CHAPTER 1
GENERAL INFORMATION

1

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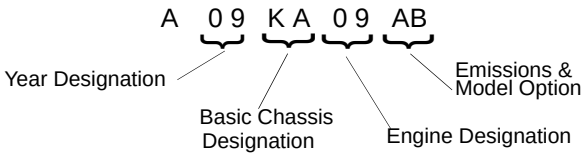
MODEL INFORMATION

Model Identification

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

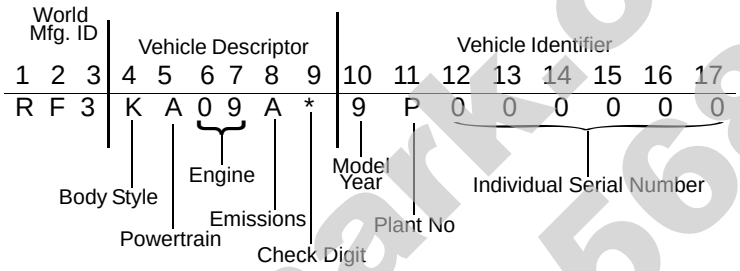
Machine Model Number Identification



Engine Designation Numbers

50cc Model: M10A - Single Cylinder, Air Cooled, SOHC, 4-Stroke, Electric Start
90cc Model: H18S - Single Cylinder, Air Cooled, SOHC, 4-Stroke, Electric Start

VIN Identification



* This could be either a number or a letter

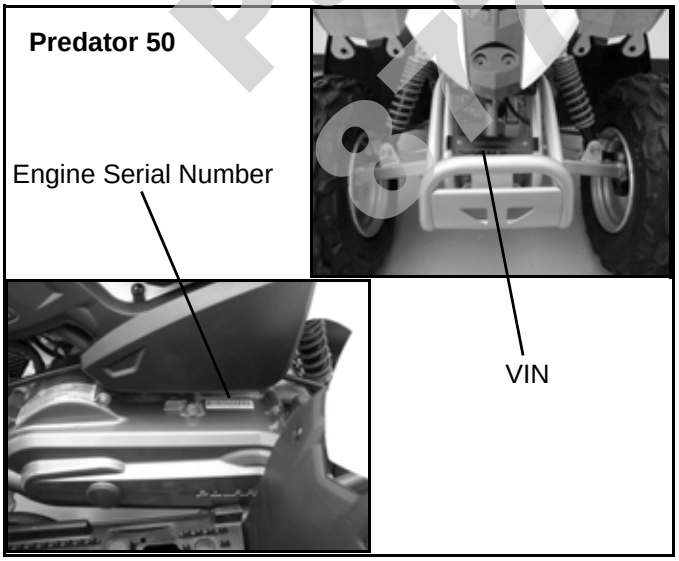
Engine Serial Number Location

Whenever corresponding about an engine, be sure to refer to the engine serial number. This information can be found stamped on the top LH side of the crankcase as shown below.

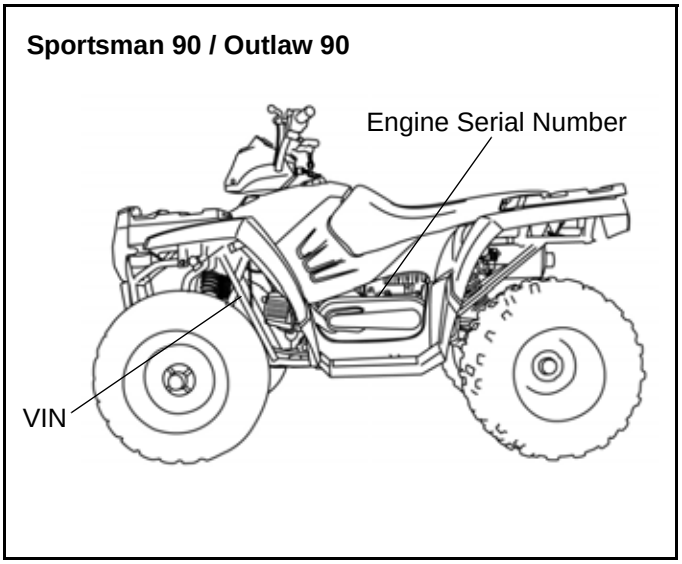
Vehicle Identification Number Location

The vehicle identification number (VIN) and engine serial number are important for identification purposes. See the illustrations below as a location reference.

Predator 50



Sportsman 90 / Outlaw 90



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GENERAL SPECIFICATIONS

MODEL.....2009 PREDATOR 50
MODEL NUMBER.....A09KA05AB, AD
ENGINE MODEL.....M10A

Category	Dimension
Length	48 in. / 122 cm
Width	31.5 in. / 80 cm
Height	28 in. / 71 cm
Wheel Base	33 in. / 84 cm
Ground Clearance	4 in. / 10 cm at Swing Arm
Rider Capacity / Max. Weight	1 rider / 90 lbs. / 41 kg
Dry Weight	185 lbs. / 84 kg
Oil Capacity	30 oz. / 900 ml
Fuel Capacity	1.2 gal / 4.5L

MODEL.....2009 OUTLAW 90
MODEL NUMBER.....A09KA09AB, AD
ENGINE MODEL.....H18S

Category	Dimension
Length	61.25 in. / 156 cm
Width	36.75 in. / 93 cm
Height	38.5 in. / 98 cm
Wheel Base	41.5 in. / 105 cm
Ground Clearance	4 in. / 10 cm at Swing Arm
Rider Capacity / Max. Weight	1 rider / 170 lbs. / 77 kg
Dry Weight	283 lbs. / 128 kg
Oil Capacity	30 oz. / 900 ml
Fuel Capacity	1.7 gal. / 6.4 L

MODEL.....2009 SPORTSMAN 90
MODEL NUMBER.....A09FA09AA, AB
ENGINE MODEL.....H18S

Category	Dimension
Length	61.75 in. / 157 cm
Width	36.75 in. / 93 cm
Height	38.5 in. / 98 cm
Wheel Base	41.5 in. / 105 cm
Ground Clearance	4 in. / 10 cm at Swing Arm
Rider Capacity / Max. Weight	1 rider / 170 lbs. / 77 kg
Dry Weight	305 lbs. / 138 kg
Oil Capacity	30 oz. / 900 ml
Fuel Capacity	2 gal. / 7.7 L
Front Rack Capacity	15 lbs. / 6.8 kg
Rear Rack Capacity	30 lbs. / 13.6 kg

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MODEL: 2009 PREDATOR 50

MODEL #: A09KA05AB, AD

ENGINE MODEL: M10A

Engine	
Platform	Aeon SOHC 4-Stroke
Engine Displacement	49.5cc
Number of Cylinders	1
Bore & Stroke (mm)	39 x 41.4 mm
Compression Ratio	9.2:1
Compression Pressure	115-155 psi
Engine Idle Speed	1500 ± 100 RPM
Cooling System	Air Cooled
Overheat Warning	n/a
Lubrication	Oil Pump Pressurized Wet Sump
Oil Requirements	Polaris SAE 40 (Above 32°F) Polaris 20W-40 (Below 32°F) 30 oz. (900 ml)
Exhaust System	USFS Approved
Carburetion	
Carburetor Model	Mikuni VM12H
Main Jet	62
Pilot Jet	12.5
Jet Needle	3X6-4
Needle Jet	n/a
Throttle Valve Cutaway	n/a
Inlet Valve Seat Size	1.2
Pilot / Air Screw	2.5 Turns Out (Initial setting, varies by ATV)
Float Height	Parallel To Float Bowl
Fuel Delivery	Gravity Feed System
Fuel Capacity	1.2 gal. (4.5 L)
Fuel Reserve Capacity	0.22 gal. (0.85 L)
Electrical	
Alternator Output	56 Watts @ 1700 RPM
Voltage Regulator	Single Phase / Full Wave
Daytime Running Lights	15 Watts
Brake Light	21 watts
Tail Light	5 watts
Ignition System	CDI Ignition
Ignition Timing	17.5° BTDC @ 1700 RPM
Spark plug / Gap	NGK CR6HSA .024 - .028 in./ .6-.7 mm
Battery / Model / Amp Hr	Low Maintenance / 12V / 5 AH
Fuses	(1) 7 Amp
Starting	Electric / Kick Start Backup
Indicator Panel	n/a

Drivetrain	
Transmission Type	Forward Gear Only
Transmission Lubricant Capacity	11.8 oz. (350 ml) or to bottom of fill hole threads
Drive Type	Chain
Clutch Type	Automatic CVT
Drive Belt	0453455
Steering / Suspension	
Front Suspension Style	Single Control Arm / Non-Adjust Shocks
Front Travel	3 in. / 7.6 cm
Rear Suspension Style	Mono Shock Swingarm / Cam Adjust Shock
Rear Travel	3 in. / 7.6 cm
Ground Clearance	4 in. / 10 cm
Shock Preload Adjustment	Rear - Cam Adjust
Toe Out	1/8 in. - 1/4 in / 3 - 6 mm
Wheels / Brakes	
Tire Size / Bolt Pattern - Front	16 x 6.5 - 7 / 4-110
Tire Size / Bolt Pattern - Rear	16 x 8 - 7 / 4-110
Air Pressure - F/R Tires	2 psi (13.8 KPa)
Brakes - Front / Rear	Drum
Parking Brake	Mechanical Lock

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MODEL: 2009 OUTLAW / SPORTSMAN 90

OUTLAW MODEL #: A09KA09AB, AD
SPORTSMAN MODEL #: A09FA09AA, AB
ENGINE MODEL: H18S

Engine	
Platform	Aeon SOHC 4-Stroke
Engine Displacement	89.9cc
Number of Cylinders	1
Bore & Stroke (mm)	47 x 51.8 mm
Compression Ratio	9.2:1
Compression Pressure	115-155 psi
Engine Idle Speed	1700 ± 100 Rpm
Cooling System	Air Cooled
Overheat Warning	n/a
Lubrication	Oil Pump Pressurized Wet Sump
Oil Requirements	Polaris SAE 40 (Above 32°F) Polaris 20W-40 (Below 32°F) 30 oz. (900 ml)
Exhaust System	USFS Approved
Carburetion	
Carburetor model	Keihin PTE16
Main Jet	82
Pilot Jet	40
Jet Needle	89Q - 3 clip
Needle Jet	11
Throttle Valve Cutaway	3.0 SA
Pilot / Air Screw	2.25 ± .5 Turns Out (Initial setting, varies by ATV)
Float Height	Parallel To Float Bowl
Fuel Delivery	Gravity Feed System
Fuel Capacity	1.7 gal. (6.4 L) - Outlaw 90 2 gal. (7.7 L) - Sportsman 90
Fuel Reserve Capacity	0.23 gal. (0.86 L) - Outlaw 90 0.22 gal. (0.85 L) - Sportsman 90
Electrical	
Alternator Output	56 Watts @ 1700 RPM
Voltage Regulator	Single Phase / Full Wave
Daytime Running Lights	15 Watts
Brake Light	21 watts
Tail Light	5 watts
Ignition System	CDI Ignition
Ignition Timing	17.5° BTDC @ 1700 RPM
Spark plug / Gap	NGK CR6HSA .024 - .028 in./ .6-.7 mm
Battery / Model / Amp Hr	Low Maintenance / 12V / 5 AH
Fuses	(1) 7 Amp
Starting	Electric / Kick Start Backup
Indicator Panel	Neutral / Reverse

Drivetrain	
Transmission Type	Integrated F/N/R
Transmission Lubricant Capacity	11.8 oz. (350 ml) or to bottom of fill hole threads
Drive Type	Chain
Clutch Type	Automatic CVT
Drive Belt	0453455
Steering / Suspension	
Front Suspension Style	Single A-arm / Cam Adjust Shocks
Front Travel	5 in. / 12.7 cm
Rear Suspension Style	Mono Shock Swingarm / Cam Adjust Shock
Rear Travel	6 in. / 15.2 cm
Ground Clearance	4 in. / 10 cm
Shock Preload Adjustment	Front - Cam Adjust Rear - Cam Adjust
Toe Out	1/8 in. - 1/4 in / 3 - 6 mm
Wheels / Brakes	
Tire Size / Bolt Pattern - Front	19 x 7 - 8 / 4-110
Tire Size / Bolt Pattern - Rear	18 x 9.5 - 8 / 4-110
Air Pressure - F/R Tires	3 psi (20.7 KPa)
Brakes - Front / Rear	Drum
Parking Brake	Mechanical Lock

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MISCELLANEOUS INFORMATION

Publication Numbers

Year	Model	Model No.	Owner's Manual PN	Parts Manual PN
2009	Predator 50	A09KA05AB, AD	9921811	9921812
2009	Outlaw 90	A09KA09AB, AD	9921796	9921815
2009	Sportsman 90	A09FA09AA, AB	9921796	9921797

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

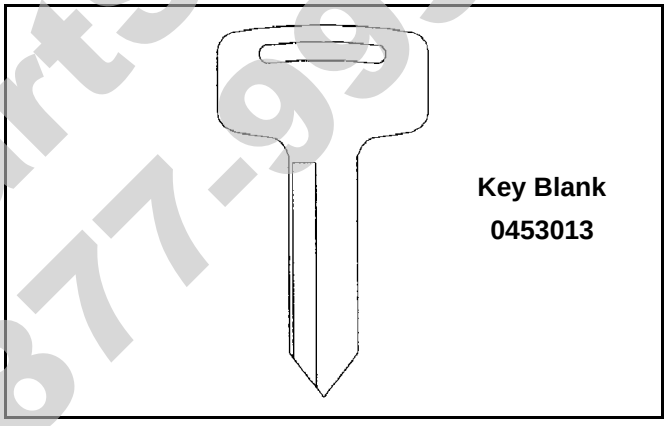
NOTE: Some manuals can be found at the Polaris website: www.polarisindustries.com or purchased from www.purepolaris.com.

Paint Codes

Painted Part	Color Description	Polaris Number
Frame / Swing Arm	Medium Gloss Black	P-067
Frame / Swing Arm	Cloud Silver	P-385

Replacement Keys

Replacement keys can be made from the original key. Polaris offers replacement key blanks (0453013) that can be cut to match the original. Should both keys become lost, ignition switch replacement is required.



Key Blank
0453013

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Special Tools - Where Used

Special Tools may be required to service this ATV. Some of the tools listed are mandatory, while other tools may be substituted with a similar tool, if available. Polaris recommends the use of Polaris Special Tools when servicing any Polaris product.

PART NUMBER	TOOL DESCRIPTION	CHAPTER TOOL USED IN
2870872	Shock Spanner Wrench	2, 5
PV-39951-A	Tachometer	2, 8
PV-35667-A	Cylinder Leakdown Tester	2, 3
2870390	Piston Support Block	3
PA-45153	Flywheel Puller	3
PA-46502	Valve Spring Compressor	3
PA-48701	Adaptor, Valve Spring Compressor	3
PV-26900-8	26 Blade Thickness Gauge (Feeler Gauge)	3
PA-47361	Carburetor Adjustment Screwdriver	4
2870975	Mity Vac™ Pressure Test Tool	4
2870623	Shock Absorber Spring Compression Tool	5
PV-63070	Christie Multi-Battery Charger	8
2870630	Timing Light	8
2870836	Battery Hydrometer	8
PV-43568	Fluke™73 Digital Multimeter	8
PV-39991	Peak Reading Adaptor	8

NOTE: Polaris dealers can order the tools listed above through the SPX Service Tools catalog or by calling SPX @ 1-800-328-6657.

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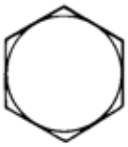
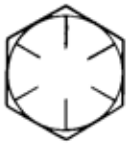
Standard Torque Specifications

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





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

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

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

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

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Conversion Table

Unit of Measure	Multiplied by	Converts to
ft. lbs.	x 12	= in. lbs.
in. lbs.	x .0833	= ft. lbs.
ft. lbs.	x 1.356	= Nm
in. lbs.	x .0115	= kg-m
Nm	x .7376	= ft. lbs.
kg-m	x 7.233	= ft. lbs.
kg-m	x 86.796	= in. lbs.
kg-m	x 10	= Nm
in.	x 25.4	= mm
mm	x .03937	= in.
in.	x 2.54	= cm
mile (mi.)	x 1.6	= km
km	x .6214	= mile (mi.)
Ounces (oz.)	x 28.35	= Grams (g)
Fluid Ounces (fl. oz.)	x 29.57	= Cubic Centimeters (cc)
Cubic Centimeters (cc)	x .03381	= Fluid Ounces (fl. oz.)
Grams (g)	x 0.035	= Ounces (oz.)
lb.	x .454	= kg
kg	x 2.2046	= lb.
Cubic inches (cu. in)	x 16.387	= Cubic centimeters (cc)
Cubic centimeters (cc)	x 0.061	= Cubic inches (cu. in)
Imperial pints (Imp pt.)	x 0.568	= Liters (l)
Liters (l)	x 1.76	= Imperial pints (Imp pt.)
Imperial quarts (Imp qt.)	x 1.137	= Liters (l)
Liters (l)	x 0.88	= Imperial quarts (Imp qt.)
Imperial quarts (Imp qt.)	x 1.201	= US quarts (US qt.)
US quarts (US qt.)	x 0.833	= Imperial quarts (Imp qt.)
US quarts (US qt.)	x 0.946	= Liters (l)
Liters (l)	x 1.057	= US quarts (US qt.)
US gallons (US gal)	x 3.785	= Liters (l)
Liters (l)	x 0.264	= US gallons (US gal)
Pounds - force per square inch (psi)	x 6.895	= Kilopascals (kPa)
Kilopascals (kPa)	x 0.145	= Pounds - force per square inch (psi)
Kilopascals (kPa)	x 0.01	= Kilograms - force per square cm
Kilograms - force per square cm	x 98.1	= Kilopascals (kPa)
p(3.14)xR2x H (height)		= Cylinder Volume

°C to °F: $^{9/5}$(°C + 32) = °F

°F to °C: $^{5/9}$(°F - 32) = °C

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SAE Tap Drill Sizes

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

Metric Tap Drill Sizes

Tap Size	Drill Size	Decimal Equivalent	Nearest Fraction
3x.50	#39	0.0995	3/32
3x.60	3/32	0.0937	3/32
4x.70	#30	0.1285	1/8
4x.75	1/8	0.125	1/8
5x.80	#19	0.166	11/64
5x.90	#20	0.161	5/32
6x1.00	#9	0.196	13/64
7x1.00	16/64	0.234	15/64
8x1.00	J	0.277	9/32
8x1.25	17/64	0.265	17/64
9x1.00	5/16	0.3125	5/16
9x1.25	5/16	0.3125	5/16
10x1.25	11/32	0.3437	11/32
10x1.50	R	0.339	11/32
11x1.50	3/8	0.375	3/8
12x1.50	13/32	0.406	13/32
12x1.75	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	

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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.
CVT: Centrifugal Variable Transmission (Drive Clutch System)
DCV: Direct current voltage.
Dial Bore Gauge: A cylinder measuring instrument which uses a dial indicator. Good for showing taper and out-of-round in the cylinder bore.
Electrical Open: Open circuit. An electrical circuit which isn't complete.
Electrical Short: Short circuit. An electrical circuit which is completed before the current reaches the intended load. (i.e. a bare wire touching the chassis).
End Seals: Rubber seals at each end of the crankshaft.
Engagement RPM: Engine RPM at which the drive clutch engages to make contact with the drive belt.
ft.: Foot/feet.
Foot Pound: Ft. lb. A force of one pound at the end of a lever one foot in length, applied in a rotational direction.
g: Gram. Unit of weight in the metric system.
gal.: Gallon.
ID: Inside diameter.
in.: Inch/inches.
Inch Pound: In. lb. 12 in. lbs. = 1 ft. lb.
kg/cm2: Kilograms per square centimeter.
kg-m: Kilogram meters.
Kilogram/meter: A force of one kilogram at the end of a lever one meter in length, applied in a rotational direction.
l or ltr: Liter.
lbs/in2: Pounds per square inch.
Left or Right Side: Always referred to based on normal operating position of the driver.
m: Meter/meters.
Mag: Magneto.
Magnetic Induction: As a conductor (coil) is moved through a magnetic field, a voltage will be generated in the windings. Mechanical energy is converted to electrical energy in the stator.
mi.: Mile/miles.
mm: Millimeter. Unit of length in the metric system. 1 mm = approximately .040".
Nm: Newton meters.
OD: Outside diameter.
Ohm: The unit of electrical resistance opposing current flow.
oz.: Ounce/ounces.
Piston Clearance: Total distance between piston and cylinder wall.
psi.: Pounds per square inch.
PTO: Power take off.
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.

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NOTES

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CHAPTER 2
MAINTENANCE

2

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PERIODIC MAINTENANCE CHART

Periodic Maintenance Overview

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 -- See Above

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.

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Pre-Ride - 40 Hour Maintenance Interval

Periodic Maintenance Chart

	Item	Maintenance Interval (whichever comes first)			Remarks
		Hours	Calendar	Miles (KM)	
■	Steering	-	Pre-Ride	-	Check for free operation
▸	Front-Suspension	-	Pre-Ride	-	Make adjustments as needed.
▸	Rear-Suspension	-	Pre-Ride	-	
	Tires	-	Pre-Ride	-	
	Engine Stop Switch		Pre-Ride	-	Check Operation
▸	Brake Lever Travel	-	Pre-Ride	-	Make adjustments as needed
	Brake System	-	Pre-Ride	-	Check Operation
	Daytime Running Lights	-	Pre-Ride	-	Check for proper operation
	Drive Chain	-	Pre-Ride	-	Check condition and slack; refer to “drive chain adjustment”
	Brake light	-	Pre-Ride	-	Check for proper operation
	Throttle	-	Pre-Ride	-	Check Operation
	Wheels / Fasteners	-	Pre-Ride	-	Make adjustments as needed
	Frame Fasteners	-	Pre-Ride	-	
▸ E	Engine Oil Level	-	Pre-Ride	-	Make adjustments as needed
▸ E	Air Filter, Pre-Filter	-	Daily	-	Inspect; clean often, replace as needed
▸	Air Box Sediment Tube	-	Daily	-	Drain deposits when visible
	Head lamp / Tail lamp	-	Daily	-	Check operation; apply dielectric grease if replacing
	CVT Housing	-	Weekly	-	Drain water as needed, check often if operating in wet conditions
▸ ■	Brake Lever travel / Brake Freeplay	10 H	Monthly	100 (160)	Inspect regularly
■ E	Spark Plug	10 H	Monthly	100 (160)	Clean; check condition; adjust gap; replace as needed
	Idle Speed	10 H	Monthly	100 (160)	Check; adjust as needed
■ E	Choke	10 H	Monthly	100 (160)	Check for proper operation
	Battery	20 H	Monthly	200 (320)	Check terminals; clean; test
▸	Engine Oil Change (Break-In Period)	30 H	6 M	300 (480)	Drain and change the oil; perform a break-in oil change after the **first 10 hours** of operation
▸	Transmission Oil (Break-In Period)	40 H	12 M	400 (640)	Inspect level; change yearly; perform break-in oil change after the **first 10 hours** of operation
▸	Oil Pre-Filter Screen	40 H	12 M	400 (640)	Clean filter at every oil change; clean annually if ATV is operated less than 10 hours

▸ 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.

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50 - 300 Hour Maintenance Interval

Periodic Maintenance Chart

Item		Maintenance Interval (whichever comes first)			Remarks
		Hours	Calendar	Miles (KM)	
▶	General Lubrication	50 H	3 M	500 (800)	Lubricate all grease fittings, pivots, & cables
■ E	Valve Clearance	50 H	3 M	500 (800)	Check clearance; adjust to specification if required; perform break-in adjustment after the **first 10 hours** of operation
	Carburetor Float Bowl	50 H	6 M	500 (800)	Drain bowl periodically and prior to storage
■ E	Throttle Cable / ETC Switch	50 H	6 M	500 (800)	Inspect; adjust; lubricate; replace if necessary
■ E	Choke Cable	50 H	6 M	500 (800)	Inspect; adjust; lubricate; replace if necessary
E	Carburetor Intake Flange	50 H	6 M	500 (800)	Inspect for proper sealing / air leaks
▶ ■	Brake Shoe Wear	50 H	6 M	500 (800)	Inspect; replace as needed
■	Drive Belt	50 H	6 M	500 (800)	Inspect; replace as needed
■ E	Fuel System	100 H	12 M	1000 (1600)	Check for leaks at tank cap, lines, fuel valve, filter, carburetor, replace lines every two years
■ E	Fuel Filter	100 H	12 M	1000 (1600)	Replace yearly
▶	Engine Mounts	100 H	12 M	1000 (1600)	Inspect
	Exhaust Muffler / Pipe	100 H	12 M	1000 (1600)	Inspect
■ E	Ignition Timing	100 H	12 M	1000 (1600)	Inspect
▶	Wiring	100 H	12 M	1000 (1600)	Inspect for wear, routing, security; apply dielectric grease to connectors subjected to water, mud, etc.
■	Clutches (Drive and Driven)	100 H	12 M	1000 (1600)	Inspect;clean; replace worn parts
■	Front Wheel Bearings	100 H	12 M	1000 (1600)	Inspect; replace as needed
	Spark Arrestor	300 H	36 M	3000 (4800)	Clean out
■	Toe Adjustment	-	-	-	Inspect periodically; adjust when parts are replaced

▶ 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.

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POLARIS LUBRICANTS AND SERVICE PRODUCTS

Lubricants / Service Products

Part No.	Description	Part No.	Description
Engine Lubricant		**Additives / Sealants / Thread Locking Agents / Misc.**	
2876248	Polaris Synthetic Youth 4-Stroke Oil SAE 40 (qt.)	2874275	Loctite Primer N, Aerosol, 25 g
2876249	Polaris Synthetic Youth 4-Stroke Oil SAE 40 (gal.)	2871956	Loctite Thread Sealant 565 (50 ml.) (6 Count)
2872175	Polaris Semi-Synthetic Oil 20W-40 (qt.)	2871949	Loctite Threadlock 242 (50 ml.) (10 Count)
2872176	Polaris Semi-Synthetic Oil 20W-40 (gal.)	2871950	Loctite Threadlock 242 (6 ml.) (12 Count)
2870791	Fogging Oil (12 oz. Aerosol)	2871951	Loctite Threadlock 262 (50 ml.) (10 Count)
Transmission Lubricant		2871557	Loctite 518 Gasket Eliminator / Flange Sealant (50 ml.) (10 Count)
2873602	Polaris (AGL) ATV Gearcase Lubricant (qt.)	2871326	Premium Carbon Clean (12 oz.) (12 Count)
Grease / Specialized Lubricants		2870652	Fuel Stabilizer (16 oz.) (12 Count)
2871312	Grease Gun Kit, Premium All Season (3 oz.)	2871957	Black RTV Silicone Sealer (3 oz. tube) (12 Count)
2871322	Premium All Season Grease (3 oz. cartridge) (24 Count)	2871958	Black RTV Silicone Sealer (11 oz. cartridge) (12 Count)
2871423	Premium All Season Grease (14 oz. cartridge) (10 Count)	2871557	Crankcase Sealant, 3-Bond 1215 (5oz.)
2871460	Starter Drive Grease (2 oz.) (12 Count)	2872893	Engine Degreaser (12oz.) (12 Count)
2871329	Dielectric Grease (Nyogel™)	NOTE: The number count supplied in the table indicates the number of units that are shipped with each order.	
2872348	Chain Lube, Aerosol (16 oz.) (12 Count)		

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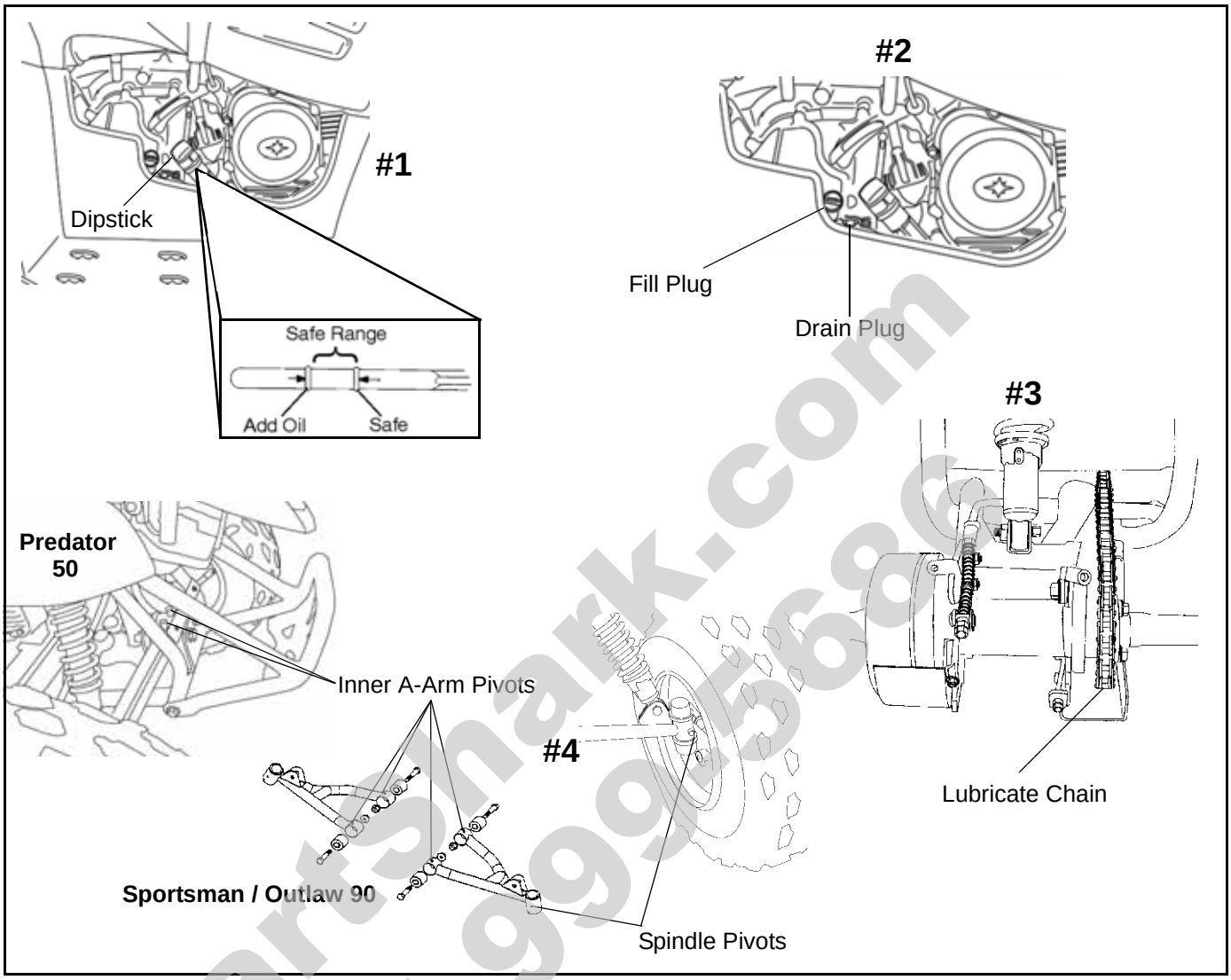
MAINTENANCE REFERENCES



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LUBRICATION CHART

#	Item	Lubrication	Method	Frequency*
1.	Engine Oil	Polaris Synthetic: SAE 40 Polaris Semi-Synthetic: 20W-40 **See Page 2.16**	Check level or change oil	Check during pre-ride inspection and change oil every 30 hours or 6 months.
2.	Transmission	Polaris ATV Gearcase Lubricant (AGL)	Check level or change lube	Inspect periodically and change lubrication every 40 hours or annually.
3.	Drive Chain	Polaris Chain Lube or SAE 80/90	Lubricate drive chain	Lubricate as required and before each ride in wet conditions. More often in severe use.
4.	Front Suspension (A-Arm and Spindle)	Polaris Premium All Season Grease**	Inspect; tighten fasteners; grease zerks	Every 3 months or 50 hours (also after washing ATV or driving in water). More often in severe use

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

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

GENERAL VEHICLE INSPECTION AND MAINTENANCE

Pre-Ride / Daily Inspection

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

- Tires - check condition and tire pressure
- Fuel and oil - fill both to their proper level; Do not overfill
- All brakes - check operation
- Throttle - check for free operation
- Headlight / Taillight / Brake light - 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

Vehicle Component Inspection Locations

Predator 50

Sportsman 90

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Frame, Nuts, Bolts and Fastener Inspection

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.

Standard Torque Specifications

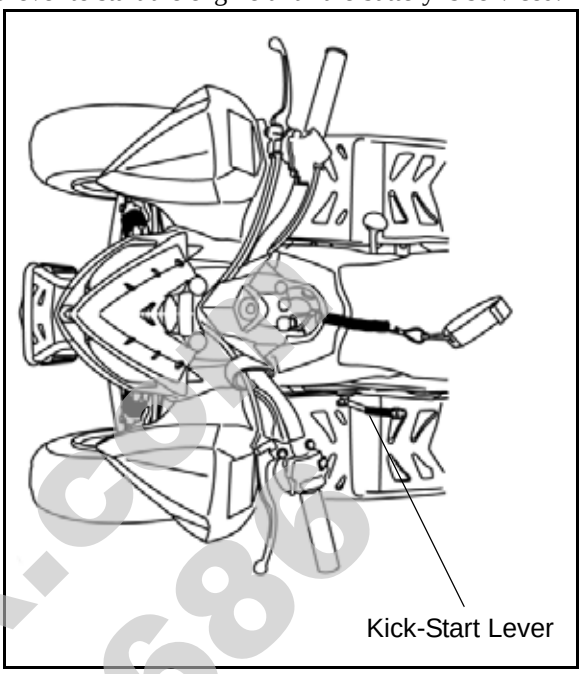
The following torque specifications are to be used as a general guideline. There are exceptions in the steering, suspension, and engine areas. Always consult the exploded views in each manual section when available for torque values of fasteners before using standard torque.

Standard Fastener Torques

FASTENER Thread Size	TORQUE (ft. lbs. / in. lbs.)	TORQUE (Nm)
5 mm bolts and nuts	39-52 in. lbs.	4.5-6 Nm
6 mm bolts and nuts	69-104 in. lbs.	8-12 Nm
8 mm bolts and nuts	13-18 ft. lbs	18-25 Nm
10 mm bolts and nuts	22-29 ft. lbs.	30-40 Nm
12 mm bolts and nuts	36-43 ft. lbs.	50-60 Nm
4 mm screws	22-30 in. lbs.	2.5-3.4 Nm
5 mm screws	30-43 in. lbs.	3.5-5 Nm
6 mm Hex bolts	87-121 in. lbs.	10-14 Nm
8 mm Hex bolts	17-22 ft. lbs.	24-30 Nm
10 mm Hex bolts	25-32 ft. lbs.	35-45 Nm

Kick-Start Lever and Operation

If the battery becomes too weak to start the engine, use the kick-start lever to start the engine until the battery is serviced.



1. Position the vehicle on a level surface.
2. Shift the transmission into neutral (if equipped).
3. Lock the parking brake.
4. Push the engine stop switch up to the RUN position.
5. Turn the key ON.
6. Fold out the kick start lever and place your foot on the lever. Thrust your heel downward to crank the engine.

7. After the engine has started, fold the kick-start lever into place.

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FUEL SYSTEM AND AIR INTAKE

Fuel System Safety

⚠ WARNING

Gasoline is extremely flammable and explosive under certain conditions.

⚠ WARNING

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.
Fill the tank to the bottom of the filler neck. This will allow for thermal expansion.

If you get gasoline in your eyes or swallow gasoline, see your doctor 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 run it in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.

Speed Control System

Per ANSI / SVIA-1-2001 (sec. 6.1.3) AS DELIVERED TO THE CONSUMER, the speed of youth models is restricted to *under* 10 MPH for the 50cc models and *under* 15 MPH for the 90cc models.

The dealer CANNOT, under any circumstances, either prior to the sale or later, even at the consumer's request, remove or adjust any speed limiting devices.

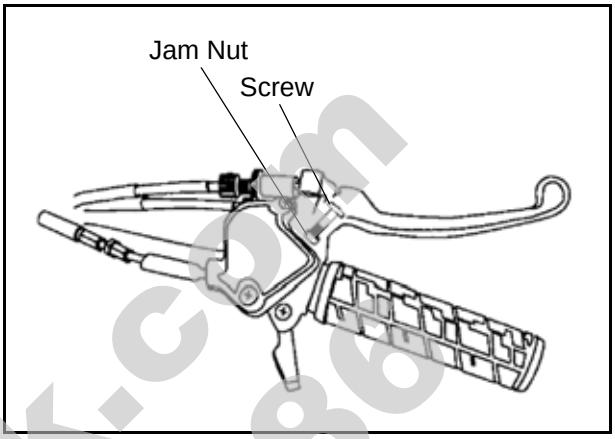
Youth model Polaris ATVs have an adjustable throttle limiting screw. Speed limiting devices may be adjusted/removed *only by consumers* when they determine that their child is capable of handling the additional speed.

Per ANSI / SVIA-1-2001 (sec. 6.2) the *unrestricted* top speed is less than 15 MPH for the 50cc models and less than 30 MPH for the 90cc models.

Throttle Stop Speed Control System

Use the following procedure to control how far the throttle opens.

IMPORTANT: This procedure should be performed by *consumers only* when they determine that their child is capable of handling the additional speed.

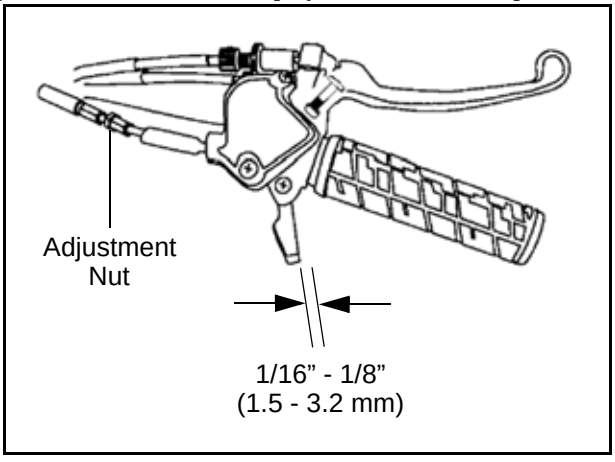


1. Loosen the jam nut.
2. Turn the screw inward to reduce speed or outward to increase speed.
3. Tighten the jam nut after adjusting.

Electronic Throttle Control (ETC)

Always check the throttle for smooth operation before riding. Periodically check the throttle free play. It should be kept between 1/16” and 1/8” (1.5mm – 3.2mm).

If adjustment is required, loosen the jam nut and turn the adjustment nut until the free play falls in to the acceptable limit.



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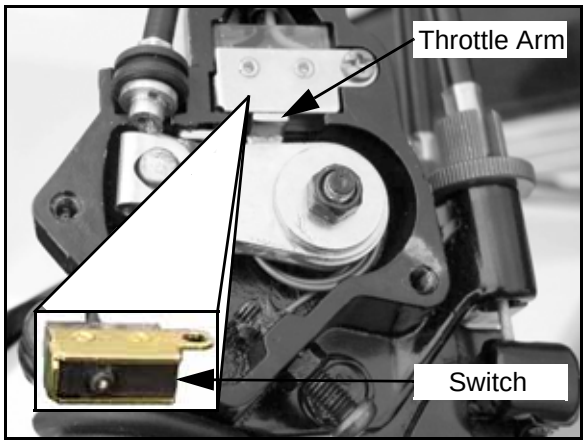
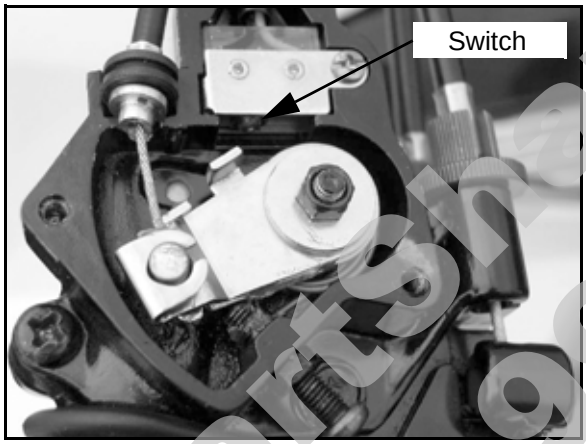
ETC Operation

When the throttle is closed (idle) the throttle arm depresses a small micro switch that limits engine rpm.



When the throttle lever is pushed forward the throttle arm moves off the micro switch and allows the engine rpm to increase with lever movement.



If the throttle cable would become hung up or stuck while the ATV is being operated, the spring loaded throttle arm will return back and depress the micro switch, limiting engine rpm.

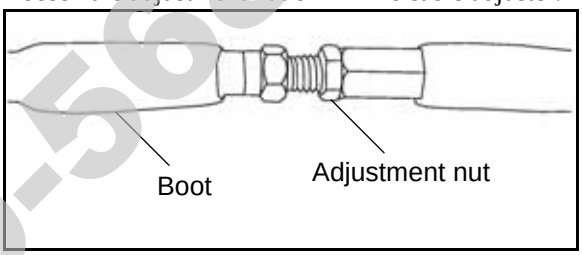
ETC Switch Adjustment

1. Slide the boot off the throttle cable adjuster and jam nut.

2. Set parking brake.
3. Start engine and set idle to specified RPM.

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

4. Loosen the adjustment nut on in–line cable adjuster.



5. Turn cable adjuster out until engine RPM begins to increase.
6. Turn cable adjuster back in until throttle lever has 1/16" (.16 cm) of travel before engine RPM increases.
7. Tighten lock nut securely and slide boot completely in place to ensure a water–tight seal.

NOTE: Verify ETC switch plunger is held inward at idle position.

8. 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.

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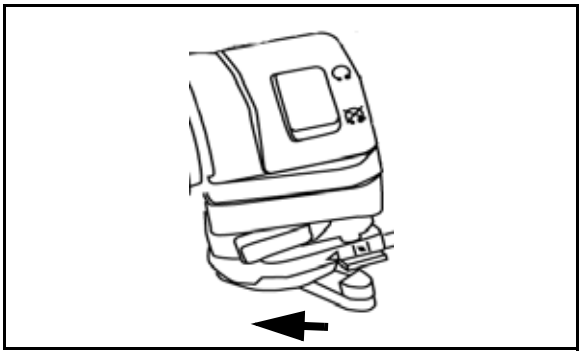
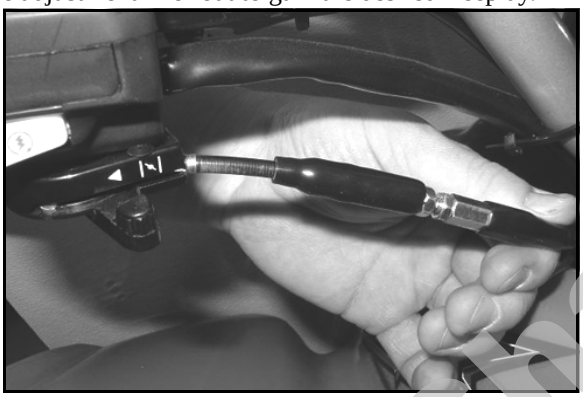
Choke Cable Adjustment

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



Adjustments to the freeplay can be made by loosening the choke cable adjustment in or out to gain the desired freeplay.



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

Idle Speed Adjustment

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

Idle Speed
50cc Mikuni: 1500 ± 100
90cc Keihin: 1700 ± 100

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.

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 all fuel lines and vent lines are not kinked or pinched.

3. Replace all fuel lines every two years.

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Pilot Air Screw Adjustment

⚠ CAUTION

The pilot air screw is calibrated at the factory to meet EPA / CARB regulations for air quality standards. Cleaning of the pilot circuit must be performed by a certified repair shop to ensure air quality standards are not exceeded.

1. Set idle speed to specification. Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.
2. To adjust the mixture screw setting, you will need to use the "D" shaped Carburetor Adjustment Screwdriver PA-47361. Slowly turn the mixture screw clockwise until engine idle RPM begins to decrease. Stop turning at this point.

Pilot Air Screw Base Setting:
50cc Mikuni: 2.5 turns out
90cc Keihin: 2.25 ± .5 turns out

3. Slowly turn mixture screw counterclockwise until idle speed returns to maximum RPM. Continue turning counterclockwise until idle RPM begins to drop. Stop turning at this point.
4. Center the mixture screw between points in Step 2 and 3.
5. Readjust idle speed if not within specification.

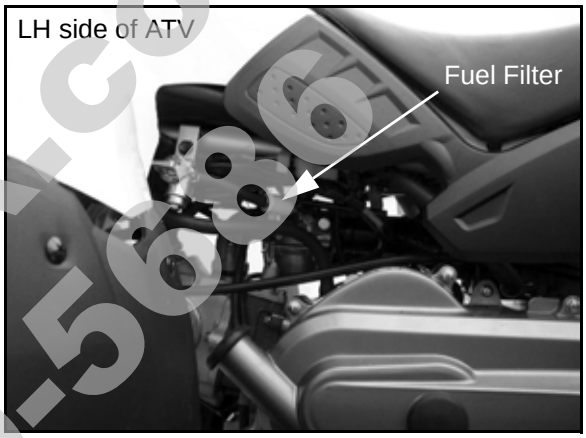
Vent Lines

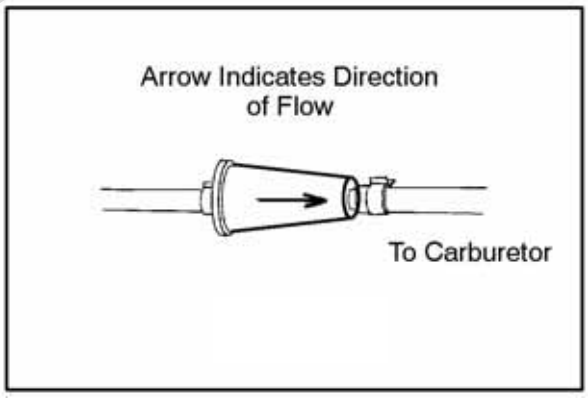
1. Check fuel tank, crankcase, carburetor, battery and transmission vent lines for signs of wear, deterioration, damage or leakage. Replace every two years.
2. Verify vent lines are routed properly and secured with cable ties.

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 Location - Located in-line between fuel valve and carburetor inlet.





To service the fuel filter:

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.
5. Turn fuel valve to 'ON'.
6. Start engine and inspect for leaks.

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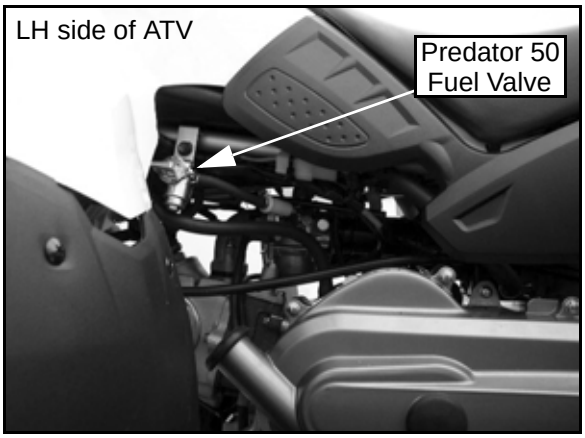
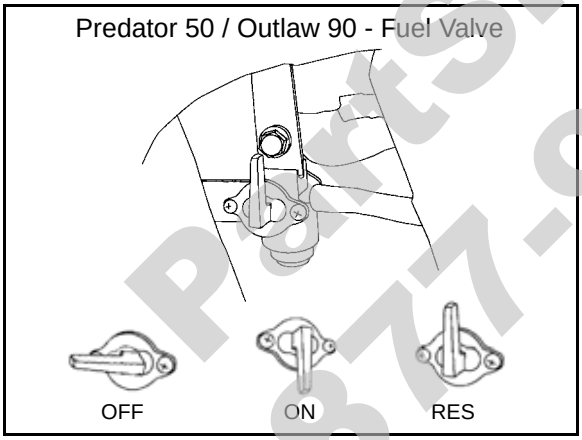
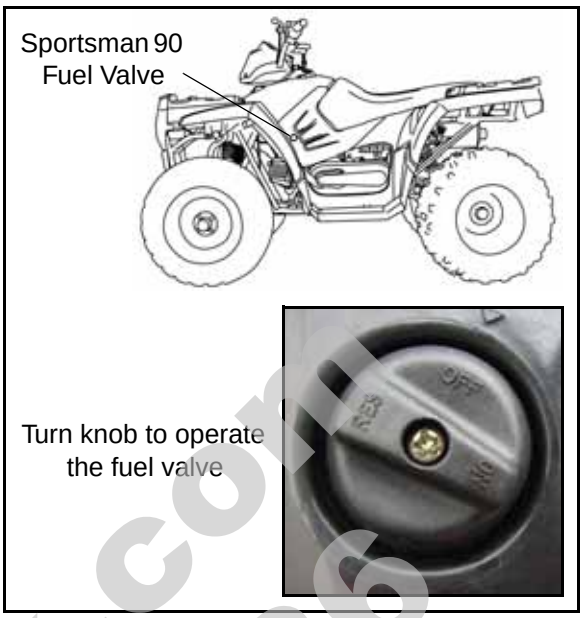
Fuel Valve Location

Predator 50 / Outlaw 90





Sportsman 90



Carburetor Draining

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

1. Turn fuel valve to the 'OFF' position.
2. Place a container beneath the bowl drain hose.
3. Loosen drain screw 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. Check for fuel leaks.
8. Start engine and re–check for leaks.

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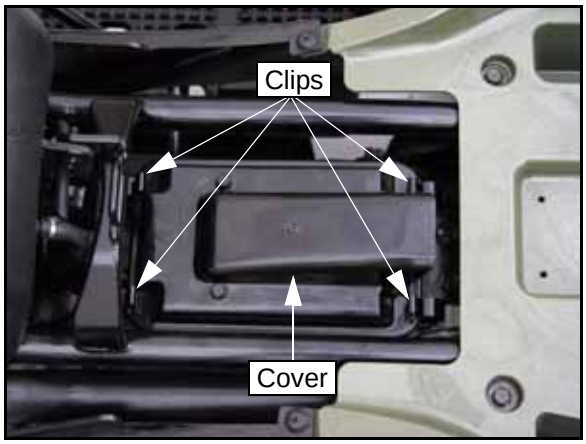
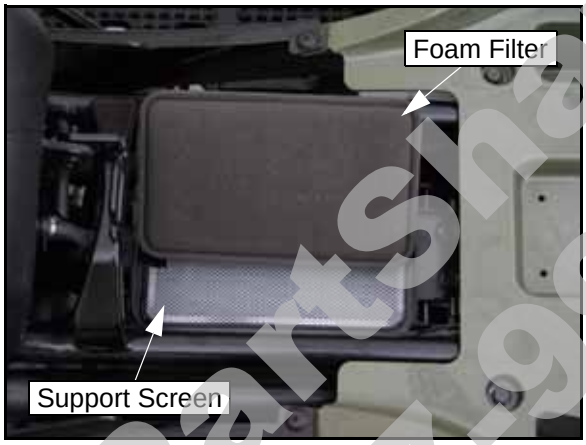
Air Filter Service

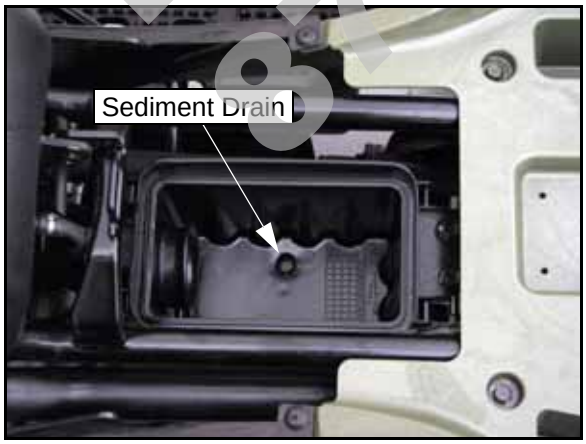
1. Remove the seat.
2. Release the air box cover spring clips and remove the cover.



3. Remove the foam air filter. Wash the foam filter in warm soapy water, then rinse and let it dry. If the filter is damaged, install a new foam filter.
4. Apply a commercially available foam filter oil to the foam filter.



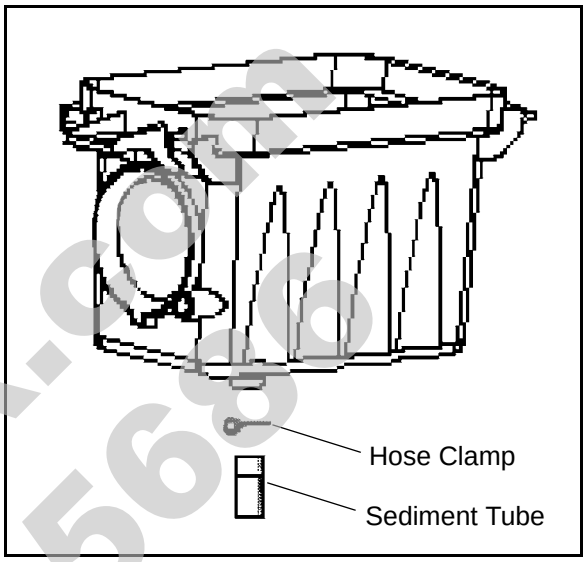
5. Inspect the filter support screen and clean away any oil or sediments in the air box.



6. Reinstall the screen, foam filter and air box cover. Secure the clips.
7. Reinstall the seat.

Air Box Sediment Tube

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



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.

1. Remove the hose clamp and remove the sediment tube.
2. Drain and clean deposits from the tube.
3. Reinstall the tube and clamp.

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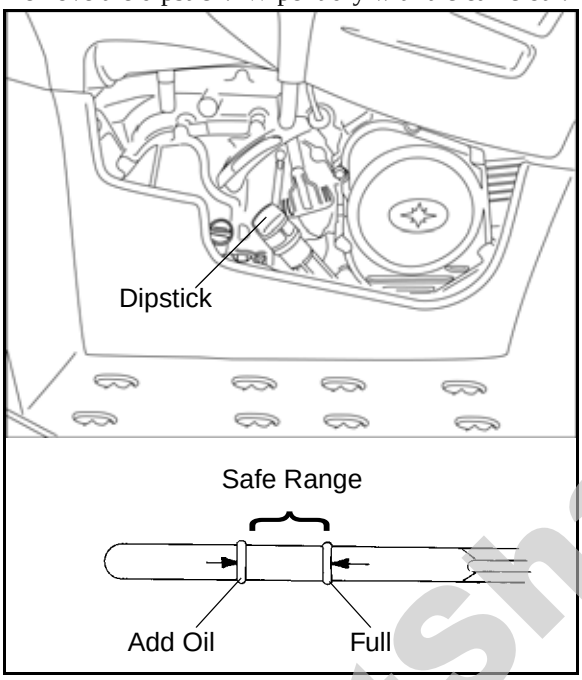
ENGINE

Engine Oil Level

Maintain the oil level within the safe range on the dipstick. Do not overfill.

To check the oil level:

1. Position the vehicle on a level surface.
2. Remove the dipstick. Wipe it dry with a clean cloth.



3. Reinstall the dipstick completely.
4. Remove the dipstick and check the oil level.

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.

5. Add the recommended oil as needed.

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.

6. Reinstall the dipstick.

Recommended Engine Oil:

Engine oil recommendations are listed under "Engine Oil and Filter Change"

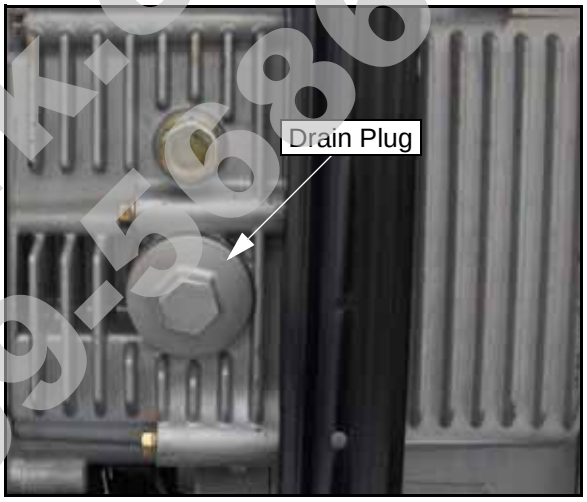
Engine Oil and Filter Change

1. Position the vehicle on a level surface.
2. Clean area around the drain plug.
3. Run engine two to three minutes until warm.
4. Stop the engine.

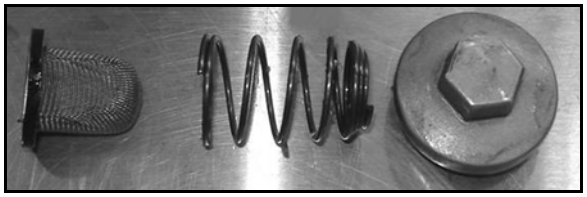
CAUTION

Hot oil can cause serious burns to skin. Do not allow hot oil to come in contact with skin.

5. Place a drain pan beneath the engine crankcase.
6. Remove the drain plug and pre-filter screen. Allow the oil to drain completely.



7. Wash the oil pre-filter screen with solvent to remove any debris. Allow the screen to air dry.



8. Inspect the O-ring on drain plug, replace if needed.

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

9. Reassemble the pre-filter screen and spring to the pre-filter plug.

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10. Reinstall the pre-filter drain plug. Torque to 11 ft. lbs. (15 Nm).

= T
Crankcase Drain Plug: 11 ft. lbs. (15 Nm)

11. Remove the dipstick. Add 30 oz. (900 ml) of recommended oil. Do not overfill.

Recommended Engine Oil:

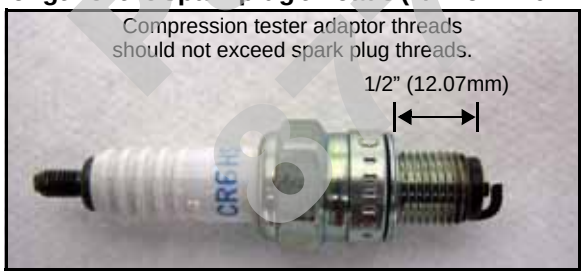
Polaris Synthetic Youth 4-Stroke Oil
SAE 40 (Above 32°F)
Quart - (PN 2876248)
Gallon - (PN2876249)

Polaris Semi-Synthetic Oil
20W-40 (Below 32°F)
Quart - (PN 2872175)
Gallon - (PN2872176)

12. Reinstall the dipstick.
13. Start the engine. Allow it to idle for one to two minutes.
14. Stop the engine and inspect for leaks.
15. Check the oil level. Add oil as needed to bring the level to the upper mark on the dipstick.

Compression / Leakdown Test

IMPORTANT: Use of a compression tester adaptor that is too long WILL CAUSE DAMAGE to the cylinder head. The adaptor length should be no longer than the length of the spark plug threads (1/2" or 12.07mm).



Cylinder Compression
Standard: 115 - 155 psi

Cylinder Leakage
Service Limit: 10%
Inspect if leakage exceeds 10%

Valve Clearance Adjustment

INTAKE / EXHAUST VALVE CLEARANCE

1. Remove the valve cover caps to expose the intake and exhaust rocker arms.

2. Remove spark plug and rotate engine to TDC on the compression stroke.
3. Insert a .002" (.06 mm) feeler gauge between end of intake valve stem and adjuster screw.
4. If adjustment is required, loosen the locknut and turn adjuster until the proper clearance is obtained.

5. When clearance is correct, hold adjuster screw and tighten locknut securely.
6. Re-check the valve clearance.
7. Repeat steps 3-5 to adjust the exhaust valve clearance.

Valve Clearance - In / Ex: .002" (.06 mm)

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Engine Mounts

Inspect engine mounts for cracks or damage.

Engine Fastener Torque

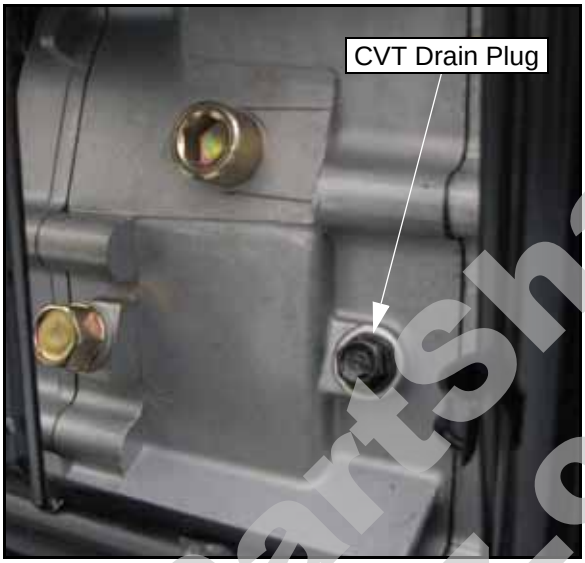
Check engine fasteners and ensure they are tight

CVT Drying (90cc Models)

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

There may be some instances when water is accidently ingested into the CVT system. Use the following instructions to dry it out before operating. The drain plug is located on the bottom of the CVT cover.

1. Remove the drain plug located under the CVT housing. Allow the water to drain. Reinstall the drain plug.



2. Shift the transmission into neutral.
3. Start the engine. Apply varying throttle for 10-15 seconds to expel the moisture and air-dry the belt and clutches. Do not hold the throttle wide open for more than 3 - 4 seconds.
4. Allow the engine RPM to settle to an idle speed.
5. Test for belt slippage. If the belt slips, repeat the process.

⚠ CAUTION

Exposure to salt water will cause corrosion to metal components. If the vehicle is operated in salt water areas, rinse it off frequently with fresh water.

Exhaust Spark Arrestor Cleaning

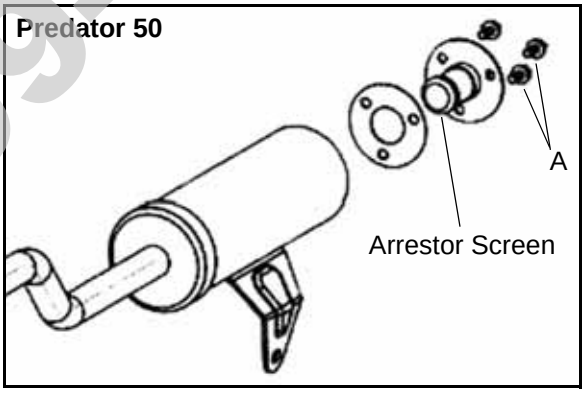
⚠ WARNING

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.

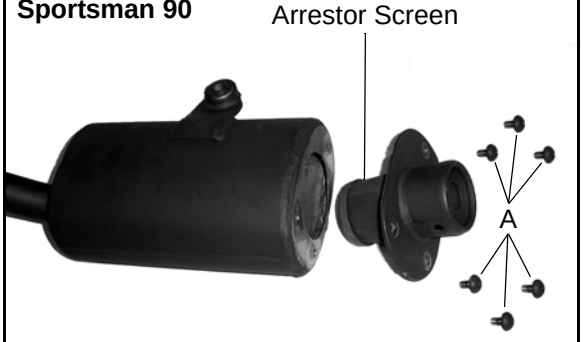
The exhaust pipe must be periodically purged of accumulated carbon as follows:

1. Remove the (3) or (6) screws (A) and remove the arrestor screen from the end of the muffler.

Predator 50



Outlaw 90
Sportsman 90



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2. Use a non-synthetic brush to clean the arrestor screen. A synthetic brush may melt if components are warm. If necessary, blow debris from the screen with compressed air.

3. Inspect the screen for wear and damage. Replace if necessary.

4. Reinstall the arrestor.

5. Torque the screws to 7 ft. lbs. (9.5 Nm).

TRANSMISSION AND FINAL DRIVE

Transmission Lubrication

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

Remember to:

- Verify the vehicle is level before proceeding.
- Verify the vent hose is routed properly and is not obstructed.
- Follow instructions to check / change transmission fluid.

TRANSMISSION SPECIFICATIONS

Recommended Lubricant:
Polaris (AGL)
ATV Gearcase Lubricant:
Quart - (PN 2873602)

Capacity:
11.8 oz. (350 ml)
or bottom of fill hole threads

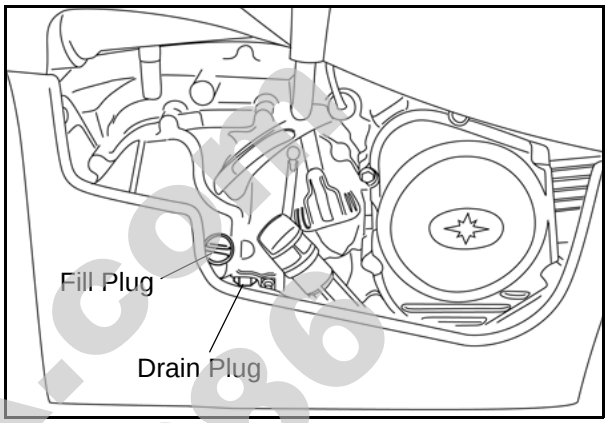
Drain Plug Torque:
14 ft. lbs. (19 Nm)

Transmission Lubricant Level

The gear case fill plug is located on the side of the gear case on the right side of the ATV. Maintain the lubricant level at the bottom of the fill plug hole threads.uld be checked monthly and changed annually.

