POLARIS
The Way Out.

2004 SPORTSMAN 600/700

SERVICE MANUAL

PN 9918803

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2004 SPORTSMAN 600/700 SERVICE MANUAL

Foreword

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

Some procedures outlined in this manual require a sound knowledge of mechanical theory, tool use, and shop procedures in order to perform the work safely and correctly. Technicians should read the text and be familiar with service procedures before starting the work. Certain procedures require the use of special tools. Use only the proper tools as specified.

This manual includes procedures for maintenance operations, component identification and unit repair, along with service specifications for 2004 Polaris Sportsman 600/700 ATVs. Comments or suggestions about this manual may be directed to: Service Publications Dept. @ Polaris Sales Inc. 2100 Hwy 55 Medina Minnesota 55340.

2004 Sportsman 600/700 ATV Service Manual (PN 9918803)

UNDERSTANDING SAFETY LABELS AND INSTRUCTIONS

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

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

⚠ DANGER

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

⚠ WARNING

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

CAUTION:

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

NOTE:

A NOTE provides key information to clarify instructions.

Trademarks

Polaris acknowledges the following products mentioned in this manual:

FLEXLOC, Registered Trademark of SPS Technologies
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Mity Vac, Registered Trademark of Neward Enterprises, Inc.
Ammco, Registered Trademark of Ammco Tools, Inc.
Torx, Registered Trademark of Textron
Hilliard, Trademark of the Hilliard Corporation
Warn, Trademark of the Warn Industries

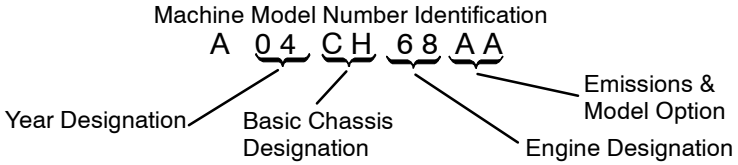
CHAPTER 1
GENERAL

Specs

1

MODEL IDENTIFICATION

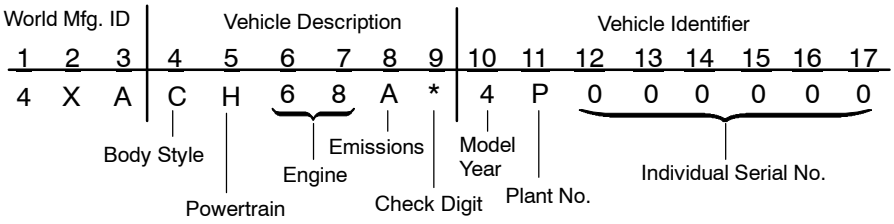
The machine model number must be used with any correspondence regarding warranty or service.



ENGINE DESIGNATION NUMBERS

EH068OLE . . . . . Twin cylinder, Liquid Cooled, 4 Stroke, Electric Start
EH059OLE . . . . . Twin cylinder, Liquid Cooled, 4 Stroke, Electric Start

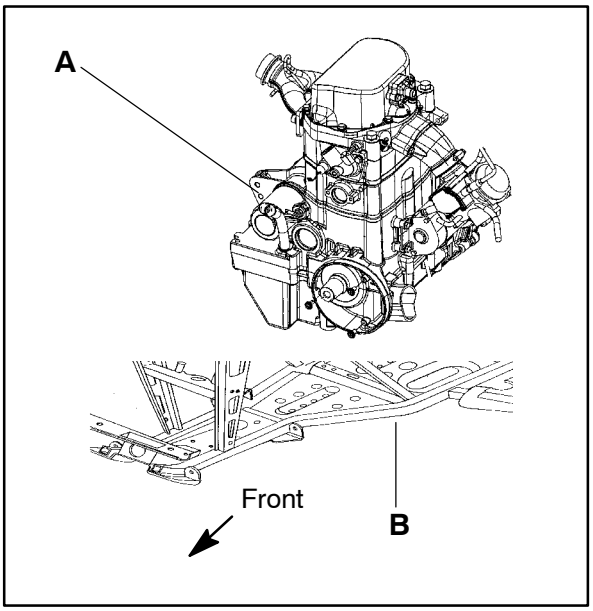
VIN IDENTIFICATION



* This could be either a number or a letter

ENGINE SERIAL NUMBER LOCATION

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

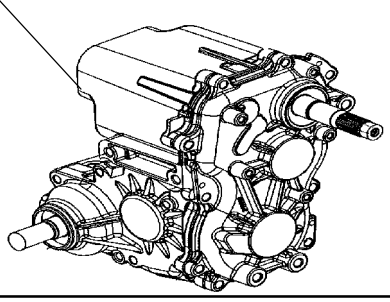


MACHINE MODEL NUMBER AND SERIAL NUMBER LOCATION

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

TRANSMISSION I.D. NUMBER LOCATION

The transmission I.D. number is located on the right side of machine.

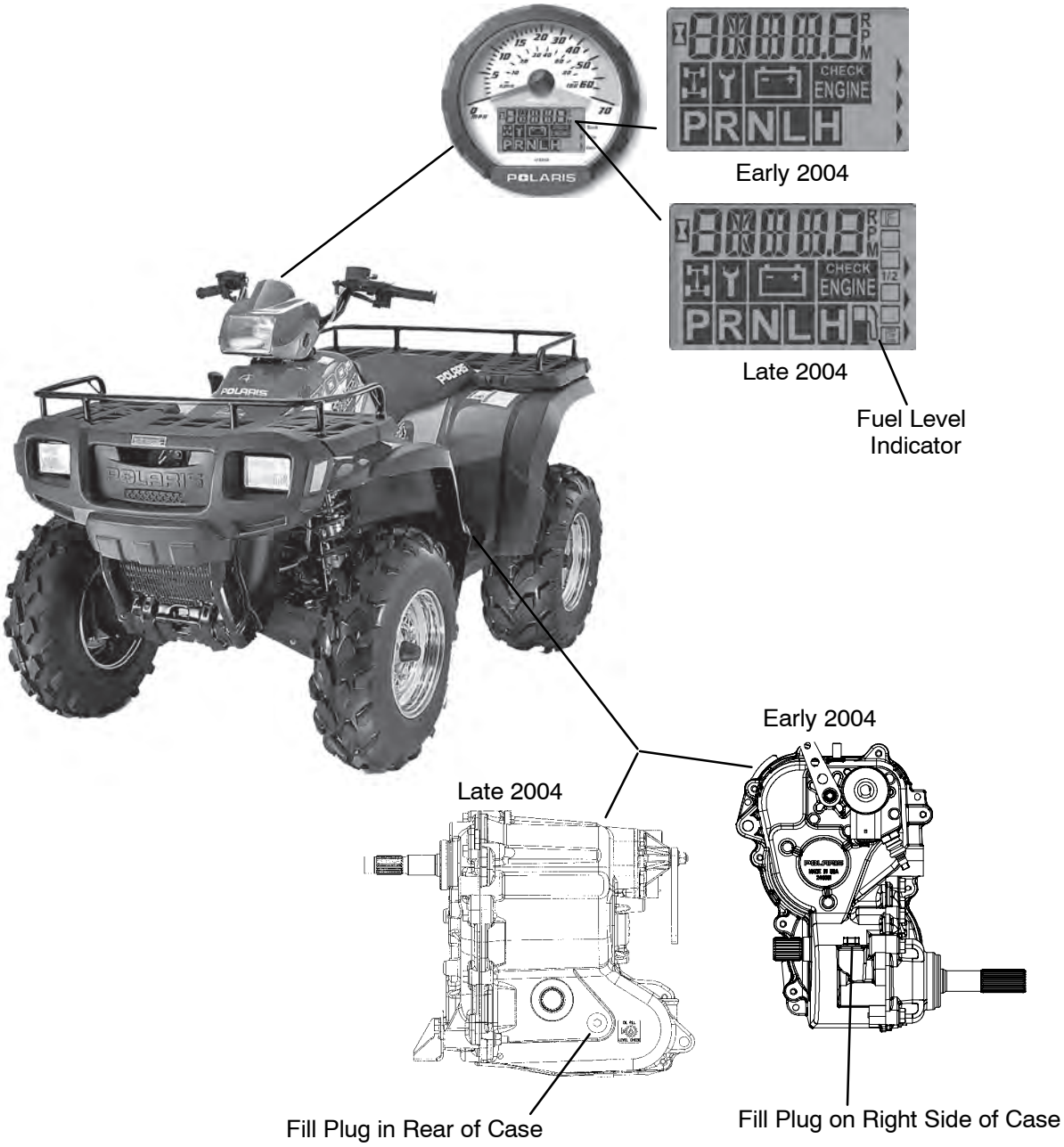


2004 SPORTSMAN MODEL IDENTIFICATION – EARLY/LATE MODELS

Mid–year changes were made to the 2004 Sportsman 600 & 700 models. When servicing your 2004 Sportsman it is important to identify which model you are working on. Throughout this service manual the different procedures (titles) are identified as “EARLY 2004” or “LATE 2004”, use the correct procedure according to the model you are working on. If the procedure (title) does not specify a “EARLY 2004 ” or “LATE 2004 ”, then the procedure pertains to both models.

To identify which model Sportsman you have, refer to the identification illustration below.

INSTRUMENT CLUSTER



MODEL: ..... 2004 EARLY/LATE SPORTSMAN 600

MODEL NUMBER: . A04CH59
ENGINE MODEL: . . EH059OLE

Category	Dimension / Capacity
Length	**81 in./205.7 cm**
Width	**46 in./116.8 cm**
Height	**47 in./119.38 cm**
Wheel Base	**50.75 in./128.9 cm**
Dry Weight	**740 lbs./335.6 kg**
Gross Vehicle Weight	**1240 lbs. / 562.45 kg**
Front Rack Capacity	**100 lbs./45.4 kg**
Rear Rack Capacity	**200 lbs./90.8 kg**
Towing Capacity	**1500 lbs./681 kg**
Hitch Tongue Capacity	**150 lbs./68 kg**
Body Style	**Gen VI**

MODEL: ..... 2004 EARLY/LATE SPORTSMAN 700

MODEL NUMBER: . A04CH68
ENGINE MODEL: . . EH068OLE

Category	Dimension / Capacity
Length	**81 in./205.7 cm**
Width	**46 in./116.8 cm**
Height	**47 in./119.4 cm**
Wheel Base	**50.75 in./128.9 cm**
Dry Weight	**740 lbs./335.6 kg**
Gross Vehicle Weight	**1240 lbs. / 562.45 kg**
Front Rack Capacity	**100 lbs./45.4 kg**
Rear Rack Capacity	**200 lbs./90.7 kg**
Towing Capacity	**1500 lbs./454 kg**
Hitch Tongue Capacity	**150 lbs./68 kg**
Body Style	**Gen VI**

MODEL: ..... LATE 2004 SPORTSMAN 600 HUNTER EDITION

MODEL NUMBER: . A04CH59
ENGINE MODEL: . . EH059LE

Category	Dimension / Capacity
Length	**81 in./205.7 cm**
Width	**46 in./116.8 cm**
Height	**47 in./119.38 cm**
Wheel Base	**50.75 in./128.9 cm**
Dry Weight	**782 lbs./355 kg**
Gross Vehicle Weight	**1240 lbs. / 562.45 kg**
Front Rack Capacity	**100 lbs./45.4 kg**
Rear Rack Capacity	**200 lbs./90.8 kg**
Towing Capacity	**1500 lbs./681 kg**
Hitch Tongue Capacity	**150 lbs./68 kg**
Body Style	**Gen VI**
Warn® Winch	**Standard**
Hand/Thumb Warmer	**Standard**

MODEL: ..... LATE 2004 SPORTSMAN 700 HUNTER EDITION

MODEL NUMBER: . A04CH68
ENGINE MODEL: . . EH068OLE

Category	Dimension / Capacity
Length	**81 in./205.7 cm**
Width	**46 in./116.8 cm**
Height	**47 in./119.4 cm**
Wheel Base	**50.75 in./128.9 cm**
Dry Weight	**740 lbs./335.6 kg**
Gross Vehicle Weight	**1240 lbs. / 562.45 kg**
Front Rack Capacity	**100 lbs./45.4 kg**
Rear Rack Capacity	**200 lbs./90.7 kg**
Towing Capacity	**1500 lbs./454 kg**
Hitch Tongue Capacity	**150 lbs./68 kg**
Body Style	**Gen VI**
Warn® Winch	**Standard**
Hand/Thumb Warmer	**Standard**

MODEL: ..... EARLY 2004 SPORTSMAN 600
MODEL NUMBER: . A04CH59
ENGINE MODEL: .. EH059OLE

Engine	
Platform	Polaris Twin Cylinder
Engine Model Number	EH0590PLE024
Engine Displacement	597cc
Number of Cylinders	2
Bore & Stroke (mm)	76.5 x 65 mm
Compression Ratio	9.35:1
Compression Pressure	150-170 psi
Engine Idle Speed	1100 ± 50 Rpm
Engine Max Operating Rpm	6500 Rpm ± 200 Rpm
Cooling System / Capacity	Liquid - 3.2 qt / 3 ltr
Overheat Warning	HOT on Instrument Cluster
Lubrication	Pressurized Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 2 qt. / 1.9 ltr
Exhaust System	Single Pipe
Carburetion	
Carburetor model	Mikuni BST 34mm
Main Jet	155
Pilot Jet	45
Pilot Air Jet	160
Jet Needle - Clip Position	J8-4FA01-3
Needle Jet	P-4
Pilot Screw	Initial Setting 21/2 Turns Out (Set at factory, non-adjustable)
Float Height	13 - 14 mm / 0.51 - 0.55 in
Fuel Delivery	Fuel Pump
Fuel Capacity / Requirement	4.25 gal US / 16 L 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	330 w @ 3000 RPM
Voltage Regulator	3-Phase - LR-390
Lights : Pod	50 watts
Grill	Two x 27 watts
Brake	8.26 watts
Tail	26.9 watts
Ignition System	CDI Ignition
Operating RPM	6000 RPM
Ignition Timing	13° BTDC @ 1200 RPM± 250
Spark plug / Gap	RC7YC/ .035 in. / 0.9 mm
Battery / Model / Amp Hr	Yuasa YB30L-B 30 Amp Hr
Circuit Breakers	Fan 10 amp / Harness 20 amp
Starting	Electric
Instrument Cluster	LCD

Drivetrain		
Transmission Type		Drumshift - H/L/N/Rev/Park
Transmission Capacity		13.5 oz. / 400ml
Rear Gearcase Capacity		5 oz. / 150ml
Front Gearcase Capacity		5 oz. / 150ml
Gear Ratio :	Low	7.5:1
	Rev	5.11:1
	High	3.09:1
	Front Drive	3.82:1
	Rear Drive	3.10:1
Clutch Type		PVT w/EBS
Belt		3211091
Steering / Suspension		
Front Suspension / Shock		A-arm / MacPherson Strut
Front Travel		6.7 in. / 17.02 cm
Rear Suspension / Shock		Progressive Rate Independent /Two x 2" Coil-over Shock
Rear Travel		9.5 in. / 24.13 cm
Ground Clearance		11.25 in. / 28.6 cm
Shock Preload Adjustment Front / Rear		Front -Non Adjustable. Rear - Ratchet Style- Std.
Turning Radius		71.5 in. / 181.6 cm unloaded
Toe Out		0 - 1/16 in / .0 - .159 mm
Wheels / Brakes		
Wheel Size / Pattern - Front		Steel 25x8-12 / 4-156
Wheel Size / Pattern - Rear		Steel 25x11-12 / 4-156
Front Tire Size		25x8-12
Rear Tire Size		25x11-12
Recommended Air Pressure F / R		5 psi Front 5 psi Rear
Brake - Front		Dual Hydraulic Disc
Brake - Rear		Dual Hydraulic Disc

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below 5°C	Above +40°F Above +5°C
Meters (Feet)	0-1800 (0-6000)	162.5	155
	above 1800 (above 6000)	150	145

CLUTCH CHART

EBS Models have no helix/spring adjustment

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	10-MH (5630513)	Blu/Grn (7041157)	Wht/ Yel (7041635)	41-37 (5132751)
	1800-3700 (6000-12000)	10-WH (5630710)	Blu/Grn (7041157)	Wht/ Yel (7041635)	41-37 (5132751)

MODEL: ..... LATE 2004 SPORTSMAN 600 & HUNTER EDITION
MODEL NUMBER: . A04CH59
ENGINE MODEL: .. EH059OLE

Engine	
Platform	Polaris Twin Cylinder
Engine Model Number	EH0590PLE024
Engine Displacement	597cc
Number of Cylinders	2
Bore & Stroke (mm)	76.5 x 65 mm
Compression Ratio	9.35:1
Compression Pressure	150-170 psi
Engine Idle Speed	1200 ± 50 Rpm
Engine Max Operating Rpm	6500 Rpm ± 200 Rpm
Cooling System / Capacity	Liquid - 3.2 qt / 3 ltr
Overheat Warning	HOT on Instrument Cluster
Lubrication	Pressurized Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 2 qt. / 1.9 ltr
Exhaust System	Single Pipe
Carburetion	
Carburetor model	Mikuni BST 34mm
Main Jet	157.5
Pilot Jet	45
Pilot Air Jet	160
Jet Needle - Clip Position	4HB41-3
Needle Jet	P-6 (829)
Pilot Screw	Initial Setting 21/2 Turns Out (Set at factory, non-adjustable)
Float Height	13 - 14 mm / 0.51 - 0.55 in
Fuel Delivery	Fuel Pump
Fuel Capacity / Requirement	4.25 gal US / 16 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	330 w @ 3000 RPM
Voltage Regulator	3-Phase - LR-302
Lights : Pod	50 watts
Grill	Two x 27 watts
Brake	8.26 watts
Tail	26.9 watts
Ignition System	DC/CDI Ignition
Operating RPM	6000 RPM
Ignition Timing	13° BTDC @ 1200 RPM
Spark plug / Gap	RC7YC/ .035 in. / 0.9 mm
Battery / Model / Amp Hr	Yuasa YB30L-B 30 Amp Hr
Circuit Breakers	Fan 10 amp / Harness 20 amp
Starting	Electric
Instrument Cluster	LCD

Drivetrain		
Transmission Type		Drumshift - H/L/N/Rev/Park
Transmission Capacity		15.2 oz. / 450ml
Rear Gearcase Capacity		5 oz. / 150ml
Front Gearcase Capacity		5 oz. / 150ml
Gear Ratio :	Low	7.5:1
	Rev	5.11:1
	High	3.09:1
	Front Drive	3.82:1
	Rear Drive	3.10:1
Clutch Type		PVT w/EBS
Belt		3211091
Steering / Suspension		
Front Suspension / Shock		A-arm / MacPherson Strut
Front Travel		6.7 in. / 17.02 cm
Rear Suspension / Shock		Progressive Rate Independent /Two x 2" Coil-over Shock
Rear Travel		9.5 in. / 24.13 cm
Ground Clearance		11.25 in. / 28.6 cm
Shock Preload Adjustment Front / Rear		Front -Non Adjustable. Rear - Ratchet Style- Std.
Turning Radius		71.5 in. / 181.6 cm unloaded
Toe Out		0 - 1/16 in / .0 - .159 mm
Wheels / Brakes		
Wheel Size / Pattern - Front		Steel 25x8-12 / 4-156
Wheel Size / Pattern - Rear		Steel 25x11-12 / 4-156
Front Tire Size		25x8-12
Rear Tire Size		25x11-12
Recommended Air Pressure F / R		5 psi Front 5 psi Rear
Brake - Front		Dual Hydraulic Disc
Brake - Rear		Dual Hydraulic Disc

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below 5°C	Above +40°F Above +5°C
Meters (Feet)	0-1800 (0-6000)	162.5	157.5
	above 1800 (above 6000)	155	150

CLUTCH CHART

EBS Models have no helix/spring adjustment

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	10-MH (5630513)	Blu/Grn (7041157)	Wht/ Yel (7041635)	41-37 (5132751)
	1800-3700 (6000-12000)	10-WH (5630710)	Blu/Grn (7041157)	Wht/ Yel (7041635)	41-37 (5132751)

MODEL: ..... EARLY 2004 SPORTSMAN 700
MODEL NUMBER: . A04CH68
ENGINE MODEL: .. EH068OLE

Engine	
Platform	Polaris Twin Cylinder
Engine Model Number	EH0680LE014
Engine Displacement	683cc
Number of Cylinders	2
Bore & Stroke (mm)	80 x 68 mm
Compression Ratio	9.78:1
Compression Pressure	150-170 psi
Engine Idle Speed	1100 ± 50 RPM
Engine Max Operating Rpm	6000 Rpm ± 200 Rpm
Cooling System / Capacity	Liquid - 3.2 qt / 3 ltr
Overheat Warning	HOT on Instrument Cluster
Lubrication	Pressurized Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 2 qt. / 1.9 ltr
Exhaust System	Single Pipe
Carburetion	
Carburetor model	Mikuni BST 34mm
Main Jet	155
Pilot Jet	47.5
Pilot Air Jet	160
Jet Needle - Clip Position	J8-4FA01-3
Needle Jet	P-6 (829)
Pilot Screw	Initial Setting 21/2 Turns Out (Set at factory, non-adjustable)
Float Height	13 - 14 mm / 0.51 - 0.55 in
Fuel Delivery	Fuel Pump
Fuel Capacity / Requirement	4.25 gal US / 16 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	330 w @ 3000 RPM
Voltage Regulator	3-Phase - LR-390
Lights : Pod	50 watts
Grill	Two x 27 watts
Brake	8.26 watts
Tail	26.9 watts
Ignition System	CDI Ignition
Operating RPM	6000 RPM
Ignition Timing	13° BTDC @ 12000 RPM ± 200
Spark plug / Gap	RC7YC/ .035 in. / 0.9 mm
Battery / Model / Amp Hr	Yuasa YB30L-B 30 Amp Hr
Circuit Breakers	Fan 10 amp / Harness 20 amp
Starting	Electric
Instrument Cluster	LCD

Drivetrain		
Transmission Type		Drumshift - H/L/N/Rev/Park
Transmission Capacity		13.5 oz. / 400ml
Rear Gearcase Capacity		10 oz. / 300ml
Front Gearcase Capacity		5 oz. / 150ml
Gear Ratio :	Low	7.5:1
	Rev	5.11:1
	High	2.89:1
	Front Drive	3.82:1
	Rear Drive	3.10:1
Clutch Type		PVT w/EBS
Belt		3211091
Steering / Suspension		
Front Suspension / Shock		A-arm / MacPherson Strut
Front Travel		6.7 in. / 17.02 cm
Rear Suspension / Shock		Progressive Rate Independent /Two x 2" Coil-over Shock
Rear Travel		9.5 in. / 24.13 cm
Ground Clearance		11.25 in. / 28.6 cm
Shock Preload Adjustment Front / Rear		Front -Non Adjustable. Rear - Ratchet Style- Std.
Turning Radius		76 in. / 193 cm unloaded
Toe Out		0 - 1/16 in / .0 - .159 mm
Wheels / Brakes		
Wheel Size / Pattern - Front		Steel 25x8-12 / 4-156
Wheel Size / Pattern - Rear		Steel 25x11-12 / 4-156
Front Tire Size		25x8-12
Rear Tire Size		25x11-12
Recommended Air Pressure F / R		5 psi Front 5 psi Rear
Brake - Front		Dual Hydraulic Disc
Brake - Rear		Dual Hydraulic Disc

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below 5°C	Above +40°F Above +5°C
Meters (Feet)	0-1800 (0-6000)	160	155
	above 1800 (above 6000)	147.5	142.5

CLUTCH CHART

EBS Models have no helix/spring adjustment

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	20-56 (5631215)	Blu/Grn (7041157)	Wht/ Yel (7041635)	41-37 (5132751)
	1800-3700 (6000-12000)	20-54 (5631214)	Blu/Grn (7041157)	Wht/ Yel (7041635)	41-37 (5132751)

MODEL: ..... LATE 2004 SPORTSMAN 700 & HUNTER EDITION
MODEL NUMBER: . A04CH68
ENGINE MODEL: .. EH068OLE

Engine	
Platform	Polaris Twin Cylinder
Engine Model Number	EH0680LE015
Engine Displacement	683cc
Number of Cylinders	2
Bore & Stroke (mm)	80 x 68 mm
Compression Ratio	9.78:1
Compression Pressure	150-170 psi
Engine Idle Speed	1200 ± 50 RPM
Engine Max Operating Rpm	6000 Rpm ± 200 Rpm
Cooling System / Capacity	Liquid - 3.2 qt / 3 ltr
Overheat Warning	HOT on Instrument Cluster
Lubrication	Pressurized Dry Sump
Oil Requirements / Capacity	Polaris 0W-40 2 qt. / 1.9 ltr
Exhaust System	Single Pipe
Carburetion	
Carburetor model	Mikuni BST 34mm
Main Jet	157.5
Pilot Jet	47.5
Pilot Air Jet	160
Jet Needle - Clip Position	4HB41-4
Needle Jet	P-6 (829)
Pilot Screw	(Set at factory, non-adjustable)
Float Height	13 - 14 mm / 0.51 - 0.55 in
Fuel Delivery	Fuel Pump
Fuel Capacity / Requirement	4.25 gal US / 16 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	330 w @ 3000 RPM
Voltage Regulator	3-Phase - LR-302
Lights : Pod	50 watts
Grill	Two x 27 watts
Brake	8.26 watts
Tail	26.9 watts
Ignition System	DC/CDI Ignition
Operating RPM	6000 RPM
Ignition Timing	13° BTDC @ 1200 RPM
Spark plug / Gap	RC7YC/ .035 in. / 0.9 mm
Battery / Model / Amp Hr	Yuasa YB30L-B 30 Amp Hr
Circuit Breakers	Fan 10 amp / Harness 20 amp
Starting	Electric
Instrument Cluster	LCD

Drivetrain		
Transmission Type		Drumshift - H/L/N/Rev/Park
Transmission Capacity		15.2 oz. / 450m
Rear Gearcase Capacity		10 oz. / 300ml
Front Gearcase Capacity		5 oz. / 150ml
Gear Ratio :	Low	7.5:1
	Rev	5.11:1
	High	2.89:1
	Front Drive	3.82:1
	Rear Drive	3.10:1
Clutch Type		PVT w/EBS
Belt		3211091
Steering / Suspension		
Front Suspension / Shock		A-arm / MacPherson Strut
Front Travel		6.7 in. / 17.02 cm
Rear Suspension / Shock		Progressive Rate Independent /Two x 2" Coil-over Shock
Rear Travel		9.5 in. / 24.13 cm
Ground Clearance		11.25 in. / 28.6 cm
Shock Preload Adjustment Front / Rear		Front -Non Adjustable. Rear - Ratchet Style- Std.
Turning Radius		76 in. / 193 cm unloaded
Toe Out		0 - 1/16 in / .0 - .159 mm
Wheels / Brakes		
Wheel Size / Pattern - Front		Steel 25x8-12 / 4-156
Wheel Size / Pattern - Rear		Steel 25x11-12 / 4-156
Front Tire Size		25x8-12
Rear Tire Size		25x11-12
Recommended Air Pressure F / R		5 psi Front 5 psi Rear
Brake - Front		Dual Hydraulic Disc
Brake - Rear		Dual Hydraulic Disc

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below 5°C	Above +40°F Above +5°C
Meters (Feet)	0-1800 (0-6000)	162.5	157.5
	above 1800 (above 6000)	155	150

CLUTCH CHART

EBS Models have no helix/spring adjustment

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	20-56 (5631215)	Blu/Grn (7041157)	Wht/ Yel (7041635)	41-37 (5132751)
	1800-3700 (6000-12000)	20-54 (5631214)	Blu/Grn (7041157)	Wht/ Yel (7041635)	41-37 (5132751)

PUBLICATION NUMBERS

Year	Model	Model No.	Owner's Manual PN	Parts Manual PN	Parts Micro Fiche PN
2004	Early Sportsman 600	A04CH59	**9918540**	**9918610**	**9918611**
2004	Early Sportsman 700	A04CH68	**9918540**	**9918612**	**9918613**
2004	Late Sportsman 600	A04CH59	**9918724**	**9918731**	**9918732**
2004	Late Sportsman 700	A04CH68	**9918724**	**9918743**	**9918744**

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

PAINT CODES

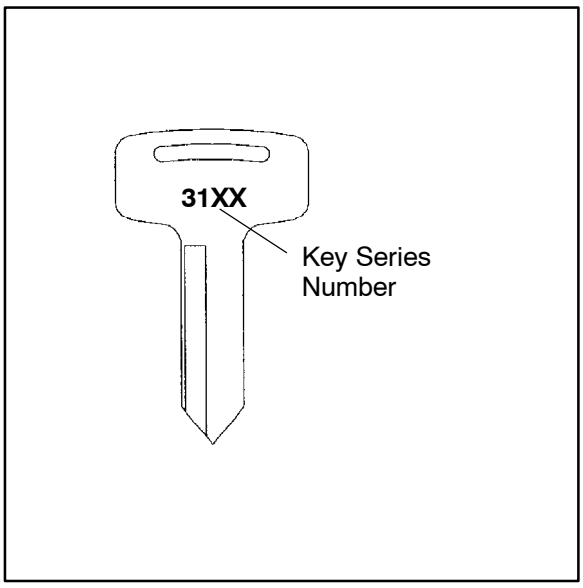
PAINTED PART	COLOR DESCRIPTION	DITZLER NUMBER	POLARIS NUMBER
Springs	Black	9440	P-067

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

Order direct from Midwest Industrial Coatings (952-942-1840). Mix as directed.

REPLACEMENT KEYS

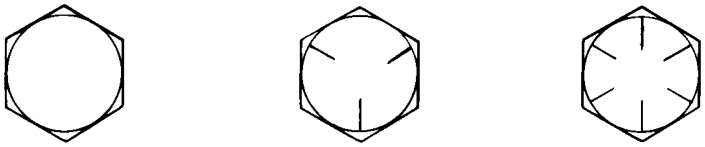
Replacement keys can be made from the original key. To identify which series the key is, take the first two digits on the original key and refer to the chart to the right for the proper part number. **Should both keys become lost, ignition switch replacement is required.**



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

STANDARD TORQUE SPECIFICATIONS

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



Bolt Size	Threads/In	Grade 2	Grade 5	Grade 8
		Torque in. lbs. (Nm)		
#10 -	24	27 (3.1)	43 (5.0)	60 (6.9)
#10 -	32	31 (3.6)	49 (5.6)	68 (7.8)
		Torque ft. lbs. (Nm)*		
1/4 -	20	5 (7)	8 (11)	12 (16)
1/4 -	28	6 (8)	10 (14)	14 (19)
5/16 -	18	11 (15)	17 (23)	25 (35)
5/16 -	24	12 (16)	19 (26)	29 (40)
3/8 -	16	20 (27)	30 (40)	45 (62)
3/8 -	24	23 (32)	35 (48)	50 (69)
7/16 -	14	30 (40)	50 (69)	70 (97)
7/16 -	20	35 (48)	55 (76)	80 (110)
1/2 -	13	50 (69)	75 (104)	110 (152)
1/2 -	20	55 (76)	90 (124)	120 (166)

Metric

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

***To convert ft. lbs. to Nm multiply foot pounds by .1.382**
***To convert Nm to ft. lbs. multiply Nm by .7376.**

SPECIFIC TORQUE VALUES OF FASTENERS
Refer to exploded views in the appropriate section.

CONVERSION TABLE

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

°C to °F: 9 (°C + 40) ÷ 5 - 40 = °F
°F to °C: 5 (°F + 40) ÷ 9 - 40 = °C

SAE TAP DRILL SIZES

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

METRIC TAP DRILL SIZES

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

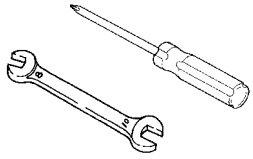
DECIMAL EQUIVALENTS

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

GLOSSARY OF TERMS

ABDC: After bottom dead center.
ACV: Alternating current voltage.
Alternator: Electrical generator producing voltage alternating current.
ATDC: After top dead center.
BBDC: Before bottom dead center.
BDC: Bottom dead center.
BTDC: Before top dead center.
CC: Cubic centimeters.
Center Distance: Distance between center of crankshaft and center of driven clutch shaft.
Chain Pitch: Distance between chain link pins (No. 35 = 3/8″ or 1 cm). Polaris measures chain length in number of pitches.
Crankshaft Run-Out: Run-out or "bend" of crankshaft measured with a dial indicator while crankshaft is supported between centers on V blocks or resting in crankcase. Measure at various points especially at PTO.
DCV: Direct current voltage.
Electrical Open: Open circuit. An electrical circuit which isn't complete.
Electrical Short: Short circuit. An electrical circuit which is completed before the current reaches the intended load. (i.e. a bare wire touching the chassis).
End Seals: Rubber seals at each end of the crankshaft.
Engagement RPM: Engine RPM at which the drive clutch engages to make contact with the drive belt.
ft.: Foot/feet.
Foot Pound: Ft. lb. A force of one pound at the end of a lever one foot in length, applied in a rotational direction.
g: Gram. Unit of weight in the metric system.
gal.: Gallon.
ID: Inside diameter.
in.: Inch/inches.
Inch Pound: In. lb. 12 in. lbs. = 1 ft. lb.
kg/cm^2 : Kilograms per square centimeter.
kg-m: Kilogram meters.
Kilogram/meter: A force of one kilogram at the end of a lever one meter in length, applied in a rotational direction.
l or ltr: Liter.
Left Side: Always referred to based on normal operating position of the driver.
m: Meter/meters.
Mag: Magneto.
Magnetic Induction: As a conductor (coil) is moved through a magnetic field, a voltage will be generated in the windings. Mechanical energy is converted to electrical energy in the stator.
mi.: Mile/miles.
mm: Millimeter. Unit of length in the metric system. 1mm = approximately .040″.
Nm: Newton meters.
OD: Outside diameter.
Ohm: The unit of electrical resistance opposing current flow.
oz.: Ounce/ounces.
Piston Clearance: Total distance between piston and cylinder wall.
psi.: Pounds per square inch.
PTO: Power take off.
qt.: Quart/quarts.
RPM: Revolutions per minute.
Regulator: Voltage regulator. Regulates battery charging system output at approx. 14.5 DCV as engine RPM increases.
Resistance: In the mechanical sense, friction or load. In the electrical sense, ohms. Both result in energy conversion to heat.
Right Side: Always referred to based on normal operating position of the driver.
RPM: Revolutions per minute.
Seized Piston: Galling of the sides of a piston. Usually there is a transfer of aluminum from the piston onto the cylinder wall. Possible causes: 1) improper lubrication; 2) excessive temperatures; 3) insufficient piston clearance; 4) stuck piston rings.
Stator Plate: The plate mounted under the flywheel supporting the battery charging coils.
TDC: Top dead center. Piston's most outward travel from crankshaft.
Volt: The unit of measure for electrical pressure of electromotive force. Measured by a voltmeter in parallel with the circuit.
Watt: Unit of electrical power. Watts = amperes x volts.
WOT: Wide open throttle.

CHAPTER 2
MAINTENANCE



2

PERIODIC MAINTENANCE CHART

Inspection, adjustment and lubrication intervals of important components are listed in the following chart. Maintenance intervals are based upon average riding conditions and vehicle speed.

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

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

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

E= Emission Control System Service (California).

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

ENGINE / COOLING / CONTROLS							
Item				**Maintenance Interval (Whichever comes first)**			**Remarks**
				Hours	**Calendar**	**Miles (Km)**	
▶		**E**	Engine Oil - Level/Change	10 hrs	-	100 (160)	Check level pre-ride Break-In service at 1 hour
▶		**E**	Oil Filter	10 hrs	-	100 (160)	Replace with oil change
▶		**E**	Air Filter - Pre-Filter	Daily	Daily	-	Inspect, clean more often in dirty or wet conditions
▶		**E**	Air Filter - Main Element	Weekly	Weekly	-	Inspect - Replace if necessary
▶			Air Box Sediment Tube	-	Daily	-	Drain deposits whenever visible
▶			Engine Breather Filter	20 hrs	Monthly	200 (320)	Inspect and clean if necessary
		E	Idle Speed	As required	As required	-	Adjust as required
	■		Throttle Cable / ETC Switch	50 hrs	6 months	500 (800)	Inspect -Adjust, Lubricate, Replace if necessary
			Choke (Enricher) Cable	50 hrs	6 months	500 (800)	Inspect -Adjust, Lubricate, Replace if necessary
			Carburetor Float Bowl	50 hrs	6 months	500 (800)	Drain bowl periodically and prior to storage
			Carburetor Air Intake Ducts/Flange	50 hrs	6 months	500 (800)	Inspect all ducts for proper sealing/air leaks
	■	**E**	Fuel System /Filter	100 hrs	12 months	1000 (1600)	Check for leaks at tank cap, lines, fuel valve, filter, pump & carburetor. Replace lines every 2 years.
			Coolant/Level Inspection	Daily	Daily		Replace engine coolant every 2 years
			Coolant Strength / System Pressure Test	100 hrs	6 months	1000 (1600)	Inspect strength seasonally; Pressure test system annually
▶			Radiator / Oil Cooler	100 hrs	12 months	1000 (1600)	Inspect / Clean external surfaces
▶			Cooling System Hoses	100 hrs	12 months	1000 (1600)	Pre-ride / Inspect for leaks
▶			Engine Mounts	100 hrs	12 months	1000 (1600)	Pre-ride / Inspect
			Recoil Housing	Weekly	Weekly		Inspect for water and drain More often if operating in wet evironment
			Exhaust Muffler / Pipe	100 hrs	12 months	1000 (1600)	Pre-ride / Inspect

PERIODIC MAINTENANCE CHART CONT'D

ELECTRICAL							
Item				Maintenance Interval (Whichever comes first)			Remarks
		E	Spark Plug	100 hrs	12 months	1000 (1600)	Inspect - Replace if necessary
▶			Wiring	100 hrs	12 months	1000 (1600)	Inspect for abrasion, routing, security. Apply Dielectric grease to connectors that are subjected to water, mud, etc.
	■		Ignition Timing	100 hrs	12 months	1000 (1600)	Inspect
▶			Battery	20 hrs	Monthly	200 (320)	Check terminals; Clean; Test
			Headlight Aim	As required	As required	-	Adjust as Necessary
			Headlamp Inspection	Daily	Daily	-	Check operation daily; Apply dielectric grease whenever lamp is replaced
			Tail Lamp Inspection	Daily	Daily	-	Check operation daily; Apply dielectric grease whenever lamp is replaced

CHASSIS / DRIVETRAIN / SUSPENSION / BRAKE							
Item				Maintenance Interval (Whichever comes first)			Remarks
				Hours	Calendar	Miles (Km)	
▶			General Lubrication	50 hrs	3 months	500 (800)	Lubricate All Fittings, Pivots, Cables, Etc.
			Front Hub Bearings		Annually		Clean and Inspect, Replace if necessary
	■		Front Hub Spindle Nut Torque		Annually		Inspect Hub Nut Torque
▶			Front Gearcase Lubricant Level	25 hrs	Monthly	250 (400)	Inspect Monthly, Change Annually
▶			Rear Gearcase Lubricant Level	25 hrs	Monthly	250 (400)	Inspect Monthly, Change Annually
▶			Transmission Lubricant Level	25 hrs	Monthly	250 (400)	Inspect Monthly, Change Annually
			Drive Belt	50 hrs	6 months	500 (800)	Inspect - Adjust, Replace if Necessary
	■		Drive and Driven Clutches	100 hrs	12 months	1000 (1600)	Inspect, Clean, Replace Worn Parts
	■		Steering	Pre-ride	Pre-ride	Pre-ride	Inspect Daily, Lubricate
	■		Toe Adjustment	As required	As required	-	Periodic Inspection, Adjust Whenever Parts are Replaced
▶			Front Suspension	Pre-ride	Pre-ride	Pre-ride	Inspect - Lubricate if desired
▶			Rear Suspension	Pre-ride	Pre-ride	Pre-ride	Inspect - Lubricate if desired
			Tires	Pre-ride	Pre-ride	-	Inspect Daily, Pre-Ride Inspection Item
	■		Brake Fluid	200 hrs	24 months	2000 (3200)	Change Every Two Years
▶			Brake Fluid Level	Pre-ride	Pre-ride	-	Inspect Sight Glass Daily Pre-Ride Inspection Item
▶			Brake Lever Travel	Pre-ride	Pre-ride	-	Inspect Daily Pre-Ride Inspection Item
▶	■		Brake Pad Wear	10 hrs	Monthly	100 (160)	Inspect Periodically
			Brake Adjustment	As required	As required	-	Inspect Deflection Daily; Adjust
			Brake System	Pre-ride	Pre-ride	-	Pre-Ride Inspection Item
			Wheels / Fasteners	Pre-ride	Pre-ride	-	Pre-Ride Inspection Item
			Frame Nuts, Bolts, Fasteners	Pre-ride	Pre-ride	-	Pre-Ride Inspection Item

PRE-RIDE / DAILY INSPECTION

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

- Tires - check condition and pressures
- Fuel and oil tanks - fill both tanks to their proper level; Do not overfill oil tank
- All brakes - check operation and adjustment (includes auxiliary brake)
- Throttle - check for free operation
- Headlight/Taillight/Brakelight - check operation of all indicator lights and switches
- Engine stop switch - check for proper function
- Wheels - check for loose wheel nuts and axle nuts; check to be sure axle nuts are secured by cotter pins
- Air cleaner element - check for dirt or water; clean or replace
- Steering - check for free operation, noting any unusual looseness in any area
- Loose parts - visually inspect vehicle for any damaged or loose nuts, bolts or fasteners
- Engine coolant - check for proper level at the recovery bottle

POLARIS LUBRICANTS,MAINTENANCE AND SERVICE PRODUCTS

Part No.	Description
Engine Lubricant	
2870791	Fogging Oil (12 oz. Aerosol)
2871098	Premium 2 Cycle Engine Oil (Quart) (12 Count)
2871281	Engine Oil (Quart) Premium 4 Synthetic 0W-40 (4-Cycle) (12 Count)
2871844	Engine Oil (Gallon) Premium 4 Synthetic 0W-40 (4-Cycle) (4 Count)
2871567	Engine Oil (16 Gallon) Premium 4 Synthetic 0W-40 (4-Cycle)
Gearcase / Transmission Lubricants	
2873602	AGL Gearcase Lubricant (12 oz. bottle) (12 Count)
2873603	AGL Gearcase Lubricant (1 Gal.) (4 Count)
2871653	ATV Angle Drive Fluid (8 oz.) (12 Count)
2872276	ATV Angle Drive Fluid (2.5 Gal) (2 Count)
2870465	Oil Pump for 1 Gallon Jug
2871654	Premium Drive Hub Fluid (8 oz.) (12 Count)
2872277	Premium Drive Hub Fluid (2.5 gal.) (2 Count)
Grease / Specialized Lubricants	
2871322	Premium All Season Grease (3 oz. cartridge) (24 Count)
2871423	Premium All Season Grease (14 oz. cartridge) (10 Count)
2871460	Starter Drive Grease (12 Count)
2871515	Premium U-Joint Lube (3 oz.) (24 Count)
2871551	Premium U-Joint Lube (14 oz.) (10 Count)
2871312	Grease Gun Kit
2871329	Dielectric Grease (Nyogel™)
Coolant	
2871323	60/40 Coolant (Gallon) (6 Count)
2871534	60/40 Coolant (Quart) (12 Count)

Part No.	Description
Additives / Sealants / Thread Locking Agents / Misc.	
2870585	Loctite™ Primer N, Aerosol, 25 g
2871956	Loctite™ Thread Sealant 565 (50 ml.) (6 Count)
2871949	Loctite™ Threadlock 242 (50 ml.) (10 Count)
2871950	Loctite™ Threadlock 242 (6 ml.) (12 Count)
2871951	Loctite™ Threadlock 262 (50 ml.) (10 Count)
2871952	Loctite™ Threadlock 262 (6 ml.) (12 Count)
2871953	Loctite™ Threadlock 271 (6 ml.) (12 Count)
2871954	Loctite™ Threadlock 271 (36 ml.) (6 Count)
2870584	Loctite™ 680-Retaining Compound (10 ml.)
2870587	Loctite™ 518 Gasket Eliminator / Flange Sealant (50 ml.) (10 Count)
2872113	Disk Brake Quiet (12 oz.) (12 Count)
2871326	Premium Carbon Clean (12 oz.) (12 Count)
2870652	Fuel Stabilizer (16 oz.) (12 Count)
2871957	Black RTV Silicone Sealer (3 oz. tube) (12 Count)
2871958	Black RTV Silicone Sealer (11 oz. cartridge) (12 Count)
2870990	DOT3 Brake Fluid (12 Count)
2872113	Disc Brake Quiet, Aerosol, (9 oz.) (12 Count)
2871557	Crankcase Sealant, 3-Bond 1215 (5oz.)
2872893	Engine Degreaser (12oz.) (12 Count)

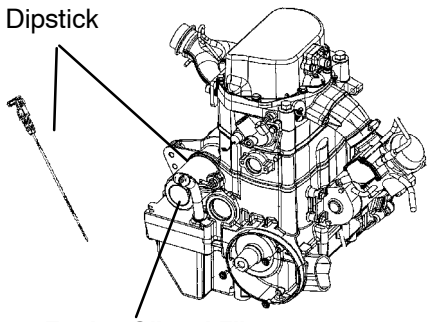
NOTE: The number count indicated by each part number in the table above indicates the number of units that are shipped with each order.

SPECIAL TOOLS

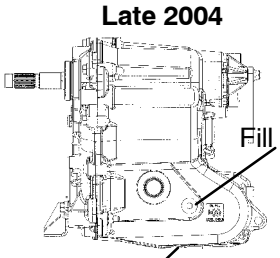
PART NUMBER	TOOL DESCRIPTION	CHAPTER TOOL USED IN
PV-43527	Oil Filter Wrench	2,3
2870872	Shock Spanner Wrench	2, 5
8712100 or 8712500	Tachometer	2,10
2200634	Valve Seat Reconditioning Kit	3
PU-45257	Valve Spring Compressor	3
PU-45652	Valve Pressure Hose	3
2871043	Flywheel Puller	3
PU-44693	Valve Train Table	3
2870390	Piston Support Block	3
PU-45497-2	Cam Gear Tooth Alignment Tool	3
PU-45497-1	Cam Gear Spring Installation Kit (3 Tapered Pins)	3
PU-45498	Cam Spanner Wrench	3
PU-45838	Gear Holder	3
PA-44995	Water Pump Mechanical Seal Installer	3
PU-45543	Universal Drive Handle	3
PU-45483	Main Seal Installer	3
PU-45658	Main Crankshaft Seal Saver	3
PA-45401	Water Pump Seal Saver	3
PU-45778	OIl System Priming Tool	3
2870975	Mity Vac™ Pressure Test Tool	3, 4, 9
2872314	Carburetor Float Adjustment Tool	4
2870871	Ball Joint Replacement Tool	5
2870623	Shock Absorber Spring Compression Tool	5
2871572	Strut Rod Wrench	5
2871573	LH Strut Spring Compressor	5
2871574	RH Strut Spring Compressor	5
7052069	Charging Needle	5
2200421	Gas Shock Recharging Kit	5
2871352	Shock Rod Holding Tool	5
2871351	Fox™ Shock IFP Depth Tool	5
2870506	Clutch Puller	6
9314177	Clutch Holding Wrench	6
2871358	Clutch Holding Fixture	6
2870341	Drive Clutch Spider Removal and Install Tool	6
2870913	Driven Clutch Puller	6
2870910	Roller Pin Tool	6
2871226	Clutch Bushing Replacement Tool Kit	6
2870386	Piston Pin Puller	6
2872292	EBS Clutch Alignment Tool	6
2201379	EBS Bushing Replacement Kit	6
8700220	Clutch Compression Tool	6
2871025	Clutch Bushing Replacement Tool Kit	6
2872608	Roller Pin Removal Tool	7
8700226	CV Boot Clamp Pliers	7
PV-43568	Fluke™ 77 Digital Multimeter	10
2870630	Timing Light	10
2870836	Battery Hydrometer	10

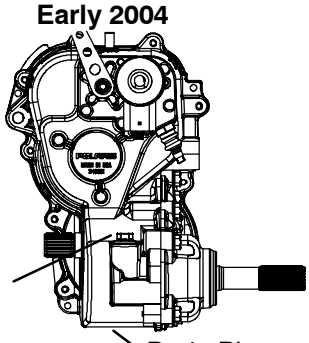
*Special Tools Can be ordered through SPX Corporation (1-800-328-6657).

LUBRICATION

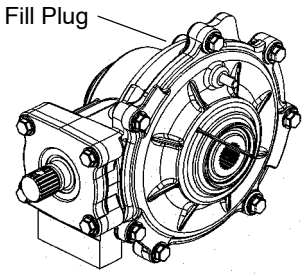


1. Engine Oil and Filter

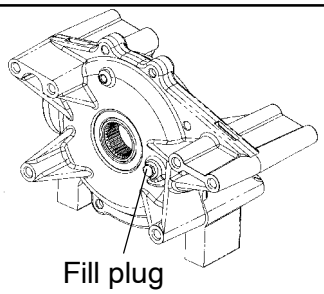




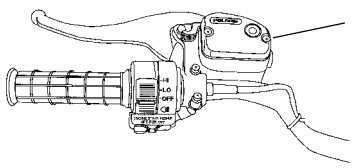
2. Transmission



3. Front Gear Case Fill Plug



4. Rear Gear Case Fill Plug



5. Brake Fluid (Left hand Master Cylinder)

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

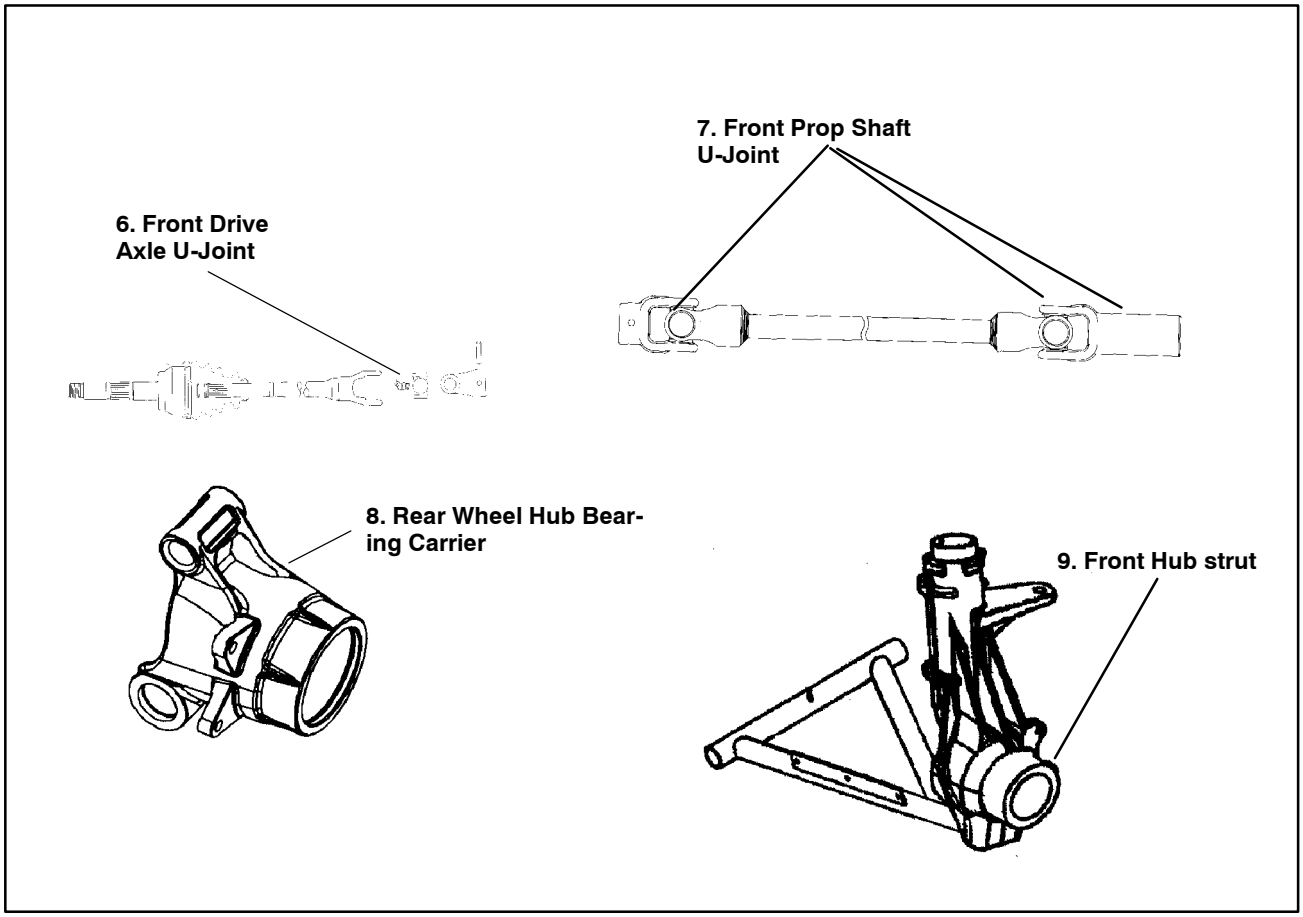
[1] Semi-annually or 50 hours of operation (refer to Maintenance Schedule for additional information) More often under severe conditions (operating in water or hauling heavy loads)

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

[3] Grease conforming to NLGI No. 2, such as Polaris Premium All Season Grease, Conoco Superlube M or Mobilegrease Special

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

LUBRICATION, CONT.



Ill. #	Item	Lube Rec.	Method	Frequency*
6.	Front Drive Axle “U” Joints	Polaris U-Joint Grease[3]	Locate grease fitting and grease with grease gun.	Semi-annually [1]
7.	Front Prop Shaft	Polaris U-Joint Grease[3]	Locate grease fitting and grease with grease gun.	Semi-annually [1]
8.	Rear Wheel Hub Bearing Carrier	Polaris All Season Grease[3]	Locate fittings and grease	Semi-annually [1]
9.	Front Hub strut	Polaris All Season Grease[3]	Locate fittings and grease	Semi-annually [1]

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

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

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

[3] Grease conforming to NLGI No. 2, such as Polaris Premium All Season Grease, Conoco Superlube M or Mobilegrease Special

FRONT GEARCASE LUBRICATION

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

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

NOTE: ***The Late 2004 front gearcase has a different fill plug height than the Early 2004 front gearcase. Be sure to follow the correct procedure below when servicing the front gearcase. Refer to Page 1.3 to help identify which model of ATV you have.***

FRONT GEARCASE SPECIFICATIONS

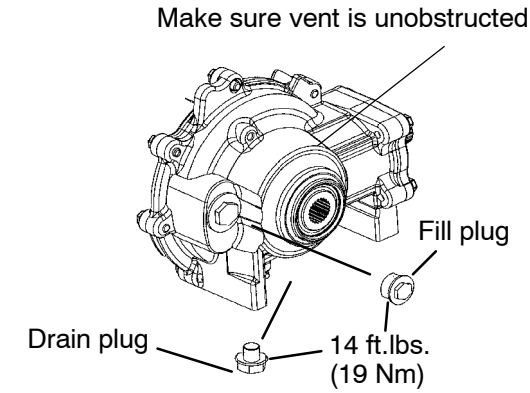
Specified Lubricant:
Premium Demand Drive Hub Fluid
(**PN 2871654**)

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

Drain Plug / Fill Plug Torque:

14 ft. lbs. (19.4 Nm)

FRONT GEARCASE



ILL. 1

To check the lubricant level:

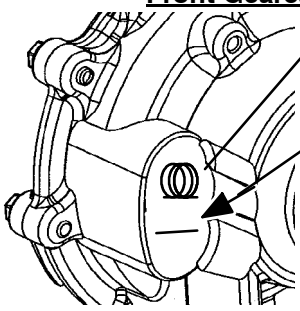
The front and rear gearcase lubricant level *cannot be checked* with a dipstick or by visual reference. The gearcase must be drained and re-filled with the proper amount of lubricant. Refer to procedures below.

To change gearcase lubricant:

Early 2004 Front Gearcase

1. Remove gearcase drain plug (11 mm) located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch and discard used oil properly.
2. Clean and reinstall drain plug using a new sealing washer.
3. Remove fill plug (8 mm hex).
4. Fill with the recommended fluid amount (5 oz.). (See ILL. 1 & ILL. 2).

Front Gearcase



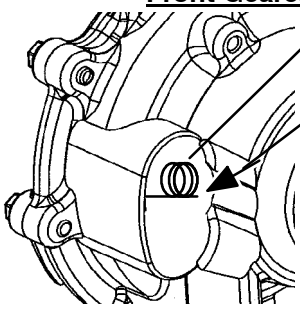
ILL. 2

5. Install fill plug and check for leaks.

Late 2004 Front Gearcase

1. Remove gearcase drain plug (11 mm) located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch and discard used oil properly.
2. Clean and reinstall drain plug using a new sealing washer.
3. Remove fill plug (8 mm hex). Check the O-ring.
4. Fill with the recommended fluid amount (5 oz.) or to the bottom of the fill plug hole threads. (See ILL. 1 & ILL. 3).

Front Gearcase



ILL. 3

5. Install fill plug and check for leaks.

REAR GEARCASE LUBRICATION

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

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

REAR GEARCASE SPECIFICATIONS

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

Capacity: 5 Oz. (150 ml.)

Drain Plug / Fill Plug Torque:

14 ft. lbs. (19.4 Nm)

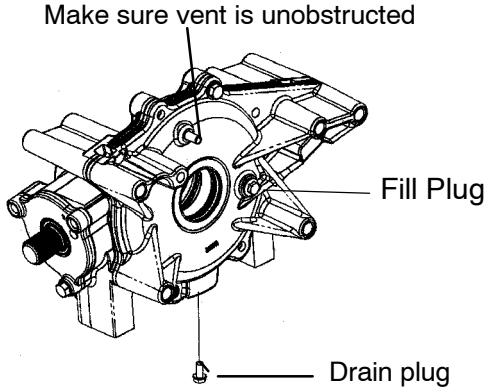
To check the lubricant level:

The rear gearcases lubricant level *cannot be checked* with a dipstick or by visual reference. The gearcase must be drained and re-filled with the proper amount of lubricant. Refer to procedure below.

To change gearcase lubricant:

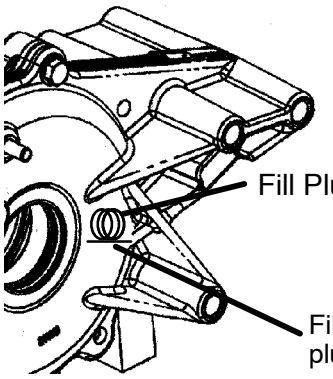
1. Remove gearcase drain plug located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch and discard used oil properly.
2. Clean and reinstall drain plug using a new sealing washer.
3. Remove fill plug.
4. Fill with the recommended fluid amount or fill to the bottom of the fill plug hole threads.
5. Install fill plug and check for leaks.

REAR GEARCASE



ILL. 3

REAR GEARCASE



EARLY 2004 TRANSMISSION LUBRICATION

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

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

To check the level:

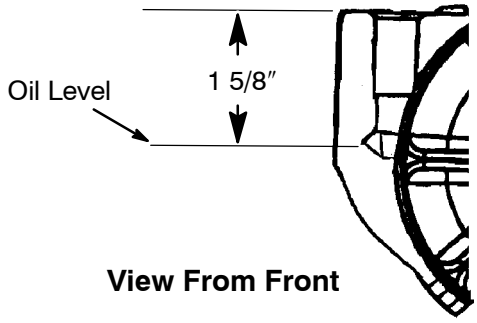
1. Remove propshaft shield from the right side of the vehicle.
2. Remove fill plug and visually inspect the oil level. Level is correct when it reaches the bottom of the fill hole as shown at right.

To change lubricant:

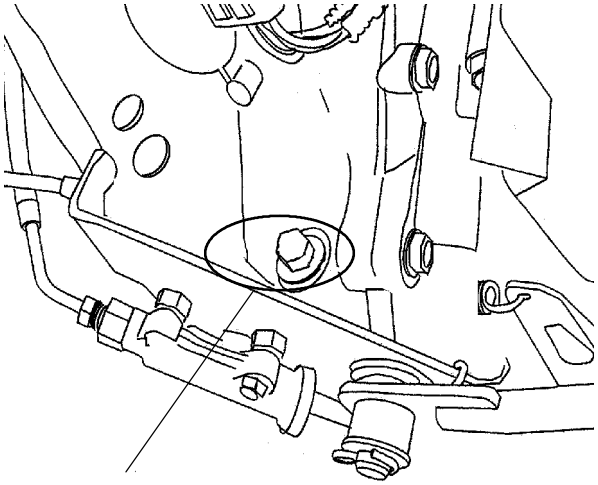
1. Remove propshaft shield from the right side of the vehicle .
2. Remove transmission drain plug to drain the oil. Catch and discard used oil properly.
3. Clean and reinstall the drain plug with a new sealing washer. Torque to specification.
4. Remove fill plug.
5. Add Polaris AGL Gearcase Lubricant to proper level as described above.
6. Check for leaks.
7. Reinstall propshaft shield.

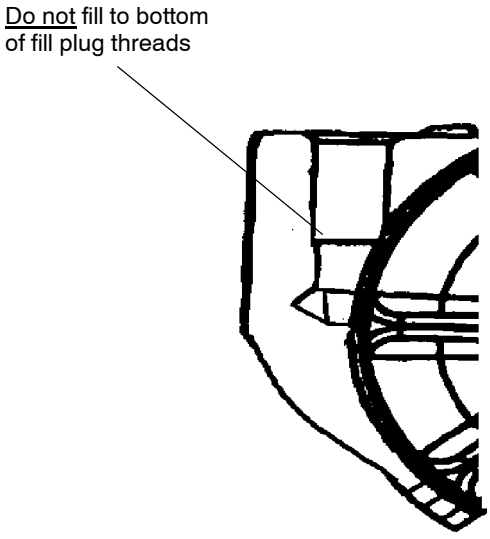
TRANSMISSION SPECIFICATIONS

Specified Lubricant:
Polaris AGL Gearcase Lubricant
(PN 2873603) (gal.) (PN 2873602) (12oz.)
Capacity: **13.5 oz. (400 ml.)**
Drain Plug / Fill Plug Torque:
14 ft. lbs. (19.4 Nm)



View From Front


Transmission Fill Plug



LATE 2004 TRANSMISSION LUBRICATION

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

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

To check the level:

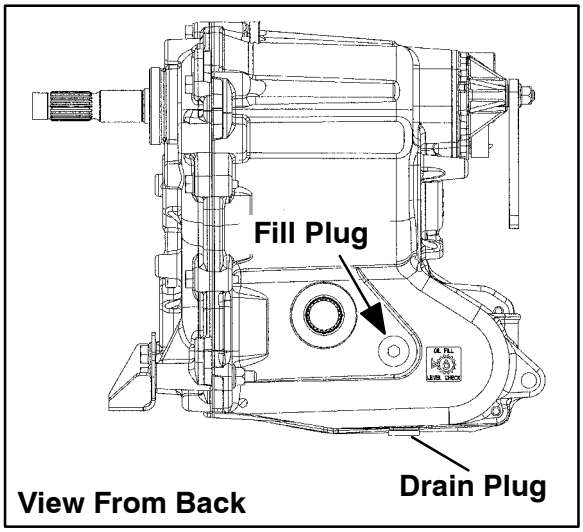
1. Remove fill plug from the back of the transmission and visually inspect the oil level. Level is correct when it reaches the bottom of the fill hole as shown at below.

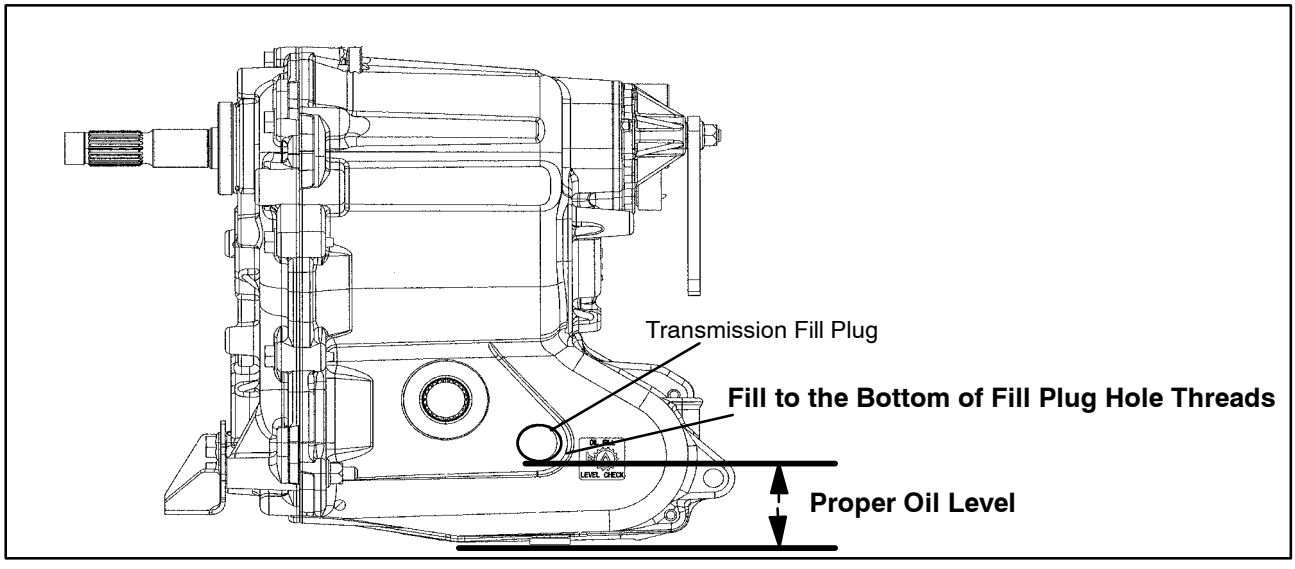
To change lubricant:

1. Remove transmission drain plug to drain the oil. Catch and discard used oil properly.
2. Clean and reinstall the drain plug. Torque to specification.
3. Remove fill plug.
4. Add 13.5 oz. of Polaris AGL Gearcase Lubricant or fill to top of the fill plug hole threads.
5. Check for leaks.
6. Reinstall fill plug and torque to 14 ft.lbs. (19.4 Nm).

TRANSMISSION SPECIFICATIONS

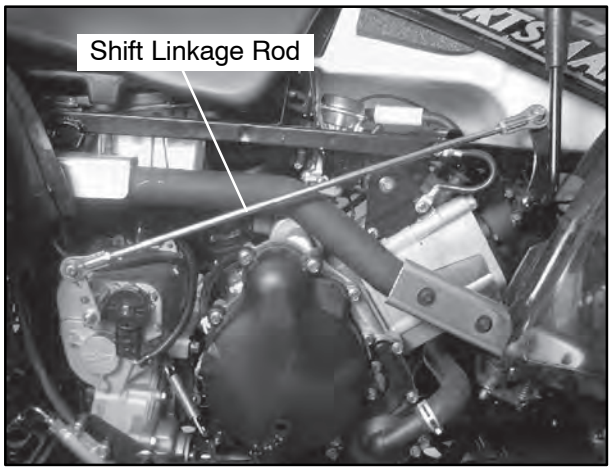
Specified Lubricant:
Polaris AGL Gearcase Lubricant
(PN 2873603) (gal.) (PN 2873602) (12oz.)
Capacity: **13.5 oz. (400 ml.)**
Drain Plug / Fill Plug Torque:
14 ft. lbs. (19.4 Nm)





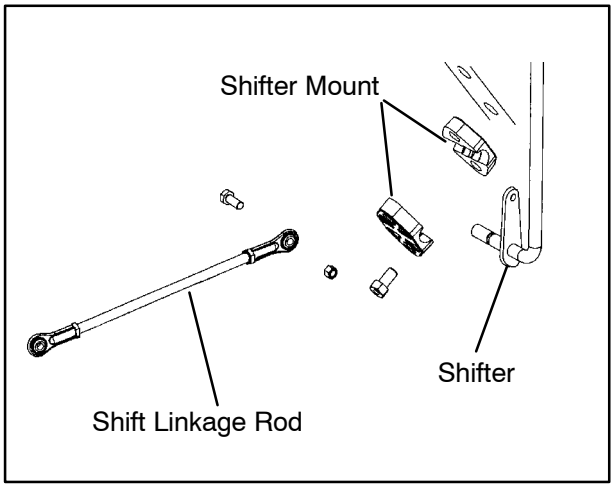
SHIFT LINKAGE INSPECTION

NOTE: Shift rod is preset at time of manufacture.



1. Inspect shift linkage tie rod ends, clevis pins, and pivot bushings and replace if worn or damaged. Lubricate the tie rod ends with a light aerosol lubricant or grease.

2. Note orientation of tie rod end studs with the ends that are up down (vertical). Remove both rod end bolts from transmission bell crank.



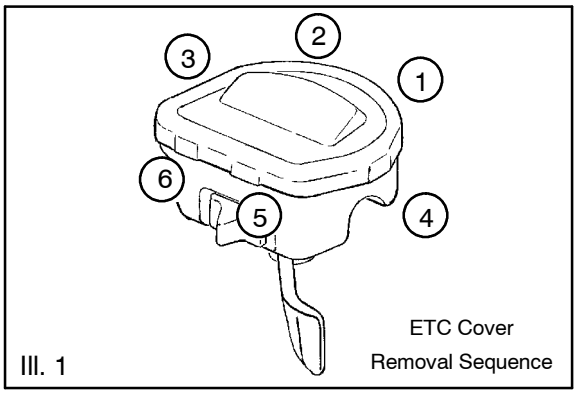
THROTTLE INSPECTION

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

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

To remove the ETC cover:

1. Use a medium flat blade screwdriver and insert blade into the pocket of the cover starting on the #1 position.
2. Twist screwdriver slightly while lifting on the cover to release snap.
3. Repeat procedure at the other five locations as shown.
   NOTE: Do not attempt to remove cover until all latch points are released.



Ill. 1 ETC Cover Removal Sequence

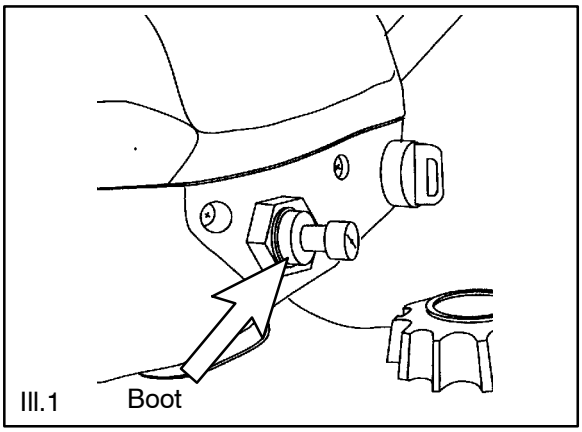
CHOKE (ENRICHER) ADJUSTMENT

If the choke knob does not stay out when pulled, adjust the choke tension by tightening (clockwise) the jam nut under the rubber boot between the choke knob and nut. Firmly grasp the rubber boot and tighten until the choke slides freely but stays out when pulled.

Verify free play of 1/16-3/16" (1.6-4.76 mm) and smooth operation of choke cable.

If smooth choke operation is not obtainable, inspect choke cable for kinks or sharp bends in routing.

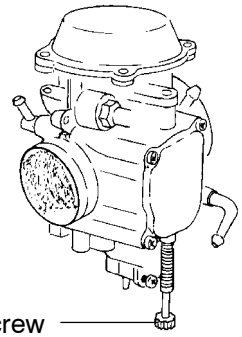
Illustration of choke may vary with models.



Ill.1

IDLE SPEED ADJUSTMENT

CV Carburetor



Ill.3

1. Start engine and warm it up thoroughly.
2. Adjust idle speed by turning the idle adjustment screw in (clockwise) to increase or out (counterclockwise) to decrease RPM. (Ill.3)

NOTE: Adjusting the idle speed affects throttle cable freeplay and electronic throttle control (ETC) adjustment. Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.

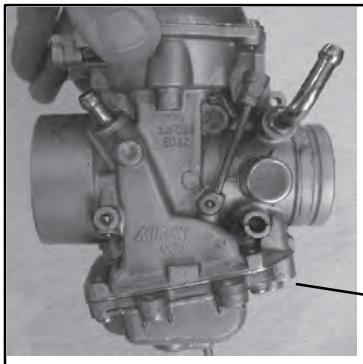
Idle Speed:
Early 2004: 1100 ± 50 RPM
Late 2004: 1200 ± 50 RPM

PILOT SCREW

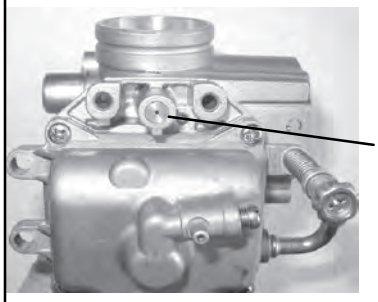
The pilot system supplies fuel during engine operation with the throttle valve closed or slightly opened. The fuel/air mixture is metered by pilot screw and discharged into the main bore through the pilot outlet.

CAUTION:

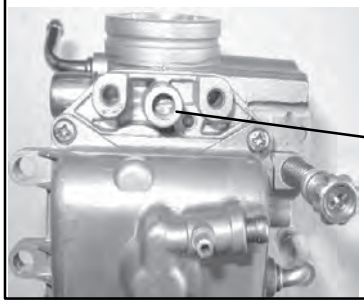
The pilot screw is calibrated at the factory to meet PEA / CRAB regulations for air quality standards and is sealed with a brass plug to prevent tampering. Removal of the tamper proof plug is not permitted. For service purposes, cleaning of the pilot circuit can be done only by a certified repair shop to ensure air quality standards are not exceeded.



Pilot Screw location



Brass Plug Installed



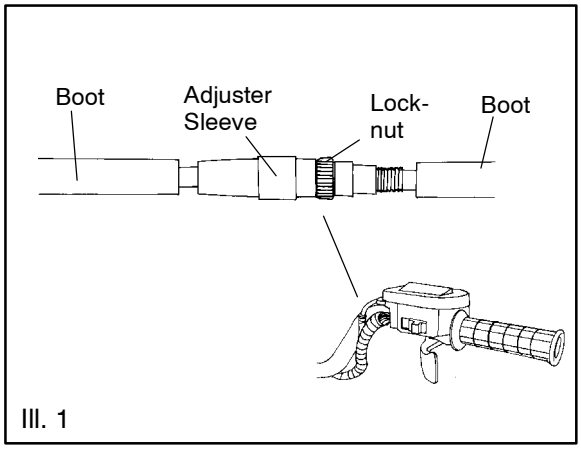
Brass Plug Removed

THROTTLE CABLE / ELECTRONIC THROTTLE CONTROL (ETC SWITCH) ADJUSTMENT

1. Slide boot off throttle cable adjuster and jam nut.
2. Place shift selector in neutral and set parking brake.

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

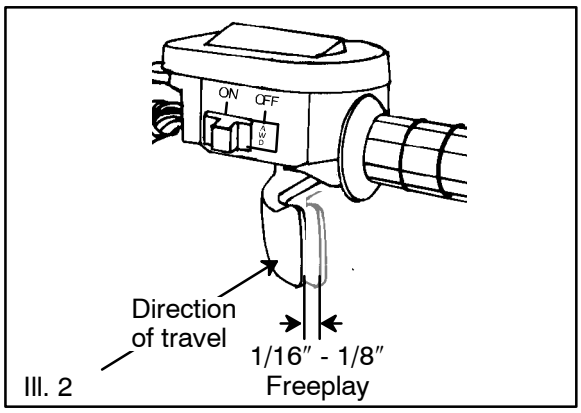
3. Start engine and set idle to specified RPM.



Ill. 1

NOTE: Be sure the engine is at operating temperature. See Idle Speed Adjustment.

4. Loosen lock nut on in-line cable adjuster (Ill. 1).
5. Turn adjuster until 1/16″ to 1/8″ freeplay is achieved at thumb lever. (Ill. 2). After making adjustments, quickly actuate the thumb lever several times and reverify freeplay.



Ill. 2

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

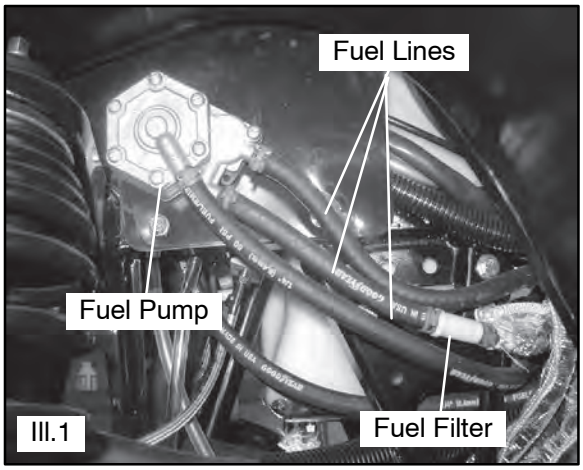
FUEL SYSTEM

⚠ WARNING

Gasoline is extremely flammable and explosive under certain conditions.

- Always stop the engine and refuel outdoors or in a well ventilated area.
- Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.
- Do not overfill the tank. Do not fill the tank neck.
- If you get gasoline in your eyes or if you swallow gasoline, seek medical attention immediately.
- If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.
- Never start the engine or let it run in an enclosed area. Engine exhaust fumes are poisonous and can result loss of consciousness or death in a short time.
- Never drain the float bowl when the engine is hot. Severe burns may result.

FUEL LINES



Ill.1

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

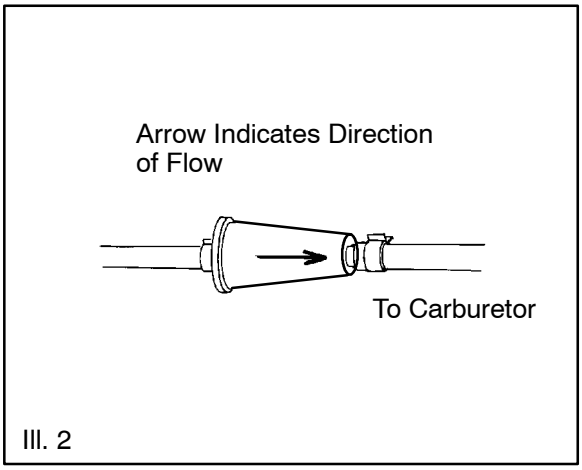
VENT LINES

Check fuel tank, oil tank, carburetor, battery and transmission vent lines for signs of wear, deterioration, damage or leakage. Replace every two years.

Be sure vent lines are routed properly and secured with cable ties. **CAUTION:** Make sure lines are not kinked or pinched.

FUEL FILTER

The fuel filter should be replaced in accordance with the Periodic Maintenance Chart or whenever sediment is visible in the filter.



Ill. 2

1. Shut off fuel supply at fuel valve.
2. Remove line clamps at both ends of the filter.
3. Remove fuel lines from filter.
4. Install new filter and clamps onto fuel lines with arrow pointed in direction of fuel flow.
5. Install clamps on fuel line.
6. Turn fuel valve “ON”.
7. Start engine and inspect for leaks.

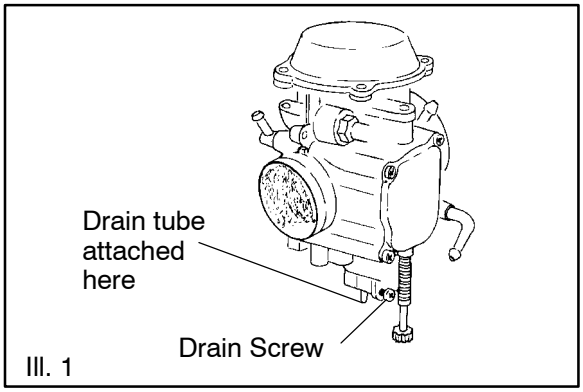
CARBURETOR DRAINING

The carburetor float bowl should be drained periodically to remove moisture or sediment from the bowl, or before extended periods of storage.

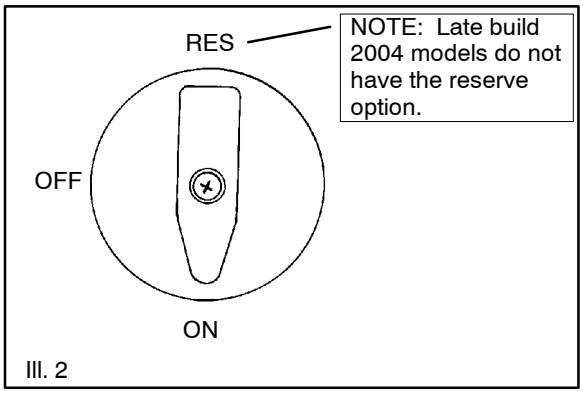
NOTE: The bowl drain screw is located on the bottom left side of the float bowl.

1. Turn fuel valve to the off position.
2. Place a clean container beneath the bowl drain spigot or bowl drain hose.
3. Turn drain screw out two turns and allow fuel in the float bowl and fuel line to drain completely.
4. Inspect the drained fuel for water or sediment.
5. Tighten drain screw.
6. Turn fuel valve to “ON”.
7. Start machine and check for leaks.

NOTE: All tubes attached to the carburetor must be check for pinching or blockage, as this will effect engine performance.



Ill. 1



Ill. 2

COMPRESSION TEST

NOTE: This engine does NOT have decompression components. Compression readings will vary in proportion to cranking speed during the test. Average compression (measured) is about **150-170 psi** during a compression test.

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

COMPRESSION TEST CONT'D

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

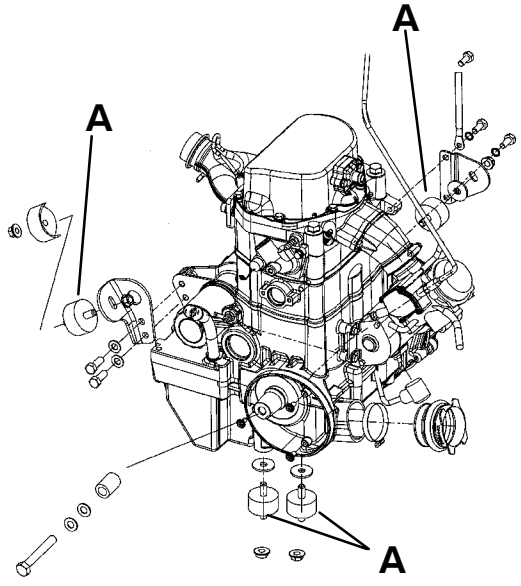
Cylinder Compression
Standard: 150-170 PSI

Cylinder Leakdown
Service Limit 10 %
(Inspect for cause if leakage exceeds 10%)

ENGINE MOUNTS

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

Check engine fasteners and ensure they are tight.



Ill. 3

BATTERY MAINTENANCE

⚠ WARNING

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

External: Flush with water.

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

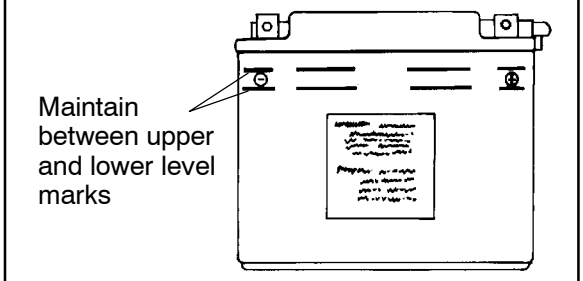
Eyes: Flush with water for 15 minutes and get prompt medical attention.

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

NOTE: New Batteries: Batteries must be fully charged before use or battery life will be reduced by 10-30% of full potential. Charge battery for 3-5 hours at a current equivalent of 1/10 of the battery's rated amp/hour capacity. Do not use the alternator to charge a new battery. (Refer to battery video **PN 9917987**)

The battery is located under the seat.

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



Ill. 1

To remove the battery:

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

⚠ CAUTION

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

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

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

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

6. Reinstall the battery caps.
7. Clean battery cables and terminals with a stiff wire brush. Corrosion can be removed using a solution of one cup water and one tablespoon baking soda. Rinse well with clean water and dry thoroughly.
8. Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable.
9. Reattach vent hose making sure it is properly routed and not kinked or pinched.
10. Coat terminals and bolt threads with Dielectric Grease (**PN 2871329**).
11. Reinstall battery cover and holder strap.

SPARK PLUG

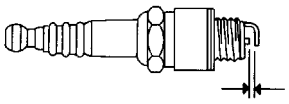
1. Remove spark plug high tension lead. Clean plug area so no dirt and debris can fall into engine when plug is removed.
2. Remove spark plug.
3. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.
4. Clean with electrical contact cleaner or a glass bead spark plug cleaner only. **CAUTION:** A wire brush or coated abrasive should not be used.
5. Measure gap with a wire gauge. Refer to specifications for proper spark plug type and gap. Adjust gap if necessary by bending the side electrode carefully. (Illustration below)
6. If necessary, replace spark plug with proper type. **CAUTION:** Severe engine damage may occur if the incorrect spark plug is used.
7. Apply a small amount of anti-seize compound to the spark plug threads.
8. Install spark plug and torque to specification.

Recommended Spark Plug:

Refer to Specifications Chapter 1

Spark Plug Torque:
14 Ft. Lbs. (19 Nm)

Spark Plug Gap



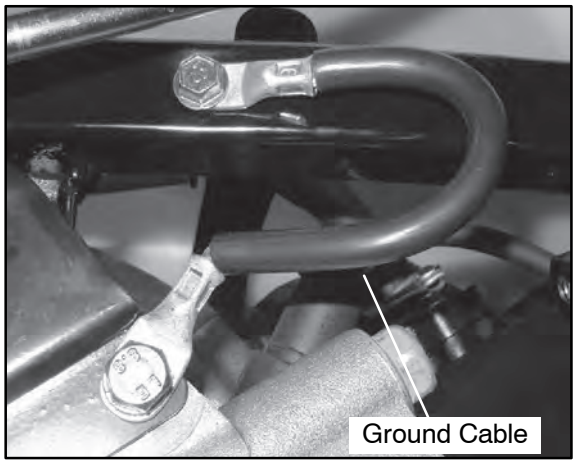
.036″ (0.9 mm)

IGNITION TIMING

Refer to Chapter 10 for ignition timing procedures.

ENGINE-TO-FRAME GROUND

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



LIQUID COOLING SYSTEM OVERVIEW

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

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

- Some coolant level drop on new machines is normal as the system is purging itself of trapped air. Observe coolant levels often during the break-in period.
- Overheating of engine could occur if air is not fully purged from system.
- Polaris Premium 60/40 anti-freeze is premixed and ready to use. Do not dilute with water.

COOLANT STRENGTH / TYPE

Test the strength of the coolant using an antifreeze hydrometer.

Antifreeze Hydrometer

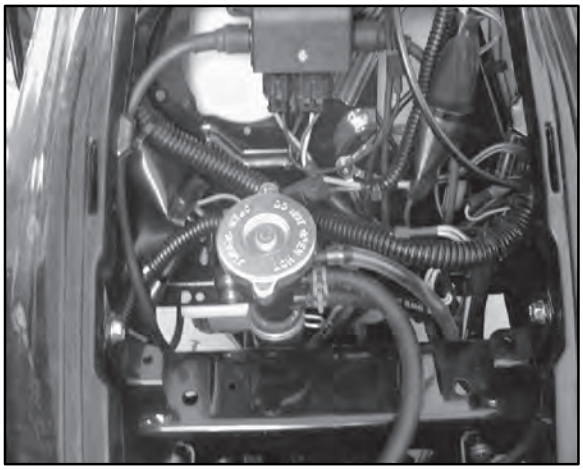
- A 50/50 or 60/40 mixture of antifreeze and distilled water will provide the optimum cooling, corrosion protection, and antifreeze protection.
- Do not use tap water. Tap water contains minerals and impurities which build up in the system. Do not add straight antifreeze or straight water to the system. Straight water or antifreeze may cause the system to freeze, corrode, or overheat.

Polaris 60/40 Anti-Freeze / Coolant

(PN 2871323)

COOLING SYSTEM HOSES

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



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

RADIATOR

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

COOLING SYSTEM PRESSURE TEST

Refer to Chapter 3 for pressure test procedures.

COOLANT LEVEL INSPECTION

⚠ WARNING

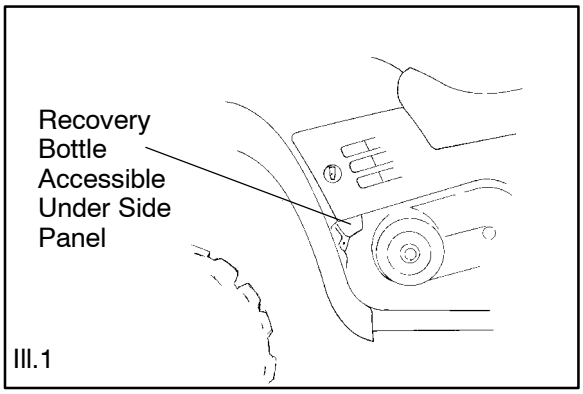
Never remove the radiator pressure cap when the engine is warm or hot. Escaping steam and fluid can cause severe burns. The engine must be allowed to cool before removing the pressure cap.

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

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

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

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



Ill.1

RADIATOR COOLANT LEVEL INSPECTION

⚠ WARNING

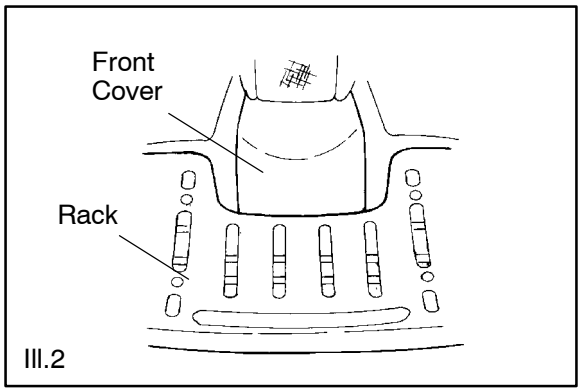
Never remove the radiator pressure cap when the engine is warm or hot. Escaping steam and fluid can cause severe burns. The engine must be allowed to cool before removing the pressure cap.

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

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

To access the radiator pressure cap:

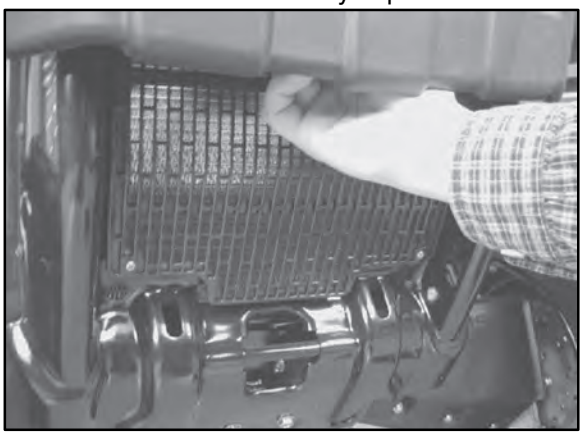
Remove the four screws securing front rack. Turn handle bars full left or right to provide more clearance. Remove front cover by placing your fingers under the front of the cover and pulling upward.



Ill.2

RADIATOR SCREEN REMOVAL

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

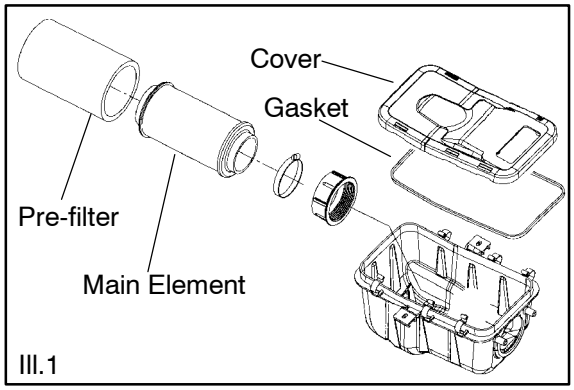


AIR FILTER/PRE-FILTER SERVICE

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

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

1. Lift up on the rear of the seat.
2. Pull the seat back and free of the tabs. **NOTE:** When reinstalling seat, make sure the slots in the seat engage the tabs in the fuel tank.
3. Remove clips (6) from air box cover and remove cover. Inspect the gasket. It should adhere tightly to the cover and seal all the way around.
4. Loosen clamp and remove air filter assembly.



Ill.1

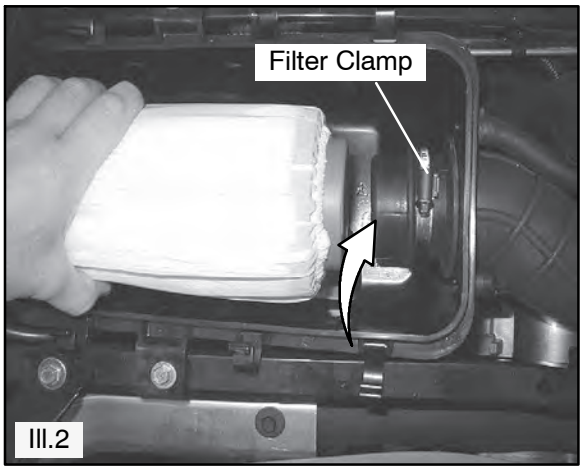
Cleaning:

5. Slip the pre-filter element off of main element. Clean the pre filter with high flash point solvent, followed by hot soapy water.
6. Rinse and dry thoroughly.
7. Inspect element for tears or damage.
8. Apply foam filter oil or clean engine oil and squeeze until excess oil is removed.
9. Inspect main filter and replace if necessary. If the filter has been soaked with fuel or oil it must be replaced.

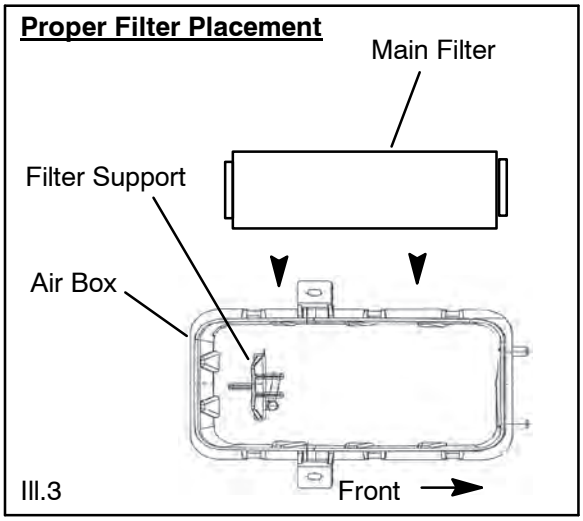
Installation:

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

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



Ill.2



Ill.3

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

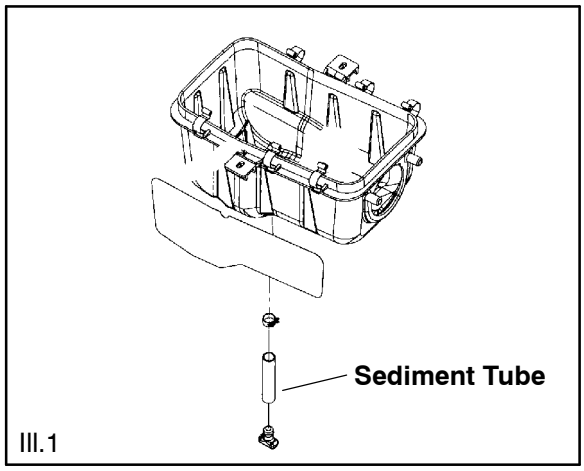
12. Install air box cover and secure with clips.

AIR BOX SEDIMENT TUBE

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

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

3. Reinstall drain plug.



Ill.1

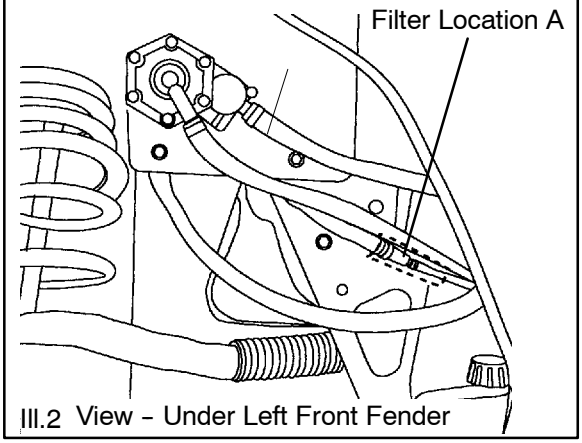
NOTE: The sediment tube will require more frequent service if the vehicle is operated in wet conditions or at high throttle openings for extended periods.

BREATHER FILTER INSPECTION

Four cycle ATV engines are equipped with a breather filter. The in-line filter is similar in appearance to a fuel filter, and is visible on the left side (Location A).

In-line breather filters should be installed with the arrow pointing toward the engine (away from the air box).

Typical Breather Filter Location



Ill.2 View – Under Left Front Fender

NOTE: In-line breather filter service life is extended when the foam air box pre-filter is in place and maintained properly. Never operate the engine without the pre-filter.

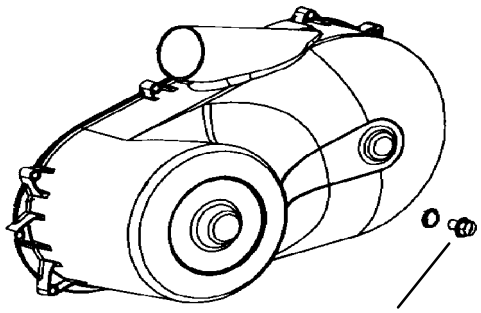
BREATHER HOSE

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

PVT DRYING & PVT DRAIN PLUG

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

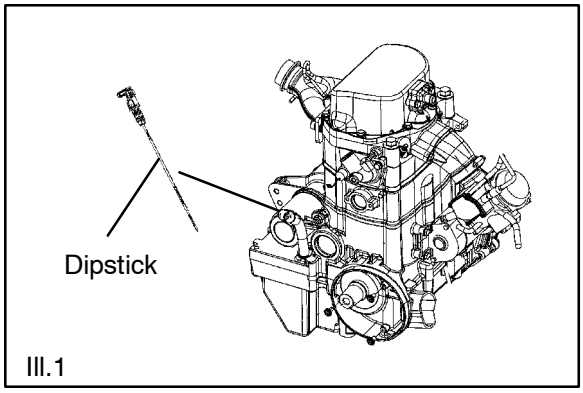
1. To release any water that maybe trapped in the PVT cover, simply remove the PVT drain plug and O–ring located on the bottom of the PVT cover and let the water drain out. The PVT drain plug is shown below.


PVT Drain Plug & O–ring
Ill.3

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

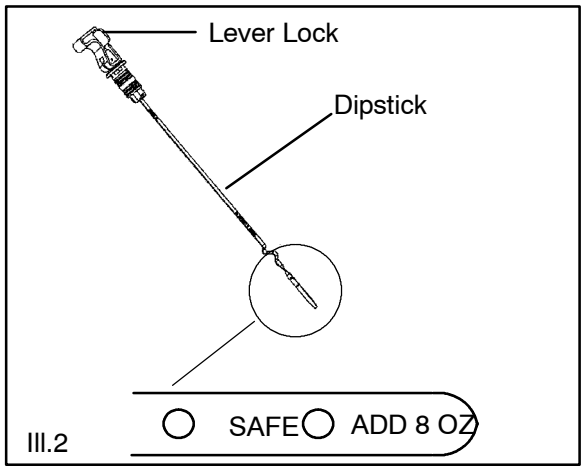
ENGINE OIL LEVEL

The 600/700 engine is a wet-sump engine, meaning the oil is contained in the bottom of the crankcase. To check the oil level:



Ill.1

1. Set machine on a level surface.
2. Start and run engine for 20-30 seconds.
3. Stop engine and unlock the lever lock.(Ill. 2) Remove dipstick and wipe dry with a clean cloth.



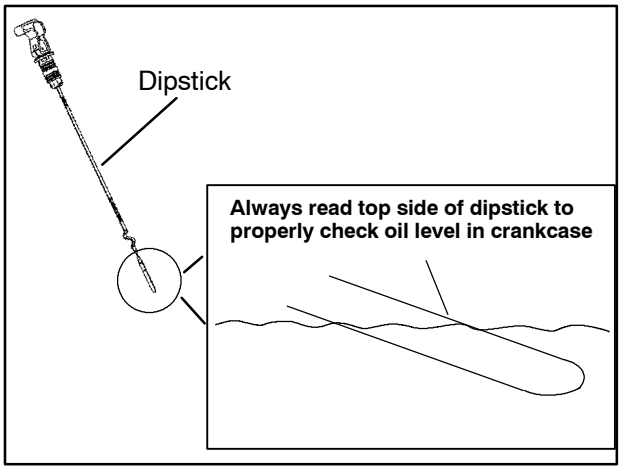
Ill.2

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

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

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

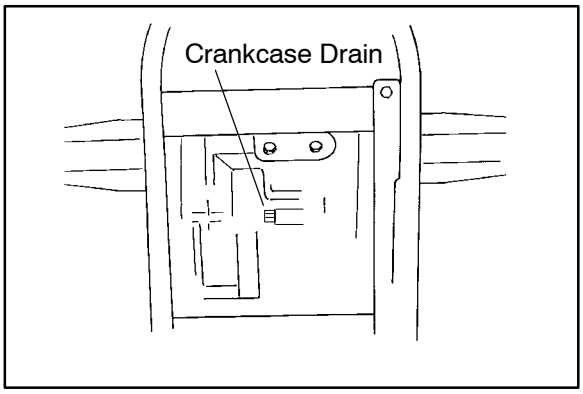
NOTE: Due to the dipstick entry angle into the crankcase, the oil level will read higher on the bottom side of the dipstick. Proper level indication is determined on the ***upper*** surface of the dipstick as it is being removed, regardless of the level marks being on top or on bottom. (See the next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



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

OIL AND FILTER CHANGE

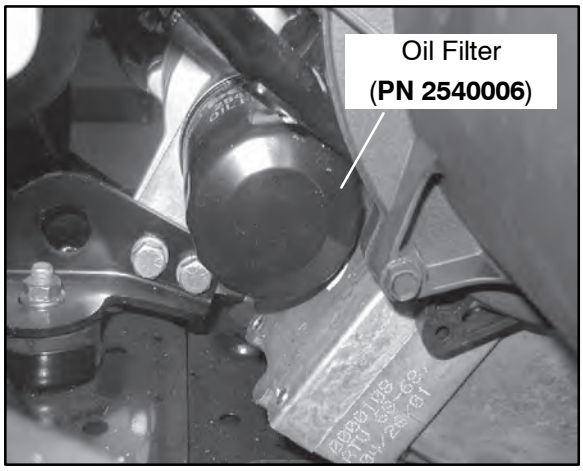
1. Place vehicle on a level surface.
2. Run engine two to three minutes until warm. Stop engine.
3. Clean area around drain plug at bottom of oil engine.
4. Place a drain pan beneath crankcase and remove drain plug.



Engine Oil Drain Plug - Bottom View

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

result.



5. Allow oil to drain completely.
6. Replace the sealing washer on drain plug. **NOTE:** The sealing surfaces on drain plug and oil tank should be clean and free of burrs, nicks or scratches.
7. Reinstall drain plug and torque to 14 ft. lbs. (19 Nm).
8. Place shop towels beneath oil filter. Using Oil Filter Wrench (**PV-43527**), turn filter counterclockwise to remove.
9. Using a clean dry cloth, clean filter sealing surface on crankcase.
10. Lubricate O-ring on new filter with a film of fresh engine oil. Check to make sure the O-ring is in good condition.
11. Install new filter and turn by hand until filter gasket contacts the sealing surface, then turn an additional 1/2 turn.
12. Remove dipstick and fill sump with 2 quarts (1.9 l) of Polaris Premium 4 Synthetic Oil (**PN 2871281**).

Recommended Engine Oil

Polaris Premium 4 All Season Synthetic, 0W-40 (PN 2871281)

Ambient Temperature Range:

-40° F to 120° F

Crankcase Drain Plug Torque:
20-22 ft. lbs. (27-30 Nm)

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

Oil Filter Wrench:
(PV-43527)

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

STEERING

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

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

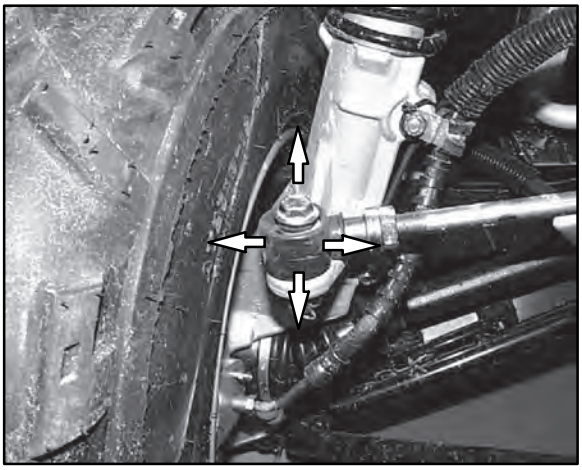
⚠ WARNING

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

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

TIE ROD END / STEERING INSPECTION

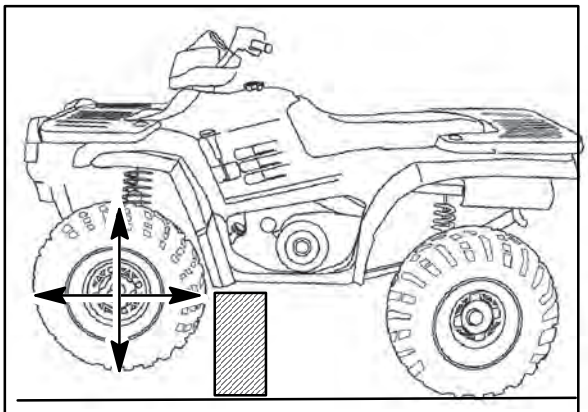
- To check for play in the tie rod end, grasp the steering tie rod, pull in all directions feeling for movement.
- Repeat inspection for inner tie rod end on steering post.



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

TIE ROD END/STEERING INSPECTION CONT'D

- If abnormal movement is detected, inspect the hub and wheel assembly to determine the cause (possible loose wheel nuts or loose front hub components).



Check for Loose Wheel or Hub

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

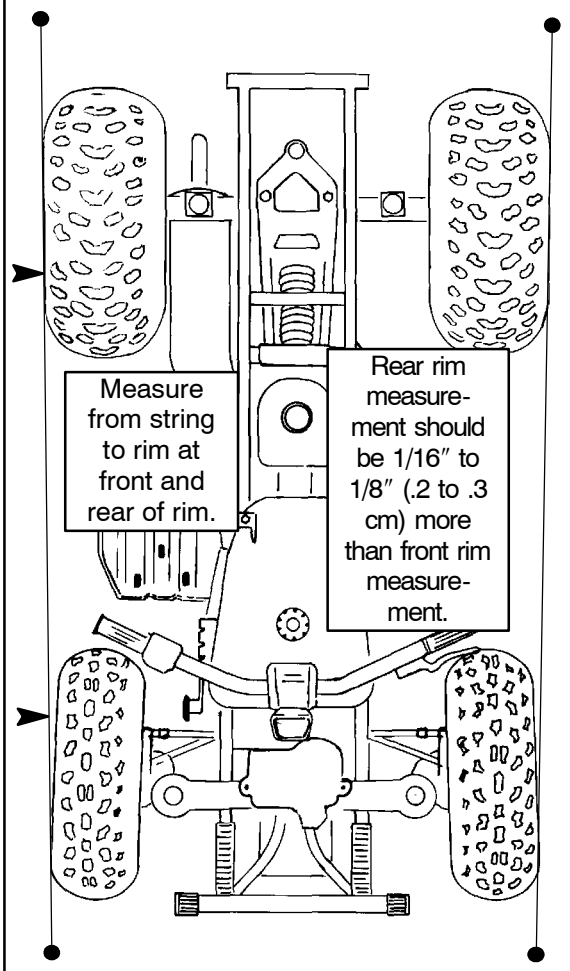
CAMBER AND CASTER

The camber and caster are non-adjustable.

WHEEL ALIGNMENT METHOD 1: STRAIGHTEDGE OR STRING

Be sure to keep handlebars centered. See notes below.

NOTE: String should just touch side surface of rear tire on each side of machine.

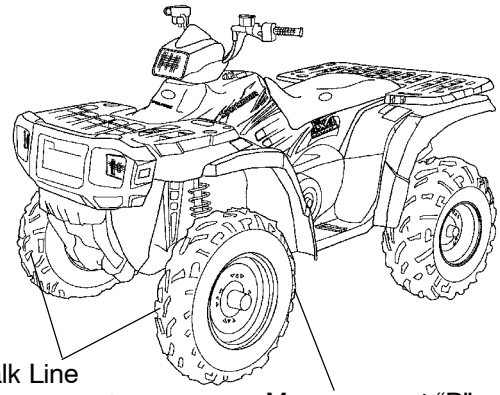


NOTE: The steering post arm "frog" can be used as an indicator of whether the handlebars are straight. The frog should always point straight back from the steering post.

WHEEL ALIGNMENT METHOD 2: CHALK

1. Place machine on a smooth level surface.
2. Set handlebars in a straight ahead position and secure handlebars in this position. **NOTE:** The steering arm "frog" can be used as an indicator of whether the handlebars are straight. The frog should always point straight back from the steering post.
3. Place a chalk mark on the center line of the front tires approximately 10″ (25.4 cm) from the floor or as close to the hub/axle center line as possible. **NOTE:** It is important that the height of both marks be equally positioned in order to get an accurate measurement.
4. Measure the distance between the marks and record the measurement. Call this measurement "A".
5. Rotate the tires 180° by moving vehicle forward or backward. Position chalk marks facing rearward, even with the hub/axle centerline.
6. Again measure the distance between the marks and record. Call this measurement "B". Subtract measurement "B" from measurement "A". The difference between measurements "A" and "B" is the vehicle toe alignment. The recommended vehicle toe tolerance is 1/8″ to 1/4″ (.3 to .6 cm) toe out. This means the measurement at the front of the tire (A) is 1/8″ to 1/4″ (.3 to .6 cm) wider than the measurement at the rear (B).

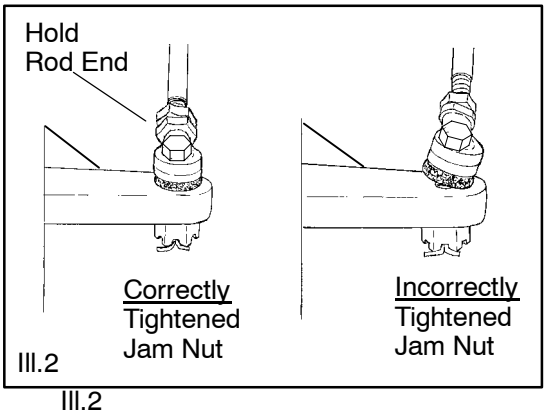
Ill.1



TOE ALIGNMENT ADJUSTMENT

If toe alignment is incorrect, measure the distance between vehicle center and each wheel. This will tell you which tie rod needs adjusting. **NOTE:** Be sure handlebars are straight ahead before determining which tie rod(s) need adjustment.

CAUTION: During tie rod adjustment, it is very important that the following precautions be taken when tightening tie rod end jam nuts. If the rod end is positioned incorrectly it will not pivot, and may break.



Ill.2

To adjust toe alignment:

- Hold tie rod end to keep it from rotating.
- Loosen jam nuts at both end of the tie rod.
- Shorten or lengthen the tie rod until alignment is as required to achieve the proper toe setting as specified in Method 1 or Method 2.
- **IMPORTANT:** When tightening the tie rod end jam nuts, the rod ends must be held parallel to prevent rod end damage and premature wear. Damage may not be immediately apparent if done incorrectly. See illustration 2.
- After alignment is complete, torque jam nuts to 12-14 ft. lbs. (16-19 Nm).

EXHAUST PIPE

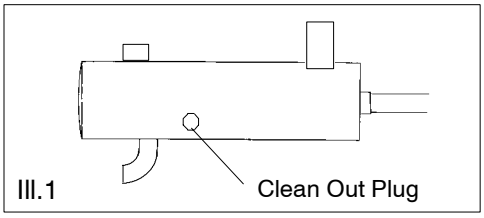
⚠ WARNING

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

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

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

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



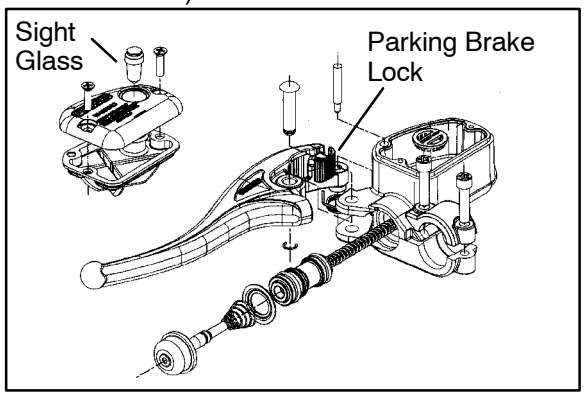
2. Place the transmission in neutral and start the engine. Purge accumulated carbon from the system by momentarily revving the engine several times.
3. If some carbon is expelled, cover the exhaust outlet and rap on the pipe around the clean out plugs while revving the engine several more times.
4. If particles are still suspected to be in the muffler, back the machine onto an incline so the rear of the machine is one foot higher than the front. Set the hand brake and block the wheels. Make sure the machine is in neutral and repeat Steps 2 and 3. **SEE WARNING**

5. If particles are still suspected to be in the muffler, drive the machine onto the incline so the front of the machine is one foot higher than the rear. Set the hand brake and block the wheels. Make sure the machine is in neutral and repeat Steps 2 and 3. **SEE WARNING**
6. Repeat Steps 2 through 5 until no more particles are expelled when the engine is revved.
7. Stop the engine and allow the arrestor to cool.
8. Reinstall the clean out plugs.

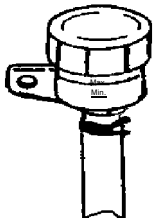
BRAKE SYSTEM INSPECTION

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

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



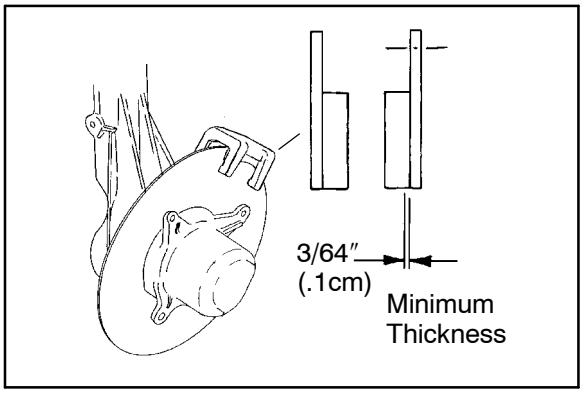
Rear Master Cylinder Reservoir



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

BRAKE PAD INSPECTION

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

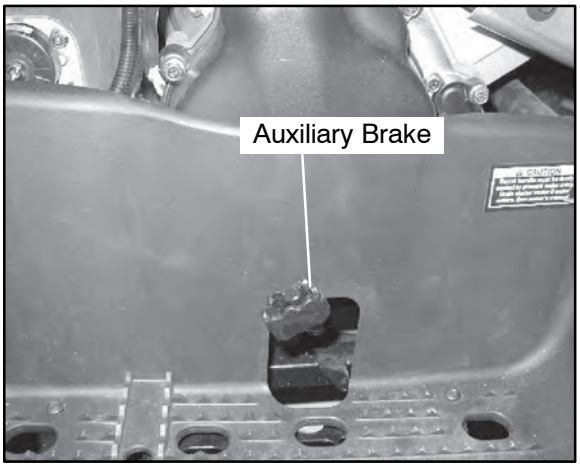


HOSE/FITTING INSPECTION

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

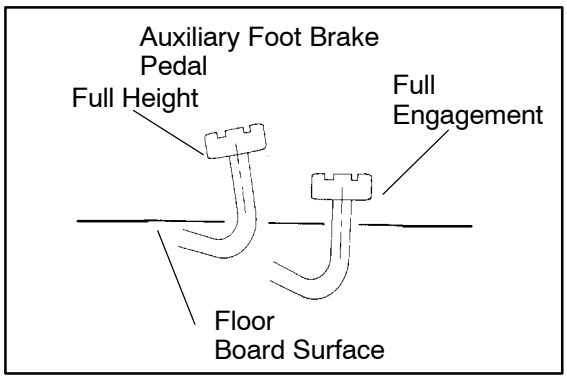
AUXILIARY BRAKE TESTING

The auxiliary brake should be checked for proper function.



Support the rear wheels off the ground.

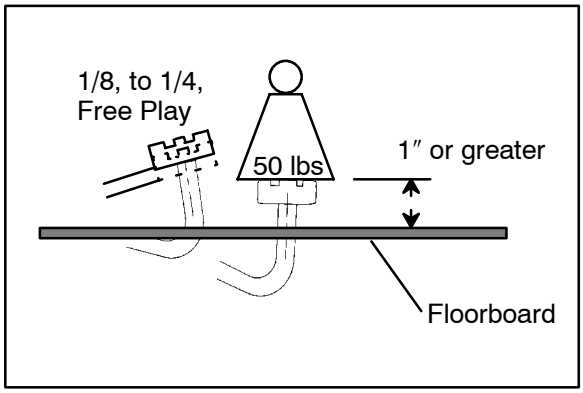
While turning the rear wheels by hand, apply the auxiliary foot brake. This brake should not stop the wheels from turning until the lever is half way between its rest position and bottoming on the footrest.



AUXILIARY BRAKE ADJUSTMENT (HYDRAULIC)

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

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



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

Free Play:

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

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

Bleeding:

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

SUSPENSION: SPRING PRELOAD ADJUSTMENT

Operator weight and vehicle loading affect suspensionspringpreloadrequirements. Adjustas necessary.

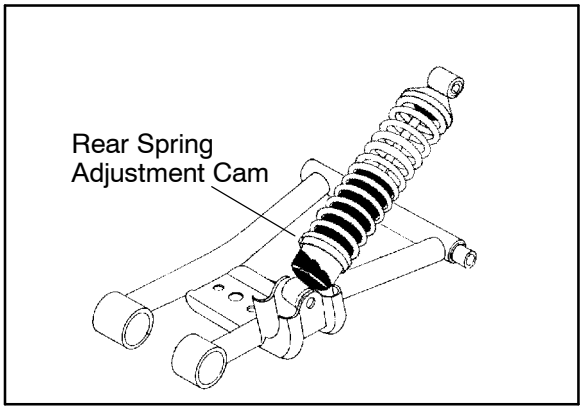
Shock Spanner Wrench

(PN 2870872)

FRONT SUSPENSION

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

REAR SUSPENSION



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

CONTROLS

Check controls for proper operation, positioning and adjustment.

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

WHEELS

Inspect all wheels for runout or damage. Check wheel nuts and ensure they are tight. Do not over tighten the wheel nuts. Apply Loctite™ 271 (**PN 2871954**) to the wheel studs whenever reinstalling the wheel nuts.

WHEEL, HUB, AND SPINDLE TORQUE TABLE

Item	Specification
Front Wheel Nuts	30 Ft. Lbs. (41 Nm)
Rear Wheel Nuts	30 Ft. Lbs. (41Nm)
Front Hub Retaining Nut	70 ft.lbs. (90 Nm)
Rear Hub Retaining Nut	80 Ft. Lbs. (108 Nm)

WHEEL REMOVAL: FRONT OR REAR

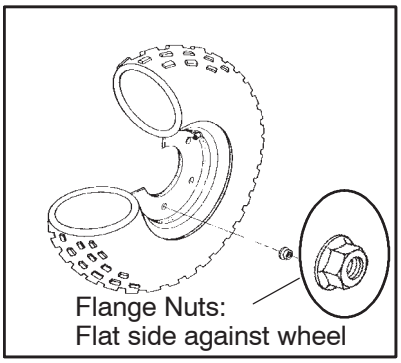
1. Stop the engine, place the transmission in gear and lock the parking brake.
2. Loosen the wheel nuts slightly.
3. Elevate the side of the vehicle by placing a suitable stand under the footrest frame.
4. Remove the wheel nuts and remove the wheel.

WHEEL INSTALLATION

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

CAUTION:

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



TIRE PRESSURE

CAUTION:

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

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

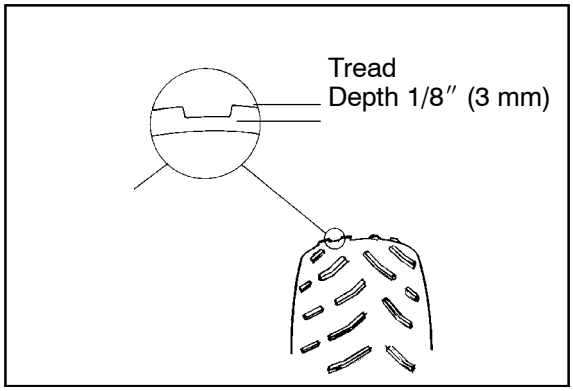
TIRE INSPECTION

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

- The use of non-standard size or type tires may affect ATV handling.

Tire Tread Depth

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



⚠ WARNING

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

Worn tires can cause an accident.

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

FRAME, NUTS, BOLTS, FASTENERS

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

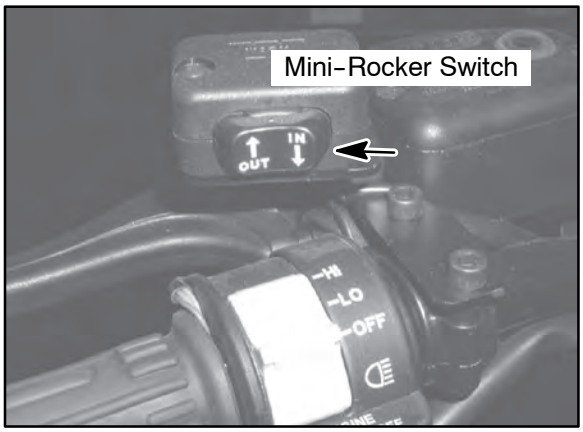
WARN® WINCH OPERATION (SPORTSMAN HUNTER EDITION)

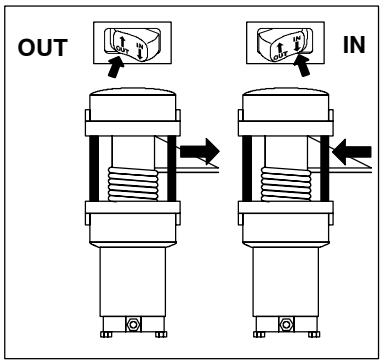
The Sportsman Hunter package is equipped with a 2500 lb. (2.5chi) Warn® Winch in the front.

Winch Handlebar Controls

The winch is located in the front bumper area.

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



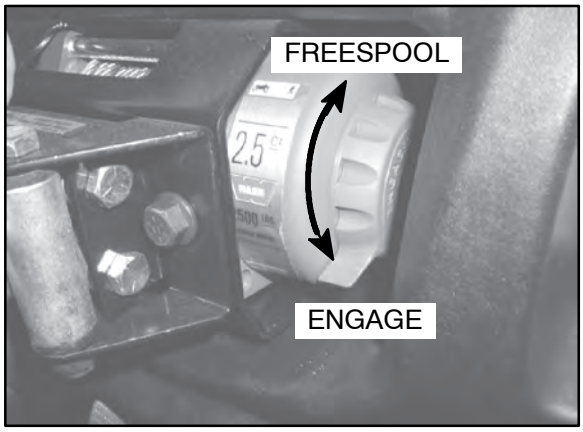


Winch Control

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

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

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

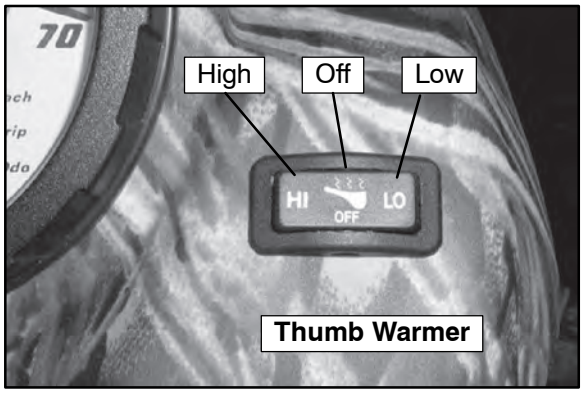


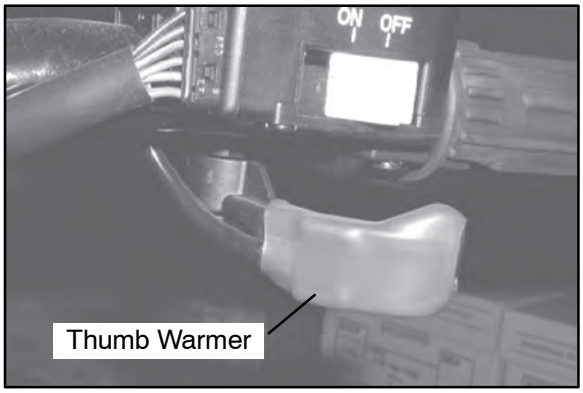
HAND / THUMB WARMER (SPORTSMAN HUNTER EDITION)

The Sportsman Hunter package is equipped with accessory hand and thumb warmers. The hand and thumb warmer's are activated by the switches located on the headlight pod.

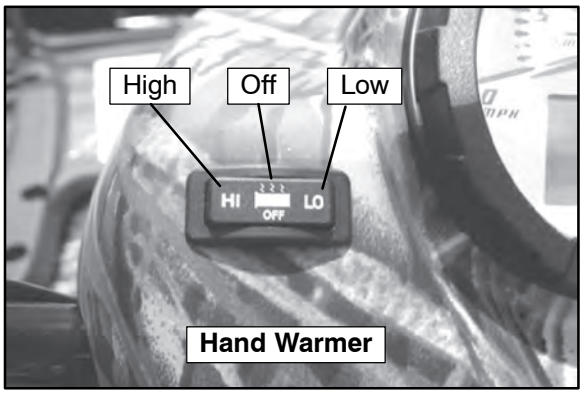
NOTE: The hand and thumb warmers may not heat up if the machine is running at low idle speed with the headlights on. Warmer performance will be better at higher engine speeds. If operating at low engine speeds, warmer performance will be better with the headlights off.

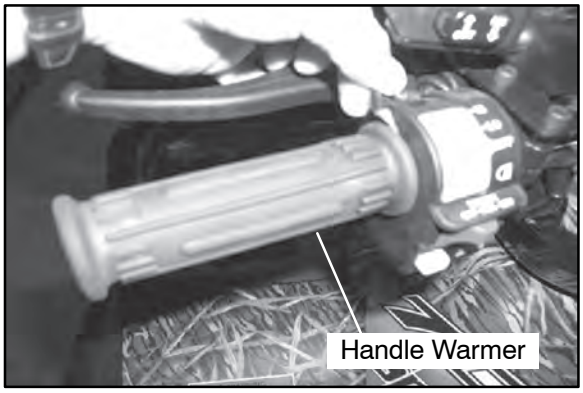
The thumb warmer switch is located on the right side of the headlight pod. Simply flip the switch to HI, OFF, or LO for operation.



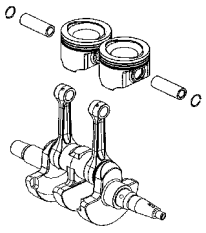


The hand warmer switch is located on the left side of the headlight pod. Simply flip the switch to HI, OFF, or LO for operation.

