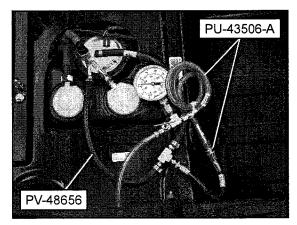


Fuel Pump Test

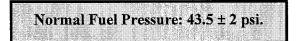
If a fuel delivery problem is suspected, make certain the fuel pump filters are not plugged, that the pump is being activated through the ECU, all electrical connections are properly secured, the fuses are good, and a minimum of 7.0 volts is being supplied. If during starting the battery voltage drops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



- 1. Remove the passenger seat from the vehicle.
- 2. Cover the fuel line connection at the fuel tank with a shop towel and disconnect the line from the fuel pump outlet.
- 3. Install the Fuel Pressure Gauge Adapter (PV-48656) in-line between the fuel pump outlet and fuel line.
- 4. Connect the hose from the Fuel Pressure Gauge Kit (PU-43506-A) to the test valve on the Fuel Pressure Gauge Adapter (PV-48656). Route the clear hose into a portable gasoline container or the vehicle's fuel tank.

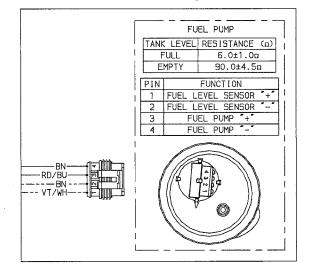


5. Turn on the key switch to activate the pump and check the system pressure on the gauge. If system pressure of 43.5 ± 2 psi is observed, the ignition switch, ECU, fuel pump, and pressure regulator are working properly. Turn the key switch off and depress the valve button on the tester to relieve the system pressure.



NOTE: If the fuel pressure is out of specification, replace the fuel pump assembly.

6. If the pump did not activate (Step 5), disconnect the harness connector from the fuel pump. Connect a DC voltmeter across terminals "3" and "4" in the plug on the vehicle fuel pump harness. Turn on the key switch and observe voltage to ensure a minimum of 7 volts is present.



4

NOTE: If the voltage was below 7 VDC, test the battery, ignition switch, relay(s), wiring harness and ECU.

7. If the reading is between 7 and 14 volts, turn key switch off and connect an ohmmeter between terminals "3" and "4" at the white fuel pump connector to check for continuity within the fuel pump.

NOTE: If there was no continuity between the pump terminals, replace the fuel pump assembly.

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

NOTE: If the pump starts, repeat steps 3, 4 and 5 to verify correct pressure.

9. If the pump still does not operate, check for correct ECU operation by plugging in a known-good ECU of the same model.

NOTE: If the pump still does not operate, replace the fuel pump assembly.

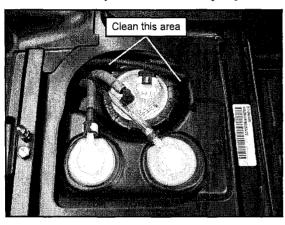
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Fuel Pump Replacement

- 1. Move the vehicle to a well ventilated area. Shift the transmission into Park and turn the ignition key off.
- 2. Remove the passenger seat to access the fuel pump.

Always wear safety goggles when working with high pressure or flammable fluids. Failure to do so could result in serious injury or complications.

3. Be sure the top of the fuel tank is clean. If it requires cleaning, hand wash the top of the tank to ensure no debris will enter the fuel system when the fuel pump is removed.



CAUTION

Failure to clean area around fuel pump may lead to debris entering the fuel tank during service. Excessive debris in fuel tank may cause premature wear of fuel pump and/or clogging of internal fuel filters.

- 4. Ensure that static has been discharged from you by touching a ground source such as the engine or frame.
- 5. While holding a shop towel over the fuel line connectors, disconnect the fuel supply line (A) from the pump and the fuel return line (B) from the tank (see "Fuel Lines Quick Connect Fittings" for specific removal procedures).

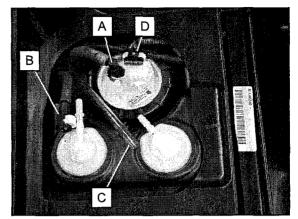


It is possible for pressurized fuel to be present when disconnecting the fuel line. It is recommended to allow the vehicle to sit for a period of one hour after shutting off the engine

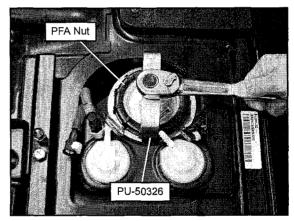
before servicing the fuel pump. This allows the exhaust to cool and fuel pressure to drop.

NOTE: A small amount of fuel may come out of the fuel lines or pump fitting. Properly drain fuel into a suitable container.

- 6. Remove the fuel tank vent line (C) from the tank fitting.
- 7. Disconnect the fuel pump electrical harness (D).

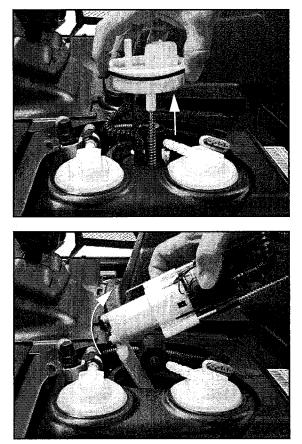


8. Place the Fuel Pump Service Tool (PU-50326) over the fuel pump PFA nut. Using a 1/2" drive ratchet or breaker bar, loosen and remove the PFA nut. Discard the PFA nut.



NOTE: Apply downward force on the fuel pump flange while removing the fuel pump PFA nut.

9. Carefully lift the fuel pump out of the fuel tank. As the fuel pump assembly is being removed, be aware of float arm and pump pre-filter. Hold the float arm to the pump body as you lift and tilt the pump to ensure that the float arm is not bent when removed from the tank.

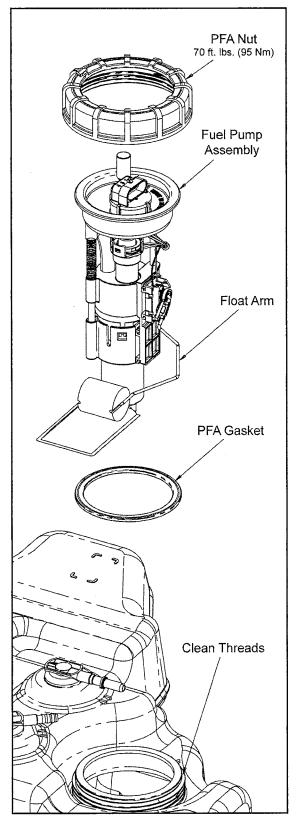


- 10. Transfer old fuel pump to a suitable container capable of safely holding fuel. The fuel pump will retain some fuel.
- 11. Inspect the inside of the fuel tank for debris (may require flashlight and mirror). If debris like mud or sand is present, fuel tank should be flushed and cleaned out prior to installation of new fuel pump assembly.

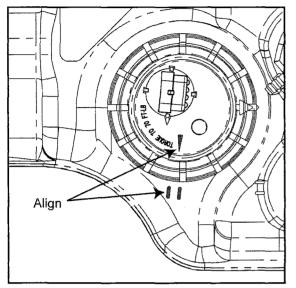
IMPORTANT: It is recommended to remove the fuel tank from the vehicle and rinse it with a small amount of clean fuel. Do not use water or any other chemicals to remove debris.

- 12. Remove new fuel pump assembly, gasket and PFA nut from packaging. Use care not to bend float arm during unpackaging. Do not lift or carry fuel pump assembly by the float arm.
- 13. Use cleaning wipes provided to clean fuel tank surface and threads. Remove all debris, grease and oil. Allow surfaces to dry completely.

14. Install new PFA gasket onto fuel pump assembly using care not to damage gasket or bend float arm.



- 15. Install fuel pump into fuel tank, hold float arm to the pump body and tilt assembly to ensure float arm does not get caught or bent during installation.
- 16. Gently push down on fuel pump flange ensuring flange is centered.
- 17. Roughly align orientation mark on fuel pump between the orientation marks on fuel tank to ensure float arm does not get bent or snagged.

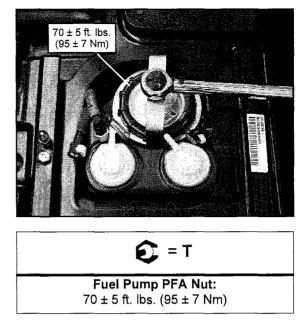


CAUTION

Failure to align the orientation marks may lead to interferences with the fuel level float arm and cause incorrect function.

18. While maintaining downward pressure, thread new PFA nut onto fuel tank and hand tighten. Use care when starting PFA nut, ensuring threads are properly aligned. Verify orientation marks are still aligned between fuel pump and fuel tank.

19. Torque PFA nut to specification using the Fuel Pump Service Tool (PU-50326) and a calibrated torque wrench.



- 20. Verify alignment of fuel pump and tank orientation marks.
- 21. Connect the fuel supply line to the pump and the fuel return line to the tank (see "Fuel Lines Quick Connect Fittings" for specific installation procedures).

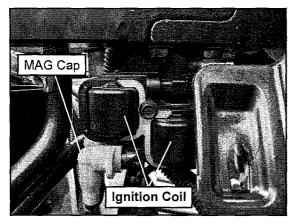
IMPORTANT: Be sure to engage the retainers on each fuel line until each snaps into place. Pull on fuel lines lightly to confirm connection.

- 22. Install the fuel tank vent line onto the tank fitting.
- 23. Connect the fuel pump electrical harness.
- 24. Test the fuel pump by turning on the key and listening for the pump to activate. Cycle the key several times to prime the system.
- 25. Install the passenger seat.

IGNITION COIL

Operation Overview

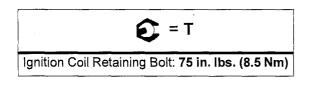
The ignition coil is used to provide high voltage to fire the spark plugs. When the ignition key is on, DC voltage is present in primary side of the ignition coil windings. During engine rotation, an AC pulse is created within the crankshaft position sensor for each passing tooth on the flywheel's encoder ring. The encoder ring missing tooth creates an "interrupt" input signal, corresponding to specific crankshaft position. This signal serves as a reference for the control of ignition timing. The ECU then calculates the time interval between the consecutive pulses, and determines when to trigger the voltage spike that induces the voltage from the primary to the secondary coil windings to fire the spark plugs.



Ignition Coil / HT Lead Replacement

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

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



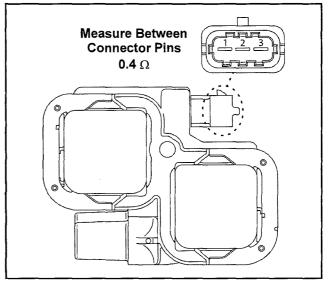
Ignition Coil Tests

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

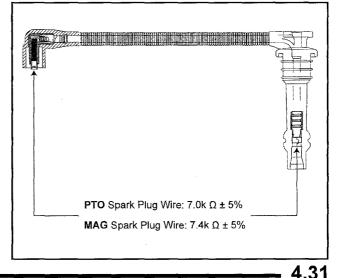
Ignition Coil Resistance Readings

Test	Pin Connection	Resistance
Primary	Between 1 & 2 Between 2 & 3	0.4 Ω
Secondary (PTO)	Between High Tension Lead Caps	7.0k Ω ± 5%
Secondary (MAG)	Between High Tension Lead Caps	7.4k Ω ± 5%

Primary Test



Secondary Test



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4

EFI DIAGNOSTICS

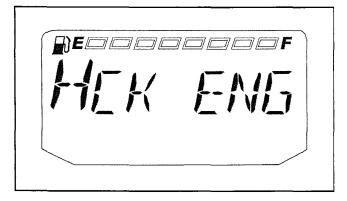
Instrument Cluster Trouble Code Display

NOTE: The diagnostic mode is accessible only when the check engine MIL has been activated.

Use the following procedure to display diagnostic trouble codes that were activated during current ignition cycle causing the MIL to illuminate. Diagnostic trouble codes will remain stored in the gauge (even if MIL turns off) until the key is turned off.

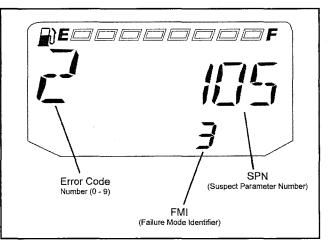
NOTE: If there is a diagnostic problem with the power steering system, the power steering MIL will illuminate and blink in place of the check engine MIL.

1. If the trouble code(s) are not displayed, use the MODE button to toggle until "CK ENG" displays on the information display area.



2. Press and hold the MODE button to enter the diagnostics code menu.

- 3. A set of three numbers will appear in the information area.
 - The first number (located far left) can range from 0 to 9. This number represents the total number of trouble code present (example: 2 means there are 3 codes present).
 - The second number (located top right) can be 2 to 6 digits in length. This number equates to the suspected area of fault (SPN).
 - The third number (located bottom right) can be 1 to 2 digits in length. This number equates to the fault mode (FMI).



- 4. If more than one code exists, press the MODE button to advance to the next trouble code.
- 5. To exit the diagnostic mode, press and hold the MODE button or turn the ignition key OFF once the codes are recorded.

Component	Condition	SPN	FMI	Digital Wrench™ P-Code
	Voltage Too High	51	3	P0123
Throttle Position (MAQS)	Voltage Too Low	51	4	P0122
Vehicle Speed Signal	Data Erratic or Intermittent (or missing)	84	2	P0503
	Received Vehicle Speed Has Error	04	19	C1069
	Voltage Too High	400	3	P0108
Manifold Absolute Pressure (MAQS)	Voltage Too Low	102	4	P0107
	Voltage Too High	405	3	P0113
Intake Air Temperature (MAQS)	Voltage Too Low	105	4	P0112
	Voltage Too High		3	P0118
Engine Temperature Sensor (ECT)	Voltage Too Low	110	4	P0117
	Temperature Too High	110	16	P0217
	Engine Overheat Shutdown		0	P1217

DIAGNOSTIC TROUBLE CODE TABLE

DIAGNOSTIC TROUBLE CODE TABLE

Component	Condition	SPN	FMI	Digital Wrench™ P-Code
	Voltage Too High		3	P0563
System Power				C1063
(Battery Potential / Power Input)		- 168 -		P0562
	Voltage Too Low		4	C1064
Engine Speed (This is applicable when the EPS module gets the engine speed from the ECM)	Received Engine Speed Has Error	190	19	C1066
Gear Sensor Signal	Voltage Too Low	523	4	P0916
ECU Memory	EEPROM: Read/Write Failure	628	12	C1073
Crankshaft Position Sensor (CPS)	Plausibility Fault	636	2	P0335
	Driver Circuit Open / Grounded		5	P0261
Injector 1 (MAG)	Driver Circuit Short to B+	651	3	P0262
	Driver Circuit Grounded		4	P1262
·····	Driver Circuit Open / Grounded		5	P0264
Injector 2 (PTO)	Driver Circuit Short to B+	652	3	P0265
	Driver Circuit Grounded		4	P1265
	Driver Circuit Open / Grounded		5	P1691
Rear Differential Output (if equipped w/TURF)	Driver Circuit Short to B+	746	3	P1692
	Driver Circuit Grounded		. 4	P1693
	Driver Circuit Open / Grounded		5	P1481
Fan Relay Driver Circuit	Driver Circuit Short to B+	1071	3	P1482
	Driver Circuit Grounded		4	P1483
Ignition Coil Primary Driver 1 (MAG)	Driver Circuit Short to B+	1268	3	P1353
Ignition Coil Primary Driver 2 (PTO)	Driver Circuit Short to B+	1269	3	P1354
	Driver Circuit Open / Grounded		5	P0230
Fuel Pump Driver Circuit	Driver Circuit Short to B+	1347	3	P0232
	Driver Circuit Grounded		4	P0231
	Voltage Too High	0507	3	P16A2
ECU Output Supply Voltage 1	Voltage Too Low	- 3597 -	4	P16A1
	Voltage Too High	2500	3	P16A9
ECU Output Supply Voltage 2	Voltage Too Low	3598	4	P16A8
	Driver Circuit Open / Grounded		5	P1836
All Wheel Drive Control Circuit (AWD)	Driver Circuit Short to B+	520207	3	P1835
(· · · · · · · · · · · · · · · · · · ·	Driver Circuit Grounded		4	P1834
Steering Over Current Shut Down (if equipped w/EPS)	Current Above Normal or Grounded	520221	6	C1050
Steering Excessive Current Error (if equipped w/EPS)	Current Above Normal or Grounded	520222	6	C1051

Component	Condition	SPN	FMI	Digital Wrench™ P-Code
Steering Torque Partial Failure (if equipped w/EPS)	Condition Exists	520223	31	C1052
Steering Torque Full Failure (if equipped w/EPS)	Condition Exists	520224	31	C1053
EPS Inverter Temperature	Greater than 110° C (230° F)	520225	16	C1054
(if equipped w/EPS)	Greater than 120° C (248° F)	- 520225	0	C1055
EPS CAN Communications Receive Error (if equipped w/EPS)	No RX Message for 2 Seconds	520226	2	U0100
EPS CAN Communications Transmit Error (if equipped w/EPS)	No TX Message for 2 Seconds	520227	2	U1100
Position Encoder Error (if equipped w/EPS)	Position Encoder Error	520228	11	C1065
EPS Software Error (if equipped w/EPS)	Software Error	520229	12	C1070
IC CAN Communication with EPS (if equipped w/EPS)	EPS Off Line (EPS DM1 not seen)	520230	31	U0131
	Driver Circuit Open / Grounded		5	P1505
Idle Air Control Valve (IAC) M17; IAC Stepper Pin 1	Driver Circuit Short to B+	520267	3	P1509
	Driver Circuit Grounded		4	P1508
	Driver Circuit Open / Grounded		5	P1515
Idle Air Control Valve (IAC) M17; IAC Stepper Pin 3	Driver Circuit Short to B+	520268	3	P1519
	Driver Circuit Grounded		4	P1518
	Driver Circuit Open / Grounded		5	P1525
Idle Air Control Valve (IAC) M17; IAC Stepper Pin 4	Driver Circuit Short to B+	520269	3	P1529
	Driver Circuit Grounded		4	P1528
	Driver Circuit Open / Grounded		5	P1535
Idle Air Control Valve (IAC) M17; IAC Stepper Pin 6	Driver Circuit Short to B+	520270	3	P1539
,	Driver Circuit Grounded		4	P1538

DIAGNOSTIC TROUBLE CODE TABLE

EFI Troubleshooting

Fuel Starvation / Lean Mixture

Symptoms: Hard start or no start, bog, backfire, popping through intake / exhaust, hesitation, detonation, low power, spark plug erosion, engine runs hot, surging, high idle, idle speed erratic.

- No fuel in tank
- Restricted tank vent, or routed improperly
- Fuel lines or fuel injectors restricted
- Fuel filter plugged
- · Fuel pump inoperative
- Air leak in system
- Intake air leak (throttle shaft, intake ducts, air box cover)

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
- Injector failure

Poor Idle

Symptom: Idle Too High (if > 1400 RPM when warm).

- Throttle stop screw tampering
- Throttle cable sticking, improperly adjusted, routed incorrectly

Symptom: Idle Too Low (if < 1100 RPM when warm).

- Plugged air filter
- · Leaking injector (rich condition)
- Belt dragging
- · Throttle stop screw tampering

Symptom: Erratic Idle.

- Throttle cable incorrectly adjusted
- · Air Leaks, dirty injector
- MAQS damaged (check with Digital WrenchTM)
- Tight valves (low compression or high leakdown)
- Ignition timing incorrect
- · Belt dragging
- Dirty air filter
- High percentage of cylinder leakdown (worn engine)
- Low compression (worn engine)
- Spark plug(s) fouled
- · Spark plug wires loose or worn

DIGITAL WRENCH™ OPERATION

Digital Wrench™ Diagnostic Software Overview

IMPORTANT: Refer to Section 2, 3 and 4 in the Instruction Manual provided in the Digital Wrench™ Diagnostic Kit to install the Polaris Digital Wrench™ diagnostic software on your computer.

The Digital Wrench[™] diagnostic software allows the technician to perform the following tests and observations:

- View or clear trouble codes
- Analyze real-time engine data
- Reflash ECU calibration files

- Perform guided diagnostic procedures
- Create customer service account records
- Perform output state control tests (on some models)

Special Tools (also refer to page 4.2)

DIGITAL WRENCH™ DIAGNOSTIC SOFTWARE	PART NUMBER	
Digital Wrench™ Diagnostic Kit	PU-47063-A	
	Digital Wrench™ Software: PU-48731	
PU-47063-A (listed above) INCLUDES:	Standard Interface Cable: PU-47151	
	SmartLink Module Kit: PU-47471	
Fuel Pressure Gauge Kit	PU-43506-A	
Fuel Pressure Gauge Adapter	PV-48656	
Fluke 73 Digital Multi-Meter or Fluke 77 DMM	PV-43546 (Fluke 77: PV-43568)	
Laptop or Desktop Computer USB/Serial Adapter: Saelig RS-232	Commercially Available (refer to diagnostic software use manual or HELP section for minimum requirements)	

Diagnostic Software Version

Always use the most current version of the Digital WrenchTM software to ensure you have the latest updates or enhancements. New reprogramming files and guided diagnostic procedures are added to these updates as they become available. For information on how to determine if you have the latest update available, refer to "Digital WrenchTM Version and Update ID".

ECU Replacement

Although the need for ECU replacement is unlikely, a specific replacement procedure is required to ensure that all essential data contained within the original ECU is transferred to the replacement ECU.

Refer to procedure and carefully follow all instructions provided in Digital WrenchTM.

Guided Diagnostic Available

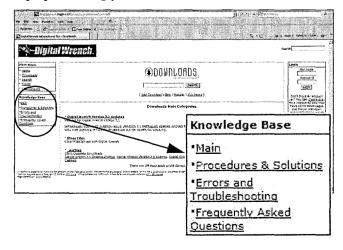
Guided diagnostics are available within Digital WrenchTM for all supported Trouble Codes (that is, any fault that will turn on the 'Check Engine' indicator).

In addition, guided diagnostics are also available for many other electrical sub systems.

Diagnostic procedures are added to subsequent versions of Digital WrenchTM as they become available. Check your release version often and upgrade when available to be sure you are using the most current software available.

Digital Wrench™ Communication Errors

If you experience problems connecting to a vehicle or any Digital WrenchTM related problem, visit the Digital WrenchTM Knowledge Base for the most current troubleshooting information, FAQs, downloads and software updates at: *http://polaris.diagsys.com/*.

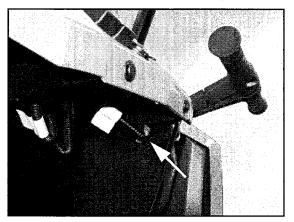


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Digital Wrench[™] - Diagnostic Connector

Located under the dash connected to a sealed plug.



Follow these steps to connect the diagnostic interface cable to the vehicle to allow Digital Wrench[™] use:

- 1. Assemble the SmartLink Module and attach the PC Interface Cable to your laptop (see page 4.3).
- 2. Remove the protective cap from the Digital Wrench[™] connector.
- 3. Connect the Vehicle Interface Cable to the Digital Wrench[™] diagnostic connector.
- 4. Turn the ignition key to the 'ON' position, select the appropriate vehicle and wait for the status to display 'Connected' in the lower left corner of the screen.
- 5. Once connected, proceed with using Digital WrenchTM.

Digital Wrench™ Serial Number Location

Open the configuration screen by clicking on the wrench icon. The serial number is located on the right side of the screen.



Digital Wrench™ Version and Update ID

Knowing what Digital WrenchTM version and update is installed will help determine which updates are required.

NOTE: Versions and updates are subject to change.

 Open the Digital WrenchTM software. Locate the version ID shown on the lower right side of the Digital WrenchTM start-up screen.

DIGINAL	
	Version: 3.3 1/20/11
	Verbori 3.3 1/2620
2011 Rzr XP 900 Status Connected	

2. In this case, the version number is 3.3 with a 1/20/11 update. Proceed to *http://polaris.diagsys.com* to see if a newer update is available.

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 In this case, a newer update (01-26-11) is available and should be downloaded before using Digital Wrench[™] (see "Digital Wrench[™] Updates").

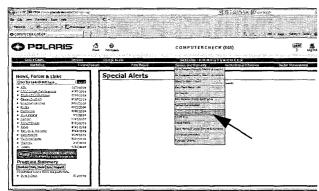
IMPORTANT: Always operate with the latest update.

Digital Wrench™ Updates

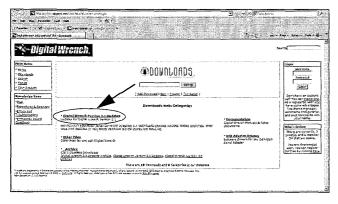
Updates are released for Digital WrenchTM via the Internet at: *http://polaris.diagsys.com*. The Digital WrenchTM website can also be accessed through the dealer website at: *www.polarisdealers.com*.

NOTE: Only authorized Polaris dealers and distributors can access the dealer website.

- 1. Log on to www.polarisdealers.com.
- 2. Locate the "Service and Warranty" drop-down menu.
- 3. Click on "Digital Wrench Updates".

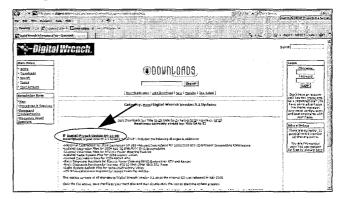


- 4. The Digital Wrench[™] portal website should appear in a new web browser.
- 5. Click on "Digital Wrench Version 3.3 Updates".



IMPORTANT: You must already have version 3.3 installed before adding these updates. They will not install if you have version 3.0 or older on your PC.

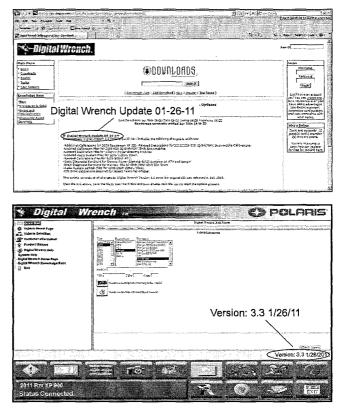
 If the update file date listed is newer than your current version and update (see "Digital Wrench[™] Version and Update ID"), download the file.



7. Click on the link shown above, save the file to your hard disk and then double-click the icon to start the update process.

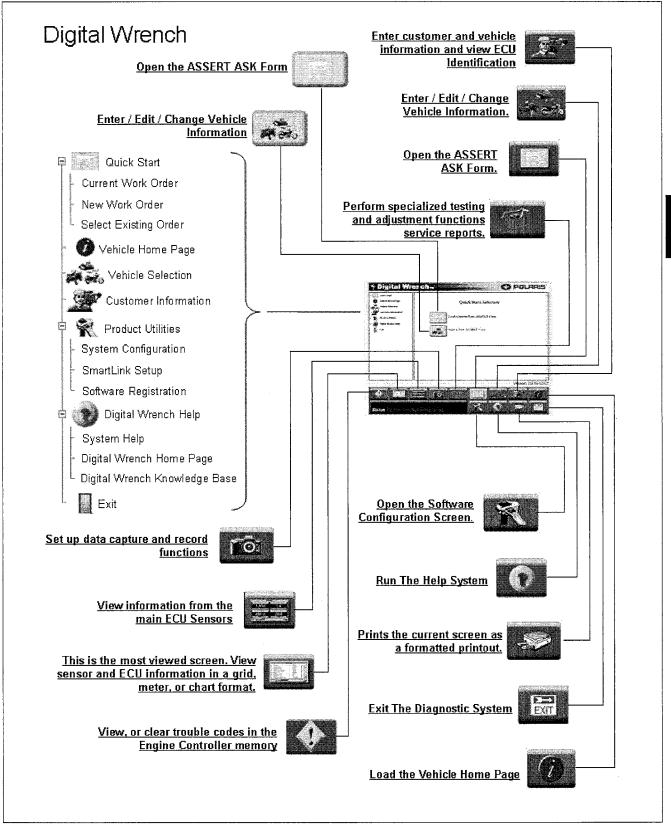
NOTE: Do not "run" or "open" the file from where they are. Select "save" and download them to your PC before running the install.

 When the update is complete, the version shown on the right side of the Digital Wrench[™] start-up screen should match the update you just downloaded.



NOTE: Versions and updates are subject to change.

Digital Wrench™ Feature Map



Engine Controller Reprogramming (Reflash)

Process Overview

The reprogramming feature is in the Special Tests menu on the Digital WrenchTM screen. Start Digital WrenchTM and click on the Special Tests menu icon (red tool box). A technician should be familiar with the process and with computer operation in general before attempting to reprogram an ECU.

The Digital Wrench[™] Engine Controller Reprogramming (or "Reflash") feature allows reprogramming of the ECU fuel and ignition map. To successfully reprogram the ECU, an Authorization Key must be obtained by entering a Request Code in the box provided on the Reflash Authorization site. The Request Code is automatically generated by Digital Wrench[™] during the reprogramming process. The Reflash Authorization site is located under the "Service and Warranty" drop down menu on the dealer website at: www.polarisdealers.com.

IMPORTANT: Failure to follow the reprogramming instructions completely and correctly can result in an engine that does not run! Replacement ECUs are programmed as "no-start" and require a reflash for them to work.

Reprogramming (Reflash) Tips:

- BATTERY VOLTAGE: The majority of problems with reprogramming can be attributed to a low battery. Be sure the battery voltage (no load) is at least 13 volts and at least 12.5 volts with the key 'ON'. Connect a battery charger if necessary to bring voltage level above minimum. Fully charge the battery before you attempt to reprogram.
- DEDICATED LAPTOP: Best results are obtained using a laptop computer that is "dedicated to Digital WrenchTM". A laptop that is used by a variety of people and in several applications around the dealership is more likely to cause a reprogramming problem than one dedicated to Digital WrenchTM diagnostics only.
- OBTAINING THE LATEST UPDATE: Reprogramming updates are provided periodically and contain the most recent calibrations (see "Digital Wrench[™] Updates").
- CLOSE NON-ESSENTIAL PROGRAMS: Polaris recommends that you DO NOT install non-essential programs on a Service Department laptop. Camera detection software, Virus Scanners, Tool Bars, etc. may clog up memory if running in the background and make it harder for the diagnostic software to operate.

- KNOW THE PROCESS: If you are not familiar with the entire reprogramming process, review the HELP section of the diagnostic software before you attempt reprogramming. Click on the ? on the tool bar or press F11. The information in the on-line help is the most current and complete information available. This should be your first step until you are familiar with the process.
- COMMUNICATION PROBLEMS: If you have had problems communicating with a vehicle while performing diagnostic functions, do not attempt reprogramming until the cause has been identified and fixed. Check all connections, and be sure battery voltage is as specified.

Proceed to *http://polaris.diagsys.com* for specific information and FAQs on how to troubleshoot communication problems.

Address Ehttp://polaris.diag	sys.com/index.php.
Main Menu * <u>Home</u>	Digital Wrench Update 04-27-09 Posted by <u>admin</u> on Friday, May 01 @ 14:55:31 CDT (5 Topic <u>Software</u>
• <u>Downloads</u> • <u>Search</u> • <u>Topics</u> • <u>Your Account</u>	Digital Wrench Version 3,1 04-27-09 is now available.
Knowledge Base	No Serial Port Need a USB Adapter for your ne Posted by <u>mike</u> on Monday, August 20 @ 13:04:17 CDT Topic Software
' <u>Errors and</u> Troubleshoating ' <u>Frequently Asked</u> Questions	es become common for computer manufacturers to ed to offer a low-cost solution.
	Communications Problems (5) Here to Fix Problems Communicating with the Vehicle

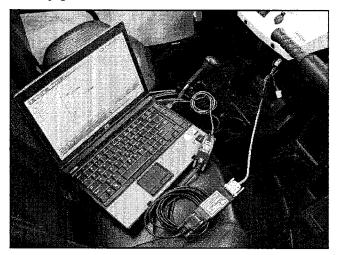
• DON'T DISTURB THE PC: While reprogramming is in progress, don't move the mouse and don't touch the keyboard. The process only takes a few minutes, and is best left alone until complete.

Reprogramming (Reflash) Procedure:

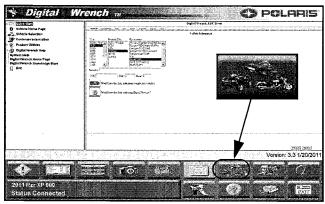
If you are not familiar with the reprogramming process, review the "Reprogramming (Reflash) Tips" before you begin. Follow the on-screen instructions as you progress through the steps. If you encounter a problem, always check the On-Line help for current tips and information.

 Verify the most current update has been downloaded and loaded into Digital Wrench[™]. See "Digital Wrench[™] Version and Update ID" on page 4.37.

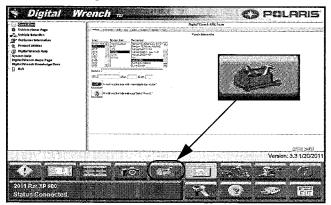
 Connect the SmartLink Module cables to the PC and vehicle. See "Digital Wrench[™] - Diagnostic Connector" on page 4.37.



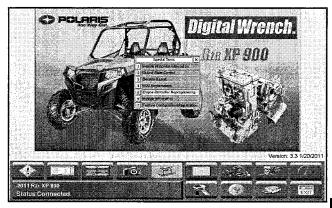
- 3. Open the Digital Wrench[™] program.
- 4. Select the model year, product line and vehicle description by selecting the "Change Vehicle Type" icon.



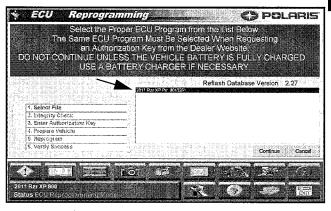
5. Select the "Special Tests" icon.



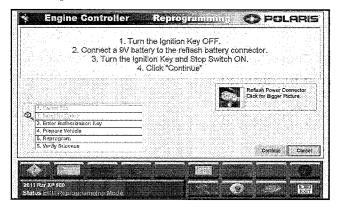
6. Select "Engine Controller Reprogramming".



7. Select the file you want to load into the ECU then click the "Continue" icon to proceed to the Integrity Check.

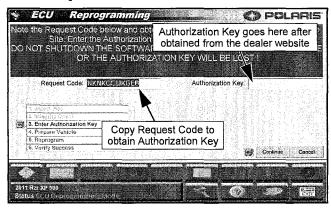


8. Follow the on screen instructions and connect a 9V battery to the reflash battery connector located off the main diagnostic connector. Click the "Continue" icon to obtain a Request Code.



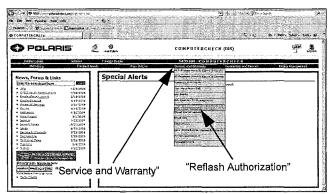
Δ

 Copy (CTRL+C) the Request Code that will be required on the dealer website in the next step. DO NOT CLOSE Digital Wrench[™] or the Request Code will be invalid. NOTE: All characters are letters; there are no numbers in a request code.

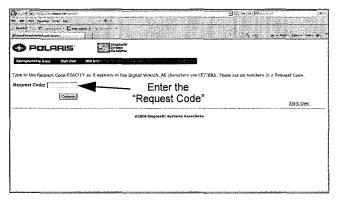


NOTE: Request Codes and Authorization Keys must be entered EXACTLY as they appear on the screen.

10. Go to *www.polarisdealers.com* and click on "ReFlash Authorization" from the "Service and Warranty" drop-down menu.



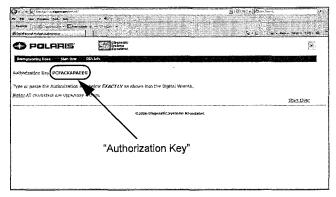
11. Enter or paste (CTRL+V) the Request Code into the box.



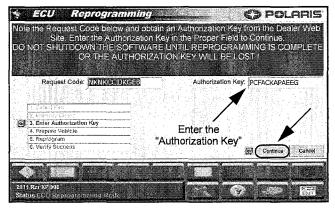
 Select the same file type from the list that you selected previously while in Digital Wrench[™]. Enter the VIN along with the customer's name and address. When completed, click the Authorize button <u>once</u> to proceed.

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Customer Zip/Postal Code.		
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Enter ALL the information and		
click on the "Authorize" button		

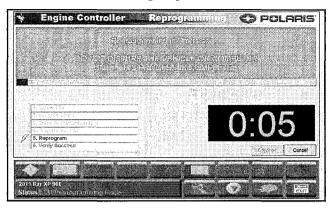
13. An "Authorization Key" will appear in the upper left corner of the screen. Copy (CTRL+C) this key exactly as it appears.



 Enter or paste (CTRL+C) the Authorization Key in the box located on the Digital Wrench[™] screen. Click the 'Continue' button and follow instructions provided on the screen to complete the reprogramming procedure.



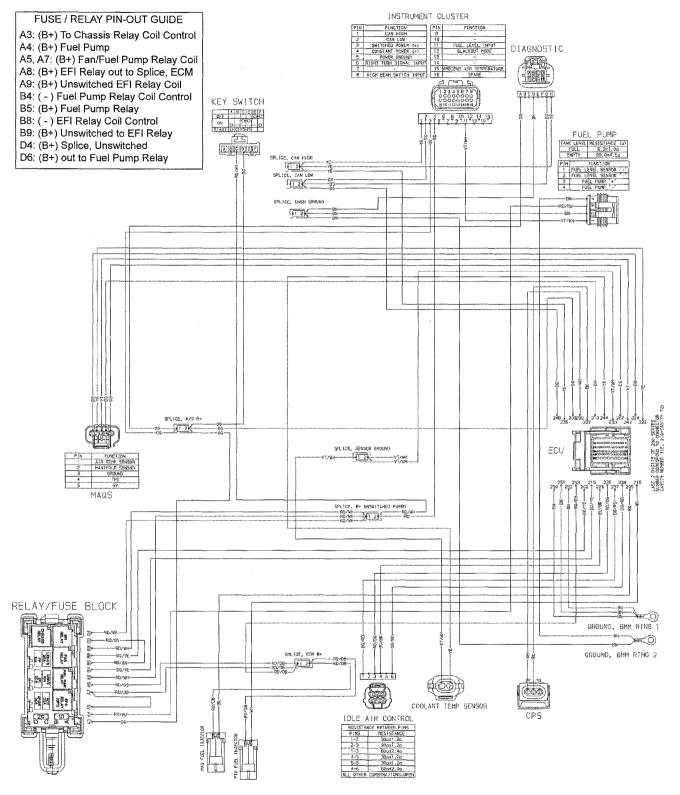
15. At this point the reflash process will begin. Do not touch the vehicle or PC during the process.



16. Once the ECU reprogramming procedure is complete, click the 'Finish' button on the screen. Verify the reflash was a success by starting the vehicle.

EFI SYSTEM ELECTRICAL OPERATION

Breakout Diagram



4.44

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CHAPTER 5 BODY / STEERING / SUSPENSION

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FOX™ SHOCK REBUILD INFORMATION		
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5

TORQUE SPECIFICATIONS

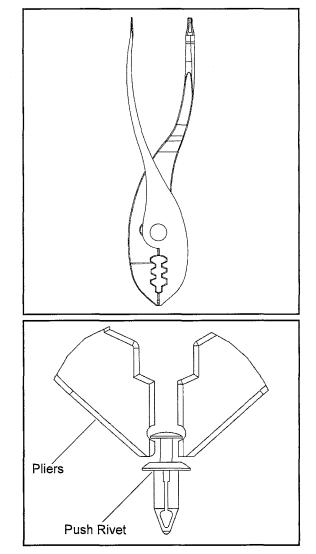
ITEM	TORQUE VALUE
Front LH/RH Upper / Lower A-Arm Bolt	50 ft. lbs. (67.7 Nm)
Outer Tie Rod to Bearing Carrier Housing	42.5 ft. lbs. (58 Nm)
Front Ball Joint Pinch Bolts	23 ft. lbs. (31 Nm)
Front Shock Mounting Bolts	50 ft. lbs. (67.7 Nm)
Rear Shock Mounting Bolts	70 ft. lbs. (95 Nm)
Wheel Hub Castle Nuts	80 ft. lbs. (108 Nm)
Wheel Nuts (Cast Aluminum Rims)	30 ft. lbs. (41 Nm) + 90° (1/4 turn)
Tie Rod End Jam Nut	13 ft. lbs. (18 Nm)
Radius Rod Mounting Bolts	50 ft. lbs. (67.7 Nm)
Trailing Arm to Main Frame Bolt	50 ft. lbs. (67.7 Nm)
Bearing Carrier to Trailing Arm Bolts	50 ft. lbs. (67.7 Nm)
Rear Brake Caliper Mounting Bolts	30 ft. lbs. (40.6 Nm)
Front Brake Caliper Mounting Bolts	31-34 ft. lbs. (42-46 Nm)
Stabilizer Bar Linkage	31-34 ft. lbs. (42-46 Nm)
Stabilizer Bar Bushing Bracket Bolts	17 ft. lbs. (23 Nm)
Stabilizer Bar Locating Clamp Bolts	10 ft. lbs. (13.5 Nm)
Seat Belt to Seat Base	40 ft. lbs. (54 Nm)
Tilt Shock Upper Fastener	7 ft. lbs. (10 Nm)
Tilt Shock Lower Fastener	12 ft. lbs. (16 Nm)
Steering Pivot Tube Fasteners	23 ft. lbs. (31 Nm)
Steering Wheel to Shaft	65 ft. lbs. (88 Nm)
Lower Steering Shaft to Box	30 ft. lbs. (41 Nm)
Steering Gear Box	17 ft. lbs. (23 Nm)

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Gas Shock Recharging Kit	2200421
Shock Shaft Seal Protector .625" Diameter	2201640
IFP Tool	PS-45908
Shock Spanner Wrench	2877408
Shock Spring Compressor Tool	2870623
Multi-Function Pliers	2876389

Multi-Function Pliers

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

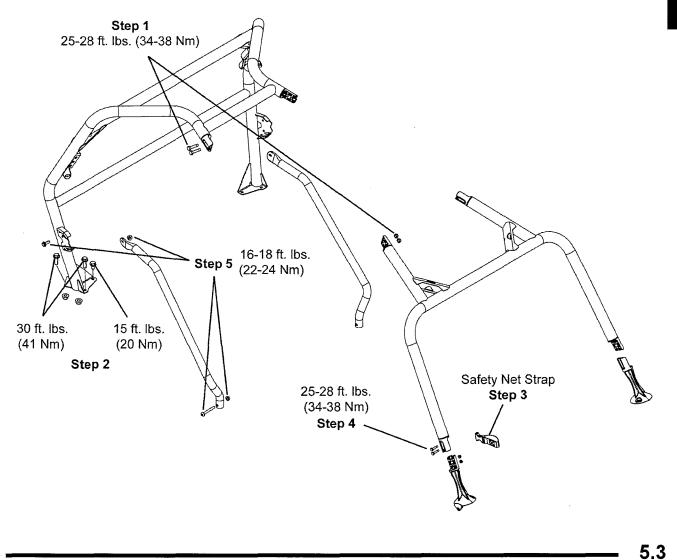


CAB FRAME

Assembly / Removal

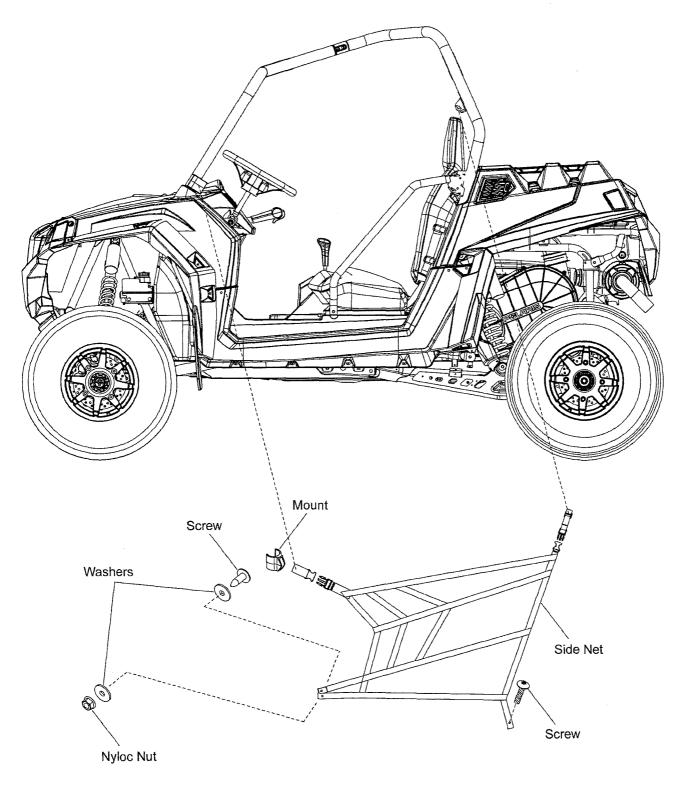
NOTE: Finger tighten all components until cab frame is completely assembled on vehicle, then tighten to specifications listed.

- 1. Assemble the rear cab frame and the front cab frame at the coupler joints and secure with four (3/8-16 x 1 1/4) screws and (3/8-16 Nyloc) nuts. Tighten screws to 25-28 ft. lbs. (34-38 Nm).
- 2. Place the assembled cab frame onto the vehicle and align the rear mount holes. Fasten the rear cab frame brackets to vehicle with four (M10x1.5x25) bolts and (M10x1.5) nuts. Tighten bolts to 30 ft. lbs. (41 Nm). Fasten the two self-tapping screws to the rear inner portion of the bracket on each side. Tighten screws to 15 ft. lbs. (20 Nm).
- 3. Place the straps from the safety net over the front coupler posts.
- 4. Fasten the front of the cab frame to the base brackets and secure with four (3/8-16 x 1 1/4) screws and (3/8-16 Nyloc) nuts. Tighten screws to 25-28 ft. lbs. (34-38 Nm).
- 5. Attach side bars to cab frame using M8 screws and nuts on top and M8 screws and nuts on the bottom. Tighten to 16-18 ft. lbs. (22-24 Nm).
- 6. To remove the cab frame, reverse the assembly procedure (steps 1-5).