1. Position the vehicle on a level surface.

2. Remove the fill plug.



3. View the lubricant level through the fill hole.

4. If the level is low, add the recommended lubricant.

5. Reinstall the fill plug.

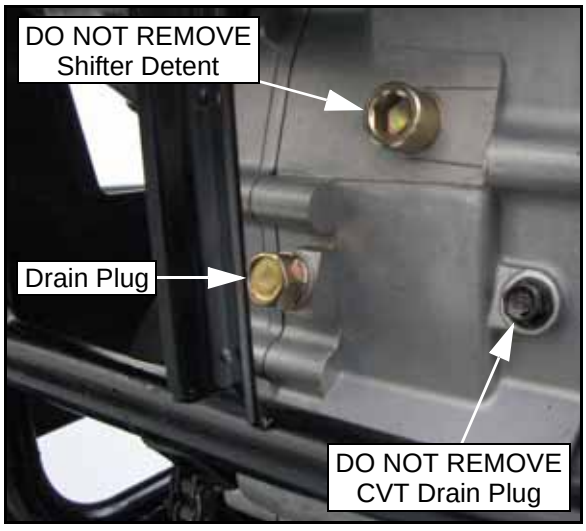
Transmission Lubricant Change

1. Position the vehicle on a level surface.

2. Remove the fill plug.

3. Place a drain pan beneath the transmission.

4. Remove the drain plug and allow the lubricant to drain completely.



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5. Clean and reinstall the drain plug. Torque to 14 ft. lbs. (19 Nm).

= T
Transmission Drain Plug: 14 ft. lbs. (19 Nm)

6. Add the recommended lubricant. Maintain the lubricant level at the bottom of the fill plug hole threads.

7. Reinstall the fill plug. Check for leaks.

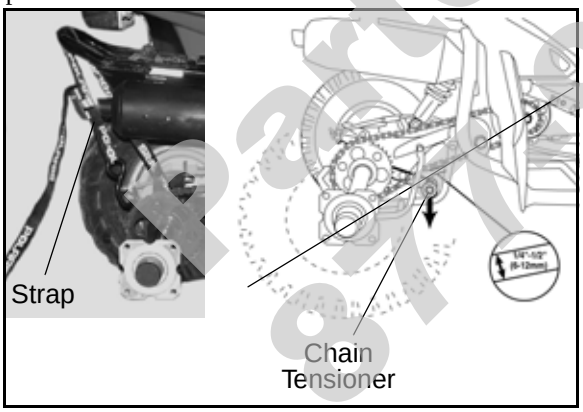
=
Polaris (AGL) ATV Gearcase Lubricant: 11.8 oz. (350 ml) or bottom of transmission fill hole threads

Drive Chain Inspection - 90cc Models

1. Check the amount of chain slack by moving the vehicle slightly forward to gain chain deflection.

2. Collapse the suspension with an adjustable trailer tie down. Fasten the strap around the axle and rear bumper tube.

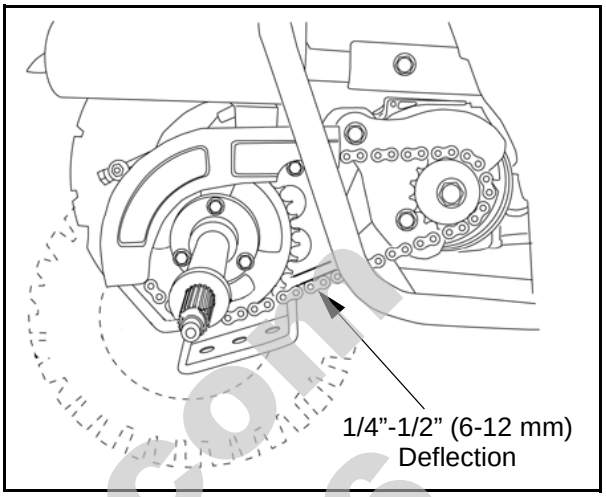
3. Tighten the strap while compressing the suspension to create a straight sight-line between the rear axle and the gear case output shaft. This establishes the tightest chain position.



4. Pull down on the tensioner to move it out of the way, then measure the chain deflection. Allowable chain deflection is **1/4”-1/2” (6-12 mm).**

Drive Chain Inspection - 50cc Models

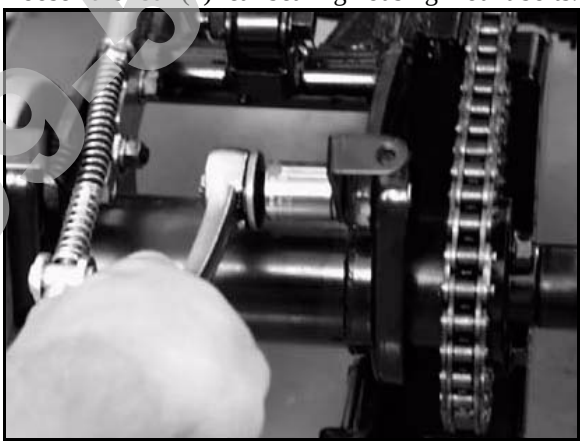
1. Check the amount of chain slack by moving the vehicle slightly forward to gain deflection at the top of the chain.



2. The chain should have **1/4”-1/2” (6-12 mm)** deflection. If the chain needs adjustment, use the following procedure.

Drive Chain Adjustment - 50 and 90cc Models

1. Loosen the four (4) rear bearing housing mount bolts.



2. Loosen the chain adjuster lock nut.

3. Turn the chain adjuster clockwise until chain tension is set to specification.

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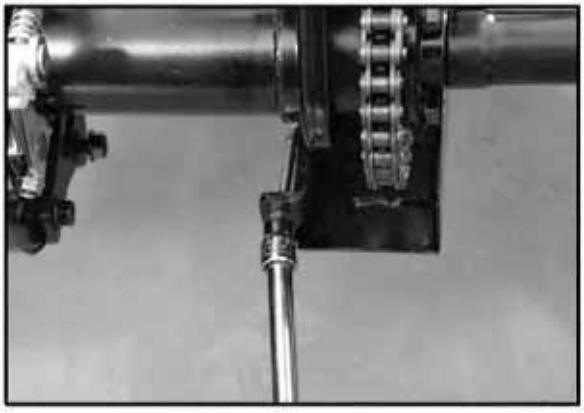
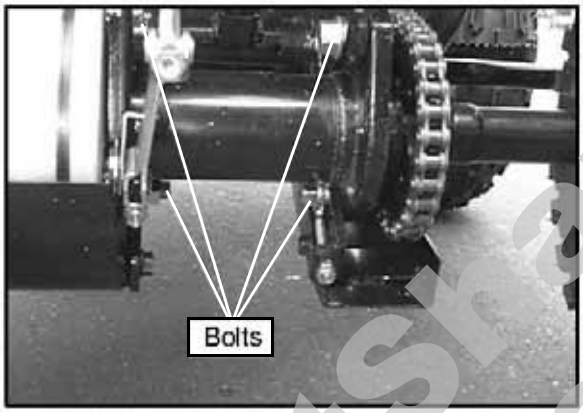
4. Tighten the chain adjuster lock nut to 84 in. lbs. (9.4 Nm) and re-verify the chain tension is at specification.

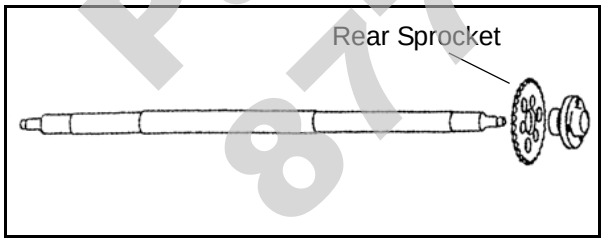


5. Tighten the four (4) bearing housing bolts to **43 lbs. (60 Nm)** and reinstall the rear cover.



Sprocket Inspection

Inspect the front and rear sprockets for worn, broken or bent teeth.



To check for wear, pull upward on the chain at the top of the rear sprocket. Replace sprocket if chain movement exceeds 1/4" (.6 cm)

ELECTRICAL AND IGNITION SYSTEM

Battery Maintenance Service Notes

⚠ 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.

CAUTION

Always wear safety glasses, rubber protective gloves and appropriate clothing when working with batteries.

IMPORTANT: DO NOT activate Youth ATV batteries unless they will be put into service within 30 days of activation.

Youth ATVs have a Low Maintenance style battery. Do not remove the battery cap strip to check acid level or add water once the battery have been activated. Perform the proper battery tests and charge or replace the battery as required.

New batteries must be fully charged before use or battery life will be significantly reduced (10-30% of the battery's full potential).

NOTE: DO NOT use a constant high-amperage battery charger to charge this style of battery. Use a low-amperage charger capable of charging voltage that is 1/10 of the battery amp-hour rating.

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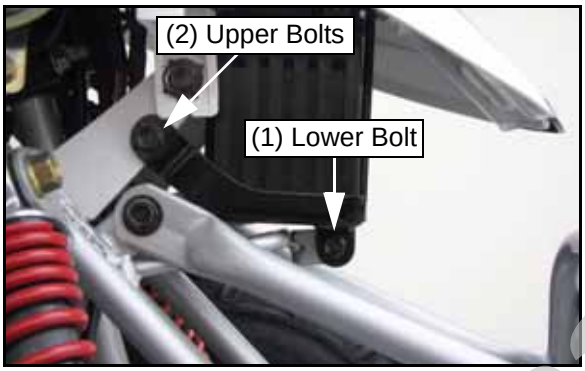
Battery Removal - 50cc

⚠ WARNING

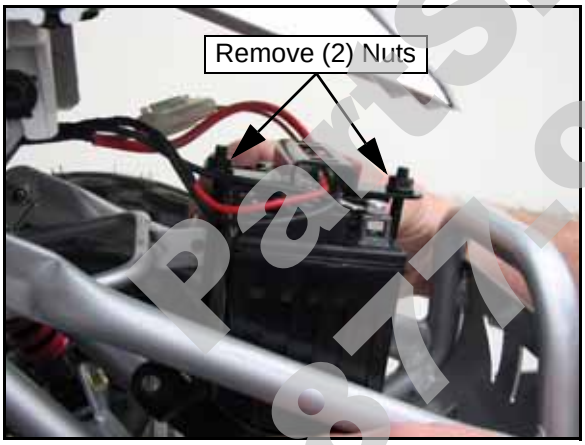
Improperly connecting or disconnecting battery cables can result in an explosion and cause serious injury or death. When removing the battery, always disconnect the negative (black) cable first. When reinstalling the battery, always connect the negative (black) cable last.

To remove the battery:

1. Remove the (3) bolts securing the battery bracket to the frame and remove the battery and bracket from the frame.



2. Remove the (2) nuts securing the hold-down strap on the battery.



3. Disconnect the black negative (-) battery cable first.
4. Disconnect the red positive (+) battery cable next.
5. Remove the battery from the ATV.

⚠ CAUTION

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

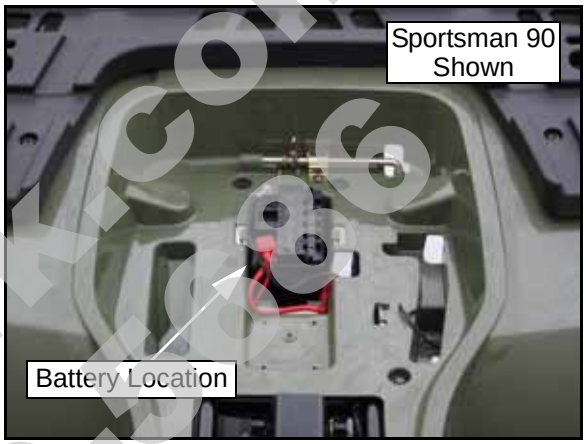
Battery Removal - 90cc

⚠ WARNING

Improperly connecting or disconnecting battery cables can result in an explosion and cause serious injury or death. When removing the battery, always disconnect the negative (black) cable first. When reinstalling the battery, always connect the negative (black) cable last.

To remove the battery:

1. Remove the seat to access the battery.



2. Disconnect the hold-down strap securing the battery in position.
3. Disconnect the black negative (-) battery cable first.
4. Disconnect the red positive (+) battery cable last.
5. Lift the battery out of the ATV.

⚠ CAUTION

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

Battery Cleaning

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

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Battery Installation

1. Place the fully charged battery in its holder.
2. Attach the hold-down strap(s).
3. Connect and tighten the red positive (+) cable first.
4. Connect and tighten the black negative (-) cable last.
5. Torque the battery terminal bolts to 3.5 ft. lbs. (4.7 Nm)
6. Verify that the cables are properly routed.

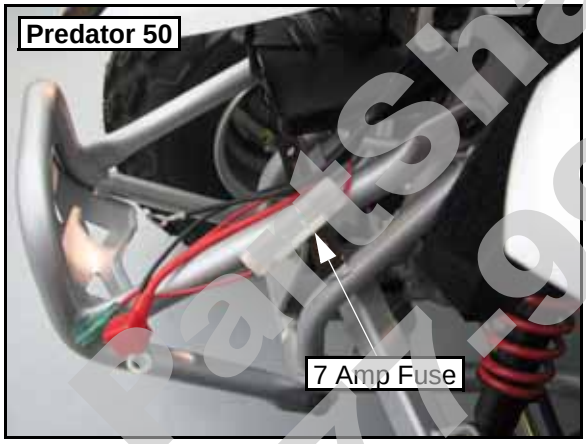
NOTE: When installing a new battery, make sure it's fully charged prior to its initial use. Using a new battery that has not been fully charged can damage the battery and result in a shorter life. It can also hinder vehicle performance. If charging is necessary, use a .5 amp battery charger.

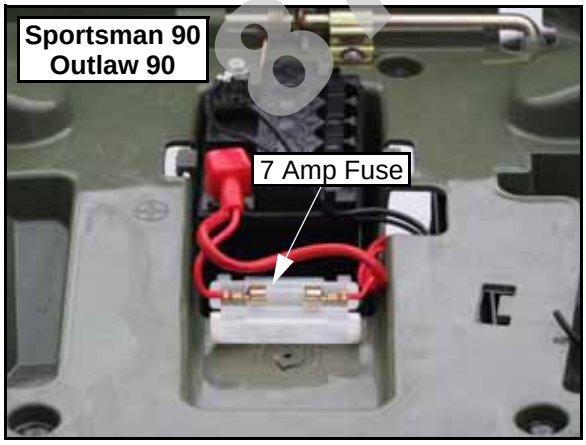
Battery Storage

Whenever the vehicle is not used for a period of three months or more, remove the battery from the vehicle, ensure that it's fully charged, and store it out of the sun in a cool, dry place. Check battery voltage each month during storage and recharge as needed to maintain a full charge.

Fuses / Fuse Holder Location

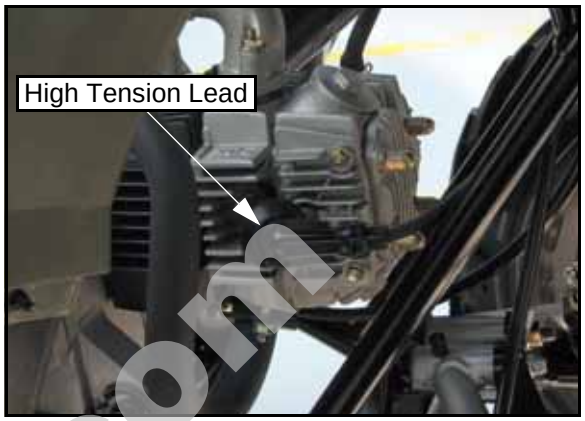
A 7 Amp fuse protects the main electrical system on all youth models. See illustrations for fuse locations.



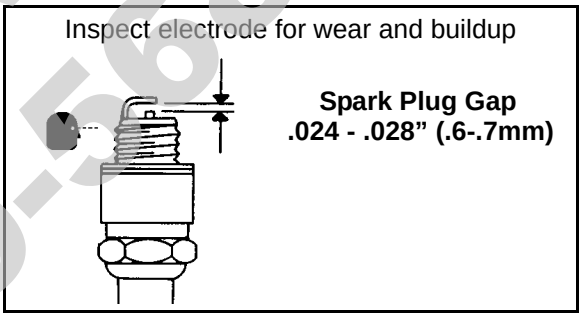


Spark Plug Inspection

1. Remove spark plug high tension lead. Clean plug area so no dirt and debris can fall into engine when plug is removed.



2. Remove spark plug.
3. Inspect electrodes for wear and carbon buildup. Look for a sharp outer edge with no rounding or erosion of the electrodes.



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

Recommended Spark Plug:
NGK CR6HSA

Spark Plug Torque:
9 ft. lbs. (12 Nm)

7. Apply a small amount of anti-seize compound to the spark plug threads.
8. Install spark plug and torque to **9 ft. lbs (12 Nm)**.

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Ignition Timing

Timing is CDI controlled and has no adjustment procedure.

NOTE: There are no timing advance marks stamped on the flywheel to read with a timing light.

Ignition Timing:
17.5° BTDC @ 1700 RPM

Engine / Frame Ground

Inspect engine-to-frame ground cable connection at the starter motor mount. Be sure it is clean and tight.

STEERING AND SUSPENSION

Steering

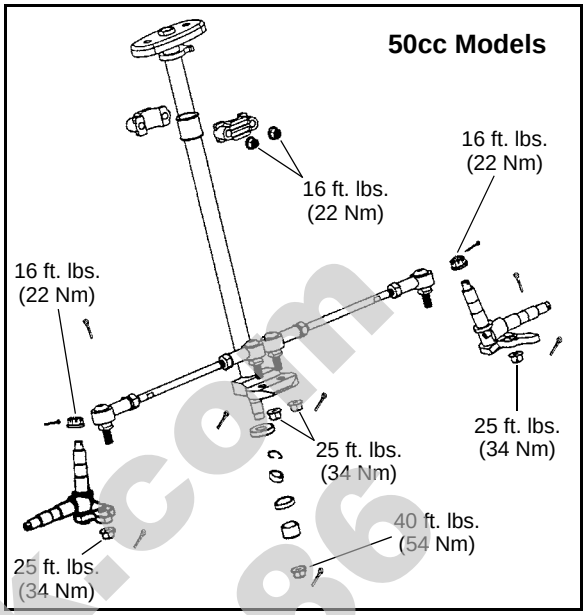
The steering components should be checked periodically for loose fasteners, worn tie rod ends, and damage. Also check to make sure all cotter pins are in place. If cotter pins are removed, they must not be re-used. Always use new cotter pins.

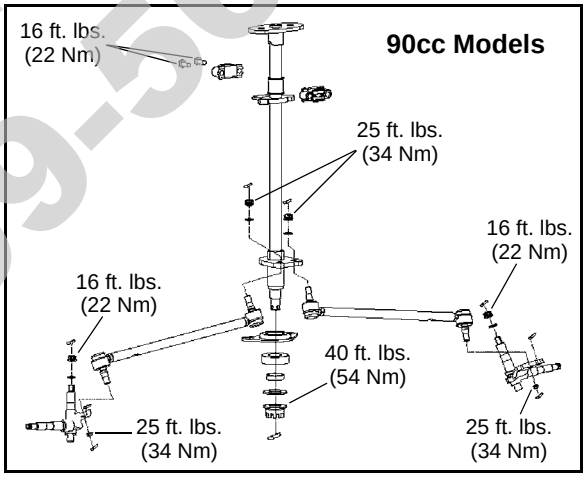
Replace any worn or damaged steering components. Steering should move freely through entire range of travel without binding. Check routing of all cables, hoses, and wiring to be sure the steering mechanism is not restricted or limited.

⚠ 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 Dealer. Only a qualified technician should replace worn or damaged steering parts. Use only genuine Polaris replacement parts.

NOTE: Whenever steering components are replaced, check front end alignment. Use only genuine Polaris parts.





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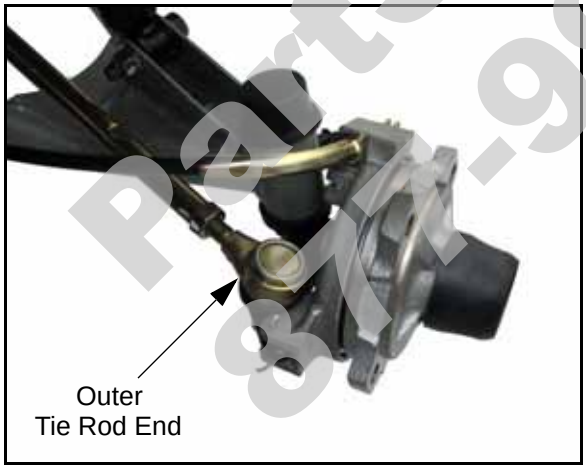
Tie Rod End / Steering Inspection

1. Elevate front end of ATV 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.

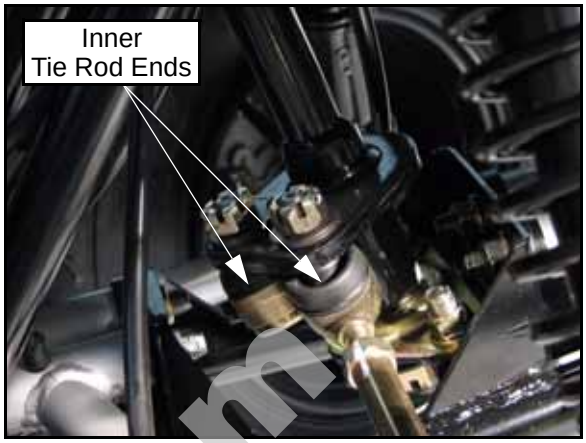
2. If abnormal movement is detected, inspect the hub and wheel assembly to determine the cause.

3. Remove the front wheels.

4. Grasp the steering tie rod and pull in all directions feeling for movement in the tie rod end.



5. Repeat inspection for inner tie rod end (on steering post).



6. Replace any worn steering components. Steering should move freely through entire range of travel without binding

Wheel Alignment

⚠ WARNING

Severe injury or death can result from improper toe alignment and adjustment.
All tie rod adjustments should be performed by an authorized Polaris dealer.

Use the following procedure to check the toe alignment of the vehicle. The recommended toe alignment is 1/8” to 1/4” (3-6 mm) toe out.

1. Set the handlebars in a straight-ahead position.

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

2. Place the stands in front of the vehicle, perpendicular to the rear tires.

3. Tie an elastic string around the stands, making sure the string just touches the side surface of the rear tires on each side of the vehicle and goes around the stands in front of the vehicle.

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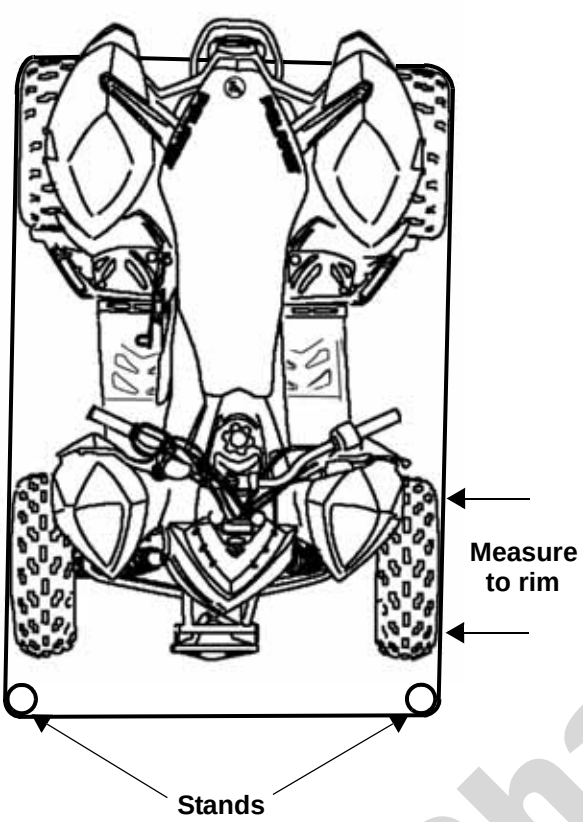
4. Measure the distance from the string to the rim at the front and rear of the front rim. Rear measurement should be 1/16” - 1/8” (2-3 mm) more than the front measurement.



Toe Adjustment

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

NOTE: Be sure the handlebars are straight ahead before determining which tie rod(s) need adjustment.

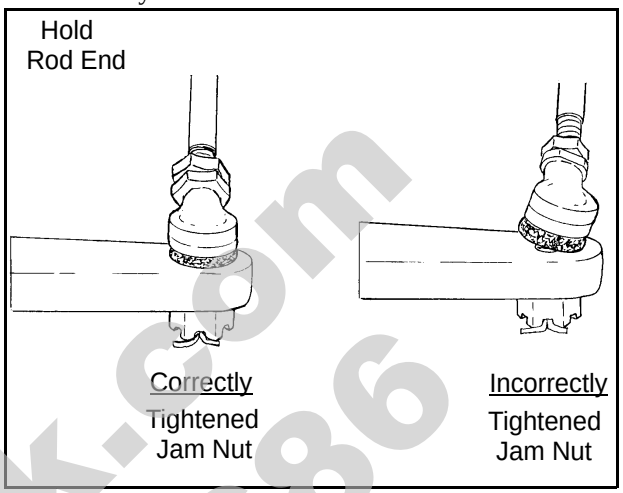
⚠ CAUTION

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

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 - (1/8” to 1/4”).

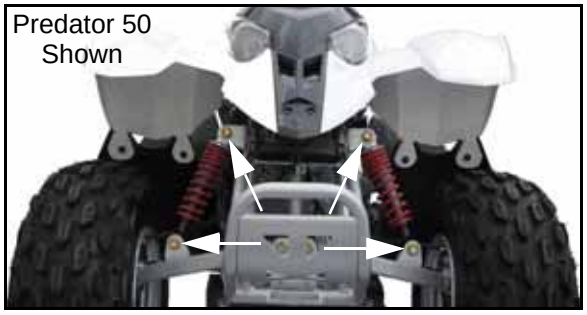
•Important: When tightening the tie rod end jam nuts, the rod ends must be held parallel to prevent rod end damage and premature wear. Damage may not be immediately apparent if done incorrectly. See illustration.



Front Suspension Inspection

Compress and release front suspension. Damping should be smooth throughout the range of travel. Inspect the front shocks and springs to ensure proper function. If the shock is leaking oil, replace it.

Check all front suspension components for wear or damage. Check shock mounting fasteners to ensure they are tight. Inspect A-arm and weldments for any sign of damage.



Rear Suspension Inspection

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

- Check all rear suspension components for wear or damage.

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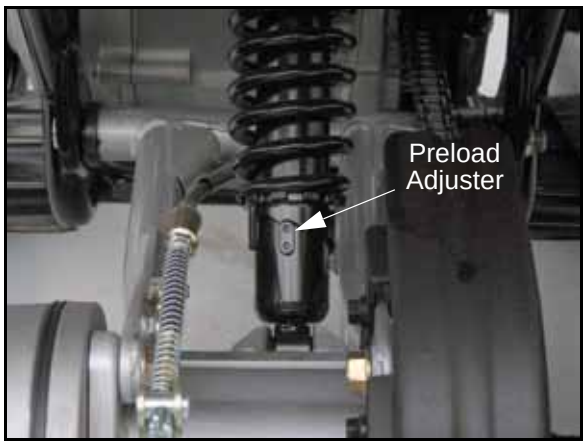
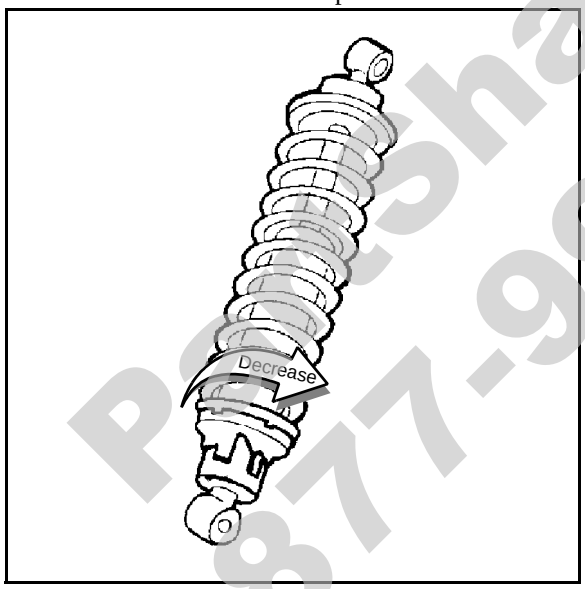
- Inspect shock for leakage.



Inspect the rear shock and spring to ensure proper function. If the shock is leaking oil, replace it. Inspect the swing arm and weldments for any sign of damage.

Suspension Spring Adjustment

The rear spring preload can be adjusted on both 50cc and 90cc models. The front spring preload can be adjusted on only 90cc models. To make preload adjustments, turn the adjuster cam to increase or decrease the amount of preload.



Shock Spanner Wrench

(PN 2870872)

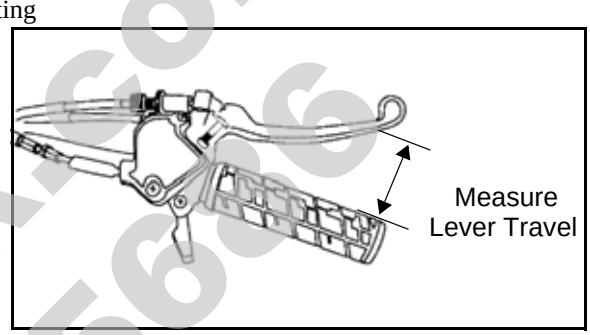
BRAKE SYSTEM

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.

Brake Lever Travel

Check brake lever travel at the intervals recommended in the Periodic Maintenance Chart. Service the brakes when brake lever travel reaches the total lever travel measurement listed in the table below. Always service the brakes when there is no longer sufficient stopping ability at the specified lever travel setting



Component	Total Lever Travel
Front brake lever	1 3/4" (45 mm)
Rear brake lever	2 1/2" (65 mm)

Brake Lever Travel
Front - 1 3/4" (45 mm)
Rear - 2 1/2" (65 mm)

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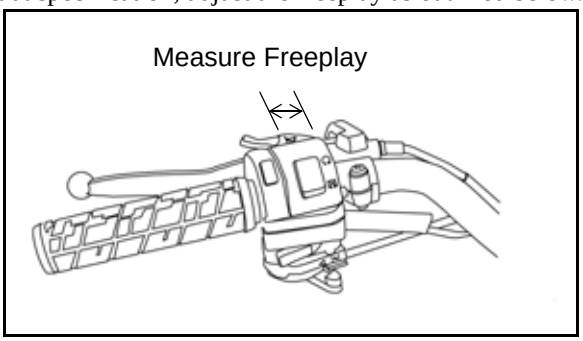
Brake Freeplay

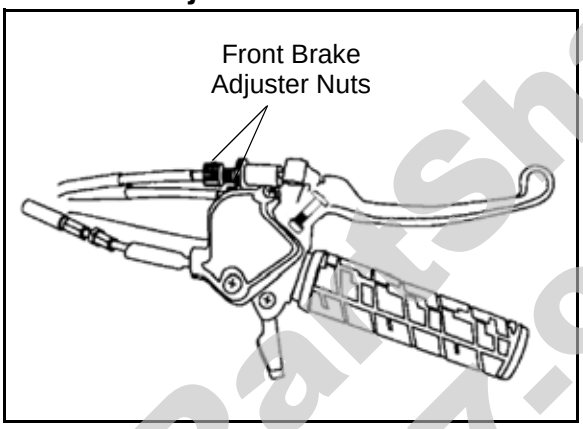
Measure the free-play of the front and rear brakes at the intervals recommended in the Periodic Maintenance Chart. If the freeplay isn't at specification, adjust the freeplay as outlined below.



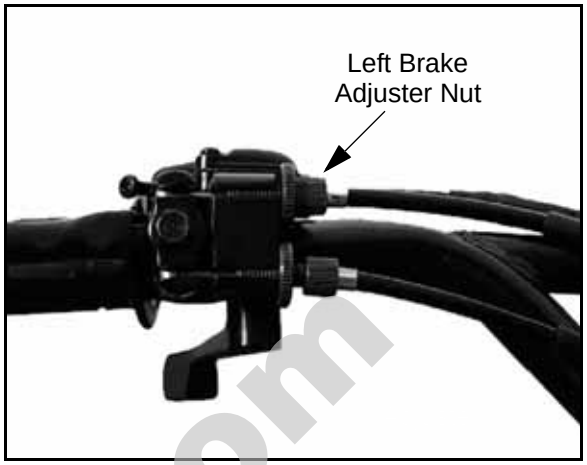
Brake Freeplay Specifications

Model	Front Brake	Rear Brake
50cc Models	.08-.12" (2-3 mm)	.08-.12" (2-3 mm)
90cc Models	.08-.12" (2-3 mm)	.08-.12" (2-3 mm)

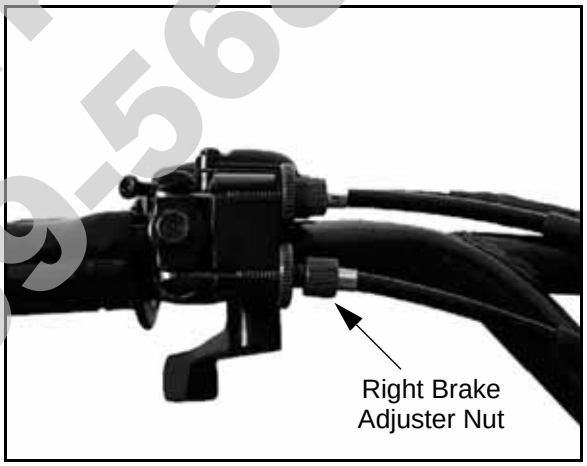
Front Brake Adjustment



1. Position the vehicle on a level surface.
2. Shift the transmission into neutral.
3. Elevate the front of the vehicle by placing a suitable stand under the frame. The front tires should be slightly off the ground.
4. While rotating the *left* front wheel, tighten the *upper* front brake adjuster nut on the right-hand control.



5. When you begin to feel a slight drag on wheel rotation, loosen the adjuster nut one full turn.
6. While rotating the *right* front wheel, tighten the *lower* front brake adjuster nut on the right-hand control.



7. When you begin to feel a slight drag on wheel rotation, loosen the adjuster nut one full turn.
8. Verify that the right hand brake functions correctly.
9. Verify that brake lever freeplay is at specification.
10. Carefully lower the vehicle to the ground.

Brake Cable Free Play
.08 - .12 (2-3 mm)

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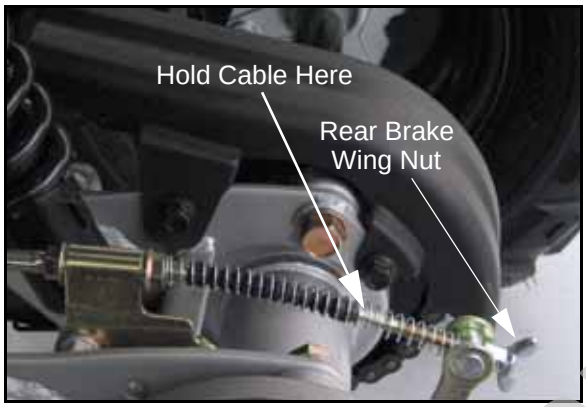
Rear Brake Adjustment

1. Position the vehicle on a level surface.
2. Shift the transmission into neutral (if applicable).
3. Elevate the rear of the vehicle by placing a suitable stand under the frame. The rear tires should be slightly off the ground.
4. While rotating the rear wheels, hold the square portion of the cable and tighten the rear brake wing nut at the rear brake drum.



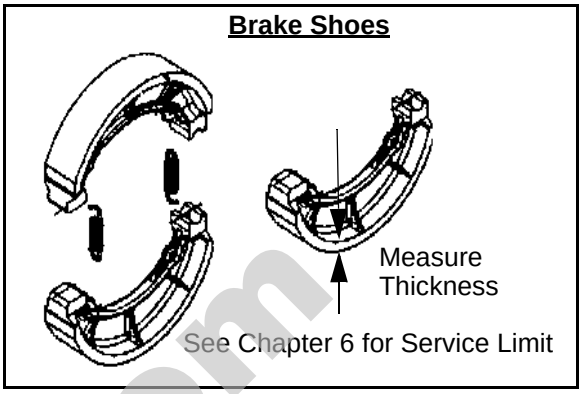
5. When you begin to feel a slight drag in wheel rotation, loosen the wing nut one full turn.
6. Verify that the left hand brake functions correctly.

7. Verify that brake freeplay is at specification.
8. Carefully lower the vehicle to the ground.

Brake Cable Free Play
.08-.12 (2-3 mm)

Brake Shoe Inspection

Brake shoes should be changed when friction material is worn to service limit. See Chapter 6 (Brakes) for specifications.



WHEELS AND TIRES

Wheels

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

Wheel, Hub and Spindle Torque Table

Item	Specification
Front Wheel Bolts	22 ft. lbs. (30 Nm)
Rear Wheel Bolts	22 ft. lbs. (30 Nm)
Front Spindle Nut	44 ft. lbs. (59 Nm)
Rear Hub Retaining Nut	58 ft. lbs. (79 Nm)

Wheel Inspection

Inspect the front and rear wheel bolts for tightness. Re-torque the wheel bolts periodically and check before each ride.

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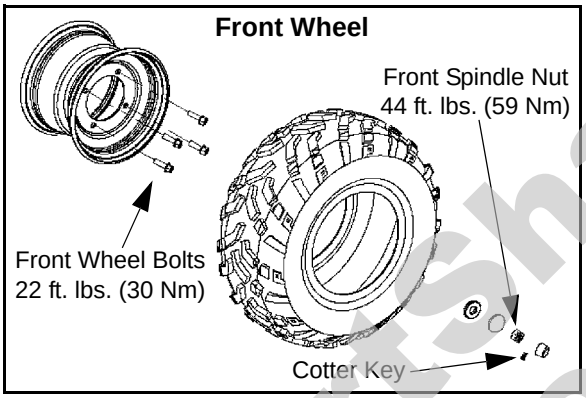
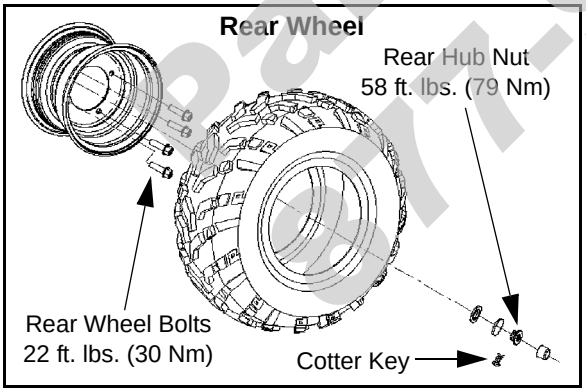
Wheel Removal - Front / Rear

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

Wheel Installation - Front / Rear

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. Install the wheel bolts and finger tighten them.
3. Lower the vehicle to the ground.
4. Securely tighten the wheel bolts to 22 ft. lbs. (30 Nm)





⚠ CAUTION

If wheels are improperly installed it could affect vehicle handling and tire wear. Be sure to properly torque and install all wheel nuts.

Tire Pressure

Tire Pressure Inspection (PSI - Cold)

MODEL	FRONT / REAR
Sportsman 90	**3 psi / 3 psi (20.7 kPa)**
Outlaw 90	**3 psi / 3 psi (20.7 kPa)**
Predator 50	**2 psi / 2 psi (13.8 kPa)**

Tire Inspection

⚠ 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.

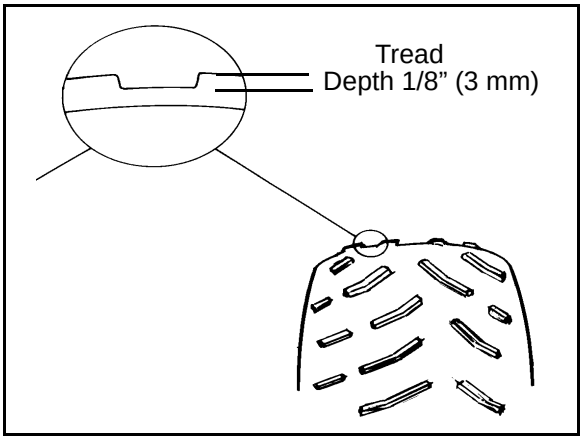
Always replace tires when the tread depth measures 1/8" (.3 cm) or less.

⚠ CAUTION

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



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CHAPTER 3

ENGINE / TRANSMISSION

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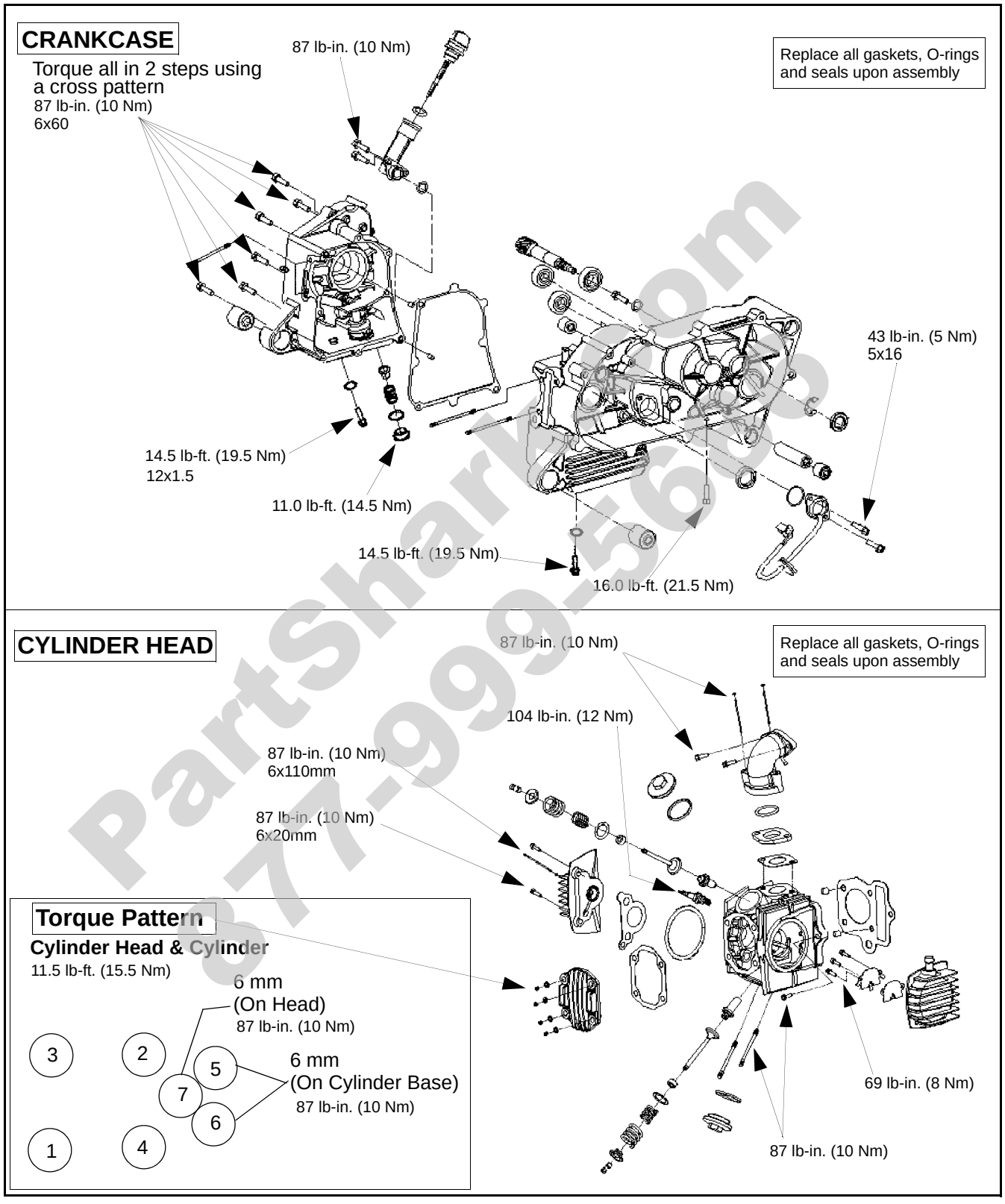
ENGINE SERVICE

Engine Exploded Views & Torque Values



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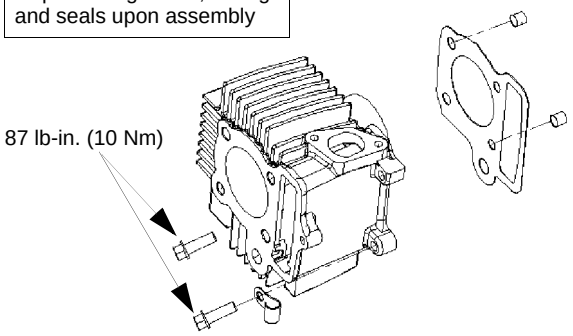
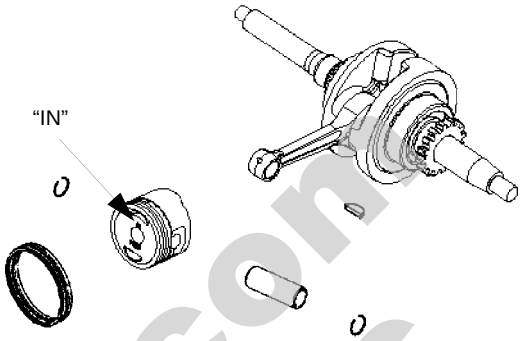
Engine Exploded Views & Torque Values

CYLINDER / CRANKSHAFT / PISTON

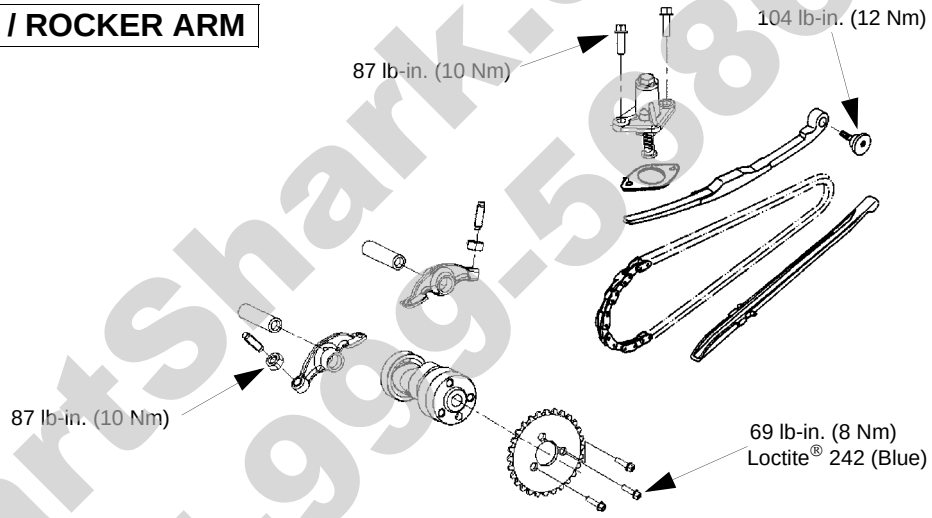
Replace all gaskets, O-rings and seals upon assembly





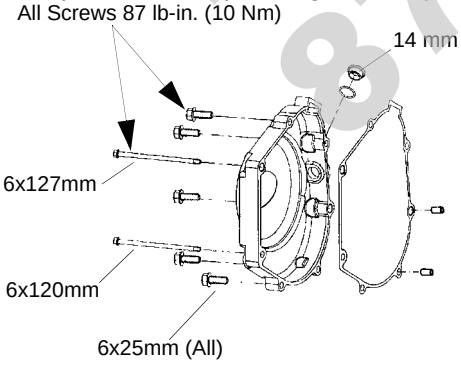
CAMSHAFT CHAIN / ROCKER ARM

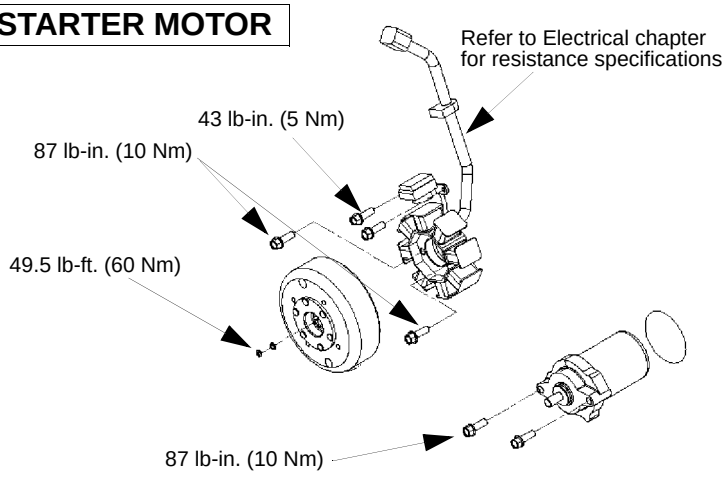
Replace all gaskets, O-rings and seals upon assembly



CRANKCASE COVER / FLYWHEEL / STARTER MOTOR

Torque all in 2 steps using a cross pattern
All Screws 87 lb-in. (10 Nm)





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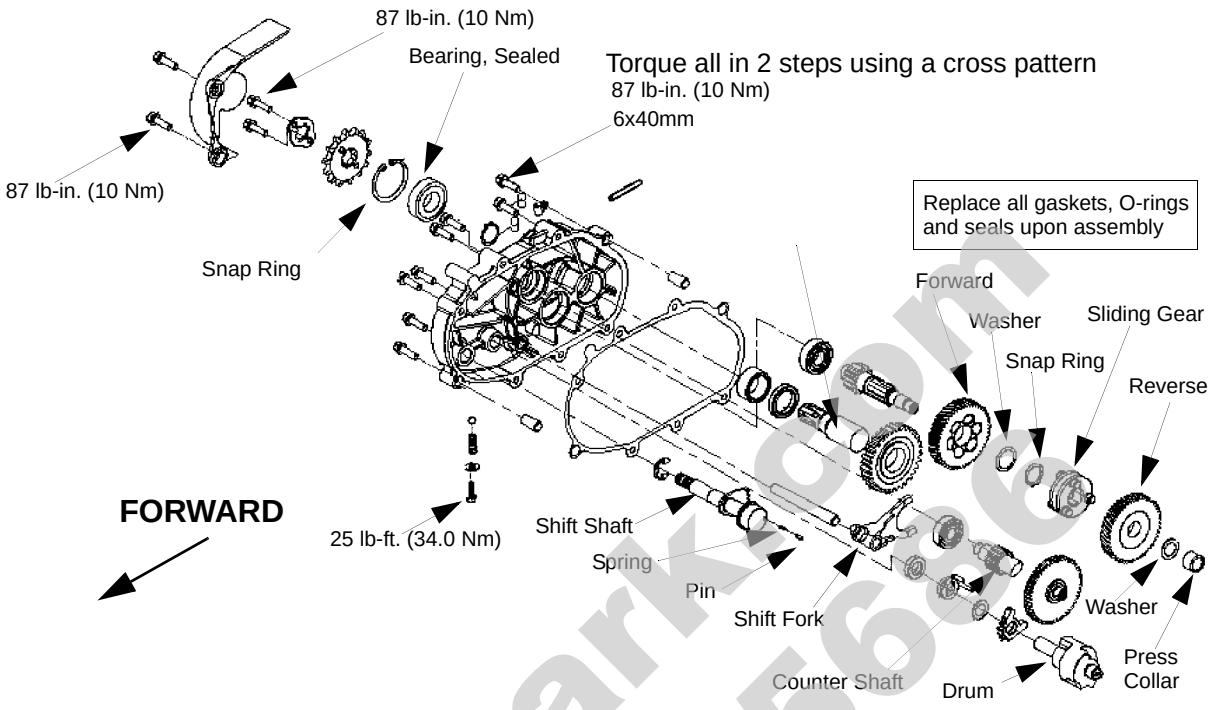
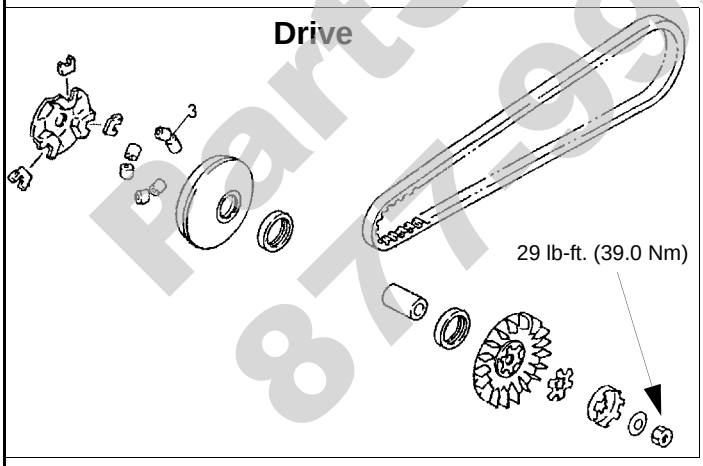
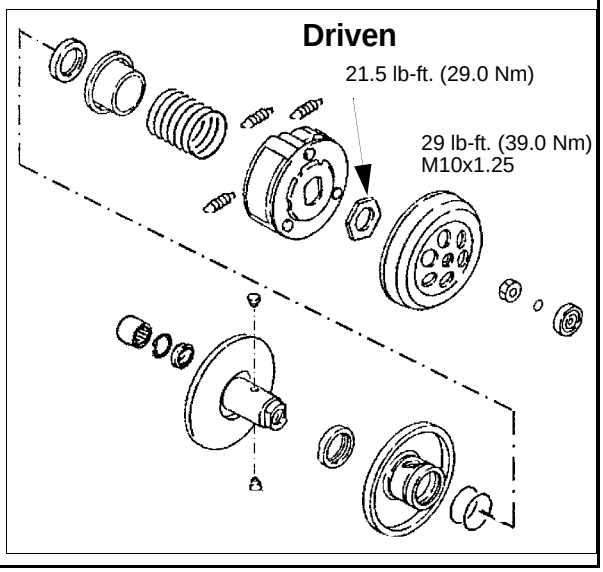
Engine Exploded Views & Torque Values

TRANSMISSION



CLUTCH (CVT)





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Special Tools

PART NUMBER	TOOL DESCRIPTION
2200634	Valve Seat Reconditioning Kit
2870390	Piston Support Block
PA-45153	Flywheel Puller
PA-46502	Valve Spring Compressor
PA-48701	Adaptor, Valve Spring Compressor

Engine Service Data

Cylinder Head / Valvetrain				Predator 50
Rocker Arm	Rocker arm ID	(In/Ex)	Std	.3937 - .3944" (10.00-10.02 mm)
	Rocker arm ID	(In/Ex)	Limit	.3976" (10.10 mm)
Rocker Arm Shaft	Rocker arm shaft OD	(In/Ex)	Std	.3926 - .3932" (9.97 - 9.99 mm)
	Rocker arm shaft OD	(In/Ex)	Limit	.3902" (9.91 mm)
Camshaft	Cam lobe height	In	Std	1.047" (26.60 mm)
			Limit	1.031" (26.20 mm)
		Ex	Std	1.039" (26.40 mm)
			Limit	1.024" (26.00 mm)
Cylinder Head	Surface warpage limit			.0020" (.05 mm)
Valve Clearance (Lash)		In	Std	.002" (.06 mm)
		Ex	Std	.002" (.06 mm)
Valve Seat	Contacting width	In	Std	.039" (1.0 mm)
			Limit	.063" (1.6 mm)
		Ex	Std	.039" (1.0 mm)
			Limit	.063" (1.6 mm)
Valve	Stem diameter		In	.1958 - .1965" (4.98 - 4.99 mm)
			Ex	.1950 - .1956" (4.96 - 4.97 mm)
			Limit	.1930" (4.90 mm)
Valve Guide	Inner Diameter		In	.1968 - .1973" (5.0 - 5.01 mm)
			Ex	.1968 - .1973" (5.0 - 5.01 mm)
			Limit	.1980" (5.03 mm)
Valve Stem to Guide	Clearance (Standard)		In	.0004 - .0015" (.01 - .037 mm)
	Clearance (Standard)		Ex	.0012 - .0022" (.03 - .057 mm)
	Clearance Limit (In)			.0031" (.08 mm)
	Clearance Limit (Ex)			.0039" (.10 mm)
Valve Spring	Free Length		Inner	1.270" (31.75 mm)
			Outer	1.365" (34.67 mm)
	Squareness			0.075" (1.9 mm)
Cam Chain				Install new as a part of any crankshaft service
Compression Pressure	(Maximum reading with throttle wide open)		Std	115-155 psi (790-1080 kPa)

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

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Engine Service Data

Cylinder / Piston / Connecting Rod				Predator 50
Cylinder	Surface warpage limit (mating with cylinder head)			.002" (.05 mm)
	Cylinder bore		Std	1.5354 - 1.5358" (39.00 - 39.01 mm)
	Taper limit			.002" (.05 mm)
	Out of round limit			.002" (.05 mm)
	Piston to cylinder clearance		Std	.0004 - .0014" (.01 - .04 mm)
			Limit	.0039" (.1 mm)
	Boring Limit			2nd Oversize (+ .0197" / .50 mm)
Piston	Outer diameter (Measure 3mm up from bottom and 90° to piston pin)	Std		1.5344 - 1.5350" (38.975 - 38.99 mm)
		1st O.S.		.0098" (.25 mm) Oversize
		2nd O.S.		.0197" (.50 mm) Oversize
	Pin Bore			.5122 - .5129" (13.01 - 13.03 mm)
Piston Pin	Pin to piston pin bore clearance			.0002 - .0005" (.004 - .012 mm)
			Degree of fit Pin Diameter	Piston Pin must be a push (by hand) fit at 68 °F (20 °C) .5117 - .5118" (12.997-13.00mm) (Limit: 12.96mm)
Piston Ring	Piston Ring Installed gap	Top ring	Std	.002 - .008" (.05 - .20 mm)
			Limit	.020" (0.5 mm)
		Second ring	Std	.002 - .008" (.05 - .20 mm)
			Limit	.020" (0.5mm)
		Oil ring	Std	.0118 - .0354" (.3 - .9 mm)
			Limit	.059" (1.5 mm)
Piston Ring	Standard clearance - piston ring to ring groove	Top ring	Std	.0008 - .0024" (.02 - .06 mm)
			Limit	.0035" (.09 mm)
		Second ring	Std	.0008 - .0024" (.02 - .06 mm)
			Limit	.0035" (.09 mm)
Connecting Rod	Connecting rod small end ID		Std	.5122" - .5129" (13.01 - 13.03 mm)
			Limit	.5141" (13.06 mm)
	Connecting rod big end axial clearance		Std	.004 - .012" (0.1 - 0.3 mm)
	Connecting rod big end radial clearance		Std	.0002 - .0005" (0.002 - 0.013 mm)
Crankshaft	Crankshaft end runout			0.0016" (0.04 mm)
	Crankshaft end runout - limit			0.0039" (0.1 mm)
Cam Shaft Chain				Install new as a part of any crankshaft service

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

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Engine Service Data

Cylinder Head / Valvetrain				Sportsman 90 / Outlaw 90
Rocker Arm	Rocker arm ID	(In/Ex)	Std	.3937 - .3944" (10.00-10.02 mm)
	Rocker arm ID	(In/Ex)	Limit	.3976" (10.10 mm)
Rocker Arm Shaft	Rocker arm shaft OD	(In/Ex)	Std	.3926 - .3932" (9.97 - 9.99 mm)
	Rocker arm shaft OD	(In/Ex)	Limit	.3902" (9.91 mm)
Camshaft	Cam lobe height	In	Std	1.047" (26.60 mm)
			Limit	1.031" (26.20 mm)
		Ex	Std	1.039" (26.40 mm)
			Limit	1.024" (26.00 mm)
Cylinder Head	Surface warpage limit			.0020" (.05 mm)
Valve Clearance (Lash)		In	Std	.002" (.06 mm)
		Ex	Std	.002" (.06 mm)
Valve Seat	Contacting width	In	Std	.039" (1.0 mm)
			Limit	.063" (1.6 mm)
		Ex	Std	.039" (1.0 mm)
			Limit	.063" (1.6 mm)
Valve	Stem diameter		In	.1958 - .1965" (4.98 - 4.99 mm)
			Ex	.1950 - .1956" (4.96 - 4.97 mm)
			Limit	.1930" (4.90 mm)
Valve Guide	Inner Diameter		In	.1968 - .1973" (5.0 - 5.01 mm)
			Ex	.1968 - .1973" (5.0 - 5.01 mm)
			Limit	.1980" (5.03 mm)
Valve Stem to Guide	Clearance (Standard)		In	.0004 - .0015" (.01 - .037 mm)
	Clearance (Standard)		Ex	.0012 - .0022" (.03 - .057 mm)
	Clearance Limit (In)			.0031" (.08 mm)
	Clearance Limit (Ex)			.0039" (.10 mm)
Valve Spring	Free Length		Inner	1.270" (31.75 mm)
			Outer	1.365" (34.67 mm)
	Squareness			0.075" (1.9 mm)
Cam Chain				Install new as a part of any crankshaft removal
Compression Pressure	(Maximum reading with throttle wide open)		Std	135-175 psi (930-1205 kPa)

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

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Engine Service Data

Cylinder / Piston / Connecting Rod				Sportsman 90 / Outlaw 90
Cylinder	Surface warpage limit (mating with cylinder head)			.002" (0.05 mm)
	Cylinder bore		Std	1.8504 - 1.8507" (47.00 - 47.01 mm)
	Taper limit			.002" (0.05 mm)
	Out of round limit			.002" (0.05 mm)
	Piston to cylinder clearance		Std	.0004 - .0014" (0.01 - 0.04 mm)
			Limit	.0039" (0.1 mm)
	Boring Limit			2nd Oversize (+ .0197" / .50 mm)
Piston	Outer diameter (Measure 5mm up from bottom and 90° to piston pin)	Std		1.8492 - 1.8500" (46.97 - 46.99 mm)
		1st O.S.		.0098" (.25 mm) Oversize
		2nd O.S.		.0197" (.50 mm) Oversize
	Pin Bore			.5122 - .5129" (13.01 - 13.03 mm)
Piston Pin	Pin to piston pin bore clearance			.0002 - .0005" (.004 - .012 mm)
	Degree of fit Pin Diameter			Piston Pin must be a push (by hand) fit at 68 °F (20 °C) .5117 - .5118" (12.997-13.00mm) (Limit: 12.96mm)
Piston Ring	Piston Ring Installed gap	Top ring	Std	.002 - .008" (.10 - .25 mm)
			Limit	.020" (0.5 mm)
		Second ring	Std	.002 - .008" (.3 - 0.45 mm)
			Limit	.020" (0.5mm)
		Oil ring	Std	.012 - .035" (0.2 - 0.7 mm)
			Limit	.059" (1.5 mm)
Piston Ring	Standard clearance - piston ring to ring groove	Top ring	Std	.0008 - .0024" (0.02. - 06 mm)
			Limit	.0035" (0.09 mm)
		Second ring	Std	.0008 - .0024" (0.02 - 0.06 mm)
			Limit	.0035" (0.09 mm)
Connecting Rod	Connecting rod small end ID		Std	.5122" - .5129" (13.01 - 13.03 mm)
			Limit	.5141" (13.06 mm)
	Connecting rod big end axial clearance		Std	.004 - .012" (0.1 - 0.3 mm)
	Connecting rod big end radial clearance		Std	.0002 - .0005" (0.002 - 0.013 mm)
Crankshaft	Crankshaft end runout			0.0016" (0.04 mm)
	Crankshaft end runout - limit			0.0039" (0.1 mm)
Oil Pump Chain				Install new as a part of any oil pump replacement
Cam Shaft Chain				

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

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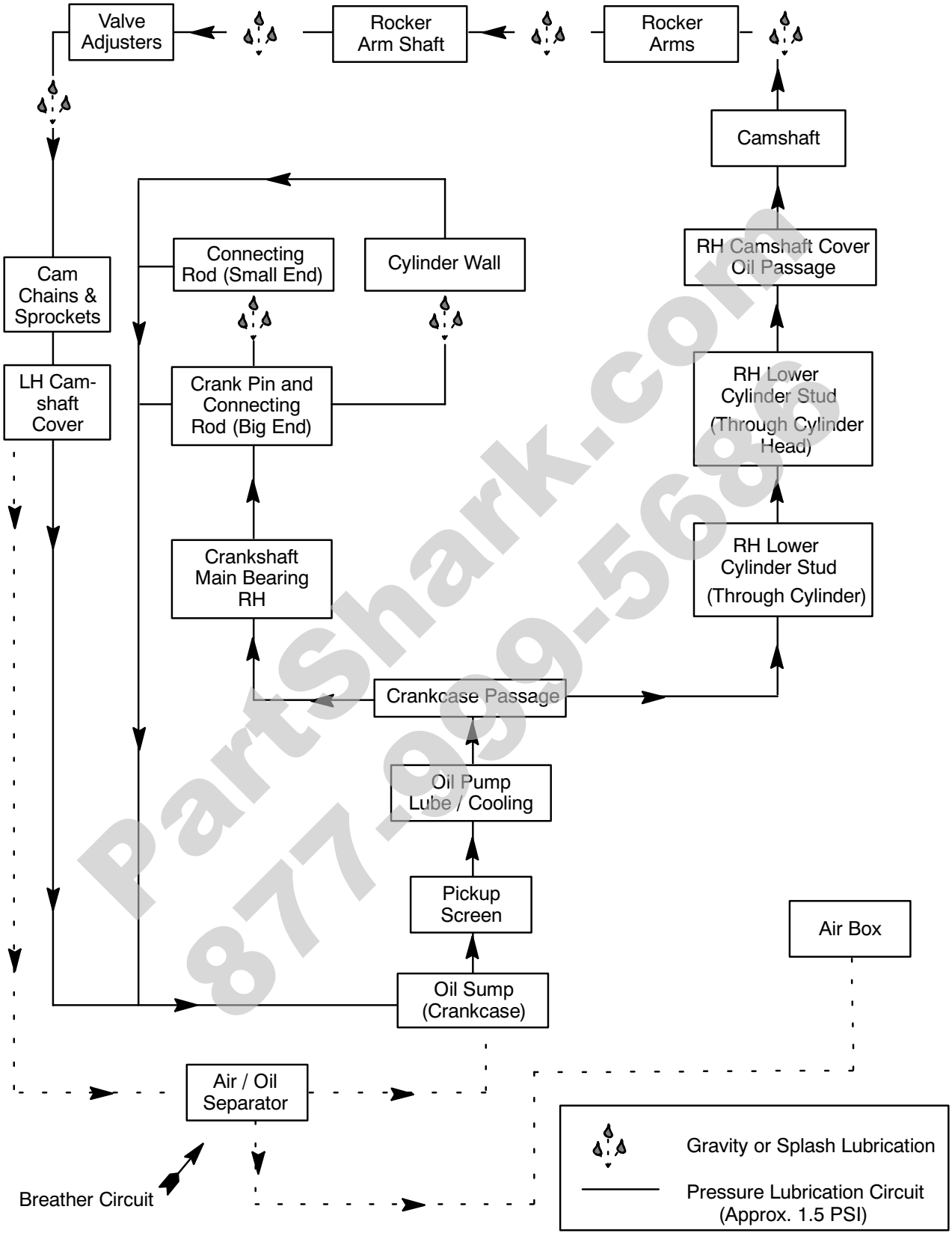
Oil Flow Diagram



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Piston / Ring Identification

The letters “IN” or the larger of two valve pockets on the piston face the intake side of the engine (UP). Other numbers may be used for size identification. Generally, four stroke engine rings have a rectangular profile. The numbers or letters on all rings must be positioned upward. Un-marked rings (such as oil control ring rails) are non directional. Always see ring installation text for specific ring information.

