CHAPTER 1
GENERAL

Specs

1

MODEL IDENTIFICATION

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

Machine Model Number Identification

A 05 CD 32 AA

- 05 – Year Designation
- CD – Basic Chassis Designation
- 32 – Engine Designation
- AA – Emissions & Model Option

ENGINE DESIGNATION NUMBERS

ES32PFE102 . . . . Single, Oil/Air Cooled, SOHC 4 Stroke, Electric Start

VIN IDENTIFICATION

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

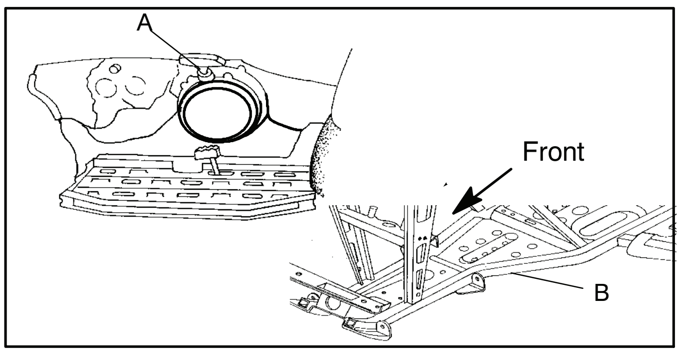
* This could be either a number or a letter

ENGINE SERIAL NUMBER LOCATION

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

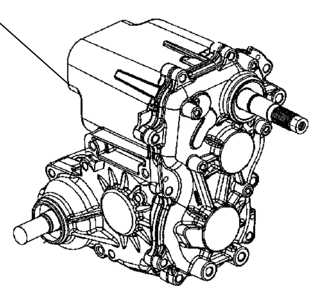
UNIT MODEL NUMBER AND SERIAL NUMBER LOCATION

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.



MODEL: ..... 2003-2005 Magnum 330 2x4
2004 MODEL NUMBER: ..... A04CB32AA, FC
2005 MODEL NUMBER: A05CB32AA
ENGINE MODEL: .. ES32PFE

Category	Dimension / Capacity
Length	81 in./206 cm
Width	46 in./116.8 cm
Height	46 in./116.8 cm
Wheel Base	49.75 in./126.37 cm
Dry Weight	590 lbs./267.6 kg
Gross Vehicle Weight	1060 Lbs. / 590 kg
Front Rack Capacity	90 lbs./40.8 kg
Rear Rack Capacity	180 lbs./81.7 kg
Towing Capacity	1000 lbs./454 kg
Hitch Tongue Capacity	100 lbs./45 kg
Body Style	Gen IV

2005 Magnum 2x4

MODEL: ..... 2003-2006 Magnum 330 4x4
2004 MODEL NUMBER: A04CD32AA, AB, AC, FB
2005 MODEL NUMBER: A05CD32AA, AB, AC
ENGINE MODEL: .. ES32PFE

Category	Dimension / Capacity
Length	81 in./206 cm
Width	46 in./116.8 cm
Height	46 in./116.8 cm
Wheel Base	49.75 in./126.37 cm
Dry Weight	637 lbs./288 kg
Gross Vehicle Weight	1100 Lbs. / 499 kg
Front Rack Capacity	90 lbs./40.8 kg
Rear Rack Capacity	180 lbs./81.7 kg
Towing Capacity	1000 lbs./454 kg
Hitch Tongue Capacity	100 lbs./45 kg
Front Cargo Box	Std.
Body Style	Gen IV

2005 Magnum 330 4x4

MODEL: . . . . 2003-2004 Magnum 330 2x4 and HDS
MODEL NUMBER: . . A04CB32AA, AC, FC
ENGINE MODEL: . . ES32PFE102

Engine	
Platform	Fuji 4 stroke, Single Cylinder
Engine Model Number	ES32PFE102
Engine Displacement	329cc
Number of Cylinders	1
Bore & Stroke (mm)	78.5 x 68 mm
Compression Ratio	9.2:1
Compression Pressure	70-90 psi w/ decompressor
Engine Idle Speed	1300 ± 100 RPM
Engine Max Operating Rpm	6900 RPM
Cooling System	Oil / Air w/ fan assist
Overheat Warning	Instrument Cluster
Lubrication	Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 1.9 qt. / 1.8 ltr
Exhaust System	USFS Approved
Carburetion	
Carburetor model	Mikuni BST 34mm
Main Jet	122.5
Pilot Jet	42.5
Pilot Air Jet	160
Jet Needle - Clip Position	4HB48-2
Needle Jet	P-0 (829) / After 1/1/2004 - P-4 (829) -3rd Clip Position
Pilot Screw	2 Turns Out (Initial starting point, settings may vary for each ATV)
Float Height	13 ± 1 mm / 0.51 ± 0.40“
Fuel Delivery	Fuel Pump
Fuel Capacity / Requirement	3.25 gal US / 12.3 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	200 w @ 5000 RPM
Voltage Regulator	3-Phase - LR-390
Lights : High Beam	30 watts
Low Beam	30 watts
Brake	Two 12V/26.9 watts
Tail	Two 12V/8.26 watts
Ignition System	DC/CDI Ignition
Ignition Timing	30° ± 2° BTDC @ 5000 RPM
Spark plug / Gap	NGK BKR6E/ .036 in. / 0.9 mm
Battery / Model / Amp Hr	Low Maintenance - 14 Amp Hr
Circuit Breakers	Fan 10 amp / Harness 20 amp
Starting	Electric / Recoil Backup
Instrument Cluster	Analog Speedo w/ LCD

Drivetrain	
Transmission Type	Drumshift - H/L/N/Rev/Park
Transmission Capacity	13.5 oz. / 400 ml
Rear Gearcase Capacity	10 oz. / 295 ml
Gear Ratio : Low	10.49:1
Rev	6.20:1
High	4.0:1
Front Drive	3.7:1
Rear Drive	3.1:1
Clutch Type	PVT Non-EBS
Belt	3211077
Steering / Suspension	
Front Suspension / Shock	A-arm / MacPherson Strut
Front Travel	6.7 in. / 17.02 cm
Rear Suspension / Shock	Swing Arm w/ Sachs Shocks
Rear Travel	7.1 in. / 18.03 cm
Ground Clearance	6.75 in. / 17.14 cm
Shock Preload Adjustment Front / Rear	Front -Non Adjustable. Rear - Cam Style- Std.
Turning Radius	72 in. / 183 cm
Toe Out	1/8-1/4- in / .0 - .159 mm
Wheels / Brakes	
Wheel Size / Pattern - Front	Steel 24x8-12 / 4-156
Wheel Size / Pattern - Rear	Steel 24x11-12 / 4-156
Front Tire Model / Size	24 x 8-12
Rear Tire Model / Size	24 x 11-12
Recommended Air Pressure	Front - 4 psi / Rear - 3 psi
Brake - Front	Dual Hydraulic Disc
Brake - Rear	Dual Hydraulic Disc

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below 5°C	+40°F to +80°F +5°C to +28°C
Meters (Feet)	0-1800 (0-6000)	127.5	122.5
	above 1800 (above 6000)	120	115

CLUTCH CHART

Standard helix spring position is 2 + 2

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	16 (5630279)	Blu/Grn (7041157)	Black (7041782)	41-35 (5133701)
	1800-3700 (6000-12000)	20-38 (5631357)	Blu/Grn (7041157)	Black (7041782)	41-35 (5133701)

MODEL: .... 2005 Magnum 330 2x4
MODEL NUMBER: . A05CB32AA
ENGINE MODEL: . . ES32PFE

Engine	
Platform	Fuji 4 stroke, Single Cylinder
Engine Model Number	ES32PFE103
Engine Displacement	329cc
Number of Cylinders	1
Bore & Stroke (mm)	78.5 x 68 mm
Compression Ratio	9.2:1
Compression Pressure	70-90 psi w/ decompressor
Engine Idle Speed	1300 ± 100 RPM
Engine Max Operating Rpm	7250 RPM
Cooling System	Oil / Air w/ fan assist
Overheat Warning	Instrument Cluster
Lubrication	Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 1.9 qt. / 1.8 ltr
Exhaust System	USFS Approved
Carburetion	
Carburetor model	Mikuni BST 34mm
Main Jet	122.5
Pilot Jet	42.5
Pilot Air Jet	160
Jet Needle - Clip Position	4HB48-3
Needle Jet	P-4M (829)
Pilot Screw	2.25 Turns Out (Initial starting point, settings may vary for each ATV)
Float Height	13 ± 1 mm / 0.51 ± 0.40"
Fuel Delivery	Fuel Pump
Fuel Capacity / Requirement	3.25 gal US / 12.3 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	200 w @ 5000 RPM
Voltage Regulator	3-Phase - LR-390
Lights : High Beam	30 watts
Low Beam	30 watts
Brake	Two 12V/26.9 watts
Tail	Two 12V/8.26 watts
Ignition System	DC/CDI Ignition
Ignition Timing	30° ± 2° BTDC @ 5000 RPM
Spark plug / Gap	NGK BKR6E/ .036 in. / 0.9 mm
Battery / Model / Amp Hr	Low Maintenance - 14 Amp Hr
Circuit Breakers	Fan 10 amp / Harness 20 amp
Starting	Electric / Recoil Backup
Instrument Cluster	Analog Speedo w/ LCD

Drivetrain	
Transmission Type	Drumshift - H/L/N/Rev/Park
Transmission Capacity	13.5 oz. / 400 ml
Rear Gearcase Capacity	10 oz. / 295 ml
Gear Ratio : Low	10.49:1
Rev	6.20:1
High	4.0:1
Front Drive	3.7:1
Rear Drive	3.1:1
Clutch Type	PVT Non-EBS
Belt	3211077
Steering / Suspension	
Front Suspension / Shock	A-arm / MacPherson Strut
Front Travel	6.75 in. / 17.1 cm
Rear Suspension / Shock	Swing Arm w/ Sachs Shocks
Rear Travel	7.1 in. / 18.03 cm
Ground Clearance	6.75 in. / 17.14 cm
Shock Preload Adjustment Front / Rear	Front -Non Adjustable. Rear - Cam Style- Std.
Turning Radius	70 in. / 178 cm
Toe Out	1/8-1/4- in / .0 - .159 mm
Wheels / Brakes	
Wheel Size / Pattern - Front	Steel 24x8-12 / 4-156
Wheel Size / Pattern - Rear	Steel 24x11-12 / 4-156
Front Tire Model / Size	24 x 8-12
Rear Tire Model / Size	24 x 11-12
Recommended Air Pressure	Front - 4 psi / Rear - 3 psi
Brake - Front	Dual Hydraulic Disc
Brake - Rear	Dual Hydraulic Disc

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below 5°C	+40°F to +80°F +5°C to +28°C
Meters (Feet)	0-1800 (0-6000)	127.5	122.5
	above 1800 (above 6000)	120	115

CLUTCH CHART

Standard helix spring position is 2 + 2

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	16 (5630279)	Blu/Grn (7041157)	Black (7041782)	41-35 (5133701)
	1800-3700 (6000-12000)	20-38 (5631357)	Blu/Grn (7041157)	Black (7041782)	41-35 (5133701)

MODEL: . . . . 2003-2004 Magnum 330 4x4 and HDS
MODEL NUMBER: . . A04CD32AA, AC, AB, FB
ENGINE MODEL: . . ES32PFE102

Engine	
Platform	Fuji 4 stroke, Single Cylinder
Engine Model Number	ES32PFE102
Engine Displacement	329cc
Number of Cylinders	1
Bore & Stroke (mm)	78.5 x 68 mm
Compression Ratio	9.2:1
Compression Pressure	70-90 psi w/ decompressor
Engine Idle Speed	1300 ± 100 RPM
Engine Max Operating Rpm	6900 RPM
Cooling System	Oil / Air w/ fan assist
Overheat Warning	HOT on Instrument Cluster
Lubrication	Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 1.9 qt. / 1.8 ltr
Exhaust System	USFS Approved
Carburetion	
Carburetor model	Mikuni BST 34mm
Main Jet	122.5
Pilot Jet	42.5
Pilot Air Jet	160
Jet Needle - Clip Position	4HB48-2
Needle Jet	P-0 (829) / After 1/1/04 - P-4 (829) - 3rd Clip Position
Pilot Screw	2 Turns Out (Initial starting point, settings may vary for each ATV)
Float Height	13 ± 1 mm / 0.51 ± 0.40"
Fuel Delivery	Fuel Pump
Fuel Capacity / Requirement	3.25 gal US / 12.3 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	200 w @ 5000 RPM
Voltage Regulator	3-Phase - LR-390
Lights : High Beam	30 watts
Low Beam	30 watts
Brake	Two 12V/26.9 watts
Tail	Two 12V/8.26 watts
Ignition System	DC/CDI Ignition
Ignition Timing	30° ± 2° BTDC @ 5000 RPM
Spark plug / Gap	NGK BKR6E/ .036 in. / 0.9 mm
Battery / Model / Amp Hr	Low Maintenance - 14 Amp Hr
Circuit Breakers	Fan 10 amp / Harness 20 amp
Starting	Electric / Recoil Backup
Instrument Cluster	Analog Speedo w/ LCD

Drivetrain	
Transmission Type	Drumshift - H/L/N/Rev/Park
Transmission Capacity	13.5 oz. / 400ml
Rear Gearcase Capacity	16 oz. / 473ml
Front Gearcase Capacity	5 oz. / 150ml
Front Gearcase (HDS)	13.5 oz. / 400ml
Gear Ratio : Low	10.49:1
Rev	6.20:1
High	4.0:1
Front Drive	3.7:1
Rear Drive	3.1:1
Clutch Type	PVT Non-EBS
Belt	3211077
Steering / Suspension	
Front Suspension / Shock	A-arm / MacPherson Strut
Front Travel	6.7 in. / 17.02 cm
Rear Suspension / Shock	Swing Arm w/ Sachs Shocks
Rear Travel	7.1 in. / 18.03 cm
Ground Clearance	6.75 in. / 17.14 cm
Shock Preload Adjustment Front / Rear	Front -Non Adjustable. Rear - Cam Style- Std.
Turning Radius	71 in. / 180 cm
Toe Out	1/8-1/4- in / .0 - .159 mm
Wheels / Brakes	
Wheel Size / Pattern - Front	Steel 24x8-12 / 4-156
Wheel Size / Pattern - Rear	Steel 24x11-12 / 4-156
Front Tire Model / Size	Titan 24x8-12
Rear Tire Model / Size	Titan 24x11-12
Recommended Air Pressure	Front - 4 psi / Rear - 3 psi
Brake - Front	Dual Hydraulic Disc
Brake - Rear	Dual Hydraulic Disc

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below 5°C	+40°F to +80°F +5°C to +28°C
Meters (Feet)	0-1800 (0-6000)	127.5	122.5
	above 1800 (above 6000)	120	115

CLUTCH CHART

Standard helix spring position is 2 + 2

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	16 (5630279)	Blu/Grn (7041157)	Black (7041782)	41-35° (5133701)
	1800-3700 (6000-12000)	20-38 (5631357)	Blu/Grn (7041157)	Black (7041782)	41-35° (5133701)

MODEL: . . . . 2005-2006 Magnum 330 4x4
MODEL NUMBER: . A05CD32AA, AC, AB
ENGINE MODEL: . . ES32PFE103

Engine	
Platform	Fuji 4 stroke, Single Cylinder
Engine Model Number	ES32PFE103
Engine Displacement	329cc
Number of Cylinders	1
Bore & Stroke (mm)	78.5 x 68 mm
Compression Ratio	9.2:1
Compression Pressure	70-90 psi w/ decompressor
Engine Idle Speed	1300 ± 100 RPM
Engine Max Operating Rpm	7250 RPM
Cooling System	Oil / Air w/ fan assist
Overheat Warning	HOT on Instrument Cluster
Lubrication	Wet Sump
Oil Requirements / Capacity	Polaris 0W-40 1.9 qt. / 1.8 ltr
Exhaust System	USFS Approved
Carburetion	
Carburetor model	Mikuni BST 34mm
Main Jet	122.5
Pilot Jet	42.5
Pilot Air Jet	160
Jet Needle - Clip Position	4HB48-3
Needle Jet	P-4M (829)
Pilot Screw	2.25 Turns Out (Initial starting point, settings may vary for each ATV)
Float Height	13 ± 1 mm / 0.51 ± 0.40"
Fuel Delivery	Fuel Pump
Fuel Capacity / Requirement	3.25 gal US / 12.3 ltr 87 Octane (minimum) 89 Oxygenated
Electrical	
Alternator Output	200 w @ 5000 RPM
Voltage Regulator	3-Phase - LR-390
Lights : High Beam	30 watts
Low Beam	30 watts
Brake	Two 12V/26.9 watts
Tail	Two 12V/8.26 watts
Ignition System	DC/CDI Ignition
Ignition Timing	30° ± 2° BTDC @ 5000 RPM
Spark plug / Gap	NGK BKR6E/ .036 in. / 0.9 mm
Battery / Model / Amp Hr	Low Maintenance - 14 Amp Hr
Circuit Breakers	Fan 10 amp / Harness 20 amp
Starting	Electric / Recoil Backup
Instrument Cluster	Analog Speedo w/ LCD

Drivetrain	
Transmission Type	Drumshift - H/L/N/Rev/Park
Transmission Capacity	13.5 oz. / 400ml
Rear Gearcase Capacity	16 oz. / 473ml
Front Gearcase Capacity	5 oz. / 400ml
Gear Ratio : Low	10.49:1
Rev	6.20:1
High	4.0:1
Front Drive	3.7:1
Rear Drive	3.1:1
Clutch Type	PVT EBS
Belt	3211069
Steering / Suspension	
Front Suspension / Shock	A-arm / MacPherson Strut
Front Travel	6.7 in. / 17.02 cm
Rear Suspension / Shock	Swing Arm w/ Sachs Shocks
Rear Travel	7.1 in. / 18.03 cm
Ground Clearance	6.75 in. / 17.14 cm
Shock Preload Adjustment Front / Rear	Front -Non Adjustable. Rear - Cam Style- Std.
Turning Radius	71 in. / 180 cm
Toe Out	1/8-1/4- in / .0 - .159 mm
Wheels / Brakes	
Wheel Size / Pattern - Front	Steel 24x8-12 / 4-156
Wheel Size / Pattern - Rear	Steel 24x11-12 / 4-156
Front Tire Model / Size	Titan 24x8-12
Rear Tire Model / Size	Titan 24x11-12
Recommended Air Pressure	Front - 4 psi / Rear - 3 psi
Brake - Front	Dual Hydraulic Disc
Brake - Rear	Dual Hydraulic Disc

JETTING CHART

Altitude		AMBIENT TEMPERATURE	
		Below 40°F Below 5°C	+40°F to +80°F +5°C to +28°C
Meters (Feet)	0-1800 (0-6000)	127.5	122.5
	above 1800 (above 6000)	120	115

CLUTCH CHART

Standard helix spring position is 2 - 2

Altitude		Shift Weight	Drive Spring	Driven Spring	Driven Helix
Meters (Feet)	0-1800 (0-6000)	16 (5630279)	Blu/Grn (7041157)	Black (7041782)	41-35° (5133701) 2-2
	1800-3700 (6000-12000)	20-38 (5631357)	Blu/Grn (7041157)	Black (7041782)	41-35° (5133701) 2-2

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

ATV PAINT INFORMATION

FRAME COLOR - (All) P067 Medium Gloss Black 9440 / 8520147.
Order direct from Midwest Industrial Coatings (952-942-1840). Mix as directed.

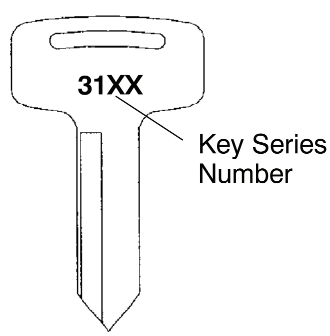
COLD WEATHER KITS FOR 4 CYCLE ATVS

Oil Tank Cover - (**PN 2871874**)
Engine Heater - (**PN 2871507**)

ACCESSORY ENGINE HEATER

REPLACEMENT KEYS

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



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

SPECIAL TOOLS

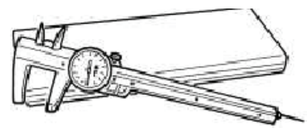
PART NUMBER	TOOL DESCRIPTION	CHAPTER TOOL USED IN
2870872	Shock Spanner Wrench	2, 7
2871043	Flywheel Puller	3
2870773	C-Clip Installation Tool	3
2870569	Crankshaft Truing Tool	3
8700229	Flywheel Holding Wrench	3
2870386	Piston Pin Puller	3
2871445	Piston Pin Puller Adapter	3
2870967	Slotted Nut Socket	3
2870968	Counter Balance Puller	3
2872314	Carburetor Float Adjustment Tool	4
2870975	Mity Vac™	3, 4, 9
2870506	Clutch Puller	6
9314177	Clutch Holding Wrench	6
2871358	Clutch Holding Fixture	6
2870341	Drive Clutch Spider Removal and Install Tool	6
2870654	Clutch Offset Alignment Tool	6
2870913	Driven Clutch Puller	6
2870910	Roller Pin Tool	6
2871226	Clutch Bushing Replacement Tool Kit	6
2870386	Piston Pin Puller	6
8700220	Clutch Compression Tool	6
2870871	Ball Joint Replacement Tool	7
2870623	Shock Absorber Spring Compression Tool	5, 7
2871572	Strut Rod Wrench	5, 7
2871573	LH Strut Spring Compressor	5, 7
2871574	RH Strut Spring Compressor	5, 7
2871710	10” Center Distance Tool	8
PV-43568	Fluke™ 77 Digital Multimeter	10
2870836	Battery Hydrometer	10
2870630	Timing Light	10
8712100 or 8712500	Tachometer	10

NOTE: Polaris dealers can order the tools listed above through their Polaris Special Service Tools catalog.

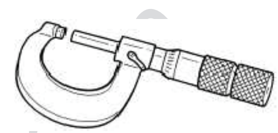
SPECIAL TOOLS

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

Standard Tools and Engine Tools



PU-45432 - Caliper or
A Basic Caliper

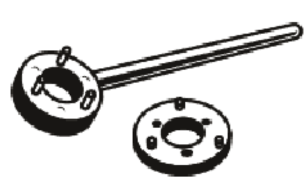


Basic Micrometer

2871043 - Flywheel Puller

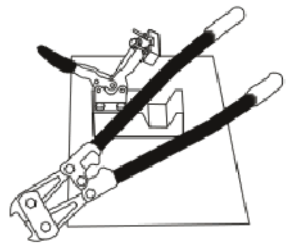
2870773 - C-Clip Install Tool

2870967 - Slotted Nut Socket



8700229 - Flywheel Holder & Adapter

Standard Tools and Engine Tools

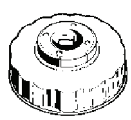


2870569 - Crankshaft True Kit

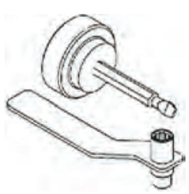
2870386 - Piston Pin Puller

2871445 - Piston Pin Puller Adapter

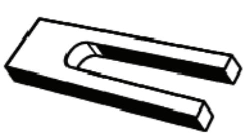
2870968 - Counter Balance Puller



PV-43527 Oil Filter Wrench

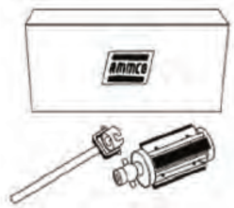


PA-44689 - Valve/Clutch Adjuster

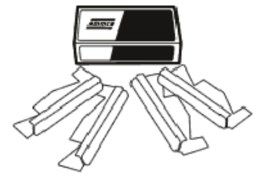


2870390 - Piston Support Block

Standard Tools and Engine Tools



2870303 - Hone Kit

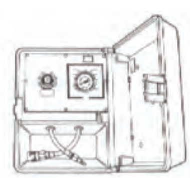


2870305 - Stone Replacement Kit

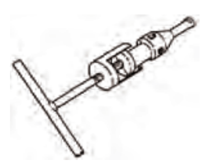
2870588 - Hone Oil (12 oz.)

2200634 - Valve Seat Reconditioning Kit

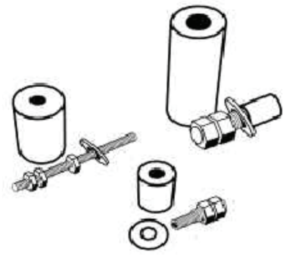
2870459 - Dial Indicator



PV-35667-A - Cylinder Leak down Tester

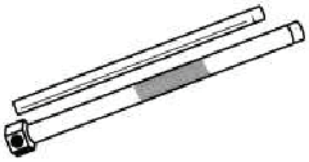


2872105 - Water Pump Seal Puller



2871283 – Crank/Water Pump Seal Install Kit

Clutch (PVT) Tools

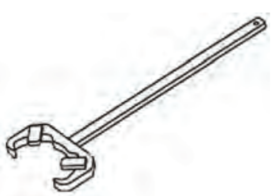


2870506 – Drive Clutch Puller

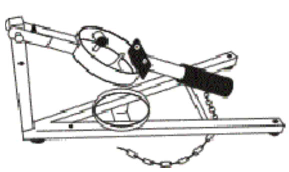
2870913 – Driven Clutch Puller

2870654 – ATV Clutch Align Tool

2872292 – EBS Clutch Align Tool

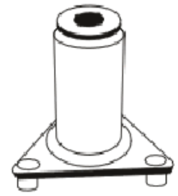


9914177–A – Drive Clutch Holding Tool

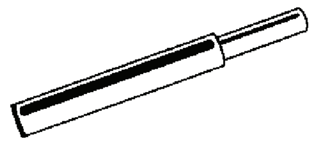


8700220 – Clutch Compression Tool

Clutch (PVT) Tools



2870341 – Drive Clutch Spider Removal Tool



2870910 – Roll Pin Tool

2871226 – Clutch Bushing Replacement Kit

2201379 – EBS Bushing Replacement Kit

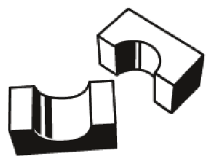
2870338 – Spider Nut Socket

2871358 – Clutch Holding Fixture

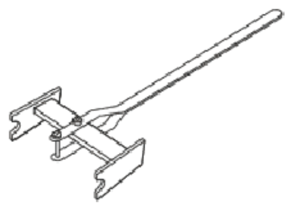
Suspension Tools

2870871 – ATV Ball Joint Tool Kit

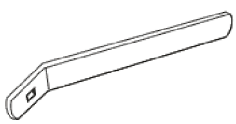
2871351 – Shock IFP Depth Tool



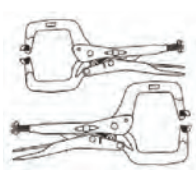
2871071 – Shock Body Holding Tool



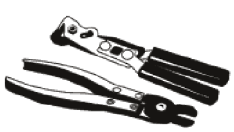
2870623 – Shock Spring Compressor



2871572 – Strut Rod Wrench



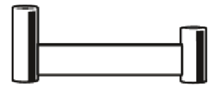
2871573 & 2871574 – Strut Spring Compressor



8700225 & 8700226 – CV Boot Clamp Pliers

Suspension & Transmission Tools

2870872 – Shock Spanner Wrench

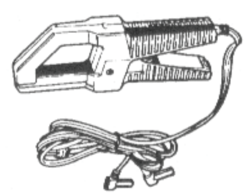


2871710 – Center Distance Tool

2872608 – Roll Pin Removal Tool

Electrical Tools

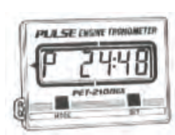
PV–43568 –Fluke 77 Multimeter



PV–39617 – Current Clamp

2870836 – Battery Hydrometer

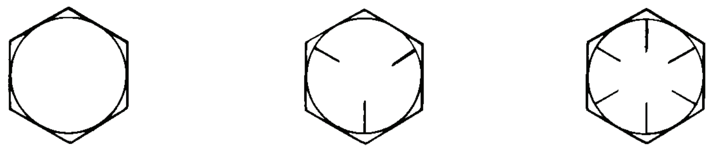
8712500 – Tachometer



PV–39951–A – Tachometer

STANDARD TORQUE SPECIFICATIONS

The following torque specifications are to be used as a general guideline. **FOR SPECIFIC TORQUE VALUES OF FASTENERS Refer to exploded views in the appropriate section.** There are exceptions in the steering, suspension, and engine sections.



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

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 Equiva-lent	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

CONVERSION TABLE

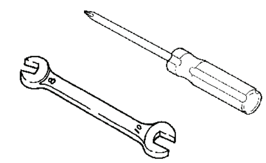
Unit of Measure	Multiplied by	Converts to
ft. lbs.	x 12	= in. lbs.
in. lbs.	x .0833	= ft. lbs.
ft. lbs.	x 1.356	= Nm
in. lbs.	x .0115	= kg-m
Nm	x .7376	= ft. lbs.
kg-m	x 7.233	= ft. lbs.
kg-m	x 86.796	= in. lbs.
kg-m	x 9.807	= Nm
in.	x 25.4	=mm
mm	x .03937	= in.
in.	x 2.54	= cm
mile (mi.)	x 1.6	= km
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

GLOSSARY OF TERMS

ABDC: After bottom dead center.
ACV: Alternating current voltage.
Alternator: Electrical generator producing voltage alternating current.
ATDC: After top dead center.
BBDC: Before bottom dead center.
BDC: Bottom dead center.
BTDC: Before top dead center.
CC: Cubic centimeters.
Center Distance: Distance between center of crankshaft and center of driven clutch shaft.
Chain Pitch: Distance between chain link pins (No. 35 = 3/8″ or 1 cm). Polaris measures chain length in number of pitches.
CI: Cubic inches.
Clutch Buttons: Plastic bushings which aid rotation of the movable sheave in the drive and driven clutch.
Clutch Offset: Drive and driven clutches are offset so that drive belt will stay nearly straight as it moves along the clutch face.
Clutch Weights: Three levers in the drive clutch which relative to their weight, profile and engine RPM cause the drive clutch to close and grip the drive belt.
Crankshaft Run-Out: Run-out or "bend" of crankshaft measured with a dial indicator while crankshaft is supported between centers on V blocks or resting in crankcase. Measure at various points especially at PTO.
DCV: Direct current voltage.
Dial Bore Gauge: A cylinder measuring instrument which uses a dial indicator. Good for showing taper and out-of-round in the cylinder bore.
Electrical Open: Open circuit. An electrical circuit which isn't complete.
Electrical Short: Short circuit. An electrical circuit which is completed before the current reaches the intended load. (i.e. a bare wire touching the chassis).
End Seals: Rubber seals at each end of the crankshaft.
Engagement RPM: Engine RPM at which the drive clutch engages to make contact with the drive belt.
ft.: Foot/feet.
Foot Pound: Ft. lb. A force of one pound at the end of a lever one foot in length, applied in a rotational direction.
g: Gram. Unit of weight in the metric system.
gal.: Gallon.
ID: Inside diameter.
in.: Inch/inches.
Inch Pound: In. lb. 12 in. lbs. = 1 ft. lb.
kg/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.
lbs/in^2: Pounds per square inch.
Left or Right Side: Always referred to based on normal operating position of the driver.
m: Meter/meters.
Mag: Magneto.
Magnetic Induction: As a conductor (coil) is moved through a magnetic field, a voltage will be generated in the windings. Mechanical energy is converted to electrical energy in the stator.
mi.: Mile/miles.
mm: Millimeter. Unit of length in the metric system. 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.
PVT: Polaris Variable Transmission (Drive Clutch System)
qt.: Quart/quarts.
Regulator: Voltage regulator. Regulates battery charging system output at approx. 14.5 DCV as engine RPM increases.
Reservoir Tank: The fill tank in the liquid cooling system.
Resistance: In the mechanical sense, friction or load. In the electrical sense, ohms, resulting in energy conversion to heat.
RPM: Revolutions per minute.
Seized Piston: Galling of the sides of a piston. Usually there is a transfer of aluminum from the piston onto the cylinder wall. Possible causes: 1) improper lubrication; 2) excessive temperatures; 3) insufficient piston clearance; 4) stuck piston rings.
Stator Plate: The plate mounted under the flywheel supporting the battery charging coils.
TDC: Top dead center. Piston's most outward travel from crankshaft.
Volt: The unit of measure for electrical pressure of electromotive force. Measured by a voltmeter in parallel with the circuit.
Watt: Unit of electrical power. Watts = amperes x volts.
WOT: Wide open throttle.

CHAPTER 2
MAINTENANCE



PERIODIC MAINTENANCE CHART

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

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

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

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

Severe Use Definition

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

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

Maintenance Chart Key

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

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

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

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

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

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

MAINTENANCE AND LUBRICATION

Periodic Maintenance Chart

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

▶ Perform these procedures more often for vehicles subjected to severe use.
E Emission Control System Service (California)
■ Have an authorized Polaris dealer perform these services.

MAINTENANCE AND LUBRICATION

Periodic Maintenance Chart

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

▶ Perform these procedures more often for vehicles subjected to severe use.
E Emission Control System Service (California)
■ Have an authorized Polaris dealer perform these services.

MAINTENANCE AND LUBRICATION

Periodic Maintenance Chart

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

▶ Perform these procedures more often for vehicles subjected to severe use.
E Emission Control System Service (California)
■ Have an authorized Polaris dealer perform these services.

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
- 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

COLD WEATHER KITS FOR 4 STROKE ATVS

Engine Heater – (**PN 2871507**)

ACCESSORY ENGINE HEATER

POLARIS LUBES/FLUIDS FOR MAGNUM 330 MODELS

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

Premium Synthetic ATV AGL Gearcase Lube

- AGL Gearcase Lube minimizes wear while providing the best silicon protection in extreme operating conditions

2873602 Quart
12 per case

2873603 Gallon
4 per case

2873604 2.5 Gallon
2 per case

ATV Angle Drive Fluid

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

2871653 8 oz. Bottle
12 per case

2872276 2.5 Gallon
2 per case

Demand Drive Hub Fluid

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

2871654 8 oz. Bottle
12 per case

2872277 2.5 Gallon
2 per case

2873554 - ATV Oil Change Kit
- Oil Filter & 3 Qts. of 0W-40 oil
- Reservoir Gasket
- Drain Plug Gasket
- Instruction Sheet

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

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

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

Premium Fuel Stabilizer

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

2870652 16 oz.
12 per case

2872280 2.5 gallon
2 per case

Engine Storage Kit

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

2859064

ATV Maintenance Kit

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

2859062

Carbon Clean Fuel Treatment

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

2871326 12 oz.
12 per case

Revival Detailing Kit

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

2872195 Revival/Detailing Kit

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

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

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

All Season Premium Grease

- Engineered for the pressure and temperature demands of Polaris ATV
- Superior adhesion and water resistance
- High-shear stability

2871322 3 oz. 4-pack — 6 per case
2871423 14 oz. — 10 per case

Premium Starter Grease
2871460 2 oz. — 12 per case

Premium U-Joint Grease
2871515 3 oz. — 24 per case
2871551 14 oz. — 10 per case

Grease Gun Kit

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

2871312 4 per case

POLARIS LUBRICANTS,MAINTENANCE AND SERVICE PRODUCTS

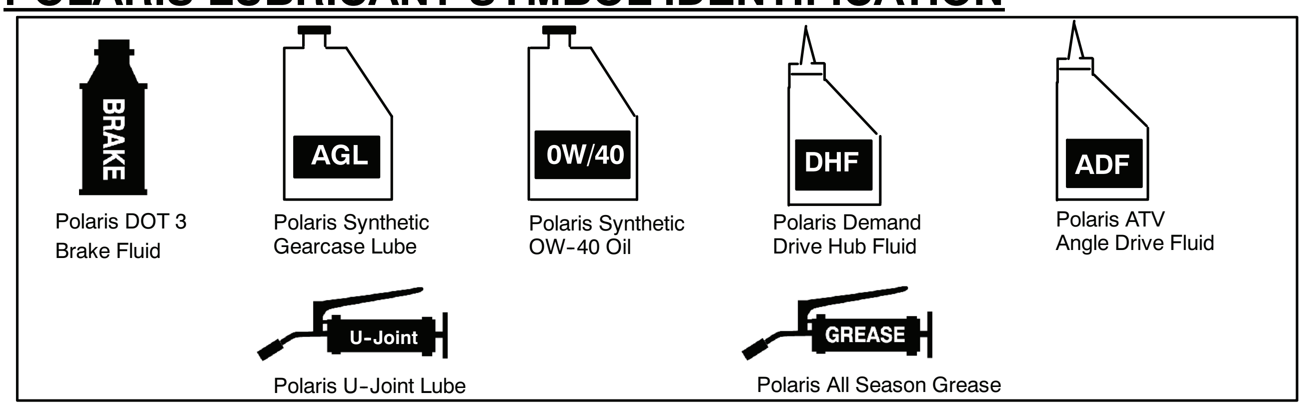
Part No.	Description
Engine Lubricant	
2870791	Fogging Oil (12 oz. Aerosol)
2871098	Premium 2 Cycle Engine Oil (Quart) (12 Count)
2871281	Engine Oil (Quart) Premium 4 Synthetic 0W-40 (4-Cycle) (12 Count)
2871844	Engine Oil (Gallon) Premium 4 Synthetic 0W-40 (4-Cycle) (4 Count)
2871567	Engine Oil (16 Gallon) Premium 4 Synthetic 0W-40 (4-Cycle)
Gearcase / Transmission Lubricants	
2873602	Premium Synthetic AGL Gearcase Lube (12 oz. bottle) (12 Count)
2873603	Premium Synthetic AGL Gearcase Lube (1 Gal.) (4 Count)
2871653	Premium ATV Angle Drive Fluid (8 oz.) (12 Count)
2872276	Premium ATV Angle Drive Fluid (2.5 Gal) (2 Count)
2870465	Oil Pump for 1 Gallon Jug
2871654	Premium Demand Drive Hub Fluid (8 oz.) (12 Count)
2872277	Premium Demand 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)

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

Part No.	Description
Additives / Sealants / Thread Locking Agents / Misc.	
2870585	Loctite™ Primer N, Aerosol, 25 g
2871956	Loctite™ Thread Sealant 565 (50 ml.) (6 Count)
2871949	Loctite™ Threadlock 242 (50 ml.) (10 Count)
2871950	Loctite™ Threadlock 242 (6 ml.) (12 Count)
2871951	Loctite™ Threadlock 262 (50 ml.) (10 Count)
2871952	Loctite™ Threadlock 262 (6 ml.) (12 Count)
2871953	Loctite™ Threadlock 271 (6 ml.) (12 Count)
2871954	Loctite™ Threadlock 271 (36 ml.) (6 Count)
2870584	Loctite™ 680-Retaining Compound (10 ml.)
2870587	Loctite™ 518 Gasket Eliminator / Flange Sealant (50 ml.) (10 Count)
2871326	Premium Carbon Clean (12 oz.) (12 Count)
2870652	Fuel Stabilizer (16 oz.) (12 Count)
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)
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.

POLARIS LUBRICANT SYMBOL IDENTIFICATION



Polaris DOT 3 Brake Fluid

Polaris Synthetic Gearcase Lube

Polaris Synthetic OW-40 Oil

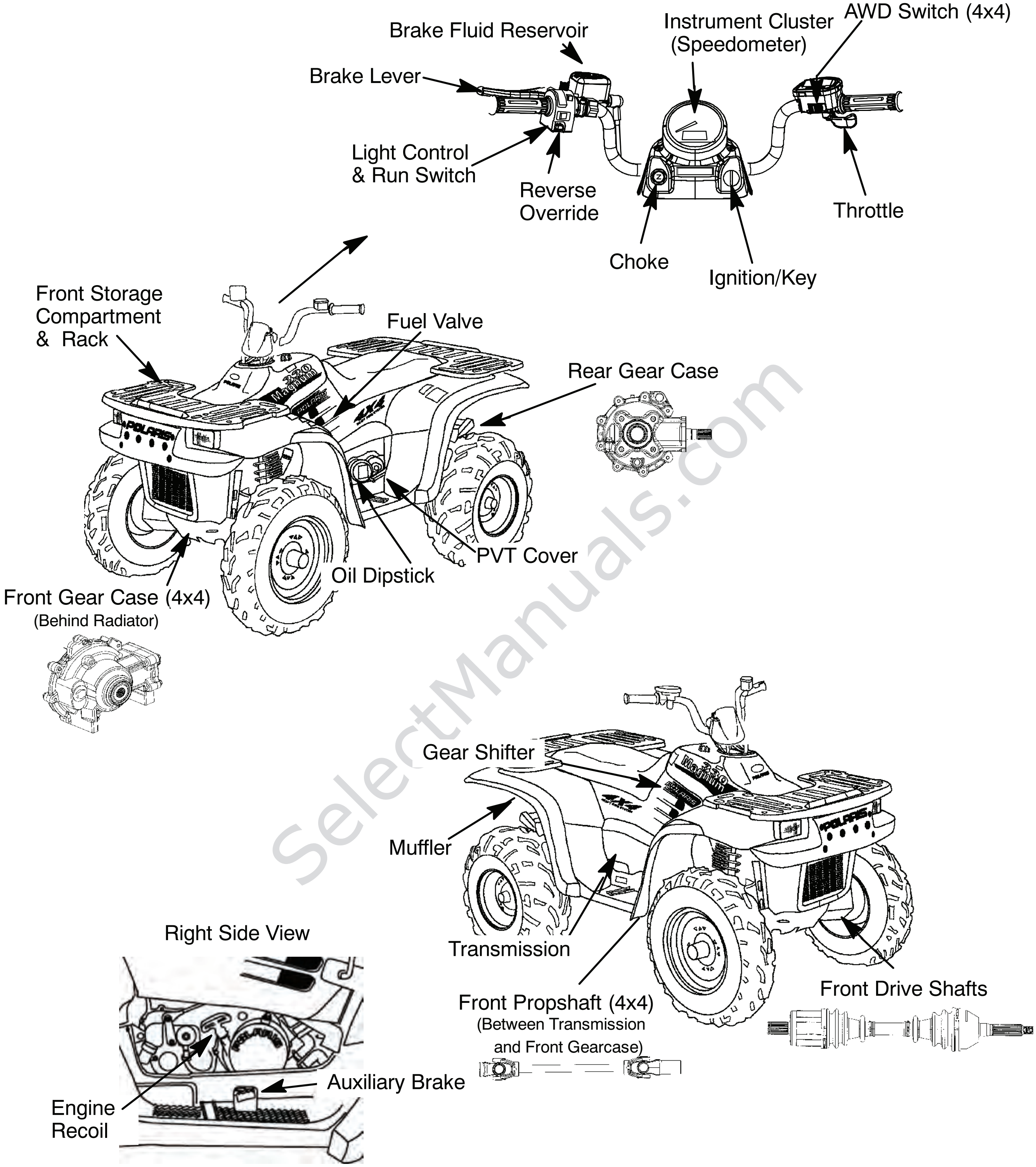
Polaris Demand Drive Hub Fluid

Polaris ATV Angle Drive Fluid

Polaris U-Joint Lube

Polaris All Season Grease

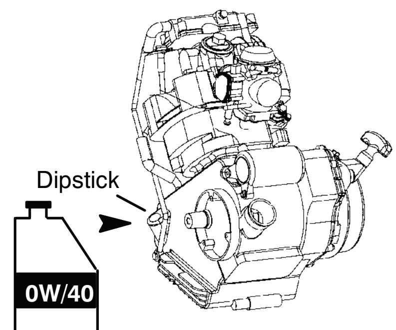
MAGNUM 330 COMPONENT LOCATIONS



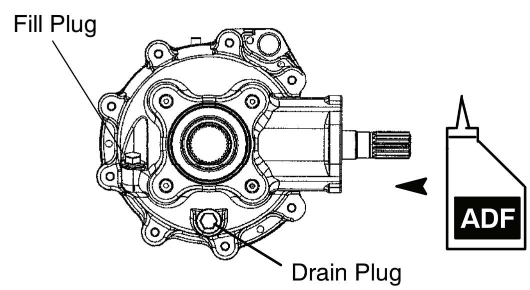
LUBRICATION

Ill. #	Item	Lube Required	Method	Frequency*
1	Engine Oil	Polaris 0W-40 Synthetic	Add oil 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	Rear Gear-case	ATV Angle Drive Fluid	Drain completely. Add lube to specified quantity.	Change annually
3	Transmis-sion	Polaris AGL Gear-case Lubricant	Add lube to bottom of fill hole	Change annually
4	Brake Fluid	Polaris DOT 3 Brake Fluid	Fill master cylinder reservoir to in-dicated level inside reservoir.	As required. Change fluid every 2 years.

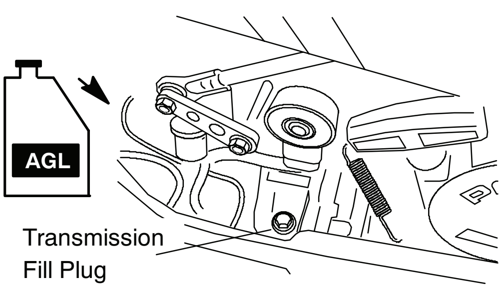
NOTE: Refer to Page 2.6 for the Polaris Lubricant Identification table.



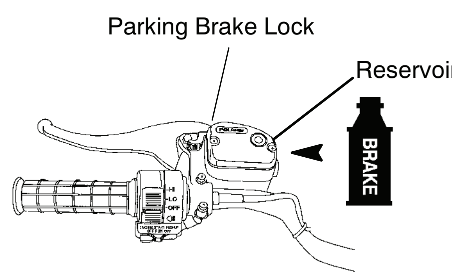
1. Engine Oil (330)



2. Rear Gearcase



3. Transmission



4. Brake Fluid

***** 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)

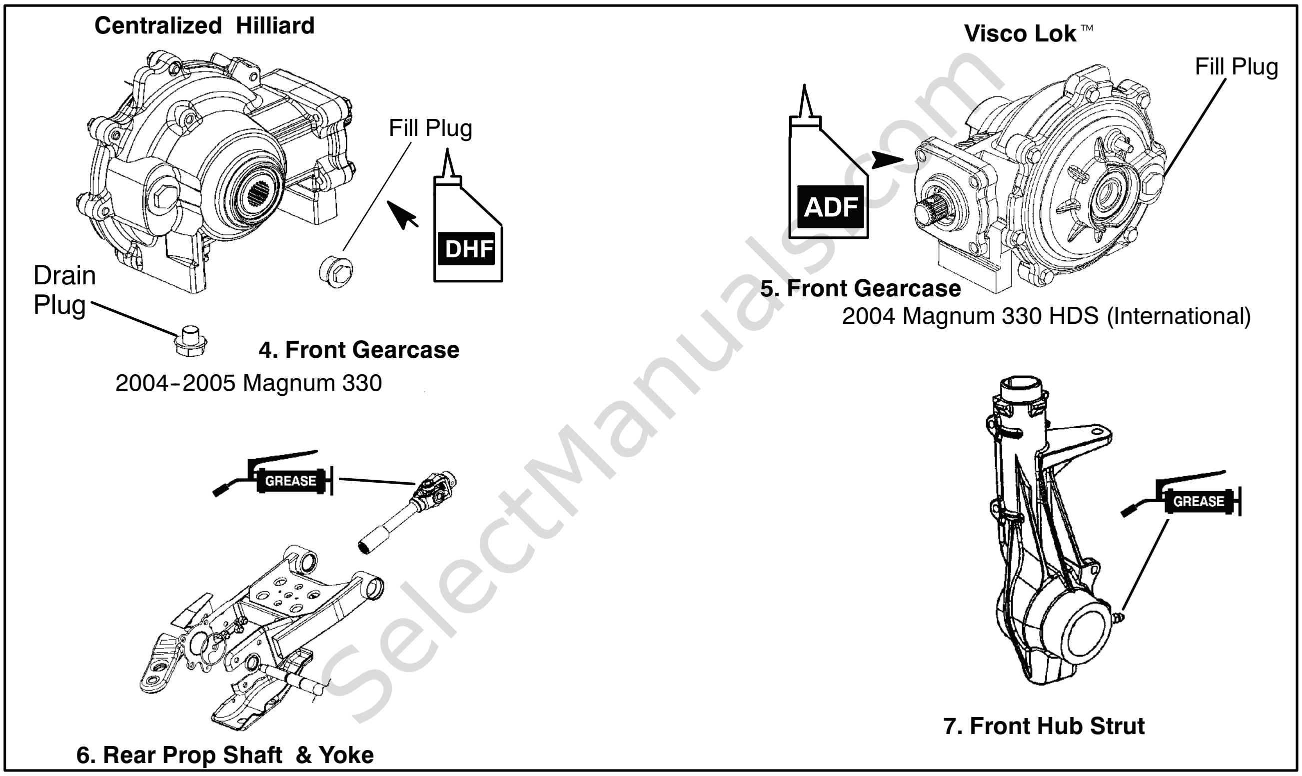
[2] Annually or 100 hours of operation (refer to Maintenance Schedule for additional information)

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

LUBRICATION

Ill. #	Item	Lube Required	Method	Frequency*
4	Front Gearcase (Domestic)	Premium Demand Drive Hub Fluid	Drain completely. Add lube to specified quantity.	Change annually
5	Front Gearcase (330 HDS)	ATV Angle Drive Fluid	Drain completely. Add lube to specified quantity.	Change annually
6	Rear Prop Shaft	Premium U-Joint Grease	Locate Fittings and Grease	Semi-annually [1]
7	Front Hub Assembly	Polaris All Season Grease	Locate Fittings and Grease	Semi-annually [1]

NOTE: Refer to Page 2.6 for the Polaris Lubricant Identification table.



***** 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)

[2] Annually or 100 hours of operation (refer to Maintenance Schedule for additional information)

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

FRONT GEARCASE LUBRICATION (4X4 MODELS ONLY)

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.
- Polaris ATV Angle Drive Fluid is used in the 2004 Magnum 330 HDS international models with Visco Lok™.
- Polaris Premium Demand Drive Fluid is used in the Magnum 330 for the Centralized Hilliard gearcase.

FRONT GEARCASE SPECIFICATIONS

2004 Magnum 330 HDS (international)

Specified Lubricant:
ATV Angle Drive Fluid (PN 2871653)

Capacity:

2004 Magnum HDS : 13.5 oz. (400 ml)

2004 Magnum 330 & 2005 Magnum 330

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

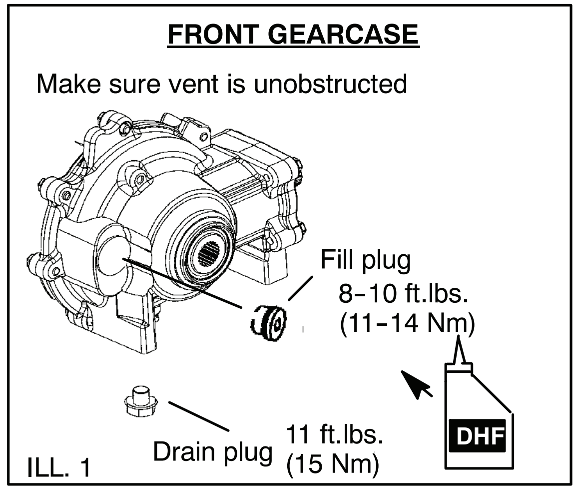
Capacity:

Magnum 330.......5 oz. (150 ml)
(Centralized Hilliard)

Drain Plug / Fill Plug Torque:
Refer to illustrations for torque specs.

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

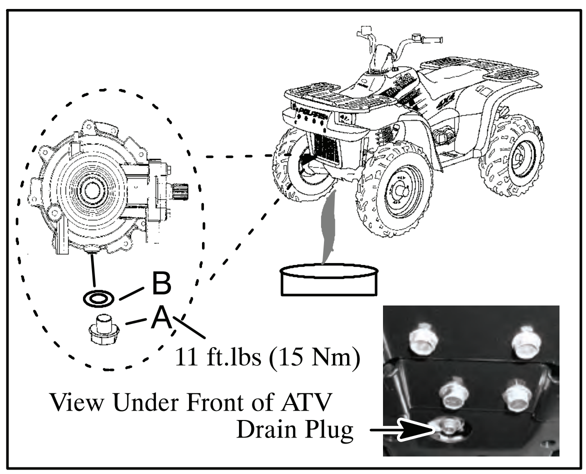
- Be sure vehicle is level before proceeding.
- Check vent hose to be sure it is routed properly and unobstructed.
- The correct front gearcase lubricant to use is Polaris Premium Demand Hub Fluid.



2004-2005 Magnum 330: To check the lubricant level:

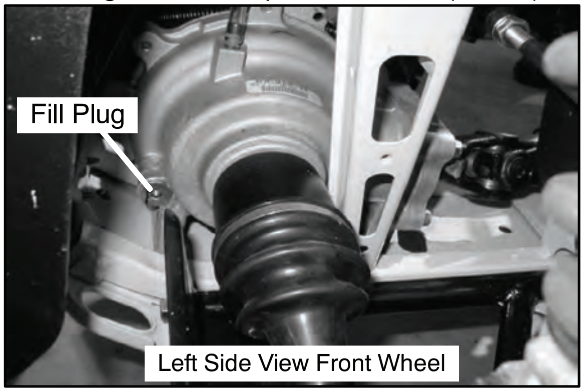
The front and rear gearcase lubricant level *cannot be checked* with a dipstick. The gearcase must be drained and re-filled with the proper amount of lubricant or be filled to the bottom of the fill plug hole threads. Refer to procedures below.

2004-2005 Magnum 330: To change gearcase lubricant:

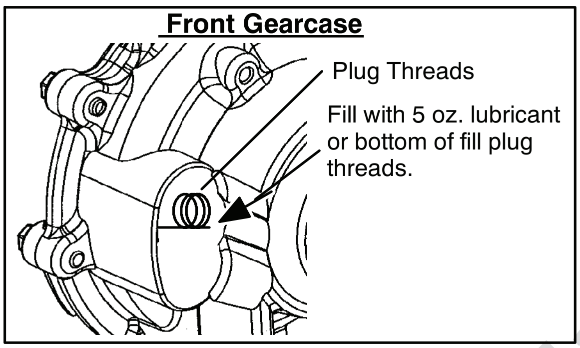


1. Remove gearcase drain plug (A) (11 mm) located on the bottom of the gearcase and drain oil. (The drain plug is accessible through the skid plate.) Catch and discard used oil properly.

2. Clean and reinstall drain plug (A) using a new sealing washer Torque to 11 ft.lbs. (15 Nm).



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



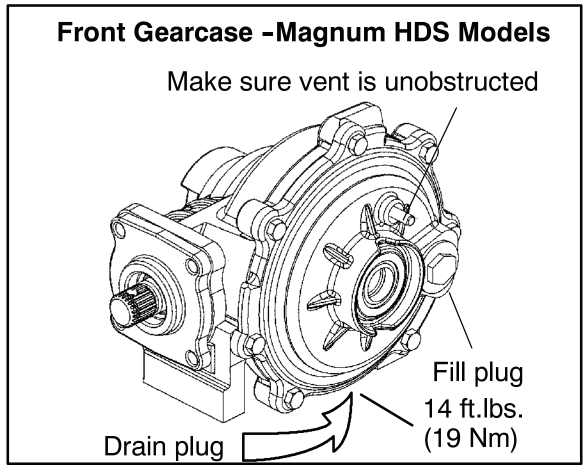
5. Install fill plug and check for leaks.
6. Check for leaks.

2004 Magnum HDS Models - To check the level:

1. The front 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 procedure below.

2004 Magnum HDS Models - To change lubricant:

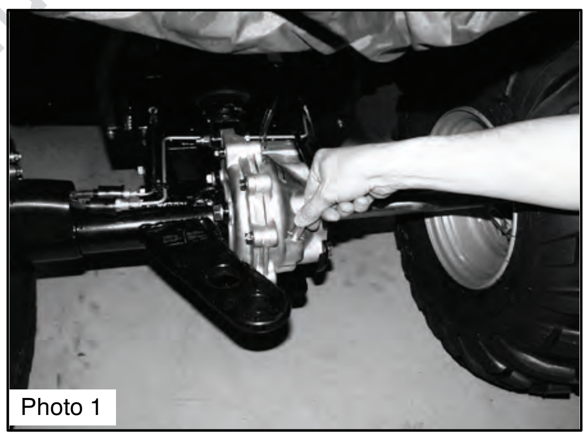
1. Remove gearcase drain plug located on the bottom and drain oil. Catch and discard used oil properly.
2. Clean and reinstall drain plug using a new sealing washer.
3. Remove fill plug.
4. Add 13.5 oz. (400 ml) of ATV Angle Drive Fluid.
5. Install fill plug and torque to 14 ft.lbs. (19 Nm).
6. Check for leaks.



REAR GEARCASE LUBRICATION

To check the level:

1. With machine on level ground, remove fill plug from rear gearcase.



2. If level is low, add the proper lubricant. Fill the rear gearcase to the bottom of the fill plug threads. Refer to Photo 2 ILL. 3.

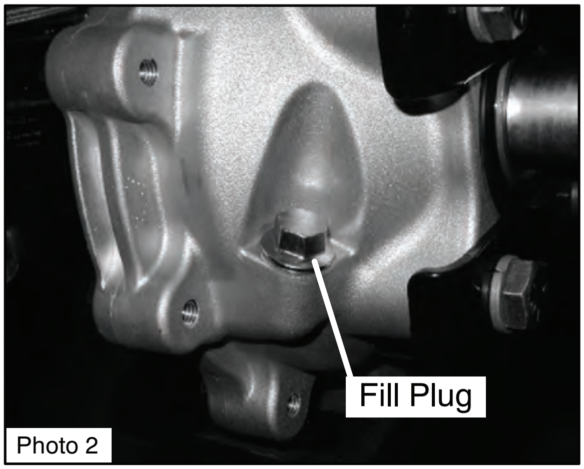
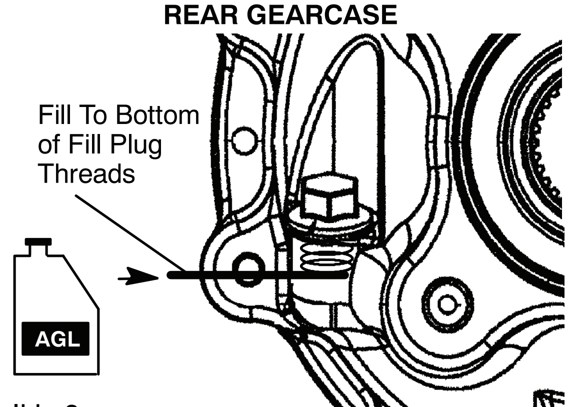


Photo 2

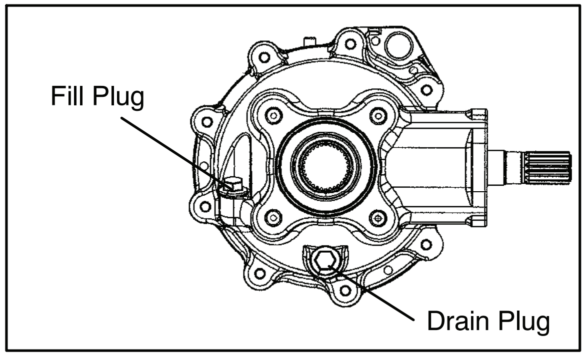


ILL. 3

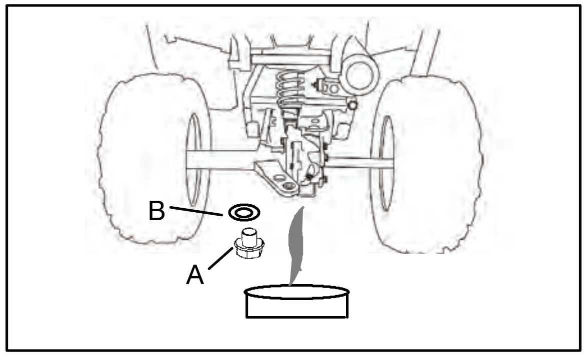
3. Reinstall fill plug. Torque to 14 ft. lbs. (19 Nm).
4. Check for leaks.

REAR GEARCASE SPECIFICATIONS
Specified Lubricant: ATV Angle Drive Fluid **(PN 2871653)**
Capacity: . . . . 10.0 Oz. (300ml.)
Drain Plug / Fill Plug Torque:
14 ft. lbs. (19.3 Nm)

To change the lubricant:



1. Remove gearcase drain plug located on the bottom and drain the oil. Catch and discard used oil properly.



2. Clean and reinstall the drain plug (A) with a new sealing washer (B) and torque to 14 ft. lbs. (19 Nm).
3. Remove fill plug.
4. Add 300 ml. of ATV Angle Drive Fluid (**PN 2871653**) or fill to the bottom of threads of the fill plug hole (Illustration 3).
5. Reinstall fill plug (A) and washer (B). Torque to 14 ft. lbs. (19.3 Nm).
6. Check for leaks.

TRANSMISSION LUBRICATION

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

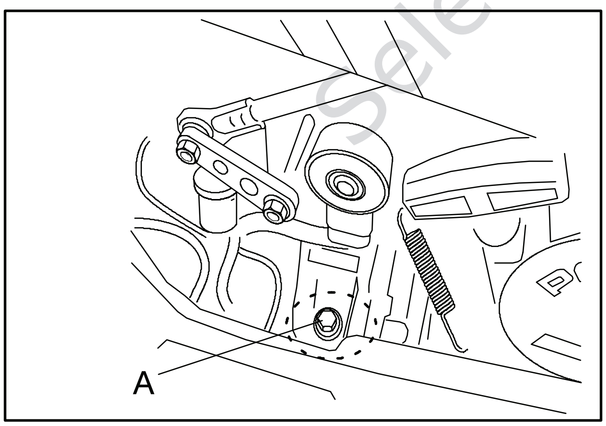
- Be sure vehicle is level before proceeding.

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

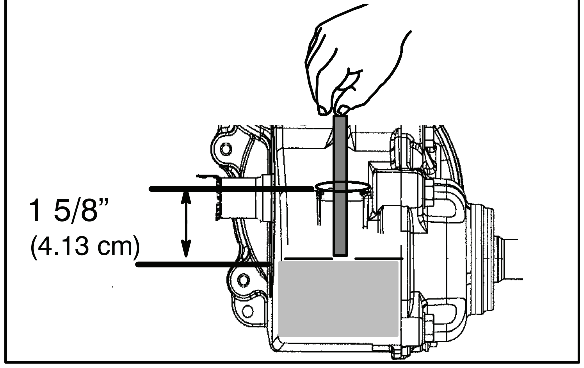
- Check vent hose to be sure it is not kinked or obstructed.
- Follow instructions on following pages to check / change transmission lubricant.

To check the level:

1. Remove propshaft shield from the right side of the vehicle, if equipped.
2. Remove fill plug (A) and visually inspect the oil level. Level is correct when it reaches the bottom of the fill hole or 1 5/8" from the top of the fill plug hole, as shown.

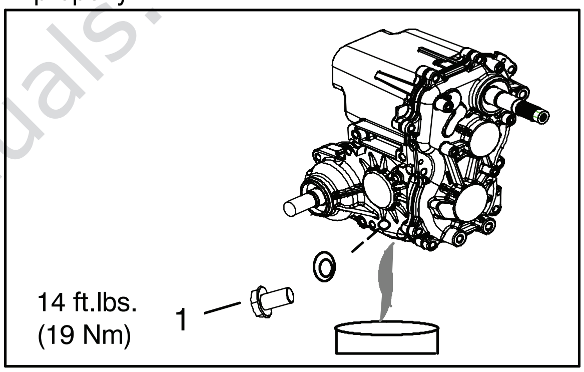


Transmission Oil Measurement

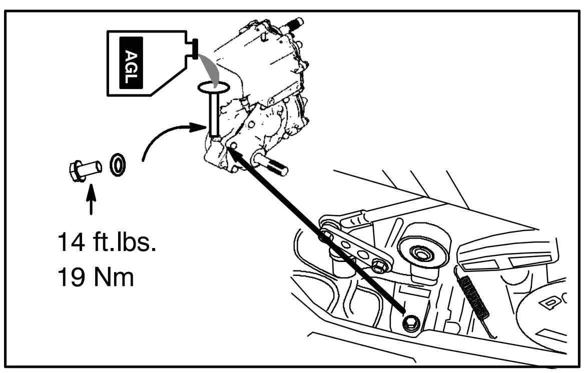


To change lubricant:

1. Remove propshaft shield from the right side of the vehicle, if equipped.
2. Remove transmission drain plug and drain the oil. The drain plug is located on the front side of the transmission. Catch and discard used oil properly.



3. Clean and reinstall the drain plug with a new sealing washer. Torque to **14 ft. lbs. (19.3 Nm)**.

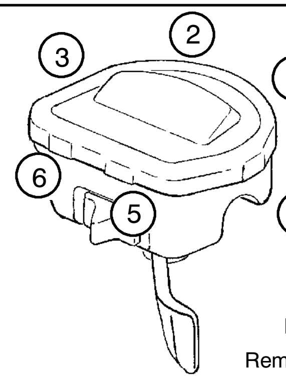


4. Remove fill plug.
5. Add 13.5 oz. (400 ml) of Polaris AGL Gearcase Lubricant or to proper level as described above. Clean and reinstall the drain plug with a new sealing washer. Torque to **14 ft. lbs. (19.3 Nm)**
6. Check for leaks.
7. Reinstall propshaft shield, if equipped.

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.

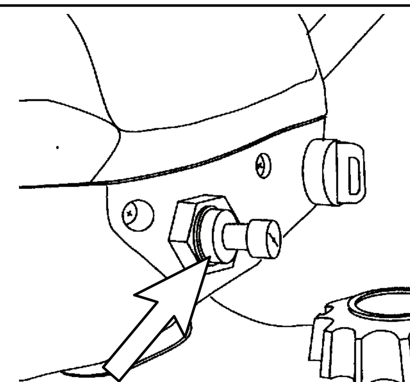


Ill. 1 ETC Cover Removal Sequence

To remove the ETC cover:

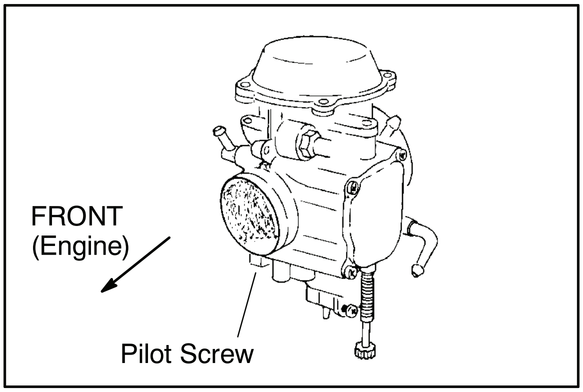
1. Use a medium flat blade screwdriver and insert blade into the pocket of the cover starting on the #1 position.
2. Twist screwdriver slightly while lifting on the cover to release snap.
3. Repeat procedure at the other five locations as shown.
   NOTE: Do not attempt to remove cover until all latch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

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.

PILOT SCREW ADJUSTMENT



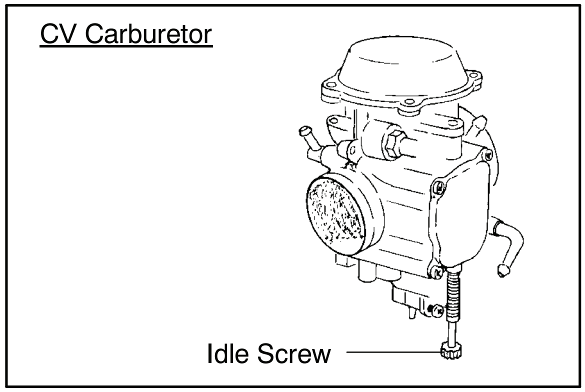
The pilot screw is set at the factory. Each carburetor will have a slightly different pilot screw setting, the adjustments below are the recommended settings, the settings may differ from these recommendations.

Pilot Screw Adjustment:
Magnum 330 - 2 Turn Out

1. Start engine and warm it up to operating temperature (about 10 minutes).
2. Turn pilot screw in (clockwise) until *lightly* seated. Turn screw out the specified number of turns. **NOTE:** Do not tighten the pilot screw forcefully against the seat or the screw and/or seat will be permanently damaged.
3. Connect an accurate tachometer that will read in increments of + or - 50 RPM such as the PET 2100DX (**PN 8712100**DX) or the PET 2500 (**PN 8712500**).
4. Set idle speed to 1200 RPM. Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.
5. Slowly turn mixture screw clockwise using the pilot screw wrench until engine begins to miss.
6. Slowly turn mixture screw counterclockwise until idle speed increases to maximum RPM. Continue turning counterclockwise until idle RPM begins to drop.
7. Center the pilot screw between the points in Step 5 and 6.
8. Re adjust idle speed if not within specification.

IMPORTANT 330 NOTE: Idle speed is specified with the lights OFF. The idle speed will drop between 100-150 RPM when the lights are turned on.

IDLE SPEED ADJUSTMENT



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.

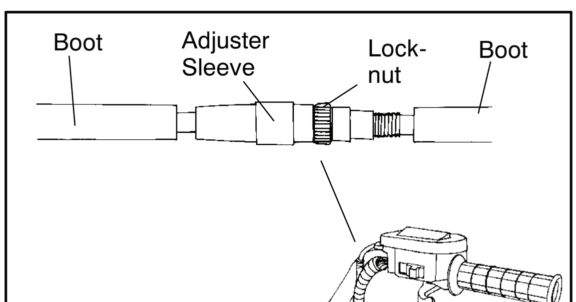
NOTE: Adjusting the idle speed affects throttle cable freeplay and electronic throttle control (ETC) adjustment. Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.

Idle Speed:

Magnum 330 1300 +/- 200

THROTTLE CABLE / ELECTRONIC THROTTLE CONTROL (ETC SWITCH) ADJUSTMENT

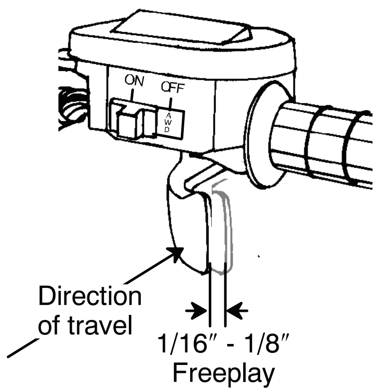
1. Slide boot off throttle cable adjuster and jam nut.
2. Place shift selector in neutral and set parking brake.
3. Start engine and set idle to specified RPM.



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.

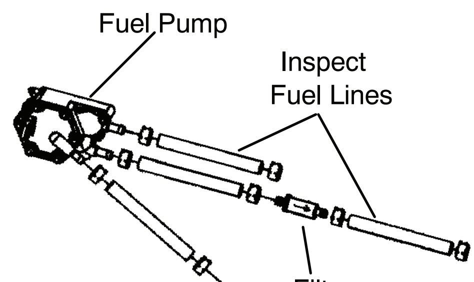
FUEL SYSTEM

⚠ 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



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.

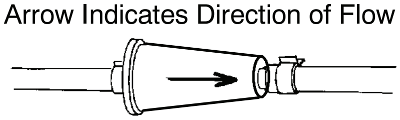
Be sure vent lines are routed properly and secured with cable ties. **CAUTION:** Make sure lines are not kinked or pinched.

FUEL FILTER

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

Fuel Filter Located Close to Carburetor

Arrow Indicates Direction of Flow



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.

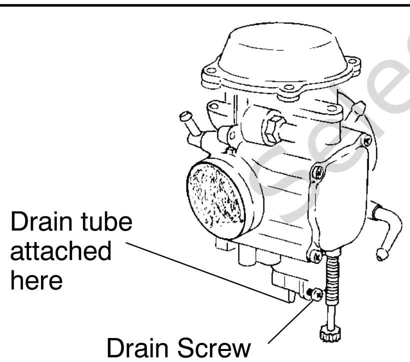
CARBURETOR DRAINING

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

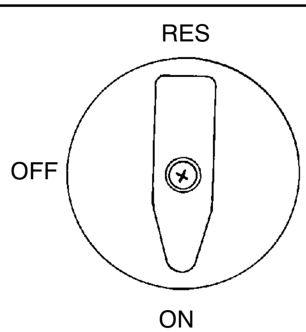
NOTE: The bowl drain screw is located on the bottom left side of the float bowl.

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: 4-Stroke engines are equipped with an automatic decompressor. Compression readings will vary in proportion to cranking speed during the test. Average compression for a **330 engine** (measured) is about **70-90 psi** during a compression test.

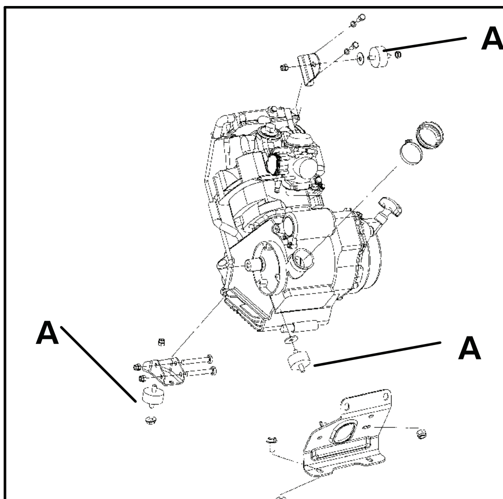
Smooth idle generally indicates good compression. Low engine compression is rarely a factor in running condition problems above idle speed. Abnormally high compression can be caused by a decompressor malfunction, or worn or damaged exhaust cam lobes. Inspect camshaft and automatic decompression mechanism if compression is abnormally high.

A cylinder leakage test is the best indication of engine condition on models with automatic decompression. Follow manufacturer's instructions to perform a cylinder leakage test. (Never use high pressure leakage tester as crankshaft seals may dislodge and leak).

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

ENGINE MOUNTS

Inspect rubber engine mounts (A) for cracks or damage. Check engine fasteners and ensure they are tight.



ENGINE FASTENER TORQUE

Check engine fasteners periodically and verify they are tight.

BATTERY MAINTENANCE

⚠ WARNING

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

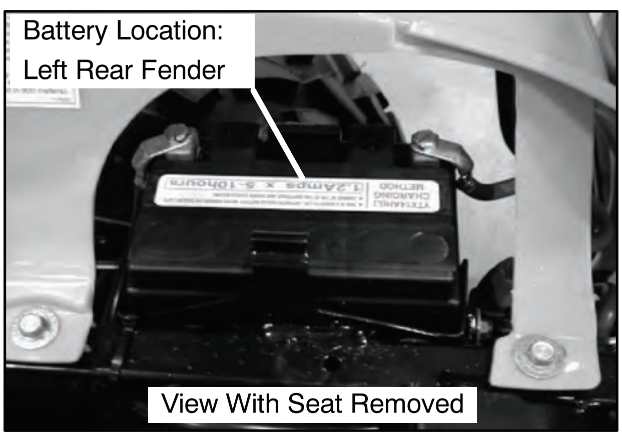
External: Flush with water.

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

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

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

The battery is located under the left rear fender.



NOTE: All Magnum 330 ATV batteries are Maintenance-Free design and construction. All Maintenance-Free batteries are fully charged and tested at the factory before installation. Expected shelf life is 6-8 months depending on storage conditions. As a general rule before placing the battery into service, check the battery condition and charge accordingly.

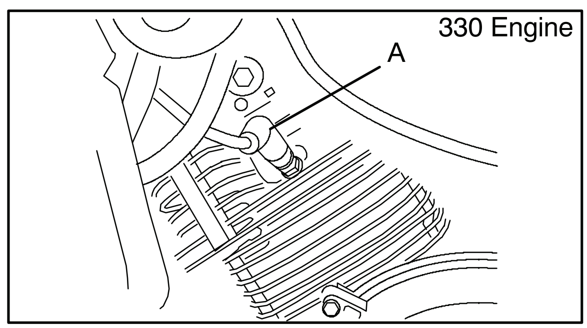
<u>New Batteries:</u> Batteries must be fully charged before use or battery life can be reduced by 10-30% of full potential. Charge battery for 3-5 hours at a current equivalent of 1/10 of the battery's rated amp/hour capacity (i.e. 12amp hr x .10 = 1.2 amp charging). Do not use the alternator to charge a new battery.

Maintenance-Free 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 Maintenance-Free battery case is dark and the cell caps are not removable, since there is no need to check electrolyte level.

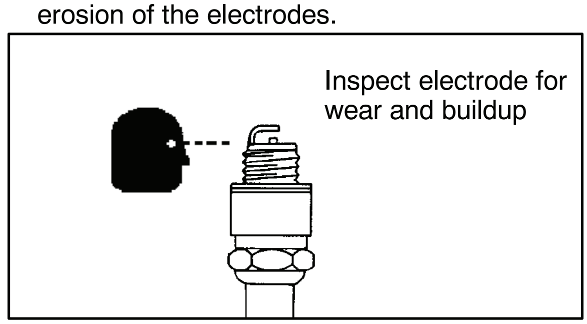
<u>NEVER</u> attempt to add electrolyte or water to a Maintenance-Free battery. Doing so will damage the case and shorten the life of the battery. Refer to the Battery Maintenance Video (PN 9917987) for proper instruction on servicing Maintenance-Free batteries.

NOTE: <u>New Batteries:</u> 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**)

SPARK PLUG



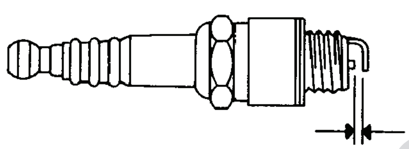
1. Remove spark plug high tension lead (A). Clean plug area so no dirt and debris can fall into engine when plug is removed.
2. Remove spark plug.
3. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.



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. (Ill. 1)
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
Spark Plug Torque:
14 Ft. Lbs. (19 Nm)

Spark Plug Gap



.036″ (0.9 mm)

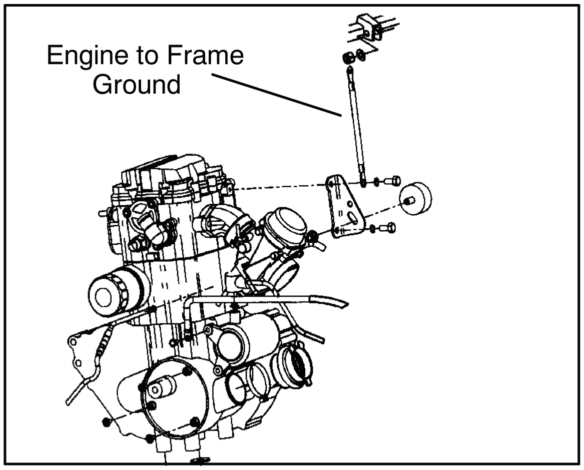
IGNITION TIMING

Refer to Chapter 10 for ignition timing procedures.

Ignition Timing 330 / 500 Engines:
30°±2° BTDC@5000RPM

Engine-To-Frame Ground

Inspect the engine-to-frame ground cable connection. Verify it is clean and tight.



To access the radiator pressure cap:

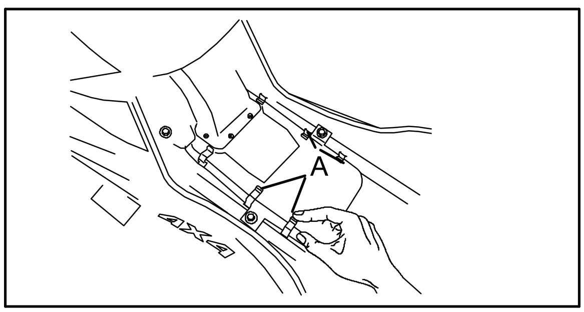
Remove the four screws securing front rack. Turn handle bars full left or right to provide more clearance. Remove front cover by placing your fingers under the front of the cover and pulling upward.

AIR FILTER/PRE-FILTER SERVICE

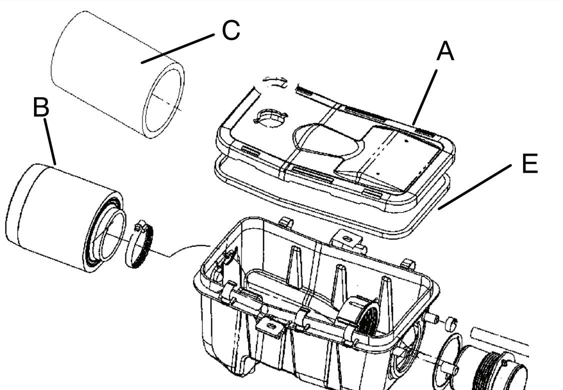
It is recommended that the air filter and pre filter be replaced annually. When riding in extremely dusty conditions, replacement is required more often.

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 from air box cover (A) and remove cover. Inspect the gasket (E). It should adhere tightly to the cover and seal all the way around.



4. Loosen clamp and remove air filter assembly (B & C).



Ill.1

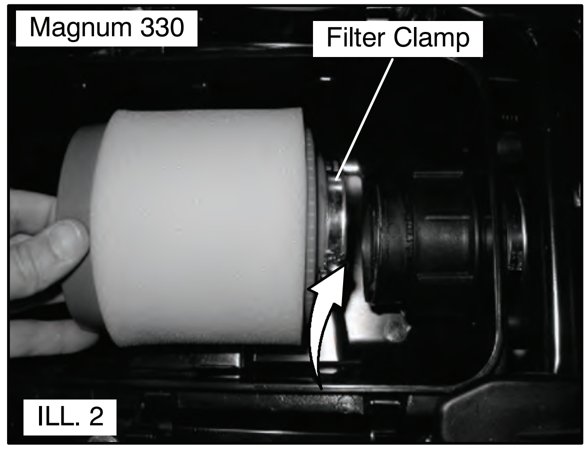
Cleaning:

5. Slip the pre-filter element (C) 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. Foam filters only: 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:

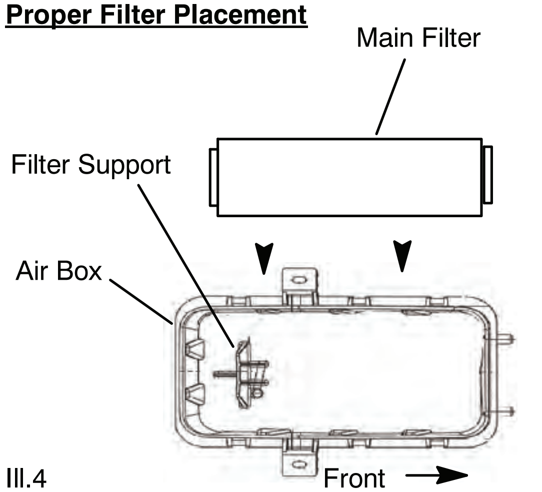
10. Reinstall pre-filter element over main filter. Be sure the element covers entire surface of main filter without folds, creases, or gaps.
11. Reinstall filter on main filter mount. Place filter clamp over the assembly and tighten.

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



ILL. 2

Proper Filter Placement



Ill.4

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 Illustrations above.

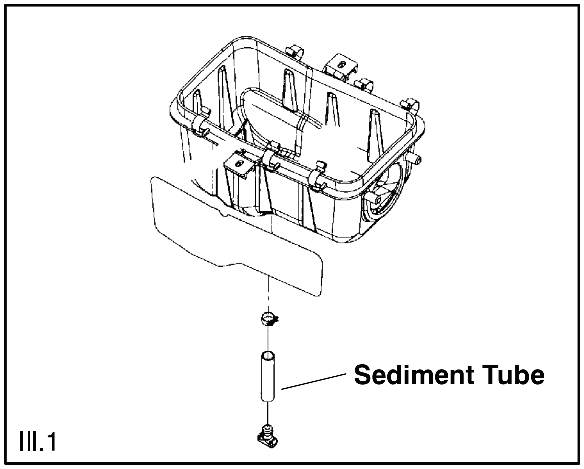
12. Install air box cover and secure with clips.

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.

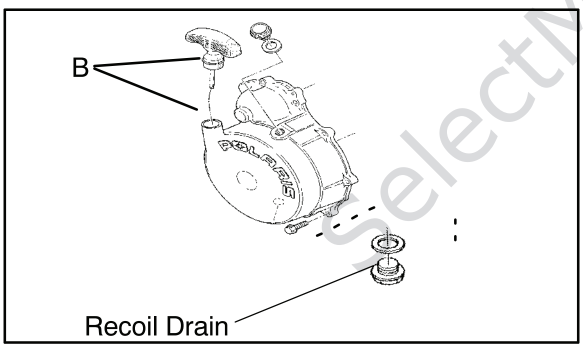


NOTE: The sediment tube will require more frequent service if the vehicle is operated in wet conditions or at high throttle openings for extended periods.

BREATHER HOSE

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

RECOIL HOUSING

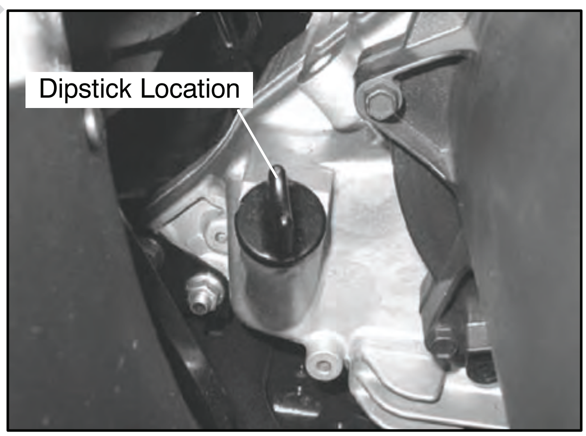


- Drain the housing periodically to remove moisture.
- Drain the recoil housing after operating the ATV in very wet conditions. This should also be done before storing the ATV. The drain screw is located at the bottom of the recoil housing. Remove the screw with a 10 mm wrench. Reinstall screw once housing has been drained.
- **CAUTION:** Make sure the manual start handle (B) is fully seated on the recoil housing, especially when travelling in wet areas. If it is not sealed properly, water may enter the recoil housing and damage components.
- Water will enter the recoil housing if the starter handle is disengaged from the rope guide when under water.
- After travelling in wet areas the recoil housing and starter should always be drained completely by removing the recoil.
- Do not open the crankcase drain unless the engine has ingested water. Some engine oil will be lost if crankcase drain is opened.
- If recoil handle seal has been damaged, the handle should be replaced.

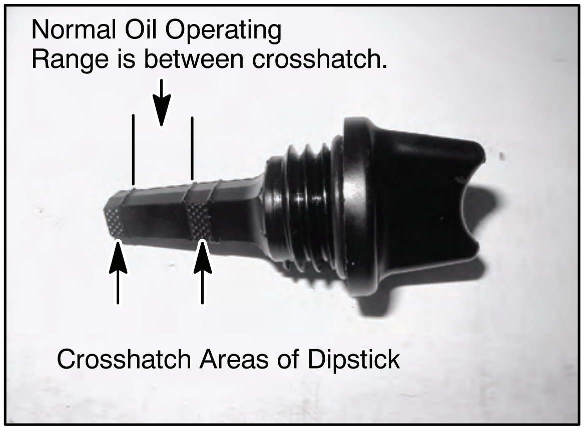
330 ENGINE OIL LEVEL

To check the oil level:

1. Set machine on a level surface.
2. Start and run engine for 20-30 seconds. This will return oil to its true level in the engine sump.
3. Stop engine, remove dipstick and wipe dry with a clean cloth.



4. Reinstall dipstick, screwing into place.
5. The dipstick must be screwed completely in to ensure accurate measurement.
6. Remove dipstick and check to see that the oil level is in the normal range. The oil should be between the top of the bottom crosshatched area and the bottom of the top crosshatched area. Add oil as indicated by the level on the dipstick. Do not overfill.



NOTE: Do not fill the over the normal oil operating range. Filling over the normal operating range could cause a mist of oil to enter the air box.

NOTE: Rising oil level between checks in cool weather driving, can indicate moisture collecting in the oil reservoir. If the oil level is over the full mark, change the oil.

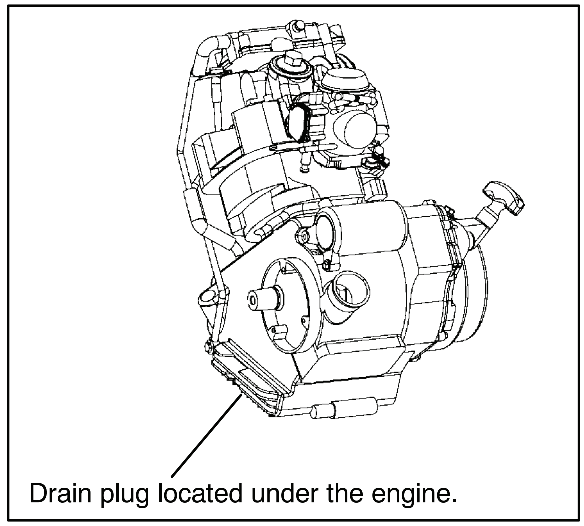
Recommended Engine Oil: **Polaris Premium 4 All Season Synthetic, 0W-40 (PN 2871281)** **Ambient Temperature Range: -40° F to 120° F**

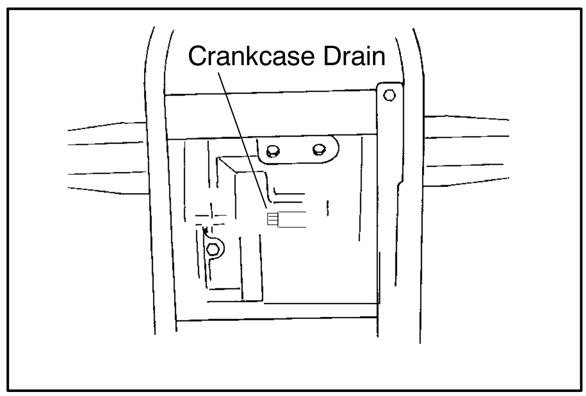
OIL AND FILTER CHANGE

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

NOTE: It is not necessary to drain the oil from the oil cooler, unless contaminants, water, or debris are found in the crankcase oil.

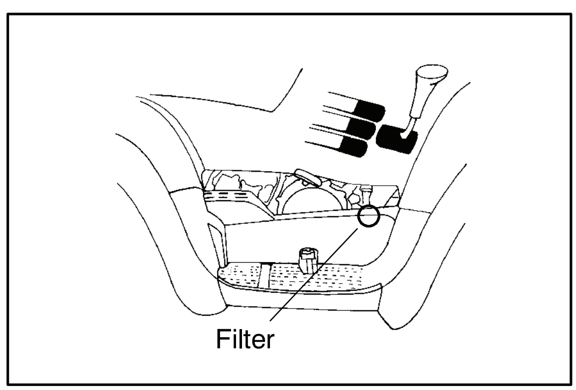
6. Replace sealing washer (A) on drain plug. **NOTE:** The sealing surfaces on drain plug and oil tank should be clean and free of burrs, nicks or scratches.
7. Reinstall drain plug and torque to 14 ft. lbs. (19 Nm).





Engine Sump Drain Plug - Bottom View

8. The oil filter is located on the right side of the machine. Place shop towels beneath oil filter. Using an oil filter wrench, 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 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 and additional 1/2 turn.

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

12. Remove dipstick and fill tank with 2 quarts (1.9 l) of Polaris Premium 4 Synthetic Oil (**PN 2871281**).
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.

Crankcase Drain Plug Torque:
14 ft. lbs. (19 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)

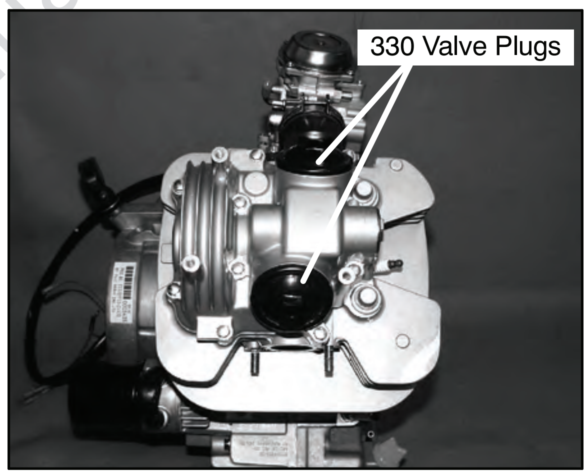
VALVE CLEARANCE 330 ENGINES

Inspect and adjust valve clearance while the engine is cold and the piston positioned at Top Dead Center (TDC) on compression stroke.

1. Remove the seat.
2. Remove body panels and fuel tank as necessary to gain access to valve cover.

   NOTE: Remove front rack, ignition, choke lever, handlebar cover, fuel valve, front cab and fuel tank (see chapter 5).
3. Remove the spark plug high tension lead and remove the spark plug. **CAUTION:** Place a clean shop towel into the spark plug cavity to prevent dirt from entering.
4. Remove rocker cover bolts, cover and gasket.

   NOTE: It may be necessary to tap cover lightly with a soft-faced hammer to loosen it from the cylinder head.
5. Remove plastic valve plugs.



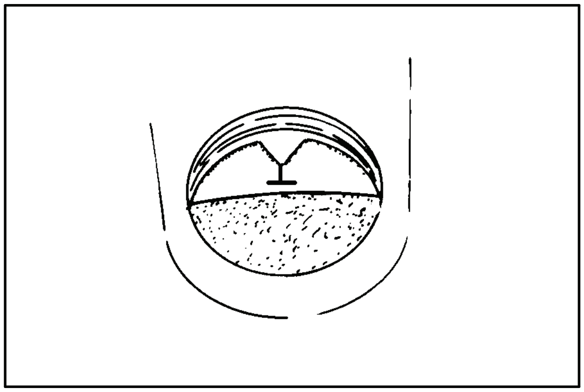
1. Clamp or pinch off vent line approximately 2″ from oil tank to avoid the end of oil tank vent fitting, and the vent line's pressure relief slit
2. Run engine for 45-60 seconds.
3. Remove the vent line clamp. The oil pump will now be properly primed and ready for field operation.
4. Remove timing inspection plug from recoil housing. Position engine at Top Dead Center (TDC).

CAUTION: Failure to position the crankshaft at TDC on compression stroke will result in improper valve adjustment.

5. Rotate engine slowly with recoil rope, watching the intake valve(s) open and close.

NOTE: Continue to rotate, observing the intake valve closing and then starting to open and the "T" aligns with the pointer. The camshaft lobes should be pointing downward at this point.

6. Verify accurate TDC positioning by observing the "T" mark aligned with the pointer in the timing inspection hole. In this position there should be clearance on all valves.

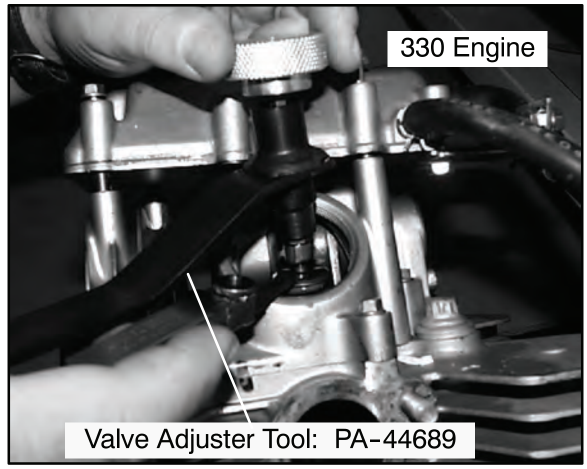


7. Check for proper valve clearance. Adjust if needed.

INTAKE VALVE CLEARANCE 330 Engines
.006″ (.15 mm)

INTAKE VALVE CLEARANCE ADJUSTMENT

1. Insert a .006″ (.15mm) feeler gauge between end of intake valve stem and clearance adjuster screw.
2. Using Valve/Clutch Adjuster Tool **(PN PA-44689)**, loosen adjuster lock nut and turn adjusting knob until there is a slight drag on the feeler gauge.



3. Hold adjuster screw and tighten adjuster lock nut securely.
4. Re-check the valve clearance.
5. Repeat adjustment procedure if necessary until clearance is correct with locknut secured.

EXHAUST VALVE CLEARANCE ADJUSTMENT

1. Insert .006″ feeler gauge(s) between end of exhaust valve stem and adjuster screw(s).
2. Loosen locknut(s) and turn adjuster screw(s) until there is a slight drag on feeler gauge(s).

NOTE: The Magnum 330 exhaust valve is adjusted the same as the intake valve. The Valve/Clutch Adjuster Tool **(PN PA-44689)** can be used to adjust the engines valves.

3. When clearance is correct, hold adjuster screw and tighten locknut securely
4. Re-check the valve clearance.
5. Repeat adjustment procedure if necessary until clearance is correct with locknut secured.

INTAKE VALVE CLEARANCE 330 Engines
.006″ (.15 mm)

6. Inspect o-rings on the plastic valve plugs, replace if damaged. Securely fasten valve plugs.
7. Scrape gasket surfaces to remove all traces of the old gasket. **CAUTION:** Use care not to damage the sealing surface of the cover or cylinder head.
8. Remove the shop towel from the spark plug cavity.

9. Install the spark plug. Torque to 14 ft. lbs. (19 Nm).
10. Install the spark plug high tension lead.
11. Install parts removed for access.

Magnum 330	
Spark Plug Torque:	14 ft. lbs. (19 Nm)

STEERING

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

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

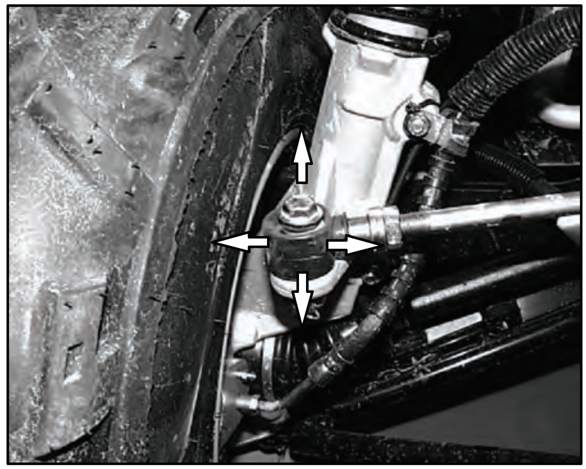
⚠ WARNING

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

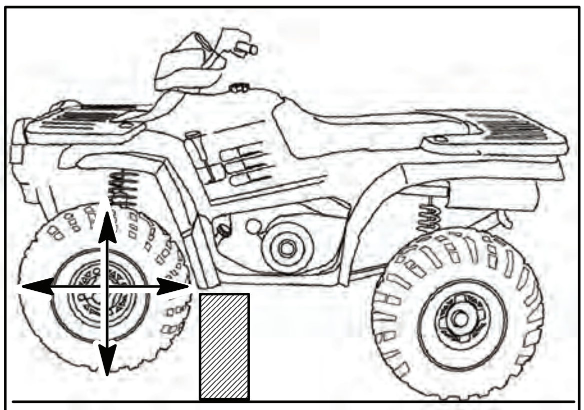
One of two methods can be used to measure toe alignment. The string method and the chalk method. If adjustment is required, refer to following pages for procedure.

TIE ROD END / STEERING INSPECTION

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



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



Check for Loose Wheel or Hub

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

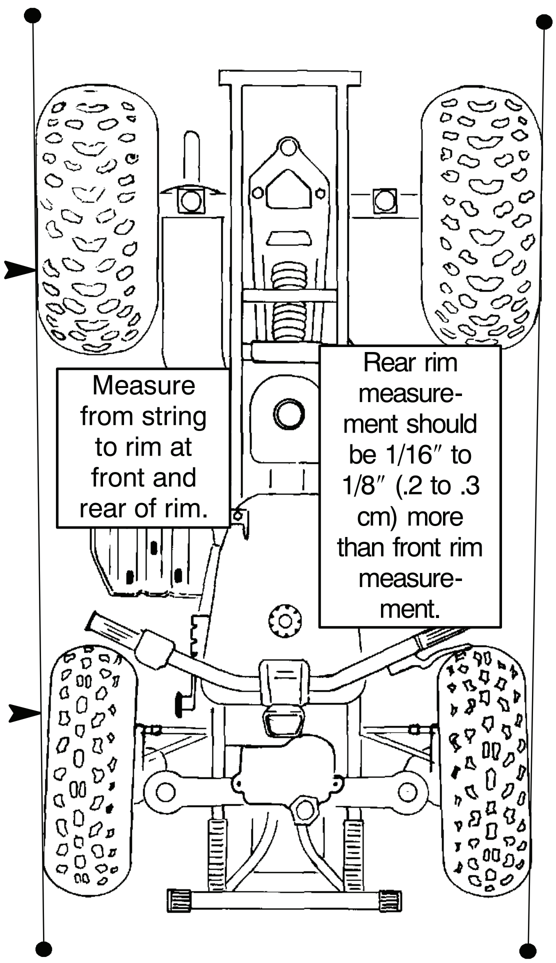
CAMBER AND CASTER

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.

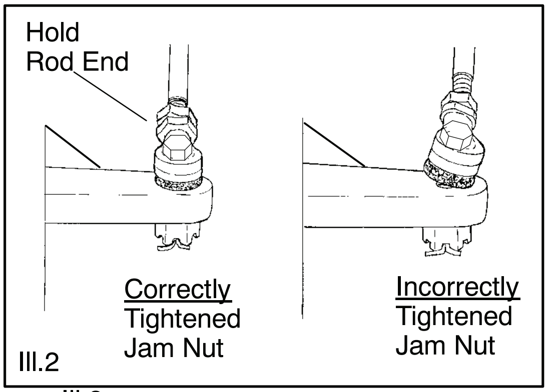
WHEEL ALIGNMENT METHOD 2: CHALK

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)

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

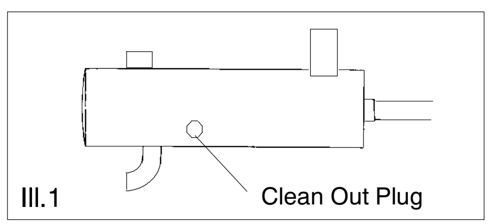
⚠ WARNING

- 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.

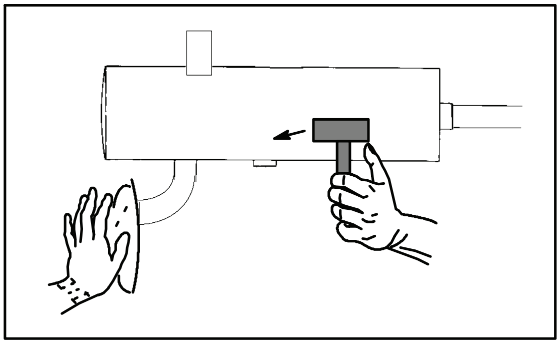
Failure to heed these warnings could result in serious personal injury or death.

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 lightly tap on the pipe around the clean out plugs while revving the engine several more times.

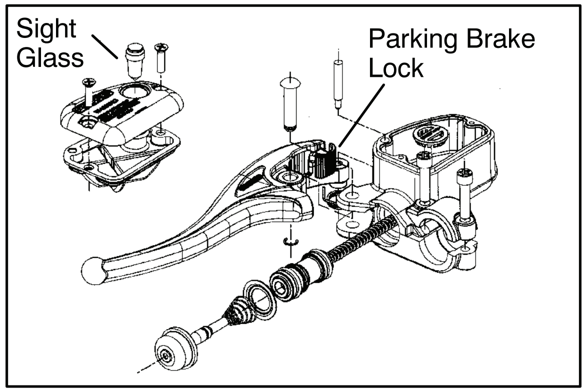


4. If particles are still suspected to be in the muffler, back the machine onto an incline so the rear of the machine is one foot higher than the front. Set the hand brake and block the wheels. Make sure the machine is in neutral and repeat Steps 2 and 3. **SEE WARNING**
5. If particles are still suspected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

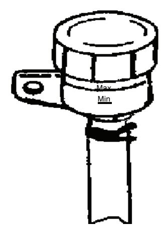
BRAKE SYSTEM INSPECTION

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**).



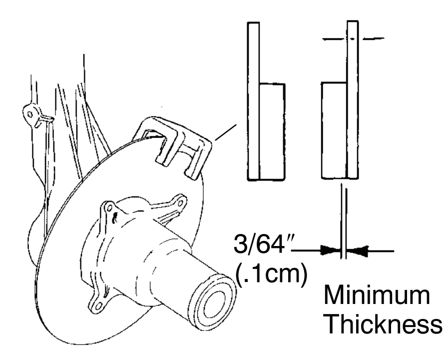
Rear Master Cylinder Reservoir



- 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.

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.

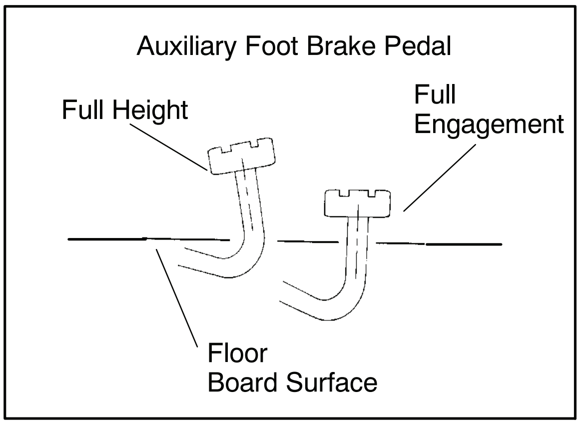


HOSE/FITTING INSPECTION

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

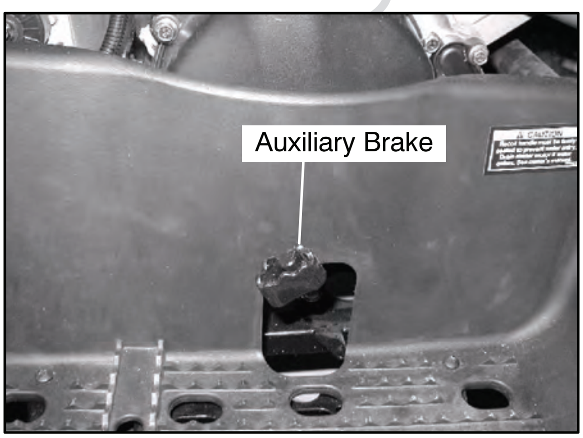
AUXILIARY BRAKE TESTING

The auxiliary brake should be checked for proper function.



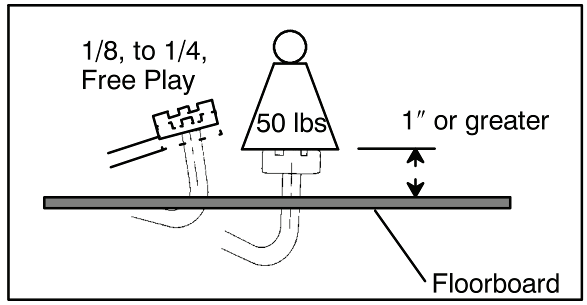
1. Support the rear wheels off the ground.
2. While turning the rear wheels by hand, apply the auxiliary foot brake. This brake should not stop the wheels from turning until the lever is half way between its rest position and bottoming on the footrest.

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:

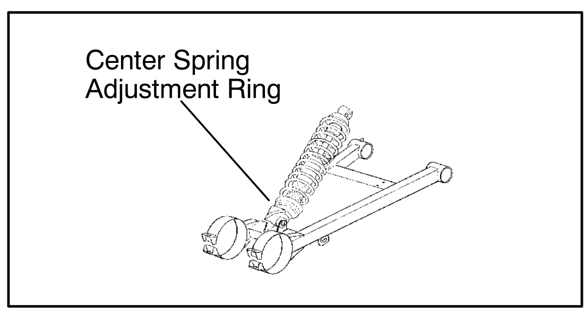
Free play of the brake pedal should be 1/8 - 1/4 inch (3.2 - 6.35 mm).

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



Shock Spanner Wrench
(PN 2870872)

Operator weight and vehicle loading affect suspensionspringpreloadrequirements. Adjustas necessary.

FRONT SUSPENSION

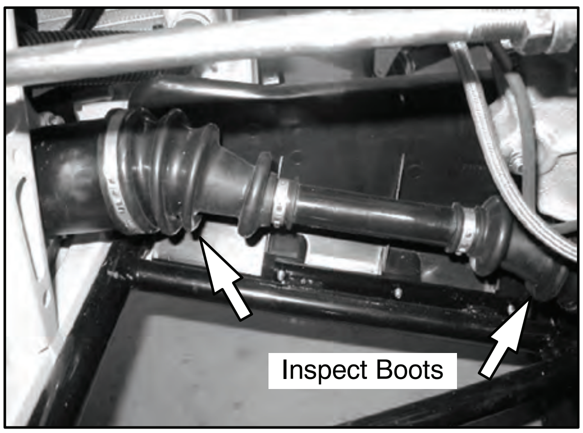
Compress and release front suspension. Damping should be smooth throughout the range of travel.

Check all front suspension components for wear or damage.

Inspect front strut cartridges for leakage.

CV SHAFT BOOT INSPECTION

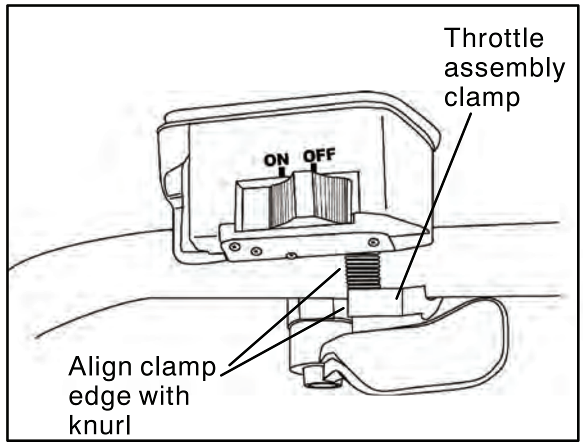
Inspect the cv shaft boots in the front of the ATV for damage, tears, wear, or leaking grease. If the rubber boot exhibits any of these symptoms, replace the boot. Refer to Chapter 7 for CV boot replacement, or have you Polaris dealer replace the boot.



CONTROLS

Check controls for proper operation, positioning and adjustment.

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



Align throttle control assembly clamp with knurl on handlebar

WHEELS

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

⚠ 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.

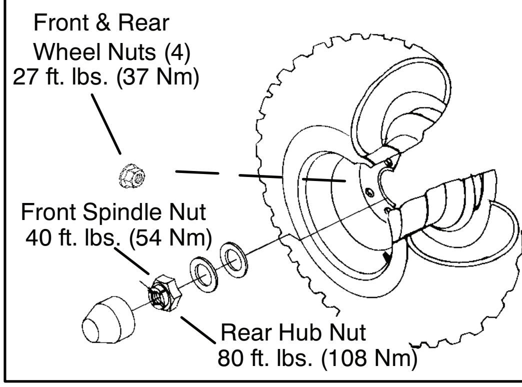
WHEELS

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

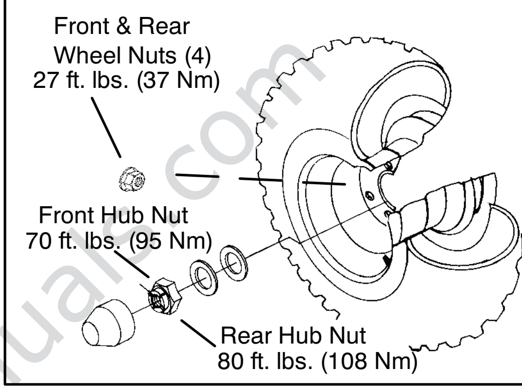
WHEEL, HUB, AND SPINDLE TORQUE TABLE

Model	Item	Specification
Magnum 330 2x4	Front Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Rear Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Front Spindle Nut	40 Ft. Lbs. (54 Nm)
	Rear Hub Retaining Nut	80 Ft. Lbs. (108 Nm)
Magnum 330 4x4	Front Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Rear Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Front Hub Retaining Nut	70 Ft. Lbs. (95 Nm)
	Rear Hub Retaining Nut	80 Ft. Lbs. (108 Nm)

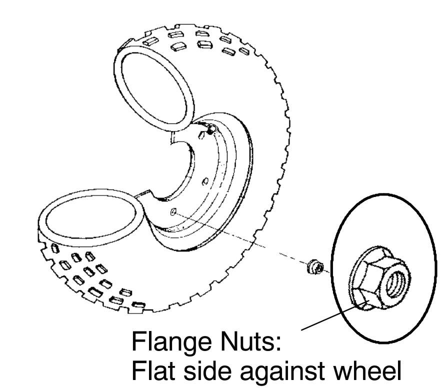
Magnum 330 2x4's



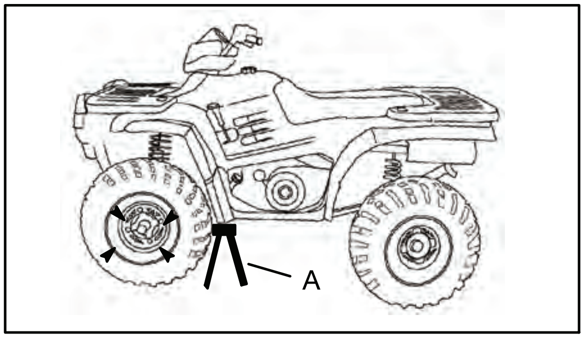
Magnum 330 4x4's



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 above.

CAUTION:

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

TIRE PRESSURE

CAUTION:

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

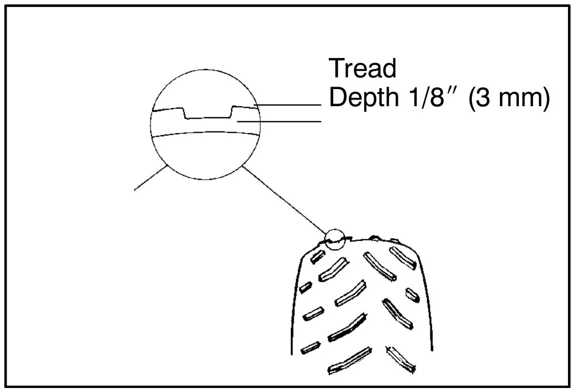
Tire Pressure Inspection (PSI - Cold)	
Front	**Rear**
4	3

TIRE INSPECTION

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

Tire Tread Depth

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



⚠ WARNING

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

Worn tires can cause an accident.

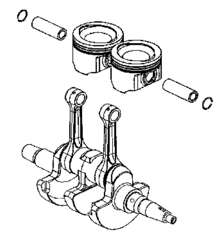
Always replace tires when the tread depth measures 1/8″ (.3 cm) or less.

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.