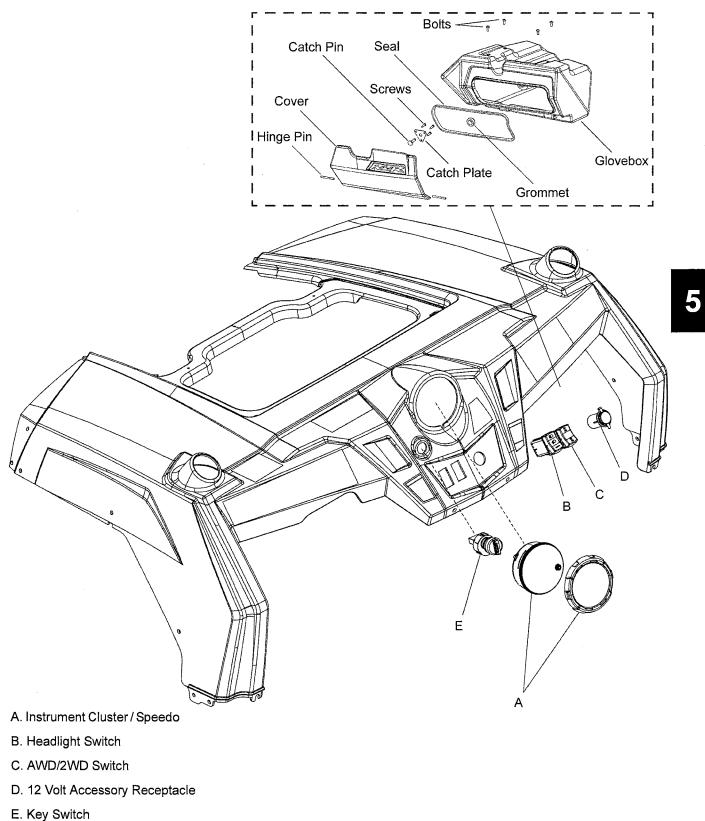


BODY EXPLODED VIEWS

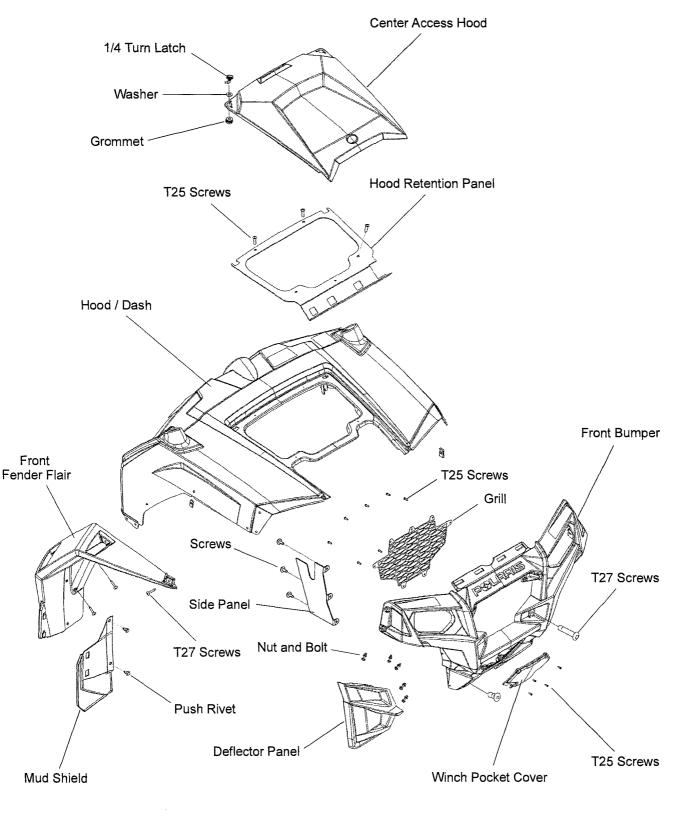
Side Safety Nets



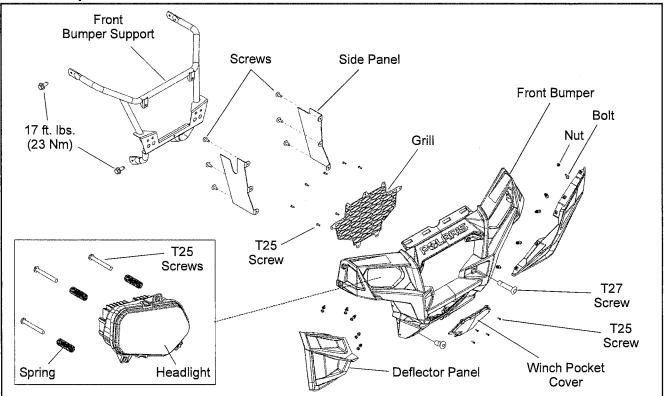
Dash Instruments / Controls / Glovebox



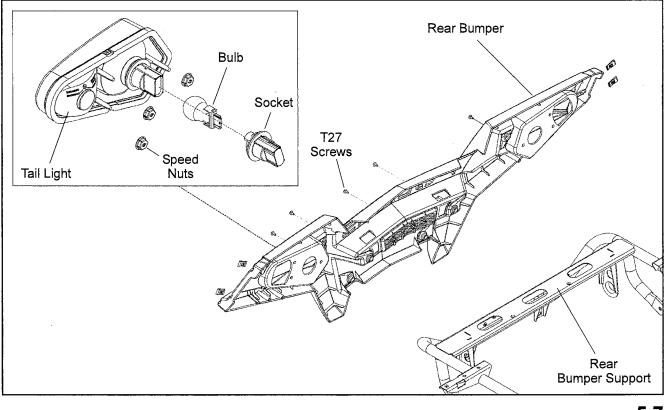
Hood / Front Body Work



Front Bumper



Rear Bumper

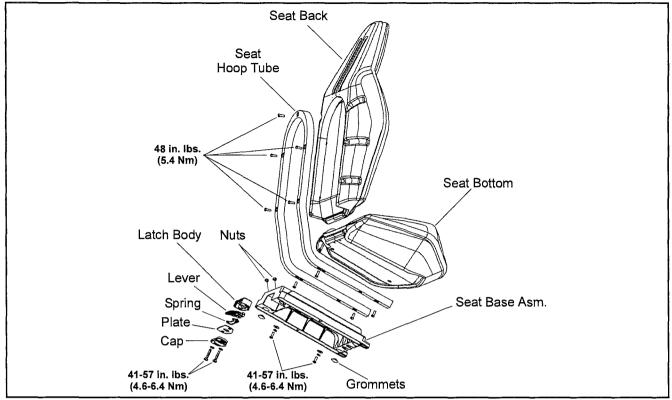


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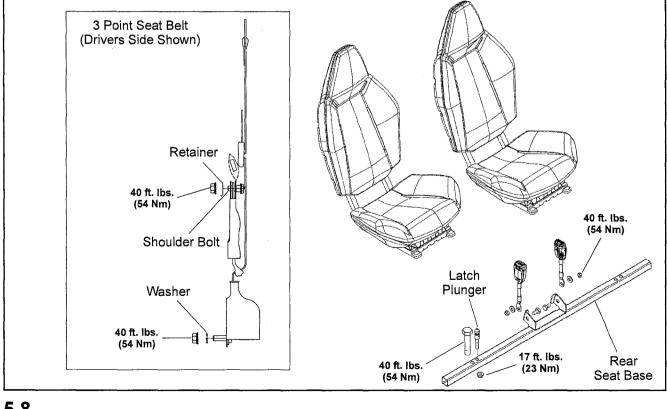
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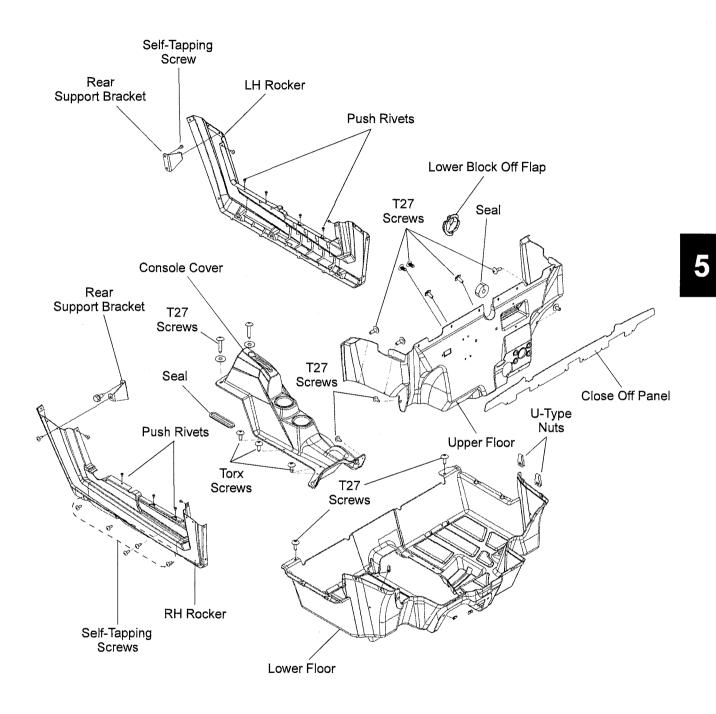
Seat Assembly



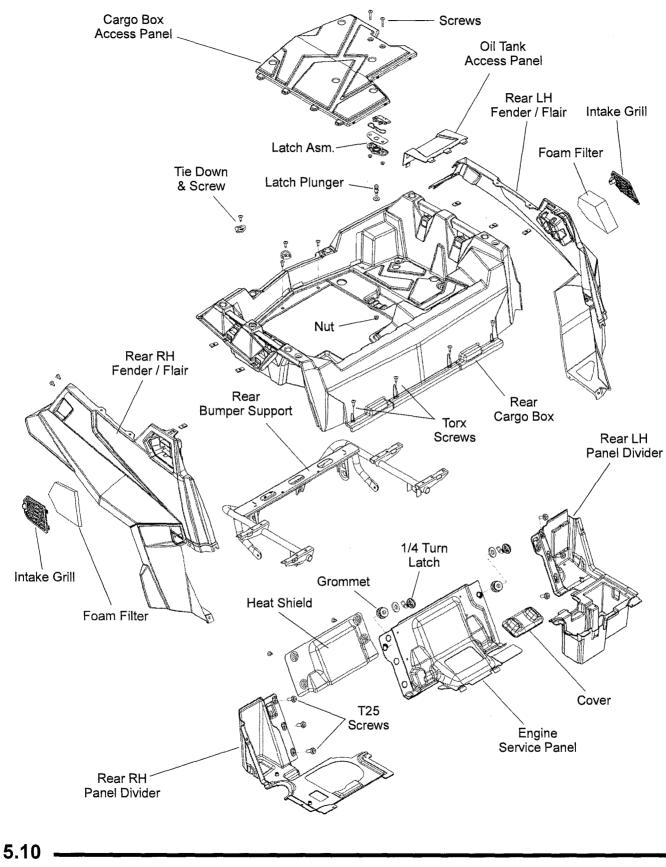
Seat Belts / Mounting



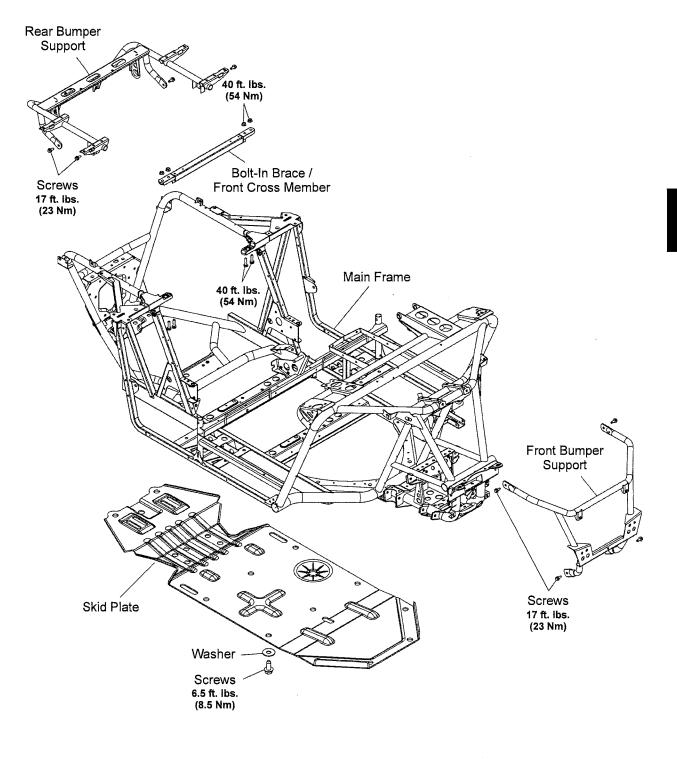
Floor / Rocker Panels



Rear Cargo Box / Fenders



Chassis / Main Frame

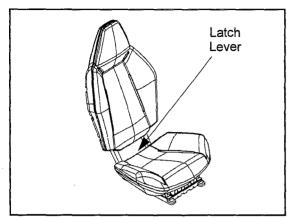


5.11

BODY COMPONENT REMOVAL

Seats

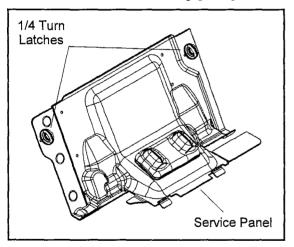
1. To remove the seats, lift upward on the latch lever located behind the seat bottom.



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

Engine Service Panel

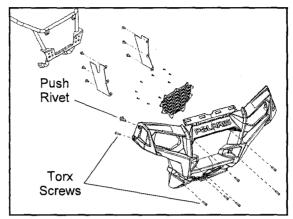
- 1. Remove driver and passenger seats.
- 2. Turn both latches 1/4 turn to disengage the panel.



3. Lift the panel upward and towards the front of the vehicle to remove it.

Front Bumper

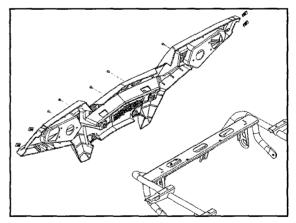
1. Remove the (2) push rivets from the sides of the front bumper.



- 2. Remove the (8) Torx screws retaining the upper, middle and lower portion of the bumper.
- 3. Disconnect the front head lamp connectors and remove the front bumper from the vehicle.

Rear Bumper

- 1. Disconnect the harness connectors at the tail lights.
- 2. Remove the (10) T-27 Torx screws retaining rear bumper to the cargo box and vehicle frame.

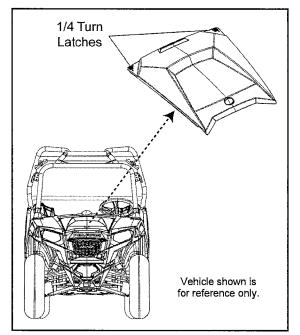


3. Remove rear bumper from vehicle.

Hood and Front Body Work

Hood Removal

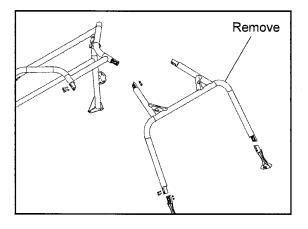
1. To remove the hood, turn both 1/4 turn latches to disengage the rear portion of the hood.



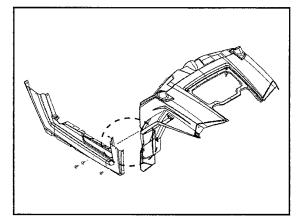
2. Tilt the hood back to disengage the front tabs and remove the hood from the vehicle.

Front Body / Dash Removal

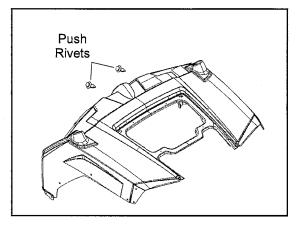
- 1. Remove the hood as previously described.
- 2. Remove the front bumper (see "BODY COMPONENT REMOVAL Front Bumper").
- 3. Remove the front portion of the cab frame assembly to allow dash removal. Refer to appropriate "CAB FRAME Assembly / Removal" procedure for assembly torque specifications.



4. Remove the push rivets and screws that attach the dash assembly to the rocker panels on each side.



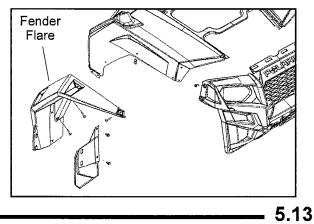
5. Remove the (2) push rivets that retain the rear portion of the dash assembly.



- 6. Disconnect all electrical dash components noting their location and wire routing.
- 7. Remove the dash assembly from the vehicle.

Front Fender Flair Removal

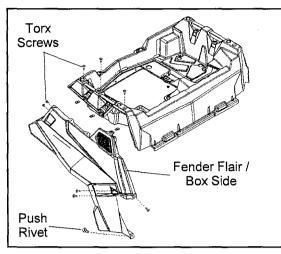
1. Remove the (6) T27 Torx screws and remove fender flairs from the dash assembly.



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Rear Fender Flair / Box Side Removal

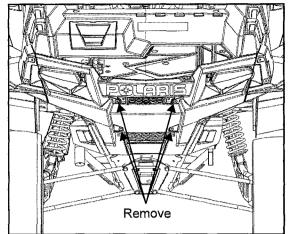
1. Remove the (8) T27 Torx screws and the (1) push rivet. Remove the fender flair / box side from the vehicle.



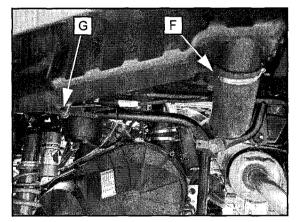
Cargo Box Assembly Removal

- 1. Remove the driver and passenger seats.
- 2. Remove the cargo box panel and the engine service panel.
- 3. Remove the (4) Torx screws (A) retaining the front of the cargo box to the vehicle frame.
- 4. Remove the (2) push rivets (B) from both the RH and LH side of the vehicle.
- 5. Remove the (4) Torx screws (C) from both the RH and LH side of the vehicle.
- 6. Remove the (2) Torx screws (D) from both the RH and LH side of the vehicle.
- 7. Remove the (6) Torx screws (E) from the rear cargo box area.

8. Remove the (4) Torx screws that attach the rear bumper to the vehicle frame.



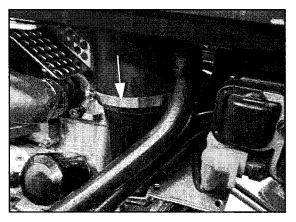
- 9. Disconnect the wire harness connectors at the tail lights.
- 10. Loosen the hose clamp (F) and disconnect the engine intake hose form the resonator box.
- 11. Remove the (2) Torx screws (G) securing the resonator box support bracket (LH side of vehicle) and the clutch intake box support bracket (RH side of vehicle).



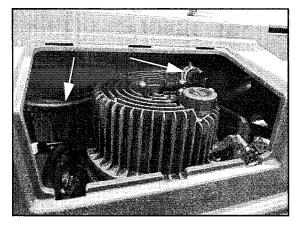


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12. Loosen the hose clamp and disconnect the clutch intake hose from the inner clutch cover.



13. Remove the vent hose from the top of the oil tank.

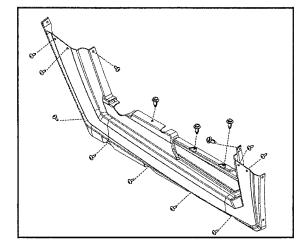


14. With the aid of an assistant, carefully lift and guide the cargo box assembly up and off the vehicle frame. Make note of wire and hose routings for reassembly.

Rocker Panels, Console and Floor

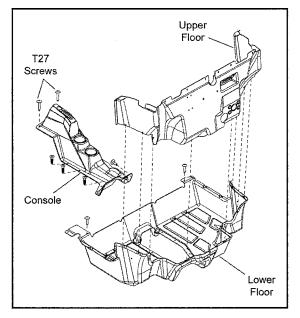
Rocker Panel Removal

1. Remove the push rivets and Torx screws retaining the rocker panel and remove panel from the vehicle.



Console and Lower Floor Removal

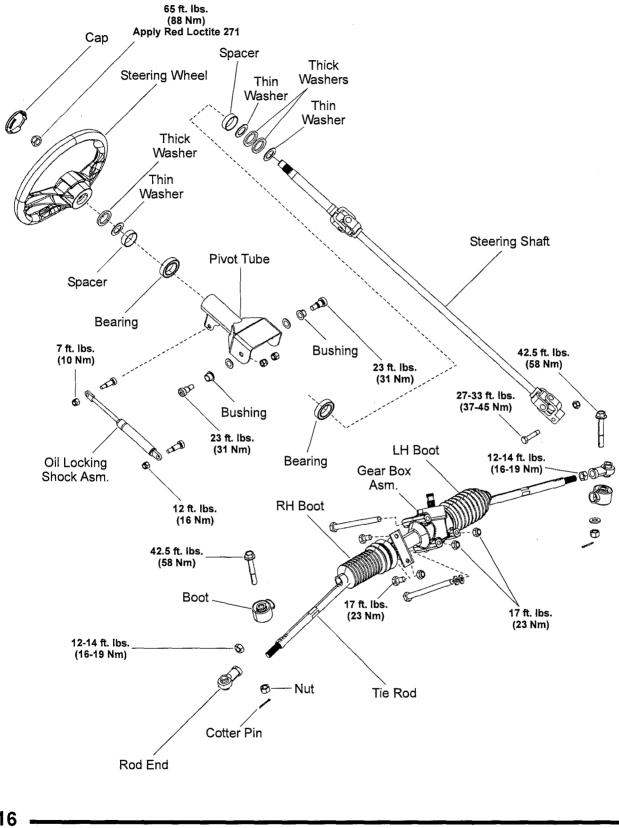
- 1. Remove both seats and rocker panels (see "Rocker Panel Removal").
- 2. Remove the T27 screws retaining the console to the floor.
- 3. Remove the shift handle knob and remove the console.



- 4. Remove the Torx screws retaining the upper floor to the lower floor.
- 5. Remove the Torx screws retaining the rear portion of the floor and remove the lower floor from the vehicle.

STEERING ASSEMBLY

Exploded View



Steering Wheel Removal

CAUTION

This procedure should NOT be used on EPS models. Using this procedure on an EPS model can permanently damage the EPS unit and cause a Power Steering Fault.

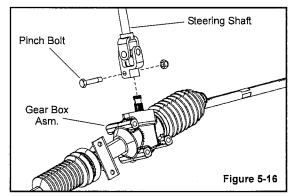
- 1. Remove the steering wheel cap.
- 2. Loosen the nut and back it half way off the steering shaft.
- 3. With a glove on your hand, place it under the steering wheel. Lift upward on the inner portion of the steering wheel while using a hammer to strike the steering shaft nut.

IMPORTANT: If the steering wheel will not pop loose, proceed to "Steering Shaft Removal".

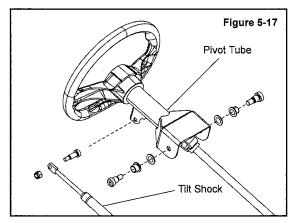
4. Once the steering wheel pops loose, completely remove the nut and lift the steering wheel off the shaft.

Steering Shaft Removal

1. Remove the pinch bolt retaining the lower portion of the steering shaft to the steering gear box assembly.



2. Remove the fastener retaining the upper portion of the steering wheel tilt shock to the pivot tube.



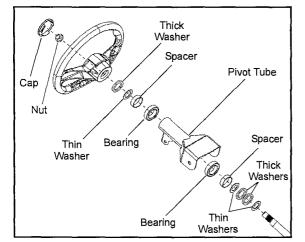
- 3. Remove the (2) fasteners that retain the pivot tube.
- 4. Remove the steering shaft, pivot tube and steering wheel from the vehicle as an assembly.
- 5. Refer to steps 11-13 of the "Steering Shaft Bearing Replacement" procedure for installation.

Steering Shaft Bearing Replacement

IMPORTANT: Replacement pivot tube assembly comes with new upper and lower bearings installed. Use this procedure if replacing just the bearings only.

- 1. Perform the "Steering Shaft Removal" procedure.
- 2. Remove the steering wheel cap and retaining nut.
- 3. Press steering shaft out of the steering wheel and pivot tube.
- 4. Note the order and location of the washers and spacers between the steering wheel and pivot tube.
- 5. Drive the bearings out of the pivot tube using a drift punch.
- 6. Inspect the pivot tube bearing surfaces for signs of excessive wear or damage.
- 7. Apply Loctite[®] 271[™] (Red) to the outer circumference of the new lower bearing race. Slide the new lower bearing onto the steering shaft and install the steering shaft through the pivot tube.

NOTE: Use care not to allow any of the Loctite $^{\mbox{\scriptsize \ensuremath{\mathbb{B}}}}$ to get in the bearing.



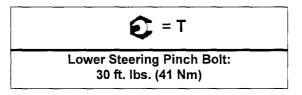
NOTE: Be sure the lower washers and spacers are still on the steering shaft.

8. Apply Loctite[®] 271[™] (Red) to the outer circumference of the new upper bearing race. Slide the new upper bearing onto the steering shaft and press it into the pivot tube by hand.

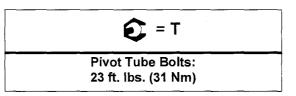
NOTE: Use care not to allow any of the Loctite $^{\ensuremath{\mathbb{B}}}$ to get in the bearing.

NOTE: Bearings will be seated in the pivot housing upon tightening the steering wheel nut in step 14.

- 9. Reinstall the upper washers and spacers in the order in which they were removed.
- Install the steering wheel and hand tighten the nut. Apply Loctite[®] 271[™].
- 11. Reinstall the steering shaft assembly in the vehicle. Install the lower portion of the steering shaft onto the steering gear box assembly (see Figure 5-16). Torque the lower pinch bolt to specification.



12. Install the (2) fasteners that retain the pivot tube (see Figure 5-17). Torque fasteners to specification.



13. Install the fastener retaining the upper portion of the steering wheel tilt shock to the pivot tube (see Figure 5-17). Torque fastener to specification.

14. Be sure the front wheels are facing straight forward. Remove the steering wheel and align as needed. Torque the steering wheel nut to 65 ft. lbs. (88 Nm). Apply Loctite[®] 271[™]

- 15. Wipe the pivot tube clean of any excess Loctite®.
- 16. Install steering wheel cap and field test steering operation.

·······

5.18

FRONT A-ARMS

Removal / Replacement

The following procedure details upper and lower A-arm removal and replacement on one side of the vehicle.

- 1. Elevate and safely support the front of the vehicle and remove the front wheel.
- 2. Remove lower shock fastener (A) from the upper A-arm.
- 3. Remove upper ball joint pinch bolt (B) from bearing carrier.
- 4. Using a soft face hammer, tap on bearing carrier to loosen the upper A-arm ball joint end while lifting upward on the upper A-arm. Completely remove the ball joint end from the bearing carrier.
- 5. Remove the front bumper to allow A-arm bolt removal.
- 6. Loosen and remove the upper A-arm through-bolt fastener (C) and remove the upper A-arm from the vehicle.
- 7. Examine A-arm bushings and pivot tube (D). Replace if worn. Discard hardware.

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

- 8. If not replacing the A-arm, thoroughly clean the A-arm and pivot tube.
- 9. Install new ball joint into A-arm. Refer to "Ball Joint Replacement" section.
- 10. Insert new A-arm bushings and pivot tube into new A-arm.
- 11. Install new upper A-arm assembly onto vehicle frame. Torque new bolt to specification.
- 12. Insert upper A-arm ball joint end into the bearing carrier. Install upper ball joint pinch bolt (B) into the bearing carrier and torque bolt to specification.
- 13. Attach shock to A-arm with fastener (A). Torque lower shock bolt to specification.
- 14. Remove lower ball joint pinch bolt (E) from bearing carrier.
- 15. Using a soft face hammer, tap on bearing carrier to loosen the lower A-arm ball joint end while pushing downward on the lower A-arm. Completely remove the ball joint end from the bearing carrier.
- 16. Loosen and remove the lower A-arm through-bolt fastener (F) and remove the lower A-arm from the vehicle.
- 17. Examine A-arm bushings and pivot tube (D). Replace if worn. Discard hardware.

- 18. If not replacing the A-arm, thoroughly clean the A-arm and pivot tube.
- 19. Install new ball joint into A-arm. Refer to "Ball Joint Replacement" section.
- 20. Insert new A-arm bushings and pivot tube into new A-arm.
- 21. Install new lower A-arm assembly onto vehicle frame. Torque new bolt to specification.
- 22. Insert lower A-arm ball joint end into the bearing carrier. Install lower ball joint pinch bolt (E) into the bearing carrier and torque bolt to specification.

WARNING

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

) = T

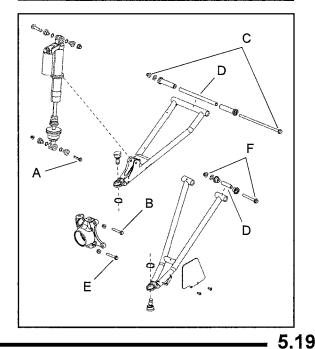
Front Upper / Lower A-arm Bolts: 50 ft. lbs. (67.7 Nm)

🗊 = Т

Front Ball Joint Pinch Bolts: 23 ft. lbs. (31 Nm)

T = T

Shock Mounting Bolts: 50 ft. lbs. (67.7 Nm)

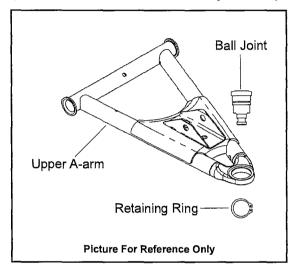


BALL JOINT SERVICE

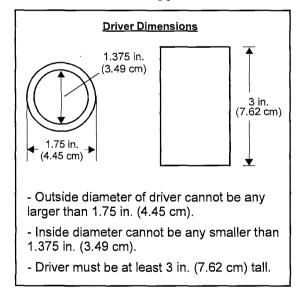
Removal

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

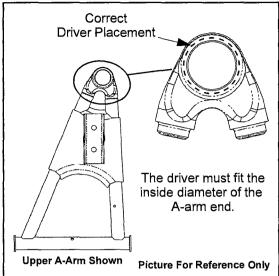
1. The A-arm must be removed to perform this procedure (see "FRONT A-ARMS - Removal / Replacement").



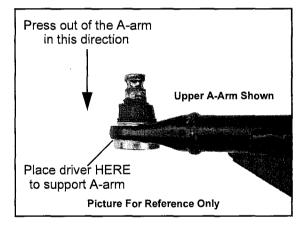
- 2. Remove the retaining ring from the ball joint.
- 3. A driver must be used for the removal of the ball joint. Use the dimensions below to fabricate or locate the correct size driver to use in the following process.



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

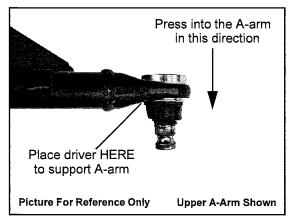


NOTE: The driver must fit the ball joint housing in the A-arm. This will allow the ball joint to be properly pressed out of the A-arm without damaging the Aarm.

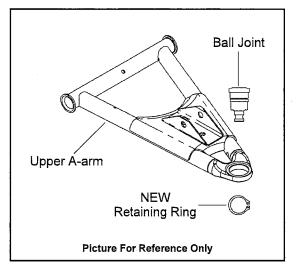


Installation

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



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



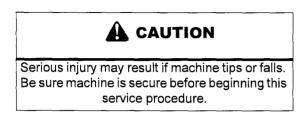
- Reinstall the A-arm (see "FRONT A-ARMS Removal / Replacement").
- 4. Repeat the ball joint service procedure for any additional A-arm ball joint replacements.

REAR RADIUS RODS

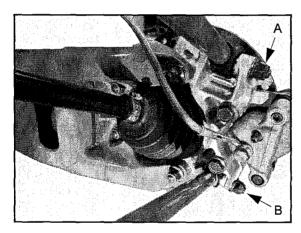
Removal / Installation

The following procedure details upper and lower radius rod removal and replacement on one side of the vehicle. Repeat the following steps to remove the A-arm from the opposite side.

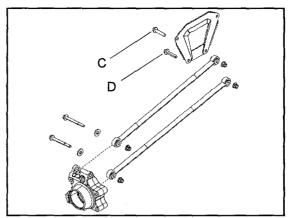
1. Raise and support vehicle by main frame.



- 2. Remove the rear wheel nuts and rear wheel.
- 3. Identify / mark radius rods "upper" and "lower".
- 4. Remove the nut, bolt and washer (A and B) attaching the upper and lower radius rod to the bearing carrier. Discard the nuts.

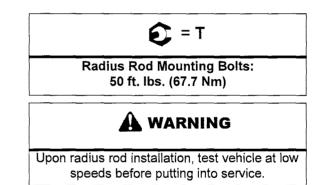


5. Remove bolts (C and D) attaching radius rods to the vehicle frame. Discard the nuts.



- 6. Remove radius rods from vehicle.
- 7. Examine radius rod shafts, boots and spherical bearings. Replace entire radius rod if any excessive wear is evident.
- 8. Reverse this procedure to reinstall the radius rods.
- 9. Torque all fasteners to specification.

NOTE: Use new attaching nuts upon installation of the rear radius rods.

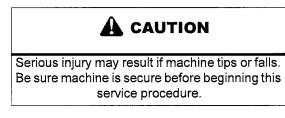


REAR TRAILING ARM

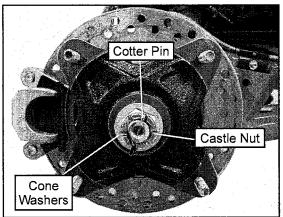
Trailing Arm Removal / Installation

NOTE: Use new attaching nuts upon installation of the rear trailing arm and bearing carrier.

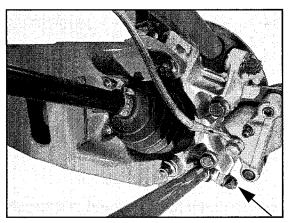
1. Raise and support vehicle by main frame.



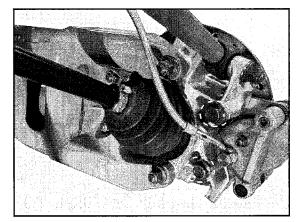
- 2. Remove the (4) wheel nuts and remove the rear wheel.
- 3. Remove the cotter pin and loosen the rear wheel hub castle nut. Remove the nut, and (2) cone washers from the rear wheel hub assembly.



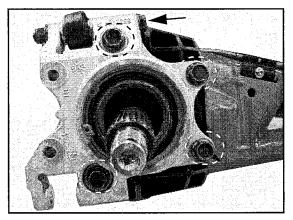
4. Remove the lower radius rod mounting bolt, nut and washer from the bearing carrier. Swing radius rod down. Discard the nut.



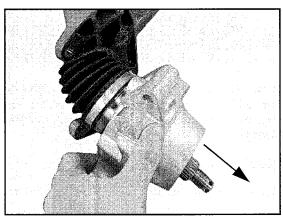
Remove the two brake caliper mounting bolts.
 CAUTION: Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.



- 6. Remove the rear wheel hub and brake disk assembly.
- 7. Remove the (5) remaining bolts that attach the rear bearing carrier to trailing arm. Discard the nuts.

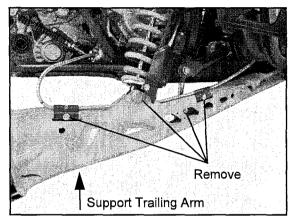


8. Remove the bearing carrier from the rear drive shaft and trailing arm.

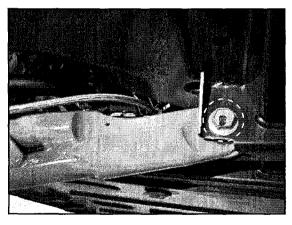


5

- 9. Rotate bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion. Replace bearing if moisture, dirt, corrosion, or roughness is evident (see Chapter 7).
- 10. Remove the (2) fasteners that secure the brake line retainers to the trailing arm.
- 11. Remove the lower stabilizer bar linkage fastener. Discard the nut.
- 12. Support trailing arm with suitable jack stand or support.
- 13. Remove the lower shock bolt. Discard the nut.



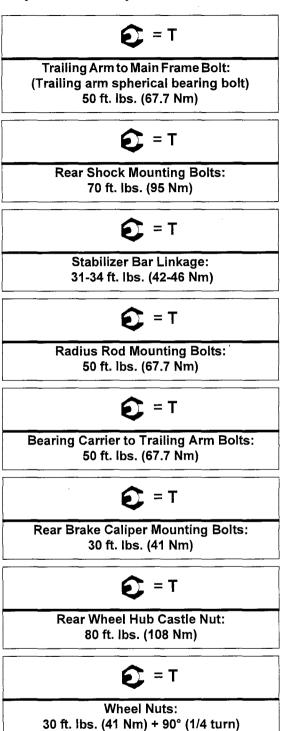
14. Remove the front trailing arm bolt. Discard the nut.



- 15. Remove trailing arm from vehicle. Visually inspect trailing arm, bushings and spherical bearing for wear. If bearing requires replacement, refer to "Trailing Arm Spherical Bearing Replacement".
- 16. Replace trailing arm if physically damaged.
- 17. Reverse this procedure to reinstall the rear trailing arm.

NOTE: Use new fastener nuts upon installation of the rear trailing arm and bearing carrier.

18. Torque all fasteners to specification.



WARNING

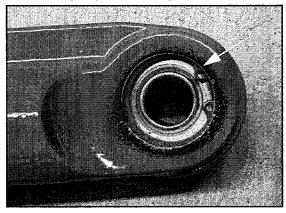
Upon rear trailing arm installation, test vehicle at low speeds before putting into service.

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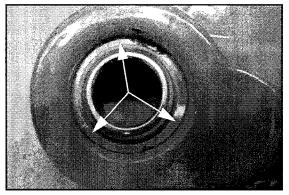
Trailing Arm Spherical Bearing Replacement

- 1. Remove trailing arm as outlined in this chapter.
- 2. Inspect spherical bearing for wear.
- 3. Remove snap ring that retains spherical bearing.

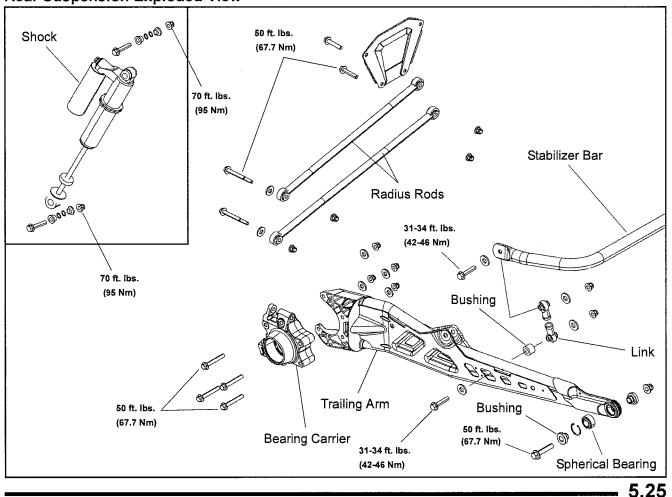


4. Properly support trailing arm so spherical bearing can be pressed out. Press bearing out of trailing arm.

5. Only press on outer most surface of the bearing race, do not press on the center spherical bearing.



- 6. Inspect trailing arm bearing housing for wear or damage. Replace trailing arm if damaged.
- 7. Press bearing in until fully seated into trailing arm casting.
- 8. Install spherical bearing and new snap ring.



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Rear Suspension Exploded View

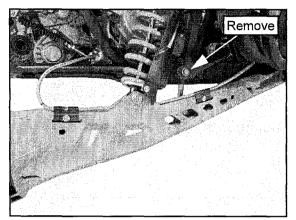
5

REAR STABILIZER BAR

Removal / Installation

Stabilizer Bar Removal

- 1. Lift and support vehicle by main frame.
- 2. Remove rear wheels nut and wheels.
- 3. Identify / mark top side of the stabilizer bar to reference during installation.
- 4. Remove the fasteners retaining the stabilizer bar to the linkage on each side of the vehicle.



- 5. Remove the (4) fasteners retaining the stabilizer bar to the vehicle frame (see below).
- 6. Remove the bushing brackets and bushings for ease of removal.
- 7. Carefully remove the stabilizer from the LH wheel well area of the vehicle.
- 8. Mark the location and remove the two stabilizer bar locating clamps (if replacing stabilizer bar).

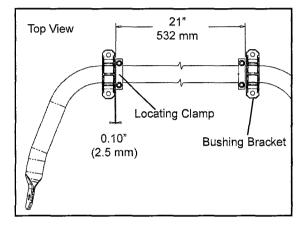
9. Inspect the stabilizer bar for straightness. Inspect the pivot bushings and replace if needed.

Stabilizer Bar Installation

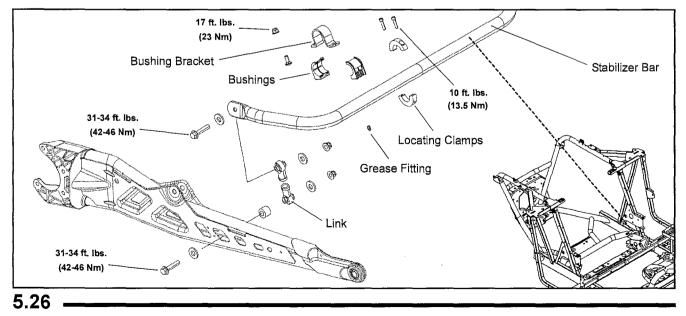
10. Carefully install stabilizer bar through the LH wheel well area.

NOTE: Be sure fuel lines and shift cable are routed ABOVE the stabilizer bar.

- 11. Fully install stabilizer bar, bushings, bracket and bracket fasteners and stabilizer links. Center stabilizer bar in the frame. Torque fasteners to specification (see below).
- Install stabilizer bar locating clamps on the INSIDE of the pivot bushing and brackets. There should be a 0.10" (2.5mm) gap between the bushing face and the locating clamps. Torque locating clamps fasteners to specification.



- 13. Torque all fasteners to specification (see below).
- 14. Lubricate stabilizer bar pivot bushings via grease fitting (fittings are accessible through skid plate).
- 15. Install rear wheels and wheel nuts. Torque wheel nuts to 30 ft. lbs (41 Nm) + 1/4 turn.



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DECAL REPLACEMENT

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.



Do not flame treat components that are installed on the vehicle. Remove the component from the vehicle before flame treating.

The body cab components are plastic polyethylene material. Therefore, they must be "flame treated" prior to installing a decal to ensure good adhesion. A bonus of the flame treating procedure is it can be used to reduce or eliminate the whitish stress marks that are sometimes left after a fender or cab is bent, flexed, or damaged.

CAUTION

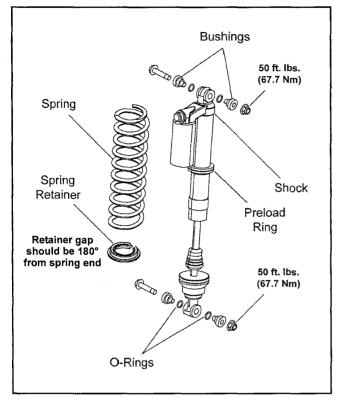
Do not flame treat painted plastic components. Painted plastic surfaces should only be wiped clean prior to decal adhesion.

To flame treat the decal area:

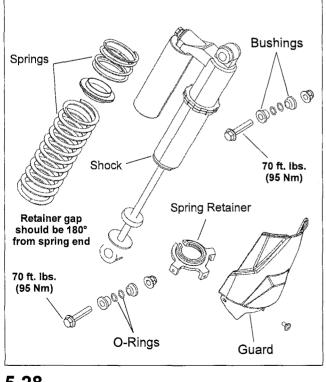
- 1. Pass the flame of a propane torch back and forth quickly over the area where the decal is to be applied until the surface appears slightly glossy. This should occur after just a few seconds of flame treating. Do not hold the torch too close to the surface (2-3 inches from the flame tip is recommended). Keep the torch moving to prevent damage.
- 2. Apply the decal on one edge first. Slowly lay down remainder of the decal while rubbing lightly over the decal surface to eliminate any air bubbles during the application.

SHOCKS / SPRINGS / FASTENERS

Front Shock Exploded View

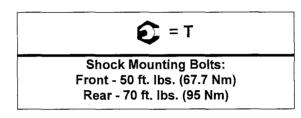


Rear Shock Exploded View



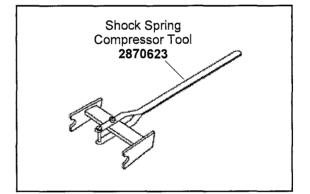
Shock Removal / Installation

- 1. Elevate the vehicle off the ground to relieve the suspension load.
- 2. Support under A-arm or trailing arm.
- 3. Remove the upper and lower fasteners retaining the shock and remove the shock from the vehicle. Discard nuts and replace with new upon installation.
- 4. Reverse the procedure to reinstall the shock. Torque new fasteners to specification (refer to exploded views).



Shock Replacement

- 1. Remove the shock and note the spring preload distance (see Chapter 2 for factory settings).
- 2. Loosen the jam nut and adjustment ring until the spring is loose. If needed, use a spring compressor to compress the spring far enough to remove the spring retainer.



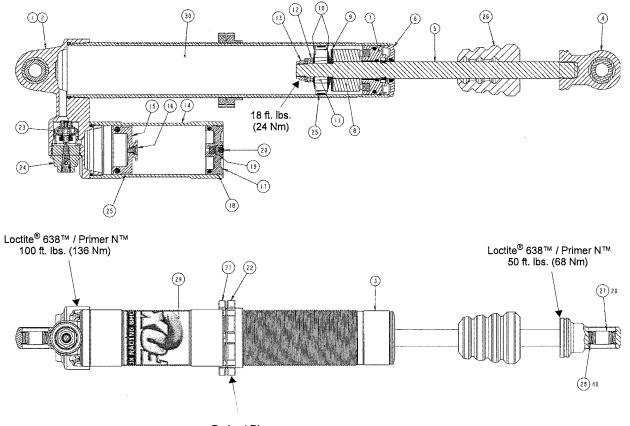
- 3. Remove the spring and spring retainer from the existing shock and install components onto the new shock.
- 4. Install the spring(s) and spring retainer.

IMPORTANT: The spring retainer gap should be 180° from the end of the spring upon installation.

- 5. Tighten the spring adjustment ring to set the preload distance noted in Step 1 (see Chapter 2 for factory settings).
- 6. Reinstall the shock onto the vehicle and torque new fasteners to specification.

FOX™ SHOCK EXPLODED VIEWS

FOX[™] 2.0 'Piggyback' Shock



Preload Ring 10 ft. lbs. (14 Nm)

Ref.	Qty	Description	Ref.	Qty	Description
1.	1	Body Cap Asm.	16.	1	Screw Asm.
2.	1	Body Cap	17.	1	Reservoir End Cap Asm.
3.	1	Body	18.	1	Retaining Ring
4.	1	Eyelet	19.	1	Pellet Retainer Set Screw, Air Valve
5.	1	Shaft	20.	1	Nylon Ball, Air Valve
6.	1	Bearing Cap Asm.	21.	1	Preload Ring, Jam Nut
7.	1	Bearing Asm.	22.	1	Preload Ring
8.	1	Spacer	23.	1	Damping Adjust Asm., Piston
9.	1	Plate, Top-Out	24.	1	Damping Adjust Asm., Concentric Adjuster
10.	1	Valving Asm.	25.	2	Bearing, External
11.	1	Piston, Damping	26.	1	Bumper
12.	2 or 3	Plate, Back-Up	27.	2	Bearing, Spherical
13.	1	Lock Nut	28.	4	Retaining Ring
14.	1	Reservoir	29.	1	Decal
15.	1	Piston Asm, Floating (IFP)	30.	-	Shock Oil (2870995)

FOX™ SHOCK SERVICE

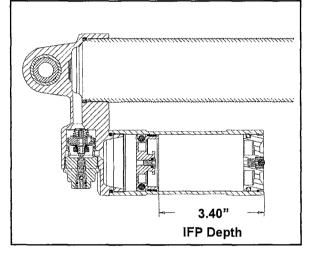
General Service Information

Recommended Service Intervals

FOX[™] Racing Shocks will perform the best if serviced at regular intervals:

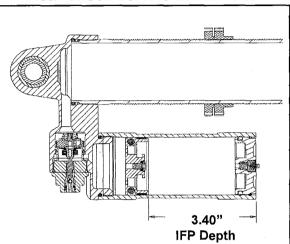
- Every ride Wash and dry the vehicle and suspension
- Every 100 hours Visually inspect shock seals
- Every 200 hours or 24 months Change shock oil and replace seals

Front Shock Service Information



SHOCK DESIGN DETAILS		
Travel	6.62"	
Extended Length	22.87"	
IFP Location	3.40"	
Nitrogen Pressure	200 psi +/- 5%	
Gas Shock Oil	2870995 (qt.)	

SHOCK VALVING		
COMPRESSION	REBOUND	
1.600 x 0.0080	1.425 x 0.012	
1.600 x 0.0060	1.350 x 0.012	
1.600 x 0.012	1.250 x 0.015	
1.425 x 0.012	1.100 x 0.015	
1.350 x 0.012	0.950 x 0.015	
1.250 x 0.012	0.800 x 0.010	
1.100 x 0.012	0.800 x 0.015	
0.950 x 0.012	0.875 x .100 Back-Up	
1.570 x 0.128 Top-Out	0.875 x .100 Back-Up	
	0.875 x .100 Back-Up	
Piston Orifice: 2x 0.070		



SHOCK DESIGN DETAILS		
Travel	7.63"	
Extended Length	22.74"	
IFP Location	3.40"	
Nitrogen Pressure	200 psi +/- 5%	
Gas Shock Oil	2870995 (qt.)	

SHOCK VALVING		
COMPRESSION	REBOUND	
1.600 x 0.012	1.425 x 0.010	
1.425 x 0.012	1.350 x 0.010	
1.350 x 0.012	1.100 x 0.010	
1.250 x 0.012	1.100 x 0.010	
1.100 x 0.012	0.950 x 0.010	
0.950 x 0.012	0.800 x 0.010	
1.570 x 0.128 Top-Out	0.875 x 0.100 Back-Up	
,	0.875 x 0.100 Back-Up	
	0.875 x 0.100 Back-Up	
Piston Orifice: 1x 0.098		

Rear Shock Service Information

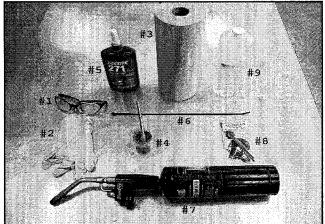
FOX[™] Shock Rebuild Information

When performing maintenance on FOXTM shocks, use the Gas Shock Recharging Kit (PN 2200421), as it contains the necessary valves, pressure gauge, and fittings to deflate and pressurize shocks.



