

SHOP MANUAL



SHOP MANUAL



TABLE OF CONTENTS

SECTION	SUBJECT	PAGE
01	SERVICE TOOLS	01-00-1
02	PERIODIC INSPECTION CHART	02-00-1
03	ENGINE	03-00-1
	01 Water-Flooded Engine Care	03-01-1
	02 Removal & Installation	03-02-1
	03 Top End	03-03-1
	04 Flywheel & Magneto	03-04-1
	05 Bottom End	03-05-1
	06 Rotary Valve & Reservoir	03-06-1
04	COOLING SYSTEM	04-00-1
	01 Circuit	04-01-1
	02 Care & Flushing	04-02-1
05	FUEL SYSTEM	05-00-1
	01 Carburetor & Intake System	05-01-1
06	OIL SYSTEM	06-00-1
	01 Oil Injection Pump, Repair & Adjustment	06-01-1
07	ELECTRICAL	07-00-1
	01 Wiring Diagram	07-01-1
	02 Ignition Timing	07-02-1
	03 Electric Starter	07-03-1
	04 Magneto System, Repair	07-04-1
	05 CDI & Charging Systems, Testing Procedures	07-05-1
08	PROPULSION & DRIVE SYSTEMS	08-00-1
09	STEERING SYSTEM	09-00-1
10	HULL/BODY	10-00-1
11	STORAGE	11-00-1
12	TECHNICAL DATA	12-00-1
13	TROUBLESHOOTING	13-00-1

Legal deposit :

National Library of Quebec
1st trimester 1989
National Library of Canada

All rights reserved. No parts of this manual may be reproduced in any form without the prior written permission of Bombardier Inc.

©Bombardier Inc. 1989

Printed in Canada

®*Registered trademarks of Bombardier Inc.

Loctite® is a trademark of Loctite Corporation

Snap-on® is a trademark of Snap-on Tools Corporation

SAFETY NOTICE

This manual has been prepared as a guide to correctly service the SEA-DOO, model 5802.

This edition was primarily published to be used by watercraft mechanics who are already familiar with all service procedures relating to Bombardier made watercraft.

Please note that the instructions will apply only if proper hand tools and special service tools are used.

This shop manual uses technical terms which may be slightly different from the ones used in parts catalog.

The content depicts parts and/or procedures applicable to the particular product at its time of manufacture. It does not include dealer modifications, whether authorized or not by Bombardier, after manufacturing the product.

In addition, the sole purpose of the illustrations/photographs throughout the manual, is to assist identification of the general configuration of the parts. They are not to be interpreted as technical drawings or exact replicas of the parts.

The use of Bombardier parts is most strongly recommended when considering replacement of any component. Dealer and/or distributor assistance should be sought in case of doubt.

Torque wrench tightening specifications must be strictly adhered to. Locking devices (ex. : lock tab, elastic stop nut) must be installed or replaced with new ones, where specified. If the efficiency of a locking device is impaired, it must be renewed.

This manual emphasizes particular information denoted by the wording and symbols ;

◆ **WARNING** : Identifies an instruction which, if not followed, could cause serious personal injury including possibility of death.

▼ **CAUTION** : Denotes an instruction which, if not followed, could severely damage vehicle components.

○ **NOTE** : Indicates supplementary information needed to fully complete an instruction.

Although the mere reading of such information does not eliminate the hazard, your understanding of the information will promote its correct use.

This information relates to the preparation and use of Bombardier watercraft and has been utilized safely and effectively by Bombardier Inc.. However, Bombardier Inc. disclaims liability for all damages and/or injuries resulting from the improper use of the contents. We strongly recommend that any services be carried out and/or verified by a highly skilled professional mechanic. It is understood that certain modifications may render use of the watercraft illegal under existing federal, provincial and state regulations.

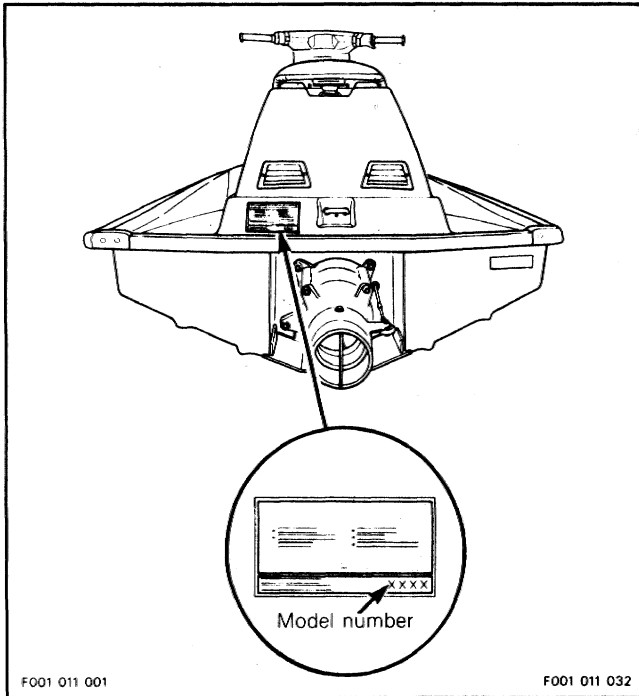
BOMBARDIER WATERCRAFT SHOP MANUAL

INTRODUCTION

This shop manual covers BOMBARDIER made SEA-DOO® watercraft 5802 model.

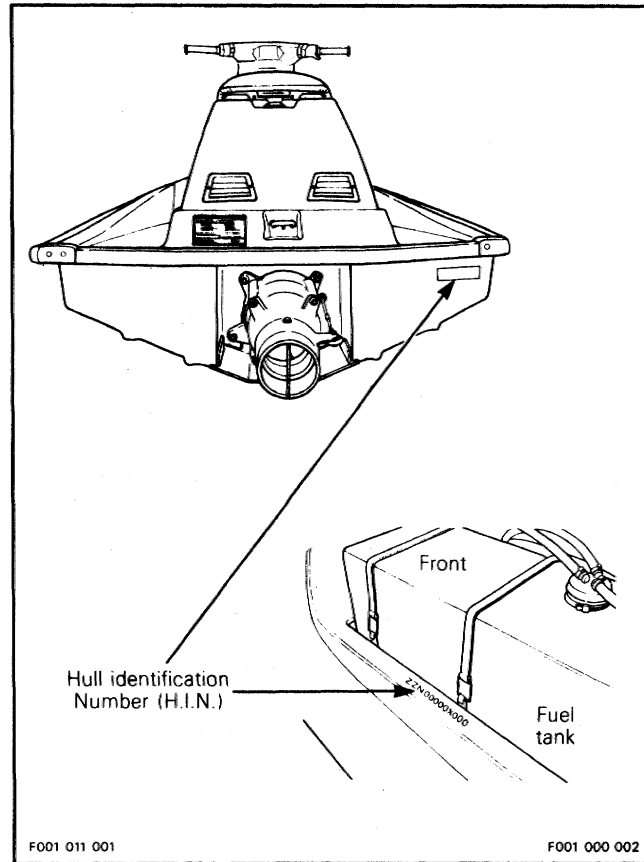
WATERCRAFT MODEL NUMBER

Can be found on U.S. Coast Guard approved label located on L.H. side of stern (rear) eyelet.



HULL IDENTIFICATION NUMBER (HIN)

Can be found at R.H. rear side of hull, and inside it.



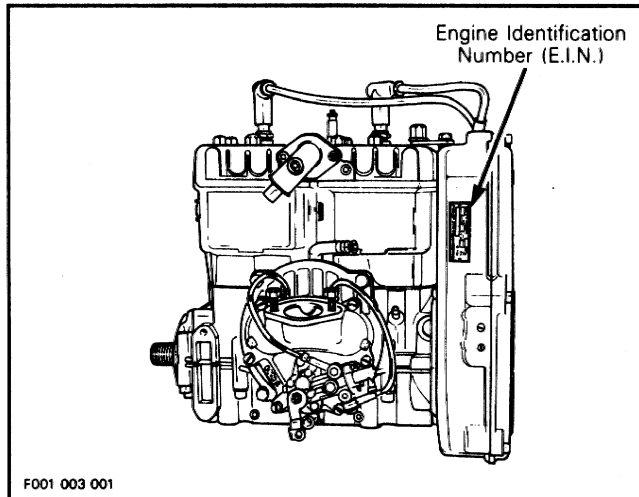
The five digits after "ZZN" are the watercraft serial number.

ZZN 1 2 3 4 5 X X X X

Serial number

ENGINE IDENTIFICATION NUMBER (EIN)

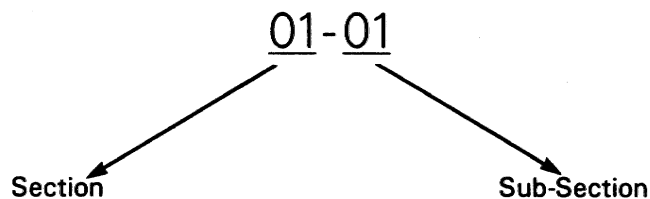
It is located on the upper side of the magneto housing.



DEFINITION OF NUMBERING SYSTEM

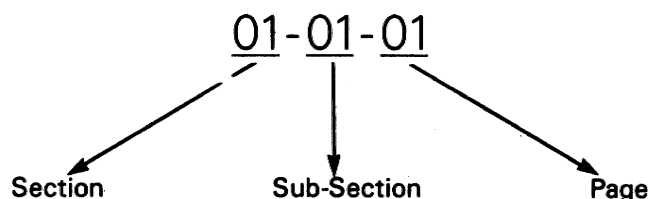
Sections and Sub-Sections System

The manual makes use of a 2-part digital numbering system (i.e. 01-01), in which the first two-digits represents the section, the second two-digits the sub-section.



Pages System

The numerotation at the bottom of each page assists the user in page location.



ARRANGEMENT OF THIS MANUAL

The manual is divided into 13 major sections :

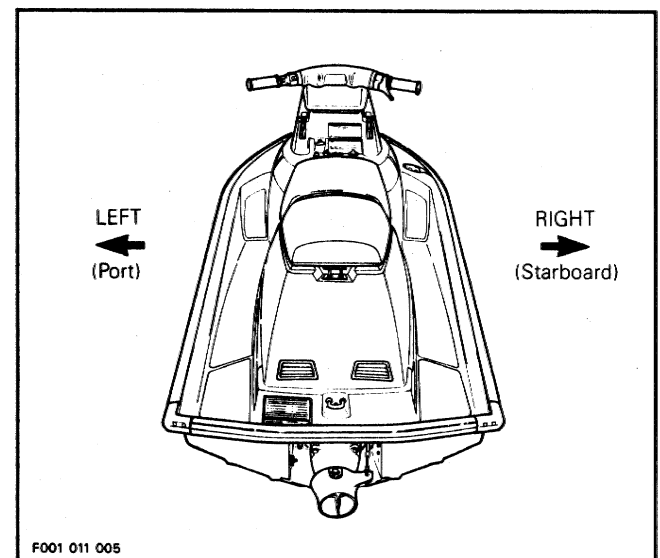
- 01 Service Tools
- 02 Periodic Inspection Chart
- 03 Engine
- 04 Cooling System
- 05 Fuel System
- 06 Oil System
- 07 Electrical
- 08 Propulsion & Drive Systems
- 09 Steering System
- 10 Hull/Body
- 11 Storage
- 12 Technical Data
- 13 Troubleshooting

Each section is divided in various sub-sections, and again, each sub-section has one or more division.

EX. : 03 ENGINE

- 01 Water-Flooded Engine Care
- 02 Removal & Installation
- 03 Top End
- 04 Flywheel & Magneto
- 05 Bottom End
- 06 Rotary Valve & Reservoir

The use of "Right" and "Left" indications in the text, always refers to driving position (when sitting on vehicle).



BOMBARDIER WATERCRAFT SHOP MANUAL

GENERAL

The information and component/system descriptions contained in this manual are correct at time of publication. Bombardier Inc. however, maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on products previously manufactured.

Bombardier Inc. reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring obligation.

ILLUSTRATIONS & PROCEDURES

An exploded view is conveniently located at the beginning of each section and is meant to assist the user in identifying parts and components.

This Shop Manual uses technical terms which may be different from the ones of the parts catalog.

When ordering parts always refer to the parts catalog.

The illustrations show the typical construction of the different assemblies and, in all cases, may not reproduce the full detail or exact shape of the parts shown, however, they represent parts which have the same or a similar function.

When something special applies (such as adjustment, inspection, etc.), boldface numbers in exploded views are used for specific parts and referred to in the text.

▼ **CAUTION : Pay attention to torque specifications. Some of these are in lbf•in instead of lbf•ft. Use appropriate torque wrench.**

▼ **CAUTION : Components of this watercraft are built with parts dimensioned in the metric system. Fasteners are metric and must not be replaced by customary SAE fasteners or vice versa. Mismatched or incorrect fasteners could cause damage to the watercraft or possible personal injury.**

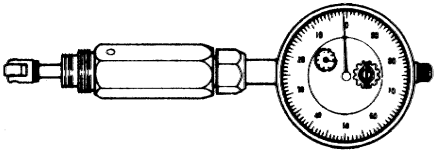
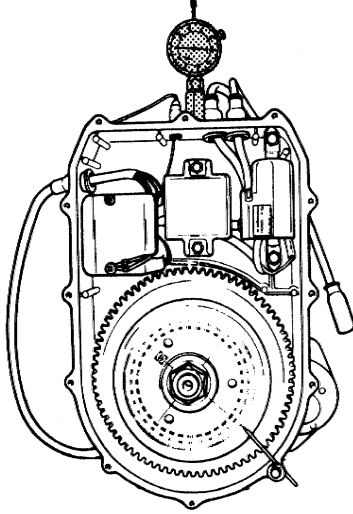
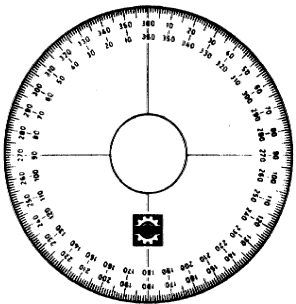
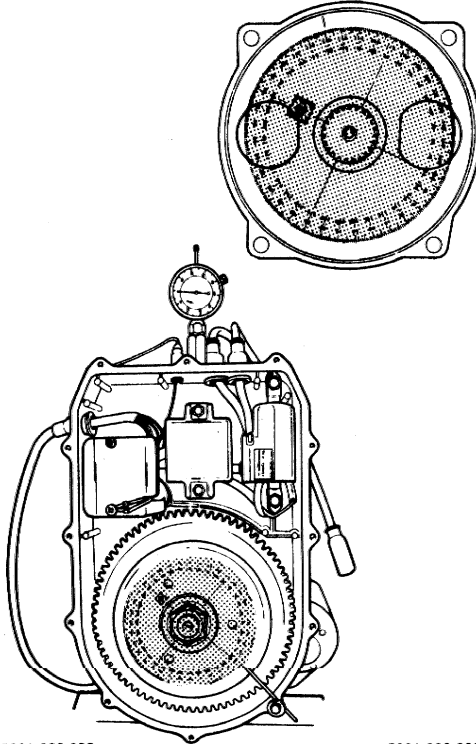
As many of the procedures in this manual are interrelated, we suggest, that before undertaking any task, you read and thoroughly understand the entire section or subsection in which the procedure is contained.

A number of procedures throughout the book require the use of special tools. Where a special tool is indicated, refer to section 01. Before commencing any procedure, be sure that you have on hand all the tools required, or approved equivalents.

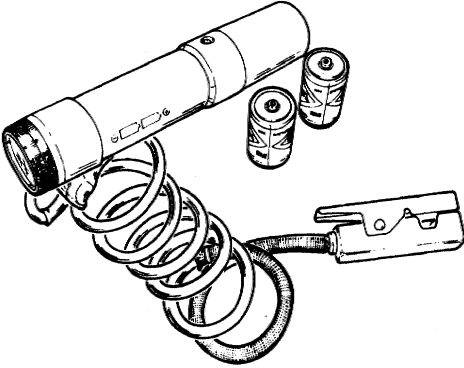
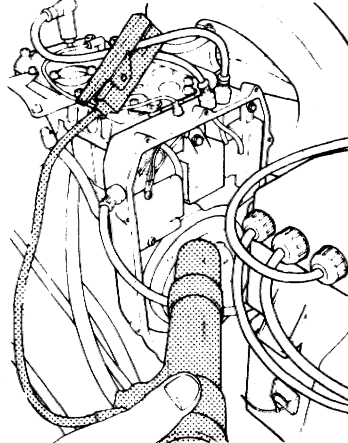
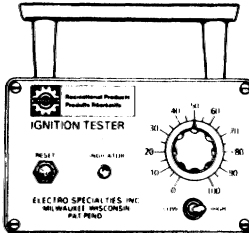
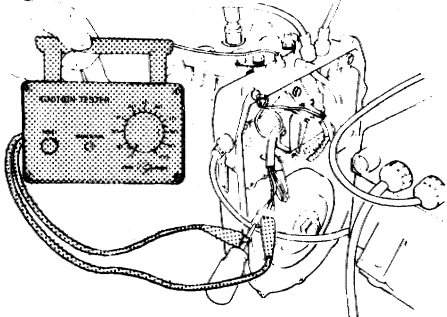
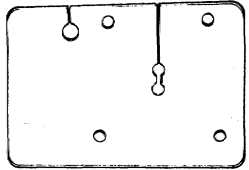
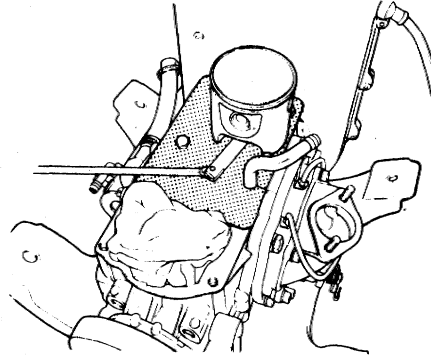
Technical Publications
Bombardier Inc.
Valcourt (Quebec) Canada

SERVICE TOOLS

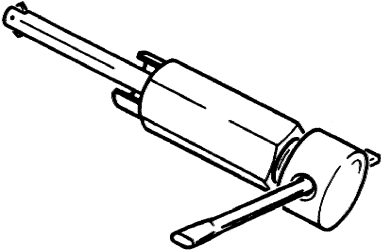
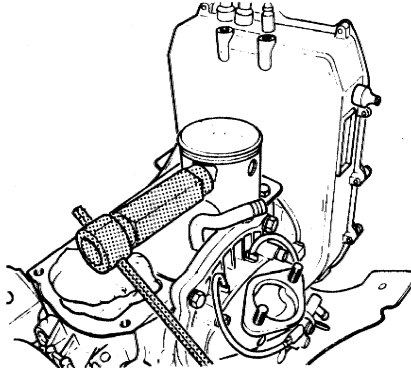
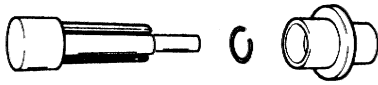
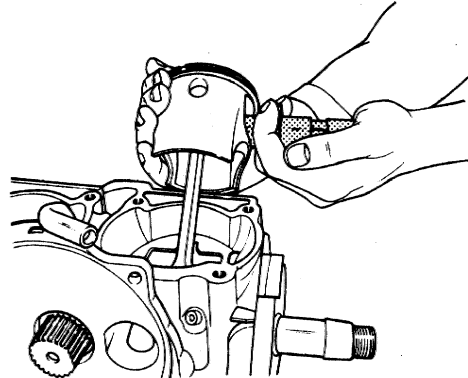
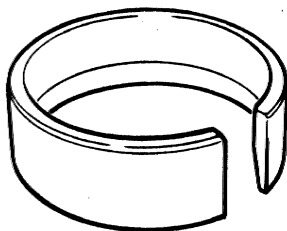
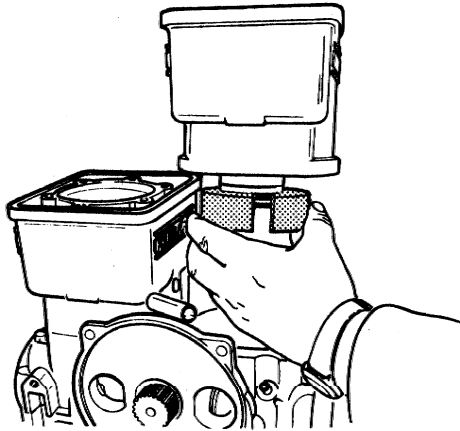
ENGINE

SERVICE TOOL	PURPOSE	APPLICATION
<p>Dial indicator (TDC gauge) 295 000 065</p>  <p>A000 001 086</p>	<p>To find TDC position. For ignition timing and rotary valve timing.</p>  <p>F001 003 055</p>	<p>5801/5802 models</p>
<p>Degree wheel 295 000 007</p>  <p>A000 001 111</p>	<p>To mark timing position of rotary valve, to check crankshaft alignment.</p>  <p>F001 003 055</p> <p>F001 003 093</p>	<p>5801/5802 models</p>


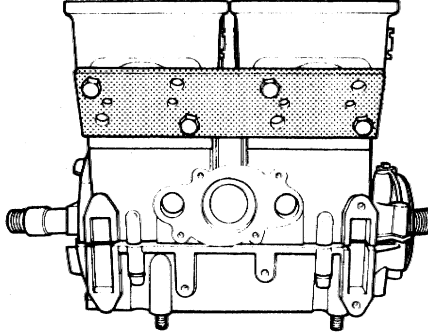
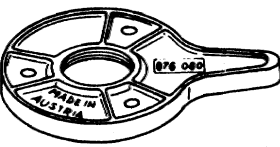
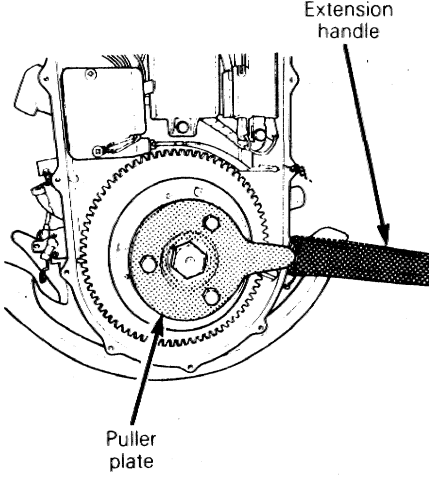
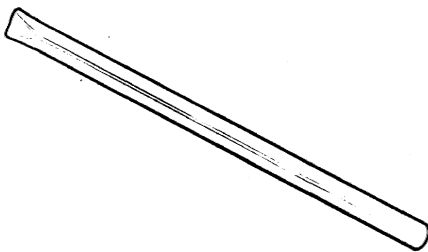
Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Stroboscopic timing light 295 000 078</p>  <p>A001 001 092</p>	<p>To verify ignition timing.</p>  <p>F001 007 024</p>	<p>5801/5802 models</p>
<p>Bombardier ignition tester 295 000 008</p>  <p>A000 002 056</p>	<p>To test engine electrical components.</p>  <p>F001 007 041</p>	<p>5801/5802 models</p>
<p>Rubber pad 290 877 030</p>  <p>F001 003 015</p>	<p>To avoid needles of connecting rod bearing from falling in crankcase.</p>  <p>F001 003 016</p>	<p>5801/5802 models</p>

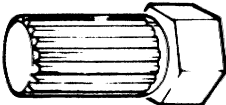
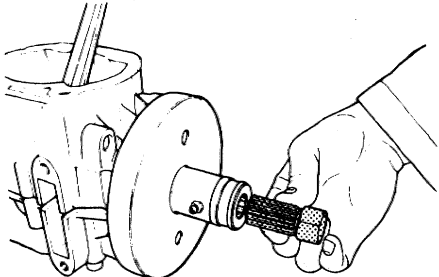
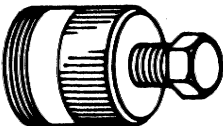
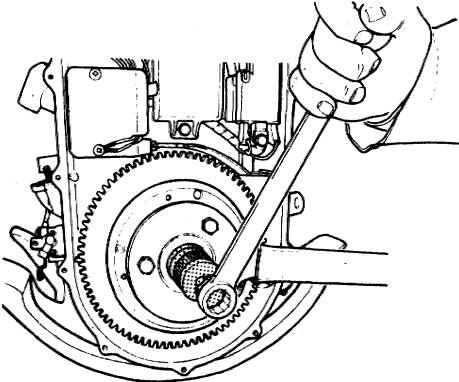
Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Piston pin puller 295 000 052</p>  <p>A001 001 045</p>	<p>To remove piston pin.</p>  <p>F001 003 018</p>	<p>5801 / 5802 models</p>
<p>Piston circlip installer 295 000 077</p>  <p>A001 001 061</p>	<p>To install circlips on piston.</p>  <p>F001 003 034</p>	<p>5801 / 5802 models</p>
<p>Ring compressor 290 876 972</p>  <p>A001 001 065</p>	<p>To compress piston rings when inserting piston in cylinder.</p>  <p>F001 003 036</p>	<p>5801 / 5802 models</p>

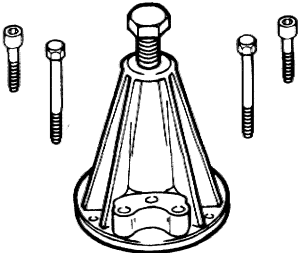
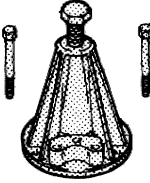

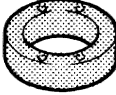
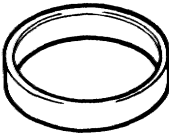
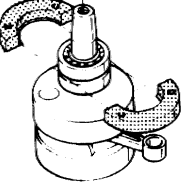
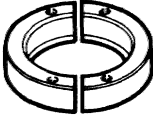

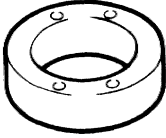

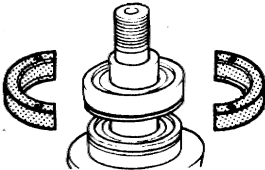
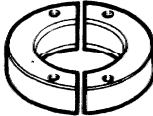
Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Aligning tool 290 876 900</p>  <p>A000 001 008</p>	<p>To align cylinders by exhaust flanges at assembly.</p>  <p>F001 003 037</p>	<p>5801/5802 models</p>
<p>Puller plate 290 876 080</p>  <p>A000 002 063</p>	<p>Used with extension handle to retain crankshaft. When removing/installing PTO flywheel and slacken/tighten MAG flywheel nut.</p>  <p>Extension handle</p> <p>Puller plate</p> <p>F001 003 045</p>	<p>5801/5802 models</p>
<p>Extension handle 295 000 003</p>  <p>F001 003 042</p>		

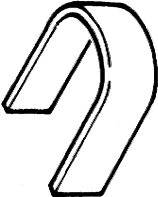
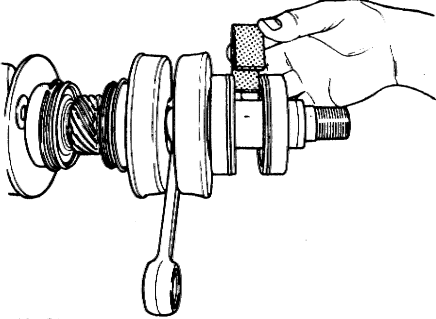
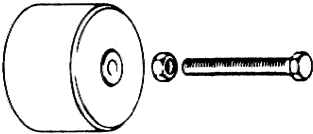
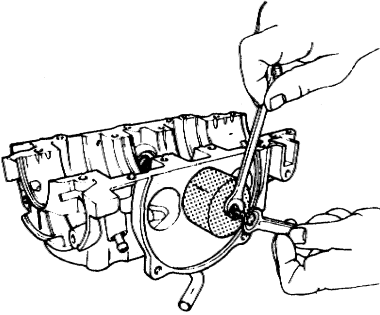

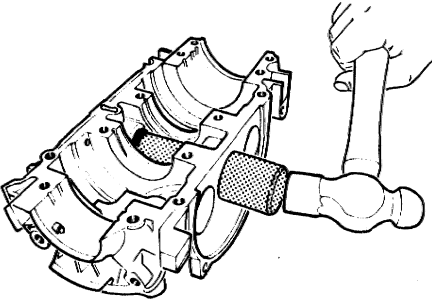

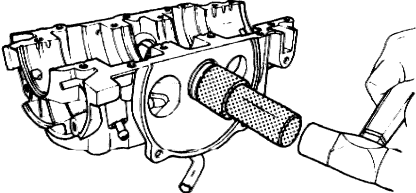
Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Impeller/PTO flywheel remover/installer 295 000 001</p>  <p style="font-size: small;">F001 009 029</p>	<p>Used to slacken/tighten PTO flywheel and impeller. Hold flywheel with puller plate and extension handle above.</p>  <p style="font-size: small;">F001 003 046</p>	<p>5801/5802 models</p>
<p>Puller 290 876 046</p>  <p style="font-size: small;">A000 002 046</p>	<p>Used with puller plate and extension handle to remove MAG flywheel.</p>  <p style="font-size: small;">F001 003 049</p>	<p>5801/5802 models</p>

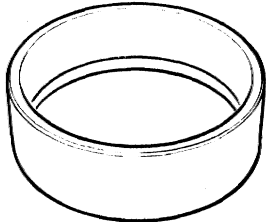
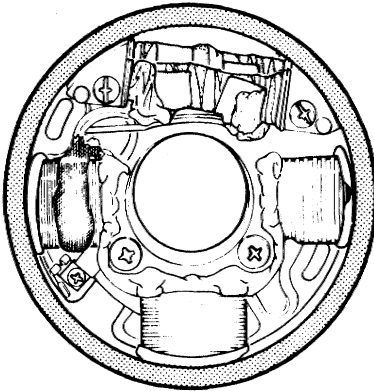
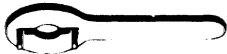
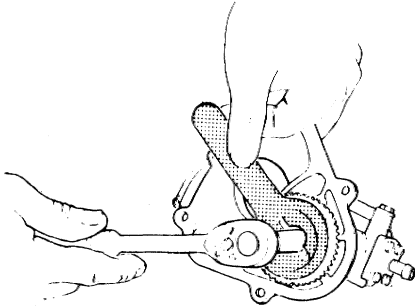
Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Puller with screws 290 876 298</p>  <p>F001 001 010</p>	<p>To remove crankshaft bearings.</p> 	<p>5801/5802 models</p>
<p>Protective cap (both ends) 290 876 557</p>  <p>F001 001 011</p>		
<p>Ring (both ends) 290 977 490</p>  <p>F001 001 013</p>	 <p>MAG side</p>	
<p>Ring halves (PTO) 290 977 475</p>  <p>F001 001 012</p>		
<p>Distance ring (MAG) 290 876 569</p>  <p>F001 001 015</p>	  <p>PTO side</p>	
<p>Ring halves (MAG) 290 276 025</p>  <p>F001 001 014</p>	<p>F001 003 094</p> <p>F001 003 095</p>	

Section 01 SERVICE TOOLS

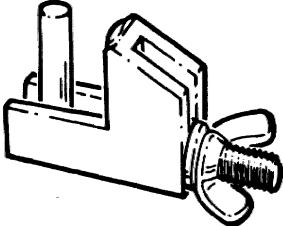
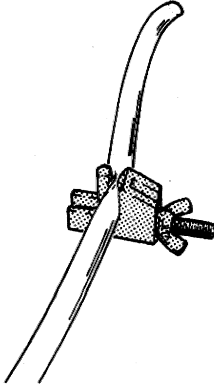
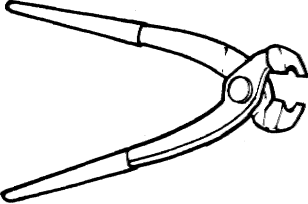
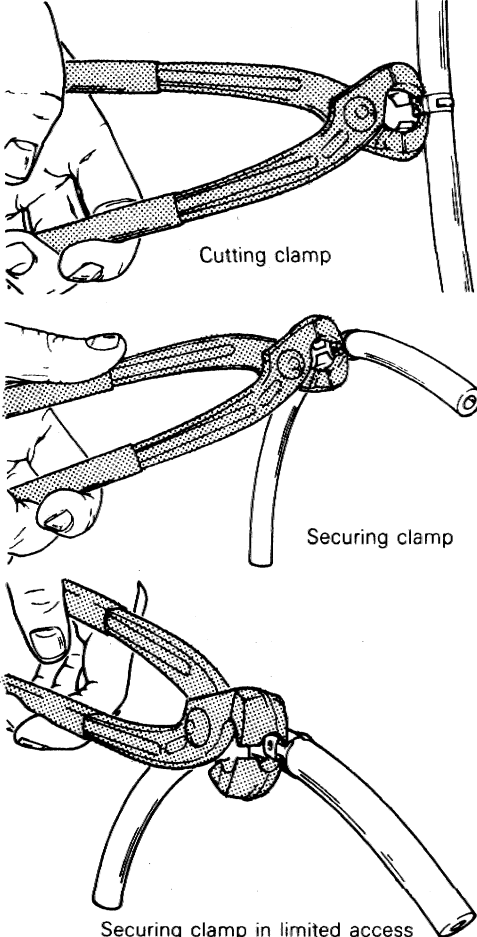
SERVICE TOOL	PURPOSE	APPLICATION
<p>Distance gauge 290 876 826</p>  <p>F001 001 017</p>	<p>To position outer crankshaft bearing on PTO side.</p>  <p>F001 003 070</p>	<p>5802 model only</p>
<p>Remover 290 876 487</p>  <p>F001 001 018</p>	<p>To remove rotary valve shaft from crankcase.</p>  <p>F001 003 076</p>	<p>5801/5802 models</p>
<p>Pusher 290 876 500</p>  <p>A000 001 091</p>	<p>To install end bearing of rotary valve shaft in crankcase.</p>  <p>F001 003 086</p>	<p>5801/5802 models</p>
<p>Pusher 290 876 605</p>  <p>A000 002 034</p>	<p>To install rotary valve shaft in crankcase.</p>  <p>F001 003 088</p>	<p>5801/5802 models</p>

Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p data-bbox="95 394 265 464">Centering tool 290 876 922</p>  <p data-bbox="95 974 194 993">A001 001 067</p>	<p data-bbox="652 394 1136 453">To position coils on armature plate at assembly.</p>  <p data-bbox="652 974 751 993">A001 004 003</p>	<p data-bbox="1164 394 1404 424">5801/5802 models</p>
<p data-bbox="95 1018 265 1087">Gear holder 290 277 905</p>  <p data-bbox="95 1600 199 1619">A000 001 042</p>	<p data-bbox="652 1018 1136 1077">To remove/install retaining nut of oil injection pump gear.</p>  <p data-bbox="652 1600 756 1619">A000 002 043</p>	<p data-bbox="1164 1018 1404 1047">5801/5802 models</p>

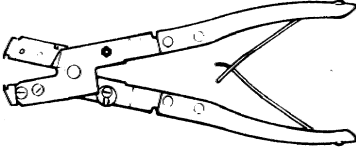
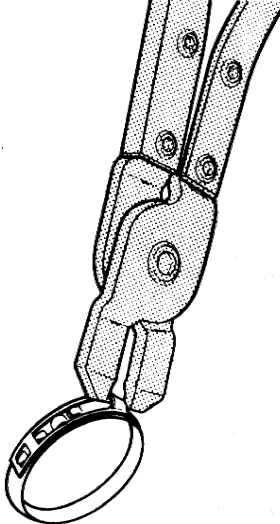
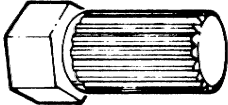

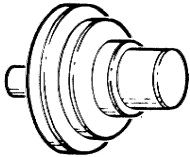
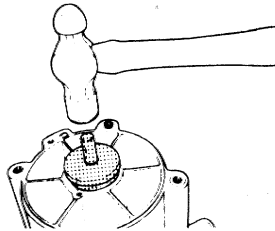
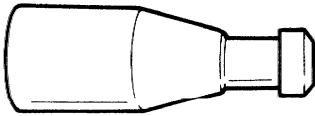
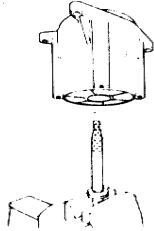
Section 01 SERVICE TOOLS

COOLING/FUEL/OIL SYSTEMS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Hose pincer 295 000 076</p>  <p>A001 001 090</p>	<p>To avoid leaks while working on oil/fuel lines.</p>  <p>A001 001 091</p>	<p>5801/5802 models</p>
<p>Pliers 295 000 070</p>  <p>F001 003 043</p>	<p>To secure/cut ear clamps on oil/fuel lines and coolant hoses.</p>  <p>Cutting clamp</p> <p>Securing clamp</p> <p>Securing clamp in limited access</p> <p>F001 001 003 F001 001 004 F001 001 005</p>	<p>5801/5802 models</p>

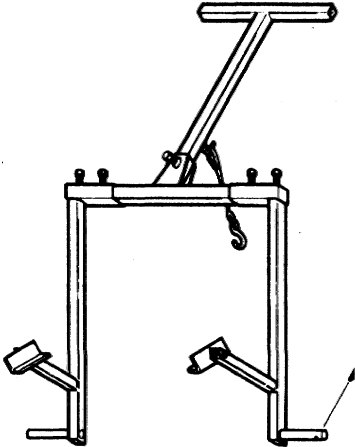
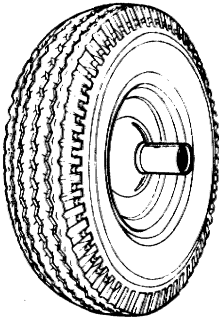
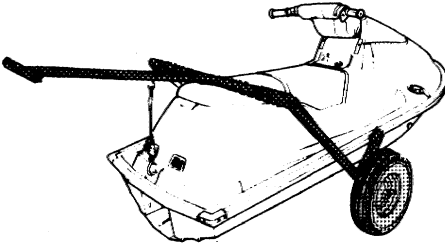
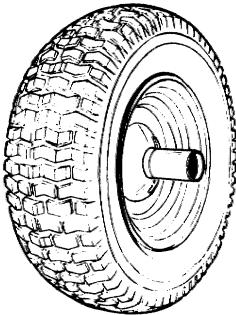
Section 01 SERVICE TOOLS

PROPULSION SYSTEM

SERVICE TOOL	PURPOSE	APPLICATION
<p>Pliers 295 000 069</p>  <p>F001 003 044</p>	<p>To remove/install drive shaft boot clamps.</p>  <p>F001 009 017</p>	<p>5801/5802 models</p>
<p>Impeller/PTO flywheel remover/installer 295 000 001</p>  <p>F001 009 029</p>	<p>Used to slacken/tighten impeller on shaft.</p>  <p>F001 009 030</p>	<p>5801/5802 models</p>
<p>Bearing/seal installer 295 000 014</p>  <p>F001 009 052</p>	<p>To install impeller shaft needle bearings and seal.</p>  <p>F001 009 054</p>	<p>5801/5802 models</p>
<p>Impeller/PTO flywheel remover/installer 295 000 002</p>  <p>F001 009 060</p>	<p>To protect seal lip when installing impeller shaft in its housing.</p>  <p>F001 009 061</p>	<p>5801/5802 models</p>

Section 01 SERVICE TOOLS

WATERCRAFT HANDLING

SERVICE TOOL	PURPOSE	APPLICATION		
<p>Dolley 295 000 027</p>  <p>F001 001 001</p>	<p>To handle watercraft in shop or on beach.</p>	<p>5801/5802 models</p>		
<p>Shop wheels 295 000 006</p>  <p>F001 001 006</p>				
<p>Beach wheels 295 000 005</p>  <p>F001 001 007</p>				<p>F001 001 008</p>

Section 02 PERIODIC INSPECTION CHART

PERIODIC INSPECTION CHART

○ NOTE : Shade area shows the maintenance frequency.

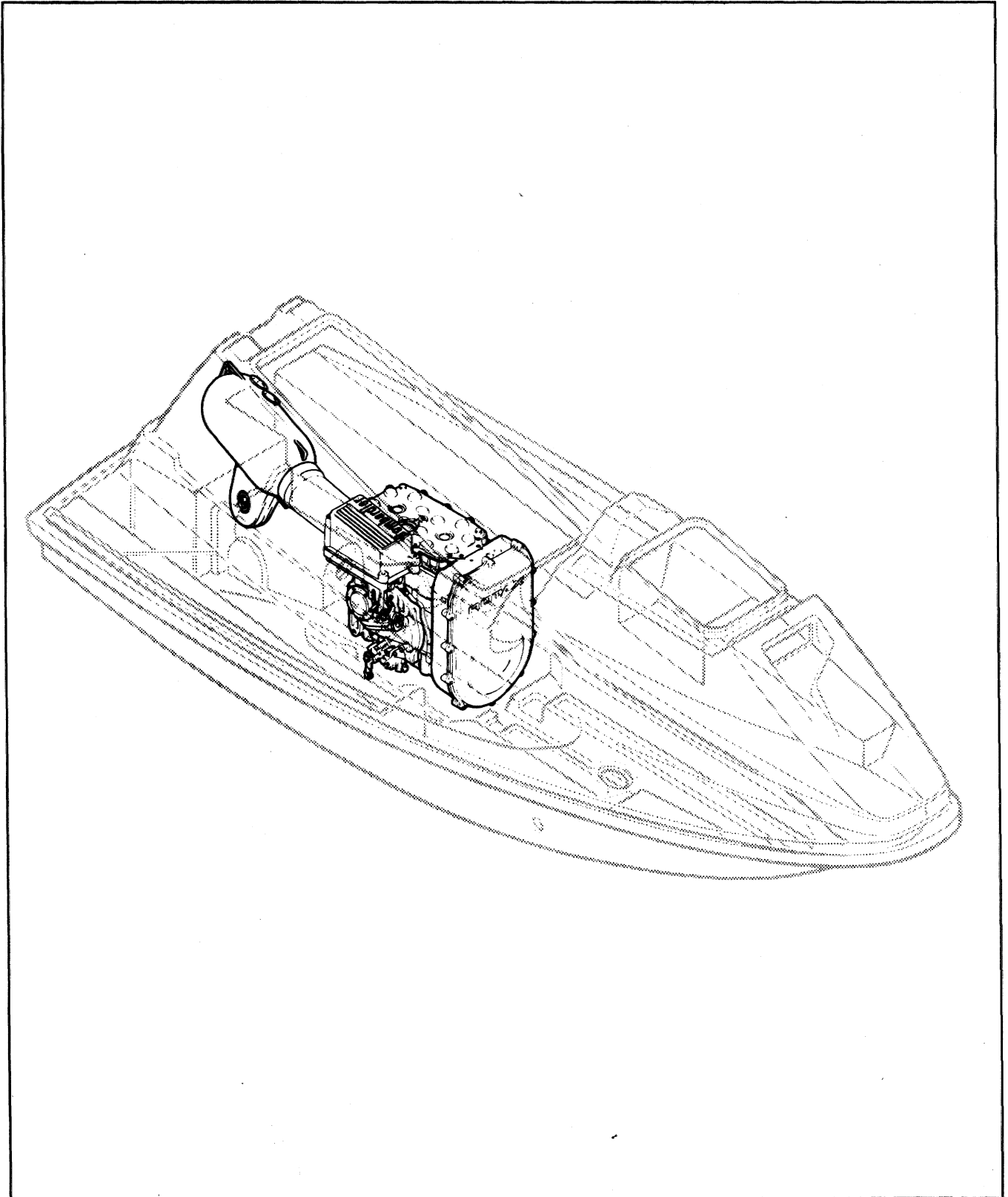
DESCRIPTION	FREQUENCY			
	Monthly	3 Months	6 Months	Yearly
Lubrication/corrosion protection	①			
Engine ignition timing				
Spark plugs, cleaning/adjustment				
Throttle/Choke cables, inspection/lubrication				
Flame arrester element, inspection				
Carburetor adjustment including choke/throttle cable adjustments				
Oil injection pump adjustment				
Fuel filter cleaning, oil filter inspection				
Oil filter, replacement				
Engine head screws, retorque				
Steering column wear/steering cable adjustment/condition				
Fastener tightening (flame arrester mount screws, carburetor mount nuts, engine mount screws, exhaust system, etc).				
Muffler, battery and reservoirs fastening devices				
Fuel/oil lines, check-valves and hoses inspection				
Inspect/clean engine drain tube	①			
Bilge system/water-trap drains, inspection				
Battery condition, electrolyte level, connections				
Engine overheating beeper/electrical connections				
Impeller shaft reservoir oil level/oil condition				Replace
Impeller condition and impeller/wear ring clearance		②		
Drive shaft boot/splines condition (both ends)		②		
Drive shaft, lubricate grease fitting at flywheel				
Water intake grill condition		②		
Hull condition				
Cooling system flushing ③				

① Every month in salt water use.

② These items have to be initially checked after three months. Thereafter, servicing to be made as specified in this chart.

③ Daily flushing in salt water use.

587 ENGINE TYPE



WATER-FLOODED ENGINE

If engine is water-flooded, it must be serviced within a few hours after the event. Otherwise engine will have to be overhauled for inspection and repair.

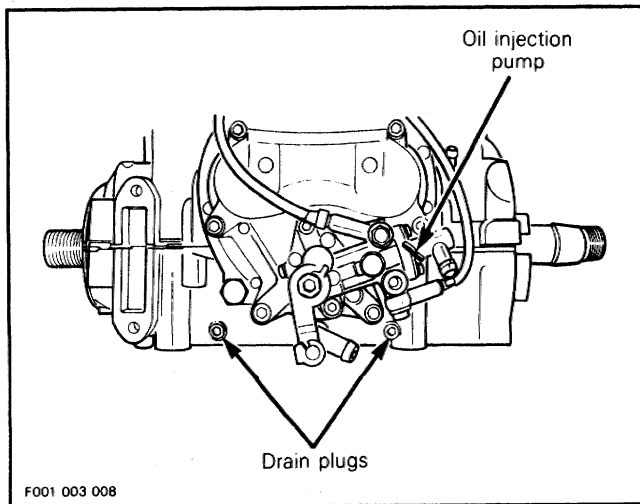
▼ **CAUTION** : A water-flooded engine must be properly lubricated, operated then lubricated again. Otherwise serious internal parts damage will occur.

Check fuel and oil reservoirs for water contamination. If necessary, siphon and refill with fresh fluids.

Turn fuel valve to "OFF" position then drain fuel filter bowl.

Drain bilge if water is present.

Remove engine crankcase drain plugs located underneath oil injection pump.



With spark plugs in place, crank engine to drain crankcase. Reinstall crankcase drain plugs.

▼ **CAUTION** : Crankcase drain plugs should have Loctite PST 567(P/N 293 800 013) applied to threads before installing.

Remove spark plugs and dry them with a clean and dry cloth. A contact cleaner spray can be used, it may be preferable to replace spark plugs. Do NOT install spark plugs in their caps, or on engine.

◆ **WARNING** : Ensure tether cord is removed from switch to prevent any spark.

Crank engine to allow water to escape from spark plug holes.

Spray SEA-DOO LUBE (P/N 293 600 006) into spark plug holes.

Crank engine again.

Re-install spark plugs then tether cord cap on switch.

Turn fuel valve to "ON" position and re-install tether cord cap over switch.

Press starting button to start engine. Some choking may be necessary. If engine does not start, repeat previous steps as necessary.

○ **NOTE** : If engine does not start after several trials, it is suggested to check ignition system for spark occurrence. Check crankshaft end seals, hydraulic lock may have pushed them out. Consider that center seals may have slipped out too. Check crankshaft alignment as specified in "BOTTOM END".

◆ **WARNING** : Ventilate bilge at least two minutes prior to checking spark.

After engine has started, spray SEA-DOO lube through carburetor intake while engine is running.

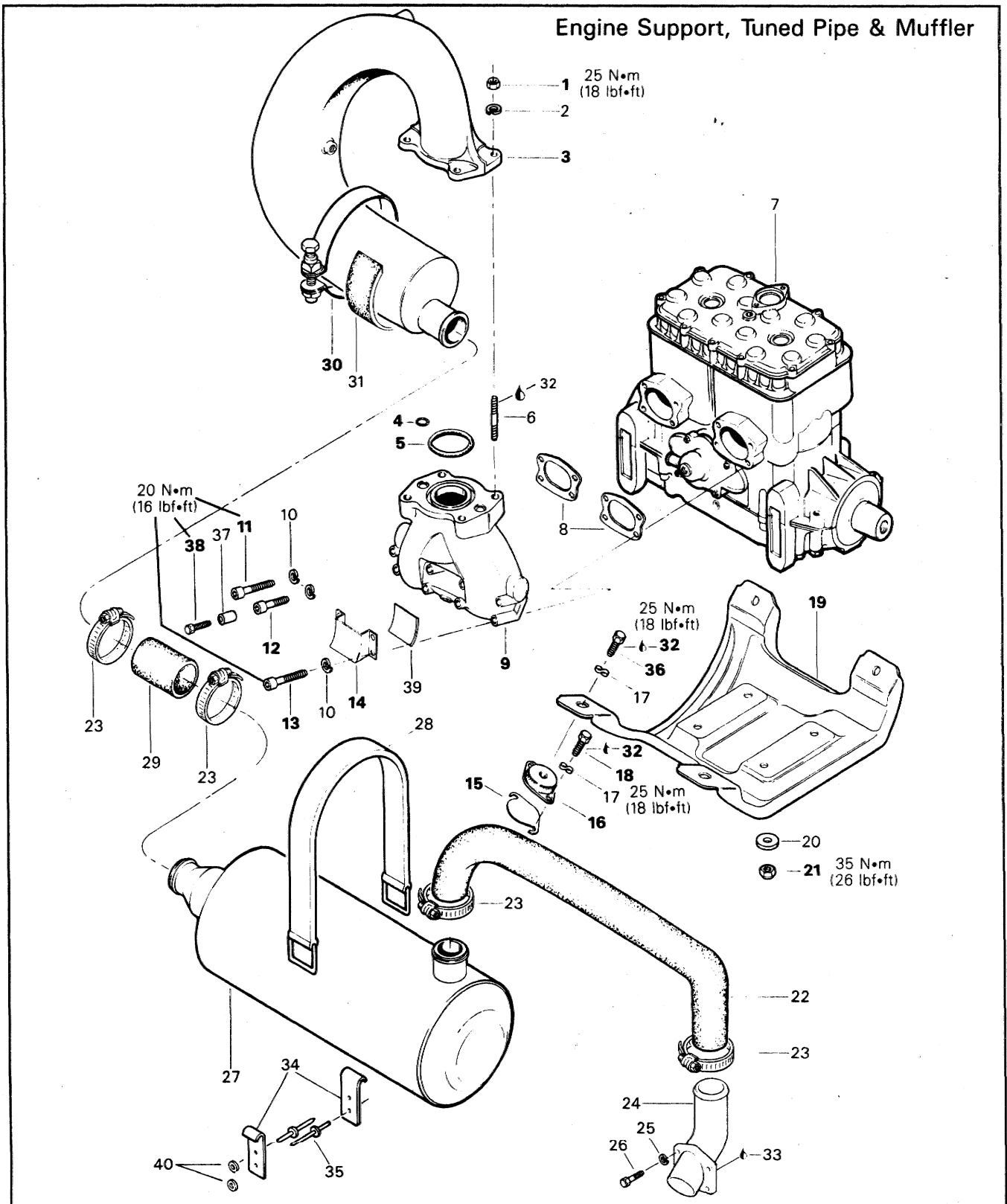
Run engine until it reaches its operational temperature.

Make sure to supply water to cool engine.

▼ **CAUTION** : Water must be supplied to cool engine with flush kit (P/N 295 000 038). Do not run engine for more than five minutes since drive line seal has no cooling out of water.

Section 03 ENGINE
Sub-Section 02 (REMOVAL & INSTALLATION)

REMOVAL & INSTALLATION



Section 03 ENGINE

Sub-Section 02 (REMOVAL & INSTALLATION)

COMPONENTS

1. Hexagonal nut M8 (4)
2. Lock washer M8 (4)
3. Tuned pipe
4. O-ring (2)
5. O-ring
6. Stud M8 x 26/16 (4)
7. Engine Rotax 587
8. Gasket (2)
9. Exhaust manifold
10. Lock washer (8)
11. Allen screw M8 x 70 (3)
12. Allen screw M8 x 60
13. Allen screw M8 x 75 (4)
14. Saddle (2)
15. Shim .40 mm (3)
Shim 1.40 mm (3)
16. Rubber mount (4)
17. Washer M8 (6)
18. Hexagonal head screw M8 x 30 (8)
19. Engine support
20. Flat washer M10 (4)
21. Elastic stop nut M10 (4)
22. Hose formed
23. Clamp (4)
24. Exhaust outlet
25. Lock washer M6 (8)
26. Hexagonal head screw M6 x 25 (4)
27. Muffler
28. Muffler strap
29. Hose 90 mm
30. Clamp (2)
31. Rubber strip (2)
32. Loctite 242
33. Sealant, 300 ml
34. Anchor (2)
35. Rivet (4)
36. Hexagonal head screw M8 x 20 (4)
37. Spacer
38. Hexagonal head screw M8 x 70
39. Rubber pad (2)
40. Flat washer (2)

GENERAL

It is not necessary to remove engine from watercraft for "TOP END" servicing nor "MAGNETO & FLYWHEEL". However engine removal is necessary to repair "BOTTOM END" and "ROTARY VALVE".

REMOVAL FROM WATERCRAFT

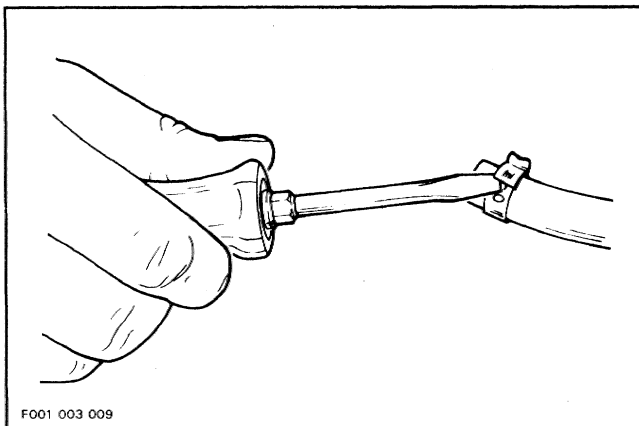
In order to remove engine from watercraft proceed as follows.

Propulsion System

Withdraw jet pump unit ass'y, refer to "PROPULSION & DRIVE SYSTEMS", section 08.

Cooling & Exhaust Systems

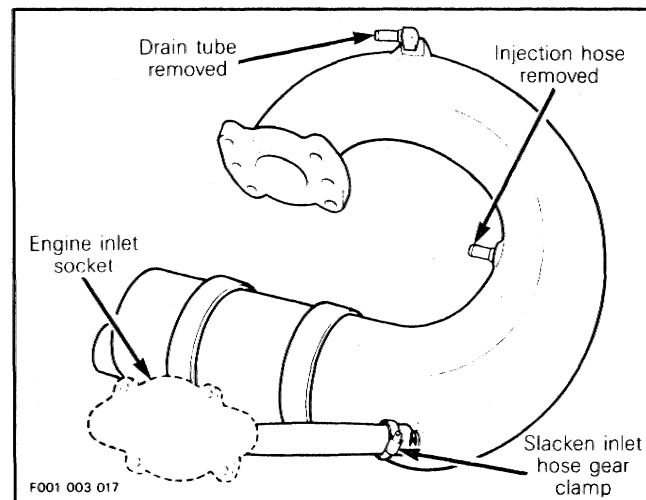
NOTE: To release a clamp from cooling hose/fuel line, insert a screwdriver blade under the end of clamp. Pry end out of locking hooks.



Disconnect hose from water outlet socket on engine, injection hose and drain tube from tuned pipe.

Slacken gear clamp from hose between bottom of tuned pipe and engine water inlet socket; insert a screwdriver through opening between tuned pipe, cylinder and magneto housing.

Slacken gear clamp on tuned pipe outlet.



Remove tuned pipe mounting nuts; slightly lift it to release nuts as necessary. Withdraw tuned pipe in a forward and rotating movement. Be careful not to drop O-rings located in exhaust manifold grooves.

Disconnect hose on exhaust manifold. Remove fasteners taking care not to drop any part, then withdraw manifold.

Section 03 ENGINE

Sub-Section 02 (REMOVAL & INSTALLATION)

Electrical Connections

◆ **WARNING** : Always disconnect starter or battery cables exactly in the specified order, black negative cable first. Electrolyte or fuel vapors can be present in the engine compartment and a spark might ignite them and possibly cause personal injuries. It is recommended to disconnect electrical connections prior to disconnecting fuel lines.

First, remove black negative cable from starter mounting bolt, then red positive cable from starter post. Wrap electrical tape around red cable connector.

Open electrical box and disconnect wires of cable coming from magneto housing.

Unscrew cable cap. Slide cap and compression grommet away then pull cable out of electrical box cover.

Intake & Fuel Systems

Slacken clamp of intake silencer boot on carburetor side.

Pivot intake silencer to rear of watercraft.

Remove both retaining screws of carburetor support from engine cover.

Turn fuel valve to "OFF" position.

Disconnect fuel supply line from carburetor.

Remove screw of banjo fitting from fuel return line. Be careful not to drop any part.

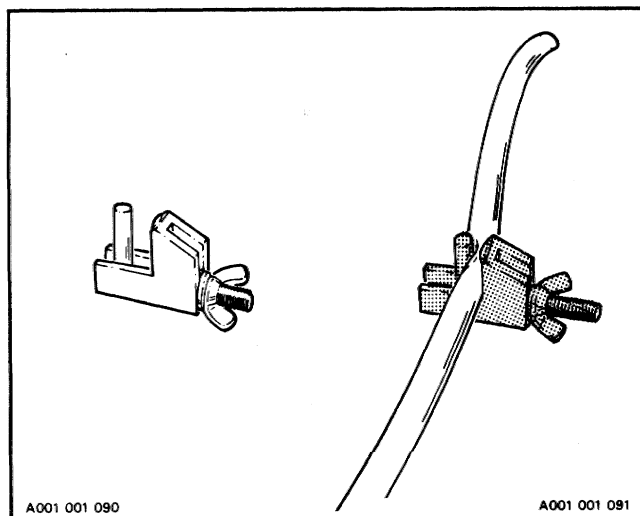
Disconnect throttle and choke cables from carburetor.

Unscrew carburetor support from engine cover.

Unscrew carburetor mount nuts then remove carburetor and flame arrester together ; slightly lift it to release nuts as necessary.

Disconnect impulse line.

To prevent excessive oil spillage, use a Hose Pincer (P/N 295 000 076).



Install hose pincer on rotary valve oil return line (on top of rotary valve housing) and oil injection pump supply line, then disconnect them.

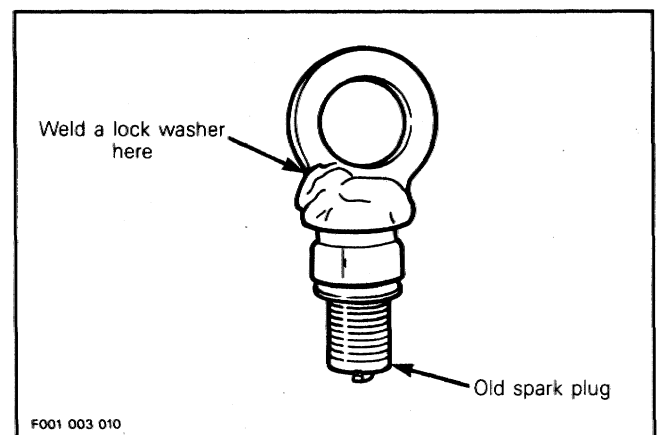
Remove throttle cable from oil injection pump.

Remove engine support mount screws.

Engine can be easily lifted using the following suggested tool.

— Cut porcelain from two old spark plugs.

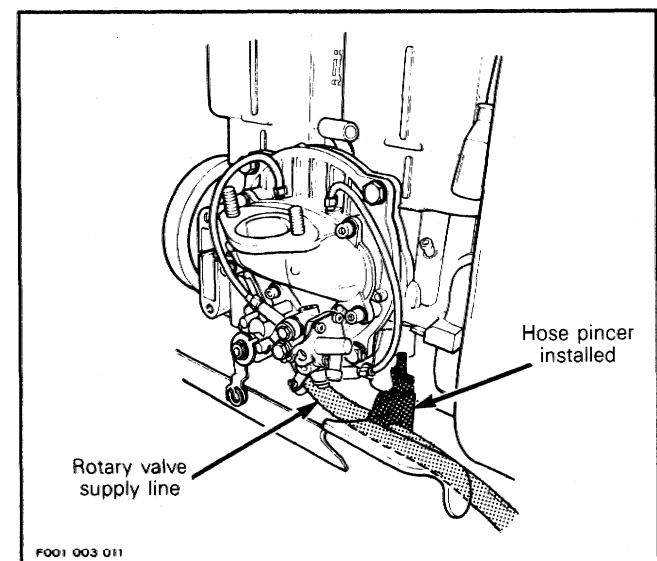
— Weld a large lock washer approximately 20 mm diameter on each spark plug as shown.



Remove spark plugs and replace by special tools.

Hook a sling into holes of special tools then using a chain block, a hoist or other suitable equipment, slowly lift engine.

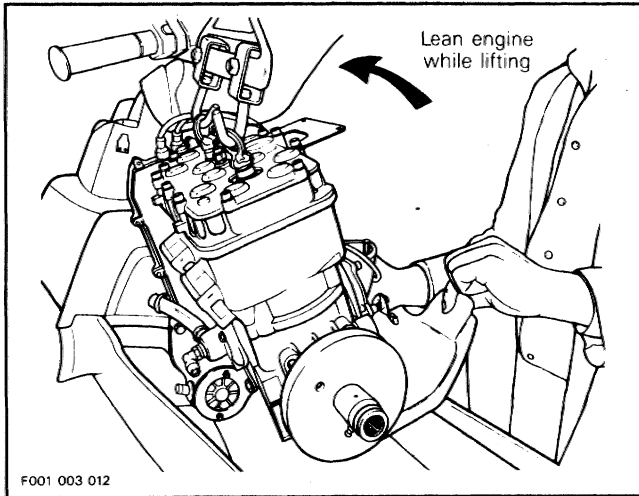
Lift it until rotary valve supply line is reachable. Install a hose pincer on hose then disconnect.



Section 03 ENGINE

Sub-Section 02 (REMOVAL & INSTALLATION)

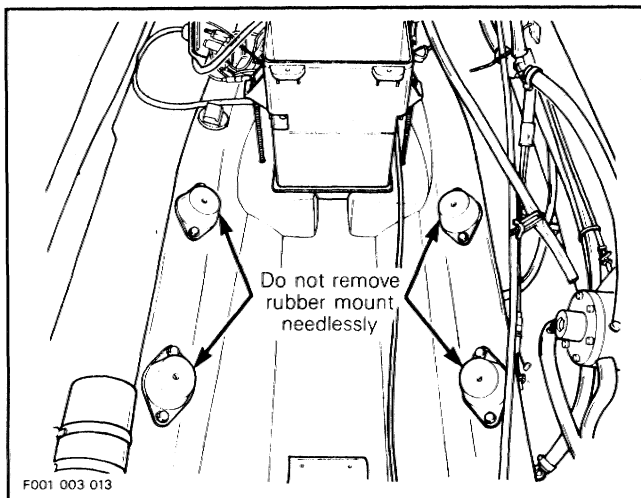
Carry on engine lifting until engine support reaches body aperture then lean engine so that it can completely leave watercraft.



▼ **CAUTION** : Be careful not to scratch body with engine support or hit fuel pump/filter nor any component.

15,16, Shim & Rubber Mount

Do not remove engine rubber mounts needlessly. They sit on shims which control engine/jet pump alignment. Alignment has been set at factory and can not be performed in workshop. Always remove rubber mounts one at a time and re-install each shim to its original location.



▼ **CAUTION** : If shims with different thickness are interchanged, engine and jet pump will be disaligned.

CLEANING

Wipe off any spillage in bilge. Clean with a bilge cleaner.

Discard all gaskets and O-rings.

Clean external parts of engine.

INSTALLATION

Installation of engine in watercraft is essentially the reverse of removal procedures. However pay particular attention to the following.

16,18, Rubber Mount & Screw

Check tightness and condition of rubber mounts. If they have been removed, apply Loctite 242 (blue) (P/N 293 800 002) on screw threads. Torque screws to 25 N•m (18 lbf•ft).

▼ **CAUTION** : Strict adherence to this torque is important to avoid damaging threads of aluminum insert in bilge.

19,21, Engine Support & Nut

Properly install support on crankcase so that rounded portion of support matches with MAG side of crankcase. Apply Loctite 242 (blue) (P/N 293 800 002) on threads then torque nuts in a criss-cross sequence to 35 N•m (26 lbf•ft).

Rotary Valve Supply Line

Make sure to re-install line before completely lower engine in bilge.

○ **NOTE** : For fuel line clamping, use special pliers (P/N 295 000 070).

32,36, Loctite 242 & Screw

Apply Loctite 242 on screw threads and torque to 25 N•m (18 lbf•ft).

Electrical Connections

First, install **red** positive cable on starter post, **then black** negative cable on starter mounting bolt, torque to 22 N•m (16 lbf•ft). Apply Dielectric Grease (P/N 293 550 004) on connectors then cover with boot.

Install cable coming from ignition housing, into electrical box cover. Connect wires making sure to match wire colors.

Install compression grommet and cap. It is strongly recommended to use a flare nut wrench to properly tighten cap.

Firmly tighten cap. To ensure water-tight mounting, pull cable ; it must not slide through grommet. Retighten as necessary.

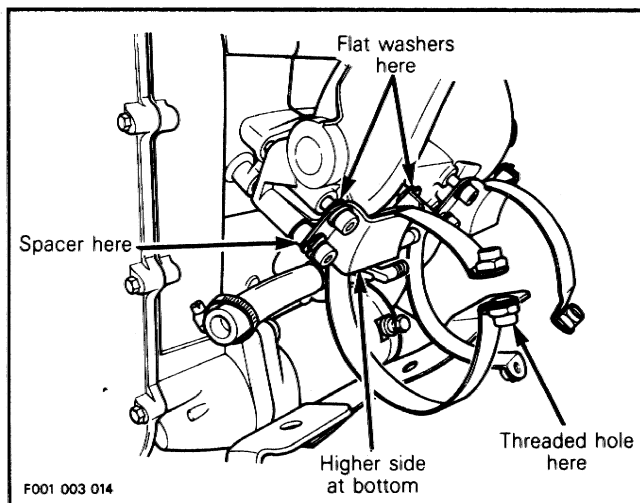
Torque cover screws to 8 N•m (71 lbf•in).

9,11,12,13,14,30,38, Exhaust Manifold, Screw, Saddle & Clamp

Position each clamp so that its screw will be accessible from top.