Accessible Components

NOTE: The top-end of the engine can be serviced without pulling the engine from the ATV. Loosen the upper steering post mounting bolts to allow enough clearance to remove cylinder head and cylinder. However, it is recommended to pull the engine to service top-end components.

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

- Flywheel
- Alternator/Stator
- Starter Motor/Starter Drive
- Oil pump
- Carburetor
- Transmission

The following components require engine removal for service:

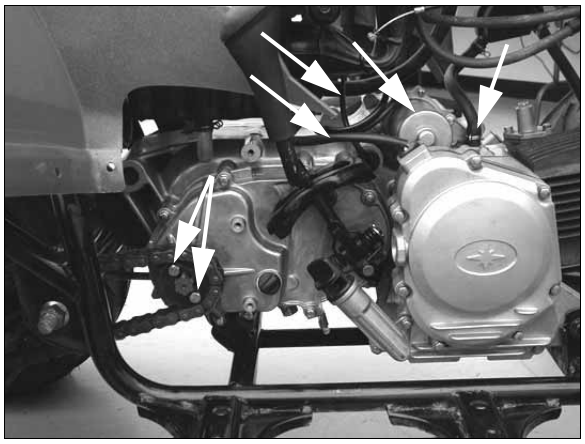
- Cam Chain and Cam Chain Drive (Lower) Sprocket
- Cylinder Head
- Rocker Arms / Shafts
- Cylinder
- Piston / Rings
- Camshaft
- Crankshaft
- Crankshaft Main Bearings
- Crankcase
- Valves

NOTE: Crankshaft components are not serviceable. Replace crankshaft as an assembly.

Engine Removal

1. Clean the ATV and work area thoroughly.
2. Remove seat.
3. Remove front cab and foot rests.

4. Disconnect battery cables.
5. Drain engine oil and / or transmission oil as required for the service to be performed. (Chapter 2)
6. Disconnect or remove from RIGHT Side:
   - Exhaust Pipe
   - Spark Plug Wire
   - Drive Sprocket Cover / Sprocket / Chain
   - Starter Motor
   - Wire Connector - Stator and Neutral Switch
   - Carburetor / Manifold
   - Breather Hose



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7. Cover any openings with a clean shop towel.

8. Disconnect or Remove From LEFT Side:

   - CVT Air Ducts
   - Breather Hose (To Valve Cover)

9. Remove (2) engine mount bolts at the front and (1) rear engine mount bolt.

10. Check for any remaining attachments and remove engine from 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 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).

CVT System

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

Transmission Adjustment (If required)

- Before tightening the gear selector bracket screws on the transmission, be sure transmission is in neutral and center the lever in the neutral slot on bracket. Inspect operation and re-adjust bracket if necessary.

Exhaust

- Replace exhaust gaskets.

Engine Mount Torque

- Front mounts (2)
- Rear mount (1)

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 an SAE 40W mineral based oil during break-in period or after engine top end service, to ensure complete piston ring seating to cylinder wall. Change to recommendation after 10 hours.
- Use fuel with a minimum octane of 87 (R+M)/2 method.
- Check oil level before each ride, especially during the break-in period.
- Change engine oil and filter after the first 10 hours of operation.

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Engine Lubrication

Oil Type:**
Above 32°F
Polaris Synthetic Youth 4-Stroke Oil (40 W)
Quart - (PN 2876248)
Gallon - (PN2876249)

Below 32°F
Polaris Semi-Synthetic Engine Oil (20W-40)
Quart - (PN 2872175)
Gallon - (PN2872176)

Capacity: Approximately 30 oz. (900ml)

Drain Plug (Engine Oil): 14 ft. lbs. (19 Nm)

Screen Fitting: 11 ft. lbs. (15 Nm)

Oil Pressure Specification: Not Applicable

** For break-in period after engine top end service, use an SAE 40W mineral based oil to ensure complete piston ring seating to cylinder wall. Change to above recommendation after 10 hours.

Transmission Lubrication

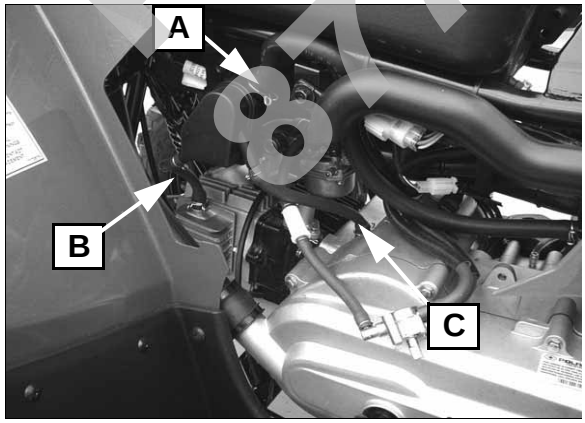
Oil Type:
Polaris AGL ATV Gearcase Lubricant
Quart - (PN 2873602)

Capacity: Approximately 11.8 oz. (350 ml)

Drain Plug (Transmission): 16 ft. lbs. (21.5 Nm)

Engine Breather / Oil Separator

The engine breather / oil separator is located on the left side. The breather provides ventilation for the cylinder head and crankcase through the air box.



A. To Air Box
B. To LH Cover
C. To Crankcase

Finding Top Dead Center (TDC)

Top Dead Center (TDC) is referenced throughout this section.

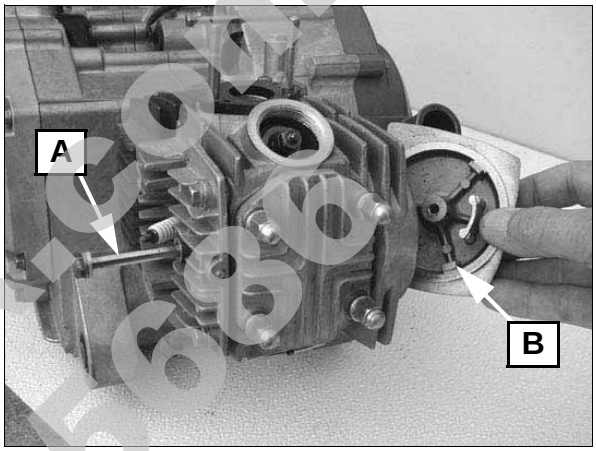
Properly locate TDC on compression stroke prior to:

- Top end disassembly or assembly
- Timing the cam shaft
- Valve clearance inspection / adjustment

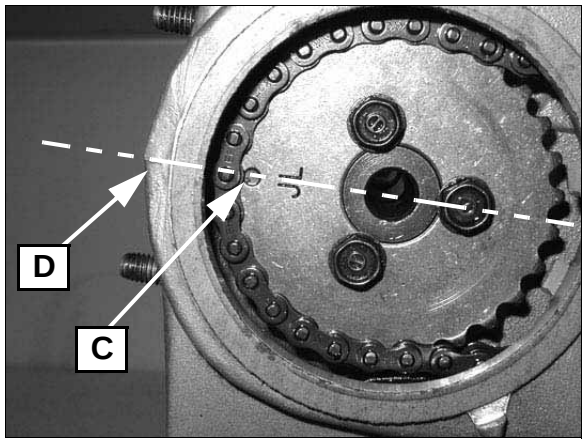
Two methods of finding TDC are shown below.

USE THE CAMSHAFT SPROCKET TIMING MARK

1. Remove bolt (A) and camshaft sprocket cover (B).



2. Rotate engine to align dot (C) on sprocket with mark (D) on top of head. Mark and dot should form a straight line through the center of camshaft and sprocket bolt as shown.



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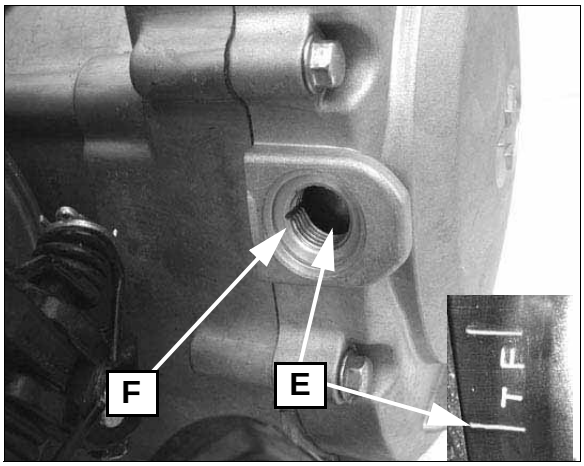
USE THE FLYWHEEL TIMING MARK

1. Remove timing hole plug from flywheel cover.
2. Rotate the engine in normal direction of rotation and watch the intake valve open and then close.
3. View straight into the timing hole and continue rotation engine until the "T" mark on flywheel (E) aligns with the groove in the timing hole (F). There should be clearance on both valves.

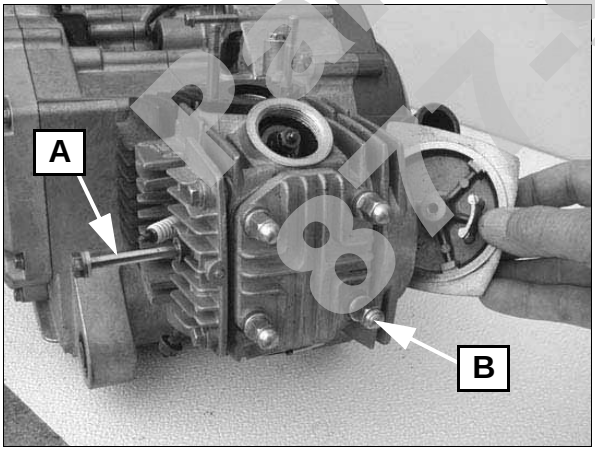


TOP-END DISASSEMBLY

Engine Disassembly

REMOVE:

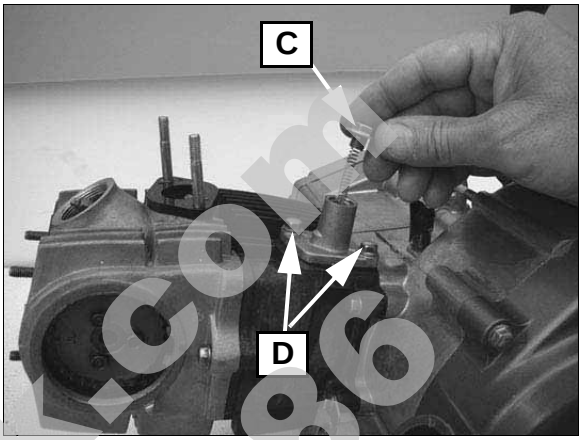
1. Engine from frame.
2. Bolt (A) and camshaft cover. Top cover nuts (B).



Cam Chain Tensioner Removal

NOTE: Tensioner can be removed with engine in frame.

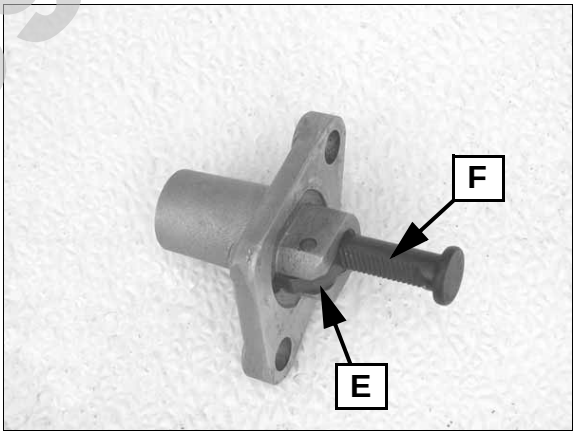
1. Find TDC on compression stroke. See "Finding Top Dead Center (TDC)" on page 3.13
2. Remove camshaft tensioner cap with spring (C).



3. Remove tensioner body bolts (D).

Cam Chain Tensioner Inspection

1. Pull plunger out of tensioner body until fully extended. Closely inspect teeth on pawl (E) and on plunger (F).



2. Hold ratchet pawl back, and push plunger in and out of tensioner body. The plunger should move smoothly through the travel range.
3. Replace tensioner assembly if any part is worn or damaged.

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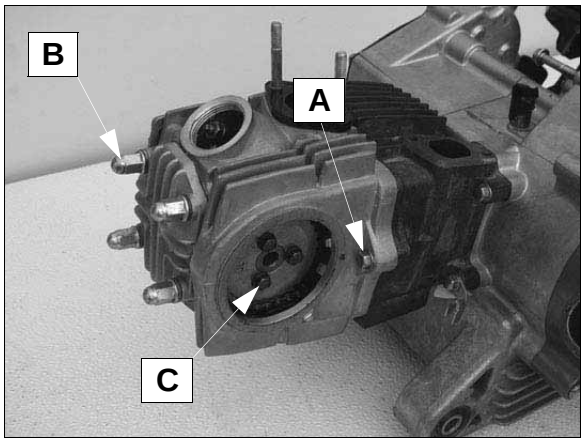
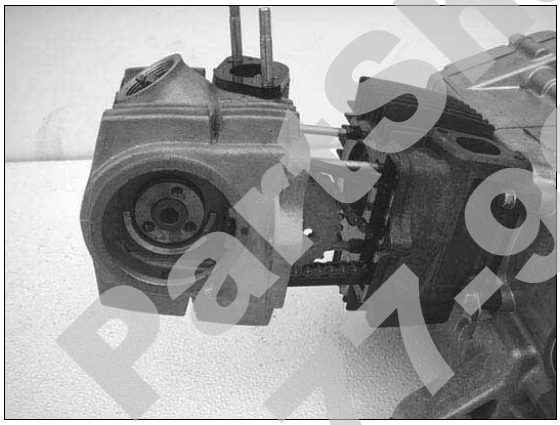
Cylinder Head Removal

REMOVE:

1. Bolt (A).
2. Nuts (B) evenly in a cross pattern until loose.
3. Cam sprocket bolts (C).



4. Slide sprocket off end of camshaft.
5. Lift cylinder head off studs.



6. Secure cam chain with a wire to prevent it from falling into crankcase.

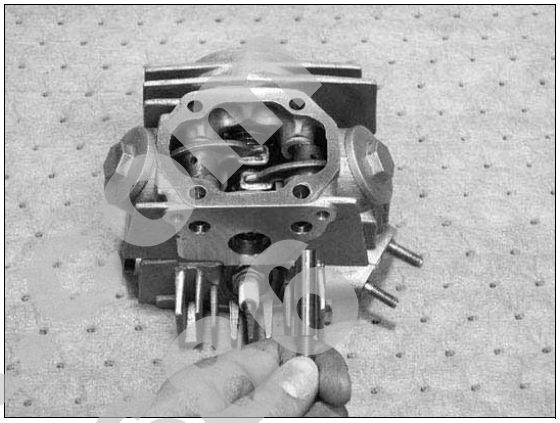
Rocker Arm Disassembly / Inspection

NOTE: Cylinder head must be removed to service the rocker arms.

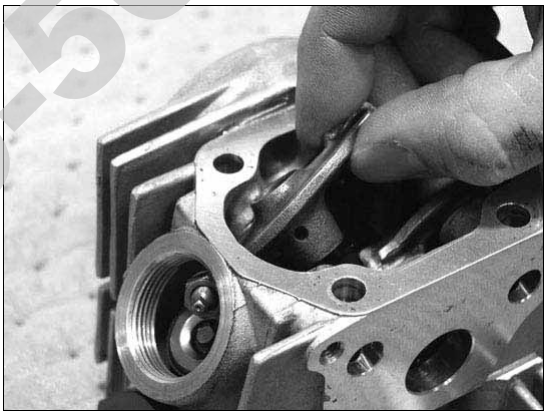
NOTE: Mark or tag rocker arms and shafts to keep them in order for assembly.

REMOVE:

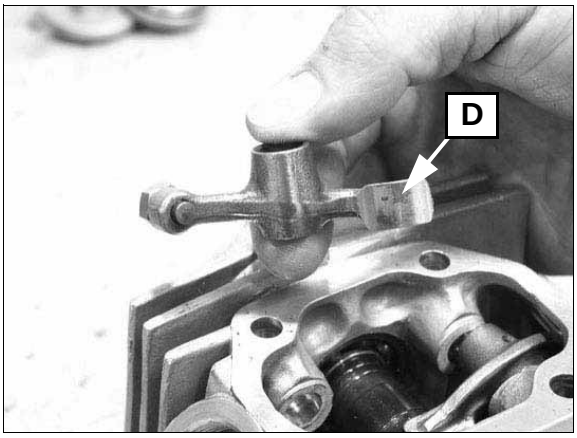
1. Right cylinder head cover. Pull rocker shaft using a bolt.



2. Rocker arm.



3. Inspect pad surface (D) of rocker arm for wear. Replace both camshaft and rocker arms if wear is visible.



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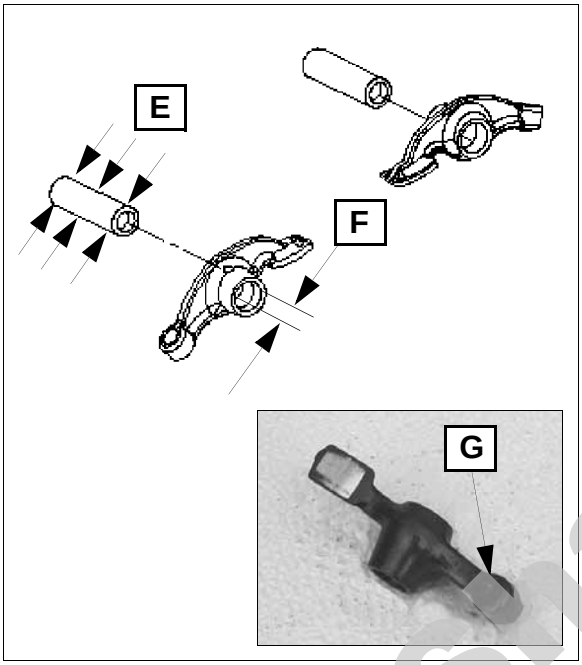
4. Measure O.D. of rocker shaft in 3 places (E).

5. Measure I.D. of rocker arm (F) and compare to specification.

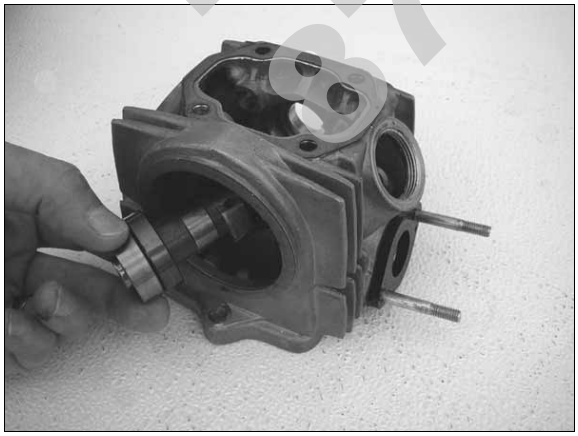
6. Inspect rocker adjuster screws (G) and the end of the valve stems for wear, pitting, or damage to threads of the adjuster or locknut. Replace all worn or damaged parts.
NOTE: Adjuster face is hardened and cannot be ground or refaced.



Camshaft Removal

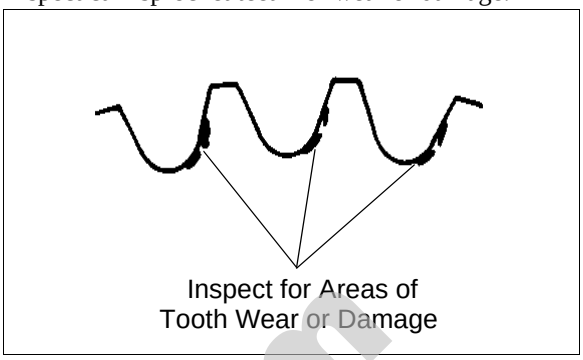
1. Rocker arms must be removed from cylinder head to remove the camshaft.

2. Slide camshaft out left side of cylinder head.

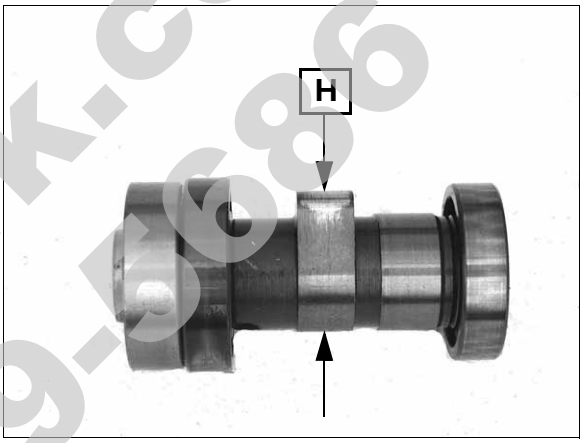


Camshaft Inspection

1. Inspect cam sprocket teeth for wear or damage.



Measure height of each cam lobe (H) using a micrometer. Replace cam if worn below minimum height. Compare to specification. Check bearings for wear, roughness, or damage.



Cam Lobe Height (50cc & 90cc)
Intake
Std: 1.047″ (26.60 mm)
Limit:1.031″(26.20 mm)

Exhaust
Std: 1.039” (26.40 mm)
Limit: 1.024” (26.00 mm)

2. Thoroughly clean the cam shaft to be sure all oil passages are clear.

Replace camshaft if damaged or if any part is worn excessively.

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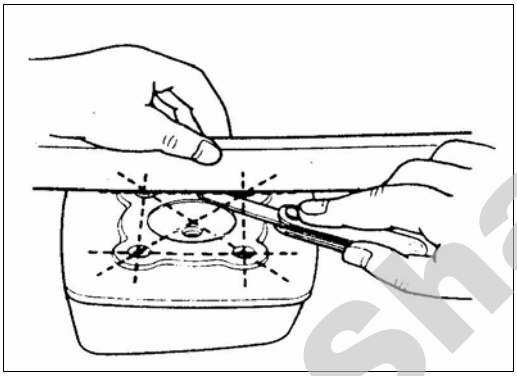
Cylinder Head Inspection

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

> **⚠ CAUTION**
>
> Use care not to damage sealing surface. If there is damage found on the cylinder head combustion chamber, it is recommended the component be replaced.

Cylinder Head Surface Inspection

1. Lay a straight edge across the surface of the 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.Milling the

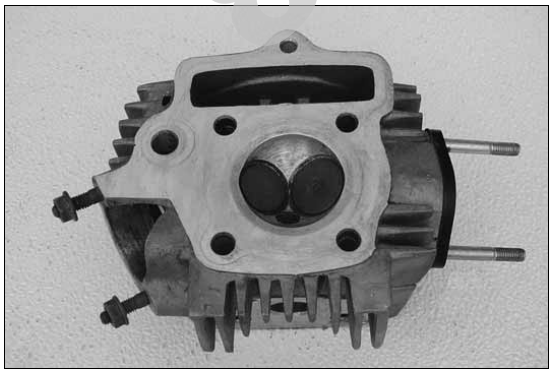


Cylinder Head Warp Limit:

.002" (.05 mm)

Combustion Chamber Inspection

Clean all accumulated carbon deposits from combustion chamber and valve seat area with a soft wire brush. Inspect the combustion chamber for cracks and/or damage from foreign debris.



Cylinder Head Disassembly

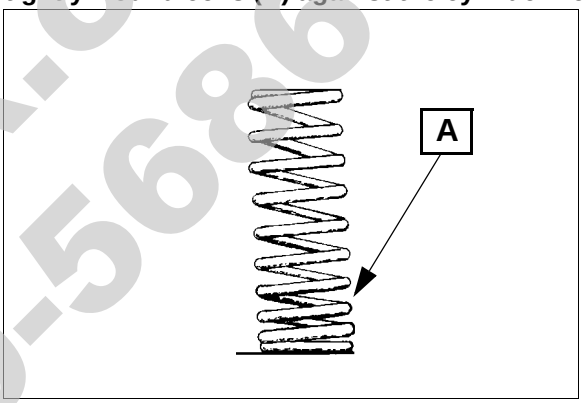
> **⚠ WARNING**
>
> Wear eye protection or a face shield during cylinder head disassembly and reassembly.

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

1. Using a valve spring compressor, compress the valve springs and remove the split keepers. 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 (A) against the cylinder head.



3. Push valve out, keeping it in order for reassembly in the same guide.

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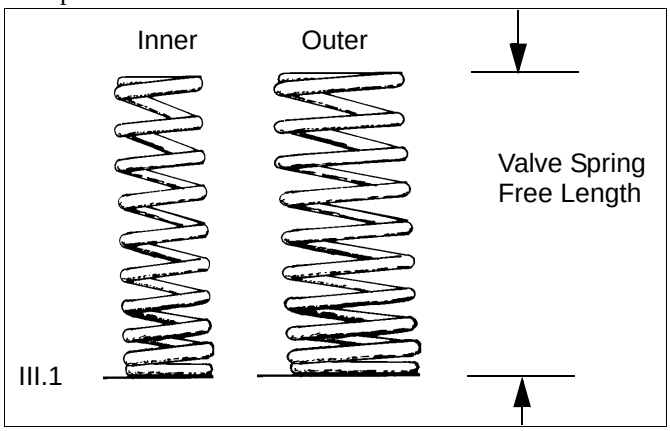
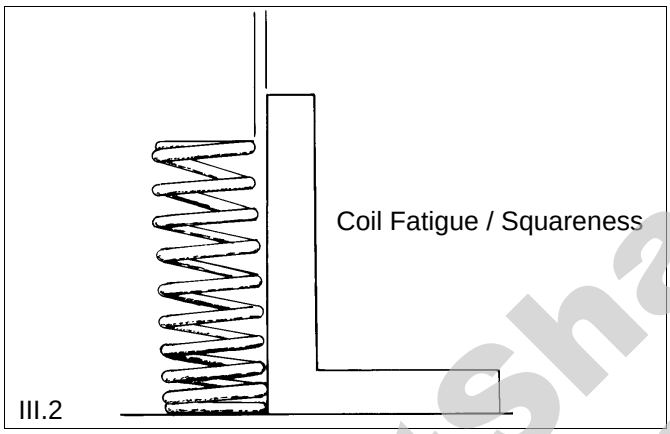
4. Measure free length of the inner and outer springs with a Vernier caliper, Ill.1. Check spring for squareness as shown in Ill.2. Replace spring if measurements are out of specification.

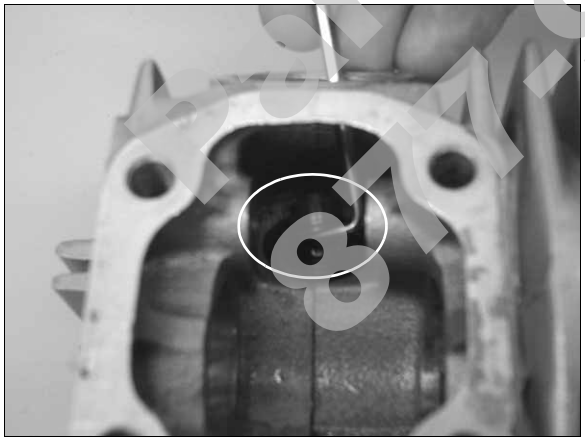


III.1



III.2

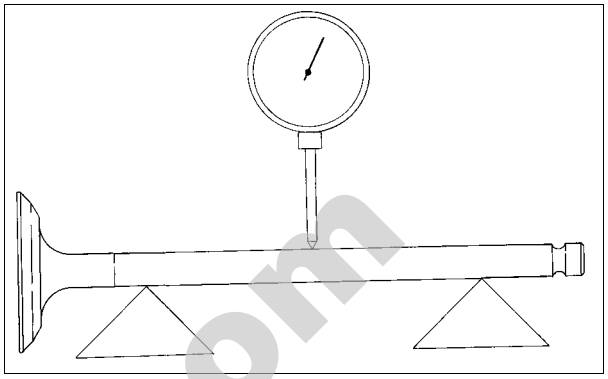
5. Remove valve seals. **NOTE:** Replace seals whenever the cylinder head is disassembled.



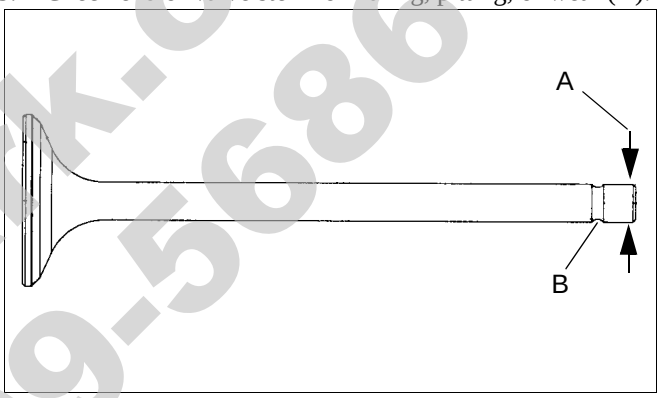
Valve Inspection

1. Remove all carbon from valve with a soft wire wheel.

2. Check valve face for runout, pitting, and burnt spots. Check for bent valve stems using "V" blocks and a dial indicator.



3. Check end of valve stem for flaring, pitting, or wear (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. Valves must be replaced if worn, bent, or damaged.

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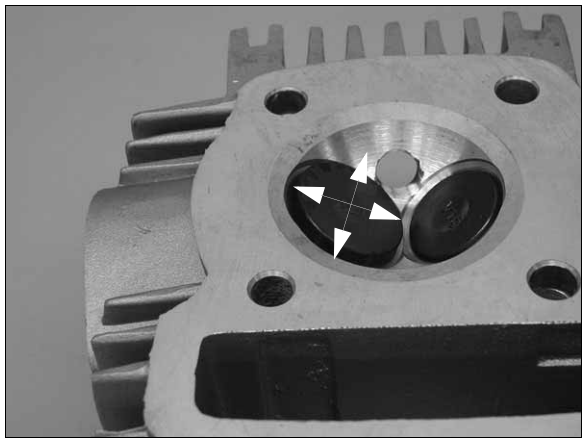
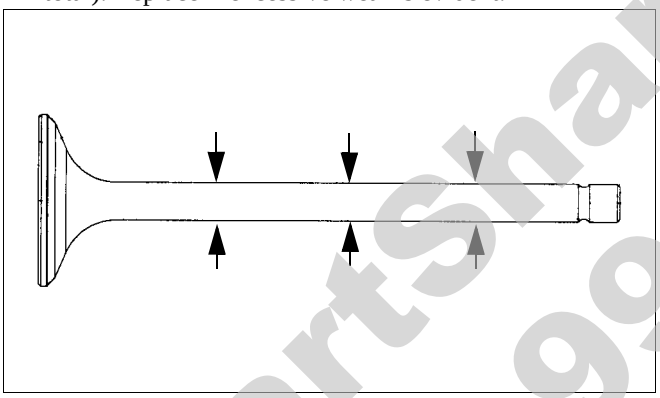
5. Install the valve in its mating guide and lift it 5mm off of the seat. Push valve back and forth and measure deflection in two directions. If deflection exceeds limit repeat test with a new valve, or measure stem to guide clearance as outlined in Step 6 and 7 to determine if wear is in the guide or the valve stem (or both).



6. Measure diameter of valve stem with a micrometer in three places and in two different directions (six measurements total). Replace if excessive wear is evident.



7. 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.

8. Subtract valve stem measurement to obtain stem to guide clearance. NOTE: Be sure to measure each guide and valve combination individually.

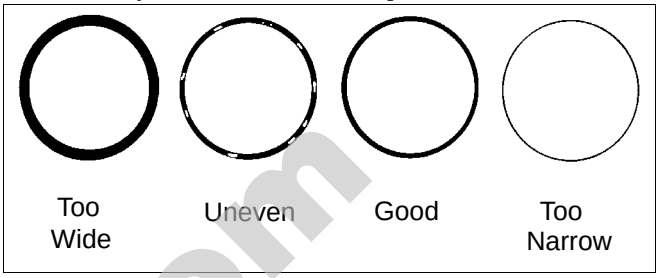
9. Replace valve and/or guide if clearance or deflection is excessive.

NOTE: If valve guides are replaced, valve seats must be reconditioned.

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. 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 cylinder head reconditioning techniques. The following is an outline of general reconditioning techniques. Follow specific seat cutting instructions provided by the manufacturer of the seat cutting equipment. Abrasive stone seat reconditioning equipment can also be used. Keep valves in order with their respective seat. Do not attempt cylinder head service without the proper tools or knowledge of cylinder head service.

⚠ CAUTION

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

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.

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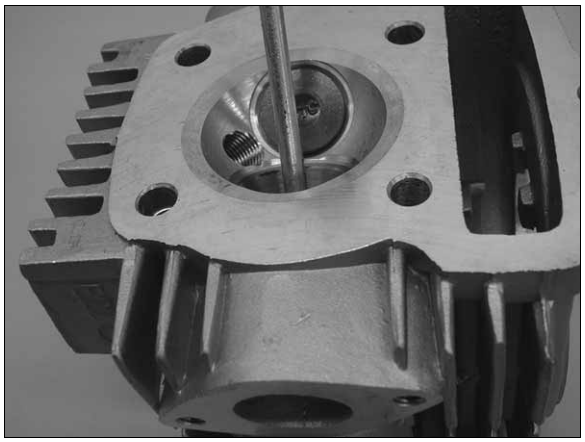
1. Install pilot into valve guide.

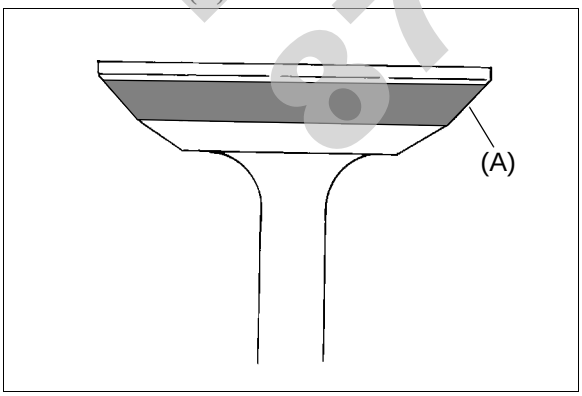


2. Apply cutting oil to valve seat and cutter.

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

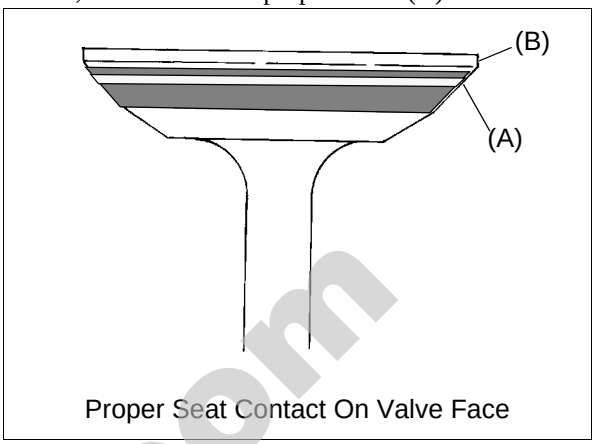
4. Inspect the cut area of the seat.
   - If the contact area is less than 75% of the circumference of the seat, rotate the pilot 180° and make another light cut.
   - If the cutter now contacts the uncut portion of the seat, check the pilot. Look for burrs, nicks, or runout. If the pilot is bent it must be replaced.
   - If the contact area of the cutter is in the same place, the valve guide is distorted from improper installation 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 marker paste to the valve seat. If using an interference angle (46°)apply black marking pen to the entire valve face (A).



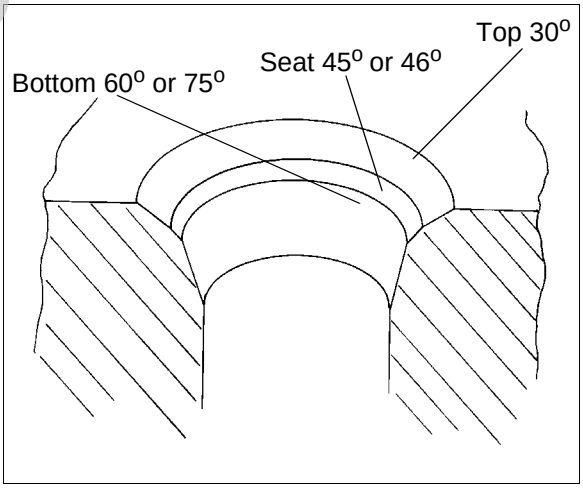
6. Insert valve into guide and tap valve lightly into place a few times.

7. Remove valve and check where the paste 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.



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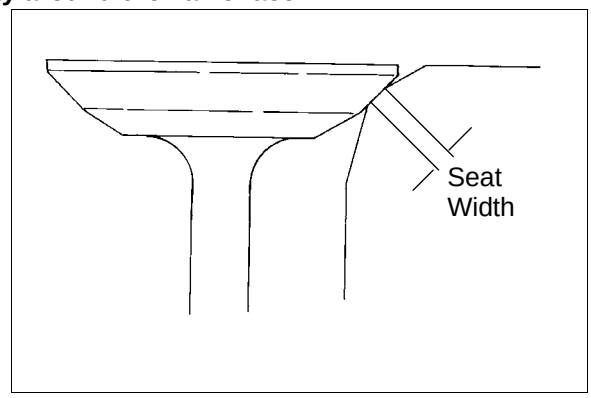
NOTE: When using an interference angle, the seat contact point on the valve will be very narrow, and is a normal condition. Look for an even and continuous contact point on the black marker, all the way around the valve face.



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 passages thoroughly.

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

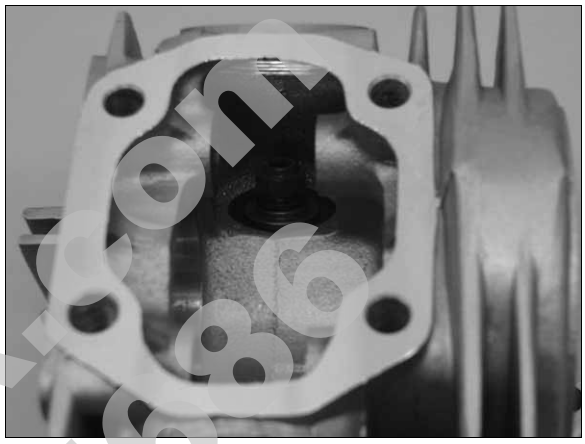
Cylinder Head Assembly

⚠ CAUTION

Wear eye and face protection during assembly.

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

1. Install new valve seals on valve guides.

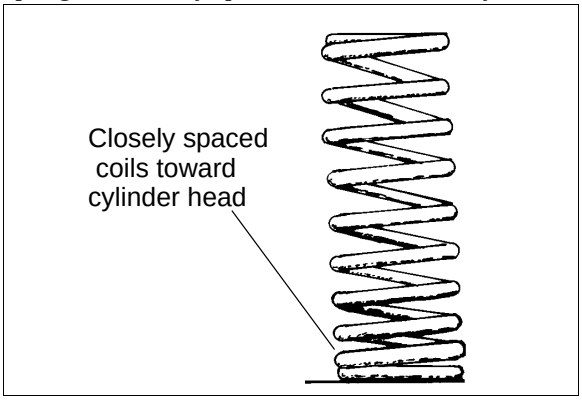


2. Apply engine oil to valve guides and seats.

3. Coat valve stem with assembly lubricant or a mixture of motor oil and molybdenum disulfide grease.

4. Install valve carefully with a rotating motion to avoid damaging valve seal.

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 springs and install spring compressor. Compress spring only enough to allow split keeper installation and prevent loss of spring tension. Install split keepers with the gap even on both sides. Repeat procedure for remaining valve

7. When all valves are installed, tap lightly with a flat punch on end of valve stem to seat split keepers. DO NOT tap on top retainer or keepers may dislodge!

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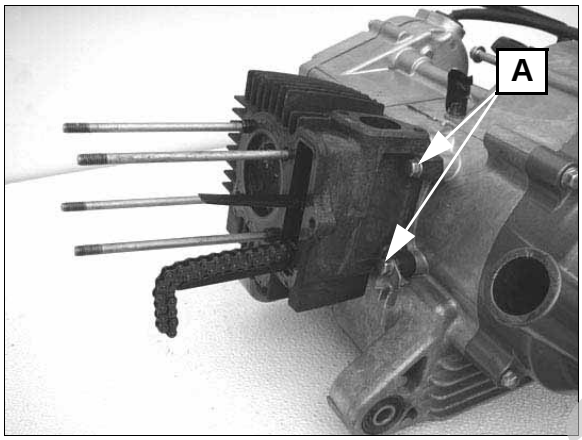
Valve Sealing Test

1. Clean and dry the combustion chamber area.
2. Pour a small amount of clean solvent into each port and check for leakage around each valve. The valve seats should hold fluid with no seepage for at least 15 seconds.

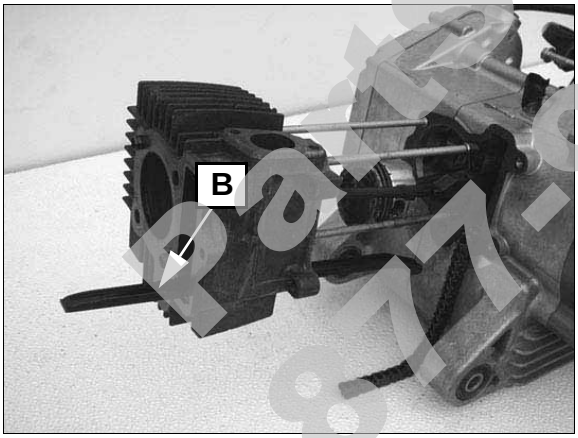
Cylinder Removal

Follow engine disassembly procedures to remove cylinder head.

1. Remove the two 6 mm cylinder base bolts (A). The hose guide is attached to the lower base bolt.



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



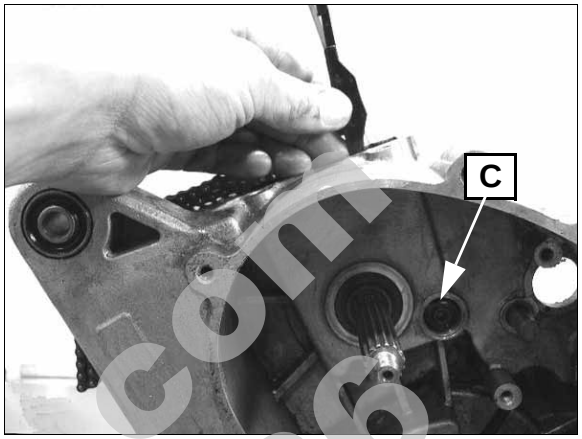
3. Rock cylinder forward and backward and lift it from the crankcase.
4. Pull the lower chain guide (B)out of cylinder.
5. Inspect guide for cracks, wear, or damage.

Cam Chain Tensioner Blade

1. To remove the tensioner blade (C), remove PVT cover and drive clutch (refer to PVT Section).

NOTE: Tensioner blade removal is only required for service of the blade.

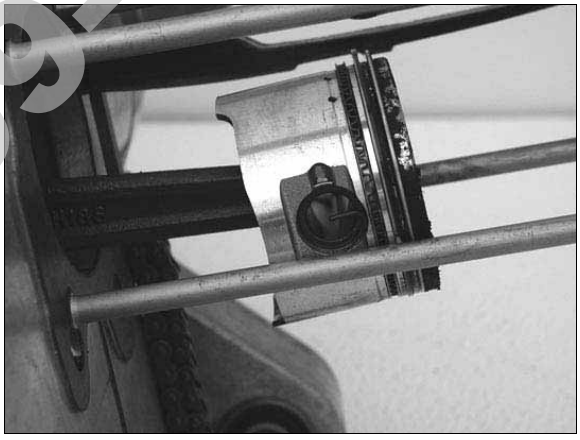
2. Remove bolt (C) securing tensioner blade to crankcase.



3. Inspect blade for cracks, wear, or damage.

Piston Removal

1. Remove piston circlips 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.



2. Remove the compression rings, starting with the top 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, or the ring may break.

* By hand: Placing both thumbs on end gap of ring and expand the ring while lifting it off the piston. Use care to not scratch the ring lands.

3. Repeat procedure for second ring.
4. The oil control ring is a three piece design consisting of a top and bottom steel rail and a center expander section. Remove top rail first followed by bottom rail and expander.

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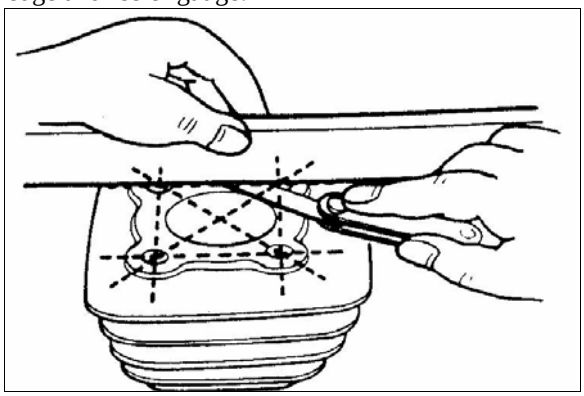
Cylinder Inspection

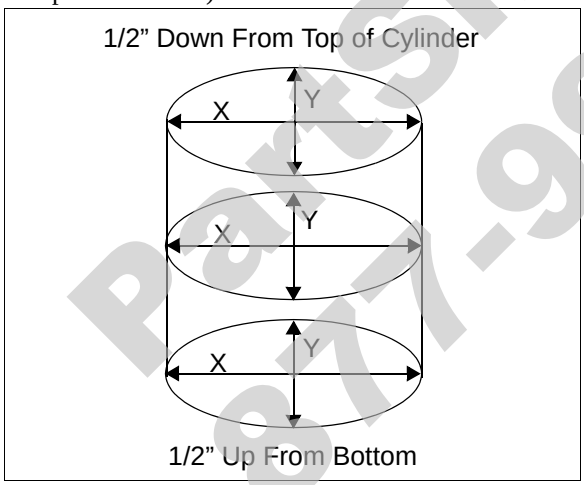
1. Remove all gasket material from the cylinder sealing surfaces. Refer to specifications at beginning of chapter.
2. Inspect the top of the cylinder for warpage using a straight edge and feeler gauge.



Cylinder Warp:

.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).



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

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

Cylinder 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. 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

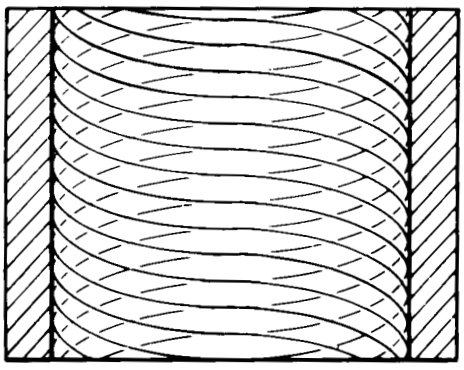
A finished cylinder should have a cross-hatch pattern to ensure piston ring seating and to aid in the retention of the fuel/oil mixture during initial break in. Hone cylinder according to hone manufacturer’s instructions, or these guidelines:

- 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.

IMPORTANT: Clean the Cylinder After Honing

Clean cylinder thoroughly after honing to remove all grit material. Wash cylinder in solvent, then in hot, soapy water. Rinse thoroughly and dry with compressed air. Oil bore immediately with engine oil to prevent rust.

If cylinder wear or damage is excessive, replace cylinder. Hone only enough to deglaze the cylinder bore.



EXAMPLE OF CROSS HATCH PATTERN

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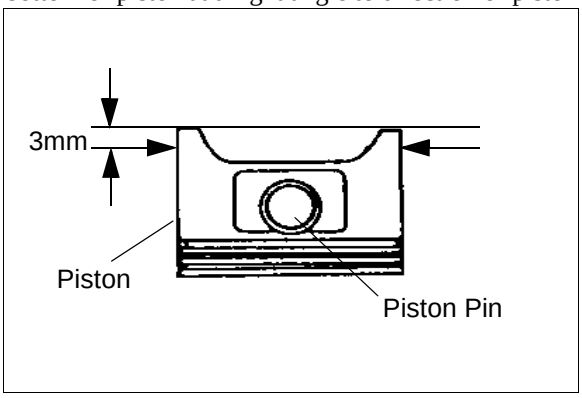
Piston Inspection

NOTE: refer to specifications at the beginning of this chapter as required.

1. Measure piston outside diameter at a point 3mm up from bottom of piston at a right angle to direction of piston pin.

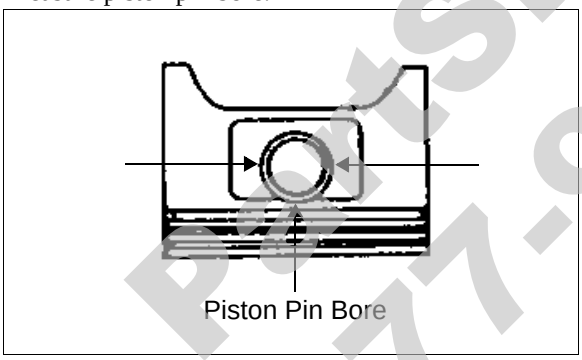


2. Subtract this measurement from the maximum cylinder measurement obtained earlier.

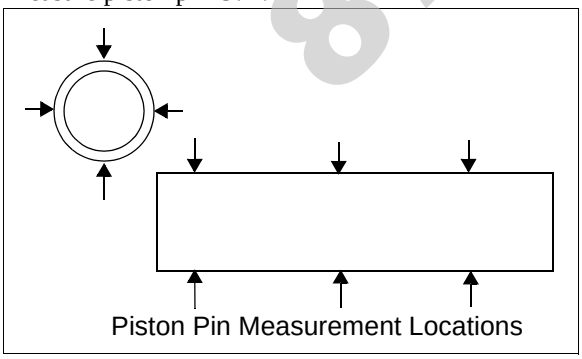
Piston to Cylinder Clearance

Std: .0004- .0014" (0.01- 0.04 mm)
Limit: .0039" (.1 mm)

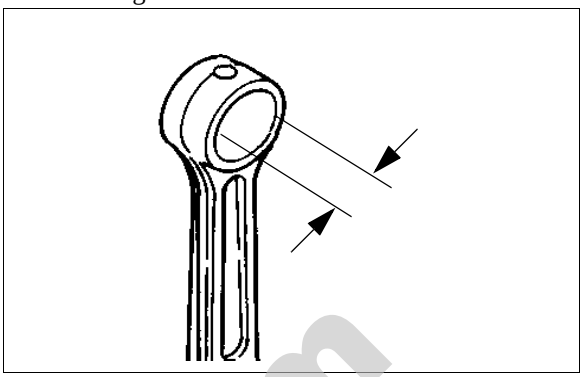
3. Measure piston pin bore.



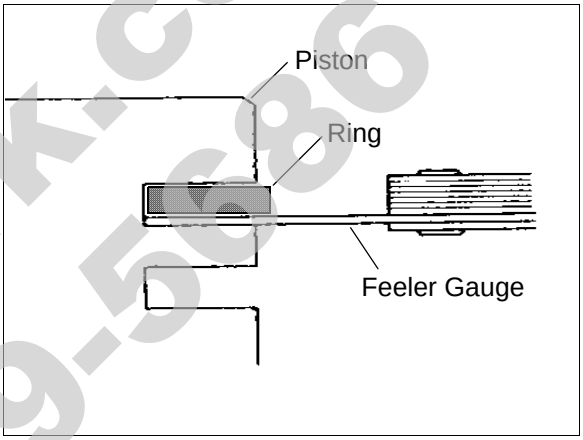
4. Measure piston pin O.D.



5. Measure connecting rod small end ID. Replace crankshaft if connecting rod small end is out-of-round.



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 limit.



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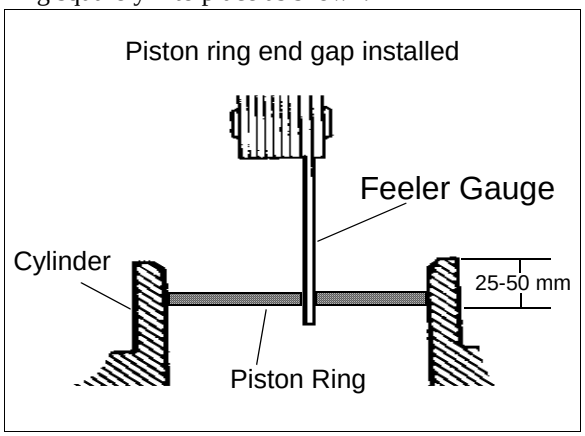
Piston Ring Installed Gap

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



Piston Ring Installed Gap

Refer to Engine Service Data For Spec

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

NOTE: Measure at two points in the cylinder. A difference in end gap indicates cylinder wear. The cylinder should be measured for excessive taper and out of round.

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

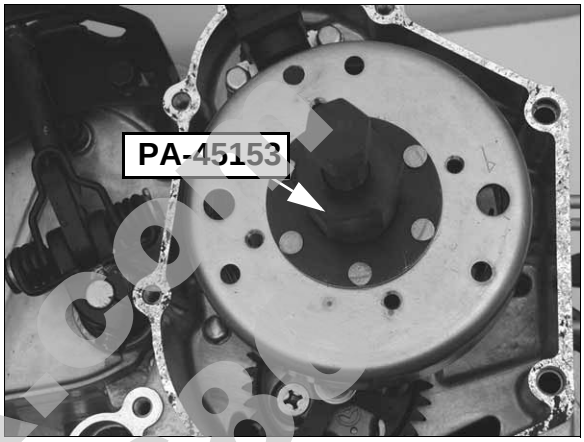
NOTE: Always check piston ring installed gap after re-boring a cylinder or when installing new rings. A re-bored cylinder should always be scrubbed thoroughly with hot soapy water, rinsed, and dried completely. Wipe cylinder bore with an oil rag immediately to remove residue and prevent rust.

BOTTOM-END DISASSEMBLY

Flywheel Removal / Inspection

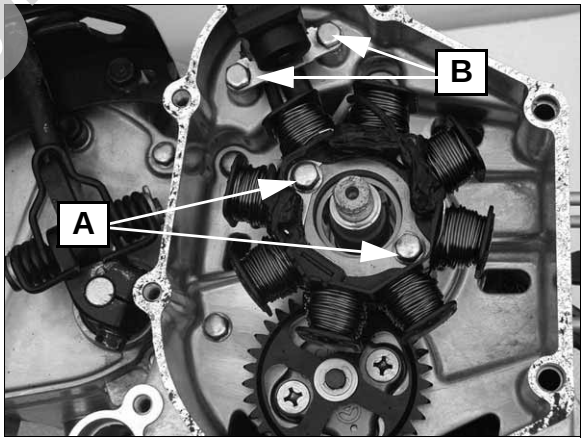
1. Remove the flywheel cover, the flywheel nut, and washer. Install flywheel puller and remove flywheel.

   CAUTION: Do not hammer or strike the tool or crankshaft may be damaged.



Stator Removal

1. Remove flywheel.
2. Loosen stator screws (A) and pulse coil screws (B) evenly and remove stator. Note wire routing for assembly.



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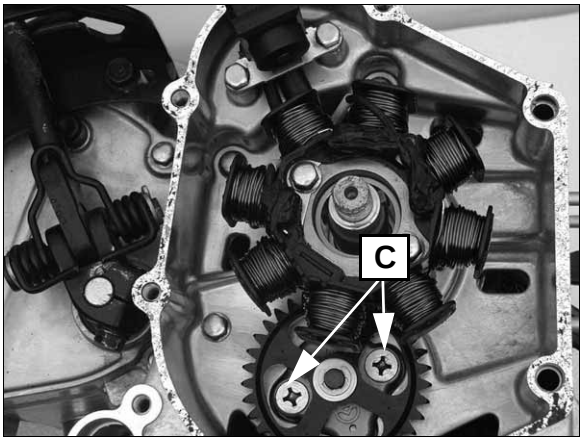
Oil Pump Removal

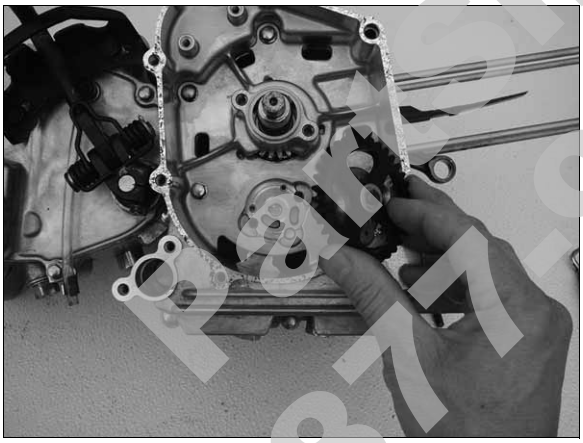
NOTE: Oil pump is not a serviceable assembly.

NOTE: The CVT system, starter motor, starter drive, flywheel, stator, oil pump and transmission can be serviced with the engine in the frame.

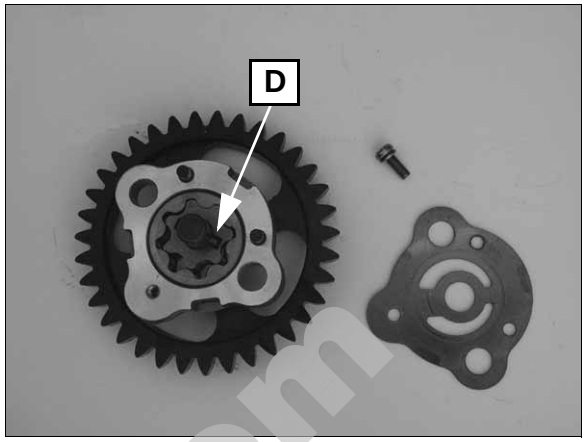
1. Remove stator.
2. Remove oil pump body screws (C).



3. Remove oil pump assembly. Inspect surface of crankcase for scratches or wear. Replace crankcase if damaged or deeply grooved.



4. Remove body screw and plate.



5. Inspect gears and drive pins (D) on pump shaft for wear or damage. Replace pump assembly if parts are worn, scratched or otherwise damaged.
6. If parts pass inspection, clean and lubricate the pump parts with clean engine oil.
7. Assemble pump and tighten screw securely.
8. Turn pump gear by hand to check for smooth operation. Replace pump or re-clean parts if any roughness or binding is evident.

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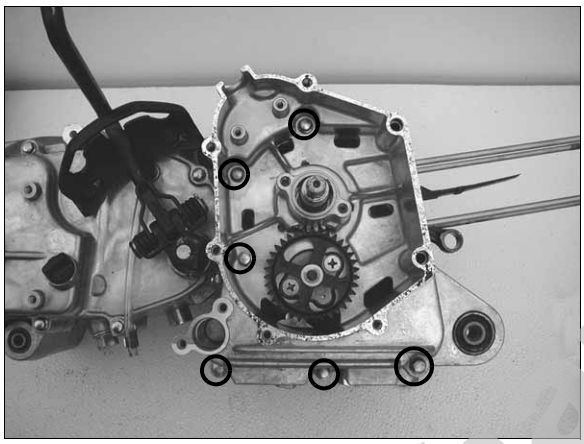
Crankcase Disassembly

NOTE: Engine must be removed to perform crankcase or crankshaft service.

NOTE: The CVT system, starter motor, starter drive, flywheel, stator, oil pump and transmission can be serviced with the engine in the frame.

NOTE: Use care during the crankshaft removal process to avoid damage to the cam chain.

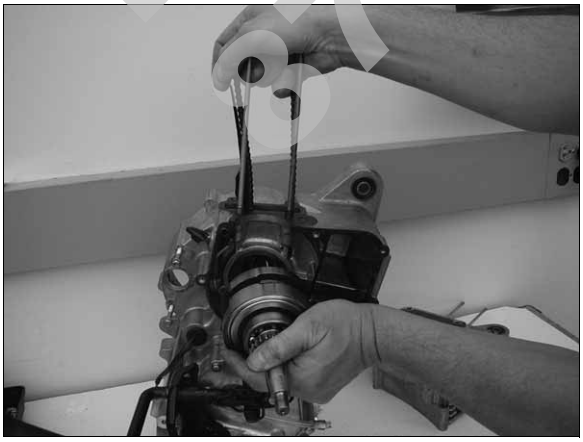
1. Remove engine, cylinder, piston, and stator assembly.
2. Loosen crankcase screws (circled) evenly and remove.



3. Separate right crankcase from left by tapping gently with a soft face hammer evenly around the case as required. Leave the crankshaft in the left crankcase half. Do not attempt to remove crankshaft with right case or cam chain will be damaged.

Crankshaft Removal

1. Support the crankcase in the upright position as shown.
2. Lift cam chain and move it as required to disengage the chain from the crankshaft sprocket teeth.
3. Remove crankshaft.

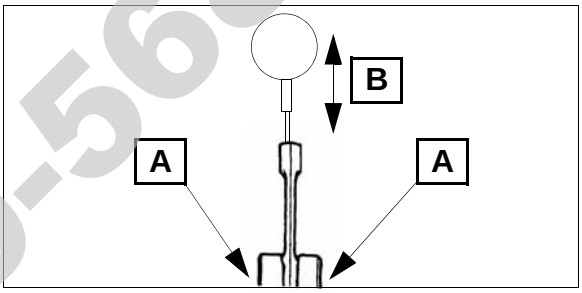


Crankshaft / Cam Chain / Sprocket Inspection

1. Inspect the crankshaft main bearings and cam chain sprocket for wear or damage.

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 outer race of each bearing. Bearings should turn smoothly and quietly. The inner race of each bearing should fit tightly on the crankshaft. The outer race should be firm with minimal side to side movement and no detectable up and down movement.