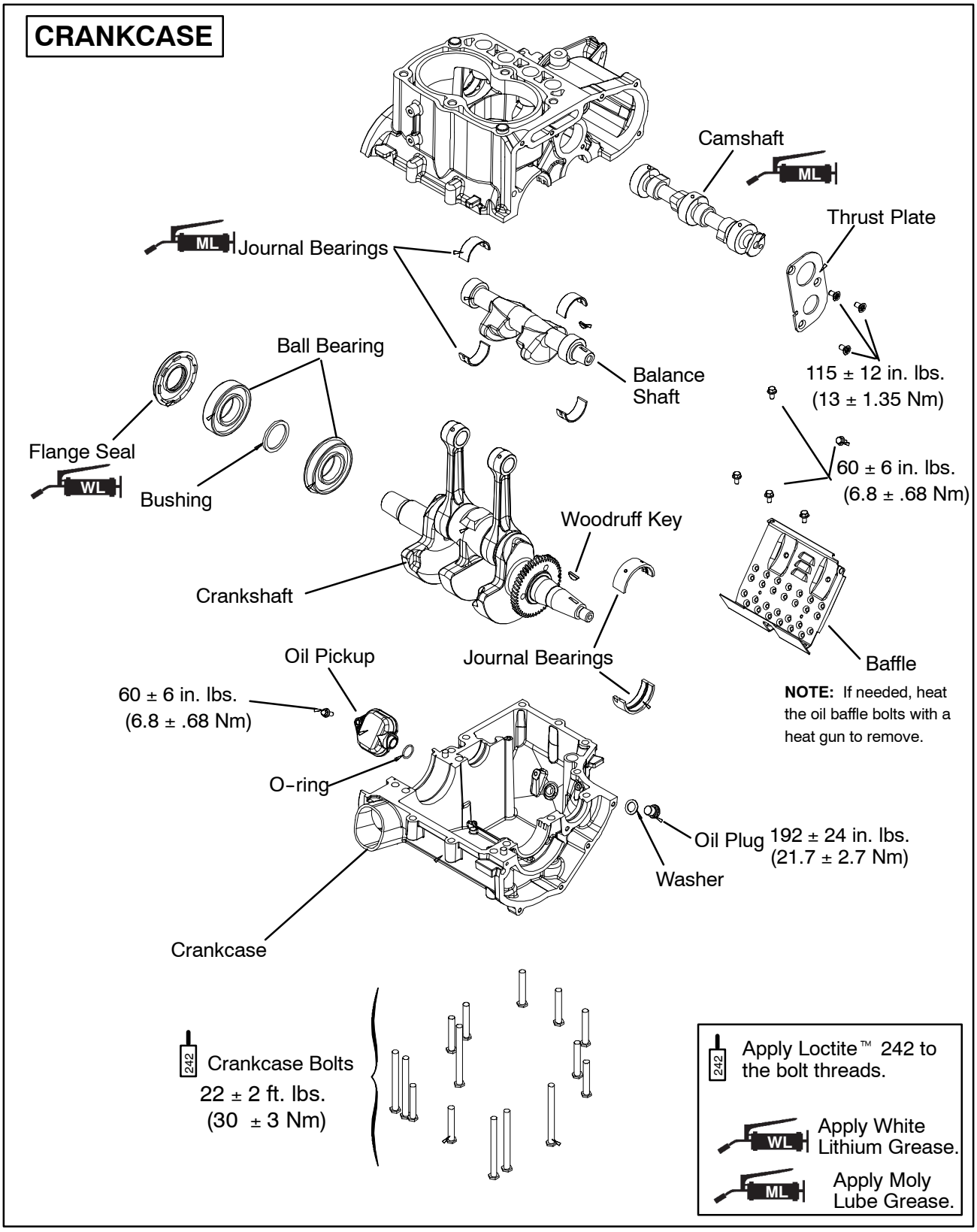




CHAPTER 3
ENGINE

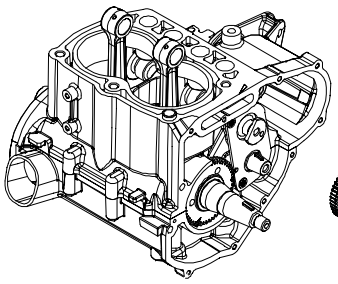


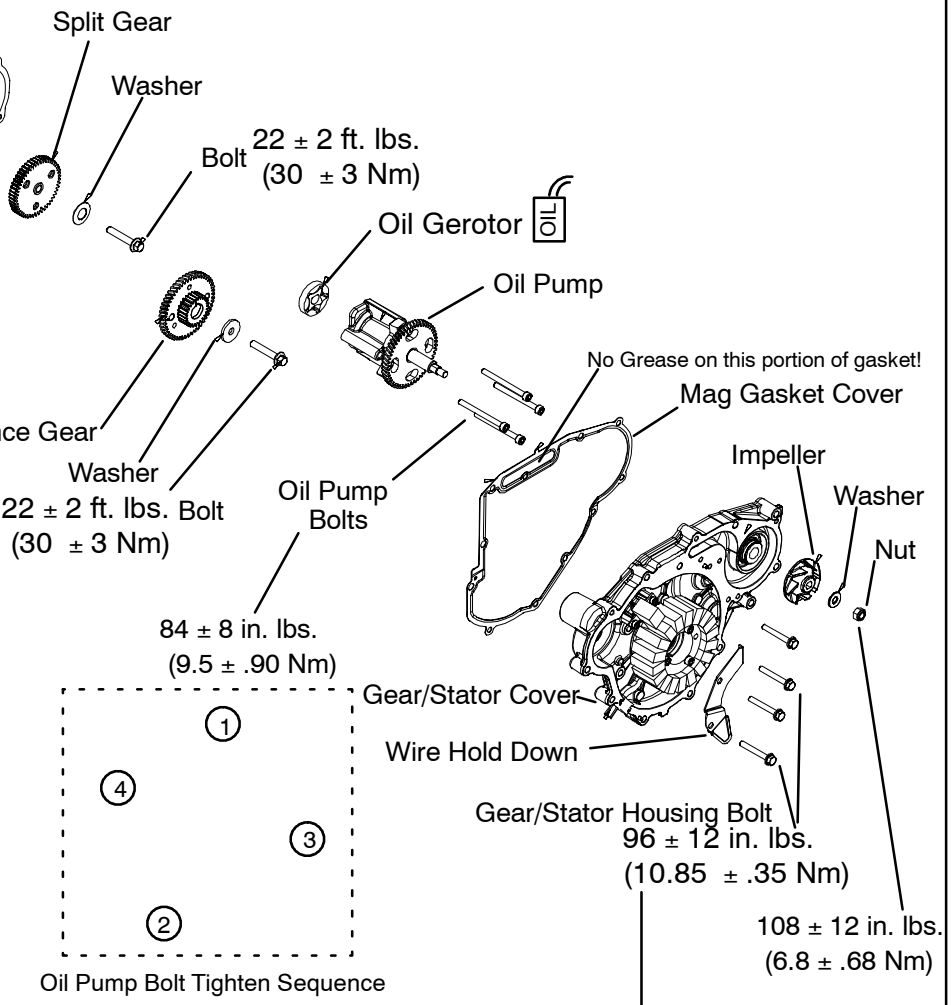
ENGINE EXPLODED VIEW

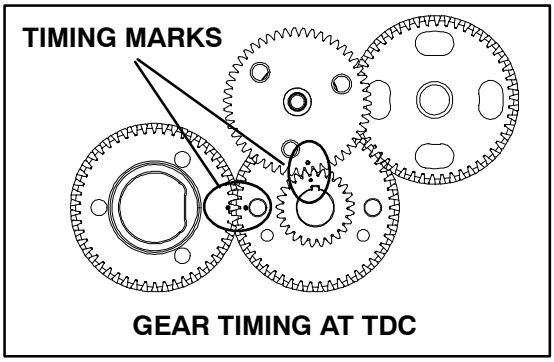


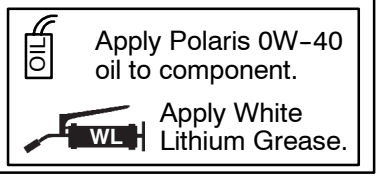
ENGINE EXPLODED VIEW

MAG SIDE

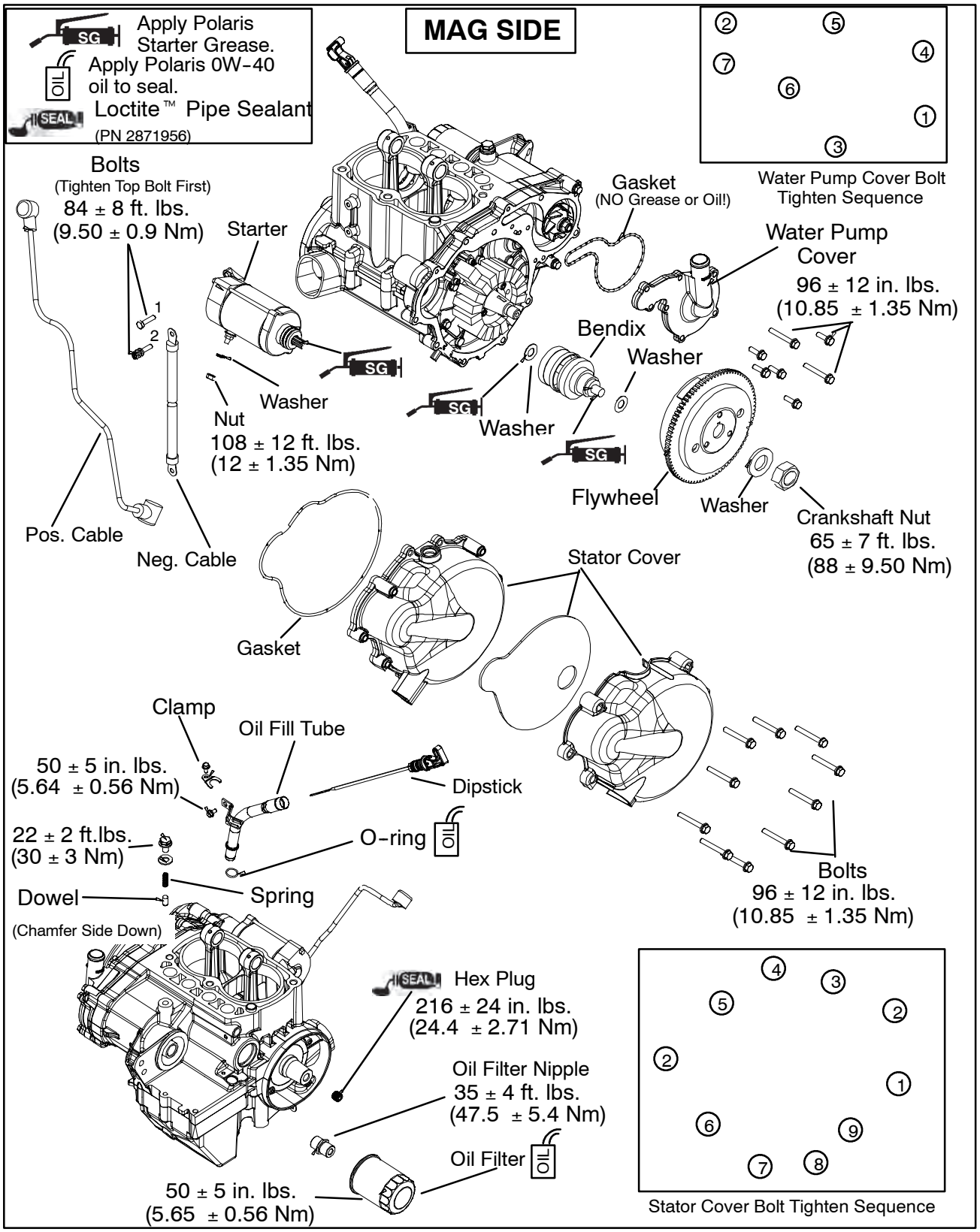




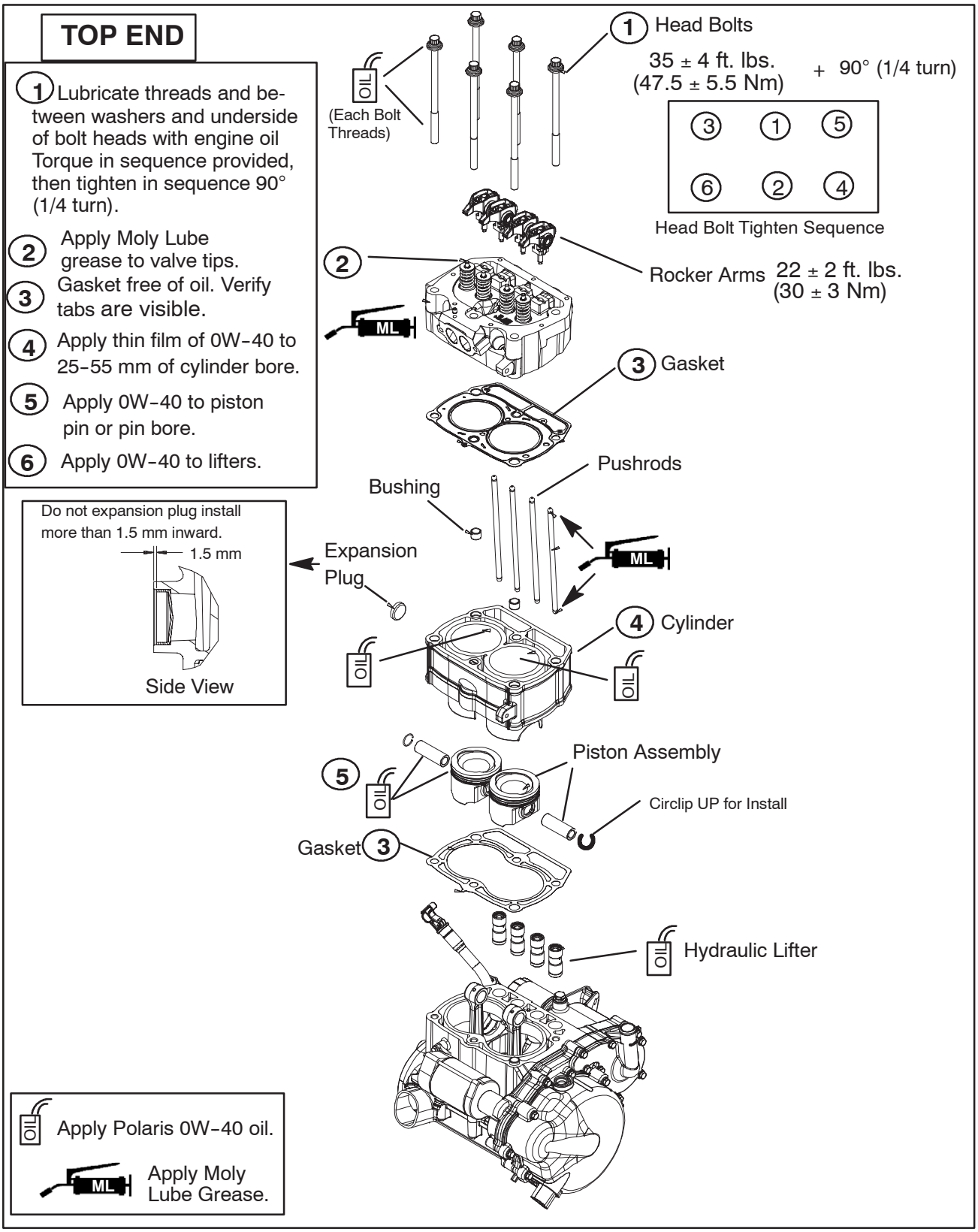




ENGINE EXPLODED VIEW

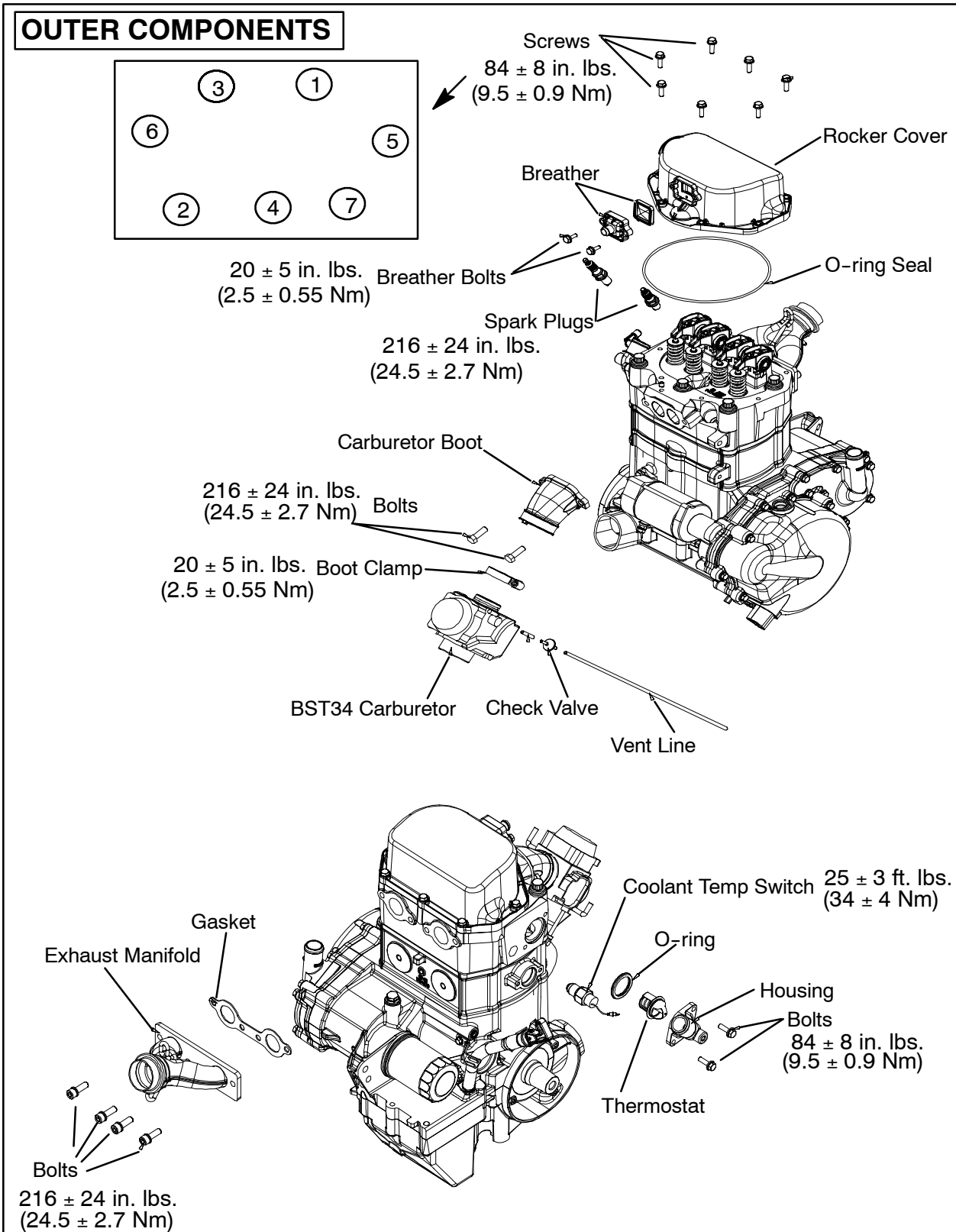


ENGINE EXPLODED VIEW



ENGINE EXPLODED VIEW

OUTER COMPONENTS



SPECIAL TOOLS

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

ACCESSIBLE COMPONENTS

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

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

The following components require engine removal for service:

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

PISTON IDENTIFICATION

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

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

Engine Model No.	Piston Diameter	Standard Piston Identification
EH680ALE	80 mm	None
EH590ALE	76.50 mm	None

TORQUE SPECIFICATIONS

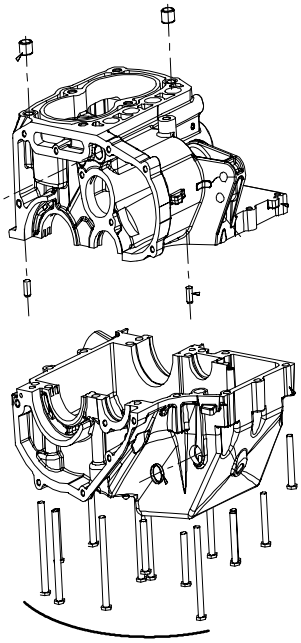
TORQUE SPECIFICATIONS			
Fastener	**Size**	**600/700 in. Lbs. (Nm)**	**600/700 ft.lbs. (Nm)**
Camshaft Gear	8 mm		22 ± 2 (30 ± 3)
Camshaft Thrust Plate	6 mm	115-± 12 (13 ± 1.35)	
Carburetor Adaptor Bolts	8 mm	216 ± 24 (24.5-± 2.7)	
Counterbalance Gear	8 mm		22 ± 2 (30 ± 3)
Crankcase Bolts	8 mm		*22 ± 2 (30 ± 3)
Crankcase Breather	5 mm	20 ± 5 (2.5 ± 0.55)	
Cylinder Head Bolts	11 mm		*35 ± 4 (47.5 ± 5.5)
Exhaust Manifold	8 mm	216 ± 24 (24.5 ± 2.70)	
Flywheel	14 mm		65 ± 7 (88 ± 9.50)
Magneto Cover	6 mm	*96 ± 12 (10.85 ± 0.35)	
Oil Baffle Weldment	5 mm	60 ± 6 (6.8 ± 0.68)	
Oil Drain Bolt (Crankcase)	12 mm	192 ± 24 (21.7 ± 2.7)	
Oil Fill Tube Bolt	5 mm	50 ± 5 (5.64 ± 0.56)	
Oil Filter Pipe Fitting	20 mm		35 ± 4 (47.5 ± 5.4)
Oil Pick Up	5 mm	60 ± 6 (6.8 ± 0.68)	
Oil Pressure Relief Plug	10 mm	22 ± 2 (30 ± 3)	
Oil Pump Housing Screw	6 mm	*84 ± 8 (9.50 ± 0.90)	
Rocker Arm	8 mm		*22 ± 2 (30 ± 3)
Rocker Cover	6 mm	*84 ± 8 (9.5 ± 0.9)	
Spark Plug	14 mm	216 ± 24 (24.5 ± 2.7)	
Starter Motor	6 mm	*84 ± 8 (9.5 ± 0.9)	
Stator Assembly	6 mm	96 ± 12 (10.85 ± 1.35)	
Stator Housing	6 mm	*96 ± 12 (10.85 ± 1.35)	
Temperature Switch	3/8 PT		25 ± 3 (34 ± 4)
Thermostat Housing	6 mm	84 ± 8 (9.5 ± 0.9)	
Timing Plug	3/4-16		7-9 (10-12 Nm)
Trigger Coil/Stator Wire Holddown	5 mm	*96 ± 12 (10.85 ± 1.35)	
Water Pump Housing Cover	6 mm	*96 ± 12 (10.85 ± 1.35)	
Water Pump Impeller Nut	8 mm	108 ± 12 (12 ± 1.35)	

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

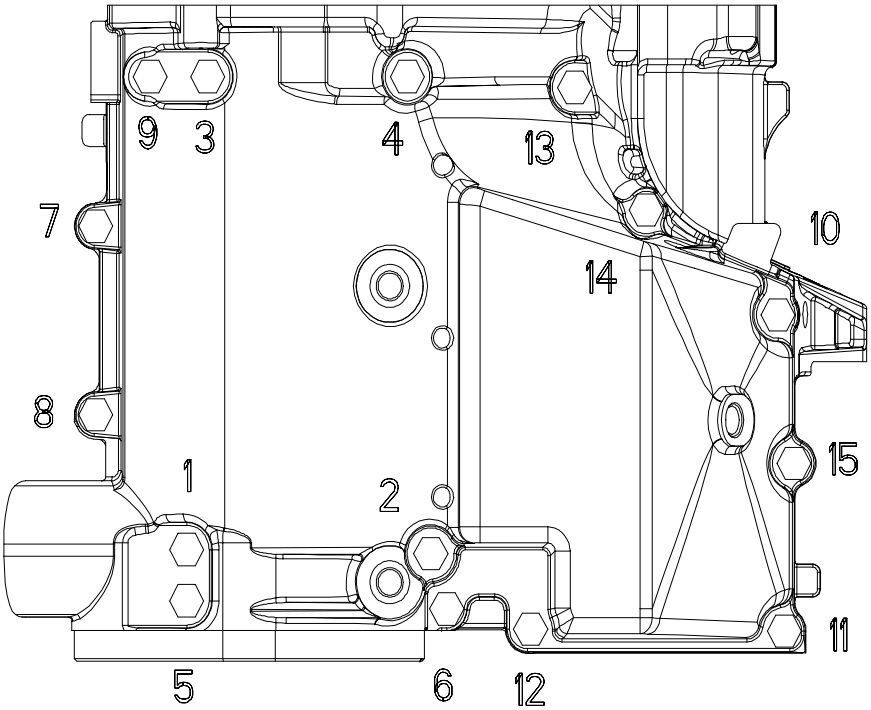
ENGINE FASTENER TORQUE PATTERNS

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

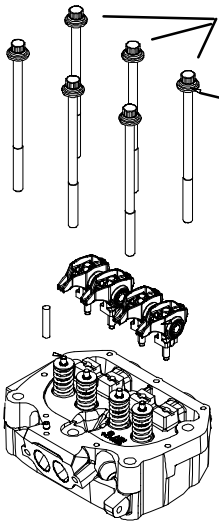
CRANKCASE BOLT TIGHTEN SEQUENCE



22 ± 2 ft. lbs.
(30 ± 3 Nm)

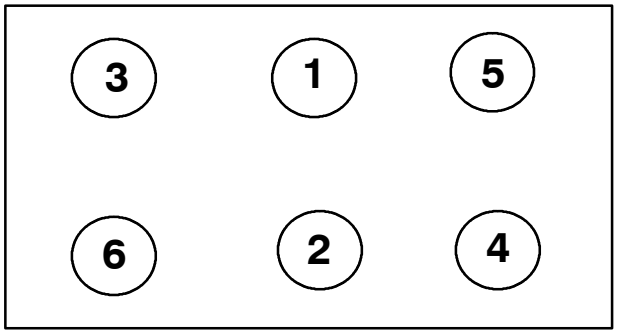


CYLINDER HEAD BOLT TIGHTEN SEQUENCE



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

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



600 ENGINE SERVICE DATA

Cylinder Head / Valve				Engine No. – EH059OLE
Camshaft	Cam lobe height	In	Std	0 .2170" ± 0.00236" (5.5118 ± 0.060 mm)
		Ex	Std	0 .2170" ± 0.00236" (5.5118 ± 0.060 mm)
	Camshaft journal OD		Mag	1.654" ± 0.00039" (42 ± 0.010 mm)
			Center	1.634" ± 0.00039" (41.50 ± 0.010 mm)
			PTO	1.614" ± 0.00039" (41 ± 0.010 mm)
	Camshaft journal bore ID		Mag	1.656" ± 0.00039" (42.07 ± 0.010 mm)
			Center	1.637" ± 0.00039" (41.58 ± 0.010 mm)
			PTO	1.617" ± 0.00039" (41.07 ± 0.010 mm)
	Camshaft Oil clearance		Std	0.00118" ± 0.00079" (0.03 ± 0.02 mm)
	End Play			0.0135" ± 0.0111" (0.3450 ± 0.2825 mm)
Counter Balance	End Play			0.005" (0.127 mm)
Cylinder Head	Surface warpage limit			0.00394" (0.1 mm)
	Standard height			3.478" (88.35 mm)
Valve Seat	Contacting width	In	Std	0.0472" + 0.00787" – 0.0039" (1.20 + 0.20 – 0.10 mm)
		Ex	Std	0.0591" + 0.00787" – 0.0039" (1.50 + 0.20 – 0.10 mm)
	Seat Angle		Std	44.75 ± 0.25°
Valve Guide	Inner diameter			0.2374" ± 0.00059" (6.030 ± 0.015 mm)
	Protrusion above head			0.5610" ± 0.00394" (14.25 ± 0.10 mm)
Valve	Margin thickness	In	Std	0.1394" ± 0.0065" (3.541 ± 0.165 mm)
		Ex	Std	0.1373" ± 0.0065"(3.488 ± 0.165 mm)
	Stem diameter		In	0.2356" ± 0.00039" (5.985 ± 0.01 mm)
			Ex	0.2346" ± 0.00039" (5.96 ± 0.01 mm)
	Stem oil clearance	Std	In	0.00177" ± 0.00098" (0.045 ± 0.025 mm)
			Ex	0.00334" ± 0.00039" (0.085 ± 0.010 mm)
	Overall length		In	4.51" ± 0.01476" (114.5550 ± 0.375 mm)
			Ex	4.5453" ± .01496" (115.45 ± 0.38 mm)
Valve Spring	Overall length		Free Length	1.8267" (46.40 mm)
			Installed Height	1.47" (37.34 mm)

600 ENGINE SERVICE DATA

Cylinder / Piston / Connecting Rod				Engine No. - EH590ALOE
Cylinder	Surface warpage limit (mating with cylinder head)			0.004" (0.10 mm)
	Cylinder bore		Std	3.0118" (76.5mm)
	Taper limit			0.00031" (0.008 mm)
	Out of round limit			0.00030" (0.0075 mm)
	Piston clearance			
			Limit	.0022" ± .00067" (.055 ± .017 mm)
	Boring limit			N/A
Lifter	Outer Diameter		Std	0.84245" ± 0.00025" (21.39 8± 0.00635 mm)
	Block Bore		Std	0.8438" ± 0.00062"(21.4322 ± 0.0157 mm)
Piston		Std		3.0096" ± .00035″ (76.445 ± .009 mm)
	Standard inner diameter of piston pin bore			0.78757" ± .00098″ (20.0045 ± 0.0025 mm)
Piston Pin	Outer diameter			0.7874" - .7872" (20 - 19.995 mm)
	Standard clearance-piston pin to pin bore			0.00027" ± 0.00019" (0.007 ± 0.005 mm)
	Degree of fit			Piston pin must be a push (by hand) fit at 68° F (20° C)
Piston Ring	Piston ring installed gap	Top ring		
			Limit	0.01181" ± 0.00393" (0.30 ± 0.10 mm)
		Second ring		
			Limit	0.01476" ± 0.00492" (0.375 ± 0.125 mm)
		Oil ring		
			Limit	0.00984" ± .00393" (0.25 ± 0.10 mm)
	Standard clearance - piston ring to ring groove	Top ring		
			Limit	0.0019" ± 0.00069" (0.0475 ± 0.0175 mm)
		Second ring		
			Limit	0.0017" ± 0.00049″ (0.0425 ± 0.0125 mm)
Connecting Rod	Connecting rod small end ID			.789" - .78841". (20.030 - 20.015 mm)
	Connecting rod small end radial clearance		Std	0.00098" ± 0.00039" (0.025 ± 0.010 mm)
	Connecting rod big end side clearance			
			Limit	0.01181" ± 0.00591" (0.30 ± 0.15 mm)
	Connecting rod big end radial clearance			
			Limit	0.00015" ± 0.00006" (0.0038 ± 0.0015 mm)
Crankshaft	Crankshaft runout limit			0.00236" (0.060 mm)

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

700 ENGINE SERVICE DATA

Cylinder Head / Valve				Engine No. - EH68ALOE / EH068OLE
Camshaft	Cam lobe height	In	Std	0 .2170" ± 0.00236" (5.5118 ± 0.060 mm)
		Ex	Std	0 .2170" ± 0.00236" (5.5118 ± 0.060 mm)
	Camshaft journal OD		Mag	1.654" ± 0.00039" (42 ± 0.010 mm)
			Center	1.634" ± 0.00039" (41.50 ± 0.010 mm)
			PTO	1.614" ± 0.00039" (41 ± 0.010 mm)
	Camshaft journal bore ID		Mag	1.656" ± 0.00039" (42.07 ± 0.010 mm)
			Center	1.637" ± 0.00039" (41.58 ± 0.010 mm)
			PTO	1.617" ± 0.00039" (41.07 ± 0.010 mm)
	Camshaft Oil clearance		Std	0.00118" ± 0.00079" (0.03 ± 0.02 mm)
	End Play			0.0167" ± 0.0098" (0.425 ± 0.25 mm)
Counter Balance	End Play			0.005" (0.127 mm)
Cylinder Head	Surface warpage limit			0.00394" (0.1 mm)
	Standard height			3.478" (88.35 mm)
Valve Seat	Contacting width	In	Std	0.0472" + 0.00787" - 0.0039" (1.20 + 0.20 - 0.10 mm)
		Ex	Std	0.0591" + 0.00787" - 0.0039" (1.50 + 0.20 - 0.10 mm)
	Seat Angle		Std	44.75 ± 0.25°
Valve Guide	Inner diameter			0.2374" ± 0.00059" (6.030 ± 0.015 mm)
	Protrusion above head			0.5610" ± 0.00394" (14.25 ± 0.10 mm)
Valve	Margin thickness	In	Std	0.1394" ± 0.0065" (3.541 ± 0.165 mm)
		Ex	Std	0.1373" ± 0.0065"(3.488 ± 0.165 mm)
	Stem diameter		In	0.2356" ± 0.00039" (5.985 ± 0.01 mm)
			Ex	0.2346" ± 0.00039" (5.96 ± 0.01 mm)
	Stem oil clearance	Std	In	0.00177" ± 0.00098" (0.045 ± 0.025 mm)
			Ex	0.00334" ± 0.00039" (0.085 ± 0.010 mm)
	Overall length		In	4.51" ± 0.01476" (114.5550 ± 0.375 mm)
			Ex	4.5453" ± .01496" (115.45 ± 0.38 mm)
Valve Spring	Overall length		Free Length	1.8267" (46.40 mm)
			Installed Height	1.47" (37.34 mm)

700 ENGINE SERVICE DATA

Cylinder / Piston / Connecting Rod				Engine No. – EH68ALOE / EH068OLE
Cylinder	Surface warpage limit (mating with cylinder head)			0.004” (0.10 mm)
	Cylinder bore		Std	3.1495” (80 mm)
	Taper limit			0.00031” (0.008 mm)
	Out of round limit			0.00030” (0.0075 mm)
	Piston clearance			
			Limit	.0016” ± .00063” (.041 ± .016 mm)
	Boring limit			N/A
Lifter	Outer Diameter		Std	0.84245” ± 0.00025” (21.39 8± 0.00635 mm)
	Block Bore		Std	0.8438” ± 0.00062”(21.4322 ± 0.0157 mm)
Piston		Std		3.1477” ± .00012″ (79.954 ± .003 mm)
	Standard inner diameter of piston pin bore			0.78789” ± .0000098″ (20.0125 ± 0.0025 mm)
Piston Pin	Outer diameter			0.7874” – .7872” (20 – 19.995 mm)
	Standard clearance-piston pin to pin bore			0.00059” ± 0.0002” (0.015 ± 0.005 mm)
	Degree of fit			Piston pin must be a push (by hand) fit at 68° F (20° C)
Piston Ring	Piston ring installed gap	Top ring		
			Limit	0.01083” ± 0.00295” (0.275 ± 0.075 mm)
		Second ring		
			Limit	0.0177” ± 0.00394” (0.45 ± 0.10 mm)
		Oil ring		
			Limit	0.0177” ± .00984” (0.45 ± 0.25 mm)
	Standard clearance - piston ring to ring groove	Top ring		
			Limit	0.0019” ± 0.00069” (0.0475 ± 0.0175 mm)
		Second ring		
			Limit	0.0017” ± 0.00049″ (0.0425 ± 0.0125 mm)
Connecting Rod	Connecting rod small end ID			.789” – .78841”. (20.030 – 20.015 mm)
	Connecting rod small end radial clearance		Std	0.00098” ± 0.00039” (0.025 ± 0.010 mm)
	Connecting rod big end side clearance			
			Limit	0.01181” ± 0.00591” (0.30 ± 0.15 mm)
	Connecting rod big end radial clearance			
			Limit	0.00015” ± 0.00006” (0.0038 ± 0.0015 mm)
Crankshaft	Crankshaft runout limit			0.00236” (0.060 mm)

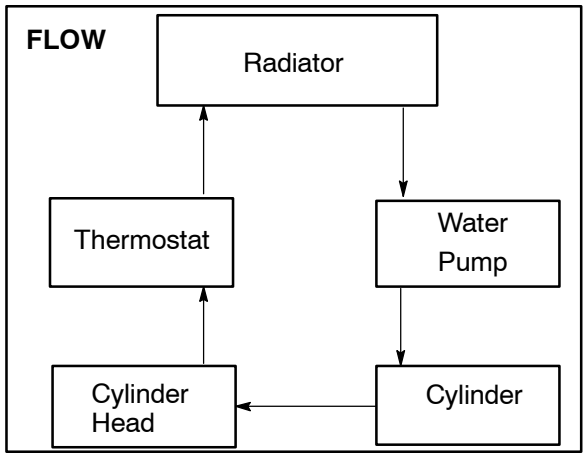
KEY - Std: Standard; OS: Oversize; ID: Inner Diameter; OD: Outer Diameter; Mag: Magneto Side; PTO: Power Take Off Side

COOLING SYSTEM SPECIFICATIONS

Fan Switch (Off) Fan Switch (On)	149° F (65° C) ± 8° 180° F (82° C) ± 3°
Hot Warning	221° F (105° C)
System Capacity	2.25 Quarts
Radiator Cap Relief Pressure	13 PSI
Thermostat	Starts opening 176° F (80° C) Open 8mm @ 205° F (96° C)

Recommended Coolant

Use only high quality antifreeze/coolant mixed with *distilled* water in a 50/50 or 60/40 ratio, depending on freeze protection required in your area. **CAUTION:** Using tap water in the cooling system will lead to a buildup of deposits which may restrict coolant flow and reduce heat dissipation, resulting in possible engine damage. Polaris Premium 60/40 Antifreeze/Coolant is recommended for use in all cooling systems and comes pre-mixed, ready to use.



COOLING SYSTEM

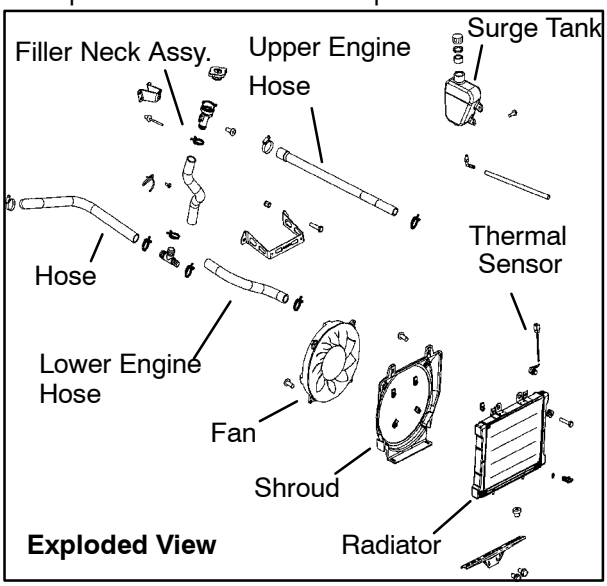
⚠ WARNING

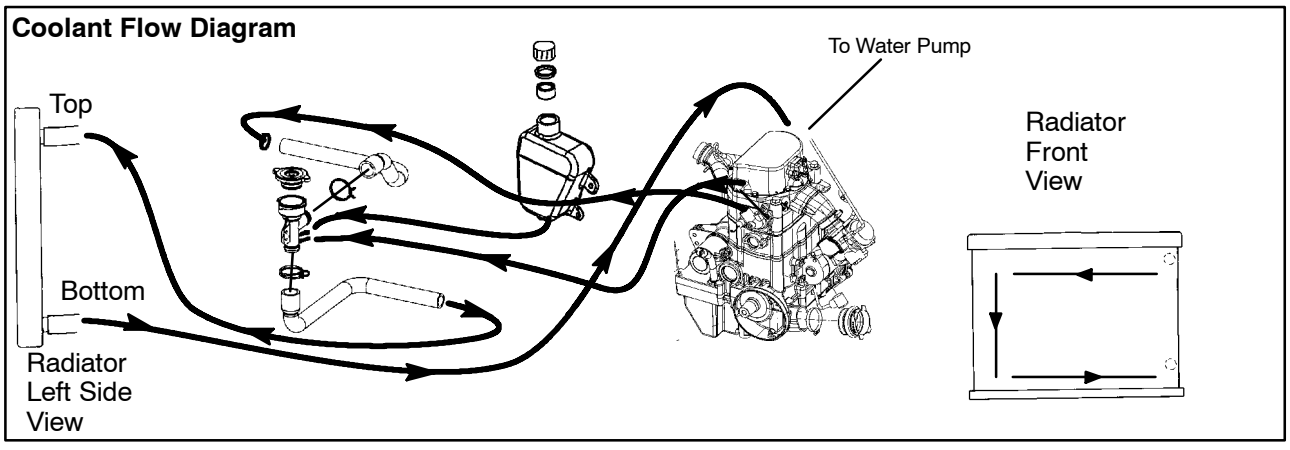
Never remove radiator cap when engine is warm or hot. The cooling system is under pressure and serious burns may result. Allow the engine and cooling system to cool before servicing.

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

Radiator Cap Pressure Test

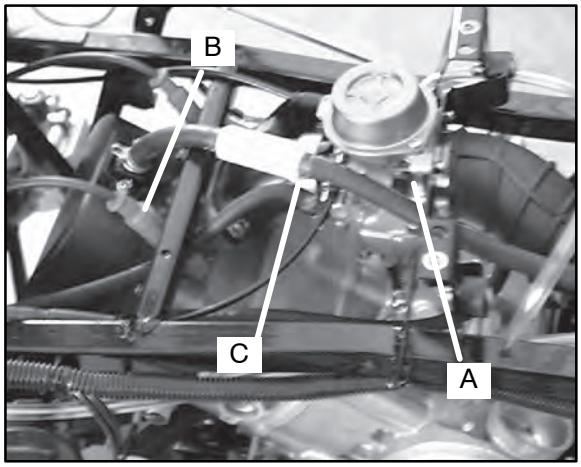
1. Remove radiator cap and test cap using a commercially available cap tester.
2. The radiator cap relief pressure is 13 lbs. Replace cap if it does not meet this specification.



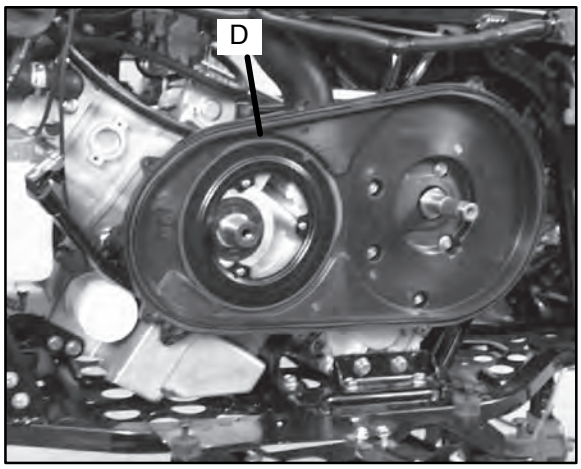


ENGINE REMOVE & INSTALL

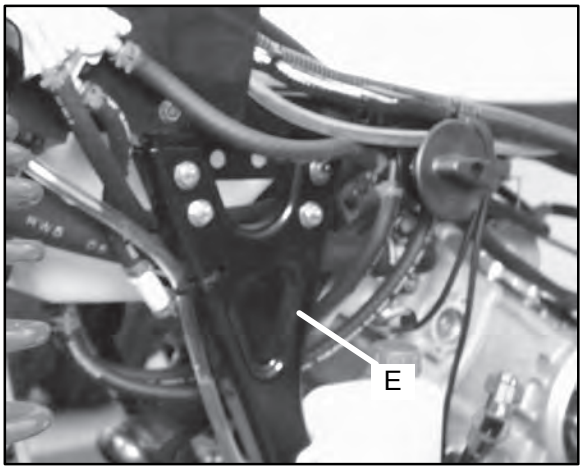
1. Clean work area.
2. Thoroughly clean the ATV engine and chassis.
3. Disconnect battery negative (-) cable.
4. Remove the following parts as required:
   - Seat
   - Left and Right Side Covers (Refer to Chapter 5)
   - Fuel Tank Cover / Front Cab (Refer to Chapter 5)
   - Fuel Tank (Refer to Chapter 4)
5. Remove springs from exhaust pipe and remove pipe.
6. Drain coolant and engine oil.
7. Remove air pre-cleaner and duct.
8. Remove airbox.



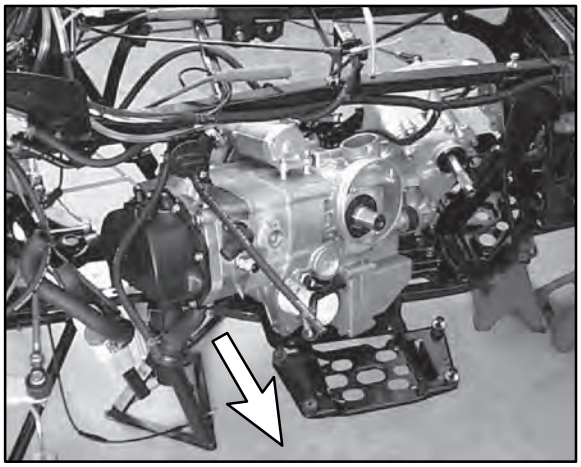
9. Remove carburetor (A). Insert a shop towel into the carburetor flange to prevent dirt from entering the intake port.
10. Disconnect spark plug high tension lead (B).
11. Remove the air breather line (C).



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



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



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

20. For engine installation, reverse these procedures.

ENGINE INSTALLATION NOTES

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

General Items

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

PVT System

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

Transmission

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

Exhaust

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

Bleed Cooling System

NOTE: This cooling system contains vent lines to help purge trapped air during filling. Refer to Page 3.14 for hose routing. Bleeding generally should not be necessary.

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

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

Engine Break In Period

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

CAUTION

Use only Polaris Premium 0–40W All Season synthetic oil or equivalent. Never substitute or mix oil brands. Serious engine damage and voiding of warranty can result.

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

1. Fill fuel tank with unleaded or leaded fuel which has a minimum pump octane number of 87= (R+ M)/2.
2. Check oil reservoir level indicated on dipstick. Add oil if necessary.

3. Drive slowly at first to gradually bring engine up to operating temperature.
4. Vary throttle positions. Do not operate at sustained idle or sustained high speed.
5. Perform regular checks on fluid levels, controls and all important areas on the vehicle.
6. Pull only light loads during initial break in.
7. Change break in oil and filter at 20 hours or 200 miles.

CYLINDER HONE SELECTION AND HONING PROCEDURE

CAUTION:

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

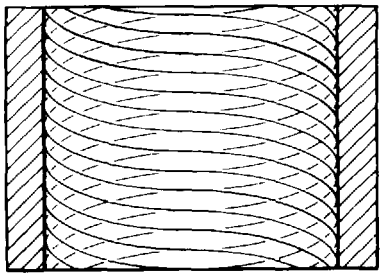
Cylinders may be wet or dry honed depending upon the hone manufacturer's recommendations. Wet honing removes more material faster and leaves a more distinct pattern in the bore.

HONING TO DEGLAZE

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

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

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



EXAMPLE OF CROSS HATCH PATTERN

IMPORTANT: Clean the Cylinder After Honing

It is very important that the cylinder be thoroughly cleaned after honing to remove all grit material. Wash the cylinder in a solvent, then in hot, soapy water. Use electrical contact cleaner if necessary to clean these areas. Rinse thoroughly, dry with compressed air, and oil the bore immediately with Polaris 4 Cycle Lubricant to prevent the formation of surface rust.

ENGINE LUBRICATION

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

Capacity – Approximately 2 U.S. Quarts (1.9 l)

Filter – (**PN 2540006**)

Filter Wrench – PV-43527 or equivalent

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

OIL PRESSURE TEST

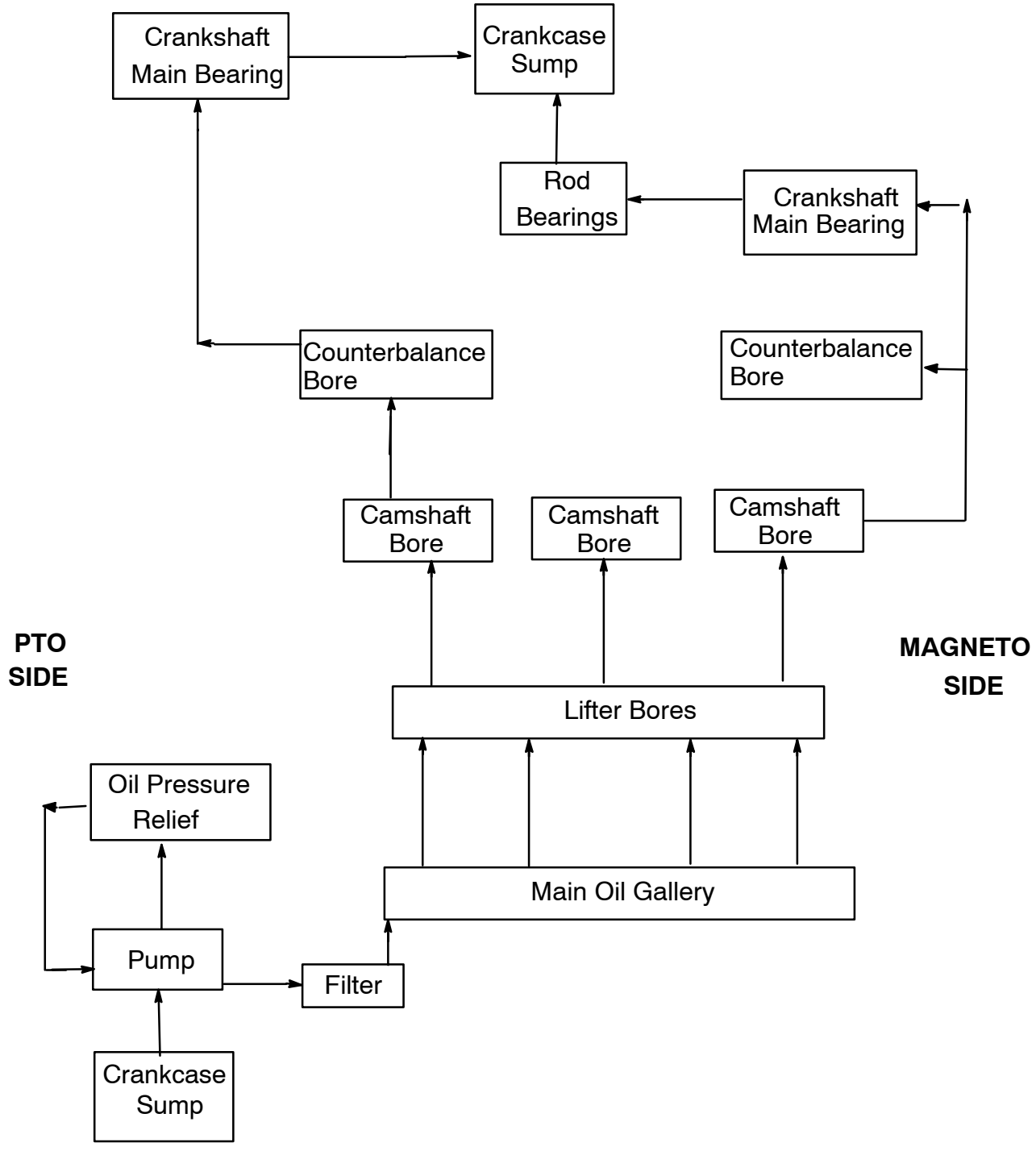
1. Remove blind plug/sender from left side of crankcase.
2. Insert a 1/8 NPT oil pressure gauge adaptor into the crankcase and attach the gauge.
3. Start engine and allow it to reach operating temperature, monitoring gauge indicator.

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

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

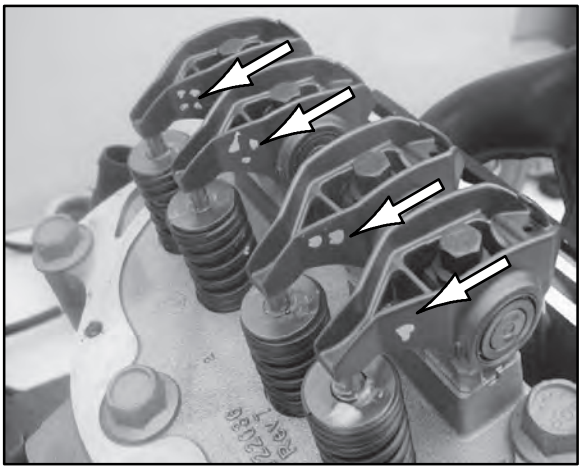
OIL FLOW

This chart describes the flow of oil through the EH68 and the EH059 engine. Beginning in the crankcase sump, the oil is drawn through an oil galley to the feed side of the oil pump. The oil is then pumped through the oil filter. If the oil filter is obstructed, a bypass valve contained in the filter allows oil to bypass the filter element. At this point, the oil is supplied to the main oil galley through a crankcase passage. Oil is then diverted three ways from the main oil galley, with the first path entering the camshaft bores, onto the rear balance shaft journal and then draining back into the crankcase sump. The second oil path from the main oil galley feeds the lifter bores and then drains back to the crankcase sump. The third oil path flows through a crankcase galley to the MAG side crankshaft journal and also to the front balance shaft journal and onto the crankcase sump. The oil pressure switch is fed off the main oil galley.



ROCKER ARM INSPECTION

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



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

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

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

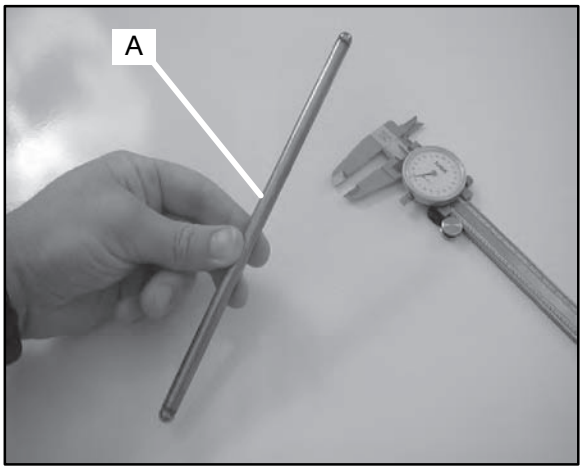
PUSH ROD INSPECTION

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

⚠ WARNING

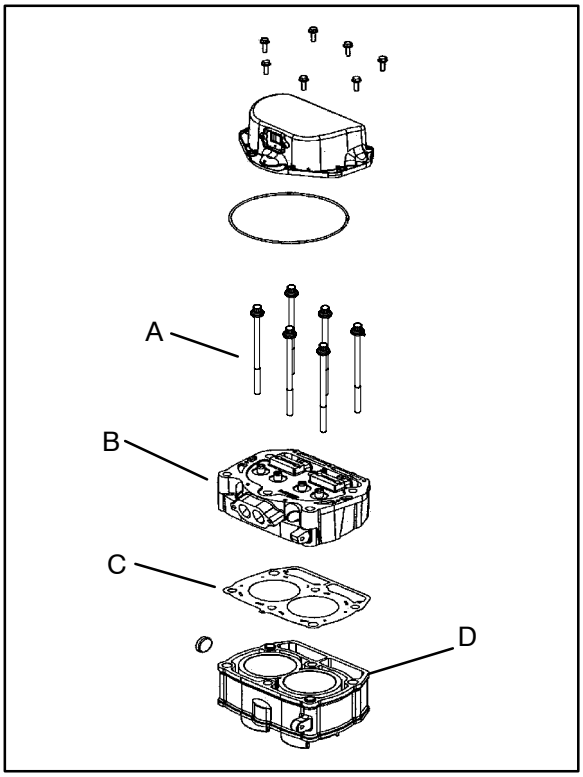
Always wear safety glasses when working with compressed air to prevent personal injury.

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



CYLINDER HEAD REMOVAL

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



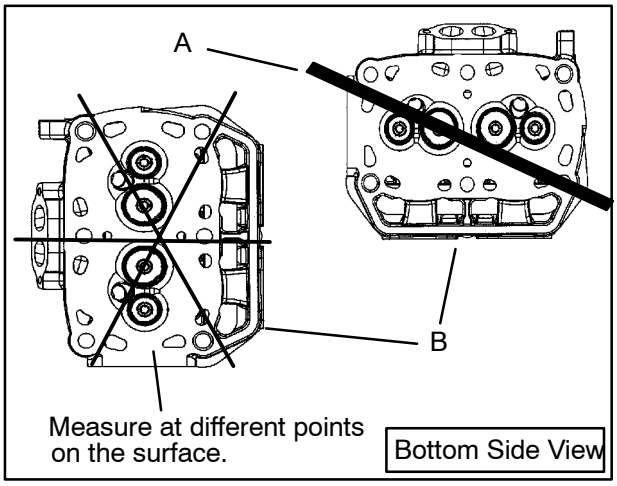
CYLINDER HEAD INSPECTION

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

CAUTION: Use care not to damage sealing surface.

CYLINDER HEAD WARPAGE

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



Cylinder Head Warpage Limit:

004″ (.1016 mm) Max.

CYLINDER HEAD DISASSEMBLY

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

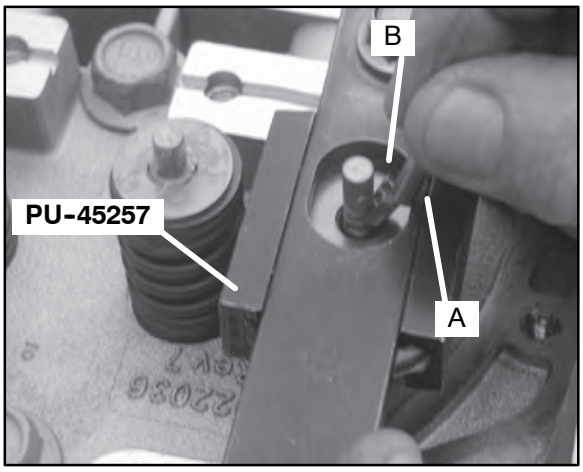
Valve Train Servicing

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

⚠ WARNING

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

1. Having already removed the valve cover, rocker arms and pushrods, align the cylinder to be worked on at top dead center. Install the Valve Pressure Hose (**PU-45652**) into the spark plug hole. Hook the hose to an air compressor and supply 50 to100 psi to the hose. This will seat the valves during valve spring removal. Do not remove air from the hose at anytime until reassembly is completed.
2. Using the Valve Spring Compressor (**PU-45257**), compress the valve spring and remove the valve keepers. **NOTE:** A small parts magnet (A) can aid in the removal of the retainers (B).



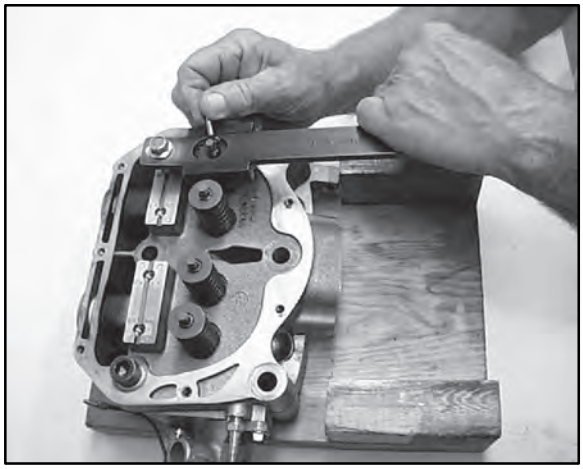
Valve Spring Compressor:
(PU-45257)
Valve Pressure Hose:
(PU-45652)

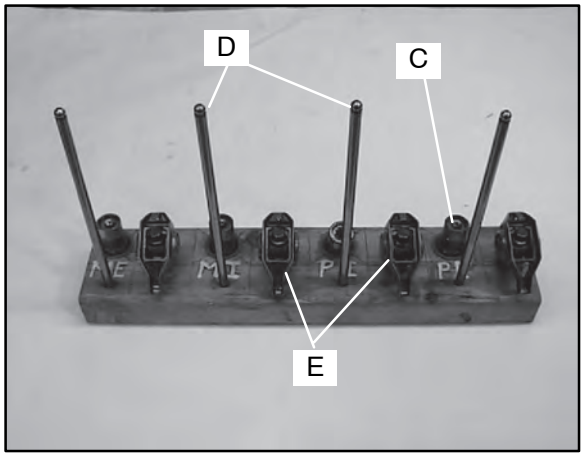
NOTE: To prevent damage to the valve seals, do not compress the valve spring more than is needed to remove the valve keepers.

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

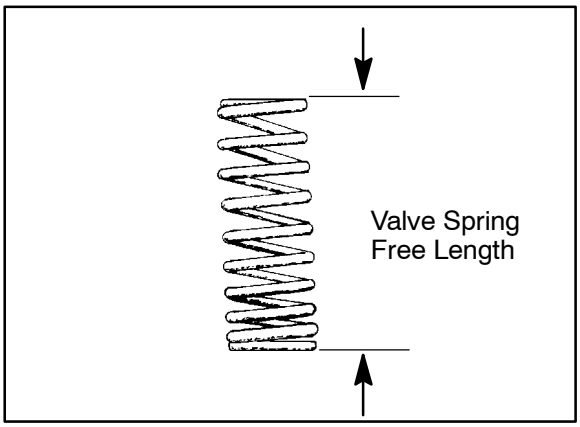
CYLINDER HEAD DISASSEMBLY, CONT.

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





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

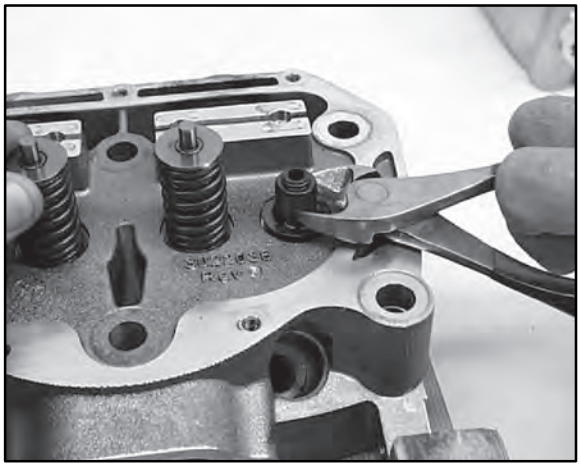


Valve Spring Length:

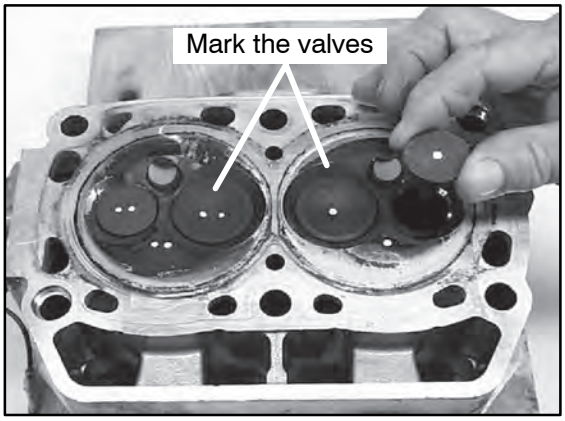
Std: 1.827″ (46.40 mm)

Installed Height: 1.47” (37.34 mm)

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

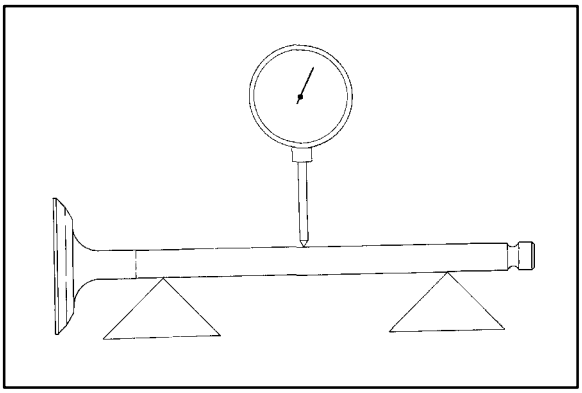


7. Mark the valves with a white pen. Remove the valves from the cylinder head. This will ensure that the valves are properly placed during engine reassembly.

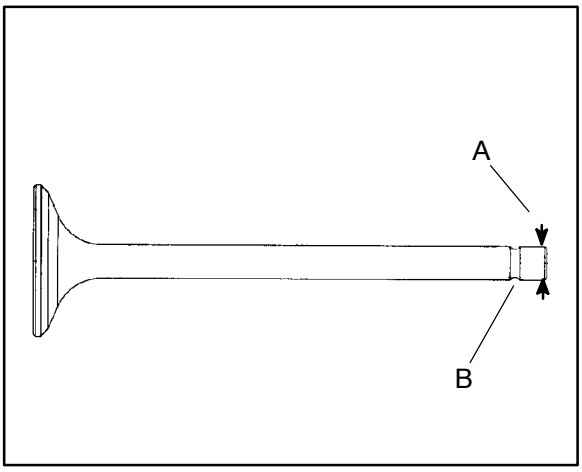


VALVE INSPECTION

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



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



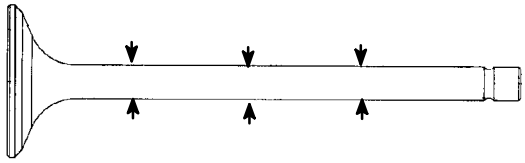
4. Inspect split keeper groove for wear or flaring of the keeper seat area (B). **NOTE:** The valves can be re-faced or end ground, if necessary. They must be replaced if extensively worn, burnt, bent, or damaged.
5. Measure diameter of valve stem with a micrometer in three places, then rotate 90 degrees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

Valve Stem Diameter:

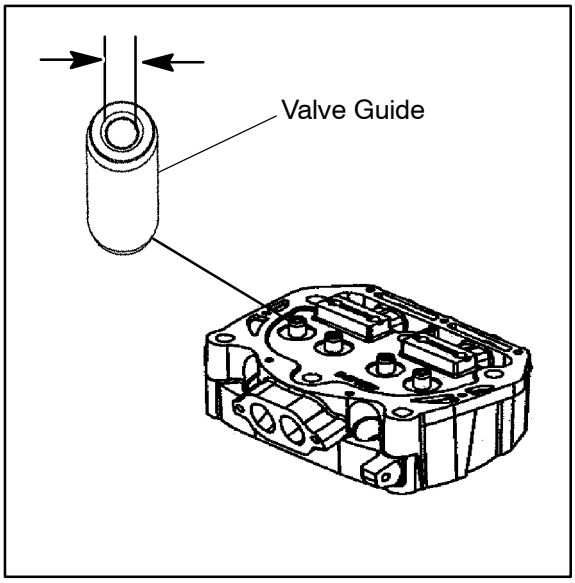
Intake: 0.2356" ± 0.00039" (5.985 ± 0.01 mm)

Exhaust: 0.2346" ± 0.00039" (5.96 ± 0.01 mm)

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



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



Valve Guide I.D.:

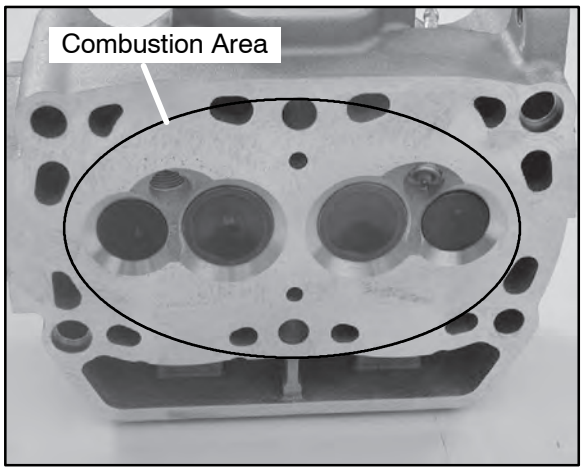
0.2374" ± 0.00059" (6.030 ± 0.015 mm)

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

COMBUSTION CHAMBER

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

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



VALVE SEAT RECONDITIONING

Cylinder Head Reconditioning

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

NOTE: The cylinder head valve guides cannot be replaced.

⚠ WARNING

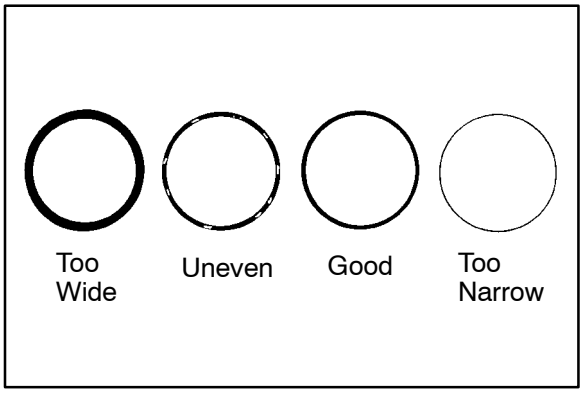
Wear eye protection or a face shield during cylinder head disassembly and reassembly.

Valve Seat Inspection

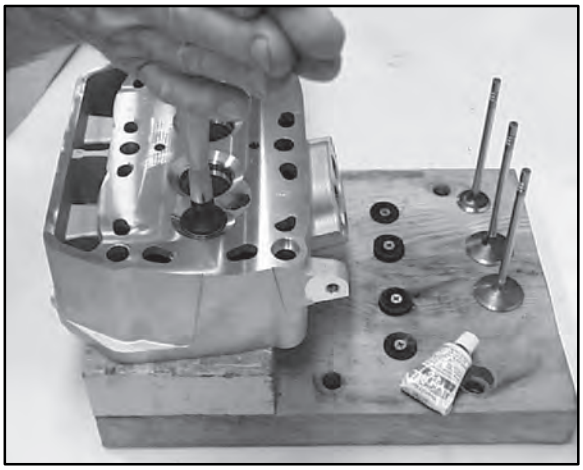
Inspect valve seat in cylinder head for pitting, burnt spots, roughness, and uneven surface. If any of the above conditions exist, the valve seat must be reconditioned. *If the valve seat is cracked the cylinder head must be replaced.*

Follow the manufacturers instructions provided with the valve seat cutters in the Cylinder Head Reconditioning Kit (**PN 2200634**). Abrasive stone seat reconditioning equipment can also be used. Keep all valves in order with their respective seat.

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



1. Install pilot into valve guide.

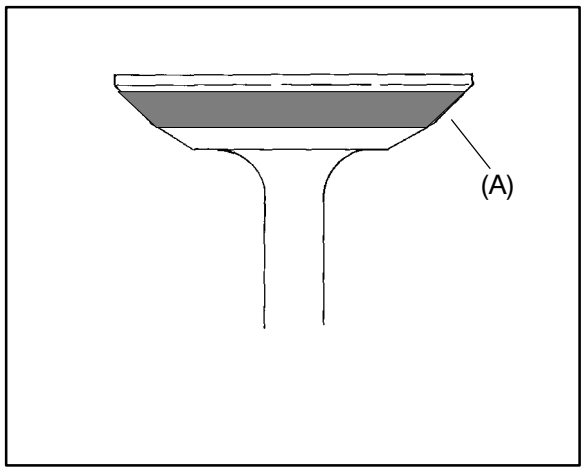


2. Apply cutting oil to valve seat and cutter.
3. Place 46° cutter on the pilot and make a light cut.
4. Inspect the cut area of the seat:
   - If the contact area is less than 75% of the circumference of the seat, rotate the pilot 180° and make another light cut.
   - If the cutter now contacts the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

VALVE SEAT RECONDITIONING CONT'D

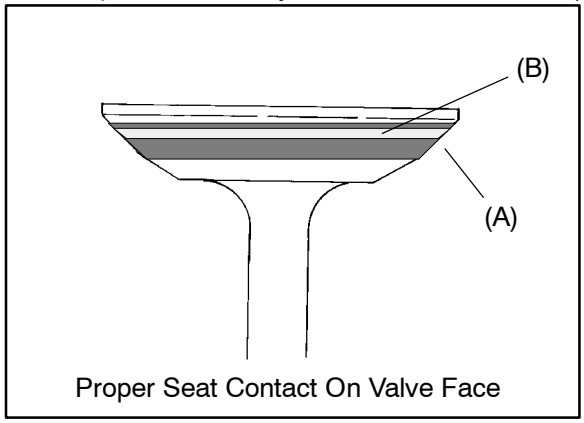
- If the contact area of the cutter is in the same place, the valve guide is distorted from improper installation.
- If the contact area of the initial cut is greater than 75%, continue to cut the seat until all pits are removed and a new seat surface is evident. **NOTE:** Remove only the amount of material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

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

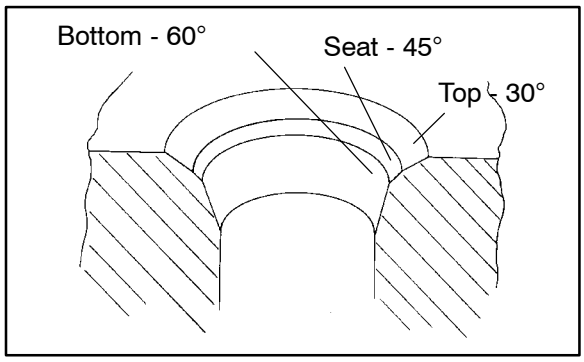


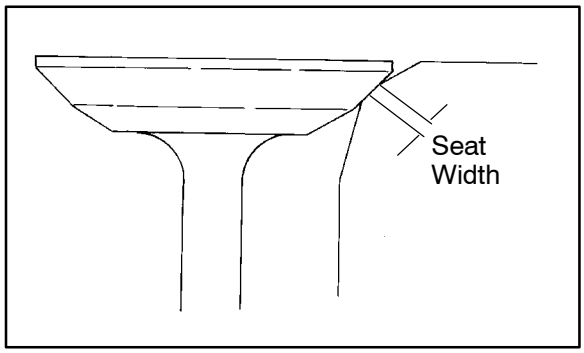
6. Insert valve into guide and tap valve lightly into place a few times.
7. Remove valve and check where the Prussian Blue™ indicates seat contact on the valve face. The valve seat should contact the middle of the valve face or slightly above, and must be the proper width.
   - If the indicated seat contact is at the top edge of the valve face and contacts the margin area(B) it is too high on the valve face. Use the 30° cutter to lower the valve seat.
   - If too low, use the 60° cutter to raise the seat. When contact area is centered on the valve face, measure seat width.
   - If the seat is too wide or uneven, use both top and bottom cutters to narrow the seat.
   - If the seat is too narrow, widen using the 45° cutter and re-check contact point on the valve face and seat width after each cut.

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



Proper Seat Contact On Valve Face





Valve Seat Width:

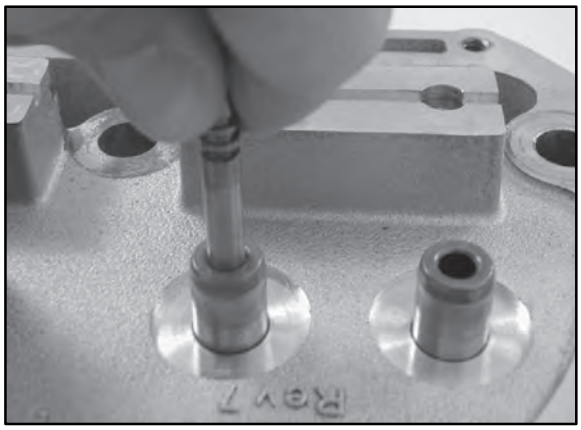
Intake Std: .028″ (.7 mm)
Limit: .055″ (1.4 mm)
Exhaust Std: .039″ (1.0 mm)
Limit: .071″ (1.8 mm)

VALVE SEAT RECONDITIONING CONT"D

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

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

9. Lubricate the valve guides with clean engine oil, and apply oil or water based lapping compound to the face of the valve. **NOTE**: Lapping is not required with an interference angle valve job.
10. Insert the valve into its respective guide and lap using a lapping tool or a section of fuel line connected to the valve stem.

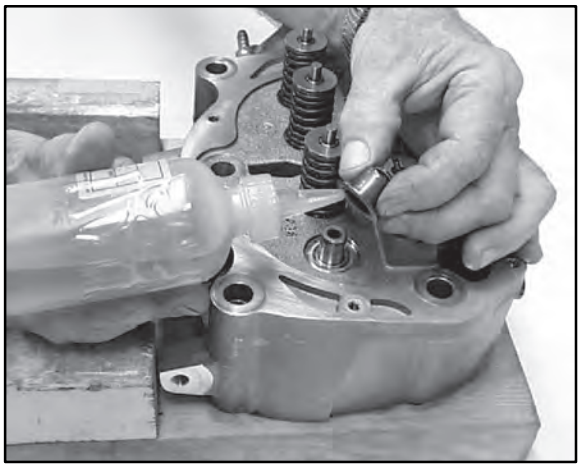


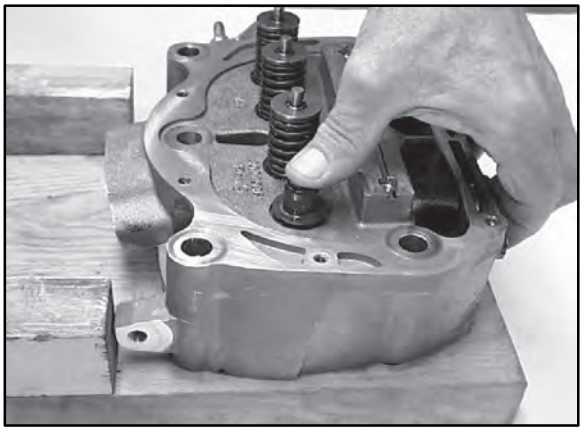
11. Rotate the valve rapidly back and forth until the cut sounds smooth. Lift the valve slightly off of the seat, rotate 1/4 turn, and repeat the lapping process. Do this four to five times until the valve is fully seated, and repeat process for the other valve(s).
12. Thoroughly clean cylinder head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

CYLINDER HEAD REASSEMBLY

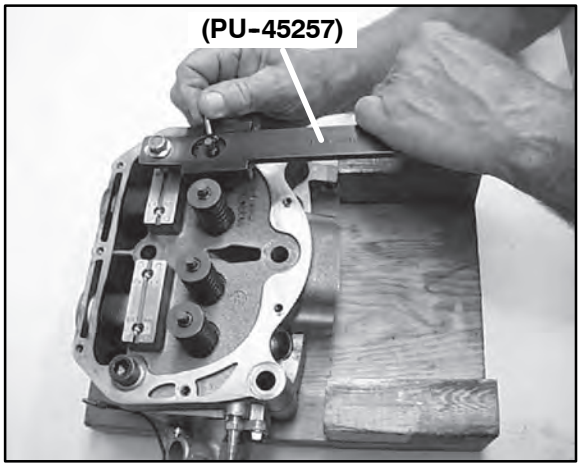
NOTE: Assemble the valves one at a time to maintain proper order.

1. Apply engine oil to valve guides and seats.
2. Coat valve stem with molybdenum disulfide grease or 0W–40 Synthetic oil.
3. Install valve carefully with a rotating motion to avoid damaging valve seal.
4. Valve seals should be installed after the valves are in the head to avoid valve seal damage. Install new valve seals on valve guides.





5. Dip valve spring and retainer in clean engine oil and install.
6. Place retainer on spring and install Valve Spring Compressor (**PU-45257**). Install split keepers with the gap even on both sides. NOTE: A small parts magnet can aid in installation of the keepers.

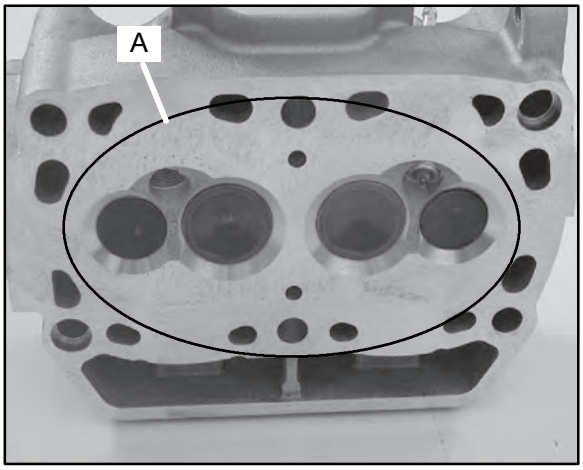


7. Repeat procedure for remaining valves. When all valves are installed, tap lightly with soft faced hammer on the end of the valves to seat the split keepers. **NOTE:** To prevent damage to the valve seals, do not compress the valve spring more than necessary to install the keepers.

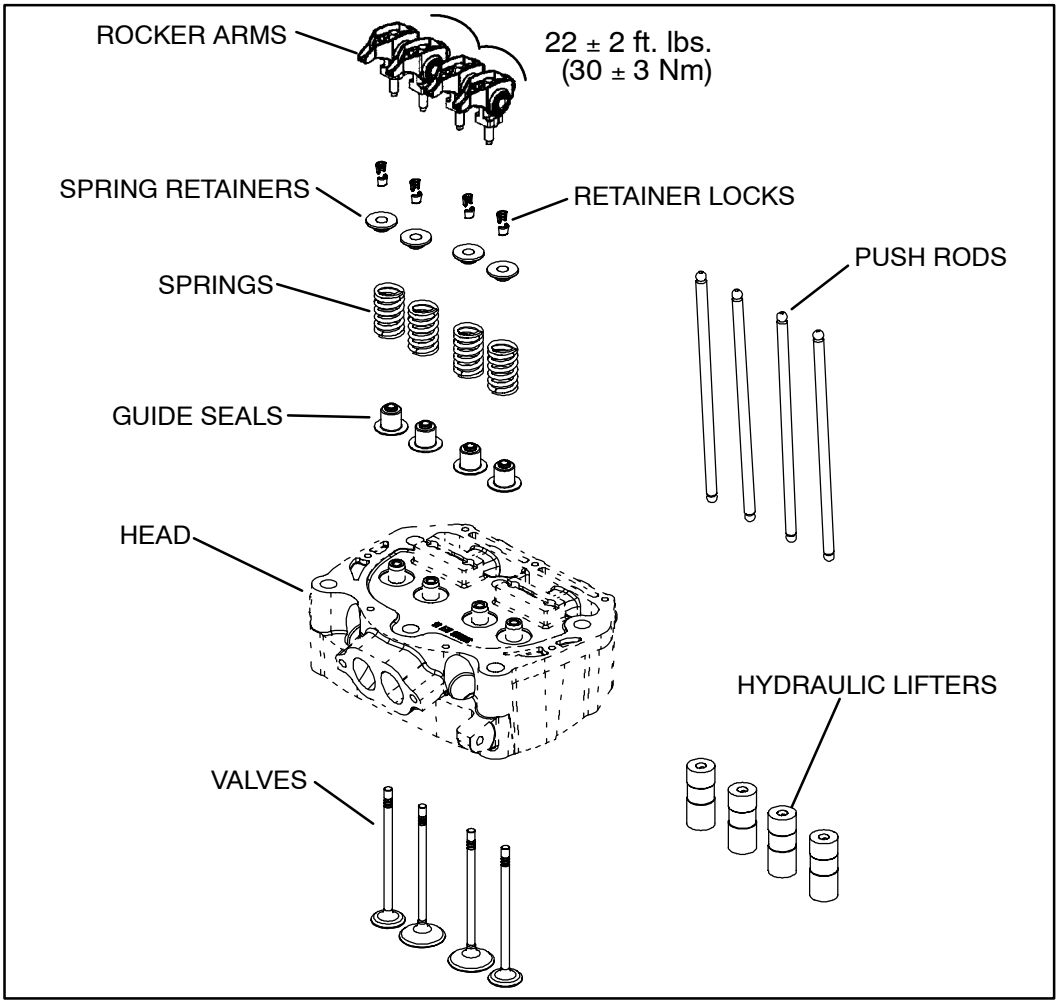
VALVE SEALING TEST

1. Clean and dry the combustion chamber area (A). Refer to Page 3.23 for cleaning tips.

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



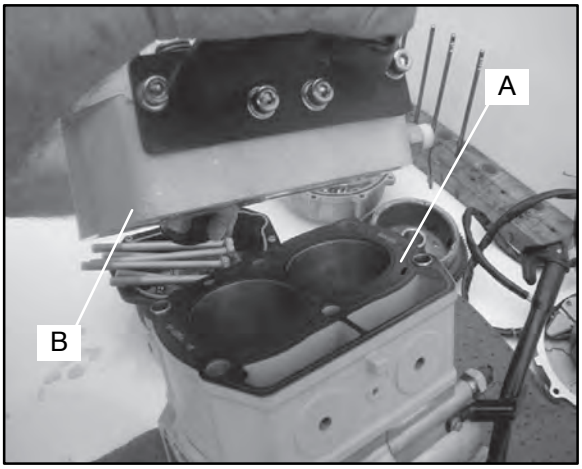
VALVE TRAIN EXPLODED VIEW



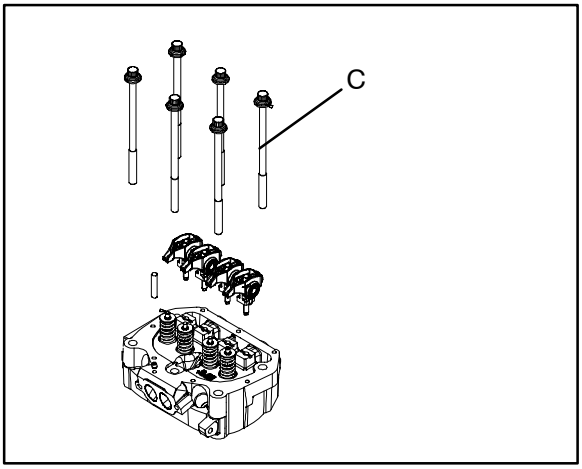
ENGINE HEAD REASSEMBLY

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

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

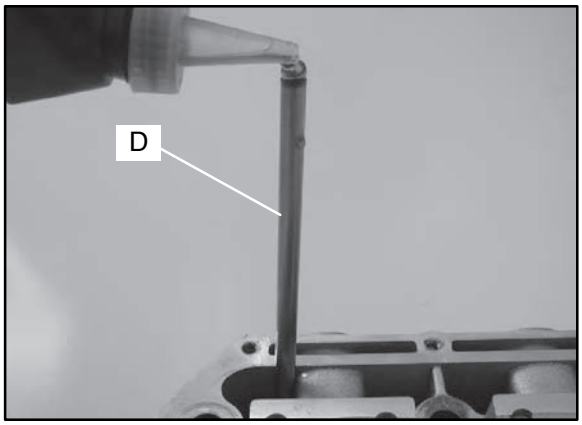


2. Install cylinder head on cylinder.
3. Lubricate threads and top of washers underside of bolt head with engine oil. Install head bolts (C). Torque to 35 ± 4 ft. lbs. (47.5 ± 5.5 Nm) in sequence provided (Pg.3.9). Allow the gasket to set for 1 minute at this torque, then turn bolts 90° (1/4 turn) in sequence . Refer to Page 3.9 for tightening sequence.

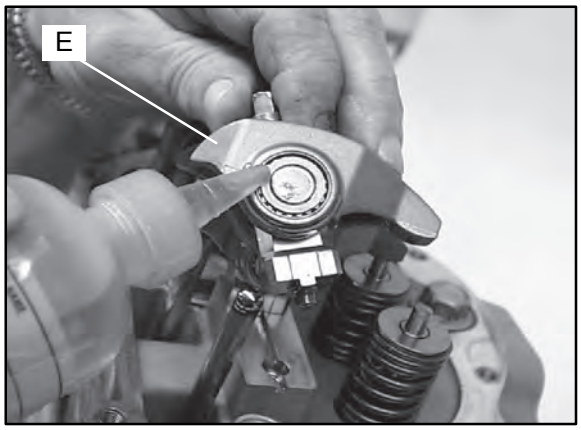


Cylinder Head Bolt Torque:
35 ± 4 ft. lbs. (47.5 ± 5.5 Nm) - Allow to set for 1 min.
Then turn additional 90° (1/4 turn)
***Torque Bolts In Sequence (Pg. 3.9)**

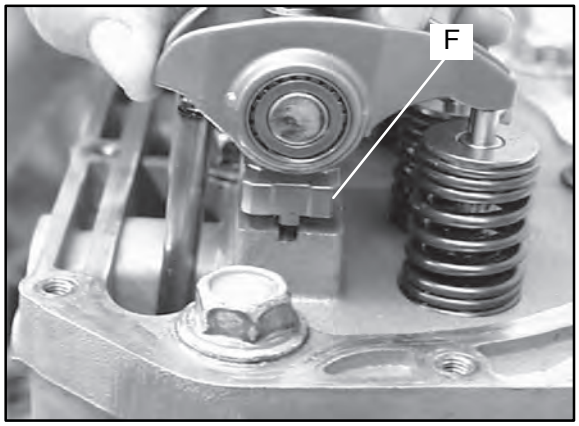
4. Lubricate push rods (D) and install into lifters.



5. Lubricate rockers (E) with engine oil.



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



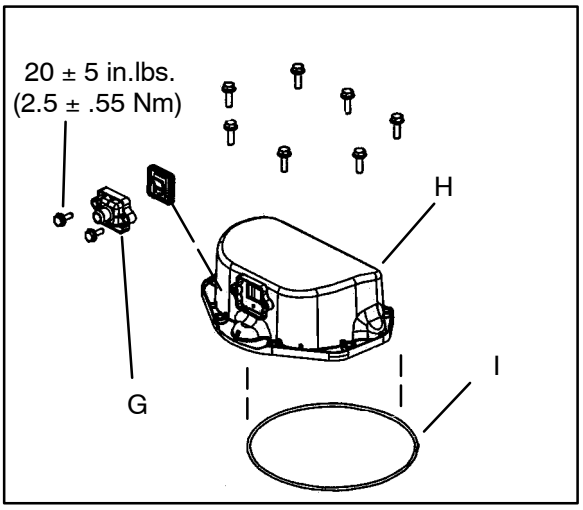
Rocker Arm Bolt Torque:
22 ± 2 ft. lbs.
(30 ± 3 Nm)

ENGINE HEAD REASSEMBLY CONT'D

8. Install breather reed (G) into rocker cover (H). Lightly apply black RTV sealant to the outer edges of the breather reed. The reed has a tab and will assemble one way only. Torque the breather bolts to 20 ± 5 in. lbs. (2.5 ± 0.55 Nm).

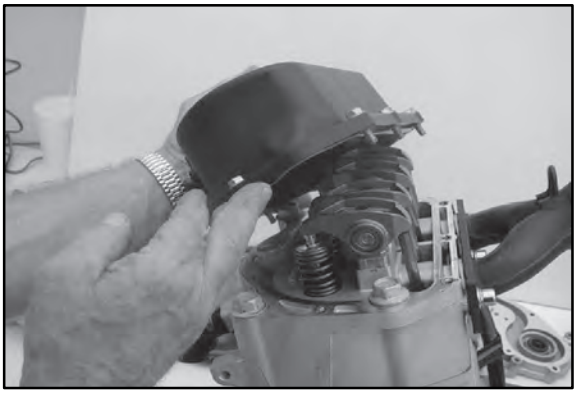
NOTE: When applying RTV, do not get any RTV inside the reed assembly.

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



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

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

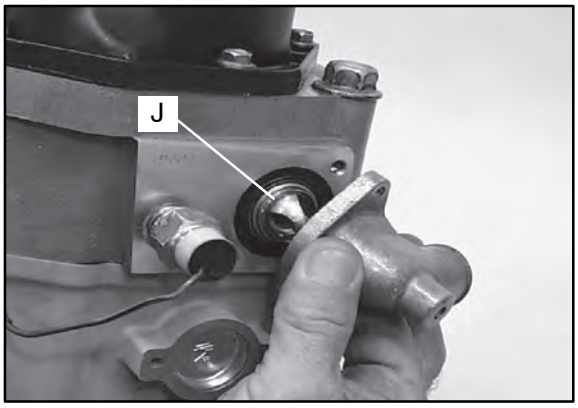


Rocker Cover Bolt Torque:

84 ± 8 in. lbs. (9.5 ± 0.9 Nm)

***Torque In Proper Sequence (Pg. 3.6)**

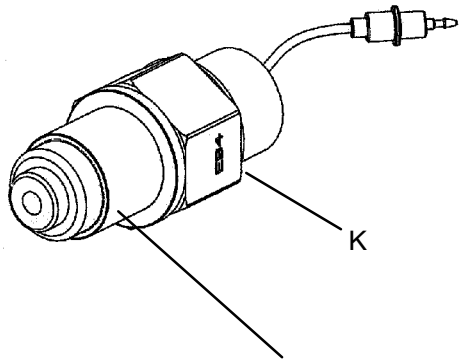
11. Install thermostat (J), new O-ring, and thermostat housing. Torque thermostat housing bolts to 84 ± 8 in.lbs. (9.5 ± 0.9 Nm).



Thermostat Housing Bolt Torque:

84 ± 8 in. lbs. (9.5 ± 0.9 Nm)

12. Apply pipe dope or Teflon tape to pipe threads of coolant temperature sender (K). Install and torque to 25 ± 3 ft. lbs. (34 ± 4 Nm). See Pg. 3.6 for placement.

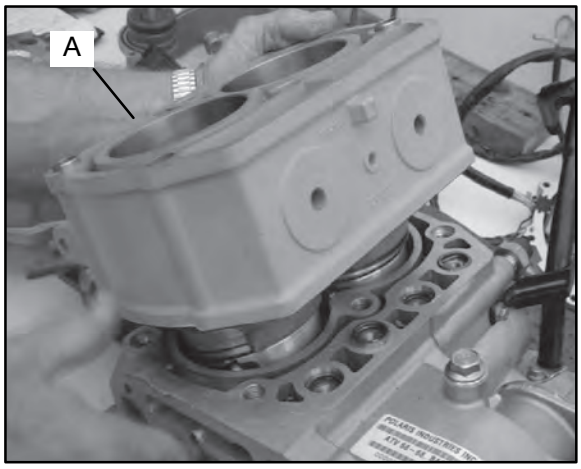


Apply pipe sealant or Teflon tape to threads.

Temperature Sender Torque:
25 ± 3 ft. lbs. (34 ± 4 Nm)

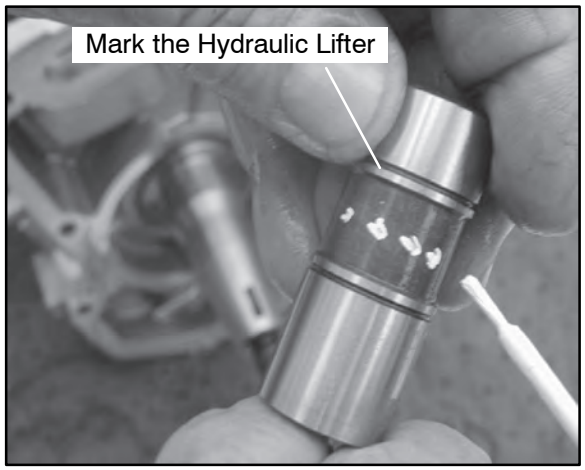
CYLINDER REMOVAL

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

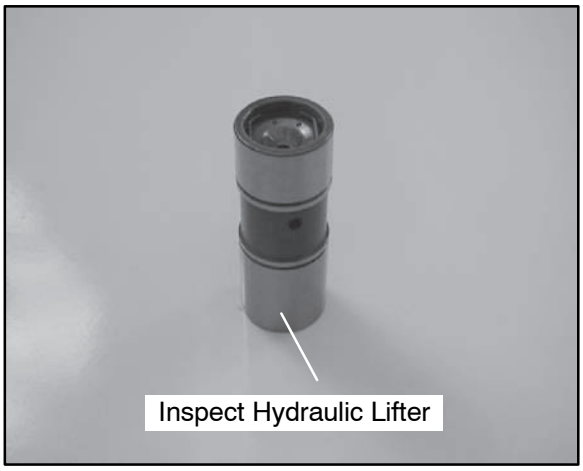


VALVE LIFTER REMOVAL/INSPECTION

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



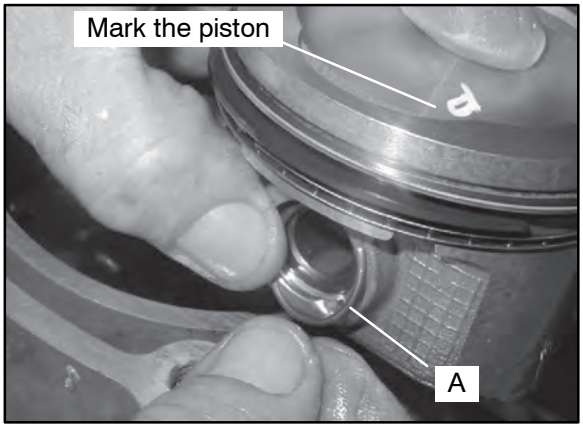
4. Check the lifters for wear or scores.
5. Check the bottom end of lifter to make sure that it has a slight convex.
6. If the bottom surface has worn flat, it may be used with the original camshaft only.



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

PISTON REMOVAL

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



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

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

2. Remove piston circlip and push piston pin out of piston. If necessary, heat the crown of the piston *slightly* with a propane torch. **CAUTION:** Do not

apply heat to the piston rings. The ring may lose radial tension.

3. Remove top compression ring:

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

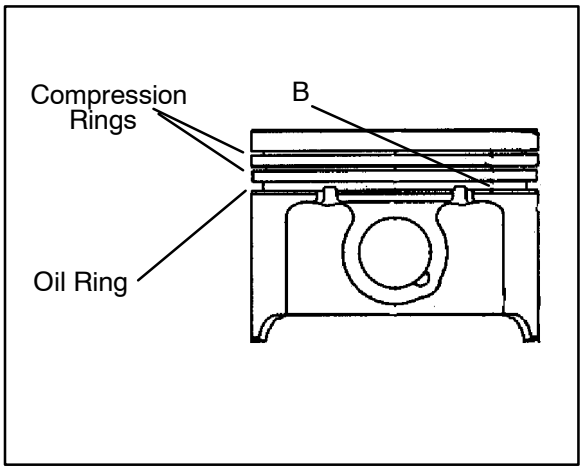
***By hand:** Placing both thumbs as shown, spread the ring open and push up on the opposite side. Do not scratch the ring lands.

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

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

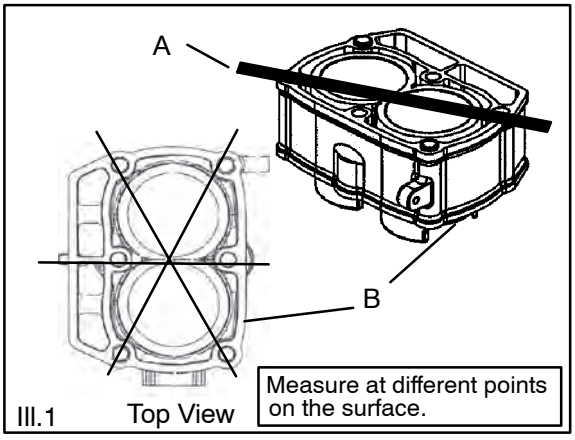
a) Remove the top rail first followed by the bottom rail.

b) Remove the expander.

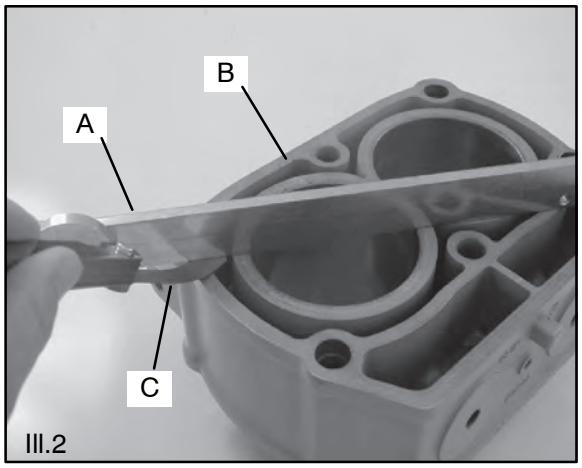


CYLINDER INSPECTION

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



Ill.1 Top View

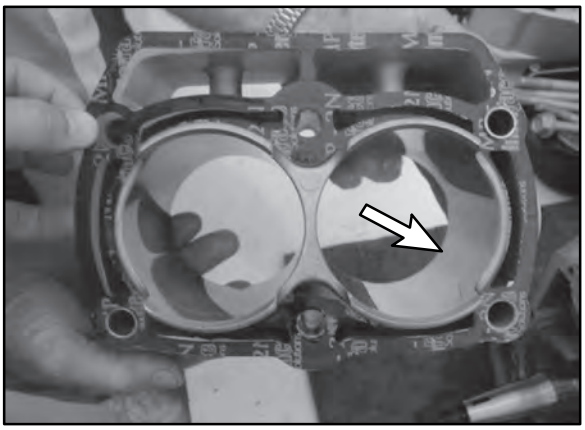


Ill.2

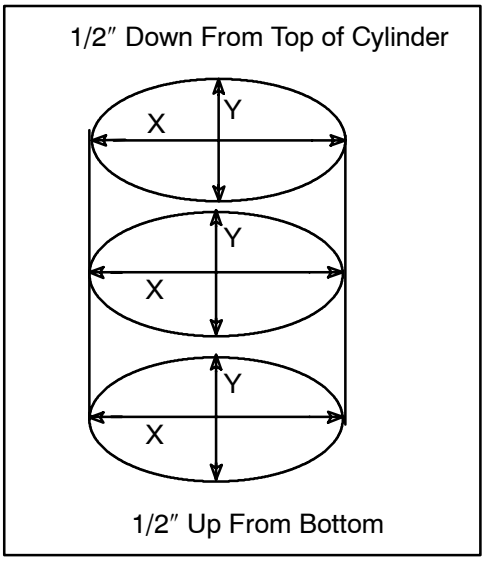
Cylinder Warpage.

.004″ (0.1 mm) Max.

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



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



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

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

Standard Bore Size (Both Cylinders):

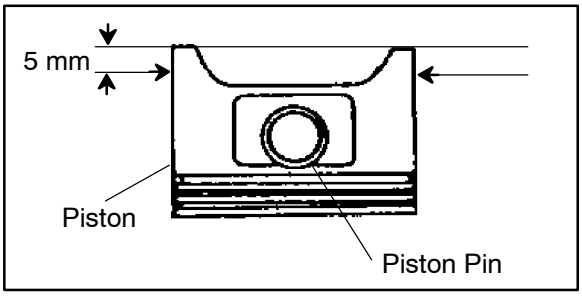
Sportsman 700 : 3.1496″ (80 mm)

Sportsman 600: 3.0018” (76.50 mm)

PISTON-TO-CYLINDER CLEARANCE

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

Subtract this measurement from the maximum cylinder measurement obtained in Step 5.



Piston to Cylinder Clearance

600: .0022" ± .00067" (.055 ± .017 mm)

700: .0016" ± .00063" (.041 ± .016 mm)

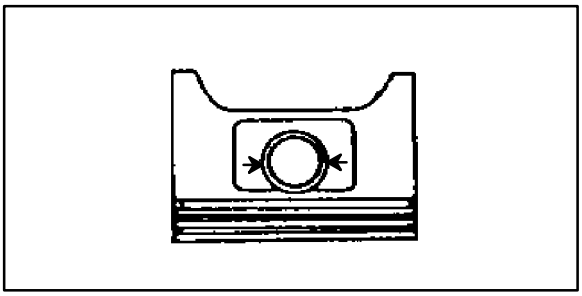
Piston O.D.

600: 3.0096" ± .00035″ (76.445 ± .009 mm)

700: 3.1477" ± .00012″ (79.954 ± .003 mm)

PISTON/ROD INSPECTION

1. Measure piston pin bore.

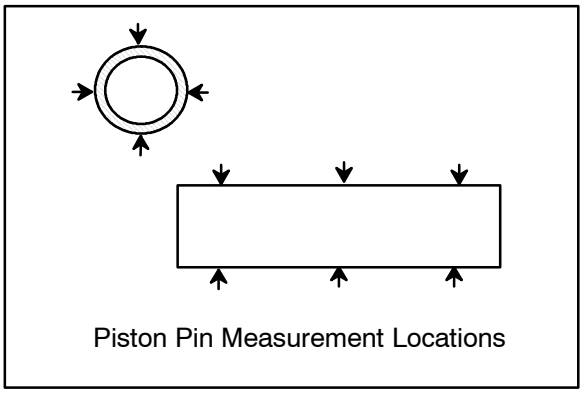


Piston Pin Bore:

600: 0.00027" ± 0.00019"
(0.007 ± 0.005 mm)

700: 0.00059" ± 0.0002"
(0.015 ± 0.005 mm)

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

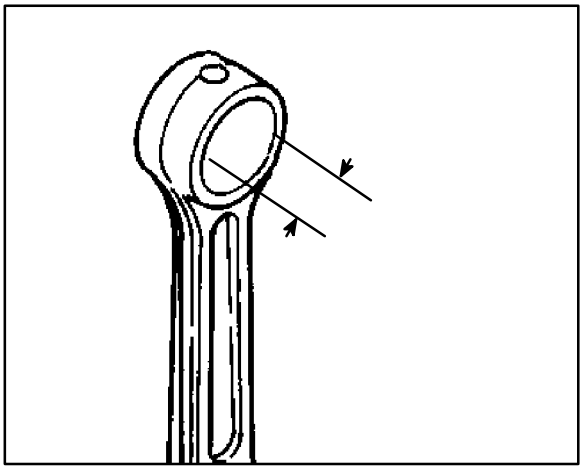


Piston Pin Measurement Locations

Piston Pin O.D.

0.7874" - .7872" (20 - 19.995 mm)

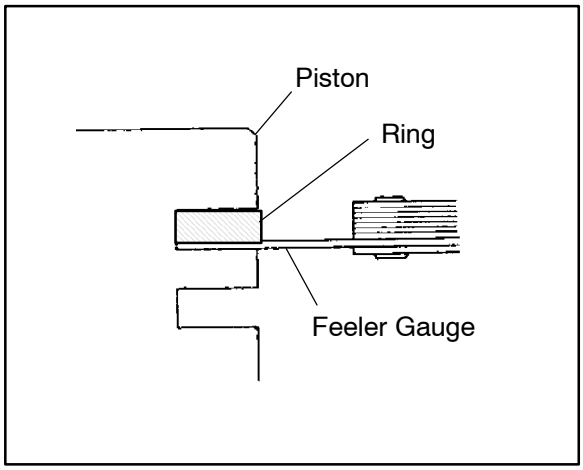
3. Measure connecting rod small end ID.



Connecting Rod Small End I.D.

.789" - .78841". (20.030 - 20.015 mm)

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

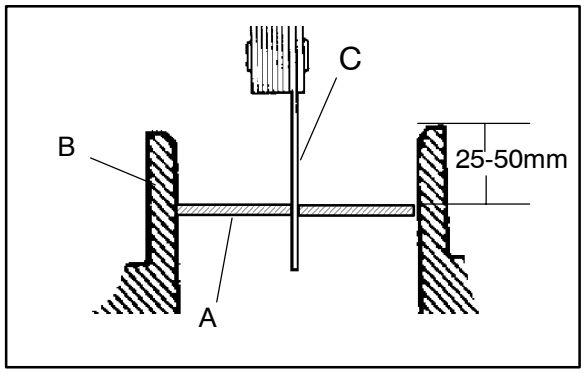


Piston Ring-to-Ring Groove Clearance

Top Ring Limit: 0.0019" ± 0.00069"
(0.0475 ± 0.0175 mm)
Second Ring Limit : 0.0017" ± 0.00049"
(0.0425 ± .0125 mm)

PISTON RING INSTALLED GAP

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



Piston Ring Installed Gap

600

Top Ring: 0.01181" ± 0.00393"
(0.30 ± 0.10 mm)
Second Ring Limit: 0.01476" ± 0.00492"
(0.375 ± 0.125 mm)
Oil Ring Limit: 0.00984" ± .00393"
(0.25 ± 0.10 mm)

700

Top Ring Limit: 0.01083" ± 0.00295"
(0.275 ± 0.075 mm)
Second Ring Limit: 0.0177" ± 0.00394"
(0.45 ± 0.10 mm)
Oil Ring Limit: 0.0177" ± .00984"
(0.45 ± 0.25 mm)

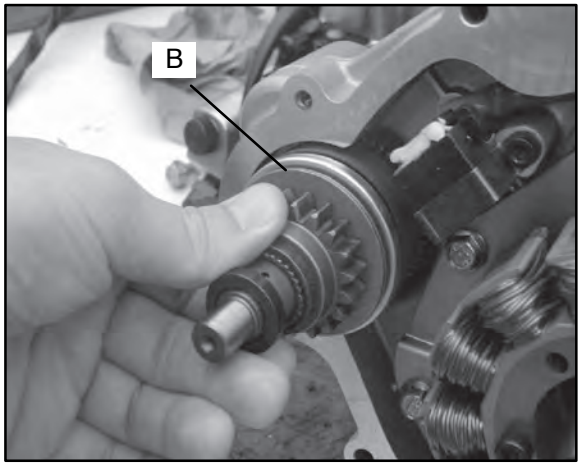
NOTE: Ring should be installed with the mark on the ring facing upward.

2. Measure installed gap with a feeler gauge (C) at both the top and bottom of the cylinder. **REMINDER:** A difference in end gap indicates cylinder taper. The cylinder should be measured for excessive taper and out of round.
3. If the *bottom* installed gap measurement exceeds the service limit, replace the rings. If ring gap is smaller than the specified limit, file ring ends until gap is within specified range.

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

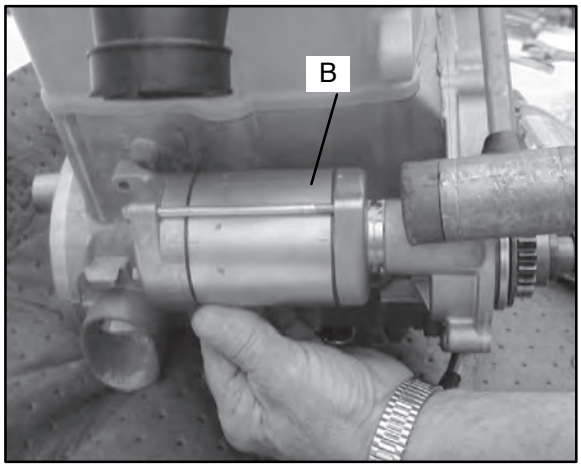
STARTER DRIVE/BENDIX REMOVAL/INSPECTION

1. Remove stator housing bolts and remove housing.
2. Remove the flywheel nut and washer. Install Flywheel Puller (**PN 2871043**) and remove flywheel. **CAUTION:** Do not thread the puller bolts into the flywheel more than 1/4″ or stator coils may be damaged.
3. Remove starter bendix assembly (A). Note the thrust washers located on both sides of the bendix.



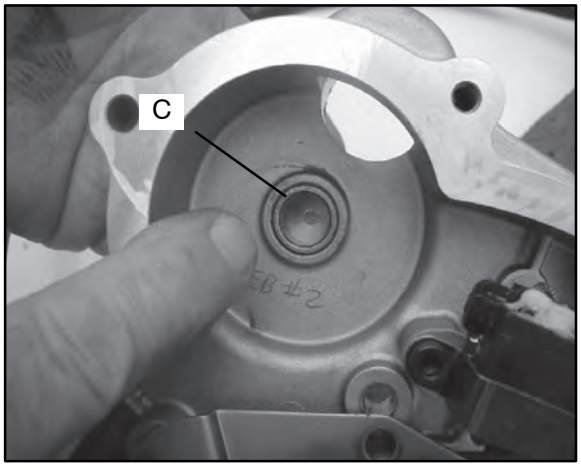
4. Inspect the thrust washer for wear or damage and replace if necessary.

5. After the bendix is removed, tap on the starter assembly with a soft faced mallet to loosen the starter from the crankcase.



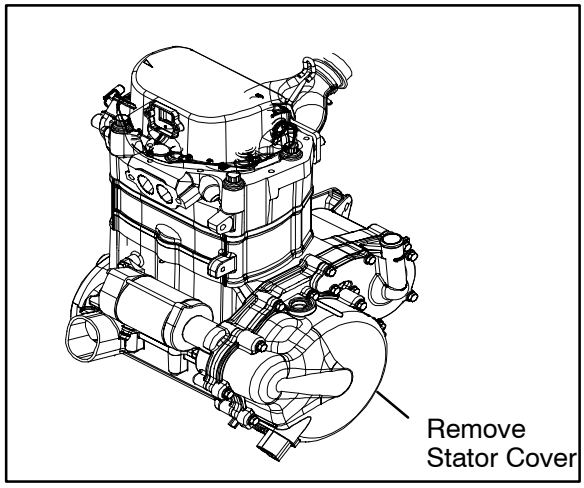
6. Inspect gear teeth on starter drive (B). Replace starter drive if gear teeth are cracked, worn, or broken.

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

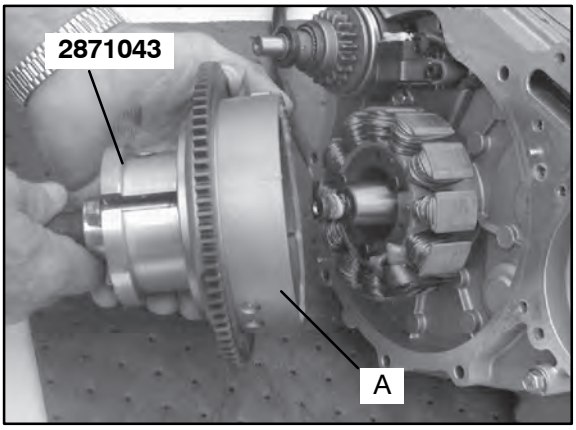


FLYWHEEL/STATOR REMOVAL/INSPECTION

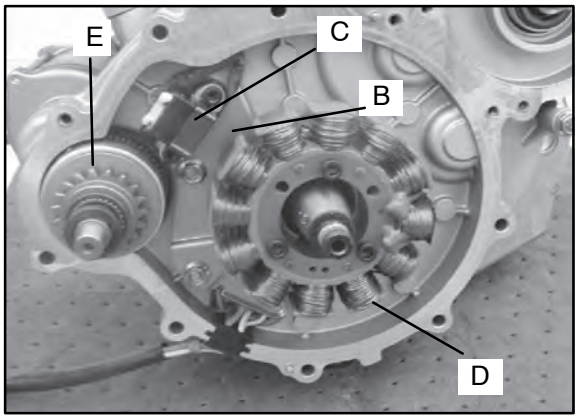
1. Remove stator housing bolts and remove housing.



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



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

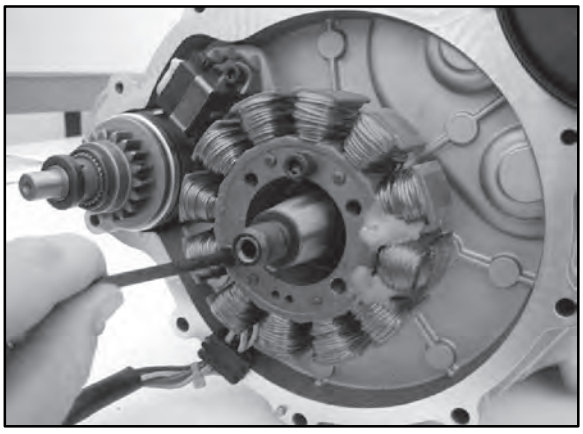


5. Remove the bendix (E) if necessary.

FLYWHEEL/STATOR INSTALLATION

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

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

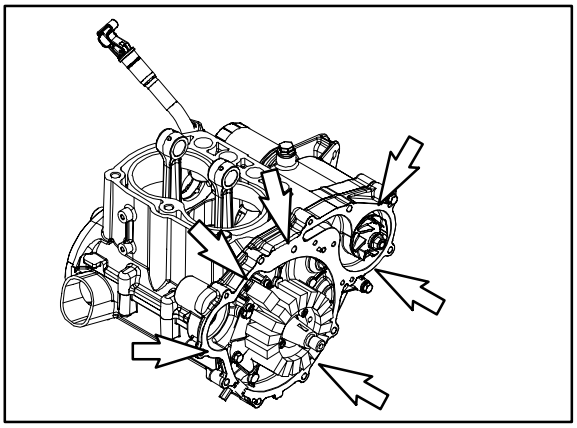


3. Install the starter bendix if removed.
4. Install woodruff key. Install the flywheel. Install the flywheel washer and nut. Torque the flywheel nut to 65 ± 7 ft.lbs. (88 ± 9.50 Nm)

Flywheel Nut Torque:

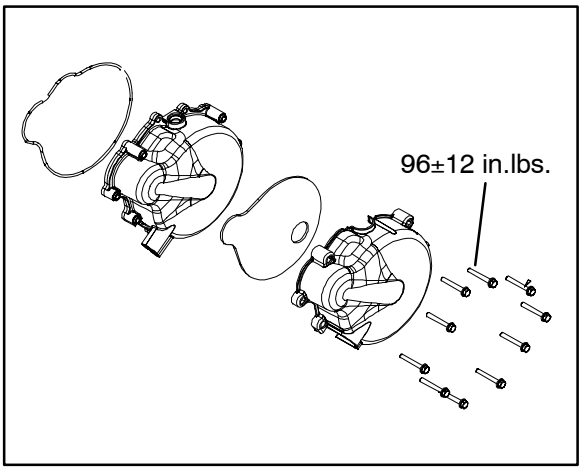
65 ± 7 ft. lbs. (88 ± 9.50 Nm)

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



FLYWHEEL/STATOR INSTALLATION

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

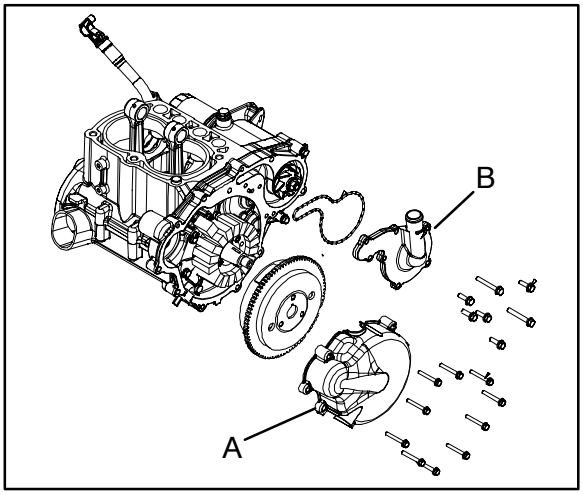


Stator Housing Bolt Torque:
96 ± 12 in.lbs. (1.85 ± 1.35 Nm)

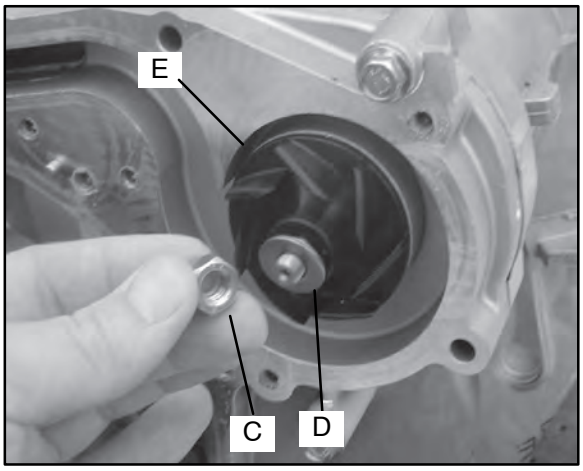
***Torque Bolts In Sequence (Pg. 3.4)**

ENGINE CRANKCASE DISASSEMBLY/INSPECTION

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

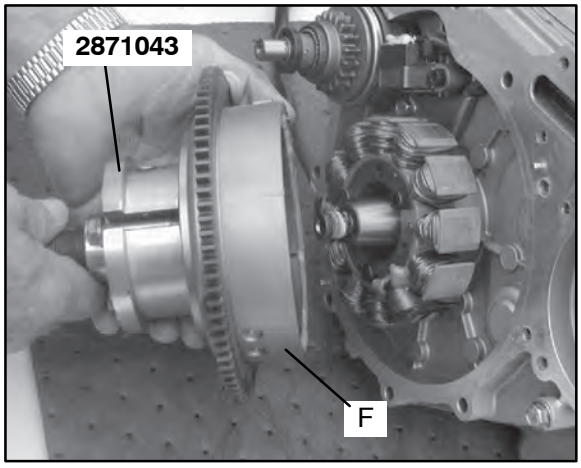


2. Remove the nylok nut (C), washer (D), and water pump impeller (E). Remove part of the water pump seal behind the impeller.

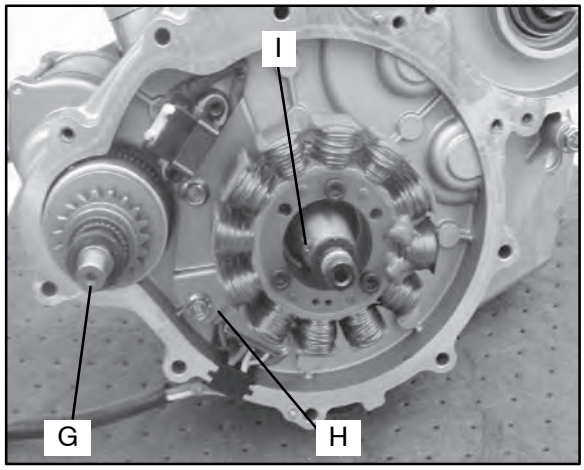


3. Remove flywheel nut and washer.
4. Install Flywheel Puller (**PN 2871043**) and remove flywheel (F). **CAUTION:** Do not thread the puller

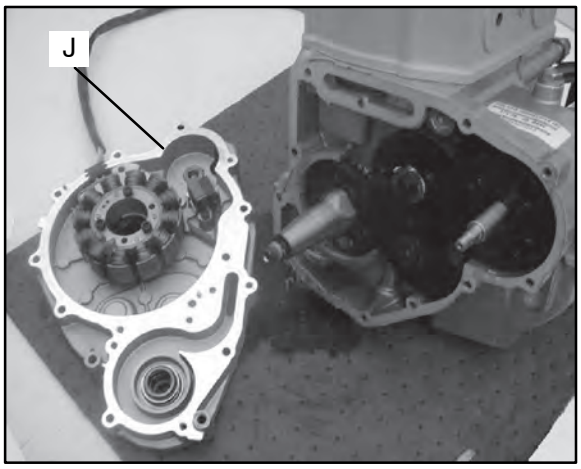
bolts into the flywheel more than 1/4″ or stator coils may be damaged.



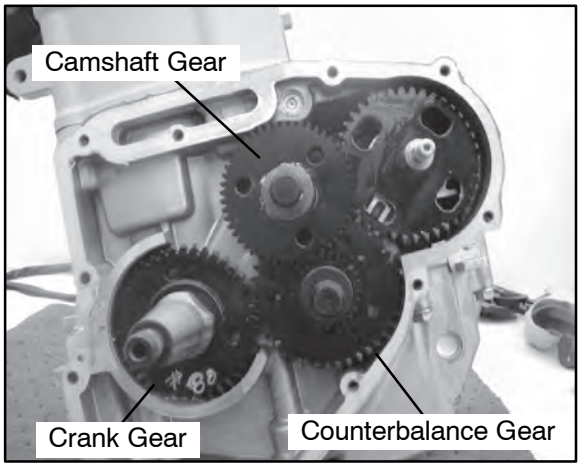
5. Remove the starter bendix (G), wire holddown plate (H), and the woodruff key (I) from the crankshaft. The stator does not have to be removed at this point.



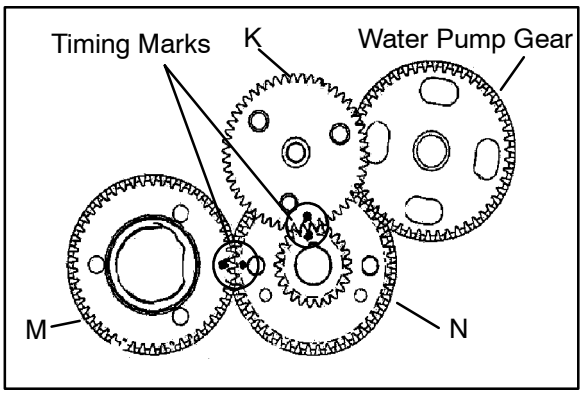
6. Remove the gear/stator housing bolts and remove the gear/stator housing cover (J) and gasket from the crankcase. Be sure to catch the excess oil from the crankcase.



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



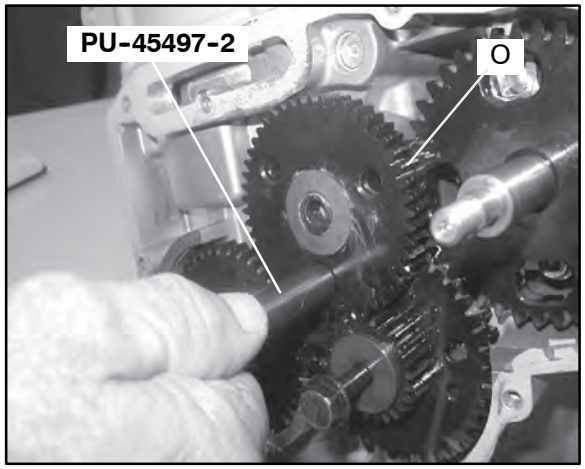
8. Use a white pen to accent the timing marks on the following gears: camshaft gear (K), crankshaft gear (M), or counterbalance gear (N) This will ensure proper gear alignment and timing during reassembly of the gears.



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

Cam Gear Removal

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



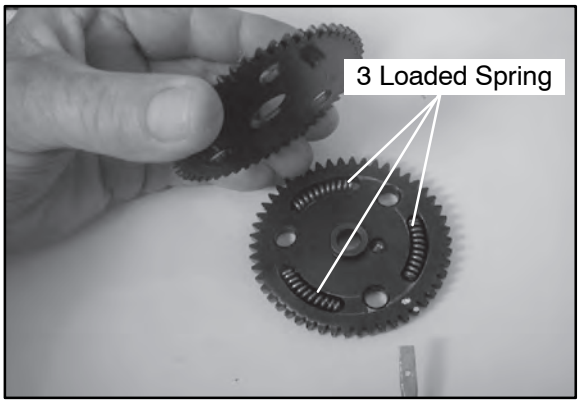
NOTE: Install the Cam Gear Tooth Alignment Tool (**PU-45497-2**) into the assembly hole counter clockwise from the timing mark as shown.

Cam Gear Alignment Tool:

(PU-45497-2)

Cam Gear Disassembly

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

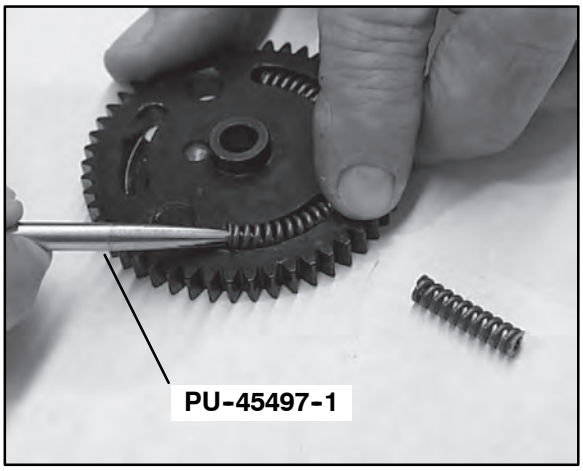


11. The cam gear assembly contains three loaded springs. To open the cam gear assembly:
    - Place the cam gear on a flat surface with the timing mark side facing up.
    - While holding both gears together, lightly work a small flathead screwdriver between the two gears.
    - Remove the top gear.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

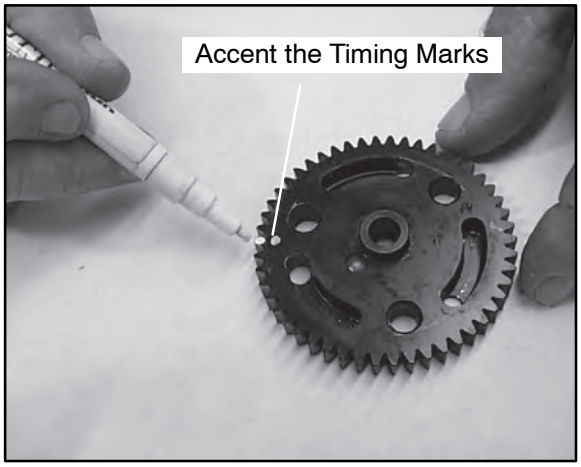
CAUTION:

WEAR SAFETY GLASSES AT ALL TIMES. USE CAUTION WHEN WORKING WITH THE TOP GEAR. THE SPRINGS COULD CAUSE INJURY OR BECOME LOST SHOULD THEY POP OUT.

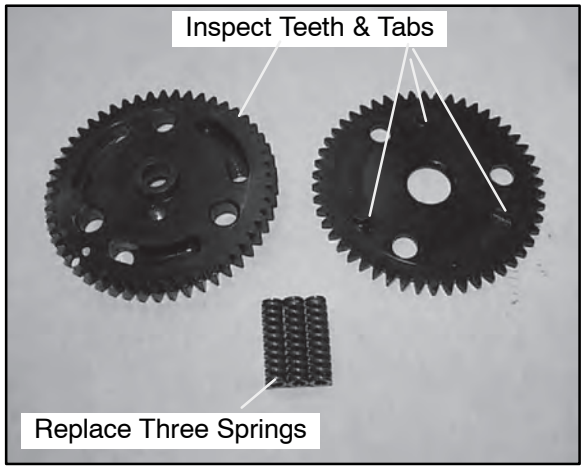
12. Remove all three springs using one of the tapered pins from the Tapered Pins (**PU-45497-1**).



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

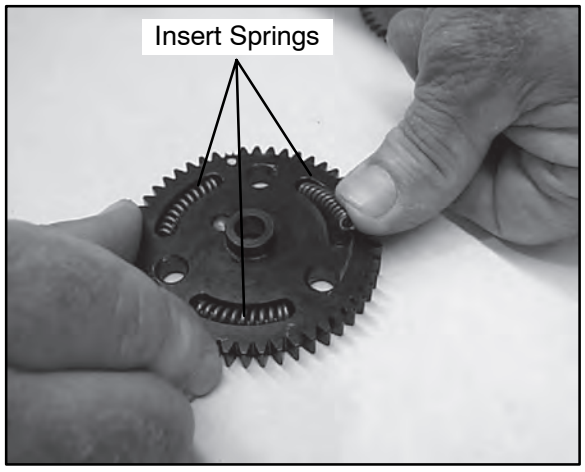


14. Inspect the gear teeth and the three tabs on the gears for wear.

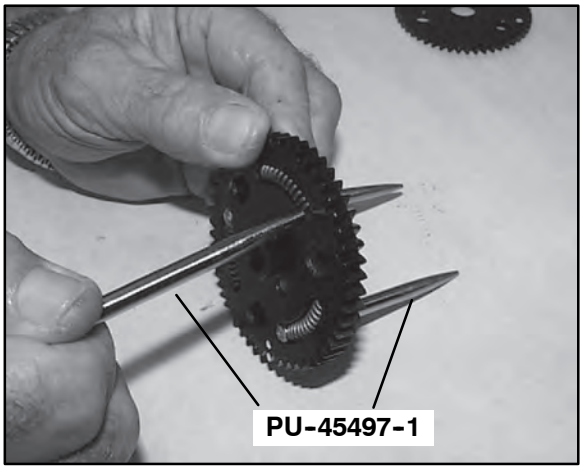


Cam Gear Reassembly

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



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

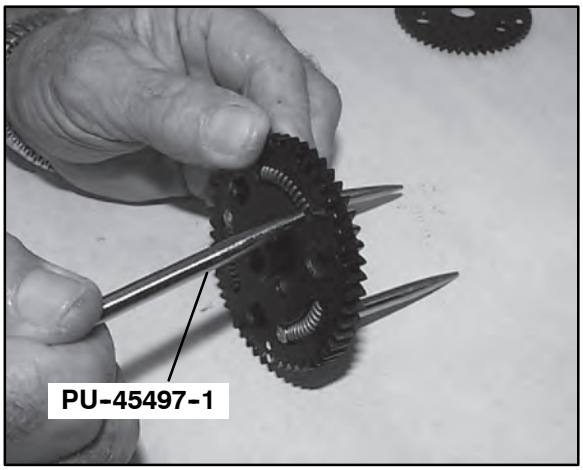


To assemble:

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

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

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

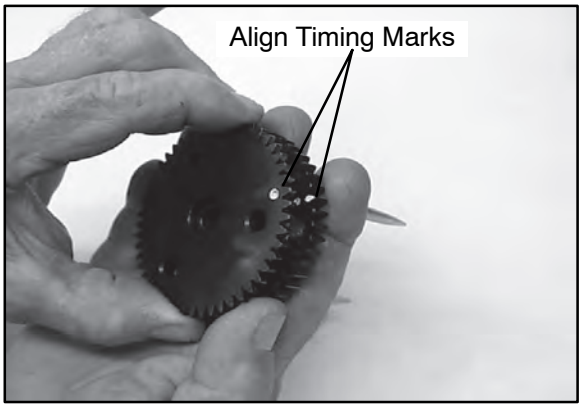


Cam Gear Spring Installation Tool Kit:
(PU-45497)

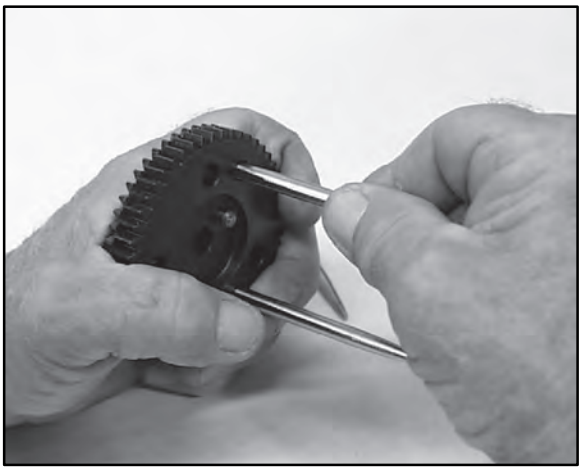
Tapered Pins:
(PU-45497-1)

Cam Gear Tooth Align Tool:
(PU-45497-2)

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

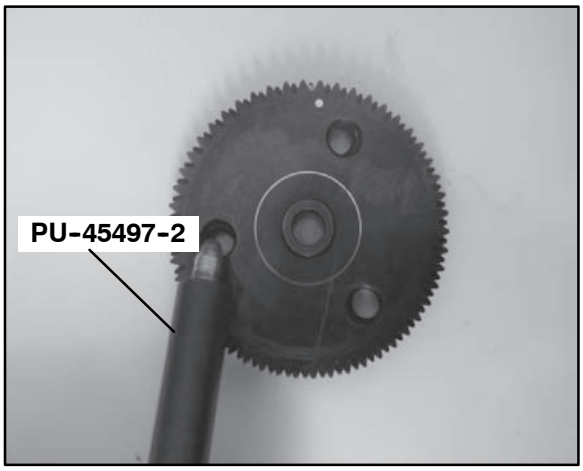


19. Once the gears are pressed together, firmly hold the gears together with one hand. Carefully remove the Tapered Pins (**PU-45497-1**) by pulling them out one at a time with the other hand.