Position each saddle so that its higher side is at bottom.

Install screws paying attention to their different length with washers and spacers as shown.



Torque screws in a criss-cross sequence to 20 N•m (15 lbf•ft).

1,3,4,5, Nut, Tune Pipe & O-Ring

Make sure that O-rings are properly located into exhaust manifold grooves prior to finalizing pipe installation.

Torque nuts in a criss-cross sequence to 25 N•m (18 lbf•ft).

▼ **CAUTION :** Make sure that a sufficient gap is present between hull and tuned pipe, and also between clamp protrusion and hull.

Final Inspection

Check throttle cable condition then after its installation, properly adjust and synchronize oil injection pump as specified in "OIL SYSTEM", section 06.

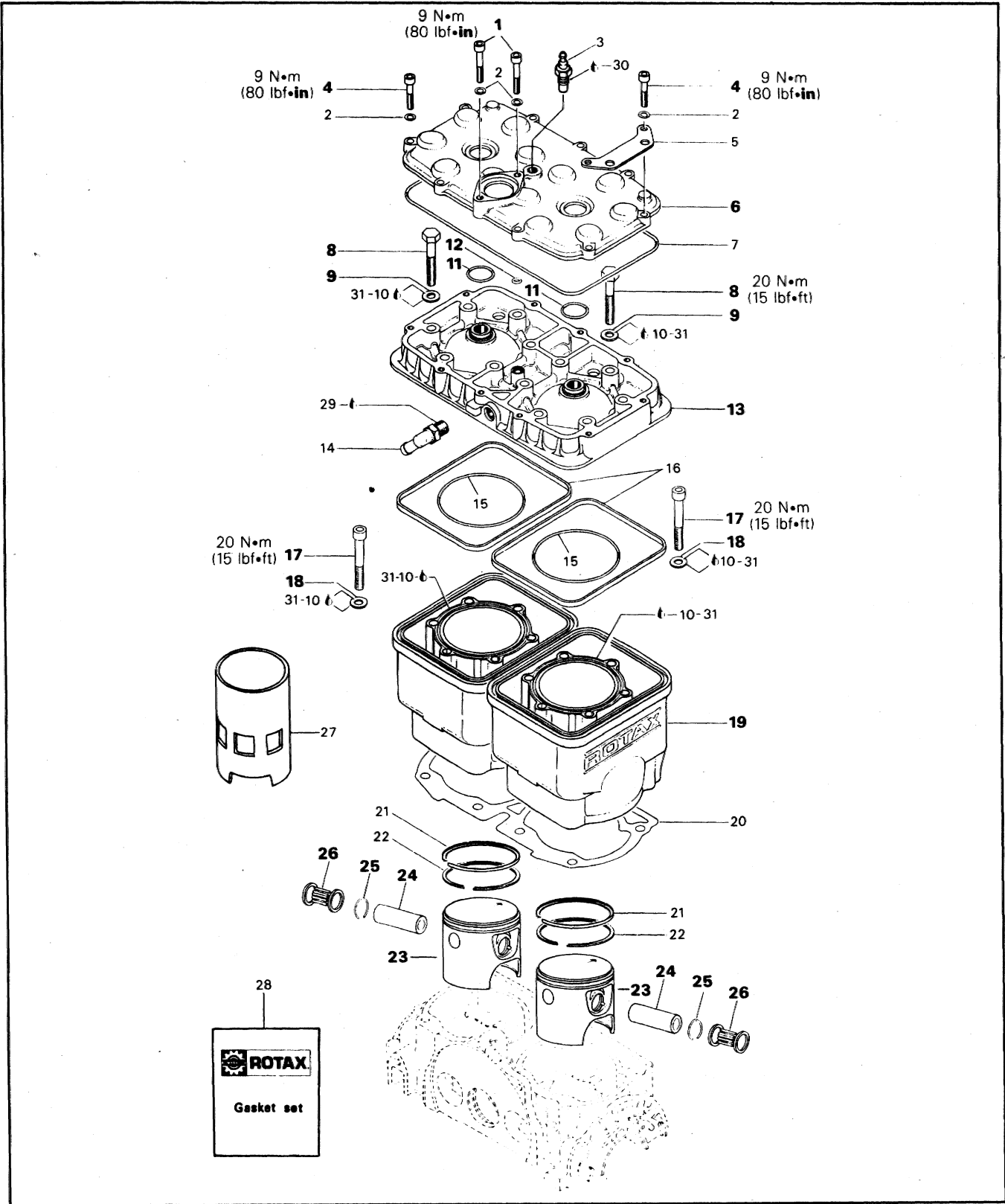
Bleed oil injection pump.

Run engine and ensure there is no leakage.

▼ **CAUTION :** Water must be supplied to cool engine with flush kit (P/N 295 000 038). Do not run engine for more than five minutes since drive line seal has no cooling out of water.

Section 03 ENGINE
Sub-Section 03 (TOP END)

TOP END



Section 03 ENGINE

Sub-Section 03 (TOP END)

COMPONENTS

1. Allen screw M6 x 35 (2)
2. Lock washer (11)
3. Sensor switch
4. Allen screw M6 x 25 (9)
5. Bracket
6. Cylinder head cover
7. O-ring
8. Hexagonal screw M8 x 55 (12)
9. Washer 8.4 (12)
10. Loctite 515
11. O-ring (2)
12. O-ring
13. Cylinder head
14. House nipple (2)
15. O-ring (2)
16. O-ring (2)
17. Allen screw M8 x 70 (8)
18. Washer (8)
19. Cylinder with sleeve (2)
20. Cylinder gasket
21. Semi-trapez ring (2)
22. Rectangular ring (2)
23. Piston (2)
24. Gudgeon pin (2)
25. Circlip (4)
26. Needle bearing (2)
27. Cylinder sleeve
28. Gasket set
29. Loctite PST 567
30. Sealant PL-32
31. Loctite Primer N

GENERAL

When repairing a seized engine, connecting rods should be checked for straightness and crankshaft for deflection/misalignment. Refer to "BOTTOM END", for procedures.

DISASSEMBLY

Disconnect thermosensor wire.

Remove cylinder head cover.

If shells, sand, salt or any other particles are present in cylinder head, clean with a vacuum cleaner.

Remove screws then cylinder head.

If shells, sand, salt or any other particles are present in cylinder cooling jacket, clean with a vacuum cleaner.

Remove screws then pull cylinder up, being careful that connecting rod does not hit crankcase edge.

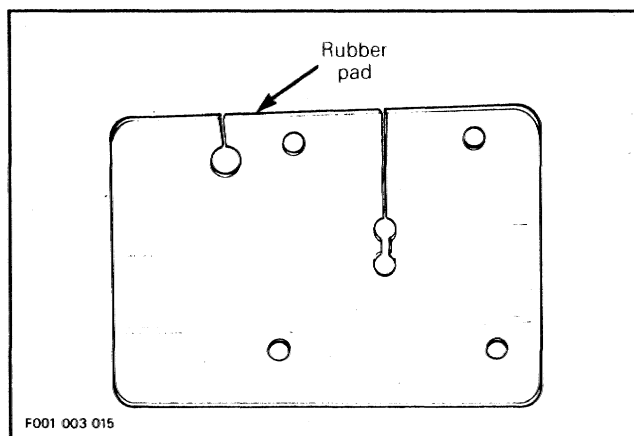
◆ **WARNING** : If screws need to be heated for removal when engine is in watercraft, do not use open flame ; use a heat gun. Since vapors can be present in engine compartment an explosion might occur.

○ **NOTE** : Even if only one cylinder needs repair, both cylinders should be lifted to allow one-piece cylinder base gasket replacement.

23,24,25,26, Piston, Piston Pin, Circlip & Needle Bearing (cageless)

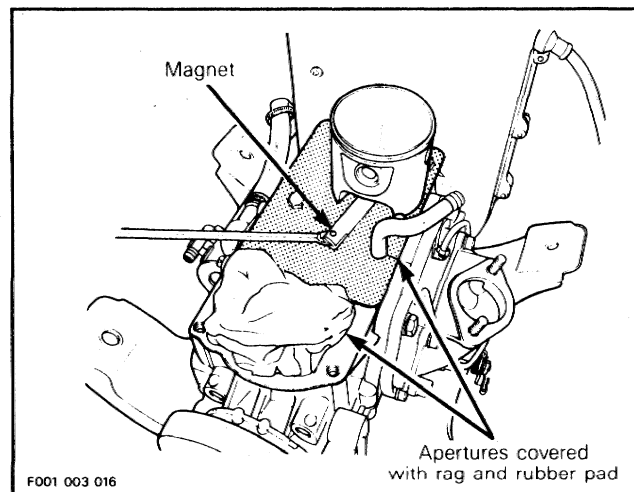
▼ **CAUTION** : This engine design features cageless piston pin bearing. At piston disassembly, rollers will fall out.

Bring piston to Top Dead Center and install Rubber Pad (P/N 290 877 030) over crankcase aperture. Secure with screws. Lower piston until it sits on pad.



If other cylinder has been removed, completely cover its aperture with a clean rag.

As an additional precautionary measure, a magnet can be installed under piston to catch rollers for removal.



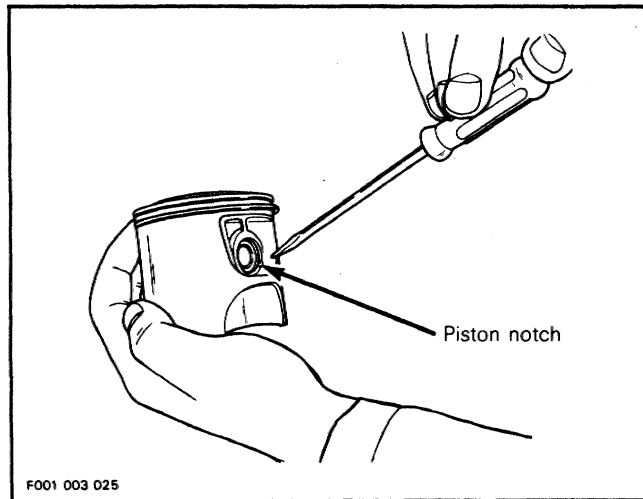
Section 03 ENGINE

Sub-Section 03 (TOP END)

○ **NOTE :** To remove MAG piston, PTO piston must be removed or ignition housing to allow access.

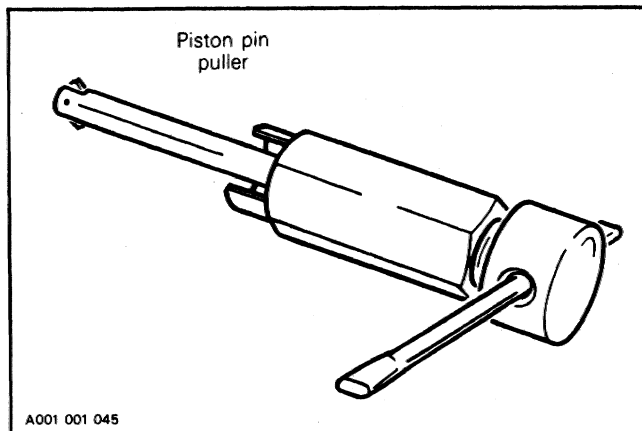
To remove circlip, insert a pointed tool in piston notch then pry it out.

◆ **WARNING :** Always wear safety glasses when removing piston circlips.

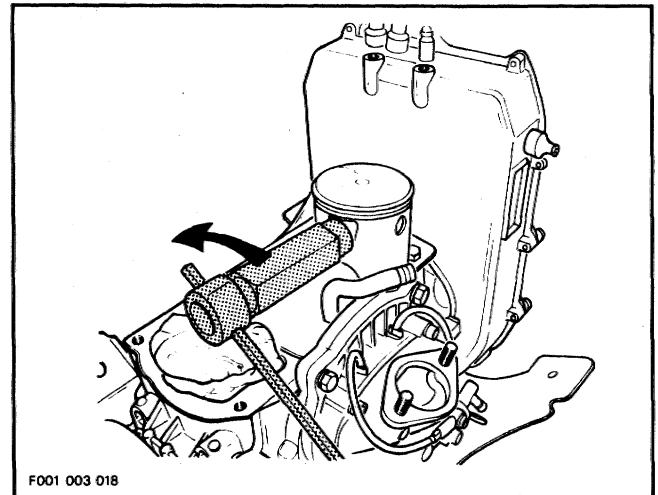


To extract piston pin, use Piston Pin Puller (P/N 295 000 042) as follows:

- Fully screw puller handle.
- Place puller stop notch in line with puller axis.
- Insert puller end into piston pin.
- Rotate stop notch of puller so that corners protrude puller end.



- Firmly hold puller and rotate handle counterclockwise to pull piston pin.



▼ **CAUTION :** Recover rollers, make sure that 31 rollers are found for each piston.

CLEANING

Discard all gaskets and O-rings.

Clean all metal components in a solvent.

Clean water passages and make sure they are not clogged.

Remove carbon deposits from cylinder exhaust port, cylinder head and piston dome.

Clean piston ring grooves with a groove cleaner tool, or with a piece of broken ring.

INSPECTION

Visually inspect parts for corrosion damage.

Inspect piston for damage. Light scratches can be sanded with a fine sand paper.

Inspect plane surfaces for warpage. Small deformation can be corrected by grinding surface with a fine sand paper. Install sand paper on a surface plate and rub part against oiled sand paper.

The inspection of engine top end should include the following measurements.

Section 03 ENGINE

Sub-Section 03 (TOP END)

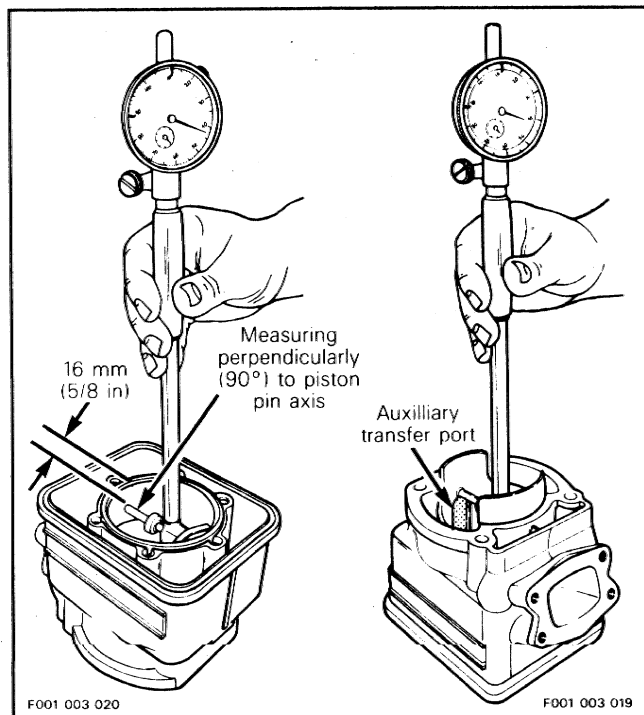
MEASUREMENTS	TOLERANCES		WEAR LIMIT
	NEW PARTS (Min.)	(Max.)	
Cylinder Taper	N.A.	N.A.	0.08 mm (.0031 in)
Cylinder Out of Round	N.A.	N.A.	0.05 mm (.0020 in)
Cylinder/Piston Clearance	0.06 mm (.0024 in)	0.07 mm (.0028 in)	0.20 mm (.008 in)
Ring/Piston Groove Clearance	0.03 mm (.001 in)	0.08 mm (.003 in)	0.20 mm (.008 in)
Ring End Gap	0.25 mm (.010 in)	0.40 mm (.016 in)	1.0 mm (.039 in)

○ **NOTE :** Replacement cylinder sleeves are available if necessary. Refer to a specialized shop for installation.

○ **NOTE :** 0.25 and 0.5 mm oversize piston and rings are available if necessary.

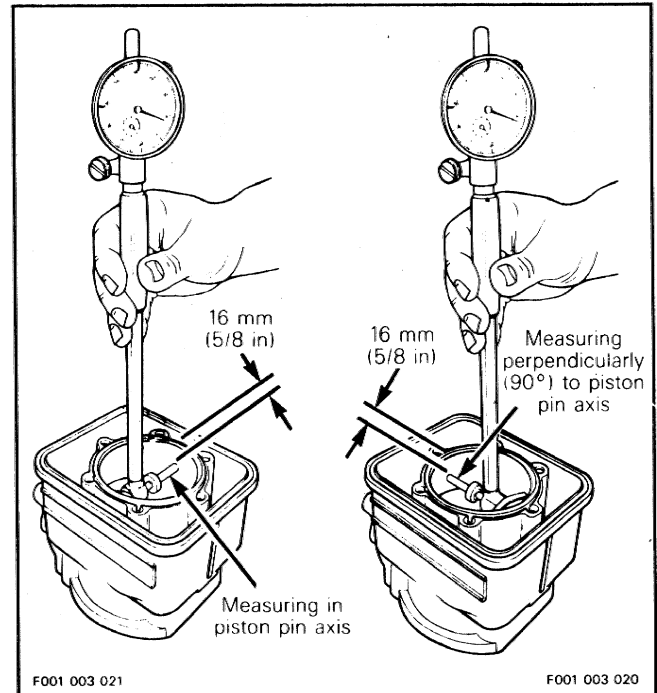
Cylinder Taper

Using a cylinder bore gauge, measure cylinder diameter 16 mm (5/8 in) from top of cylinder to just below auxiliary transfer port, facing exhaust port. If the difference between readings exceed specification, cylinder should be rebored and honed or replaced.



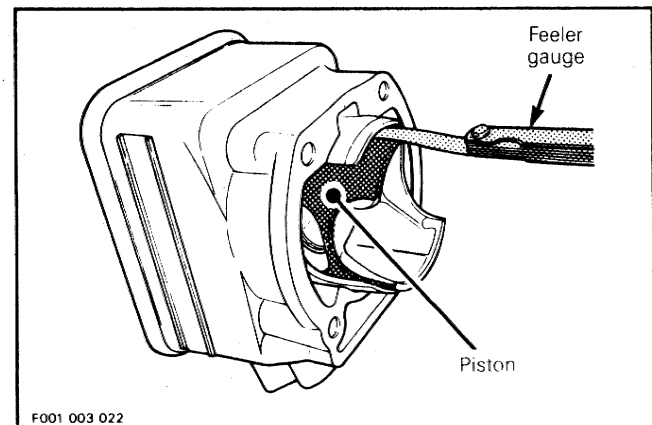
Cylinder Out of Round

Using a cylinder bore gauge, measure cylinder diameter 16 mm (5/8 in) from top of cylinder. Measure diameter in piston pin axis direction then perpendicularly (90°) to it. If the difference between readings exceed specification, cylinder should be rebored and honed or replaced.



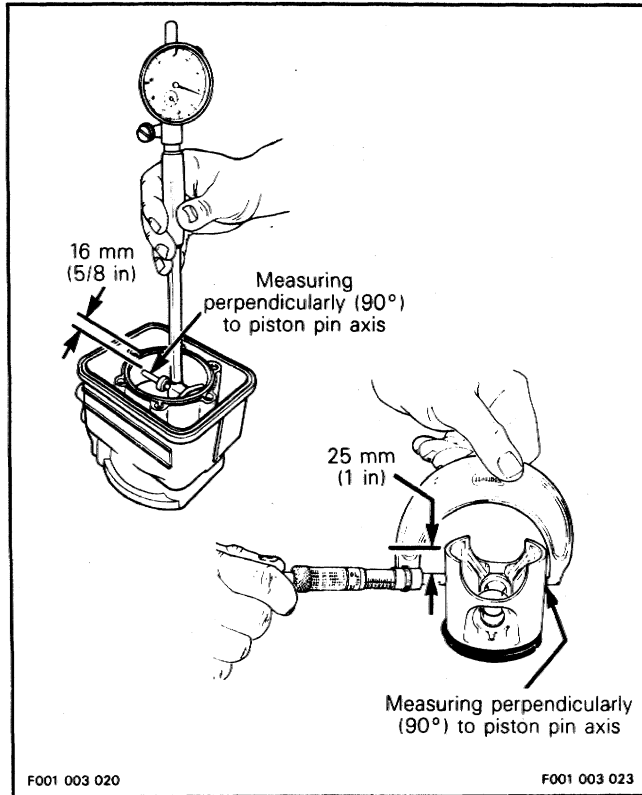
Cylinder/Piston Clearance

Clearance can be quickly checked with a long feeler gauge. Insert feeler gauge in cylinder then slide piston (without piston rings installed) into cylinder as shown in the following illustration.



Or, to accurately determine piston to cylinder wall clearance. Measure piston 25 mm (1 in) above skirt end perpendicularly (90°) to piston pin.

Measure cylinder 16 mm (5/8 in) below its top edge.

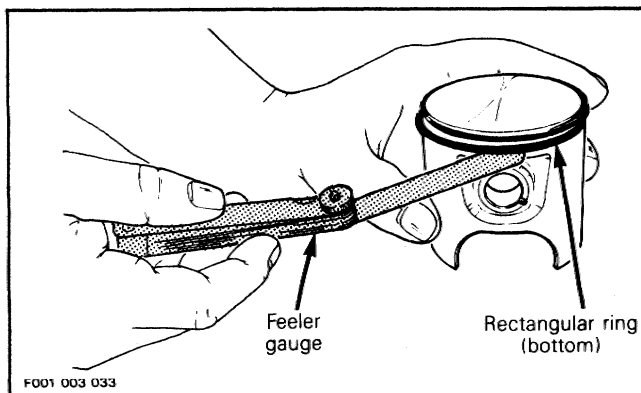


The difference between these two measurements should be within specified tolerance.

Ring/Piston Groove Clearance

Using a feeler gauge, check clearance between rectangular ring and groove. If clearance exceeds specified tolerance, replace piston.

○ **NOTE :** Ring/piston groove clearance can be correctly measured only on rectangular ring which is bottom ring.

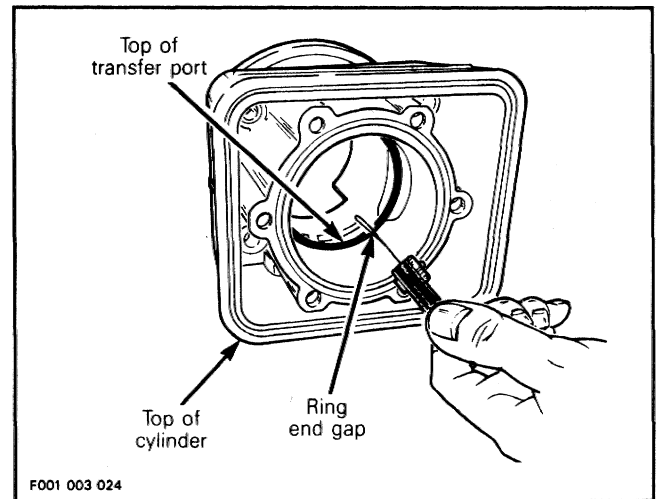


Ring End Gap

Position ring just above transfer ports, in relation with top of cylinder.

○ **NOTE :** In order to correctly position ring in cylinder, use piston as a pusher.

Using a feeler gauge, check ring end gap. If gap exceeds specified tolerance rings should be replaced.



ASSEMBLY

Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

23,24,26, Piston, Piston Pin & Roller Bearing

At assembly, locate piston so that intake hole is on rotary valve side.

Carefully cover crankcase apertures as for disassembly.

Plastic Mounting Device Method

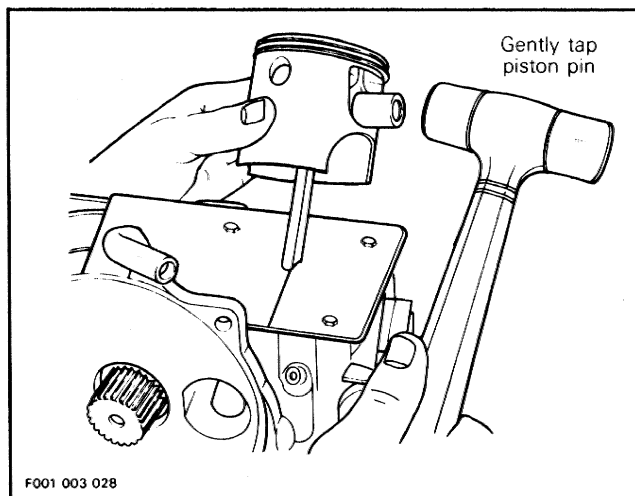
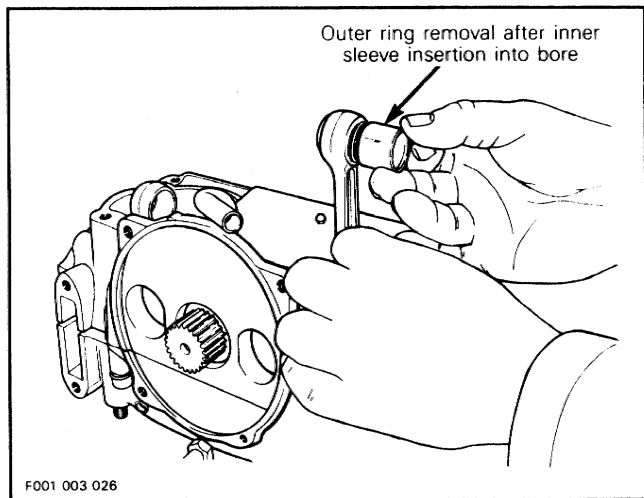
Replacement roller bearings are delivered in a convenient plastic mounting device. For installation, proceed as follows :

- Align replacement roller bearing with connecting rod bore.

Section 03 ENGINE

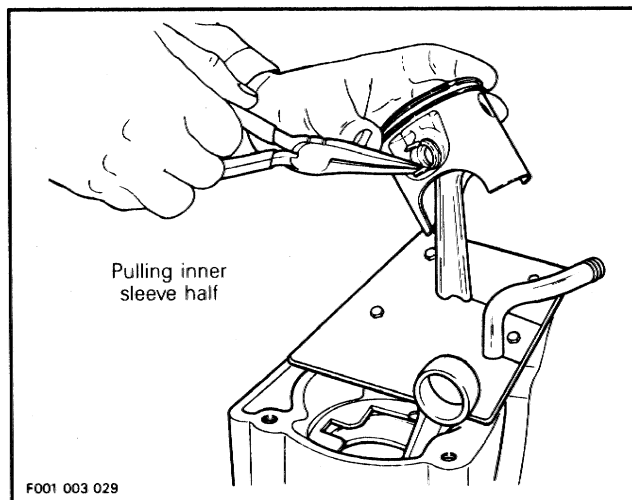
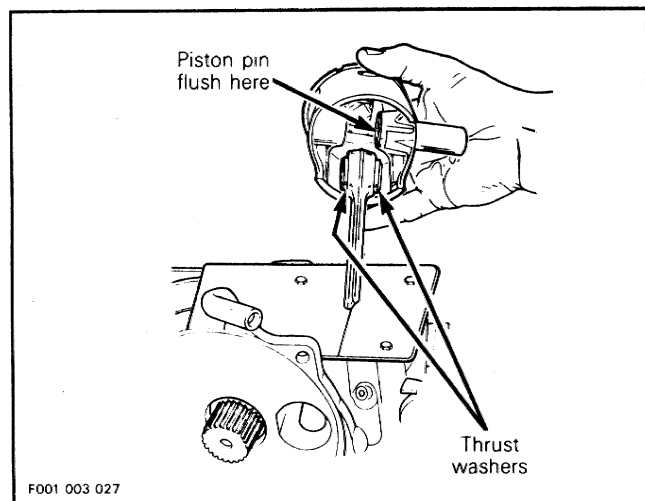
Sub-Section 03 (TOP END)

- Carefully push inner plastic sleeve into connecting rod bore ; outer plastic ring will release rollers.



- As necessary, pull halves of inner sleeve with needle nose pliers.

- Make sure thrust washers are present each side of rollers.
- Insert piston pin into piston until it comes flush with inward edge of piston hub.



Foam Method

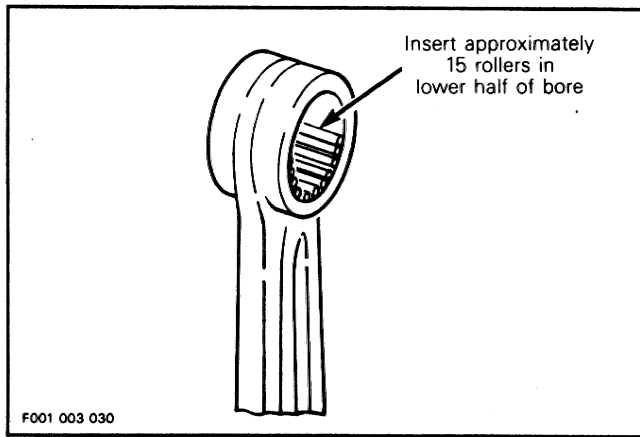
As an alternate method when no plastic mounting device is available, proceed as follows:

- Apply grease into connecting rod bearing bore.

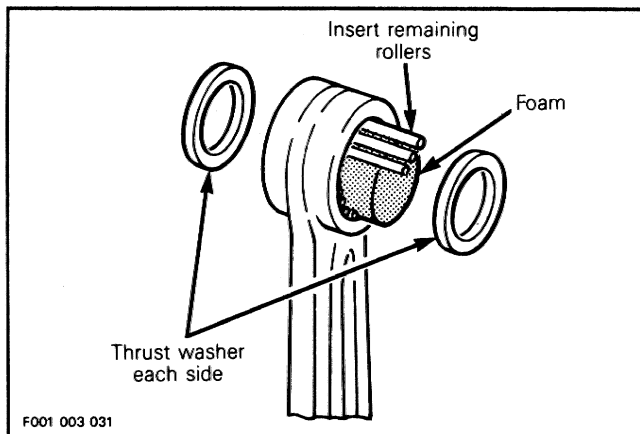
- Place piston over connecting rod and align bores, then gently tap piston pin with a fiber hammer to push out inner plastic ring on opposite side. Support piston from opposite side.

Section 03 ENGINE
Sub-Section 03 (TOP END)

- Install approximately 15 rollers in lower half of bore.



- Insert a cylindrical piece of foam material (sponge) 18 x 22 mm dia. (23/32 x 7/8 in. dia.) inside connecting rod bore to retain rollers.
- Insert remaining rollers.

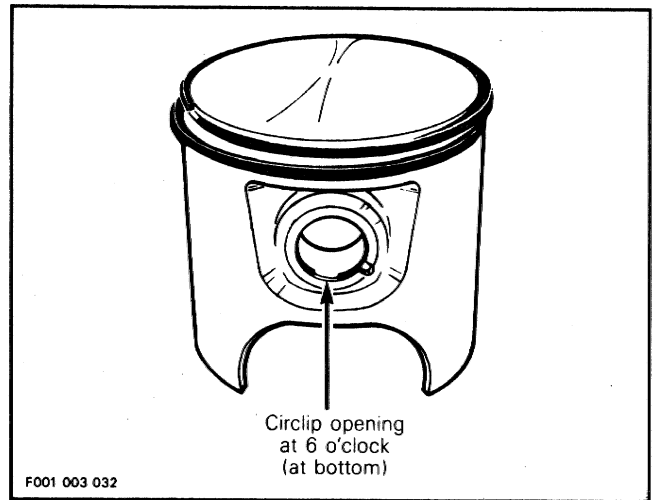


- Fit a thrust washer each side of rollers kept in position by foam and grease.
- Insert piston pin into piston until it comes flush with inward edge of piston hub.
- Place piston over connecting rod and align bores, then fully push piston pin to expulse foam piece on opposite side.

25, Circlip

Secure remaining circlip taking into consideration the following.

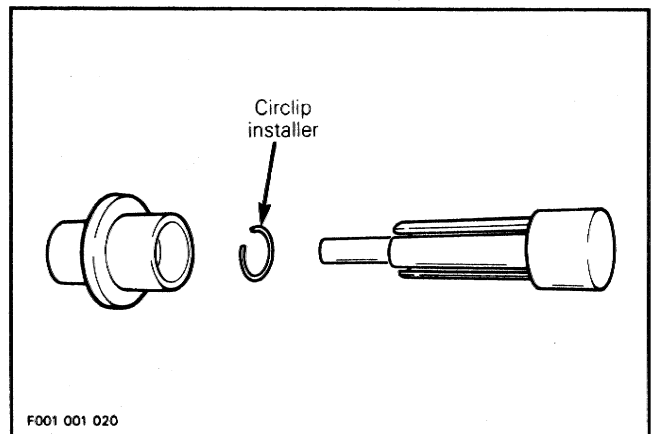
- ▼ **CAUTION** : To minimize the effect of acceleration force on circlips, install them so that their openings are located at 6 o'clock (at bottom).



- ◆ **WARNING** : Always wear safety glasses when installing piston circlips.

- ▼ **CAUTION** : Always use new circlips. At installation, take care not to deform them. Overstressed circlips will come loose and will damage engine. Circlips must not move freely after installation, replace if circlip rotates after installation.

To easily insert circlip into piston, use Circlip Installer (P/N 295 000 077).

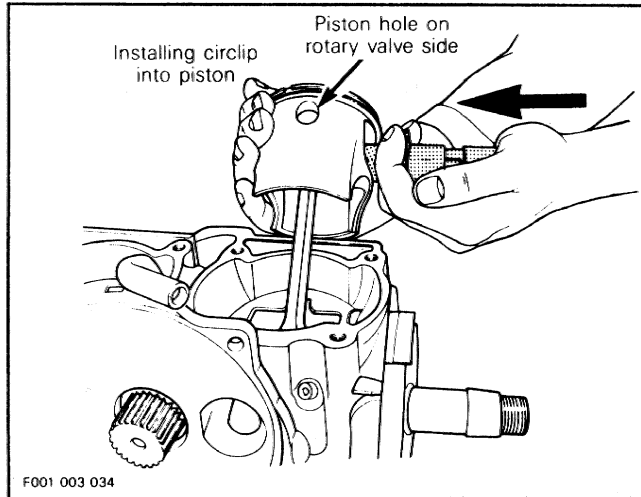


- Remove pusher from tool then insert circlip into its bore.
- Re-install pusher into tool and push until circlip comes in end of tool.
- Position end of tool against piston pin aperture.

Section 03 ENGINE

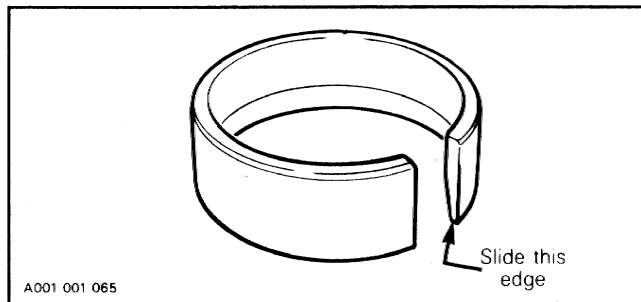
Sub-Section 03 (TOP END)

— Firmly hold piston against tool and push tool pusher to insert circlip into its groove.



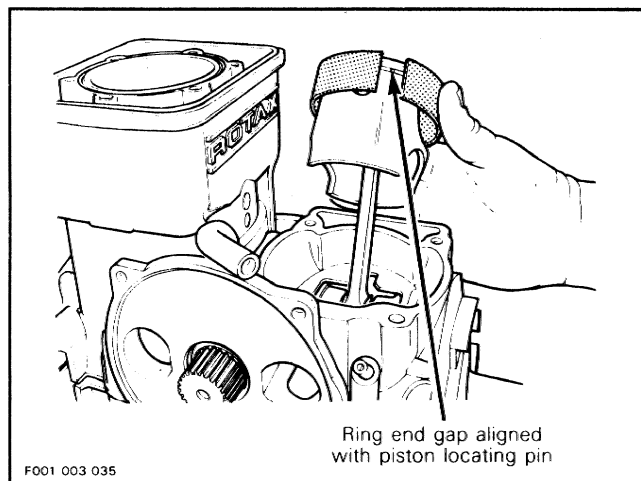
19, Cylinder

To easily slide cylinder over piston, install Ring Compressor (P/N 290 876 972) over rings.

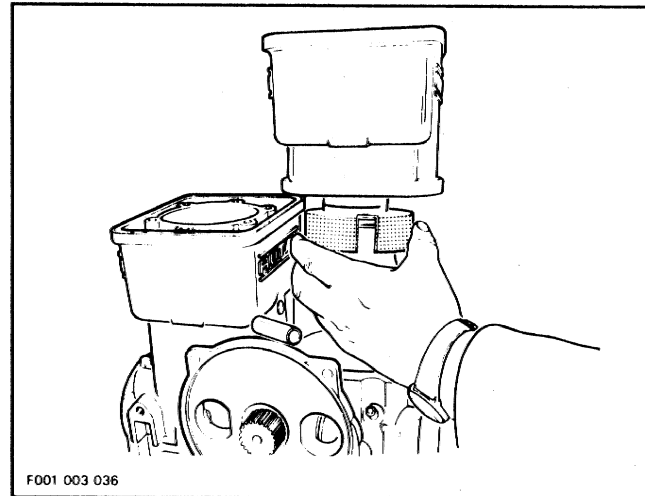


○ **NOTE:** Ring compressor will not fit on oversize piston/rings.

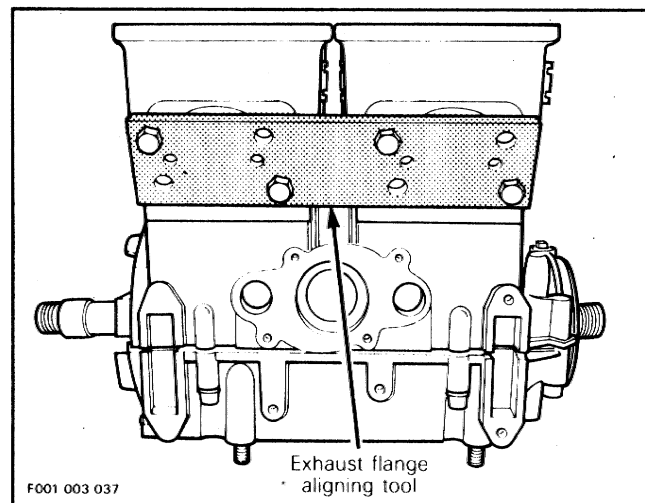
Make sure to align ring end gap with piston locating pins. Slide tool over rings.



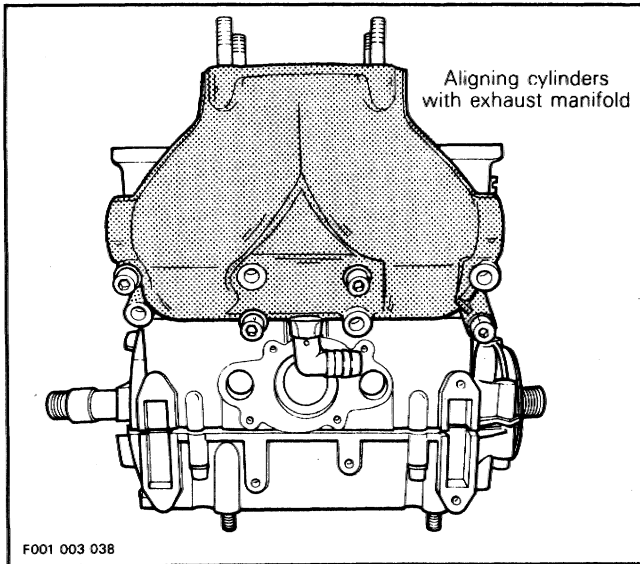
Slide cylinder over piston.



When re-assembling cylinders to crankcase, it is important to have them properly aligned so that exhaust flanges properly match up with exhaust manifold. Use Aligning Tool (P/N 290 876 900) or exhaust manifold itself.



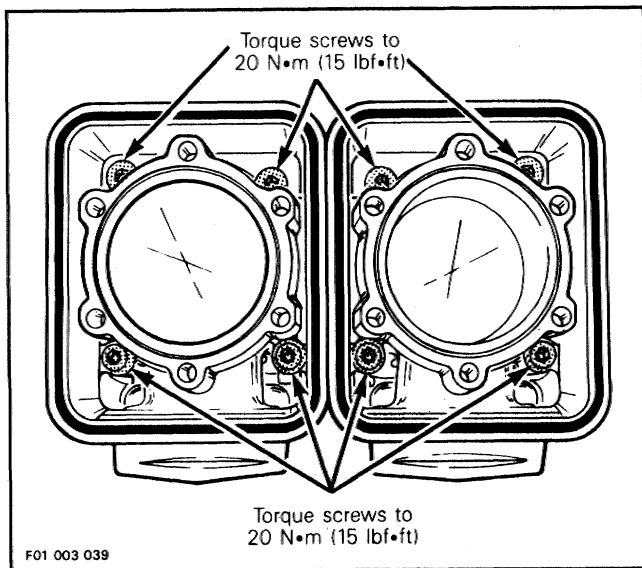
Section 03 ENGINE
Sub-Section 03 (TOP END)



○ **NOTE:** If manifold has been used for exhaust flanges alignment, remove it for engine installation in watercraft.

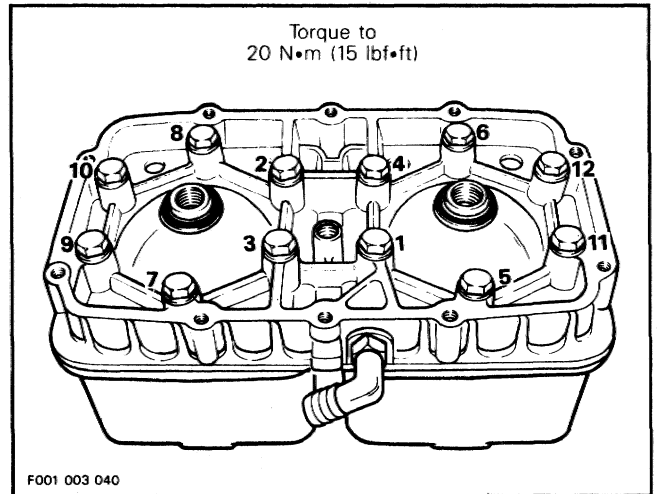
17,18,19, Screw, Washer & Cylinder

Apply Loctite 515 Gasket Eliminator (P/N 293 800 007) on washer faces. Install and torque screws in a criss-cross sequence for each cylinder to 20 N•m (15 lbf•ft).

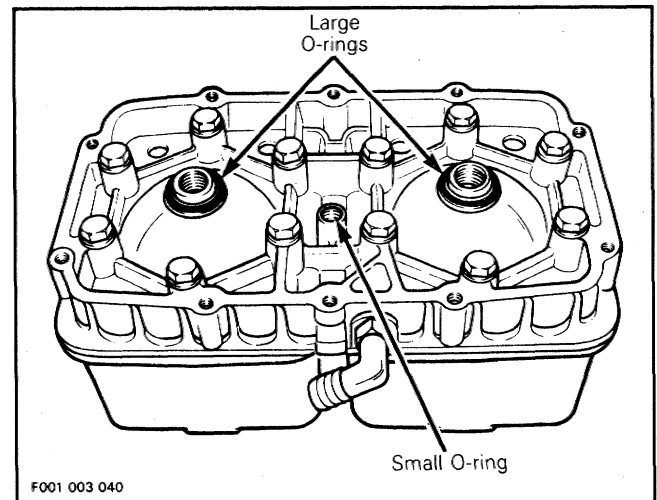


8,9,11,12,13, Screw, Washer, O-Ring & Cylinder Head

Apply Loctite 515 Gasket Eliminator (P/N 293 800 007) on washer faces and in cylinder sleeve O-ring groove. Install and torque screws to 20 N•m (15 lbf•ft) as per following illustrated sequence.



Make sure to install large O-rings around spark plugs holes and small O-ring where shown.



1,4,6, Screw & Cylinder Head Cover

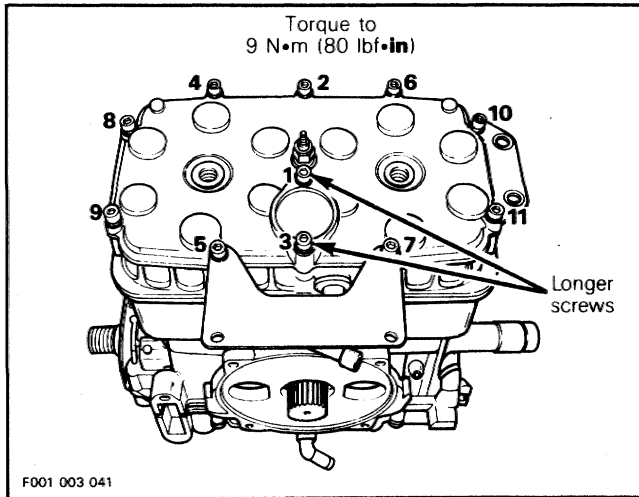
Install cover over cylinder head. The two longer screws must be installed on oval-shaped housing. Make sure to install ignition housing support and flame arrester support.

○ **NOTE:** Hand-tighten screws only. Final torque should be carried on after flame arrester/carburetor and ignition housing installation when engine will be in watercraft.

Section 03 ENGINE

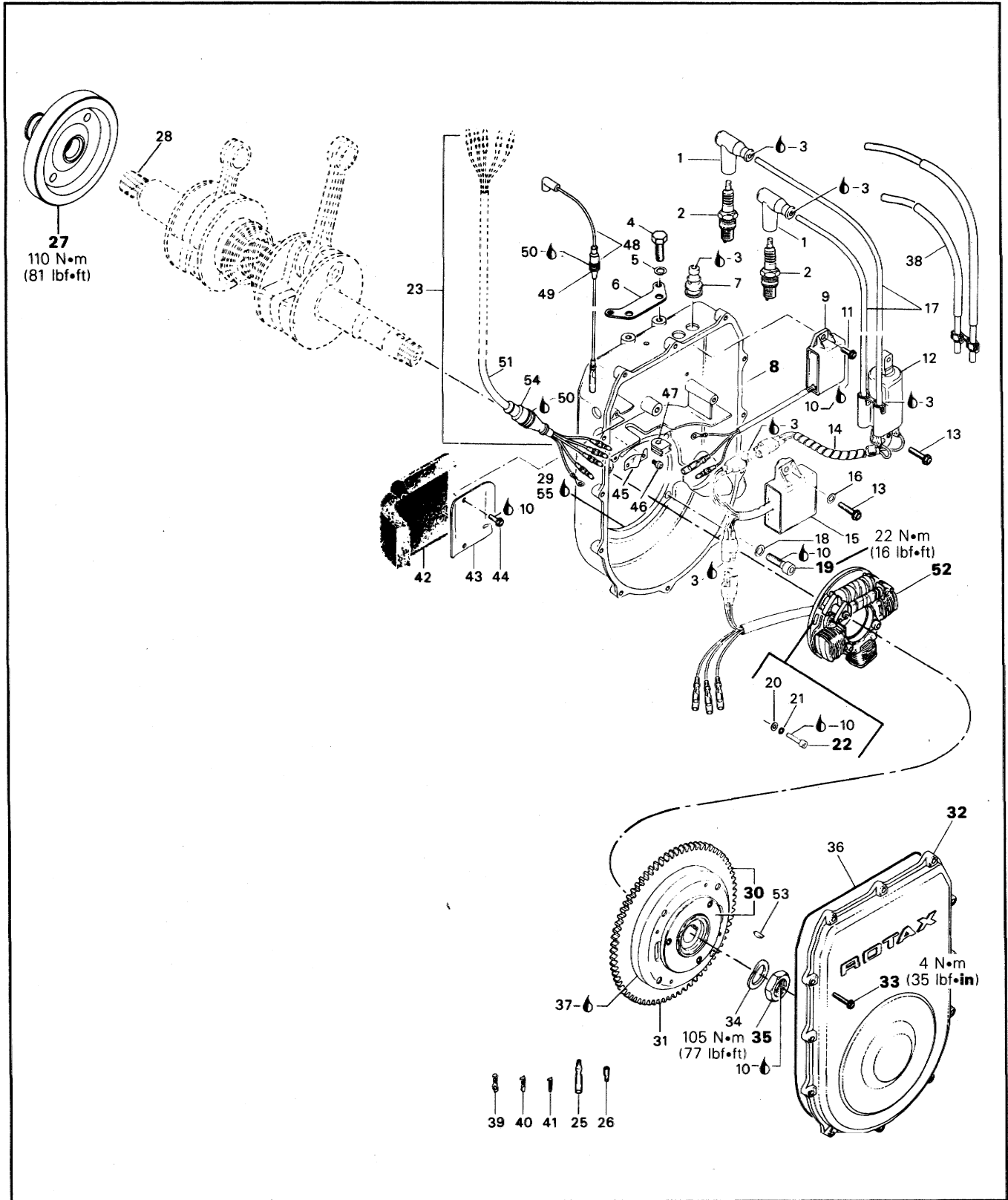
Sub-Section 03 (TOP END)

Torque cylinder head cover screws to 9 N•m (80 lbf•in)
as per following illustrated sequence.



Section 03 ENGINE
Sub-Section 04 (FLYWHEEL & MAGNETO)

FLYWHEEL & MAGNETO



Section 03 ENGINE

Sub-Section 04 (TOP END)

COMPONENTS

1. Spark plug protector (2)
2. Spark plug (2)
3. Grease "Dielectric", 150 g
4. Hexagonal head screw M8 x 20 (2)
5. Lock washer 8 mm (2)
6. Bracket
7. Protection cap (2)
8. Ignition housing
9. Speed limiter
10. Loctite 242, 10 ml
11. Screw Taptite M5 x 12 (2)
12. Ignition coil
13. Screw Taptite M6 x 25
14. Helical tape 130 mm
15. Amplifier box
16. Washer M6 (2)
17. Spark plug cable
18. Lock washer 8 mm (4)
19. Hexagonal socket head cap screw M8 x 25
20. Washer 5.5 (2)
21. Lock washer 5 mm (2)
22. Hexagonal socket head cap screw M5 x 18 (2)
23. Harness light assembly
24. Generating coil
25. Insulation sheath
26. Insulation sheath
27. PTO side flywheel
28. Anti-seize lubricant
29. Loctite 515
30. Magneto flywheel ass'y
31. Starter gear 77 teeth
32. Ignition cover
33. Combined screw M6 x 5 (12)
34. Lock washer M22
35. Hexagonal nut M22
36. O-ring
37. Loctite 648
38. High tension cable set
39. Ring terminal (2)
40. Female connector 3.96 (4)
41. Male connector 3.96 (4)
42. Protection mat
43. Protection cover
44. Screw taptite M5 x 12 (2)
45. Holding strip
46. Screw taptite M4 x 8 (2)
47. Cable grommet
48. Sensor wire with plug assembly
49. Grommet
50. Silicone 732 RTV, 90 ml
51. Harness light (without connector)
52. Armature plate assembly
53. Woodruff key 3 x 3.7
54. Grommet
55. Loctite primer N

GENERAL


The following procedures can be performed without removing engine from watercraft. However, electrical box and battery removal will be required.

REMOVAL

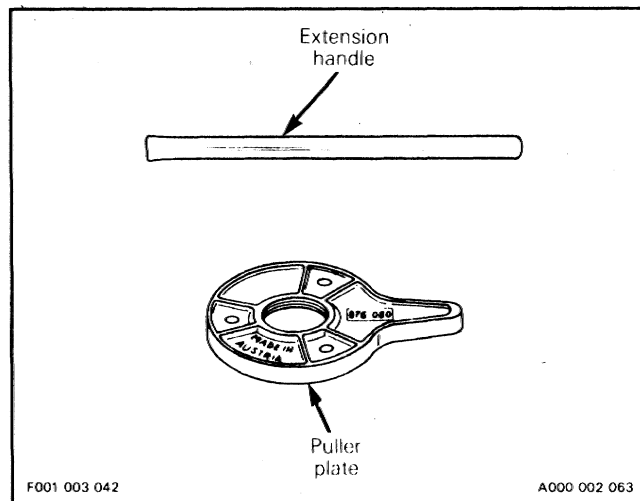
Remove ignition housing support (if applicable).


32,33, Ignition Cover & Screw

Remove screws and withdraw cover.

 **NOTE:** PTO-side flywheel must be removed prior to removing MAGneto-side flywheel since puller has to be installed on MAG flywheel.

For removal of both flywheels, MAG flywheel is locked with Puller Plate (P/N 290 876 080) and Extension Handle (P/N 295 000 003).

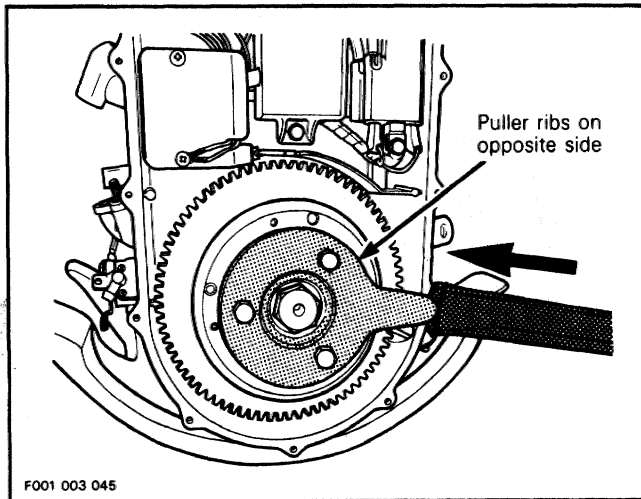


 **CAUTION:** Never lock crankshaft by inserting any tool through connecting rod bores nor through impulse fitting.

Section 03 ENGINE
Sub-Section 04 (FLYWHEEL & MAGNETO)

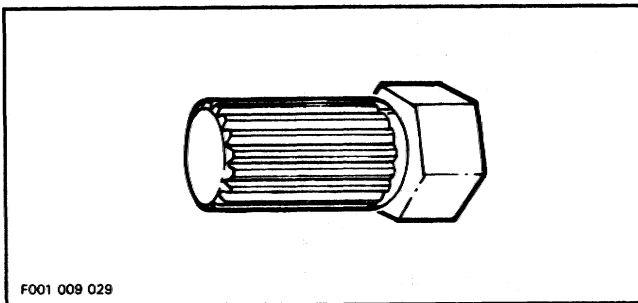
27, PTO Flywheel

Using three M8 x25 mm screws, secure Puller Plate on MAG flywheel so that puller ribs are against flywheel. Install Extension Handle on end of Puller Plate.

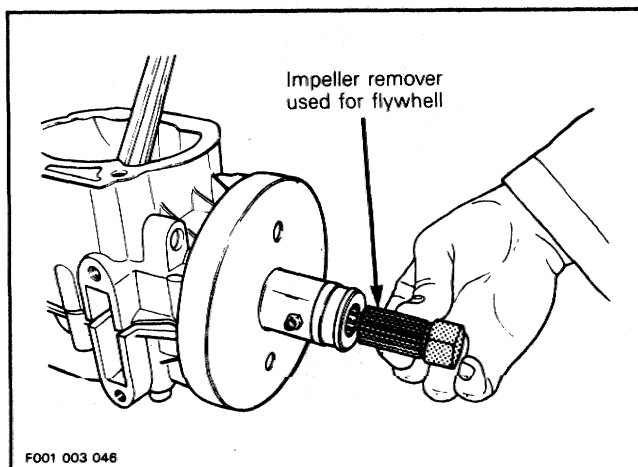


Rotate MAG flywheel so that Extension Handle end stops on work table for PTO flywheel slackening.

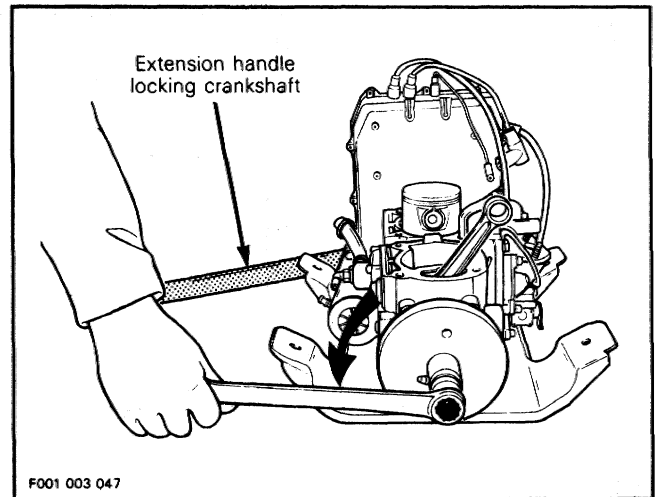
PTO flywheel is slacken using Impeller Remover (P/N 295 000 001).



Insert special tool in flywheel splines.

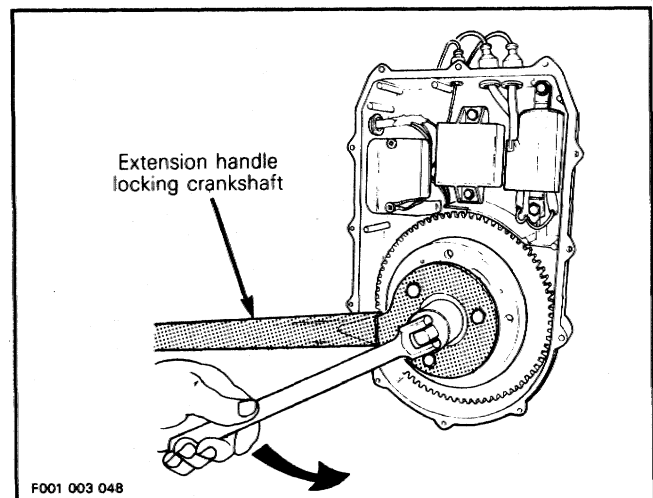


Using a suitable wrench or socket, unscrew PTO-flywheel COUNTER-CLOCKWISE when facing it.



30, Magneto Flywheel

With Puller Plate properly secured as for PTO flywheel removal, rotate MAG flywheel so that Extension Handle end stops on work table for slackening.



Using a suitable socket, unscrew retaining nut COUNTER-CLOCKWISE when facing it.

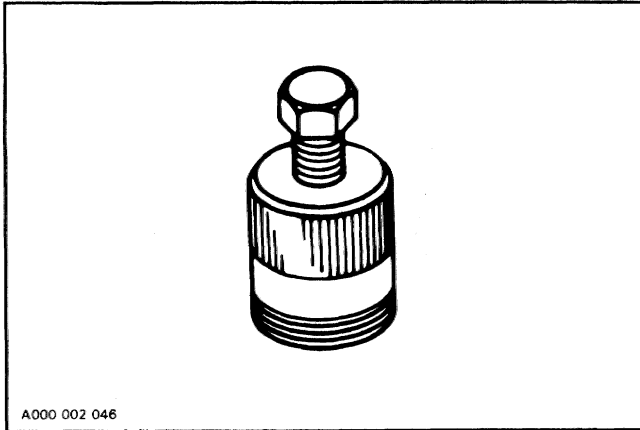
NOTE : If socket is found too large to be inserted in puller plate, machine or grind its outside diameter as necessary.

Remove nut and lock washer from flywheel.

Section 03 ENGINE

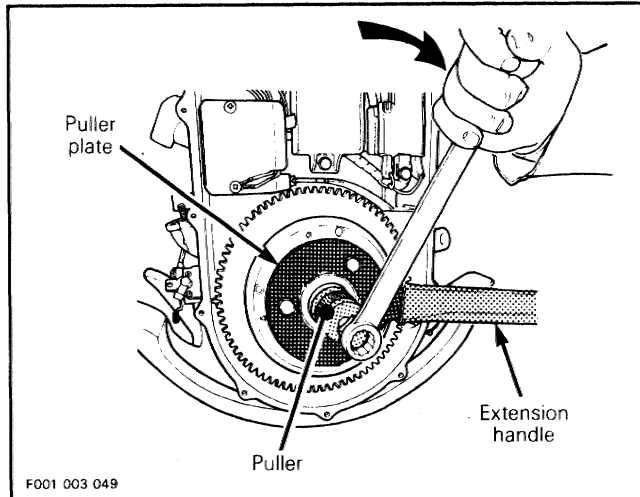
Sub-Section 04 (FLYWHEEL & MAGNETO)

Flywheel is easily freed from crankshaft with Puller (P/N 290 876 065).



Fully screw Puller in Puller Plate.

Tighten puller bolt and at the same time, tap on bolt head using a hammer to release flywheel from its taper.



22,52, Screw & Armature Plate Ass'y

To ease reassembly and further ignition timing, indexing marks should be made on armature plate and crankcase.

Remove both retaining screws and withdraw armature plate.

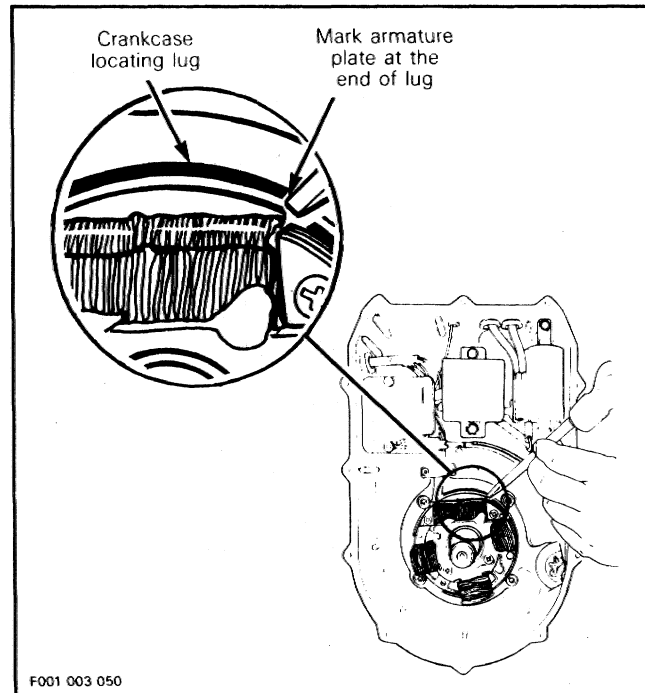
Crankcase Replacement

Since replacement crankcases do not have timing mark for armature plate location, indexing marks should be made on armature plate and crankcase to ease reassembly and further ignition timing.

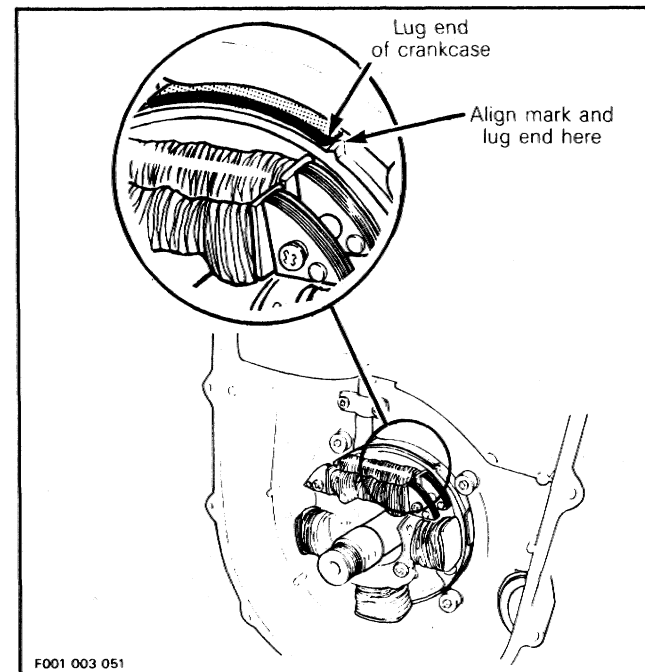
The following procedure is to find a common reference point on both crankcases (old and new) to position armature plate.

Proceed as follows:

- Find a crankcase locating lug (the top one in this example).
- Place a cold chisel at the end of chosen lug, then punch a mark on armature plate at this point.



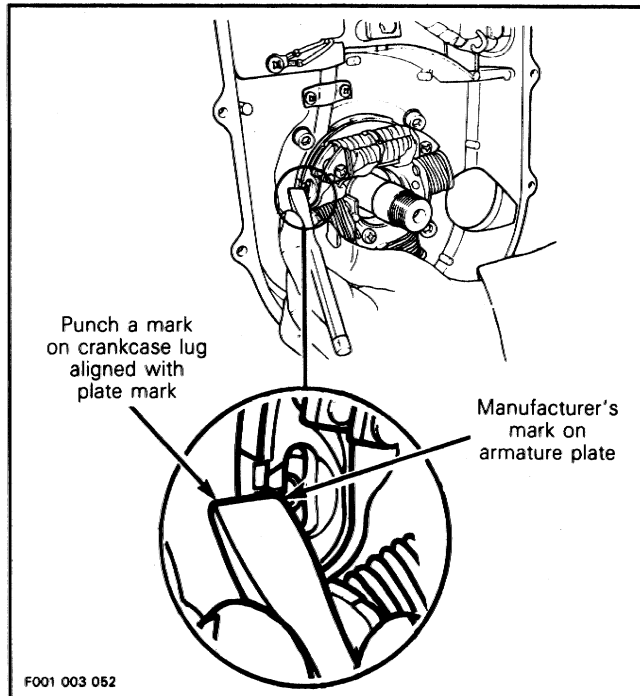
- At assembly, align armature plate mark (previously punched) with the end of the same locating lug on the new crankcase.



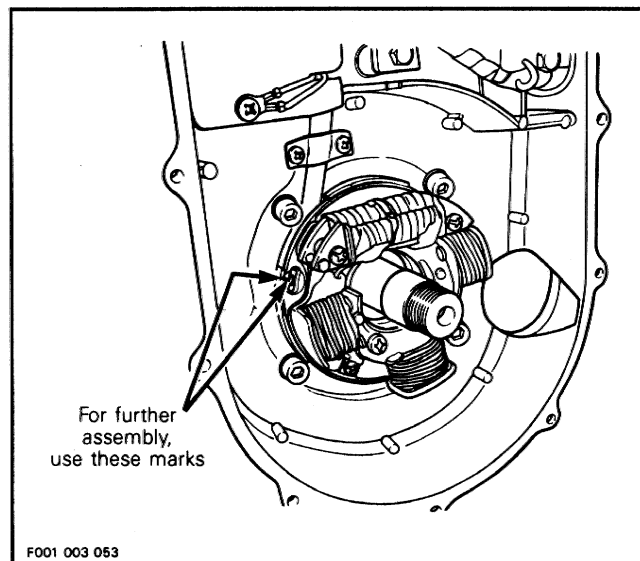
Section 03 ENGINE

Sub-Section 04 (FLYWHEEL & MAGNETO)

- Find manufacturer's mark on armature plate. In line with this mark, punch another mark on adjacent crankcase lug.



From now on, these marks will be used for further assembly positioning as a pre-timing position.



8,19, Ignition Housing & Screw

To remove ignition housing, starter has to be removed. Refer to "ELECTRICAL" under "Electric Starter", section 07-07 for procedures.