CHAPTER 3

ENGINE



3

ES32PFE10 ENGINE SERVICE DATA

Cylinder Head / Valve				ES32PFE10
Rocker Arm	Rocker arm ID			.8669-.8678″ (22.020-22.041 mm)
	Rocker shaft OD			.8656-.8661″ (21.987-22.0 mm)
	Rocker shaft Oil Clearance		Std	.0008-.0021″ (.020-.054 mm)
			Limit	.0039″ (.10 mm)
Camshaft	Cam lobe height	In	Std	1.3001–1.3041″ (33.023-33.123 mm)
			Limit	1.2883″ (32.723 mm)
		Ex	Std	1.3007-1.3047″ (33.039-33.139 mm)
			Limit	1.2889″ (32.739 mm)
	Camshaft journal OD		Mag	1.4935-1.4941″ (37.935-37.950 mm)
			PTO	1.4935-1.4941″ (37.935-37.950 mm)
	Camshaft journal bore ID		Mag	1.4963-1.4970″ (38.005-38.025 mm)
			PTO	1.4963-1.4970″ (38.005-38.025 mm)
	Camshaft Oil clearance		Std	.0022-.0035″ (.055-.090 mm)
			Limit	.0039″ (.10 mm)
Cylinder Head	Surface warpage limit			.0020″ (.05 mm)
	Standard height			2.908″ (73.8 mm)
Valve Seat	Contacting width	In	Std	.039″ (1.0 mm)
			Limit	.055″ (1.4 mm)
		Ex	Std	.059″ (1.5 mm)
			Limit	.071″ (1.8 mm)
Valve Guide	Inner diameter			.2362-.2367″ (6.000-6.012 mm)
	Protrusion above head			.681-.689″ (17.3-17.5 mm)
Valve	Margin thickness	In	Std	.039″ (1.0 mm)
			Limit	.031″ (0.8 mm)
		Ex	Std	.047″ (1.2 mm)
			Limit	.031″ (0.8 mm)
Valve	Stem diameter		In	.2343-.2348″ (5.950-5.965 mm)
			Ex	.2341-.2346″ (5.945-5.960 mm)
	Stem oil clearance	Std	In	0.0014-0.0024″ (0.035-0.062mm)
			Ex	0.0016-0.0026″ (0.040-0.067mm)
		Limit		.0059″ (0.15 mm)
	Overall length		In	3.979″ (101.0 mm)
			Ex	3.987″ (101.2 mm)
Valve Spring	Free length		Std	1.673″ (42.5 mm)
			Limit	---
	Squareness			0.075″ (1.9 mm)

ES32PFE10 ENGINE SERVICE DATA

Cylinder / Piston / Connecting Rod				ES32PFE10
Cylinder	Surface warpage limit (mating with cylinder head)			.0020″ (0.050 mm)
	Cylinder bore		Std	3.0906-3.0913″ (78.50-78.520 mm)
	Taper limit			.0020″ (0.050 mm)
	Out of round limit			.0020″ (0.050 mm)
	Piston clearance		Std	.0015-.0032″ (0.038-0.082 mm)
			Limit	.004″ (0.11 mm)
	Boring limit			.0020″ (0.5 mm)
Piston	Outer diameter	Std		3.0881-3.0891″ (78.438-78.462 mm)
		.0098″ (.25 mm) OS		3.0980-3.0989″ (78.688-78.712 mm)
		.0197″ (.50 mm) OS		3.1078-3.1087″ (78.938-78.962 mm)
	Standard inner diameter of piston pin bore			.7095-.7097″ (18.007-18.013 mm)
Piston Pin	Outer diameter			.7092-.7095″ (18.001-18.007 mm)
	Standard clearance-piston pin to pin bore			0.0-.0005″ (0.0-0.012 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	Std	.0079-.0118″ (0.20-0.30 mm)
			Limit	.039″ (1.0 mm)
		Second ring	Std	.0138-.0197″ (0.35-0.50 mm)
			Limit	.039″ (1.0 mm)
		Oil ring	Std	.0079-.0236″ (0.20-0.60 mm)
			Limit	.059″ (1.5 mm)
Piston Ring	Standard clearance - piston ring to ring groove	Top ring	Std	.0014-.0030″ (0.035-0.075 mm)
			Limit	.0059″ (0.15 mm)
		Second ring	Std	.0010-.0026″ (0.025-0.065 mm)
			Limit	.0059″ (0.15 mm)
Connecting Rod	Connecting rod small end ID			.7095-.7101″ (18.007-18.023 mm)
	Connecting rod small end radial clearance		Std	0.0-.0009″ (0.0-0.022 mm)
			Limit	.0012″ (0.03 mm)
	Connecting rod big end side clearance		Std	.0028-.0118″ (0.07-0.30 mm)
			Limit	.0138″ (0.35 mm)
	Connecting rod big end bearing clearance		Std	0.0007-0.0021″ (0.019-0.053 mm)
			Limit	0.0026″ (0.065 mm)
Crankshaft	Crankshaft runout limit (PTO end)			0.0024″ (0.060 mm)
	Crankshaft end play			0.002-0.008″ (0.05-0.20 mm)

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

SPECIAL TOOLS

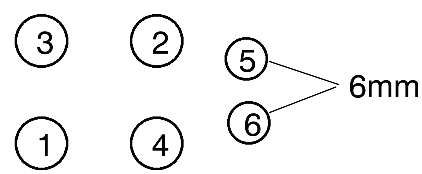
PART NUMBER	TOOL DESCRIPTION
2200634	Valve Seat Reconditioning Kit
2870390	Piston Support Block
2870159	Flywheel Puller
2871293	Slotted Nut Socket
PV-43527	Oil Filter Wrench

TORQUE SPECIFICATIONS

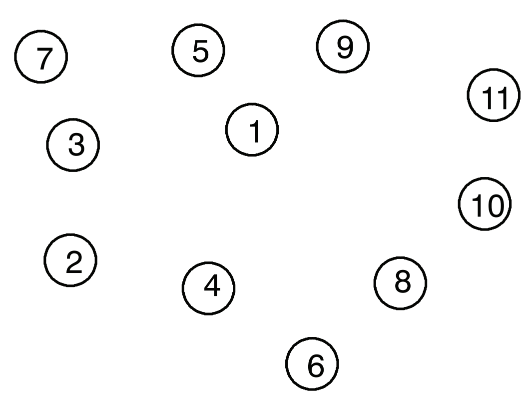
ENGINE TORQUE SPECIFICATIONS		
Fastener	**Size**	**330 ES32PFE10 Ft. Lbs. (Nm)**
Camshaft Chain Tensioner Lever	6mm	5-6.5 (7-9 Nm)
Camshaft Chain Tensioner	6mm	5-6.5 (7-9 Nm)
Camshaft Chain Tensioner Cap	11mm	8-10 (11-14 Nm)
Camshaft Sprocket	10mm	25-29 (34-40 Nm)
Carburetor Adaptor	8mm	12-14 (16-20 Nm)
Connecting Rod	8.5mm	29-33 (39-45 Nm)
Crankcase	8mm	14-15 (19-21 Nm)
Crankshaft Slotted Nut (Drive Sprocket)	28mm	35-51 (47-69 Nm)
Cylinder Base Bolts	6mm	5-7 (7-9 Nm)
Cylinder Head Bolts	10mm	Refer to Engine Assembly for torque procedure
Drive Clutch Bolt	7/16 - 20	40 (55 Nm)
Flywheel	16mm	58-72 (78-98 Nm)
Oil Hose Fittings	1/2 & 9/16	20 (27 Nm)
Oil Delivery Pipe	12mm	11-15 (15-21 Nm)
Oil Drain Bolt (Crankcase)	14mm	14-17 (19-23 Nm)
Oil Filter Pipe Fitting (Connector)	20mm	36-43 (49-59 Nm)
Oil Line Fitting		20 (27 Nm)
Oil Pump Cover	6mm	4-5 (5-7 Nm)
Oil Relief Valve Plug	14mm	14.5-16.5 (20-23 Nm)
Recoil Housing	6mm	5-6.5 (7-9 Nm)
Rocker Cover	6mm	7-8 (9-11 Nm)
Rocker Cover Block Plug	28mm	39-44 (53-59)
Rocker Adjuster Screw Lock Nut	6mm	6-7 (8-10 Nm)
Stator Plate	6mm	5-6.5 (7-9 Nm)
Starter Motor	6mm	5-6.5 (7-9 Nm)
Spark Plug	14mm	9-11 (12-15 Nm)
Oil Cooler Thermistor	--	3-3.6 (4-5 Nm)

ENGINE FASTENER TORQUE PATTERNS

Tighten cylinder head, cylinder base, and crankcase fasteners in 3 steps following the sequence outlined below.



Cylinder Head
Cylinder Base



Crankcase

PISTON IDENTIFICATION

The piston may have an identification mark or the piston may not have an identification mark for piston placement. If the piston has an identification mark, follow the directions for piston placement below. If the piston does not have an identification mark, the direction for placement of the piston does not matter.

Note the directional and identification marks when viewing the pistons from the top. The letter “F”, “ → ”, “ ▶” or **:** must always be toward the flywheel side of the engine. The other numbers are used for identification as to diameter, length and design. Four stroke engine rings are rectangular profile. The numbers or letters on all rings (except oil control rings) must be positioned upward. See text for oil control ring upper rail installation. Use the information below to identify pistons and rings.

Engine Model No.	Oversize Available* (mm)	Standard Piston Identification
ES32PFE	.25 .50	None

*Pistons and rings marked 25 are .25mm (.010″) oversized. Pistons and rings marked 50 are .50mm (.020″) oversized

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
- Oil pump
- Rocker Arms
- Cam Chain and Sprockets

The following components require engine removal for service:

- Camshaft
- Connecting Rod
- Crankshaft
- Crankshaft Main Bearings
- Crankcase

ENGINE REMOVAL

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. Disconnect spark plug high tension lead.
6. Disconnect all electrical wires from the engine.
7. Remove springs from exhaust pipe and remove pipe.
8. Drain engine oil.
9. Remove airbox.
10. Remove carburetor. Insert a shop towel into the carburetor flange to prevent dirt from entering the intake port.
11. Loosen auxiliary brake master cylinder mount if necessary for clearance.
12. Refer to PVT System Chapter 6 to remove outer clutch cover, drive belt, drive clutch, driven clutch, and inner cover.
13. Starter motor. Note ground cable location. Mark positive (+) cable mounting angle and remove cable.
14. Remove transmission linkage rod(s) from gear selector and secure out of the way.
15. Remove engine to chassis ground cable.
16. Remove all engine mount nuts and / or engine mount plates.
17. Remove engine through right side of frame.

ENGINE INSTALLATION NOTES

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

General Items

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

PVT System

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

Transmission

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

Exhaust

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

Engine Break In Period

4 Cycle Engine Break-In Period is defined as the first 10 hours of engine operation or 2 full tanks of fuel.

- Use only Polaris Premium 4 All Season Synthetic Oil, or API certified “SH” oil.
- Use fuel with a minimum octane of 87 (R+M)/2 method.
- Change break-in oil and filter at 20 hours or 500 miles, whichever comes first.

CYLINDER HONE SELECTION/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

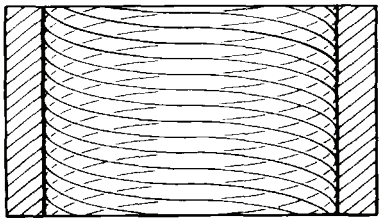
A finished cylinder should have a cross-hatch pattern to ensure piston ring seating and to aid in the retention of the fuel/oil mixture during initial break in. Hone cylinder according to hone manufacturer’s instructions, or these guidelines:

- 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.

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.

If cylinder wear or damage is excessive, it will be necessary to replace the cylinder. Hone only enough to deglaze the outer layer of the cylinder bore.



EXAMPLE OF CROSS HATCH PATTERN

HONING TO OVERSIZE

If cylinder wear or damage is excessive, it will be necessary to oversize the cylinder using a new oversize piston and rings. This may be accomplished by either boring the cylinder and then finish honing to the final bore size, or by rough honing followed by finish honing.

For oversize honing always wet hone using honing oil and a coarse roughing stone. Measure the piston (see piston measurement) and rough hone to the size of the piston. Always leave .002 - .003″ (.05 - .07 mm) for finish honing. Refer to piston-to-cylinder clearance specifications on **Page 3.2** before honing. Complete the sizing with fine grit stones to provide the proper cross-hatch finish and required piston clearance.

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:

- 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 stone approximately 1/2″ (1.3 cm) beyond the bore at the end of each stroke.
- Release the hone at regular intervals and inspect the bore to determine if it has been cleared, and to check piston fit. **NOTE:** Do not allow cylinder to heat up during honing. The thinner areas of the liner around the ports will expand causing an uneven bore.
- After honing has been completed inspect all port opening areas for rough or sharp edges. Apply a slight chamfer to all ports to remove sharp edges or burrs, paying particular attention to the corners of the intake and exhaust ports.

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 - ES32PF10

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

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

Filter .... **PN 3084963**

Oil Filter Wrench ... **PV-43527**

Drain Plug/ Screen Fitting ...... 14 ft. lbs. (19 Nm)

Oil Pressure Specification (ES32PF10) .... 71-99 PSI @ 3000 RPM, Polaris 0W-40 Synthetic (Oil temp at 122°F 50°C)

OIL PRESSURE TEST ES32PF10

WARNING: *Oil temperature and pressure can cause serious injury and damage. Wear the proper safety gear when performing these procedures.*

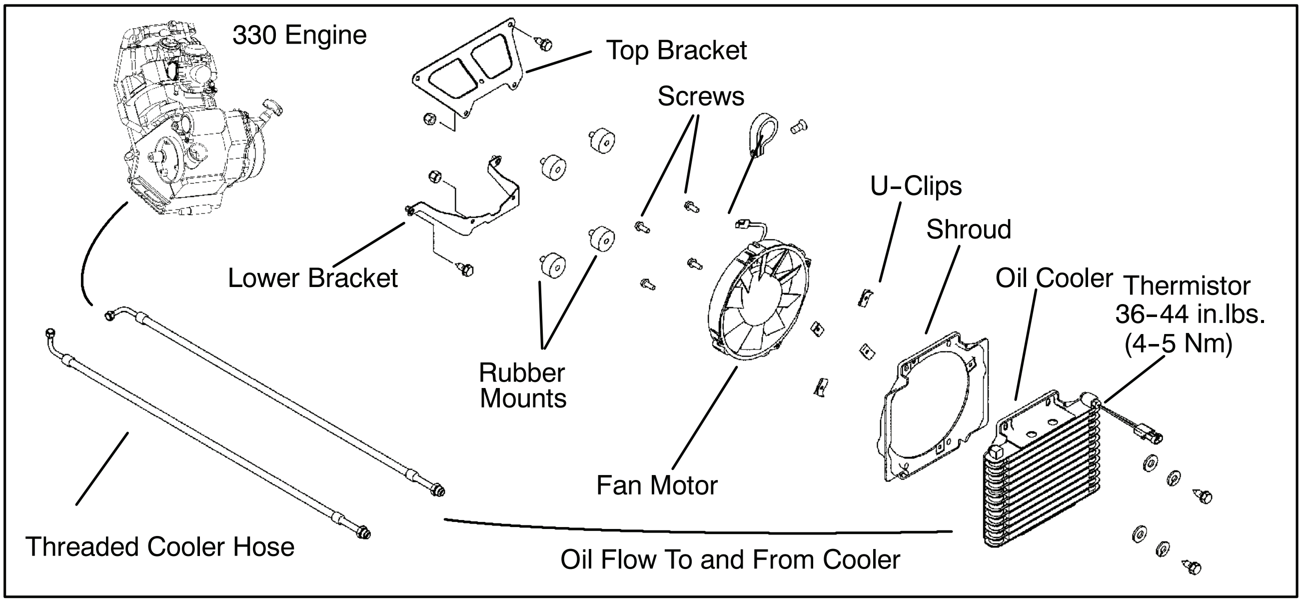
1. Remove lower blind plug behind oil filter on crankcase.
2. Insert a 1/8" NPT oil pressure gauge adaptor into the crankcase and attach gauge.

3. Start engine and allow it to reach operating temperature while monitoring gauge indicator.

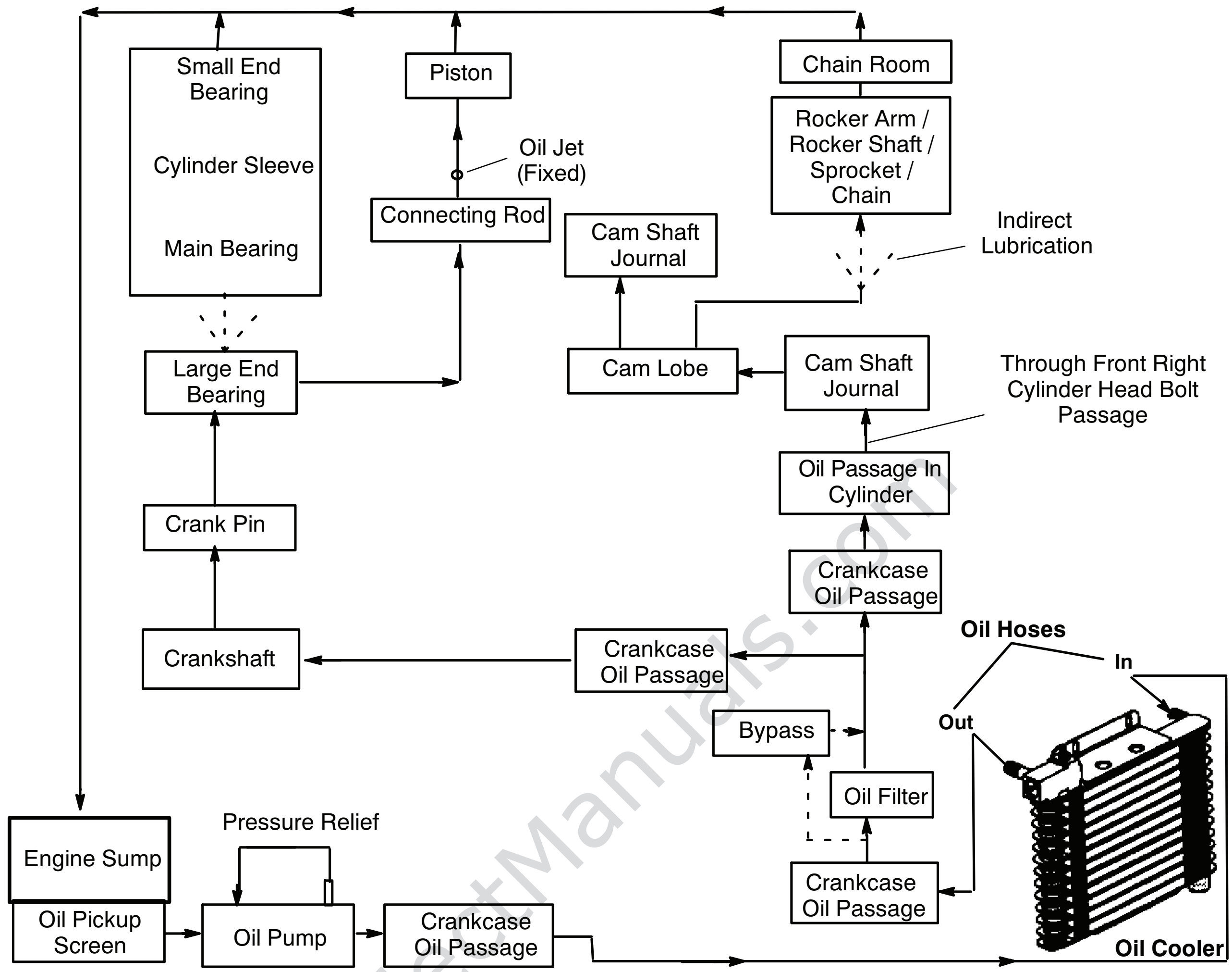
ES32PF10
Oil Pressure at 3000 RPM (Engine Hot):
Standard: 71-99 PSI
Minimum: 20 PSI at idle

NOTE: Use Polaris Premium 0-40W Synthetic Engine Lubricant (**PN 2871281**).

OIL COOLER ASSEMBLY



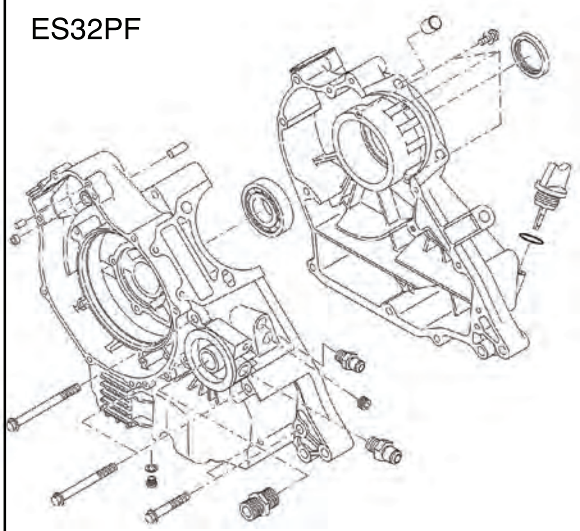
OIL FLOW DIAGRAM - ES32PF



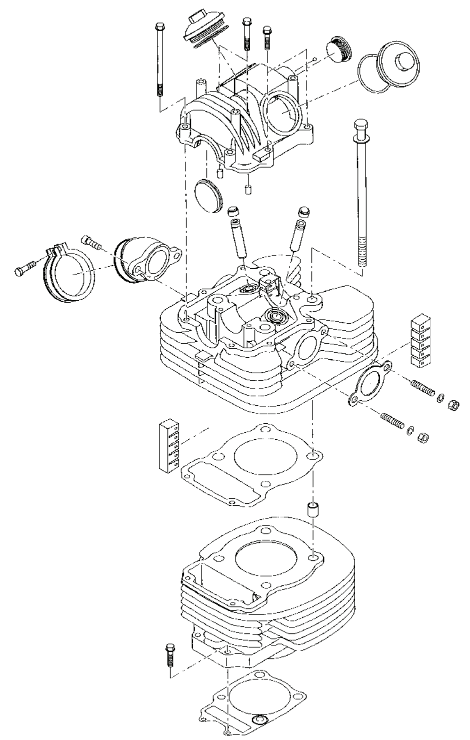
ES32PFE ENGINE EXPLODED VIEWS

Crankcase

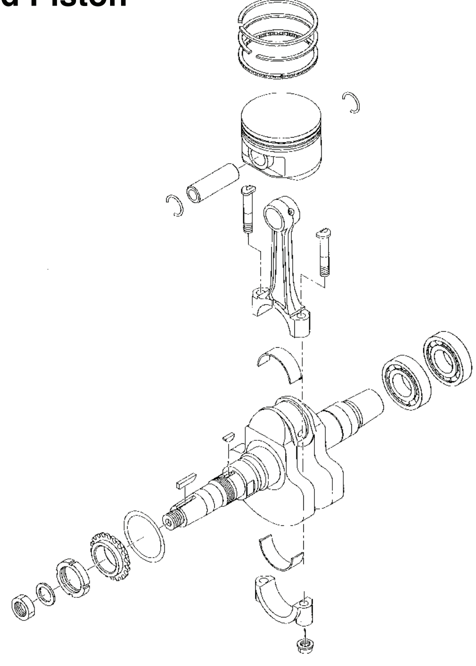
ES32PF



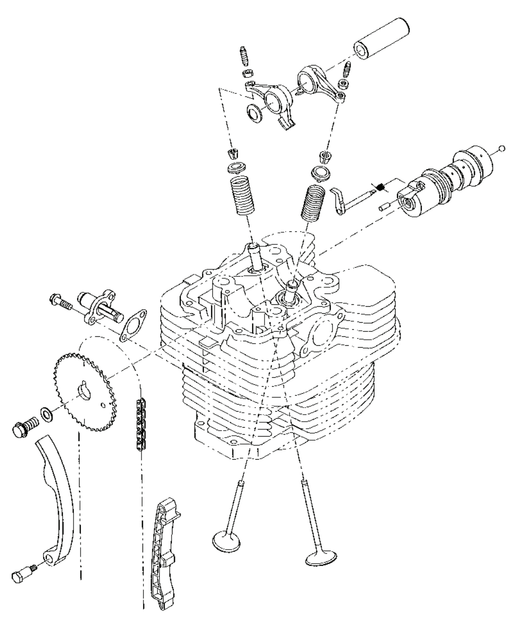
Cylinder/ Cylinder Head



Crankshaft and Piston



Valve Train



ENGINE DISASSEMBLY

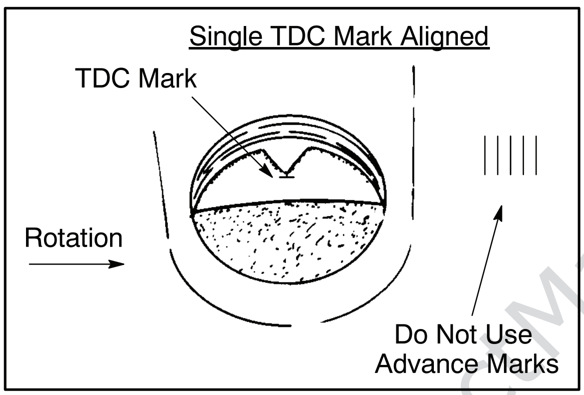
REFER TO PAGE 3.5 - 3.6 FOR ENGINE REMOVAL / INSTALLATION NOTES.

CAM CHAIN TENSIONER REMOVAL

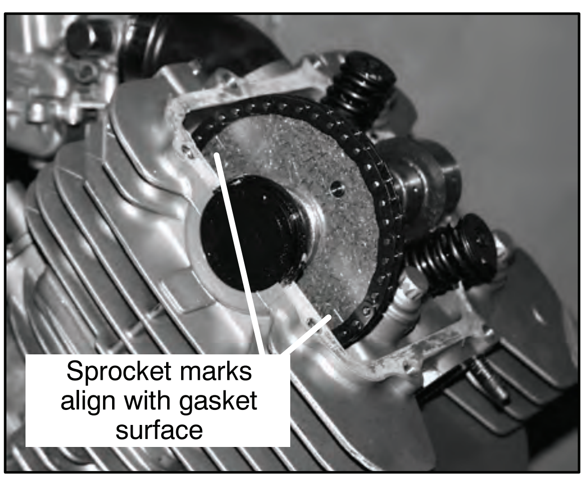
1. Remove ignition timing inspection plug from recoil housing.

To position crankshaft at Top Dead Center (TDC) on compression stroke:

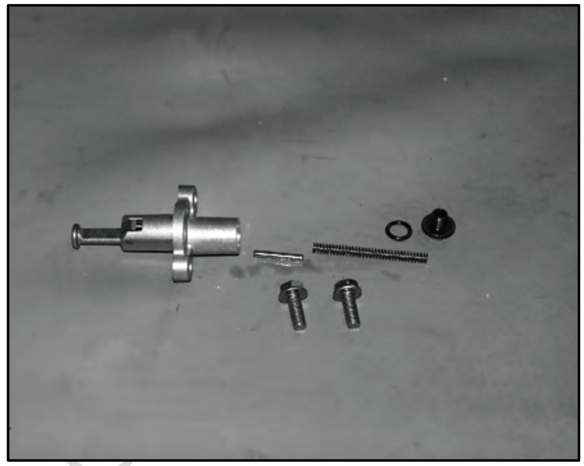
2. Rotate engine slowly in the direction of rotation watching intake valves open and start to close.
3. Continue to rotate engine slowly, watching camshaft sprocket marks and the mark in the timing inspection hole.



4. Align single (TDC) mark on flywheel with projection in inspection hole, and the cam sprocket pin (facing upward) aligned with the camshaft to crankshaft center line. **NOTE:** The sprocket marks align with gasket surface and the cam lobes should be pointing down and valves should have clearance at this point.

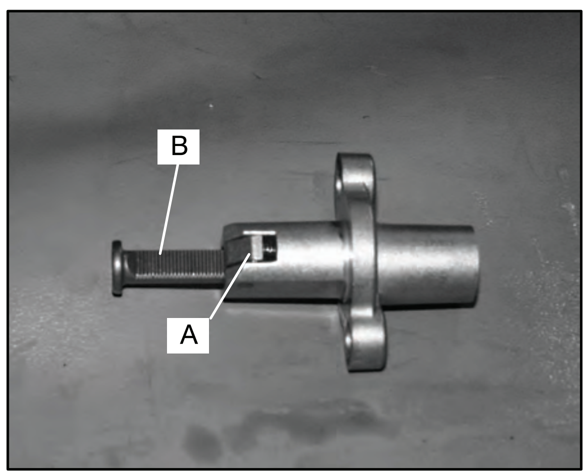


5. Remove cam chain tensioner plug, sealing washer, spring and pin. **CAUTION:** The plug is under spring tension. Maintain inward pressure while removing.
6. Remove the two 6x25 mm cam chain tensioner flange bolts.
7. Tap lightly on tensioner body with a soft face hammer and remove tensioner.



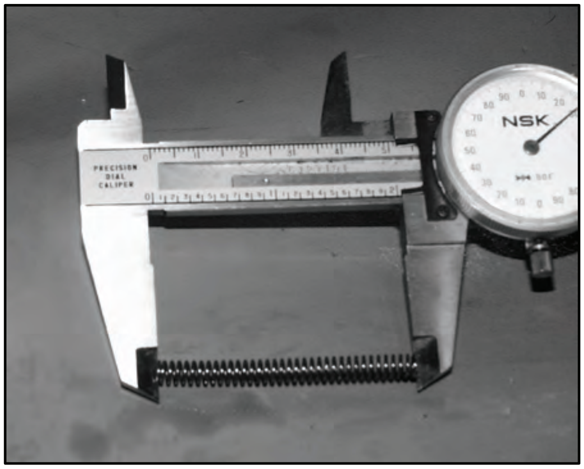
CAM CHAIN TENSIONER INSPECTION

1. Pull cam chain tensioner plunger outward to the end of its travel. Inspect teeth on ratchet pawl (A) and plunger teeth (B) for wear or damage.



2. Push ratchet pawl and hold it. The plunger should move smoothly in and out of the tensioner body.
3. Release ratchet pawl and push inward on plunger. It should remain locked in position and not move inward.

4. Measure free length of tensioner spring. Replace spring if excessively worn.

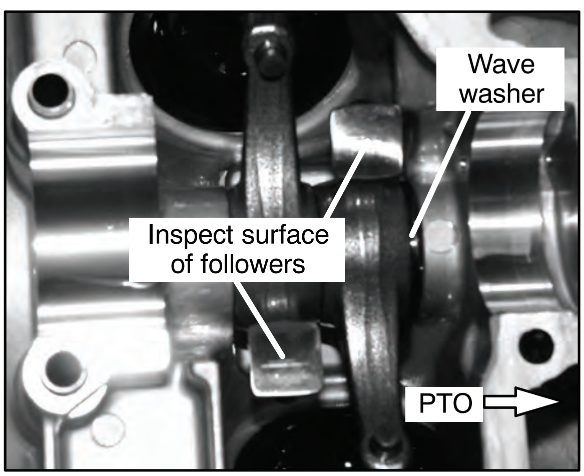


Tensioner Spring Free Length:
2.06″ (5.23 cm) Std. 1.92″ (4.88 cm) Limit

5. Replace entire tensioner assembly if any part is worn or damaged.

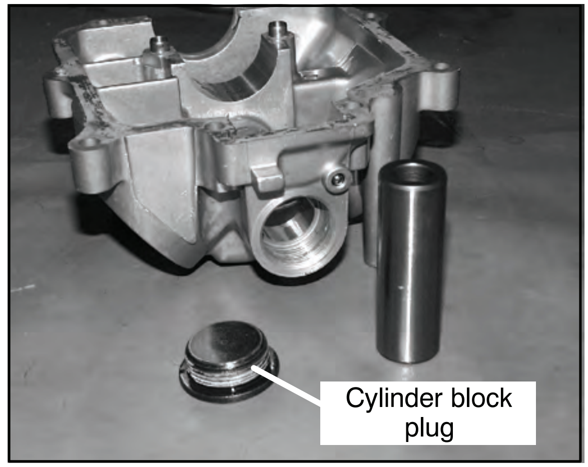
ROCKER ARM/SHAFT INSPECTION

1. Remove rocker cover.
2. Mark or tag rocker arms to keep them in order for assembly.

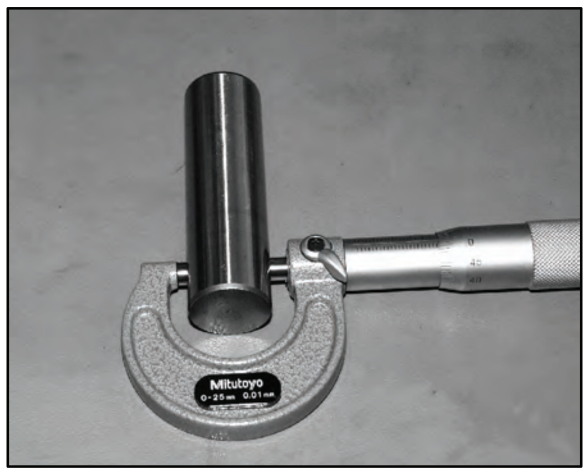


3. Inspect each rocker arm cam follower surface. If there is any damage or uneven wear, replace the rocker arm. **NOTE:** Always inspect camshaft lobe if rocker arms are worn or damaged.

4. Remove cylinder block plug using a 14 mm hex head wrench.

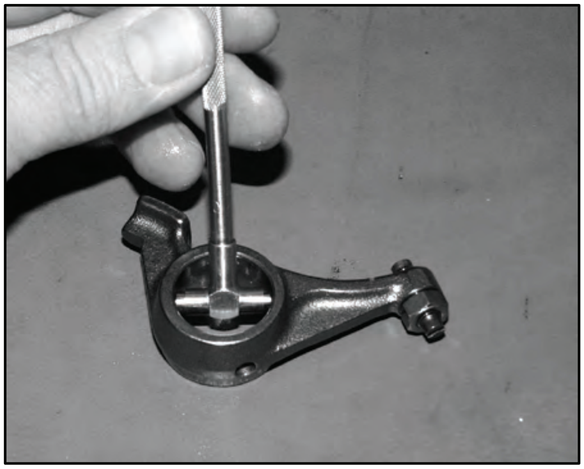


5. Measure O.D. of rocker shaft. Inspect it for wear or damage. Compare to specifications.



Rocker Shaft O.D.:
.8656-.8661″ (21.987-22.0 mm)

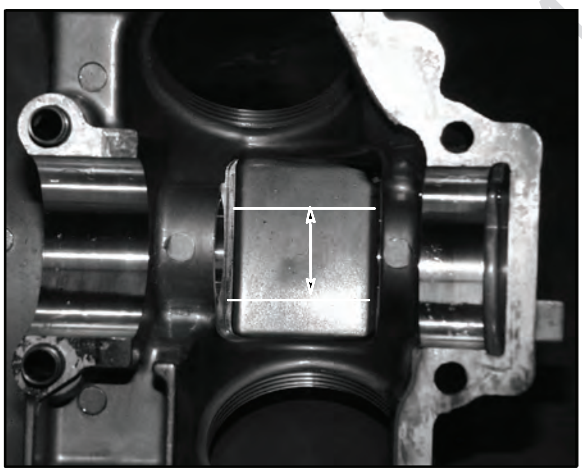
6. Measure I.D. of each rocker arm and compare to specifications.



Rocker Arm & Support I.D.:

.8669-.8678″ (22.020-22.041 mm)

7. Measure I.D. of both rocker arm shaft support areas and visually inspect surface. Compare to specifications.



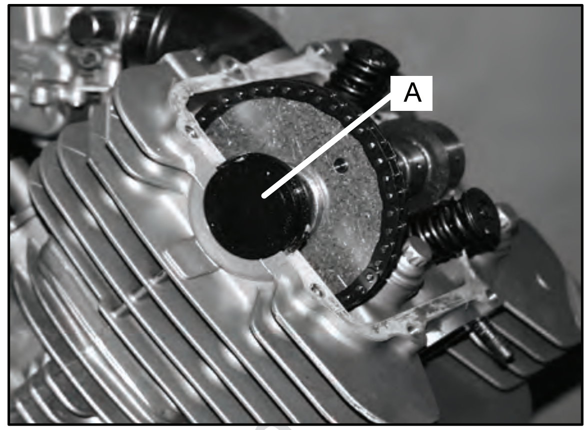
Rocker Shaft Oil Clearance:

Std: .0008-.0021″ (.020-.054 mm)
Limit: .0039″ (.10 mm)

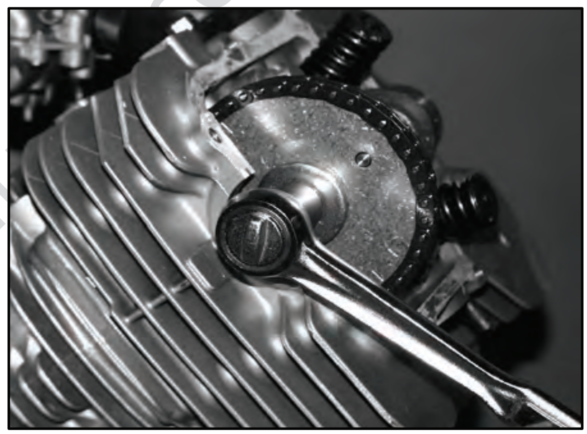
8. Inspect rocker adjuster screws for wear, pitting, or damage to threads of the adjuster or locknut. Replace all worn or damaged parts. **NOTE:** The end of the adjuster screw is hardened and cannot be ground or re-faced.

CAMSHAFT REMOVAL

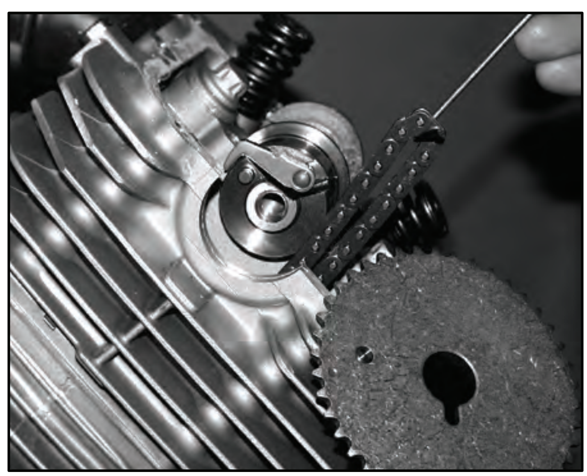
1. Remove cam shaft end plug (A).



2. Remove camshaft sprocket flange bolt and washer.



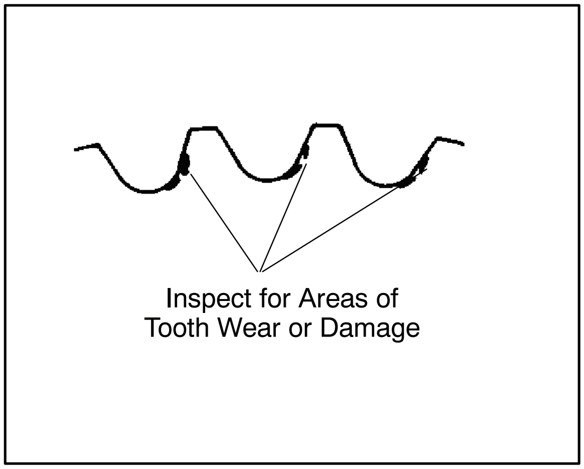
3. Place a clean shop towel in the area below cam chain sprocket.



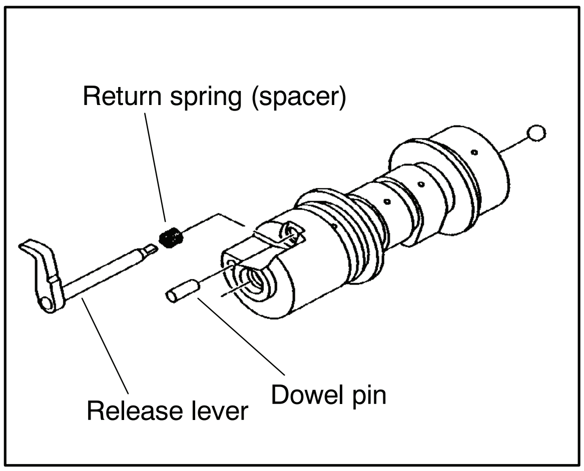
4. Remove sprocket from camshaft and chain.
5. Secure cam chain with a wire to prevent it from falling into the crankcase.

CAMSHAFT REMOVAL CONT'D

6. Inspect cam sprocket teeth for wear or damage. Replace if necessary.



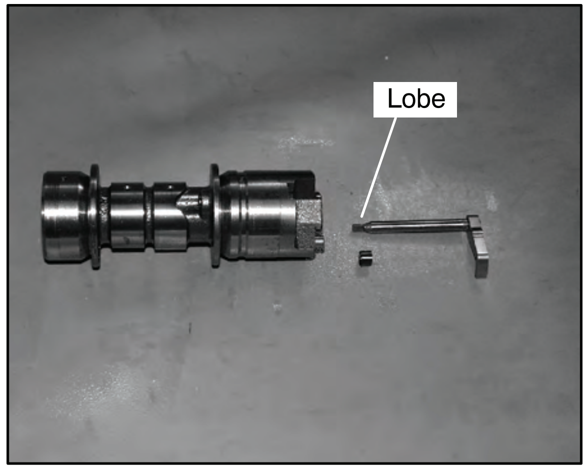
7. Remove camshaft.



AUTOMATIC COMPRESSION RELEASE REMOVAL/ INSPECTION

NOTE: The automatic compression release mechanism can be inspected and serviced without removing the camshaft from the cylinder head.

1. Check release lever shaft for smooth operation throughout the entire range of rotation.



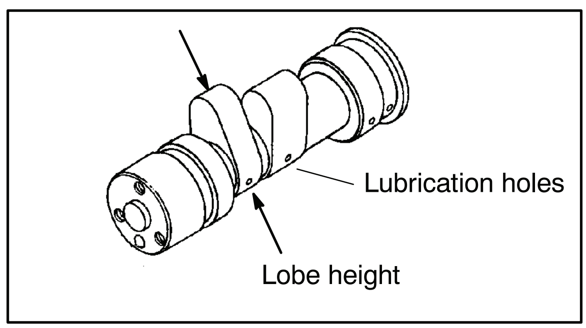
2. Remove release lever shaft and return spring (spacer).
3. Inspect shaft for wear or galling.
4. Inspect lobe on end of release lever shaft for wear and replace if necessary.

AUTOMATIC COMPRESSION RELEASE INSTALLATION

1. Slide spring onto shaft.
2. Apply engine oil to release lever shaft.

CAMSHAFT INSPECTION

1. Visually inspect each cam lobe for wear, chafing or damage.



Cam Lobe Height

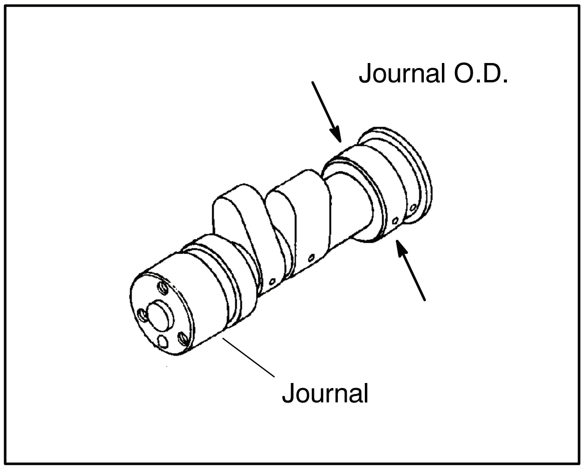
Intake

Std: 1.3001-1.3041″ (33.023-33.123 mm)
Limit: 1.2883″ (32.723 mm)

Exhaust

Std: 1.3007-1.3047″ (33.039-33.139 mm)
Limit: 1.2889″ (32.739 mm)

2. Thoroughly clean the cam shaft, making sure the oil feed holes are not obstructed.
3. Measure height of each cam lobe using a micrometer. Compare to specifications.
4. Measure camshaft journal outside diameter (O.D.)



Camshaft Journal O.D.:

Mag & PTO End: 1.4935-1.4941″ (37.935-37.950 mm)

5. Measure ID of camshaft journal bore.

Camshaft Journal I.D.:

Mag & PTO End: 1.4963-1.4970″ (38.005-38.025 mm)

6. Calculate oil clearance by subtracting journal OD from journal bore ID. Compare to specifications.

Camshaft Oil Clearance:

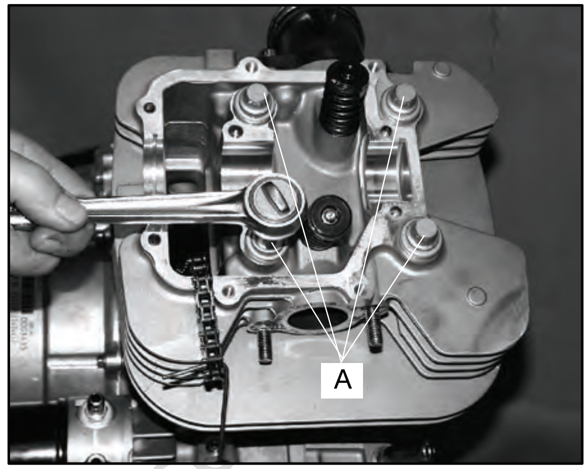
Std: .0022-.0035″ (.055-.090 mm)
Limit: .0039″ (.10 mm)

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

Replace cylinder head if camshaft journal bore is damaged or worn excessively.

CYLINDER HEAD REMOVAL

1. Loosen each of the four cylinder head bolts evenly 1/8 turn each time in a cross pattern until loose.



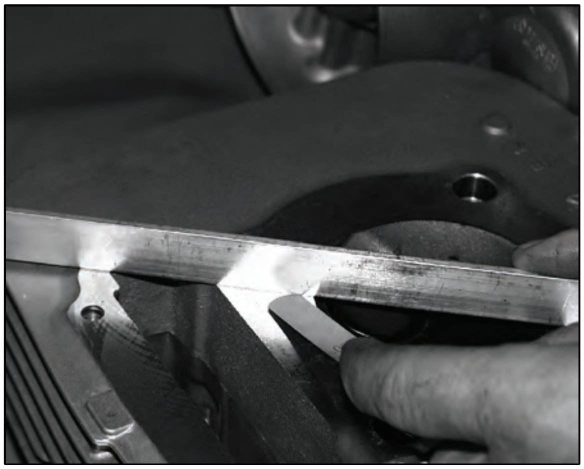
2. Remove bolts (A) and tap cylinder head lightly with a plastic hammer until loose. **CAUTION:** Tap only in reinforced areas or on thick parts of cylinder head casting to avoid damaging casting.
3. Remove cylinder head and head gasket.

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 across the surface of the cylinder. head 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.



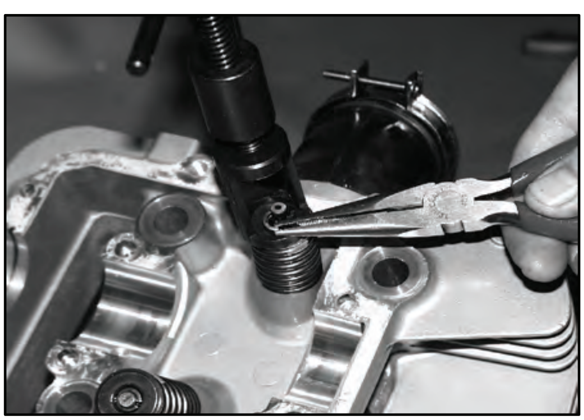
Cylinder Head Warpage Limit:
.002" (.05mm)

CYLINDER HEAD DISASSEMBLY

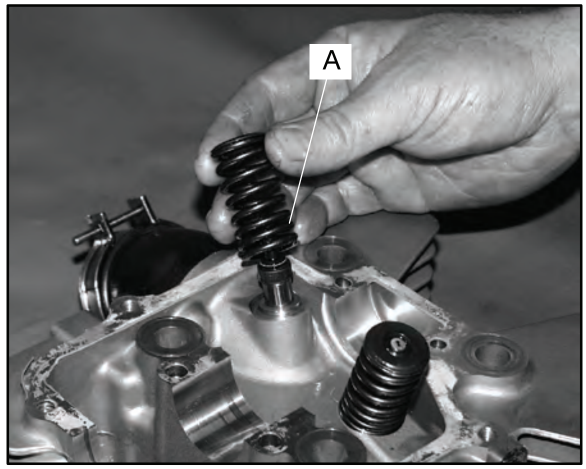
WARNING: Wear eye protection or a face shield during cylinder head disassembly and reassembly.

NOTE: Keep all parts in order with respect to their location in the cylinder head.

1. Using a valve spring compressor, compress the valve spring and remove the split keeper. **NOTE:** To prevent loss of tension, do not compress the valve spring more than necessary.

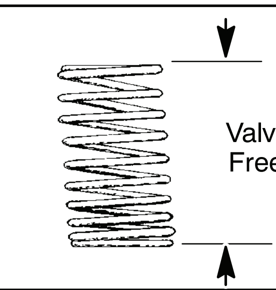


2. Remove spring retainer and spring.

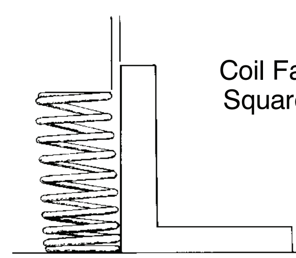


NOTE: The valve springs should be positioned with the tightly wound coils against the cylinder head on progressively wound springs (A).

3. Push valve out, keeping it in order for reassembly in the same guide.
4. Measure free length of spring with a Vernier caliper, Ill.1. Check spring for squareness as shown in Ill.2. Compare to specifications. Replace spring if either measurement is out of specification.



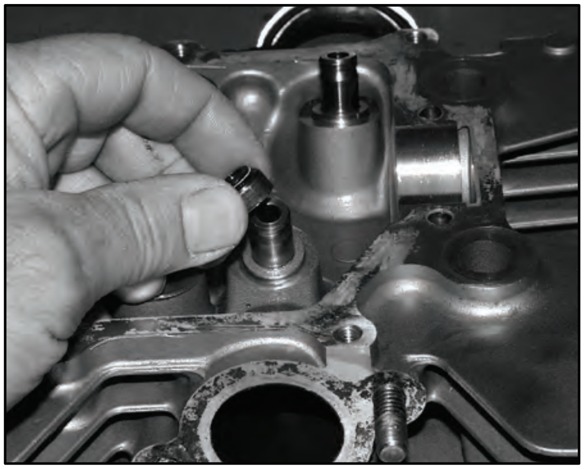
Ill.1



Ill.2

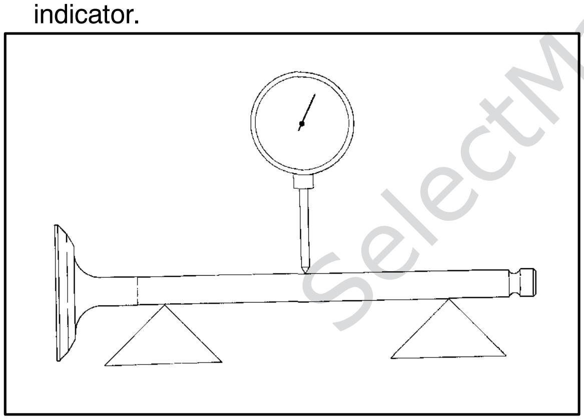
Valve Spring Length:
Std: 1.673″ (42.5 mm)
Squareness:
.075″ (1.9 mm)

5. Remove valve seals. **CAUTION:** Replace seals whenever the cylinder head is disassembled. Hardened, cracked or worn valve seals will cause excessive oil consumption and carbon buildup.

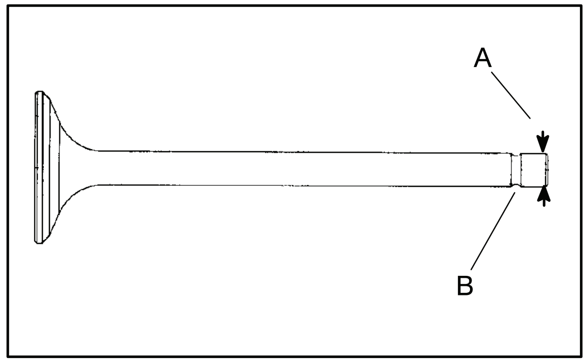


VALVE INSPECTION

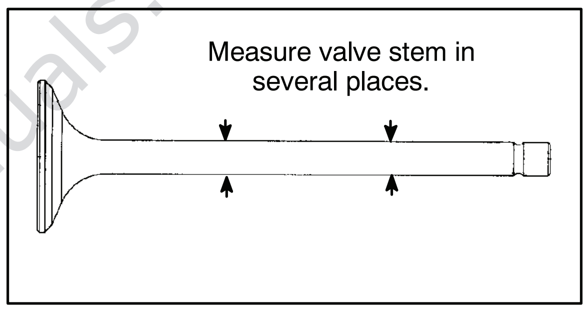
1. Remove all carbon from valve with a soft wire wheel.
2. Check valve face for runout, pitting, and burnt spots. To check for bent valve stems, mount valve in a drill or use “V” blocks and a dial indicator.



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



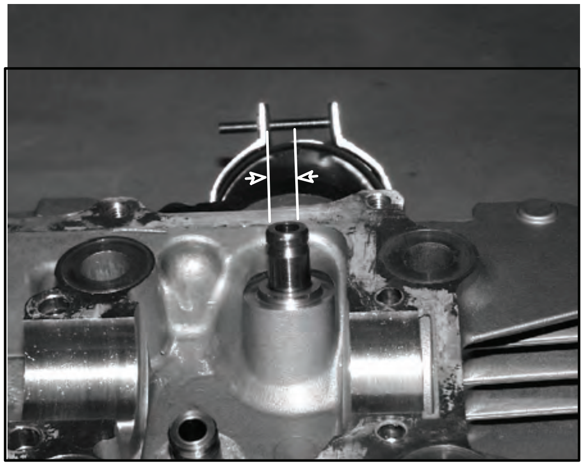
4. Inspect split keeper groove for wear or flaring of the keeper seat area (B). **NOTE:** The valves cannot be re-faced or end ground. They must be replaced if worn, bent, or damaged.
5. Measure diameter of valve stem with a micrometer in three places and in two different directions (six measurements total). Compare to specifications.



Valve Stem Diameter:

Intake: .2343-.2348″ (5.950-5.965 mm)
Exhaust: .2341-.2346″ (5.945-5.960 mm)

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, front to back and side to side.



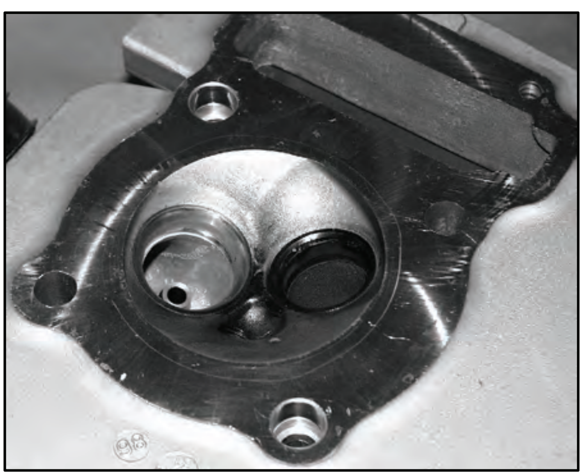
7. Subtract valve stem measurement to obtain stem to guide clearance. **NOTE:** Be sure to measure each guide and valve combination individually.
8. Replace valve and/or guide if clearance is excessive. Compare to specifications.

Valve Guide I.D.:
.2362-.2367″ (6.0-6.012 mm)

NOTE: If valve guides are replaced, valve seats must be reconditioned. Refer to Valve Seat Reconditioning for procedure.

COMBUSTION CHAMBER

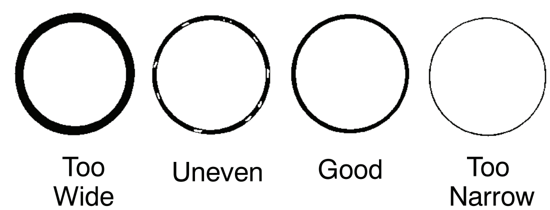
Clean all accumulated carbon deposits from combustion chamber and valve seat area with a soft wire brush.



VALVE SEAT RECONDITIONING

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. See Valve Seat Reconditioning, Page 3.19-3.21. *If the valve seat is cracked the cylinder head must be replaced.*



Cylinder Head Reconditioning

NOTE: Servicing the valve guides and valve seats requires special tools and a thorough knowledge of reconditioning techniques. Follow the instructions provided in the Valve Seat Reconditioning Kit (**PN 2200634**).

CAUTION: Wear eye protection when performing cylinder head service. Valve guide replacement will require heating of the cylinder head. Wear gloves to prevent burns.

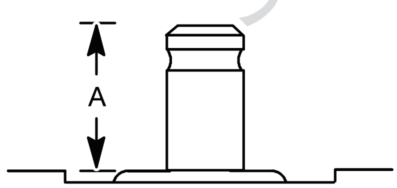
Valve Guide Removal/Installation

1. Remove all carbon deposits from the combustion chamber, valve seat and valve guide area before attempting to remove valve guides. **CAUTION:** Carbon deposits are extremely abrasive and may damage the valve guide bore when guides are removed.
2. Place new valve guides in a freezer for at least 15 minutes while heating cylinder head.
3. Heat cylinder head in an oven or use a hot plate to bring cylinder head temperature to 212° F (100° C). **CAUTION:** Do not use a torch to heat cylinder head or warpage may result from uneven heating. Head temperature can be checked with a pyrometer or a welding temperature stick.

4. Follow the manufacturers instructions provided with the valve seat cutters in the Valve Seat Reconditioning Kit (**PN 2200634**). Abrasive stone seat reconditioning equipment can also be used. Keep 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 and the valve may overheat and warp, resulting in burnt valves.

5. Once thoroughly heated, place cylinder head on blocks of wood which will allow the old guides to be removed.
6. Using valve guide driver, drive guides out of the cylinder head from the combustion chamber side. Be careful not to damage guide bore or valve seat when removing guides.
7. Place cylinder head on cylinder head table. **NOTE:** Be sure cylinder head is still at 212° F (100° C) before installing new guides.
8. Place a new guide in the valve guide installation tool and press guide in to proper depth. Check height of each guide above the cylinder head (A). Refer to specifications.
   NOTE: The guide can also be driven in to the proper depth. Inspect the guide closely for cracks or damage if a driver is used.

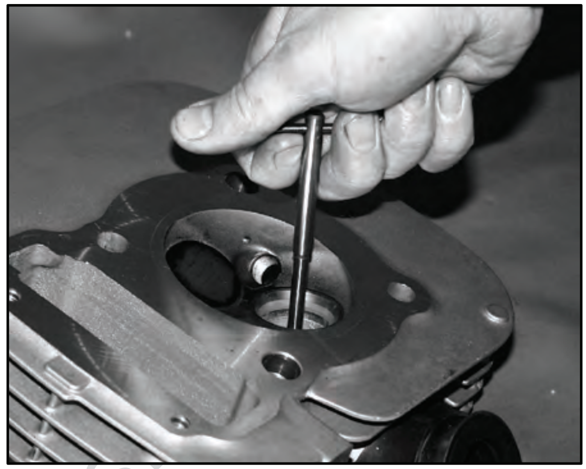


Valve Guide Installed Height

Valve Guide Height:
.681-.689″ (17.3-17.5 mm)

Reaming The Valve Guide

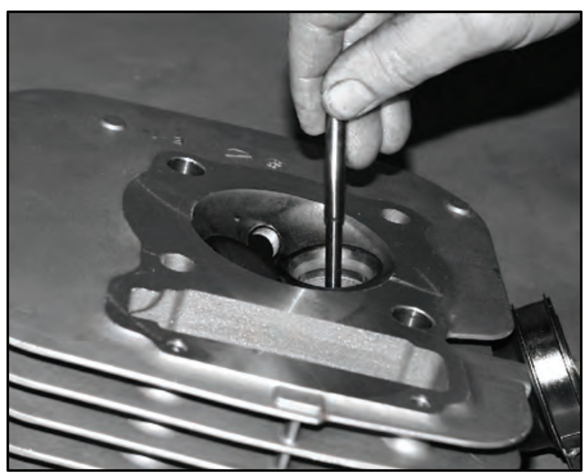
9. Allow cylinder head to cool to room temperature. Apply cutting oil to the reamer. Guides should be reamed from the valve spring side of the cylinder head. Ream each guide to size by turning the reamer clockwise continually. Continue to rotate reamer clockwise during removal of the tool.



10. Clean guides thoroughly with hot soapy water and a nylon brush. Rinse and dry with compressed air. Apply clean engine oil to guides.

VALVE SEAT RECONDITIONING

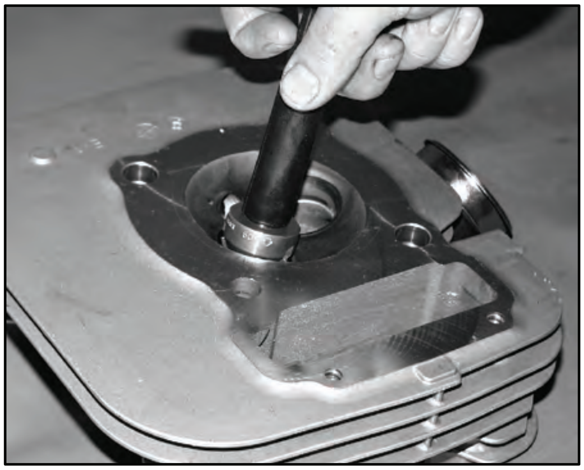
1. Install pilot into valve guide.



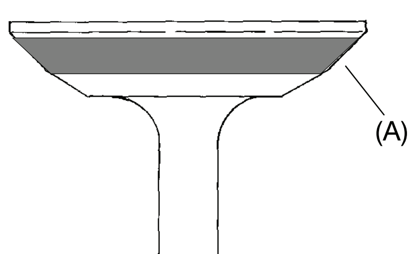
2. Apply cutting oil to valve seat and cutter.

VALVE SEAT RECONDITIONING CONT'D

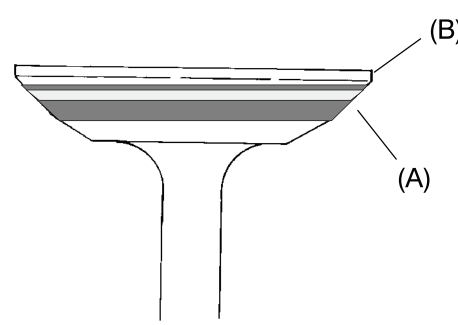
3. Place 46° cutter on the pilot and make a light cut.



4. Inspect the cut area of the seat.
   - If the contact area is less than 75% of the circumference of the seat, rotate the pilot 180° and make another light cut.
   - If the cutter now contacts the uncut portion of the seat, check the pilot. Look for burrs, nicks, or runout. If the pilot is bent it must be replaced.
   - If the contact area of the cutter is in the same place, the valve guide is distorted from improper installation and must be replaced. Be sure the cylinder head is at the proper temperature and replace the guide.
   - 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 marker to the entire valve face (A).

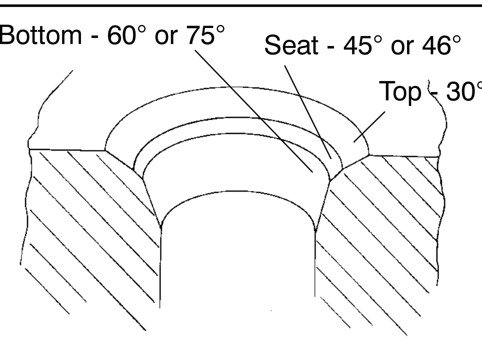


6. Insert valve into guide and tap valve lightly into place a few times.
7. Remove valve and check where the Prussian Blue™ or black marker indicates seat contact on the valve face. The valve seat should contact the middle of the valve face or slightly above, and must be the proper width (A).

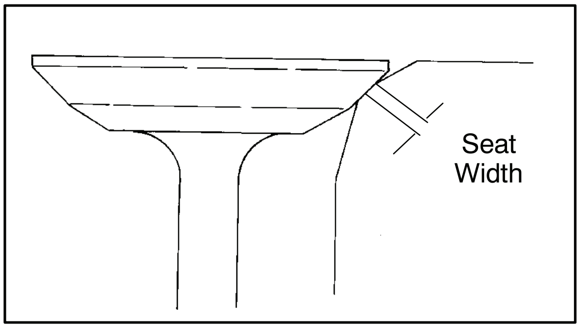


Proper Seat Contact On Valve Face

- 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° or 75° 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.



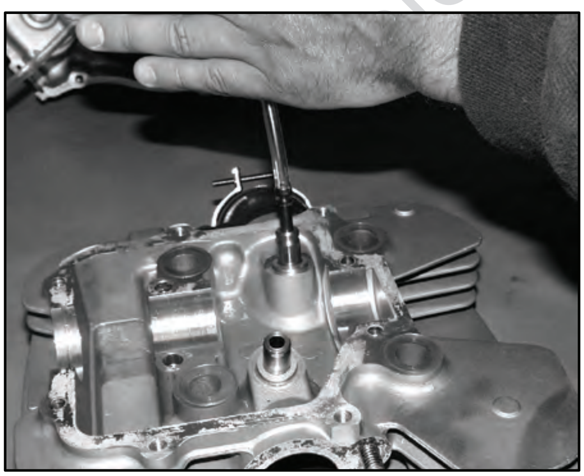
NOTE: When using an interference angle, the seat contact point on the valve will be very narrow, and is a normal condition. Look for an even and continuous contact point on the black marker, all the way around the valve face.



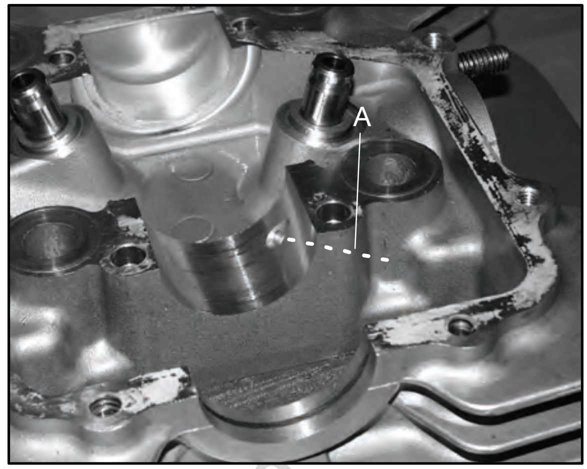
Valve Seat Width:

Intake Std: .039″ (1.0 mm)
Limit: .055″ (1.4 mm)
Exhaust Std: .059″ (1.4 mm)
Limit: .071″ (1.8 mm)

8. Clean all filings from the area with hot soapy water, rinse, and dry with compressed air.
9. Lubricate the valve guides with clean engine oil, and apply oil or water based lapping compound to the face of the valve. Lapping is not required with an interference angle.
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.
12. Clean cylinder head, valves, and camshaft oil supply passage (A) thoroughly.



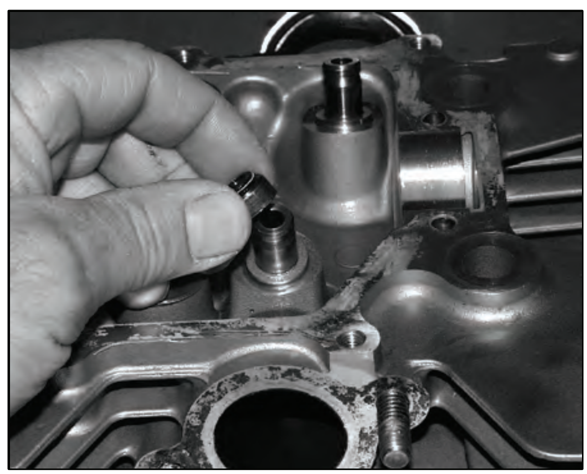
13. Spray electrical contact cleaner into oil passage and dry using compressed air.

CYLINDER HEAD ASSEMBLY

CAUTION: Wear eye protection during assembly.

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

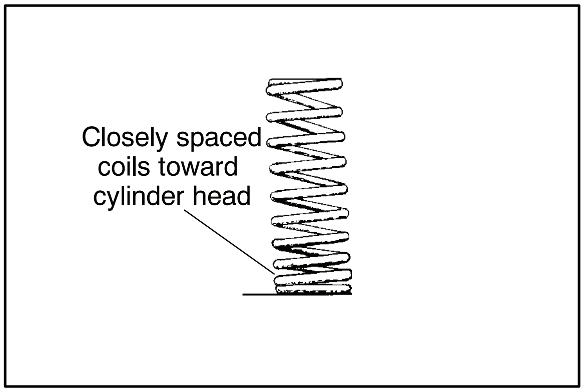
1. Install new valve seals on valve guides.



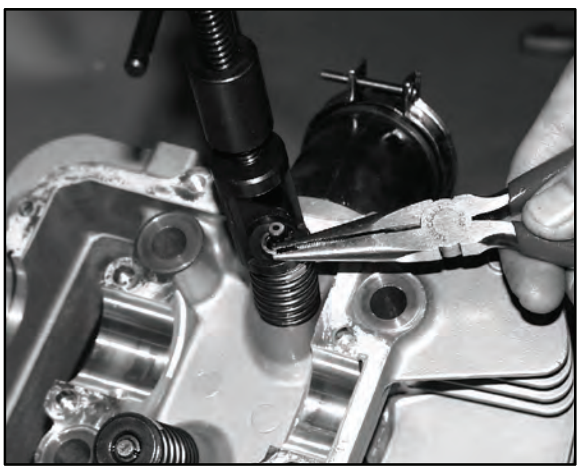
2. Apply engine oil to valve guides and seats.
3. Coat valve stem with molybdenum disulfide grease.
4. Install valve carefully with a rotating motion to avoid damaging valve seal.

CYLINDER HEAD ASSEMBLY CONT'D

5. Dip valve spring and retainer in clean engine oil and install spring with closely spaced coils toward the cylinder head.



6. Place retainer on spring and install valve spring compressor. Compress spring only enough to allow split keeper installation to prevent loss of spring tension. Install split keepers with the gap even on both sides.



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

VALVE SEALING TEST

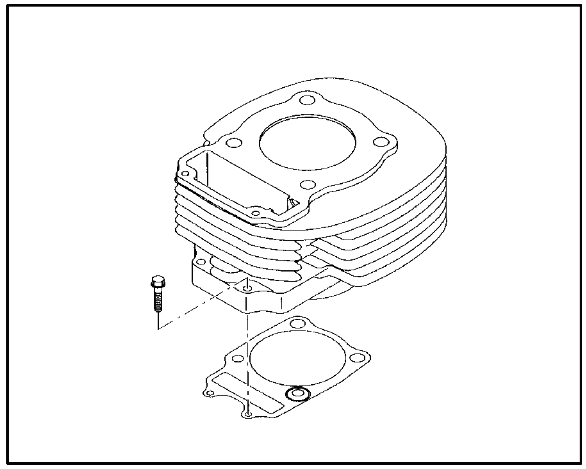
1. Clean and dry the combustion chamber area.
2. Pour a small amount of clean solvent into the intake port and check for leakage around each intake valve. The valve seats should hold fluid with no seepage.
3. Repeat for exhaust valves by pouring fluid into exhaust port.

ENGINE BOTTOM END DISASSEMBLY

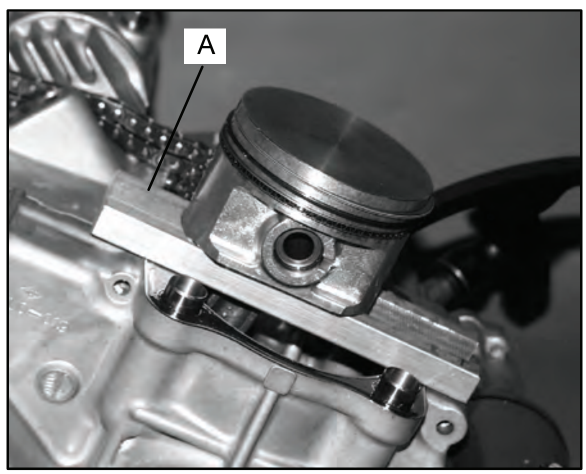
Cylinder Removal

Follow engine disassembly procedures to remove valve cover, camshaft and rocker arms, and cylinder head.

1. Remove cam chain guide at front of cylinder.
2. Remove the two 6 mm cylinder base bolts.



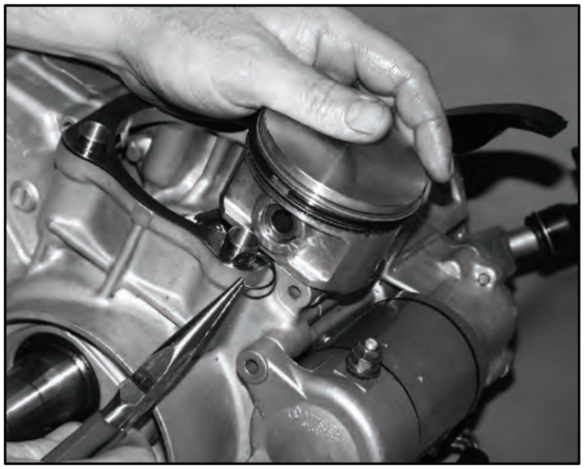
3. Tap cylinder lightly with a plastic hammer in the reinforced areas only until loose.



4. Rock cylinder forward and backward and lift it from the crankcase, supporting piston and connecting rod. Support piston with Piston Support Block (**PN 2870390**) (A).
5. Remove dowel pins from crankcase.

PISTON REMOVAL

1. Remove circlip. Note that opening for circlip access is on the intake side.



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.

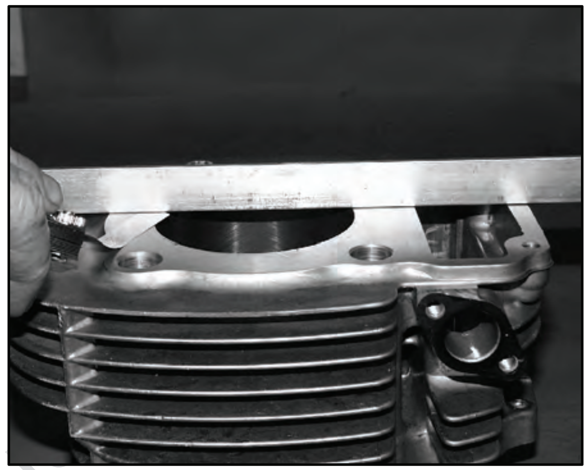
4. Repeat procedure for second ring.

The oil control ring is a three piece design consisting of a top and bottom steel rail and a center expander section.

5. Remove the top rail first followed by the bottom rail.
6. Remove the expander.

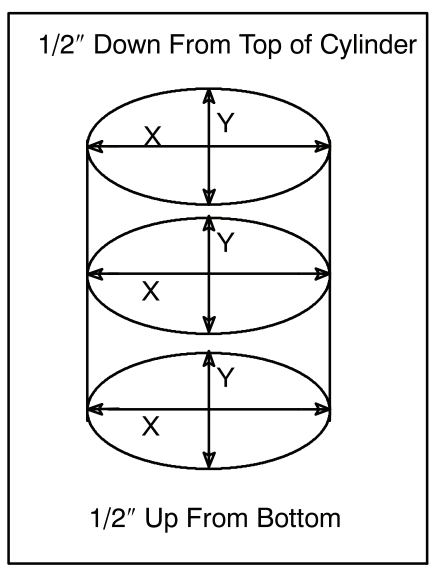
CYLINDER INSPECTION

1. Remove all gasket material from the cylinder sealing surfaces.
2. Inspect the top of the cylinder for warpage using a straight edge and feeler gauge.



Cylinder Warpage:
.002″ (.05 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).



CYLINDER INSPECTION CONT'D

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

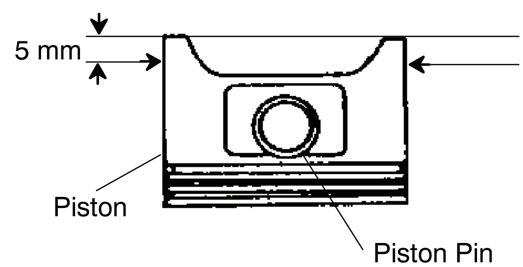
Cylinder Taper
Limit: .002 Max.
Cylinder Out of Round
Limit: .002 Max.

Cylinder Standard Bore Size:

3.0906-3.0913″ (78.50-78.520 mm)

PISTON INSPECTION

1. 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.



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

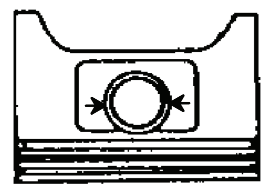
Piston to Cylinder Clearance

Std: .0015-.0032″ (.038-.082 mm)
Limit: .004″ (.11 mm)

Piston O.D.:

Std: 3.0881-3.0891″ (78.438-77.462 mm)

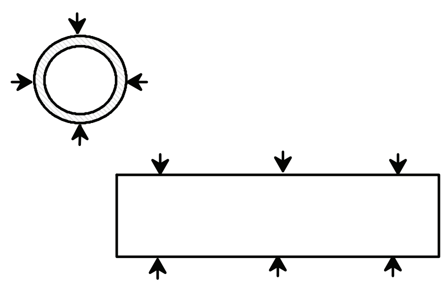
3. Measure piston pin bore.



Piston Pin Bore:

.7095-.7097″ (18.007-18.013 mm)

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

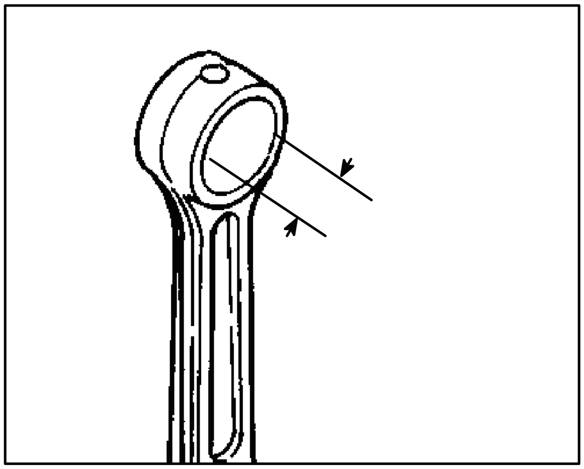


Piston Pin Measurement Locations

Piston Pin O.D.

.7092-.7095″ (18.001-18.007 mm)

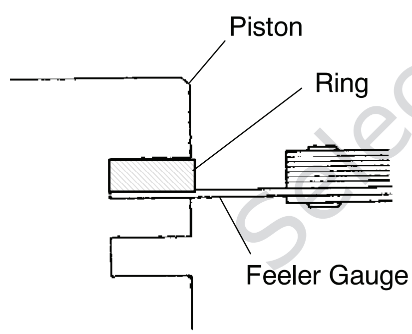
5. Measure connecting rod small end ID.



Connecting Rod Small End I.D.
.7095-.7101″ (18.007-18.023 mm)

6. 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.

Ring to groove clearance



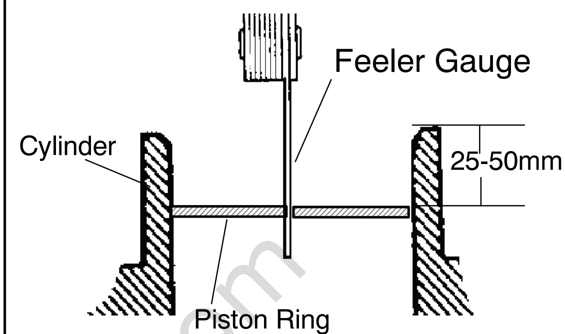
Piston Ring-to-Groove Clearance

Top Ring Std: .0014-.0030″ (.035-.075 mm)
Limit: .0059″ (.15 mm)
Second Ring Std: .0010-.0026″ (.025-.065 mm)
Limit: .0059″ (.15 mm)

PISTON RING INSTALLED GAP

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

Piston ring end gap installed



2. Measure installed gap with a feeler gauge at both the top and bottom of the cylinder.
NOTE: 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.

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 an oil rag immediately to remove residue and prevent rust.

Piston Ring Installed Gap

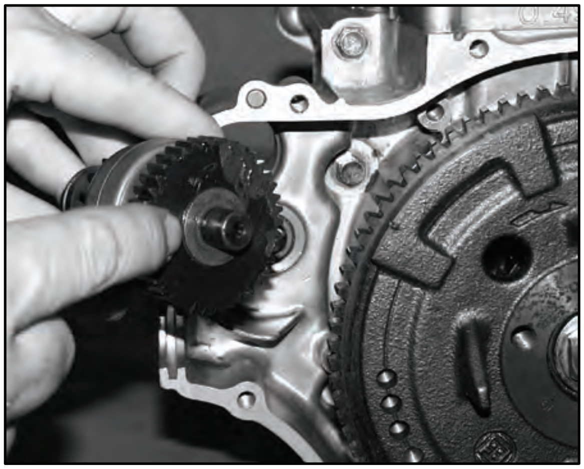
Top Ring
Std: .0079-.0118″ (.20-.36 mm)
Limit: .039″ (1.0 mm)
Second Ring
Std: .0138-.0197″ (.35-.50 mm)
Limit: .039″ (1.0 mm)
Oil Ring
Std: .0079-.0236″ (.20-.70 mm)
Limit: .059″ (1.5 mm)

CRANKCASE DISASSEMBLY

NOTE: The recoil starter, starter motor, starter drive, flywheel, stator, cam chain and sprockets can be serviced with the engine in the frame.

STARTER DRIVE REMOVAL/INSPECTION

1. Remove recoil housing bolts and remove housing.

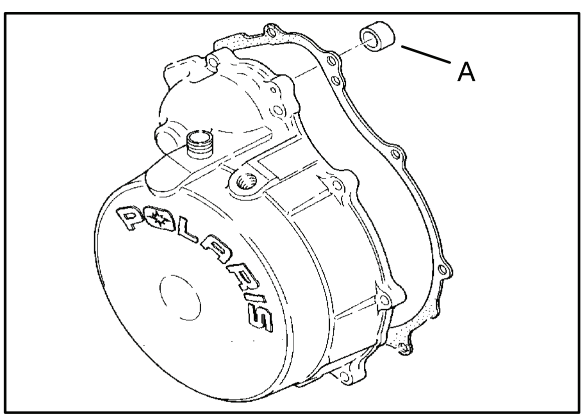


2. Remove starter drive assembly. Note the thrust washer located at the rear of the drive mechanism.
3. Inspect the thrust washer for wear or damage and replace if necessary.
4. Measure the OD of the starter drive shaft on both ends and record.

Std. Bushing ID:
.4735″-.4740″ (11.11-12.04 mm)

Std. Shaft OD:
.470″-.472″ (11.93-11.99 mm)

5. Measure the ID of the bushing in the recoil housing (A) and in the crankcase and record. Measure in two directions 90° apart to determine if bushing is out of round. Calculate bushing clearance. Replace bushing if clearance exceeds the service limit.



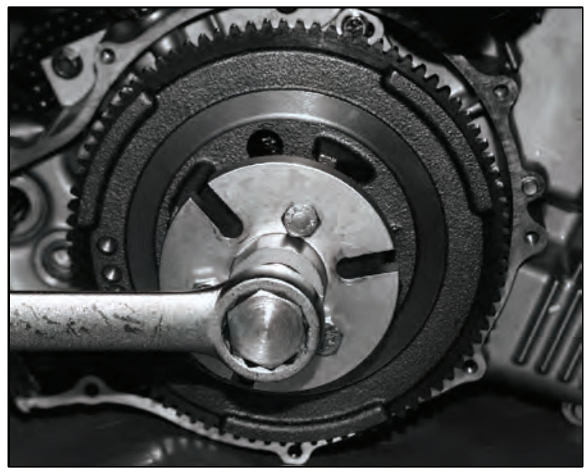
Starter Drive Bushing Clearance:
Std: .0015″-.004″ (.038-.102 mm)

Service Limit:
008″ (.203 mm)

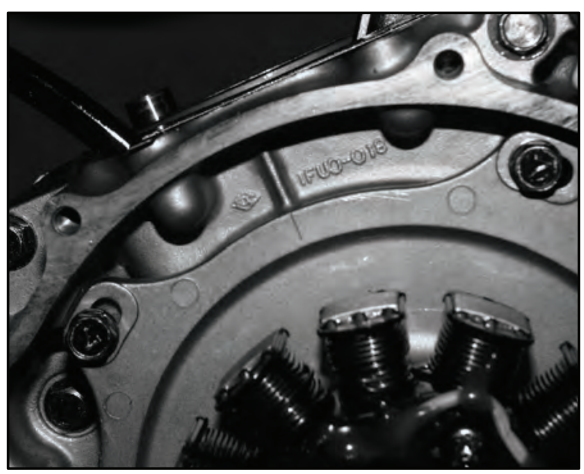
6. Inspect gear teeth on starter drive. Replace starter drive if gear teeth are cracked, worn, or broken.

FLYWHEEL/STATOR REMOVAL/INSPECTION

1. Remove flywheel nut and washer.



2. 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. Mark or note position of stator plate on crankcase.

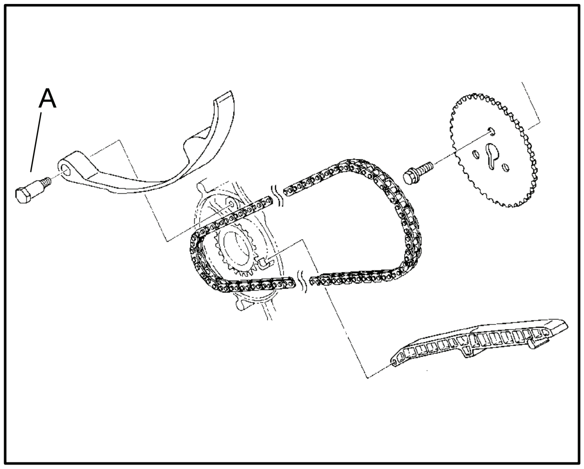


4. Remove bolts and carefully remove stator assembly, being careful not to damage crankshaft bushing on stator plate.

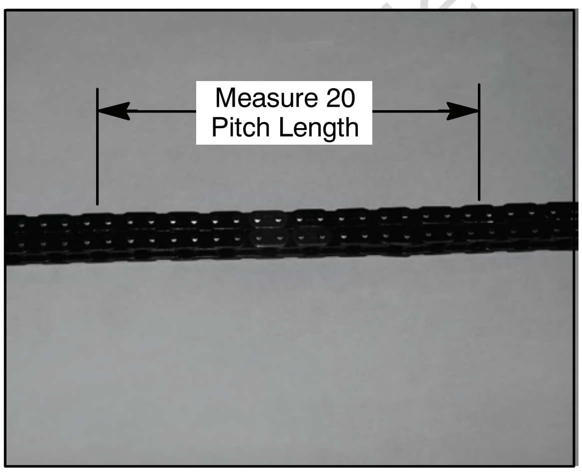
5. Replace crankshaft seal.
6. Remove large sealing O-Ring from outer edge of stator plate.

CAM CHAIN/TENSIONER BLADE

1. Remove bolt securing tensioner blade to crankcase (A).



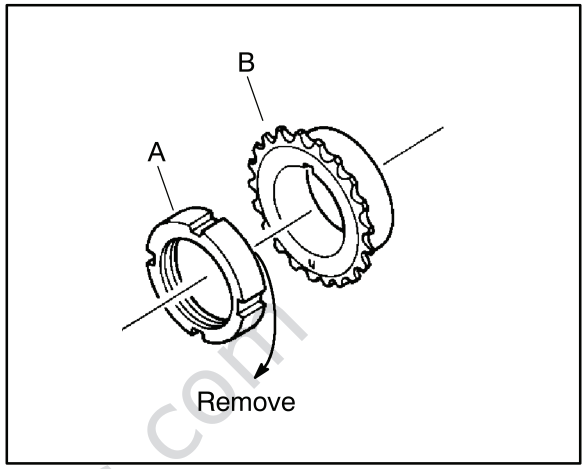
2. Remove blade and inspect for cracks, wear, or damage.
3. Remove cam chain. Inspect chain for worn or missing rollers or damage. Stretch chain tight on a flat surface and apply a 10 lb. (4.53 kg) load. Measure length of a 20 pitch section of chain. Replace if worn past service limit.



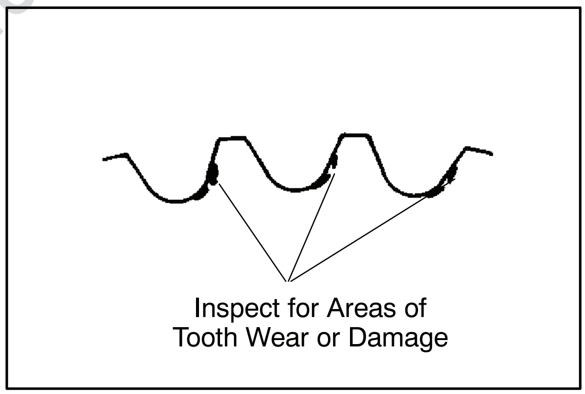
Chain Service Limit: **5.407″ (13.7 cm)**

DRIVE SPROCKET REMOVAL / INSPECTION

1. Using the Slotted Nut Socket (**PN 2871293**), remove the crankshaft slotted nut (A). **NOTE:** The slotted nut is a left hand thread.



2. Remove cam chain drive sprocket (B) and Woodruff key from crankshaft.
3. Inspect sprocket teeth for wear or damage.



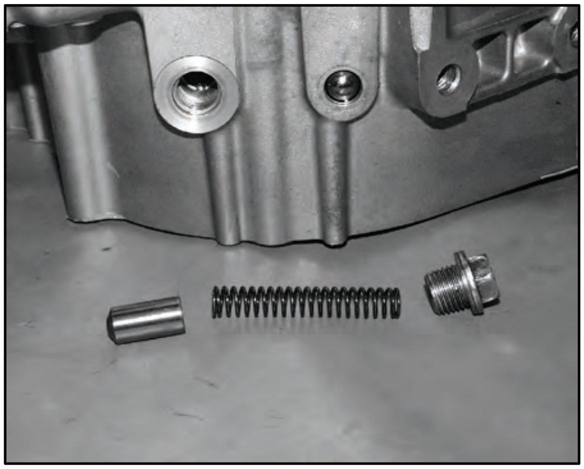
4. Inspect Woodruff key for wear.
5. Replace any worn or damaged parts.

Slotted Nut Socket   **(PN 2871293)**

PRESSURE RELIEF VALVE

The pressure relief valve opens to relieve any excess pressure from the oil pump if oil pressure reaches approximately 71 psi. It must be clean and have adequate spring pressure in order to seal properly.

1. Remove cap bolt, sealing washer, spring, and relief valve from MAG side crankcase.



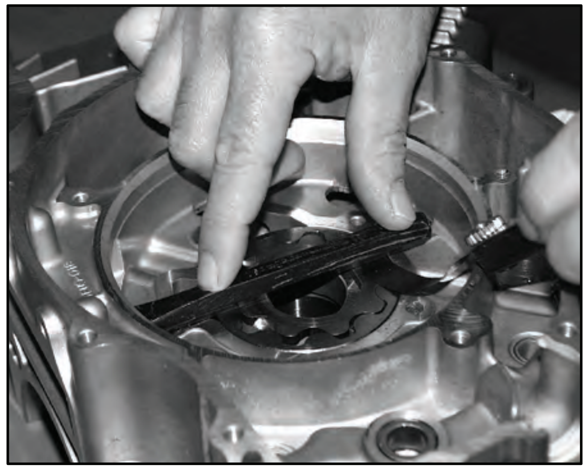
2. Inspect free length of spring and check coils for distortion.

Relief Valve Spring Free Length:
Std: 2.175″ (5.52 cm)

3. Inspect valve for wear.
4. Check seat area for nicks or foreign material that may prevent proper sealing of valve.

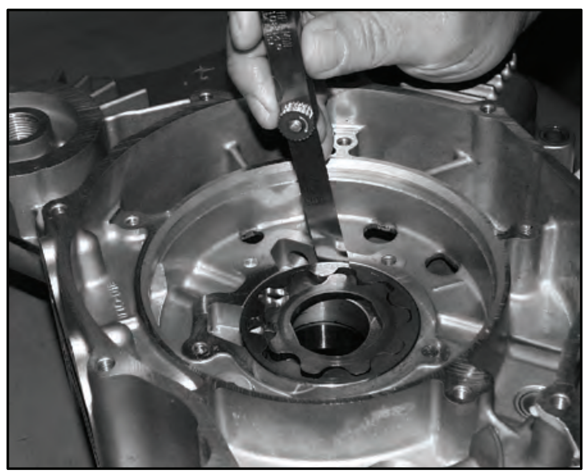
OIL PUMP REMOVAL/INSPECTION

1. Remove the five screws on the oil pump cover with an impact driver.
2. Inspect rotors and mating surface of oil pump cover. Check for nicks, burrs, or surface irregularities.
3. Measure pump end clearance using a feeler gauge and straight edge.



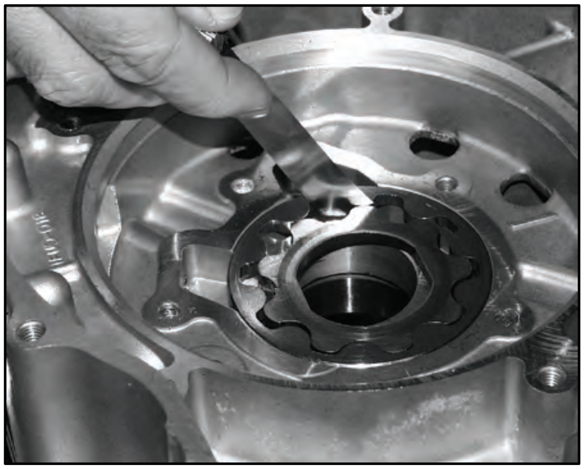
Outer Feed Rotor to Crankcase Clearance:
Std: .001-.003 (.0254-.0762 mm)
Wear Limit: .004 (.1016 mm)

4. Measure clearance between outer feed rotor and crankcase pocket with a feeler gauge.



Pump End Clearance:
Std: .001-.003 (.0254-.0762 mm)
Wear Limit: .004 (.1016 mm)

5. Measure rotor tip clearance with a feeler gauge.



Rotor Tip Clearance:
Std: .007 (.178 mm)
Wear Limit: .008 (.2032 mm)

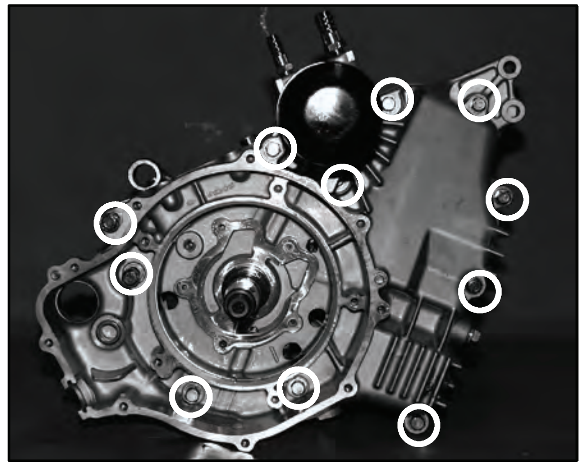
OIL PUMP ASSEMBLY

1. Clean and dry all parts thoroughly. Apply clean engine oil to all parts. *Do not* use gasket sealer on the pump cover mating surfaces or clearances will be incorrect, and oil passages may become plugged.
2. Install outer feed rotor and inner feed rotor drive pin.
3. Install inner feed rotor and feed chamber cover with screw.
4. Tighten screw securely.
5. Install oil pump on crankcase and torque bolts to 6 ft. lbs. (8 Nm).

Oil Pump Attaching Bolt Torque: 6 ft. lbs. (8 Nm)

CRANKCASE SEPARATION

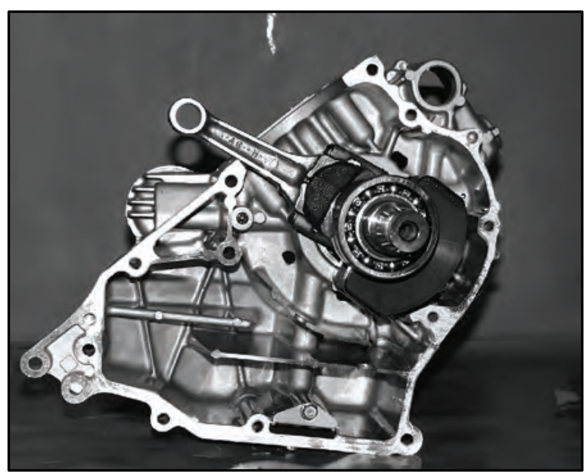
1. Remove flange bolts (11) from magneto side crankcase evenly in a criss-cross pattern.



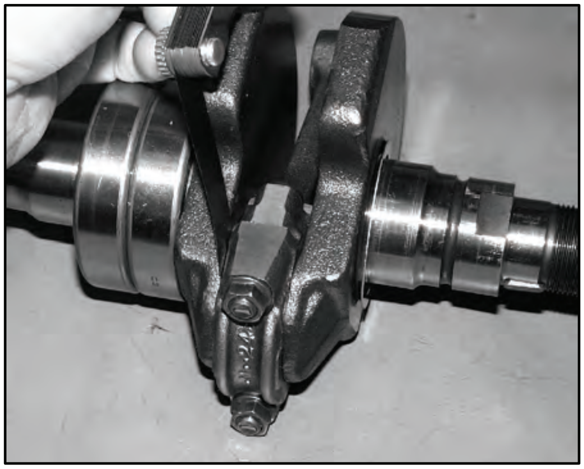
2. Separate crankcase by tapping with a soft faced hammer in reinforced areas.
3. Watch the gap along the crankcase mating surface and separate the crankcase evenly.
4. Remove the Mag (RH) crankcase from the PTO case.

CRANKSHAFT REMOVAL/INSPECTION

1. Support the MAG side crankcase and crankshaft; press the crankshaft out. Be careful not to damage the crankcase mating surface or connecting rod.



2. Use a feeler gauge to measure the connecting rod big end side clearance.



Connecting Rod Big End Side Clearance:
Std: .0028-.0118 (0.07-0.30 mm)
Limit: .0138 (.35 mm)

3. If the clearance exceeds the service limit, either the crankshaft, connecting rod or both need to be replaced. Refer to Steps 1 & 2 under crankshaft inspection to determine which part(s) are outside of specifications.

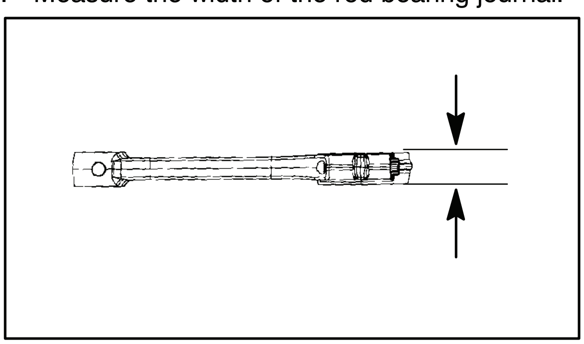
NOTE: Markings on connecting rod and cap that must be aligned for assembly. If marks are not clearly visible, mark the rod and cap with a permanent marker.

4. Remove the connecting rod nuts and connecting rod bearing cap.

NOTE: It may be necessary to lightly tap on the side of the cap with a plastic mallet to loosen it.

CRANKSHAFT INSPECTION

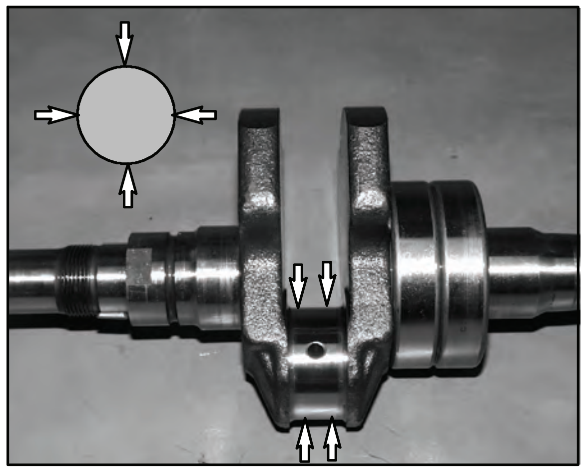
1. Measure the width of the rod bearing journal.



2. Measure the width of the connecting rod at the big end.

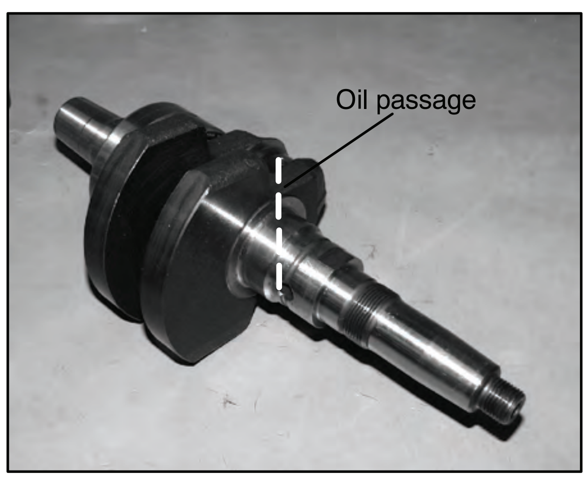
Connecting Rod Width:
Std: .8233-.8252″ (20.88-20.93 mm)

3. Visually inspect bearing journal for scoring, damage or excessive wear. Replace crankshaft if it fails visual inspection.
4. Measure the O.D. of the crankshaft rod journal in four places and in two directions away from the oil hole. Replace the crankshaft if it measures below the service limit, or if the journal is out of round.



Rod Bearing Journal O.D.:
Std: 1.6531-1.6535″ (41.989-42.000 mm)

5. Check oil passage to make sure it is clear.



CRANKSHAFT MAIN BEARING INSPECTION

1. Inspect the crankshaft main bearings.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. Look for signs of discoloration, scoring or galling. Turn the outer race of each bearing. The bearings should turn smoothly and quietly. The inner race of each bearing should fit tightly in the crankshaft. The outer race should be firm with minimal side to side movement and no detectable up and down movement.

2. Replace bearings if they fail visual inspection.

CONNECTING ROD BEARING INSPECTION

1. Inspect bearing inserts for unusual wear, peeling, scoring, damage etc. Replace as necessary.

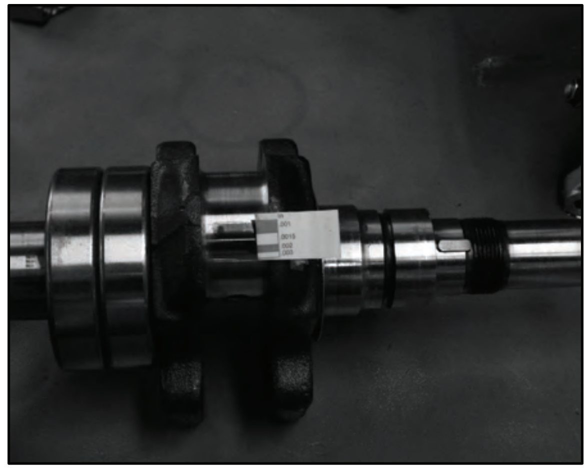
NOTE: If one insert requires replacement, replace both connecting rod bearing inserts as a set.

CONNECTING ROD BEARING CLEARANCE INSPECTION

1. Clean all oil from bearing inserts and crank pin.
2. Place a strip of Plastigauge® across the complete width of the crank pin.
3. Install the connecting rod and bearing cap in the correct orientation.
4. Torque the rod nuts to specification.

Rod Nut Torque:
29-33 ft. lbs. (39-45 Nm)

5. Remove the bearing cap being careful not to disturb the Plastigauge®.
6. Use the measuring scale on the Plastigauge® wrapper to measure the thickness of the Plastigauge®. **The rod must not turn during this procedure.**



NOTE: Use the widest part of the Plastigauge® to determine the oil clearance.

Connecting Rod To Crankshaft Clearance:
Std: .0007-.0021 (.019-.053 mm)
Limit: .0026 (.065 mm)

7. If oil clearance is not within specification, install new rod bearings and recheck the oil clearance.
8. If service limit is still exceeded, determine if the crankshaft or connecting rod needs to be replaced per Crankshaft Inspection and Connecting Rod Inspection.
9. At completion of measurement procedure; remove all traces of Plastigauge® from bearing and crankshaft.

CRANKCASE BEARING INSPECTION

1. Inspect the crankshaft main bearing in the MAG side crankcase.

NOTE: Due to extremely close tolerances and minimal side wear, the bearing must be inspected visually and by feel. Look for signs of discoloration, scoring or galling. Turn the inner race of bearing. The bearing should turn smoothly and quietly. The outer race should fit tightly in the crankcase. The inner race should be firm with minimal side to side movement and no detectable up and down movement.

2. To remove crankshaft bearing, use a blind hole bearing puller.

NOTE: Bearings are stressed during the removal procedure and *should not* be re-used

CRANKCASE INSPECTION

1. Remove all traces of gasket sealer from the crankcase mating surfaces. Inspect the surfaces closely for nicks, burrs or damage.

BEARING INSTALLATION

NOTE: To ease crankshaft bearing installation, warm the crankcase until hot to the touch. Place the bearing in a freezer.

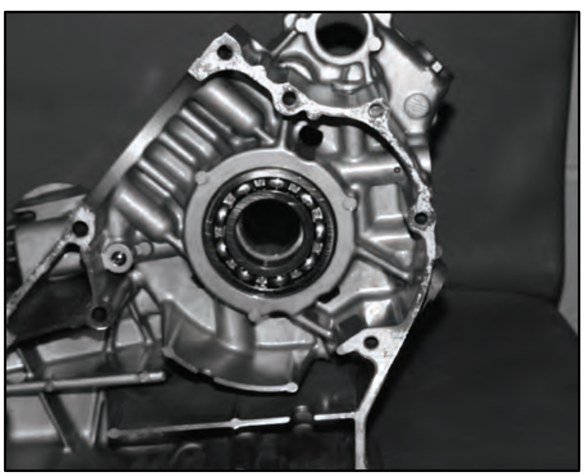
1. Install the crankshaft bearing so the numbers are visible.
2. Drive or press the new bearing into the crankcase, using the proper driver. **CAUTION:** Press only on outer race of bearing to prevent bearing damage.
   - Use a 70mm (2.755″) driver- For crankshaft main bearings.

END PLAY INSPECTION/ADJUSTMENT

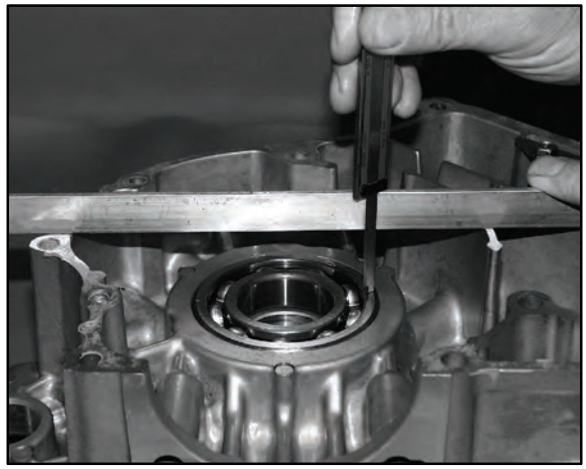
Before reassembling the crankcase,the following steps should be performed to determine the amount of crankshaft end play. Excessive end play may cause engine noise at idle and slow speeds. Too little play will side load the bearings which may lead to premature bearing failure.

Crankshaft End Play Adjustment

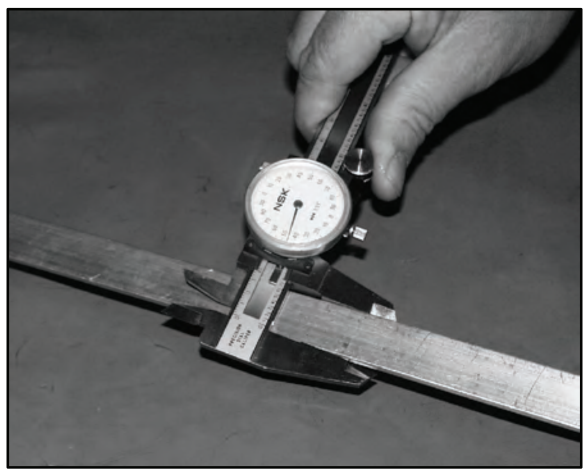
1. Make sure crankshaft bearing is firmly seated in the MAG side crankcase.



2. Measure the distance from the MAG side crankcase mating surface to the main bearing using a dial caliper and a straight edge.



3. Subtract the thickness of the straightedge from the measurement obtained in Step 2 and record. Repeat Step 2 and 3 for the PTO case. If PTO bearings are not installed in the crankcase, measure to the bearing seat in the case.

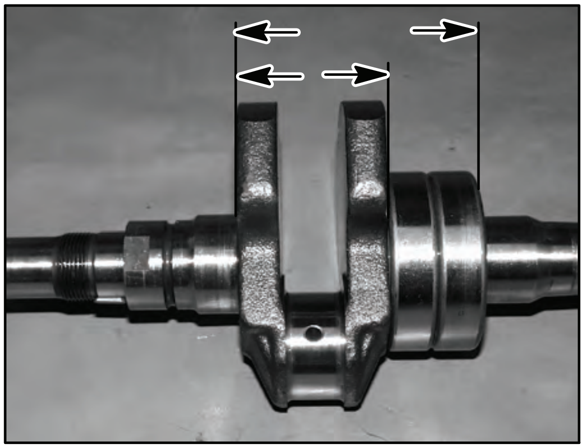


MAG Case Depth________________

+ PTO Case Depth____________________

= Total Case Width____________________

4. Measure the width of the crankshaft at the bearing seats or, if PTO bearings are installed, the width from MAG side bearing seat to the outside race of the PTO bearings with a micrometer or dial caliper and record.



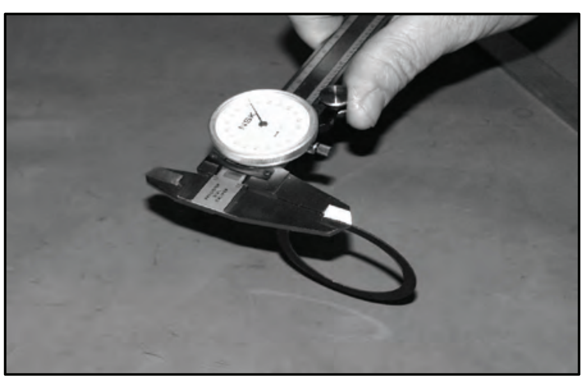
NOTE: If PTO bearings are not installed, measure the width of the bearings and add to crankshaft width.

Crankshaft Width__________________

5. Subtract the Crankshaft Width measured in Step 4 from the Total Case Width recorded in Step 3, and record below.

Total End Play______________

6. Subtract the thickness of the existing shim from the result of Step 5 to determine if a different shim is required. The result must be within the specified range listed below. Increase or decrease shim thickness as required to bring end play within range.



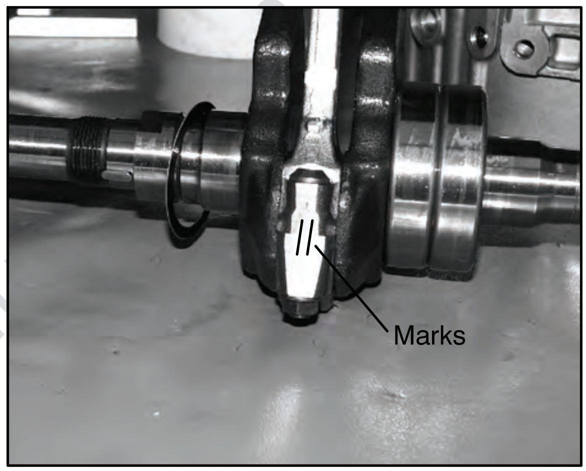
Crankshaft End Play:
008″-.016″ (.02-.04 cm)

ENGINE ASSEMBLY/ CONNECTING ROD INSTALLATION

1. Clean all oil off connecting rod, connecting rod cap and bearing inserts.
2. Install bearing inserts onto connecting rod and cap.

NOTE: First, install bearing tab into groove, then press the rest of the bearing into place.

3. Apply assembly lube onto the connecting rod bearings and crank pin.
4. Install rod and cap onto the crankshaft. Ensure that I.D. marks are aligned.



NOTE: Procedure during disassembly called for marking of connecting rod and cap. Ensure that each part is installed in its original location by noting the marks placed on the parts during disassembly.

5. Tighten rod cap nuts to 1/2 torque specification, then full torque.

Rod Nut Torque:
29-33 ft. lbs. (39-45 Nm)

6. Verify that the connecting rod is free to rotate on the crankshaft journal.

CRANKSHAFT INSTALLATION

Lubricate all bearings with clean engine oil before assembly.

1. Install the crankshaft into the PTO side crankcase.
2. Install the proper shim on the magneto end of the crankshaft.

CRANKCASE OIL STRAINER INSPECTION

1. Remove bolt securing oil strainer to the MAG side crankcase.
2. Remove oil strainer and visually inspect for any rips, tears or obstructions in screen.
3. Replace oil strainer if it fails visual inspection.

CRANKCASE REASSEMBLY

1. Apply Crankcase Sealant (**PN 2871557**) to the crankcase mating surfaces. Be sure the alignment pins are in place.
2. Set the crankcase in position carefully. Mate the crankcase halves by tapping lightly with a soft faced hammer. Continually check alignment of the cases during installation, closing the gap equally until the surfaces are tightly sealed.
3. Install the crankcase flange bolts and tighten to specified torque in 3 steps according to the torque pattern. See Page 3.4.

Crankcase Bolt Torque:

14-15 ft. lbs. (19-21 Nm)

Crankcase Sealant :

(PN 2871557)

OIL PUMP INSTALLATION

1. Inspect the oil pump sealing surface on the crankcase. Apply a light film of engine oil to the surfaces. Install outer and inner rotors over crankshaft .
2. Install oil pump cover. Torque screws to specified torque.

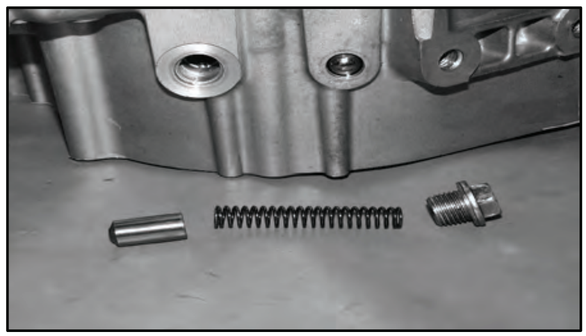
Oil Pump Cover Screw Torque:

4-5 ft. lbs. (5-7 Nm)

NOTE: Do not use gasket sealer on the pump mating surfaces.

OIL RELIEF VALVE INSTALLATION

Install the oil relief valve, spring, and plug using a new sealing washer.

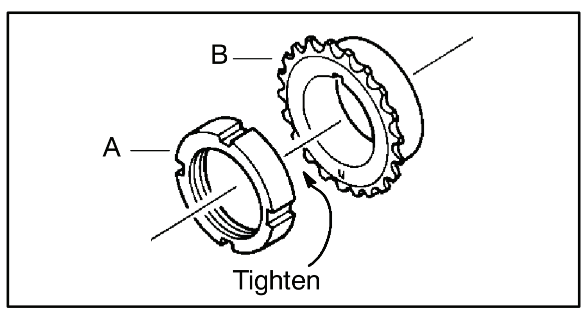


Oil Relief Valve Plug Torque:

14-17 ft. lbs. (19-23 Nm)

CAM CHAIN DRIVE SPROCKET INSTALLATION

1. Install the Woodruff key, drive sprocket, and slotted nut. Using the Slotted Nut Socket (**PN 2871293**), tighten the nut to the specified torque.



Slotted Nut Torque:

45 ft. lbs. (61 Nm)

TENSIONER BLADE INSTALLATION

1. Install the tensioner blade and tighten the mounting bolt to specified torque.

Tensioner Blade Mounting Bolt Torque:
5-6.5 ft. lbs. (7-9 Nm)

OIL FILTER INSTALLATION

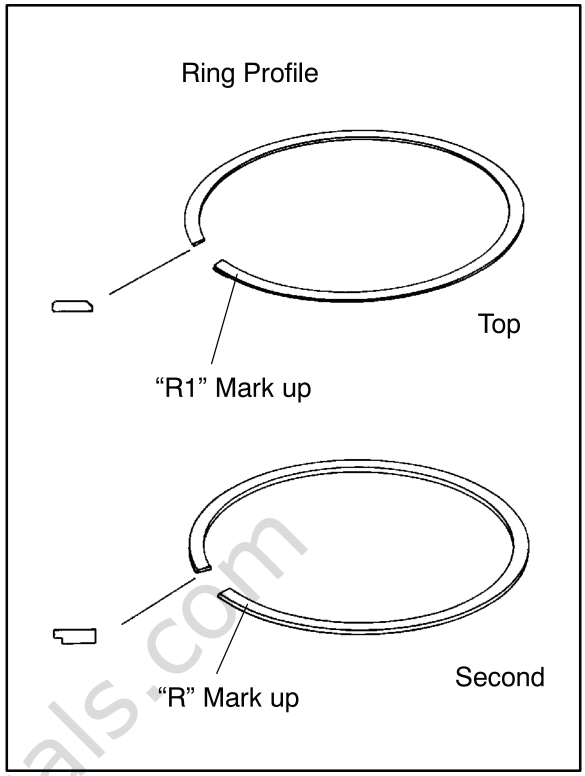
1. Apply clean engine oil to oil filter gasket. Install filter until gasket lightly touches seat and then tighten an additional 3/4 of a turn.

Oil Filter Connector Torque:
36-43 ft. lbs. (49-59 Nm)

PISTON RING INSTALLATION

NOTE: Apply clean engine oil to all ring surfaces and ring lands. Always check piston ring installed gap before rings are installed on piston. See Page 3.36. If the piston has been in service clean any accumulated carbon from the ring grooves and oil control ring holes.

1. Place the oil control ring expander in oil ring groove with the end gap facing forward. The expander has no up or down marking and can be installed either way. The ends should butt squarely together and must not overlap.
2. Install the oil ring top rail with the end gap at least 30° from the end of the expander.
3. Install the bottom rail with the gap at least 30° from the end of the expander on the side opposite the top rail gap.



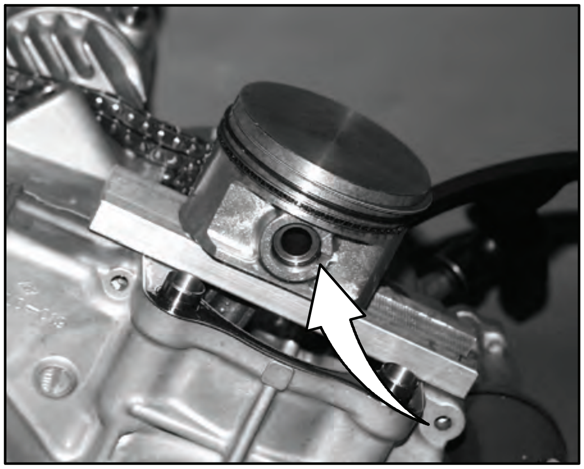
4. Install the second ring with the “R” mark facing up. Position the end gap toward the rear (intake) side of the piston.
5. Install the top ring (chrome faced) with the “R1” mark facing up and the end gap facing forward (toward the exhaust).
6. Check to make sure the rings rotate freely in the groove when compressed.

PISTON INSTALLATION

1. Clean the gasket surfaces on the cylinder and crankcase. Remove all traces of old gasket material.
2. Make sure the cylinder mounting bolt holes are clean and free of debris.
3. Install a new circlip on one side of the piston with the end gap facing *up* or *down*.

CAUTION: Circlips become deformed during the removal process. Do not re-use old circlips. Do not compress the new clip more than necessary upon installation to prevent loss of radial tension. Severe engine damage may result if circlips are re-used or deformed during installation.

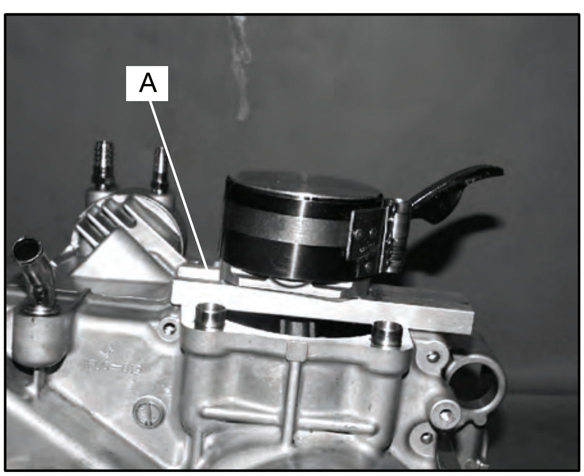
4. Apply clean engine oil to the piston rings, ring lands, piston pin bore, piston pin, and piston skirt. Lubricate the connecting rod (both ends) and crankshaft main bearing area.
5. **Install the piston on the connecting rod with the pin casting notch facing the rear of engine (starter side). The piston pin should be a push fit in the piston.**



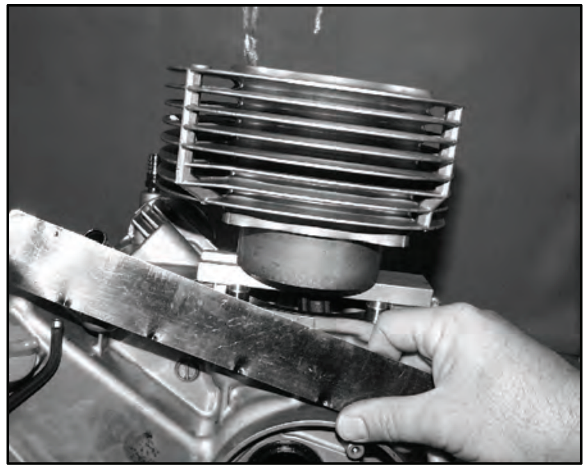
6. Install the other circlip with the gap facing up or down. (See Caution with Step 3 above). Push the piston pin in both directions to make sure the clips are properly seated in the groove.
7. Place the dowel pins in the crankcase and install a new cylinder base gasket.
8. Lubricate the piston and rings with assembly lube and install a sleeve-type ring compressor on the piston assembly. Verify that the ring gaps are 120 degrees apart from each other before installation.