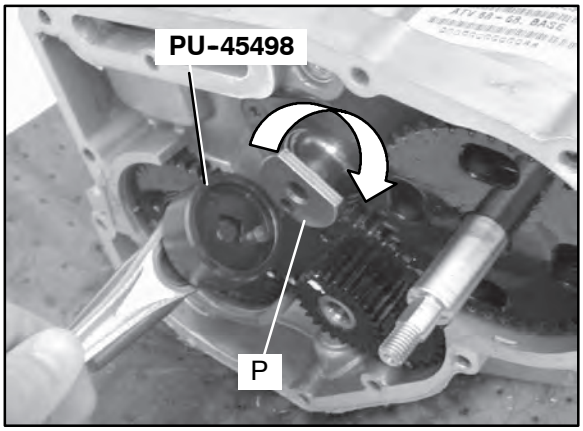
20. After the tapered pins are removed, be sure the cam gear assembly is held together tightly. Place the cam gear assembly on a flat surface. Use the Cam Gear Tooth Alignment Tool (**PU-45497-2**) (R) to align the teeth of the cam gears, as shown in the picture.

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



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

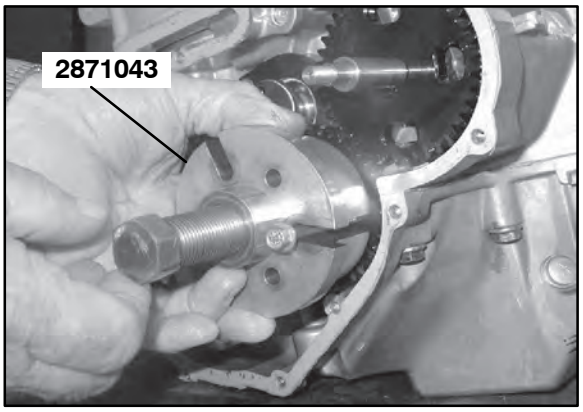
21. To remove the balance shaft gear, the flat side of the camshaft (P) must face the balance shaft gear. To rotate the camshaft, use the Cam Spanner Wrench (**PU-45498**) to rotate the camshaft so the flat side of the camshaft faces the balance shaft gear.



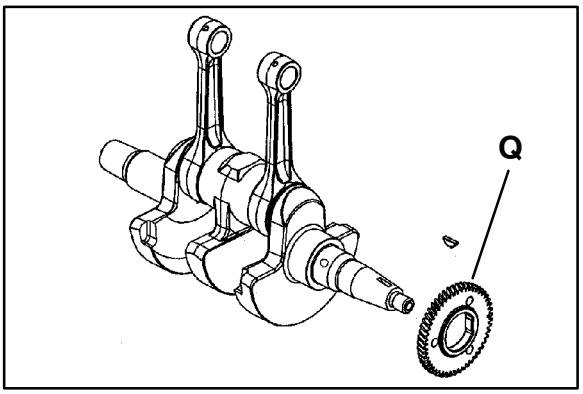
NOTE: This Cam Spanner Wrench (**PU-45498**) is only needed to rotate the camshaft when the entire valve train is assembled. If the rocker arms are removed, the cam-shaft can be turned by hand.

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

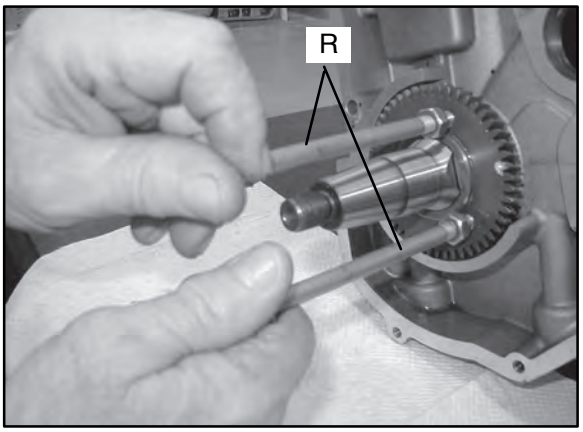
balance shaft gear.



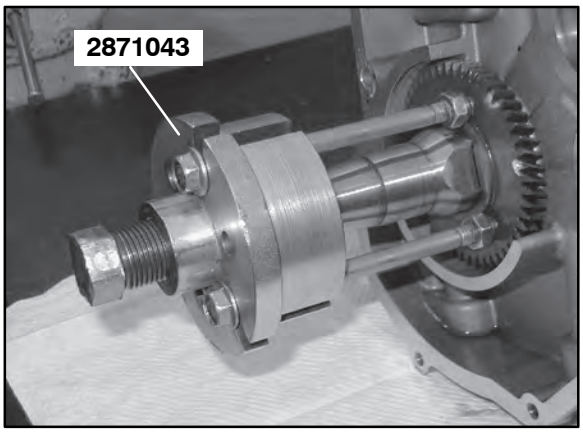
23. Inspect the crankshaft gear (Q) for broken or worn teeth. **If the crankshaft gear does not need to be replaced, it does not need to be removed**. If the crankshaft gear is damaged, remove the crankshaft gear with the Flywheel Puller (**PN 2871043**).



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

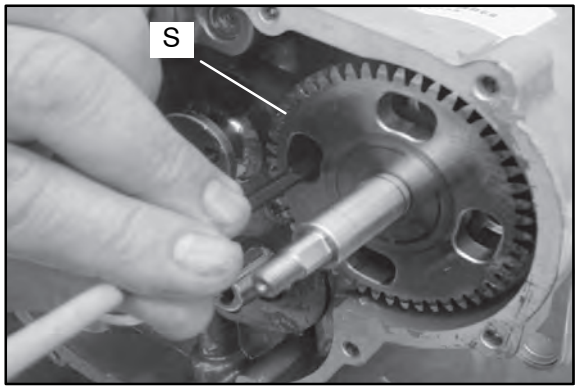


25. Install the Flywheel Puller (**PN 2871043**) and remove the crankshaft gear, if needed.

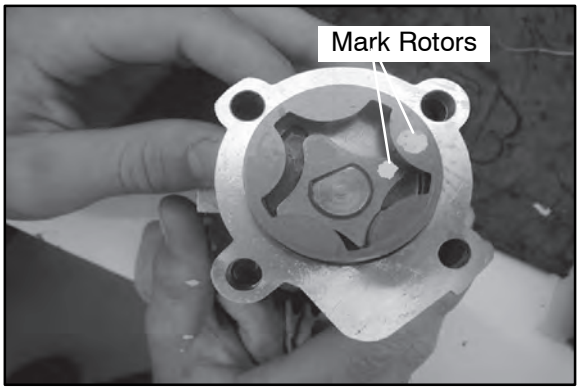


Water/Oil Pump Removal/Disassembly

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



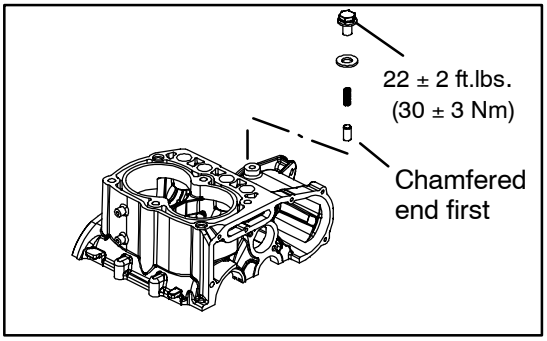
27. Inspect the oil pump rotors for wear. Mark the rotors with a white pen to ensure upon reassembly that the correct sides of the rotors are installed and mesh with the same edges as previously installed.



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

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

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

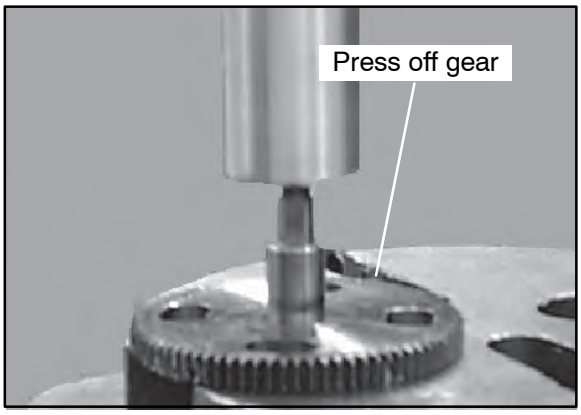


NOTE: Be sure to place the tapered end of the valve (dowel) in first. If the valve is installed incorrectly, oil pressure and oil priming problems will occur.

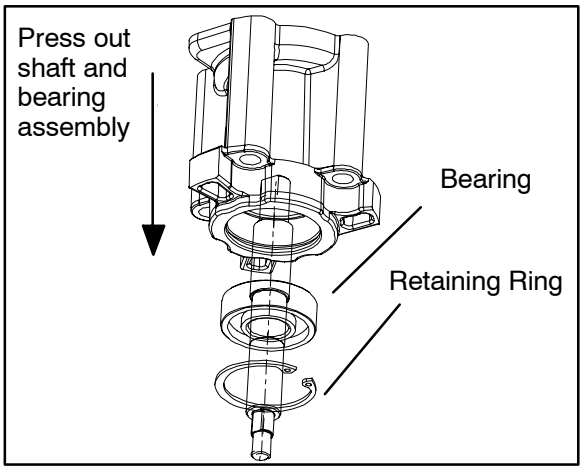
DISASSEMBLY OF WATER/OIL PUMP SHAFT

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

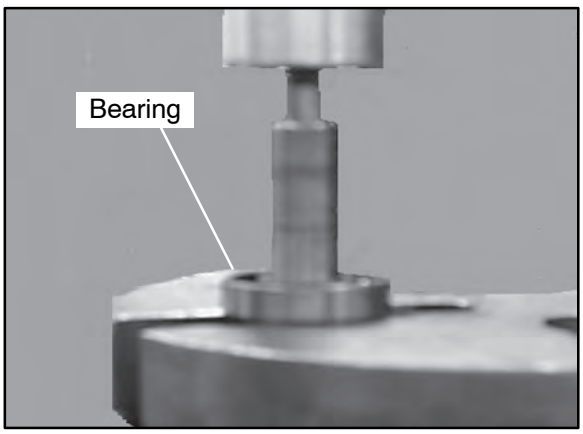
30. Carefully press the gear off the assembly while supporting the housing assembly.



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

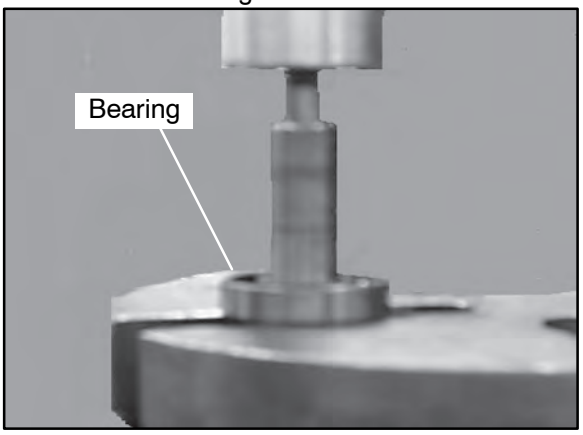


32. Place the shaft in a press to remove the bearing.

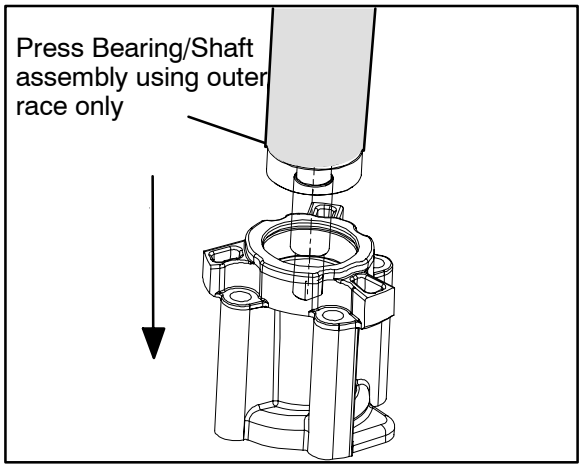


WATER/OIL PUMP REASSEMBLY

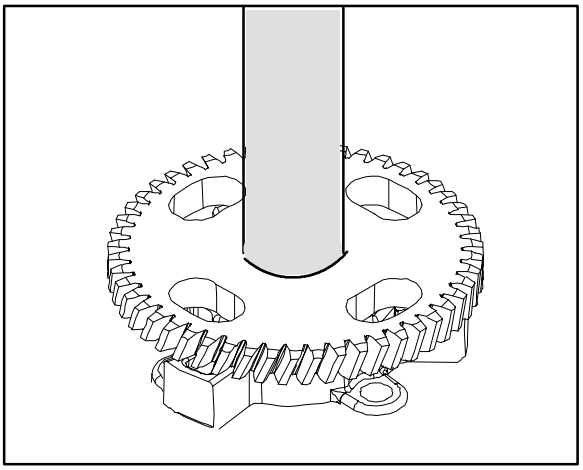
33. Press new bearing onto the shaft.



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

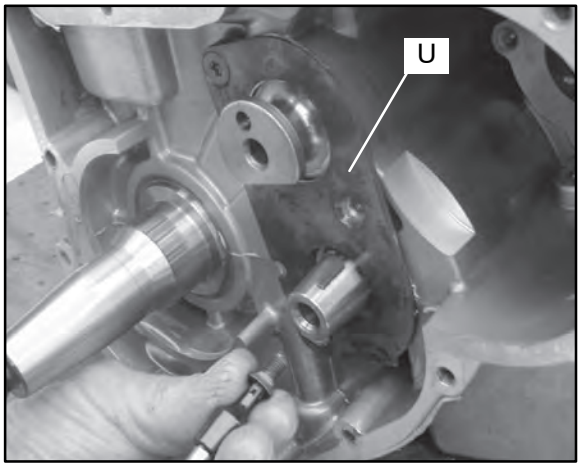


35. Press gear onto shaft while supporting the housing.

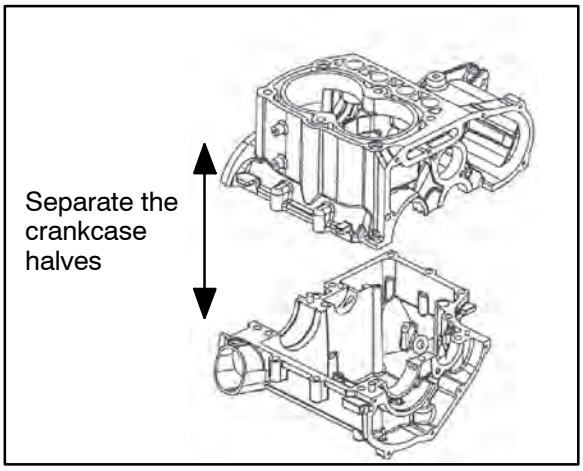


CRANKCASE DISASSEMBLY CONT'D

36. Remove thrust plate (U).

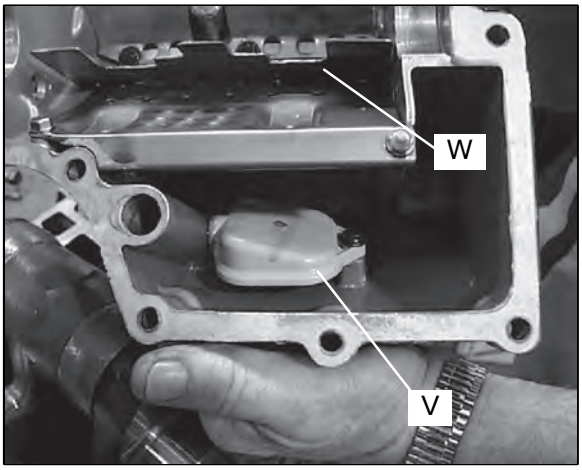


37. Remove PTO end engine mount. Remove crankcase bolts. Tap on the reinforced areas on the cases using soft hammer. Carefully separate the two crankcase halves.

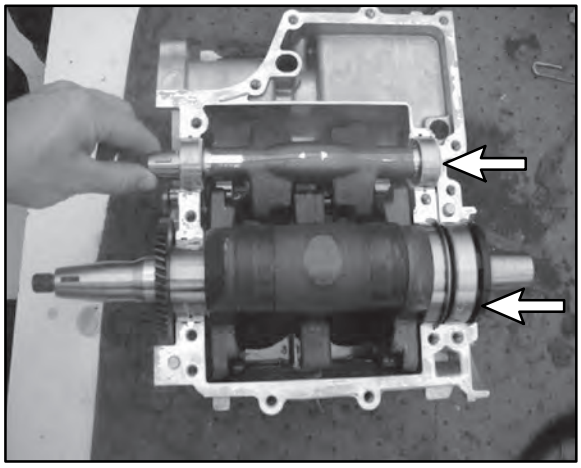


NOTE: Only remove the oil baffle if the baffle is damaged. When removing the oil baffle bolts, use a heat gun to heat the bolts and loosen the Loctite™. This will prevent any possible damage to the bolts or to the crankcase casting.

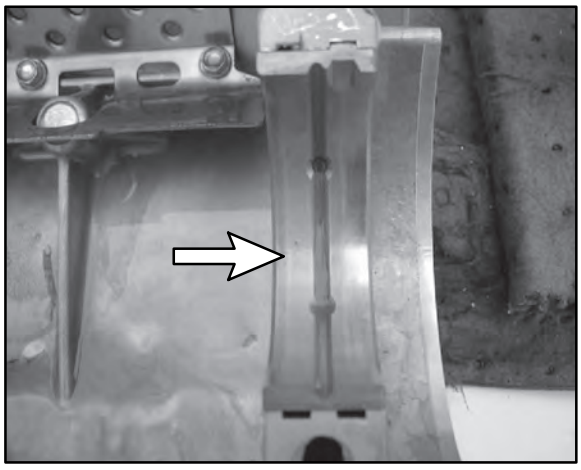
38. Remove and clean oil pick up (V) and oil baffle weldment (W).



39. Remove balance shaft and crankshaft.

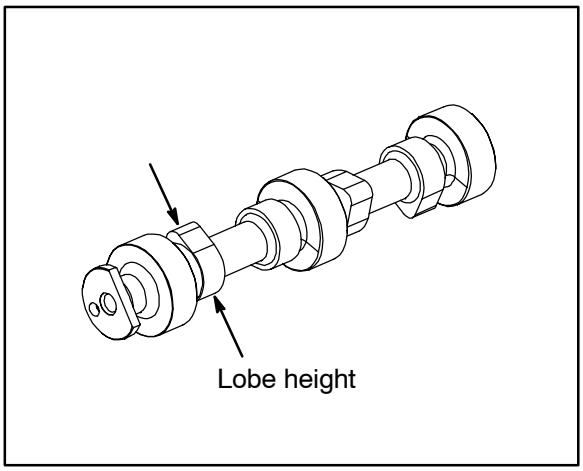


40. Remove and inspect crankshaft main journal bearings for abnormal wear. **It is recommended to replace the bearings anytime the engine is disassembled**.



CAMSHAFT INSPECTION

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

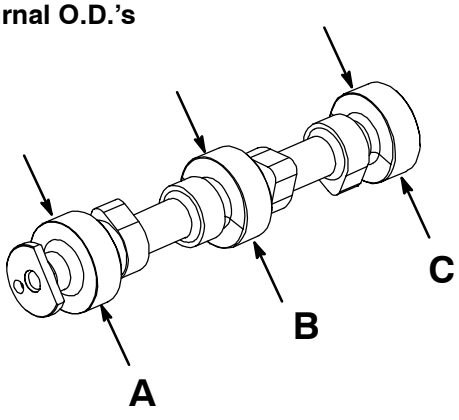


3. Measure height of each cam lobe using a micrometer. Compare to specifications.

Cam Lobe Height (Intake & Exhaust):
Std: 0 .2170" ± 0.00236"
(5.5118 ± 0.060 mm)

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

Journal O.D.'s



Camshaft Journal O.D. :

A. (Mag): 1.654" ± .00039" (42 ± .010 mm)

B. (Ctr.): 1.634" ± .00039" (41.50 ± .010 mm)

C. (PTO): 1.614" ± .00039" (41 ± .010 mm)

5. Measure ID of camshaft journal bores.

Camshaft Journal Bore I.D.:

(Mag): 1.656" ± 0.00039" (42.07 ± 0.010 mm)

(Ctr.) 1.637" ± 0.00039" (41.58 ± 0.010 mm)

(PTO) 1.617" ± 0.00039" (41.07 ± 0.010 mm)

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

Camshaft Oil Clearance:

Std: 0.00118" (.0299mm)
Limit: .0039" (.10 mm)

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

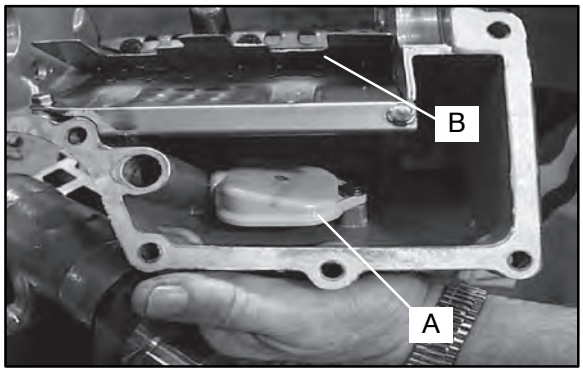
NOTE: Replace engine block if camshaft journal bores are damaged or worn excessively.

ENGINE CRANKCASE REASSEMBLY

WARNING: After any reassembly or rebuild, the engine must be primed using the Oil Priming Adapter (PU-45778) and a 3/4-full oil filter before initial start-up. Follow Steps 45-46 in this section to properly prime the engine and to help aid proper engine break in.

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

1. Install oil pick up (A), if removed. Torque bolt to 60 ± 6 in. lbs. (6.8 ± 0.68 Nm).



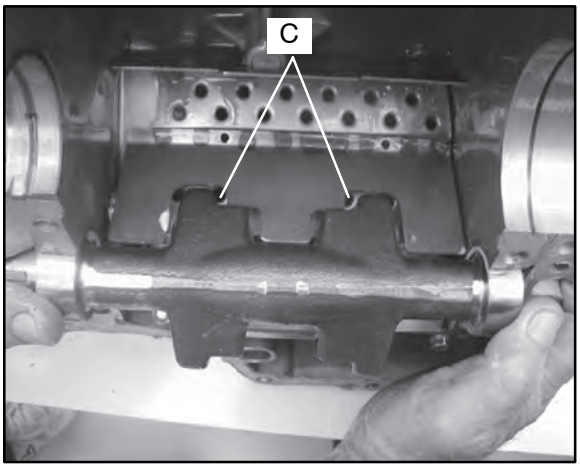
2. Install oil baffle weldment (B). Torque bolts to 60 ± 6 in. lbs. (6.8 ± 0.68 Nm).

Oil Baffle Weldment & Oil Pick Up-Bolt Torque:

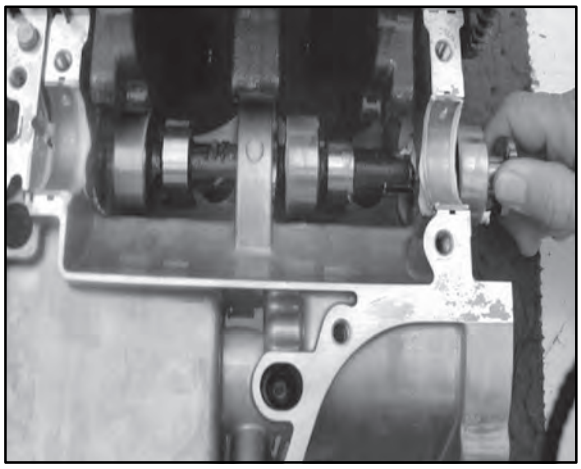
60 ± 6 in. lbs. (6.8-0.68 Nm)

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

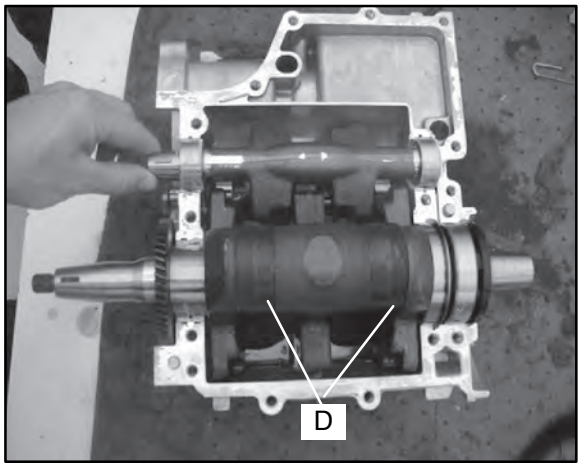
NOTE: Always install new balance shaft bearings.



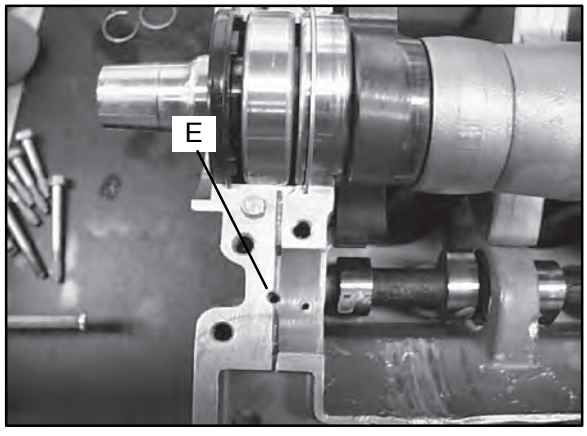
4. Apply Moly Lube Grease to cam journals and balance shaft bearing surfaces of the MAG case halve. Install cam and balance shafts.



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



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



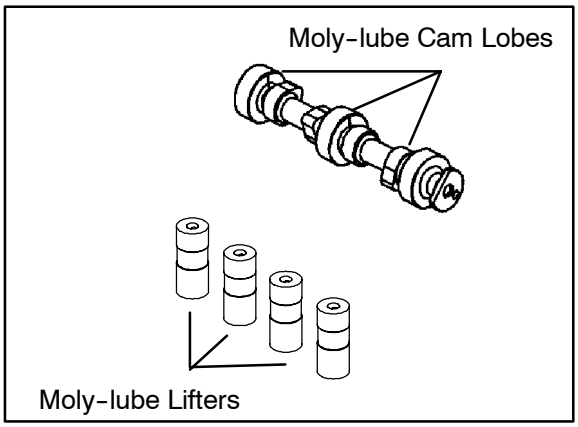
NOTE: Do not apply sealant to cam relief hole (E).

7. Assemble the crankcase halves. Apply LocTite™ 242 (**PN 2871949**)to the threads and pipe sealant to the bolt flanges. Torque bolts to 22 ± 2 ft. lbs. (30 ± 3 Nm) following torque pattern on **Page 3.9**.

Crankcase Bolt Torque:

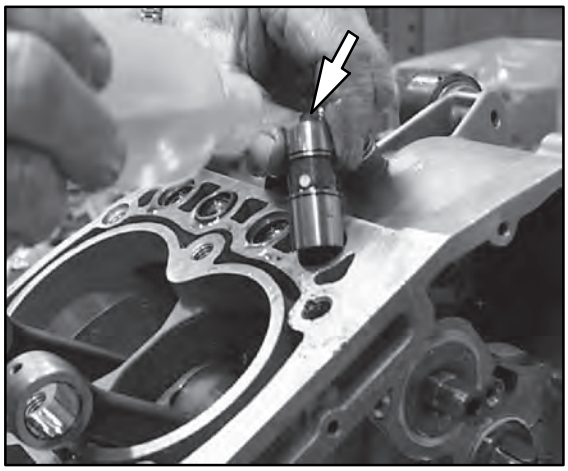
22 ± 2 ft. lbs. (30 ± 3 Nm)
***Torque in Proper Sequence (Pg. 3.9)**

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

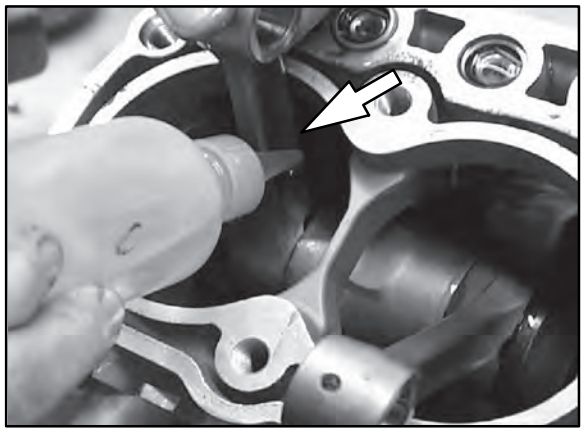


9. Lubricate lifters with engine oil and install in the original order as removed in disassembly. Apply Lubriplate or Moly Lube to the ends of the lifters.

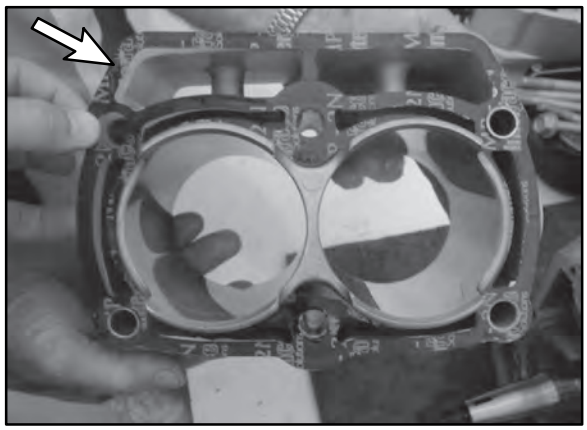
NOTE: Always replace the camshaft and lifters as a set.



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

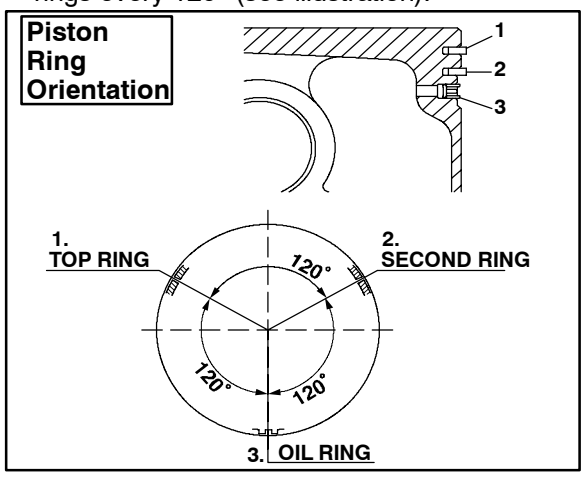


11. Install new cylinder gasket on crankcase. Align gasket on the dowel pins for proper gasket alignment.

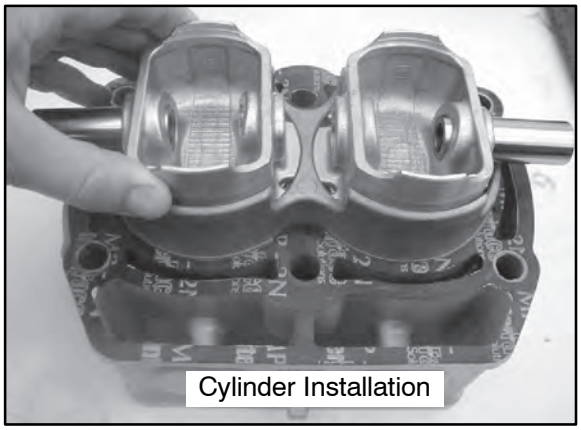


NOTE: Gasket must be installed dry. Do not use sealers or lubricants to hold in place during installation.

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

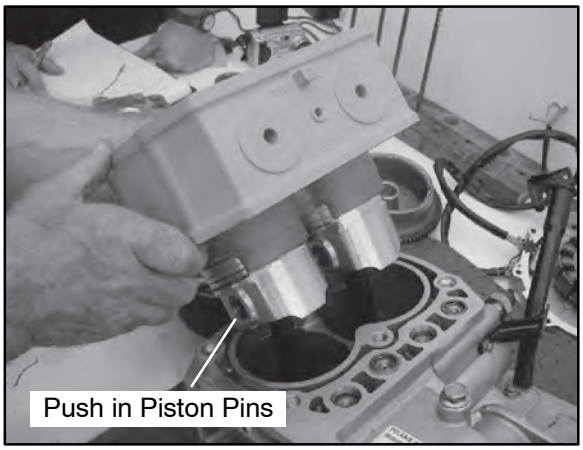


13. Install piston assemblies into cylinder aligning the piston pin holes, to ensure proper alignment of the pistons to the connecting rods upon assembly. Partially install the piston pins into the pistons.

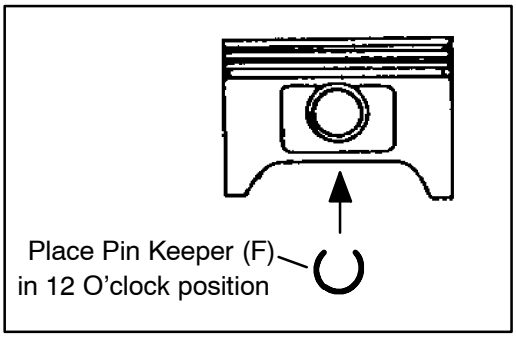

Cylinder Installation

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

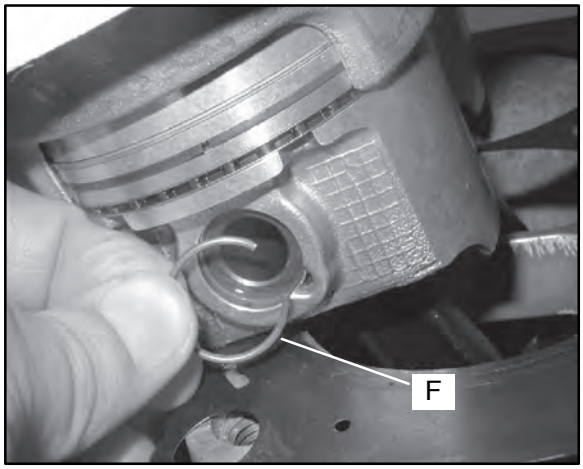
14. Position cylinder and piston assemblies onto the connecting rods and push the piston pins through the piston and connecting rods.


Push in Piston Pins

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

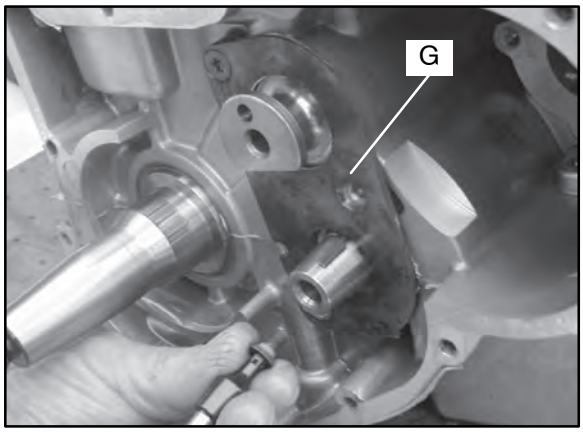


NOTE: While installing in piston pins, cover all engine passages. The clip could fall into the engine during installation.



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

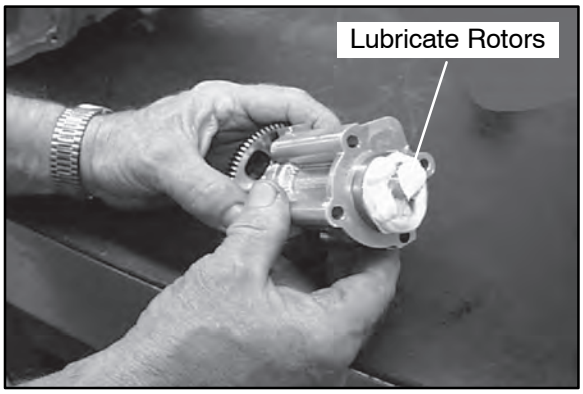
NOTE: New bolts have patch lock on the threads and do not require Loctite™.



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

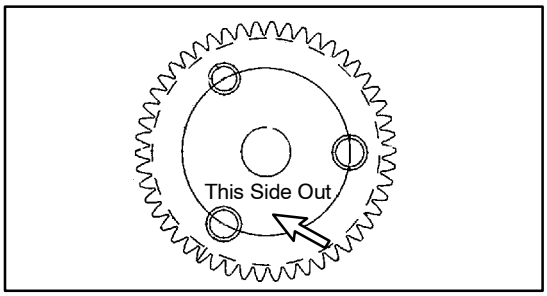
18. Apply moly lube, lubriplate, or oil to the rotors on the oil pump shaft.

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



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

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

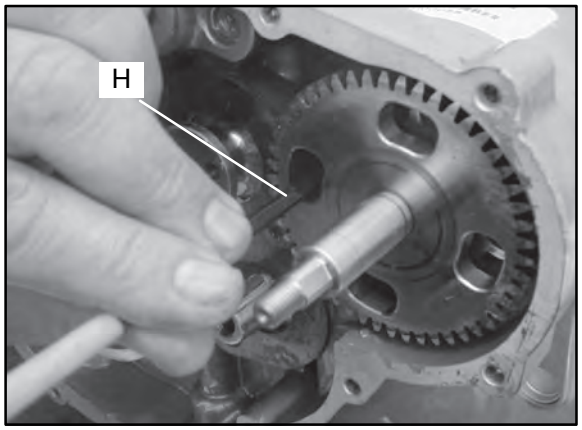


NOTE: Before assembly, clean the bolts and bolt holes with Primer N (**PN 2870585**) to remove any

debris. This will ensure proper sealing when installing bolts and new Loctite™.

20. Install oil pump housing bolts (H). The new bolts contain patch lock, so Loctite™ is not needed on the new bolts. Torque bolts to 84 ± 8 in.lbs. (9.50 ± 0.90 Nm) and follow the torque sequence on Pg. 3.3.

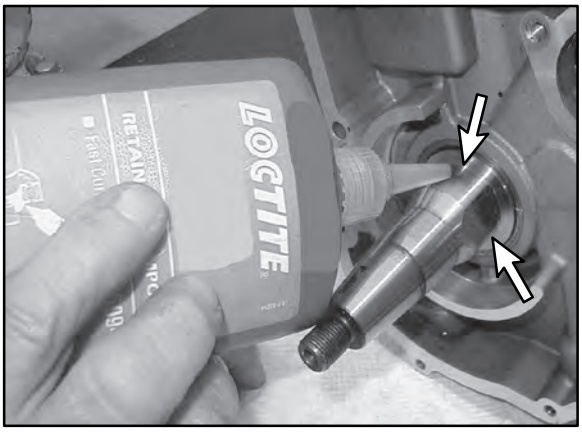
NOTE: Occasionally spin the oil pump when installing bolts to check for binding of the rotors.



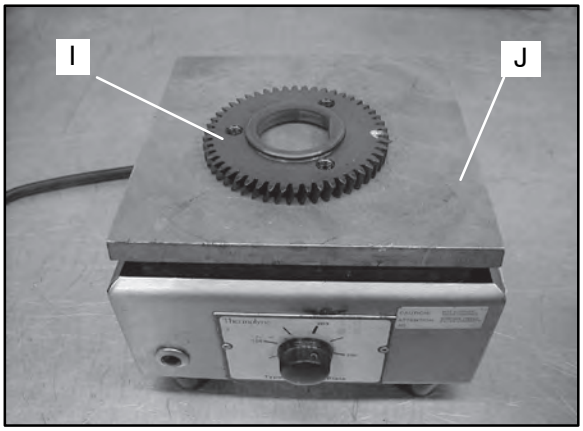
Oil Pump Bolt Torque:
84 ± 8 in.lbs. (9.50 ± 0.90 Nm)

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

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



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



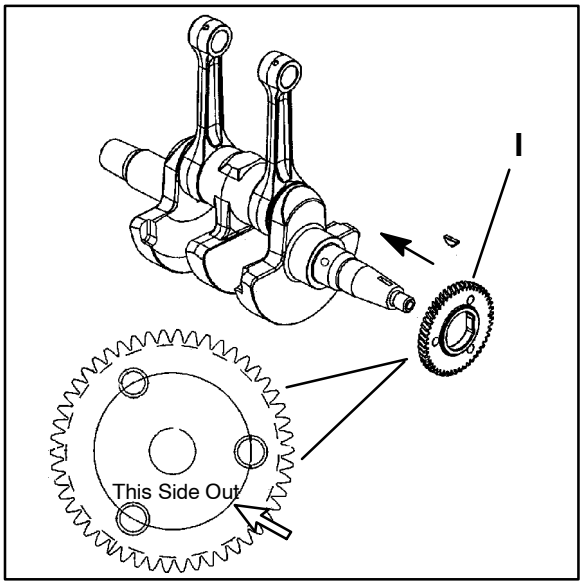
CAUTION:

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

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

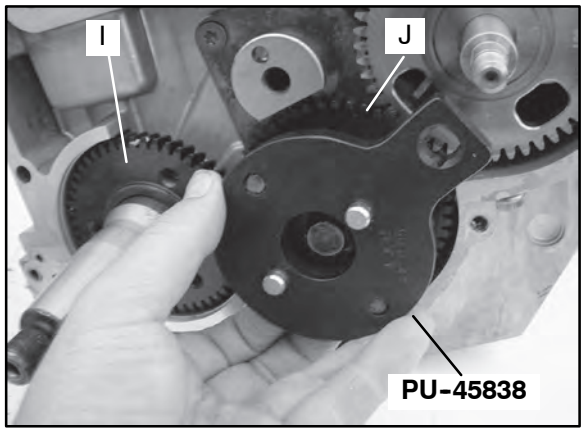
24. Install the crankshaft gear (I) onto the crankshaft.

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



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

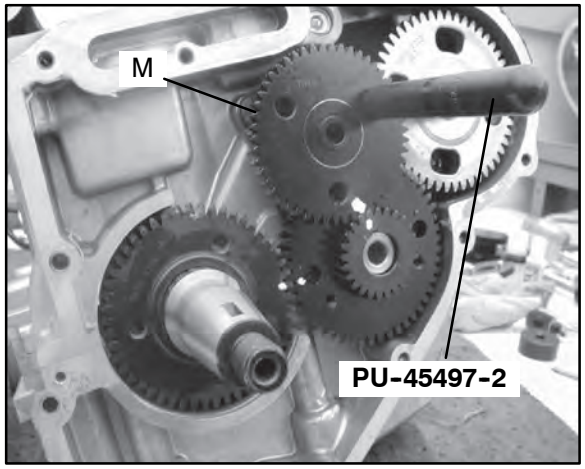
(**PU-45838**). Torque to 22 ± 2 ft. lbs.(30 ± 3 Nm).



Balance Shaft Gear Bolt Torque:

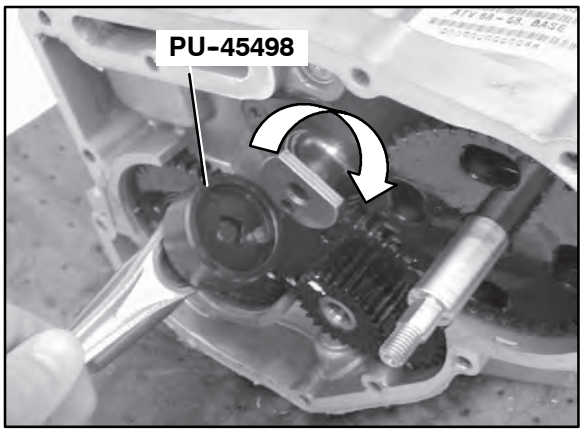
22 ± 2 ft.lbs. (30 ± 3 Nm)

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



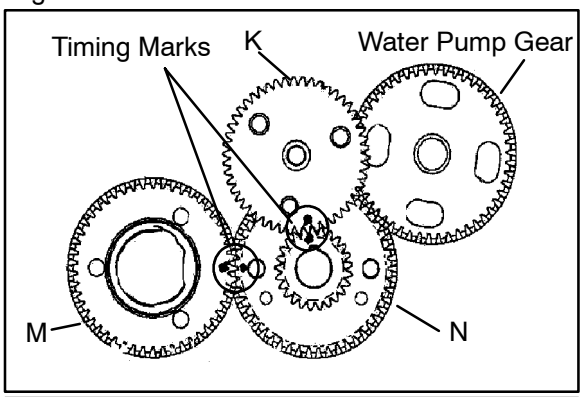
NOTE: If the timing mark on the camshaft gear does not align properly, remove the camshaft gear and tool. Use the Cam Spanner Wrench (**PU-45498**) to rotate the cam to the proper position.

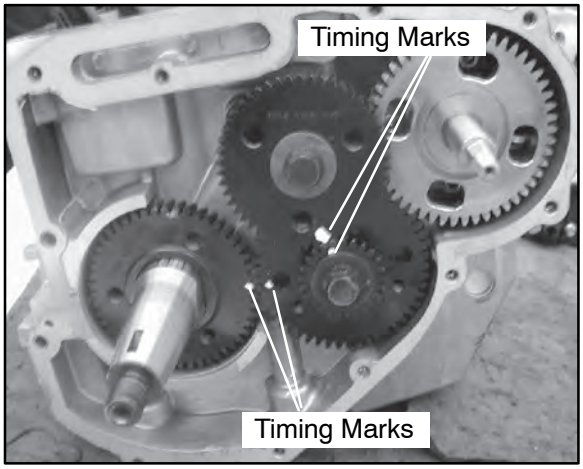
NOTE: Cam Spanner Wrench (**PU-45498**) is only needed to rotate the camshaft when the entire valve train is assembled.



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

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





Counterbalance Gear and Camshaft Gear Bolt Torque:

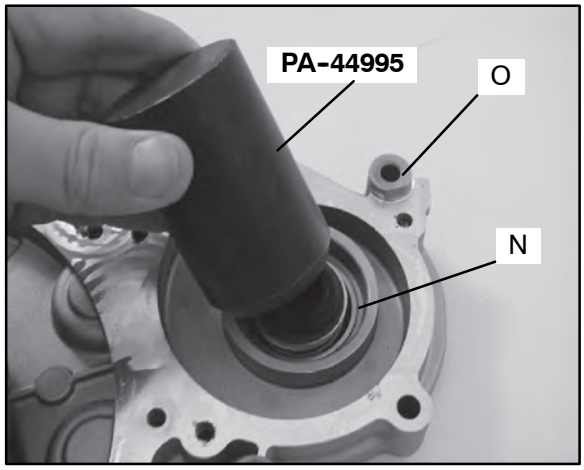
22 ± 2 ft. lbs. (30 ± 3 Nm)

GEAR/STATOR HOUSING SEAL REPLACEMENT

IMPORTANT: Due to seal design and construction, these seals MUST be installed dry

(no lubricant) during assembly. Use of lubricants (oil, soapy water, etc.) will not allow the seal to wear-in and seal properly. Do not touch seal surface or allow seal surface to come in contact with contaminates during installation. Thoroughly clean parts, tools and hands before installation.

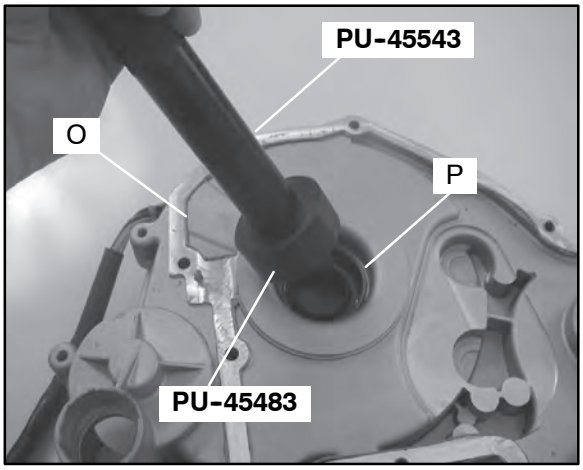
28. Before installing the gear/stator housing, replace the seals in the cover. Install a new water pump seal (N) into the gear/stator housing (O). Use the Water Pump Mechanical Seal Installer (**PA-44995**) to properly install the seal to the correct depth in the cover.



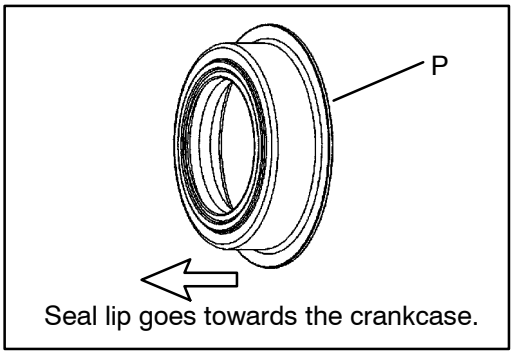
NOTE: To remove the water pump seal, the gear/stator housing must be removed. The water pump seal cannot be removed or installed with the gear/stator housing attached to the engine. Shaft damage will occur.

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

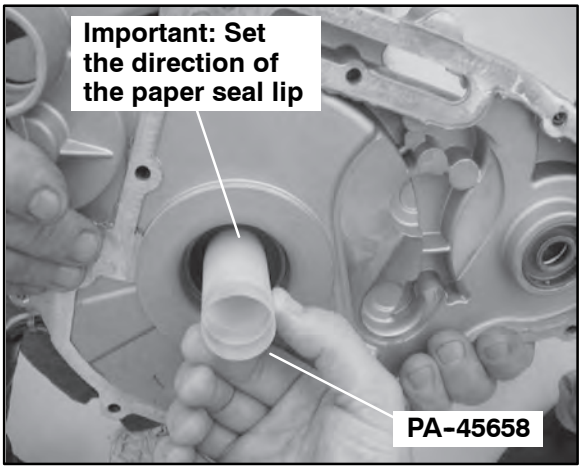
29. Install a new crankshaft seal (P) into the gear/stator housing cover (O). Use the Universal Driver Handle (**PU-45543**) and the Main Seal Installer (**PU-45483**) to seat the crankshaft seal into place.



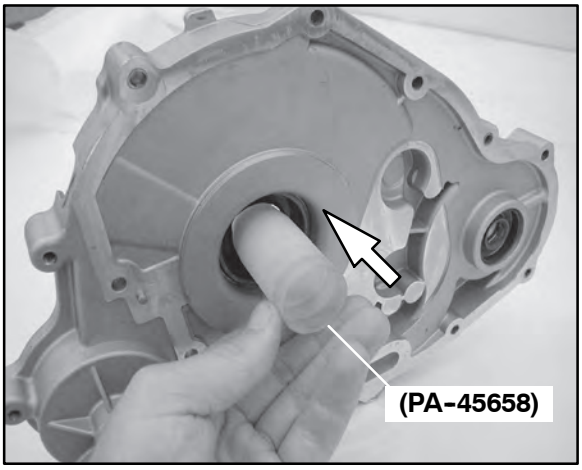
NOTE: Install the crankshaft seal (P) with the seal lip facing out (towards the crankcase).



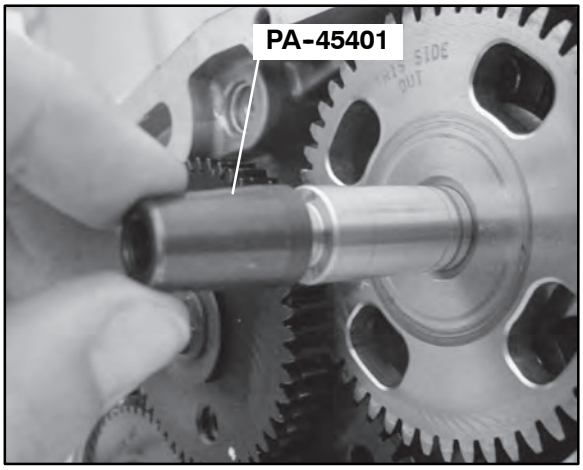
30. Once the crankshaft seal is installed into the gear/stator housing cover, set the direction of the paper lip by sliding the Main Crankshaft Seal Saver (**PA-45658**) into the crankshaft seal from the rubber lipped side to the paper lip side.(Back to Front) Remove the tool.



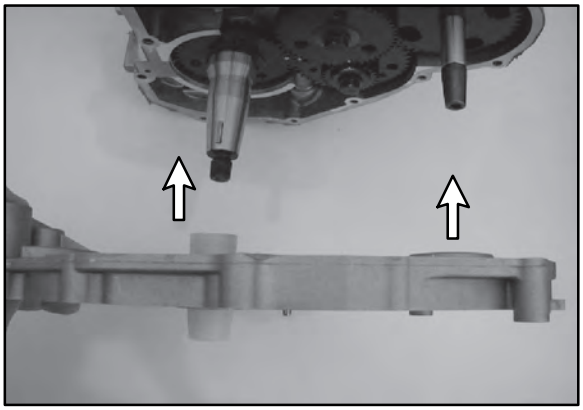
31. **Carefully** install the tapered end of the Crankshaft Seal Protection Tool (**PA-45658**) through the paper side of the crankshaft seal. (Back to Front) Leave the seal protector installed in the crankshaft seal. Check the crankshaft seal lips to verify they have not been rolled or damaged.



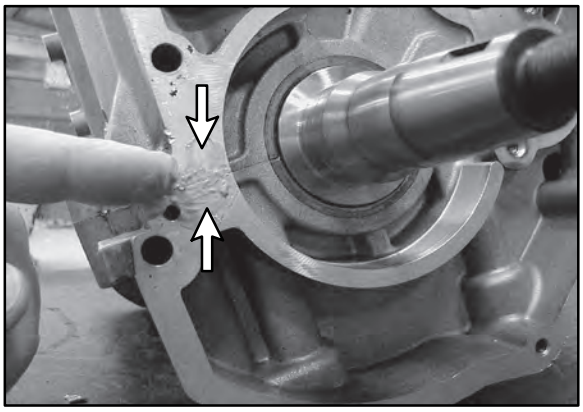
32. Before installing the gear/stator housing cover, install the Water Pump Seal Saver (**PA-45401**) onto the water pump shaft.

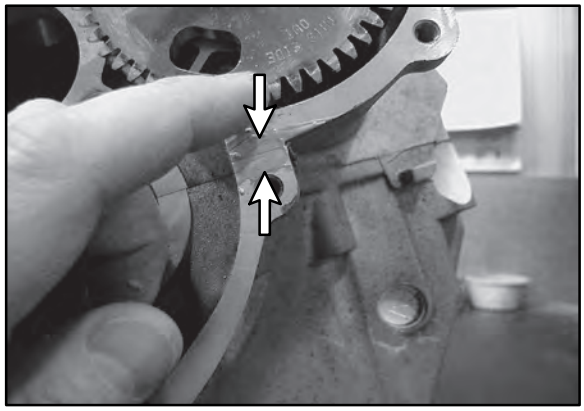


33. Install the new gasket to the gear/stator housing cover and crankcase. With the tools installed, carefully place the gear/stator housing cover over the protection tools. **NOTE:** New gasket is not shown in the picture.

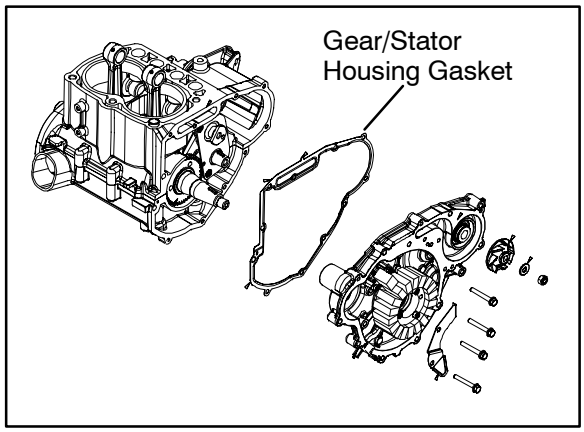


34. Apply Crankcase Sealant (**PN 2871557**) to the outside edges of the crankcase halves (See arrows), where the crankcases mate. (See photos below.) This helps to prevent coolant leakage.

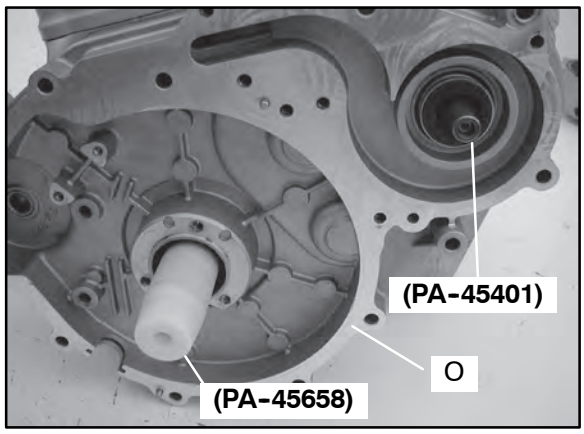




35. Install the gear/stator housing gasket onto he crankcase.



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

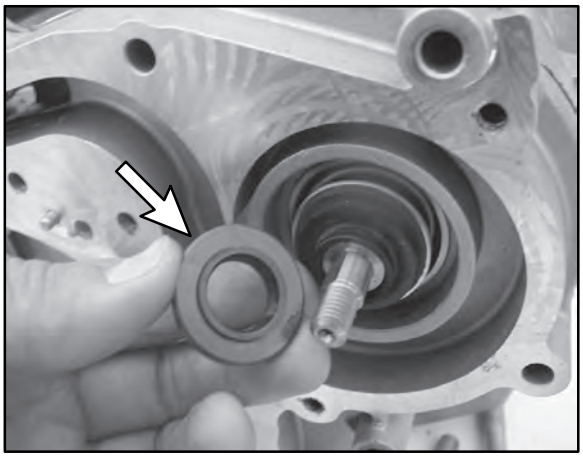


Gear/Stator Housing Bolt Torque:
96 ± 12 in. lbs. (10.85 ± 0.35 Nm)

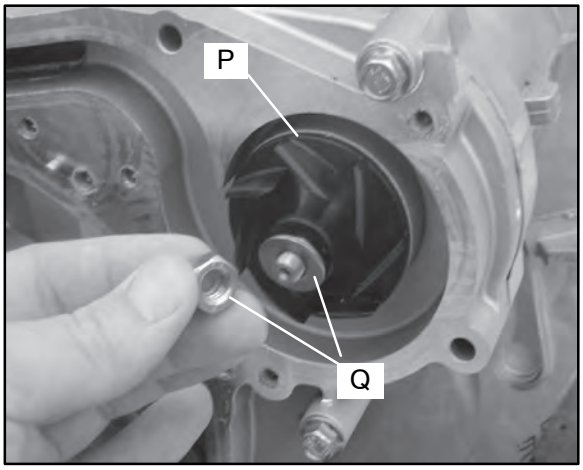
***Torque in Proper Sequence (Pg. 3.3)**

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

37. Install shaft seal with ceramic surface facing inward.



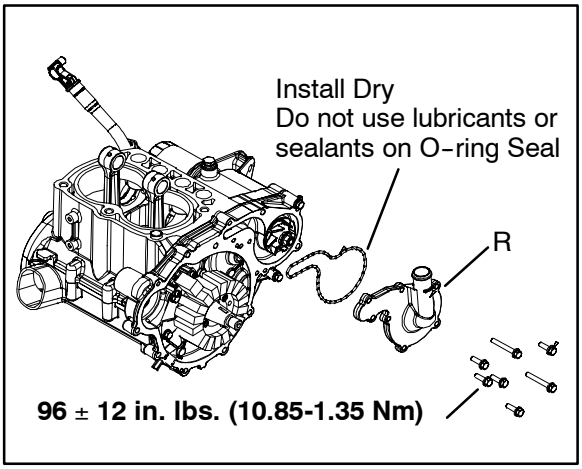
38. Install water pump impeller (P). **Secure the impeller with the washer and a <u>new nylok nut (Q)</u>.** Torque the nut to 108 ± 12 in. lbs. (6.8 ± 0.68 Nm).



Water Pump Impeller Nut Torque:

108 ± 12 in. lbs. (6.8 ± 0.68 Nm)

39. Install water pump cover (R) with new O-ring seal. Torque bolts to 96 ± 12 in. lbs. (10.85 ± 0.35 Nm) in proper sequence (See Pg. 3.4).

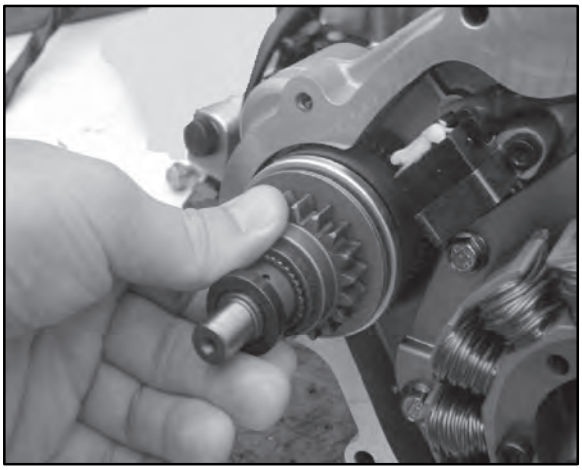


Water Pump Housing Bolt Torque:
96 ± 12 in. lbs. (10.85-1.35 Nm)

***Torque Bolts in Proper Sequence (Pg. 3.4)**

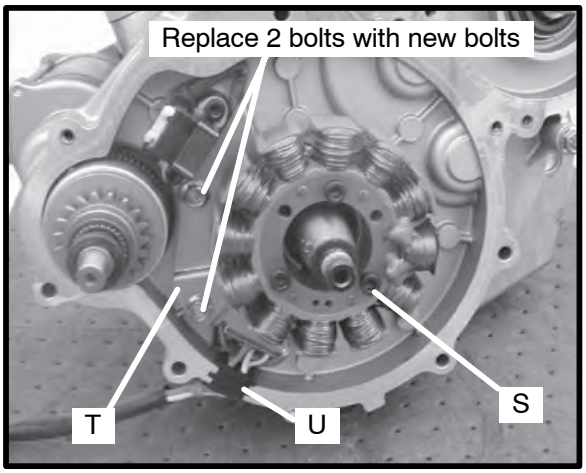
40. Sparingly apply Starter Drive Grease (**PN 2871423**) to the starter drive. Install the starter bendix.

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



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

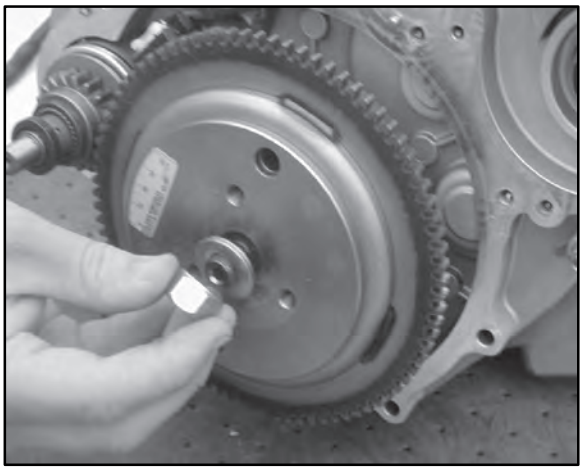
NOTE: Be sure the stator wires are routed properly under the wire hold down bracket.



Stator Assembly Bolt Torque:

96 ± 12 in.lbs. (10.85 ± 0.35 Nm)

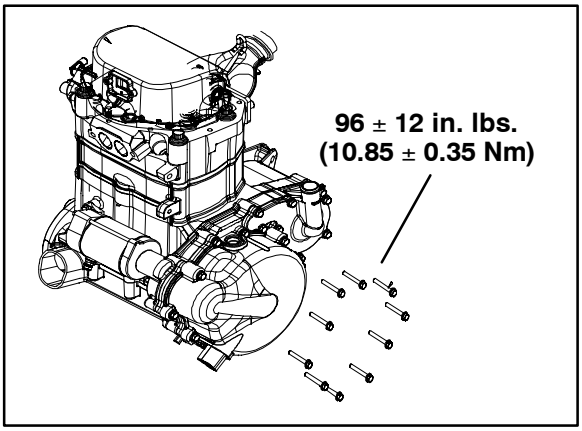
43. Install the flywheel, washer, nut, and key. Torque flywheel nut to 65 ± 7 ft. lbs. (88 ± 9.50 Nm).



Flywheel Nut Torque:

65 ± 7 ft. lbs. (88 ± 9.50 Nm)

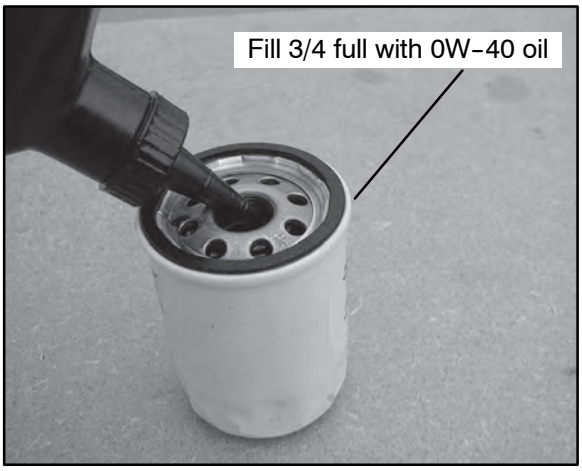
44. Install stator housing with new O-rings. Torque the bolts to 96 ± 12 in.lbs. (10.85 ± 0.35 Nm) and follow proper bolt torque sequence Pg. 3.4.



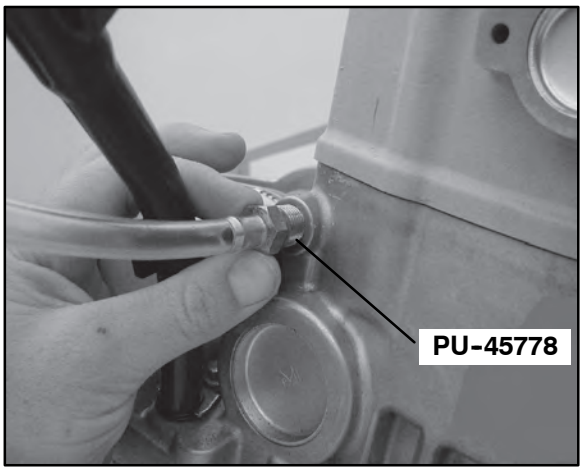
Stator Housing Bolt Torque:
96 ± 12 in. lbs. (10.85 ± 0.35 Nm)

***Torque in Proper Sequence (Pg. 3.4)**

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



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



Oil System Priming Adapter:

(PU-45778)

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

TROUBLESHOOTING

Spark Plug Fouling

- Spark plug cap loose or faulty
- Choke cable adjustment or plunger/cable sticking
- Foreign material on choke plunger seat or plunger
- Incorrect spark plug heat range or gap
- Carburetor inlet needle and seat worn
- Jet needle and/or needle jet worn or improperly adjusted
- Excessive carburetor vibration (loose or missing needle jet locating clips)
- Loose jets in carburetor or calibration incorrect for altitude/temperature
- Incorrect float level setting
- PVT system calibrated incorrectly/ components worn or mis-adjusted
- Fuel quality poor (old) or octane too high
- Low compression
- Restricted exhaust
- Weak ignition (loose coil ground, faulty coil, stator, or ETC switch)
- ETC switch mis-adjusted
- Restricted air filter (main or pre-cleaner) or breather system
- Improperly assembled air intake system
- Restricted engine breather system
- Oil contaminated with fuel

Engine Turns Over But Fails to Start

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

Engine Does Not Turn Over

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

Engine Runs But Will Not Idle

- Restricted carburetor pilot system
- Carburetor misadjusted
- Choke not adjusted properly
- Low compression
- Crankcase breather restricted

Engine Idles But Will Not Rev Up

- Spark plug fouled/weak spark
- Broken throttle cable
- Obstruction in air intake
- Air box removed (reinstall all intake components)
- Incorrect or restricted carburetor jetting
- ETC switch limiting speed
- Reverse speed limiter limiting speed
- Carburetor vacuum slide sticking/diaphragm damaged
- 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
- Carburetor vacuum slide sticking/diaphragm damaged
- Dirty carburetor
- Cam worn excessively

TROUBLESHOOTING, CONT

Piston Failure - Scoring

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

Excessive Smoke and Carbon Buildup

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

Low Compression

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

Backfiring

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

COOLING SYSTEM TROUBLESHOOTING

Overheating

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

Temperature Too Low

- Thermostat stuck open

Leak at Water Pump Weep Hole

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

BLEEDING PROCEDURE FOR 4-STROKE COOLING SYSTEMS

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

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

1. Park Machine on a flat surface. Remove radiator cap and top off coolant. Leave the cap off of the radiator. Start and idle machine for 5-10 minutes until steam is visible in the radiator cap area.

2. Stop the engine and let cool for a few minutes or until a "glug" is seen at the filler neck or there is a dropping of the coolant level, indicating that coolant has been pulled into the system.

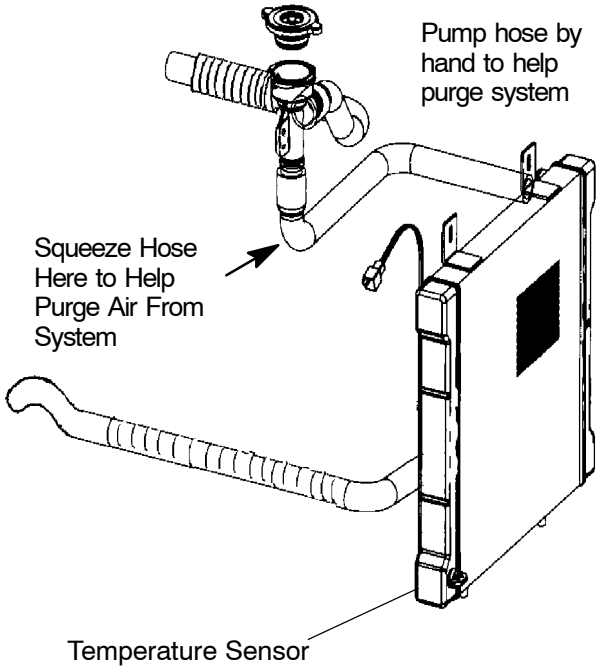
Important Tips: *Slowly squeezing the hose after the bend below the filler neck will aid in purging the system of air. Pump the hose using your hand several times as shown in the diagram. Elevating the rear of the ATV with a floor jack (rear tires 4-6, off the ground) also aids the purging of air from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

3. Always add coolant to the radiator **first,** filling to the top of the neck to replace air that has been purged from the system. Fill the reservoir only after you have completely filled the cooling system at the radiator filler neck.

4. Repeat Steps 1 and 2 four or five times or until no more coolant is pulled into the system.

5. In some instances, Steps 1 and 2 may have to be performed with the radiator cap **on** to prevent coolant loss.

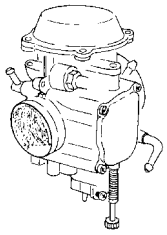
6. To test, install the radiator cap and idle machine until fan comes on. Make sure the fan comes on before the hot light.



Remote Filler Cooling System

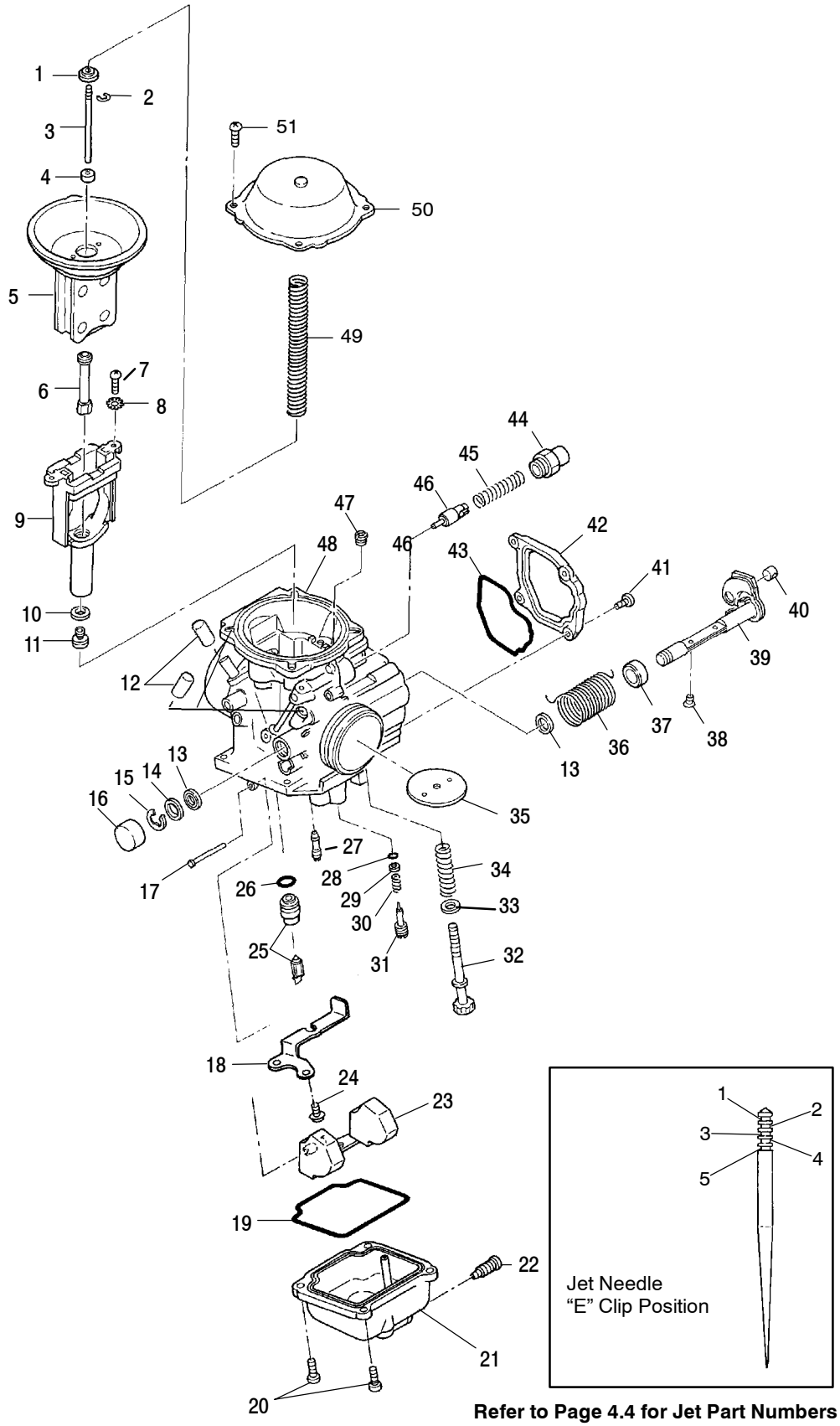
Polaris Premium Antifreeze	
2871534	Quart
2871323	Gallon

CHAPTER 4
FUEL/CARBURETION



4

BST 34 CARBURETOR EXPLODED VIEW



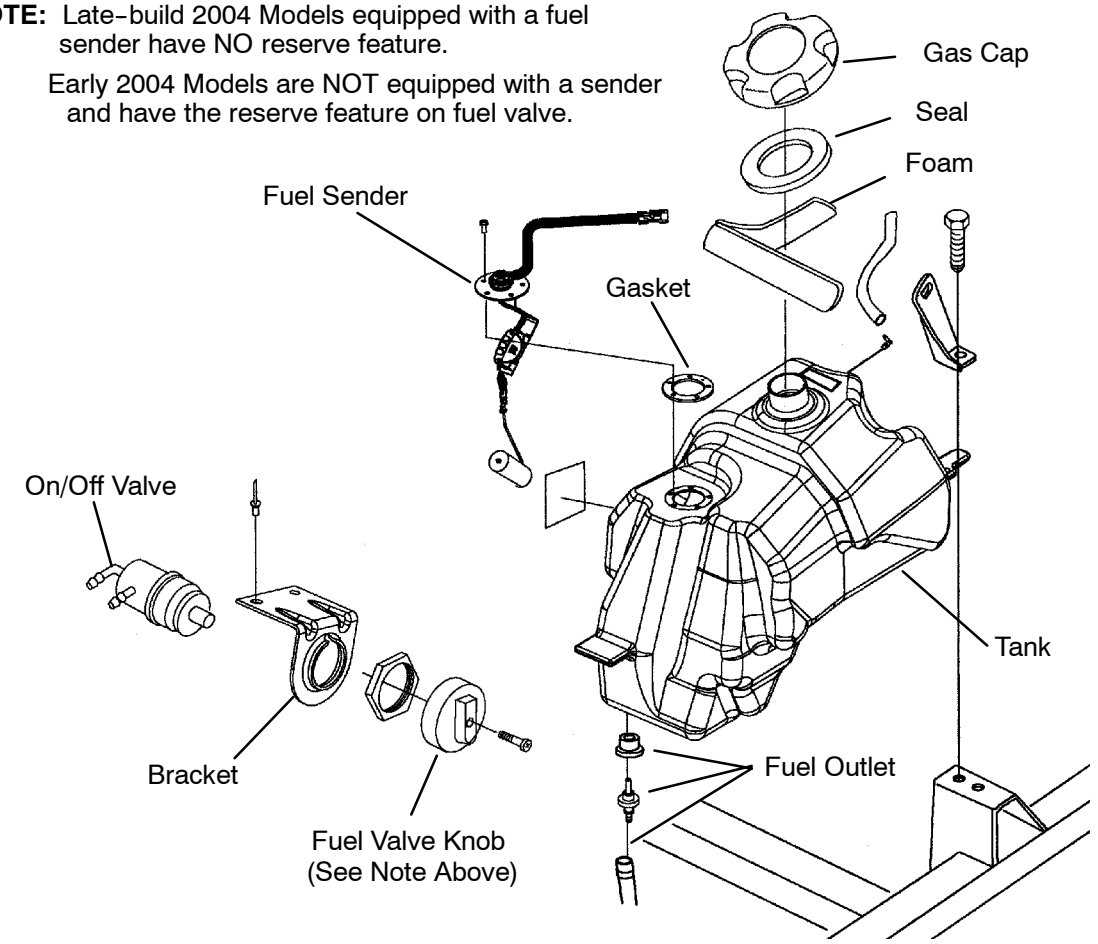
Refer to Page 4.4 for Jet Part Numbers

1. Ring
2. E-Ring
3. Jet Needle
4. Ring
5. Diaphragm
6. Needle Jet
7. Screw
8. Spring Washer
9. Jet Block
10. Washer
11. Main Jet
12. Cap
13. Seal
14. Packing
15. E-ring
16. Cap
17. Float Pin
18. Plate
19. O-ring
20. Screw
21. Float Body Assy.
22. Screw.
23. Float Assy.
24. Screw
25. Needle Valve
26. O-ring
27. Pilot Jet
28. O-ring
29. Washer
30. Spring
31. Adjuster
32. Adjuster Screw
33. Ring.
34. Spring
35. Throttle Valve
36. Spring
37. Ring
38. Screw
39. Throttle Shaft
40. Cable Guide
41. Screw
42. Cover
43. O-ring
44. Guide Holder
45. Spring
46. Plunger Assy.
47. Air Jet
48. Carburetor Assy.
49. Spring
50. Cover Assy.
51. Screw

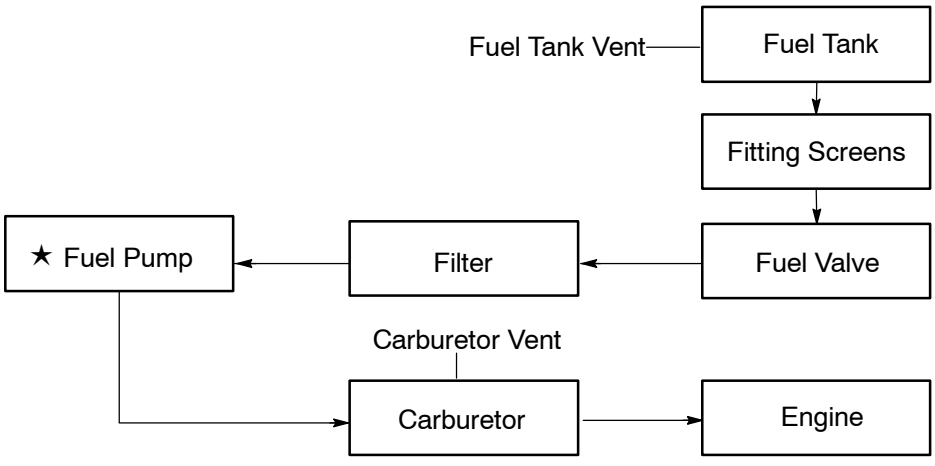
FUEL TANK ASSEMBLY

NOTE: Late-build 2004 Models equipped with a fuel sender have NO reserve feature.

Early 2004 Models are NOT equipped with a sender and have the reserve feature on fuel valve.



FUEL FLOW



★ Located Above Oil Tank

SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2870975	Mity Vac™ Pressure Test Tool
2872314	Carburetor Float Adjustment Tool

⚠ WARNING

Gasoline is extremely flammable and explosive under certain conditions.

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

⚠ Do not overfill the tank. The tank is at full capacity when the fuel reaches the bottom of the filler neck. Leave room for expansion of fuel.

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

⚠ Never drain the float bowl when the engine is hot. Severe burns may result.

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

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

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

JETTING GUIDELINES

Changes in altitude and temperature affect air density, which is essentially the amount of oxygen available for combustion. In low elevations and cold temperatures, the air is more dense and has more oxygen. In higher elevations and higher temperatures, the air is less dense with reduced oxygen.

Polaris ATV Carburetors are calibrated for an altitude of 0-6000 ft. (0-1800 meters) and ambient temperatures between +40 and +80° F (+5° to +26° C). Carburetors must be re-calibrated if operated outside this temperature and/or altitude range. The jetting installed in production is not intended for all altitudes and/or temperatures. In addition, air screw / pilot screw adjustments and PVT adjustments may be required to suit operating conditions.

CARBURETOR JETTING

CAUTION:

A main jet that is too small will cause a lean operating condition resulting in serious engine damage. Select the correct main jet carefully for elevation and temperature according to the charts in the specifications section or in the Owner's Safety and Maintenance Manual for each particular model.

IMPORTANT: The following guidelines must be followed when establishing a main jet setting:

1. Select the lowest anticipated temperature at which the machine will be operated.
2. Determine the lowest approximate altitude at which the machine will be operated.
3. Select the correct main jet from the chart on Page 1.4.
4. Clutching changes may also be required for changes in elevation. Refer to clutching chart in the specifications section for recommendations.

MIKUNI JET PART NUMBERS

Main Jets		Pilot Jets	
Jet Number	Part Number	Jet Number	Part Number
112.5	**3130554**	40.0	**3130624**
115	**3130555**	42.5	**3130526**
117.5	**3130556**		
120	**3130557**		
122.5	**3130558**		
125	**3130559**		
127.5	**3130560**		
130	**3130561**		
132.5	**3130562**		
135	**3130563**		
137.5	**3130564**		
140	**3130527**		
142.5	**3130566**		
145	**3130567**		
147.5	**3130568**		
150	**3130569**		
152.5	**3130570**		
155	**3130571**		
157.5	**3130572**		
160	**3131141**		
162.5	**3131142**		
165	**3131143**		
167.5	**3131144**		
170	**3131145**		

CV CARBURETOR SYSTEM FUNCTION

Carburetor Component Function			
System	**Main Components**	**Main Function**	**Main Affect**
Float System (Level Control)	Inlet Pipe, Needle and Seat, Float, Float Pin	Maintains specified fuel level in float chamber (carburetor float bowl)	All systems All throttle ranges
Venting	Passages in Carburetor, Vent lines to frame	Supplies atmospheric pressure to float chamber	All systems All throttle ranges
Starter (Choke/Enrichment)	Choke Lever, Cable, Plunger, Return Spring, Carb Passages (Starter Jet, Starter Bleed Pipe)	Supplies additional fuel air mixture necessary for cold starting	All throttle ranges Greatest effect at low throttle settings and idle
Pilot (Idle System)	Pilot Jet/ Passageways, Pilot-Mixture Screw with Spring Washer and Sealing O-Ring, By-pass Ports (Behind Throttle Plate), Pilot Air Jet, Pilot Outlet, Throttle Plate	Primarily supplies fuel at idle and low throttle positions	Mainly idle to 1/4 throttle Minimal effect after 1/2 throttle
Main System	Main Jet, Main Air Jet, Main Air Passage, Needle Jet, Jet Needle, Vacuum Slide, Throttle Plate	Supplies fuel at mid-range and high throttle settings.	1/4 to full throttle

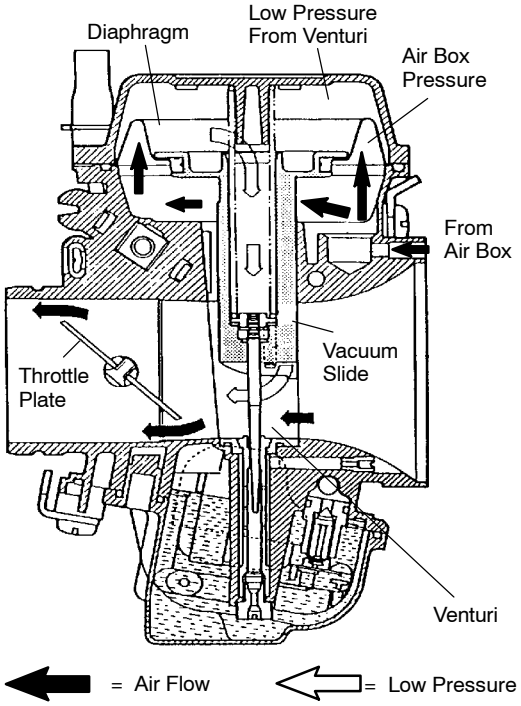
VENT SYSTEMS - CV CARBURETOR

The carburetor float bowl vent lines supply atmospheric pressure to the float bowl. The lines must be free of kinks, restrictions and be properly routed. This allows fuel to flow in the proper amount and prevents contaminants from entering the carburetor.

MIKUNI CV CARB OPERATION

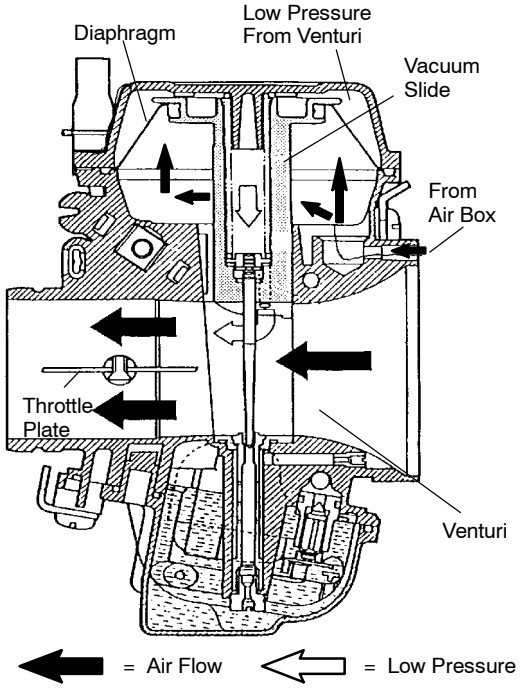
The constant velocity carburetor incorporates a mechanically operated throttle plate and a vacuum controlled slide valve (vacuum slide). The venturi cross-sectional area in the carburetor bore is increased or decreased automatically by the vacuum slide, which moves according to the amount of negative pressure (less than atmospheric) present in the venturi.

A diaphragm attached to the top of the vacuum slide is sealed to the slide and to the carburetor body forming two chambers. The chamber above the diaphragm is connected to the venturi area by a drilled orifice in the center of the vacuum slide. The chamber below the diaphragm is vented to atmospheric pressure by a passage on the air box side of the carburetor. A spring, installed in the center of the vacuum slide, dampens the slide movement and assists the return of the slide.



CARBURETOR OPERATION CONT'D

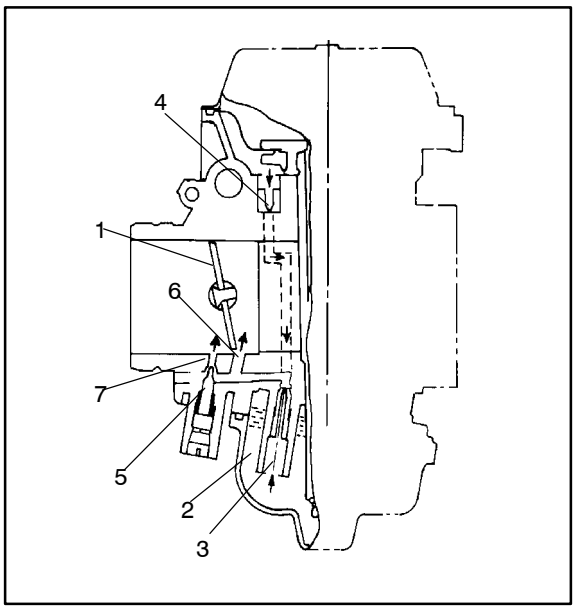
When the throttle plate is opened and engine speed begins to increase, the pressure in the venturi (and therefore in the chamber above the diaphragm) becomes significantly lower than atmospheric. Atmospheric pressure in the chamber below the diaphragm forces the diaphragm upward, raising the slide against spring pressure. When the pressure above and below the diaphragm are nearly equal, the slide moves downward under spring pressure. Raising or lowering the slide increases or decreases the cross sectional area in the venturi, and therefore the air velocity in the venturi is kept relatively constant. This provides improved fuel atomization and optimum fuel/air ratio.



Note: Diagrams are for explanation of theory only, and are not true representations of Mikuni BST carburetor.

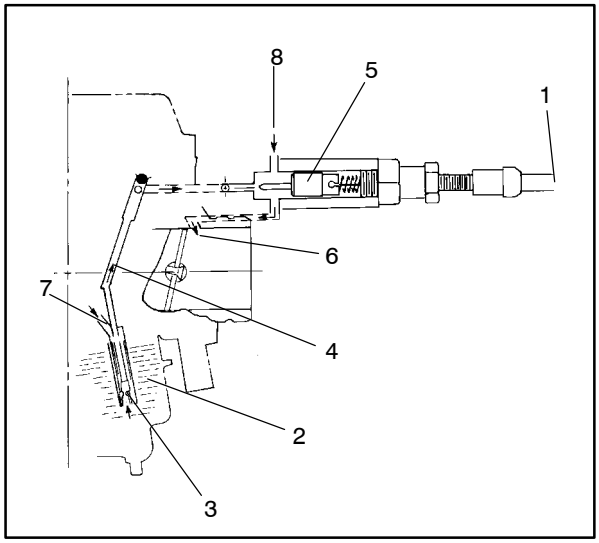
PILOT (IDLE AND SLOW) SYSTEM

This system supplies fuel during engine operation with throttle valve closed (1) or slightly opened. The fuel from float chamber (2) is metered by pilot jet (3) where it mixes with air coming in through pilot air jet (4). The mixture then goes up through pilot passage to pilot screw (5). A part of the mixture is discharged into the main bore out of bypass ports (6). The remainder is then metered by pilot screw and discharged into the main bore through pilot outlet (7).



STARTER SYSTEM (CHOKE OR ENRICHMENT)

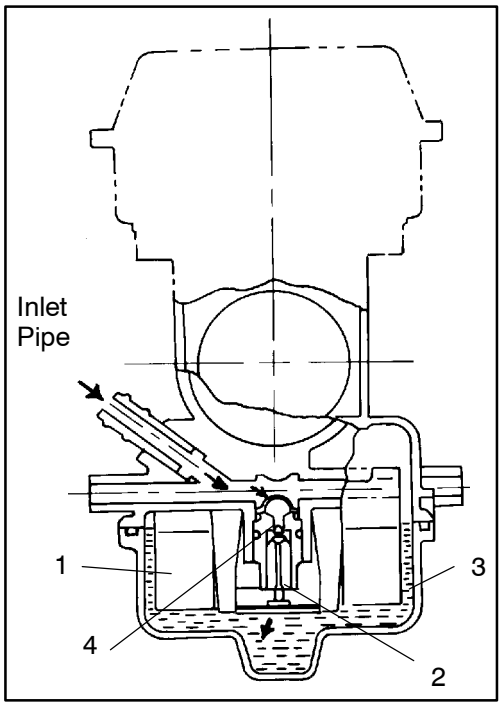
When the choke cable (1) is activated, the starter plunger (5) is lifted off the seat.

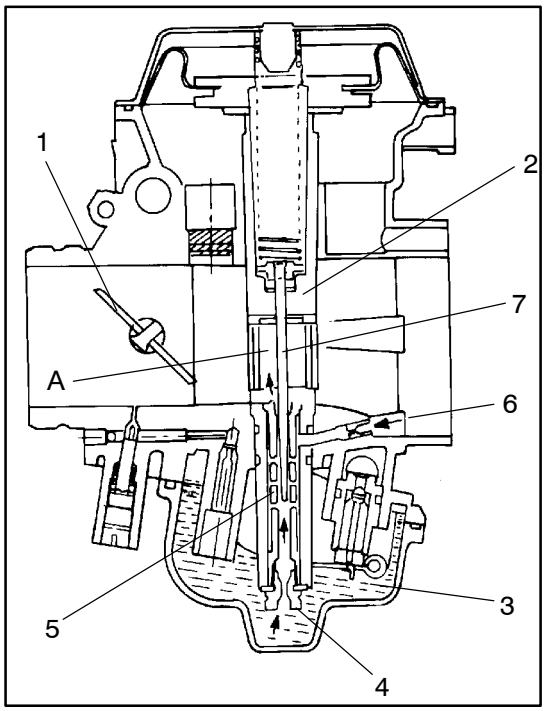


Fuel is drawn into the starter circuit from the float chamber (2) through the starter jet (3). Starter jet meters this fuel, which then flows into starter pipe (4) and mixes with the air (7) coming from the float chamber. The mixture, rich in fuel content, reaches starter plunger and mixes again with the air coming through a passage (8) extending from underneath the diaphragm. The rich fuel/air mixture for starting is discharged through starter outlet (6) in the the main bore.

FLOAT SYSTEM

Fuel enters the float chamber (3) by means of the inlet pipe and passage, through a screen on the back of the inlet needle seat (4), and around the inlet needle (2). As the fuel fills the float chamber, the float (1) rises and forces the inlet needle against the seat, shutting off the orifice in the seat. When fuel level is up in float chamber, floats are up and needle valve remains pushed up against valve seat. Under this condition, no fuel enters the float chamber. As the fuel level falls, floats go down and needle valve unseats itself to admit fuel into the chamber. In this manner, the needle valve admits and shuts off fuel alternately to maintain a practically constant fuel level inside the float chamber.





MAIN SYSTEM

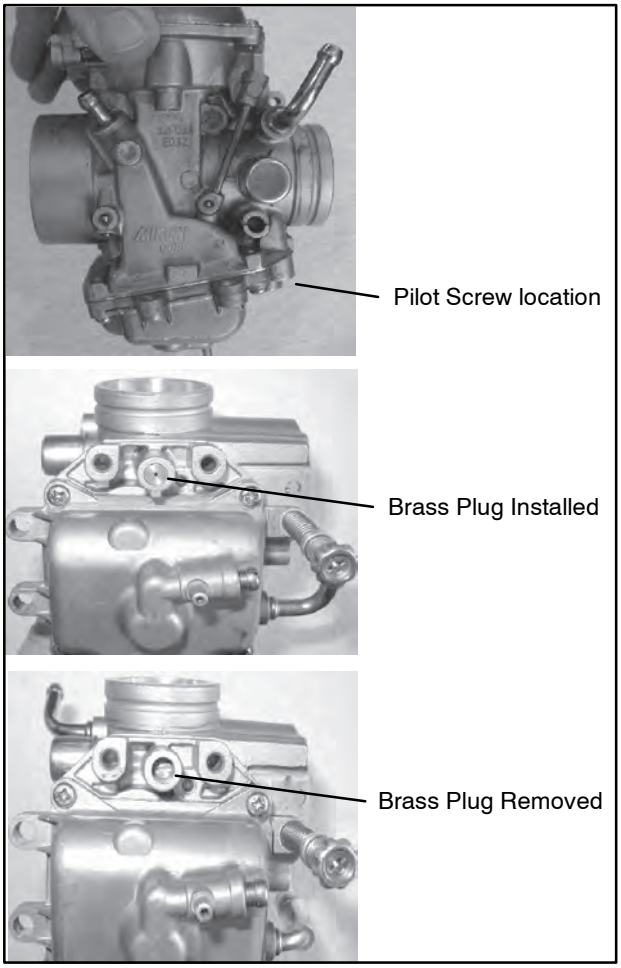
As throttle valve (1) is opened, engine speed rises, and this increases negative pressure in the venturi. Consequently the vacuum slide (2) moves upward. The fuel in float chamber (3) is metered by main jet (4), and the metered fuel enters needle jet (5), in which it mixes with the air admitted through main air jet (6) to form an emulsion. The emulsified fuel then passes through the clearance between needle jet (5) and jet needle (7), and is discharged into the venturi (A). Mixture proportioning is accomplished in needle jet (5); the clearance through which the emulsified fuel must flow is determined ultimately by throttle position and vacuum slide height.

PILOT SCREW

The pilot system supplies fuel during engine operation with the throttle valve closed or slightly opened. The fuel/air mixture is metered by pilot screw and discharged into the main bore through the pilot outlet.

CAUTION:

The pilot screw is calibrated at the factory to meet EPA / CARB regulations for air quality standards and is sealed with a brass plug to prevent tampering. Removal of the tamper proof plug is not permitted. For service purposes, cleaning of the pilot circuit can be done only by a certified repair shop to ensure air quality standards are not exceeded.

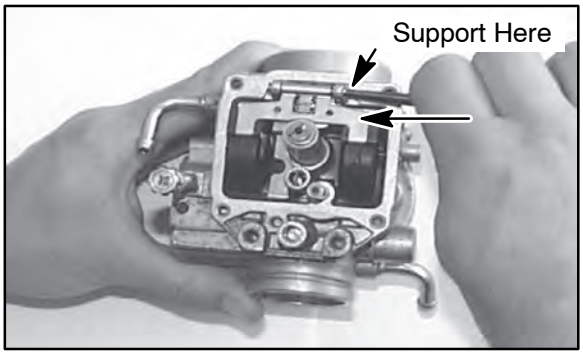


CARBURETOR DISASSEMBLY - MIKUNI CV

Use the following disassembly, assembly, and inspection techniques to service a CV carburetor.

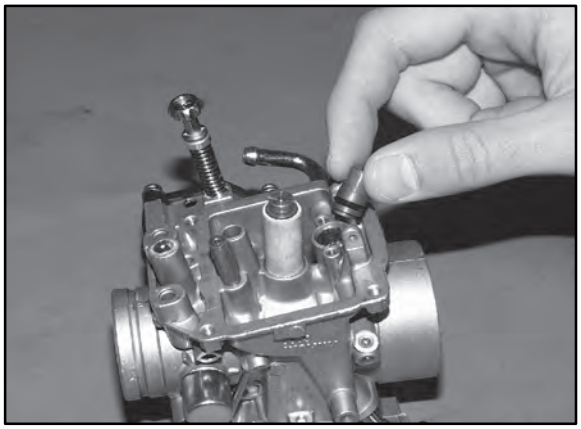
1. Remove carburetor diaphragm chamber cover with a ratchet style screwdriver. DO NOT use an impact driver to remove the screws or carburetor may be permanently damaged.

2. Remove float bowl and carefully remove the pressed float pin.



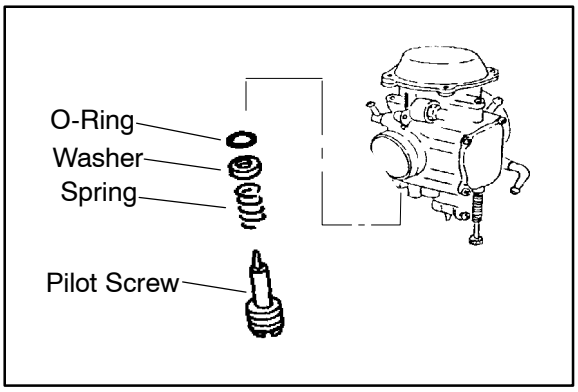
NOTE: Be careful not to damage the float pin tower during the float pin removal. Support the float pin tower while removing the float pin. This helps to prevent the float pin towers from breaking off.

3. Remove inlet needle seat retaining screw along with plate, and carefully remove needle seat. **NOTE:** Do not use a pliers to remove the seat or permanent damage may occur.

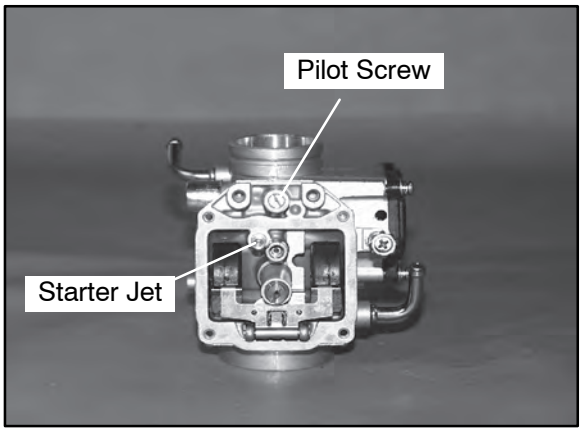


4. Remove the pilot mixture screw, spring, flat washer, and O-Ring. If an anti-tamper plug is

installed over the pilot screw cavity, it must be removed for access.



NOTE: The starter jet is not removeable. Upon disassembly, place the parts in a container for safe keeping.



CARBURETOR CLEANING

⚠ WARNING

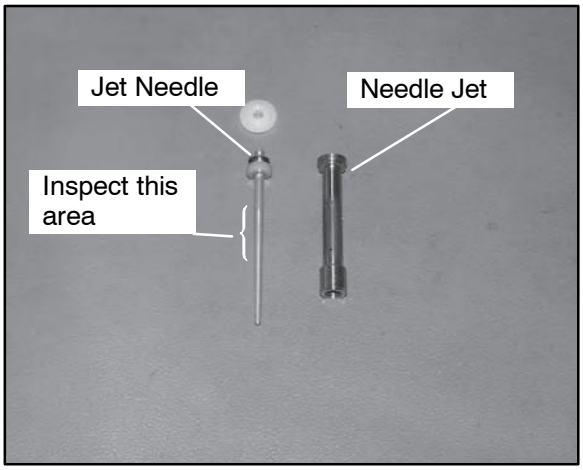
Protect eyes from contact with cleaner. Take appropriate safety measures during these procedures. Safety glasses and chemical resistant gloves are required. Should you get cleaner in your eyes or if you swallow cleaner, seek medical attention immediately.

Carburetor cleaners can be extremely caustic. Extended periods of soaking can loosen the adhesive sealer on the passage drill-way plugs. *Do not* soak rubber or plastic components (such as the vacuum slide diaphragm, needle seat screen, or O-Rings in caustic cleaning solutions. Irreparable damage may occur. Do not use agitator–type carburetor cleaning equipment. Rubber parts must be cleaned with mild detergent and hot water only.

1. Thoroughly clean the carburetor body, jets, and all passages with carburetor cleaner or electrical contact cleaner.
2. If the carburetor is extremely dirty or contaminated with fuel residue and varnish, soak for short periods only in carburetor cleaner, and rinse in hot water.
3. Replace the jets if they have a buildup of fuel residue or bacterial growth that cannot be removed. Even a small amount of residue will reduce the flow characteristics of the jet.
4. Verify all passages and jets are unobstructed by spraying electrical contact cleaner through the passages. **CAUTION:** Do not use wire or welding tip cleaners as the orifice size may be altered.
5. Use low pressure air to dry carburetor body and all components.

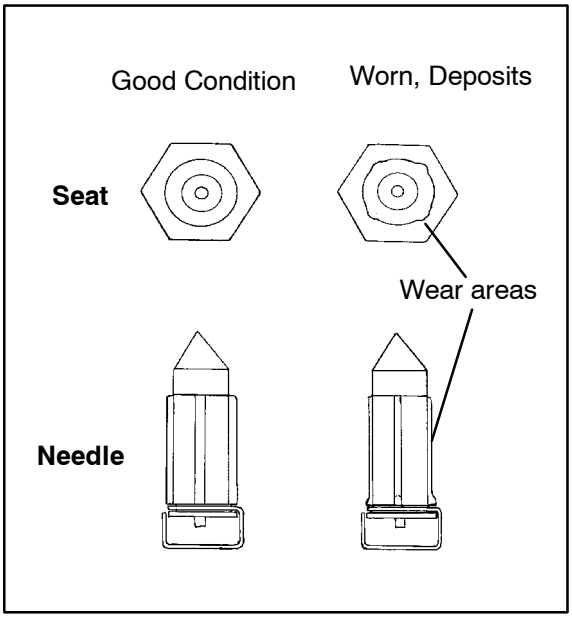
CARBURETOR INSPECTION

1. Inspect jet needle and needle jet for wear. Look for discoloration, shiny spots, or an area that looks different than the rest of the needle. The middle to upper portion of the needle contacts the needle jet and is the most likely wear point. If jet needle shows signs of wear replace *both the needle and needle jet* to prevent a rich condition. TIP: A worn *needle jet* is difficult to spot. To check, slide a slightly larger *new jet needle* into the needle jet and hold it to a light source. Light will be visible between the needle and needle jet if it is worn.



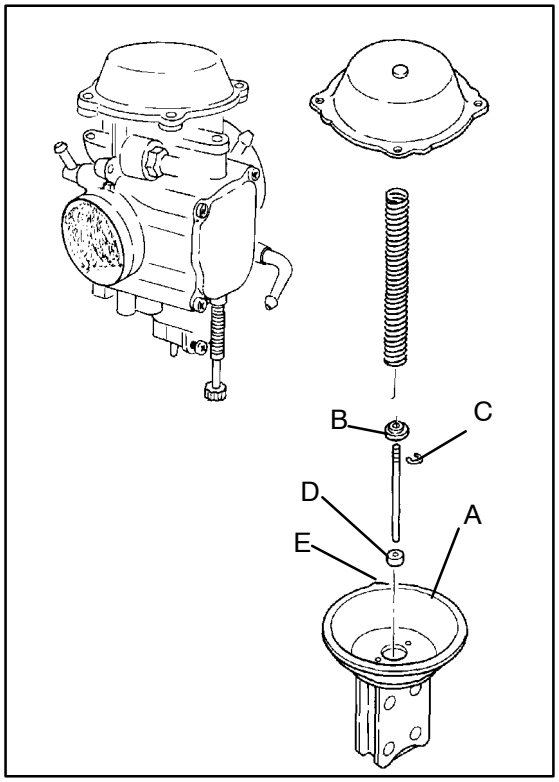
2. Inspect the inlet needle tapered surface for any sign of wear or damage. Be sure the spring loaded pin is free moving and returns freely when pushed. The inlet needle and seat should be

pressure tested after assembly.

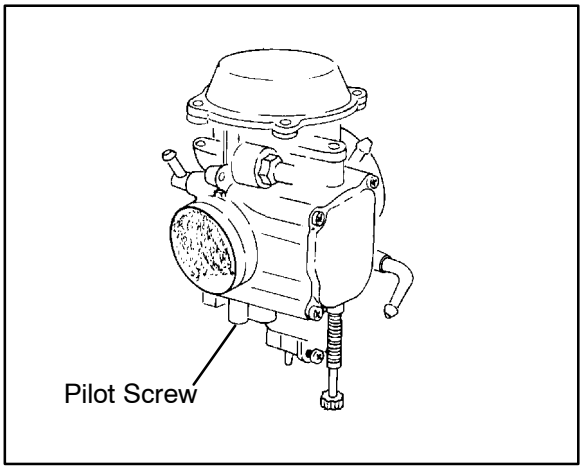


CARBURETOR ASSEMBLY

Inspect the diaphragm (A) for holes, deterioration, or damage. Make sure the diaphragm is pliable but not swollen. The diaphragm should fit properly in the carburetor body. Replace diaphragm assembly if diaphragm is damaged.



3. Replace parts in proper order. The spring seat washer (B) is stepped and must be placed on TOP of “E” Clip (C). Spacer washer (D) must be installed below the E-Clip. Refer to parts manual for more information.
4. Be sure the tab (E) on outer edge of diaphragm is positioned properly in the carburetor body.



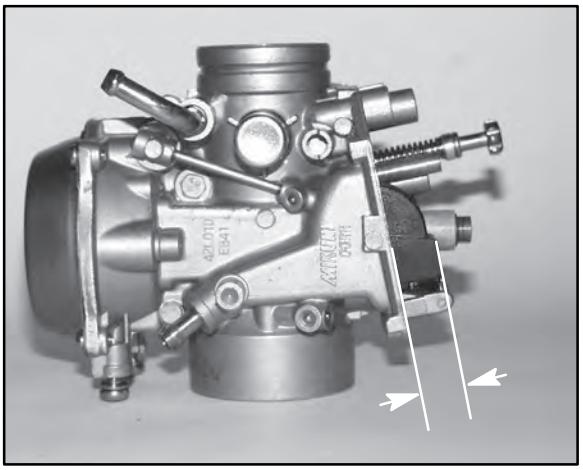
CARBURETOR ASSEMBLY CONT'D

5. Install the pilot mixture screw, spring, washer, and O-ring as an assembly. Lubricate the O-Ring with oil or light grease before installation. **CAUTION:** Do not damage the O-ring during installation. Turn the screw in until it *lightly* contacts the seat. Back out the specified number of turns. NOTE: The final pilot (idle) mixture must be adjusted with the engine running. Refer to Page NO TAG.

Pilot Mixture Screw Base Setting
(Set at Factory)
Refer to Specifications
Page in Chapter 1

FLOAT HEIGHT ADJUSTMENT

1. Place the carburetor on a level surface as shown at right to remove weight from float arm. In this position, the float tongue will rest lightly on the inlet needle valve pin without compressing the spring.

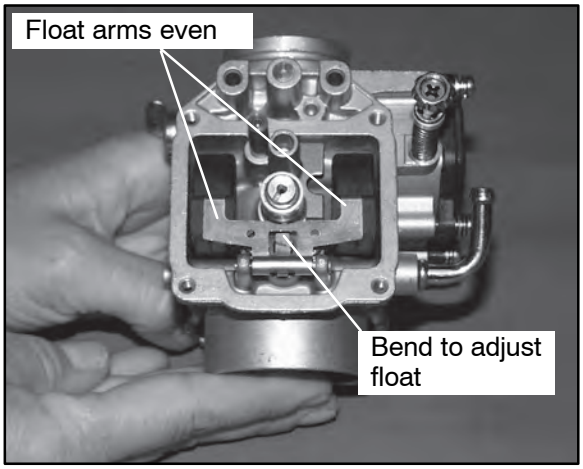


Float Height:

Std: 13-14 mm (.51-.55 in)

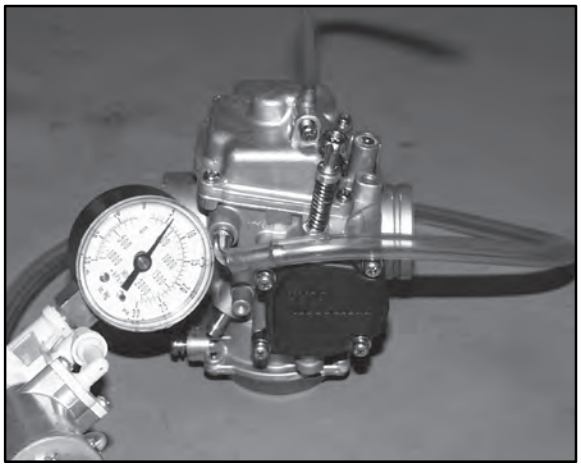
2. Measure the height from the float bowl mating surface to the top of step in float as shown. Both sides of float should be parallel to each other. The measurement should be made at the mid-point on the top of the float using Float Adjustment Tool (**PN 2872314**) or a vernier caliper. When measuring the height be sure the inlet needle valve spring is not compressed.

3. If adjustment is necessary, bend the tongue slightly. Be sure float measurement is even on left and right side.



NEEDLE AND SEAT LEAKAGE TEST

1. Install the float bowl. Invert the carburetor and install a Mity-Vac™ (**PN 2870975**) to the fuel inlet fitting. Apply 5 PSI pressure to inlet fitting. The needle and seat should hold pressure indefinitely. If not, inspect needle and seat and seat O-ring.

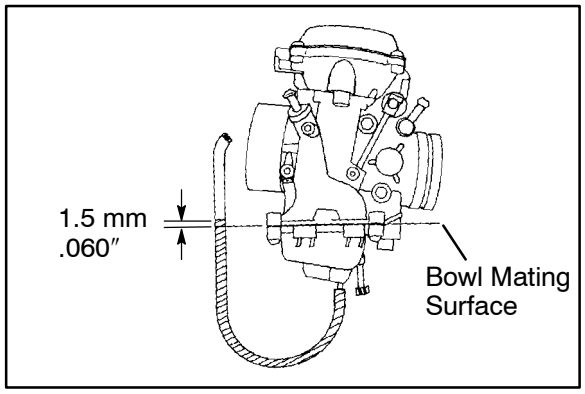


Mity Vac™ (PN 2870975)

FUEL LEVEL

A fuel level test can be performed on some models if the drain hose fitting is accessible. Be sure to re-attach the bowl drain hose after performing the test. A fuel level test allows you to observe the height of the fuel in the float bowl without removing the carburetor. The fuel level can be observed with the engine either running or shut off, however, engine must run briefly to allow fuel level to stabilize..

1. Attach a clear line to drain fitting. Be sure line fits tightly on fitting. Position hose along side of carburetor as shown.



2. Open bowl drain screw by turning counterclockwise approximately two turns. Start and run engine for 3 to 5 seconds to allow fuel level to stabilize in the line. If level is out of specification, remove carburetor and inspect inlet needle and seat, float height, passages, etc.

NOTE: If a line was removed to perform this procedure, it must be replaced.

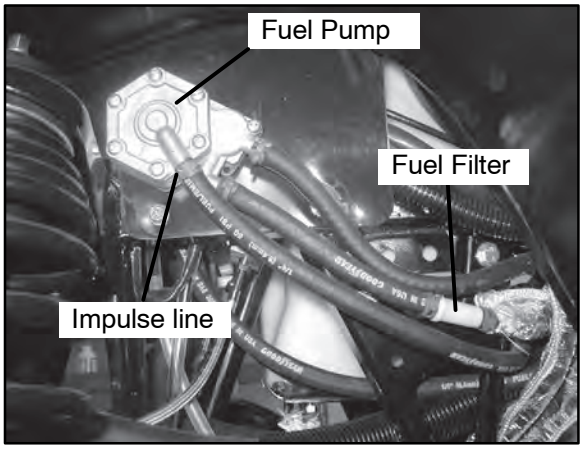
FUEL PUMP

The Polaris Sportsman 600/700 is equipped with a pressure regulated fuel pump (1-3 PSI). The pump is located under the left front fender of the machine.

To test the fuel pump:

1. Turn fuel off.
2. Disconnect impulse line from pump.
3. Connect Mity-Vac™ (**PN 2870975**) to the impulse line fitting on the pump.
4. Apply 5 inches (Hg) vacuum to the pump fitting. The diaphragm should hold vacuum indefinitely.

If fuel is present in the impulse line or vacuum chamber of the pump, the diaphragm is ruptured. The pump diaphragms must be replaced.



FUEL PUMP DISASSEMBLY

1. Remove the screws from the pump diaphragm cover. Note the location of the two longer screws.
2. Remove the diaphragm cover gasket, diaphragm, and valve body gasket.
3. Remove the outlet check valve cover, diaphragm, and gasket.

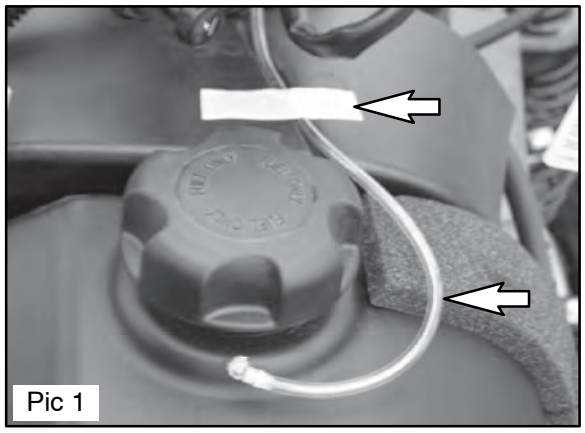
FUEL PUMP INSPECTION/ASSEMBLY

1. Inspect inlet and outlet check valves for cracks, warpage or damage. Inspect the diaphragms for cracks, holes or swelling.
2. To clean the valves or pump body, remove the set screw and washer. Remove the valve and wash with soap and water. Carburetor cleaner may be used to clean the pump body when the check valves are removed. **CAUTION:** Some carburetor cleaners are very caustic and should not be used to clean the non-metal parts of the fuel pump.
3. Check the sealing surfaces of the pump body and covers. Carefully remove all traces of old gasket and check the surfaces for damage. Replace diaphragms and gaskets as a set.
4. Reassemble the pump in the reverse order of disassembly. Tighten all screws evenly.

LATE 2004 FUEL SENDER REMOVAL/INSTALL

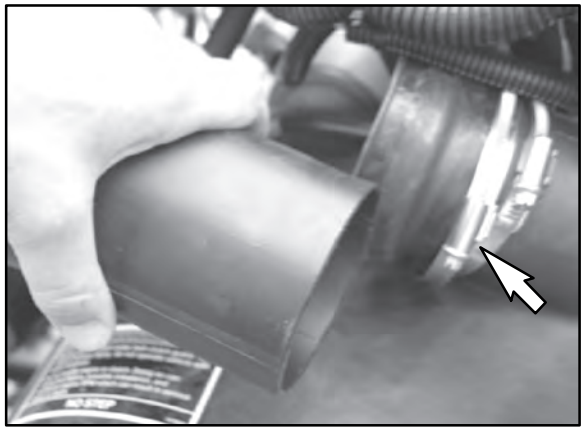
Fuel Sender Removal

1. Disconnect the negative battery cable.
2. Remove the side panels and front cab assembly. Refer to “COVER PANEL REMOVAL” in Chapter 5 for details.
3. Remove the gas tank cover vent hose. Be sure to properly route the vent hose upon reassembly.

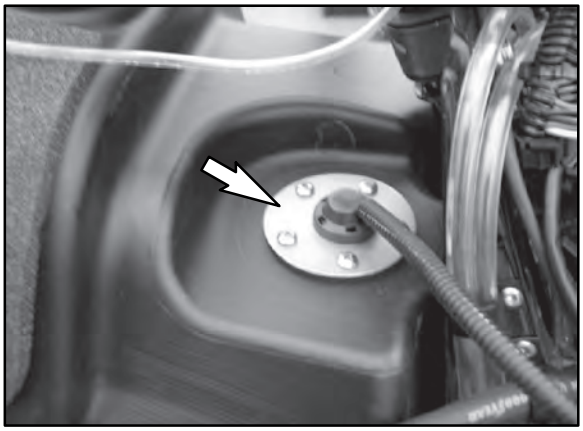


Pic 1

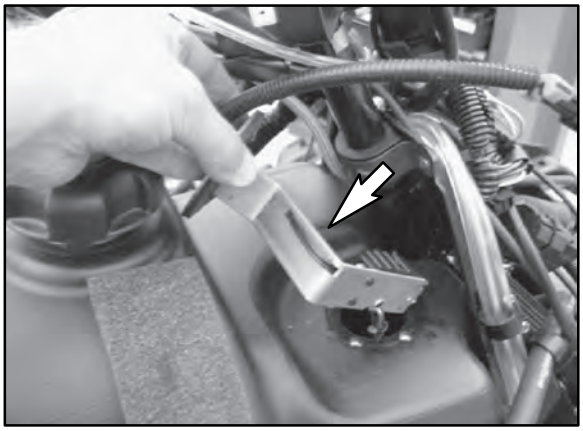
4. Remove the clamps on the PVT intake duct and remove the PVT duct.



5. With all the body panels removed from the front of the ATV and the gas tank exposed, disconnect the fuel sender wiring harness.
6. Remove the 5 screws that secure the fuel sender to the tank.



7. Slowly lift the sender out of the tank. Lift the sender out at an angle, so the float will more easily come out of the fuel tank.



Fuel Sender Installation

1. Reinstall the fuel send and a new gasket.
2. Install the 5 screws and torque the screws to 18-24 in.lbs. (2-3 Nm) in a criss-cross pattern. Reconnect the sender wiring harness and route the harness properly.
3. Reinstall the PVT intake duct, gas tank vent line, front cab assembly, and side panels.

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

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

FUEL SENDER TROUBLESHOOTING

Refer to Chapter 10 for fuel sender troubleshooting.

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 valve restricted
- Fuel filter plugged
- Carburetor vent line(s) restricted
- Plugged or restricted inlet needle and seat screen or inlet passage
- Clogged jets or passages
- Float stuck, holding inlet needle closed or inlet needle stuck
- Float level too low
- Fuel pump inoperative
- Air leak at impulse line
- Restricted impulse line (kinked, pinched)
- Intake air leak (throttle shaft, intake ducts, airbox or air cleaner cover)
- Ruptured vacuum slide diaphragm, Vacuum slide stuck closed or sticky
- Improper spring
- Jet needle position incorrect
- Incorrect pilot screw adjustment

RICH MIXTURE

Symptoms: Fouls spark plugs, black, sooty exhaust smoke, rough idle, poor fuel economy, engine runs rough/ misses, poor performance, bog, engine loads up, backfire.

- Air intake restricted (inspect intake duct)
- Air filter dirty/plugged
- Choke plunger sticking, incorrectly adjusted choke
- Choke cable binding or improperly routed
- Incorrect pilot air/fuel screw adjustment
- Faulty inlet needle and seat
- Faulty inlet needle seat O-Ring
- Float level too high
- Poor fuel quality (old fuel)
- Loose jets
- Worn jet needle/needle jet or other carburetor parts
- Dirty carburetor (air bleed passages or jets)
- Weak or damaged vacuum piston return spring
- Fouled spark plug

POOR IDLE

Idle Too High

- Idle adjusted improperly/idle mixture screw damaged
- Sticky vacuum slide
- Throttle cable sticking, improperly adjusted, routed incorrectly
- Choke cable sticking, improperly adjusted, routed incorrectly
- Plugged or restricted idle jet

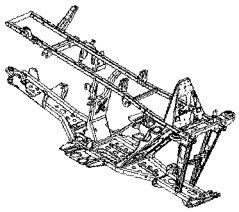
Idle Too Low

- Choke cable bending or incorrectly adjusted
- Idle speed set incorrectly
- Idle mixture screw misadjusted or damaged
- Belt dragging
- Ignition timing incorrect
- Worn jet needle/needle jet
- Plugged or restricted idle jet

Erratic Idle

- Choke cable bending or incorrectly adjusted
- Throttle cable incorrectly adjusted
- Air leaks, dirty carburetor passages (pilot circuit)
- Pilot mixture screw damaged or adjusted incorrectly
- Tight valves
- Ignition timing incorrect
- Belt dragging
- Dirty air cleaner
- Engine worn
- Spark plug fouled
- Idle speed set incorrectly (speed limiter)
- Worn jet needle/needle jet
- Plugged or restricted idle jet

CHAPTER 5
BODY AND STEERING



5

SPECIAL TOOLS

TOOL DESCRIPTION	PART NUMBER
Ball Joint Replacement Tool	**2870871**
Shock Spanner Wrench	**2870872**
Shock Absorber Spring Compression Tool	**2870623**
Strut Rod Wrench	**2871572**
LH Strut Spring Compressor	**2871573**
RH Strut Spring Compressor	**2871574**

TORQUE SPECIFICATIONS

Front A-Arm Attaching Bolt.....30 ft. lbs. (41 Nm)

Front A-Arm Ball Joint Stud Nut.....25 ft. lbs. (35 Nm)

Handlebar Adjuster Block.....10-12 ft. lbs. (14-17 Nm)

Master Cylinder .....45-55 in. lbs. (5.2-6.3 Nm)

Rear Shock Bolt (upper).....30 ft. lbs. (41 Nm)

Rear Shock Bolt (lower).....30 ft. lbs. (41 Nm)

Rear Wheel Hub Nut.....100 ft. lbs. (136 Nm)

Wheel Nuts.....30 ft. lbs. (40.6 Nm)

Upper Stabilizer Support Nut.....17 ft. lbs. (24 Nm)

Upper Control Arm Mounting Bolt....35 ft. lbs. (48 Nm)

Lower Control Arm Mounting Bolt....30 ft. lbs. (41 Nm)

Upper Wheel Bearing Carrier Bolt...35 ft. lbs. (48 Nm)

Lower Wheel Bearing Carrier Bolt....30 ft. lbs. (41 Nm)

Strut Rod Retaining Nut (Top).....15 ft. lbs. (21 Nm)

Strut Casting Pinch Bolt.....15 ft. lbs. (21 Nm)

Steering Post Nut.....0-12 ft. lbs. (14-17 Nm)

Steering Post Bushing Nuts.....0-12 ft. lbs. (14-17 Nm)

Steering Post Bearing Retainer Nuts.0-12 ft. lbs. (14-17 Nm

Tie Rod End Jam Nut.....12-14 ft. lbs. (17-19 Nm)

Tie Rod End Castle Nut.....40-45 ft. lbs. (54-61 Nm)

Tie Rod End Attaching Bolt....25-30 ft. lbs. (35-41 Nm)

COVER/PANEL REMOVAL

To Remove: **Seat**

Pull release lever at the rear of the seat Lift and pull seat rearward, disengaging seat from tabs at the rear of the fuel tank

To Remove: **Side panels (See Page 5.3)**
Remove Seat Disengage tabs at front and rear and pull away

To Remove: **Headlight pod (See Page 5.8)**

To Remove: **Front Cover**

Remove Front rack,Disengage cover and lift out

To Remove: **Rear Rack**
Remove Seat, 2 bolts at rear of rack and 2 bolts at front of rack

To Remove: **Rear Cab Assembly**
Remove Seat**,** Rear rack,1 screw–nut and washer at rear of inner left footrest, 4 screws at bottom of left rear mud flap, 1 screw, nut and washer at rear of inner right footrest, 4 screws at bottom of right rear mud flap, 4 bolts and flat washers from top of cab assembly under seat, 2 screws at rear bottom of cab assembly near tail light. Disconnect taillight harness

To Remove: **Front rack**
Remove 4 screws, lift off

To Remove: **Front Cab Assembly**
Remove Seat, Side panels, 2 screws at rear of cab at fuel tank mount bracket, Front rack, Front bumper (4 screws), Front cover panel, 3 screws from bottom left mud flap, 3 screws from bottom right mud flap, 1 inner screw from front cab to foot rest on each side, 2 screws under front panel, Remove fuel tank cap (reinstall on tank after cab is removed)

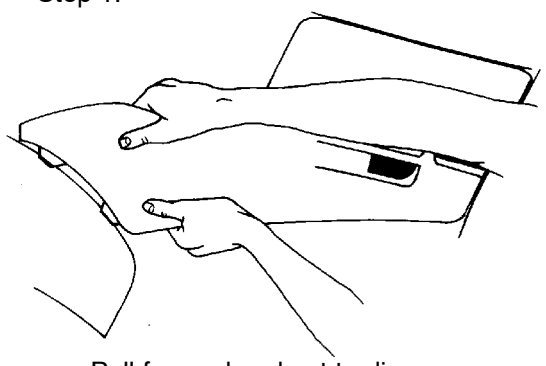
To Remove: **Radiator Cover**
Pull out slightly on the top of the radiator screen, then pull out on the bottom of the screen

SIDE PANEL REMOVAL

NOTE: Side panel removal may be difficult until the locking tabs and receivers have been snapped and unsnapped a few times.

1. Remove seat. Grasp rear of side panel near rear cab. With a quick and firm motion, pull the panel forward and outward to disengage the two rear tabs.

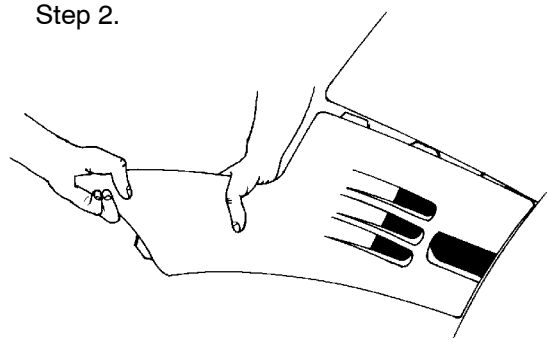
Step 1.



Pull forward and out to disengage two rear tabs.

2. Place hand on top of side panel behind the fuel tank. With a quick and firm motion, push down on the side panel to disengage the top rear two tabs. Then pull up on side panel to disengage front upper and lower tab.

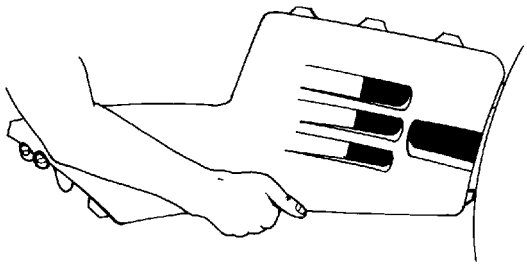
Step 2.



Push down to disengage top rear two tabs.

3. To reinstall side panel, align panel tabs with slots on front cab. Push panel upward and forward until tabs lock. Bend rear of side panel and insert the two tabs into the rear cab.

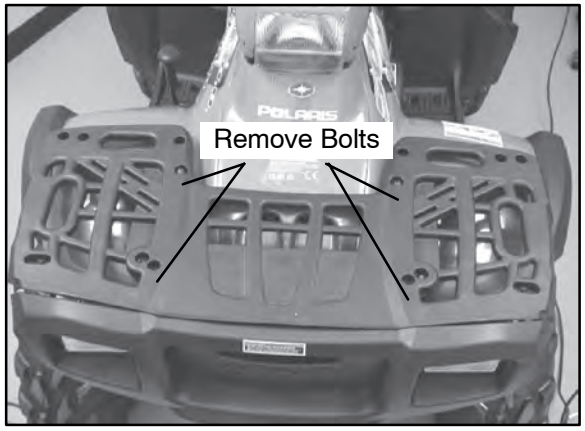
Step 3.