Unscrew retaining screws then withdraw housing.

CLEANING

Clean all metal components in a solvent.

▼ **CAUTION** : Clean armature coils and magneto magnets using only a clean cloth.

Clean crankshaft taper and threads.

INSTALLATION

Installation is essentially the reverse of removal procedures. However pay particular attention to the following.

8,19, Ignition Housing & Screw

Apply Loctite 515 Gasket Eliminator (P/N 293 800 007) on housing/crankcase mating surfaces.

○ **NOTE** : On aluminum material it is recommended to use Loctite Primer N (P/N 293 600 012) to increase curing time and gap filling capability. Refer to manufacturer's instructions.

Apply Loctite 242 (blue) (P/N 293 800 002) on screw threads then torque them in a criss-cross sequence to 22 N•m (16 lbf•ft).

After housing installation, make sure before re-installing electric starter, that inlet socket is installed on crankcase.

22,52, Screw & Armature Plate Ass'y

Position armature plate on crankcase, aligning previously traced marks on both parts.

Apply a drop of Loctite 242 (blue) (P/N 293 800 002) on screw threads and tighten.

30,35, MAG Flywheel & Nut

Apply Loctite 242 (blue) (P/N 293 800 002) on crankshaft taper.

Position Woodruff key, MAG flywheel, apply Loctite 242 (blue) and install fasteners on crankshaft.

Torque nut to 105 N•m (77 lbf•ft).

▼ **CAUTION** : Never use any type of impact wrench at flywheel installation.

27, PTO Flywheel

Apply Loctite 767 Anti-Seize (P/N 293 550 001) on crankshaft threads then screw flywheel.

Using same tool as for removal, torque flywheel to 110 N•m (81 lbf•ft).

▼ **CAUTION** : Never use any type of impact wrench at flywheel installation.

Section 03 ENGINE

Sub-Section 04 (FLYWHEEL & MAGNETO)

Ignition Timing

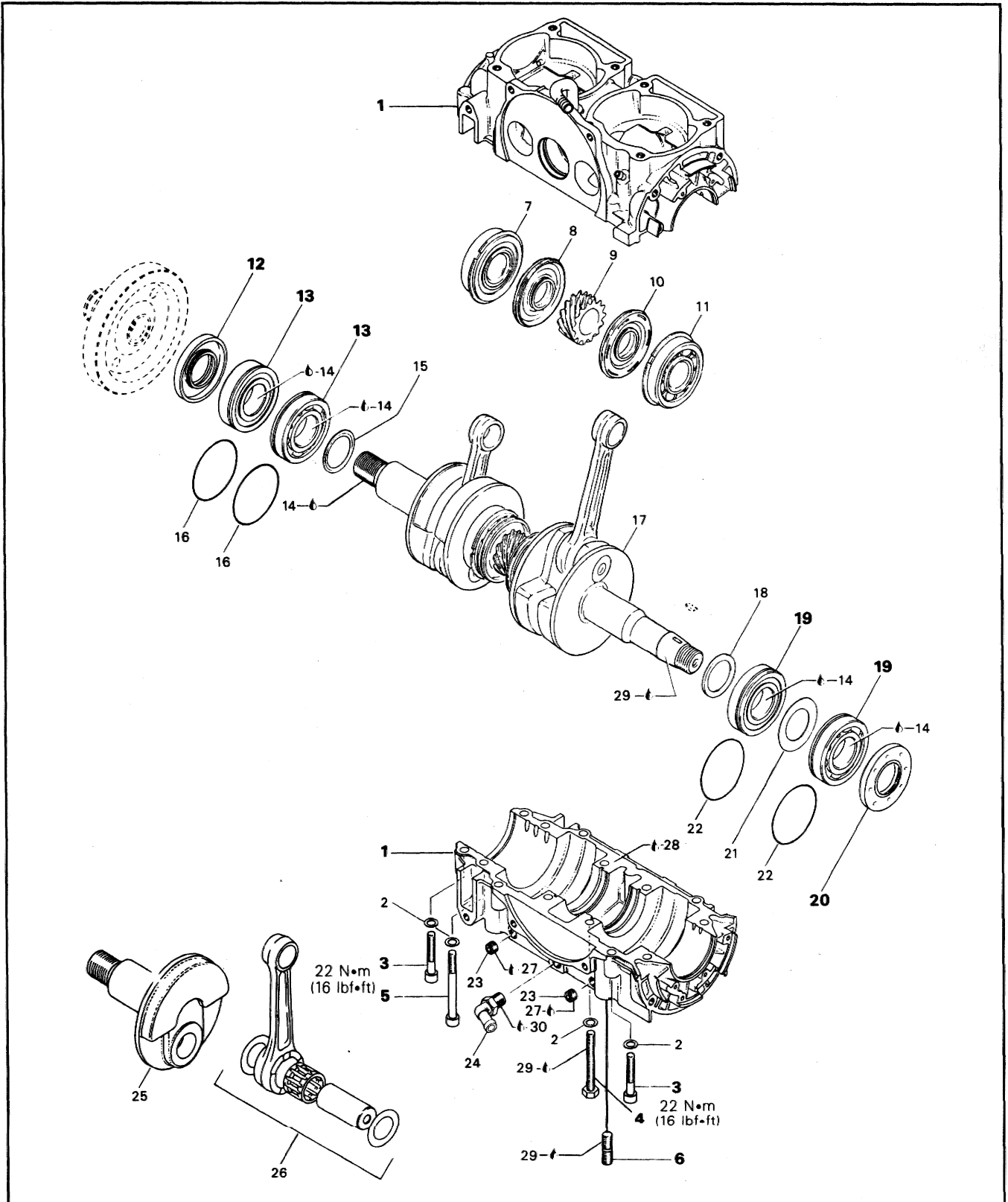
For procedures, refer to "ELECTRICAL", under "Ignition Timing" section 07-04.

32,33, Ignition Housing Cover & Screw

Properly install O-ring in cover. Torque screws in a criss-cross sequence to 4 N•m (35 lbf•in).

Section 03 ENGINE
Sub-Section 05 (BOTTOM END)

BOTTOM END



Section 03 ENGINE

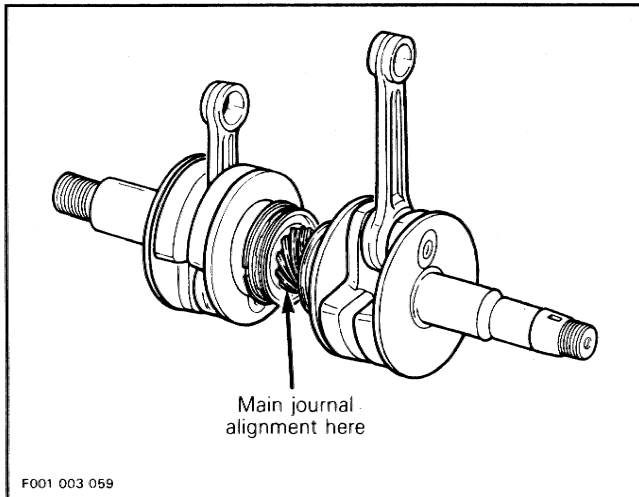
Sub-Section 05 (BOTTOM END)

COMPONENTS

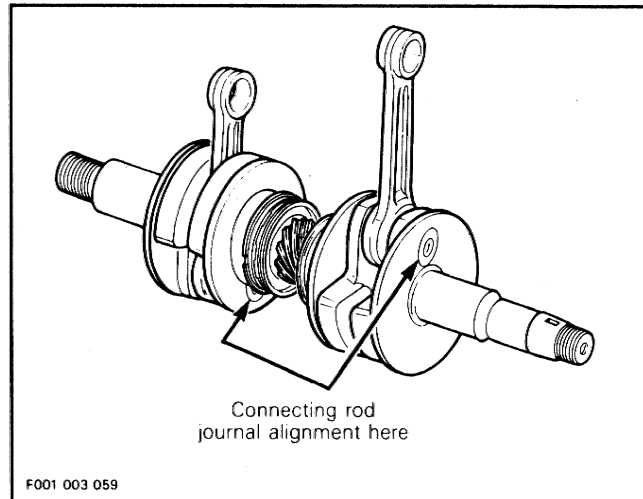
1. Crankcase ass'y
2. Lock washer 8 mm (14)
3. Hexagonal socket head cap screw M8 x 45 (6)
4. Hexagonal head screw M8 x 65 (6)
5. Allen screw M8 x 75 (2)
6. Stud M10 x 18/18 (4)
7. Ball bearing 6206
8. Oil seal
9. Central gear (14 teeth)
10. Oil seal
11. Ball bearing 6305
12. Oil seal
13. Ball bearing 6207 (2)
14. Anti-seize lubricant, 355 ml
15. Distance ring
16. O-ring (2)
17. Crankshaft
18. Distance ring
19. Ball bearing 6206 (2)
20. Oil seal
21. Shim 30.4/51/1
22. O-ring (2)
23. Plug screw (2)
24. Hose nipple
25. Crankshaft half (P.T.O. side)
26. Crankshaft rod repair kit
27. Silicone 732 RTV
28. Loctite 515, 50 ml
29. Loctite 242, 10 ml
30. Loctite PST 567

CRANKSHAFT MISALIGNMENT & DEFLECTION

Since it is an assembled crankshaft it can become misaligned or deflected. Crankshaft can be twisted on center main journal, changing timing of one cylinder in relation with the other.



Counterweights can be twisted on connecting rod journal on any or both cylinder(s)



Crankshaft Alignment at Center Main Journal

NOTE : The following verifications can be performed with engine in watercraft without overhauling engine.

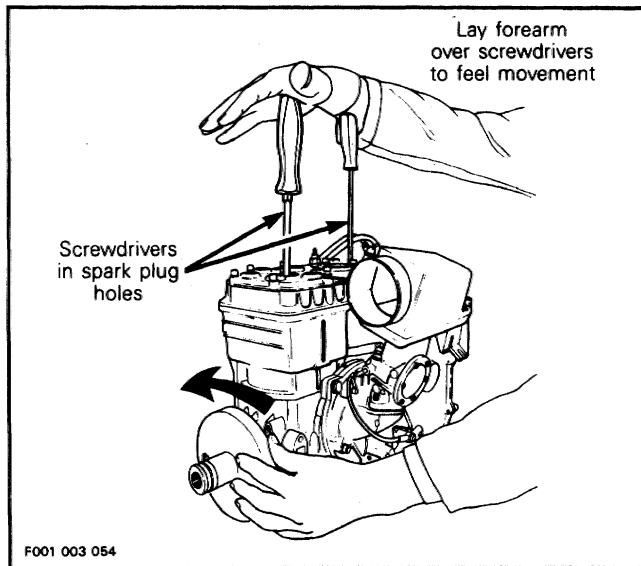
To quickly check, without accuracy, if crankshaft is twisted on center main journal, proceed as follows:

- Remove PTO flywheel guard.
- Remove spark plugs.
- Insert a screwdriver in one spark plug hole.
- Insert a longer screwdriver on the other hole.
- Lay a forearm over both screwdriver handles to feel piston displacements.

Section 03 ENGINE

Sub-Section 05 (BOTTOM END)

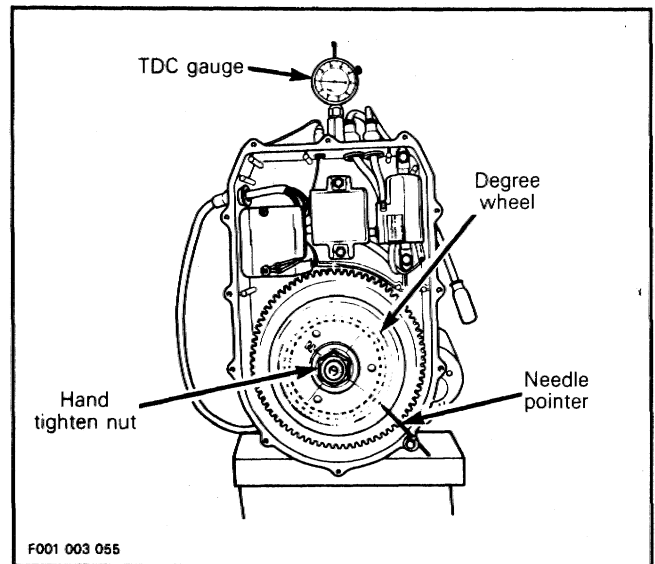
- With the other hand, slowly rotate engine by PTO flywheel.



As soon as one piston stops going up, the other must immediately go down. Any interval between strokes indicates a misaligned crankshaft.

Or, to accurately check crankshaft alignment, proceed as follows :

- Remove ignition housing cover.
- Remove MAG flywheel nut. Refer to "FLYWHEEL & MAGNETO" for procedures.
- Install Bombardier Degree Wheel (P/N 295 000 007) on crankshaft end. Hand-tighten nut only.
- Remove both spark plugs.
- Install a TDC Gauge (P/N 295 000 065) in spark plug hole on **MAG side**.
- Bring MAG piston at Top Dead Center.
- As a needle pointer, secure a wire with a cover screw and a washer.
- Rotate degree wheel (NOT crankshaft) so that needle pointer reads 360°.



- Remove TDC gauge and install on **PTO side**.
- Bring PTO piston at Top Dead Center.

Interval between cylinders must be exactly 180° therefore, needle pointer must indicate 180° on Degree Wheel ($360^\circ - 180^\circ = 180^\circ$).

Any other reading indicates a misaligned crankshaft.

Crankshaft Alignment at Connecting Rod Journal

Such misalignment may cause a crankshaft hard to be manually turned. Verification can be done by measuring deflection each end of crankshaft. Refer to "INSPECTION" paragraph.

If deflection is found greater than specified tolerance, this indicates worn bearing(s), bent and/or disaligned crankshaft.

GENERAL

Engine has to be removed from watercraft to open bottom end.

To remove water inlet socket, electric starter must be removed.

If crankshaft end seal(s) has/have to be replaced, bottom end must be opened.

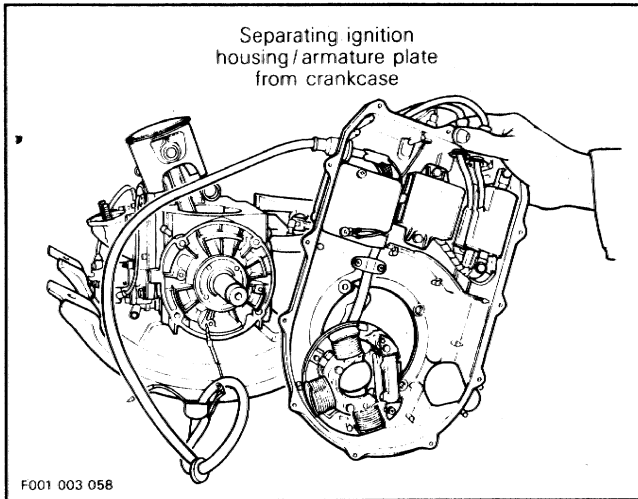
Section 03 ENGINE

Sub-Section 05 (BOTTOM END)

DISASSEMBLY

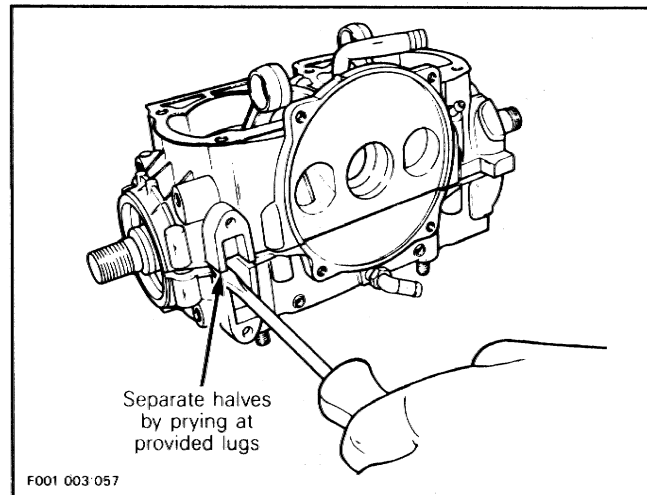
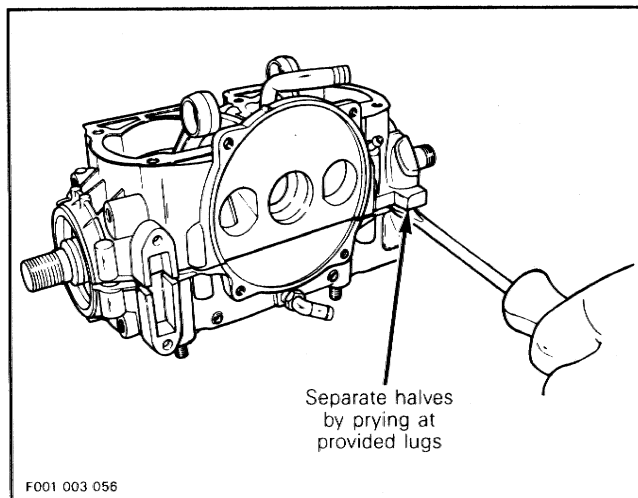
Remove the following parts:

- ignition housing and PTO flywheel on opposite side



- rotary valve cover and valve
- engine support
- crankcase retaining screws

Insert screwdrivers between crankcase lugs and pry to separate halves being careful not to damage precision surfaces.



12,13,19,20, Seal & Bearing

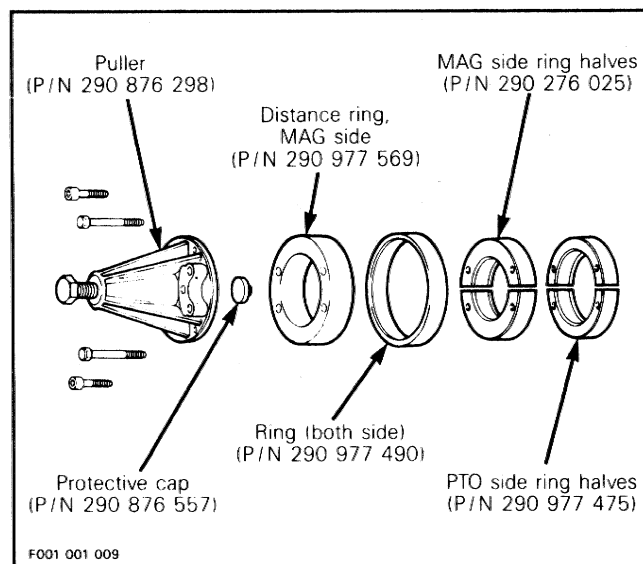
NOTE: Do not needlessly remove crankshaft bearings.

Remove end seals.

To remove end bearings from crankshaft, use crankshaft end Protective Cap (P/N 290 876 557) and Puller (P/N 290 876 298).

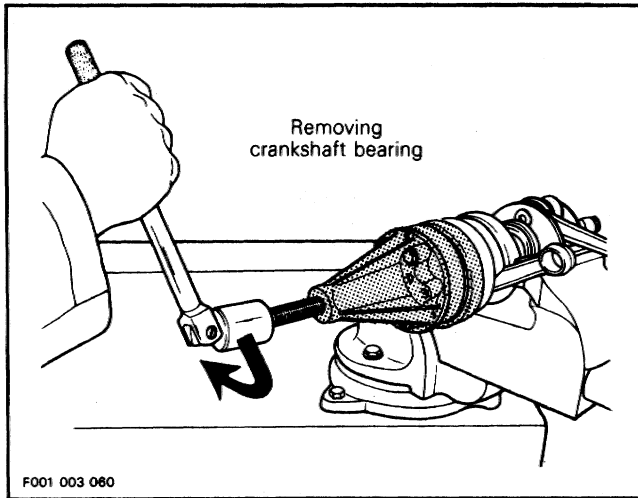
On PTO side, use Ring (P/N 290 977 490) with Ring Halves (P/N 290 977 475).

On MAG side, use Distance Ring (P/N 290 876 569) and Ring (P/N 290 977 490) with Ring Halves (P/N 290 276 025).

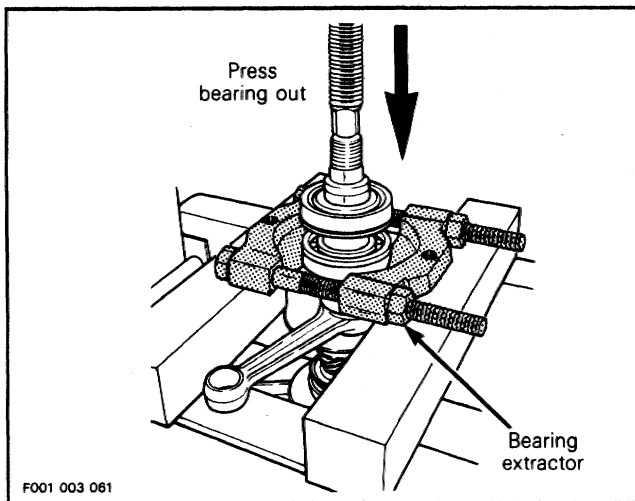


Section 03 ENGINE

Sub-Section 05 (BOTTOM END)



Or, use a bearing extractor such as Proto #4032 and a press to remove two bearings at a time.



○ **NOTE** : If bearings are to be renewed, they can be quickly removed using an Air Hammer.

CLEANING

Discard all oil seals, gaskets, O-rings and sealing rings. Clean water and oil passages and make sure they are not clogged.

Clean all metal components in a solvent.

Remove old Loctite from crankcase mating surfaces with Stripper #157 (P/N 295 000 040).

▼ **CAUTION** : Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

INSPECTION

Visually inspect parts for corrosion damage.

Inspect plane surfaces for warpage. Small deformation can be corrected by grinding surface with a fine sand paper. Install sand paper on a surface plate and rub part against oiled sand paper.

Inspect crankshaft bearings. Check for scoring, pitting, chipping or other evidence of wear. Make sure plastic cage is not melted. Rotate and make sure they turn smoothly.

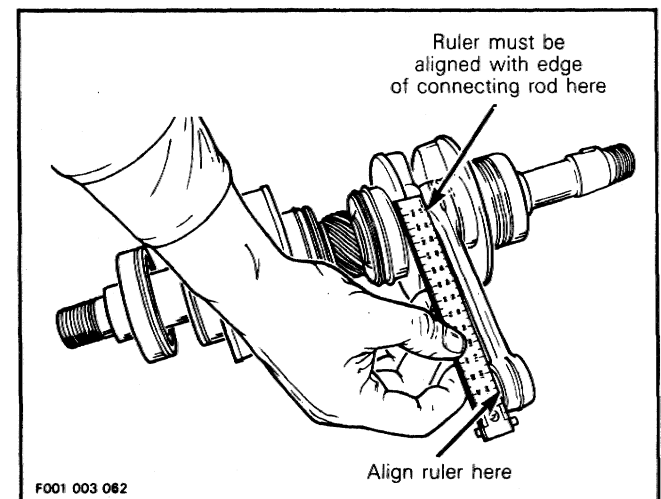
If crankshaft and/or components are found defective, it must be repaired by a specialized shop or renewed.

The inspection of engine bottom end should include the following measurements:

MEASUREMENTS	TOLERANCES	
	NEW PARTS	WEAR LIMIT
Crankshaft Deflection	N.A.	0.08 mm (.0031 in)
Connecting Rod Big End Axial Play	0.40 mm (.016 in)	1.2 mm (.047 in)

Connecting Rod Straightness

Align a steel ruler on edge of small end connecting rod bore. Check if ruler is perfectly aligned with edge of big end.



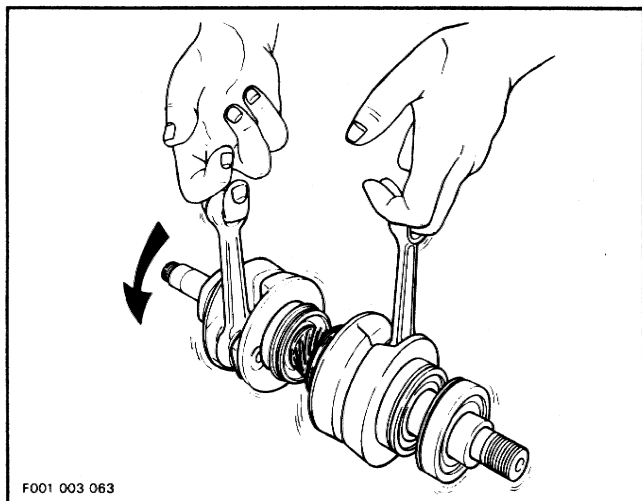
Section 03 ENGINE

Sub-Section 05 (BOTTOM END)

Crankshaft Alignment

A quick check can be made as follows.

- Insert a finger in each connecting rod.
- Lift crankshaft and apply a rotation movement to crankshaft with fingers.

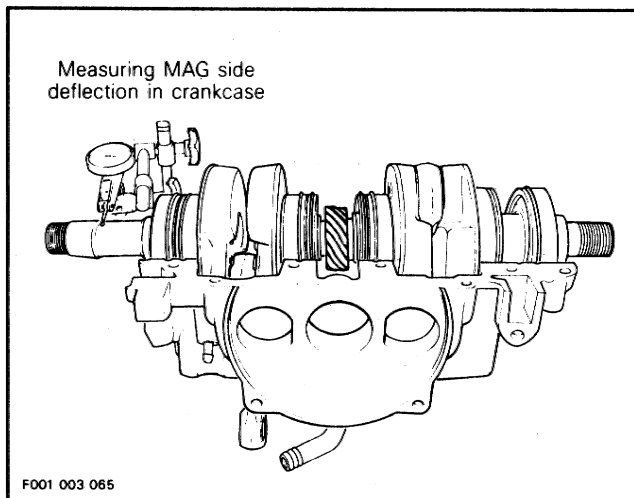
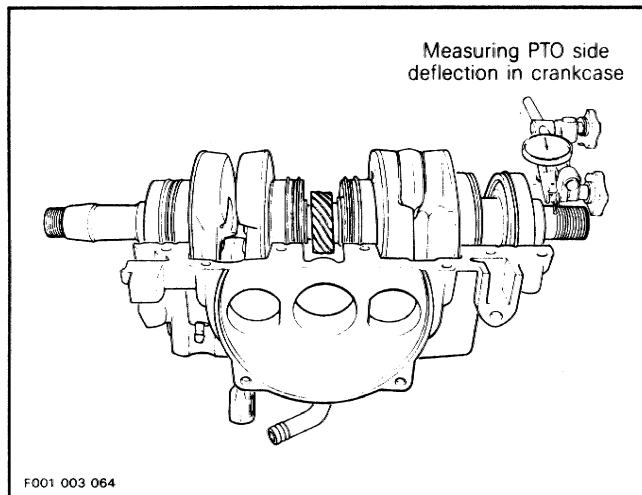


A twisted crankshaft will turn irregularly in an out of round motion.

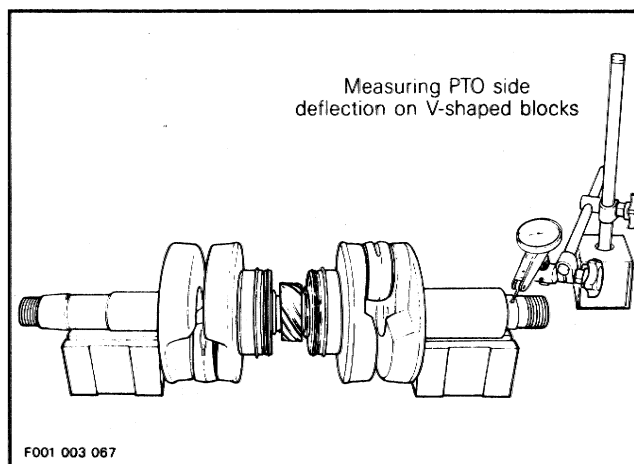
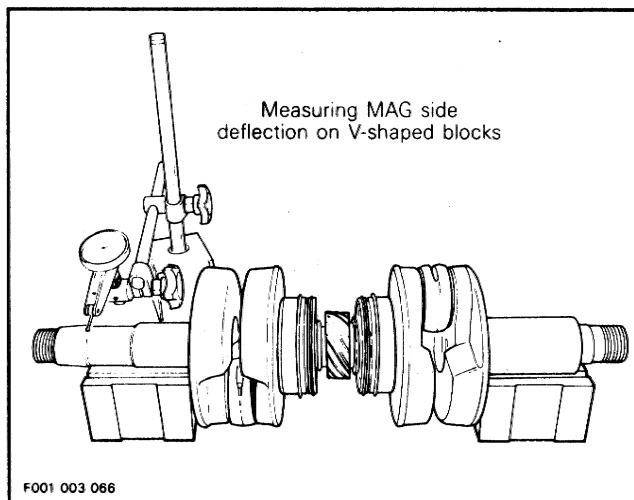
Crankshaft Deflection

Crankshaft deflection is measured each end with a dial indicator.

First, check deflection with crankshaft in crankcase. If deflection exceeds the specified tolerance, it can be either ball bearings wear, bent or twisted crankshaft at connecting rod journal.



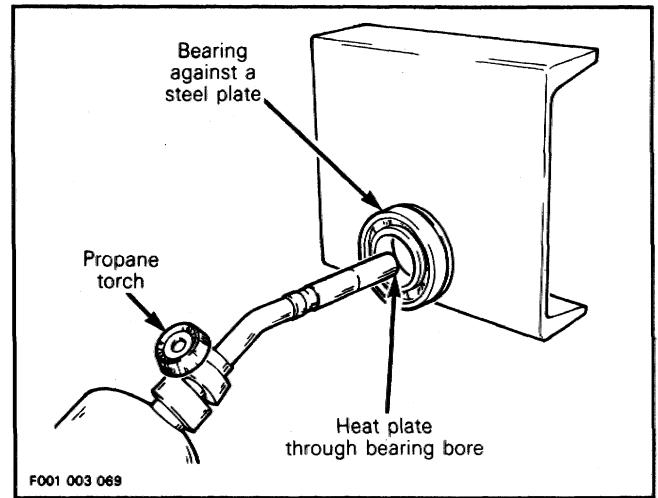
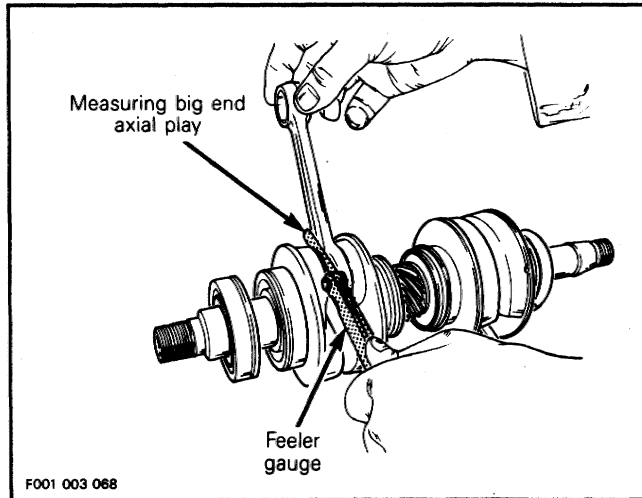
Remove crankshaft bearings and check deflection again on V-shaped blocks as illustrated.



NOTE : Crankshaft deflection can not be correctly measured between centers of a lathe.

Connecting Rod Big End Axial Play

Using a feeler gauge, measure distance between thrust washer and crankshaft counterweight.



To properly locate outer PTO bearing, temporarily install Distance Gauge (P/N 290 876 826) against inner bearing. Slide outer bearing until stopped by gauge then remove gauge.

ASSEMBLY

Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

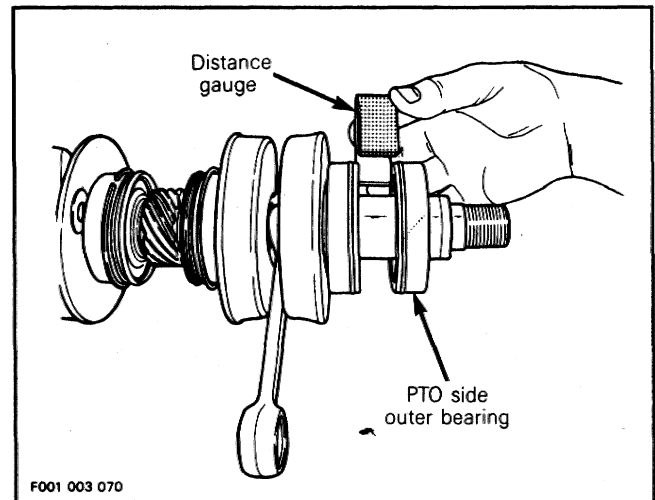
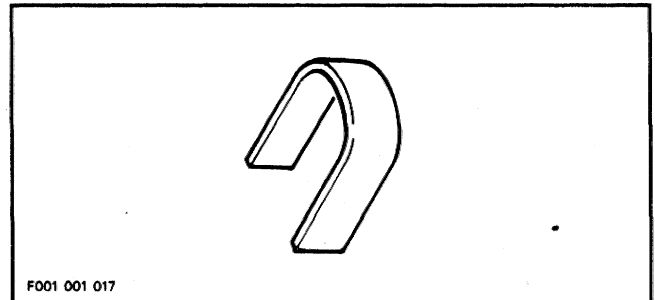
13,19, Bearing

Apply Loctite 767 Anti-Seize (P/N 293 550 001) on bearing seats.

Prior to installation, place bearings into a container filled with oil, previously heated to 75°C (167°F). This will expand bearing and ease installation.

Or, as an alternate method, apply heat with a propane torch. Lay bearing on a steel plate, then heat plate through bearing bore until smoke is noticed from bearing. Install bearing carefully on crankshaft.

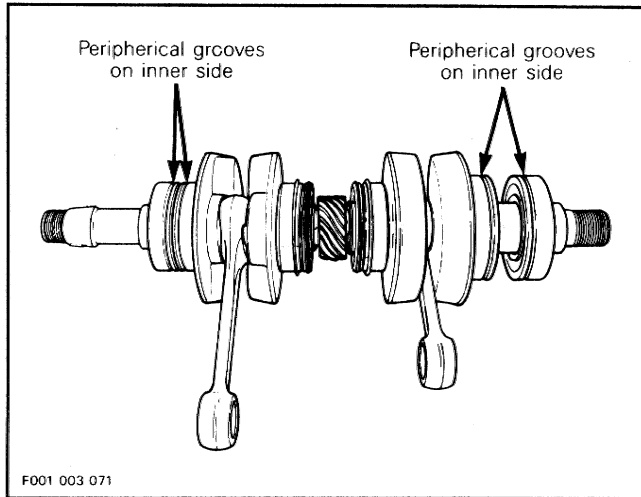
▼ CAUTION : Immediately stop heating as soon as smoke is noticed. Overheating bearing will melt plastic cage. Practice with used bearings on first try.



Section 03 ENGINE

Sub-Section 05 (BOTTOM END)

Install bearings so that their peripheral grooves be located as shown in following illustration.



12,20, Seal

At seal assembly, apply a light coat of lithium grease on seal lips.

1, Crankcase

Crankcase halves are factory matched and therefore, are not interchangeable or available as single halves.

Prior to joining crankcase halves, apply a light coat of Loctite 515 Gasket Eliminator (P/N 293 800 007) on mating surfaces. Do not apply in excess as it will spread out inside crankcase.

○ **NOTE** : On aluminum material it is recommended to use Loctite Primer N (P/N 293 600 012) to increase curing time and gap filling capability. Refer to manufacturer's instructions.

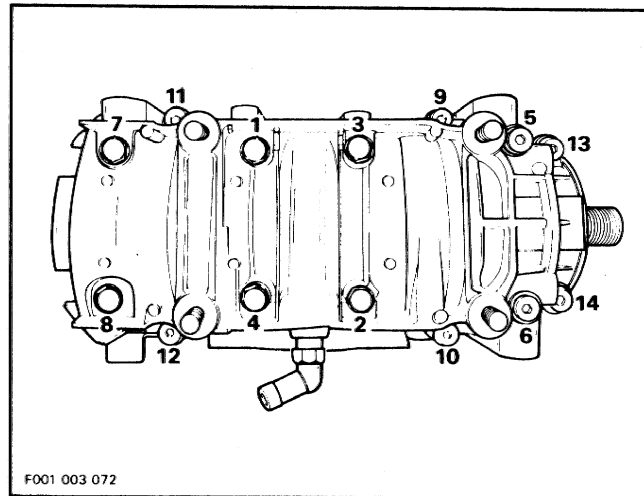
▼ **CAUTION** : Rotary valve shaft must be installed in crankcase before closing halves. Before joining crankcase halves, make sure that crankshaft gear is well engaged with rotary valve shaft gear.

Position crankcase halves together and hand-tighten bolts.

▼ **CAUTION** : Temporarily install armature plate to align crankcase halves with each other.

3,4,5, Screw

Apply Loctite 242 (blue) (P/N 293 800 002) on screw threads. Torque crankcase screws to 22 N•m (16 lbf•ft) as per following illustrated sequence.



6, Stud

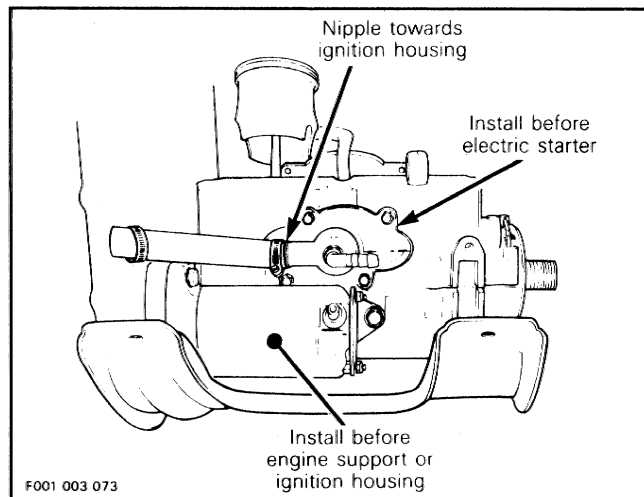
At assembly in crankcase, apply Loctite 242 (blue) (P/N 293 800 002) on stud threads.

Finalizing Assembly

○ **NOTE** : If water inlet socket has been removed from crankcase, re-install it with its nipple pointing towards ignition housing.

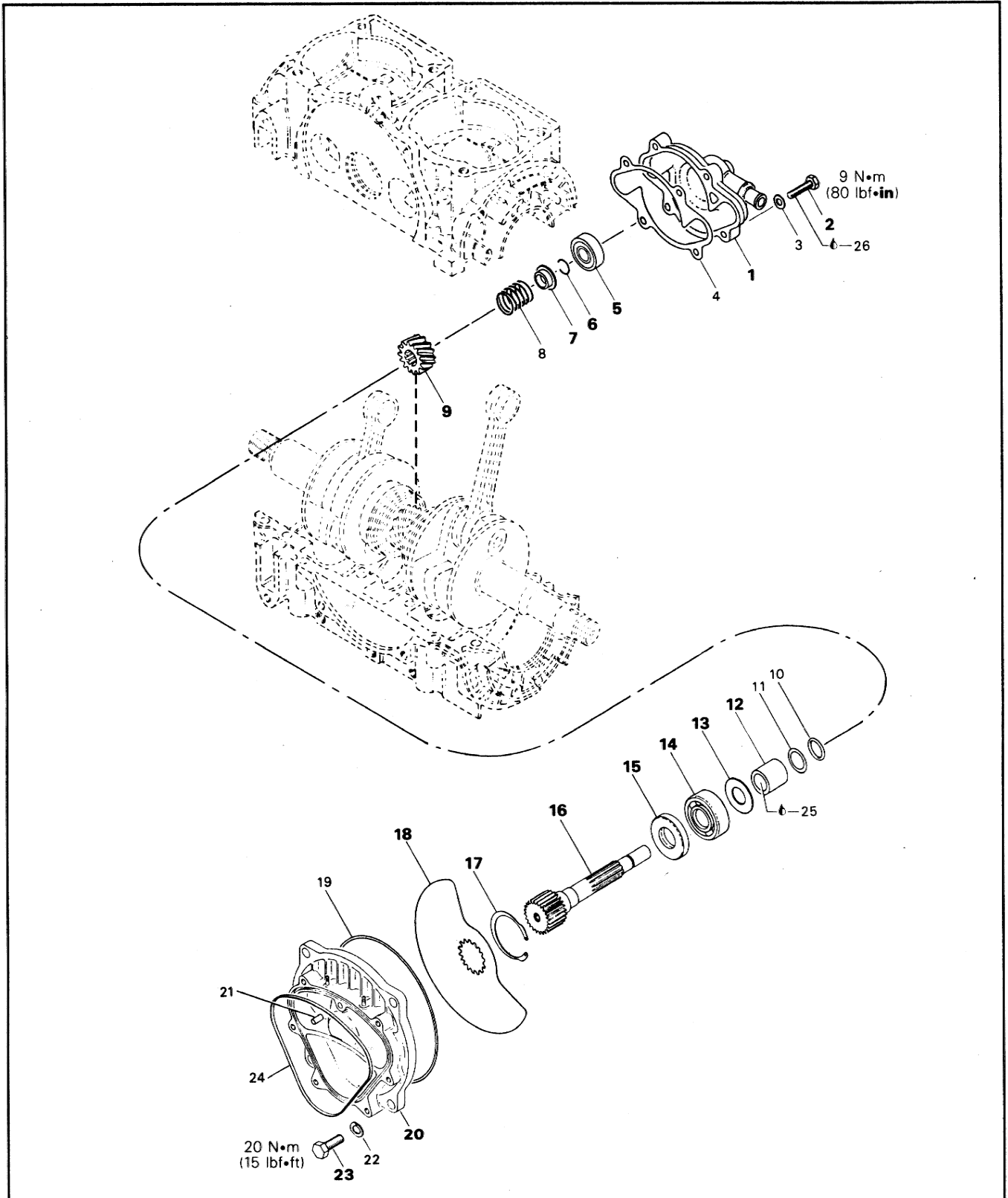
For rotary valve timing and assembly, refer to "ROTARY VALVE & RESERVOIR" for procedures.

If engine support is installed on crankcase before ignition housing, electric starter must be installed before engine support.



Section 03 ENGINE
Sub-Section 06 (ROTARY VALVE & RESERVOIR)

ROTARY VALVE



Section 03 ENGINE

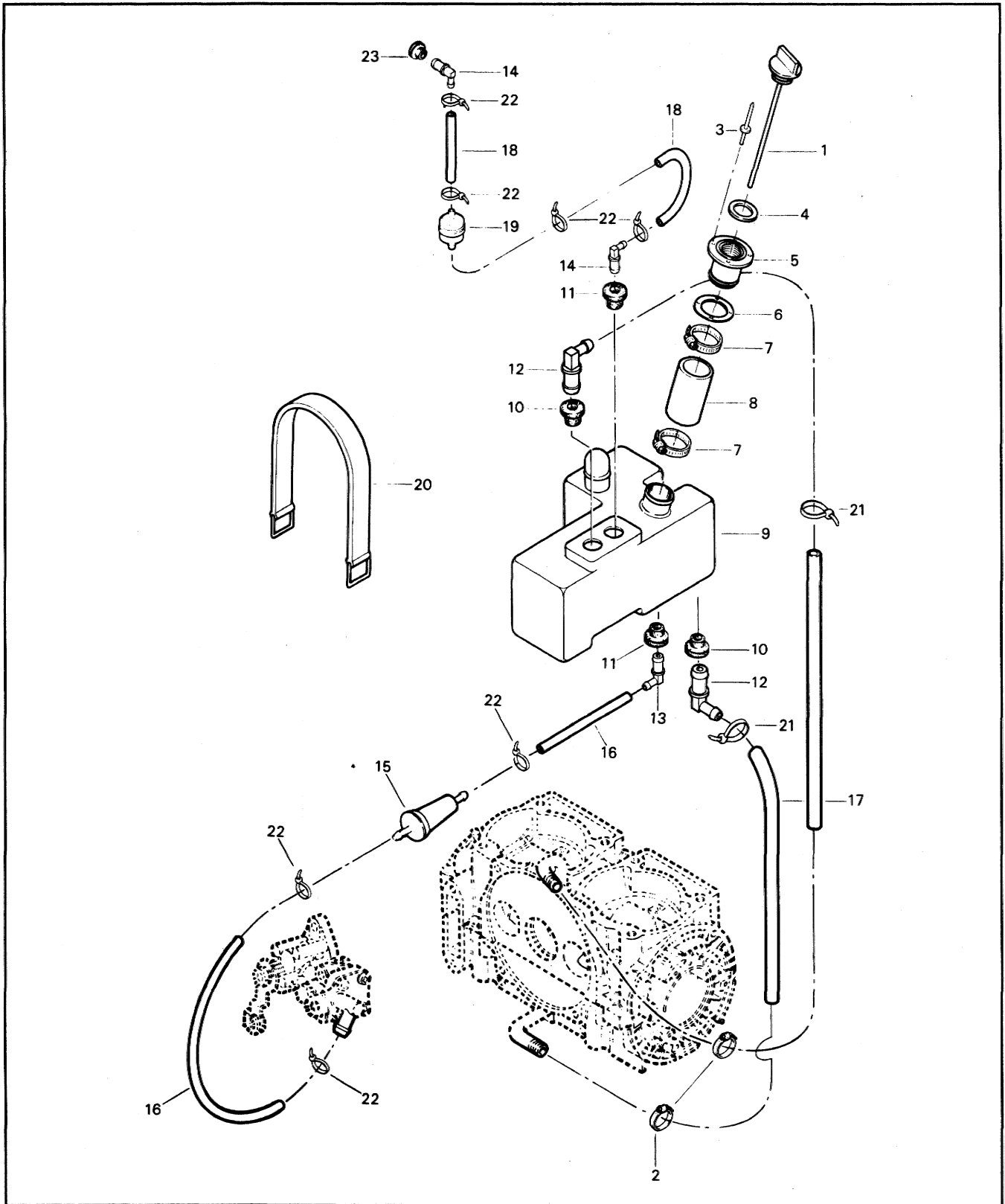
Sub-Section 06 (ROTARY VALVE & RESERVOIR)

COMPONENTS

- | | |
|-------------------------------------|--------------------------------------|
| 1. Coolant inlet socket | 14. Ball bearing 6203 |
| 2. Hexagonal head screw M6 x 25 (4) | 15. Oil seal |
| 3. Gasket ring (4) | 16. Rotary valve shaft |
| 4. Gasket | 17. Locking ring |
| 5. Ball bearing 6201 | 18. Rotary valve |
| 6. Circlip | 19. O-ring |
| 7. Spring holder cup | 20. Rotary valve cover |
| 8. Spring | 21. Dowel pin |
| 9. Sprocket 14 teeth | 22. Lock washer 8 mm (4) |
| 10. O-ring | 23. Hexagonal head screw M8 x 20 (4) |
| 11. Shim 0.5 mm | 24. Rubber ring |
| 12. Distance sleeve 24.5 mm | 25. Loctite 648 |
| 13. Shim 0.5 mm | 26. Loctite 242, 10 ml |
-

Section 03 ENGINE
Sub-Section 06 (ROTARY VALVE & RESERVOIR)

RESERVOIR



Section 03 ENGINE

Sub-Section 06 (ROTARY VALVE & RESERVOIR)

COMPONENTS

1. Oil level indicator cap
2. Clamp (2)
3. Rivet (4)
4. O-ring
5. Adapter
6. Gasket
7. Clamp (2)
8. Hose
9. Oil tank
10. Grommet (2)
11. Grommet (2)
12. 90° Elbow (2)
13. 90° Elbow
14. 90° Elbow (2)
15. Filter
16. Hose 8 mm
17. Hose 12 mm
18. Hose 6 mm
19. Valve
20. Strap
21. Tie rap
22. Tie rap
23. Grommet

NOTE : The following verifications can be performed with engine in watercraft without overhauling engine.

ROTARY VALVE COVER & VALVE GAP

A gap of 0.3 - 0.5 mm (.012 in - .020 in) must be maintained between rotary valve and crankcase.

To measure this gap, remove rotary valve cover and its O-ring.

Using solder tin for electronic applications (approximately 1.5 mm (.060 in) dia.), install three short pieces over rotary valve. If necessary, apply grease to hold in position.

Re-install cover in place WITHOUT it's O-ring and torque screws to 20 N•m (15 lbf•ft).

Remove cover then clean and measure compressed tin thickness, it must be within specified tolerance. Otherwise check cover for wear/warpage and crankcase ; re-new defective parts.

NOTE : If gap is found under tolerance, sand surface with fine sand paper on a surface plate, rub part against lightly oiled sand paper.

CRANKSHAFT & ROTARTY VALVE SHAFT GEAR BACKLASH

Remove PTO flywheel guard.

Remove spark plugs, rotary valve cover and valve.

Manually feel backlash at one position, then turn crankshaft about 1/8 turn and recheck. Continue this way to complete one revolution.

Backlash must be even at all positions. Otherwise overhaul engine to find which part is faulty (gear, rotary valve shaft or crankshaft with excessive deflection).

GENERAL

Engine must be removed from watercraft to work on rotary valve shaft/components. Refer to REMOVAL & INSTALLATION for procedures.

Bottom end must be opened to remove rotary valve shaft.

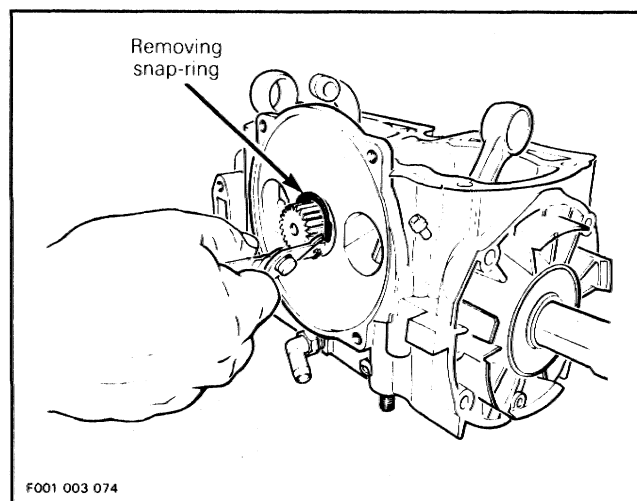
DISASSEMBLY

20,23, Rotary Valve Cover & Screw

Unscrew four retaining screws and withdraw rotary valve cover and valve.

16,17, Snap Ring & Rotary Valve Shaft

To remove rotary valve shaft assembly from crankcase, first remove snap ring from crankcase.

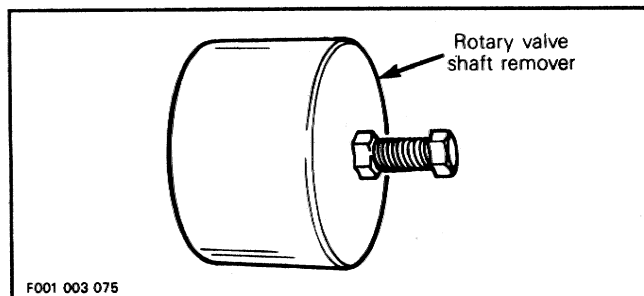


CAUTION : Bottom end must be opened to remove rotary valve shaft.

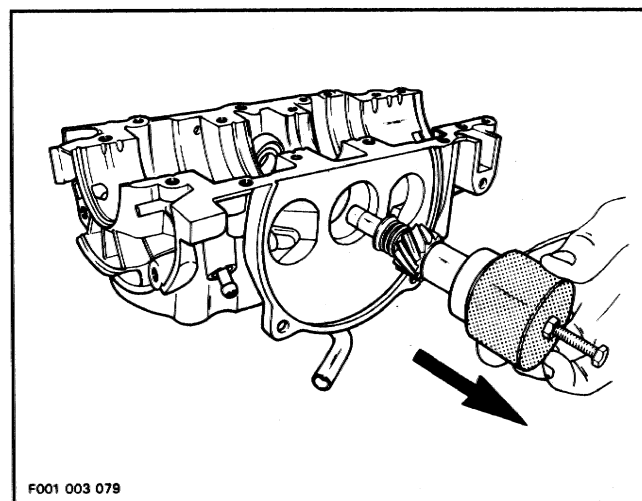
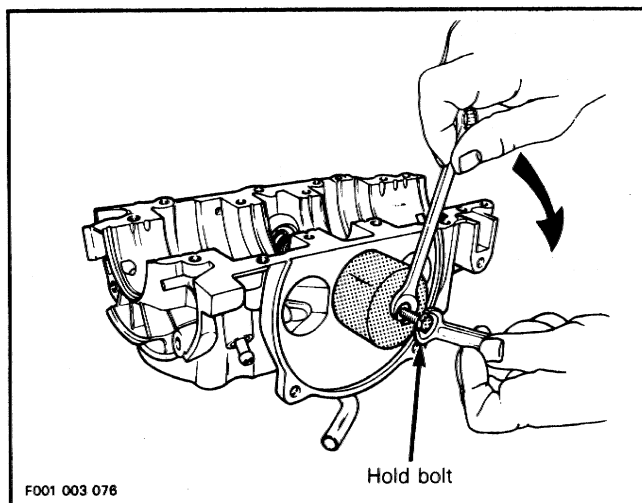
Section 03 ENGINE

Sub-Section 06 (ROTARY VALVE & RESERVOIR)

To remove rotary valve shaft, use a Remover (P/N 290 876 487).

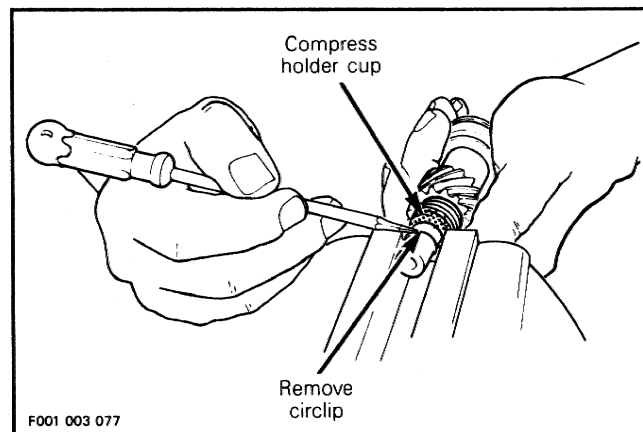


Place puller over rotary valve shaft end and screw puller bolt into shaft. While retaining bolt with a wrench, turn puller nut **CLOCKWISE** until shaft comes out.



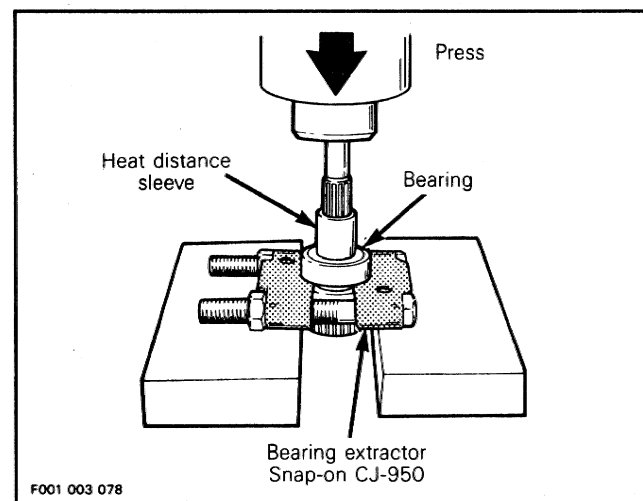
6,7, Circlip & Spring Holder Cup

If it is necessary to disassemble components of rotary valve shaft assembly, compress spring by holder cup to remove circlip.



12, Distance Sleeve

To remove distance sleeve use a bearing extractor such as Snap-On #CJ-950 as illustrated. Heat distance sleeve to approximately 150°C (300°F) to break the Loctite bond and press shaft out.



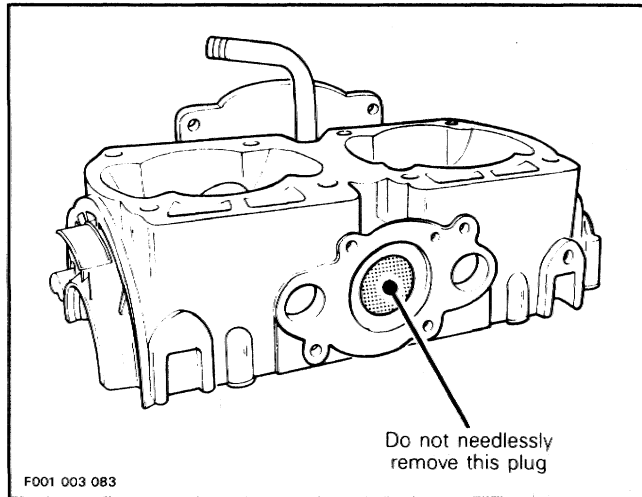
CAUTION : Ensure that rotary valve shaft is perfectly perpendicular with press tip or damage will occur.

Section 03 ENGINE

Sub-Section 06 (ROTARY VALVE & RESERVOIR)

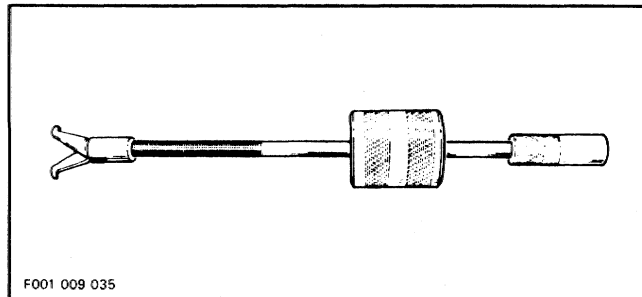
5, Bearing

○ NOTE: Do not remove plug against bearing in crankcase half.



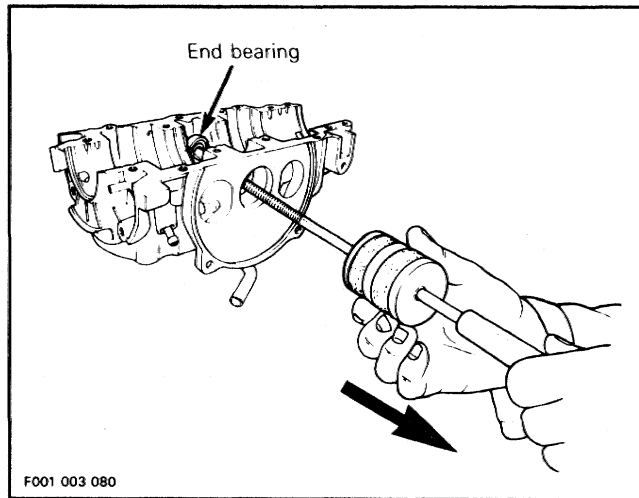
End bearing can be easily removed using the following suggested tool.

Snap-On Hammer Puller including : Handle CJ93-1
Hammer CJ125-6
Claws CJ93-4



Close puller claws so that they can be inserted in end bearing. Holding claws, turn puller shaft clockwise so that claws open and become firmly tight against bearing.

Slide puller sleeve outwards and tap puller end. Retighten claws as necessary to always maintain them tight against bearing. Continue this way until bearing completely comes out.



CLEANING

Discard all seals and O-rings.

Clean all metal components in a solvent.

Clean oil passages and make sure they are not clogged.

Clean rotary valve shaft and inside of distance sleeve.

INSPECTION

Inspect rotary valve cover for warpage. Small deformation can be corrected by surfacing with fine sand paper on a surface plate. Surface part against oiled sand paper.

Inspect bearings. Check for scoring, pitting, chipping or other evidence of wear. Make sure plastic cage (on bigger bearing) is not melted. Rotate them and make sure they turn smoothly.

The inspection of rotary valve system should include the following measurements.

Check for presence of brass filings in gear housing.

Visually check gear wear pattern. It should be even on tooth length all around. Otherwise it could indicate a bent shaft, check deflection. Replace gear if damaged.

MEASUREMENTS	TOLERANCES	
	NEW PARTS	WEAR LIMIT
Rotary Valve Cover & Valve Gap	N.A.	0.03 - 0.05 mm (.012 - .020 in)
Rotary Valve Shaft Deflection	N.A.	0.08 mm (.003 in)

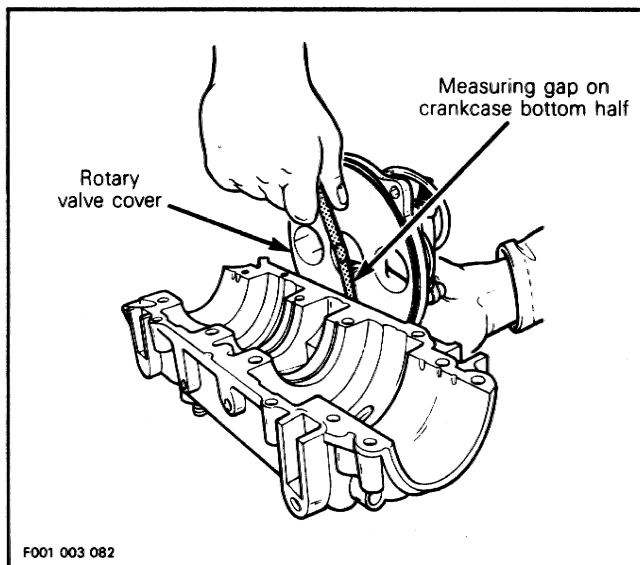
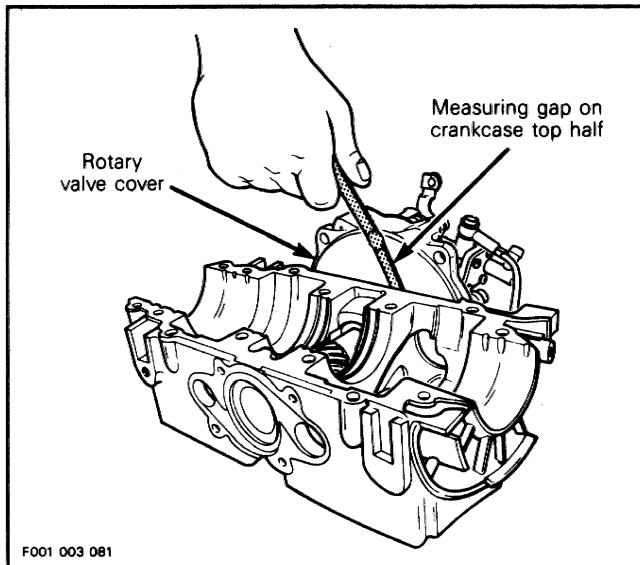
Section 03 ENGINE
Sub-Section 06 (ROTARY VALVE & RESERVOIR)

Rotary Valve Cover & Valve Gap

A gap must be maintained between rotary valve and crankcase.

To measure this gap, use a feeler gage inserted between rotary valve and upper half crankcase with rotary valve cover in place **WITHOUT** it's O-ring.

Check as much surface as possible. Follow the same procedure for lower half crankcase.

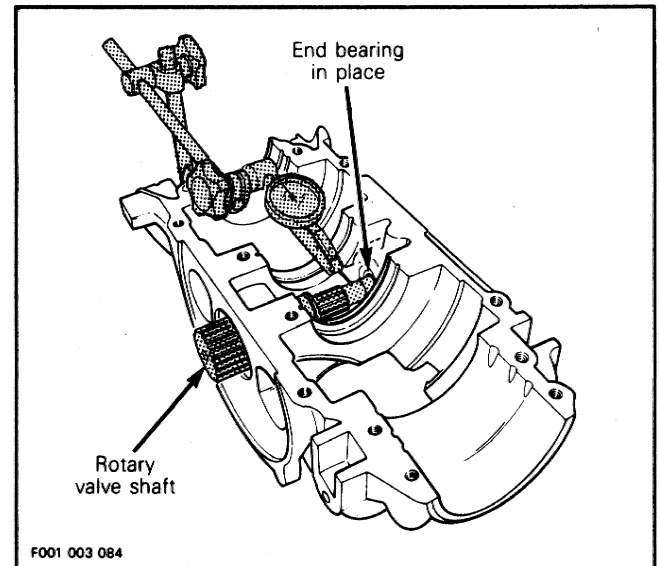


Rotary Valve Shaft Deflection

Deflection is measured with a dial gauge. Install rotary valve shaft in crankcase half, without its gear.

NOTE: End bearing must be in crankcase half.

Measure shaft deflection on gear mounting area.



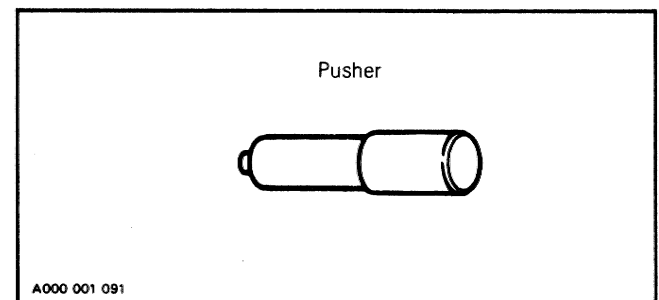
Deflection must not exceed specified value. Replace shaft as necessary.

ASSEMBLY

Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

5, Bearing

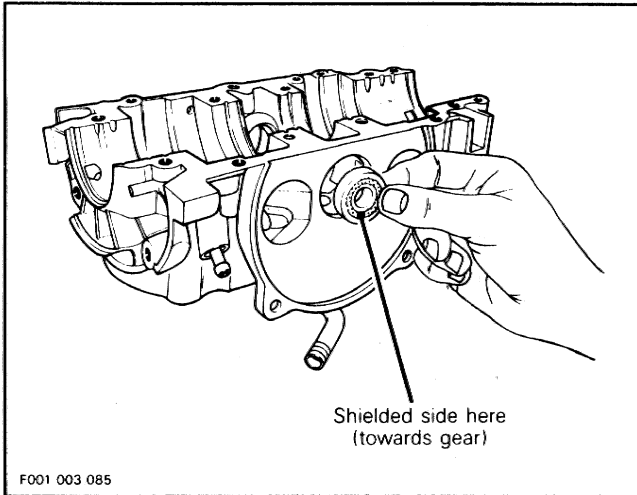
To install end bearing in crankcase, use a Pusher (P/N 290 876 500).