CYLINDER INSTALLATION

1. Position the Piston Support Block (**PN 2870390**) (A) beneath the piston skirt to support the piston during cylinder installation.



2. Apply clean engine oil liberally to the cylinder bore and tapered area of the sleeve. Install the cylinder with a slight rocking motion until the rings are captive in the sleeve.



3. Remove the ring compressor and support block.
4. Push the cylinder downward until fully seated on the base gasket.

NOTE: If cam chain is installed, hold it up while rotating the engine to avoid damage to the chain, drive sprocket teeth, or tensioner blade.

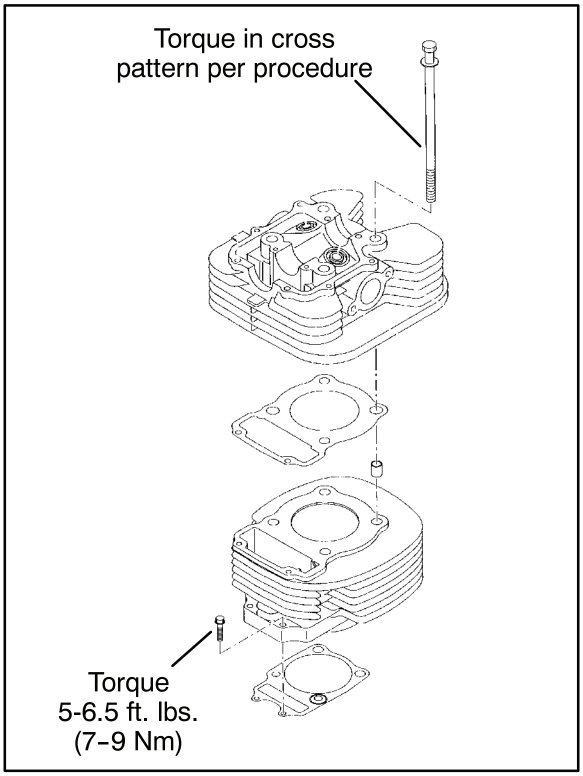
5. Install the two 6 mm bolts, but do not tighten.

CYLINDER HEAD INSTALLATION

Clean the gasket surfaces on the cylinder head and cylinder. Remove all traces of old gasket material.

1. Install the cam chain tensioner guide. Be sure bottom end of guide is located properly in crankcase.
2. Install the two dowel pins and a new cylinder head gasket.
3. Place the cylinder head on the cylinder. Apply a film of engine oil to the cylinder head bolt threads and washers, and hand tighten the bolts.

The following procedure must be used to torque the cylinder head properly:



Torque all bolts evenly in a cross pattern. Apply oil to bolt threads

***Torque bolts to 18 ft. lbs. (24.5 Nm)**

***Loosen bolts evenly 180° (1/2 turn)**

***Torque bolts to 11 ft. lbs. (14.7 Nm)**

***From this point, tighten bolts evenly 90° (1/4 turn)**

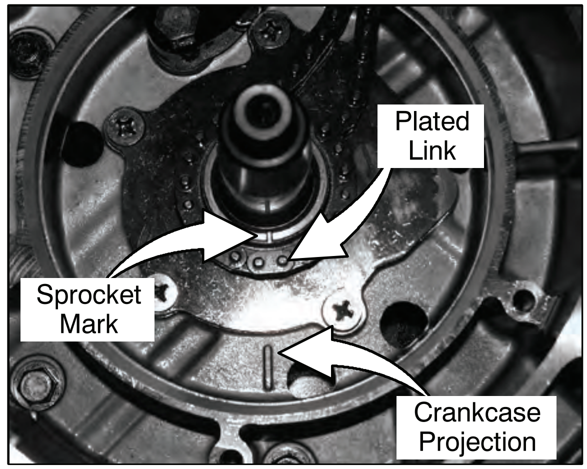
***Finally, tighten another 60° (1/6 turn)**

Torque 6mm case bolts to 5-6.5 ft. lbs. (7-9 Nm)

CAM CHAIN/CAMSHAFT INSTALLATION

CAUTION: Serious engine damage may result if the camshaft is not properly timed to the crankshaft.

Install the cam chain over the crankshaft.



IMPORTANT CAMSHAFT TIMING NOTE: In order to time the camshaft to the crankshaft, the piston must be precisely located at Top Dead Center (TDC). This can be accomplished using one of two methods.

When the stator assembly is removed, follow the procedure outlined in Method 1. This method uses the cam chain plate links to time the camshaft and the dot on the cam chain drive sprocket to establish TDC (see below, Method 1). It is important to note that this method can only be used when the stator is removed and the cam chain drive sprocket is in view. The plate links *are not* used to time the camshaft when the flywheel is installed.

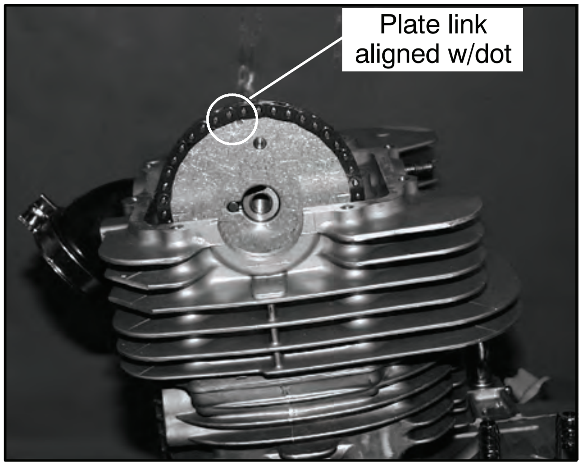
When the stator assembly is installed, use Method 2. This method establishes accurate Top Dead Center (TDC) by aligning the single mark on the flywheel with the notch in the timing inspection hole (see Method 2, Page 3.40). The camshaft sprocket alignment marks are parallel to the gasket surface, the alignment pin faces to the intake side, and camshaft lobes are pointing down.

Camshaft Installation - Timing Method 1 Refer to Illustration Page 3.39

If the stator assembly is removed: **NOTE:** Use this method only when the stator is removed and cam chain drive sprocket is in view.

1. Rotate the crankshaft until the mark on the cam chain drive sprocket is aligned with the crankcase projection (mark facing downward).
2. Align the single plated link on the cam chain with the marked tooth of the cam chain drive sprocket. Use a wire to pull the chain up through the cylinder and cylinder head, and secure it to hold the chain in place.

3. Apply Polaris Low Temp Grease (**PN 2870577**), or engine assembly lubricant to the camshaft main journals and cam lobes. Lubricate automatic compression release mechanism with clean engine oil. (To install the compression release mechanism, refer to Page 3.14).



4. Install the camshaft with the lobes facing downward and the sprocket alignment pin facing toward intake.
5. Disconnect the wire from the cam chain and install the cam sprocket with the dot facing outward.
6. Loop the cam chain over the cam sprocket, aligning the plated link on the chain with the dot on the sprocket.
7. Install the sprocket on the camshaft. Apply Loctite™ 242 (**PN 2871949** to the cam sprocket bolt and torque to specifications.

Cam Sprocket Bolt Torque:
25-29 ft. lbs. (34-40 Nm)

8. Check all cam timing marks to verify proper cam timing, and install the cam chain tensioner. See Cam Chain Tensioner Installation Page 3.41. **NOTE:** The plate links will not align after engine is rotated.

Camshaft Installation - Timing Method 2 Refer to Page 3.40

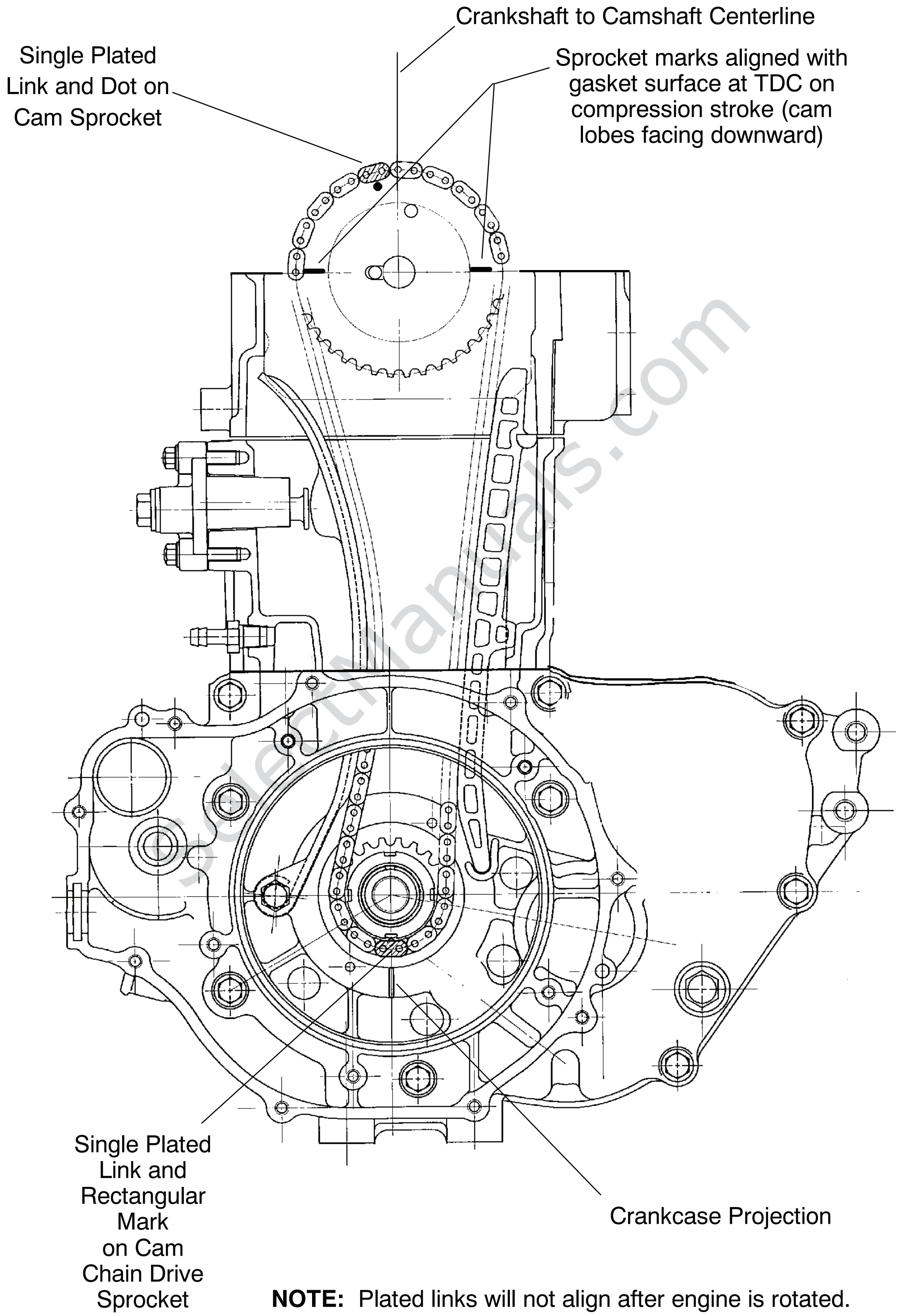
1. Apply Polaris Low Temp Grease (**PN 2870577**), or molybdenum disulfide grease to the camshaft main journals and cam lobes. Lubricate automatic compression release mechanism with clean engine oil. (To install the compression release mechanism, refer to Page 3.18).
2. Install the camshaft with the lobes facing downward and the sprocket alignment pin facing toward intake.
3. Disconnect the wire from the cam chain and rotate the engine to align the single (TDC) timing mark (Top Dead Center) on the flywheel with the notch in the timing inspection window. Be sure to use the *single* TDC mark when installing the cam. Do not use the advance marks.
4. Loop the cam chain onto the cam sprocket with the dot on the sprocket facing outward and the alignment marks parallel with gasket surface.
5. Before positioning the sprocket on the camshaft, check the position of the cam sprocket alignment pin. When the cam is positioned properly, the cam sprocket alignment pin is facing to the intake side.
6. Install the sprocket on the camshaft. Apply Loctite™ 242 (**PN 2871949**) to the cam sprocket bolt and torque to specifications.

Cam Sprocket Bolt Torque:
25-29 ft. lbs. (34-40 Nm)

7. Check all cam timing marks to verify proper cam timing, and install the cam chain tensioner body with a new gasket.
8. After tensioner installation, rotate engine at least two revolutions and re-check marks/timing.

CAMSHAFT TIMING - METHOD 1

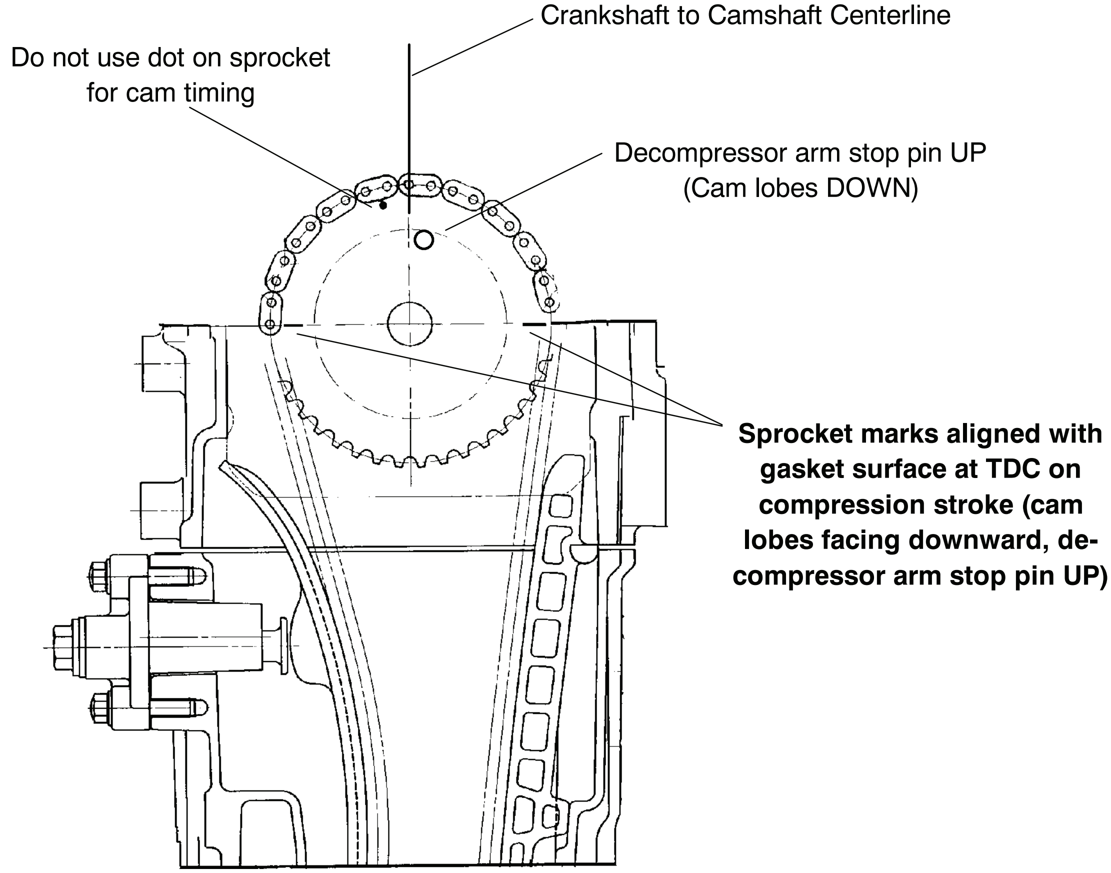
Method 1 - Camshaft Timing with Stator Removed

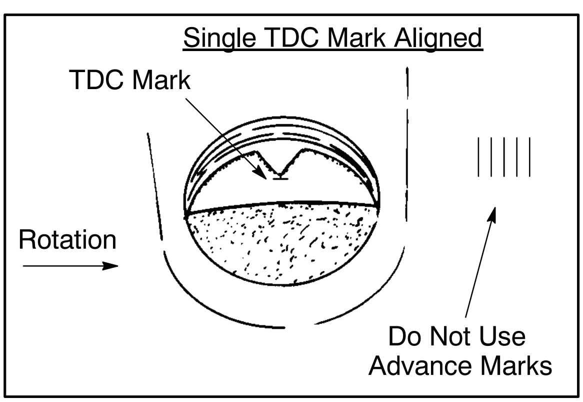


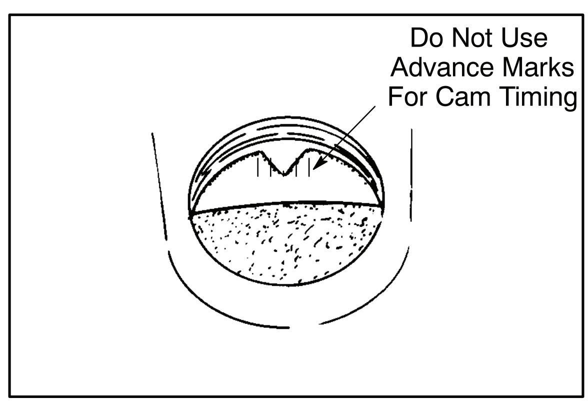
NOTE: Plated links will not align after engine is rotated.

CAMSHAFT TIMING - METHOD 2

Method 2 - Camshaft Timing Using Flywheel TDC Mark







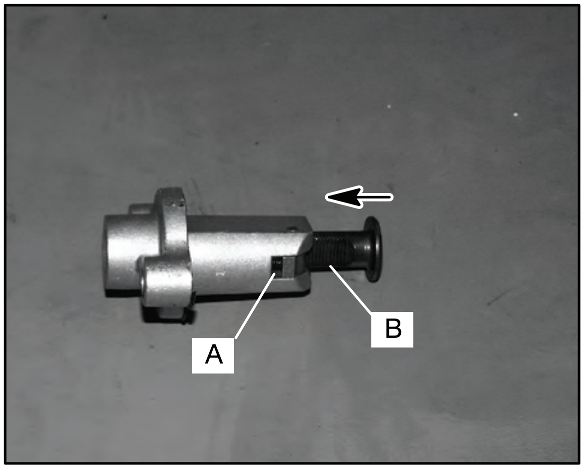
Cam Timing

(View through timing inspection hole)

Position crankshaft at TDC

CAM CHAIN TENSIONER INSTALLATION

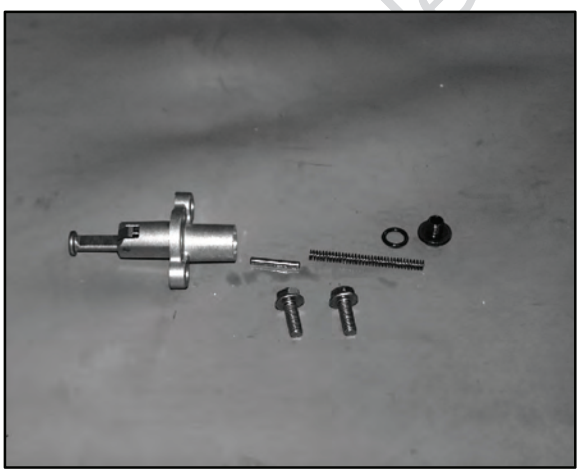
1. Release the ratchet pawl (A) and push the tensioner plunger (B) all the way into the tensioner body.



2. Install the tensioner body with a new gasket and tighten the bolts to specification.

Tensioner Bolt Torque:
8-10 ft. lbs. (11-14 Nm)

3. Install the spring, pin, new sealing washer, and tensioner plug. Torque plug to specification.



Tensioner Plug Torque:
14-19 ft. lbs. (20-25 Nm)

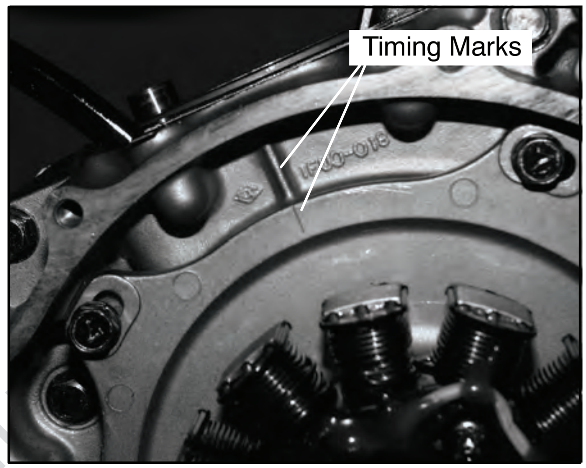
4. Slowly rotate engine two to three revolutions and re-check cam timing once chain is tight.

STATOR INSTALLATION

NOTE: The stator, flywheel, starter drive, and recoil can be assembled with the engine in the frame.

Stator

1. Apply a light film of grease to the crankshaft seal. Apply molybdenum disulfide grease or assembly lubricant to the crankshaft bushing.



2. Apply Crankcase Sealant (**PN 2871557**) to the stator plate outer surface and install a new O-Ring.
3. Install the stator plate being careful not to damage the seal. Align timing reference marks on the plate and crankcase. Be sure the plate is fully seated.
   NOTE: This is a static timing mark. Strobe timing should be performed after start up.
4. Torque bolts evenly to specification.

Stator Plate Bolt Torque:
5-6.5 ft. lbs. (7-9 Nm)

5. Seal stator wire grommet with Crankcase Sealant (**PN 2871557**).

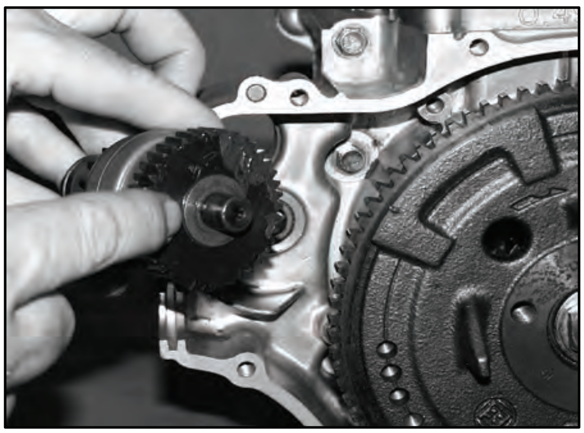
FLYWHEEL INSTALLATION

1. Install flywheel, washer, and nut. Torque flywheel to specification.

Flywheel Nut Torque:
58-72 ft. lbs. (78-98 Nm)

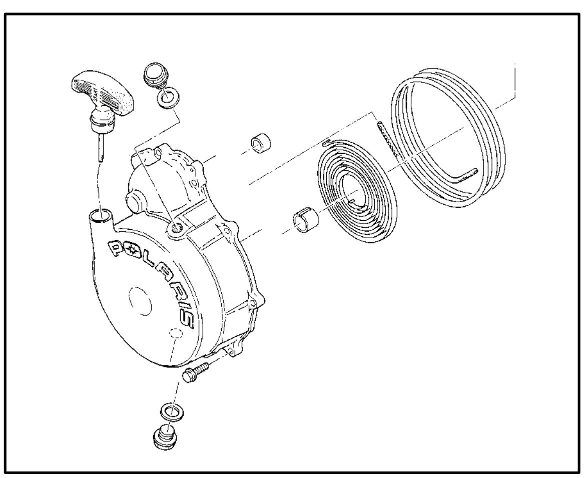
STARTER DRIVE ASSEMBLY

1. Be sure the washer is positioned on the back of the drive gear.



Starter Drive Grease:
(PN 2871460)

2. Apply Starter Drive Grease (**PN 2871460**) to the drive bushing in the crankcase and all moving surfaces of the starter drive mechanism. Install the starter drive.



3. Install recoil housing.

ROCKER SHAFT/ARM INSTALLATION

1. Assemble rocker arms, rocker shaft and wave washer into rocker cover.
2. Install and tighten rocker shaft block plug.
3. Apply engine assembly lube to the cam lobes and cam follower surfaces.
4. Rotate the engine until the cam lobes are pointing downward.
5. Apply clean engine oil liberally to the valve springs, cam chain, rocker arms, and camshaft.
6. Apply Crankcase Sealant (**PN 2871557**) to the rocker cover mating surfaces. Be sure the alignment pins are in place.
7. Install the rocker cover assembly.
8. Install rocker cover bolts and torque to specifications.

Rocker Cover Bolt Torque:
7-8 ft. lbs. (9-11 Nm)

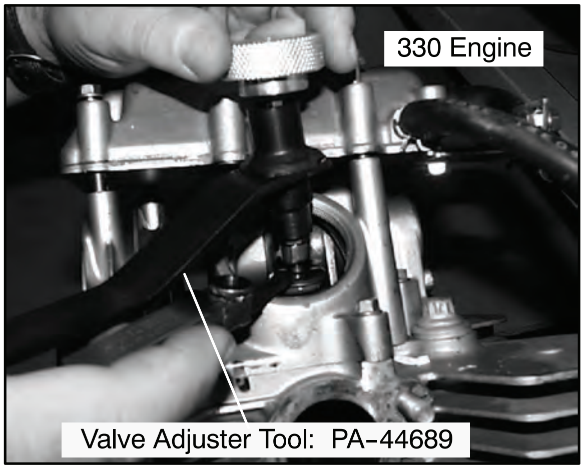
9. Adjust valves according to the “INTAKE VALVE CLEARANCE PROCEDURE” on next page.
10. Install rocker cover block plug.

Rocker Cover Block Plug Torque:
39-44 ft. lbs. (53-59 Nm)

11. Install valve adjustment caps with new o-rings. Tighten securely.

INTAKE VALVE CLEARANCE ADJUSTMENT

1. Insert a .006″ (.15mm) feeler gauge between end of intake valve stem and clearance adjuster screw.
2. Using Valve/Clutch Adjuster Tool **(PN PA-44689)**, loosen adjuster lock nut and turn adjusting knob until there is a slight drag on the feeler gauge.



3. Hold adjuster screw and tighten adjuster lock nut securely.
4. Re-check the valve clearance.
5. Repeat adjustment procedure if necessary until clearance is correct with locknut secured.

EXHAUST VALVE CLEARANCE ADJUSTMENT

1. Insert .006″ feeler gauge(s) between end of exhaust valve stem and adjuster screw(s).
2. Loosen locknut(s) and turn adjuster screw(s) until there is a slight drag on feeler gauge(s).

NOTE: The 330 exhaust valve is adjusted the same as the intake valve. The Valve/Clutch Adjuster Tool **(PN PA-44689)** can be used to adjust the 330 engines valves.

3. When clearance is correct, hold adjuster screw and tighten locknut securely
4. Re-check the valve clearance.
5. Repeat adjustment procedure if necessary until clearance is correct with locknut secured.

INTAKE VALVE CLEARANCE
330 Engines

.006″ (.15 mm)

6. 330: Inspect o-rings on the plastic valve plugs, replace if damaged. Securely fasten valve plugs.
7. Scrape gasket surfaces to remove all traces of the old gasket.
8. Remove the shop towel from the spark plug cavity.
9. Install the spark plug. Torque to 9-11 ft. lbs. (11-14 Nm).
10. Install the spark plug high tension lead.
11. Install parts removed for access.

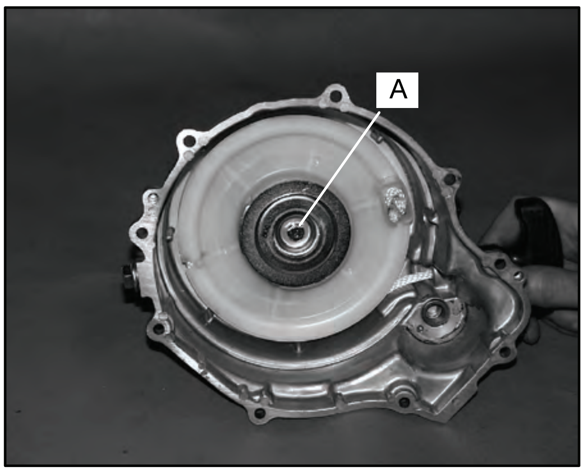
330 Engine
Spark Plug Torque: 9-11 ft. lbs. (12-14 Nm)

RECOIL DISASSEMBLY/INSPECTION

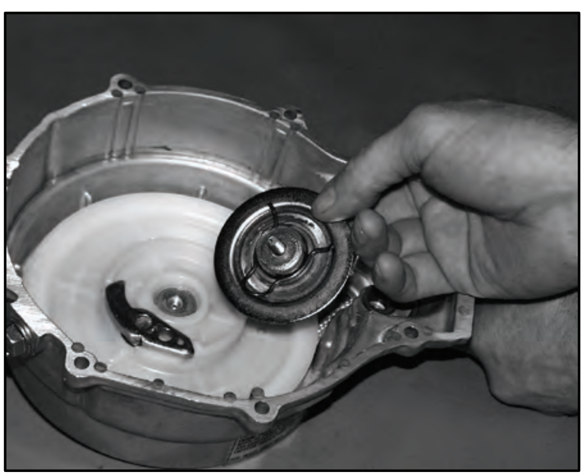
CAUTION: Recoil is under spring tension. A face shield or eye protection is required during this procedure**.**

Replace any parts found to be worn or damaged.

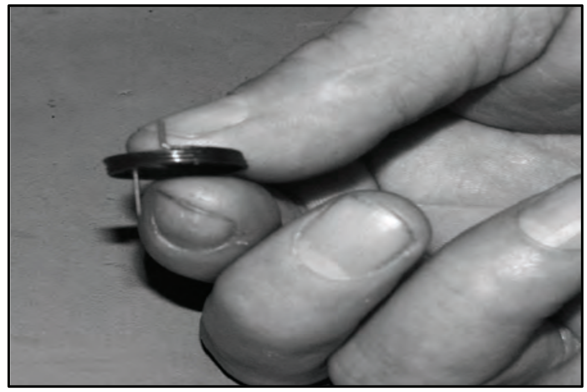
1. Remove bolts and recoil housing from engine.
2. Pull recoil rope so it is extended approximately 12-18″.Check handle c-ring for proper tension and the handle for cracks or damage which may allow water or dirt to enter the recoil housing.
   NOTE: The handle must seal tightly on the recoil housing to prevent water and dirt from entering.
3. Remove center bolt from recoil friction plate (A).



4. Inspect plate for wear or damage. Inspect plate friction spring for wear, damage, and proper tension. The spring should fit tightly on friction plate.

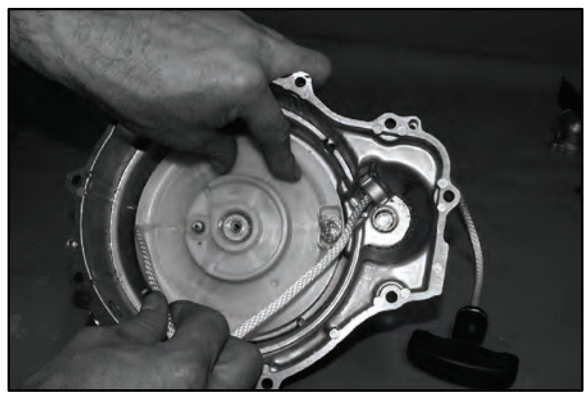


5. Remove ratchet pawl with spring and inspect. Replace spring or ratchet pawl if worn, broken, or damaged.

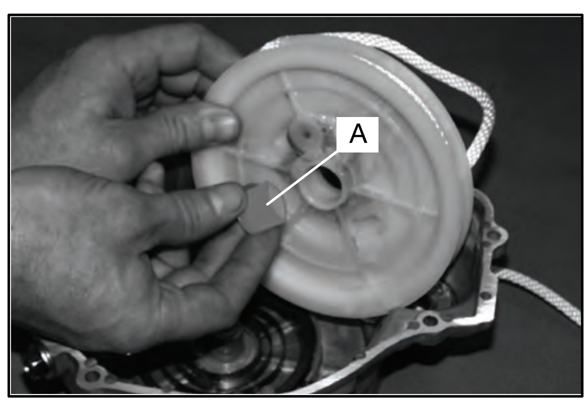


NOTE: Long arm of spring engages reel. Short end rests against pawl.

6. Hold reel firmly in housing. Pull rope handle until 12-18″ of rope is exposed, and hold reel in place.



7. Place rope in notch on outer edge of reel. Release tension on hub and allow reel to unwind approximately 6-7 turns until spring tension is released.
8. Slowly and carefully remove reel from recoil housing making sure the spring remains in the housing. Inspect the reel hub and bushing (A) for wear.



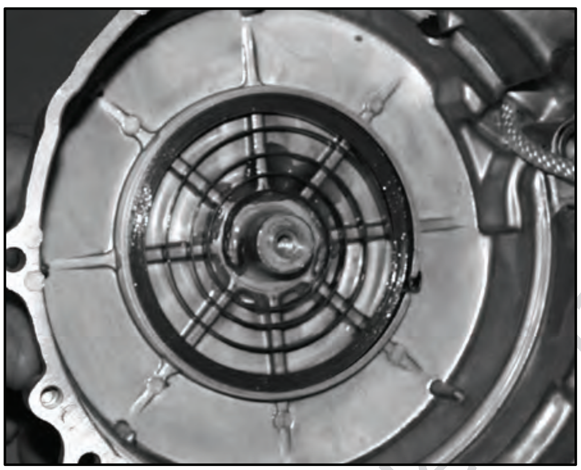
9. Unwind rope and inspect for cuts or abrasions.
10. Inspect drive tab on hub return spring for damage. To remove hub return spring, hold outer coils in place with one hand and slowly remove spring one coil at a time from the inside out.
11. Pull knot out of of recoil reel. Untie knot. Remove rope from reel.

RECOIL ASSEMBLY

CAUTION: Recoil is under spring tension. A face shield or eye protection is required during this procedure.

To install a new spring:

1. Place spring in housing with the end positioned so the spring spirals inward in a counterclockwise direction. See photo.



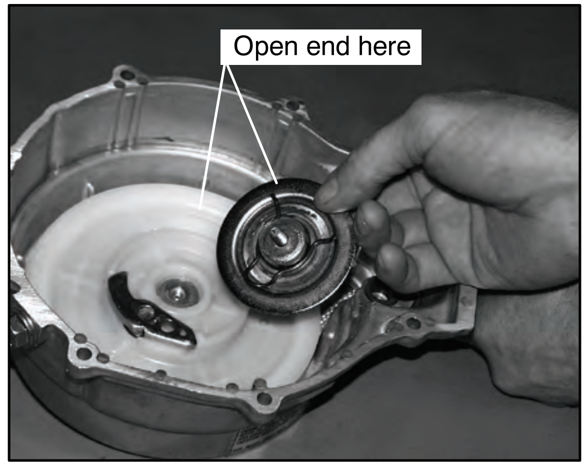
2. Hold spring in place and cut retaining wire.

To reinstall an old spring:

1. Hook outer tab in place in recoil housing and wind spring in a counterclockwise direction one coil at a time while holding the installed coils in place.
2. Lubricate the spring with light lubricant such as Premium All Season Grease.

To complete recoil assembly:

1. Route rope through guide bushing in recoil housing and into reel. Tie a secure knot in end of the rope.
2. Wind rope counterclockwise onto the reel, as viewed from ratchet side of reel.
3. Lock rope into notch on outer edge of reel.
4. Apply a small amount of grease or equivalent to the center post of the housing and the bushing.
5. Install reel into housing making sure the spring drive tab on the reel engages the spring and the reel is fully seated in the housing.



6. Apply downward pressure on the reel and rotate counterclockwise approximately 6-7 turns to pre-wind the spring. Continue rotating counterclockwise until rope on outer edge aligns with rope guide bushing.
7. Release rope from notch and allow reel to rewind completely. If more pre-wind is required, place rope in notch and add additional turns of pre-wind.
8. Install ratchet pawl and return spring, with long leg of spring engaged in reel.
9. Reinstall friction plate.
   NOTE: The friction plate must be positioned with both end tabs of the friction spring opposite the ratchet pawl.
10. Torque friction plate retaining bolt to 5-6 ft. lbs. (7-9 Nm).
11. Apply Crankcase Sealant (**PN 2871557**) to the recoil housing outer edge. Reinstall recoil housing. Seal stator wire harness grommet with RTV silicone.

SPARK PLUG FOULING TROUBLESHOOTING

- 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 pins)
- Loose jets in carburetor or calibration incorrect for altitude/temperature
- Incorrect float level setting
- PVT system calibrated incorrectly or 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
- Restricted oil tank vent

TROUBLESHOOTING

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
- Carb starter circuit
- Engine flooded
- Low compression (high cylinder leakage)
- No spark (Spark plug fouled)

Engine Does Not Turn Over

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

Engine Runs But Will Not Idle

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

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 Lobe worn

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 lobe worn

TROUBLESHOOTING

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
- Worn rings, piston, or cylinder
- Worn valves, guides or seals
- Restricted breather
- Air filter dirty or contaminated

Low Compression

- Decompressor stuck
- Cylinder head gasket leak
- No valve clearance or incorrectly adjusted
- 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 valve area)
- Rocker arm sticking

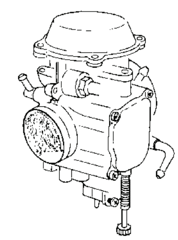
Backfiring

- ETC or speed limiter system malfunction
- Fouled spark plug or incorrect plug or plug gap
- Carburetion faulty - lean condition
- Intake / 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
- System wiring wet
- Cam lobe worn or Valve sticking
- Lean condition

NOTES

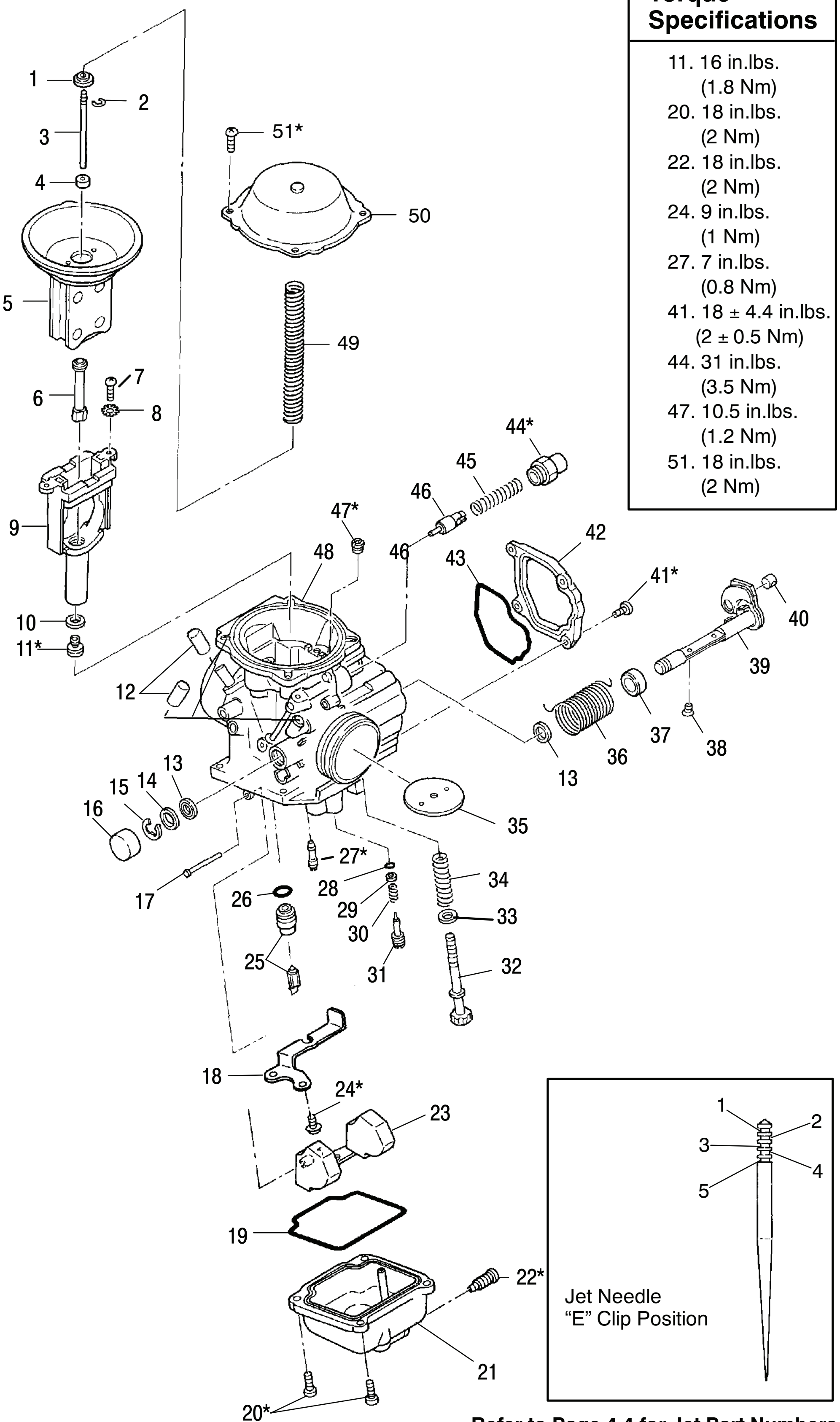
CHAPTER 4

FUEL/CARBURETION



BST 34 CARBURETOR EXPLODED VIEW

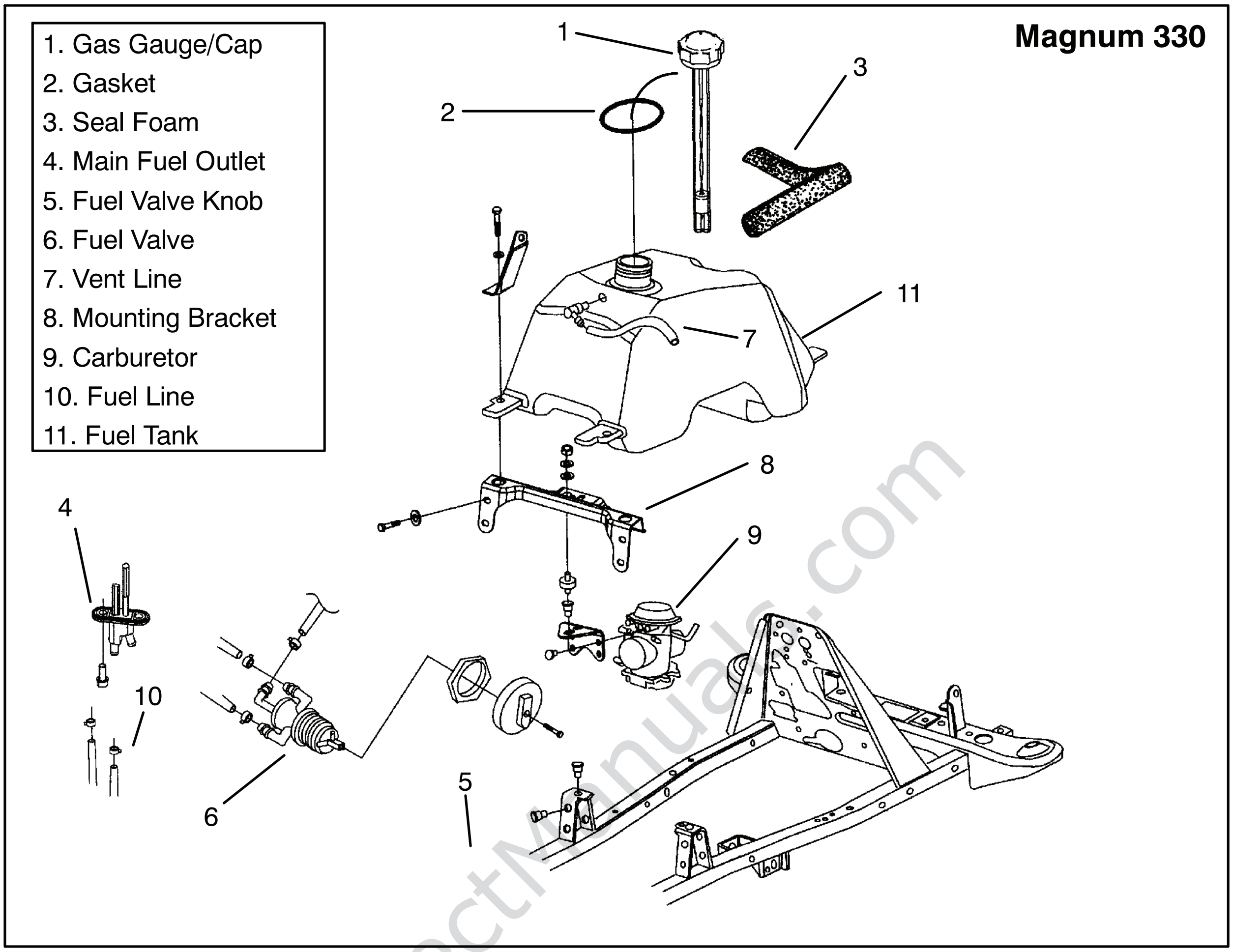
Torque Specifications
11. 16 in.lbs. (1.8 Nm)
20. 18 in.lbs. (2 Nm)
22. 18 in.lbs. (2 Nm)
24. 9 in.lbs. (1 Nm)
27. 7 in.lbs. (0.8 Nm)
41. 18 ± 4.4 in.lbs. (2 ± 0.5 Nm)
44. 31 in.lbs. (3.5 Nm)
47. 10.5 in.lbs. (1.2 Nm)
51. 18 in.lbs. (2 Nm)

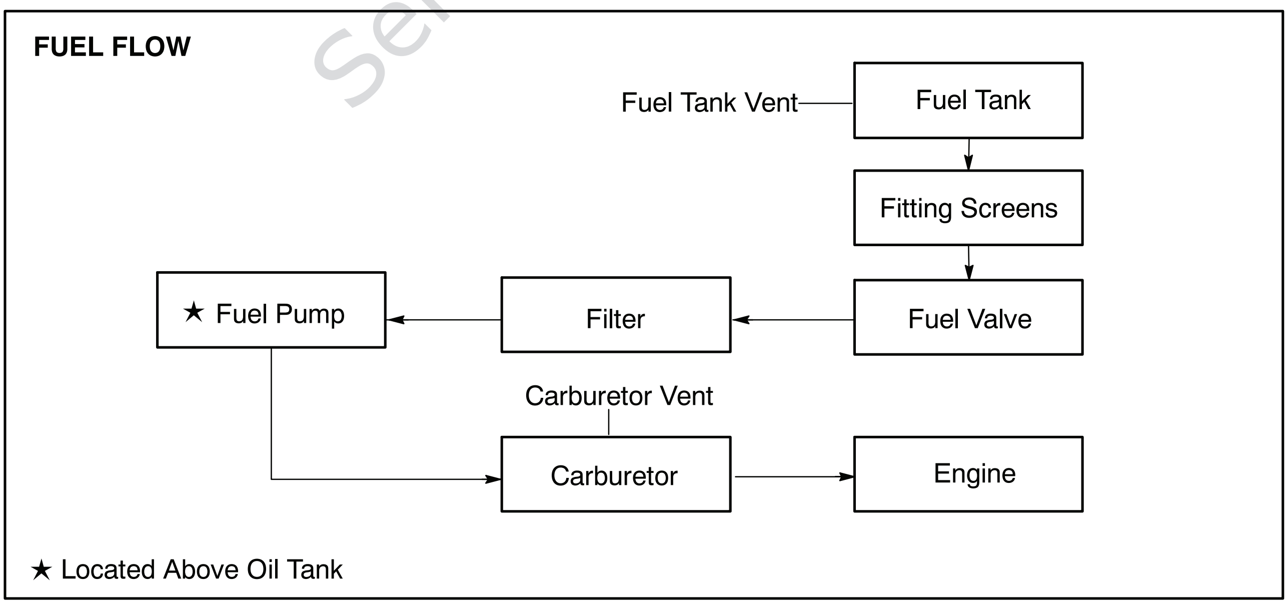


Refer to Page 4.4 for Jet Part Numbers

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





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 jetting charts 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 below.
4. Clutching changes may also be required for changes in elevation. Refer to clutching chart in Chapter 1 for recommendations.

MIKUNI JET PART NUMBERS

Main Jets

Jet Number	Part Number
112.5	**3130554**
115	**3130555**
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**

Pilot Jets

Jet Number	Part Number
40.0	**3130624**
42.5	**3130526**

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

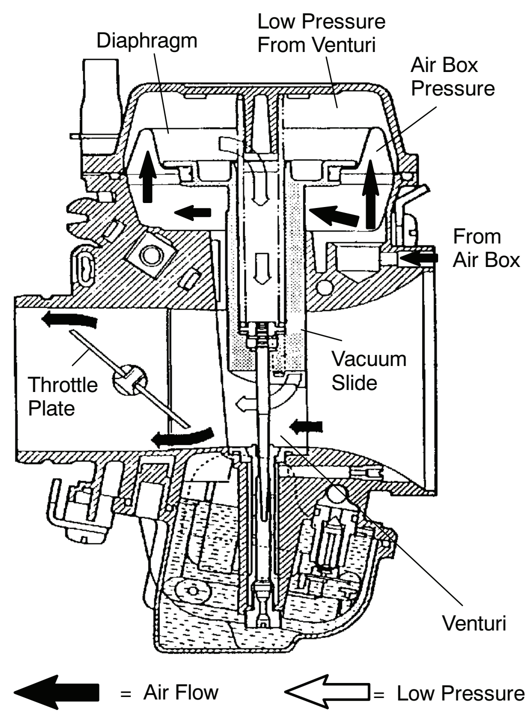
VENT SYSTEMS - CV CARBURETOR

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

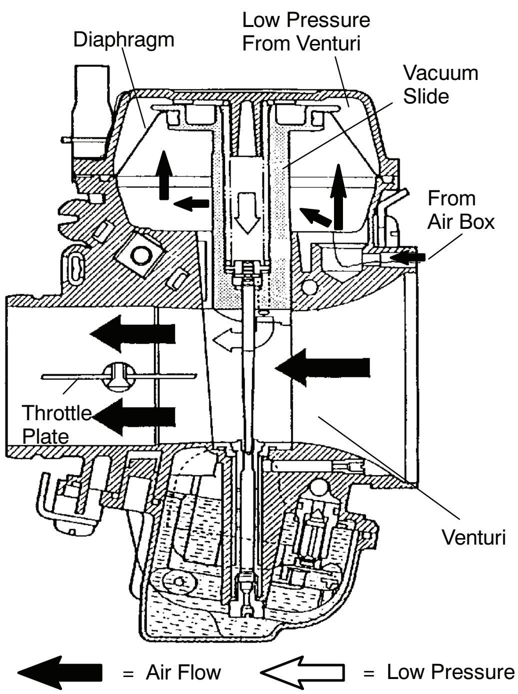
The constant velocity carburetor incorporates a mechanically operated throttle plate and a vacuum controlled slide valve (vacuum slide). The venturi cross-sectional area in the carburetor bore is increased or decreased automatically by the vacuum slide, which moves according to the amount of negative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

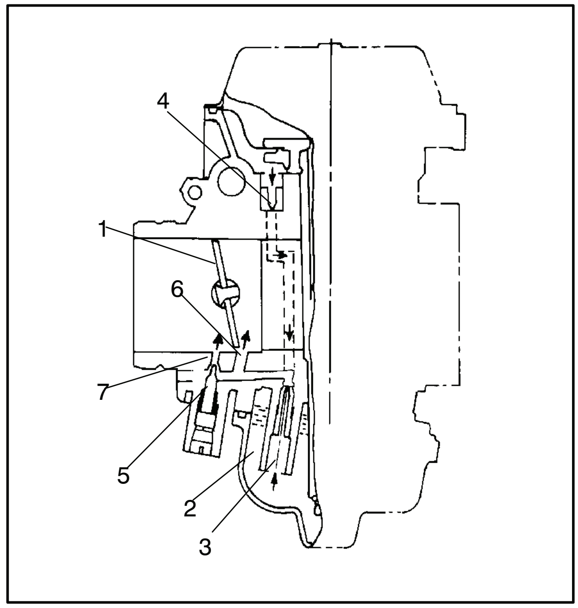
When the throttle plate is opened and engine speed begins to increase, the pressure in the venturi (and therefore in the chamber above the diaphragm) becomes significantly lower than atmospheric. Atmospheric pressure in the chamber below the diaphragm forces the diaphragm upward, raising the slide against 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.

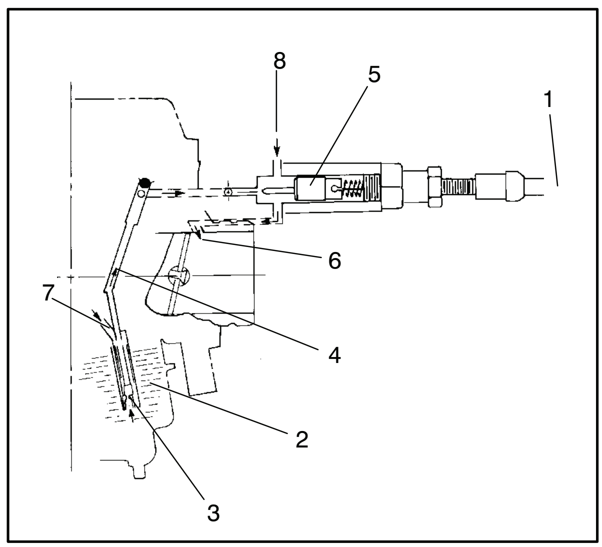
PILOT (IDLE AND SLOW) SYSTEM

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)

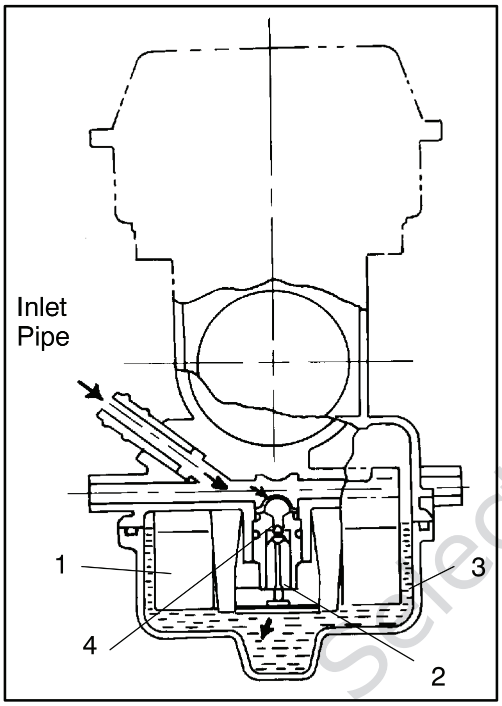
When the choke cable (1) is activated, the starter plunger (5) is lifted off the seat.



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.

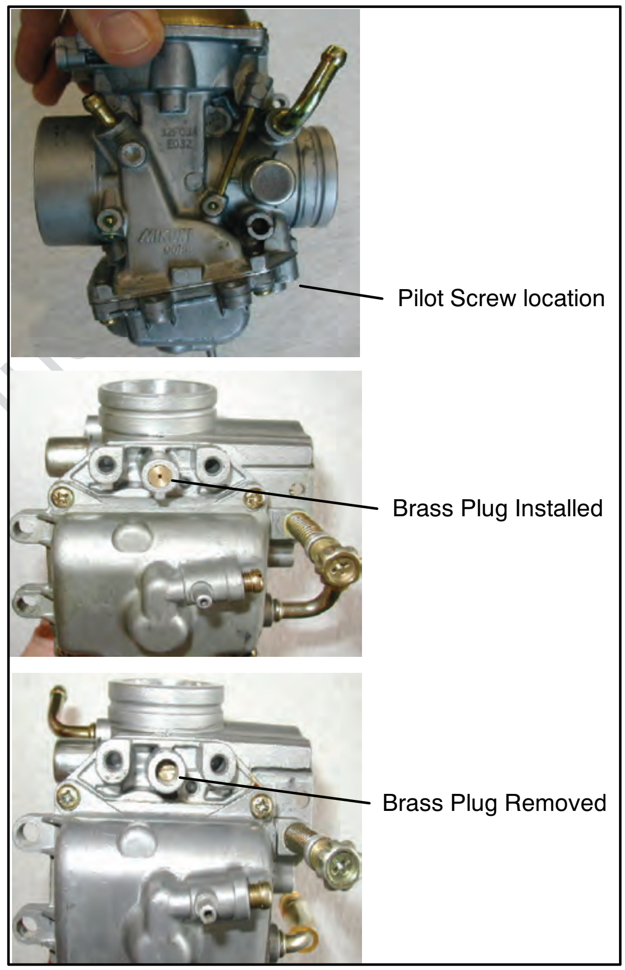


PILOT SCREW

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.

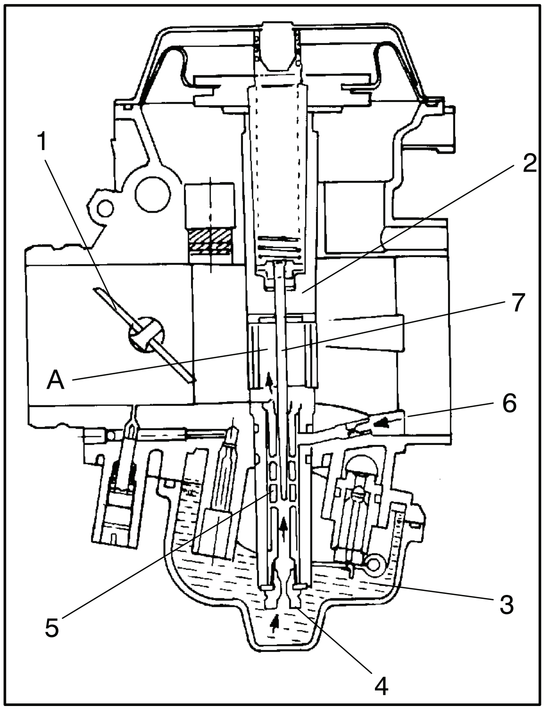
CAUTION:

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.



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.

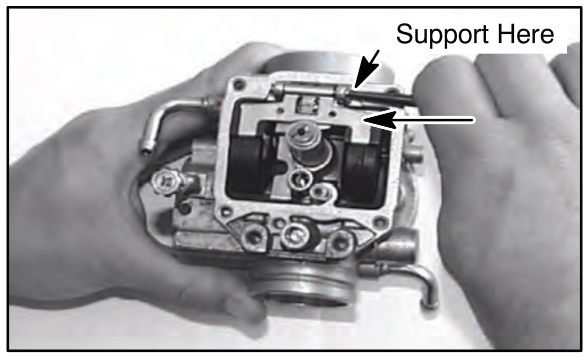


CARBURETOR DISASSEMBLY - MIKUNI CV

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

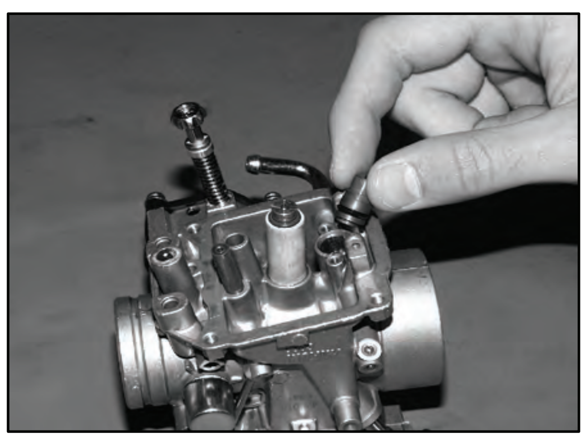
1. Remove carburetor diaphragm chamber cover with a ratchet style screwdriver. DO NOT use an impact driver to remove the screws or carburetor may be permanently damaged.

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



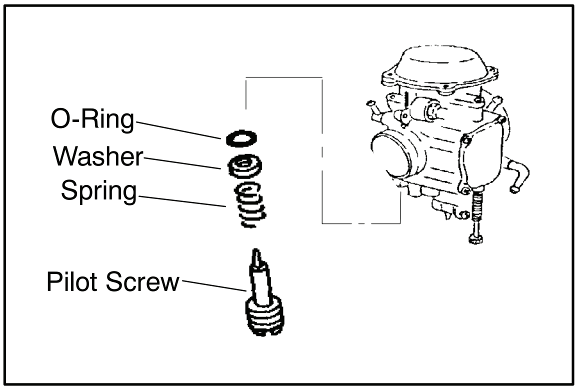
NOTE: Be careful not to damage the float pin tower during the float pin removal. Support the float pin tower while removing the float pin. This helps to prevent the float pin towers from breaking off.

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.

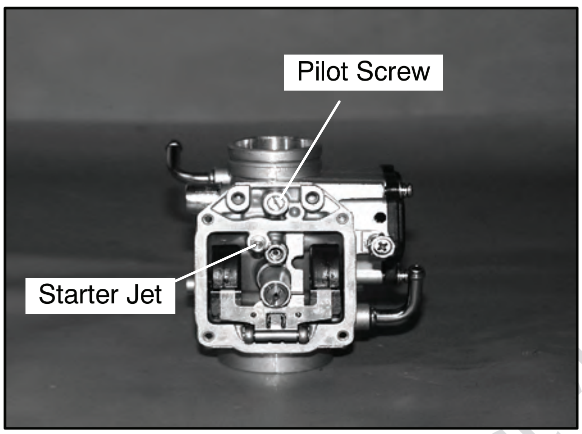


4. Remove the pilot mixture screw, spring, flat washer, and O-Ring. If an anti-tamper plug is installed over the pilot screw cavity, it must be

removed for access.



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



CARBURETOR CLEANING

WARNING

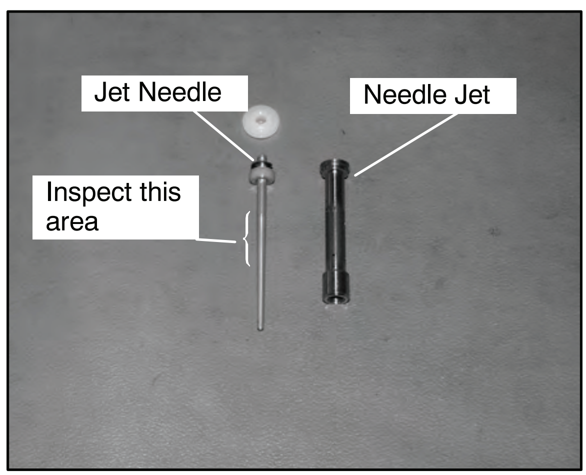
Protect eyes from contact with cleaner. Take appropriate safety measures during these procedures. Safety glasses and chemical resistant gloves are required. Should you get cleaner in your eyes or if you swallow cleaner, seek medical attention immediately.

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.

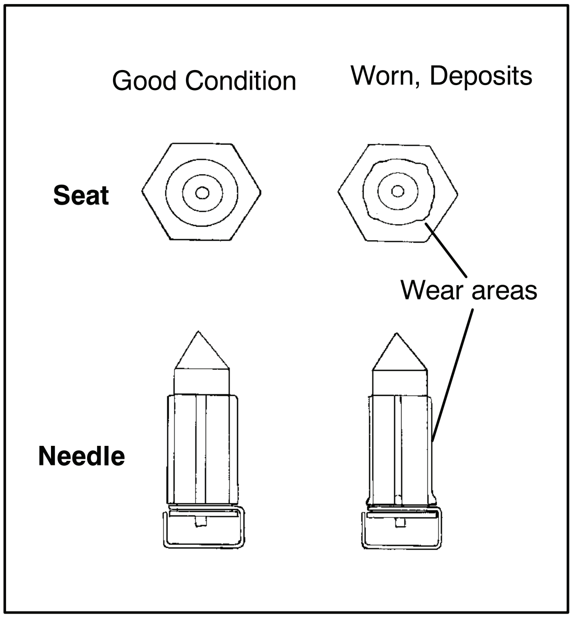
CARBURETOR INSPECTION

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

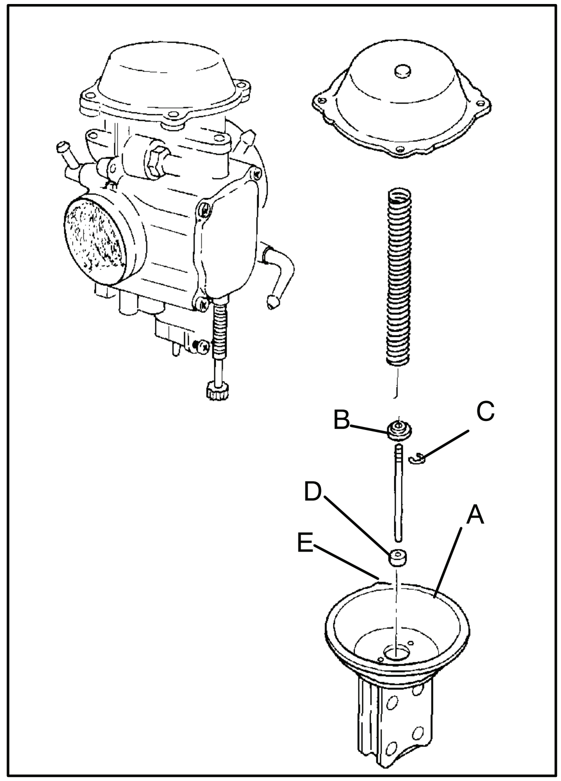
pushed. The inlet needle and seat should be pressure tested after assembly.



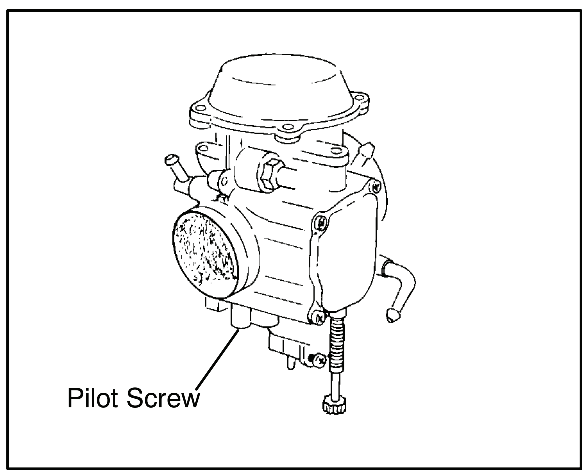
CARBURETOR ASSEMBLY

NOTE: Refer to the exploded view of the BST 34 Carburetor at the beginning of this chapter for torque specifications.

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.

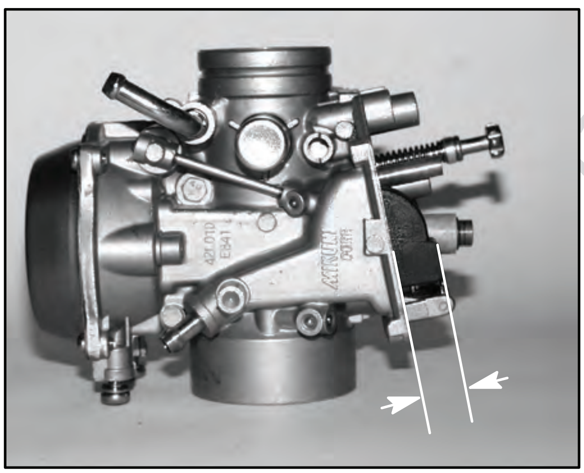


5. Install the pilot mixture screw, spring, washer, and O-ring as an assembly. Lubricate the O-Ring with oil or light grease before installation. **CAUTION:** Do not damage the O-ring during installation. Turn the screw in until it *lightly* contacts the seat. Back out the specified number of turns. **NOTE:** The final pilot (idle) mixture must be adjusted with the engine running. Refer to “IDLE SPEED ADJUSTMENT” in Chapter 2.

Pilot Mixture Screw Base Setting (Set at Factory)

FLOAT HEIGHT ADJUSTMENT

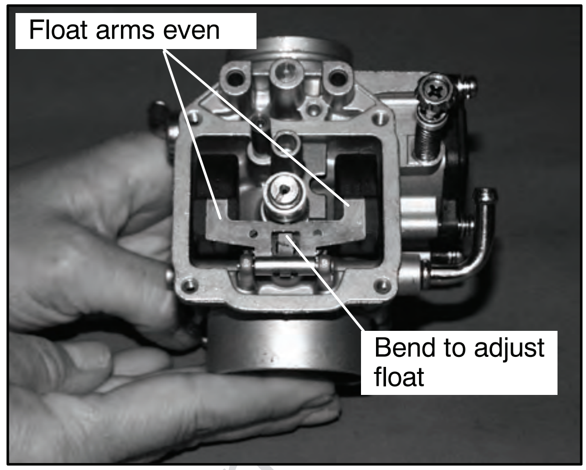
1. Place the carburetor on a level surface as shown at right to remove weight from float arm. In this position, the float tongue will rest lightly on the inlet needle valve pin without compressing the spring.



Float Height:	
Std: BST 34	**13-14 mm (.51-.55 inches)**

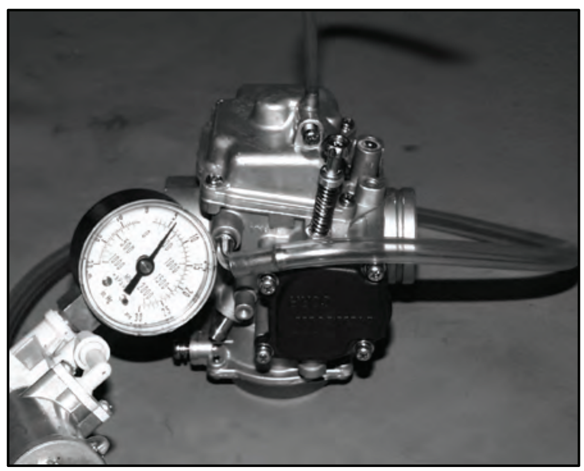
2. Measure the height from the float bowl mating surface to the top of step in float as shown. Both sides of float should be parallel to each other. The measurement should be made at the mid-point on the top of the float using Float Adjustment Tool (**PN 2872314**) or a vernier caliper. When measuring 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.

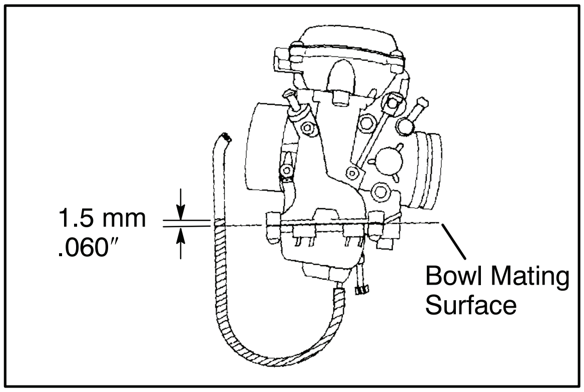


Mity Vac™ (PN 2870975)

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.

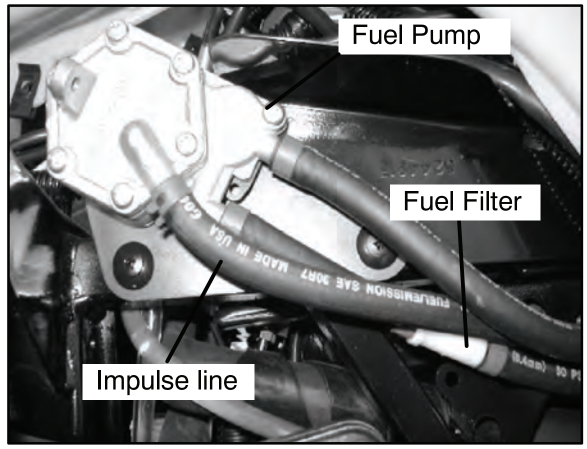
FUEL PUMP

This Polaris ATV 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.



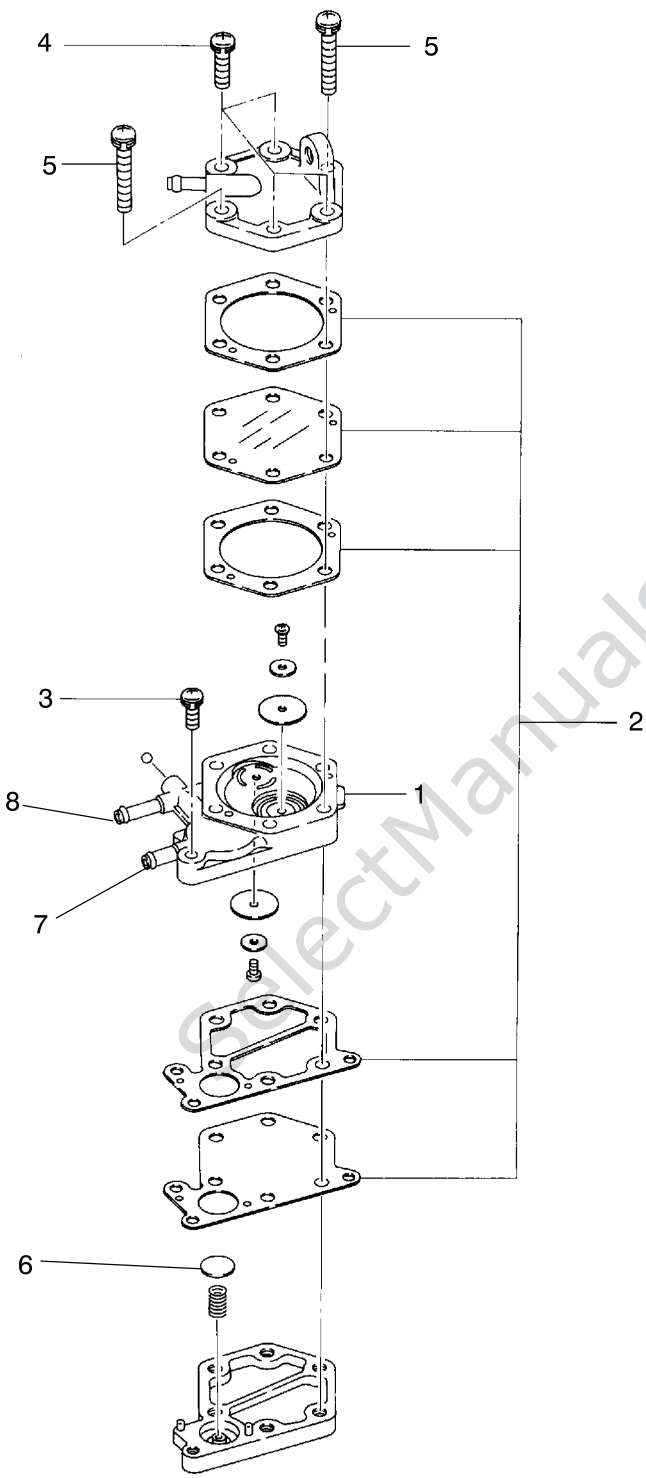
FUEL PUMP DISASSEMBLY

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.

FUEL PUMP EXPLODED VIEW



1. Fuel Pump Assembly
2. Diaphragm, Gasket Set
3. Screw and Washer Assembly
4. Screw and Washer Assembly
5. Screw and Washer Assembly
6. Pressure Regulator
7. Fuel Inlet
8. Fuel Outlet

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

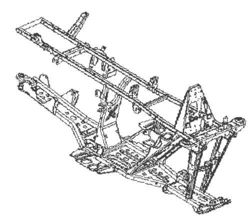
- Choke cable bending or incorrectly adjusted
- Idle speed set incorrectly
- Idle mixture screw misadjusted or damaged
- Belt dragging
- Ignition timing incorrect
- Worn jet needle/needle jet
- Plugged or restricted idle jet

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

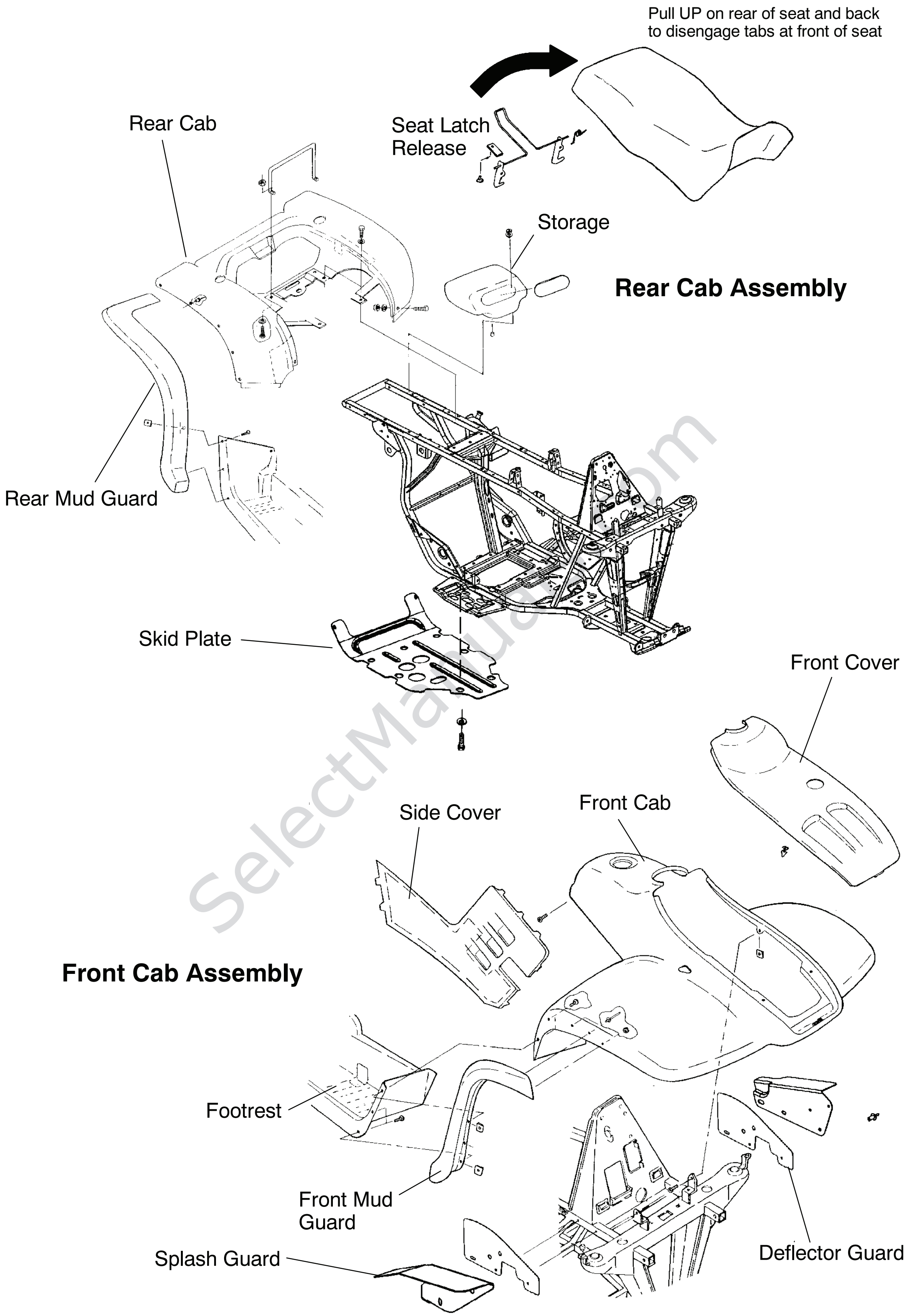
SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2870871	Ball Joint Replacement Tool
2870872	Shock Spanner Wrench
2870623	Shock Absorber Spring Compression Tool
2871572	Strut Rod Wrench
2871573	LH Strut Spring Compressor
2871574	RH Strut Spring Compressor
2871199	Seal Sleeve Installation Tool Kit

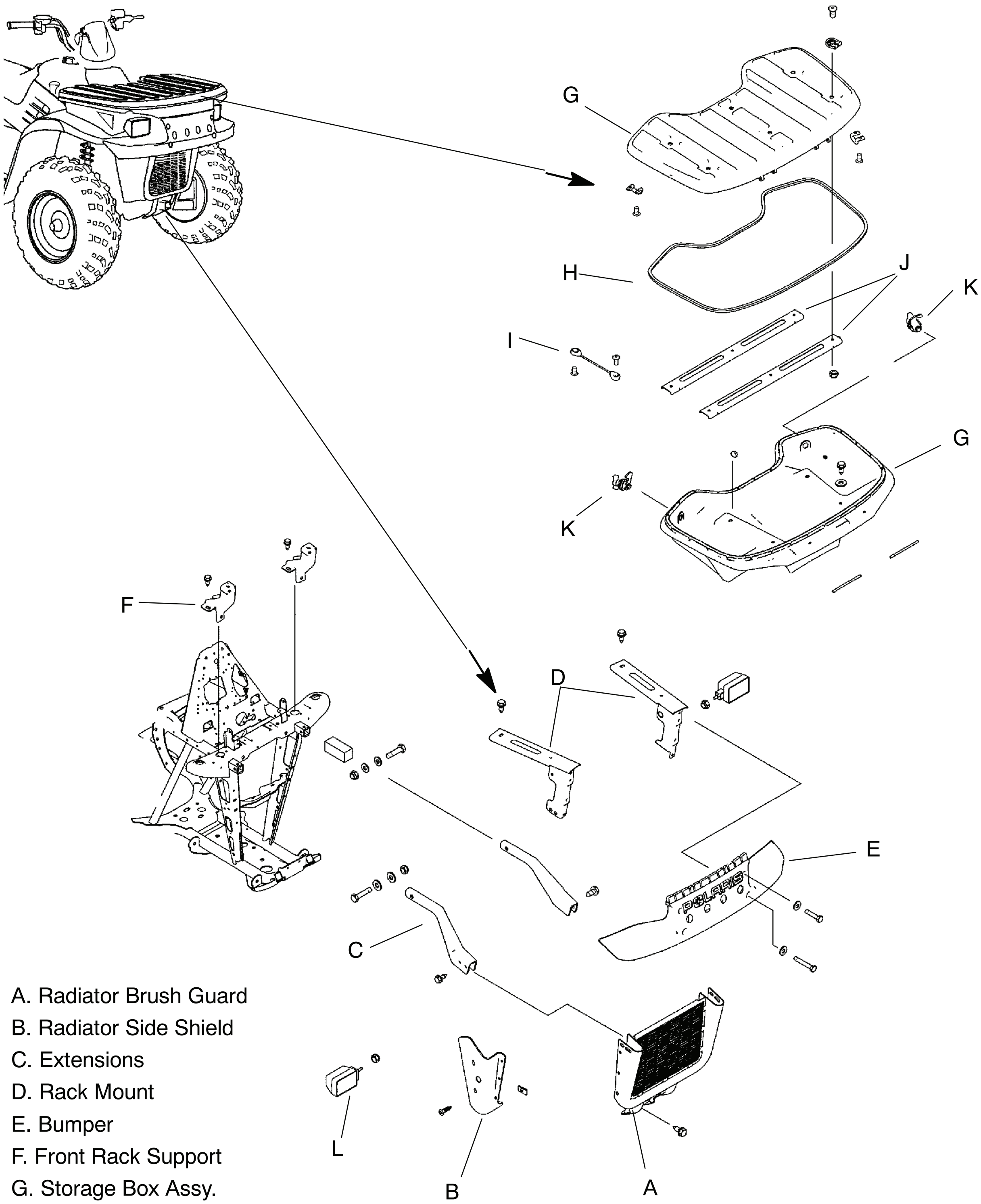
WHEEL, HUB, AND SPINDLE TORQUE TABLE

Model	Item	Specification
Magnum 330 2x4	Front Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Rear Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Front Spindle Nut	40 Ft. Lbs. (54 Nm)
	Rear Hub Retaining Nut	80 Ft. Lbs. (108 Nm)
Magnum 330 4x4	Front Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Rear Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Front Hub Retaining Nut	70 Ft. Lbs. (95 Nm)
	Rear Hub Retaining Nut	80 Ft. Lbs. (108 Nm)

BODY ASSEMBLY EXPLODED VIEW



FRONT BOX ASSEMBLY EXPLODED VIEW - 4X4



A. Radiator Brush Guard
B. Radiator Side Shield
C. Extensions
D. Rack Mount
E. Bumper
F. Front Rack Support
G. Storage Box Assy.
H. Box Seal
I. Box Latch
J. Lid Channel
K. Box Latch
L. Headlight

COVER/PANEL REMOVAL

To remove, perform these steps:

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

Side Panels

- Remove: Seat
- Disengage tabs at front and rear

Speedometer Pod (See Page 5.7)

Front Cover

- Remove: Seat
- Disengage tabs at front and rear
- Lift panel out

Rear Rack

- Remove: Seat
- 2 bolts at rear of rack
- 2 bolts at front of rack

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 mudflap
- 1 screw, nut and washer at rear of inner right footrest
- 4 screws at bottom of right rear mudflap
- 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

Front Rack

- Remove: 4 screws, lock washers, and flat washers

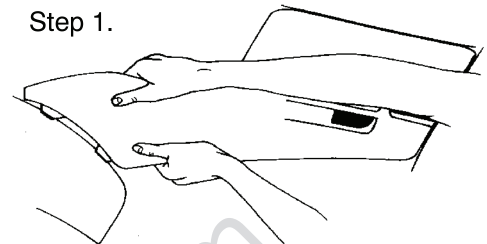
Front Cab Assembly

- Remove: Seat
- Side panels
- 2 screws at rear of cab at fuel tank mount bracket
- Front rack
- Front bumper
- Front cover panel
- 3 screws from bottom left mudflap
- 3 screws from bottom right mudflap
- 1 inner screw from front cab to foot rest on each side
- 2 screws under front panel

SIDE PANEL REMOVAL

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

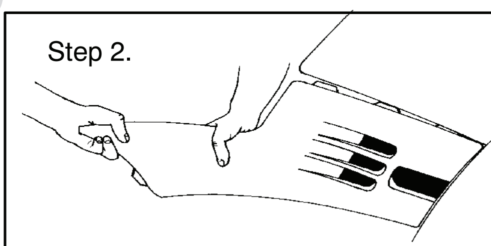
Step 1.



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 tabs. Then pull up on side panel to disengage front tabs.

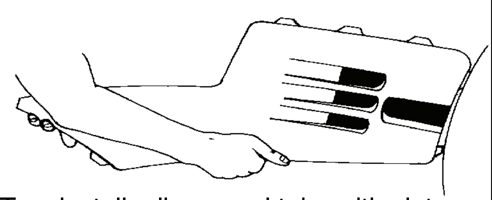
Step 2.



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.

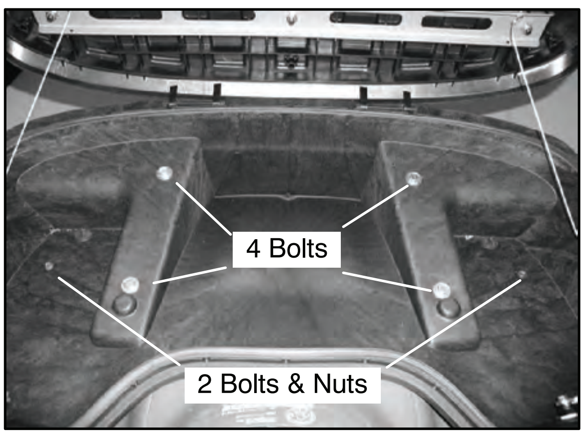


To reinstall, align panel tabs with slots. Push upward and forward until tabs lock.

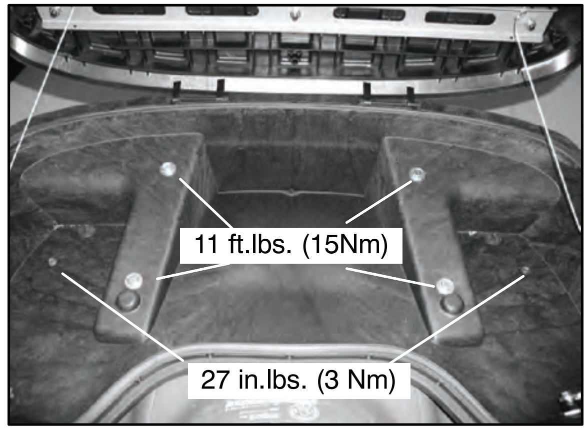
FRONT STORAGE BOX REMOVAL/INSTALLATION (4X4 MODELS)

1. Open the lid of the front storage box.

2. Remove the 4 bolts that mount the box to the frame. Remove the two bolts and nuts that secure the box to the fenders.

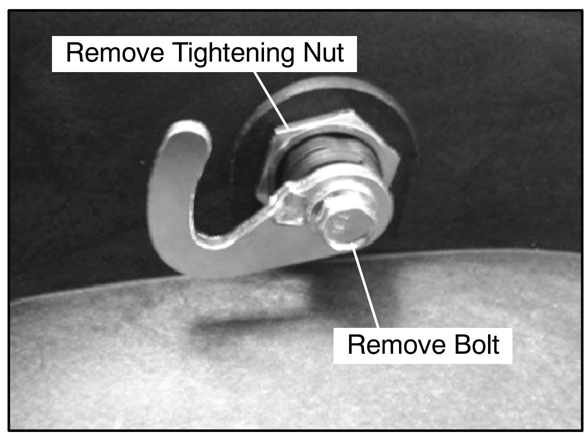


3. Carefully lift the storage box off of the front of the ATV.
4. Reverse the steps Steps 1-3 for storage box installation. Torque the 4 storage box bolts to 11 ft.lbs.(15 Nm) and the two bolts to 27 in.lbs. (3 Nm).

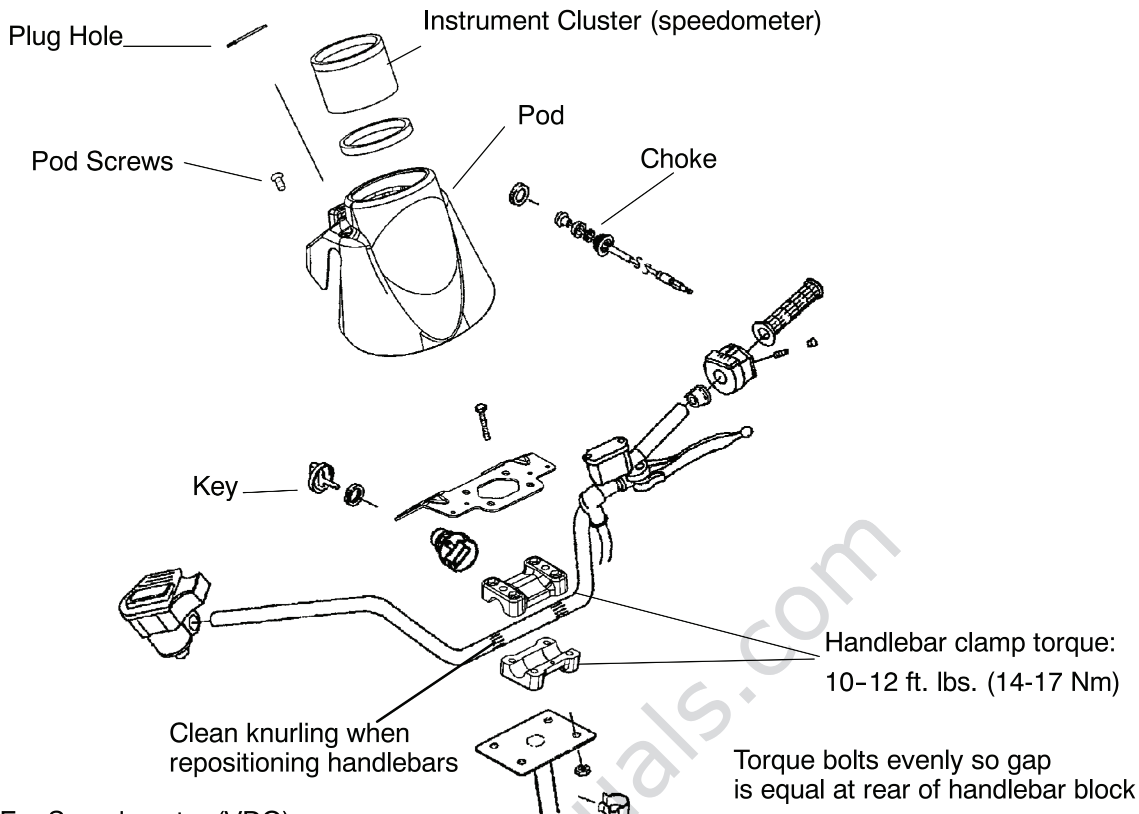


Storage Box Latch Replacement

5. Remove the bolt on the inside of the latch. Remove the tightening nut, then pull the latch assembly out.



POD EXPLODED VIEW – MAGNUM 330



Note: For Speedometer (VDO) removal refer Chapter 10 Electrical Section also.

Disassembly

- Remove two top Phillips screws.
- Lift top half of pod.
- Disconnect speedometer (VDO) cable
- Disconnect light wire cable.
- Remove ignition switch and choke cable.

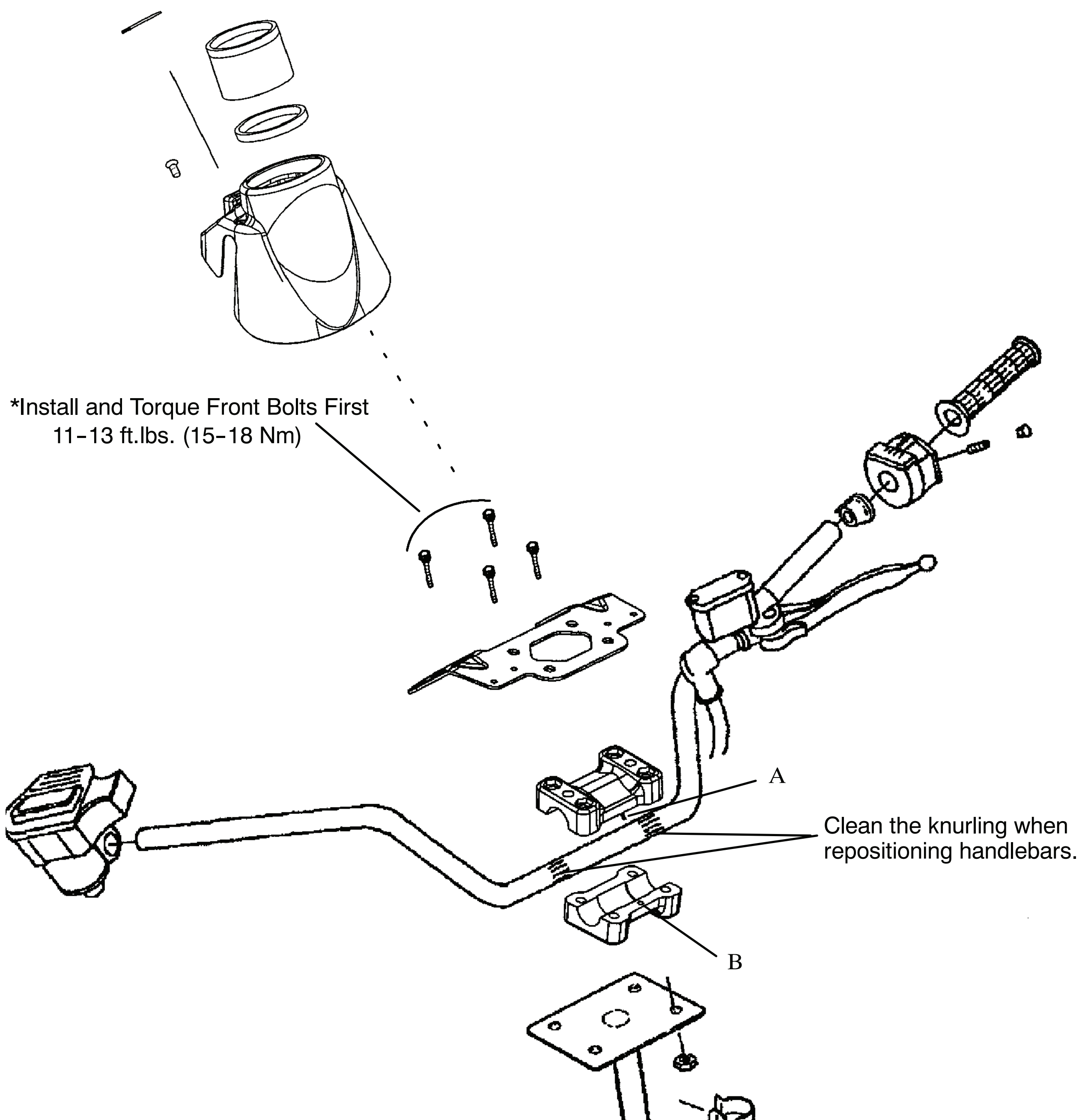
Assembly

- Install key switch and choke cable.
- Connect speedometer (VDO) cable to speedometer.
- Install pod onto mounting bracket.
- Install mounting screws

HANDLEBAR BLOCK INSTALLATION PROCEDURE

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

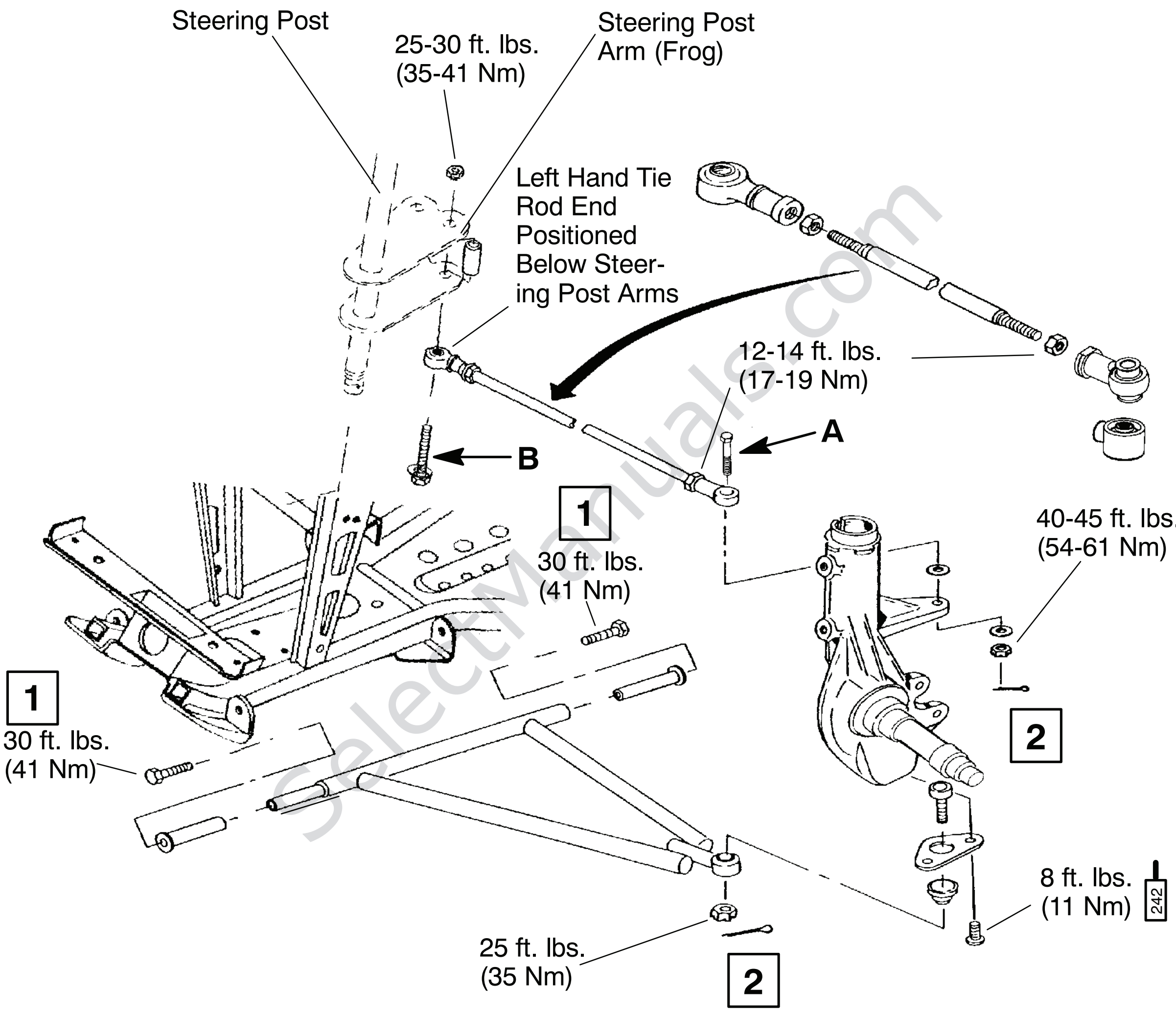
NOTE: There will be a slight gap on the backside of the blocks after the procedure is performed.



STEERING ASSEMBLY, EXPLODED VIEW, - 2X4

242 Apply Loctite™ 242 to the bolt threads.

NOTE:
To avoid damage to tie rods and other steering components, be sure to install tie rod end studs 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 positioned properly. The Right inner rod end must be placed between the steering post arms. The Left inner rod end must be below the lower arm as shown.



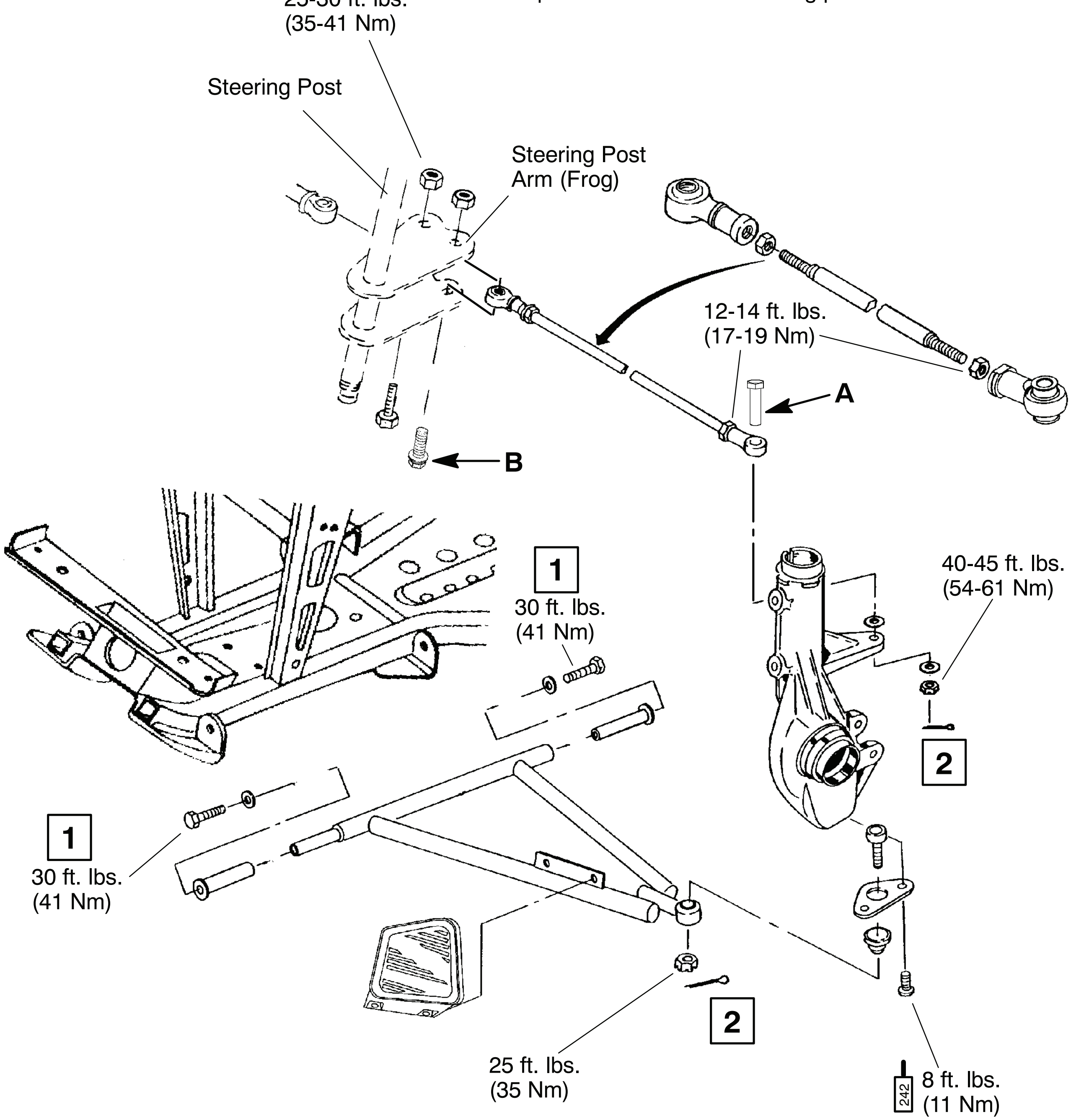
1 Always use new bolts upon reassembly

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

STEERING ASSEMBLY, EXPLODED VIEW - 4X4

Apply Loctite™ 242 to the bolt threads.

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.

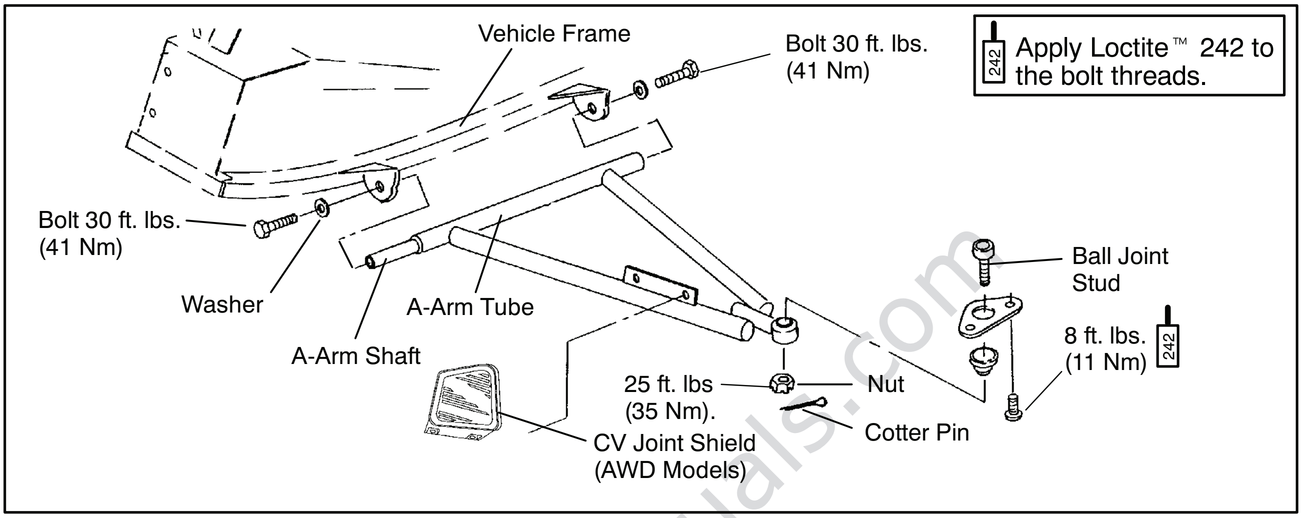


1 Always use new bolts upon reassembly

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

A-ARM REPLACEMENT

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

8. 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.

A-arm Attaching Bolt Torque:

30 ft. lbs. (41 Nm)

Ball Joint Stud Nut Torque:

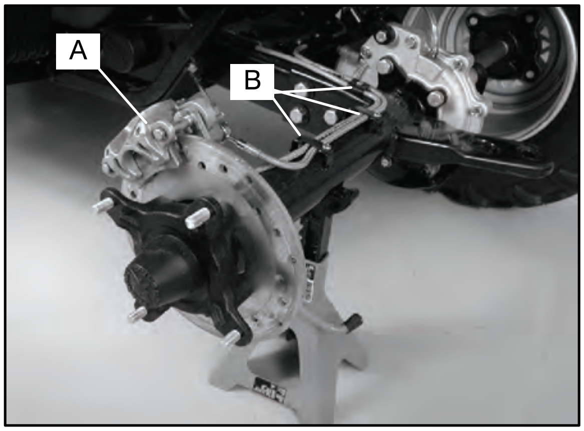
25 ft. lbs. (35 Nm)

⚠ WARNING

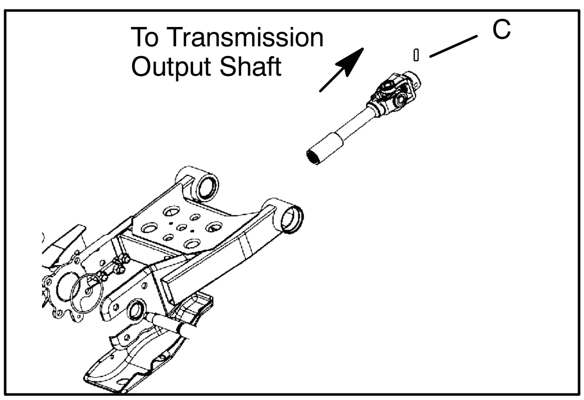
Upon A-arm installation completion, test vehicle at low speeds before putting into regular service.

SWINGARM REMOVAL / REAR DRIVE SHAFT REMOVAL

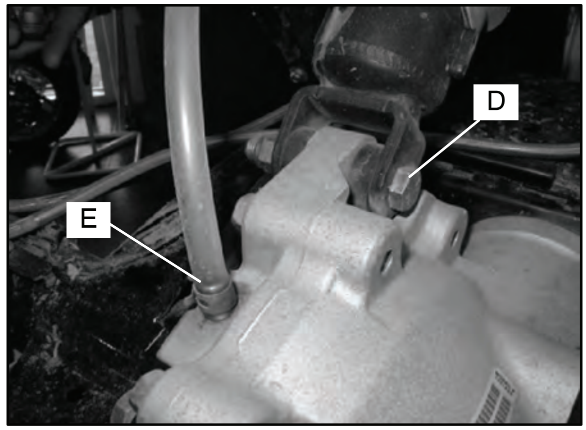
1. Safely jack up the ATV and place jackstands under the ATV frame and rear swingarm.
2. Remove the two rear tires.
3. Remove the brake caliper (A). Do not let the caliper hang by the brake line.
4. Remove the brake line brackets (B) on axle and swingarm.



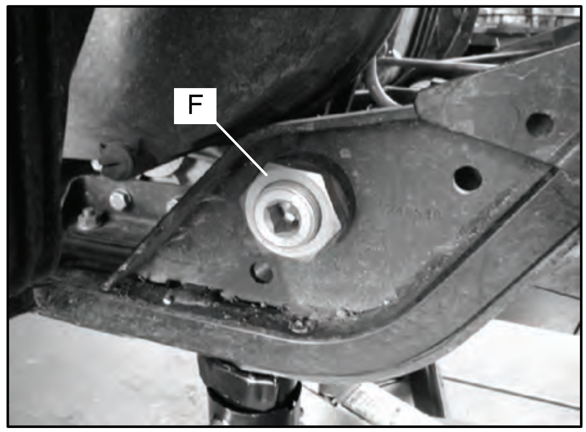
5. Remove the roll pin (C) from the drive shaft.



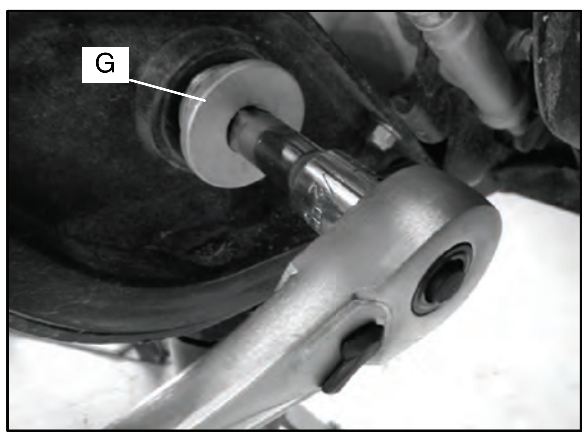
6. Remove the lower shock bolt (D) and rear gearcase vent line (E).



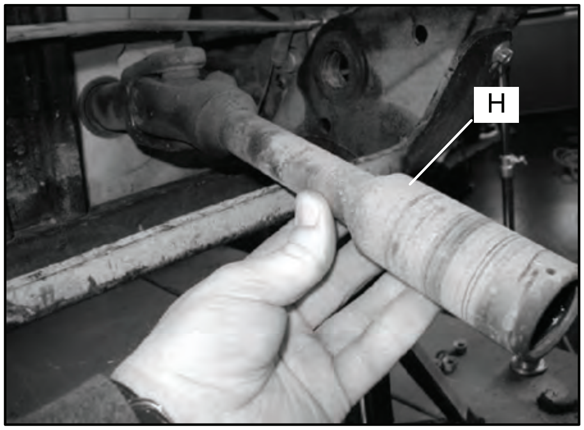
7. Remove the jam nut from the left side of the swingarm pivot (F) using a 1 3/4” socket.



8. Remove the swingarm pivot bolts (G) from both sides of the swingarm. Support the front of the swingarm during removal.



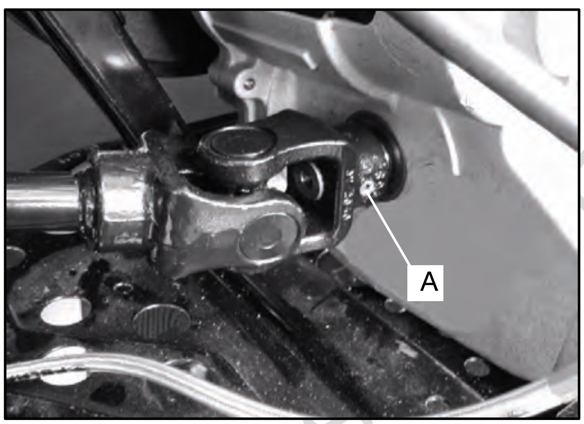
9. The swingarm is now apart from the frame. Remove the drive shaft (H) from the transmission.



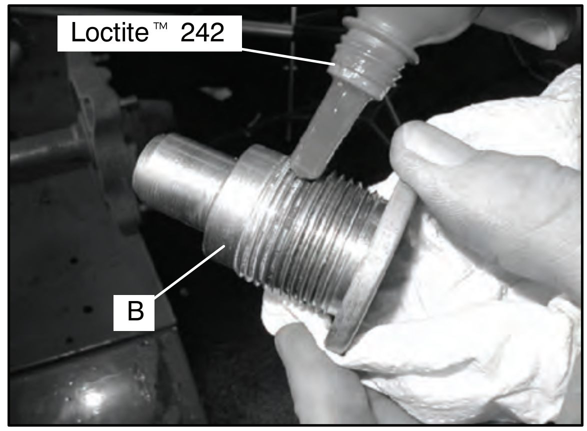
10. Remove the roller cone bearing (10), roller cup bearing (11), and foam inserts (12), if needed. Refer to the swingarm illustration on the next page.

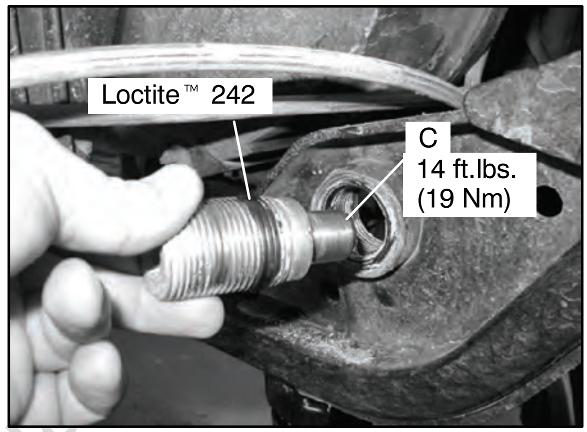
SWINGARM INSTALL / REAR DRIVE SHAFT INSTALL

1. Reinstall the driveshaft if previously removed. Install a new roll pin (A) into the drive shaft.

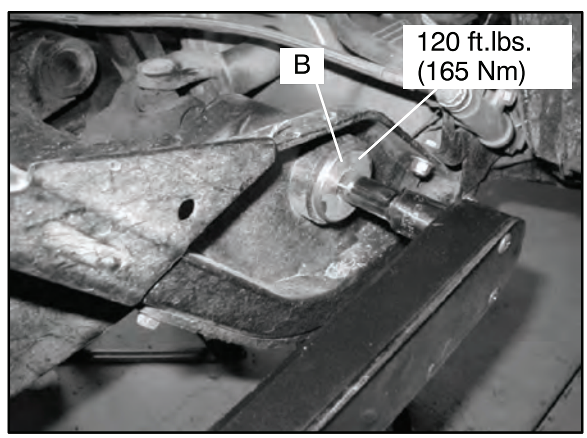


2. Reinstall the roller cone bearing (10), roller cup bearing (11), and foam inserts (12), if removed. Refer to the swingarm illustration on the next page.
3. Align the swingarm pivot holes to the frame.
4. Apply Loctite™ 242 (**PN 2871950**) to right side pivot bolt (B) and to the left side pivot bolt (C). Install both into the frame and swingarm.

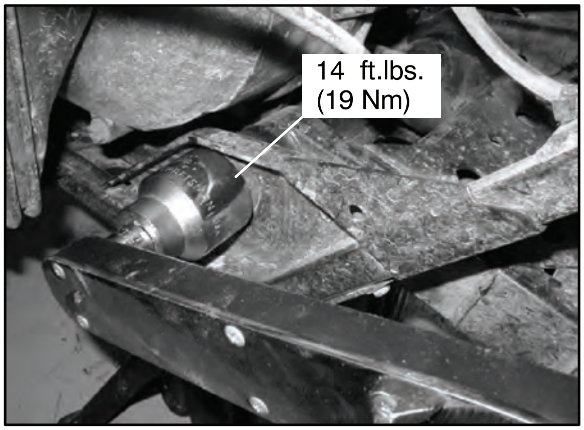




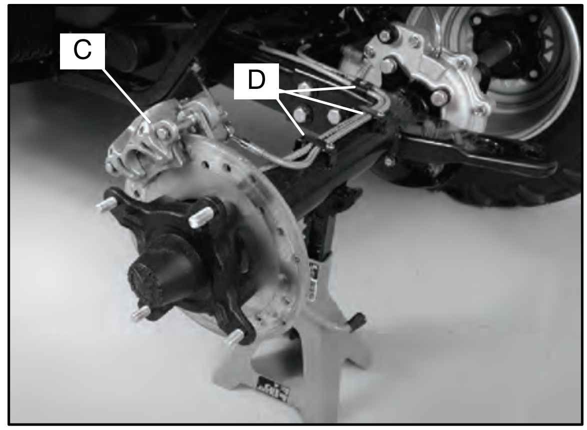
5. Tighten pivot bolts until engaged inside the swingarm bearings.
6. Torque right side pivot bolt (B) to 120 ft.lbs. (165 Nm). Torque left side pivot bolt (C) to 14 ft.lbs. (19 Nm).



