



POLARIS[®]
WATERCRAFT



2002 OCTANE SERVICE MANUAL
PART NUMBER 9918096



2002 OCTANE PERSONAL WATERCRAFT SERVICE MANUAL

Foreword

This manual is designed primarily for use by Polaris personal watercraft service technicians in a properly equipped shop. Persons using this manual should have a sound knowledge of mechanical theory, tool use, and shop procedures in order to perform the work safely and correctly. The technician should read the text and be familiar with service procedures before starting the work. Certain procedures require the use of special tools. Use only the proper tools, as specified. Cleanliness of parts and tools as well as the work area is of primary importance.

This manual includes procedures for disassembly and reassembly, inspection, maintenance, component identification and unit repair, along with service specifications for the 2002 OCTANE Personal Watercraft. A table of contents is placed at the beginning of each chapter to aid the user in locating specific areas of information.

Care is taken to ensure that all information in this manual was technically correct at the time of publication. However, all materials and specifications are subject to change without notice.

Comments or suggestions about this manual may be directed to: Engineering Services, Technical Writer, Polaris Sales Inc., 2100 Highway 55, Medina, MN 55340.

2002 Octane Service Manual (PN 9918096)

Copyright 2002 Polaris Sales Inc., Printed in U.S.A.

UNDERSTANDING SAFETY LABELS AND INSTRUCTIONS

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



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



DANGER

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



WARNING

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

CAUTION:

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

NOTE:

A NOTE provides key information to clarify instructions.

Polaris acknowledges the following products mentioned in this manual:

Loctite, Registered Trademark of the Loctite Corporation
FLEXLOC, Registered Trademark of SPS Technologies
MityVac, Registered Trademark of Neward Enterprises
Torx, Trademark of Textron
Teflon, Trademark of DuPont
Alemite, Trademark of Alemite Corporation

NOTE:

The Polaris Octane engine, hull, and components were designed and built by Polaris solely for use in competition by qualified International Jet Sports Boating Association (IJSBA) competition members.

The Octane carburetors are designed not to allow the engine to maintain idle speed. ANY modification to the stock carburetors, or throttle control system designed to override this feature constitutes a violation of EPA Clean Air Act.

The 2002 Polaris Octane is a limited-build, race-only watercraft. Polaris reserves the right to change specifications at any time without incurring obligations.



POLARIS®
WATERCRAFT

Table of Contents

Chapter 1 General Information

Chapter 2 Maintenance

Chapter 3 Engine / Cooling

Chapter 4 Carburetion / Exhaust

Chapter 5 Final Drive / Propulsion

Chapter 6 Electrical Systems

Chapter 7 Wiring Diagram



POLARIS®
WATERCRAFT

Chapter 1 / General Information

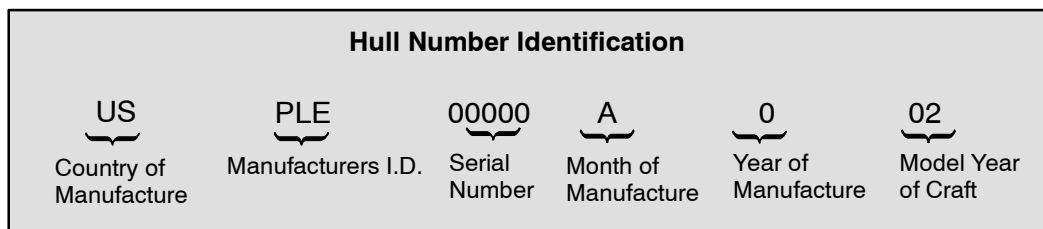
2002 PWC Identification Numbers	1.1
2002 Octane Publication Part Number	1.1
2002 Octane General Specifications	1.2 – 1.3
Standard Torque Specifications	1.4
Decimal Equivalent Chart	1.5
Conversion Chart	1.6
SAE / Metric Tap Drill Sizes	1.7
Service Glossary	1.8 – 1.9
Service Guidelines	1.10



2002 PWC Identification Numbers

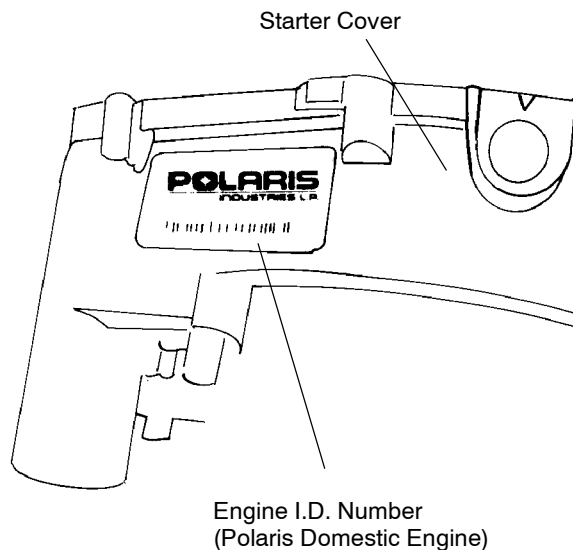
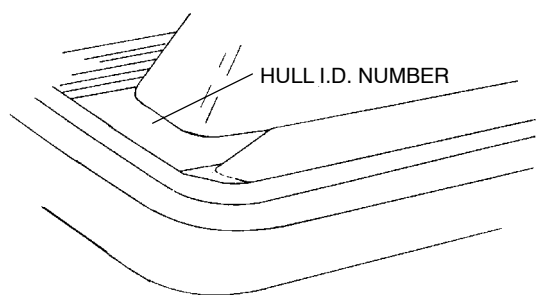
The engine I.D. number and hull I.D. number are used to register the watercraft. They are unique numbers that distinguish each watercraft from others of the same model.

If the watercraft is ever stolen these numbers will help identify it. The owner should keep a record of these numbers in a place other than the watercraft.



Month Code: A = January; B = February; etc.

Year Of Manufacture: 1 = 2001; 2 = 2002; etc.



2002 Octane Publication Part Numbers

Model	Model Number	Owner's Manual	Parts Book	Microfiche
Octane	W025402D	9917128 9918073 (Supplement)	9918094	9918095



2002 OCTANE W025402D

Length: 90 in. . . . 228.6cm
Width: 29.5 in. . . 74.93cm
Height: 29 in. . . . 73.66cm
Dry Weight: . 330 lbs. . 149.7 kg.
Category: . . Race Only – Stand Up
Riders: 1
Fuel Capacity: 4.5 US Gallons (MAX) 17L (MAX)
Oil Capacity: N/A – Pre-mix.



⚠ CAUTION

The Octane is not equipped with oil injection. Fuel must be pre-mixed with oil at a 40:1 ratio*.

The preferred method for mixing fuel and oil together is to have a fuel container 1/2 full of the amount of fuel you want to mix. Weigh the required amount of oil in a plastic cup, then empty into fuel container and mix. After mixing, add the remaining fuel.

Formula: 1 US Gallon = 128oz. ÷ 40 (Ratio) = 3.2 oz. for 1 US Gallon of fuel.

Two-cycle Engine Fuel-To-Oil Ratio Chart	
Gallons of Fuel	40:1 Ratio
5	16 ounces
10	32 ounces

* Engine “break-in” ratio is 32:1. Please reference chapter two.



2002 Octane	
Model Number	W025402D
Engine	
Platform	Polaris Marine 800 Twin
Engine Model Number	W77-DCSP-01
Engine Displacement	777cc
Number of Cylinders	2
Bore & Stroke (mm)	84 x 70
Compression Ratio (Effective)	6.7:1
Rated Horsepower	100
Maximum Torque	N/A
Cooling System	Water Cooled
Thermostat Opening Temperature	None
Overheat Warning	Overboard Water Outlets
Induction Type	Case Reed
Lubrication	Pre-Mix (40:1)
Oil Requirements	Polaris TC-W3
RPM Limiter	7200 RPM
Exhaust System	Factory Pipe - Water Cooled / Injected
Sound Reduction	None
Carburetion	
Fuel Delivery	2-40mm Keihin
Fuel Requirement	87 Oxygenated / 89 Non-Oxygenated
Idle Speed (In Water)	N/A
Electrical	
Ignition System	Digital CDI / Flywheel Magneto
Magneto Generator Output	5A / 60W @ 4500 RPM
Spark Plug	NGK BR9ES
Spark Plug Gap	.024 - .028 in. (.61 - .71mm)
Timing Degrees BTDC	20° @ 3000 RPM
Battery	12V / 19A
Circuit Breaker / (Fuses)	15 A Circuit Breaker
Starting	Electric Start - Two Button Start / Stop
Propulsion	
Jet Pump Type	Aggressor Pump, Single Stage Axial Flow, 12 Vane Stainless Steel Stator
Impeller Rotation	Counter Clockwise (From AFT)
Coupling Type	Spider Coupler / Direct Drive
Minimum Depth For Operation	2 ft. (60cm.)
Pivoting Angle	N/A
Impeller Type	3 Blade, Stainless Steel, Progressive Pitch Radial Blade
Impeller Diameter	140mm (5.511 in.)
Reverse System	None
Hull / Body	
Hull Design	Double Concave Wamper - V
Hull Material	FRC (Fiberglass Reinforced Composite)
Top Deck Material	FRC (Fiberglass Reinforced Composite)



Standard Torque Specifications

The following torque specifications are to be used as a general guideline. Use standard torque values for the appropriate size fastener when torque values are not specified. **Always consult the specific manual section for torque values of fasteners and use of locking agent.**

RECOMMENDED TORQUE SPECIFICATION STAINLESS STEEL FASTENERS (SAE)		
Bolt Size	Threads/Inch	Torque
8	18 & 32	28 in. lbs.
10	24 & 32	40 in. lbs.
1/4	20 & 28	8 ft. lbs.
5/16	18 & 24	14 ft. lbs.
3/8	16	25 ft. lbs.
3/8	24	28 ft. lbs.
7/16	14	40 ft. lbs.
1/2	13	58 ft. lbs.
1/2	20	70 ft. lbs.

RECOMMENDED TORQUE SPECIFICATION STAINLESS STEEL FASTENERS (METRIC)	
Bolt Size	Torque
5mm	45-52 in. lbs.
6mm	66-78 in. lbs.
8mm	13-16 ft. lbs.
10mm	26-30 ft. lbs.
12mm	40-44 ft. lbs.

- To convert in. lbs. to ft. lbs. divide by 12
- To convert ft. lbs. to Nm multiply foot pounds by 1.356.
- To convert Nm to ft. lbs. multiply Nm by .7376.



Decimal Equivalent Chart

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



Conversion Chart

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)
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)

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

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





SAE Tap Drill Sizes

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

Metric Tap Drill Sizes

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



Service Glossary

ABDC: After bottom dead center.

ACV: Alternating current voltage.

Alternator: Electrical generator producing voltage alternating current.

BBDC: Before bottom dead center.

BDC: Bottom dead center.

BTDC: Before top dead center.

Bow: The front of a watercraft

C: Celsius

CC: Cubic centimeters.

CDI: Capacitor discharge ignition. Ignition system which stores voltage generated by the stator plate exciter coil in a capacitor or condenser (in CDI box). At the proper moment a voltage generated by the stator plate pulser coil closes an electronic switch (thyristor) in the CDI box and allows the voltage in the capacitor to discharge into the primary windings of the ignition coil.

CI: Cubic inches.

Condenser/Capacitor: A storage reservoir for electricity, used in both E.T. and CDI systems.

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 lower half of crankcase. Measure at various points especially at the PTO end.

DCV: Direct current voltage.

Detonation: The spontaneous ignition of the unburned fuel/air mixture *after* normal ignition spark occurs. Piston looks "hammered" through, rough appearance around hole. Possible causes: 1) Compression ratio too high for the fuel octane; 2) low octane fuel; 3) over-advanced ignition timing.

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

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

F: Fahrenheit

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. There are 28 grams in one ounce.

gal.: Gallon.

Head Volume (Uninstalled): Cylinder head capacity in cc, head removed from engine with spark plug installed.

High Tension Lead: The heavy insulated wire which carries the high secondary voltage from the coil to the spark plug.

Holed Piston: Piston in which a hole has formed on the dome. Possible causes: 1) detonation; 2) pre-ignition.

HP: Horsepower.

ID: Inside diameter.

Ignition Coil: A type of transformer which increases voltage in the primary windings (approx. 200V) to a higher voltage in the secondary windings (approx. 14KV - 32KV) through induction. Secondary voltage must be high enough to ionize the air gap at the spark plug.

Ignition Generating Coil: Exciter coil, primary charge coil. Stator plate coil which generates primary ignition voltage.

in.: Inch/inches.

kg/cm²: Kilograms per square centimeter.

Kg-m: Kilogram meters.

Km: Kilometer.

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



Service Glossary - Continued

l or ltr: Liter. One liter = 1.0567 U.S. quarts.

lbs/in²: Pounds per square inch.

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

Left Side: The left hand side of the vehicle. 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. This is how mechanical energy is converted to electrical energy in the lighting coil, ignition generating coils and trigger coil.

mi.: Mile/miles.

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

N-m: Newton meters.

OD: Outside diameter.

Ohm: The unit of electrical resistance opposing current flow.

Open Circuit: An electrical circuit which is incomplete. (e.g. poor connections or broken wire preventing the flow of current).

oz.: Ounce/ounces.

Piston Clearance: Total distance between piston and cylinder wall.

Piston Erosion: Piston dome melts. Usually occurs at the exhaust port area. Possible causes: 1) lean fuel/air mixture; 2) improper spark plug heat range.

Pre-Ignition: A problem in combustion where the fuel/air mixture is ignited before normal spark ignition. Piston looks melted at area of damage. Possible causes: 1) Spark plug heat range incorrect (too hot) 2) spark plug not properly torqued; 3) "glowing" piece of head gasket, metal burr or carbon in the combustion chamber; 4) lean fuel/air mixture.

Primary Circuit: This circuit is responsible for the voltage build up in the CDI capacitor. In a CDI system the parts include the exciter coil, the trigger coil, the wires from stator plate to CDI box and to the ignition coil primary windings.

psi.: Pounds per square inch.

pts: Pint/pints

PTO: Power take off.

qt.: Quart/quarts.

RPM: Revolutions per minute.

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

Right Side: The right hand side of the vehicle. Always Referred to based on normal operating position of the rider.

Running Time: Ignition timing at specified RPM.

Secondary Circuit: This circuit consists of the ignition coil secondary windings, high tension wire and ground through the spark plug air gap.

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.

Short Circuit: An electrical circuit which is completed before the current reaches the intended component. (e.g. a bare wire touching a grounded component).

Spark Plug Reach: Length of threaded portion of spark plug. Polaris uses 3/4" (2 cm) reach plugs.

Static Timing: Ignition timing when engine is at zero RPM.

Stator Plate: The plate mounted under the flywheel supporting the primary ignition components and lighting coil.

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

Trigger Coil: Pulser coil. Generates the voltage for triggering (closing) the thyristor and timing the spark in CDI systems. Small coil mounted at the top of the stator plate next to the ignition generating coil.

Voltage Regulator: An electrical device which prevents overcharging of the battery or overloading of electrical components as engine RPM increases.



Service Guidelines

In order to perform service work efficiently and to prevent costly errors, the technician should begin by reading the text in this manual to become familiar with procedures before beginning. Pictures and illustrations have been included with the text as an aid. Notes, cautions and warnings have also been included for clarification of text and safety concerns. However, a knowledge of mechanical theory, tool use, and shop procedures is necessary to perform the service work safely and satisfactorily. Use only genuine Polaris service parts.

⚠ Cleanliness of parts and tools as well as the work area is of primary importance. Dirt and foreign matter will act as an abrasive and cause damage to precision parts. Clean the vehicle before beginning service. Clean new parts before installing.

⚠ Watch for sharp edges which can cause personal injury. Protect hands with gloves when working with sharp components.

⚠ If difficulty is encountered in removing or installing a component, look to see if a cause for the difficulty can be found. If it is necessary to tap the part into place, use a soft face hammer and tap lightly.

⚠ Some of the fasteners were installed with locking agents. Use of impact drivers or wrenches will help avoid damage to fasteners.

⚠ Always follow torque specifications as outlined throughout this manual. Incorrect torquing may lead to serious machine damage or, as in the case of steering components, can result in injury or death for the rider(s).

⚠ If a torquing sequence is indicated for nuts, bolts or screws, start all fasteners in their holes and hand tighten. Then, following the method and sequence indicated in this manual, tighten evenly to the specified torque value. When removing nuts, bolts or screws from a part with several fasteners, loosen them all about 1/4 turn before removing them.

⚠ If the condition of any gasket or O-Ring is in question, replace it with a new one. Be sure the mating surfaces around the gasket are clean and smooth in order to avoid leaks.

⚠ Some procedures will require removal of retaining rings or clips. Because removal weakens and deforms these parts, they should always be replaced with new parts. When installing new retaining rings and clips use care not to expand or compress them beyond what is required for installation.

⚠ Because removal damages seals, replace any oil or grease seals removed with new parts. A suitable driver should be used when installing a new seal to prevent distortion or damage.

⚠ Polaris recommends the use of Polaris lubricants and greases, which have been specially formulated for the top performance and best protection of our machines. In some applications, such as the engine, warranty coverage may become void if other brands are substituted.

⚠ Grease should be cleaned from parts and fresh grease applied before reassembly of components. Deteriorating grease loses lubricity and may contain abrasive foreign matter.

⚠ Whenever installing batteries, care should be taken to avoid the possibility of explosion resulting in serious burns. Always connect the positive (red) cable first and the negative (black) cable last. When working with batteries, always wear safety glasses or a face shield and protective gloves. Battery electrolyte contains sulfuric acid and is poisonous! Serious burns can result from contact with the skin, eyes or clothing. **ANTIDOTE:** External - Flush with water. Internal - Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately. Eyes - Flush with water for 15 minutes and get prompt medical attention.



POLARIS®
WATERCRAFT

Chapter 2 / Maintenance

Recommended Maintenance Products	2.1
Periodic Maintenance Schedule	2.2
Engine Break-In Procedure	2.2
Throttle / Choke / Steering Cable Lubrication	2.3
Steering / Carburetor Lubrication	2.4
Driveshaft Maintenance	2.5
Electrical Component Maintenance / Battery Maintenance	2.6 – 2.9
Spark Plug Maintenance / Type	2.10
Engine Inspection	2.11
Throttle / Choke Cable Inspection and Adjustment	2.12
Fuel Lines / Vent Lines / Fuel Filter Maintenance	2.13
Carburetor Adjustment / Air Intake Maintenance	2.14
Off Season Storage Procedures	2.15
Engine Fogging Procedure	2.16
Exterior Care / Cleaning	2.17
Final Drive / Propulsion Maintenance	2.18
Handlebar / Steering Cable Inspection	2.19
Steering Cable Adjustment Procedure	2.20 – 2.22

2



Recommended Maintenance Products

Oil and Lubricants	
High Performance Racing 2-Cycle Oil	
Quart	2873025
Gallon	2873023
16 Gallon	2873919
55 Gallon	2873024
Nature Oil Biodegradable 2-Cycle Oil	
Gallon	2872607
55 Gallon	2872926
Fuel System Maintenance Products	
Carbon Clean Plus	2871326
Isopropyl Fuel De-Icer	2870505
Premium Fuel Stabilizer	2870652
Grease	
Grease Gun Kit	2871312
All Season Premium Grease	
3 oz. / 4 pack	2871322
14 oz. Tube	2871423
Starter Grease	2871460
Nyogel Grease	2871329
General Maintenance Products	
Fogging Oil	
12 oz. Aerosol	2870791
1 Quart	2871517
Brake & Clutch Cleaner	2872889
Carb & Throttle Body Cleaner	2872890
Multi-Purpose Lubricant	2872891
Electrical Contact Cleaner	2872892
Engine Degreaser	2872893
Revival / Detailing Kit	
Revival / Detailing Kit	2871589
Restore Swirl / Scuff Eliminator	2871966
Finish Wax	2871965
Vinyl and Rubber Protectant	2871964
T 9 Metal Protectant	2871064
Retaining / Sealing Products	
Loctite™ Products	
Threadlock 242	2871950
Threadlock 262	2871952
Threadlock 271	2871954
Loctite™ 5699	2871849
Marine-Grade Silicone	8560054



Periodic Maintenance Schedule

DESCRIPTION	Pre-Ride	Pre-season	1 Mo./ 25 Hrs	3 Mo./ 50 Hrs	6 Mo./ 100 Hrs	Tune Up Item
ENGINE						
Engine corrosion protection/fogging (daily-salt water)	L**	L	L			
Exhaust cooling hoses elbow fittings in pump		I/C		I/C		•
Exhaust hose condition		I		I		
Engine mounts (Replace if removed for engine service)		I			I	•
Water inlet and outlet hoses and clamps		I	I	I	R	
Spark plugs / Compression test		I/R		I	I/R	•
Engine fastener re-torque (cyl head / cyl base, exhaust)		I		I	I	•
FUEL SYSTEM						
Fuel filter		R	I			•
Throttle and choke cables	I	I/L/A		L		•
Carburetor (see engine fogging procedure) synchronize		A/C			A	•
Fuel cap gasket	I	I	I	I	R	
Fuel lines, related hose clamps, check valves and hose inspection, fuel system pressurization		I			I	•
Vent system check-valves; hose routing		I				•
Fuel system pressure/vacuum test		I				
Fuel Tank Hold-Down Straps	I	I	I			
JET PUMP						
Drive shaft coupler assembly and bearing housing		I/L	I/L*		I/L	•
Bilge system pick-up screens and hoses	I/C	I/C				•
Cooling water inlet screen / hoses, clamps	I/C	I/C				•
Jet pump intake grate fasteners and condition		I		I		•
Impeller condition and impeller clearance		I			I	•
ELECTRICAL						
Battery condition, fluid level	I	I				•
Battery vent hose condition/routing (must be clear)		I		I		•
Battery and starter cables(clean connections / tight)		I		I	I	•
Ground cables-condition, corrosion, fastener torque		I		I	I	
Lanyard cord/engine stop switch	I	I				•

KEY

I=Inspect, A=Adjust C=Clean R=Replace item L=Lubricate

* Perform every 15 hrs. or one month when operated in salt water. **Perform daily when operated in salt water.

Engine Break-In Procedure

Properly “breaking-in” the engine is important to the life of any engine. The first tank of fuel is considered the “break-in” period. To “break-in” the engine, use a 32:1 fuel-to-oil ratio. After the “break-in” period, use a 40:1 fuel-to-oil ratio.

The preferred method for mixing fuel and oil together is to have a fuel container 1/2 full of the amount of fuel you want to mix. Weigh the required amount of oil in a plastic cup, then empty into fuel container and mix. After mixing, add the remaining fuel.

Formula: 1 US Gallon = 128oz. ÷ 40 (Desired Ratio) = 3.2 oz. for 1 US Gallon of fuel.

Two-cycle Engine Fuel-To-Oil Ratio Chart		
Gallons of Fuel	32:1 (Break In)	40:1 Ratio (Normal Operation)
5	20 ounces	16 ounces
10	40 ounces	32 ounces





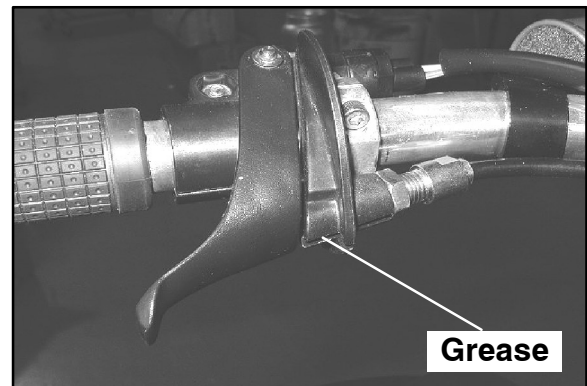
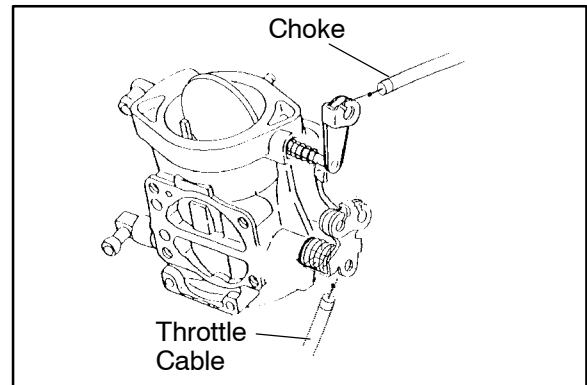
General Lubrication

Throttle / Choke Cable

1. Depress throttle lever and apply lube onto cable.
2. Apply and release throttle several times to work lubricant down cable.

NOTE: Cable seal can be moved to allow grease into cable. Verify that seals are installed in proper location after oiling.

**Polaris Premium Grease
PN 2871423**

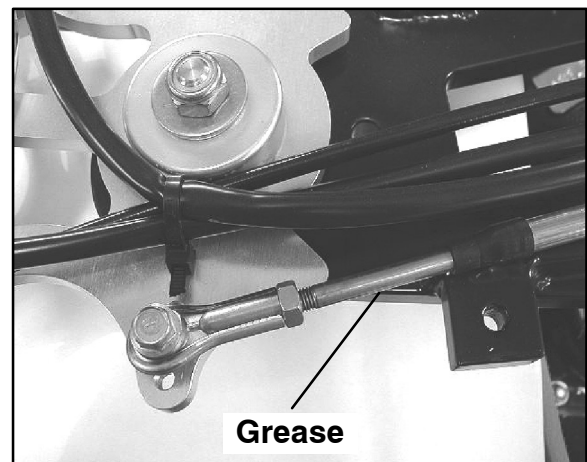


Steering Cable / Steering Joints

1. Expose inner cable and apply lubricant.

NOTE: Cable seal can be moved to allow grease into cable. Verify that seals are installed in proper location after oiling.

**Polaris Premium Grease
PN 2871423**



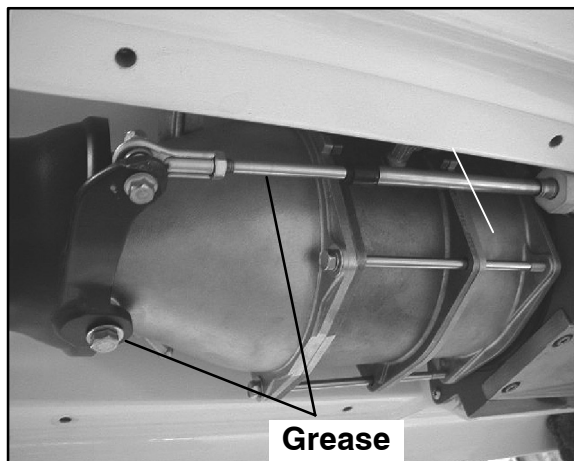


General Lubrication - Continued

Steering Nozzle

1. Lubricate nozzle pivot and trim pivot.

**Polaris Premium Grease
PN 2871423**

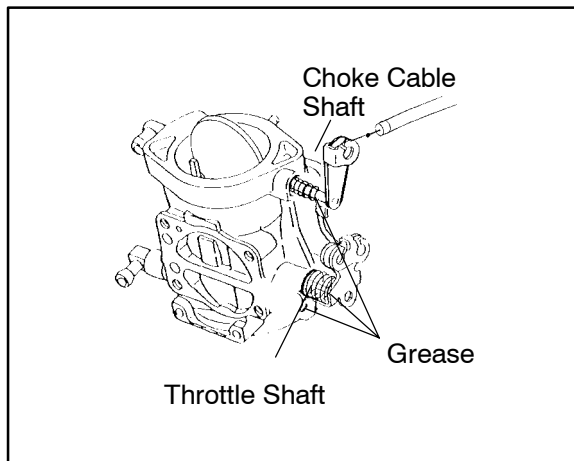


Throttle / Choke Shafts

1. Grease springs, exposed sections of cable, idle stop screw, throttle, and choke shafts at carburetor.

NOTE: Grease daily if used in salt water.

**Premium All Season Grease
PN 2871423**





Drive Shaft Maintenance

⚠ WARNING

The driveshaft shroud is designed to protect you from dangerous moving parts. It must be removed to access the coupler assembly.

CAUTION:

Grease should only be applied whenever the pump assembly, or driveshaft is removed from the watercraft. Only apply a light film of grease to the drive shaft threads and splines when assembling the pump. A very light film of grease can be used to assist in inserting the shaft through the bearing carrier.

All Season Grease PN 2871423
All Season Grease PN 2871322

Drive Shaft Coupler

The drive shaft coupler assembly consists of three (3) parts. One spider coupler screws on to the PTO end of the crankshaft, the other spider coupler screws to the end of the drive shaft. Between the two spider couplers is a rubber dampener.

No maintenance is required unless the pump and drive shaft are removed from the watercraft, or the engine has been removed or shifted from its original position.



Bearing Housing

The bearing housing is bolted to the bulkhead. Within the housing sits a sealed bearing. Only a light film of grease should be applied to the inner bearing surface and seals to assist in inserting the drive shaft during assembly. The sealed bearing requires no maintenance unless bearing failure is suspected.

During watercraft inspections, verify the bearing carrier is bolted tightly to the bulkhead.





Electrical Components

Battery Safety

When removing and installing the battery, or when performing battery maintenance always heed the following warnings and cautions:

WARNING

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

Antidote:

EXTERNAL - Flush with water.

INTERNAL - Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call a physician immediately.

EYES - Flush with water for 15 minutes and get prompt medical attention.

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

CAUTION:

The battery must be removed from the watercraft for maintenance and charging. Battery electrolyte may spill and damage the watercraft.

WARNING

Always disconnect the black (negative) cable first. Electrolyte or fuel vapors may be present in the engine compartment and a spark could ignite them which could cause personal injury. When re-installing battery connect black (negative) cable last.

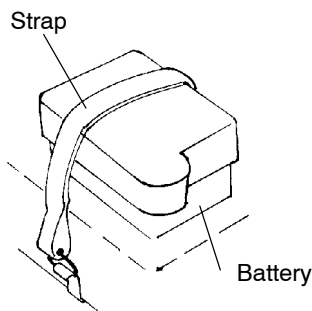
Whenever installing batteries, care should be taken to avoid the possibility of explosion resulting in serious burns. Always connect the positive (red) cable first and the negative (black) cable last. When working with batteries, always wear safety glasses or a face shield and protective gloves. Battery electrolyte contains sulfuric acid and is poisonous! Serious burns can result from contact with the skin, eyes or clothing. **ANTIDOTE:** External - Flush with water. Internal - Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately. Eyes - Flush with water for 15 minutes and get prompt medical attention.

Battery Removal

1. Remove straps or bar holding electrical box and battery in position.
2. Remove cover from top of battery.
3. Remove battery vent tube from battery.
4. Disconnect black (negative) battery cable first.
5. Disconnect red (positive) battery cable next.
6. Lift battery out of watercraft, being careful not to tip it sideways and spill any electrolyte.

CAUTION:

Battery electrolyte can damage the watercraft finish if spilled. If an electrolyte spill occurs, apply a generous amount of baking soda to the area and then rinse with fresh water.





Electrical Components - Continued

Replenishing Battery Fluid

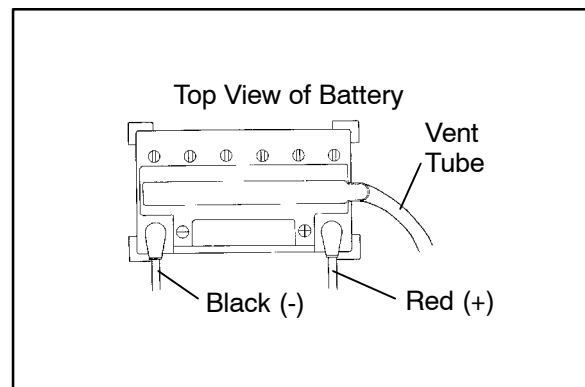
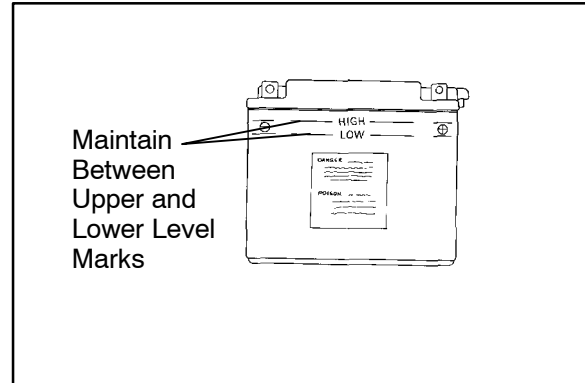
The fluid level should be kept between the upper and lower level marks.

To refill use only distilled water. Tap water contains minerals which are harmful to a battery.

Battery Connections

Battery terminals and connections should be kept free of corrosion. If cleaning is necessary, remove the corrosion with a stiff wire brush. Wash thoroughly with a solution of baking soda and water (one tablespoon of baking soda to one cup of water). Rinse well with tap water and dry off with clean shop cloths. Coat the terminals and terminal bolts with Nyogel™ grease.

Nyogel™ Grease
PN 2871329



Battery Charging

CAUTION:

The battery must be removed from the watercraft for maintenance and charging. Battery electrolyte may spill and damage the watercraft.

Always disconnect the black (negative) cable first. Electrolyte or fuel vapors may be present in the engine compartment and a spark could ignite them which could cause personal injury. When re-installing battery connect black (negative) cable last.

⚠ WARNING

Keep the battery away from sparks and open flames during charging because the battery gives off gases which are explosive. If you smell fuel do not attempt to charge the battery. When using a battery charger connect the battery to the charger before turning on the charger. This prevents the possibility of sparks at the terminals which could ignite the battery gases. Do not connect charger cables to the battery unless the charger is unplugged.

1. Remove caps from cells. Add distilled water if necessary to bring electrolyte up to proper level.
2. Connect battery to a charger. Set charging rate at 1.9 amps (maximum) and charge battery for ten hours.

CAUTION:

During charging, if the electrolyte temperature rises above 115°F (45°C) or if battery feels hot when touched, reduce the charging rate to lower the temperature and increase the charging time.

3. After battery is charged, check fluid level. If it has dropped add distilled water to bring electrolyte up to proper level.
4. Check results of charging. The specific gravity of each cell must be 1.270 at room temperature. The voltage should be 14.5 - 15.5 V during charging; 12.2 - 12.8 V after charging.

Specific Gravity
1.270 or greater - Each Cell



Electrical Components - Continued

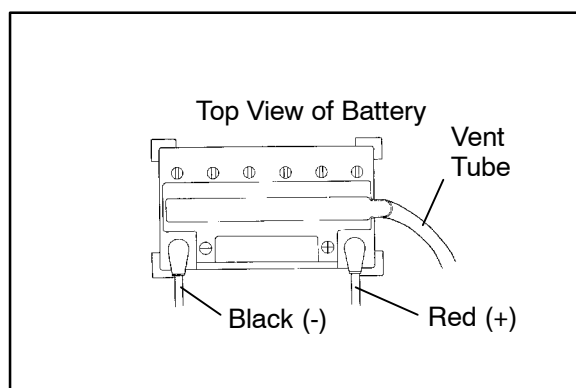
Battery Installation

WARNING

Always connect battery cables in the order specified. Red (positive) cable first, black (negative) cable last.

1. Install battery in its holder.
2. Install battery vent tube. It must be free from kinks, obstructions, or restrictions and securely installed. If not, battery gases could accumulate and cause an explosion. Avoid skin contact with electrolyte, severe burns could result.
3. Apply Nyogel™ grease to each cable bolt.

Nyogel™ Grease
PN 2871329



4. First, connect and tighten red (positive) cable.
5. Second, connect and tighten black (negative) cable.
6. Apply dielectric grease to each cable end and to terminal post area.
7. Reinstall battery cover and electrical box over battery and reconnect straps.
8. Verify that cables are properly routed.
9. Verify that vent hose is not kinked.

Battery Storage

1. Remove battery. Clean casing and terminals with baking soda and water (one tablespoon of baking soda to one cup water). Apply dielectric grease to battery terminals and all exposed cable connectors.
2. Top off battery with distilled water and charge to a specific gravity of 1.270 (test each cell). Recharge monthly as required to prevent battery discharge, sulfation, and freezing.
3. Store battery in a cool, dry place out of direct sunlight.



Electrical Components - Continued

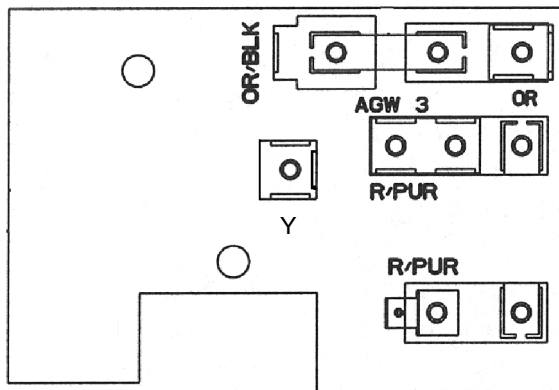
Electrical Connections

Apply Nyogel™ grease to battery posts and exposed cable connections.

Inspect electrical box for moisture, check wire sealing grommets, and apply Nyogel™ grease to terminal board connections.

Nyogel™ Grease
PN 2871329

Terminal Board

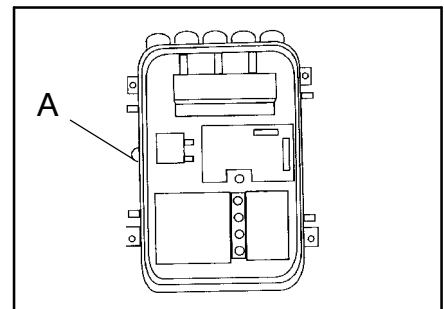


Circuit Breaker - Carbureted Models

The electrical system is protected with a 15A circuit breaker. In order to reset the circuit breaker, locate and push the reset button (A) on top of the electrical box.

Fuses

Located between the ORANGE terminal posts and ORANGE/BLK terminal post is a 3 AMP fuse. The fuse protects the bilge pump and should be checked if the the bilge pump does not turn on when the engine is running.





Electrical Components - Continued

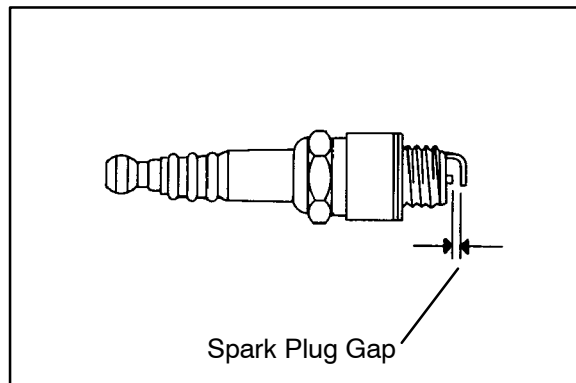
Spark Plugs

1. Disconnect high tension leads and remove spark plugs.
2. Inspect electrodes for wear, carbon buildup, or fouling (wet oily residue). Replace plugs if edges of electrodes are rounded or eroded.