2. The connecting rod big end bearing is a roller bearing. Visually inspect connecting rod big end for scoring, damage or excessive wear. If connecting rod passes visual inspection, measure radial clearance carefully with crankshaft clamped in V-blocks at points “A” and a dial indicator measuring total up and down movement “B”. Compare to specifications. If clearance is excessive replace the crankshaft assembly.



3. Clean crankshaft and all oil passages in crankcase and crankshaft.
4. Be sure oil collector passage on right side crankshaft counterweight is clear. This passage collects oil supplied by the right side crankcase oil passage (from the oil pump) and moves it by centrifugal force to the connecting rod big end bearing. See “Oil Flow Diagram” on page 3.10
5. Remove cam chain. Inspect chain for worn or missing rollers or damage. Replace if worn excessively or as part of any crankshaft repair.

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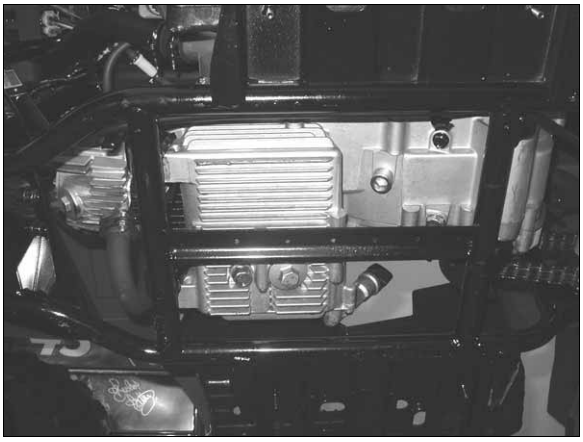
Crankcase Oil Strainer Inspection

1. Remove strainer plug.



2. Remove oil strainer and visually inspect for any rips, tears or obstructions in screen.

3. Replace oil strainer if it fails visual inspection.

ENGINE ASSEMBLY

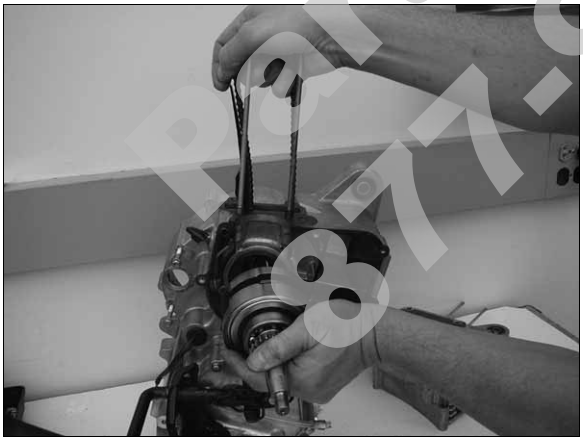
Crankcase Assembly

Lubricate all bearings with clean engine oil before assembly.

1. Support left side crankcase upright.

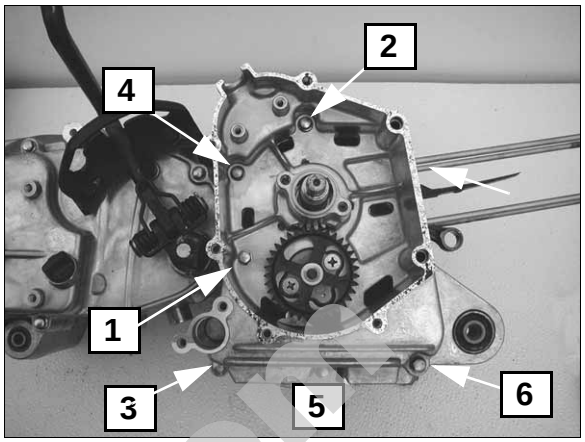
2. Drop cam chain into position in the cam chain area and hold.

3. Install crankshaft. Be sure camshaft chain is engaged on lower drive sprocket.



4. Clean mating surfaces of crankcases and install alignment pins and a new gasket.

5. Install case screws. Torque in two steps to specification following sequence shown.



Crankcase Screw Torque:

87 in. lbs. (10 Nm)

Piston Ring Installation

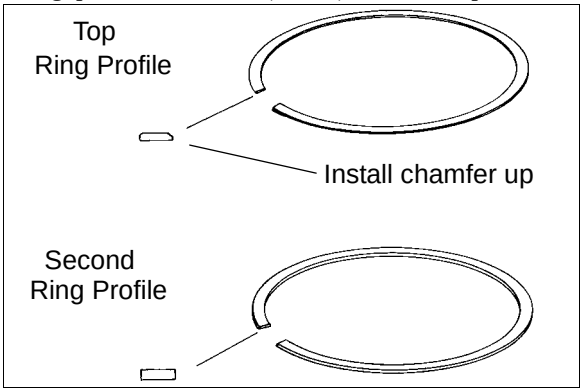
NOTE: Apply clean engine oil to all ring surfaces and ring lands. Always check piston ring installed gap before rings are installed on piston. If the piston has been in service, clean any accumulated carbon from the ring grooves and oil control ring holes.

1. Place oil control ring expander in oil ring groove with end gap facing forward. The expander has no up or down. The ends should butt squarely together and must not overlap.

2. Install oil ring top rail with end gap at least 30° from the end of the expander.

3. Install bottom rail with 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 mark facing up. Position the end gap toward the rear (intake) side of the piston.



5. Install the top ring with the chamfered edge facing up.

6. Check to make sure the rings rotate freely in the groove when compressed by hand.

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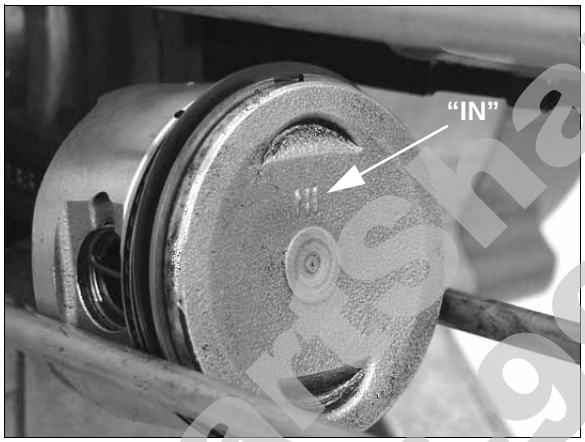
Piston Installation

⚠ CAUTION

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

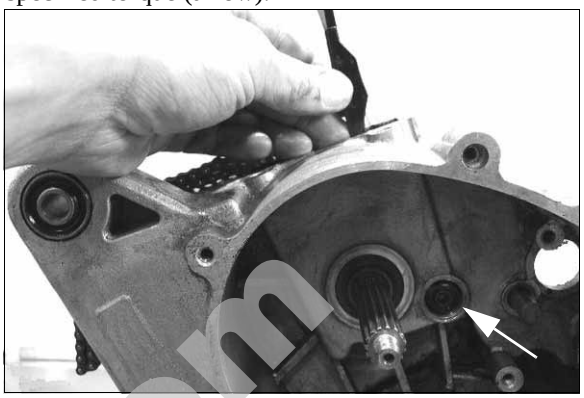
1. Install a new circlip on one side of the piston with the end gap facing up or down.
2. Apply clean engine oil to the piston rings, ring lands, piston pin bore, piston pin, and piston skirt. Lubricate the connecting rod (both ends) and crankshaft main bearing area.
3. **IMPORTANT:** Install the piston on the connecting rod with the 'IN" casting mark facing the intake side of engine. The piston pin should be a push fit into the piston.



4. Install the other circlip. Push piston pin in both directions to make sure clips are properly seated in the grooves.
5. Place dowel pins in crankcase and install a new cylinder base gasket.
6. Lubricate piston and rings with engine oil. Verify that the ring gaps are 120° apart from each other before installation.

Tensioner Blade Installation

1. Install tensioner blade and tighten mounting bolt to specified torque (arrow).



Tensioner Blade Mounting Bolt Torque:

104 in. lbs. (11.8 Nm)

Cylinder Installation

NOTE: Clean gasket surfaces on crankcase and cylinder thoroughly.

1. Install the dowel pin(s). Install a new base gasket
2. Apply engine oil liberally to cylinder bore and tapered area at bottom of cylinder. Place cylinder onto cylinder studs.
3. Guide cam chain through cylinder and secure with wire.
4. Install a ring compressor or compress rings with fingers and guide piston into taper at bottom of cylinder.
5. When rings are past the tapered portion of cylinder, install cylinder until seated against base gasket.

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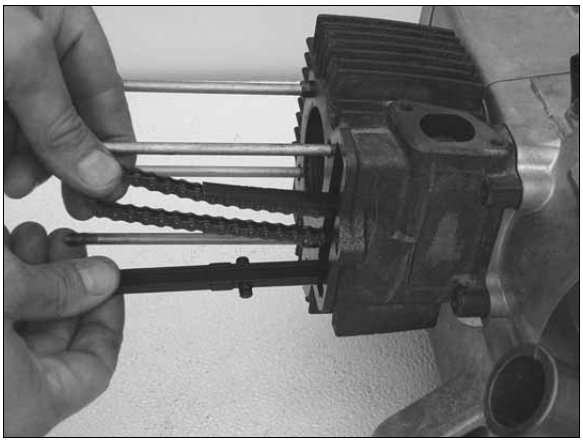
6. Install cam chain guide. Pull cam chain tight so blade will slide into notch in crankcase.

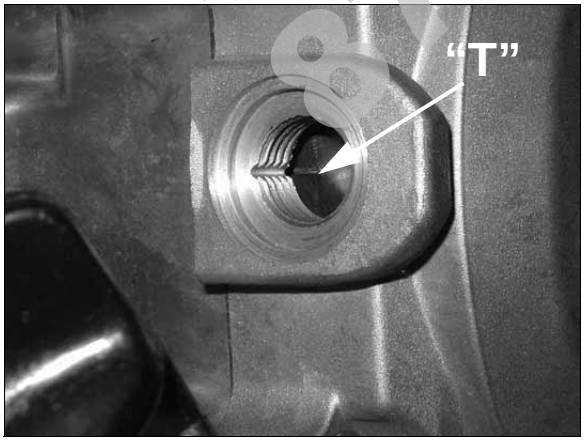


Cylinder Head & Camshaft Installation

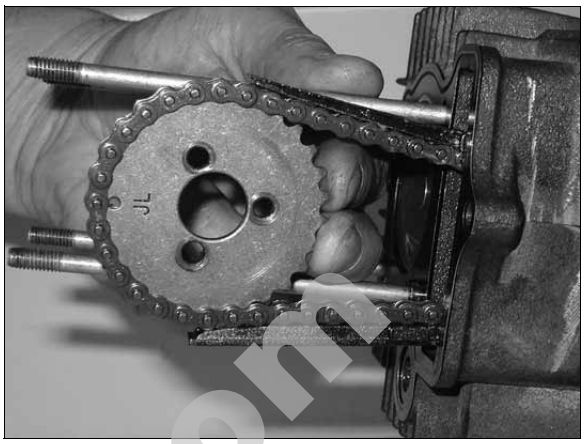
NOTE: Clean gasket surfaces on cylinder head and cylinder to remove all traces of old gasket material.

1. Install two dowel pin(s) and a new cylinder head gasket.

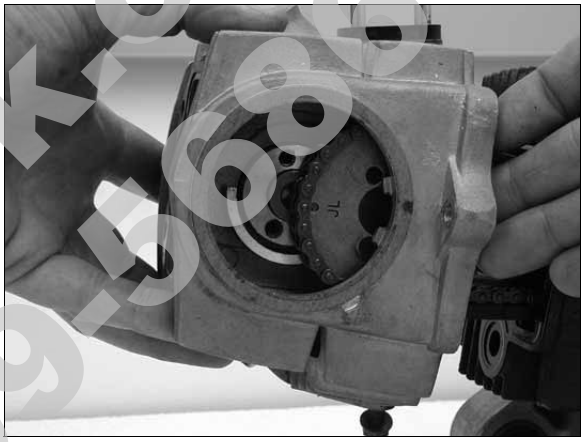
2. Rotate engine to Top Dead Center.See “Finding Top Dead Center (TDC)” on page 3.13



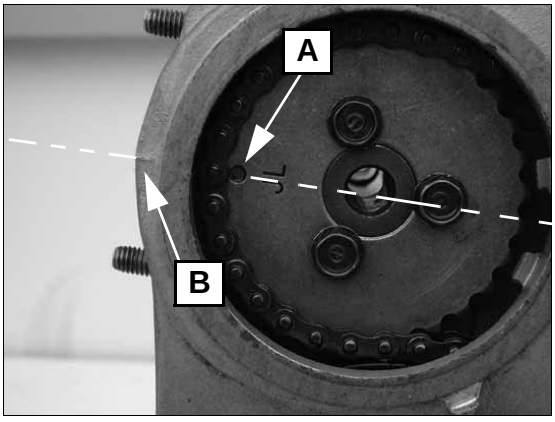
3. Install cam chain sprocket to chain with dot on sprocket at the top. Sprocket must be timed before cylinder head is installed.



4. Slide the head onto studs and guide the sprocket with chain through the cylinder head chain tower.



5. Install cam chain sprocket onto camshaft. Be sure dot (A) on sprocket is aligned with mark (B) on cylinder head. Turn camshaft to align holes and install sprocket bolts. Torque bolts to specification.



Camshaft Sprocket Bolt Torque:
69 in. lbs. (7.8 Nm)

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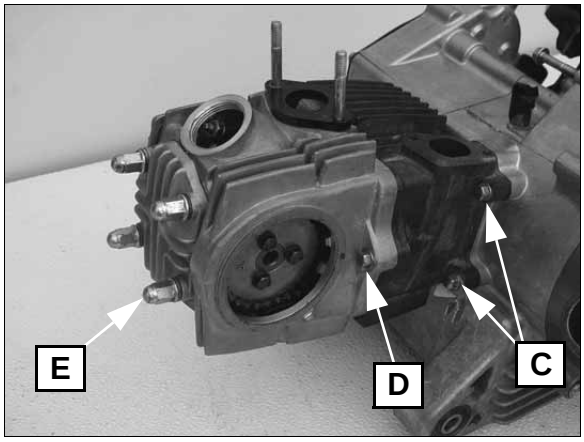
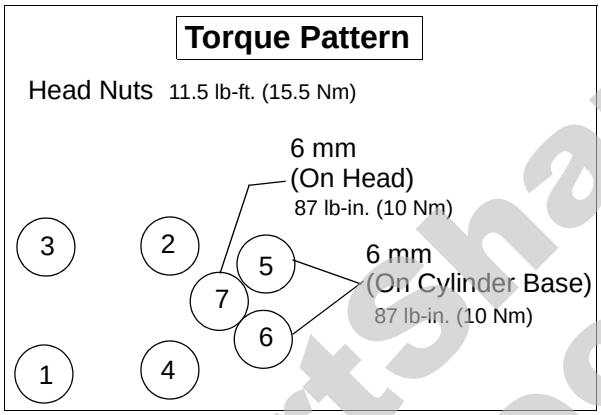
6. Install two cylinder base bolts (C) with carburetor drain hose guide on lower bolt.
7. Install cylinder head bolt (D.
8. Install four head nuts (E) with new sealing washers.

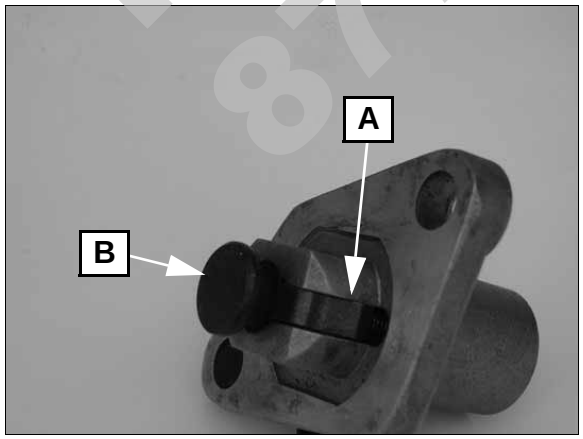


9. Torque cylinder head and bolts in two steps to specification, following the sequence shown.

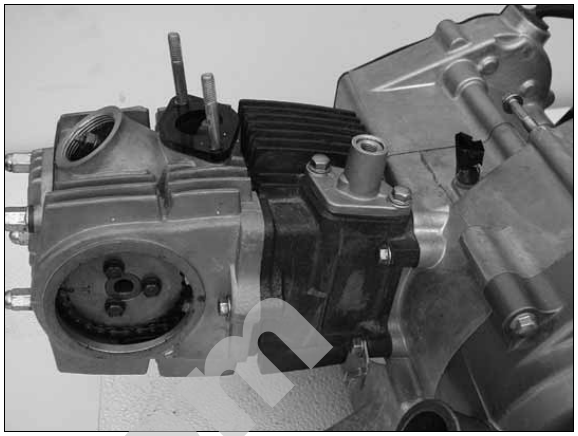


Cam Chain Tensioner Installation

1. Install tensioner body with a new gasket onto the cylinder.
2. Depress ratchet pawl (A) and push plunger (B) into tensioner body.



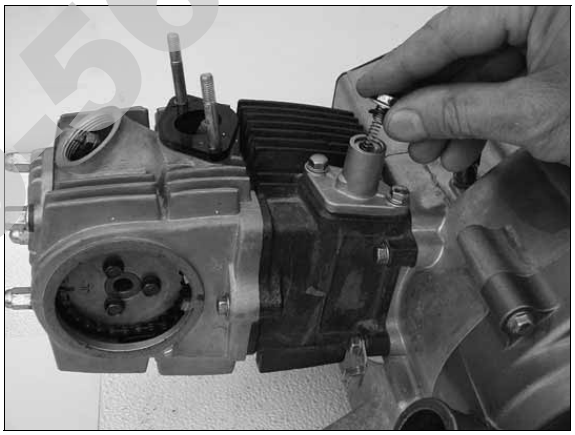
3. With the plunger retracted, install the tensioner assembly and tighten the bolts to specification.



Tensioner Body Bolt Torque:

5-6.5 ft. lbs. (7-9 Nm)

4. Install spring and cap with new sealing washer. Torque cap to specification. Verify proper camshaft timing (Step 5).



Tensioner Cap Torque:

5-6.5 ft. lbs. (7-9 Nm)

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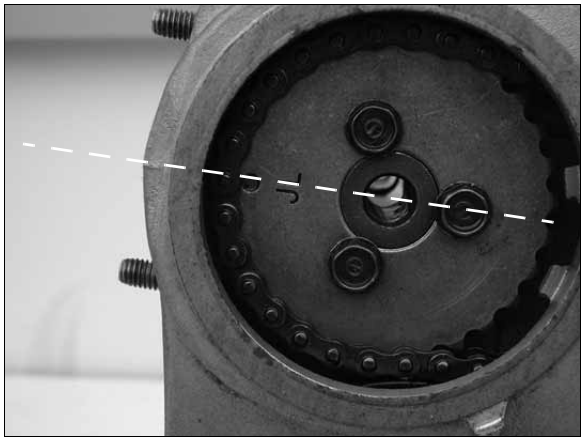
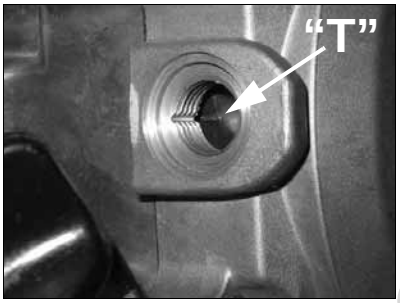
5. Slowly rotate engine 2-3 revolutions in normal direction of rotation. Rotate to TDC on compression stroke and verify camshaft timing is correct.





6. If piston rings have been replaced, drain engine oil and replace with SAE 40W mineral based oil for the first 10 hours of operation. See "Engine Lubrication" on page 3.13.

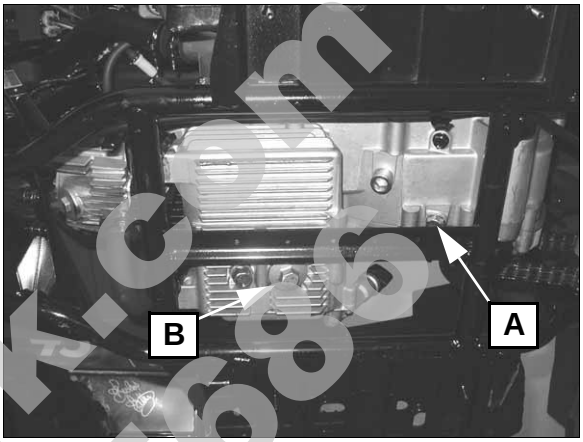
IMPORTANT: Refer to "Valve Clearance Adjustment" in Chapter 2 to complete engine assembly.

TRANSMISSION

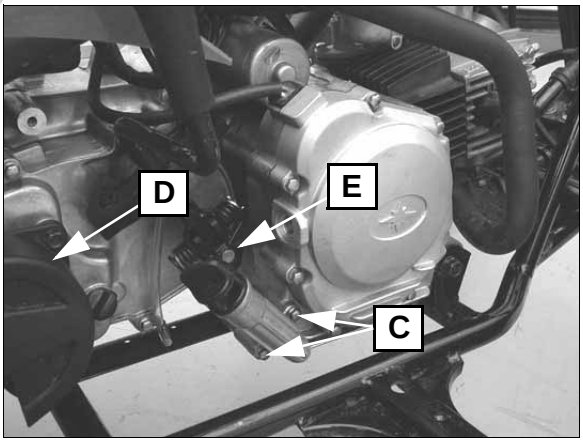
Transmission Disassembly and Inspection

NOTE: *Engine removal is not required to service transmission components. Process shown below is with engine removed for clarity. The basic disassembly and inspection process is similar for the 50cc and 90cc models. Differences are noted as required.*

1. Drain the transmission oil from the gear case (A) and engine oil from crankcase (B).



2. Remove oil dipstick tube (C).
3. Remove sprocket cover (D) and drive sprocket.
4. Mark shift selector shaft (E) and shift lever arm so the arm can be reinstalled in the same location. Remove arm and bracket.



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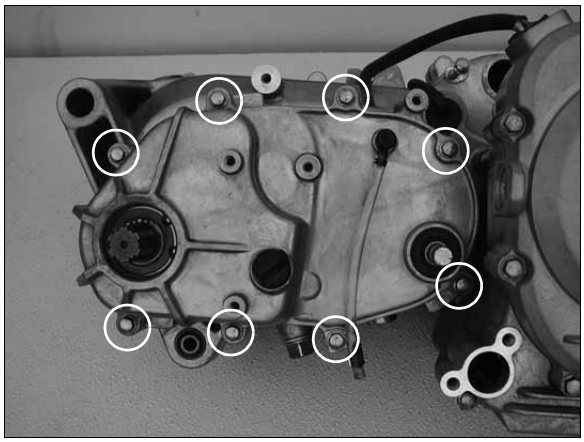
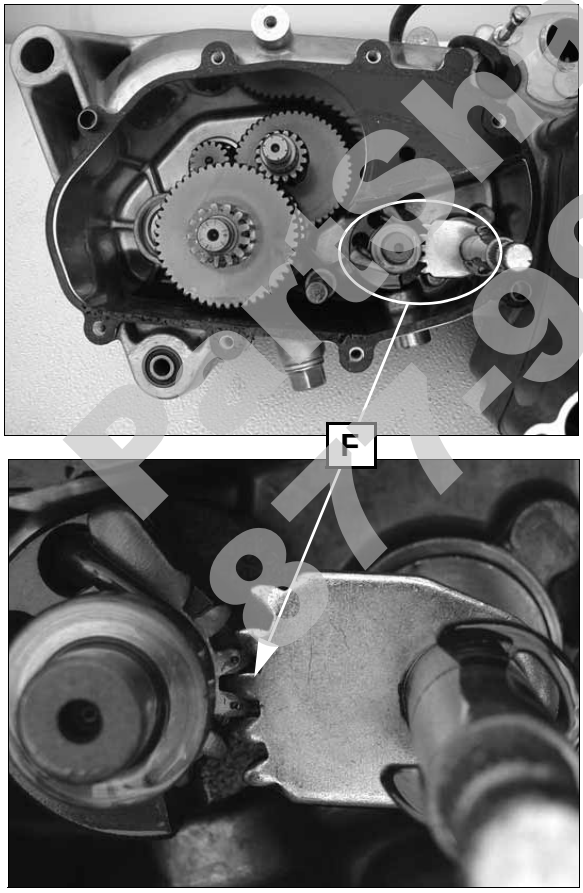
5. Remove the cover screws.

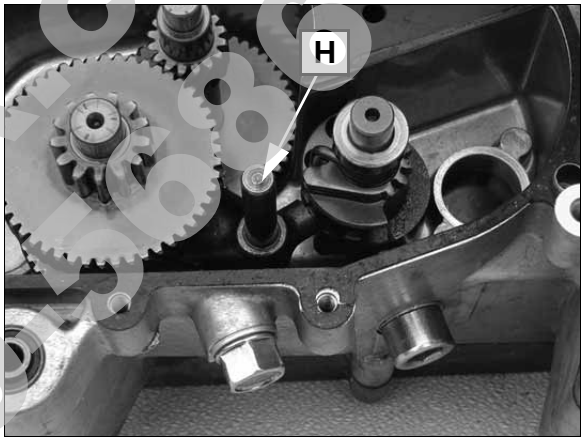


6. Remove cover with output shaft. Push or tap on shift shaft to keep it in the case.
7. Remove gasket and discard.
8. Note timing of shift shaft before removing. The center tooth (F) on shift shaft is positioned between the two dots on the drum teeth.

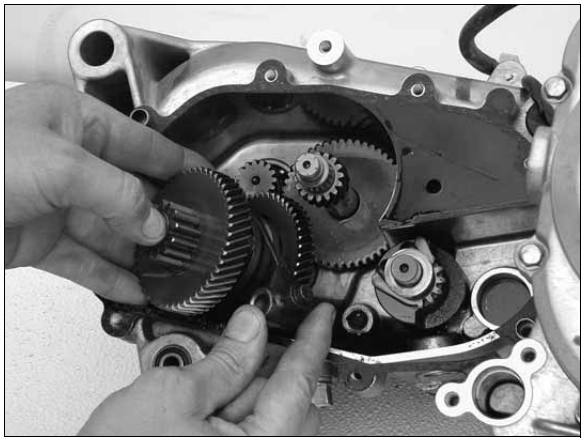


9. Remove the shift shaft by pulling straight outward. DO NOT LOSE the spring and plunger (G) on the inner end of the shaft. This plunger contacts the gear position switch.

10. Remove shift fork shaft (H)



11. Remove main shaft and shift fork as an assembly.



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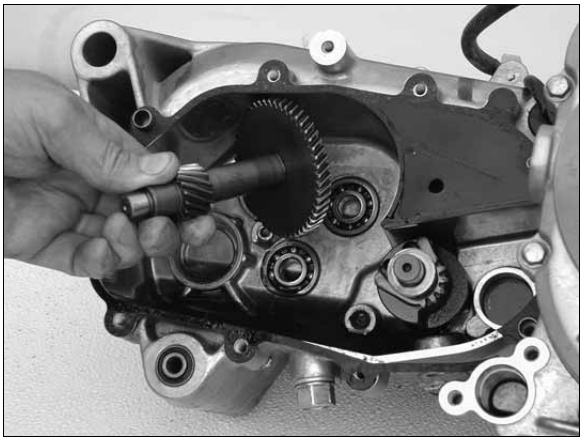
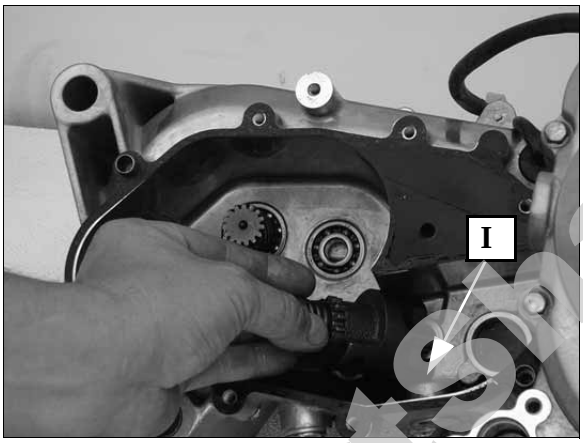
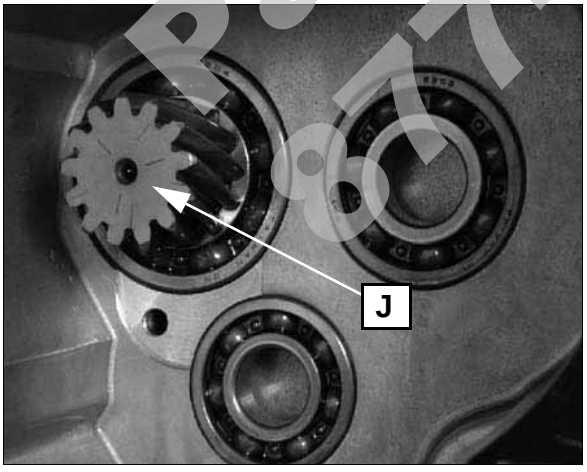
12. Remove the counter shaft.



13. Remove shift drum. Push detent ball located at (I) back against spring pressure to ease removal.



14. If input shaft or gear (J) requires service, remove driven clutch as outlined in CVT Chapter.



15. Loosen the 12mm hex bolt and remove the shift detent ball and spring assembly.

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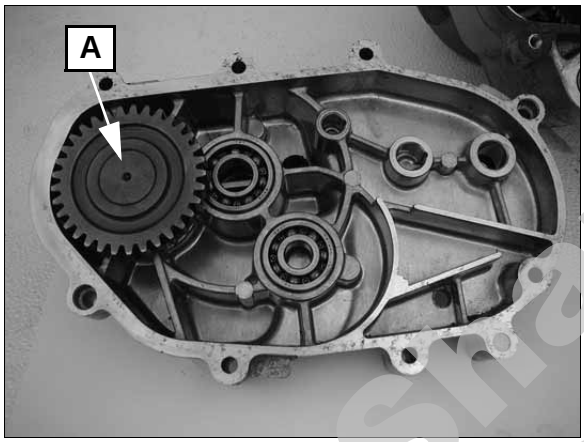
Transmission Inspection

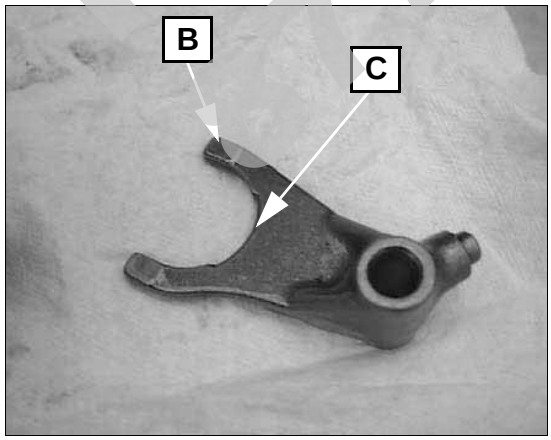
NOTE: *Always wear the appropriate protective gear and use caution when operating a press.*

1. With transmission components removed, inspect all shaft bearings visually and by feel. Bearings should roll smoothly, without excessive movement or noise. Replace any bearing that is removed, as the removal process destroys the bearing.
2. Bearings can be removed using a standard blind bearing remover. Apply lithium grease to outer race of new bearings and press into cover or case by the outer race. Do not press on inner race or bearing will be damaged.
3. Press output shaft (A) out of cover with an arbor press or a hydraulic press from outside to inside, while supporting cover completely.

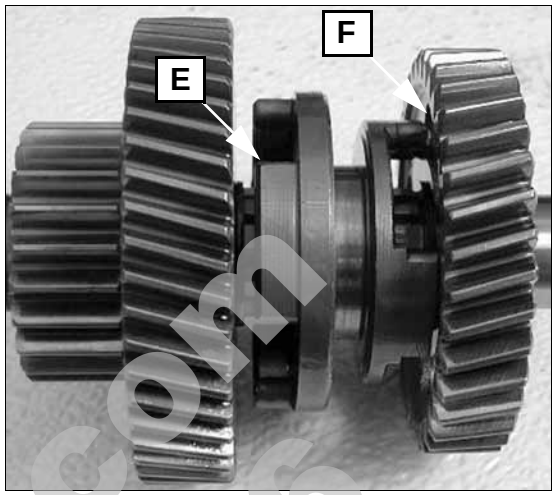


NOTE: Inspect all shafts for wear in the bearing contact areas. The sealed output shaft bearing (in the transmission cover) has a snap ring that must be removed before output shaft bearing can be pressed out of the cover.

4. Inspect the shift fork (B) for scoring or signs of wear. Area C should not show contact.

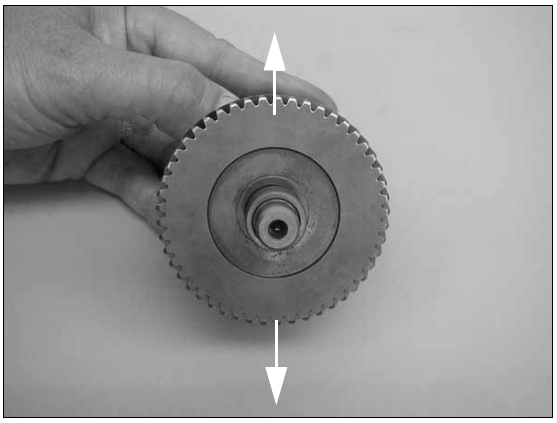


5. Inspect sliding gear dogs and dog slots in the mating gears (F) for wear or damage. The edges of dogs and slots should be square and not rounded. Replace both sliding gear and mating gears if any edges are rounded or chipped.



6. Substantial axial movement in the forward drive gear is due to liberal oil clearance for the bushing, and is a normal condition. Gear replacement is <u>not</u> required due to axial movement if radial movement (shown in Step 6) passes inspection.

7. Radial movement should not exceed .0015 in. (.04 mm).



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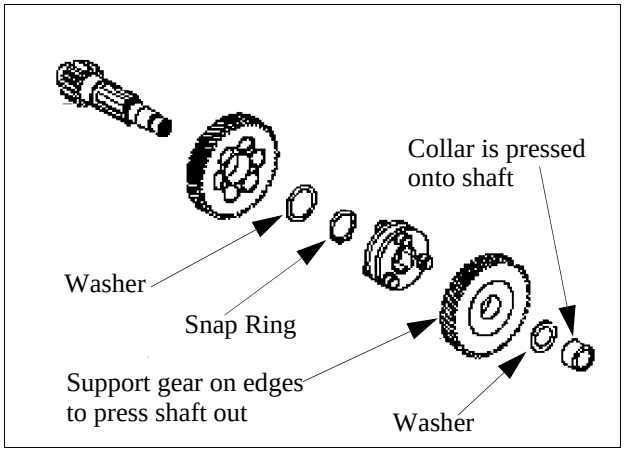
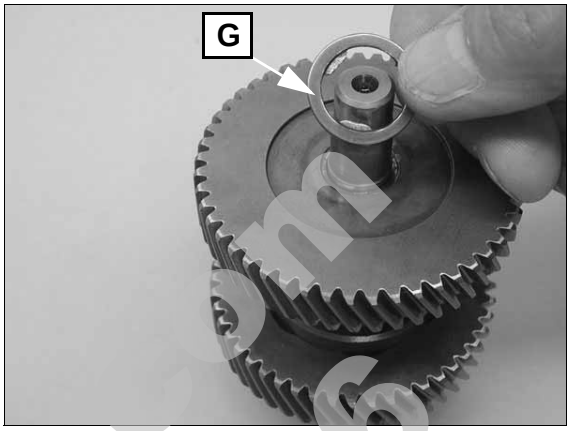
Shaft Disassembly

8. If radial movement in Step 7 was excessive, support the forward gear and press the shaft through the spacer to disassemble it from the shaft.
9. Remove the sliding gear from the shaft.
10. Remove the snap ring and thrust washer to access the reverse gear (90cc models).

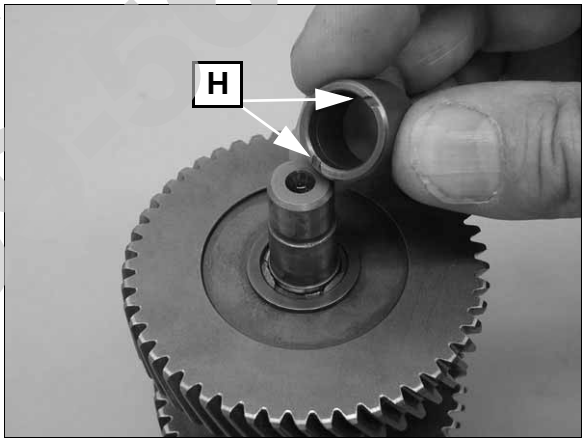


Shaft Assembly

11. Assemble the reverse gear (90cc), washer, a new snap ring, and the sliding gear on the shaft.
12. Replace gear and place it on the shaft, followed by the washer (G) as shown.



13. Grooves (H) on spacer face the washer. Press spacer onto shaft until firmly seated against the step on the shaft.



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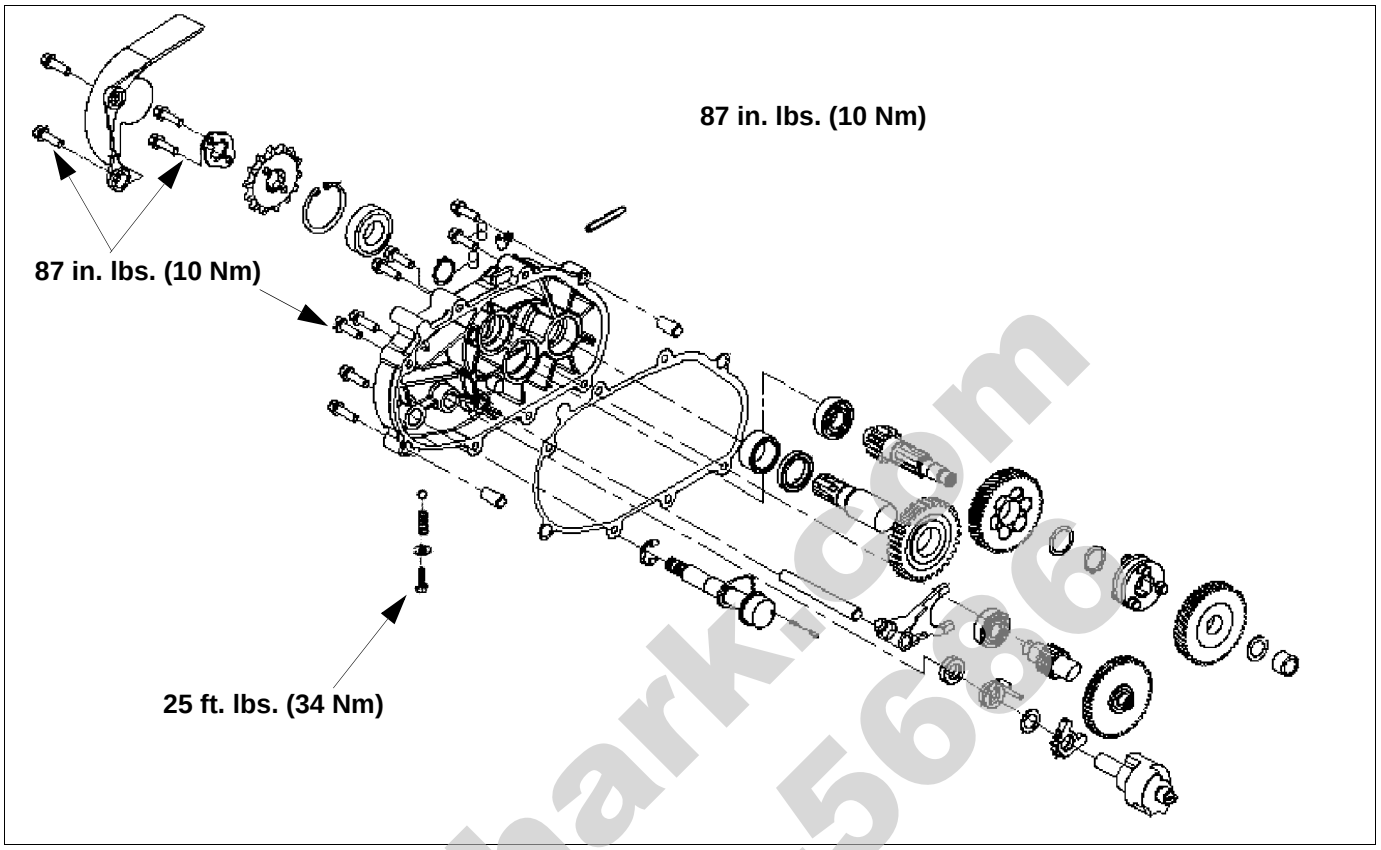
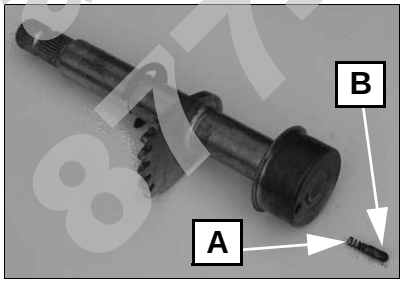
Transmission Assembly



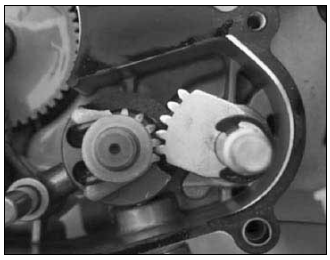
IMPORTANT: To reassemble the transmission, reverse the disassembly procedure, refer to exploded view, and review the following information and special notes.

1. Use caution when installing the gear position indicator spring (A) and pin (B) located in the end of the shift shaft. Removal of the indicator switch (located under the clutch cover) is recommended.

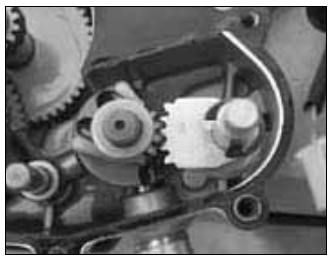


2. Check transmission operation before final assembly, and after installing outer cover and output shaft.

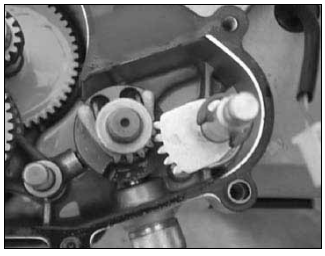
FORWARD



NEUTRAL
(90 cc)



REVERSE
(90 cc)



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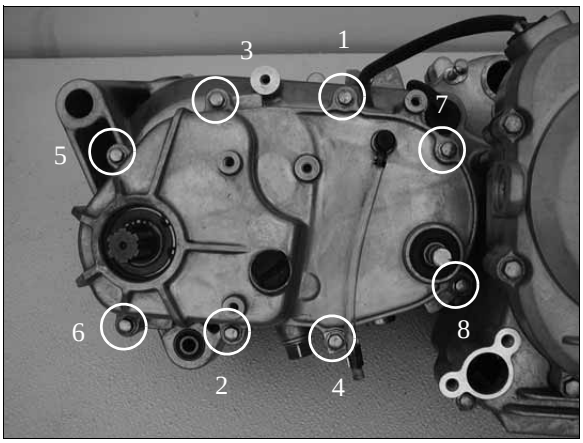
3. Assemble the detent ball and spring with transmission lubricant. Tighten bolt to specification.

Shift Detent Hex Bolt Torque
25 ft. lbs. (34 Nm)

4. Install the transmission cover and new gasket. Install the eight (8) retaining bolts and torque in two steps to specification following the sequence shown.



Transmission Cover Bolt Torque
87 in. lbs. (10 Nm)

5. Install drive sprocket. Torque retainer plate screws to specification.

Drive Sprocket Retainer Bolt Torque
87 in. lbs. (10 Nm)

6. Install oil drain plug with a new sealing washer and torque to 16 ft. lbs. (21.5 Nm).
7. Fill transmission with lubricant as specified in Maintenance Chapter 2.

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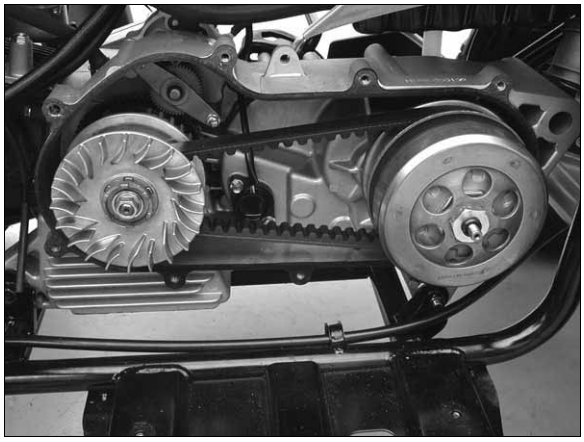
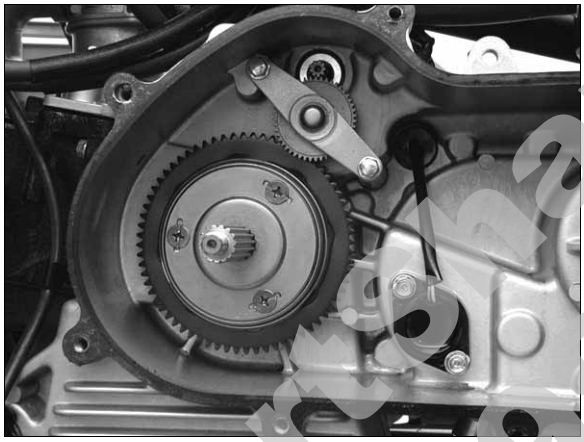
Starter Drive Mechanism (Electric)

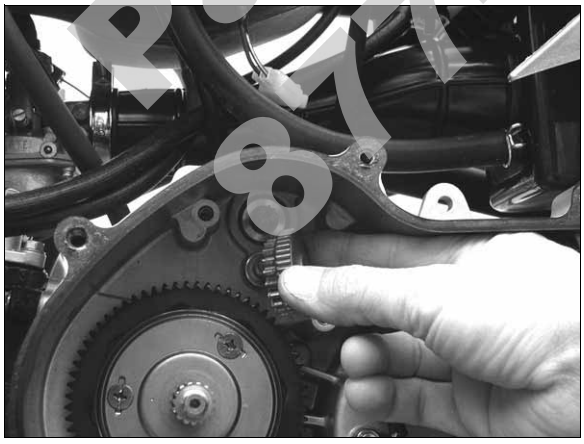
1. Remove CVT cover. See “Clutch Cover Removal” in Chapter 7.
2. Remove drive clutch.



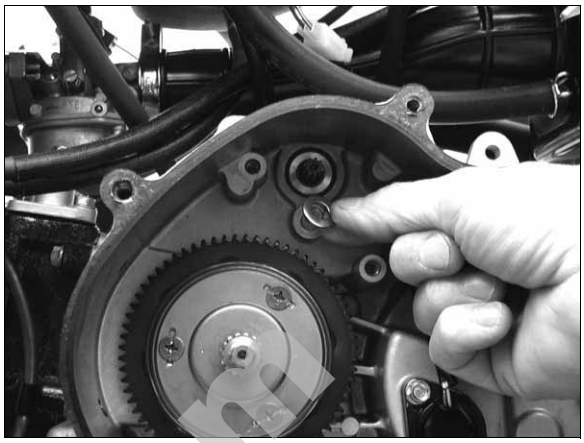
3. Remove idler gear retainer plate.



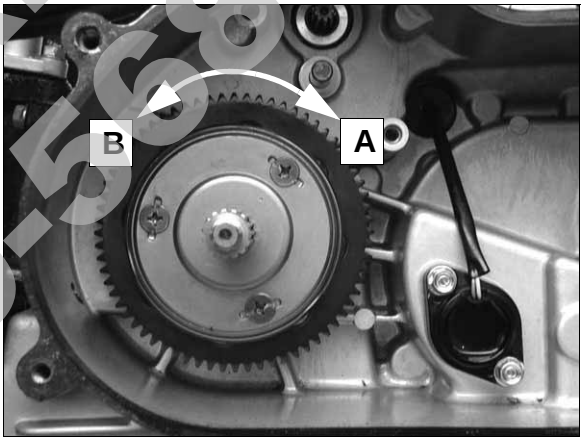
4. Remove idler gear from shaft.



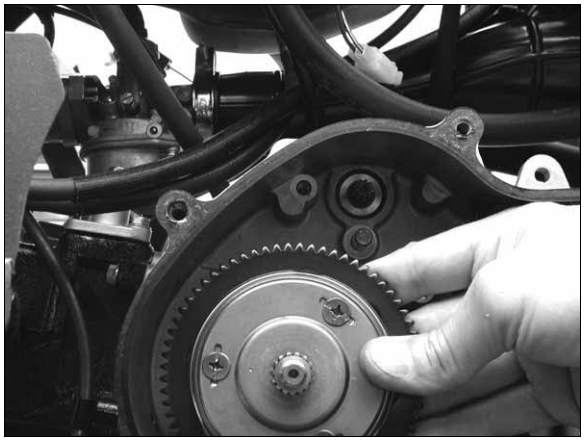
5. Remove thrust washer from shaft.



6. Before removing the starter one-way clutch / gear assembly, inspect the gear operation. The ring gear should rotate smoothly and freely in a clockwise direction (A). The gear should lock and turn the crankshaft when rotated in a counterclockwise direction (B).



7. Hold the gear and the one-way clutch together to prevent rollers from falling out of the clutch. Remove the one-way clutch and drive gear as an assembly.



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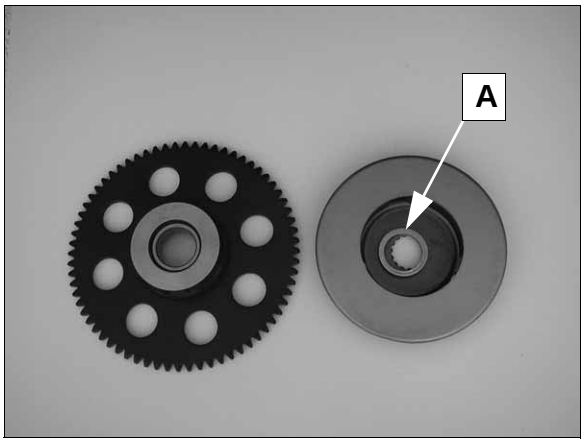
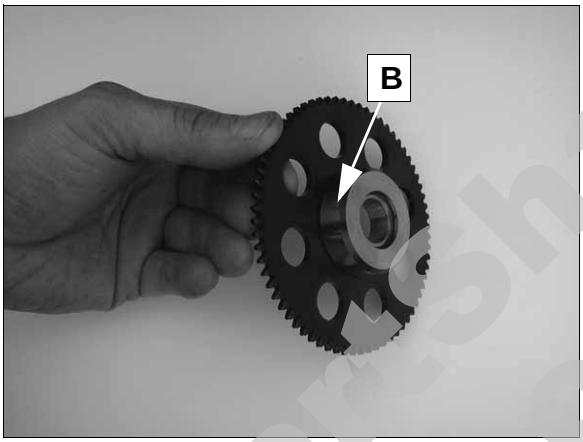
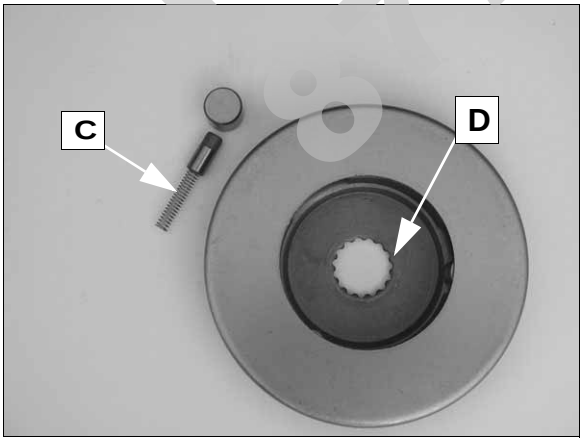
8. Lift the gear off of the one-way clutch. Note the washer inside the hub (A). This washer must be centered upon assembly.



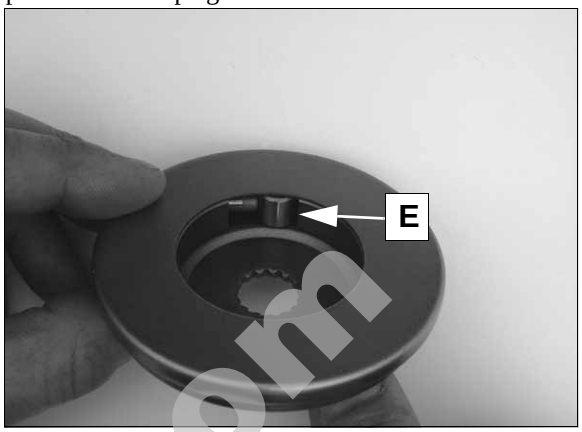
9. Inspect the surface of the gear hub (B). It must be smooth and free of surface damage. Be sure bearing in hub turns smoothly.



10. Remove the rollers, plungers and springs (C). Replace assembly if damaged or worn. Inspect the splines (D) on the one-way clutch for wear or damage.

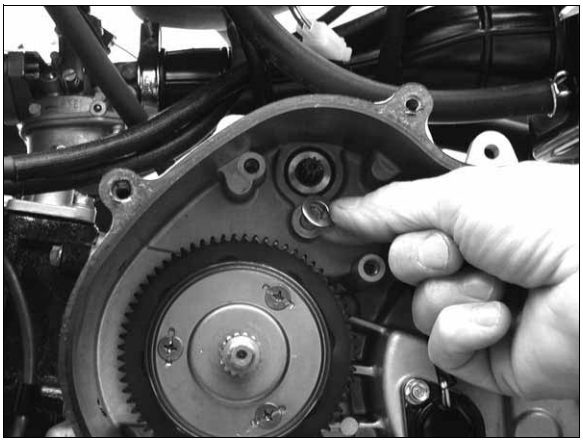


11. Assemble the springs, plungers, and rollers into the hub. Push each roller (E) back toward plunger and spring, and then release. Rollers should return freely to the extended position and stop against the hub.



12. Place the washer in the one way clutch. Install the gear hub into the clutch with a counterclockwise rotating motion.
13. Be sure the washer is centered and hub is fully seated in the one way clutch. Hold the parts together and assemble to crankshaft.

14. Install idler gear washer on shaft and idler gear. Install retaining plate. Re-assemble CVT system (Chapter 7).



Starter Idler Gear Plate
87 in. lbs. (10 Nm)

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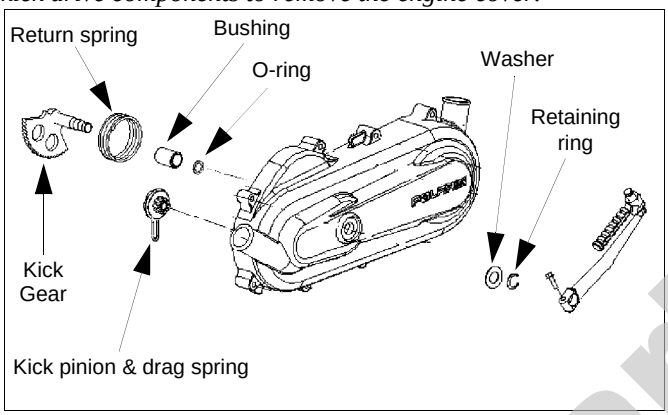
KICK START

Kick Start Disassembly / Inspection

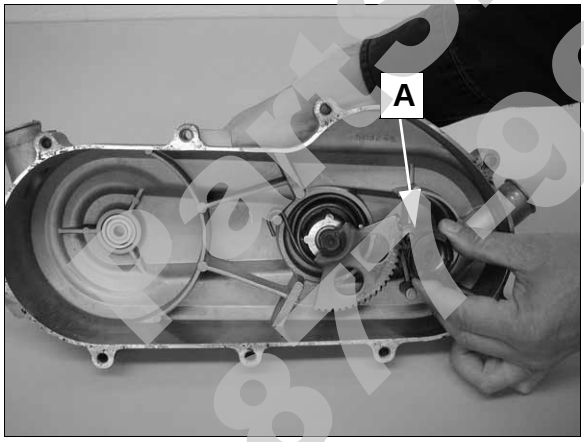
⚠ CAUTION

The kick start spring is under tension. Wear face protection during disassembly and assembly of the kick start mechanism.

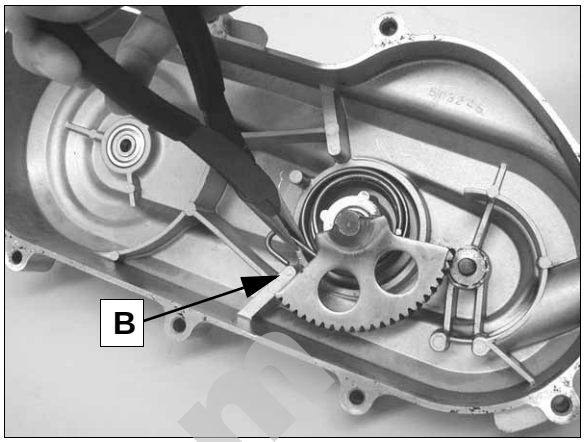
NOTE: *It is not necessary to remove the kick start lever or kick drive components to remove the engine cover.*



1. Remove clutch cover and cover gasket. (Chapter 7)
2. Remove the kick pinion (A) with drag spring attached by rotating the kick start pedal.

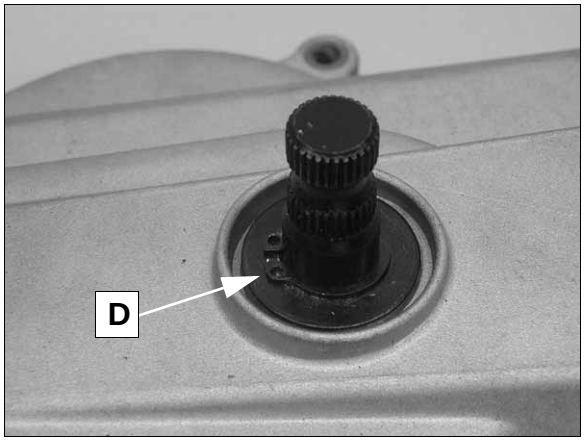


3. Disconnect hooked end of spring and set against stop at (B).



4. Mark the shaft at the opening of the kick start pedal (C), or note position of kick start pedal before removing.

5. Remove retaining ring (D) and backing washer from the shaft.



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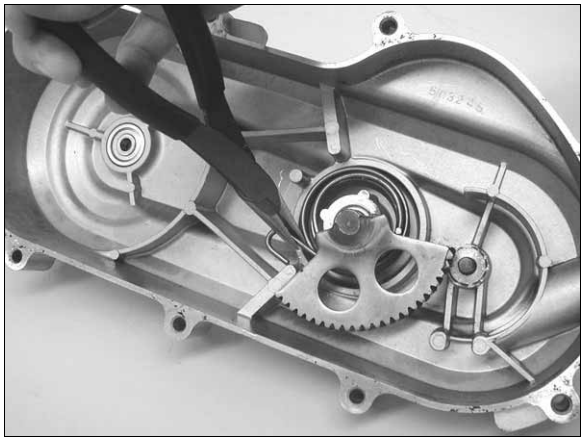
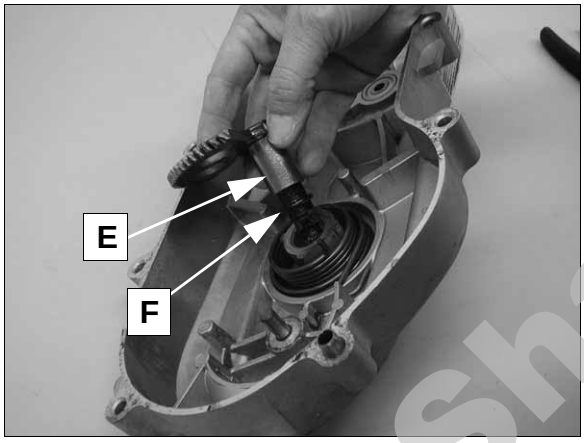
6. Lift hooked end of spring over the stop and allow it to unwind completely (about another 180 degrees).



7. Remove shaft with bushing (E), O-ring (F), and spring.

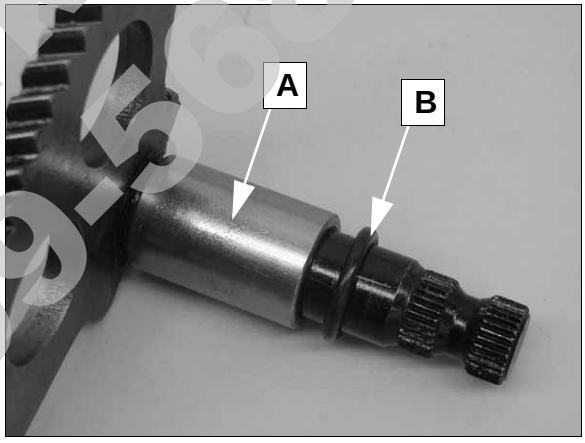


8. Inspect shaft, bushing, and spring for wear or damage. Check shaft pivot boss for cracks.

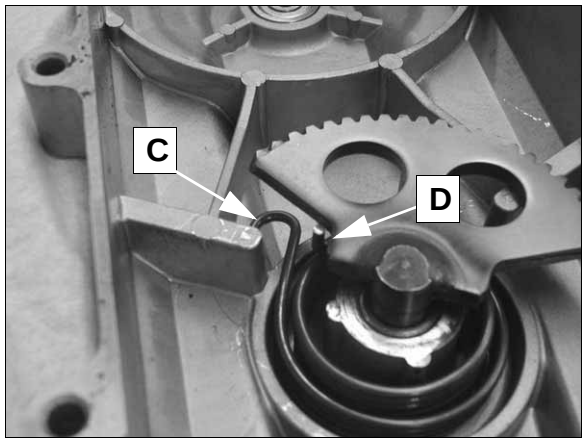
Kick Start Assembly

1. Secure cover lightly in a vise as shown. Protect the surface of the cover from damage.

2. Install spring in cover with hook and tab ends facing up.
3. Lubricate kick shaft bushing (A) with grease and install on shaft followed by a new O-ring (B).



4. Install shaft with bushing and O-ring into cover.
5. Position hooked end (C) against stop, and engage straight end (D) on edge of gear as shown.



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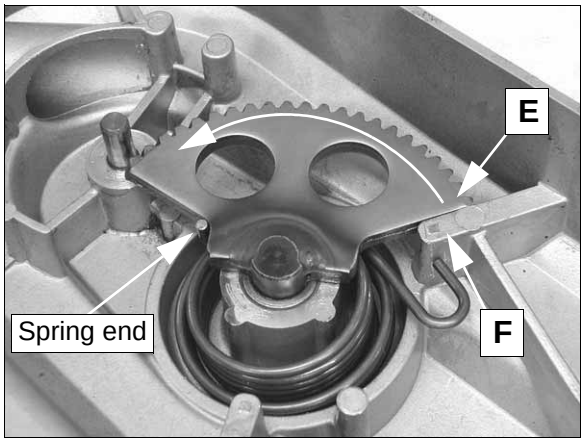
6. Hold spring up against kick gear and rotate gear counterclockwise until trailing edge (E) is past the stop (F). Push gear down until seated and then release gear to rest against the stop.

NOTE: It may be necessary to center the spring on the hub in order to allow shaft to fully seat in the cover.