7. Apply Loctite™ 242 (**PN 2871950**) to the exposed threads of the left side pivot bolt and lock nut.
8. Install and torque lock nut to 120 ft.lbs. (165 Nm). Use a 1.75” socket to tighten the lock nut.

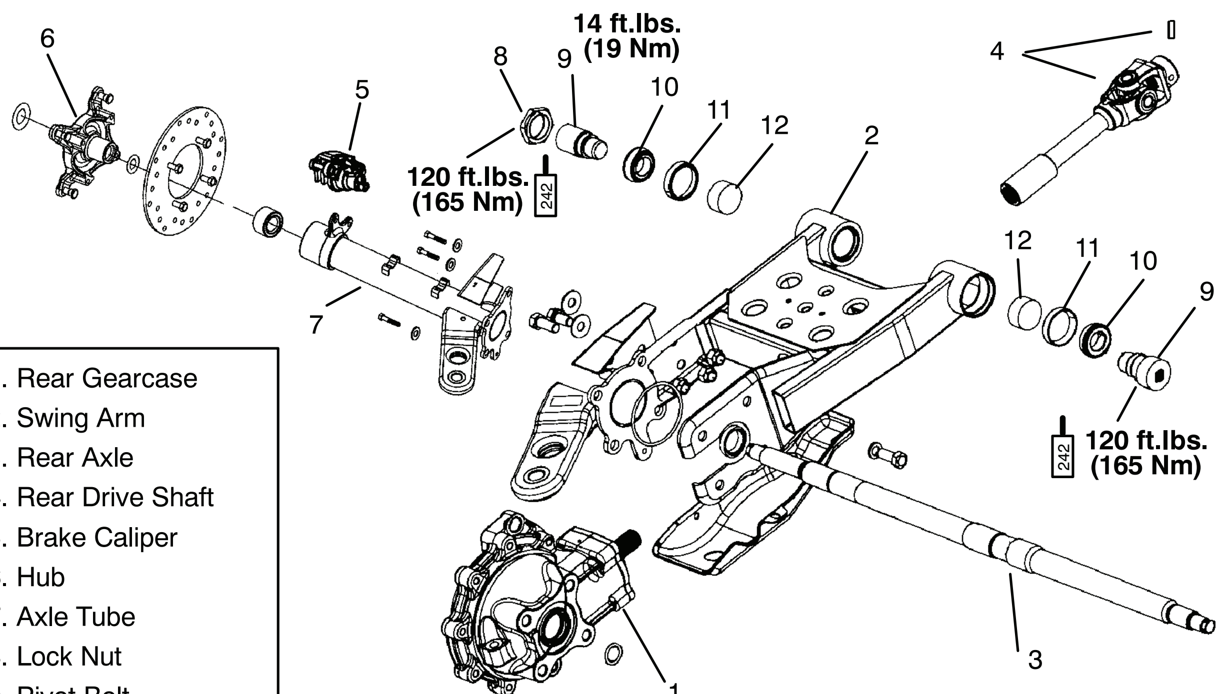


9. Reinstall the rear shock bolt and torque to 25 ft.lbs. (35 Nm). Install rear gearcase vent tube.
10. Install the brake caliper (C) and torque the brake caliper bolts to 18 ft.lbs. (25 Nm).
11. Route brake lines and secure with the brake line brackets (D).



12. Install rear wheels and torque wheel nuts to 27 ft.lbs. (37 Nm).

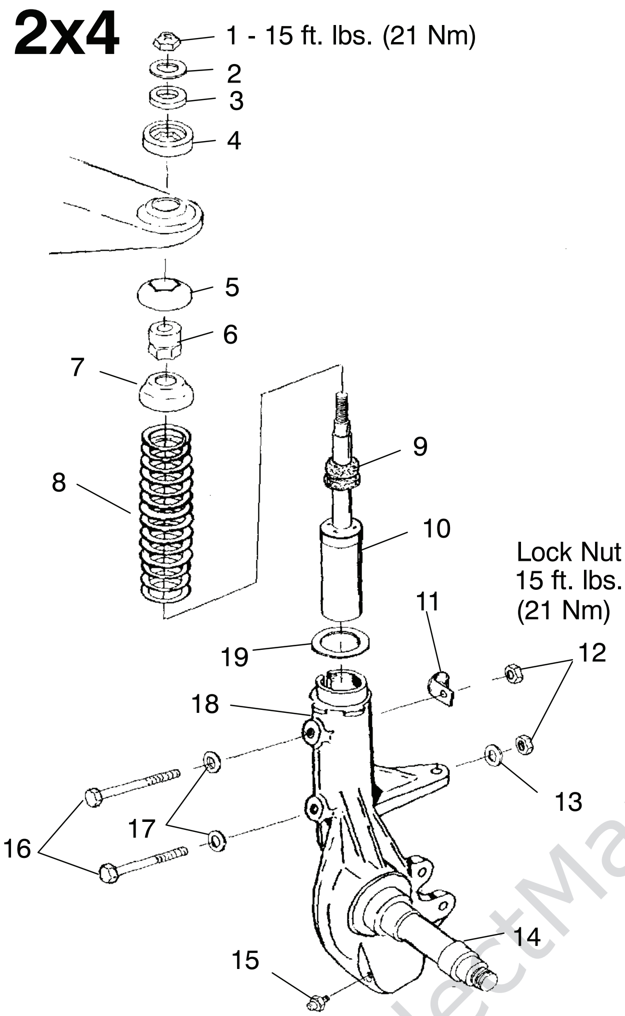
Swingarm Exploded View



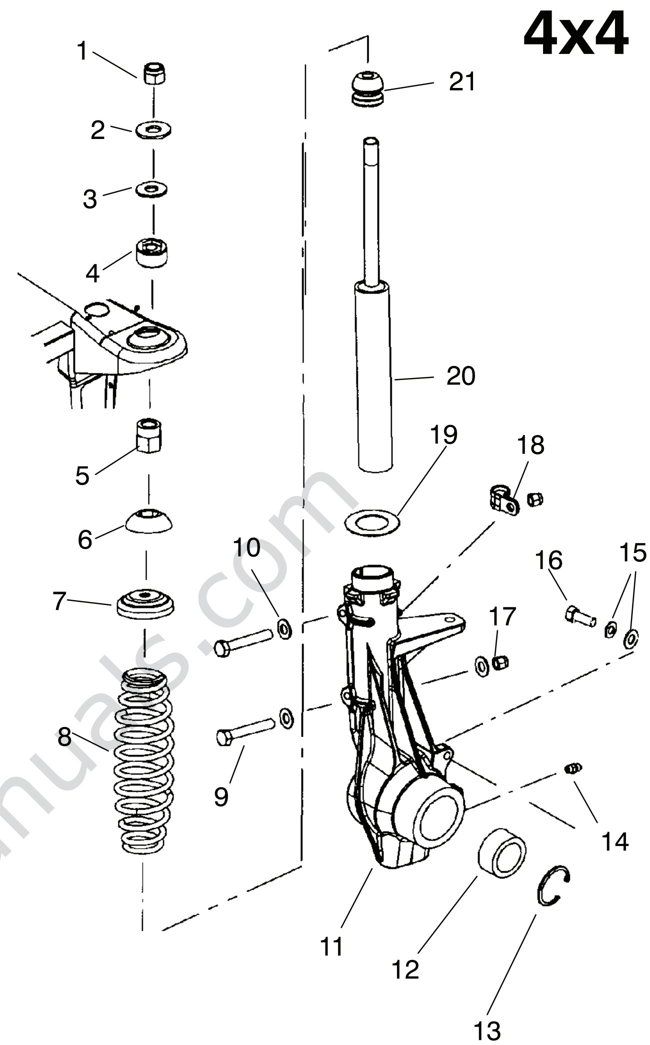
1. Rear Gearcase
2. Swing Arm
3. Rear Axle
4. Rear Drive Shaft
5. Brake Caliper
6. Hub
7. Axle Tube
8. Lock Nut
9. Pivot Bolt
10. Roller Cone Bearing
11. Roller Cup Bearing
12. Foam Inserts

242 Apply Loctite™ 242 to the bolt threads.

STRUT ASSEMBLY EXPLODED VIEW - 2X4 & 4X4 MODELS



1. Nut
2. Washer
3. Spacer Rubber
4. Upper Pivot Ball
5. Lower Pivot Ball
6. Spacer Nut
7. Spring Retainer
8. Spring
9. Strut Bumper
10. Strut Cartridge
11. Clamp
12. Lock Nut
13. Washer
14. Spindle
15. Grease Fitting
16. Bolt
17. Washer
18. Strut Housing
19. Spring Retainer Washer



1. Nylok Nut
2. Washer
3. Spacer Rubber
4. Upper Pivot Ball
5. Spacer
6. Lower Pivot Ball
7. Spring Retainer
8. Spring
9. Bolt
10. Flat Washer
11. Hubstrut
12. Bearing
13. Retaining Ring
14. Grease Fitting
15. Washer
16. Screw
17. Nylok Nut
18 Rubber Clamp
19. Washer
20. Front Strut
21. Bumper

FRONT STRUT WELDMENT REPLACEMENT

Refer to Illustrations on Page 5.15.

1. Hold strut rod with holder wrench and remove top nut.
2. Compress spring using strut spring compressor tools.

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

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)**

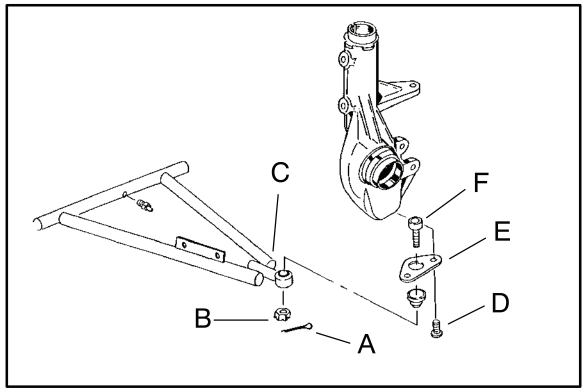
FRONT STRUT BALL JOINT REPLACEMENT

Refer to Illustrations on Page 5.15.

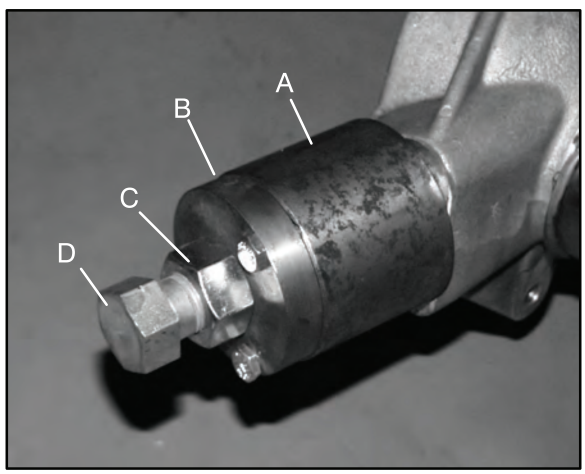
1. Loosen front wheel nuts slightly.
2. Elevate and safely support machine under footrest/frame area.

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 castlenut.
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).

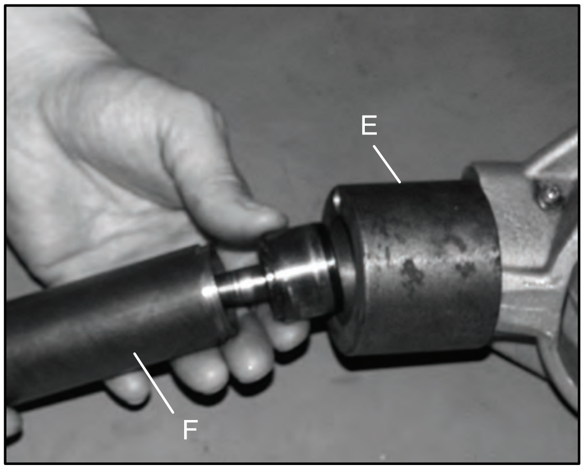


7. Using Ball Joint Replacement Tool (**PN 2870871**), remove ball joint (F) from strut housing. Refer to photos at right.
   - Install puller guide (A) with extension cap (B).
   - Apply grease to extension cap and threads of puller bolt to ease removal.
   - Thread bolt (D) with nut (C) onto ball joint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



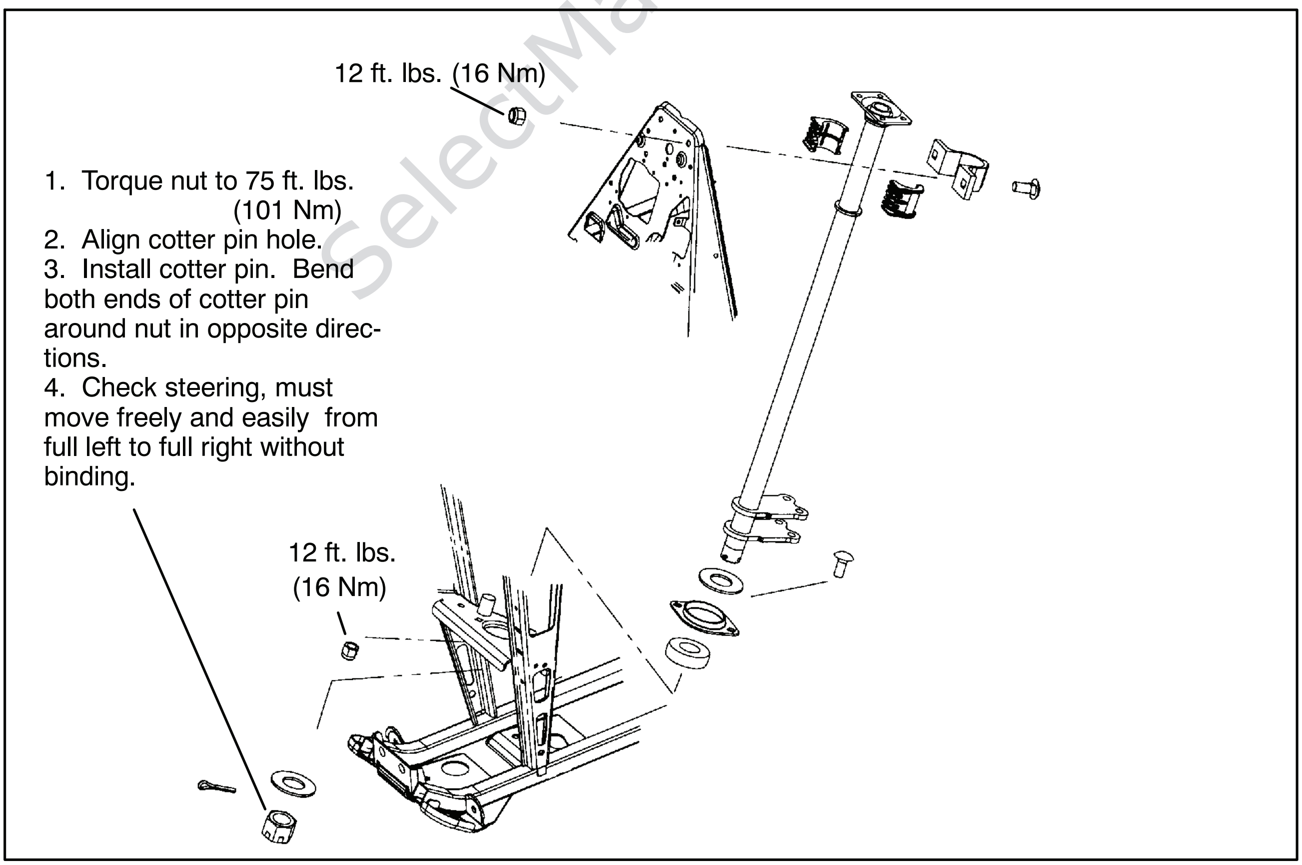
8. **To install new ball joint:**
   - Remove extension cap and attach puller guide using short bolts provided in the kit.
   - Insert new ball joint (E) into driver (F).

- Slide ball joint/driver assembly into guide.
- Drive new joint into strut housing until fully seated.



9. Apply Loctite™ 242 (**PN 2871950**) 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.

STEERING POST ASSEMBLY



DECAL REPLACEMENT

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

WARNING

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

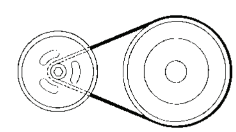
To flame treat the decal area:

1. Pass the flame of a propane torch back and forth quickly over the area where the decal is to be applied until the surface appears slightly glossy. This should occur after just a few seconds of flame treating. Do not hold the torch too close to the surface. Keep the torch moving to prevent damage.
2. Apply the decal.

NOTES

CHAPTER 6

CLUTCHING



6

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 Lock Nut (Plastic)	15 ft. lbs. (20.3 Nm)
Drive Clutch Cover Plate	90 in. lbs. (10 Nm)
Drive Clutch Spider (EBS)	200 ft.lbs. (271 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.

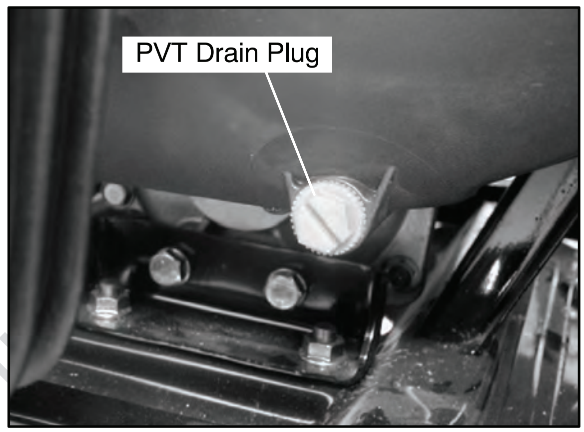
PVT MAINTENANCE/INSPECTION

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.

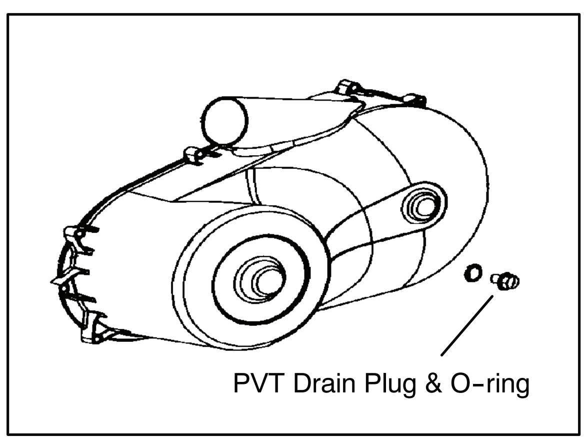
PVT DRYING

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

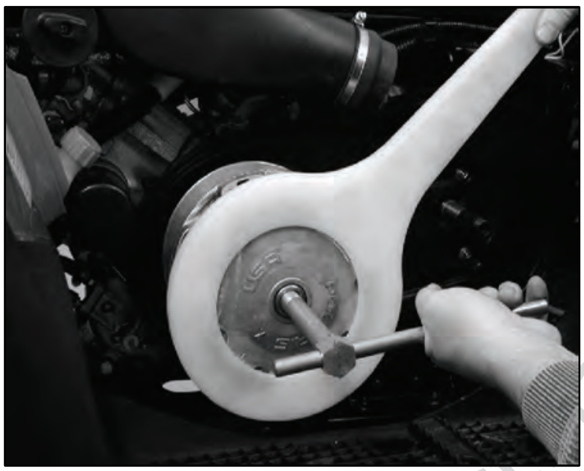
During routine maintenance or whenever PVT system overheating is evident, it's important to check the inlet *and* outlet ducting for obstructions. Obstructions to air flow through the ducts will significantly increase PVT system operating temperatures. The ATV should be operated in LOW RANGE when pulling 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. (See Page 6.7).

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 6.7.
5. Mark the drive belt direction of rotation and remove drive belt. See Page 6.14 for drive belt removal.
6. Remove drive clutch retaining bolt and remove drive clutch using puller.



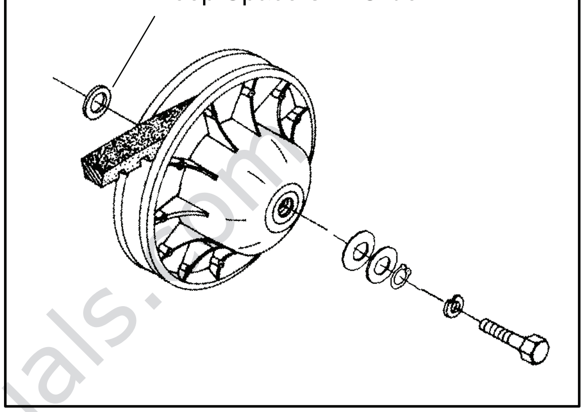
Drive Clutch Puller (PN 2870506)

Clutch Holding Wrench (PN 9314177)

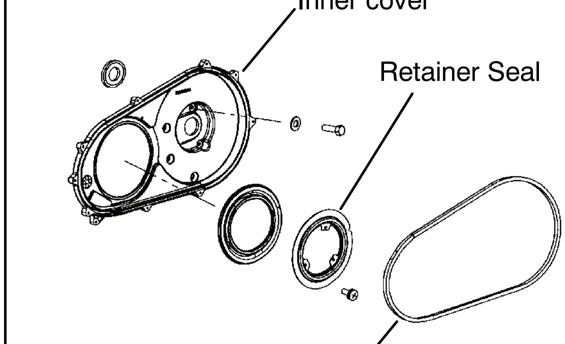
7. Remove driven clutch retaining bolt and driven clutch. Use puller if necessary.

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.

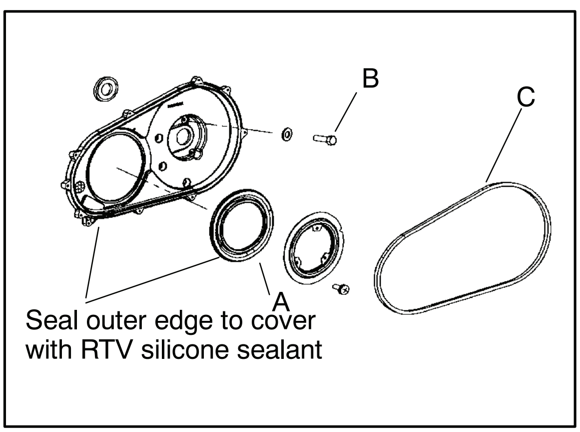


10. Remove inner cover retaining bolts at rear of cover.
11. Remove cover along with foam seal on back of cover or shaft.

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.

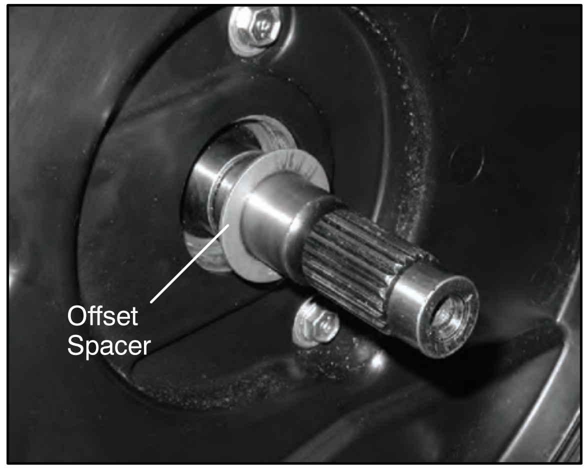


Inner Cover Bolt Torque (Rear):
12 ft. lbs. (16.6 Nm)

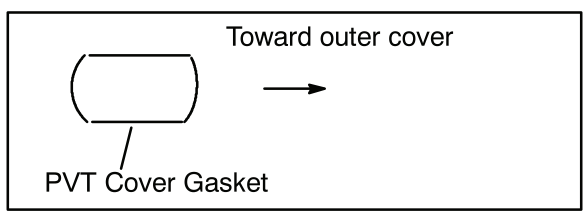
Driven Clutch Retaining Bolt Torque:
17 ft. lbs. (23.5 Nm)

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

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

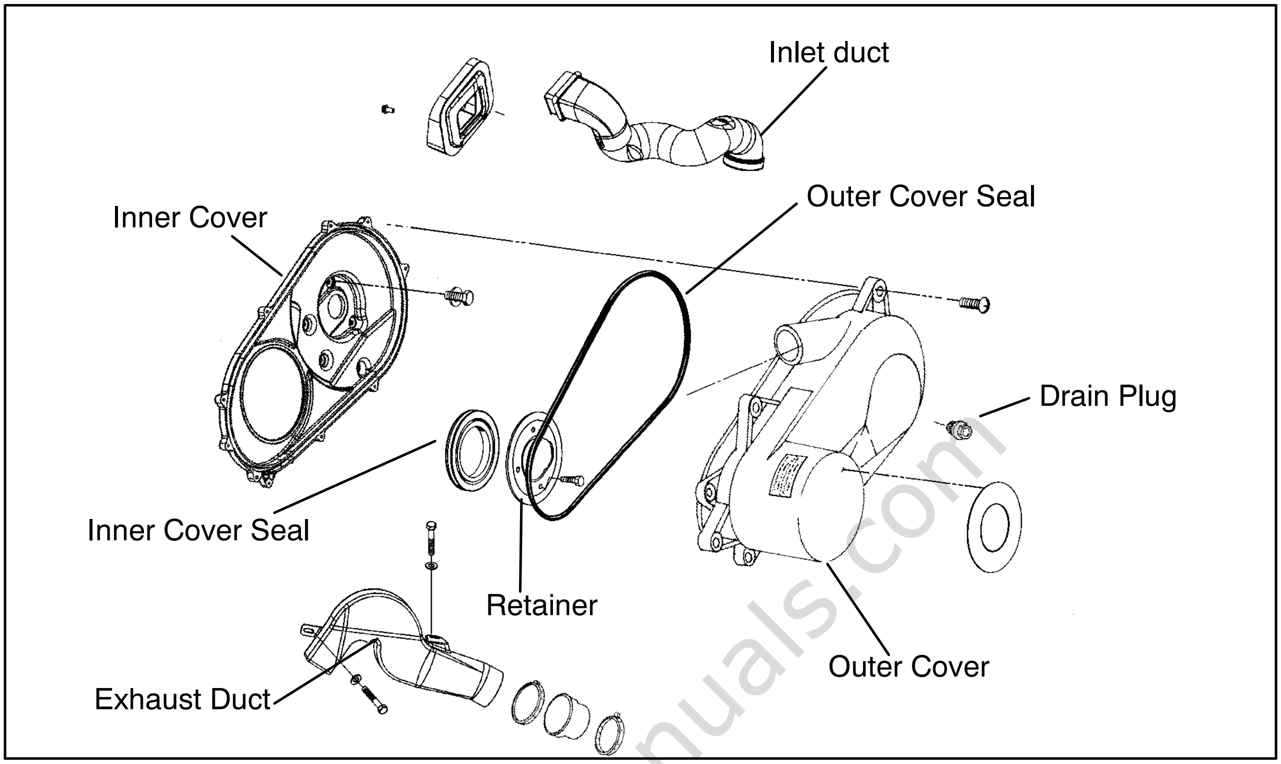


8. Clean splines inside driven clutch and on the transmission input shaft.
9. Apply a light film of grease to the splines on the shaft.
10. Install the driven clutch, washer, lock washer, and retaining bolt. Torque to specification.
11. Clean end of taper on crankshaft and the taper bore inside drive 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).

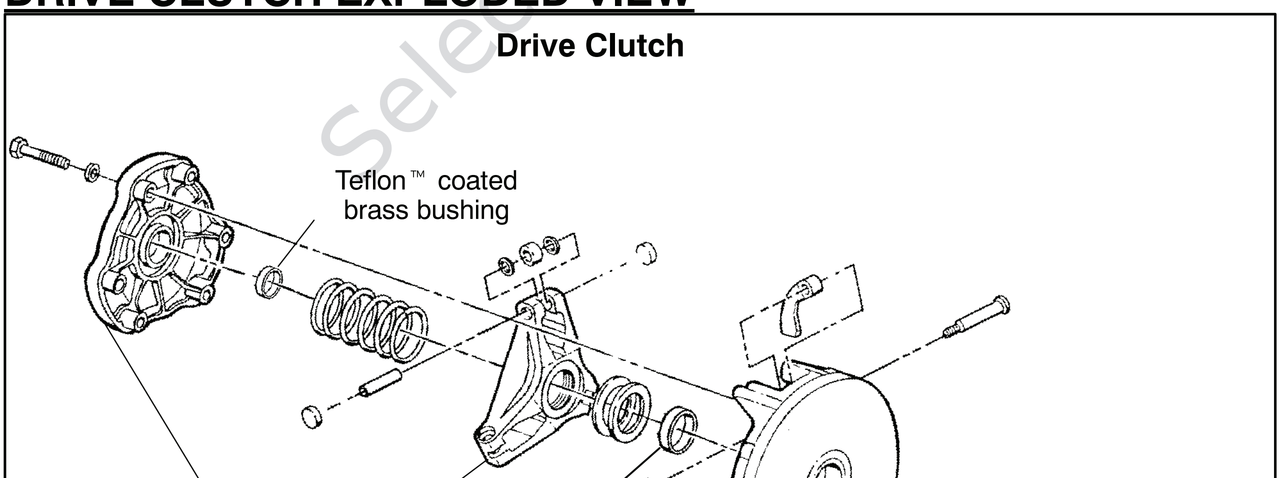


15. Reinstall PVT outer cover and secure with screws.
16. Reinstall rear cab assembly, panel and seat.

PVT SEALING AND DUCTING COMPONENTS



DRIVE CLUTCH EXPLODED VIEW



DRIVE CLUTCH SPRING SPECIFICATIONS

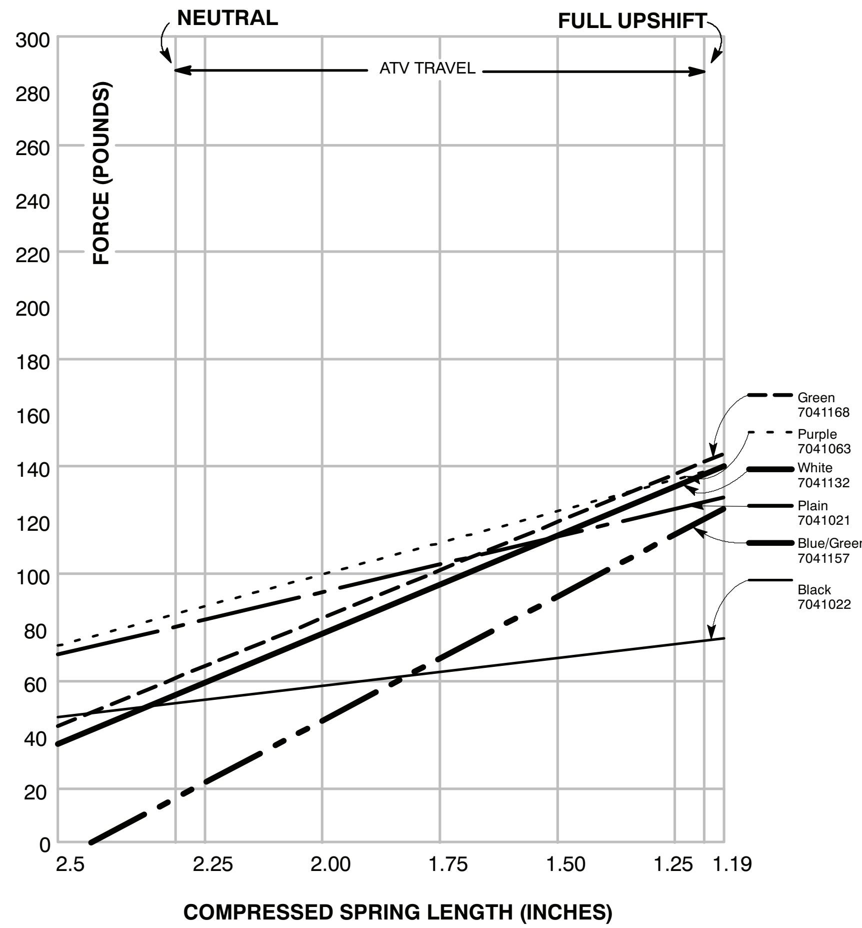
The drive clutch spring has two primary functions:

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.

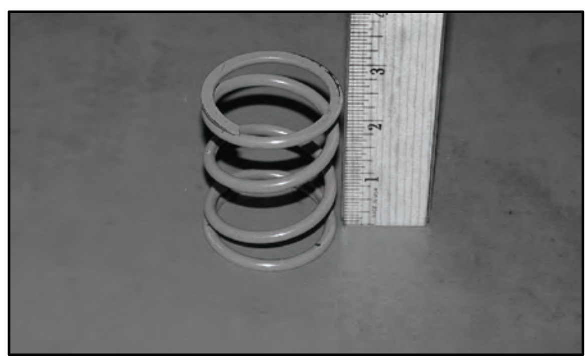
The drive clutch spring is one of the most critical components of the PVT system. It is also one of the easiest to service. Due to the severe relaxation of the coil spring is subject to during operation, it should always be inspected for tolerance limits during any clutch diagnosis or repair.

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.

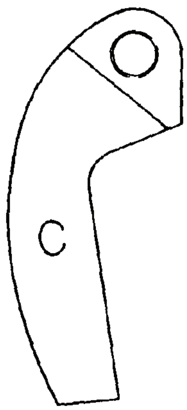


Primary Clutch Springs | **Secondary Clutch Springs**

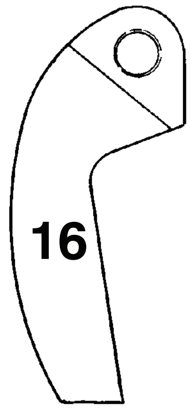
PART NUMBER	COLOR CODE	WIRE DIAMETER	FREE LENGTH ±.125″	PART NUMBER	DESCRIPTION
7041021	Plain	.157″	4.38″	**7041198**	Red
7041022	Black	.140″	4.25″	**7041782**	Black 5-coil
7041063	Purple	.168″	4.37″	**7041501**	Gold 6-coil
7041132	White	.177″	2.92″	**7041499**	Silver
7041168	Green	.177″	3.05″	**7041296**	Blue
7041157	Blue/Green	.177″	2.53″	**7041646**	Silver/Blue

SHIFT WEIGHTS

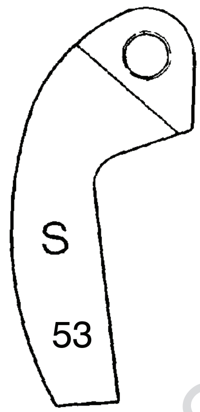
Shown below are optional shift weights which may be used in the PVT system. These shift weights have many different factors designed into them for controlling engagement RPM and shifting patterns. Shift weights should not be changed or altered without first having a thorough understanding the effects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



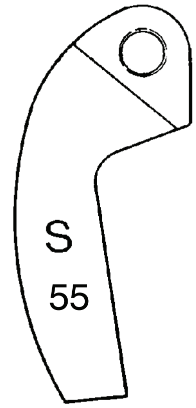
PN 5630418
50 gr



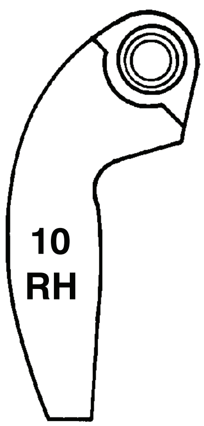
PN 5630279
43 gr



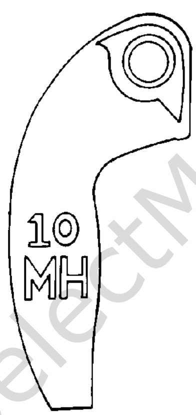
PN 5630095
53 gr



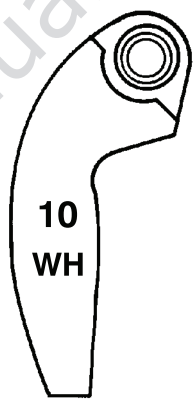
PN 5630509
55 gr



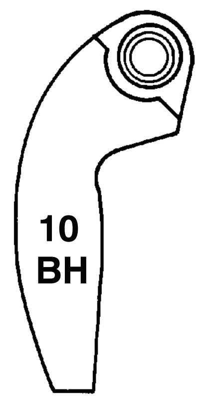
PN 5630709
44 gr



PN 5630513
50.5 gr



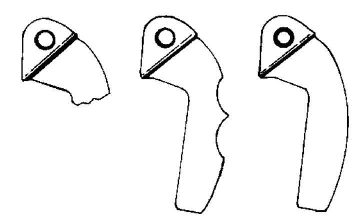
PN 5630710
46 gr



PN 5630711
47gr

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 6.12.

⚠ 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

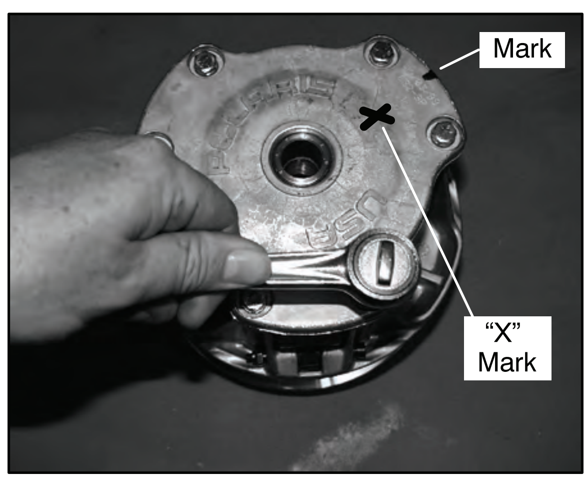
1. Inspect for any clearance between spider button to tower. If clearance exists, replace all buttons and inspect surface of towers. See Spider Removal next page.

Button to Tower Clearance:
.000 - .001″

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

NON-EBS DRIVE CLUTCH DISASSEMBLY

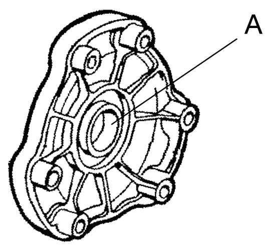
1. Using a permanent marker, mark the cover, spider, and moveable and stationary sheaves for reference, as the previous X's may not have been in alignment before disassembly.



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.

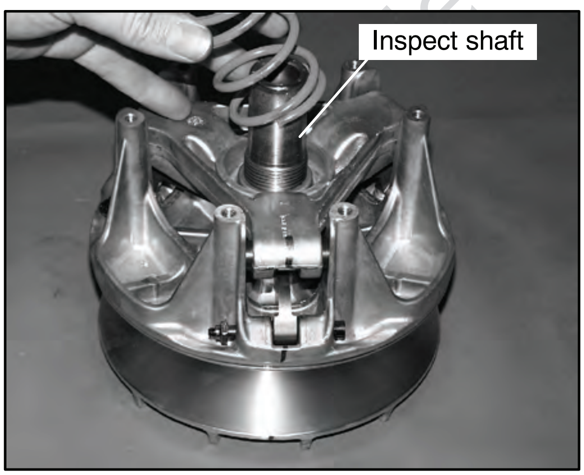
Cover Bushing inspection



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 6.8)



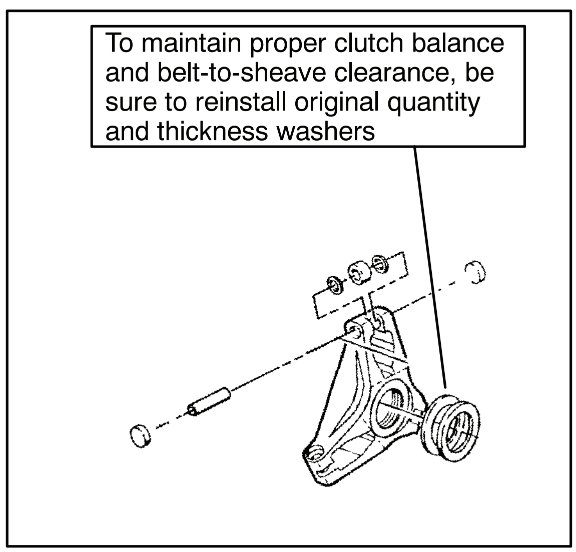
NON-EBS SPIDER REMOVAL

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)

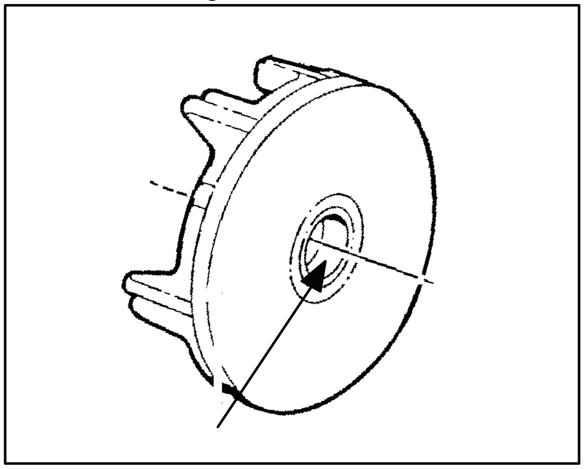
Spider Removal Tool:
(PN 2870341)

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.



Moveable Sheave Bushing Inspection

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

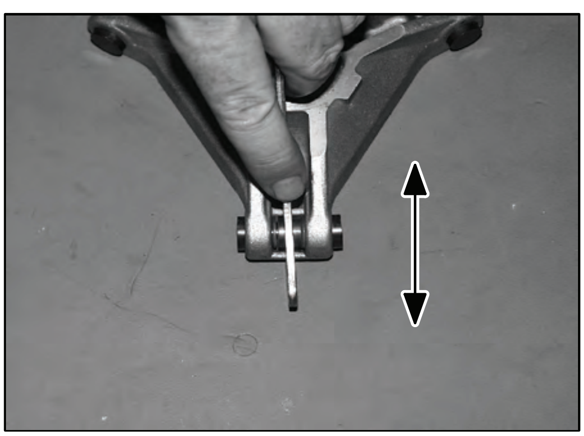


Moveable Sheave Bushing Inspection:

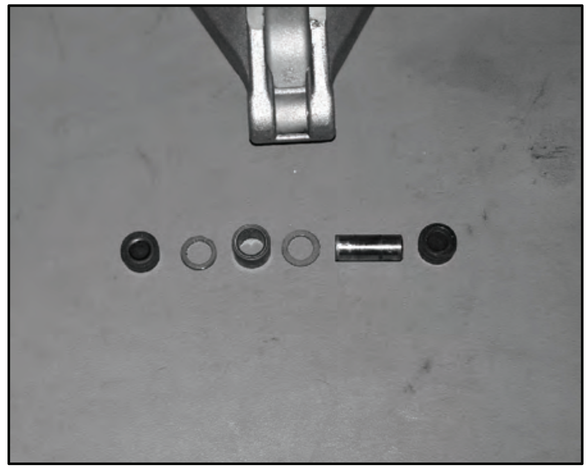
Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

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).



NON-EBS 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

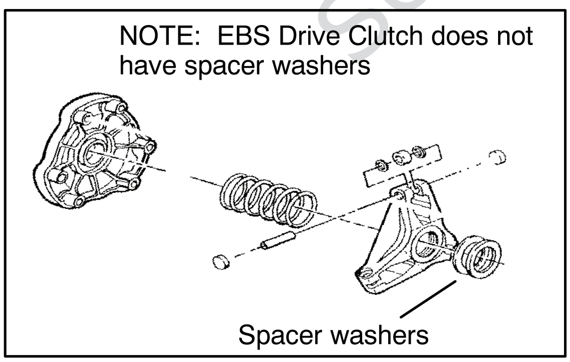
   b) X on spider, making sure spacer washers are installed underneath spider and positioned properly in recess.

   c) "X", or the marks that were made earlier under weight

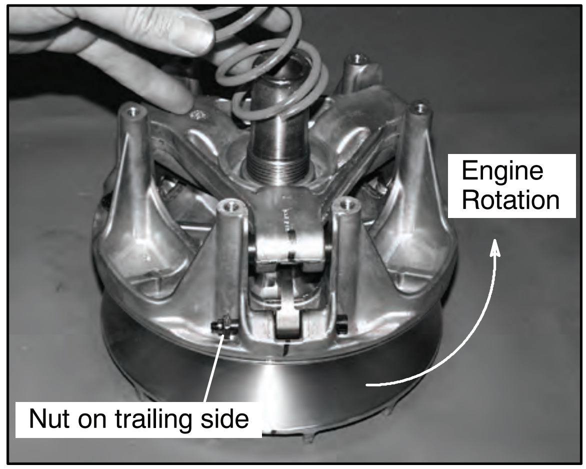
2. Install moveable sheave onto fixed sheave.
3. Install spider spacers. Use same quantity and thickness as were removed.
4. Compress spider buttons for each tower and install spider, making sure that "X", or the marks that were made earlier, on spider aligns with "X", or the marks that were made earlier 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 6.2 for torque specification.

CAUTION:

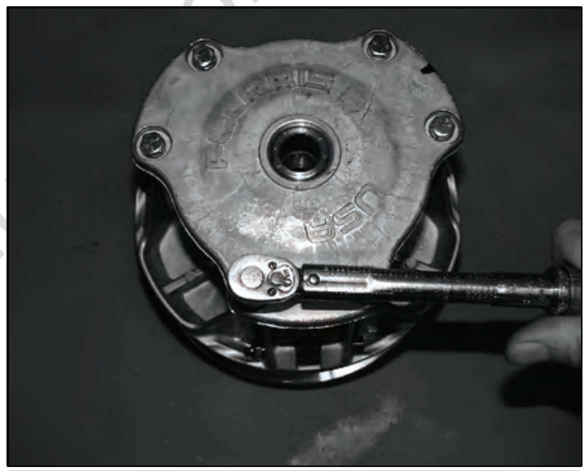
Be sure the spider spacer washers are fully seated in the recessed area of the spider. Any misalignment will alter clutch balance. Inverting the clutch while initially tightening the spider will help position the washers.



6. Install limiter nut on top of spider using the Clutch Spider Nut Socket **(PN 2870338)**. Torque to 15 ft. lbs. (20 Nm). Reinstall shift weights using new lock nuts on the bolts.
7. Reinstall clutch spring.



8. Reinstall cover, aligning "X" mark with other marks. Torque cover bolts evenly to specification.



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

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

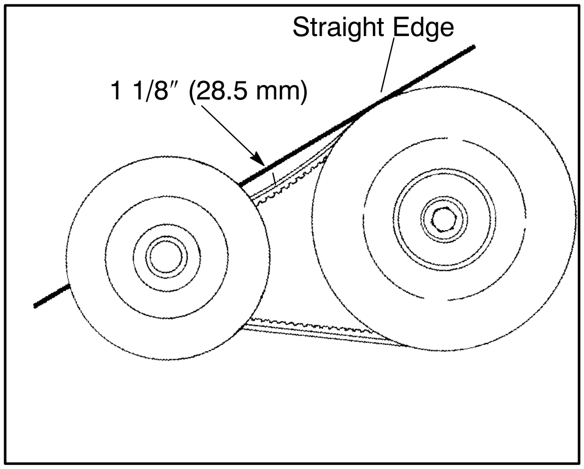
NON-EBS - DRIVE BELT TENSION

NOTE:Belt tension is <u>not</u> adjustable on EBS models.

NOTE: Pinch the sheaves lightly together with clamp to prevent the belt from being pushed into the driven sheave.

1. Place a straight edge on top of the belt between drive and driven clutch.

2. Push down on drive belt until it is lightly tensioned.
3. Measure belt deflection as shown in illustration.



Belt Deflection (Tension):

1 1/8″ (2.9 cm) - 1 1/4″ (3.2 cm)

If belt deflection is out of specification, adjust by removing or adding shims between the driven clutch sheaves.

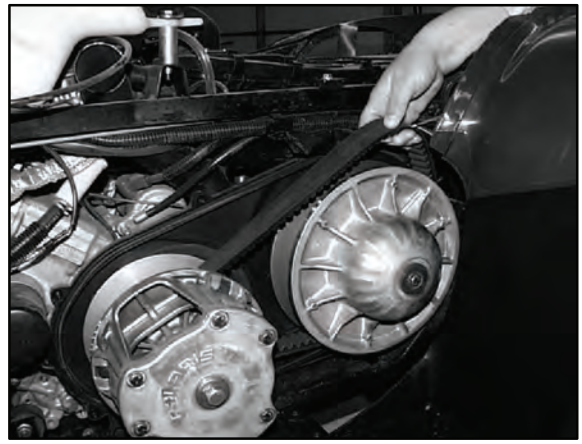
- Remove shims to decrease belt deflection
- Add shims to increase belt deflection

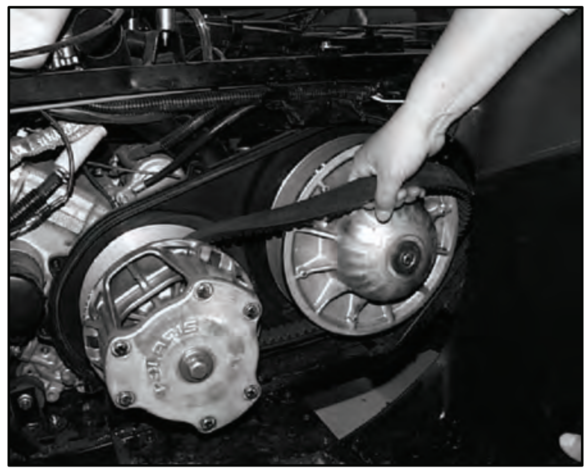
See Driven Clutch Disassembly/Inspection, Pages 6.19 - 6.20.

NOTE: At least one shim must remain between the inner and outer sheave of the driven clutch. If proper belt deflection cannot be obtained, measure drive belt width, length, and center distance of drive and driven clutch, outlined in this section; all have an effect on belt deflection.

ALL MODELS - 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.

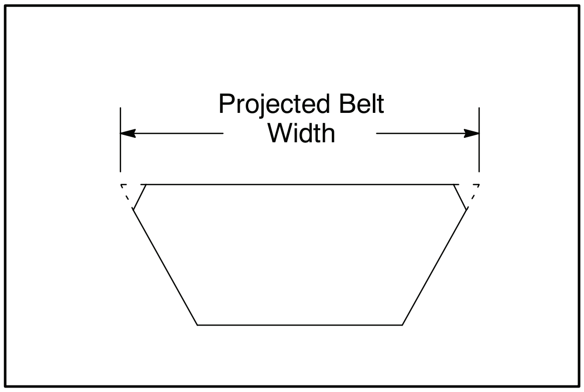




NOTE: When reinstalling the belt with the drive clutch and driven clutch already removed follow these steps:

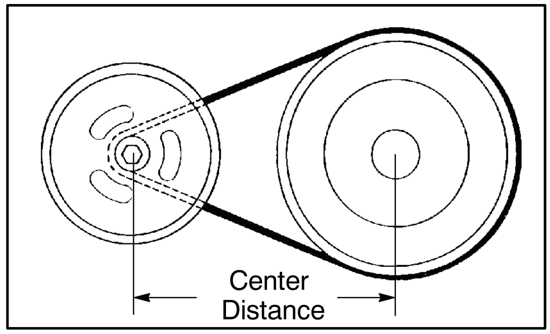
- Install the driven clutch.
- Install the belt onto the driven clutch.
- Loop the drive clutch through the belt.
- Install the drive clutch onto the crankshaft.

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)

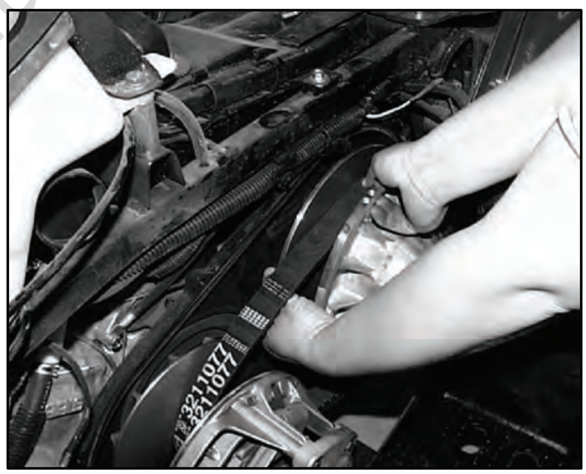
5. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Replace if necessary.
6. Inspect belt for hour glassing (extreme circular wear in at least one spot and on both sides of the belt). Hour glassing occurs when the drive train does not move and the drive clutch 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)

ALL MODELS - 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.

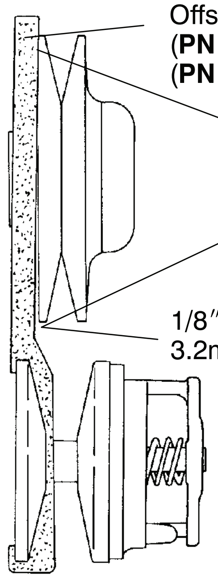


3. The belt then should be able to be pushed down into and between the sheaves.

NOTE: Be sure to position belt so part number is easily read.

ALL MODELS - CLUTCH ALIGNMENT

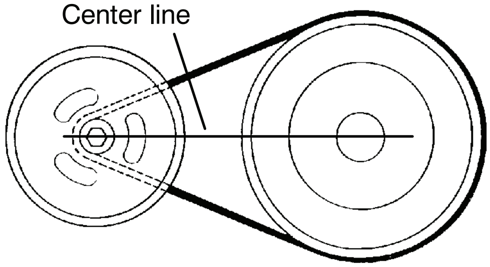
1. Remove belt and install the Clutch Offset Alignment Tool) as shown.



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, Page 6.5.
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)

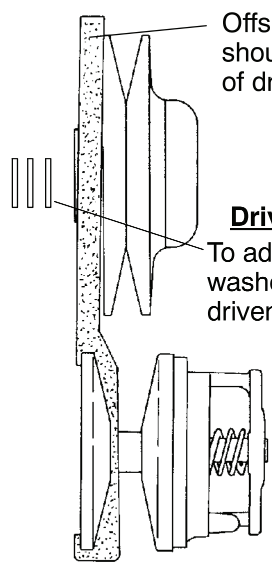
ALL MODELS - CLUTCH OFFSET

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.

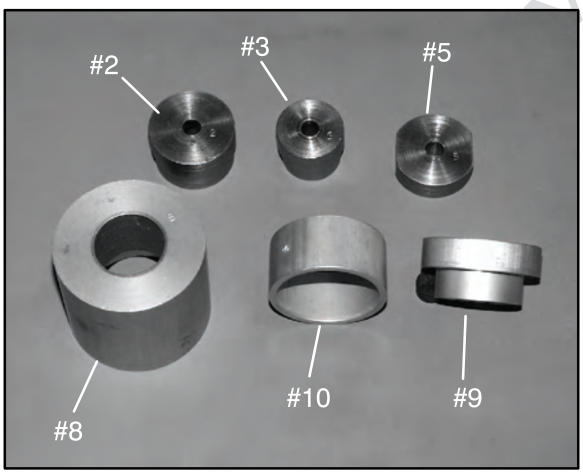


NON-EBS - DRIVE CLUTCH BUSHING SERVICE

***Clutch Bushing Replacement Tool Kit (PN 2871226)**

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

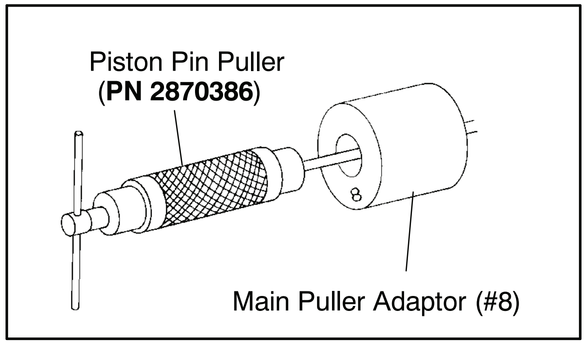
NON-EBS - DRIVE CLUTCH MOVEABLE SHEAVE - BUSHING REMOVAL



1. Install handle end of the Piston Pin Puller (**PN 2870386**) securely into bench vise and lightly grease puller threads.

Piston Pin Puller (PN 2870386)

2. Remove nut from puller rod and set aside.



3. Install the Main Puller Adapter (#8) (**PN 5020632**) onto the Piston Pin Puller (**PN 2870386**).

4. Insert the Number Two Adapter (#10) (**PN 5020633**) into the bushing from belt side as shown. With towers pointing toward vise, slide sheave and bushing onto puller rod.
5. Install the nut removed in Step 2 onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Nut is left hand thread

6. Turn sheave and puller barrel together counterclockwise on puller rod until bushing is removed.
7. Remove nut from puller rod and set aside.

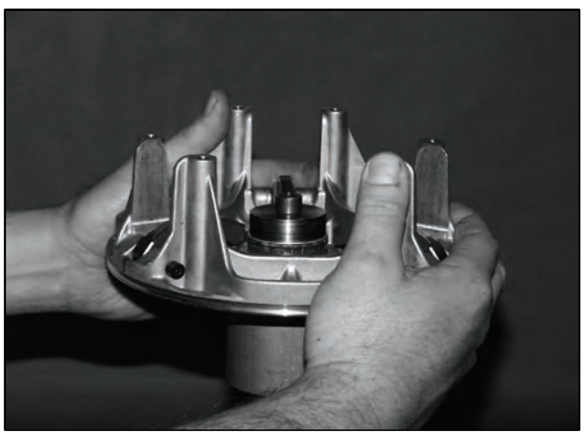
8. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

NON-EBS - DRIVE CLUTCH MOVEABLE SHEAVE - BUSHING INSTALLATION

1. Place the Main Puller Adapter (#8) (**PN 5020632**) onto the puller.
2. Apply Loctite™ 680 (**PN 2870584**) to the back side of new bushing. Push bushing into center of sheave on tower side by hand.

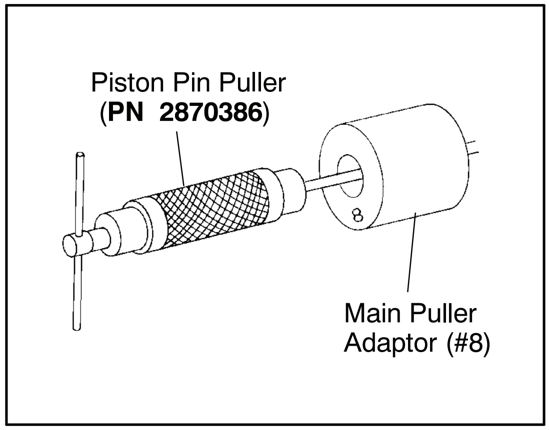
> **Bushing (PN 3576504)**
>
> **Loctite™ 680 (PN 2870584)**

3. Insert the Clutch Bushing Installation Tool (#2) (**PN 5020628**) into center of sheave and with towers pointing away from vise, slide sheave onto puller rod.
4. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
5. Turn sheave and barrel together counterclockwise until bushing is seated.



6. Remove nut from puller rod and set aside.
7. Remove sheave from puller.
8. Remove installation tool.

NON-EBS - DRIVE CLUTCH COVER - BUSHING REMOVAL



1. Install the Main Puller Adapter (#8) (**PN 5020632**) onto the Piston Pin Puller (**PN 2870386**).

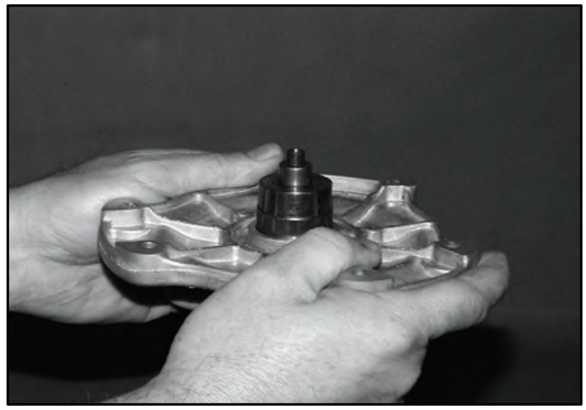
2. From outside of clutch cover, insert the Drive Cover Bushing Remover (#3) (**PN 5020629**) into cover bushing.

3. With inside of cover toward vise, slide cover onto puller.
4. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.

5. Turn clutch cover counterclockwise on puller rod until bushing is removed.
6. Remove nut from puller rod and set aside.
7. Remove bushing and bushing removal tool from puller. Discard bushing.

NON-EBS - DRIVE CLUTCH COVER - BUSHING INSTALLATION

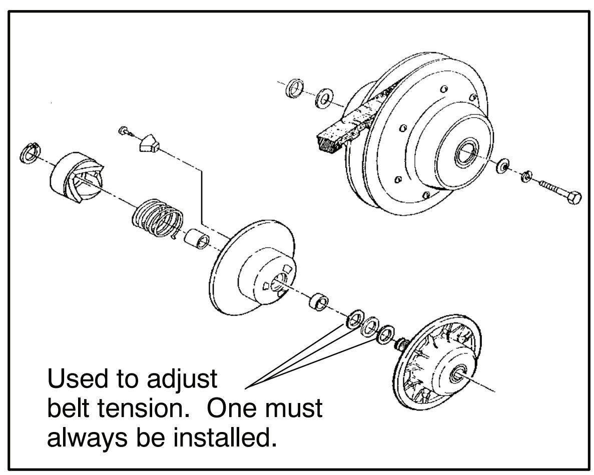
1. Apply Loctite™ 680 (**PN 2870584**) to the back side of new bushing. Working from inside of cover, insert bushing and bushing installation tool into center of clutch cover.



Bushing (PN 3576510)
Loctite™ 680 (PN 2870584)

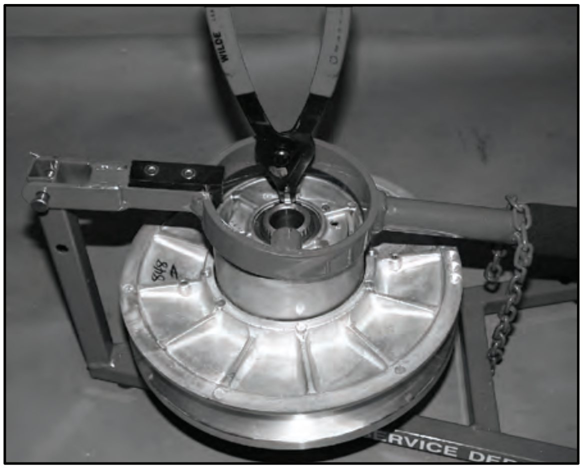
2. With the Main Puller Adapter (#8) (**PN 5020632**) on the puller, insert cover onto puller rod, placing outside of cover toward vise.
3. Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
4. Turn clutch cover and barrel together counterclockwise on puller rod until bushing is seated.
5. Remove nut from puller rod and take installation tool and clutch cover off rod.

NON-EBS - DRIVEN CLUTCH DISASSEMBLY/INSPECTION

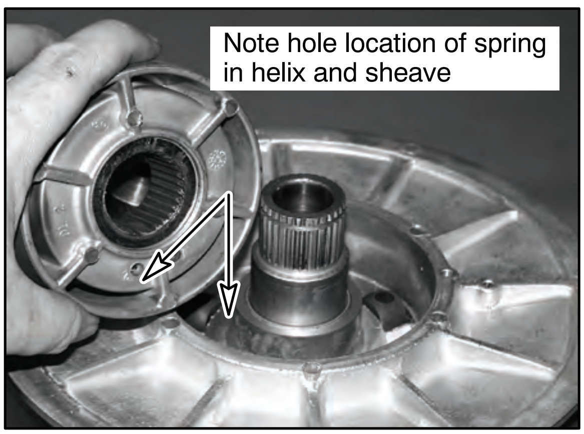


CAUTION:

Wear eye protection when removing snap ring to prevent serious personal injury.

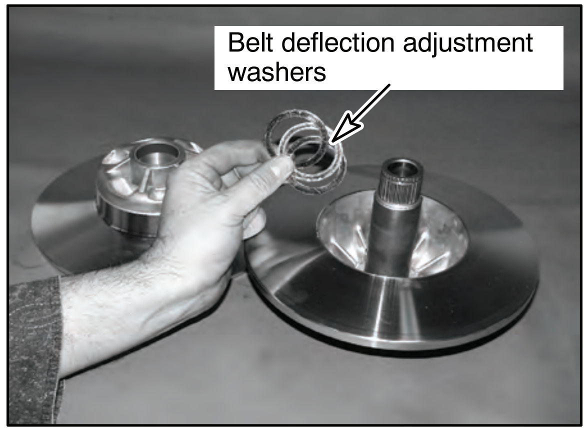


1. Apply and hold downward pressure on the helix, or place driven clutch in the Clutch Compression Tool (**PN 8700220**).
2. Remove snap ring retainer.



3. Note the location of the spring and remove helix.
4. Note the location of the spring in the moveable sheave, and remove the spring.
5. Check alignment of tabs on spring. Replace the spring if tabs are misaligned or the spring coils are distorted.

6. Inspect ramp buttons in the moveable sheave and replace if worn. **NOTE:** The ramp buttons are secured by Torx™ screws (T20).



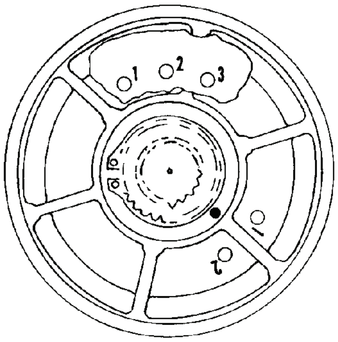
7. Remove moveable sheave and note the number of spacer washers. One spacer must remain between the sheaves when adjusting belt deflection.

Moveable Sheave Bushing Inspection:

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

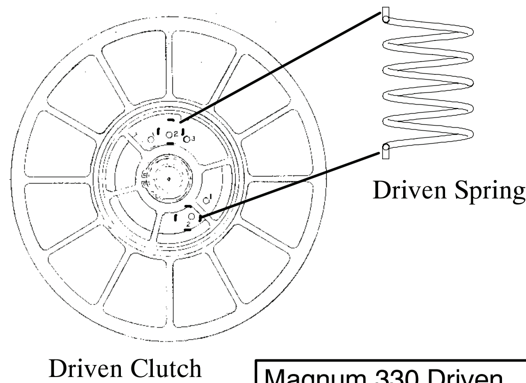
8. Inspect the Teflon™ coating on the moveable sheave bushing.
9. Inspect driven clutch faces for wear or damage.
10. Clean and inspect splines on helix and transmission input shaft.
11. Lube splines with a light film of grease. **Do not lubricate the bushings!**

NON-EBS - DRIVEN CLUTCH ASSEMBLY



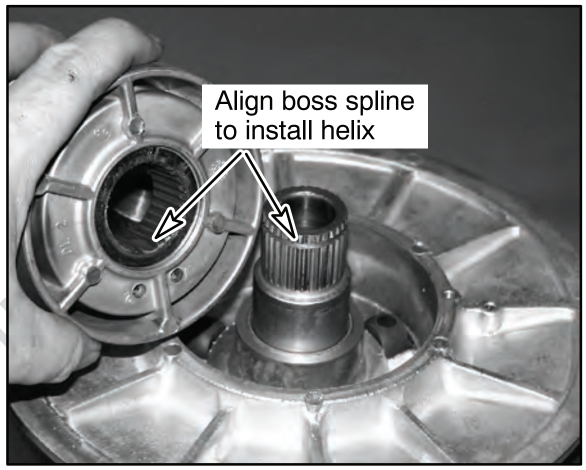
Example:	Helix		Moveable Sheave	Spring Tension
	2	-	1	Heavy
Spring/	2	-	2	↑
Position	1	-	1	
	2	-	3	
	1	-	2	↓
	1	-	3	Soft

Refer to General Information Chapter 1 for driven clutch spring color and production setting.



Ill. 2

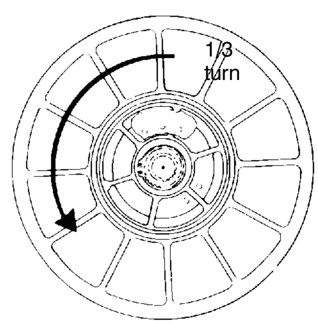
Magnum 330 Driven Spring Placement: 2-2



1. Install moveable sheave with spacer washers. **Important:** At least one spacer washer must be installed. Teflon™ bushings are self-lubricating. Do not apply oil or grease to the bushings.
2. Install spring, inserting spring tab into proper hole in moveable sheave.
3. Insert spring tab into proper hole in helix. See specifications in Chapter 1 or Illustration 2 above.

The driven clutch, helix/moveable assembly has several different spring locations which affect clutch shifting and RPMs. The greatest amount of spring tension will raise engine RPMs during clutch upshift and allow quicker backshift or downshift when pulling or negotiating a hill, for example. The least amount of tension will create a slower downshift and a harder upshift.

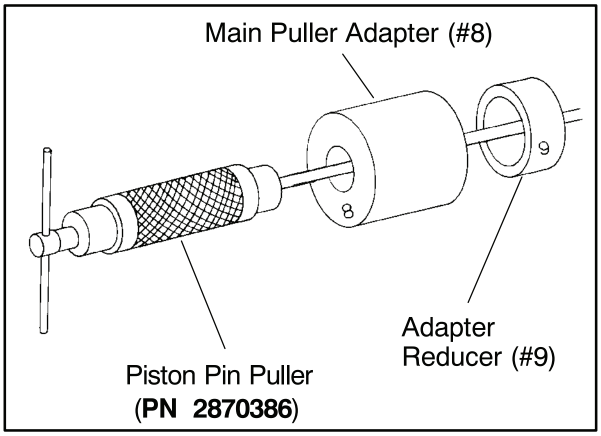
4. Line up boss spline and push helix down until it engages the splines 1/2″ to 3/4″.



5. While holding downward pressure on helix, wind moveable sheave counterclockwise approximately 1/3 turn (120°).
6. Push helix into place and install snap ring.

NON-EBS -DRIVEN CLUTCH BUSHING SERVICE

NOTE: Bushings are installed at the factory using Loctite™. In order to remove the bushing it will be necessary to apply heat. A press can be used to remove and install some of the bushings. Be sure to support the sheave or cover as close as possible to the bushing bore when using a press.

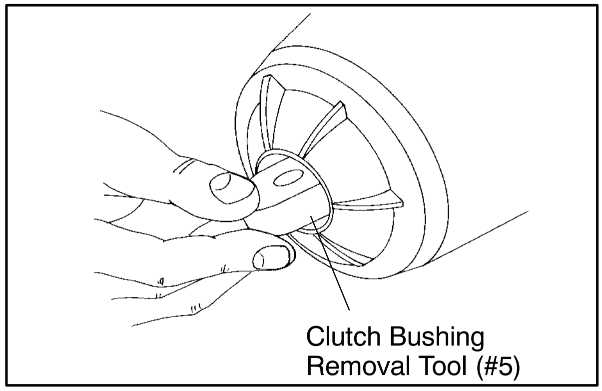


1. Install Main Puller Adapter (#8) (**PN 5020632**) onto the Piston Pin Puller (**PN 2870386)**.
2. Insert Adapter Reducer (#9) (**PN 5010279**) onto the puller, sliding it inside the main adapter.
3. Remove ramp buttons from moveable sheave.

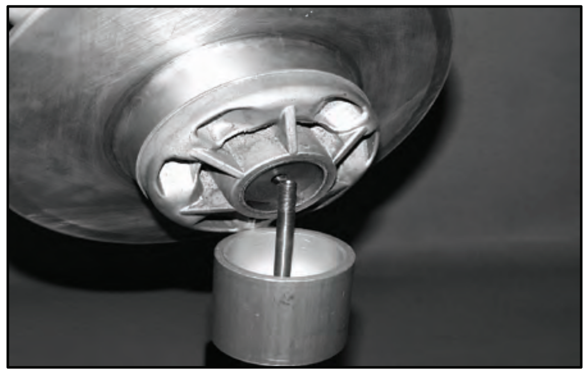
4. Using a hand held propane torch, apply heat directly on bushing until tiny smoke tailings appear.

CAUTION:

Clutch components will be hot! In order to avoid serious burns, wear heat resistant insulated gloves for the rest of the removal process.



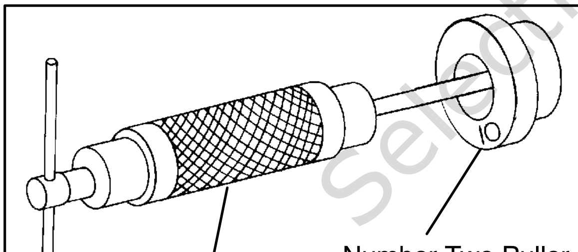
5. Working from the top, install Driven Clutch Bushing Removal Tool (#5) (**PN 5020631**) into the center of clutch sheave with smaller diameter toward bushing to be removed. See illustration.



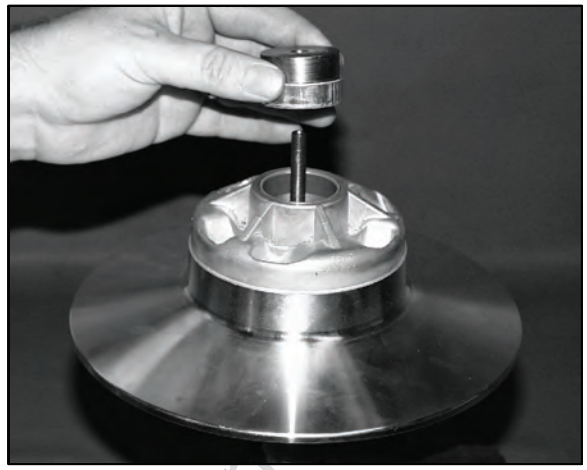
6. Install sheave onto puller.
7. Install nut onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.

8. Turn clutch sheave counterclockwise until bushing is removed. Repeat Steps 5 - 8 for other bushing.
9. Remove nut from puller rod and set aside.
10. Remove adapters from puller.
11. Remove bushing and removal tool from adapters. Discard bushing.

NON-EBS -DRIVEN CLUTCH MOVEABLE SHEAVE - BUSHING INSTALLATION



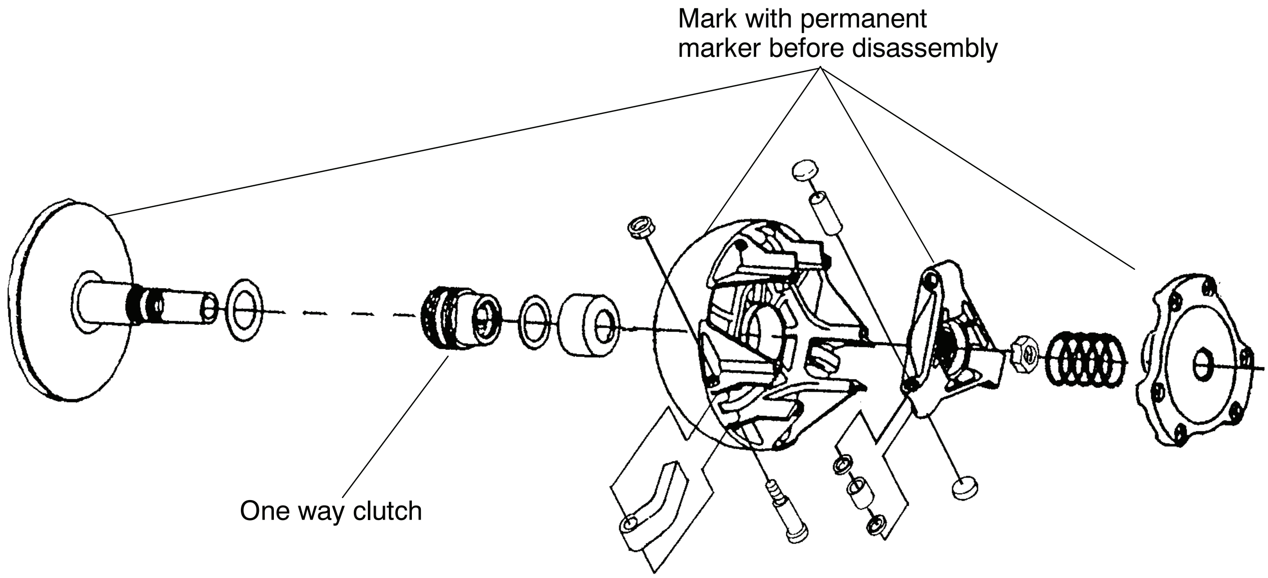
1. Working from the top, insert Number Two Puller Adapter (#10) (**PN 5020633**) onto the puller. See illustration at above.
2. Start new bushing evenly in moveable sheave. Apply Loctite™ 680 (**PN 2870584**) to the back side of new bushing.



3. Install sheave onto puller with new bushing upward as shown. Install the Number Two Puller Adapter (#10) (**PN 5020633**).

4. Install nut onto puller rod and hand tighten against installation tool.
5. Turn clutch sheave counterclockwise until bushing is seated.
6. Remove nut from puller rod and set aside.

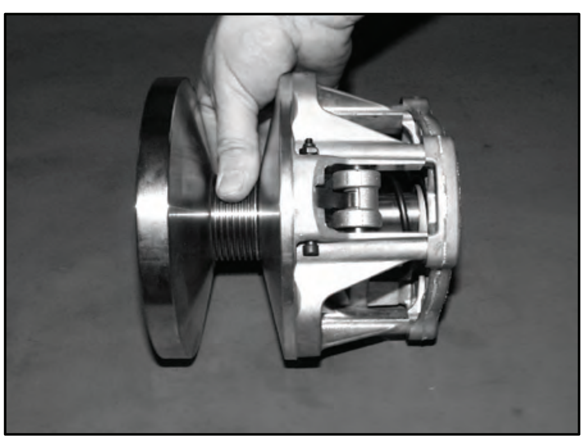
EBS DRIVE CLUTCH EXPLODED VIEW (2004 HDS MODELS)



EBS Drive Clutch

ONE-WAY CLUTCH INSPECTION (DRIVE CLUTCH)

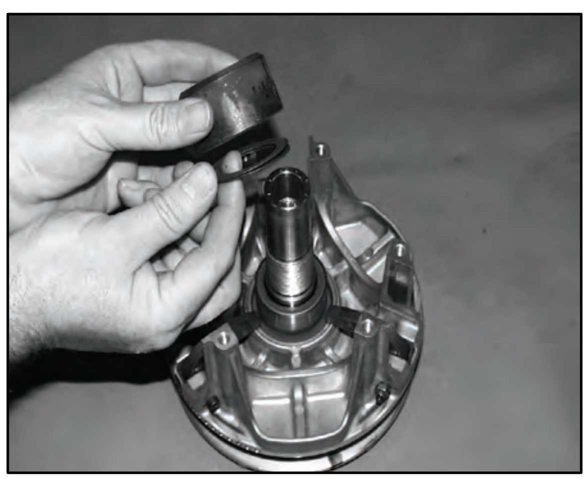
1. Rotate one-way clutch clockwise (as viewed from the cover plate side). The clutch should rotate on the shaft with only slight amount of drag. Verify there is no binding or rough spots. When rotated counterclockwise, the clutch should lock to the shaft without slipping. If problems are noted in either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



DRIVE CLUTCH INSPECTION

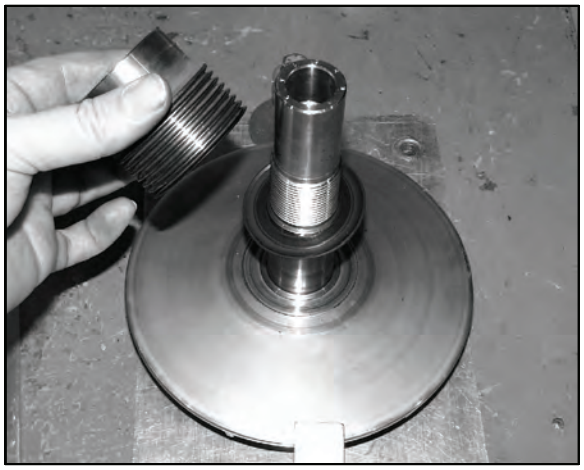
NOTE: Remove cover, spring, and spider following instructions for drive clutch removal, then proceed as follows:

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.

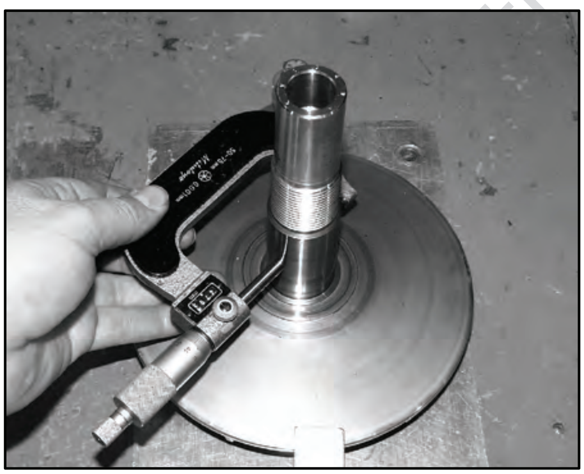


Brass Washer Thickness
Standard: .030″ (.76mm)
Service Limit: .025″ (.64mm)

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.

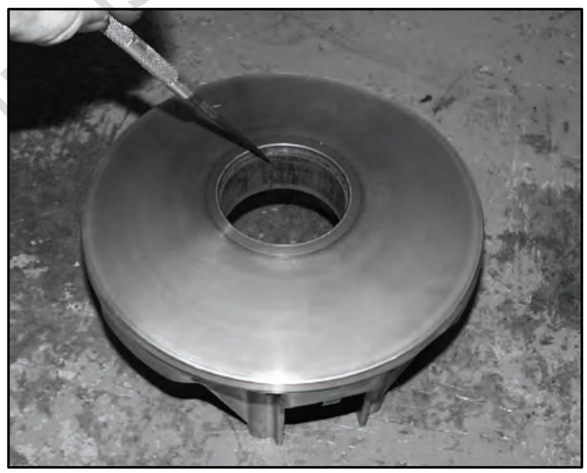
PTFE Washer Thickness
Standard: .030″ (.76mm)
Service Limit: .025″ (.64mm)

MOVEABLE SHEAVE BUSHING INSPECTION

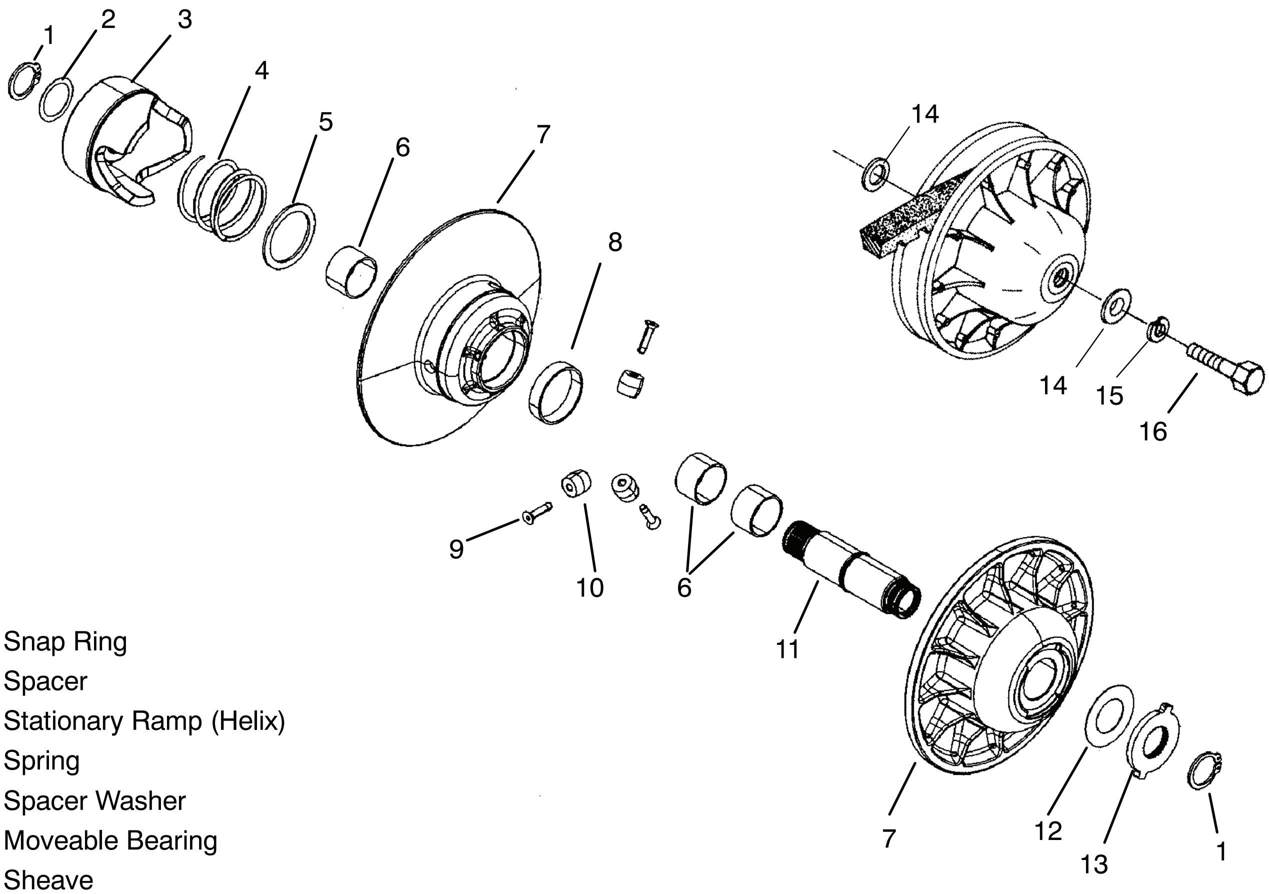
1. Inspect the Teflon™ coating on the moveable sheave bushing. Inspect BOTH sheaves for signs of wear, grooving or cracking. Clean surfaces with a 3M™ pad if needed

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.



EBS DRIVEN CLUTCH EXPLODED VIEW (2004 HDS MODELS)

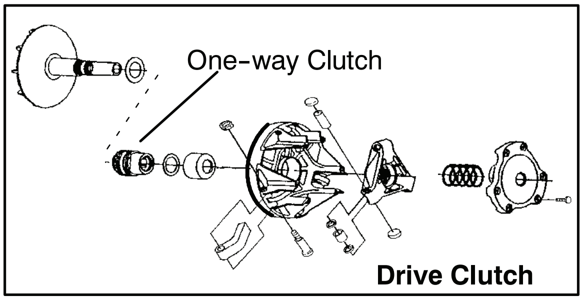


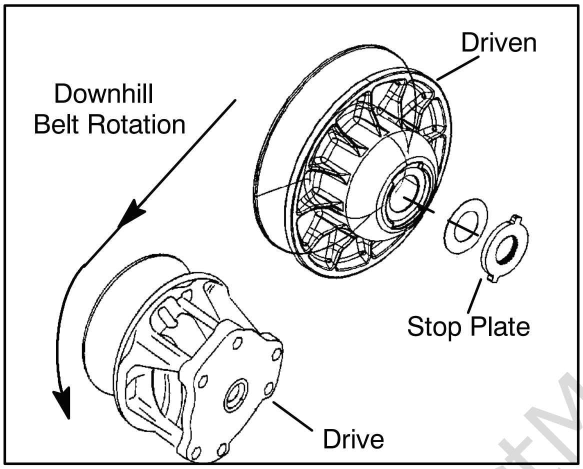
1. Snap Ring
2. Spacer
3. Stationary Ramp (Helix)
4. Spring
5. Spacer Washer
6. Moveable Bearing
7. Sheave
8. Bearing
9. Screw
10. Taper Roller
11. Shaft
12. Washer
13. Plate
14. Washer
15. Spring Lock Washer
16. Bolt

EBS DRIVEN CLUTCH DISASSEMBLY/INSPECTION -

2004 EBS Driven Clutch Operation

The 2004 Magnum HDS 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 <u>from the helix end</u> to reduce spring pressure. Review all information below before proceeding.

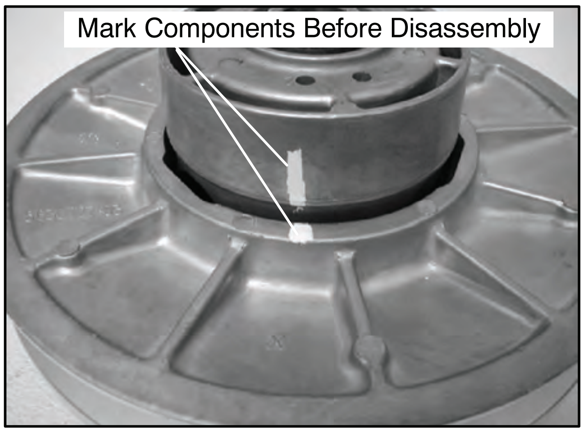
EBS DRIVEN CLUTCH DISASSEMBLY/INSPECTION -

CAUTION: The driven clutch must be disassembled <u>from the helix end</u> to lessen the chance of damage to seals in the one-way clutch. Review all information below before proceeding.

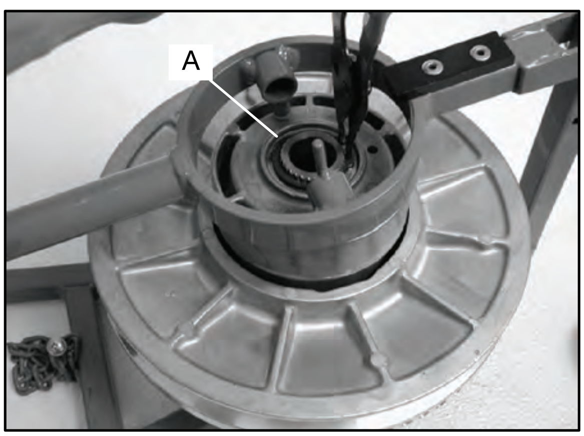
ONE-WAY CLUTCH PRELIMINARY INSPECTION (DRIVEN)

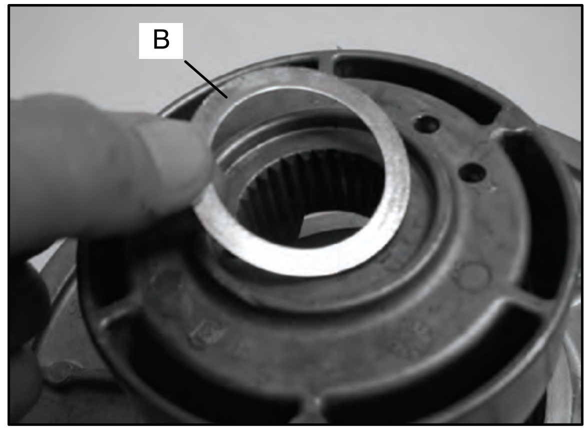
1. Remove driven clutch from the transmission input shaft. Do not attempt disassembly of the driven clutch from the outside snap ring. The driven clutch must be disassembled from the helix side or the one-way clutch seals may be damaged.

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.



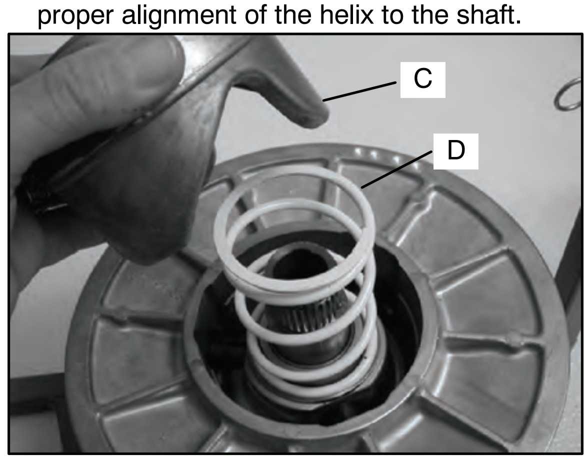
3. Place the driven assembly into the clutch holder. Push helix inward. Remove snap ring (A) and washer (B). **NOTE:** The spring is a compression spring only and has no torsional wind.

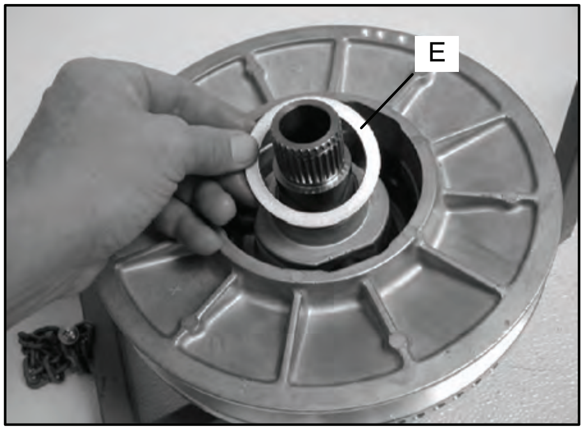




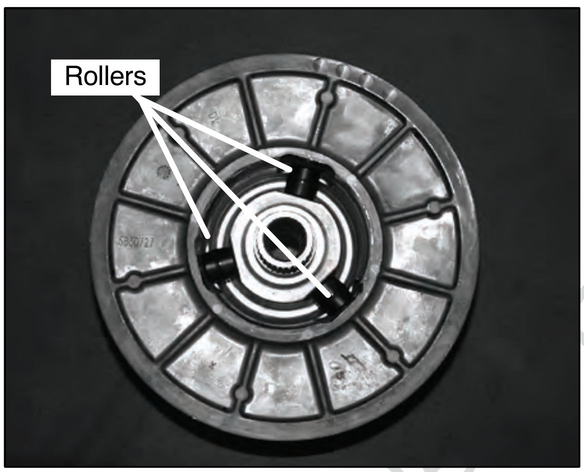
NOTE: Rotating the moveable sheave so that the rollers are not in contact with either helix ramp surfaces will lessen the effort needed to push the helix inward.

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.



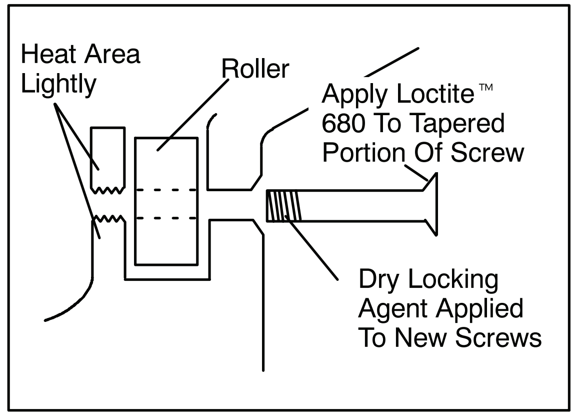


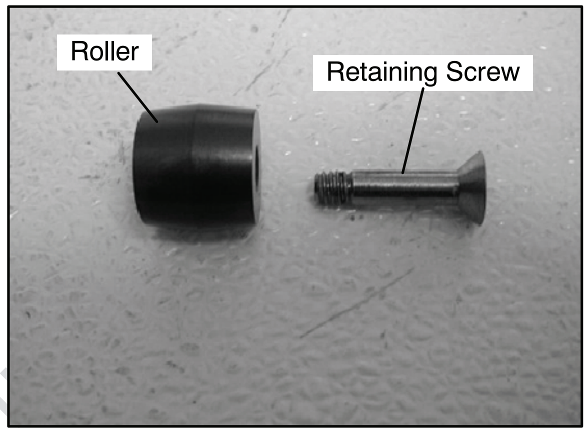
5. Inspect surface of rollers for flat spots and wear. Rollers must rotate freely on pins without excessive clearance. Check the roller pin and roller bore for wear and replace if necessary.



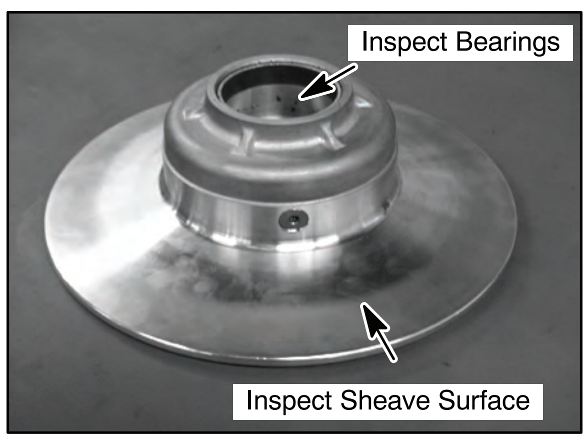
ROLLER PIN DISASSEMBLY

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.





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



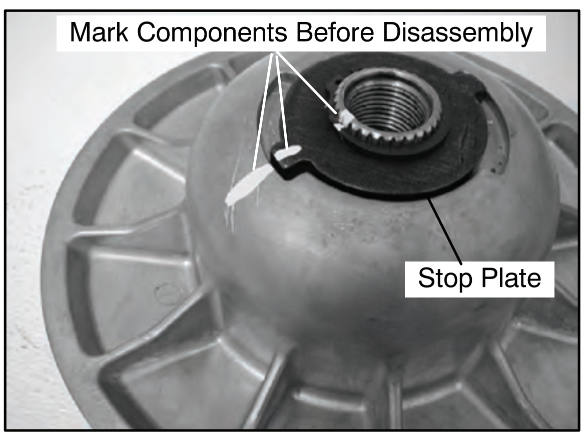
Moveable Sheave Bushing Inspection:

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.

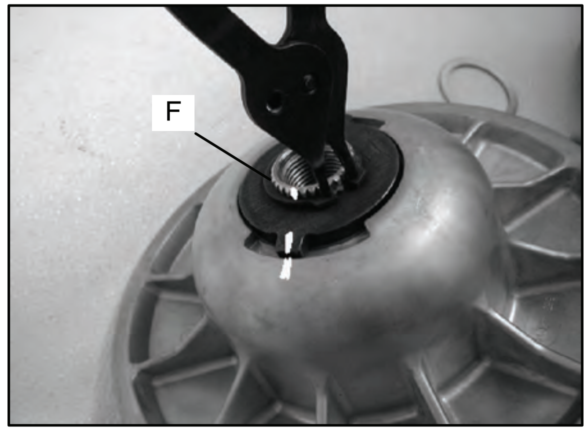
7. Check for movement of the shaft in the stationary sheave. The shaft should rotate freely until the stop plate makes contact with the sheave casting. Some lateral movement is allowable. The amount of movement shall be limited to prevent the plate from raising out of the sheave pocket.

One Way Clutch Disassembly

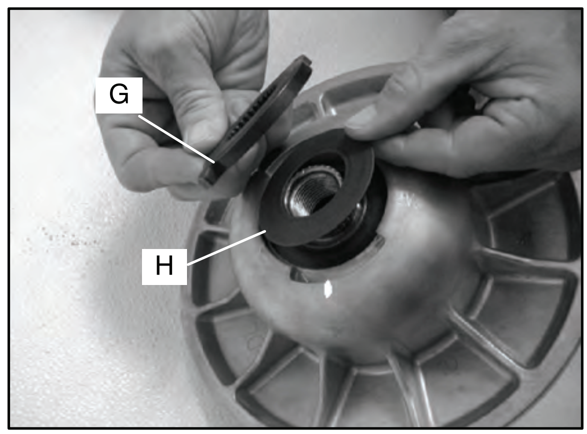
8. It is important to mark the position of the shaft, stop plate, and sheave before disassembly. This will aid in reassembly.



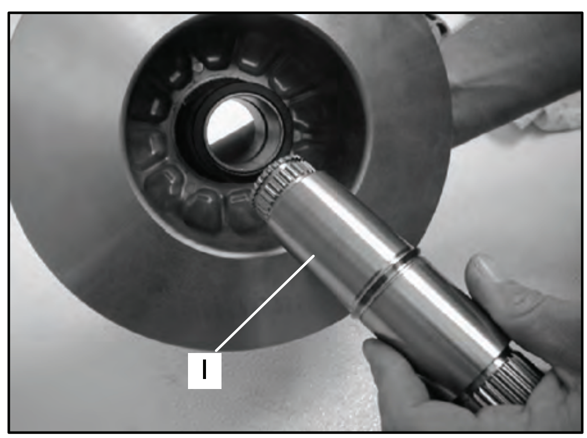
9. Remove the snap ring (F).



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.



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.

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**

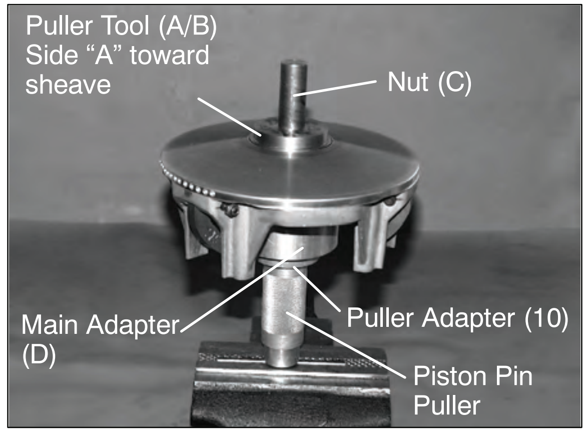
Also required: Clutch Bushing Replacement Tool Kit (PN 2871226) (ATV Clutch Kit) or (PN 2871025) (For all clutches) Piston Pin Puller (PN 2870386)

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

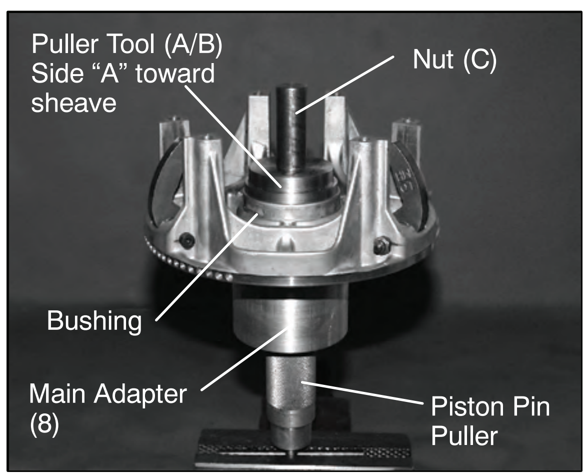
1. Remove clutch as outlined previously in this chapter.
2. Install handle end of Piston Pin Puller (**PN 2870386**) securely into bench vise and lightly grease puller threads.
3. Remove nut from puller rod and set aside.
4. Install puller adapter (Item 10 from kit **PN 2871226**).
5. Install main adapter (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.



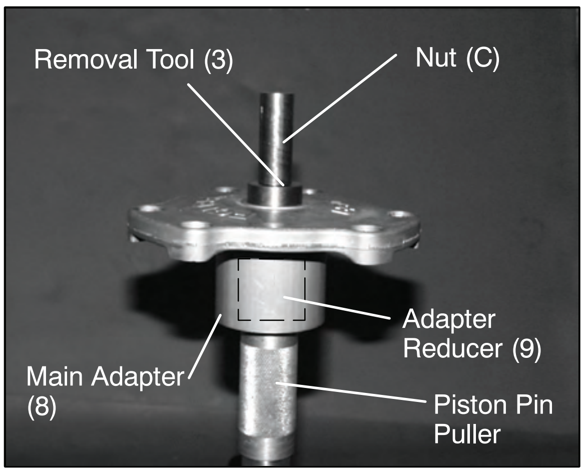
EBS Drive Clutch Moveable Sheave Bushing Installation

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.

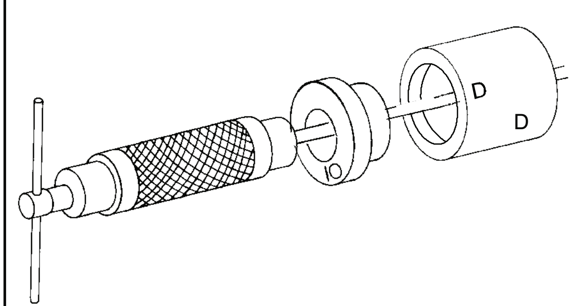
EBS Drive Clutch Cover Bushing Installation

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.

EBS DRIVEN BUSHING SERVICE

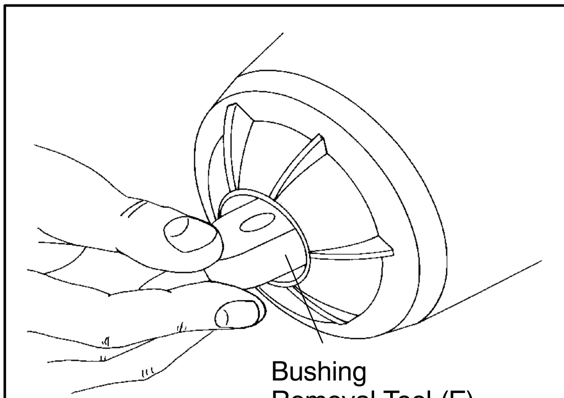
EBS Driven - Bushing Removal

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.

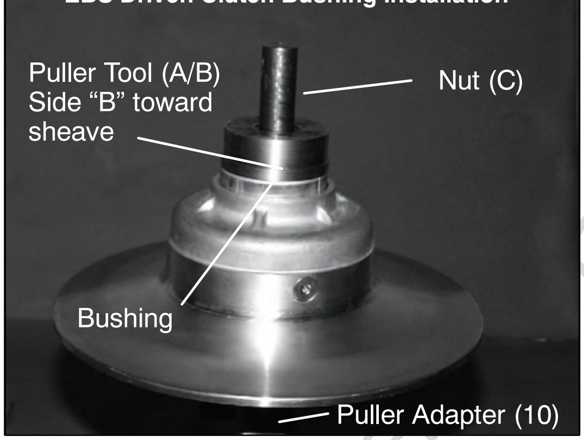
CAUTION: Clutch components will be hot! In order to avoid serious burns, wear insulated gloves during the removal process.

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.

EBS Driven Clutch Bushing Installation



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.

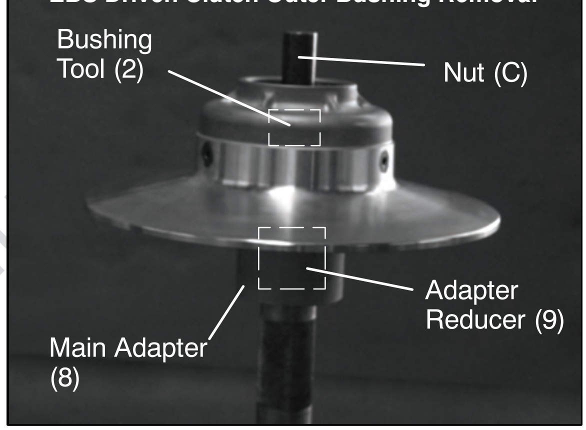
EBS Driven - Backside (Outer) Bushing Removal

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.

EBS Driven Clutch Outer Bushing Removal

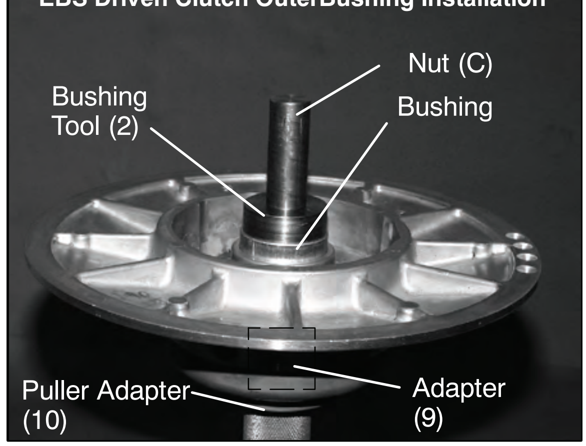


10. Remove bushing and removal tool from adapters. Discard bushing.

EBS Driven - Backside (Outer) Bushing Installation

1. Install puller adapter (Item 10) onto puller.
2. Install adapter (Item 9) onto puller.

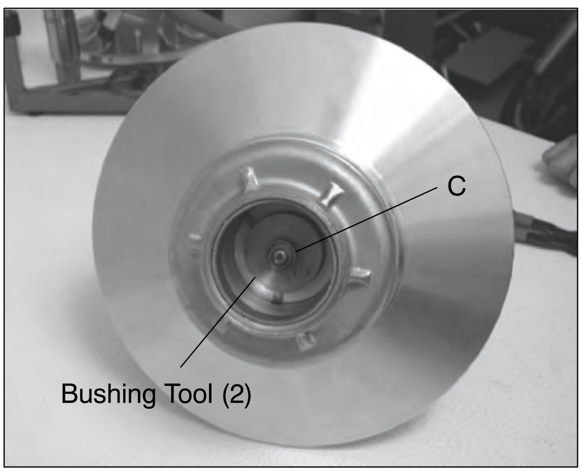
EBS Driven Clutch OuterBushing Installation



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.

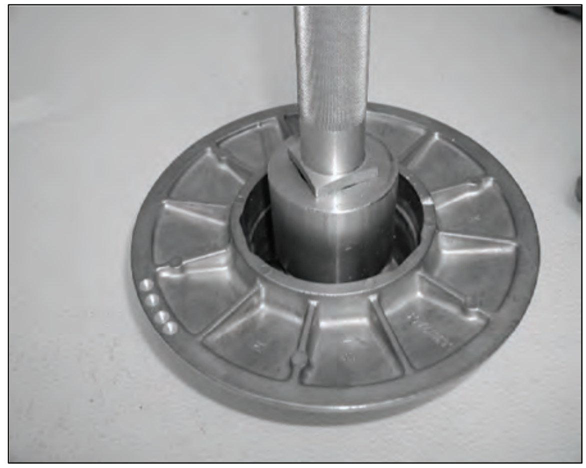
EBS Driven - Stationary Sheave (Inner) Bushing Removal

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.



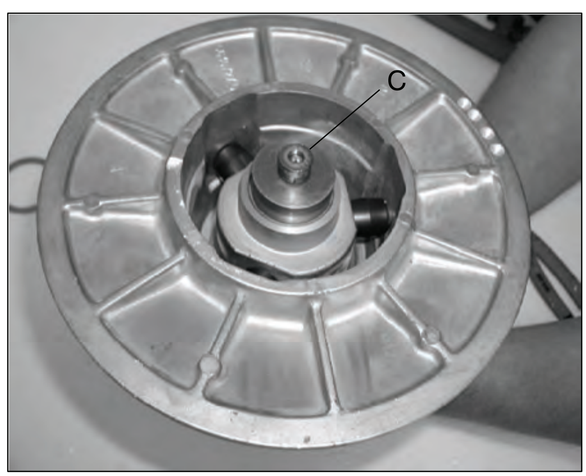
4. Install bushing tool (Item 2)
5. Install the left hand nut (C) and spacer onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
6. Turn clutch sheave counterclockwise until both bushings are removed and sheave comes free.

NOTE: In order to remove both bushings, you may have to remove the tools and slide one bushing out and then start the procedure over to remove the second bushing.

7. Remove nut (C) (left hand thread from puller rod and set aside.
8. Remove adapters from puller.
9. Remove bushing and removal tool from adapters and discard bushing.

EBS Driven - Stationary Sheave (Inner) Bushing Installation

1. Install the puller adapter onto puller
2. Install adapter 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. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.
9. Remove nut (C) (left hand thread from puller rod and set aside.
10. Remove installation tool and clutch sheave from puller.

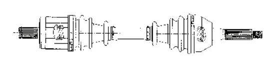
TROUBLESHOOTING

Situation	Probable Cause	Remedy
Engine RPM below specified operating range although engine is properly tuned.	-Wrong or broken drive clutch spring. -Drive clutch shift weight too heavy. -Driven clutch spring broken or installed wrong .	-Replace with recommended spring. -Install correct shift weight kit to match engine application. -Replace spring; refer to proper installation location.
Erratic engine operating RPM during accelera-tion or load vari-ations.	-Drive clutch binding. -Belt worn unevenly - thin/burnt spots -Driven clutch malfunction. -Sheave face grooved.	a. Disassemble drive clutch; inspect shift weights for wear and free operation. b. Clean and polish stationary shaft hub; reassemble clutch without spring to determine problem area. Replace belt a. Replace ramp buttons. b. Inspect movable sheave for excessive bushing clearance/ replace. -Replace the clutch.
Engine RPM above specified operating range.	-Incorrect drive clutch spring (too high spring rate). -Drive clutch shift weights incorrect for ap-plication (too light). -Drive clutch binding. -Driven clutch binding. -Converter sheaves greasy; belt slippage.	-Install correct recommended spring. -Install correct recommended shift weights. -Disassemble and clean clutch, inspecting shift weights and rollers. Reassemble without the spring and move sheaves through entire range to further determine probable cause. -Disassemble, clean, and inspect driven clutch, noting worn sheave bushing and ramp buttons and helix spring location. -Clean sheaves with denatured alcohol or brake cleaner, install new belt.
Harsh drive clutch engage-ment.	-Drive belt worn too narrow. -Excessive belt/sheave clearance with new belt.	-Replace belt. -Perform belt/sheave clearance adjustment with shim wash-ers beneath spider.
Drive belt turns over	-Wrong belt for application. -Clutch alignment out of spec. -Engine mount broken or loose.	-Replace with correct belt. -Adjust alignment offset. -Inspect/adjust or replace.

PVT cover overheating (melting)	-Plugged air intake or outlet -Belt slippage due to water, oil, grease, etc., rubbing on cover -Clutches or weight being applied to cover while in operation -Use of High vs. low range	-Clear obstruction. -Inspect system. Clean , repair or replace as necessary. Seal PVT system ducts. -Remove weight. Inform operator. -Instruct operator on guidelines for operation in proper driving range for different terrain as outlined in Owner's Safety and Maintenance Manual.
Belt slippage	-Belt worn out -Water ingestion -Belt contaminated with oil or grease	-Replace belt. -Inspect and seal PVT system. -Inspect and clean.
Belt burnt, thin spots	-Abuse (continued throttle application when vehicle is stationary, excess load) -Dragging brake -Slow, easy clutch engagement	-Caution operator to operate machine within guidelines. -Vehicle operated with park brake on. Inspect brake system. -Instruct firm, effective use of throttle for efficient engagement.
PVT noise	-Belt worn or separated, thin spots, loose belt -Broken or worn clutch components, cover hitting clutches	-Replace belt. -Inspect and repair as necessary.
Engagement erratic or stabby	-Thin spots on belt, worn belt -Drive clutch bushings stick	-Replace belt. Refer to belt burnt troubleshooting and instruct operator. -Inspect and repair clutches.
Water ingestion	-Cover seals or ducts leaking -Operator error	-Find leak and repair as necessary. -Instruct operator on guidelines for operation in wet terrain as outlined in Owner's Safety and Maintenance Manual.

CHAPTER 7

FINAL DRIVE



7

WHEEL, HUB, AND SPINDLE TORQUE TABLE[1]

Model	Item	Specification
Magnum 330 2x4 & Magnum 330 2x4 HDS	Front Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Rear Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Front Spindle Nut	40 Ft. Lbs. (54 Nm)
	Rear Hub Retaining Nut	80 Ft. Lbs. (108 Nm)
Magnum 330 4x4 Magnum 330 4x4 HDS	Front Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Rear Wheel Nuts	27 Ft. Lbs. (37 Nm)
	Front Hub Retaining Nut	70 Ft. Lbs. (95 Nm)
	Rear Hub Retaining Nut	80 Ft. Lbs. (108 Nm)

[1] Refer to exploded views and text for torque values of other fasteners

CAUTION: Locking nuts, and bolts with pre-applied locking agent should be replaced if removed. The self-locking properties of the nut or bolt are reduced or destroyed during removal.

SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2870872	Shock Spanner Wrench
2870871	Ball Joint Replacement Tool
2872608	Roller Pin Removal Tool
8700226	CV Boot Clamp Pliers

WHEEL, HUB, AND SPINDLE TORQUE TABLE[1]

[1] Refer to exploded views and text for torque values of other fasteners

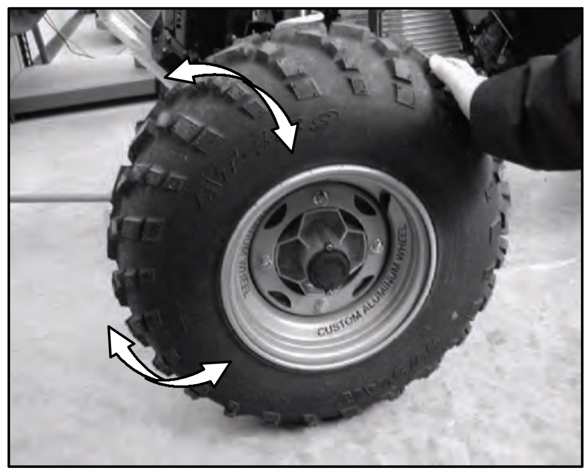
CAUTION: Locking nuts, and bolts with preapplied locking agent should be replaced if removed. The self-locking properties of the nut or bolt are reduced or destroyed during removal.

FRONT HUB DISASSEMBLY/INSPECTION (2X4)

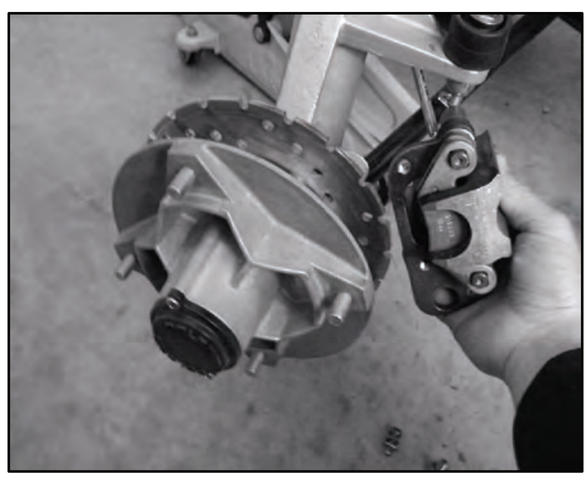
1. Elevate front end and safely support machine under footrest / frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Check bearings for side play by grasping tire / wheel firmly (top and bottom) and checking for movement. It should rotate smoothly without binding or rough spots.