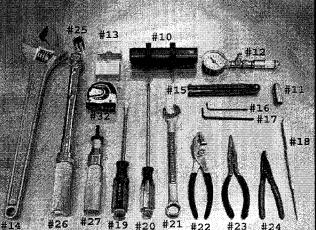
FOX[™] shocks contain high pressure nitrogen gas. Extreme caution must be used while handling and working with FOX[™] shocks and related high pressure service equipment. The pressure must be released from the shock before disassembly. It is strongly recommended you wear safety glasses and ear protection during these procedures.

TIP: Extreme cleanliness is very important during all disassembly and reassembly operations. This prevents dirt or foreign particles from entering the shock, which causes premature failure.



- 1. Safety Glasses
- 2. Latex Gloves
- 3. Lint Free Towels
- 4. Assembly Lube (lithium based grease)
- 5. Loctite #271
- 6. 12" Tie Wrap (Zip Tie)
- 7. MAPP Gas or Propane Torch
- 8. 1.834 TC Seal Kit
- 9. 5wt. Shock Fluid

Special Tools Required:Body Holding Tool (PN 2871071)Charging Needle (PN 7052069-A)Gas Shock Recharging Kit (PN 2200421)FOX™ Shock IFP Tool (PN 2871351)Seal Installation Bullet Tool (PN 2201640) (PN 2201639)



- 5
- 10. IFP Depth Setting Tool 11. Seal Installation Bullet (5/8") 12. Nitrogen Safety Needle 13. 5/8" Shaft Clamps 14. Adjustable Wrench 15. Pin Spanner Wrench (3/16" Pins) 16. 3/32" Hex Key (Allen Wrench) 17. 5/32" Hex Key (Allen Wrench) 18. Scribe or Dental Pick 19. 1/4" Flat Blade Screwdriver 20. #2 Phillips Screwdriver 21. 3/4" Open End Wrench 22. Standard Pliers 23. Small Needle Nose Pliers 24. Snap Ring Pliers 25. Socket 26. Torque Wrench 27. Torque Driver 28. Soft Faced Rubber Mallet 29. Nitrogen Tank w/ Regulator **30. Cleaning Solvent**
- 31. Vise with soft jaws
- 32. Tape Measure

FOX[™] Shock Disassembly

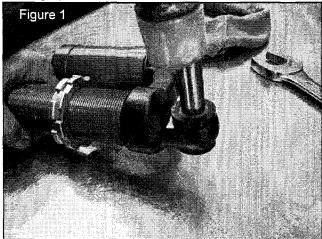
NOTE: Read through all of these instructions first to familiarize yourself with the rebuild procedure. Make sure you have a clean work area, and all of the necessary tools are available. Always use proper safety equipment when working on shock absorbers.

NOTE: Clean the entire shock assembly with soapy water. Try to remove as much dirt and grime as possible by scrubbing with a soft bristle brush. Never pressure wash your shock, as this can force water and debris inside which will damage the seals. Dry the shock assembly with compressed air, if available, or use clean towels.

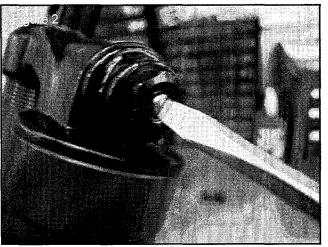
1. If your shock DOES NOT have a spring installed, skip to Step #4.

Measure the spring set length (Fig. 1). Record this number.

- 2. Back the preload adjustment ring off until spring is loose on the body. Remove the lower spring retaining clip.
- 3. Remove the spring.
- 4. If the shock has spherical bearings in the body cap or shaft eyelet, remove the reducer bushings and O-rings from both ends of the shock. If your shock has polyurethane bushings and sleeves, remove them from both ends of the shock (Fig. 1).



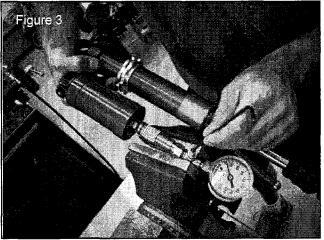
5. Note and record the setting on the Compression Adjuster Screw. Using the Flat Blade Screwdriver, count the clicks as you turn the adjuster clockwise until it stops (Fig. 2). Once you have written this number down, turn the screw all the way counterclockwise until it stops.



- 6. Clean the entire shock assembly with soapy water. Try to remove as much dirt and grime as possible by scrubbing with a soft bristle brush. Never pressure wash your shock, as this can force water and debris inside which will damage the seals. Dry the shock assembly with compressed air, if available, or use clean towels.
- 7. Remove the nylon valve cap from the FOX[™] air valve located in the reservoir end cap.
- 8. Securely clamp FOX[™] Nitrogen Safety Needle in vise.

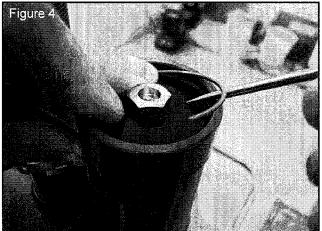
Point air valve away from face and body when charging or discharging any shock.

9. Insert the FOX[™] Safety Needle squarely into center of gas valve (Fig. 3).



- 10. Using a blunt object, depress the air valve core to release pressure.
- 11. When the shock is fully discharged, pull reservoir away from the FOX[™] Safety Needle in a straight, smooth motion.

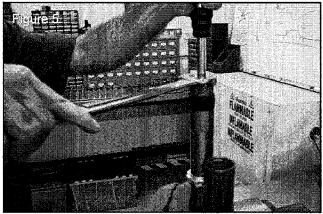
- 12. Clamp the body cap of the shock securely in vise with shaft side up.
- 13. Gently tap the reservoir end cap with a rubber mallet to expose the wire retaining ring. Locate the end of the ring and push inward with fingertip. Remove the retaining ring. A scribe or dental pick can also be used for this step, but use extreme caution not to scratch the bore of the reservoir tube (Fig. 4).



- 14. Use pliers to grab flats of the gas valve of reservoir cap. Extract cap from reservoir tube using a rocking or twisting motion. Set reservoir cap aside on a clean, lint free paper towel.
- 15. Use the appropriate size wrench to loosen the bearing assembly (Fig. 5).

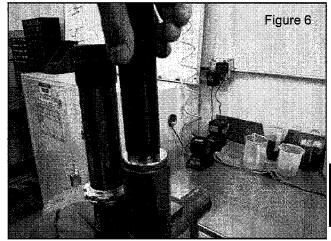
Unscrew the bearing assembly completely from the body tube. Remove the shaft assembly from the body tube, and place on a clean, lint free paper towel. Remove the shock from the vise and pour shock oil from body tube into a proper disposal container.

NOTE: DO NOT RE-USE OLD SHOCK OIL.

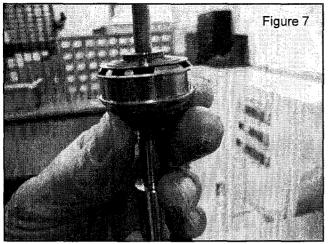


16. Clamp the body cap of the shock securely in vise with the open end of the body tube pointing up.

17. Align the slot of the IFP Depth Setting Tool with the end of the IFP (Internal Floating Piston). Engage the IFP by rotating the tool 90 degrees (Fig. 6). Gently pull the IFP out of the reservoir tube using the IFP Depth Setting Tool, and place it on a clean, lint free towel. Remove the shock from the vise and pour shock oil from body and reservoir tubes into a proper disposal container. DO NOT RE-USE OLD SHOCK OIL.



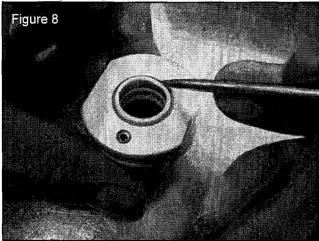
- 18. Using the 1/8" Hex Tool, remove the IFP bleed screw from the IFP.
- 19. Clean the body tube, reservoir tube, and the IFP using solvent. Dry with compressed air in a well ventilated area. If compressed air is not available, dry parts using clean, lint free paper towels and let sit in a well ventilated area to allow the solvents to evaporate.
- 20. Set body assembly aside on a clean, lint free paper towel.
- 21. Clamp the shaft eyelet securely in vise with the piston end up.
- 22. Using a 9/16" wrench, remove the piston lock nut from the end of the shaft.
- 23. Hold the tip of a phillips head screwdriver against the end of shaft. Hold the piston assembly under the top-out plate and lift upwards (Fig. 7). Slide the piston assembly onto the shaft of the Screwdriver. Pull the Screwdriver away from shock shaft while supporting the piston assembly. Slide a 12" tie wrap through the entire piston assembly. Secure the two ends of the zip tie together and remove the screwdriver. There are many pieces to the piston assembly, and the assembly order of these pieces is critical to the proper performance of your shock. This step ensures that the proper order is kept. Place piston assembly on a clean, lint free paper towel.



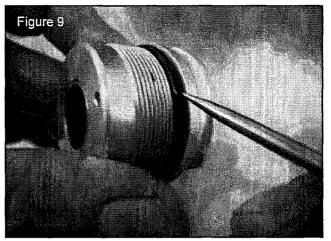
24. Slide bearing assembly off of shaft. Use extreme caution not to scratch inside of the bearing assembly when passing it over the threads at end of shaft.

FOX[™] Shock Rebuild

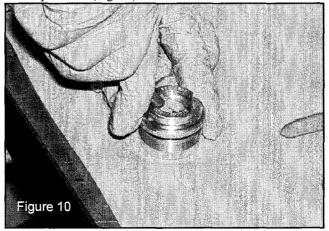
 Use a scribe or dental pick to remove the U-cup wiper (Fig. 8) and O-ring seals (Fig. 9) from the bearing housing. Be careful not to scratch the seal grooves or the DU bushing that is pressed into the bearing.



IMPORTANT: Use extreme caution when using a scribe to remove seals. Always "spear" the seal with the point of the scribe. Do not wedge the point of the scribe in behind the seal. This can scratch the surface of the seal groove which will compromise the performance and reliability of the shock absorber.



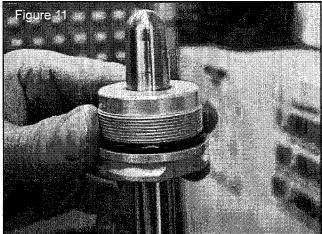
- 2. Thoroughly clean the bearing housing, and piston assembly with solvent. Dry with compressed air in a well ventilated area. If compressed air is not available, dry parts using clean, lint free paper towels and let sit in a well ventilated area to allow the remaining solvent to evaporate.
- 3. Use a scribe or dental pick to remove the O-ring seal from the IFP.
- 4. Use a scribe or dental pick to remove the O-ring seals from the reservoir end cap.
- 5. Install the new, well lubricated, O-rings into the bearing housing. Correct placement of the shaft seal O-ring is in the groove next to the DU bushing. Check to make sure the seals are properly seated, and are not twisted. If a tool is required to aid in proper seating of O-ring, use the non-writing end of a pen, or a similar soft, blunt object, to push it in.
- 6. Install the new U-cup seal into bearing. U-cup should be installed so the cupped end is facing the DU bushing inside of bearing. Check to make sure seal is properly seated. If a tool is required to aid in proper seating of U-cup seal, use the non-writing end of a pen, or a similar soft, blunt object, to push it in (Fig. 10).



- 7. Install the scraper in the bearing housing. Check for proper orientation of the scraper in the bearing. The stepped side of the scraper should be visible.
- 8. Install the new, well greased O-ring onto the IFP.
- 9. Replace the IFP bleed screw O-ring.
- 10. Install the new, well greased O-rings into the reservoir end cap.

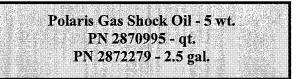
FOX[™] Shock Reassembly

- 1. Clamp shaft eyelet securely in vise, and place seal bullet tool on end of shaft.
- 2. Lubricate the bearing assembly seals with an ample amount of assembly lube. Slide the bearing assembly onto shaft with the scraper facing the eyelet (Fig. 11). This should be done in a single smooth motion to avoid damaging the seals.

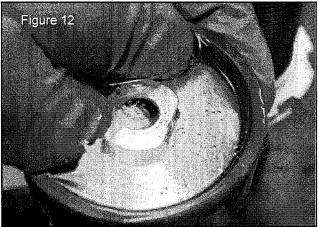


- 3. Insert the shaft of a Phillips head screwdriver through the center of the piston assembly. The pointed end of the screwdriver should be on the same side as the top-out plate. Cut and remove the tie wrap that was holding the piston assembly together.
- 4. Hold the piston assembly from underneath the top-out plate and place the end of the screwdriver onto the end of the shock shaft. Slide the piston assembly onto the shaft end. Check to make sure the piston assembly is properly seated, then install the piston lock nut. Torque the nut to 18 ft. lbs. (24 Nm) using a torque wrench and 9/16" socket. Remove shaft assembly from vise and set it aside on a clean, lint free paper towel.
- 5. Clamp the body cap of the shock securely in the vise, with the open end of the body facing up.
- 6. Using the flat blade screwdriver, turn the compression adjuster screw counter clockwise until it stops turning.
- 7. Lubricate the new IFP O-ring with an ample amount of assembly lube.

8. Fill the reservoir to the retaining ring groove with the recommended oil. You should see bubbles rising to oil surface. Wait until bubbling slows or stops completely. If oil level has fallen, add more oil until level is at retaining ring groove. Insert IFP into reservoir. Use a smooth motion and push straight in until O-ring seats into the retaining ring groove. Use your free hand to wrap new piston band around IFP with the rounded edge out, and push the IFP into the reservoir. Shock oil will come up through the IFP bleed hole.

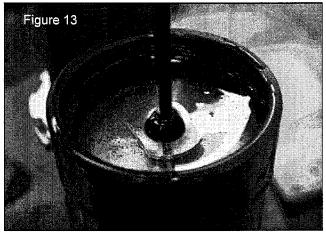


9. Push the IFP into the reservoir until you have enough oil on top of the IFP so that the bleed hole is under the surface of the oil (Fig. 12).



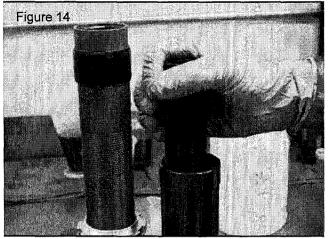
10. Quickly install the IFP Bleed Screw before the oil level drops and tighten it with the 1/8" Hex Tool (Fig. 13).

NOTE: The IFP will spin in the reservoir when the screw bottoms. This is OK.



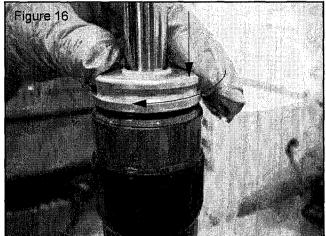
- 11. Using the IFP Depth Setting Tool, push the IFP into the reservoir until it stops.
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- 12. Fill shock body to the bottom of bearing threads with oil.
- 13. Using the IFP Depth Setting Tool, slowly pull the IFP up to the mid point of the reservoir. Then push it down to the bottom again (Fig. 14). Be careful not to pull the IFP out completely. Also, be careful that the oil level in the shock body does not disappear below the bottom of the body and into the reservoir. If the oil does recede completely from the body, you must remove the IFP and go back to step 7 of reassembly.

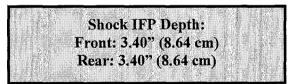


- 14. As you push the IFP down, you should see bubbles rising to the surface inside the body tube. Repeat this process several times until you don't see any new bubbles inside the body tube.
- 15. Pull the IFP up until it's top is approximately 1" from the end of the reservoir and remove the IFP depth setting tool. Again, be sure the oil level in the shock body does not drop below the bottom of the body. If the oil does recede completely from the body, you must remove the IFP and go back to step 7 of reassembly. Add oil if necessary while pulling up on the IFP.
- 16. Using the flat blade screwdriver, turn the Compression Adjuster Screw clockwise until it stops turning.
- 17. Fill the body tube with oil approximately 1/4" below the threads. Wrap the new piston band around the piston, making sure the rounded edges face out. Insert the shaft assembly into the body tube. Slowly push shaft into body until piston assembly is approximately 1" below oil surface.
- 18. Stroke the shaft up and down slowly over about a 1" range until no air bubble rise from the damping piston. Be careful to keep the damping piston at least 1/4" below the surface of the oil during this process.
- 19. Bring the damping piston up until it is approximately 1/4" below the surface of the oil. Using the mallet, give 2 3 sharp blows to the eyelet, driving the damping piston down into the shock body. This opens the valves on the damping piston. You will see the released air bubbles come to the surface of the oil.

- 20. Add oil to the body tube until the surface of the oil is to the top of the threads inside the body tube.
- 21. Pull the damping piston up until it is just below the surface of the oil. Add more oil if necessary.
- 22. Hold the shaft eyelet with one hand. With other hand, slide the bearing assembly down the shaft until contact with the body is made. Oil will overflow from around the bearing (Figure 16).



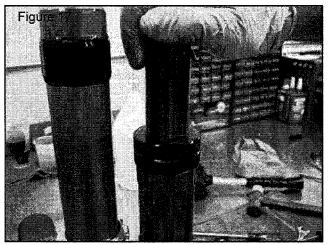
- 23. Screw the bearing assembly into the body tube by hand, holding the shaft up so that the bearing is in contact with the bottom of the damping piston assembly. Be careful not to cross-thread the bearing assembly. When the bearing will no longer thread in by hand, turn the Compression Adjuster Screw all the way counter clockwise using the flat blade screwdriver.
- 24. Tighten the bearing assembly using the appropriate size open end wrench.
- 25. Set IFP depth tool to specified length for the correct IFP depth.



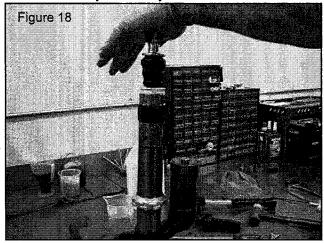
- 26. Insert IFP depth setting tool into reservoir and engage IFP. Using a long 1/8" hex tool, remove the bleed screw from the center of the IFP. TIP: Apply grease to the end of the hex tool so that the bleed screw sticks to it. This will make it easier to remove it from the IFP.
- 27. Push the IFP down to the correct depth setting. As you do this, keep the open end of the IFP depth setting tool covered with your hand. Oil will stream through the bleed hole in the IFP as you push it further into the reservoir (Fig. 17).

5.36

BODY / STEERING / SUSPENSION

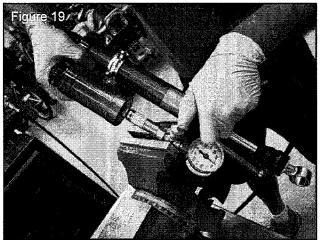


- 28. Install IFP bleed screw and tighten using the 1/8" hex tool. Remove the IFP depth setting tool. Pour the residual oil out of the reservoir tube into a proper disposal container.
- 29. Install the reservoir end cap with the FOX[™] air valve facing the outside of the reservoir tube. Push down on the reservoir end cap using even pressure, until the retaining ring groove is exposed. Install the wire retaining ring, and check to make sure retaining ring is seated properly.
- 30. Push the shaft assembly completely into the body tube (Fig. 18). It should go all the way down smoothly and without interference. If it does not, disassemble and reassemble per this procedure. Do not attempt to pull the shaft assembly back out by hand.



- 31. If reservoir cap is not properly seated against the retaining clip, tap it gently with a rubber mallet until it snaps into place. Remove shock assembly from vise.
- 32. Securely clamp FOX[™] Nitrogen Safety Needle in the vise. Be sure to point the air valve away from your face and body.
- 33. Insert the safety needle squarely into center of FOX[™] air valve, and pressurize the reservoir. Continue filling until the shaft has fully extended and the reservoir pressure is at **200 psi** (Fig. 19).

34. Continue charging with gas as you pull the reservoir away from the FOX[™] Nitrogen Safety Needle using a smooth, straight motion. Keep the reservoir as straight as possible to prevent the safety needle from bending. As the safety needle is pulled free from the FOX[™] air valve, a popping sound should be heard.



CHARGE THE SHOCK USING NITROGEN GAS ONLY. DO NOT FILL WITH ANY OTHER GASES. Doing so compromises the performance of the shock and may be EXTREMELY DANGEROUS!

- 35. Install the nylon valve cap into the FOX[™] air valve.
- 36. Remove the shock from the vise.
- 37. Clean all oil residue from the shock and reservoir with solvent, and dry with compressed air in a well ventilated area. If compressed air is not available, dry the shock and reservoir using clean, lint free paper towels and let sit in a well ventilated area to allow the solvents to evaporate.
- 38. Reinstall the spring and the spring retainer.
- 39. Thread the spring preload ring down against the spring, and set the preload to the measurement you took when you removed the spring.
- 40. Using the flat blade screwdriver, turn the Compression Adjuster Screw all the way clockwise until it stops. Now turn it counter clockwise while counting the clicks until it matches the original setting which you wrote down during disassembly.
- 41. Remove the shock from the vise.
- 42. Reinstall spherical bearing O-rings and reducers or polyurethane bushings and sleeves.

NOTE: After installation, be sure to RIDE SLOWLY initially to ensure the shock and the vehicle's suspension is performing correctly.

5.37

NOTES

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CLUTCHING (PVT) CHAPTER 6 CLUTCHING (PVT)

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SPECIAL TOOLS AND SUPPLIES

TOOL DESCRIPTION	PART NUMBER
Drive Clutch Puller	2872085
Clutch Holding Wrench	9314177
Clutch Holding Fixture	2871358-A
Spider Jam Nut Socket	PU- 50578
Drive Clutch Spider Removal and Installation Tool	2870341
Roller Pin Tool	2870910
Clutch Bushing Replacement Tool Kit	2871226
Piston Pin Puller	2870386
Driven Clutch Compression Tool	PU-50518
Clutch Bushing Replacement Tool Kit	2871025

SPECIAL SUPPLIES	PART NUMBER
Loctite® 609™ and 263™	N/A
RTV Silicone Sealer	8560054

TORQUE SPECIFICATIONS

PVT System Fastener Torques

ITEM	TORQUE VALUE
Drive Clutch Retaining Bolt	96 ft. lbs. (130 Nm)
Driven Clutch Retaining Bolt	40 ft. lbs. (54 Nm)
PVT Inner Cover Bolts	12 ft. lbs. (16 Nm)
PVT Outer Cover Screws	45-50 in. lbs. (5-5.6 Nm)
Spider Jam Nut (Apply 263 Loctite)	250 ft. lbs. (339 Nm)
Drive Clutch Spider (Apply 263 Loctite)	280-300 ft. lbs. (379-406 Nm)
Drive Clutch Cover Plate	100 in. lbs. (12 Nm)

PVT SYSTEM OVERVIEW

General Operation

🛕 WARNING

 All PVT maintenance or repairs should be performed by a certified Polaris Master Service Dealer (MSD) technician who has received the proper training and understands the procedures outlined in this manual.
 Because of the critical nature and precision balance incorporated into the PVT components, it is absolutely essential that no disassembly or repair be made without factory authorized special tools and service procedures.

The Polaris Variable Transmission (PVT) consists of three major assemblies:

1) The Drive Clutch

2) The Driven Clutch

3) The Drive Belt

The internal components of the drive clutch and driven clutch control engagement (initial vehicle movement), clutch upshift and backshift. During the development of the Polaris vehicle, the PVT system is matched first to the engine power curve; then to average riding conditions and the vehicle's intended usage. Therefore, modifications or variations of components at random are never recommended. Proper clutch setup and careful inspection of existing components must be the primary objective when troubleshooting and tuning.

Drive Clutch Operation

Drive clutches primarily sense engine RPM. The two major components which control its shifting function are the shift weights and the coil spring. Whenever engine RPM is increased, centrifugal force is created, causing the shift weights to push against rollers on the moveable sheave, which is held open by coil spring preload. When this force becomes higher than the preload in the spring, the outer sheave moves inward and contacts the drive belt. This motion pinches the drive belt between the spinning sheaves and causes it to rotate, which in turn rotates the driven clutch.

At lower RPM, the drive belt rotates low in the drive clutch sheaves. As engine RPM increases, centrifugal force causes the drive belt to be forced upward on drive clutch sheaves.

Driven Clutch Operation

Driven clutches primarily sense torque, opening and closing according to the forces applied to it from the drive belt and the transmission input shaft. If the torque resistance at the transmission input shaft is greater than the load from the drive belt, the drive belt is kept at the outer diameter of the driven clutch sheaves.

As engine RPM and horsepower increase, the load from the drive belt increases, resulting in the belt rotating up toward the outer diameter of the drive clutch sheaves and downward into the sheaves of the driven clutch. This action, which increases the driven clutch speed, is called upshifting.

Should the throttle setting remain the same and the vehicle is subjected to a heavier load, the drive belt rotates back up toward the outer diameter of the driven clutch and downward into the sheaves of the drive clutch. This action, which decreases the driven clutch speed, is called backshifting.

In situations where loads vary (such as uphill and downhill) and throttle settings are constant, the drive and driven clutches are continually shifting to maintain optimum engine RPM. At full throttle a perfectly matched PVT system should hold engine RPM at the peak of the power curve. This RPM should be maintained during clutch upshift and backshift. In this respect, the PVT system is similar to a power governor. Rather than vary throttle position, as a conventional governor does, the PVT system changes engine load requirements by either upshifting or backshifting.

PVT Break-In (Drive Belt / Clutches)

A proper break-in of the clutches and drive belt will ensure a longer life and better performance. Break in the clutches and drive belt by operating at slower speeds during the 10 hours as recommended (see Chapter 3 "Engine Break-In Period" for break-in example). Avoid aggressive acceleration and high speed operation during the break-in period.

Maintenance / Inspection

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

- 1. Belt Inspection.
- 2. Drive and Driven Clutch Buttons and Bushings, Drive Clutch Shift Weights and Pins, Drive Clutch Spider Rollers and Roller Pins, Drive and Driven Clutch Springs.
- 3. Sheave Faces. Clean and inspect for wear.
- 4. **PVT** System Sealing. Refer to the appropriate illustration(s) on the following pages. The PVT system is air cooled by fins on the drive and driven clutch stationary sheaves. The fins create a low pressure area in the crankcase casting, drawing air into the system through an intake duct. The opening for this intake duct is located at a high point on the vehicle (location varies by model). The intake duct draws fresh air through a vented cover. All connecting air ducts (as well as the inner and outer covers) must be properly sealed to ensure clean air is being used for cooling the PVT system and also to prevent water and other contaminants from entering the PVT area. This is especially critical on units subjected to frequent water forging.

Overheating / Diagnosis

During routine maintenance, or whenever PVT system overheating is evident, it's important to check the inlet *and* outlet ducting for obstructions. Obstructions to air flow through the ducts will significantly increase PVT system operating temperatures. The vehicle should be operated in Low when extended low vehicle speed operation is anticipated.

CLUTCH DRIVE BELT & COVER RELATED ISSUES: DIAGNOSIS				
Possible Causes	Solutions / What to do			
Loading the vehicle into a tall trailer when in high range.	Shift transmission to Low during loading of the vehicle to prevent belt burning.			
Starting out going up a steep incline from a stopped position.	When starting out on an incline, use Low gear. Shift transmission to Low during loading of the vehicle to prevent belt burning.			
Driving at low RPM or low ground speed (at approximately 3-7 MPH).	Drive at higher speed or use Low. The use of Low is highly recommended for cooler PVT operating temperatures and longer component life.			
Insufficient engine warm-up when exposed to low ambient temperatures.	Warm engine at least 5 min., then with transmission in neutral, advance throttle to approx. 1/8 throttle in short bursts, 5 to 7 times. The belt will become more flexible and prevent belt burning.			
Slow and easy clutch engagement.	Fast, effective use of the throttle for efficient engagement.			
Stuck in mud or snow.	Shift the transmission to Low, carefully use fast, aggressive throttle application to engage clutch. WARNING: Excessive throttle may cause loss of control and vehicle overturn.			
Climbing over large objects from a stopped position.	Shift the transmission to Low, carefully use fast, aggressive, brief throttle application to engage clutch. WARNING: Excessive throttle may cause loss of control and vehicle overturn.			
Belt slippage from water or snow ingestion into the PVT system.	Remove the PVT drain plug. Shift the transmission to neutral. Using the throttle, vary the engine rpm from idle to full throttle. Repeat several times as required. During this procedure, the throttle should not be held at the full position for more than 10 seconds. Clutch seals should be inspected for damage if repeated leaking occurs.			
Clutch malfunction.	Clutch component inspection should be performed by a Polaris MSD certified technician.			
Poor engine performance.	Fouled spark plugs, foreign material in fuel tank, restricted fuel lines, or faulty fuel pump may cause symptoms similar to clutching malfunction.			
GENERAL RANGE OPERATION GUIDELINES:	Low: Basic operational speeds less than 7 MPH, riding through rough terrain (swamps, mountains, ect.), or low ground speeds.			
CODELINES,	High: High ground speeds, or speeds above 7 MPH.			

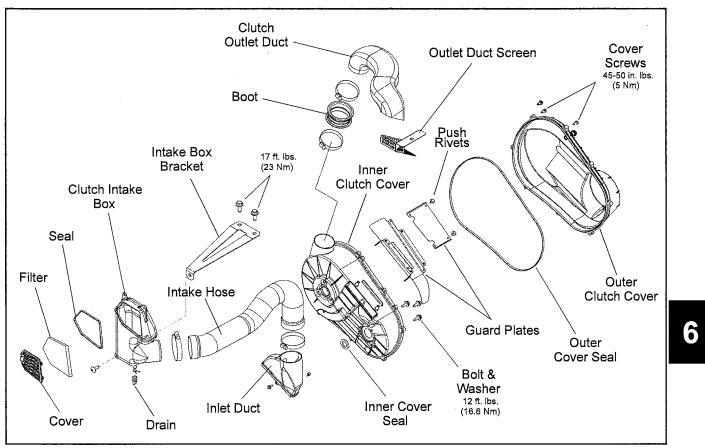
Operating in Low Gear

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

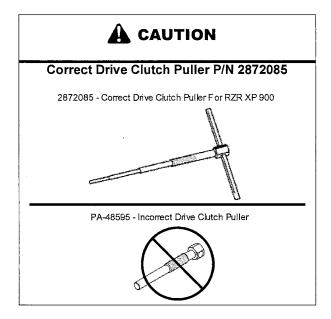
IMPORTANT: Using High gear for heavy loads, hilly terrain, or in wet, muddy conditions will increase the chance of drive belt burning.

PVT SYSTEM SERVICE

PVT Covers and Ducting Components



PVT Disassembly



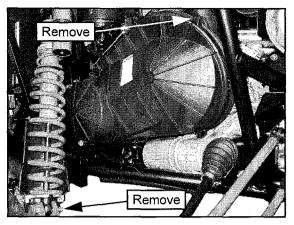
- 1. Remove the seats and engine service panel (see chapter 5).
- 2. Place transmission in neutral.
- 3. Raise and support the vehicle.

A CAUTION

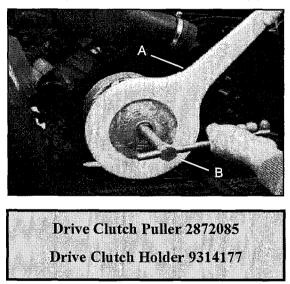
Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure.

- 4. Remove the left rear wheel.
- 5. Remove the lower mounting bolt and nut from the left rear shock. Discard the nut.
- 6. Swing shock outward toward the front of the vehicle.

7. Remove the (8) clutch cover screws and remove the outer clutch cover from the vehicle.

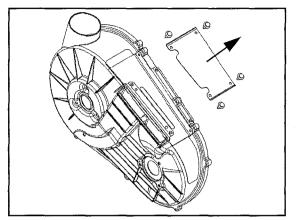


- 8. Mark the drive belt direction of rotation and remove drive belt (see "DRIVE BELT Belt Removal").
- 9. Remove the driven clutch retaining bolt and driven clutch.
- 10. Install the Drive Clutch Holder PN 9314177 (A).
- 11. Remove the drive clutch retaining bolt and remove drive clutch using the Drive Clutch Puller 2872085 (B).

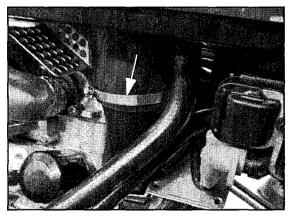


IMPORTANT: Be sure to use the correct Drive Clutch Puller (PN 2872085) to prevent damage to crankshaft.

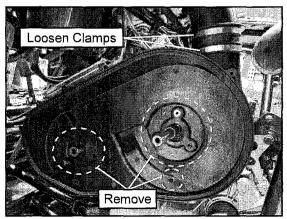
12. Remove the (4) push rivets that secure the upper guard plate to the top of the inner PVT cover. Make note of the routing of the fuel lines, vent line, battery cable and wire harness for proper assembly.



13. Loosen hose clamp attaching the PVT inlet duct to the inner clutch cover. Disengage hose from the inner clutch cover.



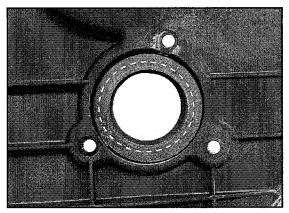
14. Loosen the hose clamps that attach the clutch outlet duct to the inner clutch cover. Disengage the hose from the cover.



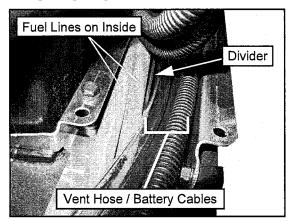
15. Remove the (7) bolts that retain the inner clutch cover to the engine and transmission. Remove inner clutch cover.

PVT Assembly

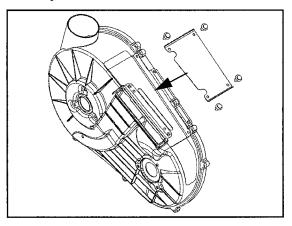
- 1. Inspect inner clutch cover. Replace if cracked or damaged.
- 2. Inspect the seal on the transmission input shaft. Replace if damaged.
- 3. Inspect inner clutch cover seal (engine side). Replace if cracked, torn or damaged.



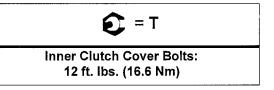
4. Install and properly align the inner clutch cover. Be sure the fuel line, vent line and battery cables are properly routed through the guard plate as shown.



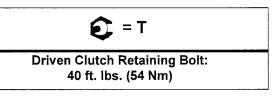
5. Install the (4) push rivets that secure the protective cover to the top of the inner PVT cover.



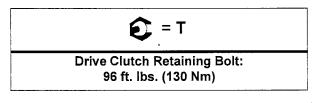
- 6. Install the (4) inner clutch cover bolts and washers that retain the cover to the transmission. Torque bolts to specification.
- 7. Install the (3) inner clutch cover bolts and washers that retain the cover to the engine. Torque bolts to specification.



- 8. Clean the splines inside the 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 and retaining bolt. Torque to specification.



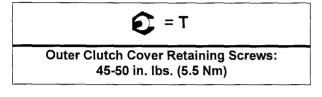
- 11. Clean the end of the taper on the crankshaft and the tapered bore inside the drive clutch.
- 12. Install drive clutch onto the engine and torque retaining bolt to specification.



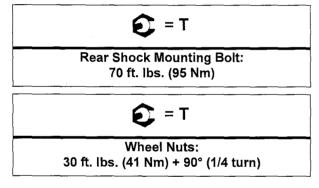
6.7

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- 13. Install the drive belt noting direction of belt rotation (see "DRIVE BELT Belt Installation"). If a new belt is installed, install so numbers can be easily read.
- 14. Install a new outer clutch cover seal with the colored stripe facing the inner clutch cover.
- 15. Reinstall outer clutch cover and secure with screws. Torque screws to specification.



- 16. Install the clutch inlet and outlet ducts and tighten the hose clamps.
- 17. Install the left rear shock lower mounting bolt and the left rear wheel. Torque fasteners to specification.

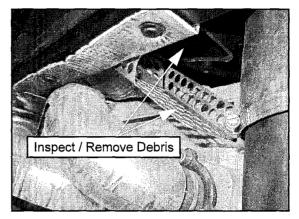


18. Install engine service panel and both seats.

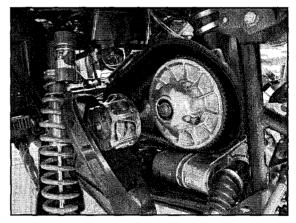
DRIVE BELT

Beit Removal

IMPORTANT: Inspect the entire clutch outlet duct (including the outlet duct screen) when replacing a drive belt. Remove any debris found in the outlet duct or outlet duct screen.



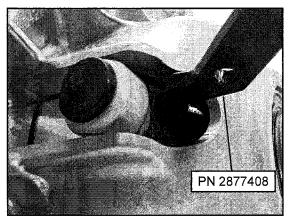
- 1. Remove the (8) screws that retain the outer clutch cover.
- 2. Maneuver the outer clutch cover outward as shown below to access the drive belt.



NOTE: Removal of left rear wheel or left rear shock is NOT necessary for belt replacement.

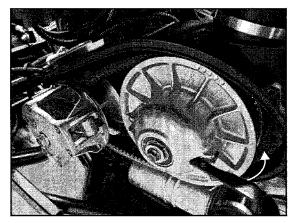
3. Mark the drive belt direction of rotation so that it can be installed in the same direction.

4. Insert the belt removal tool (**PN 2877408**) into the driven clutch as shown (tool included with vehicle's tool kit).



NOTE: Make sure the tool is square with the moveable sheave surface of the driven clutch.

5. Rotate the tool towards the clutch to open the sheaves.



6. Walk the belt out of the driven clutch and drive clutch. Remove the belt from the vehicle.

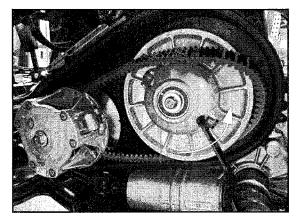
Belt Inspection

- 1. Inspect belt for hour glassing (extreme circular wear in at least one spot and on both sides of the belt). Hour glassing occurs when the drive train does not move and the drive clutch engages the belt.
- 2. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Compare belt measurements with a new drive belt. Replace if necessary.
- 3. Belts with thin spots, burn marks, etc., should be replaced to eliminate noise, vibration, or erratic PVT operation. See the Troubleshooting Chart at the end of this chapter for possible causes.

Belt Installation

NOTE: Be sure to install belt in the same direction as it was removed.

1. With the belt removal tool installed (**PN 2877408**), loop the belt over the drive clutch and over the driven clutch.



- 2. Rotate the driven clutch and walk the belt into the clutch.
- 3. Remove the belt removal tool from driven clutch
- 4. Rotate / spin the driven clutch and belt approximately 5-7 times to properly seat the belt in the driven clutch.
- 5. Install the outer clutch cover and (8) screws. Torque screws to specification.

Outer Clutch Cover Retaining Screws: 45-50 in. lbs. (5.5 Nm)

= T

PVT Break-In (Drive Belt / Clutches)

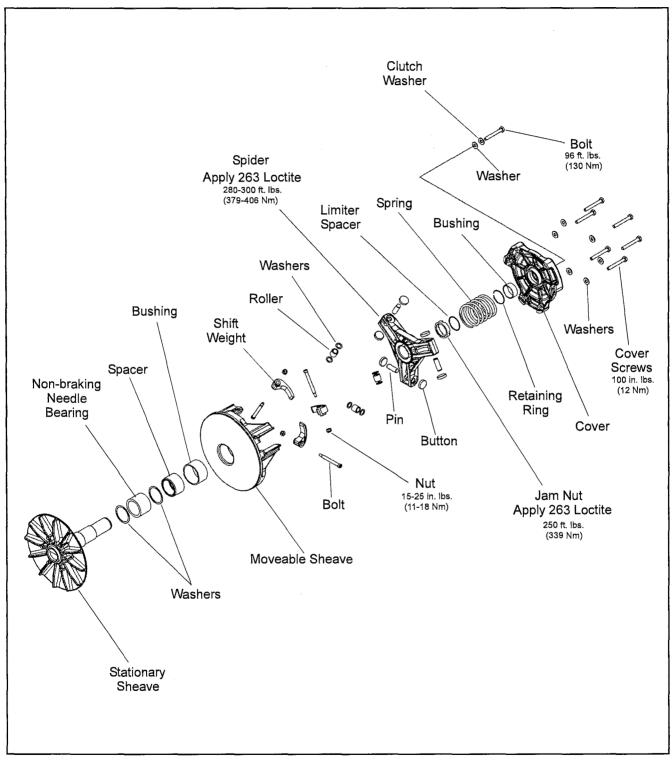
A proper break-in of the clutches and drive belt will ensure a longer life and better performance. Break in the clutches and drive belt by operating at slower speeds during the 10 hour break-in period as recommended (see Chapter 3 "Engine Break-In Period" for break-in example). Pull only light loads. Avoid aggressive acceleration and high speed operation during the break-in period.

6.9

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DRIVE CLUTCH SERVICE

Drive Clutch Exploded View

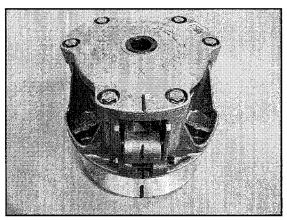


6.10

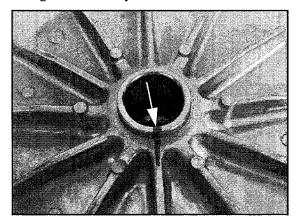
Drive Clutch Disassembly / Inspection

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

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



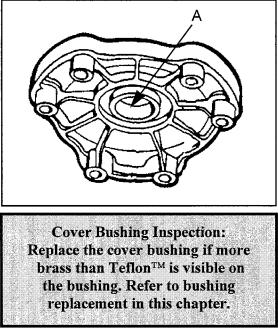
2. Mark the stationary sheave and clutch shaft to verify the shaft has not rotated in the sheave after tightening the spider during clutch assembly.



IMPORTANT: Upon reassembly, if the reference marks created in step 2 (illustrated below) are not in alignment, the clutch will not be in balance and the assembly MUST be replaced.

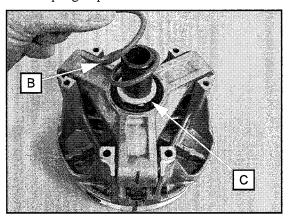
3. Remove cover bolts evenly in a cross pattern and remove cover plate.

 Inspect cover bushing (A). The outer cover bushing is manufactured with a TeflonTM coating. Wear is determined by the amount of TeflonTM remaining on the bushing.



- 5. Inspect area on shaft where bushing rides for wear, galling, nicks, or scratches. Replace clutch assembly if worn or
- 6. Remove and inspect the clutch spring (B). Refer to "Drive Clutch Spring Inspection".

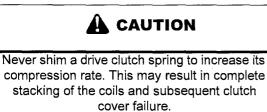
damaged.



7. Remove and inspect limiter spacer (C). Replace if necessary.

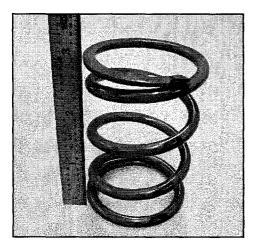
DO NOT reassemble the drive clutch without the limiter spacer. Belt life will be greatly reduced.

Drive Clutch Spring Inspection



The drive clutch spring is one of the most critical components of the PVT system. It is also one of the easiest to service. Due to the severe relaxation the spring is subject to during operation, it should always be inspected for tolerance limits during any clutch operation diagnosis or repair.

With the spring resting on a flat surface, measure its free length from the outer coil surfaces. Also check to see that spring coils are parallel to one another. Distortion of the spring indicates stress fatigue, requiring replacement.

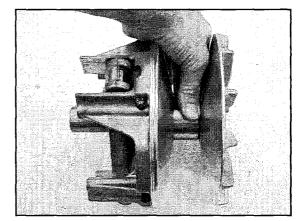


Drive Clutch Spring Specifications

Color	Blue with Yellow Stripe
Free Length	2.65" (67.342 mm)
Spring Rate	125 lb/in (43 kg/mm)
Wire Diameter	0.187" (4.75mm)

Needle Bearing Inspection

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



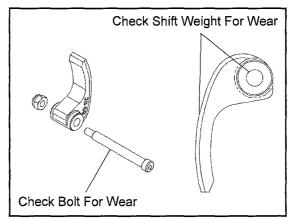
Shift Weight Inspection

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



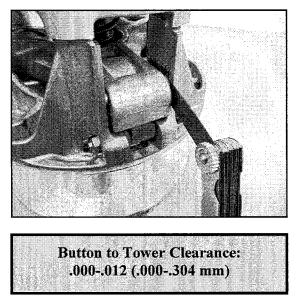
The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly!

NOTE: A damaged shift weight is usually caused by a damaged or stuck roller in the spider assembly. See "Drive Clutch Roller Pin and Button Service".



Button To Tower Clearance Inspection

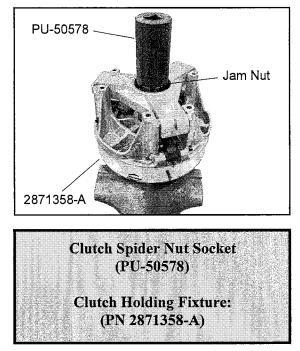
1. Inspect the button to tower clearance as shown. Replace the drive clutch if clearance is beyond specification.



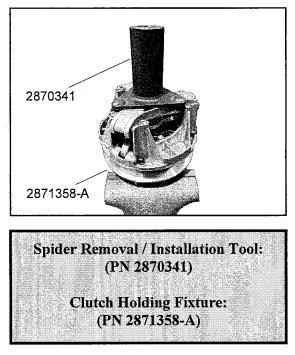
2. Inspect the tower sheave surfaces. Replace the drive clutch if worn, damaged or cracked.

Spider Removal

1. Install clutch onto holding fixture (2871358-A) and secure in bench vice. Loosen and remove the spider jam nut (counterclockwise) using the Clutch Spider Nut Socket (PU-50578).

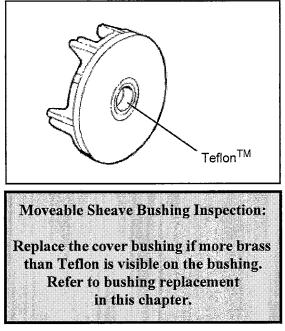


2. Loosen and remove the spider (counterclockwise) using Clutch Spider Removal / Installation Tool (PN 2870341).



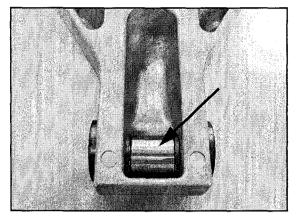
Moveable Sheave Bushing Inspection

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



Roller, Pin, and Thrust Washer Inspection

- 1. Inspect all rollers, roller bushings and roller pins by pulling a flat metal rod across the roller.
- 2. Turn roller with your finger. If you notice resistance, galling, or flat spots, replace the drive clutch.

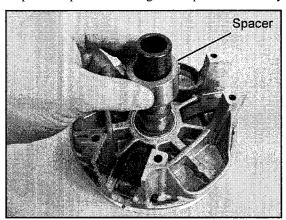


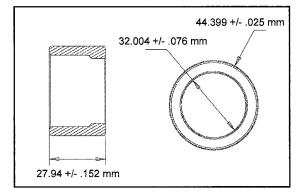
NOTE: Rollers, pins, thrust washers and buttons are not serviceable at the time of this publication.