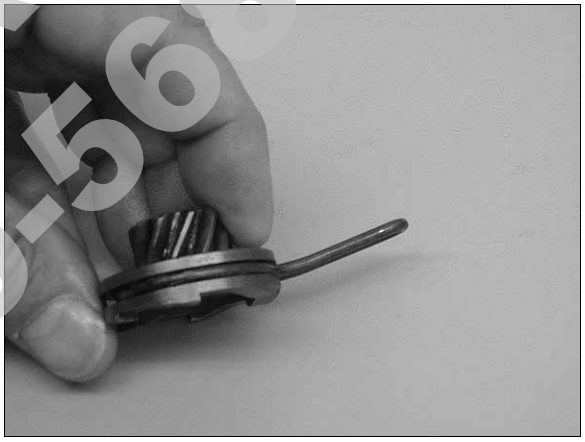


7. Hold shaft in place so spring does not disengage, and turn cover over.
8. Install retaining ring on shaft.

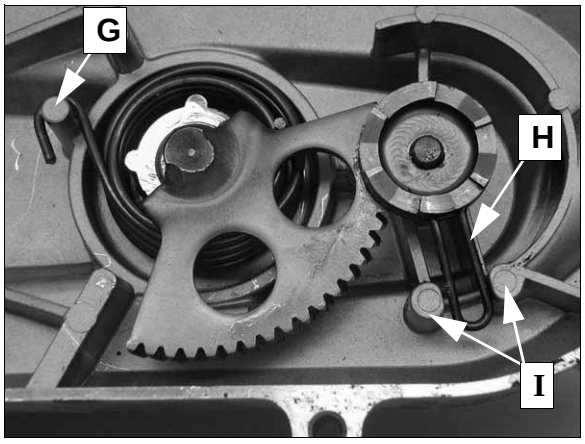
9. Install kick start pedal, aligning marks made previously.

Kick Start Pedal Bolt Torque
87 lb-in. (10 Nm)

10. Install drag spring on kick gear with bend toward bevel gear.



11. Wind the hook end of the spring over the post (G).
12. Install kick pinion with tab of drag spring (H) engaged in the between the posts (I).



13. Install cover. (Chapter 7).

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TROUBLESHOOTING

Spark Plug Fouling

- Spark plug cap loose or faulty
- Choke cable adjustment, cable or shaft sticking
- Incorrect spark plug heat range or gap
- Carburetor inlet needle and seat worn
- Jet needle and / or needle jet worn or improperly adjusted
- Loose jets in carburetor or calibration incorrect for altitude/temperature
- Incorrect float level setting
- CVT system calibrated incorrectly or components worn or mis-adjusted
- Fuel quality poor (old)
- 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 crankcase vent (engine breather)

Engine (General)

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
- Engine flooded with fuel
- Low compression (high cylinder leakage)
- No spark (Spark plug fouled)

Engine Does Not Turn Over

- Discharged battery
- Loose or corroded battery terminals / cables
- Starter motor electrical circuit faulty
- Engine seized or mechanical failure
- Kickstart components damaged

Engine Runs But Will Not Idle

- Carburetor pilot (idle) circuit restricted or blocked
- Carburetor misadjusted
- Choke not adjusted properly
- Low compression
- Insufficient valve clearance (too tight)
- Crankcase breather restricted
- Air filter restriction
- Old (degraded) fuel
- Incorrect ignition timing / sheared flywheel key

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Engine Idles But RPM Will Not Increase

- 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 / sheared flywheel key
- Restricted exhaust system
- Cam lobe worn

Engine Has Low Power

- Spark plug fouled
- Cylinder, piston, ring, or valve wear or damage (check compression / cylinder leakage)
- CVT not operating properly
- Restricted exhaust muffler
- Dirty / restricted carburetor
- Cam lobe worn

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 crankcase vent
- Air filter dirty or contaminated
- Engine oil level too high

Low Compression

- 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
- 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 wiring
- Ignition system wiring wet
- Cam lobe worn or valve sticking
- Lean condition

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Transmission

Gear Will Not Engage

- Shift arm indexed incorrectly (hits bracket)
- Shift arm slipping on spline
- CVT Belt broken
- Internal trans gear damage
- Shift fork broken or bent
- Shift shaft broken

Pops Out Of Gear

- Shift arm indexed incorrectly (hits bracket before full engagement)
- Shift arm slipping on spline
- Detent spring or ball missing, worn, or broken
- Gear engagement dogs worn (rounded) or broken
- Shift fork bent

Noise

- Incorrect transmission lubricant
- Lubricant level too low
- Lubricant level too high
- Bearings worn or damaged
- Gears worn or damaged
- CVT problem (belt)
- Final drive (chain or sprockets) worn or damaged

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CHAPTER 4
FUEL SYSTEM

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CARBURETION SYSTEM

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.

Carburetor Function

Carburetor Component Function			
System	**Main Components**	**Main Function**	**Main Affect**
Float System (Level Control)	Inlet Pipe, Needle and Seat, Float and Float Pin	Maintains specified fuel level in float chamber (carburetor float bowl).	All systems; all throttle ranges
Venting	Passages in carburetor and vent lines.	Supplies atmospheric pressure to float chamber.	All systems; all throttle ranges.
Starter (Choke Plate)	Choke Lever, Cable, and Choke Butterfly	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 / Passage-ways, Pilot–Mixture Screw with Spring Washer and Sealing O–Ring, Pilot Outlet and Throttle Valve.	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 Passage, Needle Jet, Jet Needle, Throttle Valve.	Supplies fuel at mid–range and high throttle settings.	1/4 to full throttle.

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Carburetion Specifications

PREDATOR 50	
Cutaway	n/a
Pilot Air Screw	2.5 turns out
Needle & Seat	1.2
Pilot Jet	12.5
Main Jet	62.5
E-clip Position	#4 From Top

OUTLAW 90 / SPORTSMAN 90	
Cutaway	3.0
Pilot Air Screw	2.25 ± .5 turns out
Jet Needle	89Q-3
Pilot Jet	40
Main Jet	82
E-clip Position	#3 From Top

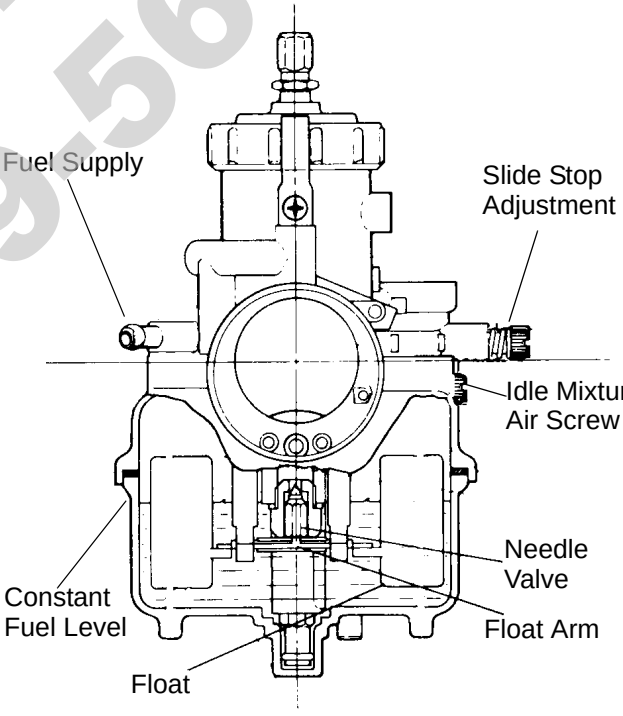
CARBURETOR OPERATION

Operation Overview

The engine of a vehicle is operated under a wide range of conditions, from idling with the throttle valve remaining almost closed, to full load or maximum output with the throttle valve fully opened. In order to meet the requirements for the proper mixture ratio under these varying conditions, a low speed fuel system, or pilot system, and a main fuel system are provided in these type of carburetors.

The function of a carburetor is to produce a combustible air/fuel mixture by breaking fuel into tiny particles in the form of vapor, to mix the fuel with air in a proper ratio, and to deliver the mixture to the engine. A proper ratio means an ideal air/fuel mixture which can burn without leaving an excess of fuel or air. Whether the proper mixture ratio is maintained or not is the key to efficient engine operation.

This carburetor has varying operations depending upon varying driving conditions. It is constructed of a float system, pilot system, main system, and starter system or initial starting device.



General VM Carburetor Representation

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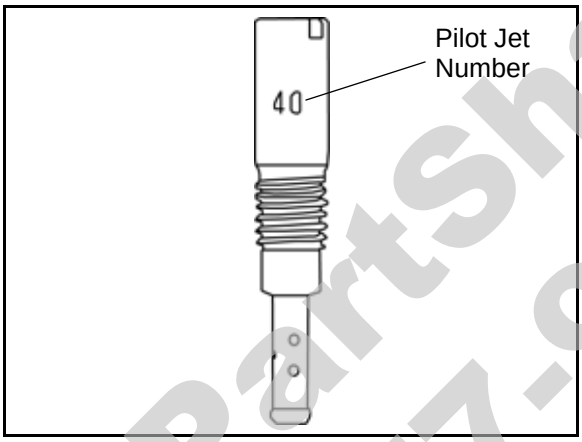
Float System

The float system is designed to maintain a constant height of gasoline during operation. When the fuel flowing from the fuel pump into the float chamber through the needle valve reaches the constant fuel level, the floats rise. When the buoyancy of the float and the fuel pressure of the fuel pump balance, the needle valve seals the orifice in the needle seat, preventing further fuel delivery, and the level of fuel in the bowl remains relatively constant.

The fuel level in the bowl assists in controlling the amount of fuel in the fuel mixture. Too high a level allows more fuel than necessary to leave the nozzle, enriching the mixture. Too low a level results in a leaner mixture, since not enough fuel leaves the nozzle. Therefore, the predetermined fuel level should not be changed arbitrarily.

Pilot Jet

From idling to low speeds, the fuel supply is metered by the pilot jet. There are several air bleed openings in the sides of the pilot jet which reduce the fuel to mist. The number stamped on the jet is an indication of the amount of fuel in cc's which passes through the jet during a one minute interval under a given set of conditions.



Pilot Mixture Screw

The pilot mixture screw controls the fuel mixture from idle to low speeds. The tapered tip of the mixture screw projects into the fuel mixture passage leading to the pilot jet air bleeds. By turning the screw in or out, the cross sectional area of the air passage is varied, in turn varying the pilot jet air supply and changing the mixture ratio.

⚠ CAUTION

The pilot air screw is calibrated at the factory to meet EPA / CARB regulations for air quality standards. Cleaning of the pilot circuit must be performed by a certified repair shop to ensure air quality standards are not exceeded.

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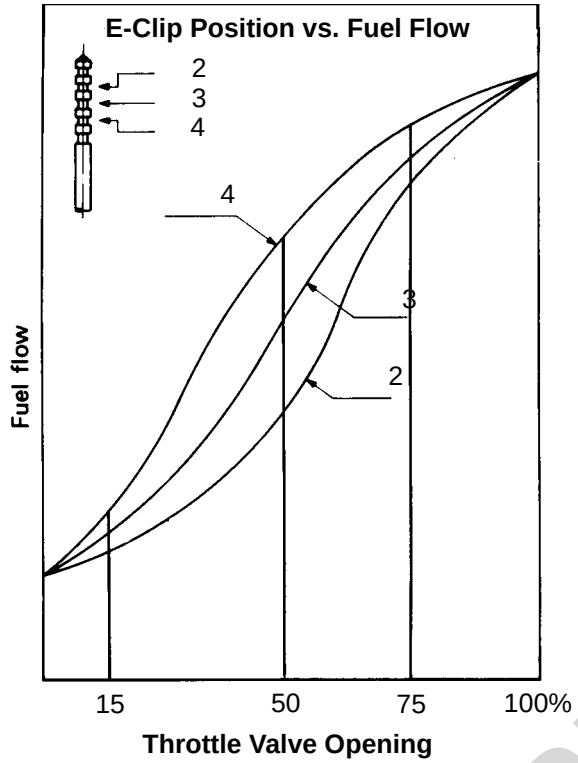
Air / Fuel Mixture Ratio

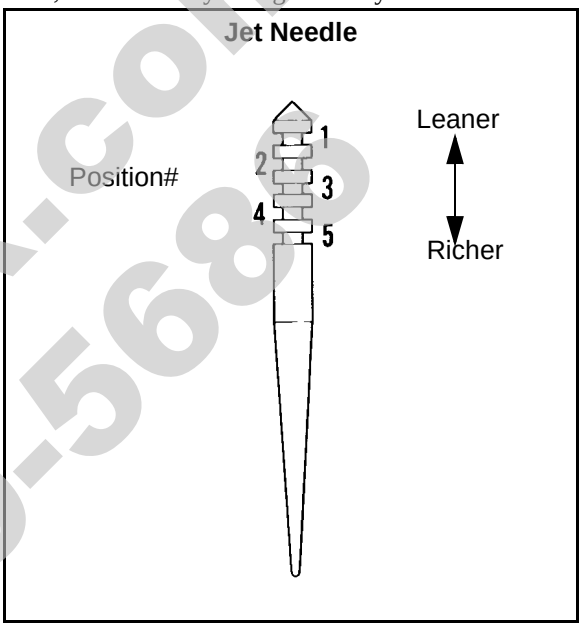


A carburetor with a slide type throttle valve is also called a variable venturi type carburetor. In this type of carburetor, the needle jet and jet needle serve to control proper air/fuel mixture ratio at the medium throttle valve opening (between 1/4 and 3/4 opening).

Having the proper needle jet and jet needle has a major impact on engine performance at partial load. The jet needle tapers off at one end and the clearance between the jet needle and the needle jet increases as the throttle valve opening gets wider. The air/fuel mixture ratio is controlled by the height of the "E" clip inserted into one of the five slots provided in the head of the jet needle. The previous chart shows the variation of fuel flow based on the height of the "E" clip.

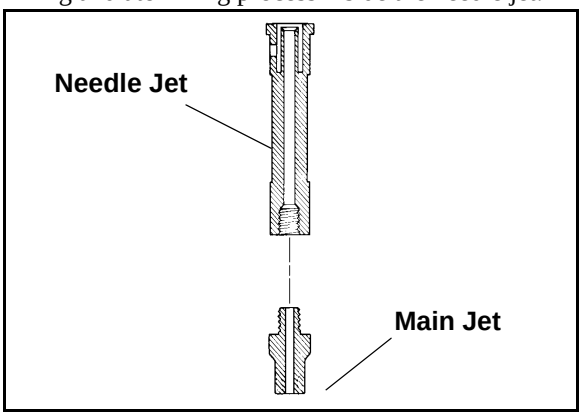
Jet Needle

The jet needle has five adjustment grooves cut into the upper portion, and is tapered from approximately the middle of the needle to the lower end. The top is fixed to the center of the throttle valve by the needle clip, and the tapered end extends into the needle jet. Fuel flows through the space between the needle jet and jet needle. This space does not vary until the throttle reaches the 1/4 open point. At that time the tapered portion of the needle begins to move out of the jet, affecting fuel flow as the opening enlarges. If the needle clip is changed from the standard position to a lower groove, the needle taper starts coming out of the jet sooner, resulting in a richer mixture. Moving the clip higher produces a leaner mixture. If the taper is worn due to vibration, fuel flow may be significantly affected.



Needle Jet

The needle jet works in conjunction with the jet needle to regulate fuel flow rate. An air bleed opening in the side of the needle jet brings in air measured by the air jet. This air initiates the mixing and atomizing process inside the needle jet.



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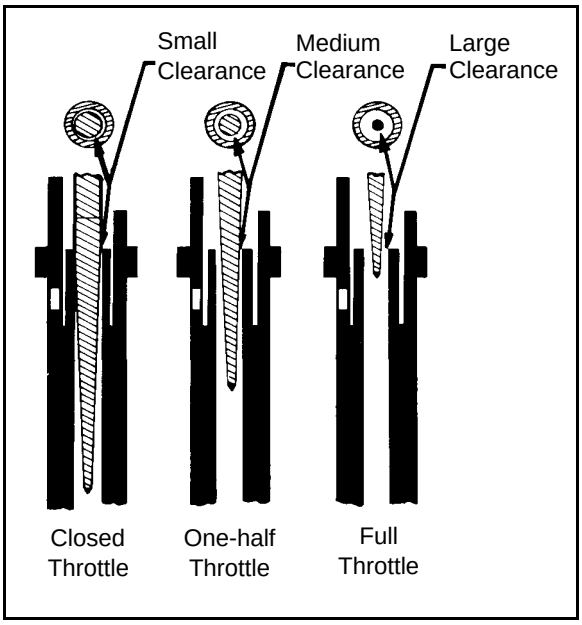
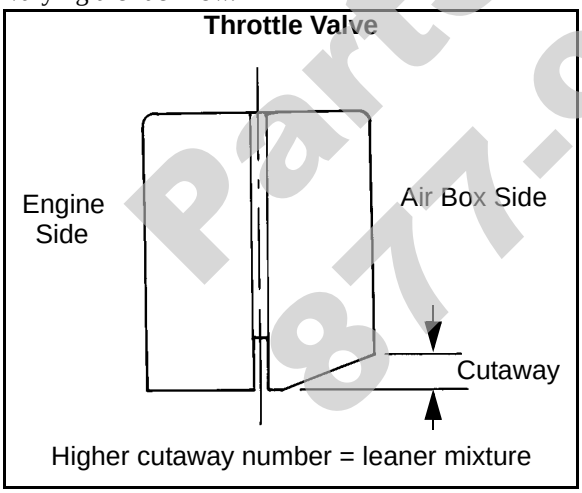
Throttle Opening vs. Fuel Flow

In a full throttle condition the cross sectioned area between the jet needle and the needle jet is larger than the cross sectioned area of the main jet. The main jet therefore has greater control over fuel flow.



Throttle slide

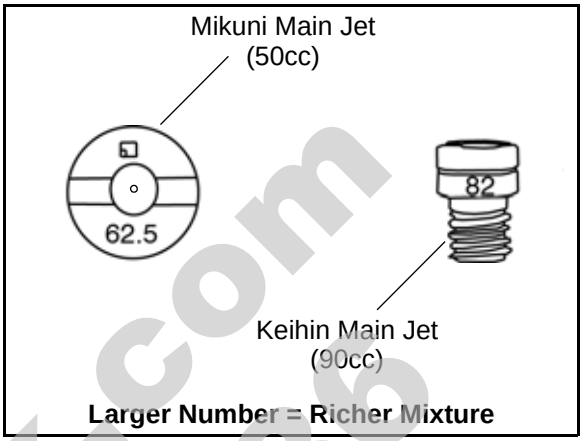
The throttle slide controls the rate of engine air intake by moving up and down inside the main bore. At small throttle openings, air flow control is performed chiefly by the cutaway. By controlling air flow the negative pressure over the needle jet is regulated, in turn varying the fuel flow.



Throttle valves are numbered 1.0, 1.5, 2.0, etc., according to the size of the cutaway. The higher the number, the leaner the gasoline/air mixture.

Main Jet

When the throttle opening becomes greater and the area between the needle jet and jet needle increases, fuel flow is metered by the main jet. The number on the jet indicates the amount of fuel CCs which will pass through it in one minute under controlled conditions. Larger numbers give a greater flow, resulting in a richer mixture.



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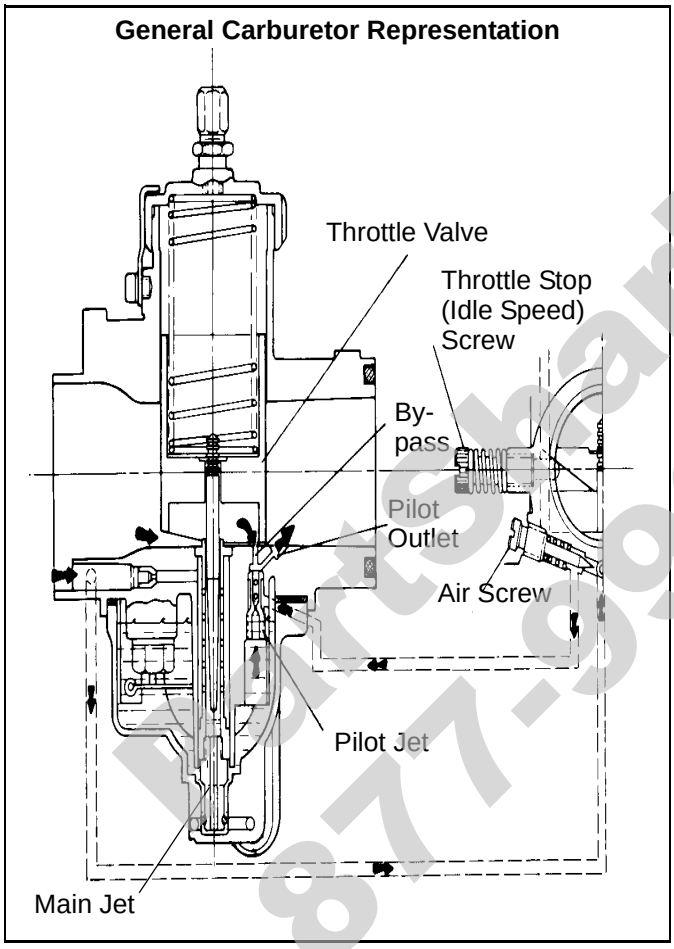
Pilot System (Idle - 3/8 Throttle)

The pilot system's main function is to meter fuel at idle and low speed driving. Though its main function is to supply fuel at low speed, it does feed fuel continuously throughout the entire operating range.

Fuel for the pilot jet is drawn from the float bowl, mixed with air regulated by the air screw, and delivered to the engine through the pilot outlet.

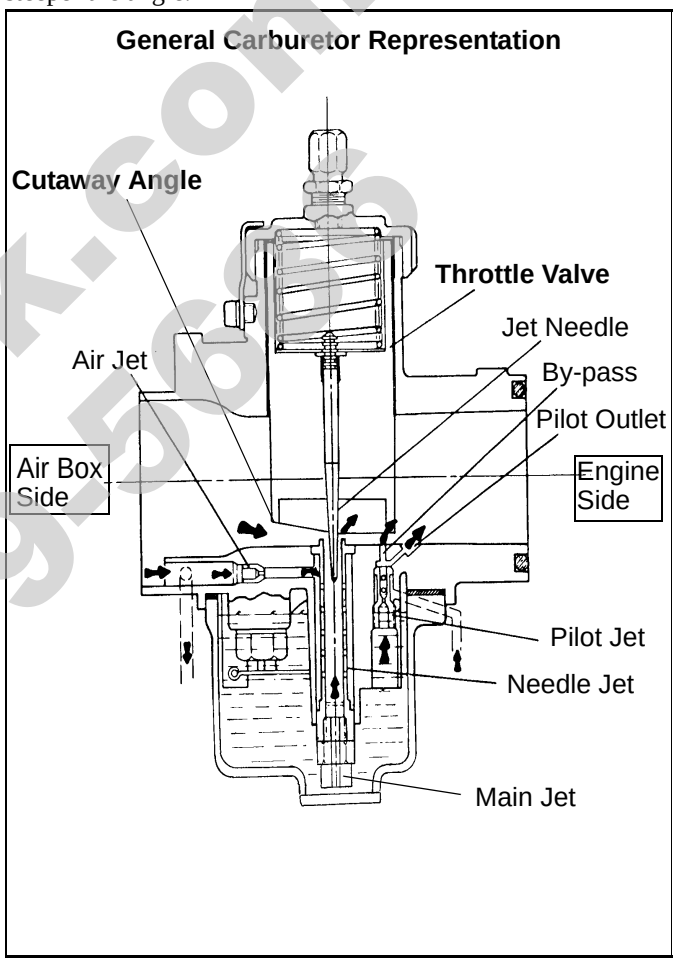
The mixture is regulated to some degree by adjusting the air screw. When the air screw is closed, the fuel mixture is made richer as the amount of air is reduced. When the air screw is opened, the mixture is made more lean as the amount of air is increased.



Slide Cutaway (1/8 - 3/8 Throttle)

Throttle valve cutaway effect is most noticeable at 1/4 throttle opening. The amount of cutaway is pre-determined for a given engine to maintain a 14:1 air/fuel ratio at part throttle. A steep angle would indicate a fairly lean mixture because there is less resistance to air flow. A flat angle would provide a much richer mixture because there is more resistance to air flow.

The venturi shape can be adjusted for each engine's breathing characteristics by using a different valve cutaway angle. A number will be stamped into the bottom of the valve (e.g. 2.5) indicating the size of the cutaway. The higher the number, the steeper the angle.



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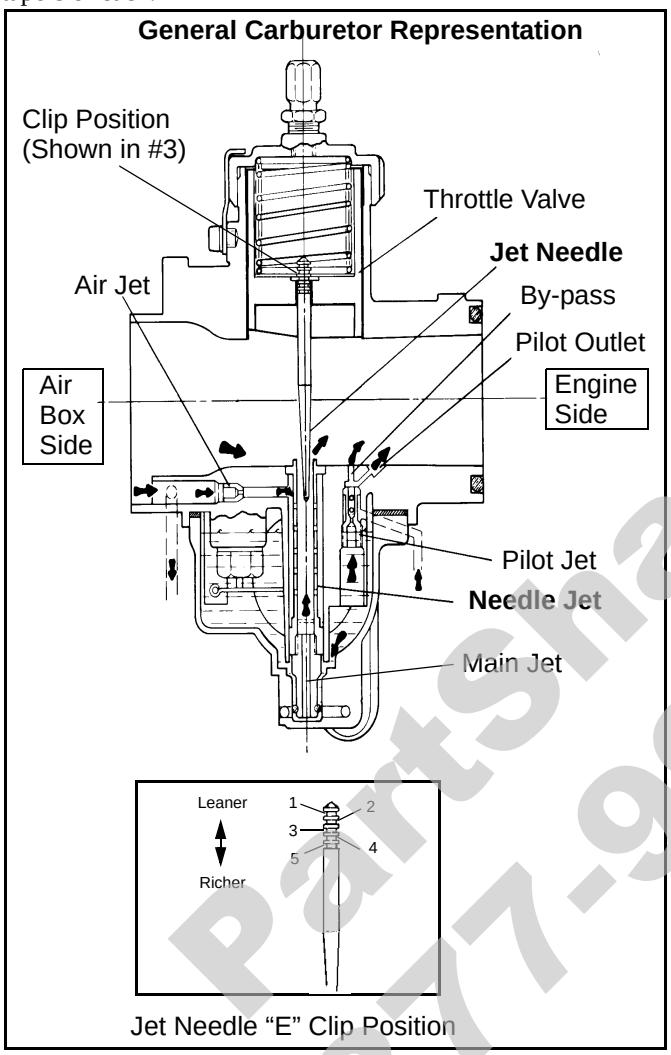
Jet Needle / Needle Jet (3/8 - 3/4 Throttle)

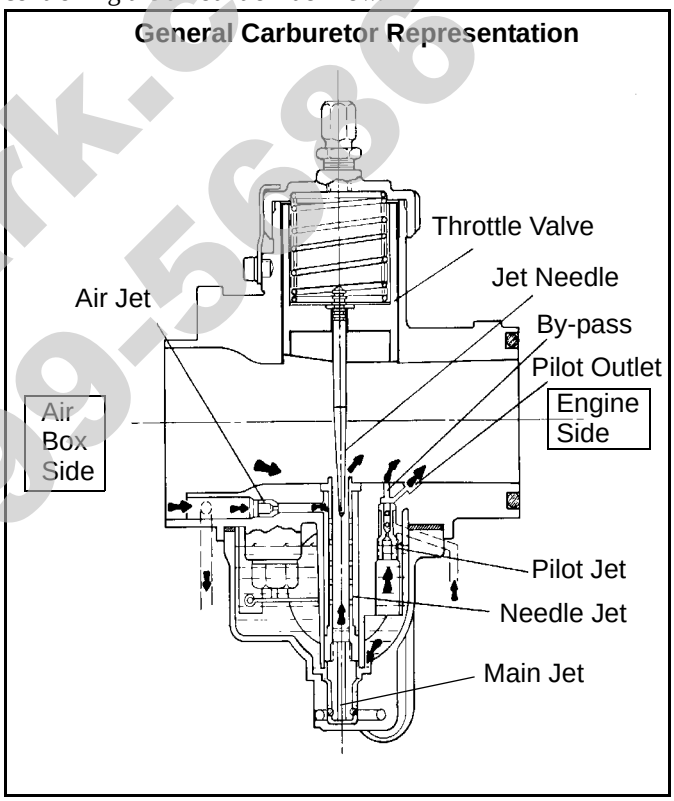
The jet needle and needle jet have the most effect between 3/8 and 3/4 throttle opening. Some mixture adjustment can be accomplished by changing the location of the "E" clip on the needle. Moving the clip down raises the needle in the jet passage and richens the mixture. Moving the clip up lowers the needle in the jet passage and leans the mixture. Letter and number codes are stamped into the needle and the jet indicating sizes and tapers of each.



Main System (3/4 to Full Throttle)

The main system is designed for delivering fuel between low speed and high speed operation. This system is made up of the jet needle, needle jet, and main jet. The main system begins to take effect as soon as there is enough air flow into the carburetor venturi to draw fuel up through the main jet and needle jet assembly. This system works in conjunction with the needle jet system.

During low speed driving, there is very little clearance between the jet needle and the needle jet; therefore, very little fuel from the main jet can pass between the jet needle and the needle jet. As the throttle valve opening is increased, the tapered jet needle is raised farther out of the needle jet, allowing greater fuel flow. Under full throttle opening, the cross sectioned area of clearance between the jet needle and the needle jet becomes greater than the cross sectioned area of the main jet. Thus the main jet is now controlling the amount of fuel flow.



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Fuel Delivery

The throttle opening chart below demonstrates component relationship to fuel flow versus throttle valve opening.

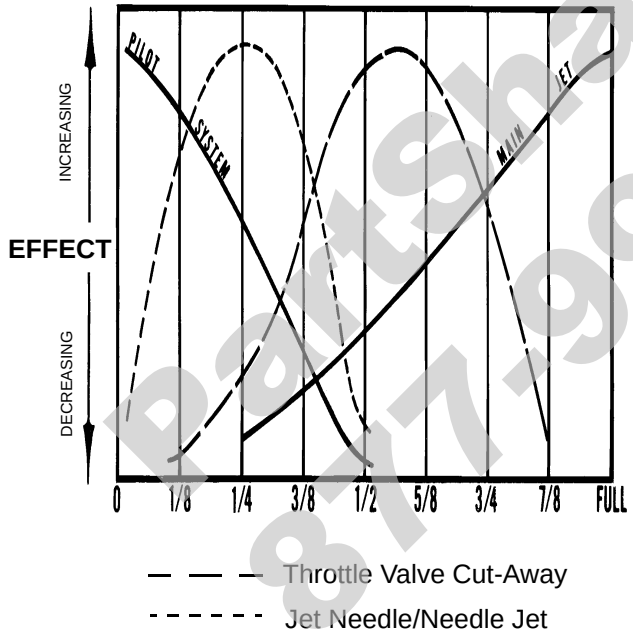
The pilot system's main function is that of a low speed jet. Its most effective range of fuel delivery is from idle to approximately 3/8 throttle valve opening.

The throttle slide controls the rate of engine air by its movement up and down in the carburetor venturi. At small throttle openings the air flow is regulated chiefly by the valve cutaway, with greatest effectiveness at 1/4 throttle opening. Throttle valves are numbered 1.0, 1.5, 2.0, etc., according to the size of the cutaway. Decreasing the cutaway number will increase the amount of fuel delivered in its effective range.

The jet needle and needle jet have an effective operating range from approximately 1/8 to 7/8 throttle opening. The amount of fuel delivered during this range relies upon the jet needle clip position, as well as the needle jet size and other specifications.

The main jet affects fuel delivery at 1/4 throttle and consistently increases to full throttle opening.

THROTTLE OPENING - Theory



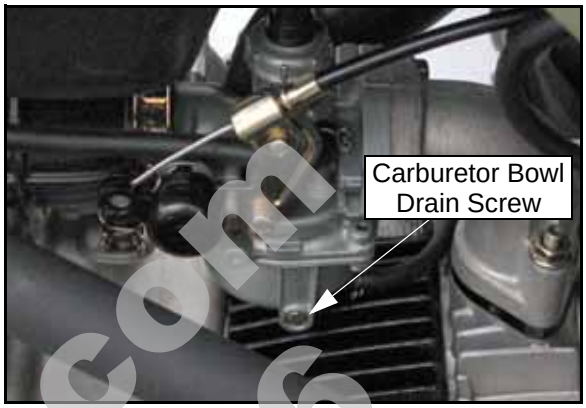
Vent System

The fuel tank vent supplies atmospheric pressure to the fuel in the tank. The vent must be free of debris and restrictions to prevent lean mixture and possible engine damage. All vent lines must be properly routed to prevent damage to the line and to prevent contaminants from entering the tank.

CARBURETOR SERVICE

Carburetor Float Bowl Draining

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



NOTE: Drain screw is located on the side of the float bowl.

1. Place a clean container beneath the bowl drain spigot or bowl drain hose.
2. Turn the fuel valve to "OFF".

OFF

3. Loosen drain screw 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".

ON

7. Inspect carburetor for fuel leaks
8. Start machine and re-check for leaks.

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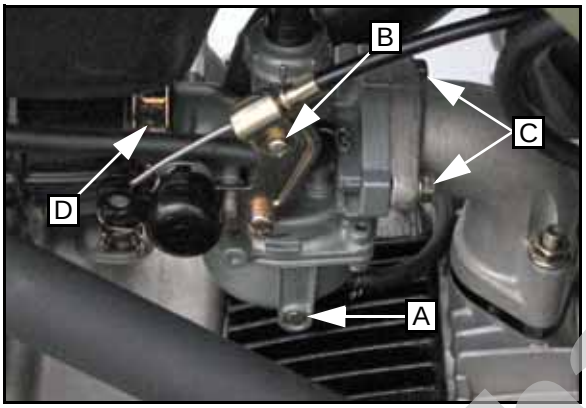
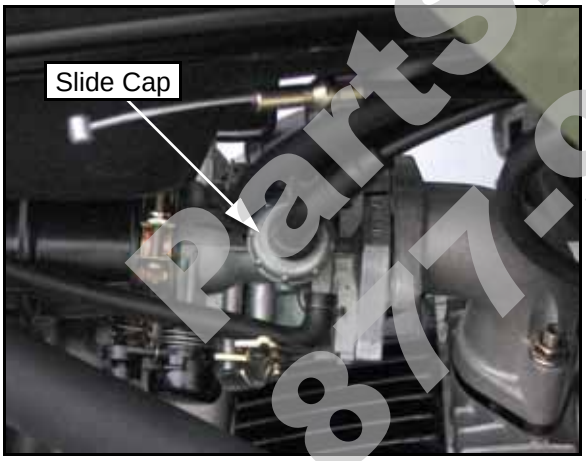
Carburetor Removal - General

The following procedure is provided to use as a reference when removing the carburetor from either of the 4-stroke youth models. Some steps may differ slightly between models.

1. Turn the fuel valve "OFF" and drain the fuel from the carb through the drain screw (A).
2. Loosen or remove screw (B) retaining the choke cable and disconnect the cable end from the choke arm.
3. Remove the carburetor mounting bolts (C).
4. Loosen the intake boot clamp (D) between the carburetor and air cleaner.



5. Rotate the carb to allow access to remove the slide.

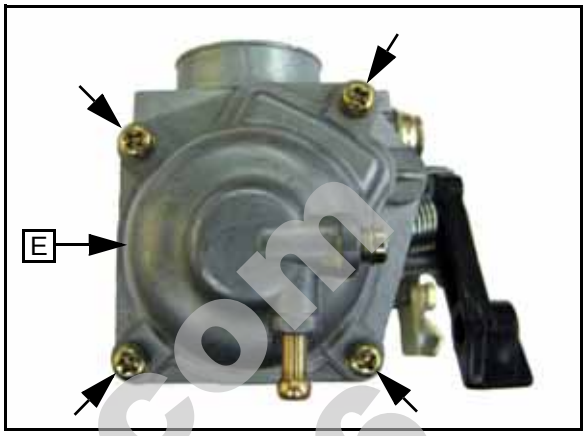


6. Remove the fuel line and vent lines. Remove carburetor from ATV.

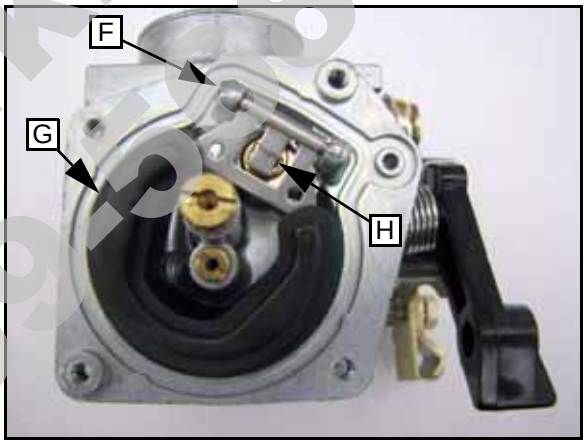
Carburetor Disassembly - 50cc (Mikuni)

Use the following procedure to disassemble the Mikuni carburetor used on the 50cc models.

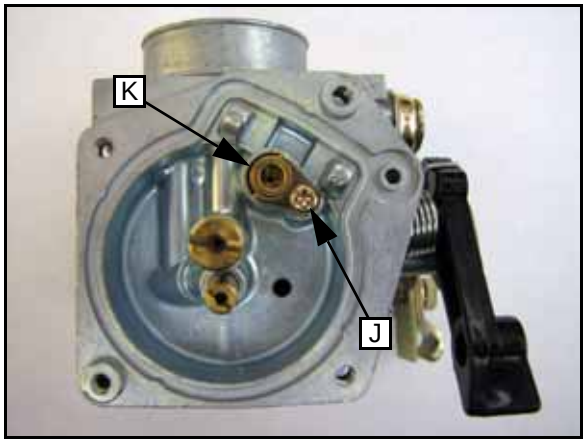
1. Remove the (4) float bowl screws and float bowl (E).



2. Remove the float pin (F), float (G), and inlet needle (H).



3. Remove the screw (J) retaining the inlet seat and remove the retaining bracket and seat (K) from the carburetor.



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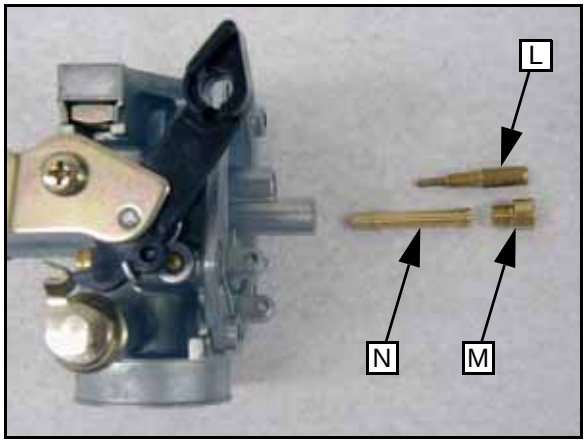
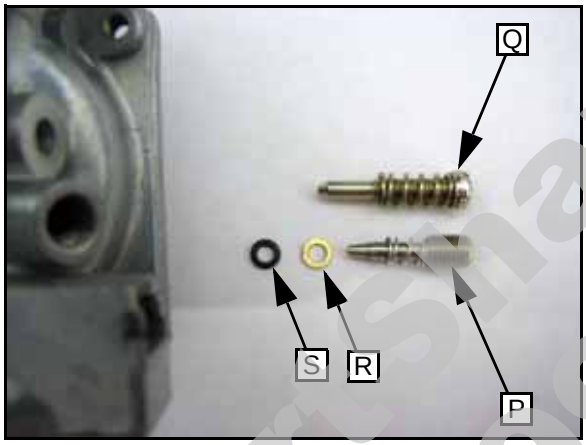
4. Remove the pilot jet (L), main jet (M), and emulsion tube (N) from the carb body.



5. Note the position of both the pilot mixture screw (P) and idle speed adjustment screw (Q) and remove both from the carb body.

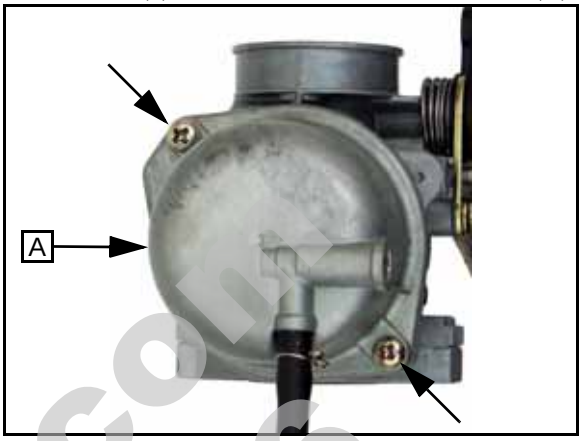


6. Remove the washer (R) and O-ring (S) from the pilot mixture screw threaded hole in the carburetor body.

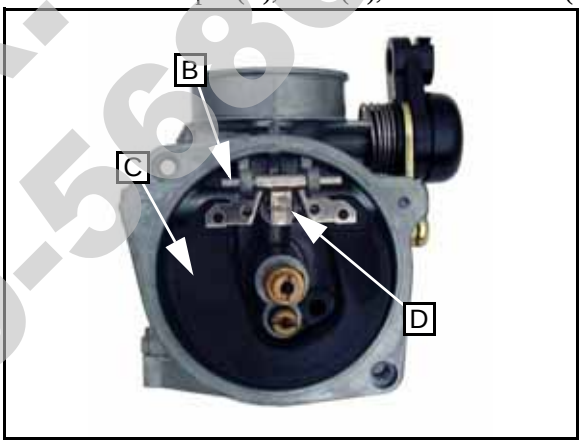
Carburetor Disassembly - 90cc (Keihin)

Use the following procedure to disassemble the Keihin carburetor used on 90cc models.

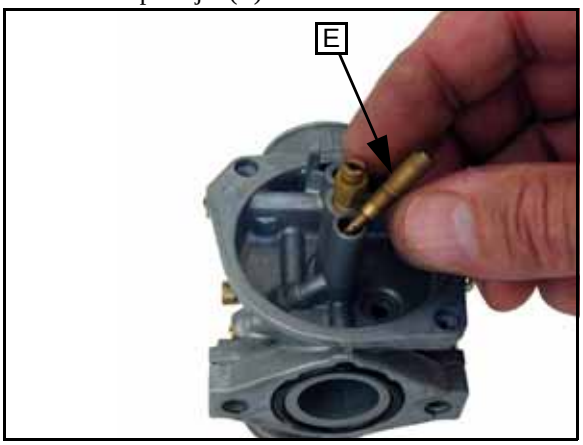
1. Remove the (2) float bowl screws and float bowl (A).



2. Remove the float pin (B), float (C), and inlet needle (D).



3. Remove the pilot jet (E).



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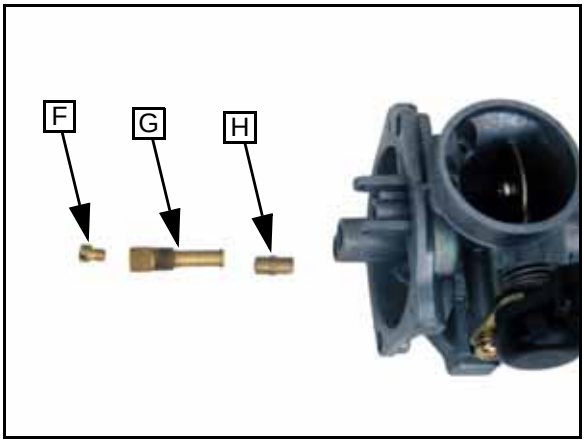
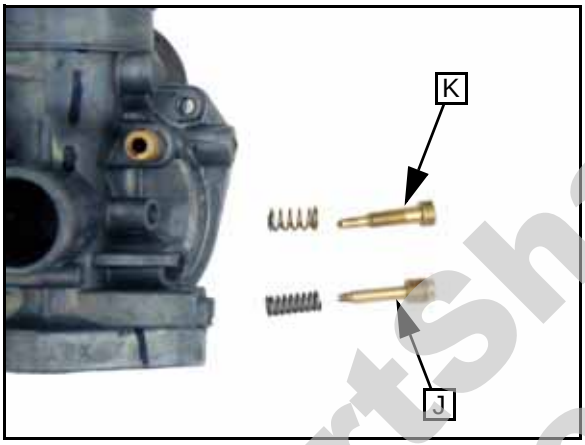
4. Remove the main jet (F), emulsion tube (G), and needle jet (H) from the carburetor body.



5. Note the position of both the pilot mixture screw (J) and idle speed adjustment screw (K) and remove both from the carb body.



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 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.

IMPORTANT: 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.

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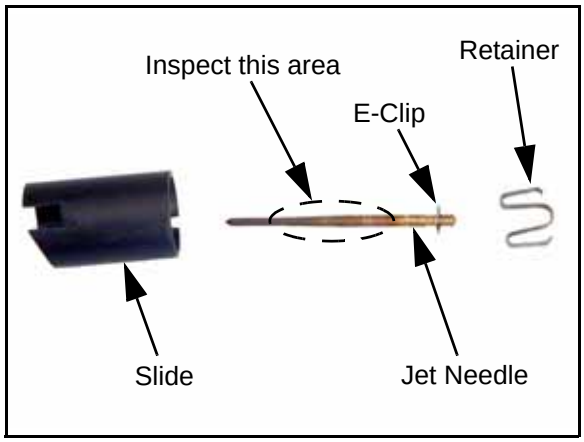
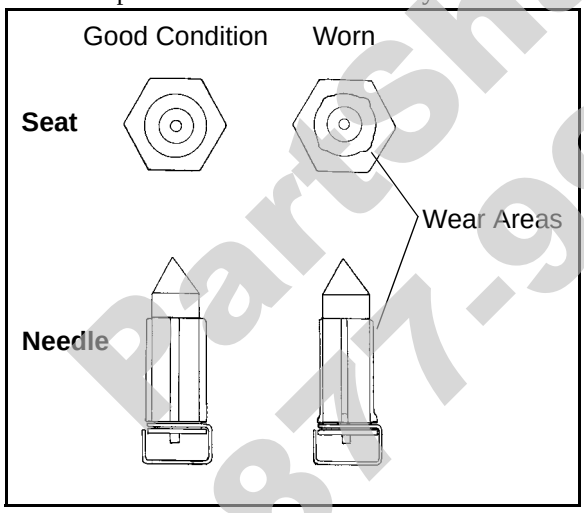
Carburetor Inspection

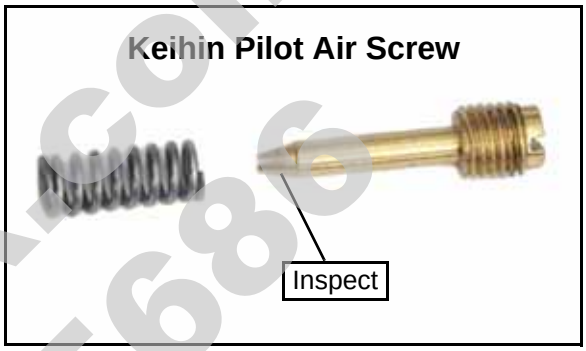
1. Remove the carburetor slide assembly. Disassemble the components and inspect for wear. Inspect slide needle and look for discoloration, shiny spots, or an area that looks different than the rest of the needle. The middle to upper portion of the needle contacts the needle jet and is the most likely wear point. If slide needle shows signs of wear replace both the needle and needle jet to prevent a rich condition.



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.



3. Inspect the idle speed adjust screw tip for flat spots and the pilot mixture screw tip for damage. If any damage is present on either screw, it must be replaced.



4. Inspect the float bowl vent tube for cracks near the bottom of the tube.

NOTE: A continuous fuel leak from the carburetor drain hose can be a result of a cracked bowl vent tube.

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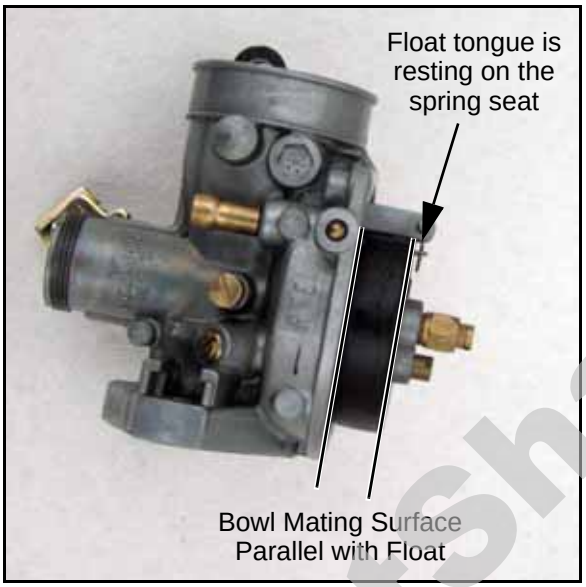
Float Height Adjustment

1. Place the carburetor at a level position to remove weight from float arm. In this position, the float tongue will rest slightly outward.

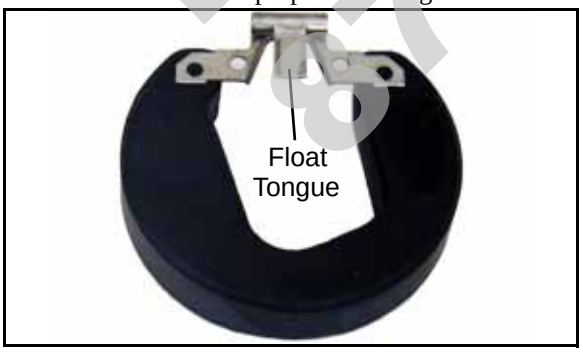
2. With the carburetor at rest and level, slightly tilt the carburetor back. The float should fall into the correct position, with the float tongue resting lightly on the inlet needle valve pin without compressing the spring. The bottom of the float should be parallel with the float bowl mating surface.

IMPORTANT: When measuring the height, verify the inlet needle valve spring is not compressed.



NOTE: If the float is past parallel with the mating surface, the carburetor has likely been tilted back too far and the float tongue is compressing the needle valve pin.

3. If adjustment is required, carefully bent the float tongue up or down to achieve the proper float height.



Float Height:
Parallel to Gasket Surface ± 1mm

Carburetor Assembly

1. Replace parts in proper order. Refer to the parts exploded view or "Disassembly" steps for further detail

2. Install the pilot air mixture screw, spring, washer, and O-ring as an assembly (Mikuni Only). Lubricate the O-Ring with oil or light grease before 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 Chapter 2 for procedure.

Air Screw Base Setting
(Set at Factory)

Factory Specification:
50cc Mikuni: 2.5 Turns Out
90cc Keihin: 2.25 ± .5 Turns Out

Needle and Seat Leak Test

1. Install the float bowl.

2. Invert the carburetor and install a Mity-Vac™ (PN 2870975) to the fuel inlet fitting.

3. 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 or gasket.

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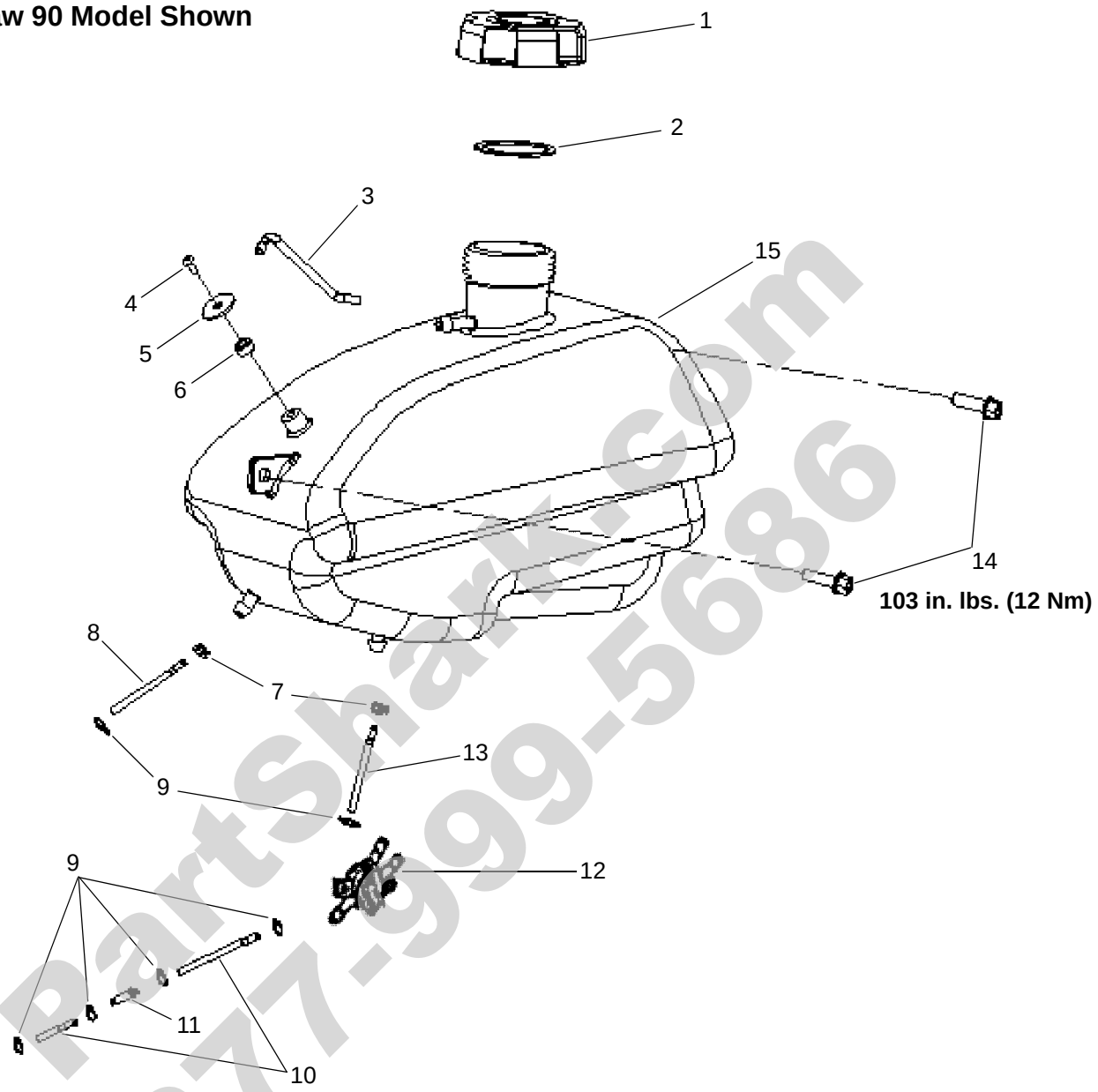
FUEL TANK EXPLODED VIEW

Outlaw 90 Model Shown



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Fuel Tank Assembly

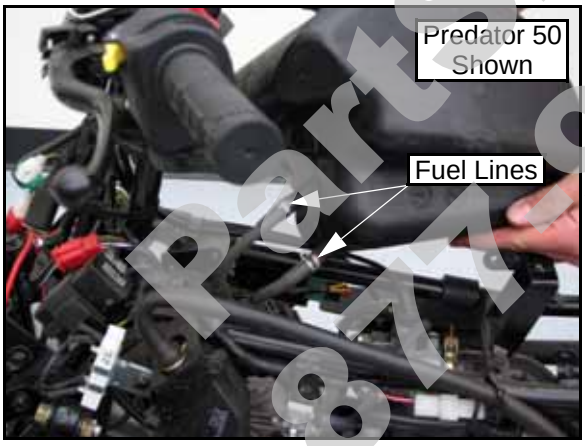
REF.	QTY.	DESCRIPTION	REF.	QTY.	DESCRIPTION
1	1	Cap, Fuel	9	6	Clip
2	1	Gasket, Fuel Cap	10	2	Fuel Line, Carb Inlet
3	1	Hose, Vent	11	1	Fuel Filter
4	1	Screw	12	1	Fuel Valve
5	1	Washer	13	1	Fuel Line, Main
6	1	Spacer	14	2	Bolt
7	2	Clamp	15	1	Fuel Tank
8	1	Fuel Line, Reserve			

Fuel Tank Removal

See Chapter 5 for body removal procedures to gain access the fuel tank.

1. Completely drain fuel from fuel tank. Be sure the fuel valve is set to “RES” to get the majority of the fuel drained from the tank.
2. Remove the vent line near the filler neck.
3. Remove the two bolts that attach the fuel tank to the frame.

4. Carefully lift up on the fuel tank.
5. Place a shop rag or towel underneath the tank and remove both fuel lines from the tank.

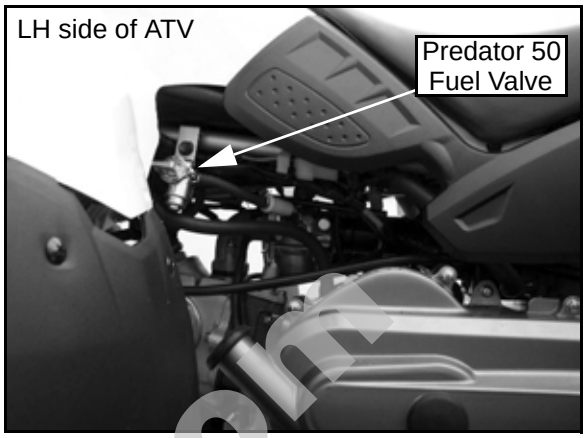


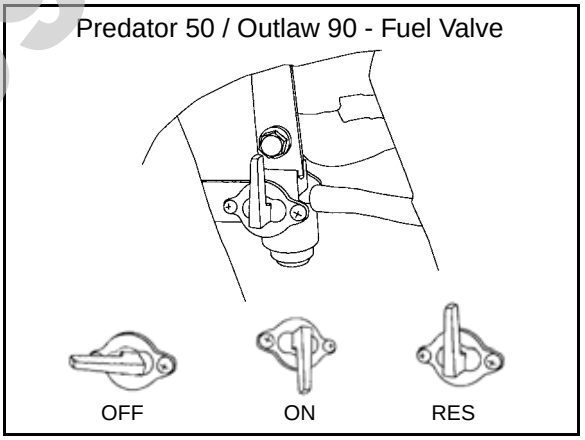
6. To reinstall the tank, reverse the removal procedure. Be sure to torque the tank mounting bolts.

Fuel Tank Mounting Bolt Torque
103 in. lbs. (12 Nm)

Fuel Valve Location

Predator 50 / Outlaw 90





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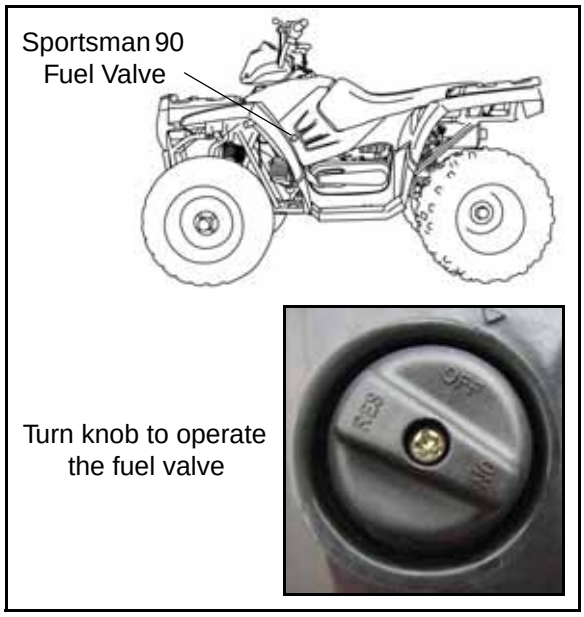
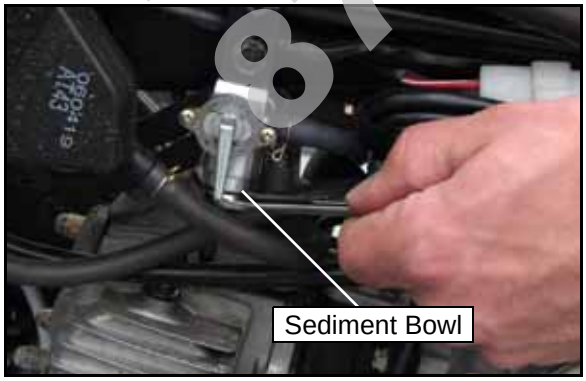
Sportsman 90



Fuel Valve Service
Predator 50 / Outlaw 90

To service the fuel valve:

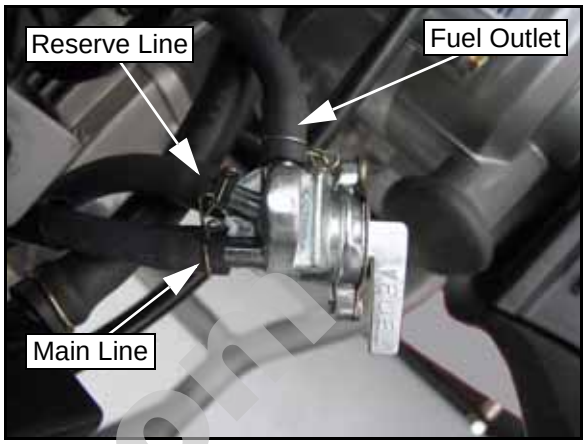
1. Turn the fuel valve to “OFF” and remove the fuel line at the carburetor fuel inlet. Turn the fuel valve to “RES” and completely drain all the fuel from the fuel tank into a suitable container.
2. Turn the fuel valve “OFF”.
3. Remove line clamps and fuel lines from the fuel valve.
4. Remove the fasteners retaining the fuel valve and remove the valve.
5. The fuel valve has a sediment bowl to catch moisture and debris. Remove the sediment bowl and inspect the valve for damage or debris. Replace the fuel valve if damaged.



6. Reverse procedures to reinstall fuel valve.

Fuel Valve Layout

Predator 50 / Outlaw 90



Sportsman 90

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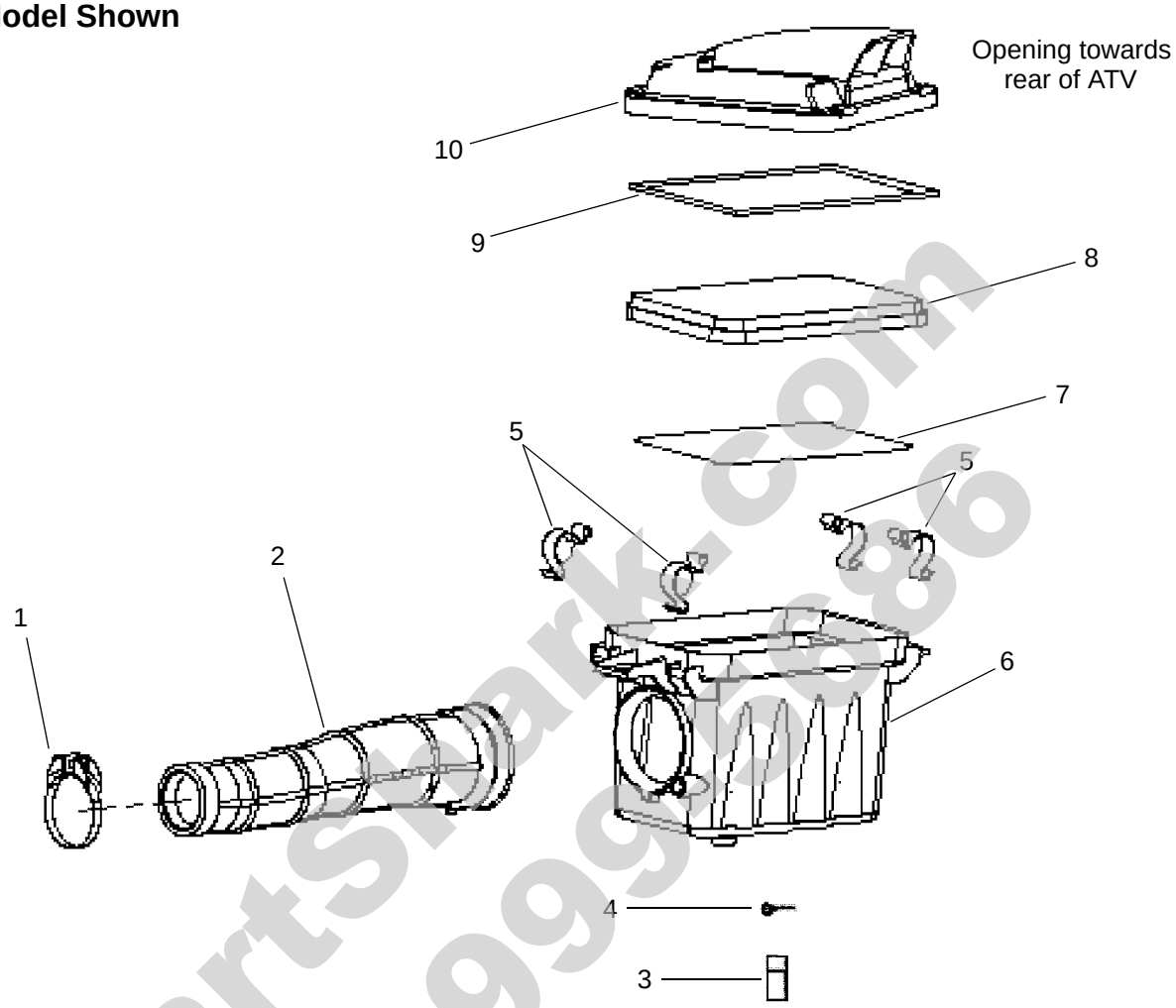
AIR CLEANER EXPLODED VIEW

90cc Model Shown



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Air Cleaner Assembly

REF.	QTY.	DESCRIPTION	REF.	QTY.	DESCRIPTION
1	1	Clamp	6	1	Box, Air Cleaner
2	1	Boot	7	1	Screen Filter
3	1	Hose, Drain	8	1	Foam Filter
4	1	Clip	9	1	Gasket
5	4	Clip	10	1	Cover, Air Cleaner

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
- Intake air leak (throttle shaft, intake ducts, airbox or air cleaner cover)
- 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 plate 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 choke plate return spring
- Fouled spark plug

Poor Idle

Idle Too High

- Idle adjusted improperly / idle mixture screw damaged
- Throttle cable sticking, improperly adjusted, routed incorrectly
- Choke cable sticking, improperly adjusted, routed incorrectly
- Plugged or restricted pilot 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 pilot 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
- Worn jet needle / needle jet
- Plugged or restricted pilot jet

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NOTES

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CHAPTER 5

BODY / SUSPENSION / STEERING

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GENERAL INFORMATION

Special Tools

Description	Part Number
Shock Spanner Wrench	2870872

Torque Specifications

Fastener	Torque
Suspension Fasteners	
A–Arm Attaching Bolt	25 ft. lbs. (34 Nm)
Shock Mounting Bolts	Front: 25 ft. lbs. (34 Nm) Rear: 36 ft. lbs. (49 Nm)
Swing Arm Mounting Bolt	50cc: 30 ft. lbs. (41 Nm) 90cc: 65 ft. lbs. (88 Nm)
Steering Fasteners	
Handlebar Adjuster Block	84 in. lbs. (10 Nm)
Inner Tie Rod Bolts	25 ft. lbs. (34 Nm)
Outer Tie Rod Bolts	25 ft. lbs. (34 Nm)
Tie Rod Jam Nuts	12–14 ft. lbs (17–19 Nm)
Steering Post Mount Nuts	16 ft. lbs. (22 Nm)
Steering Post Nut	40 ft. lbs (54 Nm)
Final Drive Fasteners	
Front Wheel Spindle Nut	44 ft. lbs (59 Nm)
Rear Wheel Hub Nut	58 ft. lbs. (79 Nm)
Front / Rear Wheel Bolts	22 ft. lbs. (30 Nm)
Sprocket Bolts	Front: 87 in. lbs. (9.8 Nm) Rear: 16 ft. lbs (22 Nm)
Chain Tensioner Bolt	84 in. lbs (10 Nm)
Bearing Carrier Mounting Bolts	40 ft. lbs (54 Nm)
Chain Guard Bolts	16 ft. lbs (22 Nm)

BODY REMOVAL - PREDATOR 50

Body Removal

1. Lift up on the seat latch and remove the seat.

2. Remove the 4 bolts retaining the body.

3. Remove the 4 fasteners attaching the body to the footwells on each side.

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4. Remove or loosen the front body attachment bolts under the running lights.