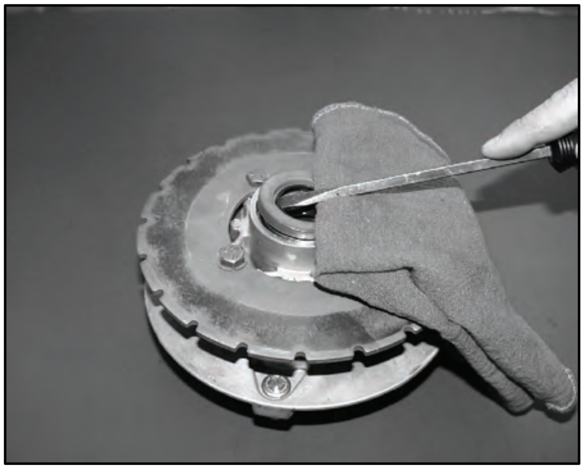


3. Remove wheel nuts and wheel.
4. Remove the two brake caliper bolts and the brake caliper. Use mechanic's wire or other suitable material to support the caliper assembly. <u>Do not allow caliper assembly to hang by the brake line!</u>

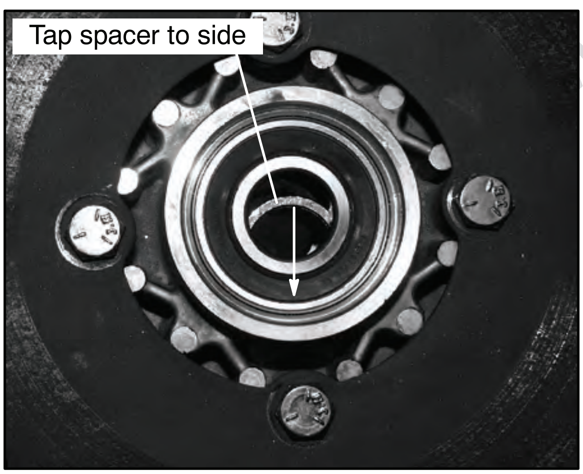


5. Remove hub cap, cotter pin, front spindle nut, and washer.

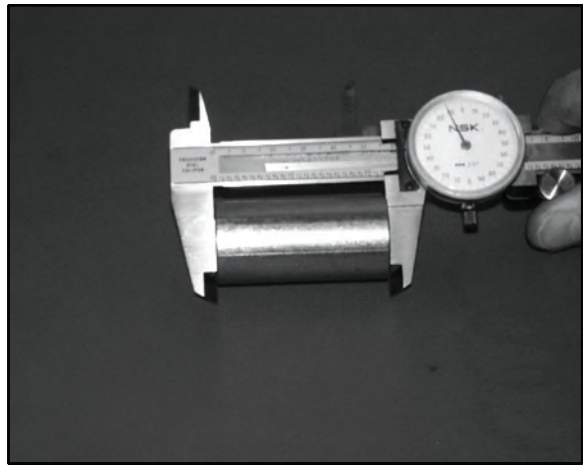
6. Rotate each bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion. Replace bearing if moisture, dirt, corrosion, or roughness is evident.
7. Place a shop towel on hub to protect surface. Carefully pry seal out of hub.



8. Using a brass drift, tap bearing spacer to one side to expose inner bearing race. Drive bearing out using a drift through opposite side of hub and discard.



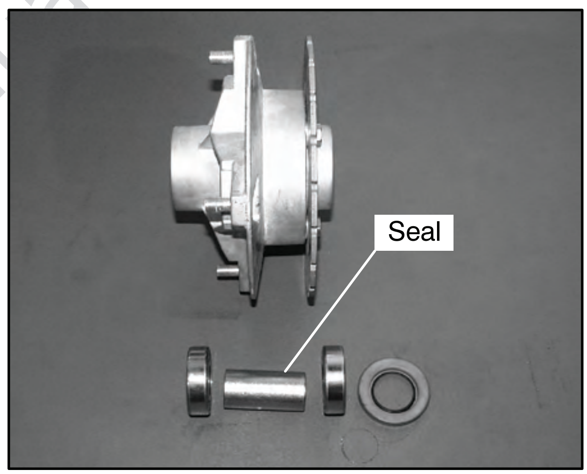
9. Remove spacer. Drive other bearing out and discard.
10. Clean hub and spacer thoroughly.
11. Inspect spacer for wear or damage. Measure length of spacer and replace if worn beyond service limit or if ends are rounded.



Bearing Spacer Length:
Service Limit: 2.1850″ (5.55 cm)

FRONT HUB ASSEMBLY (2X4)

1. Drive or press one new bearing into hub using a 1.180 (46 mm) bearing driver.

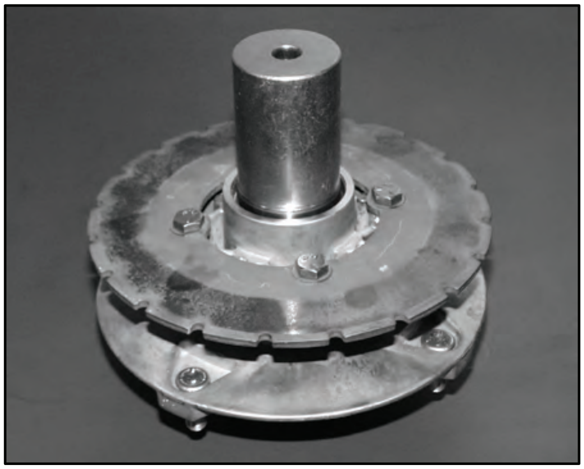


CAUTION: *Do not* drive on the inner race of the bearing.

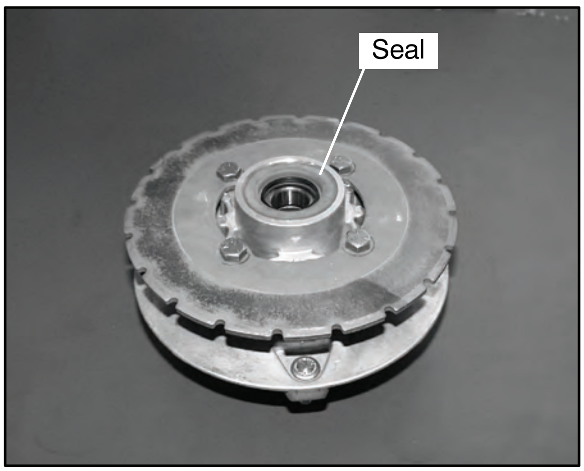
Premium All-Season Grease	
(PN 2871322)	**(3 oz. Tube)**
(PN 2871423)	**(14 oz. Tube)**

2. Coat bearing spacer with grease and install into hub. Drive or press the other bearing into hub until

seated against spacer.

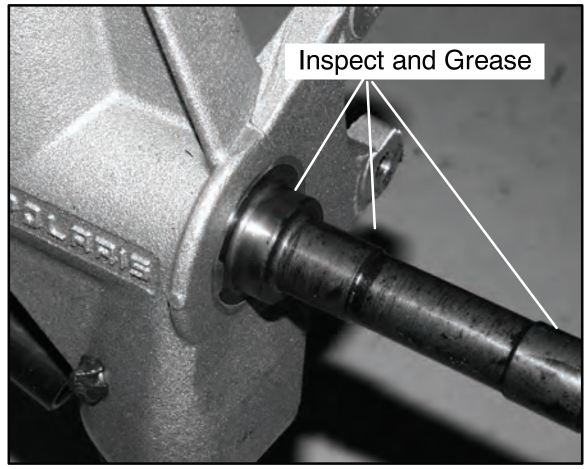


3. Install seal into hub (with numbers facing out) until flush with end of seal bore.

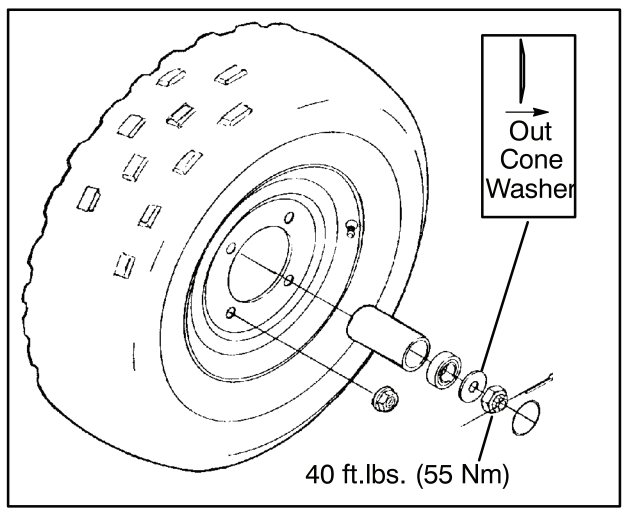


FRONT HUB INSTALLATION (2X4)

1. Inspect spindle seal and bearing surface for wear or damage.

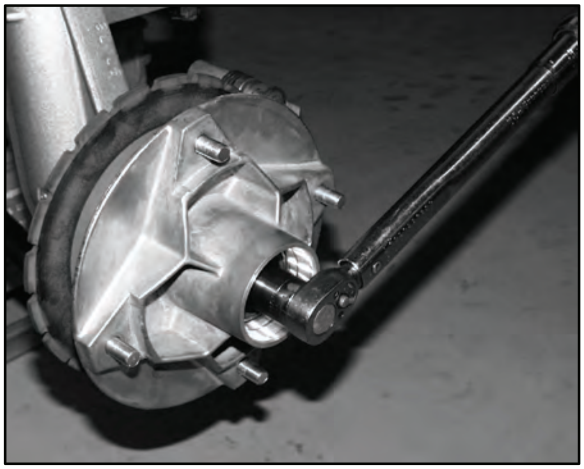


2. Apply grease to spindle.
3. Install hub on spindle.
4. Apply grease to washer and install with domed side out.



5. Install spindle nut and tighten to specification.

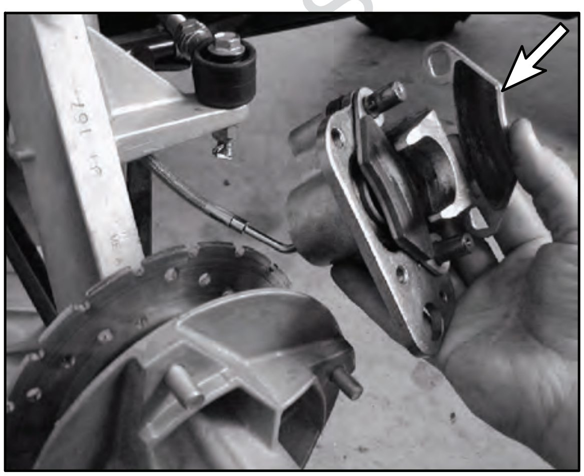
2 x 4 Spindle Nut Torque: **40 ft. lbs. (55 Nm)**



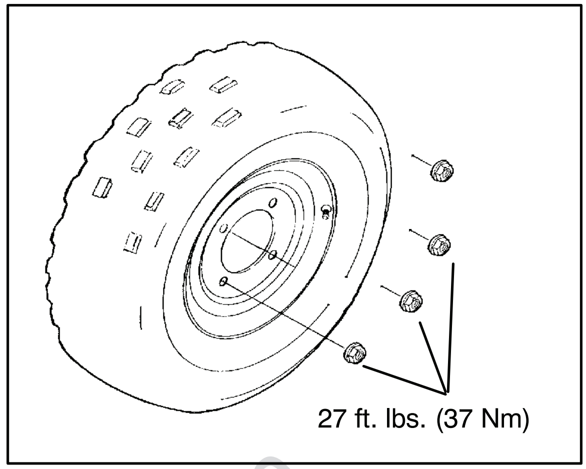
6. Install a new cotter pin. Tighten nut slightly if necessary to align cotter pin holes.
7. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around end of spindle in different directions.

Front Wheel Nut Torque
27 ft. lbs. (37 Nm)

8. Lightly grease a new O-ring and install on hub cap.
9. Install hub cap.
10. Rotate hub. It should rotate smoothly without binding or rough spots or side play.
11. Install brake caliper. Tighten bolts to specified torque.

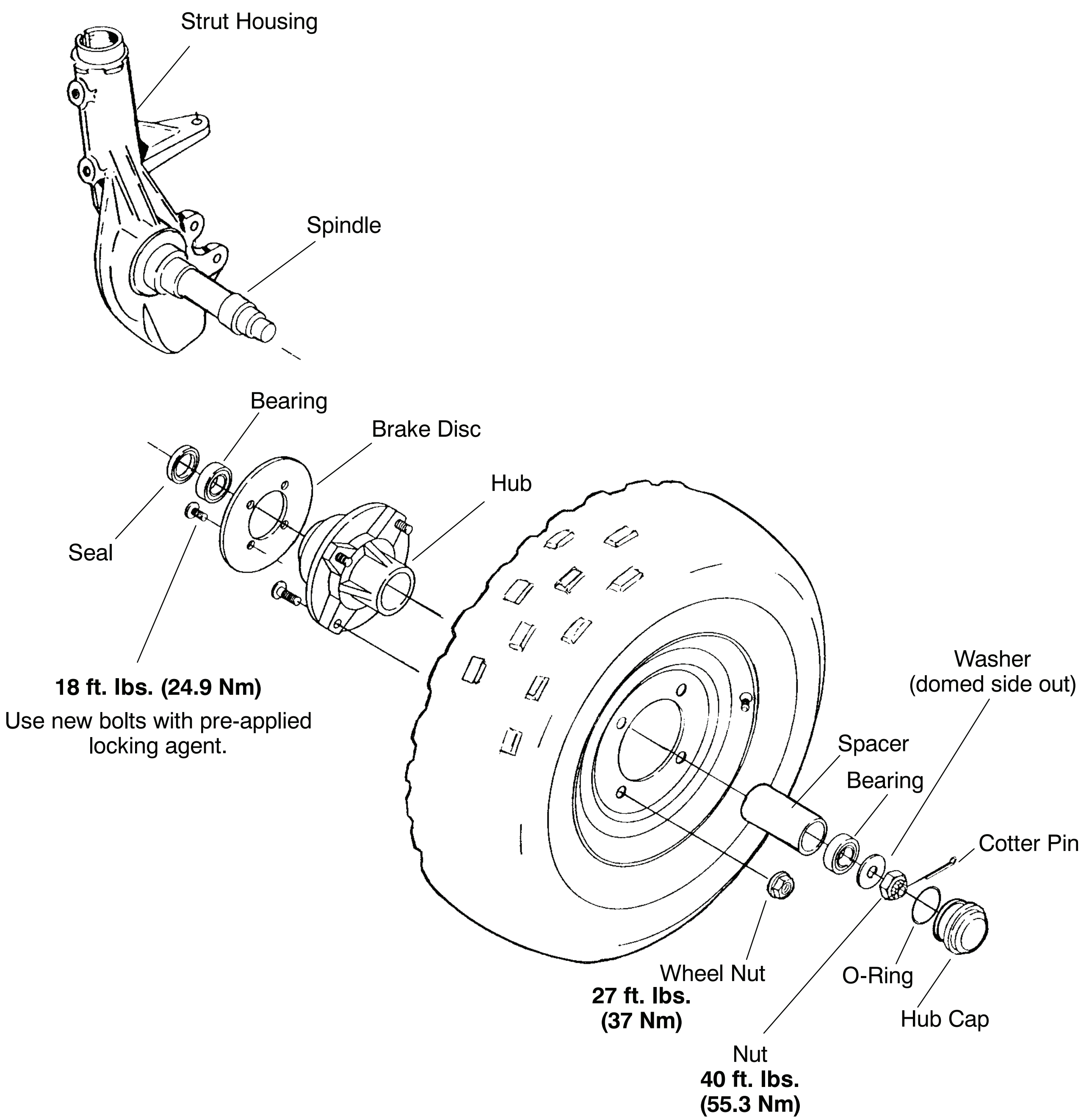


12. Install wheel and wheel nuts and tighten evenly in a cross pattern to specified torque.



Caliper Mounting Bolt Torque
18 ft. lbs. (25 Nm)

2X4 FRONT HUB EXPLODED VIEW



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.

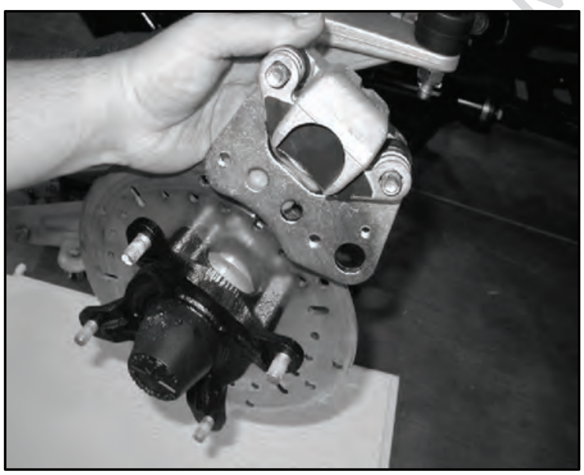
FRONT DRIVE AXLE REMOVAL (4X4)

1. Place the gear selector in park. Remove hub dust cap.
2. Remove cotter pin.
3. Loosen the hub retaining nut.
4. Loosen, but do not remove the wheel nuts.
5. Safely lift and support the front of the ATV.

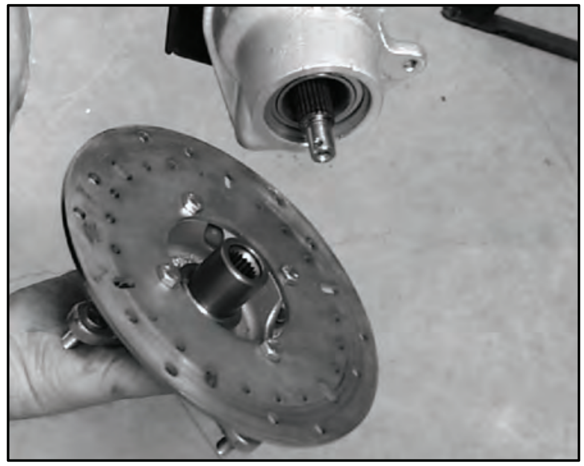
CAUTION:

Serious injury could occur if machine tips or falls.

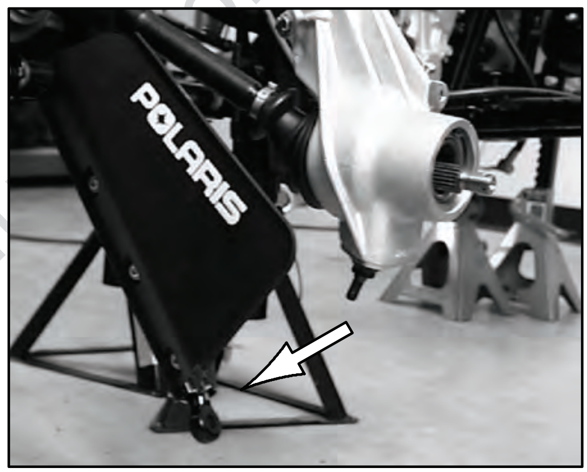
6. Remove wheel.
7. Remove the two brake caliper attaching bolts. **CAUTION:** Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.



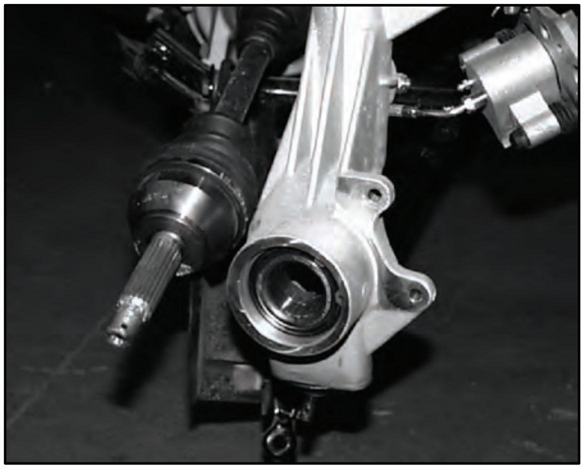
8. Remove hub.



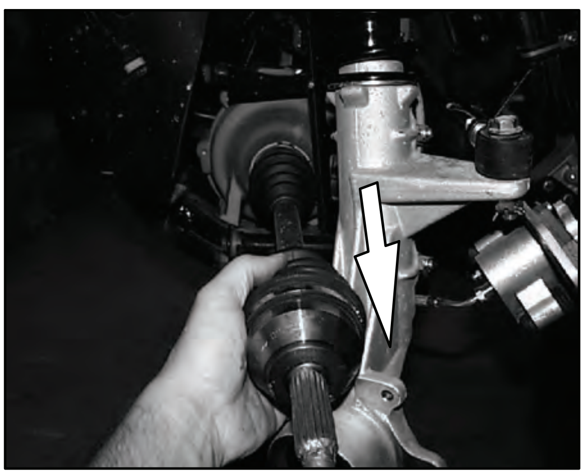
9. Remove cotter pin and nut from lower A-arm ball joint. Remove lower A-arm from ball joint.



10. Pull strut assembly out while pivoting front drive shaft downward until it clears strut assembly.

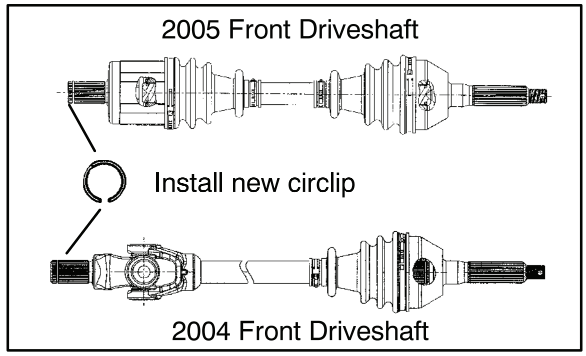


11. With short, sharp jerks, remove drive shaft from front gearcase.

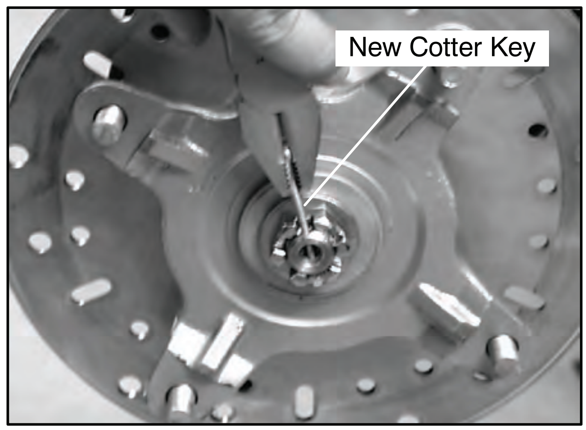


FRONT DRIVE AXLE INSTALLATION (4X4)

1. Install new spring ring on drive shaft. Apply an anti-seize compound to splines.
2. Install a new circlip onto the drive shaft before installing into front gearcase. Align splines of drive shaft with front gearcase and install by lightly tapping on drive shaft with rubber faced hammer.



3. Install drive shaft in strut.
4. Install lower ball joint, torque nut to 25 ft. lbs. (34.5 Nm) and install new cotter pin.
5. 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

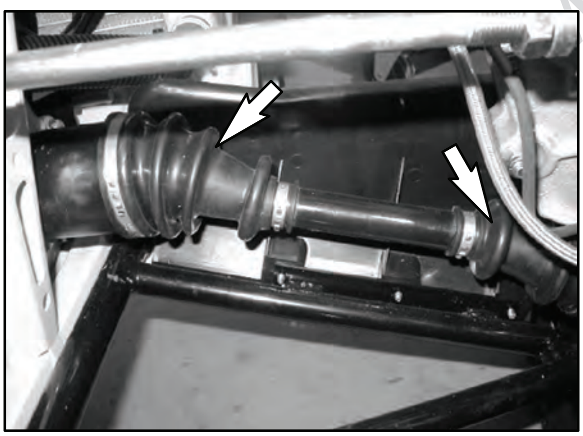
Care should be exercised during driveshaft removal or when servicing CV joints. Driveshaft components are precision parts.
Cleanliness and following these instructions is very important to ensure proper shaft function and a normal service life.

- 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.

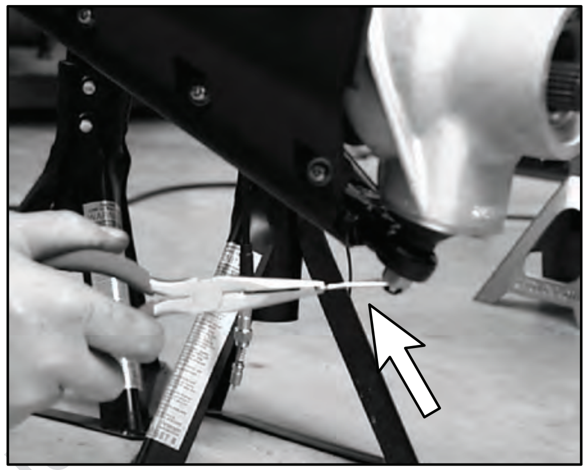
DRIVE SHAFT (CV) BOOT INSPECTION (4X4)

Check the front and rear driveshaft cv boots for any tears or leaking grease. If the driveshaft boot loses all of the grease cv joint failure will occur.

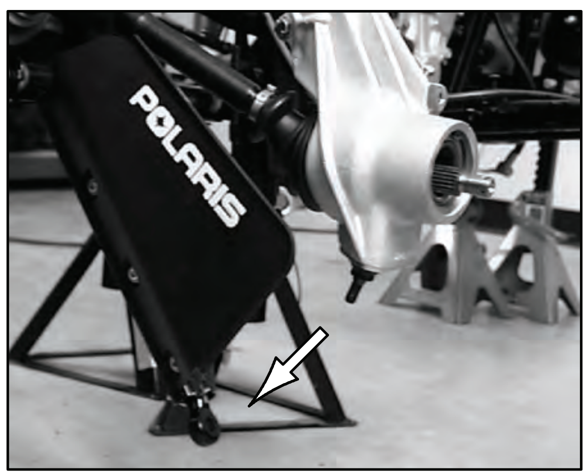


2004 MAGNUM – FRONT DRIVE SHAFT CV JOINT BOOT REPLACEMENT (4X4)

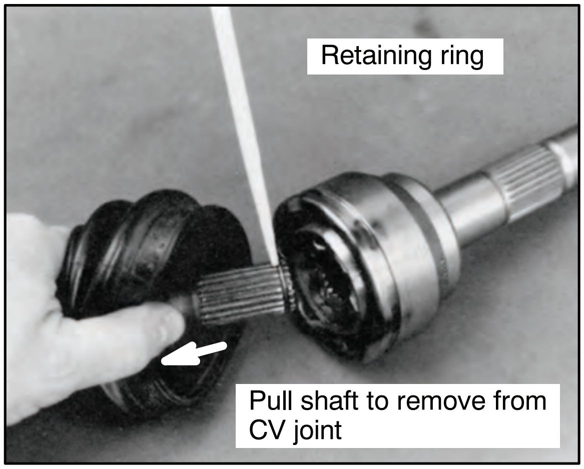
1. Remove wheel, brake caliper and wheel hub. Refer to Front Drive Axle Removal Page 7.7 for procedure.
2. Remove cotter pin and castle nut from A-arm ball joint.



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

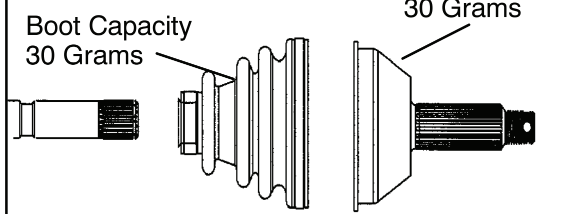
Boot replacement with complete CV joint cleaning requires an additional 30g. (Total 60g)

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.

CV BOOT REPLACEMENT CONT'D

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.

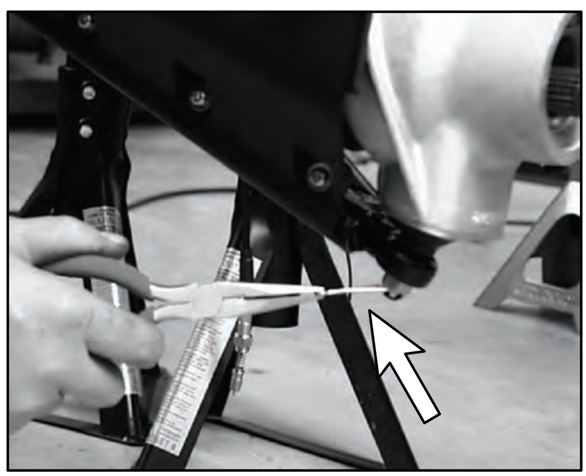
FRONT SHAFT



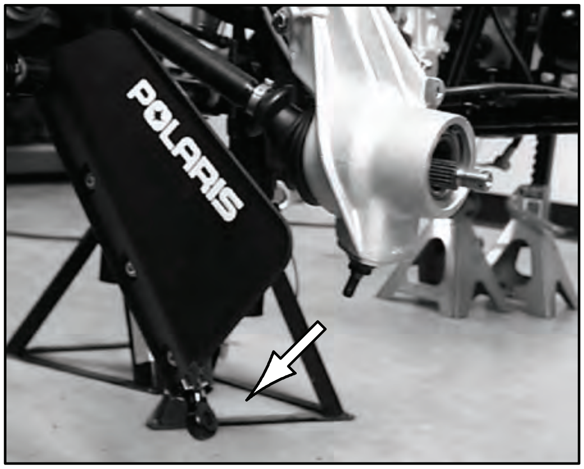
Front outboard joint capacity: 30g if boot is replaced only. Another 30g (60g total) if joint is cleaned.

2005 MAGNUM - FRONT DRIVE SHAFT CV JOINT BOOT REPLACEMENT (4X4)

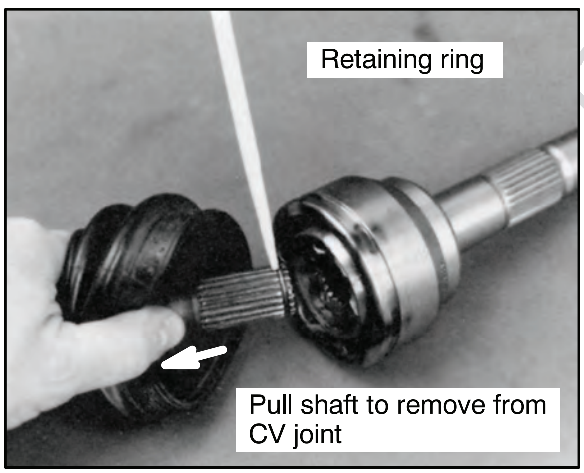
1. Remove wheel, brake caliper and wheel hub. Refer to Front Drive Axle Removal Page 7.2 for procedure.
2. Remove cotter pin and castle nut from A-arm ball joint.



3. Disconnect A-arm from ball joint using a tie rod fork.



4. Slide strut off end of drive shaft and tie it up out of the way of the shaft.
5. Remove clamps from rubber boot using the proper boot clamp pliers.
6. Remove the large end of the boot from the CV joint, slide the boot back and separate the wheel spindle and CV joint assembly from the axle shaft by pulling the shaft sharply outward, away from the CV joint. It may be necessary to tap the CV joint assembly outward with a soft faced hammer.



7. Remove small clamp and boot from driveshaft.

NOTE: If the ATV has been operated with a damaged boot, the CV joint grease may be contaminated. Inspect the grease carefully for contamination, and clean the joint thoroughly if necessary. Front drive axle CV boot replacement requires 3.5 oz. of grease.

8. Before installing the new boot, remove all grease from the boot area and shaft.

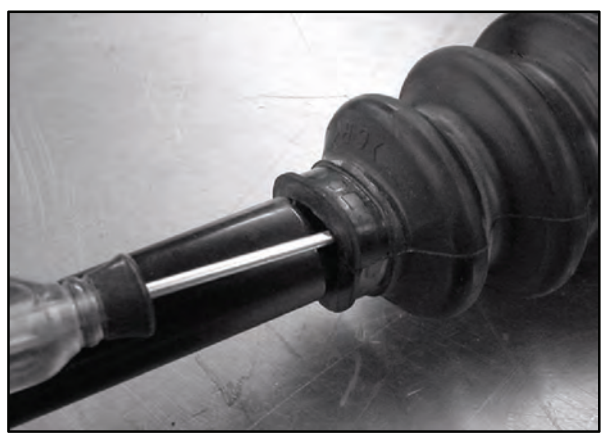
NOTE: It is very important to use the correct type and quantity of grease. Use only the grease contained in the boot kit. DO NOT use a substitute grease and DO NOT overfill or underfill the CV joint.

CV Joint Grease -3.5 oz. (Refer to parts manual for boot kit)

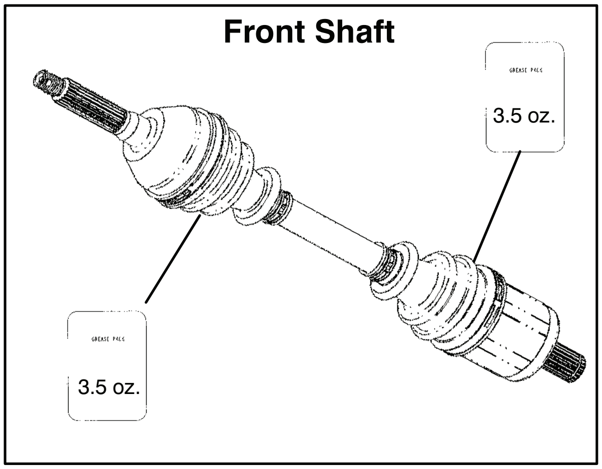
CV Boot Clamp Pliers: Earless Type (PN 8700226)

Boot replacement with complete CV joint cleaning requires the entire 3.5 oz. of grease.

9. Slide the new clamp and boot (small end first) over the splined shaft, then slide (tap) the CV joint into the splines of the axle.
10. Add grease through large end of boot.
11. Install a new boot onto the axle shaft and fill the CV joint and boot with the correct type and amount of grease.
12. While pulling out on the CV shaft, fully extend the CV joint and slide a straight O-ring pick or a small slotted screw driver between the small end of the boot and the shaft. This will allow the air pressure to equalize in the CV boot in the position that the joint will spend most of its life. Before you remove your instrument, be sure the small end of the boot is in its correct location on the axle. CARE MUST BE TAKEN TO AVOID DAMAGE TO THE NEWLY INSTALLED BOOT.

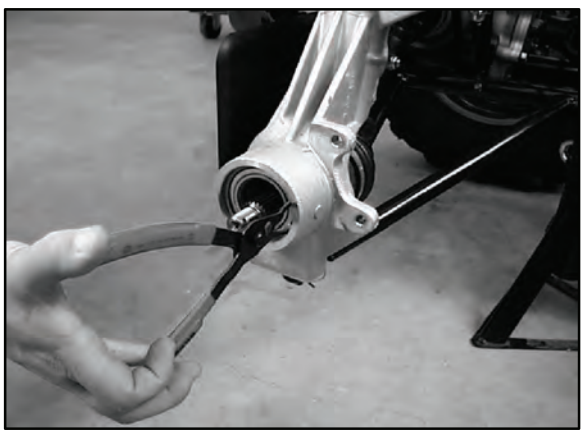


13. Install the small clamp on the boot.

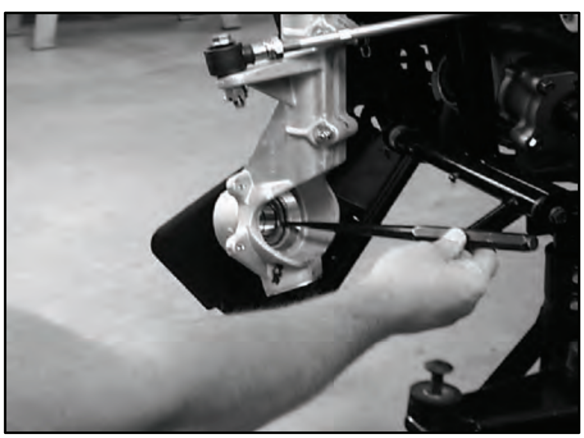


FRONT HUB DISASSEMBLY

1. Remove outer snap ring.



2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.



NOTE: Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.

3. Inspect the bearing.

NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.

4. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.

FRONT HUB ASSEMBLY

1. Support bottom of hubstrut housing.
2. Start bearing in housing.
3. Press bearing into place until outer race bottoms on housing.

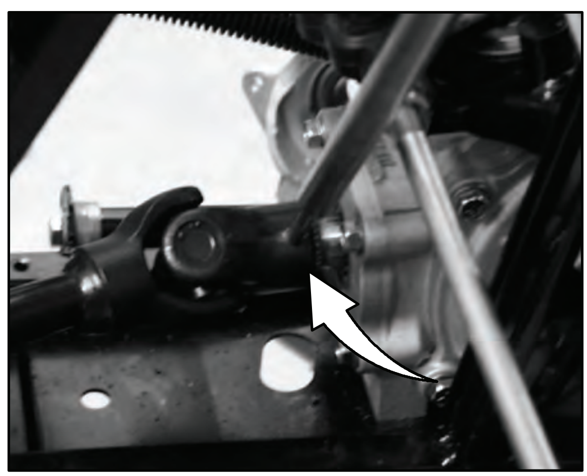
CAUTION:

When using an arbor press be sure to press only on the outer race, as bearing damage may occur.

4. Install snap ring into groove.

FRONT PROP SHAFT REMOVAL (4X4)

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.



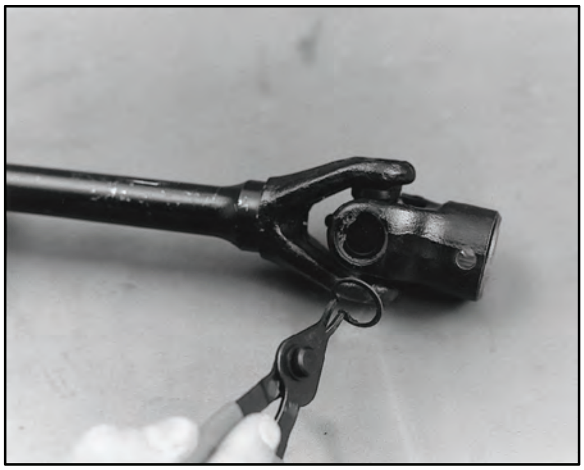
Roll Pin Remover Tool (PN 2872608)

NOTE: If removing front housing, use roll pin removal tool to remove the pins from both front drive axles.

U-JOINT DISASSEMBLY

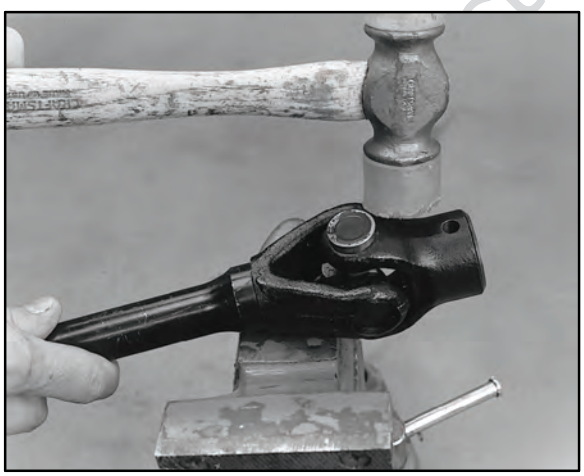
CAUTION: Wear eye protection at all times.

1. Remove internal or external snap ring from all bearing caps.



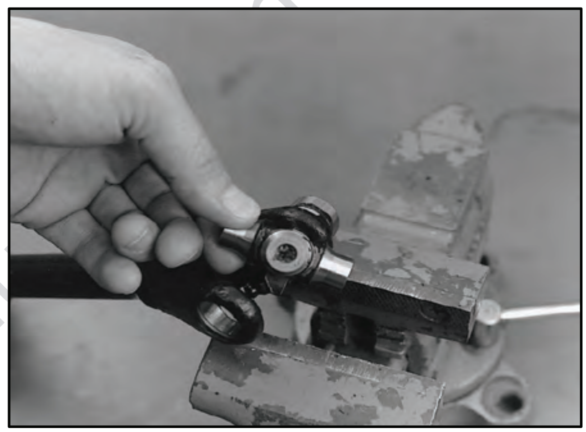
NOTE: If yoke or bearing is removed, cross bearing must be replaced. Note orientation of grease fitting and mark inner and outer yoke for correct re-positioning during installation.

2. Support inner yoke as shown and drive outer yoke down (bearing cap out) with a soft face hammer.



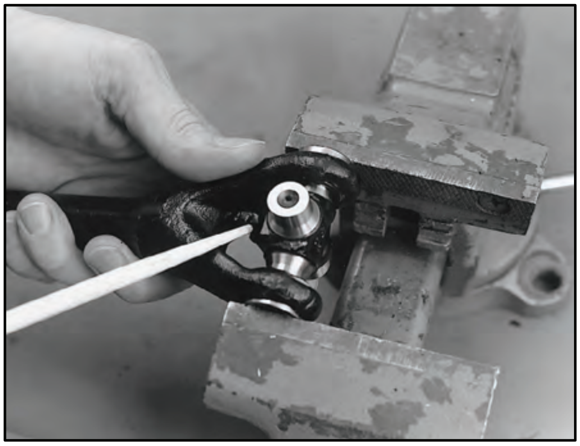
3. Support U-joint in vise as shown and drive inner yoke down to remove remaining bearing caps.

4. Force U-joint cross to one side and lift out of inner yoke.

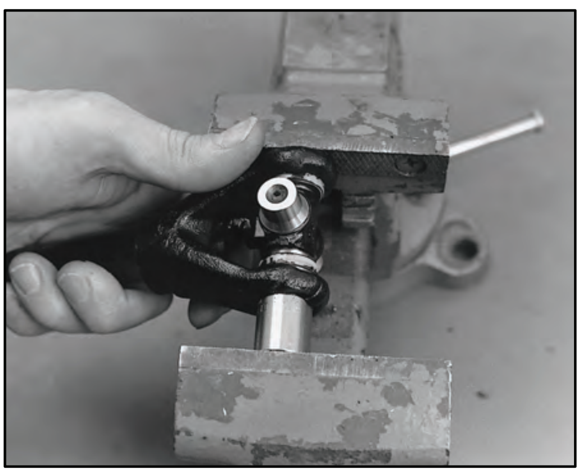


U-JOINT REASSEMBLY

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.

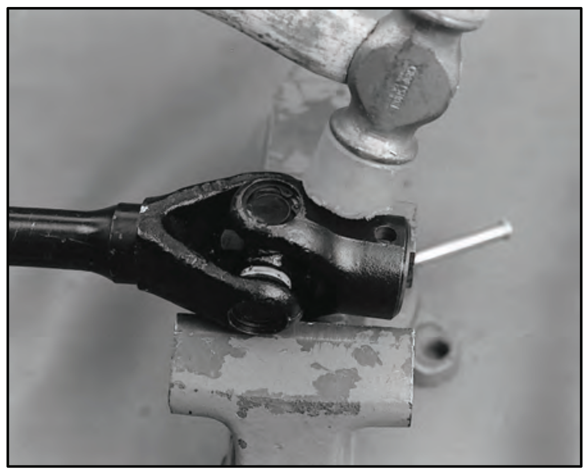


2. Using a suitable arbor or vise, fully seat bearing cap in one side. Continually check for free movement of bearing cross as bearing caps are assembled.



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.

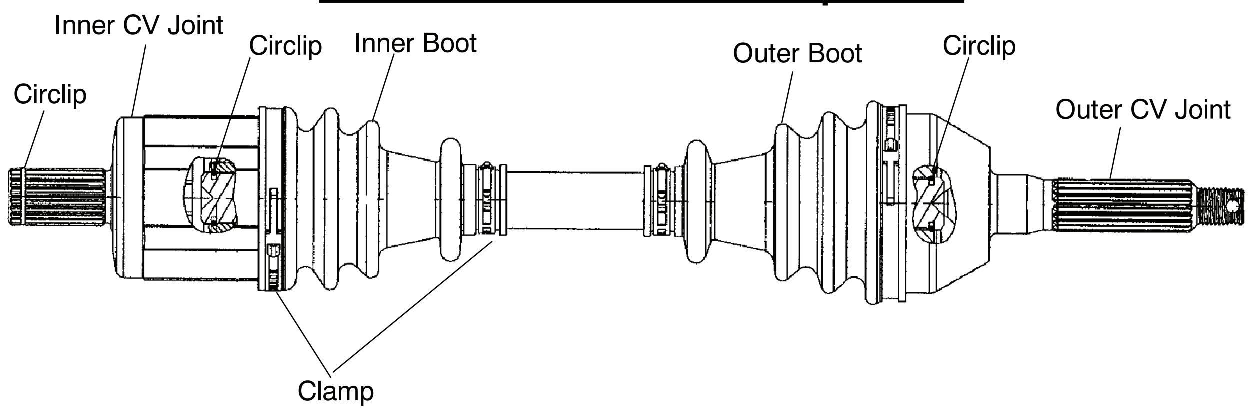


7. When installation is complete, Yokes must pivot freely in all directions without binding. If the joint is stiff or binding, tap the yoke lightly to center the joint until it pivots freely in all directions.

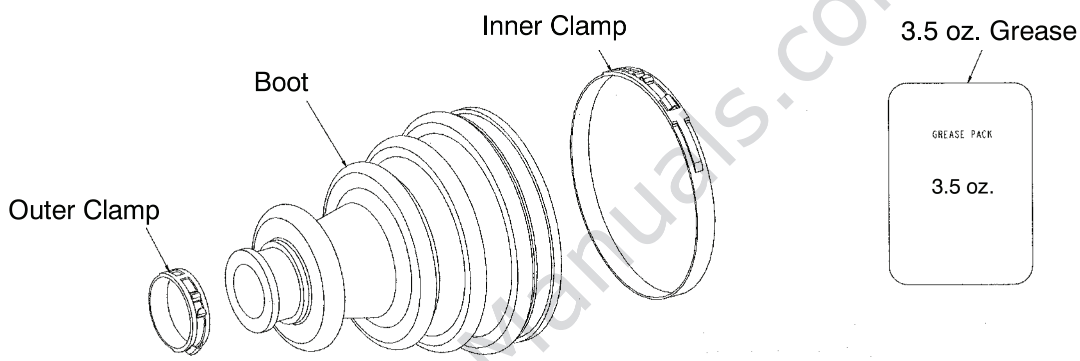
FRONT DRIVE AXLE EXPLODED VIEW (4X4)

NOTE: Refer to your parts manual for the proper replacement parts.

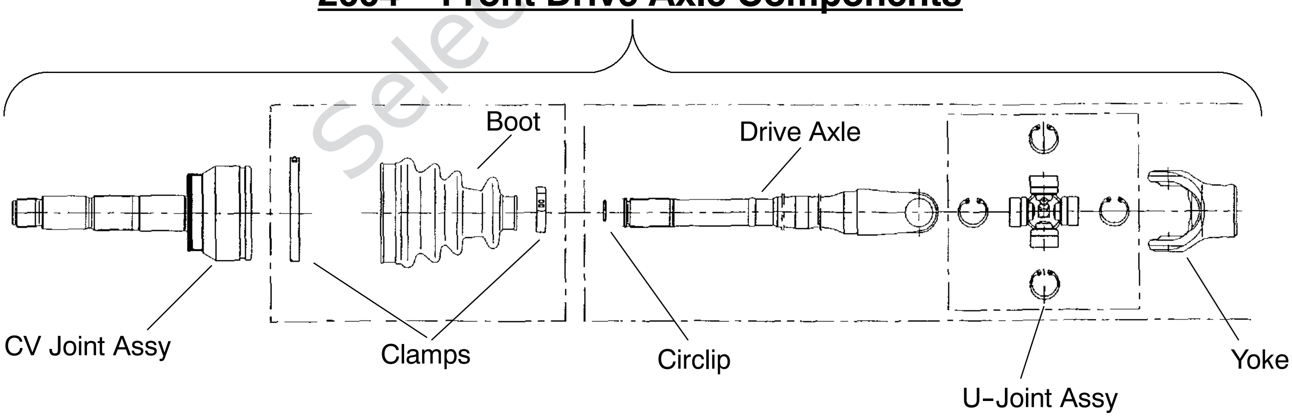
2005 - Front Drive Axle Components

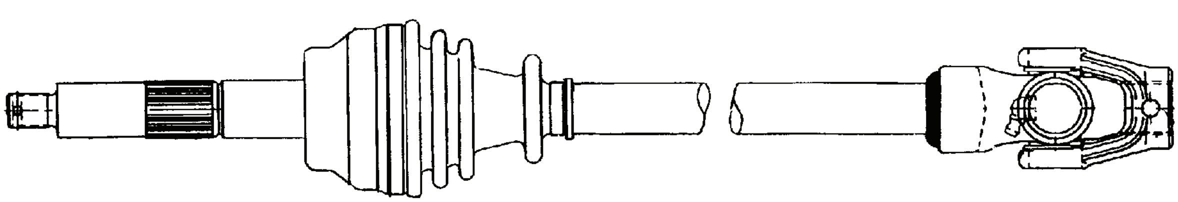


2005 - Front Drive Boot Replacement Kits



2004 - Front Drive Axle Components

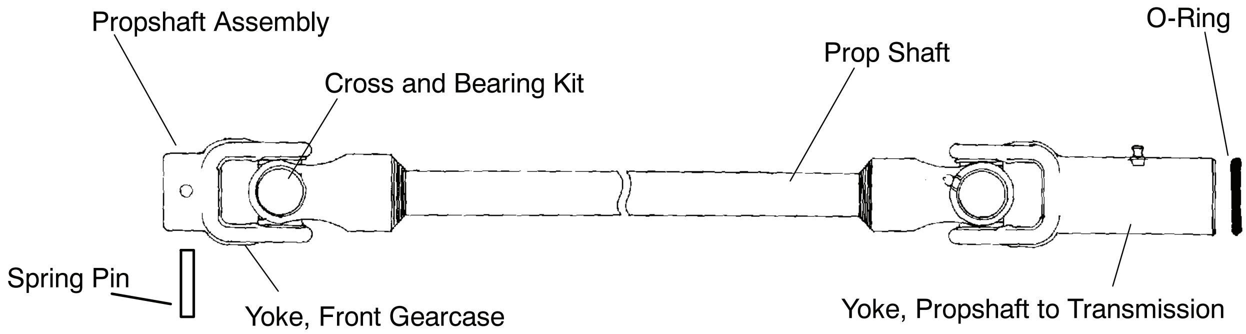




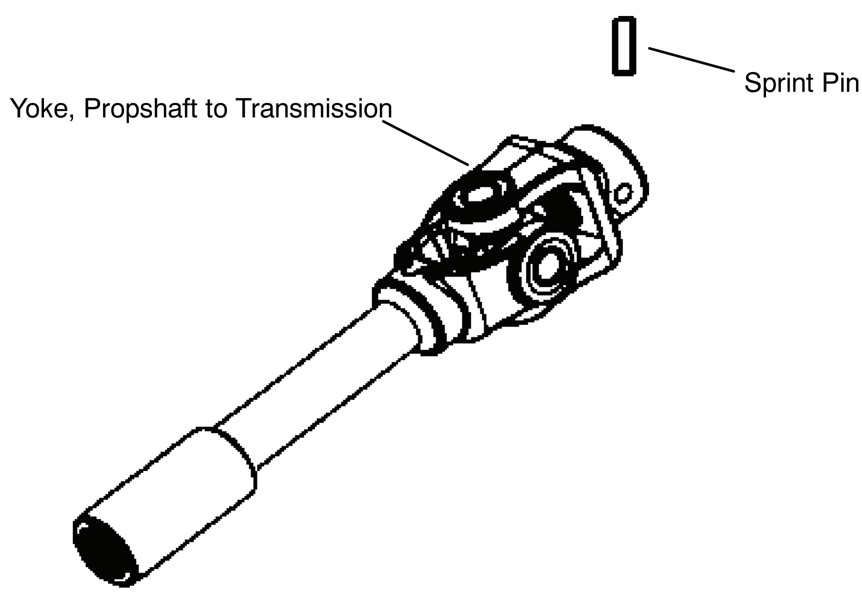
DRIVE SHAFT EXPLODED VIEW

NOTE: Refer to your parts manual for the proper replacement parts.

Front Prop Shaft Components (4x4)



Rear Prop Shaft Components (All Models)

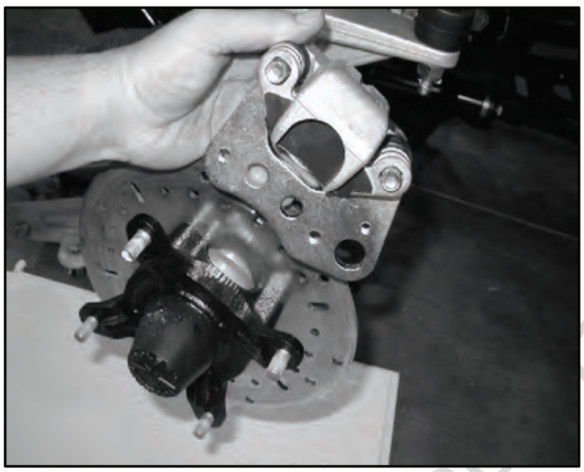


FRONT GEARCASE REMOVAL (4X4)

1. Stop engine, place machine in Park and set parking brake.
2. Loosen right front wheel nuts slightly.
3. Elevate and support machine under footrest/frame area.

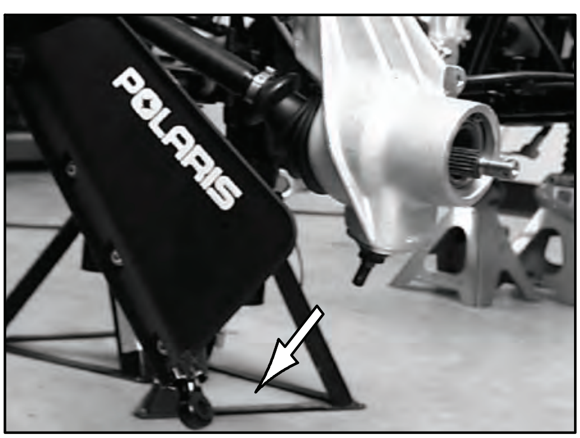
CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing and installing bearings and seals.

4. Remove right wheel nuts and wheel.
5. Remove the front brake caliper and suspend the safely suspend the brake caliper from the frame with a piece of wire.



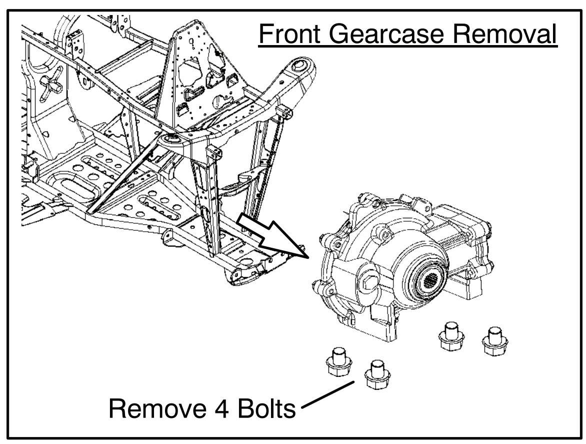
CAUTION: Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.

6. Remove the front hub from the drive shaft.
7. Remove cotter pin, lower ball joint nut and A-arm from ball joint.



8. Pull the hub and strut assembly out and pull the drive-shaft out of the hub.

9. Pull both driveshafts from the front gearcase. Replace the circlip on the driveshaft end for reassembly.
10. Remove the roller pin from the front prop shaft. Use the Roller Pin Removal Tool (**PN 2872608**).
11. Remove bolts securing bottom of housing to frame. Remove vent line. Remove the front gearcase from right side of frame.



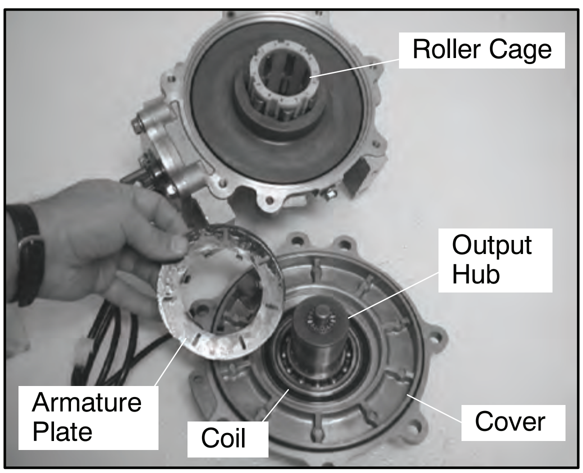
FRONT GEARCASE OPERATION - CENTRALIZED HILLIARD)

Engaging Front Gearcase: The AWD switch may be turned on or off while the vehicle is moving. Initially, the vehicle's electronic system will not enable the AWD until the engine RPM is below 3100. Once enabled, the AWD remains while the front gearcase is moving, it will not disengage until the rear wheels regain traction.

Engage the AWD switch before getting into conditions where the front wheel drive may be needed. If the rear wheels are spinning, release the throttle before switching to AWD.

CAUTION: Switching to AWD while the rear wheels are spinning may cause severe drive shaft and gearcase damage. Always switch to AWD while the rear wheels have traction or are at rest.

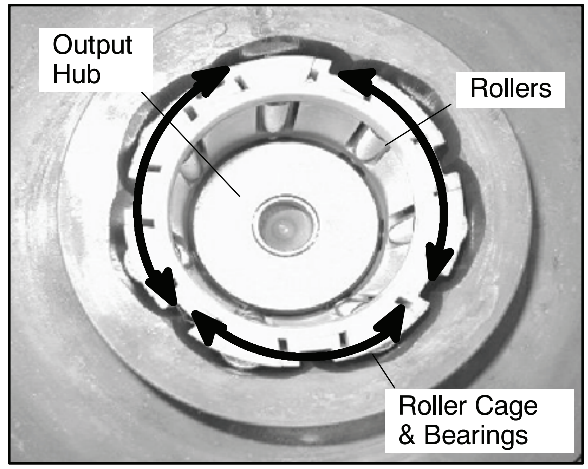
Normal Operation: With the AWD switch off the vehicle drives only the rear wheels (2 wheel drive). When the AWD switch is activated it engages the Hilliard, locking both front axles into All Wheel Drive.



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.

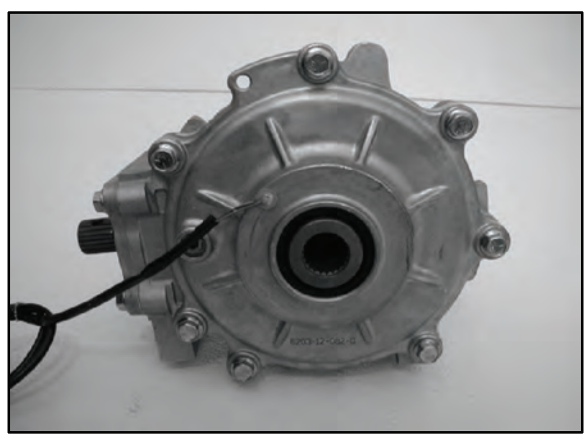
Roller Cage and Roller's Rotate Inward and Grip the Output Hub for AWD Engagement



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.

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

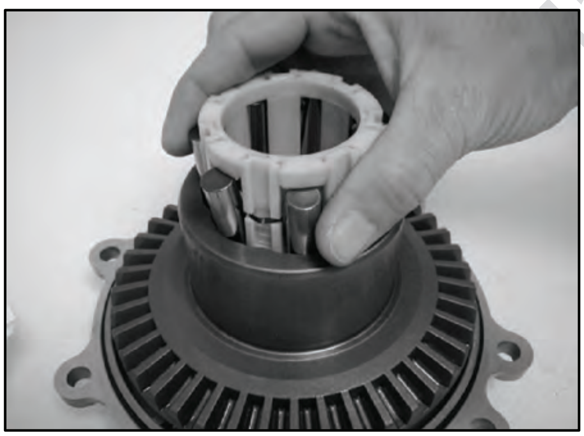
Gearcase Coil Resistance

NOTE: To test the gearcase coils resistance, use the coil harness. The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.

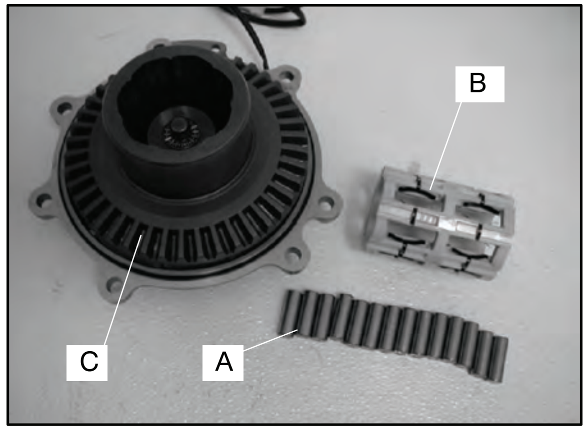
3. Remove output shaft assembly.

NOTE: Be careful not to misplace the thrust bearing located between the two output shafts.

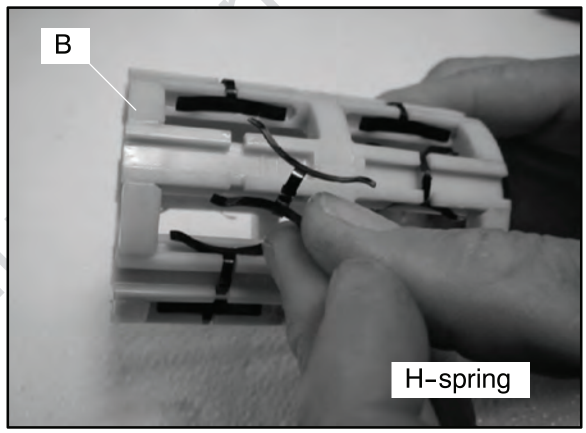
4. Clean all parts and inspect spacers for wear. Inspect ring gear for chipped, broken, or missing teeth.
5. Remove the roll cage assembly, rollers, and H-springs.



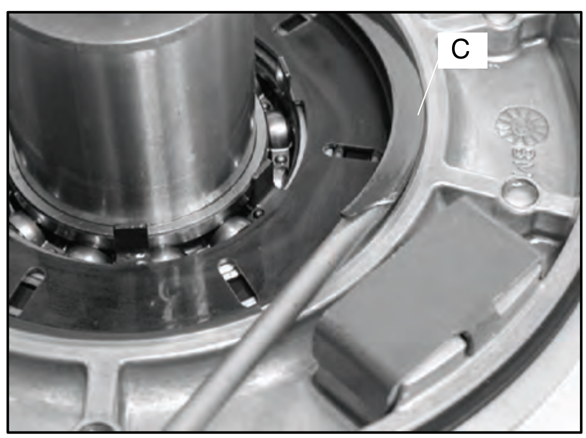
6. Thoroughly clean all parts. Inspect the rollers (A) for nicks and scratches. The rollers must slide up and down freely within the roller cage surfaces (B).
7. Inspect the ring gear (C) for consistent wear patterns. The surfaces should be free of nicks and scratches.



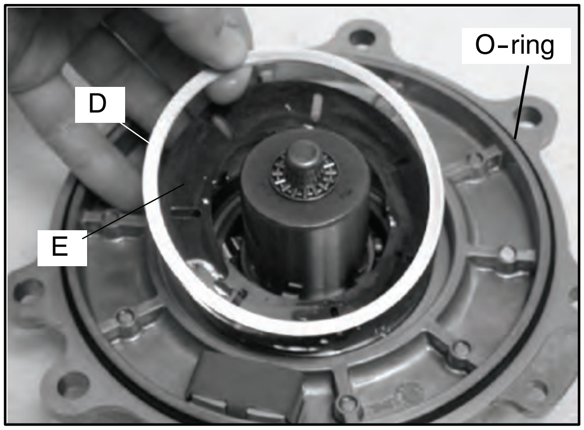
8. Inspect roll cage (B) sliding surface. This surface must be clean and free of nicks, burrs or scratches. Remove and inspect the H-springs.



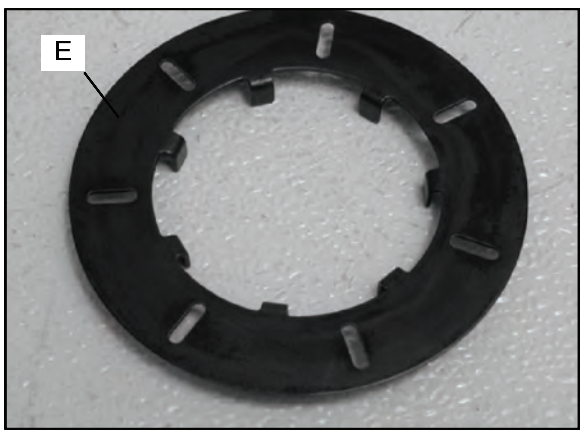
9. Use a flat head screwdriver to remove the retaining clip from the output cover.



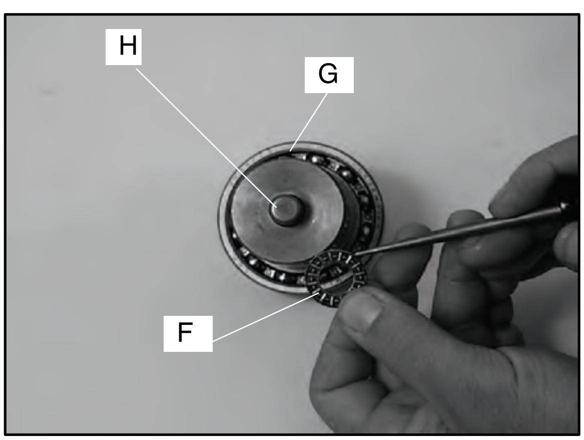
10. Remove the spacer washer (D), armature plate (E), and rubber O-ring from the output cover.



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).

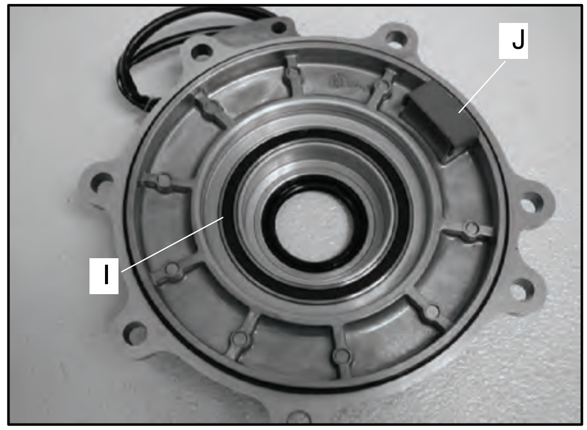


13. Inspect the magnetic coil (I) in the output housing.

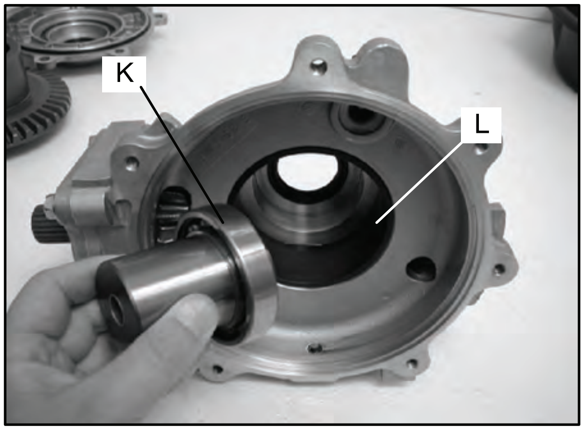
NOTE: See "FRONT GEARCASE DIAGNOSIS" later in this chapter for more details on the coil.

14. Inspect the back lash pad (J) for excessive wear.

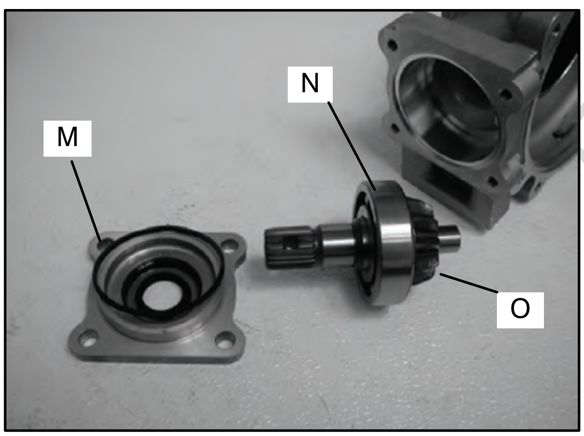
NOTE: The backlash for the centralized hilliard is set at the factory. **No readjustment is required**.



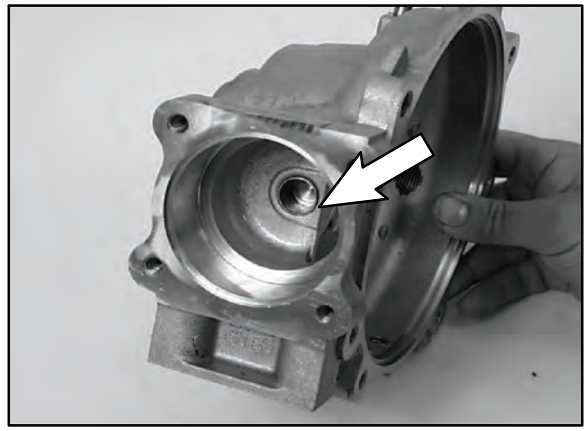
15. Remove the other output hub (K) from the main gearcase. Inspect the inner bearing (L) for wear. If there is excessive wear, replace bearing as needed.



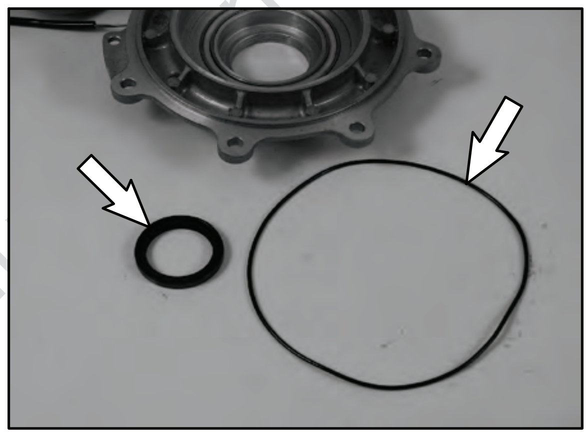
16. Remove the input cover (M), bearing (N), and the pinion gear (O). Inspect the pinion gear (O) for chipped, broken, or missing teeth. Replace the input cover O-ring.



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.

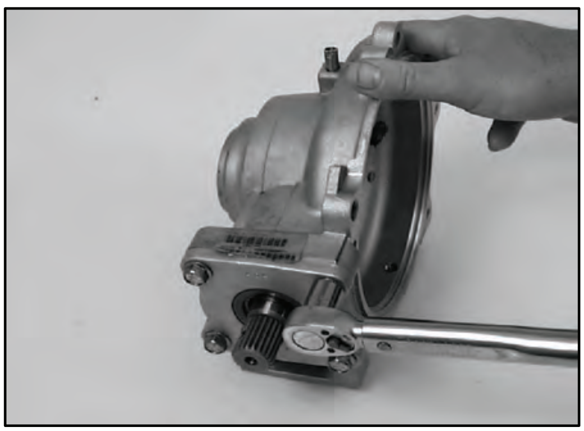


FRONT GEARCASE REASSEMBLY/INSPECTION

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.

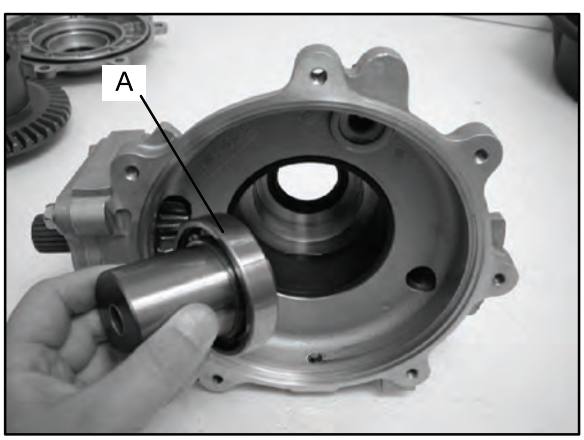
NOTE: Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement side to side.

4. Install pinion shaft, bearing, and input cover with new o-ring and torque bolts to 14 ft. lbs (19 Nm).

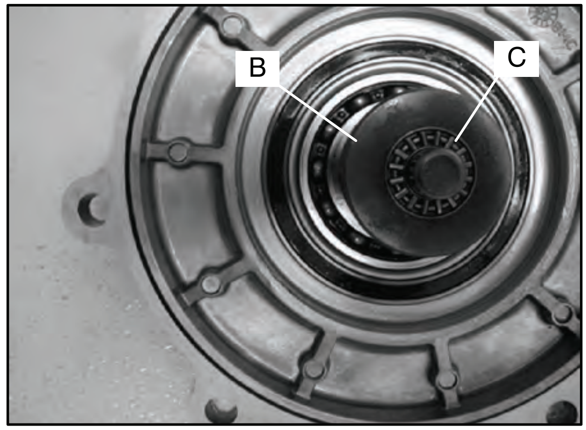


Input Cover Bolts Torque:
14 ft. lbs. (19 Nm)

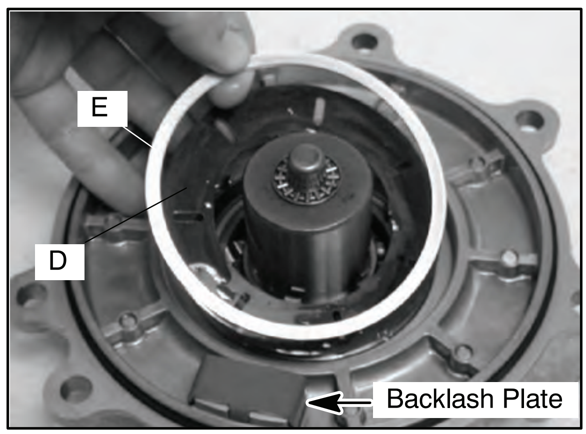
5. Install the output hub (A) into the gearcase housing. The output hub should spin freely.



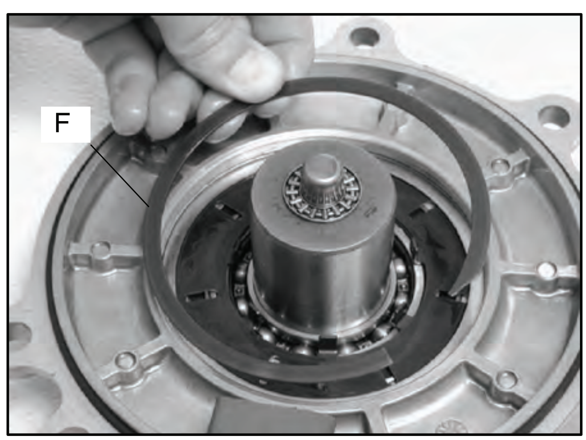
6. Install the other output hub (B) and thrust bearing (C) into the output cover. Apply a small amount of grease onto the thrust bearing.



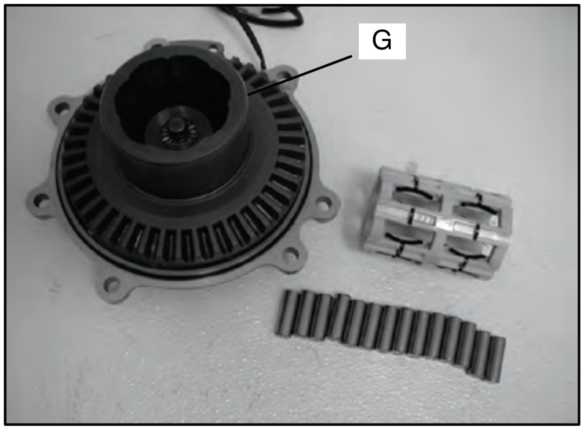
7. Install the armature plate (D) and spacer washer (E) into the output cover. **NOTE:** Be sure backlash plate in in place.



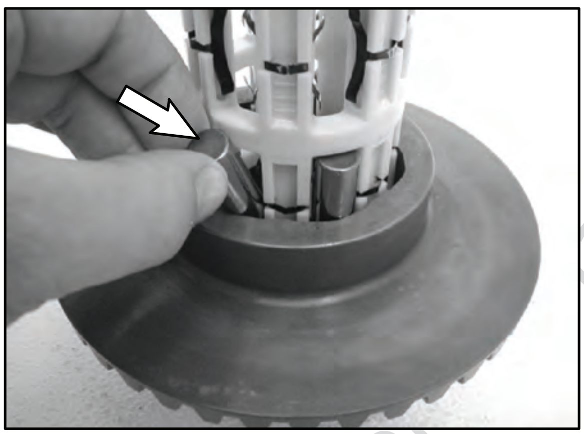
8. Install the retaining ring (F) into the output cover. Be sure the retaining ring is properly seated into the cover.



9. Install the ring gear onto the output hub on the output cover.

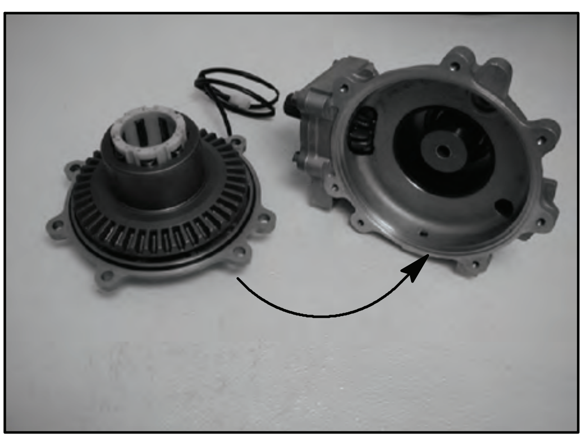


10. Install the rollers and roll cage into the ring gear. Insert the rollers as the roll cage is installed.



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)



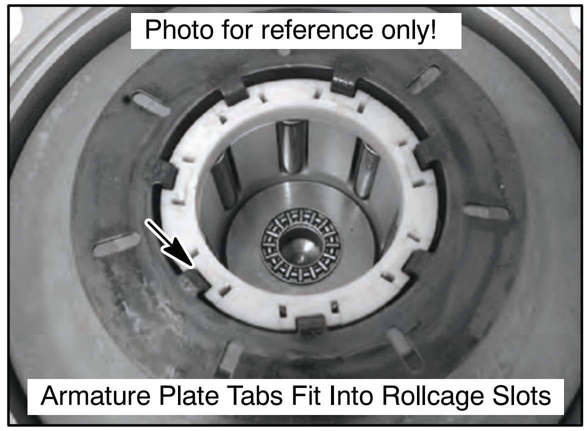


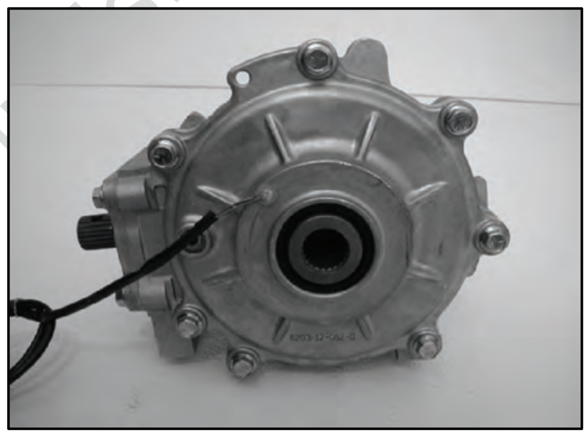
Photo for reference only!

Armature Plate Tabs Fit Into Rollcage Slots

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.

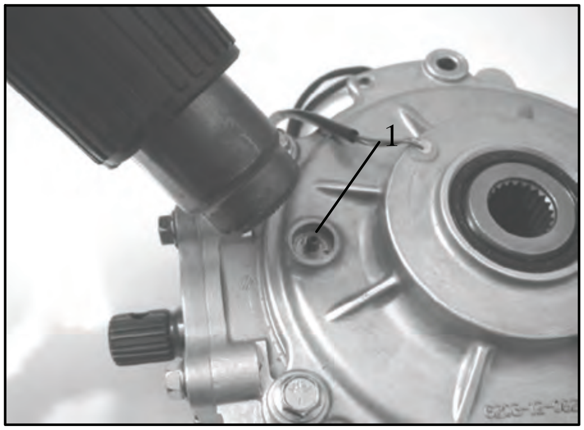


Cover Bolts Torque
14 ft. lbs. (19 Nm)

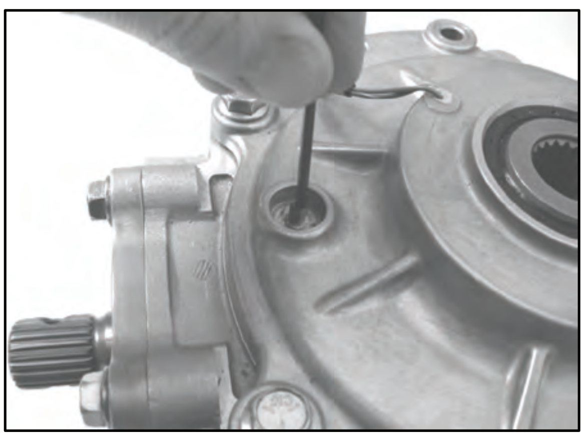
13. Install new seals into the gearcase housing and gearcase housing cover.

Back Lash Pad (Thrust Pad) Adjustment

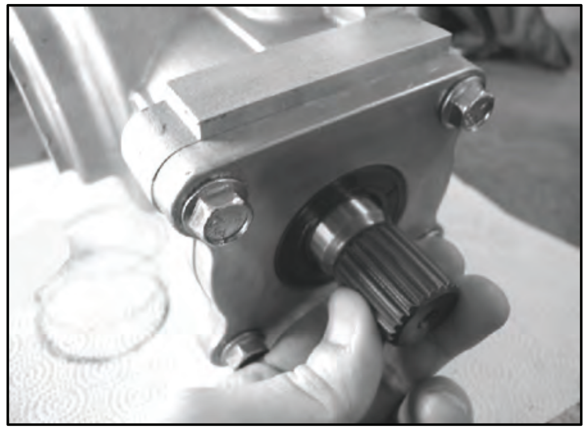
14. Lay the gearcase on the side with the output cover facing up.
15. The backlash screw is loctited into place. Use a heat gun to lightly heat up the loctite on the screw (1).



16. Using a hex wrench, turn the back-lash screw out 3-4 turns. Re-apply red loctite onto the bottom screw threads.



17. Turn the screw in until it is lightly seated, then turn the screw out 1/4 turn.
18. Set the gearcase upright. Rotate the pinion shaft at least 4 times. This ensures the ring gear completes one full rotation.

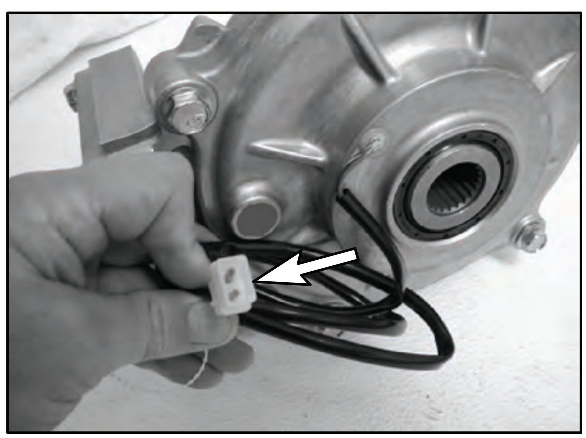


19. If a tight spot is felt during rotation, loosen the backlash screw another 1/8 turn. Perform the previous step again. Repeat this procedure until the pinion shaft rotates smoothly 4 times (1 revolution of ring gear).

FRONT GEARCASE DIAGNOSIS

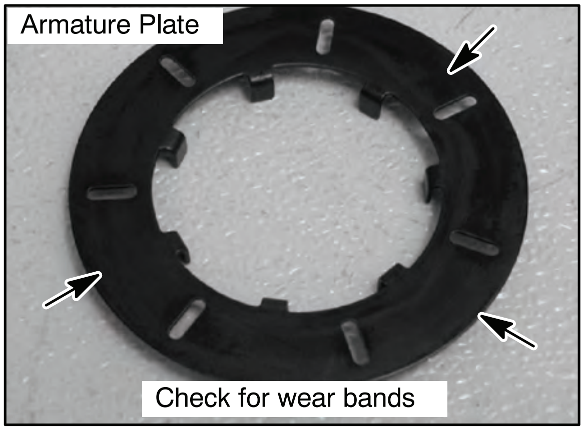
Symptom: AWD Will Not Engage.

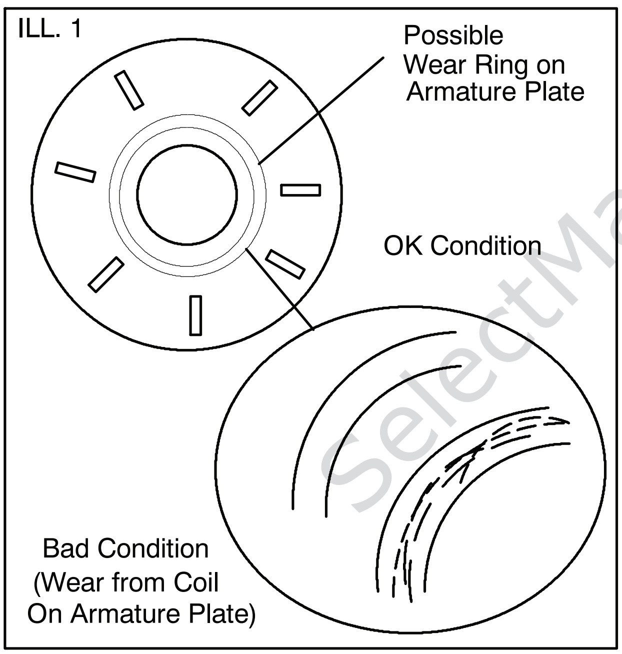
1. Check the gearcase coil resistance. To test the gearcase coil resistance, use the coil harness (Grey & Brown/White). The gearcase coils should measure between **22.8 ohms** and **25.2 ohms**.
2. Check the minimum battery voltage at the wire (Grey & Brown/White) that feeds the hub coil wire. There should be a minimum of **11.80-12.0 Volts** present for proper operation.



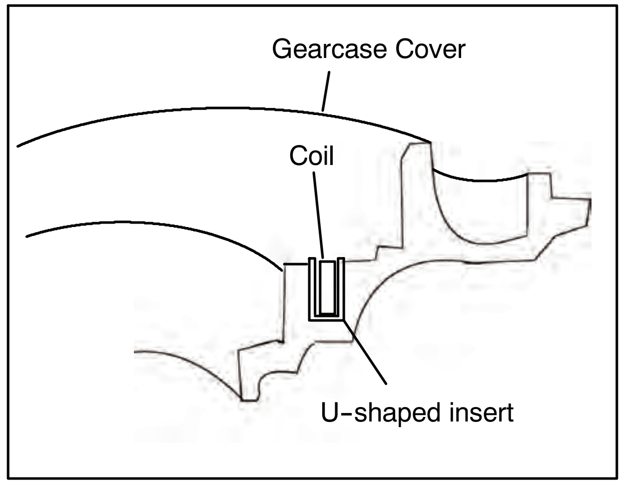
3. Inspect the armature plate for a consistent wear pattern. There should one or two distinct wear

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.



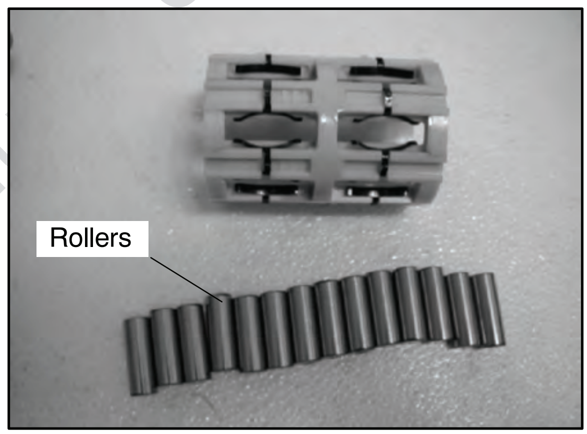


4. Check to make sure the coil is seated in the U-shaped insert that is pressed into the gearcase cover. The top of the coil should be seated below the U-shaped insert. The U-shaped insert controls the pole gap. If the top of the coil is above the surface of the U-shaped insert it raises the armature 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**).



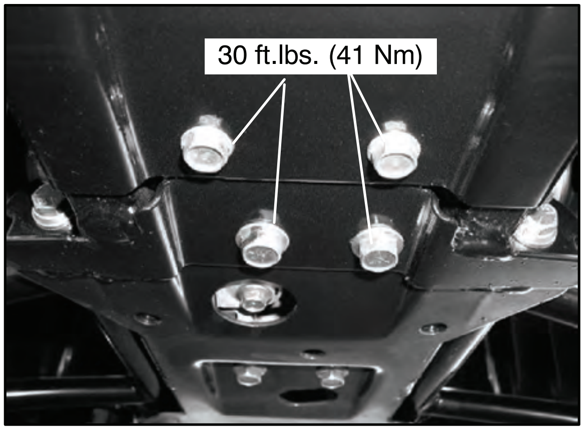
Side Cutaway View of Centralized Hilliard Cover

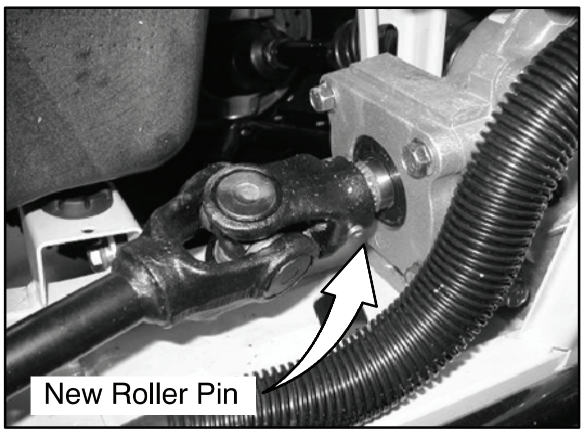
5. Inspect the rollers for nics and scratches. The rollers must slide up and down and in and out freely within the roll cage sliding surfaces.



FRONT GEARCASE INSTALLATION

1. To install gearcase, reverse removal procedure. Use new spring pin in front prop shaft.
2. Torque mounting bolts to **30 ft.lbs. (41 Nm)**.



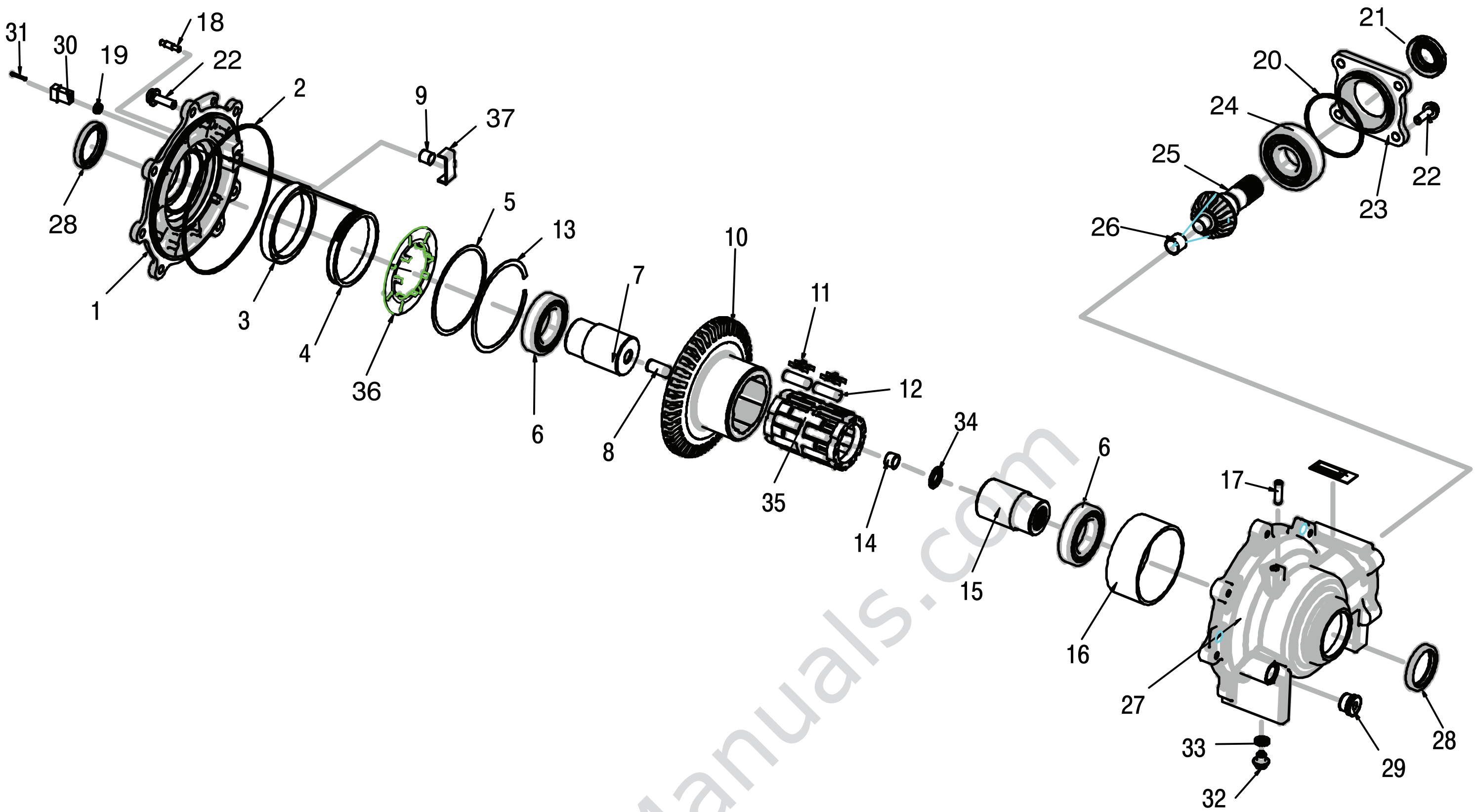


3. Add the proper lubricant to the front gearcase. Check drain plug for proper torque. Refer to Chapter 2 for fluid fill and change information.

Premium Front Hub Fluid (PN 2871654) Front Housing Capacity 5.0 fl. oz. (148 ml)

Front Housing Mount Bolt Toque: 30 ft.lbs. (41 Nm)

FRONT GEARCASE – CENTRALIZED HILLIARD EXPLODED VIEW



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Mid Gearcase	20.	1	O-Ring
1.	1	Cover, Output	21.	1	Seal
2.	1	O-Ring	22.	11	Kit, Bolt
3.	1	Insert	23.	1	Cover, Input
4.	1	Coil	24.	1	Bearing, Roller Ball
5.	1	Kit, Shim Set (Incl. Shims)	25.	1	Shaft, Pinion, 11T
6.	2	Bearing, Roller Ball	26.	1	Bushing
7.	1	Hub, Race/Output, Male	27.	1	Gearcase, LH
8.	1	Pin, Dowel	28.	2	Seal, Oil
9.	1	Dowel	29.	1	Plug, Oil Fill
10.	1	Clutch Housing/Ring Gear	30.	4	N/A
11.	1	Spring	31.	4	N/A
12.	14	Kit, Roll	32.	1	Plug, Oil Drain
13.	2	Retaining Ring	33.	1	Washer
14.	1	Bushing	34.	1	Bearing, Needle, Roller Thrust
15.	1	Hub, Race/Output, Female	35.	1	Roll Cage, Aluminum
16.	1	Bushing	36.	1	Plate Armature
17.	1	Vent	37.	1	Back Lash Plate
18.	1	N/A			
19.	1	N/A			

FRONT GEARCASE OPERATION - 2004 HDS MODELS

Front Gearcase (Visco Lok™) Operation - HDS

The following is an overview of how the Visco Lok™ front drive unit works on the Magnum 330 & 500 4x4's.

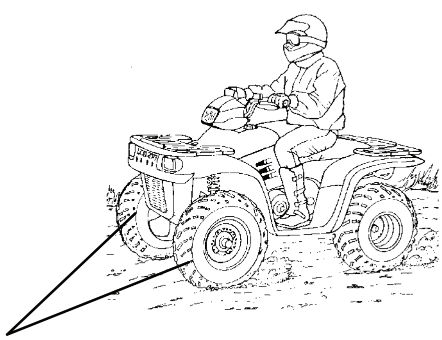
Normal Operation: The front gearcase acts like an **open** differential (this allows different wheel speeds for easy turning). This means that both wheels are receiving torque equal to the amount of load or traction. This is true whether the vehicle is going up hill or down, or traveling on a flat surface. With our ATV, if one front wheel should lose traction, momentarily you will notice 3 wheels turning until the Visco drive unit reacts.

The fourth wheel is engaged, or activated, when a difference of 6 RPM has occurred between the two front wheels of the ATV. If one front tire is turning at 0 RPM (tire with traction), it would require the other front wheel to turn at 6 RPM or greater (tire with no traction) to engage, or spin, the wheel that has traction.

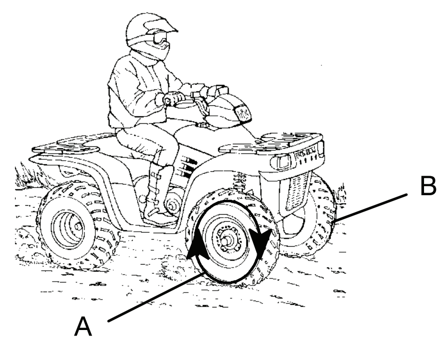
How it works: The front gearcase contains two fluids. The first fluid is the normal 80-90 weight gear lube which is used in other Polaris ATVs. The second fluid is contained inside the sealed Visco drive unit which is inside the front gearcase and is not serviceable. The fluid contained in the Visco unit is a silicone based, high viscosity (thick) viscous fluid. As the wheels turn at different speeds, they turn clutch plates (very much like a motorcycle clutch) against the reservoir that contains the viscous fluid. When the plates turn against the reservoir, it draws the viscous fluid from the reservoir which takes up space and creates pressure that forces the clutch plates together, which in turn locks the differential. When the wheels gain equal traction, a spring washer forces the fluid back to the reservoir which unlocks the differential.

Advantages: Polaris ATVs with Visco Lok™ still have true four wheel drive, not the two or three-and-a-half wheel drive of the competition. When going down a hill and the EBS is in operational mode, we have both the front and rear wheels supplying down-hill braking. Units with the Visco-Lok also maintains ease of steering.

Maintenance: The only maintenance that needs to be performed is to the gearcase itself like any other front or rear gearcase on Polaris ATVs. Check and/or change the 80-90 weight gearcase fluid periodically the owner's manual recommendations.



Both front wheels receive the same amount of torque, when the same amount of load or traction is applied. (For easy turning ability)



A. Wheel A loses traction. Momentarily 3 wheels will be turning (Wheel A and both rear).

B. In this scenario, wheel B has greater traction. When wheel A turns 6 RPM faster than wheel B, the Visco Lok™ will engage and start to spin wheel B.

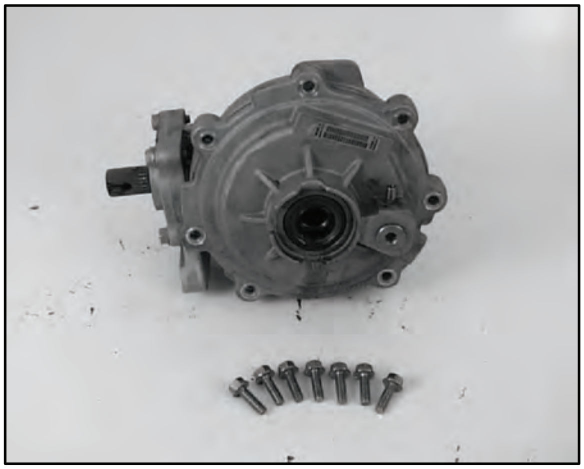
When this happens, the ATV is in All Wheel Drive until both front wheels gain equal amounts of traction. The Visco unit will then unlock.

Advantages over the competition:

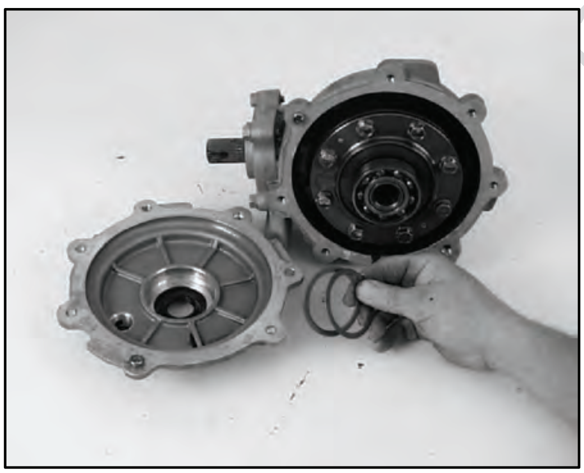
True 4 wheel drive
Front and Rear wheel down-hill braking.
Maintains "easy steering".

FRONT GEARCASE DISASSEMBLY - VISCO LOK™ (2004 HDS MODELS)

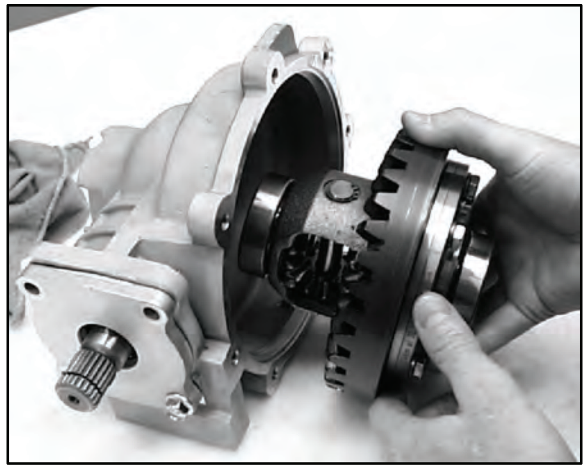
1. Drain and properly dispose of used oil.
2. Remove bolts from output shaft cover.



3. Remove output shaft cover and bearing shim(s).
4. Clean cover and inspect shim(s) for wear.



5. Remove limited-slip differential from case housing.



6. Inspect ring gear for chipped, broken, or missing teeth.

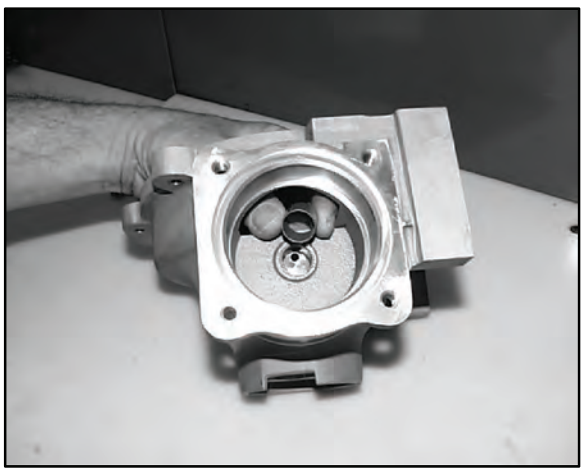
NOTE: Limited-slip differential is NOT repairable, if damaged, replace as an assembly. DO NOT disassemble the limited-slip differential.

7. Remove pinion cover and O-ring. Inspect pinion gear for chipped broken or missing teeth. Inspect pinion shaft bearing. To replace, press new bearing onto shaft.

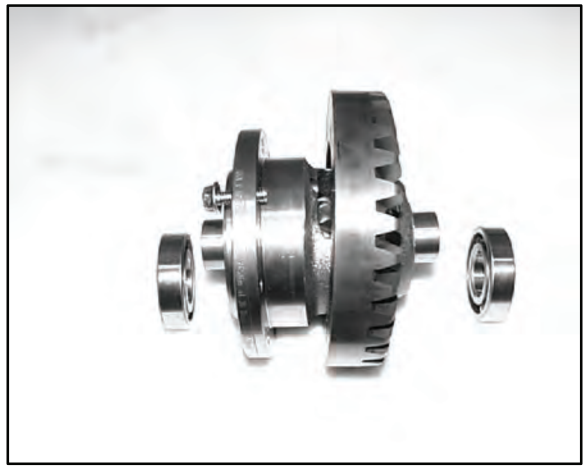
NOTE: Due to extremely close tolerances and minimal wear, the bearing must be inspected visually, and by feel. While rotating bearing by hand, inspect for rough spots, discoloration, or corrosion. The bearing should turn smoothly and quietly, with no detectable up and down movement and minimal movement side to side.

FRONT GEARCASE ASSEMBLY - VISCO LOK™ (2004 HDS MODELS)

1. Inspect pinion shaft bushing.



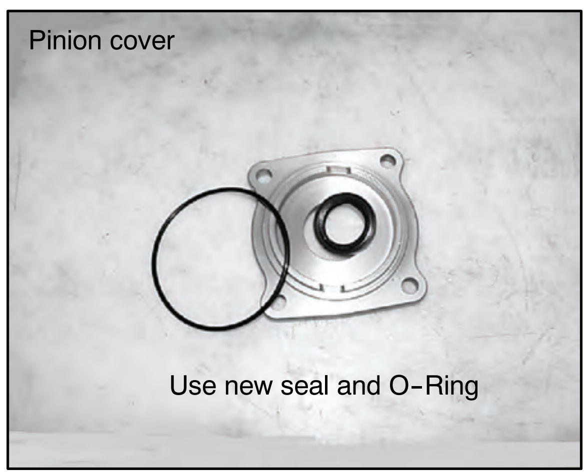
2. Inspect bearings on limited-slip differential shafts. To replace, press new bearing on to differential.
3. Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement side to side.



4. If replacing ring gear. Clean ring gear and bolts with PrimerN™ and apply red LocTite™ to threads. Tighten bolts to specification.

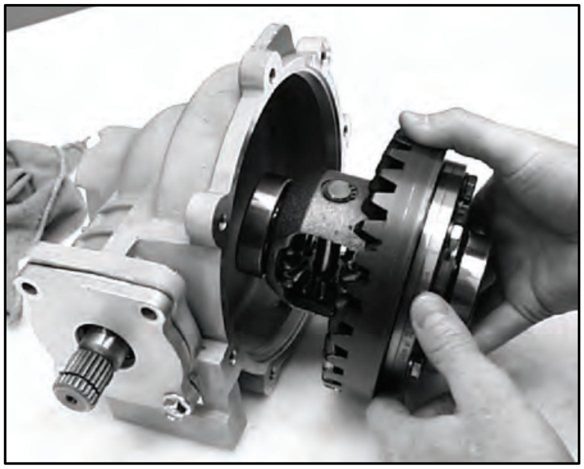
Ring Gear Bolt Torque
21 ft. lbs. (28 Nm)

5. Replace pinion cover O-ring, seals, and worn components.
6. Press pinion shaft seal into pinion cover until flush with sealing surface.
7. Install pinion shaft and pinion cover plate with new o-ring and torque bolts to 14 ft. lbs. (19 Nm).

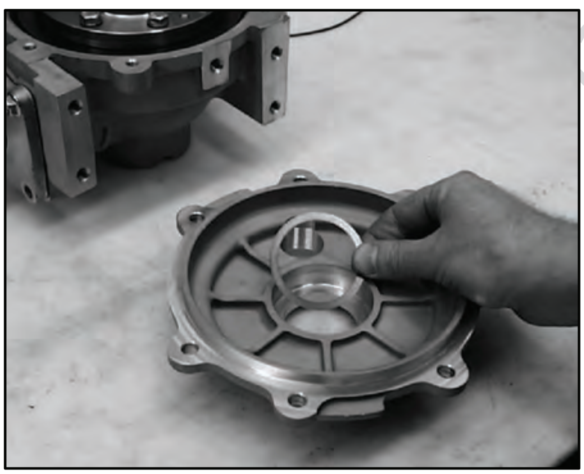


Cover Bolts Torque
14 ft. lbs. (19 Nm)

8. Install limited-slip differential in to housing.



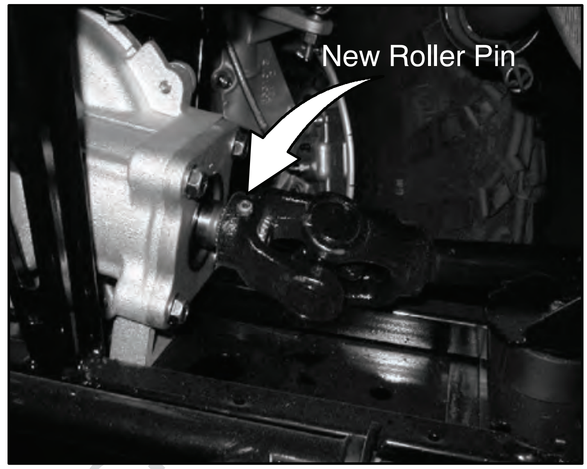
9. Grease shim(s) and install into output shaft cover. Apply Polaris Crankcase Sealant (**PN 2871557**) to surface of case and install cover bolts and torque to specification.



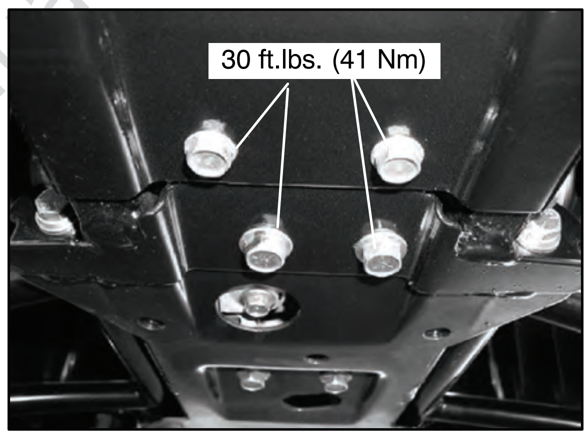
Cover Bolts Torque
14 ft. lbs.(19 Nm)

FRONT GEARCASE INSTALLATION (2004 HDS MODELS)

1. To install gearcase, reverse removal procedure. Use new roller pin in front prop shaft.



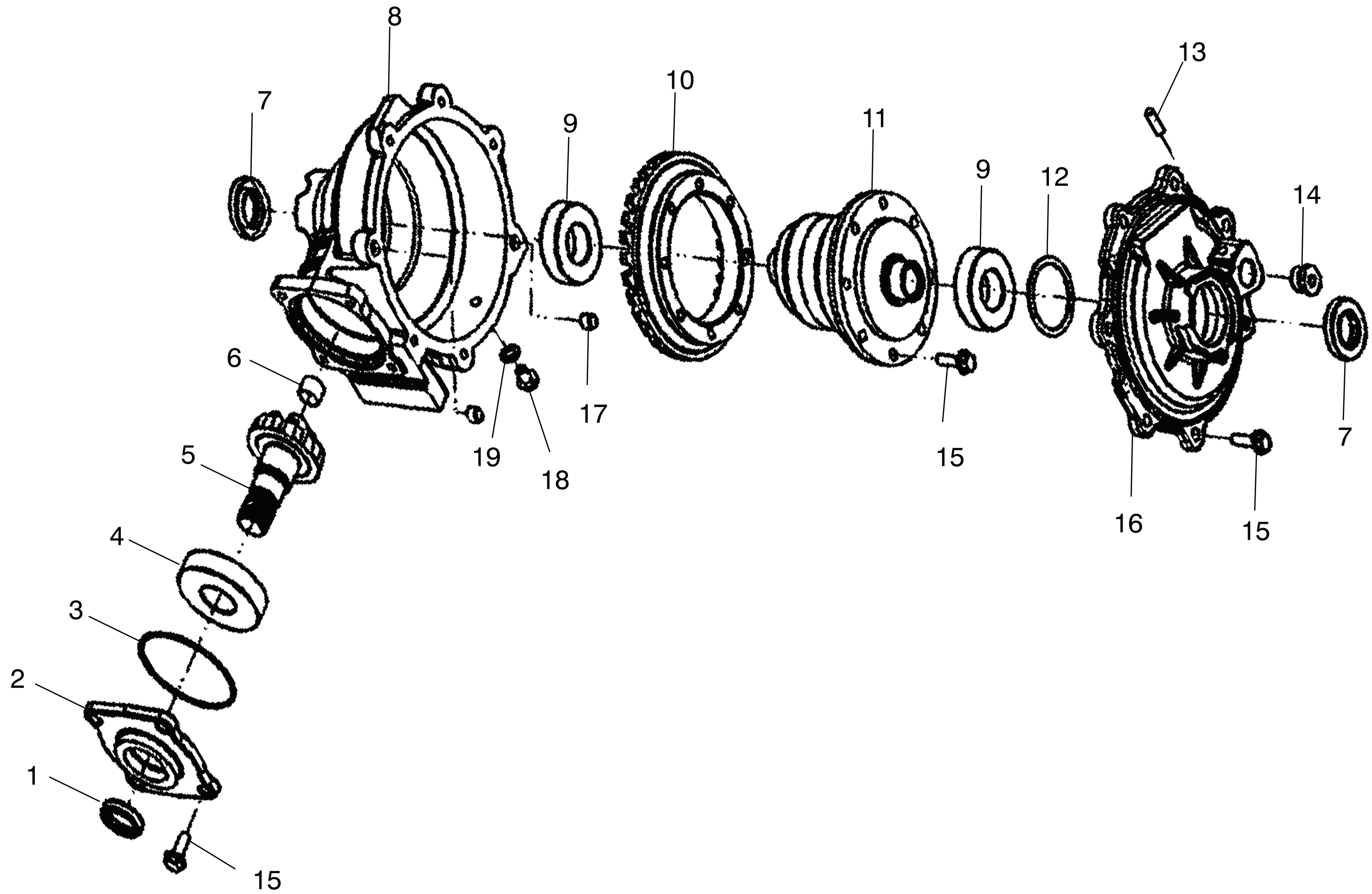
2. Torque mounting bolts to **30 ft.lbs. (41 Nm)**.



3. Add the proper lubricant to the front gearcase. Check drain plug for proper torque. Refer to Chapter 2 for fill capacities and lubricant specifications.

ATV Angle Drive Fluid (PN 2871654)

FRONT GEARCASE VISCO LOK™ EXPLODED VIEW (2004 HDS MODELS)



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Gearcase	11.	1	Differential
1.	1	Seal, Triple Lip	12.	1	Shim
2.	1	Cover, Gearcase	13.	1	Tube, Vent
3.	1	O-Ring	14.	1	Plug
4.	1	Bearing, Ball	15.	19	Screw
5.	1	Pinion, 10T	16.	1	Cover, Output, Front Housing
6.	1	Bushing	17.	2	Pipe, Knock
7.	2	Seal	18.	1	Plug
8.	1	Housing, Front Gearcase	19.	1	Washer
9.	2	Bearing			
10.	1	Gear, 31T			

REAR HUB INSPECTION

1. Support machine securely with rear 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.

REAR AXLE REMOVAL

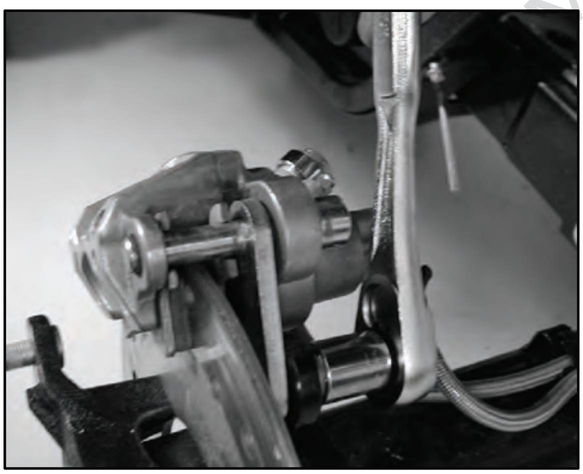
1. Lock the parking brake. Remove left rear hub cap.
2. Remove cotter pin.
3. Loosen the hub retaining nut.
4. Loosen - but do not remove - the wheel nuts.
5. Safely support the rear of the ATV.

CAUTION:

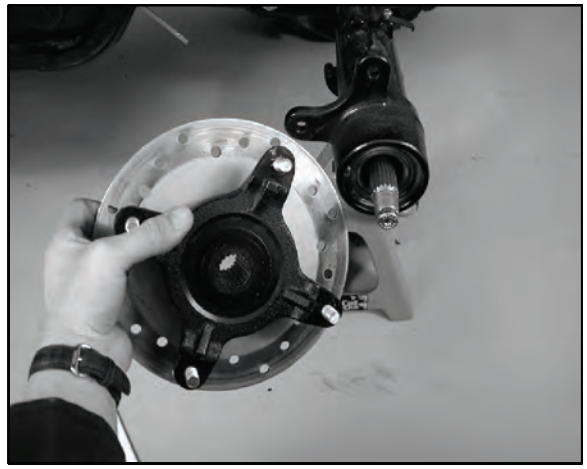
Serious injury could occur if machine tips or falls.

6. Remove left wheel.
7. Remove caliper mounting bolts and lift caliper off of the disc. Support the caliper from the machine frame.

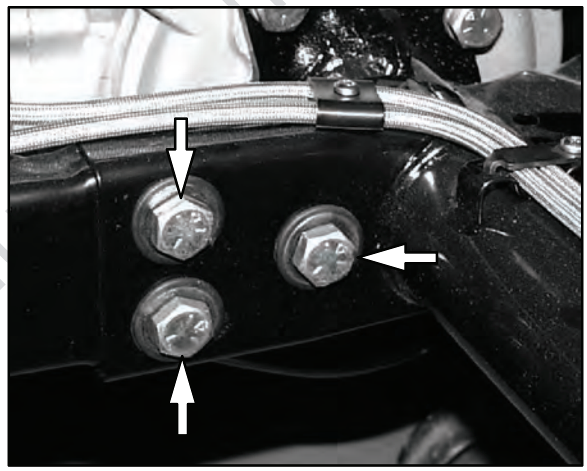
NOTE: If necessary, remove the brake line clamps to help support the caliper from the machine frame.



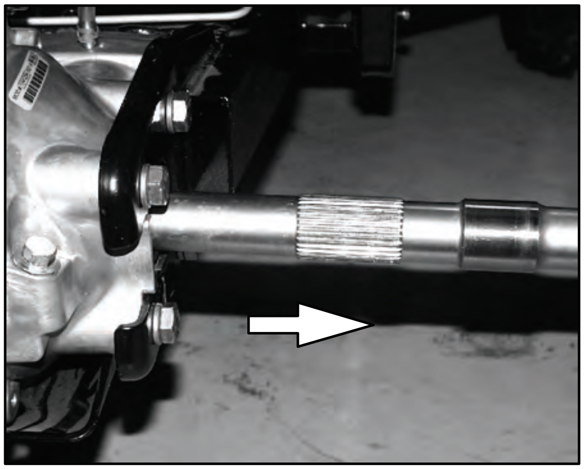
8. Remove the hub.
9. Remove skid plate, if necessary.