CAUTION:

Severe engine damage may occur if the incorrect spark plug is used. Refer to spark plug gap chart in this page for spark plug type.

3. Clean with electrical contact cleaner or a glass bead spark plug cleaner only. A wire brush or coated abrasive should not be used.
4. Measure gap with a wire gauge and refer to specifications. Adjust if necessary by bending the side electrode carefully.
5. Coat spark plug threads with a small amount of anti-seize compound.
6. Install spark plug and torque to 18ft.lbs.
7. Make sure spark plug caps are screwed completely onto end of plug wire.
8. Apply a small amount of Nyogel™ grease to inside of plug caps and install.
9. Push cap onto plug until cap “snaps” into place.



Spark Plug Gap

2002 777Engine: NGK BR9ES

Gap: .024 - .028 in. (.6 - .7mm)

Nyogel™ Grease
PN 2871329

⚠ WARNING

Use only RESISTOR TYPE spark plugs.

Ignition Timing Specifications

Refer to Electrical Section for ignition timing adjustment procedure and timing chart.





Engine

Engine Mounts

Check tightness of all engine mounts including bolts that secure mounting plate to engine. Inspect rubber mounts for cracks. Tighten or replace if necessary. Always replace engine mounts when engine is removed for service.

Compression Test

A compression test is a good indicator of engine condition. For accurate readings, use a high quality gauge and make sure the battery is in good condition and fully charged.

Compression Gauge
PN 2870852

WARNING

The spark plug high tension leads must be securely grounded to the engine block to prevent a spark which may ignite fuel or fumes, causing a fire or explosion. Some models are manufactured with grounding posts mounted to the pop-off valve / thermostat housing. Attach spark plug wires to grounding posts whenever possible.

1. Remove all spark plug high tension leads and connect securely to ground on engine block.
2. Remove all spark plugs and install compression gauge in cylinder to be tested.
3. Using the starter motor, turn engine over with throttle wide open until a maximum reading is obtained (approximately 3-5 seconds). Record reading.
4. Repeat for the other cylinders and compare to each other cylinder. All readings must be within 5% of each other.



Compression (Open Throttle at Sea Level)

Standard -120-150 lbs./sq. in
8.40-10.5 kg/sq. cm

Service Limit - Greater than 5%
variance between cylinders.



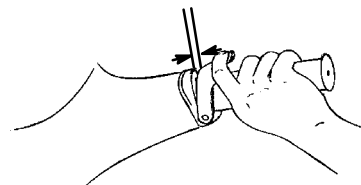
Engine - Continued

Throttle / Choke Cable Inspection

1. Check for smooth throttle opening and closing in all handlebar positions. Throttle operation should be smooth and lever must return freely without binding.
2. Inspect cable for proper routing, kinks, or damage.
3. Inspect both ends of cable and replace if frayed, kinked or damaged.

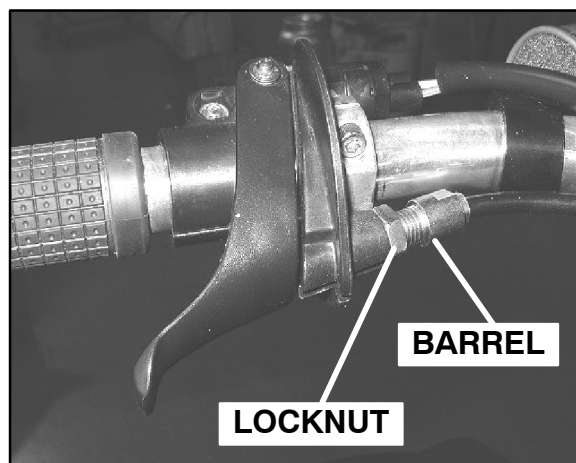
Throttle Lever Freeplay
.020 - .060" (.5 - 1.5 mm)

Throttle Lever Free Play



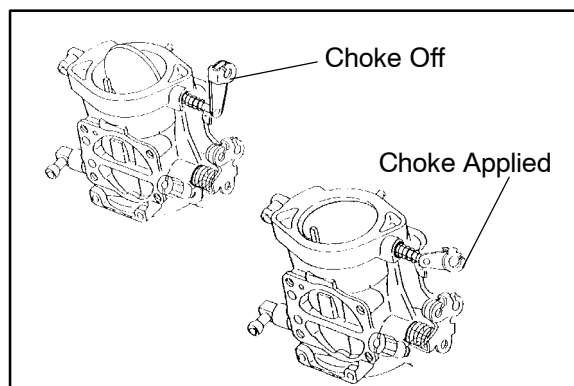
Throttle Cable Adjustment

1. Throttle cable adjustment determines the throttle lever freeplay. Always adjust throttle cable to obtain the correct throttle lever freeplay.
2. To adjust, loosen the locknut on the upper throttle cable adjuster. Turn the barrel clockwise or counter-clockwise to either loosen or tighten the throttle cable until the specified throttle lever freeplay is achieved.
3. Tighten nuts securely and re-check lever free play. Turn bars from full left to full right through entire range of motion and verify that at least the minimum lever play is present in all handlebar positions. Be sure cable is routed properly through the handlebar pad and down the steering post.



Choke Cable Adjustment

1. Locate the choke cable mount on the carburetor.
2. Pull choke knob out to completely close the choke plates. If choke plates do not completely close, loosen the locknut at the carburetor-choke cable boss. Turn the choke cable barrel clockwise or counter-clockwise to either loosen or tighten the choke cable. Correct adjustment is achieved when the choke plates completely close when the choke knob is pulled out.





Gasoline Safety

WARNING

Gasoline is highly flammable and explosive under certain conditions.

- ◆ Always exercise extreme caution whenever handling gasoline.
- ◆ Always refuel with the engine stopped and 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 over fill the tank. (Do not fill the tank neck.)
- ◆ If you get gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.
- ◆ Never start the engine or let it run in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.
- ◆ Shut off fuel valve (if applicable) whenever the watercraft is stored, parked, or transported.

Fuel Lines / Vent Lines

1. Check fuel lines and vent lines for signs of wear, deterioration, damage or leakage. Replace if necessary. Ensure that clamps are tight.
2. Be sure all lines are routed properly and secured with cable ties away from any moving parts.

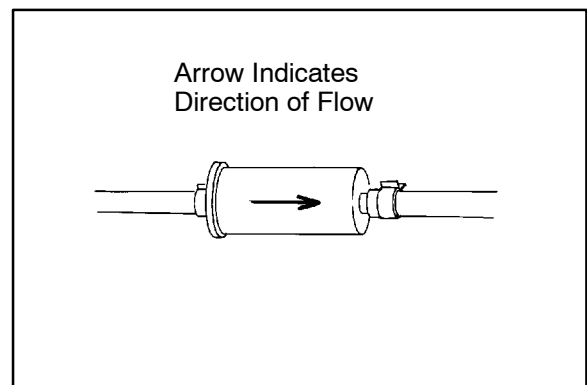
CAUTION:

Make sure lines are not kinked or pinched.

Fuel Filter

The fuel filter should be replaced annually or whenever sediment is visible in the filter.

1. Loosen line clamps at both ends of filter.
2. Remove fuel lines from filter.
3. Install new filter with arrow pointed in direction of fuel flow.
4. Re-install and tighten clamps on fuel line.
5. Start engine and inspect for leaks.



CAUTION:

Never operate the engine for more than 15 seconds without cooling water. Severe engine damage may occur from overheating.



Carburetor Adjustments

CAUTION:

DO NOT attempt to perform carburetor adjustments with the engine attached to a flush kit or inaccurate adjustment will result. Low speed mixture screw adjustments should only be performed in a test tank or in the water while secured to a trailer or dock. See carburetion section before making any adjustments to the mixture screws.

Idle Speed

The Octane does not have an idle adjustment screw, therefore idle adjustments cannot be performed.

WARNING: Never adjust the throttle cable to obtain idle speed. Always adjust the throttle cable as described under the throttle cable adjustment procedures in this chapter. If the throttle cable is adjusted without any slack, turning the handlebars to the left may increase engine speed abruptly which can cause loss of vehicle control resulting in severe injury or death.

Carburetor Air Intake

1. Remove gear clamps, and remove each air intake. Cover carburetor with a clean shop towel to prevent foreign material from entering.
2. Clean element with high flash point solvent, followed by hot soapy water.
3. Rinse in clear water and dry thoroughly using low pressure air.

CAUTION:

Wear safety glasses when using compressed air to avoid injury to eyes.

4. Reinstall air intakes and tighten clamps securely.





Off Season Storage Procedures

When the craft will not be operated for periods greater than 30 days, the following maintenance items should be performed:

- Fuel System Storage
- Flush Engine
- Fog Engine
- Drain Engine/Freeze Protection
- Corrosion Protection
- Battery Storage
- Complete Lubrication
- Cleaning Hull Interior and Exterior

Engine Draining

Engine draining is automatic. You will, however, need to make sure the exhaust system is drained. To do so, start and briefly rev up engine. This will remove enough water from the exhaust system to prevent any damage from freezing. For off season storage, remove water hose going to exhaust manifold to allow engine to drain completely.

Fuel System Storage

Top off the fuel tank with fresh fuel and add fuel conditioner/stabilizer. It is recommended that the craft be operated for approximately 10-15 minutes after stabilizing fuel to ensure treated fuel reaches the entire fuel system and all components. Follow the directions on the container for recommended amount to add for long term storage. On models equipped with a fuel/water separator, drain any water present in the bowl before storage.

**Polaris Premium Carbon Clean
Fuel System Additive
PN 2871326**

NOTE: Using a fuel stabilizer and topping off the fuel tank eliminates the need to drain the fuel system.

If you prefer to drain the fuel tank, refer to fuel handling warnings on page 2.13 and use the following procedure:

1. Drain fuel tank with a siphon or pump.
2. Leave fuel cap loose to prevent condensation from forming in fuel tank.



Engine Fogging Procedure

CAUTION:

Failure to perform the following preventive maintenance can result in serious engine corrosion during off season storage. In order to prevent rust and corrosion on internal engine parts (i.e. crankshaft, bearings, pistons, rings cylinder walls), Polaris highly recommends the regular use of Polaris fogging oil. The engine should be fogged daily when operated in salt water.

**Polaris Premium Fogging Oil and
Corrosion Inhibitor**
PN 2870791

When properly applied, fogging oil coats all internal engine parts for prevention of rust and corrosion, which in turn will extend the service life of the engine.

1. Remove air intake cover and filter.
2. Start the engine and spray Polaris fogging oil towards each carburetor throat to ensure that all internal parts are properly coated. Spray fogging oil for two to three seconds in each carburetor throat and repeat until the engine is flooded with fogging oil. Then stop the engine immediately.
3. Reinstall air filter and air intake cover. Torque bolts to proper specification. See Chapter 3, Engines.

CAUTION:

Never operate the engine for more than 15 seconds while the watercraft is out of the water. Overheating of engine and drive line components will result.





Storage / Exterior Care - Continued

Cleaning

1. Clean bilge and engine area with hot water and mild detergent (such as dish soap) or with bilge cleaner. Rinse and dry thoroughly. Wipe up remaining water with clean, dry shop cloths. Do not use abrasive cleaners. Spray all external metal surfaces with Silicone Spray. Coat all surfaces inside the engine compartment with Silicone Spray or a non-flammable protectant. Do not use petroleum based protectants or lubricants in the engine compartment, as most are flammable and also may deteriorate rubber components. Store watercraft with engine cove removed to inhibit condensation from forming in engine compartment.
2. Wash exterior of watercraft with fresh water and a mild detergent. Rinse thoroughly.
3. Inspect and thoroughly clean jet pump intake, outlet, and impeller area.
4. Inspect entire deck and hull area for damage. Inspect rub rails to be sure they are fastened securely.

WARNING: Never spray water into carburetor intake, or hull intake ports.

**T-9 Metal Protectant
PN 2871064**

**Silicone Spray
Non-Flammable For Use Inside
the Engine Compartment
(Available Commercially)**

CAUTION:

Never clean the watercraft with strong detergents, abrasives, de-greasers, paint thinner, acetone, window cleaners, ammonia or products containing alcohol. They can damage finishes, decals, vinyl, and plastics, and can accelerate UV breakdown which could cause color change and premature deterioration of parts.

5. After cleaning, protect and shine watercraft using a regular furniture polish or non-abrasive silicone wax.
6. Cover watercraft with a Polaris cover and store in a clean, dry place. Do not use plastic or coated materials as condensation and corrosion may occur.

Fire Extinguisher

1. Remove and inspect fire extinguisher condition and state of charge. Replace if necessary.



Final Drive / Propulsion

Cooling Water Pickup Hoses

Inspect the elbow nozzles in the pump stationary nozzle for debris and clean if necessary.

Fasteners

Inspect all fasteners in the pump area and make sure they are tight. These include the steering nozzle mounting bolts, steering cable bolt, trim nozzle mounting bolts (where applicable), and all reverse mechanism fasteners (where applicable). Inspect pump mounting nuts. Refer to specific torque values listed in the General Information section or Final Drive/Jet Pump section.

Scoop / Ride Plate / Intake Grate

Verify fastener torque on the scoop, ride plate, and intake grate. Inspect all components for damage. Even a small leak will ventilate the pump area, creating cavitation of the pump and reducing performance. If a leak is evident, remove the scoop and re-seal.

Impeller Clearance

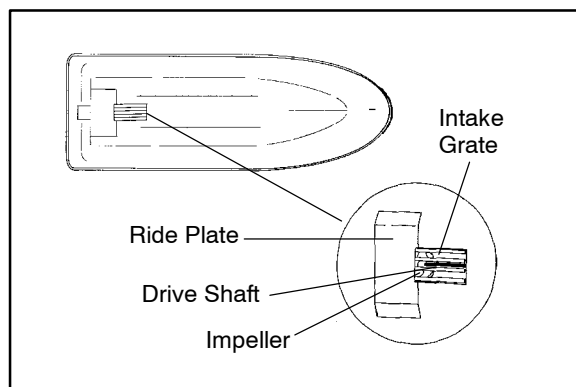
WARNING

Be sure the lanyard cord and lock plate are removed from the engine stop switch to kill the ignition or severe injury could result.

1. Remove intake grate.
2. Use a feeler gauge to measure impeller clearance along each blade in three spots. If measurement exceeds service limit, replace impeller. If clearance is excessive with a new impeller, the pump housing must be replaced.

Impeller Clearance

Standard .002-.008" (.05-.20 mm)
Service Limit .020" (.5 mm)



Pump Housing Inspection

Inspect pump housing for excessive wear, cracks, or deep gouges. Replace if necessary.

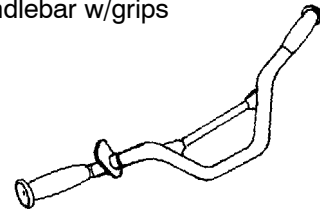


Hull / Control Systems

Handlebars/Hand Grips

1. Pull and twist on hand grips to ensure they are not loose. If loose or worn, the grips should be replaced.
2. Check steering support hub fasteners and make sure they are tight. Check handlebars and hub for cracks or damage. Replace if cracked or damaged.
3. Inspect steering arm bolt torque.

Handlebar w/grips

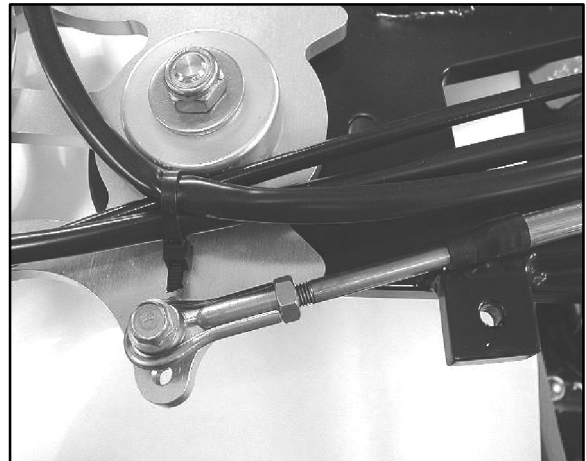


Steering Cable Inspection

1. Check handlebars for free movement throughout their full range. Visually inspect steering control cable for damage. Check cable ends for damage.

NOTE: There are three (3) steering cable mounting positions located on the steering rack ear. The stock position is in the center position. Changing the position to the inside (lower ratio) or outside (higher ratio) holes will change the steering ratio.

- Lower Ratio: Full left and right-turn movement of handlebar is required to turn steering nozzle.
 - Higher Ratio: Less left and right-turn movement of handlebar is required to turn steering nozzle.
2. Make sure cable is routed and secured properly. Inspect fasteners at ends of cable and re-torque. Inspect steering nozzle bolts and bushings for wear.

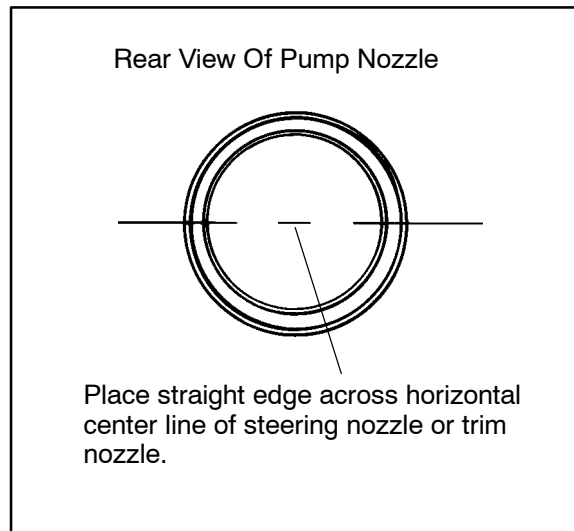




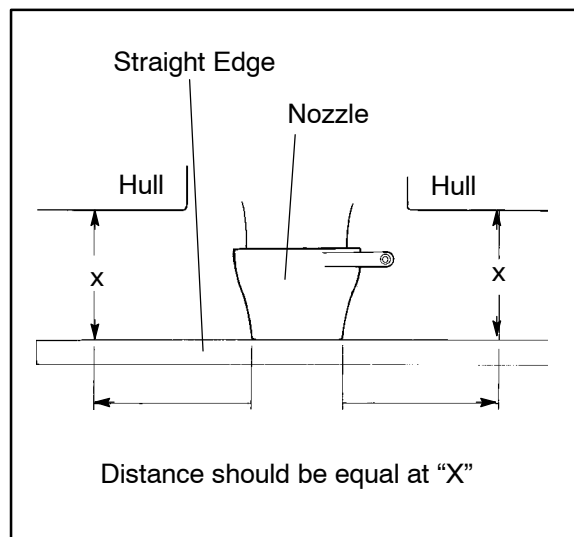
Hull / Control Systems - Continued

Steering Cable Adjustment

1. Remove handlepole pad to access steering assembly.
2. Place a straight edge across horizontal center line of steering nozzle.



3. Measure distance from straight edge to hull on left and right side. Be sure to measure at right angles to the straight edge and at equal distances from the nozzle. The distance at "X" should be equal when handlebars are straight.





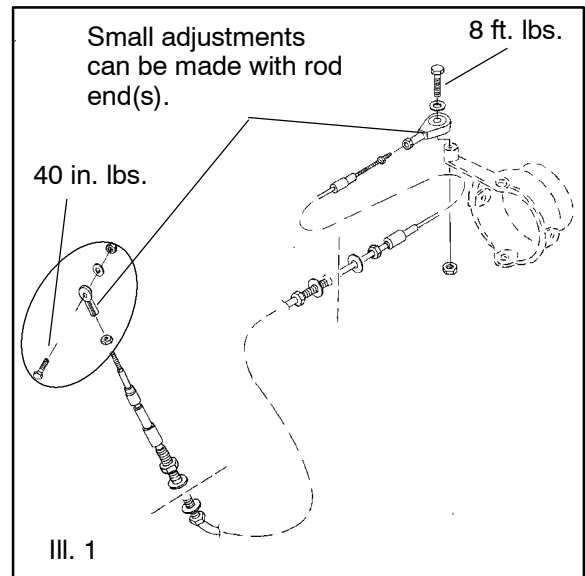
Hull / Control Systems - Continued

Steering Cable Adjustment Procedure

1. Minor adjustments can be made using the steering cable rod end(s). Loosen jam nut on rod end(s). Remove end from steering nozzle. Turn rod end in or out to adjust. Reinstall rod end, apply Loctite 242 (Blue) and tighten bolt to specifications. See III. 1.

CAUTION:

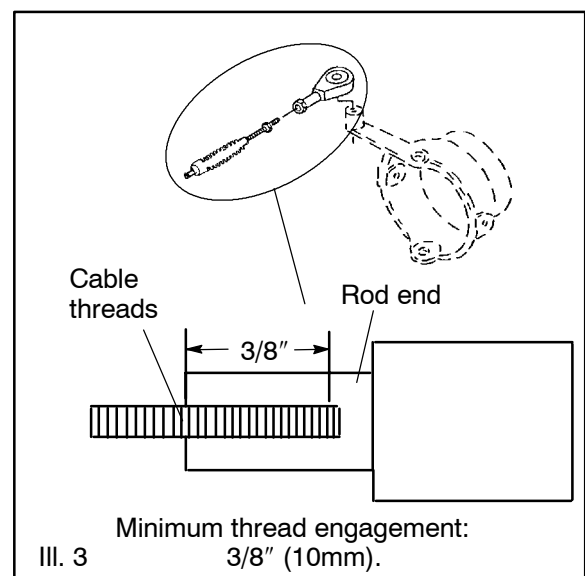
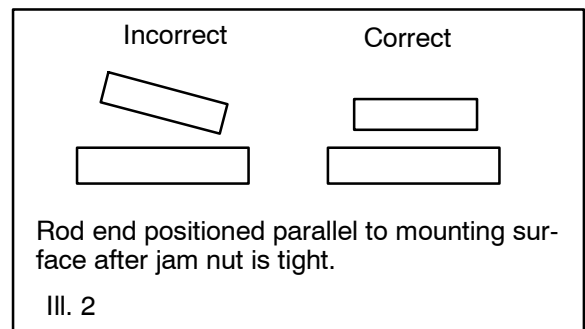
The cable must be threaded into the rod end a *minimum* of 3/8" (10mm). Do not attempt major adjustments with the rod ends.



2. Apply Loctite 242 (Blue) to threads of cable and

3. Securely tighten jam nut with rod end positioned parallel to mounting surface. See III. 2 and 3.

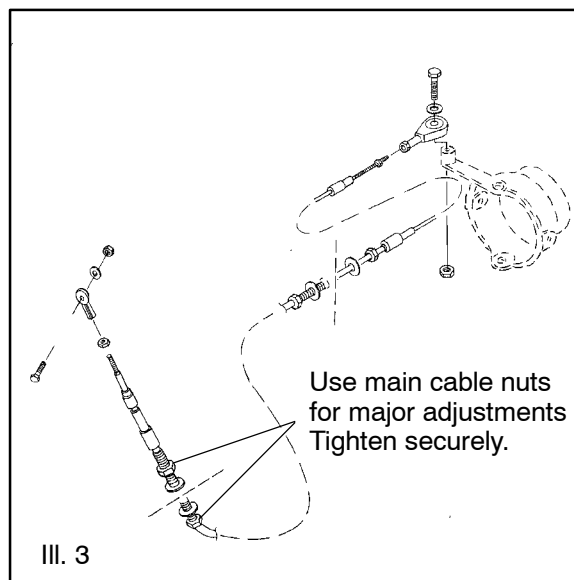
Loctite™ 242
PN 2871950





Adjustment Procedure - Continued

4. Use main cable adjuster nuts to make major adjustments. Adjuster nuts are located at forward end of cable near steering assembly. See III. 3.
5. Using two 11/16" open end wrenches, hold one nut and loosen the other. Lengthen or shorten cable to adjust nozzle centering. Tighten cable nuts securely after adjustment is complete.
6. Turn handlebars to left and right through entire steering range. The bars should move freely and smoothly without binding. If resistance or binding is evident check rod end positioning, cable condition, and routing to locate and correct the cause.





POLARIS®
WATERCRAFT

Chapter 3 / Engine and Cooling

2002 Octane Engine Specifications	3.1
Engine Torque Specifications	3.2
Engine Torque Sequences	3.3
Engine Removal and Installation	3.4
Cylinder Cover / Head Assembly	3.5
Flywheel Housing / Magneto Assembly	3.6
Cylinder / Base Gasket Assembly	3.7
Piston Assembly	3.8
Engine Mounting	3.9
Crankcase Assembly	3.10
Crankshaft Assembly	3.11
Engine Inspection Specifications and Procedures	3.12 – 3.19
Cooling System Overview	3.20

3



2002 Octane Engine Specifications

Engine Model Number	W77-DCSP-01
Cylinder Displacement (cc)	777cc
Bore Inches / (mm)	3.307 in. (84mm)
Stroke	2.756 in. (70mm)
Cylinder Head Volume (Uninstalled)	47.2cc
Cylinder Head Volume (Installed)	37.72cc
Piston-To-Cylinder Clearance Inches (mm)	.0068 ± .0006 in. (Production Tolerance)
Ring End Gap Inches (mm)	.019 ± .003 in.
Maximum Horsepower	100
Maximum Torque	N/A
Oil Requirement	Polaris TC-W3
RPM Limiter	7500 RPM
Compression (Sea Level)	120 - 150 lbs./sq.in. (8.40 - 10.5 kg/sq. in.) No greater than 5% between cylinders.

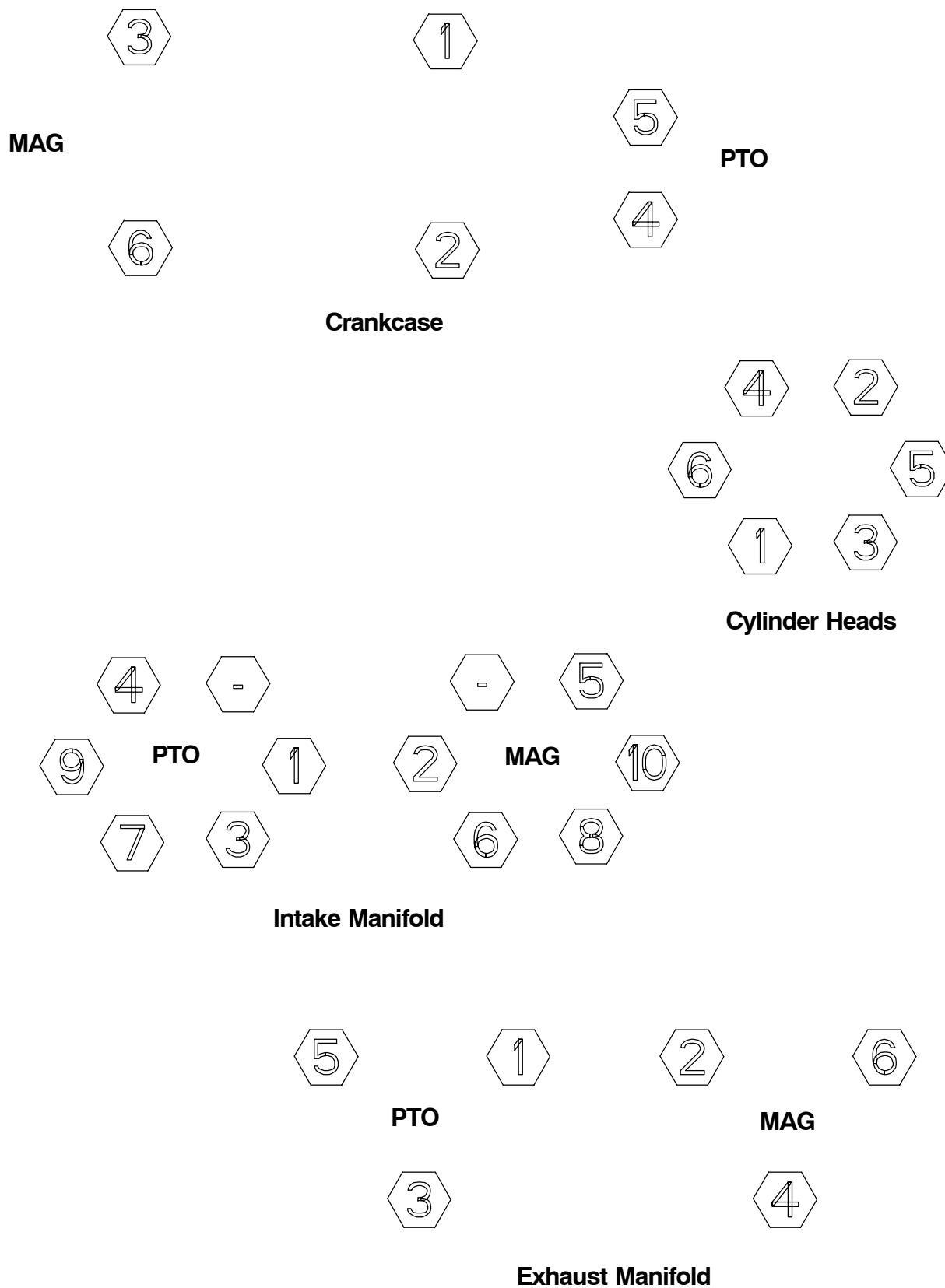
**2002 Octane Engine Torque Specifications**

Engine Fasteners	Foot lbs.	Nm	Apply:
Air Intake Cover Screws / Carburetor Mounting Bolts	9ft. lbs.	12 Nm	N/A
Air Intake Manifold Mounting Bolts	9ft. lbs.	12 Nm	N/A
Water Outlet Hose Bolts (Mounted to cyl. head covers.)	9ft. lbs.	12 Nm	N/A
Spark Plugs	18ft. lbs.	24 Nm	AS
Cylinder Head Cover Bolts	22ft. lbs.	30 Nm	N/A
Cylinder Head Bolts	20ft. lbs.	27 Nm	Loctite 242
Cylinder Base Nuts	32ft. lbs.	43 Nm	N/A
Exhaust Manifold Bolts	26ft. lbs.	36 Nm	N/A
Starter Mounting Bolts	9ft. lbs.	12 Nm	N/A
Flywheel Inspection Plug	8ft. lbs.	11 Nm	Loctite Pipe Sealant
Stator Housing Mounting Bolts	22ft. lbs.	30 Nm	N/A
Stator Harness Bracket Bolt	9ft. lbs.	12 Nm	N/A
Stator Mounting Bolts	9ft. lbs.	12 Nm	Loctite 262
Flywheel Nut	80-100ft. lbs.	108-136 Nm	Loctite 242 Coat entire inside surface of flywheel taper with 262.
Flywheel Cover Bolts	9ft. lbs.	12 Nm	N/A
Oil Pump Location Cover Bolts	5ft. lbs.	7 Nm	N/A
Crankcase Bolts 8mm 10mm	22ft. lbs. 28ft. lbs.	30 Nm 38 Nm	Loctite 242 Loctite 242
Mounting Plates to Engine Bolts	50ft. lbs.	68 Nm	Loctite 262
Mounting Plates to Hull Bolts	14ft. lbs.	19 Nm	Loctite 262





2002 Octane Torque Sequences





Engine Removal and Installation

Engine Removal

- Disconnect the negative (-), then positive (+) battery cables from the battery.
- Remove the water inlet and outlet hoses from the engine and exhaust pipe(s).
- Disconnect the throttle and choke cable from the throttle body.
- Disconnect the engine ground straps, and starter motor leads.
- Disconnect the wiring harness from the engine sensors and components. Label connections for reassembly.
- Depending on the model, it may be necessary to remove the throttle bodies, carburetors prior to engine removal. If the carburetors/throttle bodies are removed, tape off the intake manifold openings.
- Always use the help of an assistant or an engine hoist when removing the engine from the engine bay.

Engine Installation

Engine installation is done in reverse order of the removal instructions. A few important tips are listed below to ensure long and trouble free service.

- Verify prior to installing engine that the cooling hoses and ground wires are properly routed through the hull. Do not allow any wires or hoses to get pinched between the hull and engine mount straps.
- Reference the appropriate chapter in routing the steering cables and throttle cables.
- The first tank of fuel for carbureted models should be pre-mixed with Polaris 2 cycle engine oil at a 32:1 ratio.

NOTE: The Octane does not feature an oil pump.

WARNING

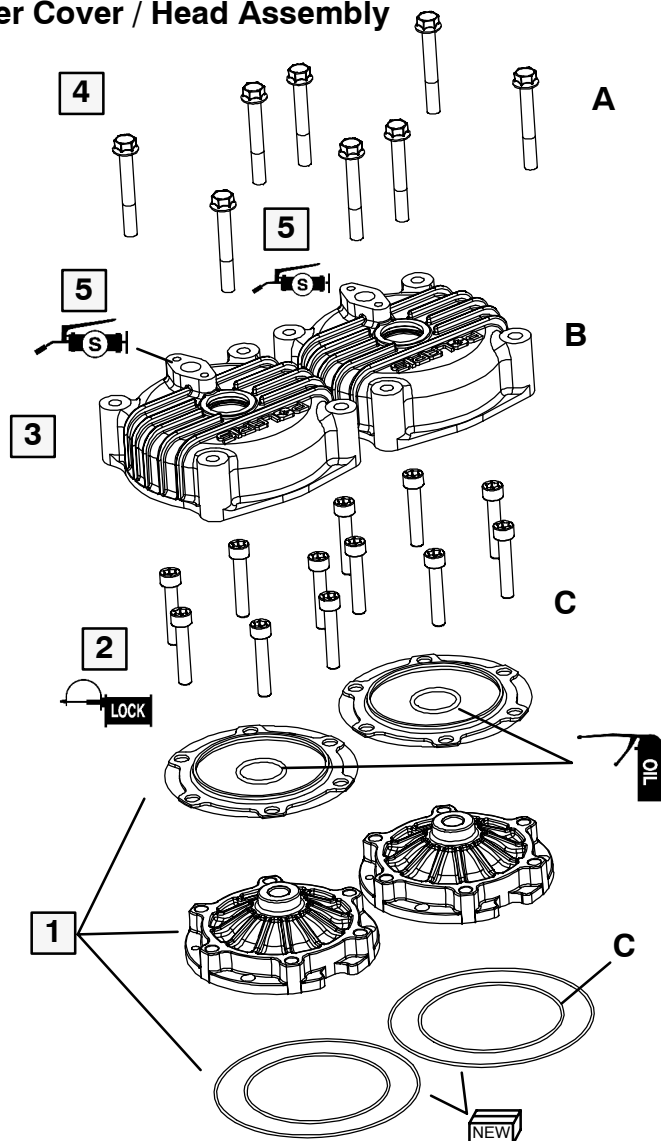
Do not install the battery ground (-) cable until all other fuel and electrical connections are done. Electrolyte or fuel vapors may be present in the engine compartment and a spark could ignite them, resulting in personal injury.

CAUTION:

Shims used for engine and driveshaft alignment must be reinstalled in their original locations. Do not allow them to be mixed up. Always verify proper engine to pump alignment after engine installation as outlined in the Jet Pump, Final Drive, Bilge section. In most cases, the number of shims used in production is marked in permanent marker next to each engine mount. The same number must be installed as a starting point, and in most cases adjustment will not be necessary. Always verify proper engine alignment before installing pump.



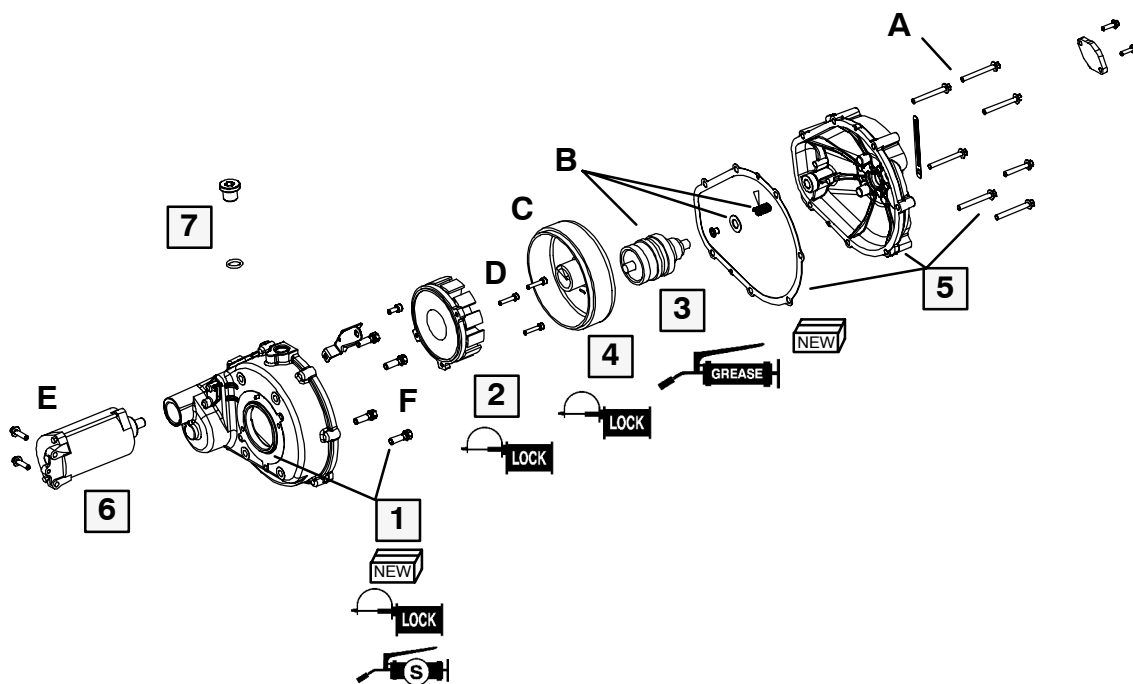
2002 Octane Cylinder Cover / Head Assembly



Disassembly Procedure	Notes
A Remove head cover bolts, and cooling hoses from cylinder head covers.	Clean threads of any threadlocking agent. Discard old gaskets.
B Remove cylinder head covers.	Discard o-rings from spark plug holes.
C Remove cylinder head bolts, cylinder head braces, and cylinder heads.	Discard o-rings. Clean threads of any threadlocking agent.
Assembly Procedure	Notes
1 Install new o-rings on cylinder. Install cylinder head, and cylinder braces.	Apply light film of two-stroke oil to o-ring. Verify that (EX) stamped on cylinder head faces exhaust-side of engine.
2 Tighten cylinder head bolts using torque sequence on page 3.3.	20 ft.lbs. (27Nm) Apply Loctite™ 242 to threads.
3 Install new cylinder head cover o-rings.	Apply light film of two-stroke engine oil to o-rings.
4 Install cylinder head cover bolts.	Torque bolts to 22 ft.lbs. (30Nm)
5 Install new water outlet gaskets and water outlet hoses.	Torque bolts to 9 ft.lbs. (12Nm) Apply marine-grade silicone to mating surfaces.