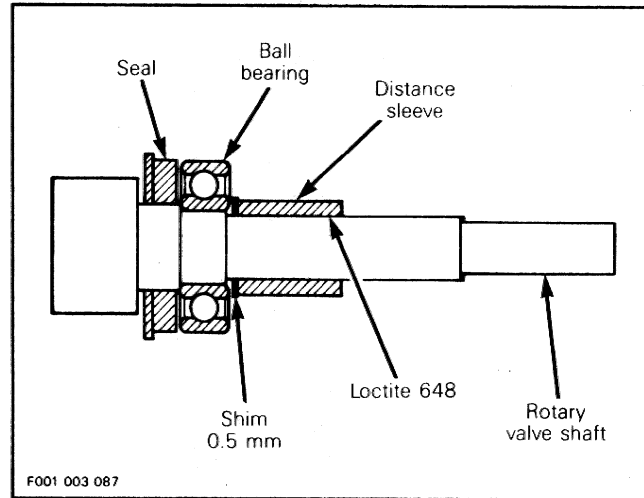
Section 03 ENGINE

Sub-Section 06 (ROTARY VALVE & RESERVOIR)

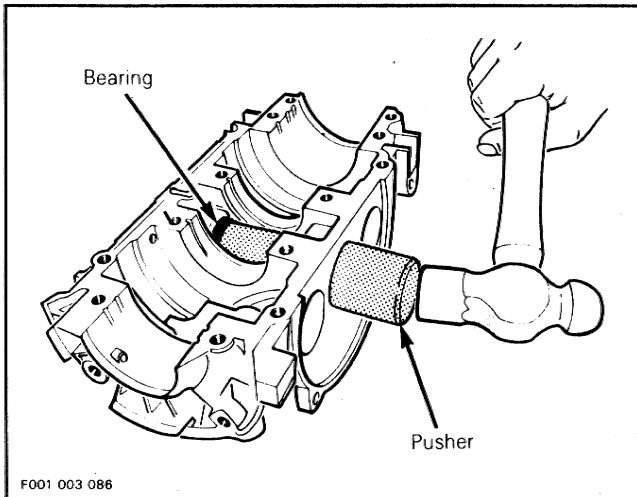
Position ball bearing shielded side towards rotary valve.



Apply Loctite 648 (green) (P/N 290 899 788) inside of distance sleeve.

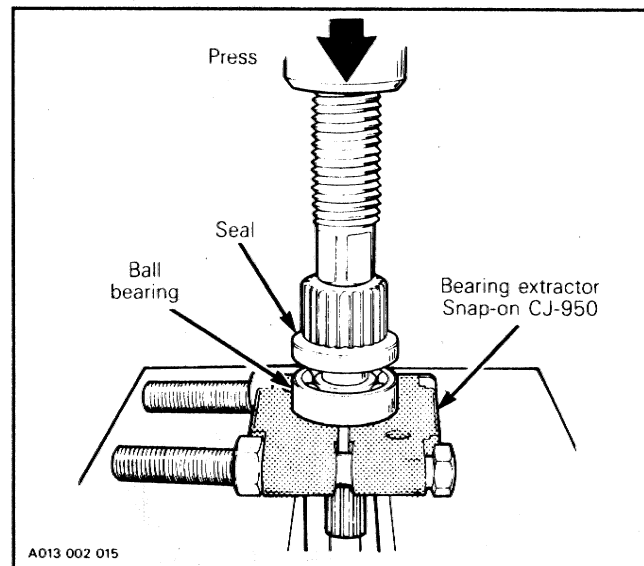


Push bearing until it stops on its seat.



14,16, Rotary Valve Shaft & Bearing

Install ball bearing as illustrated.



15,16, Seal, Rotary Valve Shaft

Apply lithium grease on seal lips. Position seal with shielded portion against splines of shaft.

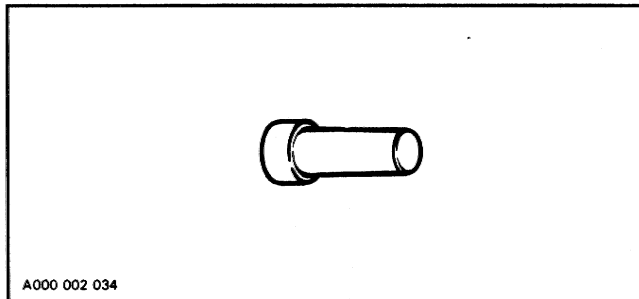
16,17, Rotary Valve Shaft Ass'y & Snap Ring

▼ **CAUTION** : Crankcase halves must be separated and crankshaft must not be present to install rotary valve shaft ass'y in crankcase.

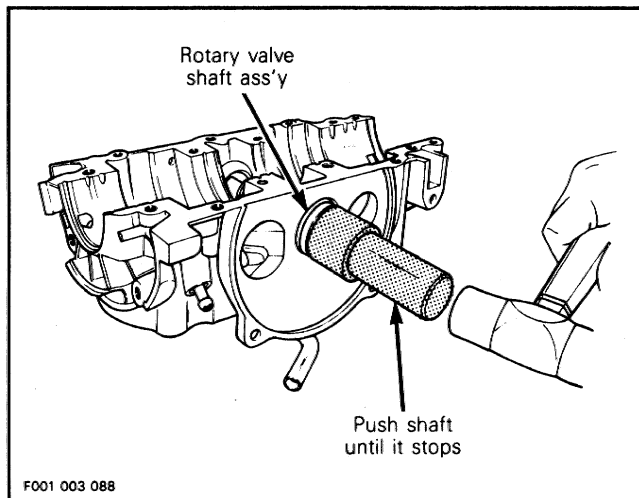
Section 03 ENGINE

Sub-Section 06 (ROTARY VALVE & RESERVOIR)

To install rotary valve shaft in crankcase, use a Pusher (P/N 290 876 605).



Push shaft until it stops on bearing seat.

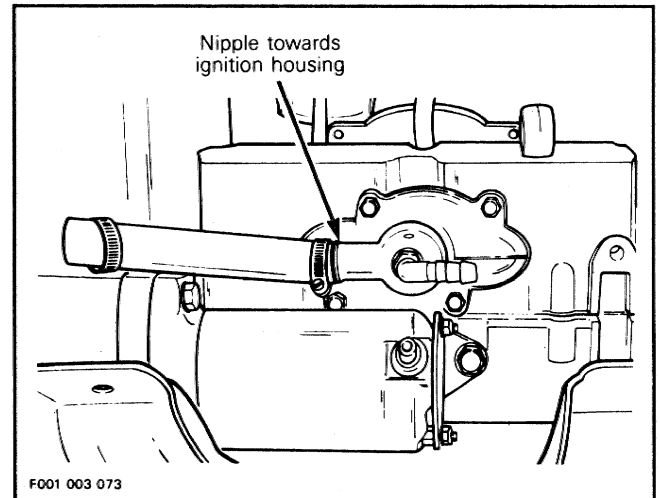


At snap ring installation, position it so that its sharp edge faces outwards.

1,2, Water Inlet Socket & Screw

When installing socket, position it so that its nipple is pointing towards ignition housing.

Apply Loctite 242 (blue) (P/N 293 800 002) on screw threads then torque to 9 N•m (80 lbf•in).



ROTARY VALVE TIMING

When the same crankcase is re-assembled, the first timing method is to be followed. However since replacement crankcase does not have timing mark (ridge), the second method is required. Take note that the second method is more accurate and may be used any time.

For both methods a TDC Gauge (P/N 295 000 065) is required.

Installation on Same Crankcase (with ridge)

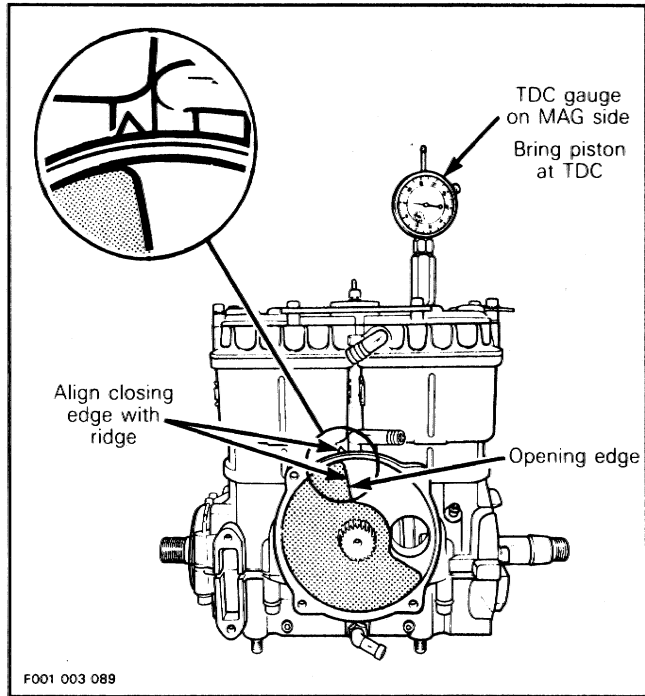
To correctly install rotary valve, proceed as follows :

- Turning crankshaft , bring **MAGneto side** piston to Top Dead Center using a TDC gauge.
- Position rotary valve on shaft splines so that its **opening edge** will be aligned with timing ridge on upper-left side of rotary valve housing.

Section 03 ENGINE

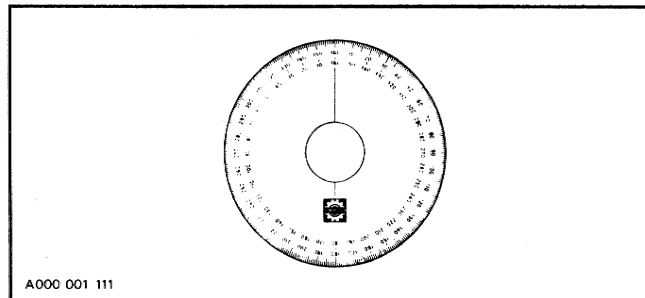
Sub-Section 06 (ROTARY VALVE & RESERVOIR)

○ NOTE : Rotary valve is asymmetrical. Therefore, try turning it inside out then re-install on splines to determine best installation position.



Installation on Replacement Crankcase (without ridge)

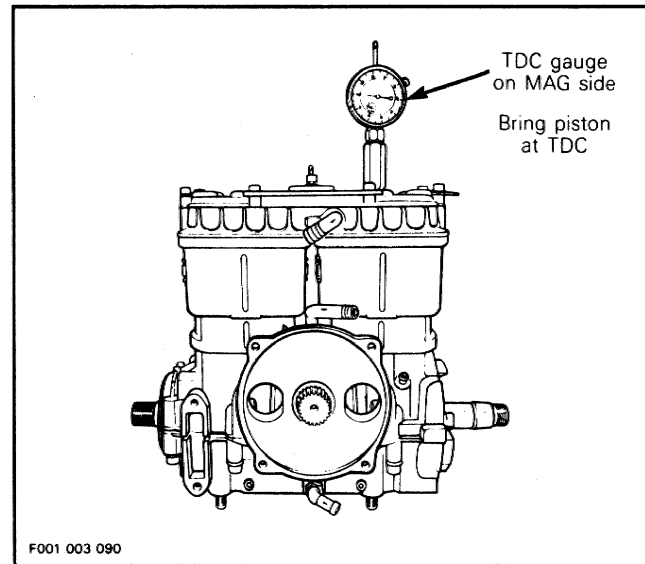
A Degree Wheel (P/N 295 000 007) is required to measure rotary valve opening and closing angles in relation with MAG side piston. Degree wheel will be installed on rotary valve shaft for measurements.



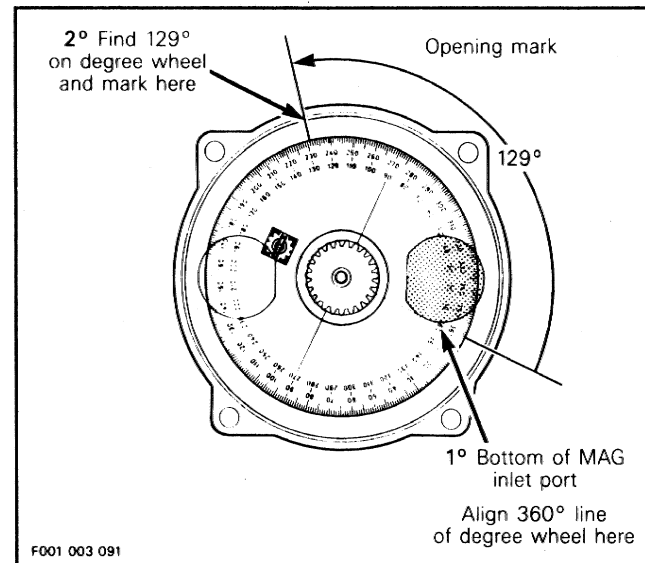
Rotary valve must be set so that timing occurs as follows :
 OPENING : 129° BTDC
 CLOSING : 49° ATDC

Proceed as follows :

- Turning crankshaft, bring **MAGneto side** piston to Top Dead Center using a TDC gauge.

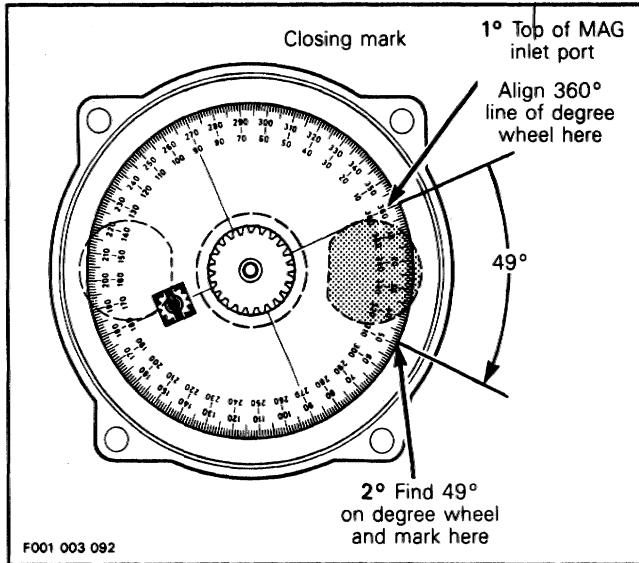


- For **opening** mark, first align 360° line of degree wheel with **BOTTOM** of **MAGneto side** inlet port. Then, find 129° line on degree wheel and mark crankcase at this point.



Section 03 ENGINE
Sub-Section 06 (ROTARY VALVE & RESERVOIR)

- For **closing** mark, first align 360° line of degree wheel with TOP of **MAGneto side** inlet port. Then, find 49° line on degree wheel and mark crankcase at this point.



- Position rotary valve on shaft splines to have edges as close as possible to marks.

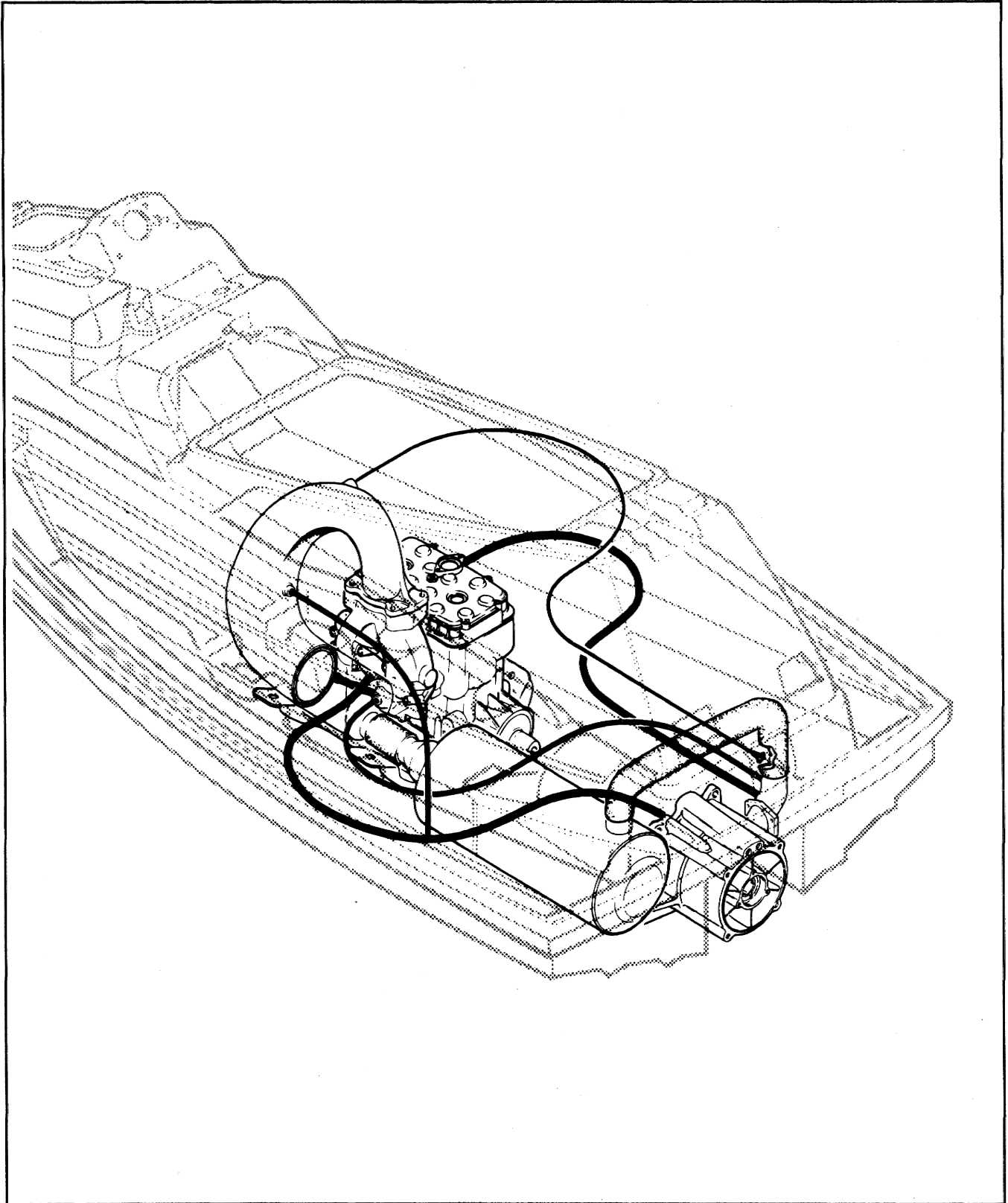
○ **NOTE** : Rotary valve is asymmetrical. Therefore, try turning it inside out then re-install on splines to determine best installation position.

Apply SEA-DOO injection oil on rotary valve before closing rotary valve cover.

20,23, Rotary Valve Cover & Screw

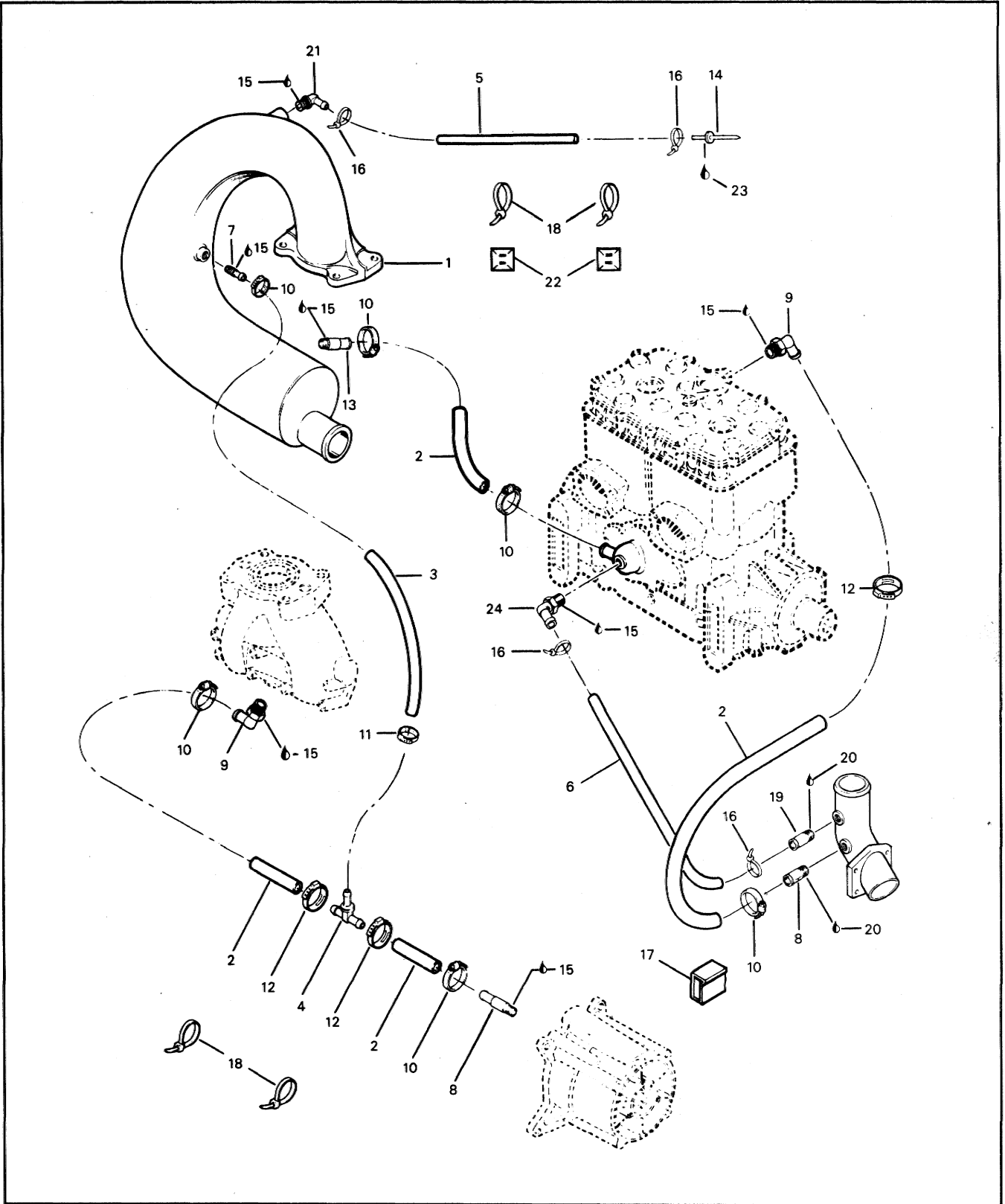
Install O-Ring and cover then torque screws to 20 N•m (15 lbf•ft) in a criss-cross sequence.

COOLING SYSTEM



Section 04 COOLING SYSTEM
Sub-Section 01 (COMPONENTS)

COMPONENTS



Section 04 COOLING SYSTEM

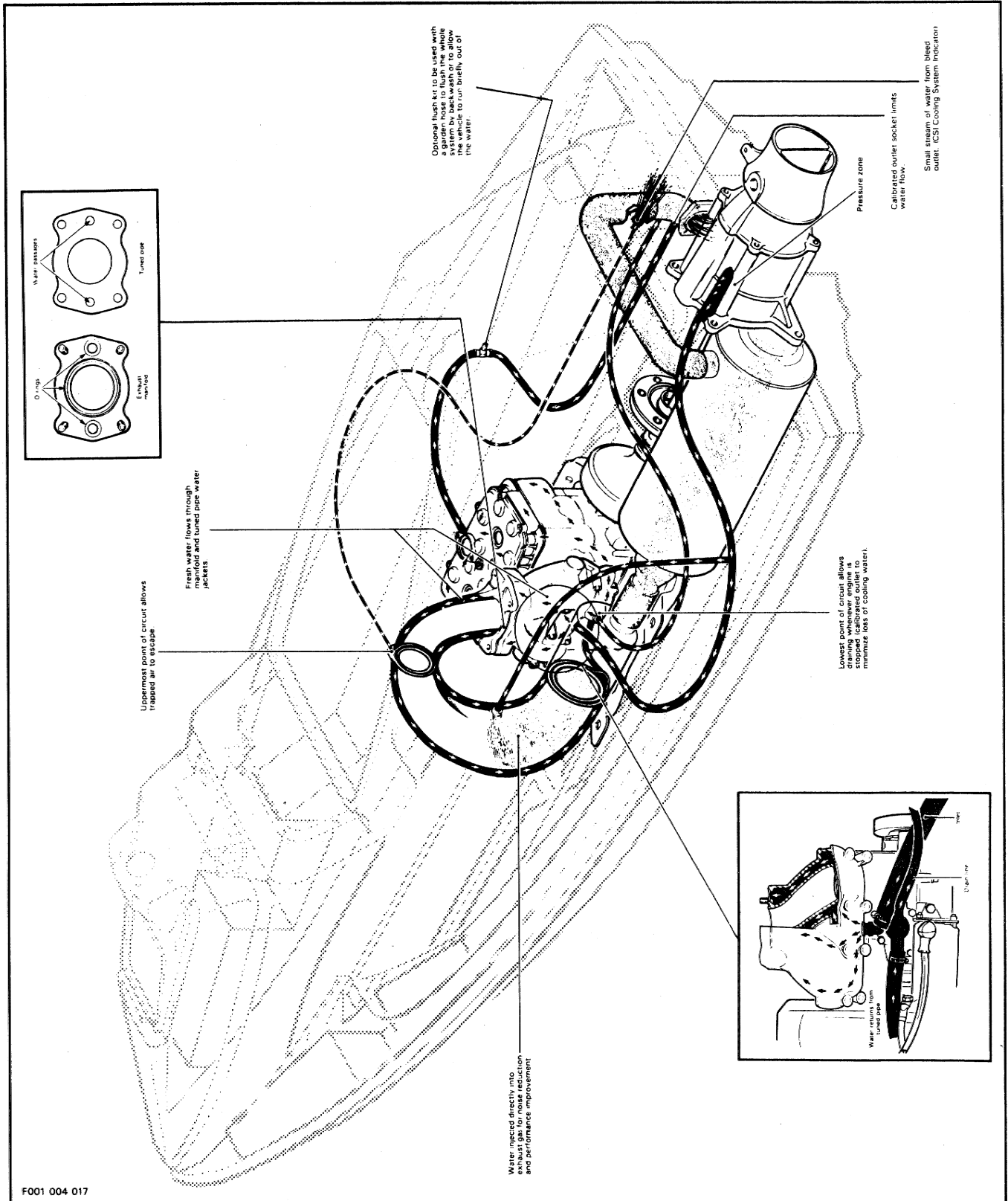
Sub-section 01 (COMPONENTS)

COMPONENTS

- | | |
|--------------------|-----------------------------|
| 1. Tuned pipe | 13. Fitting |
| 2. Hose 12.5 mm | 14. Rivet |
| 3. Hose 8 mm | 15. Loctite PST 567, 250 mL |
| 4. Tee | 16. Tie Rap (4) |
| 5. Hose 6 mm | 17. Tie Panduit |
| 6. Hose | 18. Tie Rap (4) |
| 7. Fitting | 19. Fitting |
| 8. Fitting | 20. Loctite 592, 50 mL |
| 9. Fitting 90° (2) | 21. Fitting 90° |
| 10. Clamp (6) | 22. Tie Cable |
| 11. Clamp | 23. Silicone 732 RTV, 90 mL |
| 12. Clamp (3) | 24. Fitting 90° |
-

Section 04 COOLING SYSTEM
Sub-Section 02 (CIRCUIT)

CIRCUIT



F001 004 017

Section 04 COOLING SYSTEM

Sub-Section 02 (CIRCUIT)

TECHNICAL DATA

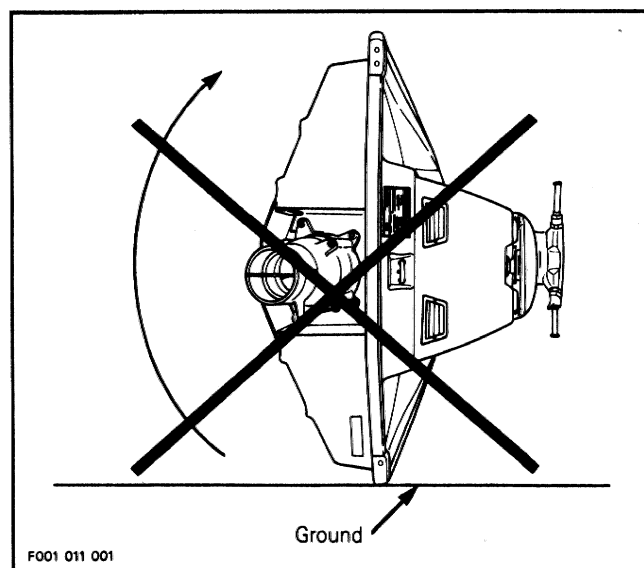
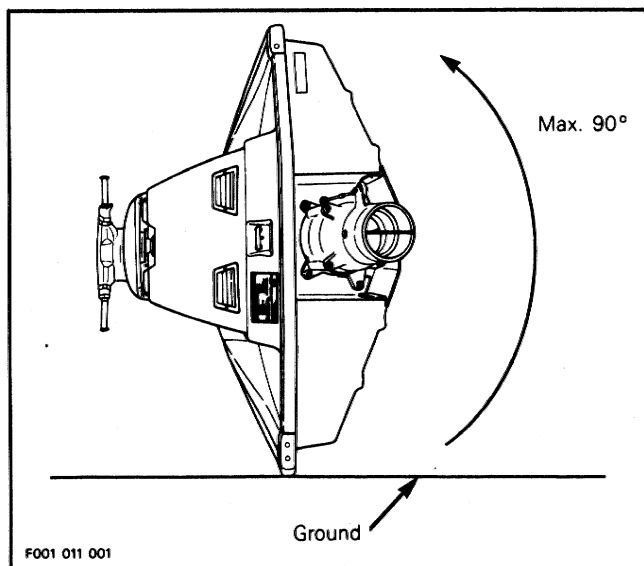
- Type : TLCS (Total Loss Cooling System)
- Coolant pressure : Pressure build-up at impeller housing (no water pump)
- Flow control : Calibrated outlet sockets at exhaust outlet and drain line (no thermostat)
- System bleeding : Self-bleed type (hose at uppermost point of circuit)
- System draining : Self-drain type (hose at lowest point of circuit)
- System flushing : A flush kit is available
- Overheat beeper : Turns on at 96-99°C (205-210°F)

Section 04 COOLING SYSTEM

Sub-Section 03 (CARE & FLUSHING)

CARE

1. When servicing hull/jet pump, always rotate watercraft counterclockwise (seen from the rear). Rotating watercraft clockwise could allow residual water in tuned pipe to enter the engine and cause damage.



2. Check joints for leaks to avoid water accumulation in the bilge.
3. Do not modify hose or socket size as coolant flow could be altered.
4. When engine is running, water must flow from bleed outlet indicating that water circulates.
5. For hose clamp installation, use special pliers (P/N 295 000 070).

6. Check overheat beeper operation by jumping terminal of thermosensor wire to ground. Beeper must operate.

○ **NOTE** : Tether cord cap must be over its switch so that beeper works.

FLUSHING

When the watercraft is operated in unclean water and particularly in salt water, flushing of cooling system is necessary.

▼ **CAUTION** : Failure to perform cooling system flushing, when watercraft is used in salt water, will result in damage to watercraft components.

Since the watercraft uses the same water where it sails, for propulsion and cooling systems, this water flows everywhere in water jackets. If the watercraft is being used in salt water and cooling system is not regularly flushed, salt will eventually corrode components.

Infiltration in cooling system of any particle present in the water is unavoidable. Deposits accumulation can clog cooling system and lead engine to severe damage.

Flushing is necessary when the watercraft is operated in :

- salt water
- unclean water
- shallow water where underwater ground is sandy and/or shells covered.

Flushing the cooling system with fresh water is essential to neutralize corroding effects of salt or other chemical products present in water. It will help to evacuate sand, salt, shells or other particles in water jackets (engine, exhaust manifold, tuned pipe) and/or hoses.

Flushing should be performed when the watercraft is not expected to be used further the same day or when the watercraft is stored for any extended time.

▼ **CAUTION** : Failure to flush cooling system, when necessary, will severely damage engine and/or exhaust system. Never flush a hot engine. Make sure engine operates during entire procedure.

◆ **WARNING** : Do not touch any electrical part when engine is running.

A convenient flush kit (P/N 295 000 038) can permanently be installed on the watercraft to ease flushing.

○ **NOTE** : If a flush kit is not installed on watercraft, disconnect outlet hose at exhaust socket. Insert garden hose nozzle into hose end for flushing.

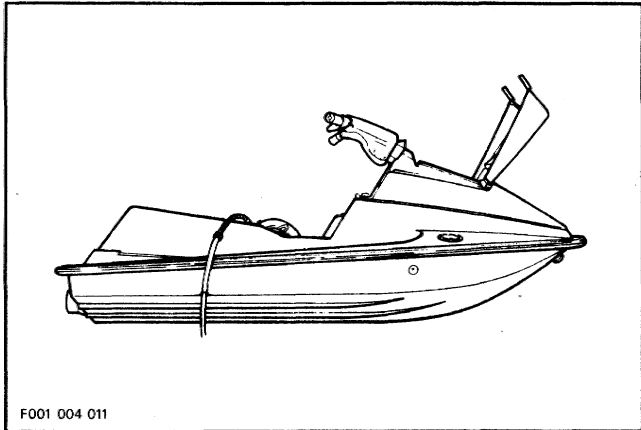
Proceed as follows :

1. Remove seat to allow access of cooling system.
2. Connect coupler hose as explained in the flush kit instruction sheet. Do not open the water tap yet.

Section 04 COOLING SYSTEM

Sub-Section 03 (CARE & FLUSHING)

○ **NOTE** : to allow a more efficient flushing on watercraft equipped with a flush kit, install a hose pincer (P/N 295 000 076) between T-fitting and exhaust socket. This will prevent water exiting through exhaust socket.



3. Start the engine **then** immediately open the water tap.

▼ **CAUTION** : Always start the engine before opening the water tap. Otherwise, water will back flow through the tuned pipe into the engine and may cause damage to internal parts. Open water tap immediately after engine is started to prevent overheating. Follow this procedure exactly.

4. Run the engine about 5 minutes at a fast idle.

▼ **CAUTION** : Never run engine longer than 5 minutes. Drive line seal has no cooling out of water.

5. Close the water tap **then** stop the engine.

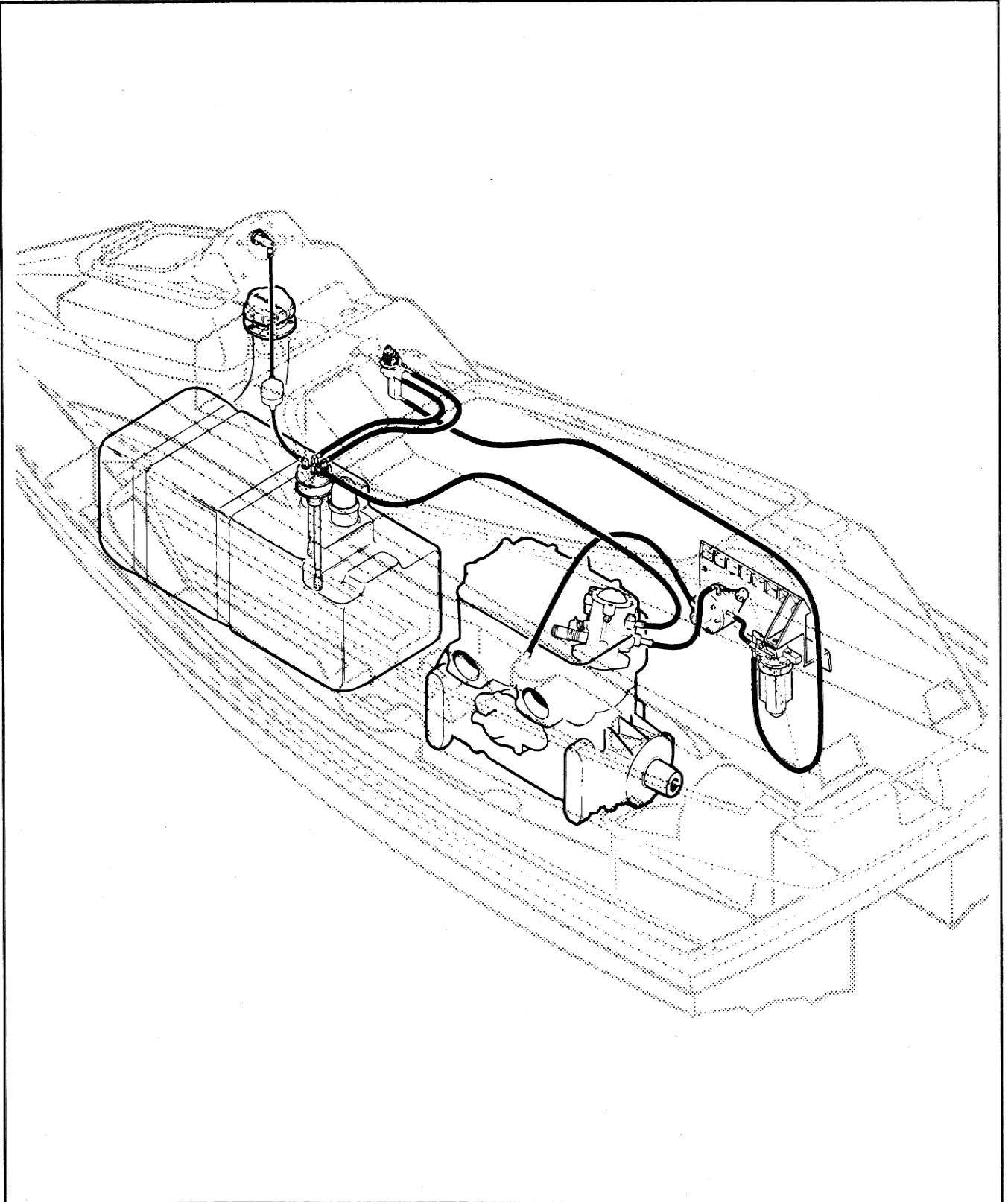
▼ **CAUTION** : Always close the water tap before stopping the engine. Follow this procedure exactly otherwise severe engine damage could occur.

6. Disconnect coupler hose from watercraft.

7. Wire off any residual water on the engine.

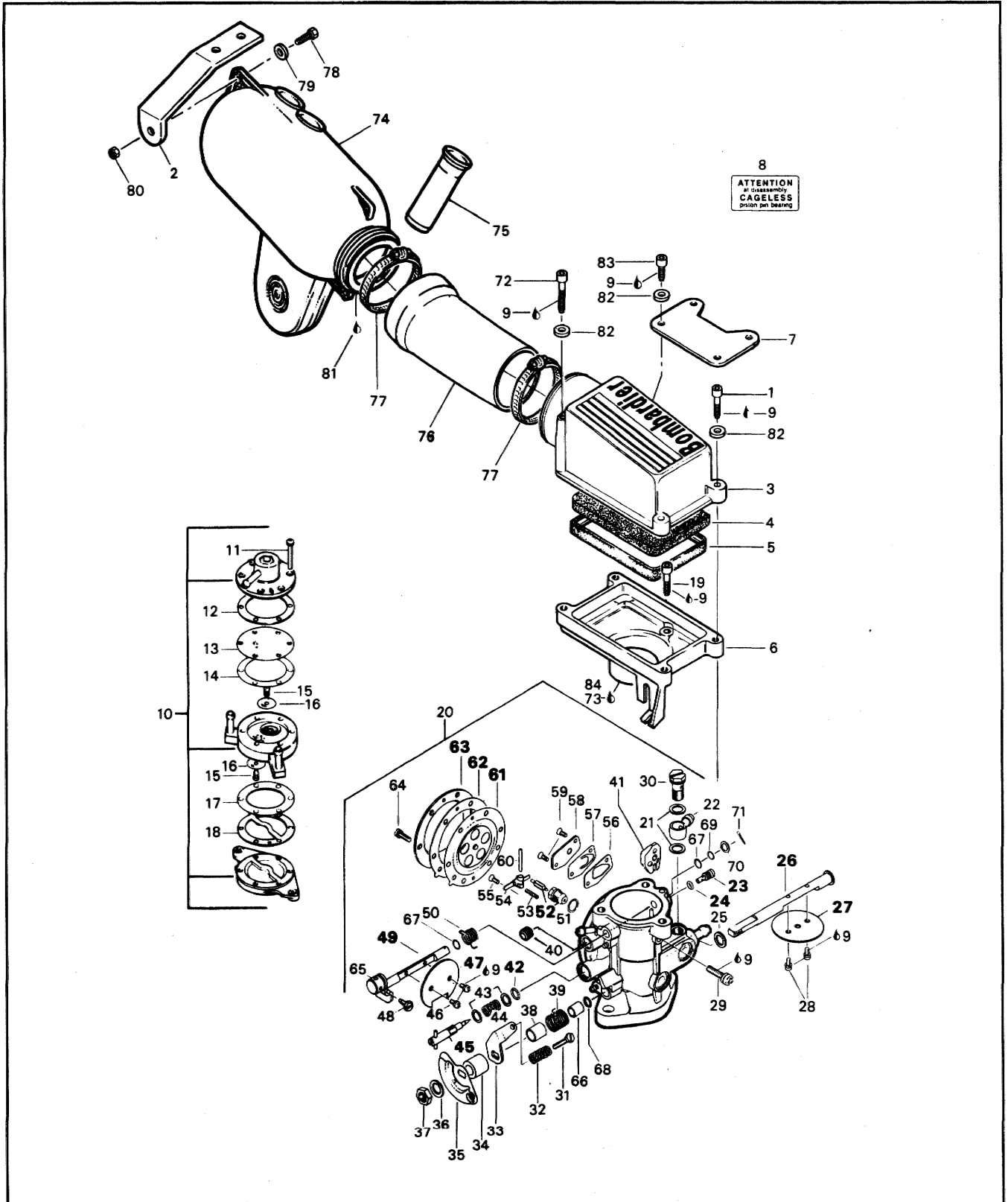
8. Re-install seat and properly latch.

FUEL SYSTEM



Section 05 FUEL SYSTEM
Sub-Section 01 (CARBURETOR & INTAKE SYSTEM)

CARBURETOR & INTAKE SYSTEM



Section 05 FUEL SYSTEM

Sub-Section 01 (CARBURETOR & INTAKE SYSTEM)

COMPONENTS

1. Allen screw M6 x 20 (2)
2. Air silencer support
3. Cover
4. Foam
5. Isolator
6. Base
7. Support
8. Sticker
9. Loctite 242, 10 mL
10. Fuel pump
11. Screw (6)
12. Parking
13. Gasket
14. Diaphragm
15. Grommet (2)
16. Valve (2)
17. Gasket
18. Packing (cap)
19. Allen screw M6 x 30 (3)
20. Carburetor assembly
21. Gasket ring (2)
22. Banjo fitting
23. Main jet (70)
Main jet (75)
Main jet (80)
Main jet (85)
Main jet (90)
Main jet (95)
Main jet (100)
24. O-ring
25. Washer
26. Throttle shaft
27. Throttle valve
28. Combined screw (2)
29. Combined screw M5 x 14
30. Plug screw
31. Idle speed screw
32. Compression spring
33. Throttle stop lever
34. Spacer
35. Throttle rope lever
36. Lock washer
37. Nut M8 x 1
38. Spacer
39. Return spring
40. Plug
41. Choke body
42. O-ring
43. Washer (2)
44. Compression spring
45. Adjustment screw
46. Combined screw (2)
47. Choke valve
48. Hexagonal head screw M4 x 10 (2)
49. Choke shaft assembly
50. Return spring
51. Sealing ring
52. Needle valve assembly
53. Compression spring
54. Valve lever
55. Countersunk screw M3 x 6
56. Gasket
57. Diaphragm
58. Diaphragm plate
59. Countersunk screw M3 x 6 (2)
60. Pin
61. Diaphragm assembly
62. Gasket
63. Cover plate
64. Combined screw M4 x 8 (6)
65. Ring
66. Spacer
67. Seal
68. Seal
69. Shim
70. Washer
71. Pin
72. Allen screw M6 x 80 (2)
73. Loctite 515, 50 mL
74. Air silencer
75. Inlet tube (2)
76. Preformed hose
77. Clamp (2)
78. Hexagonal screw M6 x 20
79. Flat washer 6 mm
80. Hexagonal nut M6
81. Silicone 732 RTV, 90 mL
82. Flat washer 6 mm (6)
83. Allen screw M6 x 12 (2)
84. Primer N

CLEANING

The entire carburetor should be cleaned with a general solvent and dried with compressed air before disassembly.

Carburetor body and jets should be cleaned in a carburetor cleaner following manufacturer's instructions.

◆ **WARNING** : Solvent with a low flash point such as gasoline, naphtha, benzol, etc., should not be used as they are flammable and explosive.

▼ **CAUTION** : Heavy duty carburetor cleaner may be harmful to the rubber parts, O-ring, etc. Therefore, it is recommended to remove those parts prior to cleaning.

Discard O-rings, diaphragms and gaskets.

INSPECTION

Inspect parts for corrosion damage (shaft, butterfly, spring, etc).

52, Needle Valve

Check needle valve tip for a grooved condition. If worn, needle and seat must be replaced as a matched set.

45, Low-Speed Mixture Screw

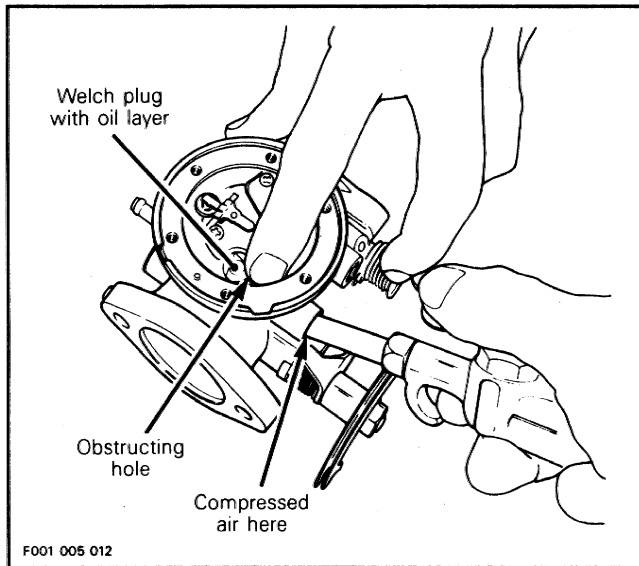
Check tip for a grooved condition. Replace if necessary.

Section 05 FUEL SYSTEM
Sub-Section 01 (CARBURETOR & INTAKE SYSTEM)

Welch Plug, Leak Test

Using a suitable pump gauge tester, perform the following test proceeding as follows.

- Hold carburetor upside down.
- Apply oil on welch plug.
- Obstruct corresponding orifice.
- Blow low-pressure compressed air through low-speed adjustment screw hole.



Bubbles escaping around welch plug indicate leak. Using a suitable punch and hammer, reseal plug. Recheck for leak.

ASSEMBLY

At assembly, pay attention to the following.

47,49, Shaft, Throttle Valve & Choke Valve

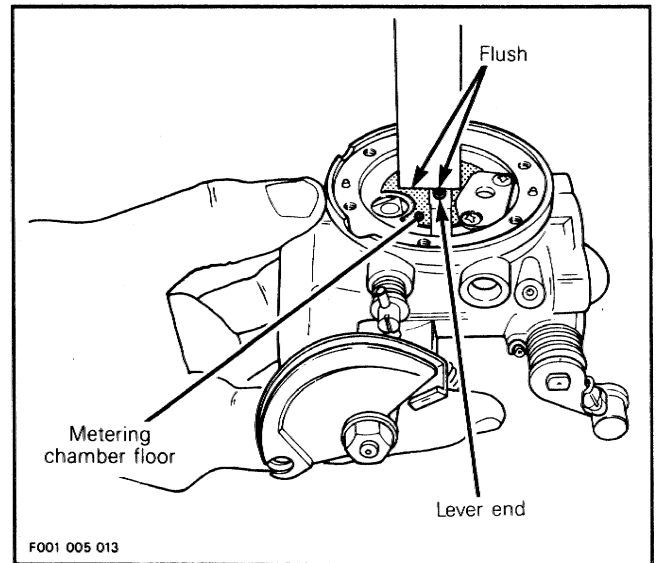
When installing butterfly into shaft, close butterfly so that it centers into carburetor bore. Then, firmly tighten screws.

▼ **CAUTION:** Always apply loctite 242 (blue) on screw threads prior to installing screws.

52, Needle Valve

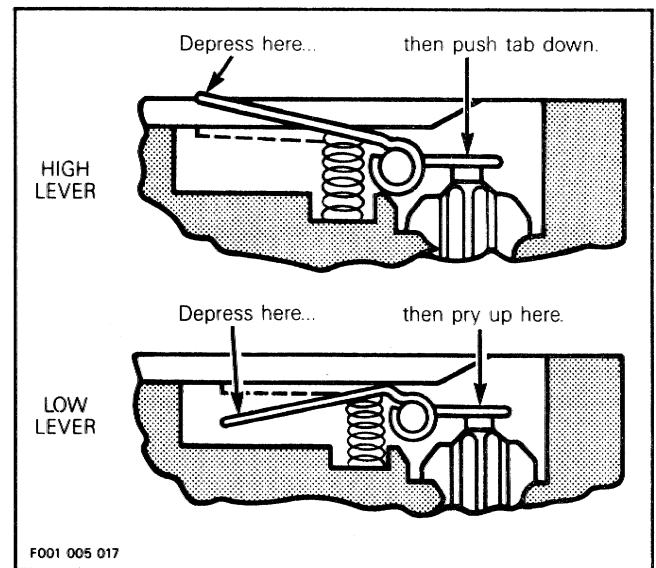
Inlet Control Lever

Rounded end of needle valve lever must be flush with surrounding metering chamber wall. Place the end of a ruler over lever to check adjustment.



To adjust, bend lever very slightly to change its height.

▼ **CAUTION:** When adjusting lever, do not pry it so that it applies pressure on needle. This could damage valve seat/needle.



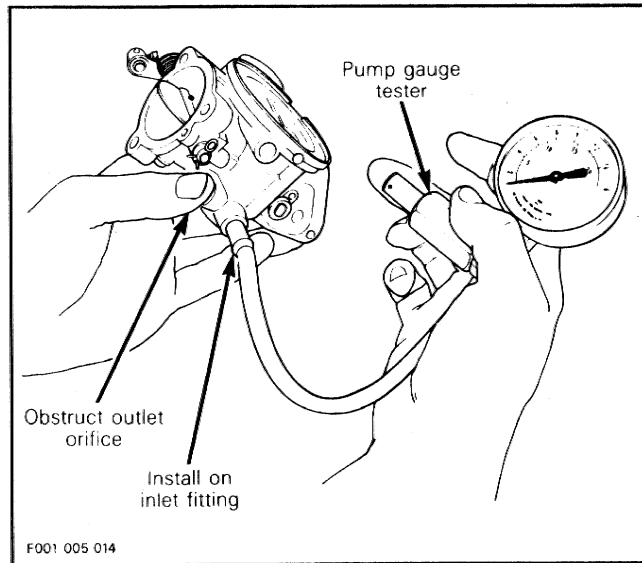
Pressure Test

Proceed as follows :

- Remove outlet banjo fitting and screw.
- Install pump gauge tester on carburetor inlet fitting.
- Obstruct outlet orifice with a finger.
- Pump tester until inlet release pressure is reached (seen by a sudden pressure drop). This must occur within 11.5-12.5 PSI, pressure will drop to approximately 6-8 PSI then stop.

Section 05 FUEL SYSTEM

Sub-Section 01 (CARBURETOR & INTAKE SYSTEM)



If release pressure is not within specification, check control lever adjustment. Replace spring as necessary.

▼ **CAUTION** : Do not stretch spring.

Leak Test

Needle valve must stand a pressure of 3 PSI for 30 seconds. Otherwise, hold carburetor upside down, pour oil over needle valve and apply pressure.

Check for bubbles. If they come from seat gasket, bubbles will exit around seat. Re-tighten as necessary.

If bubbles come from needle, replace needle and seat.

61,62,63, Diaphragm, Gasket & Cover

Install diaphragm on carburetor then gasket. Properly locate their pilot holes with carburetor pins. Make sure that their small tongues are inserted into carburetor notch.

24, 42, O-ring

When installing O-rings of low-speed mixture screw and main jet, apply some SEA-DOO LUBE (P/N 293 600 006) to prevent sticking.

Hose Clamps

Properly tighten clamps with special pliers (P/N 295 000 070).

◆ **WARNING** : Make sure there is no leak in fuel system.

Flame Arrester

◆ **WARNING** : Never operate watercraft without flame arrester.

ADJUSTMENTS

23, Main Jet

Main jet is replaceable. Different jet sizes are available to suit temperature and altitude conditions. Always inspect spark plug tip condition when dealing with main jet.

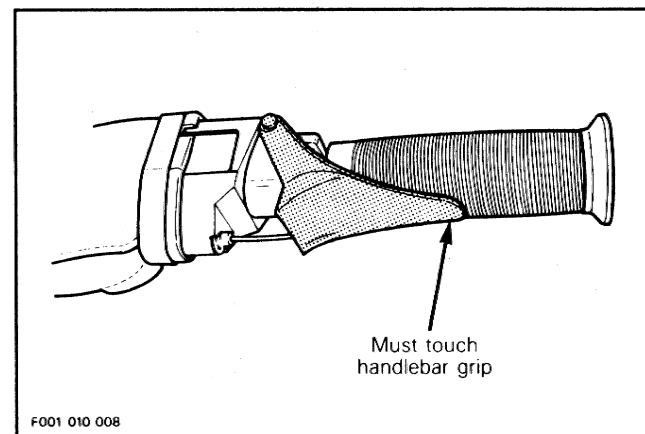
▼ **CAUTION** : When changing main jet always place O-ring on main jet before installation, when main jet is removed from carburetor body the O-ring will remain in carburetor jet bore.

Throttle Cable

▼ **CAUTION** : Make sure engine is turned off before adjusting throttle cable.

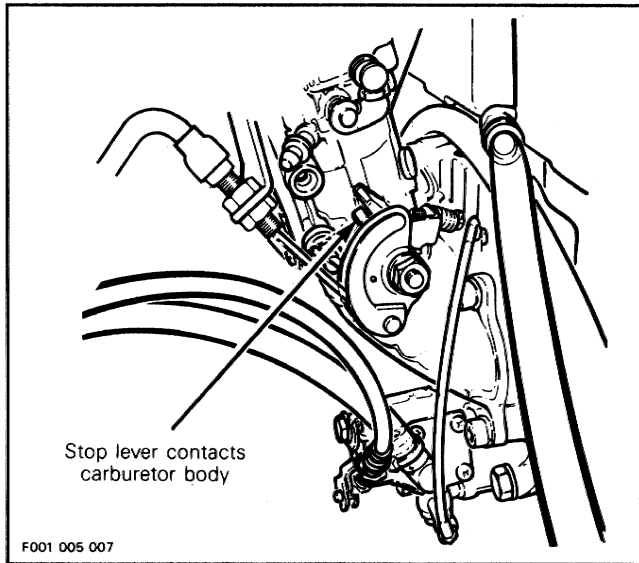
Lubricate cable with SEA-DOO LUBE.

Throttle lever must reach handlebar grip without causing strain to cable or carburetor cable bracket.



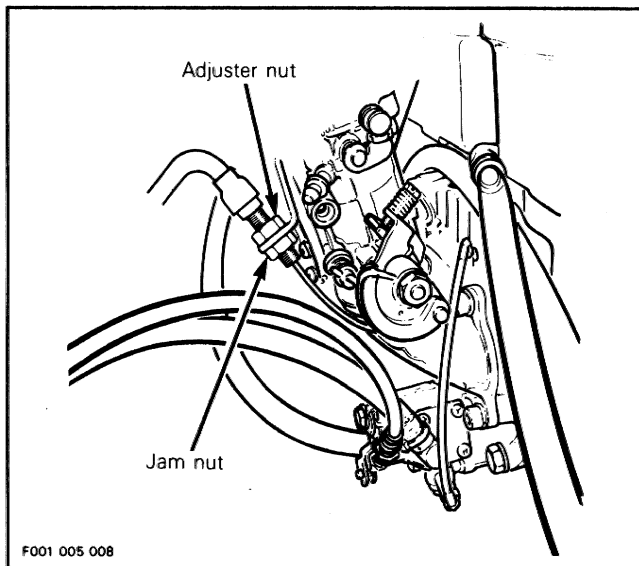
Insure carburetor butterfly is fully open at full throttle position. At this position throttle stop lever will contact carburetor body.

Section 05 FUEL SYSTEM
Sub-Section 01 (CARBURETOR & INTAKE SYSTEM)



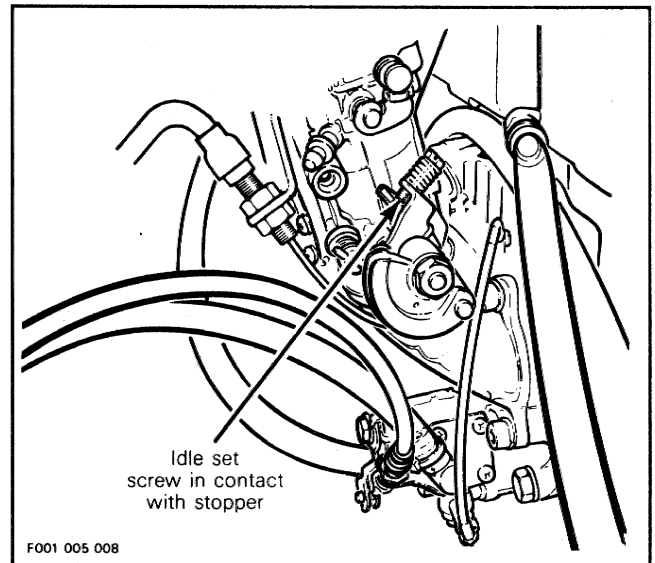
▼ **CAUTION:** Improper cable full throttle adjustment will cause strain on cable and/or damage cable bracket or throttle lever at handlebar.

To adjust, loosen jam nut then turn adjuster nut as necessary.



Tighten jam nut and recheck adjustment.

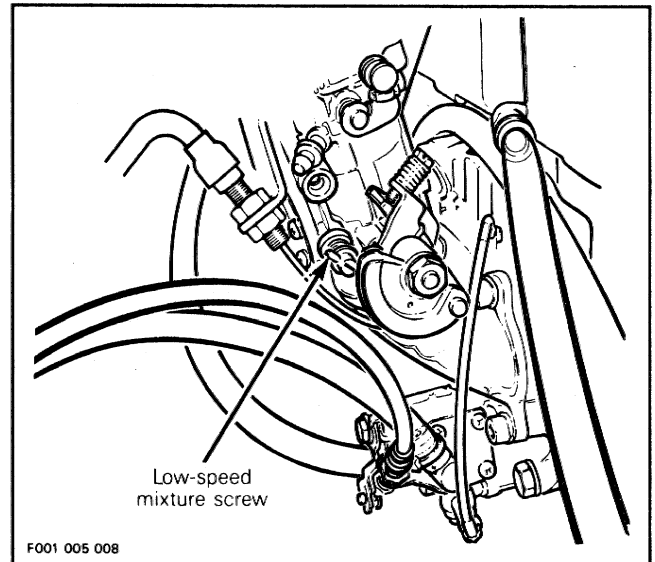
◆ **WARNING:** Make sure idle set screw contacts stopper when throttle lever is fully released at handlebar.



After throttle cable adjustment, always proceed with oil injection pump adjustment.

▼ **CAUTION:** Improper oil injection pump synchronization with carburetor can cause serious engine damage.

Low-Speed Mixture Screw



▼ **CAUTION:** Do not attempt to set engine idle speed with low-speed mixture screw. Severe engine damage can occur.

As a preliminary set-up, tighten screw in until a slight resistance is felt then back off 1-1/2 to 2 turns.

Start and warm engine.

Section 05 FUEL SYSTEM

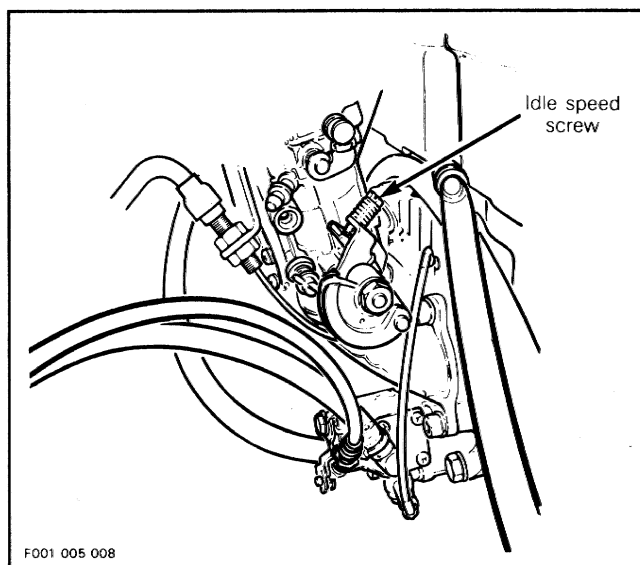
Sub-Section 01 (CARBURETOR & INTAKE SYSTEM)

▼ **CAUTION** : Water must be supplied to cool engine with flush kit P/N 295 000 038.

Turning screw in clockwise leans mixture and inversely turning screw out counter-clockwise enrichens mixture.

Turn low-speed mixture screw so that engine reaches the most suitable idle and runs smoothly. Make sure engine reacts quickly to throttle lever depression.

Idle Speed Screw



Turning screw in clockwise increases engine idle speed and inversely turning screw out counter-clockwise decreases engine idle speed.

Connect an induction-type tachometer on spark plug wire of magneto side to measure engine speed.

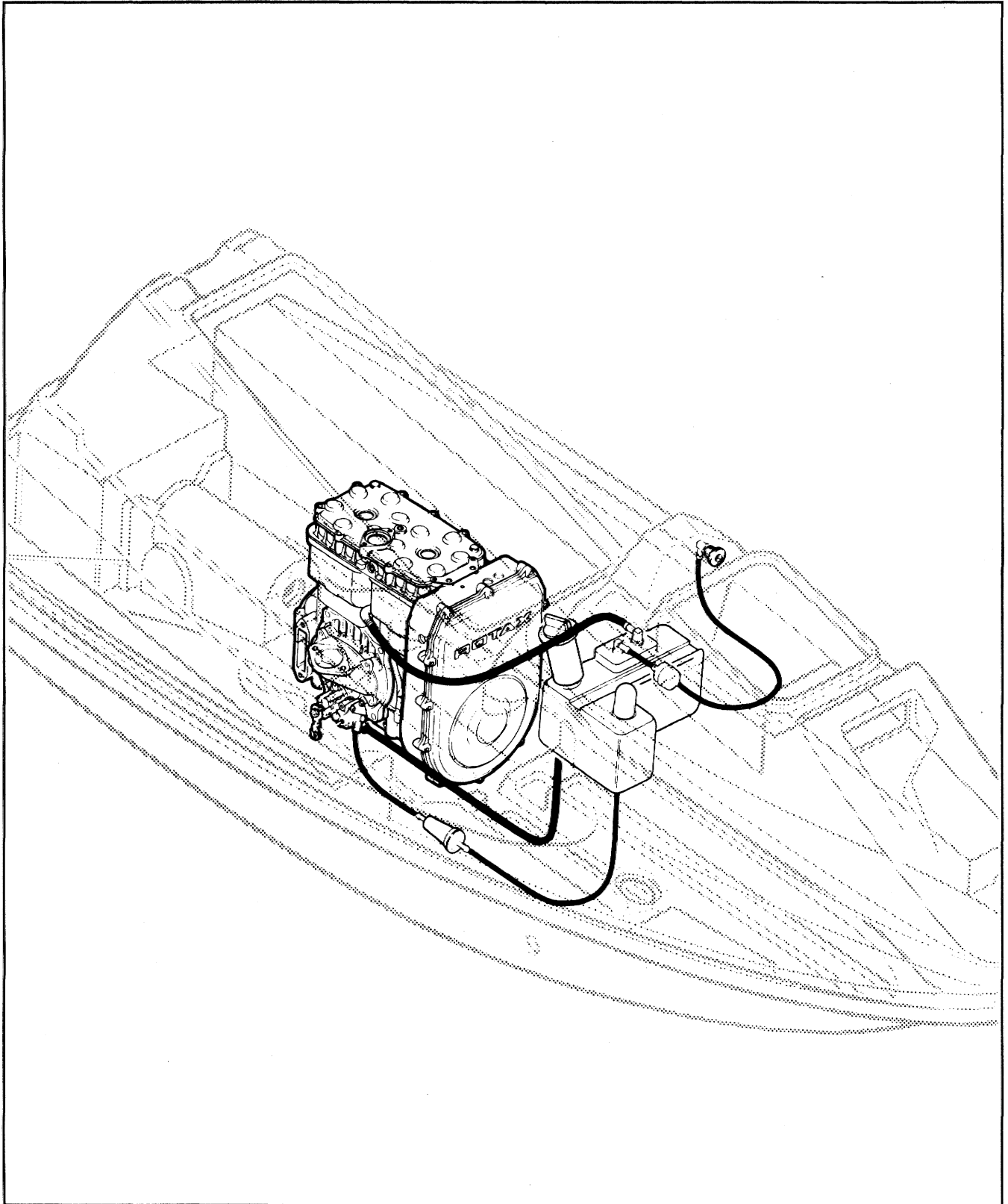
Start engine and bring to normal operating temperature.

▼ **CAUTION** : Water must be supplied to cool engine with flush kit P/N 295 000 038.