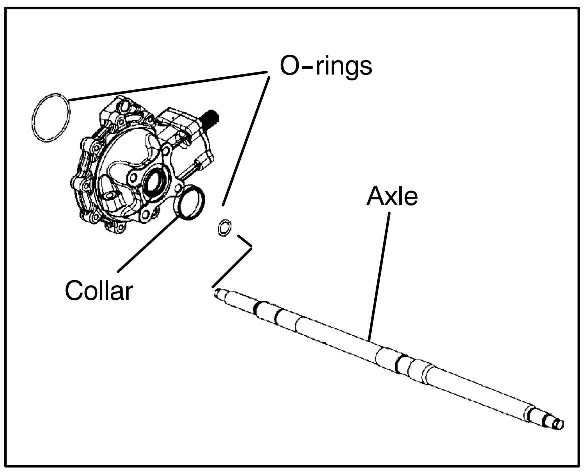
10. Remove (3) left swing arm bolts.



11. Remove (4) axle tube bolts from rear gearcase.
12. Slide axle through rear gearcase to the right enough to allow the axle tube to slip off between axle and and swingarm.

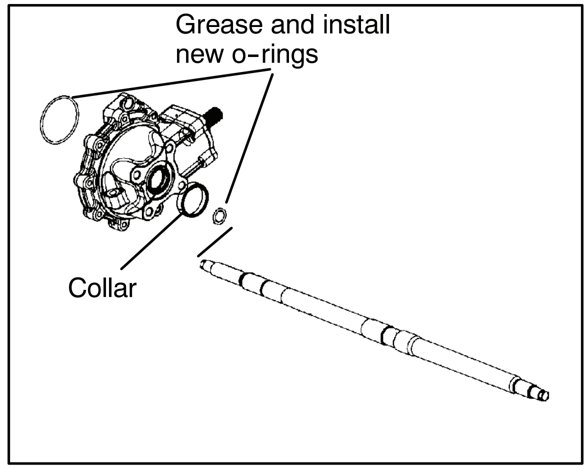


13. Slide axle through the gearcase and remove from vehicle.
14. Remove O-ring seals from both sides of gearcase and discard.

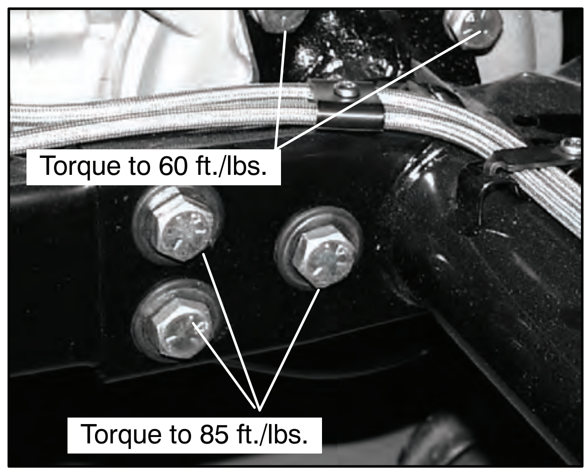


REAR AXLE INSTALLATION

1. Grease and install new O-rings on rear gearcase.
2. Install the O-rings and collar.
3. Slide axle tube assembly over axle shaft until it engages the swingarm.



4. Install (4) new axle tube bolts loosely.
5. Install (3) left swing arm bolts and torque to 85 ft. lbs (115 Nm).



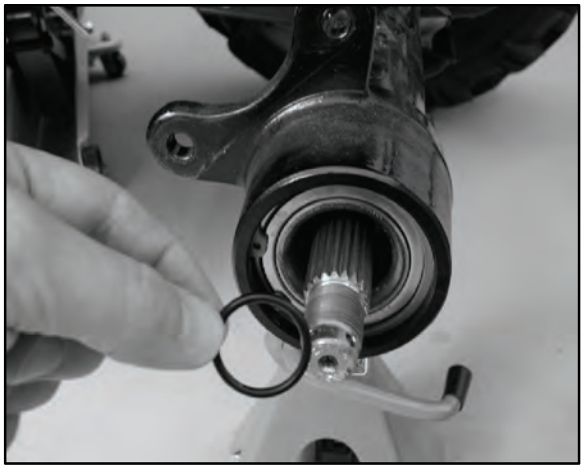
6. Torque (4) axle tube bolts in a cross pattern to 60 ft. lbs (81 Nm).

Swing Arm Bolt Torque: **85 ft. lbs. (115 Nm)** **Axle Tube Bolt Torque** **60 ft. lbs. (81 Nm)**

7. Re-install skid plate and torque bolts to 25 ft. lbs (34 Nm).

Skid Plate Bolt Torque: **25 ft. lbs. (34 Nm)**

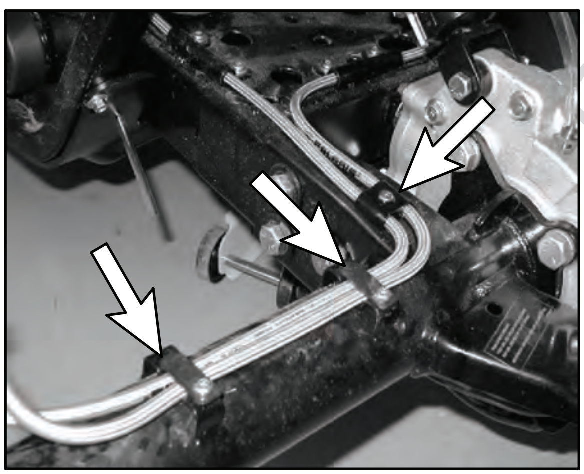
8. Install a new greased O-ring on the axle and slide the
hub onto the axle splines.



9. Install brake caliper on brake disc and torque bolts to 18 ft. lbs. (24 Nm).

Brake Caliper Bolt Torque:
18 ft. lbs. (24 Nm)

10. Anchor the brake lines to the swing arm using the hold down clamps.



11. Install cone washer with domed side facing outward.
12. Remove jackstand and torque axle nut and wheel nuts.

Rear Hub Nut Torque:
80 ft. lbs. (110.6 Nm)

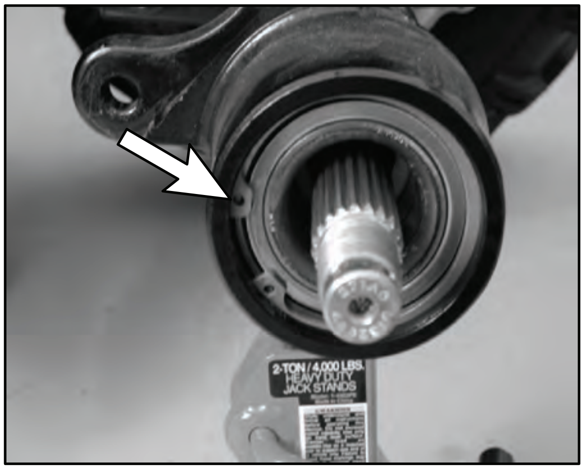
Rear Wheel Nut Torque
20 ft. lbs. (27 Nm)

13. Install a new cotter pin. Tighten nut slightly to align holes if required.
14. Install hub cap.

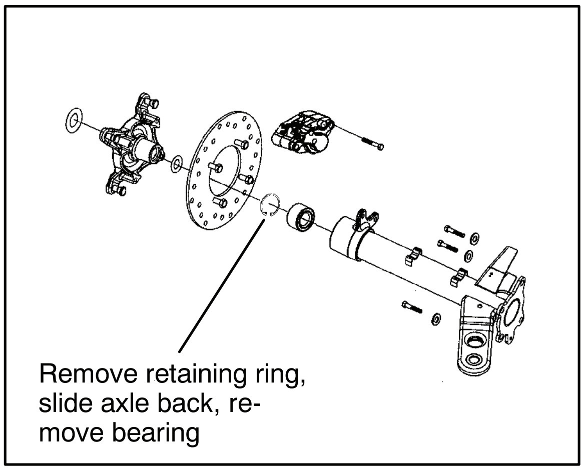
REAR AXLE BEARING REMOVAL

1. Remove left wheel and hub. (See Page 7.33 of rear axle removal, Steps 1 - 8)

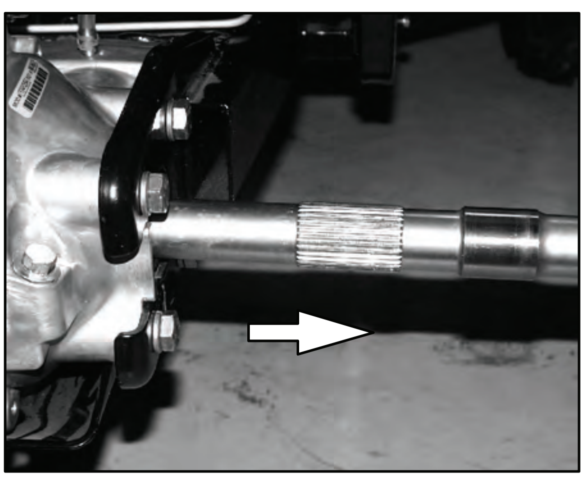
2. Remove rear brake caliper and support it from machine frame.
3. Remove and the snap ring from axle shaft.



4. Slide the axle back and remove the bearing.

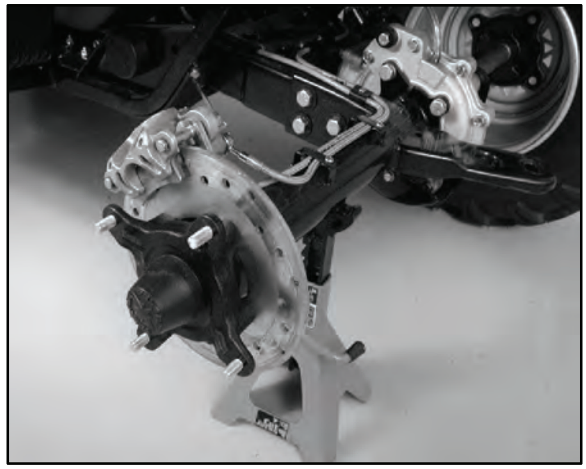


5. Slide axle through rear gearcase to the right as far as it will go.



REAR AXLE BEARING INSTALLATION

1. Clean bearing surface of axle tube and install new bearing(s), retaining ring and seals reversing steps 1 - 8 of rear axle bearing removal.
2. Torque brake caliper, rear hub nut, and rear wheel nuts to specifications.



Brake Caliper Torque:
18 ft. lbs. (24.8 Nm)

Rear Hub Nut Torque:
80 ft. lbs. (110.6 Nm)

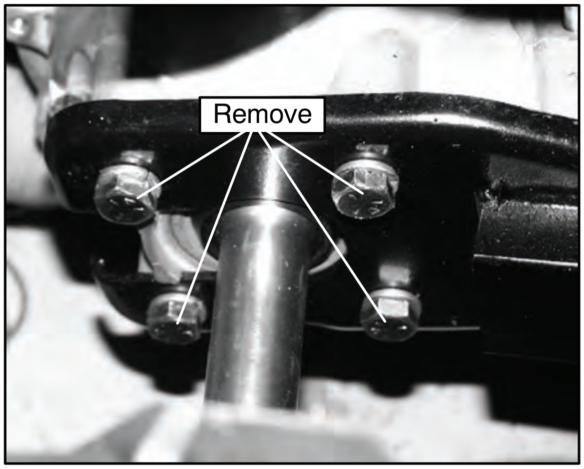
Rear Wheel Nut Torque
27 ft. lbs. (37 Nm)

REAR GEARCASE REMOVAL

1. Stop engine, place machine in gear and set parking brake.
2. Remove rear axle. Refer to rear axle removal on Pages 7.33.

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.

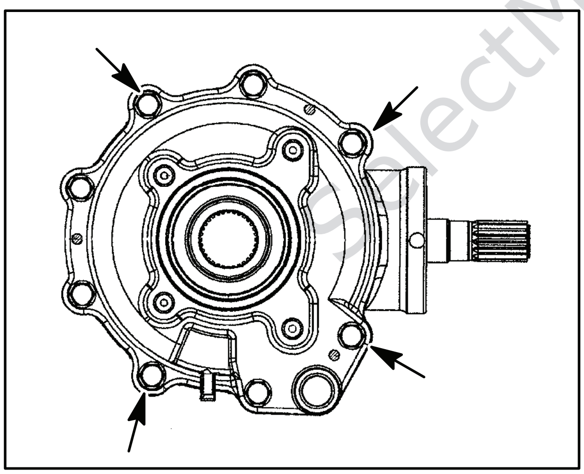
3. Remove lower shock mounting bolt.
4. Disconnect vent line from rear gearcase.
5. Remove (4) gearcase mounting bolts from swingarm assembly.



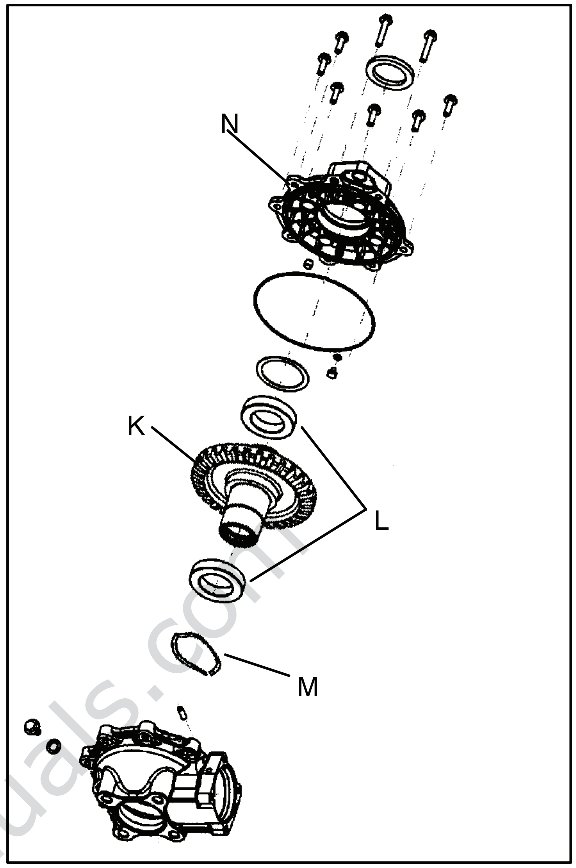
6. Remove and discard the output shaft cover seal (D) and O-ring (E).
7. Slide gearcase input shaft off prop shaft coupler and remove gearcase from swingarm assembly.

REAR GEARCASE DISASSEMBLY

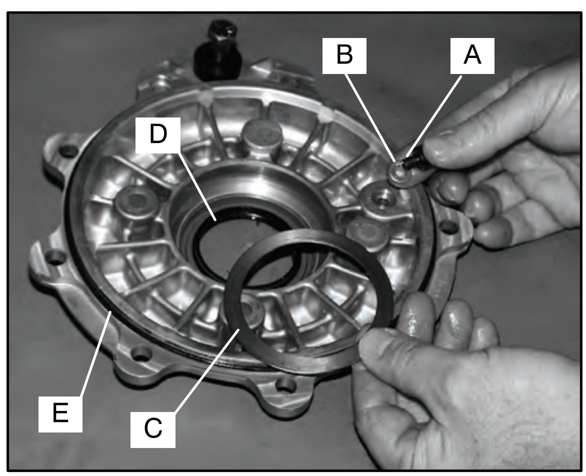
1. Drain and properly dispose of used oil.
2. Remove bolts and output shaft cover (N). The output shaft assembly will typically come out of gearcase with the cover.



3. Remove output shaft assembly from the cover.
4. Remove the wave spring (M) from the casing.
5. Inspect the bevel gear (K) teeth for chipped, worn, or broken teeth. Inspect the bearings (L) for smoothness and wear. Replace the components as needed.

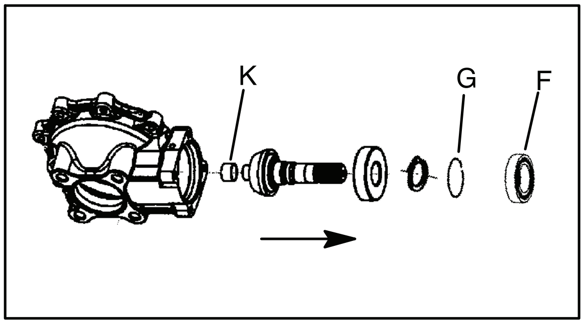


6. Remove thrust button (A) and shim (B) from output cover. Inspect for wear and replace if worn.
7. Remove output shaft bearing shim (C) from the cover and retain for re-assembly.
8. Remove and discard the output shaft cover seal (D) and O-ring (E). Replace during reassembly.

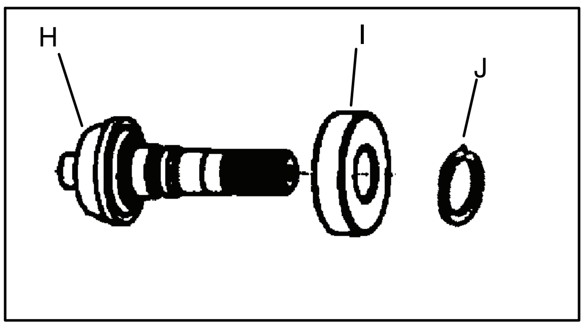


9. To remove the pinion shaft:
   - Remove the triple lip seal (F)

- Remove the retaining ring (G)
- Pull the pinion shaft out of the casing



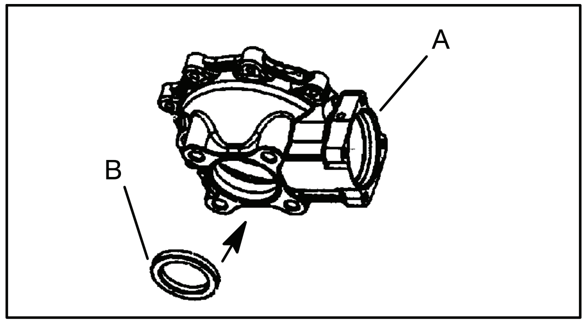
10. Inspect pinion gear (H) for chipped, broken or missing teeth. Inspect the bearing (I) for wear. Replace assembly if necessary.
11. Inspect the pinion shaft bushing (K), replace if needed.
12. Remove the snap ring (J) to remove the bearing (I) from the pinion shaft assembly.



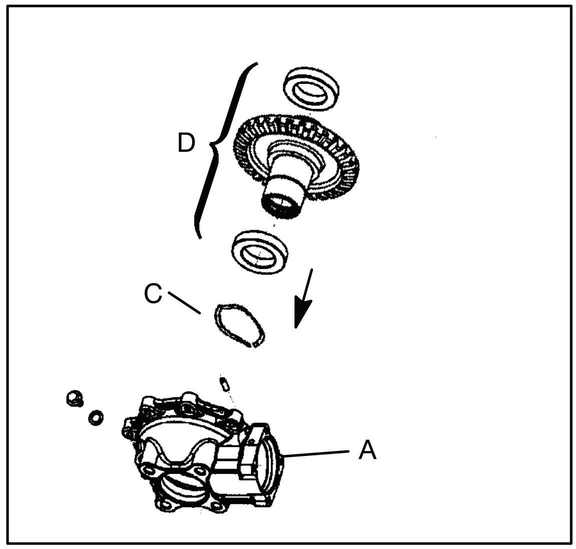
REAR GEARCASE ASSEMBLY

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.

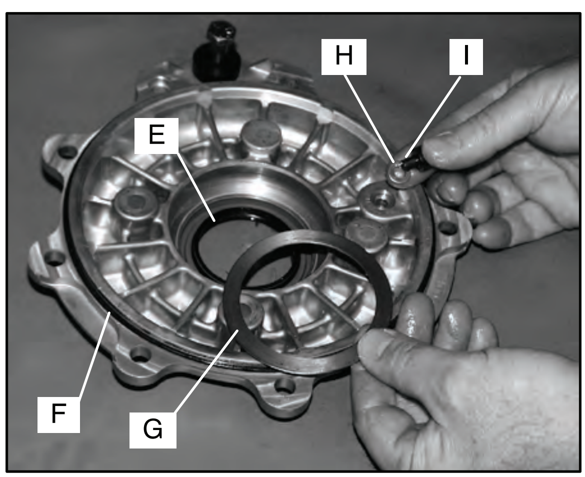
1. Replace all O-rings, seals, and worn components.
2. Press gearcase housing seal (B) into the gearcase housing until flush with sealing surface.



3. Install the wave spring (C) into the gearcase housing (A).
4. Install the output shaft assembly (D) into the gearcase housing.

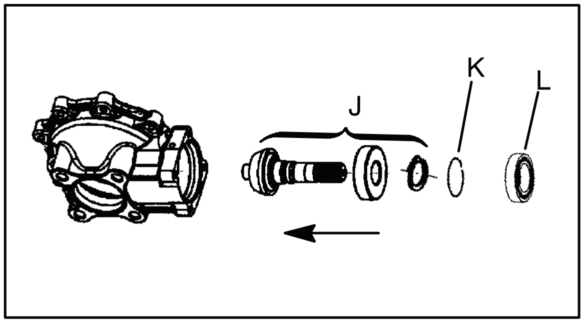


5. Press a new seal (E) into the gearcase cover.
6. Install the new lightly greased O-ring (F) onto the gearcase cover.
7. Place the output shaft shim (G) into the cover and place the original shim (H) and thrust button (I) into the cover.

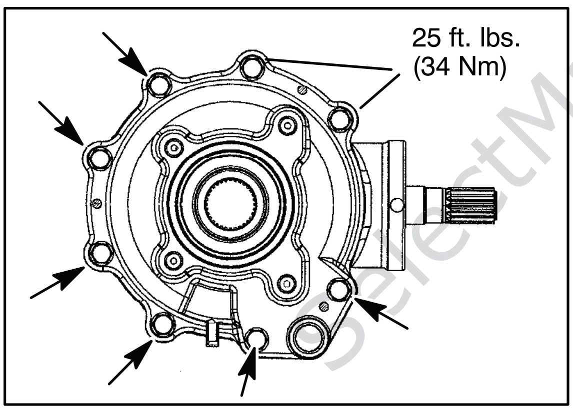


8. Install the gearcase cover onto the output shaft and gearcase housing. Install the cover bolts finger tight. **NOTE:** The cover bolts will be torqued later in the procedure.

9. Install the pinion shaft assembly (J) into the gearcase housing. Be sure the beveled output shaft gear and the pinion gear mesh smoothly.
10. Install the retaining ring (K) and install a the pinion shaft seal (L).

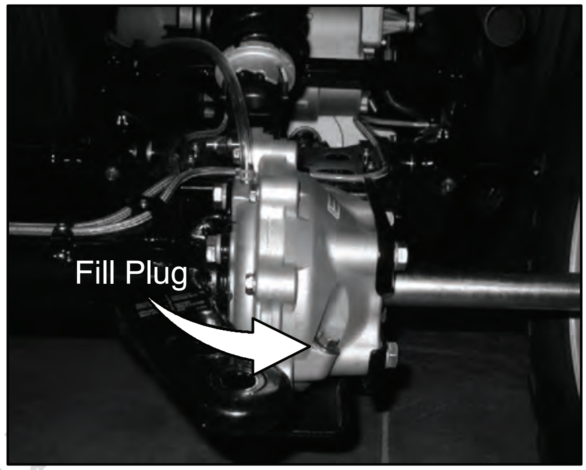


11. Torque the gearcase cover bolts in a criss cross pattern to 25 ft. lbs. (34 Nm).



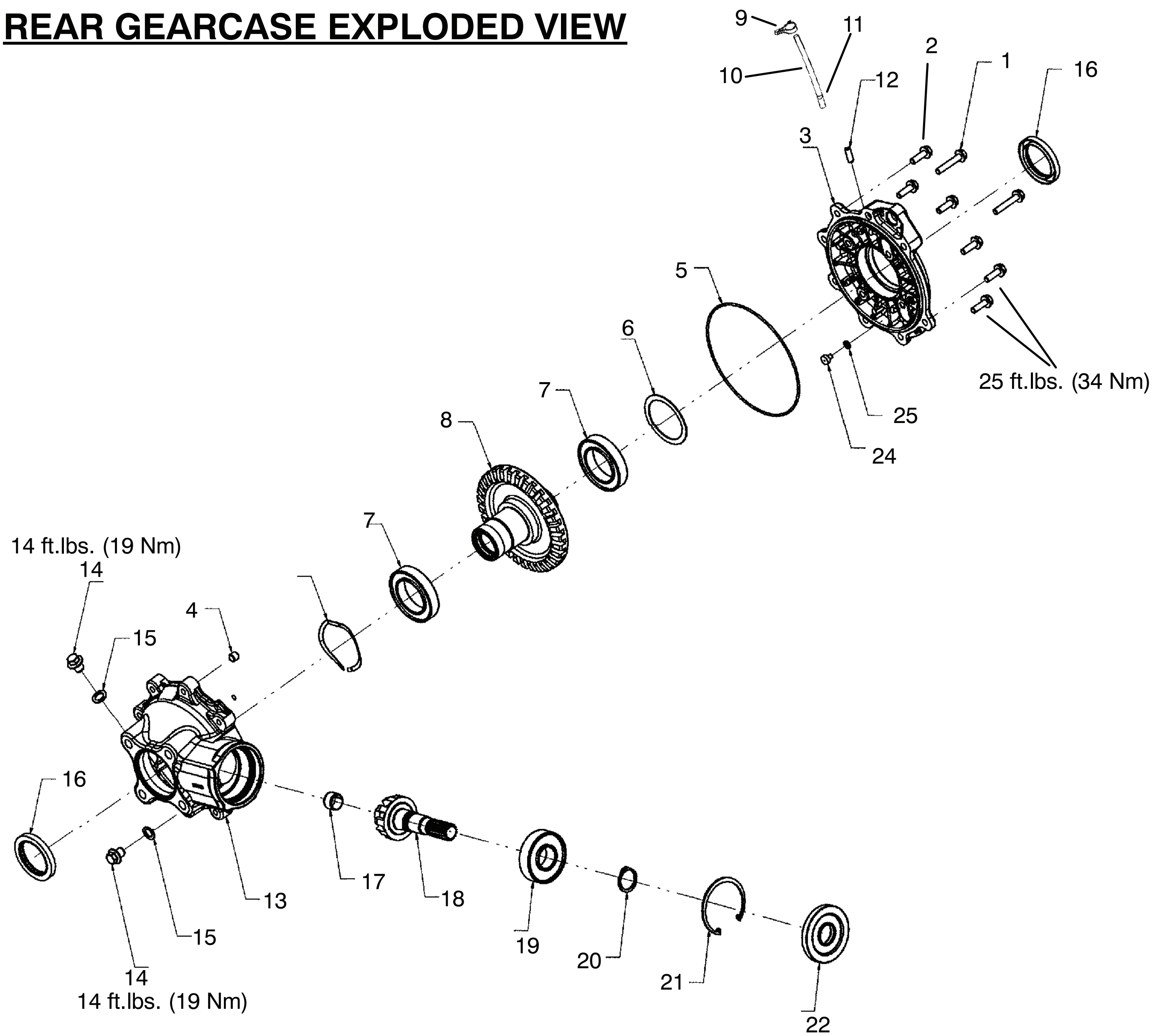
REAR GEARCASE INSTALLATION

1. To install gearcase, reverse removal procedure.
2. To install rear axle, follow the REAR AXLE INSTALLATION procedure performed earlier in this chapter.
3. Add Polaris ATV Angle Drive Fluid (**PN 2871653**) to rear gearcase. Refer to Chapter 2. Torque fill plug to 14 ft.lbs. (19 Nm).



Rear Gearcase Capacity
10.0 fl. oz. (300 ml)
or
Bottom of Threads of Fill Plug Hole

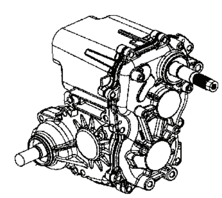
REAR GEARCASE EXPLODED VIEW



Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., Rear Gearcase	14.	2	Plug
1.	2	Screw	15.	2	Washer
2.	6	Screw	16.	2	Seal, Triple Lip
3.	2	Cover, Gearcase, Output	17.	1	Bearing, Plain
4.	1	Pipe, Knock	18.	1	Shaft, Pinion, 10T, Bevel
5.	1	O-ring	19.	1	Bearing, Ball
6.	1	Shim	20.	1	Ring, Retaining
7.	2	Bearing, Ball	21.	1	Ring, Retaining
8.	1	Gear, Bevel 31T	22.	1	Seal, Triple Lip
9.	3	Clip	23.	1	Spring, Wave
10.	AR	Line, Vent	24.	1	Thrust Button
11.	1	Clamp,Hose	25.	1	Shim
12.	1	Tube, Vent			
13.	1	Gearcase, Rear Housing			

CHAPTER 8

TRANSMISSION



8

TORQUE SPECIFICATIONS

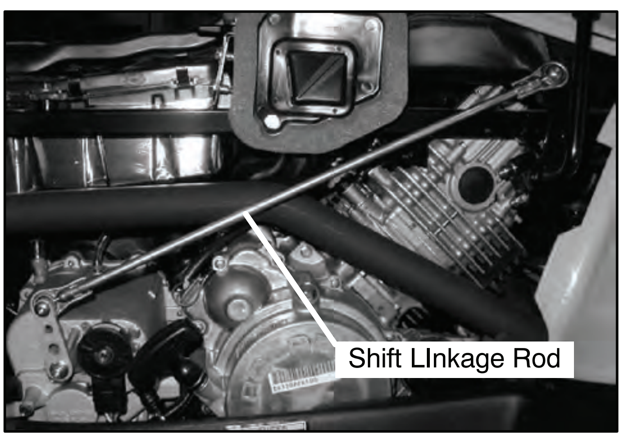
ITEM	TORQUE
Transmission Case Bolts	27-34 ft. lbs. (37-46 Nm)
Bell Crank Nut	12-18 ft. lbs. (16-24 Nm)
Transmission Drain Plug	14-18 ft. lbs. (19-24 Nm)
Transmission Mount Bolts	25 ft. lbs. (35 Nm)
Park Lockout Plunger	14-18 ft. lbs. (19-24 Nm)
Strut Casting Pinch Bolt	15 ft. lbs. (21 Nm)
Shift Cover Bolt Torque	6-12 ft. lbs. (12-16 Nm)

LUBRICATION

Refer to maintenance section for transmission lubricant type and capacity.

SHIFT LINKAGE INSPECTION

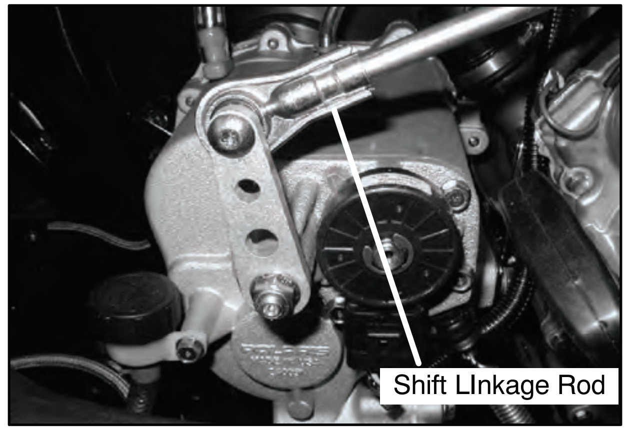
NOTE: Shift rod is preset at time of manufacture.



1. Inspect shift linkage tie rod ends, clevis pins, and pivot bushings and replace if worn or damaged.

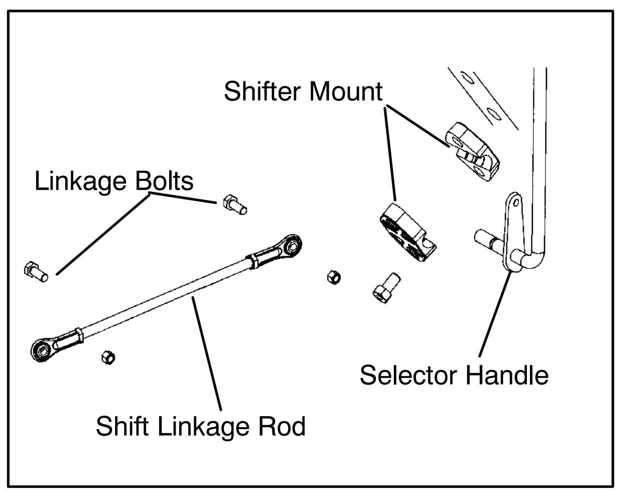
   Lubricate the tie rod ends with a light aerosol lubricant or grease.

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 and the shifter. Remove rod assembly and adjust rod ends as needed.



GEAR SELECTOR REMOVAL

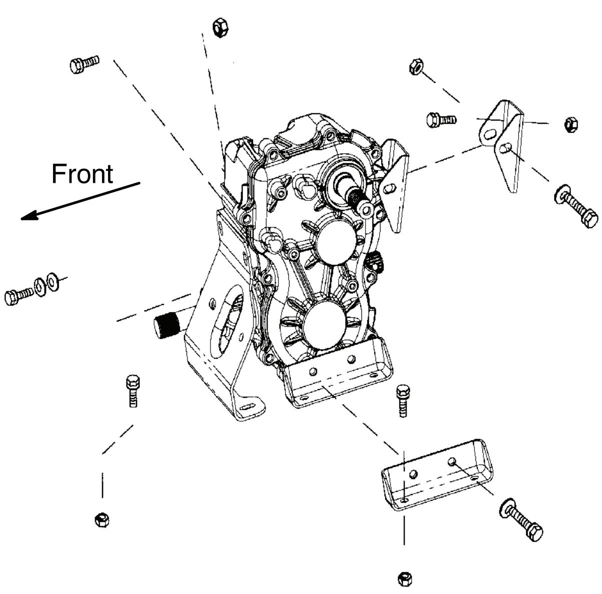
1. Disconnect linkage rod from gear selector handle.
2. Remove two bolts attaching gear selector mount to machine frame.
3. Lift gear selector out of mounting bracket and away from frame.



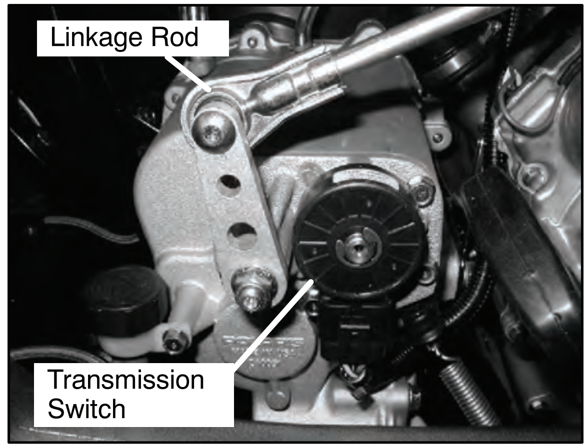
TRANSMISSION REMOVAL

1. Remove seat, rear rack, rear cab, air box, and exhaust system, and right footwell (if required for access).

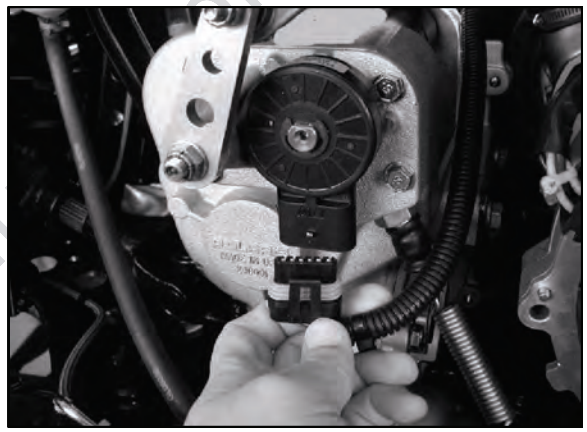
Transmission Mounting



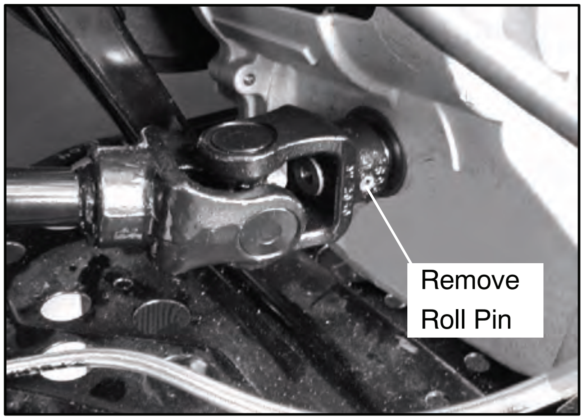
2. Disconnect transmission vent line.
3. Drain transmission lubricant.
4. Disconnect shift linkage rod end from transmission bellcrank.



5. Disconnect gear position switch harness.

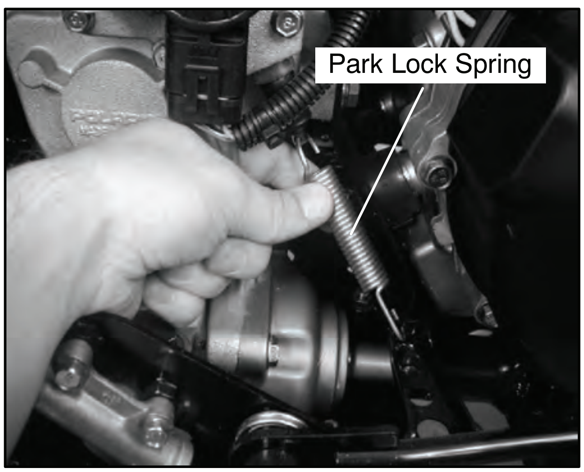


6. Remove auxiliary brake mounting bracket from frame and secure out of way for transmission removal.
7. Remove PVT outer cover, both drive and driven clutch, and inner PVT cover (refer to Clutch Chapter 6).
8. Use the Roll Pin Removal Tool (**PN 2872608**) to remove the roll pins from the front prop shaft (4x4 models) 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.



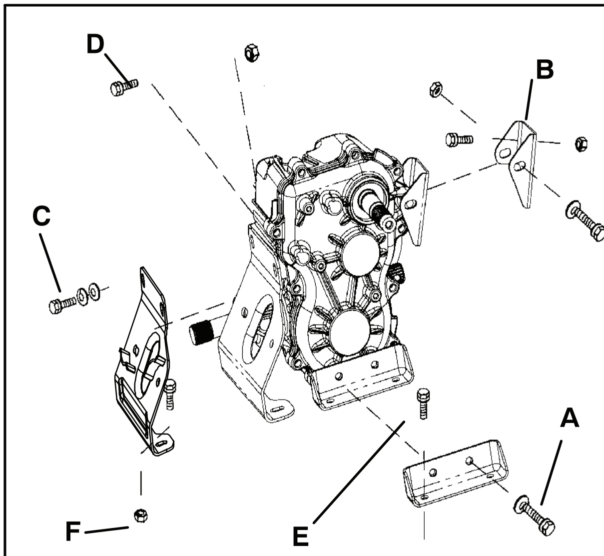
11. Remove left side transmission bracket, rear bracket, and lower right bracket bolt.
12. Remove front transmission-to-engine mount bolts. See illustration.
13. Remove transmission from right side of frame.

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 (4x4 models) 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.

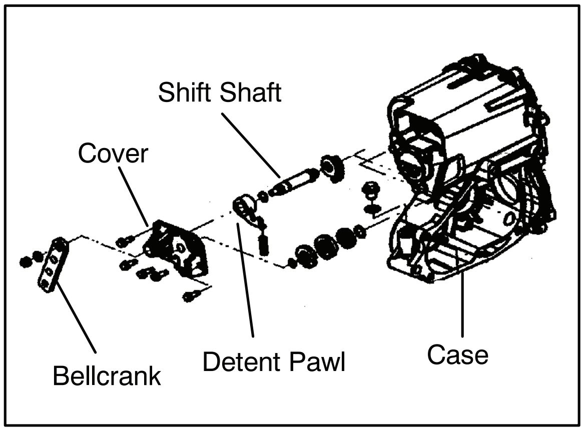
Transmission Mounting Bolts Torque
25 ft. lbs. (34.5 Nm)



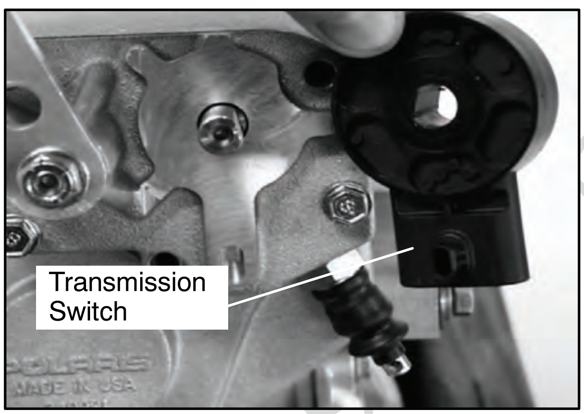
Tighten Bolts In Sequence A through F

2X4 TRANSMISSION DISASSEMBLY

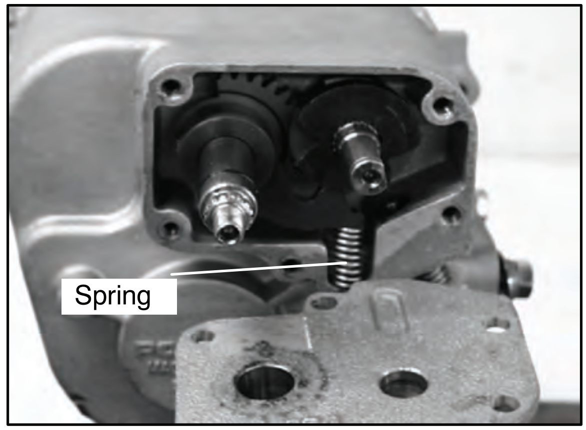
1. Place the bellcrank in neutral position.



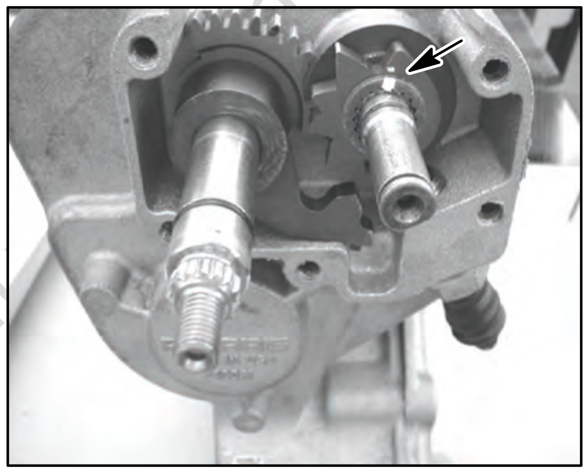
2. Remove the nut, and washer that secure the bell crank. Remove the bellcrank.
3. Remove the e-clip and then remove the transmission switch.



4. Remove the five bolts that secure the cover. Remove the detent spring.

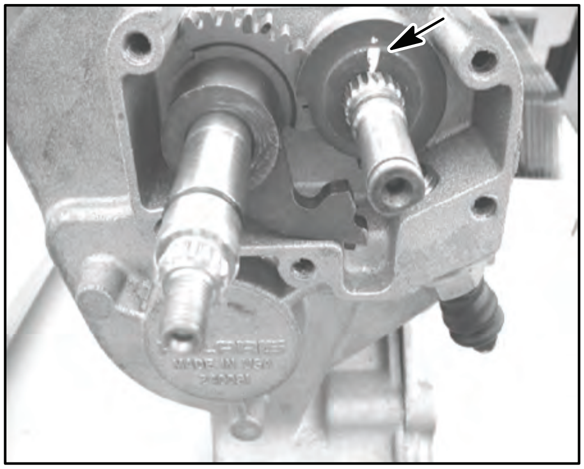


5. Mark the detent gear with a white pen. Remove the detent gear from the case.



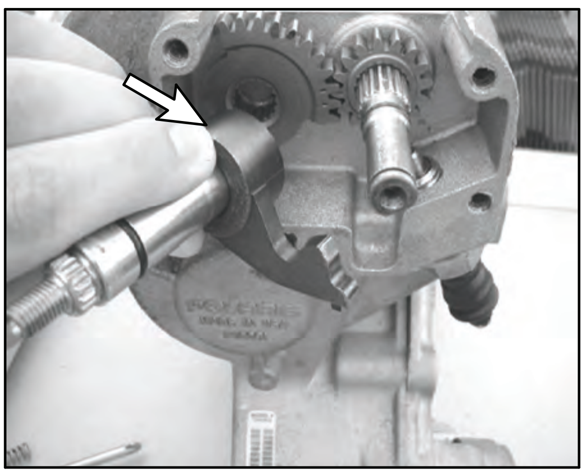
NOTE: It may be helpful to place a mark just above the keyed spline. Note the raised edge on the detent gear for reassembly.

6. Mark the shift lockout disc, this will indicate which side of the disc faces outward during assembly. Remove the shift lockout disc.

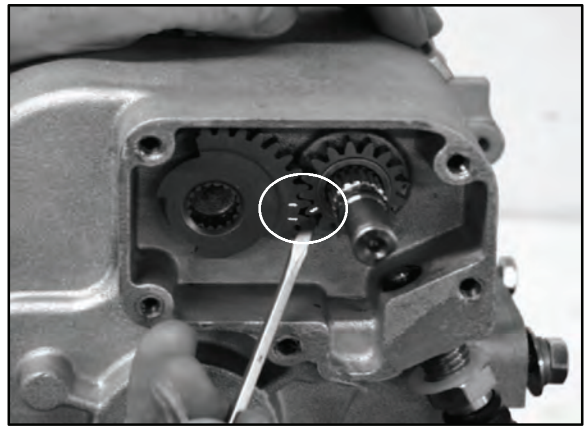


NOTE: It may be helpful to place a mark just above the keyed spline. Note the raised edge on the detent gear for reassembly.

7. Remove the shift shaft and detent lever.

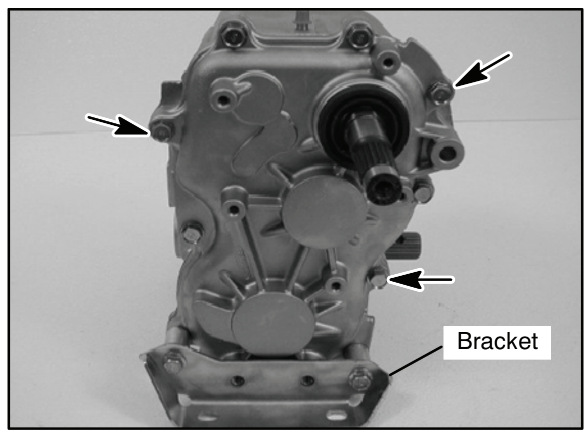


8. Note the timing marks on the shift gears. Remove the shift gears from the case.

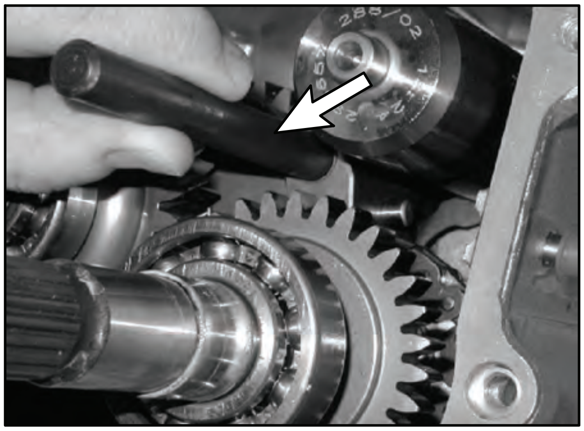


NOTE: It may be helpful to place a mark just above the keyed spline.

9. Remove the bolts on the LH transmission case cover. Tap the cover off with a soft face hammer if necessary. **NOTE:** Leave bracket attached to the LH cover during removal, only remove if needed.

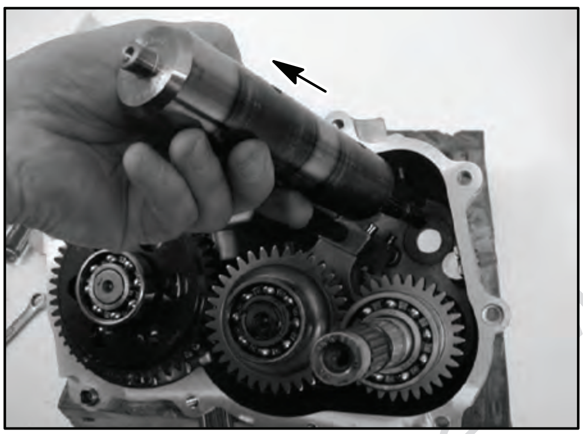


10. Lift shift rail 0.5–1” (12.70–25.40 mm). Then rotate the shift rail/forks and shift drum, so the the forks’ pins disengage from the drum.

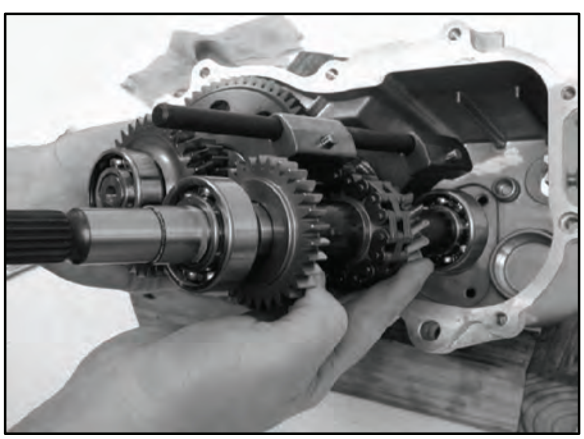


11. Remove the shift drum.

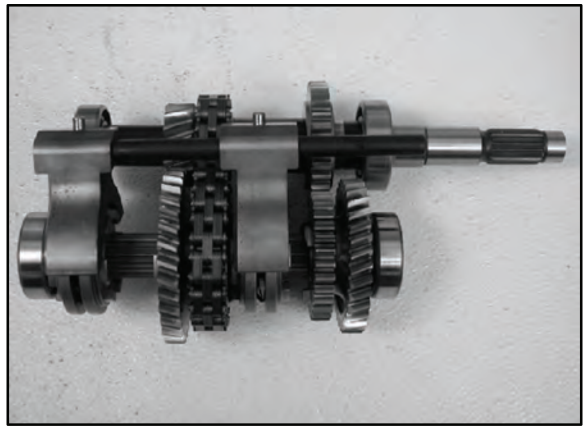
NOTE: You may have to tap the shift drum from the backside of the case to aid in removal.



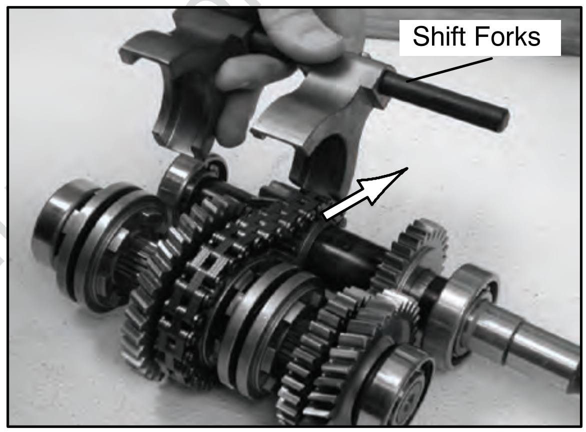
12. Remove the upper gear cluster and shift forks. You may need to move the assembly back and forth to aid in removal.



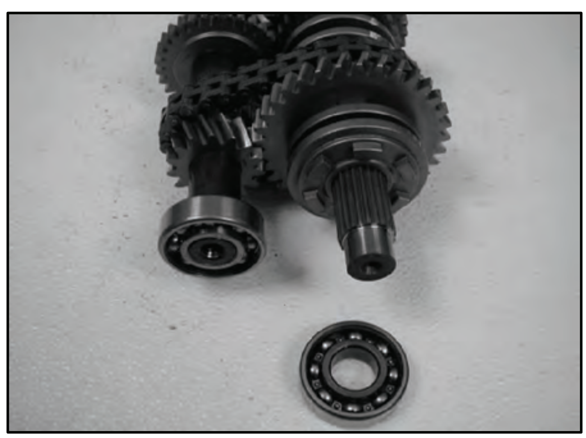
13. Set the upper gear cluster on a flat surface and inspect the components.



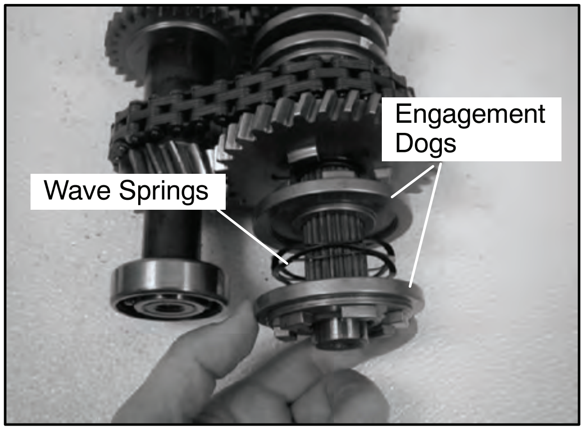
14. Remove the shift forks from the assembly. Note the correct position of each fork.



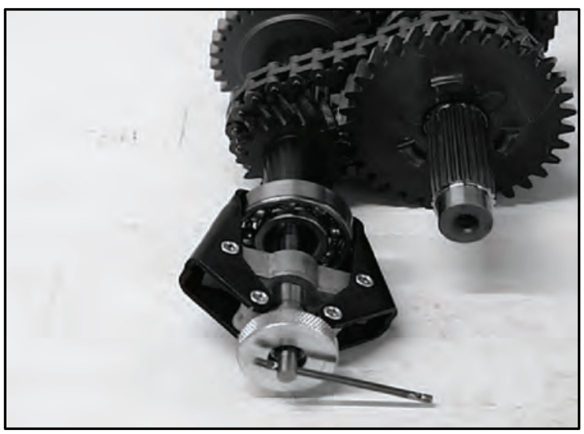
15. Remove the bearing from the reverse shaft with a puller.



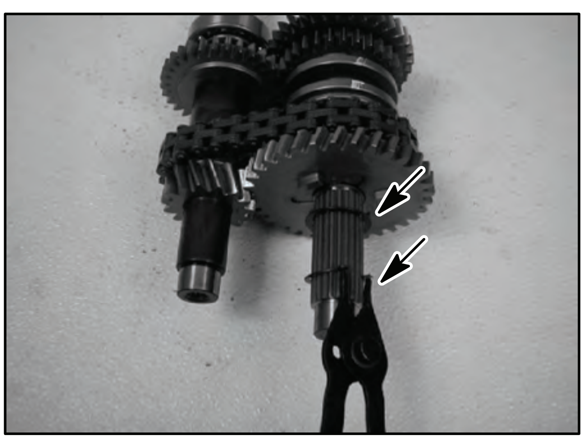
16. Remove the engagement dog. Remove the wave spring and reverse engagement dog.



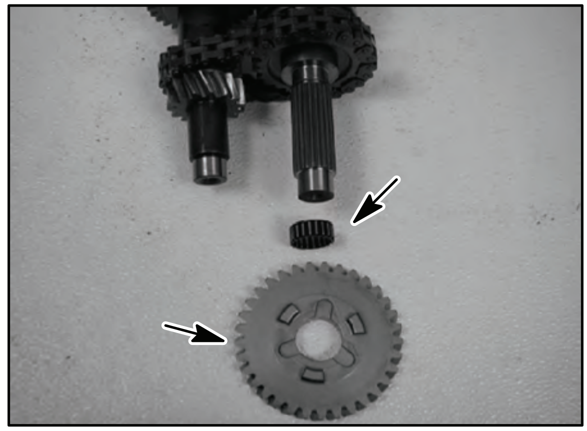
17. Remove the bearing from the input shaft with a puller.



18. Remove the snap ring and washer from the reverse shaft.



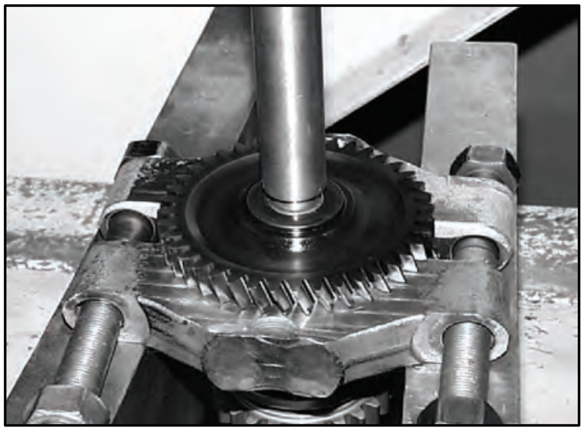
19. Remove low gear and the needle bearing.



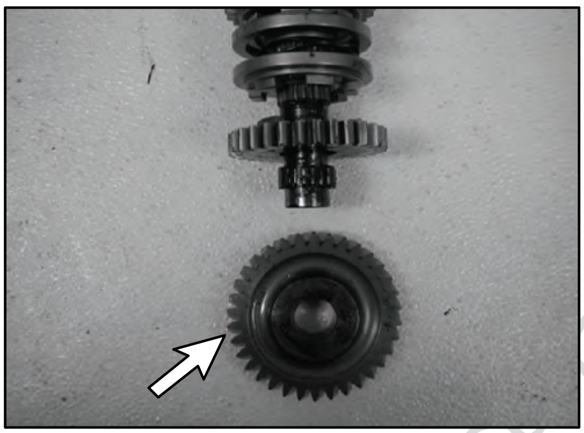
20. Remove the reverse gear shaft and silent chain.

21. Remove the rest of the bearings from the shafts.

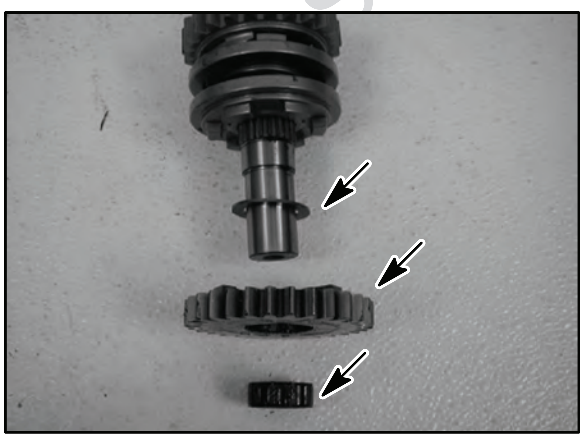
22. Use a press to remove the gear from the shaft.



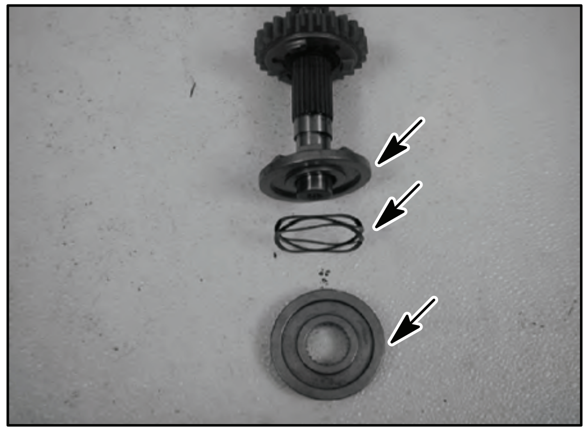
23. Make note of the direction of the gear and hub location.



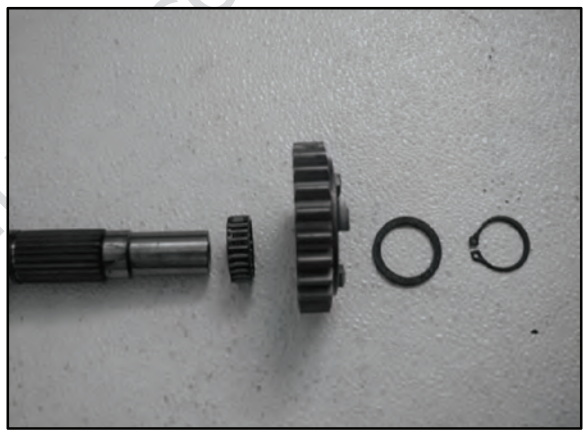
24. Remove the gear, split needle bearing, and washer from the reverse shaft.



25. Slide off the shift dogs and wave springs.

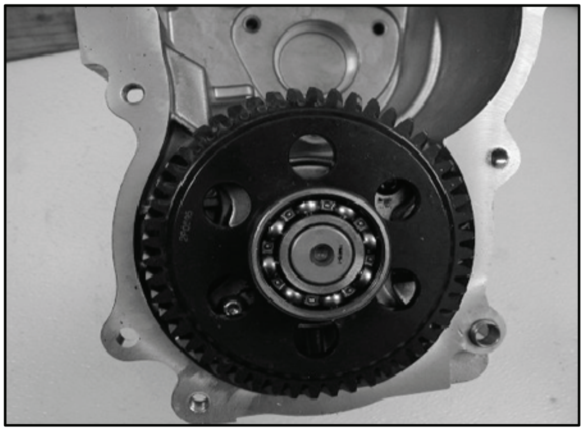


26. Remove the snap ring, washer, gear, and split needle bearing.

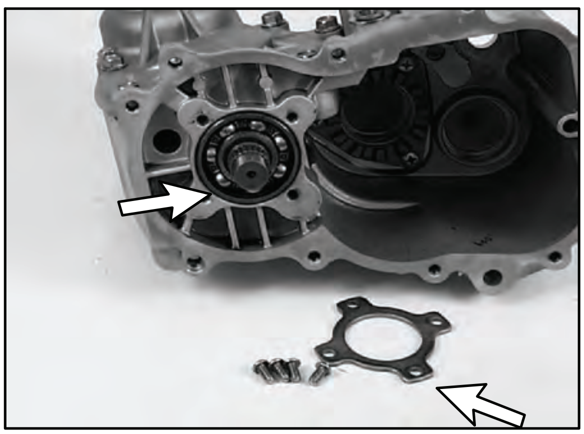


27. Inspect the input shaft for wear cracks chips for broken teeth.

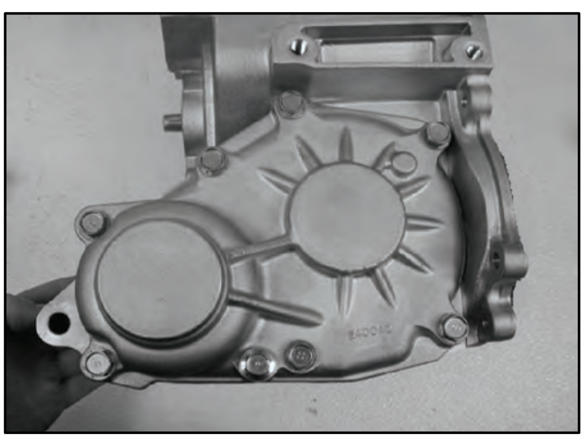
28. Remove bearing and the helical gear.



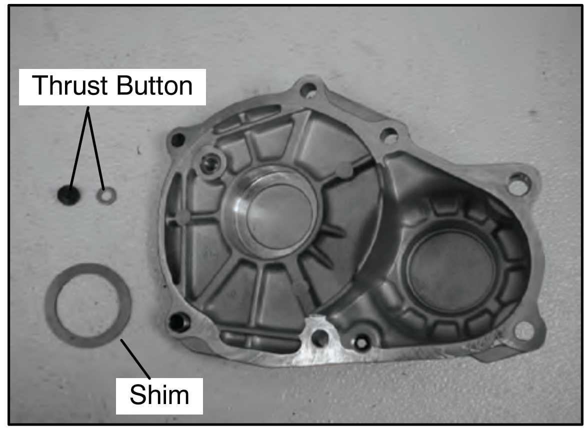
29. Remove the pinion shaft retainer plate and the pinion shaft.



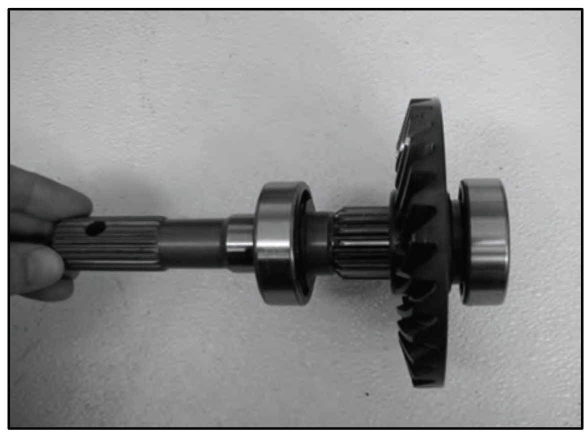
30. Remove the front housing cover screws.



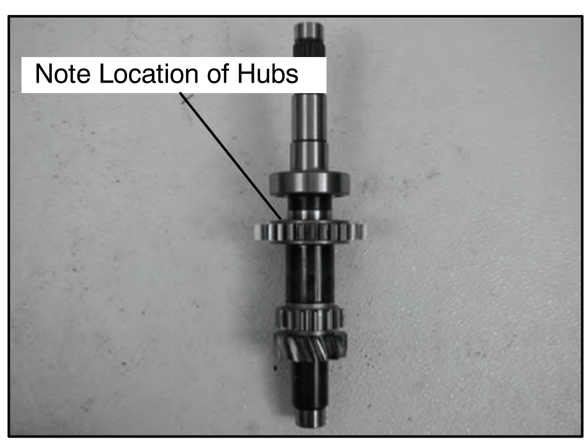
31. Remove the front housing cover, shim, thrust button, and thrust button shim.



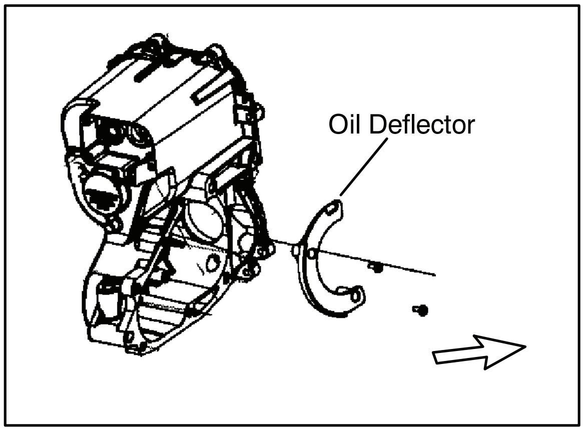
32. Remove the rear output shaft from the case.



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 the oil deflector from the transmission case if needed. Remove seals from transmission case.

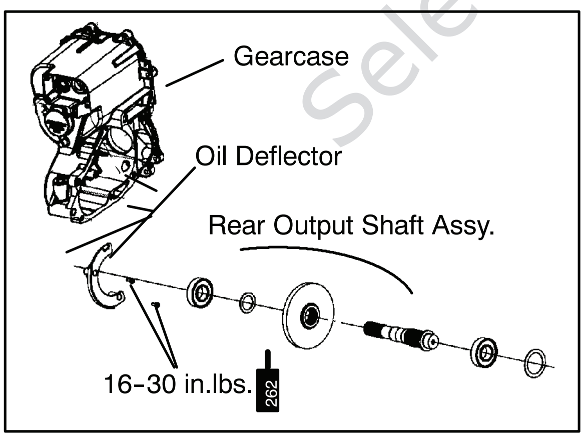


IMPORTANT: New seals should be installed after the transmission is completely assembled.

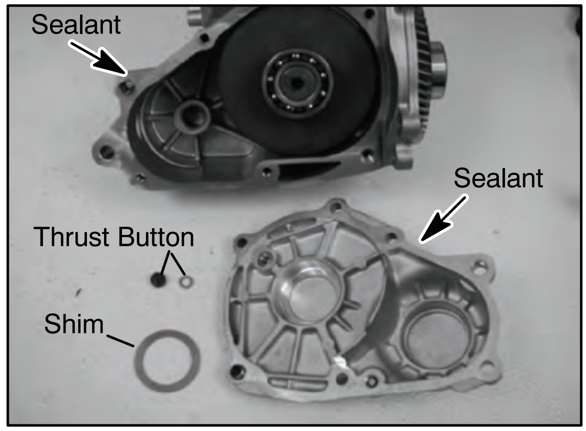
37. Inspect bearings for smooth operation. Check for excessive play between inner and outer race.

2X4 TRANSMISSION ASSEMBLY

1. Install rear output shaft into the gearcase. If previously removed, install the oil deflector. Apply Loctite™ 262 (**PN 2871951**) to the bolts and torque the bolts to 16-30 in.lbs. (1.8-3.4 Nm).



2. Before installing the cover make sure the sealing surfaces are clean and dry, and shafts are fully seated in the transmission case. Apply Polaris Crankcase Sealant (**PN 2871557**) to the mating surfaces.

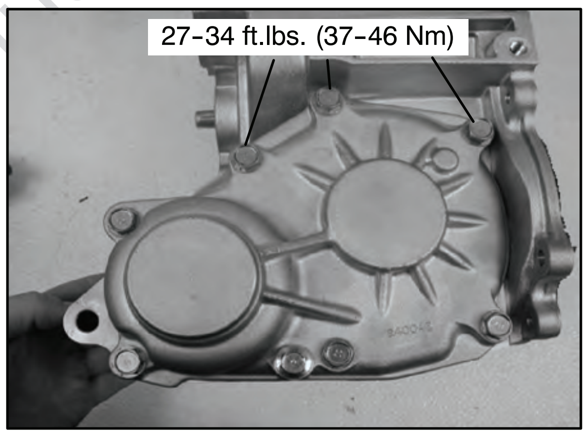


Crankcase Sealant

(PN 2871557)

3. 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.

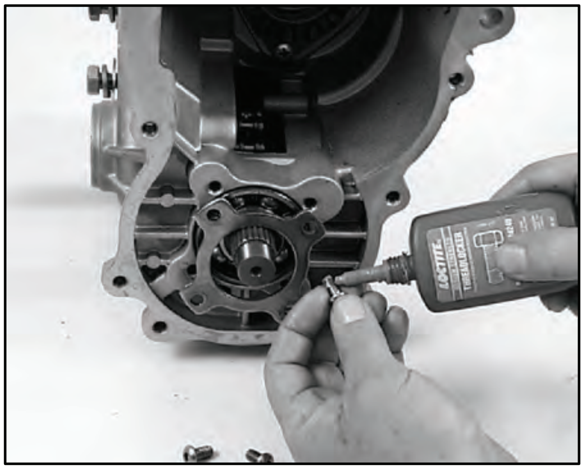


Front Cover Bolt Torque:

27-34 ft. lbs. (37-46 Nm)

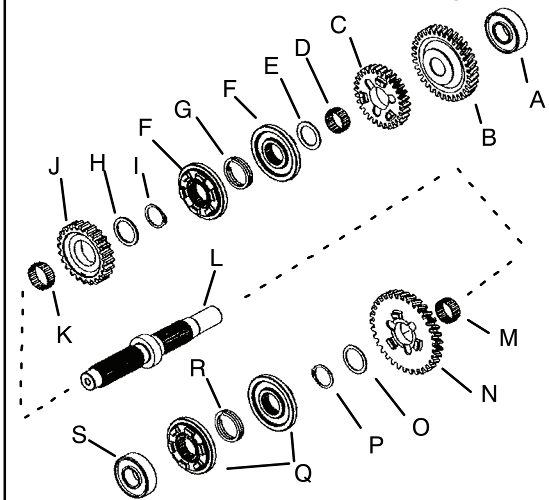
4. Apply grease to the seal lips. Apply electricians tape or somehow cover the splines of the shaft to protect the seal lips during installation. Install new rear output shaft seal.
5. Install pinion shaft with bearing.
6. Install retainer plate with flat side toward bearing.

7. Apply Loctite™ 262 (Red) (**PN 2871951**) to screw threads and torque screws to 6-12 ft. lbs. (8-16 Nm).



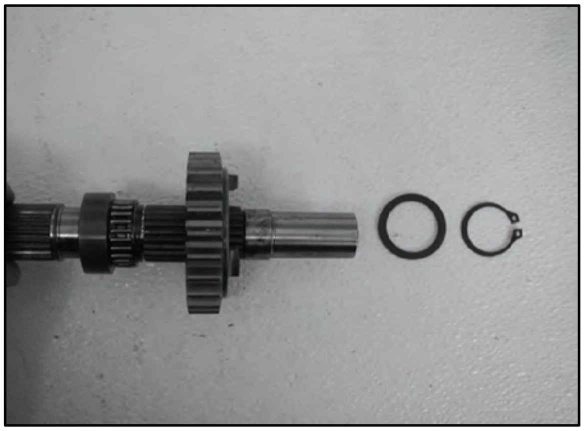
Pinion Retainer Plate Bolt Torque:
6-12 ft. lbs. (8-16 Nm)

Reverse Shaft Assembly

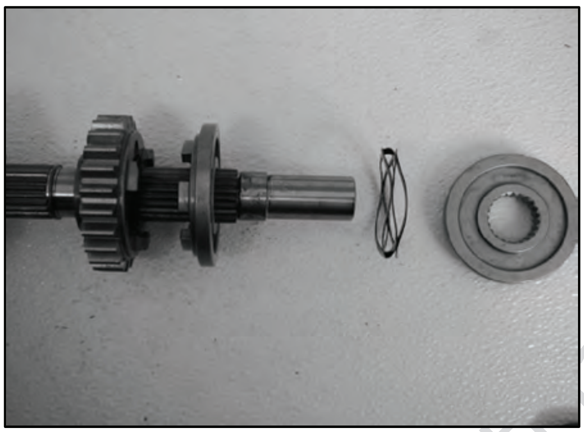


A. Bearing
B. 34T Helical Gear
C. 30T Gear
D. Split Needle Bearing
E. Washer
F. Engagement Dog
G. Wave Spring
H. Retaining Ring
I. Washer
J. 24T Sprocket
K. Bearing
L. Reverse Shaft
M. Split Needle Bearing
N. 33T Gear
O. Washer
P. Retaining Ring
Q. Engagement Dog
R. Wave Spring
S. Bearing

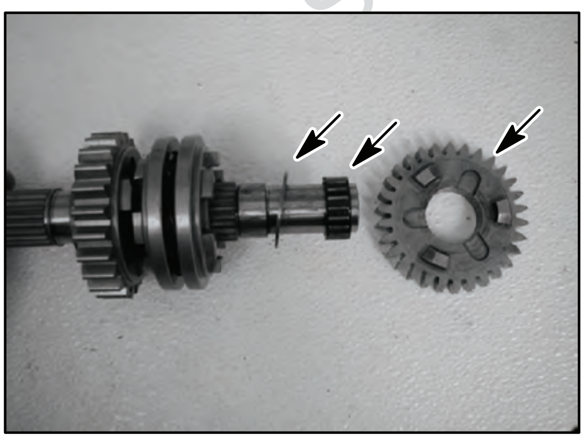
8. Install a new needle bearing, the 24T reverse sprocket, washer, and a new snap ring.
9. Install a new snap ring at this time. When installing the new snap ring, open the the snap ring just far enough to go over the shaft, to avoid stressing the snap ring. If the snap ring is overstressed it could come off the shaft and cause internal damage to the transmission.



10. Install the shift dogs and wave spring.

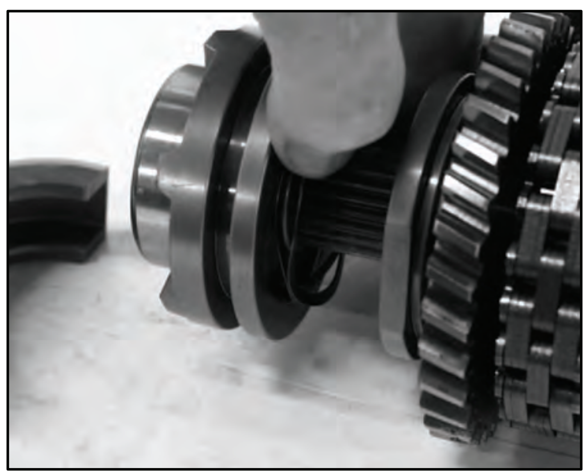


11. Install the washer, a new needle bearing and the high gear (30T gear). Install the press fit gear (34T helical) and ball bearing.



12. Slide the reverse shaft assembly through the silent chain.

13. Install a new split needle bearing, the low gear (33T), the thrust washer and the snap ring. Use of a new snap ring is recommended.
14. Install the engagement dogs, wave springs, and bearing.
15. Install the ball bearing onto the end of the input shaft.

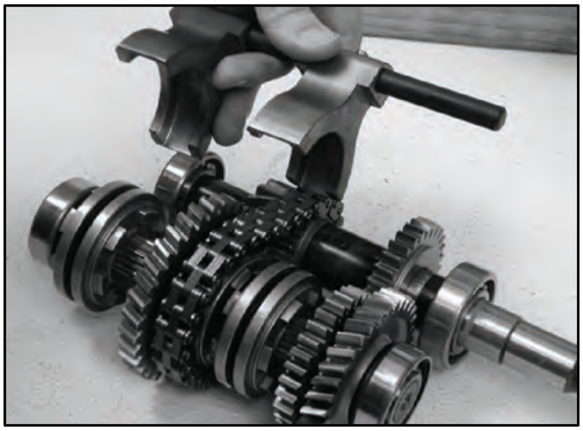


16. As the engagement dogs are installed onto the shaft, place the wave springs into the spring groove.

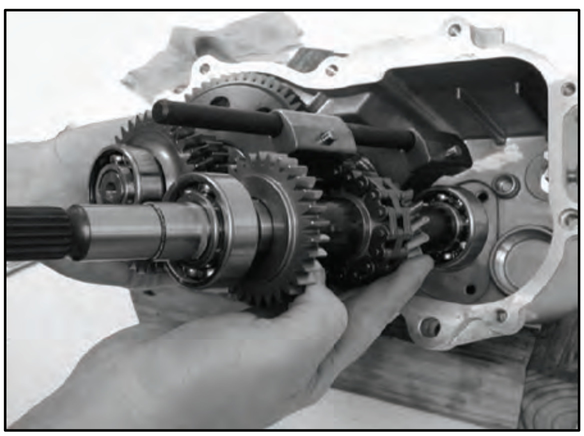
17. Install the shift forks. Keep the spring in place while the fork is being installed on the shaft and while placing the shafts into the case.

NOTE: Use caution when installing the fork, the spring can easily fall out.

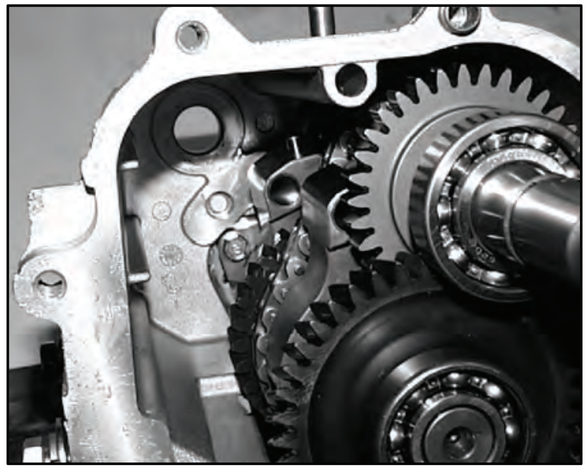
NOTE: Installing the shift rail will aid in keeping the shift forks, shift dogs, and the springs in place.



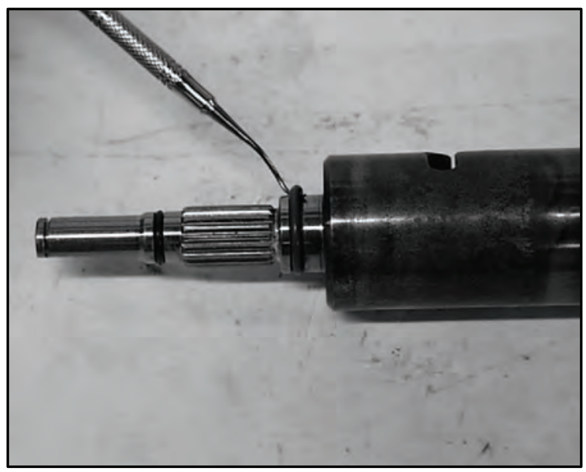
18. Carefully install the shaft assembly and gear cluster as a unit into their respective bearing case recesses. Tap with a soft face hammer to seat shaft assemblies.



19. Position the shift forks up and so the the pins point toward the 9 o'clock position, before installing the shift drum assembly.



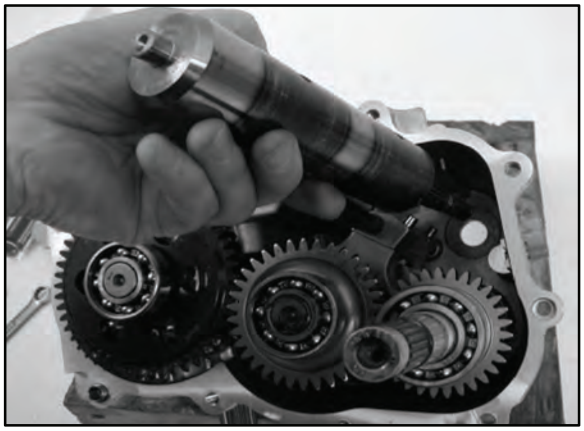
20. Replace and grease the O-ring's on the shift drum before installation.



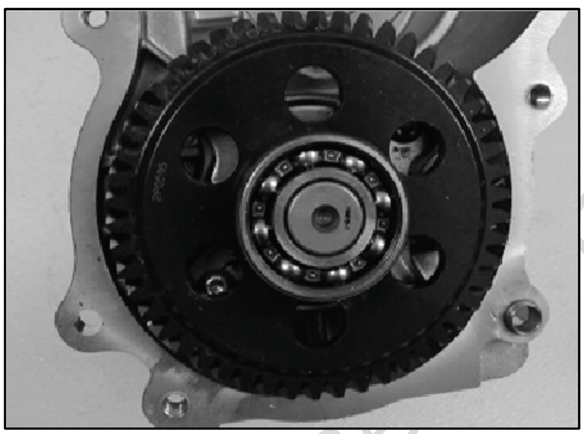
21. Install the shift drum into the case.

NOTE: Make sure shift shaft pins are properly positioned in the slot on selector arms.

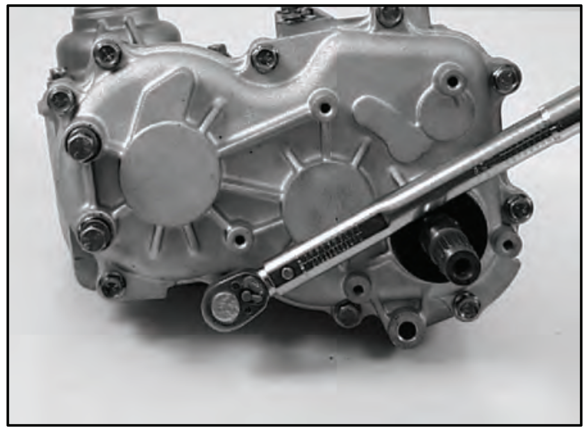
22. Lift the shift rail slightly and rotate the rail/fork assembly so it meshes with the tracks on the shift drum. Be sure the wave springs are properly in place and that the shift rail is seated into the pocket on the backside of the case.



23. Install the helical gear and bearing onto the pinion shaft.

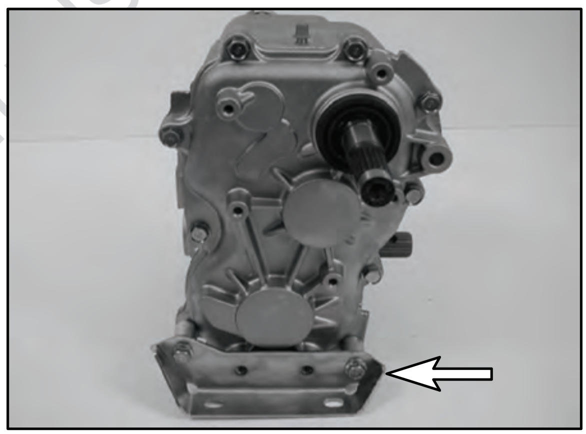


24. Clean the mating surfaces of the case and cover. Apply Crankcase Sealant (**PN 2871557**) to the mating surfaces. Be sure the locating pins (knock pipes) are in place. Reinstall cover and torque bolts in a criss-cross pattern in 3 steps to 27-34 ft. lbs. (36.50-46 Nm).

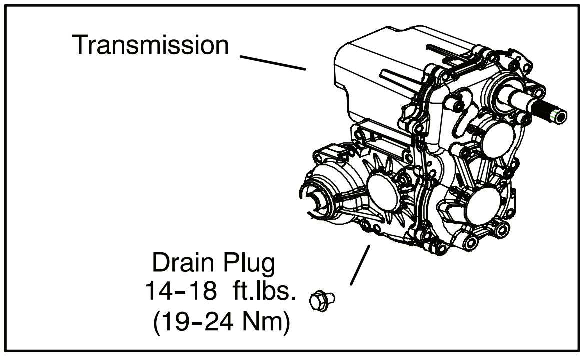


Front Cover Bolt Torque:
27-34 ft. lbs. (36.50-46 Nm)

25. Install the transmission mounting bracket, if previously removed.

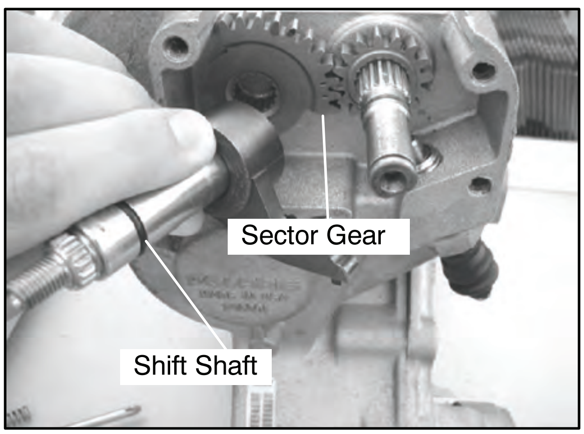


26. Grease the seal lips of the input shaft seal. Apply electricians tape or somehow cover the splines of the shaft to protect the seal lips during installation. Install new input shaft seal.
27. Install drain plug with a new sealing washer. Torque drain plug to 14-18 ft. lbs. (19-24 Nm).



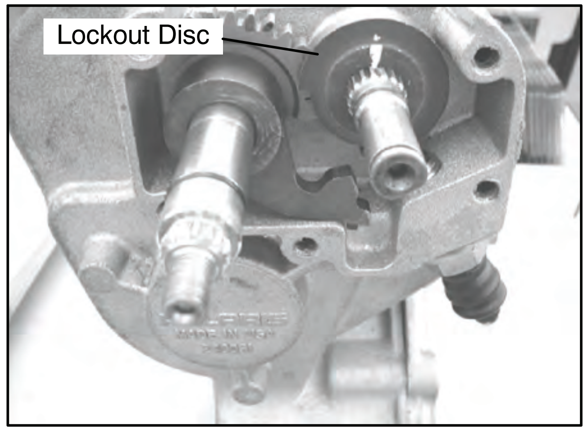
Drain Plug Torque:
14-18 ft. lbs. (19-24 Nm)

28. 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.
29. Install the shift shaft.

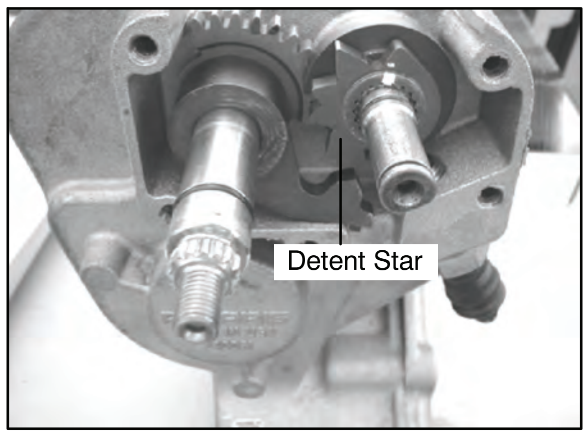


NOTE: Note the location of the skip tooth on the splines. Apply a light coating of grease on the gear teeth.

30. Install the lockout disc with the raised edge facing outward. Use the white marks that were previously applied for reference.

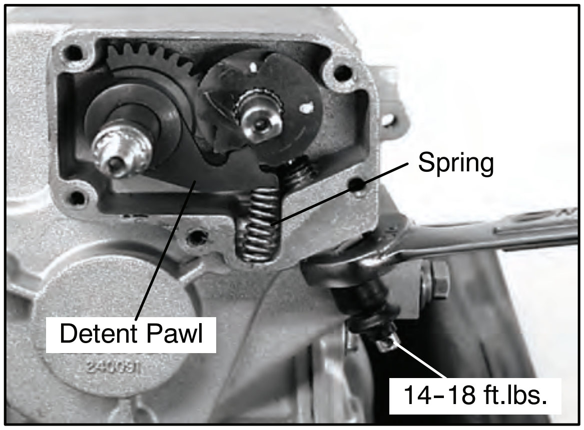


31. Install the detent star with the raised edge facing outward. Note the keyed spline on the end of the shaft.

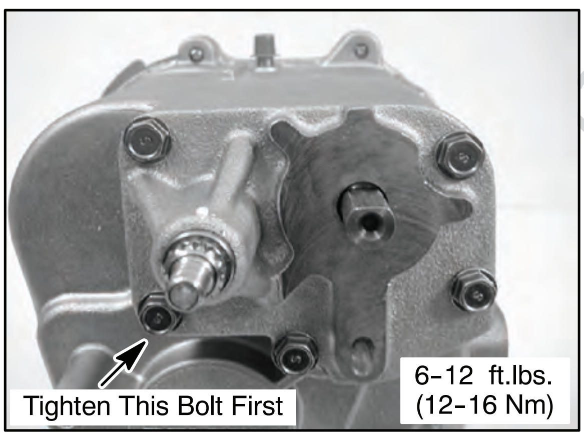


32. Install the detent pawl spring. Install a new o-ring onto the shift shaft after the detent pawl is assembled to the shaft. Place a small amount of grease on the small O-ring on the shift shaft and on the detent star. Grease the o-ring on the end of the shift drum.

33. Install the park lock mechanism. Torque the park lock to 14-18 ft.lbs. (19-24 Nm).



34. Apply Crankcase Sealant (**PN 2871557**) onto the cover and case mating surfaces. Install the cover and hand tighten all of the bolts. Tighten the bolt indicated in the picture below first and torque the bolt to 6-12 ft. lbs. (12-16 Nm). This helps to align the cover and shaft to ensure smoother shifting.

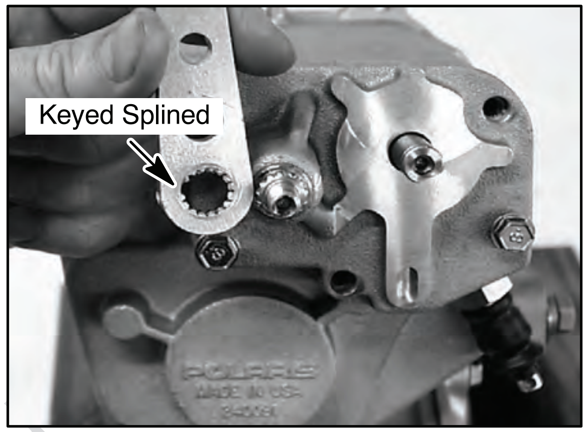


35. Torque the remaining bolts to 6-12 ft.lbs. (12-16 Nm).

Cover Bolt Torque:

6-12 ft. lbs. (12-16 Nm)

36. 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)

37. Install transmission and add Polaris Premium Synthetic Gear Case Lubricant (**PN 2871477**) in the recommended amount. Refer to Maintenance Chapter 2.

TROUBLESHOOTING CHECKLIST

Check the following items when shifting difficulty is encountered.

- Idle speed adjustment
- PVT alignment
- Transmission oil type/quality
- Transmission torque stop adjustment (where applicable)
- Engine torque stop adjustment (where applicable)
- Drive belt deflection
- Loose fasteners on rod ends
- Loose fasteners on selector box
- Worn rod ends, clevis pins, or pivot arm bushings
- Linkage rod adjustment and rod end positioning
- Shift selector rail travel
- *Worn, broken or damaged internal transmission components

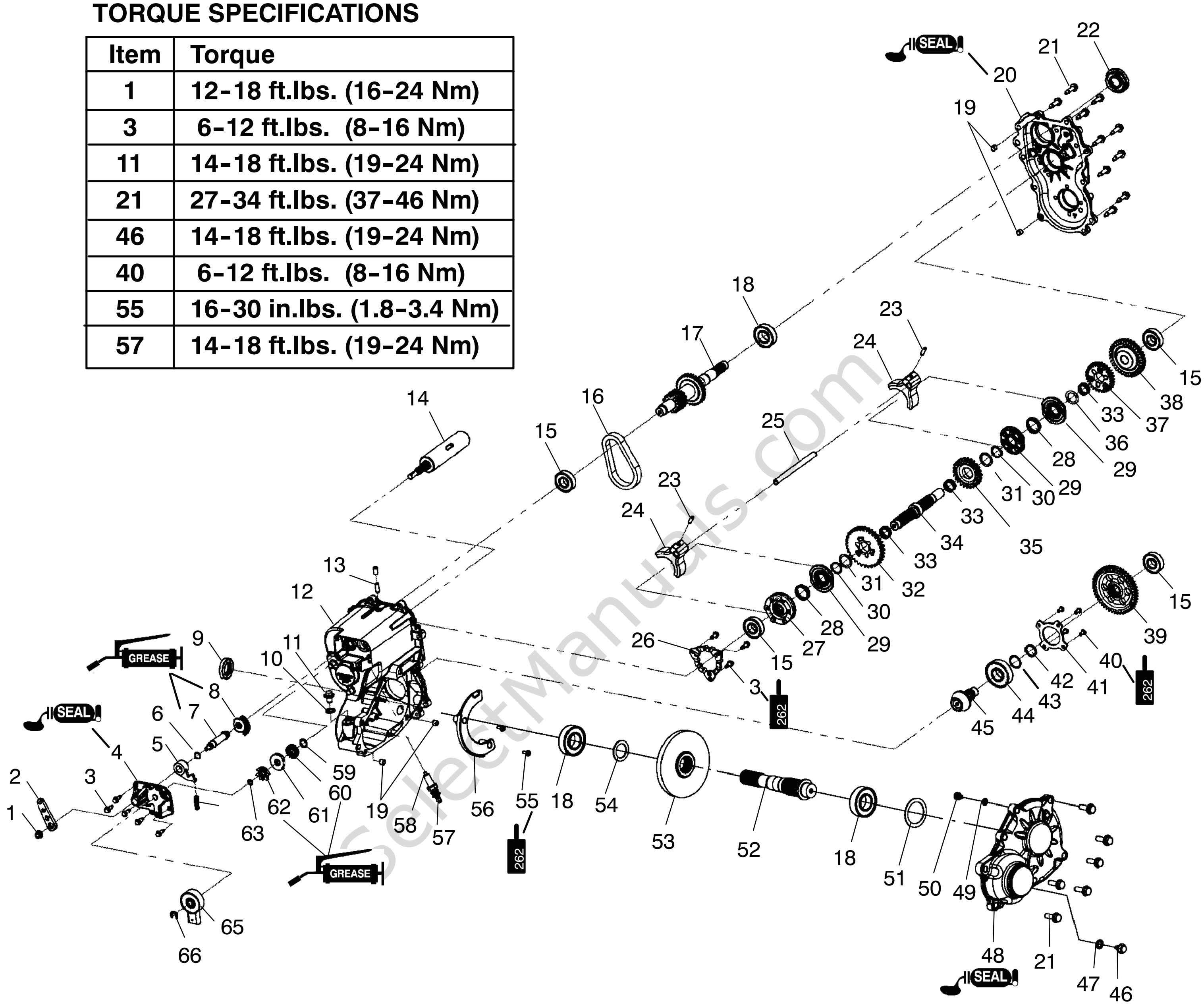
***NOTE:** To determine if shifting difficulty or problem is caused by an internal transmission problem, isolate the transmission by disconnecting linkage rod from transmission bellcrank. Manually select each gear range at the transmission bellcrank, and test ride vehicle. If it functions properly, the problem is outside the transmission.

If transmission problem remains, disassemble transmission and inspect all gear dogs for wear (rounding), damage. Inspect all bearings, circlips, thrust washers and shafts for wear.

2X4 TRANSMISSION EXPLODED VIEW

TORQUE SPECIFICATIONS

Item	Torque
1	12-18 ft.lbs. (16-24 Nm)
3	6-12 ft.lbs. (8-16 Nm)
11	14-18 ft.lbs. (19-24 Nm)
21	27-34 ft.lbs. (37-46 Nm)
46	14-18 ft.lbs. (19-24 Nm)
40	6-12 ft.lbs. (8-16 Nm)
55	16-30 in.lbs. (1.8-3.4 Nm)
57	14-18 ft.lbs. (19-24 Nm)



FOR REASSEMBLY

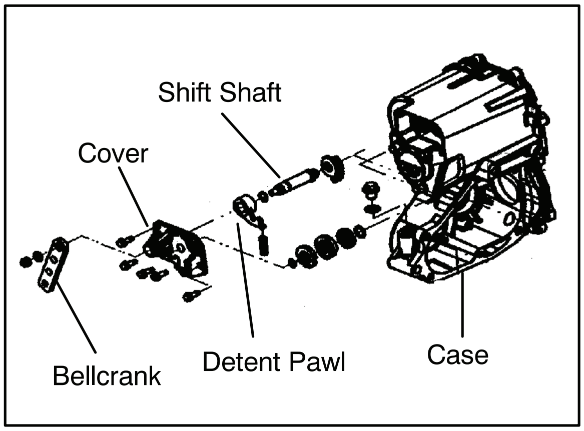
GREASE	Apply Polaris All Purpose Grease.
SEAL	Apply Polaris Crankcase Sealant
262	Apply Loctite™ 262 to the bolt threads.

2X4 TRANSMISSION EXPLODED VIEW, CONT.

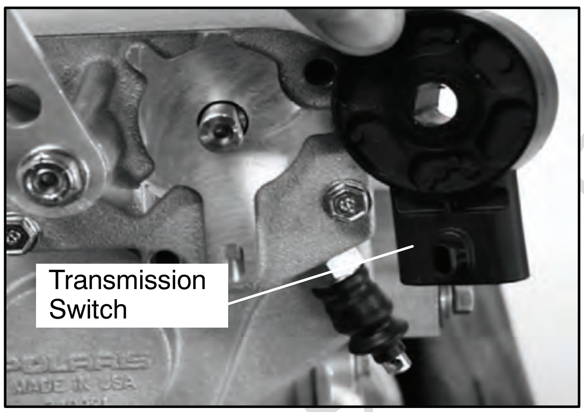
Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., 2x4 Transmission	35.	1	24T Sprocket
1.	1	Nut, Lock	36.	1	Washer
2.	1	Bellcrank	37.	1	30T Gear
3.	8	Screw	38.	1	36T Gear
4.	1	Cover	39.	1	48T Gear
5.	1	Detent Pawl	40.	4	Screw
6.	1	O-ring	41.	4	Bearing Center Drive Cover
7.	1	Shaft, Shift	42.	1	Retaining Ring
8.	1	Gear, 31T	43.	1	Spacer
9.	2	Triple Lip Seal	44.	1	Ball Bearing
10.	1	Washer	45.	1	10T Shaft
11.	1	Oil, Plug Fill	46.	1	Plug
12.	1	Main Gearcase	47.	1	Washer
13.	1	Vent Tube	48.	1	Front Output Cover
14.	1	Shift Drum	49.	1	Shim
15.	4	Ball Bearing	50.	1	Thrust Button
16.	1	Silent Chain	51.	1	Shim
17.	1	Input Shaft	52.	1	Rear Output Shaft
18.	3	Ball Bearing	53.	1	31T Gear
19.	4	Knock Pipe	54.	1	Thrust Washer
20.	1	LH Cover	55.	2	Tapping Screw / Lock Washer
21.	17	Tapping Screw	56.	1	Oil Deflector
22.	1	Dual Lip Seal	57.	1	Tie Clamp
23.	2	Dowel Pin	58.	1	Park Lockout
24.	2	Shift Fork	59.	1	O-ring
25.	1	Shift Shaft Rail	60.	1	16T Gear
26.	1	Plate	61.	1	Lockout Disc
27.	1	Engagement Dog	62.	1	Detent Star
28.	2	Wave Spring	63.	1	O-ring
29.	3	Engagement Dog	64.	1	Compression Spring
30.	2	Retaining Ring	65.	1	Switch
31.	2	Washer	66.	1	Retaining Ring
32.	1	33T Gear			
33.	3	Needle Bearing			
34.	1	Reverse Shaft			

4X4 TRANSMISSION DISASSEMBLY

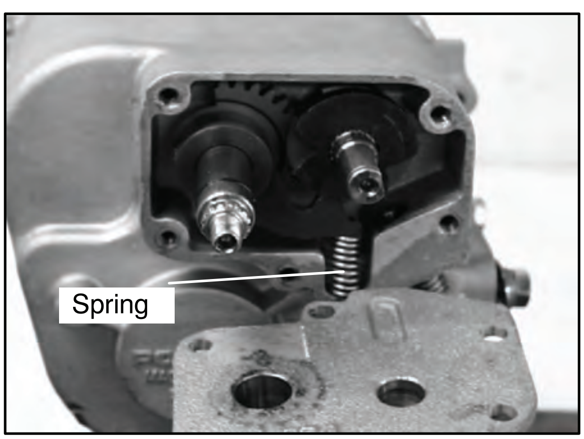
1. Place the bellcrank in neutral position.



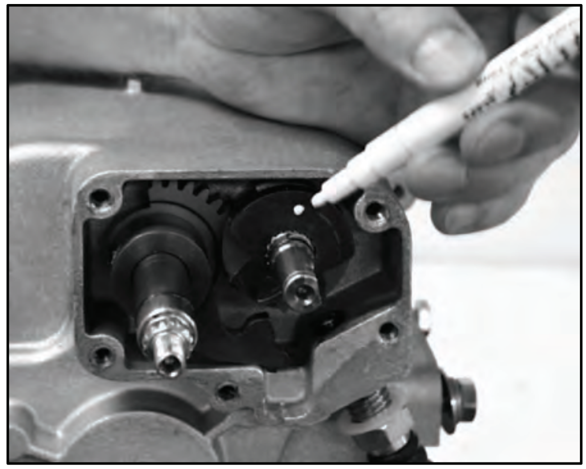
2. Remove the nut, and washer that secure the bell crank. Remove the bellcrank.
3. Remove the e-clip and then remove the transmission switch.



4. Remove the five bolts that secure the cover. Remove the detent spring.

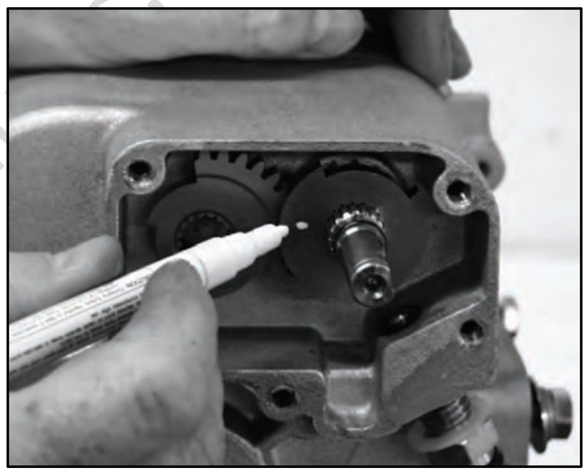


5. Mark the detent gear with a white pen. Remove the detent gear from the case.



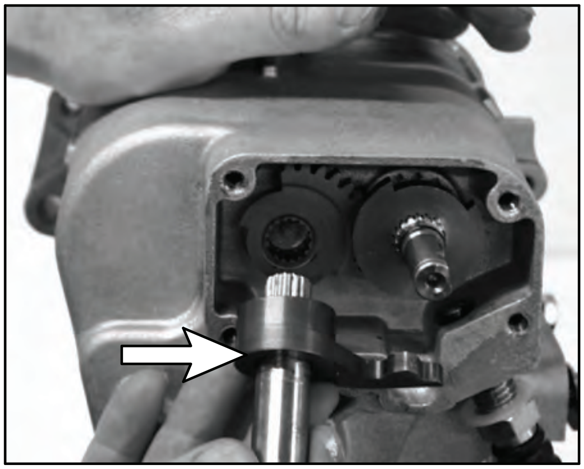
NOTE: It may be helpful to place a mark just above the keyed spline.

6. Mark the shift lockout disc, this will indicate which side of the disc faces outward during assembly. Remove the shift lockout disc.

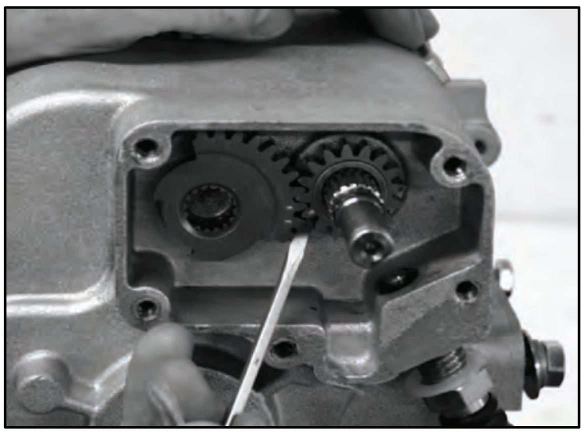


NOTE: It may be helpful to place a mark just above the keyed spline.

7. Remove the shift shaft and detent lever.

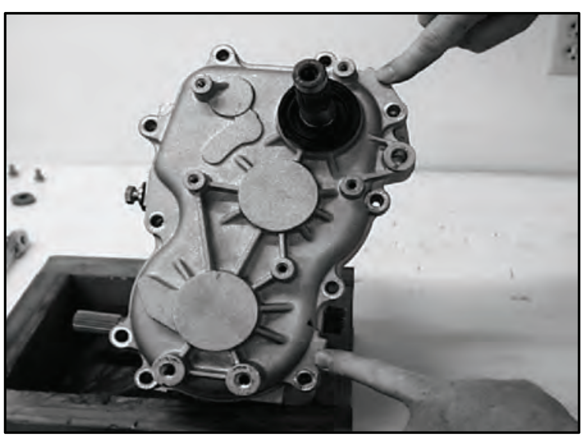


8. Note the timing marks on the shift gears. Remove the shift gears from the case.

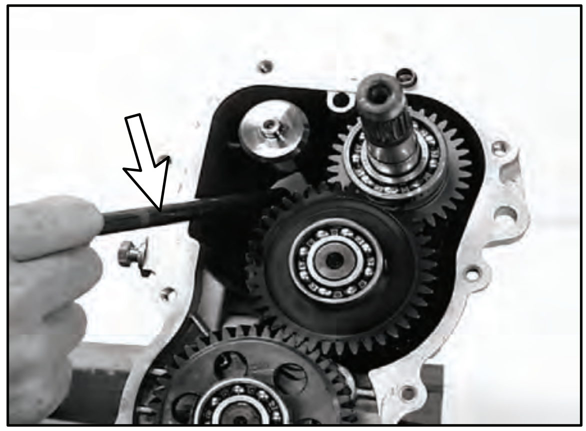


NOTE: It may be helpful to accent the timing marks using a white marking pen.

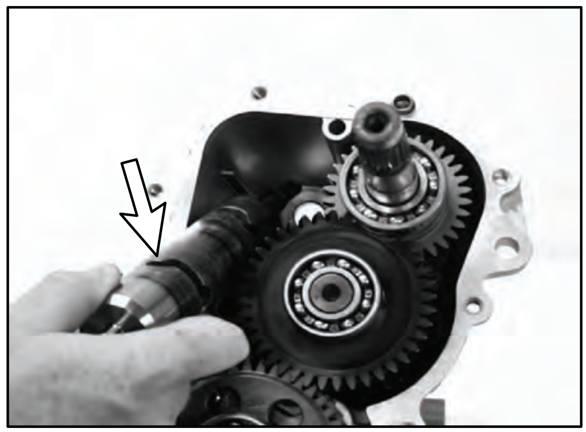
9. Remove the bolts on the LH transmission case. Tap the cover off with a soft face hammer if necessary.



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.

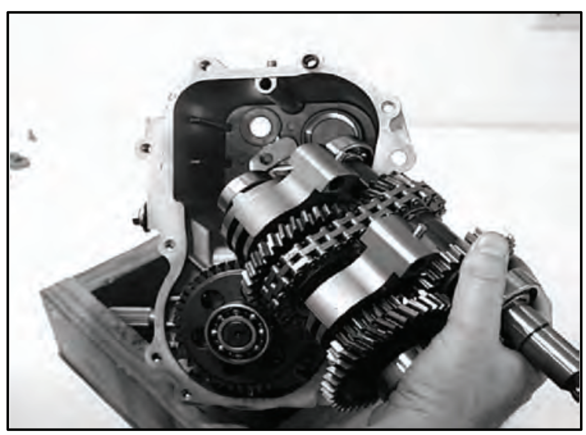


11. Remove the shift drum.

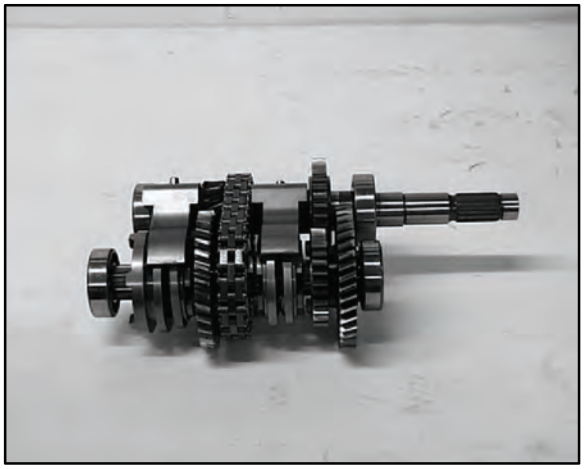


NOTE: You may have to tap the shift drum from the backside of the case to aid in removal.

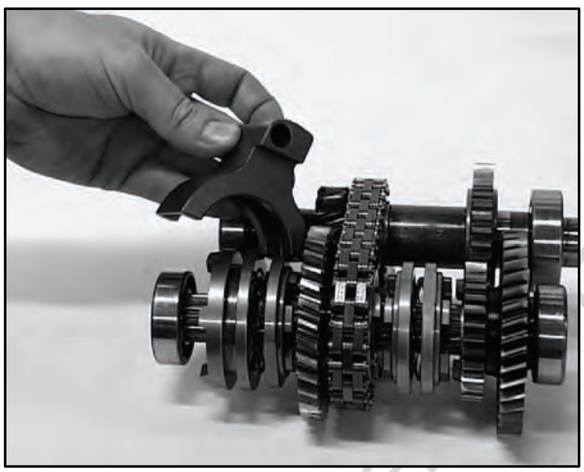
12. Remove the upper gear cluster and shift forks. You may need to move the assembly back and forth to aid in removal.



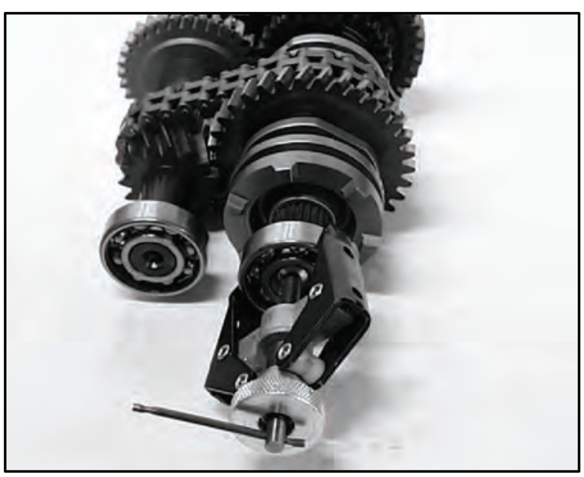
13. Set the upper gear cluster on a flat surface and inspect the components.



14. Remove the shift forks from the assembly. Note the correct position of each fork.

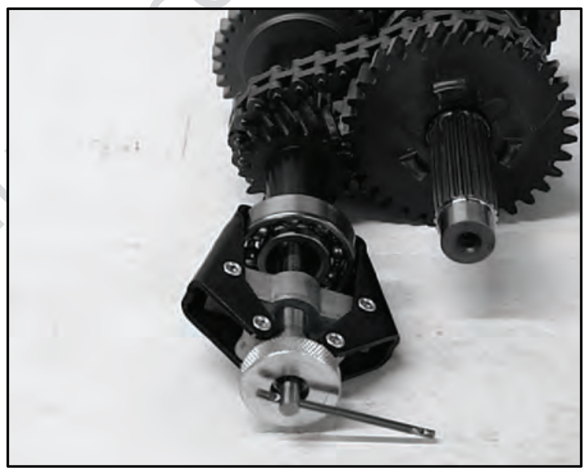


15. Remove the bearing from the reverse shaft using a puller.

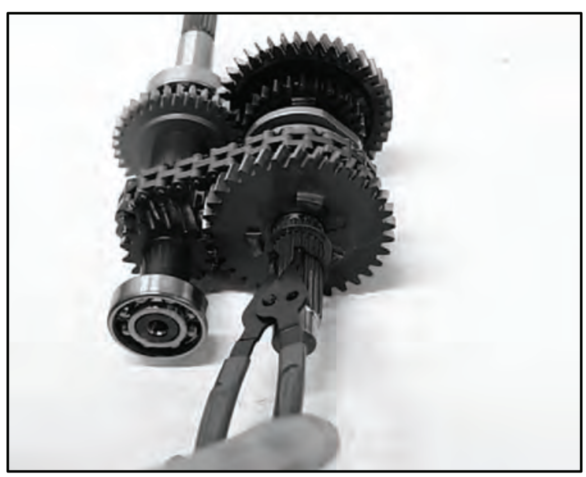


16. Remove the park lock engagement dog. Remove the wave spring and reverse engagement dog.

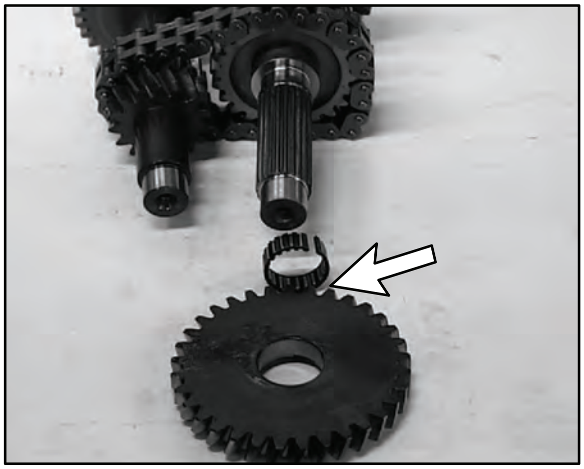
17. Remove the bearing from the input shaft with a puller.



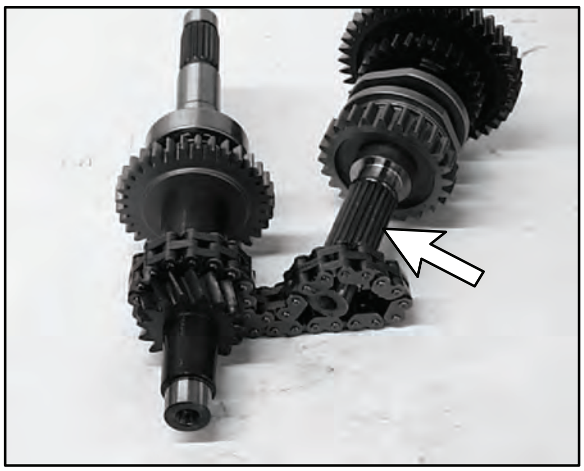
18. Remove the snap ring and washer from the reverse shaft.



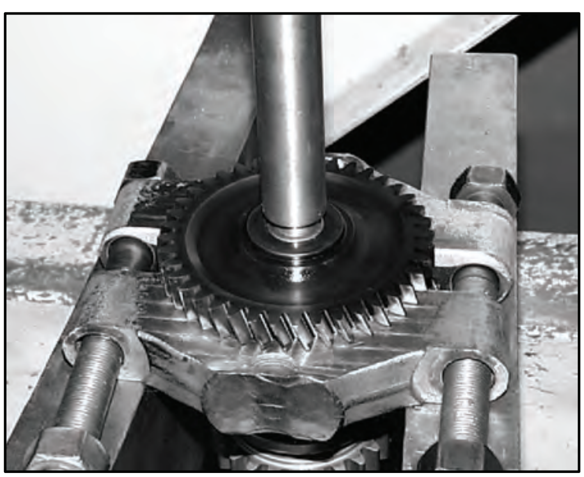
19. Remove low gear (33T) and the needle bearing.



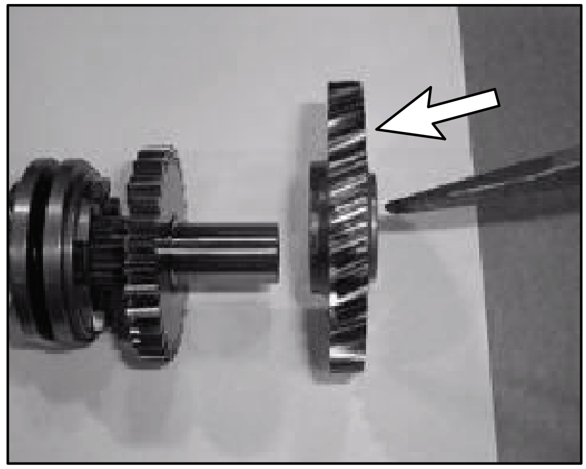
20. Remove the reverse gear shaft.