2002 Octane Flywheel Housing / Magneto Assembly

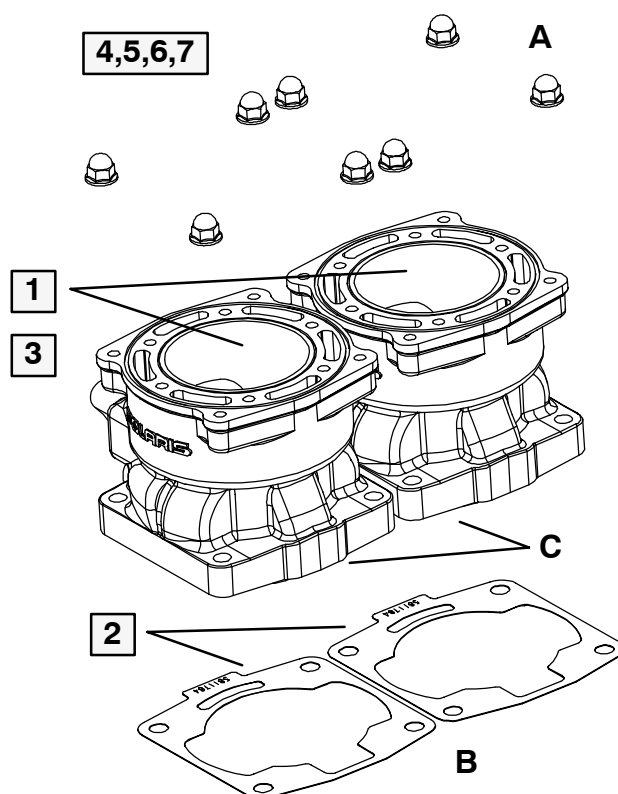


Disassembly Procedures	Notes
A Remove housing cover bolts.	Discard gasket. Verify bendix bushing and return spring are working correctly. Replace if worn.
B Remove starter bendix.	Note the number and placement of washers for assembly.
C Remove flywheel.	Install flywheel puller. Do not engage puller bolts more than 3/8" into flywheel.
D Loosen Allen™ bolts and remove stator from housing.	
E Carefully remove starter from flywheel housing..	
F Loosen four (4) flywheel housing bolts. Remove flywheel housing from engine.	Use gasket scraper to remove ALL gasket material from both crankcase and housing.
Assembly Procedures	Notes
1 Using a new housing seal, install the flywheel housing to the crankcase using three (3) bolts. The last bolt is installed after the stator is installed.	Always use new seals. Apply light film of marine-grade silicone to all non-painted surfaces on housing and crankcase. PN8560054. Tighten bolts to 22 ft.lbs. (30 Nm) Apply Loctite™ 242 to threads.
2 Install stator.	Tighten bolts to 9 ft.lbs. (12 Nm) Apply Loctite™ 242 to threads. Install last housing bolt along with harness guard. Tighten bolt to 22 ft.lbs. (30 Nm) Apply Loctite™ 242 to threads.
3 Install starter bendix.	Apply starter grease to teeth and shafts. Insert washers in quantity and position as noted in disassembly.
4 Install flywheel.	Torque: 80 - 100 ft.lbs. (108 - 136 Nm) Apply Loctite™ 242 to threads. Apply Loctite™ 262 to inner flywheel taper and crankshaft.
5 Insert new gasket, and install flywheel housing cover.	Always use new gasket. Torque bolts to 9 ft.lbs. (12 Nm) Apply Loctite™ 242 to threads. Verify oil pump cover is installed. Torque bolts to 5 ft.lbs. (7 Nm)
6 Install starter motor.	Torque bolts to 9 ft. lbs. (12 Nm)
7 Verify inspection plug is installed.	Torque to 8 ft. lbs. (11 Nm)





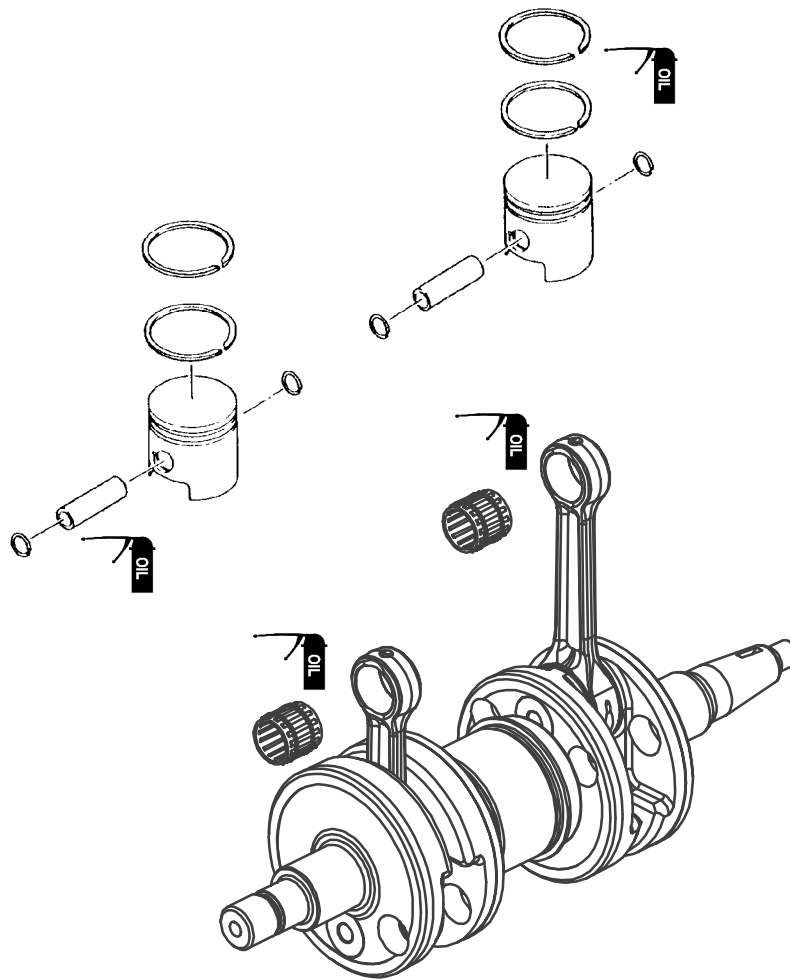
2002 Octane Cylinder / Base Gasket Assembly



Disassembly Procedure	Notes
A Loosen and remove cylinder base nuts, and remove cylinders.	
B Remove cylinder base gaskets from engine case.	Use gasket scraper to thoroughly remove ALL gasket material.
C Remove any sealant from base of cylinders.	
Assembly Procedure	Notes
1 If using original cylinders, lightly surface hone cylinder walls prior to installation.	Reference pages 3.16 and 3.17.
2 Install new cylinder base gaskets.	Open end faces intake-side.
3 Compress piston rings and carefully install cylinders.	Verify piston rings are properly seated in the ring lands. Ring locating pins face INTAKE -SIDE.
4 Loosely install cylinder base nuts.	
5 Loosely install exhaust manifold.	Manifold aides cylinder alignment during torque sequence.
6 Tighten accessible cylinder base nuts.	Torque nuts to 32 ft.lbs. (43Nm)
7 Remove exhaust manifold. Tighten remaining bolts.	Torque nuts to 32 ft.lbs. (43Nm)



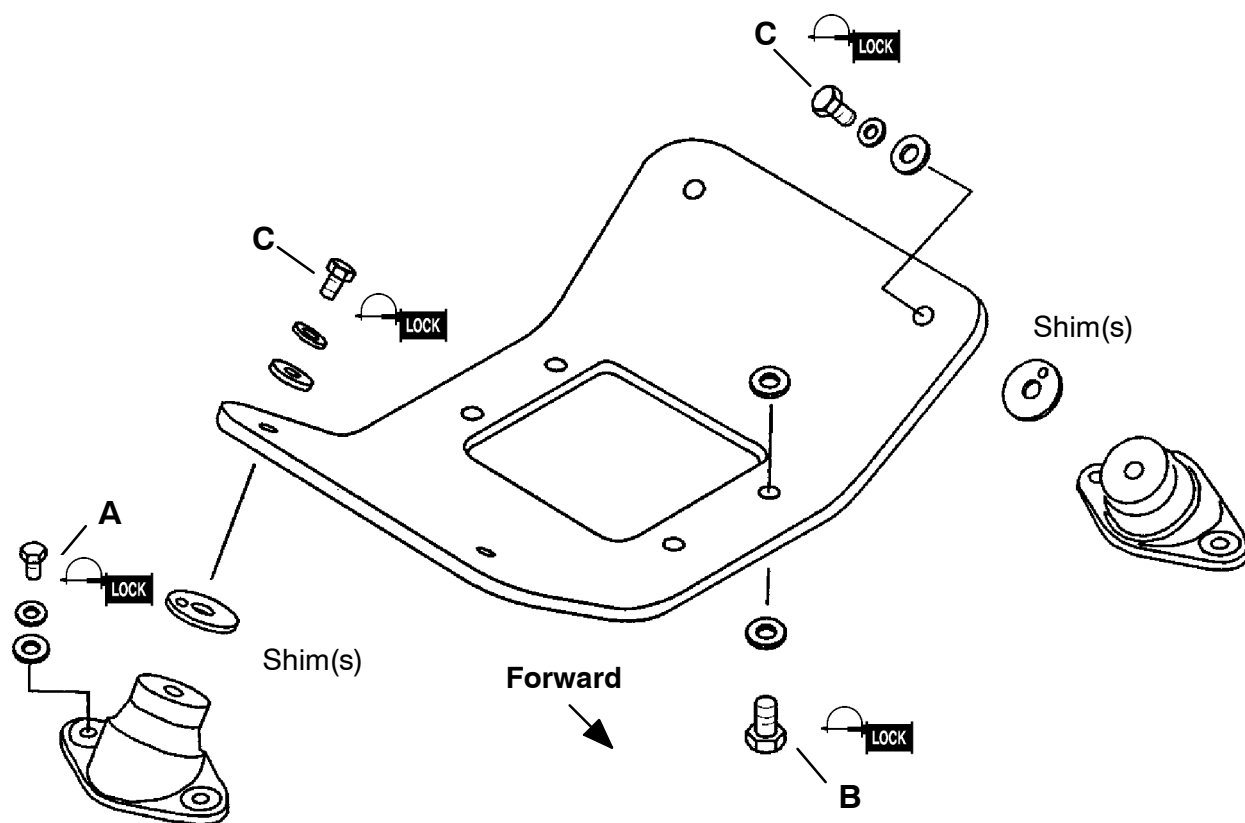
2002 Octane Piston Assembly



Disassembly Procedure	Notes
A Wearing appropriate eye protection, remove the c-clips from pistons.	NEVER re-use c-clips.
B Remove pins from pistons.	Use piston pin puller: PN PU-45255 w/ PU-45248.
C Remove pistons from connecting rods.	
D Remove rings from pistons and discard.	
Reference inspection procedures on page prior to assembly.	
Assembly Procedure	Notes
1 Install small-end needle bearings in connecting rods.	Liberally lubricate the bearing rollers and small-end.
2 Engage the piston pin in one end of the piston.	Liberally lubricate the piston pin.
3 Install a c-clip on the opposite end of the installed pin.	Use c-clip installation tool: PN 2870773. Always wear eye protection. Position c-clip opening towards the top of the piston.
4 Install new rings.	Lubricate rings with oil prior to installation. Verify ring end gaps engage around tabs.
5 Install each piston.	Verify arrow on top of piston faces the exhaust-side. Push pin through piston and small-end bearing. Following procedure from step 3, install the second c-clip.



2002 Octane Engine Mounting



Engine Mount Plate Torque Specifications

A 14 ft.lbs. (19 Nm) Apply Loctite™ 262 to threads.

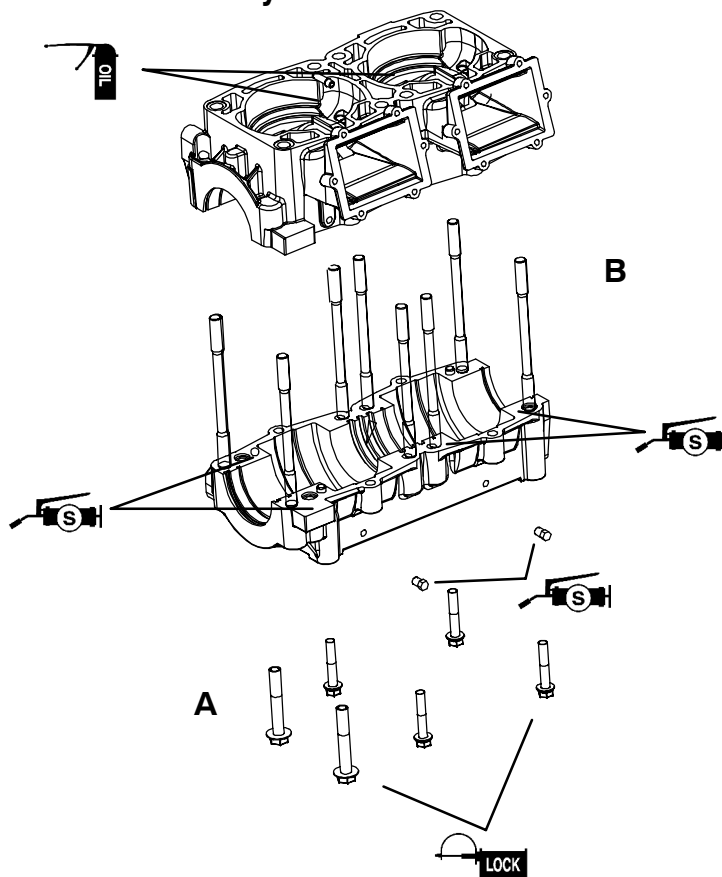
B 50 ft.lbs. (68 Nm) Apply Loctite™ 262 to threads.

C 45 ft.lbs. (61 Nm) Apply Loctite™ 262 to threads.

When removing engine mount plate, note the number and locations of any mount shims that may have been installed. If not done so already, use a marker pen to write the number next to the mount.



2002 Octane Crankcase Assembly

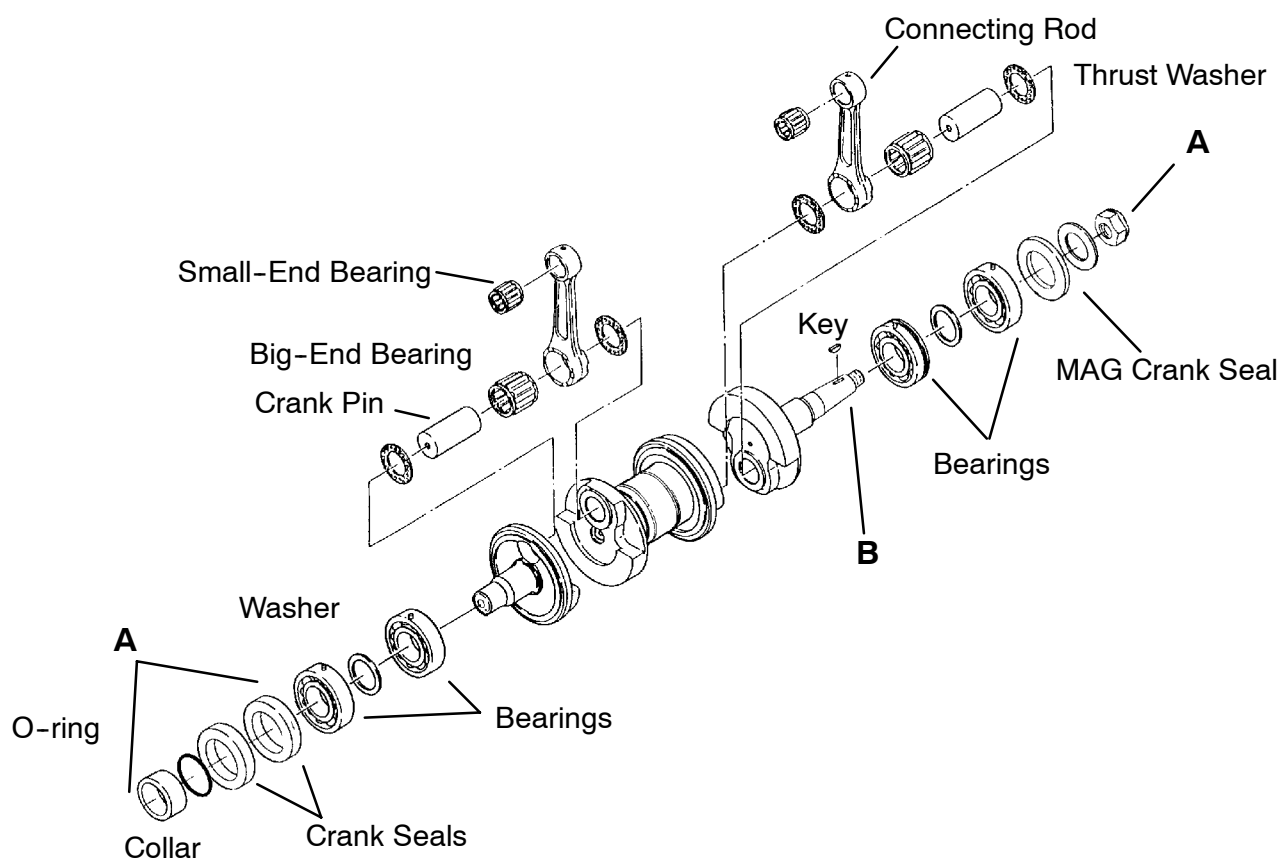


Disassembly Procedure	Notes
A Remove crankcase bolts from bottom of case.	Clean Threadlock from threads.
B Split crankcase halves.	Use gasket scraper to thoroughly remove ALL gasket material.
C Remove crankshaft from lower case.	Clean case halves thoroughly of any foreign material or oil.
Assembly Procedure	Notes
1 Verify that casehalves are clean and free from any old gasket material.	
2 Clean seal, clip, and bearing recesses.	
3 Install crankshaft in lower casehalf.	Verify that all seals, clips, and bearings fit into their appropriate recesses. Crankshaft should rotate freely once set into case.
4 Apply bead of Loctite™ 5699 to mating surfaces of lower and upper crankcases.	Verify that sealant covers entire mating surface between both case-halves. Loctite™ 5699: PN2871849.
5 Install crankcase bolts.	Apply Loctite™ 242 to bolt threads. Install and torque bolts before case sealant dries. Torque bolts using pattern on page 3.2. 8mm Bolt Torque: 22 ft.lbs. (30 Nm) 10mm Bolt Torque: 28 ft.lbs. (38 Nm)
6 Turn crankcase over. Locate main bearing oil holes in upper case and lubricate main bearings with Polaris tow-cycle oil.	Clean cylinder mating surfaces. Verify that case drain plugs are installed with marine-grade silicone and tight.





2002 Octane Crankshaft Assembly



Disassembly Procedure	Notes
A Remove PTO collar, O-ring, and both seals.	Discard O-ring and both seals. Inspect collar for wear. Replace collar if severely worn.
B Clean crankshaft assembly.	Reference crankshaft inspection procedures on pages 3.12 - 3.19.
Assembly Procedure	Notes
1 Install new PTO O-ring and collar on crankshaft.	Lubricate O-ring and collar with Polaris two-stroke oil.
2 Obtain two, new crankshaft seals. Install first seal with ribs towards bearings. Install second seal with ribs facing outward.	During seal installation, do not allow seal lips to bend. Verify that lips are sealed to crankshaft.
3 Prepare crankshaft for installation by cleaning the assembly of any foreign material.	



Engine Inspection

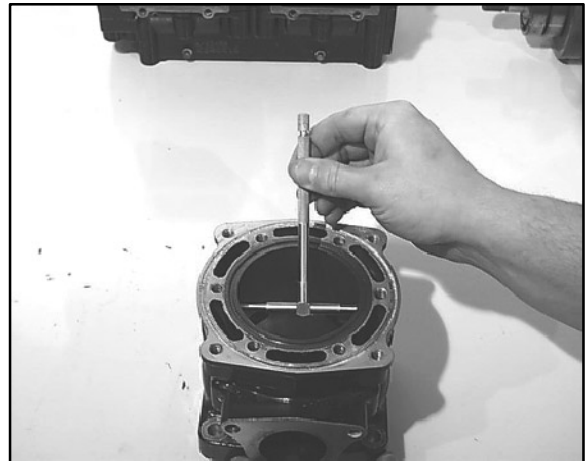
1. Check each cylinder head for warping as shown. Replace cylinder head if warp exceeds service limit.

**Cylinder Head Warp
Service Limit
.003" (.08mm)**

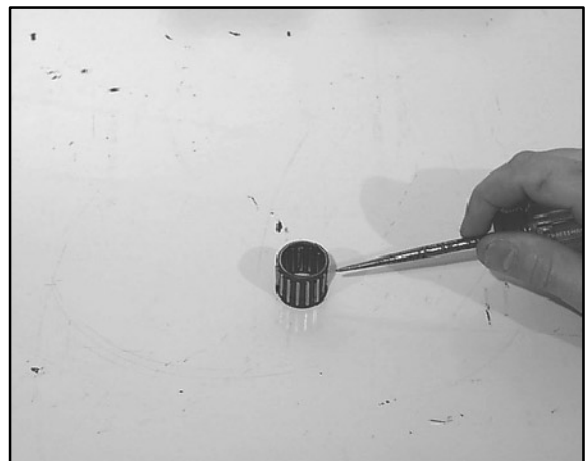


2. Inspect each cylinder for wear, scratches, or damage. If no damage is evident, measure cylinder for taper and out of round with a telescoping gauge and micrometer or a dial bore gauge. Measure bore 1/2" down from top of cylinder in two directions - in line with piston pin and 90° to the pin to determine if bore is out of round. Repeat measurements at bottom of cylinder to determine taper or out of round at the bottom. Record all measurements.

NOTE: If cylinders are worn or damaged refer to page 3.16-3.17 for boring/honing and port chamfer information.



3. Clean needle bearing in solvent and dry with compressed air.
4. Inspect needle cage carefully for cracks or shiny spots which indicate wear. Replace needle bearings if worn or cracked, and always replace them if piston damage has occurred.



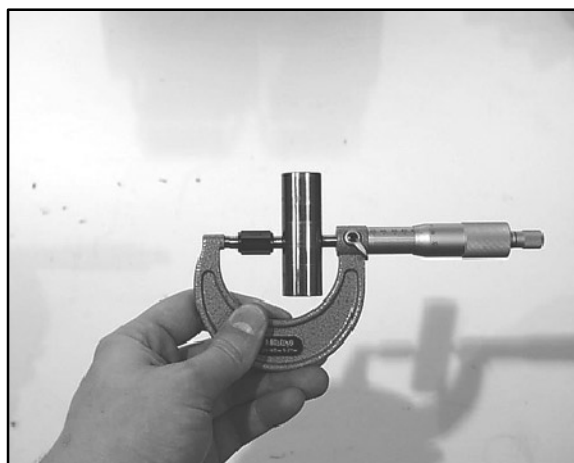


Engine Inspection - Continued

5. Visually inspect piston pin for damage, discoloration, or wear. Run your fingernail along the length of the pin and replace it if any rough spots, galling or wear is detected. Measure piston pin.

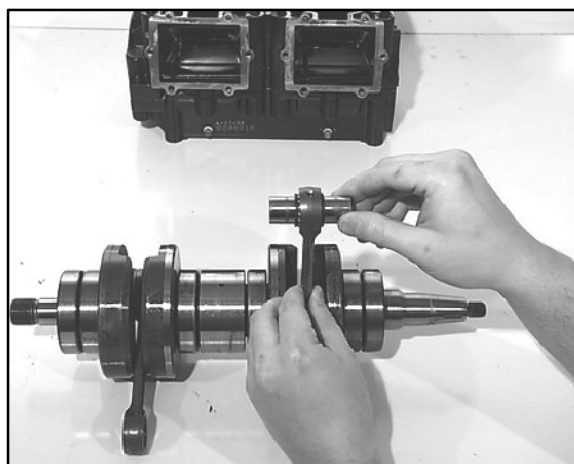
Piston Pin Diameter

19.995 - 1.998mm



Connecting Rod Small End Inspection

1. Clean small end of connecting rod and inspect inner bore with a magnifying glass. Look for any surface irregularities including pitting, wear, or dents.
2. Run your fingernail around the inside of the rod and check for rough spots, galling, or wear.
3. Oil and install needle bearing and pin in connecting rod. Rotate pin slowly and check for rough spots or any resistance to movement. Slide pin back and forth through bearing while rotating and check for rough spots.
4. With pin and bearing centered in rod, twist ends back and forth in all directions to check for excessive axial play. Pull up and down evenly on both ends of pin to check for radial play. Replace pin *and* bearing if there is any resistance to rotation or excessive axial or radial movement. If play or roughness is evident with a new pin and bearing, replace the connecting rod.
1. Inspect the starter drive.



Starter Drive Bushing I.D.

.4735" - .4740" (12.03 - 12.04mm)

Shaft O.D.

.470" - .472" (11.94 - 11.99mm)

Starter Drive Bushing Clearance

.0015" - .004" (.04 - .10mm)

Service Limit

.010" (.25mm)



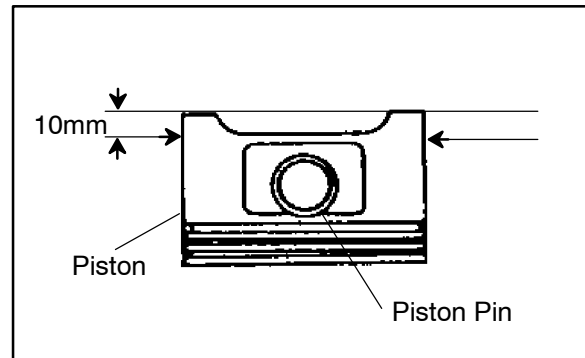


Engine Inspection - Continued

Piston Inspection/Measurement

1. Check piston for scoring or cracks in piston crown or pin area. Excessive carbon buildup below the ring lands is an indication of piston, ring or cylinder wear.
2. Measure piston outside diameter at a point 10 mm (3/8") up from bottom of skirt at a 90° angle to the direction of the piston pin. Record the measurement for each piston.

NOTE: The piston must be measured at this point to provide accurate piston-to-cylinder clearance measurement.



3. Subtract this measurement from the minimum cylinder measurement recorded previously. If clearance exceeds the service limit, determine if piston or cylinder is worn and recondition or replace as necessary.

Piston-To-Cylinder Clearance

.0055" - .0065" (.14 - .16mm)

Service Limit

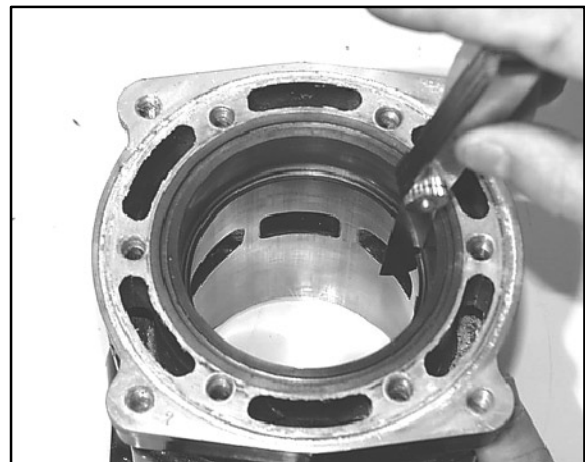
.010" (.25mm)



1. Position each piston ring 1/2" (1.3 cm) from the top of the cylinder using the piston to push it squarely into place. Measure installed gap with a feeler gauge at both the top and bottom of the cylinder.

NOTE: A difference in end gap indicates cylinder taper. The cylinder should be measured for excessive taper and out of round. Replace rings if the installed end gap exceeds the service limit.

NOTE: Always check piston ring installed gap after re-boring a cylinder or when installing new rings.



Installed Piston Ring-End Gap

.014" - .019" (.36 - .48mm)

Service Limit

.028" (.71mm)



Engine Inspection - Continued

Crankshaft Main Bearing Inspection

1. Clean crankshaft thoroughly and oil main and connecting rod bearings with Polaris Premium 2 cycle engine oil. Carefully check each main bearing on the shaft.

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

Connecting Rod (Big End) Side Clearance

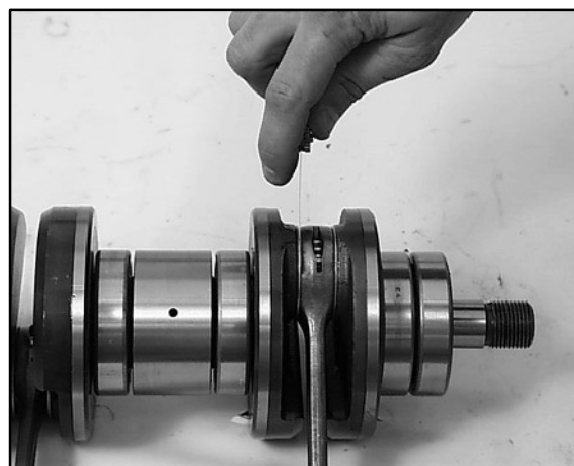
1. Measure connecting rod big end side clearance with a feeler gauge. Compare to specifications.

Connecting Rod Big End Side Clearance

.014" - .020" (.36 - .51mm)

Service Limit

.022" (.56mm)



Connecting Rod (Big End) Radial Clearance

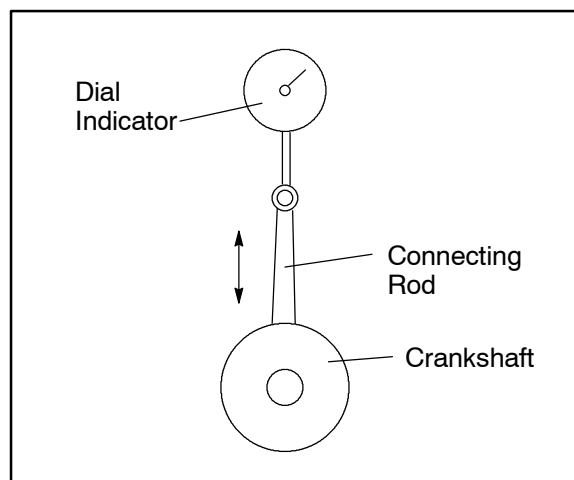
1. Rotate rod on crankshaft and check for rough spots. Check radial end play in rod by securing crankshaft in a holding fixture. Set up a dial indicator as shown in illustration at right. Support connecting rod against one thrust washer and apply up and down pressure on connecting rod. Read total movement of indicator and compare to specifications. Replace rod, bearing, pin, and thrust washers if clearance is excessive. **Important Note:** A very small amount of radial play is normal and may be barely perceptible when inspecting by feel.

Connecting Rod Big End Radial Clearance

.0015" - .0018" (.038 - .046mm)

Service Limit

.0021" (.053mm)



NOTE: Specialized equipment and a sound knowledge of crankshaft repair and straightening is required to perform crankshaft work safely and correctly. Crankshaft repair should be performed by trained Polaris service technicians in a properly equipped shop.



Engine Inspection - Continued

Cylinder Honing

The cylinder bore must be de-glazed whenever new piston rings are installed. A light honing with fine stones removes only a very small amount of material. A proper crosshatch pattern is important to provide a surface that will hold oil, and allow rings to seat properly. If the crosshatch is too steep, oil retention will be reduced. A cross-hatch angle which is too shallow will cause ring vibration, poor sealing, and overheating of the rings due to blow-by and reduced contact with the cylinder wall. Service life of the pistons and rings will be greatly reduced.

Cylinder Hone Selection

Selecting a hone which will straighten as well as remove material from the cylinder is very important. Honing a cylinder with a spring loaded glaze breaker is never advised. Polaris recommends using a rigid type hone which also has the capability of oversizing. These hones are manufactured by such companies as Sunnen Products Company of St. Louis, Missouri; and Ammco Tools, Inc., of North Chicago, Illinois.

De-glazing

If cylinder wear or damage is minimal, hone the cylinder lightly with finish stones.

NOTE: On Polaris engines, it is important to bolt exhaust manifold to cylinder to be honed and torqued to specification before honing.

Honing To Oversize

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

For oversize honing always wet hone using honing oil and a coarse roughing stone. Measure the piston (see piston measurement) and rough hone to the size of the piston or slightly larger. Always leave .002 - .003" (.05 - .07 mm) for finish honing. Complete the sizing with fine grit stones to provide the proper cross-hatch finish and required piston clearance.

Honing Procedure

1. Wash cylinder with solvent. Clamp cylinder in a soft jawed vise.





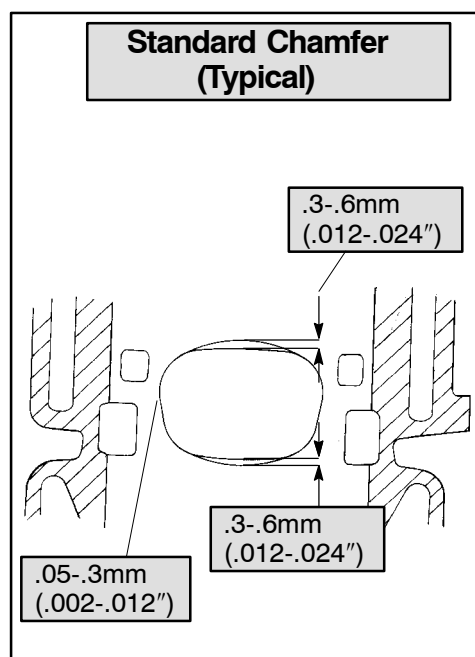
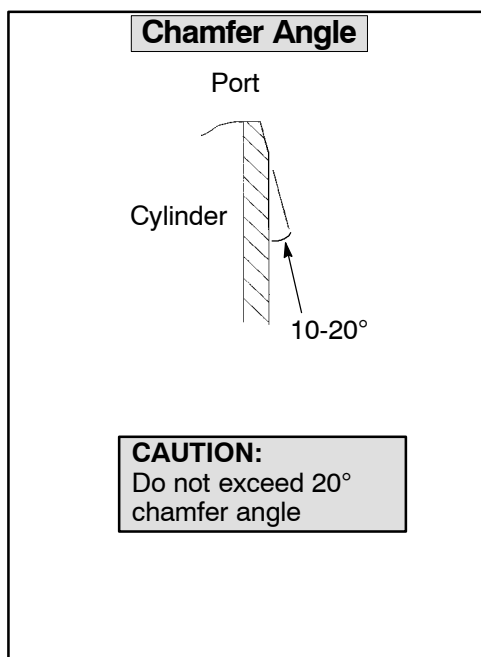
Engine Inspection - Continued

Honing Procedure, Cont.

- Place hone in cylinder and tighten stone adjusting knob until stone contacts the cylinder walls (DO NOT OVERTIGHTEN). Cylinders may be wet or dry honed depending on the hone manufacturer's recommendations. Wet honing removes more material faster and leaves a more distinct pattern in the bore. Using a 1/2" (13 mm) drill motor rotating at a speed of 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 to prevent edge loading and always bring the stone approximately 1/2" (1.3 cm) beyond the bore at the end of each stroke. Release the hone at regular intervals to inspect bore size and finish.

Port Chamfering

After honing the cylinders, chamfer all ports to remove sharp edges. To chamfer the ports, use a small hand grinder with a 1/2" - 1" (12-25mm) diameter cylindrical grinding stone or sanding roll, a half round file, or a 3 sided de-burring knife. Hold the cylinder securely by installing bolts in the exhaust mounting holes and clamping in a soft jaw vise. The corners, top and bottom edges of ports should receive a standard chamfer (.3 - .6mm) with the widest portion at the center of the port window. The sides of the ports require only de-burring (.05 - .3mm). Refer to illustration below.



IMPORTANT: Cleaning the Cylinder After Honing

Scrub the cylinders thoroughly in hot, soapy water. Pay close attention to the area where the cylinder sleeve meets the aluminum casting and use electrical contact cleaner if necessary to remove all traces of debris. Rinse the cylinders in clear water and dry thoroughly with compressed air. Immediately apply Polaris Premium 2 Cycle Lubricant or 2-stroke engine oil to all areas of the cylinder sleeve to prevent rust. Wipe cylinders with an oil coated shop towel to clean all remaining honing material from the cross hatch of the cylinder bore, and re-oil.



Engine Inspection - Continued

Crankshaft Truing

Lubricate the bearings and clamp the crankshaft securely in the holding fixture. Place the center section in the holding fixture and then straighten the remaining end. If truing the crankshaft requires striking with a hammer, always be sure to re-check previously straightened areas to verify truing. Refer to the illustrations below.

Crankshaft Alignment Fixture

PN 2870569

NOTE: The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.

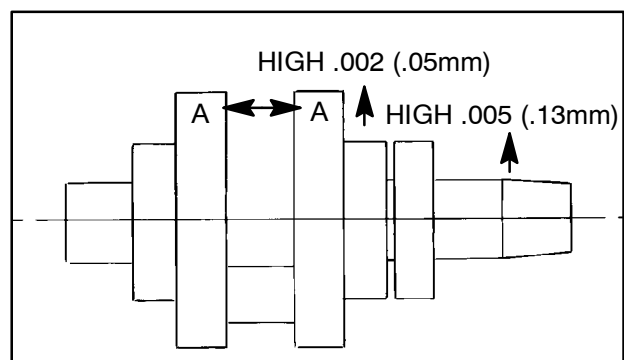
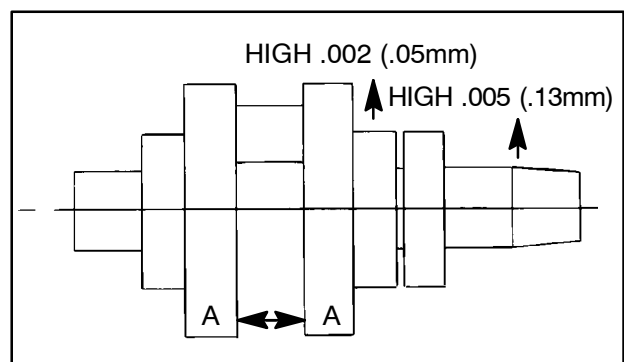
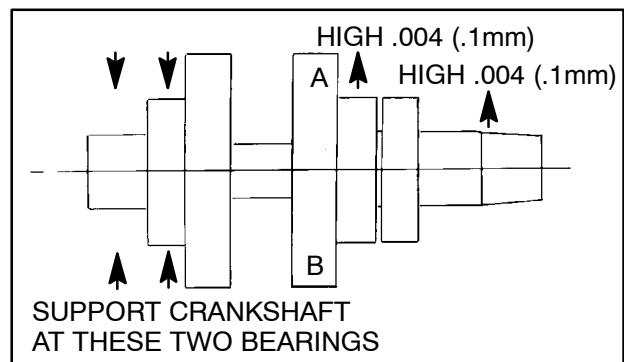
1. To correct a situation like the one shown in the illustration at right, strike the shaft at point A with a brass hammer.