Clutch Inspection

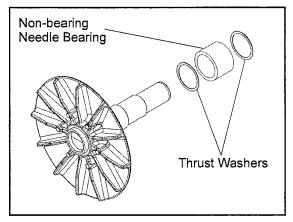
NOTE: Remove cover, spring, limiter spacer and spider following the instructions for drive clutch disassembly, then proceed as follows:

1. Remove and inspect the moveable sheave spacer. Visually inspect the spacer for damage and replace if necessary.

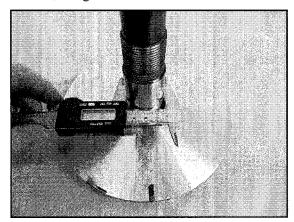


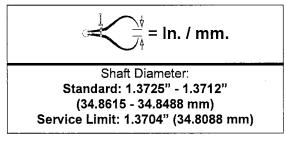


- 2. Remove the moveable clutch sheave.
- 3. Lift the bearing and thrust washers off the shaft. Replace as an assembly if worn, damaged, or if operational problems were noted prior to disassembly.



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



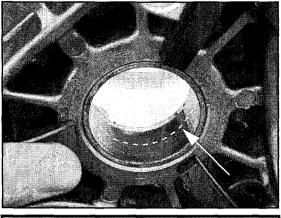


5. Visually inspect the thrust washers for damage. Measure the thickness and compare to specification. Replace if worn or damaged.

Thrust Washer Thickness: Standard: .030" (.76 mm) Service Limit: .025" (.64 mm) 6

Moveable Sheave Bushing Inspection

Inspect the TeflonTM coating (arrow) on the moveable sheave bushing. Inspect both sheaves for signs of wear, grooving or cracking. De-glaze sheave surfaces with a $3M^{TM}$ Scotch-Brite Pad if needed.



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

Bushing Service

IMPORTANT: Special Tools Required

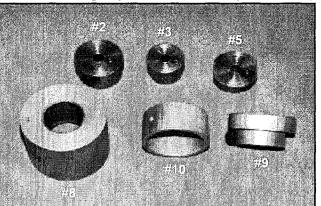
EBS Clutch Bushing Tool Kit - 2201379

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

Additional Special Tools

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

*Clutch Bushing Replacement Tool Kit (PN 2871226)



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

NOTE: Bushings are installed at the factory using Loctite[™] 609. In order to remove bushings it will be necessary to apply heat evenly to the area around each bushing. Clean all residual Loctite[™] from bushing bore prior to installing new bushing.



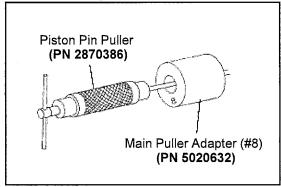
Clutch components will be hot! In order to avoid serious burns, wear insulated gloves during the removal process.

Moveable Sheave - Bushing Removal

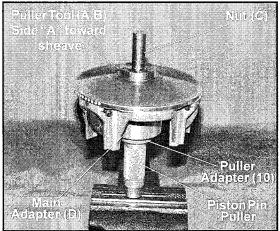
- 1. Remove clutch as outlined previously in this chapter.
- 2. Install handle end of the Piston Pin Puller (PN 2870386) securely into bench vise and lightly grease puller threads.

Piston Pin Puller (PN 2870386)

3. Remove nut from puller rod and set aside.



- 4. Install puller adapter (Item 10 from kit PN 2871226).
- 5. Install main adapter (Item D) onto puller.



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

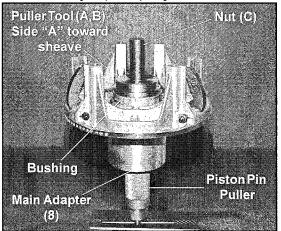
NOTE: Use Bushing Tool PA-47336.

8. Install nut (C) onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.

- 9. Turn sheave counterclockwise on puller rod until it comes free. Lift sheave off puller.
- 10. Remove nut from puller rod and set aside.
- 11. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

Moveable Sheave - Bushing Installation

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

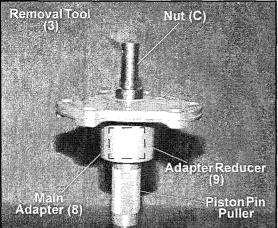


- Apply Loctite[™] 609 evenly to bushing bore inside moveable sheave.
- 3. Set bushing in place on sheave.
- 4. Insert installation puller tool (Item A/B) with "A" side down, into center of bushing.
- 5. With towers pointing upward, slide sheave, bushing and tool onto puller rod.
- 6. Install nut on 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.

6.17

Cover Bushing Removal

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



- 2. Install adapter reducer (Item 9).
- 3. From outside of clutch cover, insert removal tool (Item 3) into cover bushing.
- 4. With inside of cover toward vise, slide cover onto puller.
- 5. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.
- 6. Turn clutch cover counterclockwise on puller rod until bushing is removed and cover comes free.
- 7. Remove nut from puller rod and set aside.
- 8. Remove bushing and bushing removal tool from puller. Discard bushing.

Cover Bushing Installation

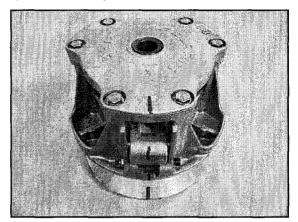
- 1. Apply Loctite[™] 609 evenly to bushing bore in cover.
- 2. Working from inside of cover, insert new bushing and bushing installation tool into center of clutch cover.
- 3. With main adapter on puller, insert cover onto puller rod, placing outside of cover toward vise.
- 4. Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
- 5. Turn clutch cover counterclockwise on puller rod until bushing is seated.
- 6. Remove nut from puller rod. Take installation tool and clutch cover off rod.

Drive Clutch Assembly

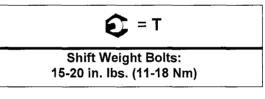


Do not apply oil or grease to the bushings.

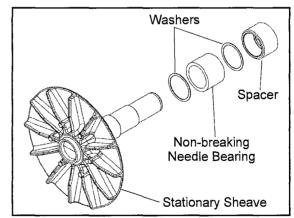
Reassemble the drive clutch in the following sequence. Be sure marks that were made during disassembly are aligned during each phase of assembly.



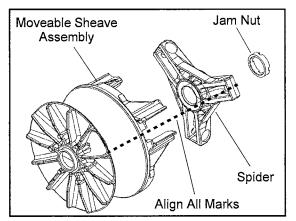
1. Install the shift weights, bolts and nuts onto the moveable sheave. Torque shift weight bolts to specification.



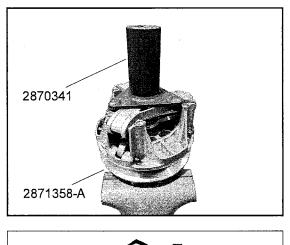
2. Install the non-braking needle bearing, the (2) washers and the spacer onto the stationary sheave.

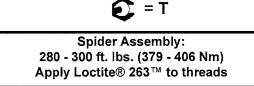


- 3. Install moveable sheave onto stationary sheave shaft. Be sure the moveable sheave slides freely on the spacer.
- 4. Apply Loctite $@263^{TM}$ to the spider threads.
- 5. Install the spider assembly onto the shaft threads. Be sure all of the alignment marks are in alignment.

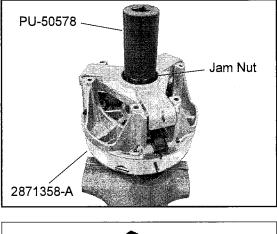


6. Install clutch onto holding fixture (PN 2871358-A) and secure in a bench vice. Tighten the spider using Clutch Spider Tool (PN 2870341). Torque spider to specification.





- 7. Apply Loctite[®] 263[™] to the threads of the spider jam nut. Install spider jam nut onto stationary shaft threads.
- Tighten the spider jam nut using Clutch Spider Nut Socket (PU-50578). Torque jam nut to specification.

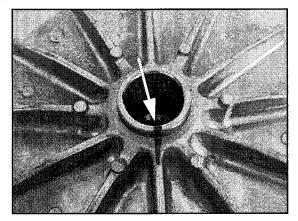




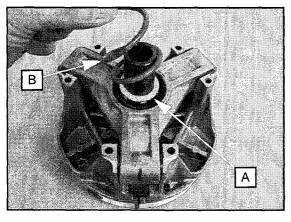
Spider Jam Nut: 250 ft. lbs. (339 Nm) Apply Loctite® 263™ to threads

9. After the spider and jam nut have been torqued, remove the clutch assembly from the holding fixture and inspect the alignment marks made during disassembly.

IMPORTANT: If the marks illustrated below are not in alignment upon assembly, the clutch will not be in balance and the drive clutch assembly must be replaced.



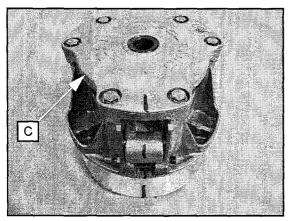
10. Install the limiter spacer (A) and the clutch spring (B).



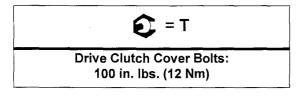


DO NOT reassemble the drive clutch without the limiter spacer. Belt life will be greatly reduced.

11. Install the drive clutch cover (C). Be sure all alignment marts are in alignment.



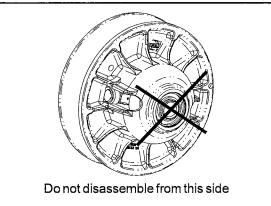
12. Install cover bolts and torque in a cross pattern evenly to specification.



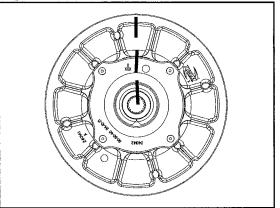
DRIVEN CLUTCH SERVICE

Clutch Disassembly

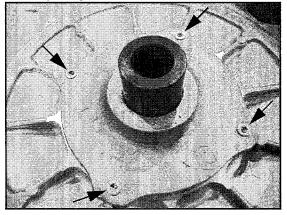
1. Remove driven clutch from the transmission input shaft. Do not attempt disassembly of the driven clutch from the outside snap ring. The driven clutch must be disassembled from the helix side.



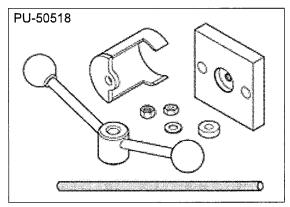
2. It is important to mark the position of the shaft, cam cover, and sheave before disassembly or use the X's on the components for reference. This will aid in reassembly and helps to maintain clutch balance after reassembly.



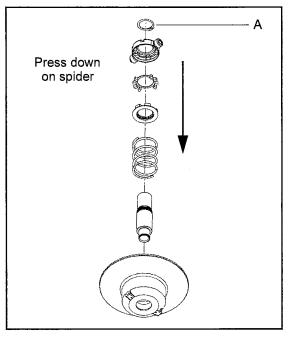
3. Remove the four screws that secure the cam (helix) assembly using a T25 Torx driver.



4. Place the clutch into the Driven Clutch Compression Tool **PU-50518**.



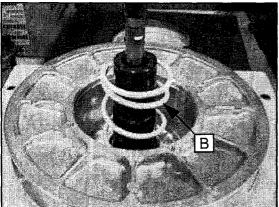
5. Press down on the top of the spider assembly, pushing the spider onto the shaft. Remove snap ring (A) and slowly release the assembly.



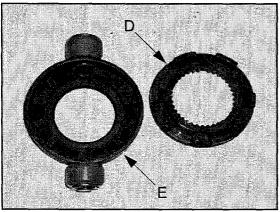
9923144 - 2011 RANGER RZR XP 900 Service Manual © Copyright 2011 Polaris Sales Inc.

6. Remove the spider assembly and spring (B).

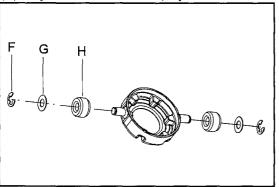
NOTE: Spring is compression only and has no torsional wind.



7. Remove the inside spider plate (D) and spider dampener (E). Inspect the spider dampener (E) for wear and replace if needed.

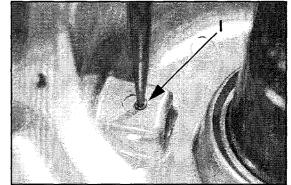


8. Remove the E-clips (F), washers (G), and the clutch rollers (H). Inspect the rollers for wear; replace if worn.

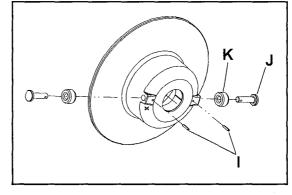


9. Remove the clutch assembly from the holding tool.

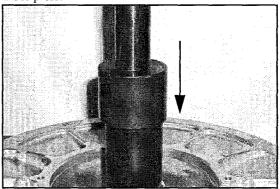
10. Press out the spring pins (I) in the inner sheave.



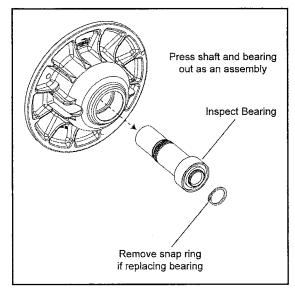
11. Pull out the clutch roller pins (J) and rollers (K).



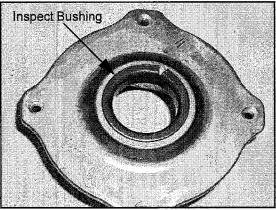
12. Press the shaft and bearing out of the outer sheave using an arbor press.



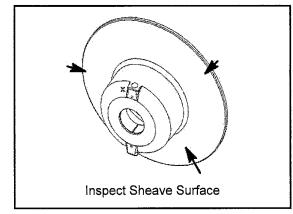
13. Inspect the bearing for wear. Spin the bearing, if the bearing does not spin smoothly, replace it. To replace the bearing, remove the snap ring from the end of the shaft and press the bearing off the shaft.



14. Inspect the cam (helix) assembly bushing for wear. If the bushing is worn or the shaft does not fit snug into the bushing, replace the cam (helix) assembly.



15. Inspect the clutch sheaves for excessive wear or damage.



Bushing Service

IMPORTANT: Special Tools Required

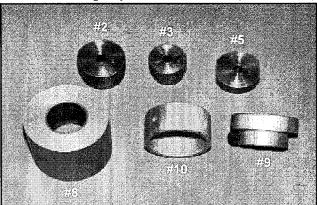
EBS Clutch Bushing Tool Kit - 2201379

ltem	Qty.	Part Description	Part #
A, B	1	EBS Puller Tool	5132027
С	1	EBS Puller Nut	5132501
D	1	EBS Main Adapter	5132029
Е	1	EBS Bushing Removal Tool	5132028
	1	Instructions	9915111

Additional Special Tools

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

*Clutch Bushing Replacement Tool Kit (PN 2871226)

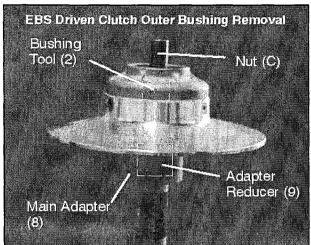


ltem	Qty.	Part Description	Part #
#2	1	P-90 Drive/Driven Clutch Bushing Install Tool	5020628
#3	1	Drive Clutch Cover Bushing Removal/ Installation Tool (all clutches)	5020629
#5	1	P-90 Driven Clutch Cover Bushing Removal Tool	5020631
#8	1	Main Puller Adapter	5020632
#9	1	Adapter Reducer	5010279
#10	1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

NOTE: Bushings are installed at the factory using Loctite[™] 609. In order to remove bushings it will be necessary to apply heat evenly to the area around each bushing. Clean all residual Loctite[™] from bushing bore prior to installing new bushing.

Clutch Bushing Removal

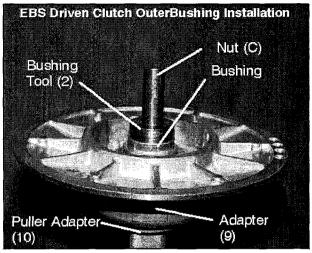
- 1. Install main puller adapter (Item 8) onto puller.
- 2. Install adapter reducer (Item 9).
- 3. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.
- 4. Flip sheave over so bushing faces downward and install onto puller.
- 5. Install bushing tool (Item 2).



- 6. Install left hand nut (C) and spacer onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
- 7. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.
- 8. Remove nut (C) (left hand thread) from puller rod and set aside.
- 9. Remove adapters from puller.
- 10. Remove bushing and removal tool from adapters. Discard bushing.

Clutch Bushing Installation

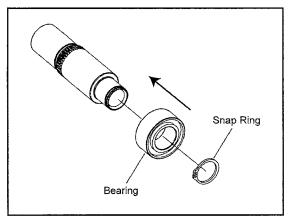
- 1. Install puller adapter (Item 10) onto puller.
- 2. Install adapter (Item 9) onto puller.



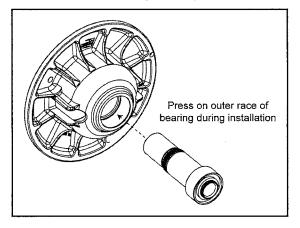
- Apply Loctite[™] 609 evenly to bushing bore inside moveable sheave.
- 4. Install sheave face down on puller.
- 5. Install new bushing on installation tool (Item 2) and install assembly into sheave.
- 6. Install left hand thread nut (C) onto puller rod and hand tighten against installation tool.
- 7. Turn clutch sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.
- 8. Remove nut (C) from puller rod and set aside.
- 9. Remove installation tool and clutch sheave from puller.

Clutch Assembly

1. Install a new bearing onto the clutch shaft using an arbor press. Once bearing is fully seated, install a new snap ring.

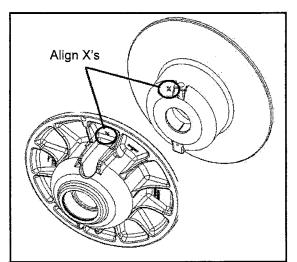


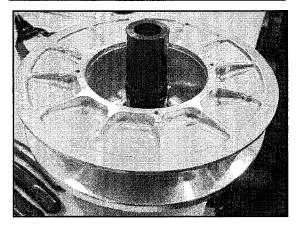
2. Install the shaft and bearing assembly into the outer sheave.



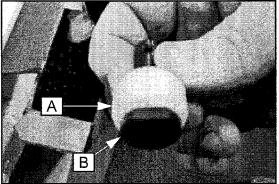
NOTE: Press only on the outer race of the bearing during installation to prevent from damaging the bearing.

3. 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.

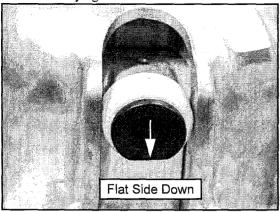




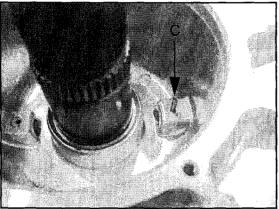
4. Install the roller (A) onto the roller pin (B) on both sides.



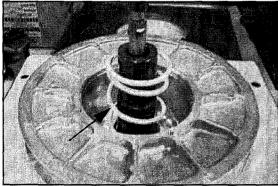
5. Install the roller pin into the sheave assembly on both sides. The flat side of the roller pin faces downward when the shaft side is laying flat on the bench.



6. Install the spring pins (C) to secure the roller pins. Install until flush with sheave surface.

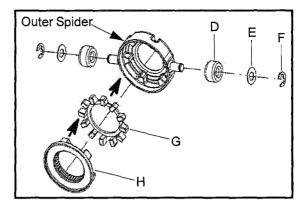


7. Install the spring over the shaft.

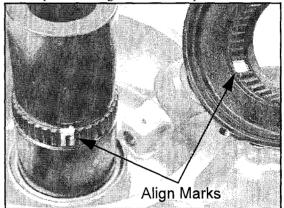


8. Install the clutch rollers (D) onto each side of the outside spider. Install the washers (E) and E-clips (F) to secure the rollers. The rollers should spin freely.

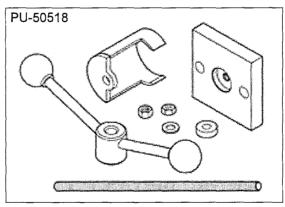
9. Install the spider dampener (G) inside the outer spider and install the inside spider plate (H).



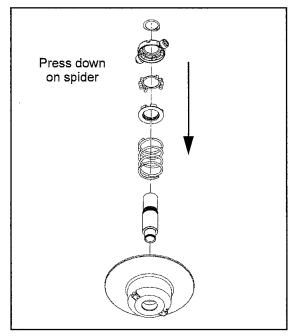
10. Install the spider assembly onto the shaft with the retaining ring on top of the spider. **NOTE:** Use the marks previously made to align the skip tooth spider, or use the "X" on top of the spider and align it with the skip tooth on the shaft.



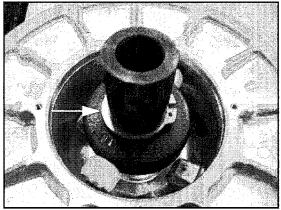
11. Place the clutch into the Driven Clutch Compression Tool **PU-50518**.



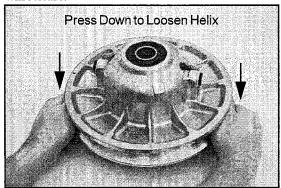
12. Press down on the top of the spider assembly, pushing the spider onto the shaft.



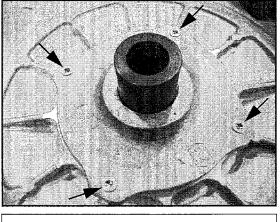
13. Slowly compress the spider into place. If the spider appears to bind while compressing, stop and make sure the skiptooth on the shaft and the spider are aligned. Once the spider passes the retaining ring notch on the shaft, install the retaining ring.



14. Install the cam (helix) assembly over the shaft. Line up the "X" on the cam, "X" on spider, and "X" on the stationary sheave or use the marks previously made before disassembly. **NOTE:** If the cam assembly (helix) is difficult to install, be sure the sheaves are aligned. To align the sheaves place the clutch assembly on a flat surface with the cam assembly (helix) side down. Press down on the moveable sheave belt face with both hands and the helix will release.



15. Use a T25 Torx driver to install the four helix retaining screws and torque to specification.

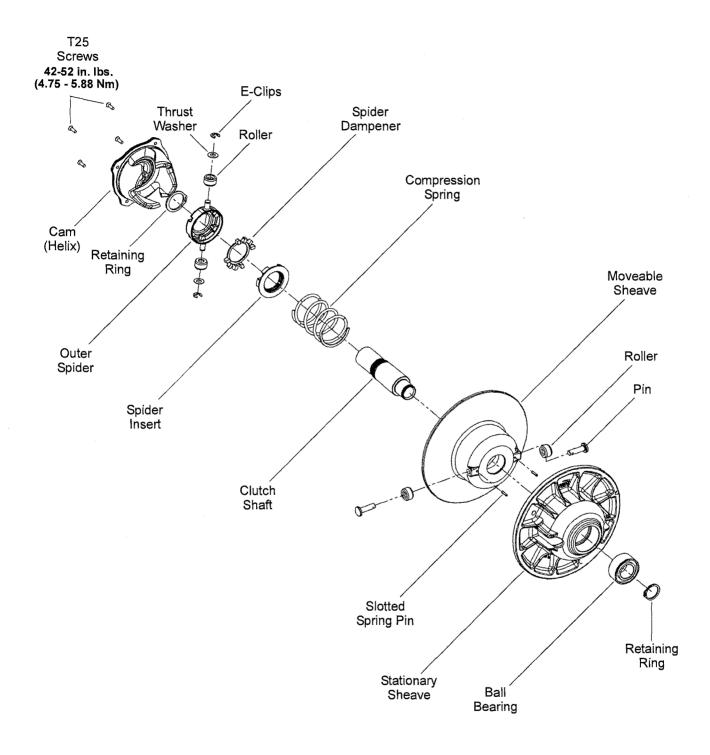


E = T Helix Retaining Screws: 42-52 in. lbs. (4.75 - 5.88 Nm)

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6

Exploded View



TROUBLESHOOTING

Situation	Probable Cause	Remedy
	-Wrong or broken drive clutch spring.	-Replace with recommended spring.
Engine RPM below specified operating range, although engine is properly	-Drive clutch shift weight too heavy.	-Install correct shift weight kit to match engine application.
tuned.	-Driven clutch spring broken or installed in wrong helix location.	-Replace spring; refer to proper installation location.
Provetia an eine	-Drive clutch binding.	A. Disassemble drive clutch; inspect shift weights for wear and free operation.B. Clean and polish stationary shaft hub; reassemble clutch without spring to determine problem area.
Erratic engine operating RPM during acceleration or load variations.	-Belt worn unevenly - thin / burnt spots.	Replace belt.
	-Driven clutch malfunction.	A. Replace ramp buttons. B. Inspect movable sheave for excessive bushing clearance.
	-Sheave face grooved.	-Replace the clutch.
	-Incorrect drive clutch spring (too high spring rate).	-Install correct recommended spring.
Engine RPM above specified operating range.	-Drive clutch shift weights incorrect for application (too light).	-Install correct recommended shift weights.
	-Drive clutch binding.	-Disassemble and clean clutch, inspecting shift weights and rollers. Reassemble without the spring and move sheaves through entire range to further determine probable cause.
	-Driven clutch binding.	-Disassemble, clean, and inspect driven clutch, noting worn sheave bushing and ramp buttons and helix spring location.
	-Converter sheaves greasy; belt slipage.	-Clean sheaves with denatured alcohol or brake cleaner, install new belt.
	-Drive belt worn too narrow.	-Replace belt.
Harsh drive clutch engagement.	-Excessive belt / sheave clearance with new belt.	-Perform belt / sheave clearance adjustment with shim washers beneath spider.
Drive belt turns over	-Wrong belt for application.	-Replace with correct belt.
Belt burnt, thin spots	-Abuse (continued throttle application when vehicle is stationary, excess load)	-Caution operator to operate machine within guidelines.
	-Dragging brake	-Inspect brake system.
		-Fast, effective use of throttle for efficient engagement.

6

Troubleshooting, Continued.....

Situation	Probable Cause	Remedy
	-Plugged air intake or outlet.	-Clear obstruction
	-Belt slippage due to water, oil, grease, etc., rubbing on cover.	-Inspect system. Clean , repair or replace as necessary. Seal PVT system ducts.
PVT cover overheating (melting)	-Clutches or weight being applied to cover while in operation.	-Remove weight. Inform operator.
	-High vs. low range.	-Instruct operator on guidelines for operation in proper driving range for different terrain as outlined in Owner's Safety and Maintenance Manual.
	-Cover seals or ducts leaking	-Find leak and repair as necessary.
Water ingestion	-Operator error	-Instruct operator on guidelines for operation in wet terrain as outlined in Owner's Safety and Maintenance Manual.
	-Belt worn out	-Replace belt.
Belt slippage	-Water ingestion	-Inspect and seal PVT system.
	-Belt contaminated with oil or grease	-Inspect and clean.
	-Belt worn or separated, thin spots, loose belt	-Replace belt.
PVT noise	-Broken or worn clutch components, cover hitting clutches	-Inspect and repair as necessary.
Engagement erratic or stabby	-Thin spots on belt, worn belt	-Replace belt. Refer to belt burnt troubleshooting and instruct operator.
	-Drive clutch bushings stick	-Inspect and repair clutches.

FINAL DRIVE CHAPTER 7 FINAL DRIVE

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SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION	
2872608	Roll Pin Removal Tool	
8700226	CV Boot Clamp Pliers (earless type)	
PU-48951	Axle Boot Clamp Tool	

TORQUE SPECIFICATIONS

Wheel and Hub Torque Table

ITEM	SPECIFICATION
Wheel Nuts	30 ft. lbs. (41 Nm) + 90° (1/4 turn)
Front Hub Castle Nut	80 ft. lbs. (108 Nm)
Rear Hub Castle Nut	80 ft. lbs. (108 Nm)
Ball Joint Pinch Bolts	23 ft. lbs. (31 Nm)
Front Brake Caliper Mounting Bolts	31-34 ft. lbs. (42-46 Nm)
Tie Rod End Fastener	42.5 ft. lbs. (58 Nm)
Propshaft Support Bearing Fasteners	16-18 ft. lbs. (22-24 Nm)
Propshaft Bearing Set Screws	65-75 in. lbs. (7.3-8.4 Nm)
Front Gearcase Cover Plate Screws	7-11 ft. lbs. (10-15 Nm)
Front Gearcase Mounting Bolts	30 ft. lbs. (41 Nm)
Bearing Carrier to Trailing Arm Bolts	50 ft. lbs. (67.7 Nm)
Radius Rod to Bearing Carrier Bolts	50 ft. lbs. (67.7 Nm)
Rear Brake Caliper Mounting Bolts	30 ft.lbs. (41 Nm)

FRONT BEARING CARRIER

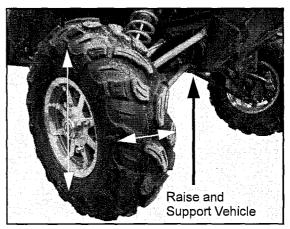
Bearing Carrier Inspection / Removal

1. Elevate front of vehicle and safely support machine under the frame area.

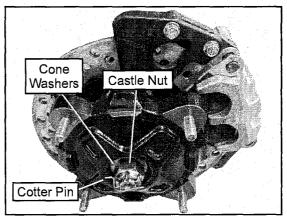


Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Check bearings for side play by grasping the top and bottom of the tire firmly and checking for movement. The tire should rotate smoothly without binding or rough spots.



- 3. Remove the (4) wheel nuts and remove the front wheel.
- 4. Remove the cotter pin and loosen the front wheel hub castle nut. Remove the nut, and (2) cone washers from the front wheel hub assembly.

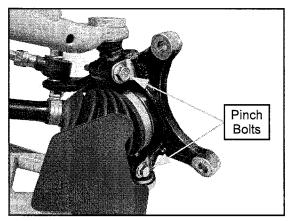


5. Remove the fastener retaining the steering tie rod end to the front bearing carrier.

 Remove and discard the two front brake caliper mounting bolts and remove the caliper from the brake disc (see Chapter 9).

CAUTION: Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.

- 7. Remove the front wheel hub assembly.
- 8. Remove and discard the upper and lower ball joint pinch bolts.



- 9. Using a soft faced hammer, lightly tap on the bearing carrier while removing the upper and lower ball joint ends.
- 10. Remove the bearing carrier from the front drive shaft.
- 11. Rotate bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion.

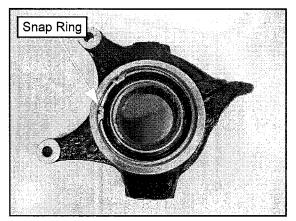
NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

12. Replace bearing if moisture, dirt, corrosion, or roughness is evident.

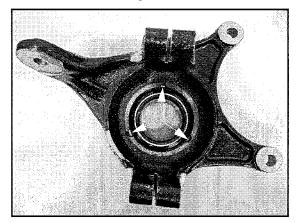
Bearing Replacement

Bearing Removal

1. Remove the outer snap ring.



2. From the back side of the bearing carrier, tap on the outer bearing race with a drift punch in the reliefs as shown.



- 3. Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.
- 4. Inspect the bearing carrier housing for scratches, wear or damage. Replace front bearing carrier if damaged.

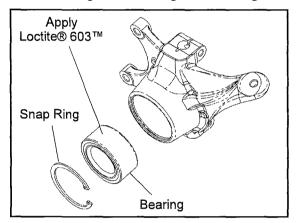
Bearing Installation

- 5. Thoroughly clean the front bearing carrier housing and the outer race on the new bearing. Be sure that all oil residue has been removed from each surface.
- 6. Support the bottom of the bearing carrier housing.

A CAUTION

Use an arbor and press only on the outer race, otherwise bearing damage may occur.

7. Apply Loctite® 603[™] retaining compound to the outer circumference of the new bearing race and carefully press the new bearing into the bearing carrier housing.

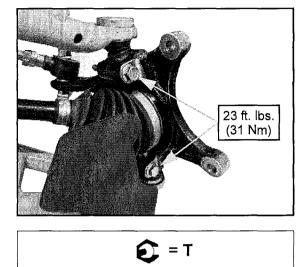


NOTE: Use care to not allow any of the Loctite® compound to get in the bearing.

8. Wipe the housing clean of any excess compound and install the snap ring.

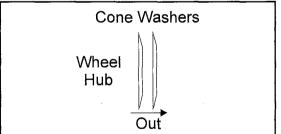
Bearing Carrier Installation

- 1. Install drive shaft axle through the backside of the bearing carrier.
- 2. Install the upper and lower ball joint ends into the front bearing carrier.
- 3. Install new pinch bolts and nuts. Torque to specification.

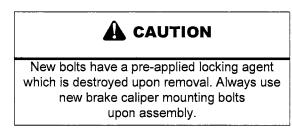


Ball Joint Pinch Bolts: 23 ft. lbs. (31 Nm)

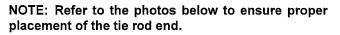
- 4. Apply Anti-Seize to drive shaft axle splines.
- 5. Install front wheel hub assembly, cone washers, and hand tighten the castle nut. Install washers with domed side out.

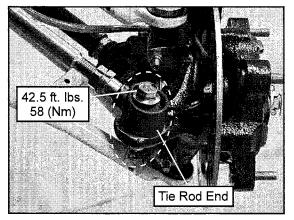


6. Install **new** brake caliper mounting bolts and torque to specification.

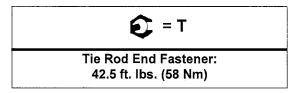


7. Install the steering tie rod end onto the front bearing carrier.

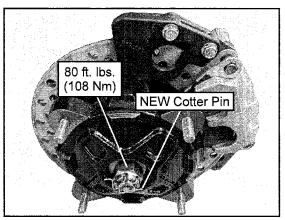




8. Torque the tie rod end fastener to specification and install a **new** cotter pin.



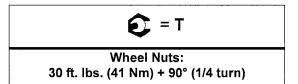
9. Torque wheel hub nut to specification and install a **new** cotter pin. Tighten nut slightly if necessary to align cotter pin holes. Bend both ends of cotter pin around end of spindle in different directions.





80 ft. lbs. (108 Nm)

10. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.



11. Rotate wheel and check for smooth operation.

FRONT DRIVE SHAFT

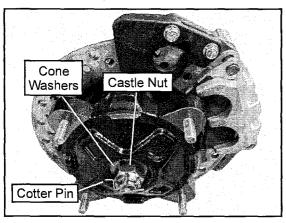
Drive Shaft Removal

1. Elevate front of vehicle and safely support machine under the frame area.



Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

- 2. Remove the (4) wheel nuts and remove the front wheel.
- 3. Remove the cotter pin and loosen the front wheel hub castle nut. Remove the nut, and (2) cone washers from the front wheel hub assembly.

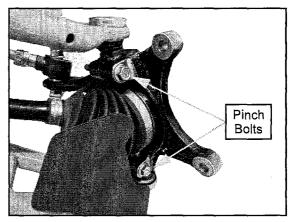


4. Remove and discard the two front brake caliper mounting bolts and remove the caliper from the brake disc (see Chapter 9).

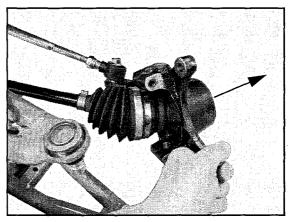
CAUTION: Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.

5. Remove the front wheel hub assembly.

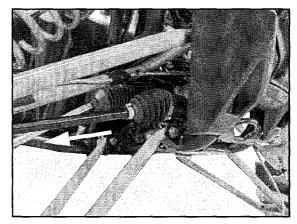
6. Remove and discard the upper and lower ball joint pinch bolts and nuts.



- 7. Using a soft faced hammer, lightly tap on the bearing carrier while removing the upper ball joint end.
- 8. Remove the drive shaft from the front bearing carrier.

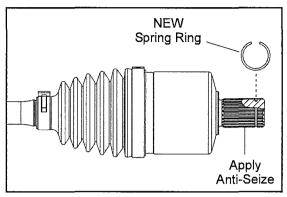


9. With a short, sharp jerk, remove drive shaft from the front gearcase.

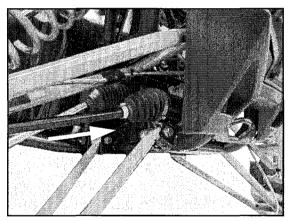


Drive Shaft Installation

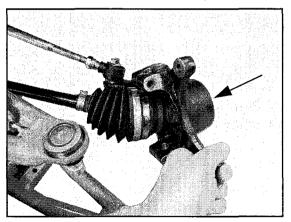
1. Install new spring ring on drive shaft. Apply an anti-seize compound to the splines.



2. Align splines of drive shaft with front gearcase and reinstall the drive shaft. Use a rubber mallet to tap on the outboard end of the drive shaft if necessary

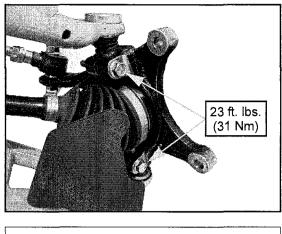


3. Install drive shaft into the front bearing carrier.



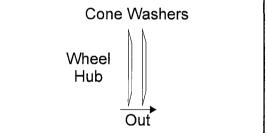
Install the upper and lower ball joint ends into the front 4. bearing carrier.

5. Install new pinch bolts and nuts. Torque to specification.

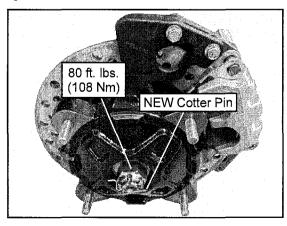




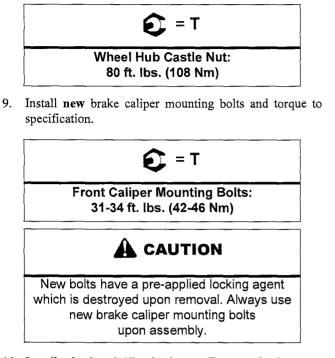
- 6. Apply Anti-Seize to drive shaft axle splines.
- 7. Install front wheel hub assembly, cone washers, and hand tighten the castle nut. Install washers with domed side out.



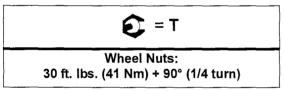
8. Torque wheel hub nut to specification and install a new cotter pin. Tighten nut slightly if necessary to align cotter pin holes. Bend both ends of cotter pin around end of spindle in different directions.



7



10. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.

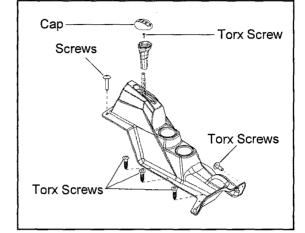


11. Rotate wheel and check for smooth operation.

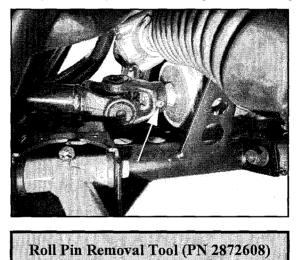
PROPSHAFT SERVICE

Removal / Installation

- 1. Remove both seats and engine service panel.
- 2. Remove the gear selector and center console.

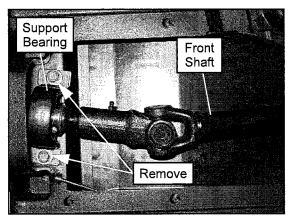


- 3. Raise and support the vehicle.
- 4. Locate the propshaft roll pin and use the Roll Pin Removal Tool (PN 2872608) to remove the roll pin. Discard roll pin.

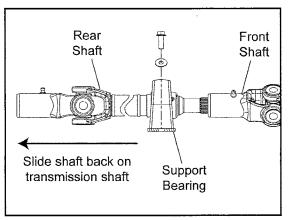


NOTE: Right front wheel can be removed to gain better access to the propshaft roll pin.

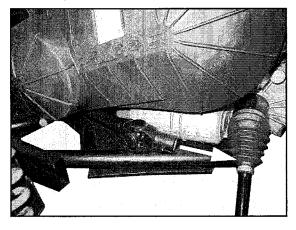
5. Remove the (2) fasteners retaining the support bearing.



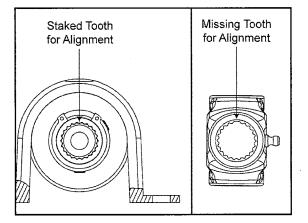
6. Slide the rear portion of the propshaft back to separate it from the front portion. Slide the rear shaft / support bearing to the passenger side of the vehicle.



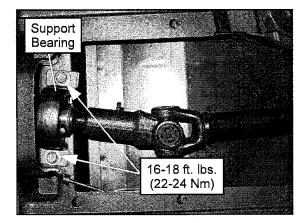
- 7. Slide the front portion of the propshaft back and away from the front gearcase to remove it.
- 8. If removing the rear portion of the propshaft, remove the bearing support (upper & lower half) from the shaft.
- 9. Pull the rear portion of the propshaft forward to disengage it from the transmission output splines. Using care, pull the shaft straight out of the back of the vehicle.



- 10. Reverse this procedure to reinstall and assemble the front and rear portions of the propshaft.
- 11. Lubricate the front gearcase splines with Anti-Seize.
- 12. Lubricate the propshaft mid joint with Polaris All Purpose Grease.
- 13. Lubricate the propshaft transmission splines with Polaris All Purpose Grease.
- 14. Align the front and rear portions of the propshaft as shown below and slide them together.



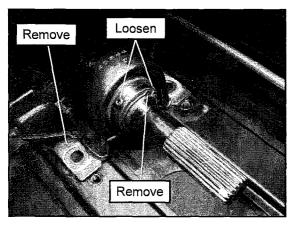
15. Torque the support bearing fasteners to specification.



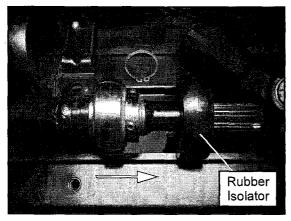
- Support Bearing Fasteners: 16-18 ft. Ibs. (22-24 Nm)
- 16. When installing the front portion of the propshaft, use a **new** roll pin.

Support Bearing Replacement

- 1. Follow steps 1-9 of the "Removal / Installation" procedure.
- 2. Remove the bearing support (upper and lower half) and the retaining ring. Loosen the (2) set screws retaining the bearing to the shaft.

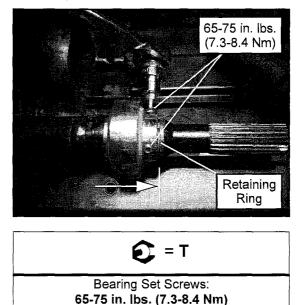


3. Remove the rubber isolator from the bearing and slide the bearing off the end of the shaft.

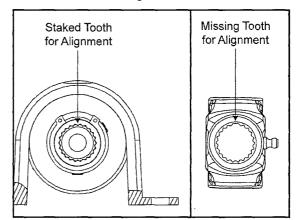


- NOTE: If bearing is seized on the shaft, remove the rear portion of the shaft from the vehicle. Refer to "Removal / Installation".
- 4. Clean the mounting surface of the shaft and install the new bearing.
- 5. Install a **new** retaining ring and slide the bearing tight against the retaining ring.

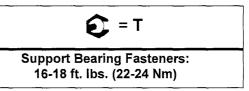
6. Apply Loctite[®] 242[™] to the set screw threads and torque the
(2) bearing set screws to specification.



7. Align the front and rear portions of the propshaft as shown below and slide them together.



- 8. Install the rubber isolator over the bearing.
- 9. Install the upper and lower halves of the bearing support along with the (2) fasteners. Torque the support bearing fasteners to specification.



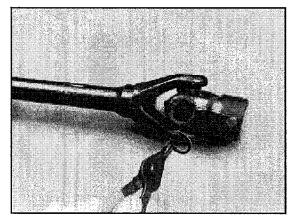
- 10. Install the front portion of the propshaft onto the front gearcase and install a **new** roll pin.
- 11. Reinstall the center console, selector handle and seats.

PROPSHAFT U-JOINT SERVICE

Disassembly

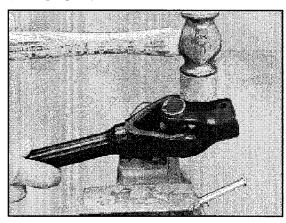


1. Remove internal or external snap ring from bearing caps.

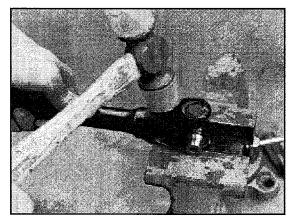


NOTE: If yoke or bearing is removed, cross bearing must be replaced. Note orientation of grease fitting and mark inner and outer yoke for correct repositioning during installation.

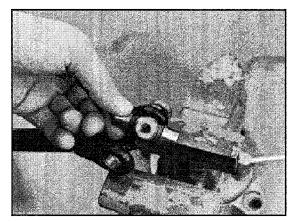
2. Support inner yoke as shown and drive outer yoke down (bearing cap out) with a soft face hammer.



3. Support U-joint in vise as shown and drive inner yoke down to remove remaining bearing caps.

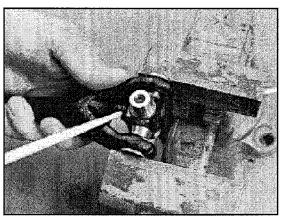


4. Force U-joint cross to one side and lift out of inner yoke.

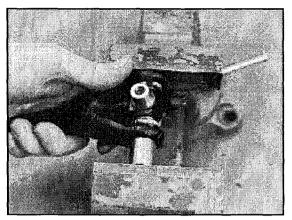


Assembly

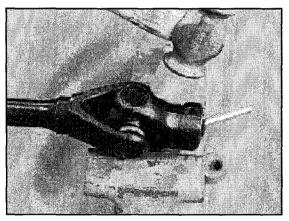
- 1. Install new bearing caps in yoke by hand. Carefully install U-joint cross with grease fitting properly positioned inward toward center of shaft. Take care not to dislodge needle bearings upon installation of cross joint.
- 2. Tighten vise to force bearing caps in.



3. Using a suitable arbor, fully seat the bearing cap in one side. Continually check for free movement of bearing cross as bearing caps are assembled.



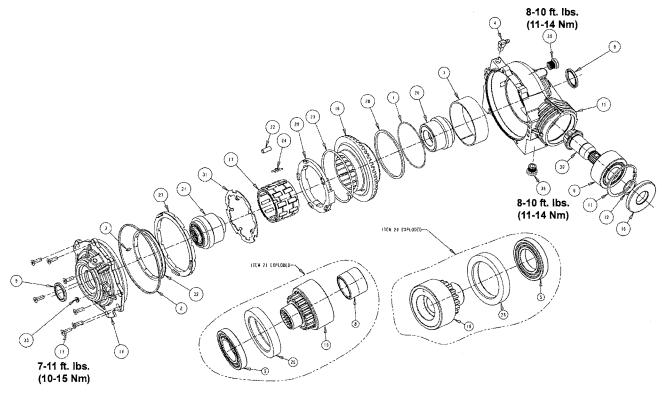
- 4. Install snap ring to contain bearing cap just installed. Repeat procedure for other side.
- 5. Install outer yoke, aligning marks made at disassembly and repeat Steps 1-3 to install bearing caps on outer yoke.
- 6. Seat all bearing caps against snap rings by supporting cross shaft and tapping on 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.

FRONT GEARCASE / CENTRALIZED HILLIARD

Centralized Hilliard Exploded View



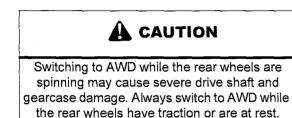
REF#	DESCRIPTION	QTY	REF#	DESCRIPTION	QTY
1	O-Ring	1	17	Roll Cage	1
2	O-Ring	1	19	Hub / Race Assembly	2
3	Dowel Pin	1	20	Hub Sub-Assembly (Female)	1
4	Vent Hose Fitting	1	21	Hub Sub-Assembly (Male)	1
5	Ball Bearing	2	22	Rollers	20
6	Ball Bearing (Double Row)	1	23	Torsion Spring	1
7	Bushing	1	24	H-Clip Spring	20
8	Bushing	1	26	Nylon Spacer	2
9	Oil Seal	2	27	Backlash Spacer	1
10	Oil Seal	1	28	Ring Gear Spacer	1
11	Retaining Ring, Internal	1	29	Torsion Spring Retainer	1
12	Retaining Ring	1	30	Pinion Gear	1
13	Cover Screws, M6 (T30 Torx)	7	31	Armature Plate	1
14	Cover Plate Assembly	1	32	AWD Coil	1
15	Gearcase Housing	1	35	Fill Plug	1
16	Clutch Housing (Ring Gear)	1	36	Drain Plug, Magnetic	1

7.13

All Wheel Drive Operation

The AWD switch may be turned on or off while the vehicle is moving, however, AWD will not enable until the engine RPM drops below 3100. Once the AWD is enabled, it remains enabled until the switch is turned off.