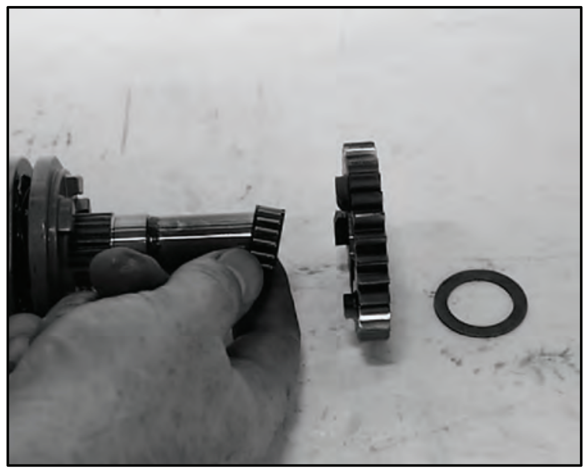
21. Remove the rest of the bearings from the shafts.
22. Use a press to remove the gear from the shaft.



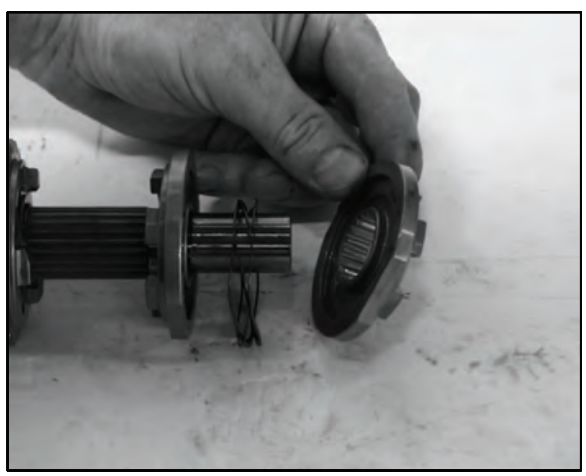
23. Make note of the direction of the gear and hub location.



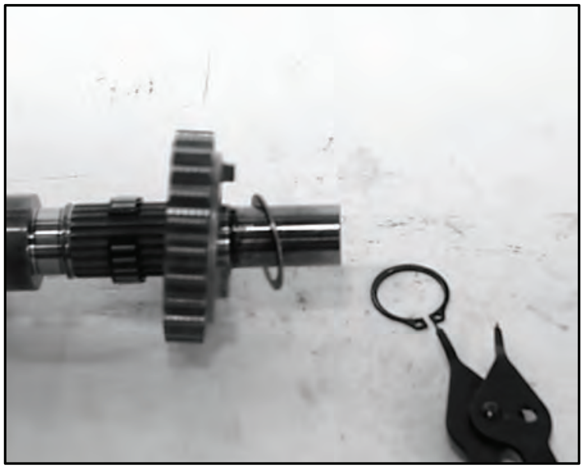
24. Remove the gear, split bearing, and washer from the reverse shaft.



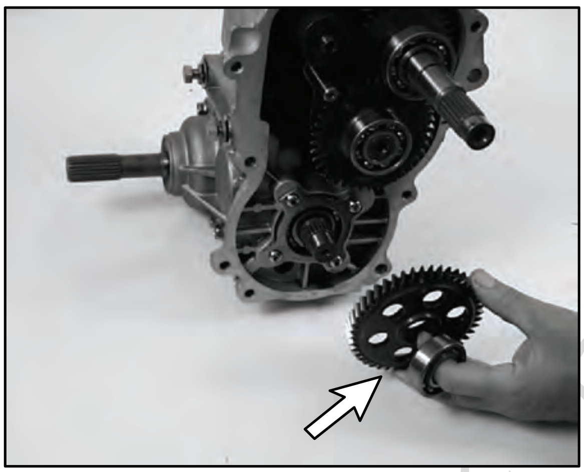
25. Slide off the shift dogs and wave springs.



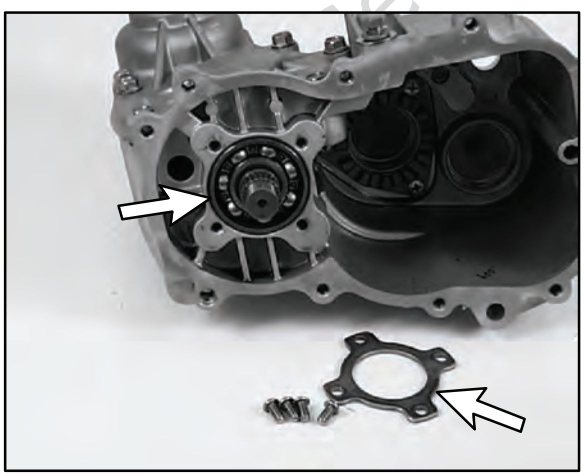
26. Remove the snap ring, washer, gear, and split bearing.



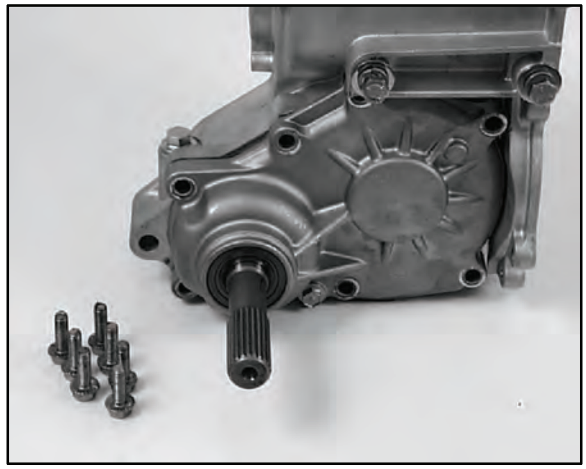
27. Remove bearing and the helical gear.



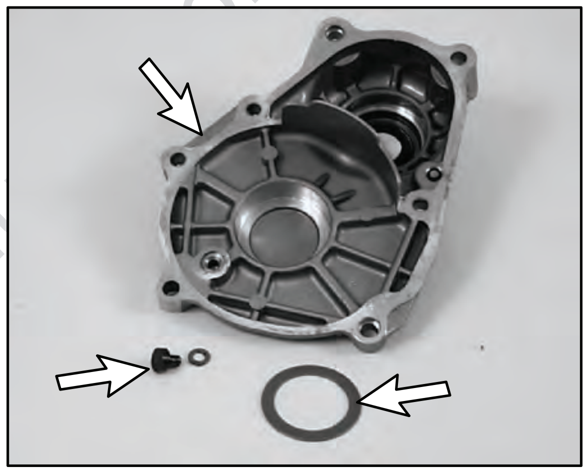
28. Remove the pinion shaft retainer plate and the pinion shaft.



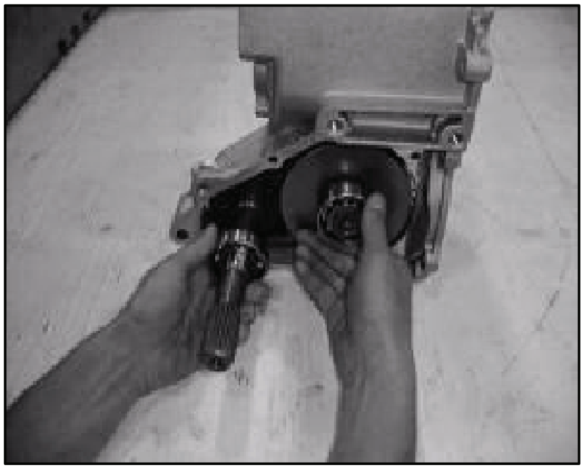
29. Remove the front housing cover screws.



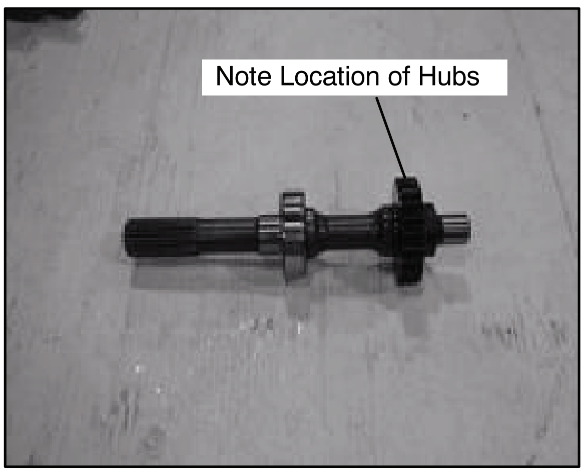
30. Remove the front housing cover, shim, thrust button, and thrust button shim.



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.

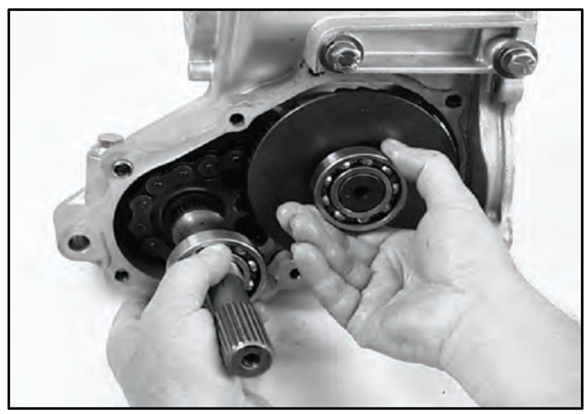
IMPORTANT: New seals should be installed after the transmission is completely assembled.

37. Inspect bearings for smooth operation. Check for excessive play between inner and outer race.

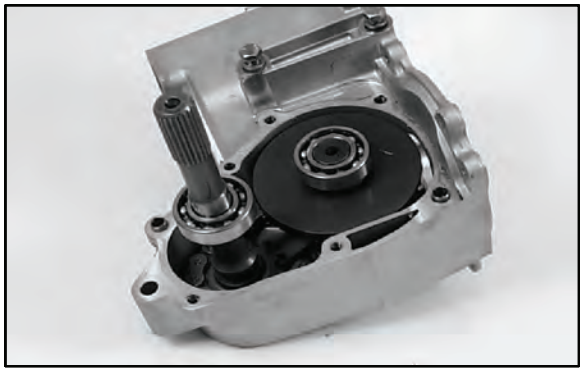
4X4 TRANSMISSION REASSEMBLY

1. Reinstall the chain onto the front output shaft and rear output shaft.

2. Install front and rear output shafts into the case.

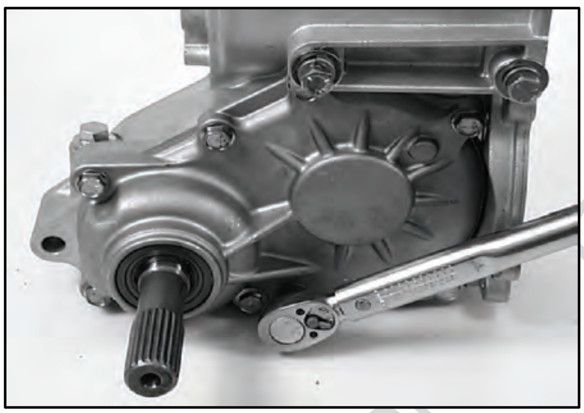


3. Before installing the cover make sure the sealing surfaces are clean and dry, and shafts are fully seated in the transmission case. Apply Crankcase Sealant (**PN 2871557**) to the mating surfaces.



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).



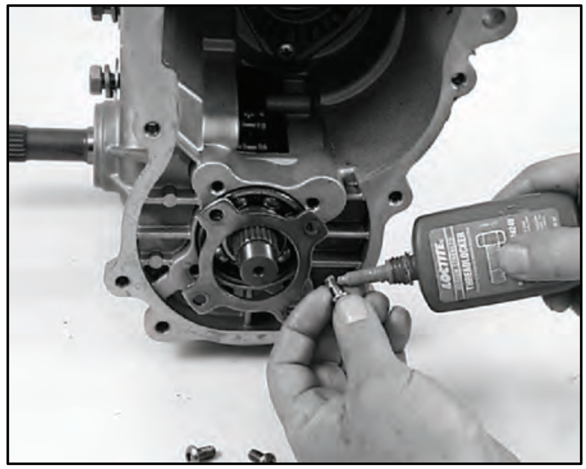
NOTE: Make sure that the case locating pins (knock pipes) are in place.

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).



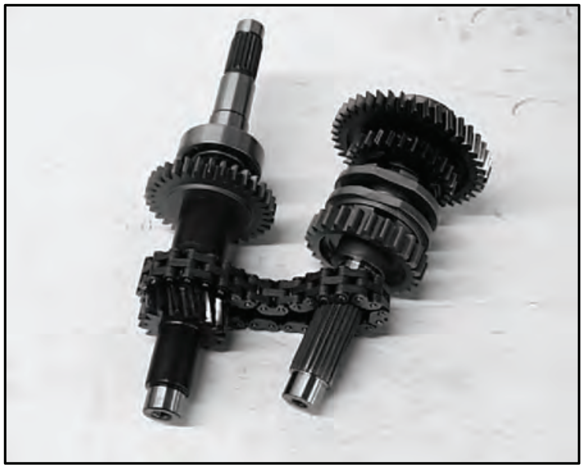
Pinion Retainer Plate
Bolt Torque:

6-12 ft. lbs. (8-16 Nm)

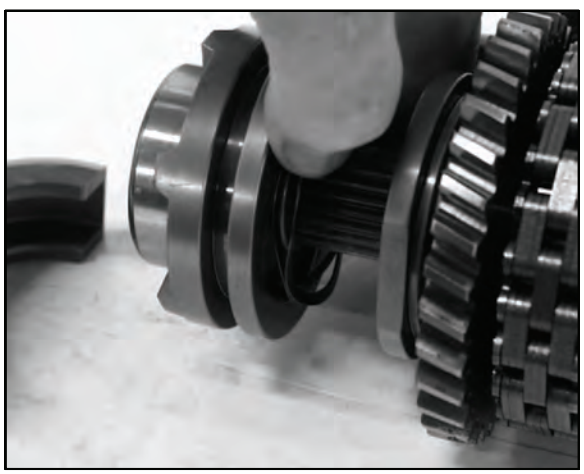
9. Install the a new needle bearing, the 24T reverse sprocket, washer, and a new snap ring. Install the shift dogs and wave spring. Install the washer, a new needle bearing and the high gear. Install the press fit gear and ball bearing.

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.

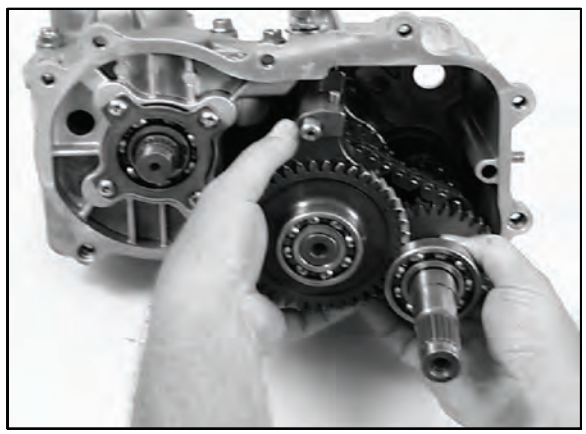


13. Install the ball bearing onto the end of the input shaft.
14. As the engagement dogs are installed onto the shaft, place the wave springs into the spring groove. Keep the spring in place while the fork is being installed on the shaft and while placing the shafts into the case.

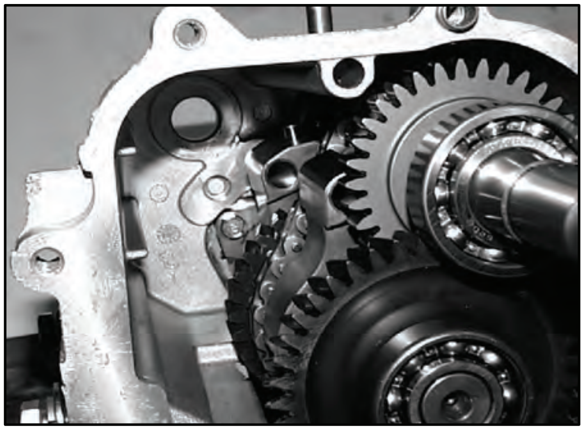
NOTE: Use caution when installing the fork, the spring can easily fall out.

NOTE: Installing the shift rail will aid in keeping the shift forks, shift dogs, and the springs in place.

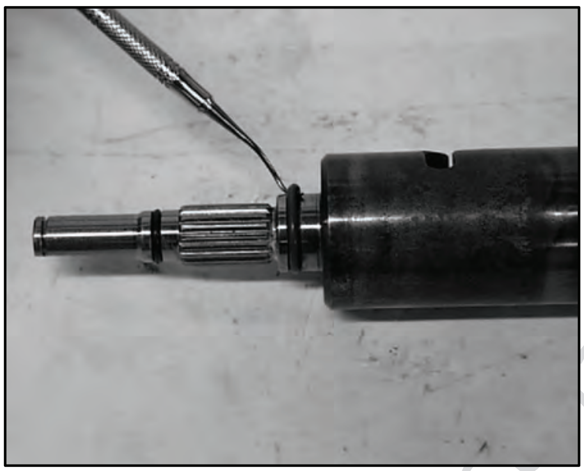
15. Carefully install the shaft assembly and gear cluster as a unit into their respective bearing case recesses. Tap with a soft face hammer to seat shaft assemblies.



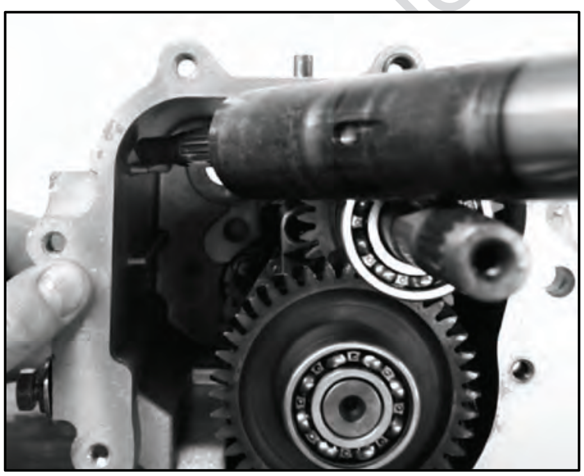
16. Position the shift forks up and so the the pins point toward the 9 o'clock position, before installing the shift drum assembly.



17. Replace and grease the O-rings on the shift drum before installation.

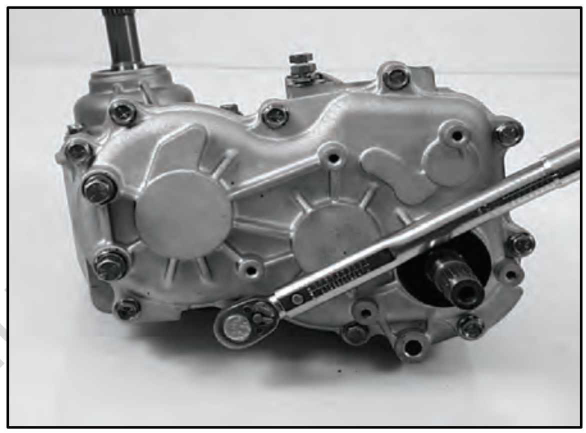


18. Install the shift drum into the case.



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 and torque bolts in a criss-cross pattern in 3 steps to 27-34 ft. lbs. (36.50-46 Nm).



Front Cover Bolt Torque:

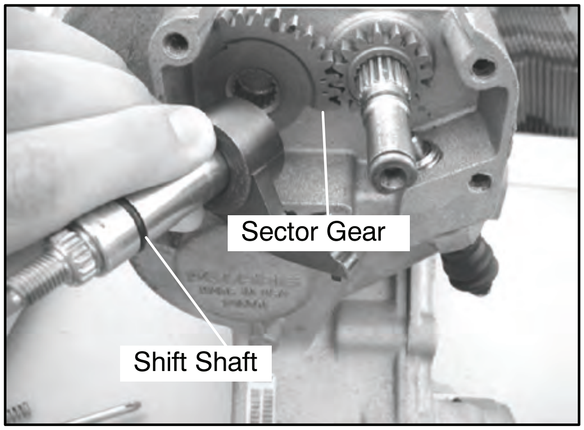
27-34 ft. lbs. (36.50-46 Nm)

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:

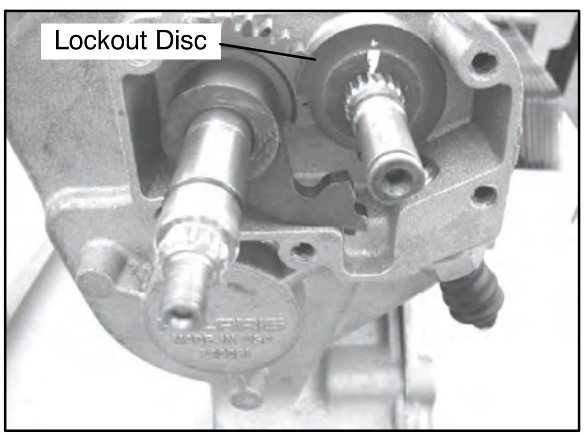
14-18 ft. lbs. (19-24 Nm)

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.
25. Install the shift shaft.

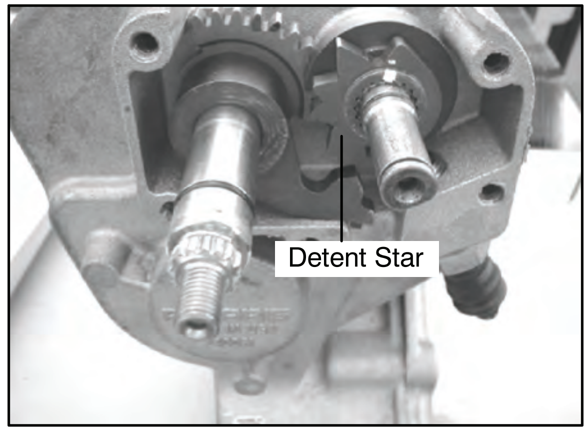


NOTE: Note the location of the skip tooth on the splines. Apply a light coating of grease on the gear teeth.

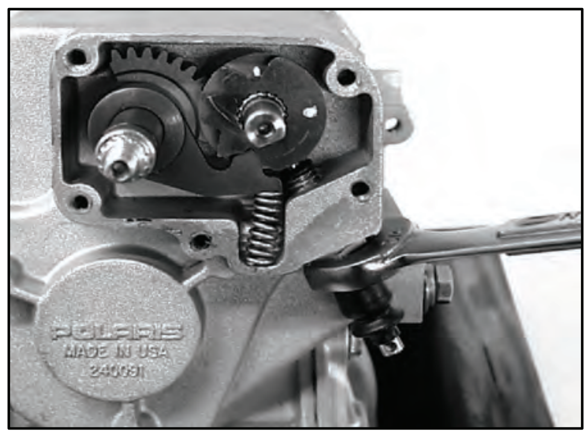
26. Install the lockout disc with the raised edge facing outward. Use the white marks that were previously applied for reference.



27. Install the detent star with the raised edge facing outward. Note the keyed spline on the end of the shaft.

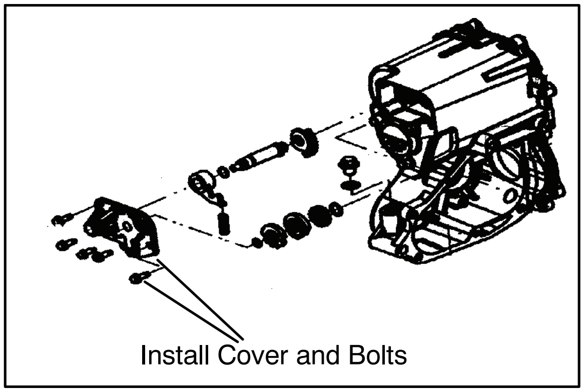


28. Install the detent pawl spring. Install a new o-ring onto the shift shaft after the detent pawl is assembled to the shaft. Place a small amount of grease on the small O-ring on the shift shaft and on the detent star. Grease the o-ring on the end of the shift drum.

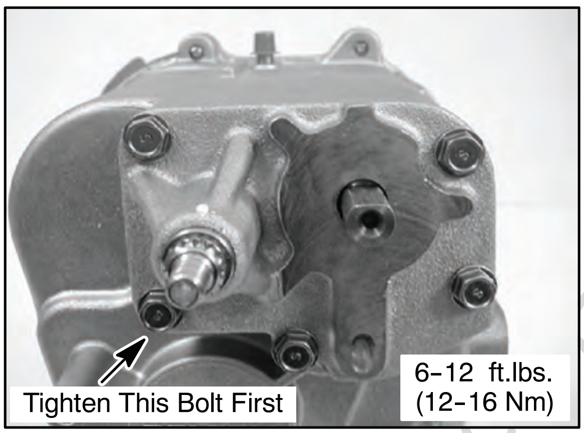


29. Install the park lockout assembly. Torque park lockout to 12 - 14 ft. lbs. (16-19 Nm).

30. Apply Crankcase Sealant (**PN 2871557**) onto the cover and case mating surfaces.



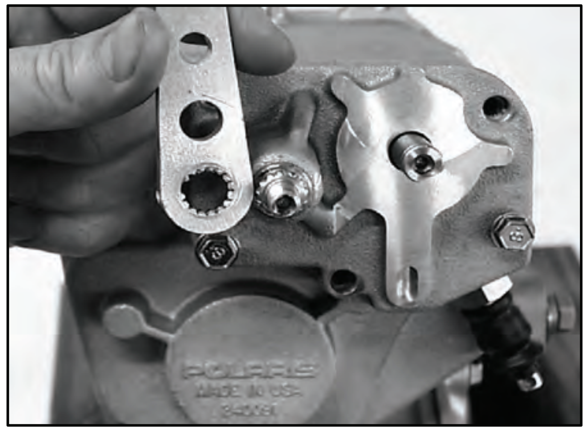
31. Tighten the bolt shown below first. This helps to align the cover and shafts to ensure smoother and precise shifting. Torque the bolt to 6-12 ft. lbs. (12-16 Nm).



32. Torque the remaining bolts to 6-12 ft.lbs. (12-16 Nm).

Shifter Cover Bolt Torque:
6-12 ft. lbs. (12-16 Nm)

33. 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)

TROUBLESHOOTING CHECKLIST

Check the following items when shifting difficulty is encountered.

- Idle speed adjustment
- Transmission oil type/quality
- Transmission torque stop adjustment (where applicable)
- Engine torque stop adjustment (where applicable)
- Drive belt deflection
- Loose fasteners on rod ends
- Loose fasteners on selector box
- Worn rod ends, clevis pins, or pivot arm bushings
- Linkage rod adjustment and rod end positioning
- Shift selector rail travel
- *Worn, broken or damaged internal transmission components

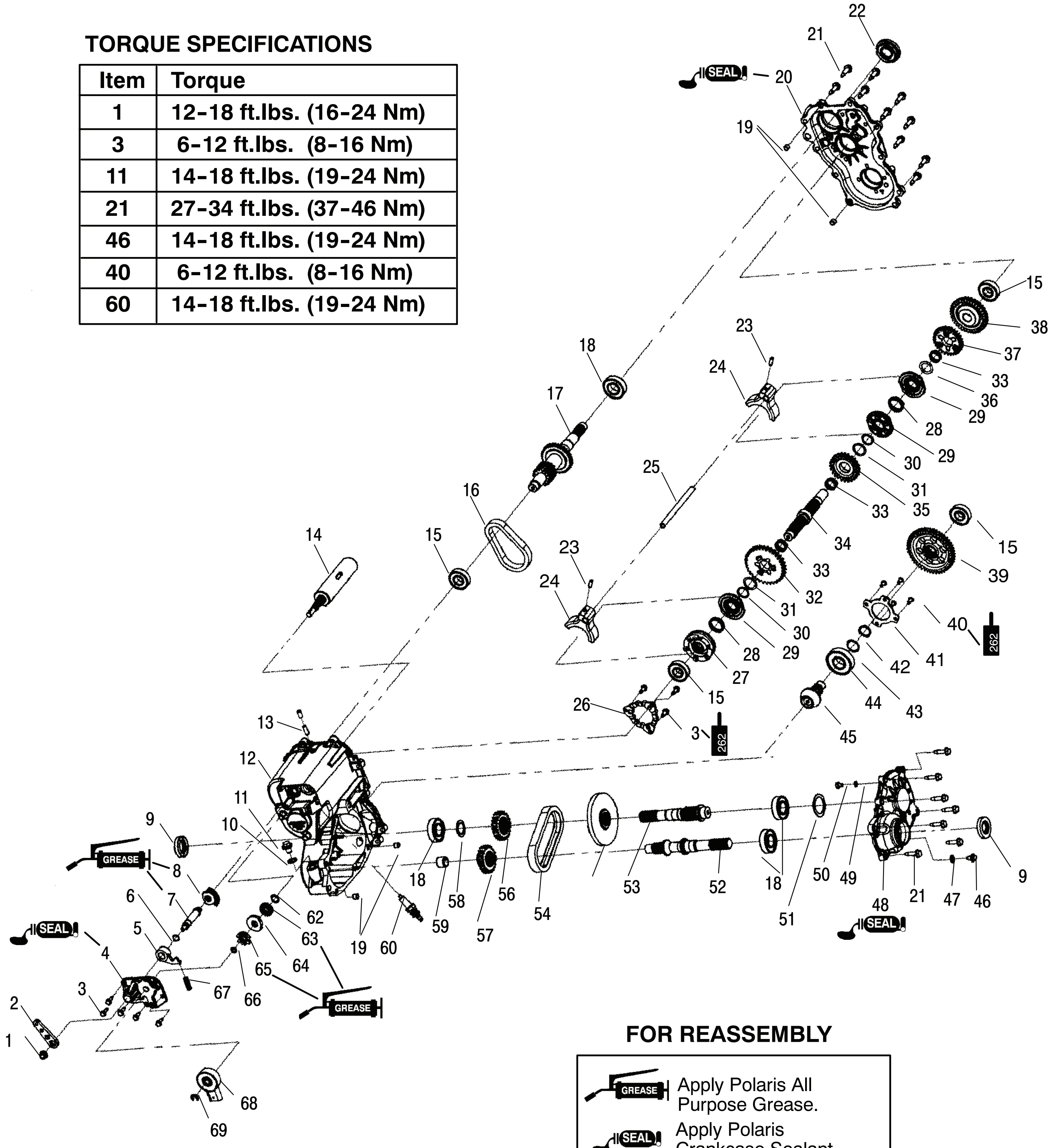
NOTE: To determine if shifting difficulty or problem is caused by an internal transmission problem, isolate the transmission by disconnecting linkage rods from transmission bellcranks. Manually select each gear range at the transmission bellcrank, and test ride vehicle. If it functions properly, the problem is outside the transmission.

If transmission problem remains, disassemble transmission and inspect all gear dogs for wear (rounding), damage. Inspect all bearings, circlips, thrust washers and shafts for wear.

4X4 TRANSMISSION EXPLODED VIEW

TORQUE SPECIFICATIONS

Item	Torque
1	12-18 ft.lbs. (16-24 Nm)
3	6-12 ft.lbs. (8-16 Nm)
11	14-18 ft.lbs. (19-24 Nm)
21	27-34 ft.lbs. (37-46 Nm)
46	14-18 ft.lbs. (19-24 Nm)
40	6-12 ft.lbs. (8-16 Nm)
60	14-18 ft.lbs. (19-24 Nm)



FOR REASSEMBLY

Apply Polaris All Purpose Grease.

Apply Polaris Crankcase Sealant

Apply Loctite™ 262 to the bolt threads.

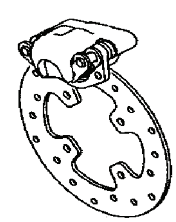
4X4 TRANSMISSION EXPLODED VIEW, CONT.

Ref.	Qty.	Description	Ref.	Qty.	Description
	1	Asm., 4x4 Transmission	35.	1	24T Sprocket
1.	1	Nut, Lock	36.	1	Washer
2.	1	Bellcrank	37.	1	Gear
3.	8	Screw	38.	1	Gear
4.	1	Cover	39.	1	Gear
5.	1	Detent Pawl	40.	4	Screw
6.	1	O-ring	41.	1	Bearing Center Drive Cover
7.	1	Shaft, Shift	42.	1	Retaining Ring
8.	1	Gear, 31T	43.	1	Spacer
9.	2	Triple Lip Seal	44.	1	Ball Bearing
10.	1	Washer	45.	1	10T Shaft
11.	1	Oil, Plug Fill	46.	1	Plug
12.	1	Main Gearcase	47.	1	Washer
13.	1	Vent Tube	48.	1	Front Output Cover
14.	1	Shift Drum	49.	1	Shim
15.	4	Ball Bearing	50.	1	Thrust Button
16.	1	Silent Chain	51.	1	Shim
17.	1	Input Shaft	52.	1	Front Output Shaft
18.	4	Ball Bearing	53.	1	Rear Output Shaft
19.	4	Knock Pipe	54.	1	31T Gear
20.	1	LH Cover	55.	1	Silent Chain
21.	17	Tapping Screw	56.	1	22/18T Sprocket
22.	1	Dual Lip Seal	57.	1	2/22T Sprocket
23.	2	Dowel Pin	58.	1	Thrust Washer
24.	2	Shift Fork	59.	1	Bushing
25.	1	Shift Shaft Rail	60.	1	Tie Clamp
26.	1	Plate	61.	1	Park Lockout
27.	1	Engagement Dog	62.	1	O-Ring
28.	2	Wave Spring	63.	1	16T Gear
29.	3	Engagement Dog	64.	1	Disc Lockout
30.	2	Retaining Ring	65.	1	Star Detent
31.	12	Washer	66.	1	O-ring
32.	1	33T Gear	67.	1	Compression Spring
33.	3	Needle Bearing	68.	1	Switch
34.	1	Reverse Shaft	69.	1	Retaining Ring

NOTES

CHAPTER 9

BRAKES



9

SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
2870975	Mity Vac™ Pressure Test Tool

SPECIFICATIONS

Front Brake Caliper		
Item	**Standard**	**Service Limit**
Brake Pad Thickness	.298″ / 7.6 mm	.180″ / 4.6 mm
Brake Disc Thickness	.150-.164″ / 3.8-4.166 mm	.140″ / 3.556 mm
Brake Disc Thickness Variance Between Measurements	-	.002″ / .051 mm
Brake Disc Runout	-	.010″ / .254 mm

Rear Axle Brake Caliper		
Item	**Standard**	**Service Limit**
Brake Pad Thickness	.318″ / 8 mm	.180″ / 4.6 mm
Brake Disc Thickness	.150-.164″ / 3.8-4.166 mm	.140″ / 3.556 mm
Brake Disc Thickness Variance Between Measurements	-	.002″ / .051 mm
Brake Disc Runout	-	.010″ / .254 mm

Master Cylinder I.D. - Front	.750″ /19 mm
/Master Cylinder I.D. - Aux. Rear	.50″ / 12.7 mm

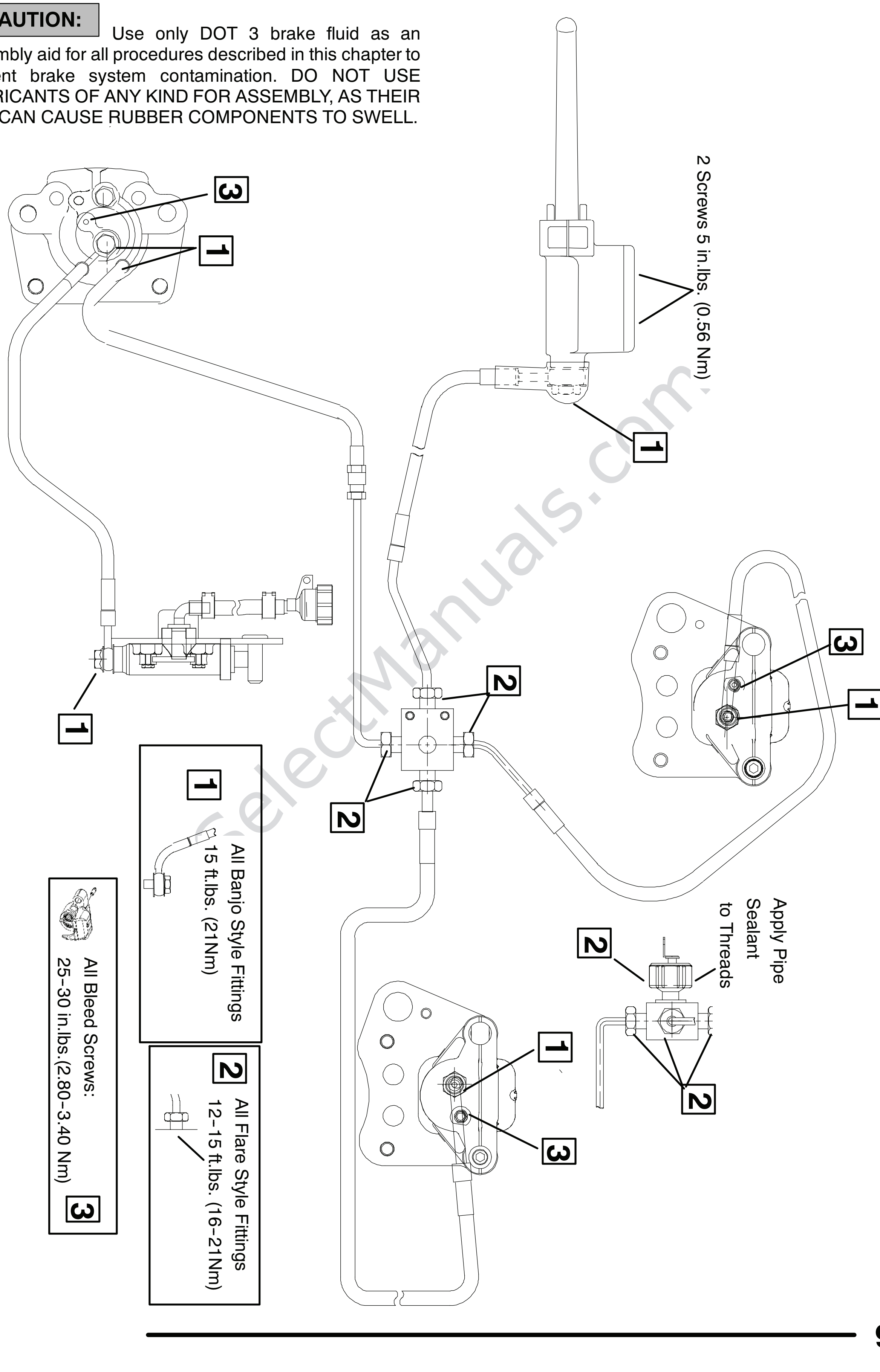
TORQUE SPECIFICATIONS

Item	Torque (ft. lbs. except where noted*)	Torque (Nm)
Front Caliper Mounting Bolts	18	24
Rear Caliper Mounting Bolts	28	38
Hand Master Cylinder Mounting Bolts	*25 in. lbs.	3
Hand Master Cylinder Reservoir Cover Bolt	*5 in. lbs.	0.56
Rear Master Cylinder Mounting Bolts	8–11	11–15
Brake Line Banjo Bolt	15	21
Brake Line Flared Pipe Fitting	12–15	17–21
Bleeder Screws	*25–30 in. lbs.	2.8–3.3
Brake Disc Mounting Bolts	18	24
Wheel Mounting Nuts	27	37

NOTE: Refer to the tightening procedures in this chapter when torquing the bolts. Some special procedures are used when torquing certain bolts and fasteners.

BRAKE SYSTEM

CAUTION: Use only DOT 3 brake fluid as an assembly aid for all procedures described in this chapter to prevent brake system contamination. DO NOT USE LUBRICANTS OF ANY KIND FOR ASSEMBLY, AS THEIR USE CAN CAUSE RUBBER COMPONENTS TO SWELL.



BRAKE 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.

BRAKE NOISE TROUBLESHOOTING

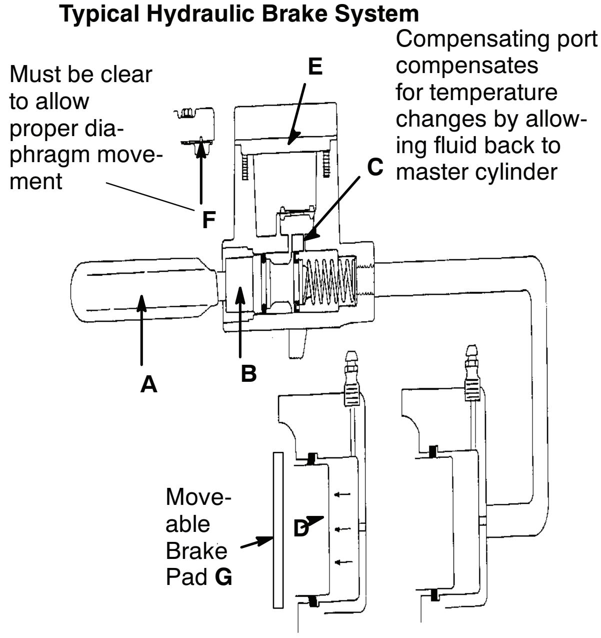
Dirt or dust buildup on the brake pads and disc is the most common cause of brake noise (squeal caused by vibration). If cleaning does not reduce the occurrence of brake noise, Permatex™ Disc Brake Quiet (**PN 2872113**) can be applied to the back of the pads. Follow directions on the package. This will keep pads in contact with caliper piston(s) to reduce the chance of squeaks caused by dirt or dust.

Brake Noise Troubleshooting

Possible Cause	**Remedy**
Dirt, dust, or imbedded material on pads or disc	Spray disc and pads with CRC Brake Kleen™ or equivalent non-flammable aerosol brake cleaner. Remove pads and/or disc hub to clean imbedded material from disc or pads.
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**).

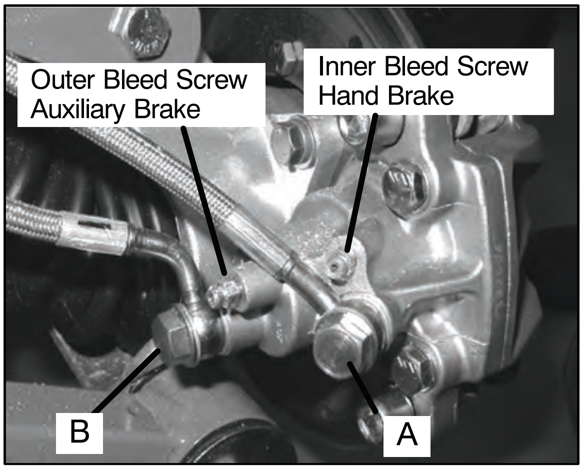
WARNING: Once a bottle is opened, use what is necessary and discard the rest in accordance with local laws. Do not store or use a partial bottle of brake fluid. Brake fluid is hygroscopic, meaning it rapidly absorbs moisture. This causes the boiling temperature of the brake fluid to drop, which can lead to brake fade and the possible loss of control.

REAR HYDRAULIC CALIPER BLEEDING

The rear 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 9.5 - 9.6, 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.

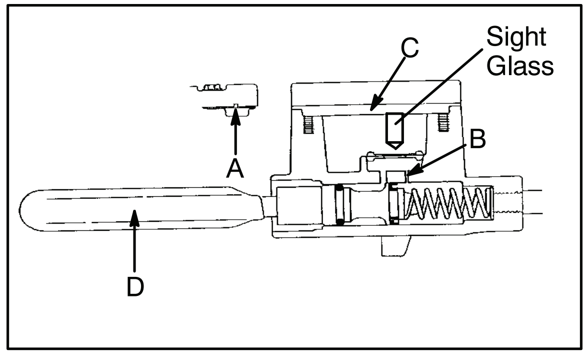
CAUTION:

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.



4. If changing fluid, remove old fluid from reservoir with a Mity Vac™ pump or similar tool.

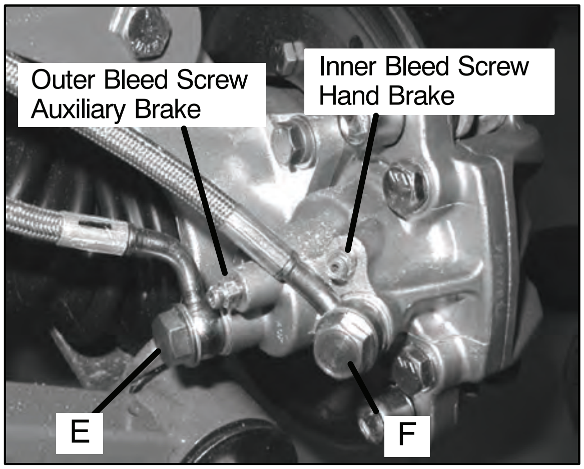
Mity Vac™ (PN 2870975)

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 above.

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:

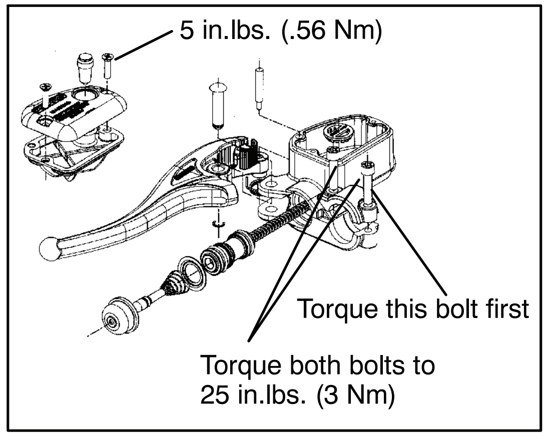
Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.

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

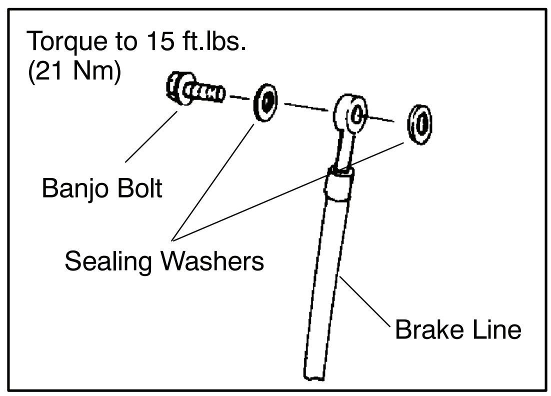
Notice: When replacing the brake master cylinder assembly or master cylinder parts, use the correct parts. There are different brake master cylinders for the different Polaris ATV models. Refer to your parts manual or guide for the correct parts. ***This master cylinder is not serviceable and is replaced 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.



Hand Master Cylinder 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**).

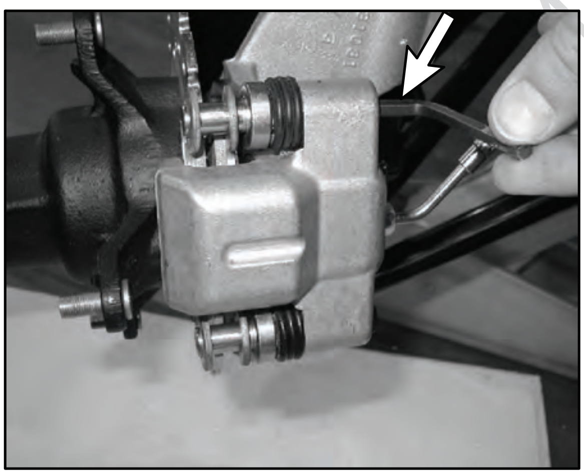
Polaris DOT 3 Brake Fluid

(PN 2870990)

4. Follow bleeding procedure on Pages 9.5-9.6. Check all connections for leaks and repair if necessary.

FRONT PAD REMOVAL

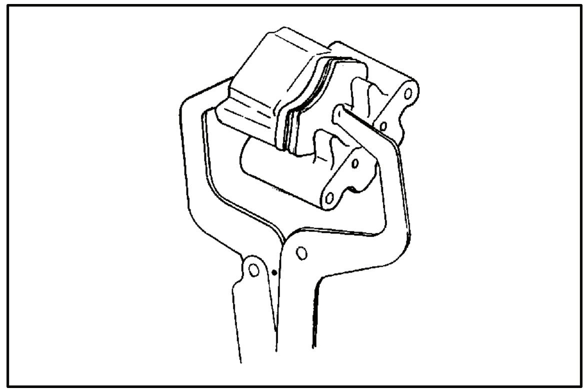
1. Elevate and support front of machine.



CAUTION:

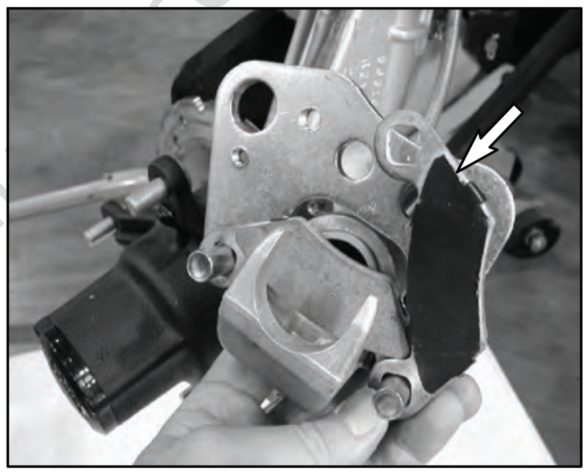
Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

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.

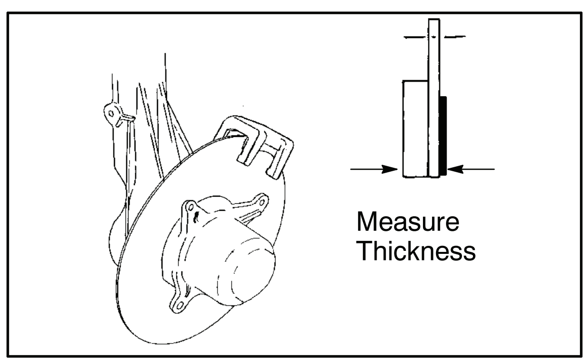


NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

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

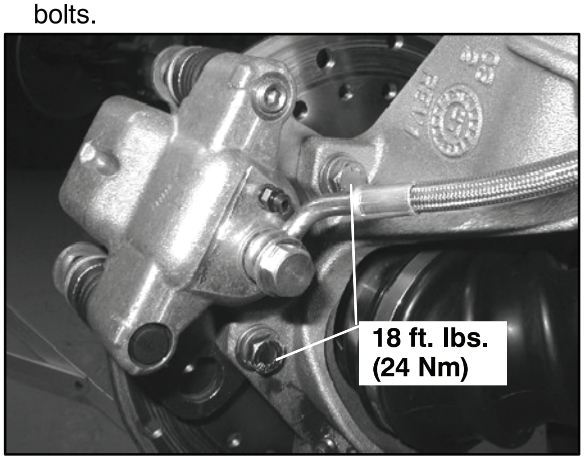
FRONT PAD ASSEMBLY

1. Lubricate mounting bracket pins with a light film of Polaris Premium All Season Grease, and install rubber dust boots.

Polaris Premium All Season Grease

(PN 2871423)

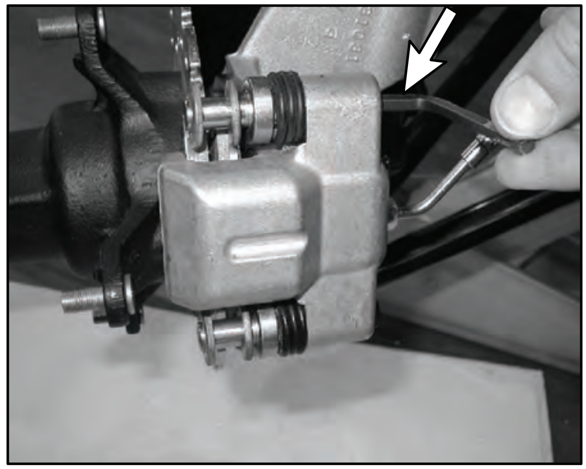
2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other. Be sure pads and disc are free of dirt or grease.
3. Install caliper on hub strut, and torque mounting bolts.



Front Caliper Mounting Bolts

Torque: 18 ft. lbs. (24 Nm)

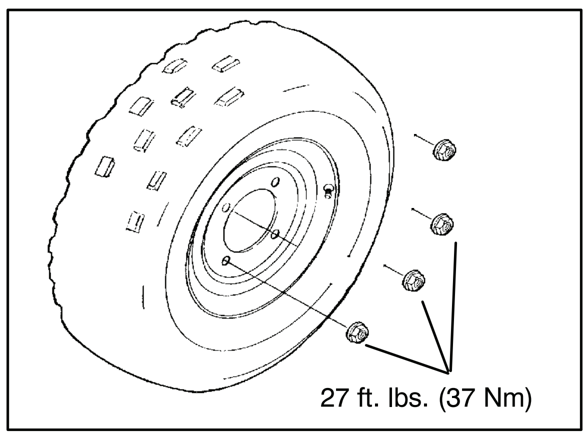
4. Slowly pump the brake lever until pressure has been built up. Maintain at least 1/2″ (12.7 mm) of brake fluid in the reservoir to prevent air from entering the brake system.
5. Install the adjuster screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counterclockwise).



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.



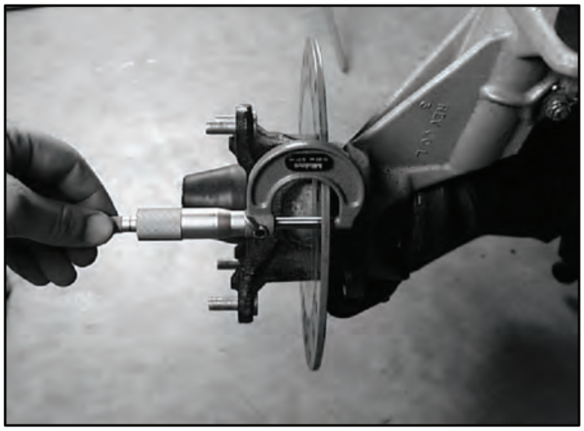
BRAKE BURNISHING PROCEDURE

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.



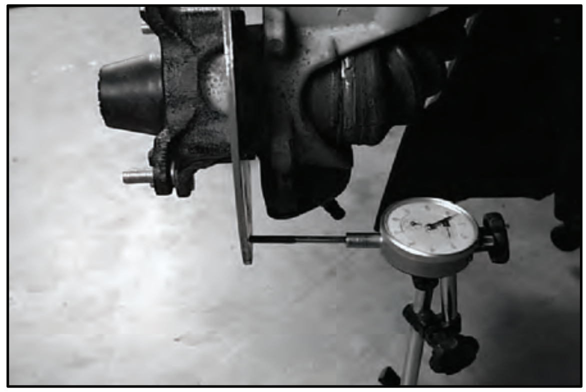
Brake Disc Thickness

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.



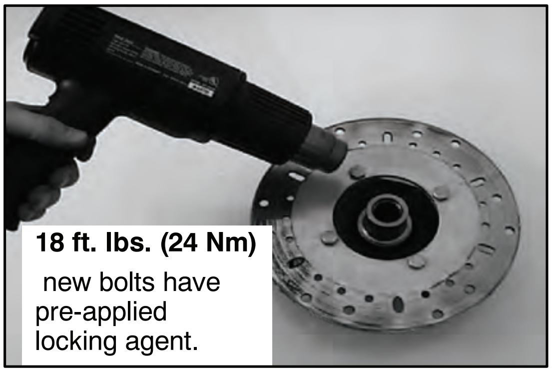
Brake Disc Runout

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. (24 Nm)
new bolts have pre-applied locking agent.

2. Remove bolts and disc.
3. Clean mating surface of disc and hub.
4. Install disc on hub.
5. Install new bolts and tighten to specified torque.

Front Brake Disc Mounting Bolt Torque
18 ft. lbs. (24 Nm)

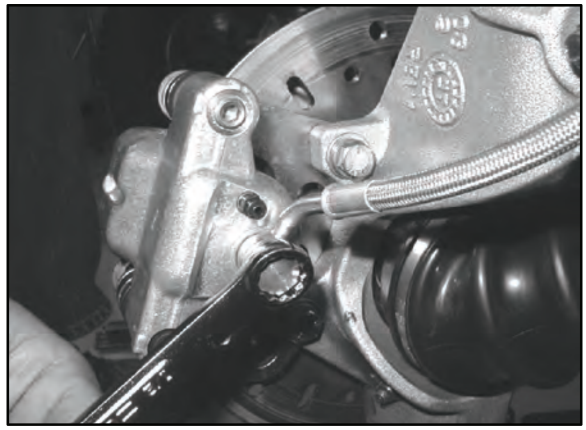
CAUTION: Always use new brake disc mounting bolts. The bolts have a pre-applied locking agent which is destroyed upon removal.

FRONT CALIPER REMOVAL

CAUTION:

Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

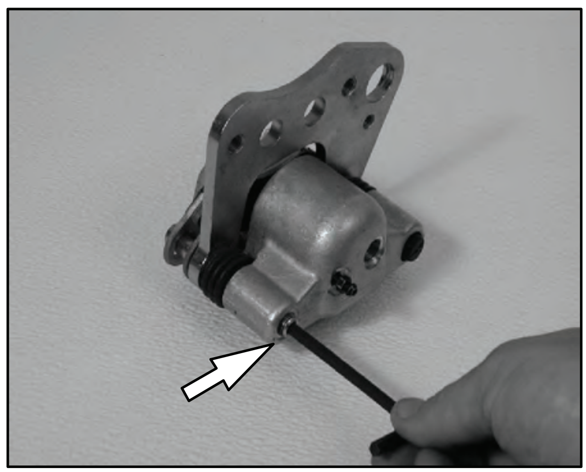
1. Using a line wrench, loosen and remove brake line to caliper. Place a container under caliper to catch fluid draining from brake line.



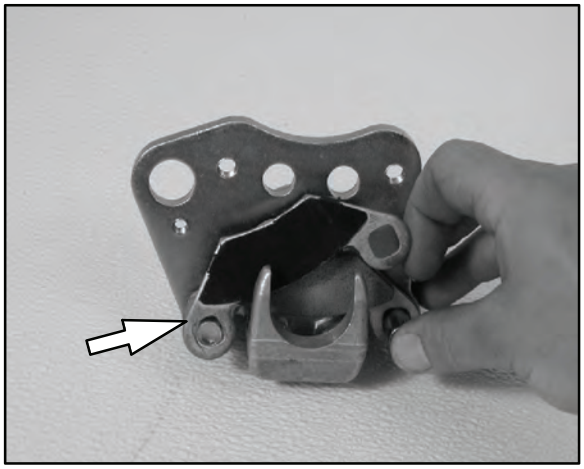
2. Remove the brake line caliper bolts.
3. Remove brake caliper and drain fluid into container. Do not reuse brake fluid.

FRONT CALIPER DISASSEMBLY

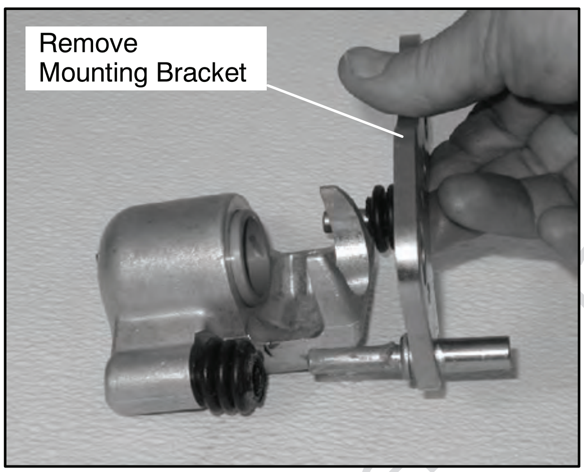
1. Remove brake pad adjuster screw.



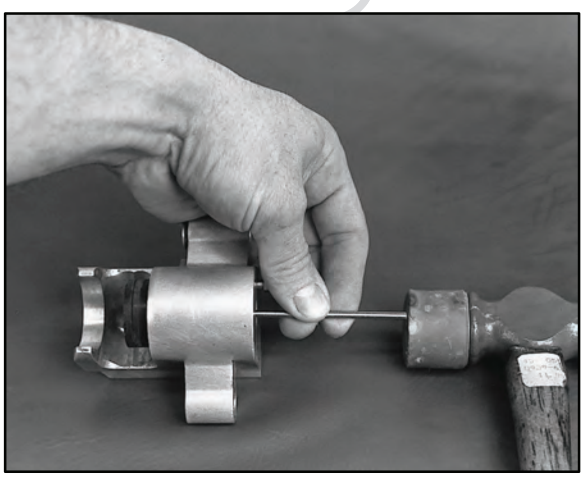
2. Push upper pad retainer pin inward and slip brake pads past edge.



3. Remove mounting bracket, pin assembly and dust boot.

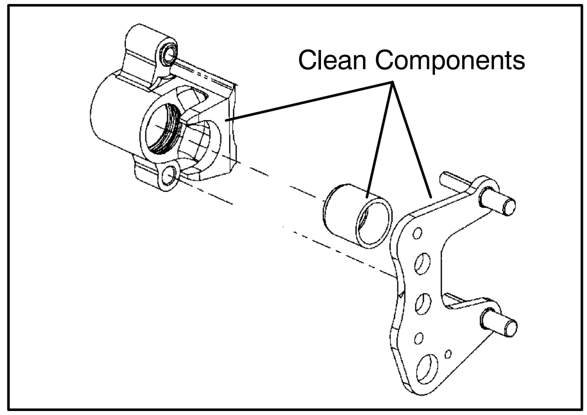


4. Remove piston, dust seal and piston seal.



5. Clean the caliper body, piston, and retaining bracket with brake cleaner or alcohol.

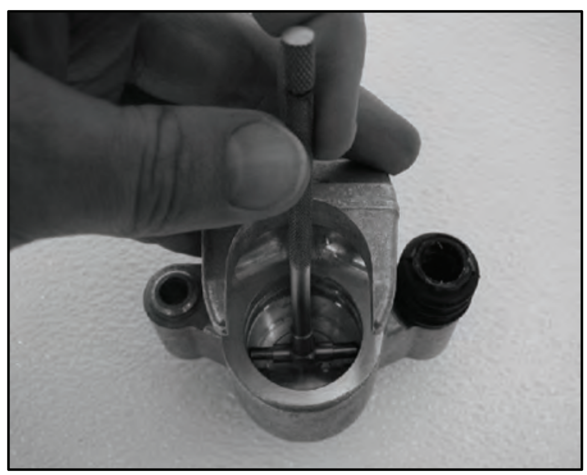
NOTE: Be sure to clean seal grooves in caliper body.



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)

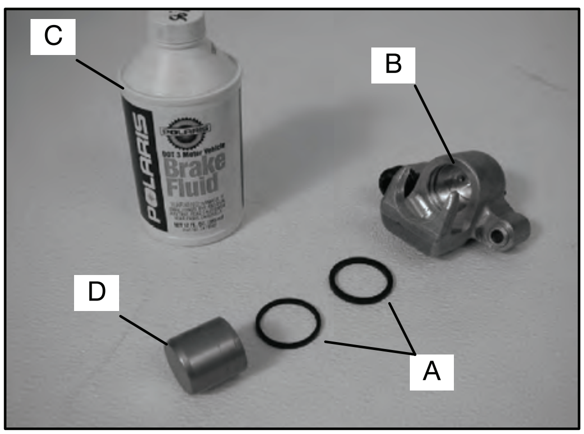


2. Inspect piston for nicks, scratches, wear or damage. Measure diameter and replace if damaged or worn beyond service limit.

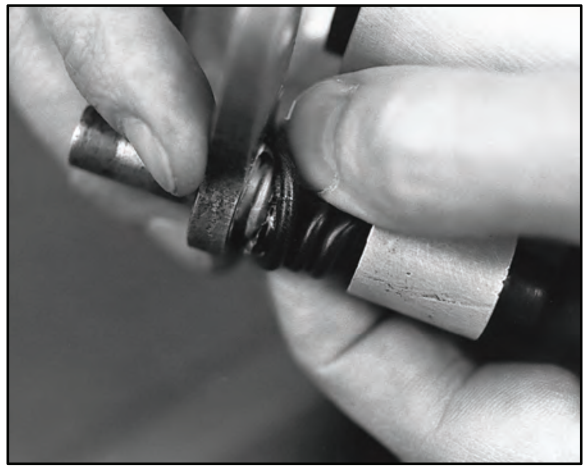
3. Inspect the brake disc and pads as outlined for brake pad replacement this section. See Pages 9.11.

FRONT CALIPER ASSEMBLY

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.



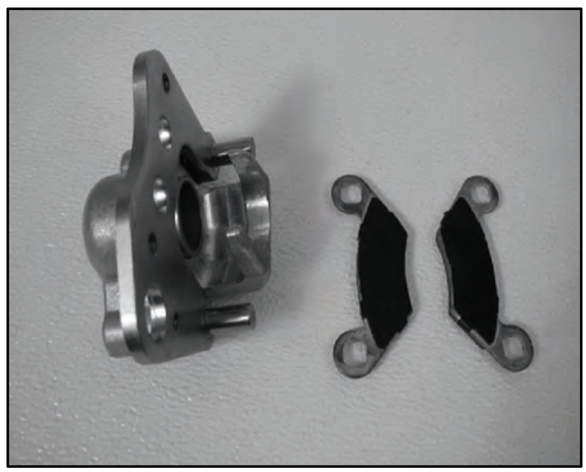
2. Coat piston with clean Polaris DOT 3 Brake Fluid (C). Install piston (D) with a twisting motion while pushing inward. Piston should slide in and out of bore smoothly, with light resistance.
3. Lubricate the mounting bracket pins with Polaris Premium All Season Grease, and install the rubber dust seal boots.



Polaris Premium All Season Grease

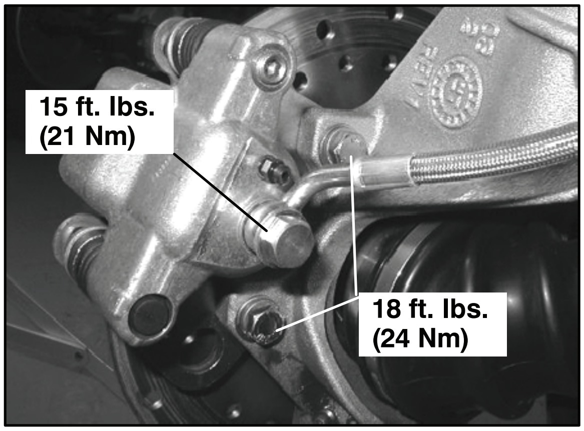
(PN 2871423)

4. Compress the mounting bracket and make sure the dust seals are fully seated. Install the pads as shown on Page 9.8-9.9. Clean the disc and pads with brake parts cleaner or denatured alcohol to remove any dirt, oil or grease.



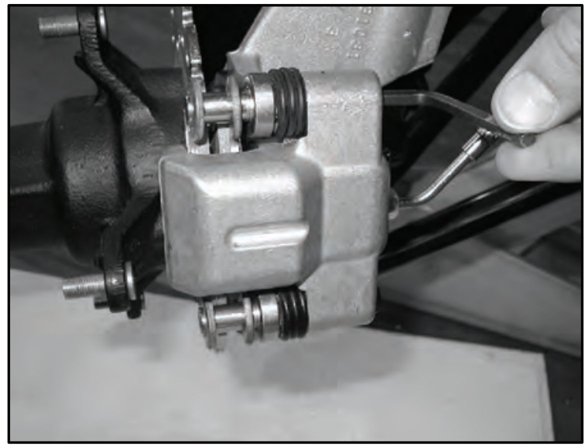
FRONT CALIPER INSTALLATION

1. Install caliper on hub strut, and torque mounting bolts.



Front Caliper Mounting Bolt Torque
18 ft. lbs. (24 Nm)

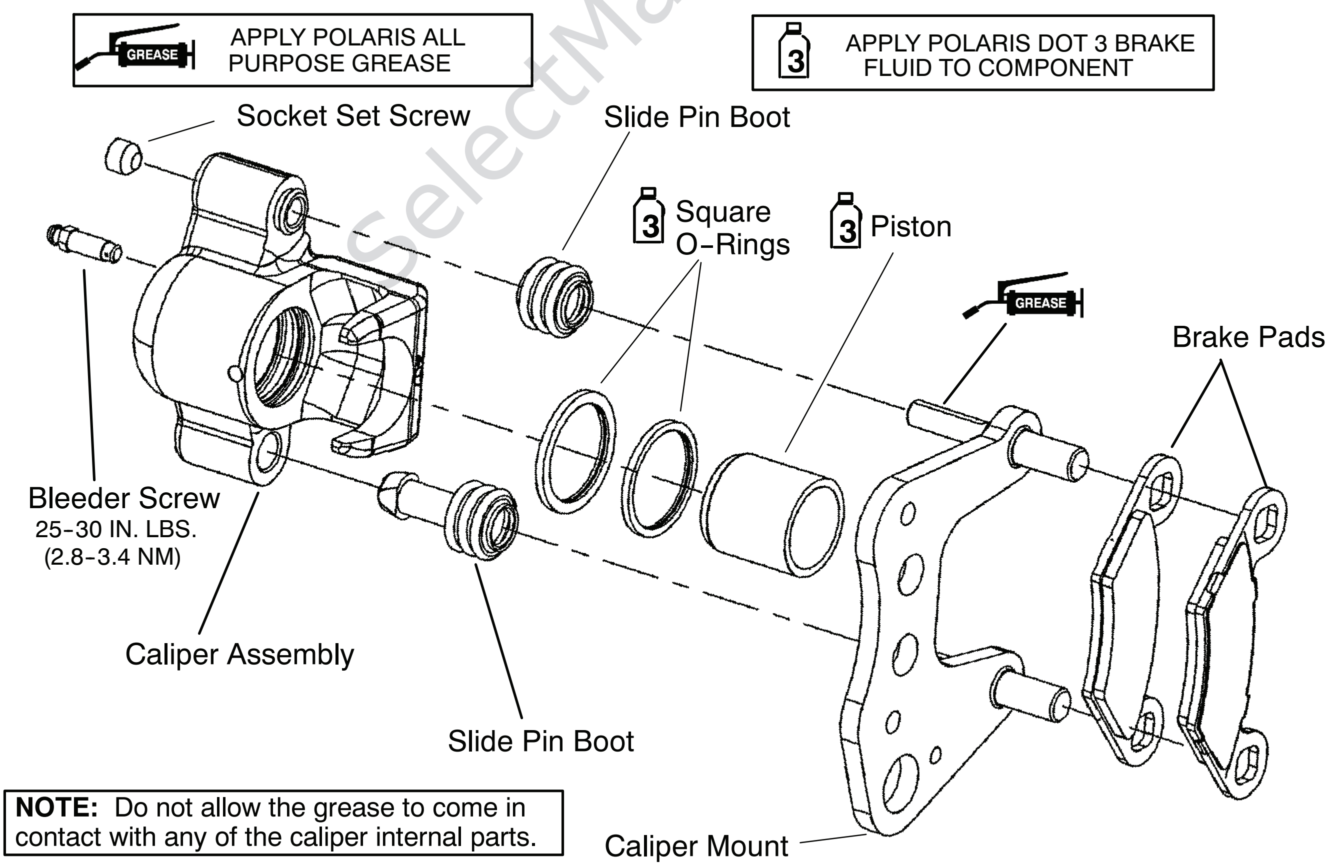
2. Install brake line. Torque to 15 ft.lbs. (20 Nm).
3. Install the adjuster screw and turn until stationary pad contacts disc, then back off 1/2 turn.



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
27 ft. lbs. (37 Nm).

FRONT BRAKE CALIPER EXPLODED VIEW



NOTE: Do not allow the grease to come in contact with any of the caliper internal parts.

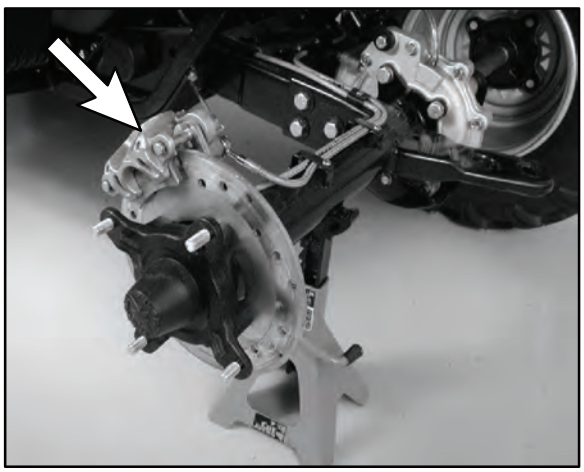
BRAKE BURNISHING PROCEDURE

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. Remove the left tire and support the machine.
2. Remove caliper mounting bolts and lift caliper off of disc.

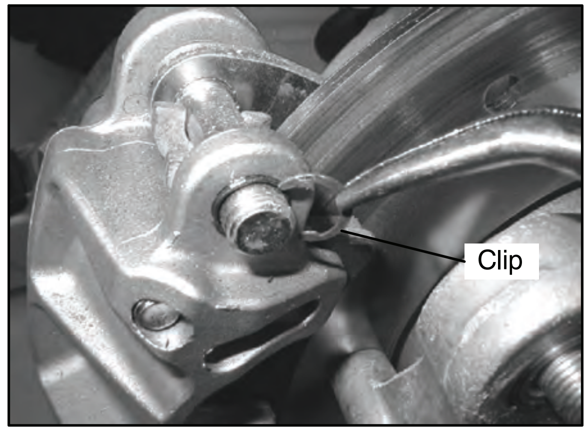


NOTE: When removing caliper, be careful not to damage brake line. Support caliper so as not to kink or bend brake line.

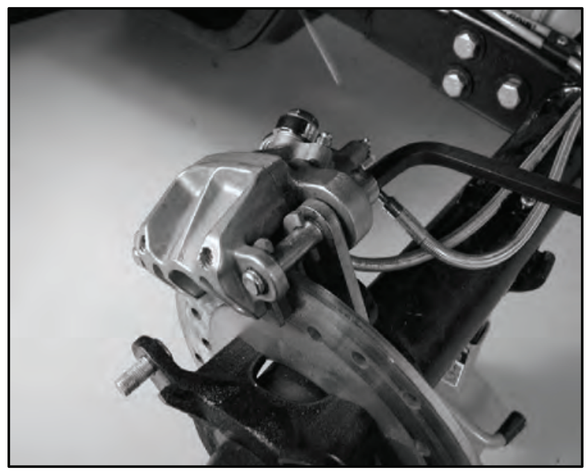
3. Push caliper pistons into caliper bore slowly with pads installed.

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.

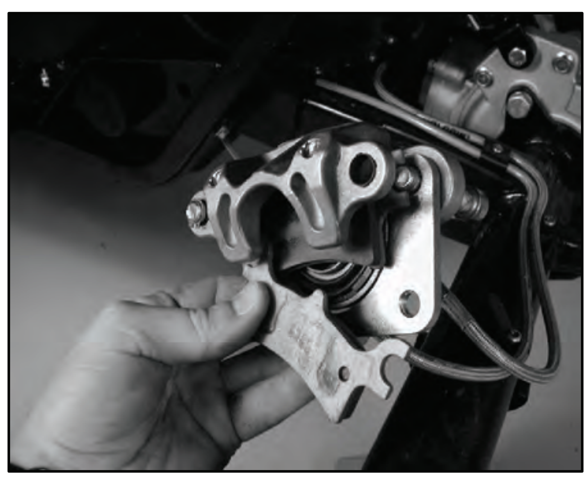
4. Remove the snap ring from the slide bolt.



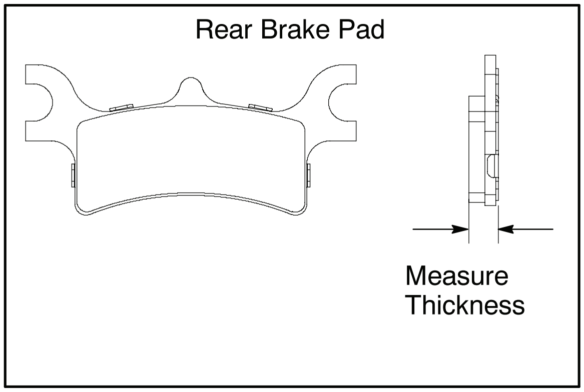
5. Remove a slide bolt with a hex wrench.



6. Remove the brake pads from the caliper.



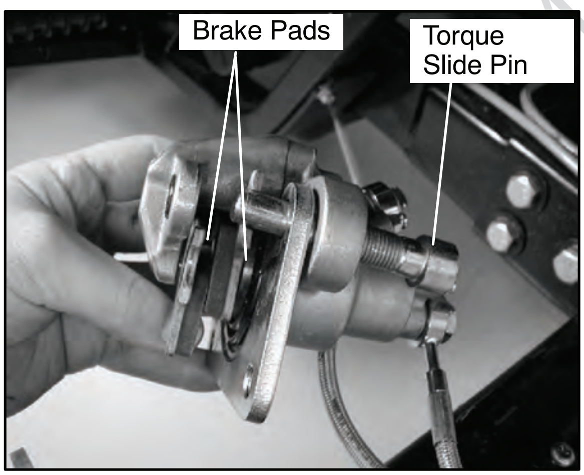
7. Clean the caliper with brake cleaner or alcohol.
8. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



Rear Brake Pad Thickness	
New	**.318″ (8.0 mm)**
Service Limit	**.180″ (4.6 mm)**

REAR BRAKE PAD INSTALLATION

1. Install new pads in caliper body.

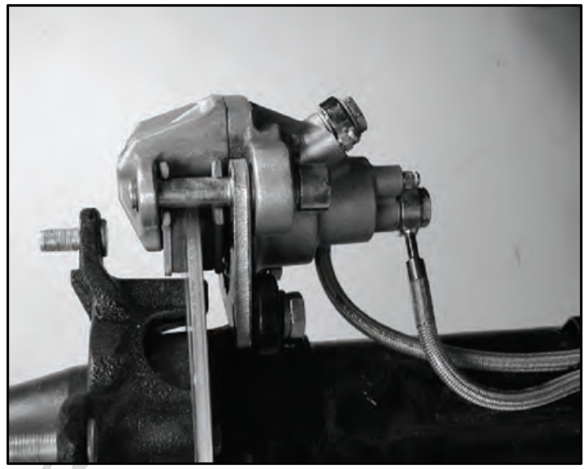


2. Tighten the slide pin with a hex wrench.
3. Install the slide bolt snap ring. Torque the slide pin to 30-35 ft. lbs. (41 Nm-48 Nm).

Caliper Slide Pin Torque:

30-35 ft. lbs. (41 Nm-48 Nm)

4. Install caliper and torque the mounting bolts.



Rear Brake Caliper Mounting Bolt

Torque: 18 ft. lbs. (24 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.

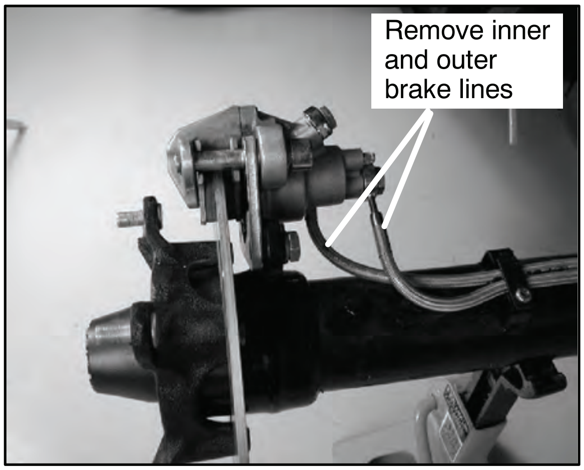
Auxiliary Brake Master Cylinder Fluid Level

Between MIN and MAX lines

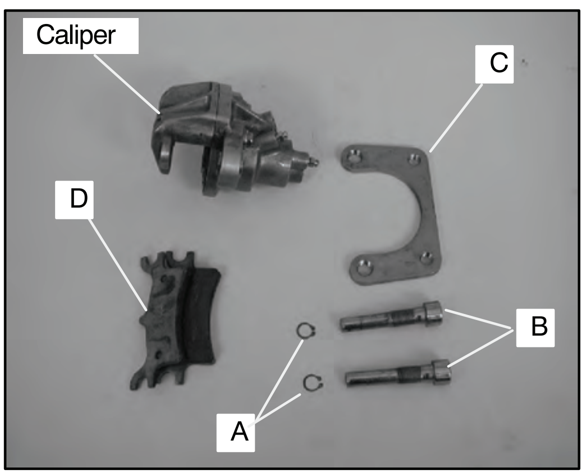
6. It is recommended that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise. Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Repeat procedure 10 times.

REAR CALIPER REMOVAL/INSPECTION

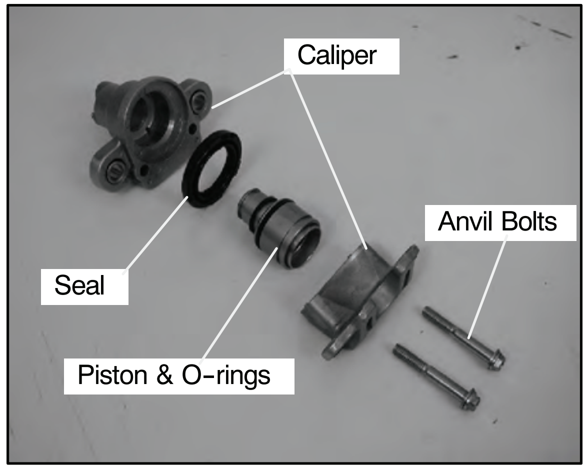
1. Clean caliper area before removal.
2. Using a socket wrench loosen the banjo bolts, remove hand brake (inner) and auxiliary brake (outer) lines. Place a container to catch brake fluid draining from brake lines.



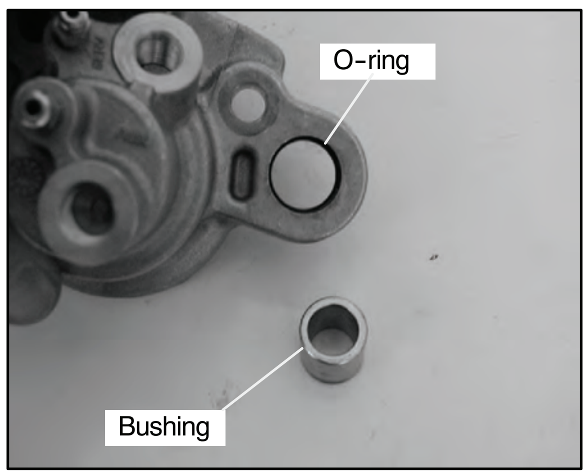
3. Remove the two caliper bolts and the caliper.
4. Remove the slide bolt snap rings (A), the slide pins (B), the bracket pad (C), and the brake pads (D).



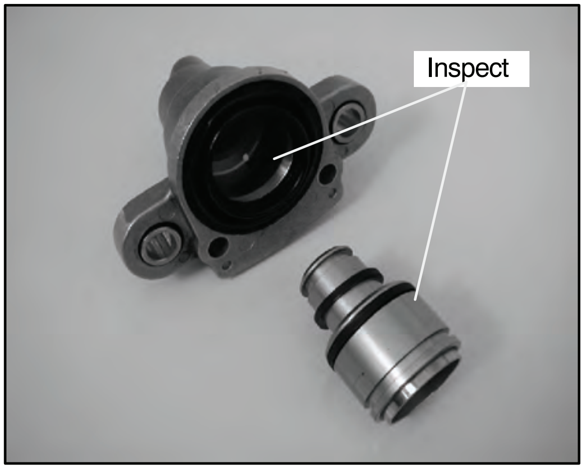
5. Remove the anvil bolts and separate caliper halves and remove pistons with piston pliers.



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. Replace if necessary.



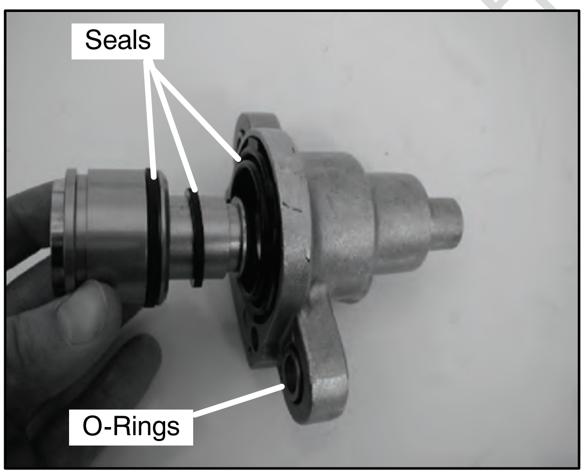
9. Inspect caliper piston bore for scratches, severe corrosion, or galling and replace if necessary.



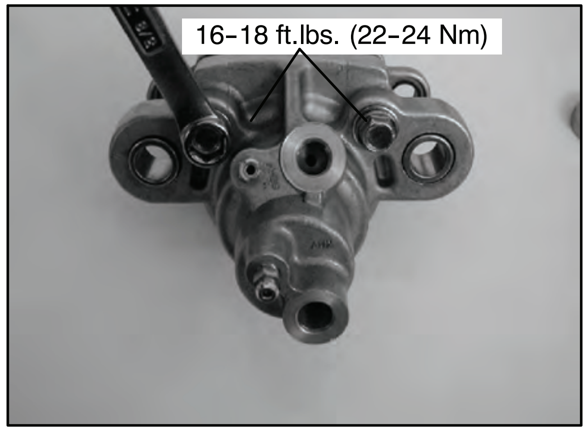
10. Inspect surface of caliper piston for nicks, scratches, or damage and replace if necessary.

REAR CALIPER REASSEMBLY

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.



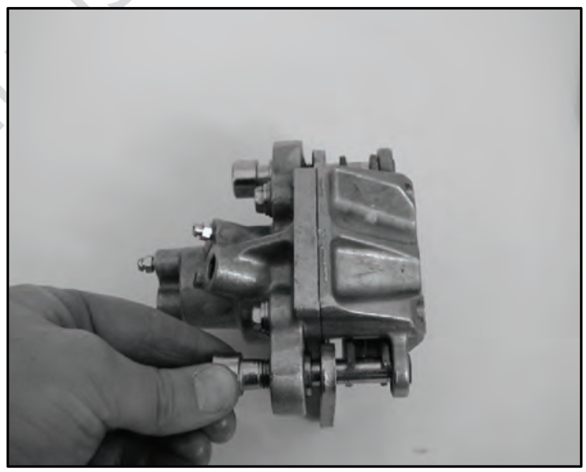
2. Carefully assemble caliper body, making sure O-rings are properly positioned in groove. Tighten the caliper anvil bolts and then torque the anvil bolts evenly to 16-18 ft. lbs. (22-24 Nm).



Caliper Anvil Bolt Torque:

16-18 ft. lbs. (22 Nm-24 Nm)

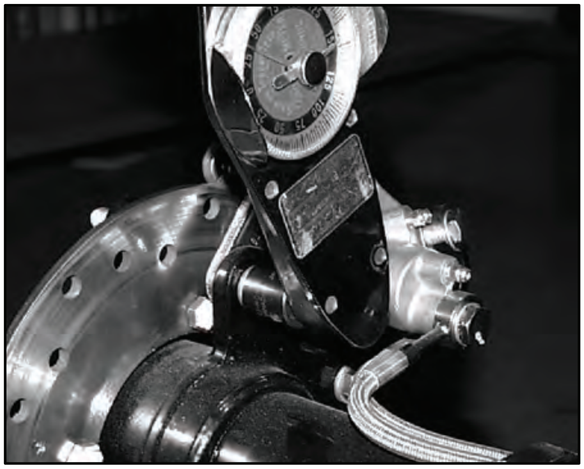
3. Install brake pads in caliper body with friction material facing each other. Install the slide pins and the slide pin retaining ring. Torque the slide pins to 30-35 ft.lbs. (41-48 Nm).



Caliper Slide Pin Torque:

30-35 ft. lbs. (41 Nm-48 Nm)

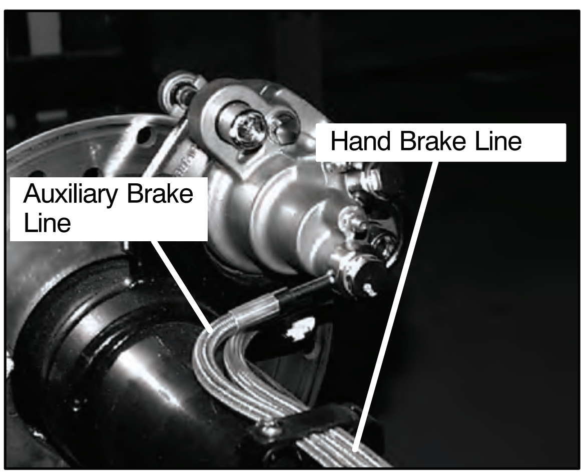
4. Install caliper and torque mounting bolts to 18 ft.lbs (24 Nm).



Caliper Mounting Bolt Torque

18 ft. lbs. (24 Nm)

5. Install brake lines and tighten to 15 ft.lbs. (20 Nm).



Banjo Bolt Torque:

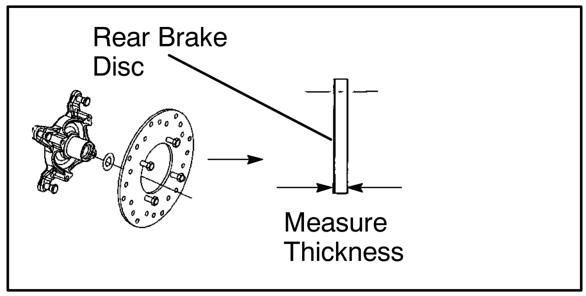
15 ft. lbs. (21 Nm)

6. Follow bleeding procedure outlined on pages 9.5-9.6 of this section and refer to system overview and illustration on Page 9.4.

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.



Rear Brake Disc Thickness

New .158-.164"/4.0-4.16 mm
Service Limit .140″ (3.56 mm)

Brake Disc Thickness Variance

Service Limit .002″ (.051 mm)
difference between measurements

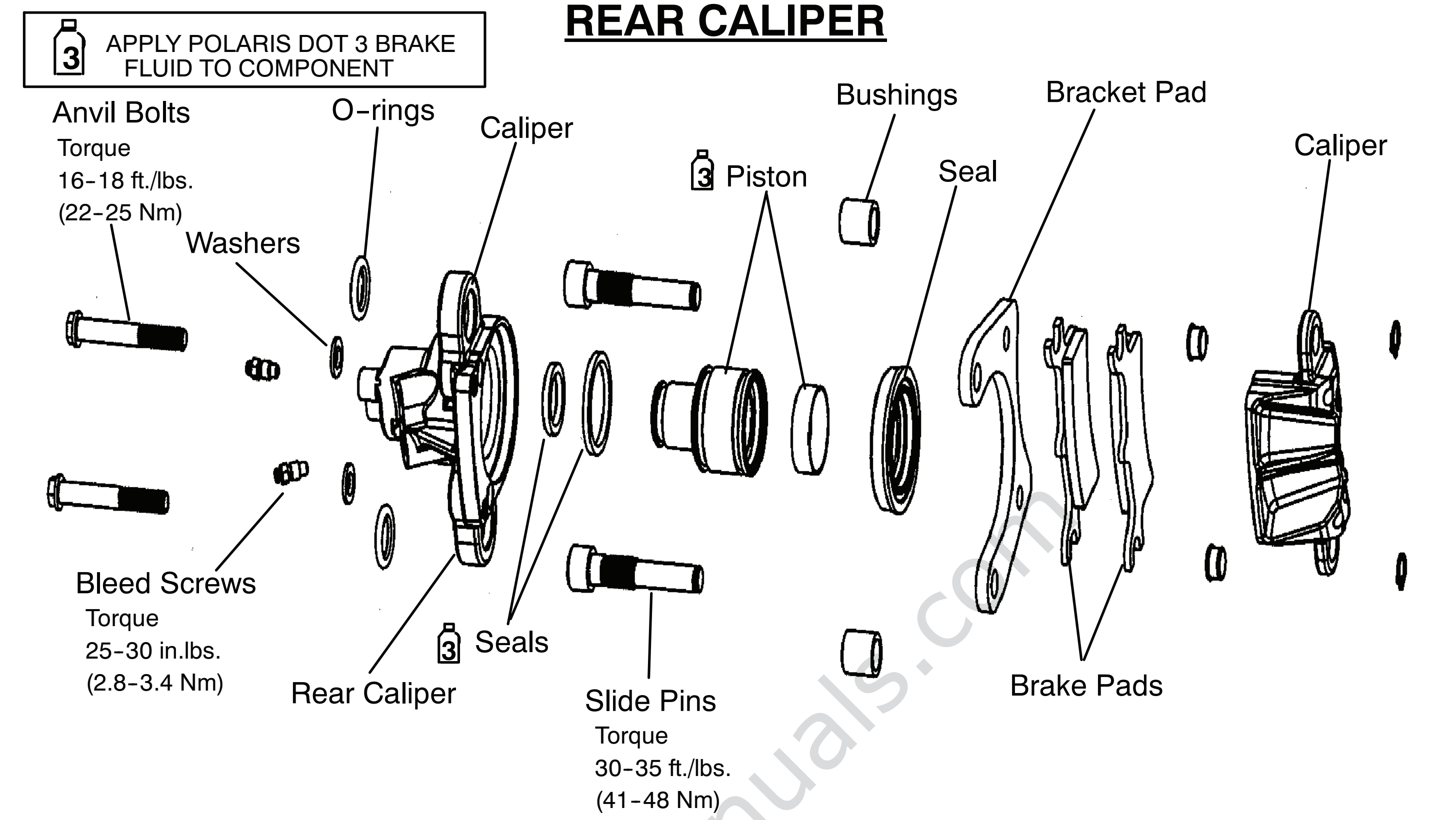
3. Mount dial indicator and measure disc runout. Replace the disc if runout exceeds specifications.

Brake Disc Runout

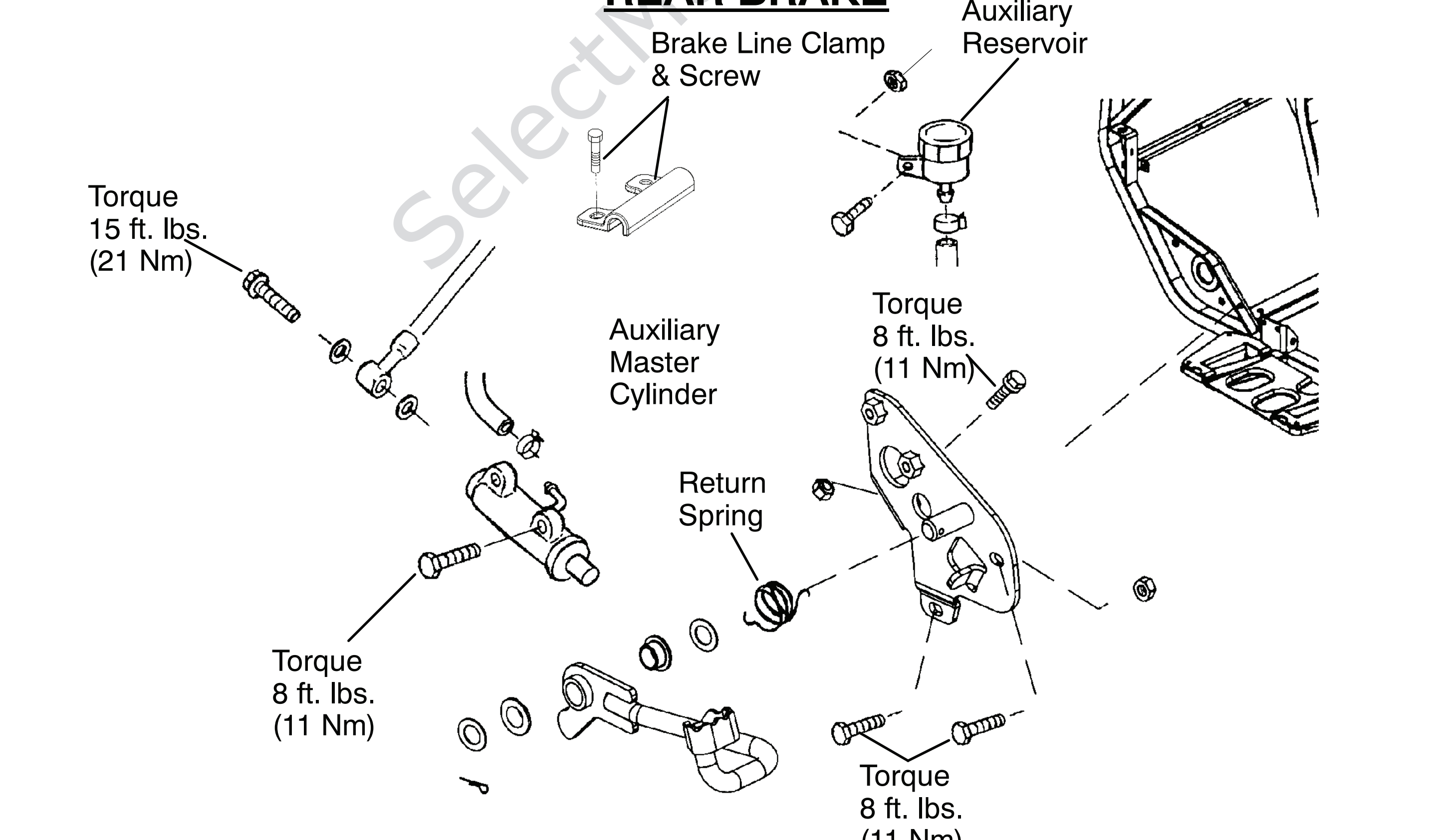
Service Limit .010" / .254 mm

REAR CALIPER/REAR BRAKE EXPLODED VIEW

REAR CALIPER



REAR BRAKE



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

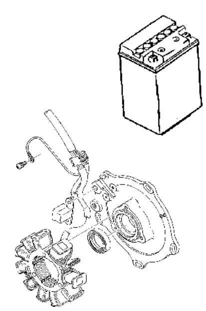
Lever Vibration
- Disc damaged
- Disc worn (runout or thickness variance exceeds service limit)

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



SPECIAL TOOLS

PART NUMBER	TOOL DESCRIPTION
PV-43568	Fluke™ 77 Digital Multimeter
2870630	Timing Light
2870836	Battery Hydrometer
2460761	Hall Sensor Probe Harness
2871745	Static Timing Light Harness

ELECTRICAL SERVICE NOTES

Keep the following notes in mind when diagnosing an electrical problem.

- Refer to wiring diagram for stator and electrical component resistance specifications.
- When measuring resistance of a component that has a resistance value under 10 Ohms, remember to subtract meter lead resistance from the reading. Connect the leads together and record the resistance. The resistance of the component is equal to tested value minus the lead resistance.
- Become familiar with the operation of your meter. Be sure leads are in the proper jack for the test being performed (i.e. 10A jack for current readings). Refer to the Owner's manual included with your meter for more information.
- Voltage, amperage, and resistance values included in this manual are obtained with a Fluke™ 77 Digital Multimeter (**PV-43568**). This meter is used for when diagnosing electrical problems. Readings obtained with other meters may differ.
- Pay attention to the prefix on the multimeter reading (K, M, etc.) and the position of the decimal point.
- For resistance readings, isolate the component to be tested. Disconnect it from the wiring harness or power supply.

INSTRUMENT CLUSTER/SPEEDOMETER IDENTIFICATION PER MODEL

NOTE: The 2004-2005 Magnum 330 and 2004 Magnum 330 HDS (international) have different instrument clusters. Follow the correct instrument cluster information in the service manual when reading the manual.

2004-2005 Magnum 330 Instrument Cluster

2004 Magnum 330 HDS (international) Instrument Cluster

MAGNUM 330 (2004-2005 MAGNUM) INSTRUMENT CLUSTER/ SPEEDOMETER INFO

INSTRUMENT CLUSTER TROUBLESHOOTING -

Introduction
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 wheel 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. In addition to the ground speed in Kilometers Per Hour (KPH), odometer, and trip odometer, the electronic speedometer provides the following functions: (See Illustration) 1. Hour meter
2. Programmable Service Interval
3. Gear Indicator
4. High Engine Coolant Temperature
5. High/Low Battery Voltage

Vehicle Speed and Odometer
An electronic wheel speed sensor located on the right front brake caliper bracket senses vehicle speed. The speedometer head does not differentiate between forward and reverse wheel rotation. Static Timing Light Harness **(PN 2871745)**, with the Hall Sensor Probe Harness **(PN 2460761)**, can be used to quickly test the sensor.

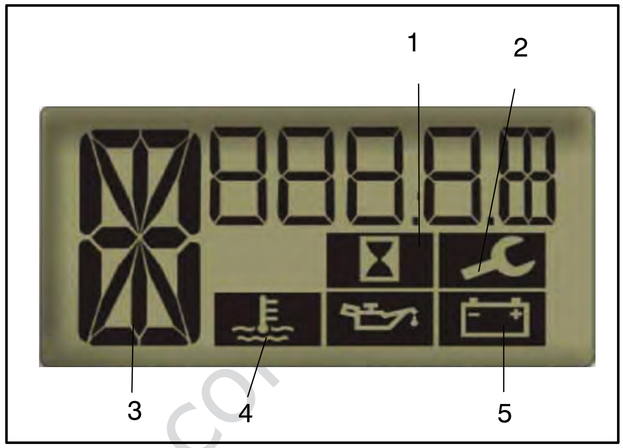
Hour Meter (Engine Run Time)
Logs the total hours the engine has been in operation.

Programmable Service Interval
The purpose of the programmable service interval is to provide the consumer and their dealer with a convenient way to schedule routine maintenance. When the ATV leaves the factory, this feature is turned "OFF". You must enable this feature if you intend to use it to track maintenance requirements.

High Engine Coolant Temperature
Indicates the engine is overheating. Refer to **Chapter 3 "Cooling System Troubleshooting"** for help with diagnosis of overheating.

High/Low Battery Voltage
Indicates that the battery is nearing full discharge, or that a failed battery or voltage regulator is causing an excessively high voltage on the DC bus.

Diagnostic Mode
Refer to Page 10.13 on how to operate the diagnostic mode.



1. Rider Information Center

2. Speedometer Needle - In addition to depicting vehicle speed, this needle will flash to indicate a fault condition.

3. Speedometer graph depicting both miles per hour and kilometers per hour.

Programmable Service Interval
To enable the programmable service interval function, scroll to the Programmable Service Interval (P.S.I.) mode, which is initially indicated by the "wrench" icon and the word "OFF".

1. Press and hold the mode/reverse override button until the wrench icon begins flashing. When the wrench icon begins to flash, release the button.

2. Begin entering the next service hour total by releasing and pressing the mode/reverse override button. Each time the mode/reverse override button is pressed and released the service interval time is increased by an hour. **NOTE**: Continuing to hold down the mode button will add to the hour total faster.

3. When the desired hour total has been reached, stop pressing the mode/reverse override button and wait for the wrench icon to quit flashing. Once the wrench icon quits flashing the service hours are set. If you scroll past the intended number, hold the button down until the count turns over to “0”. At this point you can re-attempt to set the number.

4. The P.S.I. then counts down from this total per hours of engine operation.

5. When the number reaches “0”, the wrench icon will flash for five seconds during vehicle start up to remind the driver that the next scheduled service is due. To turn the P.S.I. off, toggle to the service interval mode and press the mode/reverse override button for approximately seven seconds until the word “OFF” appears in the Rider Information Center.

Diagnostic Mode

Warning Indications Displayed on Rider Information Center

Warning Indication	Warning Explanation
“E”	Most of the time this error message indicates that you are between gears. It can also indicate that the transmission switch is broken.
“StAtr”	“Stator” - is displayed when the gauge senses ground speed but no engine rpm for at least 10 seconds. May indicate a failing stator or wiring problem.
“hdLbr”	“Handlebar” - is displayed when the mode/override button is stuck in for more than ten seconds in any mode except Programmable Service Interval or Diagnostic modes.

NOTE: The gauge will shut itself off if the voltage on the DC bus is too excessive. This is usually the result of an open battery condition. 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.

The initial screen displayed looks similar to Ill. 1 and is referring to the software version currently installed in your instrument cluster. This information is only briefly displayed.

Ill. 1

Use the mode/reverse override button to toggle through the diagnostic screens.

The first screen indicates battery voltage. Refer to Ill. 2.

Ill. 2

Screen three (Ill. 4) is the tachometer for setting idle speed. This mode is not operational while in motion.

Ill. 4

NOTE: As long as you are in the diagnostic mode, the wrench icon will remain lit.

To leave the diagnostic mode, either shift the machine out of neutral or turn the key switch off and on.

NOTE: Any movement of the tires will trigger the speedometer out of the diagnostic mode.

SPEEDOMETER TROUBLESHOOTING (2004-2005 MAGNUM)

TEST 1 - NO ALL WHEEL DRIVE

START HERE

SPEED READOUT OK?

N: CHECK SPEEDOMETER (PERFORM TEST 2)

Y:

- KEY SWITCH ON
- TRANSMISSION IN NEUTRAL
- AWD SWITCH ON

Y:

ON HUB COIL CONNECTOR (LEAVE IT CONNECTED) MEASURE FOR 12V FROM BROWN/WHITE TO THE COIL BODY (GROUND)

N: NOT AN INSTRUMENT CLUSTER PROBLEM; CHECK AWD SWITCH AND HUB COIL

Y:

LEAVE AWD SWITCH ON
TURN KEY SWITCH OFF
DISCONNECT 16 PIN CONNECTOR FROM CLUSTER
TURN KEY SWITCH ON
CHECK FOR 12V FROM BRN/WHITE TO GROUND

N: WIRING PROBLEM

Y:

TURN KEY SWITCH OFF
RECONNECT CLUSTER
LEAVE HEADLIGHT POD DISASSEMBLED
SHIFT TO LOW OR HIGH
LEAVE AWD ON

LEAVE KEY SWITCH OFF
REMOVE THROTTLE CONTROL COVER
DISCONNECT THROTTLE CONTROL HARNESS
CHECK FOR CONTINUITY ACROSS AWD INDICATOR BULB

Y: REPLACE INSTRUMENT CLUSTER

N: BAD AWD BULB. PROCEED TO MECHANICAL AWD COMPONENTS IF AWD PROBLEM PERSISTS.

Note: If AWD light comes on, instrument cluster is O.K. Proceed to mechanical tests (in Service Manual). Shade the AWD light with your hand 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.

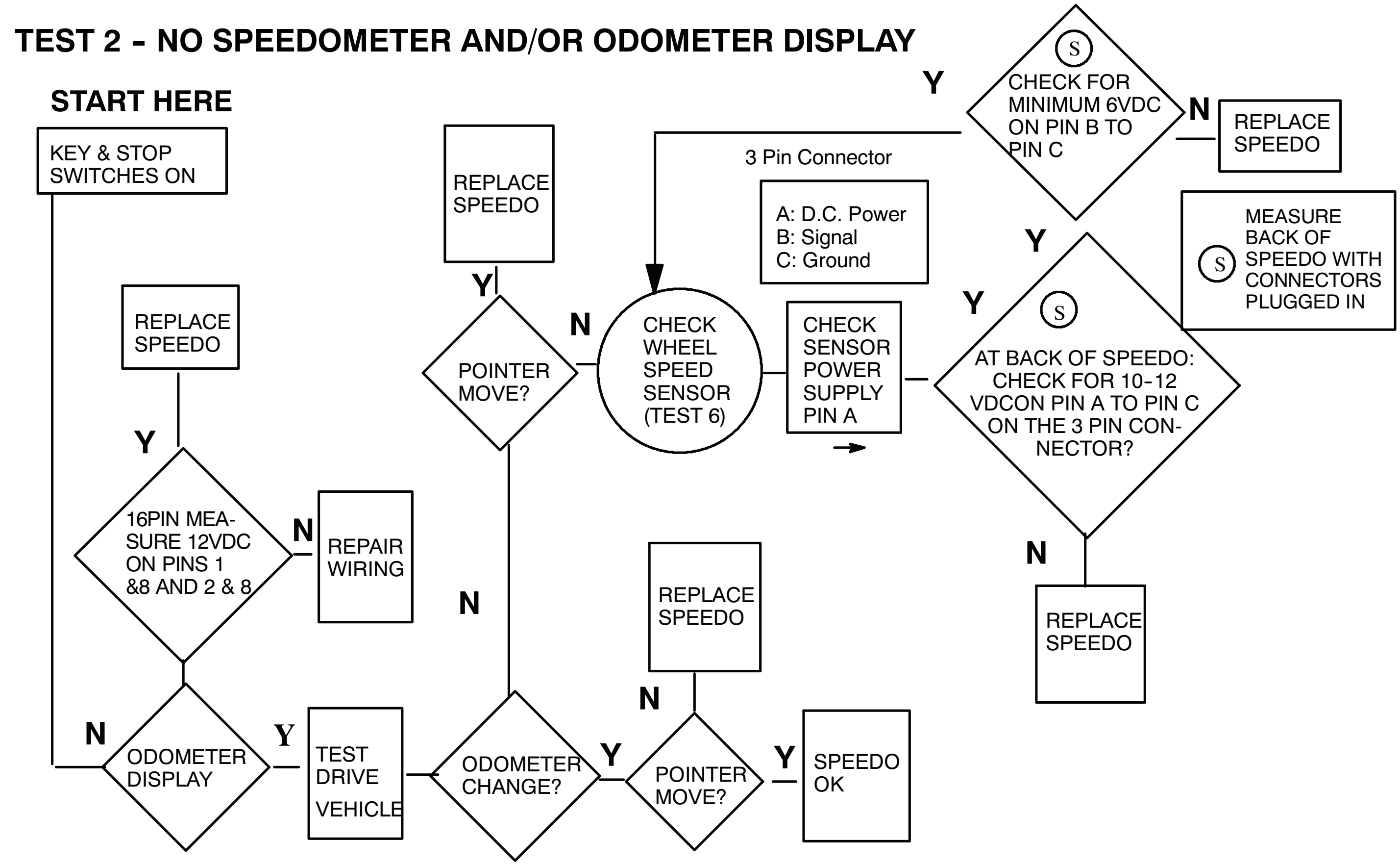
16 Pin Connector

1. Red (04), Orn/Wht (05)- 12V Constant
2. Red/White- 12V Switched
3. Grey/Orange- Mode/Override button
4. Black- Ignition Kill
5. Green (05)- Speedo Diagnostic
6. Blue (05) - Speedo Diagnostic
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. Orange/Red (04)- Park Gear
12. Purple (04)- Reverse Gear
13. Grn/Wht (04), Brn/Red (05)- Neutral
14. Wht/Blu (04), - Low Gear; Wht (05)- Gear Signal
15. Blue/Red (04)- High Gear
16. Brown/White- AWD Control

Note: Reversing polarity when connecting the battery or other DC power source backwards will fail the AWD control and the instrument cluster If the key switch and the AWD switch are turned on.

SPEEDOMETER TROUBLESHOOTING (2004-2005 MAGNUM)

TEST 2 - NO SPEEDOMETER AND/OR ODOMETER DISPLAY



TEST 3 - NO REVERSE SPEED LIMIT

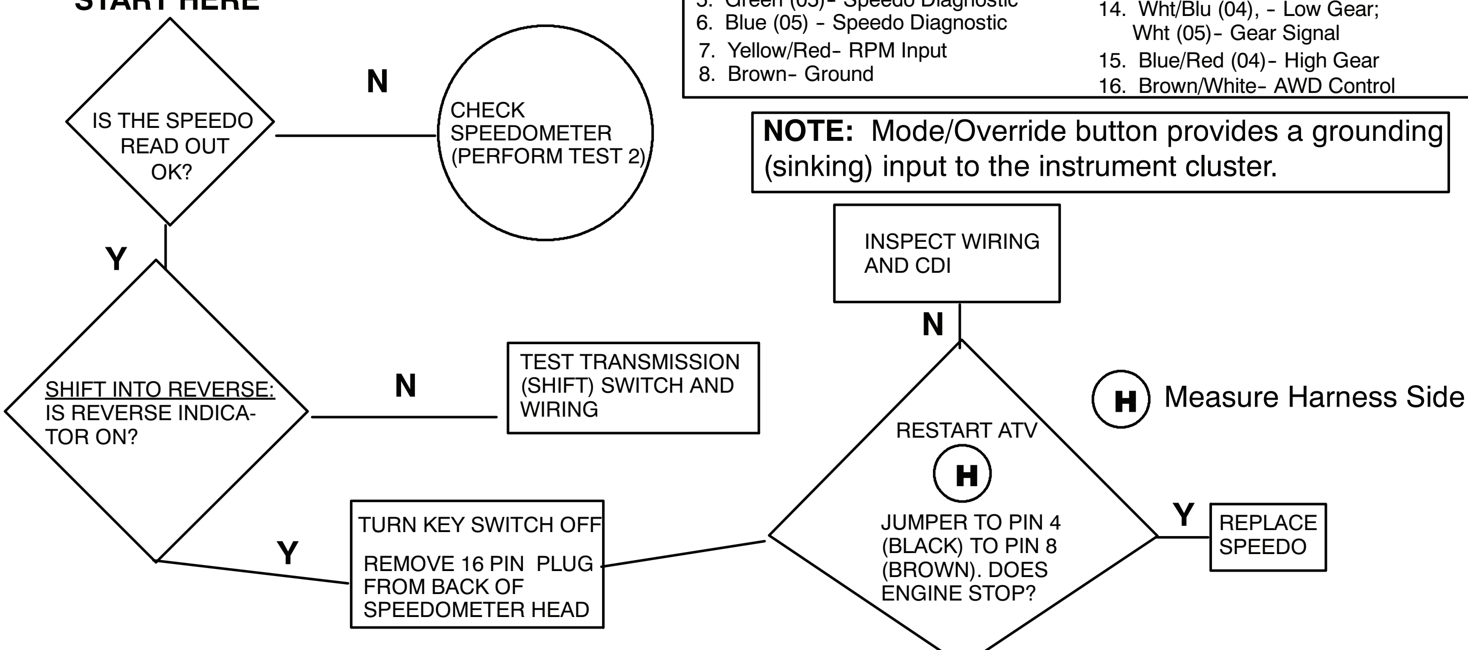
(VEHICLE EXCEEDS 7-9 MPH IN REVERSE)

START HERE

16 Pin Connector

1. Red (04), Orn/Wht (05)- 12V Constant
2. Red/White- 12V Switched
3. Grey/Orange- Mode/Override button
4. Black- Ignition Kill
5. Green (05)- Speedo Diagnostic
6. Blue (05) - Speedo Diagnostic
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. Orange/Red (04)- Park Gear
12. Purple (04)- Reverse Gear
13. Grn/Wht (04), Brn/Red (05)- Neutral
14. Wht/Blu (04), - Low Gear; Wht (05)- Gear Signal
15. Blue/Red (04)- High Gear
16. Brown/White- AWD Control

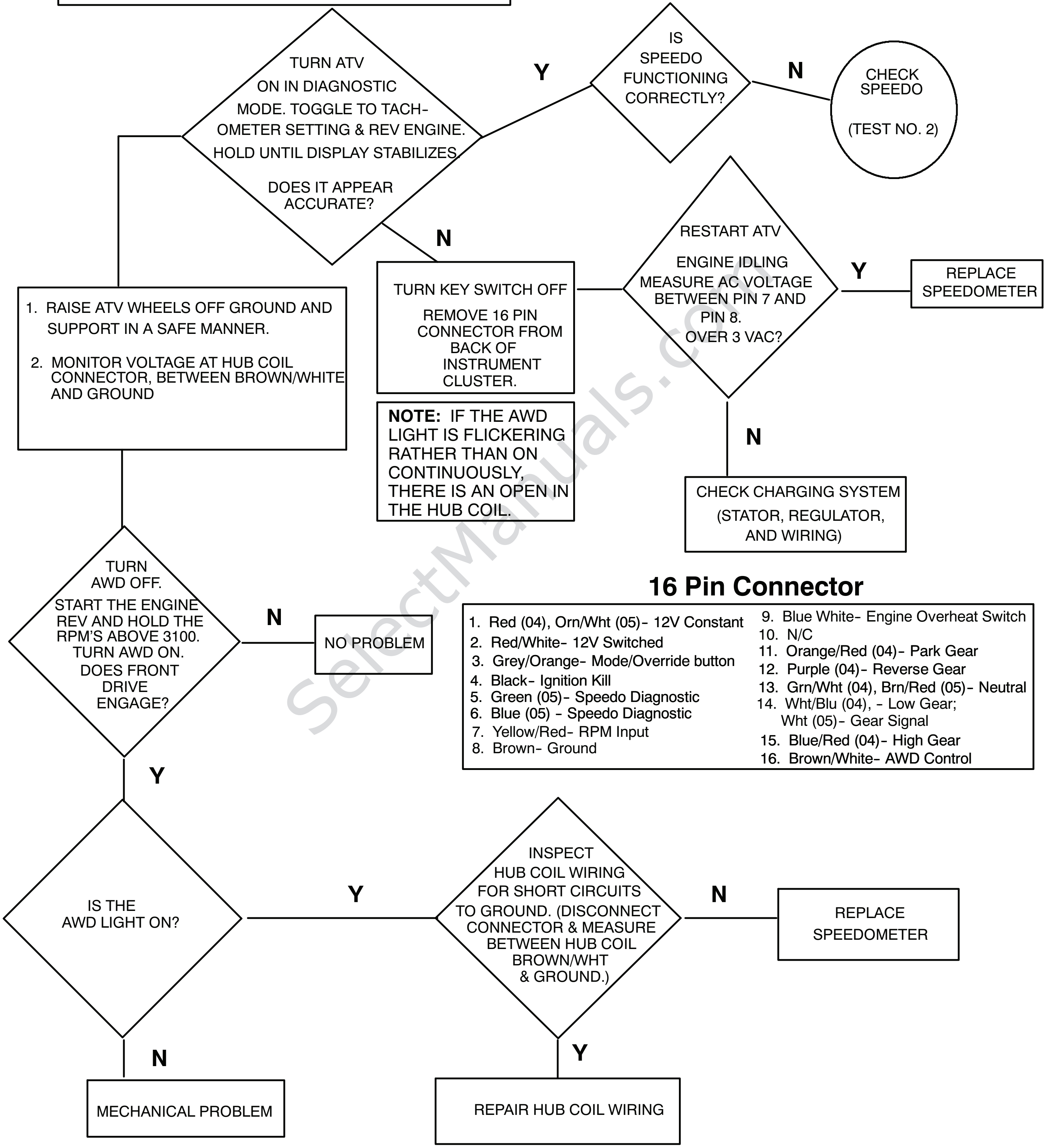
NOTE: Mode/Override button provides a grounding (sinking) input to the instrument cluster.