NOTE: The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.

2. To correct a situation like the one shown in the illustration at right, squeeze the crankshaft at point A. (Use tool from alignment kit).

3. If the crank rod pin location is 180° from the dial indicator (opposite that shown above), it will be necessary to spread the crankshaft at the A position as shown in the illustration at right. When rebuilding and straightening a crankshaft, straightness is of utmost importance. Runout must be as close to zero as possible.

NOTE: Maximum allowable runout is .004" (.1 mm).





Engine Inspection - Continued

Crankshaft Indexing

Polaris Watercraft crankshafts are pressed together or “indexed” so the connecting rod journal center lines are 180° apart from each other.

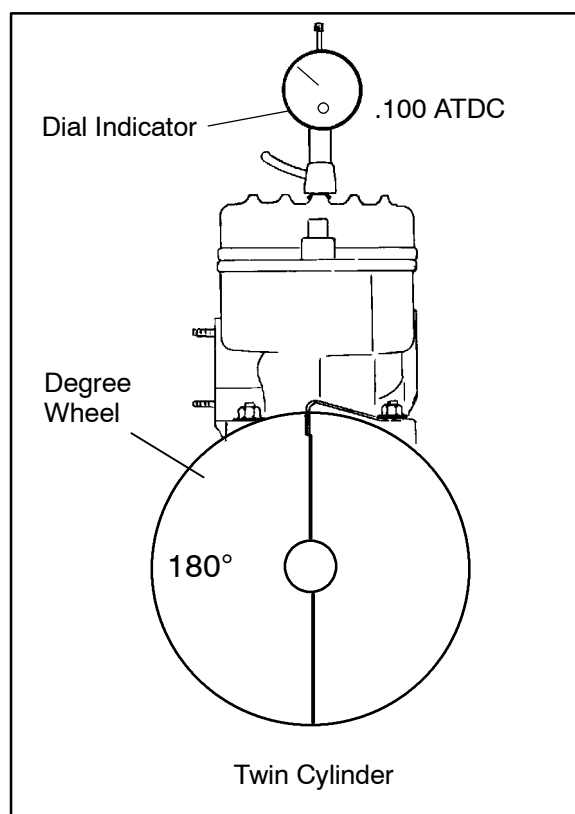
It is sometimes necessary to check multi-cylinder crankshafts to verify that one cylinder has not been forced out of position relative to the other cylinder or cylinders. Causes for out-of-index crankshafts include but are not limited to:

- Hydrolock from water or fuel.
- Impact to impeller from foreign object or accident;
- Abrupt piston or other mechanical failure;

Following is a method of checking:

CAUTION:

Disconnect battery ground cable and **all** spark plug high tension leads; ground high tension leads to engine. Disconnect lanyard from engine stop switch before proceeding with the following steps.



1. Securely fasten a degree wheel on the flywheel or output coupler/driveshaft. Use a large degree wheel for more accuracy, and make sure it is mounted concentrically with the crankshaft center line. Cut a slot in a paper or cardboard degree wheel and slide it over the driveshaft if engine and pump shaft is installed in craft. Again, be sure to secure the degree wheel.
2. Sharpen a coat hanger or section of welding rod and anchor it to a convenient spot. Point the sharpened end at the outer perimeter of the flywheel or drive coupler mounted degree wheel.
3. Install a dial indicator into the magneto end cylinder spark plug hole (front) (#1). (The ignition timing is referenced by the magneto end.)
4. Rotate the engine to bring the piston to top dead center (TDC) on the cylinder with the indicator installed.
5. Locate TDC as accurately as possible by finding the center of the point where there is no piston movement. “Zero” the dial indicator at this point. Continue to rotate the crankshaft in the normal direction of rotation (counter clockwise as viewed from the rear of the craft) until the dial indicator reads .100” (2.54mm) after top dead center (ATDC). **IMPORTANT:** Do not allow the crankshaft to move from this position.
6. Bend the pointer or move the degree wheel until the pointer aligns with the 180° mark on the degree wheel.
7. With the pointer aligned, make sure the degree wheel and pointer are secured and will not move out of position. Re-check accuracy of this location by repeating steps 4 and 5. The pointer should align with the 180° mark when the dial indicator reads .100” (2.54mm) ATDC.

IMPORTANT: Do not move the degree wheel or pointer after the initial setting on the mag end cylinder - simply read the wheel and dial indicator.

8. Remove the dial indicator and install in cylinder #2 (center). Repeat steps 4 and 5 for cylinder # 2. Note the degree wheel indication when the dial indicator reads .100” ATDC. It should be 180° from cylinder #1.

Symptoms of an out of index crankshaft can include:

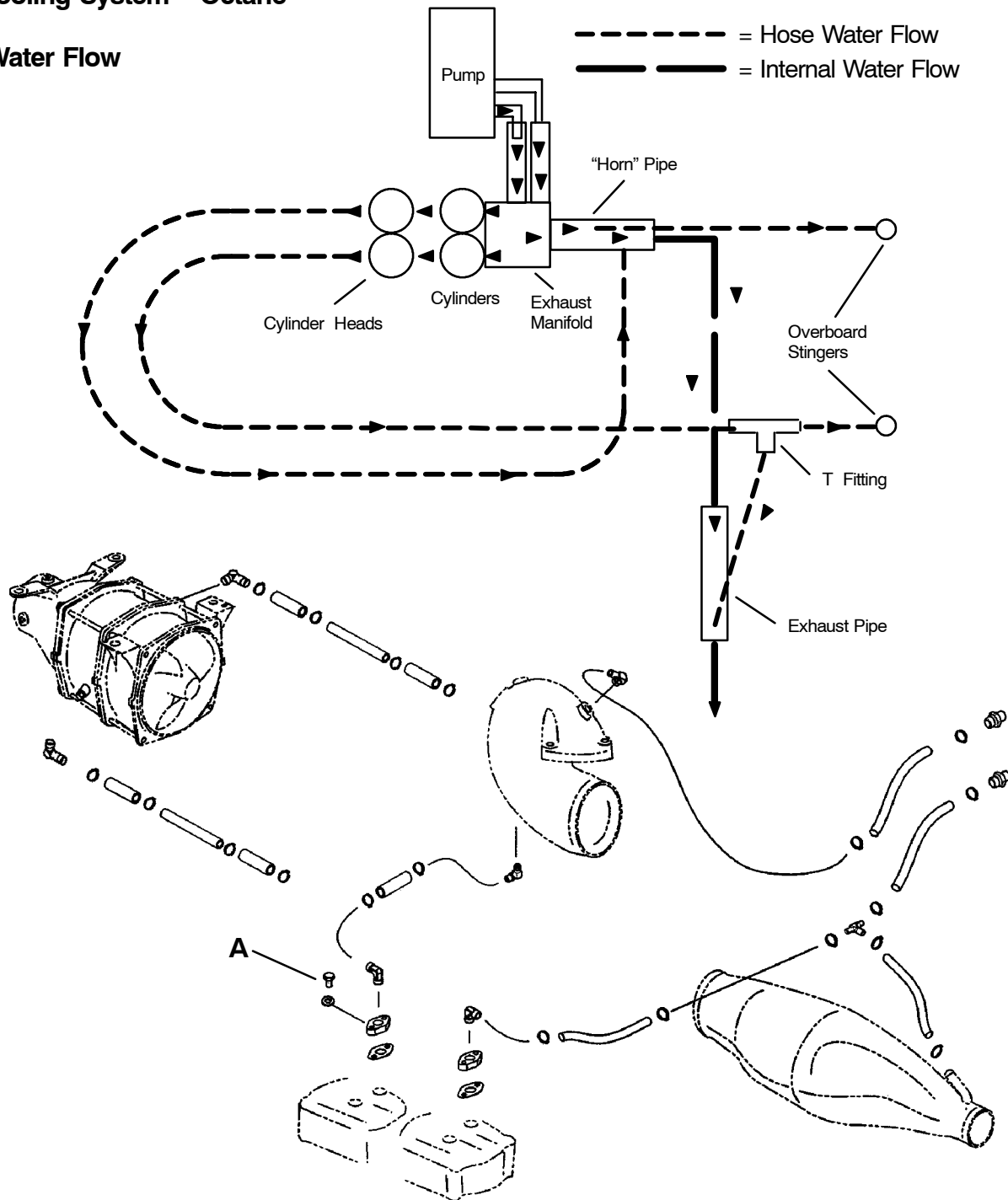
- Difficulty calibrating carburetor (repetitive plug fouling on one cylinder with no other cause);
- Unexplained piston failure on one cylinder (i.e. severe detonation, broken ring lands, piston holing);
- Excessive vibration of engine, backfiring, etc.;
- Rough idle, poor top speed.





Cooling System - Octane

Water Flow



Cooling System Torque / Assembly Specifications

A 9 ft.lbs. (12 Nm)

Micro Hose Gear Clamps 22 in.lbs. (9.5 Nm)



Chapter 4 / Carburetion and Exhaust

Carburetor Specifications	4.1
Carburetor Jet Part Number	4.2
Carburetor Exploded View	4.3
Carburetor Diagram / Fuel Delivery Effect Chart	4.4
Air Intake Exploded View	4.5
Vent / Fuel Line Delivery Exploded View	4.6
Fuel Tank Exploded View	4.7
Carburetor Delivery Circuit Overview	4.8 – 4.9
Pop-Off Valve Testing	4.10
Fuel Filter	4.11
Carburetor Disassembly / Inspection	4.12 – 4.15
Carburetor Cleaning	4.15
Carburetor Assembly	4.15 – 4.16
Throttle / Choke Cable Adjustment	4.16 – 4.17
Mixture Screw Adjustment and Tuning	4.18
Fuel Tank Vent Operation	4.18
Fuel Pump Operation	4.19
Fuel Pump Maintenance	4.20
Reed Valve Removal / Inspection	4.21
Fuel Line Air Leak Testing	4.22
Exhaust System Exploded View	4.23
Exhaust System Inspection	4.24



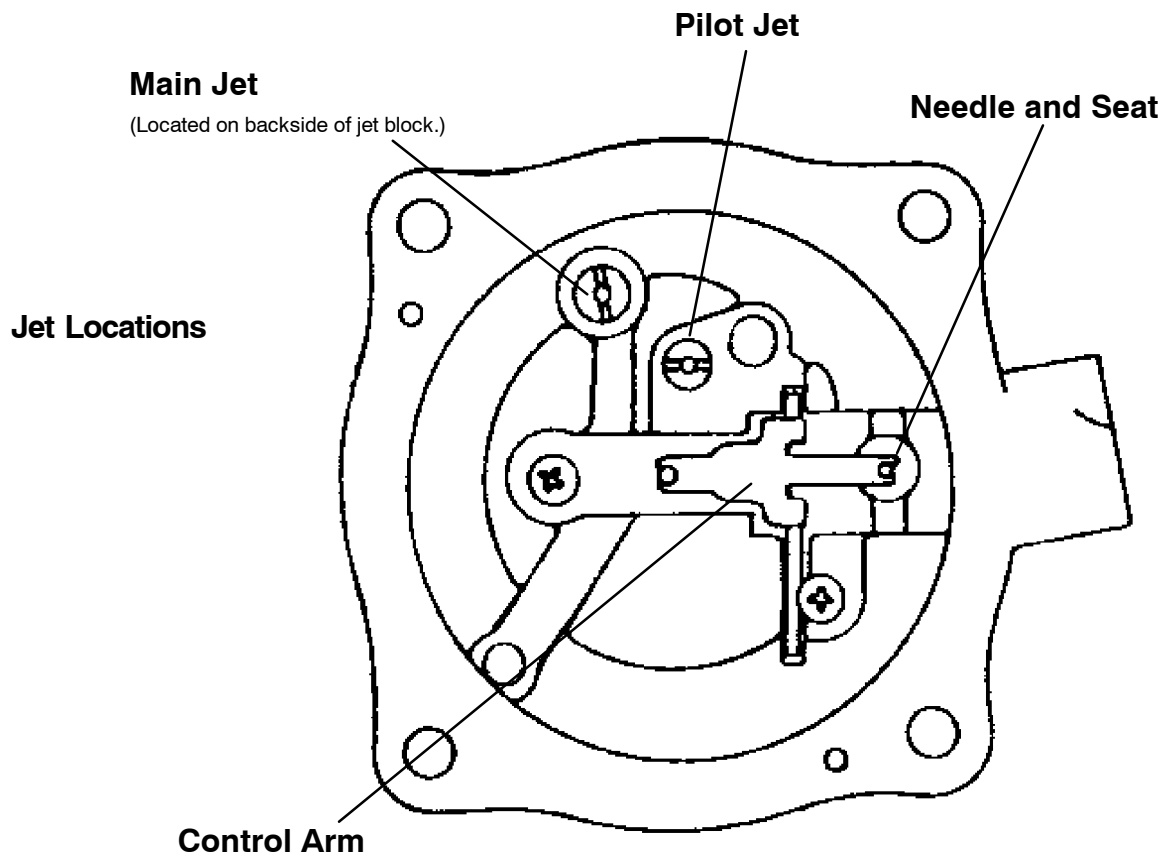
2002 Octane Carburetor Specifications*

⚠ CAUTION

The Octane is not equipped with oil injection. Fuel must be pre-mixed with oil at a 40:1 ratio. Reference Fuel/Oil ratio chart in chapters one and two.

Carburetor Manufacture	Keihin
Size	38mm / 38mm Venturi
Fuel Regulator System	Diaphragm
Float Arm Level	1.5mm
Starter System	Choke
Main System	#140
Mid Range System	N/A
Pilot System	#68
Low Speed Screw	1 3/4 Turns Out From Lightly Seated
Idle Speed (In Water)	N/A
Needle & Seat Pop Off Pressure	18 - 20 PSI
Valve Spring	26 Grams

*The carburetor assembly, when ordered as a replacement part, will have 142 main jets installed from the factory. 140 main jets are installed at the time of manufacture.





⚠ WARNING

Gasoline is highly flammable and explosive under certain conditions.

- ◆ Always exercise extreme caution whenever handling gasoline.
- ◆ Always refuel with the engine stopped and 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 over fill the tank. (Do not fill the tank neck.)
- ◆ If you get gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.
- ◆ Never start the engine or let it run in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.
- ◆ Shut off fuel valve whenever the watercraft is stored or parked.

The following chart lists all main and pilot jets and the part number of each that are presently available.

MAIN JET NO.	PART NO.	MAIN JET NO.	PART NO.	PILOT JET NO.	PART NO.
80	3050101	160	3050194	40	3050118
82	3050102	165	3050195	42	3050119
85	3050103	170	3050196	45	3050120
88	3050104	175	3050197	48	3050121
90	3050105	180	3050198	50	3050122
92	3050106	185	3050199	52	3050123
95	3050107	190	3050201	55	3050124
98	3050108	195	3050202	58	3050125
100	3050109	200	3050203	60	3050126
102	3050110			62	3050127
105	3050111			65	3050128
108	3050112			68	3050129
110	3050113			70	3050130
112	3050114			72	3050131
115	3050115			75	3050132
118	3050116			78	3050133
120	3050117			80	3050134
122	3050179			82	3050171
125	3050180			85	3050172
128	3050181			88	3050173
130	3050182			90	3050174
132	3050183			92	3050175
135	3050184			95	3050176
138	3050185			98	3050177
140	3050186			100	3050178
142	3050187				
145	3050188				
148	3050189				
150	3050190				
152	3050191				
155	3050192				
158	3050193				

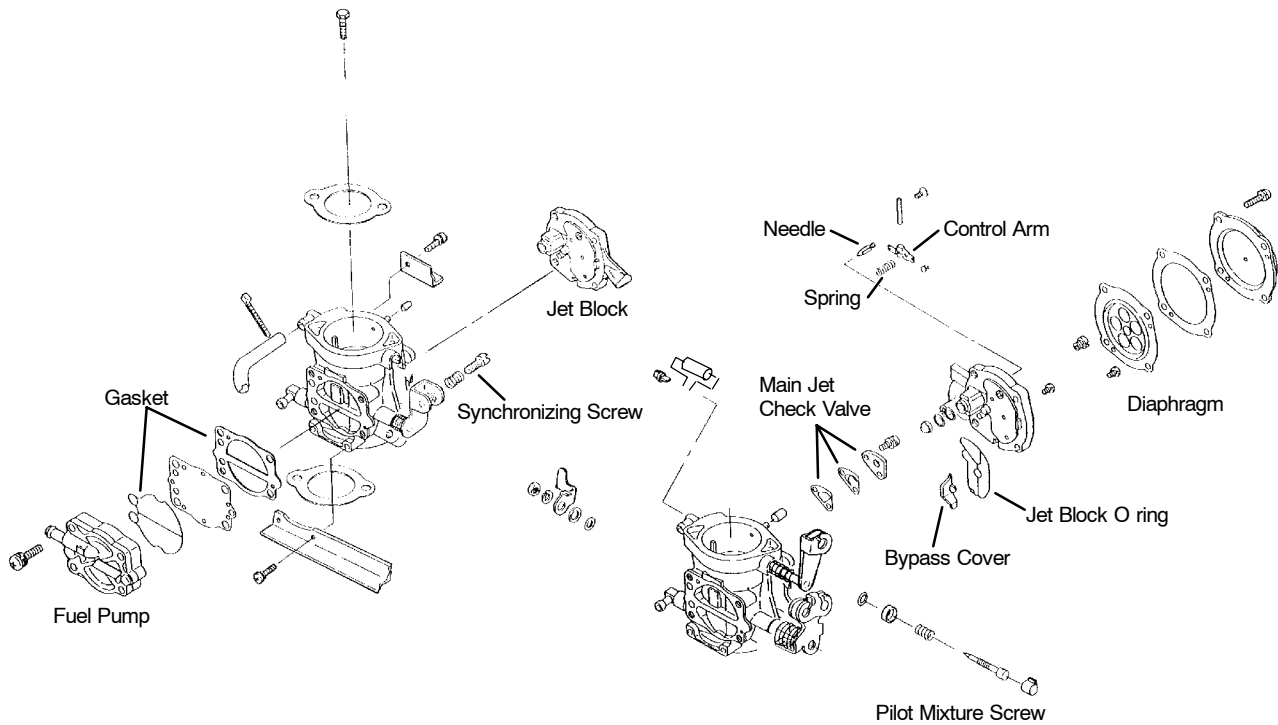
IMPORTANT: Prior to performing any adjustments to carburetors check the following:

- Verify that no water is present in the fuel system. Check the water trap for presence of water.
- Check for proper choke operation.
- Verify all fuel and vent lines are routed and secured properly.
- Check the reed valves for damage.
- Check fuel pump diaphragms for damage.
- Verify all seal and gaskets are in good condition (no air leaks present).
- Check engine compression (see engine section).
- Verify proper fuel flow (i.e. fuel flow through shut off valve).
- Synchronize carburetors; inspect throttle plates (butterfly) for damage.



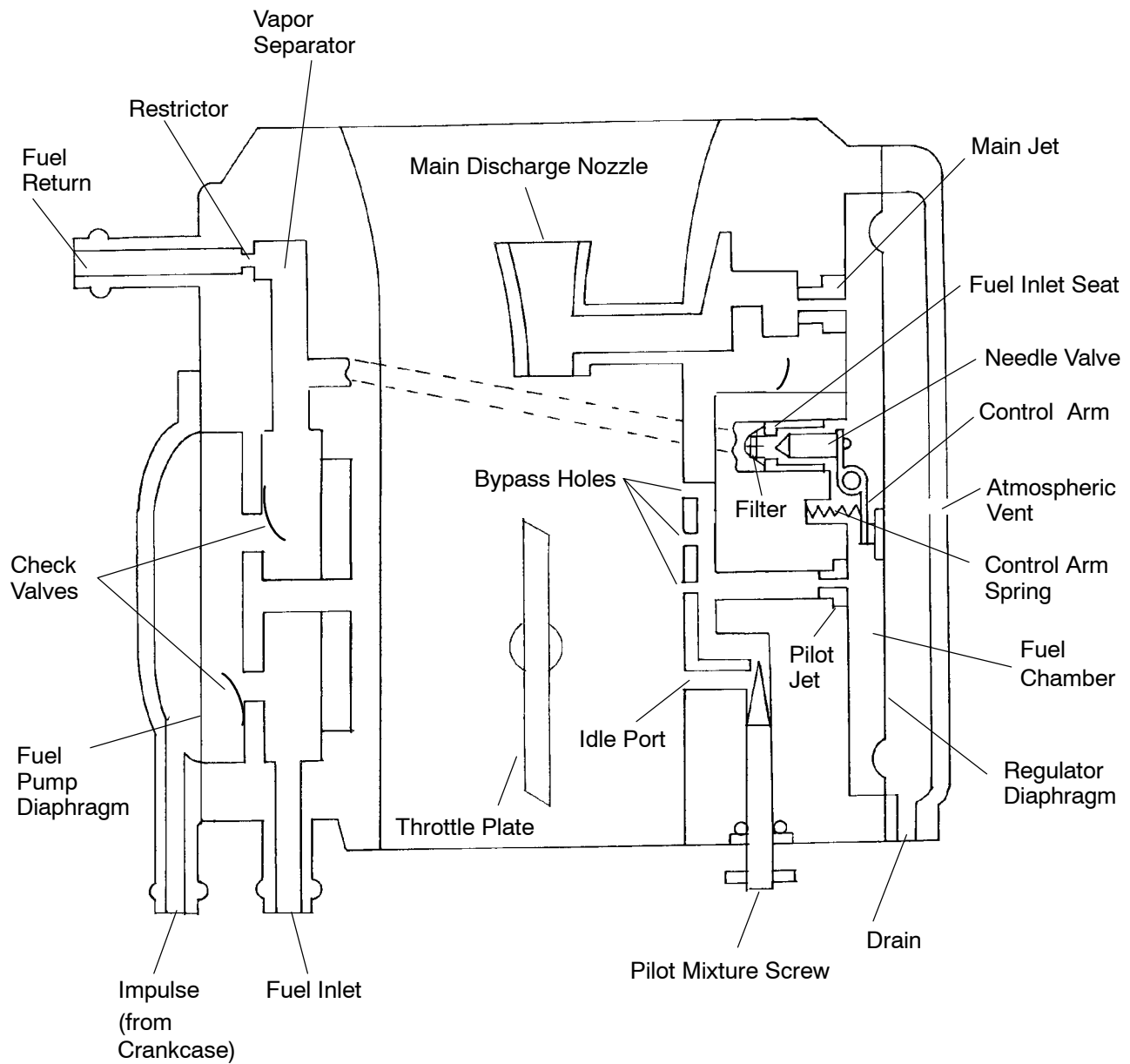


Octane Carburetor

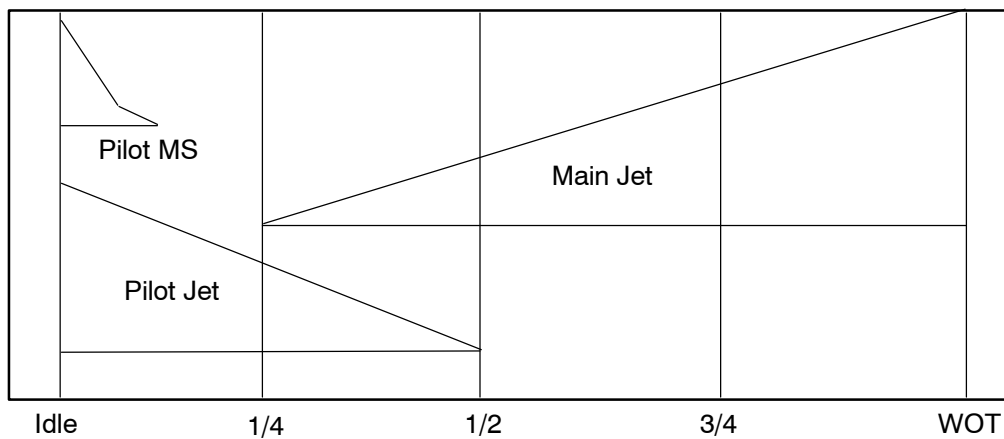




2002 Keihin Carburetor System - Octane

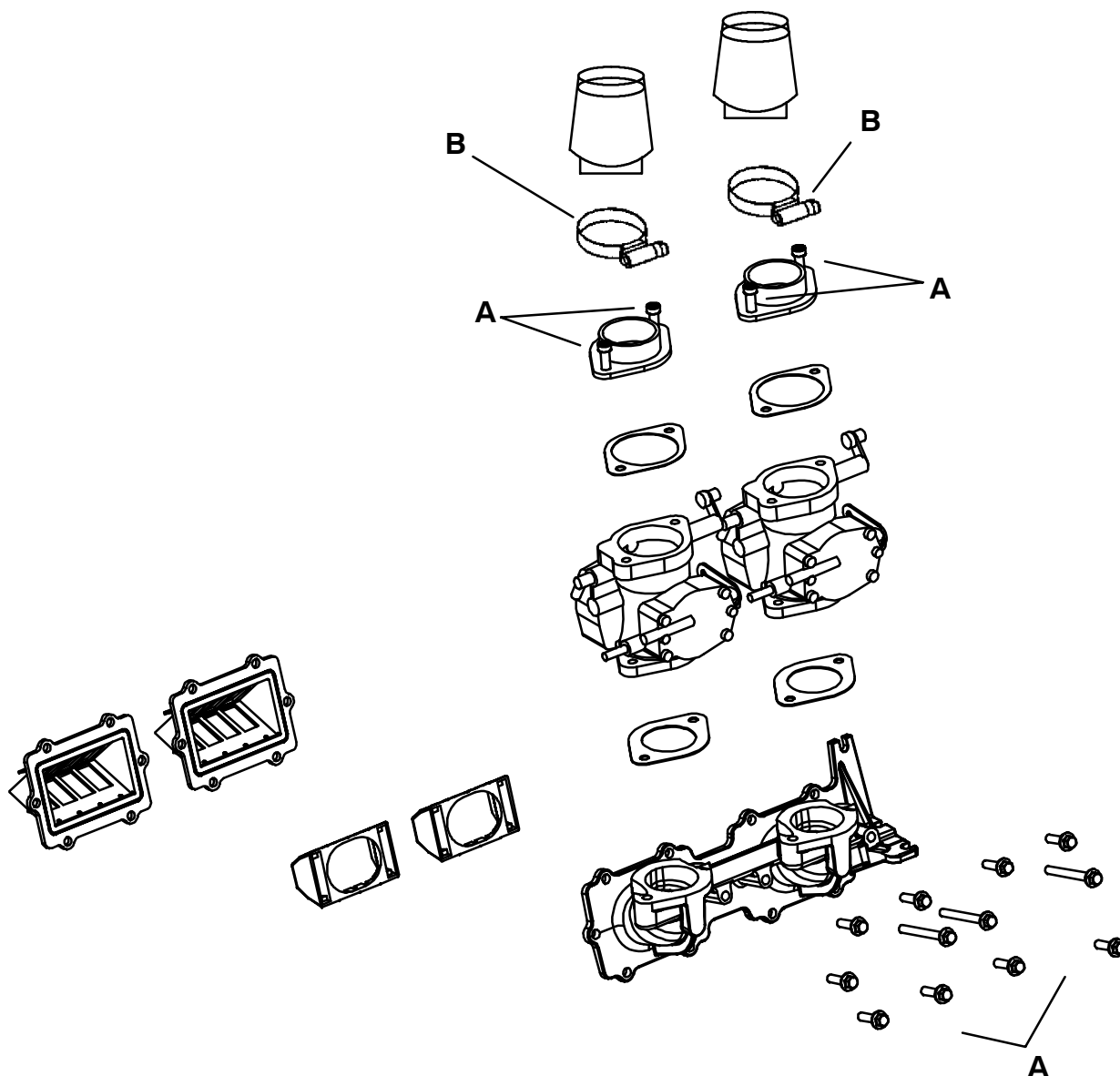


Fuel Delivery Effect Diagram





Air Intake Assembly Exploded View - Octane



Air Intake Assembly Specifications

A 9 ft.lbs. (12 Nm)

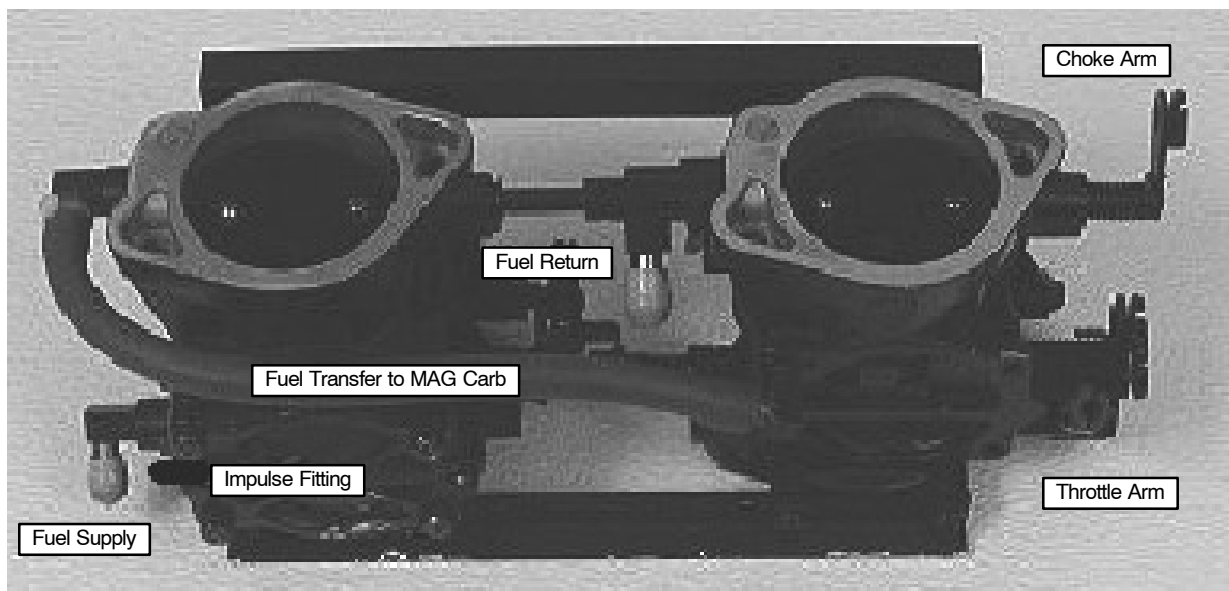
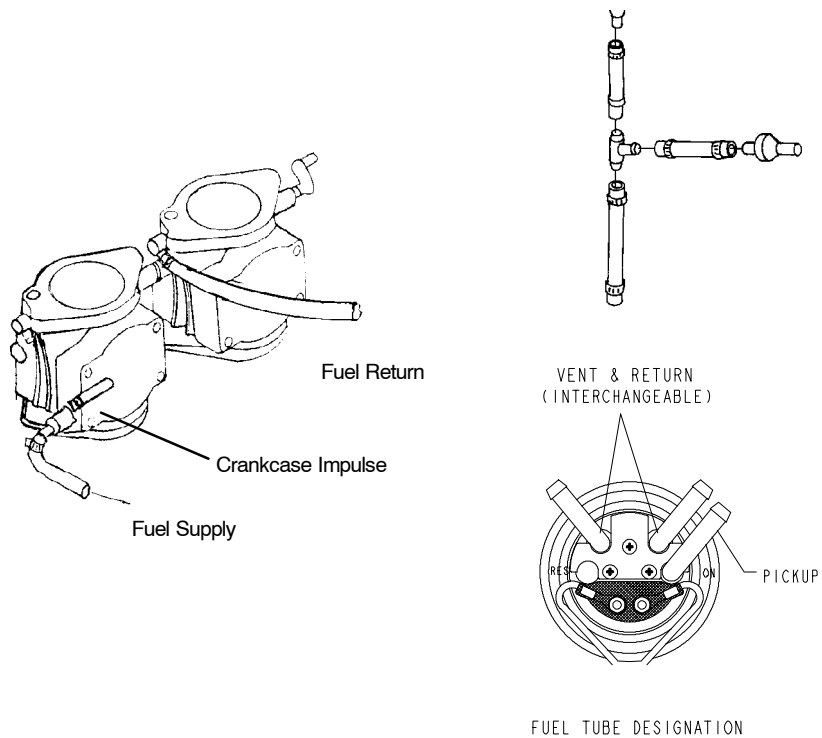
B 25 in.lbs. (3 Nm)

Never re-use gaskets. Replace carburetor gaskets with new during assembly.

During assembly, verify reed stuffers are correctly installed and in working condition with no visible cracking. Check reed cages for cracked or broken petals.

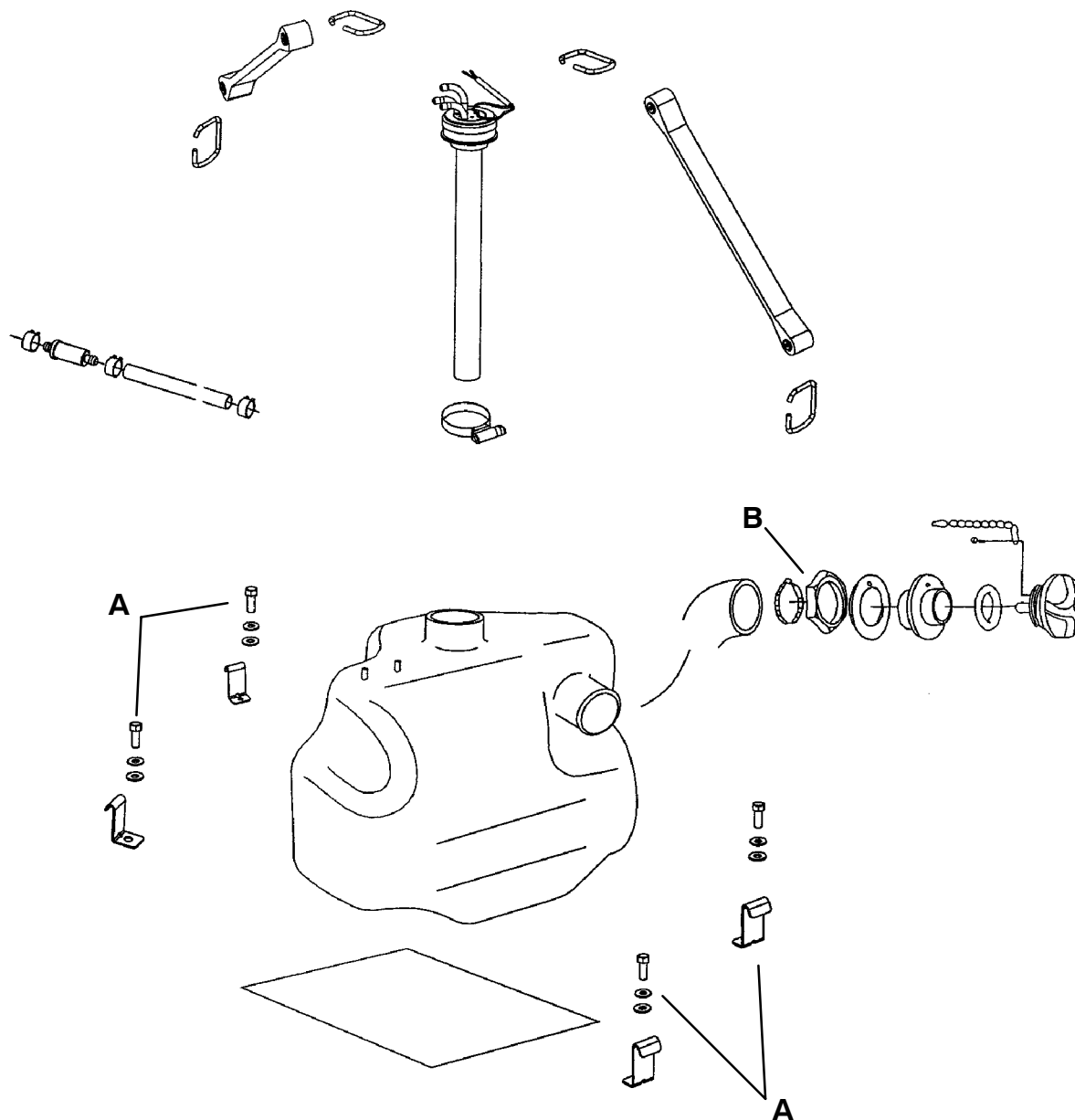


Vent / Fuel Line Delivery Exploded View - Octane





Fuel Tank Exploded View - Octane



Fuel Tank Torque / Assembly Specifications

Micro Gear Clamps: 22 in.lbs. (2.5 Nm)

Large Gear Clamps: . . . 35 in.lbs. (4 Nm)

A 14 ft.lbs. (19 Nm) Apply Loctite™ 242 to threads.

B 10 - 15 ft.lbs. (14 - 20 Nm)

Verify that fuel tank pad is located under fuel tank at all times. Replace if damaged.

Always use new gaskets



2002 Keihin Carburetor System Overview - Octane

The Keihin carburetor is a floatless diaphragm type. Several separate but overlapping systems are used to meter fuel and air properly.

1. Air Metering System

The metering of air is controlled by the *throttle plate*. The position of the throttle plate determines which fuel delivery system or systems supply fuel from the *fuel chamber* to the engine.

2. Inlet Needle Valve System/Fuel Chamber

The amount of fuel allowed into the *fuel chamber* is controlled by the *inlet needle valve assembly*. Opening and closing of the valve is controlled by *regulator diaphragm* movement and spring pressure under the *control arm*. The regulator diaphragm is sealed to the carburetor body forming two chambers. One side is vented to atmospheric pressure, the other side (fuel chamber) is exposed to the venturi (low pressure) through the fuel delivery jets and passages. Atmospheric pressure pushes on one side of the diaphragm, applying pressure on the *control arm* in the fuel chamber. This reduces pressure on the *inlet needle* and allows it to lift more easily off the seat. When the engine is running, pressure in the carburetor venturi (and therefore the fuel chamber) is less than atmospheric. This increases the effect of the atmospheric pressure on the diaphragm and lever and overcomes spring pressure. When the lever return spring pressure is overcome by these forces, the needle lifts off of the seat or “pops off”, allowing pressurized fuel from the fuel pump to enter the fuel chamber. Fuel inlet needle “pop off” pressure is influenced by many factors. Atmospheric pressure, venturi low pressure, the amount of spring pressure on the control arm, and fuel pressure from the fuel pump all have an effect on operating pop off pressure. All of these forces combined regulate the amount of fuel that enters the carburetor fuel chamber and the engine. Changes to pop-off pressure are *not* recommended.

3. Idle (Pilot) System

The carburetors used on the Octane have no means of controlling idle speed. However, the carburetors do use a pilot mixture screw and pilot jet to meter fuel at low throttle settings.

4. High Speed System

The high speed system consists of the main jet. This has an effect on mixture from 1/4 to full throttle, with the greatest effect at 1/2 to wide open throttle. Compensating for altitude is accomplished only by changing main jets.