Engage the AWD switch before getting into conditions where the front wheel drive may be needed. If the rear wheels are spinning, release the throttle before switching to AWD.

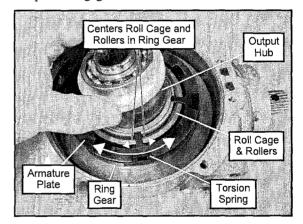


With the AWD switch off, the vehicle drives through the rear wheels only (2 wheel drive). When the AWD is enabled, the front drive acts as an on-demand AWD system. This means, the front drive will engage once the rear wheels have lost traction, and will remain engaged until the torque requirement goes away (i.e. rear wheels regain traction).

If the rear wheels are spinning, release the throttle before turning the AWD switch on. If AWD is engaged while the wheels are spinning, severe drive shaft and front gearcase damage could result. **AWD Engagement:** When the AWD switch is activated, the AWD coil is powered by a 12 Vdc input which creates a magnetic field. This magnetic field attracts an armature plate that is keyed to the roll cage. When the ring gear and roll cage are spinning (vehicle is moving), the energized coil and armature plate will apply drag to the roll cage that indexes the rollers inside the ring gear to an engagement position. While in the engagement position (not engaged), until the rear wheels lose traction. Once the rear wheels begin to lose traction, the front drive will engage by coupling the output hubs to the ring gear via the rollers. The front drive will remain engaged until the torque requirement goes away (i.e. rear wheels regain traction).

AWD Disengagement: Once the rear wheels regain traction, the front wheels will return to the "over-running" condition. The vehicle is now back to rear wheel drive until the next loss of rear wheel traction occurs.

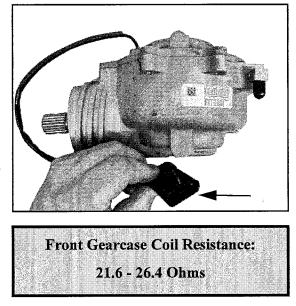
Torsion Spring Operation: The torsion spring acts as a return mechanism to help disengage the coupling of the output hubs and ring gear by creating an "over-running" condition for the rollers upon disengagement.



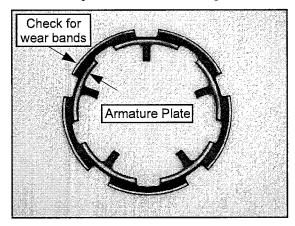
AWD Diagnosis

Symptom: AWD Will Not Engage

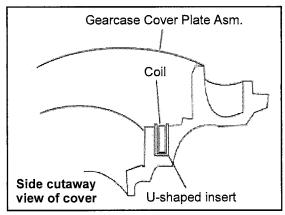
1. Check the gearcase coil resistance. To test the coil resistance, measure between the Grey and Brown/White wires. The measurement should be within specification.



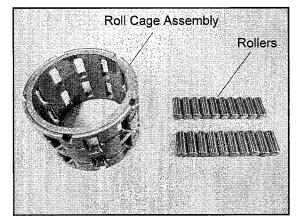
- 2. Turn the ignition and AWD switches on and place gear selector in High or Low gear. Check for minimum battery voltage at the Gray and Brown/White chassis wires that power the coil. A minimum of 11 Vdc should be present.
- 3. If electrical tests are within specification, remove gearcase (see "Gearcase Removal") and inspect components.
- 4. Inspect the armature plate for a consistent wear pattern. There should be two distinct wear bands (one band inside the other). If only one band of wear is present (or if there is wear between the two bands), inspect the coil area as indicated in Step 5. A wear band with an interrupted wear mark may indicate a warped plate, which may cause intermittent operation. See the following illustrations:



5. Check to make sure the coil is seated in the U-shaped insert that is pressed into the gearcase cover. The top of the coil should be seated below the U-shaped insert. The U-shaped insert controls the pole gap. If the top of the coil is above the surface of the U-shaped insert it raises the armature plate, thereby increasing pole gap. If the pole gap increases the coil will not be strong enough to engage the AWD system. If this is found, replace the cover plate assembly.



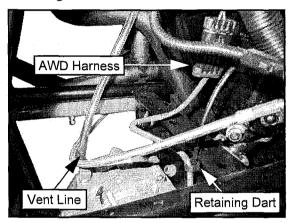
- 6. Inspect the rollers for nicks and scratches. The rollers must slide up, down, in and out freely within the roll cage sliding surfaces and H-springs.
- 7. Inspect the roll cage assembly for cracks or excessive wear. If damaged, replace the roll cage assembly.



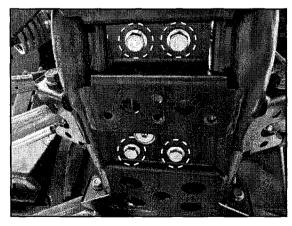
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Gearcase Removal

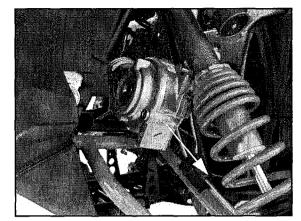
- 1. Raise and support vehicle
- 2. Place gear selector in neutral.
- 3. Refer to "FRONT DRIVE SHAFT Drive Shaft Removal" and remove both front drive shafts from the front gearcase.
- 4. Remove the front section of the propshaft (see "PROPSHAFT SERVICE").
- 5. Disconnect the wire harness for the front gearcase and remove the harness from the retaining dart.
- 6. Remove the vent line from the front gearcase and plug vent line fitting.



7. Remove the (4) bolts securing the front gearcase to the frame.

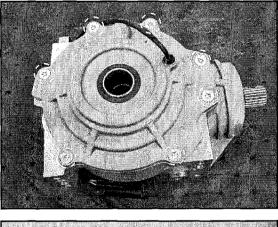


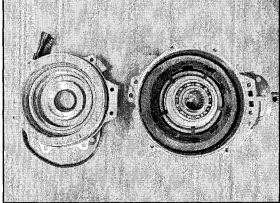
8. Rotate front of gearcase up so the input shaft is facing down. Lift and remove the gearcase from the front LH wheel well area and slide it out of the vehicle above the upper A-arm.



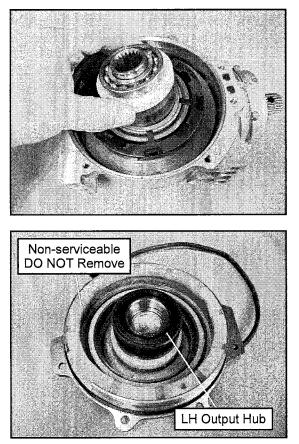
Gearcase Disassembly / Inspection

- 1. Drain and properly dispose of gearcase fluid. Remove any metal particles from the drain plug magnet.
- 2. Remove the (7) cover screws and remove the cover plate assembly.



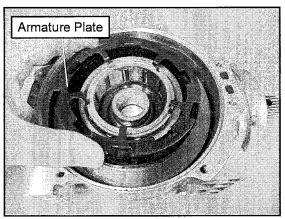


3. Remove the LH output hub assembly from the clutch housing or outer cover plate assembly.

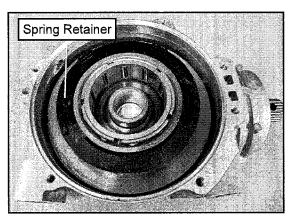


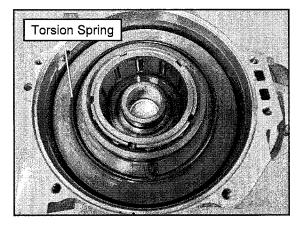
NOTE: Nylon spacer is non-serviceable and should not be removed.

4. Remove and inspect the armature plate. Refer to "AWD Diagnosis" for detailed inspection process.

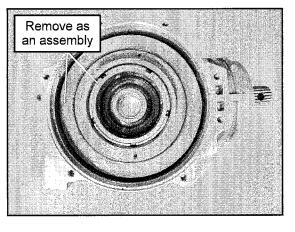


5. Remove the torsion spring retainer and torsion spring from the top of the ring gear.



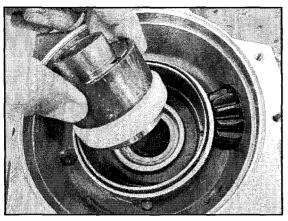


6. Remove the clutch housing / ring gear and roll cage assembly from the gearcase housing.

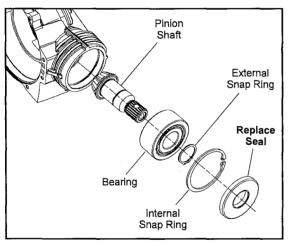


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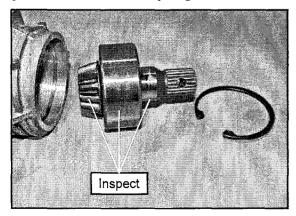
7. Remove the RH output hub assembly from the gearcase housing.



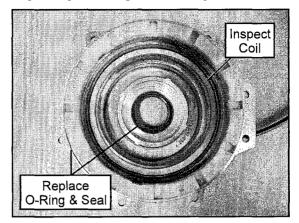
8. Remove pinion seal, internal retaining ring and pinion gear assembly from the gearcase housing. Inspect and clean the gearcase housing and replace all oil seals and O-rings.



9. Inspect the pinion gear for chipped, broken or missing teeth. Inspect the pinion bearing for signs of wear and the pinion shaft seal surface for pitting.



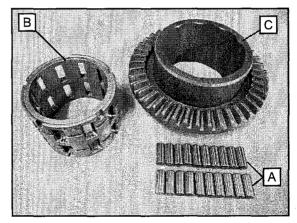
10. Inspect the AWD coil located in the outer cover plate assembly. Refer to "AWD Diagnosis" for detailed inspection process. Replace the cover plate seal and O-ring.



11. Remove the roll cage assembly and rollers from the clutch housing. Use a shop towel to cover the housing in order to retain all the rollers.

NOTE: Rollers are spring loaded. Take care not to allow them to fall out or lose them upon removal of the roll cage.

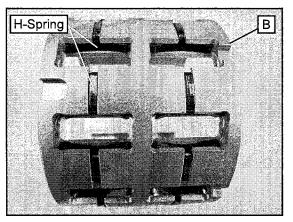
12. Thoroughly clean all parts and inspect the rollers (A) for nicks and scratches. The rollers must slide up and down and in and out freely within the roll cage (B) sliding surfaces and H-springs.



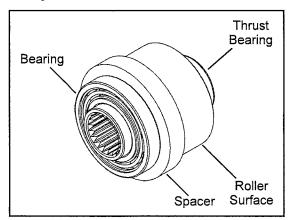
IMPORTANT: Refer to the "Electronic Parts Catalog" for individual part availability. Most parts are to be replaced as an assembly or as a complete kit.

13. Inspect clutch housing / ring gear (C) for a consistent wear pattern. Inspect the ring gear for chipped, broken, or missing teeth.

14. Inspect the roll cage assembly (B) sliding surfaces and Hsprings. The sliding surfaces must be clean and free of nicks, burrs or scratches. If damaged, replace the roll cage assembly.



15. Inspect both output hub assemblies. Inspect the bearings and replace if needed.



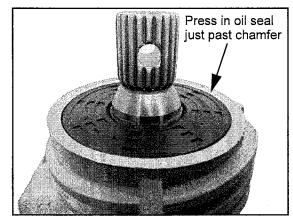
16. Clean and inspect all remaining front gearcase components. Check each for excessive wear or damage.

Gearcase Assembly

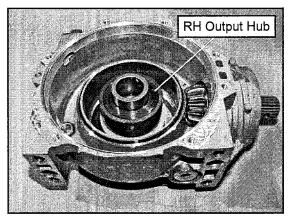
- 1. As mentioned during gearcase disassembly section, replace all O-rings, seals and worn components.
- 2. Install pinion shaft assembly and install internal snap ring.

NOTE: If bearing replacement was required, press new bearing onto the pinion shaft and install a new external snap ring.

3. Install a new pinion shaft seal into the pinion gear housing. Using a universal seal installer, press the new seal into the housing until the seal is just below the housing chamfer.



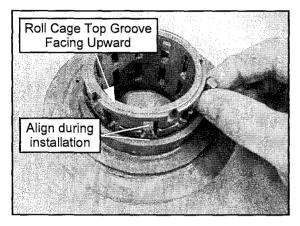
4. Install the RH output hub into the gearcase housing.



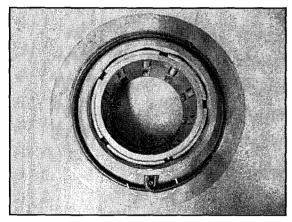
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5. Carefully install the rollers into the roll cage assembly while installing the assembly into the clutch housing.

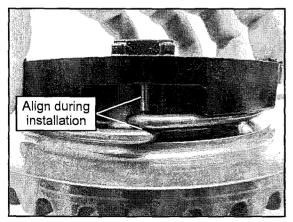
NOTE: Install the roll cage so that the ring gear grooves line up with the roll cage windows (see below). Be sure role cage top groove is facing upward.



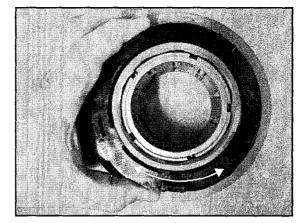
6. Install the torsion spring by wrapping each leg of the spring around the dowel pin on the ring gear.



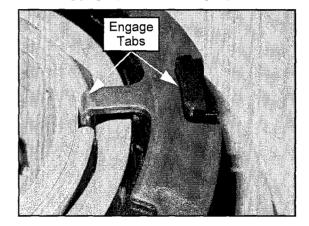
7. Align the spring retainer dowel pin with the ring gear dowel pin and install the retainer on top of the torsion spring.



8. Check the action of the torsion spring by rotating in both directions to ensure the spring and retainer are installed properly.

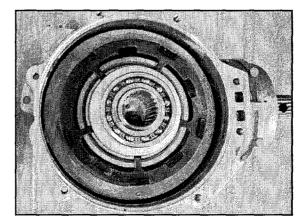


9. Install the armature plate. Be sure all of the armature plate tabs are fully engaged into the roll cage assembly and that it is resting properly on the torsion spring retainer.



NOTE: Verify armature plate tabs are in the roll cage slots and that it rests properly on the spring retainer.

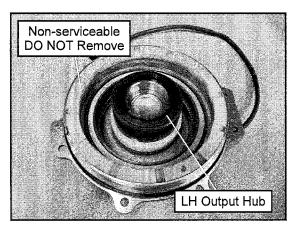
10. Carefully install the ring gear and roll cage assembly into the gearcase housing.



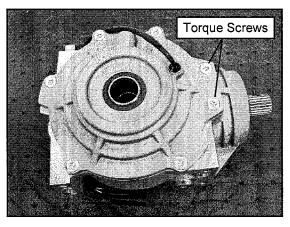
11. Install a new O-ring on the cover plate assembly.

NOTE: Be sure the square O-ring is placed flat on the cover surface. If the O-ring is twisted fluid leakage may occur.

12. Carefully install the LH output hub assembly into the cover plate. Take care not to damage the new cover plate seal while installing the output hub.



13. Install the output cover assembly onto the gearcase housing. Install the (7) cover plate screws and torque to specification.

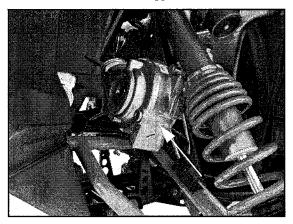




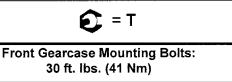
Cover Plate Screws: 7-11 ft. lbs. (10-15 Nm)

Gearcase Installation

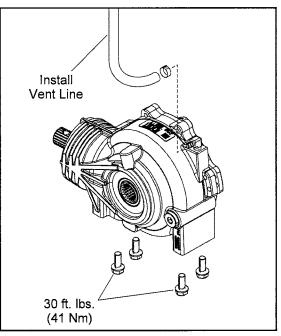
1. Install the gearcase back into the vehicle through the LH wheel well area, above the upper A-arm.



- 2. Lubricate the splines of the front gearcase with Anti-Seize.
- 3. Install the propshaft onto the front gearcase input shaft. Use a NEW spring pin in the front propshaft.
- 4. Install the (4) bolts that secure the front gearcase to the frame and torque to specification.

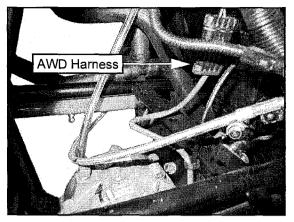


5. Install the vent line.

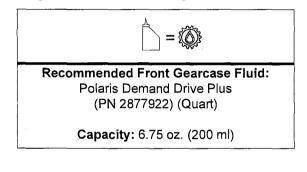


7.21

6. Connect the AWD wire harness.



- 7. Refer to "FRONT DRIVE SHAFT Drive Shaft Installation" and install both front drive shafts into the gearcase.
- 8. Add the proper lubricant to the front gearcase. Refer to Chapter 2 for fluid fill and change information.



REAR BEARING CARRIER

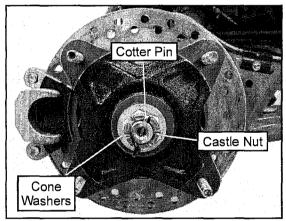
Bearing Carrier Inspection / Removal

1. Elevate rear of vehicle and safely support machine under the frame area.

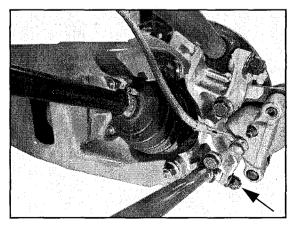


Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

- 2. Check bearings for side play by grasping the top and bottom of the tire firmly and checking for movement. The tire should rotate smoothly without binding or rough spots.
- 3. Remove the (4) wheel nuts and remove the rear wheel.
- 4. Remove the cotter pin and loosen the rear wheel hub castle nut. Remove the nut, and (2) cone washers from the rear wheel hub assembly.

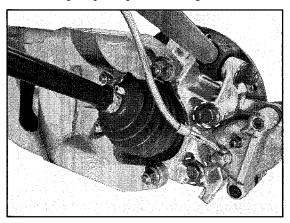


5. Remove the lower radius rod outer mounting bolt, nut and washer from the bearing carrier. Swing radius rod down. Discard the nut.

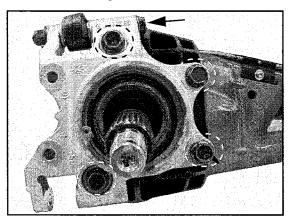


6. Remove the two brake caliper mounting bolts. Remove the rear brake caliper assembly.

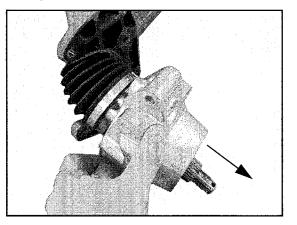
CAUTION: Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.



- 7. Remove the rear wheel hub and brake disk assembly.
- 8. Remove the (5) remaining bolts that attach the rear bearing carrier to the trailing arm. Discard the nuts.



9. Remove the bearing carrier from the rear drive shaft and trailing arm.



10. Rotate bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

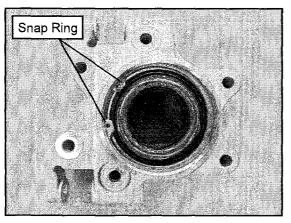
11. Replace bearing if moisture, dirt, corrosion, or roughness is evident.

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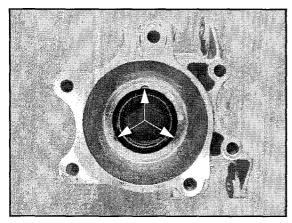
Bearing Replacement

Bearing Removal

1. Remove the outer snap ring.



2. From the back side of the bearing carrier, tap on the outer bearing race with a drift punch in the reliefs as shown.



- 3. Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.
- 4. Inspect the bearing carrier housing for scratches, wear or damage. Replace rear bearing carrier if damaged.

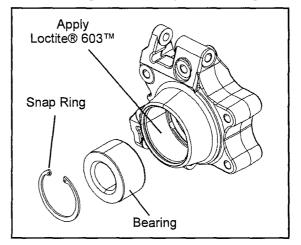
Bearing Installation

- 5. Thoroughly clean the rear bearing carrier housing and the outer race on the new bearing. Be sure that all oil residue has been removed from each surface.
- 6. Support the bottom of the bearing carrier housing.

CAUTION

Use an arbor and press only on the outer race, otherwise bearing damage may occur.

7. Apply Loctite[®] 603[™] retaining compound to the outer circumference of the new bearing race and carefully press the new bearing into the bearing carrier housing.

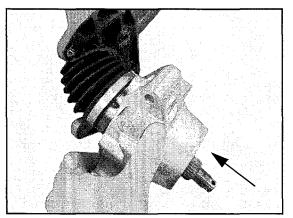


NOTE: Use care to not allow any of the Loctite[®] compound to get in the bearing.

8. Wipe the housing clean of any excess compound and install the snap ring.

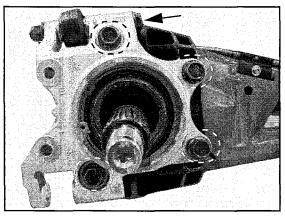
Bearing Carrier Installation

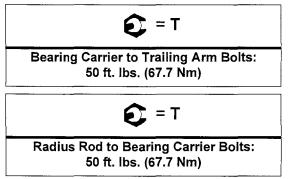
1. Install drive shaft through the backside of the bearing carrier.



2. Install the (4) fasteners that attach the rear bearing carrier to the trailing arm. Install the (1) fastener that attaches the upper radius rod to the bearing carrier. Torque bolts to specification.

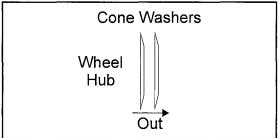
NOTE: Use new nuts upon installation of the rear bearing carrier.



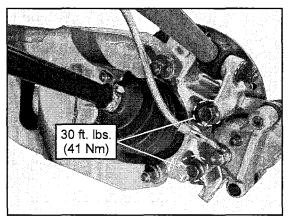


3. Apply anti-seize to drive shaft splines.

4. Install rear wheel hub assembly, cone washers, and hand tighten the castle nut. Install washers with domed side out.



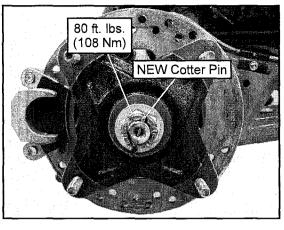
5. Install the rear brake caliper assembly and new bolts. Torque to specification.

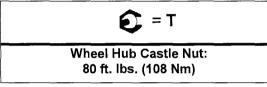


Rear Caliper Mounting Bolts: 30 ft. lbs. (41 Nm) 7

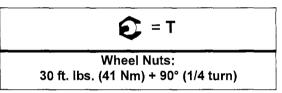
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6. Torque wheel hub nut to specification and install a **new** cotter pin. Tighten nut slightly if necessary to align cotter pin holes.





7. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.



8. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around end of spindle in different directions.

REAR DRIVE SHAFT

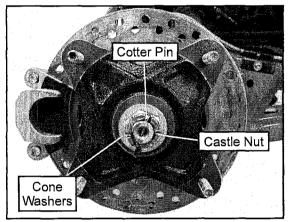
Drive Shaft Removal

1. Raise and support the vehicle.

CAUTION

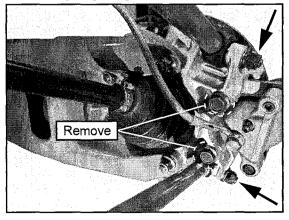
Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this procedure. Always wear eye protection.

- 2. Remove the wheel nuts from rear wheel. Remove the rear wheel.
- 3. Remove the cotter pin and loosen the rear wheel hub castle nut. Remove the nut, and (2) cone washers from the rear wheel hub assembly.

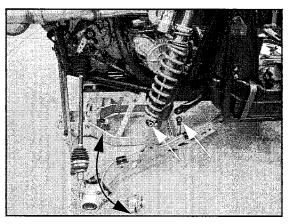


- 4. Remove the (2) bolts attaching the upper and lower radius rods to the bearing carrier. Discard the nuts. Let the radius rods swing downward.
- 5. Remove the brake caliper mounting bolts. Remove the rear brake caliper assembly.

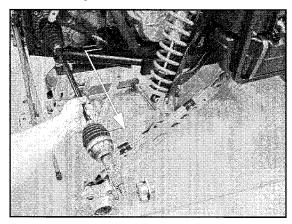
CAUTION: Do not hang the caliper by the brake line. Use wire to hang caliper to prevent damage to the brake line.



- 6. Remove the rear hub assembly from the bearing carrier.
- 7. Support the trailing arm from underneath.
- 8. Remove the lower shock mounting bolt and nut. Swing the shock inward. Discard the nut.
- 9. Remove the stabilizer bar mounting bolt, washer and nut. Discard the nut.
- 10. Lift the trailing arm assembly upward so the rear drive shaft is parallel with the ground.
- 11. Leaving the drive shaft in the transmission, swing the rear trailing arm assembly outward until it is free from the rear drive shaft.
- 12. Lower the trailing arm.

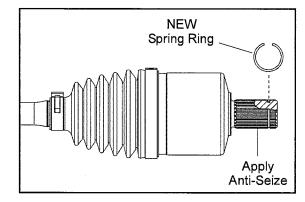


13. With a short, sharp jerk, remove drive shaft from the transmission splines.

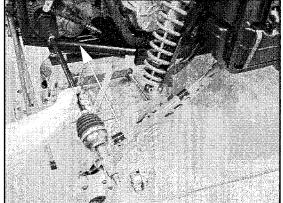


Drive Shaft Installation

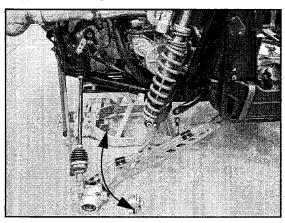
1. Install **new** spring ring on drive shaft. Apply an anti-seize compound to the splines.



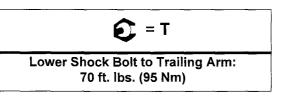
2. Align splines of drive shaft with transmission splines and reinstall the drive shaft. Use a rubber mallet to tap on the outboard end of the drive shaft if necessary.



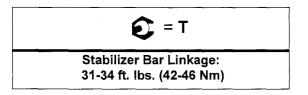
3. Swing the rear trailing arm assembly outward and upward until the rear axle can be inserted into the bearing carrier. Support the trailing arm from underneath.



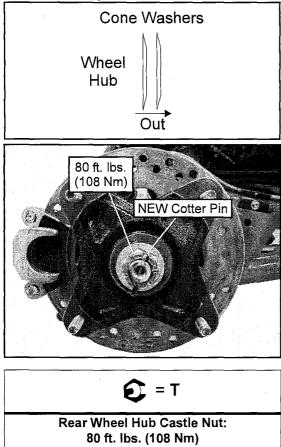
4. Install the lower shock mounting bolt and **new** nut. Torque fastener to specification.



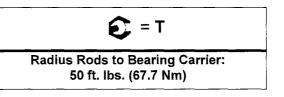
5. Install the stabilizer bar mounting bolt, washer and **new** nut. Torque fastener to specification.



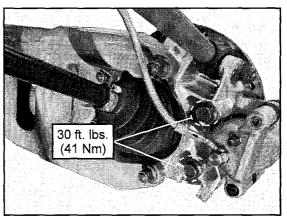
- 6. Apply Anti-Seize to drive shaft axle splines.
- 7. Install rear wheel hub assembly. Install the (2) cone washers and castle nut. Torque castle nut to specification. Install new cotter pin.

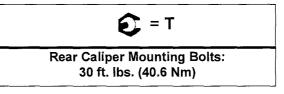


8. Install the radius rod bolts, washers and **new** nuts. Torque fasteners to specification.



9. Install the rear brake caliper assembly and **new** bolts. Torque to specification.





10. Install wheel and (4) wheel nuts. Torque wheel nuts to specification.



Wheel Nuts: 30 ft. lbs. (41 Nm) + 90° (1/4 turn)

DRIVE SHAFT CV JOINT / BOOT REPLACEMENT

Drive Shaft / CV Joint Handling Tips

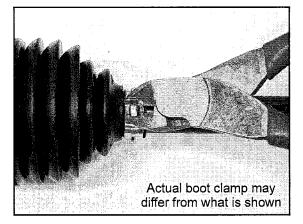
Care should be exercised during drive shaft removal or when servicing CV joints. Drive shaft components are precision parts.

Cleanliness and following these instructions is very important to ensure proper shaft function and a normal service life.

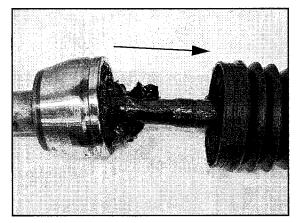
- The complete drive shaft and joint should be handled by getting hold of the interconnecting shaft to avoid disassembly or potential damage to the drive shaft joints.
- Over-angling of joints beyond their capacity could result in boot or joint damage.
- Make sure surface-ground areas and splines of shaft are protected during handling to avoid damage.
- Do not allow boots to come into contact with sharp edges or hot engine and exhaust components.
- The drive shaft is not to be used as a lever arm to position other suspension components.
- Never use a hammer or sharp tools to remove or to install boot clamps.
- Be sure joints are thoroughly clean and that the proper amount and type of grease is used to refill when joint boots are replaced and when joints are cleaned. Refer to text for grease capacity of CV joints and CV joint boots.

Outer CV Joint / Boot Replacement

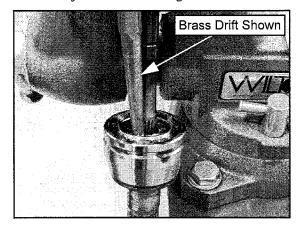
1. Using a side cutters, cut away and discard the boot clamps.



2. Remove the large end of the boot from the CV joint and slide the boot down the shaft.

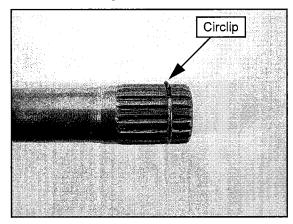


- 3. Clean the grease from the face of the joint.
- 4. Place the drive shaft in a soft-jawed vise. Using a soft-faced hammer, or brass drift, strike the inner race of the joint to drive the joint off the drive shaft. Be sure to tap evenly around the joint to avoid binding.



IMPORTANT: Tap on inner race only!

5. Make sure the circlip is on the shaft and not left in the joint.



7

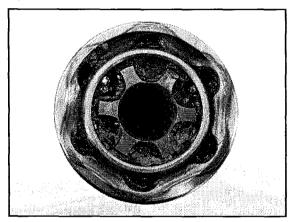
7.29

6. Remove the CV boot from the shaft.



Complete disassembly of the CV joint is NOT recommended. The internal components are a precision fit and develop their own characteristic wear patterns. Intermixing the internal components could result in looseness, binding, and/or premature failure of the joint.

IMPORTANT: If the grease in the joint is obviously contaminated with water and/or dirt, the joint should be replaced.

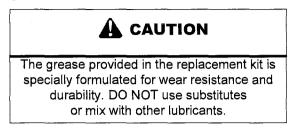


- 7. Thoroughly clean the joint with an appropriate solvent and dry the joint to prevent any residual solvent from being left in the joint upon reassembly.
- 8. Visually inspect the joint by tilting the inner race to one side to expose each ball. Severe pitting, galling, play between the ball and its cage window, any cracking or damage to the cage, pitting or galling or chips in raceways call for joint replacement.

NOTE: Shiny areas in ball tracks and on the cage spheres are normal. Do not replace CV joints because parts have polished surfaces. Replace CV joint only if components are cracked, broken, worn or otherwise unserviceable.

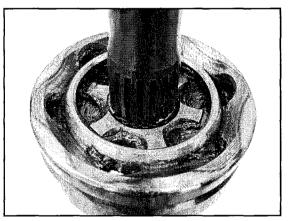
- 9. Clean the splines on the end of the shaft and apply a light coat of grease prior to reassembly.
- 10. Slide the small boot clamp and boot (small end first) onto the drive shaft and position the boot in it's groove machined in the shaft.
- 11. Install a new circlip on the end of the shaft.

12. Grease the joint with the special CV joint grease provided in the boot replacement kit. Fill the cavity behind the balls and the splined hole in the joint's inner race. Pack the ball tracks and outer face flush with grease. Place any remaining grease into the boot.



NOTE: The amount of grease that's provided is premeasured, so use all the grease.

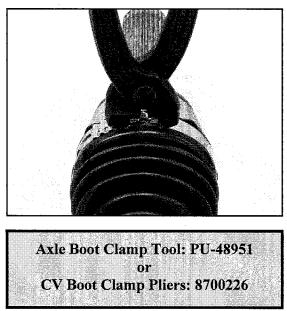
13. Slide the joint onto the drive shaft splines and align the circlip with the lead-in chamfer on the inner race of the joint.



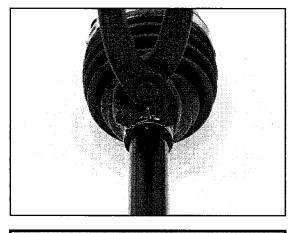
- 14. Use a soft-faced hammer to tap the joint onto the drive shaft until it locks into place.
- 15. Pull on the joint to make sure it is securely locked in place.
- 16. Remove excess grease from the CV joint's external surfaces and place the excess grease in the boot.
- 17. Pull the boot over the joint and position the boot lips into the grooves on the joint housing and shaft. Make sure the boot is not dimpled or collapsed.

7.30

18. Install and tighten the large clamp using the appropriate clamp tool.



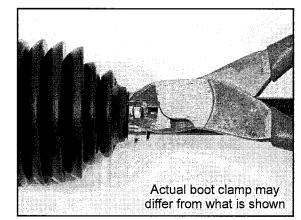
- 19. While pulling out on the CV shaft, fully extend the CV joint and slide a straight O-ring pick or a small slotted screw driver between the small end of the boot and the shaft. This will allow the air pressure to equalize in the CV boot in the position that the joint will spend most of its life. Before you remove your instrument, be sure the small end of the boot is in its correct location on the shaft.
- 20. Install and tighten the small clamp on the boot using the appropriate clamp tool.



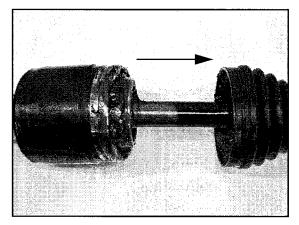
Axle Boot Clamp Tool: PU-48951 or CV Boot Clamp Pliers: 8700226

Inner Plunging Joint / Boot Replacement

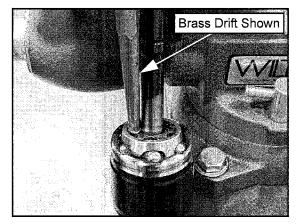
1. Using a side cutters, cut away and discard the boot clamps.



2. Remove the large end of the boot from the plunging joint and slide the boot down the shaft.



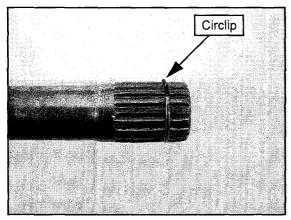
- 3. Clean the grease from the face of the joint and place the drive shaft in a soft-jawed vise.
- 4. Using a soft-faced hammer, or brass drift, strike the inner race of the joint to drive the joint off the drive shaft. Be sure to tap evenly around the joint to avoid binding.



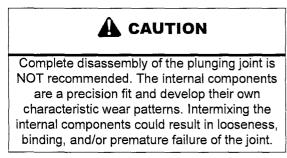
IMPORTANT: Tap on inner race only!



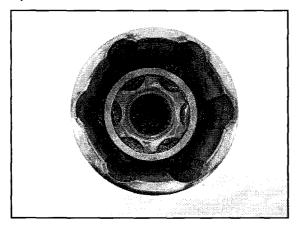
5. Make sure the circlip is on the shaft and not left in the joint.



6. Remove the boot from the shaft.



IMPORTANT: If the grease in the joint is obviously contaminated with water and/or dirt, the joint should be replaced.



- 7. Thoroughly clean the joint with an appropriate solvent and dry the joint to prevent any residual solvent from being left in the joint upon reassembly.
- 8. Visually inspect the joint for damage. Replace if needed.
- 9. Clean the splines on the end of the shaft and apply a light coat of grease prior to reassembly.

7.32

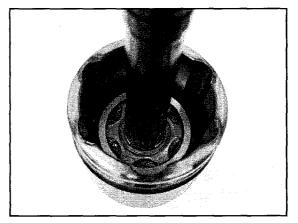
- 10. Slide the small boot clamp and boot (small end first) onto the drive shaft and position the boot in its groove machined in the shaft.
- 11. Install a new circlip on the end of the shaft.
- 12. Grease the joint with the special joint grease provided in the boot replacement kit. Fill the cavity behind the balls and the splined hole in the joint's inner race. Pack the ball tracks and outer face flush with grease. Place any remaining grease into the boot.



The grease provided in the replacement kit is specially formulated for wear resistance and durability. DO NOT use substitutes or mix with other lubricants.

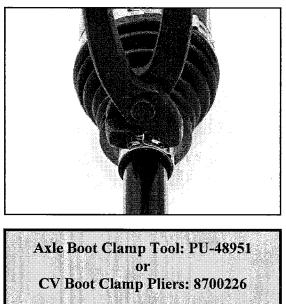
NOTE: The amount of grease that's provided is premeasured, so use all the grease.

- 13. Fully compress the joint and push the drive shaft firmly into the inner race.
- 14. Align the circlip with the lead-in chamfer.

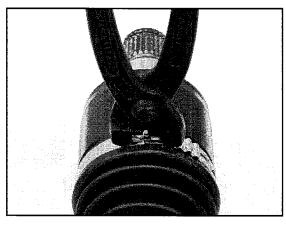


- 15. Use a soft-faced hammer to tap the joint onto the drive shaft until you reach the end of the splines and the joint locks in place.
- 16. Pull on the joint to test that the circlip is seated and that the joint is securely fastened to the shaft.
- 17. Remove excess grease from the plunging joint's external surfaces and place the excess grease in the boot.
- Pull the boot over the joint and position the boot lips into the grooves on the joint housing and shaft. Make sure the boot is not dimpled or collapsed.
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19. Install and tighten the small clamp using the appropriate clamp tool.

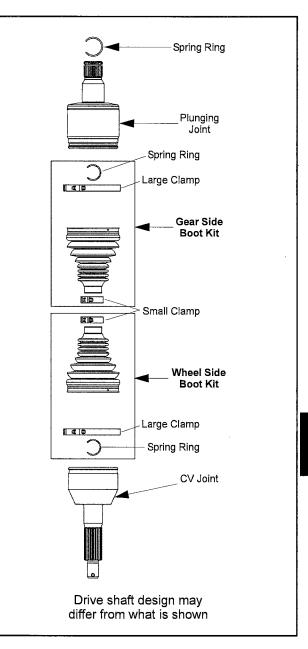


- 20. Pull out on the drive shaft to center the joint in the housing. Slide a straight O-ring pick or a small slotted screw driver between the large end of the boot and the joint housing and lift up to equalize the air pressure in the boot.
- 21. Position the boot lip in its groove. Install and tighten the large clamp using the appropriate clamp tool.



Axle Boot Clamp Tool: PU-48951 or CV Boot Clamp Pliers: 8700226

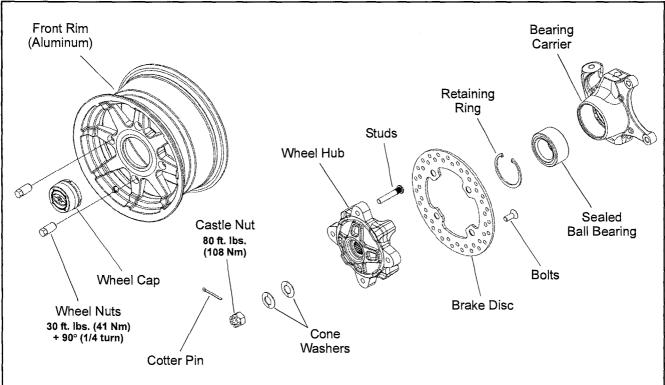
Drive Shaft Exploded View



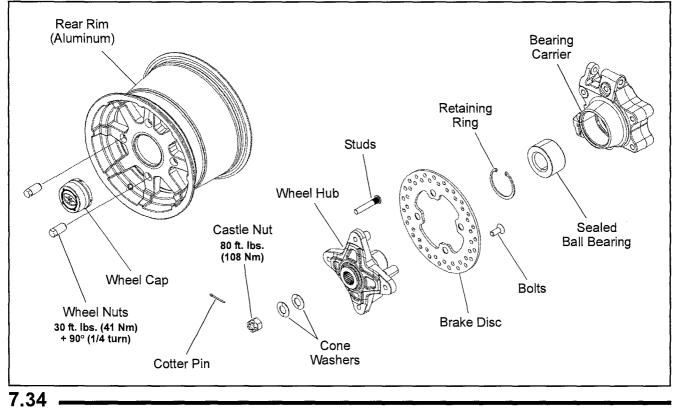
7.33

WHEEL HUBS

Front Hub Exploded View



Rear Hub Exploded View



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CHAPTER 8 TRANSMISSION

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8

SPECIFICATIONS

Torque Specifications

ITEM	TORQUE VALUE
Bearing Retaining Plate Screws	8-10 ft. lbs. (11-14 Nm)
Bell Crank Nut	12-18 ft. lbs. (16-24 Nm)
Fill / Drain Plugs	10-14 ft. lbs. (14-19 Nm)
Gear Sector Cover	7-9 ft. lbs. (9-12 Nm)
Park Flange Screws	8-10 ft. lbs. (11-14 Nm)
Rear Transmission Isolator Mount Bolt	40 ft. lbs. (54 Nm)
Snorkel Tube	Refer to "Snorkel Gear Backlash Procedure"
Snorkel Tube Locking Screw	8-10 ft. lbs. (11-14 Nm)
Support and Shift Cable Bracket Bolts	17 ft. lbs. (23 Nm)
Transmission Case Screws	15-20 ft. lbs. (20-27 Nm)
Vehicle Speed Sensor Screw	7-9 ft. lbs. (9-12 Nm)

Transmission Mounting and Torque Values

Special Tools

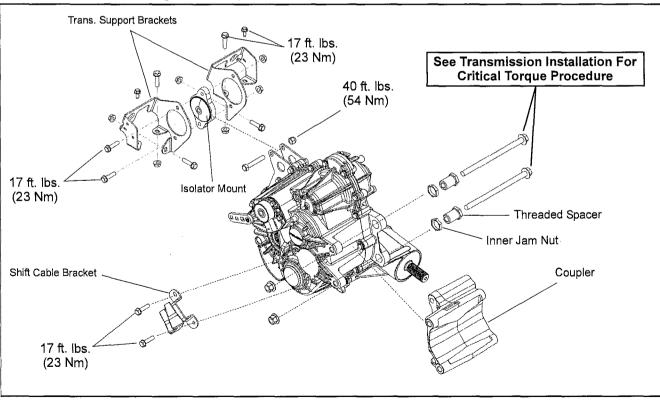
PART NUMBER	TOOL DESCRIPTION
PA-50231	Snorkel Tool
2871698 (Part of 2871702 Kit)	Rear Output Seal Driver
2871699 (Part of 2871702 Kit)	Rear Driveshaft Seal Guide
2871282	Bearing Seal Driver (50 mm)
PU-50566	Transmission Nut Socket
PU-50658	Clutch Center Distance Tool

Lubrication

= 🚳

Recommended Transmission Lubricant: AGL Plus (PN 2878068) (Quart)

Capacity: 44 oz. (1300 ml)



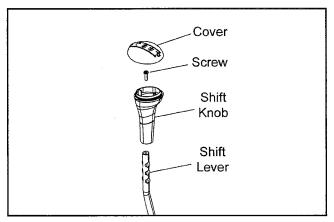
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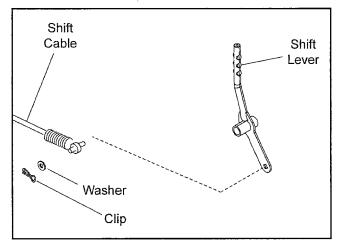
SHIFT LEVER

Removal

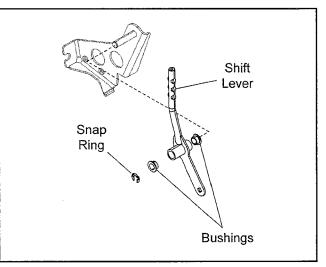
1. Remove the shift knob cover, retaining screw and shift knob from the shift lever.



- 2. Remove the screws retaining the center console using a T27 and T30 Torx driver. Remove the console from the vehicle.
- 3. Remove the clip and washer retaining the shift cable to the shift lever and disconnect the cable end from the lever.



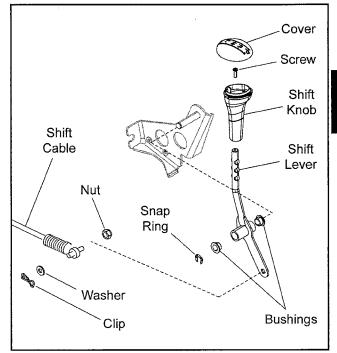
4. Remove the retaining ring and slide the shift lever off the mounting bracket and out from the frame.



5. Remove both bushings from the shift lever and service as needed.

Installation

1. Perform the removal steps in reverse order to install the gear shift lever (lever, cable, console, shift knob).



8

TRANSMISSION

SHIFT CABLE

Inspection

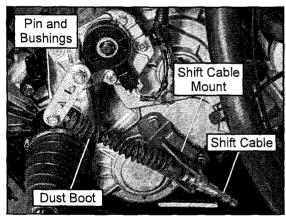
Shift cable adjustment may be necessary if symptoms include:

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

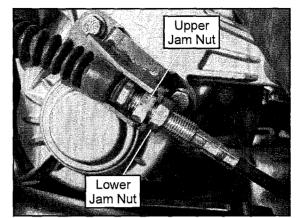
Inspect shift cable, clevis pins, and pivot bushings and replace if worn or damaged.

Adjustment

- 1. Locate the shift cable attached to the transmission case in the right rear wheel well area.
- 2. Inspect shift cable, clevis pin, pivot bushings, and dust boot. Replace if worn or damaged.



3. If adjustment is required, loosen the lower jam nut and pull the cable out of the mount to move the upper jam nut.



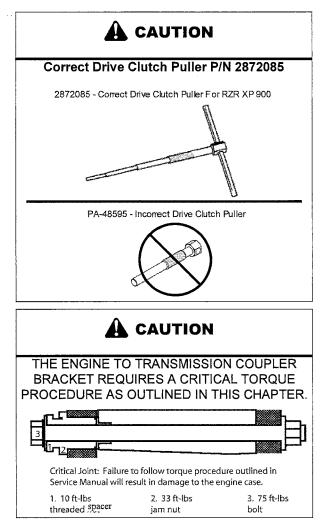
- 4. Adjust the shift cable so there is the same amount of cable travel when shifting slightly past HIGH gear and PARK.
- 5. Thread the upper or lower jam nut as required to obtain proper cable adjustment.

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

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

TRANSMISSION SERVICE

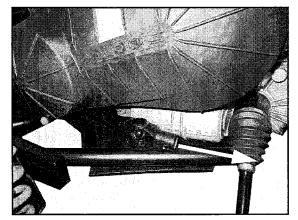
Transmission Removal



- 1. Remove the seats, console cover and engine service panel (see Chapter 5).
- 2. Disconnect the (-) negative battery cable from the battery.
- 3. Remove the rear bumper and cargo box as an assembly (see Chapter 5).
- 4. Remove the air box assembly (see Chapter 4 "ECT Sensor Replacement").
- 5. Raise and support the vehicle.



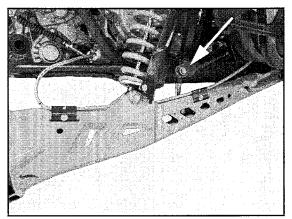
Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this procedure. Always wear eye protection. 6. Remove the propshaft from the transmission input shaft (see Chapter 7).