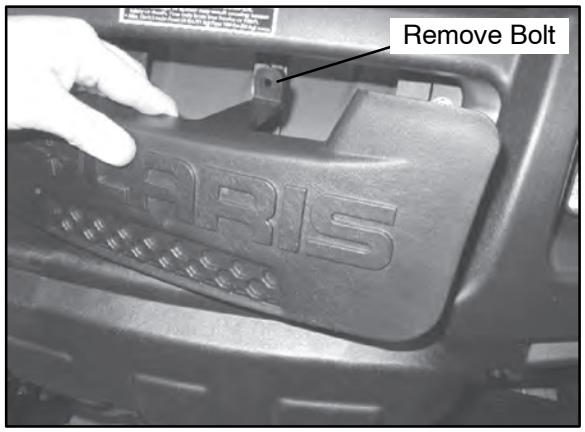
To reinstall, align panel tabs with slots. Push upward and forward until tabs lock.

FRONT RACK/BUMPER REMOVAL

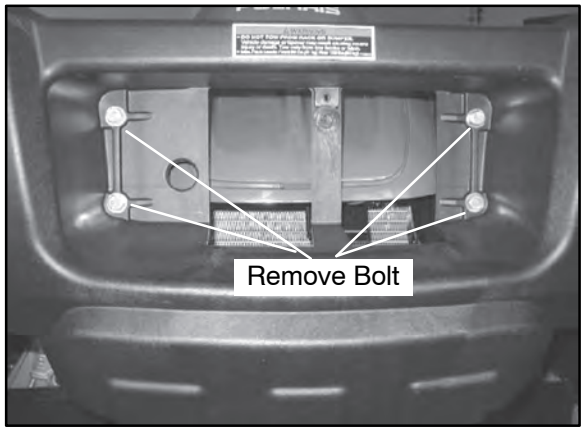
1. Remove the four bolts from the top rack.



2. Remove the bolt that secures the panel located in the middle of the bumper.

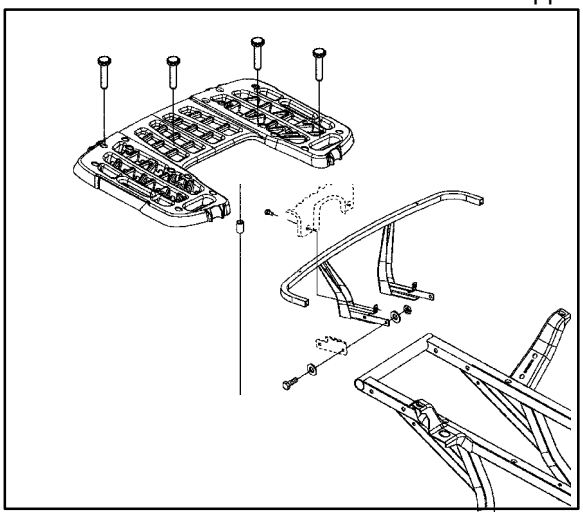


3. Remove the four bolts that secure the front bumper.



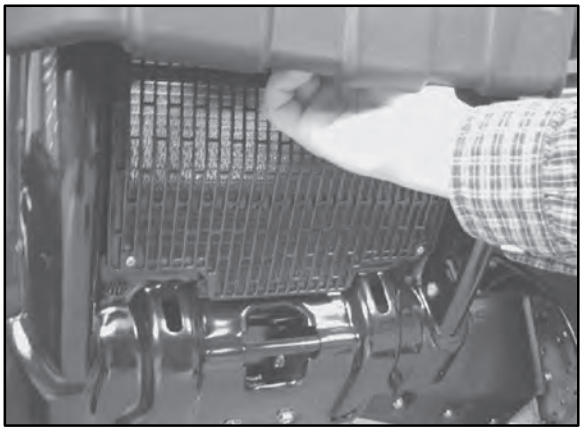
REAR RACK REMOVAL

1. Remove the four bolts that secure the rear rack to the rear rack support.



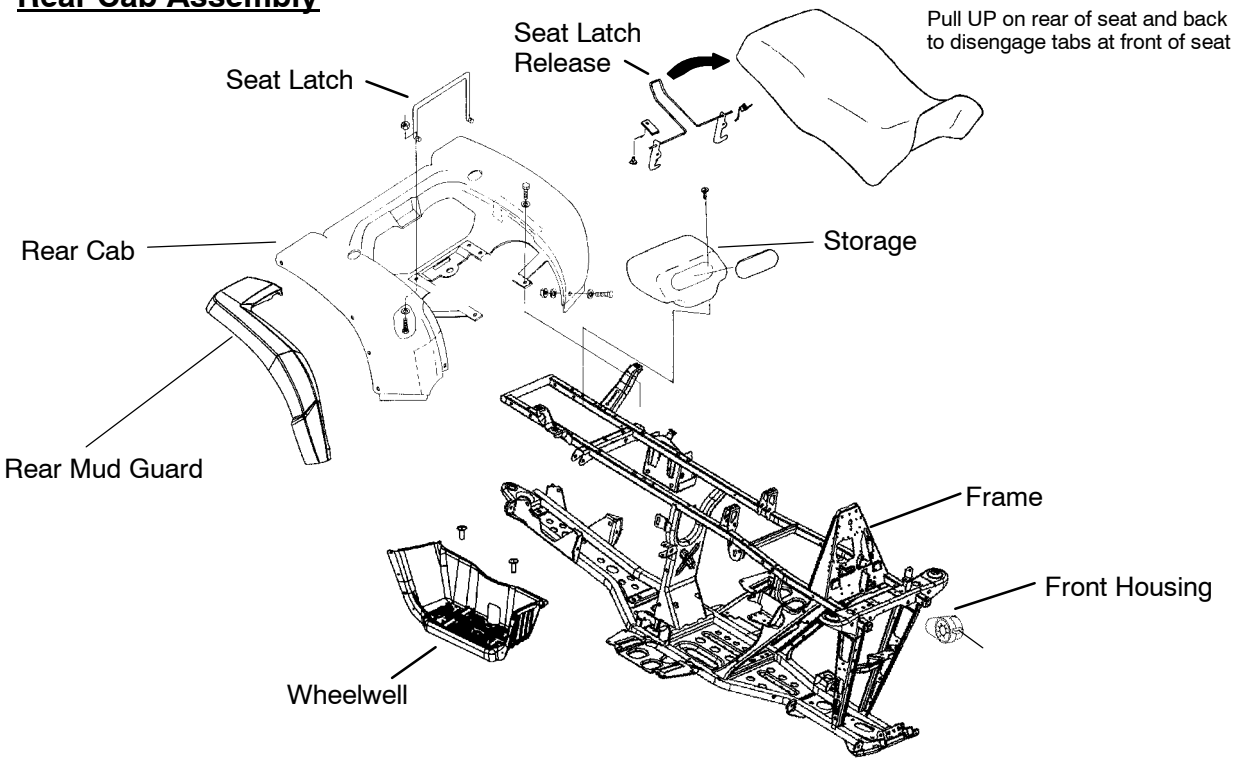
FRONT GRILL REMOVAL

1. Pull out slightly on the top of the radiator screen.
2. With the top free, pull out on the bottom of the screen.
3. To install the screen, place the top of the screen up into the bumper area. Press in the bottom of the screen into the rubber grommets first and then press in the top of the screen. Be sure the screen is tightly in place.

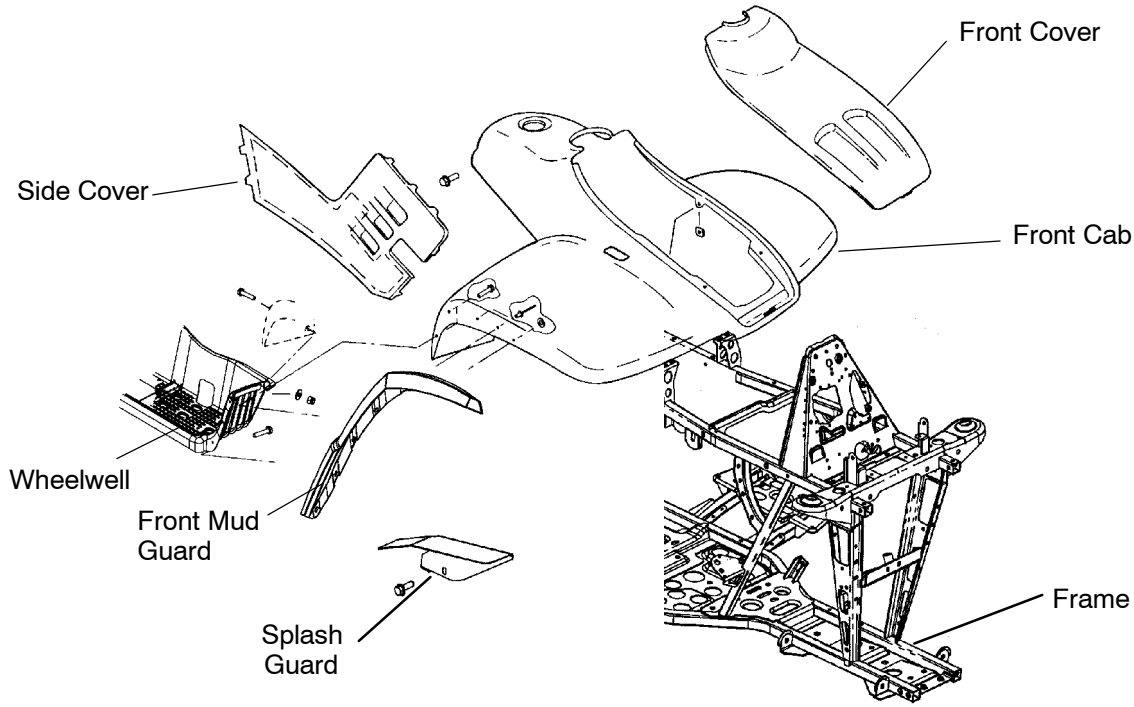


BODY ASSEMBLY EXPLODED VIEW

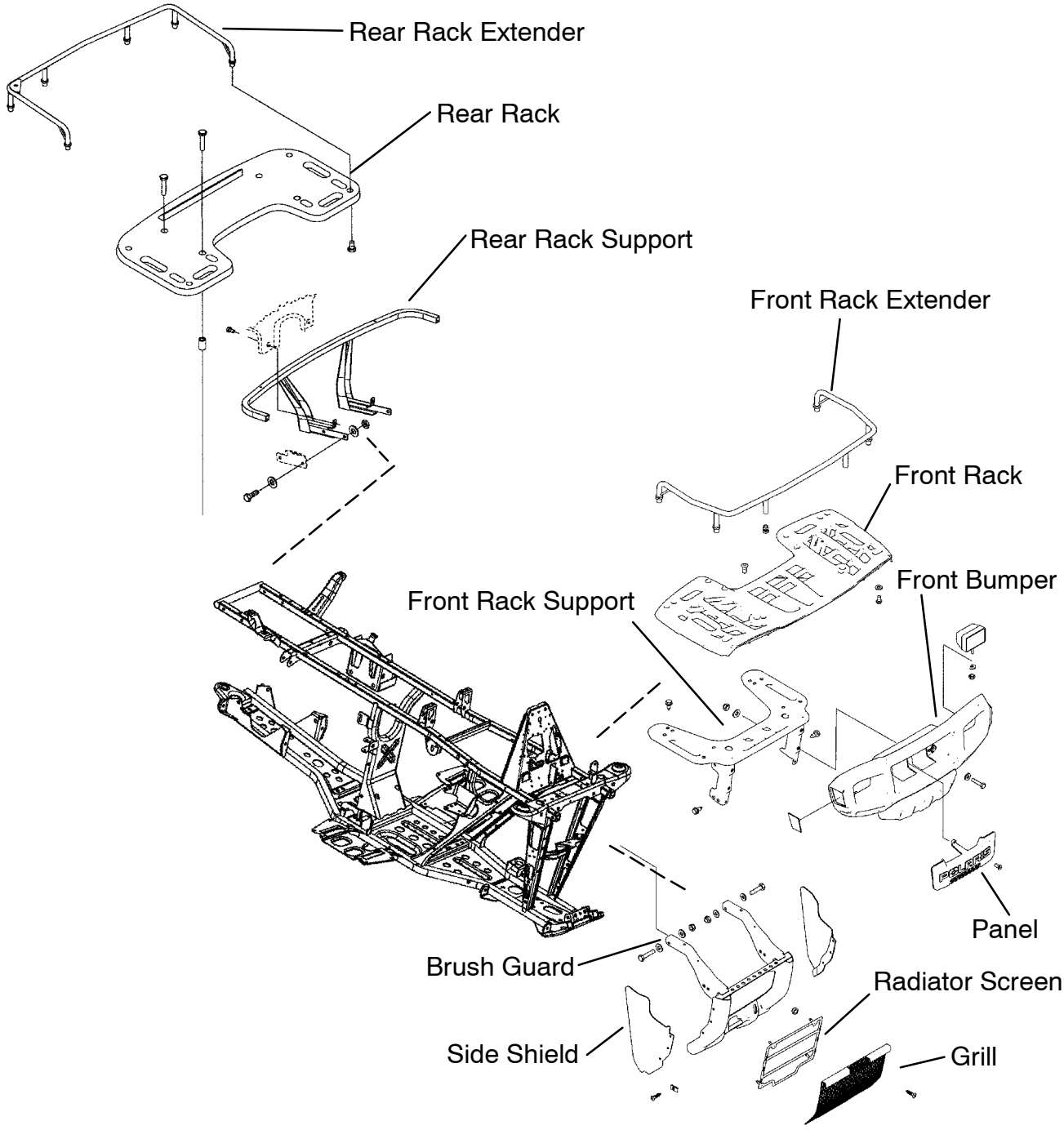
Rear Cab Assembly



Front Cab Assembly

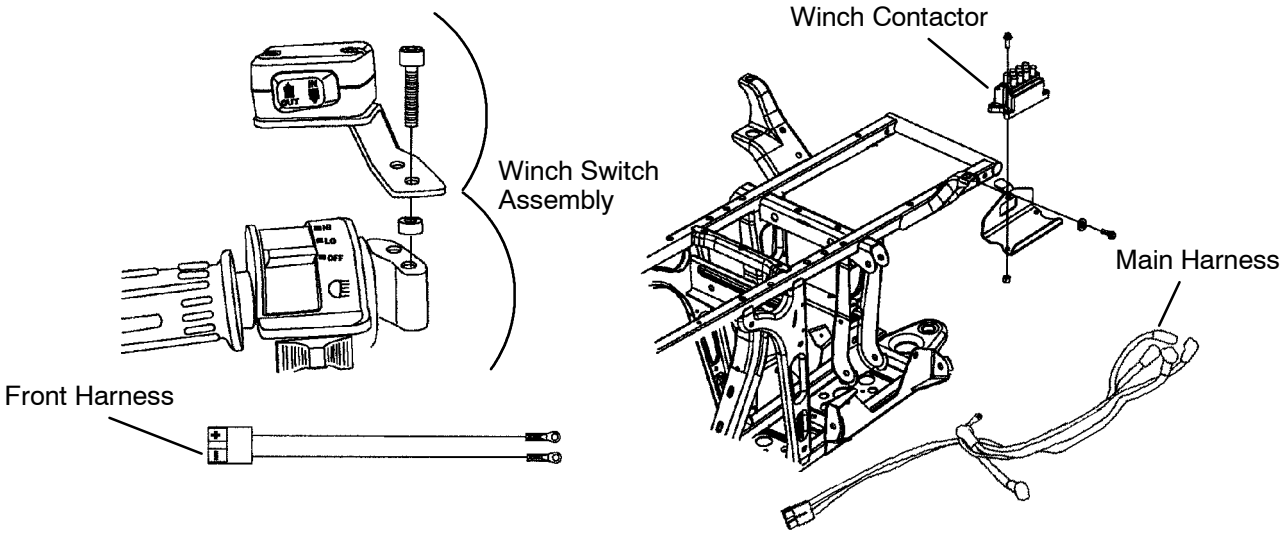


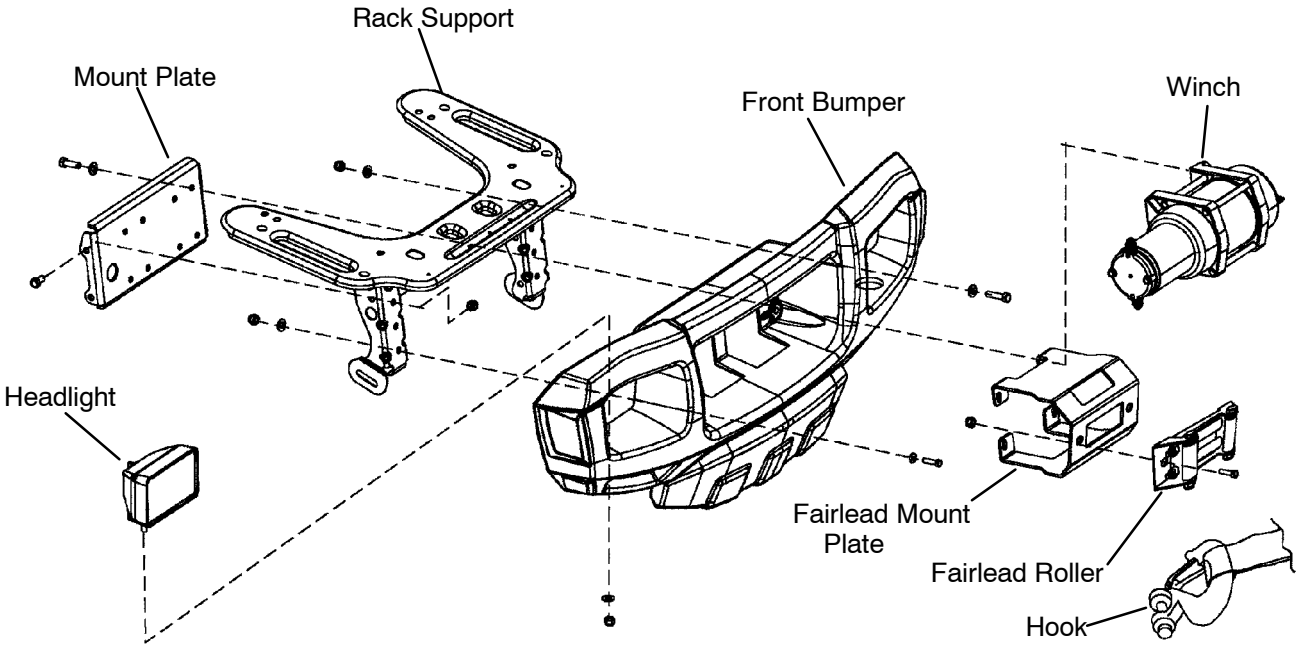
BODY RACK EXPLODED VIEW



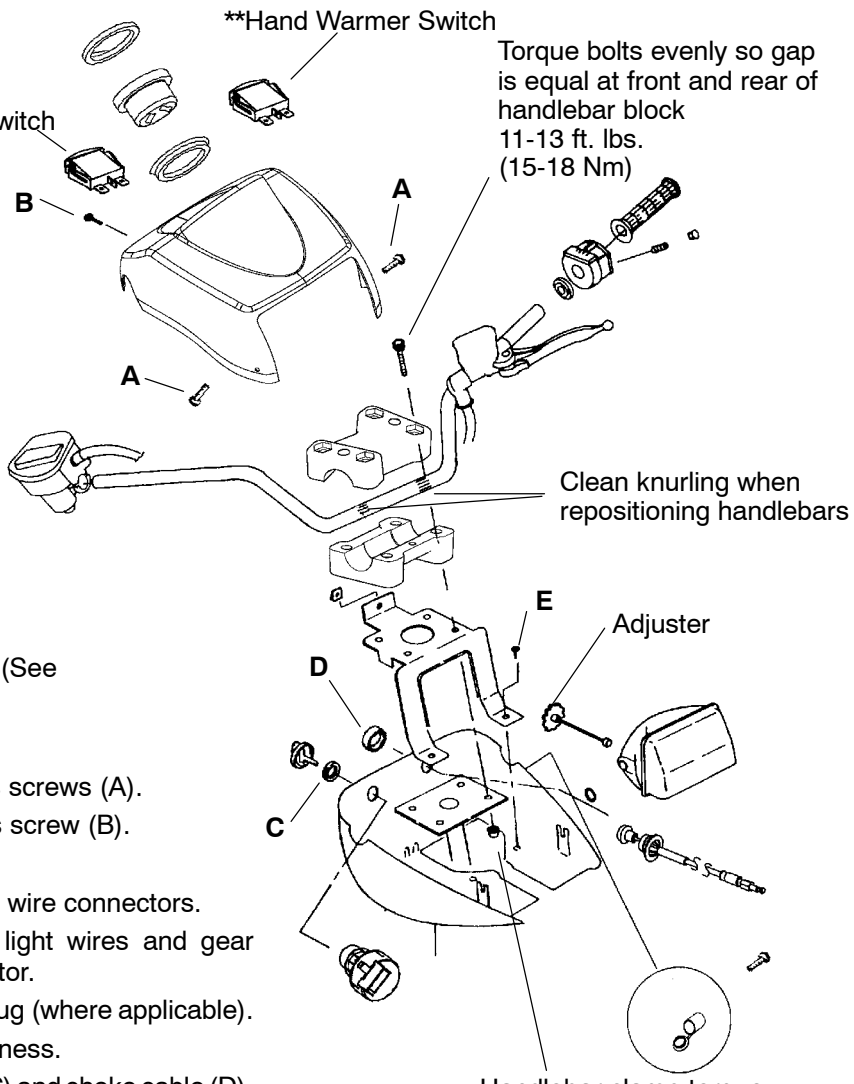
WARN® WINCH ASSEMBLY COMPONENTS (SPORTSMAN HUNTER PACKAGE)

NOTE: The Warn® Winch Assembly is only standard on the Hunter Package Sportsman ATV





HEADLIGHT POD EXPLODED VIEW



** Models w/ thumb warmer and hand warmer standard. (See Chapter 10 for more details)

Disassembly

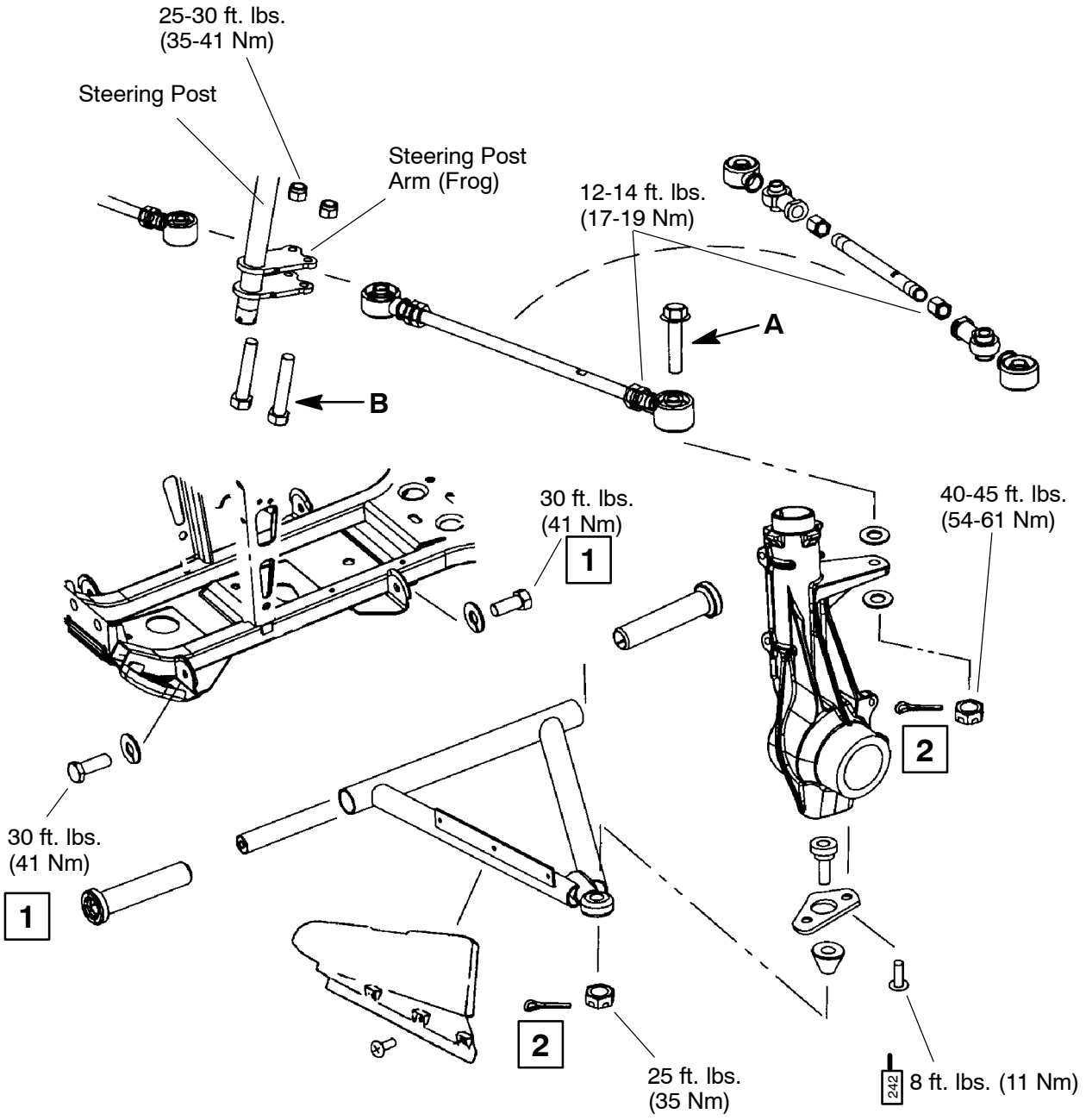
- Remove two side Phillips screws (A).
- Remove one rear Phillips screw (B).
- Lift top half of pod.
- Disconnect speedometer wire connectors.
- Disconnect oil indicator light wires and gear position indicator connector.
- Disconnect 12V power plug (where applicable).
- Disconnect headlight harness.
- Remove ignition switch (C) and choke cable (D).
- Remove headlight with adjuster.
- Remove two screws securing bottom half of pod (E).

Assembly

- Install bottom of pod onto handlebar and secure to brackets.
- Install key switch, choke cable, and headlight.
- Connect 12V power outlet (where applicable)
- Connect headlight.
- Connect speedometer connectors to speedometer.
- Install top of pod onto bottom half, making sure interlocking tabs mate properly.
- Install two side Phillips screws.
- Install one rear Phillips screw.
- To adjust headlight, refer to procedure outlined in Maintenance chapter.
- To apply decals, refer to Page 5.15.

STEERING/A-ARM EXPLODED VIEW

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

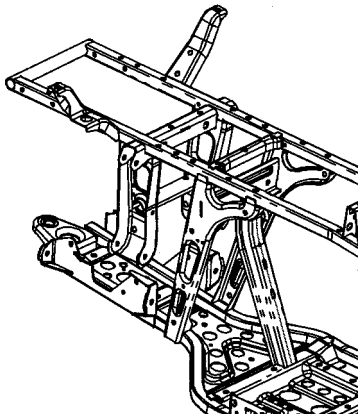


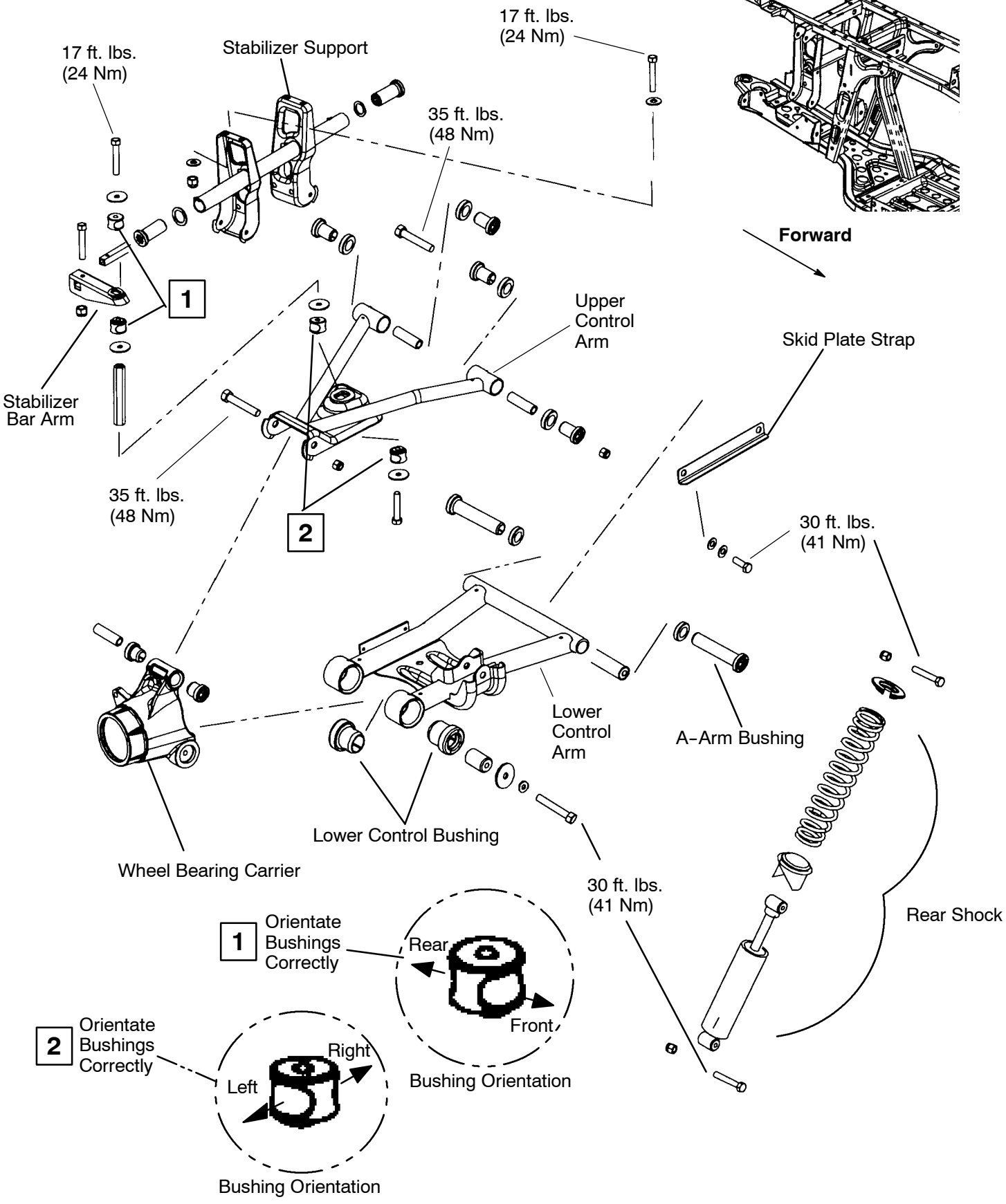
1 Always use new bolts upon reassembly

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

242 Apply Loctite™ 242 to the bolt threads.

REAR SUSPENSION EXPLODED VIEW





A-ARM REPLACEMENT

1. Elevate and safely support vehicle with weight removed from front wheel(s). Remove wheels.
2. Remove cotter pin from ball joint stud at wheel end of A-arm and loosen nut until it is flush with end of stud.
3. Using a soft face hammer, tap nut to loosen A-arm from bolt. Remove nut and A-arm from hub strut assembly.
4. Loosen two bolts on A-arm tube by alternating each about 1/3 of the way until A-arm can be removed.
5. Examine A-arm shaft. Replace if worn. Discard hardware.
6. Insert A-arm shaft into new A-arm.
7. Install CV joint shields.
8. Install new A-arm assembly onto vehicle frame. Torque new bolts to 30 ft. lbs. (41.4 Nm).

⚠ WARNING

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

A-arm Attaching Bolt Torque:

30 ft. lbs. (41 Nm)

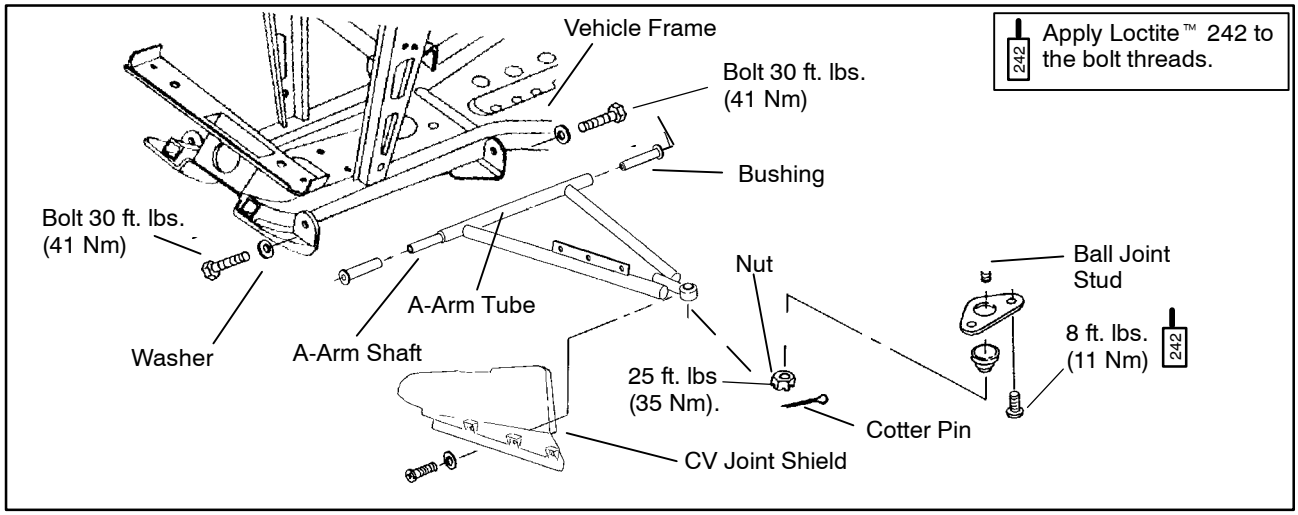
Ball Joint Stud Nut Torque:

25 ft. lbs. (35 Nm)

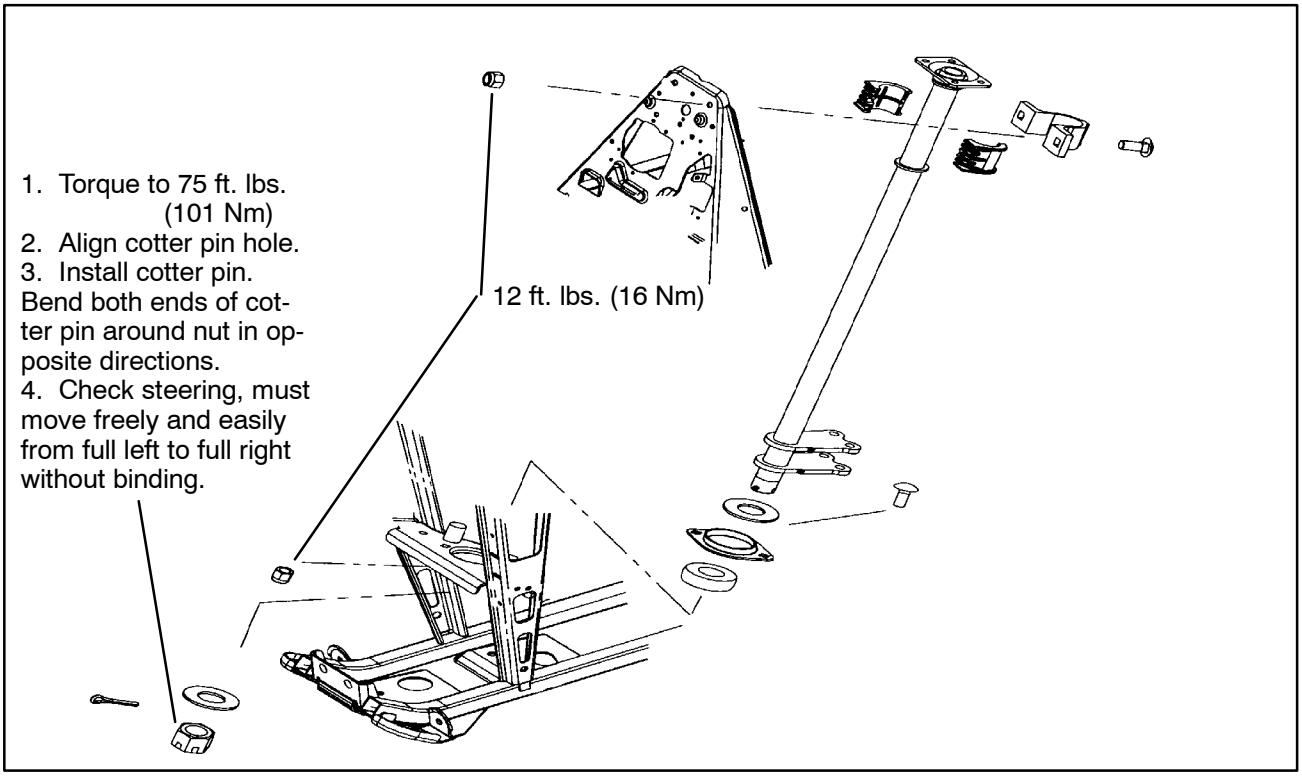
9. Attach A-arm to hub strut assembly. Tighten ball joint nut to 25 ft. lbs. (35 Nm). If cotter pin holes are not aligned, tighten nut slightly to align. Install a new cotter pin with open ends toward rear of machine. Bend both ends in opposite directions around nut.

⚠ WARNING

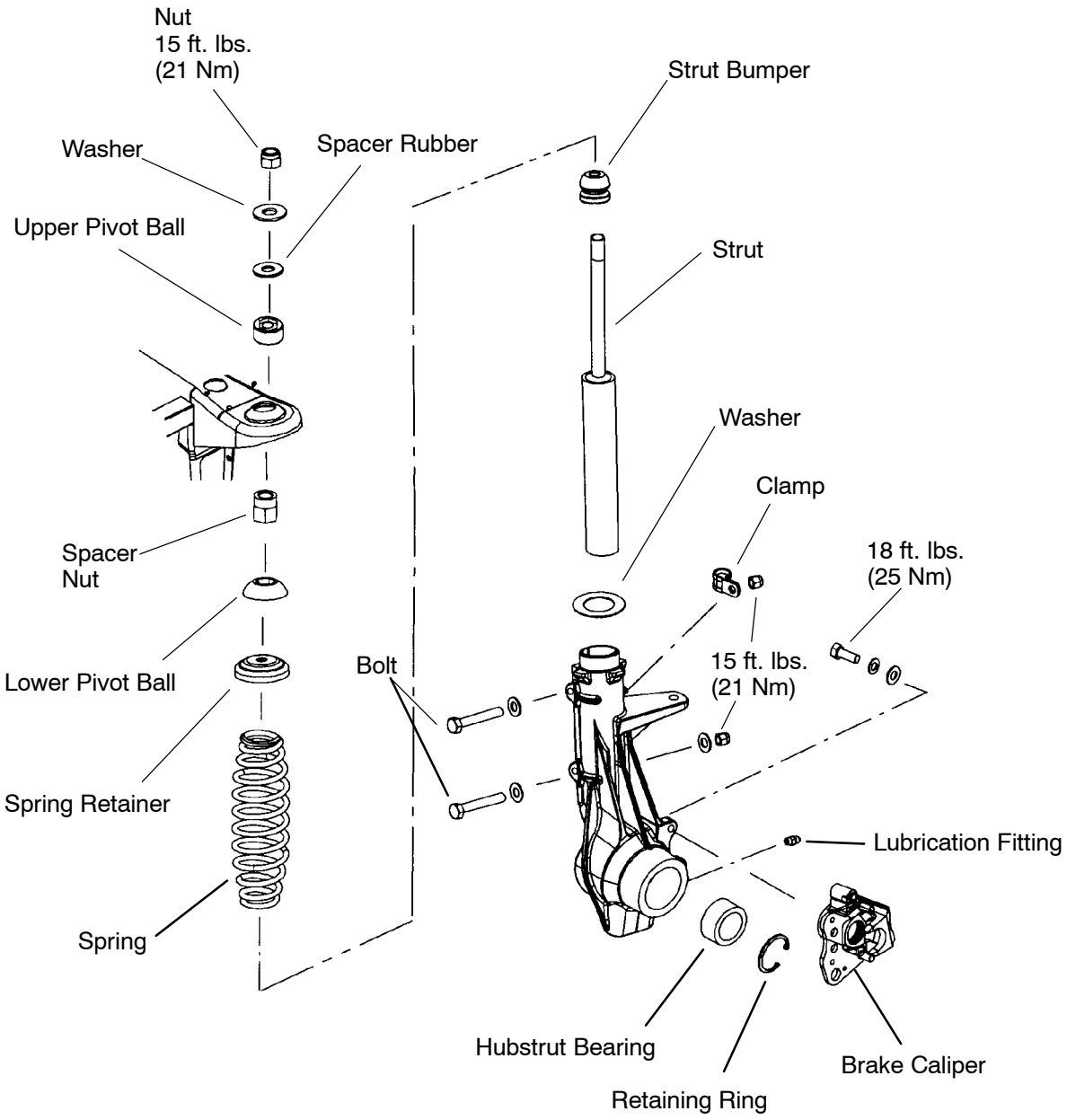
Upon A-arm installation completion, test vehicle at low speeds before putting into regular service.



STEERING POST ASSEMBLY



FRONT STRUT ASSEMBLY EXPLODED VIEW



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

FRONT STRUT CARTRIDGE REPLACEMENT

REFER TO ILLUSTRATION ON PAGE 5.13

1. Compress spring using strut spring compressor tools.

Strut Spring Compressor Tools

(PN 2871573) and (PN 2871574)

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

Strut Rod Nut Torque

15 ft. lbs. (21 Nm)

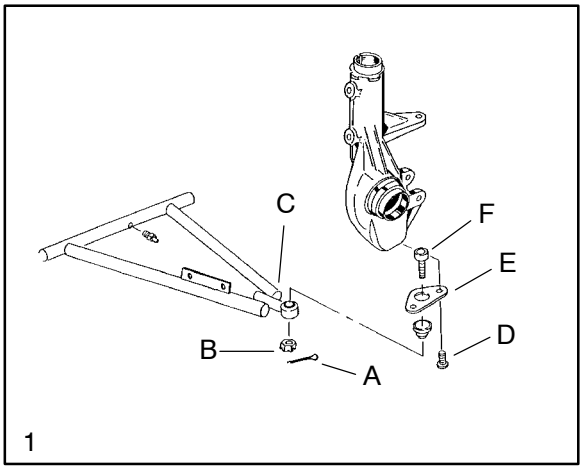
BALL JOINT REPLACEMENT

REFER TO ILLUSTRATION ON PAGE 5.13

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

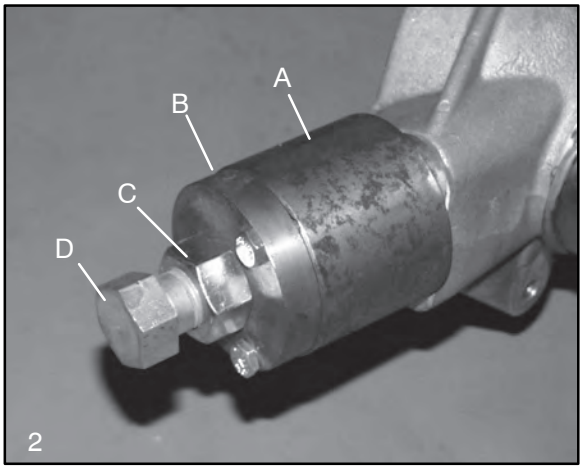
CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure.

3. Remove wheel nuts and wheels.
4. Remove cotter pin (A) from ball joint castle nut.
5. Remove castle nut (B) and separate A-arm (C) from ball joint stud.
6. Remove screws (D) and ball joint retaining plate plate (E). (Refer to Illustration 1 on this page.)



1

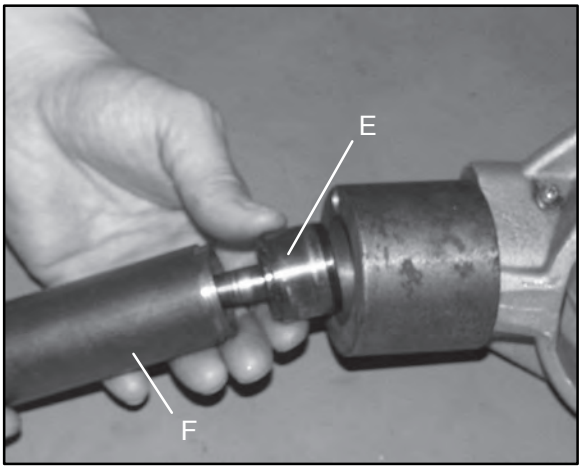
7. Using the Ball Joint Replacement Tool (**PN 2870871**), remove ball joint (F) from strut housing. Refer to photo 2.
   - Install puller guide (A) with extension cap (B).
   - Apply grease to extension cap and threads of puller bolt to ease removal.
   - Thread bolt (D) with nut (C) onto ball joint stud as shown.
   - Applying heat will ease removal.
   - Hold bolt (D) and turn nut (C) clockwise until ball joint is removed from strut housing.



2

BALL JOINT REPLACEMENT CONT'D

8. To install new ball joint:
   - Remove extension cap and attach puller guide using short bolts provided in the kit.
   - Insert new ball joint (E) into driver (F).
   - Slide ball joint/driver assembly into guide.
   - Applying heat will ease installation.
   - Drive new joint into strut housing until fully seated.



9. Apply Loctite™ 242 (**PN 2871949**) to threads of retaining plate screws or install new screws with pre-applied locking agent. Torque screws to 8 ft. lbs. (11 Nm).
10. Install A-arm on ball joint and torque castle nut to 25 ft. lbs. (35 Nm).
11. Reinstall cotter pin with open ends toward rear of machine.

DECAL REPLACEMENT

⚠ WARNING

The following procedure involves the use of an open flame. Perform this procedure in a well ventilated area, away from gasoline or other flammable materials. Be sure the area to be flame treated is clean and free of gasoline or flammable residue.

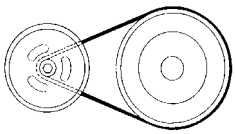
The side panels, front and rear fender cabs are plastic polyethylene material. Therefore, they must be "flame treated" prior to installing a decal to ensure good adhesion. A bonus of the flame treating procedure is it can be used to reduce or eliminate the whitish stress marks that are sometimes left after a fender or cab is bent, flexed, or damaged.

To flame treat the decal area:

1. Pass the flame of a propane torch back and forth quickly over the area where the decal is to be applied until the surface appears slightly glossy. This should occur after just a few seconds of flame treating. Do not hold the torch too close to the surface. (2–3 inches from the flame tip is recommended) Keep the torch moving to prevent damage.
2. Apply the decal on one edge first. Slowly lay down remainder of the decal while rubbing lightly over the decal surface to eliminate any air bubbles during the application.

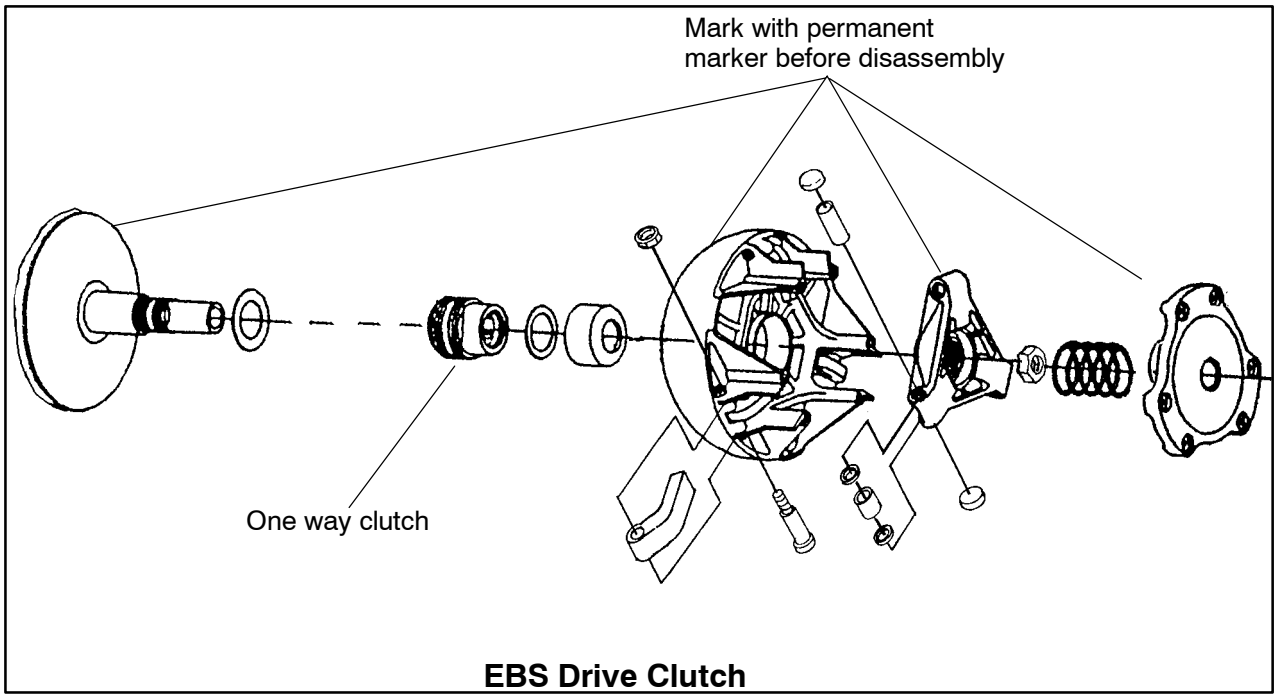
NOTES

CHAPTER 6
CLUTCHING



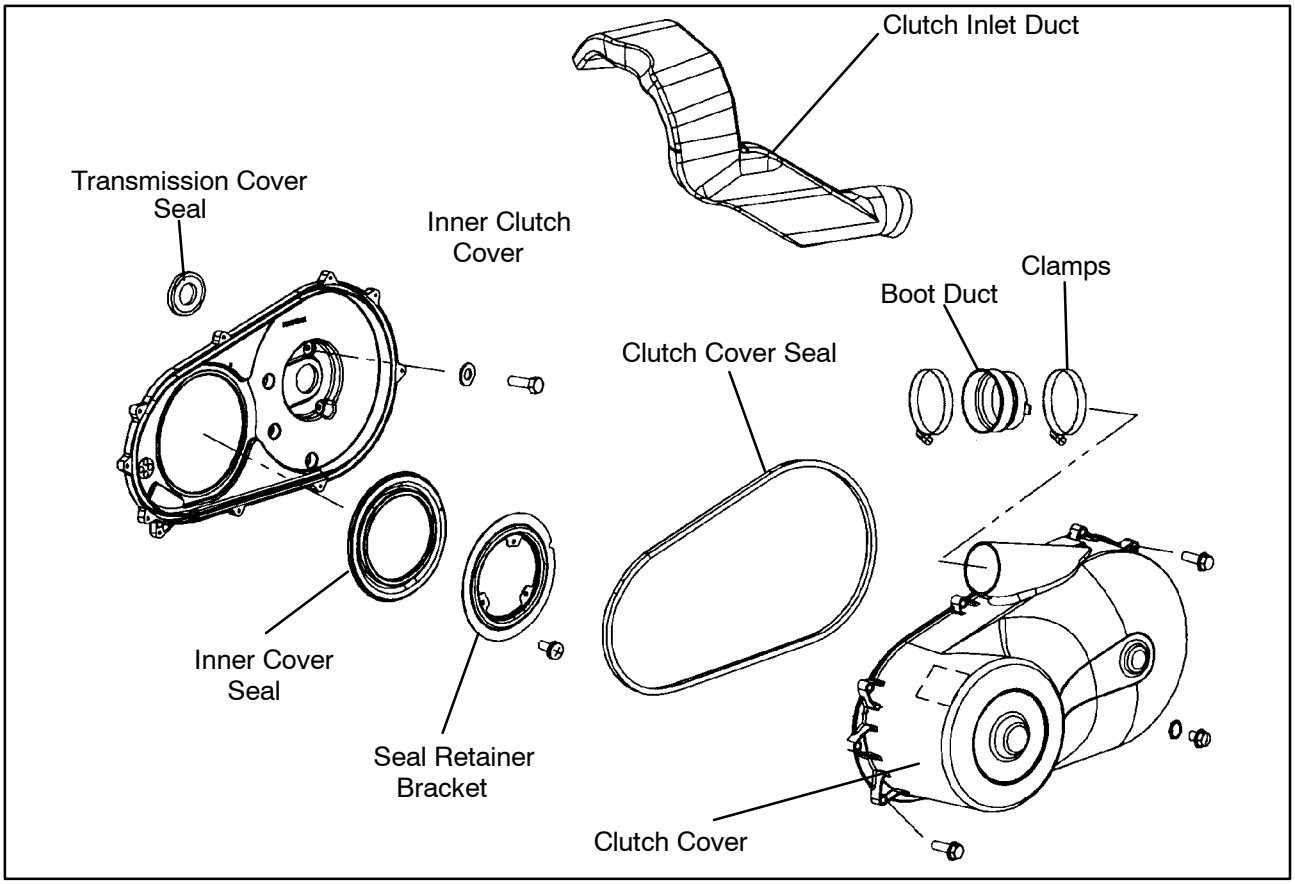
6

DRIVE CLUTCH EXPLODED VIEW

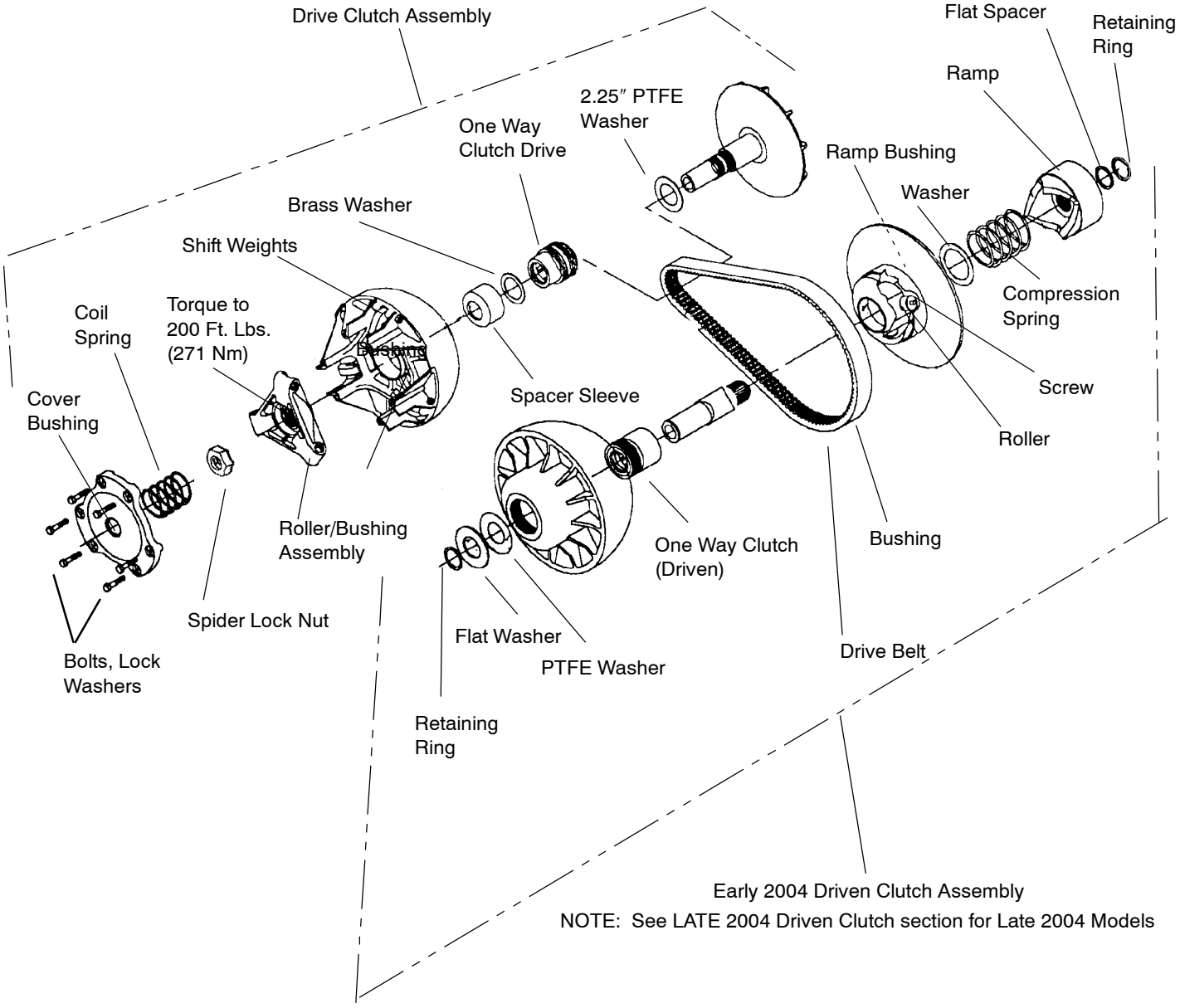


EBS Drive Clutch

PVT SEALING AND DUCTING COMPONENTS



ENGINE BRAKING SYSTEM (EBS) EXPLODED VIEW



NOTE: See LATE 2004 Driven Clutch section for Late 2004 Models

NOTE: Refer to the correct section of Chapter 6 when servicing the driven clutch. Two different style EBS driven clutches were used. The Drive clutch did not change. Refer to the "EARLY 2004" or "LATE 2004" DRIVEN CLUTCH section for service. To determine if you have an EARLY or LATE 2004 model refer to Page 1.3 for model identification.

SPECIAL SERVICE TOOLS AND SUPPLIES

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

SPECIAL SUPPLIES	PART NUMBER
Loctite™ 680	**2870584**
RTV Silicone Sealer	**2870661**
Loctite Gasket Remover	**2870601**

PVT SYSTEM FASTENER TORQUES

PVT COMPONENT	TORQUE VALUE
Drive Clutch Retaining Bolt	40 ft. lbs. (54 Nm)
Driven Clutch Retaining Bolt	17 ft. lbs. (23 Nm)
PVT Inner Cover Bolts	12 ft. lbs. (16 Nm)
Drive Clutch Spider EBS Clutch	200 ft. lbs. (271 Nm)
Drive Clutch Spider Lock Nut (Plastic)	15 ft. lbs. (20.3 Nm)
Drive Clutch Cover Plate	90 in. lbs. (10 Nm)

PVT OPERATION OVERVIEW

⚠ WARNING

⚠ All PVT maintenance or repairs should be performed only by a certified Polaris Master Service Dealer (MSD) technician who has received the proper training and understands the procedures outlined in this manual. **Because of the critical nature and precision balance incorporated into the PVT components, it is absolutely essential that no disassembly or repair be made without factory authorized special tools and service procedures.**

The Polaris Variable Transmission (PVT) consists of three major assemblies: 1) The Drive Clutch; 2) The Driven Clutch; and 3) The Drive Belt. The internal components of the drive clutch and driven clutch control engagement (initial vehicle movement), clutch upshift and backshift. During the development of a Polaris ATV, the PVT system is matched first to the engine power curve; then to average riding conditions and the vehicle's intended usage. Therefore, modifications or variations of components at random are never recommended. Proper clutch setup and careful inspection of existing components must be the primary objective when troubleshooting and tuning.

DRIVE CLUTCH OPERATION

Drive clutches primarily sense engine RPM. The two major components which control its shifting function are the shift weights and the coil spring. Whenever engine RPM is increased, centrifugal force is created, causing the shift weights to push against rollers on the moveable sheave, which is held open by coil spring preload. When this force becomes higher than the preload in the spring, the outer sheave moves inward and contacts the drive belt. This motion pinches the drive belt between the spinning sheaves and causes it to rotate, which in turn rotates the driven clutch.

At lower RPM, the drive belt rotates low in the drive clutch sheaves. As engine RPM increases, centrifugal force causes the drive belt to be forced upward on drive clutch sheaves.

DRIVEN CLUTCH OPERATION

Driven clutches primarily sense torque, opening and closing according to the forces applied to it from the drive belt and the transmission input shaft. If the torque resistance at the transmission input shaft is greater than the load from the drive belt, the drive belt is kept at the outer diameter of the driven clutch sheaves.

DRIVEN CLUTCH OPERATION CONT'D

As engine RPM and horsepower increase, the load from the drive belt increases, resulting in the belt rotating *up* toward the outer diameter of the drive clutch sheaves and *downward* into the sheaves of the driven clutch. This action, which increases the driven clutch speed, is called *upshifting*.

Should the throttle setting remain the same and the vehicle is subjected to a heavier load, the drive belt rotates back *up* toward the outer diameter of the driven clutch and *downward* into the sheaves of the drive clutch. This action, which decreases the driven clutch speed, is called *backshifting*.

In situations where loads vary (such as uphill and downhill) and throttle settings are constant, the drive and driven clutches are continually shifting to maintain optimum engine RPM. At full throttle a perfectly matched PVT system should hold engine RPM at the peak of the power curve. This RPM should be maintained during clutch upshift and backshift. In this respect, the PVT system is similar to a power governor. Rather than vary throttle position, as a conventional governor does, the PVT system changes engine load requirements by either upshifting or backshifting.

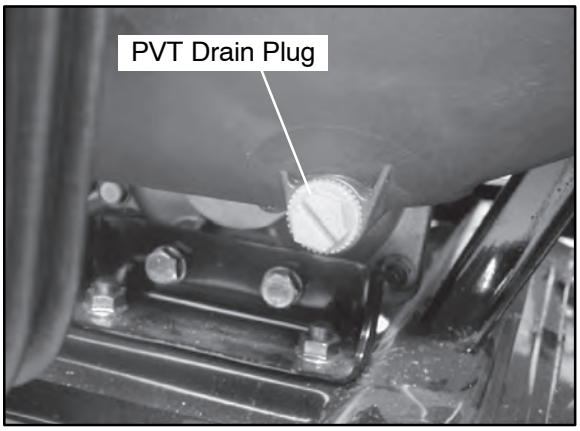
PVT MAINTENANCE/INSPECTION

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

1. **Drive to Driven Clutch Offset, Belt Width.** See Page-6.16–6.18
2. **Drive and Driven Clutch Buttons and Bushings, Drive Clutch Shift Weights and Pins, Drive Clutch Spider Rollers and Roller Pins, Drive and Driven Clutch Springs.** See Pages 6.11-6.12
3. **Sheave Faces.** Clean and inspect for wear.
4. **PVT System Sealing.** Refer to appropriate illustrations and photos. The PVT system is air cooled by fins on the drive clutch stationary sheave. The fins create a low pressure area in the crankcase casting, drawing air into the system through an intake duct. The opening for this intake duct is located at a high point on the vehicle (location varies by model). The intake duct draws fresh air through a vented cover. All connecting air ducts, as well as the inner and outer covers, must be properly sealed to ensure clean air is being used for cooling the PVT system. This also will prevent water and other contaminants from entering the PVT area. A sealed PVT is especially critical on units subjected to frequent water forging.

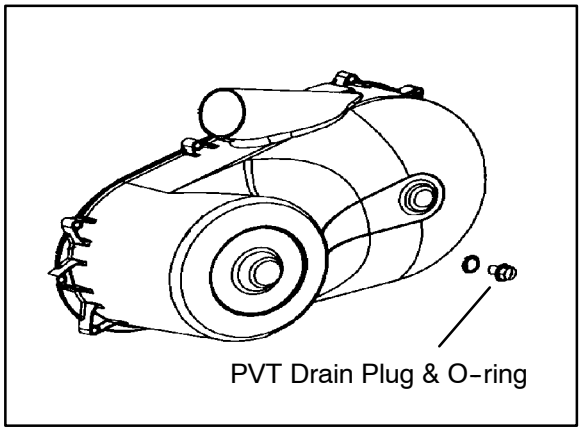
PVT DRYING

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



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

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



PVT OVERHEATING/DIAGNOSIS

During routine maintenance or whenever PVT system overheating is evident, it's important to check the inlet *and* outlet ducting for obstructions. Obstructions to air flow through the ducts will significantly increase PVT system operating temperatures. The ATV should be operated in LOW RANGE when pulling or plowing heavy loads, or if extended low speed operation is anticipated.

GENERAL RANGE OPERATION GUIDELINES:	**Low Range**: Heavy pulling, basic operational speeds less than 7 MPH, riding through rough terrain (swamps, mountains, etc..), low ground speeds.
	High Range: High ground speeds, speeds above 7 MPH.

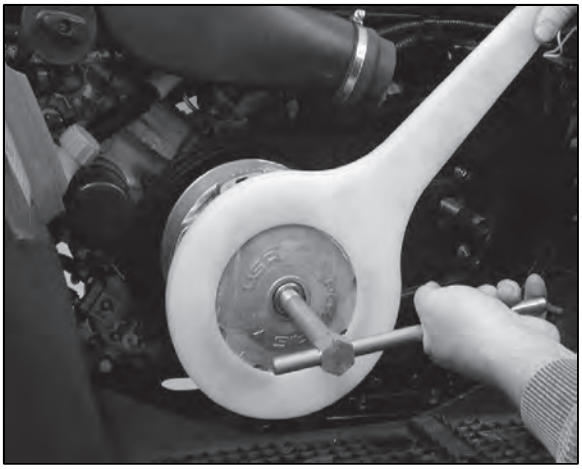
Diagnosis of Clutch Drive Belt & Cover Related Issues:

Possible Causes	Solutions/What to do
Loading the ATV into a pickup or tall trailer when in high range.	Shift transmission to low range during loading of the ATV to prevent belt burning.
Starting out going up a steep incline.	When starting out on an incline, use low range, or dismount the ATV after first applying the park brake and perform the "K" turn.
Driving at low RPM or low ground speed (at approximately 3–7 MPH).	Drive at higher speed or use Low Range. The use of Low Range is highly recommended for cooler PVT operating temperatures and longer component life.
Insufficient warm–up of ATVs exposed to low ambient temperatures.	Warm engine at least 5 min., then with transmission in neutral, advance throttle to approx. 1/8 throttle in short bursts, 5 to 7 times. The belt will become more flexible and prevent belt burning.
Slow and easy clutch engagement.	Fast, effective use of the throttle for efficient engagement. Continuous operation at the point of engagement (initial vehicle movement) increases PVT temperatures and component wear.
Towing/Pushing at low RPM/low ground speed.	Use Low Range only.
Plowing snow, dirt, etc./utility use.	Use Low Range only.
Stuck in mud or snow.	Shift the transmission to Low Range, carefully use fast, aggressive throttle application to engage clutch. **Warning: Excessive throttle may cause loss of control and vehicle overturn.**
Climbing over large objects from a stopped position.	Shift the transmission to Low Range, carefully use fast, aggressive, throttle application to engage clutch. **Warning: Excessive throttle may cause loss of control and vehicle overturn.**
Belt slippage from water or snow ingestion into the PVT system.	Shift the transmission to neutral. Using the throttle, vary the engine rpm from idle to **3/4 throttle**. Engage transmission in the lowest possible range and test for belt slippage Repeat several times as required. **During this procedure, the throttle should not be held at the full position for more than 10 seconds**. PVT seals should be inspected for damage if repeated leaking occurs.
Clutch malfunction.	Inspection/repair of clutch components should be performed by a certified Polaris MSD techinician.

PVT DISASSEMBLY

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

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



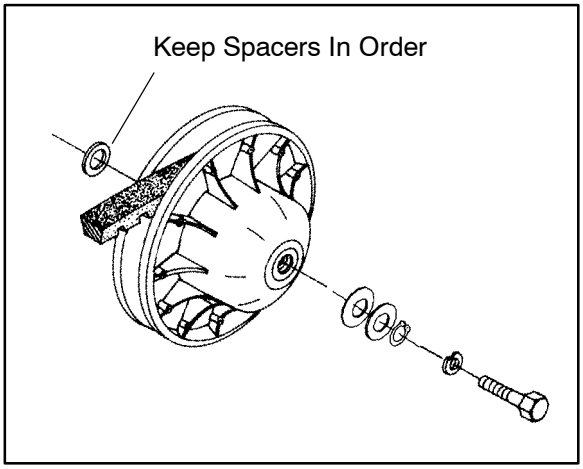
Drive Clutch Puller (PN 2870506)

Clutch Holding Wrench (PN 9314177)

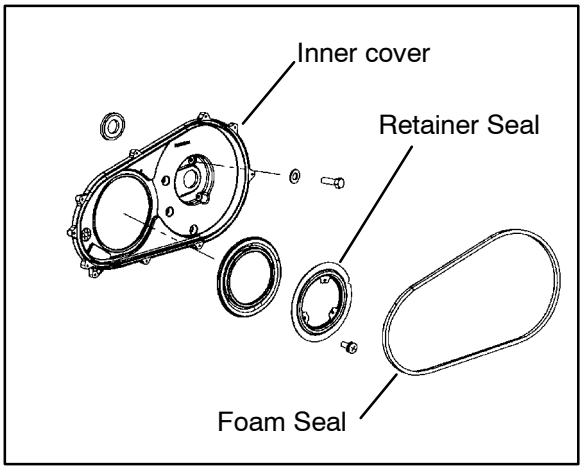
7. Remove driven clutch retaining bolt and driven clutch. Use puller if necessary.

Driven Clutch Puller (PN 2870913)

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



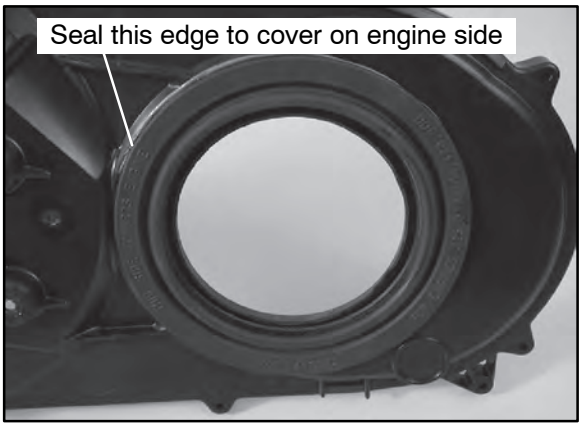
9. Remove cover screws and retainer plate.



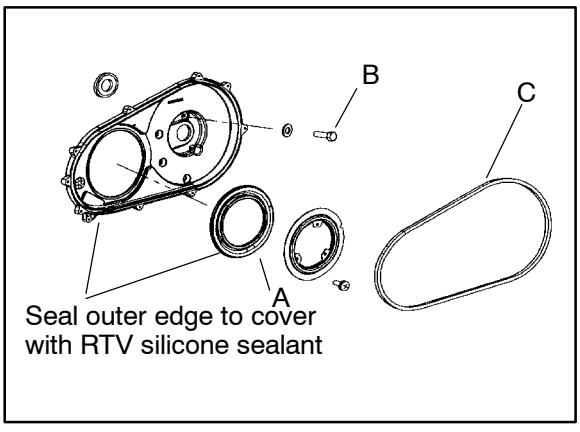
10. Remove inner cover retaining bolts at rear of cover.
11. Remove cover along with foam seal on back of cover or shaft.

PVT ASSEMBLY/INSPECTION

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



2. Place a new seal on transmission input shaft.
3. Apply RTV silicone sealant to outside edge of inner cover-to-engine seal, to ensure a water tight fit between the seal and the cover on engine side. Surfaces must be clean to ensure adhesion of silicone sealant.
4. Reinstall cover and tighten rear cover bolts just enough to hold it in place.
5. Fit lip of inner cover seal (A) to engine. Install seal retainer plate and tighten screws securely.
6. Torque rear inner cover bolts (B) to specification.

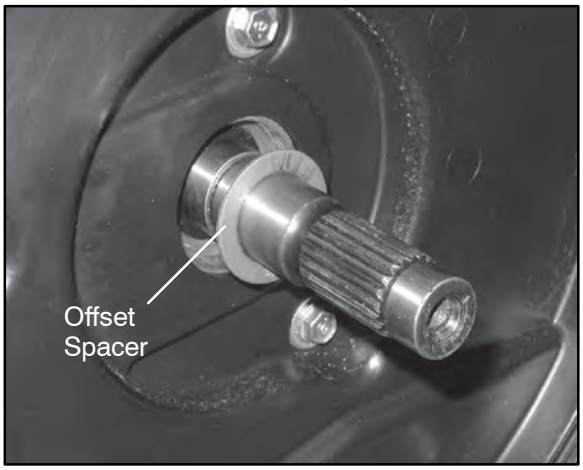


Inner Cover Bolt Torque (Rear):
12 ft. lbs. (16.6 Nm)

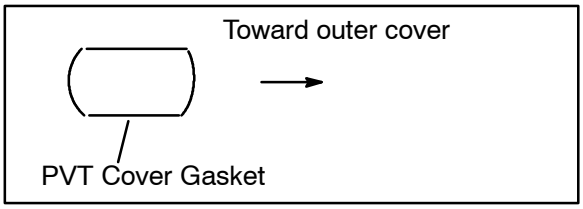
Driven Clutch Retaining Bolt Torque:
17 ft. lbs. (23.5 Nm)

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

7. Install clutch offset spacer(s) on transmission input shaft.



8. Clean splines inside driven clutch and on the transmission input shaft.
9. Apply a light film of grease to the splines on the shaft.
10. Install the driven clutch, washer, lock washer, and retaining bolt. Torque to specification.
11. Clean end of taper on crankshaft and the taper bore inside drive clutch.
12. Install drive clutch and torque retaining bolt to specification.
13. Reinstall drive belt noting direction of rotation. If a new belt is installed, install so numbers can be easily read.
14. Only replace PVT outer cover rubber gasket if it is damaged. Place the gasket with the narrow side out (C).



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

DRIVE CLUTCH SPRING SPECIFICATIONS

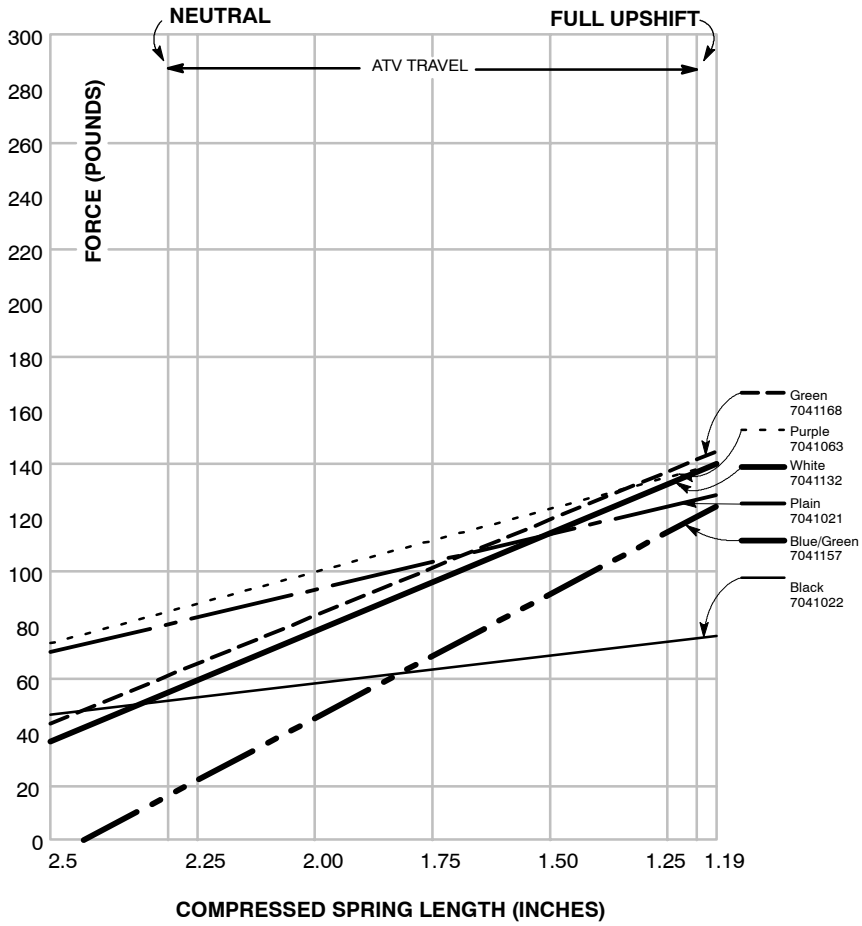
The drive clutch spring has two primary functions:

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

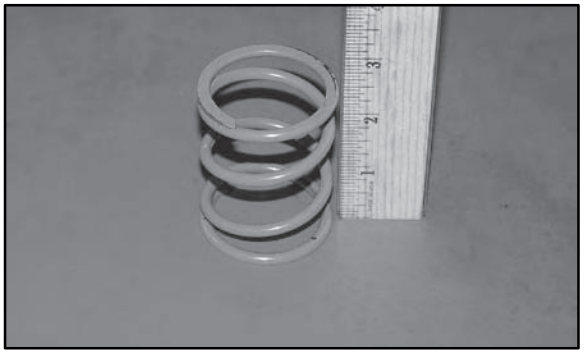
The drive clutch spring is one of the most critical components of the PVT system. It is also one of the easiest to service. Due to the severe stress the coil spring is subject to during operation, it should always be inspected for tolerance limits during any clutch diagnosis or repair.

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

CAUTION: Never shim a drive clutch spring to increase its compression rate. This may result in complete stacking of the coils and subsequent clutch component failure.



Measuring Spring Length: With the spring resting on a flat surface, measure its free length from the outer coil surfaces as shown. Refer to the spring specification chart for specific free length measurements and tolerances. Also check to see that spring coils are parallel to one another. Distortion of the spring indicates stress fatigue, requiring replacement.



Primary Clutch Springs

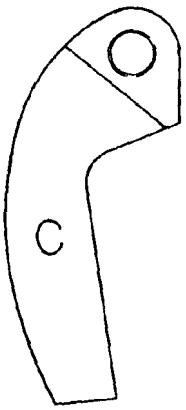
PART NUMBER	COLOR CODE	WIRE DIAMETER	FREE LENGTH ±.125″
7041021	Plain	.157″	4.38″
7041022	Black	.140″	4.25″
7041063	Purple	.168″	4.37″
7041132	White	.177″	2.92″
7041168	Green	.177″	3.05″
7041157	Blue/Green	.177″	2.53″

Secondary Clutch Springs

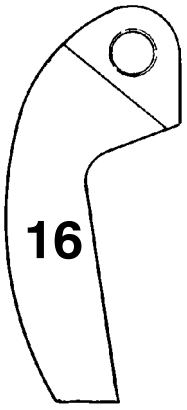
PART NUMBER	DESCRIPTION
7041198	Red
7041782	Black 5-coil
7041501	Gold 6-coil
7041499	Silver
7041296	Blue
7041646	Silver/Blue

SHIFT WEIGHTS

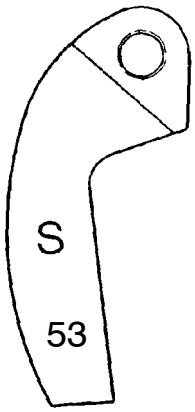
Shown below are optional shift weights which may be used in the PVT system. These shift weights have many different factors designed into them for controlling engagement RPM and shifting patterns. Shift weights should not be changed or altered without first having a thorough understanding the effects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



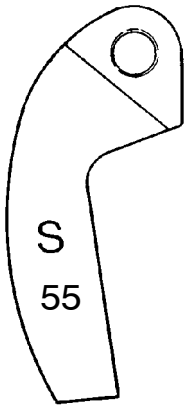
PN 5630418
50 gr



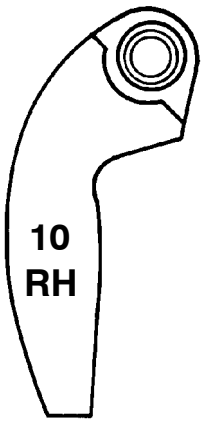
PN 5630279
43 gr



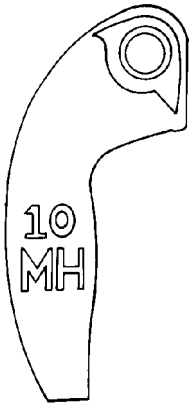
PN 5630095
53 gr



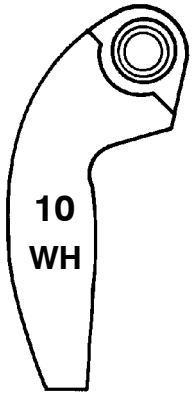
PN 5630509
55 gr



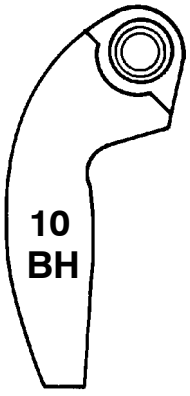
PN 5630709
44 gr



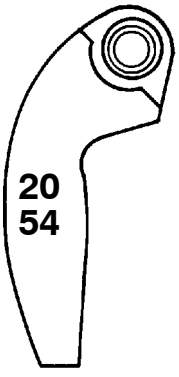
PN 5630513
50.5 gr



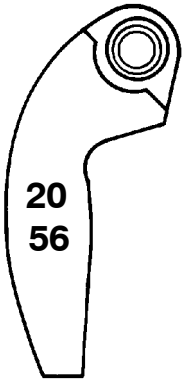
PN 5630710
46 gr



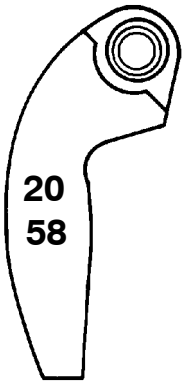
PN 5630711
47gr



PN 5631214
54 gr



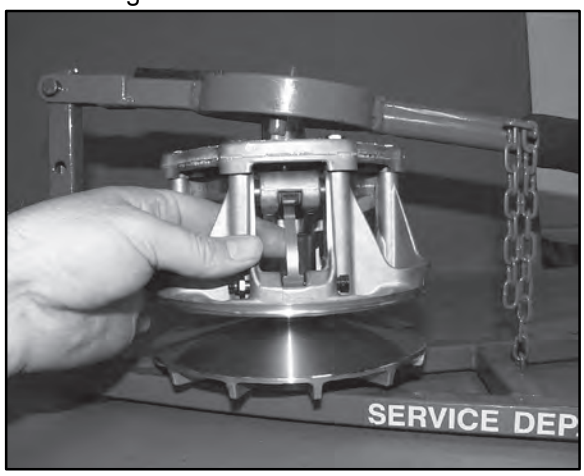
PN 5631215
56 gr

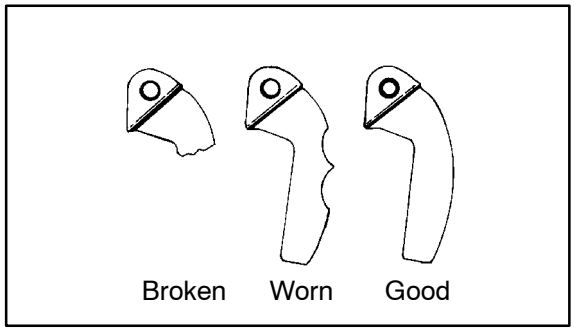


PN 5631216
58 gr

SHIFT WEIGHT INSPECTION

1. Inspect as shown, using a clutch holding tool to compress the moveable sheave. The contact surface of the weight should be smooth and free of dents or gall marks. Remove shift weight bolts and weights.





Inspect the weight pivot bore and pivot bolts for wear or galling. If weights or bolts are worn or broken, replace in sets of three with new bolts. **NOTE:** A damaged shift weight is usually caused by a damaged or stuck roller in the spider assembly. See roller inspection, Page 6.13.

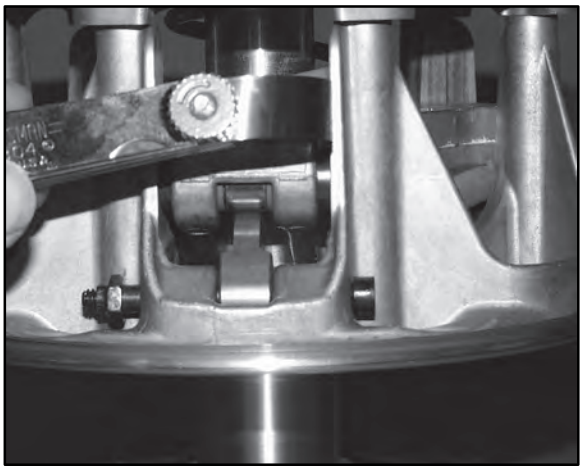
⚠ WARNING

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

All PVT maintenance or repairs should be performed only by a certified Polaris Master Service Dealer (MSD) technician who has received the proper training and understands the procedures outlined in this manual. **Because of the critical nature and precision balance incorporated into the PVT system, it is absolutely essential that no attempt at disassembly or repair be made without factory authorized special tools and service procedures.**

BUTTON TO TOWER CLEARANCE INSPECTION

1. Inspect for any clearance between spider button to tower. If clearance exists, replace all buttons and inspect surface of towers. See Spider Removal Page 6.12.

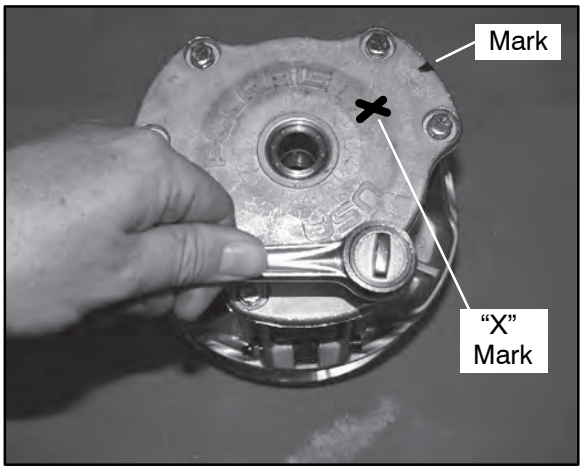


Button to Tower Clearance:
.000 - .001″

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

DRIVE CLUTCH DISASSEMBLY

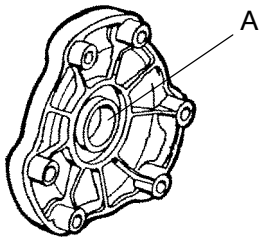
1. Using a permanent marker, mark the cover, spider, and moveable and stationary sheaves for reference, as the previous X's may not have been in alignment before disassembly.



DRIVE CLUTCH DISASSEMBLY CONT'D

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

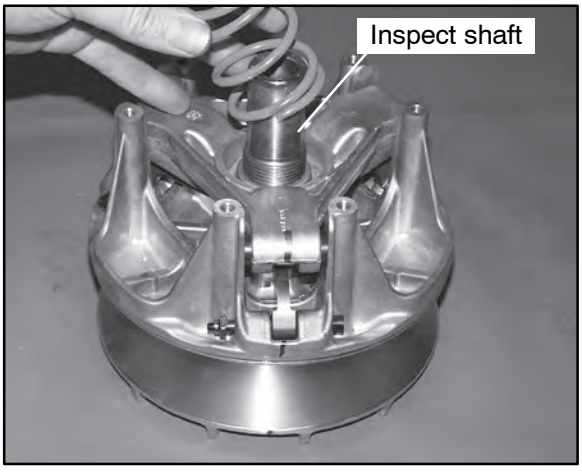
Cover Bushing inspection



Cover Bushing Inspection:

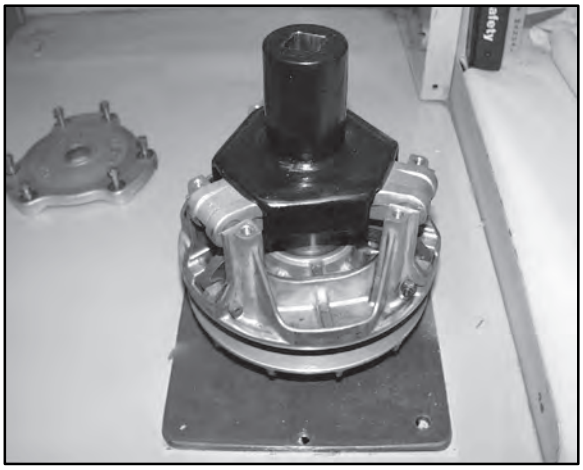
Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

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



SPIDER REMOVAL

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

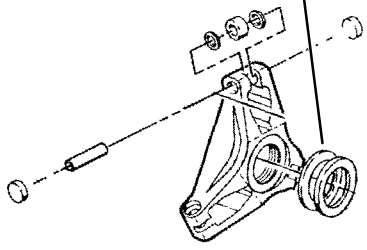


Clutch Holding Fixture:
(PN 2871358)

Spider Removal Tool:
(PN 2870341)

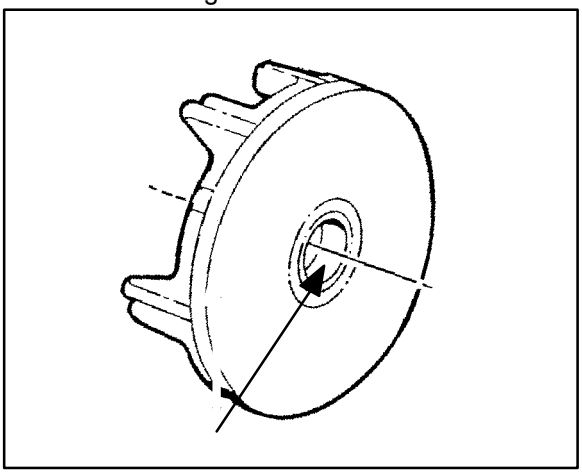
NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. Be sure to note the number and thickness of these washers.

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



Moveable Sheave Bushing Inspection

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

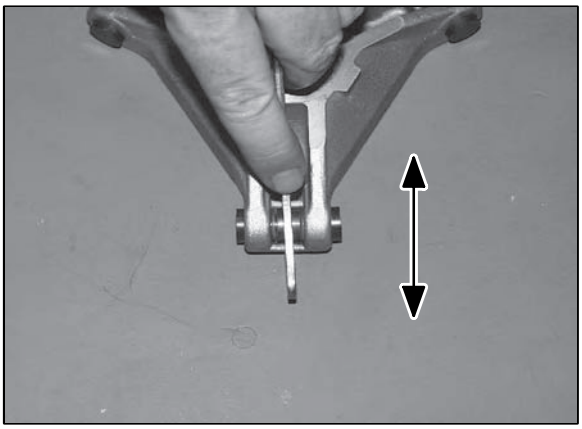


Moveable Sheave Bushing Inspection:

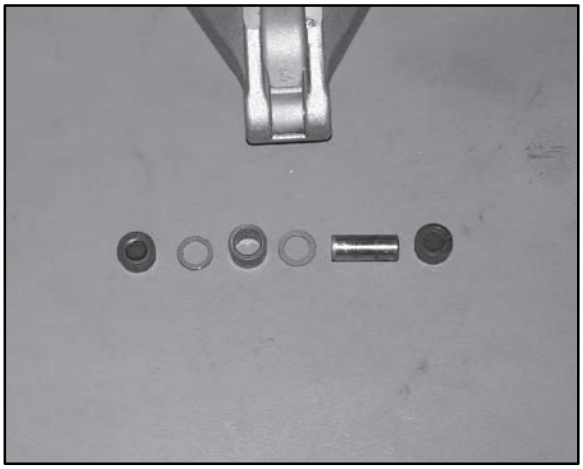
Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

Roller, Pin and Thrust Washer Inspection

3. Inspect all rollers, bushings and roller pins by pulling a flat metal rod across the roller. Turn roller with your finger. If you notice resistance, galling, or flat spots, replace rollers, pins and thrust washers in sets of three. Also inspect to see if roller and bushing are separating. Bushing must fit tightly in roller. Use the Roller Pin Tool (**PN 2870910**) to replace rollers and pins. Take care not to damage roller bushing or bearing surface of the new pin during installation.



4. Rubber backed buttons can and should be used in all ATV clutches *if the hollow roller pin is changed to a solid roller pin.* **NOTE:** The rubber side of the button is positioned toward the solid roller pin. It is recommended to switch all buttons to the rubber version during service (if needed).



DRIVE CLUTCH REASSEMBLY

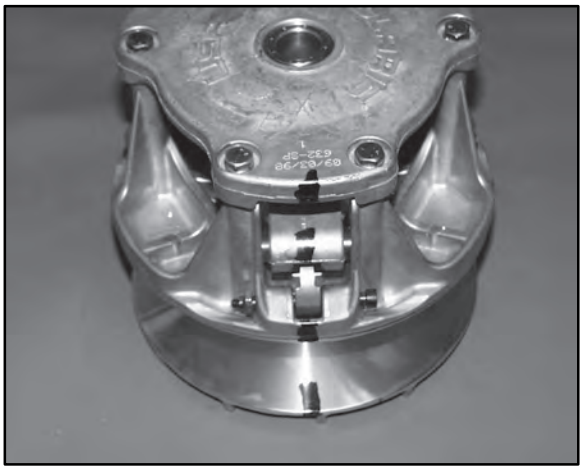
NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. The Teflon bushings are self-lubricating. **Do not apply oil or grease to the bushings**.

1. Reassemble drive clutch in the following sequence. Be sure the “X”, or the marks that were made earlier, are aligned during each phase of assembly.

   a) “X”, or the marks that were made earlier on cover

   b) X on spider, making sure spacer washers are installed underneath spider and positioned properly in recess.

   c) “X”, or the marks that were made earlier under weight

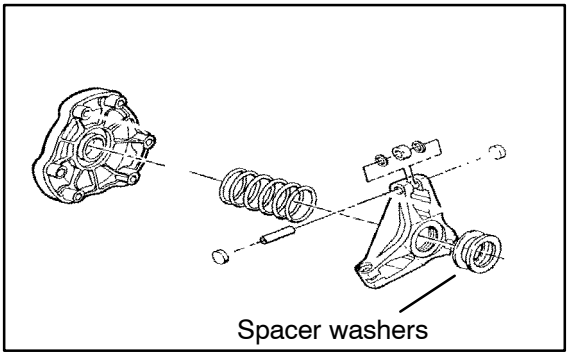


DRIVE CLUTCH REASSEMBLY CONT'D

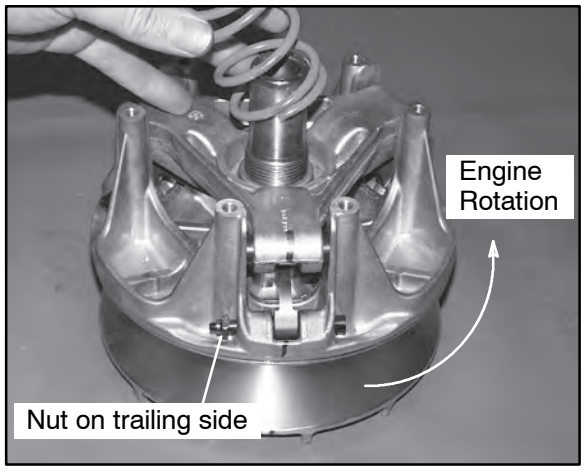
2. Install moveable sheave onto fixed sheave.
3. Install spider spacers. Use same quantity and thickness as were removed.
4. Compress spider buttons for each tower and install spider, making sure that "X", or the marks that were made earlier, on spider aligns with "X", or the marks that were made earlier on the moveable sheave.
5. Torque spider to specification using the holding fixture and spider tool. Torque with smooth motion to avoid damage to the stationary sheave. Refer to Page 6.3 for torque specification.

CAUTION:

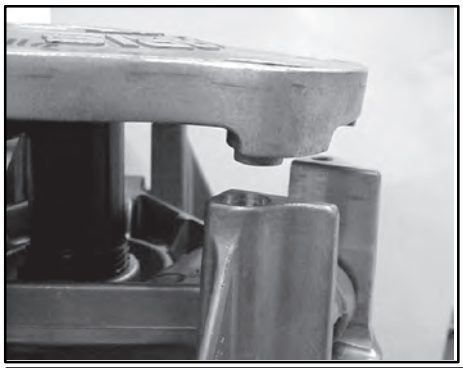
Be sure the spider spacer washers are fully seated in the recessed area of the spider. Any misalignment will alter clutch balance. Inverting the clutch while initially tightening the spider will help position the washers.

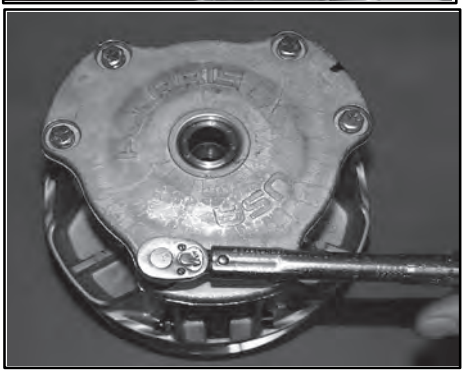


6. Install limiter nut on top of spider using the Clutch Spider Nut Socket **(PN 2870338)**. Torque to 15 ft. lbs. Reinstall shift weights using new lock nuts on the bolts.
7. Reinstall clutch spring.



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



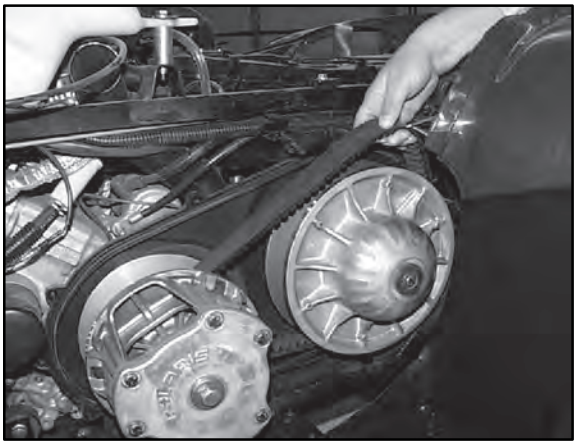


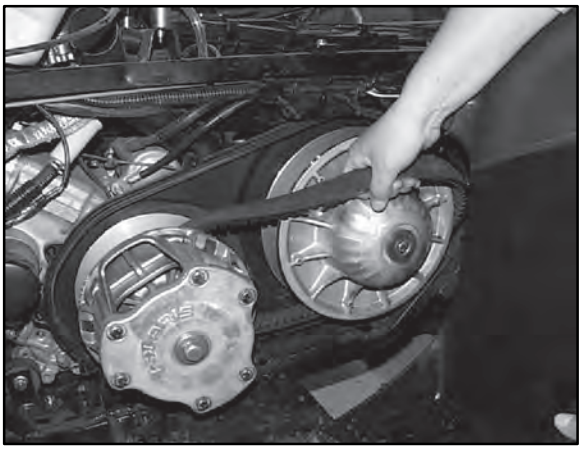
Spider Torque:
200 ft. lbs. (271 Nm)

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

DRIVE BELT REMOVAL/INSPECTION

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

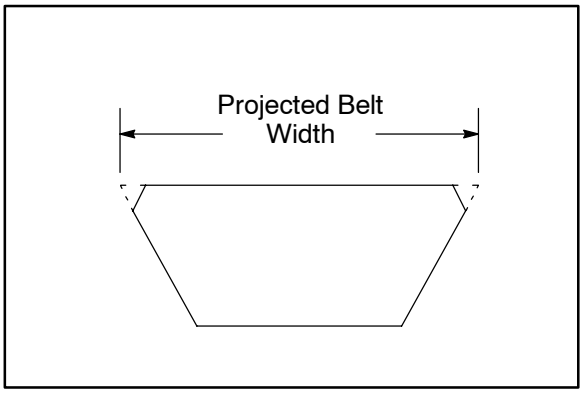




NOTE: When reinstalling the belt with the drive clutch and driven clutch already removed follow these steps:

- Install the driven clutch.
- Install the belt onto the driven clutch.
- Loop the drive clutch through the belt.
- Install the drive clutch onto the crankshaft.

4. Measure belt width and replace if worn. Generally, belts should be replaced if clutches can no longer be adjusted to provide proper belt deflection.
   - The top edges have been trimmed on some drive belts. It will be necessary to project the side profiles and measure from corner to corner.
   - Place a straight edge on each side of the drive belt.
   - Place another straight edge on top of belt.
   - Measure the distance where the side straight edges intersect the top, as shown in the illustration.



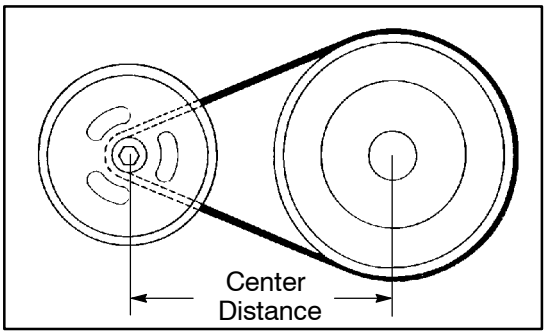
Belt Width:

New 1.174 - 1.188″ (2.98-3.02 cm)

Wear Limit 1.125″ (2.86 cm)

5. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Replace if necessary.
6. Inspect belt for hour glassing (extreme circular wear in at least one spot and on both sides of the belt). Hour glassing occurs when the drive train does not move and the drive clutch engages the belt continuously in one spot.
7. Measure belt length with a tape measure around the outer circumference of the belt. Belts which measure longer than nominal length may require driven shimming or engine adjustment for a longer center distance to obtain proper belt deflection. Belts which measure shorter than nominal length may require driven shimming or a shorter center distance. *Remember, proper belt deflection is the desired goal - not a specific center distance.*
8. Replace belt if worn past the service limit. Belts with thin spots, burn marks, etc., should be replaced to eliminate noise, vibration, or erratic PVT operation. See Troubleshooting Chart at the

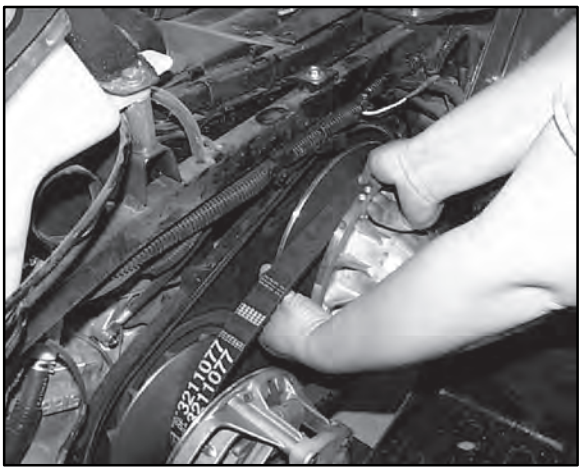
end of this chapter for possible causes.



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

DRIVE BELT INSTALLATION

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

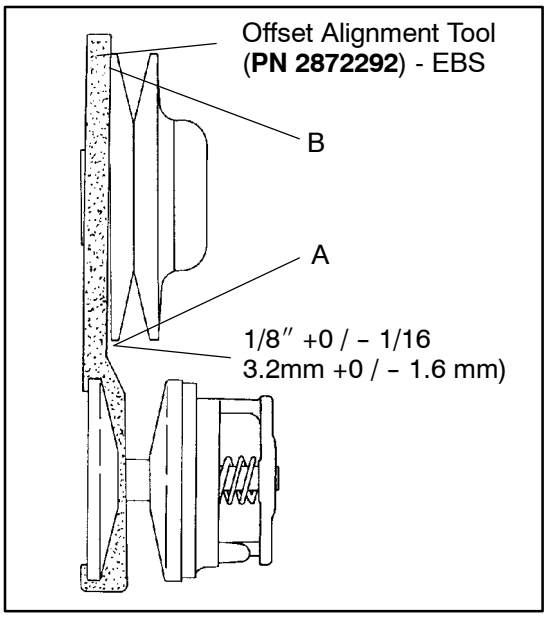


3. The belt then should be able to be pushed down into and between the sheaves.

NOTE: Be sure to position belt so part number is easily read.

CLUTCH ALIGNMENT

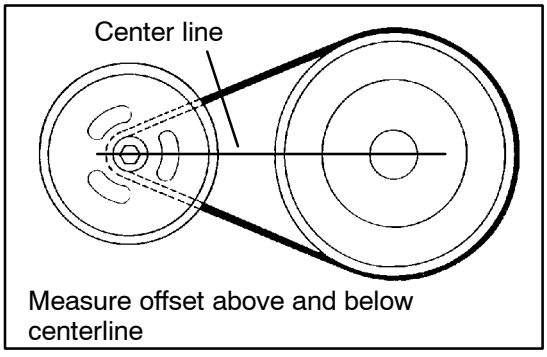
1. Remove belt and install the Clutch Offset Alignment Tool (**PN 2872292**) as shown.



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

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

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



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

Shim Kit (PN 2200126)

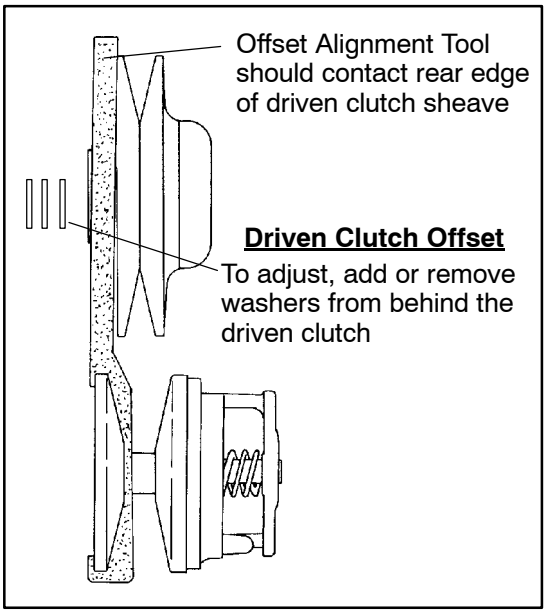
CLUTCH OFFSET

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

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

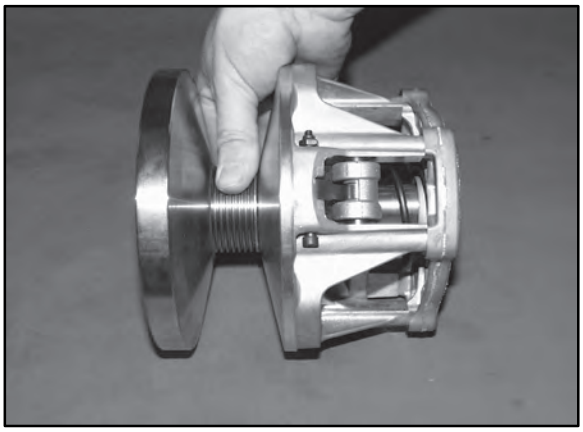
Spacer Washer (PN 7556401)

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



ONE-WAY CLUTCH INSPECTION (DRIVE CLUTCH)

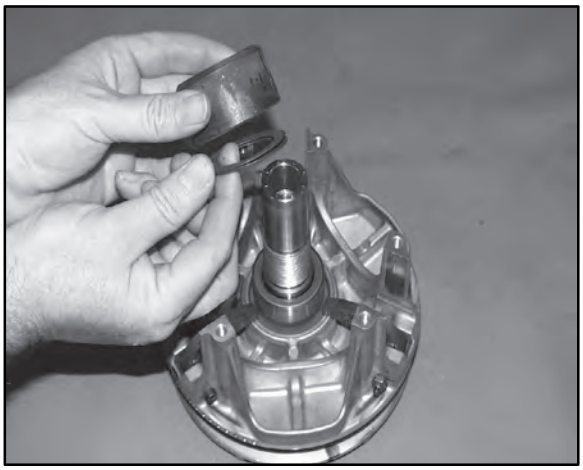
1. Rotate one-way clutch clockwise (as viewed from the cover plate side). The clutch should rotate on the shaft with only slight amount of drag. Verify there is no binding or rough spots. When rotated counterclockwise, the clutch should lock to the shaft without slipping. If problems are noted in either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



DRIVE CLUTCH INSPECTION

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

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

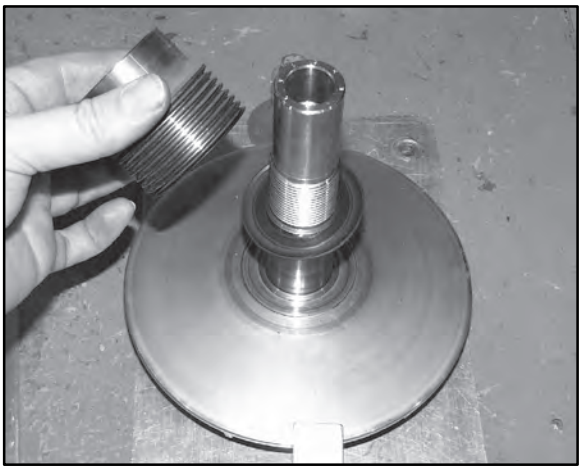


Brass Washer Thickness

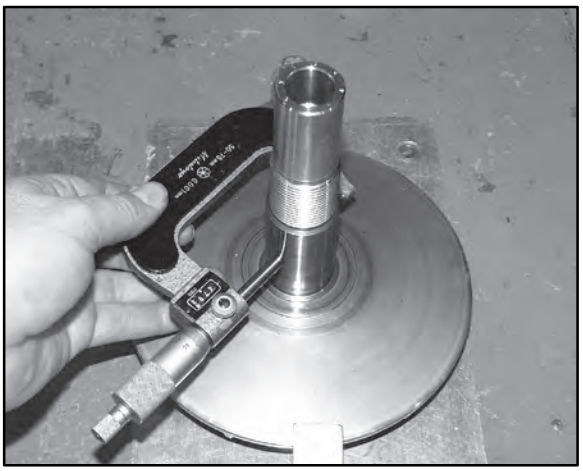
Standard: .030″ (.76mm)
Service Limit: .025″ (.64mm)

2. Lift one-way clutch off shaft. Replace as an assembly if worn, damaged, or if problems were

noted.



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



Shaft Diameter
Standard: 1.3745″ - 1.375″
Service Limit: 1.3730″

4. Remove 2 1/2″ PTFE washer from shaft. Visually inspect the washer for damage. Measure the thickness and compare to specification. Replace if worn or damaged.

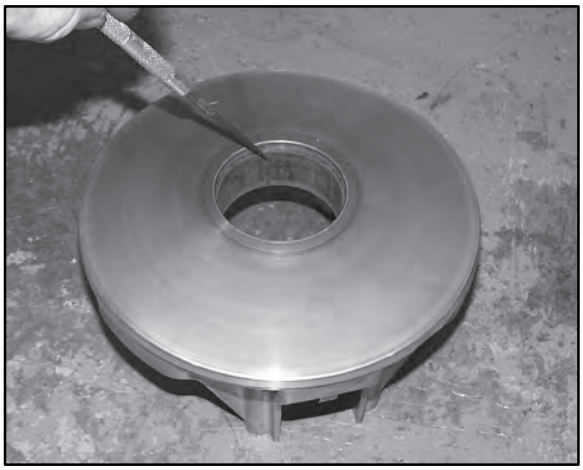
PTFE Washer Thickness
Standard: .030″ (.76mm)
Service Limit: .025″ (.64mm)

MOVEABLE SHEAVE BUSHING INSPECTION

1. Inspect the Teflon™ coating on the moveable sheave bushing. Inspect BOTH sheaves for signs of wear, grooving or cracking. Clean surfaces with a 3M™ pad if needed

Moveable Sheave Bushing Inspection:

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

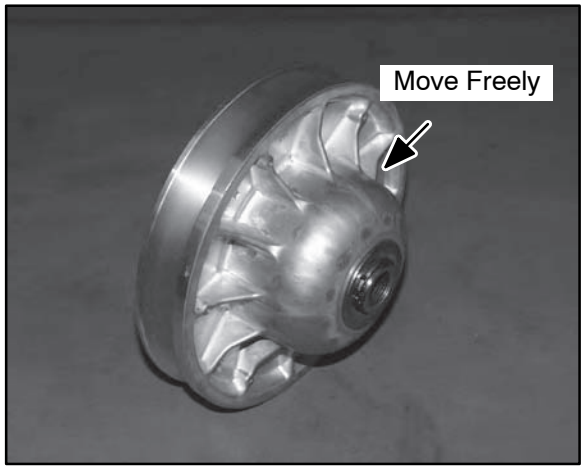


EARLY 2004 - EBS DRIVEN CLUTCH DISASSEMBLY/INSPECTION

CAUTION: The driven clutch must be disassembled from the helix end to lessen the chance of damage to seals in the one-way clutch. Review all information below before proceeding.

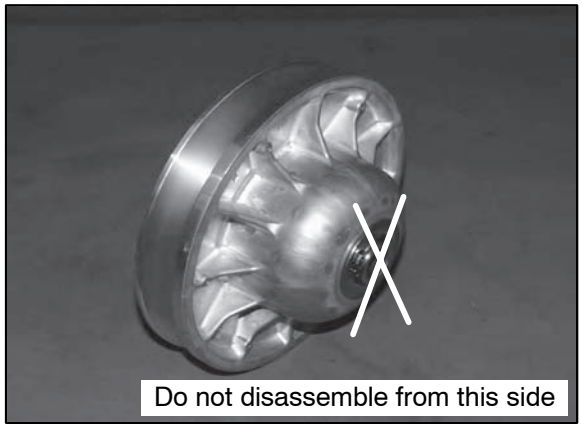
EARLY 2004 - ONE-WAY CLUTCH PRELIMINARY INSPECTION (DRIVEN)

1. With drive belt removed and transmission in gear, hold the inner sheave and rotate the outer sheave of the driven clutch in a counterclockwise direction as shown at right. The sheave should rotate with only a slight amount of drag. There should not be any binding or rough spots.

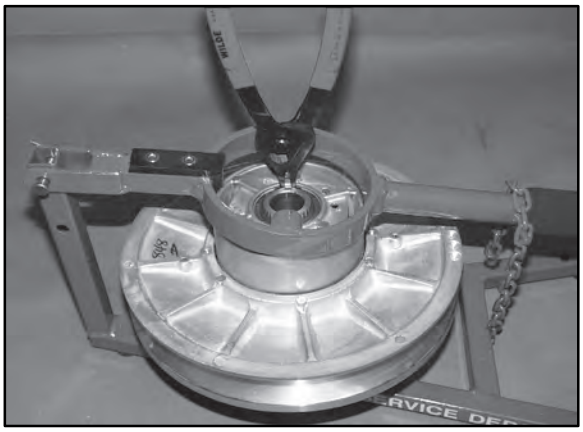


2. When rotated clockwise, the outer sheave should lock to the shaft and inner sheave without slipping.

3. 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 or the one-way clutch seals may be damaged.

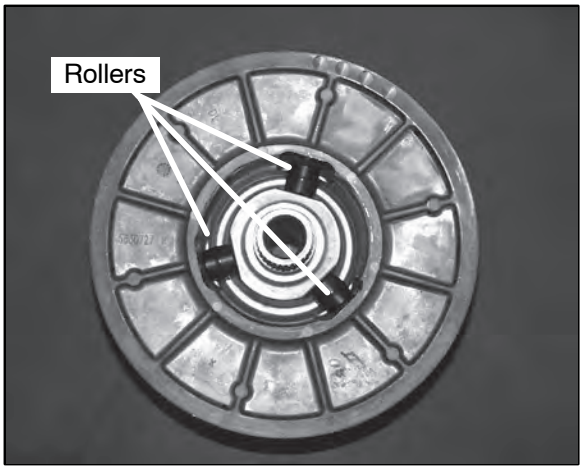


4. Place the driven assembly into the clutch holder. Push helix inward. Remove snap ring, washer, helix, and spring. NOTE: The spring is a compression spring only and has no torsional wind.



NOTE: Rotating the moveable sheave so that the rollers are not in contact with either helix ramp surfaces will lessen the effort needed to push the helix inward.

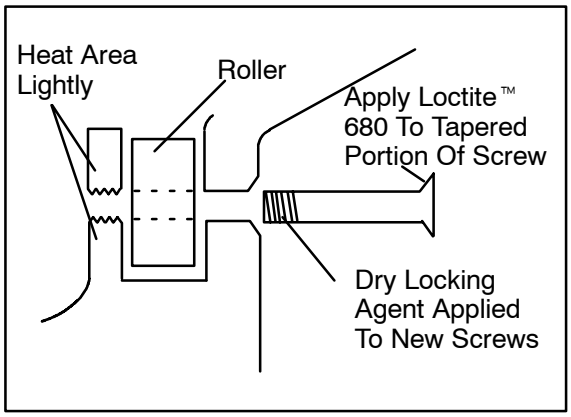
5. Remove spring seat washer and inspect for wear or damage. Replace if worn.
6. Inspect surface of rollers for flat spots and wear. Rollers must rotate freely on pins without excessive clearance. Check the roller pin and roller bore for wear and replace if necessary.

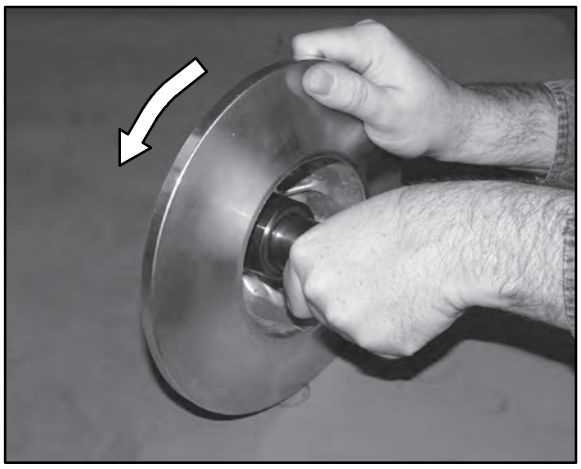


ROLLER PIN DISASSEMBLY

New roller retaining bolts have a dry locking agent applied to the threads. Before attempting to remove the roller pins, heat the threaded area lightly with a propane torch. ***Wear heat resistant gloves during this procedure.*** Use a high quality hexagonal wrench in good condition to avoid screw damage. A small amount of valve grinding compound can be applied to the tip of the hex wrench to ensure a tight fit. Always use new bolts if they are removed for inspection. Apply Loctite™ 680 retaining compound sparingly to the tapered head portion of the roller retaining screws. Do not allow locking agent to

contact the inside of the rollers. Do not lubricate the roller or roller pin.





7. Inspect moveable sheave bushing for wear. Inspect BOTH sheaves for signs of wear, grooving or cracking. Clean surfaces with a 3M™ pad if needed

Moveable Sheave Bushing Inspection:

Replace the bushing if more brass than Teflon™ is visible on the surface of the bushing.

8. Check for movement of the shaft in the one-way clutch. If the shaft can be moved laterally, or if the one-way clutch does not function properly as described in Step 1 and 2 on Page 6.18, replace driven clutch assembly.

EARLY 2004 - EBS DRIVE BUSHING SERVICE

EBS CLUTCH BUSHING REMOVAL AND INSTALLATION (Use Tool Kit PN 2201379)

The contents of this kit include:

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

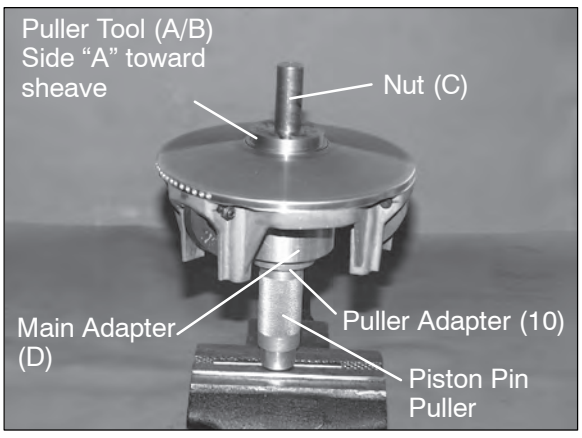
Also required: Clutch Bushing Replacement Tool Kit (PN 2871226) (ATV Clutch Kit) or (PN 2871025) (For all clutches) Piston Pin Puller (PN 2870386)

REMOVAL AND INSTALLATION INSTRUCTIONS

NOTE: Bushings are installed at the factory using Loctite™ 609. In order to remove bushings it will be necessary to apply heat evenly to the area around each bushing. Clean all residual Loctite from bushing bore prior to installing new bushing.

EBS Drive Clutch Moveable Sheave Bushing Removal

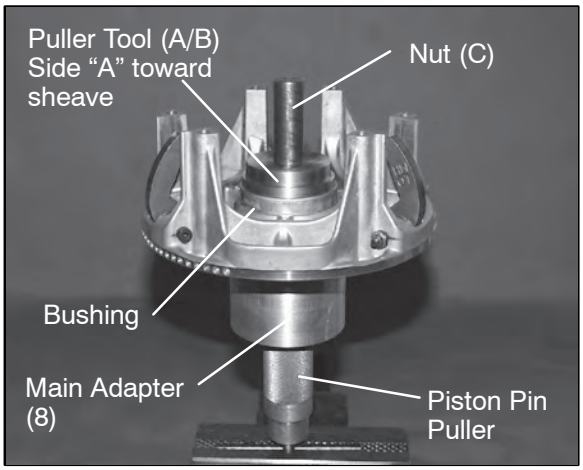
1. Remove clutch as outlined previously in this chapter.
2. Install handle end of Piston Pin Puller (**PN 2870386**) securely into bench vise and lightly grease puller threads.
3. Remove nut from puller rod and set aside.
4. Install puller adapter (Item 10 from kit **PN 2871226**).
5. Install main adapter (Item D) onto puller.



6. With towers pointing toward the vise, slide sheave onto puller rod.
7. Install removal tool (Item A/B) into center of sheave with “A side” toward sheave.
8. Install nut (C) onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.
9. Turn sheave counterclockwise on puller rod until it comes free. Lift sheave off puller.
10. Remove nut from puller rod and set aside.
11. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

EBS Drive Moveable Bushing Installation

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

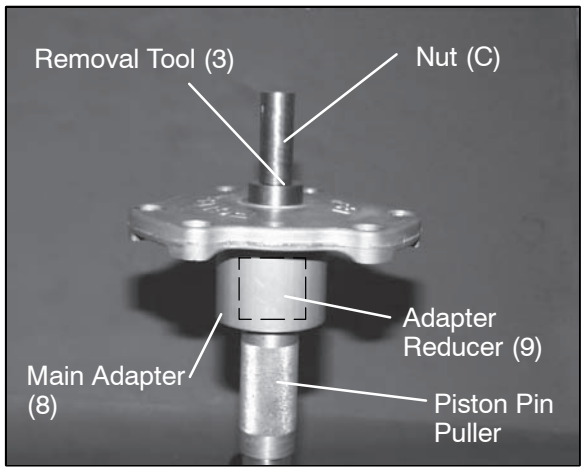


EBS Drive Clutch Moveable Sheave Bushing Installation

2. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
3. Set bushing in place on sheave.
4. Insert installation puller tool (Item A/B) with “A” side down, into center of bushing.
5. With towers pointing upward, slide sheave, bushing and tool onto puller rod.
6. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
7. Turn sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.
8. Remove nut from puller rod and set aside.
9. Remove sheave from puller.
10. Remove installation tool.

EBS Drive Clutch Cover Bushing Removal

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



EBS Drive Clutch Cover Bushing Removal

2. Install adapter reducer (Item 9).
3. From outside of clutch cover, insert removal tool (Item 3) into cover bushing.
4. With inside of cover toward vise, slide cover onto puller.
5. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.
6. Turn clutch cover counterclockwise on puller rod until bushing is removed and cover comes free.
7. Remove nut from puller rod and set aside.
8. Remove bushing and bushing removal tool from puller. Discard bushing.

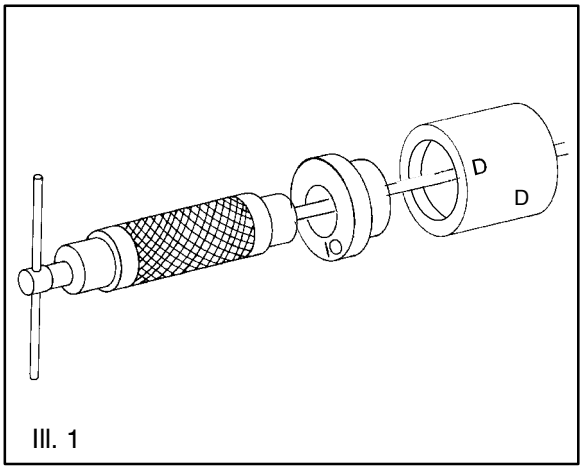
EBS Drive Clutch Cover Bushing Installation

1. Apply Loctite™ 609 evenly to bushing bore in cover.
2. Working from inside of cover, insert new bushing and bushing installation tool into center of clutch cover.
3. With main adapter on puller, insert cover onto puller rod, placing outside of cover toward vise.
4. Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
5. Turn clutch cover counterclockwise on puller rod until bushing is seated.
6. Remove nut from puller rod. Take installation tool and clutch cover off rod.

EARLY 2004 – EBS DRIVEN BUSHING SERVICE

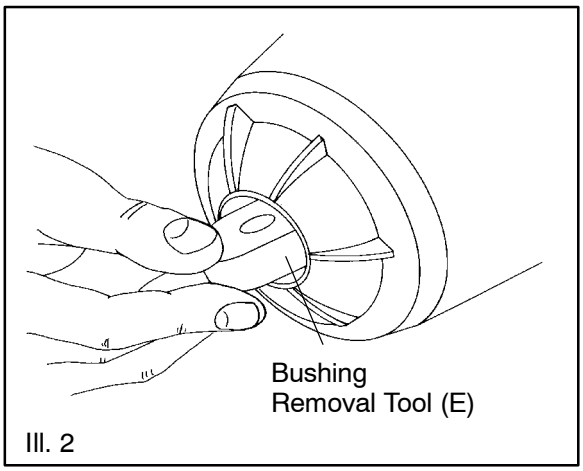
EBS Driven - Bushing Removal

1. Install puller adapter (Item 10) onto puller.



Ill. 1

2. Insert EBS main adapter (Item D) onto puller. See Ill. 1.
3. Install bushing removal tool (Item E) into center of clutch sheave. See Ill. 2.



Ill. 2

4. Install sheave onto puller.
5. Install left hand nut onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
6. Using a hand held propane torch, apply heat evenly around outside of bushing until tiny smoke tailings appear.

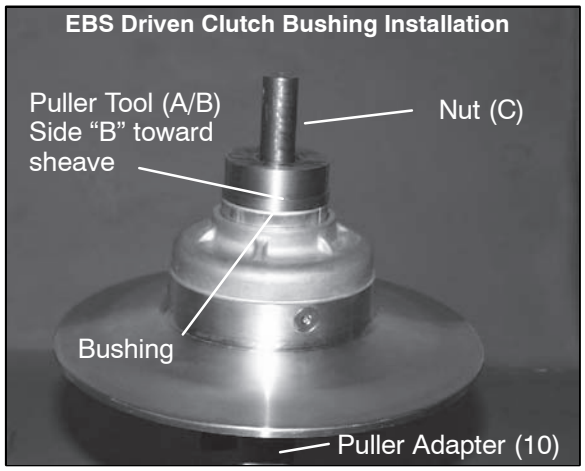
CAUTION: Clutch components will be hot! In order to avoid serious burns, wear insulated gloves during the removal process.

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 remove tool from adapters. Discard bushing.

EBS Driven - Bushing Installation

1. Slide adapter (Item 10) onto puller.



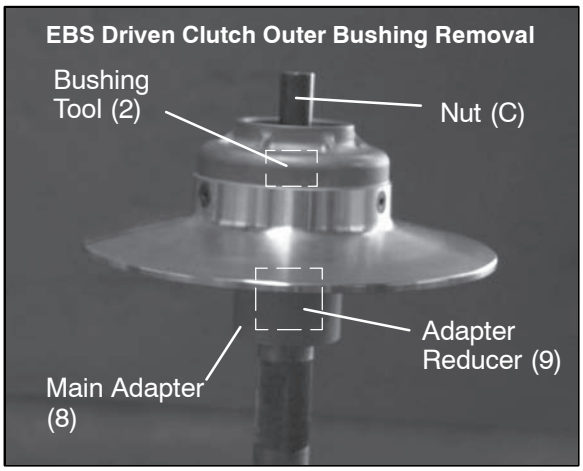
2. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
3. Install sheave onto puller (belt surface up).
4. Place new bushing on side B of installation tool (Item A/B) and slide both over puller rod.
5. Install nut (C) onto puller rod and hand tighten against installation tool.
6. Turn clutch sheave counterclockwise until bushing is seated.
7. Remove nut (C) (left hand thread) from puller rod and set aside.
8. Remove installation tool and clutch sheave from puller.

EBS Driven - Backside (Outer) 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.

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

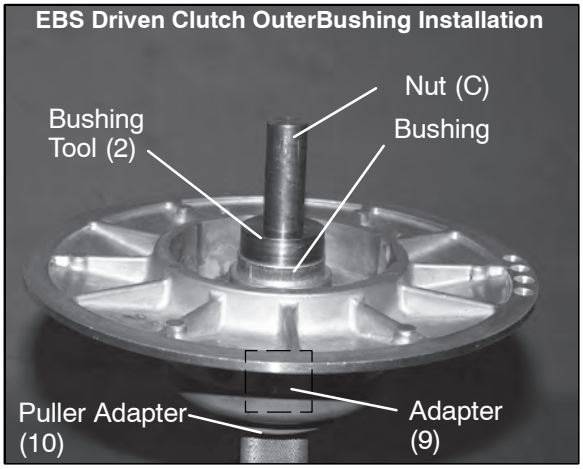
4. Flip sheave over onto puller.
5. Install bushing tool (Item 2).
6. Install left hand nut (C) and spacer onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
7. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.
8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove adapters from puller.



10. Remove bushing and removal tool from adapters. Discard bushing.

EBS Driven - Backside (Outer) Bushing Installation

1. Install puller adapter (Item 10) onto puller.
2. Install adapter (Item 9) onto puller.



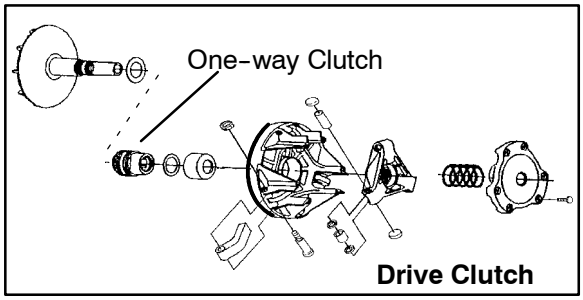
3. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
4. Install sheave face down on puller.
5. Install new bushing on installation tool (Item 2) and install assembly into sheave.
6. Install left hand thread nut (C) onto puller rod and hand tighten against installation tool.
7. Turn clutch sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.

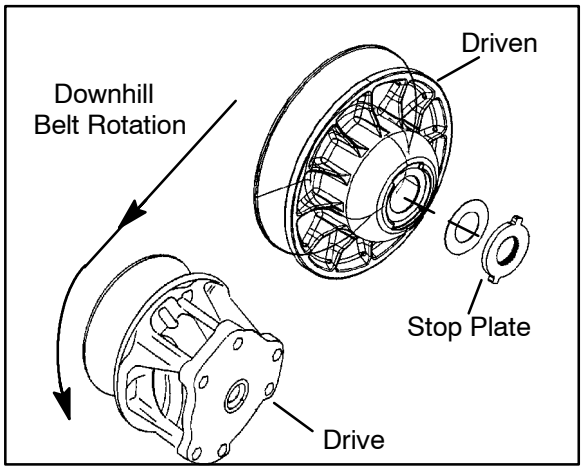
8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove installation tool and clutch sheave from puller.