WARNING: The carburetor must be jetted correctly for the ambient air temperature and altitude at which the watercraft is to be operated in. A main jet that is too small for given conditions will cause a lean running condition. A lean running condition can cause serious engine damage.

5. Choke System

The purpose of the choke system is to supply an overly rich mixture for starting a cold engine. When the *choke plate* is fully closed and throttle plate is open, a strong vacuum is applied to the main nozzle, bypass, and idle ports, and a very rich fuel air mixture is discharged to the engine for starting.





2002 Keihin Carburetor System Overview - Octane - Continued

Pop Off Pressure

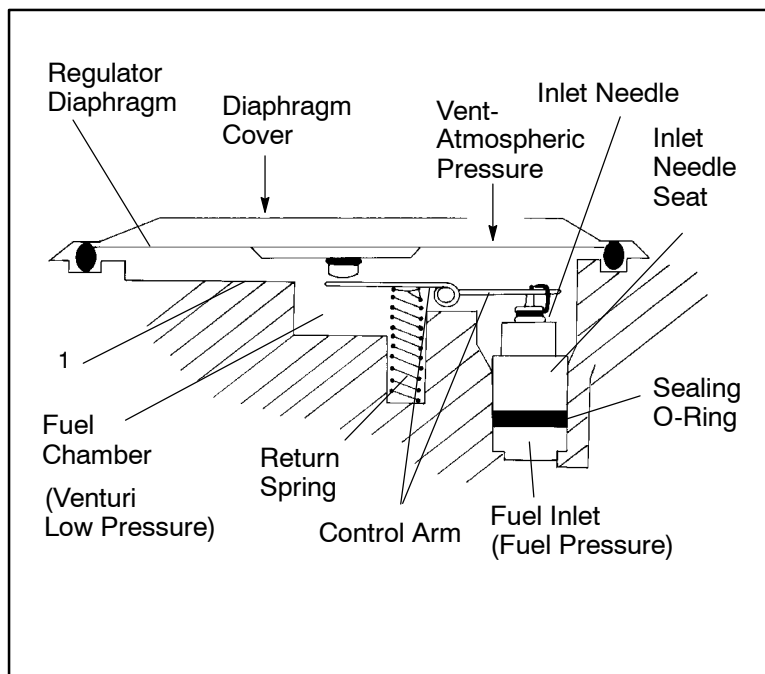
Carburetor pop-off pressure is pre-set at the factory for a given engine. Test as outlined on following page. If pop-off pressure is incorrect, follow the procedure below to find the cause. Pop-off pressure should not be changed to correct a running condition problem unless required by changes in elevation, or engine/carburetor modifications for racing.

Fuel inlet needle "pop off" pressure is influenced by many factors. Atmospheric pressure, venturi vacuum (low pressure), the amount of spring pressure on the control arm, fuel pressure from the fuel pump, and the size of the needle and seat all have an affect on operating pop off pressure. All of these forces combined regulate the amount of fuel that enters the carburetor fuel chamber and the engine.

Needle Valve / Diaphragm Operation

The amount of fuel allowed into the *fuel chamber* is controlled by the *inlet needle valve assembly*. Opening and closing of the valve is controlled by *regulator diaphragm* movement and spring pressure under the *control arm*.

The regulator diaphragm is sealed to the carburetor body forming two chambers. One side is vented to atmospheric pressure, the other side (fuel chamber) is connected to the venturi via the jets and passages. Atmospheric pressure pushes on one side of the diaphragm, applying pressure on the *control arm* in the fuel chamber. This reduces pressure on the *inlet needle* and allows it to lift more easily off the seat. When the engine is running, pressure in the carburetor venturi (and therefore the fuel chamber) is less than atmospheric. This increases the effect of the atmospheric pressure on the diaphragm and lever. When return spring pressure is overcome by these forces, the needle lifts off of the seat or "pops off", allowing pressurized fuel to enter the fuel chamber.



Pop off pressure cannot be tested with the engine running. However, a static pressure test can help identify problems within *each individual carburetor*.

The measurement indicates the amount of pressure required to force the fuel inlet needle off of the needle seat *without* the engine running. Thoroughly inspect *all* system components whenever a rich or lean condition is encountered.

NOTE: If inlet needle does not seal properly, fuel may enter the engine and cause flooding when the engine is off.

Low pop off pressure may be caused by:

- Foreign material in the tip of the needle or needle seat
- Worn, broken, or damaged lever arm return spring
- Leaking needle seat O-Ring
- Corrosion on lever arm, lever arm pin, and/or return spring
- Incorrect lever arm return spring (Use only genuine Polaris parts)
- Fuel return line kinked or return restrictor orifice plugged (in carburetors or in return line)



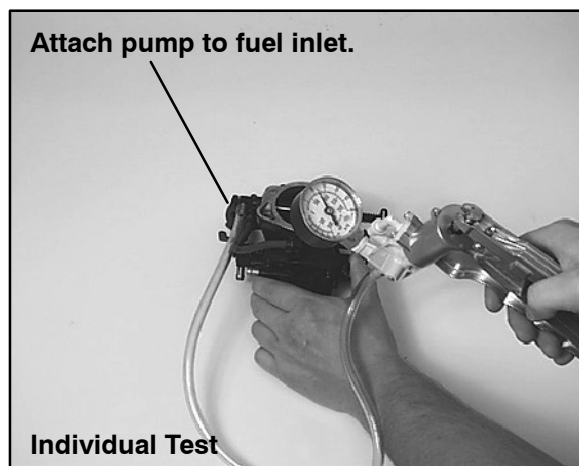
Carburetor Pop-Off Valve Testing

If operating pop off pressure is too high, the amount of fuel available to the engine will be reduced, causing a lean condition.

High pop off pressure may be caused by:

- Restricted fuel inlet passage
- Inlet needle stuck in seat
- Corrosion on lever arm, lever arm pin, and/or return spring
- Incorrect lever arm return spring (Use only genuine Polaris parts)
- Fuel return line orifice missing

Testing Needle and Seat Pop Off Pressure



1. **Pressure test each carburetor individually.** To provide accurate readings remove the regulator diaphragm and its cover before testing. Wet the needle with WD40™ or a similar substance. **NOTE:** Do not use gasoline due to the hazard of fire. Protect your eyes from the spray when the needle valve “pops off”.
2. Remove the fuel lines connecting the carburetors.
3. Attach the Mity Vac™ to the fuel inlet fitting of the carburetor to be tested.
4. Plug the fuel return outlet of the carburetor to be tested.
5. Pressurize the carburetor with the pump until the needle valve pops off. Pump slowly and note the pressure when the valve opens. Test the valve at least three times to ensure an accurate reading. Be sure to keep the needle valve wet. **NOTE:** The reason for wetting the needle valve is to duplicate actual conditions during operation. When the engine is running, the needle valve has fuel running through to wet it and engine vibrations to help the needle obtain a good seal.

Apply 10-18 PSI. The carburetors should hold pressure at no less than 5-8 PSI. Otherwise see pop off pressures listed in the specifications in the beginning of this section. If the carbs do not hold pressure, needle and/or seat leakage is evident.



Gasoline Safety

WARNING

Gasoline is highly flammable and explosive under certain conditions.

- ◆ Always exercise extreme caution whenever handling gasoline.
- ◆ Always refuel with the engine stopped and outdoors or in a well ventilated area.
- ◆ Do not smoke or allow open flames or sparks in or near the area where refueling, maintenance, or repair work is performed or where gasoline is stored.
- ◆ Do not over fill the tank. (Do not fill the tank neck.)
- ◆ If you get gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.
- ◆ Never start the engine or let it run in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.
- ◆ For models without fuel valve, disconnect battery ground terminal.

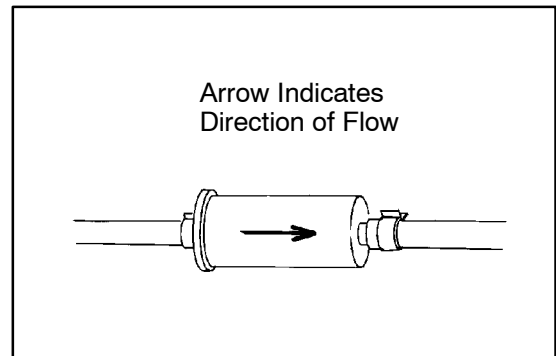
Fuel Filter

WARNING

Gasoline is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in the work area. Be sure the work area is well ventilated. See gasoline warning above. Pressure may be present in the fuel tank. Remove the fuel cap slowly to release pressure before removing fuel filter clamps and lines.

The fuel filter is an in-line type filter and should be replaced annually or when contaminated with fuel or water.

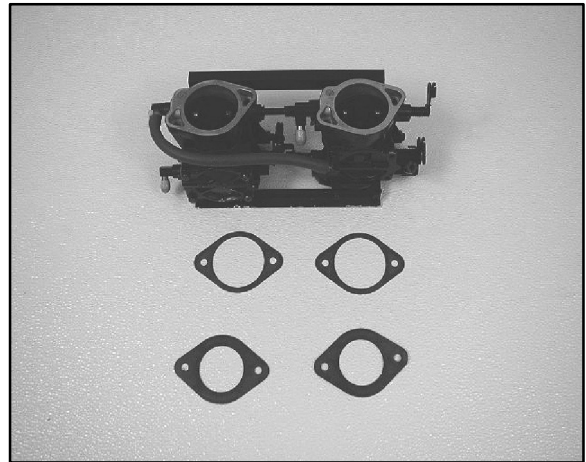
After replacement, check for leaks. If the filter leaks, correct the problem before operating the craft.





Carburetor Disassembly / Inspection

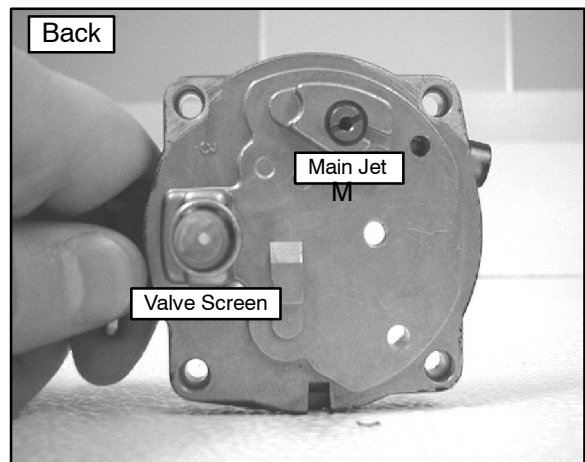
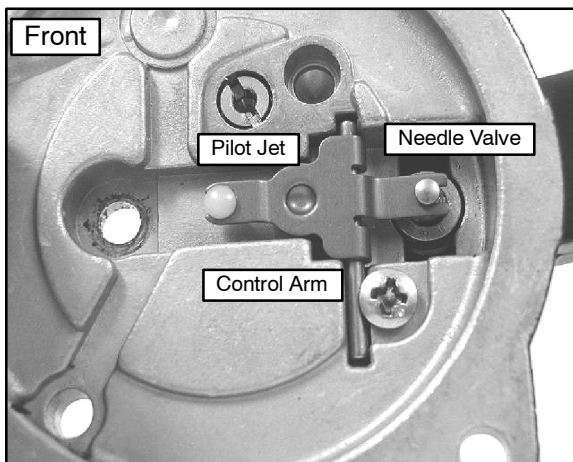
1. Carburetor assembly and gaskets. Always perform your work in a clean environment.



2. Remove jet block diaphragm. Inspect for hardening or cracks.



3. Remove jet block assembly. Verify components are in working condition. Loosen control arm screw. Carefully remove needle valve and spring.

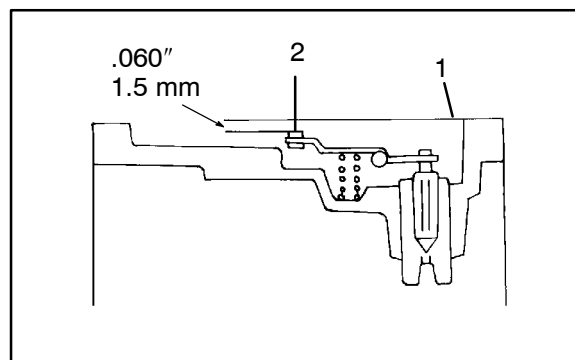




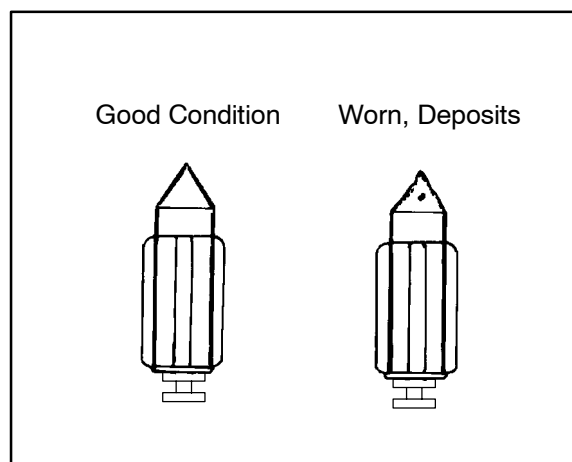
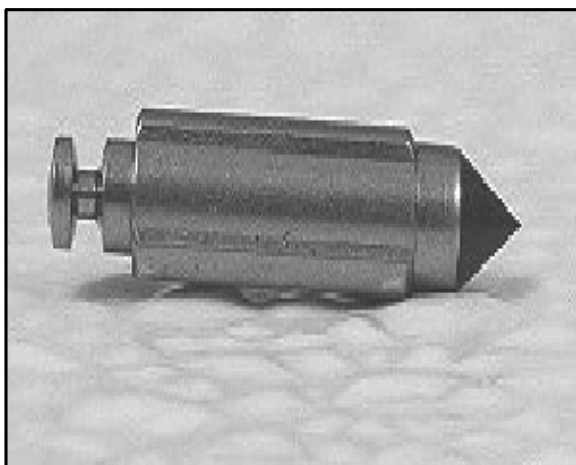
Carburetor Disassembly / Inspection - Continued

4. Measure control arm height from machined surface to top of plastic button on control arm. Remove screw and remove control arm and inlet needle.

NOTE: Top of plastic button #2 should be .060" (1.5 mm) below casting surface #1 as per illustration at right. Variances in control arm positioning will result in incorrect fuel supply. If the control arm is too close to the diaphragm, fuel levels will increase, resulting in a rich operating condition. If the control arm is too far below the casting parallel line a lean condition will result.



5. Inspect inlet needle for wear, damage, or foreign material.



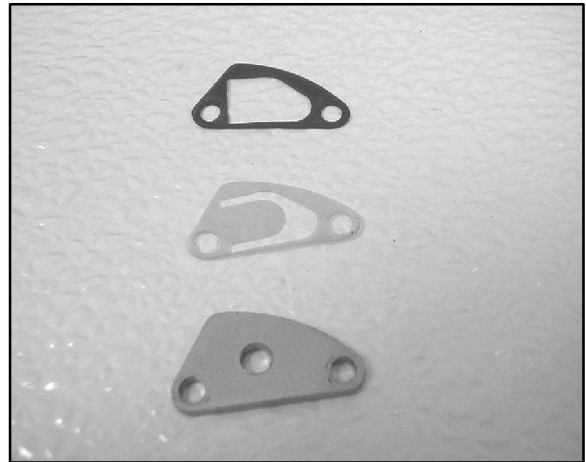
6. Inspect needle seat O-rings for damage. Replace O-rings upon assembly. Clean screen of debris or replace if torn or damaged.
7. Inspect the condition of jet block O-ring. Replace upon assembly. Remove bypass covers and remove any obstructions.



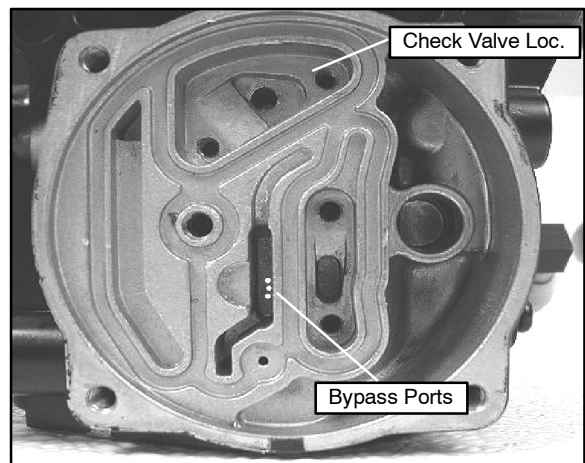


Carburetor Disassembly / Inspection - Continued

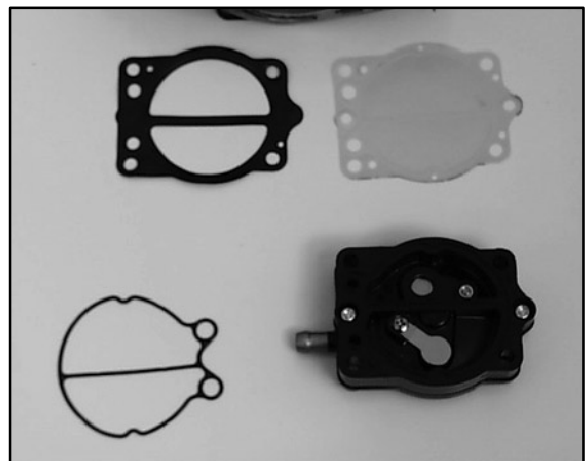
8. Remove check valve. The valve must lay flat against the plate to seal properly. Replace if distorted or bent. Replace gasket if torn or damaged.



9. With check valves, needle valve, and O-rings removed, thoroughly inspect the carburetor casting for debris and cracking. Clean all discharge ports.



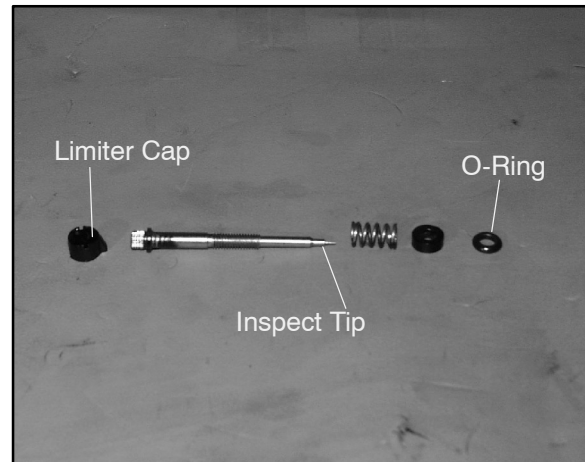
10. Remove fuel pump body screws and carefully lift assembly from carburetor.
11. Remove gasket, diaphragm, and O-ring. Examine each for cracking, holes, distortion and fatigue. Replace if required.
12. Inspect the check valves in the fuel pump body. The valves cannot be disassembled and must be replaced as an assembly.





Carburetor Disassembly / Inspection - Continued

13. Note position of limiter cap on low speed mixture screw. Carefully remove the cap (pull off). Turn mixture screw in (clockwise) while counting the exact number of turns until lightly seated. Record the number for future reference. Remove low speed mixture screw, spring, washer, and O-ring. Carefully inspect the tip of needle for wear or damage. Replace if necessary.



Carburetor Cleaning

1. Thoroughly clean all passages with carburetor cleaner or electrical contact cleaner.

WARNING

Wear eye protection when using compressed air or chemical spray cleaners. If you get cleaner in your eyes or if you swallow cleaner, see your doctor immediately. Some carburetor cleaners are extremely caustic and extended periods of soaking can loosen the adhesive sealer on passage drill-way plugs. Do not soak rubber or plastic components (such as diaphragms, needle seat screen, or O-Rings) in caustic cleaning solutions. Irreparable damage will occur. Do not use agitator type carburetor cleaning equipment. Rubber parts must be cleaned with mild detergent and hot water only.

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 are extremely dirty or have a buildup of fuel residue, corrosion, or fungus. Even a small amount of foreign material will reduce the flow characteristics of a jet.
4. Verify all passages and jets are unobstructed by spraying electrical contact cleaner through the passages.

CAUTION:

Do not use wire or welding tip cleaners on the jets as the orifice size may be altered.

5. Use low pressure air to dry carburetor body and all components.

Carburetor Assembly

NOTE: Assemble in reverse order of disassembly. When assembling carburetors, keep in mind the following:

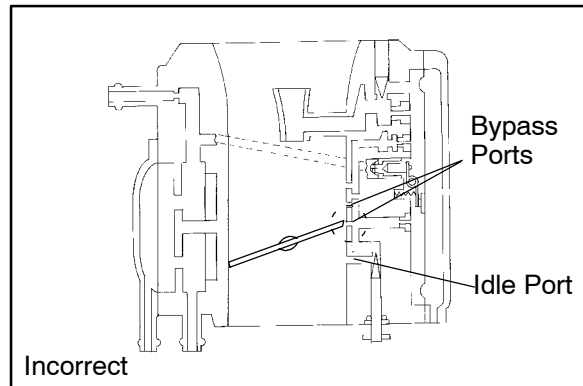
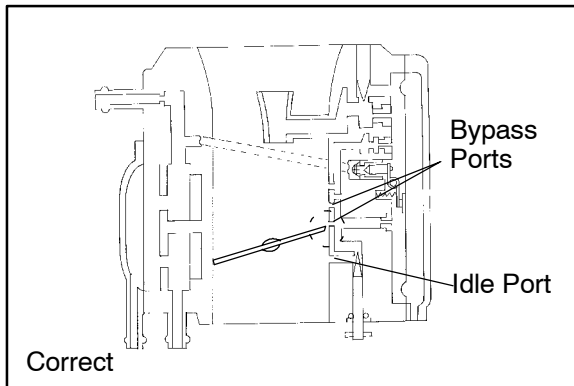
- Maintain cleanliness at all times, especially watching for paint chips caused by cover removal.
- Proper needle valve control arm level, set to specification.
- Do not apply pressure on top of the needle valve assembly during adjustment.
- Use Loctite™ 242 to prevent corrosion of carburetor mounting bolts and diaphragm cover.

NOTE: Precautions must be taken to prevent Loctite™ from interfering with any mechanisms, linkages, diaphragms; entering any cavities, hoses, or orifices. Loctite™ can plug off passages, or gum up linkages and components.



Carburetor Assembly - Continued

6. Apply Loctite™ 242 to screws and install diaphragm cover with drain hole facing downward. Use care when using Loctite™ to ensure it does not enter the carburetor or linkages.
7. Grease all exposed shafts and springs with Polaris Premium All Season Grease.
8. Manually synchronize carburetors. Look down each carb bore and verify throttle plates are just below first bypass hole (not on or above). Adjust accordingly with idle stop screw.



NOTE: These are initial settings from which additional fine tuning may be necessary.

Polaris Premium All Season Grease

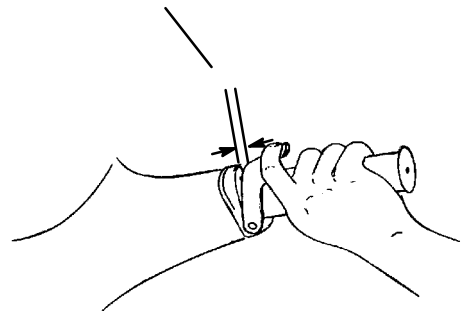
PN 2871322 3 oz. Cartridge
PN 2871423 14 oz. Cartridge

Throttle / Choke Cable Inspection

1. Check for smooth throttle opening and closing in all handlebar positions. Throttle operation should be smooth and lever must return freely without binding.
2. Inspect cable for proper routing, kinks, or damage.
3. Inspect both ends of cable and replace if frayed, kinked or damaged.

Throttle Lever Freeplay
.020 - .060" (.5 - 1.5 mm)

Throttle Lever Free Play





Cable Adjustment

Throttle Cable Adjustment

Please reference throttle cable adjustment procedures in chapter two.

Choke Cable Adjustment

Please reference choke cable adjustment procedures in chapter two.

Idle Speed Adjustment

The carburetors used on the Octane have no idle adjustment.

Mixture Screw Adjustment - Base Setting - Keihin

CAUTION:

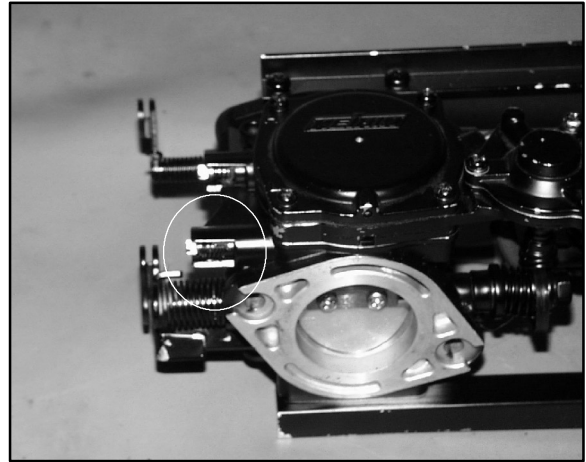
The low speed (idle) mixture screw base settings are determined at the factory using a flow meter. Limiter caps are then installed to allow only slight adjustment of the screws in each direction to compensate for changes in altitude and temperature. The base settings should not be changed. If large adjustments are necessary for proper mixture, the carburetors, fuel system, and engine should be inspected to find the cause of a rich or lean condition. (See Lean Condition Troubleshooting in Maintenance section.) If the carburetor has been tampered with or disassembled before exact base settings were recorded, use the following procedure to adjust each screw. Note: The base settings are for elevations between sea level and 3000 ft. (900 meters).

1. Remove limiter cap(s).
2. Turn mixture screw in until lightly seated, then turn screw out the specified number of turns (see specifications in beginning of this chapter).
3. Reinstall limiter cap(s) with tab positioned mid-way between the stops to allow slight adjustment in each direction.
4. Test the craft under actual operating conditions to verify proper mixture.



Mixture Screw Adjustment and Tuning

1. The low speed mixture screw is located lowermost on carburetor. Remove limiter cap (pull outward).
2. Fine tune to achieve best throttle response.



Fuel Tank Vent Operation

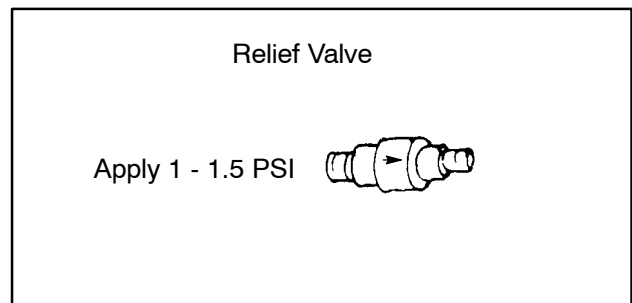
The fuel tank vent system consists of an *inlet* check valve and a *pressure relief valve*. The inlet check valve allows air to enter the tank as the fuel supply is being used. The pressure relief valve maintains a 1-1.5 PSI positive pressure in the fuel tank. If pressure in the tank exceeds 1.5 PSI, the valve releases and excess pressure is allowed to escape.

Inspection

The check valves can be tested for proper operation by applying pressure to one end with the Mity Vac™. Apply approximately 5 PSI to the end of the valve marked VAC. The valve should hold steady pressure. Try to apply pressure to the other end of the valve, it should allow air to go through easily with no pressure build up. Replace the check valve if found to be faulty.

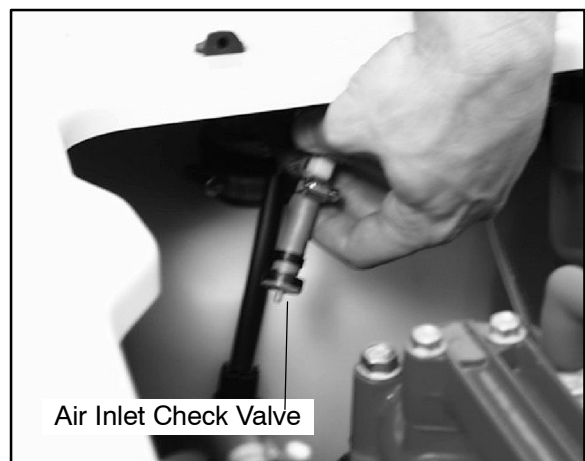
Relief Valve Testing

Apply air pressure with a Mity Vac™ to relief valve. With air pressure applied in the direction of the arrow, the valve should “pop” between 1.0 and 1.5 PSI. In the opposite direction it should hold pressure.



Fuel Tank Check Valve Testing

To test the air inlet check valve, remove the valve and apply approximately 5 PSI pressure to the end of the valve marked “VAC”. The valve should hold steady pressure. Connect the tester to the other end and apply pressure. Air should pass through the valve with no pressure build up. Replace the check valve if it holds pressure both ways or fails to hold pressure one way.

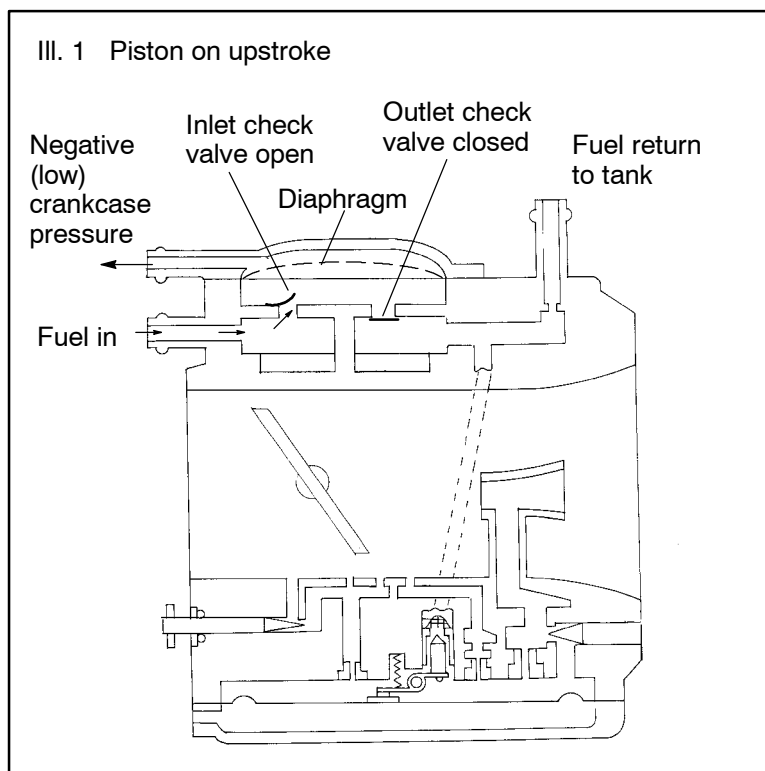




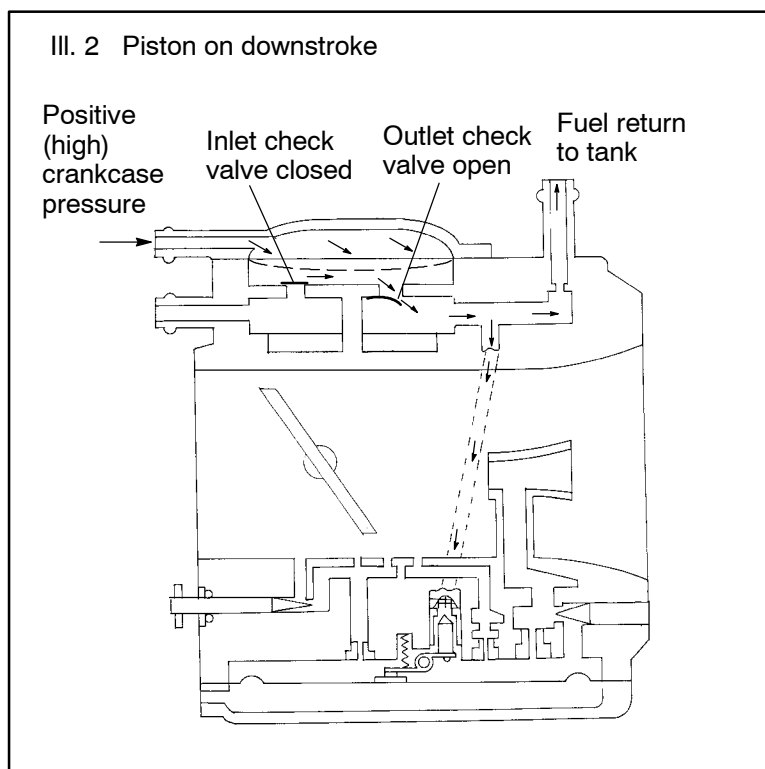
Fuel Pump Operation

The pump supplies fuel to carburetors. On three cylinder models two fuel pumps supply fuel to each of the end carburetors and commonly to the center cylinder.

When the piston is on the upstroke crankcase pressure is low, the diaphragm in the fuel chamber moves outward toward the chamber cover. This causes a negative (low) pressure in the fuel chamber. The check valve on the fuel supply side of the chamber opens, allowing fuel to enter. This vacuum causes the outlet check valve to close so fuel cannot return from the carburetor. See Ill. 1.



When the piston is on its downstroke, the pressure from the crankcase becomes positive causing the diaphragm to move in the opposite direction, reversing the pressure in the pump chamber. This causes the inlet check valve to close and the outlet valve to open, delivering pressurized fuel to the carburetor fuel chambers. see Ill. 2.

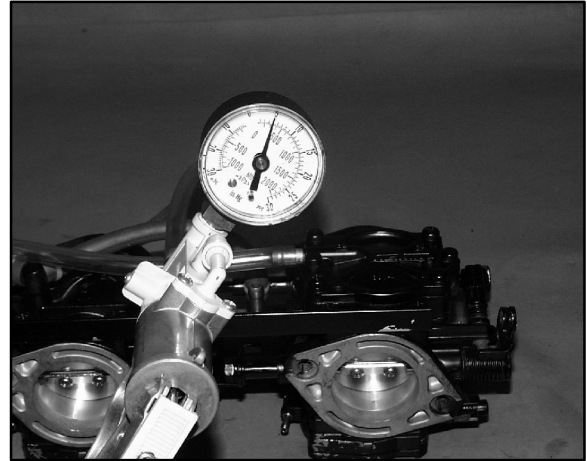




Fuel Pump Maintenance

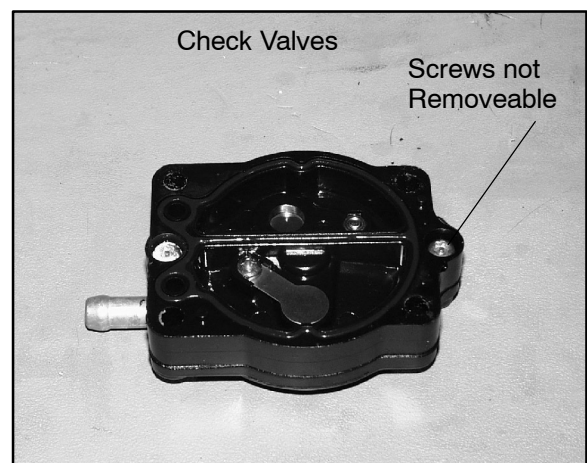
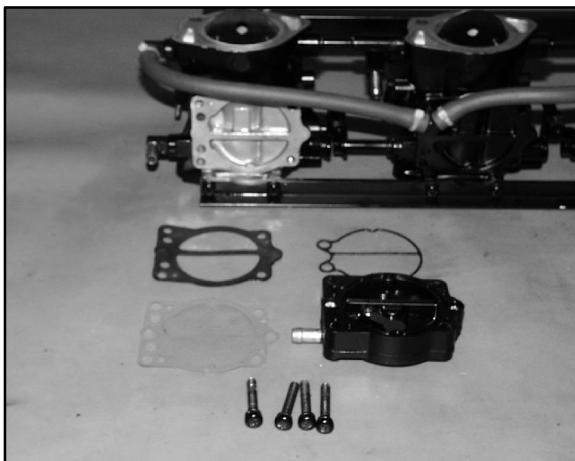
The fuel pump does not require any specific scheduled maintenance. However, the following should be observed:

- **Output:** The pump output may be checked by removing the fuel supply line from the rear cylinder carburetor (PTO end) and placing it into a container. With the engine idling a steady small stream of fuel should be observed.
- **Cleaning:** The pump and impulse line must be disassembled and cleaned whenever water is present in fuel (beyond separator) or in the engine.
- **Impulse Diaphragm Inspection:** Loosen clamp and remove impulse line from pump fitting. Apply 5 PSI pressure to impulse line fitting. The diaphragm should hold pressure indefinitely. Remove and inspect the pump diaphragms if the impulse chamber does not hold pressure.



Disassembly/Inspection

1. Remove fuel pump body screws (4) and carefully lift assembly from carburetor.
2. Remove gasket, diaphragm, and O-ring. Carefully examine each for cracks, holes, distortion or fatigue (stretching). Replace if necessary.
3. Inspect the check valves in the fuel pump body. The valve body cannot be disassembled and must be replaced as an assembly if check valves are damaged or bent.





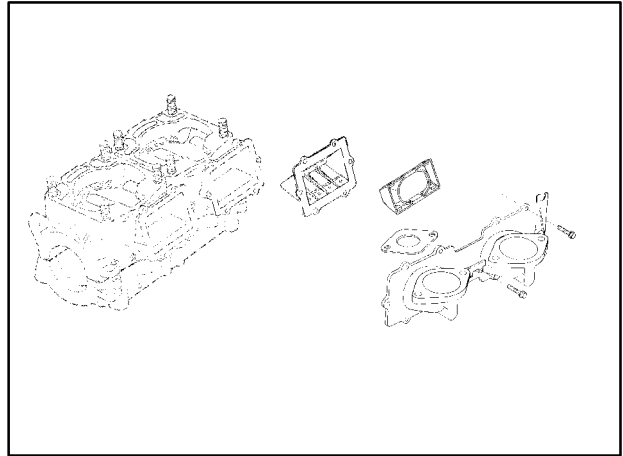
Reed Valve Removal

1. Remove air box inlet and hose clamp. Remove air box cover and screen. Remove (9) intake base bolts and intake base.

CAUTION:

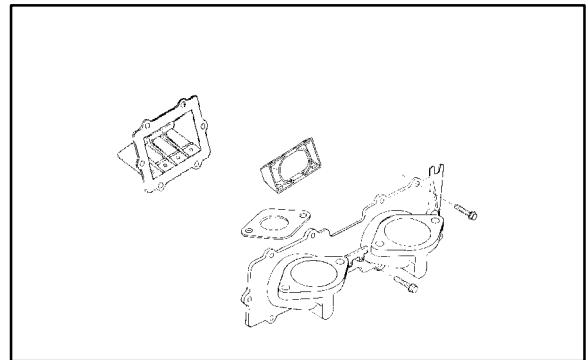
Cover carbs and use care not to drop washers or debris into carb openings.