5. Remove the screws attaching the front cover to the body. There are 2 screws located in front and 2 screws located behind the front cover.

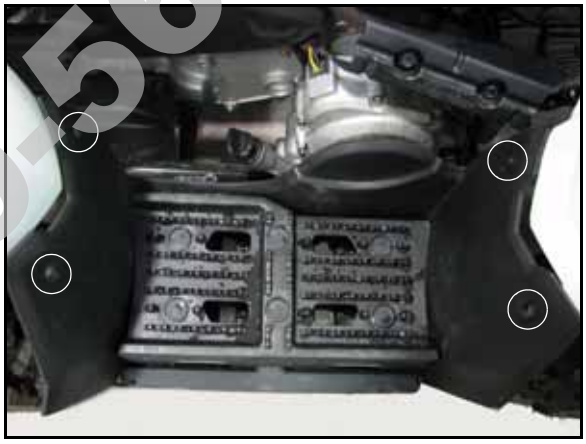
6. Remove the running light adjustment screw from each side.

7. Unhook the running light harnesses and completely remove the front cover with the running lights attached.

8. Remove the fuel tank cap and carefully remove the body from the frame.

Footwell Removal

1. Remove the 4 fasteners attaching the body to the footwells on each side.



2. Remove the 6 rubber plugs from the removable footwell to access the 6 screws.

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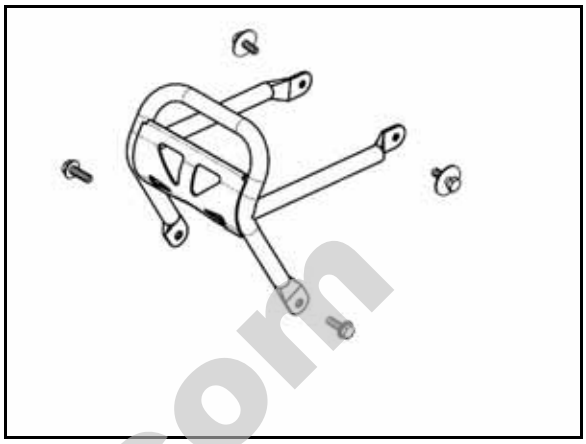
3. Remove the 6 screws and lift the removable footwell off.

4. Remove the 4 screws attaching the main footwells to the frame on each side and remove the footwells.

Front Bumper Removal / Installation

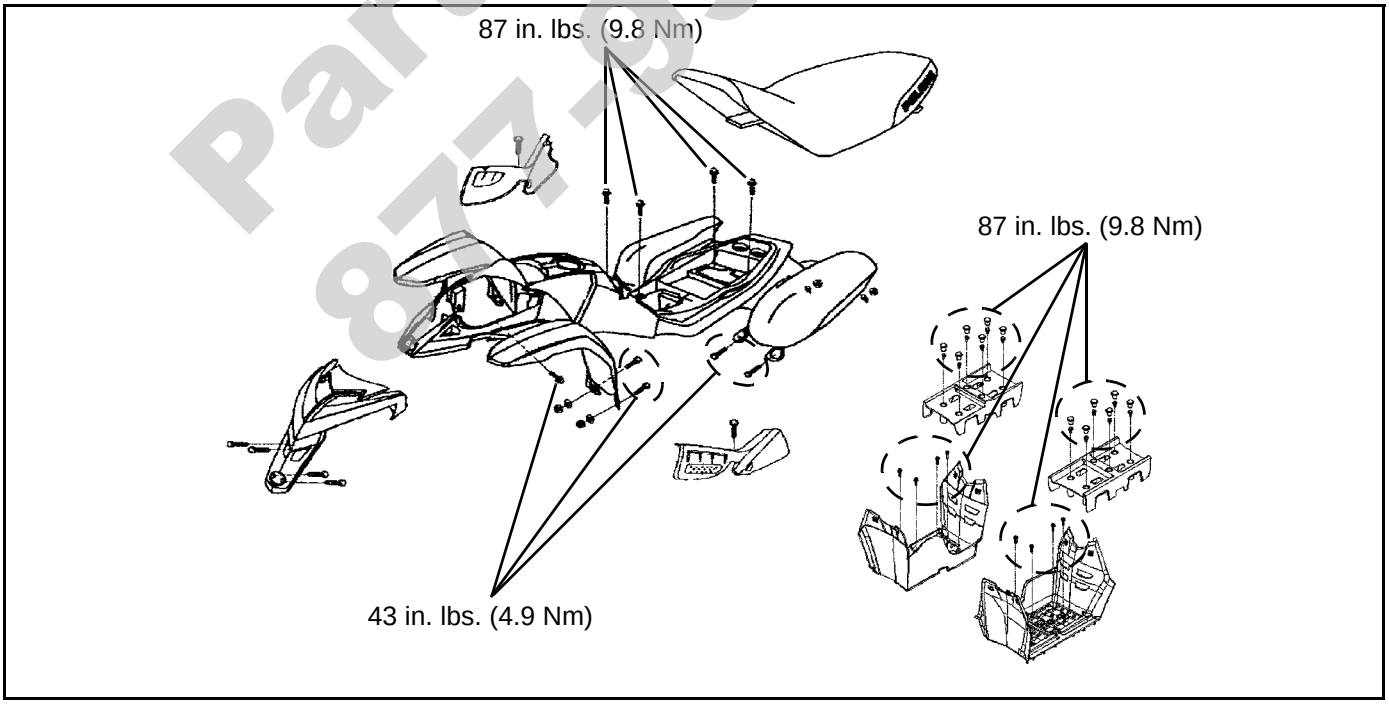
1. Remove the (4) mounting bolts retaining the front bumper and remove the bumper from the ATV.



2. Reverse the previous procedure to reinstall the bumper.
3. Torque mounting bolts to 87 in. lbs. (9.8 Nm).

Front Bumper Mount Bolt Torque
87 in. lbs. (9.8 Nm)

Predator 50 - Body Exploded View



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BODY REMOVAL - OUTLAW 90

Rear Cab Removal

1. Lift up on the seat latch and remove the seat.

2. Remove the (4) bolts retaining the rear cab and the (2) screw inserts retaining the rear portion of the side panels to the rear cab.

3. Remove the (2) fasteners attaching the rear cab supports to the frame. There is (1) on each side under the rear cab.

4. Remove the (3) fasteners on each side attaching the footwells to the rear cab.

5. Remove the rear cab from ATV.

Side Panel Removal

1. Remove the seat.

2. Remove the (2) insert fasteners near the front portion of the side panel and the screw insert near the rear portion of the side panel.

3. Repeat step 2 to remove the other side panel.

Footwell Removal

1. Remove the (6) fasteners attaching the front and rear cab to the footwells on each side.

2. Remove the (4) bolts attaching the footwell to the frame support.

3. Repeat steps 1 and 2 to remove the other side if required.

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Front Cab Removal

1. Remove the front cab cover by carefully lifting up on the cover to disengage the plastic tabs.

2. Remove the (2) screw inserts attaching the front cab to the fuel tank cover.

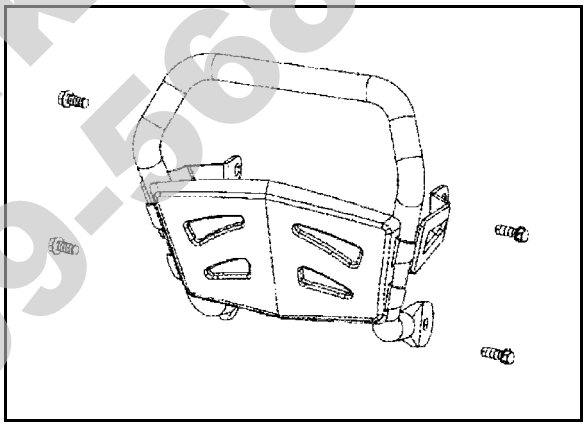
3. Remove the (2) bolts under the front portion of the front cab. There is (1) on each side under the front cab.

4. Disengage the locking tabs attaching the front cab to the fuel tank cover and remove the front cab from the ATV.

5. Remove the fuel tank cap to allow the tank cover to be removed if required.

Front Bumper Removal / Installation

1. Remove the (4) mounting bolts retaining the front bumper and remove the bumper from the ATV.



2. Reverse the previous procedure to reinstall the bumper.

3. Torque mounting bolts to 87 in. lbs. (9.8 Nm).

Front Bumper Mount Bolt Torque
87 in. lbs. (9.8 Nm)

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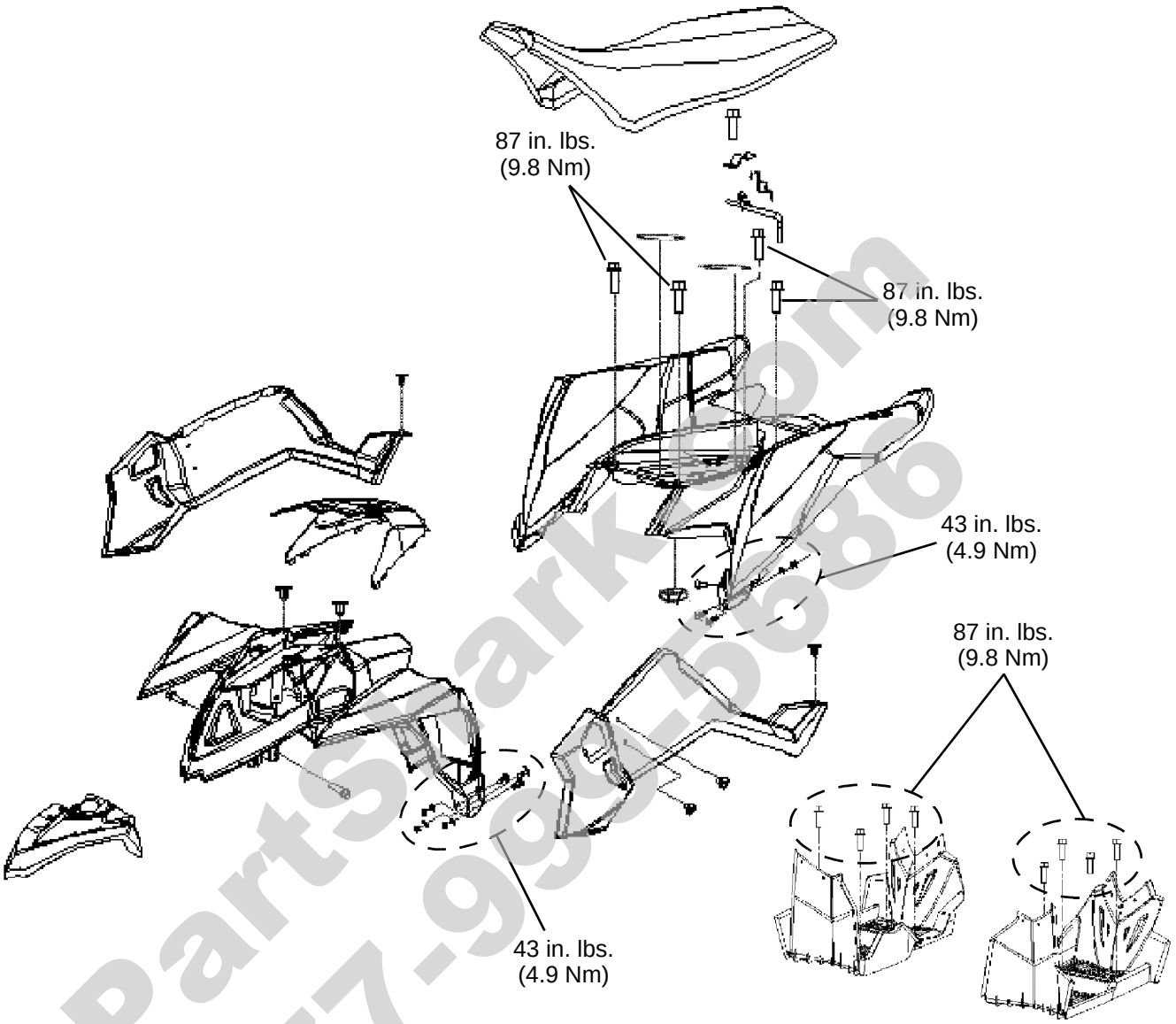
Outlaw 90 - Body Exploded View



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BODY REMOVAL - SPORTSMAN 90

Rear Cab Removal

1. Lift up on the seat latch and remove the seat. The seat latch is located under the LH rear fender area

2. Remove the (2) bolts in the rear rack attaching the rear cab and rack to the rear cab supports.

3. Remove the (4) bolts retaining the rear cab. Also remove the (2) screw inserts attaching the rear portion of the side panels to the rear cab.

4. Remove the (4) fasteners and (1) screw insert on each side attaching the footwells to the rear cab.

5. Disconnect the tail light and remove rear cab from the ATV.

Side Panel Removal

1. Remove the seat

2. Remove the (2) screw inserts from the side panel.

3. Repeat step 2 to remove the other side panel.

Footwell Removal

1. Remove the (8) fasteners and (1) screw insert attaching the front and rear cab to the footwells on each side.

2. Remove the (4) bolts attaching the footwell to the frame support.

3. Repeat steps 1 and 2 to remove the other side if required.

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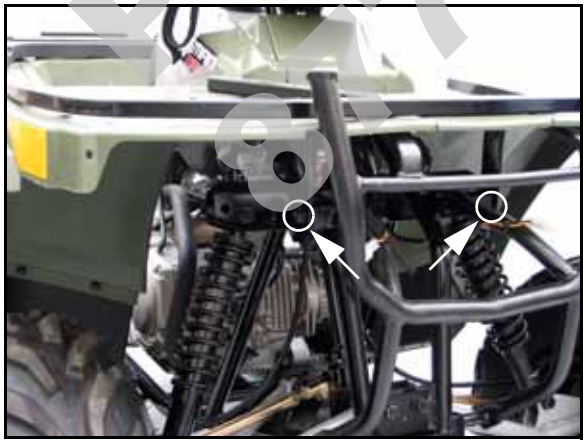
Front Cab Removal

1. Remove the (3) bolts and (2) screws retaining the front bumper to the ATV. The (2) screws are on the backside of the front bumper and attach the bumper to the front cab.

2. Disconnect the daytime running lights and remove the front bumper.

3. Remove all (8) fasteners retaining the front rack and remove the rack from the ATV.

4. Remove the (2) lower bolts retaining the front rack support and remove the support.



5. Remove the (2) screw inserts attaching the front cab to the front cab cover under the handle bar pod.

6. Disengage the locking tabs attaching the front cab cover to the front cab and remove the cover.

7. Remove the fuel cap and carefully lift up and pull the front cab towards the rear of the ATV to completely remove it.

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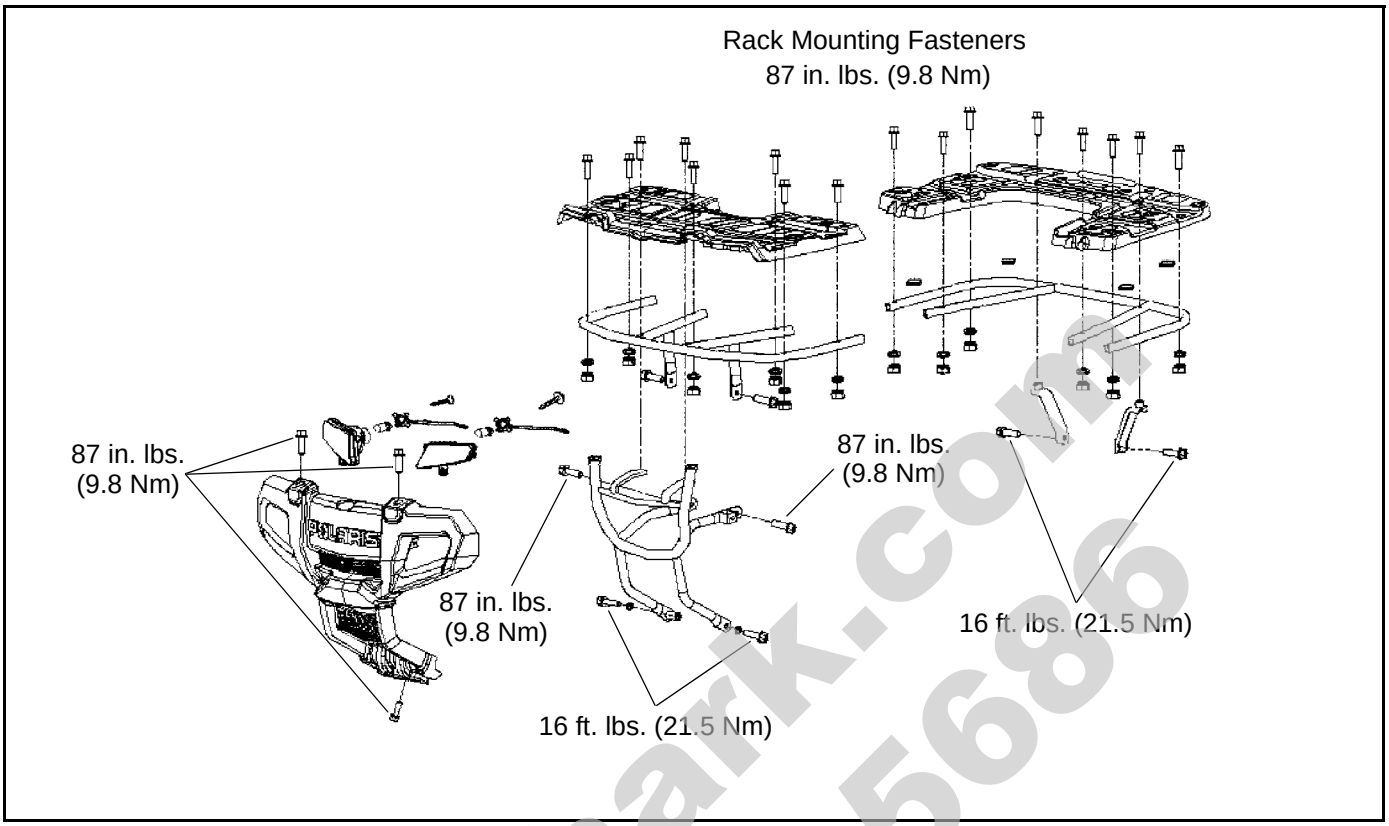
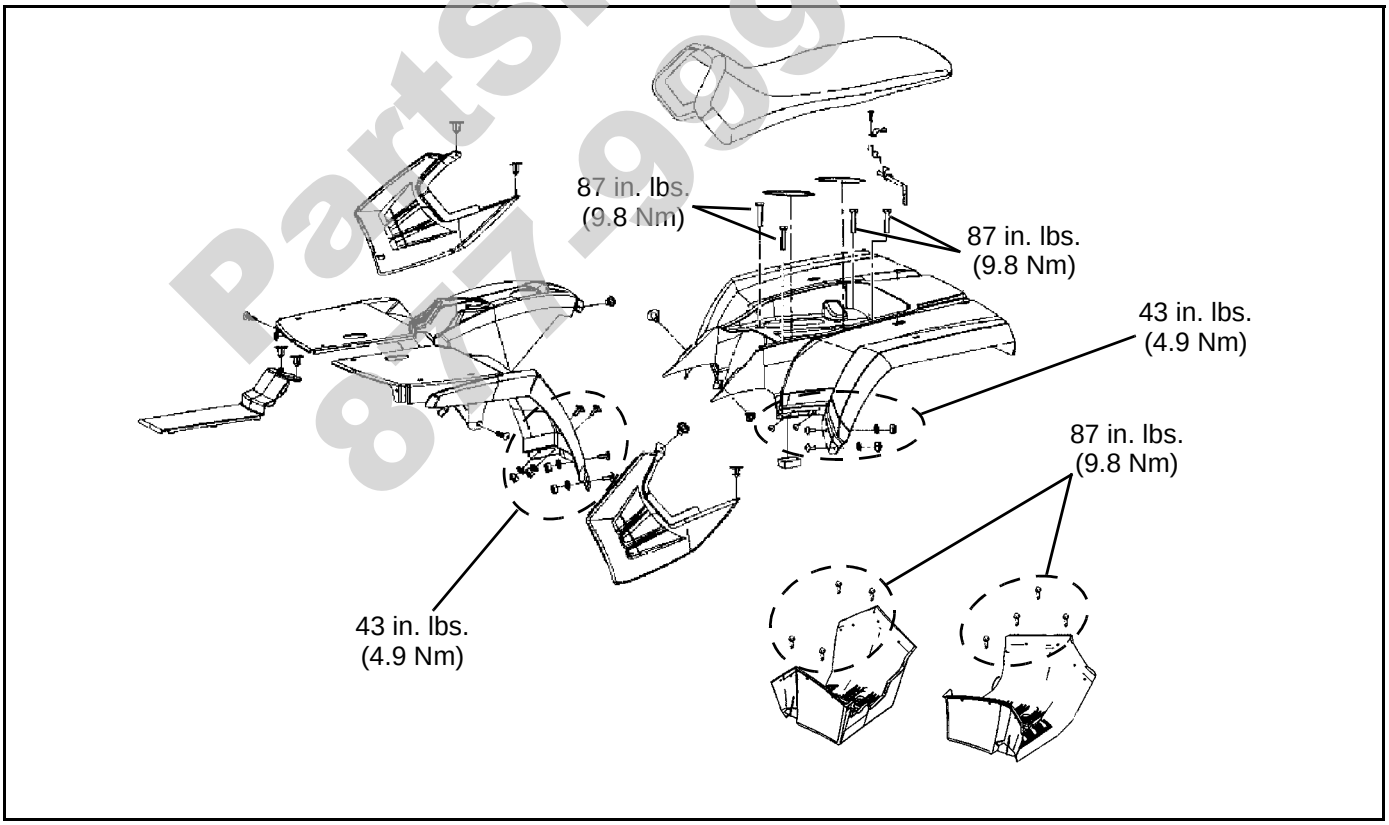
Bumper and Rack Removal



Sportsman 90 - Body Exploded View



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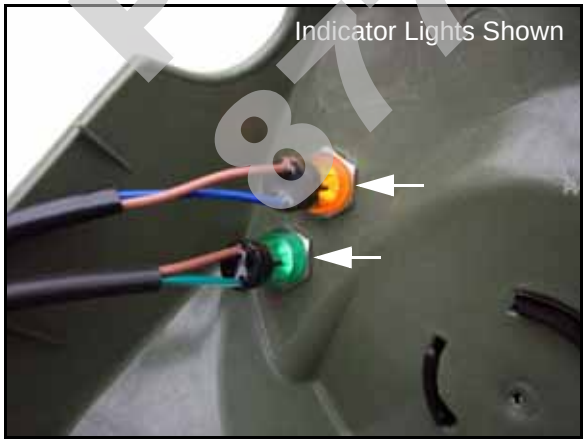
Indicator Light / Ignition Switch Replacement

1. Remove the (3) screws retaining the upper portion of the pod.

2. Disconnect the ignition switch harness and/or indicator light harnesses.

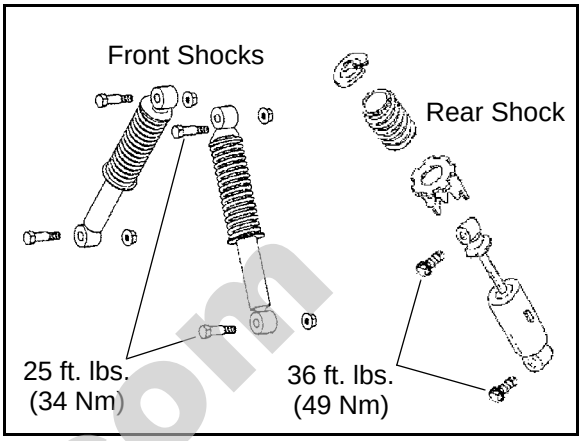
3. To remove the indicator lights and/or ignition switch, remove the retaining nut(s) and remove the component.



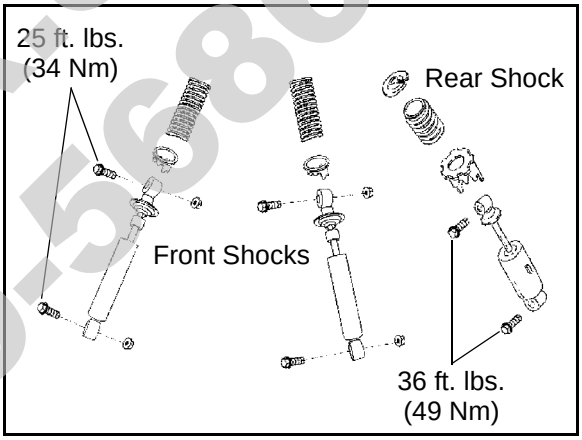
NOTE: The indicator lights are a complete assembly. Bulb replacement is not possible.

SUSPENSION

50cc Shocks and Springs



90cc Shocks and Springs



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Front Shock Removal

1. Elevate front end of the ATV off the ground to remove shock spring tension.

> **⚠ CAUTION**
>
> Severe injury could occur if machine tips or falls.

2. Remove the upper shock mounting bolt from the frame and the lower shock mounting bolt from the front suspension arm / A-arm.

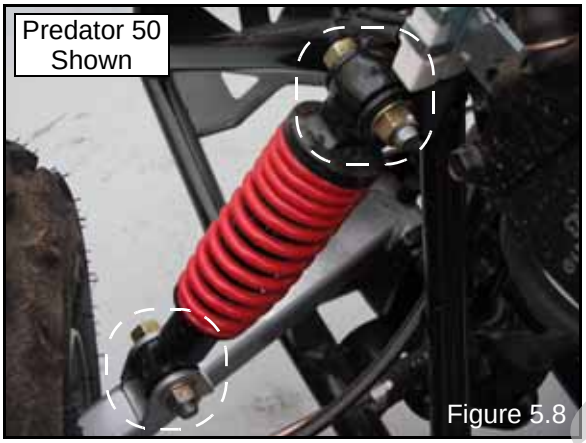


Figure 5.8

3. Replace the shock or spring as required.
4. Install shock as shown in Figure 5.8.
5. Torque shock mounting bolts to specification.

> = T
>
> Front Shock Mounting Bolt Torque:
> 25 ft. lbs. (34 Nm)

Rear Shock Removal

1. Elevate rear end of the ATV off the ground to remove shock spring tension.

> **⚠ CAUTION**
>
> Severe injury could occur if machine tips or falls.

2. Remove the upper shock mounting bolt from the frame and the lower shock mounting bolt from the swing arm.

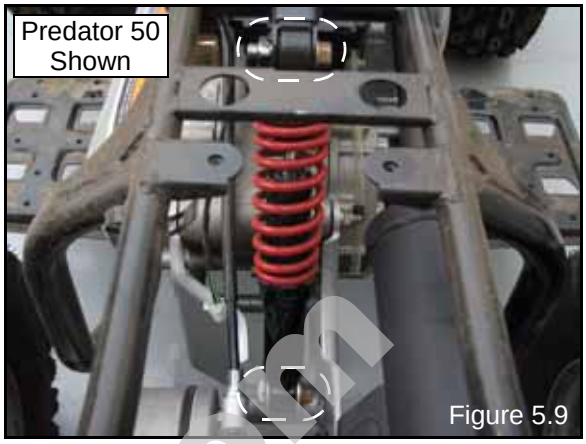


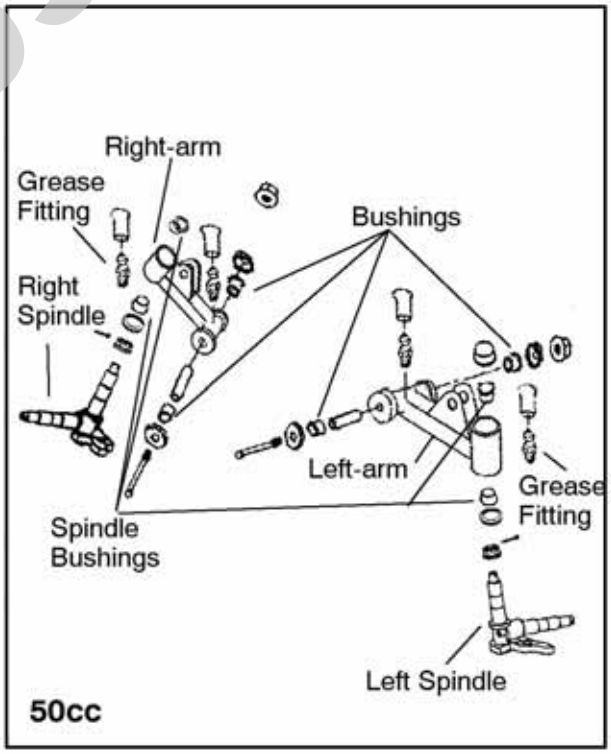
Figure 5.9

3. Replace the shock, spring or adjuster cam as required
4. Install the shock as shown in Figure 5.9.
5. Torque shock mounting bolts to specification.

> = T
>
> Rear Shock Mounting Bolt Torque:
> 36 ft. lbs. (49 Nm)

FRONT CONTROL ARM - 50CC

Control Arm Exploded View



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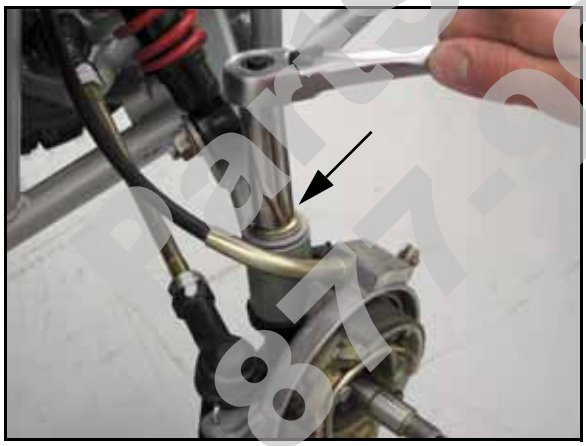
Control Arm Replacement

1. Elevate front end of ATV off the ground far enough to remove the wheel.

> **⚠ CAUTION**
>
> Severe injury could occur if machine tips or falls.

2. Remove the dust cap and cotter pin.
3. Remove wheel nut and remove wheel and hub as an assembly.

4. Remove the cotter pin from the upper spindle castle nut and remove the nut.



5. Slide the spindle assembly out from the end of the control arm.
6. Remove the lower shock mounting fastener and inner control arm fastener.

7. Remove control arm from the ATV.
8. To reinstall, reverse steps 1 - 7. Torque all fasteners to specification.

= T
Inner Control Arm Bolt Torque: 25 ft. lbs. (34 Nm)

= T
Front Shock Mounting Bolt Torque: 25 ft. lbs. (34 Nm)

= T
Wheel Nut Torque: 44 ft. lbs. (59 Nm)

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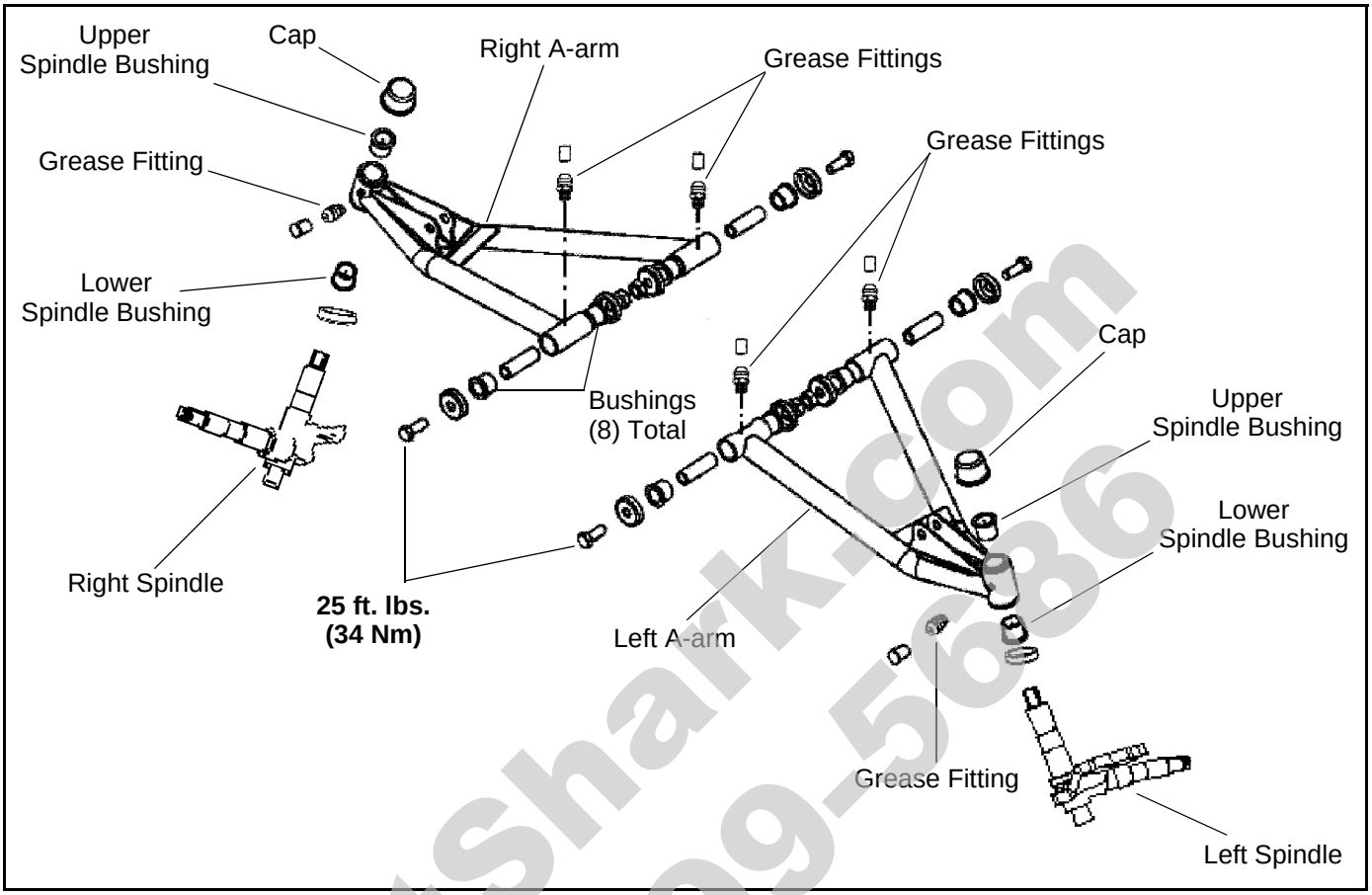
FRONT A-ARM - 90CC

A-arm Exploded View



A-arm Replacement

1. Elevate front end of ATV off the ground far enough to remove the wheel.

CAUTION

Severe injury could occur if machine tips or falls.

2. Remove the dust cap and cotter pin.
3. Remove wheel nut and remove wheel and hub as an assembly.

4. Remove the cotter pin from the upper spindle castle nut and remove the nut.

5. Slide the spindle assembly out from the end of the control arm.

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6. Remove the lower shock mounting fastener and the inner A-arm fasteners.

7. Remove A-arm from the ATV.

8. To reinstall, reverse steps 1 - 7. Torque all fasteners to specification.

= T
Inner Control Arm Bolt Torque: 25 ft. lbs. (34 Nm)

= T
Front Shock Mounting Bolt Torque: 25 ft. lbs. (34 Nm)

= T
Wheel Nut Torque: 44 ft. lbs. (59 Nm)

SWING ARM

Removal

1. Elevate rear end of ATV off the ground far enough to remove the rear wheel(s).

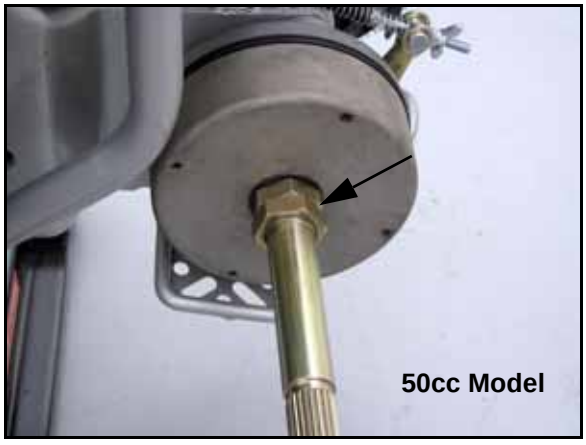
⚠ CAUTION

Severe injury could occur if machine tips or falls.

2. Remove the dust cap and cotter pin from the LH rear wheel

3. Remove LH rear wheel nut and remove wheel and hub as an assembly.

4. Remove the brake drum housing retaining nuts (50cc models only).



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5. Remove the rear brake cable adjuster nut and pull cable out from swing arm bracket.

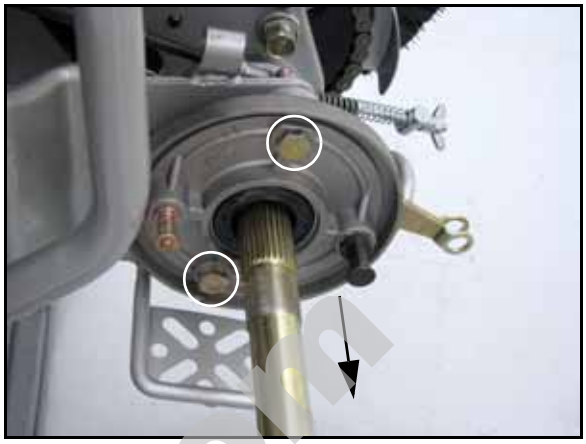
6. Remove the (2) nuts and (2) bolts retaining the axle housing to the rear swing arm.

7. Remove the rear brake drum housing and remove the rear brake shoes.

CAUTION

Springs are under tension. Wear safety glasses and use caution when removing springs. Severe injury can result.

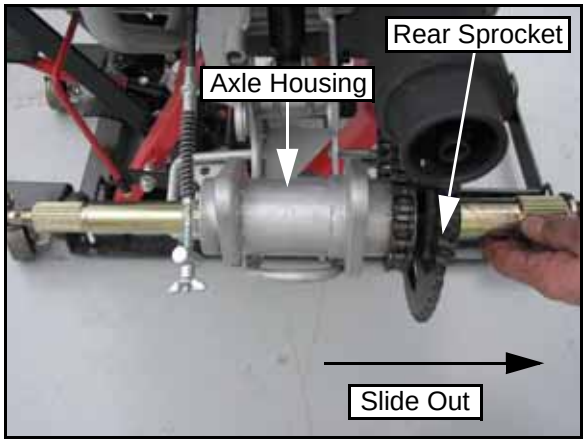
8. Remove the (2) bolts retaining the inner brake housing to the axle housing and slide inner housing off the axle.



9. Remove the (2) bolts retaining the chain guard and remove the guard.

10. Rotate the axle housing far enough forward to remove the chain from the sprocket.

11. Slide axle out of the axle housing and rear sprocket and remove the housing and sprocket assemblies.



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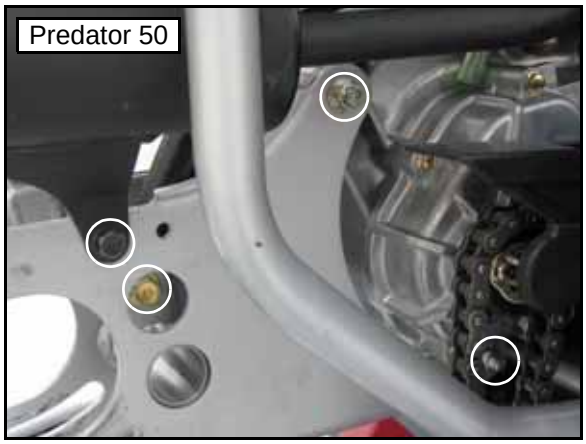
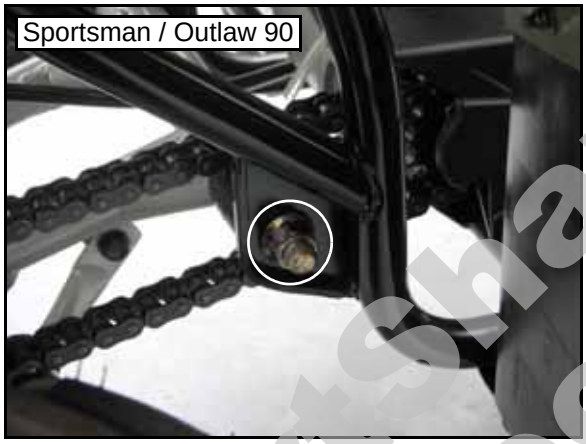
12. **50cc** - Remove the (2) through-bolts, exhaust mount bolt and lower shock mounting bolt from the swing arm and remove the swing arm from the ATV.
90cc - Remove the (1) through-bolt on 90cc models as shown in the second image below.





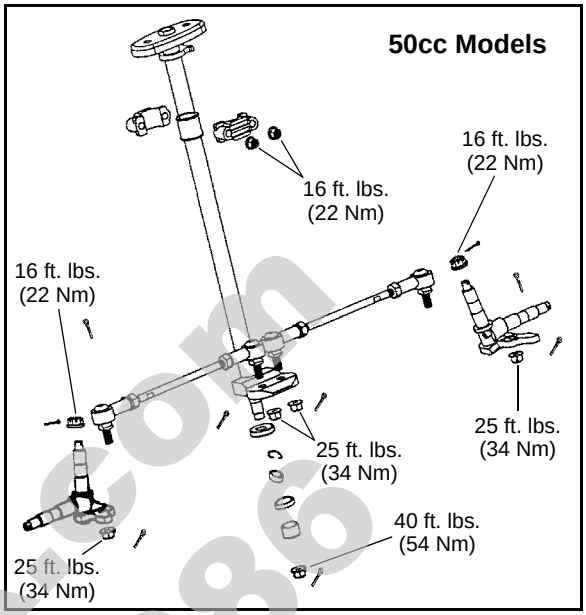
13. To reinstall, reverse steps 1 - 12.

NOTE: When installing the axle nuts on 50cc models, torque the first nut to 43 ft. lbs. (58 Nm). Then tighten the second jam nut against the first nut and torque to the same value.

14. Torque all other fasteners to specification. See torque specification table on page 5.2

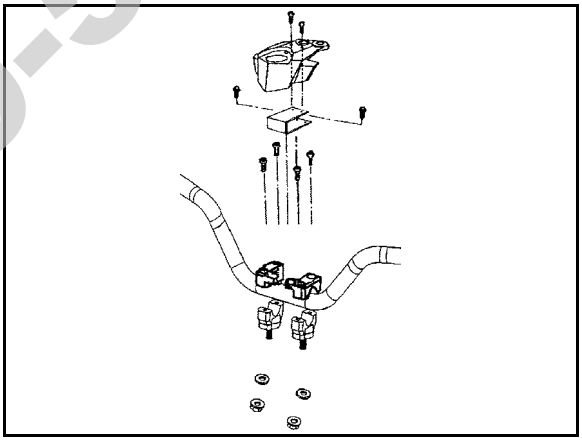
STEERING - 50CC

Steering Assembly Exploded View

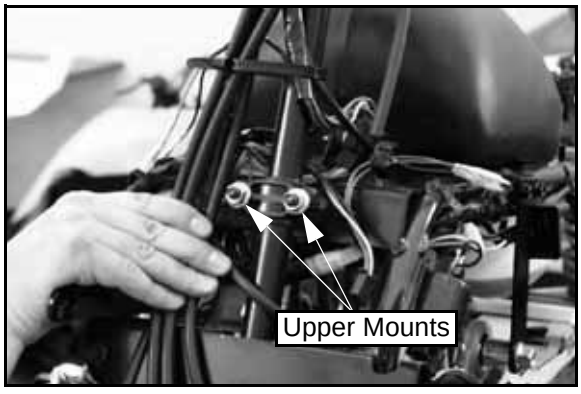


Steering Post Removal

1. Remove handlebar fasteners and retainer block.



2. Remove the upper steering post mounting bolts.



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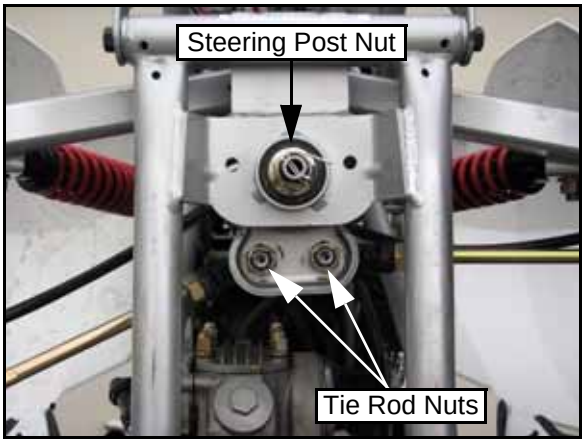
3. Remove the inner tie-rod nuts and the steering post nut.

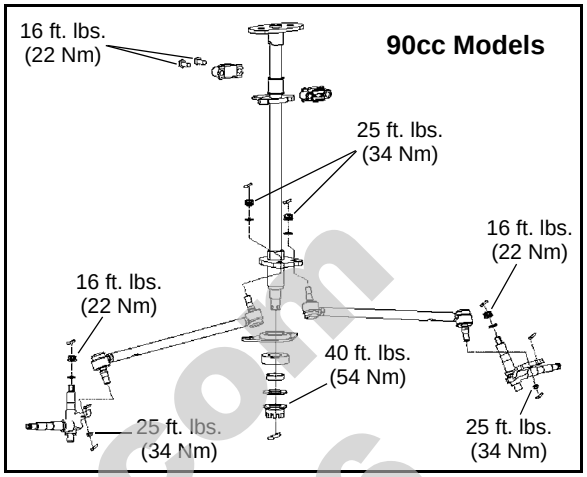


4. Carefully remove the steering post from the ATV.

5. To reinstall, reverse steps 1 - 4. Torque all fasteners to specification. See torque specifications listed in the exploded view.

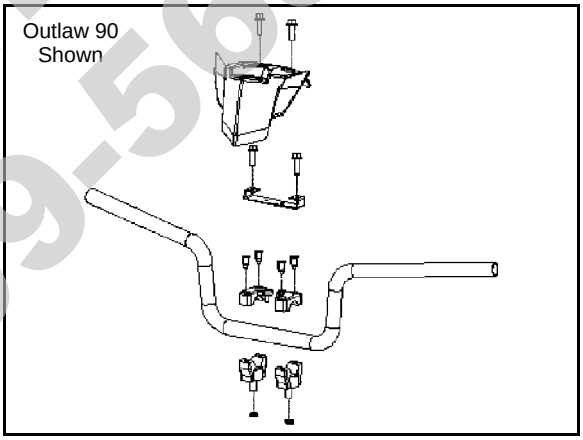
STEERING - 90CC

Steering Assembly Exploded View

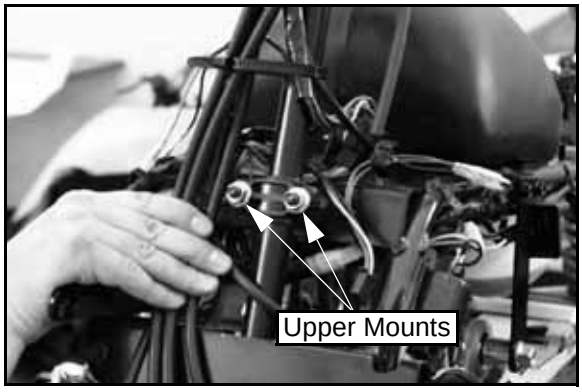


Steering Post Removal

1. Remove handlebar fasteners and retainer block.



2. Remove the upper steering post mounting bolts.



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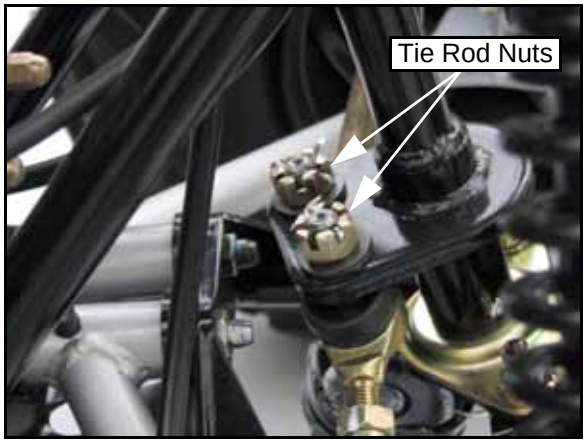
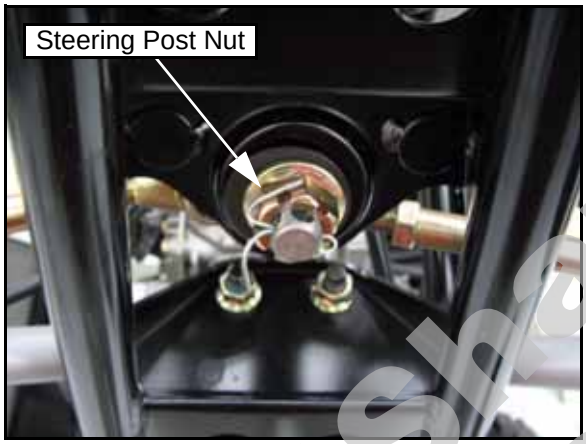
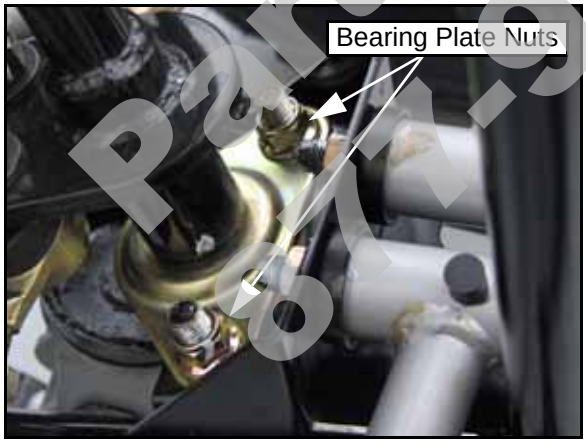
3. Remove the inner tie-rod nuts.



4. Remove the steering post nut.



5. Remove the (2) nuts retaining the bearing plate.



6. Carefully remove the steering post from the ATV.

7. To reinstall, reverse steps 1 - 6. Torque all fasteners to specification. See torque specifications listed in the exploded view.

TIE ROD

Removal / Adjustment

Steering tie rods can be replaced by removing the rod-end castle nut at the steering post and spindle.

Tighten inner and outer tie rod bolts and jam nuts to specification

NOTE: See Chapter 2 for Toe Alignment procedure.

Inner / Outer Tie Rod Nut Torque **25 ft. lbs. (34 Nm)**
Tie Rod Jam Nut Torque **12-14 ft. lbs. (17-19 Nm)**

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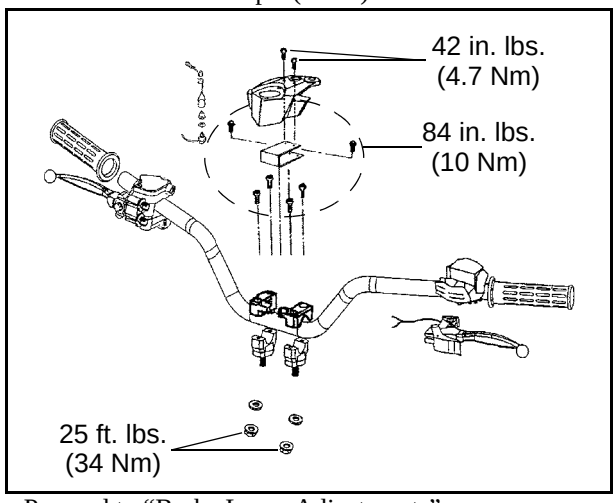
HANDLEBAR

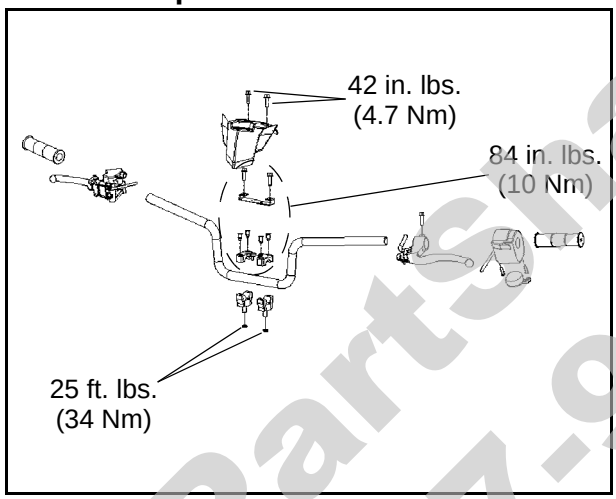
Predator 50 Exploded View

1. Install the lower clamps. (circle)

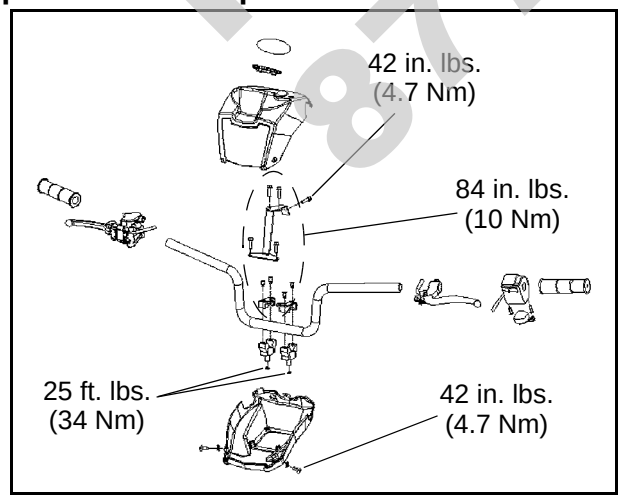


2. Proceed to “Brake Lever Adjustments”.

Outlaw 90 Exploded View



Sportsman 90 Exploded View



DECAL REPLACEMENT

⚠ WARNING

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

⚠ WARNING

Do not flame treat components that are installed on the vehicle. Remove the component from the vehicle before flame treating.

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

To flame treat the decal area:

1. Pass the flame of a propane torch back and forth quickly over the area where the decal is to be applied until the surface appears slightly glossy. This should occur after just a few seconds of flame treating. Do not hold the torch too close to the surface (2-3 inches from the flame tip is recommended). Keep the torch moving to prevent damage.

2. Apply the decal on one edge first. Slowly lay down remainder of the decal while rubbing lightly over the decal surface to eliminate any air bubbles during the application.

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CHAPTER 6
BRAKES

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SPECIFICATIONS

General Specifications

Front Brake Drum		
Item	**Standard**	**Service Limit**
Brake Shoe Thickness	0.10” (2.54 mm)	0.05” (1.27 mm)
Brake Drum Inner Diameter	3.35" / (85.09 mm)	3.38" / (88.85 mm)
Rear Brake Drum		
Item	**Standard**	**Service Limit**
Brake Shoe Thickness	0.15” (3.81 mm)	0.08" / (2 mm)
Brake Drum Inner Diameter	5.05" / (128.27 mm)	5.08" / (129.0 mm)

Torque Specifications

Item	Torque (ft. lbs. except where noted*)	Torque (Nm)
Brake Arm Retaining Bolts	43 in. lbs.	4.9
Axle Housing Flange Nuts or Brake Plate Bolts	40	54
Chain Guard Bolts	16	22
Rear Brake Drum Axle Nuts (50cc)	-	-

NOTE: Refer to the tightening procedures in this chapter when torquing the bolts. Some special procedures are used when torquing certain bolts and fasteners.

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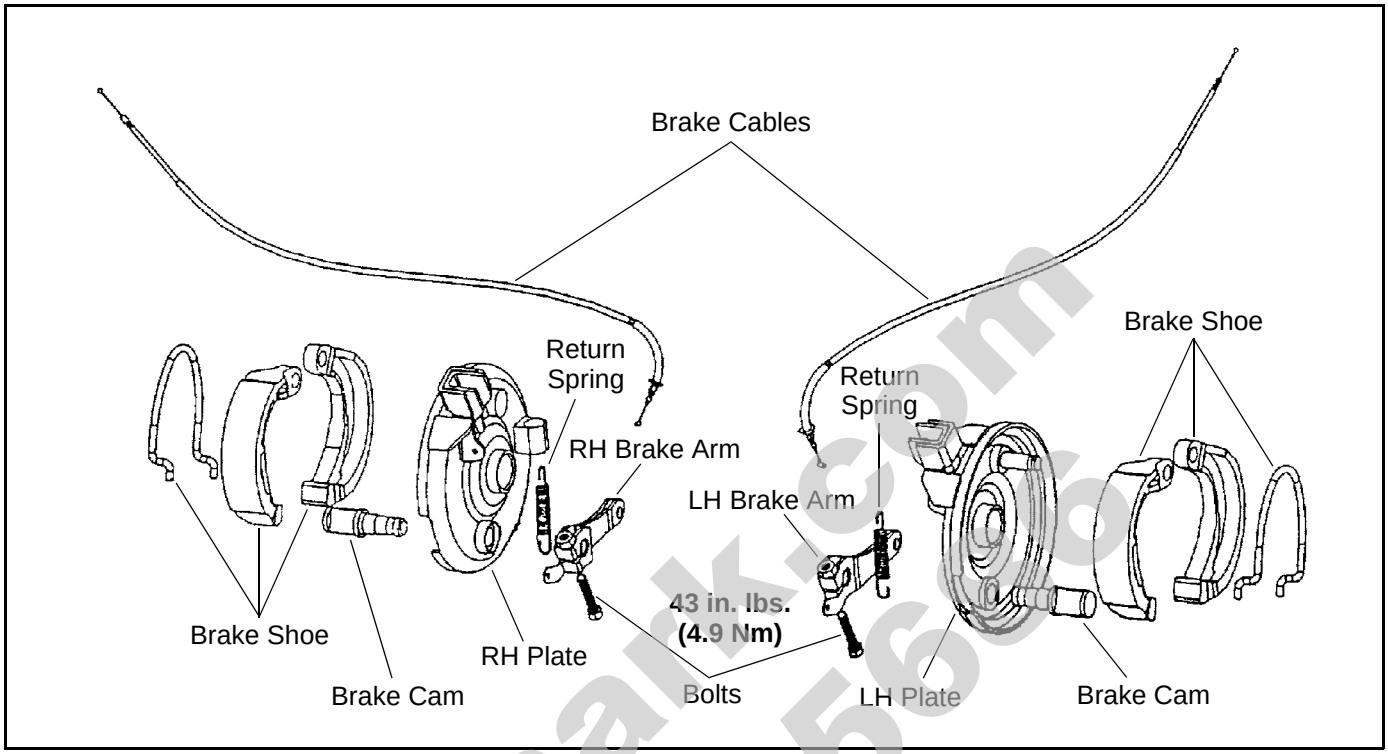
FRONT BRAKES

Exploded View



Front Brake Service

1. Elevate front end of ATV off the ground far enough to remove the wheel.

⚠ CAUTION

Severe injury could occur if machine tips or falls.

2. Remove the dust cap and cotter pin.
3. Remove wheel nut and remove wheel and hub as an assembly.

4. Remove the outer bearing spacer from the wheel hub.

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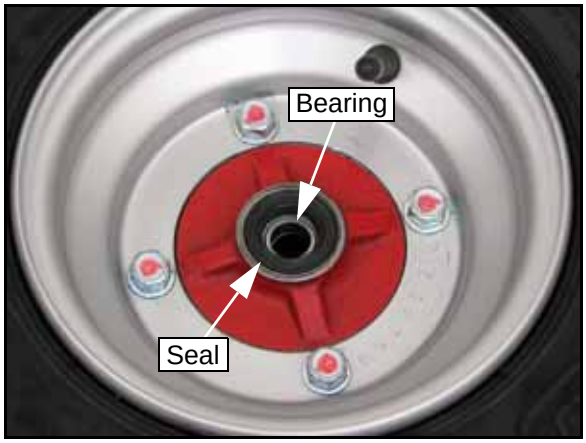
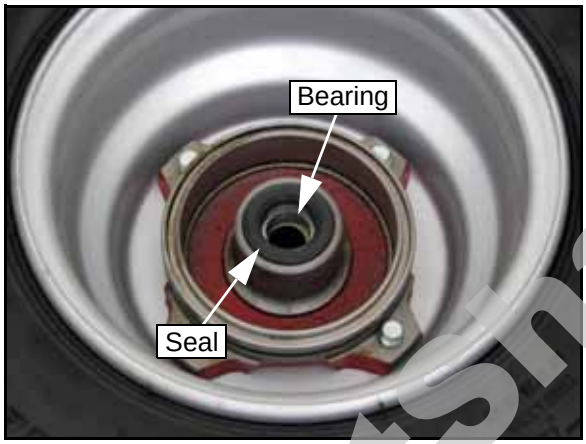
5. Inspect the outer seal and outer bearing for wear or damage.