- 7. Remove rear wheels from the vehicle.
- 8. If internal transmission repair is required, drain the transmission lubricant (see Chapter 2).
- 9. Remove the lower mounting bolt from the left rear shock. Swing shock outward.
- 10. Remove the outer clutch cover, drive belt, drive clutch, driven clutch, inner clutch cover and clutch outlet duct (see Chapter 6).

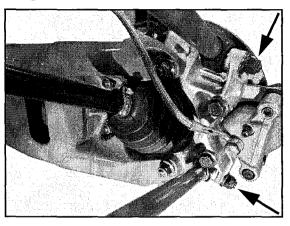
IMPORTANT: Be sure to use the correct Drive Clutch Puller (PN 2872085) to prevent damage to crankshaft.

- 11. Loosely install the left rear shock bolt to hold left rear trailing arm up in position.
- 12. Remove the stabilizer bar mounting bolt and nut from both sides. Discard nuts and replace with new upon assembly.

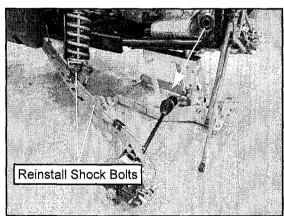


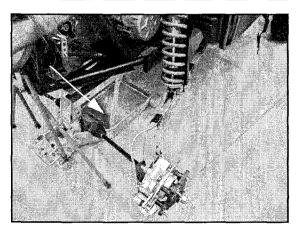
TRANSMISSION

13. Remove the (4) bolts attaching the upper and lower radius rods to the bearing carriers (left and right side). Discard nuts and replace with new upon assembly. Allow the radius rods swing downward.

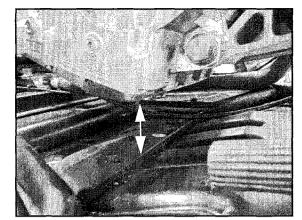


- 14. Remove both lower shock bolts (left and right side) while supporting the trailing arms from underneath. Lift training arms up and swing trailing arms outward to remove the drive shafts from the transmission.
- 15. Maneuver the drive shafts out of the vehicle frame. Reinstall the lower shock bolts to hold the trailing arms up during the rest of the removal procedure.

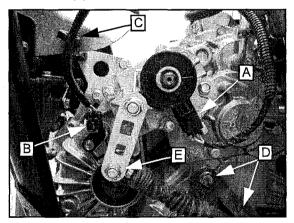




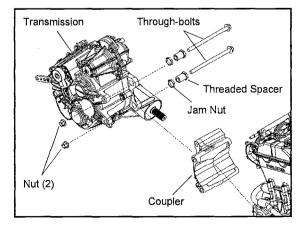
16. Place a spacer or support between the vehicle frame and engine to hold the engine up in position.



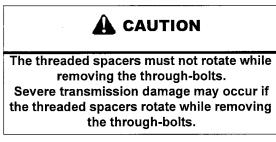
- 17. Remove vent hose from transmission.
- 18. Remove the gear position switch connector (A), speed sensor connector (B), harness from routing clip (C), shift bracket bolts (D), shift bracket (D), shift cable clevis pin and washer (E) from the transmission.



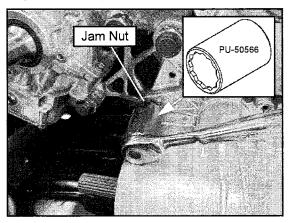
19. To remove the through-bolts: Hold through-bolt firmly in position with an open ended wrench from the left hand side of the transmission. From the right hand side of the transmission, remove the nut that secures through-bolt.



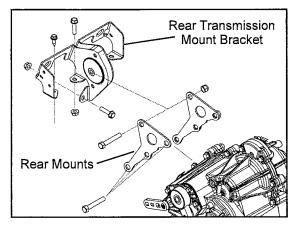
IMPORTANT: Be sure the through-bolt does not rotate while removing the nut from the right hand side of the transmission.



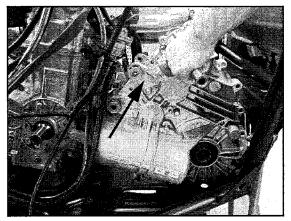
- 20. Remove the through bolts from the left hand side of the vehicle after the nut has been removed. Discard the through-bolts and the nuts.
- 21. Using special tool PU-50566, loosen the inner jam nuts and remove the threaded spacers from the transmission case. Inspect threads, replace if damaged or if wear is evident.



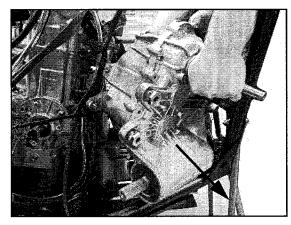
- 22. Remove the (2) rear exhaust springs securing the muffler to the rear transmission mounting bracket.
- 23. Remove the (6) bolts attaching the rear transmission mount bracket to the frame. Remove the (3) bolts that attach the (2) rear mounts to the transmission. Remove the mount assemblies from the vehicle.



24. Slide transmission towards the rear of the vehicle. Lift the front of the transmission upward.



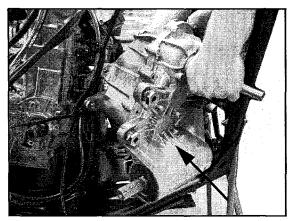
25. Rotate front of the transmission towards the left hand side of the vehicle. With the help of an assistant, remove transmission from the left rear wheel well area.



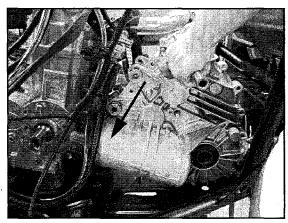
8

Transmission Installation

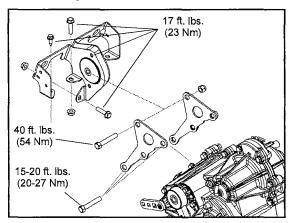
1. With the help of an assistant, position the rear of the transmission into the vehicle frame through the left rear wheel well area.



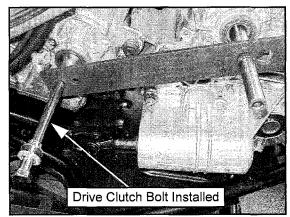
2. Slide transmission towards the rear of the vehicle while lifting the front of the transmission upward. Rotate the front of the transmission towards the engine. When in position, lower the front of the transmission.

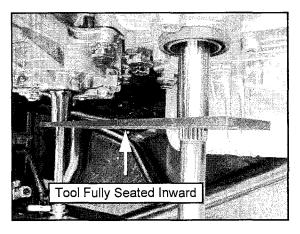


3. Install the rear transmission mount assemblies. Torque all fasteners to specification.

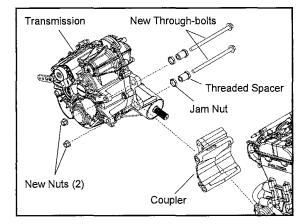


- 4. Install the (2) rear exhaust springs securing the muffler to the rear transmission mounting bracket.
- 5. Install the Clutch Center Distance Tool (PU-50658) onto the crankshaft and transmission input shaft to properly position the clutch center distance. The pictures below show the tool (PU-50658) properly installed.

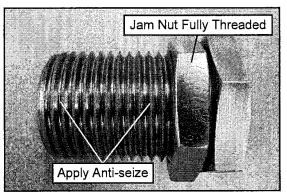




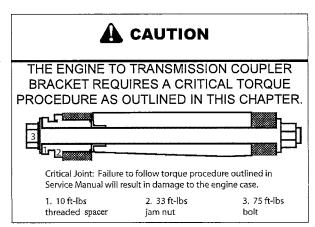
6. Align coupler and front transmission mounting holes.

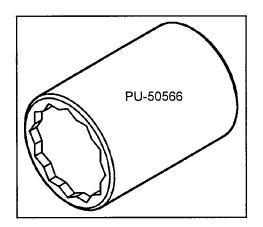


7. Apply anti-seize to the threaded spacers and fully thread the inner jam nuts onto threaded spacers.

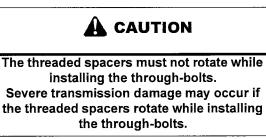


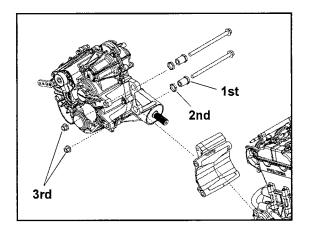
- 8. Install threaded spacers into the transmission case by hand approximately 3 turns.
- 9. Install NEW transmission through-bolts and nuts by hand.
- 10. Lightly tighten both threaded spacers by hand. Be sure inner jam nuts are fully threaded onto the threaded spacers.



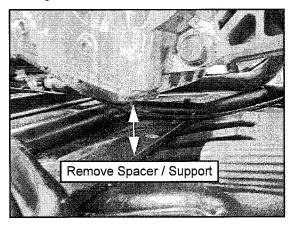


- 11. Using special tool PU-50566 and a proper torque wrench, torque the threaded spacer to 10 ft. lbs. (14 Nm).
- 12. Using special tool PU-50566 and a proper torque wrench, torque the inner jam nut to 33 ft. lbs. (45 Nm).
- 13. From the right side of the transmission, torque the (2) new nuts onto the through-bolts to 75 ft. lbs. (102 Nm). Be sure the through-bolts do not rotate while applying torque to the nut.

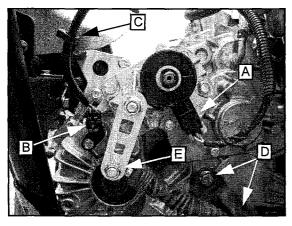




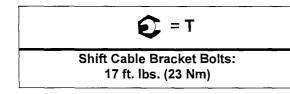
- 14. Remove the clutch center distance tool.
- 15. Remove the spacer or support between the vehicle frame and engine.



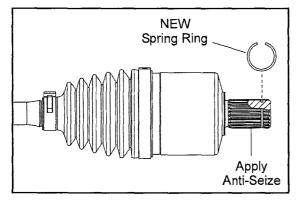
16. Install and properly route the gear position switch connector (A), speed sensor connector (B), harness into routing clip (C), shift bracket (D), shift bracket bolts (D), shift cable clevis pin and washer (E) onto the transmission.



17. Torque the (2) shift cable bracket bolts to specification.

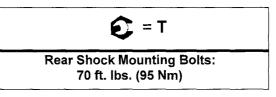


- 18. Install and properly route the vent hose.
- 19. Lubricate the transmission splines and mid propshaft joint splines with Polaris All Purpose Grease. Install the propshaft onto the transmission input shaft (see Chapter 7).
- 20. Install inner clutch cover, outlet duct, drive clutch, driven clutch, belt and outer clutch cover (see Chapter 6).
- 21. Install new spring ring on rear drive shafts. Apply an antiseize compound to the splines.

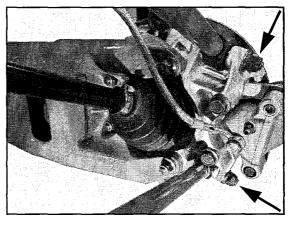


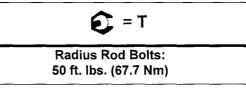
22. Swing the rear trailing arm out and up. Align the splines of the drive shaft with the transmission splines. Push inward on the trailing arm assembly until the rear drive shafts lock into the transmission splines.

23. Install the rear shocks onto the trailing arms and install the lower mounting bolts with new retaining nuts. Torque to specification.

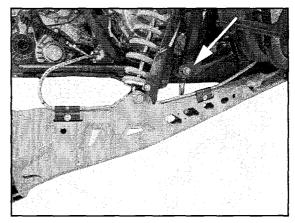


24. Install the (4) rear radius rods to the bearing carriers on each side. Use new retaining nuts. Torque to specification.





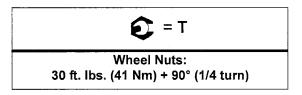
25. Install the stabilizer bar link mounting bolts and new nuts. Torque to specification.



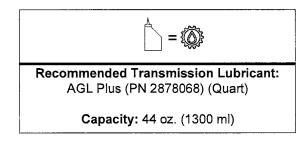
Stabilizer Bar Linkage: 31-34 ft. Ibs. (42-46 Nm)

8.10

26. Install rear wheels and wheel nuts. Torque to specification.



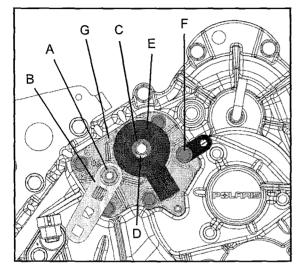
- 27. Properly lower the vehicle.
- 28. Install the air box assembly as outlined in the EFI Chapter (see Chapter 4 "ECT Sensor Replacement").
- 29. Install the rear bumper and cargo box as an assembly (see Chapter 5).
- 30. Connect the (-) negative battery cable.
- 31. Install the engine service panel, console cover and seats.
- 32. If transmission lubricant was drained, fill the transmission with the specified amount of **Polaris AGL Plus** (see Chapter 2 "Transmission Lubrication").



Transmission Disassembly

NOTE: Refer to the exploded view at the end of this chapter as a reference.

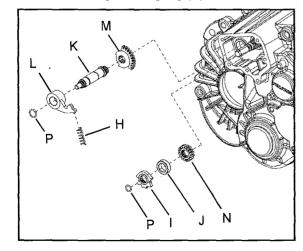
- 1. Place the transmission in High gear before disassembly.
- 2. Drain and properly dispose of the transmission lubricant (see Chapter 2).
- 3. Remove the bellcrank nut (A) and bellcrank (B).



- 4. Remove the E-clip (C) that retains the spring washer (D), flat washer (D) and gear switch (E). Remove the switch.
- 5. Remove the sector cover bolts (F) and remove the sector cover (G).

NOTE: Removal can be aided by using your thumbs to press in on the shafts while pulling out the cover with your fingers.

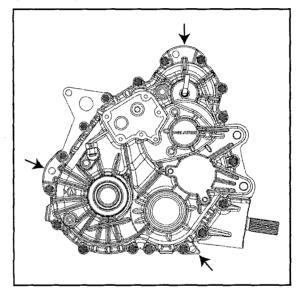
6. Remove the compression spring (H).



- 7. Remove the detent star (I). Note how the detent star fits onto the splined shaft with the raised edge facing outward for reassembly.
- 8. Remove the spacer (J).
- 9. Remove the shift shaft (K), detent pawl (L) and the shift sector gears (M and N).

IMPORTANT: Note the timing marks on the shift gears (M and N) for reassembly purposes.

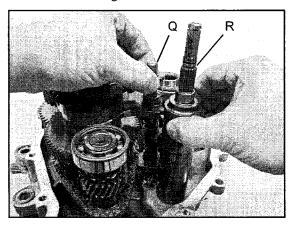
- 10. Remove the O-rings (P) from each shaft and discard. Use new O-rings upon assembly.
- 11. Remove all the transmission case bolts. Using suitable pry bars, remove the cover using the designated pry points (indicated by the black arrows in the illustration below).



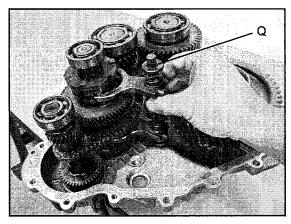
Do not pry on case sealing surfaces. Use only the designated pry points on the transmission.

8.12

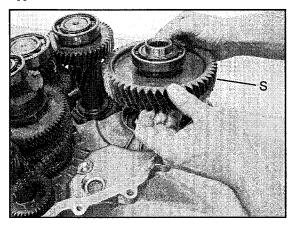
12. Lift up on the shift shaft rail (Q) and move the rail assembly rearward to allow the shift fork pins to be removed from the shift drum (R). Remove the shift drum (R) from the transmission housing.



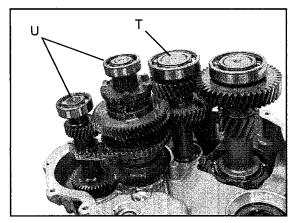
13. Remove the shift shaft rail (Q) and shift forks from the transmission housing as an assembly.



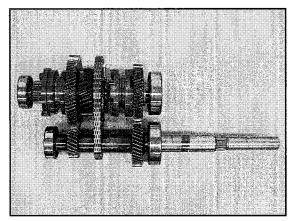
14. Remove the rear output shaft assembly (S) by lifting underneath the gear or by tapping the shaft from the opposite side.



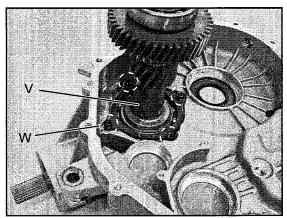
15. Remove the idler gear shaft assembly (T) and gear cluster assembly (U) from the transmission housing by pulling both assemblies straight up.



16. Place the gear cluster assembly on a clean surface for inspection. If disassembly is required, refer to "Gear Cluster Disassembly".



17. Using a 5 mm Allen wrench, remove the screws that secure the pinion shaft assembly (V). Lift the pinion shaft assembly straight up to remove it from the housing. Note the longer screw (W) that locks the snorkel tube.

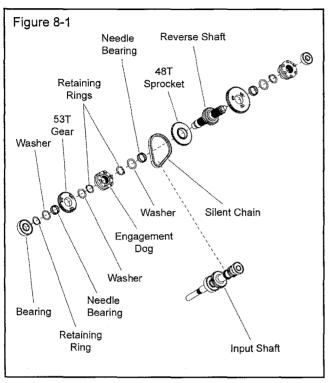


8

18. Remove all seals from the gearcase halves and clean the cases in preparation for assembly.

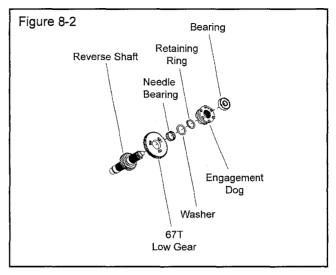
Gear Cluster Disassembly

Remove the bearing from the reverse shaft using a bearing puller. Remove the retaining ring and slide the washers, 53T gear and needle bearing off the reverse shaft (see Figure 8-1).

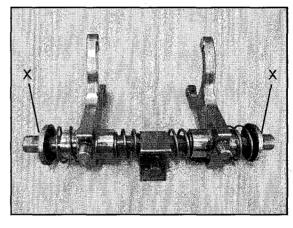


- 20. Remove the retaining ring and engagement dog from the reverse shaft (see Figure 8-1).
- 21. Remove the retaining ring, washer, needle bearing, and sprocket from the reverse shaft (see Figure 8-1).
- 22. Tilt the two shafts towards each other and remove the silent chain from the two shafts.

23. If necessary, disassemble the other end of the reverse shaft. Remove the bearing, engagement dog, retaining ring, washer, gear and needle bearing from the reverse shaft (see Figure 8-2).



24. To disassemble the shift shaft rail remove the snap ring (X) from the end of the shift rail on either side.



CAUTION

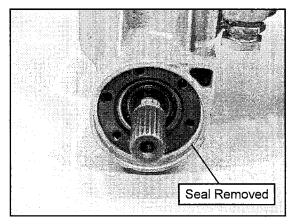
Use caution when disassembling the shift rail. The compressed springs on the shift rail may pop off causing eye or face injury.

Snorkel Shaft Removal / Disassembly

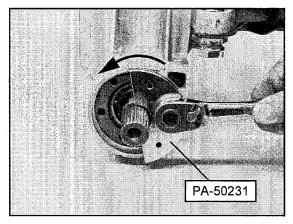
CAUTION

The pinion shaft must be removed prior to removing the snorkel shaft assembly. Failure to remove pinion shaft, will result in damage to the snorkel shaft.

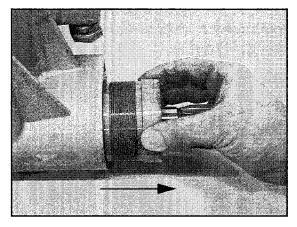
25. Extract the seal from the snorkel shaft to access the snorkel tube for removal.



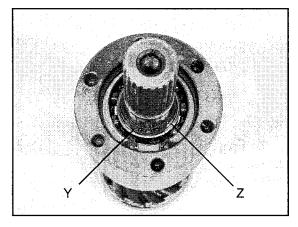
26. Using the Snorkel Tool (PA-50231), fully loosen the snorkel tube.



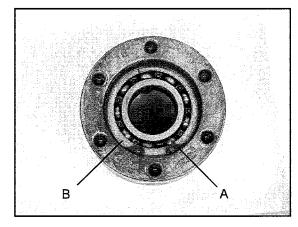
27. Remove the snorkel tube and shaft assembly from the transmission case.



28. Remove the snap ring (Y) and shim (Z) from the snorkel shaft.

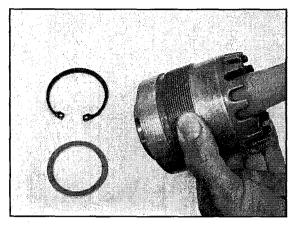


- 29. Use an arbor press to remove the snorkel tube from the snorkel shaft.
- 30. Remove the snap ring (A) and shim (B) retaining the bearing in the snorkel tube.

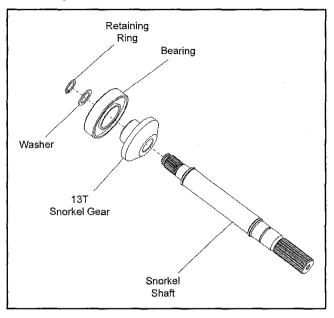


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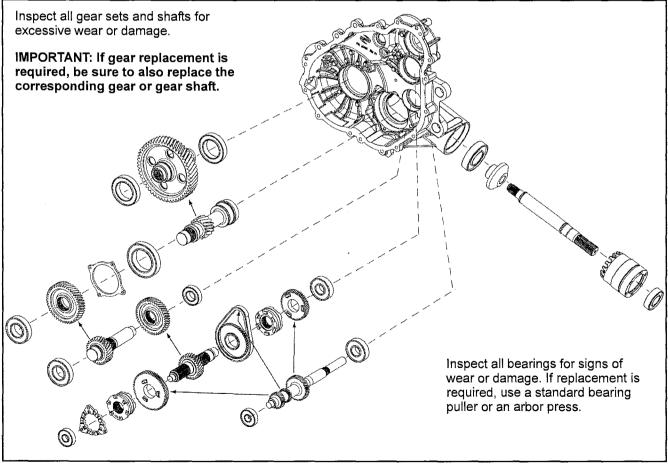
31. Lightly tap on the bearing from the opposite side to remove it from the snorkel tube.



32. Remove the retaining ring to remove the remaining washer, bearing and gear from the snorkel shaft.

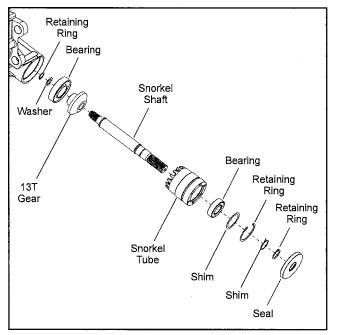


Gear / Shaft / Bearing Inspection



Snorkel Gear Backlash Procedure

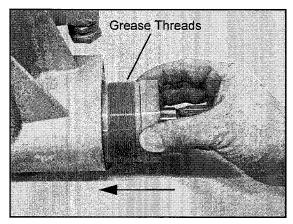
1. Reassemble the snorkel tube and snorkel shaft assembly by reversing the disassembly procedure (see "Snorkel Shaft Removal / Disassembly" in previous section).



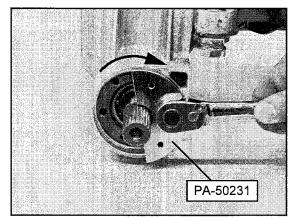
- 2. After the 13T gear and bearing are pressed onto the snorkel shaft (flush to the shoulder), install the washer and new retaining ring.
- 3. Press the gear back towards the retaining ring. Avoid excessive force so the retaining ring is not damaged or prestressed significantly.

IMPORTANT: Failure to press the gear back against the washer and retaining ring will lead to a gear backlash change after vehicle is placed into service.

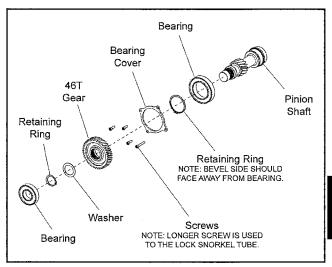
4. Apply a small amount of white lithium grease or Anti-Seize on the threads of the snorkel tube.



5. Install the snorkel shaft into the gearcase. Using the Snorkel Tool (PA-50231), tighten the snorkel tube until it is lightly seated in the transmission housing.

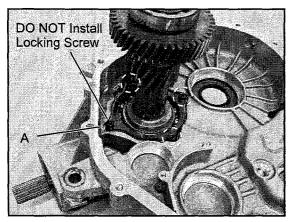


6. Inspect the pinion shaft assembly. Replace bearings if needed. Inspect each gear for damage, chips or abnormally worn teeth.



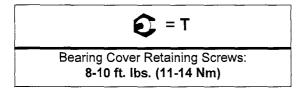
NOTE: If pinion shaft was disassembled, the bearing cover must be installed on the shaft before installing the 46T gear.

- 7. Install the pinion shaft assembly. Be sure to properly mesh the snorkel shaft bevel gear with the pinion shaft bevel gear.
- 8. Apply Loctite 242[®] to the threads of the bearing cover retaining screws.
- 9. Using a 5 mm Allen wrench, install only the (3) screws that secure the pinion shaft assembly as shown below. Leave the longer locking screw (A) out at this point.



IMPORTANT: DO NOT install the longer screw (A). Installing the longer screw will lock the snorkel tube and not allow for backlash setting adjustment.

10. Torque the bearing cover retaining screws to specification.

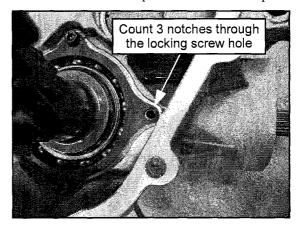


11. Rotate the snorkel tube *counterclockwise* using the snorkel tool (PA-50231) until the snorkel gear and pinion gear have 'zero' backlash.

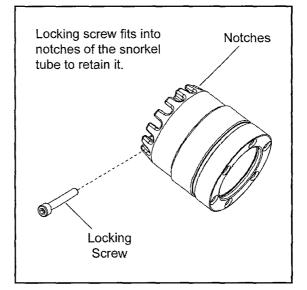
IMPORTANT: DO NOT overtighten the snorkel tube when backing it out. At the 'zero' backlash position, you should still be able to turn the snorkel shaft using your fingers, but it will feel rough and may have some tight spots. 12. Look down into the transmission housing to see the snorkel locking screw hole opening to reference your starting point.

NOTE: If you have a hard time seeing into the hole, insert a small Allen wrench, punch or screwdriver into the hole to feel when the notch is aligned with the hole.

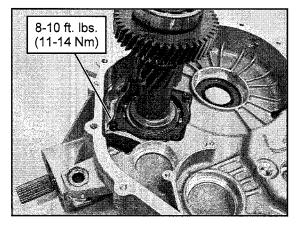
13. Slowly rotate the snorkel tube *clockwise* while counting the number of notches passing through the hole opening as you rotate the tube. Rotate the snorkel tube to the **3rd** notch from the 'zero' backlash position obtained in step 11.

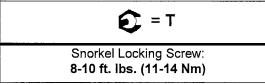


- 14. Check the pinion shaft gear backlash again by feel. If the pinion shaft gear lash appears to be too tight, rotate the snorkel shaft *clockwise* to the next notch (4th notch).
- 15. Once the backlash is set, apply Loctite 242[®] to the threads and install the locking screw to secure the snorkel tube.



16. Torque the locking screw to specification.

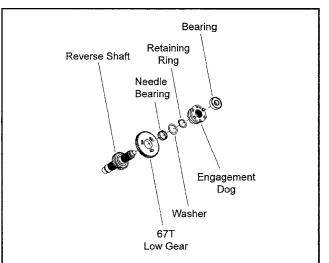


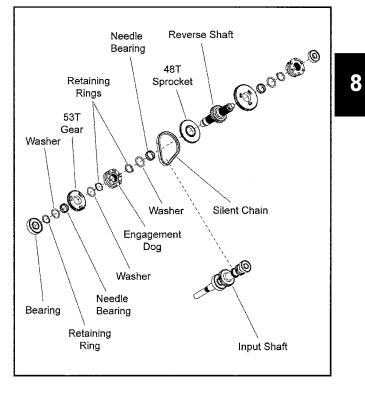


Transmission Assembly

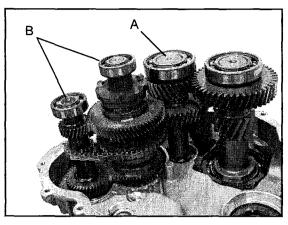
IMPORTANT: The snorkel shaft and pinion shaft must be installed prior to transmission assembly. The snorkel shaft cannot be installed after assembling the transmission.

- 1. Clean both transmission case halves thoroughly. Inspect case half mating surfaces for damage.
- 2. Assemble the reverse shaft assembly and input shaft assembly if previously disassembled (see illustrations).

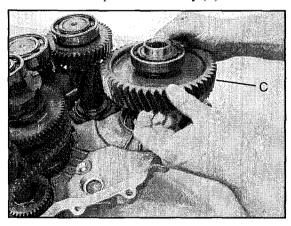




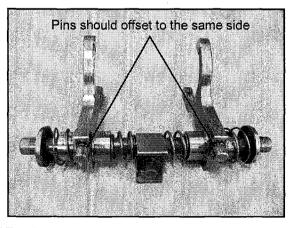
3. Install the idler gear shaft assembly (A) and gear cluster assembly (B) into the transmission housing, all at the same time.



4. Install the rear output shaft assembly (C).

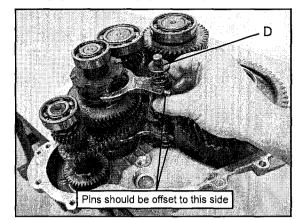


5. Assemble the shift shaft rail if previously disassembled.



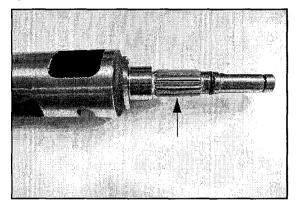
NOTE: Both shift forks need to be orientated the same way, so that the shift fork pins are both offset to the same side of the rail.

6. Install the shift shaft rail (D) and shift forks into the transmission housing as an assembly. Be sure the shift forks are engaged into the engagement dogs.

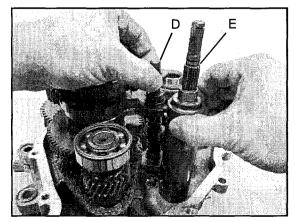


NOTE: Shift fork pins should be offset towards the input shaft as shown above.

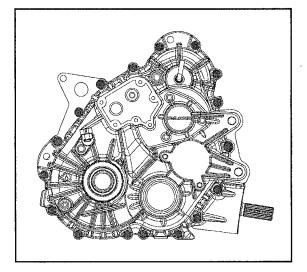
7. Inspect the shift drum for any damage or wear. Inspect the splines of the shift drum.

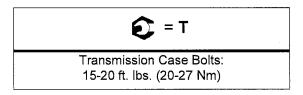


8. Install the shift drum (E) into the transmission housing. Lift up on the shift shaft rail (D) and move the rail assembly towards the shift drum to allow the shift fork ends to be installed into the shift drum (E).

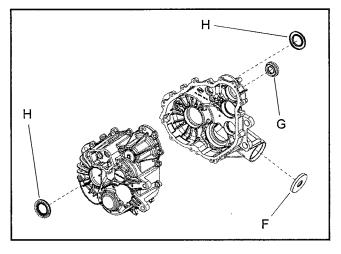


- 9. Apply a continuous bead of Crankcase 3 Bond Sealant (PN 2871557) to the left hand transmission mating surface.
- 10. Install the transmission case cover and retaining bolts. Torque bolts to specification.

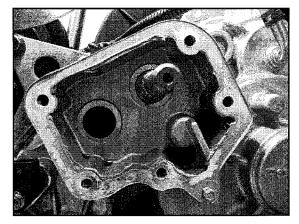




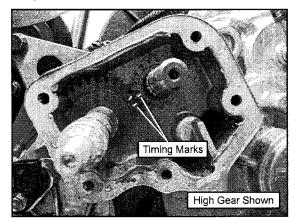
- 11. Install new seals into the transmission case halves.
 - The snorkel shaft seal (F), should be pressed in until it seats against the housing counter-bore.
 - The input shaft seal (G), should be pressed in until it seats flush with the housing.
 - The rear output shaft seals (H), can be installed using a standard bushing installation tool. Seals should be installed just past the case lead-in chamfer (.070 in. or 1.8 mm from the outer face of the bore).



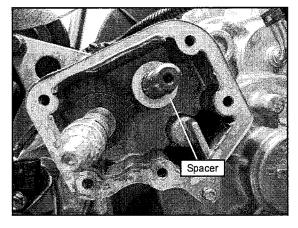
12. Thoroughly clean the shift shaft housing. Be sure the transmission is in High gear prior to reassembly.



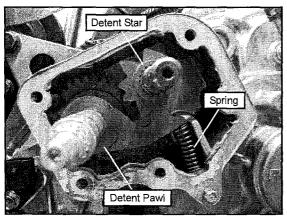
13. Install the sector gear (16T) onto the shift drum shaft. Install the shift shaft assembly and sector gear (11T) into the bushing pocket on the left side. Align the timing marks on the gears as shown.



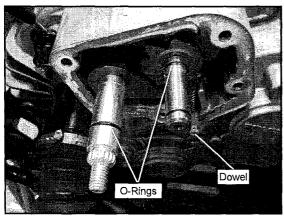
14. Install the spacer onto the shift drum shaft.



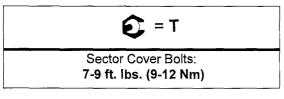
- 15. Install the detent star onto the shift drum shaft. Be sure to install the detent star with the raised edge facing outward and skip-tooth aligned.
- 16. Install the detent pawl onto the shift shaft and carefully install the compression spring.



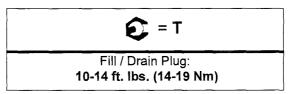
17. Install a new O-ring on each shift shaft. Apply a small amount of white lithium grease on the O-rings, shift shafts and component contact surfaces prior to installing the sector cover.



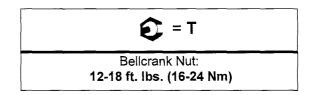
- 18. Clean the transmission and gear sector cover mating surfaces thoroughly.
- 19. Apply Crankcase Sealant (3-Bond) (PN 2871557) onto the cover and transmission case mating surface.
- 20. Install the sector cover and align the transmission case dowel with the alignment hole. Install and torque the bolts to specification.



21. Install the transmission drain plug and torque to specification.



22. Install the bellcrank onto the shift shaft. Note the key splined on the bellcrank and shift shaft. Install the nut and torque to specification.



23. Refer to "Transmission Installation" to complete the repair.

8.22 -

TROUBLESHOOTING

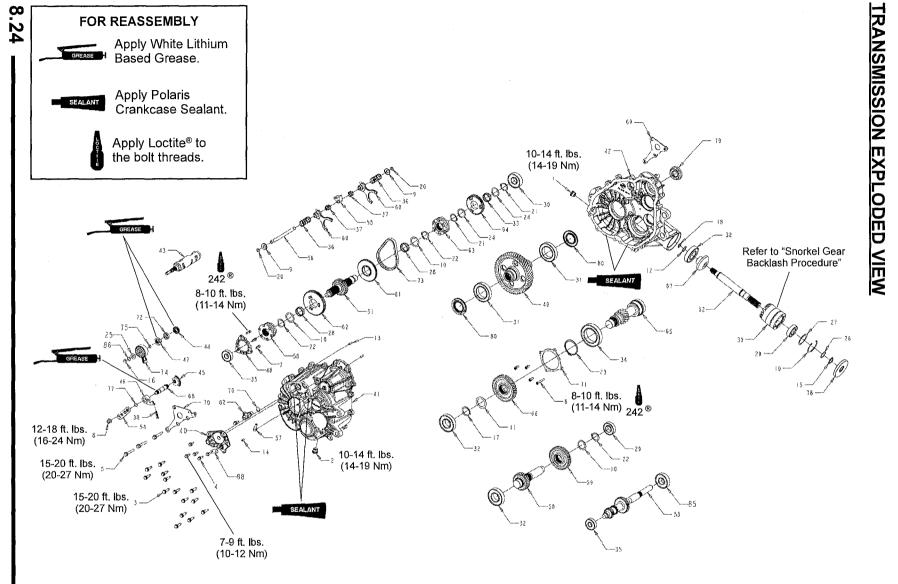
Troubleshooting Checklist

Check the following items when shifting difficulty is encountered.

- Shift cable adjustment/condition
- PVT alignment (clutch center distance)
- Idle speed (throttle cable routing)
- Transmission lubricant type/quality
- Loose fasteners on sector gear cover
- Worn rod ends, clevis pins, or pivot arm bushings
- Shift selector rail travel
- Worn, broken or damaged internal transmission components

NOTE: To determine if shifting difficulty or problem is caused by an internal transmission problem, isolate the transmission by disconnecting the shift cable end from the transmission bellcrank. Manually select each gear range at the transmission bellcrank, and test ride vehicle. If it functions properly, the problem is outside the transmission.

If transmission problem remains, disassemble transmission and inspect all gear dogs for wear (rounding) or damage. Inspect all bearings, circlips, thrust washers and shafts for wear.



9923144 - 2011 RANGER RZR XP 900 Service Manual © Copyright 2011 Polaris Sales Inc. TRANSMISSION

Exploded View, Continued

Ref.	Qty.	Description	Ref.	Qty.	Description
1.	1	Fill Plug	44.	1	Gear, Sector 16T
2.	1	Drain Plug, Magnetic	45.	1	Gear, Sector 31T
3.	14	Screw, M8 x 1.25 x 30	46.	1	Pawl, Detent
4.	6	Screw, M6 x 1 x 20	47.	1	Star, Detent
5.	3	Screw, M8 x 50	48.	1	Plate, Park, 12-Face
6.	1	Screw, M6 x 1 x 40	49.	1	Shaft, Output 53T
7.	6	Screw, M6 x 1 x 18	50.	1	Shaft, Idler 29T
8.	1	Nut, NyLoc, M8 x 1.25	51.	1	Shaft, Reverse 29T
9.	2	Washer, Cup	52.	1	Shaft, Front Output
10.	3	Washer	53.	1	Shaft, Input Helical
11.	1	Washer	54.	1	Bellcrank
12.	1	Washer	55.	1	Collar, Shift
13.	2	Pin, Dowel	56.	1	Rail, Shift Shaft
14.	1	Pin, Spring	57.	1	Tube, Vent, 1/4 in.
15.	1	Retaining Ring, External	58.	1	Shift Dog, Park
16.	1	Snap Ring	59.	1	Gear, 44T
17.	1	Retaining Ring, External	60.	2	Fork, Shift
18.	1	Retaining Ring, External	61.	1	Sprocket, 48T, 6-Face
19.	1	Retaining Ring, Internal	62.	1	Gear, Low 67T
20.	2	Retaining Ring, External	63.	1	Engagement Dog, 6-Face
21.	2	Retaining Ring, External	64.	1	Gear, 53T
22.	3	Retaining Ring, External	65.	1	Shaft, Pinion 11T
23.	1	Retaining Ring, External	66.	1	Gear, 46T
24.	2	Washer, Thrust	67.	1	Gear, Snorkel 13T
25.	1	Washer, Thrust	68.	1	Shaft, Shift
26.	1	Shim	69.	1	Weldment, Rear Mount Bracket
27.	1	Shim	70.	1	Bracket, Rear Mount
28.	2	Bearing, Needle Cage	71.	1	Cover, Bearing, Center Drive
29.	2	Bearing, Ball	72.	1	Spacer
30.	2	Bearing, Ball	73.	1	Chain, Silent
31.	2	Bearing, Ball	74.	1	Switch, Rotary, 2-Pin
32.	3	Bearing, Ball	75.	1	O-Ring
33.	1	Bearing, Needle Cage	76.	1	O-Ring
34.	1	Bearing, Ball	77.	1	O-Ring
35.	2	Bearing, Ball	78.	1	Seal, Triple Lip
36.	2	Spring, Compression	79.	1	Seal, Dual Lip
37.	2	Spring, Compression	80.	2	Seal, Triple Lip
38.	1	Spring, Compression, Detent	81.	-	N/A
39.	1	Tube, Snorkel	82.	1	Sensor, Speed
40.	1	Cover, Sector Gears	85.	1	Bearing, Ball
41.	1	Case, RH	86.	1	Spring, Wave
42.	1	Case, LH	88.	1	Bracket, Wire Harness
43.	1	Drum, Shift		1	• • • • • • • • • • • • • • • • • • • •

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CHAPTER 9 BRAKES

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9

GENERAL SPECIFICATIONS

FRONT BRAKE SYSTEM			
ltem	Standard	Service Limit	
Front Brake Pad Thickness	.297 ± .007" (7.54 ± .178 mm)	.180" (4.6 mm)	
Front Brake Disc Thickness	.188" (4.78 mm)	.170" (4.32 mm)	
Front Brake Disc Runout	-	.010" (.254 mm)	

REAR BRAKE SYSTEM			
ltem	Standard	Service Limit	
Rear Brake Pad Thickness	.298 ± .007" (7.57 ± .178 mm)	.180" (4.6 mm)	
Rear Brake Disc Thickness	.188" (4.78 mm)	.170" (4.32 mm)	
Rear Brake Disc Runout	- (.010" (.254 mm)	

TORQUE SPECIFICATIONS

SPECIAL TOOLS

ltem	Torque ft. Ibs.	Torque Nm
Front Caliper Mounting Bolts	31-34	42-46
Rear Caliper Mounting Bolts	30	41
Brake Line Flare	12-15	16-20
Brake Line Banjo Bolts (Caliper Attachment)	15	20
Brake Line Banjo Bolt (Master Cylinder Attachment)	15	20
Brake Switch	15	20
Brake Disc to Hub Bolts	30	41
Master Cylinder to Frame	17	23
Brake Pedal Mounting Bracket to Frame	17	23

Part Number	Tool Description
2870975	Mity Vac™ Pressure Test Tool

BRAKE SYSTEM SERVICE NOTES

Disc brake systems are light weight, low maintenance, and perform well in the conditions this vehicle will routinely encounter. There are a few things to remember when replacing disc brake pads or performing brake system service to ensure proper system function and maximum pad service life.

- DO NOT over-fill the master cylinder fluid reservoir.
- Make sure the brake pedal returns freely and completely.
- Adjust stop pin on brake caliper(s) after pad service.
- Check and adjust master cylinder reservoir fluid level after pad service.
- Make sure atmospheric vent on reservoir is unobstructed.
- Test for brake drag after any brake system service and investigate cause if brake drag is evident.
- Make sure caliper moves freely on guide pins (where applicable).
- Inspect caliper piston seals for foreign material that could prevent caliper pistons from returning freely.
- Perform a brake burnishing procedure after installing new pads to maximize service life.
- DO NOT lubricate or clean the brake components with aerosol or petroleum products. Use only approved brake cleaning products.

BRAKE NOISE TROUBLESHOOTING

Dirt or dust buildup on the brake pads and disc is the most common cause of brake noise (squeal caused by vibration). If cleaning does not reduce the occurrence of brake noise, PermatexTM Disc Brake Quiet can be applied to the back of the pads. Follow directions on the package. This will keep pads in contact with caliper piston(s) to reduce the chance of squeaks caused by dirt or dust.

Brake Noise Troubleshooting			
Possible Cause	Remedy		
Dirt, dust, or imbedded material on pads or disc	Spray disc and pads with CRC Brakeleen TM or an equivalent non-flammable aerosol brake cleaner. Remove pads and/or disc hub to clean imbedded material from disc or pads.		
Pad(s) dragging on disc (noise or premature pad wear) because of improper adjustment	Adjust pad stop (front calipers)		
Master cylinder reservoir overfilled	Set to proper level		
Master cylinder compensating port restricted	Clean compensating port		
Master cylinder piston not returning completely	Inspect. Repair as necessary		
Caliper piston(s) not returning	Clean piston(s) seal		
Operator error (riding the brake)	Educate operator		
Loose wheel hub or bearings	Check wheel and hub for abnormal movement.		
Brake disc warped or excessively worn	Replace disc		
Brake disc misaligned or loose	Inspect and repair as necessary		
Noise is from other source (axle, hub, disc or wheel)	If noise does not change when brake is applied check other sources. Inspect and repair as necessary		
Wrong pad for conditions	Change to a softer or harder pad		

9.3

9

HYDRAULIC BRAKE SYSTEM OPERATION

The Polaris brake system consists of the following components or assemblies: brake pedal, master cylinder, hydraulic brake lines, brake calipers, brake pads, and brake discs, which are secured to the drive line.

When the foot activated brake lever is applied it applies pressure on the piston within the master cylinder. As the master cylinder piston moves inward it closes a small opening (compensating port) within the cylinder and starts to build pressure within the brake system. As the pressure within the system is increased, the pistons located in the brake calipers move outward and apply pressure to the moveable brake pads. These pads contact the brake discs and move the calipers in their floating bracket, pulling the stationary side pads into the brake discs. The resulting friction reduces brake disc and vehicle speed.

The friction applied to the brake pads will cause the pads to wear. As these pads wear, the piston within the caliper moves further outward and becomes self adjusting. Fluid from the reservoir fills the additional area created when the caliper piston moves outward.

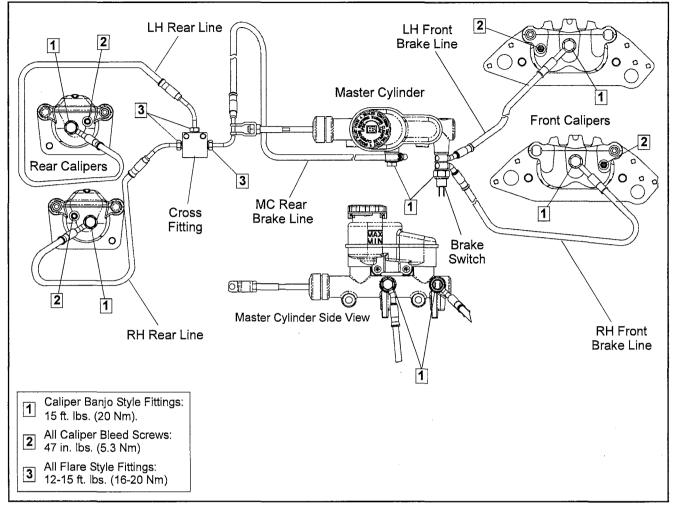
Brake fluid level is critical to proper system operation. Too little fluid will allow air to enter the system and cause the brakes to feel spongy. Too much fluid could cause brakes to drag due to fluid expansion.

Located within the master cylinder is the compensating port which is opened and closed by the master cylinder piston assembly. As the temperature within the hydraulic system changes, this port compensates for fluid expansion or contraction. Due to the high temperatures created within the system during heavy braking, it is very important that the master cylinder reservoir have adequate space to allow for fluid expansion. Never overfill the reservoir! Do not fill the reservoir beyond the MAX LEVEL line!

When servicing Polaris brake systems use only **Polaris DOT 4 Brake Fluid (PN 2872189)**. **WARNING:** Once a bottle is opened, use what is necessary and discard the rest in accordance with local laws. Do not store or use a partial bottle of brake fluid. Brake fluid is hygroscopic, meaning it rapidly absorbs moisture. This causes the boiling temperature of the brake fluid to drop, which can lead to early brake fade and the possibility of serious injury.

BRAKE SYSTEM EXPLODED VIEW

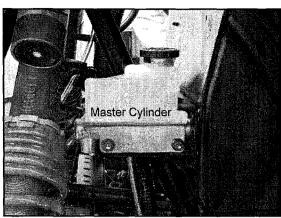
RZR XP 900



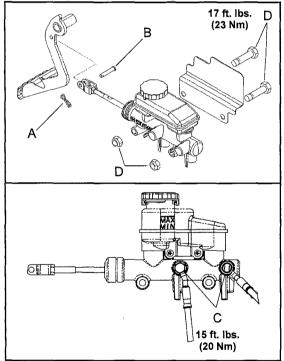
MASTER CYLINDER

Removal

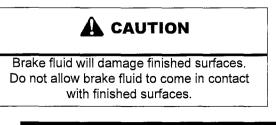
1. Locate the master cylinder above the left front tire in the wheel well area.