2. Remove fuel inlet lines and plug to prevent fuel spills. See fuel warnings on page 4.7. Remove choke and throttle cables from carb assembly. Remove fuel return line and plug.
3. Remove flange nuts securing carb rack assembly to intake manifold and remove carb rack.
4. Remove intake manifold bolts and intake manifold flange nuts. Remove manifold. Inspect all gaskets and mating surfaces for possible air leaks.
5. Remove reed stuffers, reed gaskets, reed assembly, and lower reed gaskets.

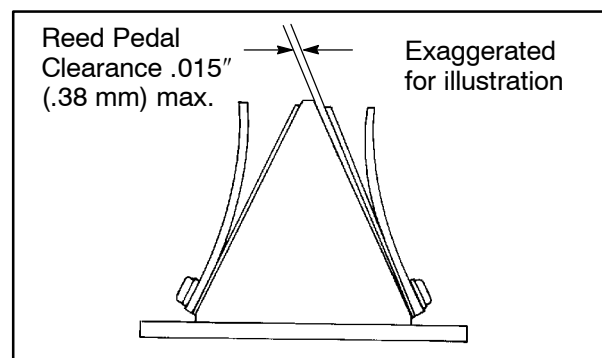


Reed Valve Inspection

1. Thoroughly inspect condition of reed valve stuffers, reed valves and gaskets. Replace if necessary.
2. Reed valves are sometimes held open by carbon or other small particles. Remove screws from reed stop. Remove the reed, making sure not to flip the reed if it is to be re-used. Reverse positioning of a reed will cause breakage.



3. Wipe reed cage and reed valve clean. Reassemble reed, reed stop and screws to cage and tighten. **NOTE:** If a gap of greater than .015" (.4 mm) exists, replace the reed valve.
4. Clean and dry components for reassembly. Apply Loctite 242 to reed stop screws for reassembly to engine.
5. See installation of reed cage and intake manifold in Engine Section.





Fuel Line Air Leak Testing

Fuel lines may develop air leaks causing the PWC to run lean or be hard to start. If you suspect this to be the case, the following would be suggested areas to check.

All fuel line clamps: Carb rack hose connections; fuel line from carb rack back to fuel pump; fuel pump back to shut off valve; shut off valve to fuel tank drop tube, then drop tube lines within tank. The return line may also cause lean conditions to exist regarding inlet needle and seat pop off.

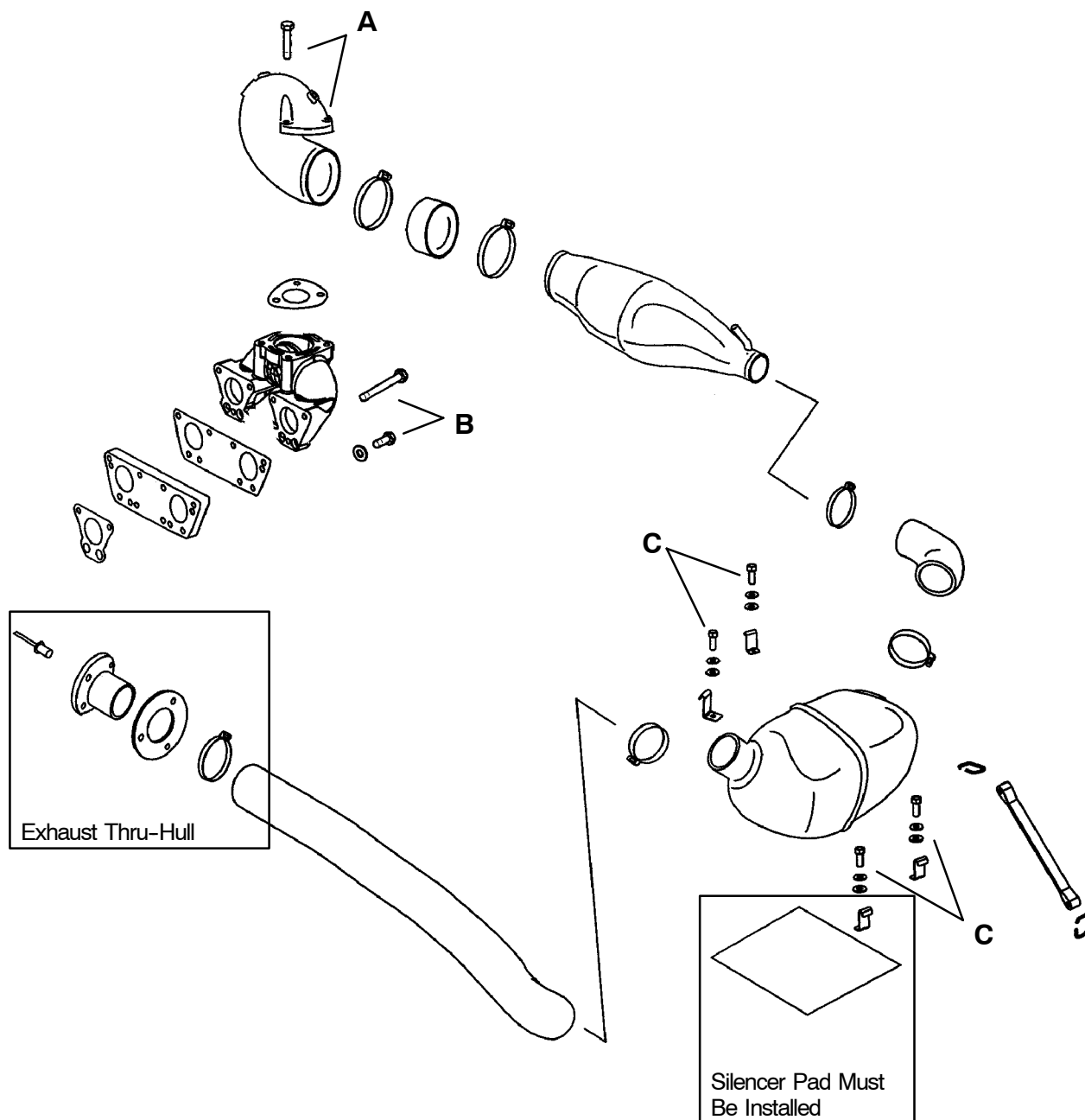
Fuel lines within the fuel tank may become distorted from fuel additives. In this case, lines should be replaced.

1. To check for air leaks in the main fuel line, remove fuel in line from fuel pump and fuel out lines from fuel tank. Attach a Mity Vac™ to one end and plug the opposite end. Pressurize the line with 10-14 PSI. The line should hold this pressure for five minutes. If pressure will not hold, check hose clamps and fuel shut off valve.
2. To verify if the shut off valve is leaking, bypass the valve. If it maintains pressure, the valve is faulty and should be repaired or replaced. This test should be done on both main fuel line and reserve line, switching the shut off valve accordingly.
3. To check for air leaks from the fuel pump through the carb rack, remove the fuel line from the fuel pump out line, and remove the return line from the fuel tank.
4. Attach one end of the line and install the Mity Vac™ on the other end. Apply 8 to 9 PSI to the line. It should maintain that pressure for five minutes. If not, check hose clamps and inspect lines for damage. If after checking lines and clamps no leaks are found, carbs should be taken apart and inspected.





Exhaust System Exploded View - Octane



Exhaust System Torque / Assembly Specifications

Micro Gear Clamps: 22 in.lbs. (2.5 Nm)

Large Gear Clamps: 35 in.lbs. (4 Nm)

A 44 ft.lbs. (60 Nm)

Exhaust manifold-to pipe bolts.

B 26 ft.lbs. (36 Nm)

Apply Loctite™ 242 to threads.

C 14 ft.lbs. (19 Nm)

Apply Loctite™ 242 to threads.

Verify that mating surfaces are free of contaminants. Always use new gaskets.



Exhaust System - Inspection

A complete inspection of exhaust components is critical to proper operating performance. Inspect all hoses for cracks, pinholes, swelling, tears, discoloration, air bubbles, and fatigue. If any of these are evident, the hose **MUST** be replaced.

NOTE: A hole in an exhaust hose no more than a pin head in diameter can cause significant power loss and poor runability.

- Cracking can occur at the bends in the hose and undersides due to normal wear and tear. Inspection of hoses involve the entire hose.
- All worm gear clamps must be in good working condition. Replace if rusted, stripped, or stretched.
- Inspect each exhaust hose for signs of internal melting or foreign material. Replace hose if lining are melted.

NOTE: Burned or bubbled exhaust components are signs of extreme exhaust temperatures. When found, the cooling hoses should be checked for proper operation. Check the condition of the water inlet fitting located at the top of the exhaust pipe. For more information on cooling systems, refer to the chapter three, cooling section.

Exhaust System Troubleshooting

Problem	Possible Cause
Poor Performance	Exhaust leaks: Operate watercraft with seat off. If performance improves, inspect exhaust hoses and connections. Tighten worm gear clamps. Exhaust Flow Obstructions: Check inner linings of hoses for signs of melting. Exhaust leaks at manifold: Replace exhaust manifold gasket(s), re-torque manifold.
Overheating Exhaust Components	Obstructed cooling hoses: Refer to cooling section in chapter three. Obstructed inlet grate: Check for foreign material in and around the inlet grate and pump. Fuel and ignition problems: Refer to this chapter's Lean Fuel Mixture troubleshooting guide and chapter seven for ignition troubleshooting.



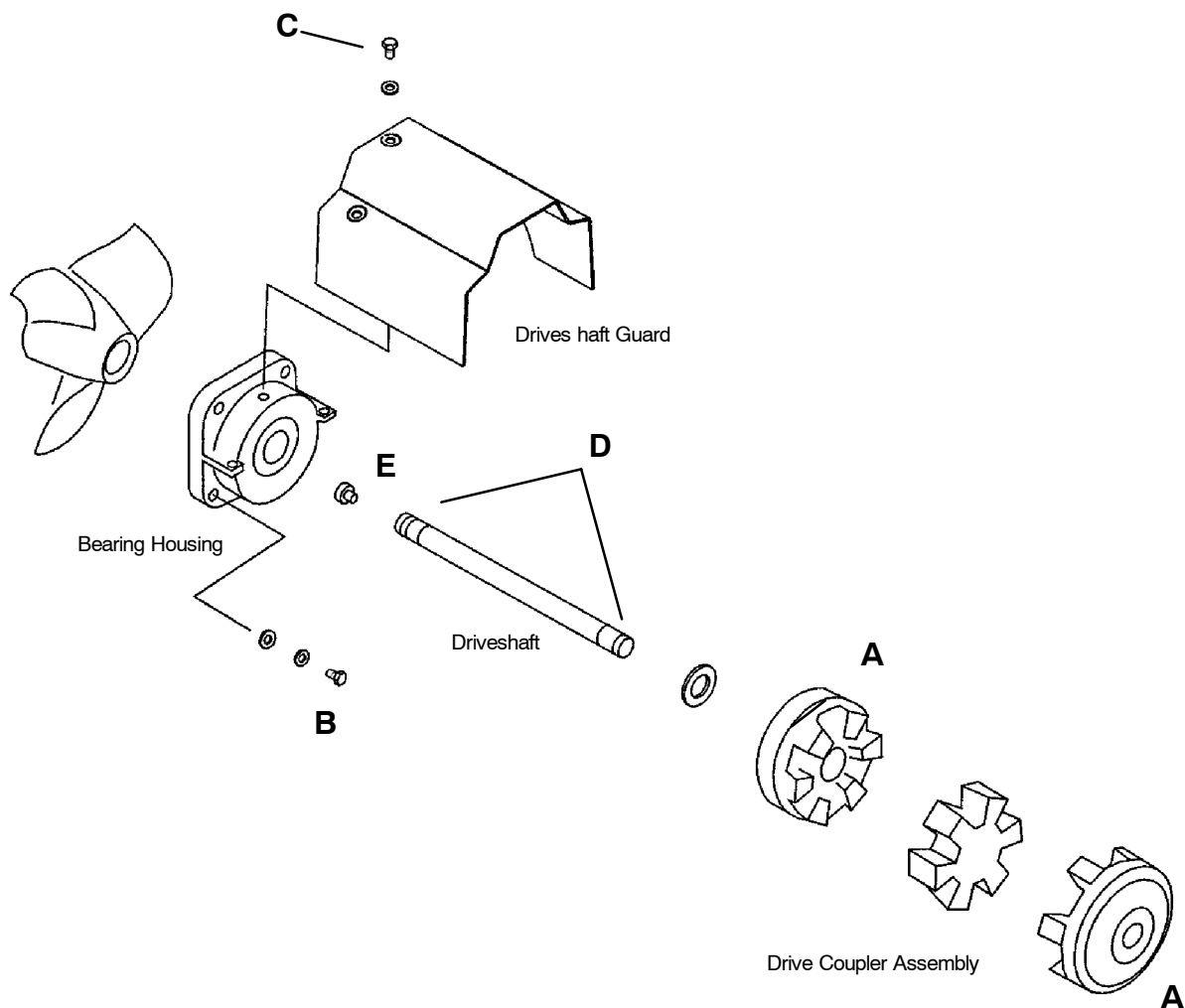
POLARIS®
WATERCRAFT

Chapter 5 / Final Drive and Hull Control Systems

Driveshaft / Coupler / Bearing Carrier Exploded View	5.1
Pump Assembly Exploded View	5.2
Pump Induction Exploded View	5.3
Pump Removal	5.4
Driveshaft Removal	5.4
Drive Coupler Removal	5.4
Drive Coupler Installation	5.4
Bearing Carrier Disassembly / Inspection / Assembly	5.5
Impeller Clearance Specifications / Driveshaft Inspection	5.6
Stator Disassembly	5.7 – 5.8
Stator Assembly	5.9
Pump Alignment	5.10 – 5.11
Engine Compartment Exploded View	5.12
Handlepole / Controls Exploded View	5.13
Steering Assembly Exploded View	5.14



Driveshaft / Coupler / Bearing Carrier

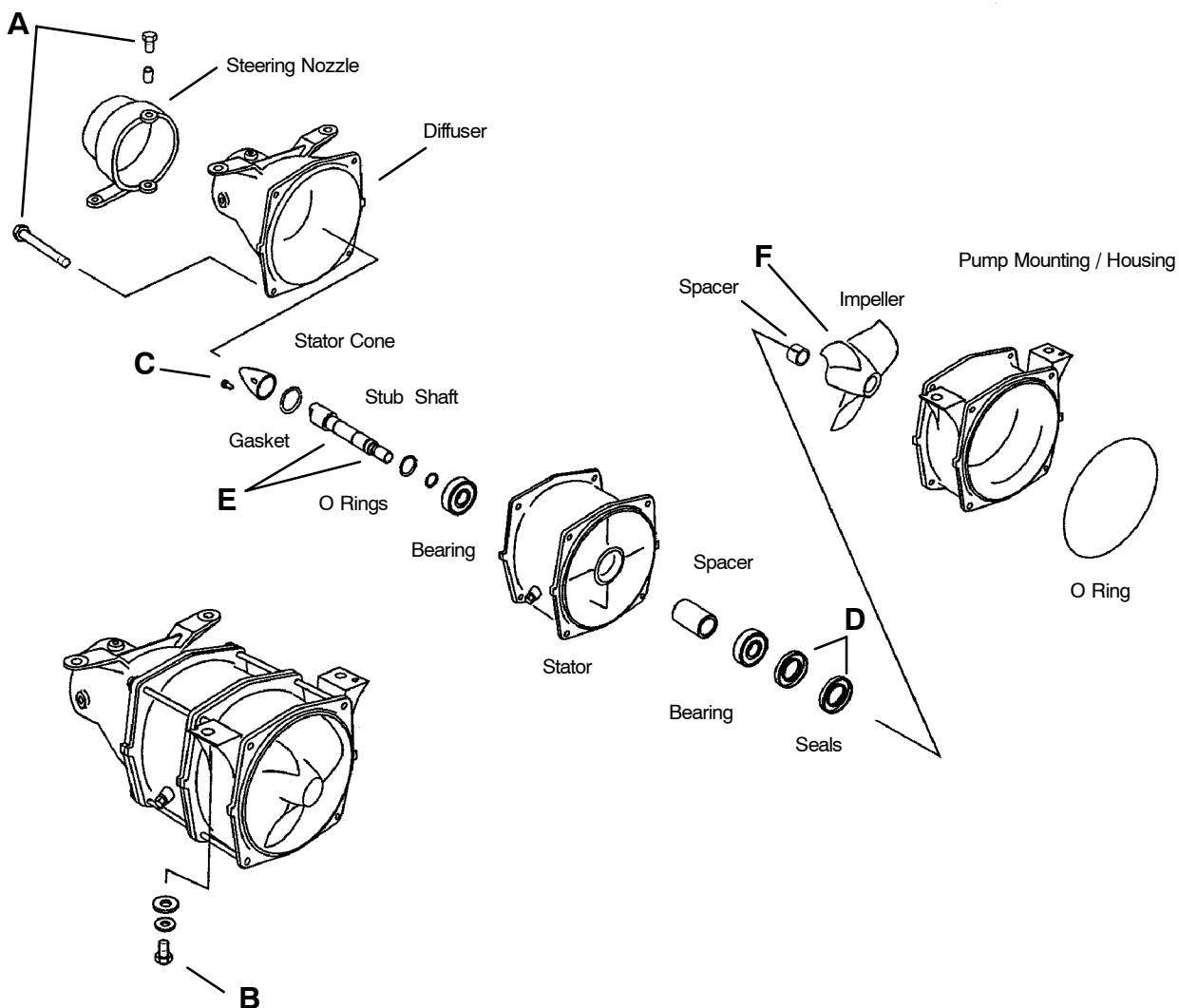


Driveshaft / Coupler / Bearing Carrier Torque Specifications

- A Hand Tight Apply light film of Premium All Season grease to inner threads.
- B 14-18 ft.lbs. (19 - 24 Nm)
- C 30 - 43 in. lbs. (3.4 - 4.9 Nm)
- D Apply light film of Premium All Season Grease to splines and shaft during assembly.
- E Verify driveshaft bumper is in place during shaft installation.



Pump Assembly



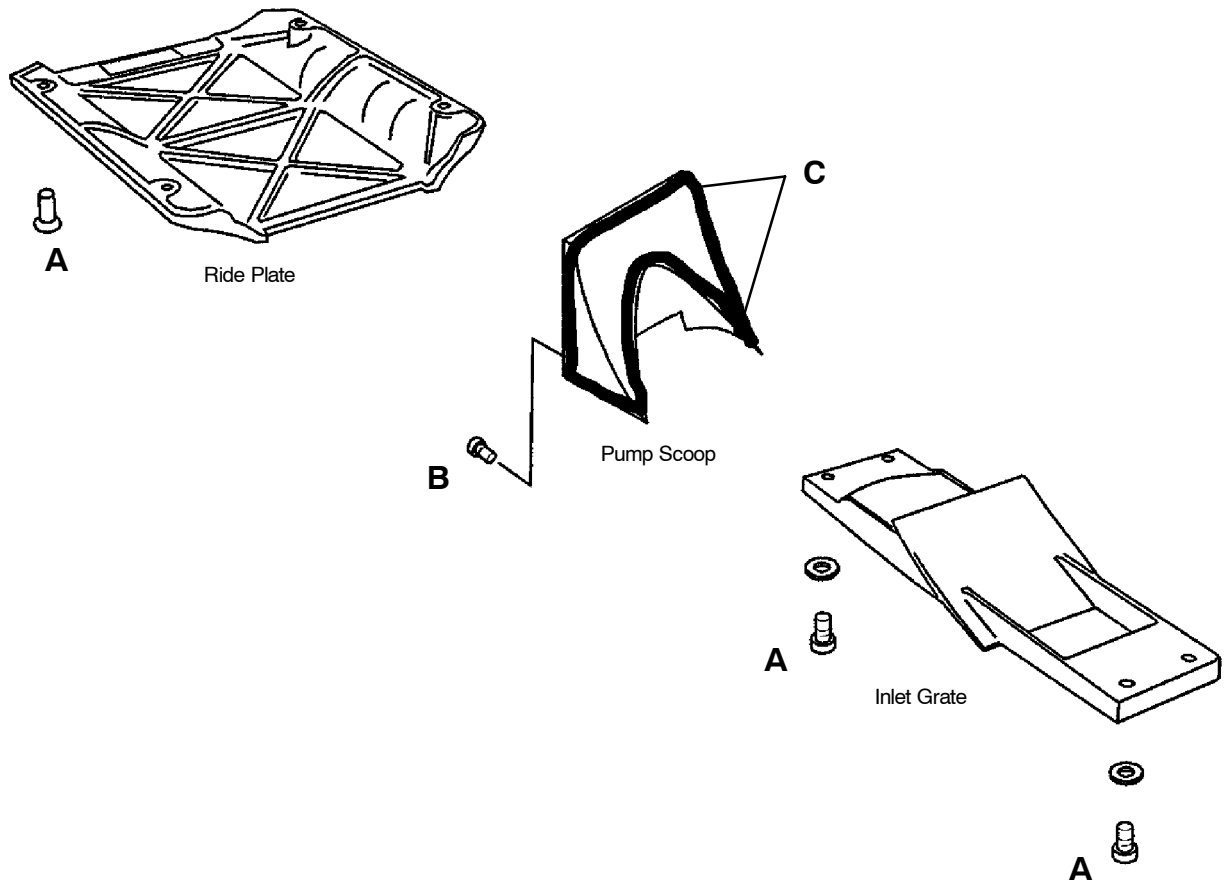
Pump Assembly Torque Specifications

- A 18 ft.lbs (25 Nm) Apply Loctite™ 242 to threads.
- B 26 - 30 ft. lbs. (35 - 41 Nm) Verify number of shims and locations during disassembly for correct alignment during assembly.
- C 78 in.lbs. (8 Nm)
- D Install seals with lip facing impeller.
- E Apply Polaris Premium All Season Grease.
- F Impeller Torque: 100 ft.lbs. (138 Nm) Apply Loctite™ 242 to threads.





Pump Induction



Pump Induction Torque Specifications

A 8 ft.lbs. (11 Nm) Apply Loctite™ 242 to threads.

B 40 In. Lbs. (4.5 Nm)

C Apply a liberal bead of marine grade silicone to pump inlet mating surfaces.



Pump Removal

1. Remove the ride plate from the hull.
2. Disconnect the steering linkage from the steering nozzle. Disconnect the two (2) water-in hoses from the pump to the bulkhead.
3. Locate the two (2) rear pump mounting bolts that attach the pump assembly to the hull. Remove both bolts.

NOTE: During production, pump alignment is obtained by inserting shim washers between the hull and the two rear pump mounts. Retain the quantity and positions of each group of washers from reassembly.

4. Loosen and remove the four (4) diffuser-to stator mounting bolts. Remove the diffuser from the stator assembly.
5. Carefully pull the stator/impeller assembly away from the pump mount.
6. To remove the pump mount, remove the two (2) remaining pump-to-hull mounting bolts.

Assembly and installation is reverse of removal. Remember to install the correct number of shim washers in the correct location when mounting the pump to the hull.

Driveshaft Removal

NOTE: Driveshaft removal requires the removal of the pump assembly and the physical movement of the engine.

1. Remove pump assembly.
2. Loosen and remove the three (3) bolts mounting the exhaust pipe to the exhaust manifold.
3. Locate the blue exhaust pipe-to-water box connector. Using a nut driver, loosen the gear clamps at this connection.
4. Disconnect the two (2) water-in hoses from the bulkhead to the exhaust pipe.
5. Disconnect the water outlet hoses from the overboard stingers and exhaust pipe assembly.
6. Remove any fuel in the fuel tank and store in an approved container. Disconnect the fuel supply, return and vent lines from the fuel tank.
7. Un-hook the fuel tank hold-down straps. Remove the fuel tank from the engine compartment.
8. With the exhaust pipe loose, rotate the pipe down and towards the rear of the watercraft in a clockwise motion. The entire exhaust pipe can be removed using this technique.
9. Locate the four (4) engine plate-to-engine mount bolts. Loosen and remove bolts.
10. Position engine forward in the engine compartment.
11. Loosen and remove the four (4) bearing carrier-to-bulkhead mounting bolts. Carefully pull the bearing carrier along with driveshaft through the bulkhead into the engine compartment.

Assembly is reverse of removal.

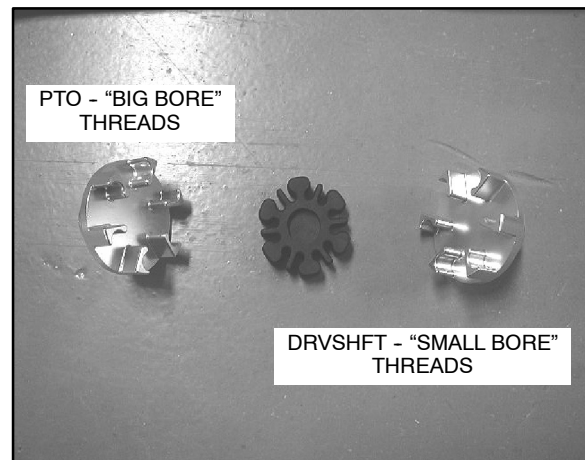
Drive Coupler Removal

1. The drive couplers are screwed on to the crankshaft and driveshaft ends. Remove by twisting counter-clockwise.

NOTE: Inspect drive coupler “fingers” for cracks, fatigue, and obvious breaks. Verify coupler dampener is firm and not compromised by cracking or missing pieces.

Drive Coupler Installation

1. Installation is the reverse of removal. Lightly coat the inner thread surfaces of each coupler to prevent corrosion.
2. Hand-tighten coupler ends to both crankshaft and driveshaft ends.



CAUTION: During assembly, do not install the dampener unless engine-to-pump alignment is verified to be correct. Incorrect engine-to-pump alignment may cause serious engine and driveline damage.



Bearing Carrier Inspection - Disassembly / Assembly*

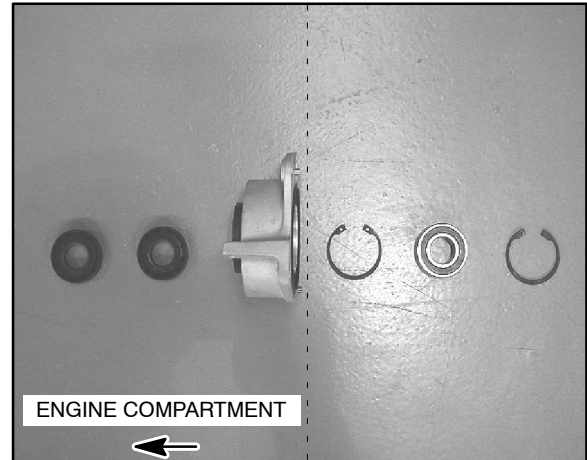
The bearing carrier uses a sealed bearing for increased durability and performance. Routine maintenance and grease applications are not required. Although the carrier is not pressed on to the driveshaft, the driveshaft uses an interference fit to prevent water intrusion and driveshaft failure.

1. Begin inspection by removing the driveshaft from the bearing carrier. Mount driveshaft in a soft-jawed vice and carefully push or pull the bearing carrier off of the driveshaft.
2. Reference the driveshaft inspection procedures in this chapter to check driveshaft runout.
3. Remove the seals from the bearing carrier. Discard both seals. Using a snap ring pliers, remove the two snap rings that are positioned on both sides of the bearing.
4. Using a press, remove the bearing from the carrier assembly.

Inspect the bearing for sign of failure and galling. Bearing should rotate smoothly with no bumps or flat spots with slight resistance. If bearing "freewheels", replace bearing.

1. Bearing carrier assembly is reverse of disassembly.
2. Always lightly coat the seal lips and mating surfaces with grease.
3. The bearing may be pressed in or installed by carefully heating housing and installing the bearing cold. Position bearing between snap ring recesses.
4. Push driveshaft through carrier to anticipated mounting position. Verify seal lips maintain seal against driveshaft and are not compromised.

NOTE: Spline-end of driveshaft faces impeller.





Impeller Clearance

1. Remove lanyard cord and lock plate from engine stop switch. Disconnect battery ground (-) cable.
2. Remove intake grate and check impeller to housing clearance with a feeler gauge. Measure clearance at leading edge, middle, and trailing edge of each blade. Replace impeller if clearance exceeds service limit at any point. If clearance exceeds service limit with a new impeller, replace pump housing.

Impeller Clearance

Std: .002 - .008" (.05 - .20 mm)

Service Limit: .020" (.5 mm)



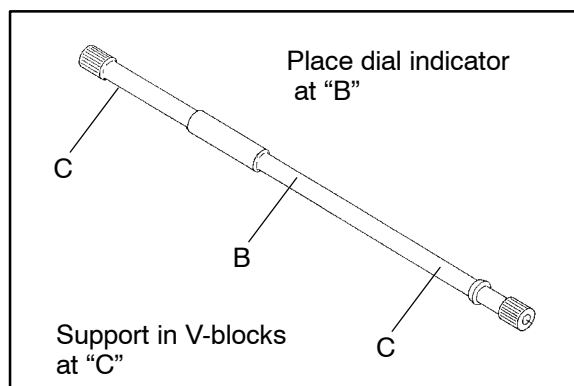
Drive Shaft Inspection

1. Clean driveshaft and support in V - blocks as shown (C). Measure runout by rotating shaft and observing dial indicator at point "B". Replace if runout exceeds the service limit.

NOTE: Excessive driveshaft runout can cause vibration, bearing, and spline failure. See Pump/Final Drive Troubleshooting at the end of chapter 2.

Drive Shaft Runout

Service Limit: .005" (.13mm)



2. Inspect driveshaft splines and threads carefully for wear or damage. Replace worn parts. Rubber bumper controls driveshaft end play. Replace if worn, cracked or damaged.

NOTE: If drive shaft, impeller, or coupler splines are worn or damaged, improper pump-to-hull, or pump-to-engine alignment should be suspected. Refer to Pump/Drive shaft Alignment on pages 5.12 - 5.14 for more information.

Drive Shaft End Play

.100-.200" (2.54-5.08mm)



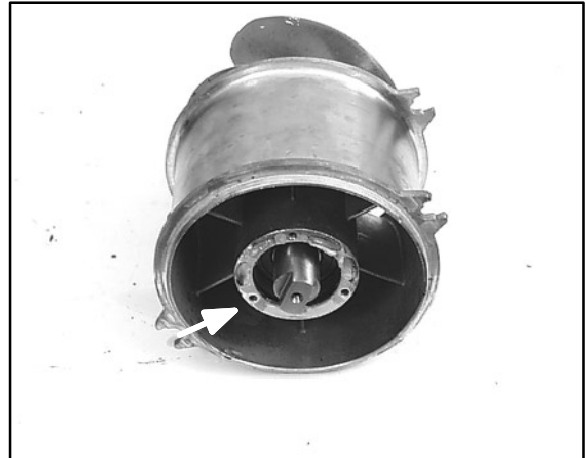


Stator Disassembly

1. Remove tail cone screws (3) and tail cone. Inspect O-ring seal located behind tail cone. Replace seal if damage is evident.

NOTE:

When removing tail cone, hold stator with cone pointed down. Twist cone off. This will allow any water from entering the impeller assembly. It is normal for a small amount of water to be inside the cone during operation.



2. Mount stub shaft flat surfaces in a vise to prevent the impeller and stator from rotating.



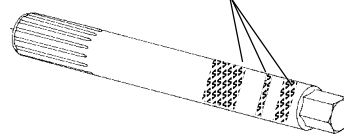
3. Install impeller removal tool and turn counterclockwise to remove. The impeller removal tool can be identified by (3) knurled sections on the shaft.

Impeller Removal Tool

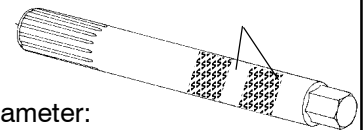
PN 2871036

Impeller Tool Diameter:
.852" (21.65mm)

Impeller Removal Tool
has 3 knurled sections



Coupler Tool Has 2
Knurled Sections



Coupler Tool Diameter:
.787" (20 mm)



Stator Disassembly - Continued

4. Remove stator assembly from vise. Using a soft-faced hammer, tap stub shaft out of housing.
5. Inspect shaft and collar for wear, scratches, or damage. Install new O-rings upon reassembly.



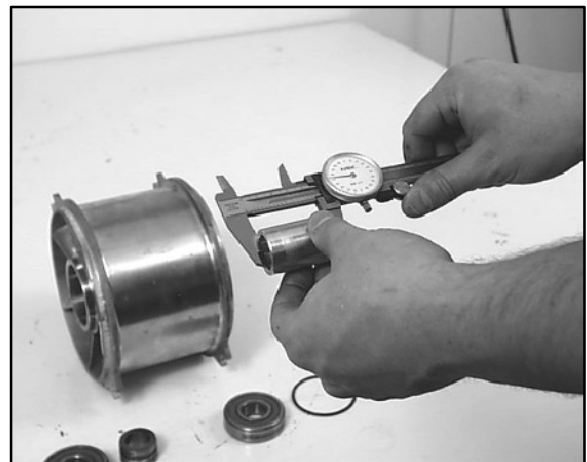
6. Using a brass hammer or aluminum drift, tap bearing spacer to one side of the stator housing. Drive out bearings by tapping on inner races.



7. Measure spacer with a Vernier caliper. Replace if worn beyond service limit. If the spacer is too short, the bearings will be side-loaded and premature wear will result.

Bearing Spacer Length

Service Limit: 1.730" (43.94 mm)





Stator Assembly

NOTE: Seals, bearings, and O-rings should be replaced if removed. Heat the impeller housing evenly with a heat gun to ease removal of bearings in next step. Remove tail cone O-ring before applying heat. To ease installation, wrap bearings in wax paper and chill in a freezer for 30 minutes or longer. Warm the impeller housing evenly with a heat gun or a propane torch. **DO NOT OVERHEAT.**

1. Press or drive bottom bearing into place until it bottoms against the shoulder in the pump housing. Apply grease to center bearing spacer and install. Verify that bearing spacer is centered, and install second bearing.

CAUTION:

Do not drive on the inner race. Bearing damage will result. Drive on outer race only.

2. Place impeller spacer onto inner race of front bearing.



3. Apply marine grease to seal lips and also between the two seals. Install two new oil seals over impeller spacer with lips up and visible (toward impeller). Press seals to bottom of chamfer on seal bore (about 1/8"/.32 cm beyond end of bore).

WARNING: Never allow the impeller spacer to push up through the two seals when inserting the stub shaft. If spacer pushes through seals, the seal lips will be compromised and allow water into bearing housing.



4. Grease and install two new O-rings on stub shaft. Mount stub shaft flats in a vise. Grasp stator assembly with thumbs over impeller spacer. Carefully lower assembly over stub shaft. Verify that stub shaft has not pushed impeller spacer up through seals.

NOTE: If impeller spacer has pushed up through seals, push into place slowly and carefully to prevent dislodging seal springs.

5. Hand thread impeller onto stub shaft. Torque to specifications. Rotate impeller by hand to insure proper rotation.



Impeller Torque
100 ft. lbs. (138 Nm)
Apply Loctite™ 242 to threads.



Pump Alignment

CAUTION:

During production, pump alignment is determined by installing simulated pump and engine fixtures to the watercraft. With the fixtures installed, shims are inserted between the engine plate-to-engine mounts and between the pump assembly-to-hull mounting locations.

Prior to ANY engine or pump removal, the exact number and locations for these shims should be noted for use during re-assembly.

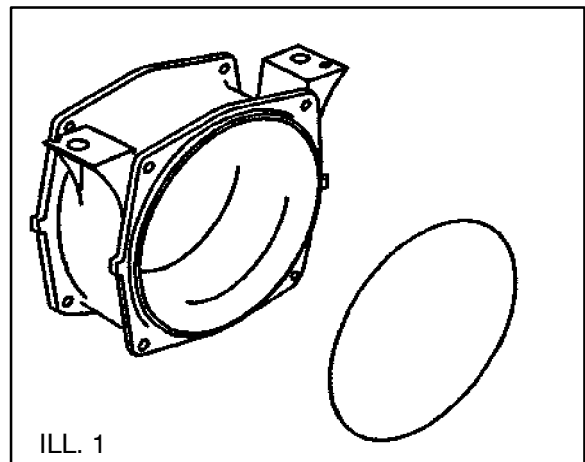
The drive coupler is the key to any attempt to align the engine with the driveline. With the coupler dampener removed, a feeler gauge can be used to measure the axial clearance between the two coupler faces when both the engine and pump assemblies are installed. When differences occur, shims should be added between the engine plate and engine mounts.

The pump assembly is aligned to the hull at a pre-determined angle. Any deviation from the original angle requires realignment of the engine and drive couplers.

Pump Alignment Process

NOTE: The following process assumes that all essential pump parts have been removed from the hull.

1. Attach the pump mount to the hull. (ILL. 1)
 - Always use a new o-ring.
 - Apply a thin bead of marine grade silicone to mating surfaces.
 - Torque mounting bolts to specification before silicone cures.
 - Allow silicone to cure.
2. Obtain stator housing with impeller assembly attached.
3. Obtain diffuser and the four (4) mounting bolts that attach the stator and diffuser to the pump mount.

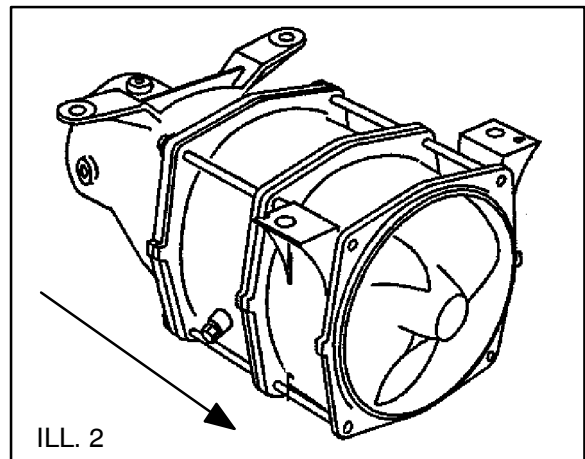


4. Insert the stator into the pump mount, then the diffuser. Have an assistant hold the two pieces in place while inserting and hand-tightening the four (4) mounting bolts. (ILL. 2)

NOTE: Verify that the stator and diffuser are seated correctly and evenly while tightening mounting bolts.

5. Torque mounting bolts to specification.

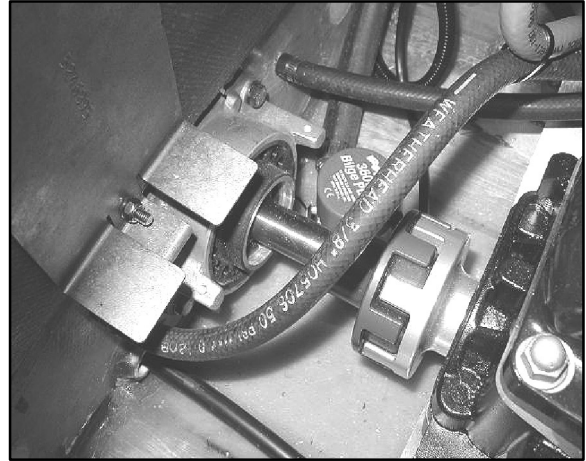
NOTE: If installed correctly, there will be a small gap between the rear mounting arms and the bottom of the hull. Do not install washers at this point.