LATE 2004 - EBS DRIVEN CLUTCH DISASSEMBLY/INSPECTION -

Late 2004 EBS Driven Clutch Operation

The late model EBS driven clutch provides the same engine braking abilities as the earlier EBS driven clutch.





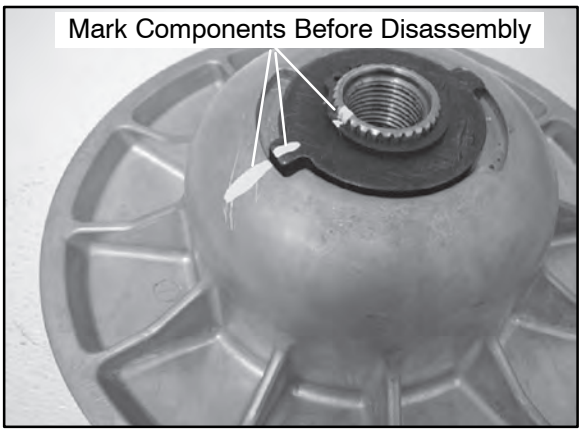
When the ATV is moving downhill the drive train turns the driven clutch, belt, and one way clutch in the direction of engine rotation. When the one-way clutch (see exploded view of drive clutch) exceeds the drive clutch rotational speed, the one-way clutch locks to the drive clutch shaft and engine braking occurs. Essentially the driven clutch has become the "driving" clutch. The stop plate (bow plate) that is fixed to the transmission shaft rotates in the pocket of the sheave, allowing the stationary sheave to rotate with the moveable sheave as the rollers move to the other side of the ramp, providing instant EBS braking. Engine braking (EBS) continues until the drive clutch speed exceeds the one-way clutch speed, or until the throttle is applied and the engine reaches clutch engagement speed, lifting the belt off of the one-way clutch.

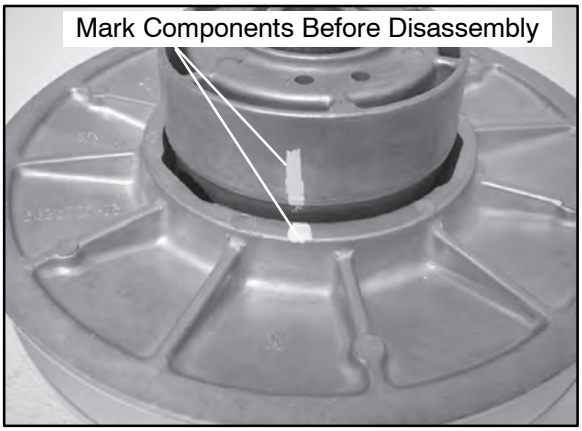
CAUTION: The driven clutch must be disassembled from the helix end to reduce spring pressure. Review all information below before proceeding.

DRIVEN DISASSEMBLY/ASSEMBLY

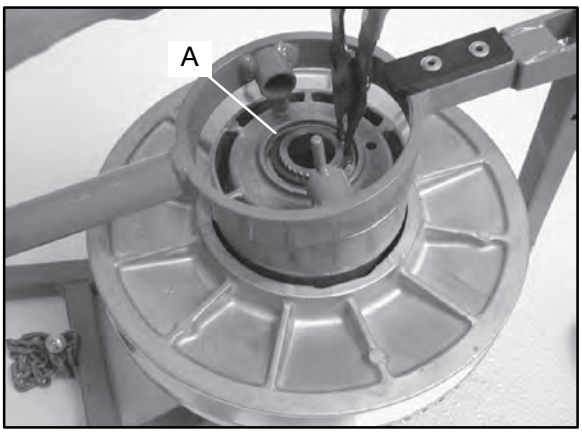
1. Remove driven clutch from the transmission input shaft. Do not attempt disassembly of the driven clutch from the outside snap ring. The driven clutch must be disassembled from the helix side or the one-way clutch seals may be damaged.

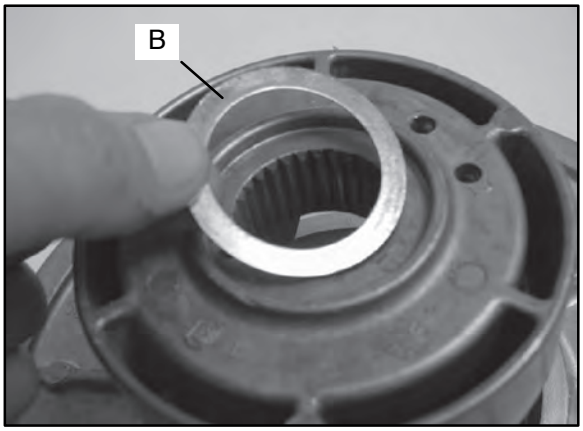
2. It is important to mark the position of the shaft, stop plate, and sheave before disassembly. Mark the helix and inside sheave also. This will aid in reassembly.





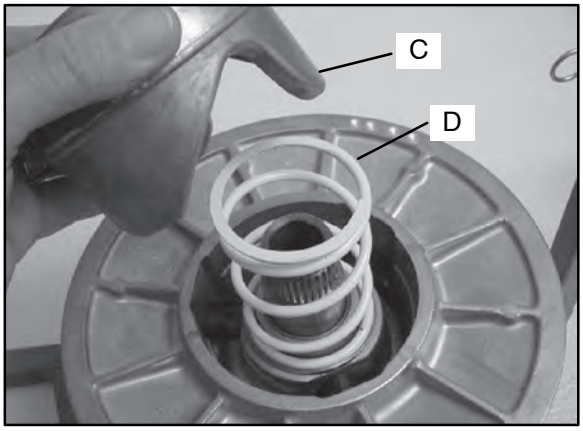
3. Place the driven assembly into the clutch holder. Push helix inward. Remove snap ring (A) and washer (B). **NOTE:** The spring is a compression spring only and has no torsional wind.

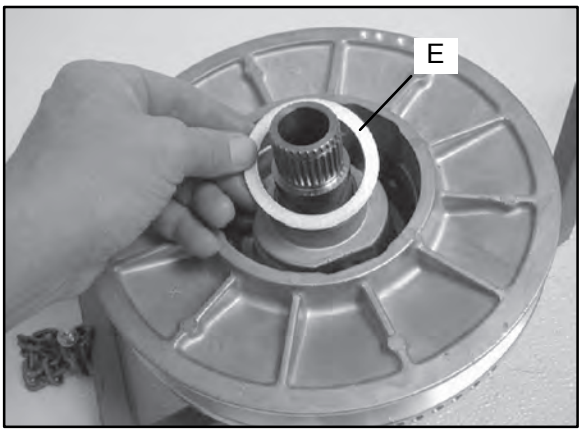


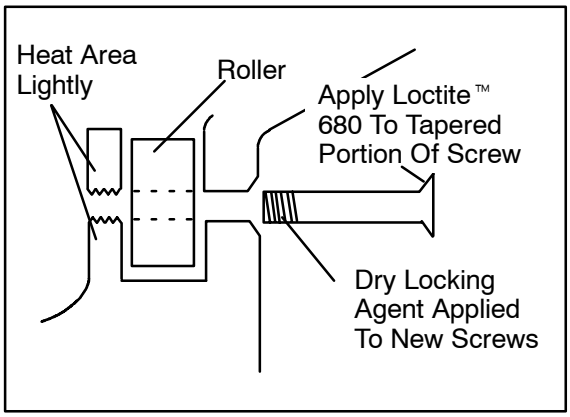


NOTE: Rotating the moveable sheave so that the rollers are not in contact with either helix ramp surfaces will lessen the effort needed to push the helix inward.

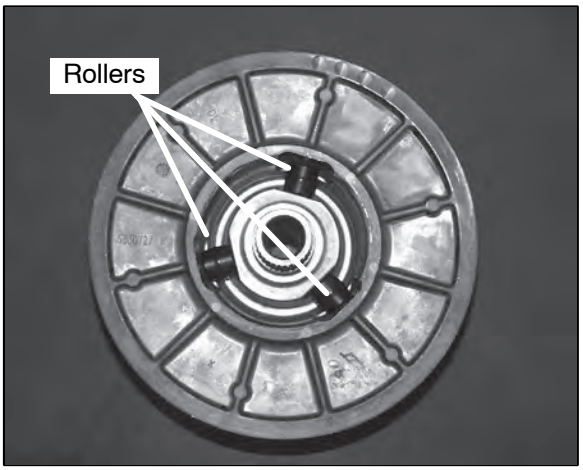
4. Remove helix (C), spring (D), and spring seat washer (E) and inspect for wear or damage. Replace if worn.
   NOTE: Note the keyed spline on the shaft and helix for reassembly. The keyed shaft ensure proper alignment of the helix to the shaft.

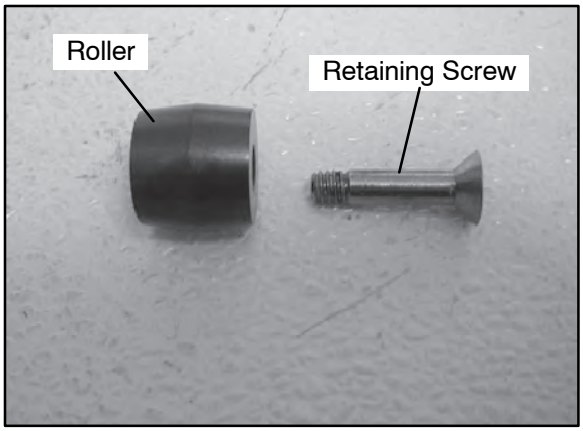




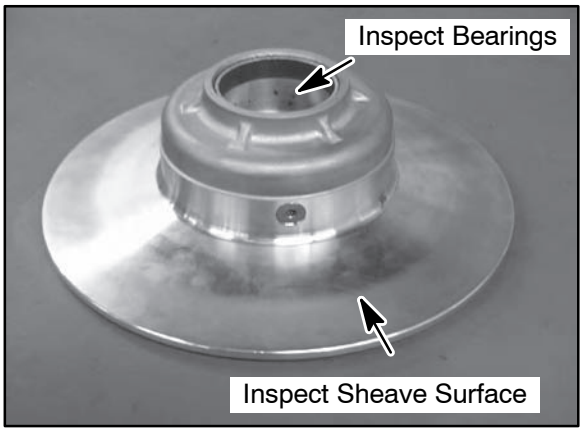


5. Inspect surface of rollers for flat spots and wear. Rollers must rotate freely on pins without excessive clearance. Check the roller pin and roller bore for wear and replace if necessary.





6. Inspect moveable sheave bushing for wear. Inspect BOTH sheaves for signs of wear, grooving or cracking. Clean surfaces with a 3M™ pad if needed



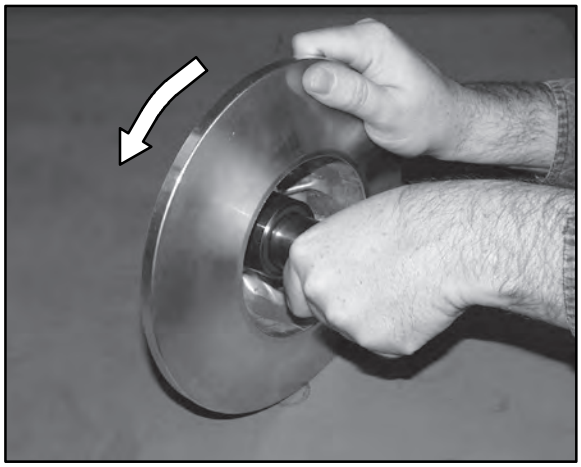
ROLLER PIN DISASSEMBLY

New roller retaining bolts have a dry locking agent applied to the threads. Before attempting to remove the roller pins, heat the threaded area lightly with a propane torch. ***Wear heat resistant gloves during this procedure.*** Use a high quality hexagonal wrench in good condition to avoid screw damage. A small amount of valve grinding compound can be applied to the tip of the hex wrench to ensure a tight fit. Always use new bolts if they are removed for inspection. Apply Loctite™ 680 retaining compound sparingly to the tapered head portion of the roller retaining screws. Do not allow locking agent to contact the inside of the rollers. Do not lubricate the roller or roller pin.

Moveable Sheave Bushing Inspection:

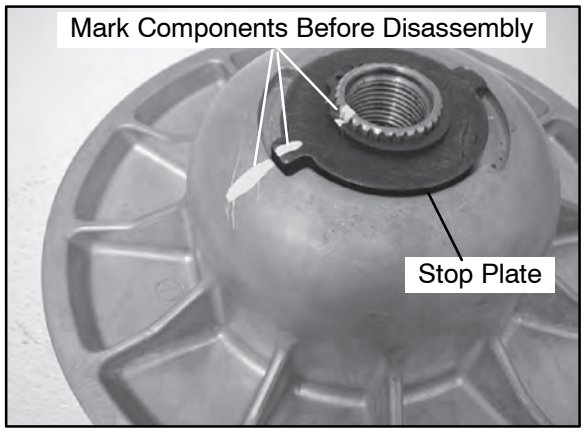
Replace the bushing if more brass than Teflon™ is visible on the surface of the bushing. See "EBS DRIVEN BUSHING SERVICE" later in this chapter.

7. Check for movement of the shaft in the stationary sheave. The shaft should rotate freely until the stop plate makes contact with the sheave casting. Some lateral movement is allowable. The amount of movement shall be limited to prevent the plate from raising out of the sheave pocket.

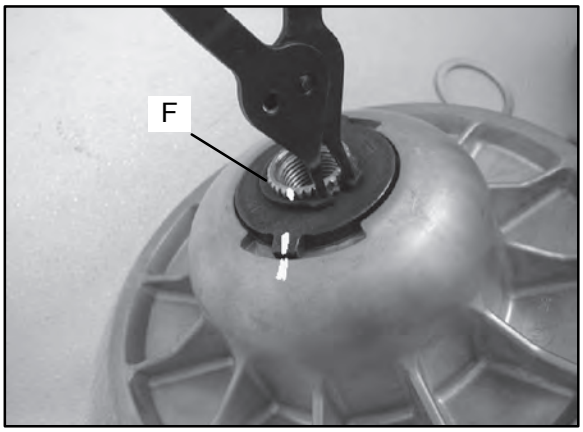


One Way Clutch Disassembly

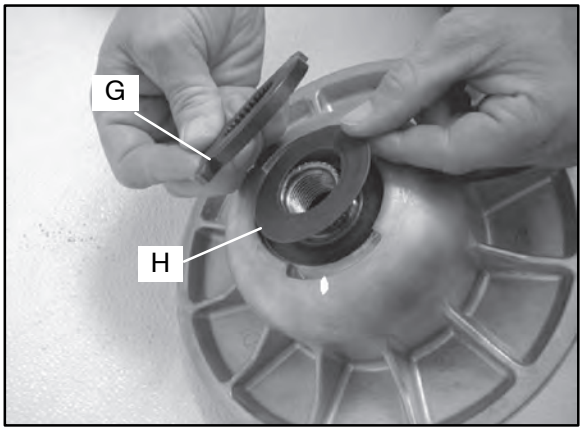
8. It is important to mark the position of the shaft, stop plate, and sheave before disassembly. This will aid in reassembly.



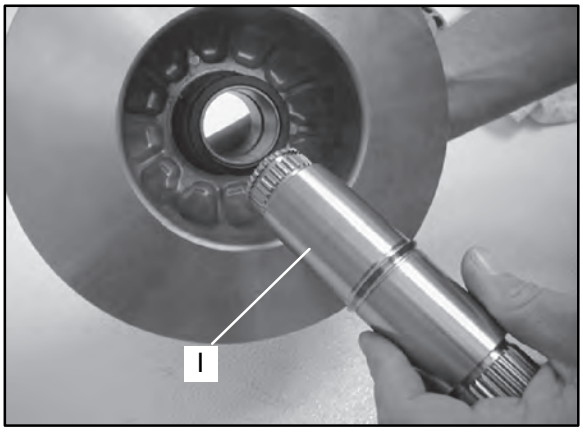
9. Remove the snap ring (F).



10. Remove the stop plate (G) and spacer washer (H).



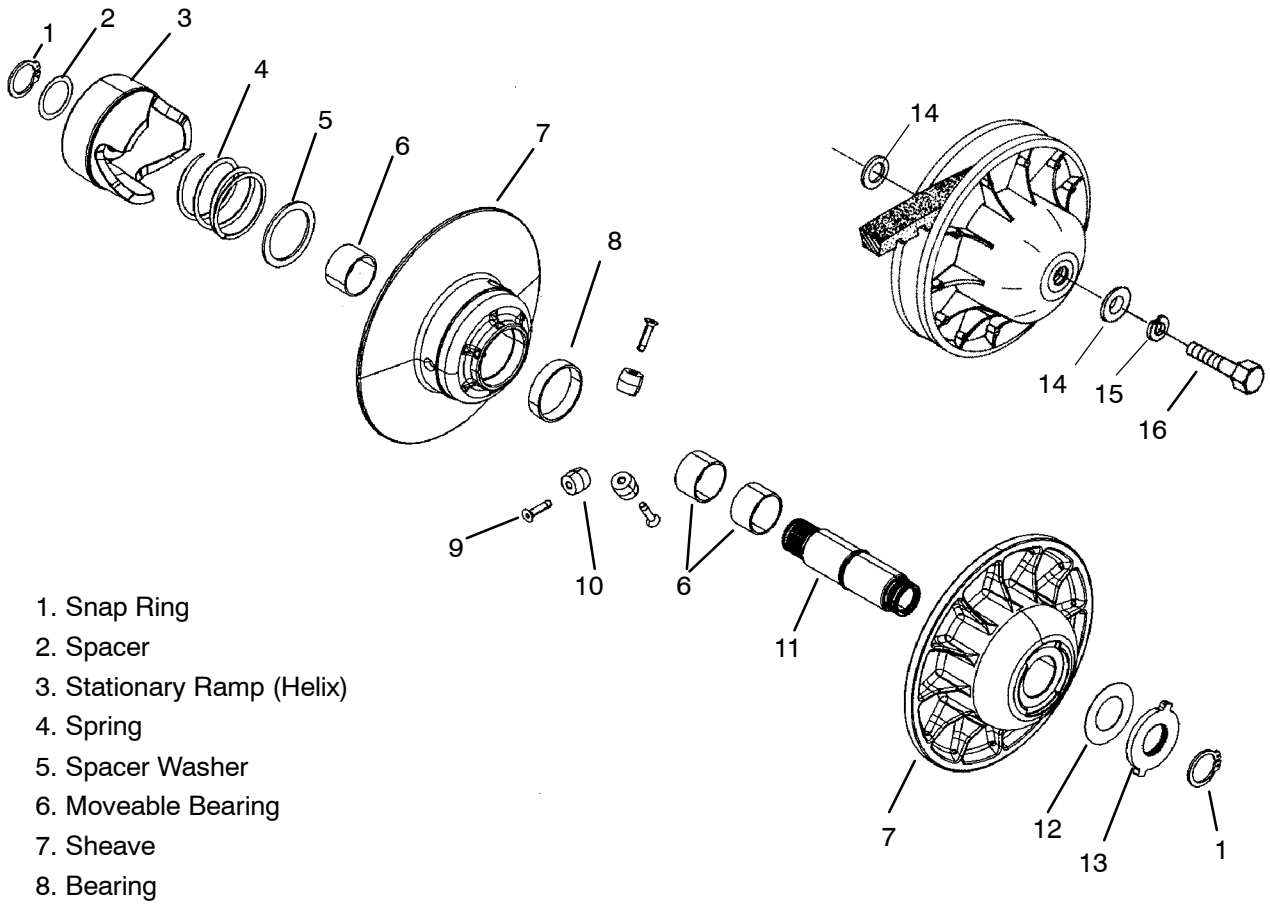
11. Remove the shaft (I) from the sheave assembly. Inspect washers and bearing for wear.



LATE 2004 – DRIVEN CLUTCH REASSEMBLY

1. Simply reverse the steps of the disassembly process. Replace any parts needed. See “EBS DRIVEN BUSHING SERVICE” later in this chapter for replacement of driven bushings .
2. Be sure to use the alignment marks for reassembly.

LATE 2004 EBS DRIVEN CLUTCH EXPLODED VIEW



1. Snap Ring
2. Spacer
3. Stationary Ramp (Helix)
4. Spring
5. Spacer Washer
6. Moveable Bearing
7. Sheave
8. Bearing
9. Screw
10. Taper Roller
11. Shaft
12. Washer
13. Plate
14. Washer
15. Spring Lock Washer
16. Bolt

LATE 2004 - EBS DRIVE BUSHING SERVICE

EBS CLUTCH BUSHING REMOVAL AND INSTALLATION (Use Tool Kit PN 2201379)

The contents of this kit include:

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

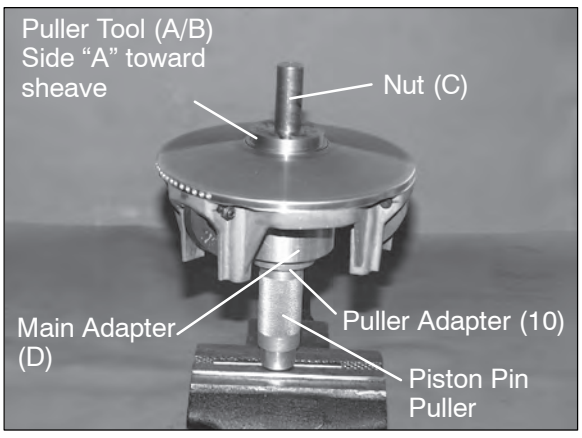
Also required: Clutch Bushing Replacement Tool Kit (PN 2871226) (ATV Clutch Kit) or (PN 2871025) (For all clutches) Piston Pin Puller (PN 2870386)

REMOVAL AND INSTALLATION INSTRUCTIONS

NOTE: Bushings are installed at the factory using Loctite™ 609. In order to remove bushings it will be necessary to apply heat evenly to the area around each bushing. Clean all residual Loctite from bushing bore prior to installing new bushing.

EBS Drive Clutch Moveable Sheave Bushing Removal

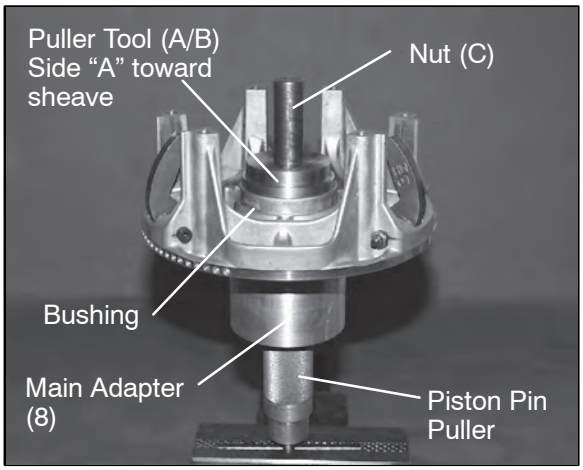
1. Remove clutch as outlined previously in this chapter.
2. Install handle end of Piston Pin Puller (**PN 2870386**) securely into bench vise and lightly grease puller threads.
3. Remove nut from puller rod and set aside.
4. Install puller adapter (Item 10 from kit **PN 2871226**).
5. Install main adapter (Item D) onto puller.



6. With towers pointing toward the vise, slide sheave onto puller rod.
7. Install removal tool (Item A/B) into center of sheave with “A side” toward sheave.
8. Install nut (C) onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.
9. Turn sheave counterclockwise on puller rod until it comes free. Lift sheave off puller.
10. Remove nut from puller rod and set aside.
11. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

EBS Drive Moveable Bushing Installation

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

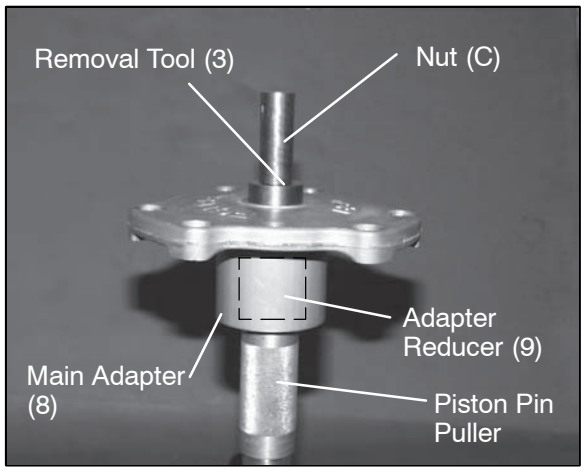


EBS Drive Clutch Moveable Sheave Bushing Installation

2. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
3. Set bushing in place on sheave.
4. Insert installation puller tool (Item A/B) with “A” side down, into center of bushing.
5. With towers pointing upward, slide sheave, bushing and tool onto puller rod.
6. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
7. Turn sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.
8. Remove nut from puller rod and set aside.
9. Remove sheave from puller.
10. Remove installation tool.

EBS Drive Clutch Cover Bushing Removal

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



EBS Drive Clutch Cover Bushing Removal

2. Install adapter reducer (Item 9).
3. From outside of clutch cover, insert removal tool (Item 3) into cover bushing.
4. With inside of cover toward vise, slide cover onto puller.
5. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.
6. Turn clutch cover counterclockwise on puller rod until bushing is removed and cover comes free.
7. Remove nut from puller rod and set aside.
8. Remove bushing and bushing removal tool from puller. Discard bushing.

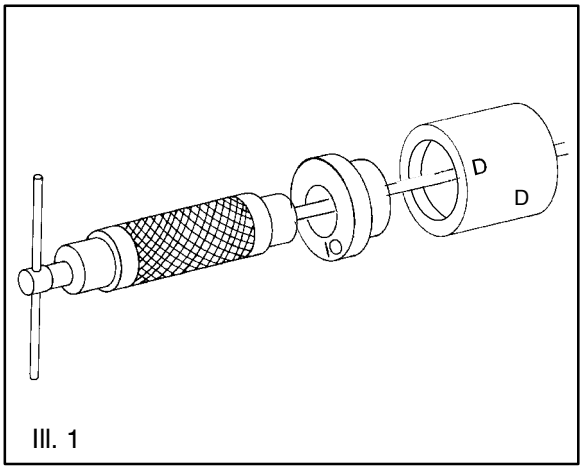
EBS Drive Clutch Cover Bushing Installation

1. Apply Loctite™ 609 evenly to bushing bore in cover.
2. Working from inside of cover, insert new bushing and bushing installation tool into center of clutch cover.
3. With main adapter on puller, insert cover onto puller rod, placing outside of cover toward vise.
4. Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
5. Turn clutch cover counterclockwise on puller rod until bushing is seated.
6. Remove nut from puller rod. Take installation tool and clutch cover off rod.

LATE 2004 – EBS DRIVEN BUSHING SERVICE

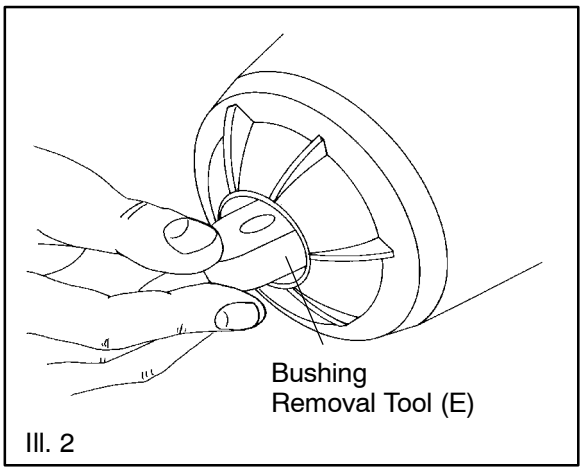
EBS Driven - Bushing Removal

1. Install puller adapter (Item 10) onto puller.



Ill. 1

2. Insert EBS main adapter (Item D) onto puller. See Ill. 1.
3. Install bushing removal tool (Item E) into center of clutch sheave. See Ill. 2.



Ill. 2

4. Install sheave onto puller.
5. Install left hand nut onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
6. Using a hand held propane torch, apply heat evenly around outside of bushing until tiny smoke tailings appear.

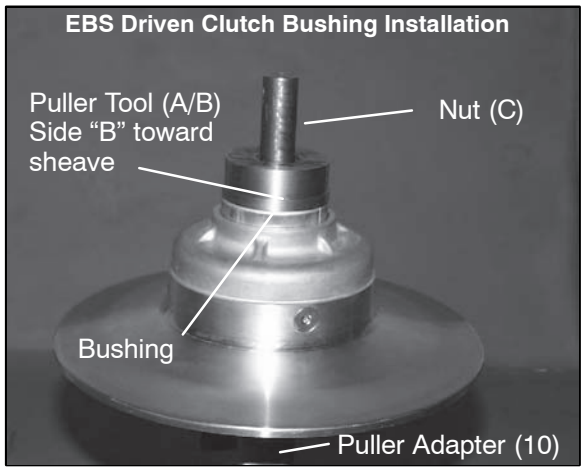
CAUTION: Clutch components will be hot! In order to avoid serious burns, wear insulated gloves during the removal process.

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.

EBS Driven - Bushing Installation

1. Slide adapter (Item 10) onto puller.



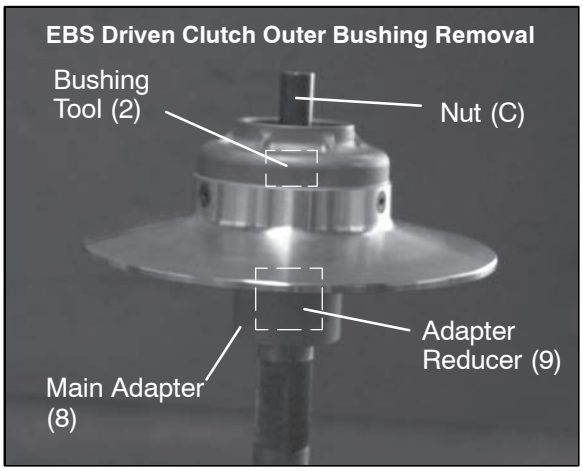
2. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
3. Install sheave onto puller (belt surface up).
4. Place new bushing on side B of installation tool (Item A/B) and slide both over puller rod.
5. Install nut (C) onto puller rod and hand tighten against installation tool.
6. Turn clutch sheave counterclockwise until bushing is seated.
7. Remove nut (C) (left hand thread) from puller rod and set aside.
8. Remove installation tool and clutch sheave from puller.

EBS Driven - Backside (Outer) 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.

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

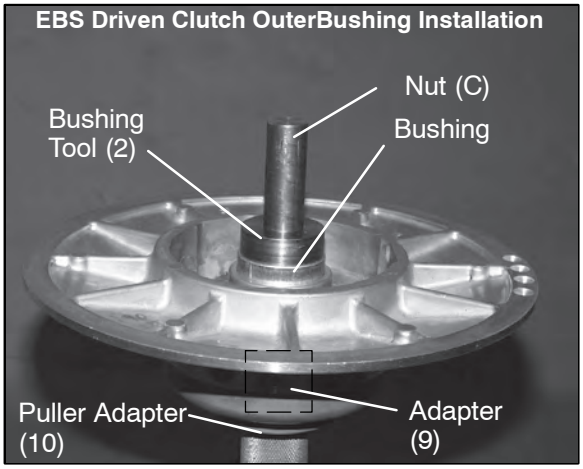
4. Flip sheave over onto puller.
5. Install bushing tool (Item 2).
6. Install left hand nut (C) and spacer onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
7. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.
8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove adapters from puller.



10. Remove bushing and removal tool from adapters. Discard bushing.

EBS Driven - Backside (Outer) Bushing Installation

1. Install puller adapter (Item 10) onto puller.
2. Install adapter (Item 9) onto puller.

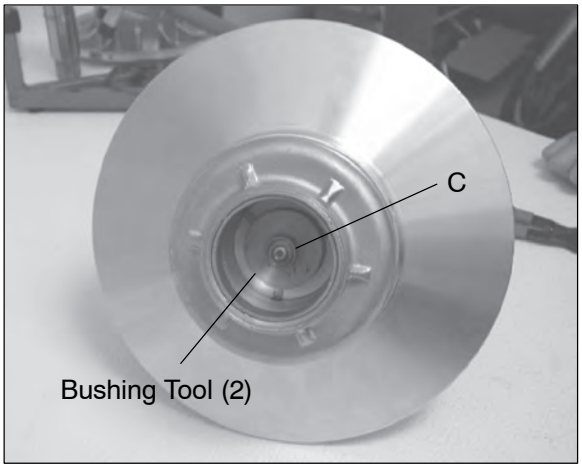


3. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
4. Install sheave face down on puller.
5. Install new bushing on installation tool (Item 2) and install assembly into sheave.
6. Install left hand thread nut (C) onto puller rod and hand tighten against installation tool.
7. Turn clutch sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.

8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove installation tool and clutch sheave from puller.

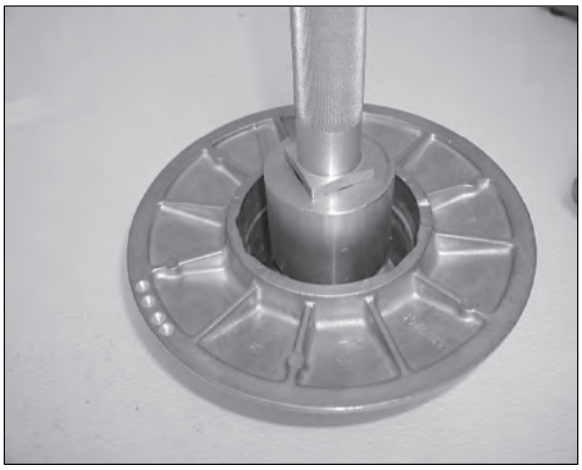
EBS Driven - Stationary Sheave (Inner) Bushing Removal

1. Install puller adapter onto puller.
2. Install adapter reducer.



3. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.

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



4. Install bushing tool (Item 2)
5. Install the left hand nut (C) and spacer onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
6. Turn clutch sheave counterclockwise until both bushings are removed and sheave comes free.

TROUBLESHOOTING

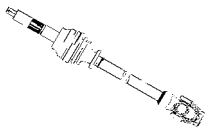
Situation	Probable Cause	Remedy
Engine RPM below specified operating range although engine is properly tuned.	-Wrong or broken drive clutch spring.	-Replace with recommended spring.
	-Drive clutch shift weight too heavy.	-Install correct shift weight kit to match engine application.
	-Driven clutch spring broken or installed wrong .	-Replace spring; refer to proper installation location.
Erratic engine operating RPM during acceleration or load variations.	-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.
	-Belt worn unevenly - thin/burnt spots	Replace belt
	-Driven clutch malfunction.	a. Replace ramp buttons. b. Inspect movable sheave for excessive bushing clearance/ replace.
	-Sheave face grooved.	-Replace the clutch.
Engine RPM above specified operating range.	-Incorrect drive clutch spring (too high spring rate).	-Install correct recommended spring.
	-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 slippage.	-Clean sheaves with denatured alcohol or brake cleaner, install new belt.
Harsh drive clutch engagement.	-Drive belt worn too narrow.	-Replace belt.
	-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.
	-Clutch alignment out of spec.	-Adjust alignment offset.
	-Engine mount broken or loose.	-Inspect/adjust or replace.
PVT cover overheating (melting)	-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.
	-Clutches or weight being applied to cover while in operation	-Remove weight. Inform operator.
	-Use of 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.
Water ingestion	-Cover seals or ducts leaking	-Find leak and repair as necessary.
	-Operator error	-Instruct operator on guidelines for operation in wet terrain as outlined in Owner's Safety and Maintenance Manual.

TROUBLESHOOTING

Situation	Probable Cause	Remedy
Belt slippage	-Belt worn out	-Replace belt.
	-Water ingestion	-Inspect and seal PVT system.
	-Belt contaminated with oil or grease	-Inspect and clean.
Belt burnt, thin spots	-Abuse (continued throttle application when vehicle is stationary, excess load)	-Caution operator to operate machine within guidelines.
	-Dragging brake	-Vehicle operated with park brake on. Inspect brake system.
	-Slow, easy clutch engagement	-Instruct firm, effective use of throttle for efficient engagement.
PVT noise	-Belt worn or separated, thin spots, loose belt	-Replace belt.
	-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.

NOTES

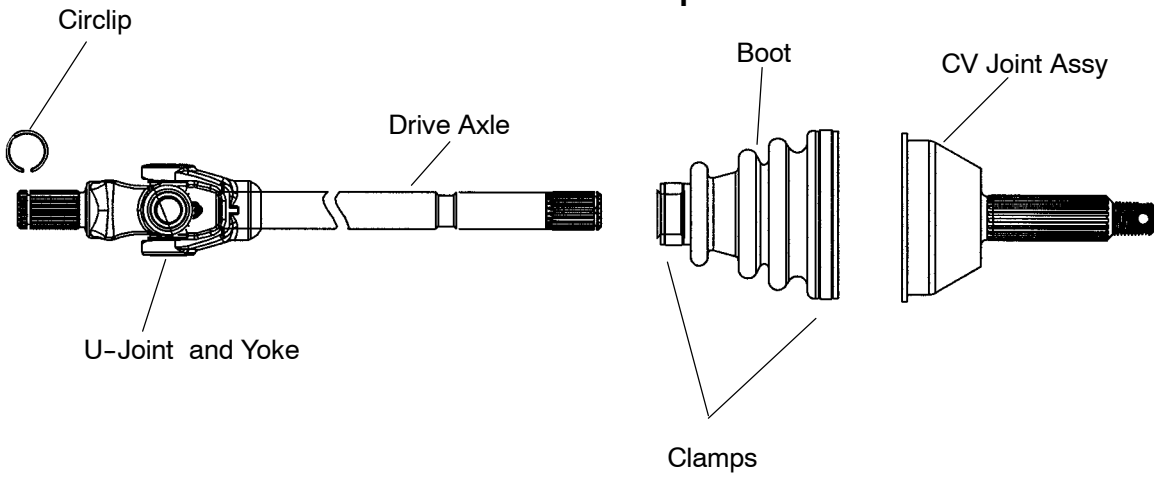
CHAPTER 7
FINAL DRIVE



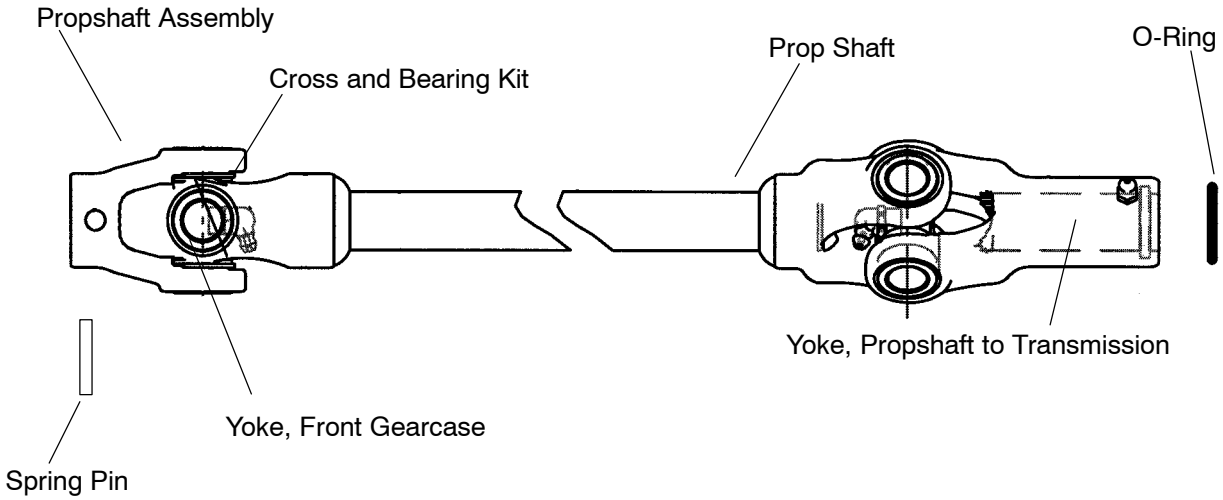
7

AWD FRONT DRIVE AXLE EXPLODED VIEW

Front Drive Axle Components



Front Prop Shaft Components



SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2872608	Roller Pin Removal Tool
8700226	CV Boot Clamp Pliers

WHEEL AND HUB TORQUE TABLE

Item	Specification
Front Wheel Nuts	30 Ft. Lbs. (41 Nm)
Rear Wheel Nuts	30 Ft. Lbs. (41 Nm)
Front Hub Nut	70 Ft. lbs. (95 Nm)
Rear Hub Retaining Nut	80 Ft. Lbs. (109 Nm)

CAUTION: Locking nuts and bolts with preapplied locking agent should be replaced if removed. The self-locking properties of the nut or bolt are reduced or destroyed during removal.

FRONT HUB INSPECTION

1. Support machine securely with front wheels elevated.
2. Grasp wheel/hub and check for movement.
3. If movement is detected, inspect hub, hub nut torque and bearing condition and correct as necessary.

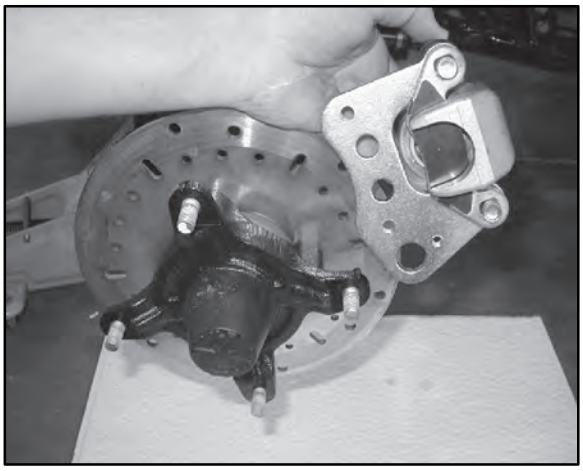
FRONT DRIVE AXLE REMOVAL

1. Shift the the ATV into park. Remove hub dust cap.
2. Remove cotter pin.
3. Loosen the hub retaining nut.
4. Loosen - but do not remove - the wheel nuts.
5. Safely lift and support the front of the ATV.

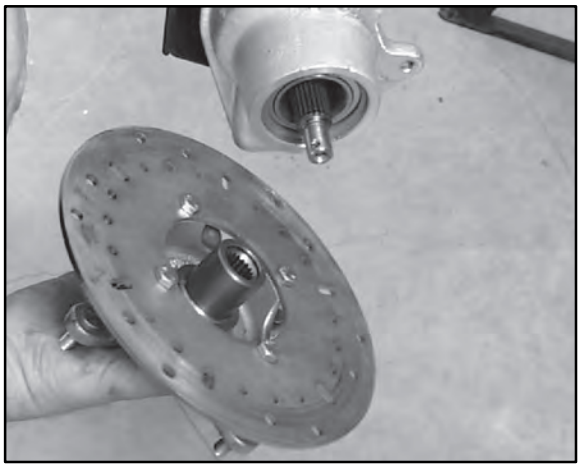
CAUTION:

Serious injury could occur if machine tips or falls.

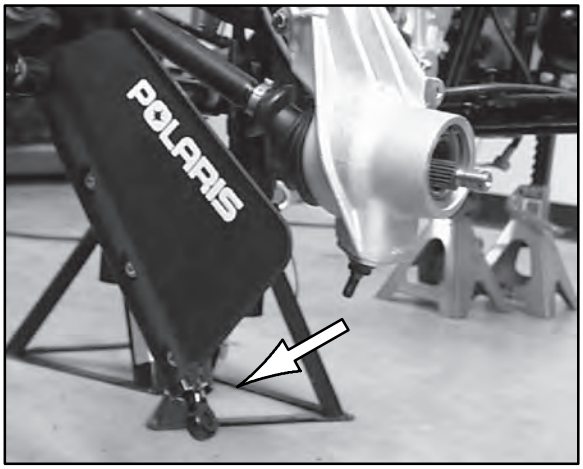
6. Remove wheel.
7. Remove the two brake caliper attaching bolts. **CAUTION:** Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.



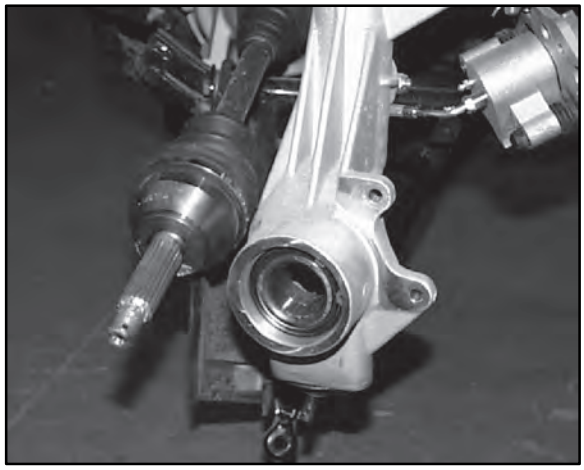
8. Remove hub.



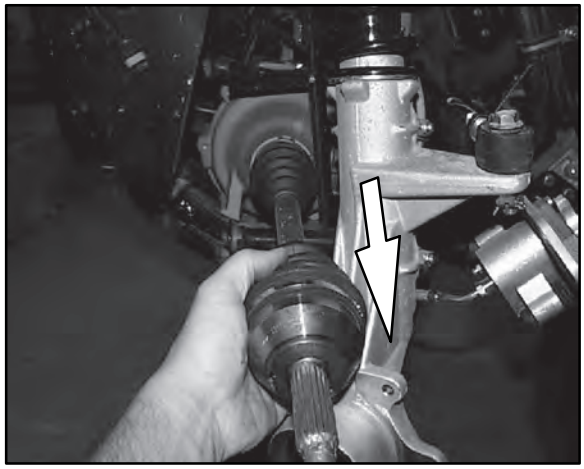
9. Remove cotter pin and nut from lower A-arm ball joint. Remove lower A-arm from ball joint.



10. Pull strut assembly out while pivoting front drive shaft downward until it clears strut assembly.

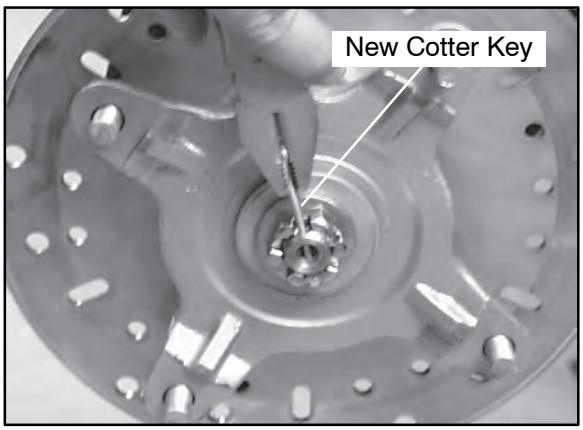


11. With short, sharp jerks, remove drive shaft from front gearcase.



FRONT DRIVE AXLE INSTALLATION

1. Install new spring ring on drive shaft. Apply an anti-seize compound to splines. Align splines of drive shaft with front gearcase and install by lightly tapping on drive shaft with rubber faced hammer.
2. Install drive shaft in strut.
3. Install lower ball joint, torque nut to 25 ft. lbs. (34.5 Nm) and install new cotter pin.
4. Install hub and tighten hub nut to 70 ft. lbs. (95 Nm).



Front Hub Retaining Nut Torque

70 ft. lbs. (95 Nm)

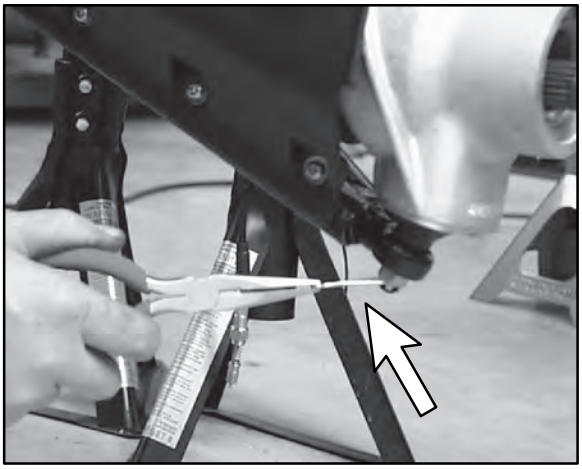
DRIVESHAFT AND CV JOINT HANDLING TIPS

Care should be exercised during driveshaft removal or when servicing CV joints. Driveshaft components are precision parts.
Cleanliness and following these instructions is very important to ensure proper shaft function and a normal service life.

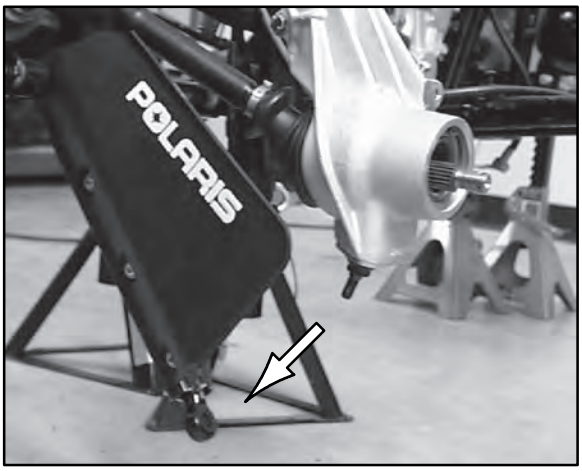
- The complete driveshaft and joint should be handled by getting hold of the interconnecting shaft to avoid disassembly or potential damage to the driveshaft joints.
- Over-angling of joints beyond their capacity could result in boot or joint damage.
- Make sure surface-ground areas and splines of shaft are protected during handling to avoid damage.
- Do not allow boots to come into contact with sharp edges or hot engine and exhaust components.
- The driveshaft is not to be used as a lever arm to position other suspension components.
- Never use a hammer or sharp tools to remove or to install boot clamps.
- Be sure joints are thoroughly clean and that the proper amount and type of grease is used to refill when joint boots are replaced and when joints are cleaned. Refer to text for grease capacity of CV joints and CV joint boots.

FRONT DRIVE SHAFT CV JOINT BOOT REPLACEMENT

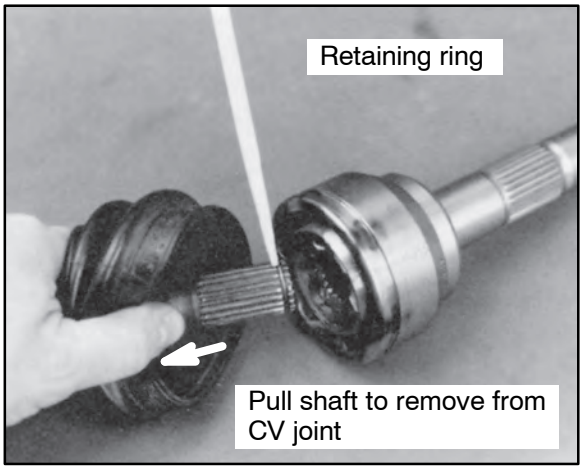
1. Remove wheel, brake caliper and wheel hub. Refer to Front Drive Axle Removal Page 7.3 for procedure.
2. Remove cotter pin and castle nut from A-arm ball joint.



3. Disconnect A-arm from ball joint using a tie rod fork.



4. Slide strut off end of drive shaft and tie it up out of the way of the shaft.
5. Remove clamps from rubber boot using the proper boot clamp pliers.
6. Remove the large end of the boot from the CV joint, slide the boot back and separate the wheel spindle and CV joint assembly from the axle shaft by pulling the shaft sharply outward, away from the CV joint. It may be necessary to tap the CV joint assembly outward with a soft faced hammer.



7. Remove small clamp and boot from driveshaft.

NOTE: If the ATV has been operated with a damaged boot, the CV joint grease may be contaminated. Inspect the grease carefully for contamination, and clean the joint thoroughly if necessary. Front drive axle CV boot replacement requires 30g of grease. If CV joint is cleaned, an additional 30g of grease is required. Refer to information following.

8. Before installing the new boot, remove all grease from the boot area and shaft.

NOTE: It is very important to use the correct type and quantity of grease. Use only the grease contained in the boot kit. DO NOT use a substitute grease and DO NOT overfill or underfill the CV joint.

CV Joint Grease -30g (PN 1350046)

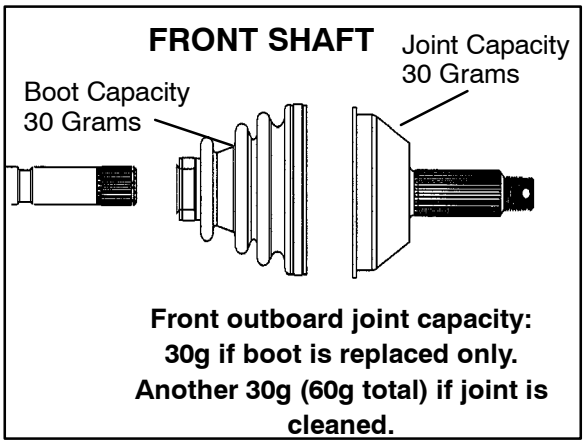
CV Boot Clamp Pliers:
Earless Type (PN 8700226)

Boot Replacement requires 30g

Boot replacement with complete CV joint cleaning requires an additional 30g. (Total 60g)

9. Slide the new clamp and boot (small end first) over the splined shaft, then slide (tap) the CV joint into the splines of the axle. Install small boot clamp.
10. Add grease through large end of boot.
11. Position large end of boot on CV joint, purge excess air by partially compressing axle into CV

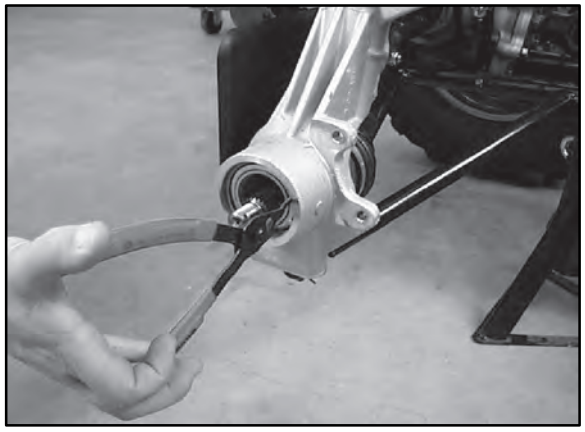
bell, lift one edge of boot to let out excess air Secure with clamp.



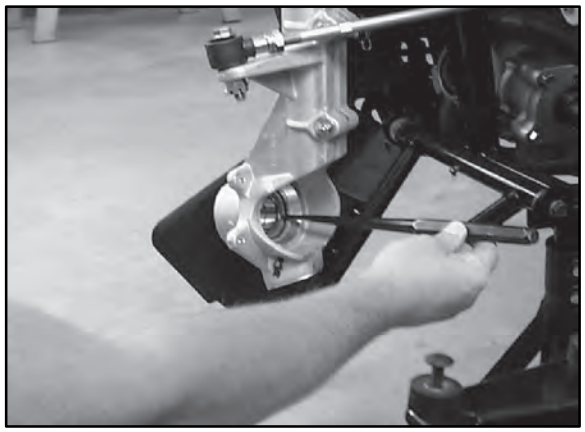
Front outboard joint capacity: 30g if boot is replaced only. Another 30g (60g total) if joint is cleaned.

FRONT HUB DISASSEMBLY

1. Remove outer snap ring.



2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.



NOTE: Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.

3. Inspect the bearing.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

4. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.

FRONT HUB ASSEMBLY

1. Support bottom of hubstrut housing.
2. Start bearing in housing.
3. Press bearing into place until outer race bottoms on housing.

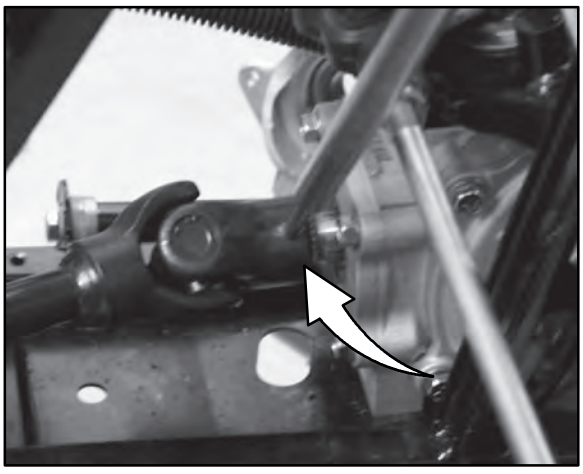
CAUTION:

When using an arbor press be sure to press only on the outer race, as bearing damage may occur.

4. Install snap ring into groove.

FRONT PROP SHAFT REMOVAL

1. Using Roll Pin Removal Tool (**PN 2872608**), remove the roll pin from prop shaft at rear of housing. Slide prop shaft back and away from front housing. Pull sharply forward to remove from transmission shaft.



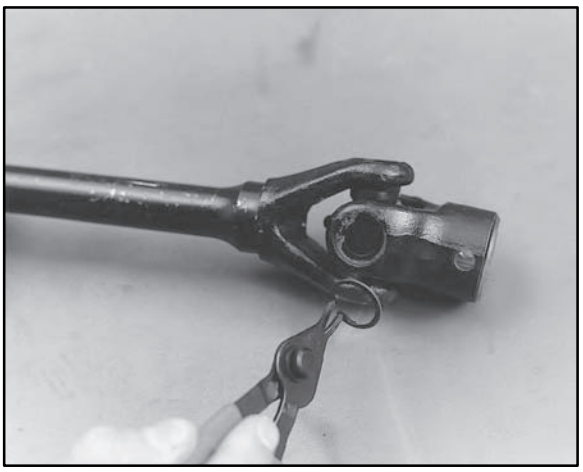
Roll Pin Remover Tool (PN 2872608)

NOTE: If removing front housing, use roll pin removal tool to remove the pins from both front drive axles.

U-JOINT DISASSEMBLY

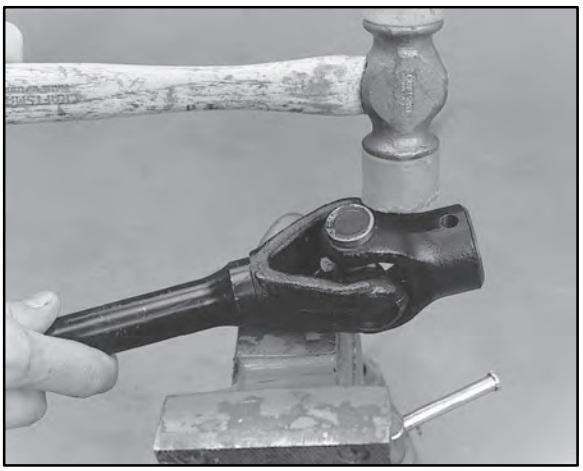
CAUTION: Wear eye protection at all times.

1. Remove internal or external snap ring from all bearing caps.

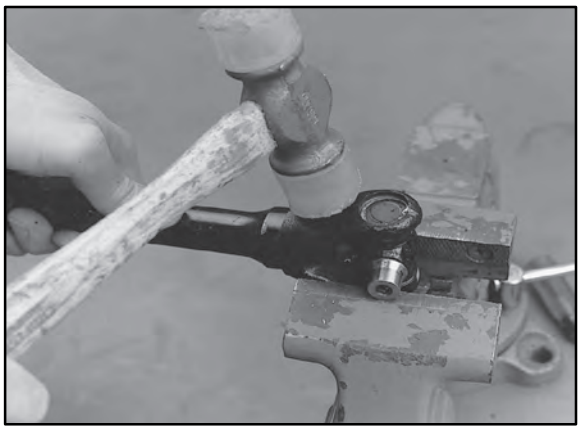


NOTE: If yoke or bearing is removed, cross bearing must be replaced. Note orientation of grease fitting and mark inner and outer yoke for correct re-positioning during installation.

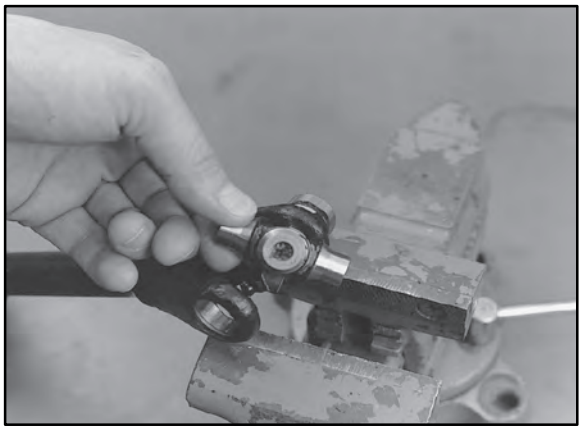
2. Support inner yoke as shown and drive outer yoke down (bearing cap out) with a soft face hammer.



3. Support U-joint in vise as shown and drive inner yoke down to remove remaining bearing caps.

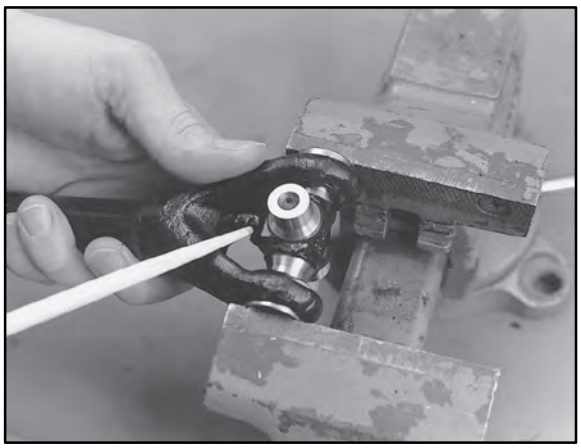


4. Force U-joint cross to one side and lift out of inner yoke.

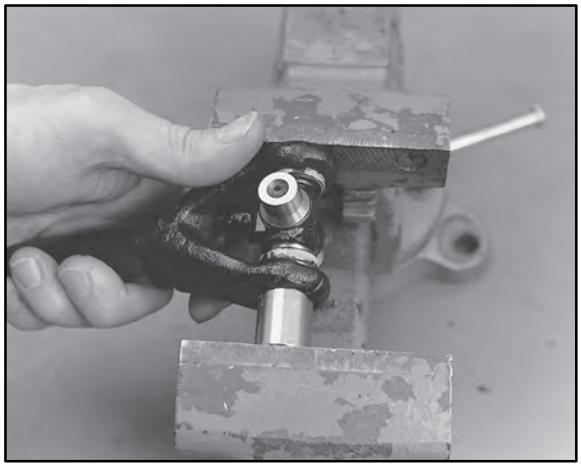


U-JOINT REASSEMBLY

1. Install new bearing caps in yoke by hand. Carefully install U-joint cross with grease fitting properly positioned inward toward center of shaft. Take care not to dislodge needle bearings upon installation of cross joint. Tighten vise to force bearing caps inward.

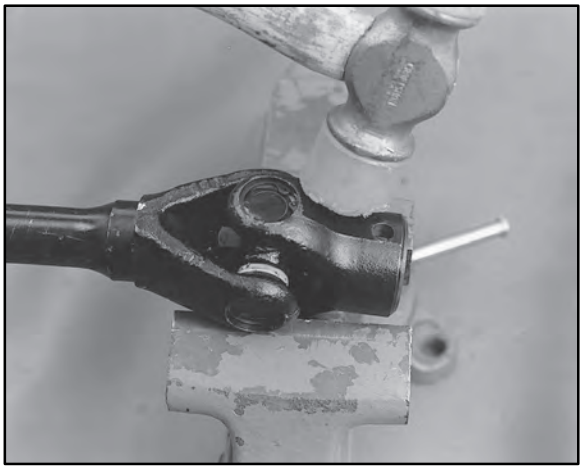


2. Using a suitable arbor or vise, fully seat bearing cap in one side. Continually check for free movement of bearing cross as bearing caps are assembled.



3. Install snap ring to contain bearing cap just installed. Repeat procedure for other side.
4. Install outer yoke, aligning marks made before disassembly.

5. Repeat Steps 1-3 to install bearing caps on outer yoke.
6. Seat all bearing caps against snap rings by supporting cross shaft and tapping on each corner as shown.



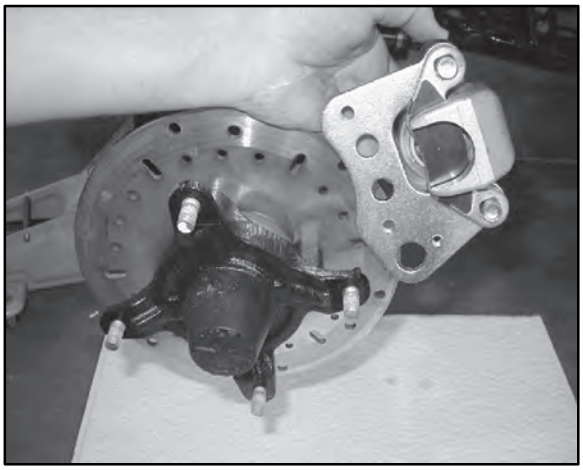
7. When installation is complete, Yokes must pivot freely in all directions without binding. If the joint is stiff or binding, tap the yoke lightly to center the joint until it pivots freely in all directions.

FRONT GEARCASE REMOVAL

1. Stop engine, place machine in Park and set parking brake.
2. Loosen right front wheel nuts slightly.
3. Elevate and support machine under footrest/frame area.

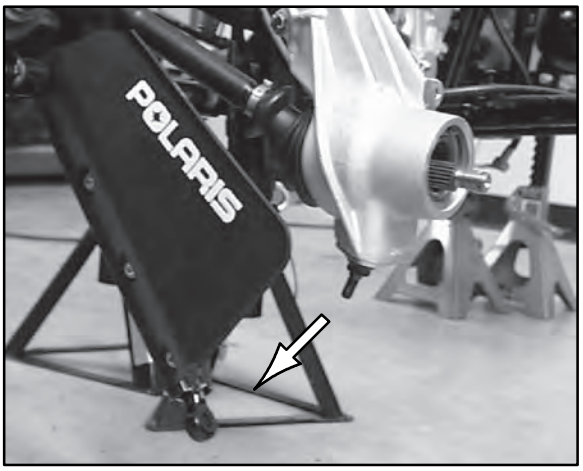
CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing and installing bearings and seals.

4. Remove right wheel nuts and wheel.
5. Remove the front brake caliper and safely suspend the brake caliper from the frame with a piece of wire.

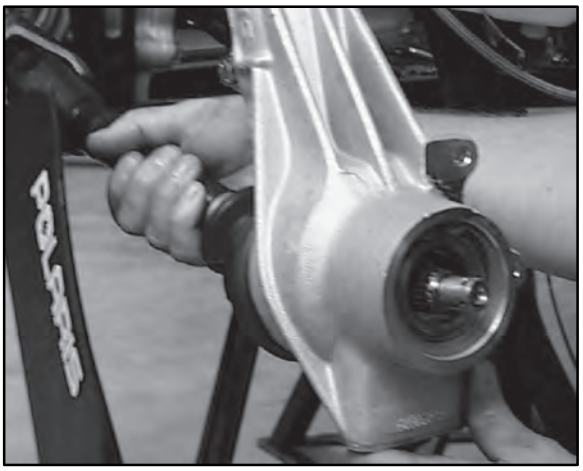


CAUTION: Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.

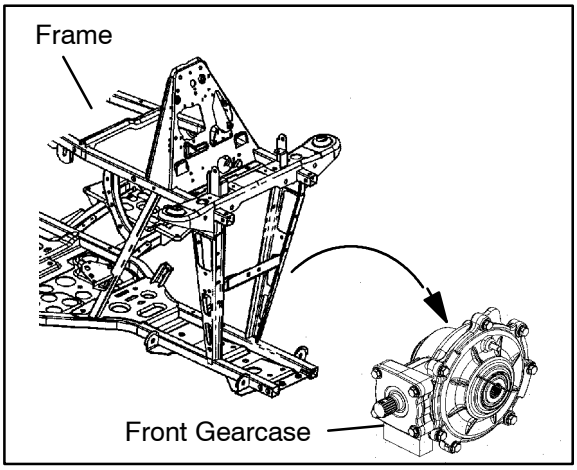
6. Remove the front hub from the drive shaft.
7. Remove cotter pin, lower ball joint nut and A-arm from ball joint.



8. Pull the hub and strut assembly out and pull the drive-shaft out of the hub.
9. Pull both driveshafts from the front gearcase. Replace the circlip on the driveshaft end for reassembly.

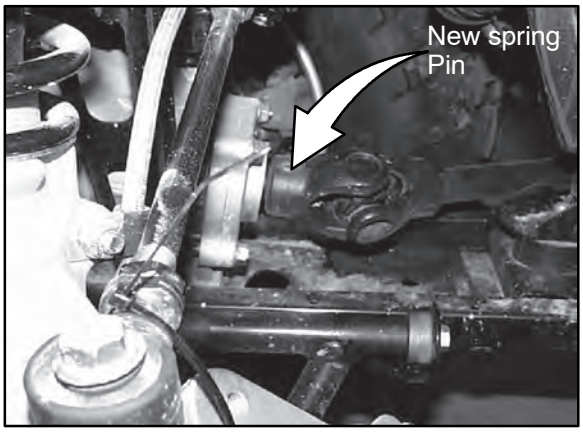


10. Remove bolts securing bottom of housing to frame. Remove vent line. Remove the front gearcase from right side of frame.



FRONT GEARCASE INSTALLATION

1. To install gearcase, reverse removal procedure. Use new spring pin in front prop shaft.



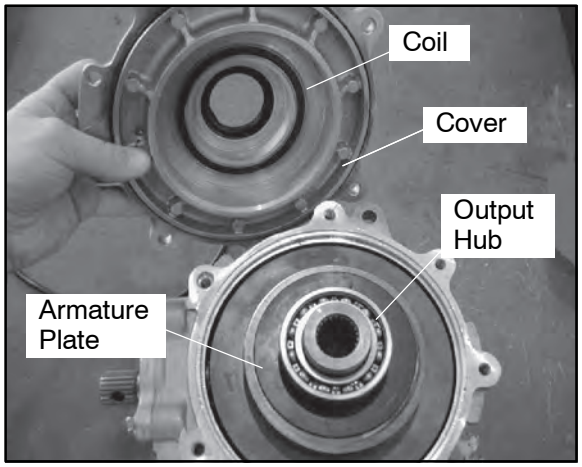
2. Add the proper lubricant to the front gearcase. Check drain plug for proper torque. Refer to Chapter 2 for fill capacities.

Premium Front Housing Fluid
(PN 2871654)

Front Housing Capacity
5.0 fl. oz. (148 ml)

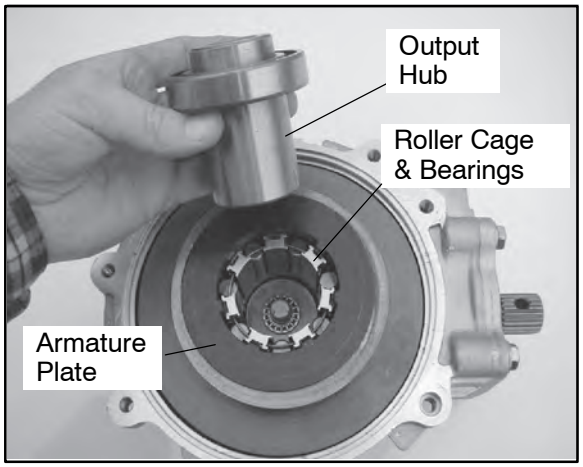
EARLY 2004 - FRONT GEARCASE OPERATION - CENTRALIZED HILLIARD)

Normal Operation: With the AWD switch off the vehicle drives only the rear wheels (2 wheel drive). When the AWD switch is activated it engages the Hilliard, locking both front axles into All Wheel Drive.

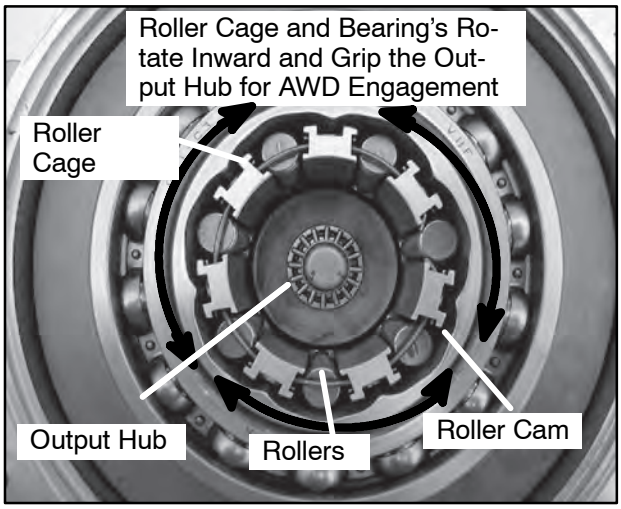


4x4 Engagement: When the AWD switch is activated, a 12 VDC current charges the central coil which creates a magnetic field. This magnetic field attracts an armature plate keyed to a roller cage that contains 14 rollers and roller cam. The difference in rpm by input shaft and front axles the forces the rollers up the external cam. The rollers engage themselves to the output hubs that link both front axles, resulting in True All Wheel Drive.

CAUTION: If the rear wheels are spinning, release the throttle before turning the AWD switch on. If AWD is engaged while the wheels are spinning, severe drive shaft and clutch damage could result.

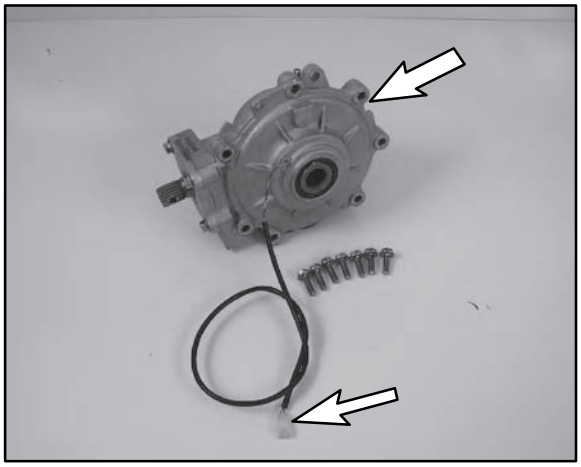


Disengagement: As the front and rear wheels gain traction, rotating very close to the same speed, the front wheels "overdrive" the output hubs and the rollers are forced outward, disengaging the AWD. The vehicle is now back to rear wheel drive until the next loss of traction.



EARLY 2004 - FRONT GEARCASE DISASSEMBLY/INSPECTION

1. Drain and properly dispose of used oil. Remove any metal particles from the drain plug magnet.
2. Remove bolts and output shaft cover.

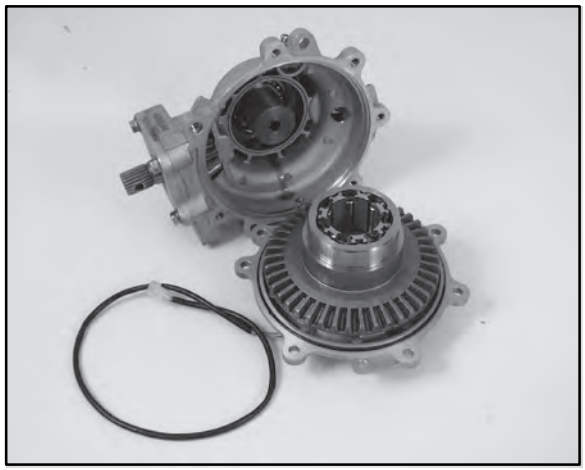


Front Gearcase Coil Resistance:
22.8-25.2 Ohms

Gearcase Coil Resistance

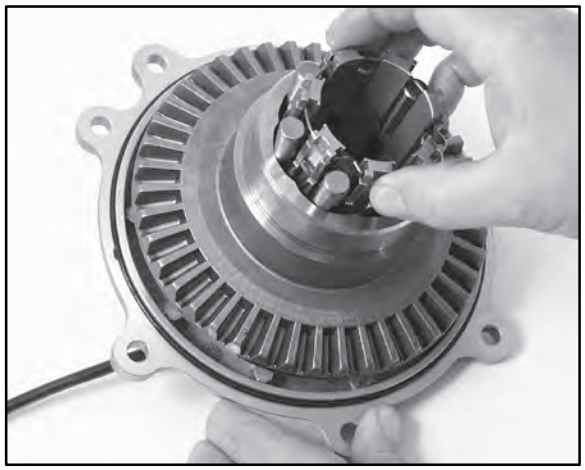
NOTE: To test the gearcase coils resistance, use the coil harness. The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.

3. Remove output shaft assembly.

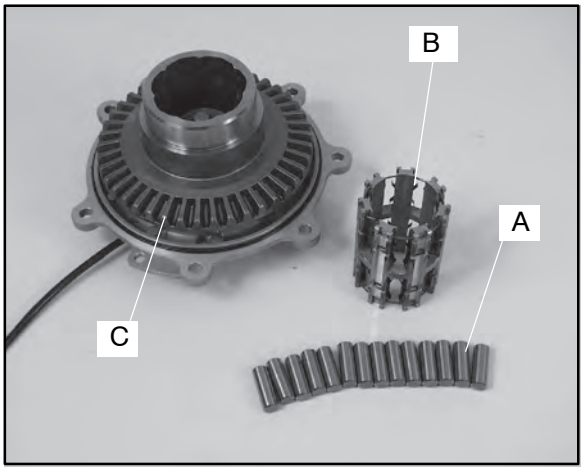


NOTE: Be careful not to misplace the thrust bearing located between the two output shafts.

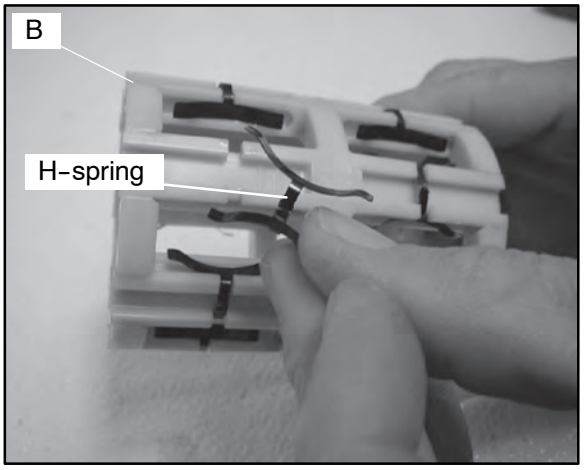
4. Clean all parts and inspect spacers for wear. Inspect ring gear for chipped, broken, or missing teeth.
5. Remove the roll cage assembly, rollers, and H-springs.



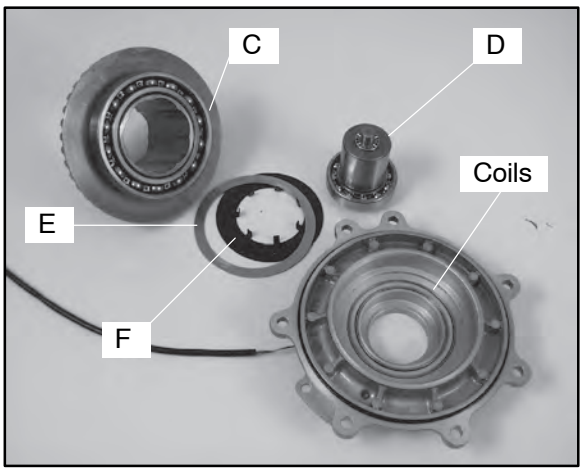
6. Thoroughly clean all parts. Inspect the rollers (A) for nicks and scratches. The rollers must slide up and down freely within the roller cage surfaces (B).



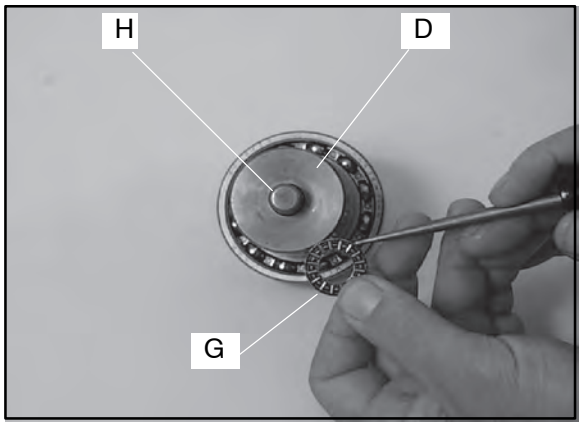
7. Inspect the ring gear (C) for consistent wear patterns. The surfaces should be free of nicks and scratches.
8. Inspect roll cage (B) sliding surface. This surface must be clean and free of nicks, burrs or scratches. Remove and inspect the H-springs.



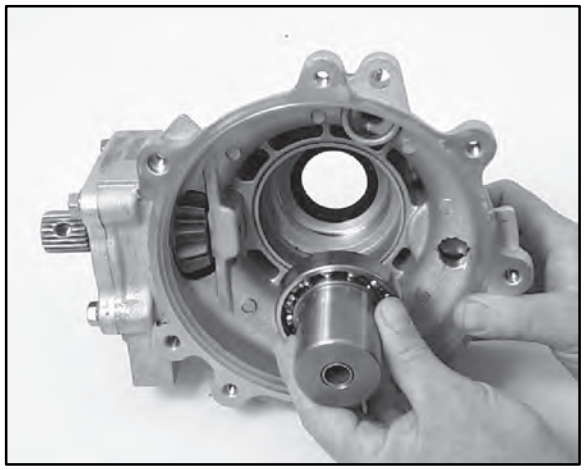
9. Remove the ring gear (C), the output hub (D), the shim (E), and the armature plate (F) from the output cover.



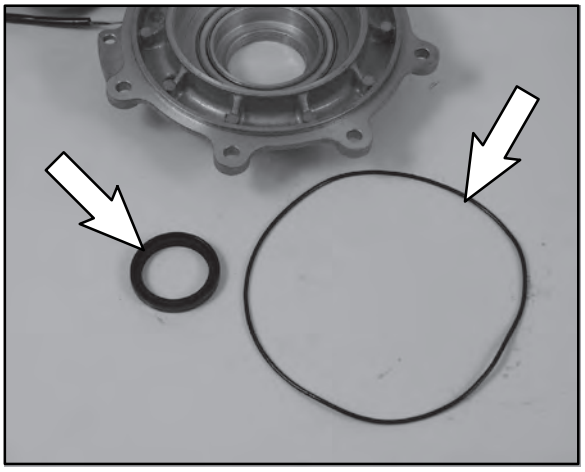
10. Inspect the armature plate (F) for a consistent wear pattern. Uneven wear of the armature plate (F) indicates a warped plate, which may cause intermittent operation.
11. Remove the thrust bearing (G) from the output hub (D). Inspect the thrust bearing (G) and the dowel (H).



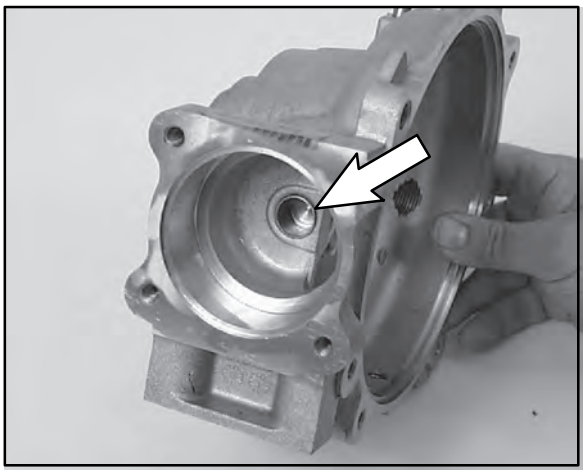
12. Remove the other output hub from the main gearcase.



13. Remove the O-ring and seal from the output cover.



14. Remove the input cover, bearing, and the pinion gear. Inspect the pinion gear for chipped, broken, or missing teeth. Inspect the output shaft bushing. Replace as needed. Clean the inside surfaces of both gearcase halves.

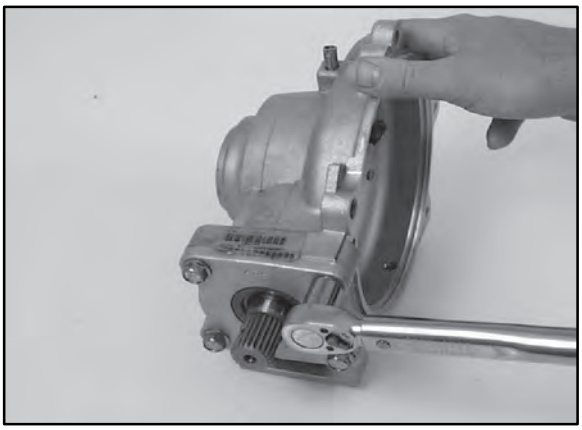


EARLY 2004 - FRONT GEARCASE REASSEMBLY/INSPECTION

1. Replace all O-rings, seals, and worn components.
2. Press the pinion shaft seal into the pinion cover, until the seal is flush with the sealing surface.
3. Inspect bearings on output and pinion shafts. To replace, press new bearing on to shaft.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement side to side.

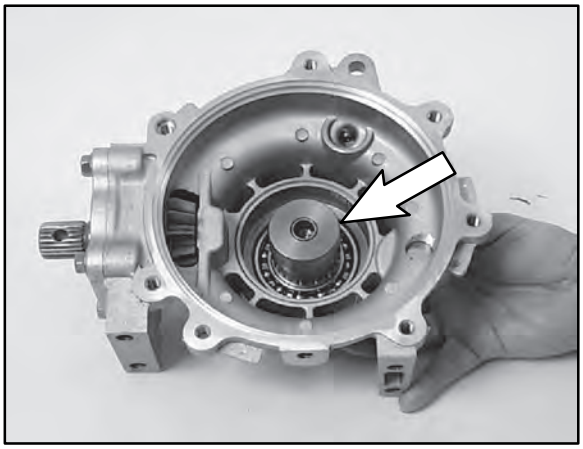
4. Install pinion shaft, bearing, and input cover with new o-ring and torque bolts to 14 ft. lbs (19 Nm).



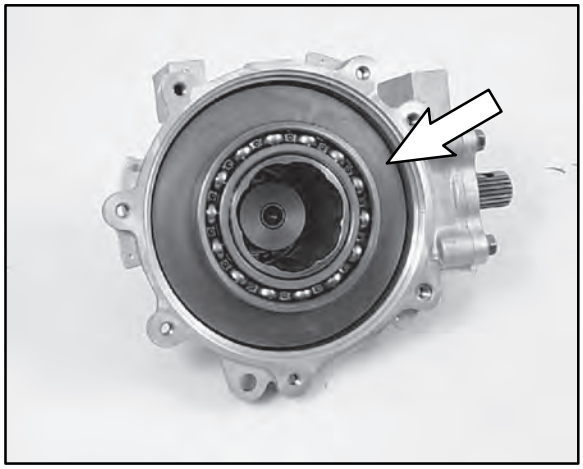
Cover Bolts Torque

14 ft. lbs. (19 Nm)

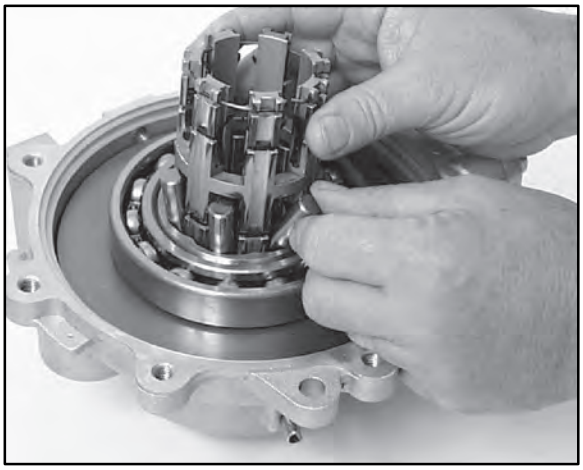
5. Install the output hub into the gearcase housing. The output hub should spin freely.



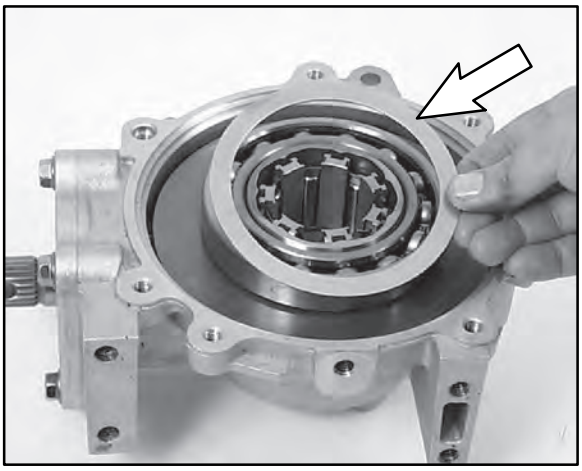
6. Install the ring gear into the gearcase housing.



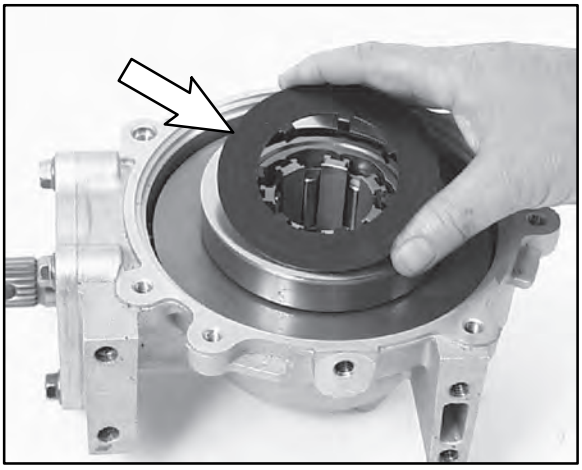
7. Slide the roll cage into the ring gear. Insert the rollers as the roll cage is installed.



8. Install the shim onto the ring gear.

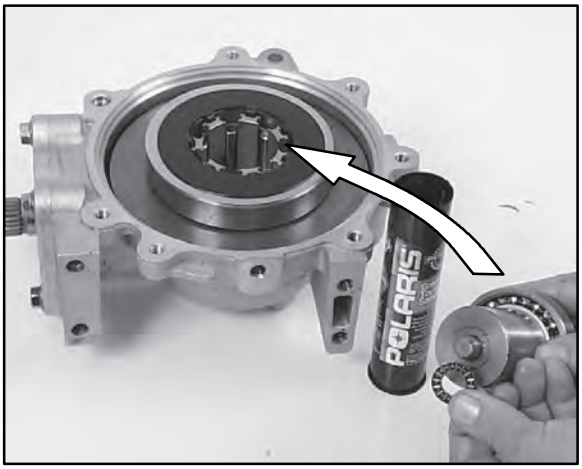


9. Install the armature plate onto the ring gear.

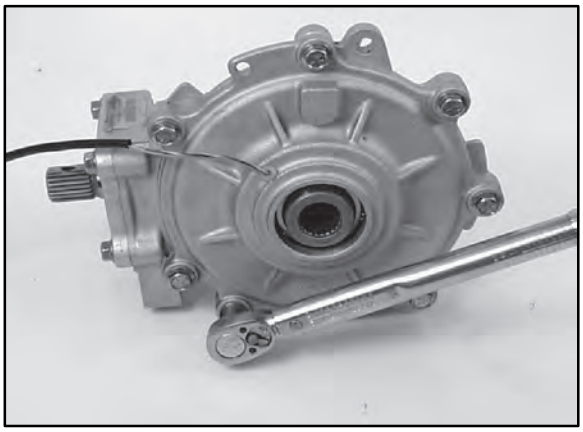


NOTE: Be sure armature plate tabs are placed into the slots on roll cage.

10. Apply grease to the thrust bearing. Insert the thrust bearing onto the output hub. Insert the output hub, dowel, and thrust bearing into the ring gear.

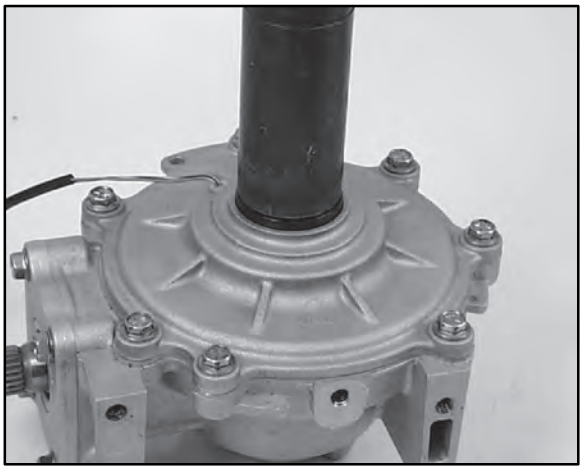


11. Install output cover with new o-ring and torque bolts to 14 ft. lbs. (19 Nm).



Cover Bolts Torque
14 ft. lbs. (19 Nm)

12. Install new seals into the gearcase housing and gearcase housing cover.

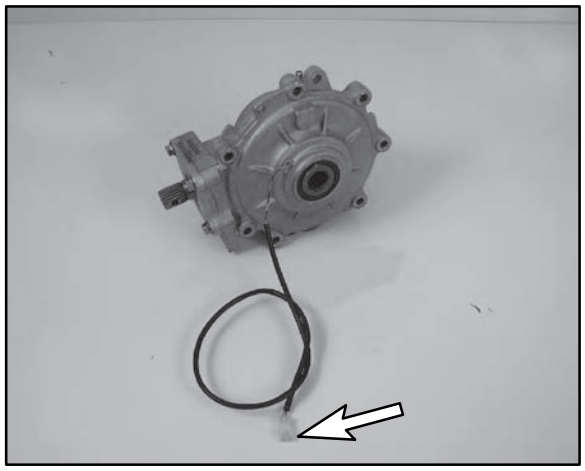


EARLY 2004 - FRONT GEARCASE DIAGNOSIS

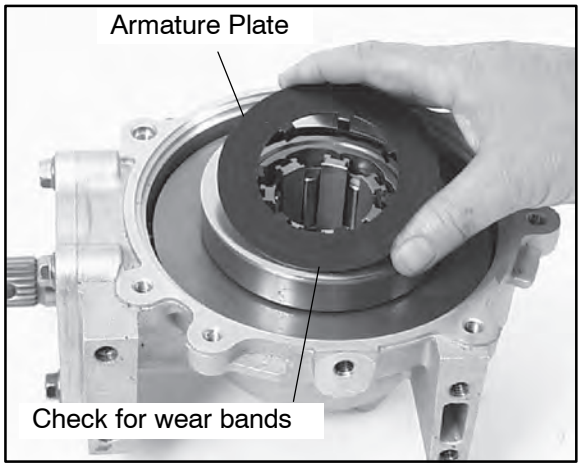
Symptom: AWD Will Not Engage.

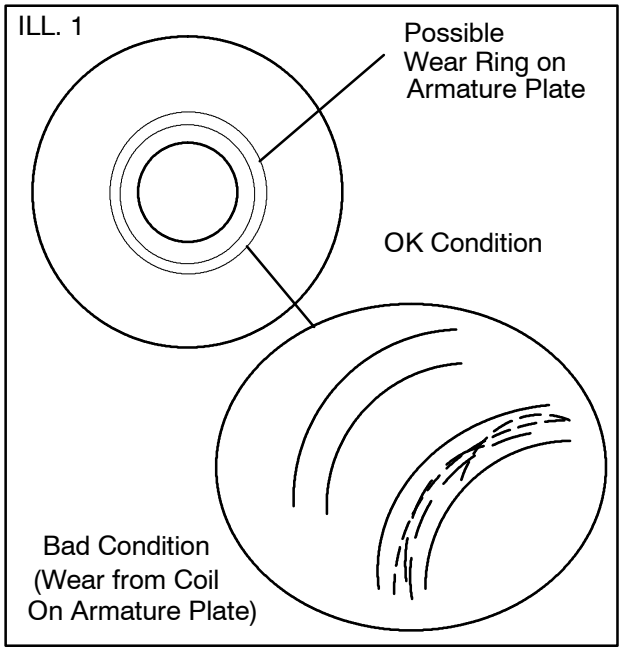
1. Check the gearcase coil resistance. To test the gearcase coil resistance, use the coil harness (Grey & Brown/White). The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.
2. Check the minimum battery voltage at the wire (Grey & Brown/White) that feeds the hub coil wire. There should be a minimum of **11.80-12.0 Volts**

present for proper operation.

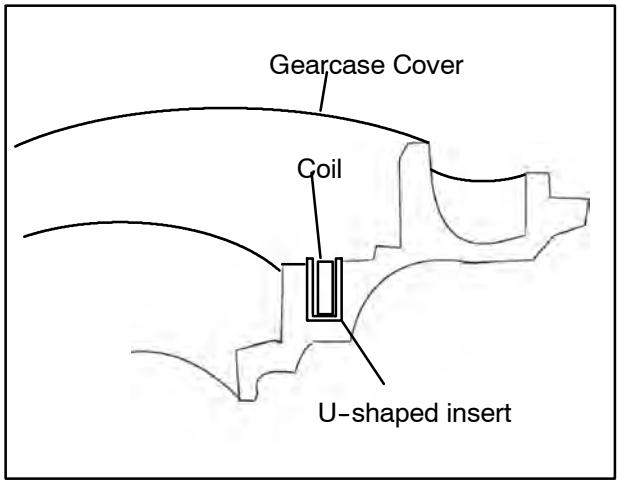


3. Inspect the armature plate for a consistent wear pattern. There should one or two distinct wear bands (one band inside the other). If only one band of wear is present (or if there is wear between the two bands, inspect the coil area as indicated in Step 4. A band with an interrupted wear mark may indicate a warped plate, which may cause intermittent operation. See Illustration 1.





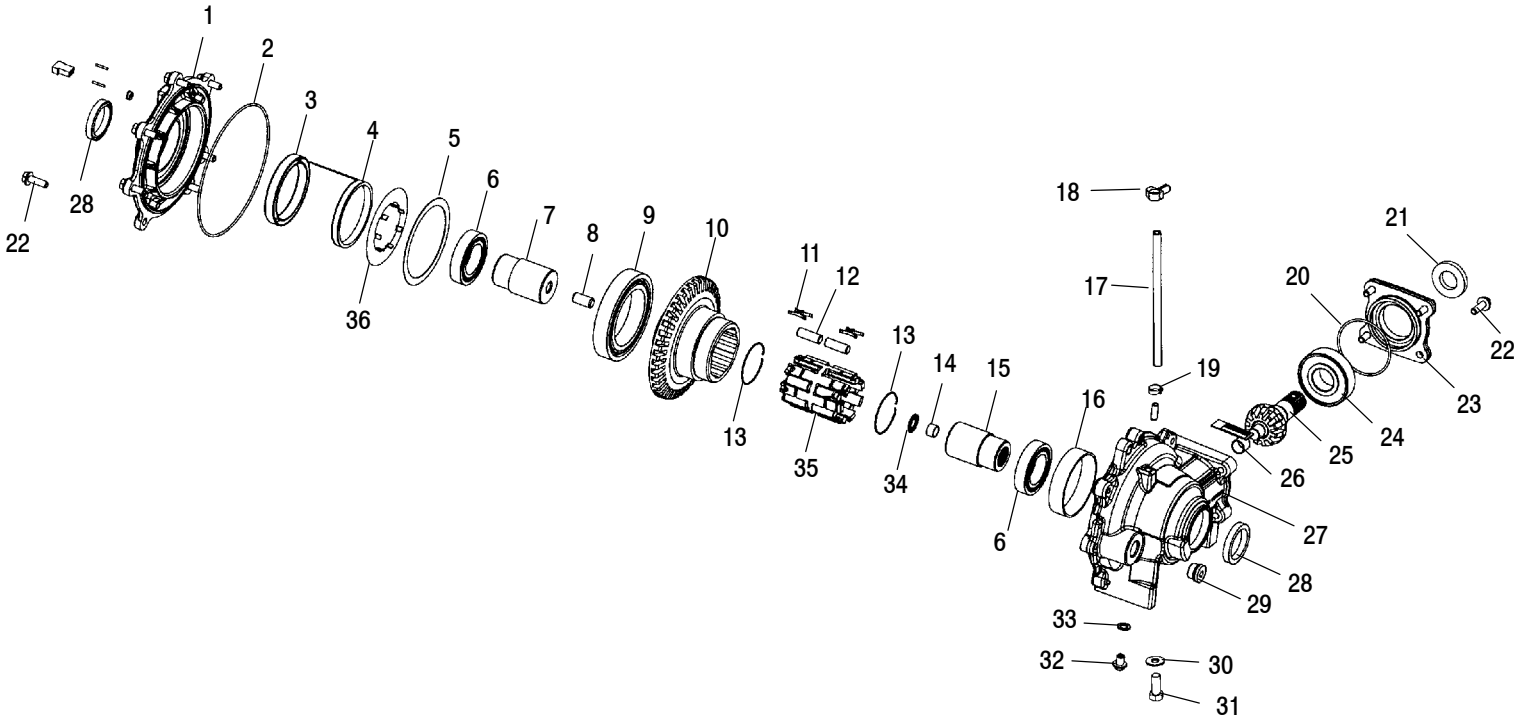
4. Check to make sure the coil is seated in the U-shaped insert that is pressed into the gearcase cover. The top of the coil should be seated below the U-shaped insert. The U-shaped insert controls the pole gap. If the top of the coil is above the surface of the U-shaped insert it raises the armature plate, thereby increasing pole gap. If the pole gap increases the coil will not be strong enough to engage the AWD system. If this is the cause order a new Plate Cover Assembly (**PN 3233952**).



Side Cutaway View of Centralized Hilliard Cover

5. Inspect the rollers in the roll cage for nics and scratches. The rollers must slide up and down and in and out freely within the roll cage sliding surfaces.

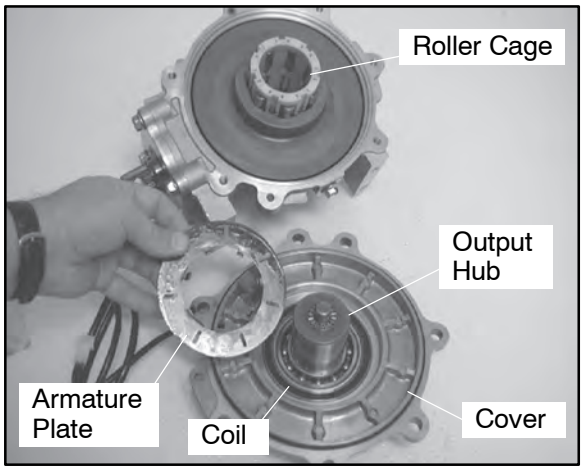
EARLY 2004 - FRONT GEARCASE EXPLODED VIEW



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Mid Gearcase	20.	1	O-Ring
1.	1	Cover, Output	21.	1	Seal
2	1	O-Ring	22.	11	Kit, Bolt
3.	1	Insert	23.	1	Cover, Input
4.	1	Coil	24.	1	Bearing, Roller Ball
5.	1	Kit, Shim Set (Incl. Shims)	25.	1	Shaft, Pinion, 11T
6.	2	Bearing, Roller Ball	26.	1	Bushing
7.	1	Hub, Race/Output, Male	27.	1	Gearcase, LH
8.	1	Pin, Dowel	28.	2	Seal, Oil
9.	1	Bearing, Roller Ball	29.	1	Plug, Oil Fill
10.	1	Clutch Housing/Ring Gear	30.	4	Washer, Spring Lock
11.	1	Spring	31.	4	Screw
12.	14	Kit, Roll	32.	1	Plug, Oil Drain
13.	2	Ring, Retaining	33.	1	Washer
14.	1	Bushing	34.	1	Bearing, Needle, Roller Thrust
15.	1	Hub, Race/Output, Female	35.	1	Roll Cage, Aluminum
16.	1	Bushing	36.	1	Plate Armature
17.	AR	Line, Fuel			
18.	1	Clip			
19.	1	Clamp, Hose			

LATE 2004 - FRONT GEARCASE OPERATION - CENTRALIZED HILLIARD)

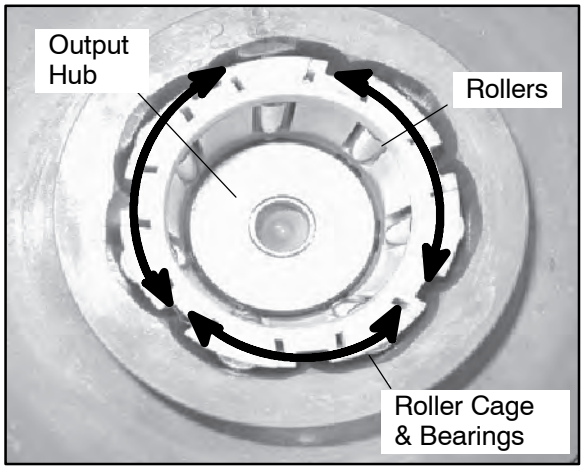
Normal Operation: With the AWD switch off the vehicle drives only the rear wheels (2 wheel drive). When the AWD switch is activated it engages the Hilliard, locking both front axles into All Wheel Drive.



4x4 Engagement: When the AWD switch is activated, a 12 VDC current charges the central coil which creates a magnetic field. This magnetic field attracts an armature plate keyed to a roller cage that contains 14 rollers and roller cam. The difference in rpm by input shaft and front axles the forces the rollers up the external cam. The rollers engage themselves to the output hubs that link both front axles, resulting in True All Wheel Drive.

CAUTION: If the rear wheels are spinning, release the throttle before turning the AWD switch on. If AWD is engaged while the wheels are spinning, severe drive shaft and clutch damage could result.

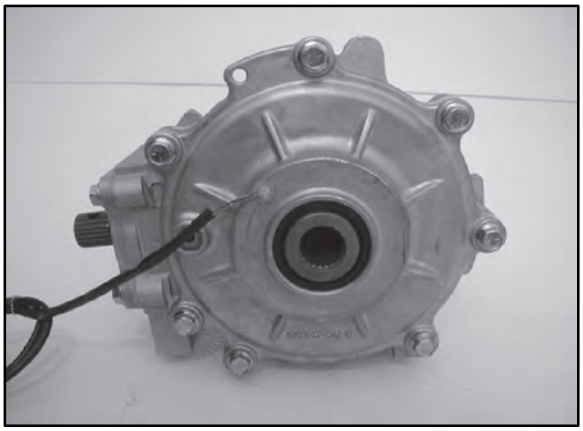
Roller Cage and Roller's Rotate Inward and Grip the Output Hub for AWD Engagement



Disengagement: As the front and rear wheels gain traction, rotating very close to the same speed, the front wheels "overdrive" the output hubs and the rollers are forced outward, disengaging the AWD. The vehicle is now back to rear wheel drive until the next loss of traction.

LATE 2004 - FRONT GEARCASE DISASSEMBLY/INSPECTION

1. Drain and properly dispose of used oil. Remove any metal particles from the drain plug magnet.
2. Remove bolts and output shaft cover.

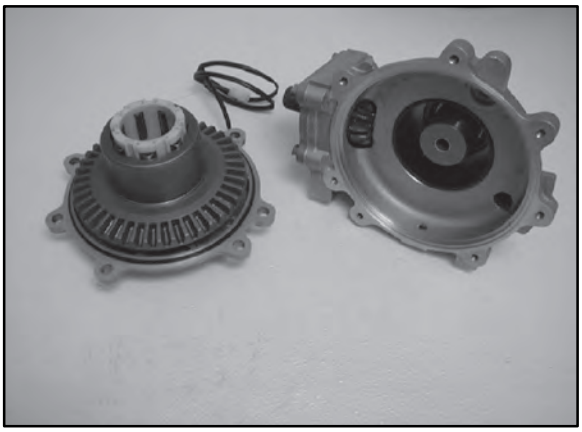


Front Gearcase Coil Resistance:
22.8-25.2 Ohms

Gearcase Coil Resistance

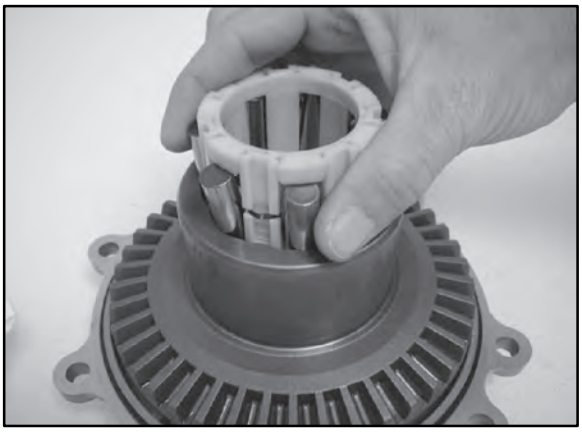
NOTE: To test the gearcase coils resistance, use the coil harness. The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.

3. Remove output shaft assembly.

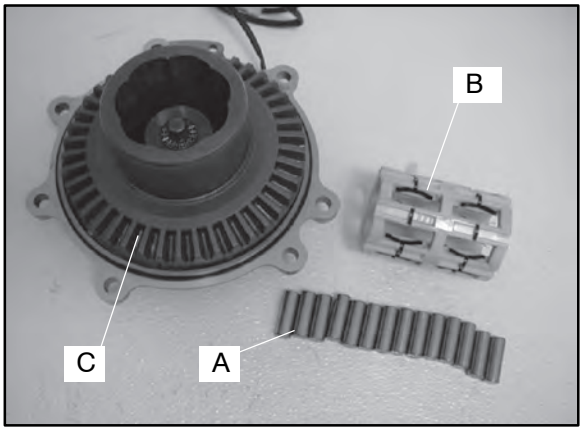


NOTE: Be careful not to misplace the thrust bearing located between the two output shafts.

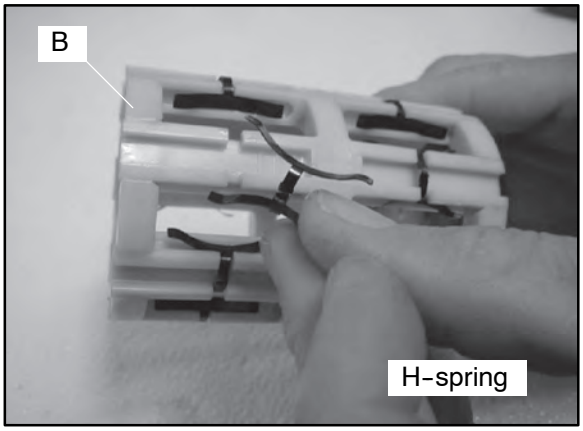
4. Clean all parts and inspect spacers for wear. Inspect ring gear for chipped, broken, or missing teeth.
5. Remove the roll cage assembly, rollers, and H-springs.



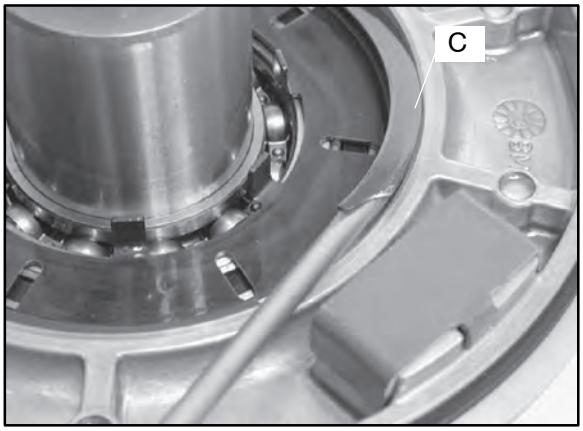
6. Thoroughly clean all parts. Inspect the rollers (A) for nicks and scratches. The rollers must slide up and down freely within the roller cage surfaces (B).
7. Inspect the ring gear (C) for consistent wear patterns. The surfaces should be free of nicks and scratches.



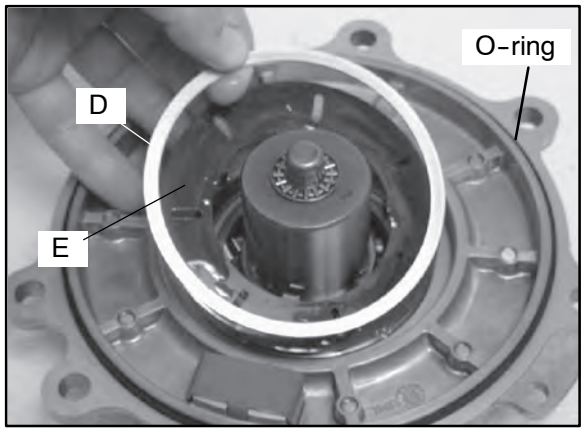
8. Inspect roll cage (B) sliding surface. This surface must be clean and free of nicks, burrs or scratches. Remove and inspect the H-springs.



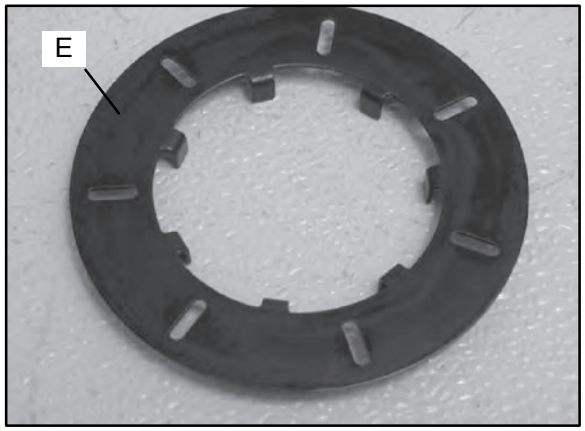
9. Use a flat head screwdriver to remove the retaining clip from the output cover.



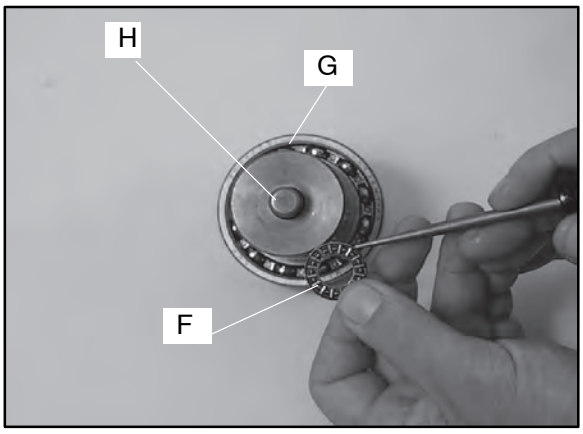
10. Remove the spacer washer (D), armature plate (E), and rubber O-ring from the output cover.



11. Inspect the armature plate (E) for a consistent wear pattern. Uneven wear of the armature plate (E) indicates a warped plate, which may cause intermittent operation. **NOTE:** See "FRONT GEARCASE DIAGNOSIS" later in this chapter for more details.



12. Remove the output hub (G) from the cover. Remove the thrust bearing (F) from the output hub (G). Inspect the thrust bearing (F) and the dowel (H).

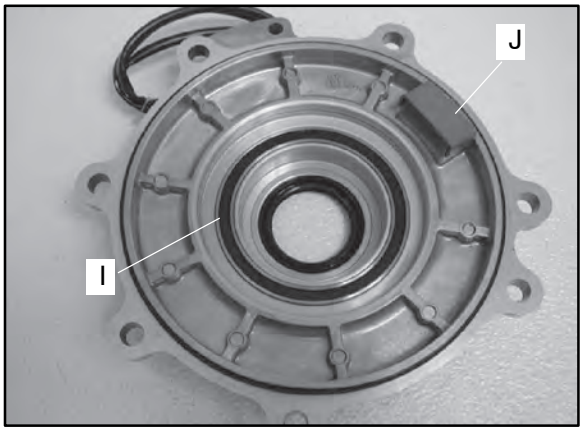


13. Inspect the magnetic coil (I) in the output housing.

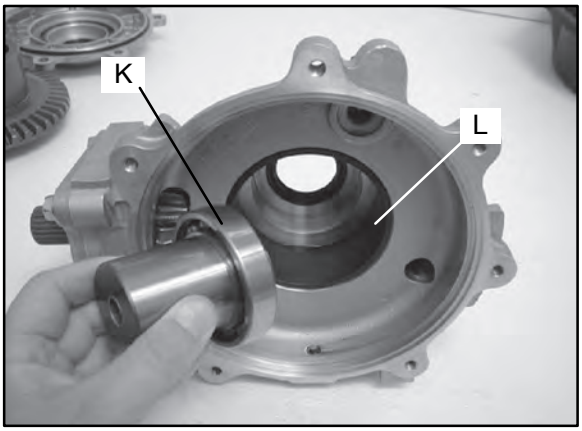
NOTE: See "FRONT GEARCASE DIAGNOSIS" later in this chapter for more details on the coil.

14. Inspect the back lash pad (J) for excessive wear.

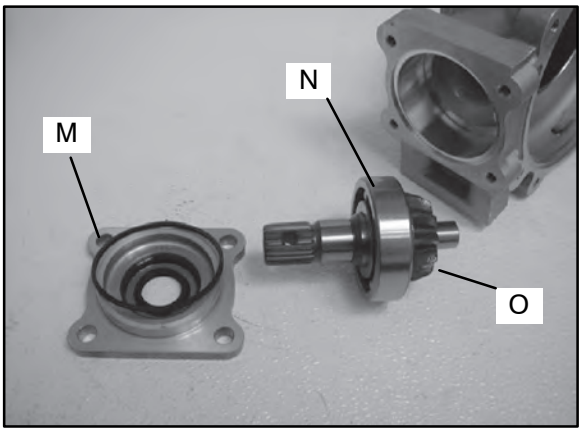
NOTE: The backlash for the centralized hilliard is set at the factory. **No readjustment is required**.



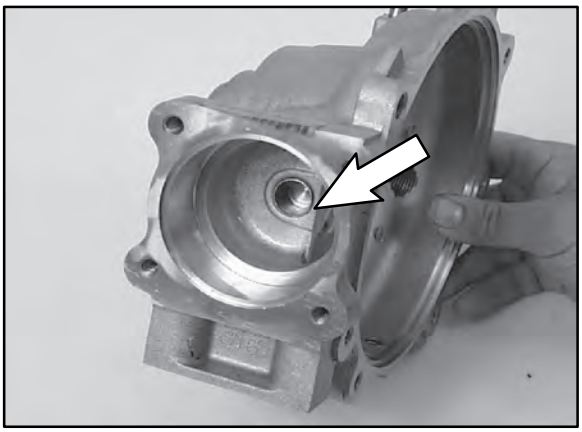
15. Remove the other output hub (K) from the main gearcase. Inspect the inner bearing (L) for wear. If there is excessive wear, replace bearing as needed.



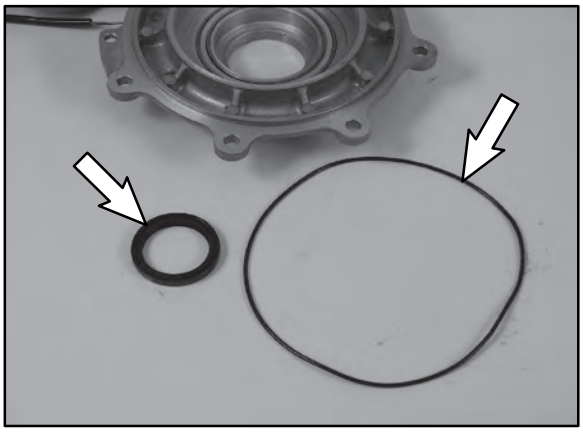
16. Remove the input cover (M), bearing (N), and the pinion gear (O). Inspect the pinion gear (O) for chipped, broken, or missing teeth. Replace the input cover O-ring.



17. Inspect the output shaft bushing. Replace as needed. Clean the inside surfaces of both gearcase halves.



18. Remove and replace the O-rings and seals from the assembly.

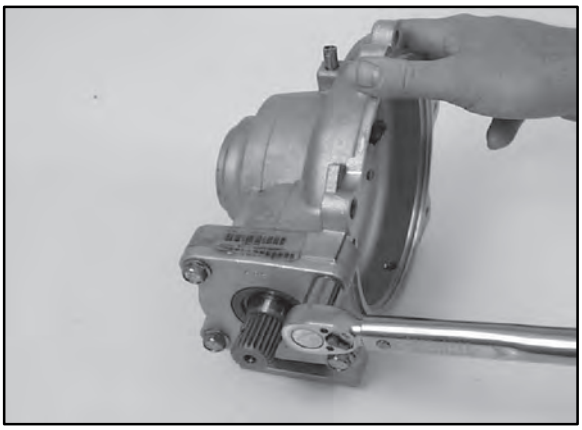


LATE 2004 - FRONT GEARCASE REASSEMBLY/INSPECTION

1. Replace all O-rings, seals, and worn components.
2. Press the pinion shaft seal into the pinion cover, until the seal is flush with the sealing surface.
3. Inspect bearings on output and pinion shafts. To replace, press new bearing on to shaft.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement side to side.

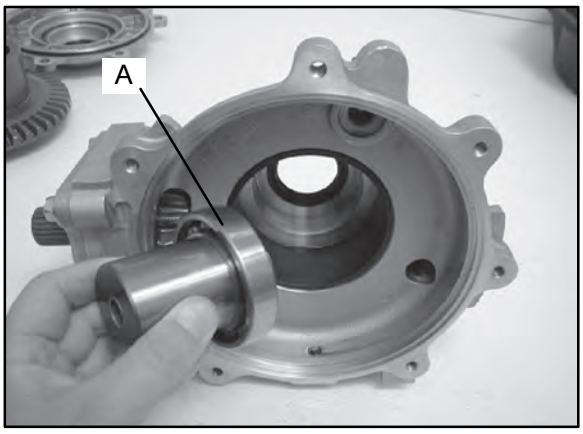
4. Install pinion shaft, bearing, and input cover with new o-ring and torque bolts to 14 ft. lbs (19 Nm).



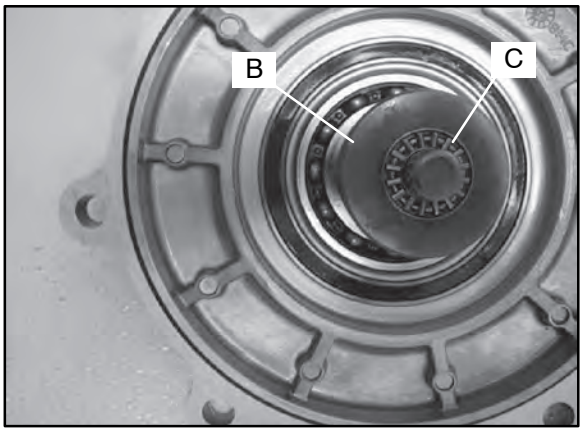
Input Cover Bolts Torque:

14 ft. lbs. (19 Nm)

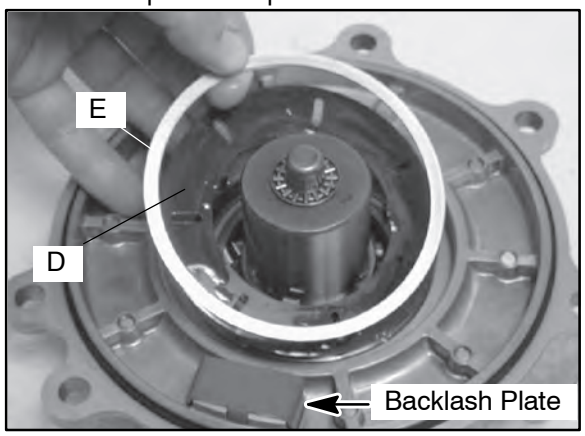
5. Install the output hub (A) into the gearcase housing. The output hub should spin freely.



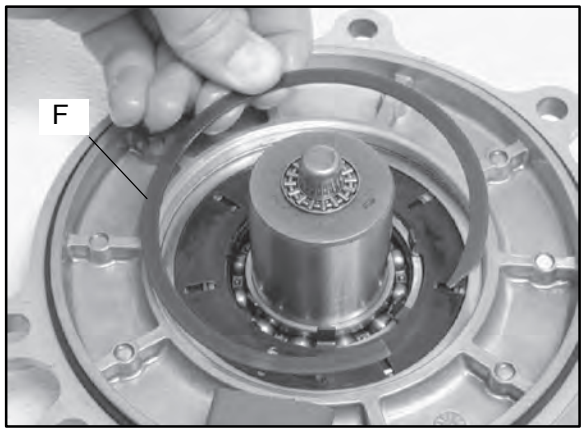
6. Install the other output hub (B) and thrust bearing (C) into the output cover. Apply a small amount of grease onto the thrust bearing.



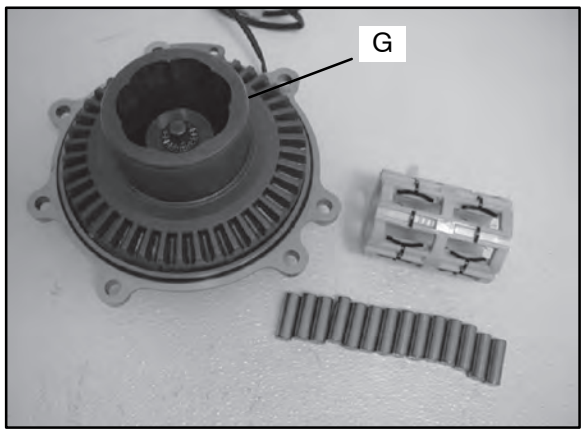
7. Install the armature plate (D) and spacer washer (E) into the output cover. **NOTE:** Be sure backlash plate is in place.



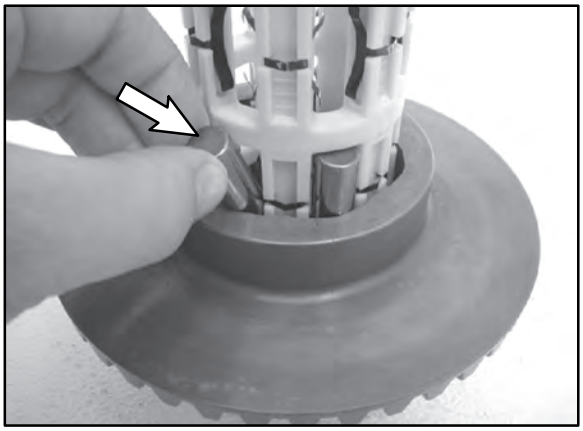
8. Install the retaining ring (F) into the output cover. Be sure the retaining ring is properly seated into the cover.



9. Install the ring gear onto the output hub on the output cover.

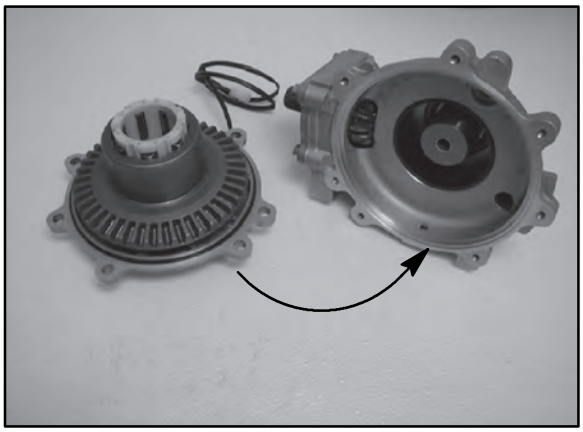


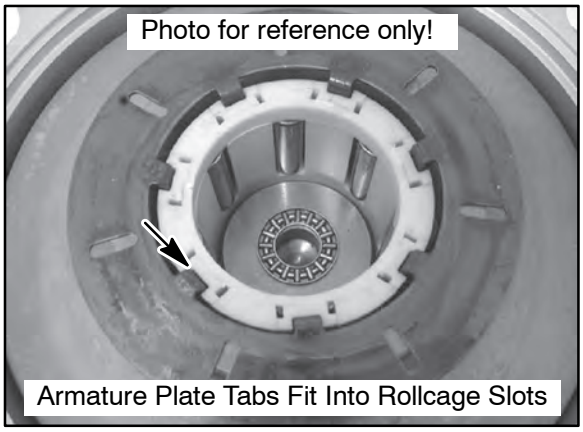
10. Install the rollers and roll cage into the ring gear. Insert the rollers as the roll cage is installed.



11. Install the output cover assembly onto the main gearcase.

NOTE: Be sure armature plate tabs are placed into the slots on roll cage. (See Reference Photo)

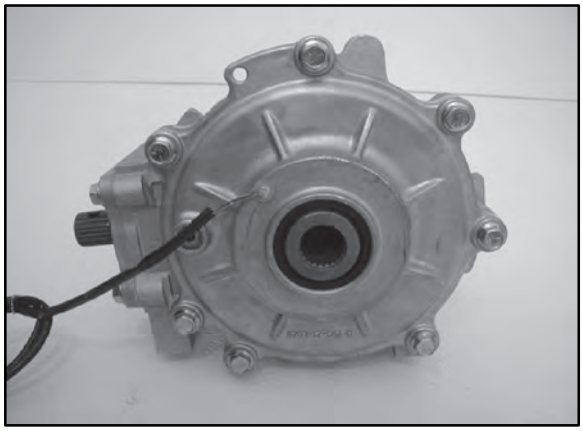




NOTE: This photo is for reference only, the armature plate is actually installed in the output cover.

12. Install output cover with new o-ring and torque bolts to 14 ft. lbs. (19 Nm).

NOTE: Be sure the square O-ring is placed flat on the cover surface, if the O-ring is twisted fluid leakage may occur.



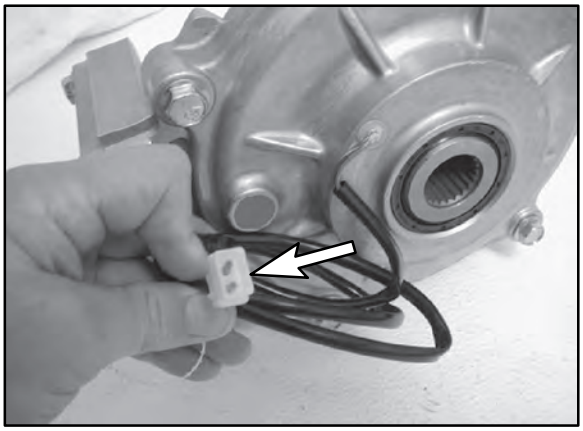
Cover Bolts Torque
14 ft. lbs. (19 Nm)

13. Install new seals into the gearcase housing and gearcase housing cover.

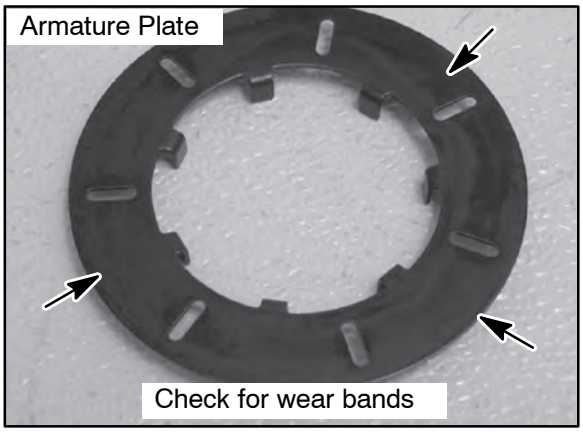
LATE 2004 - FRONT GEARCASE DIAGNOSIS

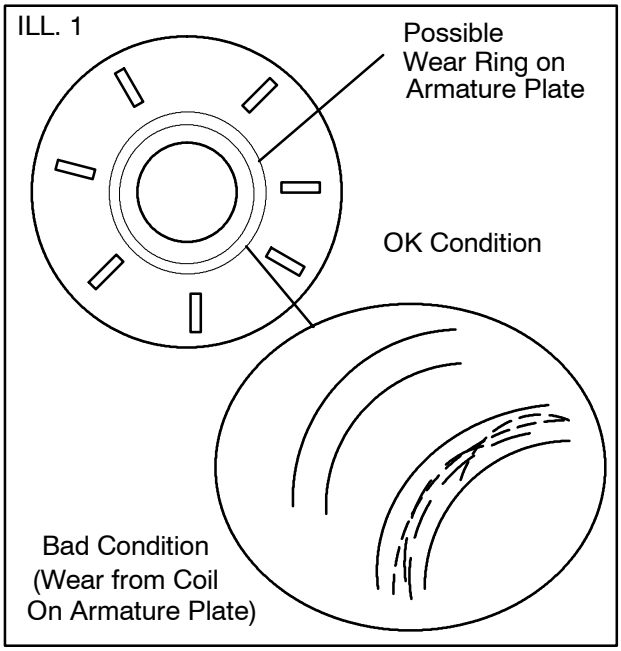
Symptom: AWD Will Not Engage.