2. Remove the clip (A) from the clevis pin (B) that attaches the master cylinder to the brake pedal lever.



3. Place a container to catch brake fluid under the master cylinder brake line banjo bolts (C).



NOTE: Make note of front and rear brake line locations to master cylinder.

4. Loosen the brake line banjo bolts (C) and allow fluid to drain.

NOTE: Dispose of fluid properly. Do not re-use.

5. Remove the two mounting fasteners (D) that secure the master cylinder to the frame.

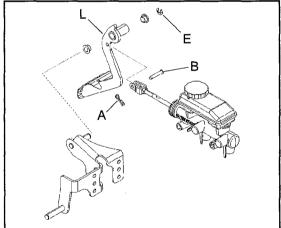
Installation

- 1. Reverse Steps 1-5 for master cylinder installation. Refer to the torque specifications in the illustration.
- 2. After installing the foot brake check pedal freeplay. Pedal freeplay should not exceed .090" (2.286 mm).

BRAKE PEDAL LEVER

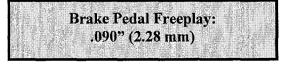
Pedal Removal

- 1. Locate the brake pedal lever (L) and remove the master cylinder clevis pin (B) and clip (A).
- 2. Remove the E-ring (E) from the pedal mount and remove the brake pedal lever (L) from the vehicle.



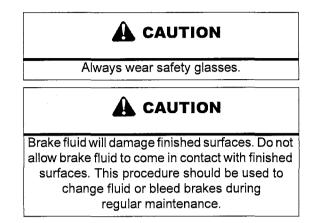
Pedal Installation

 Reverse "Removal" steps to install brake pedal lever. Brake pedal freeplay should not exceed .090" (2.28 mm).

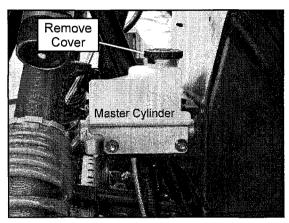


BRAKE BLEEDING / FLUID CHANGE

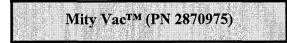
NOTE: When bleeding the brakes or replacing the fluid always start with the furthest caliper from the master cylinder.



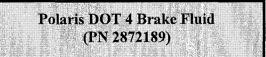
1. Clean master cylinder reservoir cover thoroughly and remove the cover.



2. If changing fluid, remove old fluid from reservoir with a Mity VacTM pump or similar tool.

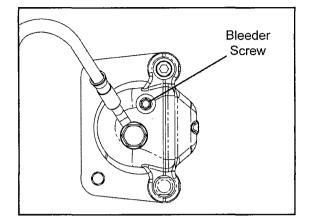


3. Add brake fluid to the indicated MAX level of reservoir.



4. Begin bleeding procedure with the caliper that is farthest from the master cylinder. Install a box end wrench on caliper bleeder screw. Attach a clean, clear hose to fitting and place the other end in a clean container. Be sure the hose fits tightly on fitting.

- 5. Have an assistant slowly pump foot pedal until pressure builds and holds.
- 6. Hold brake pedal down to maintain pedal pressure, and open bleeder screw. Close bleeder screw and release pedal.



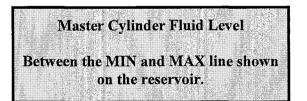
NOTE: Do not release foot pedal before bleeder screw is tight or air may be drawn into master cylinder.

7. Repeat procedure until clean fluid appears in bleeder hose and all air has been purged. Add fluid as necessary to maintain level in reservoir.



Maintain at least 1/2"(1.27 cm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

- 8. Tighten bleeder screw securely and remove bleeder hose. Torque bleeder screw to 47 in. lbs. (5.3 Nm).
- 9. Repeat procedure Steps 5 8 for the remaining calipers.
- 10. Add brake fluid to MAX level inside reservoir.



- 11. Install master cylinder reservoir cover.
- 12. Field test machine at low speed before putting into service. Check for proper braking action and pedal reserve. With pedal firmly applied, pedal reserve should be no less than 1/2"(1.3 cm).
- 13. Check brake system for fluid leaks.

FRONT BRAKE PADS

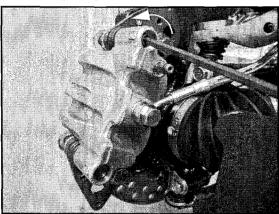
Pad Removal

1. Elevate and support front of vehicle.

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

CAUTION

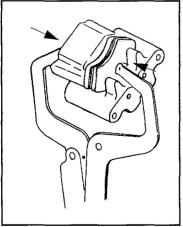
- 2. Remove the wheel nuts and front wheel.
- 3. Loosen the pad adjuster screw 2-3 turns.



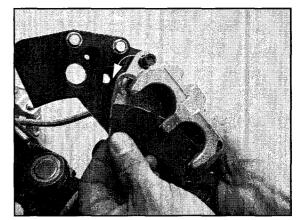
4. Remove the upper and lower caliper mounting bolts and remove the caliper from the front hub.

NOTE: When removing caliper, use care not to damage brake line. Support caliper so to avoid kinking or bending brake line.

5. Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.



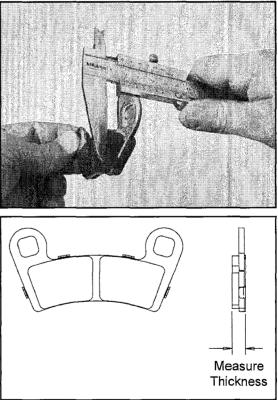
NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required. 6. Push the mounting bracket inward and the slip outer brake pad out between the bracket and caliper body.



7. Remove the inner pad from the bracket and caliper.

Pad Inspection

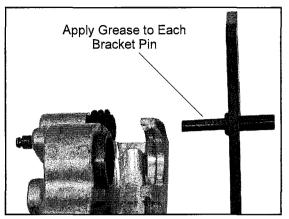
1. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



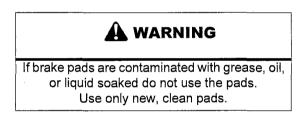
Front Brake Pad Thickness: .297 ± .007" (7.5 ± .178 mm) Service Limit: .180" (4.6 mm)

Pad Assembly / Installation

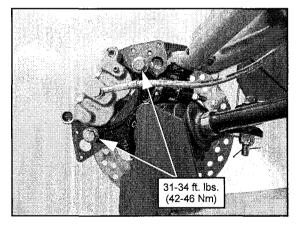
1. Lubricate mounting bracket pins with a light film of silicone grease and install rubber dust boots.

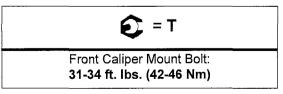


2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other.

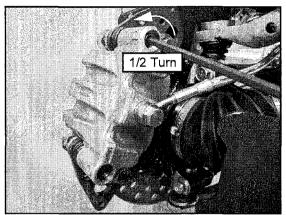


3. Install caliper onto front hub and torque mounting bolts to specification.

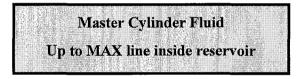




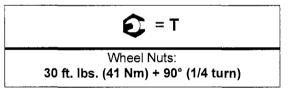
- 4. Slowly pump the brake pedal until pressure has been built up. Maintain at least 1/2, (12.7 mm) of brake fluid in the reservoir to prevent air from entering the brake system.
- 5. Install the adjustment set screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counterclockwise).



6. Verify fluid level in reservoir is up to MAX line inside reservoir and install reservoir cap.



7. Install wheel and torque wheel nuts to specification.



Brake Burnishing Procedure

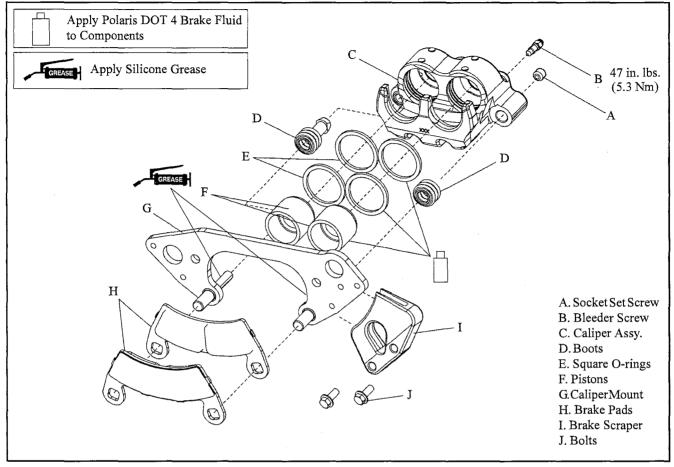
It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warping may result. Repeat this procedure 10 times. Do not make more than 3 stops per 1 mile (1.6 km).

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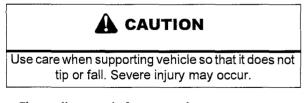
FRONT CALIPER SERVICE

Caliper Exploded View



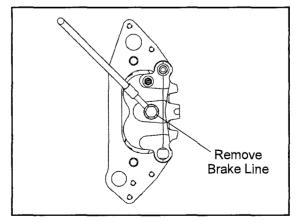
Caliper Removal

- 1. Elevate and safely support the front of the vehicle.
- 2. Remove the (4) wheel nuts and the front wheel.

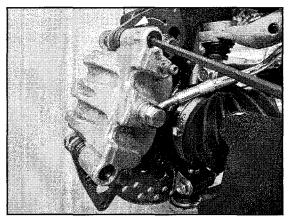


3. Clean caliper area before removal.

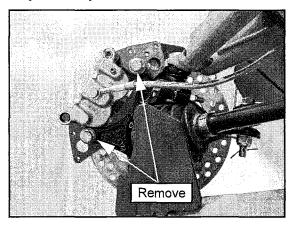
4. Place a container below the caliper to catch brake fluid when removing the line. Remove brake line from caliper.



5. Loosen brake pad adjustment set screw 2-3 turns to allow brake pad removal after the caliper is removed.

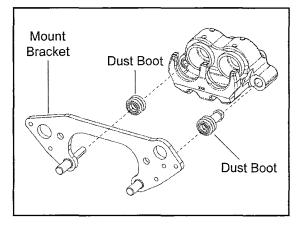


6. Remove the two caliper mounting bolts and remove the caliper assembly from the front hub.

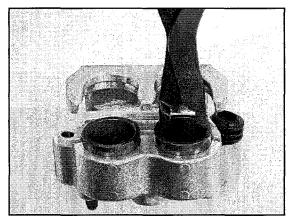


Caliper Disassembly

- 1. Remove both brake pads from the caliper (see "FRONT BRAKE PADS - Pad Removal").
- 2. Remove mount bracket assembly and dust boots.

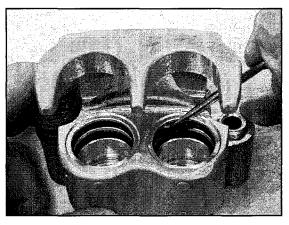


- 3. Thoroughly clean the caliper before disassembly and prepare a clean work area for disassembly.
- 4. Use a commercially available caliper piston pliers to extract the pistons from the caliper.



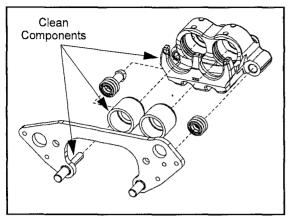
IMPORTANT: Do not remove the caliper pistons with a standard pliers. The piston sealing surfaces will become damaged if a standard pliers is used.

5. Once the pistons are removed, use a pick to carefully remove the square O-rings from the caliper. O-rings should be replaced during caliper service.



BRAKES

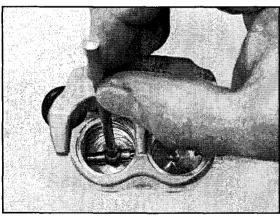
6. Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.

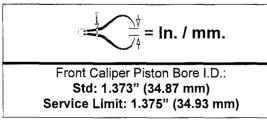


NOTE: Be sure to clean seal grooves in caliper body.

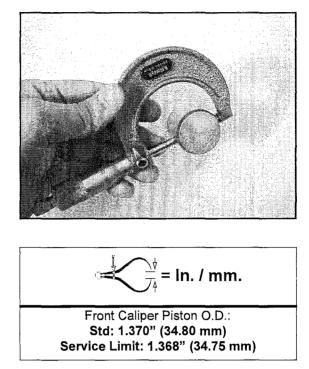
Caliper Inspection

1. Inspect caliper body for nicks, scratches, pitting or wear. Measure bore size and compare to specifications. Replace if damaged or worn beyond service limit.





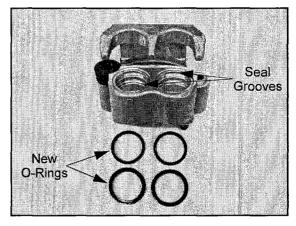
2. Inspect piston for nicks, scratches, pitting or wear. Measure piston diameter and replace if damaged or worn beyond service limit.



3. Inspect the brake disc and pads as outlined in this chapter.

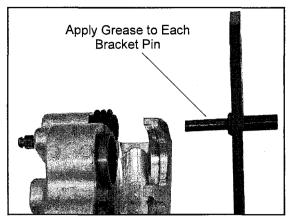
Caliper Assembly

1. Install new O-rings in the caliper body. Be sure the grooves are clean and free of residue or brakes may drag upon assembly.



2. Coat pistons with clean Polaris DOT 4 Brake Fluid. Install pistons with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.

3. Lubricate the mounting bracket pins with silicone grease and install the rubber dust seal boots.

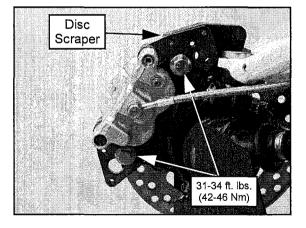


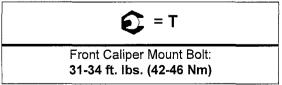
4. Compress the mounting bracket and make sure the dust seal boots are fully seated. Install the brake pads. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.

Caliper Installation

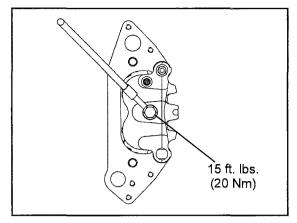
- 1. Install the brake line onto the caliper taking care not to allow any debris to enter the caliper.
- 2. Install the caliper and torque the mounting bolts to specification.

IMPORTANT: If disc scraper was removed, reinstall it upon caliper installation.

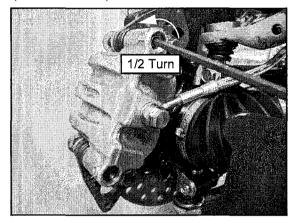




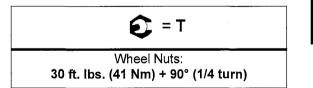
3. Torque the banjo bolt to the proper torque specification.



4. Install the adjustment set screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counterclockwise).



- 5. Perform brake bleeding procedure as outlined earlier in this chapter.
- 6. Install wheel and torque wheel nuts to specification.



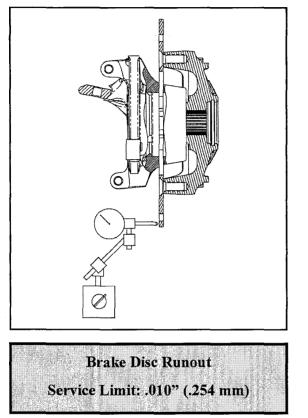
7. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.

NOTE: If new pads are installed, refer to "FRONT BRAKE PADS - Brake Burnishing Procedure".

FRONT BRAKE DISC

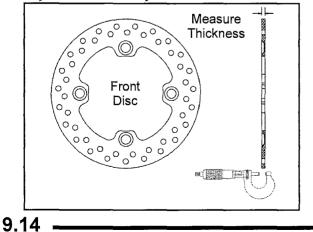
Disc Runout

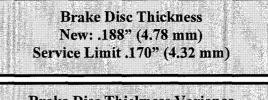
1. Mount dial indicator as shown to measure disc runout. Slowly rotate the disc and read total runout on the dial indicator. Replace the disc if runout exceeds specification.



Disc Inspection

- 1. Visually inspect disc for scoring, scratches, or gouges. Replace the disc if any deep scratches are evident.
- 2. Use a 0-1" micrometer and measure the disc thickness at eight different points around the pad contact surface. Replace disc if worn beyond service limit.

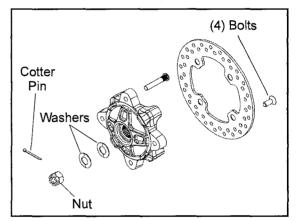




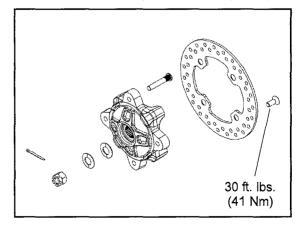
Brake Disc Thickness Variance Service Limit: .002" (.051 mm) difference between measurements

Disc Replacement

- 1. Remove the front brake caliper (see "FRONT CALIPER SERVICE").
- 2. Remove wheel hub cotter pin, castle nut and washers.
- 3. Remove the wheel hub assembly from the vehicle and remove the (4) bolts retaining the disc to the hub.



- 4. Clean the wheel hub mating surface and install new disc on wheel hub.
- 5. Install new bolts and torque to 30 ft. lbs. (41 Nm).





Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

- 6. Install wheel hub assembly, washers, and castle nut. Torque castle nut to 80 ft. lbs. (108 Nm) and install a new cotter pin.
- 7. Install the front brake caliper (see "FRONT CALIPER SERVICE").
- 8. Follow bleeding procedure outlined earlier in this chapter.
- 9. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.

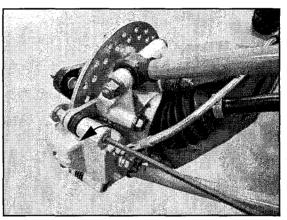
REAR BRAKE PADS

Pad Removal

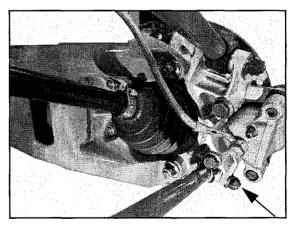
1. Elevate and support rear of vehicle.

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

- 2. Remove the rear wheel.
- 3. Loosen pad adjuster screw 2-3 turns.

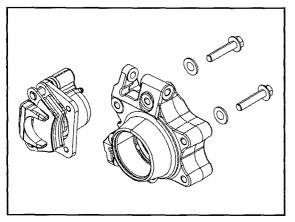


4. Remove the lower radius rod outer mounting bolt, nut and washer from the bearing carrier. Swing radius rod down. Discard the nut.



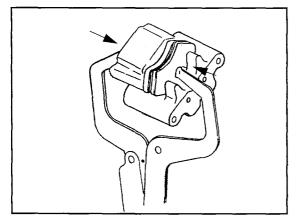
BRAKES

5. Remove the two caliper mounting bolts and lift caliper off the brake disc.

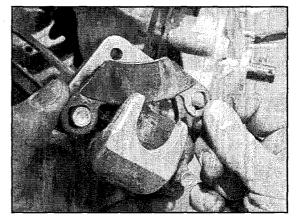


NOTE: When removing caliper, be careful not to damage brake line. Support caliper so as not to kink or bend brake line.

6. Push caliper piston into the caliper bore slowly using a Cclamp or locking pliers with pads installed.

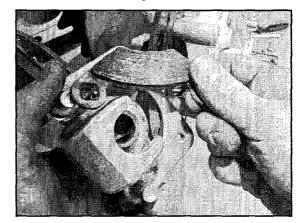


NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required. 7. Push caliper mounting bracket inward and slip outer brake pad past the edge to remove.



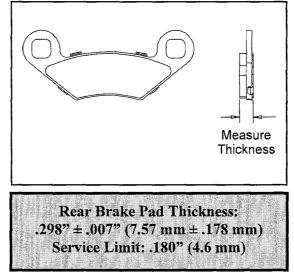
Remove the inner brake pad.

8.



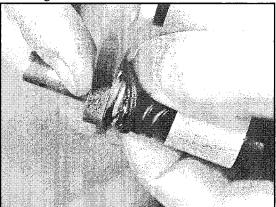
Pad Inspection

- 1. Clean the caliper with brake cleaner or alcohol.
- 2. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.

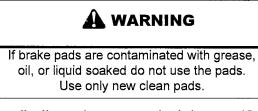


Pad Assembly / Installation

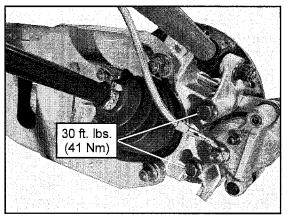
1. Lubricate mounting bracket pins with a light film of silicone grease and install rubber dust boots.

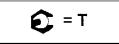


2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other.

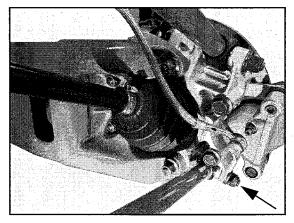


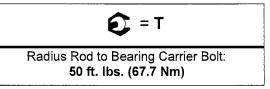
3. Install caliper and torque mounting bolts to specification.



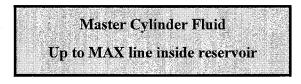


Rear Caliper Mount Bolt: 30 ft. Ibs. (41 Nm) 4. Install lower radius rod bolt, washer and new nut. Torque to specification.

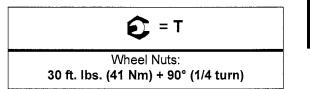




- 5. Slowly pump the brake pedal until pressure has been built up. Maintain at least 1/2, (12.7 mm) of brake fluid in the reservoir to prevent air from entering the brake system.
- 6. Install the adjustment set screw and turn clockwise until the stationary pad contacts the disc, then back off 1/2 turn.
- 7. Verify fluid level in reservoir is up to the MAX line inside reservoir and install reservoir cap.



8. Install wheel and torque wheel nuts to specification.



Brake Burnishing Procedure

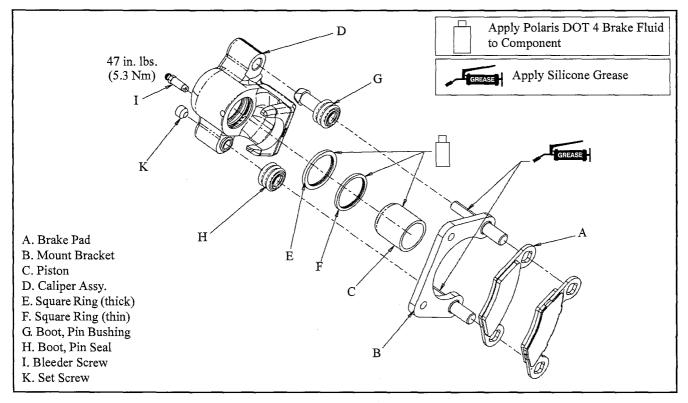
It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warping may result. Repeat this procedure 10 times. Do not make more than 3 stops per 1 mile (1.6 km).

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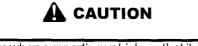
REAR CALIPER SERVICE

Caliper Exploded View



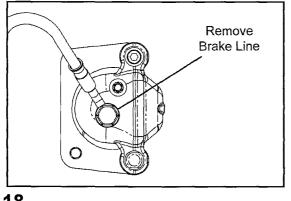
Caliper Removal

1. Elevate and safely support the rear of the vehicle.

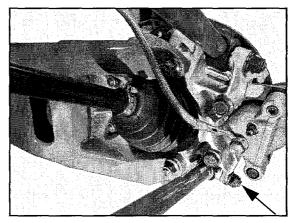


Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur.

- 2. Remove the (4) wheel nuts and rear wheel. Clean caliper area before removal.
- 3. Place a container below the caliper to catch the brake fluid when removing the line. Remove brake line from caliper.



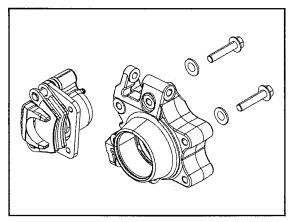
4. Remove the lower radius rod outer mounting bolt, nut and washer from the bearing carrier. Swing radius rod down. Discard nut.



5. Loosen the brake pad adjustment set screw to allow brake pad removal after the caliper is removed.

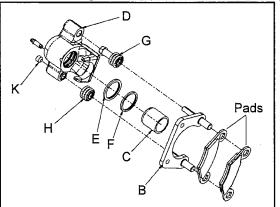


9923144 - 2011 RANGER RZR XP 900 Service Manual © Copyright 2011 Polaris Sales Inc. 6. Remove the two caliper mounting bolts and remove the caliper.

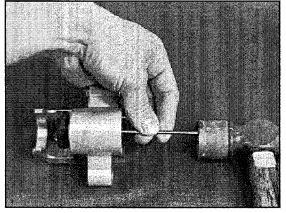


Caliper Disassembly

- 1. Remove brake pad adjustment set screw (K).
- 2. Push upper pad retainer pin inward and slip brake pads past the edge and remove from the caliper.
- 3. Remove mounting bracket (B) and dust boots (G) and (H).

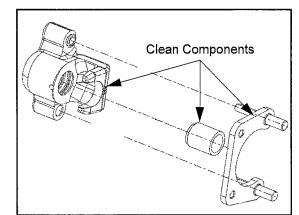


4. Using a hammer and a small punch, remove the piston (C) from the caliper body (D). Remove the square O-rings (E) and (F) from the caliper body (D).



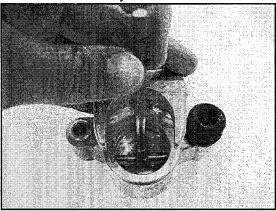
5. Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.

NOTE: Be sure to clean seal grooves in caliper body.



Caliper Inspection

1. Inspect caliper body for nicks, scratches or wear. Measure bore size and compare to specifications. Replace if damage is evident or if worn beyond service limit.



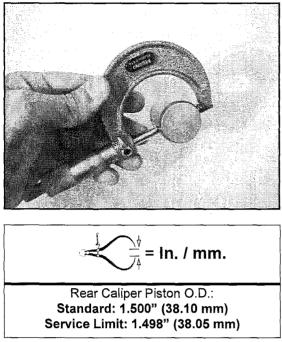
Service Limit: 1.507" (38.28 mm)

9

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BRAKES

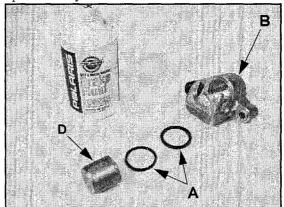
2. Inspect piston for nicks, scratches, wear or damage. Measure diameter and replace if damaged or worn beyond service limit.



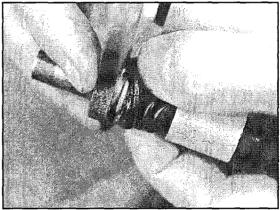
3. Inspect the brake disc and pads as outlined in this chapter.

Caliper Assembly

1. Install new caliper seals (A) in the caliper body (B). Be sure groove is clean and free of residue or brakes may drag upon assembly.



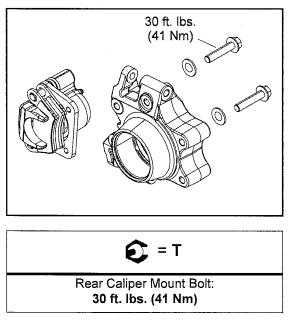
- Coat piston with clean Polaris DOT 4 Brake Fluid (PN 2872189). Install piston (D) with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly with light resistance.
- 3. Lubricate the mounting bracket pins with silicone grease and install the rubber dust seal boots.



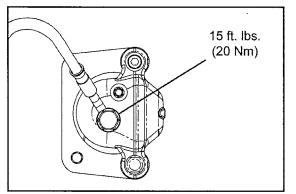
4. Compress the mounting bracket and make sure the dust seals are fully seated. Install the brake pads. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.

Caliper Installation

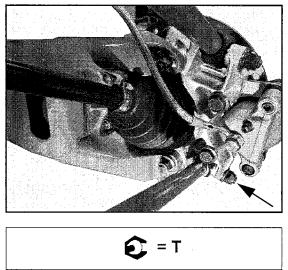
1. Install the rear caliper with the mounting bolts. Torque mounting bolts to specification.



2. Install brake line banjo bolt and torque to specification.



3. Install lower radius rod bolt, washer and new nut. Torque to specification.



Radius Rod to Bearing Carrier Bolt: 50 ft. lbs. (67.7 Nm)

- 4. Install the pad adjustment screw and turn until stationary pad contacts disc, then back off 1/2 turn.
- 5. Follow bleeding procedure outlined earlier in this chapter.
- 6. Install wheel and torque wheel nuts to specification.

Wheel Nuts: 30 ft. lbs. (41 Nm) + 90° (1/4 turn)

NOTE: If new pads are installed, refer to "REAR BRAKE PADS - Brake Burnishing Procedure".

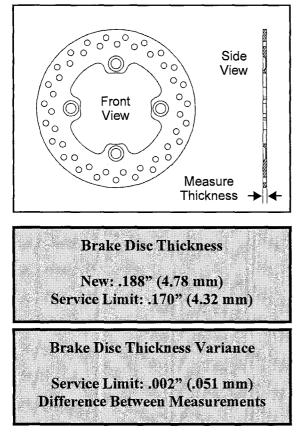
9

BRAKES

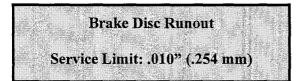
REAR BRAKE DISC

Disc Inspection

- 1. Visually inspect disc for scoring, scratches, or gouges. Replace the disc if any deep scratches are evident.
- 2. Use a 0-1" micrometer and measure the disc thickness at eight different points around the pad contact surface. Replace disc if worn beyond service limit.



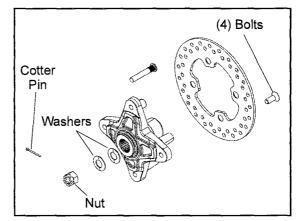
3. Mount a dial indicator and measure disc runout. Slowly rotate the disc and read total runout on the dial indicator. Replace the disc if runout exceeds specifications.



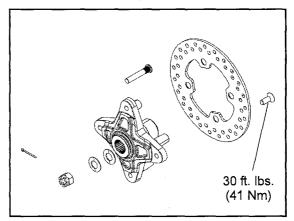
Disc Replacement

- 1. Remove rear brake caliper (see "REAR CALIPER SERVICE").
- 2. Remove wheel hub cotter pin, castle nut and washers.

Remove the hub assembly from the vehicle and remove the
 (4) bolts retaining the disc to the hub.



- 4. Clean the wheel hub mating surface and install new disc on wheel hub.
- 5. Install new bolts and torque to 30 ft. lbs. (41 Nm).



Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

- 6. Install wheel hub assembly, washers, and castle nut. Torque castle nut to 80 ft. lbs. (108 Nm) and install a new cotter pin.
- 7. Install rear caliper (see "REAR CALIPER SERVICE"). Follow bleeding procedure outlined earlier in this chapter.
- 8. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when pedal is released. If the brake drags, re-check assembly and installation.

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TROUBLESHOOTING

Brakes Squeal / Poor Brake Performance

- Air in system
- Water in system (brake fluid contaminated)
- · Caliper or disc misaligned
- Caliper dirty or damaged
- Brake line damaged or lining ruptured
- Worn disc and/or friction pads
- · Incorrectly adjusted stationary pad
- · Worn or damaged master cylinder or components
- · Damaged break pad noise insulator
- Brake pads dragging
- Brake caliper dragging

Pedal Vibration

- Disc damaged
- Disc worn (runout or thickness variance exceeds service limit)

Caliper Overheats (Brakes Drag)

- · Compensating port plugged
- Pad clearance set incorrectly
- Brake pedal binding or unable to return fully
- Residue build up under caliper seals
- Operator riding brakes

Brakes Lock

- Alignment of caliper to disc
- Caliper pistons sticking
- Improper assembly of brake system components

9

NOTES

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GENERAL INFORMATION

Special Tools

Part Number	Tool Description
PV-43568	Fluke [™] 77 Digital Multimeter
PV-43526	Connector Test Kit
2870630	Timing Light
PU-50338	Battery Hydrometer
2460761	Hall Effect Sensor Probe Harness
2871745	Static Timing Light Harness
PU-50296	Battery Conductance Analyzer (MDX-610P)
PU-49466	Relay Bypass
-	Digital Wrench TM (see Chapter 4)

Electrical Service Notes

Keep the following notes in mind when diagnosing an electrical problem:

- Refer to wiring diagram for stator and electrical component resistance specifications.
- When measuring resistance of a component that has a resistance value under 10 Ohms, remember to subtract meter lead resistance from the reading. Connect the leads together and record the resistance. The resistance of the component is equal to tested value minus the lead resistance.
- Become familiar with the operation of your meter. Be sure leads are in the proper jack for the test being performed (i.e. 10A jack for current readings). Refer to the Owner's Manual included with your meter for more information.
- Voltage, amperage, and resistance values included in this manual are obtained with a Fluke[™] 77 Digital Multimeter (PV-43568). This meter is used when diagnosing electrical problems. Readings obtained with other meters may differ.
- Pay attention to the prefix on the multimeter reading (K, M, etc.) and the position of the decimal point.
- For resistance readings, isolate the component to be tested. Disconnect it from the wiring harness or power supply.

Under-Dash Components

The following switches and components can be accessed underneath the instrument / dash panel:

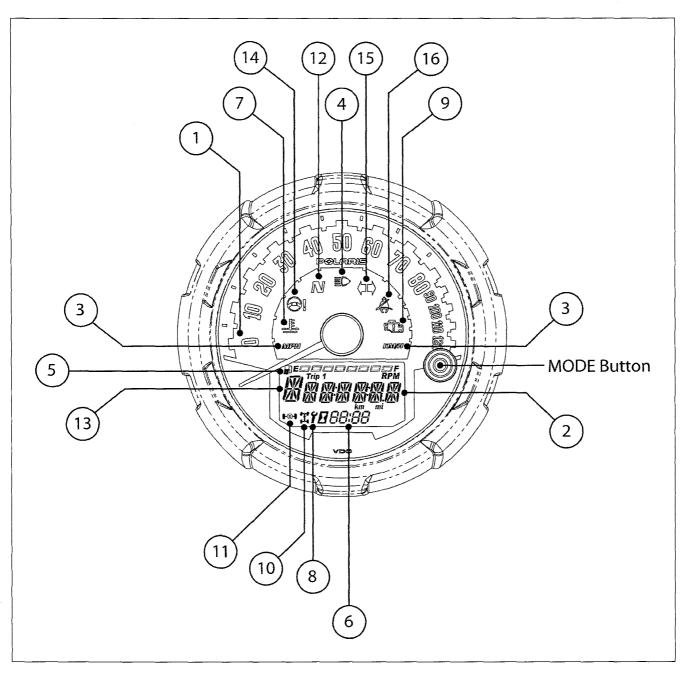
- Speedometer
- Digital Wrench Diagnostic Connector
- AWD Switch
- Headlamp Switch
- 12 Vdc Accessory Power Point
- Ignition Switch
- Fuse / Relay Box

ELECTRICAL

INSTRUMENT CLUSTER

Overview

The instrument cluster displays critical vehicle information to the user. Reference the following page for display functions and descriptions.



NOTE: Some features are not applicable to all models.

IMPORTANT: The use of a high pressure washer may damage the instrument cluster. Wash the vehicle by hand or with a garden hose using mild soap. Certain products, including insect repellents and chemicals, will damage the instrument cluster lens. Do not use alcohol to clean the instrument cluster. Do not allow insect sprays to contact the lens. Immediately clean off any gasoline that splashes on the instrument cluster.

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10.4

Rider Information Display

The rider information display is located in the instrument cluster. All segments will light up for 1 second at start-up.

NOTE: If the instrument cluster fails to illuminate, a battery over-voltage may have occurred and the instrument cluster may have shut off to protect the electronic speedometer.

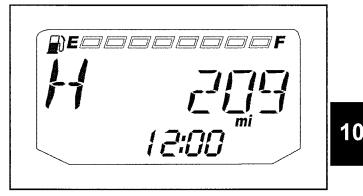
- 1. Vehicle Speed Display Analog display of vehicle speed in MPH or km/h.
- 2. Information Display Area Odometer / Trip Meter / Tachometer / Engine Temperature / Engine Hours / Service Info / Clock - LCD display of the service hour interval, total vehicle miles or km., total engine hours, a trip meter, engine RPM and engine temperature.
- 3. **MPH / KM/H Display -** MPH is displayed when the instrument cluster is in the *Standard* mode. KM/H is displayed when the instrument cluster is in the *Metric* mode.
- 4. **High Beam Indicator** LED icon illuminates whenever the Headlamp switch is in the high beam position.
- 5. **Fuel Level Indicator -** LCD bar graph indicating current fuel level. All segments will flash when the last segment is cleared indicating a low fuel warning.
- 6. Clock Displays current time in either 12-hour or 24-hour formats.
- 7. Engine Temperature Indicator LED icon illuminates when the ECM determines the engine is overheating. The indicators will initially flash to indicate the engine is overheating. The indicators will stay lit and not flash if a severe overheating condition exists.
- 8. Service Interval Indicator Preset at the factory and adjustable by the user, a flashing wrench symbol alerts the operator that the preset service interval has been reached and maintenance should be performed. The wrench icon will flash for 10 seconds upon start-up once it reaches 0.
- 9. Check Engine MIL Illuminated when the ECM has detected a Diagnostic Trouble Code in the engine management system.
- 10. AWD Indicator Illuminated when the AWD / TURF switch is in the *AWD* position.
- 11. **TURF Indicator** Illuminated when the AWD / TURF switch is in the *TURF* position (INT'L Models Only).
- 12. Neutral Gear Indicator LED icon illuminates when gear selector is in the neutral (N) position.

- 13. Gear Position Indicator Displays gear selector position.
- H = High
- L = LowN = Neutral
- R = Reverse
- P = Park
- --= Gear Signal Error (shifter stuck between gears)
- 14. **Power Steering System MIL-**LED icon illuminates when a fault has occurred with the power steering system. This indicator illuminates when the key is turned to the ON position and goes off when the engine is started (EPS Option Only).
- 15. Turn Signal / Hazard Lamp Indicator LED icon illuminates whenever the LH, RH or hazard lamps are activated (INT'L Models Only).
- 16. Helmet / Seat Belt Indicator LED icon illuminates for several seconds when the key is turned to the ON position. The lamp is a reminder to the operator to ensure all riders are wearing helmets and seat belts before operating the vehicle.

Information Display Area

The LCD portion of the instrument cluster is the information display area. Information displayed in this area includes: odometer, trip meter, engine RPM, engine hours, service interval, clock, engine Diagnostic Trouble Codes (DTCs) and power steering DTCs.

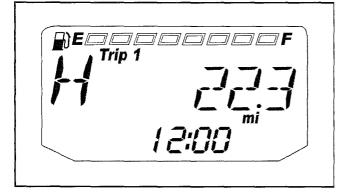
Odometer



The odometer records and displays the total distance traveled by the vehicle. The odometer can not be reset.

ELECTRICAL

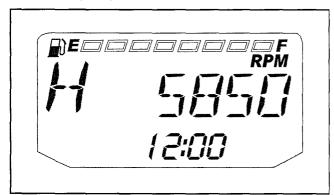
Trip Meter



The trip meter records the miles traveled by the vehicle on each trip. To reset the trip meter:

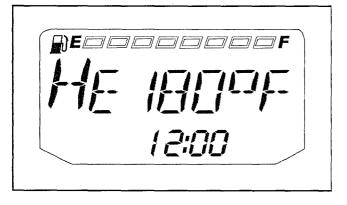
- 1. Toggle the MODE button to TRIP 1.
- 2. To reset to 0, push and hold the MODE button until the distance display changes to 0.

Tachometer (RPM)

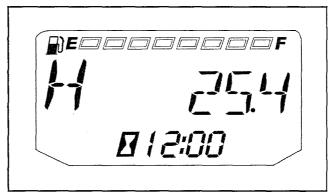


Engine RPM can be displayed digitally.

Engine Temperature

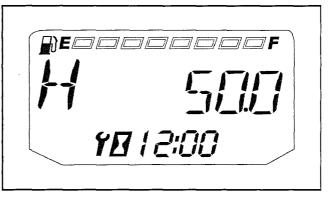


Engine temperature can be displayed in Fahrenheit or Celsius. Refer to "Units of Measurement" to change the format. **Engine Hours**



Engine hours are logged anytime the engine is running. Total hours can not be reset.

Programmed Service Interval

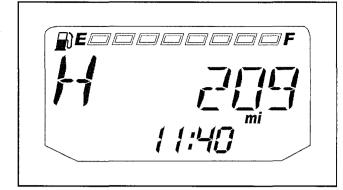


The initial factory service interval setting is 50 hours. Each time the engine is started, the engine hours are subtracted from the service interval hours. When the service interval reaches 0, the LCD wrench icon will flash for approximately 10 seconds each time the engine is started.

To change the hour setting or reset the function, follow these steps:

- 1. Toggle the MODE button until the wrench icon is displayed in the information area.
- 2. Press and hold the MODE button until the information display area begins to flash.
- 3. Toggle the MODE button to increase the service interval hours in 5 hour increments to a maximum of 100 hours.
- 4. To turn off the service interval function, toggle the MODE button until "OFF" is displayed.

Clock



The clock displays the time in a 12-hour or 24-hour format. Refer to "Units of Measurement" to change the format (Standard 12-hour / Metric-24 hour). To set the clock, follow these steps:

- 1. Toggle the MODE button until the odometer is displayed.
- 2. Press and hold the MODE button until the hour segment flashes. Release the button.
- 3. With the segment flashing, tap the MODE button to advance to the desired setting.
- 4. Press and hold the MODE button until the next segment flashes. Release the button.
- 5. Repeat steps 3-4 twice to set the 10 minute and 1 minute segments. After completing the 1-minute segment, step 4 will save the new settings and exit the clock mode.

Units of Measurement

	Standard Display	Metric Display
Distance	Miles (MPH)	Kilometers (KM/H)
Time	12-Hour Clock	24-Hour Clock
Temperature	Fahrenheit	Celsius

To change between Standard and Metric units of measurement, follow these steps:

- 1. Turn the key to the OFF position.
- 2. Press and hold the MODE button while turning the key to the ON position.
- 3. When the display flashes the distance setting, tap the MODE button to advance to the desired setting.



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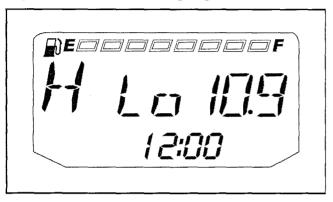
- 4. Press and hold the MODE button to save the setting and advance to the next display option.
- 5. Repeat the procedure to change remaining display settings.

ELECTRICAL

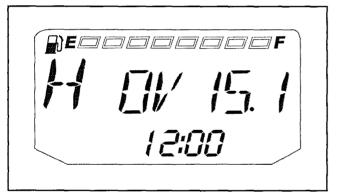
Under / Over Voltage

This warning usually indicates that the vehicle is operating at an RPM too low to keep the battery charged. It may also occur when the engine is at idle and a high electrical load is applied (lights, cooling fan or other accessories).

If battery voltage drops below 11 volts, a warning screen will display "Lo" and provide the present battery voltage. If voltage drops below 8.5 volts, LCD backlighting and icons will turn off.



If battery voltage rises above 15 volts, a warning screen will display "OV" and provide the present battery voltage. If voltage rises above 16.5 volts, LCD backlighting and icons will turn off.

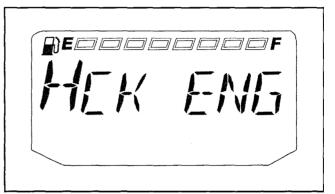


Diagnostic Mode

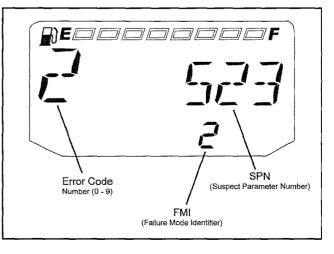
The diagnostic mode is accessible only when the check engine MIL has been activated.

Use the following procedure to display diagnostic trouble codes that were activated during current ignition cycle causing the MIL to illuminate. Diagnostic trouble codes will remain stored in the gauge (even if MIL turns off) until the key is turned off.

1. If the trouble code(s) are not displayed, use the MODE button to toggle until "CK ENG" displays on the information display area.



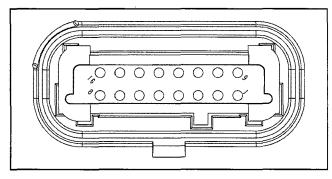
- 2. Press and hold the MODE button to enter the diagnostics code menu.
- 3. A set of three numbers will appear in the information area.
 - The first number (located far left) can range from 0 to 9. This number represents the total number of trouble code present (example: 2 means there are 3 codes present).
 - The second number (located top right) can be 2 to 6 digits in length. This number equates to the suspected area of fault (SPN).
 - The third number (located bottom right) can be 1 to 2 digits in length. This number equates to the fault mode (FMI).



- 4. Use the trouble code reference table in the EFI Chapter for a description of each code (see Chapter 4).
- 5. If more than one code exists, press the MODE button to advance to the next trouble code.
- 6. To exit the diagnostic mode, press and hold the MODE button or turn the ignition key OFF once the codes are recorded.

NOTE: If there is a diagnostic problem with the power steering system, the power steering MIL will illuminate and blink in place of the check engine MIL.

Instrument Cluster Pinouts



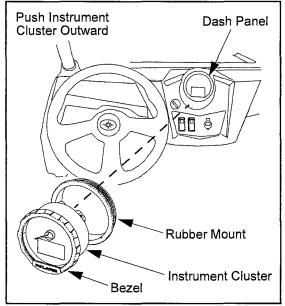
FUNCTION	PIN
CAN High	1
CAN Low	2
Switched Power (Vdc)	3
Constant Power (Vdc)	4
Ground	5
High Beam Input	8
Fuel Level Sensor	11
International Models Only	
Turn Signal Input, LH	6
Turn Signal Input, RH	7

Instrument Cluster Removal

NOTE: Do not allow alcohol or petroleum products to come in contact with the instrument cluster lens.

1. Disconnect the wire harness connector from the back side of the instrument cluster.

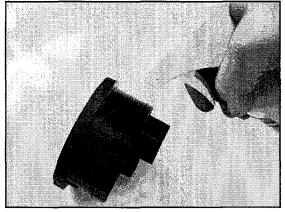
2. Push the instrument cluster out from the back side of the dash while securely holding the dash and rubber mount.



NOTE: Do not remove the rubber mount from the dash panel. Only remove the rubber mount if necessary. The bezel is a snap-on assembly and is a serviceable part.

Instrument Cluster Installation

1. Spray a soap and water mixture onto the outer surface area of the instrument cluster. This will help the instrument cluster slide into the rubber mount more easily.

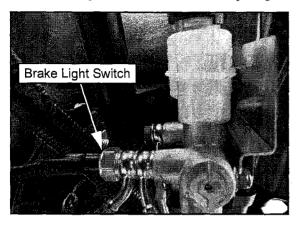


- 10
- 2. Be sure the rubber mount inside the dash is fully installed and that the indexing key on the rubber mount is lined up with the keyway in the dash.
- 3. Hold the dash securely and insert the instrument cluster into the dash. Twist the instrument cluster gently in a clockwise motion to properly seat the instrument cluster into the rubber mount. Apply pressure on the bezel while pressing down on the instrument cluster.

SWITCHES / CONTROLS

Brake Light Switch

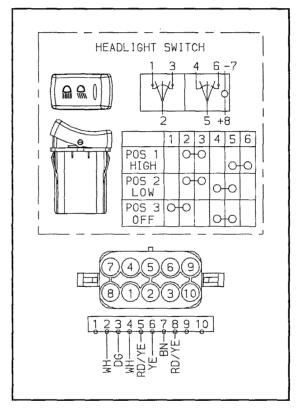
1. The brake light switch is located on the front brake line banjo bolt of the master cylinder. The brake switch can be accessed through the left front wheel well opening.



- 2. Disconnect wire harness from switch and connect an ohmmeter across switch contacts. The reading should be infinite (OL).
- 3. Apply the brake and check for continuity. If there is no continuity or if resistance is greater than 0.5 ohms, clean the switch terminals. Re-test and replace switch if necessary.
- 4. For switch replacement, refer to Chapter 9 "Brakes".