Pump Alignment - Continued

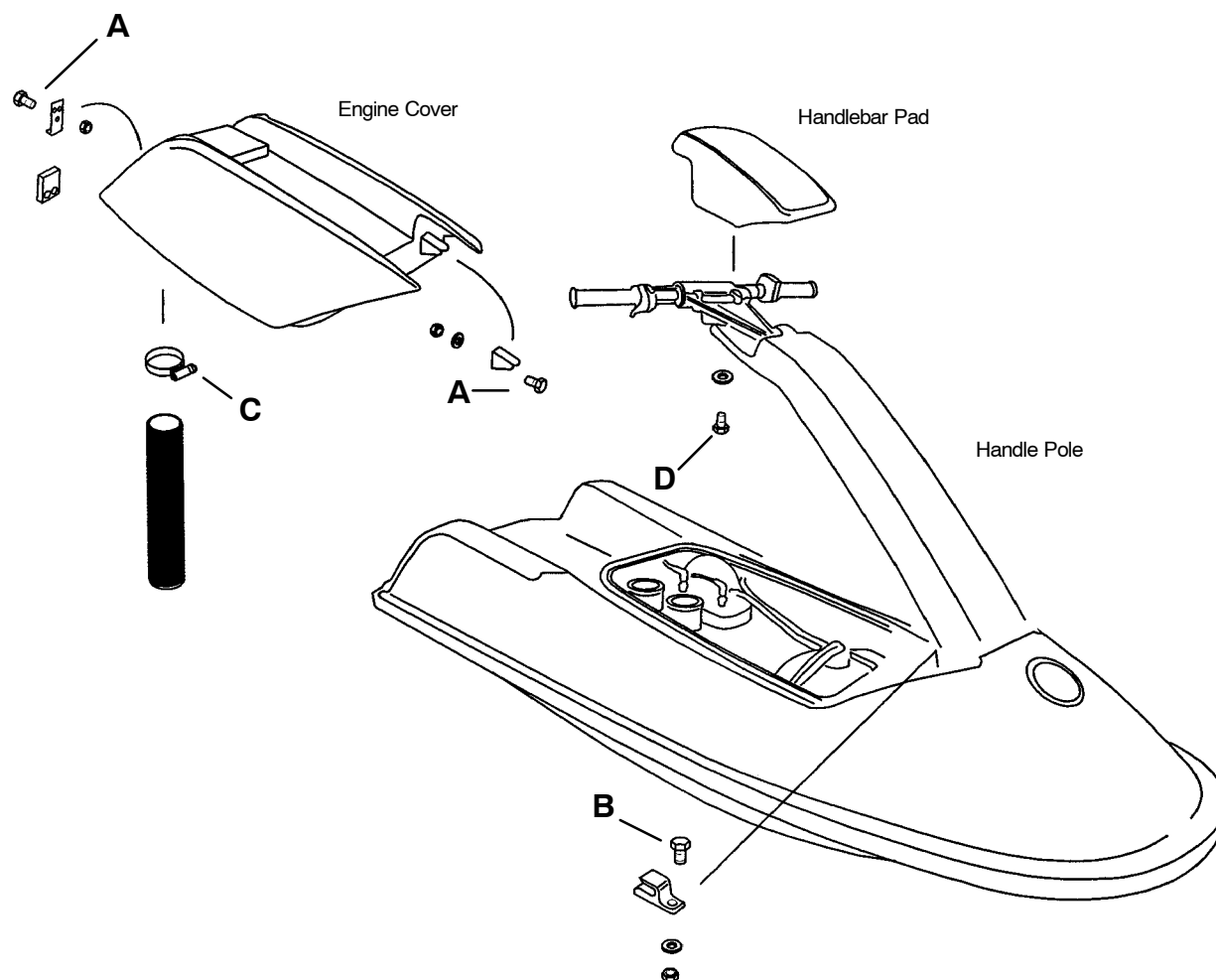
6. Move around into the engine compartment. Install driveshaft assembly with bearing carrier already attached.
7. Push the driveshaft into the pump so that the splines fully engage the impeller.
8. Slide the bearing carrier up against the bulkhead. Use the mounting screws to attach the carrier to the bulkhead wall. Torque to specifications.
9. Install the coupler on the end of the drive shaft. Hand tighten.
10. Hand tighten the PTO-end drive coupler on the crankshaft.
11. Using the number of shims installed between the engine plate and engine mounts at the time of manufacture, install the engine and slide it rearward toward the bulkhead.
12. Engage the couplers without the dampener installed.
13. Verify that engine plate-to-engine mount holes are aligned. (Install bolts to hold engine.)
14. Using a feeler gauge, check the clearance between one of the PTO coupler towers in relation to the face of the opposing driveshaft coupler. Record the measurement.
15. Without rotating the driveshaft, insert the feeler gauge between at least three (3) equidistant points around the circumference of the two couplers with the same measurement taken in the first attempt.
16. All measurements should be the same.
17. An additional check would be lay a straight edge across the individual fingers on both couplers. the straight edge should lay flat across both coupler surfaces. Perform this check at three (3) different points around the circumference of the two couplers.



NOTE: Different measurements or gaps indicate a mis-aligned engine-to-pump assembly.



Engine Compartment Door Assembly



Engine Compartment Door Assembly Specifications

A 14 ft.lbs. (23 Nm)

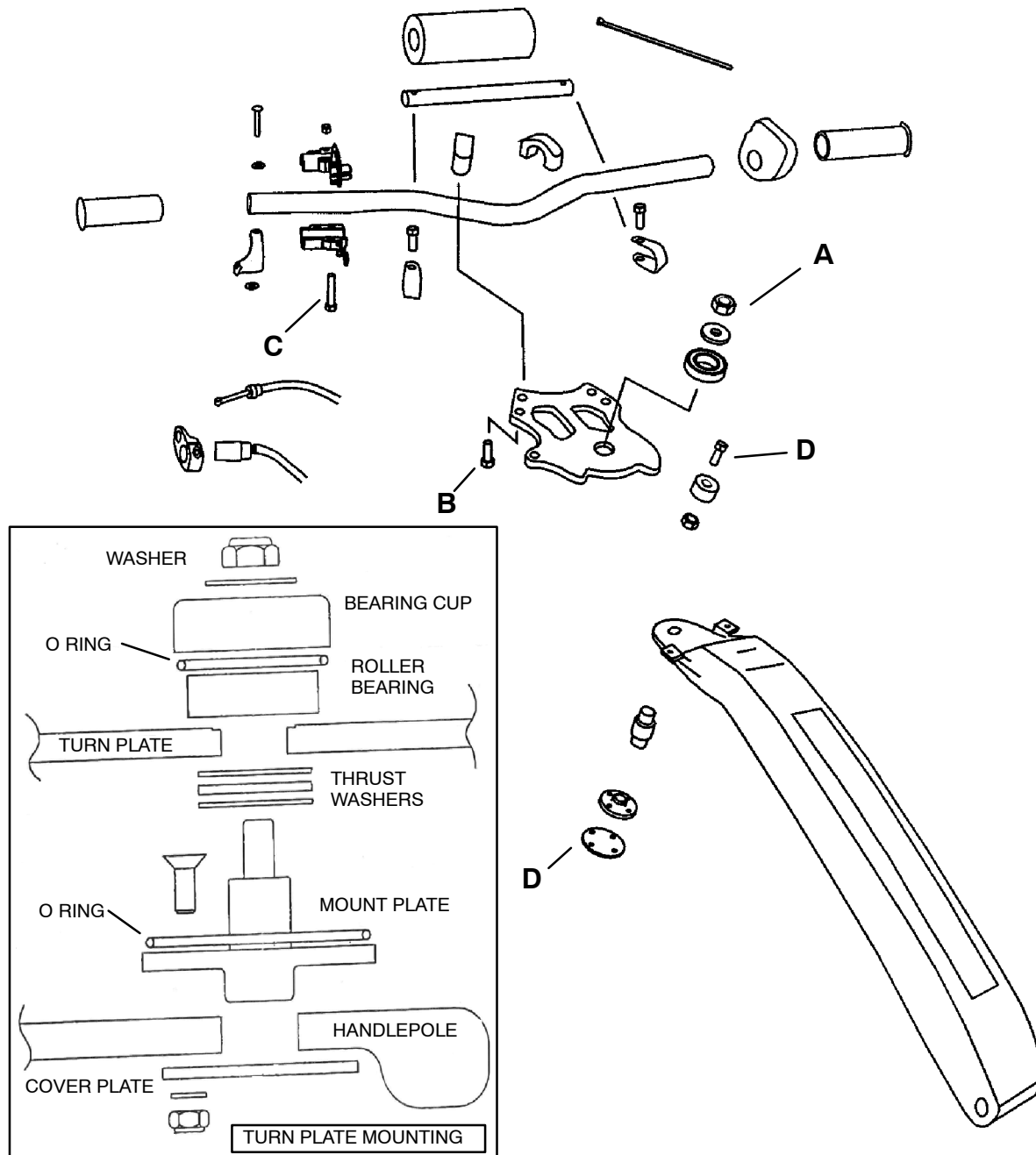
B 18ft.lbs. (24 Nm)

C 35 in.lbs. (4 Nm)

D 8 ft.lbs. (11 Nm)



Handlepole / Controls Assembly



Handlepole / Controls Assembly Specifications

A TIGHTEN SO THERE IS NO FREEPLAY BETWEEN TURN PLATE AND HANDLEPOLE

DO NOT OVERTIGHTEN!

B 14 ft.lbs. (19 Nm)

C 14 in.lbs. (1.6 Nm)

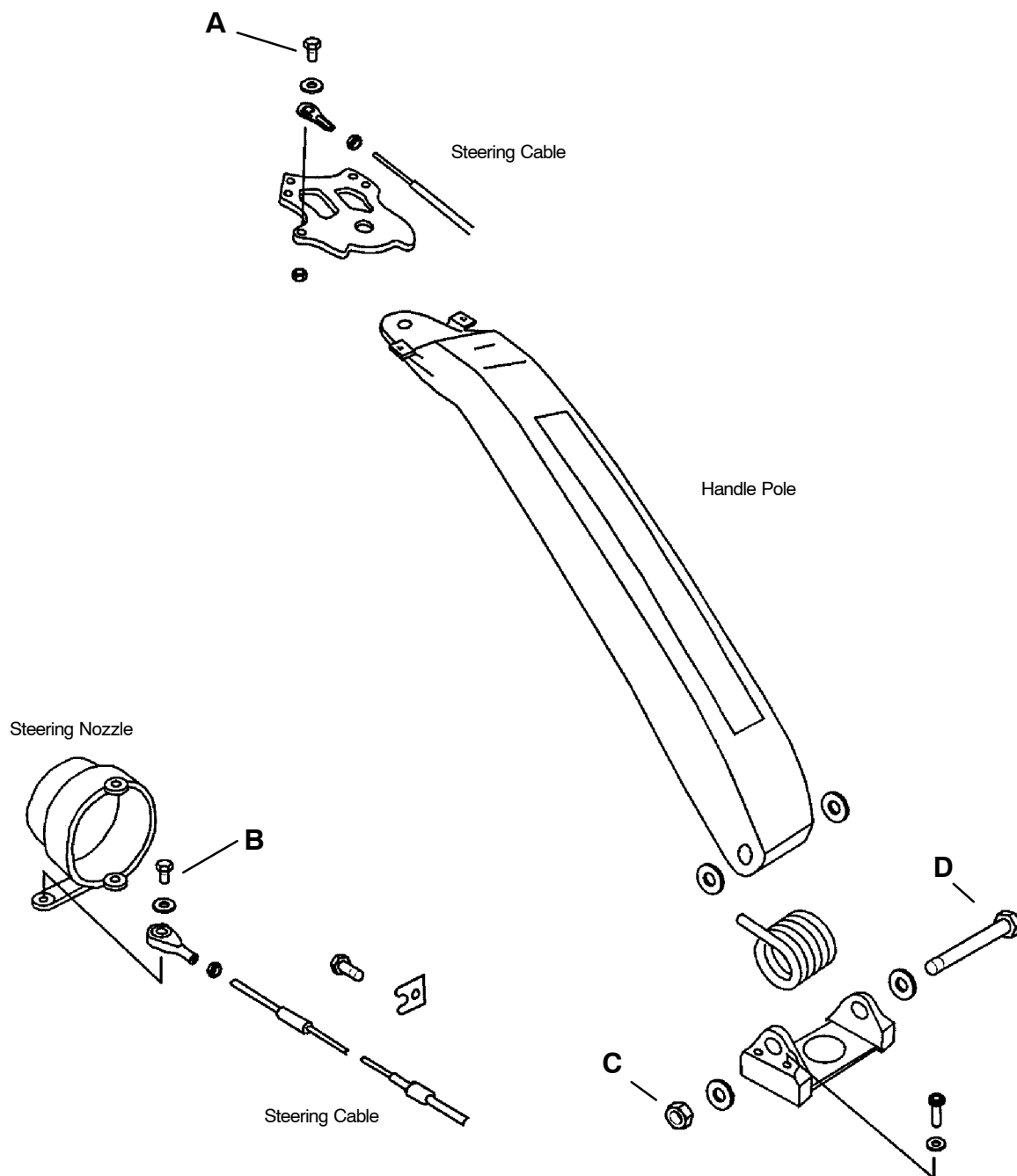
D 5 ft.lbs. (7 Nm)

THROTTLE LEVER-TO-BLOCK CLEARANCE = .020" - .060".

LIGHTLY GREASE SEALS, O-RINGS, AND CABLES PRIOR TO EACH RACE.



Steering Assembly



Steering Assembly Specifications

A 40 in.lbs. (4.5 Nm)

B 8 ft.lbs. (11 Nm)

C 30 ft.lbs. (41 Nm)

D 13 ft.lbs. (18 Nm)

NEVER RE-USE NYLOCK NUTS. REPLACE WITH NEW.

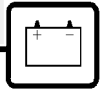




POLARIS®
WATERCRAFT

Chapter 6 / Electrical Systems

Spark Plug Specifications	6.1
Alternator Specifications	6.1
Ignition Timing / CDI / Timing Chart Specifications	6.2
Regulator Rectifier Specifications	6.2
Ignition System Overview	6.3
Electrical Component Testing	6.4
Battery Testing / Maintenance	6.5 – 6.7
Dynamic Ignition Timing Adjustment	6.8 – 6.9
Ignition Point Adjustment Unit	6.10 – 6.11
Trigger Coil Testing	6.12
Ignition System Troubleshooting / Specifications	6.13 – 6.16
Ignition Coil Wire Sequence	6.17
Starter Motor Disassembly / Inspection / Assembly	6.18 – 6.24



2002 Spark Plug Specifications

Model	Spark Plug	Spark Plug Gap	
Octane	NGK BR9ES	.024 – .028	.6 – .7

WARNING

Use only resistor type spark plugs in all Polaris products.

2002 Alternator Specifications

Model	Alternator Output
Octane	5A / 60W @ 4500 RPM

2002 Ignition Timing / CDI Specifications

Model	Ignition Timing			CDI Box
	Degrees BTDC	Inches	MM	
Octane	20° @ 3000 RPM	.104	2.64	4010558

WARNING

Always verify ignition timing when replacing the CDI controller.

800 Domestic Engine Degrees-to-Piston Position Conversion Chart

136mm Rod 70mm Stroke

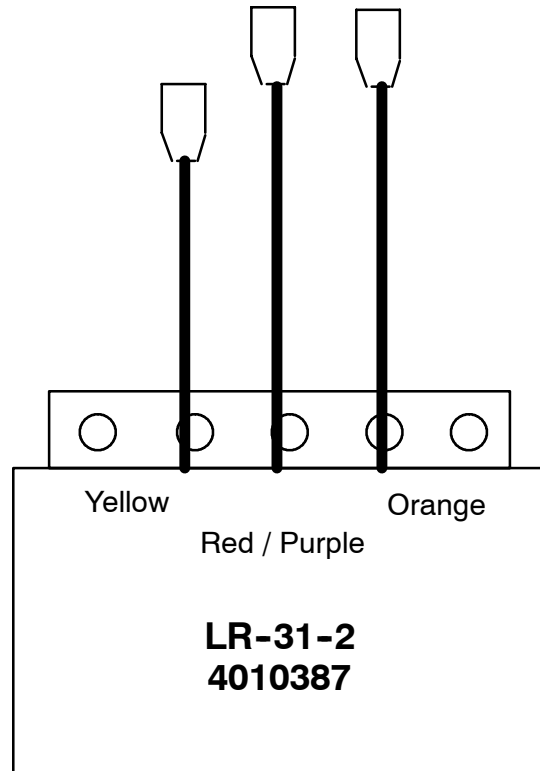
Degrees BTDC	Inches/MM
10	.026/.63
11	.032/.81
12	.038/.96
13	.044/1.12
14	.051/1.30
15	.059/1.49
16	.067/1.70
17	.075/1.91
18	.084/2.14
19	.094/2.38
20	.104/2.64
21	.114/2.90
22	.125/3.18
23	.137/3.47
24	.148/3.77
25	.161/4.08
26	.174/4.41
27	.187/4.74
28	.200/5.09
29	.215/5.45
30	.229/5.82
31	.244/6.20
32	.259/6.59
33	.275/6.99
34	.291/7.40
35	.308/7.82





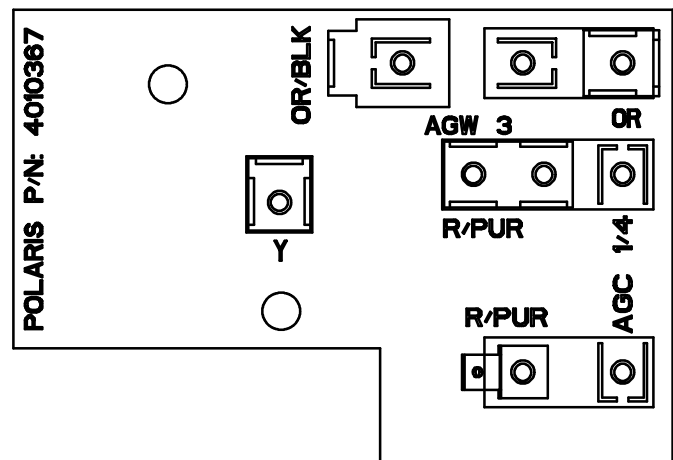
Regulator / Rectifier (LR-31-2)

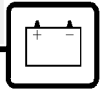
Wire Color	Function
Red / Purple	Stator (Vdc) - Battery Voltage
Orange	Switched DC
Yellow	Stator - (Tachometer Signal)



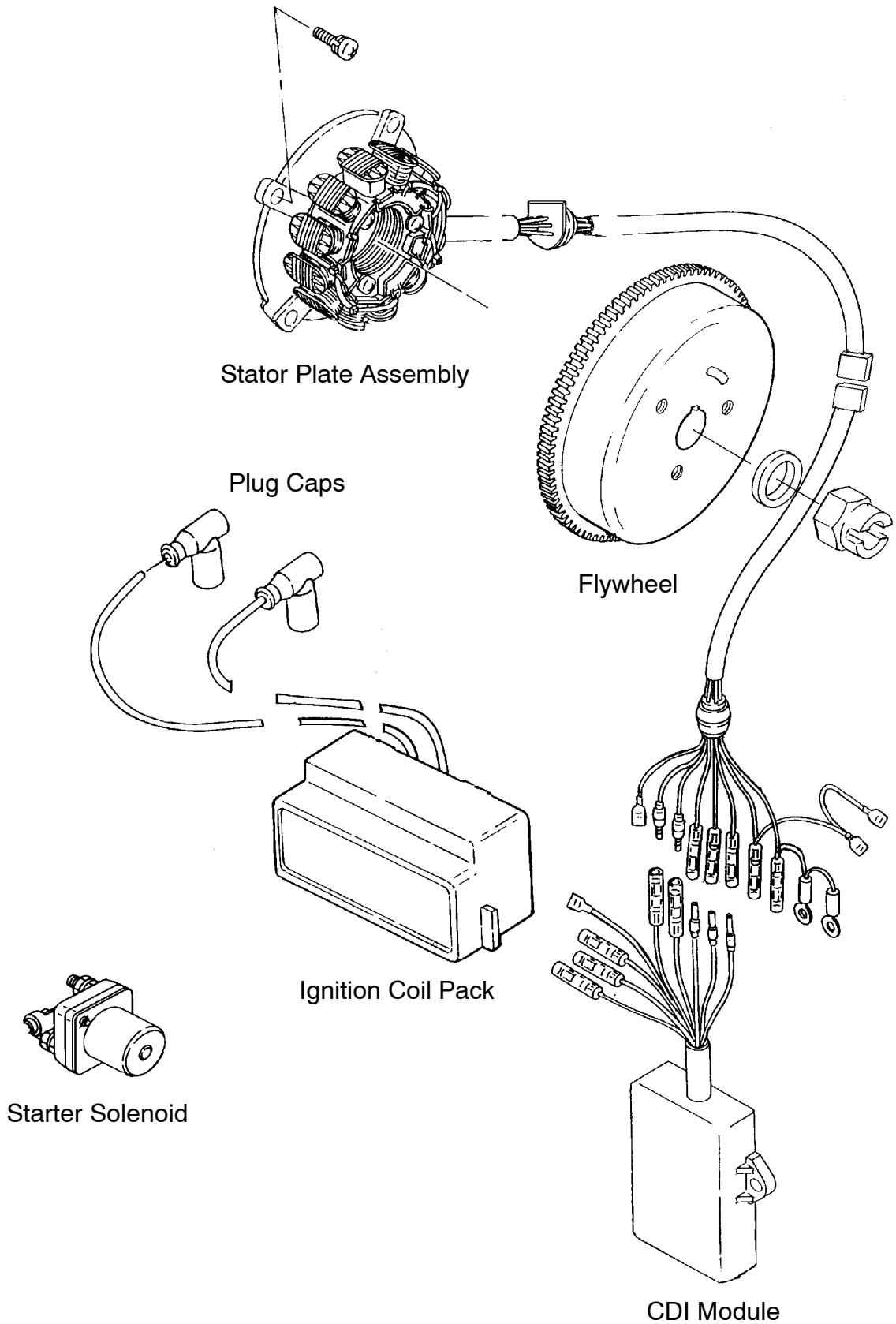
Regulator Set Point: 14.4 Vdc
Regulator Current Rating: 20 AMPS
Alternator: 12 Pole / 6 Pulse

Octane Terminal Board





Domestic Ignition System Overview





Electrical Testing

Charging System Testing - Unregulated Voltage - Carbureted Models

1. Open electrical box to gain access to components.
2. Turn multimeter to Volts AC position.
3. Disconnect the Yellow and Red/Pur wires from the terminal board and CDI module. Connect one of the tester leads to the Yellow stator wire and the other lead to the Red/Pur stator wire.
4. Start the engine. While observing the voltage reading, increase engine speed to about 3000 RPM. Reading should be above 20 VAC. If output is low, test the stator battery charge coils with an ohmmeter and compare to specification: .75 ohms.

Charging System Testing - Regulated Voltage - Carbureted Models

1. Turn multimeter to volts DC and connect the leads across the battery terminals.
2. Start and briefly run the engine at 3000 RPM. Measured voltage should be around 14–14.5 VDC. A higher reading may indicate a regulator problem or a poor ground. A lower reading may indicate an excessive system load, stator problem, or a faulty regulator or wire connection.
3. If DC voltage is low, check all connections and charge the battery prior to re-test.

NOTE: The regulator/rectifier is located within the LR module. It is not serviceable and must be replaced if suspect.

Start / Stop Switch Testing - All Models

1. Set multimeter to Ohms position.
2. Unplug the start switch harness from the connector located on handle bar.
3. Connect one of the test leads to the RED/PUR pin, and the other to the Y/R pin.
4. Press the start button. Resistance readings should be .3 ohms or less. Replace switch assembly if readings are above expected range.
5. Insert tether into stop switch. Connect meter leads with BLK and BLK/Y pins. Readings should indicate O.L.
6. Push stop button with tether installed, reading should indicate continuity.
7. Remove tether, readings should indicate continuity.

Tether Switch Testing - All Models

1. Set multimeter to Ohms position.
2. Unplug the start / stop switch harness from the connector located under the handle bar cover.
3. Connect one of the test leads to the Black/Yellow pin, and the other to the Black pin.
4. Disconnect the tether cord. Resistance readings should be .3 ohms or less. If resistance readings are out of range, replace the switch.
5. Connect the tether cord. An OPEN reading should be indicated on the multimeter. If not, replace the switch.

Bilge Pump Testing

Power to the bilge pump is supplied by the LR-31-2 regulator/rectifier. When the LR senses that the engine is running via the YELLOW stator wire, the LR provides 12 Vdc on the ORANGE circuit.

The bilge pump circuit consists of a ORANGE/BLK and BLK wire. The BLK is grounded to the ground strap, while the ORANGE/BLK is terminated to the FUSED-protected ORANGE/BLK tab on the terminal board.

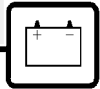
To test the bilge pump while the boat is not running, terminate the ORANGE/BLK wire to any RED/PUR tab on the terminal board. If the bilge pump will not run, check the circuit for any short circuits. If none are found, replace the pump.

If the bilge pump does not turn on when the boat is running, follow this process:

1. Verify that ACv is present on the YELLOW stator wire when the engine is running. If not, verify cause.
2. Replace LR module and re-check.

If the bilge pump does not turn off when the engine stops, check the bilge pump OR/BLK circuit for shorts to battery voltage. If none are found, replace the LR module.





Battery Testing

 **WARNING:** Whenever installing batteries, care should be taken to avoid the possibility of explosion, resulting in serious burns. Always connect the positive (red) cable first and the negative (black) cable last. When working with batteries, always wear safety glasses or a face shield and protective gloves. Battery electrolyte contains sulfuric acid and is poisonous! Serious burns can result from contact with the skin, eyes or clothing.

ANTIDOTE: External - Flush with water. Internal - Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately. Eyes - Flush with water for 15 minutes and get prompt medical attention.

Preparing A New Battery For Service

NOTE: Do not service the battery unless it will be put into regular service within 30 days.

To assure maximum service life and performance from a battery, it must have proper initial servicing. To service a new battery, the following steps must be taken:

- Remove vent plug from vent fitting.
- Fill battery with electrolyte to upper level marks on case.
- Set battery aside and allow it to cool and stabilize for 1/2 hour.
- Add electrolyte to bring level back to upper level mark on case. **NOTE:** This is the last time that electrolyte should be added. If the level becomes low after this point, add only distilled water.
- Charge battery at 1/3 of its amp/hr rating for up to 2 hrs. **NOTE:** This charge rate is to be used only on new batteries during the first-time charge. After this charge, they should be charged at the normal charge rate of 1/10 of amp/hr.
- Check specific gravity of each cell with a hydrometer to assure each has a reading of 1.270 or higher.

Battery Testing

There are three tests which can easily be made to determine a battery's condition. Whenever the complaint is related to either the starting or charging systems, the battery should be checked first.

OCV - Open Circuit Voltage Test

Battery voltage should be checked with a digital multimeter. Readings of 12.4 DCV or less require further battery testing and charging.

NOTE: Lead-acid batteries should be kept at or as near full charge as possible. If the battery is stored or used in a partially charged condition, hard crystal sulfation will form on the plates, reducing their efficiency and possibly ruining the battery.

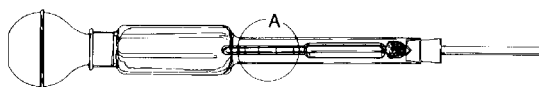


Specific Gravity Test

A tool such as the battery hydrometer can be used to measure electrolyte strength or specific gravity. As the battery goes through the charge-discharge cycle, the electrolyte goes from a heavy (more acidic) state at full charge to a light (more water) state when discharged. The hydrometer can measure state of charge and differences between cells in a multi-cell battery. Readings of 1.270 or greater should be observed in a fully charged battery. Differences of more than .025 between the lowest and highest cell readings indicate a need to replace the battery.

Open Circuit Voltage

STATE OF CHARGE	CONVENTIONAL LEAD-ACID	YUMICRON TYPE
100% Charged	12.60V	12.70V
75% Charged	12.40V	12.50V
50% Charged	12.10V	12.20V
25% Charged	11.90V	12.0V
0% Charged	less than 11.80V	less than 11.9V



Detail A

	1.10
	1.15
	1.20
	1.25
	1.30

Specific Gravity

STATE OF CHARGE*	CONVENTIONAL LEAD-ACID	YUMICRON TYPE
100% Charged	1.270	1.275
75% Charged	1.210	1.225
50% Charged	1.160	1.175
25% Charged	1.120	1.135
0% Charged	less than 1.100	less than 1.115

* At 80°F

NOTE: Subtract .01 from the specific gravity reading at 40° F.

Battery Hydrometer

PN 2870836

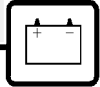
Load Test

A battery may indicate a full charge condition in the OCV test and the specific gravity test, but still not have the storage capacity necessary to properly function in the electrical system. For this reason a battery capacity or load test should be conducted whenever poor battery performance is encountered.

NOTE: This test cannot be performed with an engine or starting system that is not working properly.

1. Attach a multimeter to the battery. The reading should be 12.4 DCV or greater.
2. Engage electric starter and view registered battery voltage while cranking engine. Continue the test for 15 seconds. During this cranking period, the observed voltage should not drop below 9.5 volts. If the beginning voltage is 12.4 or higher and the cranking voltage drops below 9.5 volts during the test, replace the battery.





Refilling a Low Battery

The normal charge/discharge cycle of a battery causes the cells to give off hydrogen and oxygen. These gases are the ingredients of water. Because of the loss of these gases and the lowering of the electrolyte level, it will be necessary to add pure, clean distilled water to bring the fluid to the proper level. After filling, charge the battery to raise the specific gravity to the fully charged (1.270 or greater) position.

Off-season Storage

To prevent battery damage during extended periods of non-use, the following basic battery maintenance items must be performed:

- Remove battery from machine and wash case and battery tray with a mild solution of baking soda and water. Rinse with lots of fresh water after cleaning. **NOTE:** Do not get any of the baking soda into the battery or the acid will be neutralized.
- Using a wire brush or knife, remove any corrosion from cables and terminals.
- Make sure electrolyte is at proper level. Add distilled water if necessary.
- Charge at a rate no greater than 1/10 of the battery's amp/hr capacity until the electrolyte's specific gravity reaches 1.270 or greater.
- Store battery either in machine with cables disconnected, or store in a cool dry place. **NOTE:** Stored batteries lose their charge at the rate of 1% per day. They should be recharged to a full charge every 60 to 90 days during a non-use period. If stored during the winter months, the electrolyte will freeze at a higher temperature as the battery discharges. The chart below indicates freezing points by specific gravity.

ELECTROLYTE FREEZING POINTS	
Specific Gravity of Electrolyte	Freezing Point
1.265	-75°F
1.225	-35°F
1.200	-17°F
1.150	+5° F
1.100	+18°F
1.050	+27°F

Charging Procedure

Charge the battery with a charger no larger than 1/10 of the battery's amp/hr rating for as many hours as needed to raise the specific gravity to 1.270 or greater.

WARNING

The gases given off by a battery are explosive. Any spark or open flame near a battery can cause an explosion which will spray battery acid on anyone close to it. Battery acid will cause burns to skin. In case of contact with battery acid, wash the affected area with large quantities of cool water and seek immediate medical attention.



Dynamic Ignition Timing Adjustment - All Domestic Carbureted Models

WARNING

When replacing a CDI box on ANY domestic carbureted model, it is *very important* to check timing. A new CDI box may be programmed slightly different than the one being replaced, causing ignition timing to be advanced or retarded too far.

NOTE: Always verify timing of engine at room temperature only (68° F/20° C).

Verify the ignition position at maximum advance (3000 RPM) when checking the timing.

If engine damage has occurred due to a suspected ignition related problem, check the ignition timing at the specified operating RPM.

Always dial indicate the timing mark before attempting to adjust the ignition timing. To indicate the marks:

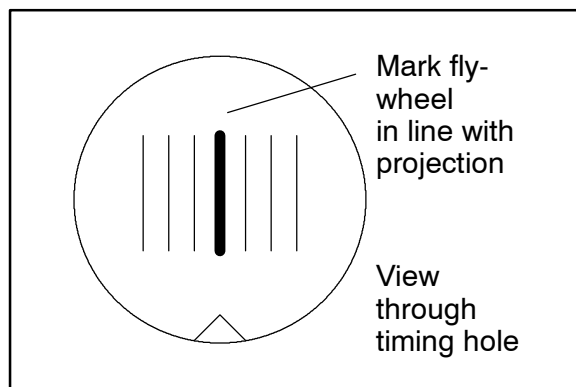
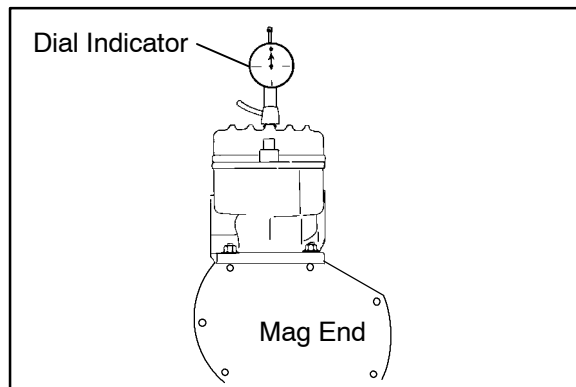
1. Remove timing inspection plug from starter cover.
2. Remove front (Mag) cylinder spark plug and install dial indicator.
3. Rotate crankshaft by hand while observing dial indicator. As the piston touches the indicator plunger, the dial will begin to rotate. Find the exact point where the pointer stops rotating and reverses direction. This will be Top Dead Center (TDC).
4. While holding crankshaft with piston at TDC, zero indicator by rotating bezel until "O" on dial and pointer align.
5. Rotate crankshaft *opposite* the direction of rotation about .200" BTDC (2 pointer revolutions).
6. Rotate the crankshaft in the normal direction of rotation to .104" (2.64mm) BTDC.
7. Using a fast drying white ink, mark the flywheel in line with the projection in the inspection hole to make it easier to see with a strobe light.
8. Verify proper piston position by repeating steps 2 - 5.
9. Remove dial indicator and install spark plug.
10. Connect a tachometer according to manufacturer's instructions.
11. Connect a timing light to the front (Mag) cylinder. Start engine and increase RPM to 3000.

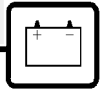
Timing Light

PN 2870630

CAUTION:

Never operate engine for more than 15 seconds without cooling water. Severe engine damage may occur from overheating.



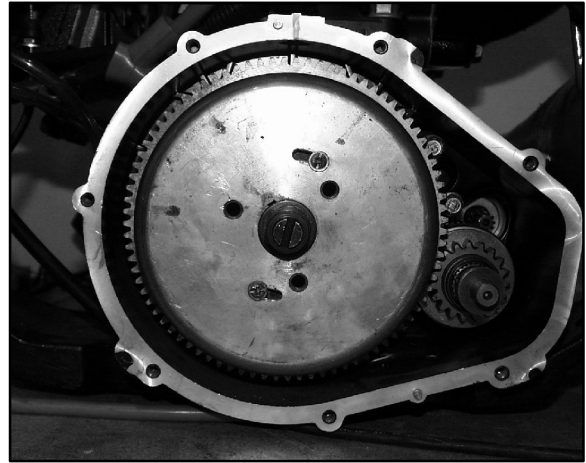


Dynamic Ignition Timing Adjustment - All Domestic Carbureted Models - Continued

12. Point timing light at inspection hole. Be sure to view the mark at 90° to the window to avoid misreading. Note the position of the scribed mark in relation to the pointer.
13. If marks do not align, stop engine and reinstall dial indicator in Mag end cylinder. Rotate the engine until the mark is in the same position as sighted with the strobe light. Read dial indicator and compare reading to Degrees to Piston Chart on page 7.1.

Ignition Timing Adjustment

1. Remove flywheel cover.
2. Loosen magnet holder screws.
3. Rotate magnet holder to adjust ignition timing. Rotating the magnet holder clockwise (as viewed from the front) will advance the timing and rotating counterclockwise will retard timing. Move the magnet holder in the *opposite direction* approximately the same amount as the mark must move. Tighten screws securely.
4. Verify proper ignition timing with the timing light.





Ignition Timing Adjustment - Ignition Point Adjustment Unit

1. Set timing as indicated in previous section.
2. Remove battery cover and exhaust hoses as required to access the battery and electrical box.
3. Remove negative (-) cable from battery terminal.
4. Carefully open the electrical box. Remove the LR module and the CDI. (Leave components connected to wires.)



5. With the CDI box accessible, attach the harness of the Ignition Point Adjustment Unit, (PN 2872290), to the serial port on the CDI.
6. Reassemble the electrical box completely. Reconnect the battery and exhaust hoses.
7. Remove the timing cover plug.





Ignition Timing Adjustment - Ignition Point Adjustment Unit - Continued

8. Connect timing to light to MAG high tension wire. Start engine and verify timing with timing light.

CAUTION:

Never operate the engine for more than 15 seconds while the watercraft is out of the water. Overheating of engine and drive line components will result.



9. Timing can now be set to exact specification using the Ignition Point Adjustment Unit. Press the "POS" or "NEG" button to advance or retard timing until timing is at specification. Pressing the "POS" or "NEG" buttons will advance or retard the timing in one degree increments up to two degrees each way.
10. After correct timing has been established, remove the timing light and install the timing cover plug.
11. Remove exhaust and battery cable. Open electrical box and disconnect the Ignition Point Adjustment Unit. Reassemble the electrical box and install.
12. Reconnect the battery and any exhaust hoses that were removed to access the electrical box.