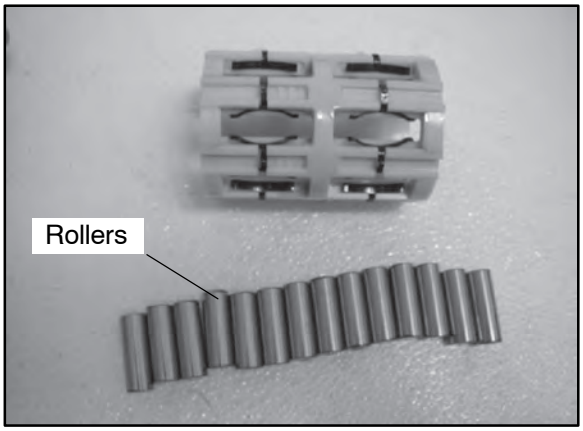
1. Check the gearcase coil resistance. To test the gearcase coil resistance, use the coil harness (Grey & Brown/White). The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.
2. Check the minimum battery voltage at the wire (Grey & Brown/White) that feeds the hub coil wire. There should be a minimum of **11.80-12.0 Volts** present for proper operation.



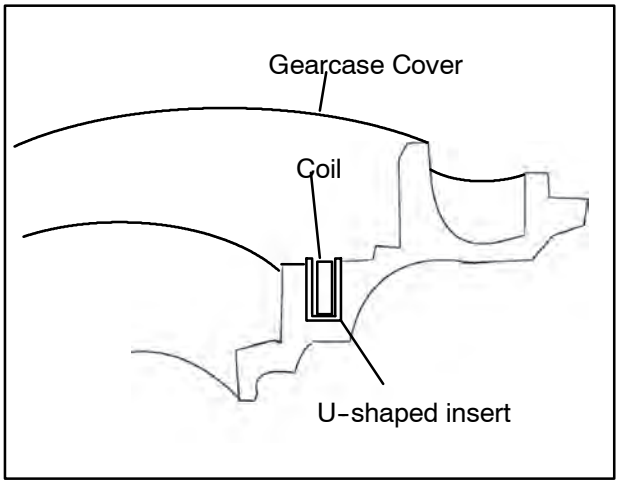
3. Inspect the armature plate for a consistent wear pattern. There should one or two distinct wear bands (one band inside the other). If only one band of wear is present (or if there is wear between the two bands, inspect the coil area as indicated in Step 4. A band with an interrupted wear mark may indicate a warped plate, which may cause intermittent operation. See Illustration 1.







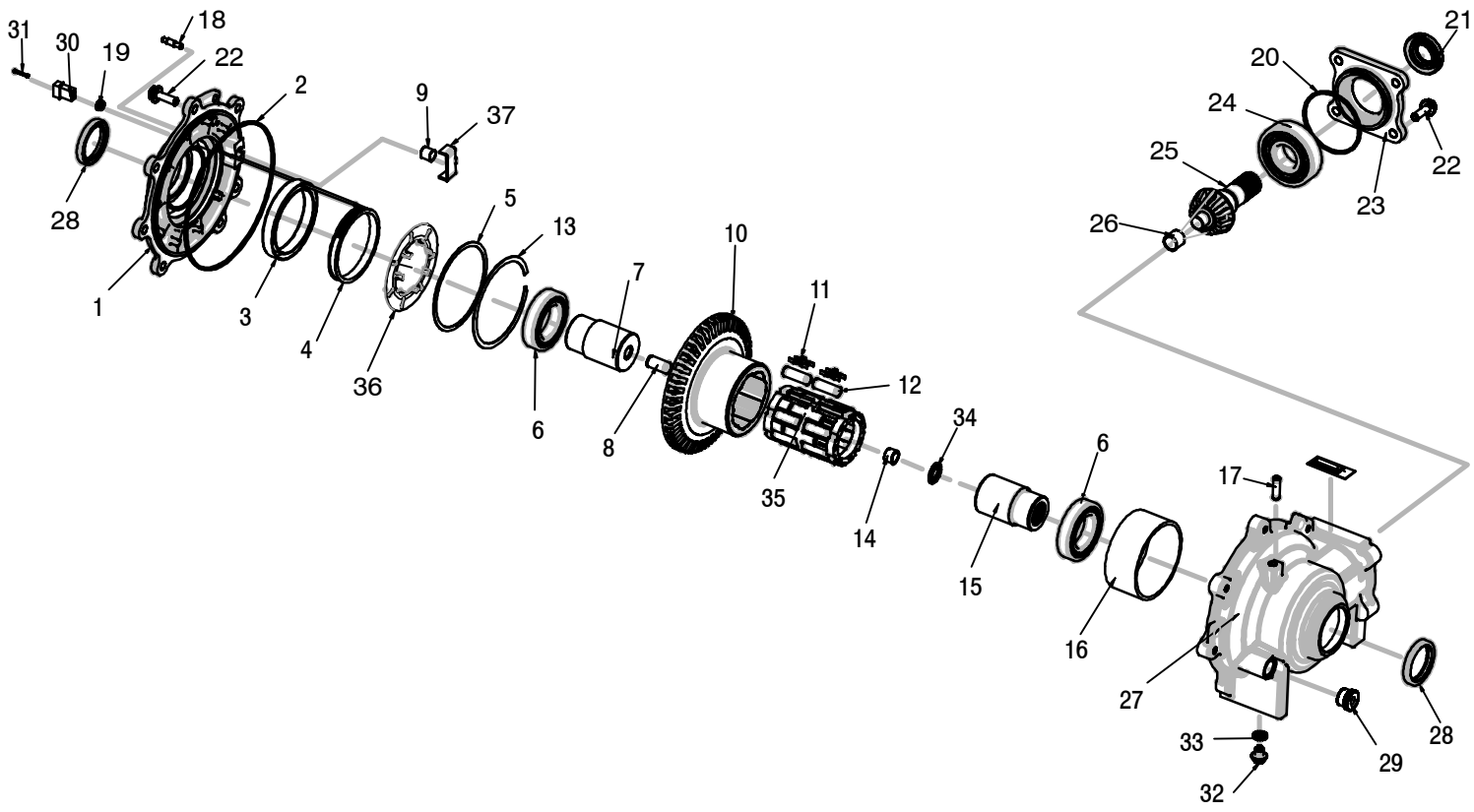
4. Check to make sure the coil is seated in the U-shaped insert that is pressed into the gearcase cover. The top of the coil should be seated below the U-shaped insert. The U-shaped insert controls the pole gap. If the top of the coil is above the surface of the U-shaped insert it raises the armature plate, thereby increasing pole gap. If the pole gap increases the coil will not be strong enough to engage the AWD system. If this is the cause order a new Plate Cover Assembly (**PN 3233952**).



Side Cutaway View of Centralized Hilliard Cover

5. Inspect the rollers for nics and scratches. The rollers must slide up and down and in and out freely within the roll cage sliding surfaces.

LATE 2004 FRONT GEARCASE - CENTRALIZED HILLIARD EXPLODED VIEW



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Mid Gearcase	20.	1	O-Ring
1.	1	Cover, Output	21.	1	Seal
2.	1	O-Ring	22.	11	Kit, Bolt
3.	1	Insert	23.	1	Cover, Input
4.	1	Coil	24.	1	Bearing, Roller Ball
5.	1	Kit, Shim Set (Incl. Shims)	25.	1	Shaft, Pinion, 11T
6.	2	Bearing, Roller Ball	26.	1	Bushing
7.	1	Hub, Race/Output, Male	27.	1	Gearcase, LH
8.	1	Pin, Dowel	28.	2	Seal, Oil
9.	1	Dowel	29.	1	Plug, Oil Fill
10.	1	Clutch Housing/Ring Gear	30.	4	N/A
11.	1	Spring	31.	4	N/A
12.	14	Kit, Roll	32.	1	Plug, Oil Drain
13.	2	Retaining Ring	33.	1	Washer
14.	1	Bushing	34.	1	Bearing, Needle, Roller Thrust
15.	1	Hub, Race/Output, Female	35.	1	Roll Cage, Aluminum
16.	1	Bushing	36.	1	Plate Armature
17.	1	Vent	37.	1	Backlash Plate
18.	1	N/A			
19.	1	N/A			

REAR HUB REMOVAL

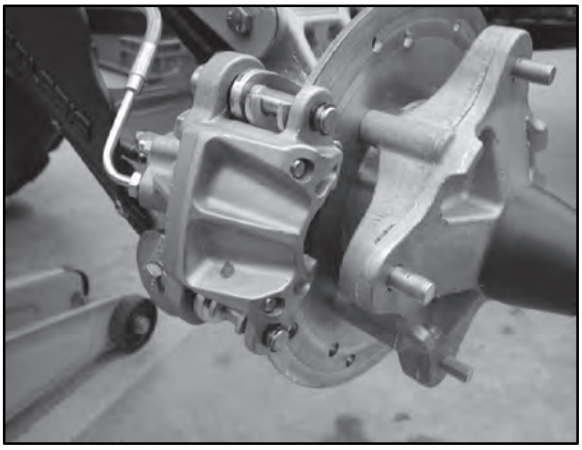
1. Place the ATV in Park and lock the parking brake. Remove rear hub cap.

2. Remove cotter pin.
3. Loosen the hub retaining nut.
4. Loosen the wheel nuts.
5. Safely support the rear of the ATV.

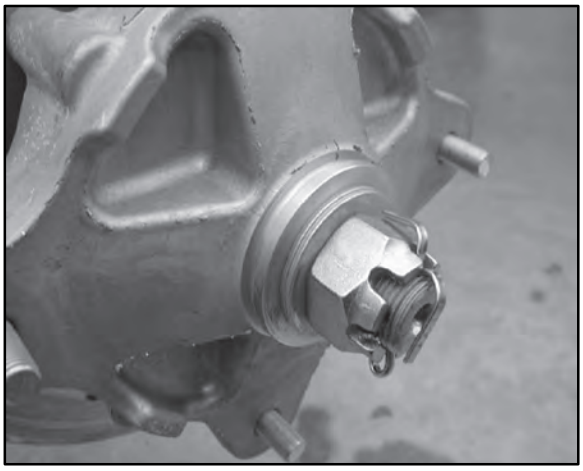
CAUTION:

Secure the machine. Serious injury could occur if machine tips or falls.

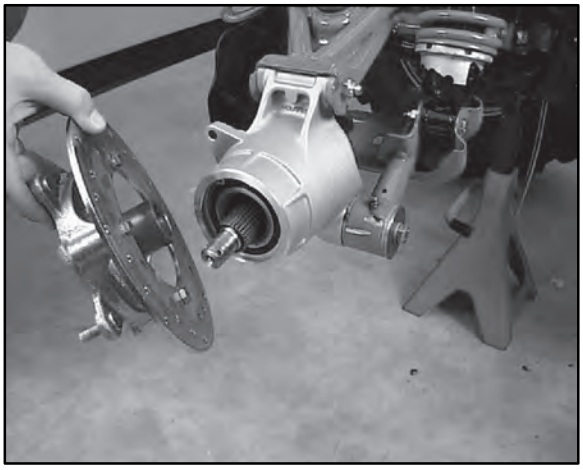
6. Remove wheel nuts and wheel.
7. Remove the rear brake caliper and safely suspend the caliper from the frame with a piece of wire.



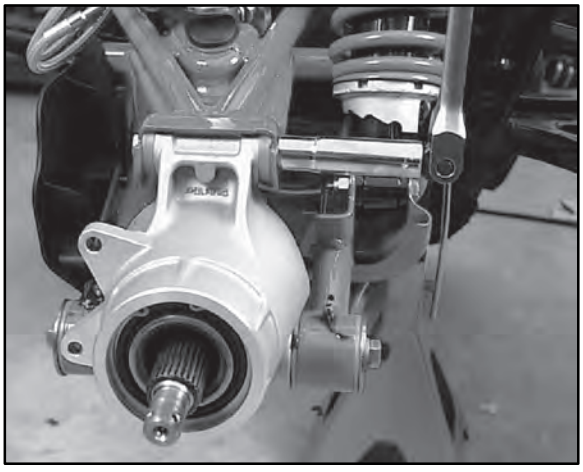
8. Remove hub nut, domed washer and flat washer.



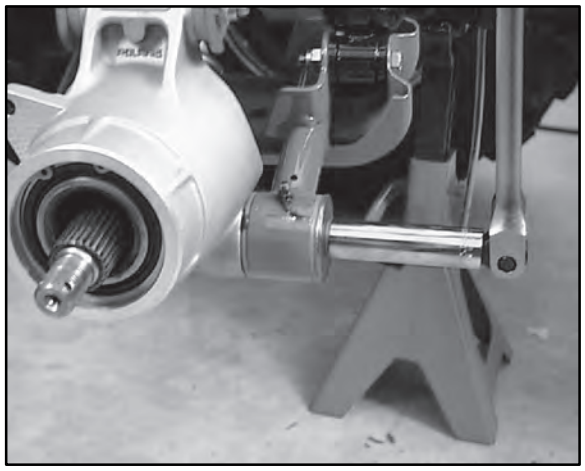
9. Remove hub.



10. Remove upper control arm bolt as shown.



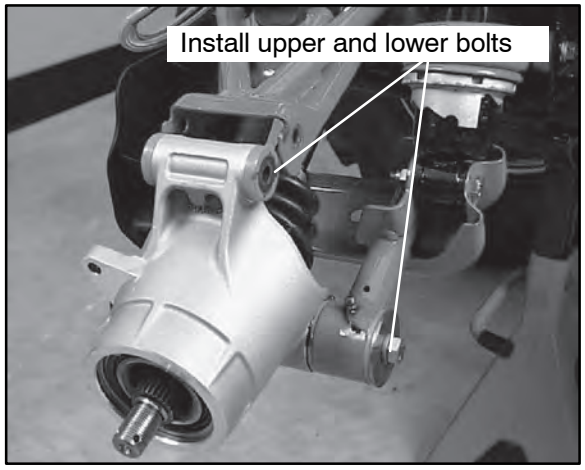
11. Remove both lower control arm bolts.



12. Remove bearing carrier.

REAR HUB INSTALLATION

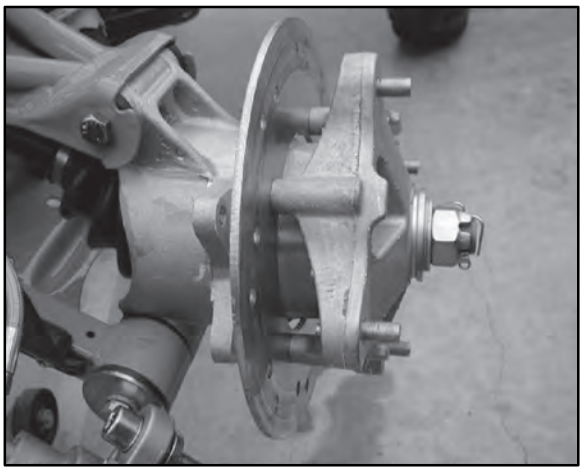
1. Insert bearing carrier on drive shaft.
2. Align bottom of carrier housing and lower control arm. Grease and slide lower control arm bushings into place, securing corner housing.



Lower Control Arm Bolt Torque:
40 ft. lbs. (54 Nm)

Upper Control Arm Bolt Torque:
35 ft. lbs. (48 Nm)

3. Install and torque both lower control arm bolts.
4. Lift bearing carrier until top aligns with upper control arm. Install and torque upper control arm bolt and torque to specification.



Rear Hub Nut Torque:
80 ft. lbs. (109 Nm)

Rear Wheel Nut Torque
30 ft. lbs. (41 Nm)

5. Pull drive shaft outward and install hub onto driveshaft splines.
6. Install cone washers with domed side facing outward.
7. Install retainer nut, wheel and wheel nuts.
8. Remove jackstand and torque axle nut and wheel nuts.
9. Install a new cotter pin. Tighten nut slightly to align holes if required.

10. Install hub cap.

REAR HUB DISASSEMBLY

1. Remove outer snap ring.

2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.

NOTE: Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.

3. Inspect bearing.

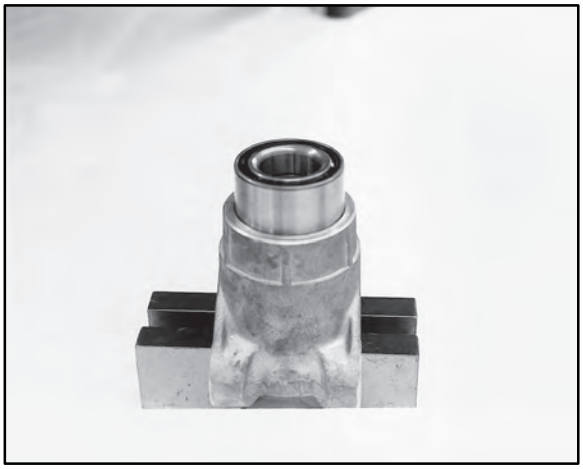
NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

4. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.

REAR HUB ASSEMBLY

1. Support bottom of bearing carrier housing.

2. Start bearing in housing.



3. Press bearing into place until outer race bottoms on housing.

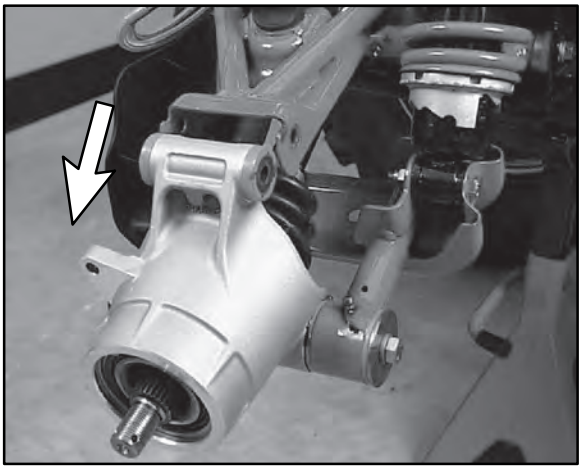
CAUTION:

Use an arbor press only on the outer race, as bearing damage may occur.

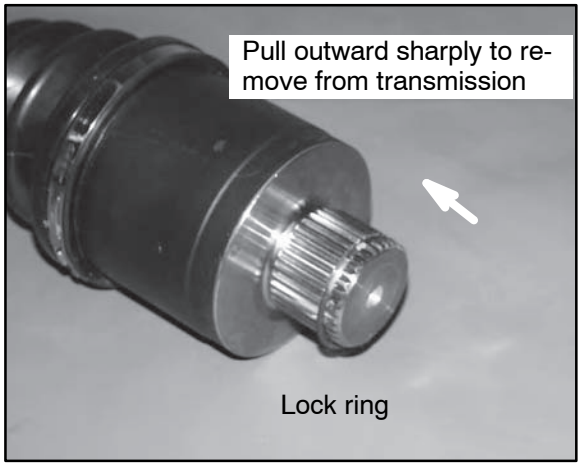
4. Install snap ring into groove.

REAR DRIVE SHAFT REMOVAL

1. Remove rear hub and bearing carrier. (See Pages 7.26).
2. Tip hub outward and remove shaft from hub.



3. Pull sharply outward to remove shaft from transmission. Install a new lock ring upon assembly.



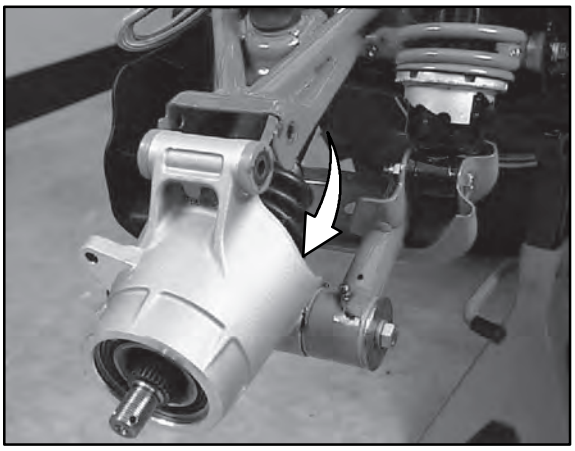
DRIVESHAFT AND CV JOINT HANDLING TIPS

Care should be exercised during driveshaft removal or when servicing CV joints. Driveshaft components are precision parts.
Cleanliness and following these instructions is very important to ensure proper shaft function and a normal service life.

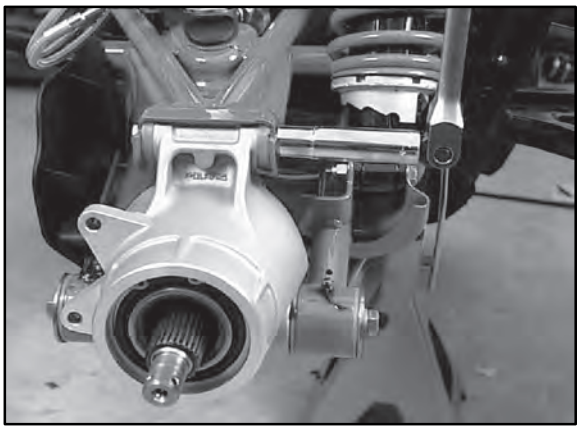
- The complete driveshaft and joint should be handled by getting hold of the interconnecting shaft to avoid disassembly or potential damage to the driveshaft joints.
- Over-angling of joints beyond their capacity could result in boot or joint damage.
- Make sure surface-ground areas and splines of shaft are protected during handling to avoid damage.
- Do not allow boots to come into contact with sharp edges or hot engine and exhaust components.
- The driveshaft is not to be used as a lever arm to position other suspension components.
- Never use a hammer or sharp tools to remove or to install boot clamps.
- Be sure joints are thoroughly clean and that the proper amount and type of grease is used to refill when joint boots are replaced and when joints are cleaned. Refer to text for grease capacity of CV joints and CV joint boots.

REAR DRIVE SHAFT INSTALLATION

1. Slide shaft assembly into bearing carrier hub.



2. Apply anti-seize compound to splines of shaft.
3. Install a new lock ring and install the shaft.
4. Lift bearing carrier into place and install bolt to upper control arm. Torque bolt to 35 ft. lbs. (48 Nm).

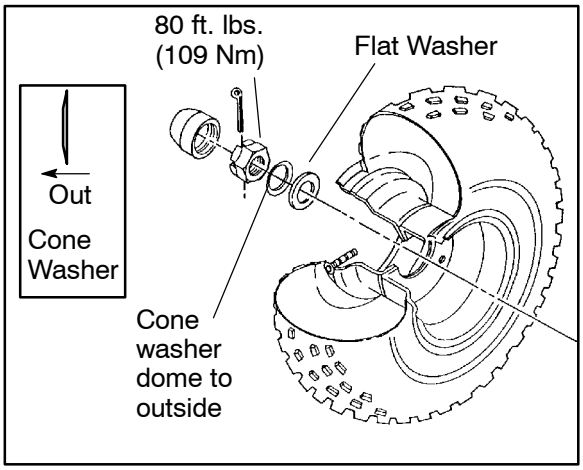


5. Install hub, flat washer, domed washer (domed side out) and nut. Torque center hub nut to 80 ft. lbs. (109 Nm). Install new cotter pin and hub cap.

Rear Hub Nut Torque:

80 ft. lbs. (109 Nm)

6. Install rear wheel and torque wheel nuts to specification.



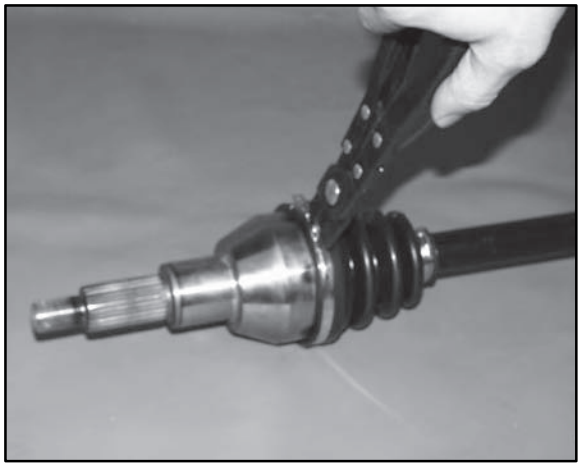
Rear Wheel Nut Torque:

30 ft. lbs. (41 Nm)

7. Grease all fittings thoroughly with Premium U-Joint Lubricant (**PN 2871551**).

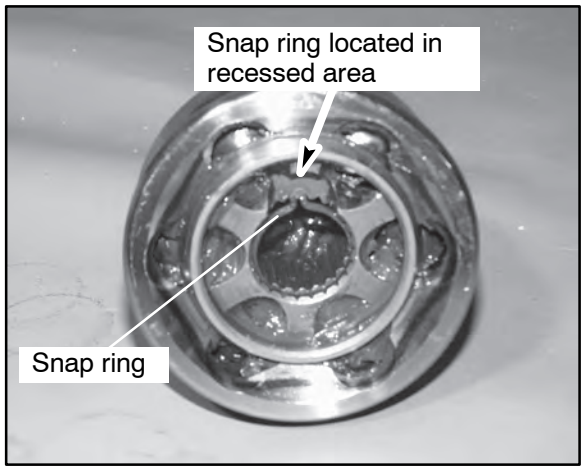
REAR DRIVE SHAFT SERVICE

1. Remove clamps from rubber boot(s) using the proper boot clamp pliers.

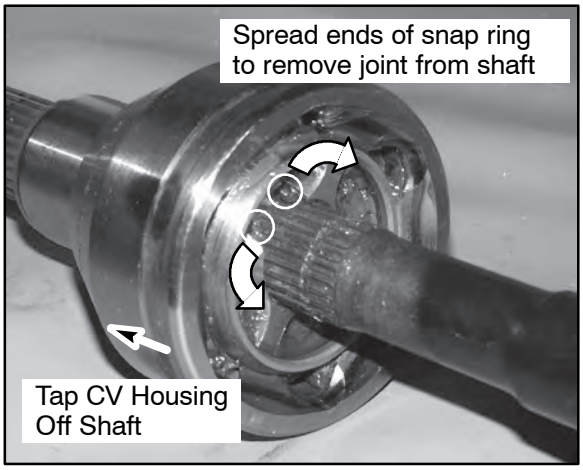


CV Boot Clamp Pliers:
Earless Type (PN 8700226)

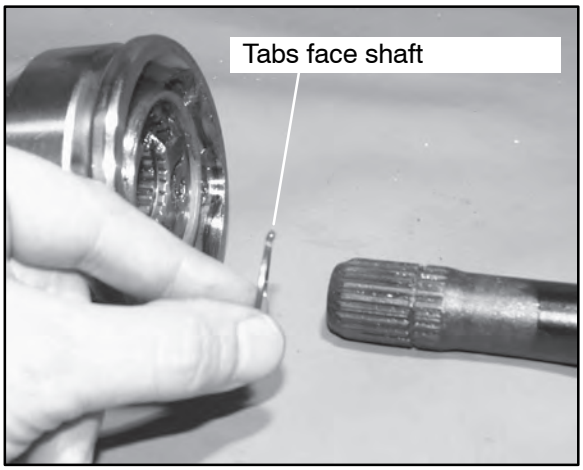
2. **NOTE:** Photo at right is shown without shaft for clarity. Wipe grease away from recess in CV joint inner hub to locate snap ring.



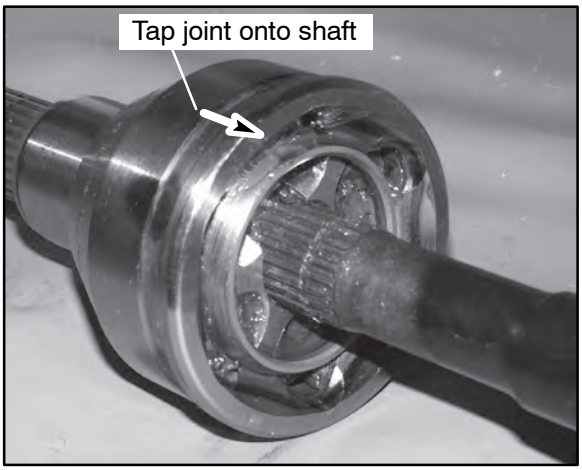
3. Open the snap ring using a snap ring pliers or small needle nose pliers. Tap CV housing off shaft with a soft faced hammer while holding snap ring open.



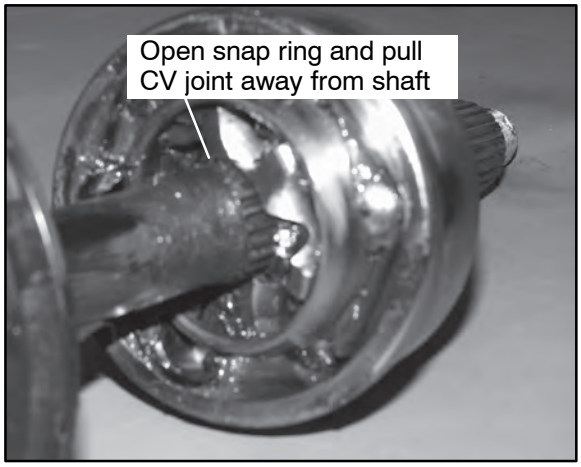
4. Place a new snap ring in the groove of the CV joint inner hub, with tabs facing the shaft as shown.



5. Refit CV joint on interconnecting shaft by tapping with a plastic hammer on the joint housing. Take care not to damage threads on the outboard CV joint. The joint is fully assembled when the snap ring is located in the groove on the interconnecting shaft.



6. Install and tighten large boot clamp with boot clamp pliers.
7. Remove any excess grease from the CV joint external surfaces and position joint boot over housing, making sure boot is seated in groove. Position clamp over boot end and make sure clamp tabs are located in slots. **NOTE:** Before tightening boot clamp on inboard joint, make sure any air pressure which may have built up in joint boot has been released. The air should be released after the plunging joint has been centered properly. Tighten boot clamp using boot clamp pliers.



Boot Replacement

1. Remove CV joint from end of shaft.
2. Remove boot from shaft.

NOTE: When replacing a damaged boot, check the grease for contamination by rubbing it between two fingers. A gritty feeling indicates contamination. If the grease is not contaminated, the boot can be replaced without cleaning the CV joint. Use the recommended amount of grease for *boot replacement* only (see below). Proceed to Boot Installation.

CV Joint Cleaning / Replacement

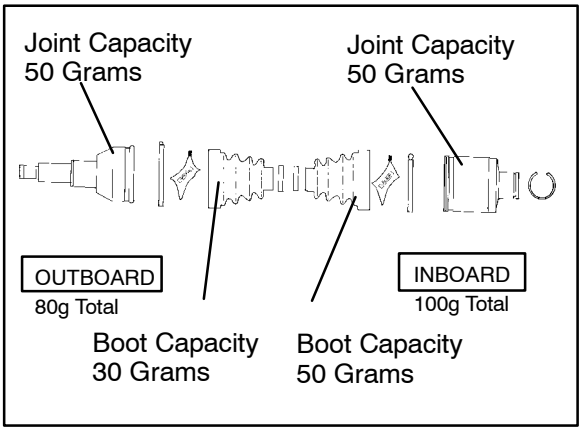
NOTE: Shiny areas in ball tracks and on the cage spheres are normal. Do not replace CV joints because parts have polished surfaces. Replace CV joint only if components are cracked, broken, worn or otherwise unserviceable.

3. Thoroughly clean and dry the CV joint and inspect ball tracks and cages for wear, cracks or other damage.

4. Add the recommended amount of grease for *CV joint cleaning* to the joint as shown below. Be sure grease penetrates all parts of the joint.

Boot Installation

5. Fit joint boot and clamps on interconnecting shaft. Make sure small end of boot is fully seated in groove.
6. Position small clamp over small end of boot. Be sure it is seated all the way around in the clamp recess on the boot.
7. Tighten small boot clamp using boot clamp pliers.
8. Fill boot with grease supplied from boot service kit and spread evenly inside CV joint. Be sure to use only the Constant Velocity Joint grease supplied with boot service kit. **NOTE:** IF CV JOINT WAS CLEANED, add the recommended amount of grease to the joint *in addition* to the grease pack supplied with boot kit.

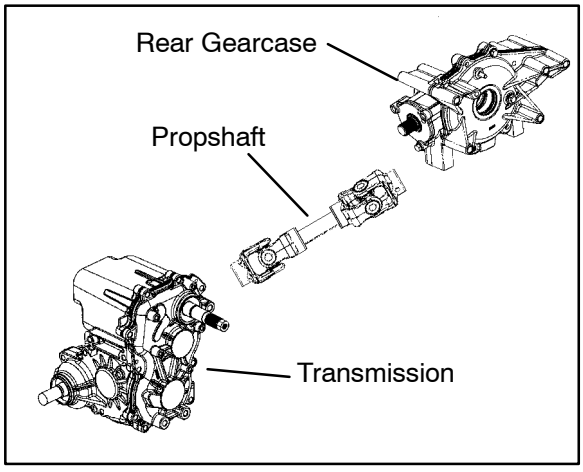


NOTE: CV Joint Grease Capacity:

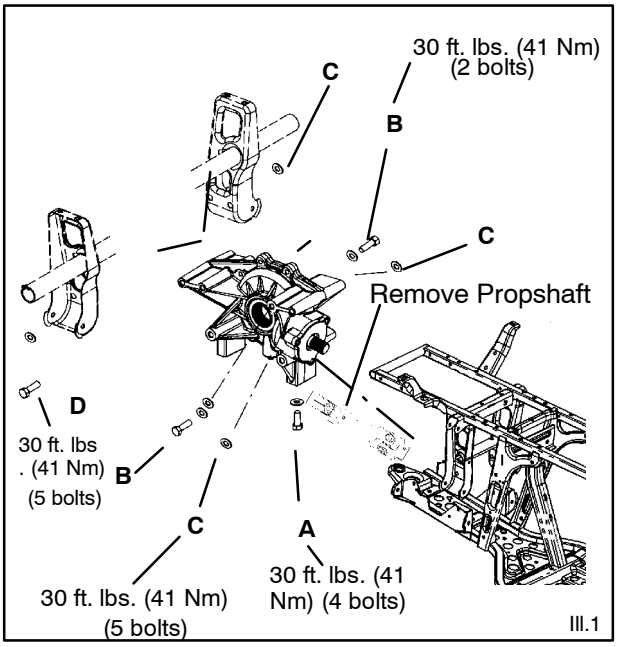
CV Joint Grease - 30g (PN 1350046)
50g (PN 1350047)

Outboard joint - 30g if boot is replaced only. Another 50g (80 total) if joint is cleaned.
Inboard joint - 50g if boot is replaced only. Another 50g (100total) if joint is cleaned.

REAR PROPSHAFT REMOVAL/INSTALL



1. Loosen or remove the bolts the bolts that secure the rear gearcase to the frame. Slide the rear gearcase back enough to slide the rear propshaft from the transmission shaft. Remove the rear drive shaft.
2. To install the rear propshaft:
   - Slide transmission end of propshaft onto the transmission output shaft
   - Slide the rear gearcase back into place and align propshaft to rear gearcase input shaft
   - Tighten the rear gearcase as shown in illustration 1.



REAR GEARCASE REMOVAL

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

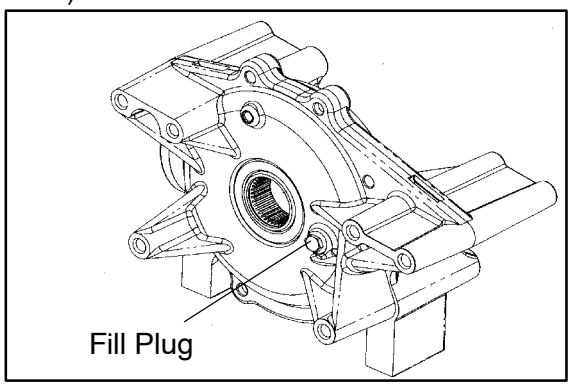
1. Place the ATV in park and set the parking brake.
2. Jack up the rear of the ATV and safely support the ATV with jackstands.
3. Remove the two rear tires.
4. Remove the rear prop shaft from the rear gearcase.
5. Remove the rear drive shafts. Refer to the “Rear Drive Shaft Removal” section.
6. Remove the upper shock mounting bolt.
7. Remove the four mounting bolts and washers (A) on the underside of the rear gearcase.
8. Remove the two mounting bolts and washers (B) from the front of the rear gearcase.
9. Remove the five bolts, nuts, and washers, (C) and (D), that hold the gearcase to the frame.

NOTE: To remove the bottom bolts (C) from the rear gearcase the lower control may have to be removed.

10. Pull the gearcase from the frame.

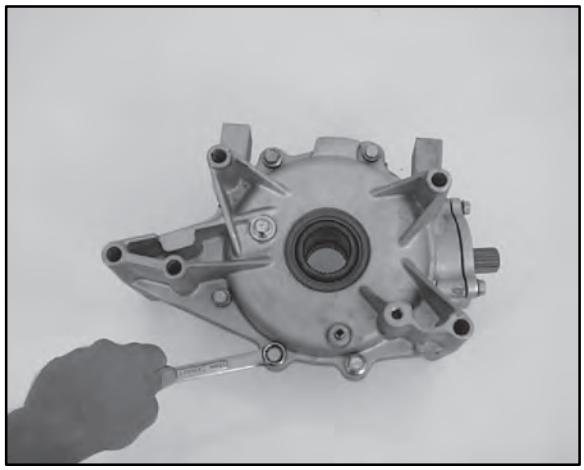
REAR GEARCASE INSTALLATION

1. To install the rear gearcase, reverse the removal procedures.
2. Torque the installation bolts and nuts to the torques specified in Ill. 1 on previous page.
3. Refill the rear gearcase with **5 oz. (150 ml)** of Polaris Premium Gearcase Lubricant (**PN 2871653).** Torque the fill plug to 14 ft. lbs. (19 Nm).

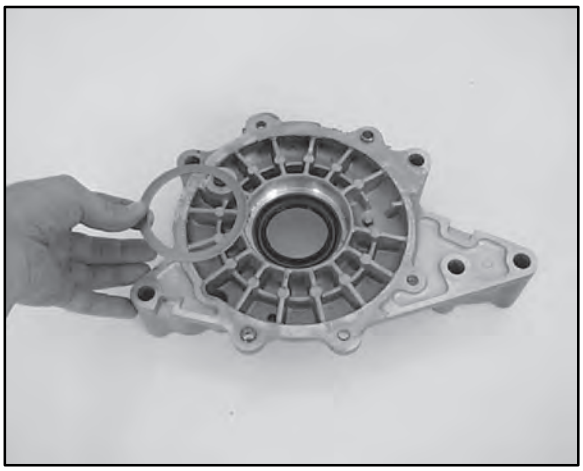


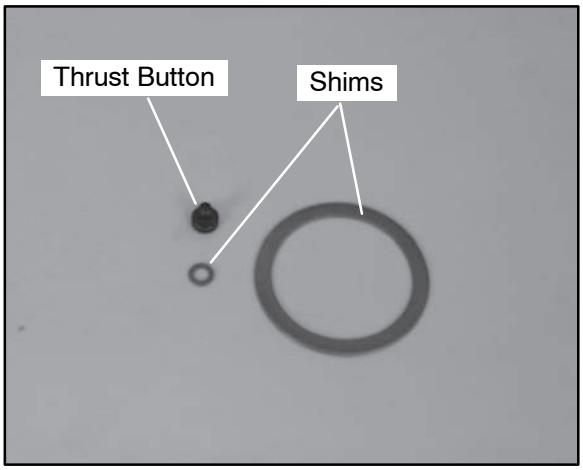
REAR GEARCASE DISASSEMBLY

1. Drain and properly dispose of used oil.
2. Remove the gearcase housing cover bolts and the gearcase housing cover.

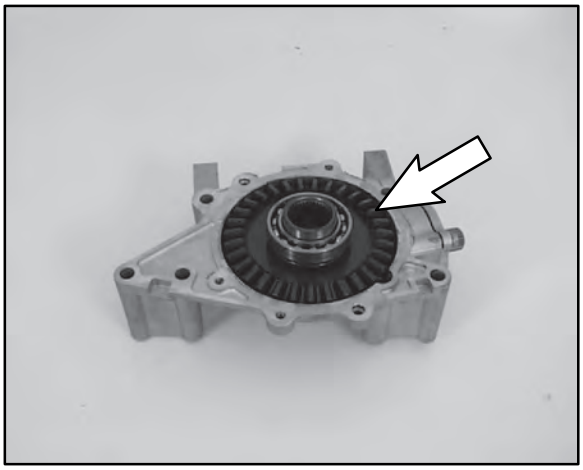


3. Remove the shim, thrust button, and thrust button shim from the gearcase.



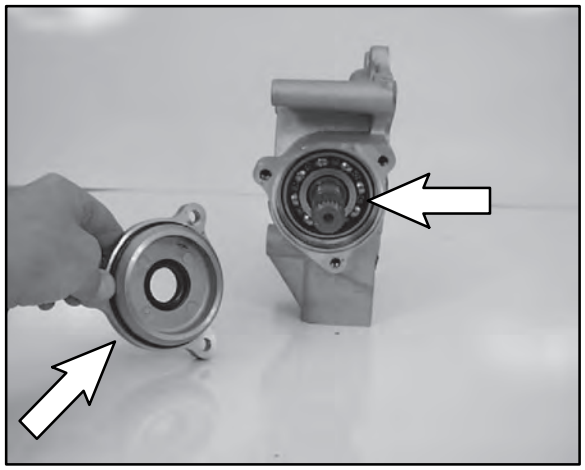


4. Remove rear bevel gear from the gearcase housing. cover.

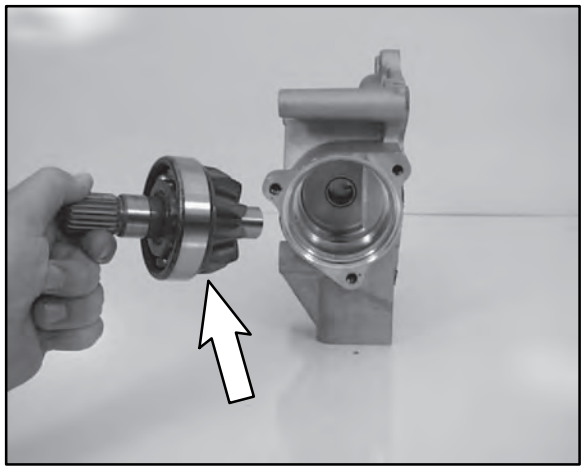


5. Inspect the ring gear for abnormal wear, broken, or chipped teeth. Spin the bearing to check the ball bearings for smoothness. Replace the bearing if needed.

6. Remove the input shaft cover and the pinion shaft from the gearcase housing. See next page.

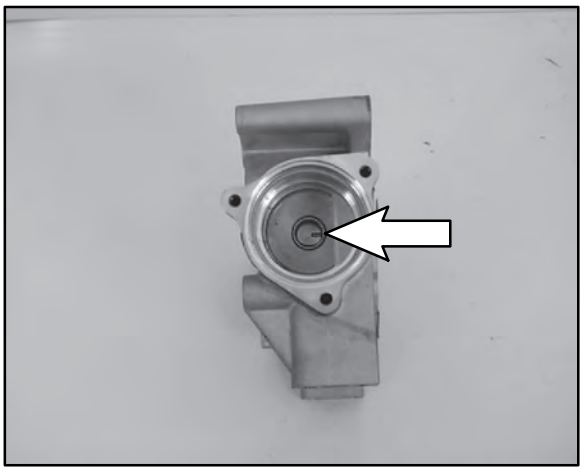


7. Inspect the ring gear for abnormal wear, broken, or chipped teeth. Spin the bearing to check the ball bearings for smoothness. Replace the bearing if needed.

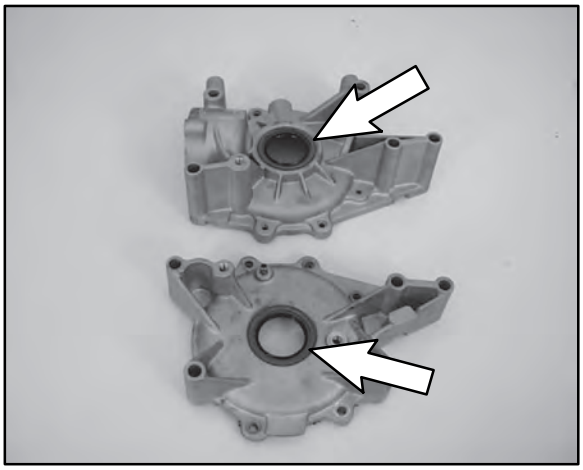


REAR GEARCASE REASSEMBLY

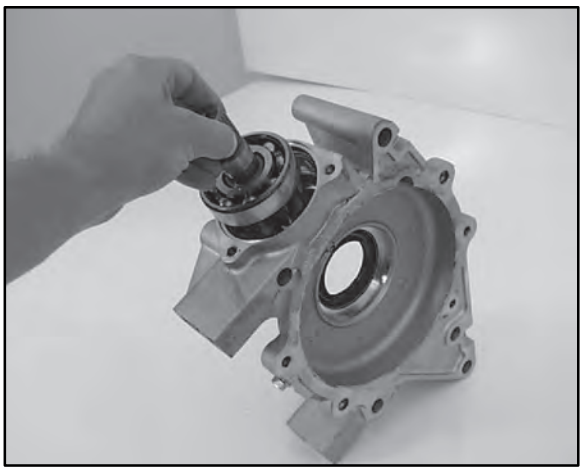
1. Inspect the pinion shaft bushing for wear.



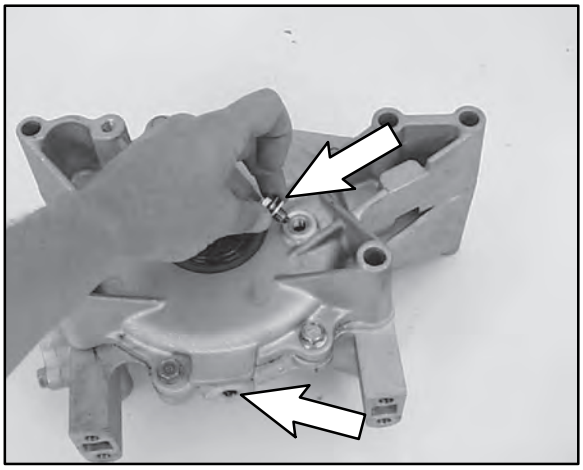
2. Replace all O-rings, seals, and worn components.



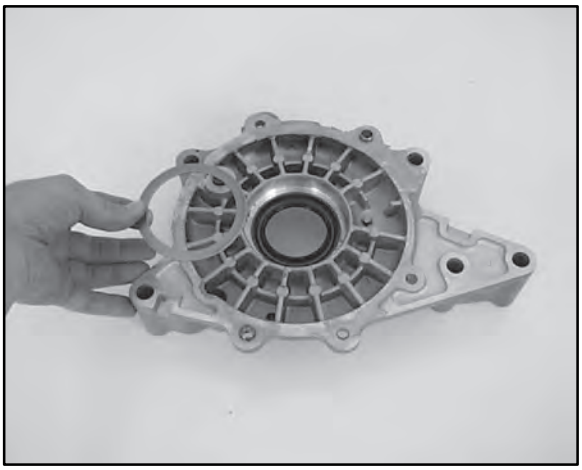
3. Install the pinion shaft into the gearcase housing. Install the pinion shaft cover and torque the cover bolts to 25 ft. lbs. (34 Nm).



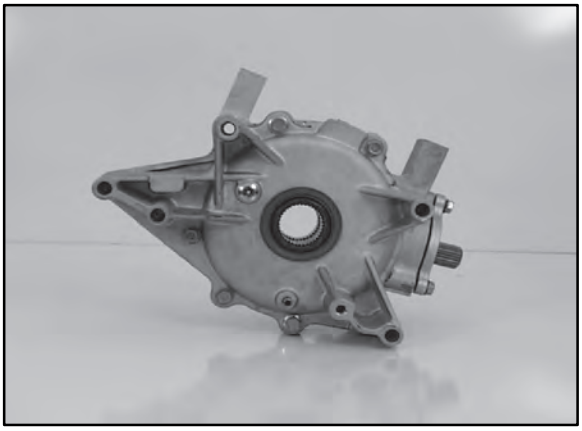
Pinion Shaft Cover Bolt Torque:
25 ft. lbs. (34 Nm)



4. Install the original shim(s), thrust button, and thrust button shims into the gearcase cover.



5. Apply Crankcase Sealant (**PN 2871557**) to surface of case and install cover bolts. Install the gearcase cover onto the gearcase housing. Torque the cover bolts to 25 ft. lbs. in a criss cross pattern.

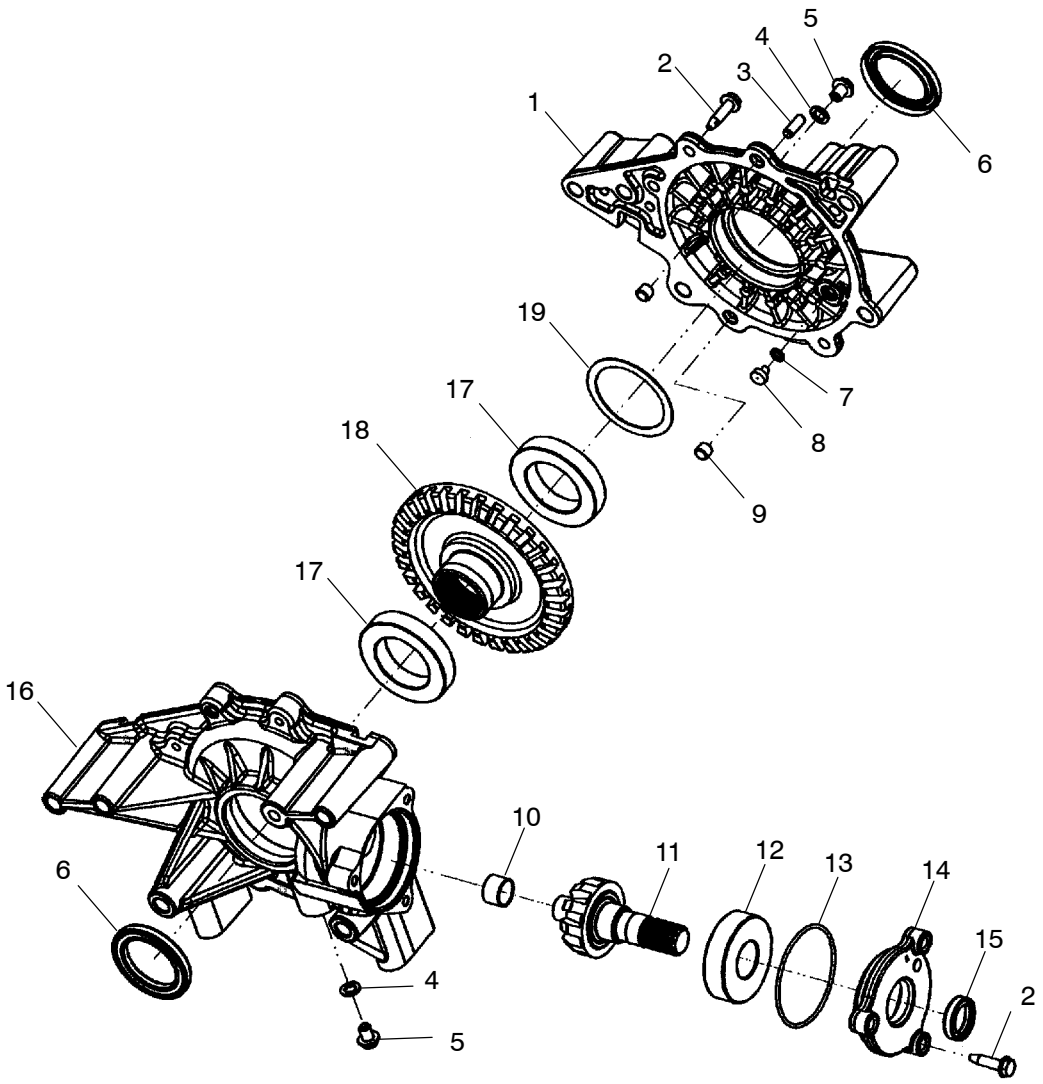


Gearcase Cover Bolt Torque:

25 ft. lbs. (34 Nm)

6. Install the drain plugs. Replace the drain plug washers to ensure proper sealing after filling.

REAR GEARCASE EXPLODED VIEW

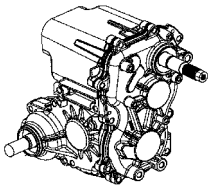


Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Rear Gearcase	11.	1	10T Pinion Shaft
1.	1	Cover, Output, LH	12.	1	Ball Bearing
2.	8	Screw	13.	1	O-ring
3.	1	Tube Vent	14.	1	Cover, Input
4.	2	Washer	15.	1	Seal
5.	2	Plug	16.	1	Rear Gearcase Housing
6.	2	Bearing, Roller Ball	17.	2	Ball Bearing
7.	AR	Shim	18.	1	31T Gear
8.	1	Thrust Button	19.	AR	Shim
9.	2	Knock Pipe			
10.	1	Bushing			

NOTES

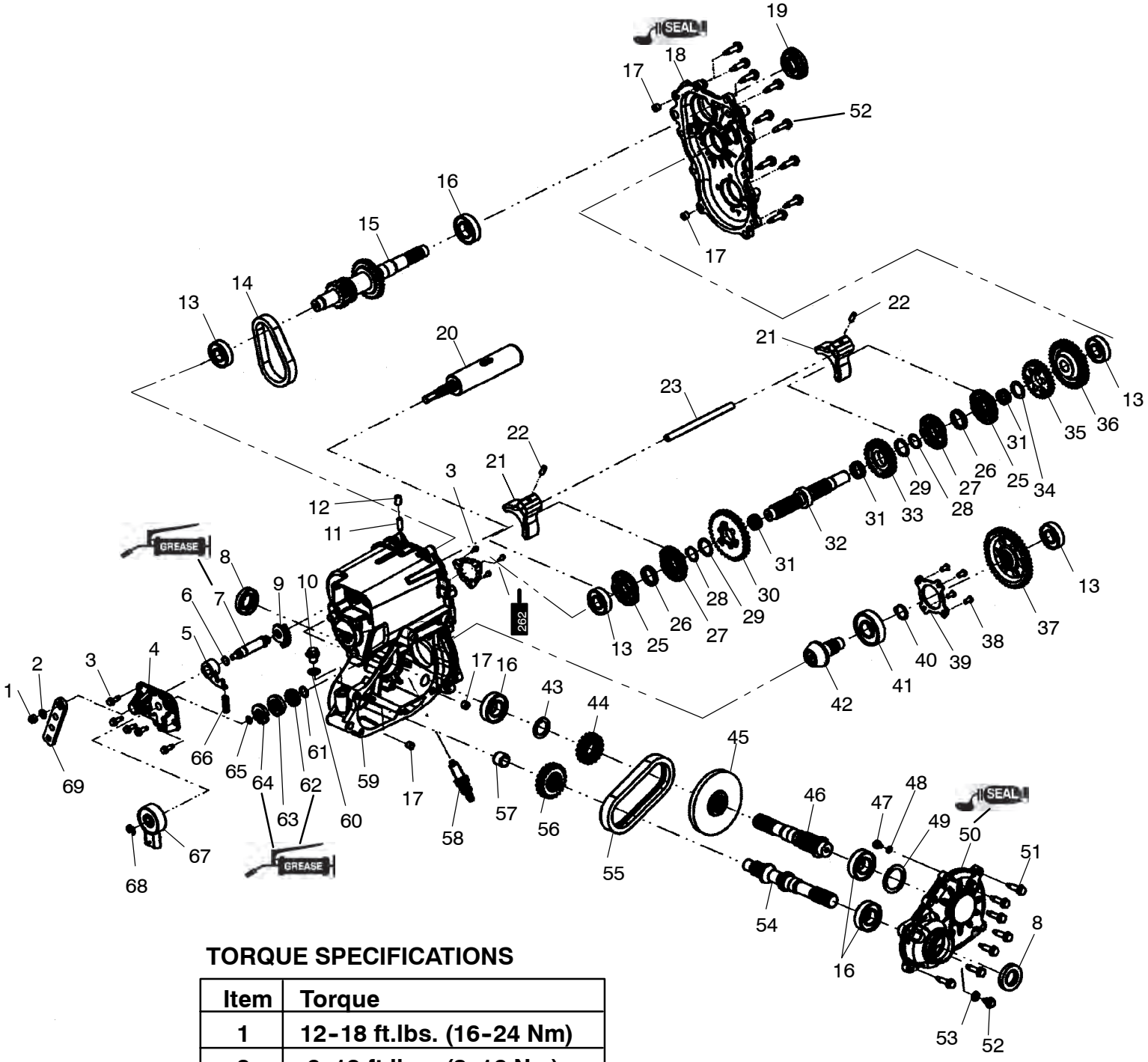
CHAPTER 8

TRANSMISSION



8

EARLY 2004 TRANSMISSION EXPLODED VIEW



TORQUE SPECIFICATIONS

Item	Torque
1	12-18 ft.lbs. (16-24 Nm)
3	6-12 ft.lbs. (8-16 Nm)
10	14-18 ft.lbs. (19-24 Nm)
52	27-34 ft.lbs. (37-46 Nm)
38	6-12 ft.lbs. (8-16 Nm)
58	14-18 ft.lbs. (19-24 Nm)

FOR REASSEMBLY

GREASE — Apply White Lithium Based Grease.

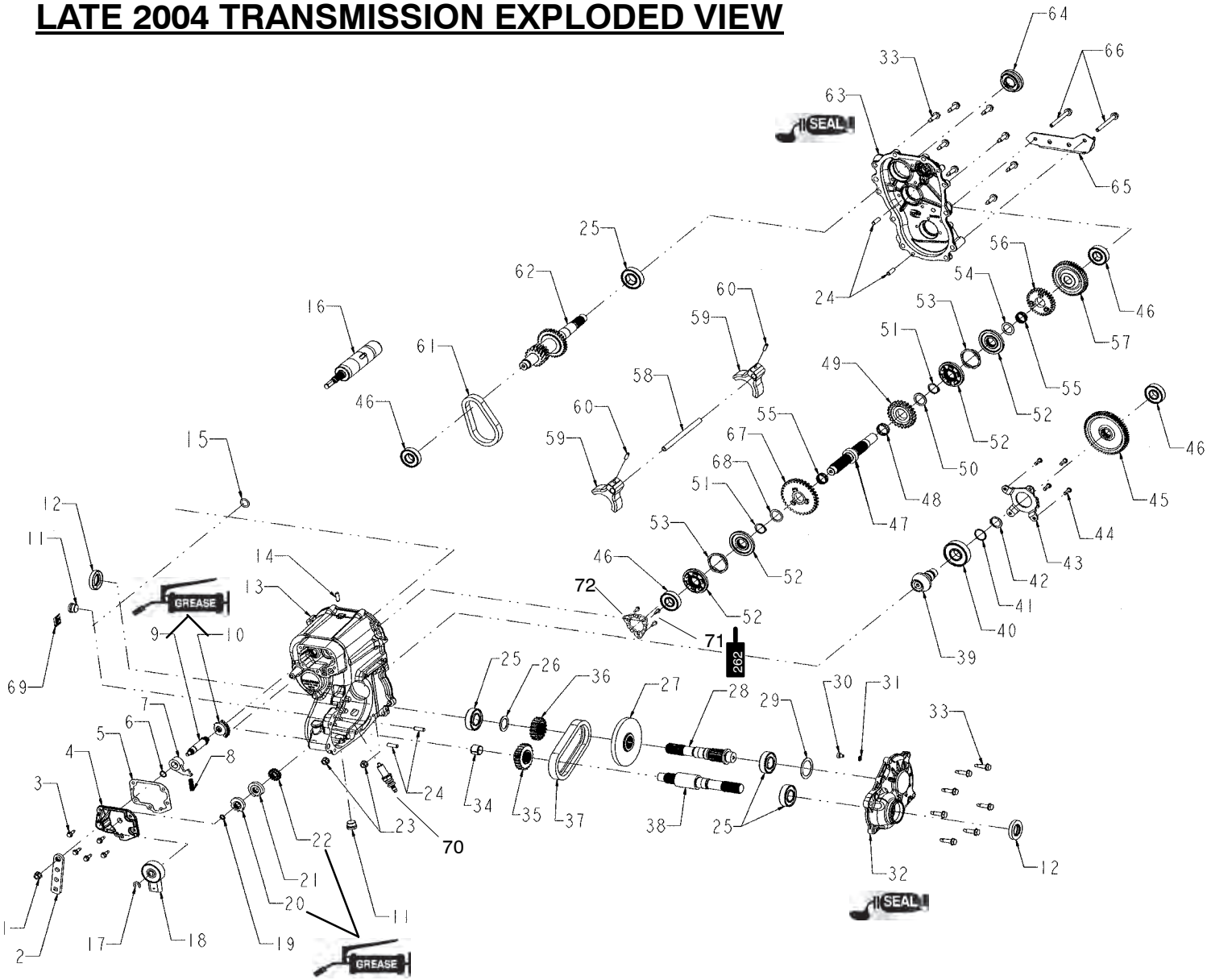
SEAL — Apply Polaris Crankcase Sealant

262 — Apply Loctite™ 262 to the bolt threads.

EARLY 2004 TRANSMISSION EXPLODED VIEW, CONT.

Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., 4x4 Transmission	35.	1	28T Gear
1.	1	Nut	36.	1	40T Gear
2.	1	Washer	37.	1	44T Gear
3.	8	Screw	38.	4	Screw
4.	1	Cover	39.	1	Cover Bearing
5.	1	Detent Pawl	40.	1	Ring
6.	1	O-ring	41.	1	Ball Bearing
7.	1	Shaft, Shift	42.	1	10T Pinion Shaft
8.	2	Seal	43.	1	Thrust Washer
9.	1	Gear, 31T	44.	1	22T/18T Sprocket
10.	1	Oil, Plug Fill	45.	1	31T Gear
11.	1	Vent Tube	46.	1	Main Rear Output Shaft
12.	1	Cap Vent Tube	47.	1	Thrust Button
13.	4	Bearing	48.	AR	Shim
14.	1	Silent Chain	49.	AR	Shim
15.	1	Input Shaft	50.	1	Front Output Cover
16.	4	Bearing	51.	17	Screw
17.	4	Knock Pipe	52.	1	Plug
18.	1	LH Cover	53.	1	Washer
19.	1	Seal	54.	1	Front Output Shaft
20.	1	Shift Drum	55.	1	Silent Chain
21.	2	Shift Fork	56.	1	22/22T Sprocket
22.	2	Dowel Pin	57.	1	Bushing
23.	1	Shift Shaft Rail	58.	1	Park Lockout
24.	1	Park Plate	59.	1	Main Gearcase
25.	1	Engagement Dog	60.	1	Washer
26.	2	Wave Spring	61.	1	O-Ring
27.	3	Engagement Dog	62.	1	16T Gear
28.	2	Retaining Ring	63.	1	Lockout Disc
29.	2	Washer	64.	1	Star Detent
30.	1	33T Gear	65.	1	O-ring
31.	2	Needle Bearing	66.	1	Compression Spring
32.	1	Reverse Shaft	67.	1	Switch
33.	1	24T Sprocket	68.	1	Retaining Ring
34.	1	Washer	69.	1	Bellcrank

LATE 2004 TRANSMISSION EXPLODED VIEW



TORQUE SPECIFICATIONS

Item	Torque
1	12-18 fl.lbs. (16-24 Nm)
3	7-9 ft.lbs. (9.5-12 Nm)
23	15-19 ft.lbs. (20-26 Nm)
33	27-34 ft.lbs. (37-46 Nm)
39	6-12 ft.lbs. (8-16 Nm)
70	14-18 ft.lbs. (19-24 Nm)
71	6-12 ft.lbs. (8-16 Nm)

FOR REASSEMBLY

GREASE — Apply White Lithium Based Grease.

SEAL — Apply Polaris Crankcase Sealant

262 — Apply Loctite™ 262 to the bolt threads.

LATE 2004 TRANSMISSION EXPLODED VIEW, CONT.

Ref.	Qty.	Description	Ref.	Qty.	Description
			35.	1	22T Sprocket
1.	1	Nut	36.	1	19T Sprocket
2.	1	Shift Drum Bellcrank	37.	1	Silent Chain
3.	5	Sector Cover Screws	38.	1	Front Main Output Shaft
4.	1	Sector Cover	39.	1	10T Spiral Pinion Shaft
5.	1	Sector Cover Gasket	40.	1	Ball Bearing
6.	1	O-ring	41.	1	Spacer
7.	1	Detent Pawl	42.	1	Retaining Ring
8.	1	Compression Spring	43.	1	Bearing Center Drive Cover
9.	1	Shift Shaft	44.	4	Torx Screws
10.	1	31T Sector Gear	45.	1	60T Mid Output Helical Gear
11.	2	Hollow Hex Plug	46.	4	Ball Bearing
12.	2	Triple Lip Seal	47.	1	Reverse Shaft
13.	1	Gearcase	48.	1	Needle Cage Bearing
14.	1	Vent Tube	49.	1	24T 6 Face Sprocket
15.	1	O-ring	50.	1	Washer
16.	1	Shift Drum	51.	2	External Retaining Ring
17.	1	External Retaining Ring	52.	4	6 Face Engagement Dog
18.	1	6-Pin Switch	53.	2	Wave Spring
19.	1	O-ring	54.	1	Washer
20.	1	Detent Star	55.	2	Needle Cage Bearing
21.	1	Lockout Disc	56.	1	30T 6 Face Gear
22.	1	16T Sector Gear	57.	1	47T Mid Output Helical Gear
23.	2	Lock Nut	58.	1	Shift Shaft Rail
24.	4	Dowel Pin	59.	2	Shift Fork
25.	4	Ball Bearing	60.	2	Dowel Pin
26.	1	Thrust Washer	61.	1	Silent Chain
27.	1	31T Spiral Gear	62.	1	Input Shaft Assy.
28.	1	Output Shaft	63.	1	LH Main Cover
29.	1	Shim	64.	1	Dual Lip Seal
30.	1	Thrust Button	65.	1	Transmission Mount Bracket
31.	1	Shim	66.	2	Hex Screw
32.	1	Output Cover	67.	1	33T 6 Face Gear
33.	15	Screw	68.	1	Washer
34.	1	Plain Bearing	69.	1	Label
			70.	1	Park Lock
			71.	1	Bolts
			72.	1	Park Plate

2004 TRANSMISSION INFORAMTION

The Early 2004 transmission is the same as the Late 2004 transmission, except for the location of the fill plug. Refer to Chapter 2 for fill plug locations.

TORQUE SPECIFICATIONS

COMPONENT	FT. LBS. (IN.LBS.)	NM
Transmission Case Bolts	27-34	37-46
Oil Deflector Screws	(16-30)	2-3.3
Shift Cover Bolt	6-12	8-16
Bell Crank Nut	12-18	16-24
Trans. Drain Plug / Fill Plug	14-18	19-24
Trans. Mounting Bolts	25	34.5
Snorkel Lock Screw	8-12	11-16

LUBRICATION

Refer to maintenance section for transmission lubricant type and capacity.

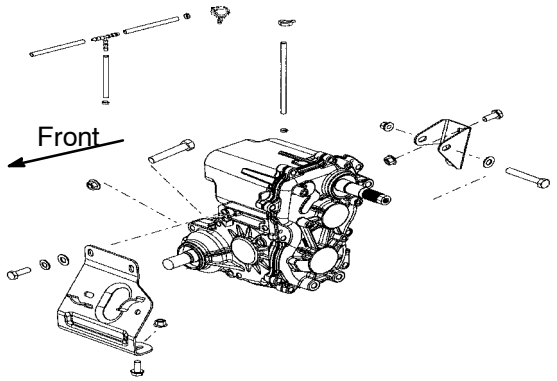
GEAR SELECTOR REMOVAL

1. Disconnect linkage rod from gear selector handle.
2. Remove two bolts attaching gear selector mount to machine frame.
3. Lift gear selector out of mounting bracket and away from frame.

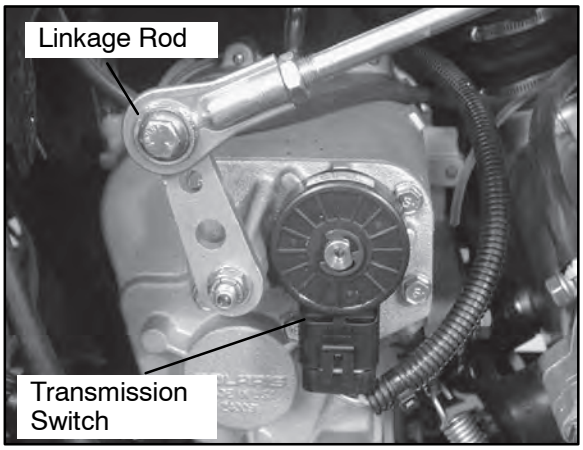
TRANSMISSION REMOVAL

1. Remove seat, rear rack, rear cab, air box, and exhaust system, and right footwell (if required for access).

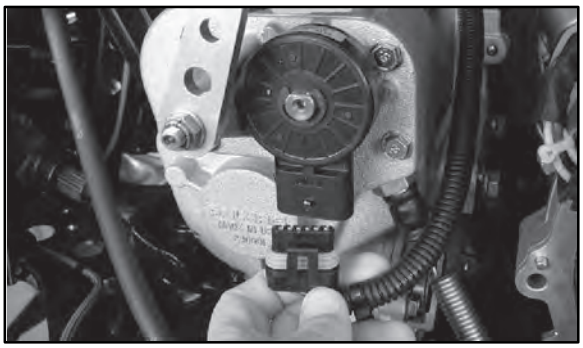
Transmission Mounting



2. Disconnect transmission vent line.
3. Drain transmission lubricant.
4. Disconnect shift linkage rod end from transmission bellcrank.

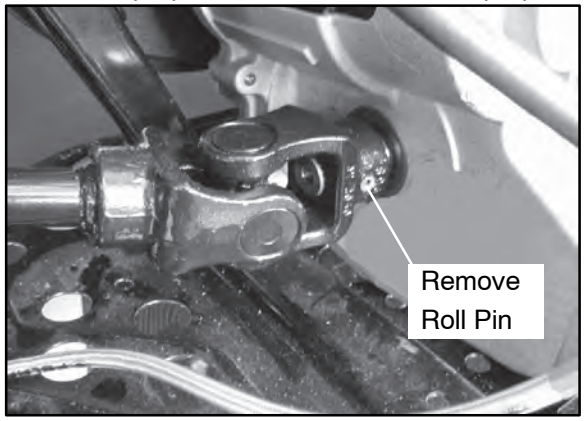


5. Disconnect gear position switch harness.

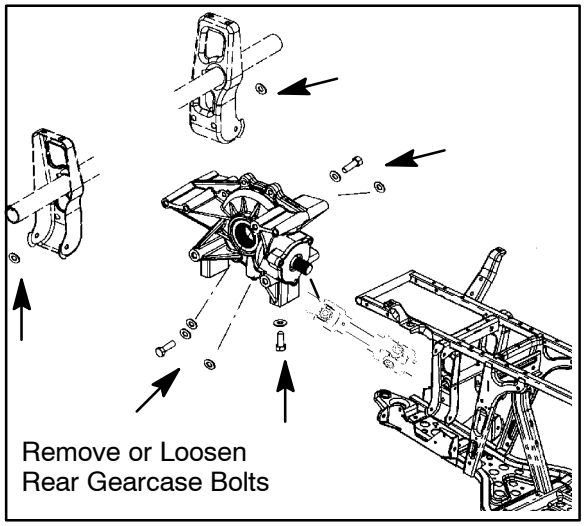


6. Remove auxiliary brake mounting bracket from frame and secure out of way for transmission removal.

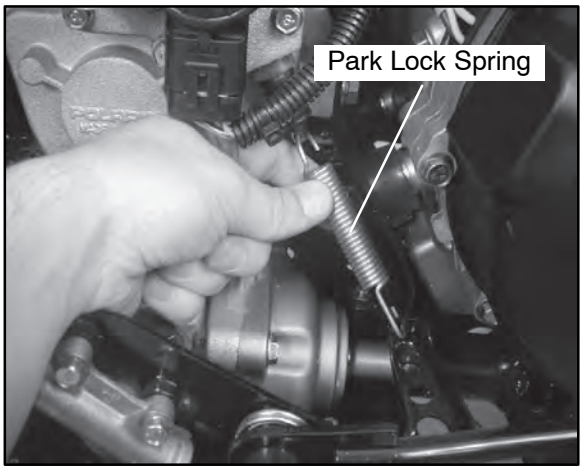
7. Remove PVT outer cover, both drive and driven clutch, and inner PVT cover (refer to Clutch Chapter 6).
8. Use the Roll Pin Removal Tool (**PN 2872608**) to remove the roll pins from the front prop shaft and the rear prop shaft. Remove the front propshaft.



9. Loosen or remove the bolts that secure the rear gearcase. Move the rear gearcase back just enough to slide the rear propshaft from the transmission shaft.



10. Remove the park lock spring.



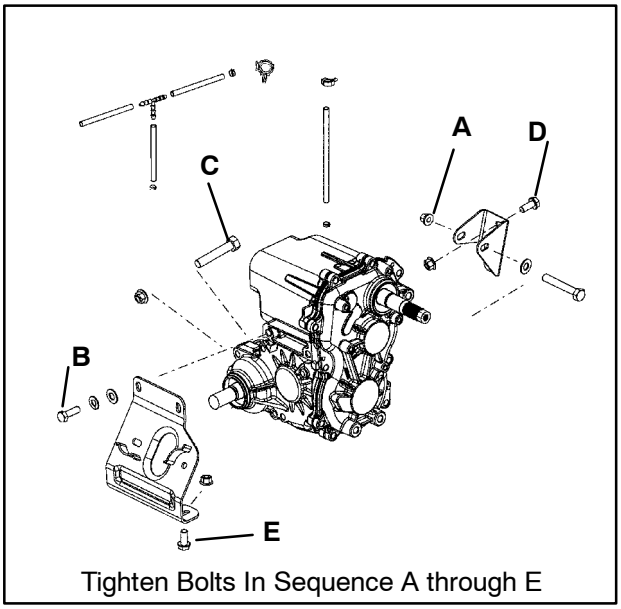
11. Remove left side transmission bracket, rear bracket, and lower right bracket bolt.
12. Remove front transmission-to-engine mount bolts. See illustration.
13. Remove transmission from right side of frame.

TRANSMISSION INSTALLATION

1. Install transmission from right side of vehicle.
2. Align rear output shaft to rear propshaft yoke and roll pin hole.
3. Slide rear output shaft into propshaft yoke.
4. Position transmission in frame.
5. Install front propshaft and roll pin.
6. Loosely install left side and rear mounting brackets.
7. Loosely install lower right bracket bolt.
8. Loosely install front mounting bolts.
9. Tighten mounting fasteners in order A-F as shown.

NOTE: Align clutches as outlined in Clutch Chapter 6.

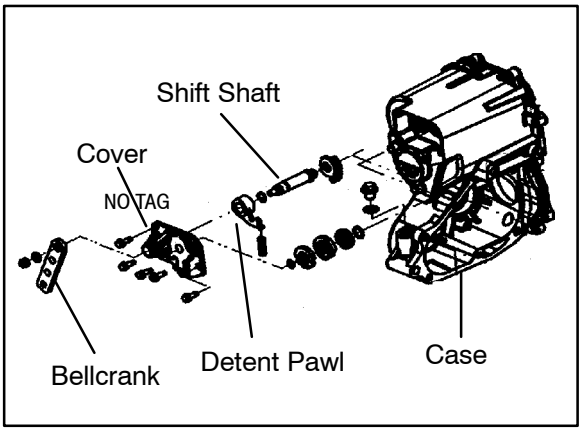
Transmission Mounting Bolts Torque
25 ft. lbs. (34.5 Nm)



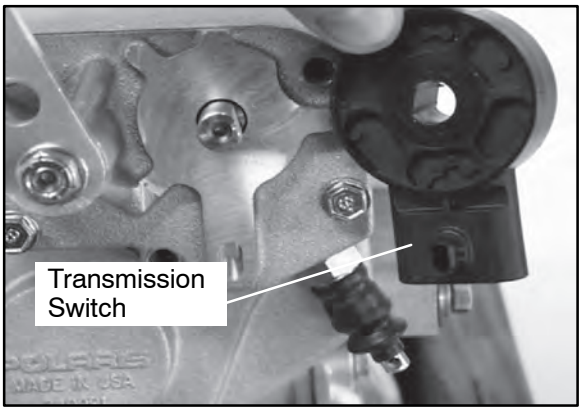
Tighten Bolts In Sequence A through E

TRANSMISSION DISASSEMBLY

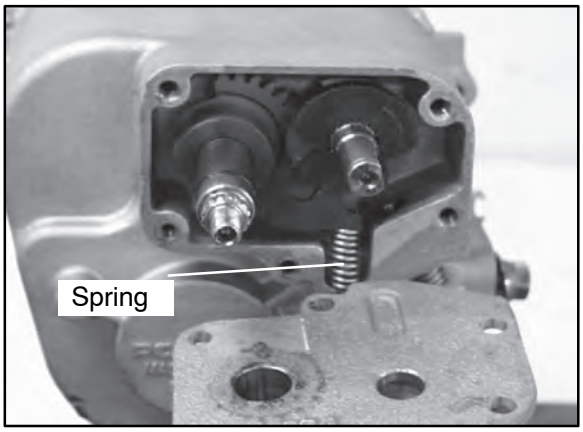
1. Place the bellcrank in neutral position.



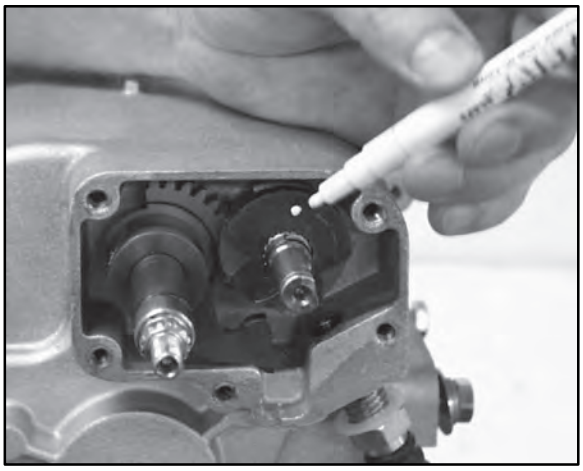
2. Remove the nut, and washer that secure the bell crank. Remove the bellcrank.
3. Remove the e-clip and then remove the transmission switch.



4. Remove the five bolts that secure the cover. Remove the detent spring.

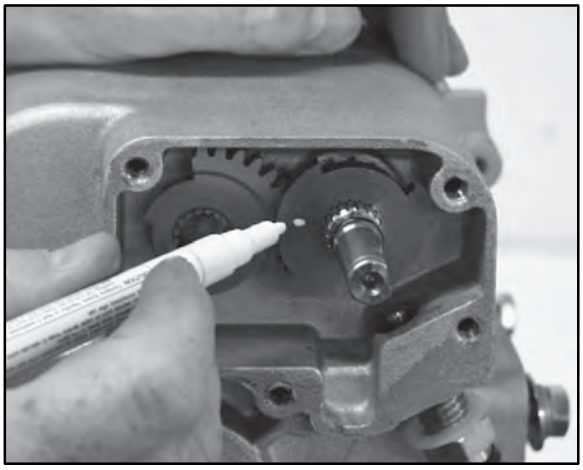


5. Mark the detent gear with a white pen. Remove the detent gear from the case.



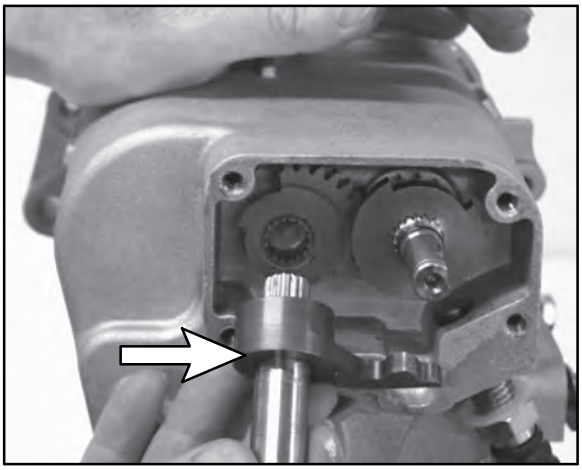
NOTE: It may be helpful to place a mark just above the keyed spline for reference.

6. Mark the shift lockout disc, this will indicate which side of the disc faces outward during assembly. Remove the shift lockout disc.

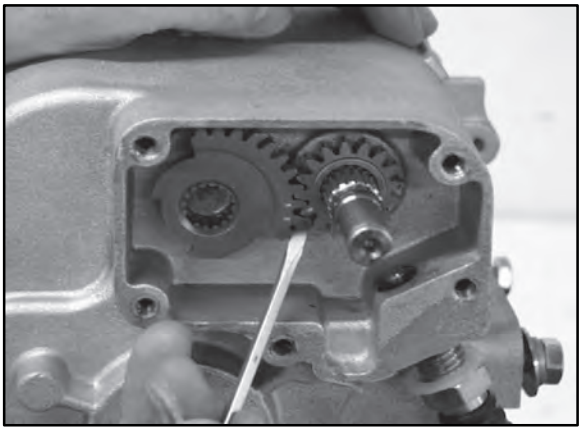


NOTE: It may be helpful to place a mark just above the keyed spline for reference.

7. Remove the shift shaft and detent lever.

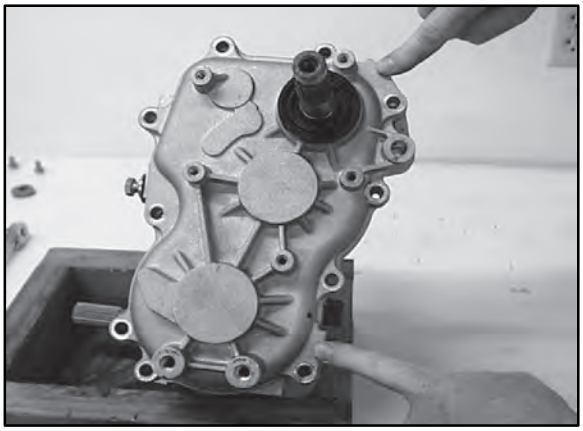


8. Note the timing marks on the shift gears. Remove the shift gears from the case.

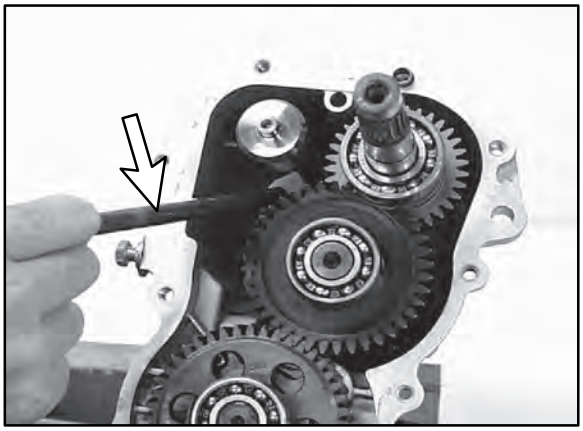


NOTE: It may be helpful to accent the timing marks using a white marking pen for reference.

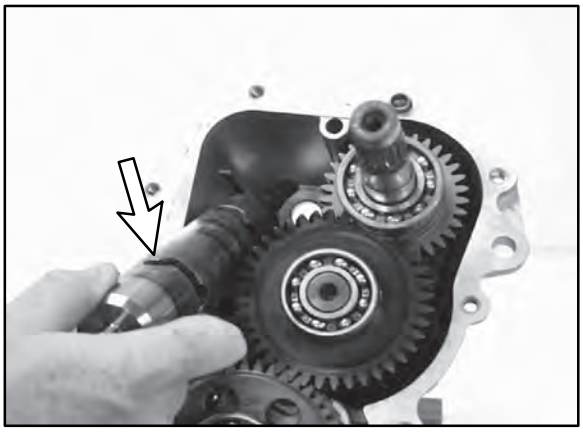
9. Remove the bolts on the LH transmission case. Tap the cover off with a soft face hammer if necessary.



10. Lift shift rail 0.5–1" (12.70–25.40 mm). Then rotate the shift rail/forks and shift drum, so the the forks' pins disengage fro the drum.

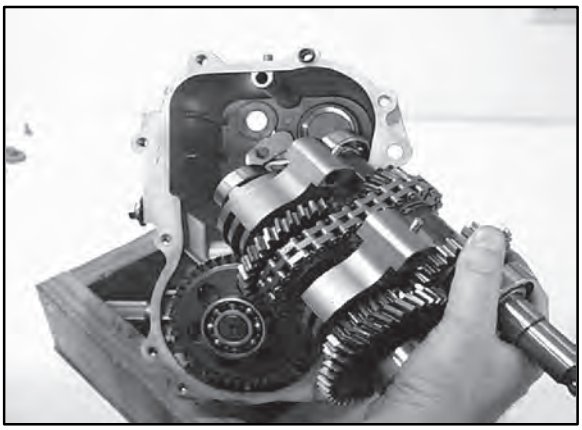


11. Remove the shift drum.

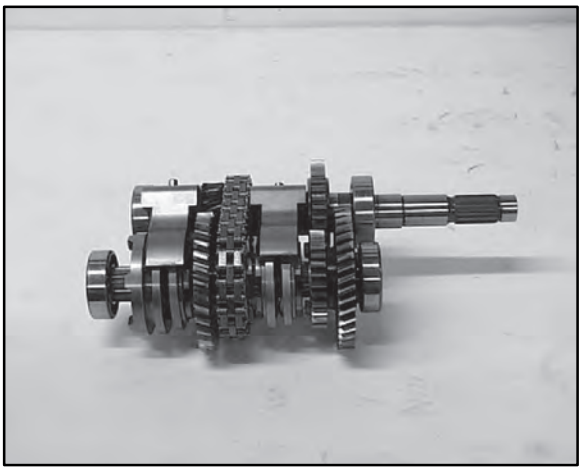


NOTE: You may have to tap the shift drum from the backside of the case to aid in removal.

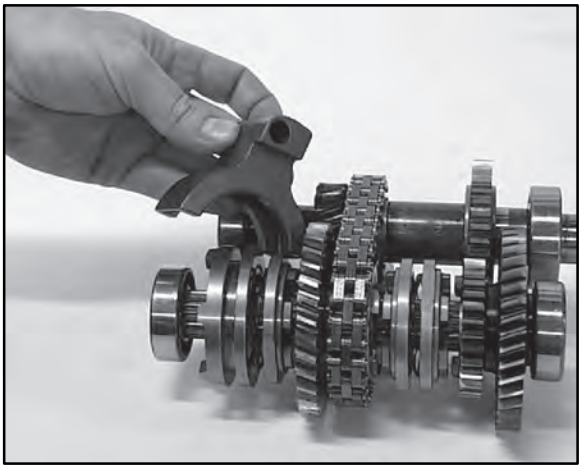
12. Remove the upper gear cluster and shift forks. You may need to move the assembly back and forth to aid in removal.



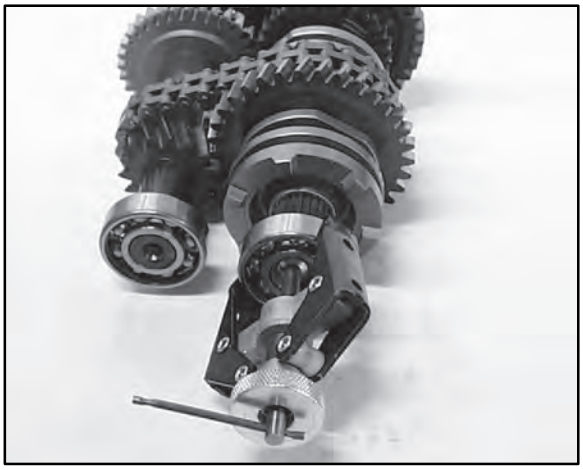
13. Set the upper gear cluster on a flat surface and inspect the components.



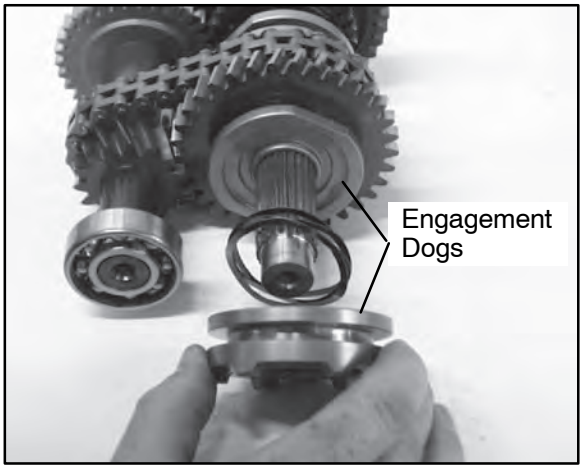
14. Remove the shift forks from the assembly. Note the correct position of each fork.



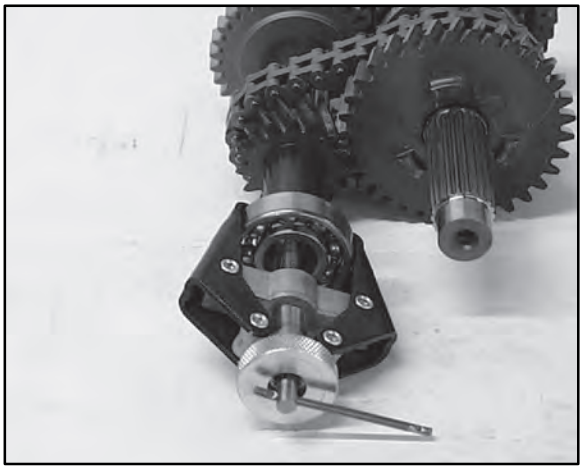
15. Remove the bearing from the reverse shaft using a puller.



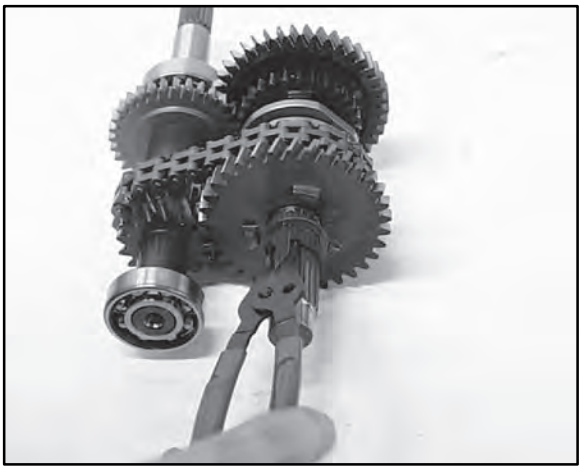
16. Remove the park lock engagement dog. Remove the wave spring and reverse engagement dog.



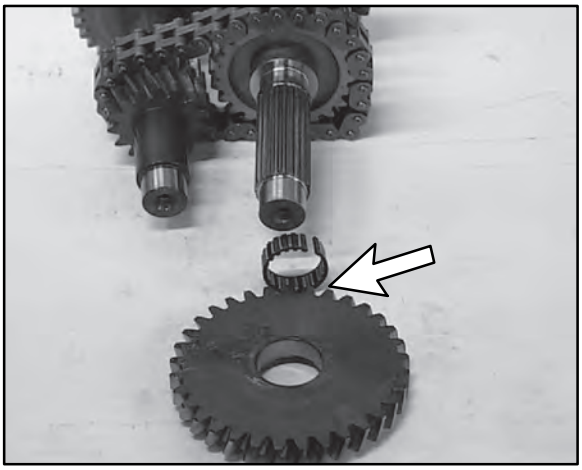
17. Remove the bearing from the input shaft with a puller.



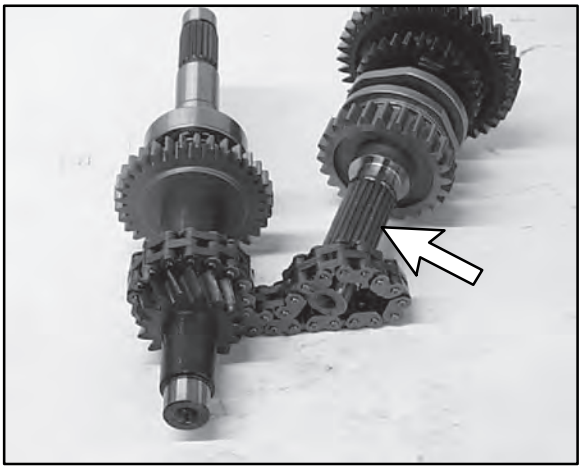
18. Remove the snap ring and washer from the reverse shaft.



19. Remove low gear (33T) and the needle bearing.

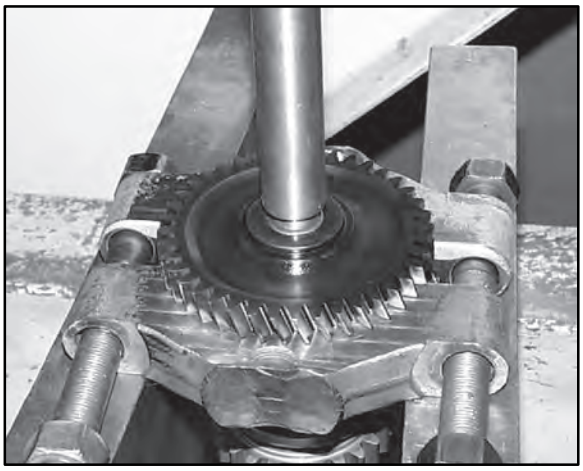


20. Remove the reverse gear shaft.

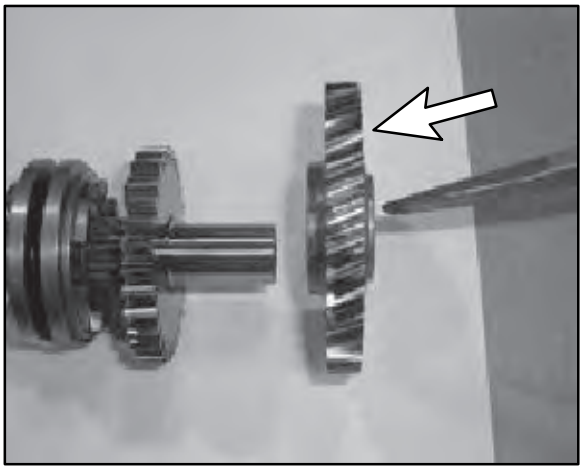


21. Remove the rest of the bearings from the shafts.

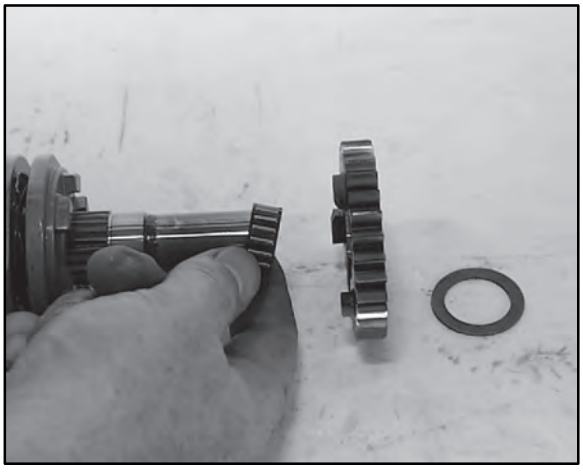
22. Use a press to remove the gear from the shaft.



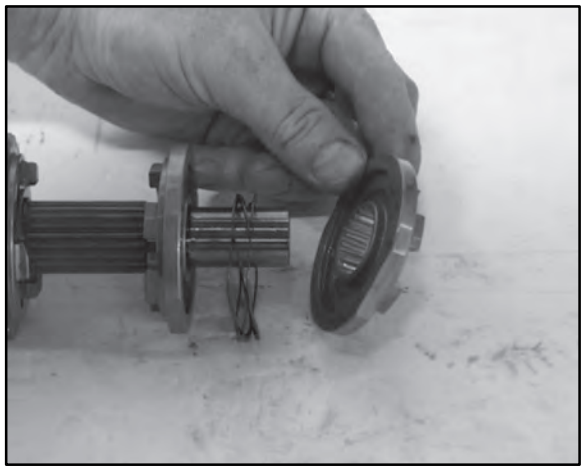
23. Make note of the direction of the gear and hub location.



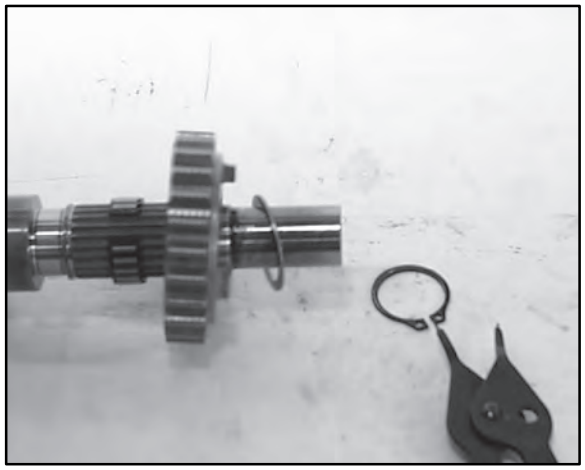
24. Remove the gear, split bearing, and washer from the reverse shaft.



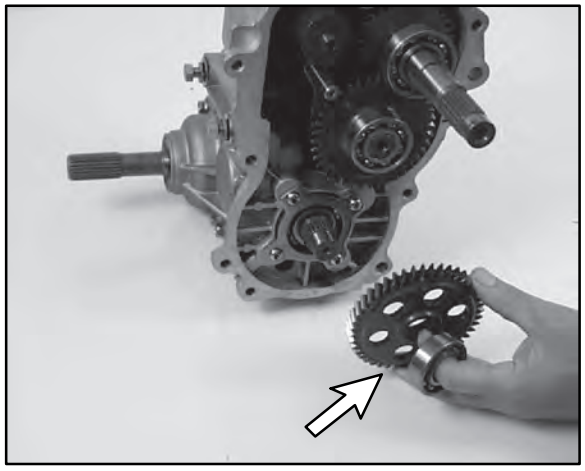
25. Slide off the shift dogs and wave springs.



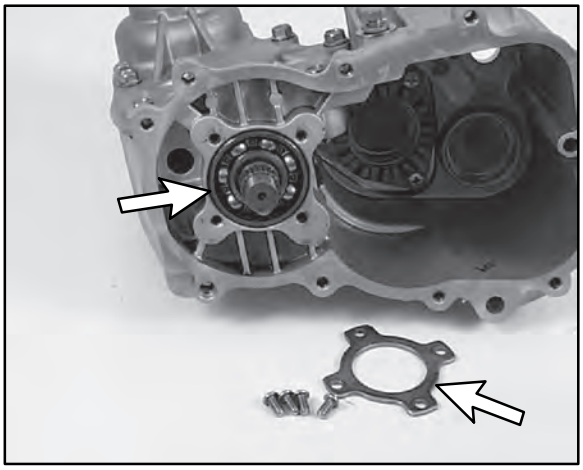
26. Remove the snap ring, washer, gear, and split bearing.



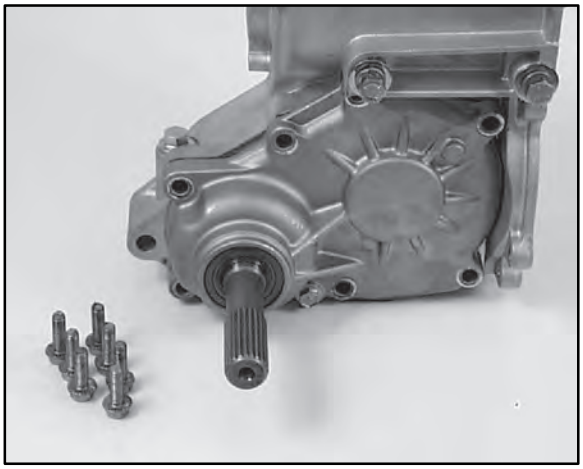
27. Remove bearing and the helical gear.



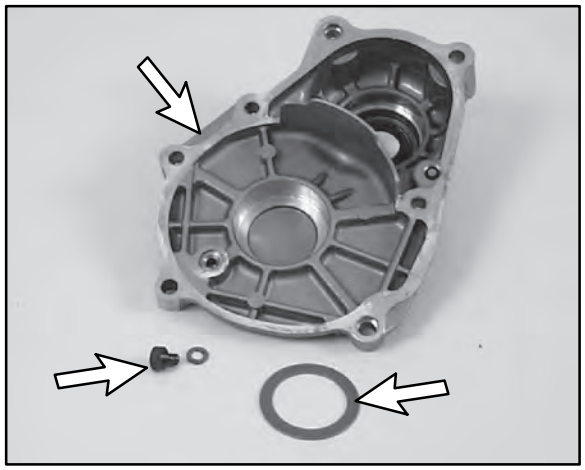
28. Remove the pinion shaft retainer plate and the pinion shaft.



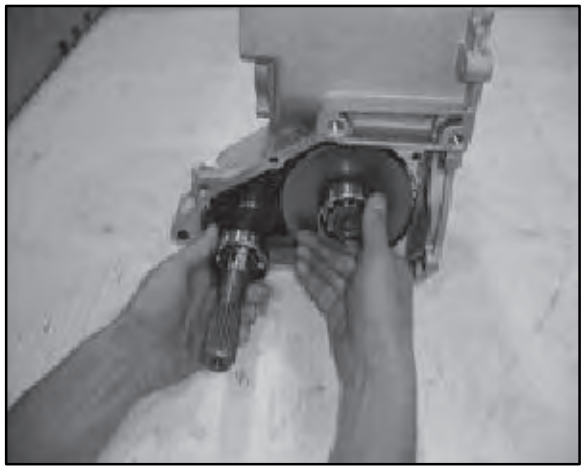
29. Remove the front housing cover screws.



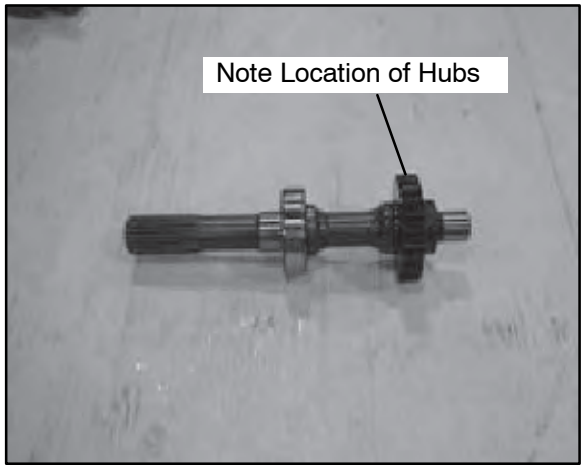
30. Remove the front housing cover, shim, thrust button, and thrust button shim.



31. Remove the shafts as an assembly.



32. Remove the silent chain from the assembly for shaft inspection.



33. Clean all components in a parts washer and inspect for wear.

34. Inspect engagement dogs of gears and replace if edges are rounded.

35. Inspect gear teeth for wear, cracks, chips or broken teeth. Note the location of the hubs on the gear.

36. Remove seals from transmission case.

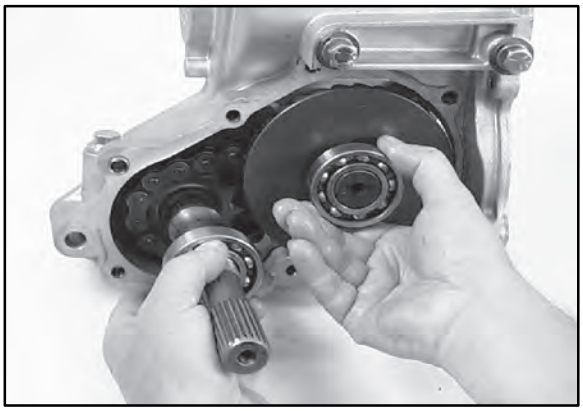
IMPORTANT: New seals should be installed after the transmission is completely assembled.

37. Inspect bearings for smooth operation. Check for excessive play between inner and outer race.

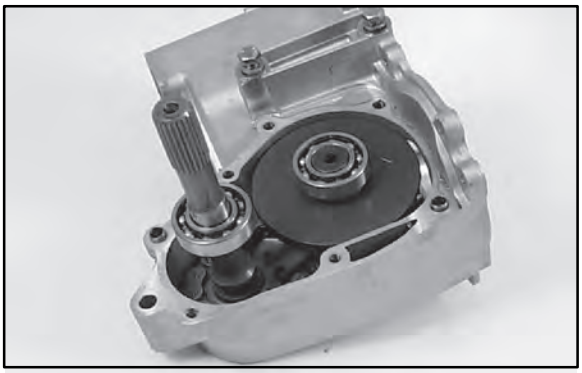
TRANSMISSION REASSEMBLY

1. Reinstall the chain onto the front output shaft and rear output shaft.

2. Install front and rear output shafts into the case.



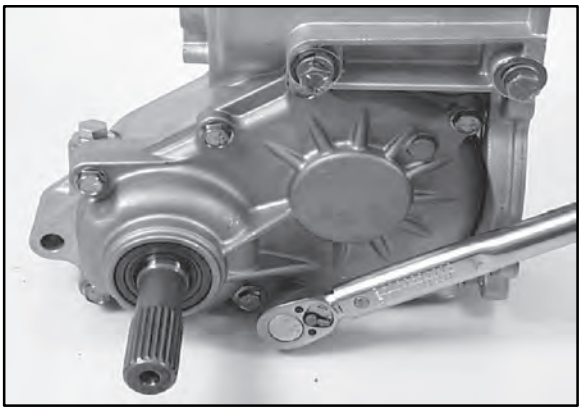
3. Before installing the cover make sure the sealing surfaces are clean and dry, and shafts are fully seated in the transmission case. Apply Crankcase Sealant (**PN 2871557**) to the mating surfaces.



Crankcase Sealant

(PN 2871557)

4. Reinstall the thrust button shim, thrust button, and other shims into the cover. Reinstall cover and torque bolts in a criss-cross pattern in 3 steps to 27–34 ft. lbs. (36.50–46 Nm).

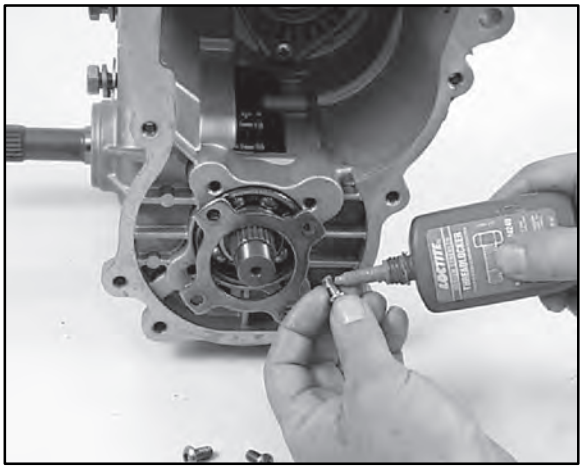


NOTE: Make sure that the case locating pins (knock pipes) are in place.

Front Cover Bolt Torque:

27–34 ft. lbs. (36.50–46 Nm)

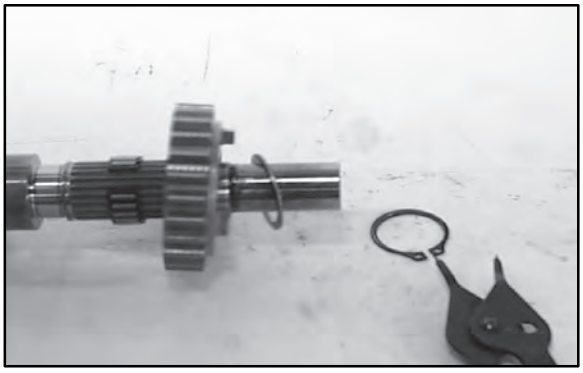
5. Install new front and rear output shaft seals. Apply grease to the seal lips. Cover the splines of the shaft to protect the seal lips during installation.
6. Install pinion shaft with bearing.
7. Install retainer plate with flat side toward bearing.
8. Apply Loctite™ 262 (Red) (**PN 2871951**) to screw threads and torque screws to 6–12 ft. lbs. (8–16 Nm).



Pinion Retainer Plate Bolt Torque:

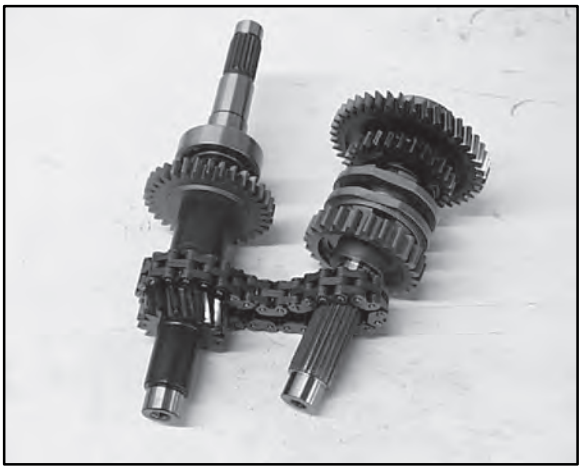
6–12 ft. lbs. (8–16 Nm)

9. Install the a new needle bearing, the 24T reverse sprocket, washer, and a new snap ring. Install the shift dogs and wave spring. Install the washer, a new needle bearing and the high gear. Install the press fit gear and ball bearing.

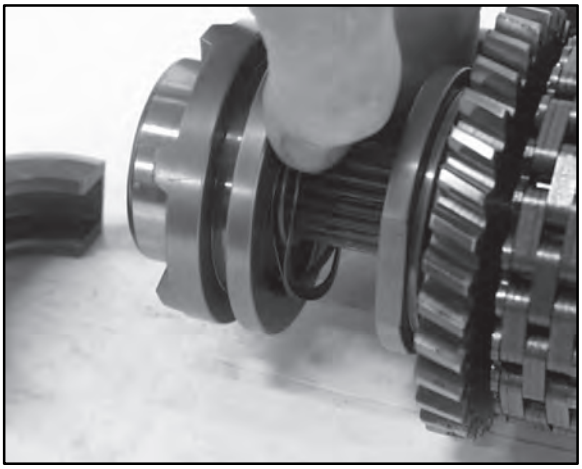


NOTE: Install a new snap ring at this time. When installing the new snap ring, open the the snap ring just far enough to go over the shaft, to avoid stressing the snap ring. If the snap ring is over-stressed, it could come off the shaft and cause internal damage to the transmission.

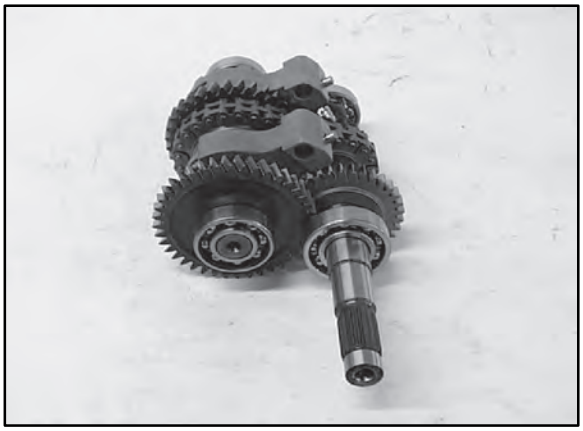
10. Slide the reverse shaft assembly through the silent chain.



11. Install a new needle bearing, the low gear, the thrustwasher and the snap ring. Use of a new snap ring is recommended.
12. Install the engagement dogs, wave springs, and bearing.



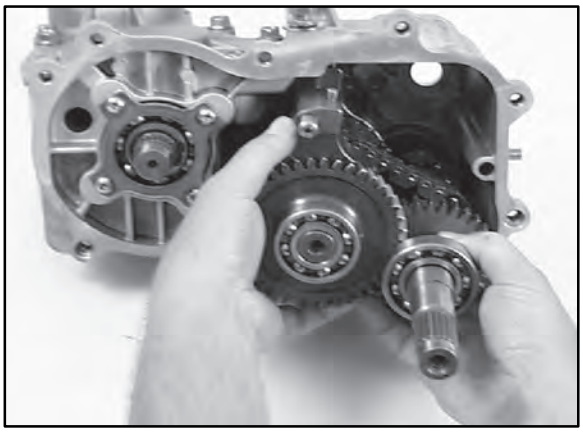
13. Install the ball bearing onto the end of the input shaft.
14. As the engagement dogs are installed onto the shaft, place the wave springs into the spring groove. Keep the spring in place while the fork is being installed on the shaft and while placing the shafts into the case.



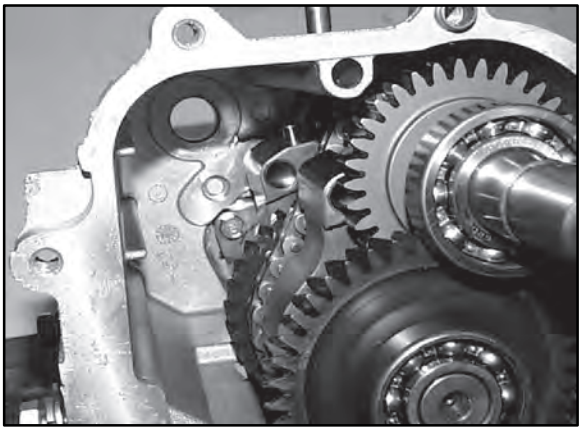
NOTE: Use caution when installing the fork, as the spring can easily fall out.

NOTE: Installing the shift rail will aid in keeping the shift forks, shift dogs, and the springs in place.

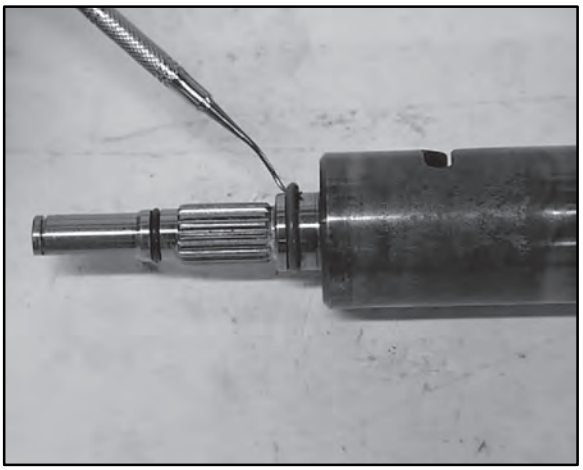
15. Carefully install the shaft assembly and gear cluster as a unit into their respective bearing case recesses. Tap with a soft face hammer to seat shaft assemblies.



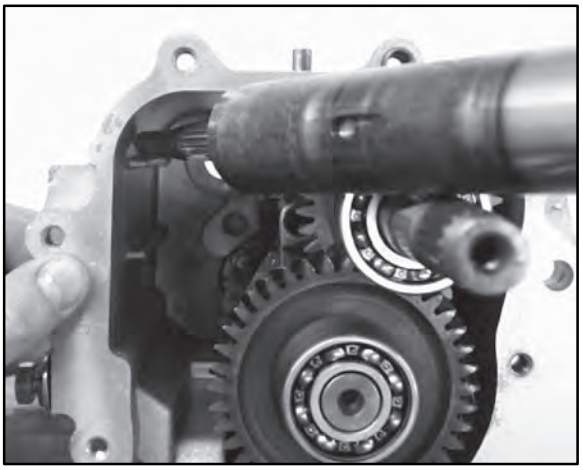
16. Position the shift forks up and so the the pins point toward the 9 o'clock position, before installing the shift drum assembly.



17. Replace and grease the O-rings on the shift drum before installation.

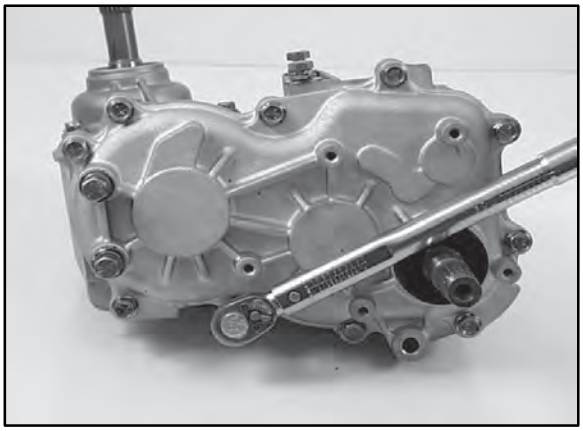


18. Install the shift drum into the case.



NOTE: Make sure shift shaft pins are properly positioned in the slot on selector arms.

19. Lift the shift rail slightly and rotate the rail/fork assembly so it meshes with the tracks on the shiftdrum. Be sure the wave springs are properly in place and that the shift rail is seated into the pocket on the backside of the case.
20. Install the helical gear and bearing onto the pinion shaft.
21. Clean the mating surfaces of the case and cover. Apply Crankcase Sealant (**PN 2871557**) to the mating surfaces. Be sure the locating pins (knock pipes) are in place. Reinstall cover, LH mounting bracket and torque bolts in a criss-cross pattern in 3 steps to 27-34 ft. lbs. (36.50-46 Nm).

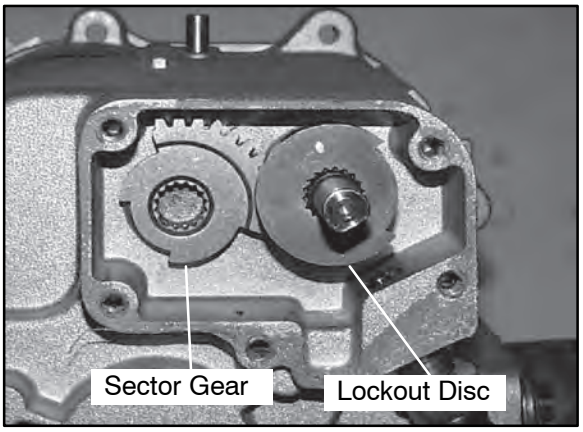


Front Cover Bolt Torque:
27-34 ft. lbs. (36.50-46 Nm)

22. Grease the seal lips of the input shaft seal. Apply electricians tape or somehow cover the splines of the shaft to protect the seal lips during installation. Install new input shaft seal.
23. Install drain plug with a new sealing washer. Torque drain plug to 14-18 ft. lbs. (19-24 Nm).

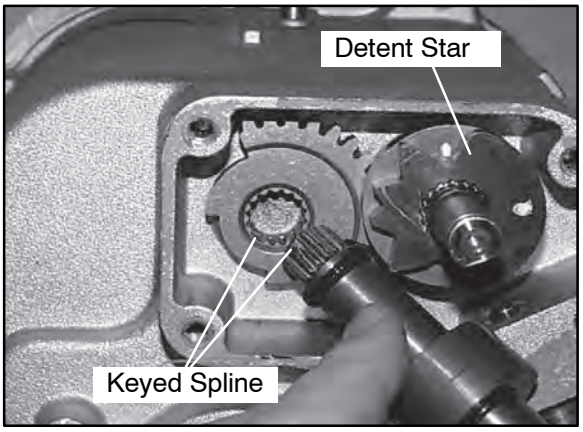
Drain Plug Torque:
14-18 ft. lbs. (19-24 Nm)

24. Place a small amount of grease (**PN 2871551**) into the pocket before installing the sector gear. Install the shift gear (16T) on the shift drum shaft. Install the sector gear in the bushing pocket on the left side. Aligning the timing marks on the gears.

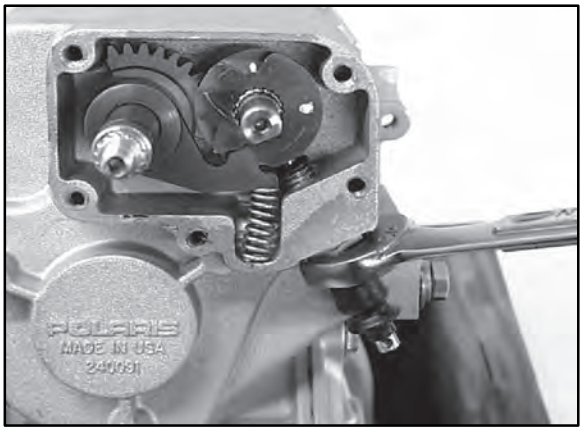


NOTE: Note the location of the skip tooth on the splines. Apply a light coating of grease on the gear teeth.

25. Install the lockout disc. Use the white marks that were previously applied for reference.
26. Install the shift shaft and the detent star. Note the keyed spline on the end of the shaft.

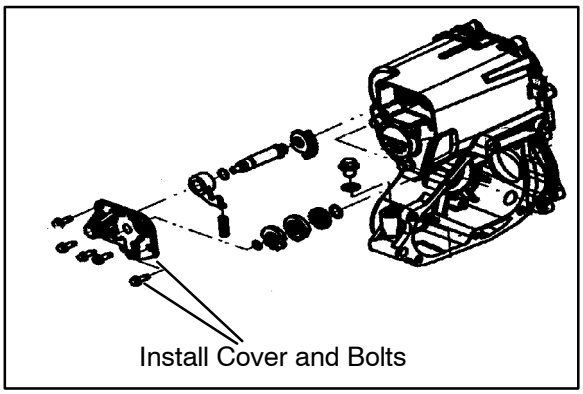


27. Install the detent pawl and spring. Install a new o-ring onto the shift shaft after the detent pawl is assembled to the shaft. Place a small amount of grease on the small O-ring on the shift shaft and on the detent star. Grease the o-ring on the end of the shift drum.

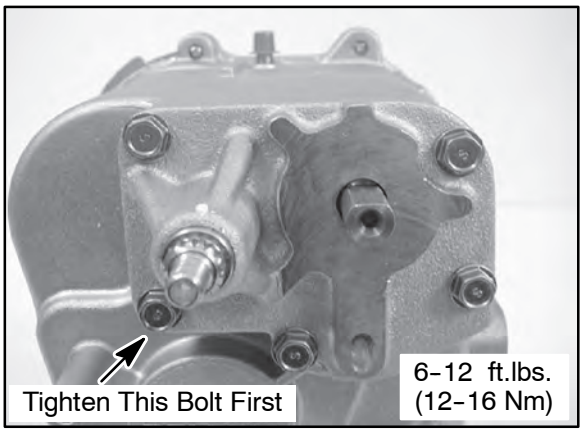


28. Install the park lockout assembly. Torque park lockout to 12 - 14 ft. lbs. (16-19 Nm).

29. Apply Crankcase Sealant (**PN 2871557**) onto the cover and case mating surfaces. Install the cover and hand tighten all of the bolts.



30. Tighten the bolt shown below first. This helps to align the cover and shafts to ensure smoother and precise shifting. Torque the bolt to 6-12 ft. lbs. (12-16 Nm).

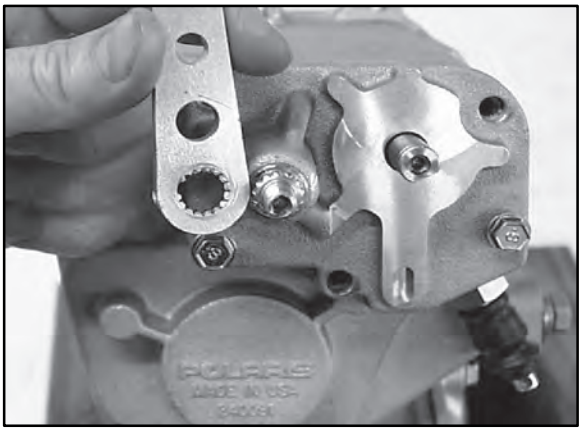


31. Torque the remaining bolts to 6-12 ft.lbs. (12-16 Nm).

Cover Bolt Torque:

6-12 ft. lbs. (12-16 Nm)

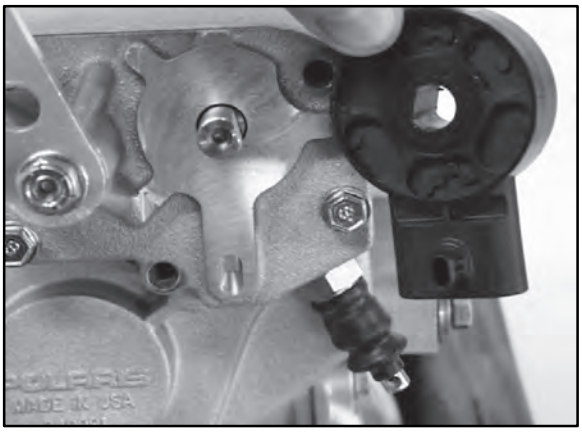
32. Install a new bellcrank onto the shift shaft. Note the keyed spline on the bellcrank and shaft. Install the washer and nut. Torque the bellcrank nut to 12-18 ft. lbs. (16-24 Nm).



Bellcrank Nut Torque:

12-18 ft. lbs. (16-24 Nm)

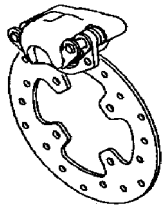
33. Install the shift switch. Install the retaining clip. Hook up the switch harness and reconnect the lockout plunger spring.



NOTE: Rotate the bellcrank to line the flat side of the switch up to the flat side of the shaft.

34. Install transmission and add Polaris AGL Gearcase Lubricant (**PN 2873602**) in the recommended amount. Refer to Maintenance Chapter 2 for more information.

CHAPTER 9
BRAKES



SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2870975	Mity Vac™ Pressure Test Tool

SPECIFICATIONS

Front Brake Caliper		
Item	**Standard**	**Service Limit**
Brake Pad Thickness	.298″ / 7.6mm	.180″ / 4.6mm
Brake Disc Thickness	.150-.164″ / 3.810-4.166mm	.140″ / 3.556mm
Brake Disc Thickness Variance Between Measurements	-	.002″ / .051mm
Brake Disc Runout	-	.005″ / .50mm

Rear Axle Brake Caliper		
Item	**Standard**	**Service Limit**
Brake Pad Thickness	.318″ / 7.6mm	.180″ / 4.6mm
Brake Disc Thickness	.177-.187″ /4.496-4.750mm	.167″ / 4.242mm
Brake Disc Thickness Variance Between Measurements	-	.002″ / .051mm
Brake Disc Runout	-	.005″ / .25mm

Master Cylinder I.D. - Front	.750″
Master Cylinder I.D. - Aux. Rear	.500″

TORQUE SPECIFICATIONS

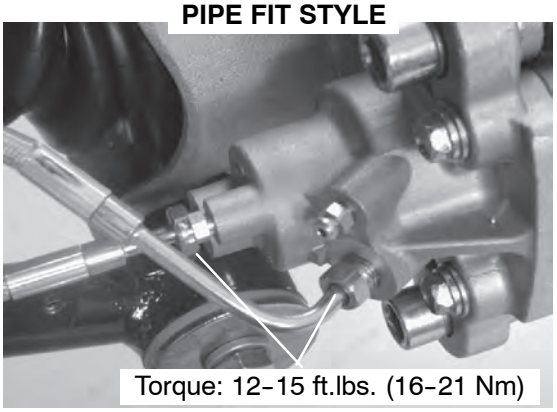
Item	Torque (ft. lbs. except where noted*)	Torque (Nm)
Caliper Mounting Bolts	18.0	24
Handlebar Master Cyl. Clamp Bolts	*25 in. lbs.	3.0
Handlebar Master Cyl. Reservoir Cover Bolt	*5 in. lbs.	0.56
Brake Line Banjo Bolts (if equipped)	15.0	21
Brake Line Pipe Fittings (if equipped)	12–15	16–21
Brake Disc Mount Bolts	18.0	25
Wheel Mounting Nuts	20.0	28
Rear Master Cyl Mounting Bolts	8–11	11–15
Bleeder Screws	*25–30 in. lbs.	3–3.3

NOTE: Refer to the tightening procedures in this chapter when torquing the bolts. Some special procedures are used when torquing certain bolts and fasteners.

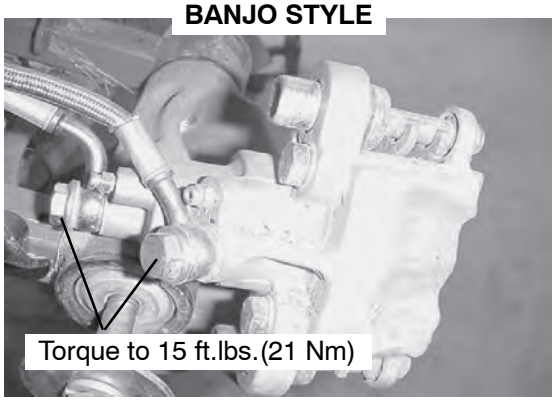
2004 BRAKE LINE IDENTIFICATION

NOTE: 2004 Sportsman ATVs have two different styles of brake lines. The two styles of brake lines are "pipe fit" style and "banjo" style. Be sure to use the proper torque specifications when installing the brake lines onto the caliper. Refer to the pictures below to identify which style of brake line your ATV contains. Although the pictures throughout this chapter reflect the pipe fit style, follow the same procedures if you have the banjo style brake line.

PIPE FIT STYLE



BANJO STYLE



BRAKE SYSTEM SERVICE NOTES

Polaris disc brake systems are light weight, low maintenance and perform well in the conditions ATVs routinely encounter. However, there are a few things to remember when replacing disc brake pads or performing brake system service to ensure proper system function and maximum pad service life.

- Perform a brake burnishing procedure after installing new pads to maximize service life.
- Optional pads are available to suit conditions in your area. Select a pad to fit riding style and environment.
- Do not over-fill the master cylinder fluid reservoir.
- Make sure the brake lever and pedal returns freely and completely.
- Adjust stop pin on front caliper after pad service.
- Check and adjust master cylinder reservoir fluid level after pad service.
- Make sure atmospheric vent on reservoir is unobstructed.
- Test for brake drag after any brake system service and investigate cause if brake drag is evident.
- Make sure caliper moves freely on guide pins (where applicable).
- Inspect caliper piston seals for foreign material that could prevent caliper pistons from returning freely.