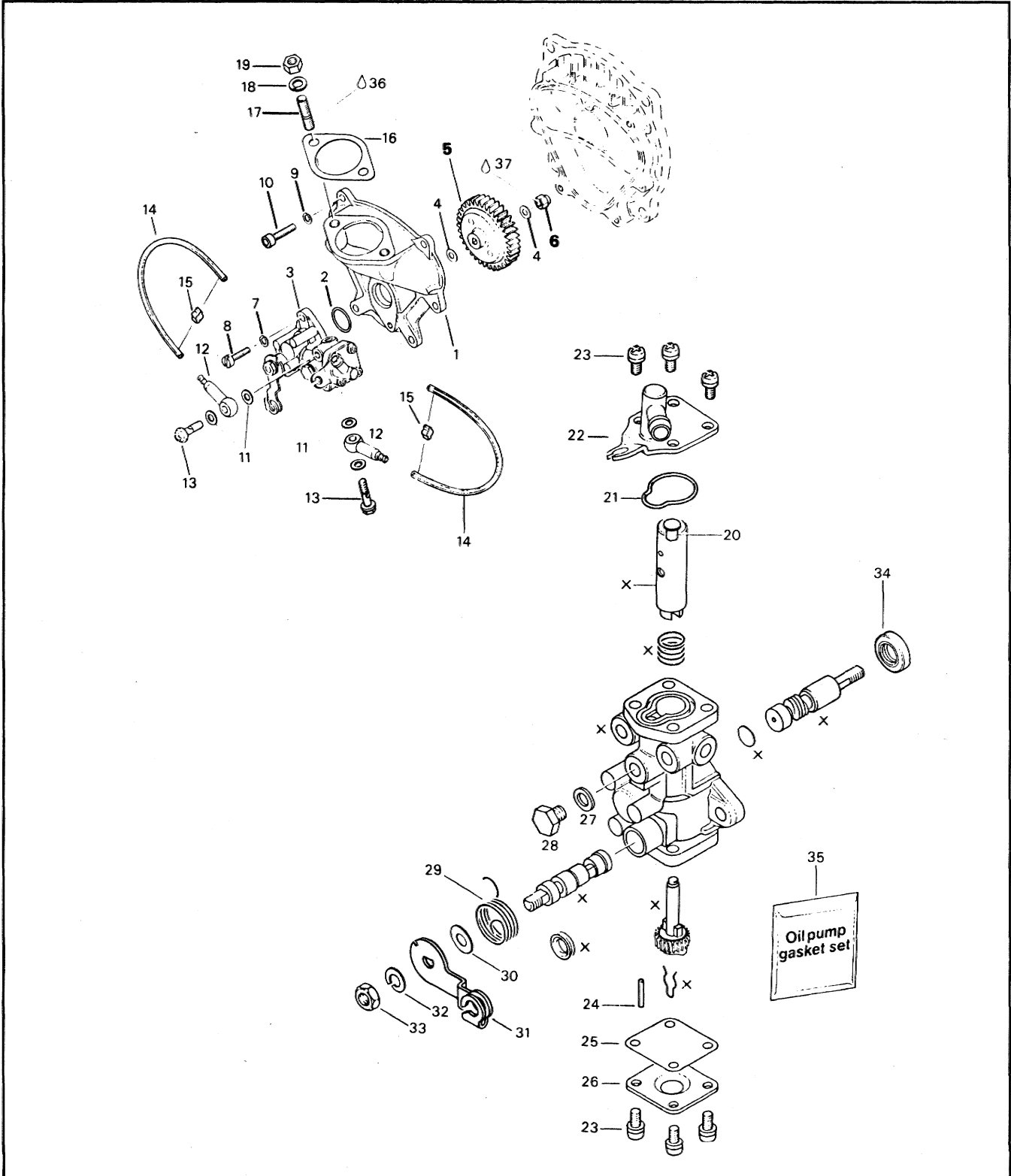
Turn screw so that engine idles at 1200 RPM in water or 1500 RPM out of water.

Stop engine and recheck oil injection pump aligning marks and readjust as necessary.

OIL SYSTEM



OIL INJECTION PUMP, REPAIR & ADJUSTMENT



PARTS IN ILLUSTRATION MARKED WITH "X" ARE NOT AVAILABLE AS SPARE PARTS.

Section 06 OIL SYSTEM

Sub-Section 01 (REPAIR & ADJUSTMENT)

COMPONENTS

1. Oil pump mounting flange
2. O-ring
3. Oil pump
4. Washer 6, 2 (2)
5. Oil pump gear 41 teeth
6. Lock nut M6
7. Lock washer (2)
8. Cylindrical slotted screw M5 x 16 (2)
9. Lock washer (6)
10. Hexagonal socket head cap screw M6 x 20 (6)
11. Oil banjo gasket (4)
12. Valve (2)
13. Valve bolt M6 x 16 (2)
14. Oil line 170 mm
15. Clamp (4)
16. Gasket 39 mm
17. Stud M8 x 19 (2)
18. Lock washer (2)
19. Nut M8 (2)
20. Retainer
21. O-ring
22. Plate
23. Screw with lock washer M4 x 8 (8)
24. Stop pin
25. Gasket
26. Cam casing cover
27. Gasket
28. Hexagonal head screw M6 x 8
29. Spring
30. Washer
31. Lever
32. Lock washer
33. Nut M6
34. Seal
35. Gasket set
36. Loctite 242, 10 mL
37. Loctite 271, 10 mL

CLEANING

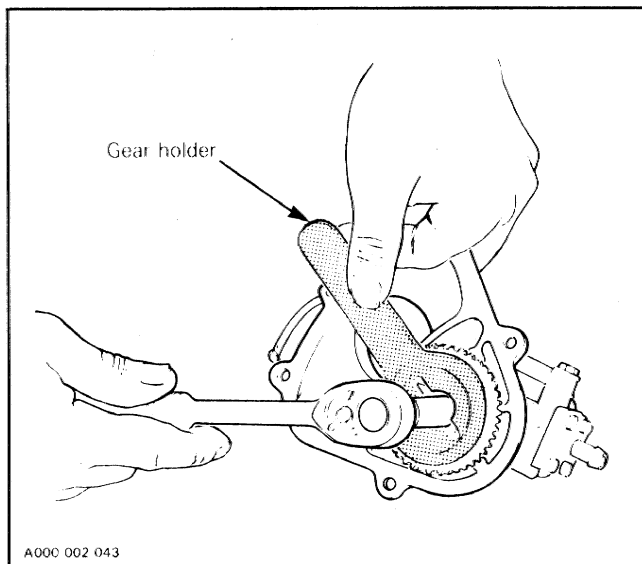
Discard all seals and O-rings. Clean metal components in a solvent.

DISASSEMBLY

○ **NOTE:** Some oil pump parts are not available in single parts.

5, 6, Oil Pump Gear & Lock Nut

To remove retaining nut, lock gear using gear holder (P/N 290 277 905).

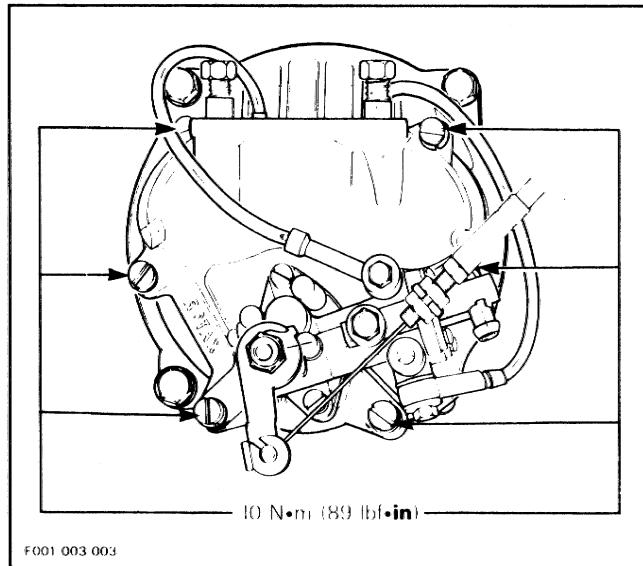


ASSEMBLY

10, Screw

Torque to 10 N•m (89 lbf•in).

▼ **CAUTION:** Whenever oil injection lines are removed, always make the routing as shown.



ADJUSTMENTS

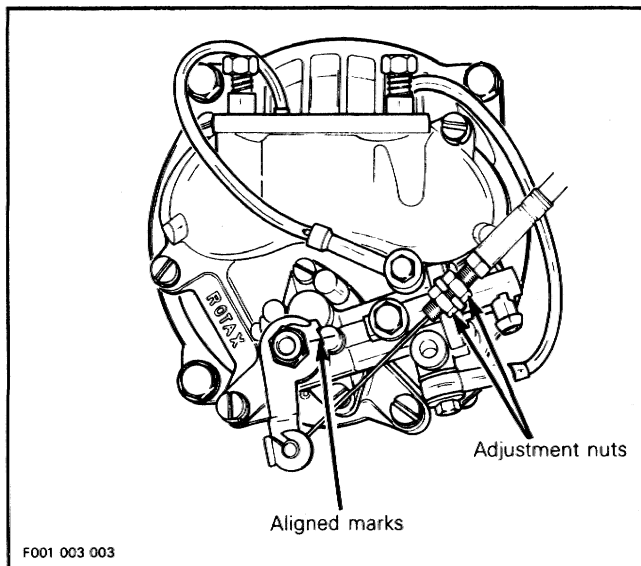
Synchronization

▼ **CAUTION** : As oil injection pump adjustment is dependant on throttle cable position, make sur to perform throttle cable adjustment first.

Eliminate throttle cable free-play bby depressing throttle lever until a slight resistance is felt. In this position, marks on pump body and lever must align.

○ **NOTE** : A mirror may be used to facilitate this verification.

If necessary, turn cable nuts to obtain pump mark alignment.



Tighten adjustment nuts and recheck alignment marks.

▼ **CAUTION** : Proper oil injection pump adjustment is very important. Any delay in the opening of pump can result in serious engine damage.

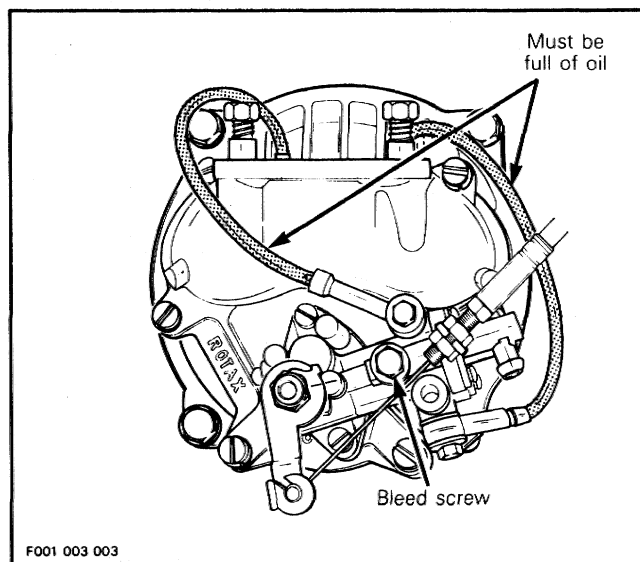
Bleeding

▼ **CAUTION** : Oil injection system must be bled and ajustment checked before operating engine.

Ensure oil injection reservoir is sufficently filled.

Install a dry rag below oil injection pump.

Remove bleed screw to allow oil to flow.



Keep flowing until all air has escaped from line. Make sure no air bubbles remain in oil feed line.

Re-install and tighten bleed screw.

Wipe any oil spillage.

Check small oil lines between pump and intake manifold. They must be full of oil.

If not, engine at idle speed while manually holding pump lever in fully open position. Do not activate throttle lever.

▼ **CAUTION** : Water must be supplied to cool engine with flush kit P/N 295 000 038.

CHECKING OPERATION

On Watercraft

○ **NOTE** : Main oil line must be full of oil. See bleeding procedure above.

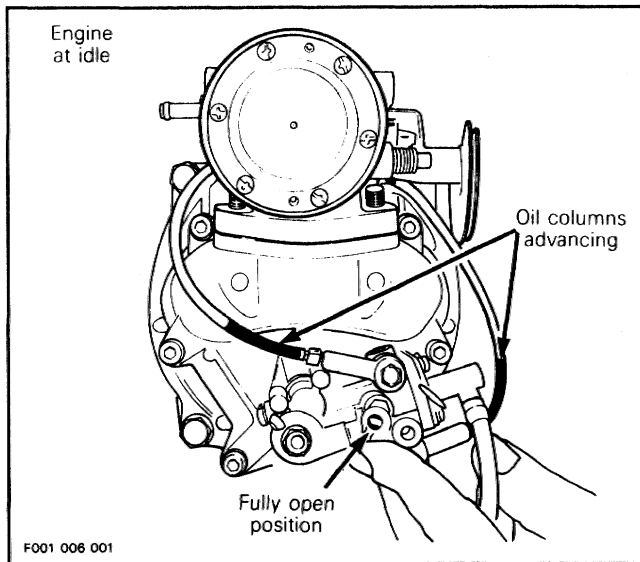
Unbolt banjo fittings from pump. Strat engine and stop it as soon as it fires.

Check that oil level in small oil lines is passed banjo fitting en by about 25 mm (1 in) (this will be indicated by a clear section of small oil lines of about 25 mm (1 in). Repeat the procedure until this condition is attained.

Reconnect banjo fittings with a washer on each side, start engine and run at idle while holding the pump lever in fully open position. Oil columns must advance into small oil lines.

Section 06 OIL SYSTEM

Sub-Section 01 (REPAIR & ADJUSTMENT)

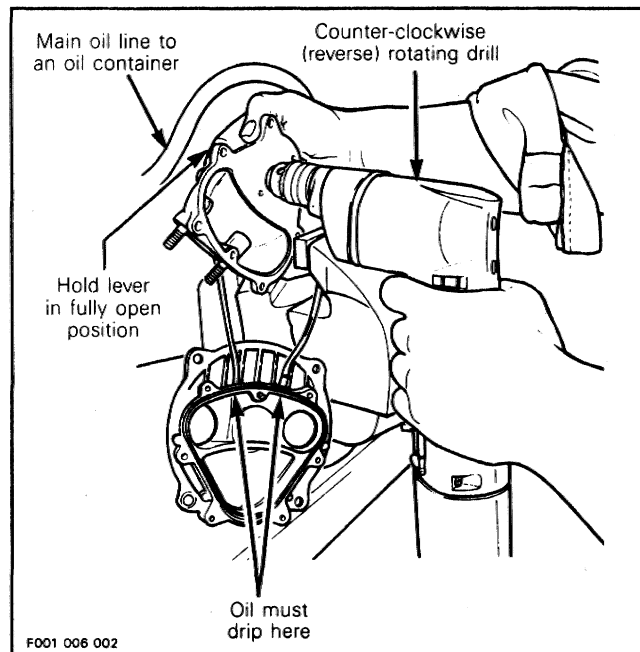


If not remove pump assembly and check the pump gear and drive shaft (if applicable) for defects, replace as necessary. Test pump as describes below.

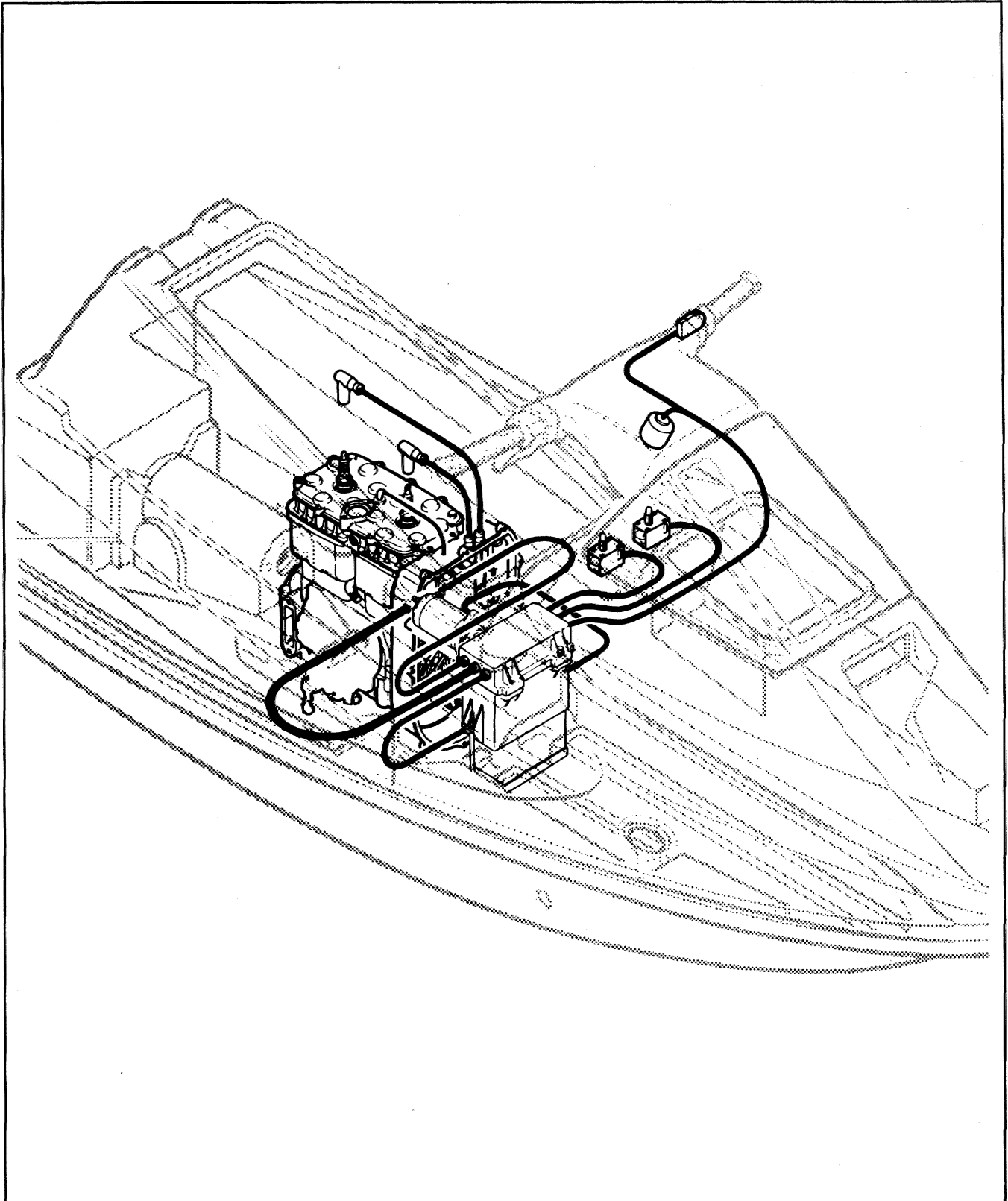
○ **NOTE :** Through normal use, oil level must not drop in small tubes. If oil drops, verify check valve operation in banjo fittings. Replace as necessary.

Bench Test

Connect a hose filled with injection oil to main line fitting. Insert other hose end in an injection oil container. Using a counter-clockwise (reverse position) rotating drill rotate pump shaft. Oil must drip from outer holes while holding lever in a fully open position. If not replace pump.



ELECTRICAL



WIRING DIAGRAM

WIRING COLOR CODES

First color of a wire is the main color. Second color is the tracer color.

Ex: YELLOW/BLACK is a YELLOW wire with a BLACK tracer.

Some wires have a colored-identification tube near wire terminal. On wires having such a tube, tube color (NOT wire color) will be used.

Ex: A BLUE wire with a yellow identification tube is referred as a YELLOW wire.

Color Codes

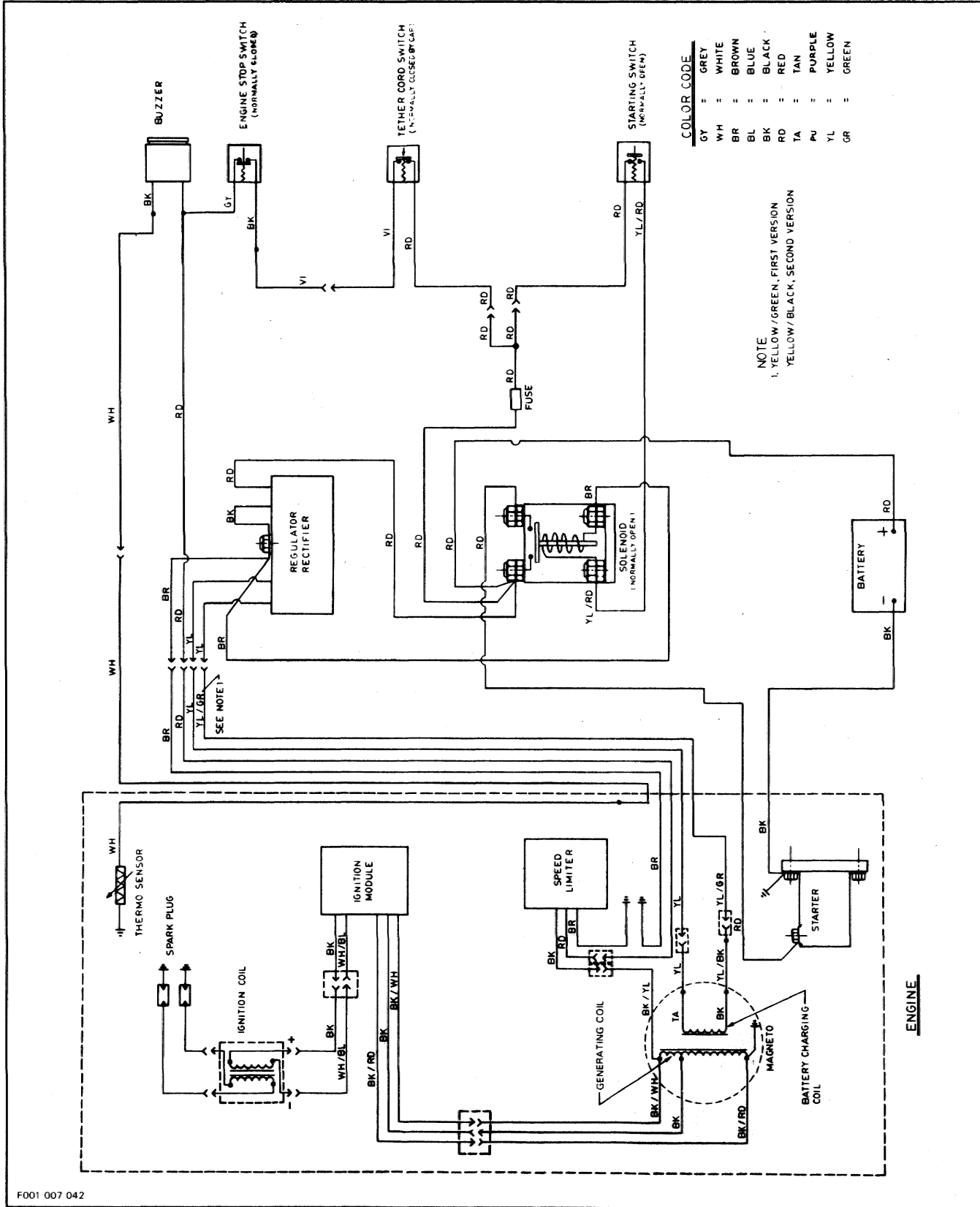
YL = YELLOW
BK = BLACK
BR = BROWN
BL = BLUE
GN = GREEN
GY = GREY
PU = PURPLE
RD = RED
TA = TAN
WH = WHITE

◆ **WARNING:** Ensure all terminals are properly crimped on wires and connector housings are properly fastened. Ensure electrical box is water-tight.

Section 07 ELECTRICAL

Sub-Section 01 (WIRING DIAGRAM)

WIRING DIAGRAM FOR 5802 MODEL



IGNITION TIMING

NIPPONDENSO ELECTRONIC IGNITION SYSTEM

This section is mainly divided in two parts, the first one using a top dead center gauge to **verify flywheel timing mark position**. The second one using a stroboscopic timing light to **check ignition timing**.

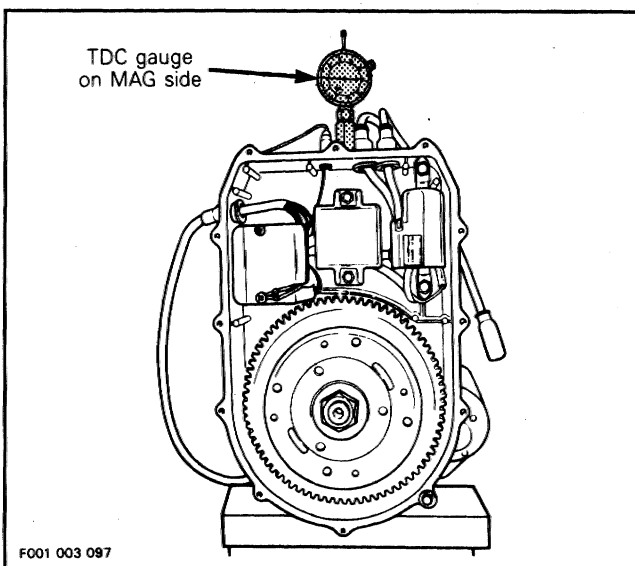
Flywheel timing mark position verification is required to :

1. Troubleshoot a missing or broken flywheel woodruff key.
2. Troubleshoot a flywheel corresponding to a different engine type.
3. Scribe the timing mark on a new service flywheel.

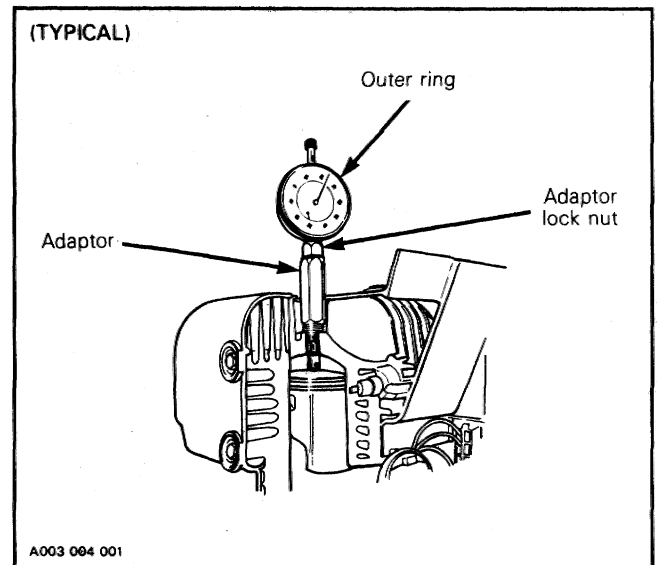
Always verify flywheel timing mark position before checking ignition timing.

Verifying Flywheel Timing Mark Position

1. Disconnect MAG side spark plug wire and remove spark plug.
2. Unfasten electrical box then move box and battery away to allow accessing ignition system.
3. Remove ignition housing cover.
4. Install and adjust a TDC gauge (P/N 295 000 065) in spark plug hole as follows :



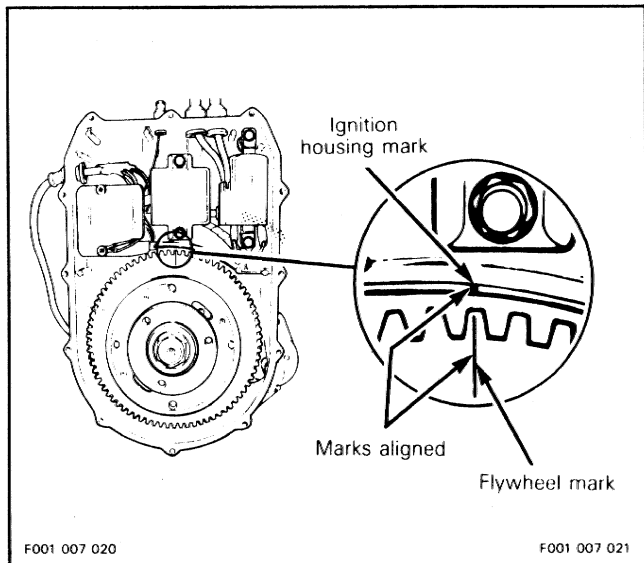
Rotate MAG flywheel clockwise (when facing it) until piston is just before top dead center.



- Loosen adaptor lock nut then holding gauge with dial face toward magneto, screw adaptor in spark plug hole.
 - Slide gauge far enough into adaptor to obtain a reading then finger tighten adaptor lock nut.
 - Rotate MAG flywheel clockwise until piston is at Top Dead Center.
 - Unlock outer ring of dial and turn it until "0" (zero) on dial aligns with pointer.
 - Lock outer ring in position.
5. From this point, rotate flywheel back 1/4 turn then rotate it clockwise to reach 2.18 mm (.086 in) BTDC (Before Top Dead Center).
 6. Check if flywheel mark align with mark on ignition housing.

Section 07 ELECTRICAL

Sub-Section 02 (IGNITION TIMING)



If marks do not align, scribe a new one onto flywheel facing ignition housing mark. This new mark becomes the reference when using stroboscopic timing light.

CAUTION : Timing mark position verification cannot be used as a timing procedure, therefore, always check the timing with a stroboscopic timing light at 6000 RPM after the marks have been checked.

Checking Ignition Timing

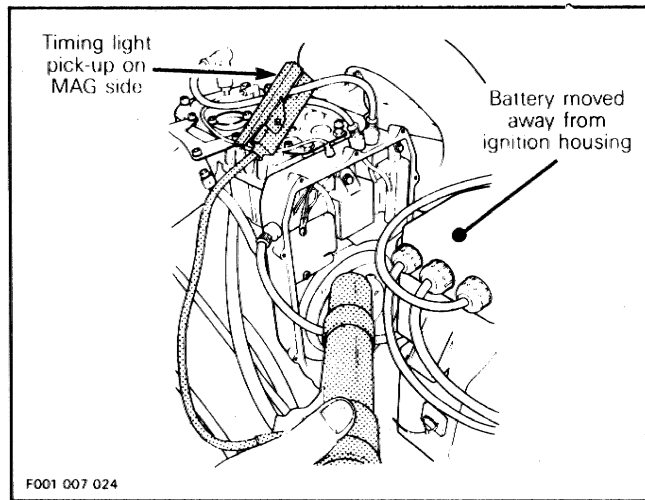
NOTE : To perform this procedure it is recommended to use a stroboscopic timing light rated to work up to 6000 RPM.

To check ignition timing, use a timing light (P/N 295 000 078).

NOTE : This timing light is battery powered (two batteries, type "C") and therefore needs no auxiliary power source.

The ignition components are affected by temperature variation, therefore, timing must be checked when engine is cold, after MAXIMUM 20 seconds idling.

1. Connect timing light pick-up to MAG side spark plug lead.



2. Connect an induction-type tachometer to spark plug wire.

3. Start engine and point timing light straight in line with ignition housing timing mark. Bring engine to 6000 RPM for a brief instant.

NOTE : On this NIPPONDENSO system, timing advance decreases as engine speed increases. When marks are aligned at 6000 RPM, spark occurrence is still before top dead center.

4. Check if flywheel mark (or reference one previously scribed) aligns with ignition housing mark.

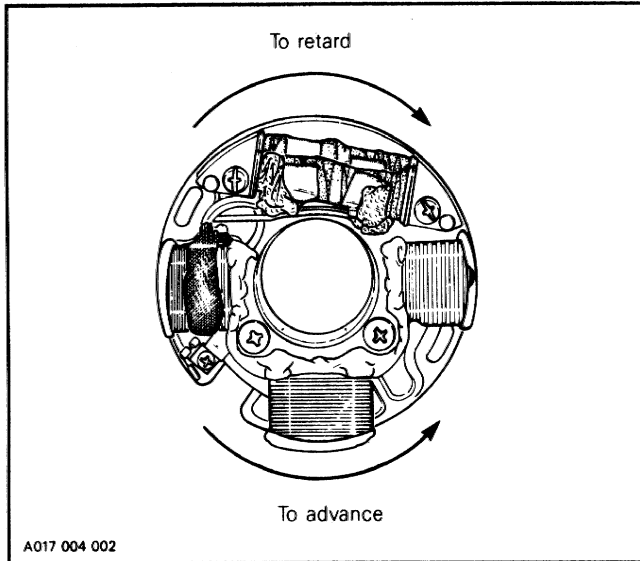
CAUTION : If engine is to be run more than a few minutes, connect flush kit (P/N 295 000 038) to properly cool engine.

If timing marks align, timing is correct.

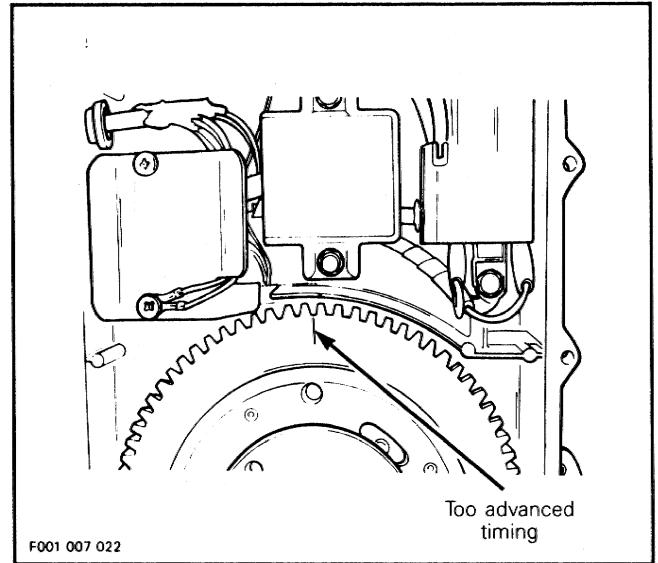
IGNITION TIMING ADJUSTMENT

Timing is performed by moving armature plate, clockwise to retard spark occurrence or counter-clockwise to advance.

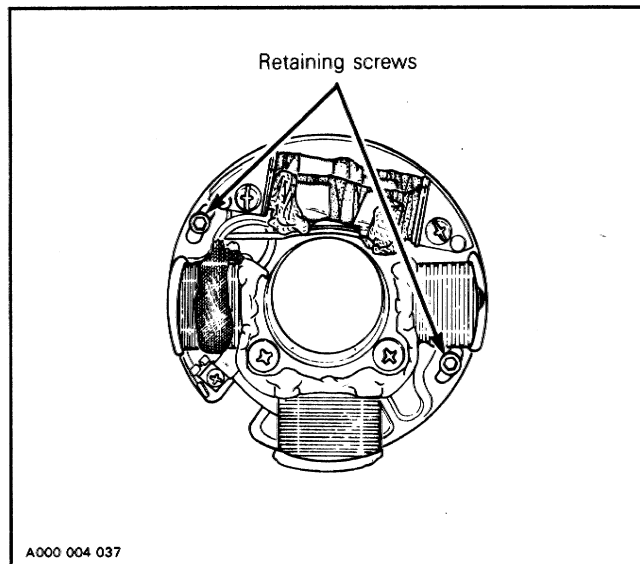
Section 07 ELECTRICAL
Sub-Section 02 (IGNITION TIMING)



To adjust, loosen both armature plate retaining screws and lightly rotate armature plate in proper direction.

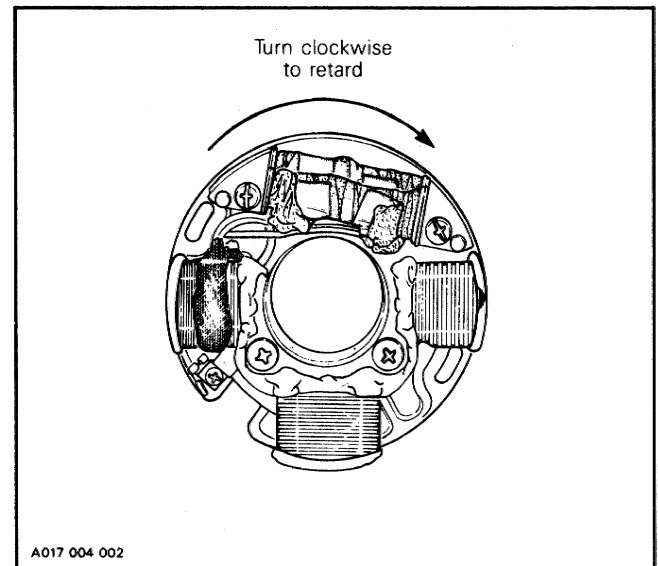


In this case, turn armature plate clockwise.



Refer to the difference between marks to determine the amount of rotation.

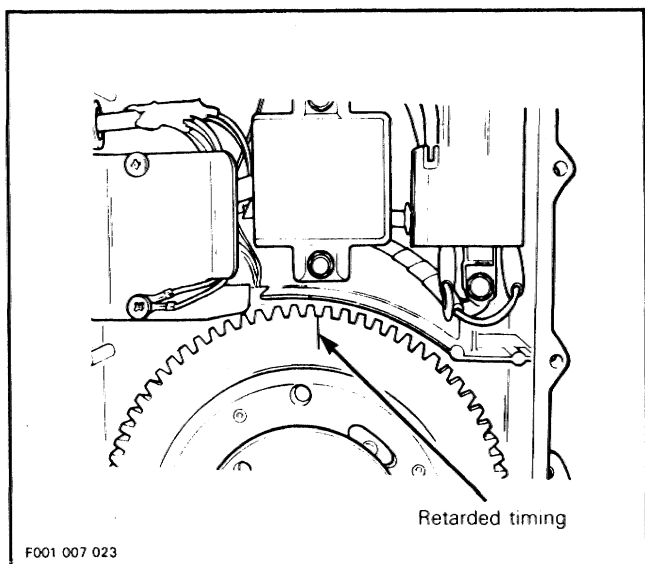
When flywheel mark is on **left** side of ignition housing mark, it indicates **advanced** timing.



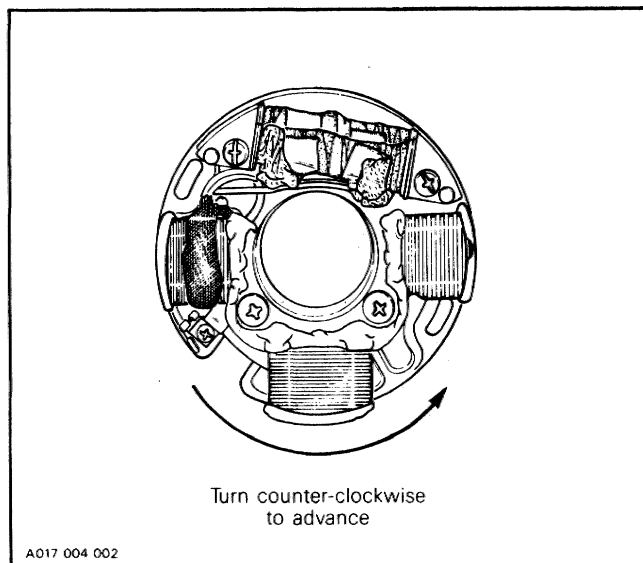
When flywheel mark is on **right** side of ignition housing mark, it indicates **retarded** timing.

Section 07 ELECTRICAL

Sub-Section 02 (IGNITION TIMING)



In this case, turn armature plate counter-clockwise.



After adjustment, tighten armature plate retaining screws.

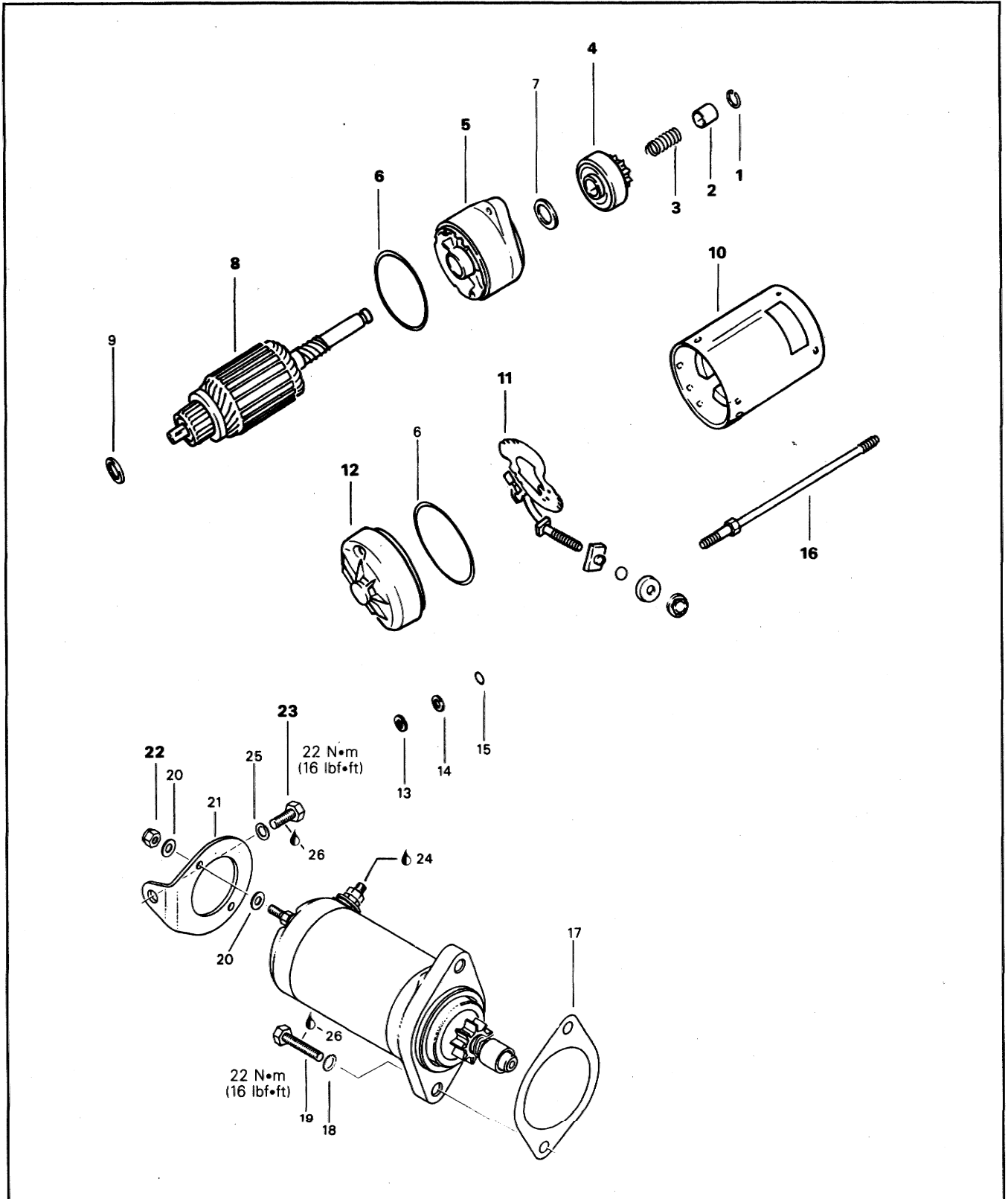
▼ **CAUTION** : Make sure armature plate screws are well secured. Armature plate screws must have Loctite 242 (blue) (P/N 293 800 002) applied before tightening.

Reinstall removed parts.

Recheck ignition timing (make sure engine is cold).

Section 07 ELECTRICAL
Sub-Section 03 (ELECTRIC STARTER)

ELECTRIC STARTER



Section 07 ELECTRICAL

Sub-Section 03 (ELECTRIC STARTER)

COMPONENTS

- | | |
|----------------------------|--------------------------------------|
| 1. Circlip | 14. Washer (2) |
| 2. Pinion stop collar | 15. Waved washer (2) |
| 3. Spring | 16. Through bolt (2) |
| 4. Starter clutch assembly | 17. Gasket |
| 5. Starter clutch housing | 18. Internal tooth lock washer 8 mm |
| 6. O-ring | 19. Hexagonal head screw M8 x 30 (2) |
| 7. Washer | 20. Washer 5 mm (4) |
| 8. Armature | 21. Starter support |
| 9. Trust washer | 22. Elastic stop nut M5 (2) |
| 10. Yoke assembly | 23. Hexagonal head screw M8 x 16 |
| 11. Brush holder | 24. Grease "dielectric", 150 g |
| 12. Commutator end frame | 25. Washer 8 mm (2) |
| 13. O-ring (2) | 26. Loctite 242 (blue) |

TROUBLESHOOTING

Causes of troubles are not necessarily related to starter but may be due to a faulty battery, switches, electrical cables and/or connections. Consult the following troubleshooting table.

◆ **WARNING** : Short circuiting electric starter is always a danger, therefore disconnect the battery ground cable before carrying out any kind of maintenance on starting system. Do not place tools on battery.

Section 07 ELECTRICAL
Sub-Section 03 (ELECTRIC STARTER)

STARTING SYSTEM TROUBLESHOOTING TABLE

SYMPTOM	CAUSE	REMEDY
Starter does not turn.	Burnt fuse. Poor contact of starter switch contact points. Open circuit between starter switch and solenoid switch.	Check wiring condition and replace fuse. Repair or replace switch. Repair.
Starter turns ; but does not crank the engine.	Burnt or poor contact of solenoid switch contact disc. Poor contact of brush. Burnt commutator. Commutator mica too high. Shorted armature. Weak brush spring tension. Weak magnet Worn bushings. Weak battery. Shorted battery cell(s). Poor contact of battery terminal(s). Poor battery ground cable connection.	Replace solenoid switch. Straighten commutator and brush. Turn commutator in lathe. Undercut mica. Repair or replace armature. Replace spring. Replace yoke assembly. Replace bushings. Recharge battery. Replace battery. Clean and tighten terminal(s). Clean and tighten.
Starter turns, but overrunning clutch pinion does not mesh with ring gear.	Worn clutch pinion gear. Defective clutch. Poor movement of clutch on splines. Worn clutch bushing. Worn starter bushing(s). Worn ring gear.	Replace clutch. Replace clutch. Clean and correct. Replace clutch. Replace bushing(s). Replace ring gear.
Starter motor keeps running.	Shorted solenoid switch winding. Melted solenoid switch contacts. Starter switch returns poorly. Sticking or defective starter clutch.	Replace solenoid switch. Replace solenoid switch. Replace starter switch. Lubricate or replace.

Section 07 ELECTRICAL

Sub-Section 03 (ELECTRIC STARTER)

REMOVAL

Unfasten electrical box from hull.

Disconnect black cable ground connection from battery.

◆ **WARNING** : Always disconnect ground cable first and connect last.

Disconnect red cable connection from battery.

Withdraw battery and move electrical box away.

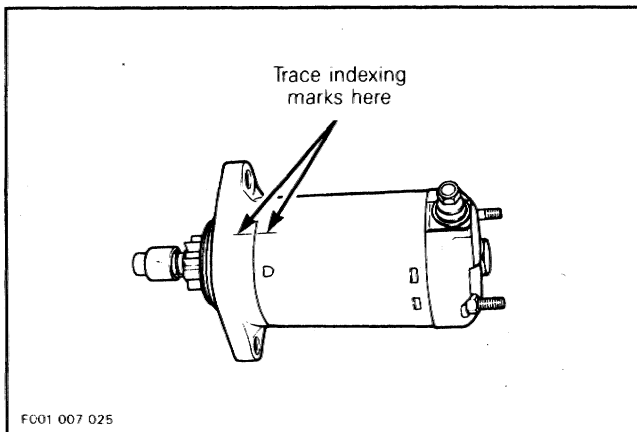
Remove the following parts.

- Ignition housing cover.
- MAG flywheel.
- Armature plate.
- Tuned pipe.
- Cables from starter.
- Screw of starter rear support (item #23).
- Ignition housing with starter.

DISASSEMBLY

10,11,12,16,22, Yoke, Brush Holder, End Frame, Through Bolt & Nut

Before disassembling, trace index marks on yoke and clutch housing to ease further assembly.



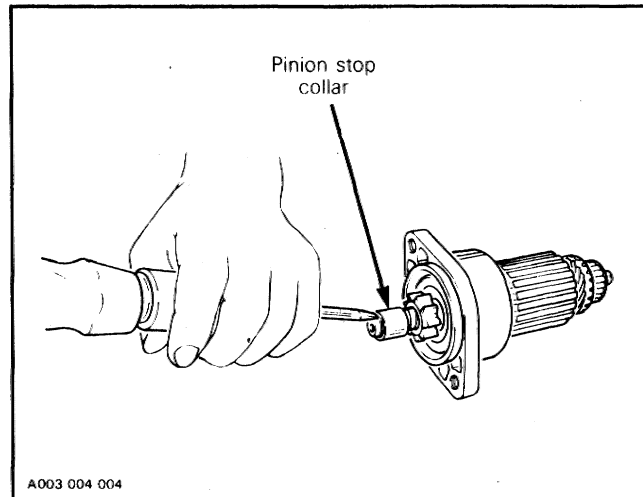
Remove starter support nuts then through bolts. Separate end frame from yoke. Withdraw yoke from armature.

Brush holder can be removed from end frame by unscrewing nut retaining terminal.

Check that the radial play between the armature shaft and end frame is not greater than 0.20 mm (.008 in). Replace end frame if so.

1,2,3, Snap Ring, Pinion Stop Collar & Spring

Tap the pinion stop collar using a screwdriver. Remove circlip. Disassemble pinion stop collar and spring.



4,5,6,8, Clutch Ass'y, Housing, O-ring & Armature

Turn assembly counter-clockwise to remove it from armature assembly.

Pull housing from armature.

CLEANING

▼ **CAUTION** : Yoke ass'y and drive unit assembly must not be immersed in cleaning solvent.

Discard all O-rings and gasket.

Clean brushes and holders with a clean cloth soaked in solvent. Brushes must be dried thoroughly with a clean cloth.

Blow brush holders clean using compressed air.

◆ **WARNING** : Always wear safety goggles when using compressed air.

Remove dirt, oil or grease from commutator using a clean cloth soaked in suitable solvent. Dry well using a clean, dry cloth.

Clean engine starter gear teeth and drive unit (clutch).

○ **NOTE** : Bushings must not be cleaned with grease dissolving agents.

Immerse all metal components in cleaning solution. Dry using a clean, dry cloth.

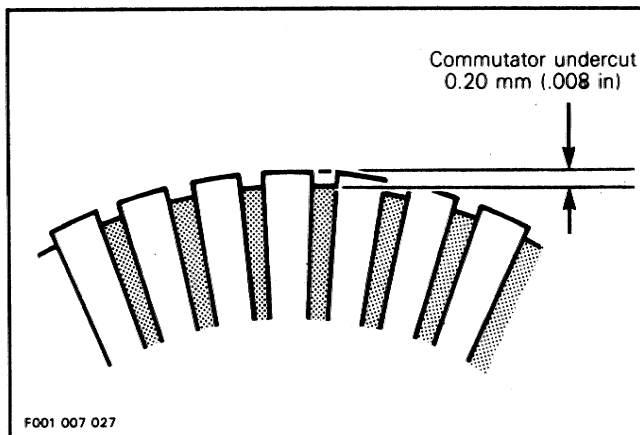
INSPECTION

Armature

○ **NOTE** : An ohmmeter may be used for the following testing procedures, except for the one concerning shorted windings in armature.

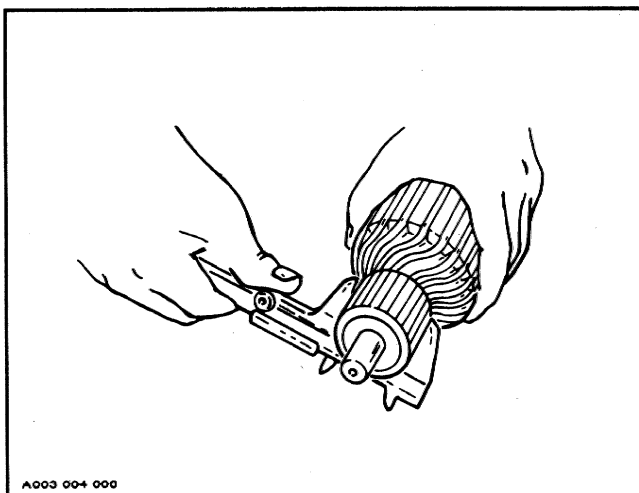
Check commutator for roughness, burnt or scored surface. If necessary, turn commutator on a lathe, enough to resurface only.

Check commutator for mica depth. If depth is less than 0.20 mm (.008 in), undercut mica. Be sure that no burrs are left and no copper dust remains between segments after undercutting operation is completed.



Check commutator out-of-round condition with V-shaped blocks and an indicator. If commutator out-of-round is more than 0.40 mm (.016 in), commutator should be turned on a lathe.

Check commutator outer diameter. If less than 30.7 mm (1.209 in), replace.



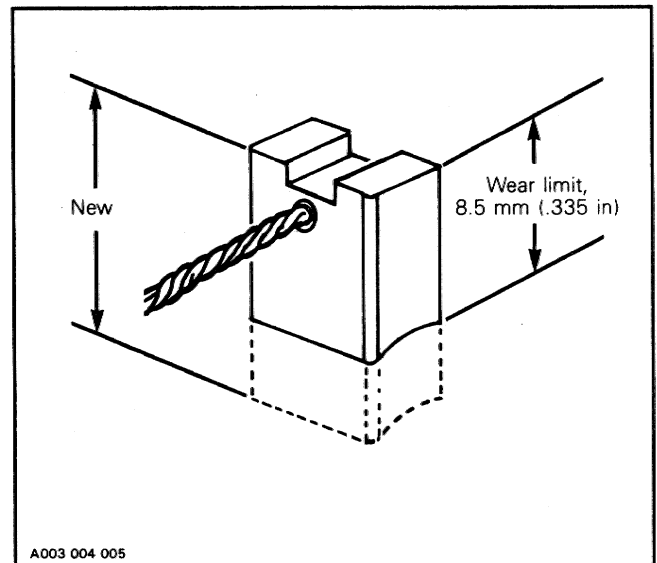
Brush Holder

Check brush holder for insulation using an ohmmeter. Place one test probe on insulated brush holder and the other test probe on brush holder plate. If continuity is found, brush holder has to be repaired or replaced.

Brush Length

Measure brush length. If less than 8.5 mm (.335 in), replace them.

○ **NOTE** : New brush length is 12 mm (.472 in).



Overrunning Clutch

Pinion of overrunning clutch should turn smoothly in clockwise direction, and should not slip in a counter-clockwise direction. If defective, replace.

Check pinion teeth for wear and damage. If defective, replace.

Starter Switch

Switch condition can be checked with an ohmmeter. Install test probes on RED and YELLOW/RED wires of switch. Measure resistance, it should be high when button is released and must be close to "0" (zero) ohms when activated.

Section 07 ELECTRICAL

Sub-Section 03 (ELECTRIC STARTER)

Solenoid Switch

Inspect connections and clean as necessary. Solenoid switch condition can be checked with an ohmmeter. Install test probes on large connectors of solenoid. Measure resistance when current is applied to small connectors; +12V on YELLOW/RED wire and -12V on BROWN wire. If it is more than a few ohms, replace solenoid switch.

IMPORTANT: No current must be present on large cables when using ohmmeter, otherwise meter could be damaged.

ASSEMBLY

Reverse the order of disassembly to reassemble starter. However, attention should be paid to the following operations.

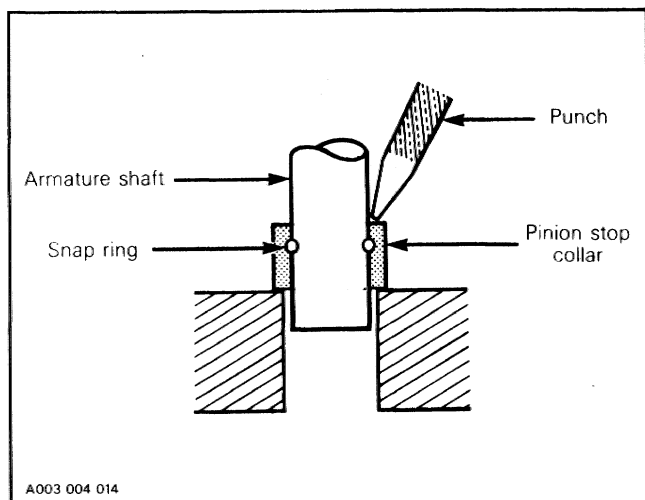
Prior to assembling, coat sliding surfaces on armature shaft splines, overrunning clutch and bushing with G.E. Versilube G 314 M lubricant or equivalent.

Apply motor oil on metal bushings.

1,2, Circlip & Pinion Stop Collar

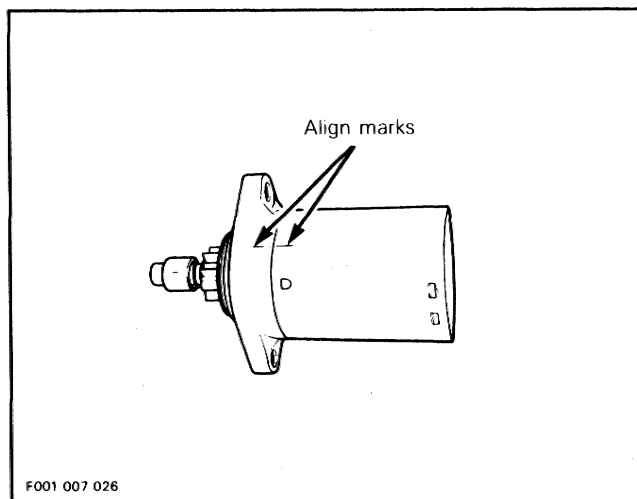
After placing stop collar on armature shaft, fit circlip into armature shaft, then make sure that it is properly secured.

Slide stop collar over circlip and secure in place by punching it at two or three places.



5,10, Housing & Yoke ass'y

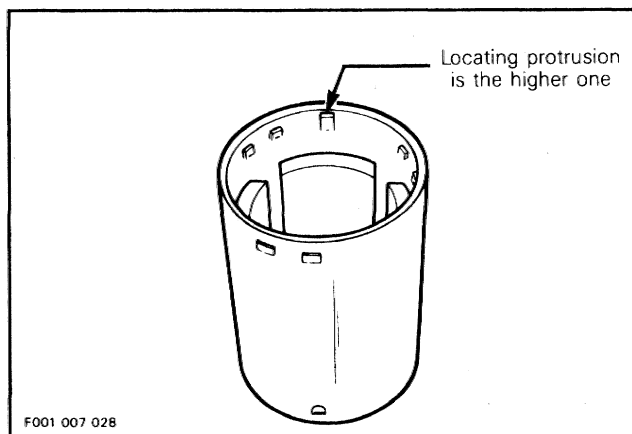
Align previously traced indexing marks.



10,12,16, Yoke ass'y, End Frame & Through Bolt

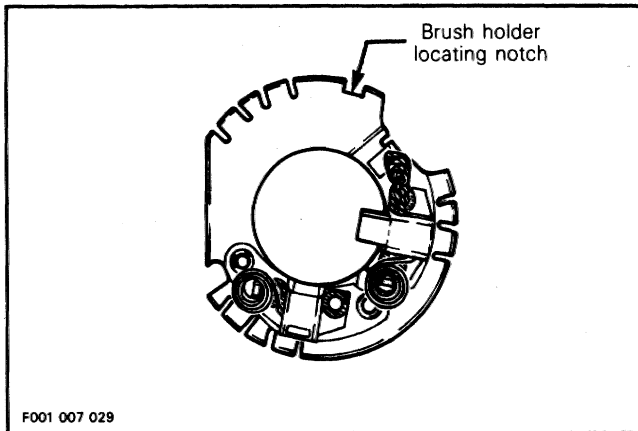
Open brushes and slide over commutator.

Align yoke locating notch with yoke locating protrusion and properly sit brush holder into yoke.

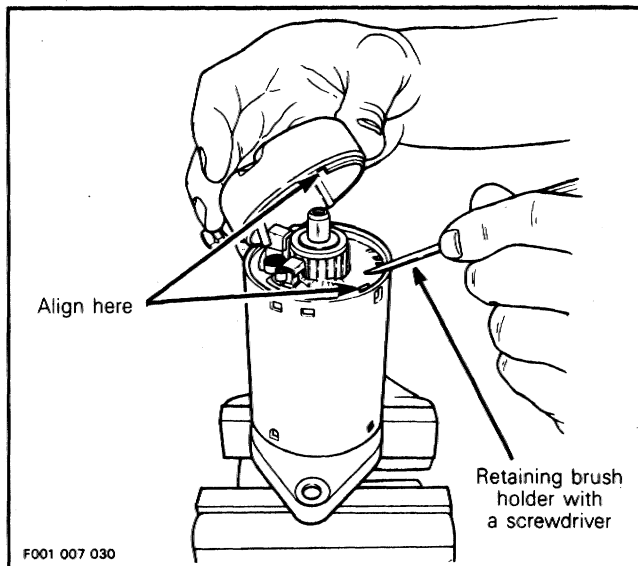


Section 07 ELECTRICAL

Sub-Section 03 (ELECTRIC STARTER)



To ease end frame installation, retain brush holder with a small screwdriver while installing end frame.



Align end frame notch with brush holder notch/yoke protrusion.

▼ **CAUTION:** Make sure end frame fits perfectly on yoke.

INSTALLATION

Make sure that starter and engine mating surfaces are free of debris. Serious trouble may arise if starter is not properly aligned.

Install starter and torque screws to 22 N•m (16 lbf•ft).

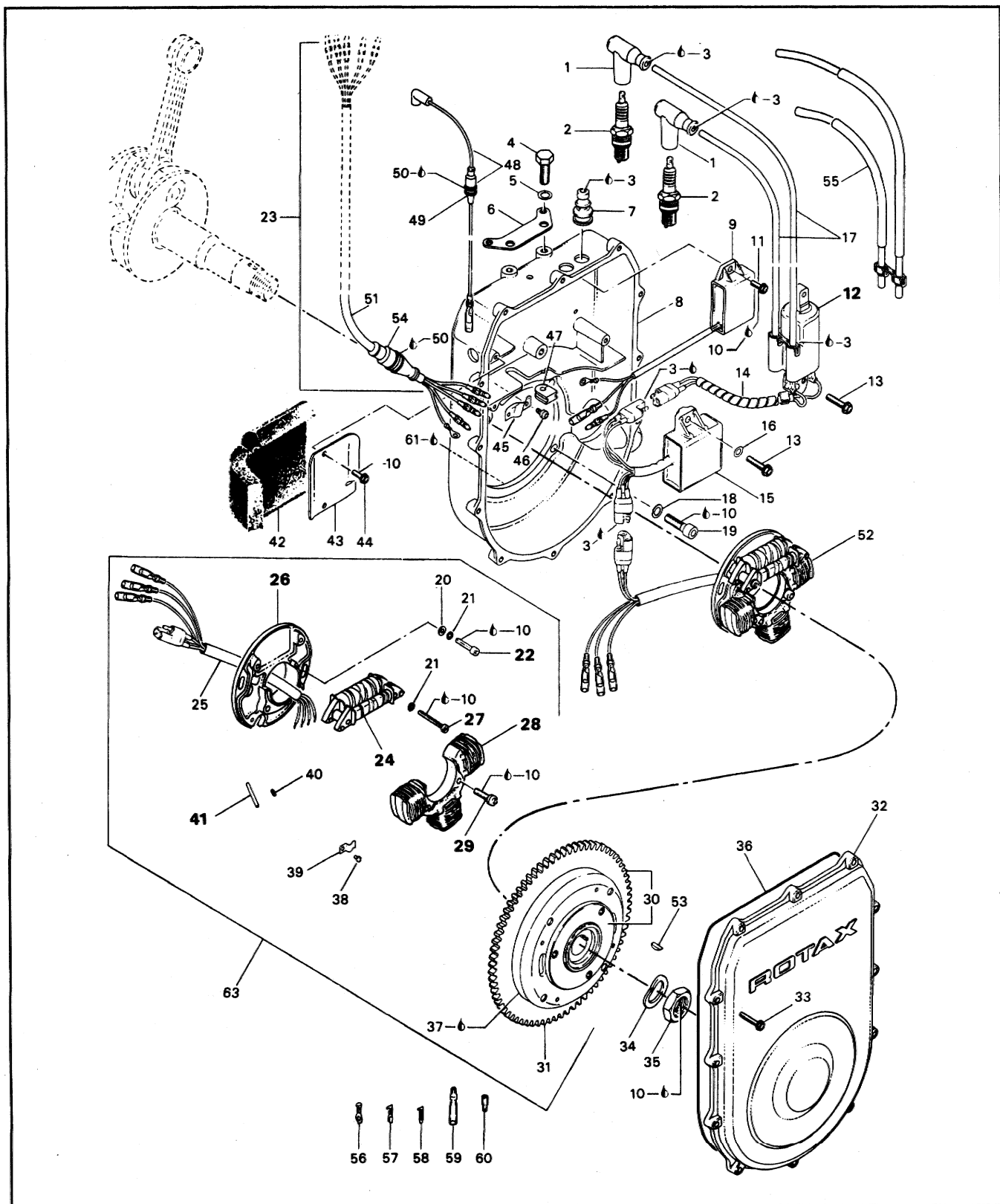
Connect the red battery cable to the starter.

Then connect black cable to starter.

◆ **WARNING:** Always connect red positive cable first then black ground cable last. Whenever connecting the red positive cable to the starter motor make sure the battery cables are disconnected to prevent electric shock.

Section 07 ELECTRICAL
Sub-Section 04 (MAGNETO SYSTEM)

MAGNETO SYSTEM, REPAIR



Section 07 ELECTRICAL

Sub-Section 04 (MAGNETO SYSTEM)

COMPONENTS

1. Spark plug protector (2)
2. Spark plug (2)
3. Grease "dielectric", 150 g
4. Hexagonal head screw M8 x 20 (2)
5. Lock washer 8 mm (2)
6. Bracket
7. Protection cap (2)
8. Ignition housing
9. Speed limiter
10. Loctite 242, 10 mL
11. Screw taptite M5 x 12 (2)
12. Ignition coil
13. Screw taptite M6 x 25 (4)
14. Helical tape 130 mm
15. Amplifier box
16. Washer 6 mm (2)
17. Spark plug cable
18. Lock washer 8 mm (4)
19. Allen screw M8 x 25 (4)
20. Washer 5.5 (2)
21. Lock washer 5 mm (4)
22. Allen screw M5 x 18 (2)
23. Harness light assembly
24. Generating coil
25. Harness ass'y
26. Armature plate
27. Slotted head screw M5 x 35 (2)
28. Battery charging coil
29. Screw M6 x 25 (2)
30. Magneto flywheel ass'y
31. Starter gear 77 teeth
32. Ignition cover
33. Combined screw M6 x 5 (12)
34. Lock washer 22 mm
35. Hexagonal nut M22
36. O-ring
37. Loctite 271, 10 mL
38. Combined screw M4 x 8
39. Cable clamp
40. Splice connector (6)
41. Shrink tube 30 mm (6)
42. Protection mat
43. Protection cover
44. Screw taptite M5 x 12 (2)
45. Holding strip
46. Screw taptite M4 x 8 (2)
47. Cable grommet
48. Sensor wire with plug assembly
49. Grommet
50. Silicone 732 RTV, 90 mL
51. Harness (without connector)
52. Armature plate assembly
53. Woodruff key 3 x 3.7
54. Grommet
55. High tension cable set
56. Ring terminal (2)
57. Female connector 3.96 (4)
58. Male connector 3.96 (4)
59. Insulation sheath
60. Insulation sheath
61. Loctite 515 & primer N

REMOVAL

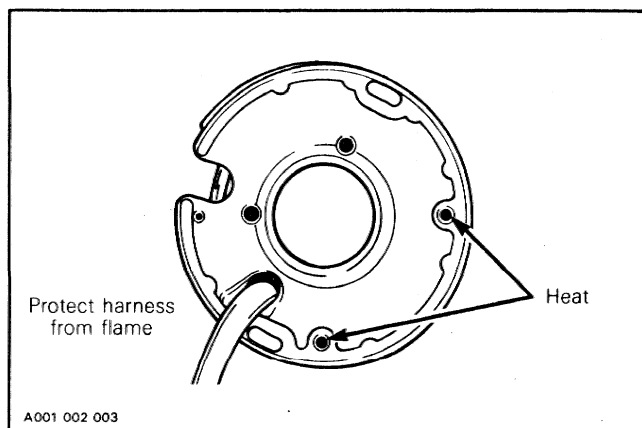
Refer to "ENGINE" under "FLYWHEEL & MAGNETO", section 02-04 for parts removal.