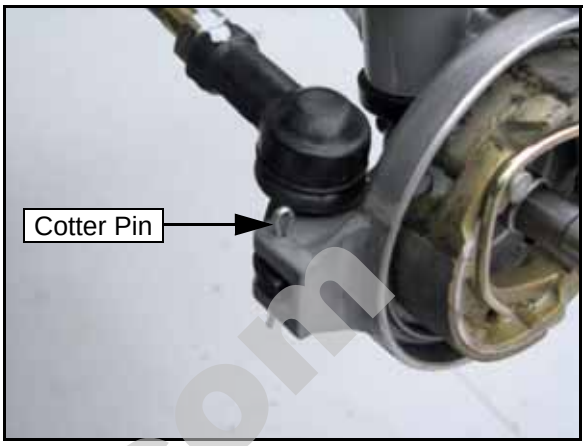


6. Flip the wheel hub and inspect the inner seal and inner bearing for wear or damage.

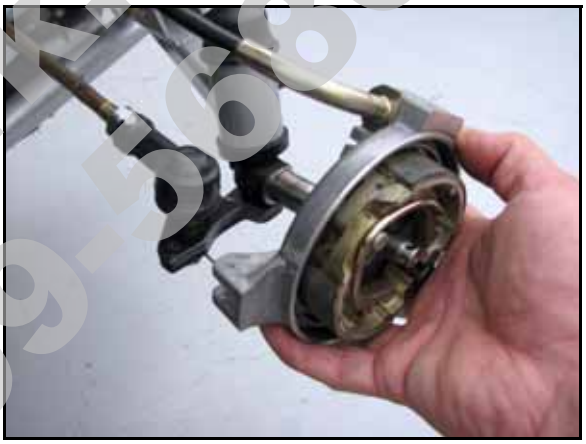


Brake Drum Backing Plate Removal

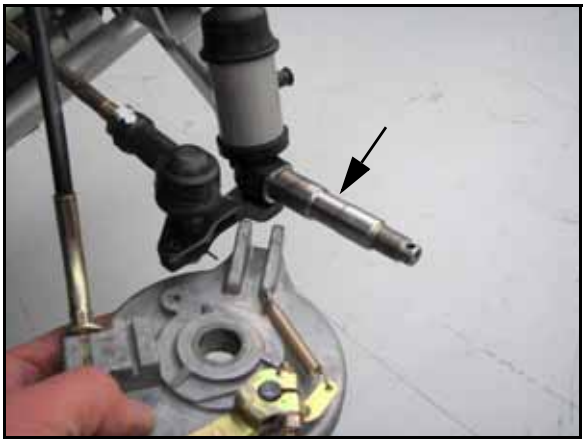
7. If service is required to backing plate components, remove the cotter pin retaining the backing plate to the spindle.



8. Remove the backing plate assembly from the spindle shaft assembly.



9. Inspect spindle shaft surface for pitting or other damage. Replace spindle assembly if necessary.



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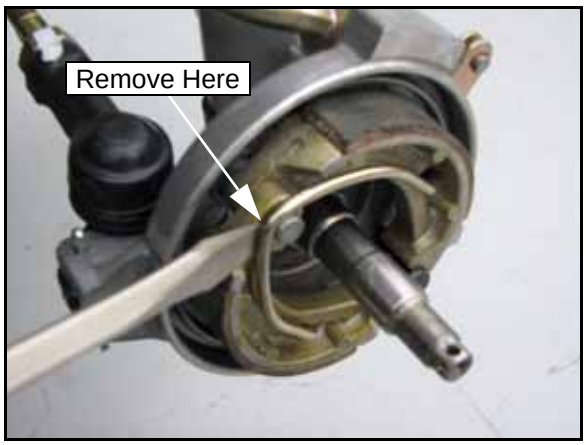
Brake Shoe Removal

10. Reinstall brake backing plate and components if previously removed.

11. Using a suitable tool, lift up on the spring near the retainer stud as shown and remove the spring.



CAUTION

Spring is under tension. Wear safety glasses and use caution when removing spring. Severe injury can result.

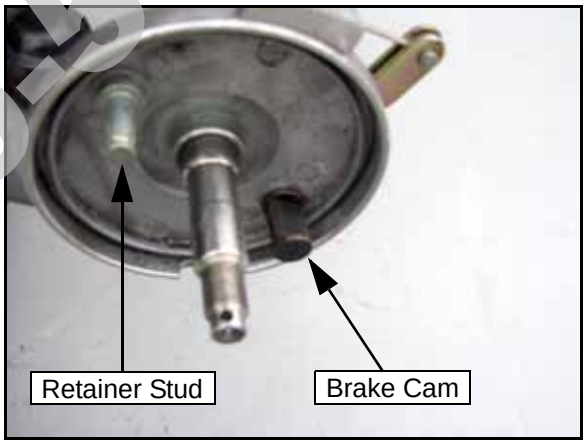
12. Slide brake shoes off retainer stud and remove from backing plate.

13. Inspect the brake shoe pad material. Replace if worn beyond specification.

= In. / mm.

Front Brake Shoe Pad Thickness:
Service Limit: 0.05” (1.27 mm)

14. Inspect the shoe retainer stud and brake cam for wear or damage.



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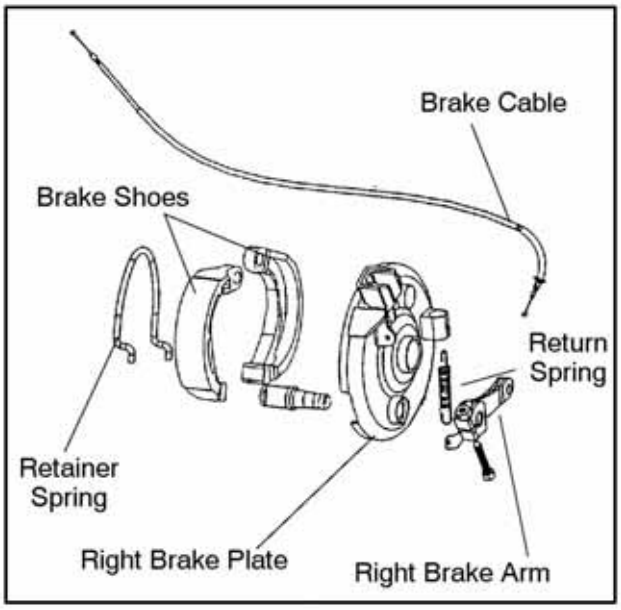
Brake Assembly

15. Use the illustration below as reference when reassembling the front brake components.



16. Inspect oil seals and bearings for wear or damage upon assembly. Replace bearings and seals if necessary.

17. Install the wheel hub and tighten the front spindle nut to specification.

Front Wheel Spindle Nut Torque:
44 ft. lbs. (59 Nm)

NOTE: Perform the "Brake Lever Adjustment" procedure outlined in Chapter 2 when finished.

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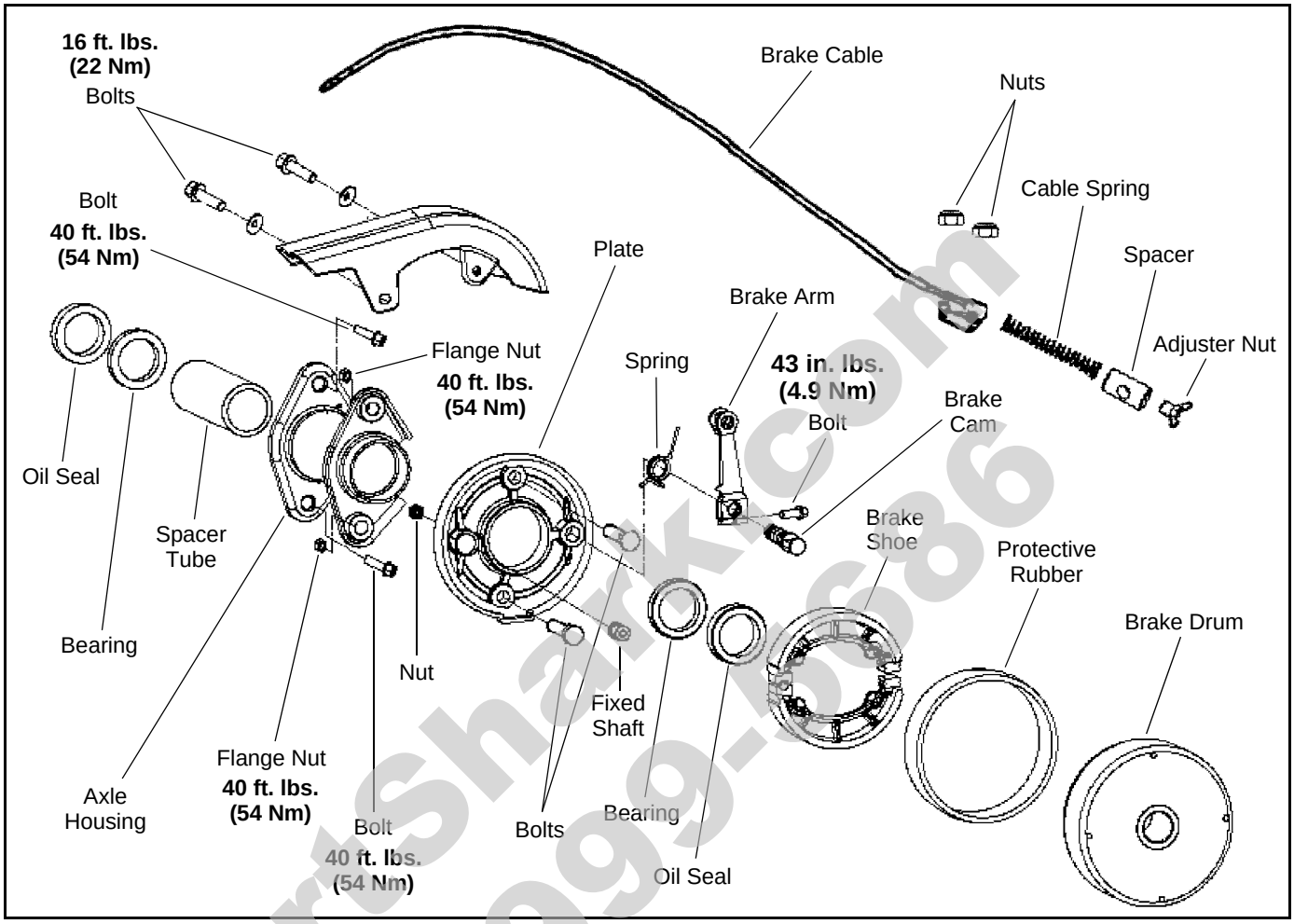
REAR BRAKE

Exploded View



Rear Brake Service

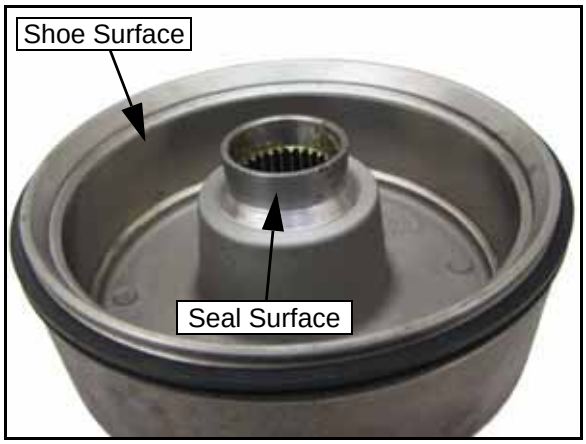
NOTE: Follow the "Swing Arm Removal" procedure outlined in Chapter 5 to access the rear brake components.

1. Follow the "Swing Arm Removal" procedure to the point where the rear brake drum housing can be accessed.

NOTE: You do not need to fully disassemble the rear axle / swing arm to service the rear brakes.

2. Once the rear brake drum housing has been removed, clean and inspect the brake drum housing.

3. Inspect the brake shoe contact surface and the axle housing seal surface for excessive wear, pitting, or damage. Replace if necessary.



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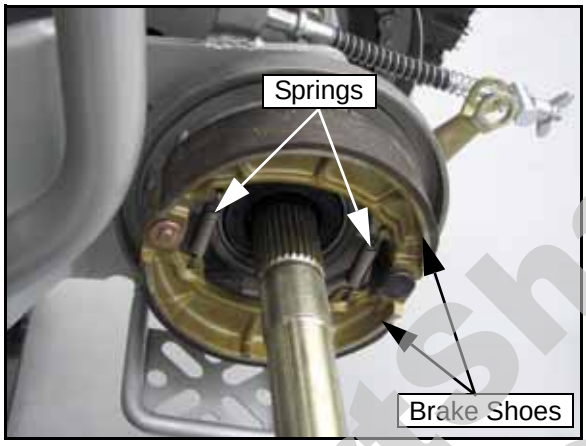
4. Inspect the protective rubber gasket for nicks or other damage. Replace if necessary.

5. Carefully remove the retainer springs and brake shoes from the backing plate.



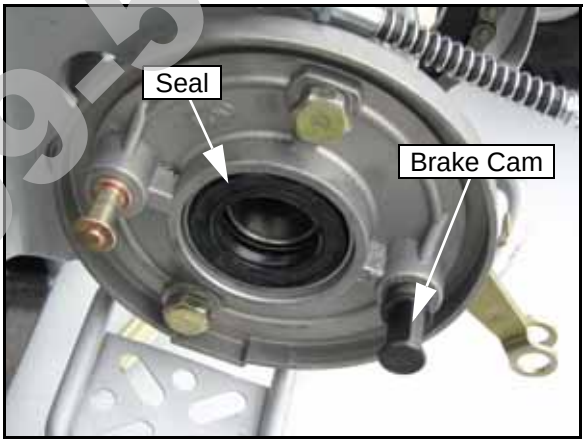
CAUTION

Springs are under tension. Wear safety glasses and use caution when removing springs. Severe injury can result.

6. Inspect the brake shoe pad material. Replace if worn beyond specification.

Rear Brake Shoe Pad Thickness:
Service Limit: 0.08" (2 mm)

7. Inspect the backing plate seal and brake cam for excessive wear or damage. Replace if necessary.



8. Inspect all oil seals and bearings for wear or damage upon assembly. Replace bearings and seals if necessary.

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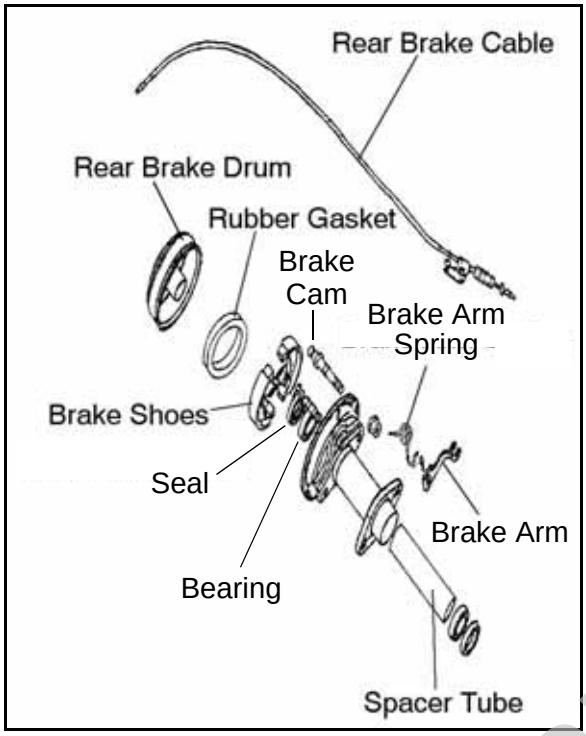
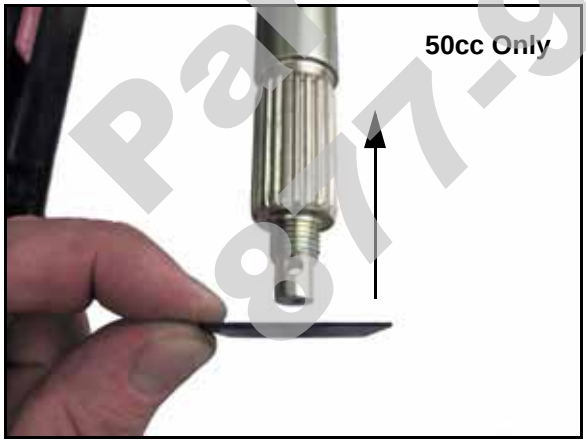
9. Reinstall rear brake components. Use illustration below as a reference.



NOTE: 50cc models use (2) axle nuts and a cone washer to secure the brake drum. When installing the axle nuts on 50cc models, torque the first nut to 43 ft. lbs. (58 Nm). Then tighten the second jam nut against the first nut and torque to the same value.

NOTE: Ensure the cone washer is installed on the axle as shown below.



10. Install the swing arm following the procedure outlined in **Chapter 5**. Tighten the rear wheel hub nut(s) to specification.

Rear Wheel Hub Nut Torque:
58 ft. lbs. (79 Nm)

Brake Lever Adjustments

Perform the "Brake Lever Adjustment" procedures outlined in Chapter 2 after completing any brake service.

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NOTES

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CHAPTER 7
CVT SYSTEM

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CVT SYSTEM

⚠ WARNING

All CVT 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 CVT components, it is absolutely essential that no disassembly or repair be made without factory authorized special tools and service procedures.

The Polaris Variable Transmission (CVT) 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 CVT 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.

CVT Maintenance / Inspection

Under normal operation the CVT 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 CVT components. See "CVT Overheating / Diagnosis" on page 7.3. for more information.

1. Drive clutch rollers and bushings. Driven clutch rollers, pins, and spring.
2. Clutch sheave faces. Clean and inspect for wear.
3. CVT system sealing. The CVT system on 90cc models is air cooled by fins on the drive clutch. The fins create a low pressure area around the drive clutch, drawing fresh air in through the intake duct. The opening for this intake duct is located at a high point on the vehicle. All connecting air ducts, as well as the clutch cover, must be sealed to ensure clean air is being used for cooling the CVT system. This also reduces the chance of water and other contaminants entering the CVT area.

Drive Clutch Operation

Drive clutches primarily sense engine RPM. The major component which controls shifting function are the shift centrifugal weights (rollers) inside the moveable sheave. Whenever engine RPM is increased, centrifugal force is created, causing the rollers to push against the cam plate and force the moveable sheave toward 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. If belt speed is sufficient, centrifugal friction shoes on the driven clutch overcome their return spring pressure and swing outward against the transmission drive hub, and the vehicle (if in gear) begins to move.

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, changing the ratio of the drive to driven clutch from low to high.

Driven Clutch Operation

CVT driven clutches primarily sense torque, but also react to RPM, applying and retracting the friction shoes according to the forces applied to it from the drive belt, while at the same time reacting to the torque at 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 (low ratio).

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 torque sensing driven clutch will close, forcing the drive belt back up toward the outer diameter of the driven clutch. This also forces the belt downward into the sheaves of the drive clutch. This action, which decreases the driven clutch speed, is called backshifting.

In situations where loads vary and throttle settings are constant, the drive and driven clutches are continually shifting to maintain optimum engine RPM. At full throttle a perfectly matched CVT 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 CVT system is similar to a power governor. Rather than vary throttle position, as a conventional governor does, the CVT system changes engine load requirements by either upshifting or backshifting.

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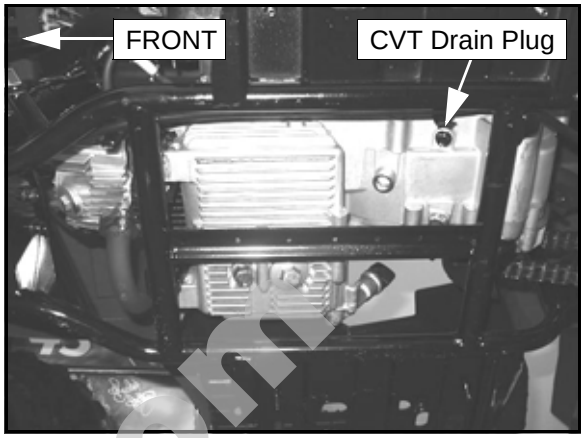
CVT System Drying

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

1. To drain any water that may be trapped inside the CVT area, remove the CVT drain plug and O-ring located on the bottom of the crankcase and let the water drain out. The CVT drain plug is shown at right.

2. To further expel water from the CVT area cover and to dry out the CVT system, shift the transmission to neutral and rev the engine slightly to expel the moisture. This will also air-dry the belt and clutches.

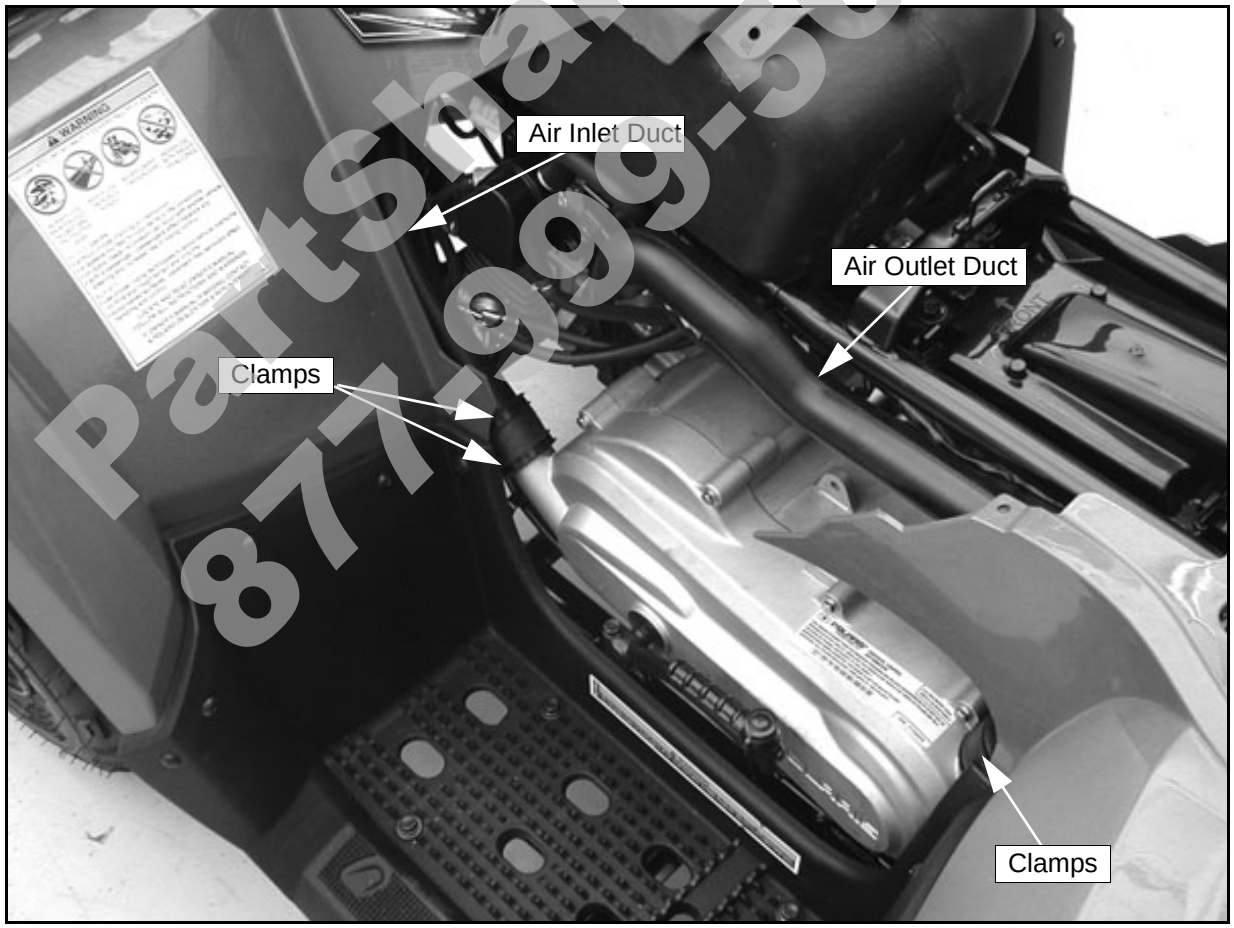
3. Allow engine RPM to settle to idle speed, shift transmission to lowest available range and test for belt slippage. Repeat as needed.



CVT Overheating / Diagnosis

During routine maintenance or whenever CVT system overheating is evident, it's important to check the inlet and outlet ducts for obstructions. Obstructions to air flow through the ducts will significantly increase CVT system operating temperatures.

CVT Air Duct System (90cc Models Only)



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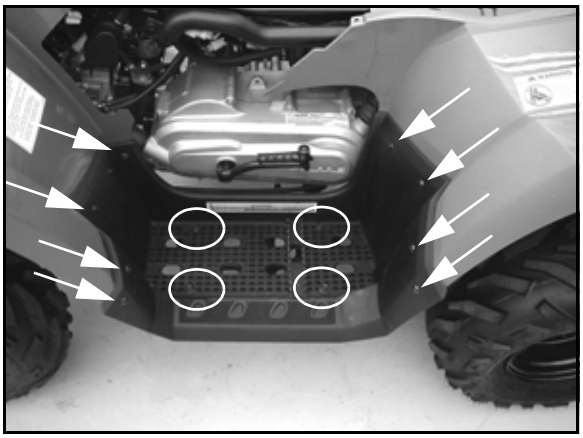
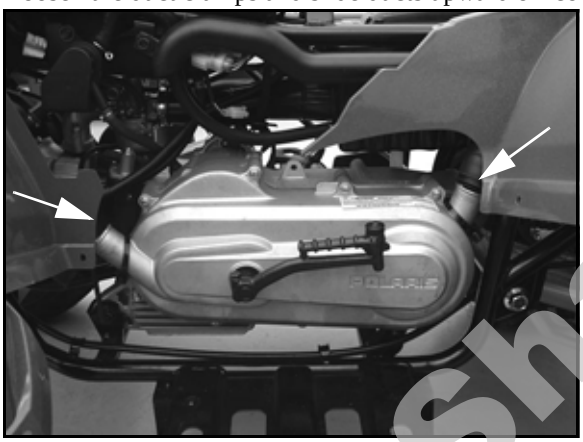
Clutch Cover Removal

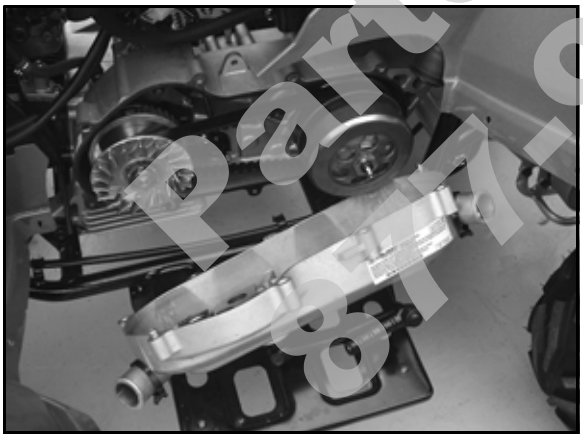
1. Remove the left foot rest.



2. Loosen the duct clamps and slide ducts upward off cover.

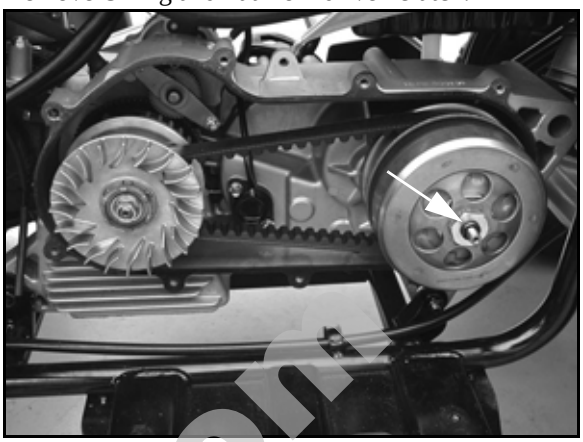


3. Remove all screws and cover with kick start lever attached.

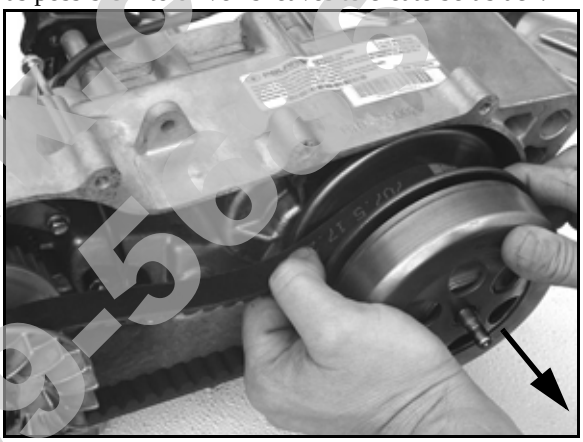


Drive Belt Removal

1. Remove O-ring and nut from driven clutch.



2. Pull outer sheave of driven toward you and push belt as far as possible into driven sheaves to create belt slack.

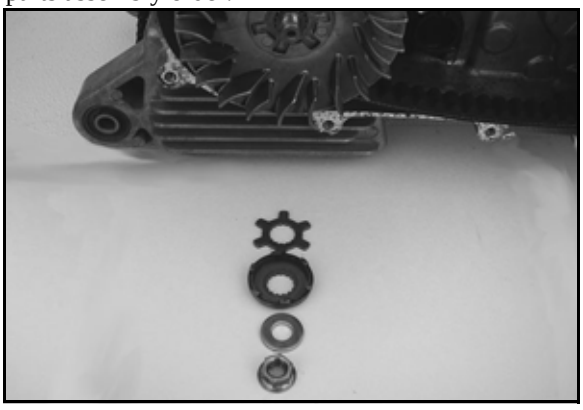


3. Slide driven clutch off shaft with belt. Remove belt from driven clutch sheaves and then from drive clutch.

DRIVE CLUTCH SERVICE

Drive Clutch Disassembly and Inspection

1. Remove outer drive clutch sheave and drive belt. Note parts assembly order.



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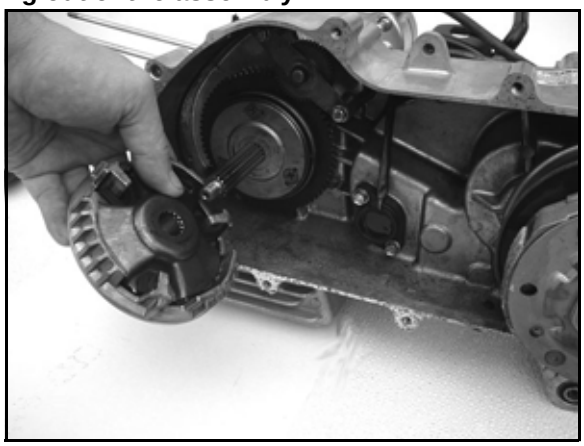
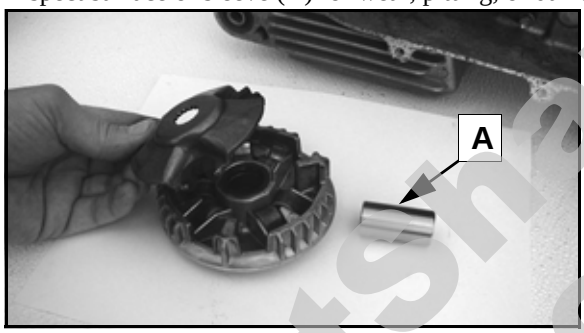
2. Slide sheave and cam plate off crankshaft as an assembly.

NOTE: When removing primary sliding sheave and cam plate assembly, hold cam plate and sliding sheave together. This prevents the rollers from falling out of the assembly.

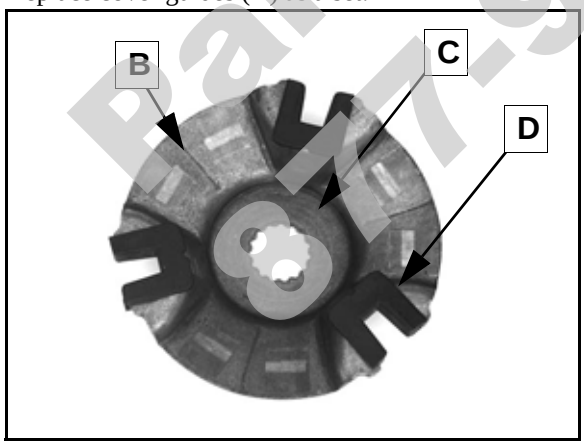


3. Remove cam plate.

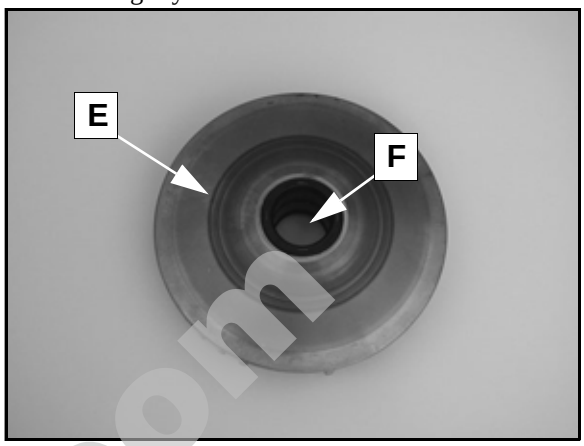
4. Inspect surface of sleeve (A) for wear, pitting, or damage.



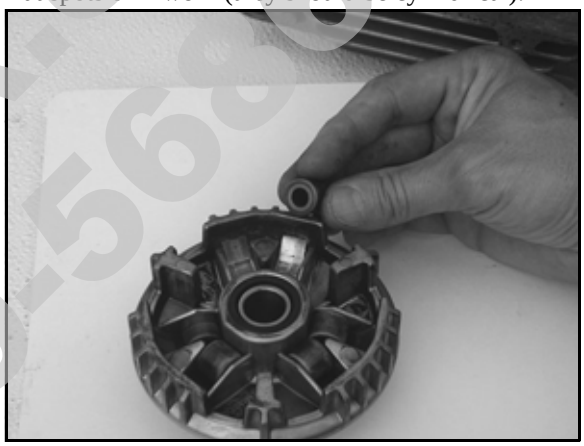
5. Inspect cam plate for wear on surface (B) and splines (C). Replace cover guides (D) as a set.



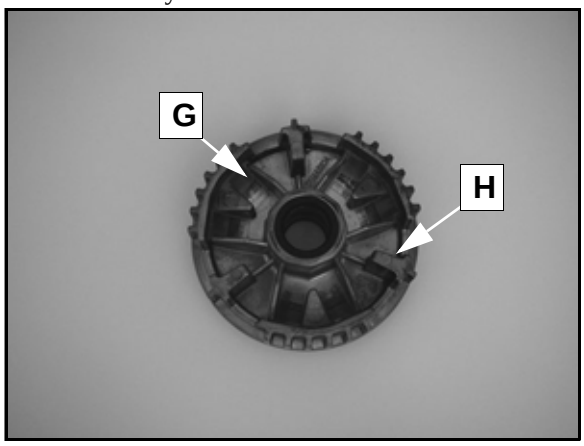
6. Inspect sheave faces (E) for grooves or wear. Check bushings (F) and seals in the moveable sheave. The sleeve should be a close, smooth fit in the bushings and seals should fit tightly on the sleeve.



7. Remove and inspect each roller. Replace as a set if any have flat spots or if worn (they should be cylindrical).



8. Inspect the roller tracks (G) and both sides of the cam plate tabs (H) for wear. Compare the drive and deceleration side of the tabs to determine if drive side is worn. Replace drive clutch assembly if tabs or roller tracks are worn.



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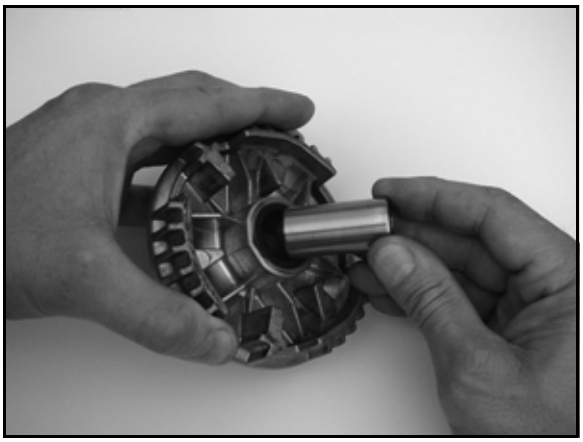
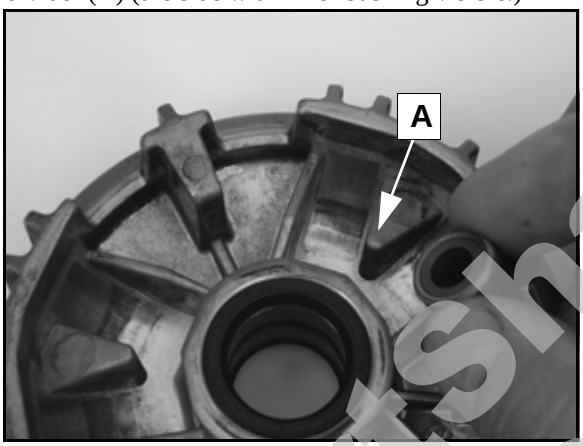
Drive Clutch Assembly

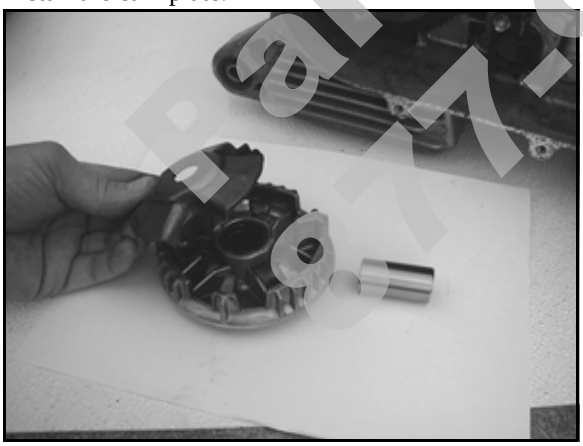
1. Apply a very light film of grease to the seal lips and drive clutch sleeve. Then install the sleeve.



2. Install all rollers with open end facing inward toward divider (A) (the side with inner bushing visible.)

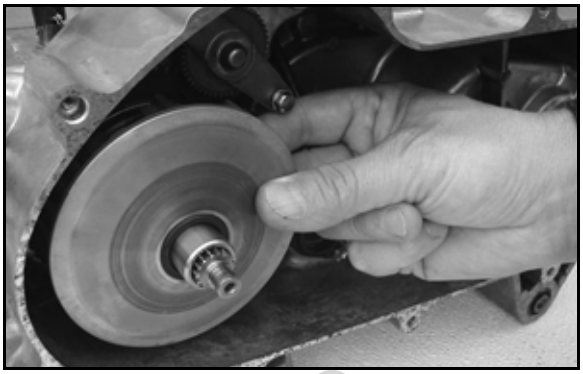


3. Install the cam plate.



4. Install the bushing, primary sliding sheave and cam plate assembly.

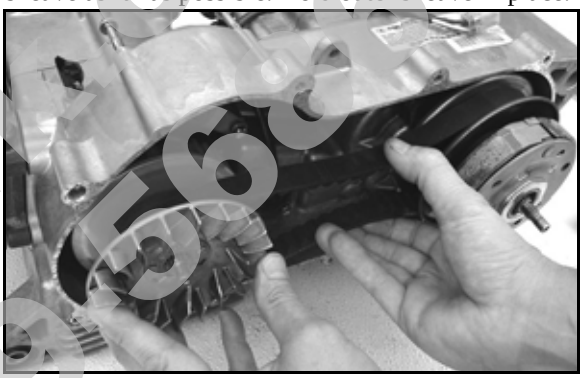
NOTE: When installing the primary sliding sheave and the cam plate assembly, hold the assembly together to prevent the rollers from dislodging.



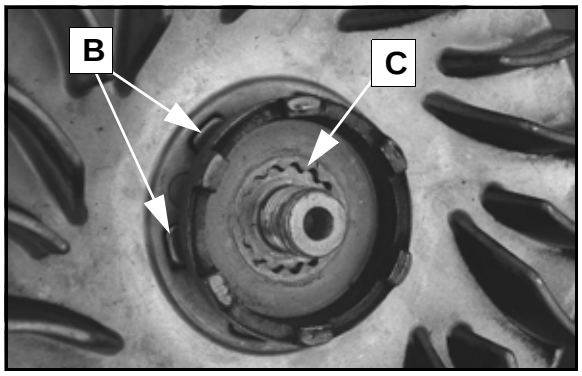
5. Open the sheaves of the secondary clutch and push the belt down between the sheaves.

6. Install the driven clutch on the transmission input shaft, looping the belt onto the drive clutch sleeve as shown.

7. Pinch the belt in the middle and install the outer drive clutch sheave as far as possible. Hold outer sheave in place.



8. Install the claw washer, engaging the inner spline of the washer on the crankshaft and the outer claws (B) in the sheave.



9. Install the kick start drive hub, making sure the inner splines (C) are engaged on the crankshaft.

10. Install flat washer and nut and torque to specification.

Drive Clutch Lock Nut Torque
29 ft. lbs. (39 Nm)

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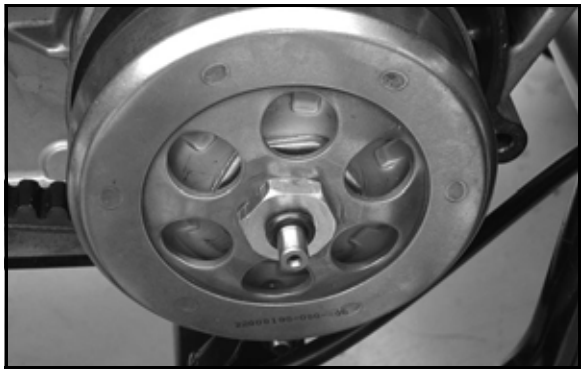
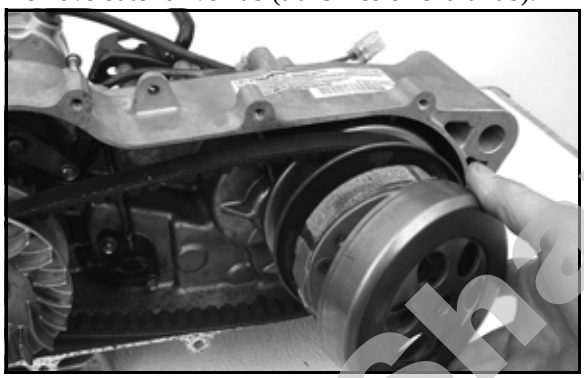
DRIVEN CLUTCH SERVICE

Driven Clutch Disassembly and Inspection

1. Remove driven clutch assembly by removing O-ring and nut.



2. Remove outer drive hub (transmission shaft hub).

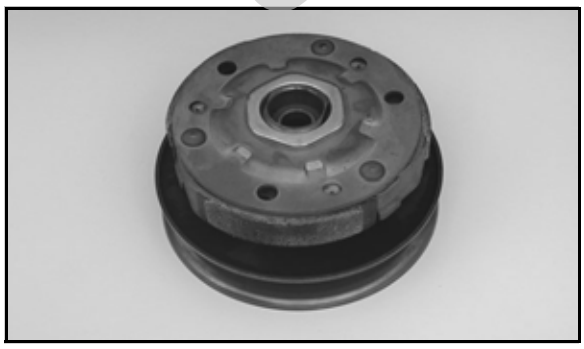


3. Remove drive belt. See "Drive Belt Removal" on page 7.4.

4. Secure the driven clutch assembly in a soft jaw vise or clamp. Loosen the retaining nut about 1 turn. Hold downward pressure on the friction shoe plate, and then remove the nut. Release pressure on plate and remove the friction shoe assembly and driven spring.

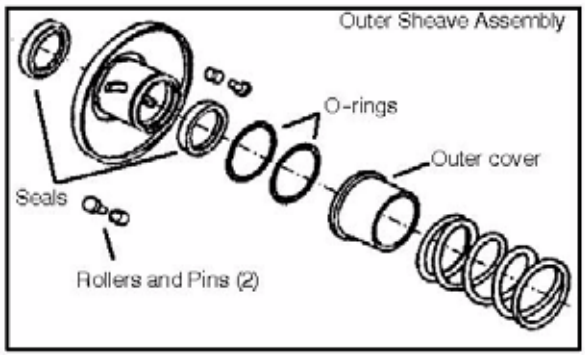
⚠ CAUTION

Spring pressure can cause components to eject suddenly. Use care during removal.



5. Remove the outer roller pin cover by turning and pulling up on the cover. Replace the two sealing O-rings.

6. Remove rollers and pins using a needle-nose pliers and inspect all components. Replace if any damage or excess wear is found. Replace the o-rings and seals anytime the driven is apart.



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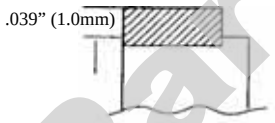
7. To replace friction shoes, remove E-clips that retain the backing plate. Use a suitable tool to remove and install the return springs connecting the shoes, using care not to stretch the springs more than is necessary.

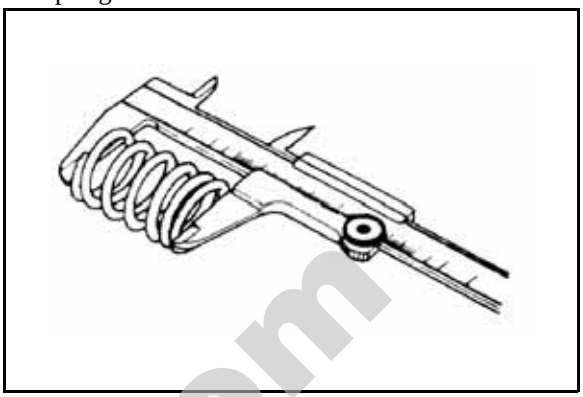
8. Inspect the condition of the secondary clutch drive hub. Measure the inside diameter of the hub using a caliper and compare to specification. If either of these measurements exceeds the limit, replace the drive hub.



Driven Clutch Hub I. D.
Service Limit: 4.43" (112.5 mm)

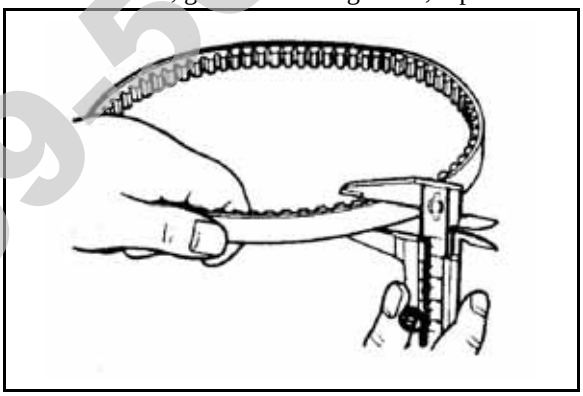
Driven Clutch Friction Shoe Thickness
Service Limit: .039" (1.0mm)

9. Use a vernier caliper to check the length of the compression spring. At full extension, the measurement should be no less than 2.74" (69.7 mm). If out of specification, replace the spring.



Driven Compression Spring Length
Service Limit: 2.74" (69.7mm)

10. Inspect the surface of the drive belt for uneven wear or grease deposits. Using a vernier caliper, measure the width of the belt. The service limit of the belt is .626" (15.9 mm). If the width of the belt is less than the service limit, or if the belt is worn, glazed or hour-glassed, replace.



CVT Drive Belt Width
Service Limit: .626" (15.9mm)

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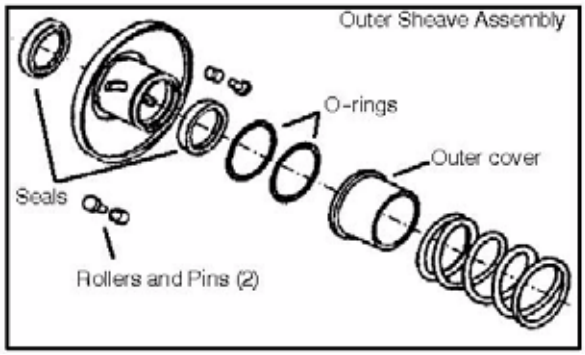
Driven Clutch Assembly

1. Insert new seals into the outer sheave assembly. Fill the outer sheave cavity with fresh grease and slide onto the inner sheave shaft. Align and insert the (2) roller/pin assemblies. Install new o-rings and the outer roller pin cover. Place the washer onto the threaded shaft and apply Loctite 272 to the threads.



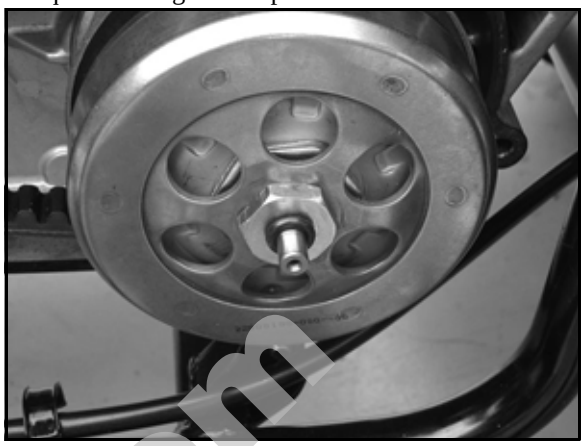
2. *Have an assistant available for final assembly*. Install the compression spring. Place the friction pad assembly over the spring and compress the driven assembly together with both hands. With the assembly compressed and the threads exposed, have an assistant thread a new assembly nut onto the shaft. Secure the assembly in a clamping device and torque the assembly nut to specification.

Driven Assembly Nut Torque
50-54 ft. lbs. (68-73 Nm)

3. Install the drive belt on driven clutch and move belt as far into the sheaves as possible.

4. Loop the belt over the drive clutch and install driven clutch on transmission shaft.

5. Install driven clutch hub, then the retaining nut and O-ring. Torque retaining nut to specification.



Driven Clutch Nut Torque
24 ft. lbs. (34 Nm)

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NOTES

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CHAPTER 8
ELECTRICAL

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GENERAL INFORMATION

Special tools

PART NUMBER	TOOL DESCRIPTION
PV-43568	Fluke™77 Digital Multimeter
2870836	Peak Reading Adaptor
2870630	Timing Light
8712100 or 8712500	Tachometer

Electrical System Service Notes

Reference the following notes when diagnosing electrical problems.

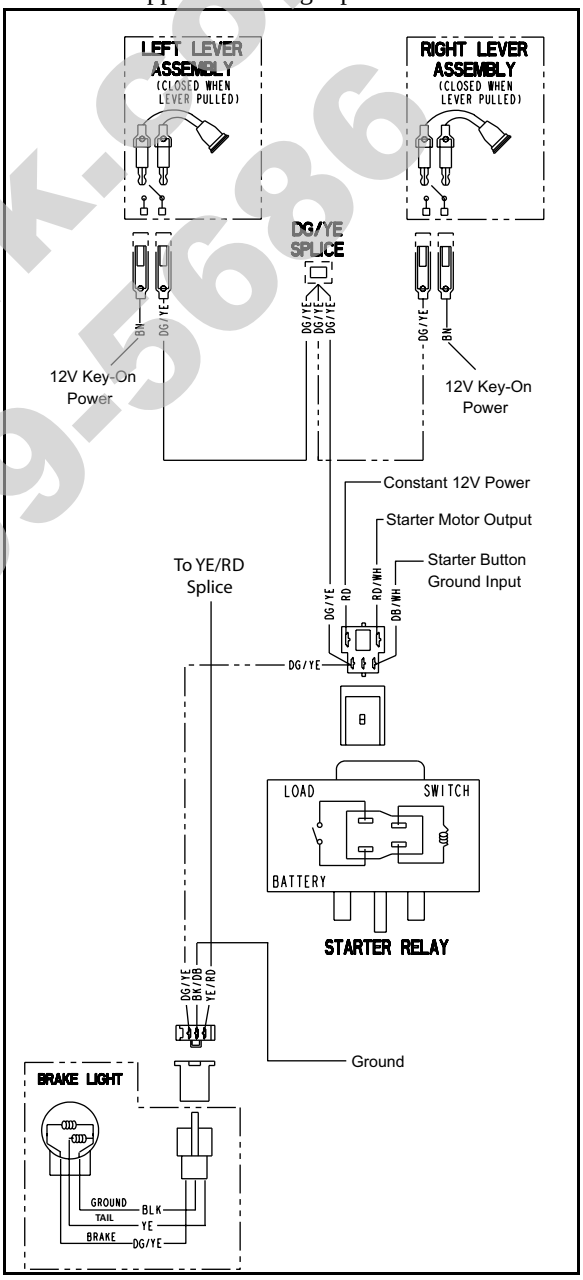
- The ignition system timing is non-adjustable. The specifications in Chapter 1 are intended for reference only.
- Refer to wiring diagram for stator and electrical component resistance specifications.
- When measuring resistance of a component that has a low resistance value (under 10 Ohms), remember 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 the 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 the 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 acceptable for use 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.

SWITCHES AND CONTROLS

Brake Lever Switches

Each brake lever utilizes an electrical brake switch that sends voltage to activate the starter relay and brake light.

1. Locate the brake switches on each of the brake levers.
2. Disconnect wire harness from brake switch and connect an ohmmeter across the two switch wires.
   The reading should be infinite (•).
3. Apply brake the brake lever(s) and check for continuity between switch contacts. Replace switch if there is no continuity or if the resistance is greater than .5 ohms when the brake is applied with slight pressure.



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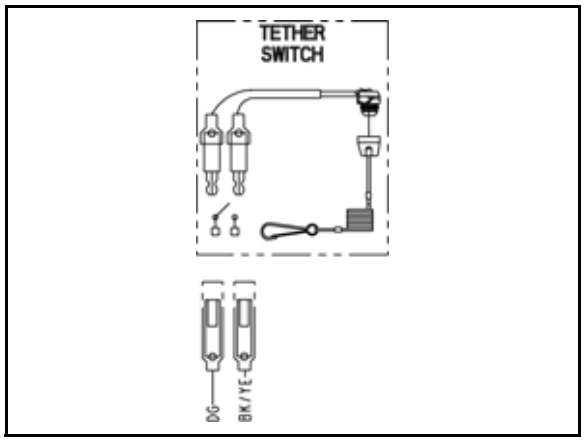
Tether Switch Test

1. Disconnect wires from switch.

2. Connect an ohmmeter across the two switch wires (DG and BK/YE). With the boot installed, reading should indicate continuity. Replace the switch if there is greater than .5 ohms resistance.

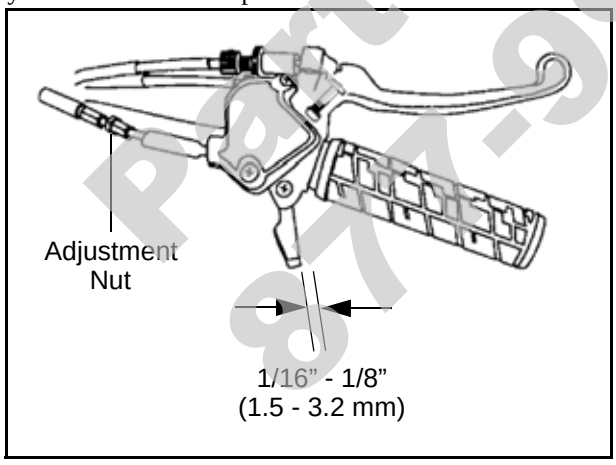


3. Pull tether boot from switch and check for an infinite (∞) reading. Replace switch if continuity exists.

Electronic Throttle Control (ETC)

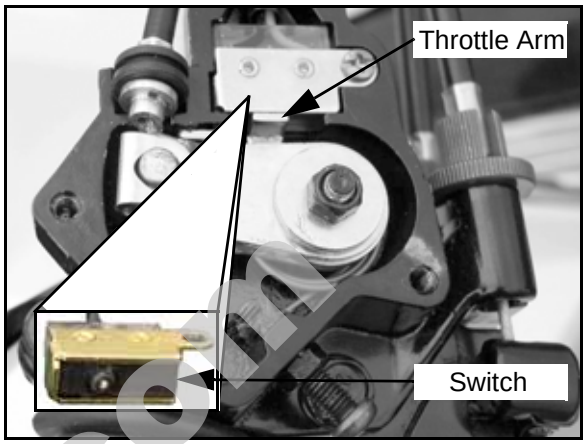
Always check the throttle for smooth operation before riding. Periodically check the throttle free play. It should be kept between 1/16" and 1/8" (1.5mm – 3.2mm).

If adjustment is required, turn the adjustment nut until the free play falls within the acceptable limit.

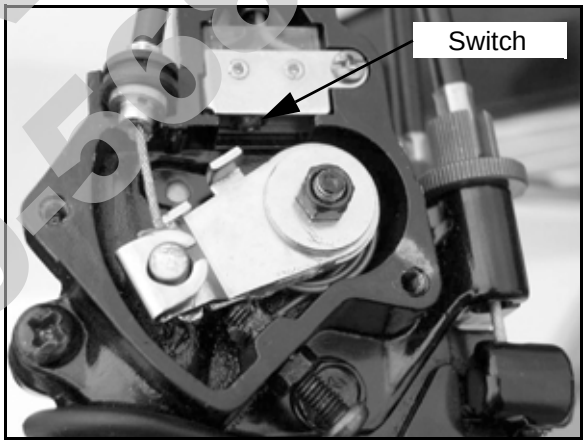


ETC Operation

When the throttle is closed (idle) the throttle arm depresses a small micro switch that limits engine rpm.



When the throttle lever is pushed forward the throttle arm moves off the micro switch and allows the engine rpm to increase with lever movement.



If the throttle cable would become hung up or stuck while the ATV is being operated, the spring loaded throttle arm will return back and depress the micro switch, limiting engine rpm.

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ETC Switch Adjustment

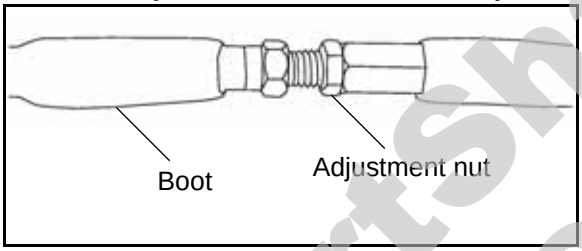
1. Slide the boot off the throttle cable adjuster and jam nut.

2. Set parking brake.

3. Start engine and set idle to specified RPM.

NOTE: Be sure the engine is at operating temperature. See "Idle Speed Adjustment" in Chapter 2.

4. Loosen the adjustment nut on in–line cable adjuster.



5. Turn cable adjuster out until engine RPM begins to increase.

6. Turn cable adjuster back in until throttle lever has 1/16" (.16 cm) of travel before engine RPM increases.

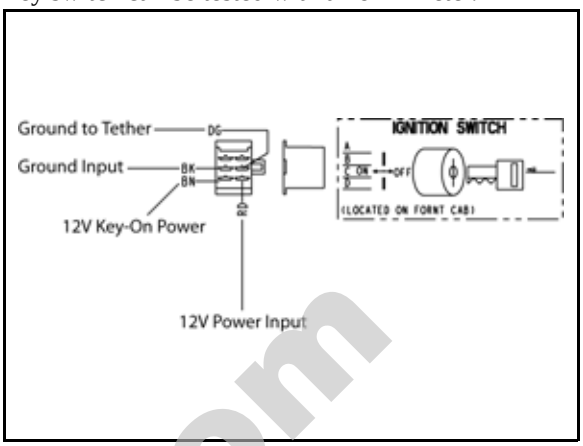
7. Tighten lock nut securely and slide boot completely in place to ensure a water–tight seal.

NOTE: Verify ETC switch plunger is held inward at idle position.

8. 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.

Key Switch

The key switch can be tested with an ohm meter.



When the key switch is turned to the "ON" position, there should be continuity between the red (RD) and brown (BN) wires. There should also be continuity between the black (BK) and dark green (DG) wires.

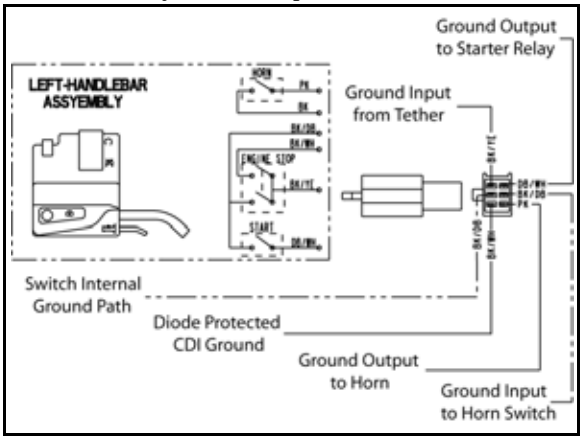
When the key is turned to the "OFF" position, there should no continuity between any of the wires.

KEY SWITCH CONTINUITY CHART

Color / Switch Position	RD	BN	BK	DG
ON	●	●	●	●
OFF				

Left Hand Switch Assembly

The following illustration shows the internal operation of the LH switch assembly. If any part of the switch is faulty, the entire LH switch assembly must be replaced.



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DAYTIME RUNNING LIGHTS

"DRL" Test

The daytime running lights are powered by an AC current from the Generator / Stator.

If running lights are not working, perform the following:

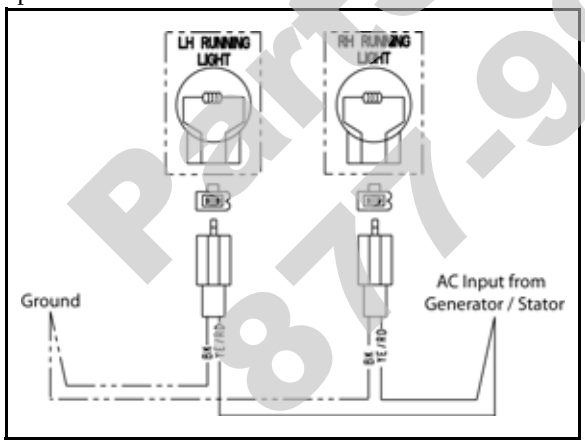
1. Disconnect the harness from the faulty light.
2. Using a Volt Ohm Meter, measure the AC voltage between the yellow red (YE/RD) and black (BK) wires. Voltage above 5 VAC should be present when unit is running.

If voltage is present:

1. Replace the faulty bulb.

If voltage is not present:

1. The black wire should have continuity to ground. If no continuity is present, check for an open in the wiring harness or a poor connection.
2. If black wire has good continuity to ground, check the wiring harness from the stator to the running lights. There should be continuity between the (YE/RD) wire at the light connector and the (YE/RD) wire at the Generator / Stator.
3. If continuity is good. Perform stator resistance tests by using the resistance chart located in the wiring diagram.
4. Replace Generator / Stator if resistance is not within specification.

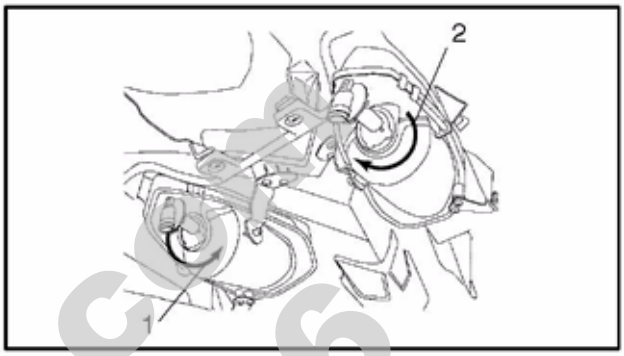


"DRL" Lamp Replacement

If the daytime running lights do not operate, lamp replacement may be required. Install only the recommended replacement lamps.

Predator 50 / Outlaw 90:

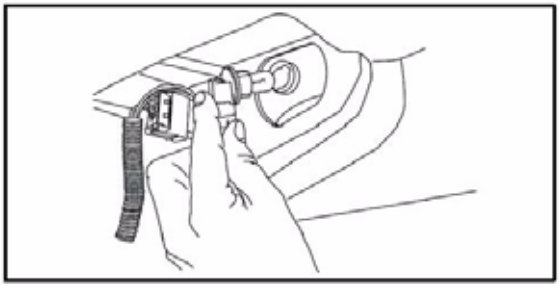
1. Locate the lamp socket (1)(2) below the front cover. Rotate the socket about 1/4 turn and remove it from the housing.



2. Without twisting, pull the lamp out of the socket.
3. Apply Dielectric Grease **PN 2871329** to the new bulb contacts and install.
4. Reinstall the socket into the housing and rotate about 1/4 turn.
5. Start the engine to make sure the lights come on. If the lights do not operate, check the charging system and related wiring for possible malfunction.

Sportsman 90:

1. Remove the light housing from the bumper. Separate the housing by removing the four screws from the rear cover.
2. Rotate the lamp socket counterclockwise about 1/4 turn and remove it from the housing.



3. Without twisting, pull the lamp out of the socket.
4. Apply Dielectric Grease **PN 2871329** to the new bulb contacts and install.
5. Reinstall the socket into the housing and rotate clockwise about 1/4 turn.
6. Start the engine to make sure the lights come on. If the lights do not operate, check the charging system and related wiring for possible malfunction.