CAUTION: Use only DOT 3 brake fluid as an assembly aid for all procedures described in this chapter to prevent brake system contamination. DO NOT USE LUBRICANTS OF ANY KIND FOR ASSEMBLY.

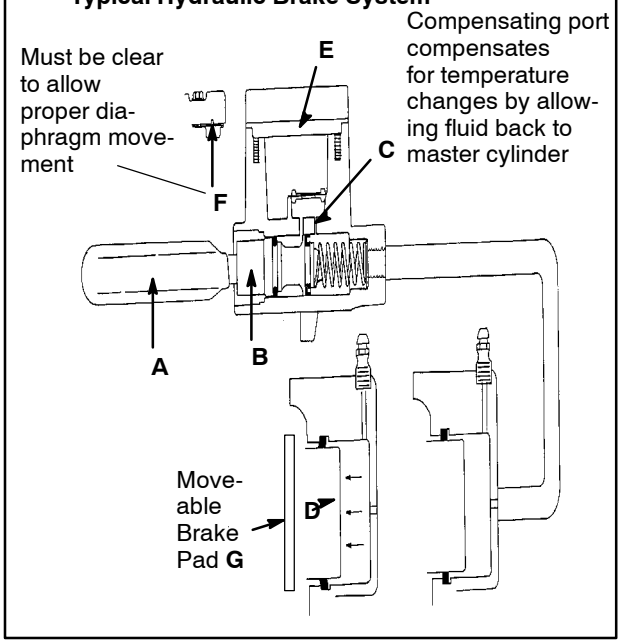
BRAKE NOISE TROUBLESHOOTING

Dirt or dust buildup on the brake pads and disc is the most common cause of brake noise (squeal caused by vibration). If cleaning does not reduce the occurrence of brake noise, Permatex™ Disc Brake Quiet (**PN 2872113**) can be applied to the back of the pads. Follow directions on the package. This will keep pads in contact with caliper piston(s) to reduce the chance of squeaks caused by dirt or dust. See table on the next page.

Brake Noise Troubleshooting	
Possible Cause	**Remedy**
Dirt, dust, or imbedded material on pads or disc	Spray disc and pads with CRC Brake Kleen™ or equivalent non-flammable aerosol brake cleaner. Remove pads and/or disc hub to clean imbedded material from disc or pads.
Pad(s) dragging on disc (noise or premature pad wear) Improper adjustment Insufficient lever or pedal clearance Master cylinder reservoir overfilled Master cylinder compensating port restricted Master cylinder piston not returning completely Caliper piston(s) not returning Operator error (riding the brake / park brake applied)	Adjust pad stop (front calipers) Check position of controls & switches. Set to proper level Clean compensating port Inspect. Repair as necessary Clean piston(s) seal Educate operator
Loose wheel hub or bearings	Check wheel and hub for abnormal movement.
Brake disc warped or excessively worn	Replace disc
Brake disc misaligned or loose	Inspect and repair as necessary
Noise is from other source (chain, axle, hub, disc or wheel)	If noise does not change when brake is applied check other sources. Inspect and repair as necessary
Wrong pad for conditions	Change to a softer or harder pad

HYDRAULIC BRAKE SYSTEM OPERATION OVERVIEW

Typical Hydraulic Brake System



The Polaris disc brake system consists of the following components or assemblies: brake lever; master cylinder; hydraulic hose; brake calipers (slave cylinder); brake pads; and brake discs, which are secured to the drive line.

When the hand activated brake lever (A) is applied it contacts piston (B) within the master cylinder. As the master cylinder piston moves inward it closes a small opening (compensating port C) within the cylinder and starts to build pressure within the brake system. As the pressure within the system is increased, the piston (D) located in the brake caliper moves outward and applies pressure to the brake pad. This pad contacts the brake disc and moves the caliper in its floating bracket, pulling the stationary side pad into the brake disc. The resulting friction reduces brake disc and vehicle speed. As the lever pressure is increased, the braking affect is also increased.

The friction applied to the brake pads will cause the pads to wear. As these pads wear, the piston within the caliper moves further outward and becomes self adjusting. Fluid from the reservoir fills the additional area created when the caliper piston moves outward.

Brake fluid level is critical to proper system operation. Too little fluid will allow air to enter the system and cause the brakes to feel spongy. Too much fluid could cause brakes to drag due to fluid expansion.

Located within the master cylinder is the compensating port (C) which is opened and closed by the master cylinder piston assembly. The port is open

when the lever is released and the master cylinder piston is outward. As the temperature within the hydraulic system changes, this port compensates for fluid expansion (heated fluid) or contraction (cooled fluid). During system service, be sure this port is open. Due to the high temperatures created within the system during heavy braking, it is very important that the master cylinder reservoir have adequate space to allow for fluid expansion. **Never overfill the reservoir!** Fill to 1/4″ - 5/16″ (.64 - .80 cm) from top of the cylinder.

This system also incorporates a diaphragm (E) as part of the cover gasket; and a vent port (F) located between the gasket and the cover. The combination diaphragm and vent allow for the air above the fluid to equalize pressure as the fluid expands or contracts. Make sure the vent is open and allowed to function. If the reservoir is over filled or the diaphragm vent is plugged the expanding fluid may build pressure in the brake system leading to brake failure.

When servicing Polaris ATV brake systems, use only Polaris DOT 3 Brake Fluid (**PN 2870990**).

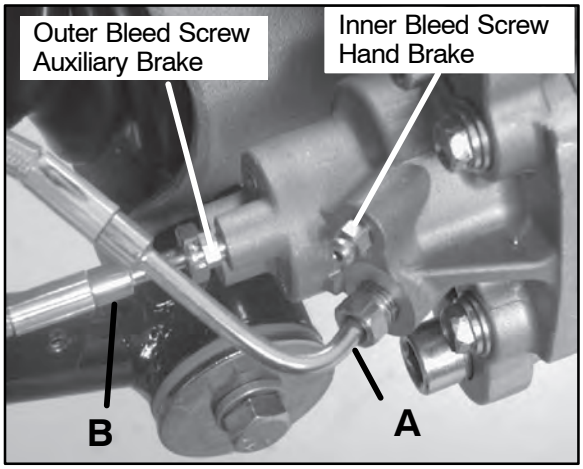
WARNING: Once a bottle is opened, use what is necessary and discard the rest in accordance with local laws. Do not store or use a partial bottle of brake fluid. Brake fluid is hygroscopic, meaning it rapidly absorbs moisture. This causes the boiling temperature of the brake fluid to drop, which can lead to brake fade and the possible loss of control.

HYDRAULIC CALIPER BLEEDING

This caliper is a single piston design. The caliper pistons are “T”-shaped, which allows both hand and foot brake to use the same caliper piston, but remain separated by seals. The hand brake system applies hydraulic pressure to both front calipers and only the *outer* diameter of the rear caliper pistons. The auxiliary (foot) brake applies pressure to the inner portion of the rear caliper pistons. Because the hand and foot brake hydraulic systems are separate, there are also two bleed screws – one for the outer fluid chamber (hand brake), and one for the inner fluid chamber (foot brake). The basic procedure for bleeding the brake system is the same as outlined on page 9.4 - 9.5, however, each system must be bled separately.

Hydraulic Auxiliary Brake inspection and adjustment is outlined in Chapter 2 beginning on Page 2.27.

NOTE: Uppermost (inner) bleed screw and brake line (A) is for hand brake system. Lower (outer) bleed screw and brake line (B) is for auxiliary (foot) brake system.



BRAKE BLEEDING - FLUID CHANGE

NOTE: When bleeding the brakes or replacing the fluid, always start with the caliper farthest from the master cylinder.

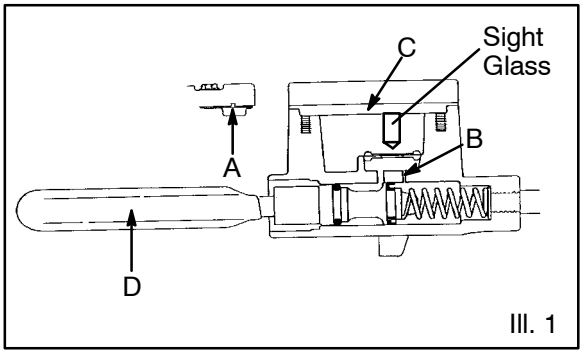
CAUTION:

Always wear safety glasses during these procedures. Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.

NOTE: Do not remove brake lever when reservoir fluid level is low.

This procedure should be used to change fluid or bleed brakes during regular maintenance.

1. Clean reservoir cover thoroughly.
2. Remove screws, cover and diaphragm (C) from reservoir.
3. Inspect vent slots (A) in cover and remove any debris or blockage.

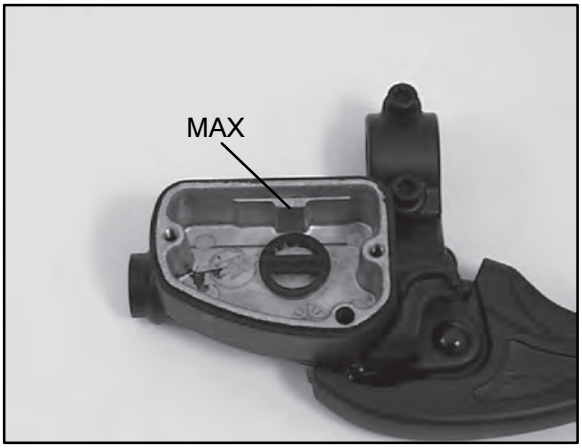


Ill. 1

4. If changing fluid, remove old fluid from reservoir with a Mity Vac™ pump or similar tool.

Mity Vac™ (PN 2870975)

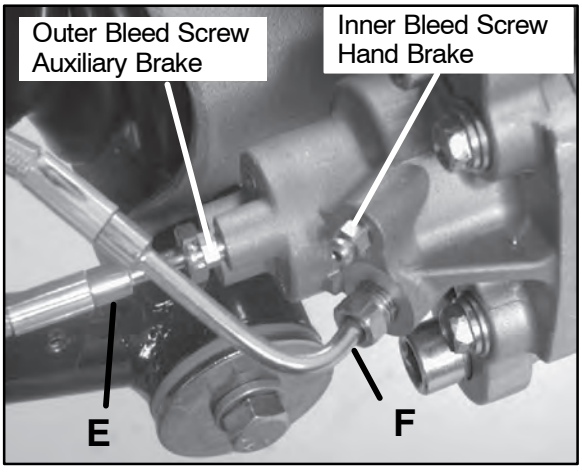
5. Add brake fluid to the indicated MAX level inside reservoir.



Polaris DOT 3 Brake Fluid

(PN 2870990)

6. Begin bleeding procedure with the caliper that is farthest from the master cylinder. Install a box end wrench on caliper bleeder screw. Attach a clean, clear hose to fitting and place the other end in a clean container. Be sure the hose fits tightly on fitting. (E) is Auxiliary Brake Line, (F) is Hand Brake Line.



NOTE: Fluid may be forced from supply port (B) when brake lever is pumped. Place diaphragm (C) in reservoir to prevent spills. Do not install cover. See Illustration 1 on the previous page.

7. *Slowly* pump brake lever (D) until pressure builds and holds.
8. While maintaining lever pressure, open bleeder screw. Close bleeder screw and release brake lever. **NOTE:** Do not release lever before bleeder screw is tight or air may be drawn into caliper.

Bleeder Screw Torque

25-30 in.lbs. (2.80 -3.40 Nm)

9. Repeat procedure until clean fluid appears in bleeder hose and all air has been purged. Add fluid as necessary to maintain level in reservoir.

CAUTION:

Maintain at least 1/2″ (1.27 cm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

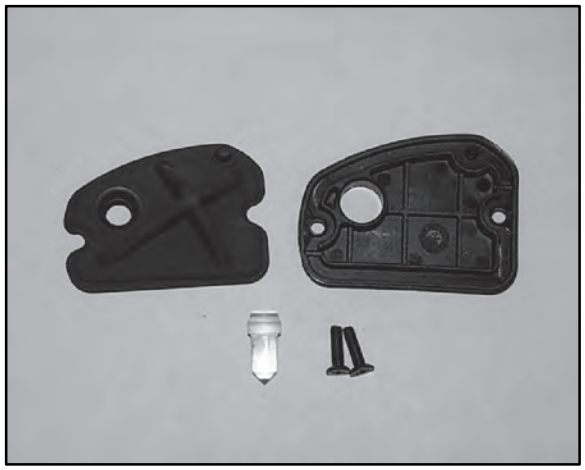
10. Tighten bleeder screw securely and remove bleeder hose. Torque the bleeder screw to 25-30 in.lbs. (2.80 -3.40 Nm).
11. Repeat procedure Steps 5-9 for the remaining caliper(s).
12. Add Polaris Dot 3 Brake Fluid (**PN 2870990**) to MAX level inside reservoir.

Master Cylinder Fluid Level:

MAX level inside reservoir

Sight glass must look dark, if sight glass is clear, fluid level is too low

13. Install diaphragm, cover and screws. Tighten screws to 5 in. lbs. (0.56 Nm).



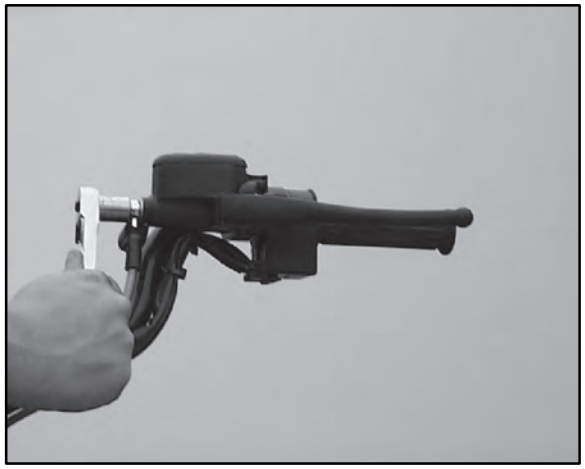
Reservoir Cover Torque -

5 in. lbs. (0.56 Nm)

14. Field test machine at low speed before putting into service. Check for proper braking action and lever reserve. With lever firmly applied, lever reserve should be no less than 1/2″ (1.3 cm) from handlebar.
15. Check brake system for fluid leaks and inspect all hoses and lines for wear or abrasion. Replace hose if wear or abrasion is found.

MASTER CYLINDER REMOVAL

1. Clean master cylinder and reservoir assembly. Make sure you have a clean work area to disassemble brake components.



2. Place a shop towel under brake line connection at master cylinder. Loosen banjo bolt; remove bolt and sealing washers.

CAUTION:

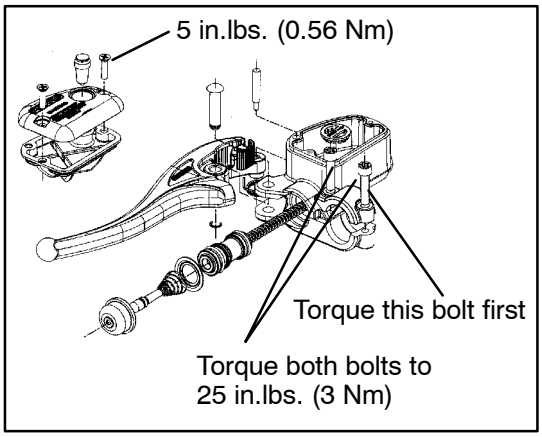
Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.

3. Remove master cylinder from handlebars.
4. Hold brake upright and continue to remove master cylinder. Cover brake line to avoid spillage.

MASTER CYLINDER INSTALLATION

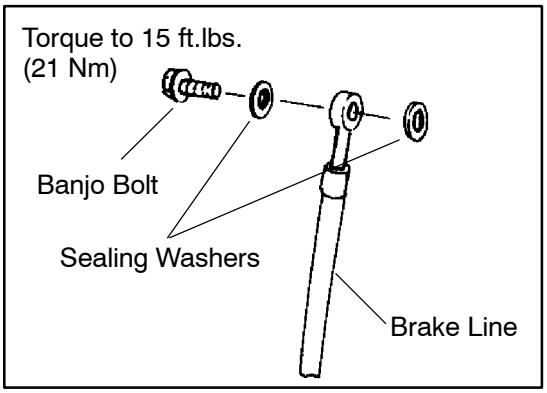
Notice: When replacing the brake master cylinder assembly or master cylinder parts, use the correct parts. There are different brake master cylinders for the different Polaris ATV models. Refer to your parts manual or guide for the correct parts. ***The master cylinder is not serviceable and is replaced as a unit.***

1. Install master cylinder on handlebars. Torque clamp bolts to 25 in. lbs. (3 Nm). Torque the inside bolt first as indicated in the illustration to the right.



NOTE: To speed up the brake bleeding procedure, the master cylinder can be purged of air before brake line is attached. Fill with DOT3 Brake Fluid (**PN 2870990**) and pump lever slowly two to three times with finger over the outlet end to purge master cylinder of air.

2. Place new sealing washers on each side of banjo line and torque banjo bolt to specification.



Handlebar Master Cyl. Clamp Bolt Torque 25 in. lbs. (3 Nm)

Brake Line Banjo Bolt Torque 15 ft. lbs. (21 Nm)

3. Fill reservoir with DOT3 Brake Fluid (**PN 2870990**).

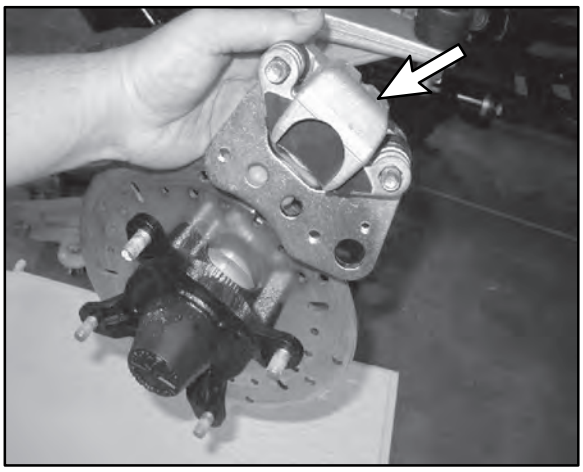
Polaris DOT 3 Brake Fluid

(PN 2870990)

4. Follow bleeding procedure on Pages 9.7-9.8. Check all connections for leaks and repair if necessary.

FRONT PAD REMOVAL

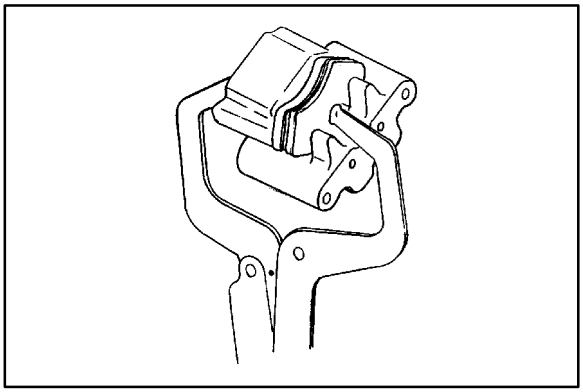
1. Elevate and support front of machine.



CAUTION:

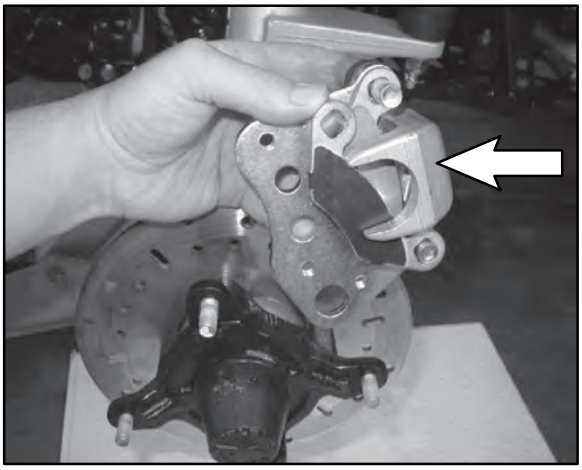
Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

2. Remove the front wheel. Loosen pad adjuster screw 2-3 turns.
3. Remove caliper mounting bolts.
4. Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.

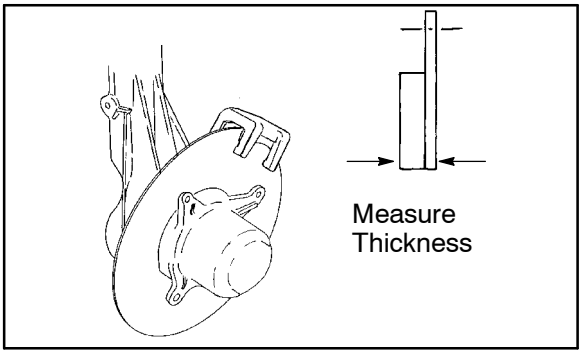


NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

5. Push mounting bracket inward and slip outer brake pad past edge. Remove inner pad.



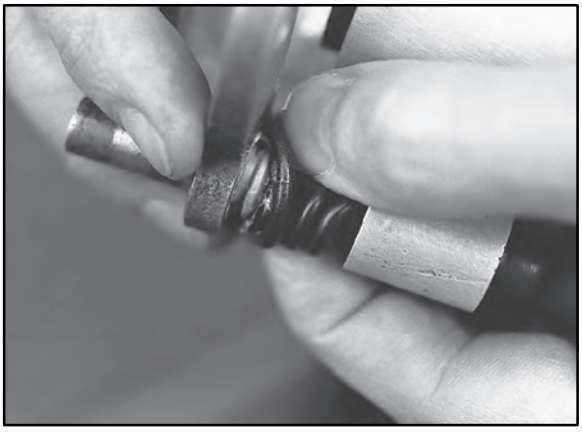
6. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



Front Brake Pad Thickness
New .298″ / 7.6 mm
Service Limit .180″ / 4.0 mm

FRONT PAD INSTALLATION

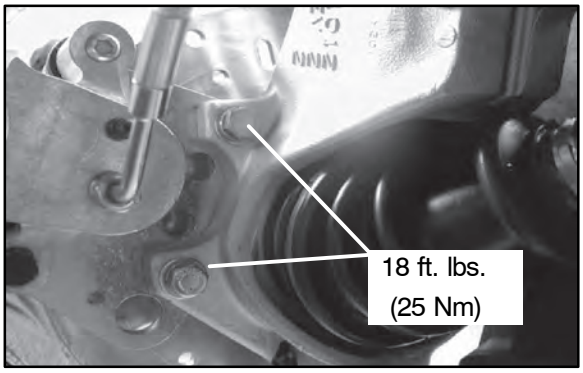
1. Lubricate mounting bracket pins with a light film of Polaris Premium All Season Grease, and install rubber dust boots.



Polaris Premium All Season Grease

(PN 2871423)

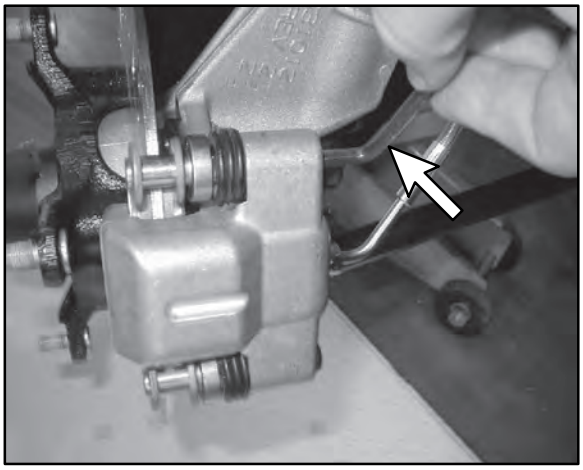
2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other. Be sure pads and disc are free of dirt or grease.
3. Install caliper on hub strut, and torque mounting bolts.



Front Caliper Mounting Bolts

Torque: 18 ft. lbs. (25Nm)

4. Slowly pump the brake lever until pressure has been built up. Maintain at least 1/2″ (12.7 mm) of brake fluid in the reservoir to prevent air from entering the brake system.
5. Install the adjuster screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counterclockwise).



6. Verify fluid level in reservoir is up to MAX line inside reservoir and install reservoir cap.

Master Cylinder Fluid
Up to MAX line inside reservoir

7. Install wheels and torque wheel nuts.

Front Wheel Nut Torque

20 ft. lbs. (27 Nm)

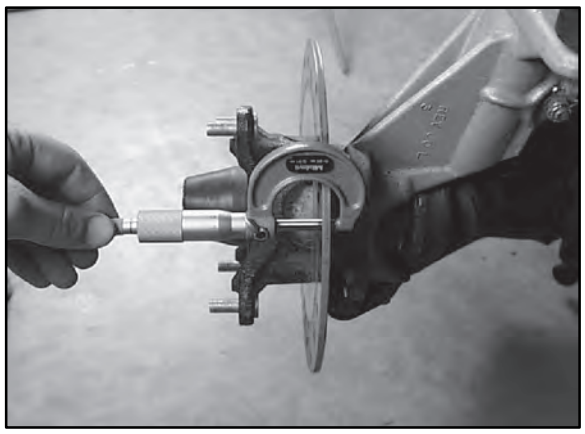
BRAKE BURNISHING PROCEDURE

It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warpage may result. Repeat this procedure 10 times.

FRONT DISC INSPECTION

1. Visually inspect the brake disc for nicks, scratches, or damage.
2. Measure the disc thickness at eight different points around the pad contact surface using a 0-1″ micrometer. Replace disc if worn beyond service limit.



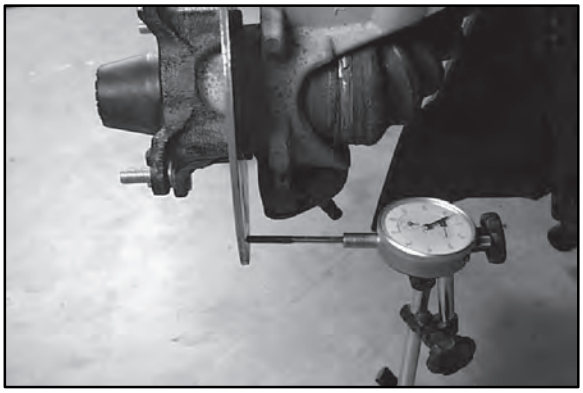
Brake Disc Thickness

New .150-.164″ (3.810-4.166 mm)
Service Limit .140″ / 3.556 mm

Brake Disc Thickness Variance

Service Limit: .002″ (.051 mm) difference between measurements.

3. Mount dial indicator as shown to measure disc runout. Slowly rotate the disc and read total runout on the dial indicator. Replace the disc if runout exceeds specifications.



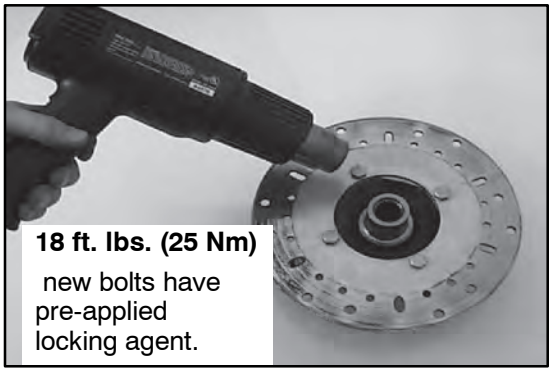
Brake Disc Runout

Service Limit .010″ (.254 mm)

FRONT BRAKE DISC REMOVAL / REPLACEMENT

NOTE: To reduce the possibility of warpage, try removing the brake disc mounting bolts before applying heat to the bolts.

1. Apply heat to the hub in the area of the brake disc mounting bolts to soften the bolt locking agent.



18 ft. lbs. (25 Nm)
new bolts have pre-applied locking agent.

2. Remove bolts and disc.
3. Clean mating surface of disc and hub.
4. Install disc on hub.
5. Install new bolts and tighten to specified torque.

Front Brake Disc Mounting Bolt Torque
18 ft. lbs. (25 Nm)

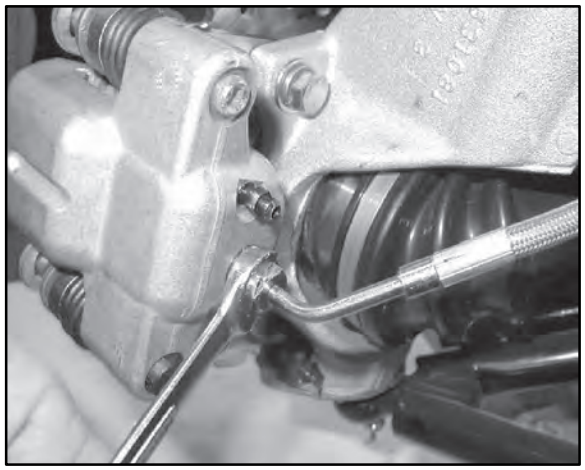
CAUTION: Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

FRONT CALIPER REMOVAL

CAUTION:

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

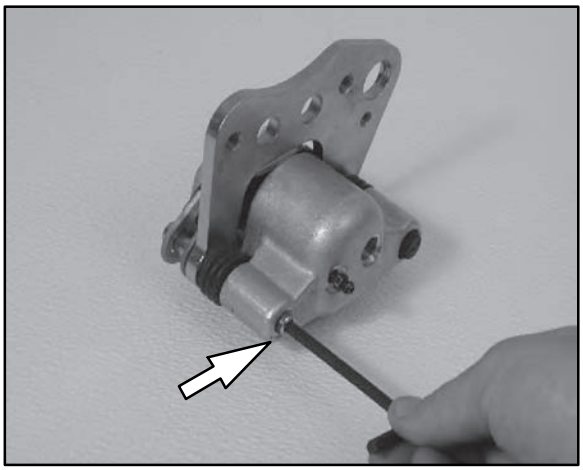
1. Remove brake pads. See Page 9.9–9.10.
2. Using a line wrench, loosen and remove brake line to caliper. Place a container under caliper to catch fluid draining from brake line.



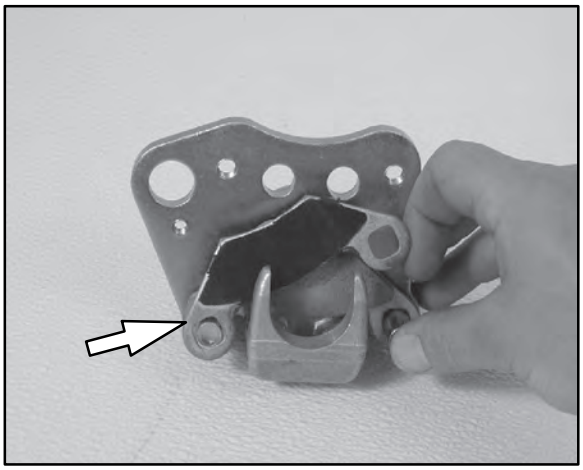
3. Remove brake caliper and drain fluid into container. Do not reuse brake fluid.

FRONT CALIPER DISASSEMBLY

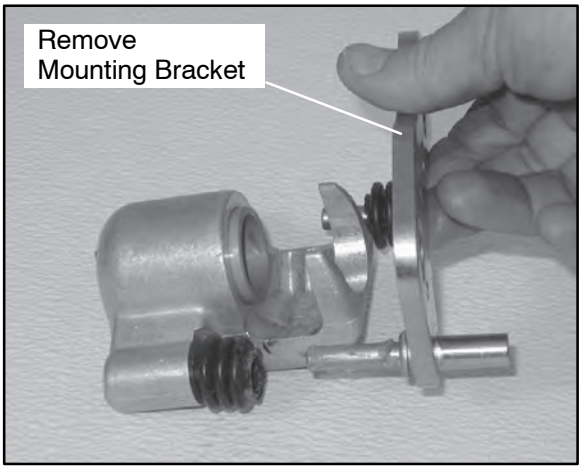
1. Remove brake pad adjuster screw.



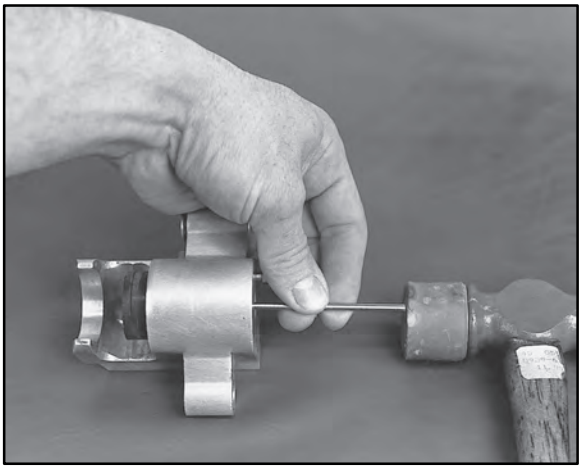
2. Push upper pad retainer pin inward and slip brake pads past edge.



3. Remove mounting bracket, pin assembly and dust boot.

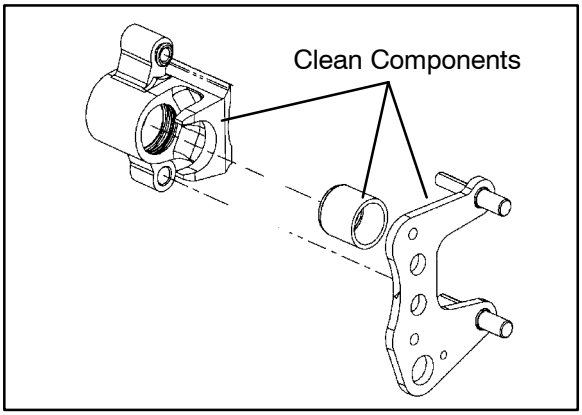


4. Remove piston, dust seal and piston seal.



5. Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.

NOTE: Be sure to clean seal grooves in caliper body.

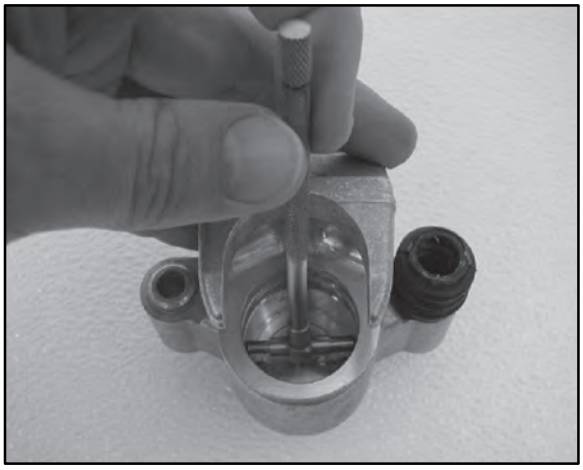


FRONT CALIPER INSPECTION

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.

Front Caliper Piston Bore I.D.

Std. 1.191-1.192″ (30.25-30.28 mm)
Service Limit 1.193″ (30.30 mm)

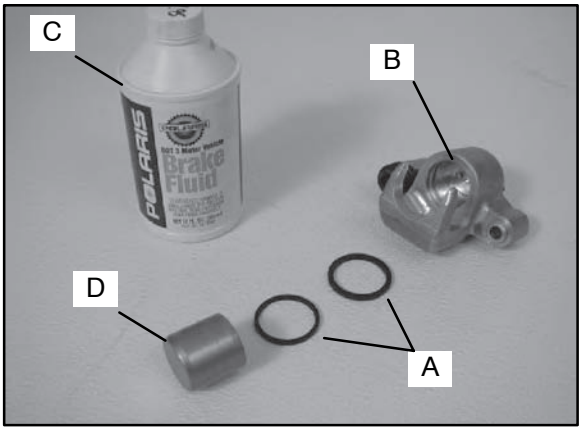


2. Inspect piston for nicks, scratches, wear or damage. Measure diameter and replace if damaged or worn beyond service limit.

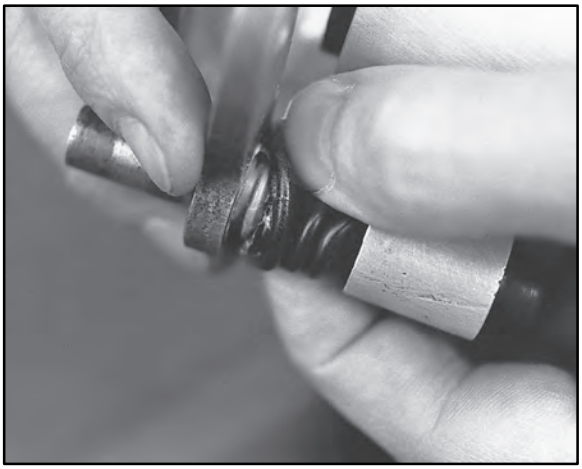
3. Inspect the brake disc and pads as outlined for brake pad replacement this section. See Pages 9.10–9.11.

FRONT CALIPER REASSEMBLY

1. Install new O-rings (A) in the caliper body (B). Be sure groove is clean and free of residue or brakes may drag upon assembly.



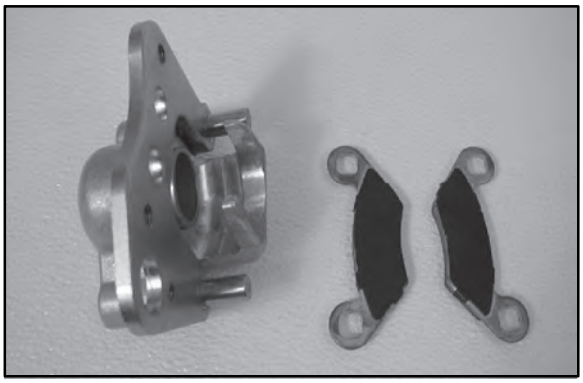
2. Coat piston with clean Polaris DOT 3 Brake Fluid (C). Install piston (D) with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.
3. Lubricate the mounting bracket pins with Polaris Premium All Season Grease, and install the rubber dust seal boots.



Polaris Premium All Season Grease

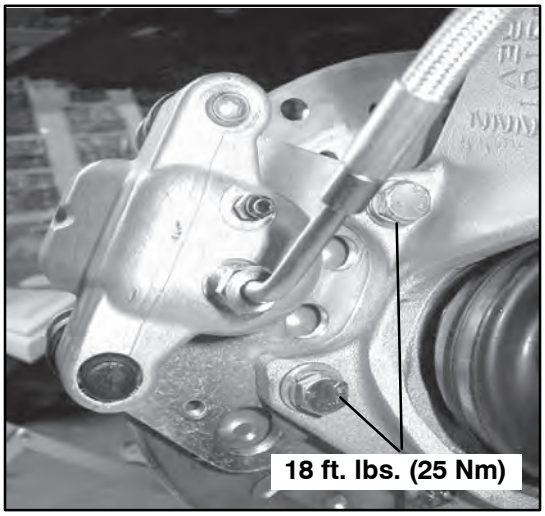
(PN 2871423)

4. Compress the mounting bracket and make sure the dust seals are fully seated. Install the pads as shown on Page 9.10. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.



FRONT CALIPER INSTALLATION

1. Install caliper on hub strut, and torque mounting bolts.



Front Caliper Mounting Bolt Torque
18 ft. lbs. (25 Nm)

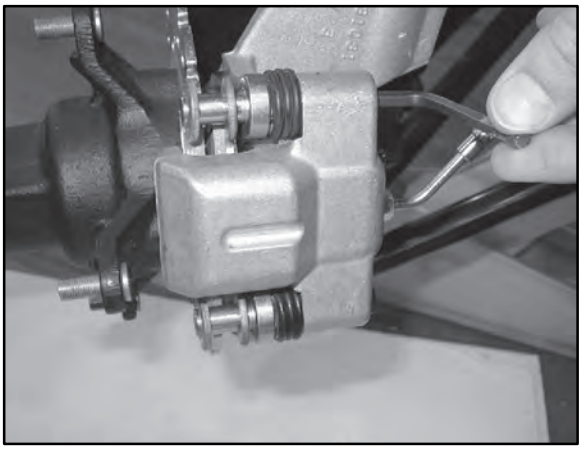
2. Install brake line and tighten securely with a line wrench. Torque the brake lines to the proper torque specification.

NOTE: See Page 9.3 to identify which style brake line the ATV has installed.

Brake Line Torque

Banjo Style: 15 ft. lbs. (21 Nm)
Pipe Fit Style: 12-15 ft. lbs. (16-20 Nm)

3. Install the adjuster screw and turn until stationary pad contacts disc, then back off 1/2 turn.

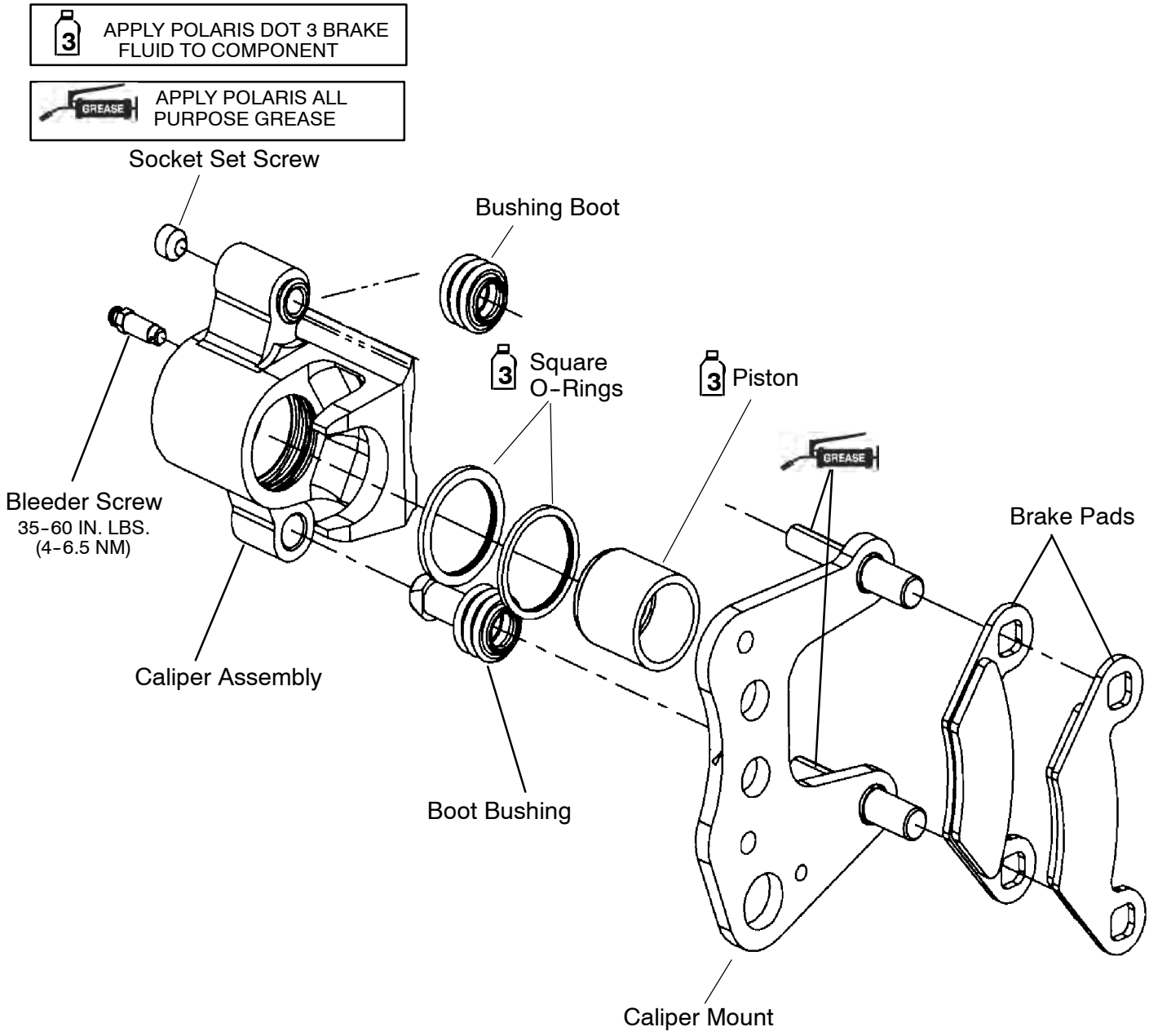


4. Follow brake bleeding procedure outlined on Pages 9.5-9.6.
5. Install wheels and torque wheel nuts to specification.

Front Wheel Nut Torque
20 ft. lbs. (27 Nm).

NOTES

FRONT BRAKE CALIPER EXPLODED VIEW



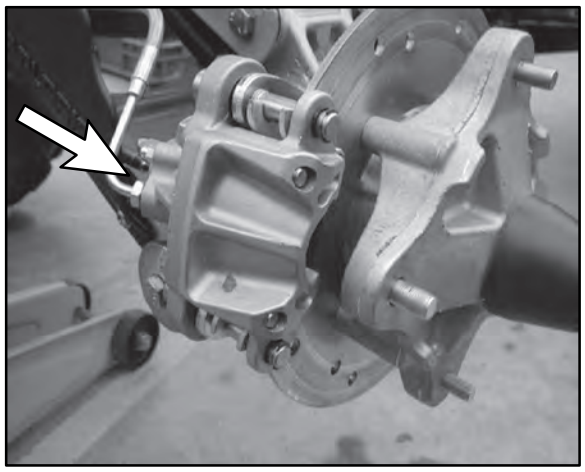
BRAKE BURNISHING PROCEDURE

It is required that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Allow pads and disc to cool sufficiently during the procedure. Do not allow pads or disc to become hot or warpage may result. Repeat this procedure 10 times.

REAR BRAKE PAD REMOVAL

1. Support the machine. Remove the rear tire.



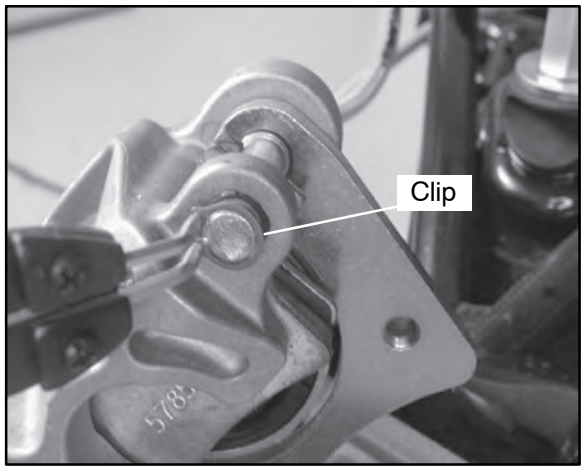
2. Remove caliper mounting bolts and lift caliper off of disc.

NOTE: When removing caliper, be careful not to damage brake line. Support caliper so as not to kink or bend brake line.

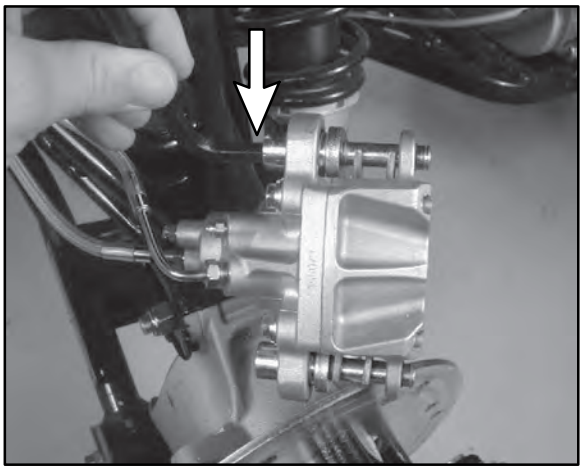
3. Push caliper pistons into caliper bore slowly with pads installed.

NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

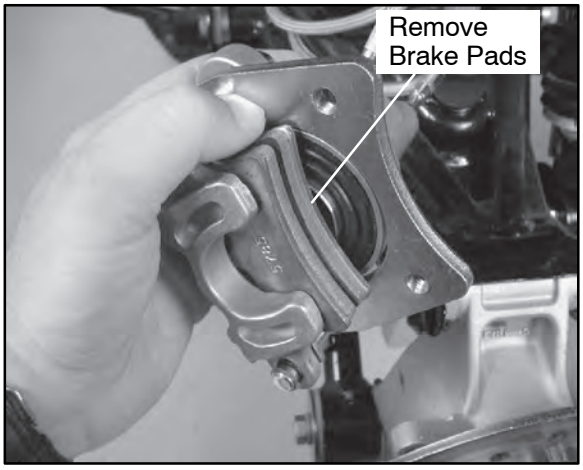
4. Remove the clip from the slide bolt.



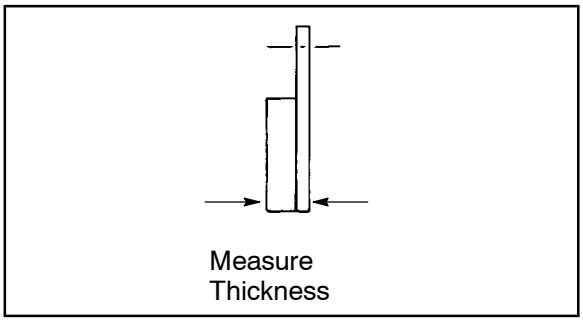
5. Remove a slide bolt with a hex wrench.



6. Remove the brake pads from the caliper.



7. Clean the caliper with brake cleaner or alcohol.
8. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.

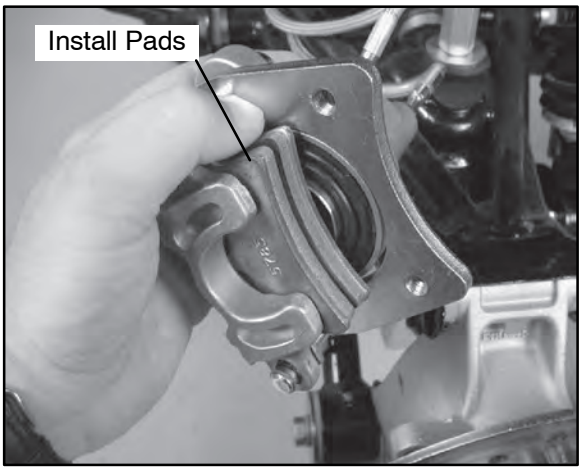


Rear Brake Pad Thickness
New: .318″ (8.0 mm)

Service Limit: .180″ (4.6 mm)

REAR BRAKE PAD INSTALLATION

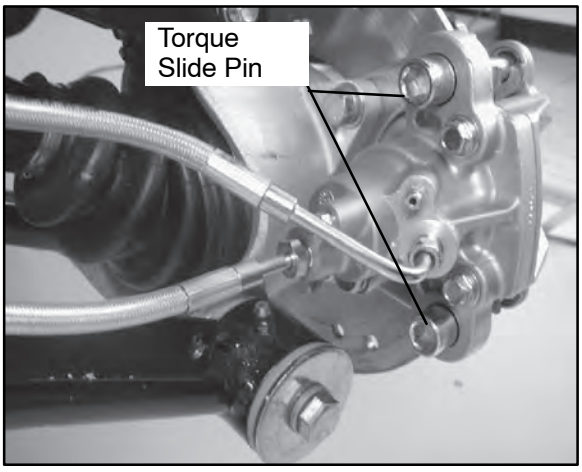
1. Install new brake pads in caliper body.



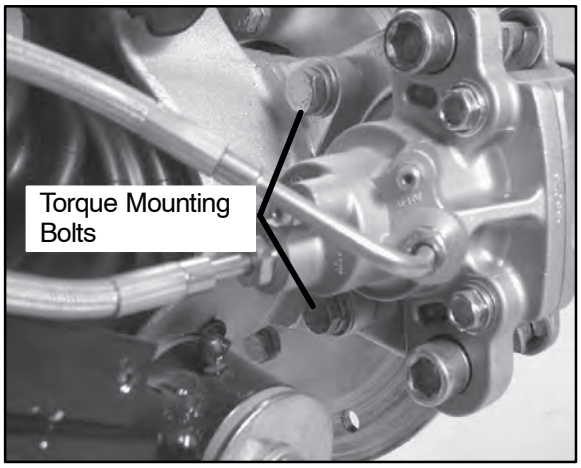
2. Tighten the slide pin with a hex wrench.
3. Install the slide bolt snap ring. Torque the slide pin to 30–35 ft. lbs. (41 Nm–48 Nm).

Caliper Slide Pin Torque:

30–35 ft. lbs. (41 Nm–48 Nm)



4. Install caliper and torque the mounting bolts.



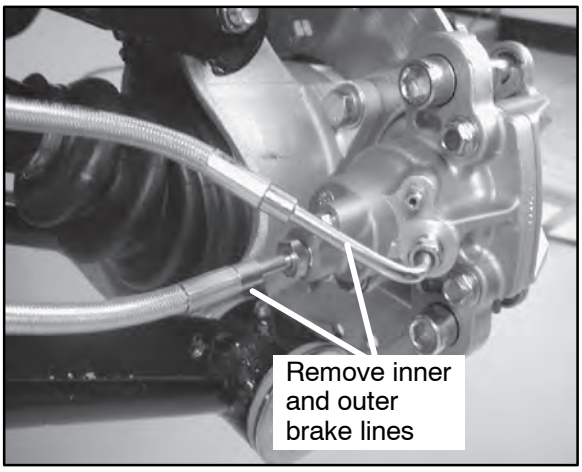
Rear Brake Caliper

Torque: 18 ft. lbs. (25 Nm)

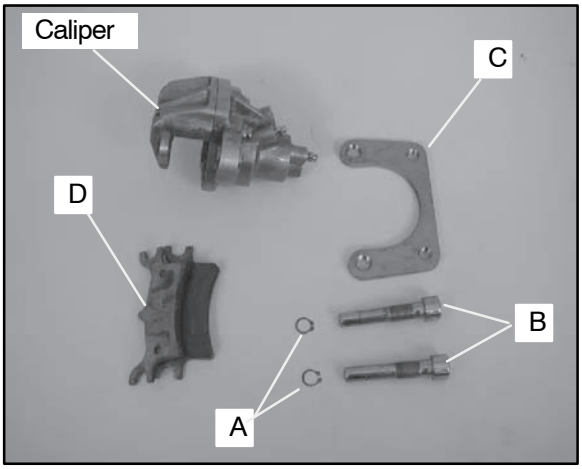
5. Slowly pump the brake lever until pressure has been built up. Maintain at least 1/2″ (12.7 mm) of brake fluid in the reservoir to prevent air from entering the master cylinder.
6. It is recommended that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise. Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Repeat procedure 10 times.

REAR CALIPER REMOVAL/INSPECTION

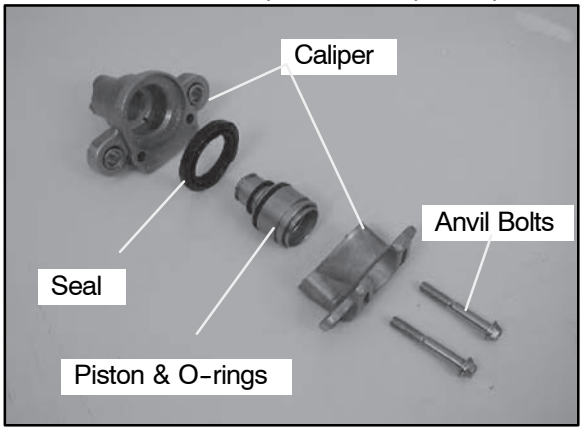
1. Clean caliper area before removal.
2. Using a flare nut wrench, remove hand brake (inner) and auxiliary brake (outer) lines. Place a container to catch brake fluid draining from brake lines.



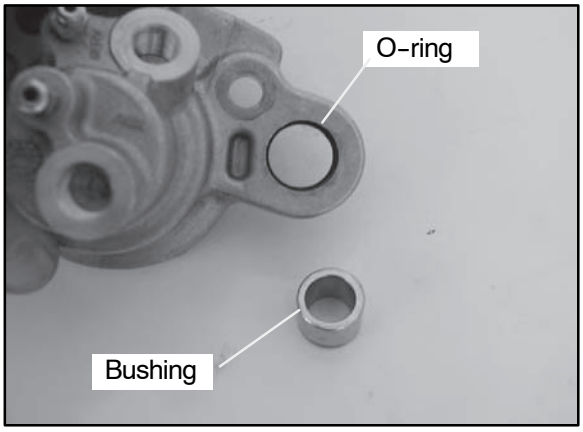
3. Remove the two caliper bolts and the caliper.
4. Remove the slide bolt snap rings (A), the slide pins(B), the bracket pad (C), and the brake pads (D).



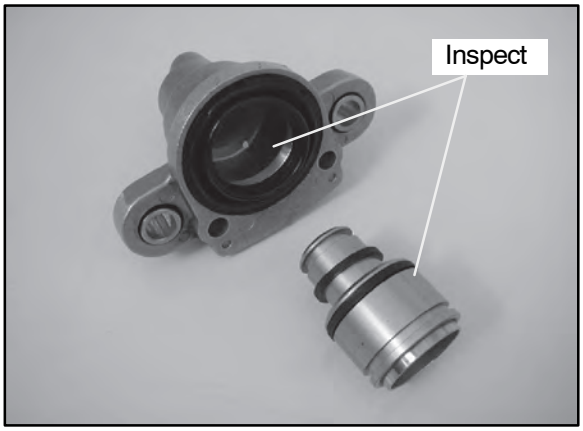
5. Remove the anvil bolts and separate caliper halves and remove pistons with piston pliers.



6. Remove seals and O-rings. Clean the O-ring grooves.
7. Clean disc, caliper body, and pistons with brake cleaner or alcohol.
8. Remove the slide bolt bushings. Inspect the bushings and O-rings and replace if necessary.



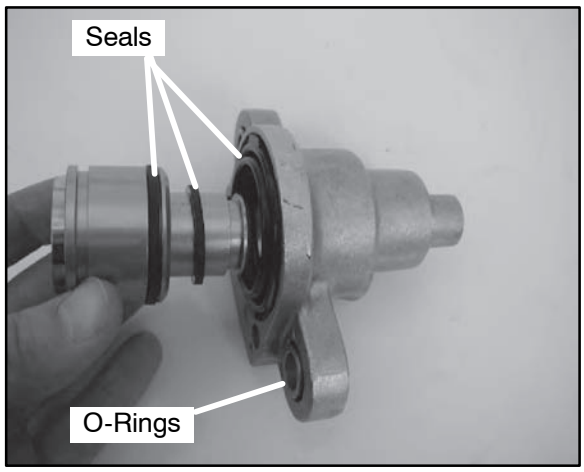
9. Inspect caliper piston bore for scratches, severe corrosion, or galling and replace if necessary.



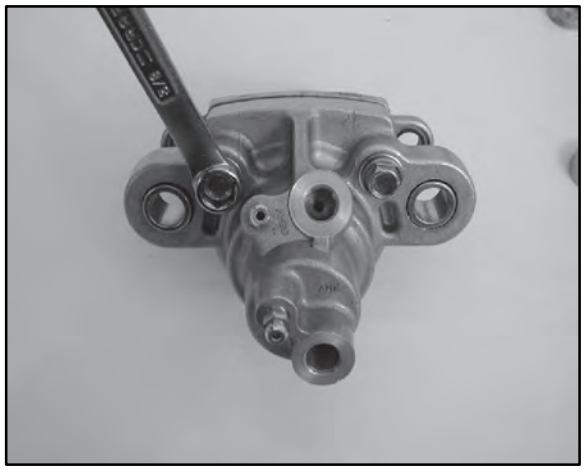
10. Inspect surface of caliper piston for nicks, scratches, or damage and replace if necessary.

REAR CALIPER ASSEMBLY

1. Install new O-rings in the slide bolt bushing holes. Be sure O-ring and seal grooves are thoroughly cleaned of all residue, or piston may bind in bore. Apply brake fluid to piston seals and install carefully with a twisting motion to ease assembly until fully seated.



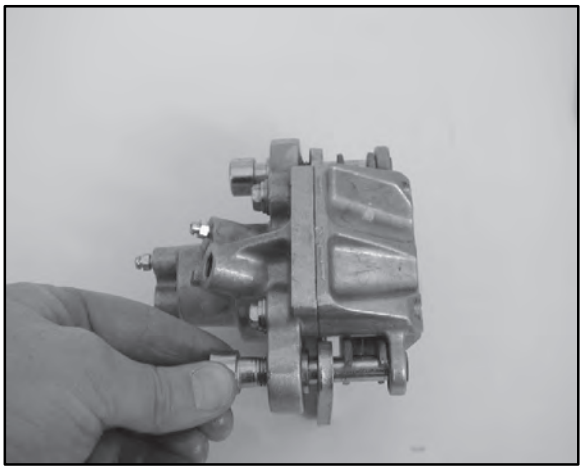
2. Carefully assemble caliper body, making sure O-rings are properly positioned in groove. Tighten the caliper anvil bolts and then torque the anvil bolts evenly to 16–18 ft. lbs. (22–25 Nm).



Caliper Anvil Bolt Torque:

16–18 ft. lbs. (22 Nm–25 Nm)

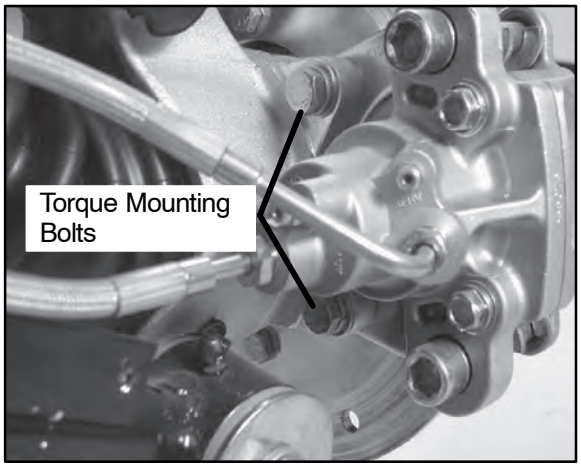
3. Install brake pads in caliper body with friction material facing each other. Install the slide pins and the slide pin retaining ring. Torque the slide pins to 30–35 ft.lbs. (41–48 Nm).



Caliper Slide Pin Torque:

30–35 ft. lbs. (41 Nm–48 Nm)

4. Install caliper and torque mounting bolts to 18 ft.lbs (25 Nm).

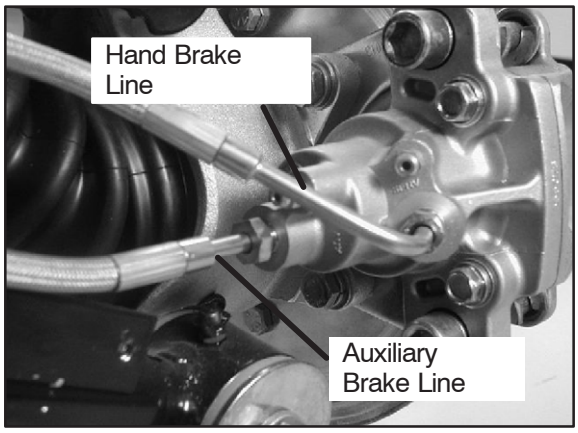


Caliper Mounting Bolt Torque

18 ft. lbs. (25 Nm)

5. Install brake line and tighten securely with a line wrench. Torque the brake lines to the proper torque specification.

NOTE: See Page 9.3 to identify which style brake line your ATV has installed.



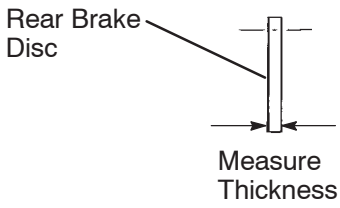
Brake Line Torque

Banjo Style: 15 ft. lbs. (21 Nm)
Pipe Fit Style: 12–15 ft. lbs. (16–20 Nm)

6. Follow bleeding procedure outlined on Pages 9.6-9.7 of this section and refer to system overview and illustrations on Pages 9.2–9.3.
7. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when lever is released. If the brake drags, re-check assembly and installation.

REAR BRAKE DISC INSPECTION

1. Visually inspect disc for scoring, scratches, or gouges. Replace the disc if any deep scratches are evident.
2. Use a 0-1″ micrometer and measure disc thickness at 8 different points around perimeter of disc. Replace disc if worn beyond service limit.



Brake Disc Thickness

New .177-.187″ (4.496-4.750 mm)
Service Limit .167″ (4.242 mm)

Brake Disc Thickness Variance

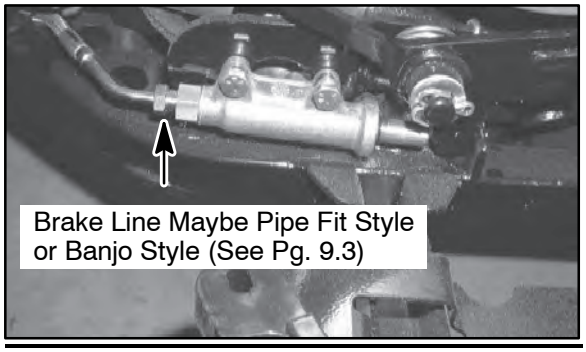
Service Limit .002″ (.051 mm) difference between measurements

3. Mount dial indicator and measure disc runout. Replace the disc if runout exceeds specifications.

Brake Disc Runout

Service Limit .010″ (.254 mm)

AUXILIARY BRAKE REMOVAL / INSTALL



Brake Pedal Removal / Install

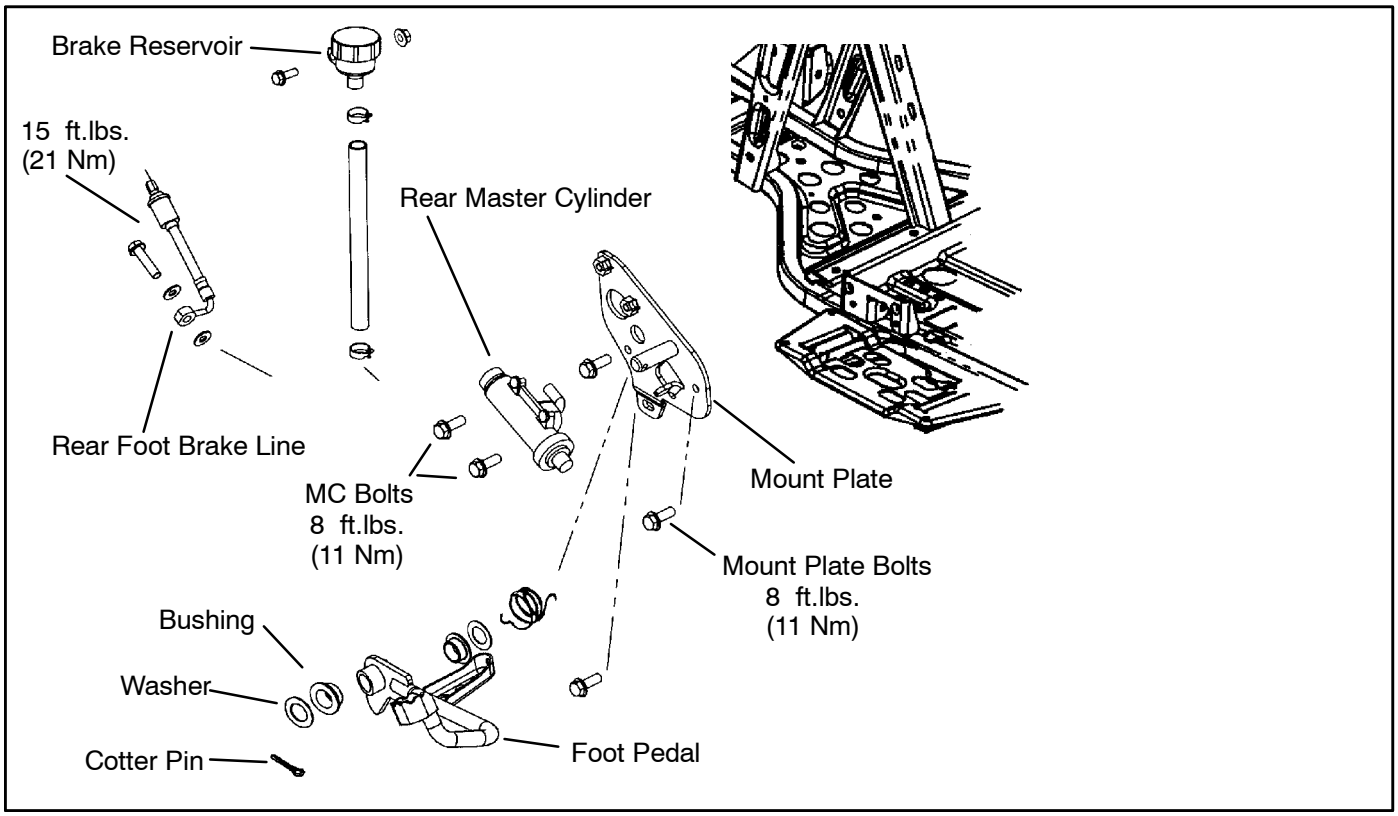
1. To remove the brake pedal:
   - Remove the spring attached to the transmission park lock mechanism
   - Remove the cotter key
   - Remove the washers, bushings, and tension spring
2. Reverse the steps for installation, use a new cotter key during installation.

Rear Brake Master Cylinder Removal / Install

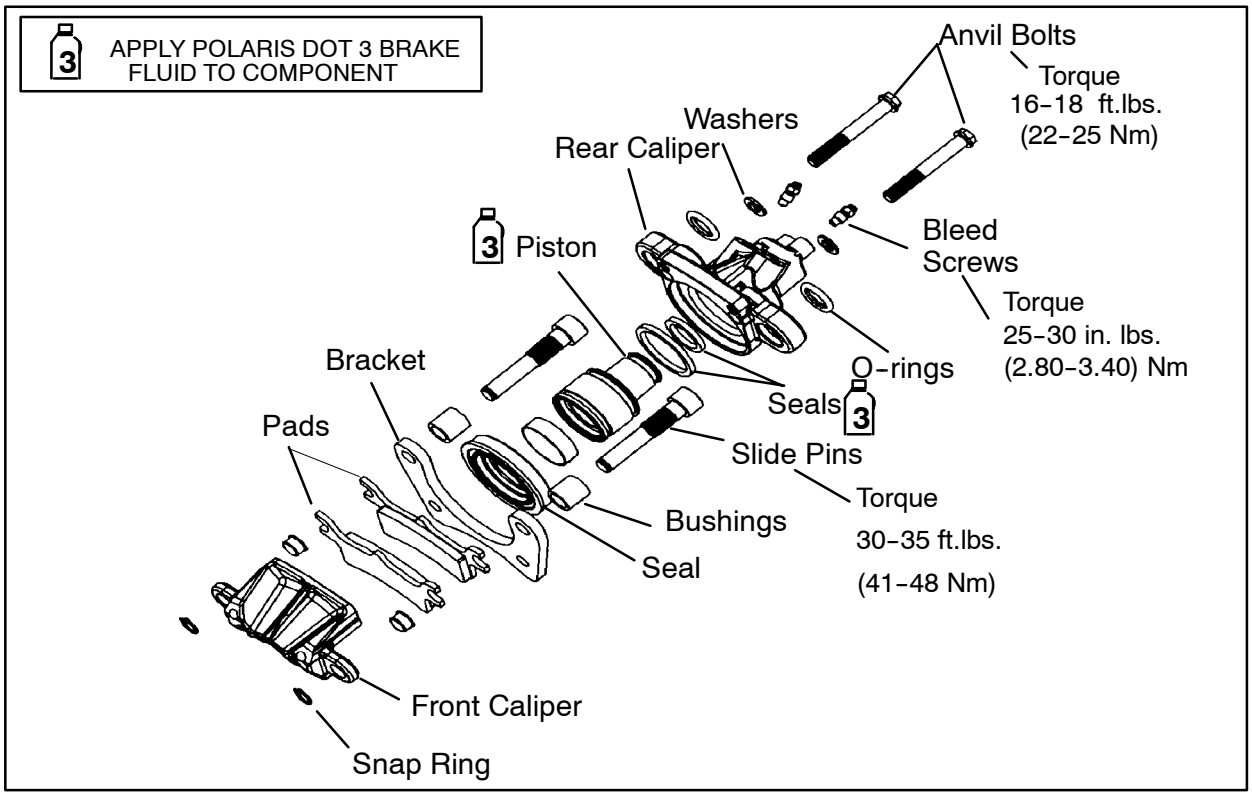
1. If necessary, remove the rear brake line from the master cylinder. Use a suitable container to catch the brake fluid. Dispose of brake fluid properly.
2. Remove the two bolts that secure the rear master cylinder to the brake mount plate. Replace parts as needed.
3. To install the rear brake master cylinder, mount the master cylinder to the mount plate and torque bolts to 8 ft.lbs. (11 Nm).
4. Reinstall the brake line and torque the banjo bolt to 15 ft.lbs. (21 Nm). If the rear brake line is the pipe fit style, torque the fitting to 12–15 ft. lbs. (16–20 Nm).

NOTE: See Page 9.3 to identify which style brake line your ATV contains.

AUXILIARY MASTER CYLINDER ASSEMBLY



REAR BRAKE CALIPER EXPLODED VIEW



TROUBLESHOOTING

Brakes Squeal

- Dirty/contaminated friction pads
- Improper alignment
- Worn disc
- Worn disc splines

Poor Brake Performance

- Air in system
- Water in system (brake fluid contaminated)
- Caliper/disc misaligned
- Caliper dirty or damaged
- Brake line damaged or lining ruptured
- Worn disc and/or friction pads
- Incorrectly adjusted lever
- Incorrectly adjusted stationary pad
- Worn or damaged master cylinder or components
- Improper clearance between lever and switch

Lever Vibration

- Disc damaged
- Disc worn (runout or thickness variance exceeds service limit)

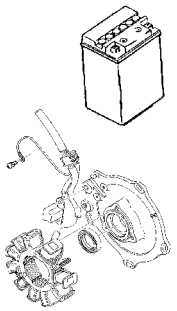
Caliper Overheats (Brakes Drag)

- Compensating port plugged
- Pad clearance set incorrectly
- Auxiliary brake pedal incorrectly adjusted
- Brake lever or pedal binding or unable to return fully
- Parking brake left on
- Residue build up under caliper seals
- Operator riding brakes

Brakes Lock

- Alignment of caliper to disc.

CHAPTER 10
ELECTRICAL

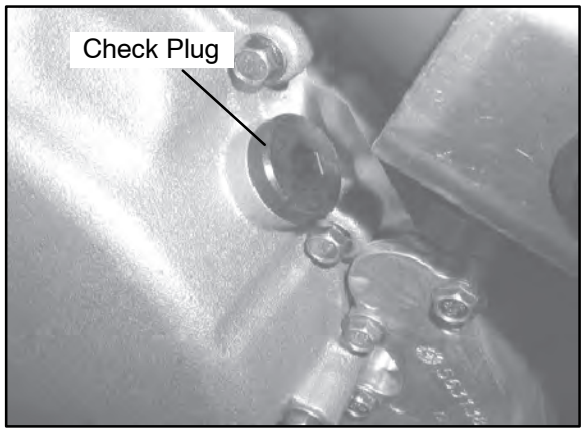


10

TIMING CHECK PROCEDURE

NOTE: ***2004 Sportsman 600/700 ATVs were built with either a Ducati ignition system or a Kokusan ignition system. Ducati ignitions were installed on all models built before February 20, 2003. Kokusan ignitions were installed on models built on February 20, 2003 and after. Be sure to identify the build date of the ATV to properly identify the style of ignition system used for proper diagnosis purposes.***

1. The ignition timing check hole is in the starter recoil/magneto housing. Remove the check plug.

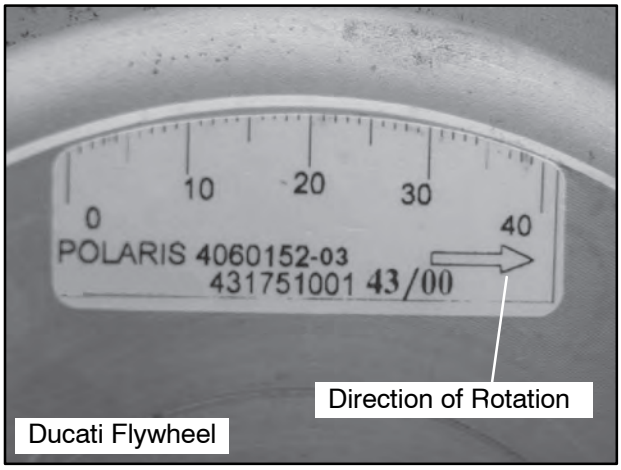


NOTE: The ignition timing marks are stamped on the outside of the flywheel. Ignition timing must be inspected with the engine at room temperature (68°F / 20° C).

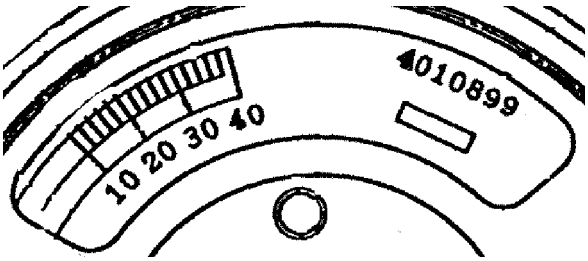
2. With the transmission in neutral, start the engine and open throttle until engine is at 5000 ± 200 RPM.
3. Direct the timing light at the ignition timing check hole and check the ignition timing. **NOTE:** Do not allow the engine to warm up. The timing will retard approximately 2° when the engine is warm.

If the ignition timing is not within the specified range, test the ignition components for signs of failure.

The timing tag on the flywheel indicates the direction of rotation and the scale for ignition timing.

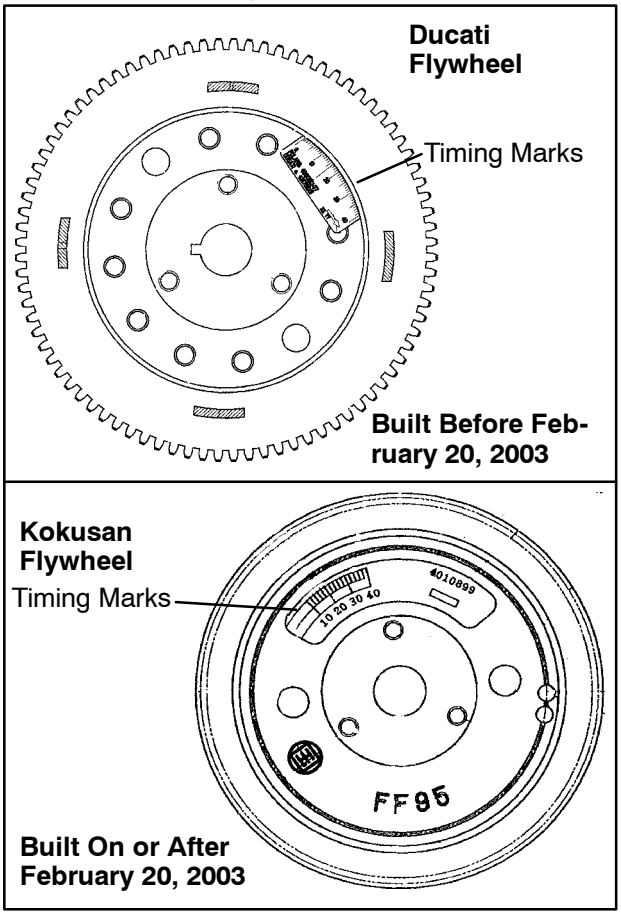


Ducati Flywheel

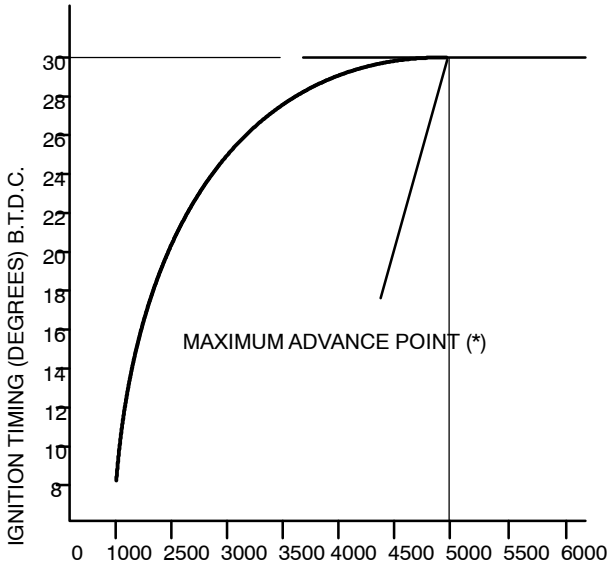


Kokusan Flywheel

2004 Model Flywheel Identification

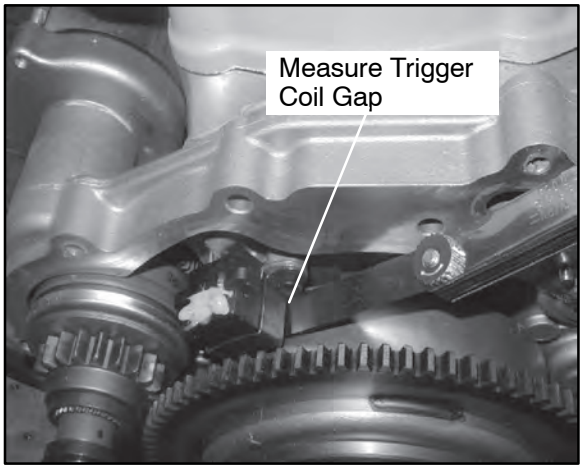


Typical Ignition Timing Curve
*** Actual advance point may vary by several hundred RPM above or below 5000 . Use the point of maximum advance when checking ignition timing**



TRIGGER COIL GAP

Measure trigger coil gap with a feeler gauge. The gap should be .022–.028 inch (.56–.71 mm).



Trigger Coil Gap:

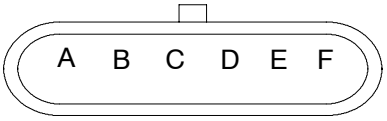
.022–.028 inch (.56–.71 mm)

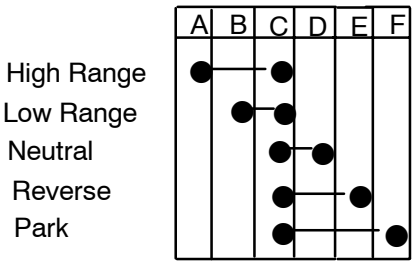
GEAR POSITION INDICATOR SWITCH TEST

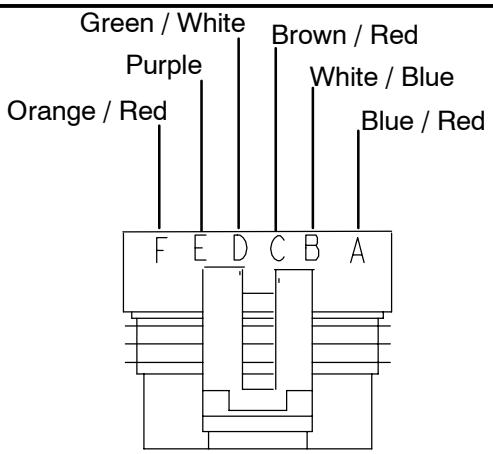
NOTE: Also see "INSTRUMENT CLUSTER TROUBLESHOOTING" for gear switch resistance.

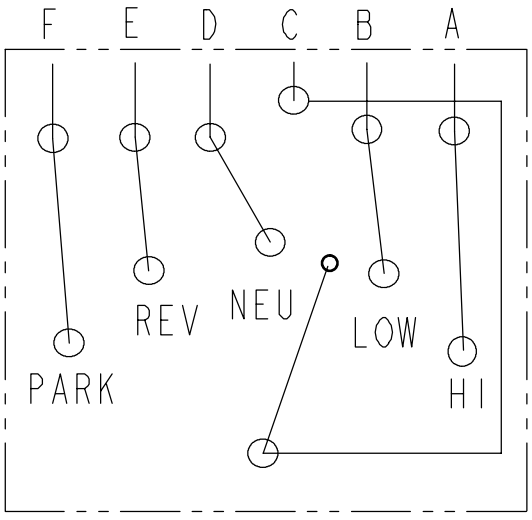
TRANSMISSION SWITCH

High/Low/Neutral/Reverse/Park Switch







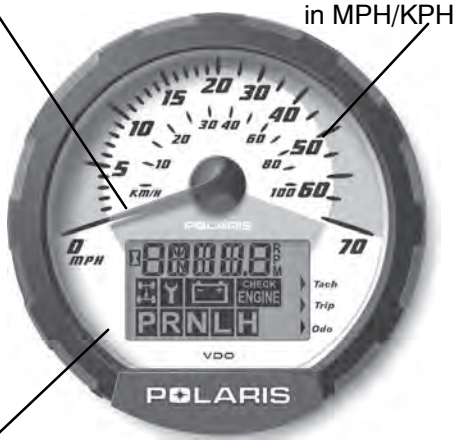


INSTRUMENT CLUSTER OVERVIEW

EARLY 2004

(A) Speedo Needle (also flashes during warning condition)

(B) Speedometer in MPH/KPH



(C) Rider Information Center

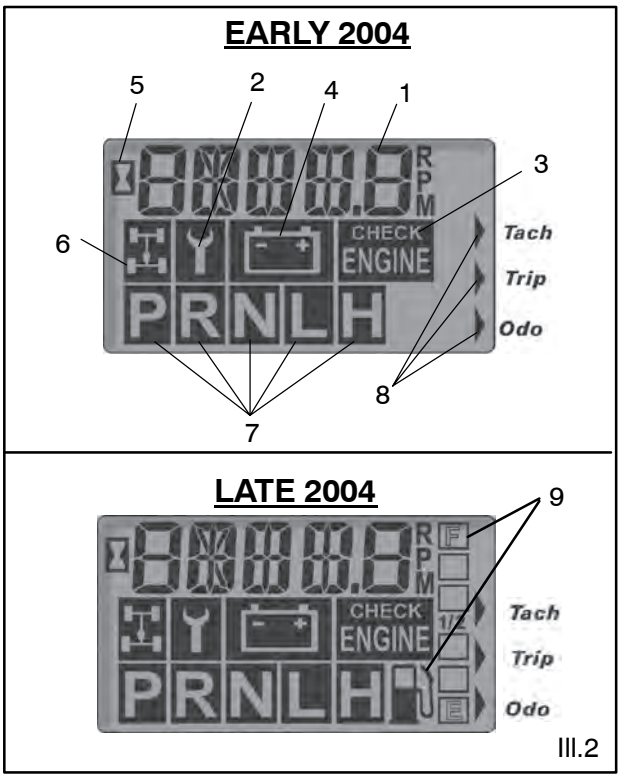
LATE 2004

(A) Speedo Needle (also flashes during warning condition)

(B) Speedometer in MPH/KPH

(C) Rider Information Center

Ill.1



NOTE: The sole difference between Early and Late 2004 instrument clusters is the activation of the fuel gauge and sender on Late 2004 models.

Introduction

Refer to Illustration 1:

The Polaris ATV Instrument Cluster is powered by battery voltage (12 VDC) and requires inputs from the engine RPM, transmission gear, and wheel speed sensor for proper operation. Two harnesses plug into the cluster head; one from the right front wheel speed sensor, and one from the vehicle main harness. A non-serviceable internal memory battery maintains odometer and hour meter data when the machine is not running. The illumination lamp inside the gauge is non-serviceable and is designed to last for the life of the unit. (A) The speedometer needle indicates speed from an electronic wheel speed sensor located on the right front brake caliper bracket and the needle also flashes during a warning condition. The speedometer needle indicates speed in MPH and KPH. **NOTE**: **A flashing needle could indicate a hot engine, low battery warning, or the No. 10 Pin could be grounded.** (B) The speedometer features numbers in Mile Per Hour (MPH) and Kilometers Per Hour (KPH). (C) The Rider Information Center performs a number of functions (See Illustration 2):

1. Odometer/Tachometer/Trip meter/Hour Meter

*** Odometer** records the miles traveled by the ATV.

***Tachometer** displays engine RPM. This feature will also display with the vehicle in motion NOTE: Small RPM fluctuations from day to day are normal because of changes in humidity, temperature, and elevation.

***Trip meter** records the miles traveled by the ATV if reset before each trip or total miles to 999. To reset the trip meter, select the trip meter mode. Press and hold the mode button (override button) until the total changes to *0*. **NOTE:** In the Rider Information Center, the trip meter display contains a decimal point, but the odometer displays without a decimal point.

***Hour Meter** logs the total hours the engine has been in operation.

2.Programmable Service Interval/Diagnostic Mode

***Service Interval** – The purpose of the programmable service interval is to provide the consumer and the dealer with a convenient way to schedule routine maintenance. When the ATV leaves the factory, this feature is set at “50 hours”. When the first 50 hours of engine operation are finished the wrench icon will flash for 10 seconds each time the ATV is started as a reminder that ATV maintenance is due. **NOTE:** To reset the Service Interval, follow the directions on the on Page 10.7, “Setting New Service Interval”.

3. Check Engine Warning Indicator

The word HOT will display alpha numerically when the engine is overheating. Do not continue to operate the ATV if this warning appears. Refer to **Chapter 3 “Cooling System Troubleshooting”** for help with diagnosis of overheating.

4. High/Low Battery Voltage

This warning usually indicates that the ATV is being operated at an RPM too low to keep the battery charged. A low battery warning may also occur under normal operation if the machine is at idle and high electrical load (lights, cooling fan, accessories) is applied. Driving at a higher RPM or connecting a battery charger will usually clear the warning.

5. Engine Hour Display Indicator

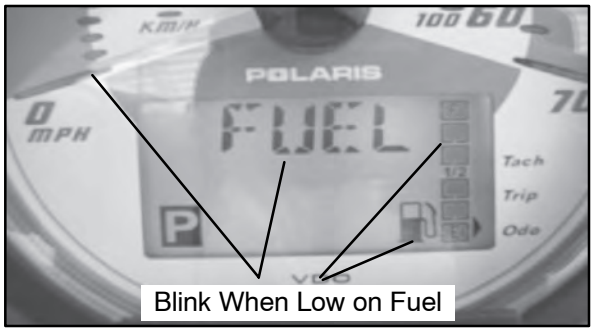
Displays number of hours of engine operation.

6. AWD Indicator
Illuminates when the electrical portion of the AWD system is enabled.

7. Gear Indicator
Specifies what position the shift lever and transmission are in. This area is blank if a fault occurs.

8. Mode Indicator
Indicates which modes are being utilized.

9. Fuel Gauge
The segments of the fuel gauge indicate the level of fuel in the fuel tank. When the last segment clears, a low fuel warning is activated. All related icons will flash, "FUEL" will display in the LCD, and the speedometer needle will blink. If riding, be sure to refuel immediately.



Blink When Low on Fuel

DIAGNOSTIC MODE

NOTE: This gauge features auto shut-off protection if the voltage on the DC bus is excessive. This is usually the result of an open battery condition, and the gauge is designed to survive such an event.

NOTE: If the gauge will not indicate what gear it is in and will not allow AWD operation, AWD can still be enabled by holding in the mode/override button.

To enter the diagnostics mode:

1. Turn the key switch off and wait 10 seconds.
2. Set the park brake and shift the transmission to neutral.
3. Hold the mode/reverse override button as you turn the key switch on.
4. Release the switch as soon as the display is activated.

Use the mode/reverse override button to toggle through the diagnostic screens.

NOTE: The initial screen display refers to the software version installed on your ATV. This information is only displayed briefly.

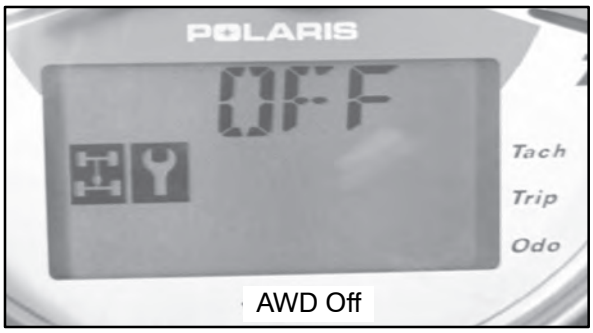
Screen 1: The first screen indicates battery voltage. Refer to Ill. 2.

Ill. 2

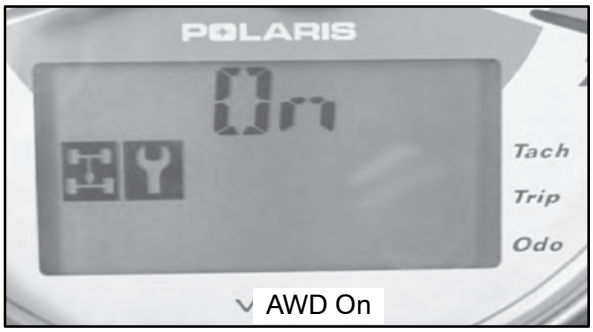
Screen 2: **Tachometer** (Ill. 3) indicates engine rpm.

Ill.3

Screen 3: **AWD diagnostic screen.** This screen indicates whether or not current is flowing through the AWD coil on models with switchable AWD.



AWD Off



AWD On

Screen 4: **Gear circuit diagnostic**. This screen displays the resistance value (in ohms) being read at the gear switch input of the gauge. **NOTE: 10-20% variance from these readings is within normal parameters.**

23 Ohms in Park

158 Ohms in Neutral

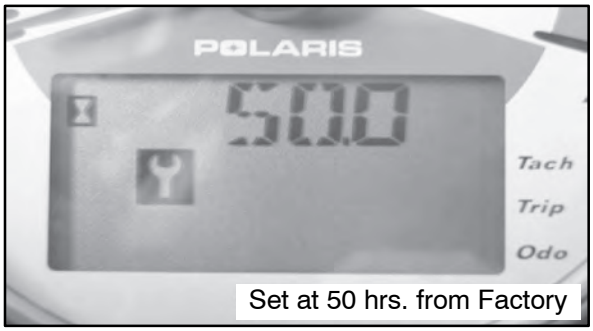
75 Ohms in Reverse

297 Ohms in Low

628 Ohms in High

Screen 5: Programmable service interval. The purpose of the programmable service interval is to provide the consumer and dealer with a convenient reminder for routine maintenance. When the ATV leaves the factory, this feature is set at 50 hours.

Once the service interval mode is set with the hours when service is due, the hours of actual engine operation are subtracted from the set hours until *0* is reached. When the counter reaches *0*, the wrench icon will flash quickly for 10 seconds each time the vehicle is started as a reminder that the periodic maintenance is due.



Set at 50 hrs. from Factory

SETTING A NEW SERVICE INTERVAL:

Setting Service Interval After Countdown (zero):
1. While in the service interval mode, press and hold the mode/override button until the wrench icon flashes. When it begins to flash, release the button.
2. The setting will increase by one hour each time the button is pressed. Pressing and holding the button will allow the numbers to escalate much faster.

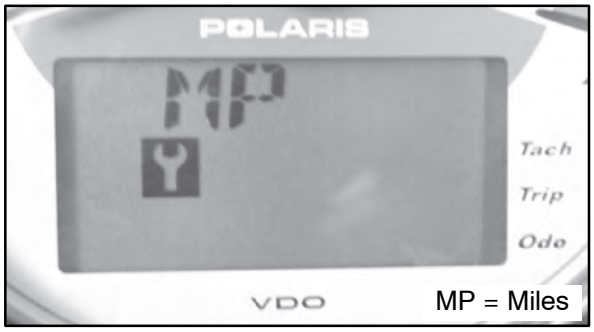
3. When the desired time increment is displayed, release the button and wait for the wrench to stop flashing. When the wrench stops blinking, your service hours are set. (Next Page)

NOTE: If you scroll past the intended number, hold the button down until the count turns over to *0*. You can then reset the number.

Turn Service Interval OFF:
1. If the service interval is enabled (functioning) on your ATV and you wish to turn it off, toggle to the service interval mode.
2. Press and hold the mode button for approximately 7 seconds until the word *OFF* appears in the Rider Information Center. The service interval is now off.
3. To enable (turn on) the service interval mode, repeat the steps above in "Setting Service Interval After Countdown".

Change Service Interval Time:
If you would like to change the service interval time, (for example change the interval from 50 hrs. to 55 hrs.). Follow the steps below:
1. While in the service interval mode, press and hold the mode button for approximately 7 seconds until the word *OFF* appears in the Rider Information Center.
2. Wait 5 seconds and then press the mode button in until the wrench icon flashes. Press the mode button again to set the desired service increment. Release the button and wait for the wrench icon to stop flashing. The new service interval is now set.

Screen 6: Miles/Kilometers toggle, The display in the trip meter and odometer can be changed to display either kilometers or miles. The current display mode will be shown as "KM" or "MP". To change, hold in the mode button until the letters flash, then press and release the button once. When the display stops flashing, the mode has been set.



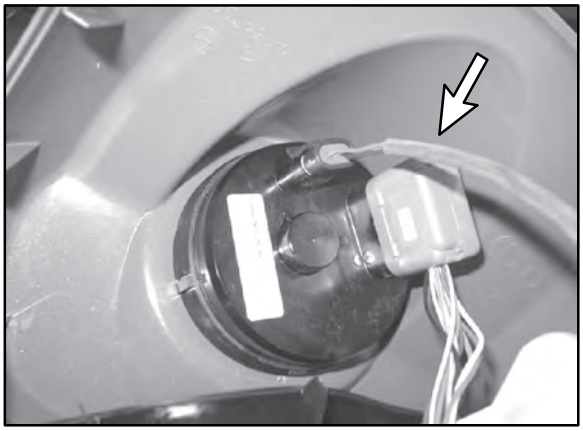
NOTE: As long as you are in the diagnostic mode, the wrench icon will remain lit.

NOTE: To leave the diagnostic mode, turn the key switch off and on.

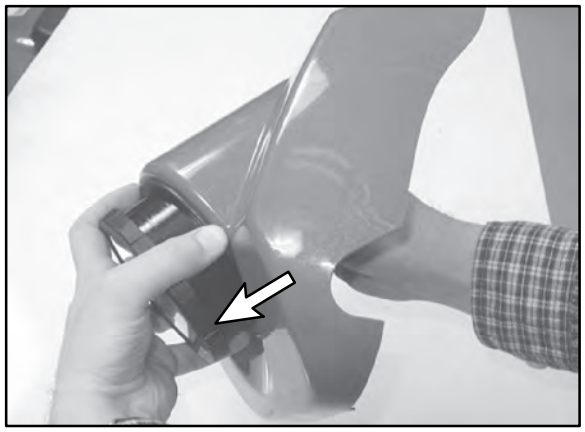
NOTE: Any movement of the tires will trigger the speedometer out of the diagnostic mode and into standard display mode.

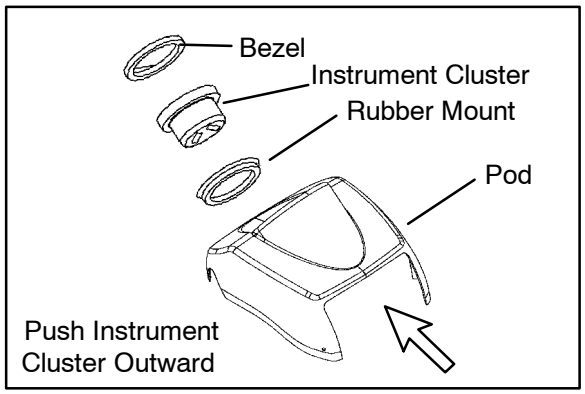
SPEEDOMETER REMOVAL

1. Remove the three screws that secure the headlight pod cover and disconnect the wire connectors from the instrument cluster.



2. Push the instrument cluster out from the backside of the pod, while securely holding the pod.

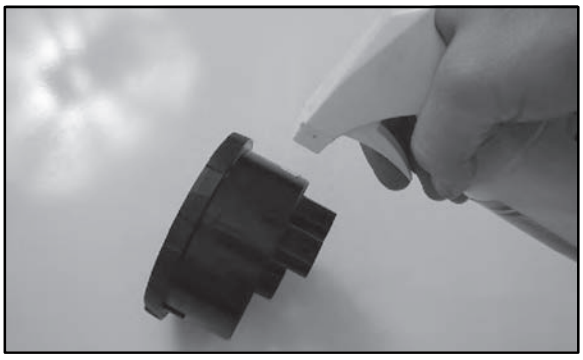




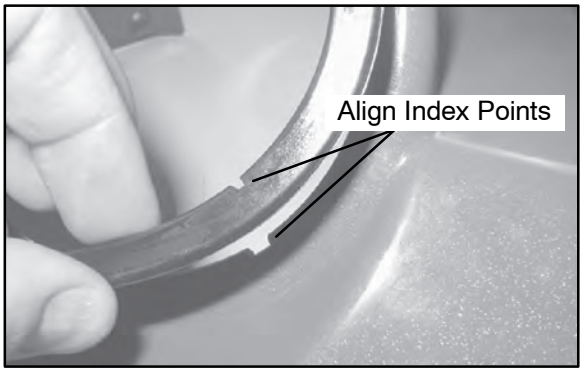
NOTE: Do not remove the rubber grommet in the pod. Only remove the rubber grommet if necessary. The bezel is a snap-on assembly and is a serviceable part.

SPEEDOMETER INSTALLATION

1. Spray a soap and water mixture onto the outer surface area of the instrument cluster. This will help the instrument cluster slide into the pod assembly more easily.



2. Be sure the rubber grommet inside the pod is fully installed and that the indexing key is in the headlight pod keyway.



3. Hold the pod assembly securely and insert the instrument cluster into the pod assembly. Twist the instrument cluster gently in a clockwise motion to properly seat the instrument cluster into the pod assembly. Apply pressure on the bezel while pressing down on the instrument cluster.

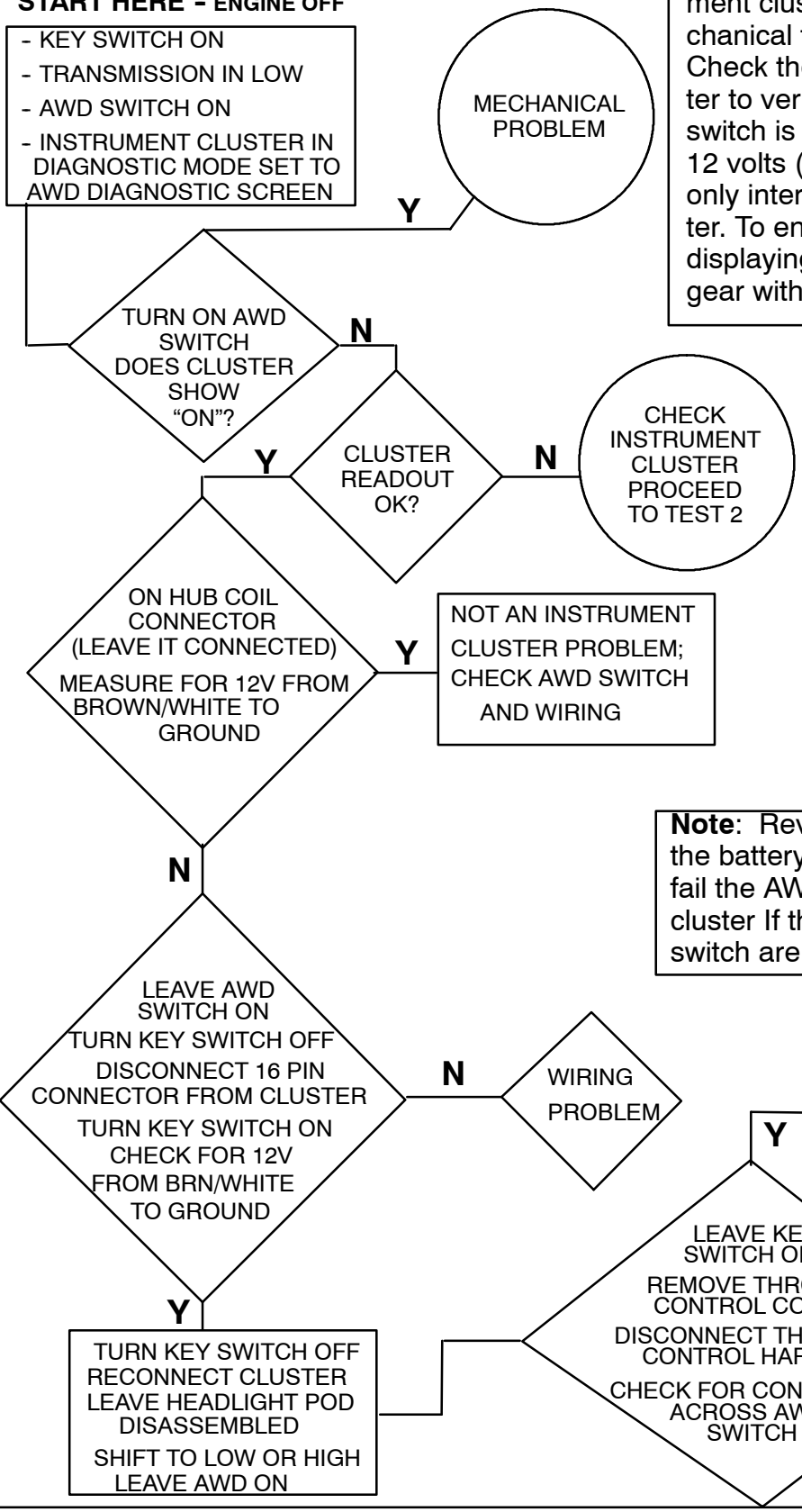
NOTE: Do not allow alcohol or petroleum products to come in contact with the instrument cluster lens.

SPEEDOMETER TROUBLESHOOTING

TEST 1 - NO ALL WHEEL DRIVE

START HERE - ENGINE OFF

- KEY SWITCH ON
- TRANSMISSION IN LOW
- AWD SWITCH ON
- INSTRUMENT CLUSTER IN DIAGNOSTIC MODE SET TO AWD DIAGNOSTIC SCREEN



Note: If AWD icon comes on, instrument cluster is O.K. Proceed to mechanical tests (in Service Manual). Check the AWD icon on instrument cluster to verify it's operation. The AWD switch is directly powered by switched 12 volts (red/white). The gear switch only interfaces with the instrument cluster. To enable AWD, the cluster must be displaying low or high gear, or reverse gear with the override button pushed in.

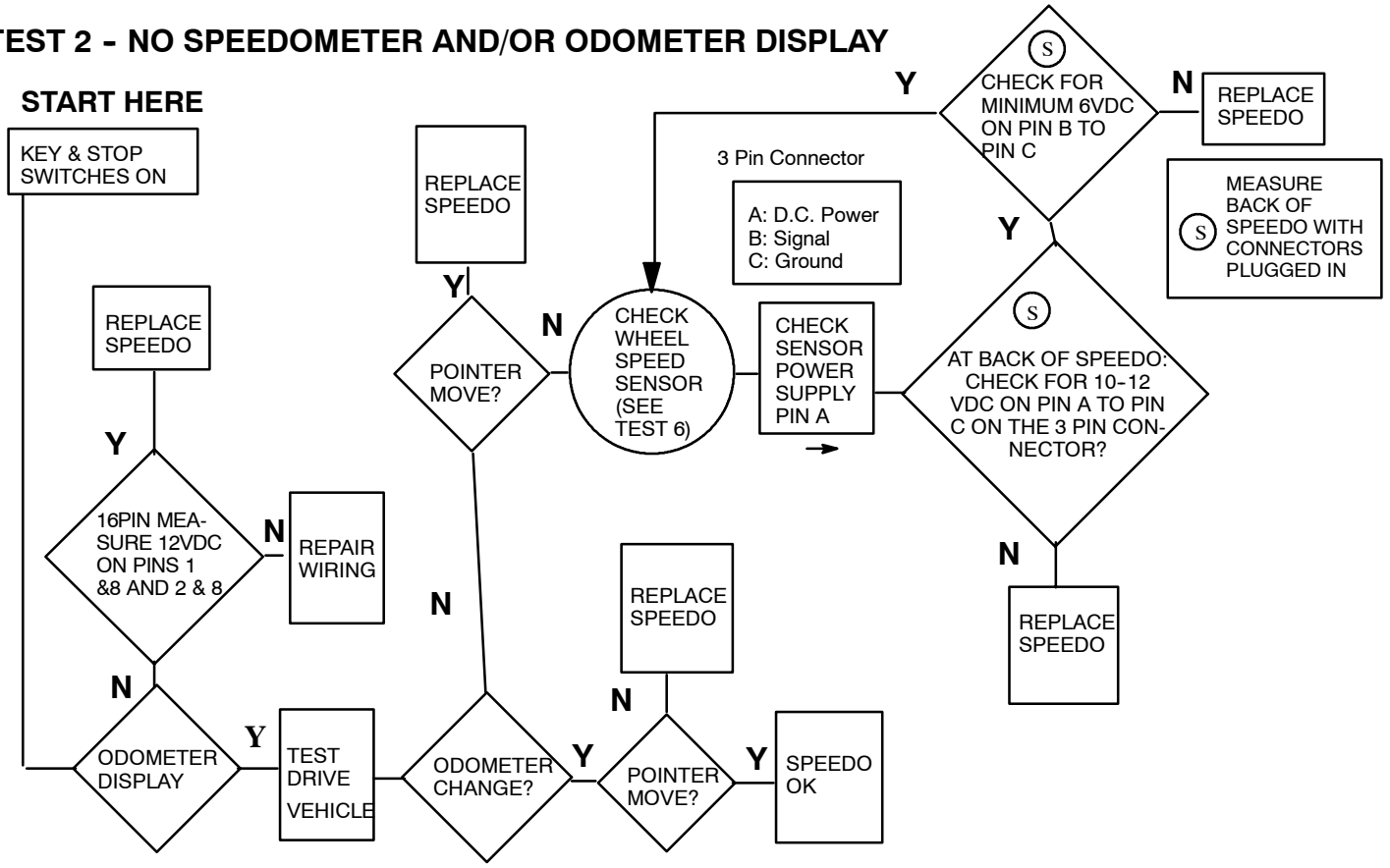
16 Pin Connector

1. Red- 12V Ignition Switch
2. Red/White- 12V ETC and AWD Switch
3. Grey/Orange- Mode/Override button
4. Black- Ignition Kill
5. Green- Diagnostic (Factory Use Only)
6. Blue- Diagnostic (Factory Use Only)
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. N/C
12. Purple/White- Fuel Sender (if equipped)
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. N/C
16. Brown/White- AWD Coil

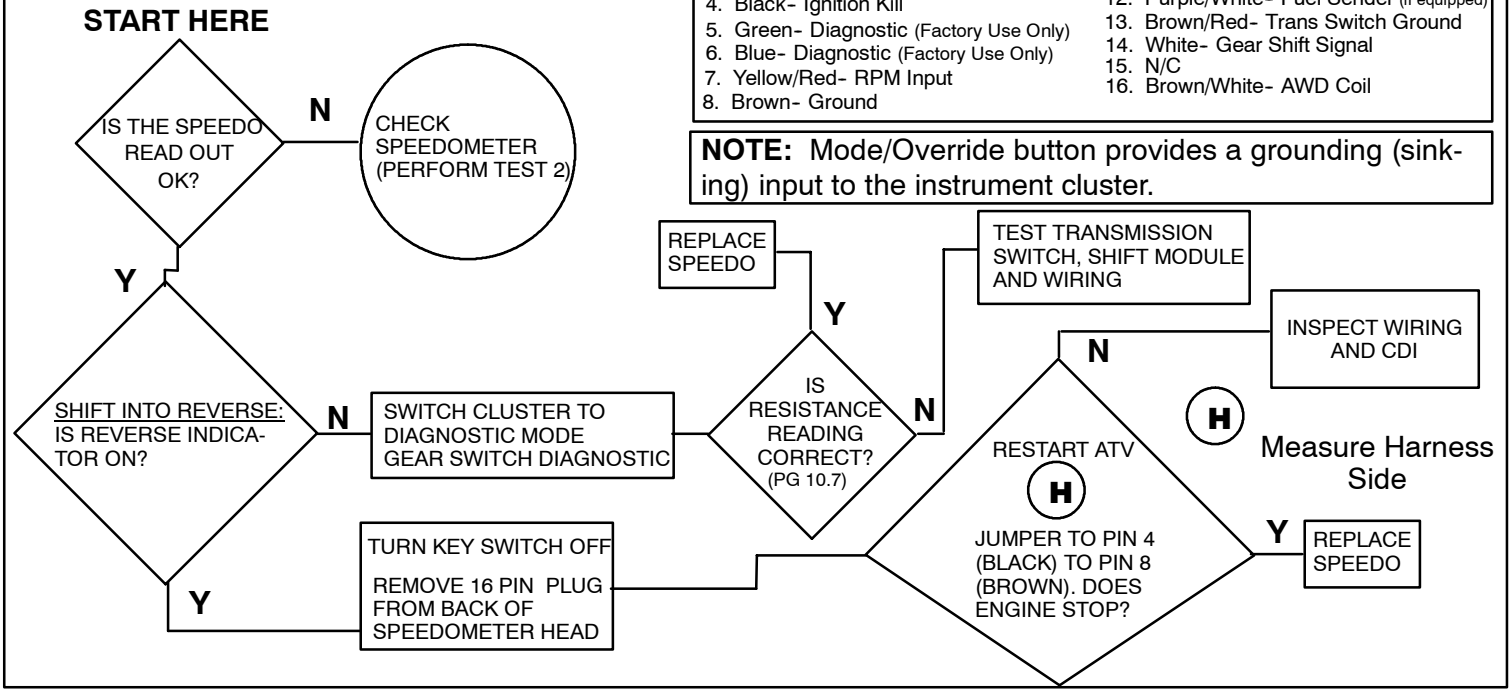
Note: Reversing polarity when connecting the battery or other DC power source will fail the AWD control and the instrument cluster If the key switch and the AWD switch are turned on.

SPEEDOMETER TROUBLESHOOTING

TEST 2 - NO SPEEDOMETER AND/OR ODOMETER DISPLAY



TEST 3 - NO REVERSE SPEED LIMIT (VEHICLE EXCEEDS 7-9 MPH IN REVERSE)



16 Pin Connector

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6. Blue- Diagnostic (Factory Use Only)
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. N/C
12. Purple/White- Fuel Sender (if equipped)
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. N/C
16. Brown/White- AWD Coil

NOTE: Mode/Override button provides a grounding (sinking) input to the instrument cluster.

SPEEDOMETER TROUBLESHOOTING

TEST 4 - NO AWD HUB SAFETY LIMIT

NOTE: IF THE AWD ICON DOES NOT COME ON OR IF 12 VDC IS NOT REGISTERING AND AWD IS ENGAGING ABOVE 3100 RPM,IT MAY BE A MECHANICAL PROBLEM.

START HERE

IS SPEEDO FUNCTIONING CORRECTLY?

Y

N

CHECK SPEEDO (TEST NO. 2)

ATV IN NEUTRAL ACTIVATE DIAGNOSTIC MODE. TOGGLE TO TACH-OMETER SETTING & REV ENGINE. HOLD UNTIL DISPLAY STABILIZES. DOES IT APPEAR ACCURATE?

Y

N

1. RAISE ATV WHEELS OFF GROUND AND SUPPORT IN A SAFE MANNER.
2. MONITOR VOLTAGE AT HUB COIL CONNECTOR, BETWEEN BROWN/WHITE AND GROUND

TURN KEY SWITCH OFF

REMOVE 16 PIN CONNECTOR FROM BACK OF INSTRUMENT CLUSTER.

RESTART ATV

ENGINE IDLING MEASURE AC VOLTAGE BETWEEN PIN 7 AND PIN 8. OVER 3 VAC?

Y

REPLACE SPEEDOMETER

N

CHECK CHARGING SYSTEM (STATOR, REGULATOR, AND WIRING)

TURN AWD OFF. START THE ENGINE REV AND HOLD THE RPM'S ABOVE 3100. TURN AWD ON. DOES FRONT DRIVE ENGAGE?

N

NO PROBLEM

Y

IS THE AWD ICON ON?

Y

INSPECT HUB COIL WIRING FOR SHORT CIRCUITS TO GROUND. (DISCONNECT CONNECTOR & MEASURE BETWEEN HUB COIL BROWN/WHT & GROUND.)

N

REPLACE SPEEDOMETER

Y

REPAIR HUB COIL WIRING

N

MECHANICAL PROBLEM

16 Pin Connector

1. Red- 12V Ignition Switch
2. Red/White- 12V ETC and AWD Switch
3. Grey/Orange- Mode/Override button
4. Black- Ignition Kill
5. Green- Diagnostic (Factory Use Only)
6. Blue- Diagnostic (Factory Use Only)
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. N/C
12. Purple/White- Fuel Sender (if equipped)
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. N/C
16. Brown/White- AWD Coil

SPEEDOMETER TROUBLESHOOTING

TEST 5 REVERSE SPEED LIMITER ACTIVATED IN FORWARD GEAR

(Engine loses spark when vehicle speed is above 7-9 mph.)

START HERE

INSTRUMENT CLUSTER FUNCTION OK?

CHECK SPEEDOMETER (PERFORM TEST 2)

16 Pin Connector

1. Red- 12V Ignition Switch
2. Red/White- 12V ETC and AWD Switch
3. Grey/Orange- Mode/Override button
4. Black- Ignition Kill
5. Green- Diagnostic (Factory Use Only)
6. Blue- Diagnostic (Factory Use Only)
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. N/C
12. Purple/White- Fuel Sender (if equipped)
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. N/C
16. Brown/White- AWD Coil

Y

SHIFT TO LOW OR HIGH GEARS. IS REVERSE INDICATOR ICON ON OR GEAR ON?

DOES GEAR INDICATOR GO BLANK?

N

Y

CHECK TRANSMISSION SWITCH, RESISTOR MODULE AND RELATED WIRING

TURN KEY SWITCH OFF
REMOVE 16 PIN PLUG FROM BACK OF INSTRUMENT CLUSTER
RESTART ATV AND TEST DRIVE

CHECK FUEL & IGNITION SYSTEMS

Y

PROBLEM REMAINS?

N

REPLACE SPEEDOMETER

NOTE: OVERRIDE SWITCH PLAYS NO ROLE IN REVERSE GEAR OUTPUT

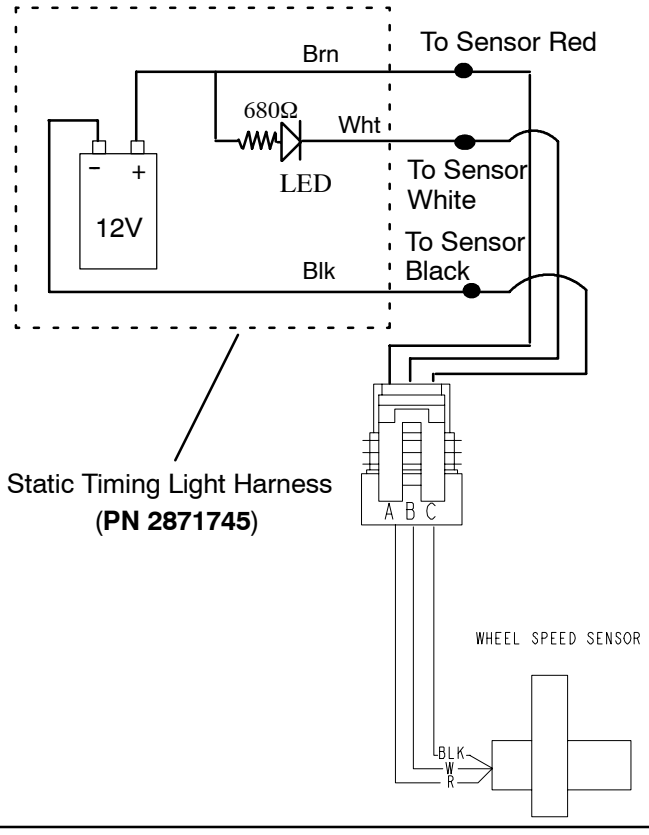
TEST 6 WHEEL SPEED SENSOR

Tools Required:

- Static Timing Light Harness **(PN 2871745)**
- Hall Sensor Probe Harness **(PN 2460761)** or equivalent jumper wires.

To test wheel speed sensor:

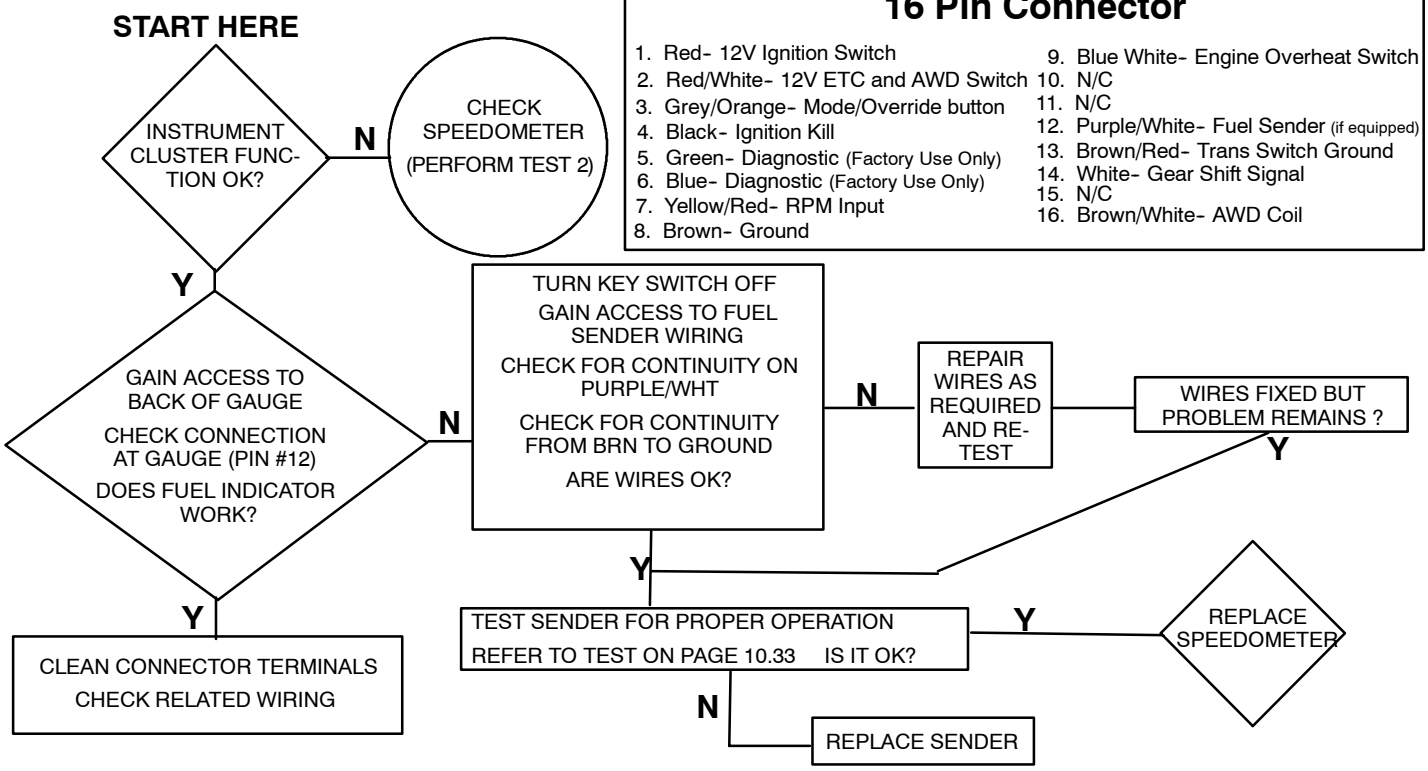
1. Disconnect 3 Pin connector from speedometer.
2. Connect wires from test light to sensor 3 Pin connector as shown at right, using the Hall Sensor Probe Harness **(PN 2460761)** or jumper leads.
3. Elevate front right side of vehicle until tire is off the ground.
4. Slowly turn right front wheel while observing the test light.
5. If light flashes, sensor is O.K. Be sure connections are good and 9 volt battery is in good condition.



Static Timing Light Harness (**PN 2871745**)

SPEEDOMETER TROUBLESHOOTING

TEST 7 FUEL GAUGE DISPLAY NOT WORKING



16 Pin Connector

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4. Black- Ignition Kill
5. Green- Diagnostic (Factory Use Only)
6. Blue- Diagnostic (Factory Use Only)
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. N/C
12. Purple/White- Fuel Sender (if equipped)
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. N/C
16. Brown/White- AWD Coil

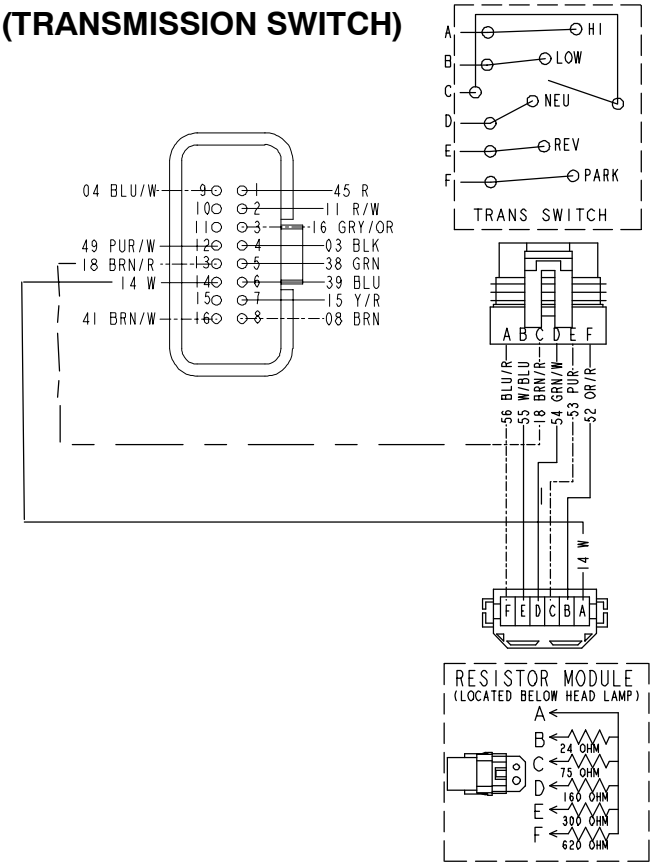
TEST 8 SHIFT INDICATOR NOT WORKING (TRANSMISSION SWITCH)

Operation:

The Instrument cluster sends a signal through the White wire to the resistor module. This signal completes it's path on the Brown/Red wire through the transmission switch. Depending on the transmission switch position, the Instrument cluster interprets the resistance reading and displays the corresponding shift position in the LCD panel.

Testing:

Use the diagram provided to test the continuity loop at each of the shift points with a multi-meter. **NOTE:** *The Instrument cluster contains this diagnostic feature.*



16 Pin Connector

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2. Red/White- 12V ETC and AWD Switch
3. Grey/Orange- Mode/Override button
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5. Green- Diagnostic (Factory Use Only)
6. Blue- Diagnostic (Factory Use Only)
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. N/C
12. Purple/White- Fuel Sender (if equipped)
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. N/C
16. Brown/White- AWD Coil

COOLANT TEMPERATURE SENSOR TEST (HOT LIGHT)

With the ignition switch (and engine stop switch) "ON", power is delivered to the hot light via the Red/White wire. The Blue/White wire (ground) out of the light socket is connected to the coolant temperature sensor on the cylinder head. In normal operating conditions, the temperature sensor is non-conductive (open). If engine coolant reaches the specified temperature, the sensor becomes conductive completing the ground path for the light.

With engine cold, disconnect lead and measure resistance of sensor between connector terminal and ground. There should be no continuity or very high resistance (megohms).

Hot Light On	230° F (110° C)

FAN CONTROL CIRCUIT OPERATION / TESTING

The fan switch is located on the radiator. Power is supplied to the fan switch via the Red/Black wire when the ignition key is ON. When the fan switch reaches the specified temperature, it becomes conductive and sends power to the fan motor through to the Orange/Black wire. The ground path for the fan motor is through the Brown harness wire.

CAUTION: ***Keep hands away from fan blades during this procedure. Serious personal injury could result.***

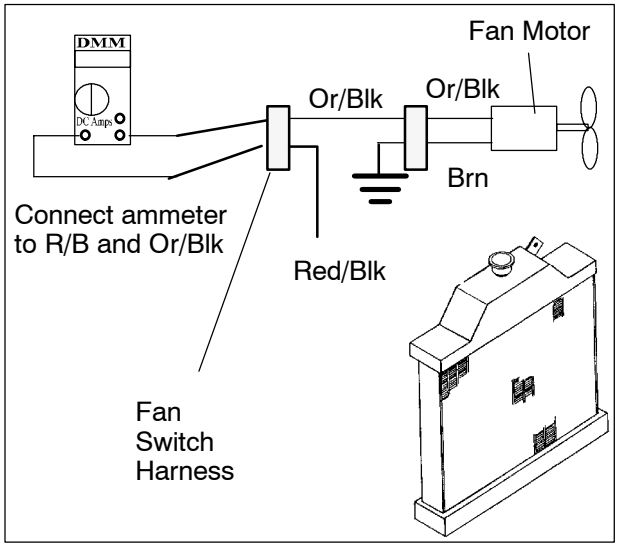
NOTE: The fan switch may not function or operation may be delayed if coolant level is low or if air is trapped in the cooling system. Be sure cooling system is full and purged of air. Refer to Maintenance Chapter 2 for cooling system information.

FAN CONTROL SWITCH BYPASS TEST

1. Disconnect harness from fan switch on radiator.
2. Place a jumper wire between the Red/Blk and Org/Blk wires in the connector.
3. With the ATV in "Park" and with the parking brake on, turn the ignition key (and engine stop switch) "ON". The fan should start running.
4. If the fan runs with the jumper wire installed, check the fan control switch and connector terminals. If the fan does not run or runs slowly with the jumper wire installed, check the fan motor wiring, ground, and motor condition (refer to Fan Motor Testing this section). Repair or replace as necessary.

FAN MOTOR CURRENT DRAW

A current draw test will provide a good indication of fan motor condition. A worn or damaged fan motor will draw more current, which causes a reduction in blade speed and reduced cooling.



1. Disconnect the harness from the fan switch.
2. Connect a DC ammeter in between the fan switch harness wires as shown.
3. Be sure fan blade is free to rotate.
4. Turn ignition key and engine stop switch to "ON" position. Read the current draw on ammeter with fan running.
5. If the fan motor draws more than 15 Amps, replace the motor.

Fan Motor Current Draw:
Should Be Less Than 15 Amps

NOTE: This fan motor current draw specification only applies to Sportsman 600/700.

FAN CONTROL SWITCH OPERATION TEST

1. Place switch in a water bath and submerse it to the base of the threads. Do not allow threads to contact container or inaccurate reading will result.
2. Heat the coolant slowly and monitor the temperature with a thermometer or Fluke™ meter pyrometer. The switch should be closed (conductive) at the "ON" temperature indicated in the chart, and stay conductive until the "OFF" temperature is reached.

REFER TO PARTS MANUAL FOR FAN SWITCH APPLICATION		
Fan Switch Operation	**Continuity (On)**	**No Continuity (Off)**
Temperature	180° F (82° C) ± 3°F	149° F (65° C) ± 8°F

ELECTRONIC THROTTLE CONTROL (ETC) SWITCH

The Electronic Throttle Control (ETC) system is designed to stop the engine of an ATV in the event of a mechanical problem with the throttle mechanism. The ETC switch is mounted independently of the throttle actuator lever inside the throttle block assembly. This is a *normally closed* switch, and is held in the open position (contacts are separated (as shown below) by throttle cable tension. The contacts are "open" during normal operation regardless of throttle lever position. In the event of a mechanical problem in the throttle mechanism (cable tension is lost), the switch contacts close, connecting the CDI black wire to ground, which prevents ignition spark. This is the same as turning the key or engine stop switch "OFF".