DISASSEMBLY

24, Generating Coil

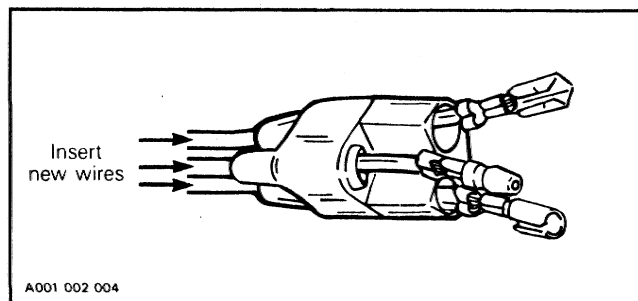
To replace generating coil :

- Heat the armature plate to 150°C (300°F) around the screw holes to break the Loctite bond.



CAUTION : Protect harness from flame.

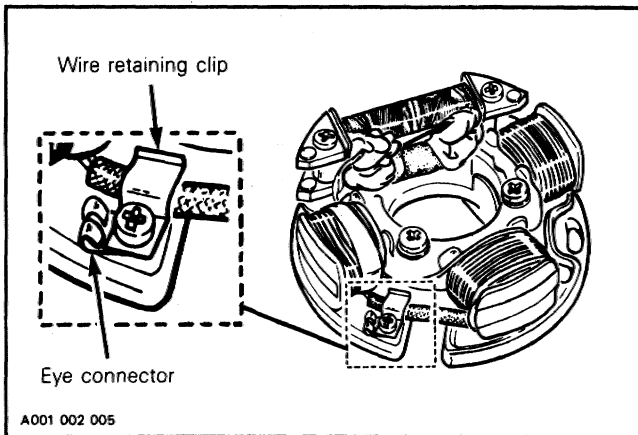
- Remove screws.
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



CAUTION : Replace the old wires in the connector with the same color coded new wires.

Section 07 ELECTRICAL
Sub-Section 04 (MAGNETO SYSTEM)

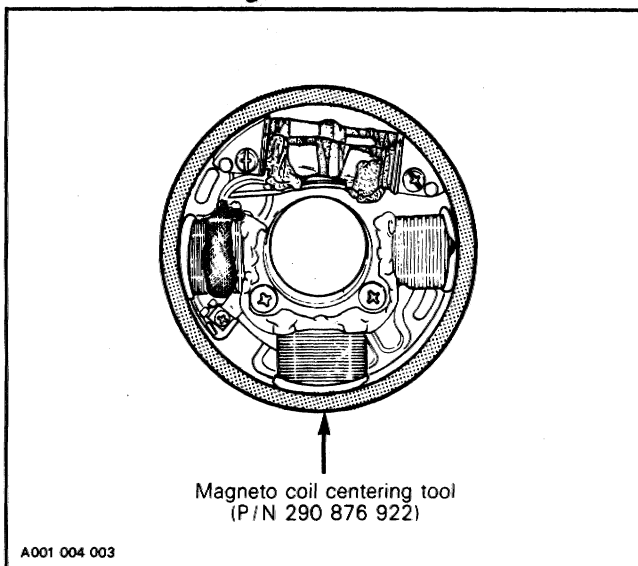
- Install a new receptacle connector to the black / yellow striped wire.
- To install the ground connector to the armature plate, tape the new black lead to the old one and pull it under the lighting coil with the old wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



24,27, Generating Coil & Screw

To install the new coil on the armature plate, remove the shipping nuts from the new coil and apply Loctite 242 (blue, medium strength) to screws before assembly.

Use magneto coil centering tool (P/N 290 876 922) and install so that it fits around armature plate before tightening screws.

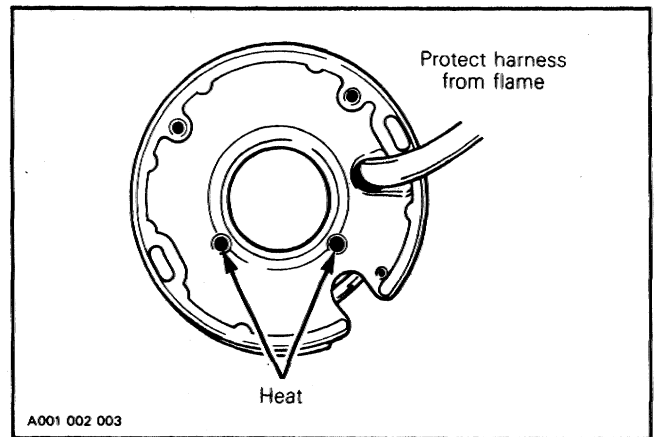


CAUTION: Before reinstalling the magneto, remove the loose epoxy from harness.

29, Battery Charging Coil

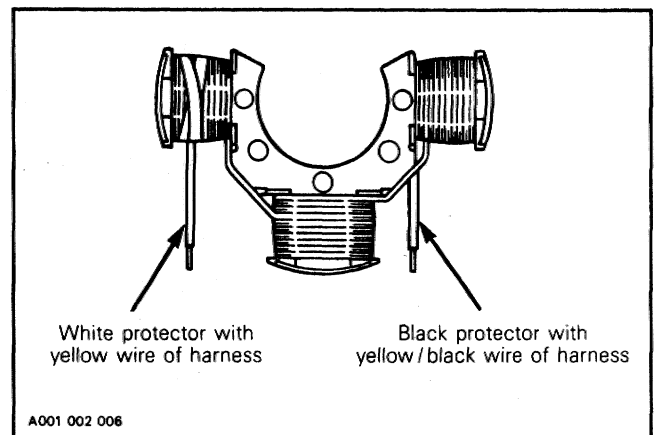
To replace battery charging coil :

- Heat the armature plate to 150°C (300°F) around the screw holes to break the Loctite bond.



CAUTION: Protect harness from flame.

- Remove screws.
- Remove the wire retaining clip from armature plate.
- Pull out protector tubes and unsolder the splice connectors.
- Solder the yellow wire in the harness to the white tube protected wire of the coil.
- Solder the yellow / black striped wire in the harness to the black tube protected wire of the coil.



41, Protector Tube

Position protector tubes over connections.

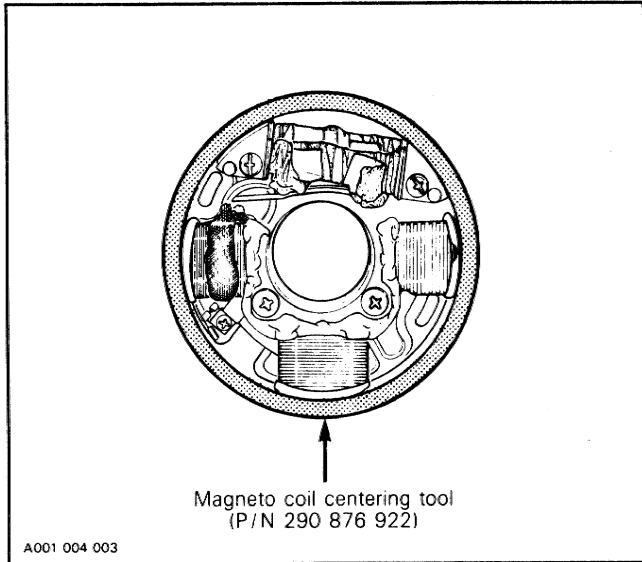
Section 07 ELECTRICAL

Sub-Section 04 (MAGNETO SYSTEM)

10,29, Screw & Battery Charging Coil

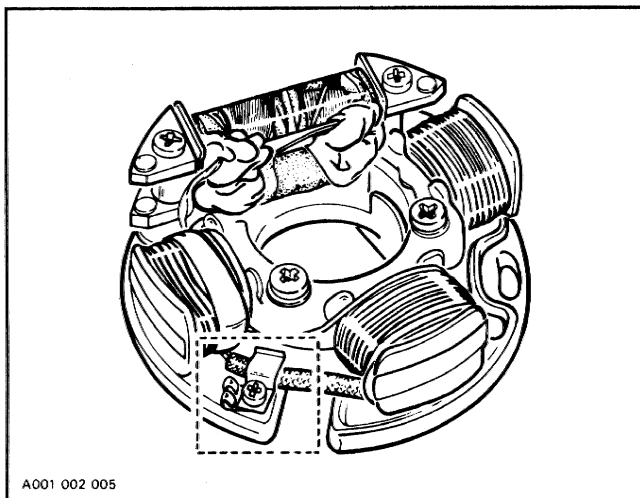
Prior to assembly, apply Loctite 242 (blue, medium strength).

Use magneto coil centering tool (P/N 290 876 922) and install it so that it fits around armature plate before tightening screws.



— Fasten retaining clip onto protector tubes.

The ground terminal from generating coil must be fastened under this clip.



▼ **CAUTION** : Before reinstalling magneto, remove the loose epoxy from harness.

ASSEMBLY

○ **NOTE** : Always apply dielectric grease on all electrical connections.

22,26, Screw & Armature Plate

Position the armature plate on the crankcase, aligning the marks on both parts.

Put a drop of Loctite 242 on screw threads and tighten.

12, Ignition coil

When connecting wires to ignition coil, connect BLACK wire with " + " symbol underneath coil and WHITE/BLUE wire with " - " symbol.

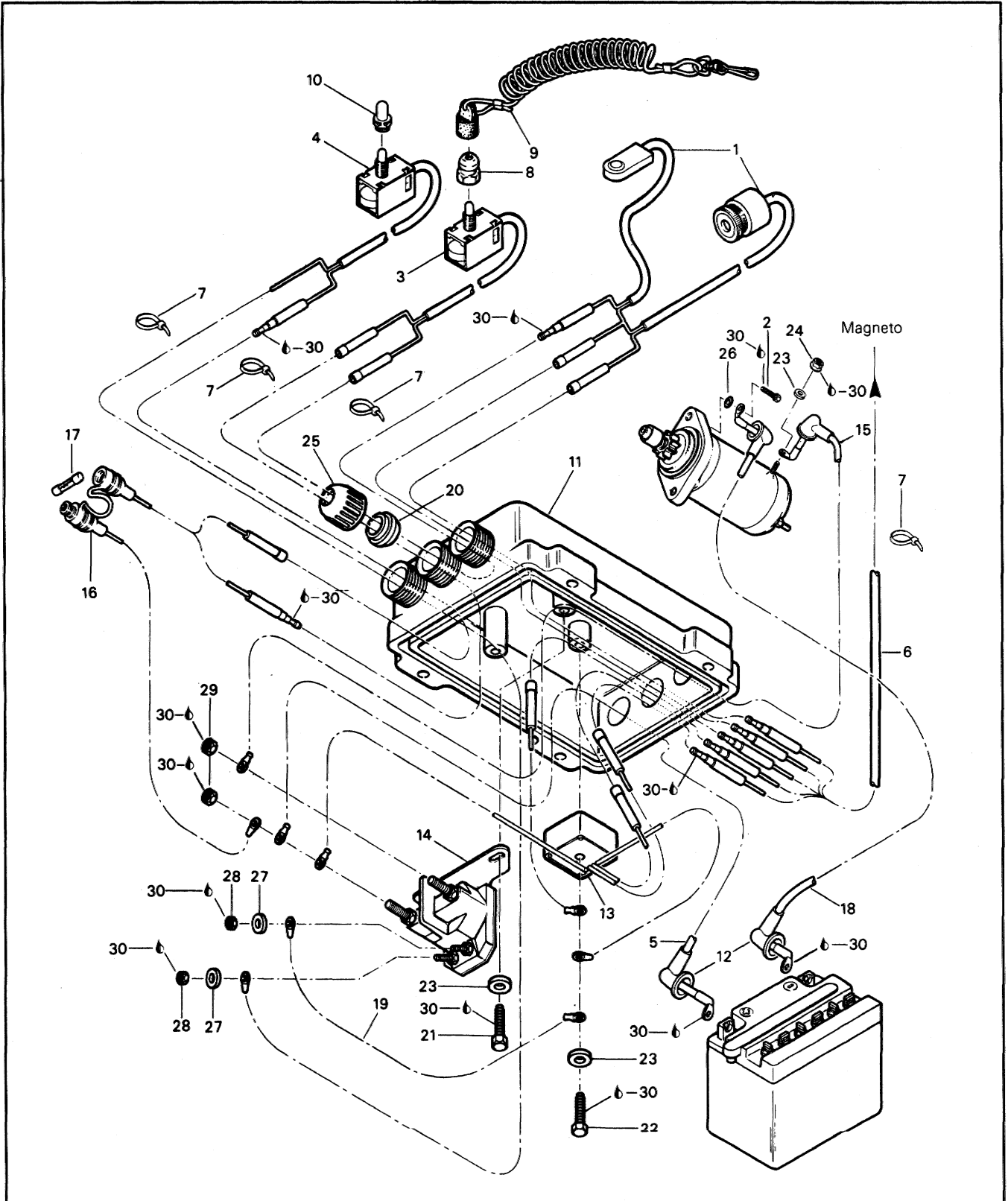
INSTALLATION

Refer to "ENGINE" under "FLYWHEEL & MAGNETO" section 02-04 for parts installation.

Perform ignition timing.

Section 07 ELECTRICAL
Sub-Section 05 (CDI & CHARGING SYSTEMS)

CDI & CHARGING SYSTEMS; TESTING PROCEDURES



Section 07 ELECTRICAL

Sub-Section 05 (CDI & CHARGING SYSTEMS)

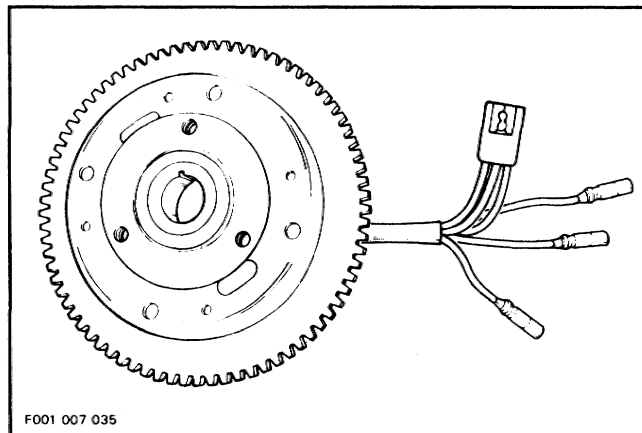
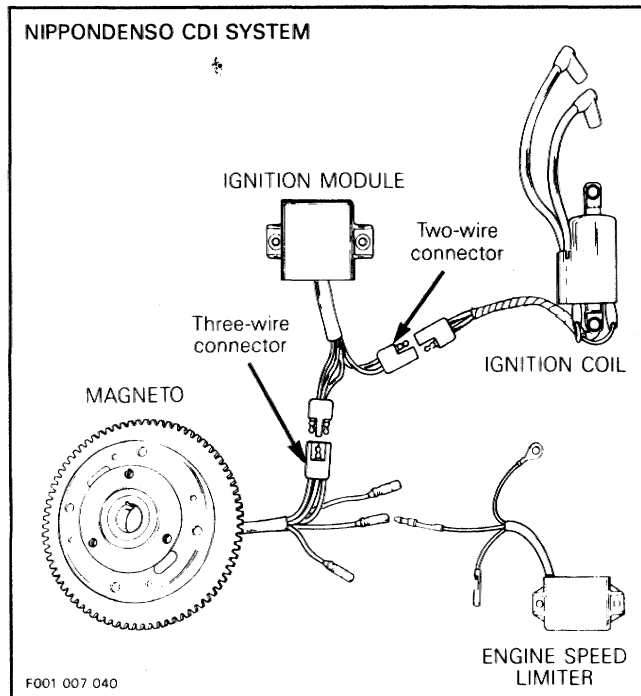
COMPONENTS

1. Buzzer and stop switch assembly
2. Hexagonal head screw M8 x 30 (2)
3. Safety ignition switch
4. Ignition switch-starter
5. Current wire (positive) red cable
6. Wiring harness
7. Tie rap
8. Switch nut
9. Cap assembly
10. Cap
11. Cover
12. Protector cap (2)
13. Rectifier
14. Solenoid
15. Cable starter
16. Fuse holder
17. Fuse
18. Ground cable
19. Ground cable
20. Grommet (6)
21. Self tapping screw M6.3 x 16 (2)
22. Self tapping screw M6.3 x 38
23. Washer (4)
24. Nut lock M6
25. Cap (6)
26. Internal tooth lock washer
27. Washer (2)
28. Elastic stop nut 10-32 (2)
29. Elastic stop nut 1/4-20 (2)
30. Grease "dielectric", 150 g

NIPPONDENSO IGNITION SYSTEM

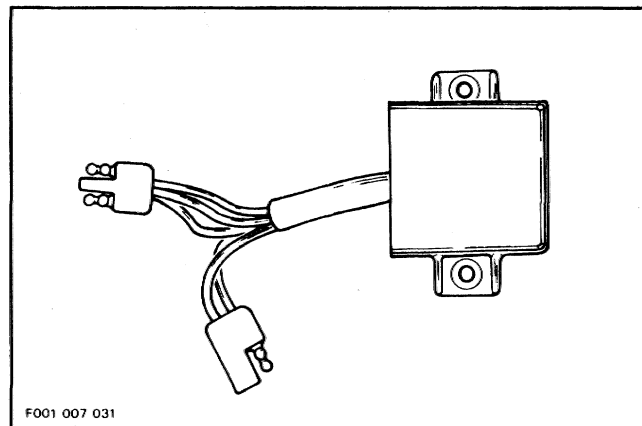
GENERAL

The Nippondenso Capacitor Discharge Ignition system includes the following components :



Ignition Module

It receives its primary electric current from magneto via a three-wire connector which charges a capacitor. It controls spark occurrence by discharging capacitor to primary winding of ignition coil.

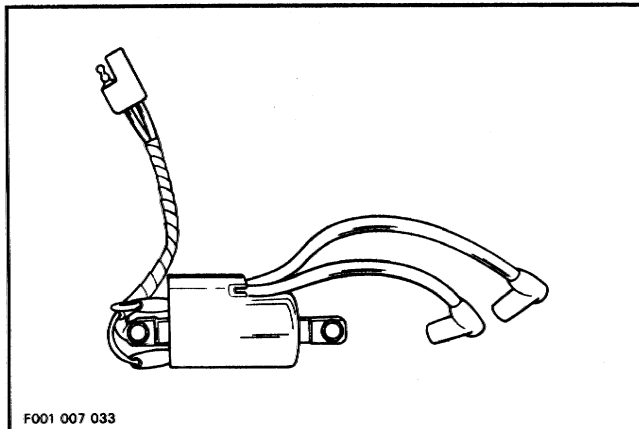


Magneto

It is the primary source of electrical energy. It transforms magnetic field into electric current through a low speed and a high speed coil.

Ignition Coil

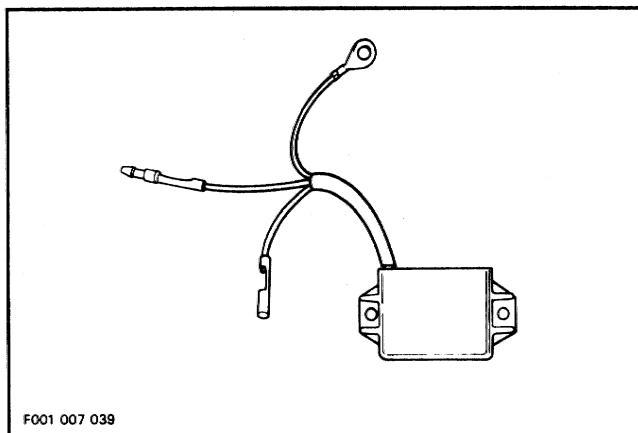
It receives its energy from ignition module via a two-wire connector. It induces voltage to a high level in secondary winding to produce a spark at spark plug.



Engine Speed Limiter

It has three functions :

- Keep high voltage away from tether cord switch.
- Provide engine stop by connecting YELLOW/BLACK wire with BROWN wire (ground).
- Limit engine RPM to prevent over-reving.



IGNITION SYSTEM TESTING PROCEDURE

When dealing with ignition problems, the following items should be verified in this order.

1. Spark occurrence/spark plug condition.
2. Battery condition.
3. Electrical connections.
4. Engine stop/tether cord switches.
5. Engine speed limiter.
6. Magneto output.
7. Ignition module output.
8. Ignition coil output.

▼ **CAUTION :** Whenever replacing a component in ignition system, check ignition timing.

The first three items can be checked with known automotive equipment and other items as follows.

Engine Stop/Tether Cord Switches Verification

Engine Stop Switch

Disconnect the BLACK and GREY wires in the electrical box. Using an ohmmeter, connect test probes to switch BLACK and GREY wires.

Measure resistance, it must be close to zero ohm in its operating position and an open circuit when depressed.

Tether Cord Switch

Disconnect the PURPLE and RED wires in the electrical box. Using an ohmmeter, connect test probes to switch PURPLE and RED wires.

Measure resistance, it must be close to zero ohm when cap is over switch and an open circuit when removed.

Engine Speed Limiter

○ **NOTE:** It is located behind ignition coil.

A defective speed limiter may cause the following problems :

- No spark.
- Uninterruption of spark when engine stop/tether cord switch is used.
- Incorrectly controlled engine max. RPM.
- Misfiring/black fouled spark plugs.

To check engine speed limitation function, run engine and check its maximum speed, it should be around 6300 ± 100 RPM. If not, replace limiter.

Cut-out switch function can be checked with an ohmmeter (preferably a digital one) as follows :

- Without voltage on RED wire, connect test probes to BLACK and BROWN wires. Note resistance. Reverse probe connections on the same wires and note resistance. Resistances should be approximately the same for both readings.
- Now, apply +12V on RED wire and -12V on BROWN wire. Keep connections firmly tightened for readings.

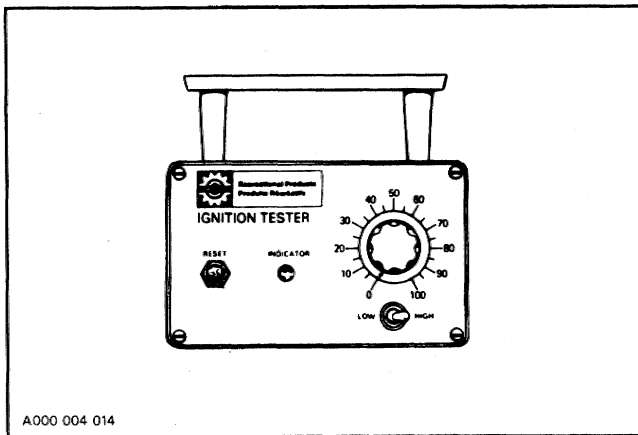
Section 07 ELECTRICAL

Sub-Section 05 (CDI & CHARGING SYSTEMS)

- Measure resistance between BLACK and BROWN wires. Note resistance. Reverse probe connections on the same wires and note resistance.
- A good speed limiter will have approximately the same resistances on both directions without voltage and a much higher resistance on one direction when voltage is applied to it.

BOMBARDIER IGNITION TESTER

The remaining items can be easily checked with Bombardier Ignition Tester (P/N 295 000 008)



For more information about operating and maintenance of the tester, refer to its instruction manual.

Use of Bombardier Ignition Tester

This tester can verify generating coil (low/high speed), ignition module, ignition coil and battery charging coil.

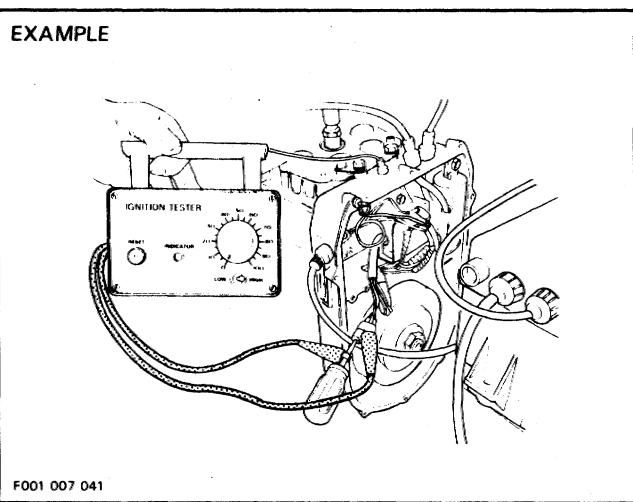
Always make sure that tester batteries are in good condition.

Test Condition

All tests are performed on watercraft at cranking speed with spark plugs installed.

Always proceed in the following order :

1. Connect tester P and N clip leads as indicated for each specific test.



2. Follow test procedure sequence.
3. Install cap over tether cord switch and depress starting button until light turns on, or otherwise, for a maximum of five seconds.

IMPORTANT : Since protection cover is removed in ignition housing to access connectors, re-install both BROWN wires to engine to complete ground circuit. Otherwise engine will not stop when engine stop button or tether cord are activated.

4. If engine starts when performing some test, allow it to idle while observing indicator. Then, shut engine off.
5. After every test that lights the indicator lamp, reset the indicator circuit by depressing the reset button.

Analysis of Test Results

Indicator lamp lights at specific setting

Output is as specified. Test results should repeat three times. If readings do not repeat, output is erratic and cause should be investigated (loose connections or components, etc.).

Indicator lamp lights at lower setting

This indicates that the output is less than that designed to operate in a satisfactory manner. However, before coming to the conclusion of a faulty condition be certain that correct engine cranking conditions were met before condemning the tested part.

Section 07 ELECTRICAL

Sub-Section 05 (CDI & CHARGING SYSTEMS)

Indicator lamp does not light

One component is defective. Proceed as instructed to find defective component.

Intermittent ignition problems

In dealing with intermittent problems there is no easy diagnosis. For example, problems that occur only at normal engine operating temperature have to be tested under similar conditions.

In most cases of temperature and/or vibration failure, only parts replacement can solve the problem as most of these failures return to normal when engine is not running.

Multiple problems

There is always the possibility of more than one faulty part. If after a component has been replaced, the problem still persists, carefully repeat the complete test procedure to find the other faulty part.

Safety Precautions

◆ **WARNING :** To prevent powerful electric shocks while cranking engine, neither touch any electronic ignition components (ignition coil, high tension wire, wire harness, etc.) nor tester lead clips. Also make sure that tester leads do not touch any metallic object.

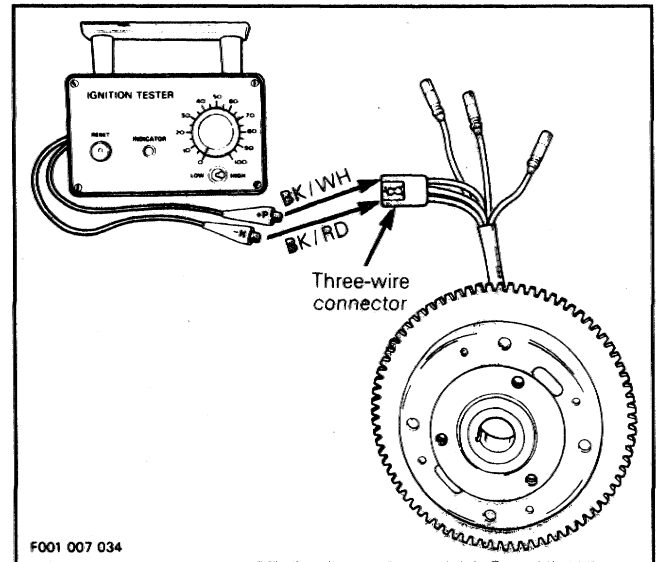
◆ **WARNING :** Ventilate bilge at least two minutes prior to performing any test.

TESTS

Magneto, High Speed Generating Coil Output

1. Disconnect three-wire connector from ignition module.
2. Connect tester wires then set switch and dial as follows :

Tester wires	Component wires	Tester switch position	Tester dial position
N	BLACK/RED of magneto harness	HIGH	85
P	BLACK/WHITE of magneto harness		



3. Perform test. Push reset button and repeat test three times.

Results

- a) Indicator lamp lights : High speed generating coil is OK. Proceed with low speed generating coil test.
- b) Indicator lamp does not light : The problem is a faulty high speed generating coil. Replace it.

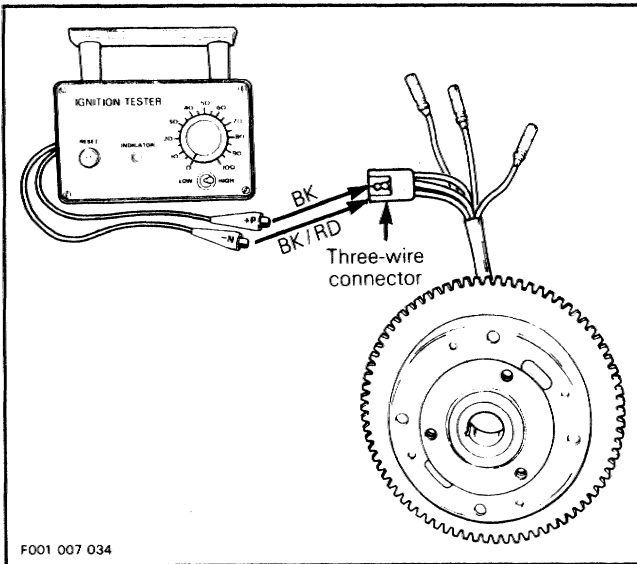
Magneto, Low Speed Generating Coil

1. Disconnect three-wire connector from ignition module harness.
2. Connect tester wires then set switch and dial as follows :

Tester wires	Component wires	Tester switch position	Tester dial position
N	BLACK/RED of magneto harness	HIGH	50
P	BLACK of magneto harness		

Section 07 ELECTRICAL

Sub-Section 05 (CDI & CHARGING SYSTEMS)



3. Perform test. Push reset button and repeat test three times.

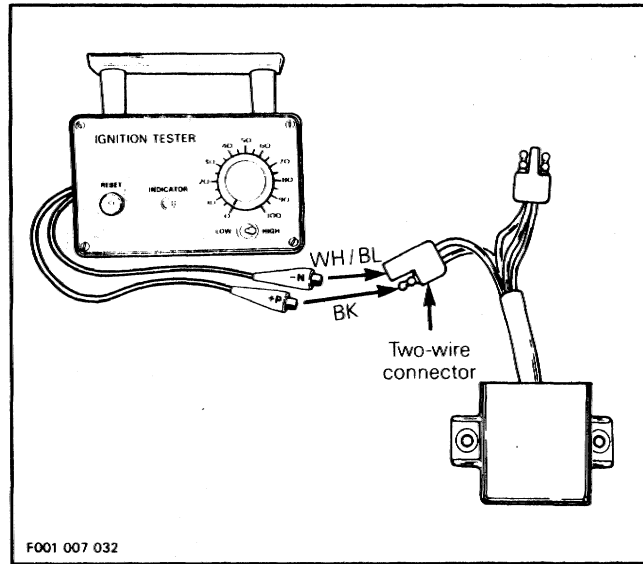
Results

- a) Indicator lamp lights : Low speed generating coil is OK. Proceed with ignition module test.
- b) Indicator lamp does not light : Low speed generating coil is faulty. Replace it.

Ignition Module

1. Separate two-wire connector between ignition module and coil.
2. Connect tester wires then set switch and dial as follows :

Tester wires	Component wires	Tester switch position	Tester dial position
N	WHITE / BLUE of ignition module	HIGH	75
P	BLACK of ignition module		



3. Perform test. Push reset button and repeat test three times.

Results

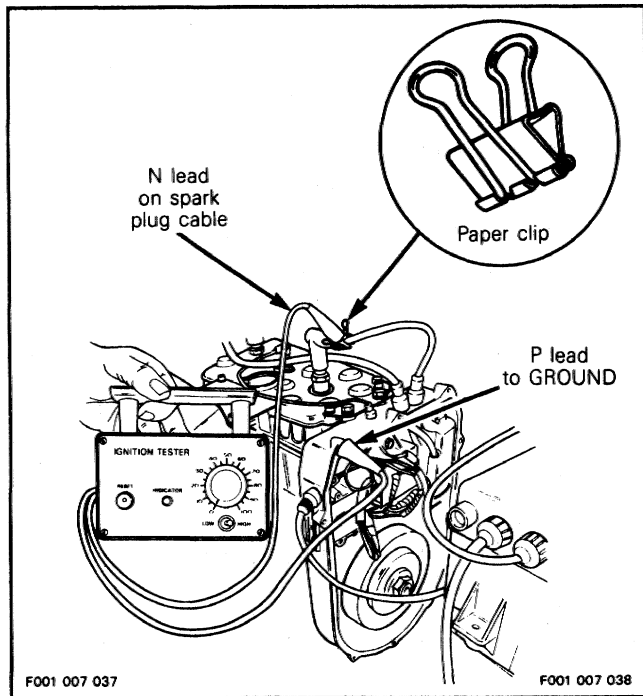
- a) indicator lamp lights : Ignition module is OK. Proceed with ignition coil test.
- b) Indicator lamp does not light : Ignition module is faulty. Replace it.

Ignition Coil Output

1. Install a test adapter such as a paper clip to spark plug cable close to MAG spark plug.
2. Connect tester wires then set switch and dial as follows :

Tester wires	Component wires	Tester switch position	Tester dial position
N	Adapter clip on spark plug	LOW	70
P	Ground		

Section 07 ELECTRICAL
Sub-Section 05 (CDI & CHARGING SYSTEMS)



3. Perform test. Push reset button and repeat test three times.

Results

- a) Indicator lamp lights : Ignition coil is OK.
- b) Indicator lamp does not light on one or both cylinder(s) : Ignition coil is faulty. Replace it.

SUMMARY TABLE

Test to perform	Tester wires	Component wires	Switch	Dial
High speed generating coil	N	BLACK / RED of magneto harness	HIGH	85
	P	BLACK / WHITE of magneto harness		
Low speed generating coil	N	BLACK / RED of magneto harness	HIGH	50
	P	BLACK of magneto harness		
Ignition module	N	WHITE / BLUE of ignition module	HIGH	75
	P	BLACK of ignition module		
Ignition coil	N	Adapter clip on spark plug	LOW	70
	P	Ground		

IGNITION COMPONENTS RESISTANCE MEASUREMENT

As an alternate method, ignition components can be checked with an ohmmeter (preferably a digital one). Proceeding by elimination, check magneto generating coils then ignition coil. If everything is OK then it is a malfunction of ignition module.

Disconnect connectors at ignition module, ignition coil and magneto junction. Check resistance or continuity between each terminal with a high-sensitivity ohmmeter. Refer to the following table for values and wire colors.

NOTE : An ignition coil with good resistance measurement can still be faulty. Voltage leak can occur at high voltage level which is not detectable with an ohmmeter.

	PART NAME	WIRE COLOR	RESISTANCE OHM (Ω)
MAGNETO	High speed generating coil	BLACK / WHITE with BLACK / RED	2.8 - 4.2
	Low speed generating coil	BLACK with BLACK / RED	120 - 180
	Insulation	Check each wire with ground for short circuit	open circuit (∞)
IGNITION COIL	Primary winding	BLACK with WHITE / BLUE	0.23 - 0.43
	Secondary winding	End of each spark plug cable	2.45 - 4.55K
	Insulation	Check each wire of primary and secondary windings with ground for short circuit	open circuit (∞)

NOTE : A short circuit will read zero (0) ohm (or close to) on ohmmeter.

Section 07 ELECTRICAL

Sub-Section 05 (CDI & CHARGING SYSTEMS)

BATTERY CHARGING SYSTEM

GENERAL

Magneto

It is the primary source of electrical energy. It transforms magnetic field into electric current through a three-pole coil. It outputs Alternating Current (AC).

Rectifier/Regulator

A full-wave rectifier receives magneto AC current and transforms it into Direct Current (DC) to allow battery charging. Battery is the DC source for electric starter, engine speed limiter and engine overheat beeper.

Included in the same unit, a regulator keeps voltage at a steady level to prevent any damage to components.

TESTING PROCEDURE

○ **NOTE** : First, ensure that battery is in good condition prior to performing the following test.

Current Test

Proceed as follows :

— Start engine.

○ **NOTE** : Start engine before connecting cables. Otherwise ammeter may be damaged as current flow is much higher at starting.

— Disconnect positive cable from battery and connect an ammeter between cable and battery post.

— Bring engine to approximately 5500 RPM.

Depending on battery charge, current reading should be approximately 5 A (Amperes). If not, check magneto output prior to concluding that rectifier is faulty.

Voltage Test

Proceed as follows :

— Start engine.

— Connect a voltmeter, set on DC volt scale, on battery posts.

— Bring engine to approximately 5500 RPM.

If voltmeter reads over 15 Volts, regulator is defective. Replace it.

○ **NOTE** : Whatever the voltmeter type used (peak voltage or RMS), the voltage must not exceed 15 V. A faulty regulator will allow voltage to exceed 15 V as engine speed is increased.

▼ **CAUTION** : During this test the battery cables must be reconnected to the battery.

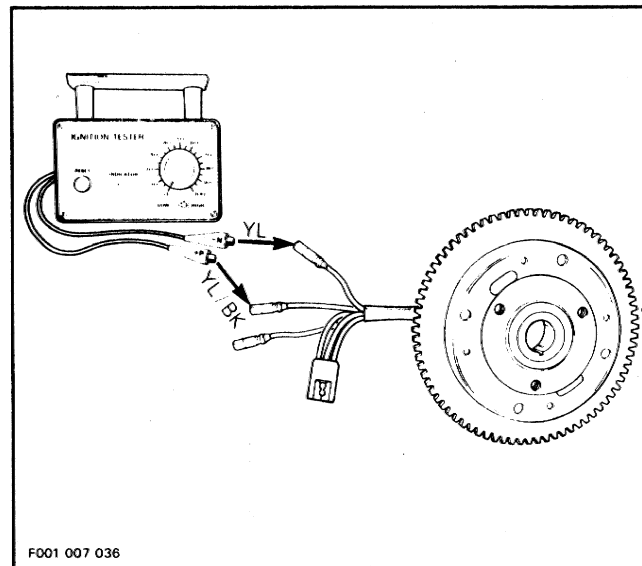
Magneto, Battery Charging Coil

With Bombardier Ignition Tester

Operate it as for ignition system verifications.

1. Disconnect wires coming from magneto harness.
2. Connect tester wires then set switch and dial as follows :

Tester wires	Component wires	Tester switch position	Tester dial position
N	YELLOW of magneto harness	LOW	85
P	YELLOW/BLACK of magneto harness		



3. Perform test. Push reset button and repeat test three times.

RESULTS

- a) Indicator lamp lights : Battery charging coil output is OK.
- b) Indicator lamp does not light : Battery charging coil is faulty. Replace it.

Section 07 ELECTRICAL
Sub-Section 05 (CDI & CHARGING SYSTEMS)

Resistance Measurement

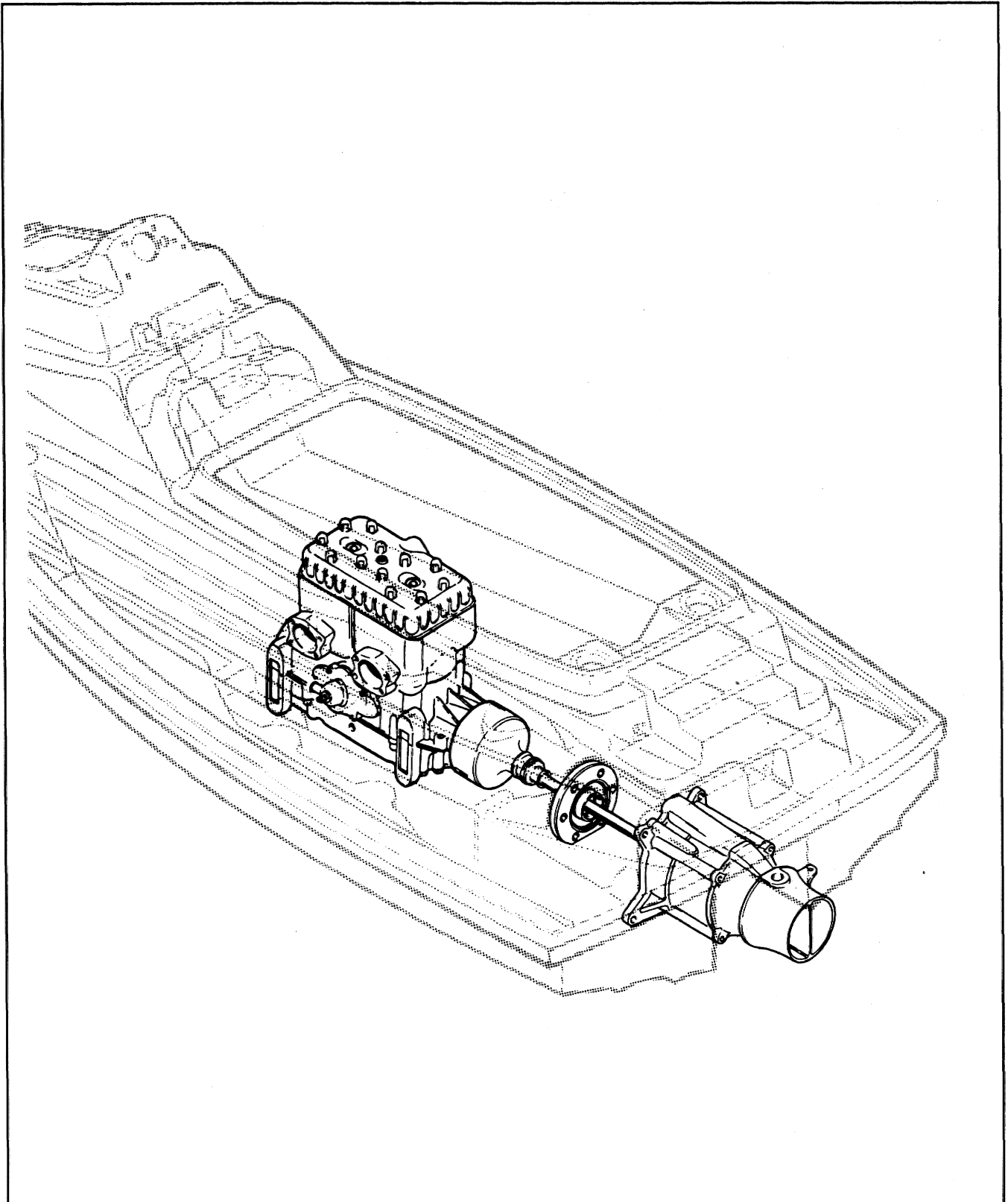
As an alternate method, battery charging coil can be checked with an ohmmeter(preferably a digital one).

Use the following table.

PART NAME		WIRE COLOR	RESISTANCE OHM (Ω)
MAGNETO	Battery charging coil	YELLOW with YELLOW/BLACK of magneto harness	0.21 - 0.31
	Insulation	Check each wire with ground for short circuit	open circuit (∞)

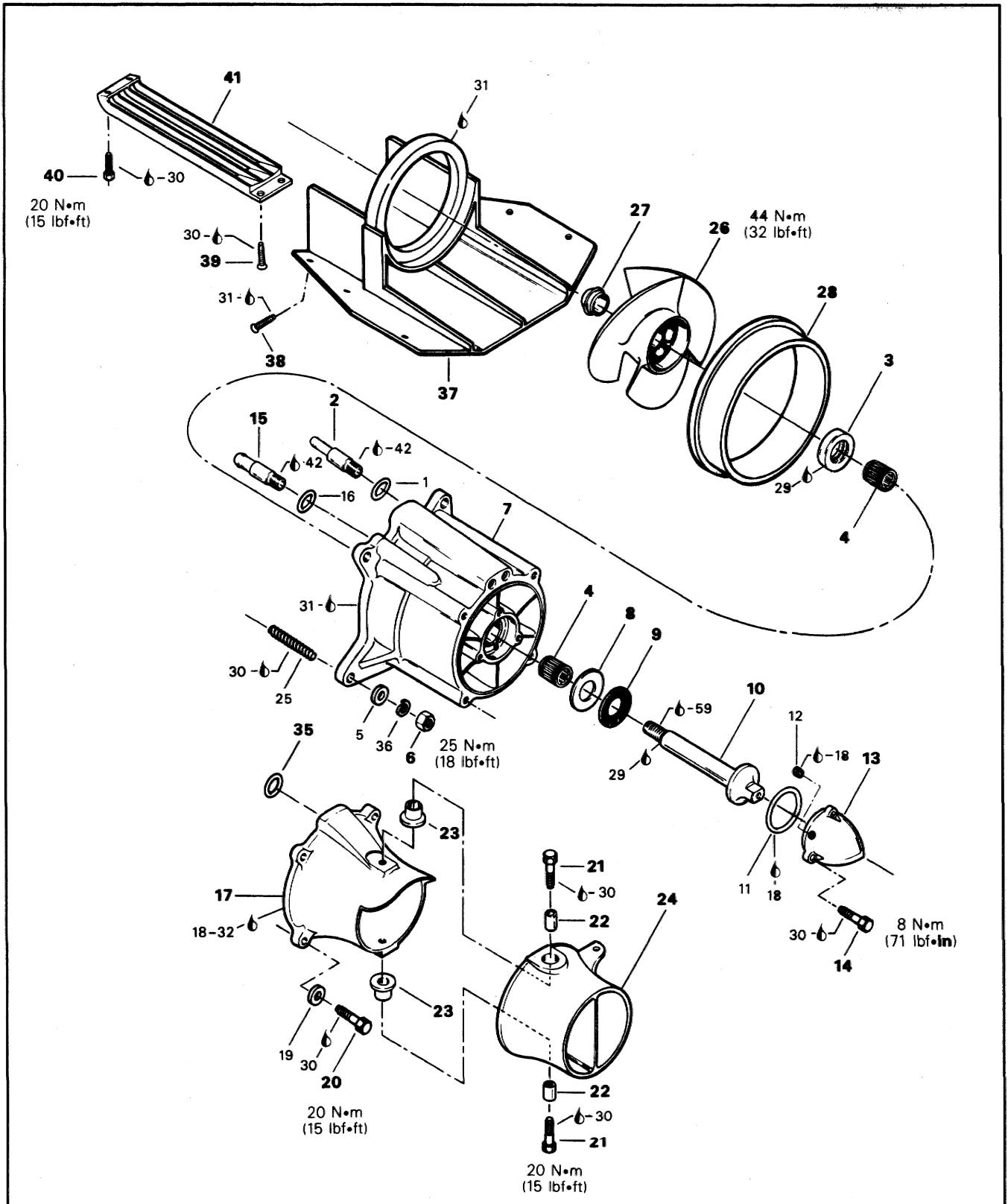
○ **NOTE :** A short circuit will read zero (0) ohm (or close to) on ohmmeter.

PROPULSION & DRIVE SYSTEMS



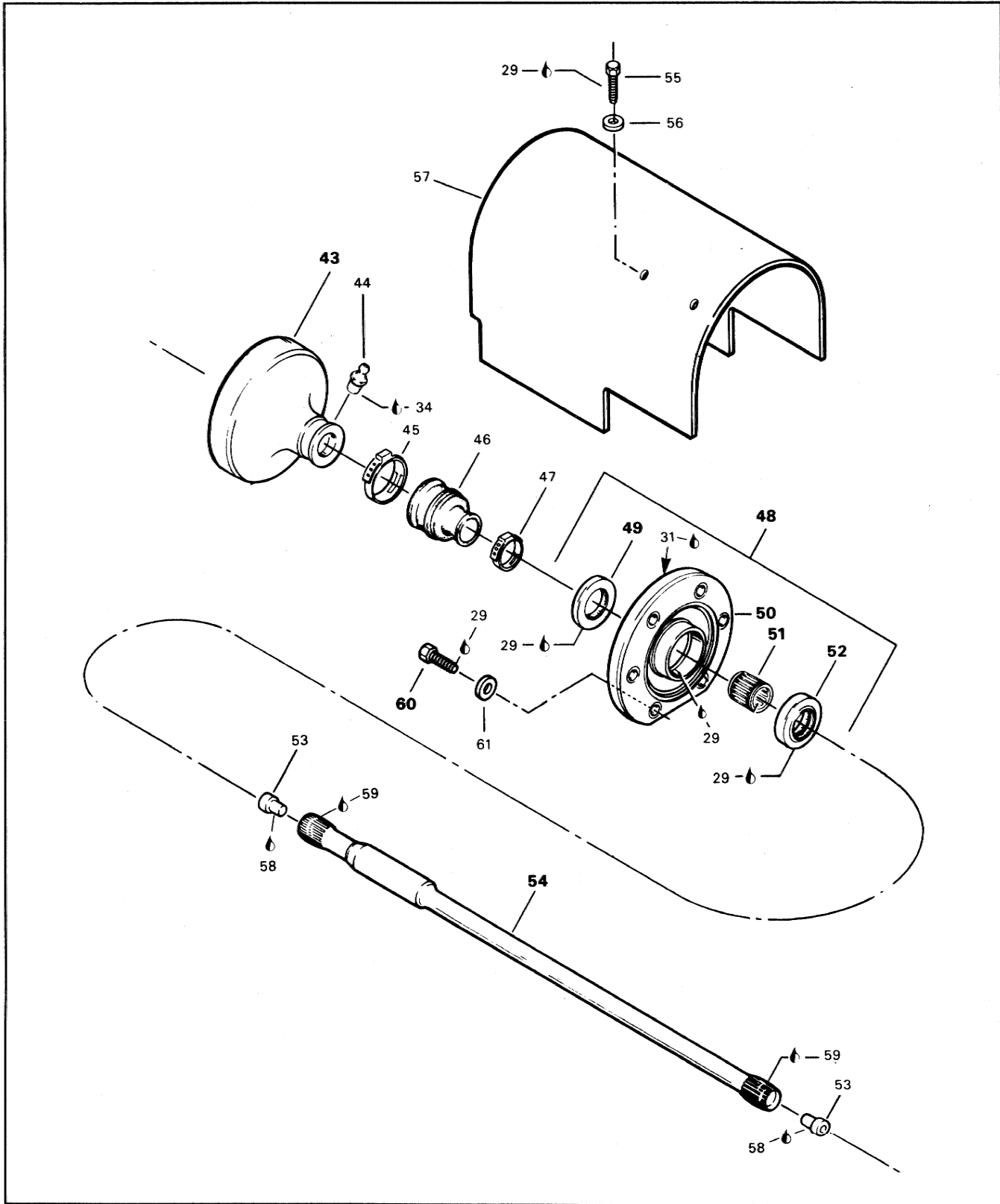
Section 08 PROPULSION & DRIVE SYSTEMS
Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

JET PUMP UNIT



Section 08 PROPULSION & DRIVE SYSTEMS
Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

DRIVE SHAFT & FLEX COUPLING



Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

COMPONENTS

1. O-ring (3)
2. Fitting (bailer) (2)
3. Seal (double lip)
4. Needle bearing (2)
5. Flat washer M10 (4)
6. nut M10 (4)
7. Impeller housing
8. Thrust washer
9. Thrust bearing
10. Impeller shaft
11. O-ring
12. Allen set screw (2)
13. Housing cover
14. Hexagonal head screw M5 x 20 (3)
15. Fitting (pump)
16. O-ring (2)
17. Venturi
18. Loctite 515
19. Flat washer M8 (4)
20. Hexagonal head screw M8 (4)
21. Hexagonal head screw M8 x 25 (2)
22. Sleeve (2)
23. Bushing (2)
24. Nozzle
25. Stud M10 x 45 (4)
26. Impeller
27. Boot
28. Wear ring
29. Sealant PL 32
30. Loctite 242 (blue)
31. Loctite 517 superflex ultra blue
32. Loctite primer N
35. O-ring (2)
36. Lock washer M10 (4)
37. Ride shoe
38. Countersunk phillips screw M6 x 35 (6)
39. Countersunk phillips screw M6 x 15 (2)
40. Hexagonal head screw M6 x 20 (2)
41. Grate
42. Loctite PST 567
43. Flywheel
44. Grease fitting
45. Clamp
46. Rubber boot
47. Clamp
48. Seal carrier assembly
49. Seal (single lip)
50. Seal carrier
51. Needle bearing
52. Seal (double lip)
53. Plug (bumper)
54. Drive shaft
55. Hexagonal head screw M6 x 12 (4)
56. Spring washer (3)
57. Flywheel protector
58. Loctite 414 super bond
59. Loctite 767 Anti-seize
60. Screw M6 x 35 (6)
61. Washer (6)

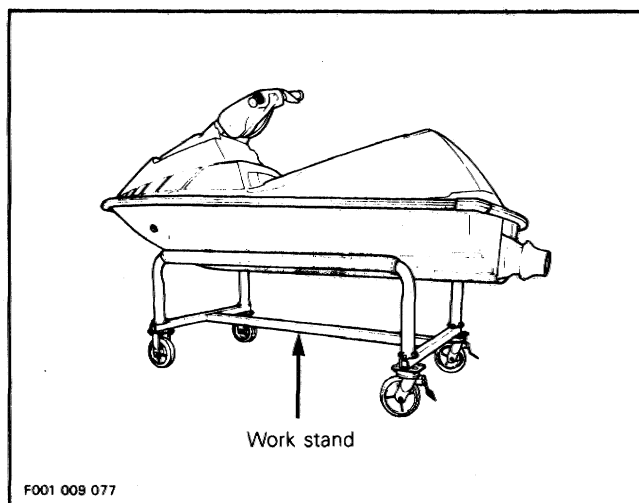
○ NOTE : Some reference numbers are deliberately missing.

◆ **WARNING :** It is strongly recommended to remove fuse from fuse holder, in electric box, to prevent engine/propulsion system from unexpected rotation.

JET PUMP SERVICING

○ NOTE : This portion outlines some routine procedures. To obtain complete information concerning these procedures, inspection, parts, illustrations, sealing/thread locking products, tightening torques etc, refer to "REMOVAL AND OVERHAUL" and following portion.

To work on watercraft, it is suggested to install it on a suitable stand so that it is secure. Thus, if access is needed to water inlet area, it will be easy to slide underneath watercraft. Working on the ride shoe, etc, can be done by simply blocking the rear of vehicle above work stand.



Impeller Condition & Impeller/Wear Ring Clearance

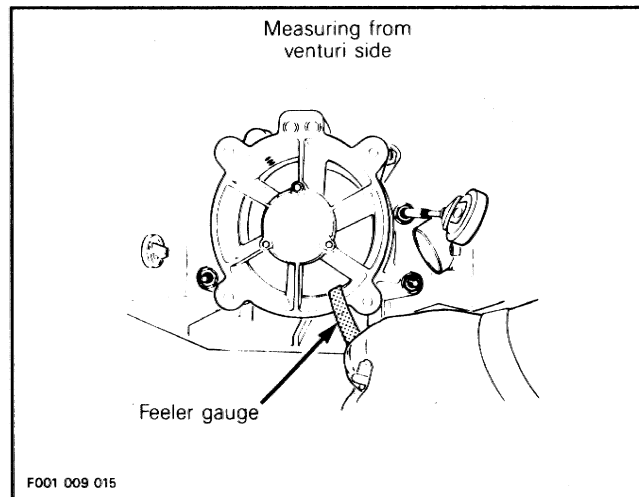
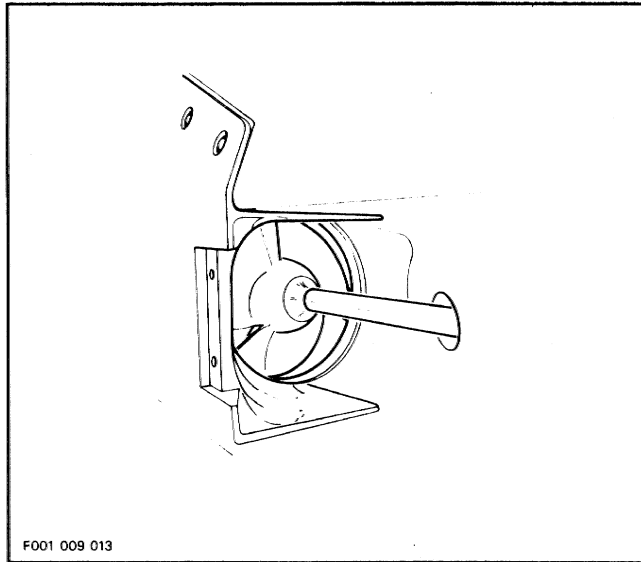
○ NOTE : These verifications can be performed without removing impeller housing and thus, avoiding cleaning and sealing pump to hull.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

Impeller Condition

Impeller and boot condition can be quickly checked from underside of the watercraft. Remove grate and look through water inlet opening.

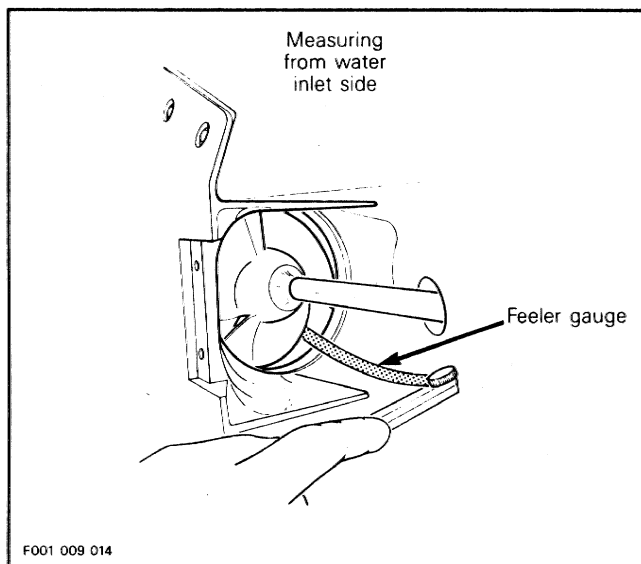


Using a long feeler gauge (30 cm (12 in) blades), measure clearance between impeller blade tip and wear ring. Measure each blade at its center. Clearance should not exceed 1.00 mm (.040 in). If clearance is greater, disassemble jet pump and inspect impeller and wear ring. Renew worn parts.

Impeller/Wear Ring Clearance

This clearance is critical for jet pump performance.

Clearance can be checked from water inlet opening, after inlet grate removal, or from venturi side, after venturi/nozzle assembly removal, however this may be more difficult.



Oil Inspection/Replacement

Detach ball joint of steering cable from nozzle.

Remove four retaining screws from venturi.

Pull venturi and nozzle assembly apart.

Remove the lower plug of housing cover.

Check oil level, it should be to bottom of plug threads.

If oil level is low, check impeller shaft seal and/or housing cover O-Ring for leaks. If everything is correct, add proper amount of oil.

To check oil condition, insert a wire through opening then withdraw. A whitish oil indicates water contamination.

This may involve defective impeller boot and/or impeller shaft seal and/or O-Ring of housing cover. Jet pump unit should be overhauled to repair boot or seal.

To replace oil, remove housing cover so that oil can drain.

Thoroughly clean reservoir and inside of cover with a solvent.

Re-install cover and remove top plug from cover.

Pour approximately 80 mL (2.7 oz) of oil through top hole until oil flows out from bottom hole. Use SEA-DOO JET PUMP SYNTHETIC OIL (P/N 293 600 011) only.

CAUTION: This is a synthetic oil. Do not mix with mineral based oil.

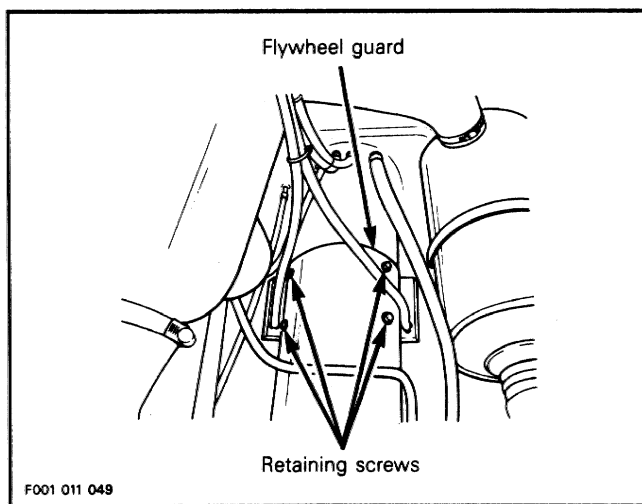
Properly re-install removed parts.

Section 08 PROPULSION & DRIVE SYSTEMS
Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

REMOVAL AND OVERHAUL

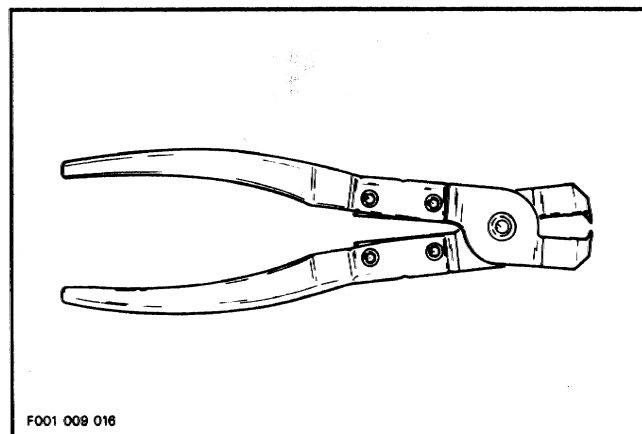
○ **NOTE :** Whenever removing a part, visually check for damage such as : corrosion, crack, split, break, porosity, cavitation, deformation, distortion, heating discoloration, wear pattern, missing plating, missing or broken needle on needle bearing, water damage diagnosed by black-colored spots, etc. Renew any damaged part. As a quick check, manually feel clearance and end play, where applicable, to detect excessive wear.

Remove flywheel guard.

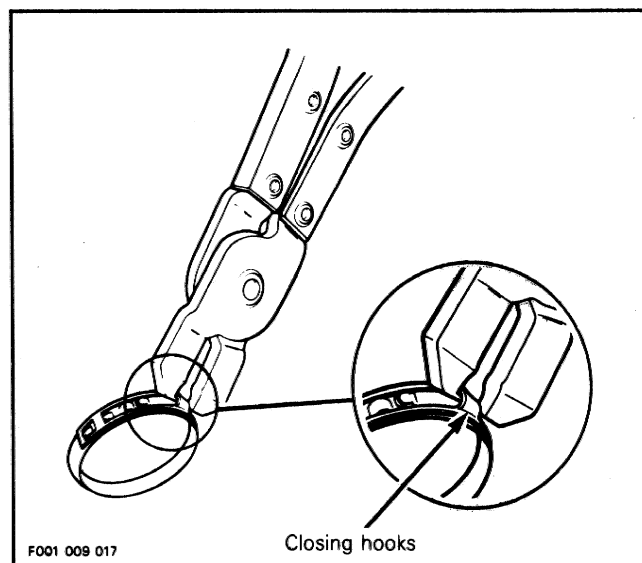


Unfasten small clamp on drive shaft boot as follows :

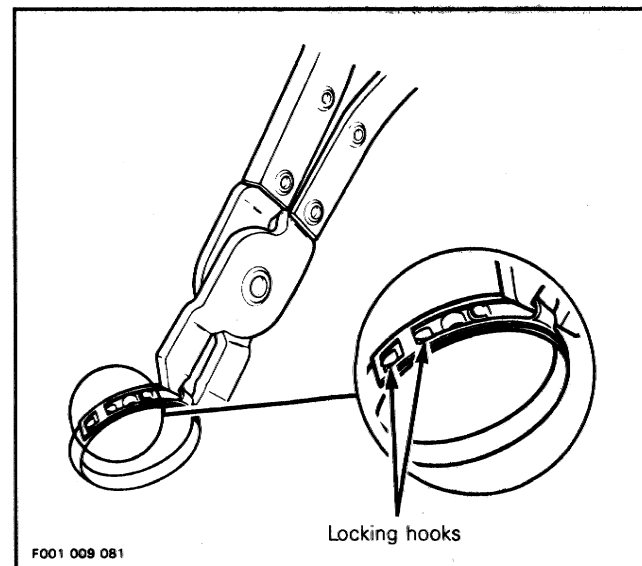
— Use pincer (P/N 295 000 069).



— Insert pointed tips of pincers in closing hooks.



— Squeeze pincers to draw hooks together and disengage windows from locking hooks.

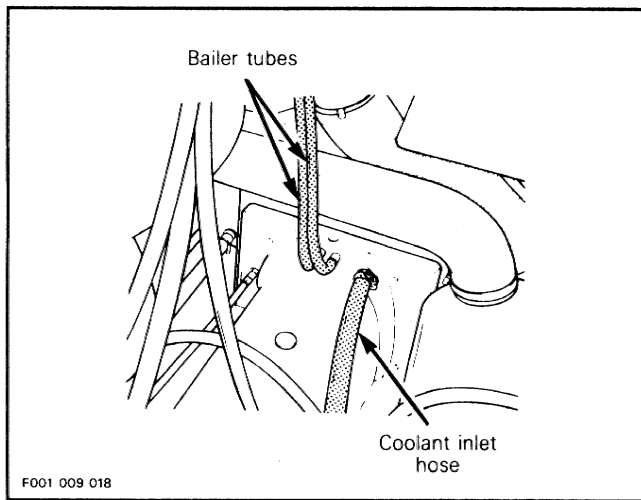


— Keep clamp for later use.

From inside bilge, disconnect coolant inlet hose and both bailer tubes from impeller housing.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



Remove ball joint fasteners to release it from nozzle.

21,22,23,24, Screw, Sleeve, Bushing & Nozzle

Manually turn nozzle from side to side; it must pivot easily.

NOTE: To ease steering operation, inside of nylon bushings can be slightly enlarged with a 13 mm (1/2 in) round file (rat tail type).

Remove two retaining screws and withdraw nozzle.

Push sleeves and bushings out of nozzle.

17,20,35, Venturi, Screw & O-Ring

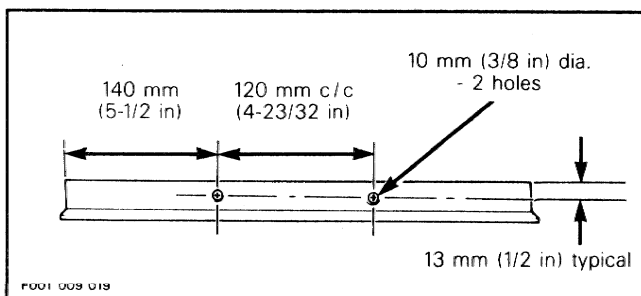
Remove four retaining screws and withdraw venturi.

6,7, Nut & Impeller Housing

Impeller housing can be easily separated from the hull with following suggested tool.