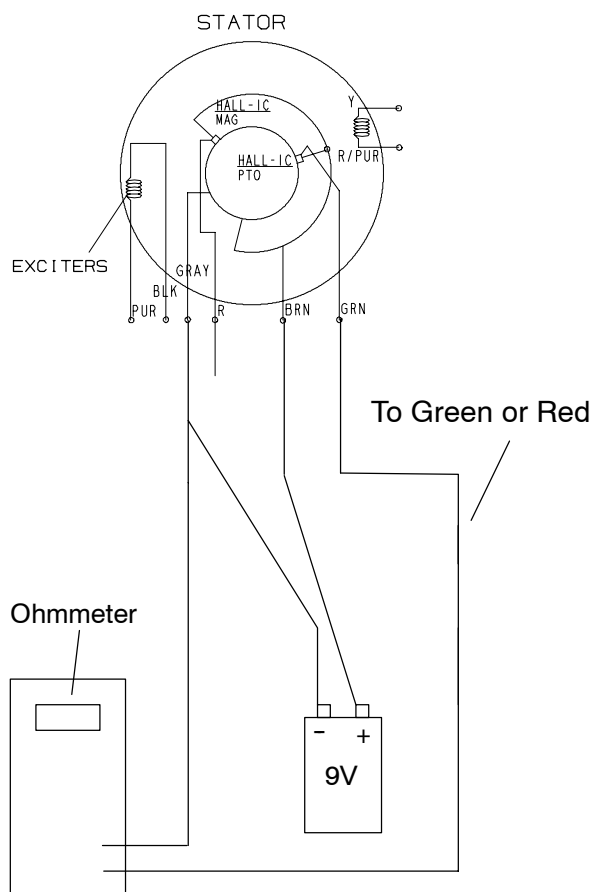




Trigger Coil Testing - Generation III PVL Ignition Systems

The “trigger coils” are *Hall Effect* sensors and require a constant DC power source via the brown wire out of the CDI module. The wire is powered when the engine is cranked for starting and while running. When a magnet (sealed in the magnet holder on the flywheel) is passed by the sensor, the sensor becomes conductive and triggers the release of the energy stored in the capacitor, creating the ignition spark.

1. To test trigger coils, disconnect the stator wires and attach a 9 volt battery to the brown and gray wires from the stator plate. Connect one lead of an ohmmeter to the gray stator wire. Connect the other lead to the red or green wire. Refer to the illustration at right.
2. Rotate flywheel *slowly* while observing the ohmmeter indication. The ohmmeter should indicate an open circuit (∞) until the magnet in the magnet holder passes by the sensor. At this point the reading should switch to low resistance (under 25 ohms). It should go back to infinite as flywheel rotation continues.
3. Repeat the test for the other trigger coils.



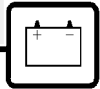
NOTE: Actual resistance readings may vary with different meters. A specific resistance reading is not critical. The reading must, however, switch sharply from high to low resistance, and then back again as the flywheel is rotated.

Alternate Method Of Testing Hall Effect Sensors

Connect the static timing tool, PN 2871745, as you would in the procedure above. Simply connect the WHITE test lead to the RED or Green lead from the stator. Connect the RED lead to the BROWN stator wire, and the BLACK lead to the GRAY stator lead.

The LED light will blink on and off as the flywheel rotates past each Hall Effect Sensor.





PVL Ignition Troubleshooting

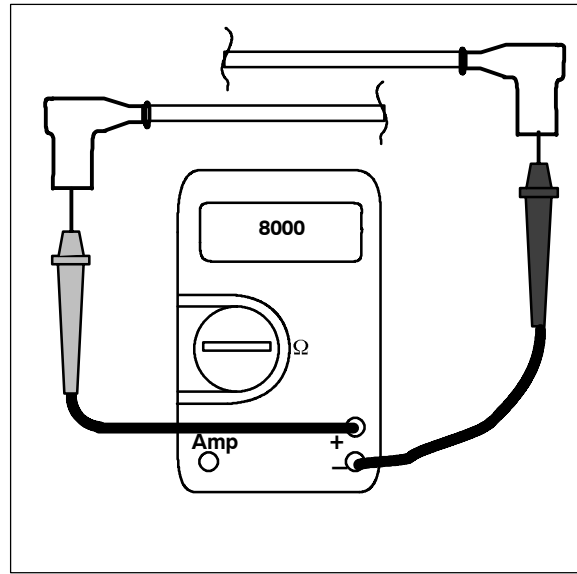
CAUTION:

- Verify spark plugs are **RESISTOR TYPE**!
- If the battery voltage is low, cranking rpm will be lower. The ignition system may show weak spark with a plug out of the cylinder, but not spark under compression or it may show no spark at all. Install a charger on the battery to ensure good cranking rpm.

1. Check continuity from inside of both spark plug caps .

SPECIFICATION:

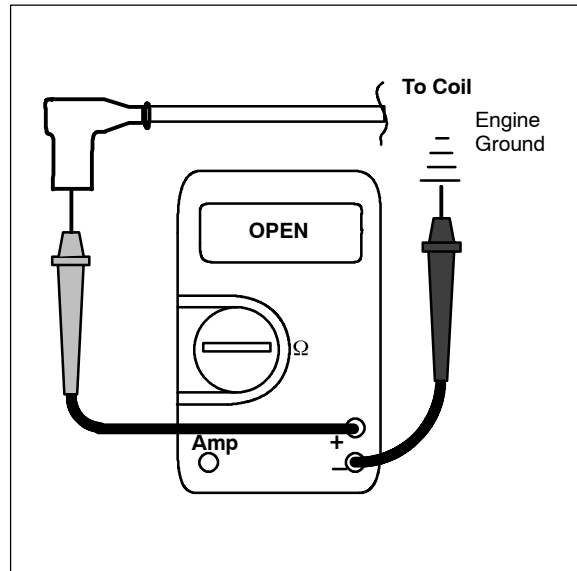
Approximately 8000 ohms



2. Check continuity from inside spark plug caps to engine stud.

SPECIFICATION:

O.L. OPEN



NOTE: Replace coil assembly if readings are incorrect.

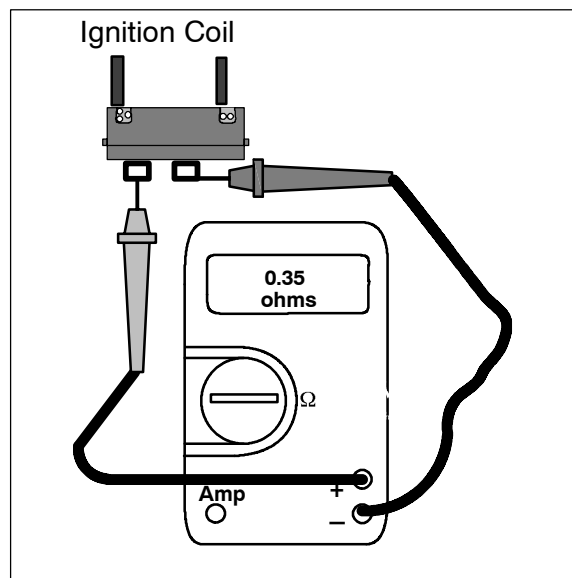


PVL Ignition Troubleshooting - Continued

3. Open electrical box. Check the primary side resistance of the ignition coil tabs:

SPECIFICATION:

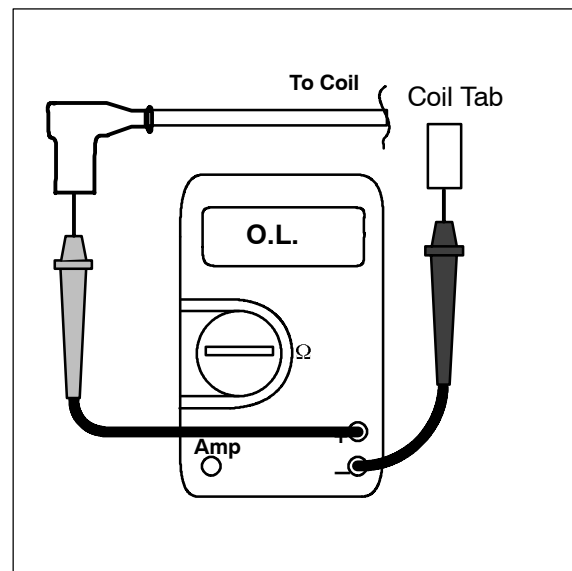
0.35 ohms



4. Check the secondary side resistance of the ignition coils. Coil tab to each secondary lead:

SPECIFICATION:

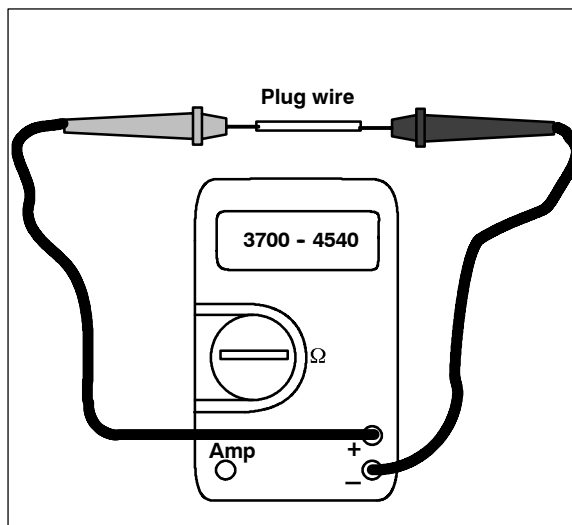
O.L. OPEN



5. If the readings are still out of range, open the electrical box and remove the plug wire(s).

SPECIFICATION:

3700 - 4540 ohms

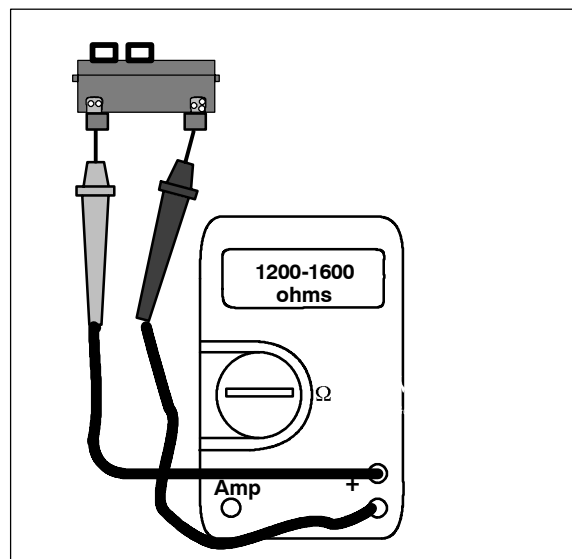


**PVL Ignition Troubleshooting - Continued**

6. Check the resistance of the coil without the plug wires installed.

SPECIFICATION:

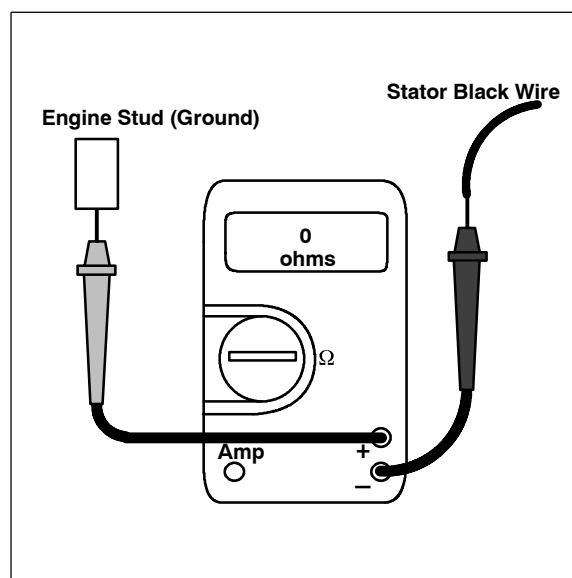
1200 - 1800 ohms



7. If all three plug wires show open, remove plug caps and recheck continuity from center conductor of plug wires to engine ground. If still bad, open box and check coil ground path.
8. Open the electrical box and check for correct connections between the stator, CDI, coils, and terminal board. Inspect the wiring for incorrect connections or physical damage.
- Disconnect the stator from the electrical box (within the electrical box).
 - Connect the negative test lead of the ohm meter to the black wire coming from the stator and leave it connected for the duration of test 2.
 - Connect the positive test lead to an engine ground.

SPECIFICATION:

0 ohms



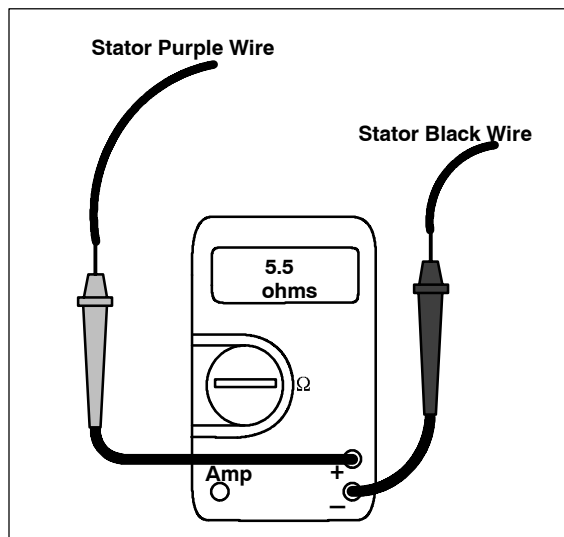


PVL Ignition Troubleshooting - Continued

9. Connect the positive test lead to the purple wire:

SPECIFICATION:

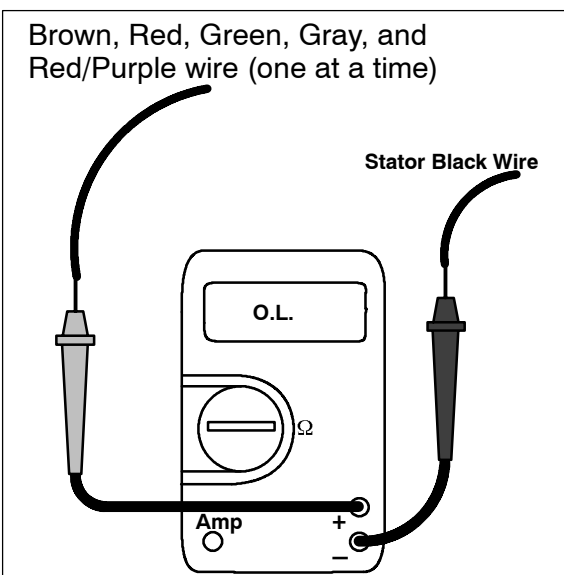
5.5 ohms

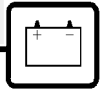


10. Connect the positive meter lead to the following wires.

SPECIFICATION: (Stator)

BRN to BLK:	O.L.
RED to BLK:	O.L.
GRN to BLK:	O.L.
RED/PUR to BLK:	O.L.
GRY to BLK:	O.L.



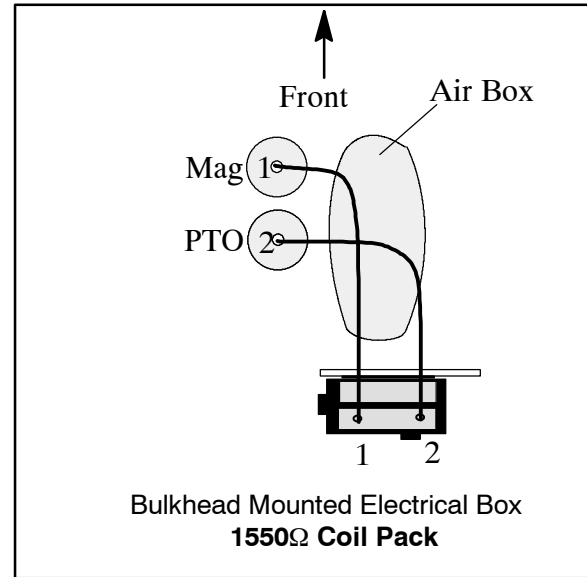


Carbureted Domestic Engine Ignition Coils

NOTE: The ignition system used on all Polaris 700 personal watercraft engines are simultaneously firing types. Ignition spark on each cylinder occurs at the same time. Combustion only occurs in the cylinder in which the piston is on the compression stroke.

To Determine Wire Sequence

1. Refer to the lengths of each wire. Each spark plug wire should easily reach their respective spark plugs.
2. Connect each wire to the ignition coil. There is no sequence to connecting the wires to the coil.
3. Apply Corrosion Resistant Nyogel™ grease (PN 2871329) to both ends of the spark plug cap.





Starter Motor - Disassembly

1. Remove starter motor and disassemble. Mark end covers and housing for proper reassembly.
2. Remove housing through bolts.

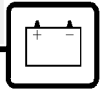


3. Remove brush end bushing dust cover and armature thrust washers. Keep washers in order for reassembly.



4. Remove drive end cover and armature. Remove thrust washer, phenolic washer, and shim washers. Keep washers in order for reassembly.





Starter Motor - Disassembly - Continued

5. Measure resistance between starter input terminal and insulated brushes. Reading should be .3 ohms or less. Remember to subtract meter lead resistance.

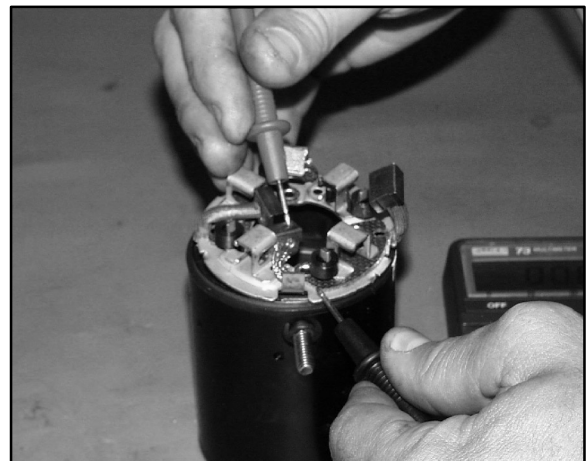


6. Measure resistance between insulated brush and starter housing. Reading should be infinite. (OL). Inspect insulation on brush wires for damage and repair or replace as necessary.



7. Slide positive brush springs to the side, pull brushes out of their guides and remove brush plate. Slide brush end frame off end of starter. **NOTE:** The electrical input post must stay with the field coil housing.

8. Measure resistance between ground brush and brush plate. Resistance should be .3 ohms or less.





Starter Motor - Inspection

Brush Inspection

1. Measure length of each carbon brush. Replace brush assembly when worn to 5/16" (8 mm) or less. The brushes must slide freely in their holders.

Carbon Brush

Service Limit 5/16" (8mm)

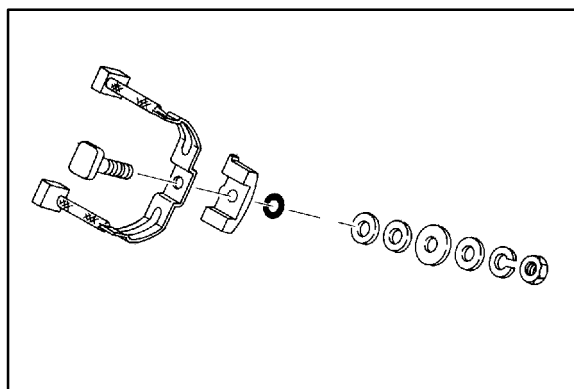
Brush Replacement

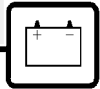
1. Remove terminal nut with lock washer, flat washer, large phenolic washer, 2 small phenolic spacers, and sealing O-ring. Inspect O-ring and replace if damaged.
2. Slide positive brush springs to the side, pull brushes out of their guides and remove brush plate.

Cleaning

CAUTION:

Some cleaning solvents may damage the insulation in the starter. Care should be exercised when selecting an appropriate solvent. If the commutator needs cleaning use only an electrical contact cleaner.





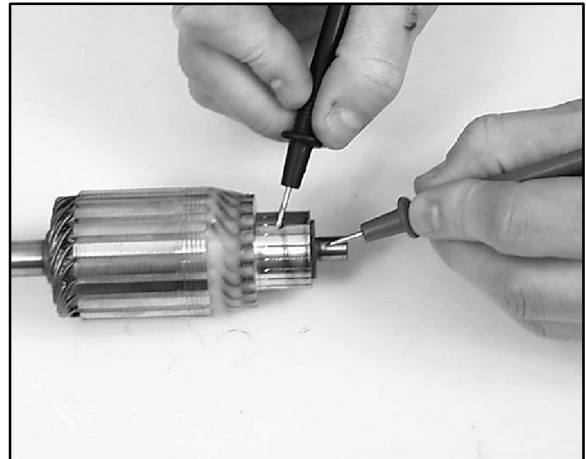
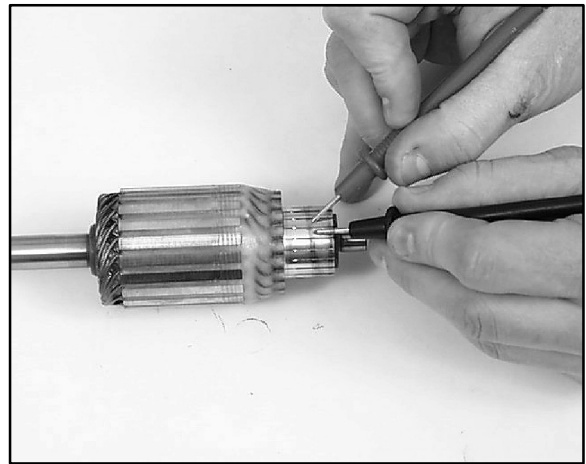
Starter Motor - Inspection

Armature Testing

1. Using a digital multimeter, measure resistance between each of the segments of the commutator. The reading should indicate .3 ohms or less.
2. Measure resistance between commutator and armature shaft. Reading should be infinite (OL). Inspect surface of commutator wear or discoloration. Replace if excessively worn or damaged.
3. Place armature in a growler. With growler on, position a hacksaw blade lengthwise, 1/8" (.3 cm) above armature coil laminates. Rotate armature 360°. If the hacksaw blade is drawn toward the armature on any point, the armature is faulty and must be replaced.
4. Inspect permanent magnets in starter housing. Make sure they are not cracked or separated from housing.

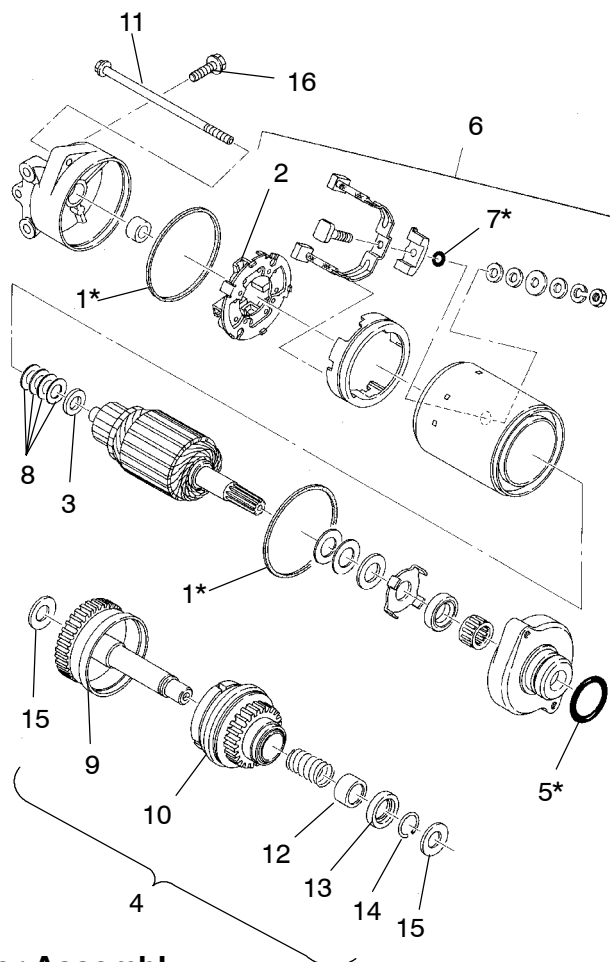
CAUTION:

Use care when handling starter housing. Do not drop or strike the housing as magnet damage is possible. If magnets are damaged, starter must be replaced.





Starter Motor - Assembly



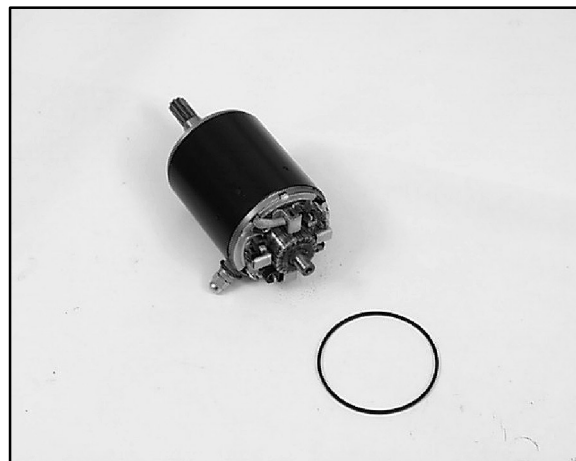
Ref.	Qty.	Description
1.	2	Rubber Ring*
2.	4	Brush Spring
3.	1	Thrust Washer
4.	1	Gear Assembly
5.	1	O-Ring*
6.	1	Brush Complete
7.	1	O-Ring*
8.	AR	Thrust Washer
9.	1	Shaft Complete
10.	1	Gear Assembly
11.	1	Through Bolt
12.	1	Cover
13.	1	Stopper
14.	1	Snap Ring
15.	2	Washer
16.	2	Flange Bolt

Ref.	Qty.	Description
1.	2	Rubber Ring*
2.	4	Brush Spring
3.	1	Thrust Washer
4.	1	Gear Assembly
5.	1	O-Ring*
6.	1	Brush Complete
7.	1	O-Ring*
8.	AR	Thrust Washer
9.	1	Shaft Complete
10.	1	Gear Assembly
11.	1	Through Bolt
12.	1	Cover
13.	1	Stopper
14.	1	Snap Ring
15.	2	Washer
16.	2	Flange Bolt

*Do not reuse. Replace with new parts.

Starter Assembly

1. Install brush plate to field magnet housing aligning index tab.
2. Install O-ring, two small phenolic spacers, large phenolic washer, flat washer, lock washer, and terminal nut.
3. While holding brush springs away from brushes, push brushes back and hold in place.
4. Slide armature into field magnet housing. Release brushes.
5. Lightly grease drive end bushing and reinstall drive end frame on armature. Inspect seal for wear or damage. Replace drive end cap if necessary.





Starter Motor - Assembly - Continued

6. Be sure wire insulation is in place around positive brush wire and pushed completely into slot on phenolic plate.
7. Using a non-petroleum grease, lubricate brush end bushing and install shims.

Nyogel™ Grease PN 2871329

8. Align brush plate and install cover and screws.
9. Reinstall bolts and tighten evenly and securely.
10. Lightly grease pinion shaft and install pinion, spring stopper, and snap ring.

Starter Solenoid Bench Test

To measure the resistance of the pull-in coil, connect one meter lead to the Yellow/Red wire and the other to ground. The resistance should be 2.8-3.6 ohms. Refer to Electric Starter System Testing in this section to further test the solenoid.





Starter Motor - Troubleshooting

Condition: Starter fails to turn motor or motor turns slowly.

CAUTION:

Make sure that engine crankshaft is free to turn before proceeding.

With the tester on VDC, place the tester black lead on the battery negative (-) terminal and the tester red lead on the battery positive (+) terminal. Reading should be 12.4 v or greater. Is it? No→ Yes↓	Remove battery, test and/or service. Install a fully charged shop battery to continue the test. (Continue on with left column.)
Disconnect the red engagement coil wire from the starter solenoid. Connect the black tester wire to an appropriate ground and the red lead to the red harness wire at the solenoid. Push the start button. The meter should read battery voltage. Does it? No→ Yes↓	With the black tester lead on ground, check for voltage at the large relay in terminal, the circuit breaker in and out terminals, and across both sides of the start switch with the switch on start. Repair or replace any defective part(s).
Reconnect the solenoid. Connect the tester black lead to the battery positive terminal and the red tester lead to the solenoid end of the battery-to-solenoid cable. Push the start button. The reading must be less than .1v DC. Is it? No→ Yes↓	Clean the battery to solenoid cable ends or replace the cable.
Connect the black tester lead to the solenoid end of the battery-to-solenoid cable and the red tester lead to the solenoid end of the solenoid-to-starter cable. Push the start button. The reading must be less than .1v DC. Is it? No→ Yes↓	Replace the starter solenoid.
Connect the black tester lead to the solenoid end of the solenoid-to-starter cable and the red tester lead to the starter end of the same cable. Push the start button. The reading must be less than .1v DC. Is it? No→ Yes↓	Clean the solenoid-to-starter cable ends or replace the cable.
Connect the black tester lead to the starter frame. Connect the red tester lead to the battery negative terminal. Push the start button. Reading should be less than .1v DC. Is it? No→ Yes↓	Clean the ends of the engine-to-battery negative cable or replace the cable.
If all these tests indicate a good condition, yet the starter still fails to turn, or turns slowly, the starter must be removed for static testing and inspection.	

A

Air Intake Manifold Assembly, 4.5
Alternator Specifications, 6.1
Armature Testing, 6.21

B

Battery Charging, 2.7
Battery Chrging Procedure, 6.7
Battery Connections, 2.7
Battery Fluid, Replenishing, 2.7
Battery Installation, 2.8
Battery Load Test, 6.6
Battery Safety, 2.6
Battery Specific Gravity Test, 6.6
Battery Storage, 2.8, 6.7
Battery Testing, 6.5
Brush Inspection, Starter Motor, 6.20
Brush Replacement, Starter Motor, 6.20

C

Carburetor Adjustment Overview, 2.14
Carburetor Air Intake Maintenance, 2.14
Carburetor Assembly, 4.15–4.16
Carburetor Cleaning, 4.15
Carburetor Disassembly / Inspection, 4.12–4.15
Carburetor Exploded View, 4.3
Carburetor Jet Locations, 4.1
Carburetor Jet Part Numbers, 4.2
Carburetor Pop–Off Testing, 4.10
Carburetor Specifications, 4.1
Carburetor System Overview, 4.8–4.10
Choke Cable Adjustment, 2.12, 4.17
Circuit Breakers, 2.9
Cooling System – Exploded View, 3.20
Crankcase Assembly, 3.10
Crankshaft Assembly, 3.11
Crankshaft Truing, 785cc, 3.18

Cylinder Cleaning, 3.17
Cylinder Head Cover / Head Assembly, 3.5
Cylinders / Base Gasket Assembly, 3.7

D

De-glazing, 3.16
Degrees–To–Piston Position Conversion Chart, 6.1
Domestic Ignition System Overview, 6.3
Drive Shaft Inspection, 5.6
Driveshaft / Coupler / Bearing Carrier Exploded View, 5.1
Dynamic Timing Adjustment, 6.8–6.10

E

Electrical Fuses, 2.9
Electrical Testing
 Bilge Pump, 6.4
 Charging System Testing
 Regulated Voltage, 6.4
 Unregulated Voltage, 6.4
 Start / Stop Switch Testing, 6.4
 Tether Switch Testing, 6.4
Engine Break–In Procedure, 2.2
Engine Fuel–To–Oil Ratio Chart, 1.2
Engine Removal / Installation, 3.4
Engine Specifications, 3.1
Engine Torque Sequences, 3.3
Engine Torque Specifications, 3.2
Exhaust System Exploded View, 4.23
Exhaust System Inspection, 4.24
Exhaust System Troubleshooting, 4.24

F

Flywheel Housing / Magneto Assembly, 3.6
Fuel Filter, 4.11
Fuel Line Air Leak Testing, 4.22
Fuel Pump Maintenance, 4.20
Fuel Pump Operation, 4.19
Fuel Tank Check Valve Testing, 4.18

Fuel Tank Exploded View, 4.7
Fuel Tank Inspection, 4.18
Fuel Tank Relief Valve Testing, 4.18
Fuel Tank Vent Operation, 4.18

G

Gasoline Safety Warnings, 2.13
Gasoline Warnings, 4.2, 4.11
General Engine Inspection, 3.12–3.19
General Information
 Conversion Chart, 1.6
 Decimal Equivalent Chart, 1.5
 Metric Tap Drill Sizes, 1.7
 SAE Tap Drill Sizes, 1.7
 Service Glossary, 1.8–1.9
 Service Guidelines, 1.10
 Standard Torque Specifications, 1.4

H

HIN Identification Numbers, 1.1
Hone Selection, 3.16
Honing Procedure, 3.16
Honing to Oversize, 3.16

I

Idle Speed Adjustment, 4.17
Idle Speed Warning, 2.14
Ignition Coils, 6.17
Ignition Timing / CDI Box Specifications, 6.1
Ignition Timing Adjustment – Ignition Point Adjustment Unit, 6.10–6.12
Impeller Clearance, 5.6

K

Keihin Carburetor Overview, 4.4

M

Maintenance
 Bearing Housing, 2.5
 Cleaning, 2.17
 Compression Test, 2.11
 Cooling Water Pickup Hoses, 2.18
 Driveshaft Couplers, 2.5
 Driveshaft Maintenance, 2.5
 Electrical Components, Battery Removal, 2.6
 Electrical Connections, 2.9
 Engine Mounts, 2.11
 Engines, Throttle / Choke Cable Inspection, 2.12
 Fasteners, 2.18
 Fire Extinguisher, 2.17
 Fuel System
 Fuel and Vent Lines, 2.13
 Fuel Filter, 2.13
 Handlebars / Hand Grips, 2.19
 Impeller Clearance, 2.18
 Scoop / Ride Plate / Intake Grate, 2.18
 Steering Cable / Steering Joints, 2.3
 Steering Cable Inspection, 2.19
 Steering Nozzle, 2.4
 Throttle / Choke Cable, 2.3
 Throttle / Choke Cable Inspection, 4.16
 Throttle / Choke Shafts, 2.4
Terminal Board Overview, 2.9
Mixture Screw Base Setting Adjustment, 4.17
Mixture Screw Inspection and Adjustment, 4.18

N

Needle Valve / Diaphragm Operation, 4.9

O

Octane Engine Mount, 3.9
Octane General Specifications, 1.2–1.3
Octane Publication Part Numbers, 1.1

P

Periodic Maintenance Chart, 2.2–2.3
Piston Assembly, 3.8
Port Chamfering, 3.17
Pump Assembly Exploded View, 5.2
Pump Housing Inspection, 2.18

Pump induction Exploded View, 5.3
PVL Ignition Troubleshooting, 6.13–6.16

R

Recommended Maintenance Products / Lubricants, 2.1
Reed Valve Inspection and Replacement, 4.21
Regulator Rectifier Overview, 6.2
Resistor–Type Spark Plug Warning, 2.10

S

Spark Plug handling and Specifications, 2.10
Spark Plug Specifications, 6.1
Starter Assembly, 6.22
Starter Motor Assembly, 6.22–6.24

Starter Motor Cleaning, 6.20
Starter Motor Disassembly, 6.18
Starter Motor Troubleshooting, 6.24
Starter Solenoid Bench Test, 6.23
Steering Cable Adjustment, 2.20–2.22
Storage Procedures, 2.15
 Engine Draining, 2.15
 Engine Foggin Procedures, 2.16
 Fuel System Storage, 2.15
Storage, Battery, 6.7

T

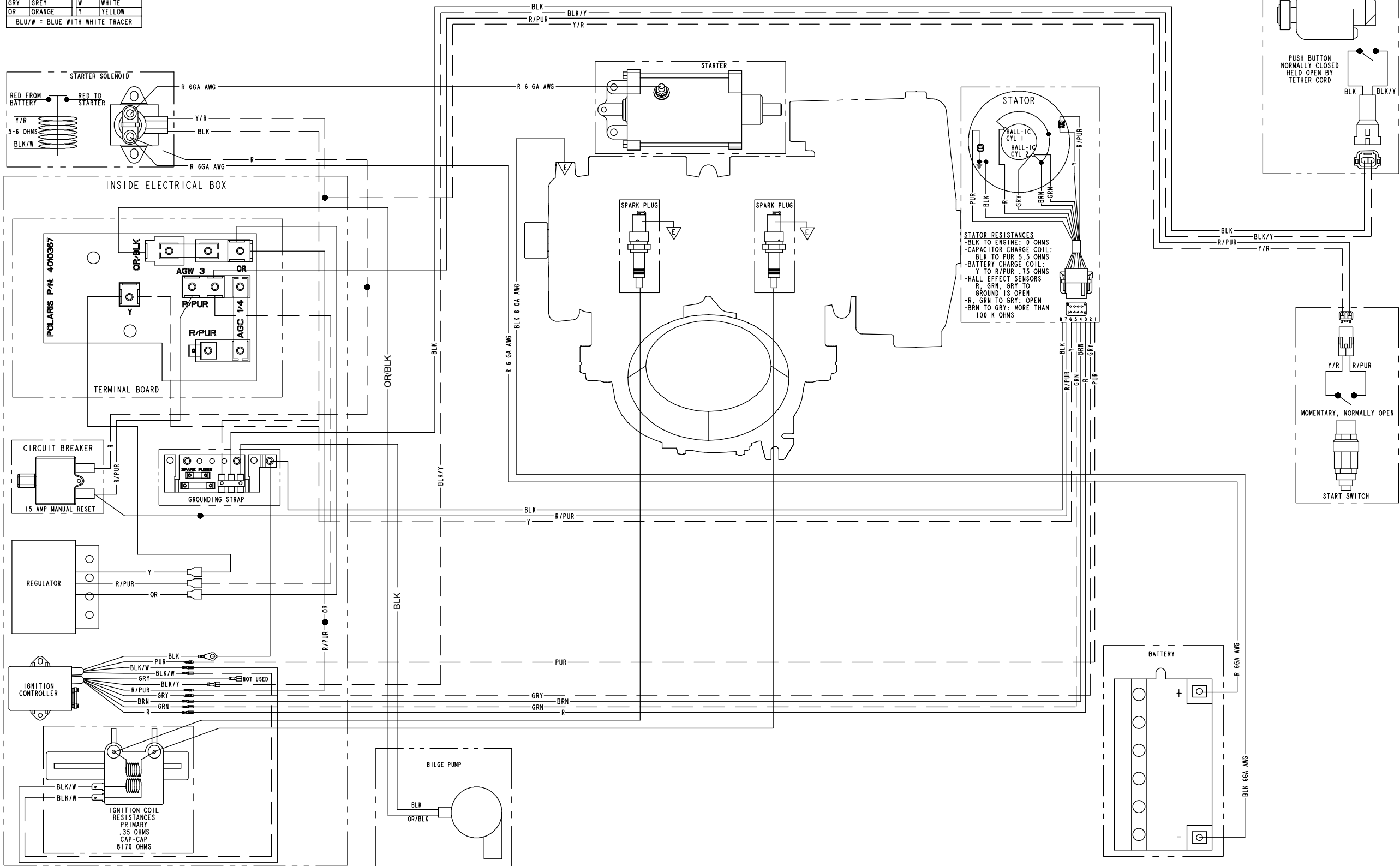
Throttle Cable Adjustment, 2.12, 4.17

V

Vent / Fuel Line Delivery Exploded View, 4.6

WIRES ARE REPRESENTED BY SOLID
OR DASHED LINES TO SIMPLIFY
TRACING IN DIAGRAM

COLOR TABLE			
BLK	BLACK	PK	PINK
BLU	BLUE	PUR	PURPLE
BRN	BROWN	R	RED
GRN	GREEN	T	TAN
GRY	GREY	W	WHITE
OR	ORANGE	Y	YELLOW
BLU/W = BLUE WITH WHITE TRACER			



Octane