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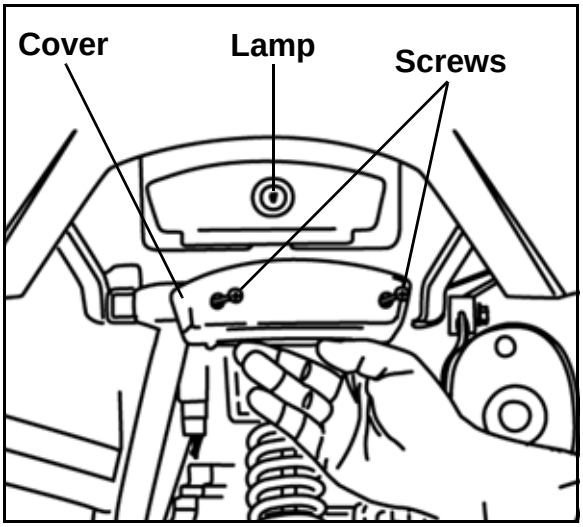
TAIL LIGHT

Tail Light Lamp Replacement

If the tail light lamp does not work, the lamp may need to be replaced.



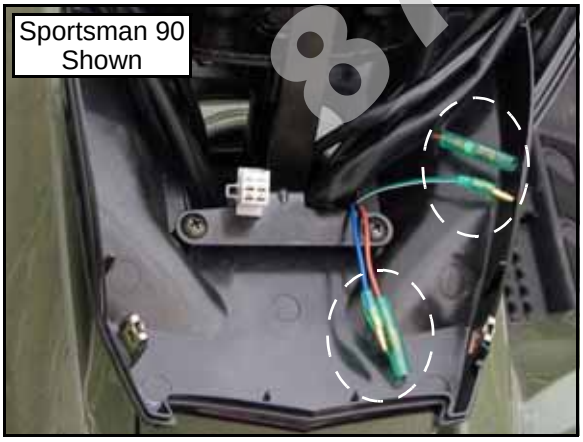
1. Remove the two screws securing the lens cover. Remove the lens cover.
2. Remove the lamp and replace it with a new recommended lamp. Apply Dielectric Grease (PN 2871329) to the lamp terminals.
3. Test the light for proper operation.
4. Reinstall the lens cover.

INDICATOR LAMPS (90CC MODELS)

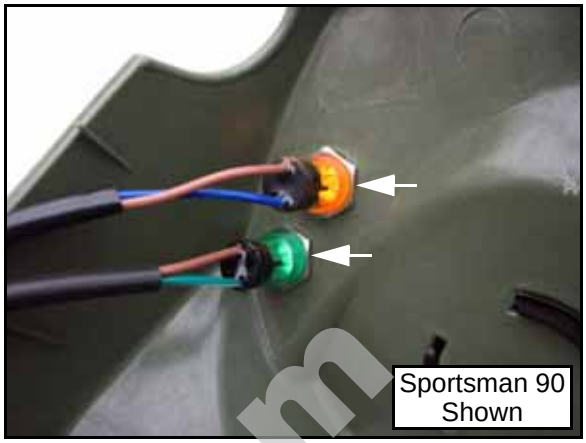
Indicator Lamp Replacement

Outlaw 90 / Sportsman 90:

1. Remove the handlebar cover or pod to access the lamps.
2. Disconnect the indicator light wire connections from the harness.



3. Remove the nut from the backside of the indicator lamp.



4. Remove the lamp.
5. Install new lamp(s) into the cover or pod and secure with retaining nut.
6. Apply dielectric grease to the wire connections of the new lamp.
7. Reconnect wire connections and assemble the handlebar cover or pod.
8. Turn ignition key to the “ON” position and shift the transmission into “Neutral” or “Reverse” to verify light operation.

9. If the lights do not operate, check battery voltage at the light harness and check related wiring for possible malfunction.

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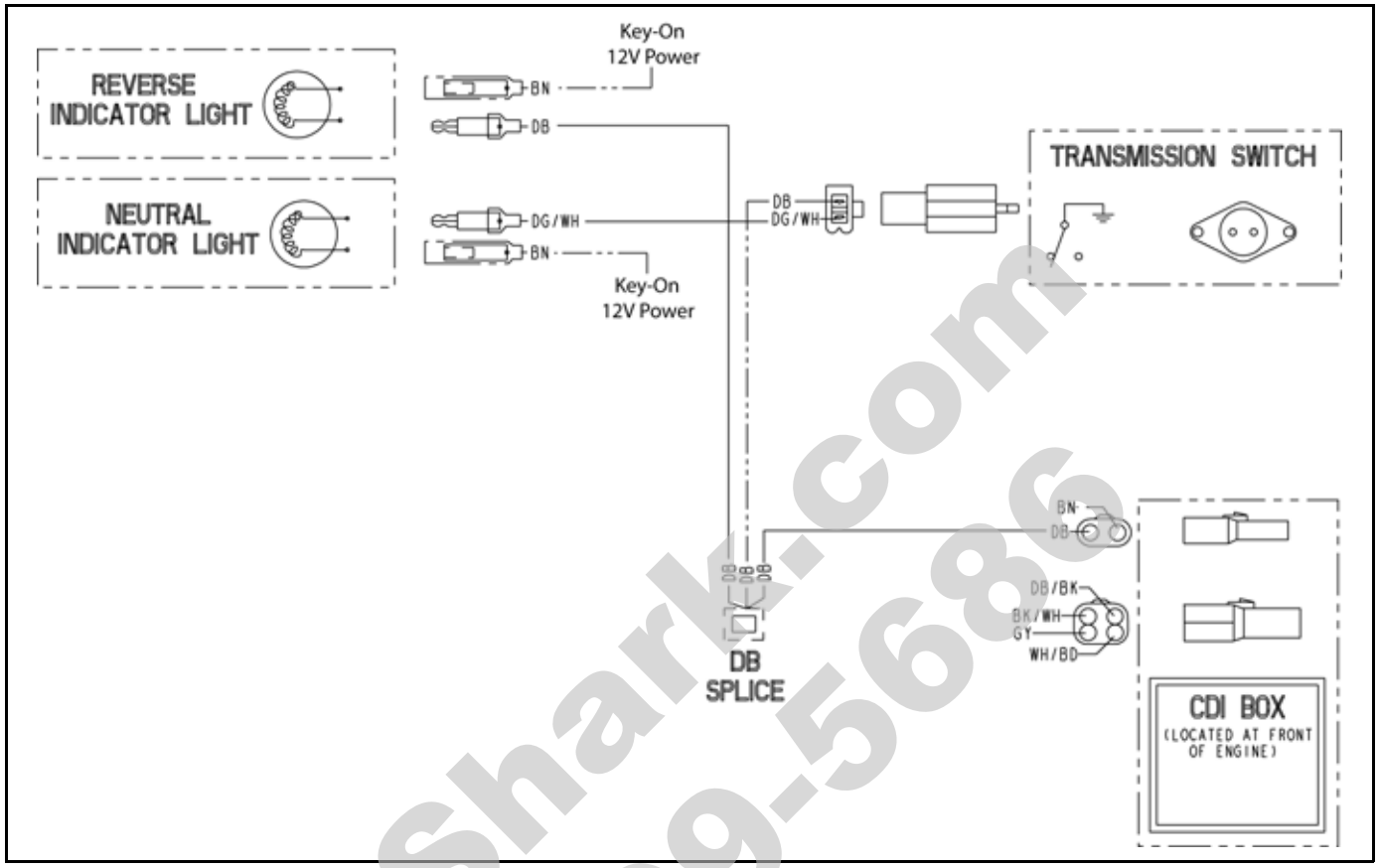
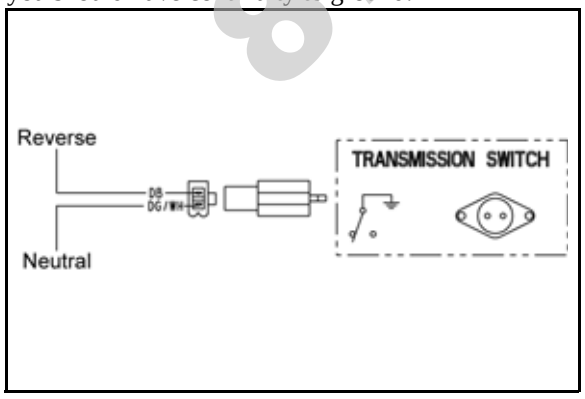
TRANSMISSION SWITCH

Transmission Switch - Circuit Breakout



Testing

1. With the switch installed, use an ohmmeter to test continuity between the switch leads and engine ground.
2. First, shift the transmission into "neutral" and test for continuity between the DG/WH wire and ground.
3. Then shift the transmission into "reverse" and test for continuity between the DB wire and ground. In both tests you should have continuity to ground.



Removal

1. Remove the CVT cover. The indicator switch will be visible between the drive and driven clutch. Refer to CVT Chapter for CVT cover removal and installation.
2. Remove the (2) screws and pull on switch to release from crankcase.

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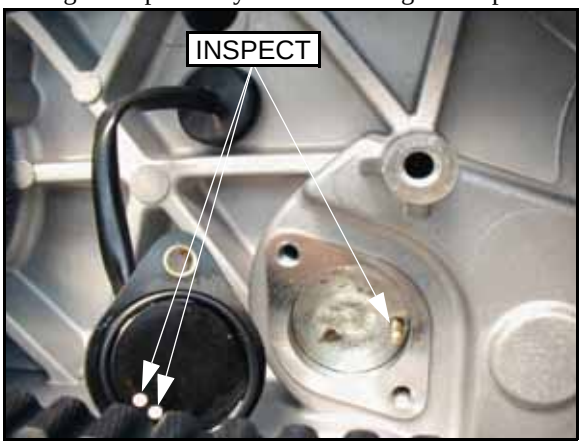
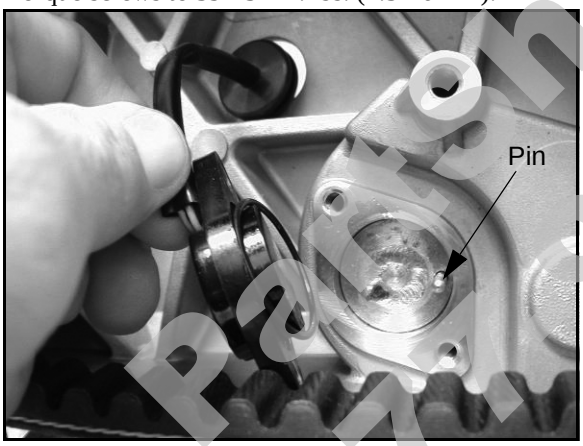
3. Inspect the shift indicator contacts, shift drum, pin and spring. Verify the pin is not sticking in the drum or is damaged. Replace any worn or damaged components.



Installation

1. Install spring and pin into shift drum.
2. Install switch with new O-ring. Route wires through crankcase.
3. Install retaining screws.
4. Torque screws to 39 - 52 in. lbs. (4.5 - 6 Nm).



IGNITION SYSTEM

Overview

The Youth ATV ignition system consists of a simple magneto-driven system that includes a stator Pulser Coil, CDI Box, Ignition Coil and related wiring / connectors.
Timing is non-adjustable on this ignition system.

Ignition System Troubleshooting

No Spark, Weak or Intermittent Spark

- No 12 volt power on brown (BN) wire at CDI box or no CDI box ground path from the black/white (BK/WH) wire
- 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
- 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)
- Sheared flywheel key
- Flywheel loose or damaged
- Excessive crankshaft runout on magneto. (RH) end should not exceed .005”
- Faulty CDI module

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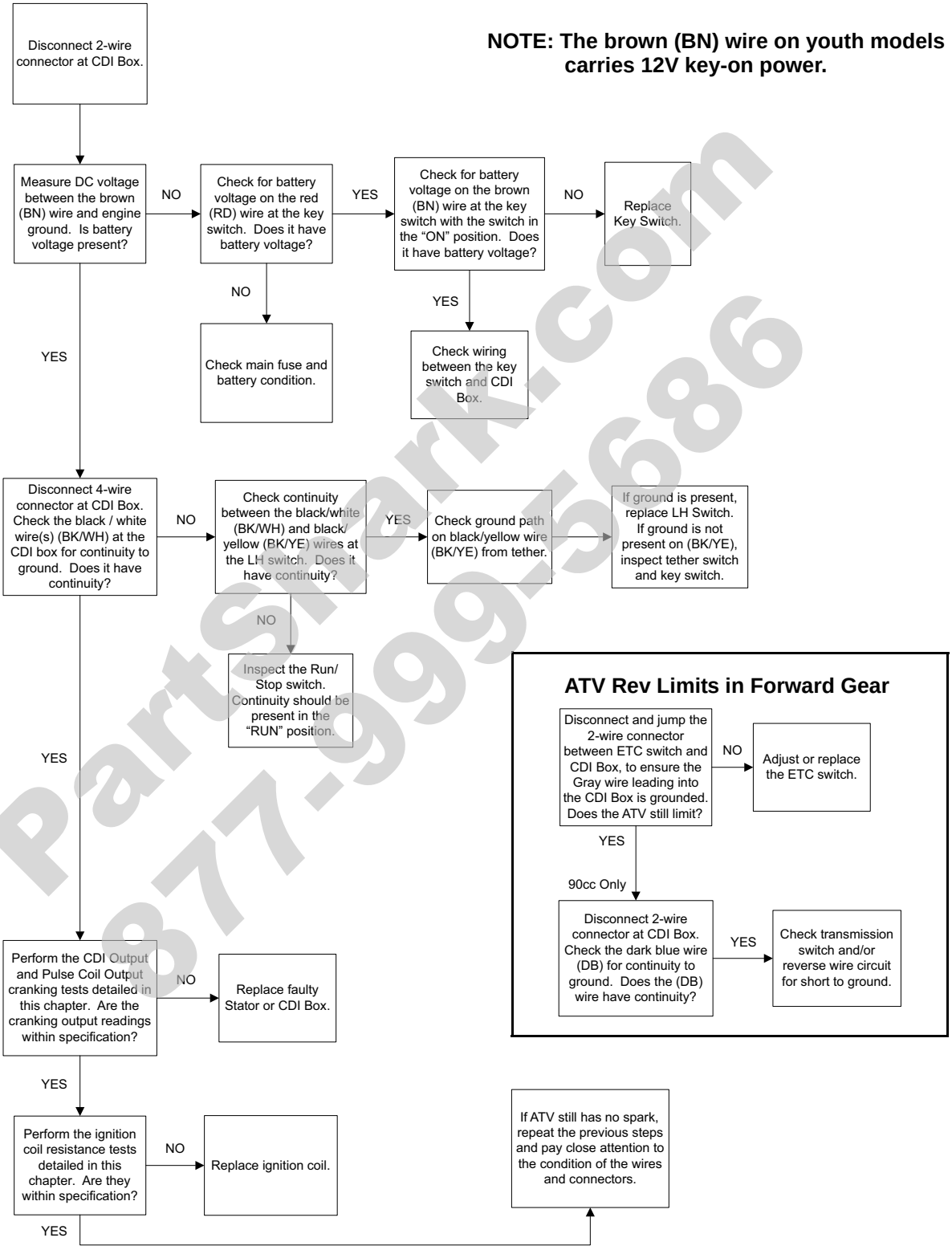
Ignition System Testing

Whenever troubleshooting an electrical problem, first check all terminal connections to be sure they are clean and tight. Use the following flow chart as a guide for troubleshooting. **NOTE: The brown (BN) wire on youth models carries 12V key-on power.**

Condition: No spark or intermittent spark.



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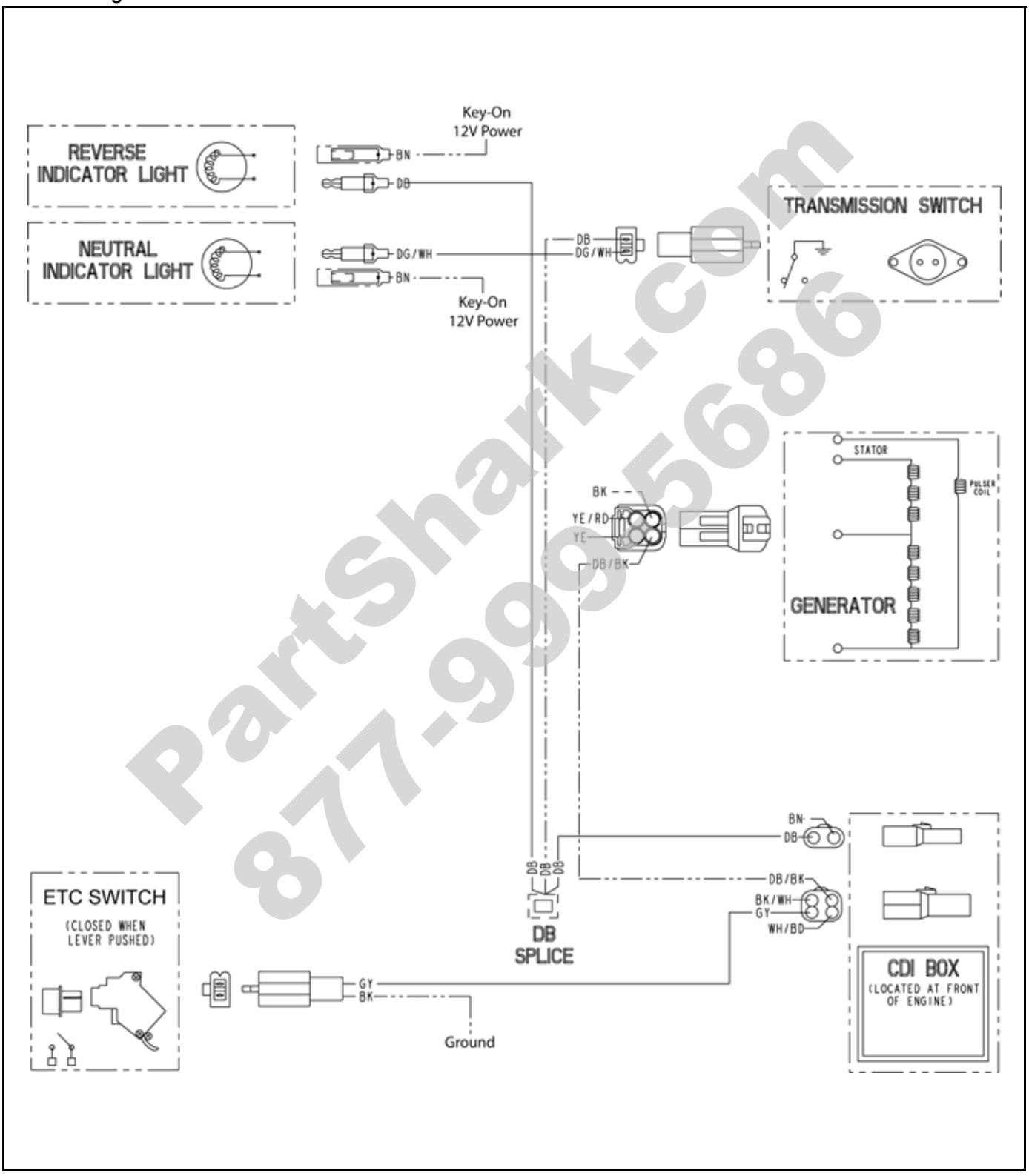
RPM Ignition Limiter Functions

NOTE: The CDI box reads the RPM signal from the stator. The CDI box acts as a limiter by retarding the ignition timing if RPM reaches the specified limit. In reverse gear, the CDI box retards ignition timing and limits RPM once it receives a ground path from the transmission switch dark blue (DB) wire indicating the ATV is in reverse. The CDI box can also receive a ground path from the ETC switch causing the CDI box to retard timing and limit RPM if the throttle cable becomes slack or stuck.



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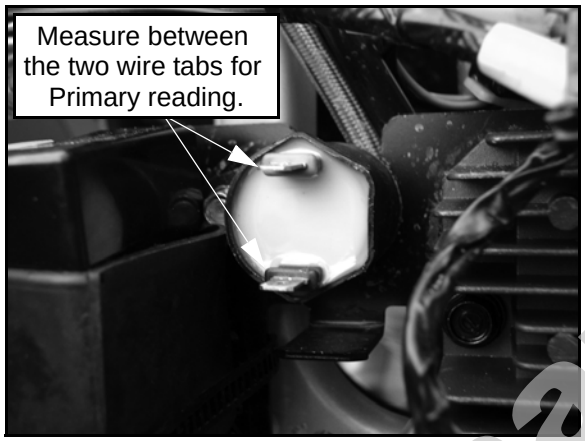
RPM Limiter Specifications

Model	Max RPM	Ignition Timing
50cc	7400	33.5° BTDC
90cc	8400	33.5° BTDC

NOTE: There are no timing advance marks stamped on the flywheel to read with a timing light.

Ignition Coil Test



Test Description	Resistance
Ignition Coil Primary Winding	0.2 Ω ± 20%
Ignition Coil Secondary Winding (With Cap Installed) (Without Cap Installed)	 8 K Ω ± 20% 3 K Ω ± 20%
Spark Plug Resistor Cap	5 K Ω

CDI Output Test Using Peak Reading Adaptor

Re-connect all wires to the CDI box. Disconnect the white/blue (WH/DB) CDI output wire from ignition coil primary terminal. Install the Peak Reading Adaptor (PV-39991) to your meter and connect one meter lead to engine ground and the other to the (WH/DB) CDI Output wire at the ignition coil. Set meter to read DC Volts. Crank engine and verify CDI output to the ignition coil. When finished, reconnect CDI output wire to ignition coil.

Output Test	Connect Meter Leads To:	Reading
CDI Output	WH/DB to Engine Ground	180 DC Volts ± 20%

Pulser Coil Output / Resistance Tests

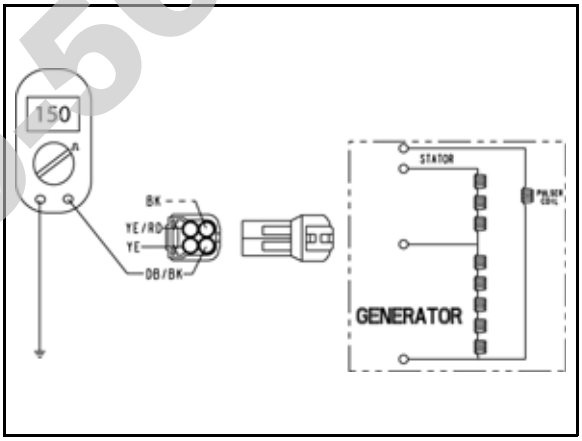
Disconnect the 4-wire connector at the CDI box. Install the Peak Reading Adaptor (PV-39991) to your meter and connect one meter lead to the dark blue / black wire (DB/BK) and the other to engine ground. Set meter to read DC Volts. Crank engine and verify pulser coil output.

Voltage Test	Connect Meter Leads Between:	Reading (With Peak Reading Adapter)
Pulser Coil	DB/BK to Engine Ground	5 DC Volts minimum @ cranking RPM

If readings are within specifications, test the resistance value of the pulser coil. When finished, reconnect the 4-wire connector to CDI box.

Ohm Test	Connect Meter Leads To:	Ω Reading
Pulser Coil	Blue to Black	150 Ω ± 20%

Pulser Coil Testing



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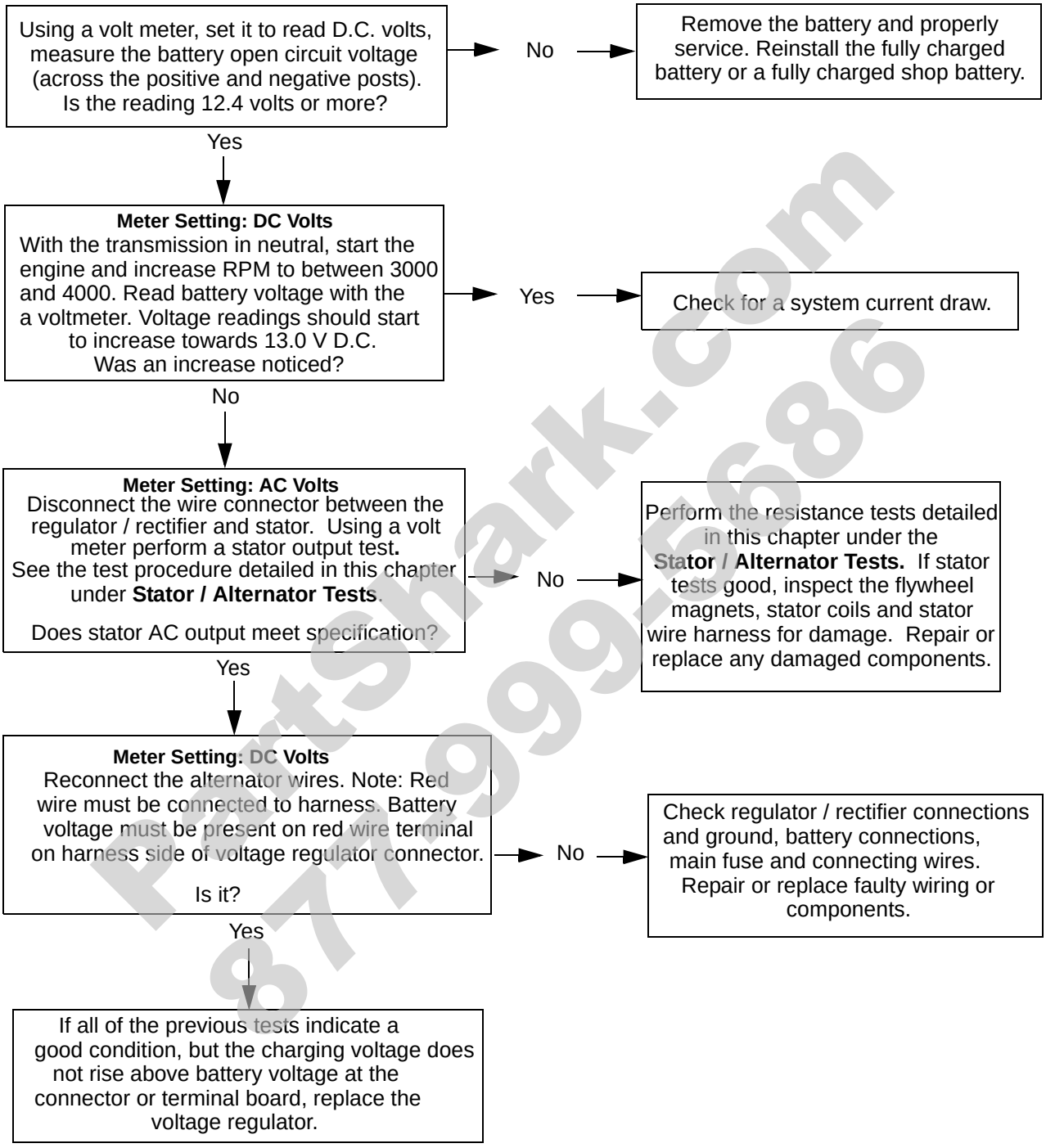
CHARGING SYSTEM

Charging System Testing

Whenever charging system problems are suspected, proceed with the following system checks:



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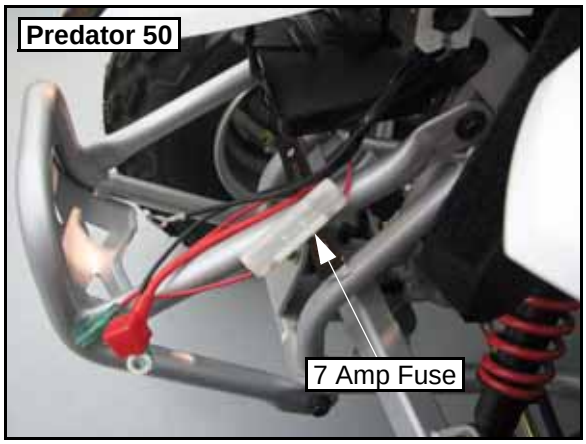
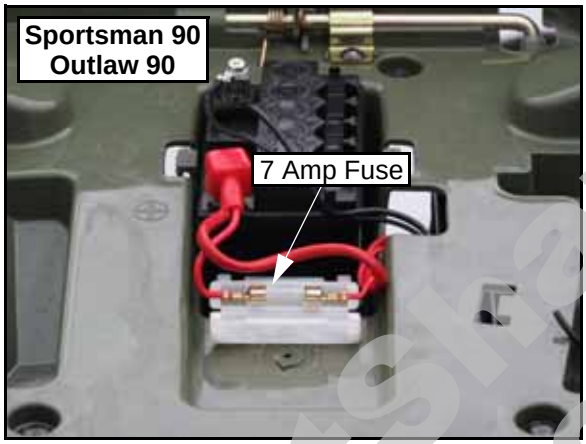
Main Fuse / Fuse Holder Location

A 7 Amp fuse protects the main electrical system on all youth models. See illustrations for fuse locations.



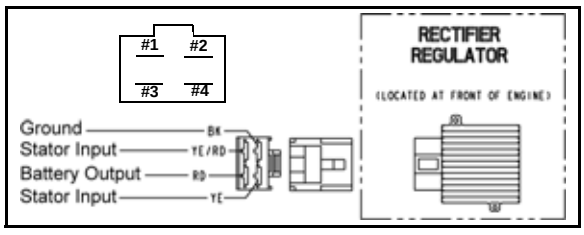


NOTE: Use only the recommended fuse capacity, as use of a higher amperage fuse to correct blown-fuse situations could lead to electrical component damage.

Voltage Regulator / Rectifier

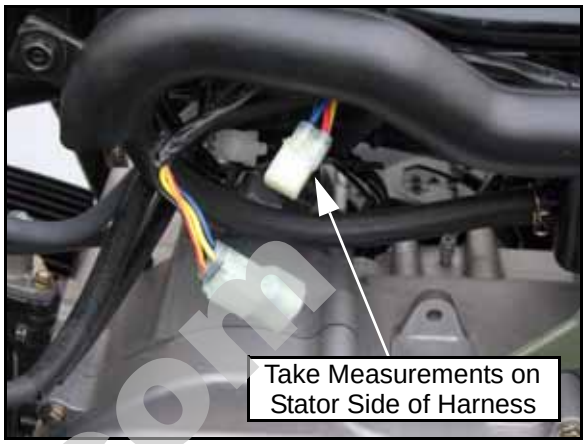
The voltage regulator / rectifier is located under the LH rear fender on the 90cc models and under the RH front fender on the 50cc models.

The regulator diodes can be tested with an ohm meter. Attach the postive '+' lead to position #1 and the negative '-' lead to position #2. There should be measurable resistance. Reverse the leads and test. There should be no continuity. Positions #3 and #4 should be tested the same and achieve the same results.



Stator / Alternator Tests

Two tests can be performed using a multimeter to determine the condition of the stator (alternator).



TEST 1: Measure resistance value of each stator leg.

1. Measure the resistance value of the stator legs. Use the following chart as a reference when testing.

Ohm Test	Connect Meter Leads To:	Ω Reading
Battery Charge Coil	BK to Ground	0.1 Ω ± 20%
	BK to RD	0.9 Ω ± 20%
	BK to YE	0.5 Ω ± 20%

TEST 2: Measure AC voltage output of each stator leg. Test at **cranking rpm** with a voltmeter set to read AC volts.

2. Turn over the engine with the starter motor.
3. First measure from the red wire (RD) to engine ground. Compare readings to specifications.
4. Next measure from the yellow wire (YE) to engine ground. Compare readings to specifications.

AC Output Test	Connect Meter Leads To:	AC Reading
Battery Charge Coil	RD to Ground	8 VAC
	YE to Ground	5 VAC

NOTE: To check the charging system output further, start the engine and perform the same tests. Voltage should increase with increased RPM.

Maximum Stator Output
6.5 Amps @ W.O.T.

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BATTERY

Battery Maintenance Service Notes

⚠ 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.

CAUTION

Always wear safety glasses, rubber protective gloves and appropriate clothing when working with batteries.

IMPORTANT: DO NOT activate Youth ATV batteries unless they will be put into service within 30 days of activation.

Youth ATVs have a Low Maintenance style battery. Do not remove the battery cap strip to check acid level or add water once the battery have been activated. Perform the proper battery tests and charge or replace the battery as required.

New batteries must be fully charged before use or battery life will be significantly reduced (10-30% of the battery's full potential).

NOTE: DO NOT use a constant high-amperage battery charger to charge this style of battery. Use a low-amperage charger capable of charging voltage that is 1/10 of the battery amp-hour rating.

New Battery Activation

⚠ WARNING

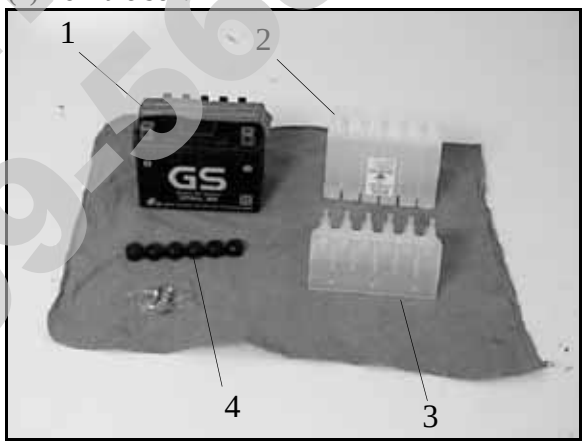
Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Antidote:

External: Flush with water.
Internal: Drink large quantities of water or milk.
Eyes: Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, 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

To ensure maximum service life and performance from a new battery, perform the following steps.

1. Remove the battery (1), battery acid (2), funnel (3) and cap (4) from the box.



2. Remove the protective strip from the top of the battery. Insert the battery electrolyte funnel into the filler holes.

3. Carefully press the battery electrolyte pack onto the funnel. The funnel will puncture the pack seals, releasing electrolyte into the battery. Allow the pack to drain for 20 minutes, periodically tapping the sides to release any air-lock or bubbles that may be present.

4. Properly dispose of the battery electrolyte pack. Let battery set with the vent cap strip off for 30 minutes to allow full absorption of the electrolyte. After 30 minutes, install the battery seal strip onto the battery.

5. Charge the battery initially for 3 to 5 hours using Christie Charger **PA-37453** or a charger with an output capable of 1/10th the battery's amp-hour rating.

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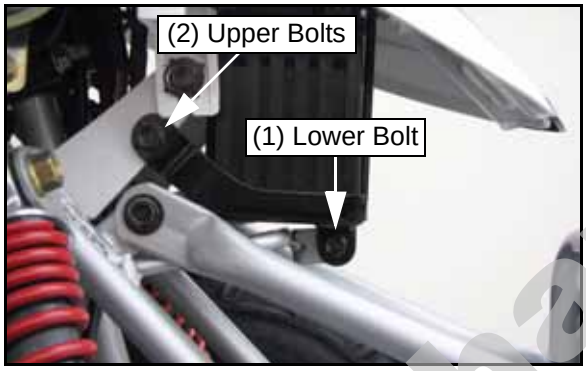
Battery Removal - 50cc

⚠ WARNING

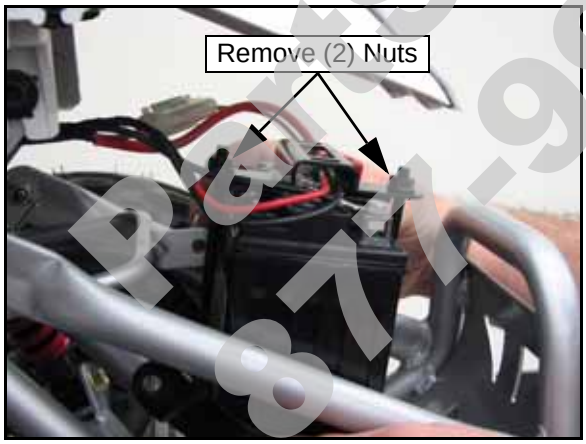
Improperly connecting or disconnecting battery cables can result in an explosion and cause serious injury or death. When removing the battery, always disconnect the negative (black) cable first.
When reinstalling the battery, always connect the negative (black) cable last.

To remove the battery:

1. Remove the (3) bolts securing the battery bracket to the frame and remove the battery and bracket from the frame.



2. Remove the (2) nuts securing the hold-down strap on the battery.



3. Disconnect the black negative (-) battery cable first.
4. Disconnect the red positive (+) battery cable next.
5. Remove the battery from the ATV.

⚠ CAUTION

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

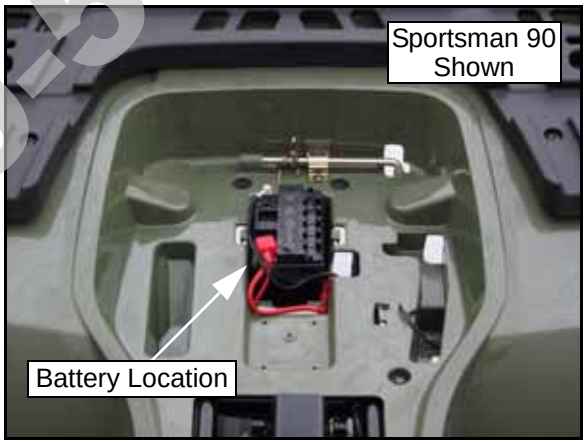
Battery Removal - 90cc

⚠ WARNING

Improperly connecting or disconnecting battery cables can result in an explosion and cause serious injury or death. When removing the battery, always disconnect the negative (black) cable first.
When reinstalling the battery, always connect the negative (black) cable last.

To remove the battery:

1. Remove the seat to access the battery.



2. Disconnect the hold-down strap securing the battery in position.
3. Disconnect the black negative (-) battery cable first.
4. Disconnect the red positive (+) battery cable last.
5. Lift the battery out of the ATV.

⚠ CAUTION

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

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Battery Cleaning

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

Battery Installation

1. Place the fully charged battery in its holder.
2. Attach the hold-down strap(s).
3. Connect and tighten the red positive (+) cable first.
4. Connect and tighten the black negative (-) cable last.
5. Torque the battery terminal bolts to 3.5 ft. lbs. (4.7 Nm)
6. Verify that the cables are properly routed.

NOTE: When installing a new battery, make sure it's fully charged prior to its initial use. Using a new battery that has not been fully charged can damage the battery and result in a shorter life. It can also hinder vehicle performance. If charging is necessary, use a .5 amp battery charger.

Battery Voltage Test

Battery voltage should be checked with a digital multi-tester. Readings of 12.4 or less require further battery testing and charging. See Load Test.

NOTE: Batteries should be kept at or near a full charge as possible. If the battery is stored or used in a partially charged condition, crystal sulfation will form on the plates, reducing the efficiency and service life of the battery.

Battery Load Test

CAUTION
Remove the spark plug high tension lead and connect securely to engine ground before proceeding.

A battery may indicate a full charge condition in the battery voltage 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 suspected. To perform this test:

1. Connect a multi-tester to the battery in the same manner as was done in the battery voltage test. The reading should be 12.4 volts or greater.
2. Engage the electric starter and view the registered battery voltage while cranking the engine. Continue the test for 15 seconds. During this cranking period, the observed voltage should not drop below 9.5 volts.
3. If the beginning voltage is 12.6 or higher and the cranking voltage drops below 9.5 volts during the test, replace the battery.

Battery Charging Procedure

Charge the battery using a charger capable of producing voltage 1/10th of the battery's amp/hr rating. *Example:* Youth ATV batteries have an amp/hr rating of 4.85 amps. Do not exceed .5 amps charging voltage or damage to the battery will result.

Fully charged, the battery should read **12.8-13.0 Volts**. After charging is complete, let the battery stand 1-2 hours and re-test the voltage. **Do not overcharge the battery!**

There is no need to remove the cell cap strip or add water for the life of the battery.

YOUTH ATV BATTERY CHARGING CHART

State of Charge	Voltage	Action	Charge Time
100%	12.8-13.0 V	None	FULL None Required
75%	12.5-12.8 V	Slight Charge	3-6 Hours @ 0.5 A
50%	12.0-12.5V	Charge	5-11 Hours @ 0.5 A
25%	11.5-12.0v	Charge	13+ Hours @ 0.5 A Check Charging
0%	Less than 11.5v	Charge	20 Hours @ 0.5 A Battery may be dead

Because of the characteristics of a sealed battery, overcharging decreases the volume of electrolyte. The longer the overcharge time, the greater the drop in electrolyte, and subsequently starting power. Water cannot be added to a sealed battery. *If a sealed battery is overcharged, it will have to self-discharge before it can be used.* Overcharging can also warp plates, making future charging difficult. Watch charging times carefully, or use a charger with limited charging time/current capabilities. Polaris recommends using the Christie Multi Battery Charger **(PV-67030)**, available from tool provider SPX for charging batteries. Always stop charging if the battery becomes warm to the touch. Let it cool sufficiently before resuming charging.

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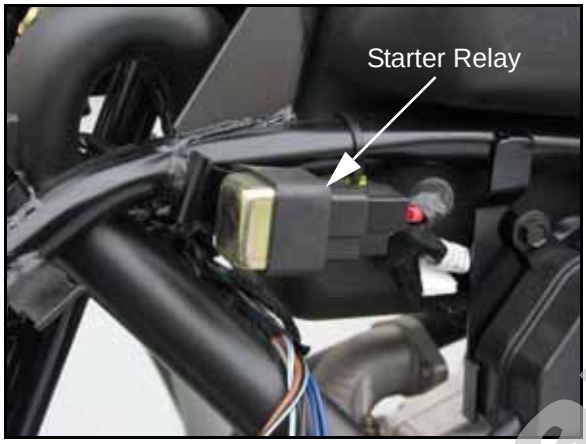
Battery Storage

Whenever the vehicle is not used for a period of three months or more, remove the battery from the vehicle, ensure that it's fully charged, and store it out of the sun in a cool, dry place. Check battery voltage each month during storage and recharge as needed to maintain a full charge.

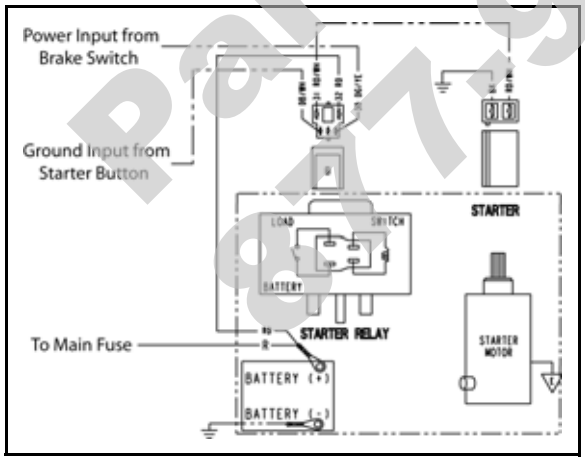
STARTER SYSTEM

Starter Relay



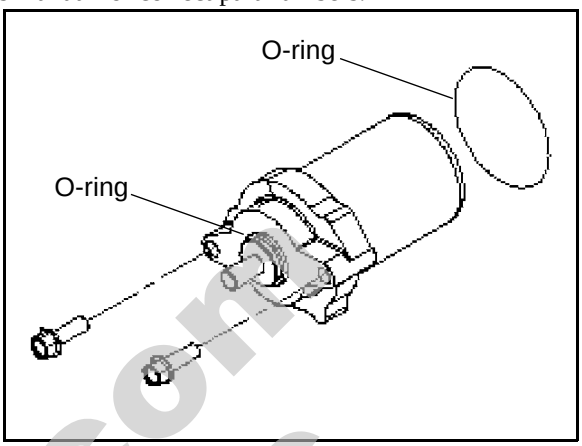
The starter relay consists of a simple 2-way circuit. Power is present at the (RD) wire from the battery. Once the switching side of the relay receives power from the brake switch and a ground path from the starter button, battery power is sent to the starter motor to crank the engine.

Use the illustration below when troubleshooting a "No Start" condition.



Starter Motor Service

The starter motor is a complete service part. If it is determined that the starter motor is the failed part, replace as needed. See the parts manual for correct part numbers.



Starter Disassembly

NOTE: Use only electrical contact cleaner to clean starter motor parts. Other solvents may leave a residue or damage internal parts and insulation.

NOTE: Some starter motors may not be serviceable. Replacement of entire assembly may be required. Check the parts manual for replacement part information.

1. Disconnect the negative battery cable and starter motor harness. Remove the (2) bolts from the starter and pull it from the engine.

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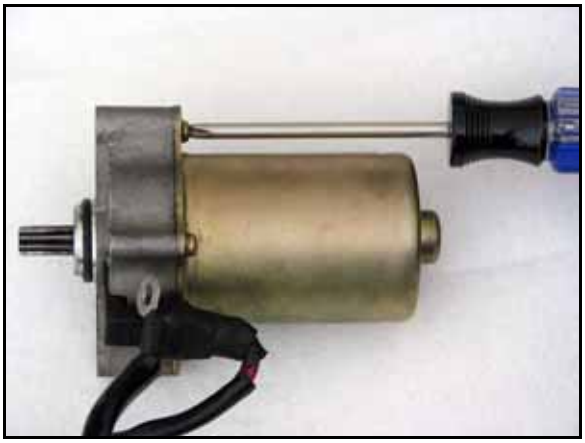
2. Remove the three screws and washers.

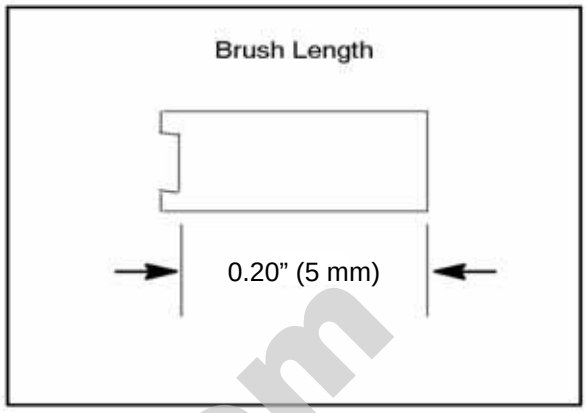


3. Remove magnet housing while holding the armature and brush holder section together.

Starter Brush Inspection / Replacement

1. Using an Ohm meter, measure the resistance between the cable terminal and the insulated brush. The reading should be .3 ohms or less. Measure the resistance between the cable terminal and brush housing. Make sure the brush is not touching the case. The reading should be infinite (no reading).

2. Remove the brush plate and brushes. Measure the brush length and replace if worn past the service limit.



Brush Length Service Limit
0.20“ (5 mm)

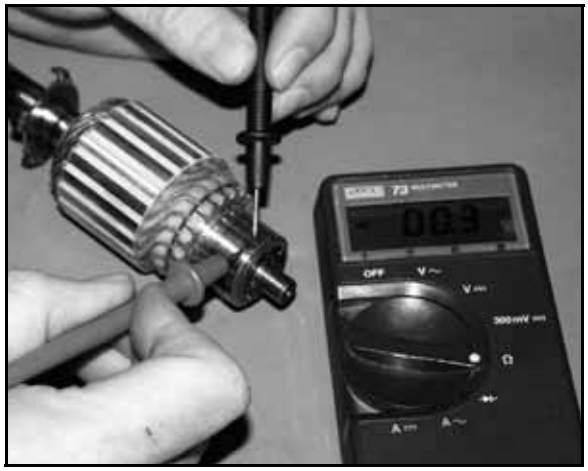
3. Inspect the surface of the commutator for wear or discoloration. See Armature Test.

4. Be sure that the terminal bolt insulation washer is properly seated in the housing and the tab on the brush plate engages the notch in the brush plate housing.

Armature Test

1. Inspect surface of commutator. Replace if excessively worn or damaged.

2. Using a digital multi-tester, measure the resistance between each of the commutator segments. The reading should be .3 ohms or less.



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3. Measure the resistance between each commutator segment and the armature shaft. The reading should be infinite. (no continuity)

4. Check commutator bars for discoloration. Bars discolored in pairs indicate shorted coils, requiring replacement of the starter motor.
5. 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.
6. Inspect the permanent magnets in starter housing. Make sure they are not cracked or separated from housing.

CAUTION

Use care when handling the starter housing. Do not drop or strike the housing, as magnet damage is possible. If the magnets are damaged, the starter must be replaced.

Starter Reassembly

1. Place armature in field magnet casing.
2. Inspect and replace the O-rings if damaged.
3. Install case sealing O-ring. Make sure O-ring is in good condition and not twisted on the case. Lubricate the ends of the armature shaft and oil seal with a light film of grease, and install housing.
4. Install brush housing onto the armature, pushing back brushes while installing armature shaft.
5. Reinstall starter motor housing screws and washers. Make sure O-rings are in good condition and seated in groove. Tighten sufficiently.
6. Reinstall the starter motor to the engine.

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.

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 next page to perform voltage drop tests on the starter system.

Voltage should not exceed .1 DC volts per connection

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 starter button
- Faulty ignition switch (Do other systems function?)
- Faulty starter solenoid or starter motor
- Engine problem - seized or binding (Can engine be rotated easily with recoil starter?).

Starter Motor Turns Over Slowly

- Battery discharged - low specific gravity
- Excessive circuit resistance - poor connections (see Voltage Drop Test below)
- Engine problem - seized or binding (Can engine be rotated easily with recoil starter?)
- 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

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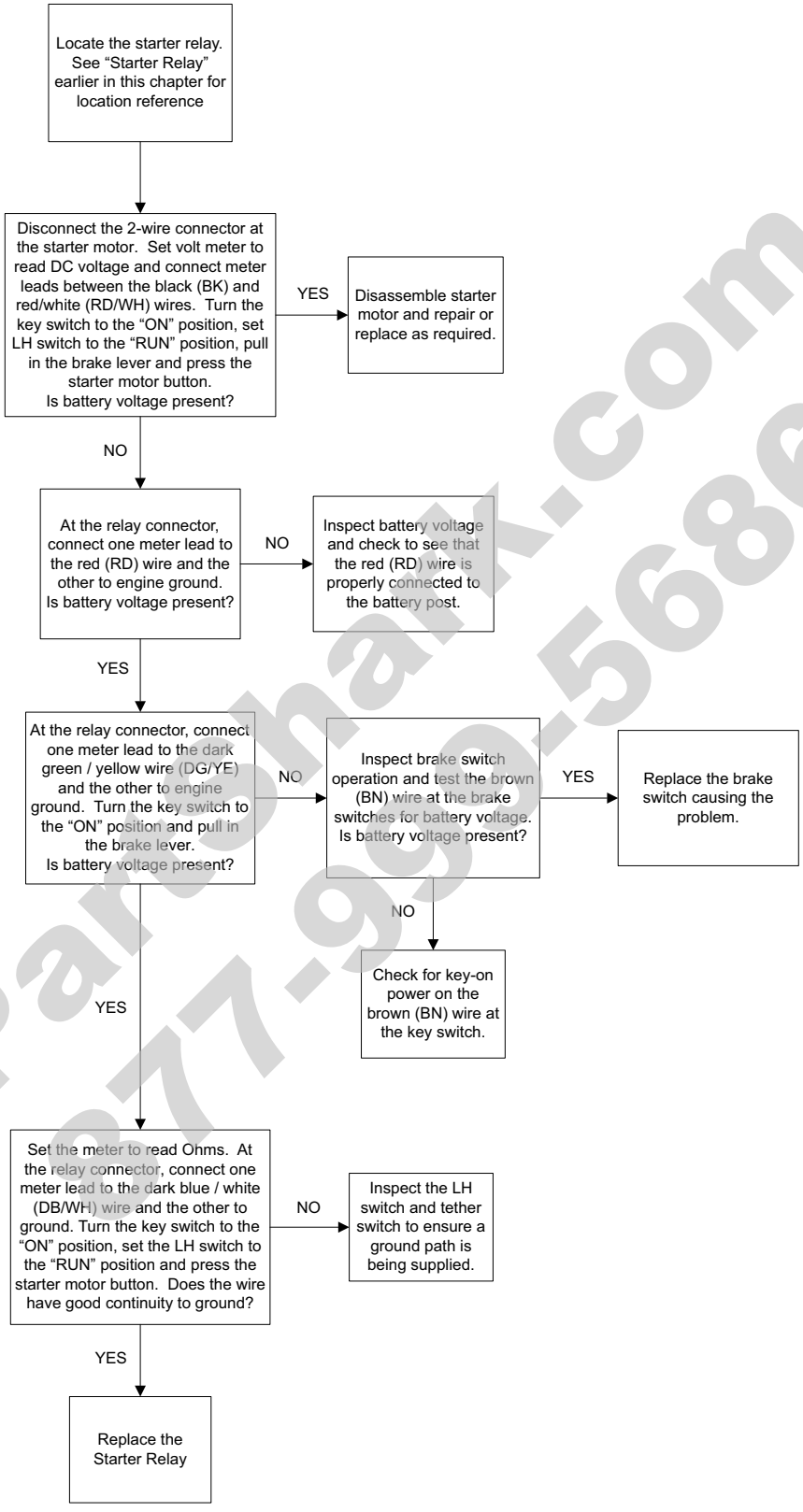
Starter System Testing

Condition: Starter motor fails to turn engine. **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.



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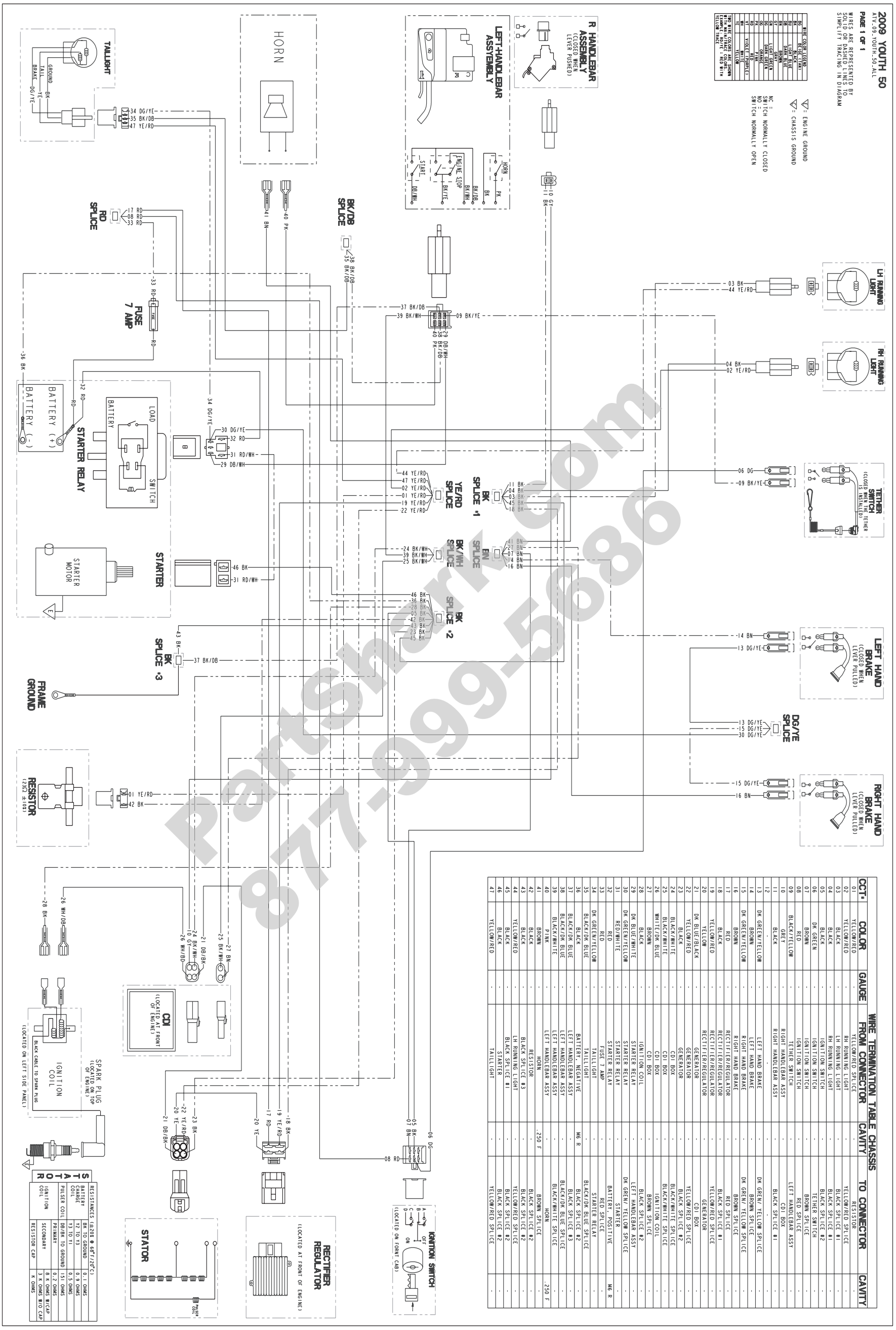
2009 PREDATOR 50



WIRE TERMINATION TABLE CHASSIS

CCT#	COLOR	GAUGE	FROM CONNECTOR	CAVITY	TO CONNECTOR	CAVITY
01	YELLOW/RED	-	YELLOW/RED SPLICE	-	RESISTOR	-
02	YELLOW/RED	-	RH RUNNING LIGHT	-	YELLOW/RED SPLICE	-
03	BLACK	-	LH RUNNING LIGHT	-	BLACK SPLICE #1	-
04	BLACK	-	RH RUNNING LIGHT	-	BLACK SPLICE #1	-
05	BLACK	-	IGNITION SWITCH	-	BLACK SPLICE #2	-
06	DK GREEN	-	IGNITION SWITCH	-	TETHER SWITCH	-
07	BROWN	-	IGNITION SWITCH	-	BROWN SPLICE	-
08	RED	-	IGNITION SWITCH	-	RED SPLICE	-
09	BLACK/YELLOW	-	TETHER SWITCH	-	LEFT HANDLEBAR ASSY	-
10	GREY	-	RIGHT HANDLEBAR ASSY	-	CDI BOX	-
11	BLACK	-	RIGHT HANDLEBAR ASSY	-	BLACK SPLICE #1	-
12	-	-	-	-	-	-
13	DK GREEN/YELLOW	-	LEFT HAND BRAKE	-	DK GREN/ YELLOW SPLICE	-
14	BROWN	-	LEFT HAND BRAKE	-	BROWN SPLICE	-
15	DK GREEN/YELLOW	-	RIGHT HAND BRAKE	-	DK GREN/ YELLOW SPLICE	-
16	BROWN	-	RIGHT HAND BRAKE	-	BROWN SPLICE	-
17	RED	-	RECTIFIER/REGULATOR	-	RED SPLICE	-
18	BLACK	-	RECTIFIER/REGULATOR	-	BLACK SPLICE #1	-
19	YELLOW/RED	-	RECTIFIER/REGULATOR	-	YELLOW/RED SPLICE	-
20	YELLOW	-	RECTIFIER/REGULATOR	-	GENERATOR	-
21	DK BLUE/BLACK	-	GENERATOR	-	CDI BOX	-
22	YELLOW/RED	-	GENERATOR	-	YELLOW/RED SPLICE	-
23	BLACK	-	GENERATOR	-	BLACK SPLICE #2	-
24	BLACK/WHITE	-	CDI BOX	-	BLACK/WHITE SPLICE	-
25	BLACK/WHITE	-	CDI BOX	-	BLACK/WHITE SPLICE	-
26	WHITE/DK BLUE	-	CDI BOX	-	IGNITION COIL	-
27	BROWN	-	CDI BOX	-	BROWN SPLICE	-
28	BLACK	-	IGNITION COIL	-	BLACK SPLICE #2	-
29	DK BLUE/WHITE	-	STARTER RELAY	-	LEFT HANDLEBAR ASSY	-
30	DK GREEN/YELLOW	-	STARTER RELAY	-	DK GREN/ YELLOW SPLICE	-
31	RED/WHITE	-	STARTER RELAY	-	STARTER	M6 R
32	RED	-	STARTER RELAY	-	BATTERY, POSITIVE	-
33	RED	-	FUSE 7 AMP	-	RED SPLICE	-
34	DK GREEN/YELLOW	-	TAILLIGHT	-	STARTER RELAY	-
35	BLACK/DK BLUE	-	TAILLIGHT	-	BLACK/DK BLUE SPLICE	-
36	BLACK	-	BATTERY, NEGATIVE	M6 R	BLACK SPLICE #2	-
37	BLACK/DK BLUE	-	LEFT HANDLEBAR ASSY	-	BLACK SPLICE #3	-
38	BLACK/DK BLUE	-	LEFT HANDLEBAR ASSY	-	BLACK/DK BLUE SPLICE	-
39	BLACK/WHITE	-	LEFT HANDLEBAR ASSY	-	BLACK/WHITE SPLICE	.250 F
40	PINK	-	LEFT HANDLEBAR ASSY	-	HORN	-
41	BROWN	-	HORN	.250 F	BROWN SPLICE	-
42	BLACK	-	RESISTOR	-	BLACK SPLICE #2	-
43	BLACK	-	BLACK SPLICE #3	-	BLACK SPLICE #2	-
44	YELLOW/RED	-	LH RUNNING LIGHT	-	YELLOW/RED SPLICE	-
45	BLACK	-	BLACK SPLICE #1	-	BLACK SPLICE #2	-
46	BLACK	-	STARTER	-	BLACK SPLICE #2	-
47	YELLOW/RED	-	TAILLIGHT	-	YELLOW/RED SPLICE	-

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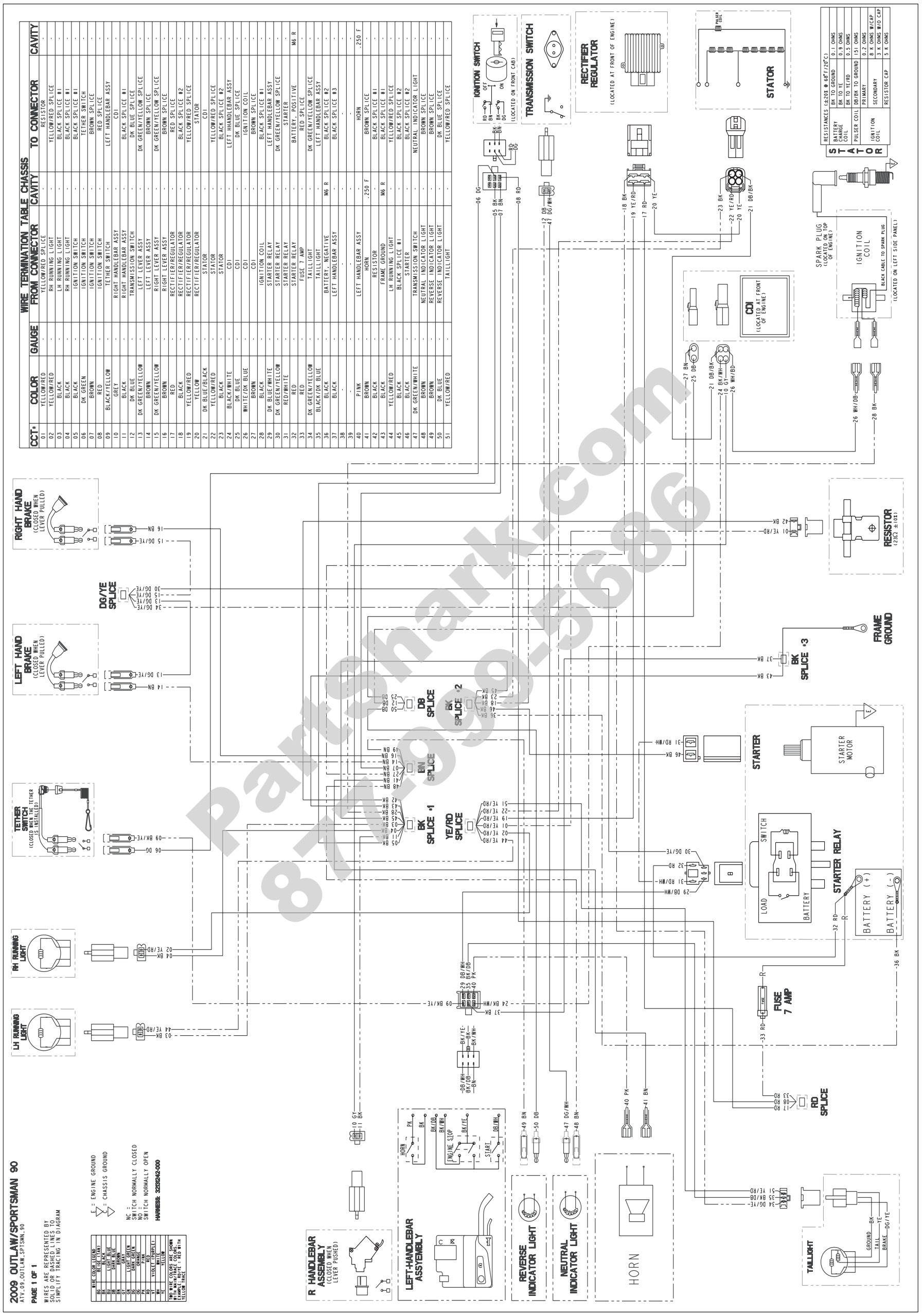
WIRE DIAGRAM

2009 OUTLAW 90 / SPORTSMAN 90



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