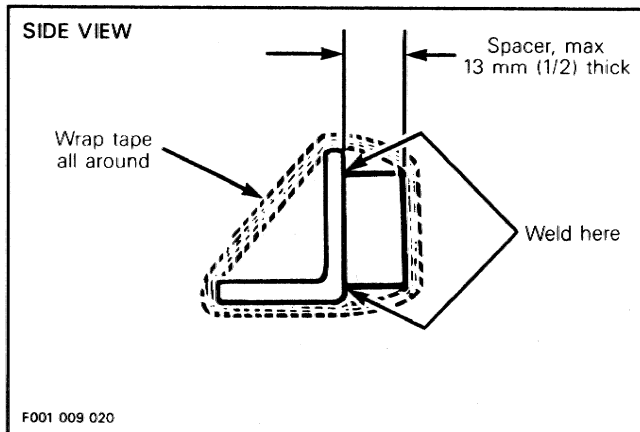
— Use two steel angle bars 25 x 25 x 3 mm (1 x 1 x 1/8 in) thick x 400 mm (16 in) long.

— Drill two 10 mm (3/8 in) dia. holes in each bar as shown in the following drawing.

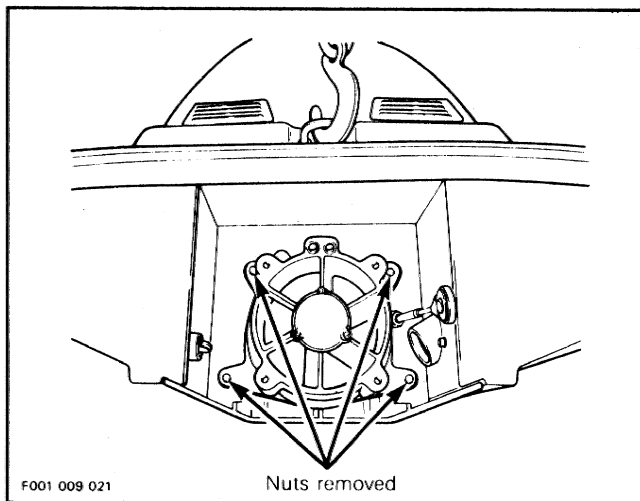


— Weld one spacer 13 mm (1/2 in) thick x 25 mm (1 in) wide x approximately 50 mm (2 in) long, each end of each bar on the same side of holes.

— Wrap protective tape around each spacer to prevent scratching rear end of hull.



Remove nuts retaining impeller housing to hull.

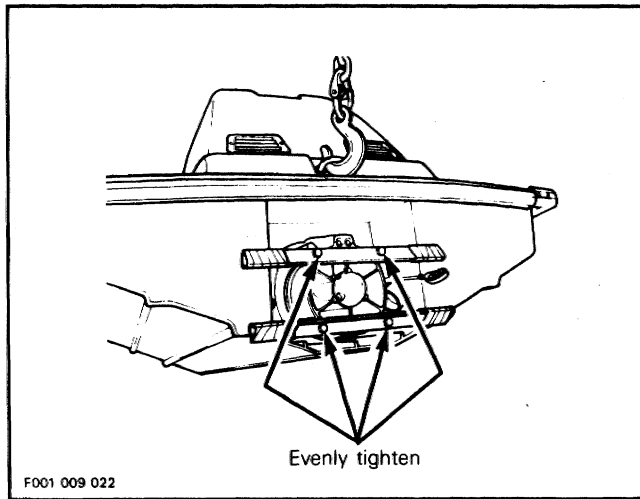


Using screws previously removed from venturi, insert them in angle bar holes, then engage screws in impeller housing.

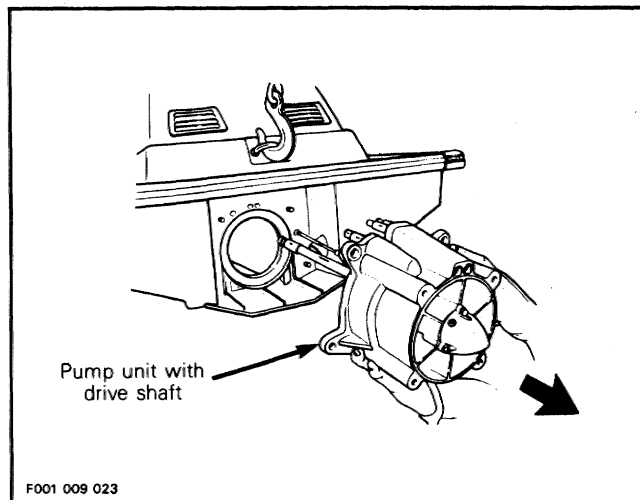
Evenly tighten four screws to remove impeller housing.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



Withdraw pump unit and drive shaft together.

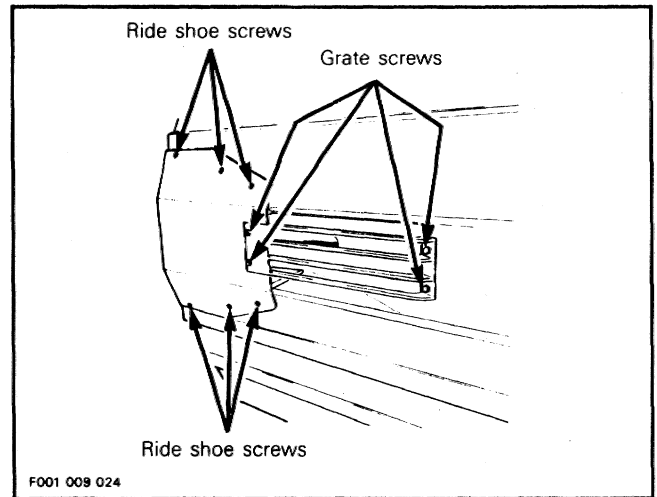


37,38,39,40,41, Ride Shoe, Screw & Grate

○ **NOTE** : Grate must be removed prior to removing ride shoe. Impeller housing must be removed to allow ride shoe removal.

○ **NOTE** : An impact screwdriver can be used to slacken stuck screws.

Remove four retaining screws of grate then withdraw it.
Remove six retaining screws of ride shoe then withdraw it.



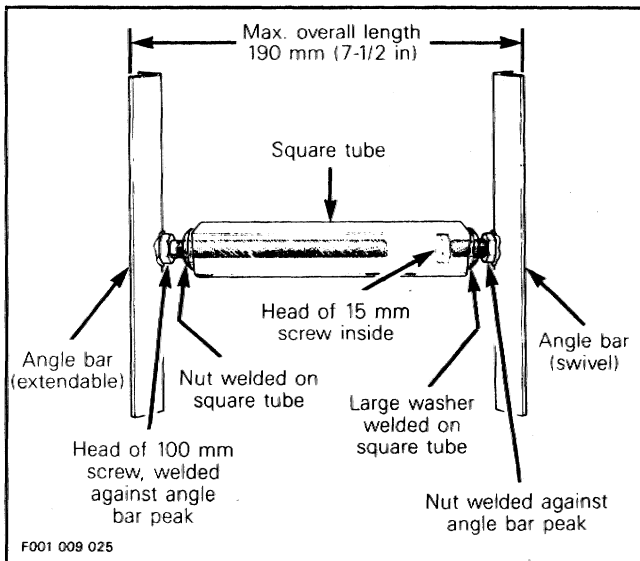
Ride shoe can be easily separated from hull with following suggested tool.

▼ **CAUTION** : Prying ride shoe is likely to be damageable. Use special tool when ride shoe needs to be removed without damage.

- Use two steel angle bars 25 x 25 x 3 mm (1 x 1 x 1/8 in) thick x 225 mm (9 in) long.
- A kind of turnbuckle is needed to apply extension force between ride shoe and hull. Use a 25 mm (1 in) square tube by approximately 125 mm (5 in) long so that, with all parts welded, its overall length will not exceed 190 mm (7-1/2 in).
- On one end, weld a 10 mm (3/8 in) dia. nut.
- Weld the head of a 10 x 100 mm (3/8 x 4 in) screw on top of one angle bar then screw in square tube.
- Insert a 10 x 15 mm (3/8 x 1/2 in) screw through a large and thick washer or a suitable sleeve.
- Install a nut on screw. Do not fully tighten, ensure screw can easily rotate into washer. Weld the top of other angle bar to nut.
- Weld the washer to the remaining end of square tube.

Section 08 PROPULSION & DRIVE SYSTEMS

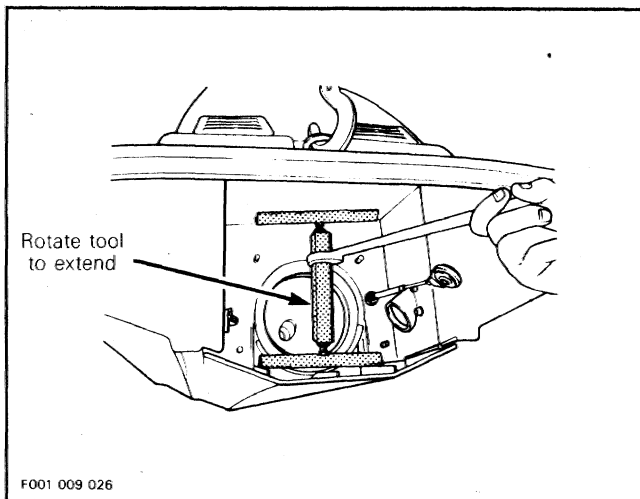
Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



Insert special tool between ride shoe ribs and hull as shown.

CAUTION: Ensure lower part of tool sits at least on outer ribs in order to reduce applied pressure for removal. Ensure that tool is installed vertically.

Using a wrench, turn tool body so that it extends to unstick and release ride shoe from hull.



48,60, Seal Carrier Ass'y & Screw

NOTE: Drive shaft/pump housing or engine must be removed to allow removal of seal carrier ass'y.

Since it is sealed to prevent water coming inside bilge, seal carrier ass'y should not be removed needlessly.

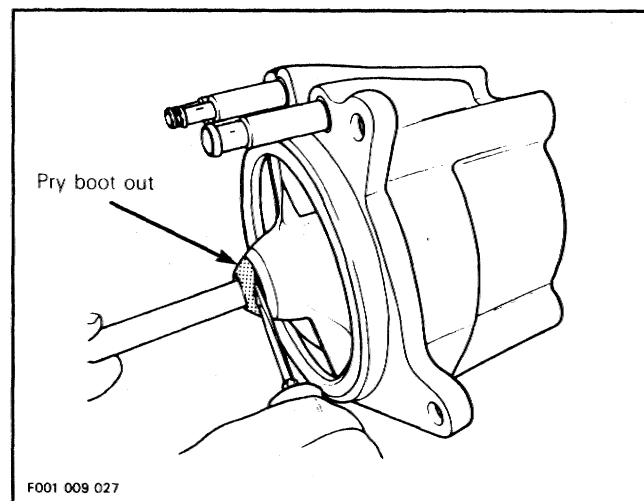
Remove six retaining screws and carefully pry seal carrier away from hull.

DISASSEMBLY

27, Boot

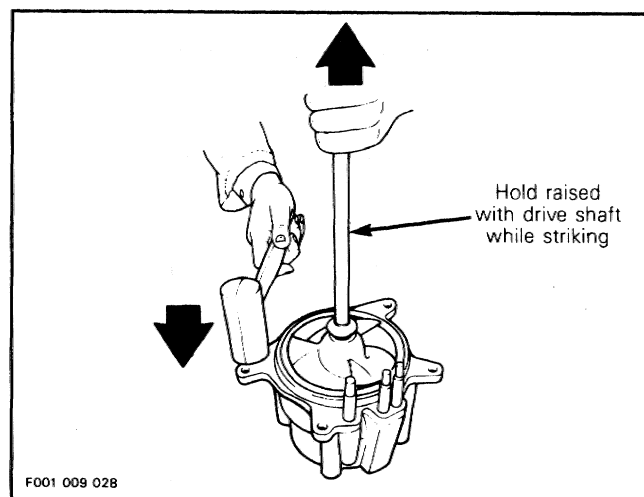
CAUTION: Do not pull drive shaft to release it from impeller, this could damage boot. Boot must be slipped out of impeller before removing drive shaft.

Insert a screwdriver blade between impeller and flange of boot. Carefully pry boot all around to release from impeller. To ease this operation, apply liquid soap between boot and impeller, as they begin to separate.



Withdraw drive shaft.

NOTE: A jammed drive shaft can be removed by holding pump unit by drive shaft, slightly raised above a smooth surface, then striking all around of impeller housing with a fiber hammer. Corroded parts can be loosened by applying penetrating oil such as SEA-DOO LUBE (P/N 293 600 006).



Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

2,15, Fitting

Fittings can be removed with vise grip or suitable pliers. Do not contact hose mounting area.

13,14, Housing Cover & Screw

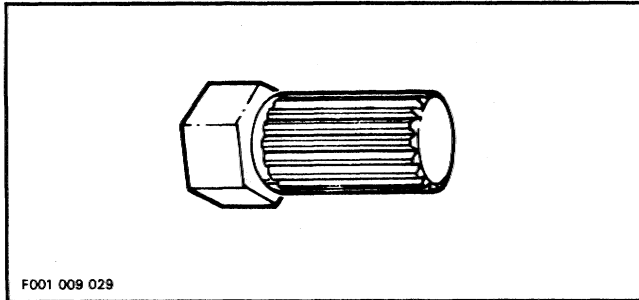
Starting with pump assembly in horizontal position, remove three retaining screws.

Place container under cover to catch oil.

Using a fiber hammer, gently tap cover to release from impeller housing.

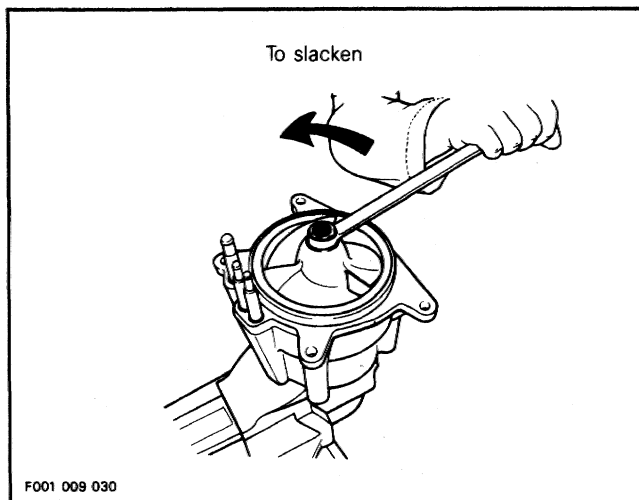
Insert flat sides of impeller shaft in a vise.

Impeller is slacken using impeller remover (P/N 295 000 001)



Insert special tool in impeller splines.

Rotate counter-clockwise and completely unscrew impeller.



CAUTION: Never use any impact wrench to slacken impeller.

To remove impeller, apply a rotation movement and pull at same time. Slide out of housing and remove tool.

Lift impeller housing away from impeller shaft.

Slide thrust washer and thrust bearing off shaft.

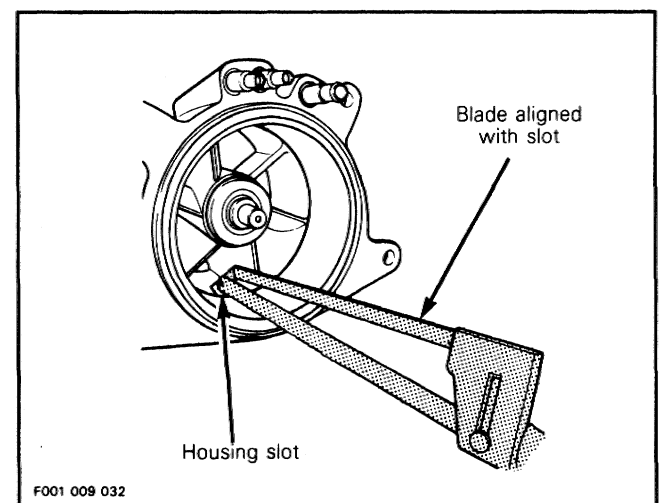
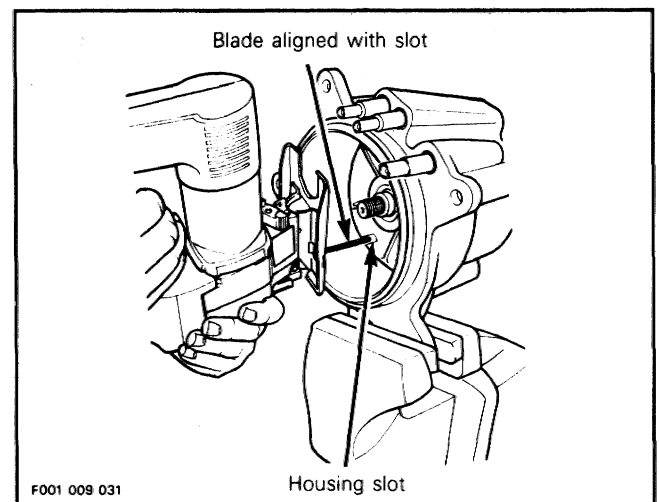
28, Wear Ring

Place impeller housing in a brass jaw vise so that it is firmly retained by a lug.

Cut wear ring in line with the provided slot.

NOTE: Wear ring can be cut using a jigsaw, a small buffer or a low clearance hacksaw such as Snap-On HS3.

CAUTION: When cutting ring, be careful not to damage impeller housing.



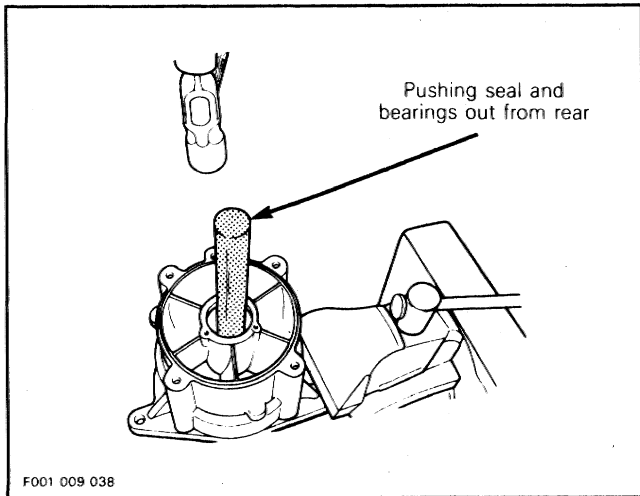
After cutting ring, insert a screwdriver blade under slit and raise ends of ring. Slide ring out.

3, Seal

NOTE: If bearings and seal need to be renewed, the special pusher described in bearing removal (the following item), can be used to push the three parts at same time. Simply insert pusher from the rear and push towards the front.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

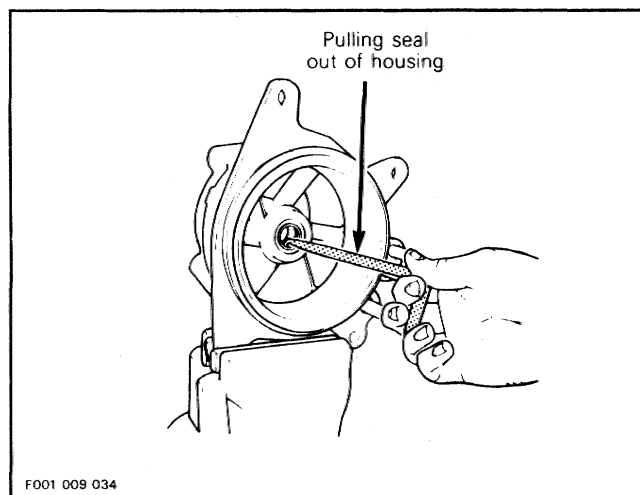
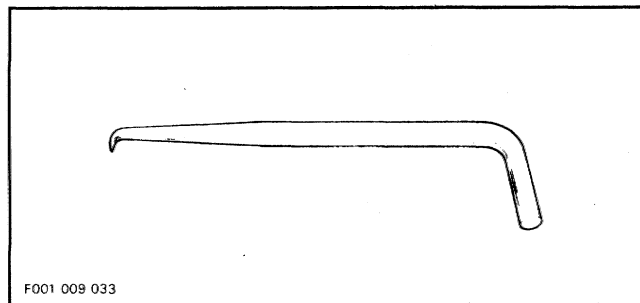


If only seal needs to be renewed, proceed as follows.

CAUTION: It is not recommended to push seal out with a punch. Housing and/or bearing(s) could be damaged.

Seal should be removed using the following suggested tool.

Seal puller, Snap-On #S6129.

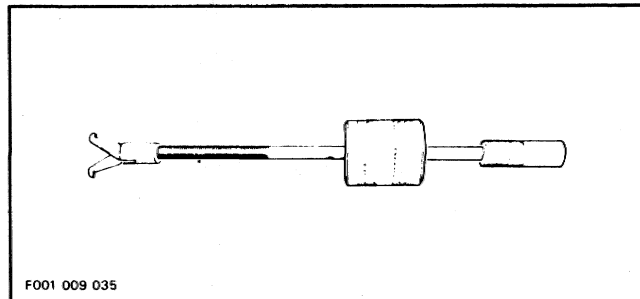


Or, use a Snap-On Hammer Puller including :

Handle CJ93-1

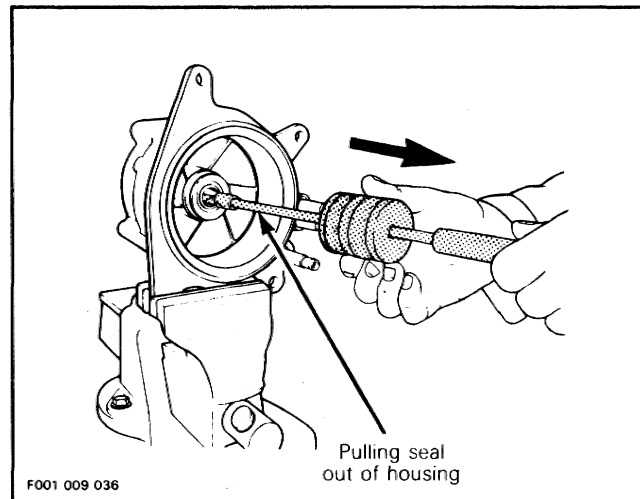
Hammer CJ125-6

Claws CJ93-4



Close puller claws so that they can be inserted between seal and bearing. Holding claws, turn puller shaft clockwise so that claws open and tighten against seal.

Slide puller sleeve outwards and **gently** tap puller end. Work with small strikes otherwise claws will slip out. As soon as seal begins to slide out, retighten claws to always maintain them tight against seal. Continue pulling until seal is out.



4, Needle bearing

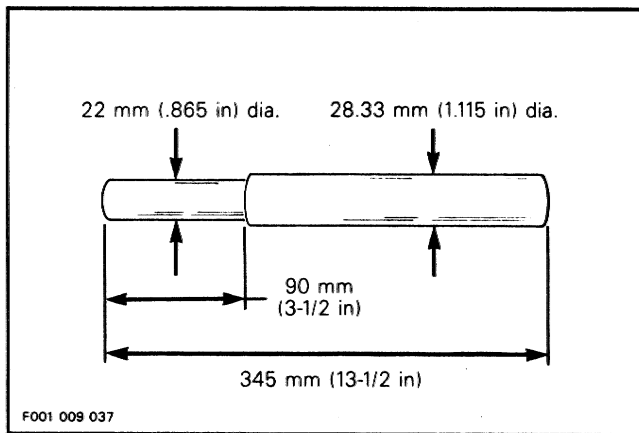
NOTE: It is always recommended to renew both bearings, even if only one needs to be replaced.

Bearings can be easily removed with the following suggested pusher.

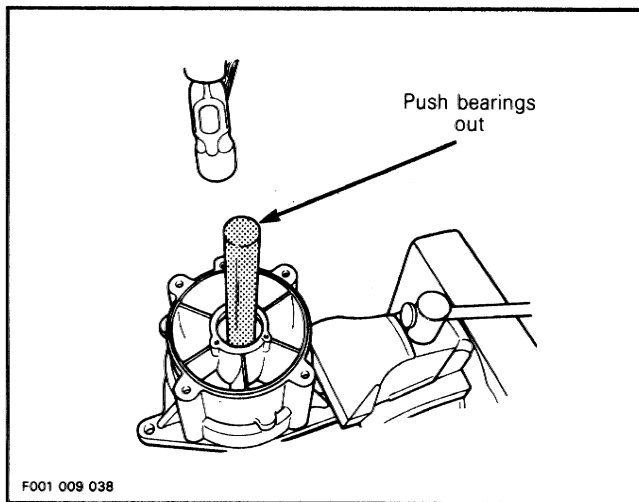
Use a 30 mm dia. x 345 mm long (1-1/8 dia. x 13-1/2 in) steel shaft. Machine shaft as per the following drawing.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



Insert pusher into one bearing then push tool using a arbor press until bearings are out. This remover tool may also be used with a hammer. However, care should be taken not to damage bearing journals.



NOTE : If seal is to be renewed at same time, simply insert pusher from the side opposite of seal then push seal and bearings out.

49,50,51,52, Seal, Seal Carrier & Needle Bearing

Seals and bearing can be removed using same suggested tools as for pump unit.

Properly support inner portion of seal carrier to avoid a spring effect when removing seals and bearing.

CLEANING

NOTE : Bailer tube fittings and cooling supply fitting can be removed to ease cleaning of impeller housing mating surface.

Most silicone can be removed out with a scraper such as Snap-On #CS-A12.

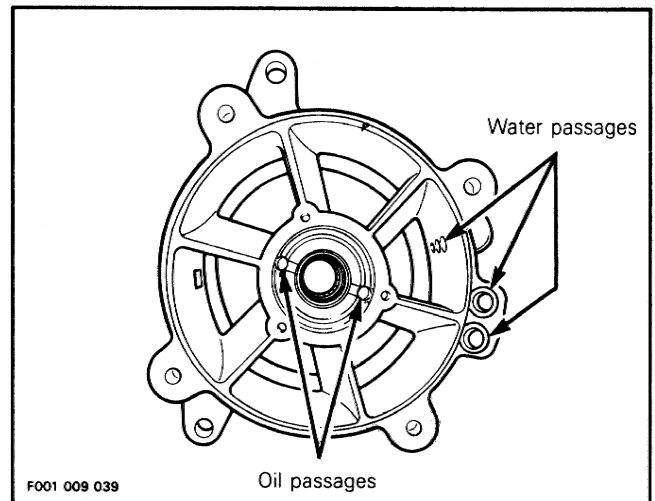
Remaining silicone can be removed with a steel brush (disc) mounted on a drill motor.

Bombardier stripper #157 (P/N 295 000 040) can be used to remove remaining silicone. Carefully apply on mating surfaces taking care not to extend outside of this area because paint will be damaged. Let product dissolve silicone then scrape it.

Properly clean all threads.

Discard all O-Rings and clean parts in a solvent.

Carefully check water passages (bailer, cooling system) and oil passages. Blow low pressure compressed air through them and make sure they are not clogged.



INSPECTION

26,43,51,54, Impeller, Flywheel, Needle Bearing & Drive Shaft

Visually inspect splines of drive shaft, impeller and flywheel. Check for wear or deformation. Renew any damaged part.

54, Drive Shaft

Wear

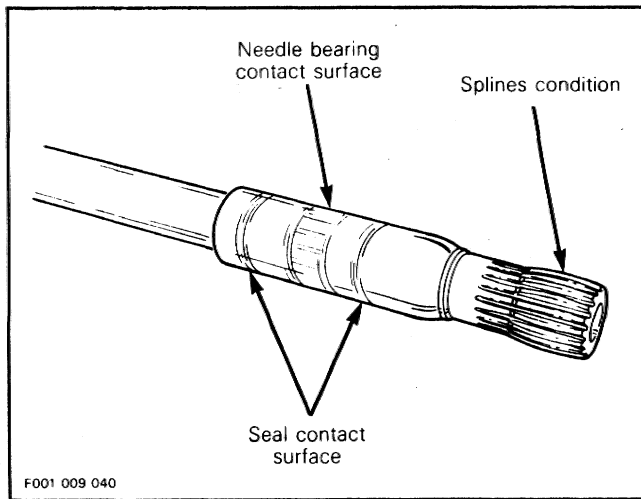
Visually inspect shape of dampers for deformation or other damage. Ensure they are firmly retained.

Inspect needle bearing of seal carrier and its contact surface. Check for scoring, pitting, chipping or other evidence of wear.

With a finger tip, feel contact surfaces of bearing and seals. If any irregular surface is found, renew drive shaft.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

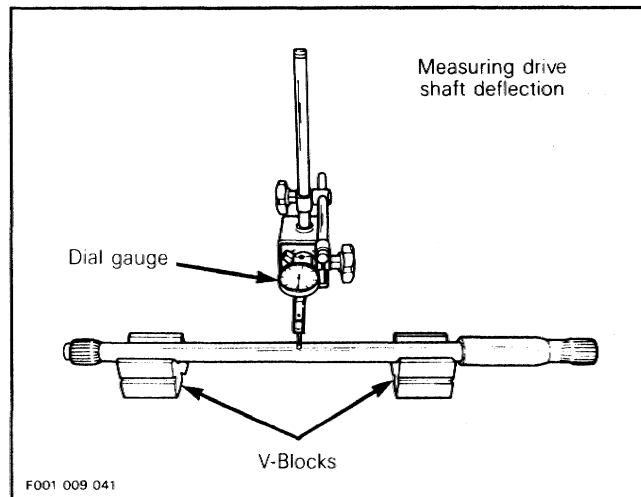


Deflection

Excessive deflection could damage splines of drive shaft, impeller, flywheel or floating seal carrier.

Install drive shaft in V-Blocks and set a dial gauge in center of shaft. Slowly rotate shaft; difference between highest and lowest dial gauge reading is deflection. Refer to the following illustration.

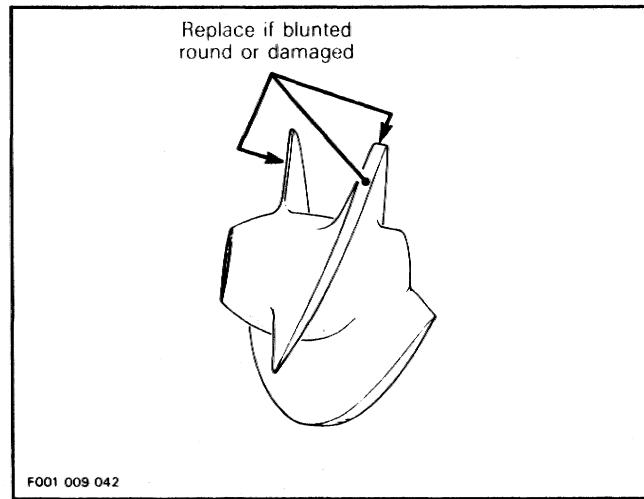
Maximum permissible deflection is 0.5 mm (.020 in).



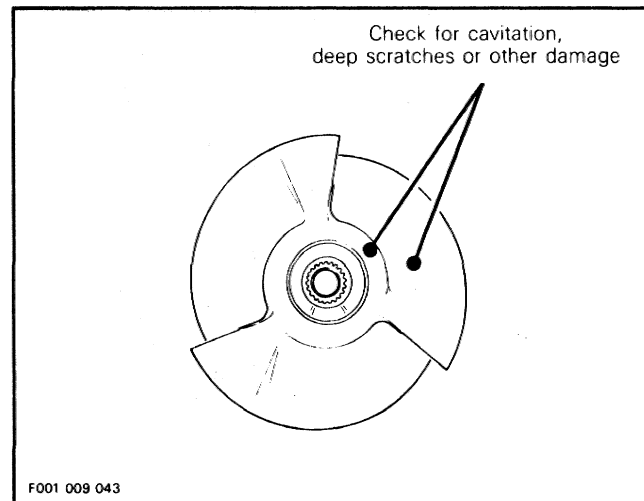
26,28, Impeller & Wear Ring

Examine impeller in wear ring for distortion.

Check if tips of blades are blunted round, chipped or broken. Such impeller is unbalanced and will vibrate and damage wear ring, impeller shaft, shaft seal or bearings. Renew if damaged.



Check impeller for cavitation damage, deep scratches or any other damage.



Check wear ring for deep scratches, irregular surface or any apparent damage.

If impeller / wear ring clearance is too large and impeller is in good shape, renew wear ring.

4,10, Needle Bearing & Impeller Shaft

Wear

Inspect needle bearings and their contact surface. Check for scoring, pitting, chipping or other evidence of wear.

With a finger tip, feel contact surface of seal. If any irregular surface is found, renew drive shaft.

With impeller shaft installed with bearings, rotate it and make sure it turns smoothly.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

Radial Play

Radial play is critical for jet pump unit life span.

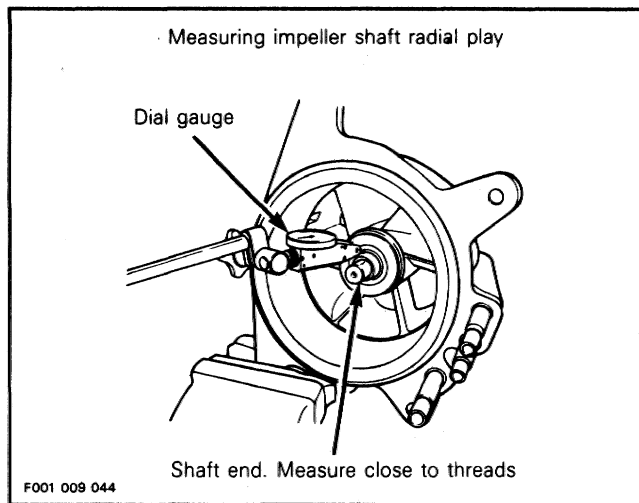
Radial play of impeller shaft is checked with shaft in housing, without impeller.

Retain housing in a brass jaw vise making sure not to damage housing lug.

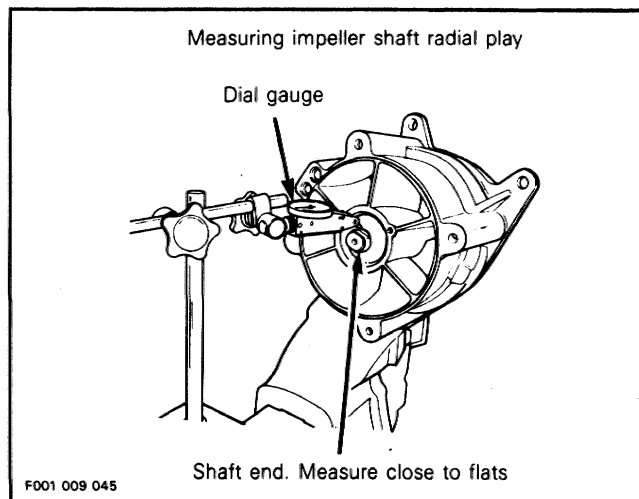
Set a dial gauge and position its tip onto end of shaft, close to end of threads.

Move shaft end up and down. Difference between highest and lowest dial gauge reading is radial play.

Maximum permissible radial play is 0.05 mm (.002 in).



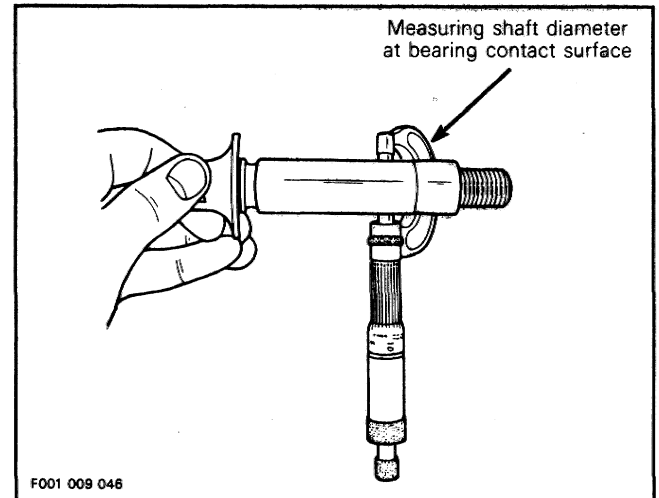
To check both bearings, proceed the same way with other end of shaft. Position tip of gauge on diameter, close to flats on shaft.



Excessive play can come either from worn bearings or impeller shaft.

Measuring shaft diameters will determine defective part.

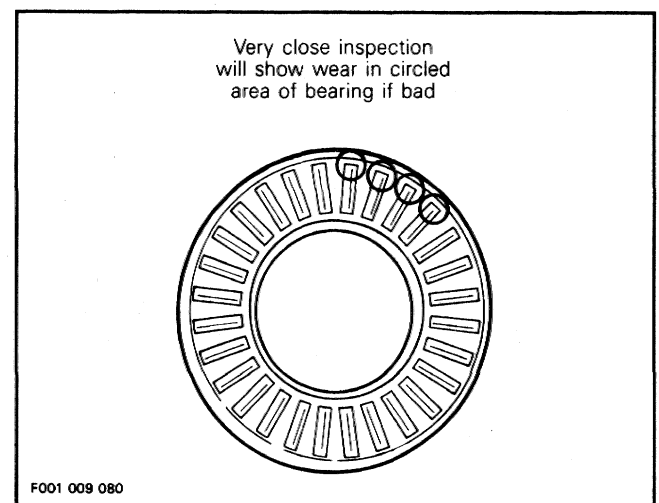
Using a micrometer, measure diameters on bearing contact surfaces. Minimum shaft diameter should be 22.23 mm (.8753 in). If shaft is within tolerance, that indicates worn bearings. Replace both bearings.



NOTE: If shaft is to be replaced, it is recommended to replace both bearings at same time. In addition, it is suggested to replace thrust bearing and thrust washer.

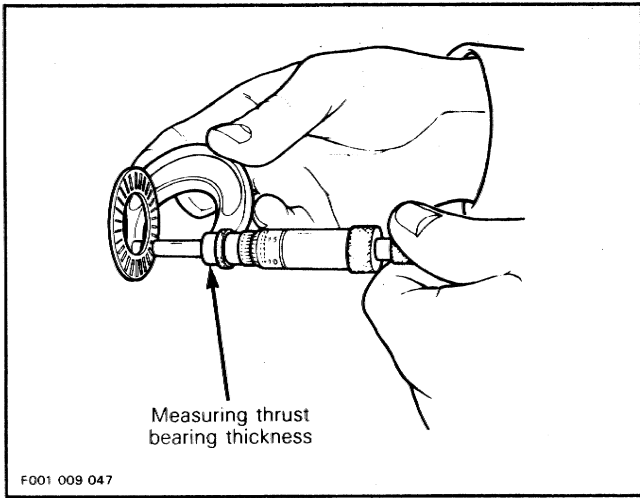
8,9, Thrust Washer & Thrust Bearing

Visually inspect thrust washer, thrust bearing and their contact surface. Check for scoring, pitting, chipping or other evidence of wear.



Measure thrust bearing thickness. If roller diameter is found smaller than 1.93 mm (.076 in), renew it.

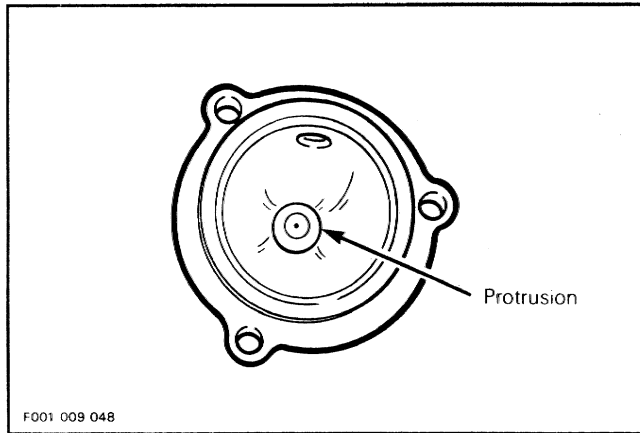
Section 08 PROPULSION & DRIVE SYSTEMS
Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



○ **NOTE :** When replacing either washer or bearing, it is recommended to renew both.

13, Housing Cover

Visually inspect protrusion inside cover. If worn, a small peak in center will be apparent.



3,49,52, Seal

Carefully inspect seal lips. Make sure that lips are not worn, distorted, cracked or present any other damage. Renew as necessary.

ASSEMBLY

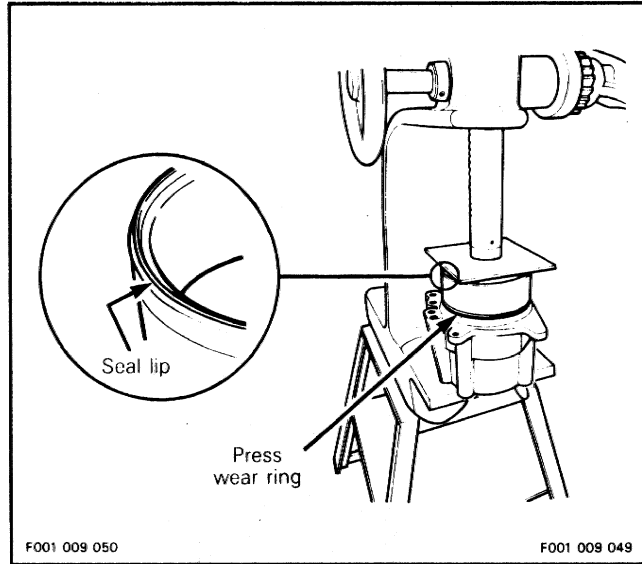
28, Wear Ring

If wear ring features a lip on one edge, position lip outwards of housing.

To ease insertion into housing, apply liquid soap onto outside circumference of wear ring.

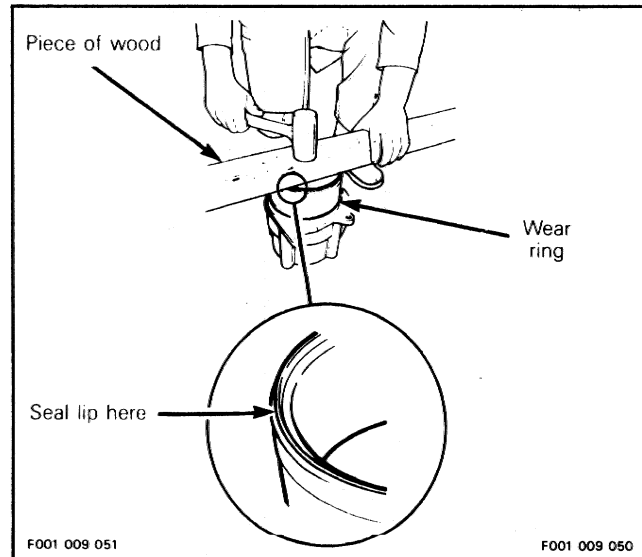
To install ring in housing, use a square steel plate approx. 180 x 180 mm x 6 mm thick (7 x 7 in x 1/4 in) and a press.

Manually engage ring in housing making sure it is equally inserted all around. Press ring until it seats into bottom of housing.



If a press is not readily available, a piece of wood such as a 2 x 4 x 12 in. long, can be used.

Manually engage ring in housing making sure it is equally inserted all around. Place wood piece over ring. Using a hammer, strike on wood to push ring. Strike one side then rotate wood piece about 90° and strike again. Work this way, frequently rotating wood piece so that ring slides equally all around until it seats into bottom of housing.

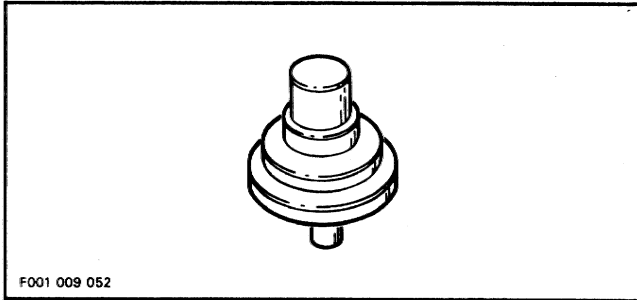


Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

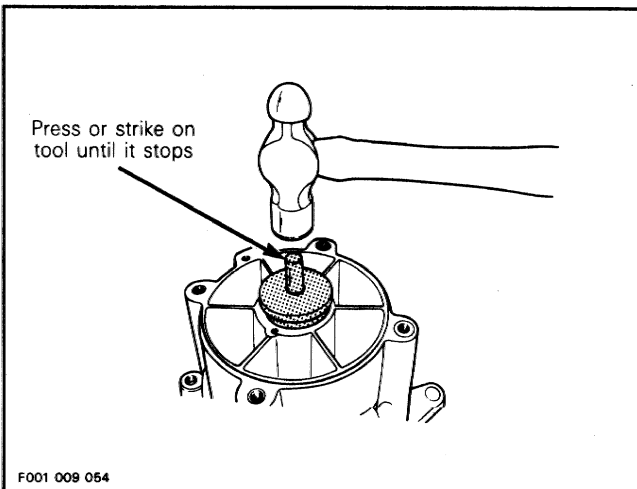
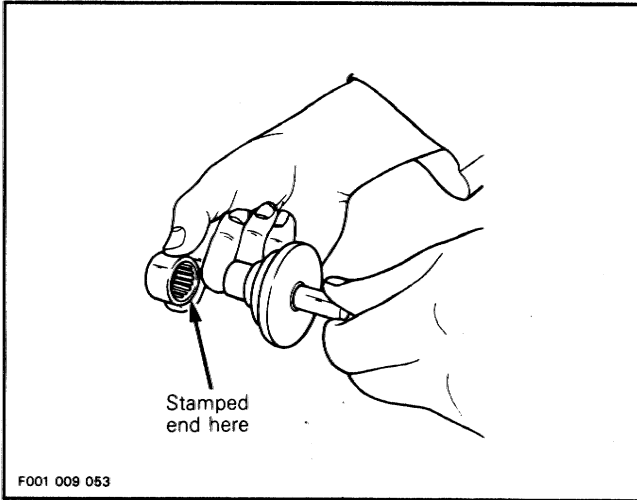
3,4, Seal & Needle Bearing

Bearings and seal will be properly installed in housing using bearing installer tool (P/N 295 000 014).



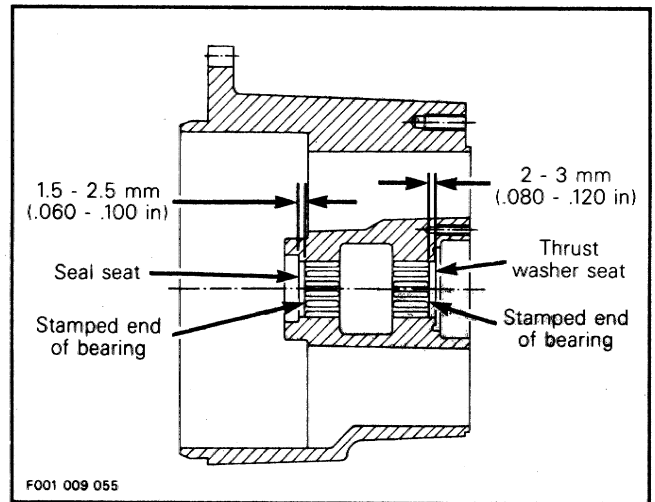
Stamped end of bearings (showing identification markings) must be located toward outside of housing.

Properly insert bearing on tool. Preferably using an arbor press or striking tool end with a hammer until tool flange contacts housing when pushing bearing. Proceed the same for both bearings.



CAUTION: This tool has been designed to properly position bearings and seal thus, providing space for lubrication purposes. The tool flanges allow for this. If a different pusher type is being used, components must be properly positioned as follows.

Bearing on impeller side must be 1.5 to 2.5 mm (.060 - .100 in) inside reservoir measured from seal seat. Bearing on venturi side must be 2 to 3 mm (.080 - .120 in) inside reservoir measured from thrust washer seat. Refer to following illustration.

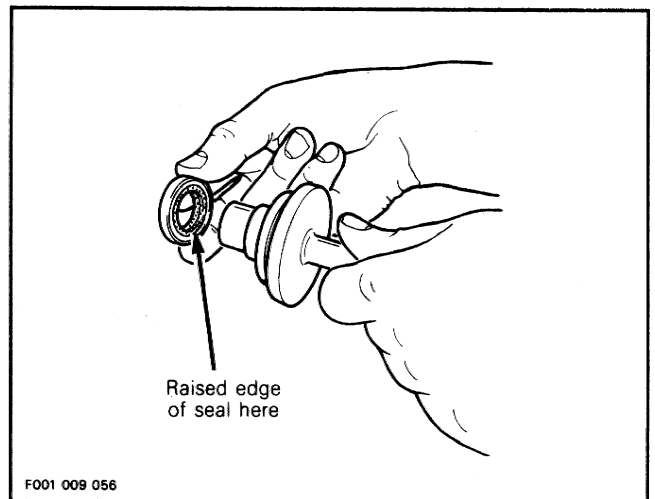


Same tool will be used to install seal in housing.

Seal must be installed so that raised edges of lips are toward outside of housing (toward impeller).

Apply PL-32 sealant (P/N 293 800 001) in seal housing, all around outer diameter and on seal seat.

Properly insert seal on tool.

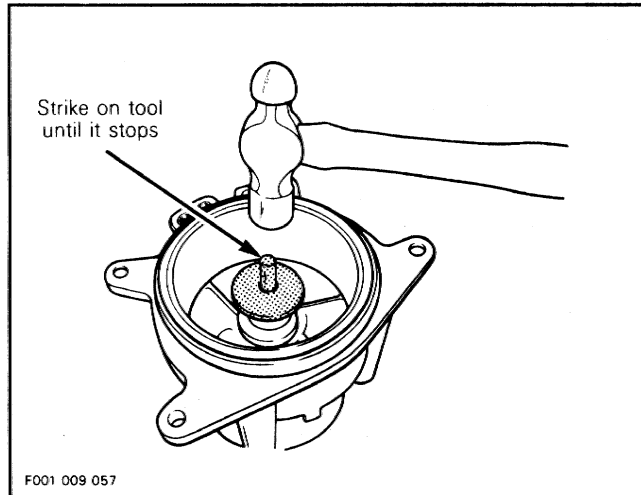


CAUTION: Take care that no sealant contacts any roller of bearing.

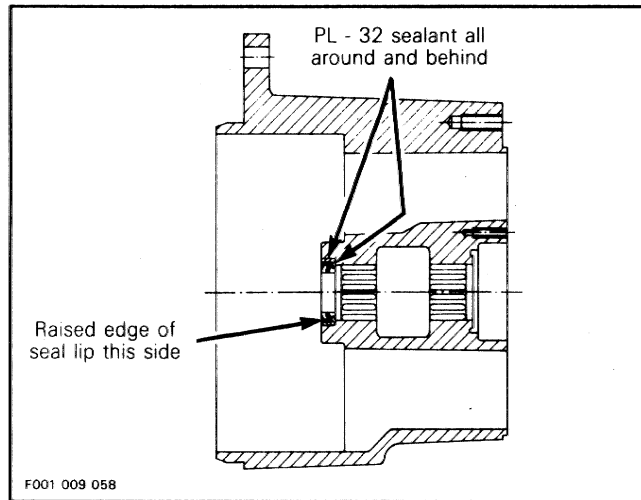
Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

Strike tool end with a hammer until tool flange contacts housing.



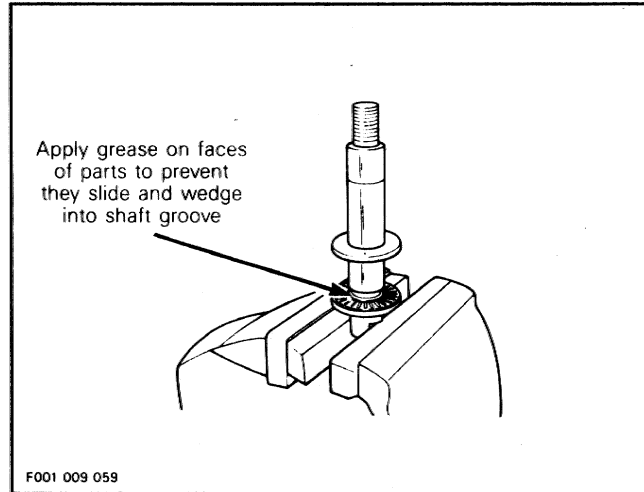
Pack Bearing Grease (P/N 293 550 005) between seal lips.



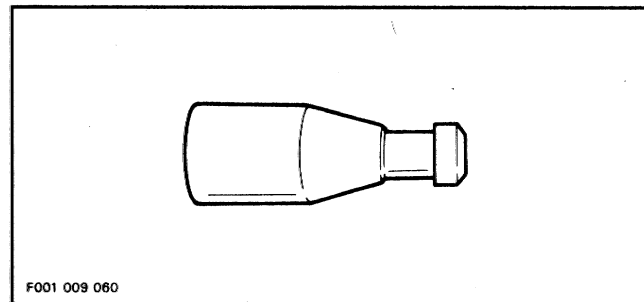
7,8,9,10,26, Impeller Housing, Thrust Washer, Thrust Bearing, Impeller Shaft & Impeller

Insert flat edges of impeller shaft in a vise so that shaft is vertical.

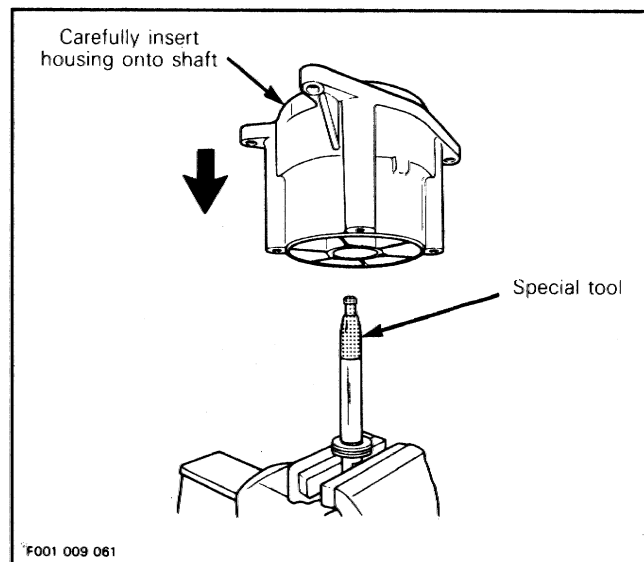
Apply Bearing Grease (P/N 293 550 005) both sides of thrust bearing then insert onto shaft followed by thrust washer. Properly center washer and bearing with shaft flange. Grease will prevent parts from sliding at installation and thus possibly wedging thrust bearing into shaft groove.



To prevent seal lip damage when inserting impeller shaft, use impeller shaft guide (P/N 295 000 002).



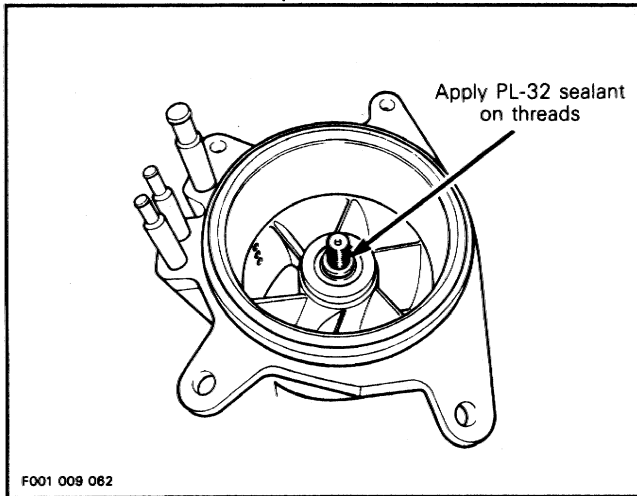
Insert tool onto shaft end then carefully slide housing over shaft.



Remove special tool and apply PL-32 sealant (P/N 293 800 001) over shaft threads.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



▼ **CAUTION :** Make sure thrust washer and bearing have not slipped in shaft groove.

To ease impeller installation, apply liquid soap on wear ring.

Insert impeller into wear ring. Manually rotate impeller and push so that it slides on impeller threads. Carefully engage threads making sure they are well aligned.

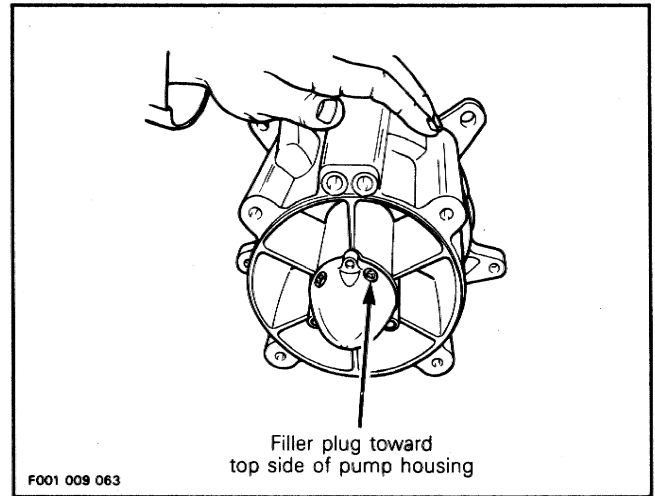
Install impeller remover (P/N 295 000 001) into impeller splines and tighten.

▼ **CAUTION :** Make sure thrust washer and bearing are not wedged in shaft groove. To check, manually pull and push impeller housing, an axial play must be felt.

Torque impeller to 44 N•m (32 lbf•ft) then remove tool.

▼ **CAUTION :** Never use any impact wrench to tighten impeller.

Apply Loctite 515 (P/N 293 800 007) then install new O-Ring on housing cover then carefully insert in impeller housing cover making sure to properly position plugs to top side.

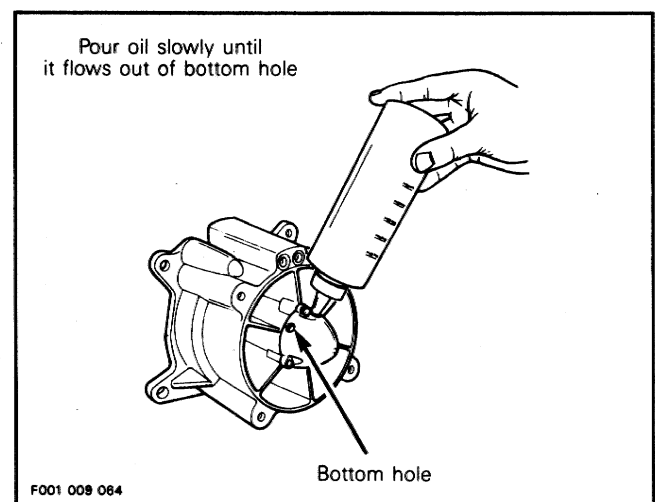


Apply Loctite 242 (blue) (P/N 293 800 002) on screw threads and evenly tighten cover screws. Torque to 8 N•m (71 lbf•in).

Place housing horizontally as in its operating position so that plugs in cover are located in top. Remove both plugs from cover. Pour approximately 80 ml (2.7 on) of SEA-DOO JET PUMP SYNTHETIC OIL (P/N 293 600 011) only in reservoir until oil comes level with bottom of lower hole.

▼ **CAUTION :** This is a synthetic oil. Do not mix with mineral based oil.

○ **NOTE :** When filling, oil must be poured into cover quite slowly to allow complete housing fill.



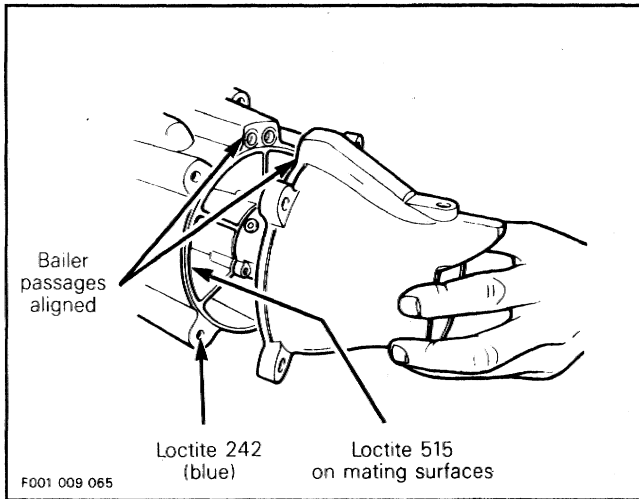
Apply Loctite 515 (P/N 293 800 007) on plugs then secure on cover.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)

17,20,35, Venturi, Screw & O-Ring

Install new O-Rings around bailer passages. Position venturi with bailer passages on top. Apply Loctite 515 Gasket Eliminator (P/N 293 800 007) on mating surface. Apply Loctite 242 (blue) (P/N 293 800 002) on threads and install screws and washers then torque to 20 N•m (15 lbf•ft) in a criss-cross sequence.



NOTE: On aluminum material it is recommended to use Loctite Primer N (P/N 293 600 012) to reduce curing time and to increase gap filling capability. Refer to manufacturer's instructions.

2,15, Fitting

Apply Loctite PST 567 (P/N 293 800 013) on threads, then thread fittings into pump housing until threads are bottomed.

Install new O-Rings.

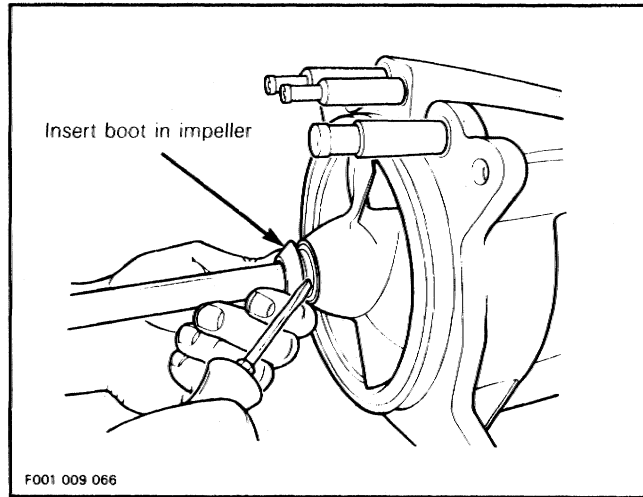
27, Boot

Slide a new boot on drive shaft. To ease installation, apply some liquid soap on outer circumference of boot.

Generously apply Loctite 767 Anti-Seize (P/N 293 550 001) on drive shaft splines and impeller splines.

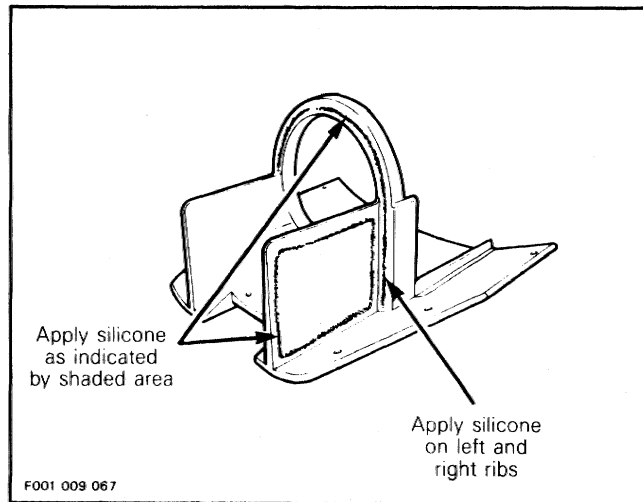
Make sure rubber damper is on drive shaft end.

Insert drive shaft in impeller then carefully insert boot in impeller. Use blade of a screwdriver to push on boot.



37,38,39,40,41, Ride Shoe, Screw & Grate

Apply Loctite 587 Superflex Ultra Blue (P/N 293 800 016) on ride shoe as shown in the following illustration.



Carefully install ride shoe on hull. Apply Loctite 587 Superflex Ultra Blue (P/N 293 800 016) on screw threads, install and tighten in a criss-cross sequence.

From inside of bilge, apply Loctite 732 RTV Silicone (P/N 293 800 006) on end of screws to completely seal hull.

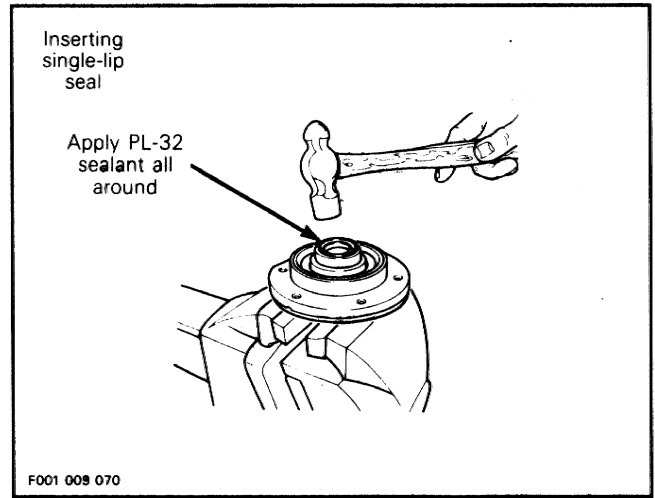
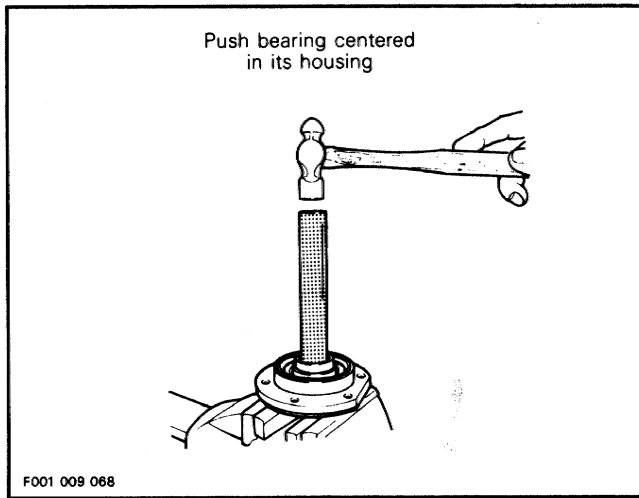
Apply Loctite 242 (blue) (P/N 293 800 002) on threads of grate screws, install and tighten. Torque both front screws (hexagonal head) to 20 N•m (15 lbf•ft).

50,51, Seal Carrier & Needle Bearing

Properly support inner portion of seal carrier to avoid a spring effect when installing seals and bearing.

Push bearing with same pusher used at disassembly. Center bearing in longitudinal axis of housing.