Test the ETC switch at the harness connector. **NOTE:** Adjust throttle cable freeplay (ETC switch) and make sure throttle mechanism is functioning properly before testing the switch. Refer to Maintenance Chapter 2 for cable adjustment procedure.

ETC OPERATION TEST

Remove throttle block cover by carefully releasing all tabs around edge of cover.

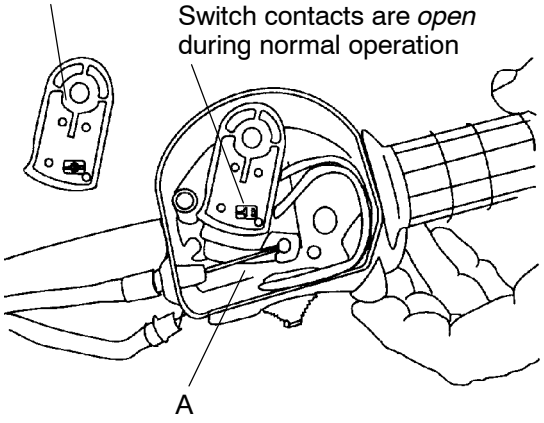
Place transmission in neutral and apply parking brake.

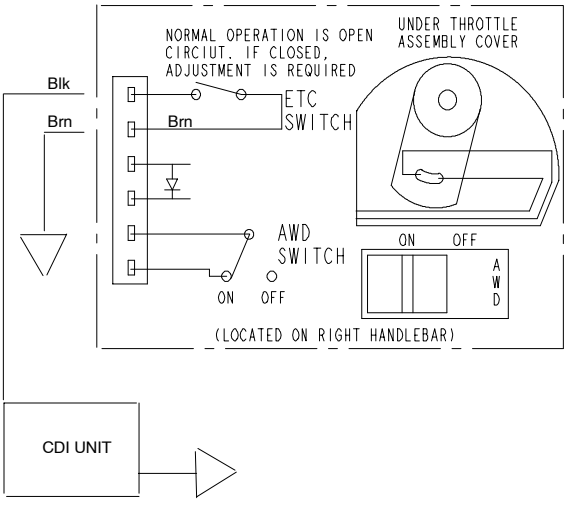
Start engine and open throttle lever slightly until engine RPM is just above idle speed.

Hold throttle cable with fingers at point "A" as shown below and release throttle lever. If the ETC system is functioning properly, the engine will lose spark and stop.

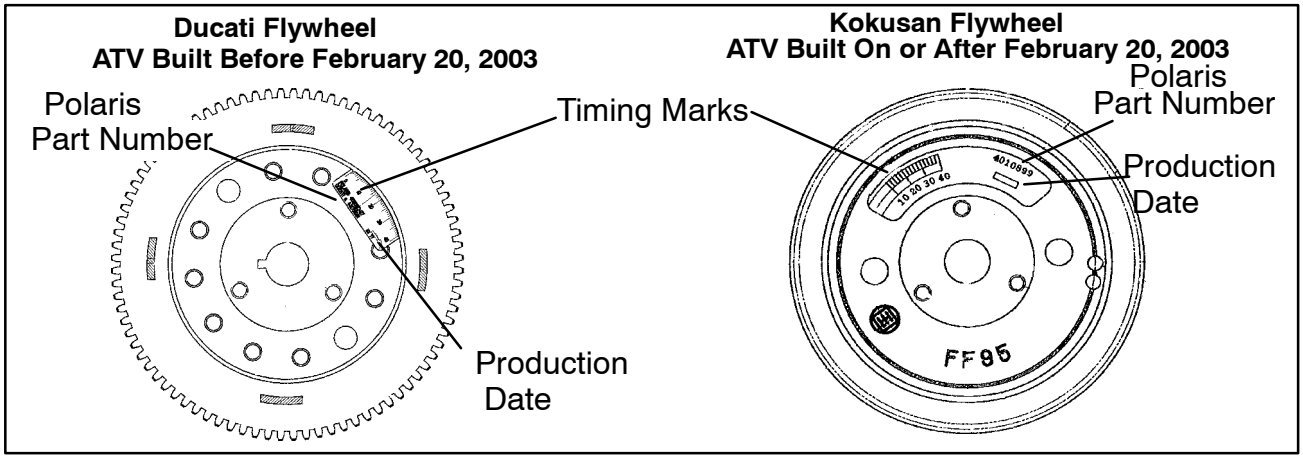
Electronic Throttle Control (ETC) Switch
(Composite Throttle Housing)

ETC switch contacts are *closed* in a fault condition (throttle cable slack).





FLYWHEEL IDENTIFICATION



Flywheel Identification Stamp Location

The flywheel can be identified by the stamp mark in location A. Refer to "I.D." location in chart below. Do not use the cast mark to determine flywheel application.

Engine Application	Cast	Stamp	Comment
Ducati Flywheel EH059OLE23, EH068OLE13	4060152	8°	300 W
Kokusan Flywheel EH059OLE24, EH068OLE15	4010899	8°	300 W

600/700 - DC / CDI IGNITION

The Sportsman 600/700 has incorporated into it's design a DC/ CDI ignition system.

Some of the advantages of DC ignition are:

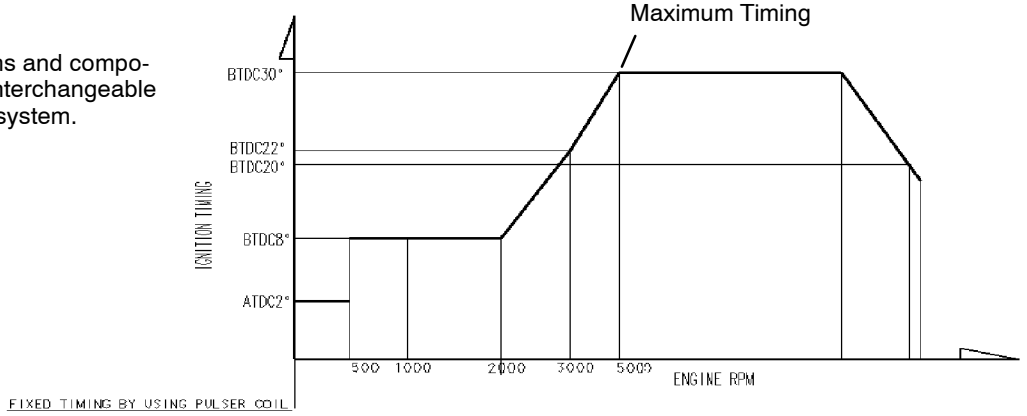
- Stronger, more consistent spark at low rpm for better performance
- Easier starts
- Simpler component design for ease trouble shooting and maintenance

Operation Overview:

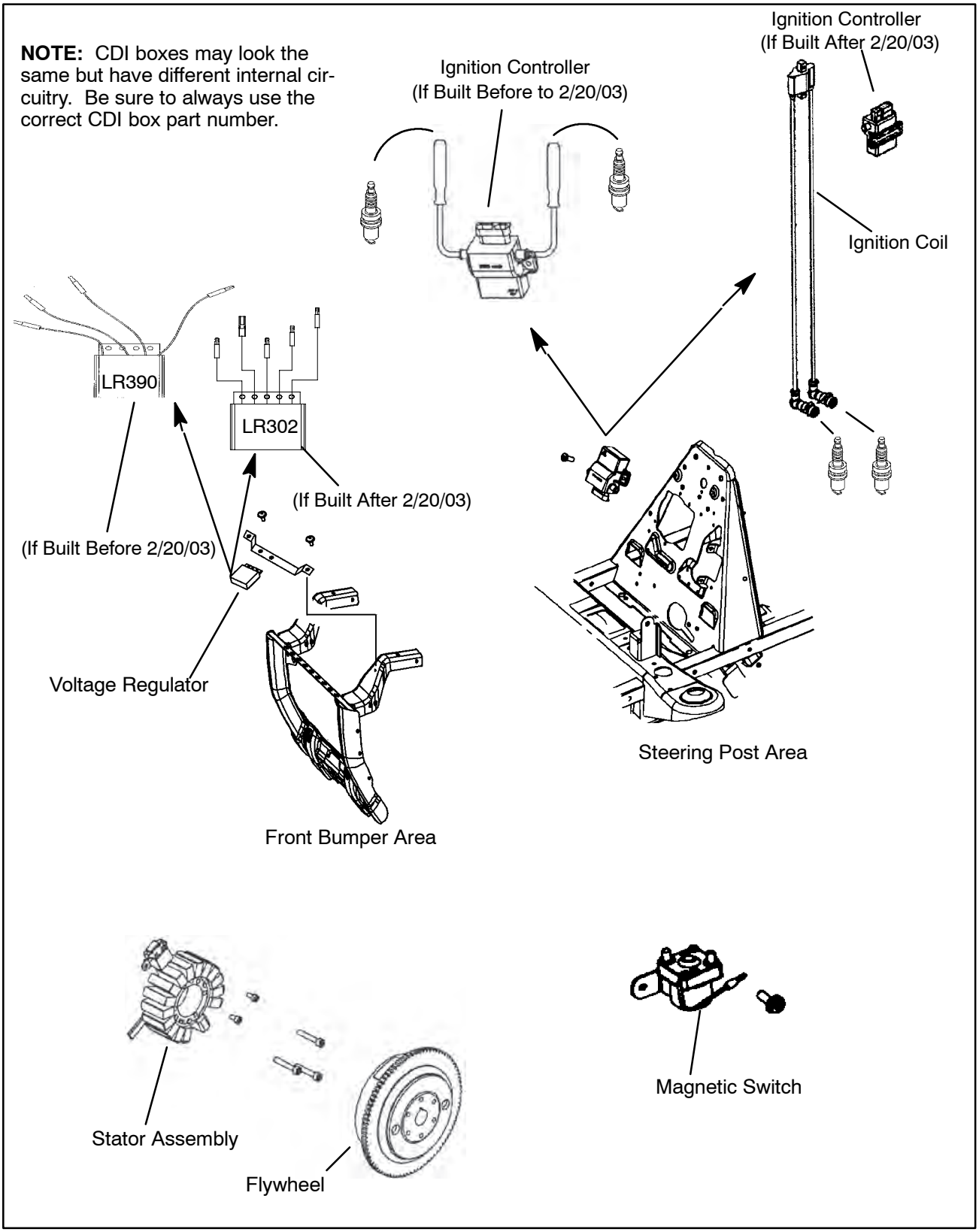
The DC/CDI system relies on battery power for ignition. Instead of generating DC voltage via magnetic induction, a 12 volt DC current is supplied directly to the CDI unit from the battery at the CDI, 12 volt DC current charges an internal capacitor to build up the initial ignition charge. A small A/C signal from the Trigger (Pulse) coil closes a thyristor (located in the CDI) at a point pre-determined in the crankshaft rotation by magnets on the flywheel's outer diameter. This signal releases the electrical charge which saturates the coil for ignition. DC/CDI systems have the ability to ignite with as little as 6 volts of power.

NOTE:

DC/CDI systems and components are not interchangeable with any other system.



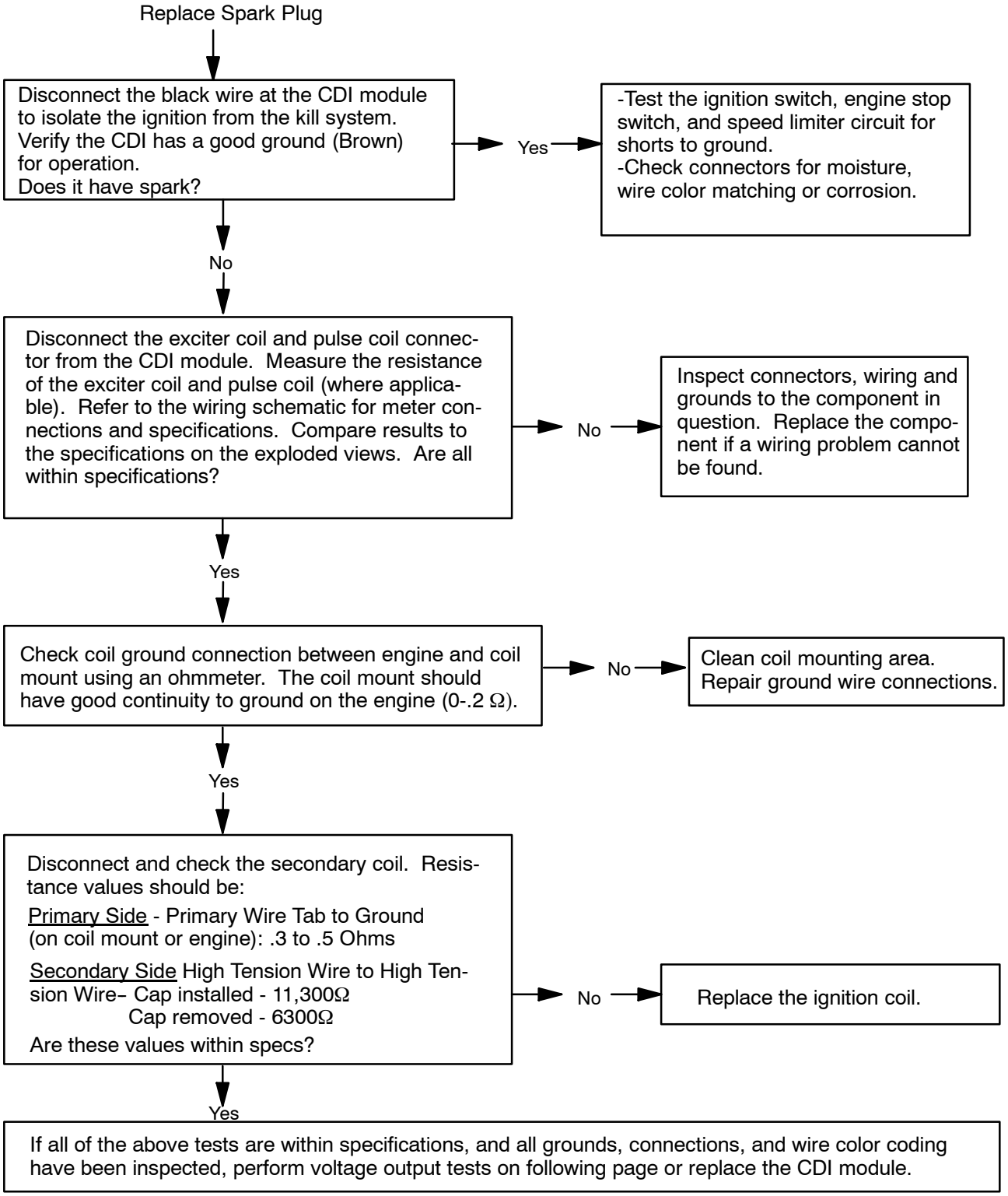
COMPONENTS OF 600/700 330 WATT ALTERNATOR IGNITION SYSTEM



IGNITION SYSTEM TESTING FLOW CHART

Whenever troubleshooting an electrical problem, first check all terminal connections to be sure they are clean and tight. Also be sure that colors match when wires are connected. Use the following pages as a guide for troubleshooting. The resistance values are also given on the specification pages.

Condition: No Spark or intermittent spark



IGNITION SYSTEM TROUBLESHOOTING

No Spark, Weak or Intermittent Spark

- Spark plug gap incorrect
- Fouled spark plug
- Faulty spark plug cap or poor connection to high tension lead
- Related wiring loose, disconnected, shorted, or corroded
- Engine Stop switch or ignition switch faulty
- ETC switch misadjusted or faulty
- Wire harness or connections wet, corroded
- Poor ignition coil ground (e.g. coil mount loose or corroded)
- Faulty stator (measure resistance of all ignition related windings)
- Incorrect wiring (inspect color coding in connectors etc)
- Faulty ignition coil winding (measure resistance of primary and secondary)
- Worn magneto (RH) end Crankshaft bearings
- Sheared flywheel key
- Flywheel loose or damaged
- Trigger coil air gap too wide (where applicable) - should be .016-.040″ (.4-1.0 mm)
- Excessive crankshaft runout on magneto (RH) end - should not exceed .0024″
- Faulty CDI module

CDI OUTPUT TEST USING PEAK READING ADAPTOR

Re-connect all CDI wires to stator wires. Disconnect CDI module wire from ignition coil primary terminal. Connect one meter lead to engine ground and the other to the ignition coil primary wire leading from the CDI module. Crank engine and check output of CDI wire to coil (130 DCV). Reconnect CDI to coil .

Output w/ Peak output tester
130 DCV
Average Output w/ Digital Voltmeter
20 DCV

CDI CRANKING OUTPUT TEST WITH PEAK READING VOLTMETER

The following peak voltage tests will measure the amount of output directly from each component. A peak reading voltmeter must be used to perform the tests. A variety of peak reading adaptors are commercially available for use with the Fluke ™ 77 Digital Multimeter (**PV-43568**) and other digital VOMs which will allow peak voltage tests to be performed accurately. Follow the directions provided with the adaptor. All measurements are indicated in DC Volts. Readings obtained without a peak reading adaptor will be significantly different.

Disconnect the stator connectors from the CDI module. Test output from exciter coil, pulse (trigger) coil, and compare to the chart. The following measurements are obtained when cranking the engine with the electric starter, spark plug installed. The starter system must be in good condition and the battery fully charged.

330 Watt 4 Stroke (Sportsman 600/700 Built Before February 20, 2003)

Coil	Connect Meter Wires To:	Reading (With Peak Reading Volt meter)
Capacitor Charge coil	Brown and Yellow	34 DCV
Pulse (Trigger)	Black and Red	3.3 DCV

330 Watt 4 Stroke (Sportsman 600/700 Built After February 20, 2003)

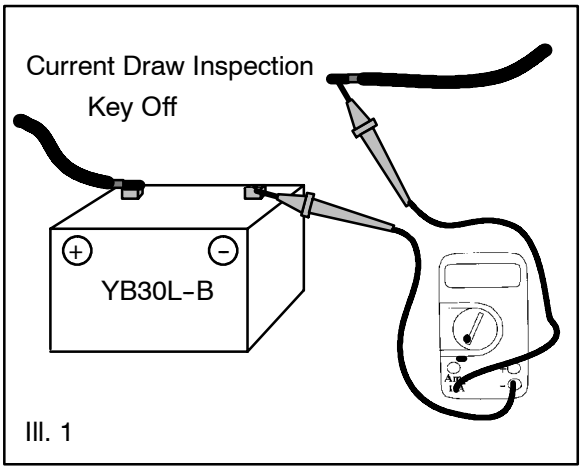
Coil	Connect Meter Wires To:	Reading (With Peak Reading Volt meter)
Detection	Orange and White	3 DCV
Pulse (Trigger)	Blue and Green	190 Ohms

CURRENT DRAW - KEY OFF

CAUTION: Do not connect or disconnect the battery cable or ammeter with the engine running. Damage will occur to electrical components.

Connect an ammeter in series with the negative battery cable. Check for current draw with the key off. If the draw is excessive, loads should be disconnected from the system one by one until the draw is eliminated. Check component wiring as well as the component for partial shorts to ground to eliminate the draw.

Refer to Illustration 1 on the next page.



Ill. 1

Current Draw - Key Off:
Maximum of .01 DCA (10 mA)

CHARGING SYSTEM "BREAK EVEN" TEST

CAUTION: ***Do not allow the battery cable or ammeter to become disconnected with the engine running. Follow the steps below as outlined to reduce the chance of damage to electrical components.***

WARNING: Never start the engine with the 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.

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.

1. Connect a tachometer according to manufacturer's instructions.
2. With the negative cable still connected to the battery, connect one meter lead (set to DC amps) to the battery post and the other to the negative battery cable
3. With engine off and the key and kill switch in the ON position, the ammeter should read negative amps (battery discharge). Reverse meter leads if a positive reading is indicated.
4. Shift transmission into neutral and start the engine. *With the engine running at idle, disconnect the negative cable from the battery post without disturbing the meter leads.* Observe meter readings
5. Increase engine RPM while observing ammeter and tachometer.
6. Note RPM at which the battery starts to charge (ammeter indication is positive).
7. With lights and other electrical load off, the "break even" point should occur at approximately 1500 RPM or lower.
8. Turn the lights on and engage parking brake lock to keep brake light on.
9. Repeat test, observing ammeter and tachometer. With lights on, charging should occur at or below 2000 RPM.

ALTERNATOR OUTPUT TEST (AC AMP)

This test measures AC amperage from the alternator.

CAUTION: This test simulates a "full load" on the alternator at idle. Do not increase idle RPM or perform this test longer than required to obtain a reading. The alternator stator windings may overheat. 3-5 seconds is acceptable. Failure to place red lead in the fuse-protected "10 Amp" socket will damage the meter.

To Calculate Available Alternator Output

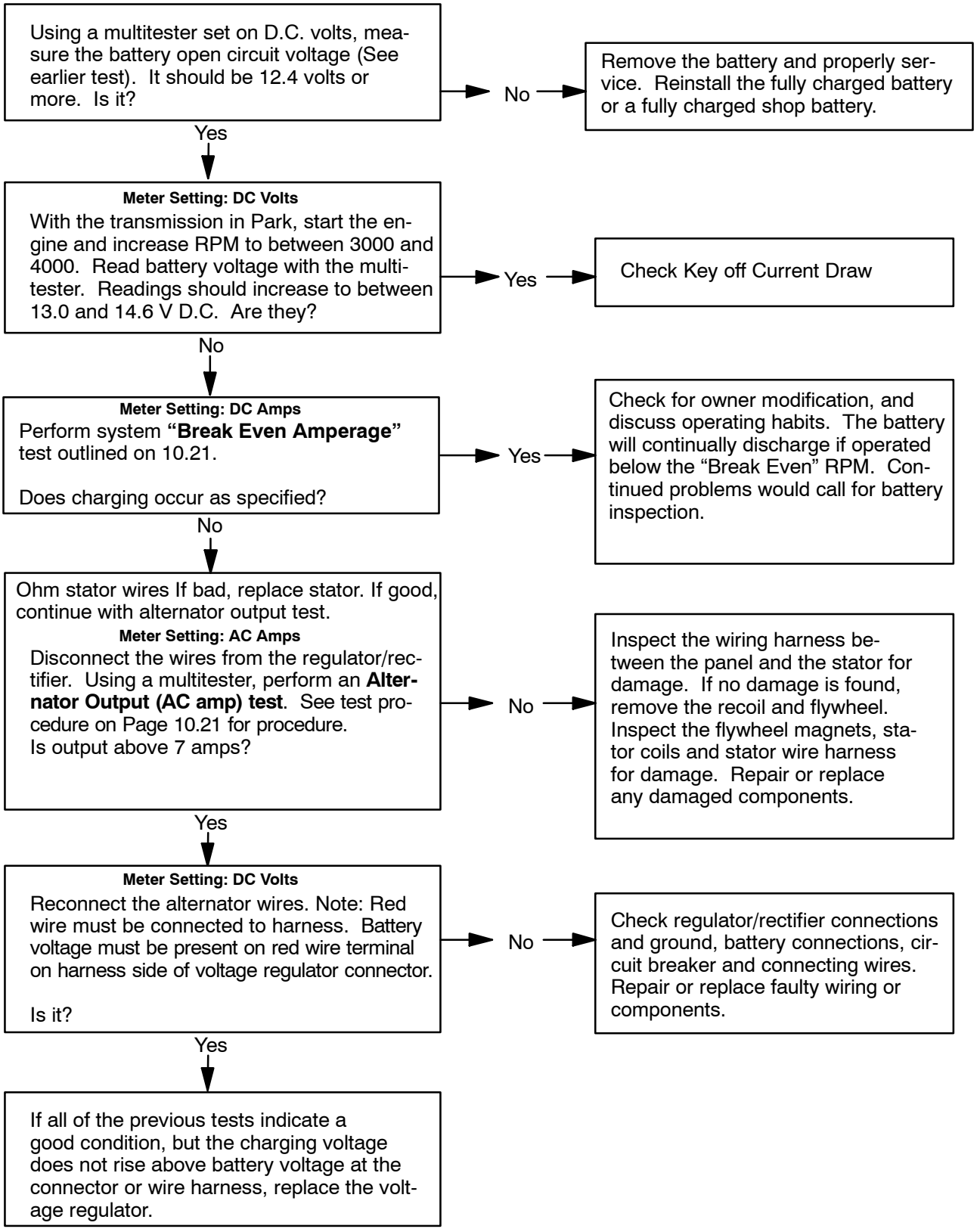
$$I = \frac{P}{E} \qquad \frac{200W}{12V} = 16.7 \text{ Amps} \qquad \frac{250W}{12V} = 20.8 \text{ Amps}$$

I = Current in Amps
P = Power in Watts
E = Electromotive Force (Volts)

1. Maximum alternator output will be indicated on the meter. DO NOT increase engine RPM above idle.
2. Place the red lead on the tester in the 10A jack.
3. Turn the selector dial to the AC amps (A□) position.
4. Connect the meter leads to the Yellow and Yellow/Red wires leading from the alternator.
5. Start the engine and let it idle. Alternator Current Output Reading should be a minimum of **7A/AC at idle**.

CHARGING SYSTEM TESTING FLOW CHART

Whenever charging system problems are suspected, proceed with the following system check after verifying that all wires are in good condition, connected and not kinked or pinched.

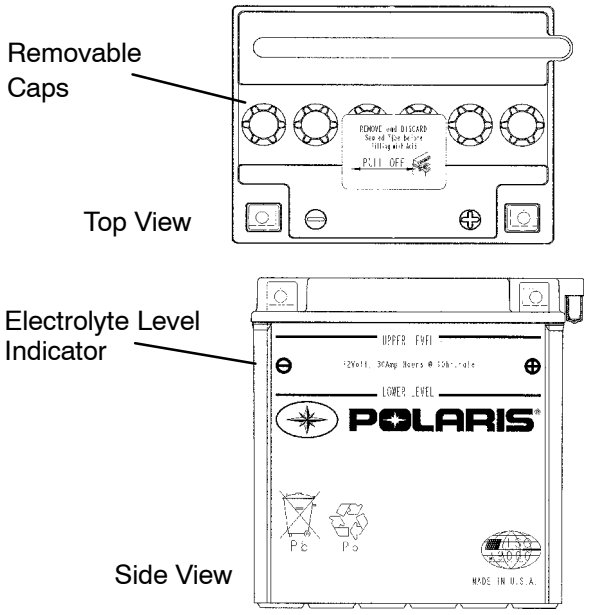


BATTERY IDENTIFICATION

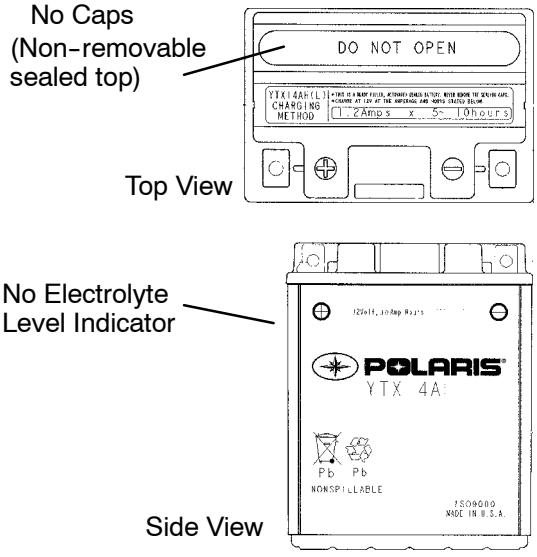
NOTICE: It is important to identify what type of battery you have installed in your ATV. Different types of batteries require different service procedures. Proper servicing and upkeep of your battery is very important for maintaining long battery life.

Your ATV may have a Conventional Battery or a Sealed Low Maintenance Battery. To identify which type of battery your ATV has, refer to the illustration below and follow the correct service and charging procedures that follow in the manual.

CONVENTIONAL BATTERY



SEALED LOW MAINTENANCE BATTERY



BATTERY ACTIVATION (CONVENTIONAL)

⚠WARNING

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

External: Flush with water.

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

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

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

WARNING: The gases given off by a battery are explosive. Any spark or open flame near a battery can cause an explosion which will spray battery acid on anyone close to it. Should there be contact with battery acid, wash the affected area with large quantities of cool water and seek immediate medical attention.

To ensure maximum service life and performance from a new battery, perform the following steps. **NOTE:** Do not service the battery unless it will be put into regular service within 30 days. After initial service, **add only distilled water** to the battery. Never add electrolyte after a battery has been in service.

NOTE: **New Battery:** Battery must be fully charged before use or battery life will be significantly reduced 10-30% of the battery's full potential.

To activate a new battery:

1. Remove vent plug from vent fitting. Remove cell caps.
2. Fill battery with electrolyte to upper level marks on case.
3. Set battery aside to allow for acid absorption and stabilization for 30 minutes.
4. Add electrolyte to bring level back to upper level mark on case. **NOTE:** This is the last time that electrolyte should be added. If the level becomes low after this point, add only distilled water.
5. Charge battery at 1/10 of its amp/hour rating. Examples: 1/10 of 9 amp battery = .9 amp; 1/10

of 14 amp battery = 1.4 amp; 1/10 of 18 amp battery = 1.8 amp (recommended charging rates).

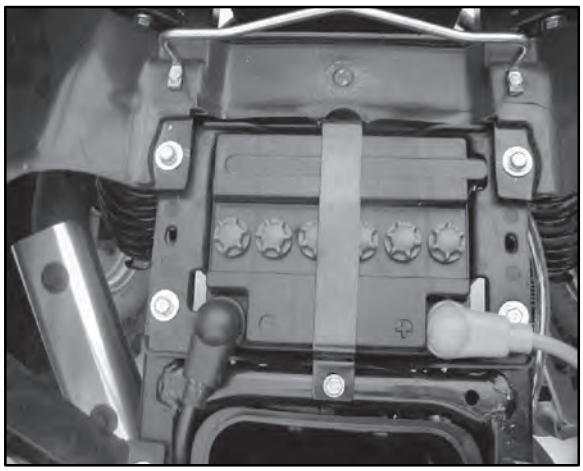
6. Check specific gravity of each cell with a hydrometer to assure each has a reading of 1.270 or higher.

BATTERY TERMINALS/TERMINAL BOLTS

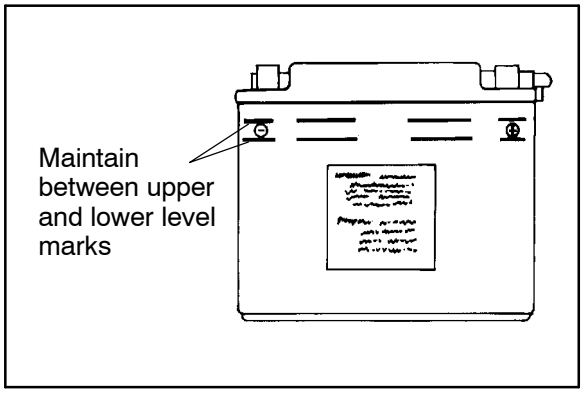
Use Polaris corrosion resistant Nyogel™ grease (**PN 2871329**) on battery bolts. See Battery Installation on Page 10.24.

CONVENTIONAL BATTERY INSPECTION/REMOVAL

The battery is located under the seat.



Inspect the battery fluid level. When the battery fluid nears the lower level, remove the battery and fill with *distilled water only* to the upper level line. To remove the battery:



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

⚠ CAUTION

Whenever removing or reinstalling the battery, disconnect the negative (black) cable first and reinstall the negative cable last!

3. Remove the battery.
4. Remove the filler caps and add ***distilled water only*** as needed to bring each cell to the proper level. Do not overfill the battery.

⚠ Refill using only distilled water. Tap water contains minerals which are harmful to a battery.

⚠ Do not allow cleaning solution or tap water inside the battery. Battery life may be reduced.

5. Reinstall the battery caps.

CONVENTIONAL BATTERY INSTALLATION

1. Clean battery cables and terminals with a stiff wire brush. Corrosion can be removed using a solution of one cup water and one tablespoon baking soda. Rinse well with clean water and dry thoroughly.
2. Route the cables correctly.
3. Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable. Coat terminals and bolt threads with Nyogel™ Grease **(PN 2871329)**.
4. Install clear battery vent tube from vehicle to battery vent. **WARNING:** Vent tube must be free from obstructions and kinks and securely installed. If not, battery gases could accumulate and cause an explosion. The vent tube should be routed away from frame and body to prevent contact with electrolyte. Avoid skin contact with electrolyte, as severe burns could result. If electrolyte contacts the vehicle frame, corrosion will occur.
5. Reinstall the holder strap.

CONVENTIONAL BATTERY TESTING

Whenever a service complaint is related to either the starting or charging systems, the battery should be checked first.

Following are three tests which can easily be made on a battery to determine its condition: OCV Test, Specific Gravity Test and Load Test.

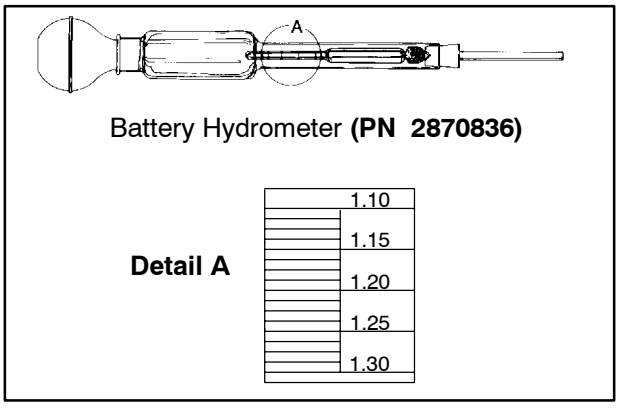
CONVENTIONAL BATTERY OCV - OPEN CIRCUIT VOLTAGE TEST

Battery voltage should be checked with a digital multitester. Readings of 12.6 volts or less require further battery testing and charging. See charts and Load Test on below.

NOTE: Lead-acid batteries should be kept at or near a full charge as possible. Electrolyte level should be kept between the low and full marks. If the battery is stored or used in a partially charged condition, or with low electrolyte levels, hard crystal sulfation will form on the plates, reducing the efficiency and service life of the battery.

CONVENTIONAL BATTERY SPECIFIC GRAVITY TEST

A tool such as a Battery Hydrometer (**PN 2870836**) can be used to measure electrolyte strength or specific gravity. As the battery goes through the charge/discharge cycle, the electrolyte goes from a heavy (more acidic) state at full charge to a light (more water) state when discharged. The hydrometer can measure state of charge and differences between cells in a multi-cell battery. Readings of 1.270 or greater should be observed in a fully charged battery. Differences of more than .025 between the lowest and highest cell readings indicate a need to replace the battery.



Battery Hydrometer **(PN 2870836)**

OPEN CIRCUIT VOLTAGE		
State of charge	Conventional Lead-acid	YuMicron™ Type
100% Charged	12.60V	12.70V
75% Charged	12.40V	12.50V
50% Charged	12.10V	12.20V
25% Charged	11.90V	12.0V
0% Charged	less than 11.80V	less than 11.9V

SPECIFIC GRAVITY		
State of charge*	Conventional lead-acid	YuMicron™ Type
100% Charged	1.265	1.275
75% Charged	1.210	1.225
50% Charged	1.160	1.175
25% Charged	1.120	1.135
0% Charged	less than 1.100	less than 1.115

* At 80°F

NOTE: Subtract .01 from the specific gravity reading at 40° F.

LOAD TEST

CAUTION: ***To prevent shock or component damage, remove spark plug high tension leads and connect securely to engine ground before proceeding.***

NOTE: This test can only be performed on machines with electric starters. This test cannot be performed with an engine or starting system that is not working properly.

A battery may indicate a full charge condition in the OCV test and the specific gravity test, but still may not have the storage capacity necessary to properly function in the electrical system. For this reason, a battery capacity or load test should be conducted whenever poor battery performance is encountered. To perform this test, hook a multitester to the battery in the same manner as was done in the OCV test. The reading should be 12.6 volts or greater. Engage the starter and observe the battery voltage while cranking the engine. Continue the test for 15 seconds. During cranking the observed voltage should not drop below 9.5 volts. If the beginning voltage is 12.6 volts or higher and the cranking voltage drops below 9.5 volts during the test, replace the battery.

OFF SEASON STORAGE

To prevent battery damage during extended periods of non-use, the following basic battery maintenance items must be performed:

- Remove the battery from the machine and wash the case and battery tray with a mild solution of baking soda and water. Rinse with lots of fresh water after cleaning. **NOTE:** Do not get any of the baking soda into the battery or the acid will be neutralized.
- Using a wire brush or knife, remove any corrosion from the cables and terminals.
- Make sure that the electrolyte is at the proper level. Add distilled water if necessary.
- Charge at a rate no greater than 1/10 of the battery's amp/hr capacity until the electrolyte's specific gravity reaches 1.270 or greater.
- Store the battery either in the machine with the cables disconnected, or store in a cool place.

NOTE: Recharge to full capacity every 30 to 60 days during a non-use period. If the battery is stored during the winter months, electrolyte will freeze at higher temperatures as the battery discharges. The chart below indicates freezing points by specific gravity.

Electrolyte Freezing Points	
Specific Gravity of Electrolyte	Freezing Point
1.265	-75° F
1.225	-35° F
1.200	-17° F
1.150	+5° F
1.100	+18° F
1.050	+27° F

CHARGING PROCEDURE

1. Remove the battery from the ATV to prevent damage from leaking or spilled acid during charging.
2. Charge the battery with a charging output no larger than 1/10 of the battery's amp/hr rating. Charge as needed to raise the specific gravity to 1.270 or greater.
3. Install battery in vehicle with positive terminal toward the front. Coat threads of battery bolt with a corrosion resistant dielectric grease.

Dielectric Grease

(PN 2871329)

4. Connect battery cables.

⚠ WARNING

To avoid the possibility of explosion, connect positive (red) cable first and negative (black) cable last.

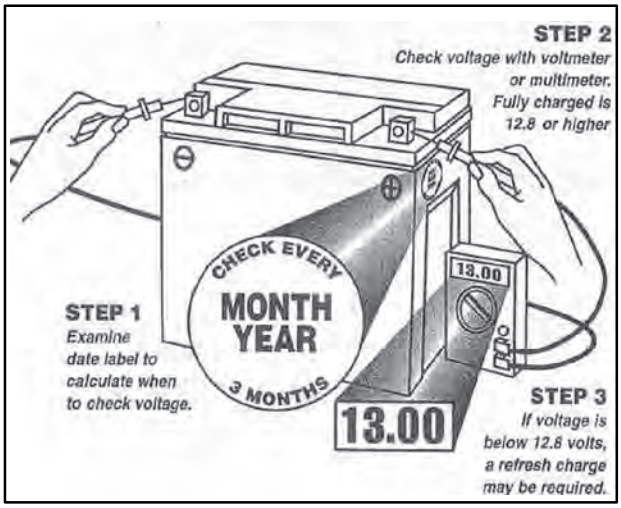
5. After connecting the battery cables, install the cover on the battery and attach the hold down strap.
6. Install clear battery vent tube from vehicle to battery vent. **WARNING:** Vent tube must be free from obstructions and kinks and securely installed. If not, battery gases could accumulate and cause an explosion. Vent should be routed away from frame and body to prevent contact with electrolyte. Avoid skin contact with electrolyte, as severe burns could result. If electrolyte contacts the vehicle frame, corrosion will occur.
7. Route cables so they are tucked away in front and behind battery.

LOW MAINTENANCE BATTERY

NOTE: All Low Maintenance batteries are fully charged and tested at the factory before installation. Expected shelf life varies on storage conditions. As a general rule before placing the battery into service, check the battery condition and charge accordingly.

Battery Check:

1. Check the date label on the side of the battery to calculate when to check voltage. The battery should be checked every 3 months.
2. Check the voltage with a voltmeter or multimeter. **A fully charged battery should be 12.8 V or higher.**
3. If the voltage is below 12.8 V, the battery will need to be recharged.



New Batteries: Batteries must be fully charged before use or battery life can be reduced by 10-30% of full potential. Charge battery for 3-5 hours using a variable rate charger. Do not use the alternator to charge a new battery. A high rate battery charger can cause battery damage.

Low Maintenance batteries are permanently sealed at the time of manufacture. The use of lead-calcium and AGM technology instead of lead-antimony allows the battery acid to be fully absorbed. For this reason, a Low Maintenance battery case is dark and the cell caps are not removable, since there is no need to check electrolyte level.

NEVER attempt to add electrolyte or water to a Low Maintenance battery. Doing so will damage the case and shorten the life of the battery. Refer to the Battery Activation and Maintenance Video (PN 9917987) for proper instruction on servicing Low Maintenance batteries.

NOTE: New Batteries: Batteries must be fully charged before use or battery life will be reduced by 10-30% of full potential. Charge battery for 3-5 hours at a current equivalent of 1/10 of the battery's rated amp/hour capacity. Do not use the alternator to charge a new battery. (Refer to Battery Activation and Maintenance video **PN 9917987**)

NEVER attempt to add electrolyte or water to a Low Maintenance battery. Doing so will damage the case and shorten the life of the battery. Refer to the Battery Maintenance Video (PN 9917987) for proper instruction on servicing Low Maintenance batteries.

To service a Low Maintenance battery:

1. Remove battery from the vehicle
2. Test battery with a voltage meter or load tester to determine battery condition. This will determine the length of time required to charge the battery to full capacity. Refer to capacity table.
3. Charge battery using a variable rate charger.

LOW MAINTENANCE BATTERY CHARGING

If battery voltage is 12.8 V or less, the battery may need recharging. When using an automatic charger, refer to the charger manufacturer's instructions for recharging. When using a constant current charger, use the following guidelines for recharging.

NOTE: Always verify battery condition before and 1-2 hours after the end of charging.

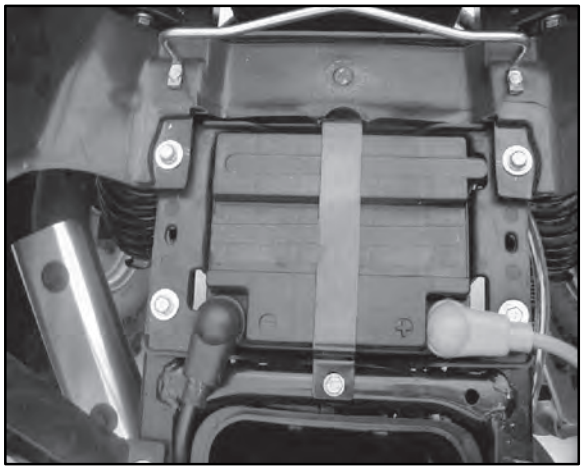
WARNING: An overheated battery could explode, causing severe injury or death. Always watch charging times carefully. Stop charging if the battery becomes very warm to the touch. Allow it to cool before resuming charging.

Battery Charging Reference Table

State of Charge	Voltage	Action	Charge Time (*See note below)
100%	12.8-13 V	None, check voltage at 3 mos. after manufacture date	None Required
75-100%	12.5-12.8 V	May need slight charge	3-6 hours
50-75%	12.0-12.5 V	Needs Charge	5-11 hours
25-50%	11.5-12.0 V	Needs Charge	At least 13 hours, verify state of charge
0-25%	11.5 V or less	Needs Charge	At least 20 hours

LOW MAINTENANCE BATTERY INSPECTION/ REMOVAL

The battery is located under the seat.



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

⚠ CAUTION

Whenever removing or reinstalling the battery, disconnect the negative (black) cable first and reinstall the negative cable last!

3. Remove the battery.

LOW MAINTENANCE BATTERY INSTALLATION

1. Clean battery cables and terminals with a stiff wire brush. Corrosion can be removed using a solution of one cup water and one tablespoon baking soda. Rinse well with clean water and dry thoroughly.
2. Route the cables correctly.
3. Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable. Coat terminals and bolt threads with Nyogel™ Grease **(PN 2871329)**.
4. Reinstall the holder strap.

LOW MAINTENANCE BATTERY TESTING

Whenever a service complaint is related to either the starting or charging systems, the battery should be checked first.

Following are three tests which can easily be made on a battery to determine its condition: OCV Test, Specific Gravity Test and Load Test.

LOW MAINTENANCE BATTERY – OCV - OPEN CIRCUIT VOLTAGE TEST

Battery voltage should be checked with a digital multitester. Readings of 12.8 volts or less require further battery testing and charging. See charts and Load Test.

NOTE: Lead-acid batteries should be kept at or near a full charge as possible. If the battery is stored or used in a partially charged condition, or with low electrolyte levels, hard crystal sulfation will form on the plates, reducing the efficiency and service life of the battery.

NOTE: Use a voltmeter or multimeter to test batter voltage.

OPEN CIRCUIT VOLTAGE		
State of charge	Maintenance Free	YuMicron™ Type
100%	13.0V	12.70V
75% Charged	12.80V	12.50V
50% Charged	12.50V	12.20V
25% Charged	12.20V	12.0V
0% Charged	less than 12.0V	less than 11.9V

* At 80°F

NOTE: Subtract .01 from the specific gravity reading at 40° F.

LOW MAINTENANCE BATTERY LOAD TEST

CAUTION: ***To prevent shock or component damage, remove spark plug high tension leads and connect securely to engine ground before proceeding.***

NOTE: This test can only be performed on machines with electric starters. This test cannot be performed with an engine or starting system that is not working properly.

A battery may indicate a full charge condition in the OCV test and the specific gravity test, but still may not have the storage capacity necessary to properly function in the electrical system. For this reason, a battery capacity or load test should be conducted whenever poor battery performance is encountered. To perform this test, hook a multitester to the battery in the same manner as was done in the OCV test. The reading should be 12.6 volts or greater. Engage the starter and observe the battery voltage while cranking the engine. Continue the test for 15 seconds. During cranking the observed voltage should not drop below 9.5 volts. If the beginning voltage is 12.6 volts or higher and the cranking voltage drops below 9.5 volts during the test, replace the battery.

LOW MAINTENANCE BATTERY OFF-SEASON STORAGE

To prevent battery damage during extended periods of non-use, the following basic battery maintenance items must be performed:

- Remove the battery from the machine and wash the case and battery tray with a mild solution of baking soda and water. Rinse with lots of fresh water after cleaning.
- Using a wire brush or knife, remove any corrosion from the cables and terminals.
- Make sure that the electrolyte is at the proper level.
- Charge at a rate no greater than 1/10 of the battery's amp/hr capacity until the electrolyte's specific gravity reaches 1.270 or greater.
- Store the battery either in the machine with the cables disconnected, or store in a cool place.

NOTE: Stored batteries lose their charge at the rate of 1% per day. Recharge to full capacity every 30 to 60 days during a non-use period. If the battery is stored during the winter months, electrolyte will freeze at higher temperatures as the battery discharges. The chart below indicates freezing points by specific gravity.

Electrolyte Freezing Points	
Specific Gravity of Electrolyte	Freezing Point
1.265	-75° F
1.225	-35° F
1.200	-17° F
1.150	+5° F
1.100	+18° F
1.050	+27° F

LOW MAINTENANCE BATTERY CHARGING PROCEDURE

1. Remove the battery from the ATV to prevent damage from leaking or spilled acid during charging.
2. Charge the battery with a variable rate charging output. Charge as needed to raise the specific gravity to 1.270 or greater.
3. Install battery in vehicle with positive terminal toward the front. Coat threads of battery bolt with a corrosion resistant Nyogel™ Grease (**PN 2871329**).
4. Route cables so they are tucked away in front and behind battery.
5. Connect battery cables.

⚠ WARNING

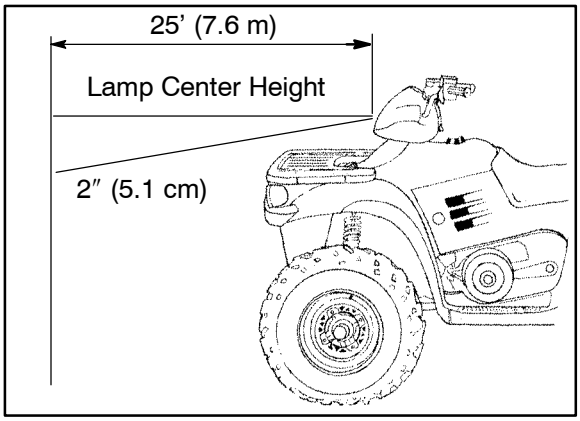
To avoid the possibility of sparks and explosion, connect positive (red) cable first and negative (black) cable last.

6. After connecting the battery cables, install the cover on the battery and attach the hold down strap.

HIGH BEAM HEADLIGHT ADJUSTMENT

The headlight beam can be adjusted to any position desired by turning the adjusting knob located on the bottom right side of the headlight pod.

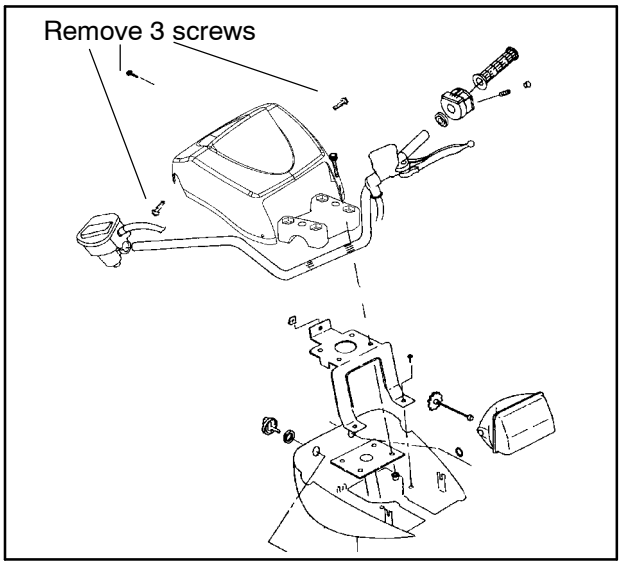
1. Place the vehicle on a level surface with the headlight approximately 25’ (7.6 m) from a wall.



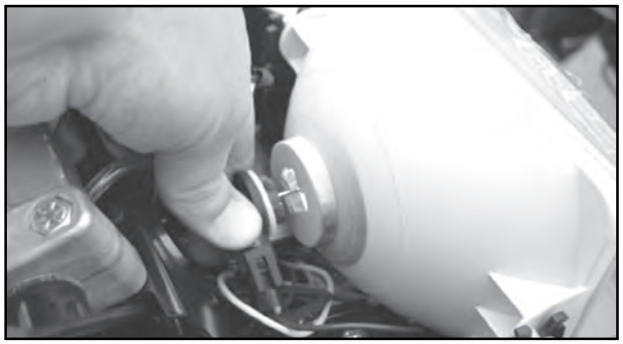
2. Measure the distance from the floor to the center of the headlight and make a mark on the wall at the same height.
3. Start the engine and turn the headlight switch to high beam.
4. Observe headlight aim. The most intense part of the headlight beam should be aimed 2″ (5.1 cm) below the mark placed on the wall in Step 2 **NOTE:** Rider weight must be included on the seat. On machines with separate low beam lights, the drop should be 8″ (20.3 cm) in 25’ from the center of the low beam lamp.
5. Adjust beam to desired position .

HIGH BEAM HEADLIGHT BULB REPLACEMENT

CAUTION: Do not service while headlight is hot. Serious burns may result. Protect lamp during install.



1. Remove three Phillips screws on the headlight pod.
2. Lift pod cover up.
3. Disconnect instrument cluster harness.
4. Remove rubber shield from headlamp housing.
5. Push in and turn plastic retainer counter clockwise and remove.

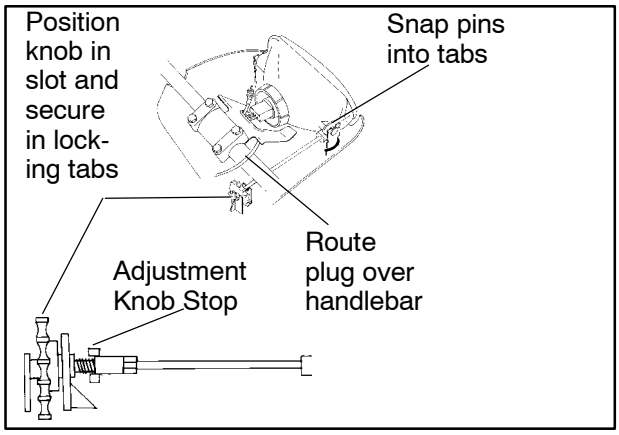


6. Carefully remove headlamp bulb from housing.
7. Reverse procedure to install new headlamp bulb.

HEADLIGHT HOUSING REPLACEMENT

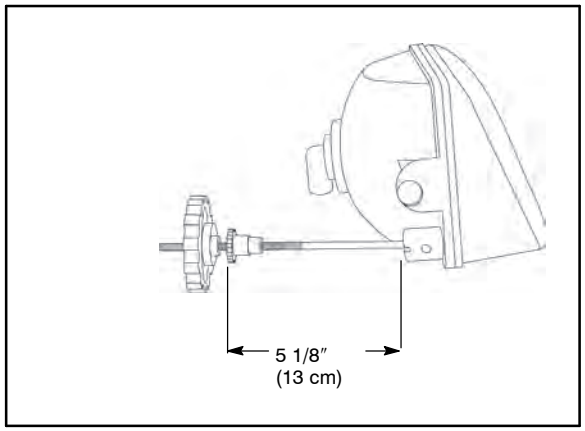
1. Remove three Phillips screws on the headlight pod.
2. Lift pod cover up. Unplug instrument cluster from harness.
3. Unplug headlamp from wiring harness.
4. Remove O-Ring from headlight pivot pins.

5. Pull the headlight housing up to release from the locking tabs.



6. Lift the adjusting knob up to remove from the locking tabs.
7. Carefully pull the assembly up and out of pod.

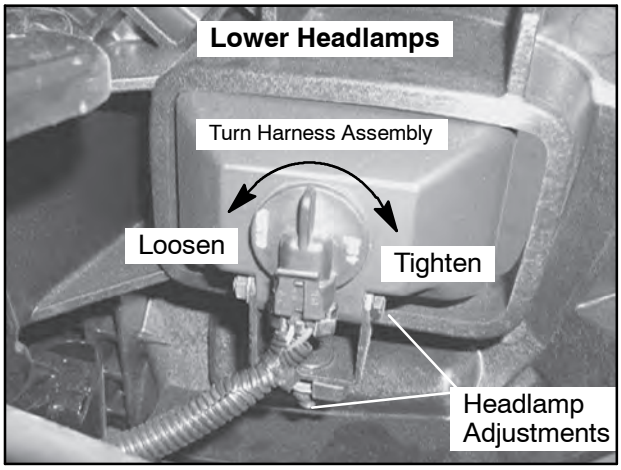
8. Reverse the steps to install the new housing and reassemble the pod.



NOTE: The distance from the headlamp parting line to the end of the adjustment knob stop is 5 1/8, (13 cm). See illustration.

9. Adjust the headlight aim by turning the adjusting knob.

LOWER HEADLAMP REMOVAL/INSTALLATION



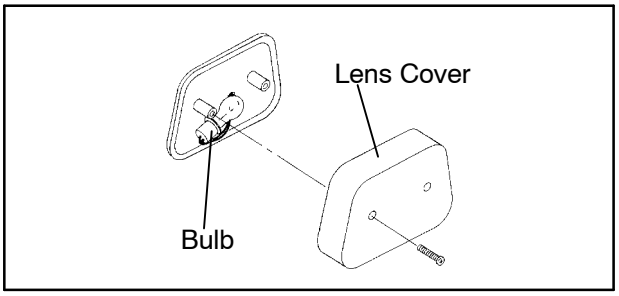
1. Turn the back of the headlight harness in a counter-clockwise direction to loosen.
2. Pull the harness assembly out from the headlight assembly.
3. Remove the headlamp and replace with a new headlamp.
4. Install the new headlamp and harness assembly into the headlight assembly. Turn the headlight harness clockwise to secure the headlamp into place.

Lower Headlamp Adjustment

5. Loosen the nuts that secure the lower headlamps. Adjust the headlamps as needed.
6. Tighten the nuts on the headlamps after adjustment is made.

TAILLIGHT/BRAKELIGHT LAMP REPLACEMENT

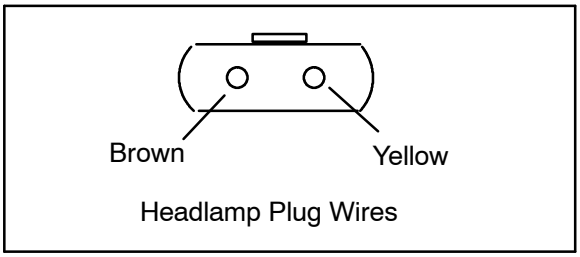
If the taillight/brakelight does not work the lamp may need to be replaced.



1. From the rear of the taillight remove two screws holding lens cover in place and remove lens cover.
2. Remove lamp and replace it with recommended lamp. Apply Dielectric Grease **(PN 2871329)**.
3. Reinstall the lens cover removed in step 1.
4. Test the taillight/brakelight to see it is working.

HEADLAMP SWITCH

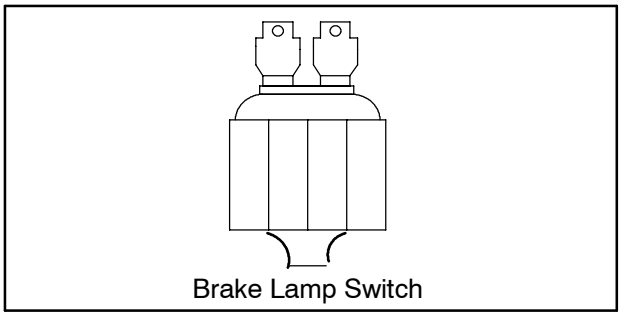
Remove the headlight pod cover. Probe the headlamp plug wires (Brown and Yellow) at back of connector. Turn headlight on.



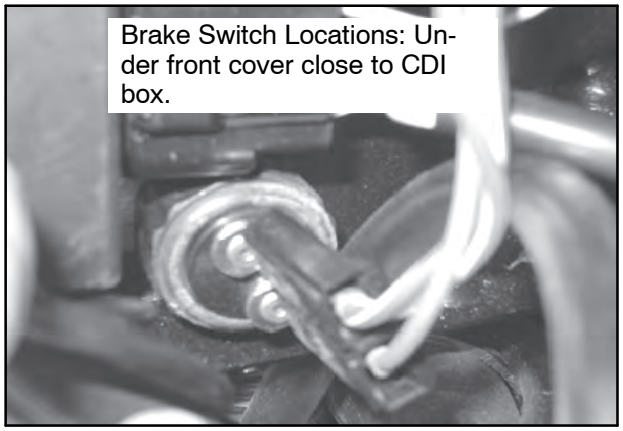
Headlamp Plug Wires

BRAKE LIGHT SWITCH

1. Remove the front cover.



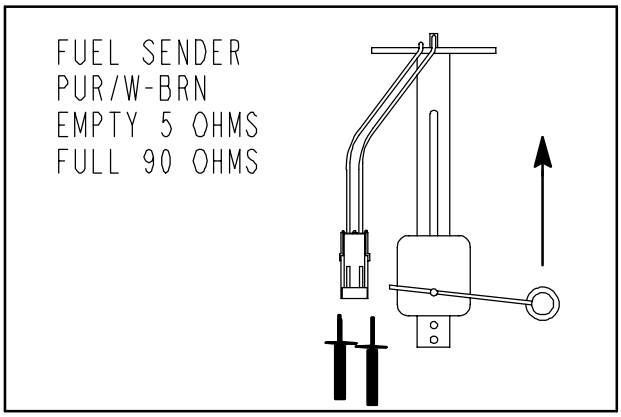
Brake Lamp Switch



2. Disconnect wire harness from switch.
3. Connect an ohmmeter across switch contacts. Reading should be infinite (∞).
4. Apply brake at handlebar lever and check for continuity between switch contacts. Replace switch if there is no continuity or greater than .5 ohms resistance when the brake is applied with slight pressure.

FUEL SENDER TEST

1. Remove the fuel sender from the fuel tank. Refer to Chapter 4 “FUEL SENDER REMOVAL/INSTALLATION”.
2. Stand the fuel sender on a flat surface.
3. Hook up an ohm meter to the fuel sender harness (Brown & Purple / White).
4. With the sender float in the **empty position**, the meter should read **5 ohms**.
5. Slowly lift the sender float to the **full position**, the meter should now read **90 ohms**.

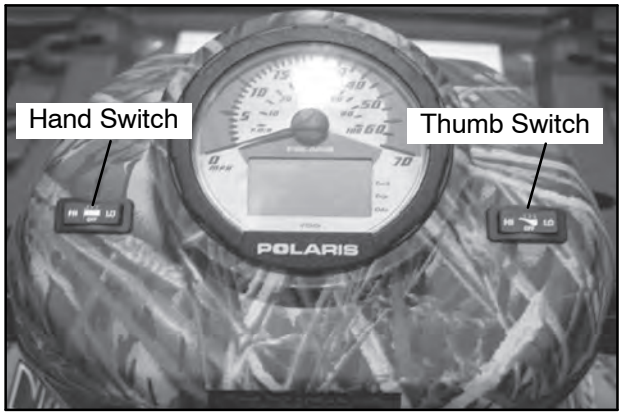


6. If the reading are not **between 5 ohms and 90 ohms**, or if the reading is erratic, replace the fuel sender.

HAND/THUMB WARMER SWITCHES (SPORTSMAN HUNTER EDITION)

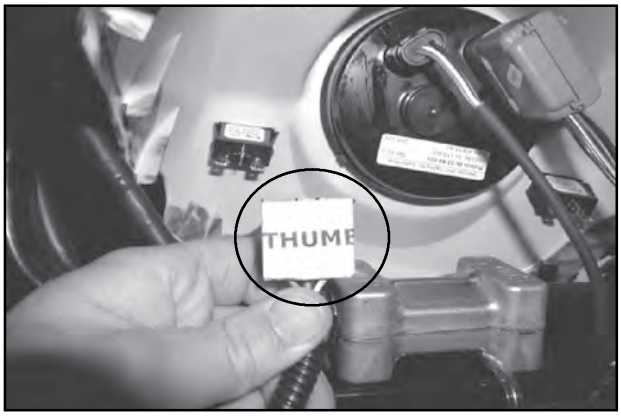
Button Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the top of the headlight pod (3 screws).



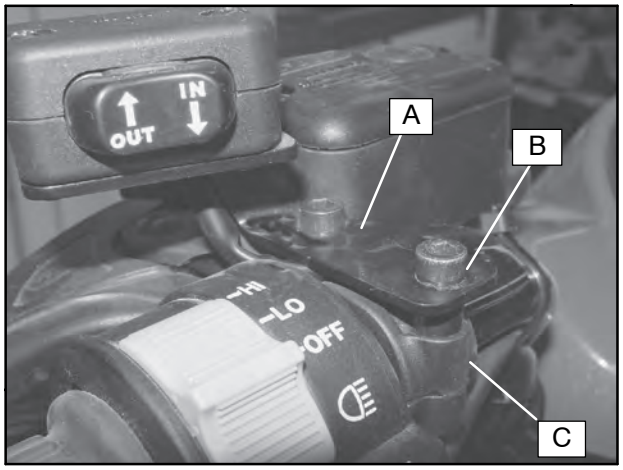
3. Disconnect the harness from the backside of the switch.
4. On the inside of the pod, squeeze the button tabs to together and push the button out of the top of the headlight pod.
5. To install the switch, squeeze the tabs together and insert the switch into the headlight pod. The switch will snap into place.

6. Reinstall the harness to the backside of the switch. Be sure to install the correct harness to the correct switch. The thumb harness is clearly marked for installation.

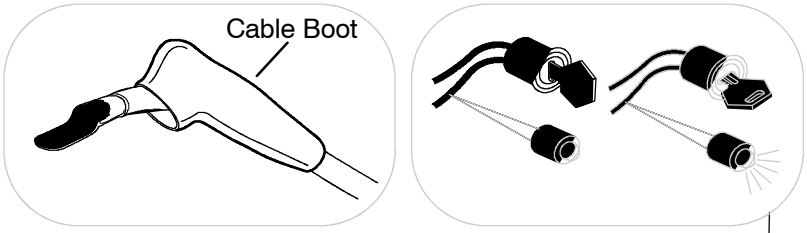


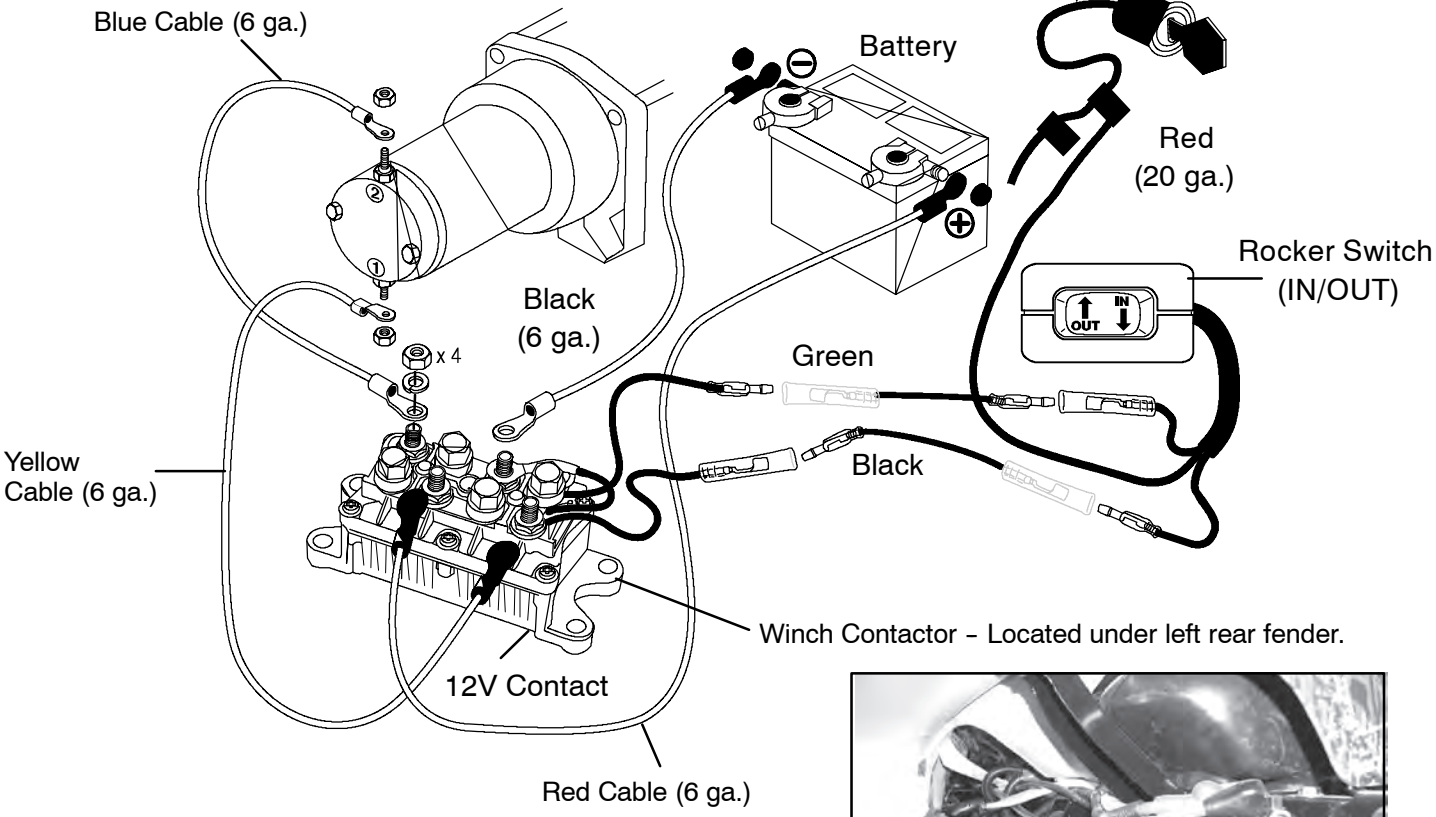
WARN® WINCH SWITCH INSTALLATION (SPORTSMAN HUNTER EDITION)

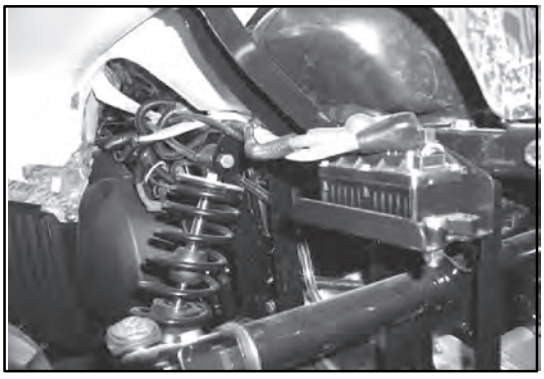
1. Remove the front (A) and rear (B) bolts from the master cylinder clamp. Be careful not to lose the spacers (C).
2. Rotate the mini-rocker switch upward and mount as shown. Route the wire between the switch mounting bracket and the master cylinder clamp, next to the front spacer.
3. Reposition the spacers between the mini-rocker switch mounting bracket and the master cylinder clamp and reinstall the bolts to secure the switch. Torque the rear bolt first, then torque the front bolt. Torque to 25 in./lbs. (3 N/m).
4. Secure the cables to the handlebars as needed with the new panduits provided in the toolbox.

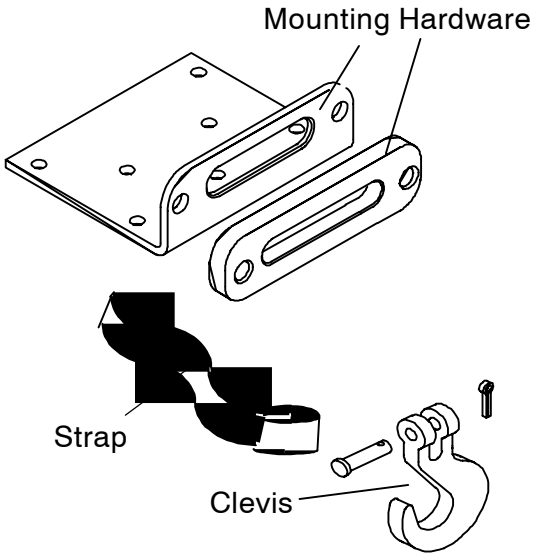


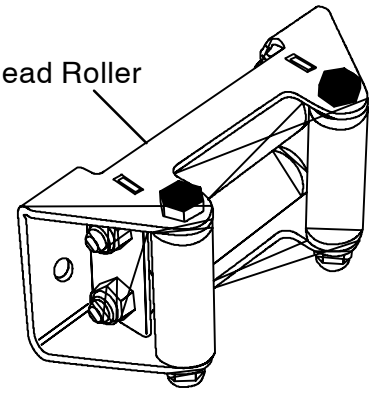
BASIC WARN® WINCH WIRING (SPORTSMAN HUNTER EDITION)











STARTER SYSTEM TROUBLESHOOTING

Starter Motor Does Not Turn

- Battery discharged. Low specific gravity
- Loose or faulty battery cables or corroded connections (see Voltage Drop Tests)
- Related wiring loose, disconnected, or corroded
- Poor ground connections at battery cable, starter motor or starter solenoid (see Voltage Drop Tests)
- Faulty key switch
- Faulty kill switch
- Faulty starter solenoid or starter motor.
- Engine problem - seized or binding (Can engine be rotated easily with recoil starter?)

Starter Motor Turns Over Slowly

- Battery discharged - low specific gravity
- Excessive circuit resistance - poor connections (see Voltage Drop Test below)
- Engine problem - seized or binding (Can engine be rotated easily?)
- Faulty or worn brushes in starter motor

Starter Motor Turns - Engine Does Not Rotate

- Faulty starter drive
- Faulty starter drive gears or starter motor gear
- Faulty flywheel gear or loose flywheel

VOLTAGE DROP TEST

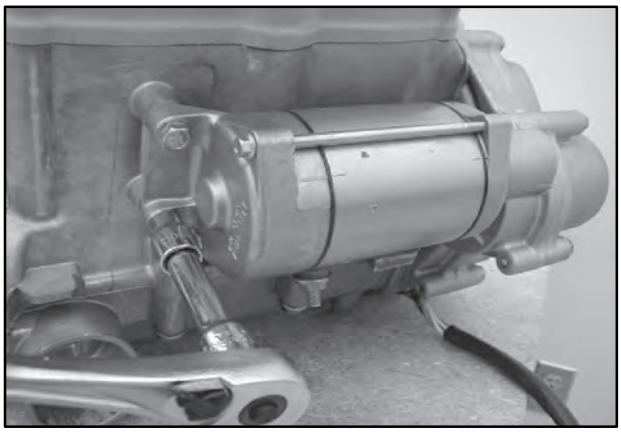
The Voltage Drop Test is used to test for bad connections. When performing the test, you are testing the amount of voltage drop through the connection. A poor or corroded connection will appear as a high voltage reading. Voltage shown on the meter when testing connections should not exceed .1 VDC per connection or component.

To perform the test, place the meter on DC volts and place the meter leads across the connection to be tested. Refer to the chart on 1.47 to perform voltage drop tests on the starter system.

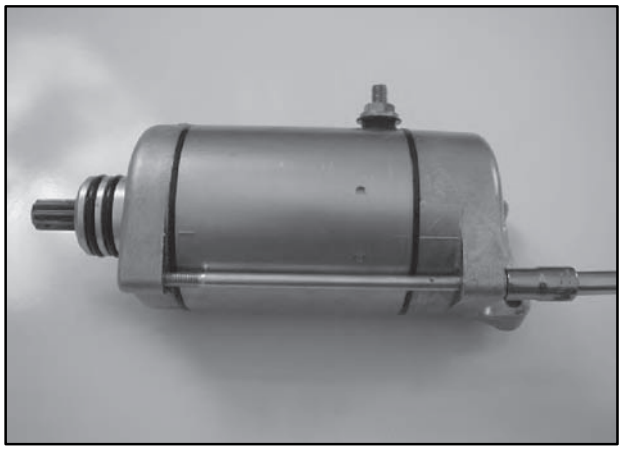
Voltage should not exceed .1 DC volts per connection

STARTER MOTOR REMOVAL/ DISASSEMBLY

NOTE: Use electrical contact cleaner to clean starter motor parts. Some solvents may leave a residue or damage internal parts and insulation.

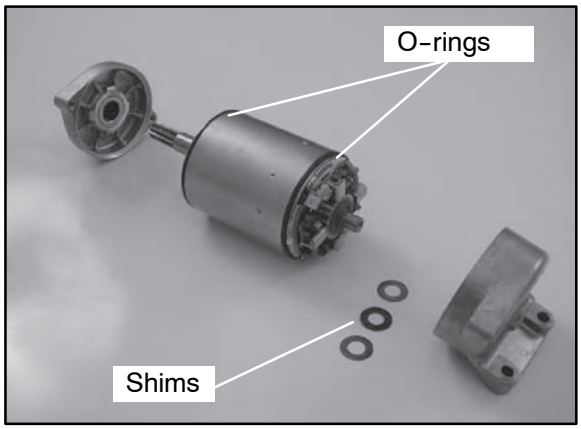


1. Remove the starter from the engine.
2. Remove the two bolts, washers, and sealing O-Rings. Inspect O-Rings and replace if damaged.



NOTE: Note the alignment marks on both ends of the starter motor casing. These marks must align during reassembly.

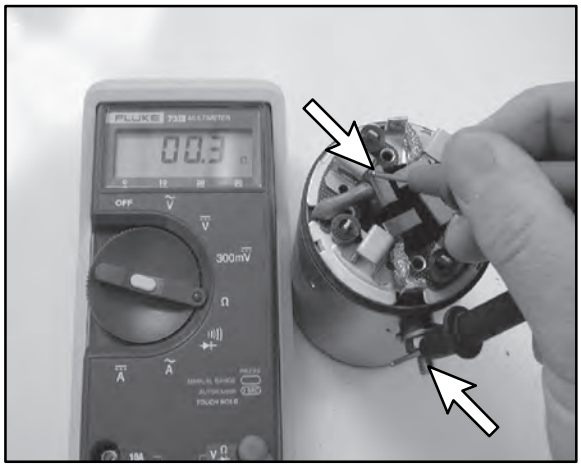
3. Remove the front bracket assembly and the rear bracket assembly. Remove the shims from the armature shaft and inspect the O–rings located on the armature housing.



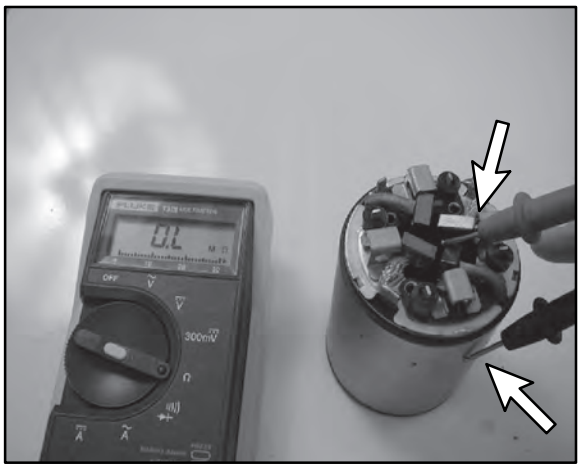
NOTE: The shims will be replaced during reassembly.

BRUSH INSPECTION/REPLACEMENT

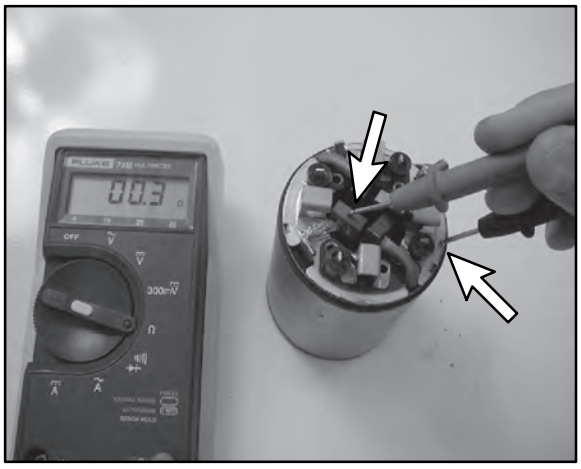
1. Measure resistance between starter input terminal and insulated brushes. The reading should be .3 ohms or less. Remember to subtract meter lead resistance.



2. Measure resistance between insulated brush and starter housing. Reading should be infinite. (OL). Inspect insulation on brush wires for damage and repair or replace as necessary.

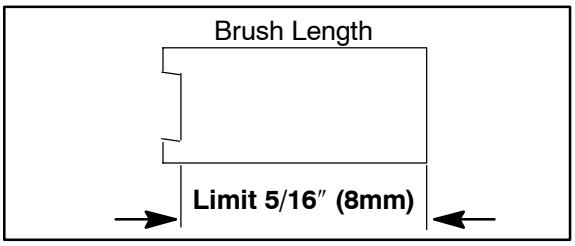


3. Slide positive brush springs to the side, pull brushes out of their guides and remove brush plate. Slide brush end frame off end of starter. **NOTE:** The electrical input post must stay with the field coil housing.
4. Measure resistance between ground brush and brush plate. Resistance should be .3 ohms or less.



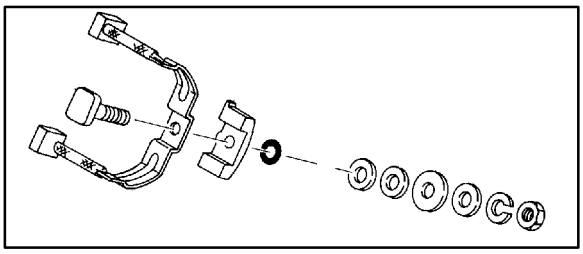
Inspection

1. Measure length of each carbon brush. Replace brush assembly when worn to 5/16″ (8 mm) or less. The brushes must slide freely in their holders.



Brush Replacement

1. Remove terminal nut with lock washer, flat washer, large phenolic washer, the small phenolic spacers, and sealing O-ring. Inspect O-ring and replace if damaged.



2. Slide positive brush springs to the side, pull brushes out of their guides and remove brush plate.

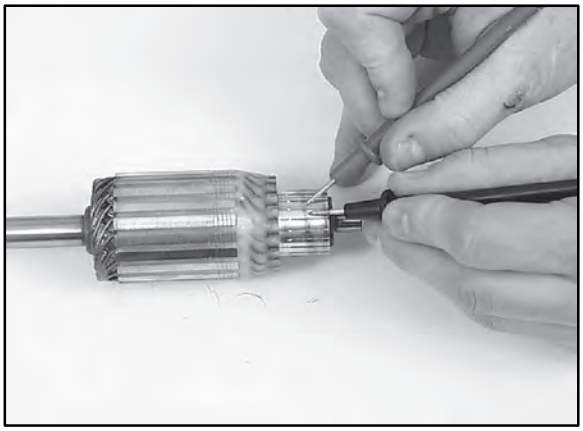
Cleaning

CAUTION:

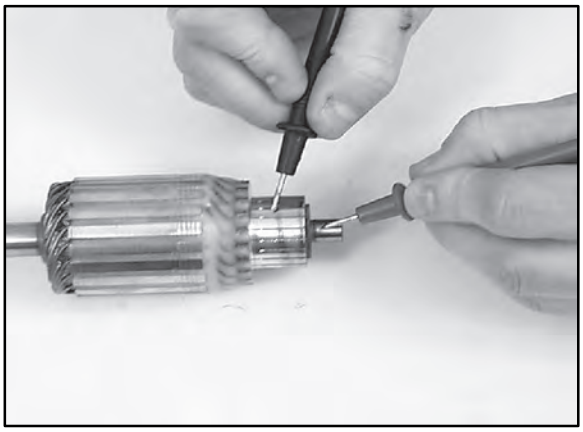
Some cleaning solvents may damage the insulation in the starter. Care should be exercised when selecting an appropriate solvent. If the commutator needs cleaning use only electrical contact cleaner.

ARMATURE TESTING

1. Remove armature from starter casing. Note order of shims on drive end for reassembly.



2. Inspect surface of commutator. Replace if excessively worn or damaged.
3. Using a digital multitester, measure the resistance between each of the commutator segments. The reading should be .3 ohms or less.
4. Measure the resistance between each commutator segment and the armature shaft. The reading should be infinite (no continuity).



5. Check commutator bars for discoloration. Bars discolored in pairs indicate shorted coils, requiring replacement of the starter motor.

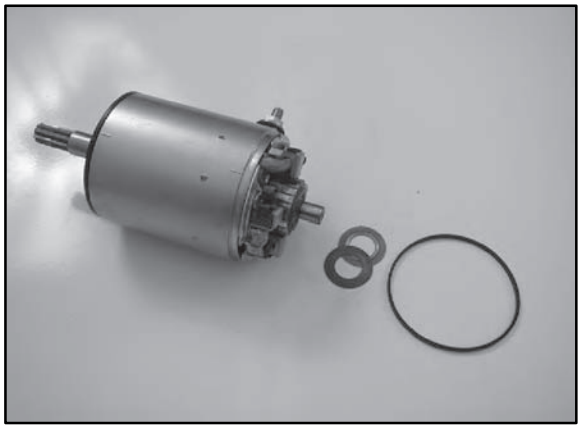
6. Place armature in a growler. Turn growler on and position a hacksaw blade or feeler gauge lengthwise 1/8″ (.3 cm) above armature coil laminates. Rotate armature 360°. If hacksaw blade is drawn to armature on any pole, the armature is shorted and must be replaced.

CAUTION:

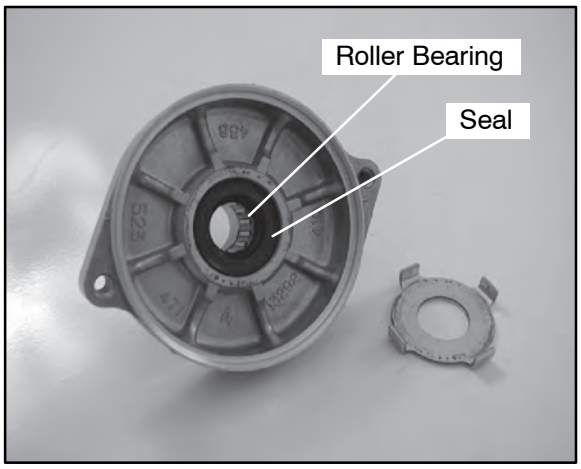
Use care when handling starter housing. Do not drop or strike the housing as magnet damage is possible. If magnets are damaged, starter must be replaced.

STARTER REASSEMBLY/INSTALLATION

1. Install brush plate to field magnet housing aligning index tab.



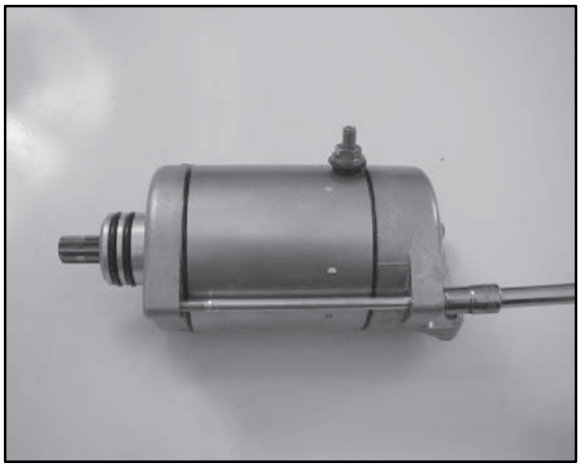
2. Install O-ring, two small phenolic spacers, large phenolic washer, flat washer, lock washer, and terminal nut.
3. While holding brush springs away from brushes, push brushes back and hold in place.
4. Slide armature into field magnet housing. Release brushes.
5. Lightly grease the drive roller bearing and reinstall drive end frame on armature. Inspect seal for wear or damage. Replace drive end cap if necessary.



6. Be sure wire insulation is in place around positive brush wire and pushed completely into slot on phenolic plate.
7. Using a non-petroleum grease, lubricate brush end bushing and install shims.

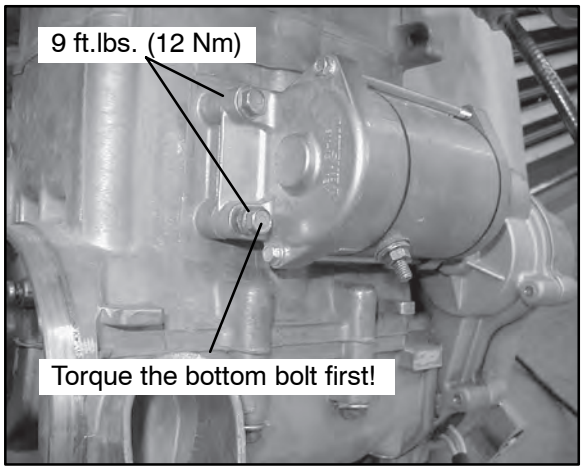
Dielectric Grease (PN 2871329)

8. Align brush plate and install cover and screws.
9. Lightly grease pinion shaft and install pinion, spring stopper, and snap ring.



10. Install the starter onto the engine case. Hand tighten each of the starter bolts. **Torque the bottom bolt first to 9 ft.lbs. (12 NM)**. Then torque the top bolt to the same specification.

NOTE: It is important to tighten the bottom starter bolt first, as the bottom hole acts as a pilot hole to properly align the starter drive (bendix) with the flywheel. This helps to prevent binding and starter damage.



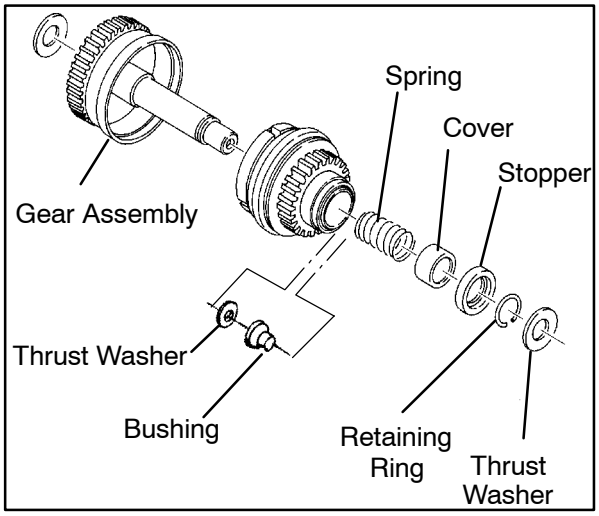
STARTER SOLENOID BENCH TEST

To measure the resistance of the pull-in coil, connect one meter lead to the solenoid lead wire and the other to ground. The resistance should be 2.8-3.6 ohms. Refer to Electric Starter System Testing in this section to further test the solenoid.

STARTER DRIVE

Pinion Gear - Anti Kick-out Shoe, Garter Spring Replacement

If the garter spring is damaged, the overrun clutch may fail to return properly. Use either of the following methods to remove and install a new garter spring.

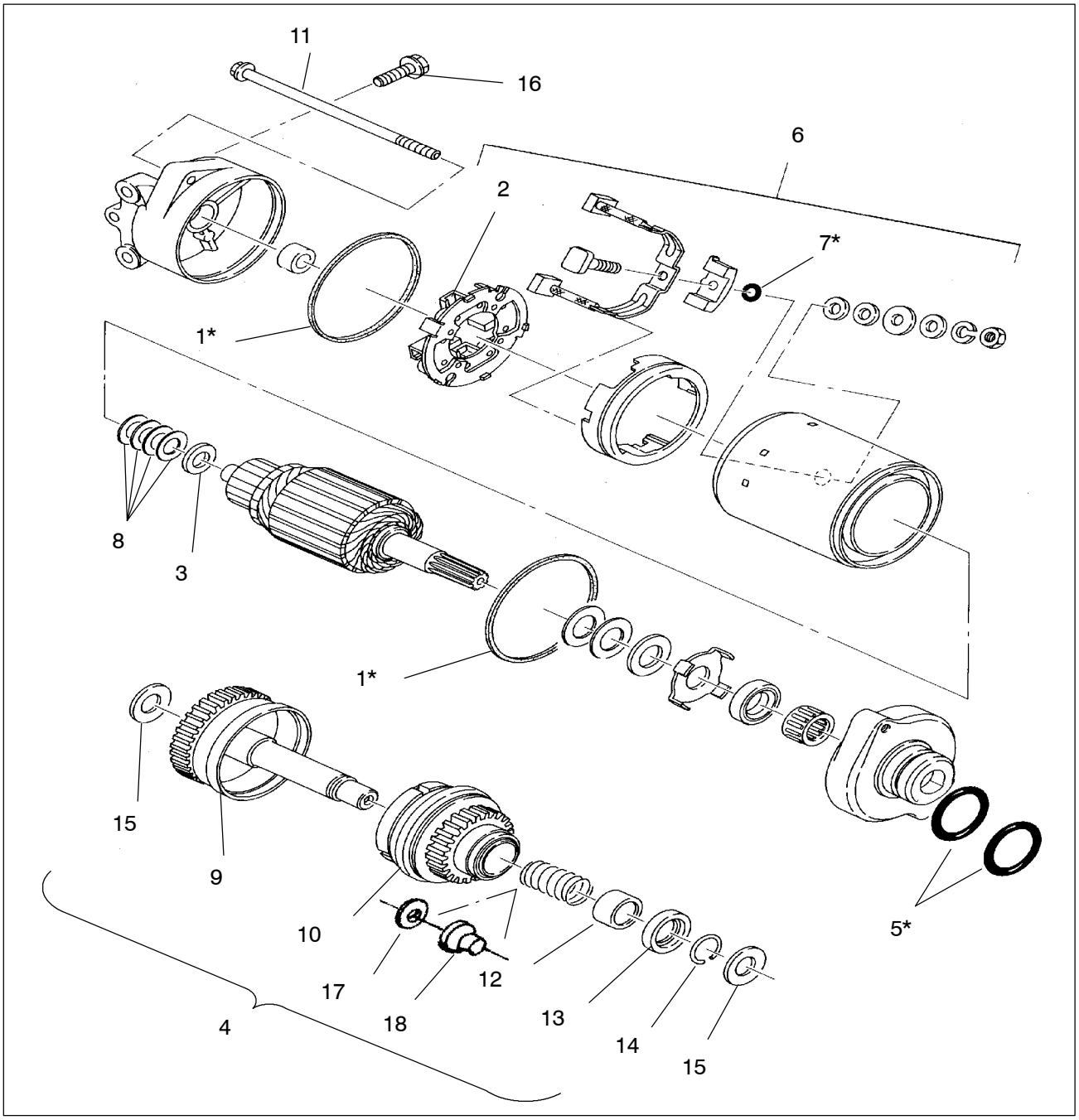


Polaris Premium Starter Drive Grease

(PN 2871460)

1. Screw the overrun clutch out to the engaged position on the pinion shaft assembly. Use a small piece of wire with the end bent in a hook and pick the old spring out of its channel. Slide it off the end of the shaft. Slide the new spring over the overrun clutch and into the spring groove. Make sure that the spring is positioned between the shoe alignment pins and the back flange of the anti kick-out shoes.
2. Remove the retaining ring, thrust washer, spring retainers and clutch return spring. Screw the overrun clutch off the end of the pinion shaft. Remove the old spring and install a new one. Lightly grease the pinion shaft and reinstall the clutch, spring, retainers, end washer and lock ring in the reverse order. Make sure the end washer is positioned properly so that it will hold the lock ring in its groove.

STARTER ASSEMBLY



Ref.	Description	Ref.	Description
1.	Rubber Ring*	10.	Gear Assembly
2.	Brush Spring	11.	Though Bolt
3.	Thrust Washer	12.	Cover
4.	Gear Assembly	13.	Stopper
5.	O-Ring*	14.	Snap Ring
6.	Brush Complete	15.	Washer
7.	O-Ring*	16.	Flange Bolt
8.	Thrust Washer	17.	Thrust Washer
9.	Shaft Complete	18.	Flange Bushing

*Do not reuse. Replace with new parts.

STARTER SYSTEM TESTING FLOW CHART

Condition: Starter fails to turn motor. **NOTE:** Make sure engine crankshaft is free to turn before proceeding with dynamic testing of starter system. A digital multitester must be used for this test.

With the tester on the VDC position, place the tester's black lead on the battery negative and the red lead on the battery positive.

Reading should be 12.4 V D. C. or greater.

→ No → Remove battery and properly service. Install fully charged shop battery to continue test.

Yes

Disconnect coil engagement wire from the starter solenoid. Connect tester black wire to battery ground. Connect red tester lead to harness wire at solenoid. Turn on ignition switch and depress the starter button. Tester should read battery voltage.

→ No → Check voltage on both sides of circuit breaker, ignition switch/engine stop switch and starter button. The voltage on both sides should be the same. **NOTE:** The ignition switch and engine stop switch must be on and the starter button depressed. Replace component if failed .

Yes → Test starter solenoid coil by connecting an ohmmeter between the solenoid wire and the solenoid mounting plate. Resistance should be 3.4Ω. Check solenoid ground path by measuring resistance between mounting plate and battery negative terminal (-).

Voltage Drop Testing

See Page 10.24 for instructions.

Reconnect the solenoid. Connect the tester black lead to the battery positive and the red lead to the solenoid end of the battery-to-solenoid wire. Depress starter button. Reading should be less than .1 V D.C.

→ No → Clean the battery-to-solenoid cable ends or replace the cable.

Yes

Connect the black tester lead to solenoid end of battery-to-solenoid cable. Connect red tester lead to solenoid end of solenoid-to-starter cable. Depress starter button. Reading should be less than .1 V D.C.

→ No → Replace the starter solenoid.

Yes

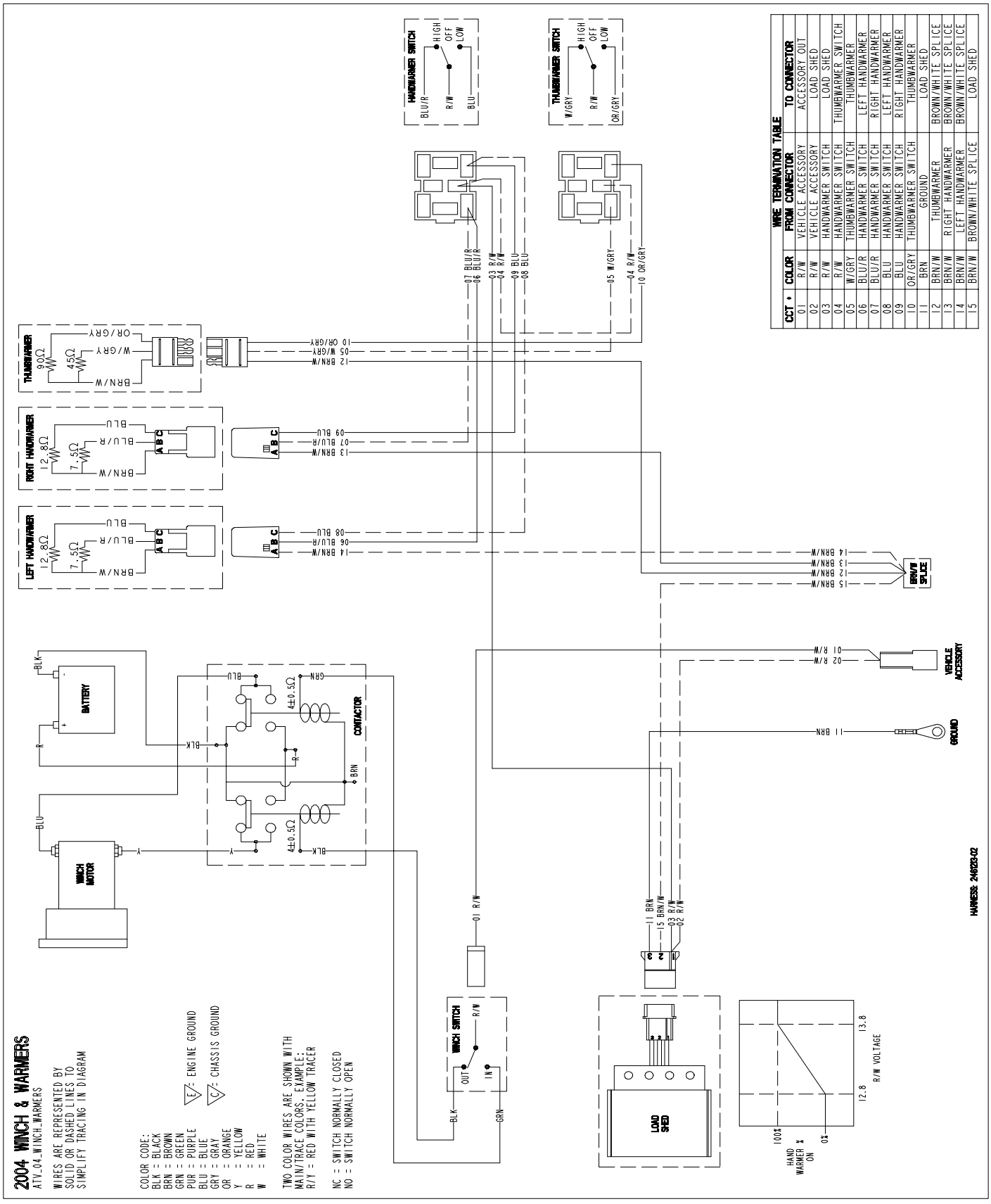
Connect the black tester lead to the solenoid end of the solenoid-to-starter cable. Connect the red tester lead to the starter end of the same cable. Depress the starter button. The reading should be less than .1 V D.C.

→ No → Clean the solenoid-to-starter cable ends or replace the cable.

Yes

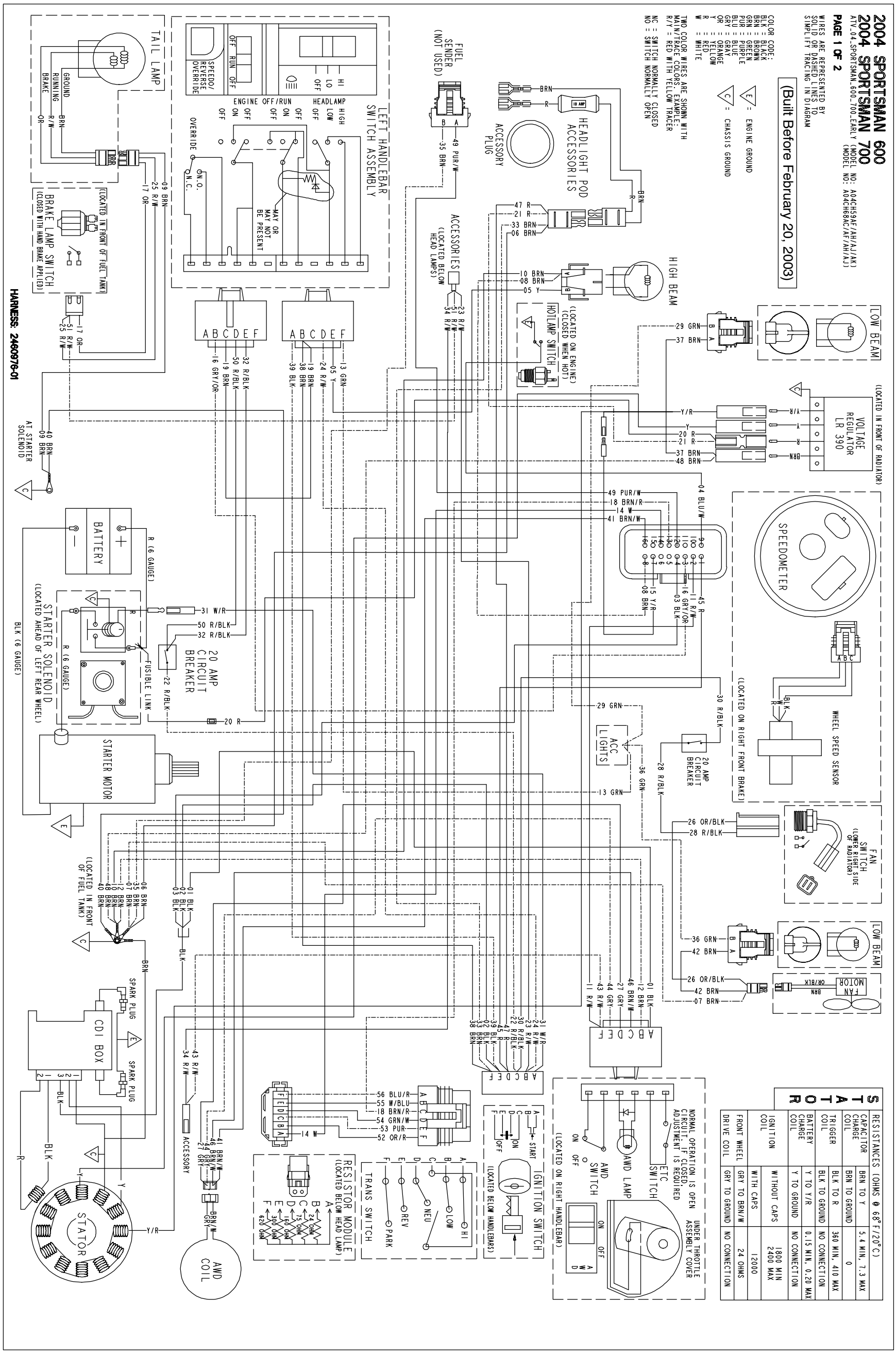
If all of these indicate a good condition, yet the starter still fails to turn, the starter must be removed for static testing and inspection.

WIRING DIAGRAM - HAND AND THUMB WARMERS / WINCH (HUNTER EDITION)



NOTES

WIRING DIAGRAM EARLY 2004 SPORTSMAN 600/700 (BUILT BEFORE FEB. 20, 2003)



2004 SPORTSMAN 600 WIRE LIST (Built Before February 20, 2003)
2004 SPORTSMAN 700

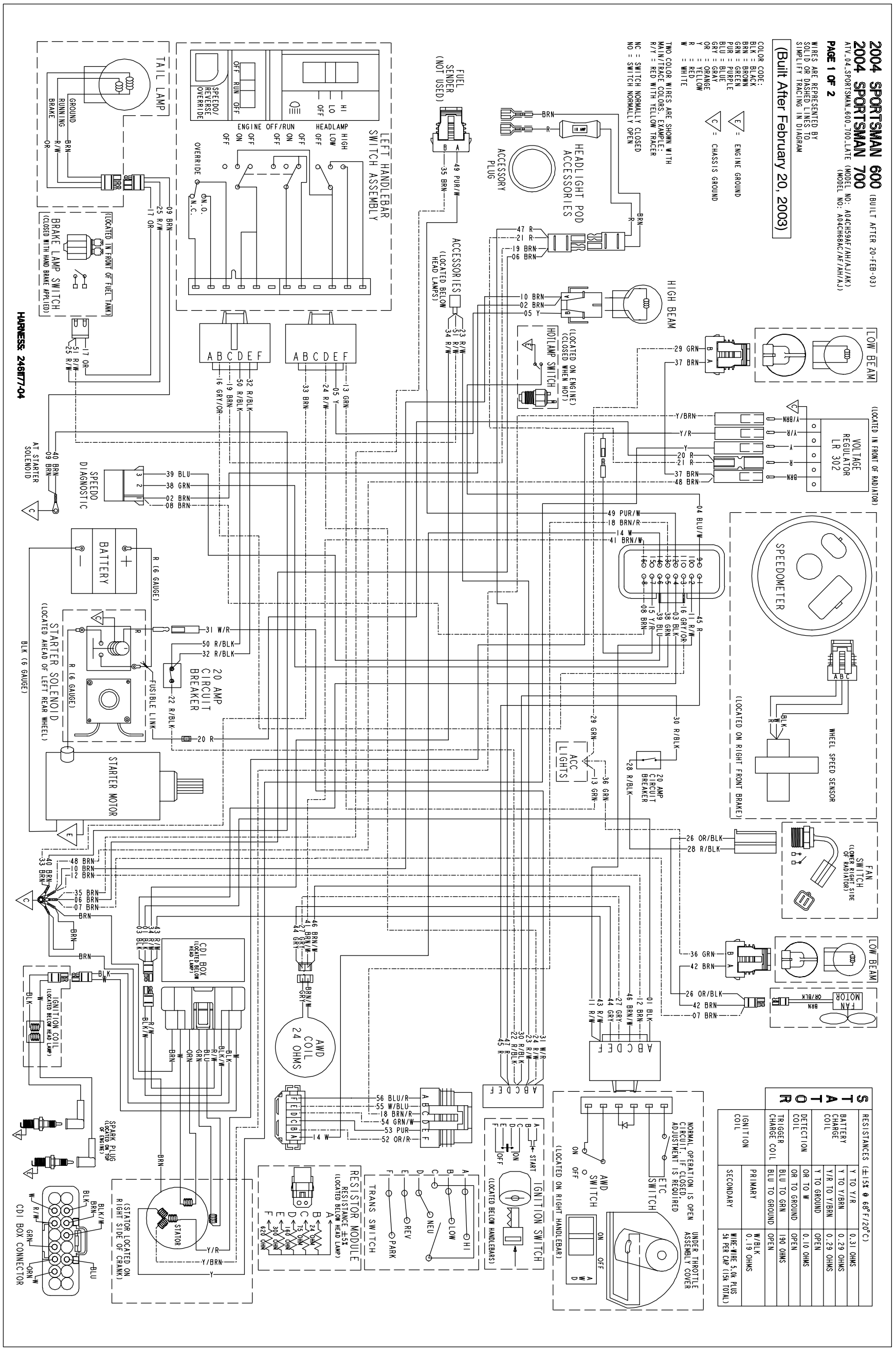
ATV_04_SPORTSMAN_600_700_EARLY (MODEL NO: A04CH59AF/AH/AJ/AK)
(MODEL NO: A04CH68AC/AF/AH/AJ)

WIRE TERMINATION TABLE

REF #	COLOR	GAUGE	FROM CONNECTOR	TO CONNECTOR
01	BLACK	20	ETC AND AWD SWITCH	CDI
02	BLACK	20	IGNITION SWITCH	CDI
03	BLACK	20	CDI	SPEEDOMETER
04	BLUE/WHITE	20	SPEEDOMETER	TEMP SWITCH
05	YELLOW	18	HEADLIGHT	LH HANDLEBAR
06	BROWN	16	GROUND	HDLT POD ACCESSORIES
07	BROWN	18	GROUND	FAN MOTOR
08	BROWN	20	HEADLIGHT	SPEEDOMETER
09	BROWN	18	GROUND	TAILLIGHT
10	BROWN	18	GROUND	HEADLIGHT
11	RED/WHITE	20	SPEEDOMETER	ETC AND AWD SWITCH
12	BROWN	20	ETC AND AWD SWITCH	GROUND
13	GREEN	18	LH HANDLEBAR	ACC LIGHTS
14	WHITE	20	RESISTOR MODULE	SPEEDOMETER
15	YELLOW/RED	20	ALTERNATOR	SPEEDOMETER
16	GRAY/ORANGE	20	SPEEDOMETER	LH HANDLEBAR
17	ORANGE	18	TAILLIGHT	BRAKE LIGHT SENSOR
18	BROWN/RED	20	TRANS SWITCH	SPEEDOMETER
19	BROWN	20	LH HANDLEBAR	LH HANDLEBAR
20	RED	14	FUSIBLE LINK	VOLTAGE REGULATOR
21	RED	14	HDLT POD ACCESSORIES	VOLTAGE REGULATOR
22	RED/BLACK	16	CIRCUIT BREAKER	IGNITION SWITCH
23	RED/WHITE	18	IGNITION SWITCH	ACCESSORIES
24	RED/WHITE	18	IGNITION SWITCH	LH HANDLEBAR
25	RED/WHITE	18	TAILLIGHT	BRAKE LIGHT SENSOR
26	ORANGE/BLACK	18	FAN SWITCH	FAN MOTOR
27	GRAY	20	ETC AND AWD SWITCH	HUB COIL
28	RED/BLACK	16	FAN SWITCH	FAN CIRCUIT BREAKER
29	GREEN	18	ACC LIGHTS	LH HEADLIGHT
30	RED/BLACK	16	IGNITION SWITCH	FAN CIRCUIT BREAKER
31	WHITE/RED	18	SOLENOID	IGNITION SWITCH
32	RED/BLACK	18	CIRCUIT BREAKER	LH HANDLEBAR
33	BROWN	20	HDLT POD ACCESSORIES	IGNITION SWITCH
34	RED/WHITE	20	ACCESSORIES	CDI
35	BROWN	20	GROUND	FUEL SENDER
36	GREEN	18	ACC LIGHTS	RH HEADLIGHT
37	BROWN	18	VOLTAGE REGULATOR	LH HEADLIGHT
38	BROWN	20	IGNITION SWITCH	LH HANDLEBAR
39	BLACK	20	LH HANDLEBAR	IGNITION SWITCH
40	BROWN	12	BATT (-)	GROUND
41	BROWN/WHITE	20	HUB COIL	SPEEDOMETER
42	BROWN	18	FAN MOTOR	RH HEADLIGHT
43	RED/WHITE	20	CDI	ETC AND AWD SWITCH
44	GRAY	20	ETC AND AWD SWITCH	HUB COIL
45	RED	20	SPEEDOMETER	IGNITION SWITCH
46	BROWN/WHITE	20	ETC AND AWD SWITCH	HUB COIL
47	RED	16	IGNITION SWITCH	HDLT POD ACCESSORIES
48	BROWN	14	GROUND	VOLTAGE REGULATOR
49	PURPLE/WHITE	20	FUEL SENDER	SPEEDOMETER
50	RED/BLACK	18	CIRCUIT BREAKER	LH HANDLEBAR
51	RED/WHITE	18	ACCESSORIES	BRAKE LIGHT SWITCH
52	ORANGE/RED	20	RESISTOR MODULE	TRANS SWITCH
53	PURPLE	18	RESISTOR MODULE	TRANS SWITCH
54	GREEN/WHITE	18	RESISTOR MODULE	TRANS SWITCH
55	WHITE/BLUE	18	RESISTOR MODULE	TRANS SWITCH
56	BLUE/RED	18	RESISTOR MODULE	TRANS SWITCH

NOTES:

WIRING DIAGRAM LATE 2004 SPORTSMAN 600/700 (BUILT AFTER FEB. 20, 2003)



2004 SPORTSMAN 600 WIRE LIST (BUILT AFTER 20-FEB-03)
2004 SPORTSMAN 700

(Built After February 20, 2003)

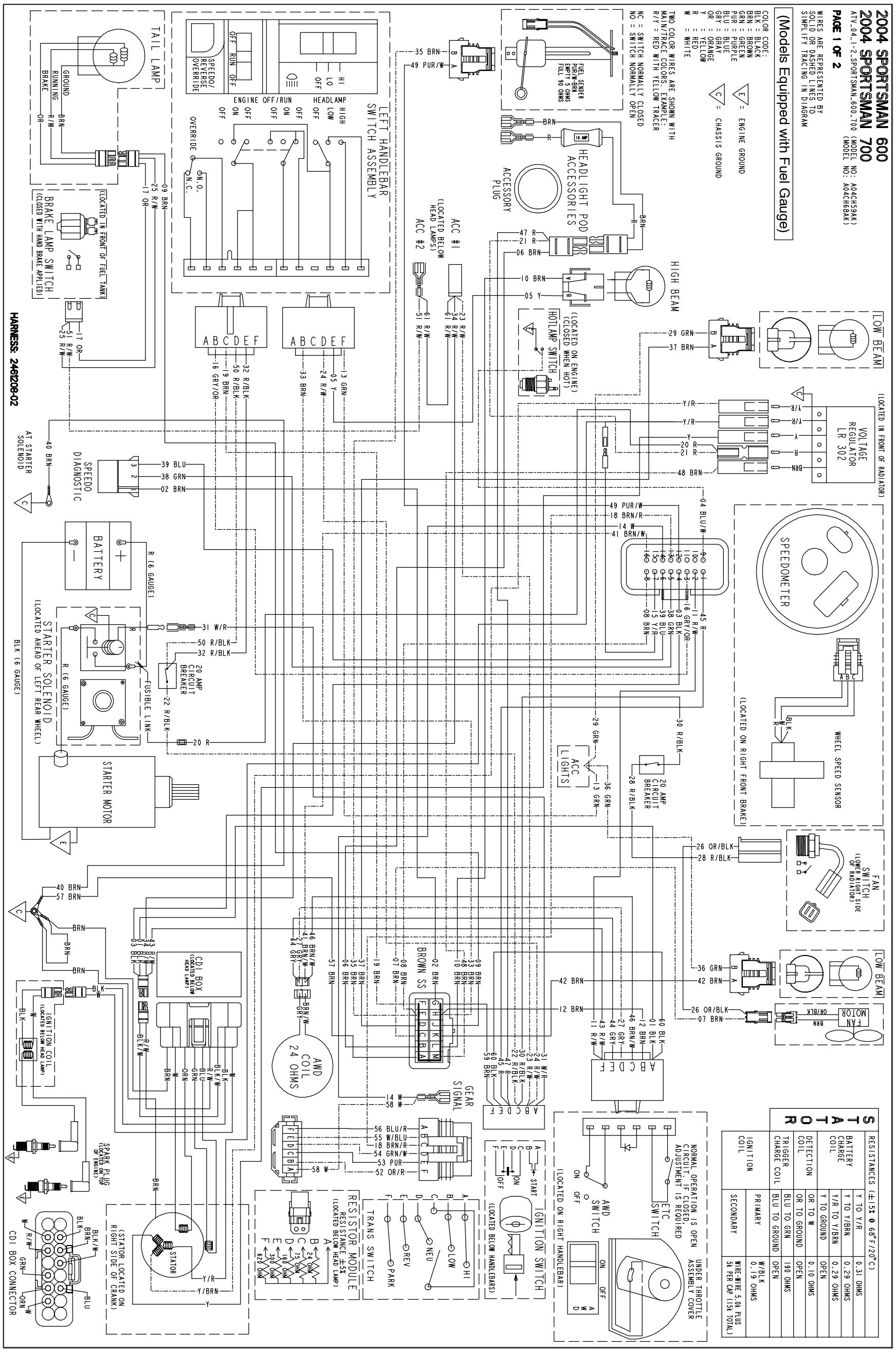
ATV_04_SPORTSMAN_600_700_LATE (MODEL NO: A04CH59AF/AH/AJ/AK)
(MODEL NO: A04CH68AC/AF/AH/AJ)

WIRE TERMINATION TABLE

REF #	COLOR	GAUGE	FROM CONNECTOR	TO CONNECTOR
01	BLACK	20	ETC AND AWD SWITCH	CDI
02	BROWN	20	UPPER HEADLIGHT	SPEEDO DIAGNOSTIC
03	BLACK	20	CDI	SPEEDOMETER
04	BLUE/WHITE	20	SPEEDOMETER	TEMP SWITCH
05	YELLOW	18	UPPER HEADLIGHT	LH HANDLEBAR
06	BROWN	16	GROUND	HDLT POD ACC
07	BROWN	18	GROUND	FAN MOTOR
08	BROWN	20	SPEEDO DIAGNOSTIC	SPEEDOMETER
09	BROWN	18	GROUND	TAILLIGHT
10	BROWN	18	GROUND	UPPER HEADLIGHT
11	RED/WHITE	20	SPEEDOMETER	ETC AND AWD SWITCH
12	BROWN	20	ETC AND AWD SWITCH	GROUND
13	GREEN	18	LH HANDLEBAR	ACC LIGHTS
14	WHITE	20	RESISTOR MODULE	SPEEDOMETER
15	YELLOW/RED	20	ALTERNATOR	SPEEDOMETER
16	GRAY/ORANGE	20	SPEEDOMETER	LH HANDLEBAR
17	ORANGE	18	TAILLIGHT	BRAKE LIGHT SENSOR
18	BROWN/RED	20	TRANS SWITCH	SPEEDOMETER
19	BROWN	20	LH HANDLEBAR	HDLT POD ACC
20	RED	14	FUSIBLE LINK	VOLTAGE REGULATOR
21	RED	14	HDLT POD ACC	VOLTAGE REGULATOR
22	RED/BLACK	16	CIRCUIT BREAKER	IGNITION SWITCH
23	RED/WHITE	18	IGNITION SWITCH	ACCESSORIES
24	RED/WHITE	18	IGNITION SWITCH	LH HANDLEBAR
25	RED/WHITE	18	TAILLIGHT	BRAKE LIGHT SENSOR
26	ORANGE/BLACK	18	FAN SWITCH	FAN MOTOR
27	GRAY	20	ETC AND AWD SWITCH	HUB COIL
28	RED/BLACK	16	FAN SWITCH	FAN CIRCUIT BREAKER
29	GREEN	18	ACC LIGHTS	LH HEADLIGHT
30	RED/BLACK	16	IGNITION SWITCH	FAN CIRCUIT BREAKER
31	WHITE/RED	18	SOLENOID	IGNITION SWITCH
32	RED/BLACK	18	CIRCUIT BREAKER	LH HANDLEBAR
33	BROWN	20	GROUND	LH HANDLEBAR
34	RED/WHITE	20	ACCESSORIES	CDI
35	BROWN	20	GROUND	FUEL SENDER
36	GREEN	18	ACC LIGHTS	RH HEADLIGHT
37	BROWN	18	VOLTAGE REGULATOR	LH HEADLIGHT
38	GREEN	20	SPEEDOMETER	SPEEDO DIAGNOSTIC
39	BLUE	20	SPEEDOMETER	SPEEDO DIAGNOSTIC
40	BROWN	12	BATT (-)	GROUND
41	BROWN/WHITE	20	HUB COIL	SPEEDOMETER
42	BROWN	18	FAN MOTOR	RH HEADLIGHT
43	RED/WHITE	20	CDI	ETC AND AWD SWITCH
44	GRAY	20	ETC AND AWD SWITCH	HUB COIL
45	RED	20	SPEEDOMETER	IGNITION SWITCH
46	BROWN/WHITE	20	ETC AND AWD SWITCH	HUB COIL
47	RED	16	IGNITION SWITCH	HDLT POD ACC
48	BROWN	14	GROUND	VOLTAGE REGULATOR
49	PURPLE/WHITE	20	FUEL SENDER	SPEEDOMETER
50	RED/BLACK	18	CIRCUIT BREAKER	LH HANDLEBAR
51	RED/WHITE	18	ACCESSORIES	BRAKE LIGHT SWITCH
52	ORANGE/RED	20	RESISTOR MODULE	TRANS SWITCH
53	PURPLE	18	RESISTOR MODULE	TRANS SWITCH
54	GREEN/WHITE	18	RESISTOR MODULE	TRANS SWITCH
55	WHITE/BLUE	18	RESISTOR MODULE	TRANS SWITCH
56	BLUE/RED	18	RESISTOR MODULE	TRANS SWITCH

NOTES:

WIRING DIAGRAM LATE 2004 SPORTSMAN 600/700 (MODELS WITH FUEL GAUGE)



2004 SPORTSMAN 600
2004 SPORTSMAN 700

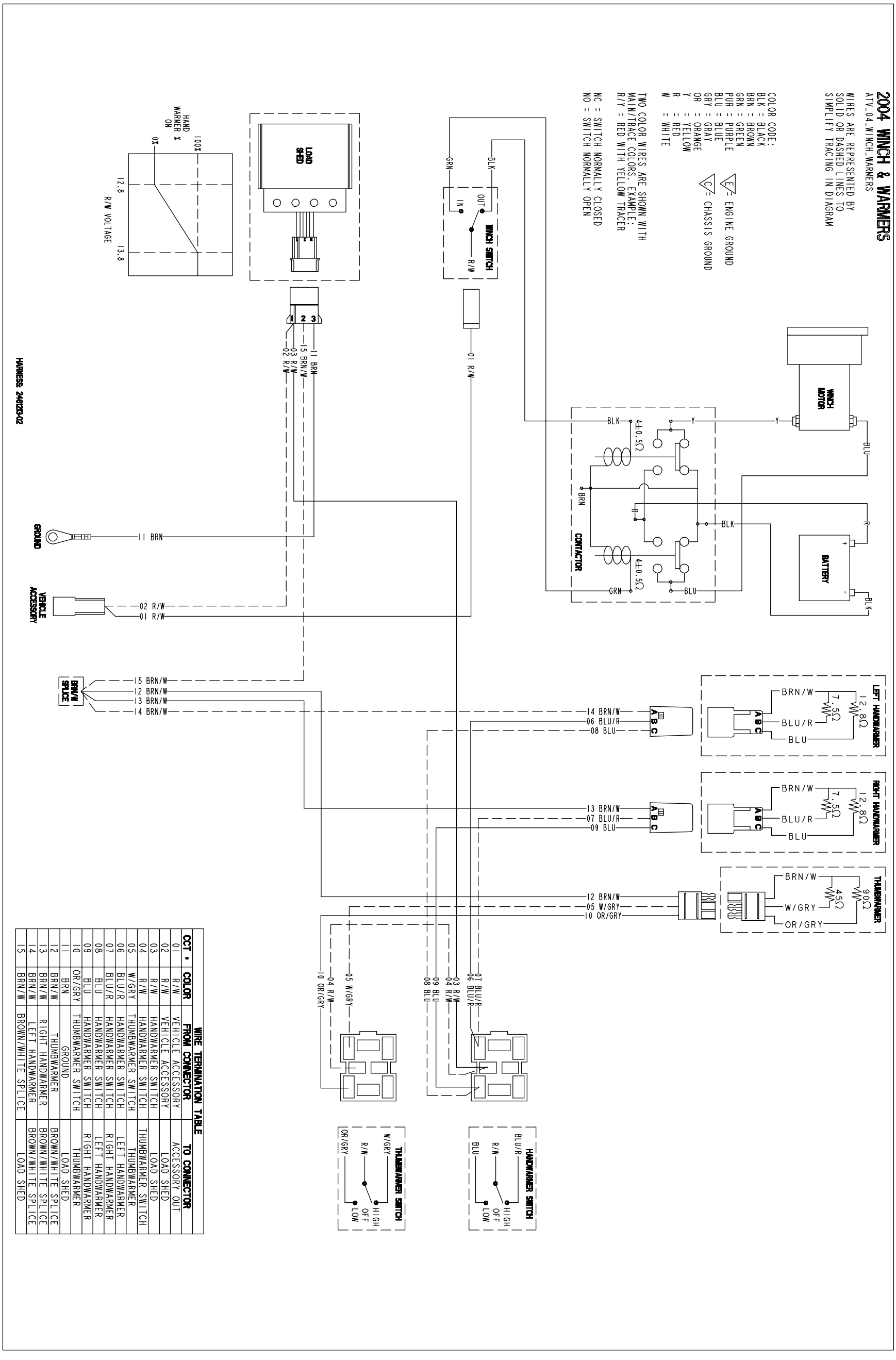
ATV_04_1-2_SPORTSMAN_600_700 (MODEL NO: A04CH59AK)
(MODEL NO: A04CH68AK)

WIRE TERMINATION TABLE

REF #	COLOR	GAUGE	FROM CONNECTOR	TO CONNECTOR
01	BLACK	20	ETC AND AWD SWITCH	CDI
02	BROWN	20	BROWN SS	SPEEDO DIAGNOSTIC
03	BLACK	20	CDI	SPEEDOMETER
04	BLUE/WHITE	20	SPEEDOMETER	TEMP SWITCH
05	YELLOW	18	UPPER HEADLIGHT	LH HANDLEBAR
06	BROWN	16	BROWN SS	HDLT POD ACC
07	BROWN	18	BROWN SS	FAN MOTOR
08	BROWN	20	BROWN SS	SPEEDOMETER
09	BROWN	18	BROWN SS	TAILLIGHT
10	BROWN	18	BROWN SS	UPPER HEADLIGHT
11	RED/WHITE	20	SPEEDOMETER	ETC AND AWD SWITCH
12	BROWN	20	ETC AND AWD SWITCH	BROWN SS
13	GREEN	18	LH HANDLEBAR	ACC LIGHTS
14	WHITE	20	GEAR SIGNAL	SPEEDOMETER
15	YELLOW/RED	20	ALTERNATOR	SPEEDOMETER
16	GRAY/ORANGE	20	SPEEDOMETER	LH HANDLEBAR
17	ORANGE	18	TAILLIGHT	BRAKE LIGHT SENSOR
18	BROWN/RED	20	TRANS SWITCH	SPEEDOMETER
19	BROWN	20	LH HANDLEBAR	BROWN SS
20	RED	14	FUSIBLE LINK	VOLTAGE REGULATOR
21	RED	14	HDLT POD ACC	VOLTAGE REGULATOR
22	RED/BLACK	16	20A CIRCUIT BREAKER	IGNITION SWITCH
23	RED/WHITE	18	IGNITION SWITCH	ACC #1
24	RED/WHITE	18	IGNITION SWITCH	LH HANDLEBAR
25	RED/WHITE	18	TAILLIGHT	BRAKE LIGHT SENSOR
26	ORANGE/BLACK	18	FAN SWITCH	FAN MOTOR
27	GRAY	20	ETC AND AWD SWITCH	HUB COIL
28	RED/BLACK	16	FAN SWITCH	FAN CIRCUIT BREAKER
29	GREEN	18	ACC LIGHTS	LH HEADLIGHT
30	RED/BLACK	16	IGNITION SWITCH	FAN CIRCUIT BREAKER
31	WHITE/RED	18	SOLENOID	IGNITION SWITCH
32	RED/BLACK	18	20A CIRCUIT BREAKER	LH HANDLEBAR
33	BROWN	20	BROWN SS	LH HANDLEBAR
34	RED/WHITE	20	ACC #1	CDI
35	BROWN	20	BROWN SS	FUEL SENDER
36	GREEN	18	ACC LIGHTS	RH HEADLIGHT
37	BROWN	18	BROWN SS	LH HEADLIGHT
38	GREEN	20	SPEEDOMETER	SPEEDO DIAGNOSTIC
39	BLUE	20	SPEEDOMETER	SPEEDO DIAGNOSTIC
40	BROWN	12	GROUND	GROUND
41	BROWN/WHITE	20	HUB COIL	SPEEDOMETER
42	BROWN	18	BROWN SS	RH HEADLIGHT
43	RED/WHITE	20	CDI	ETC AND AWD SWITCH
44	GRAY	20	ETC AND AWD SWITCH	HUB COIL
45	RED	20	SPEEDOMETER	IGNITION SWITCH
46	BROWN/WHITE	20	ETC AND AWD SWITCH	HUB COIL
47	RED	16	IGNITION SWITCH	HDLT POD ACC
48	BROWN	14	BROWN SS	VOLTAGE REGULATOR
49	PURPLE/WHITE	20	FUEL SENDER	SPEEDOMETER
50	RED/BLACK	18	20A CIRCUIT BREAKER	LH HANDLEBAR
51	RED/WHITE	18	ACC #2	BRAKE LIGHT SWITCH
52	ORANGE/RED	20	RESISTOR MODULE	TRANS SWITCH
53	PURPLE	18	RESISTOR MODULE	TRANS SWITCH
54	GREEN/WHITE	18	RESISTOR MODULE	TRANS SWITCH
55	WHITE/BLUE	18	RESISTOR MODULE	TRANS SWITCH
56	BLUE/RED	18	RESISTOR MODULE	TRANS SWITCH
57	BROWN	14	GROUND	BROWN SS
58	WHITE	20	RESISTOR MODULE	GEAR SIGNAL
59	BROWN	20	BROWN SS	IGNITION SWITCH
60	BLACK	20	ETC AND AWD SWITCH	IGNITION SWITCH
61	RED/WHITE	18	ACC #1	ACC #2

NOTES:

WIRING DIAGRAM 2004 SPORTSMAN 600/700 HUNTER EDT. (HAND WARM/WINCH)



WIRE TERMINATION TABLE

CCT #	COLOR	FROM CONNECTOR	TO CONNECTOR
01	R/W	VEHICLE ACCESSORY	ACCESSORY OUT
02	R/W	VEHICLE ACCESSORY	LOAD SHED
03	R/W	HANDWARMER SWITCH	LOAD SHED
04	R/W	HANDWARMER SWITCH	THUMBWARMER SWITCH
05	W/GRY	THUMBWARMER SWITCH	THUMBWARMER
06	BLU/R	HANDWARMER SWITCH	LEFT HANDWARMER
07	BLU/R	HANDWARMER SWITCH	RIGHT HANDWARMER
08	BLU	HANDWARMER SWITCH	LEFT HANDWARMER
09	BLU	HANDWARMER SWITCH	RIGHT HANDWARMER
10	OR/GRY	THUMBWARMER SWITCH	THUMBWARMER
11	BRN	GROUND	LOAD SHED
12	BRN/W	THUMBWARMER	BROWN/WHITE SPLICE
13	BRN/W	RIGHT HANDWARMER	BROWN/WHITE SPLICE
14	BRN/W	LEFT HANDWARMER	BROWN/WHITE SPLICE
15	BRN/W	BROWN/WHITE SPLICE	LOAD SHED

A

B

C

D

E

F

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