Headlamp Switch

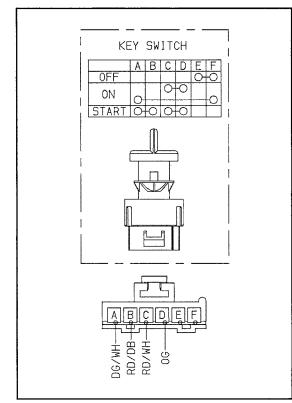
- 1. Disconnect the headlamp switch harness by depressing the connector locks and pulling on the connector. Do not pull on the wiring.
- 2. Test between the 3 sets of outputs (OFF / LOW / HIGH). If any of the tests fail, replace headlamp switch assembly.
 - Move the switch to HIGH. There should be continuity between switch pins 2 and 3; 5 and 6.
 - Move the switch to LOW. There should be continuity between switch pins 2 and 3; 4 and 5.
 - Move the switch to OFF. There should be continuity between switch pins 1 and 2; 4 and 5.



NOTE: Pins 7 and 8 provide power and ground to light the switch lamp.

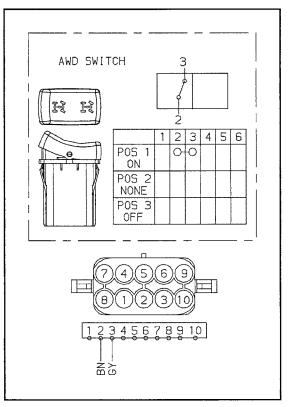
Ignition Key Switch

- 1. Disconnect the key switch harness by depressing the connector lock and pulling on the connector. Do not pull on the wiring.
- 2. Test between the 3 sets of outputs (OFF / ON / START). If any of the tests fail, replace ignition switch assembly.
 - Turn the ignition key to ON. There should be continuity between switch pins C and D.
 - Turn the ignition key to START. There should be continuity between switch pins A and B; C and D.



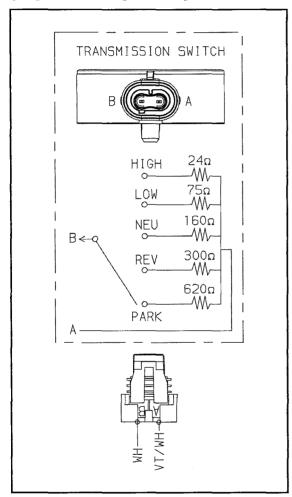
AWD / 2WD Switch

- 1. Disconnect the AWD / 2WD switch harness by depressing the connector locks and pulling on the connector. Do not pull on the wiring.
- 2. Test between the 2 sets of outputs (AWD / 2WD). If any of the tests fail, replace the switch assembly.
 - Move the switch to AWD (ON). There should be continuity between switch pins 2 and 3.
 - Move the switch to 2WD (NONE / OFF). There should be no continuity between any pins.



Transmission (Gear Position) Switch

- 1. The transmission (gear position) switch is located on the RH side of the transmission and can be accessed through the RH wheel well area.
- 2. Disconnect the transmission switch harness by lifting the connector lock and pulling on the connector. Do not pull on the wiring.
- 3. Test the transmission switch continuity readings for each gear position and compare to the specification table below.



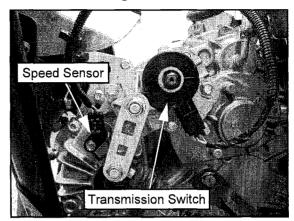
Gear Position	Resistance Value when measured at switch terminals A and B
HIGH	24 Ω
LOW	75 Ω
NEU	160 Ω
REV	300 Ω
PARK	620 Ω

10.12-

VEHICLE SPEED SENSOR

Speed Sensor Location

The speed sensor is located on the RH side of the transmission and can be accessed through the rear RH wheel well area.



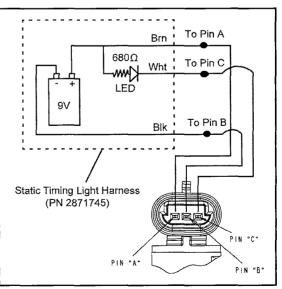
Speed Sensor Testing

Special Tools Required:

Static Timing Light Harness (PN 2871745)

Hall Sensor Probe Harness (PN 2460761)

- 1. Disconnect the 3 wire harness from the speed sensor and remove the sensor from the transmission.
- 2. Connect the wires from the Static Timing Light Harness to the sensor 3 pin connector using the Hall Sensor Probe Harness (PN 2460761).
- 3. Pass a screwdriver back and forth in front of the sensor tip.
- 4. Be sure connections are good and 9V battery is in good condition. If the light flashes, the sensor is good.



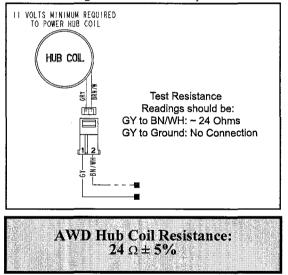
ALL WHEEL DRIVE COIL

Operation Overview

- When the key switch is "ON", 12 VDC power is present at the hub coil.
- When the AWD switch is "ON", and if the criteria is met, the Engine Controller provides a ground path (brown/white wire). When this occurs the AWD icon should display in the instrument cluster.
- The AWD system must be grounded to operate.

Diagnosing System Failures

- Verify the AWD switch is functional and that a minimum of 11 volts is present at the hub coil.
- Verify the AWD hub coil is functional. Test the AWD hub coil using an ohm meter. See specifications below:



- Verify the wiring harness, wiring, connectors, connector pins and grounds are undamaged, clean and connect properly.
- Verify continuity of wire connections with a known good volt/ohm meter.

IMPORTANT: Verify all wires and wiring connections have been tested properly with a known good volt/ ohm meter before suspecting a component failure. 80% of all electrical issues are caused by bad/failed connections and grounds.

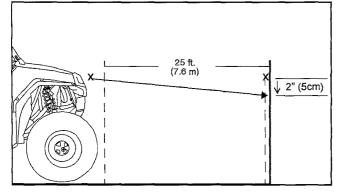
ELECTRICAL

HEAD LIGHTS

Headlight Adjustment

The headlight beams are adjustable.

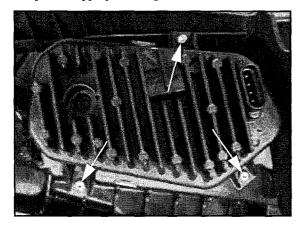
1. Place the vehicle on a level surface with the headlight approximately 25 ft. (7.6 m) from a wall.



- 2. Measure the distance from the floor to the center of the headlight and make a mark on the wall at the same height.
- 3. With the machine in Park, start the engine and turn the headlight switch to the LOW position.
- 4. The most intense part of the LOW beam headlight beam should be aimed 2 in. (5 cm) below the mark placed on the wall in Step 2.

NOTE: Rider weight must be included in the seat while performing this procedure.

5. Adjust the beam to the desired position by loosening or tightening the (3) T-25 adjustment screws and moving the lamp to the appropriate height.



6. Adjust the beam to desired position. Repeat the procedure to adjust the other headlight.

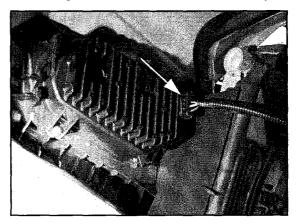


Due to the nature of light utility vehicles and where they are operated, headlight lenses become dirty. Frequent washing is necessary to maintain lighting quality. Riding with poor lighting can result in severe injury or death.

Headlamp Replacement

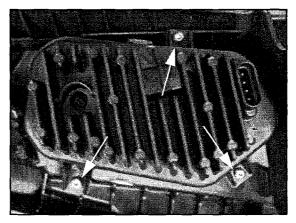
IMPORTANT: If an LED headlamp has fogging or moisture inside, disconnect the headlamp(s) for a few days to allow the moisture to clear out.

1. Disconnect the wire harness from the headlamp assembly. Be sure to pull on the connector, not on the wiring.

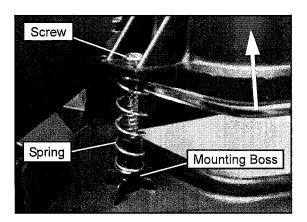


2. Remove the (3) T-25 headlamp mounting screws and (3) adjustment preload springs.

NOTE: The front bumper can be removed and placed face down on a suitable workbench to ease headlamp replacement (see Chapter 5).



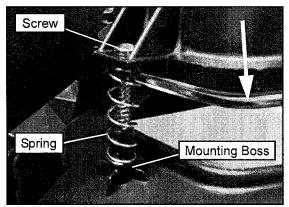
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3. Carefully lift and remove headlamp assembly from the bumper.

Headlamp Installation

- 1. Install the headlamp adjustment springs onto the front bumper mounting bosses.
- 2. Insert the (3) T-25 headlamp mounting screws into the headlamp assembly mounting holes.
- Maneuver the headlamp assembly into position. Be sure all
 (3) headlamp springs and mounting screws are properly aligned with mounting bosses on the front bumper.



- 4. Fully tighten all (3) headlamp screws until the headlamp assembly is full seated. Back headlamp mounting screws off 1/8" to 1/4" (2-3 turns).
- 5. Install the front bumper as shown in Chapter 5 if previously removed.
- 6. Connect headlamp electrical connector to the headlamp assembly.
- 7. Perform the "Headlight Adjustment" procedure as shown in this chapter.

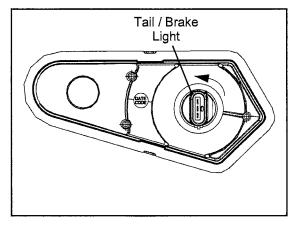
TAIL / BRAKE LIGHTS

Bulb Replacement

Before replacing the bulb(s), use a digital multi-meter to test the harness to ensure the lamp is receiving 12 volts and that a ground path is present.

If a tail light or brake light does not work the bulb may need to be replaced.

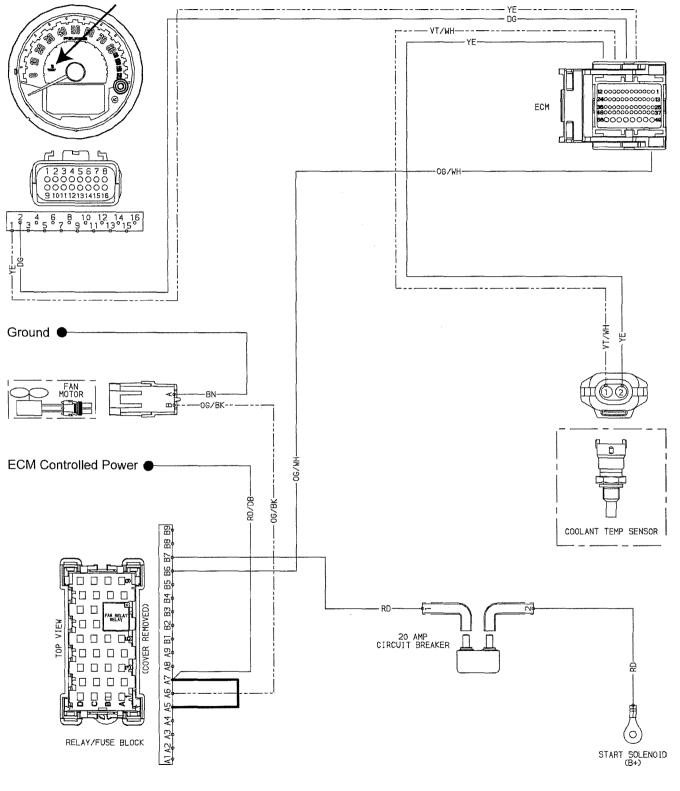
1. Remove bulb by turning the rubber base 1/4 turn and pulling the bulb out. Replace it with recommended bulb. Apply Dielectric Grease (PN 2871329).



2. Test the tail light and brake light to verify it is working properly.

COOLING SYSTEM

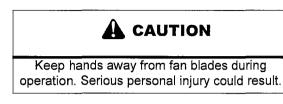
Cooling System Break-Out Diagram





Fan Control Circuit Operation / Testing

Power is supplied to the fan via the Orange/Black wire when the relay is ON. The ground path for the fan motor is through the Brown harness wire. Refer to "RELAYS" later in this chapter for more information on fan functions.



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.

Fan Control Circuit Bypass Test

- 1. Disconnect harness from coolant temperature sensor on the engine cylinder head (see Chapter 4 for location).
- 2. With the transmission in Park, start the engine. After a few seconds, the fan should start running and the "Check Engine" indicator should display on the instrument cluster. This indicates all other components are working properly.
- 3. If the fan does not run or runs slowly, check the fan motor wiring, ground, motor condition and mechanical relay for proper operation. Repair or replace as necessary. If the fan runs with the sensor harness disconnected, but will not turn on when the engine is hot, check the coolant temperature sensor and connector terminals.

Coolant Temperature Sensor

The coolant temperature sensor can be tested using an ohmmeter or voltmeter.

- 1. With the engine and temperature sensor at room temperature ($68^{\circ}F = 20^{\circ}C$), disconnect the harness.
- 2. With the meter in the ohms mode, place the meter leads onto the sensor contacts.
- 3. Use the table Temperature / Resistance table to determine if the sensor needs to be replaced.

TEMPERATURE °F (°C)	RESISTANCE
68 °F (20 °C)	$2.5 \text{ k} \Omega \pm 6\%$
212 °F (100 °C)	$186 \Omega \pm 2\%$

NOTE: If the coolant temperature sensor or circuit malfunctions the radiator fan will default to 'ON' while the engine is running.

EFI DIAGNOSTICS

EFI Component Testing

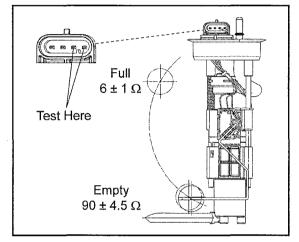
All EFI component information and diagnostic testing procedures are located in Chapter 4.

Refer to Chapter 4 "Electronic Fuel Injection System (EFI)" when diagnosing an EFI system or component.

FUEL SENDER

Testing

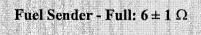
- 1. Remove the fuel pump assembly from the fuel tank (see Chapter 4 "Fuel Pump Replacement").
- 2. Using an Ohm meter, measure the resistance of the fuel sender as shown below.



3. Allow the sender float to sit in the **empty position** and compare to specification.

Fuel Sender - Empty: 90 \pm 4.5 Ω

4. Slowly move the sender float to the **full position** and compare to specification.



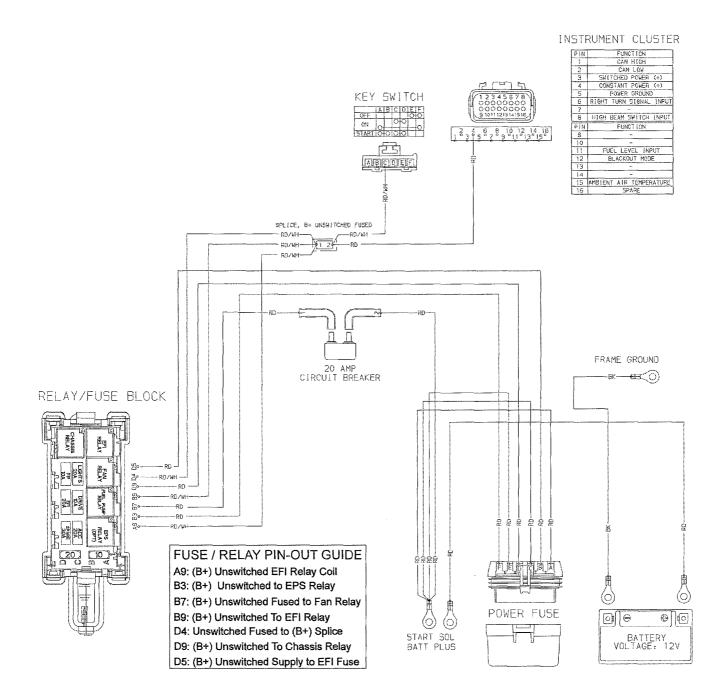
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- 5. If the readings are out of specification, or if the reading is erratic or LCD display "sticks", check the following before replacing the fuel pump assembly:
 - Loose float
 - Float contact with tank
 - Bent float rod
- 6. If none of the conditions exist, the fuel sender assembly is faulty. Replace the fuel pump assembly (see Chapter 4).

FUSE BOX: FUSES / RELAYS / CIRCUIT BREAKER

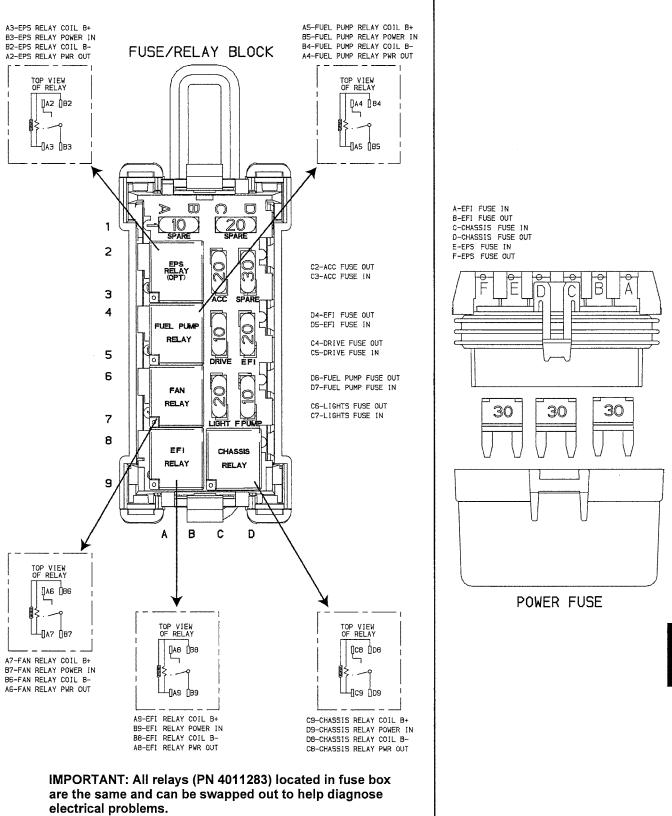
Overview / Operation

Located in the fuse box under the dash, the fuses provide overload protection for wiring and components such as the instrument cluster, ECU, EFI system, main harness, lights, accessories and power steering. The relays assist with component operation like the cooling fan, fuel pump, EFI system, drive system and electronic power steering. A separate 20-amp circuit breaker protects the fan motor circuit.



ELECTRICAL

Fuse Box Detail



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Relay Operation

Located in the fuse box under the dash, the relays assist with component operation like the cooling fan, fuel pump and EFI system, drive system and EPS.

CHASSIS RELAY provides power to the following systems:

- Lights (Headlights / Taillights)
- Drive (AWD)
- Accessory (12V Receptacles / Accessory Options)

CHASSIS RELAY

Color	FUNCTION
Red	30-Amp fuse protected 12 Vdc constant battery voltage.
Brown	Relay coil ground.
Orange	12 Vdc power input from key switch to enable relay.
White	Provides 12 Vdc power for lights, drive and accessory circuits.

EFI RELAY provides power to the following systems:

- Fuel Injectors
- Ignition Coil
- Fan Relay
- Fuel Pump Relay

EFI RELAY

Color	FUNCTION
Red / White	20-Amp fuse protected 12 Vdc constant battery voltage.
Dark Green / Yellow	ECU ground input to enable relay.
Red / White	20-Amp fuse protected 12 Vdc constant battery voltage.
Red / Dark Blue	Provides 12 Vdc power for EFI system circuits.

FAN RELAY provides power to the following system:

Fan Motor

FAN RELAY

COLOR	FUNCTION
Red	20-Amp circuit breaker protected 12 Vdc constant battery power.
Orange / White	ECU ground input to enable relay.
Red / Dark Blue	12 Vdc switched power from EFI relay.
Orange / Black	Provides 12 Vdc power for fan operation.

FUEL PUMP RELAY provides power to the following system:

Fuel Pump

FUEL PUMP RELAY

COLOR	FUNCTION
Red / Green	10-Amp fuse protected 12 Vdc battery voltage.
Dark Green / Yellow	ECU ground input to enable relay.
Red / Dark Blue	12 Vdc switched power from EFI relay.
Red / Blue	Provides 12 Vdc power for fuel pump operation.

EPS RELAY (OPT) provides power to the following system:

• Electronic Power Steering Unit

EPS RELAY (OPT)

COLOR	FUNCTION	
Red	30-Amp fuse protected 12 Vdc constant battery voltage.	
Brown	Relay coil ground.	
Orange	12 Vdc power input from key switch to enable relay.	
Orange	Provides 12 Vdc power for EPS operation.	

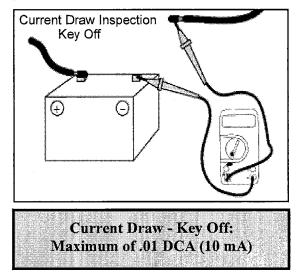
ELECTRICAL

CHARGING SYSTEM

Current Draw - Key Off

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.



Charging System "Break Even" Test

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.

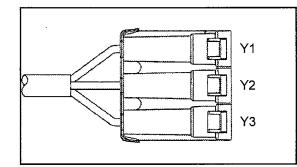
🔒 WARNING

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. Using an inductive amperage metering device, (set to DC amps) connect to the negative battery cable.
- 2. With engine off, key switch and lights in the on position, the ammeter should read negative amps (battery discharge).
- 3. Shift transmission into park and start the engine. With the engine running at idle, observe meter readings.
- 4. Increase engine RPM while observing ammeter and tachometer. Note the RPM at which the battery starts to charge (ammeter indication is positive).
- 5. With lights and other electrical loads off, the "break even" point should occur at approximately 1500 RPM or lower.
- 6. With the engine running, turn the lights on and depress the brake pedal to keep brake lights on.
- 7. Repeat test, observing ammeter and tachometer. With lights on, charging should occur at or below 2000 RPM.

Charging System Stator (Alternator) Tests

Three tests can be performed using a multi-meter to determine the condition of the stator (alternator).



TEST 1: Resistance Value of Each Stator Leg

1. Measure the resistance value of each of the three stator legs: Y1 to Y2, Y1 to Y3, and Y2 to Y3. Each test should measure: $0.11\Omega \pm 15\%$

Test	Connect Meter Leads To:	Ohms Reading	
Battery Charge Coil	Y1 to Y2	$0.11\Omega \pm 15\%$	
Battery Charge Coil	Y1 to Y3	$0.11\Omega \pm 15\%$	
Battery Charge Coil	Y2 to Y3	$0.11\Omega \pm 15\%$	

NOTE: If there are any significant variations in ohm readings between the three legs it is an indication that one of the stator legs may be weak or failed.

TEST 2: Resistance Value of Each Stator Leg to Ground

 Measure the resistance value of each of the stator legs to ground: Y1 to Ground, Y2 to Ground, Y3 to Ground. Each test should measure: Open Line (OL)

Test	Connect Meter Leads To:	Ohms Reading
Battery Charge Coil	Y1, Y2, or Y3 to Ground	Open Line (Infinity)

NOTE: Any measurement other than Infinity (open) will indicate a failed or shorted stator leg.

TEST 3: Measure AC Voltage Output of Each Stator Leg at Charging RPM

- 1. Set the selector dial to measure AC Voltage.
- 2. Start the engine and let it idle.
- 3. While holding the engine at a specified RPM, separately measure the voltage across each 'leg' of the stator by connecting the meter leads to the wires leading from the alternator (Y1 to Y2, Y1 to Y3, Y2 to Y3).
- 4. Refer to the following table for approximate AC Voltage readings according to RPM. Test each leg at the specified RPM in the table.

Example: The alternator current output reading should be approximately 21 VAC at 1300 RPM between each 'leg'.

NOTE: If one or more of the stator leg output AC voltage varies significantly from the specified value, the stator may need to be replaced.

RPM Reading	AC Voltage (VAC) Reading	
1300	21 VAC ± 25%	
3000	47 VAC ± 25%	
5000	79 VAC ± 25%	

Stator (Alternator) Replacement

Refer to Engine Chapter "Stator Cover Removal / Inspection" procedure to service the stator.

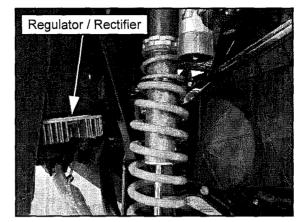
NOTE: The stator cover can be removed with the engine installed in the chassis.

IMPORTANT: Be sure to thoroughly clean the area around the stator cover prior to removal.

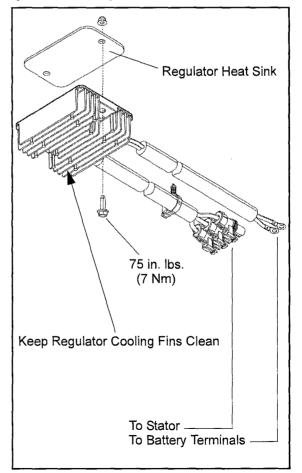
10.22-

Regulator / Rectifier

The Regulator / Rectifier is located in the left rear wheel well area in front of the left rear shock. It is mounted under the LH panel divider, below the ECU.

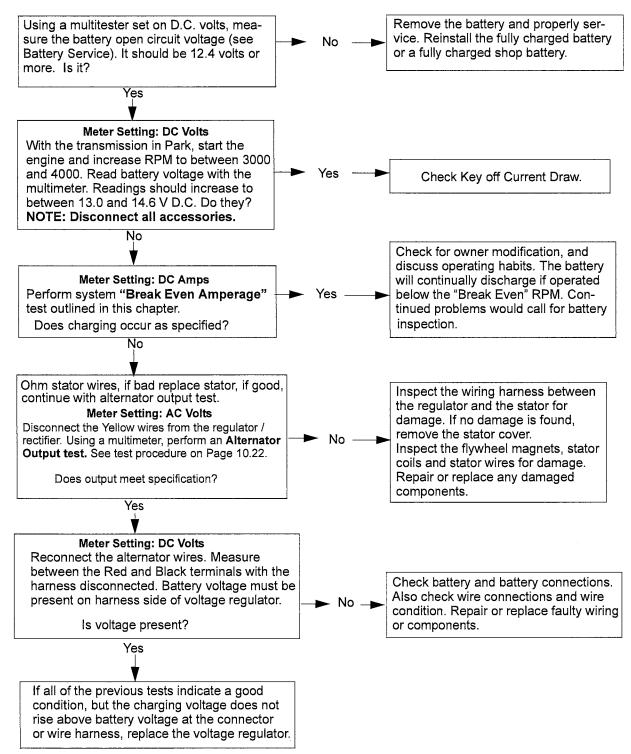


NOTE: If the regulator / rectifier overheats, the unit will turn itself off to cool down. The unit will turn on again after it has cooled down. If it turns off, verify the cooling fins are clean, free from debris and that adequate airflow is present.



Charging System Testing Flow Chart

Whenever charging system problems are suspected, proceed with the following system check after verifying that all wires are in good condition, connected and not exposed or pinched.



10.23

10

BATTERY SERVICE

Battery Specifications

Battery PN 4011224

Туре	Polaris / Deka ETX30L Sealed - Maintenance Free	
Voltage	12 Vdc	
Nominal Capacity @ 10 HR Rate	30 AH	
CCA	365	
Nominal Open Circuit Voltage	12.8 Vdc or more.	
Recommended Charging Rate	1.8A @ 5-10 HR or 6.0A @ 1 HR	

IMPORTANT: Never attempt to open the battery. If the seal is broken, the battery will be ruined and will fail within a few weeks.

General Battery Information



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

\Lambda WARNING

Battery electrolyte is poisonous. It contains acid! Serious burns can result from contact with the 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 a 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 closed space. Always shield eyes when working near batteries.

Keep out of reach of children.

- 1. Check battery voltage with a volt/ohm meter. A fully charged battery should be 12.8 V or higher.
- 2. If the voltage is below 12.6 V, the battery will need to be recharged (see "Charging Procedure").

To service a Maintenance Free battery:

- 1. Remove battery from the vehicle (see Chapter 2).
- 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 OCV table (see "OCV - Open Circuit Voltage Test").
- 3. Charge the battery as recommended (see "Charging Procedure").

Battery Removal / Installation

See Chapter 2 "Maintenance" for battery removal and installation procedures.

Battery Off Season Storage

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

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

Battery Testing

Whenever a service complaint is related to either the starting or charging systems, the battery should be checked first.

The following are two tests which can easily be made on a sealed Maintenance Free battery to determine its condition: OCV Test and a Load Test.

OCV - Open Circuit Voltage Test

Battery voltage should be checked with a digital multitester. Readings of 12.6 volts or less require further battery testing and charging. See the following chart and "Load Test".

NOTE: Maintenance Free batteries should be kept at a high state of charge during storage. If the battery is stored or used at a low state of charge, hard crystal sulfation will form on the plates, reducing the efficiency and service life of the battery.

NOTE: Use a volt/ohm meter to test battery voltage.

OPEN CIRCUIT VOLTAGE			
State of Charge Maintenance Fre			
100%	12.8 V and up		
75% Charged	12.6 V		
50% Charged	12.3 V		
25% Charged	12.0 V		
0% Charged	11.8 V or less		

Battery PN 4011224

Load Test

A CAUTION

To prevent shock or component damage, remove spark plug high tension leads and connect securely to engine ground before proceeding.

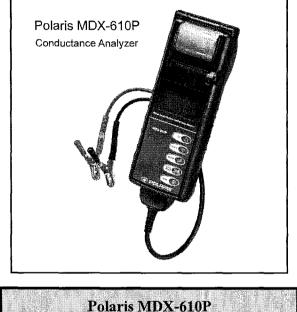
A battery may indicate a full charge condition in the OCV test, but still may not have the storage capacity necessary to properly function in the electrical system. For this reason, a battery capacity or load test should be conducted whenever poor battery performance is encountered.

To perform this test, use a load testing device that has an adjustable load. Apply a load of three times the ampere-hour rating. At 14 seconds into the test, check battery voltage. A good 12V battery will have at least 10.5 volts. If the reading is low, charge the battery and retest.

Battery Conductance Analyzer

Conductance describes the ability of a battery to conduct current. A conductance tester functions by sending a low frequency AC signal through the battery and a portion of the current response is captured, from this output a conductance measurement is calculated. Conductance testing is more accurate than voltage, specific gravity, or load testing.

Authorized Polaris dealers/distributors are required to use the conductance analyzer when testing 12V Polaris batteries.



SPX PN: PU-50296

Charging Procedure

If battery voltage is 12.6 Vdc or less, the battery may need recharging. When using an automatic charger, refer to the charger manufacturer's instructions for recharging.

Do not exceed 6 amps when charging the 4011224 battery.

NOTE: Charge the battery using an automatic charger that will not exceed 14.6 Vdc. An automatic charger will signal when charging is complete.

NOTE: Allow the battery to stand disconnected for at least 1-2 hours after being properly charged. If the voltage drops below 12.6 volts, charging was ineffective or the battery needs to be replaced.

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 PN 4011224

State of Charge	Voltage (DC)	Action	Charge Time
100%	12.8 or more	None, check again in 3 months	None Required
75% - 100%	12.6 - 12.8	May need slight charge	3 - 6 hrs
50% - 75%	12.3 - 12.6	Needs Charge	5 - 11 hrs
25% - 50%	12.0 - 12.3	Needs Charge	At least 13 hrs
0% - 25%	12.0 or less	Needs Charge	At least 20 hrs

NOTE: Follow the charger instructions supplied by the manufacture regarding the order or connections, switch positions and when to connect the charger to an outlet.

STARTING SYSTEM

Troubleshooting

Starter Motor Does Not Run

- · Battery discharged
- Loose or faulty battery cables or corroded connections (see Voltage Drop Tests)
- Related wiring loose, disconnected, or corroded
- Poor ground connections at battery cable, starter motor or starter solenoid (see Voltage Drop Tests)
- · Faulty key switch
- Faulty starter solenoid or starter motor
- Engine problem seized or binding (can engine be rotated easily)

Starter Motor Turns Over Slowly

- Battery discharged
- Excessive circuit resistance poor connections (see Voltage Drop Test)
- Engine problem seized or binding (can engine be rotated easily)
- Faulty or worn brushes in starter motor

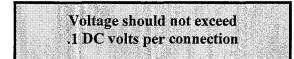
Starter Motor Turns - Engine Does Not Rotate

- Faulty starter drive
- Faulty starter drive gears or starter motor gear
- Faulty flywheel gear or loose flywheel

Voltage Drop Test

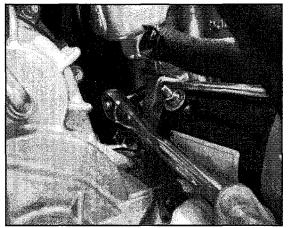
The Voltage Drop Test is used to test for bad connections. When performing the test, you are testing the amount of voltage drop through the connection. A poor or corroded connection will appear as a high voltage reading. Voltage shown on the meter when testing connections should not exceed 0.1 VDC per connection or component.

To perform the test, place the meter on DC volts and place the meter leads across the connection to be tested. Refer to the voltage drop tests on the starter system in this chapter.



Starter Motor Removal

- 1. Remove the driver side seat and disconnect the battery.
- 2. Raise and support rear of vehicle.
- 3. Remove the RH rear wheel.
- 4. Remove the (+) positive wire from the starter motor terminal.
- 5. From the RH side wheel well using an 8mm flex socket, remove the negative battery cable nut and the (2) fasteners securing the starter motor to the engine.



NOTE: The (-) negative battery cable is mounted to the engine using the upper starter mounting bolt / stud.

6. Remove the starter from the engine.

Starter Motor Installation

- 1. Inspect and replace starter motor O-ring if needed.
- 2. Lubricate the starter motor O-ring with fresh engine oil.
- 3. Install the starter motor onto the engine case.
- 4. Hand tighten the upper starter mounting bolt / stud.
- 5. Install and torque the lower mounting bolt to specification.

IMPORTANT: Tighten the lower starter bolt first, as the bottom hole acts as a pilot hole to properly align the starter drive (bendix) with the flywheel. This helps prevent binding and starter damage.

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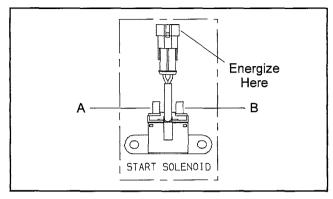
- 6. Torque the upper starter mounting screw to specification.
- 7. Install the (-) negative battery cable to the upper starter mounting bolt / stud. Torque nut to specification.

С = Т

Starter Mounting Bolts and Nut: 7 ft. lbs. (10 Nm)

Starter Solenoid Bench Test

Test the start solenoid by powering the solenoid using battery voltage for a maximum of 5 seconds. With the solenoid energized, resistance should read about $0 - 0.5\Omega$ between terminals (A) and (B). If resistance measurement is out of specification, replace the starter solenoid.



Starter Solenoid Operation

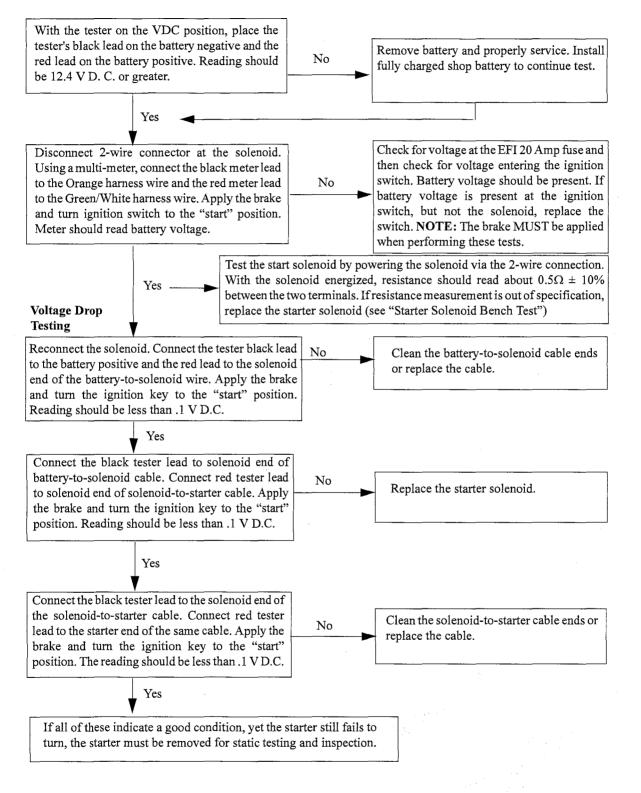
To energize the Starter Solenoid the following must occur:

- The brake must be applied to provide a ground path via the Orange wire.
- The key switch must be turned to the "start" position to provide 12V power via the Green / White wire.
- Once the pull-in coil is energized, the solenoid provides a current path for 12V power to reach the starter motor.

NOTE: See "ELECTRICAL SYSTEM BREAOUTS: Starter-Interlock" provided in this chapter for starter solenoid operation.

STARTING SYSTEM TESTING FLOW CHART

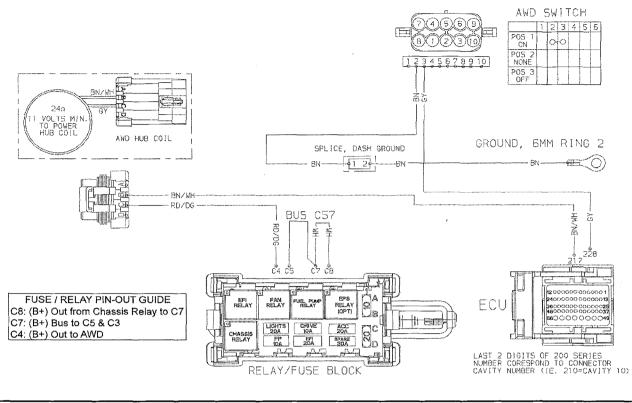
Condition: Starter fails to turn over the engine.



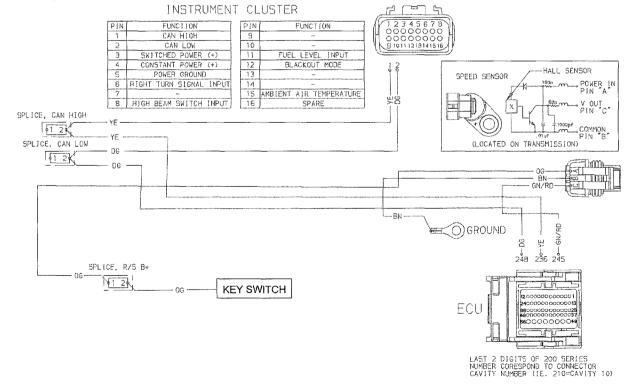
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ELECTRICAL SYSTEM BREAKOUTS

AWD

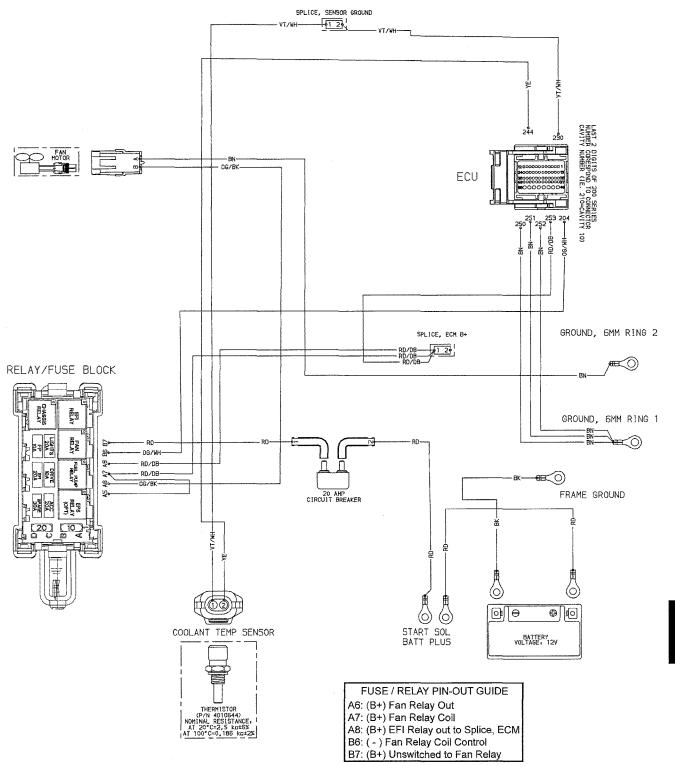


Vehicle Speed Sensor



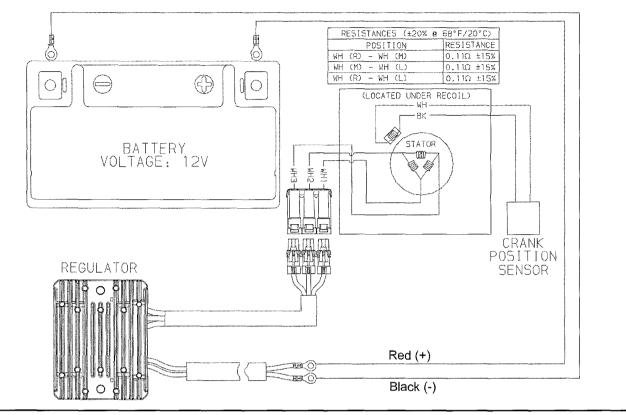


Cooling Fan

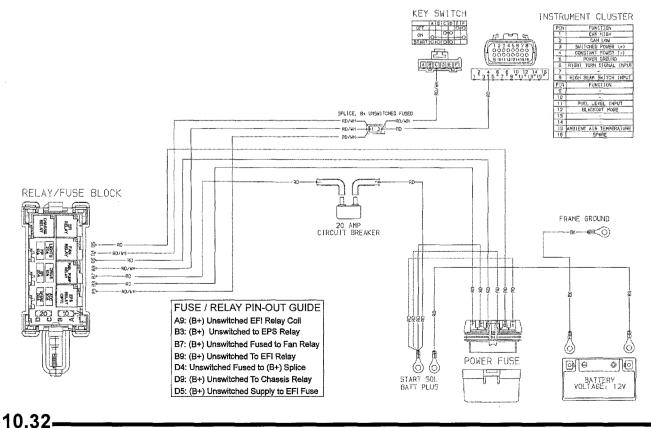


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Charging System



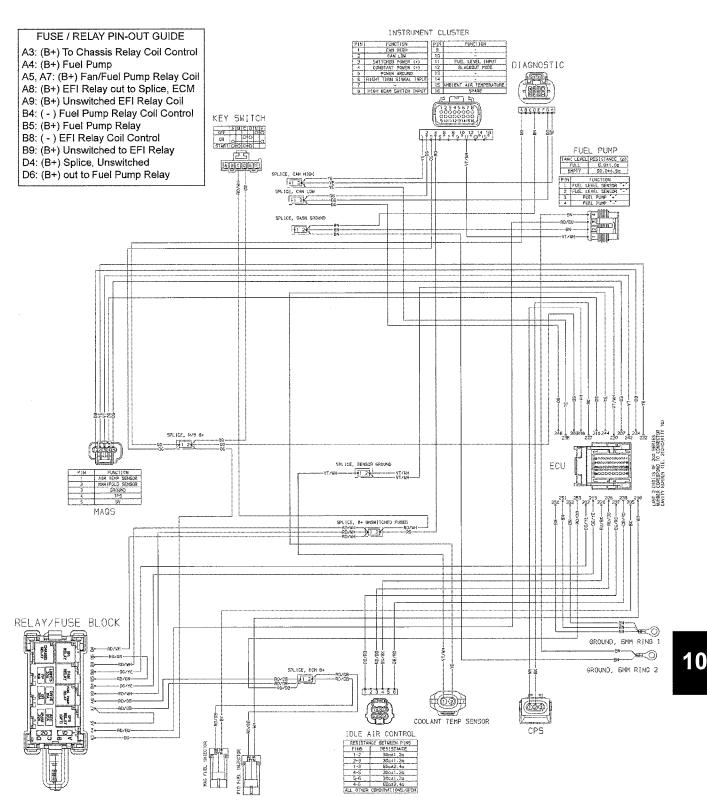
Chassis Power



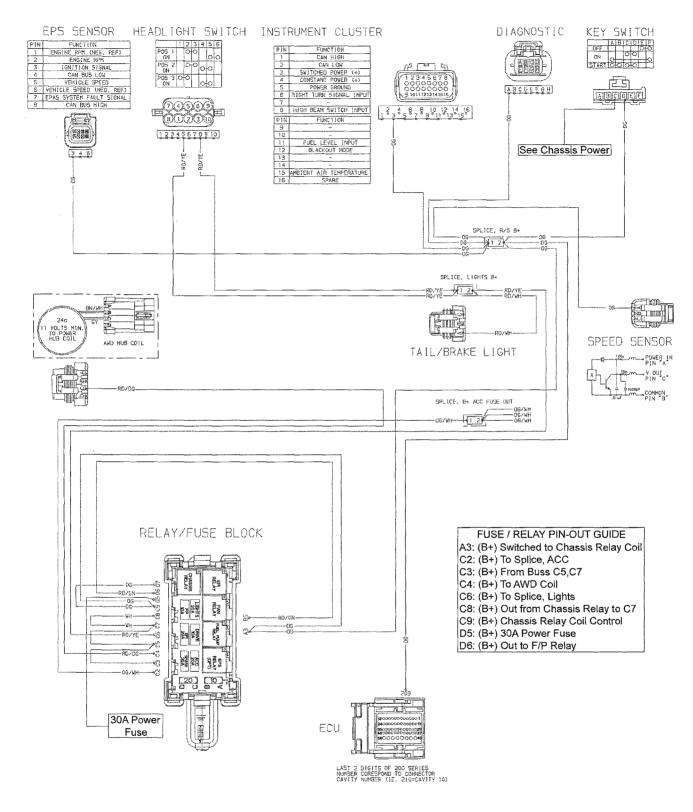
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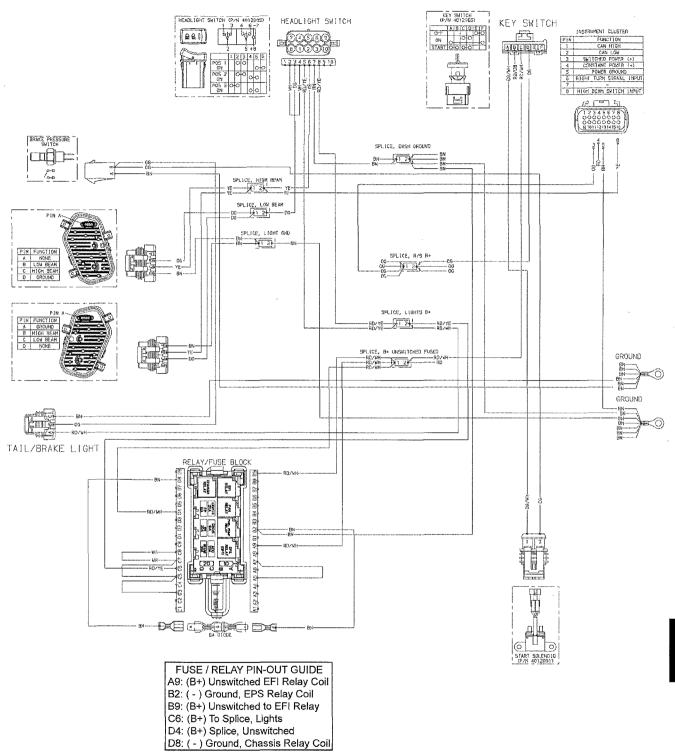
EFI



Key-On Battery Power



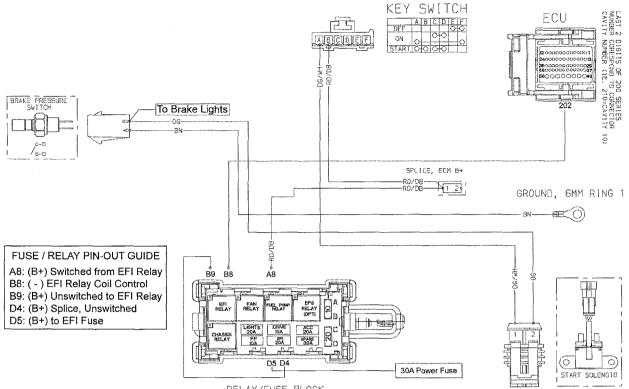
Lights



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Starter-Interlock



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