Section 08 PROPULSION & DRIVE SYSTEMS
Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



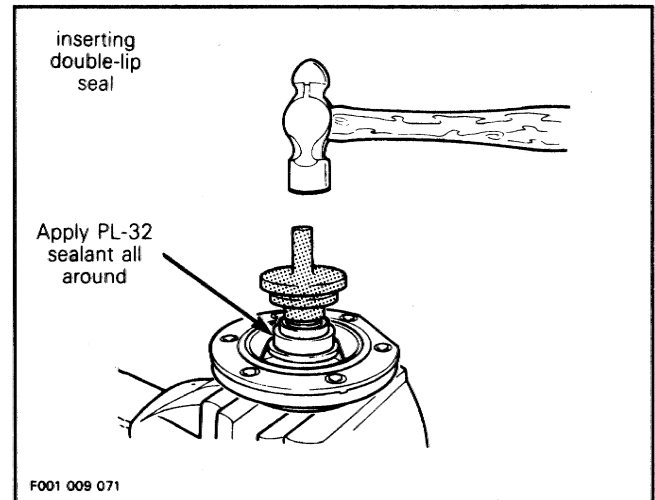
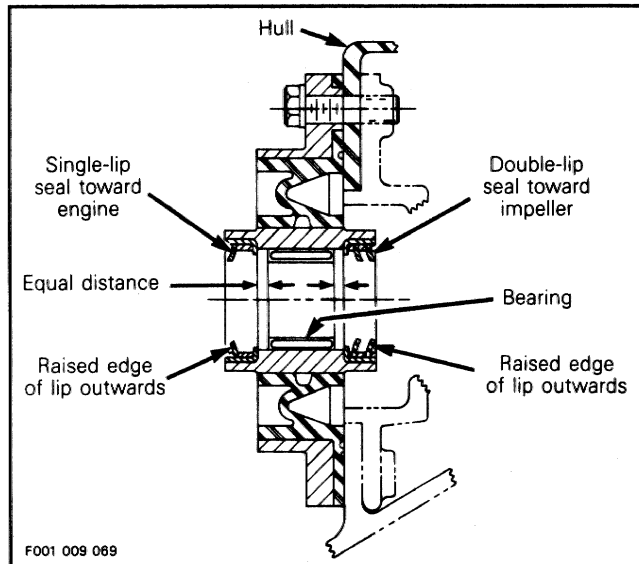
49,50,52, Seal & Seal Carrier

Install double-lip seal toward impeller side and single lip seal toward engine side.

On both seals, raised edge of lip must be located outwards of seal carrier.

Since one lip exceeds seal edge, it is recommended to use a special tool (P/N 295 000 014) to avoid lip damage on double-lip seal.

Push seal until it comes flush with its housing.



Apply PL-32 Sealant (P/N 293 800 001) all around outside diameter of seals.

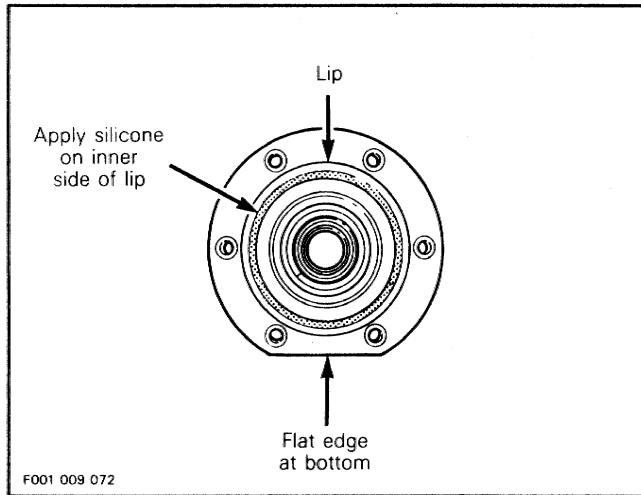
Single-lip seal can be carefully inserted, using a hammer, until it comes flush with its housing.

Pack seals and bearing with Bearing Grease (P/N 293 550 005).

Apply Loctite 587 Superflex Ultra Blue (P/N 293 800 016) all around inner side of seal carrier lip. Install seal carrier with its flat edge at bottom.

Section 08 PROPULSION & DRIVE SYSTEMS

Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



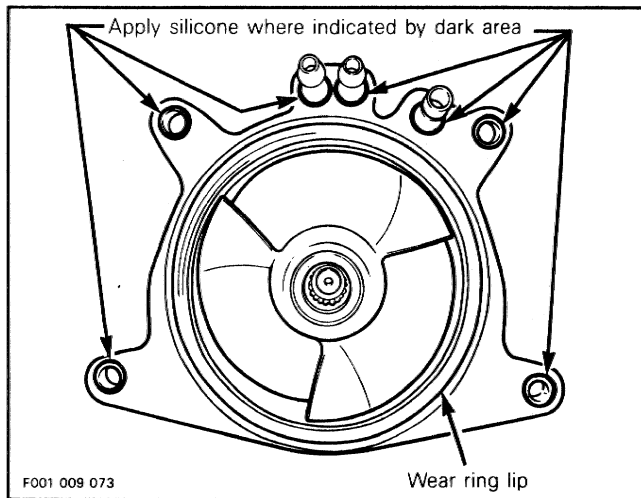
Prior to installing screws, apply PL-32 Sealant (P/N 293 800 001) on all screw threads. Evenly tighten screws in a criss-cross sequence.

○ **NOTE** : Seal carrier screws should not be tightened until pump is installed, to insure perfect alignment.

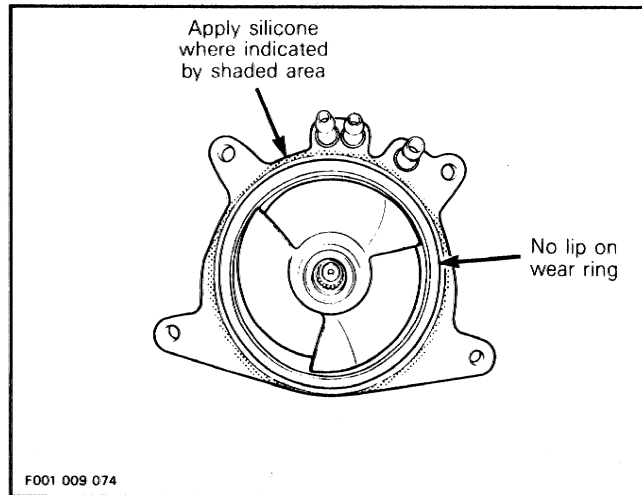
INSTALLATION

Pump Unit

Apply Loctite 587 Superflex Ultra Blue (P/N 293 800 016) on pump as shown in the following illustration.



○ **NOTE** : If wear ring does not feature a lip on its edge, apply additional silicone all around housing as shown.



Make sure rubber damper is on drive shaft end.

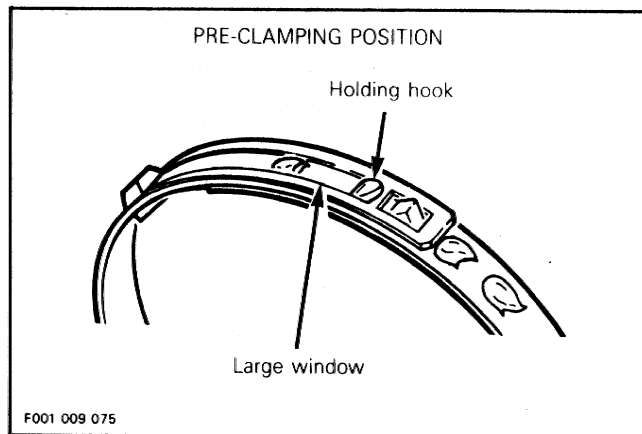
Insert drive shaft end through hull tunnel. Slide through seal carrier being careful not to damage seals. Push on pump until shaft comes close to flywheel.

While holding pump, guide and engage shaft splines in flywheel. Rotate shaft to properly index splines. Make sure boot is well positioned over shaft end.

If necessary, tap pump end with a rubber hammer until retaining nuts and washers can be installed. Apply Loctite 242 (blue) (P/N 293 800 002) on threads and equally tighten nuts in a criss-cross sequence and torque to 25 N•m (18 lbf•ft).

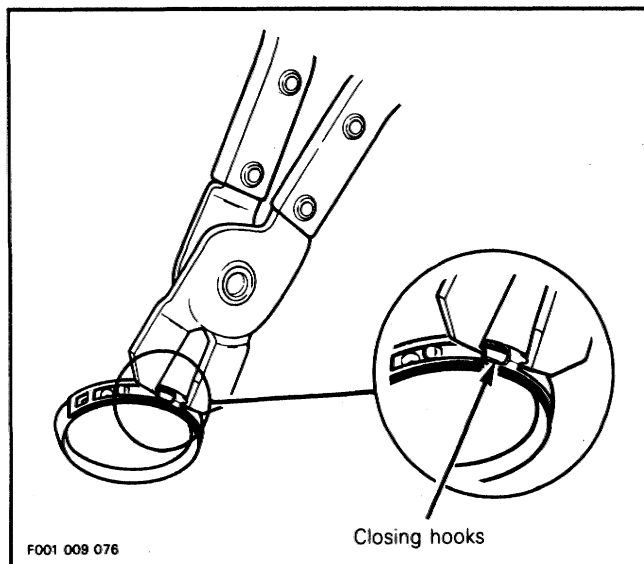
Secure boot clamp as follows :

- Use pincer (P/N 295 000 069) as for removal.
- Manually engage holding hook in large window. This is a pre-clamping position only.

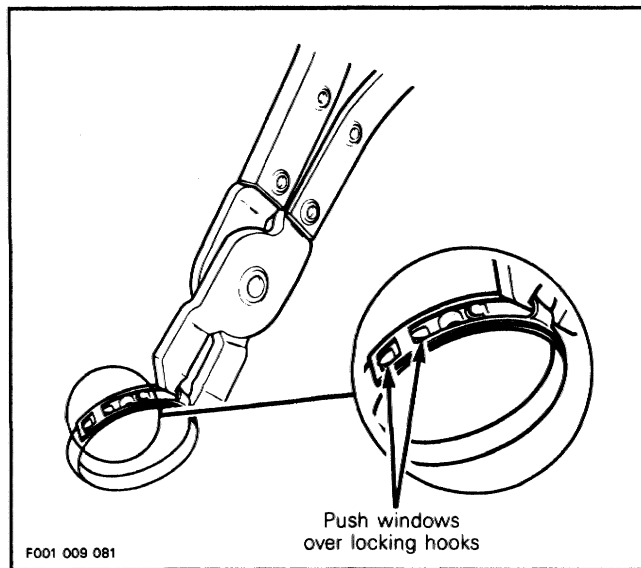


- Insert pointed tips of pincers first in closing hooks.

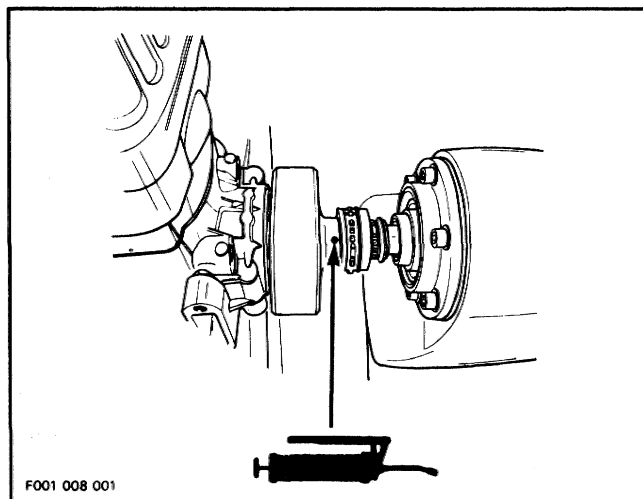
Section 08 PROPULSION & DRIVE SYSTEMS
Sub-Section 01 (PROPULSION & DRIVE SYSTEMS)



- Squeeze pincers to draw closing hooks together. When both large and small windows are directly over the two locking hooks, press those windows down to engage and seal clamp.



Using a grease gun, carefully lubricate, with Bearing Grease (P/N 293 550 005), at grease fitting until boot is just beginning to expand. From this point, immediately stop.



Secure flywheel guard.

Secure coolant inlet hose and both bailer tubes to impeller housing.

21,22,23,24, Screw, Sleeve Bushing & Nozzle

Insert bushings in nozzle, positioning their flanges from inside of nozzle. Apply LPS #3 lubricant or equivalent on outer circumference of sleeve then insert in nylon bushings.

Install nozzle on venturi, positioning its steering arm on RH side. Apply Loctite 242 (blue) on threads and install screws then torque to 20 N•m (15 lbf•ft).

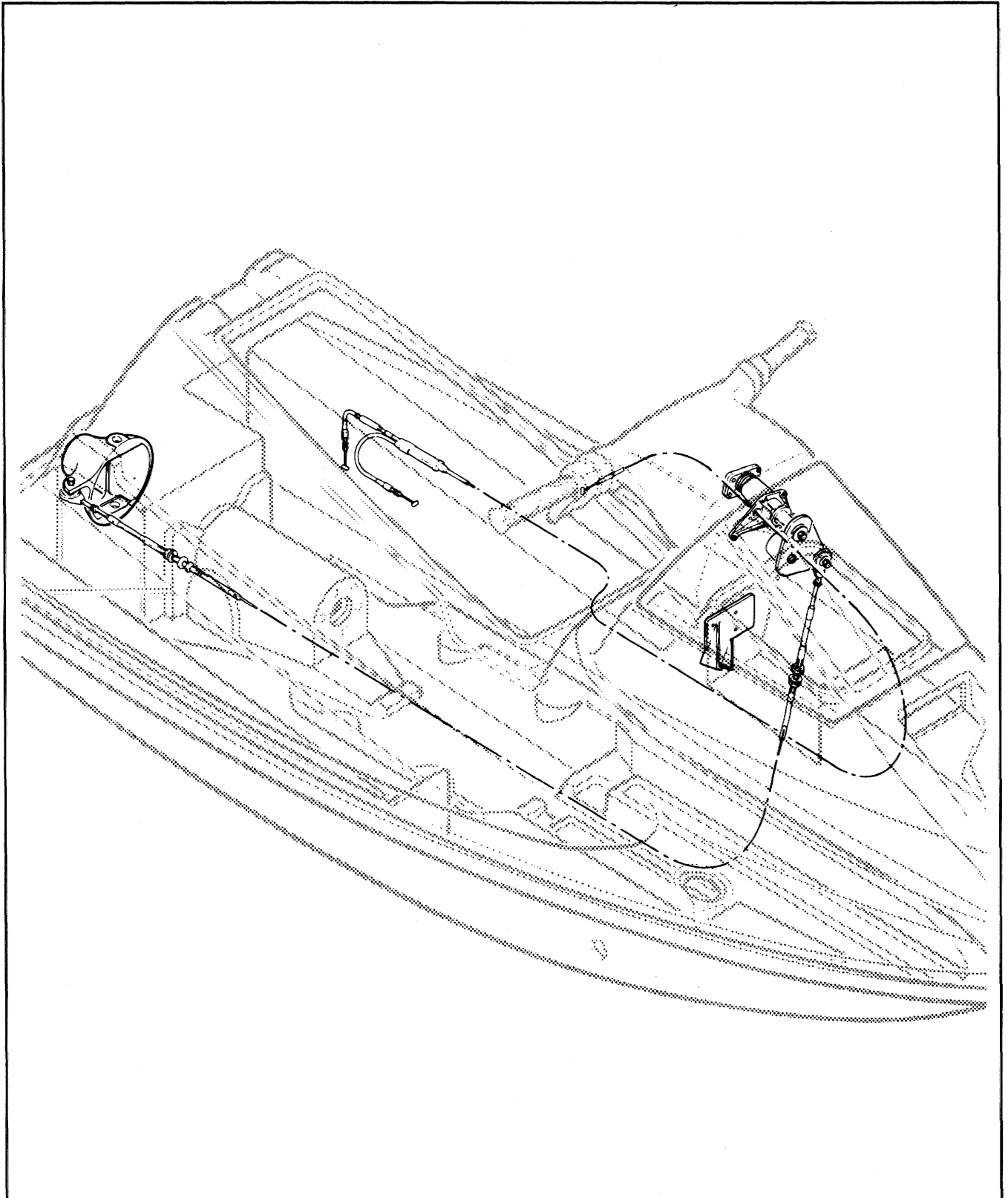
Re-install steering cable ball joint on nozzle and check handlebar / nozzle alignment.

To allow impeller seats into wear ring, start engine so that impeller rotates for a moment.

Slightly lubricating wear ring with SEA-DOO LUBE (P/N 293 600 006) before starting insures no stiction during initial start.

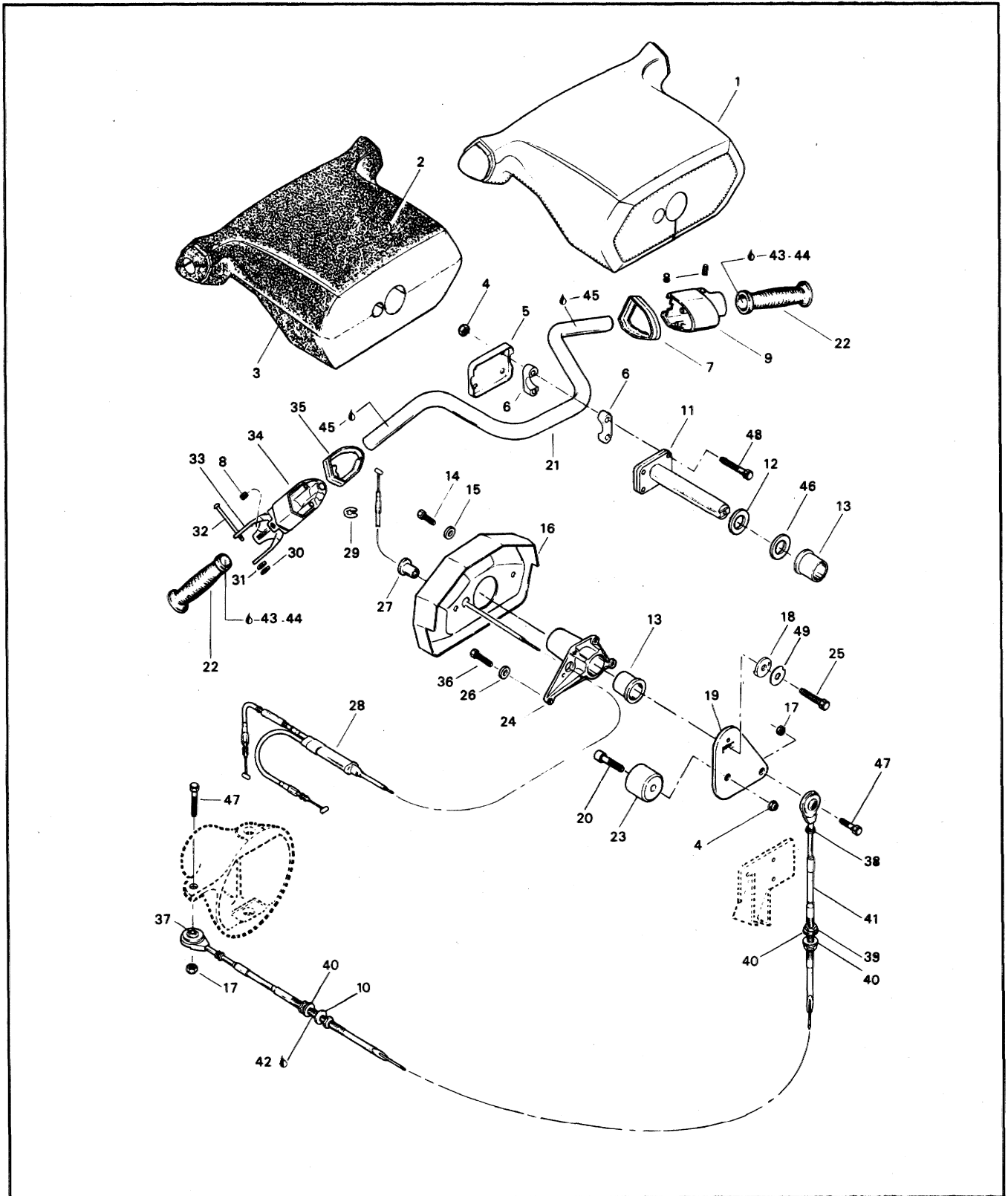
▼ CAUTION : Water must be supplied to cool engine with flush kit (P/N 295 000 038). Do not run engine longer than five minutes since drive line seal has no cooling out of water.

STEERING SYSTEM



Section 09 STEERING SYSTEM
Sub-Section 01 (STEERING SYSTEM)

STEERING SYSTEM



Section 09 STEERING SYSTEM

Sub-Section 01 (STEERING SYSTEM)

COMPONENTS

1. Cover
2. Foam (Top)
3. Foam (Bottom)
4. Elastic Stop Nut M8 (5)
5. Steering Clamp
6. Steering Support (4)
7. Adapter
8. Set Screw (2)
9. Left Handle Housing
10. Threading Oil
11. Stem Steering
12. Washer (Shim)
13. Bushing (2)
14. Hexagonal Head Screw M6 x 20 (2)
15. Washer 6 mm (2)
16. Collar
17. Elastic Stop Nut M6 (2)
18. Washer
19. Stem Arm Steering
20. Allen Screw M8 x 30
21. Handle Bar
22. Grip (2)
23. Stopper Bushing
24. Steering Support
25. Allen Screw M8 x 20
26. Washer 8 mm (4)
27. Grommet
28. Throttle Cable
29. Circlip
30. Circlip
31. Washer
32. Pin
33. Throttle Handle
34. Throttle Handle Housing
35. Adapter
36. Hexagonal Head Screw M8 x 25 (4)
37. Ball Joint (2)
38. Nut 10-32 (2)
39. Jam Nut 7/16 (4)
40. Washer 7/16 (3)
41. Cable
42. Loctite U Blue, 300 mL
43. Primer "449", 475 mL
44. Sealant Adhesif (Grey 221), 305 mL
45. Primer "260", 946.3 mL
46. Washer (Shim)
47. Hexagonal Head Screw M6 x 30 (2)
48. Hexagonal Head Screw M8 x 55 (4)
49. Washer
50. Washer (2)

ASSEMBLY

1, Cover

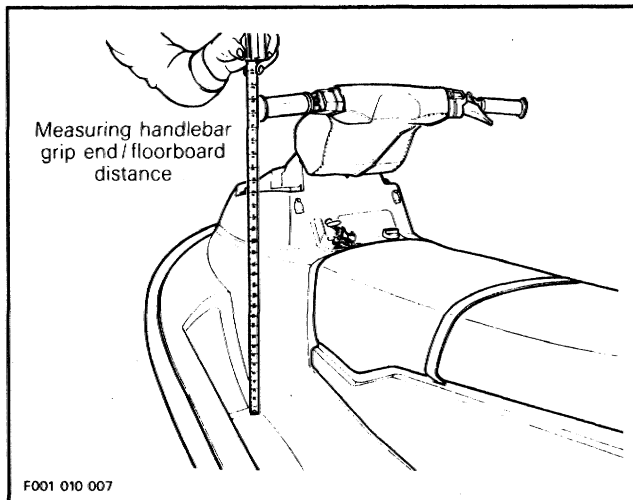
To ease cover installation, it can be heated with a hair dryer or a heat gun.

▼ **CAUTION:** Overheating could damage vinyl cover.

ADJUSTMENT

Steering Jet Pump Nozzle

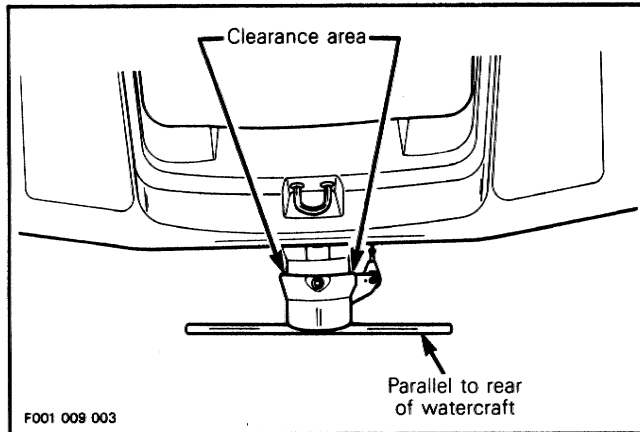
Position handlebar in straight ahead position by measuring each side the distance from handlebar grip end to floorboard.



Section 09 STEERING SYSTEM

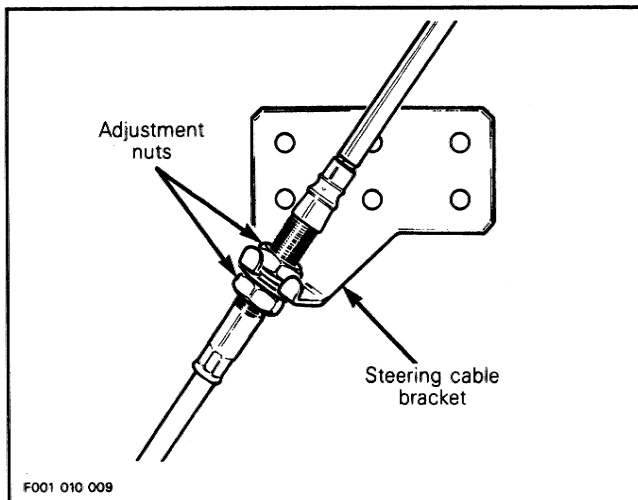
Sub-Section 01 (STEERING SYSTEM)

Check jet pump nozzle position by placing a straight edge on nozzle outer end. Straight edge should be parallel to rear of watercraft.



Steering alignment adjustment should be performed on outer cable adjustment nuts on steering cable bracket near steering stem.

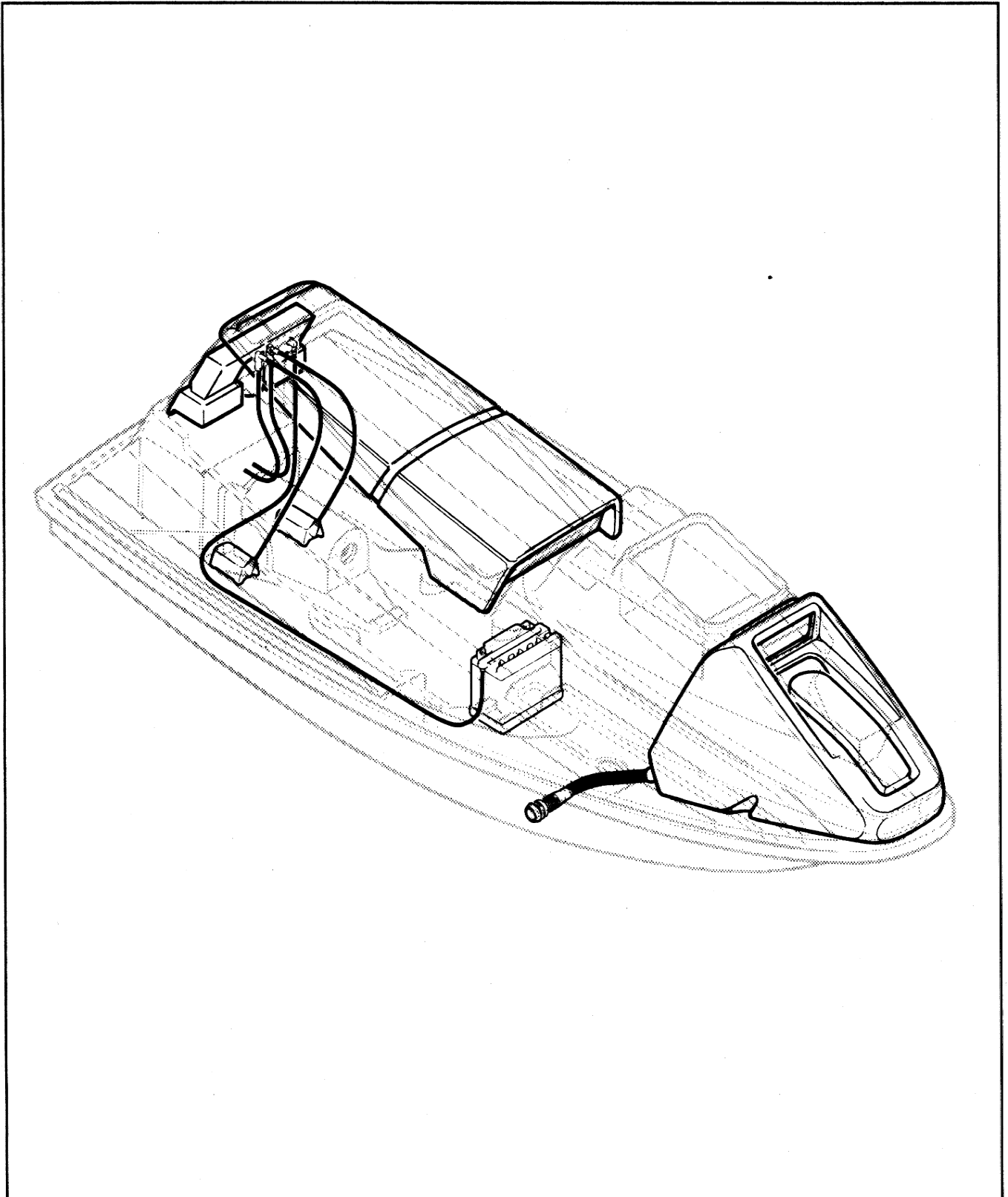
Adjust nuts so that nozzle pivots from side to side but does not contact venturi housing on either side. To verify, insert a paper sheet or a feeler gauge ($\sim .005$ in) between nozzle and venturi at indicated area.



After adjustment, properly tighten nuts.

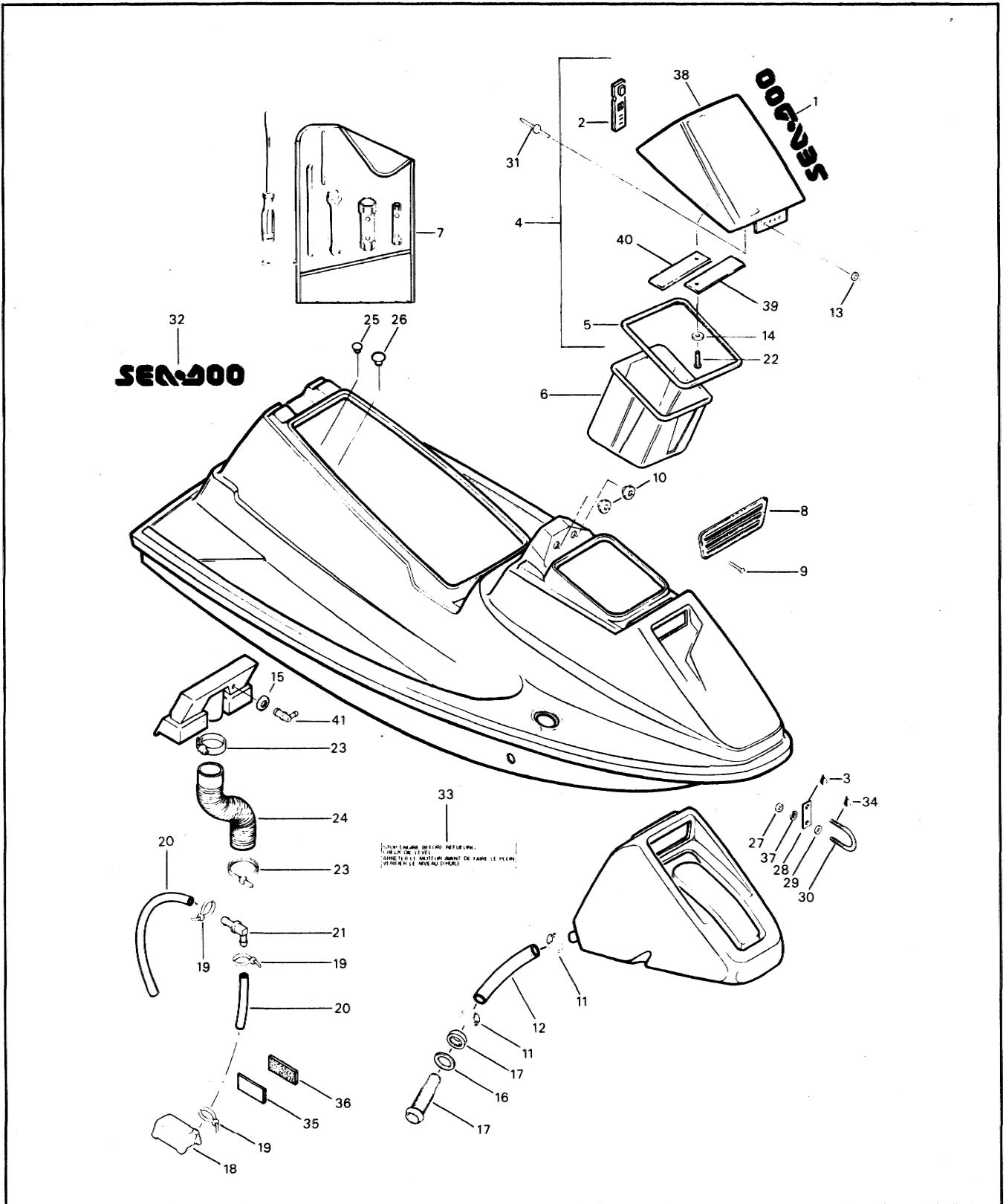
◆ **WARNING:** Ensure handlebar and jet pump nozzle operate freely from side to side and that jet pump nozzle does not contact the side of venturi housing.

HULL/BODY



Section 10 HULL/BODY
Sub-Section 01 (HULL/BODY)

HULL/BODY



Section 10 HULL/BODY

Sub-Section 01 (HULL/BODY)

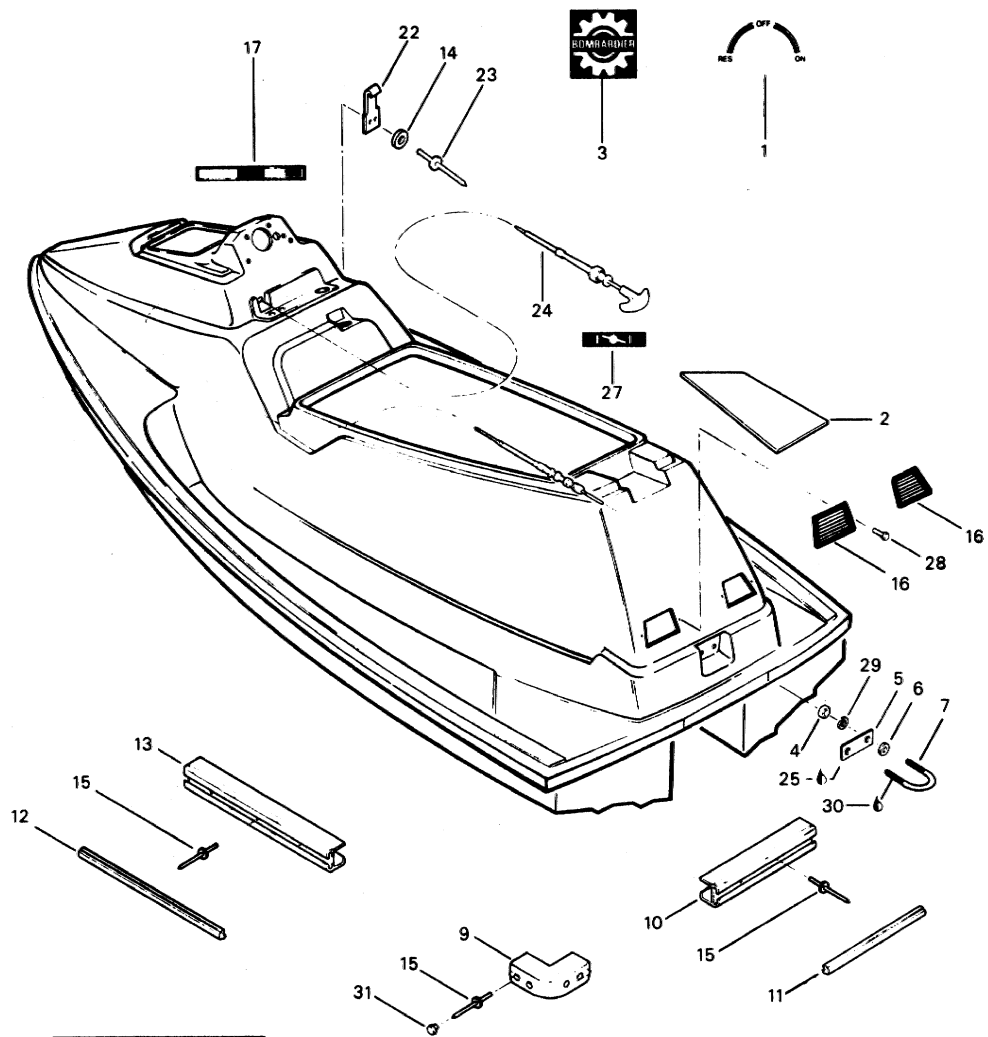
COMPONENTS

1. "Sea Doo" Sticker
2. Latch (2)
3. Silicone 732 RTV, 90 mL
4. Cover Assembly
5. Seal
6. Storage Basket
7. Tool Kit
8. Grill
9. Rivet (2)
10. Grommet (2)
11. Clamp (4)
12. Hose
13. Washer (4)
14. Tank Water Trap
15. Grommet
16. Gasket (2)
17. Fitting (2)
18. Bailer (2)
19. Tie Rap
20. Hose
21. 90° Elbow (2)
22. Vent Baffle
23. Tie Rap (2)
24. Rear Vent Hose
25. Small Plug (2)
26. Large Plug
27. Elastic Stop Nut M8 (2)
28. Plate
29. Washer M8 (2)
30. Tie Ring
31. Rivet (4)
32. "Sea Doo" Sticker (2)
33. "Fuel" Sticker
34. Loctite 271, 10 mL
35. Velcro (2)
36. Velcro (2)
37. Lock Washer (2)

Section 10 HULL/BODY
Sub-Section 01 (HULL/BODY)

BODY

19 — **Bombardier**



WARNING

- Read the operator's manual.
- Do not drink alcohol or use drugs while operating the boat.
- Do not operate the boat if you are tired or have a headache.
- Do not operate the boat if you are under the influence of alcohol or drugs.
- Do not operate the boat in rough seas or in conditions that you do not understand.
- Do not operate the boat in conditions that you do not understand.
- Do not operate the boat in conditions that you do not understand.

DISASSEMBLY

- Do not disassemble the boat unless you are qualified to do so.
- Do not disassemble the boat unless you are qualified to do so.
- Do not disassemble the boat unless you are qualified to do so.
- Do not disassemble the boat unless you are qualified to do so.
- Do not disassemble the boat unless you are qualified to do so.
- Do not disassemble the boat unless you are qualified to do so.

THIS BOAT IS NOT REQUIRED TO COMPLY WITH THE FOLLOWING U.S. COAST GUARD SAFETY STANDARDS IN EFFECT ON THE DATE OF CERTIFICATION:

- Fuel System
- Safe Loading
- Display of Capacity Information
- Flotation
- Powerd Ventilation

AS AUTHORIZED BY U.S. COAST GUARD GRANT OF EXEMPTION (CG-BE-001)

Bombardier Corp. 2575 Boulevard des Peres, St. Louis, MO 63118
Imported by Coleman
Manufactured in Canada



Section 10 HULL/BODY

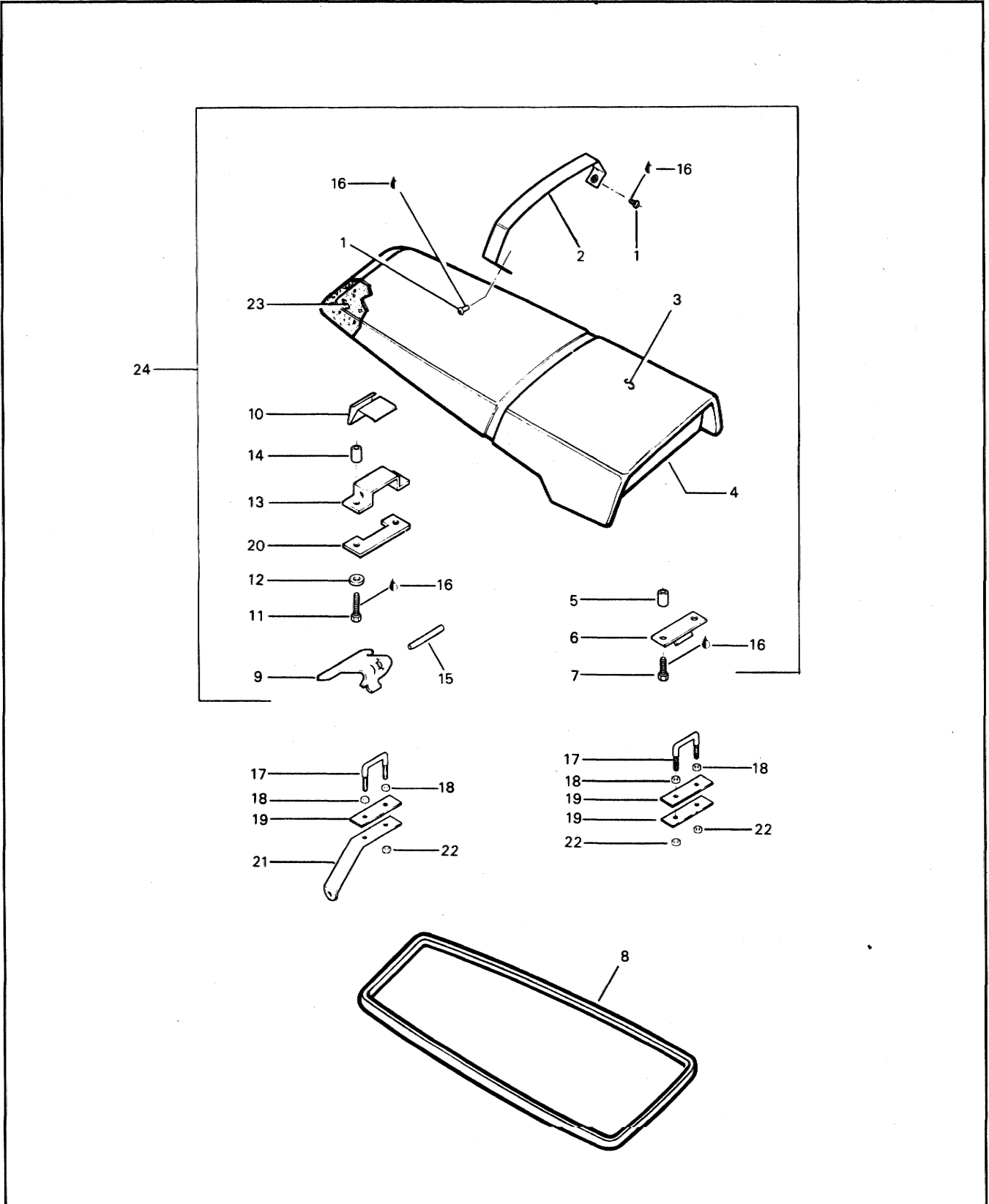
Sub-Section 01 (HULL/BODY)

COMPONENTS

1. "Valve" Sticker
2. R.H. Carpet, L.H. Carpet
3. "Bombardier" Sticker
4. Stop Nut M8 (2)
5. Plate
6. Washer 8 mm (2)
7. Tie Ring
8. Sticker
9. Corner Bumper (2)
10. Rear Bumper
11. Rear Trim
12. Side Trim
13. Side Bumper
14. Washer (4)
15. Rivet (54)
16. Rear Inlet Grill (2)
17. "Start" Sticker
18. R.H. Decal, L.H. Decal
19. "Bombardier" Sticker (2)
20. "Warning" Sticker
21. "Avertissement" Sticker
22. Support (2)
23. Rivet (4)
24. Choke Cable
25. Silicone 732 RTV, 90 mL
26. Bilge Drain Plug
27. "Choke" Sticker
28. Rivet (4)
29. Lock Washer 8 mm (2)
30. Loctite 271, 10 mL
31. Plug (8)

Section 10 HULL/BODY
Sub-Section 01 (HULL/BODY)

SEAT



Section 10 HULL/BODY

Sub-Section 01 (HULL/BODY)

COMPONENTS

- | | |
|-------------------------------------|--------------------------|
| 1. Cap Screw M6 x 10 (2) | 13. Latch Support |
| 2. Seat Strap | 14. Spacer 12 mm (2) |
| 3. Seat Cover Assembly | 15. Lever Pin |
| 4. Base Seat | 16. Loctite 242, 10 mL |
| 5. Spacer 8 mm (2) | 17. Hook (2) |
| 6. Front Tab | 18. Nut M6 (4) |
| 7. Screw Hexagonal M6 x 20 (2) | 19. Back Up Plate (3) |
| 8. Seal Neoprene "D" | 20. Stopper Plate |
| 9. Lever | 21. Air Silencer Support |
| 10. Spring | 22. Lock Nut 6 mm (4) |
| 11. Hexagonal Cap Screw M6 x 25 (2) | 23. Foam |
| 12. Flat Washer 6 mm (2) | 24. Seat Assembly |
-

GENERAL

Seat

Adjust front and rear hooks so that when seat is latched, seal is compressed to insure a water-tight fit.

Hull & Body Repair

Upper body is made of fiberglass. Hull is made of fiberglass featuring aluminum inserts to allow strong structural attachment points.

Fiberglass finish is made of gel coat layer which gives its color and smooth finish.

Gel coat and fiberglass repair kits are available through automotive or marine suppliers.

STORAGE

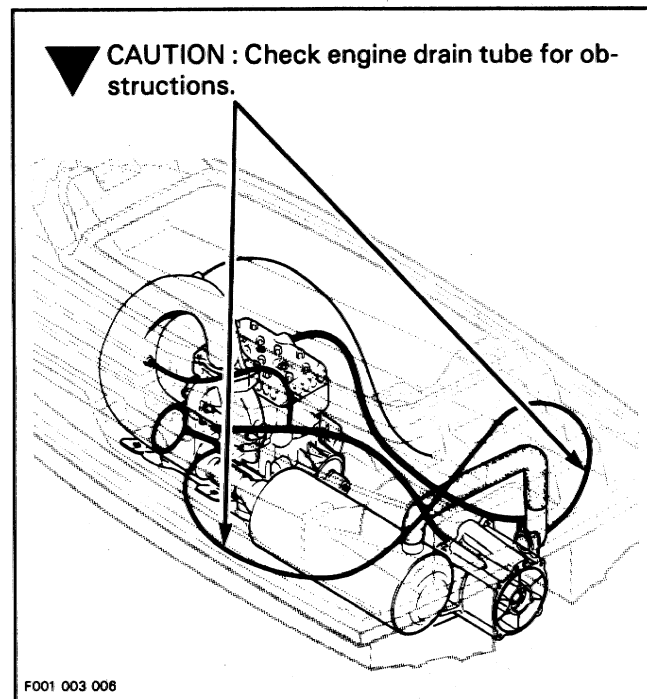
During winter or when the watercraft is not to be in use for prolonged time, proper storage is a necessity. Storage during long period of inactivity consists of checking and replacing missing, broken or worn parts and protecting cooling system against freezing (where applicable) and/or corrosion.

Proper lubrication and treatment should be performed to insure that parts do not become corroded.

ENGINE DRAINING

Check engine drain tube from engine water inlet socket to exhaust outlet socket. Make sure there is no sand or obstructions so that water can leave the engine. Clean tube as necessary.

▼ **CAUTION** : Water in engine drain tube must be free to flow out, otherwise water could be trapped in engine. Should water freeze in engine, severe damage will occur.



WATERCRAFT RINSING

Thoroughly rinse the watercraft hull, bilge, engine compartment etc. with fresh water.

PROPULSION SYSTEM

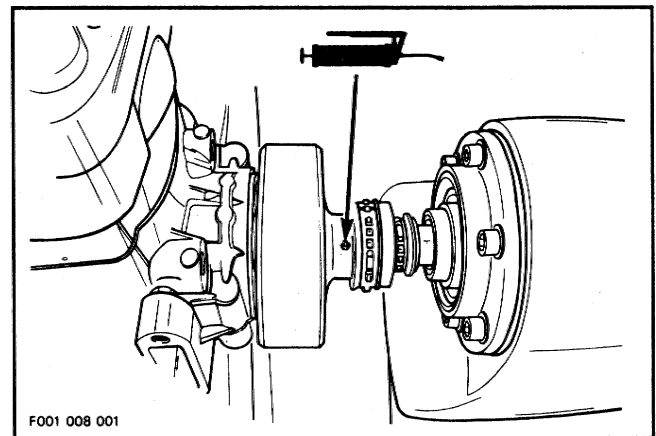
Lubricant in impeller shaft reservoir. Should be drained and reservoir cleaned.

Refill with SEA-DOO JET PUMP SYNTHETIC OIL (P/N 293 600 011) only.

▼ **CAUTION** : This is a synthetic oil. Do not mix with mineral based oil.

Lubricate drive shaft splines through grease fitting at flywheel end.

▼ **CAUTION** : Do not lubricate excessively. Immediately stop when a slight movement is noticed on rubber boot.



COOLING SYSTEM FLUSHING AND ENGINE INTERNAL LUBRICATION

Cooling system has to be flushed with **fresh water** to prevent salt, sand or dirt accumulation which might clog water passages. This will be achieved with the flush kit P/N 295 000 038.

Engine must be lubricated to prevent corrosion on internal parts. This will be achieved by spraying SEA-DOO LUBE (P/N 293 600 006) through air intake opening after removal of air intake silencer.

Flushing and lubrication will be done at the same time while engine is running.

Section 11 STORAGE

Procedure

Properly connect flush kit coupler hose to engine outlet hose.

Attach other end of flush kit coupler hose to a garden hose.

▼ **CAUTION** : Never flush a hot engine. Always start engine first then start water flow. Severe engine damage could result if not done in this order.

Start engine then start water flow. Make sure engine operates during entire procedure.

◆ **WARNING** : Do not touch any electrical part when engine is running.

Spray SEA-DOO LUBE through air intake opening, keeping engine at a fast idle. Lubrication of engine should be done at least for one minute. After approximately half a minute, close fuel tank valve to run engine out of gas while lubricating.

▼ **CAUTION** : When engine begins to run irregularly because of gas starvation, immediately stop water flow before engine dies. Severe engine damage could result if not done in this order.

◆ **WARNING** : Perform this operation in a well ventilated area.

Press unlocking button to remove coupler hose. Re-install dust cap over tee fitting.

Remove both spark plugs and spray SEA-DOO LUBE into each cylinder.

Crank the engine a few turns to distribute the oil on cylinder wall.

Apply anti-seize lubricant on spark plug threads then re-install them.

Re-install air intake silencer.

▼ **CAUTION** : Do not run the engine during the storage period.

FUEL SYSTEM

To prevent gum and varnish formation inside components, siphon all gas from fuel tank.

◆ **WARNING** : Remove fuel tank cap slowly. Fuel may be under pressure and might spray out when removing cap. Gasoline is flammable and explosive under certain conditions. Always work in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity. Always wipe off any fuel spillage from the watercraft.

BATTERY

Remove and clean battery. Apply dielectric grease (P/N 293 550 004) or petroleum jelly on battery posts and all exposed cable connectors.

Add distilled water if necessary then give the battery a full charge at a maximum rate of two amperes.

Store the battery on a shelf in a warm dry place away from direct sunlight.

To prevent battery sulphating and discharging, charge every month.

ANTI-CORROSION TREATMENT

Wipe off any residual water in the engine compartment.

Spray SEA-DOO LUBE over all metallic components in engine compartment.

ADDITIONAL RECOMMENDED PROTECTION

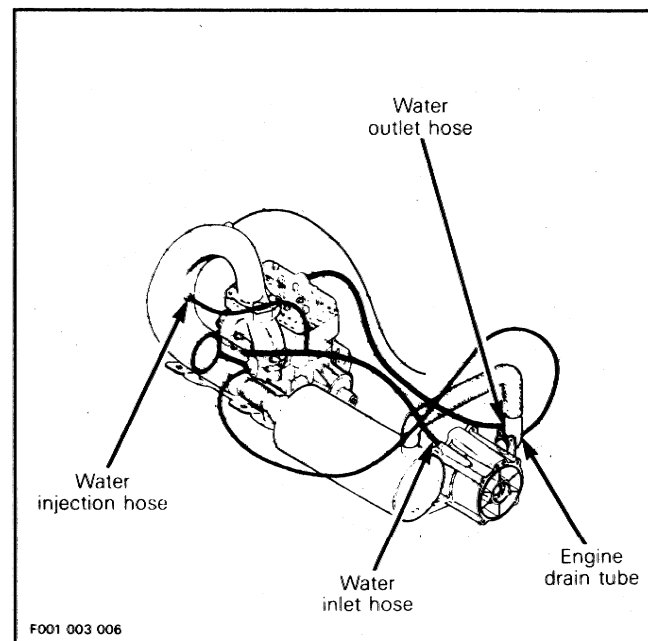
Cooling system may be filled with a 50/50 distilled water / antifreeze solution.

▼ **CAUTION** : Always use ethylene-alcohol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

○ **NOTE** : The engine will not have to run during this operation.

Four hoses have to be disconnected to allow air to escape and antifreeze solution to completely fill cooling system water jackets.

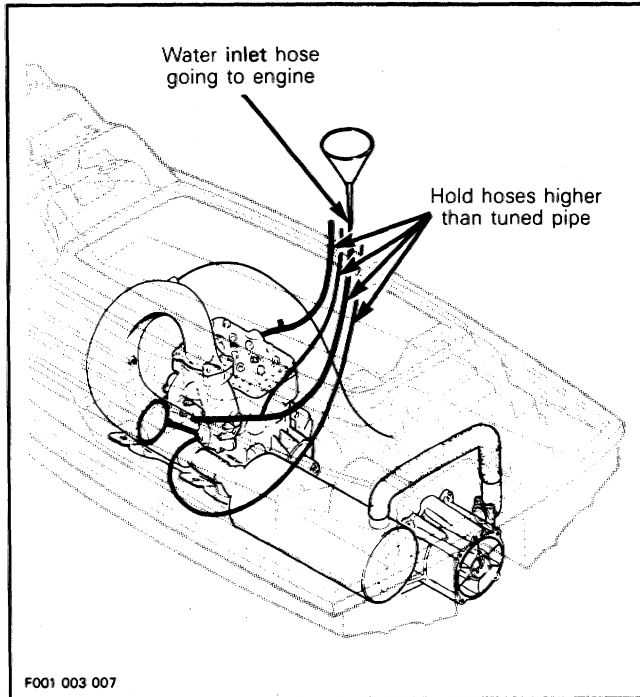
Disconnect the hoses where shown.



Section 11 STORAGE

Raise all hoses above the highest point of tuned pipe and temporarily tie them together.

Insert a funnel into inlet hose going to the water inlet socket at engine. Pour about 2 liters (1/2 gal) of 50/50 antifreeze/distilled water solution through the funnel.



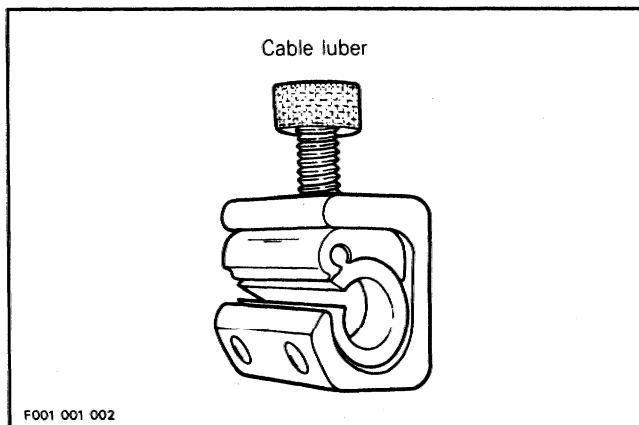
The following steps should be performed to provide the watercraft enhanced protection.

Remove muffler and drain out as much water as possible. Re-install muffler.

OR : Disconnect one hose from muffler and pour some antifreeze liquid inside muffler. Re-connect hose.

Lubricate the throttle cable with SEA-DOO LUBE.

NOTE : A cable luber can be used on throttle cable end to power inject SEA-DOO LUBE into cable. Refer to a motorcycle parts supplier for availability.



Clean the bilge with hot water and detergent or with bilge cleaner. Rinse thoroughly.

Wash the body with soap and water solution (only use mild detergent). Rinse thoroughly with fresh water. Remove marine organisms from the hull. Apply a non-abrasive wax such as silicon wax. Protect the seat with vinyl protectant such as Armor All® or the equivalent.

CAUTION : Never clean apparent fiberglass and plastic parts with strong detergent, degreasing agent, paint thinner, acetone etc.

If the watercraft is to be stored outside, cover it with an opaque tarpaulin.

CAUTION : The watercraft must never be left in water for storage.

TECHNICAL DATA

ENGINE			
Engine type		ROTAX 587, water cooled	
Induction type		Rotary valve	
Exhaust system		Water cooled, water injected	
Starting system		Electric start	
Lubrication	Gas/Oil mixture & ratio	N.A.	
	Oil injection pump	Gear	
	Oil type	SEA-DOO injection oil	
Number of cylinders		2	
Bore	Standard	76.0 mm	(2.992 in)
	First oversize	76.25 mm	(3.002 in)
	Second oversize	76.50 mm	(3.022 in)
Stroke		64 mm	(2.520 in)
Displacement		580 cm ³	35.3 in ³
Compression ratio (uncorrected)		11.5 : 1	
Compression pressure		1070 kPa	(155 lb/in ²)
Engine maximum output		42 KW (56 HP) @ 5750 RPM	
Engine maximum torque		67 N•m (49 lbf•ft) @ 5500 RPM	
Cylinder head warpage		—	
Piston ring type and quantity		1 ETL - 1 RR	
Ring end gap	New	0.25 - 0.40 mm	(.010 - .016 in)
	Wear limit	1.00 mm	(.039 in)
Ring/piston groove clearance	New	0.03 - 0.08 mm	(.001 - .003 in)
	Wear limit	0.2 mm	(.008 in)
Piston/cylinder wall clearance	New	0.06 - 0.07 mm	(.002 - .003 in)
	Wear limit	0.2 mm	(.008 in)
Cylinder taper (maximum)		0.08 mm	(.003 in)
Cylinder out of round (maximum)		0.05 mm	(.002 in)
Connecting rod big end axial play	New	0.4 mm	(.016 in)
	Wear limit	1.2 mm	(.047 in)
Crankshaft end-play		N.A.	
Crankshaft deflection		0.08 mm	(.003 in)
Rotary valve timing	Opening	129° BTDC	
	Closing	49° ATDC	
Crankcase/rotary valve gap		0.3 - 0.5 mm	(.001 - .020 in)
ADDITIONAL INFORMATION :			

Section 12 TECHNICAL DATA

ELECTRICAL		
Magneto generator output		160 W @ 5500 RPM
Ignition system, type		CDI 4/5 p
Spark plug	Make and type	Champion N4C
	Gap	0.5 mm (.020 in)
Ignition timing	BTDC	2.18 mm (.086 in)
	Note	@ 6000 RPM
Generating coil	Low speed	120 - 180 Ω
	High speed	2.8 - 4.2 Ω
Battery charging coil		0.21 - 0.31 Ω
High tension coil	Primary	0.23 - 0.43 Ω
	Secondary	2.45 - 4.55 K Ω
ADDITIONAL INFORMATION : Engine RPM limiter operates at 6300 RPM.		
CARBURATION		
Carburetor, type		Diaphragm
Carburetor number		BN-38-34
Main jet		85
Pilot jet		—
Adjustment	Low-speed mixture screw	1-1/2 - 2 turn
	High speed screw	N.A.
	Idle speed	1200 RPM
Gas, type		Unleaded
ADDITIONAL INFORMATION :		
COOLING		
Type	Total loss type - Direct flow from jet propulsion unit.	
Thermostat	None	
ADDITIONAL INFORMATION : Engine equipped with overheat beeper set to 96 - 99°C (205 - 210°F).		

Section 12 TECHNICAL DATA

TIGHTENING TORQUES				
E N G I N E	Exhaust manifold screw/studs		20/6 N•m (15/4 lbf•ft)	
	Magneto ring nut		105 N•m (77 lbf•ft)	
	Flywheel (PTO side)		110 N•m (81 lbf•ft)	
	Crankcase screws	M6	N.A.	
		M8	20 N•m	(15 lbf•ft)
	Crankcase/engine support nuts		12 N•m	(9 lbf•ft)
	Engine support/hull		25 N•m	(18 lbf•ft)
	Cylinder head screws		20 N•m	(15 lbf•ft)
	Crankcase/cylinder screws		20 N•m	(15 lbf•ft)
	Tuned pipe		25 N•m	(18 lbf•ft)
	Saddle clamps		20 N•m	(15 lbf•ft)
	Cylinder head cover screws		10 N•m	(7 lbf•ft)
P U M P	Impeller shaft		44 N•m (32 lbf•ft)	
Handlebar nuts		26 N•m	(19 lbf•ft)	
ADDITIONAL INFORMATION : Starter mounting screw : 22 N•m (16 lbf•ft) Starter lock nuts : 5 N•m (44 lbf•in)				

Section 12 TECHNICAL DATA

PROPULSION			
Propulsion system		Bombardier Formula pump	
Jet pump type		Axial flow single stage	
Impeller rotation (seen from rear)		Counter-clockwise	
Transmission		Direct drive	
Coupling type		Crown splines	
P R O P U L S I O N U N I T	Oil type	SEA-DOO JET PUMP SYNTHETIC OIL (P/N 293 600 011) only	
	Steering (nozzle) pivoting angle	30°	
	Minimum required water level	60 cm (24 in)	
	Drive shaft deflection maximum	0.50 mm (.020 in)	
	Impeller outside diameter	New	139.85 mm (5.506 in)
		Wear limit	138.68 mm (5.460 in)
	Pump case inside diameter	New	140.46 mm (5.530 in)
		Wear limit	—
	Impeller/pump case clearance	New	0.31 ± .13 mm (.012 ± .005 in)
		Wear limit	1.02 mm (.040 in)
PERFORMANCE			
Pump static thrust		—	
Cruising range at full throttle	Fuel tank without reserve	2 h	
	Fuel tank reserve	30 minutes	
Maximum speed		64 km/h (40 MPH)	
DIMENSIONS			
Number of passenger (driver incl.)		2	
Length, overall		244 cm (96 in)	
Width, overall		105 cm (41.5 in)	
Height, overall		92 cm (36.2 in)	
Mass		166 kg (365 lb)	
Load limit		160 kg (352 lb)	
M A T E R I A L S	Hull	Composite	
	Air intake silencer	Composite	
	Flame arrestor	Aluminum foam	
	Exhaust muffler	Aluminum	
	Steering padding	Polypropylene	
	Fuel tank	Polyethylene	
	Injection oil tank	Polyethylene	
ADDITIONAL INFORMATION :			

Section 12 TECHNICAL DATA

ELECTRICAL	
Battery	12 V, 20 A•h
Starting system fuse	8 A
ADDITIONAL INFORMATION :	
CAPACITIES	
Fuel tank	29.10 L (7.7 U.S. gal)
Impeller shaft reservoir	Capacity 60 mL (2.0 oz U.S.)
	Oil level height To lower plug
Cooling system	N.A.
Injection oil tank	2.8 L (95 U.S. fl oz)
ADDITIONAL INFORMATION :	
STANDARD EQUIPMENT	
Tether cord	Yes
Tool kit	Yes
Fuel tank reserve	Yes
Overheating warning device	Yes
ADDITIONAL INFORMATION :	

TROUBLESHOOTING

The following chart is provided to help in diagnosing the probable source of simple troubles.

ENGINE WILL NOT START

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Engine does not turn over	<ul style="list-style-type: none"> • Fuse burnt out • Battery discharged • Battery connections, corroded/ loose • Water in engine • Starter or solenoid • Seized engine 	<p>Check wiring then replace fuse. Charge/replace. Clean and tighten.</p> <p>See section 03-01. See section 07-03. See section 03.</p>
Engine slowly turns	<ul style="list-style-type: none"> • Discharged or weak battery 	Charge/replace.
Engine turns over	<ul style="list-style-type: none"> • Tether cord removed • Fuel tank, empty or water-contaminated • Fuel filter, clogged or water-contaminated • Flooded engine : <ul style="list-style-type: none"> — Fouled/defective spark plugs — Misure of choke • Water in engine • Carburetion/ignition 	<p>Install cap over switch. Refill. Siphon & fill with fresh gas.</p> <p>Clean.</p> <p>Replace. Use only with cold engine. Clean/replace spark plugs. See section 03-01. See sections 05 and 07.</p>

ENGINE MISFIRES, RUNS IRREGULARLY

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	<ul style="list-style-type: none"> • Fouled/defective/ worn spark plugs • Faulty RPM limiter • Too much oil supplied in engine • Faulty ignition system 	<p>Clean/verify spark plug and heat range. Replace as required. See section 07-05. Improper oil pump adjustment. See section 07-05.</p>
Lean fuel mixture	<ul style="list-style-type: none"> • Fuel : Level too low, stale or water-contaminated • Fuel filter, clogged or water-contaminated • Carburetor adjustment 	<p>Siphon and/or refill.</p> <p>Clean.</p> <p>See section 05.</p>
Rich fuel mixture (high fuel consumption)	<ul style="list-style-type: none"> • Partially closed choke • Flame arrestor dirty/clogged • Carburetor adjustment 	<p>Adjust choke cable. Clean or replace. See section 05.</p>

Section 13 TROUBLESHOOTING

ENGINE OVERHEATS

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Overheating beeper sounds	<ul style="list-style-type: none">• Clogged jet pump water intake• Cooling system clogged• Carburetor adjustment• Incorrect type of gas or oil• Ignition timing	Clean. Clean. See section 05. Siphon and refill. See section 07-01.

ENGINE CONTINUALLY BACKFIRES

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	<ul style="list-style-type: none">• Fouled/defective/ worn spark plugs	Clean/verify spark plug and heat range. Replace as required.
Overheated engine	<ul style="list-style-type: none">• See "ENGINE OVERHEATS"	
Ignition timing	<ul style="list-style-type: none">• Incorrectly set	See section 07-01.

ENGINE PINGING OR KNOCKING

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none">• Poor quality gasoline/low octane• Spark plug heat range too high • Ignition timing too advanced	Use well known quality gasoline. Use recommended spark plug number. See section 07-01.

ENGINE LACKS ACCELERATION OR POWER

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none">• Weak spark/incorrect fuel mixture• Throttle does not reach wide open position• Exhaust system clogged• Water in gas or injection oil	Refer to "ENGINE MISFIRES...". See section 05. Clean. Siphon and replace.
Overheated engine	<ul style="list-style-type: none">• See "ENGINE OVERHEATS"	

Section 13 TROUBLESHOOTING

ENGINE RUNS TOO FAST

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none">• Faulty engine RPM limiter	See section 07-05.
Watercraft can not reach top speed	<ul style="list-style-type: none">• Cavitation, jet pump water intake clogged• Cavitation, damaged/worn impeller	Clean. See section 08.

ABNORMAL NOISE FROM PROPUSION SYSTEM

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none">• Weeds or debris jammed around impeller• Lack of oil in impeller shaft reservoir/damaged bearing	Clean and check for damage. See section 08.