SPEEDOMETER TROUBLESHOOTING (2004-2005 MAGNUM)

TEST 4 - NO AWD HUB SAFETY LIMIT

NOTE: IF THE AWD LIGHT DOES NOT COME ON OR IF 12 VDC IS NOT REGISTERING AND AWD IS ENGAGING ABOVE 3100 RPM,IT MAY BE A MECHANICAL PROBLEM.



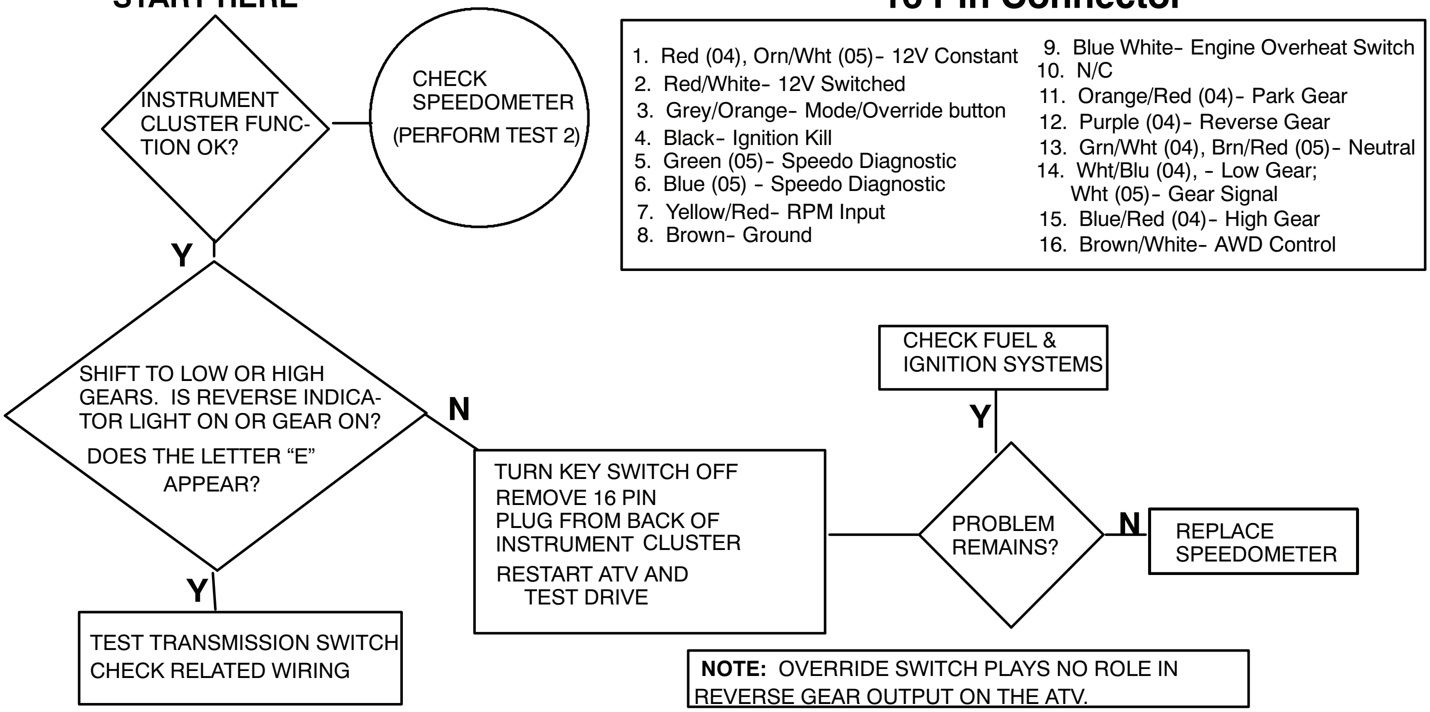
16 Pin Connector

1. Red (04), Orn/Wht (05)- 12V Constant
2. Red/White- 12V Switched
3. Grey/Orange- Mode/Override button
4. Black- Ignition Kill
5. Green (05)- Speedo Diagnostic
6. Blue (05) - Speedo Diagnostic
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. Orange/Red (04)- Park Gear
12. Purple (04)- Reverse Gear
13. Grn/Wht (04), Brn/Red (05)- Neutral
14. Wht/Blu (04), - Low Gear; Wht (05)- Gear Signal
15. Blue/Red (04)- High Gear
16. Brown/White- AWD Control

SPEEDOMETER TROUBLESHOOTING (2004-2005 MAGNUM)

TEST 5 REVERSE SPEED LIMITER ACTIVATED IN FORWARD GEAR

(Engine loses spark when vehicle speed is above 7-9 mph.)



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:

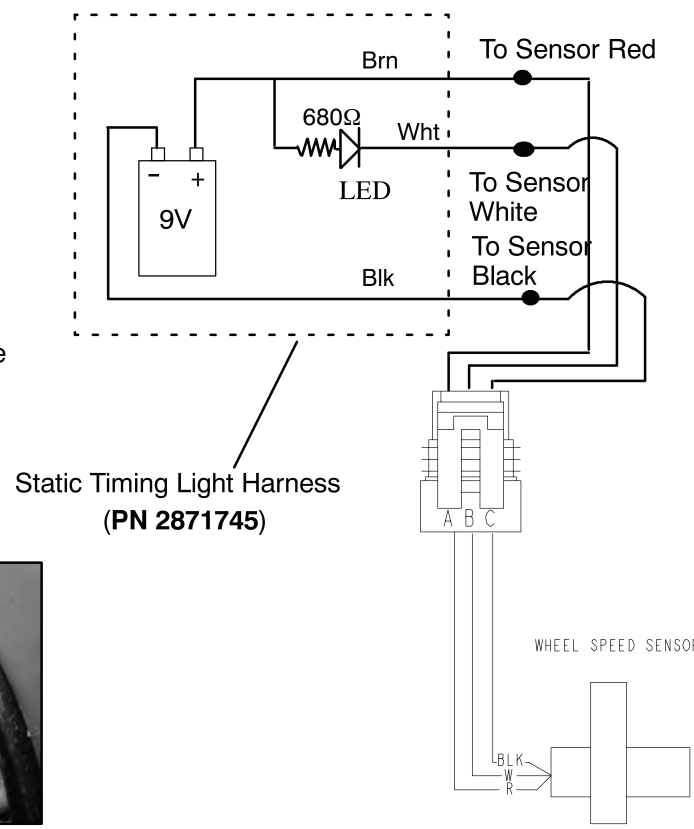
1.Disconnect 3 Pin connector from speedometer.

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.

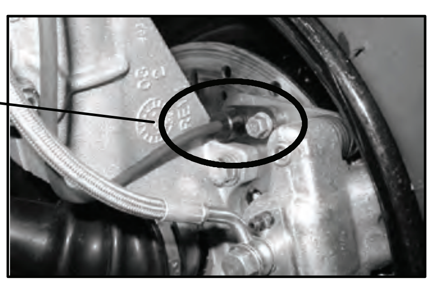
3. Elevate front right side of vehicle until tire is off the ground.

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.

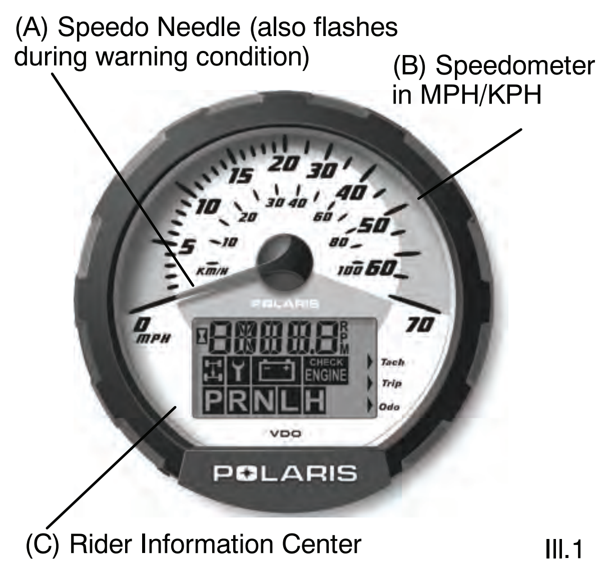


WHEEL SPEED SENSOR LOCATION

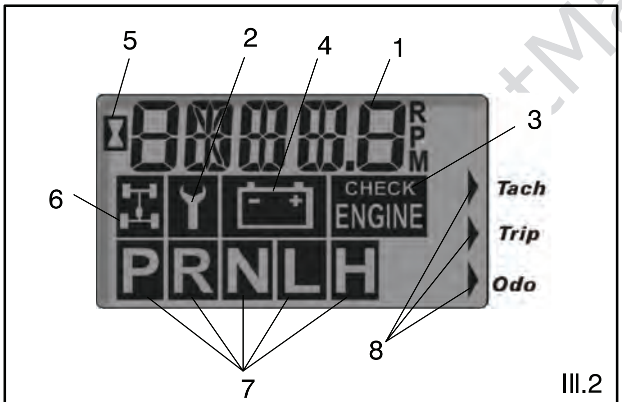


2004 MAGNUM 330 HDS (INTL.) INSTRUMENT CLUSTER/ SPEEDOMETER

INSTRUMENT CLUSTER OVERVIEW - 330 HDS



Ill.1



Ill.2

Introduction

Refer to Illustration 1:

The Polaris ATV Instrument Cluster is powered by battery voltage (12 VDC) and requires inputs from the engine RPM, transmission gear, and wheel speed sensor for proper operation. Two harnesses plug into the cluster head; one from the right front wheel speed sensor, and one from the vehicle main harness. A non-serviceable internal memory battery maintains odometer and hour meter data when the machine is not running. The illumination lamp inside the gauge is non-serviceable and is designed to last for the life of the unit. (A) The speedometer needle indicates speed from an electronic wheel speed sensor located on the right front brake caliper bracket and the needle also flashes during a warning condition. The speedometer needle indicates speed in MPH and KPH. **NOTE**: **The 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):

Refer to 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 on each trip it it's reset before each trip. 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 their 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 Page 10.11, "Setting New Service Interval".

***Diagnostic Mode** is for informational purposes only. Consumers should return the ATV to their Polaris dealer. See "**Diagnostic Mode Operation**" on the next page for more information.

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.

DIAGNOSTIC MODE - 330 HDS

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.

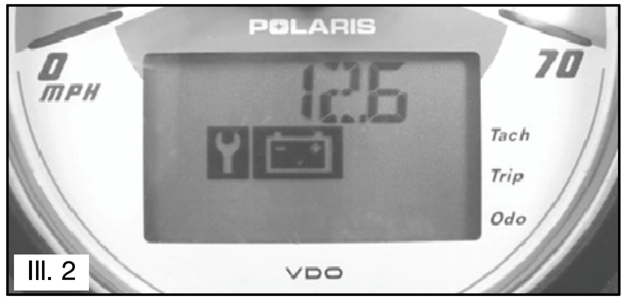
To enter the diagnostics mode:

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.

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.

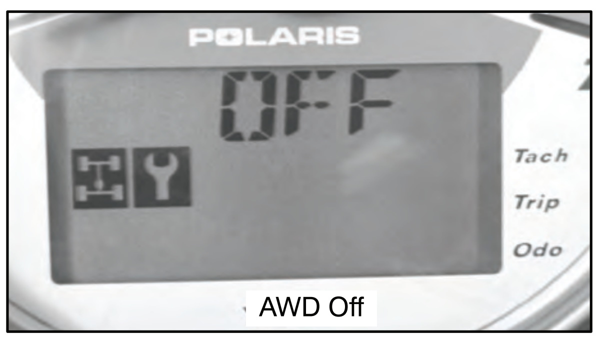


Ill. 2

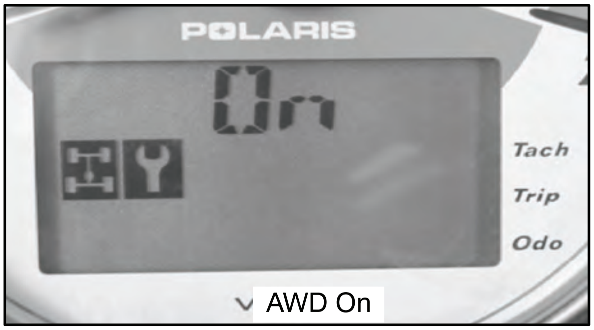
Screen 2: **Tachometer** (Ill. 3) indicates engine rpm for setting idle speed. NOTE: RPM's can be viewed outside of diagnostic mode also.

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.



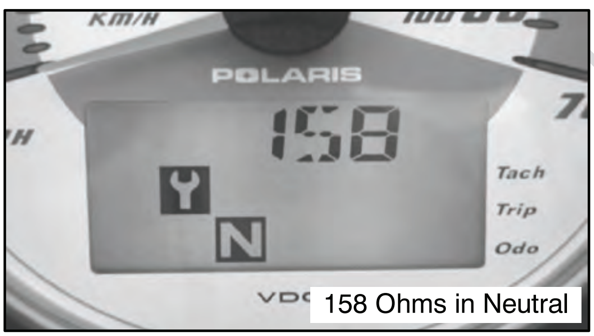
AWD Off



AWD On

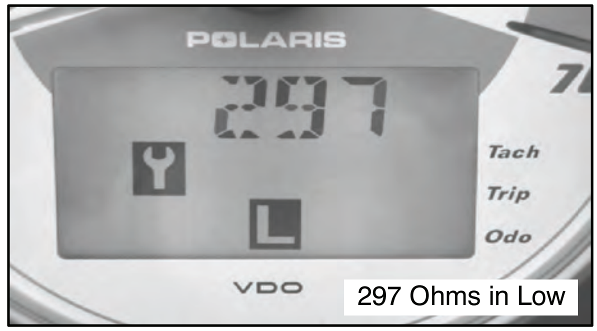
Screen 4: **Gear circuit diagnostic**. This screen displays the resistance value (in ohms) being read at the gear switch input of the gauge. NOTE: 10-20% variance from these readings is within normal parameters.

23 Ohms in Park



158 Ohms in Neutral

75 Ohms in Reverse

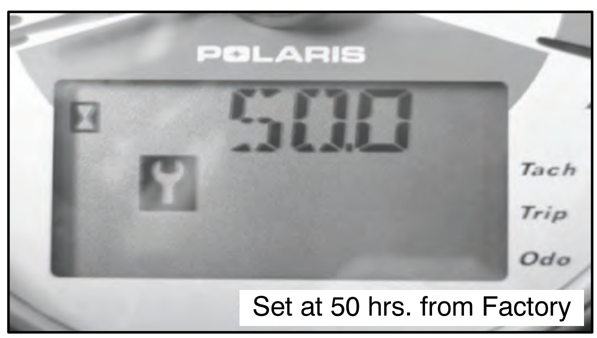


297 Ohms in Low

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.

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:

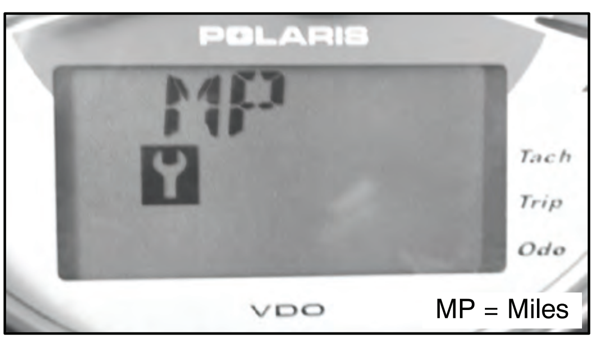
1. If the service interval is enabled (functioning) on your ATV and you wish to turn it off, toggle to the service interval mode.
2. Press and hold the mode button for approximately 7 seconds until the word *OFF* appears in the Rider Information Center. The service interval is now off.
3. To enable (turn on) the service interval mode, repeat the steps above in “Setting Service Interval After Countdown”.

Change Service Interval Time:

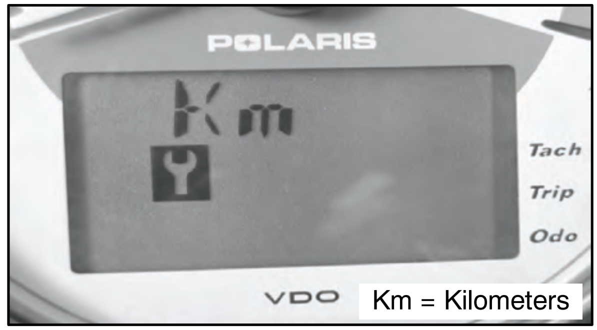
If you would like to change the service interval time, (for example change the interval from 50 hrs. to 55 hrs.). Follow the steps below:

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.



MP = Miles



Km = Kilometers

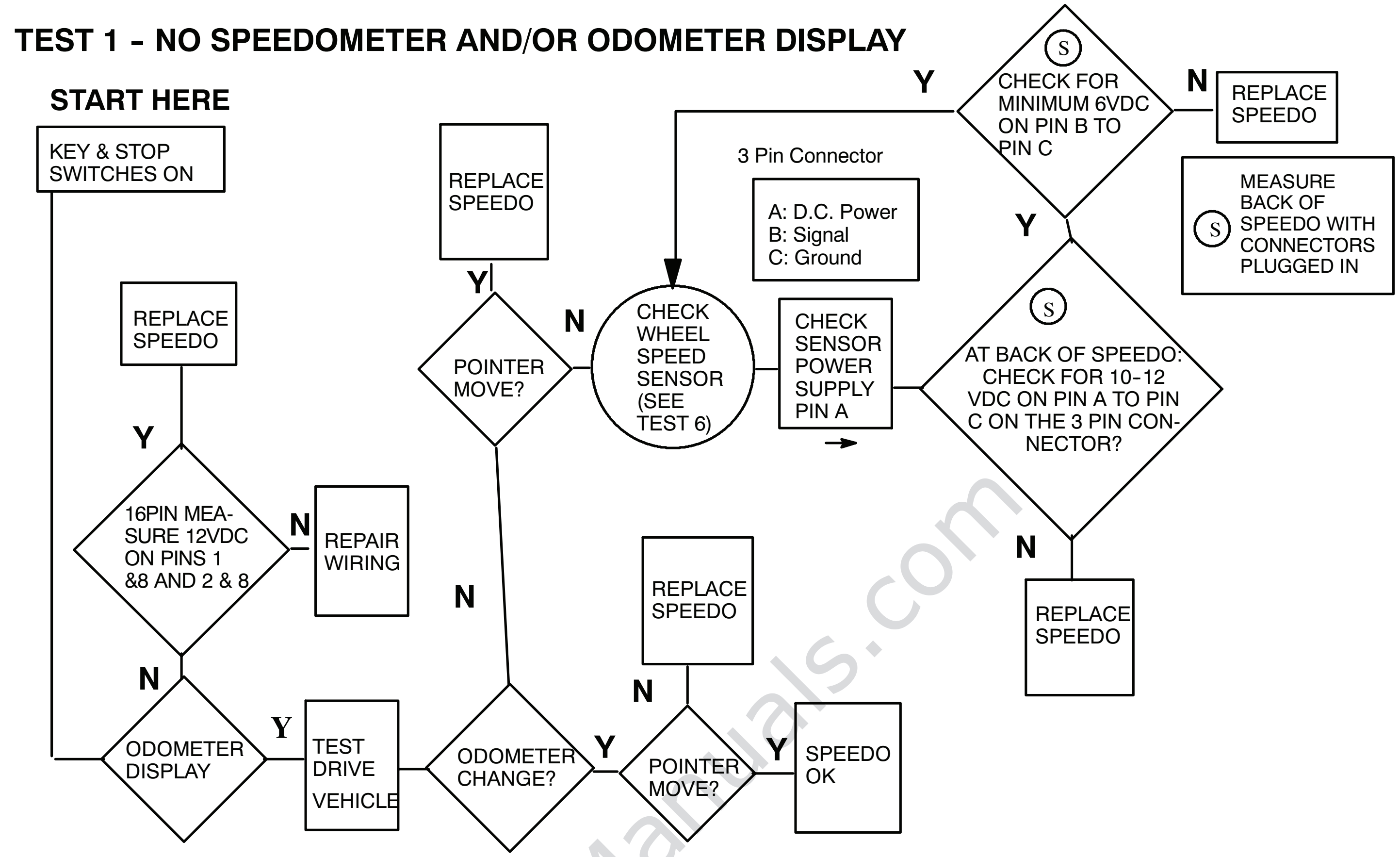
NOTE: As long as you are in the diagnostic mode, the wrench icon will remain lit.

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 TROUBLESHOOTING (2004 MAGNUM HDS)

TEST 1 - NO SPEEDOMETER AND/OR ODOMETER DISPLAY

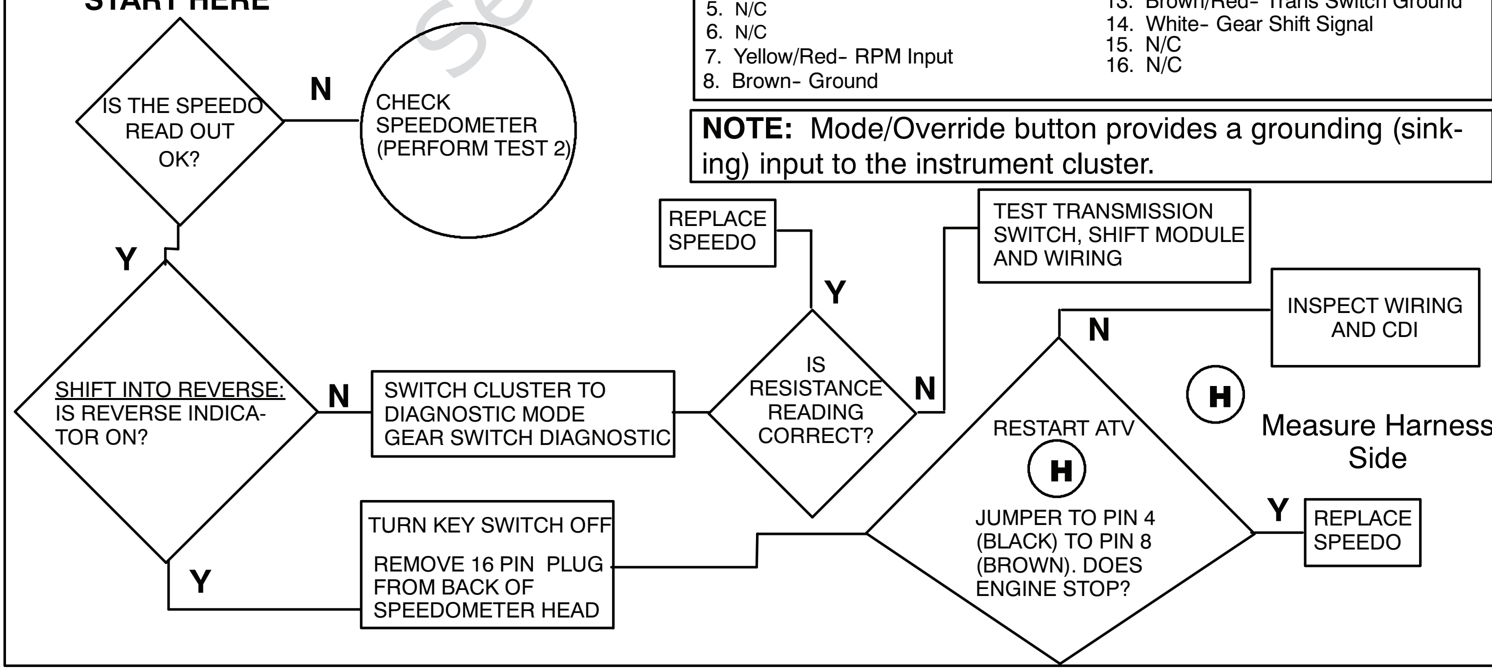


TEST 2 - NO REVERSE SPEED LIMIT (VEHICLE EXCEEDS 7-9 MPH IN REVERSE)

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. N/C
6. N/C
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. N/C
12. N/C
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. N/C
16. N/C

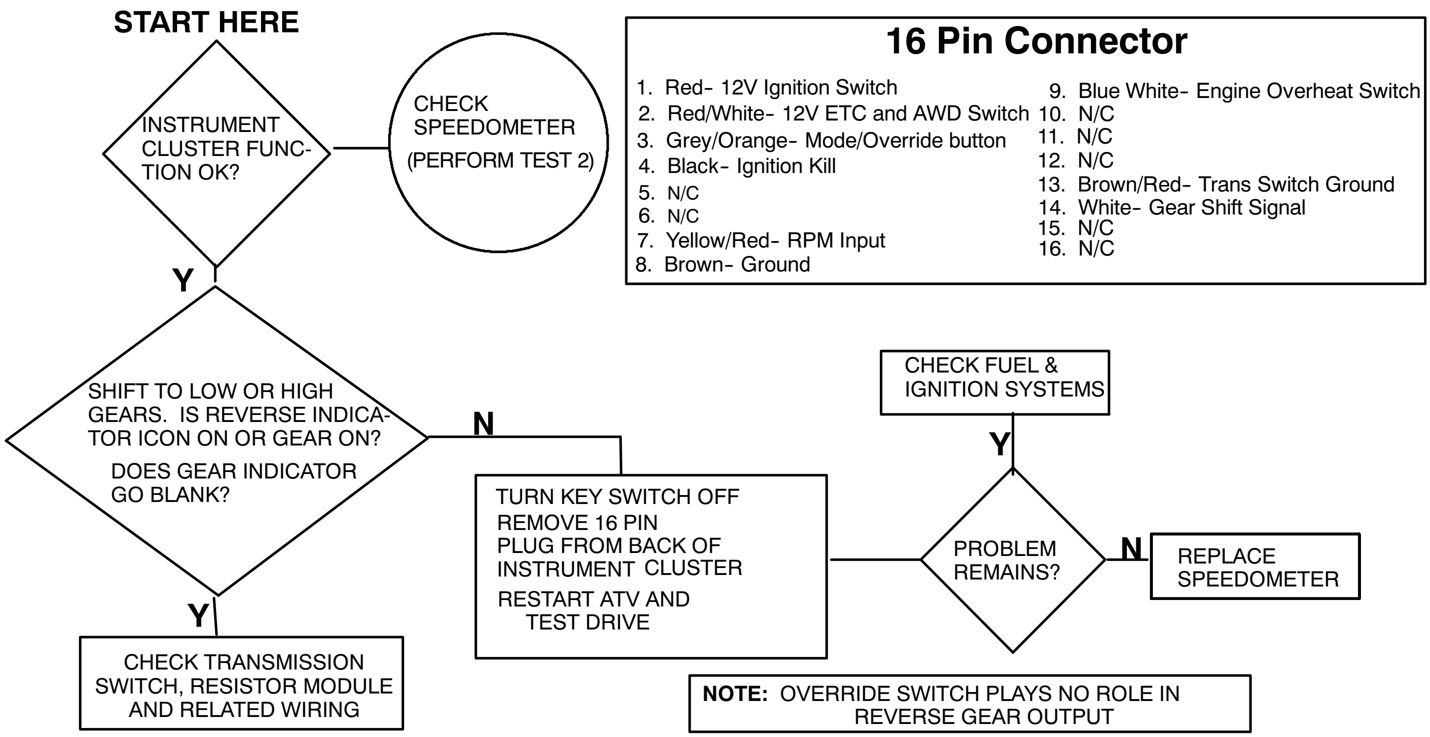
NOTE: Mode/Override button provides a grounding (sinking) input to the instrument cluster.



SPEEDOMETER TROUBLESHOOTING (2004 MAGNUM HDS)

TEST 3 REVERSE SPEED LIMITER ACTIVATED IN FORWARD GEAR

(Engine loses spark when vehicle speed is above 7-9 mph.)



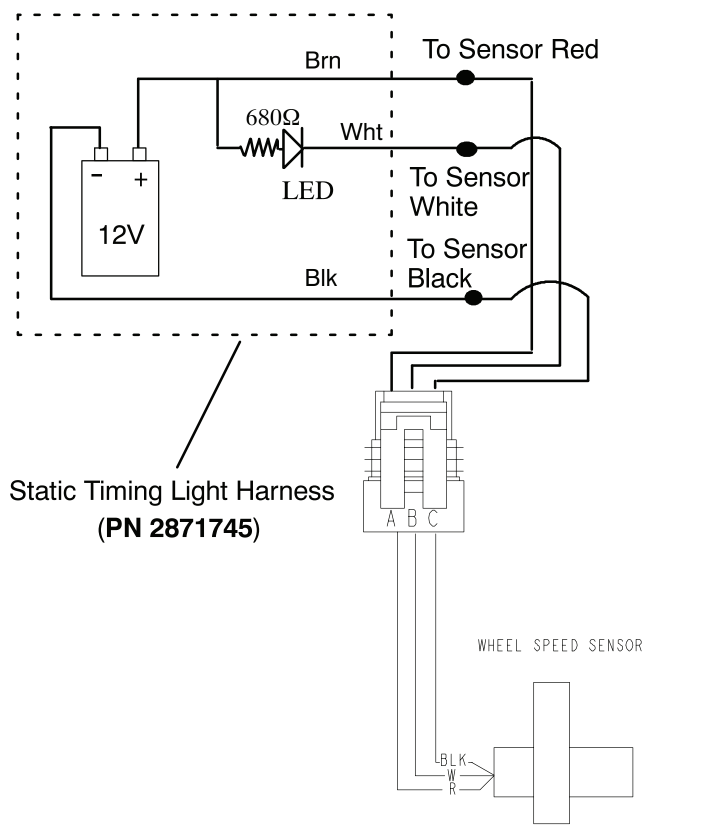
TEST 4 WHEEL SPEED SENSOR

Tools Required:

- Static Timing Light Harness **(PN 2871745)**
- Hall Sensor Probe Harness **(PN 2460761)** or equivalent jumper wires.

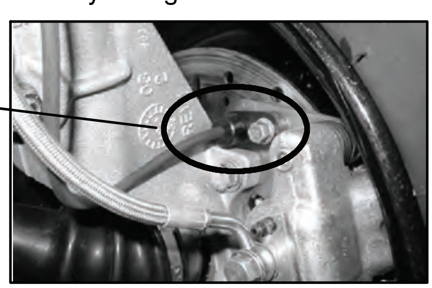
To test wheel speed sensor:

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.



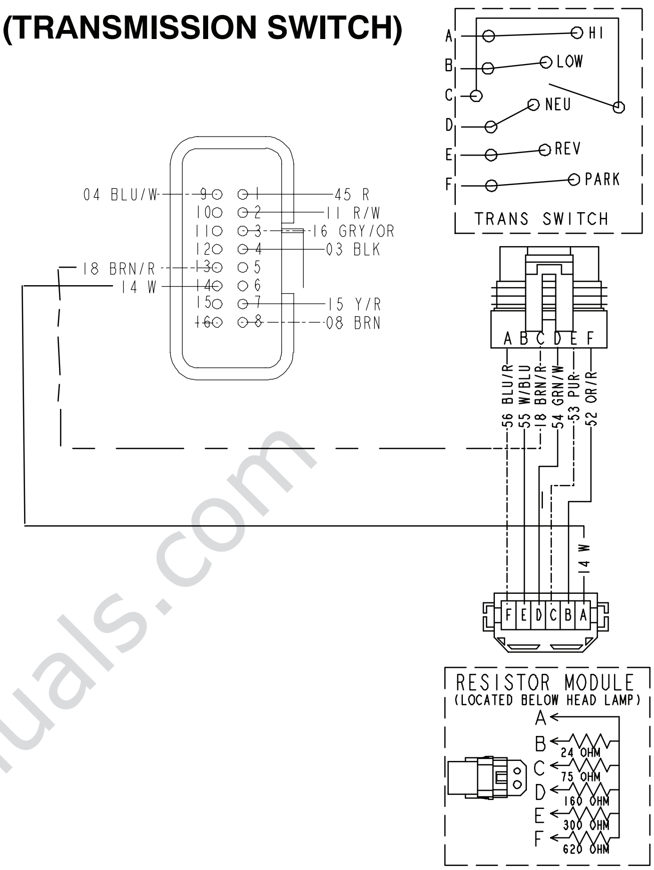
Static Timing Light Harness (**PN 2871745**)

WHEEL SPEED SENSOR LOCATION



SPEEDOMETER TROUBLESHOOTING (2004 MAGNUM HDS)

TEST 7 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:

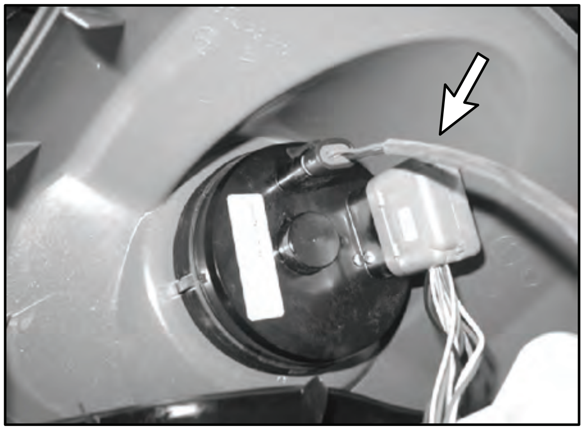
Use the diagram provided to test the continuity loop at each of the shift points with a multi-meter. **NOTE:** *The Instrument cluster contains this diagnostic feature.*

16 Pin Connector

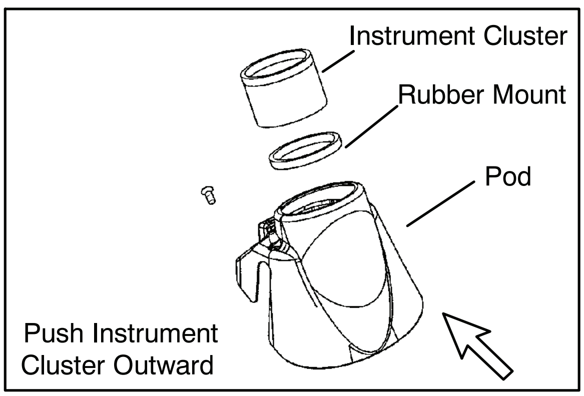
1. Red- 12V Ignition Switch
2. Red/White- 12V ETC and AWD Switch
3. Grey/Orange- Mode/Override button
4. Black- Ignition Kill
5. N/C
6. N/C
7. Yellow/Red- RPM Input
8. Brown- Ground
9. Blue White- Engine Overheat Switch
10. N/C
11. N/C
12. N/C
13. Brown/Red- Trans Switch Ground
14. White- Gear Shift Signal
15. N/C
16. N/C

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.



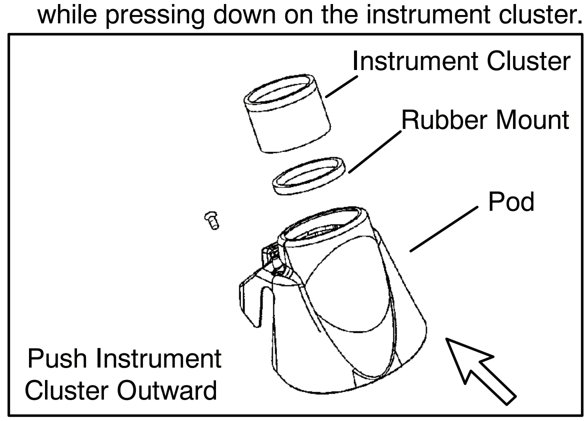
NOTE: Do not remove the rubber grommet in the pod. Only remove the rubber grommet if necessary. The bezel is a snap-on assembly and is a serviceable part.

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: Be sure the key on the instrument cluster housing is aligned with the keyway in the rubber grommet, to ensure proper alignment.

NOTE: Do not allow alcohol or petroleum products to come in contact with the instrument cluster lens.

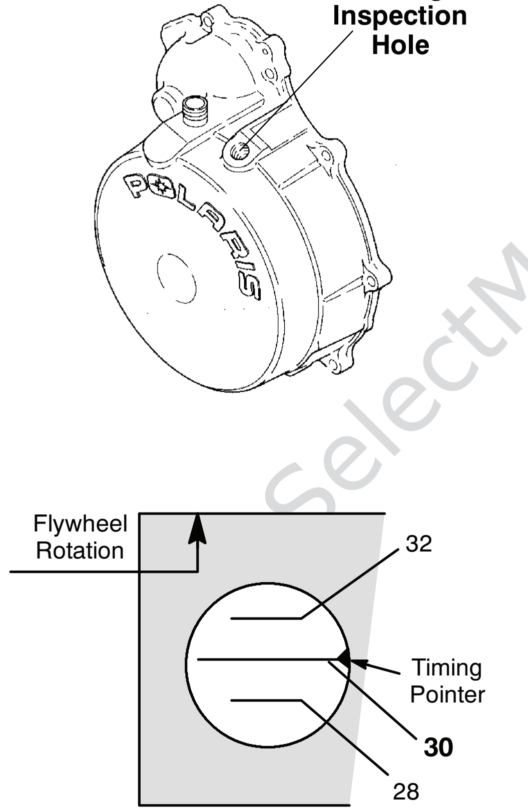
TIMING CHECK PROCEDURE

1. The ignition timing check hole is in the starter recoil/magneto housing. Remove the check plug.

NOTE: 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 set engine speed to 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.

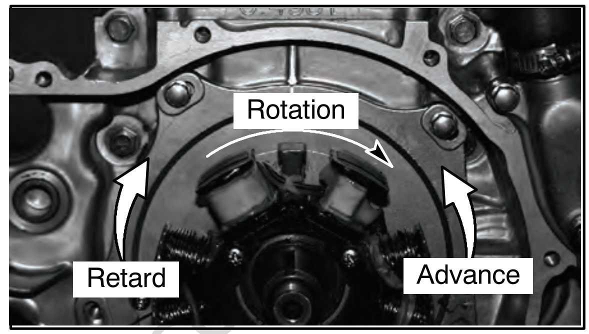
If the ignition timing is not within the specified range, adjust the stator plate position as described in the following text.



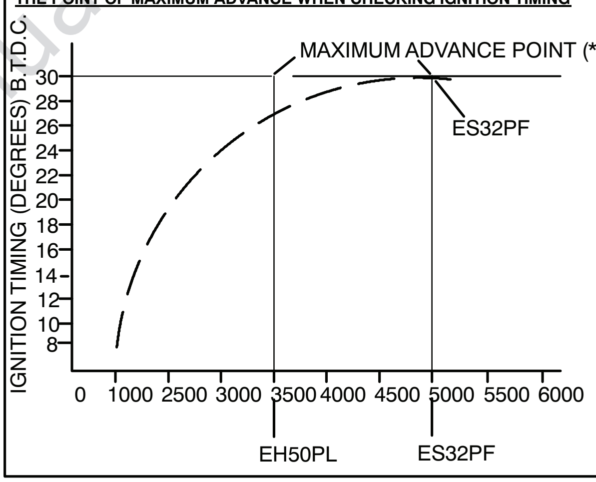
Magnum 330
30° @ 5000 RPM

Stator Adjustment

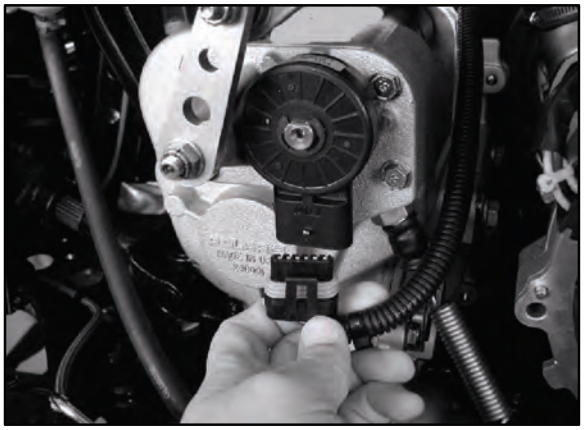
1. Remove the magneto housing.
2. Remove the flywheel.
3. Loosen the stator plate screws and adjust the stator plate position. **NOTE:** Moving the stator plate clockwise retards (delays) the ignition timing. Moving the plate counterclockwise advances it.



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



GEAR POSITION INDICATOR SWITCH TEST

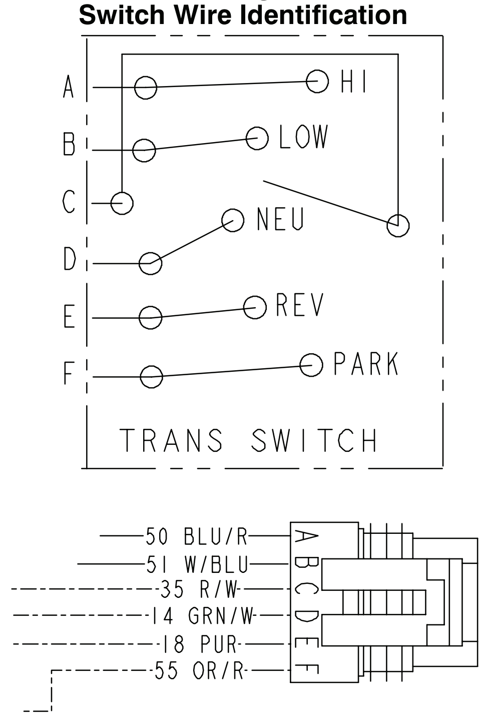


Magnum 330 Transmission Gear Switch

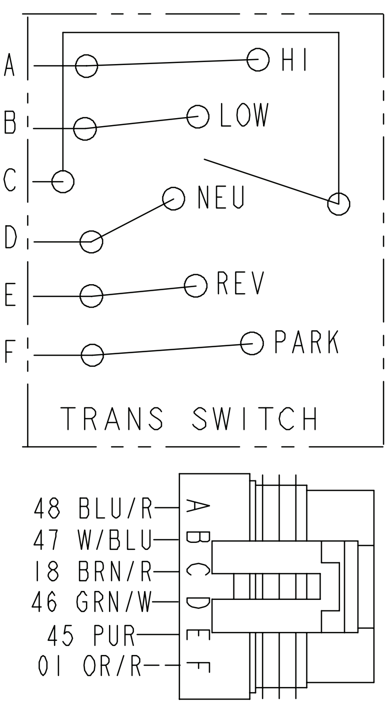
Drum Switch Continuity -All Magnums

	A	B	C	D	E	F
High Range	●		●			
Low Range		●	●			
Neutral			●	●		
Reverse			●		●	
Park			●			●

2004-2005 Magnum - Drum Switch Wire Identification



2004 Magnum HDS - Drum Switch Wire Identification



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

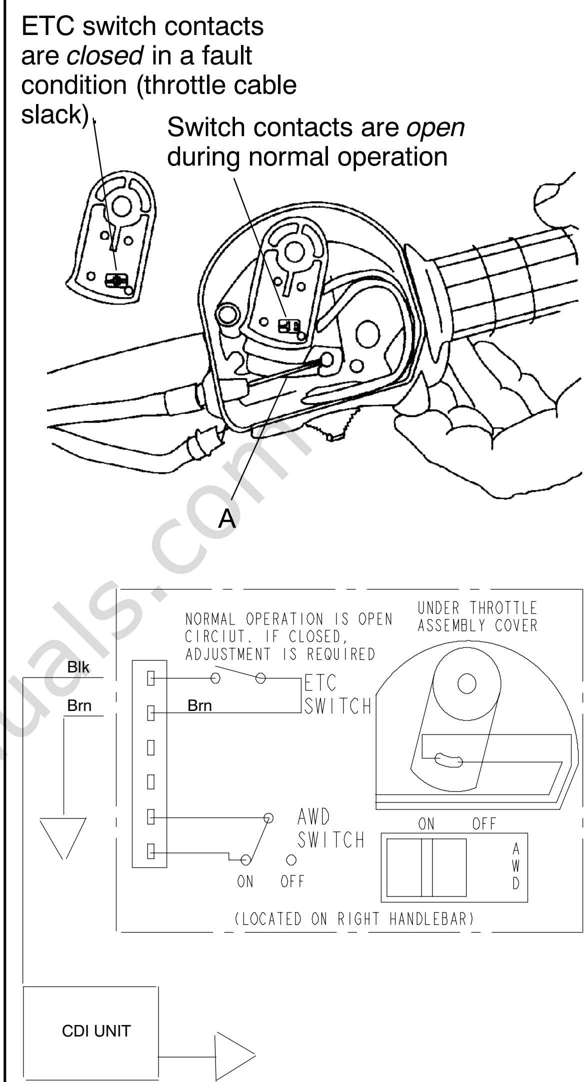
Remove throttle block cover by carefully releasing all tabs around edge of cover.

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.

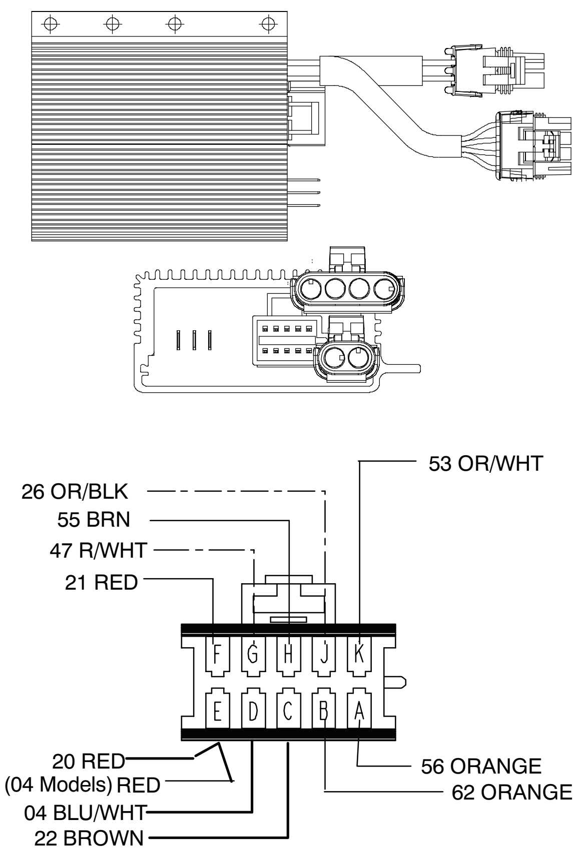
Electronic Throttle Control (ETC) Switch (Composite Throttle Housing)



ECM OPERATION

ECM or Sure Power Box

(Located Under Front Cab Area)



The ECM (logic box) integrates three electronic features found on the Polaris ATV. These features are **alternator rectifier/regulator**, **engine temperature controller**, and **solid state circuit breaker outputs**.

Regulator:

The regulator takes the output of the 3-phase alternator and applies it to the battery. SCRs are used to connect and disconnect the alternator from the batter to achieve regulation of the battery voltage. The regulator circuit produces current on the BATTERY pin (Pins E & F). If a high voltage transient is detected on the BATTERY pin this causes the regulator to assume an open battery condition. The high voltage transient will cause the regulator to turn off for a short period of time. If there truly is an open battery then the regulator will remain off as the minimum battery requirement will not be met. The regulator will not turn on unless there exists a battery voltage in excess of the minimum battery voltage requirement.

Engine Temperature Controller:

The engine temperature controller has several features. Its primary function is to control the fan motor. The fan motor is turned on and off at preset temperatures as determined by the engine temperature thermistor. If the engine temperature continues to rise it will turn on an engine hot indicator. The module also contains provisions for detecting an open thermistor. An open thermistor will cause the engine hot indicator to light and cause the fan motor to come on.

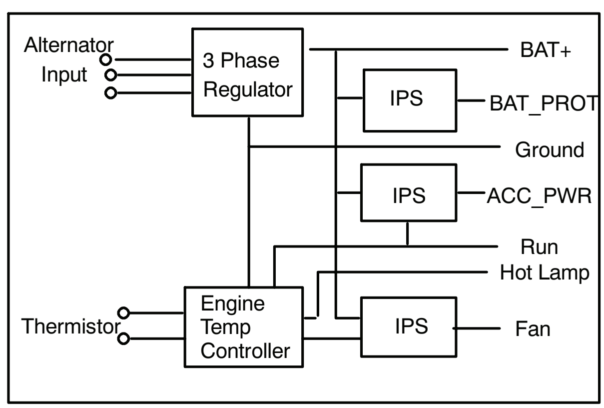
The engine temperature controller is enabled by the RUN signal (Pin G). The controller can only come on if the RUN signal is active. The engine hot output provides a grounded output for a lamp. The FAN output (Pin J) is protected against short circuit and overload by electronic means internal to the module. The FAN output has a linear current limit. If the maximum temperature of the switching device is exceeded the fan output will turn off until the device has cooled.

Solid State Circuit Breaker Outputs:

The module provides two solid state circuit breaker outputs. The first output (BAT_PROT) is active at all times. This output is routed to the key switch and the left hand control assembly (LHCA) to provide power for lamps, pod, and front hub coils. The second output (ACC_PWR) is enabled by the RUN signal. This second output is used for accessories.

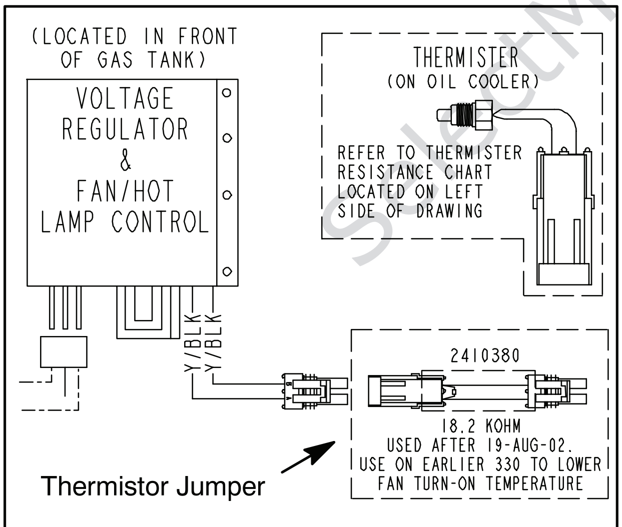
The BAT_PROT output is protected from overloads and short circuits. If a overload or short circuit occurs that output turns off. The output can be reset by removing load from it by turning the key switch or LHCA switch off.

The ACC_PWR switch has a linear current limit. If the maximum output current is exceeded the output voltage will be reduced. If the maximum temperature of the solid-state device is exceeded it will shut off. It will automatically turn back on when it has cooled.



Wire Color	Pin	Description
Orange	A and B	BAT_PROT – Protected battery output used to power the headlight and instrument cluster.
Brown	C and H	GND – Battery Negative
Blue/ White	D	HOT_LAMP – Engine hot signal. Provides a ground path for a lamp.
Red	E and F	BAT+ – Positive side of battery. Both pins should be used to carry current.
Pink	F	Provides +12V When engine is running or cranking.
Red / White	G	RUN – At +12V when ignition switch is on and RUN/OFF switch is RUN.
Orange / Black	J	Signal that enables operation of the fan.
Orange /White	K	ACC_PWR – This signal provides power to the accessories.

2004 MODELS – THERMISTOR JUMPER



NOTE: A thermistor jumper is installed on some 2004 330 engines to modify the thermistor resistance fan 'ON' temperature. When diagnosing fan or overheat issues check this thermistor jumper if installed before testing. Follow the steps in the "OIL COOLER FAN CONTROL TEST".

OIL COOLER FAN CONTROL TEST

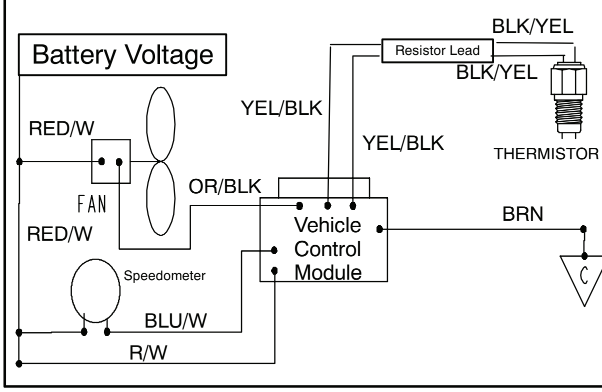
Oil Cooler Fan Notes

- Thermistor resistance decreases with temperature
- Both fan and hot indicator should be on with the thermistor unplugged
- Fan blade should rotate drawing air in through cooler (blowing on engine)

THERMISTOR RESISTANCE VS. TEMPERATURE			
Oil Temperature	Resistance ± 20%	Fan ON/OFF	Hot Light ON/OFF
77° F (25° C)	100KΩ	Fan OFF	OFF
240° F (116° C)	3.5KΩ	Fan OFF	OFF
260° F (127° C)	2.5KΩ	Fan ON	OFF
290° F (143° C)	1.6KΩ	Fan ON	Hot Indicator ON

Oil Cooler Fan Circuit

'HOT' indication and fan 'ON' with resistor leads disconnected from module and key on



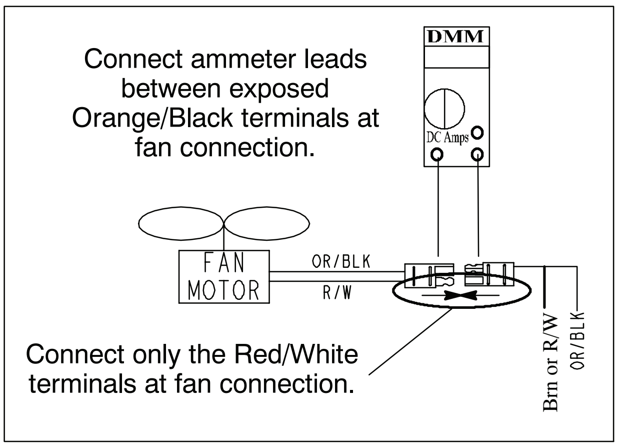
Thermistor / Fan Control Test

- Turn key switch to ON and engine stop switch to RUN. Do not start engine.
- Test voltage on R/W wire at vehicle control module. R/W wire should have 12-14 Volts DC (battery voltage)
- Disconnect thermistor leads **and** resistor jumper from the main harness (Black/Yellow wires) - Fan and Hot

indicator ON? (If not, test speedometer, fan motor and circuit)

- Test the resistance of the thermistor (refer to temperature/resistance table). Replace thermistor if out of specified range. See the wiring diagram or chart for thermistor resistance values at various oil temperatures. The resistance of the thermistor is approximately100kΩ at 77°F.
- Replace vehicle control module and test system if all else appears okay.

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.

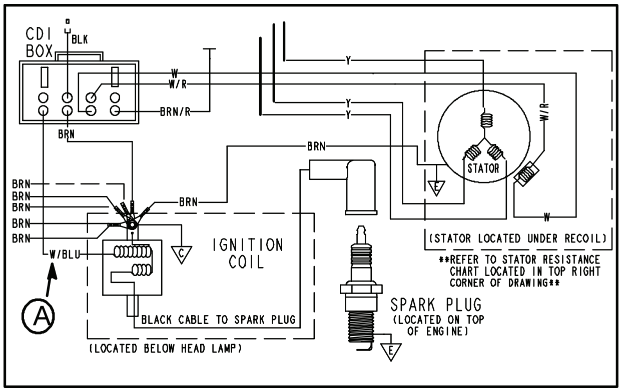
1. Turn key to off.
2. Disconnect the thermistor.
3. Reconnect fan motor connector to place a DC ammeter in series as shown in the Illustration.
4. Be sure fan blade is free to rotate.
5. Turn ignition key and engine stop switch to “ON” position. Read the current draw on ammeter with fan running.
6. If the fan motor draws more than 7.5 Amps, replace the motor.

IGNITION SYSTEM TROUBLESHOOTING

No Spark, Weak or Intermittent Spark

- No12 volt power or ground to CDI
- 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
- 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
- Excessive crankshaft runout on magneto (RH) end - should not exceed .005″
- Faulty CDI module

CDI OUTPUT TEST USING PEAK READING ADAPTOR OR A VOLT METER (330)



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 (A). Crank engine and check output of CDI wire to coil. Reconnect coil wire to CDI.

Test	Connect Meter Wires To:	Reading
CDI Output	White/Blue to Ground	200 Volts DC

Perform this test using a multimeter and with the ATV off. All readings are in ohms.

Test	Connect Meter Wires To:	Reading In Ohms
Pulse Coil	White/Red to White	522 Ω ± 20%
Pulse Coil	White/Red to Ground	Open
Charge Coil	Yellow to Yellow	0.5 Ω ± 20%
Charge Coil	Yellow to Ground	Open

CDI CRANKING OUTPUT TEST (330)

The following peak voltage tests will measure the amount of output directly from each component. A peak reading voltmeter can 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 the detection and pulse (trigger) coil, and compare to the chart. The following measurements were 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.

200 Watt 4 Stroke DC/CDI Ignition

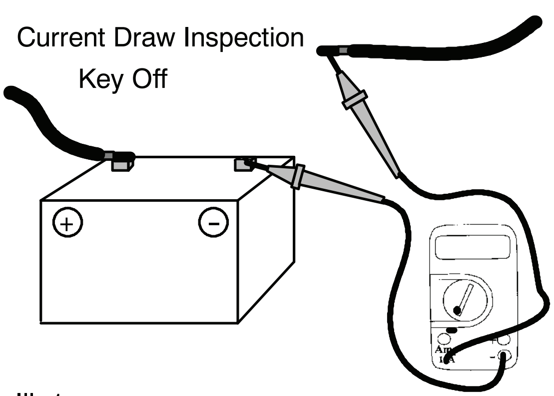
Test	Connect Meter Wires To:	Reading (With VOM)	Reading (With Peak Reading Adapter)
Pulse Coil	White/Red and White	0.15 Volts AC	4.5 Volts DC

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 column.



Ill. 1

Current Draw - Key Off:
Maximum of .01 DCA (10 mA)

CHARGING SYSTEM "BREAK EVEN" TEST

CAUTION: ***Do not allow the battery cables to become disconnected with the engine running. Follow the steps below as outlined to reduce the chance of damage to electrical components.***

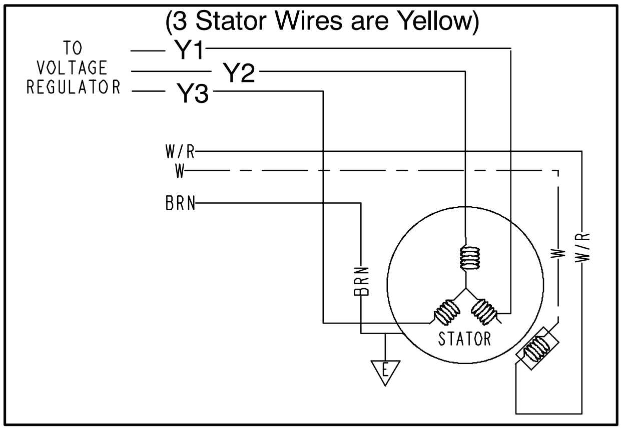
The "break even" point of the charging system is the point at which the alternator overcomes all system loads (lights, etc.) and begins to charge the battery. Depending on battery condition and system load, the break even point may vary slightly. The battery should be fully charged before performing this test.

WARNING: Never start the engine with an ammeter connected in series. Damage to the meter or meter fuse will result. Do not run test for extended period of time. Do not run test with high amperage accessories.

1. Connect a tachometer to the engine.
2. Using an inductive amperage metering device, (set to DC amps) connect to the negative battery cable
3. With engine off and the key, kill switch, and lights in the ON position, the ammeter should read negative amps (battery discharge). Reverse meter lead if a positive reading is indicated.
4. Shift transmission into Park and start the engine. *With the engine running at idle,* observe meter readings.
5. Increase engine RPM while observing ammeter and tachometer.
6. Note RPM at which the battery starts to charge (ammeter indication is positive).
7. With lights and other electrical loads off, the "break even" point should occur at approximately 1500 RPM or lower.
8. With the engine running, turn the lights on and engage parking brake lock to keep brake light on.
9. Repeat test, observing ammeter and tachometer. With lights on, charging should occur at or below 2000 RPM.

ALTERNATOR OUTPUT TEST

Three tests can be performed using a multimeter to determine the condition of the stator (alternator).



TEST 1: Resistance Value of Each Stator Leg

1. Measure the resistance value of each of the three stator legs: Y1 to Y2, Y1 to Y3, and Y2 to Y3. Each should measure **0.50 ohms.**

Test	Connect Meter Wires To:	Reading In Ohms
Charge Coil	Yellow to Yellow	0.50 Ω ± 20%
Charge Coil	Yellow to Ground	Open

2. When measuring any of the Yellow wires to ground, the reading should be infinite (open).

NOTE: If there are any significant variations in ohm's readings between the three legs; it is an indication that one of the three stator legs maybe weak or failed.

TEST 2: Resistance Value of Stator Leg to Ground

1. Measure the resistance value of each of the stator legs to ground: Y1 to Ground, Y2 to Ground, Y3 to Ground.

NOTE: Any measurement other than Infiniti (open) will indicate a failed or shorted stator leg.

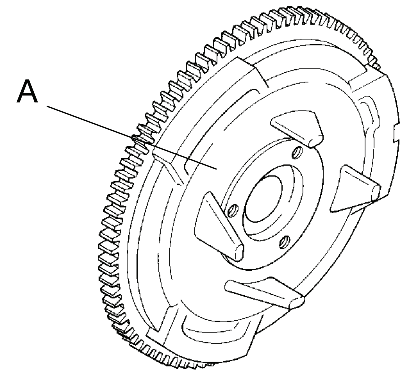
TEST 3: Measure AC Voltage Ouput of Each Stator Leg at Charging RPM

1. Set the selector dial to measure AC Voltage.
2. Start the engine and let it idle.
3. While holding the ATV at a specified RPM, separately measure the voltage across each 'leg' of the stator by connecting the meter leads to the wires leading from the alternator (Y1 to Y2, Y1 to Y3, Y2 to Y3).
4. Refer to the table below for approximate Voltage AC readings according to RPM. Test each leg at the specified RPM in the table. **Example**: The alternator current output reading should be approximately **17 Vac at 1300 RPM between each 'leg'**.

NOTE: If one or more of the stator leg output AC voltage varies significantly from the specified value, the stator may need to be replaced.

ATV RPM Reading	AC Voltage (Vac) Reading
1300	**17 Vac ± 25 %**
3000	**40 Vac ± 25 %**
5000	**65 Vac ± 25 %**

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	Type	Cast	Stamp	Comment	I.D. Stamp
Magnum 330 ES32PFE10	N/A	N/A	N/A	200W	N/A

330 MAGNUM – DC / CDI IGNITION

The Magnum 330 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

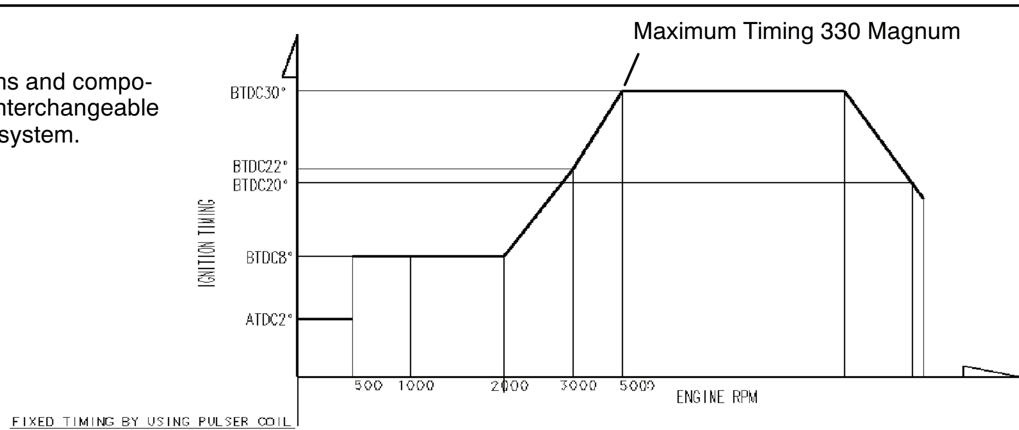
Operation Overview:

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:

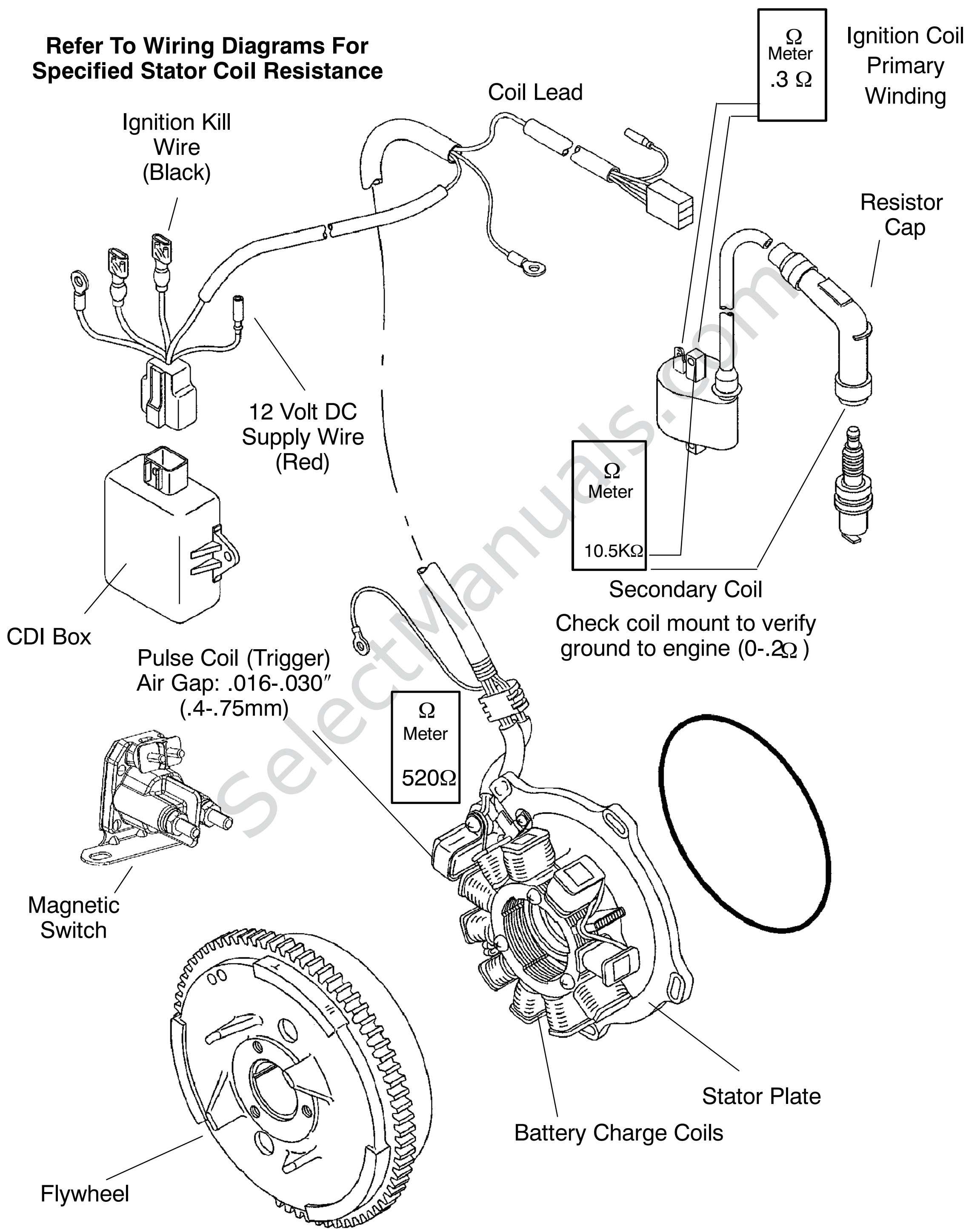
DC/CDI systems and components are not interchangeable with any other system.



COMPONENTS OF ES32PF 200 WATT ALTERNATOR DC/CDI IGNITION

MAGNUM 330 MODELS

Note: DC/CDI components are not compatible with any other type of ignition



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

Replace Spark Plug

Disconnect the black wire at the CDI module to isolate the ignition from the kill system. Verify the CDI has a good ground (Brown) for operation. Does it have spark?

Yes → -Test the ignition switch, engine stop switch, and speed limiter circuit for shorts to ground. -Check connectors for moisture, wire color matching or corrosion.

No ↓

Verify that 12 VDC power is getting to the CDI module. Refer to the wiring schematic for meter connections and specifications. Compare results to the specifications on the exploded views. Are all within specifications?

No → Inspect battery, switches, connectors, and wiring to the component in question. Replace the faulty component if a wiring problem cannot be found.

Yes ↓

Check coil ground connection between engine and coil mount using an ohmmeter. The coil should have good continuity to ground on the engine (0-.2 Ω).

No → Repair ground wire connections.

Yes ↓

Disconnect and check the secondary coil. Resistance values should be:

Primary Side - Primary Wire Tab to Ground (on coil mount or engine): .3 to .5 Ohms

Secondary Side High Tension Wire to High Tension Wire- Cap installed - 10,500Ω
Cap removed - 6300Ω

Are these values within specs?

No → Replace the ignition coil.

Yes ↓

If all of the above tests are within specifications, and all grounds, connections, and wire color coding have been inspected, perform voltage output tests on following page or replace the CDI module.

CHARGING SYSTEM TESTING

Whenever charging system problems are suspected, proceed with the following system check.

Using a multitester set on D.C. volts, measure the battery open circuit voltage. It should be 12.4 volts or more. Is it?

No → Remove the battery and properly service. Reinstall the fully charged battery or a fully charged shop battery.

Yes ↓

Meter Setting: DC Volts

With the transmission in neutral, start the engine and increase RPM to between 3000 and 4000. Read battery voltage with the multitester. Readings should increase to between 13.0 and 14.6 V D.C. Are they?

Yes → Check Key off Current Draw

No ↓

Meter Setting: DC Amps

Perform system **"Break Even Amperage"** test outlined on Page 10.24.

Does charging occur as specified?

Yes → Check for owner modification, and discuss operating habits. The battery will continually discharge if operated below the "Break Even" RPM. Continued problems would call for battery inspection.

No ↓

Ohm stator wires (Y) If bad replace, if good, continue with alternator output test.

Meter Setting: AC Amps

Disconnect the Yellow wires from the regulator/rectifier. Using a multitester, perform an **Alternator Output (AC amp) test**. See test procedure on Page 10.25 for procedure.

Is output above 5 amps?

No → Inspect the wiring harness between the panel and the stator for damage. If no damage is found, remove the recoil and flywheel. Inspect the flywheel magnets, stator coils and stator wire harness for damage. Repair or replace any damaged components.

Yes ↓

Meter Setting: DC Volts

Reconnect the alternator wires. Note: Red wire must be connected to harness. Battery voltage must be present on red wire terminal on harness side of voltage regulator connector.

Is it?

No → Check regulator/rectifier connections and ground, battery connections, circuit breaker and connecting wires. Repair or replace faulty wiring or components.

Yes ↓

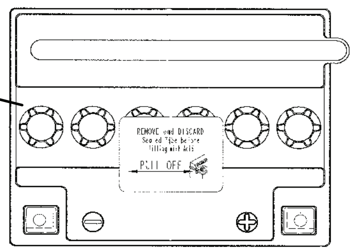
If all of the previous tests indicate a good condition, but the charging voltage does not rise above battery voltage at the connector or terminal board, replace the voltage regulator.

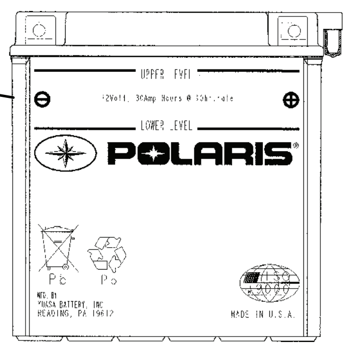
BATTERY IDENTIFICATION

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.

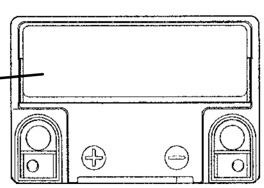
Your ATV may have a Conventional Battery or a Sealed Low Maintenance Battery. To identify which type of battery your ATV has, refer to the illustration below and follow the correct service and charging procedures that follow in the manual.

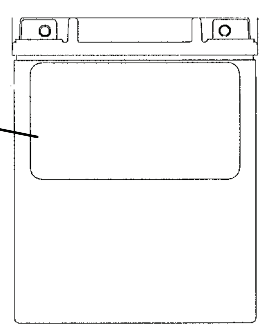
CONVENTIONAL BATTERY





SEALED LOW MAINTENANCE BATTERY





INITIAL BATTERY ACTIVATION

⚠WARNING

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

External: Flush with water.

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

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

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

WARNING: The gases given off by a battery are explosive. Any spark or open flame near a battery can cause an explosion which will spray battery acid on anyone close to it. Should battery acid spill, wash the affected area with large quantities of cool water and seek immediate medical attention.

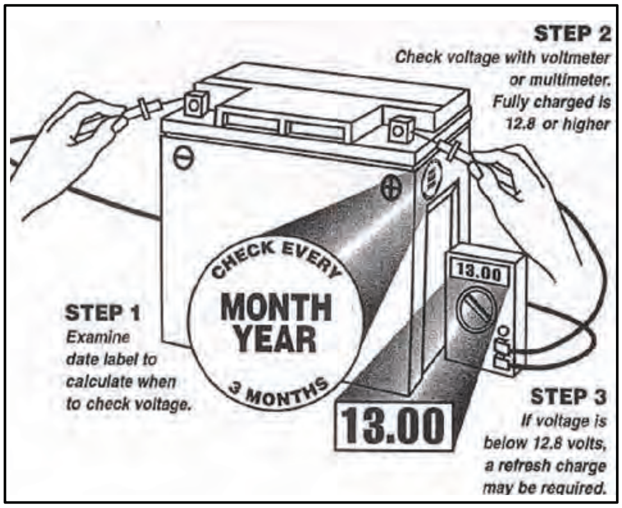
NOTE: All Magnum ATV batteries are Low Maintenance design and construction. All Low Maintenance batteries are fully charged and tested at the factory before installation. Expected shelf life is 6-8 months depending on storage conditions. As a general rule before placing the battery into service, check the battery condition and charge accordingly . Low Maintenance batteries should be charged anytime the voltage drops below 12.5 VDC.

SEALED 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 batter 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.

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.

SEALED 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.

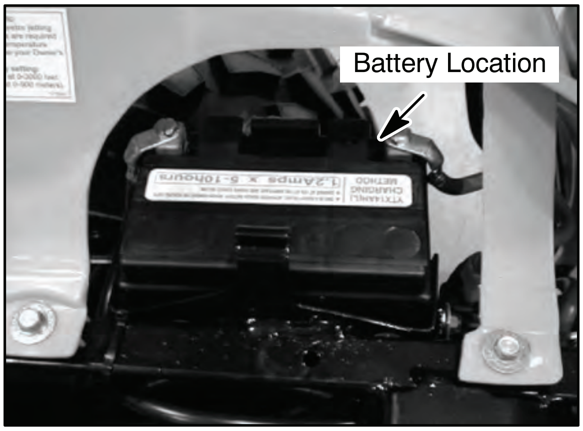
WARNING: An overheated battery could explode, causing severe injury or death. Always watch charging times carefully. Stop charging if the battery becomes very warm to the touch. Allow it to cool before resuming charging.

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

SEALED LOW MAINTENANCE BATTERY INSPECTION/ REMOVAL

The battery is located under the seat and right rear fender.



1. Disconnect holder strap and remove cover.
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.

SEALED 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.

SEALED 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.

SEALED 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.

SEALED 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.

SEALED 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.
- Charge at a rate no greater than 1/10 of the battery's amp/hr capacity until the voltage reaches 13.0VDC 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 up to 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

SEALED 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 voltage to 12.8VDC 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.

CONVENTIONAL BATTERY ACTIVATION/ SERVICE

To ensure maximum service life and performance from a battery, perform the following steps.

NOTE: This section contains information for both Conventional Lead-Acid batteries and Sealed Low Maintenance batteries. Before service, identify the battery type in the vehicle. Use the section that applies to the battery.

⚠WARNING

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

External: Flush with water.

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

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

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

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.

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:

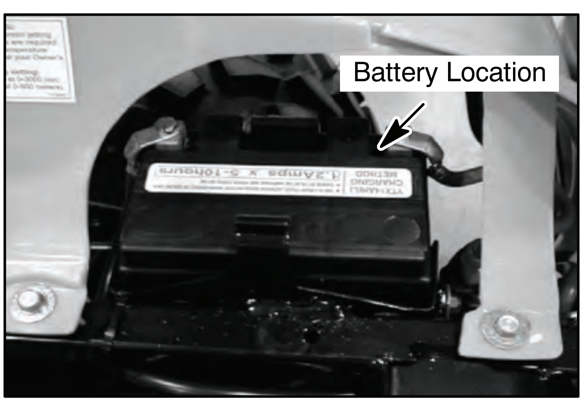
1. Remove vent plug from vent fitting. Remove cell caps.
2. Fill battery with electrolyte to upper level marks on case.
3. Set battery aside to allow for acid absorption and stabilization for 30 minutes.
4. Add electrolyte to bring level back to upper level mark on case. **NOTE:** This is the last time 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

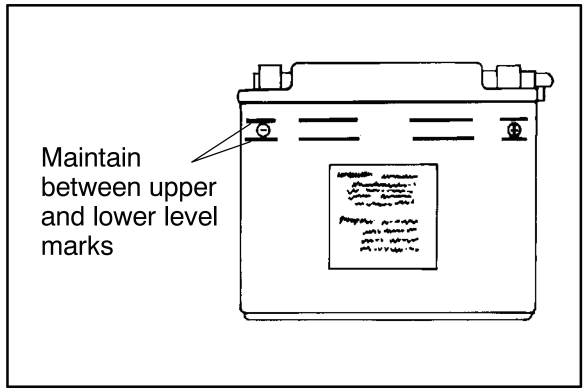
Use Polaris corrosion resistant Nyogel™ grease (**PN 2871329**) on battery bolts. See "BATTERY INSTALLATION" in this chapter.

CONVENTIONAL BATTERY INSPECTION/REMOVAL

The battery is located under the seat and right rear fender.



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.

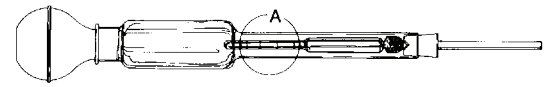
CONVENTIONAL BATTERY OCV - OPEN CIRCUIT VOLTAGE TEST

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.

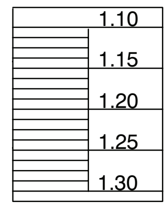
CONVENTIONAL BATTERY SPECIFIC GRAVITY TEST

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)**

Detail A



OPEN CIRCUIT VOLTAGE		
State of charge	Conventional Lead-acid	YuMicron™ Type
100%	12.60V	12.70V
Charged	12.40V	12.50V
75% Charged	12.10V	12.20V
50% Charged	11.90V	12.0V
25% Charged	less than	less than 11.9V
0% Charged	11.80V	

SPECIFIC GRAVITY		
State of charge*	Conventional lead-acid	YuMicron™ Type
100%	1.265	1.275
Charged	1.210	1.225
75% Charged	1.160	1.175
50% Charged	1.120	1.135
25% Charged	less than 1.100	less than 1.115
0% Charged		

* At 80°F

NOTE: Subtract .01 from the specific gravity reading at 40° F.

CONVENTIONAL 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.

CONVENTIONAL 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: Stored batteries can lose their charge at the rate of up to1% 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

CONVENTIONAL 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 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.

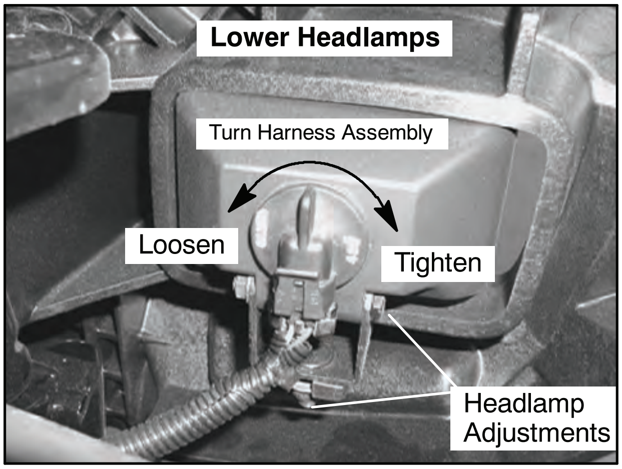
⚠ WARNING

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.

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

LOWER HEADLAMP REMOVAL/INSTALLATION



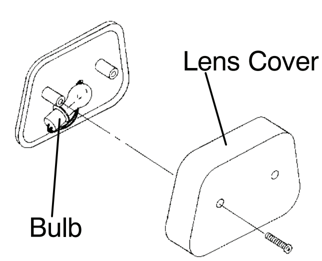
1. Turn the back of the headlight harness in a counter-clockwise direction to loosen.
2. Pull the harness assembly out from the headlight assembly.
3. Remove the headlamp and replace with a new headlamp.
4. Install the new headlamp and harness assembly into the headlight assembly. Turn the headlight 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

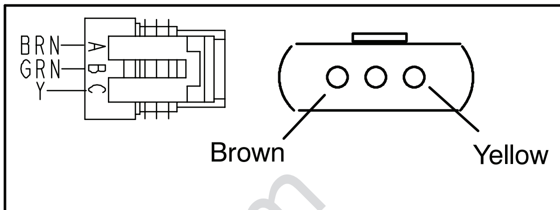
If the taillight/brakelight does not work the lamp may need to be replaced.



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 Nyogel™ Grease **(PN 2871329)**.
3. Reinstall the lens cover removed in step 1.
4. Test the taillight/brakelight to see it is working.

HEADLAMP SWITCH

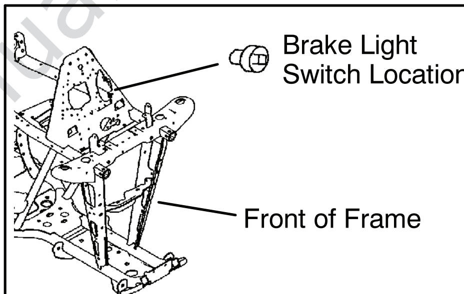
Probe the headlamp plug wires (Brown and Yellow) at back of connector. Turn headlight on. Test for battery voltage across the connections.

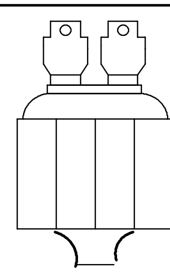


Headlamp Plug Wires

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.

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?)
- **NOTE:** The Magnum 330 will not pull start or key start if the battery is disconnected or completely dead.

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
- Automatic compression release inoperative

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.

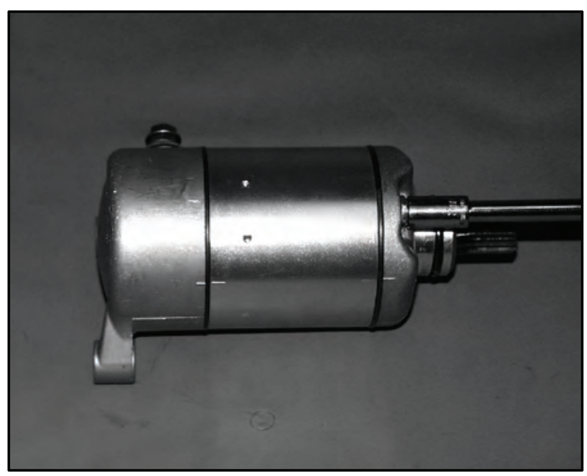
To perform the test, place the meter on DC volts and place the meter leads across the connection to be tested. Refer to the chart on 10.27 to perform voltage drop tests on the starter system.

Voltage should not exceed .1 DC volts per connection

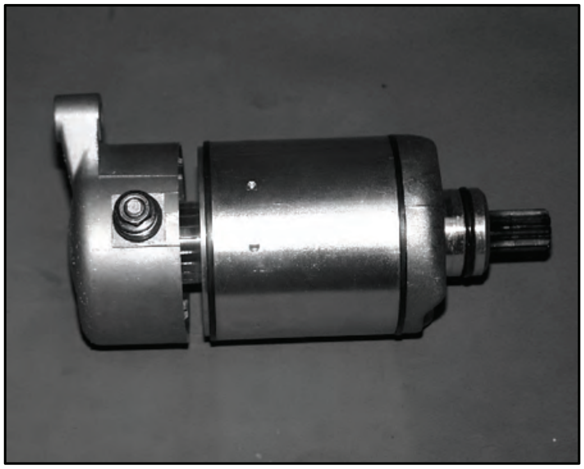
STARTER MOTOR DISASSEMBLY

NOTE: Use only electrical contact cleaner to clean starter motor parts. Some solvents may leave a residue or damage internal parts and insulation.

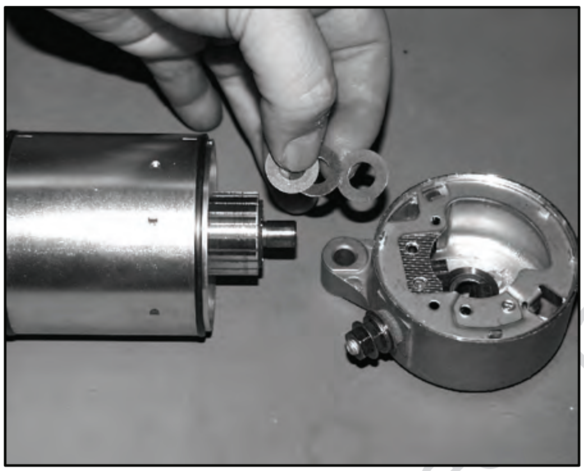
1. Note the alignment marks on both ends of the starter motor casing. These marks must align during reassembly.



2. Remove the two bolts, washers, and sealing O-Rings. Inspect O-Rings and replace if damaged.

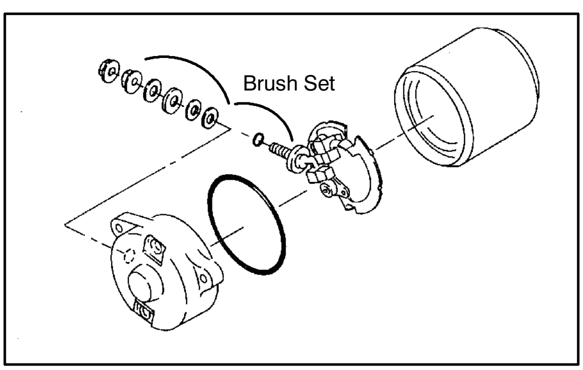


3. Remove brush terminal end of housing while holding other two sections together.

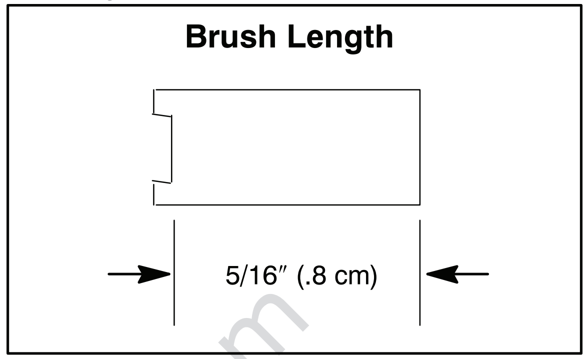


4. Remove shims from armature shaft. **NOTE:** All shims must be replaced during reassembly.

BRUSH INSPECTION/REPLACEMENT

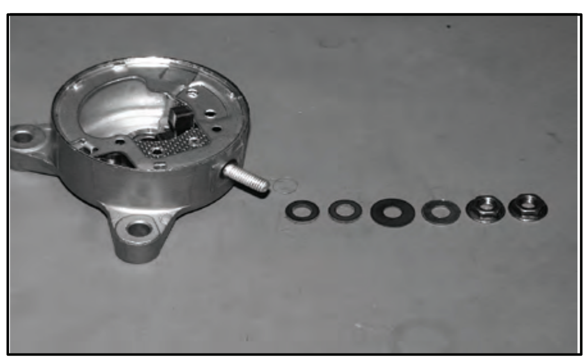


1. Using a digital multitester, measure the resistance between the cable terminal and the insulated brush. The reading should be .3 ohms or less.
2. Measure the resistance between the cable terminal and brush housing. Make sure the brush is not touching the case. The reading should be infinite.
3. Remove nut, flat washer, large phenolic washer, two small phenolic washers, and O-Ring from brush terminal. Inspect the O-Ring and replace if damaged.



Brush Length Service Limit:
5/16″ (.8 cm)

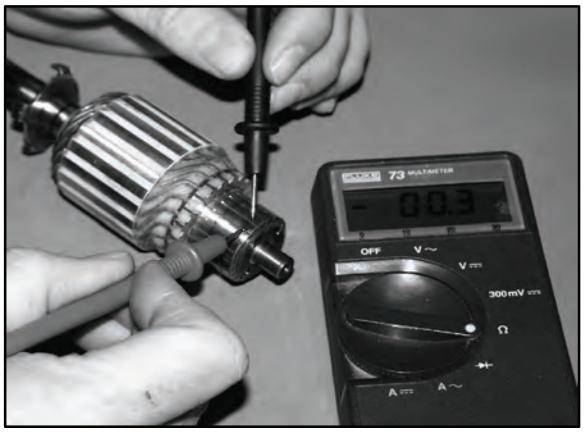
4. Remove brush plate and brushes. Measure length of brushes and replace if worn past the service limit. Replace springs if they are discolored or have inadequate tension.
5. Inspect surface of commutator for wear or discoloration. See Steps 3-6 of armature testing on Page 10.40.
6. Install a new carbon brush assembly in the brush housing. **NOTE:** Be sure that the terminal bolt insulating washer is properly seated in the housing, and the tab on the brush plate engages the notch in the brush plate housing.
7. Place a wrap of electrical tape on the threads of the terminal bolt to prevent O-Ring damage during reinstallation.
8. Install the O-Ring over the bolt. Make sure the O-ring is fully seated.



9. Remove the electrical tape and reinstall the two small phenolic washers, the large phenolic washer, flat washer, and nut.

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.

STARTER ASSEMBLY

1. Place armature in field magnet casing.
2. Place shims on drive end of armature shaft with phenolic washer outermost on shaft. Engage tabs of stationary washer in drive end housing, holding it in place with a light film of grease.
3. Install case sealing O-Ring. Make sure O-Ring is in good condition and not twisted on the case. Lubricate needle bearing and oil seal with a light film of grease, and install housing, aligning marks.
4. Install O-Ring on other end of field magnet casing. Make sure it is in good condition and not twisted on the case.
5. Align casing marks and install housing, pushing back brushes while installing shaft in bushing.
6. Reinstall starter motor housing bolts.
   Make sure O-Rings are in good condition and seated in groove.
7. Inspect permanent magnets in starter housing. Make sure they are not cracked or separated from housing.

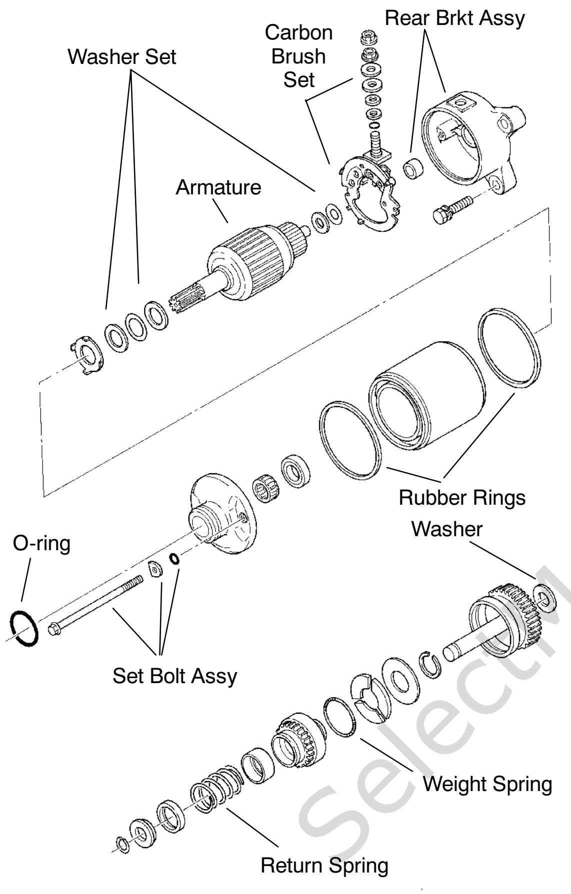
CAUTION: Use care when handling starter housing. Do not drop or strike the housing as magnet damage is possible. If magnets are damaged, starter must be replaced.

STARTER DRIVE

Pinion Gear - Anti Kick-out Shoe, Garter Spring Replacement

If the garter spring is damaged, the overrun clutch may fail to return properly. The replacement spring is **(PN 7042039)**. Use either of the following methods to remove and install a new garter spring.

Starter Motor Exploded View



- Method 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.
- Remove the lock ring, end 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 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 White/Red engagement coil wire from the starter solenoid. Connect tester black wire to battery ground. Connect red tester lead to White/Red 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 key switch turned to "Start". Replace the defective component.

Yes → Test starter solenoid coil by connecting an ohmmeter between the solenoid red 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 10.38 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

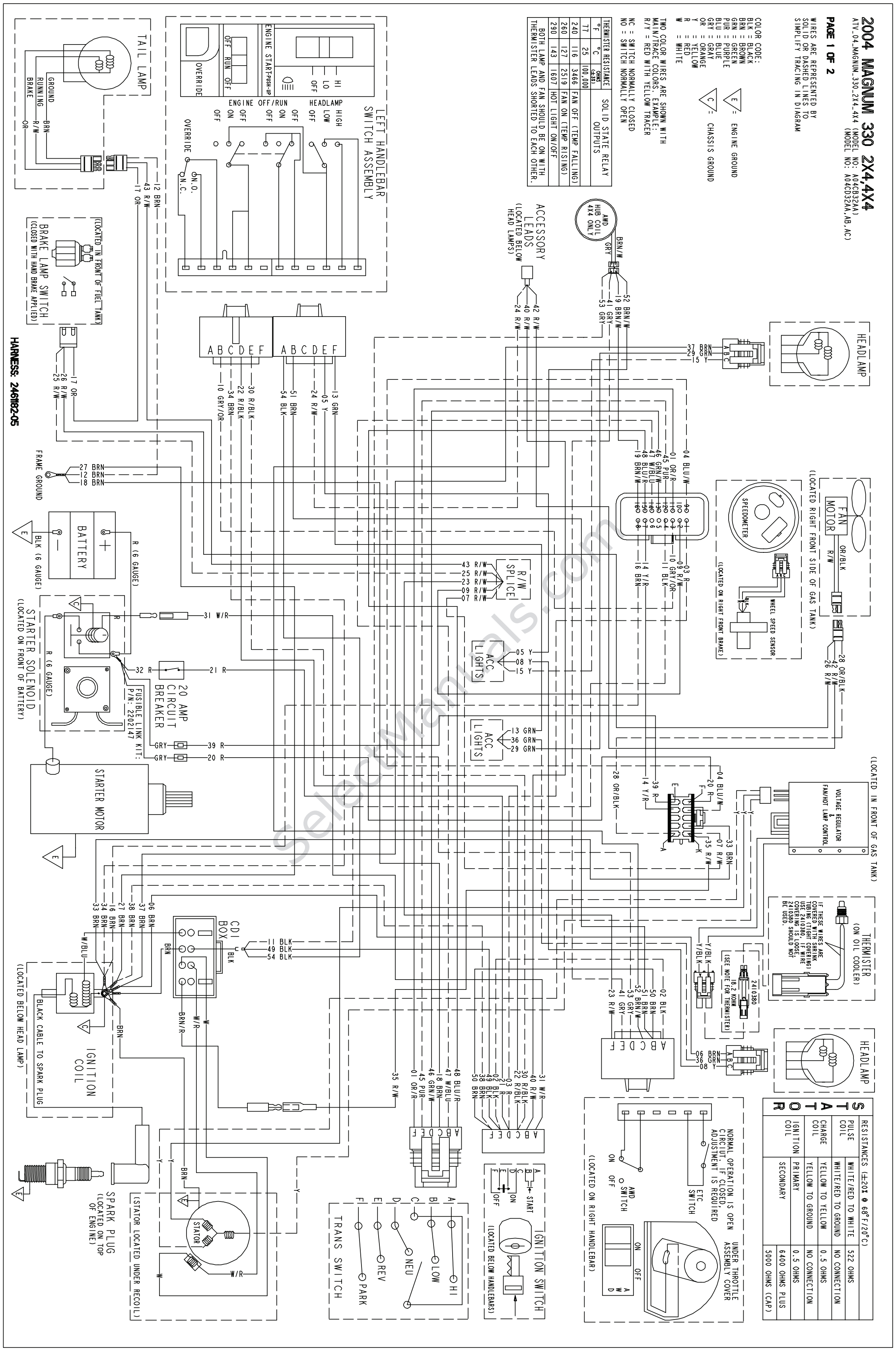
Connect the black tester lead to the solenoid end of the solenoid-to-starter cable. Connect the red tester lead to the starter end of the same cable. Depress the starter button. The reading should be less than .1 V D.C.

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 2004 MAGNUM 330 2X4/4X4 (DOMESTIC)



WIRING DIAGRAM 2004 MAGNUM 330 2X4/4X4 (DOMESTIC)

2004 MAGNUM 330 2X4,4X4
ATV_04_MAGNUM_330_2X4_4X4 (MODEL NO: A04CB32AA)
(MODEL NO: A04CD32AA,AB,AC)

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WIRE TERMINATION TABLE

REF #	COLOR	GUAGE	FROM CONNECTOR	TO CONNECTOR
01	ORANGE/RED	20	SPEEDOMETER	TRANS SWITCH
02	BLACK	20	ETC AND AWD SWITCH	IGNITION SWITCH
03	RED	20	IGNITION SWITCH	SPEEDOMETER
04	BLUE/WHITE	20	SPEEDOMETER	ECM
05	YELLOW	18	LIGHT ACCESSORIES	LH HANDLEBAR
06	BROWN	18	GROUND	RH HEADLIGHT
07	RED/WHITE	20	ECM	R/W SPLICE
08	YELLOW	18	LIGHT ACCESSORIES	RH HEADLIGHT
09	RED/WHITE	20	R/W SPLICE	SPEEDOMETER
10	GREY/ORANGE	20	SPEEDOMETER	LH HANDLEBAR
11	BLACK	20	SPEEDOMETER	CDI
12	BROWN	18	TAILLIGHT	FRAME GROUND
13	GREEN	18	LH HANDLEBAR	LIGHT ACCESSORIES
14	YELLOW/RED	20	ECM	SPEEDOMETER
15	YELLOW	18	LIGHT ACCESSORIES	LH HEADLIGHT
16	BROWN	20	SPEEDOMETER	COIL GROUND
17	ORANGE	18	TAILLIGHT	BRAKE LIGHT SENSOR
18	BROWN	20	FRAME GROUND	TRANS SWITCH
19	BROWN/WHITE	20	SPEEDOMETER	HUB COIL
20	RED	16	SOLENOID BATTERY (+)	ECM
21	RED	16	IGNITION SWITCH	CIRCUIT BREAKER
22	RED/BLACK	18	LH HANDLEBAR	IGNITION SWITCH
23	RED/WHITE	18	ETC AND AWD SWITCH	R/W SPLICE
24	RED/WHITE	16	R/W ACCESSORIES #1	LH HANDLEBAR
25	RED/WHITE	16	R/W SPLICE	BRAKE LIGHT SENSOR
26	RED/WHITE	16	FAN MOTOR	BRAKE LIGHT SENSOR
27	BROWN	12	FRAME GROUND	COIL GROUND
28	ORANGE/BLACK	18	FAN MOTOR	ECM
29	GREEN	18	LIGHT ACCESSORIES	LH HEADLIGHT
30	RED/BLACK	18	IGNITION SWITCH	LH HANDLEBAR
31	WHITE/RED	18	SOLENOID	IGNITION SWITCH
32	RED	16	CIRCUIT BREAKER	SOLENOID BATTERY (+)
33	BROWN	16	ECM	COIL GROUND
34	BROWN	18	LH HANDLEBAR	COIL GROUND
35	RED/WHITE	20	ECM	CDI
36	GREEN	18	LIGHT ACCESSORIES	RH HEADLIGHT
37	BROWN	18	GROUND	LH HEADLIGHT
38	BROWN	18	GROUND	IGNITION SWITCH
39	RED	16	ECM	SOLENOID BATTERY (+)
40	RED/WHITE	18	R/W ACCESSORIES #1	IGNITION SWITCH
41	GRAY	18	ETC AND AWD SWITCH	HUB COIL
42	RED/WHITE	16	R/W ACCESSORIES #1	FAN MOTOR
43	RED/WHITE	18	R/W SPLICE	TAILLIGHT
44	-		-	-
45	PURPLE	20	SPEEDOMETER	TRANS SWITCH
46	GREEN/WHITE	20	SPEEDOMETER	TRANS SWITCH
47	WHITE/BLUE	20	SPEEDOMETER	TRANS SWITCH
48	BLUE/RED	20	SPEEDOMETER	TRANS SWITCH
49	BLACK	20	IGNITION SWITCH	CDI
50	BROWN	20	IGNITION SWITCH	ETC AND AWD SWITCH
51	BROWN	20	LH HANDLEBAR	ETC AND AWD SWITCH
52	BROWN/WHITE	18	HUB COIL	ETC AND AWD SWITCH
53	GRAY	18	HUB COIL	ETC AND AWD SWITCH
54	BLACK	20	LH HANDLEBAR	CDI

NOTES:

WIRING DIAGRAM 2004 MAGNUM 330 HDS 2X4/4X4 (INTERNATIONAL)

2004 MAGNUM 330 2X4/4X4 HDS VL

ATV_04_MAGNUM_330_HDS_VL (MODEL NO: A04CB32FC)
(MODEL NO: A04CD32FB)

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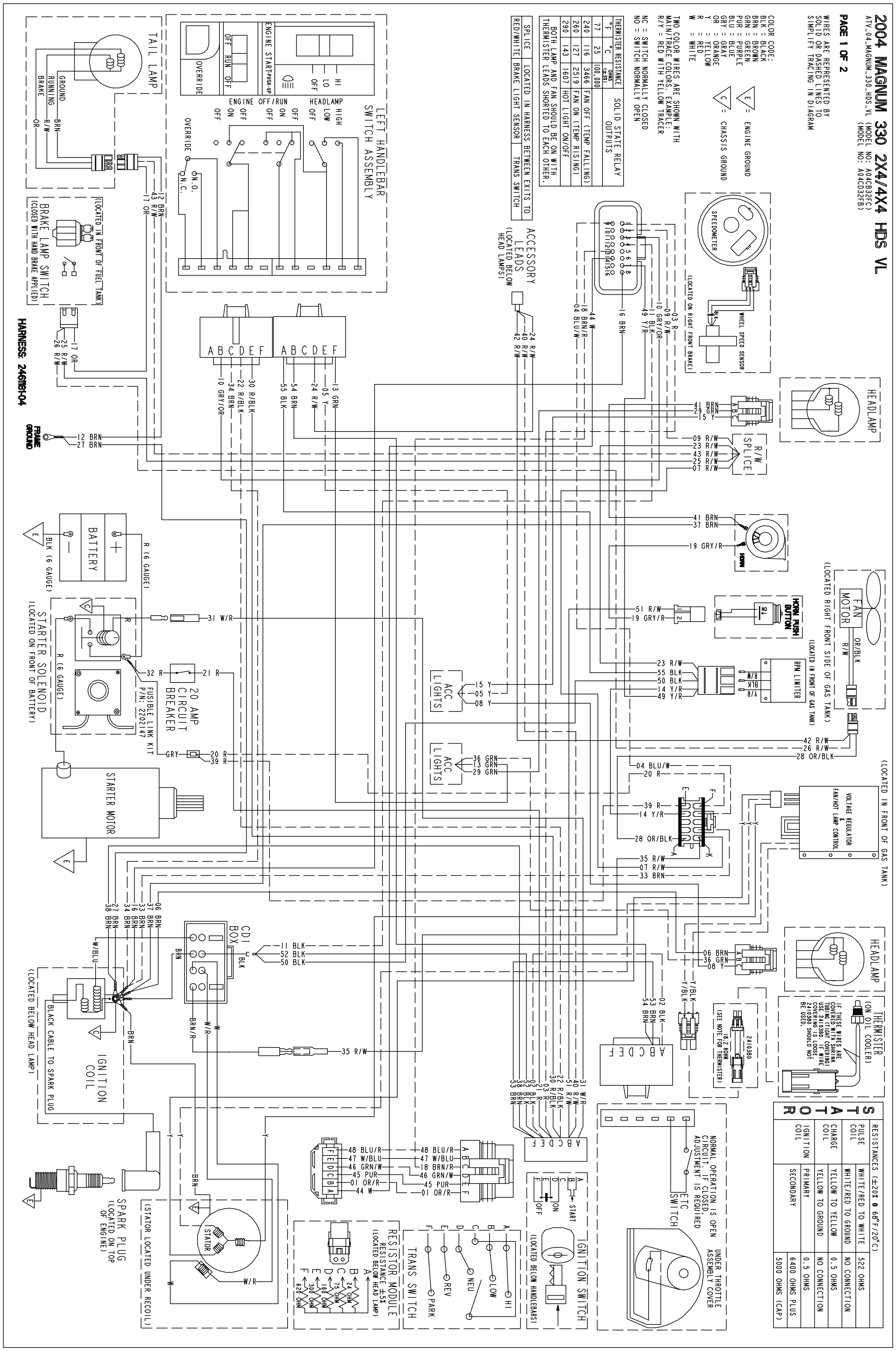
WIRE TERMINATION TABLE

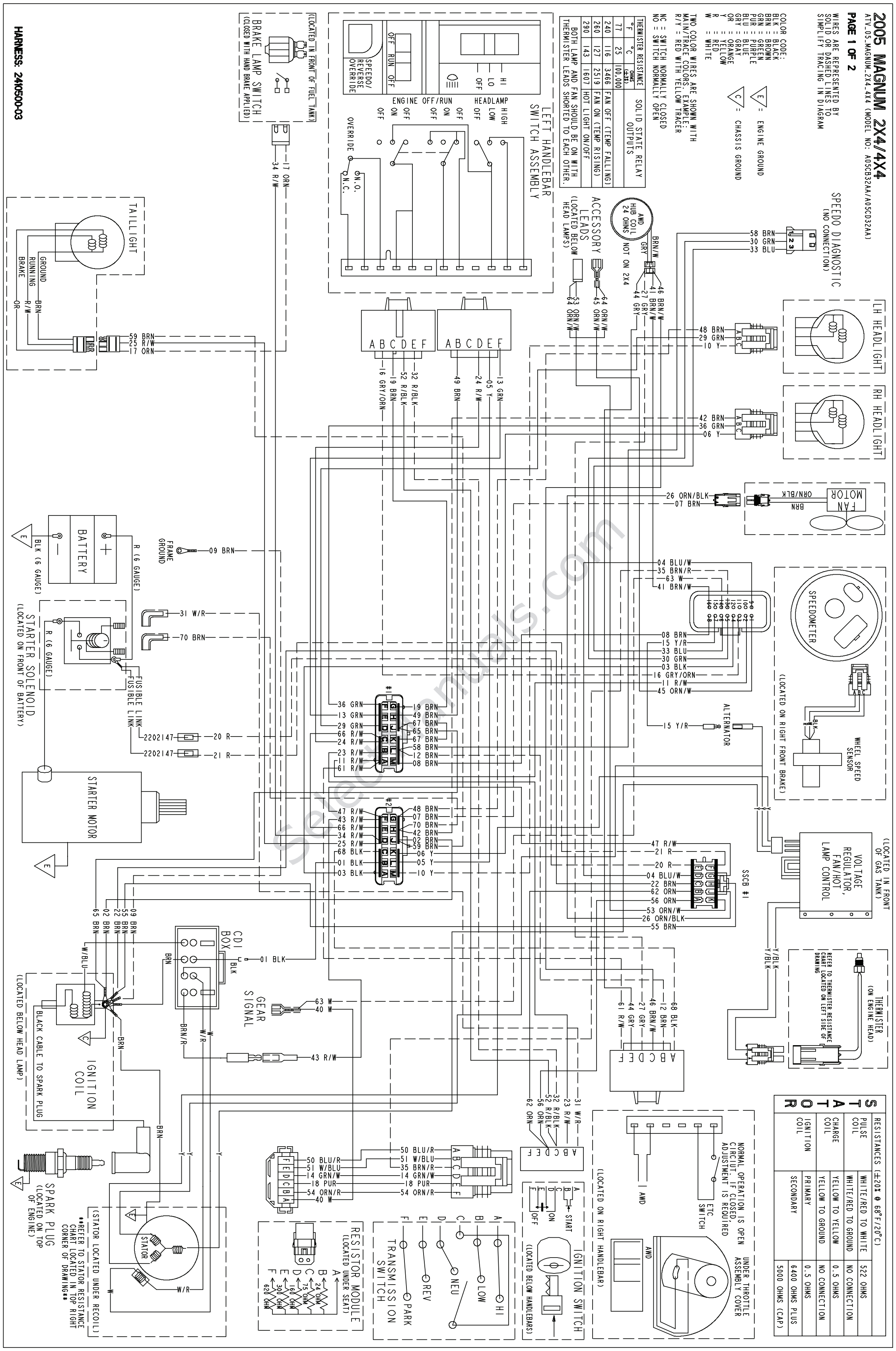
REF #	COLOR	GUAGE	FROM CONNECTOR	TO CONNECTOR
01	ORANGE/RED	18	RESISTOR MODULE	TRANS SWITCH
02	BLACK	20	ETC AND AWD SWITCH	IGNITION SWITCH
03	RED	20	IGNITION SWITCH	SPEEDOMETER
04	BLUE/WHITE	20	SPEEDOMETER	ECM
05	YELLOW	18	LIGHT ACCESSORIES	LH HANDLEBAR
06	BROWN	18	GROUND	RH HEADLIGHT
07	RED/WHITE	20	ECM	R/W SPLICE
08	YELLOW	18	LIGHT ACCESSORIES	RH HEADLIGHT
09	RED/WHITE	20	R/W SPLICE	SPEEDOMETER
10	GREY/ORANGE	20	SPEEDOMETER	LH HANDLEBAR
11	BLACK	20	SPEEDOMETER	CDI
12	BROWN	18	TAILLIGHT	FRAME GROUND
13	GREEN	18	LH HANDLEBAR	LIGHT ACCESSORIES
14	YELLOW/RED	20	ECM	RPM LIMITER
15	YELLOW	18	LIGHT ACCESSORIES	LH HEADLIGHT
16	BROWN	20	SPEEDOMETER	GROUND
17	ORANGE	18	TAILLIGHT	BRAKE LIGHT SENSOR
18	BROWN/RED	20	SPEEDOMETER	TRANS SWITCH
19	GREY/RED	18	HORN	HORN SWITCH
20	RED	18	SOLENOID BATTERY (+)	ECM
21	RED	16	IGNITION SWITCH	CIRCUIT BREAKER
22	RED/BLACK	18	LH HANDLEBAR	IGNITION SWITCH
23	RED/WHITE	18	RPM LIMITER	R/W SPLICE
24	RED/WHITE	16	R/W ACCESSORIES #1	LH HANDLEBAR
25	RED/WHITE	16	R/W SPLICE	BRAKE LIGHT SENSOR
26	RED/WHITE	16	FAN MOTOR	BRAKE LIGHT SENSOR
27	BROWN	12	FRAME GROUND	COIL GROUND
28	ORANGE/BLACK	18	FAN MOTOR	ECM
29	GREEN	18	LIGHT ACCESSORIES	LH HEADLIGHT
30	RED/BLACK	18	IGNITION SWITCH	LH HANDLEBAR
31	WHITE/RED	18	SOLENOID	IGNITION SWITCH
32	RED	16	CIRCUIT BREAKER	SOLENOID BATTERY (+)
33	BROWN	16	ECM	COIL GROUND
34	BROWN	18	LH HANDLEBAR	COIL GROUND
35	RED/WHITE	20	ECM	CDI
36	GREEN	18	LIGHT ACCESSORIES	RH HEADLIGHT
37	BROWN	18	GROUND	HORN
38	BROWN	18	GROUND	IGNITION SWITCH
39	RED	18	ECM	SOLENOID BATTERY (+)
40	RED/WHITE	18	R/W ACCESSORIES #1	IGNITION SWITCH
41	BROWN	18	HORN	LH HEADLIGHT
42	RED/WHITE	16	R/W ACCESSORIES #1	FAN MOTOR
43	RED/WHITE	18	R/W SPLICE	TAILLIGHT
44	WHITE	20	RESISTOR MODULE	SPEEDOMETER
45	PURPLE	18	RESISTOR MODULE	TRANS SWITCH
46	GREEN/WHITE	18	RESISTOR MODULE	TRANS SWITCH
47	WHITE/BLUE	18	RESISTOR MODULE	TRANS SWITCH
48	BLUE/RED	18	RESISTOR MODULE	TRANS SWITCH
49	YELLOW/RED	18	RPM LIMITER	SPEEDOMETER
50	BLACK	18	RPM LIMITER	CDI
51	RED/WHITE	18	HORN SWITCH	IGNITION SWITCH
52	BLACK	20	CDI	IGNITION SWITCH
53	BROWN	20	ETC AND AWD SWITCH	IGNITION SWITCH
54	BROWN	20	ETC AND AWD SWITCH	LH HANDLEBAR
55	BLACK	20	LH HANDLEBAR	RPM LIMITER

NOTES:

WIRING DIAGRAM 2004 MAGNUM 330 2X4/4X4 HDS (INTERNATIONAL)



WIRING DIAGRAM 2005 MAGNUM 330 2X4/4X4



WIRING DIAGRAM 2005 MAGNUM 330 2X4/4X4

2005 MAGNUM 2X4/4X4

ATV_05_MAGNUM_2X4_4X4 (MODEL NO:A05CB32AA/A05CD32AA

PAGE 2 OF 2

WIRE TERMINATION TABLE

REF #	COLOR	GAUGE	FROM CONNECTOR	TO CONNECTOR
01	BLACK	20	CDI STOP WIRE	SPLICE #2
02	BROWN	16	GROUND	SPLICE #2
03	BLACK	20	SPEEDOMETER	SPLICE #2
04	BLUE/WHITE	20	SPEEDOMETER	SSCB #1
05	YELLOW	18	LH HANDLEBAR	SPLICE #2
06	YELLOW	18	RH HEADLIGHT	SPLICE #2
07	BROWN	18	FAN MOTOR	SPLICE #2
08	BROWN	20	SPEEDOMETER	SPLICE #1
09	BROWN	14	GROUND	FRAME GROUND
10	YELLOW	18	LH HEADLIGHT	SPLICE #2
11	RED/WHITE	20	SPEEDOMETER	SPLICE #1
12	BROWN	20	ETC AND AWD SWITCH	SPLICE #1
13	GREEN	18	LH HANDLEBAR	SPLICE #1
14	GREEN/WHITE	18	TRANS SWITCH	RESISTOR MODULE
15	YELLOW/RED	20	ALTERNATOR	SPEEDOMETER
16	GRAY/ORANGE	20	SPEEDOMETER	LH HANDLEBAR
17	ORANGE	18	TAILLIGHT	BRAKE LIGHT SENSOR
18	PURPLE	18	TRANS SWITCH	RESISTOR MODULE
19	BROWN	18	LH HANDLEBAR	SPLICE #1
20	RED	16	FUSIBLE LINK	SSCB #1
21	RED	16	FUSIBLE LINK	SSCB #1
22	BROWN	18	SSCB #1	GROUND
23	RED/WHITE	18	IGNITION SWITCH	SPLICE #1
24	RED/WHITE	16	LH HANDLEBAR	SPLICE #1
25	RED/WHITE	18	TAILLIGHT	SPLICE #2
26	ORANGE/BLACK	16	SSCB #1	FAN MOTOR
27	GRAY	20	ETC AND AWD SWITCH	HUB COIL
29	GREEN	18	LH HEADLIGHT	SPLICE #1
30	GREEN	20	SPEEDOMETER	SPEEDO DIAGNOSTIC
31	WHITE/RED	18	START SOLENOID	IGNITION SWITCH
32	RED/BLACK	18	IGNITION SWITCH	LH HANDLEBAR
33	BLUE	20	SPEEDOMETER	SPEEDO DIAGNOSTIC
34	RED/WHITE	18	BRAKE LIGHT SENSOR	SPLICE #2
35	BROWN/RED	20	SPEEDOMETER	TRANS SWITCH
36	GREEN	18	RH HEADLIGHT	SPLICE #1
40	WHITE	20	GEAR SIGNAL	RESISTOR MODULE
41	BROWN/WHITE	20	SPEEDOMETER	HUB COIL
42	BROWN	18	RH HEADLIGHT	SPLICE #2
43	RED/WHITE	18	CDI	SPLICE #2
44	GRAY	20	ETC AND AWD SWITCH	HUB COIL
45	ORANGE/WHITE	20	SPEEDOMETER	ACC #1
46	BROWN/WHITE	20	ETC AND AWD SWITCH	HUB COIL
47	RED/WHITE	18	SSCB #1	SPLICE #2
48	BROWN	18	LH HEADLIGHT	SPLICE #2
49	BROWN	18	LH HANDLEBAR	SPLICE #1
50	BLUE/RED	18	TRANS SWITCH	RESISTOR MODULE
51	WHITE/BLUE	18	TRANS SWITCH	RESISTOR MODULE
52	RED/BLACK	18	IGNITION SWITCH	LH HANDLEBAR
53	ORANGE/WHITE	18	ACC #2	SSCB #1
54	ORANGE/RED	18	TRANS SWITCH	RESISTOR MODULE
55	BROWN	18	GROUND	SSCB #1
56	ORANGE	18	IGNITION SWITCH	SSCB #1
58	BROWN	20	SPEEDO DIAGNOSTIC	SPLICE #1
59	BROWN	16	TAILLIGHT	SPLICE #2
61	RED/WHITE	20	ETC AND AWD SWITCH	SPLICE #1
62	ORANGE	18	IGNITION SWITCH	SSCB #1
63	WHITE	20	SPEEDOMETER	GEAR SIGNAL
64	ORANGE/WHITE	18	ACC #1	ACC #2
65	BROWN	16	GROUND	SPLICE #1
66	RED/WHITE	16	SPLICE #1	SPLICE #2
67	BROWN	16	SPLICE #1	SPLICE #1
68	BLACK	20	ETC AND AWD SWITCH	SPLICE #2
70	BROWN	18	START SOLENOID	SPLICE #2

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