

# SHOP MANUAL



**5805, 5851, 5812, 5860**



**219 • 100 • 006**



# ***SHOP MANUAL***



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# SAFETY NOTICE

This manual has been prepared as a guide to service the SEA-DOO, models SP<sub>5805</sub>, XP<sub>5851</sub>, GTS<sub>5812</sub> and GTX<sub>5860</sub>.

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. : locking disk, 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. Always use common shop safety practice.

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.

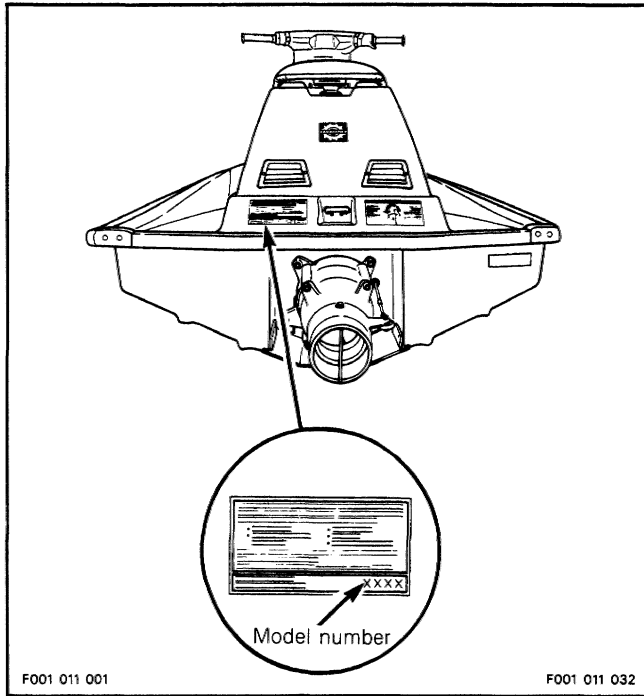
# BOMBARDIER WATERCRAFT SHOP MANUAL

## INTRODUCTION

This *Shop Manual* covers BOMBARDIER made SEA-DOO® watercraft models SP5805, XP5851, GTS5812 and GTX5860

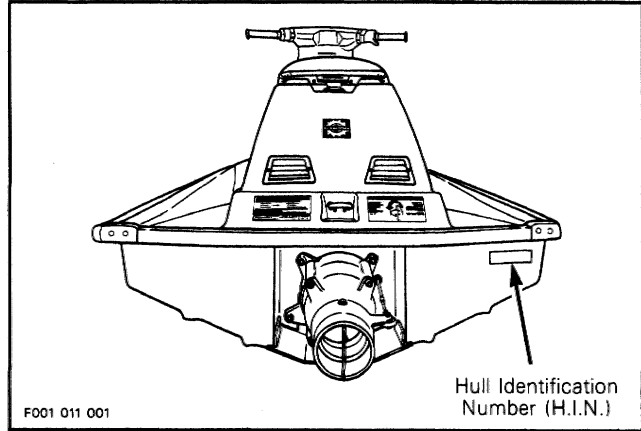
## WATERCRAFT MODEL NUMBER

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



## HULL IDENTIFICATION NUMBER (H.I.N.)

Can be found at right hand rear side of hull, and inside it.



The five digits after ZZN are the watercraft serial number.

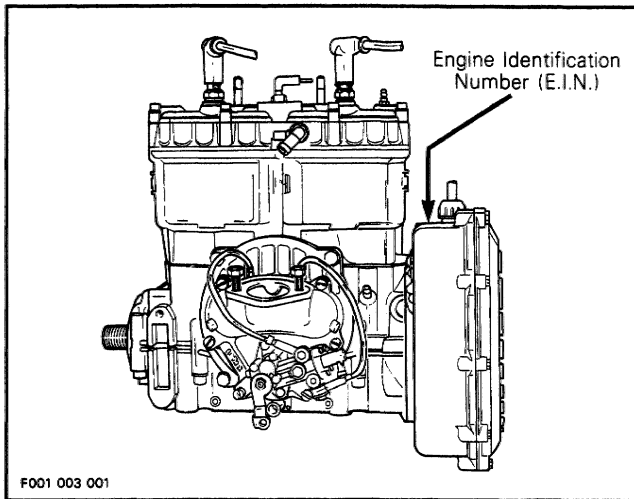
ZZN 1 2 3 4 5 X X X X

Serial number



## ENGINE IDENTIFICATION NUMBER (E.I.N.)

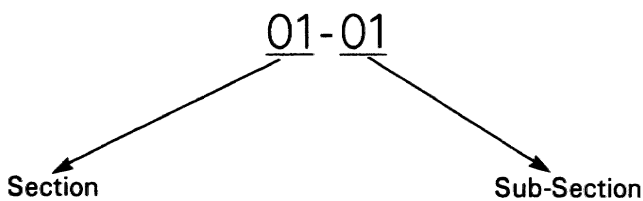
It is located on the upper side of the magneto housing.



## DEFINITION OF NUMBERING SYSTEM OF THIS MANUAL

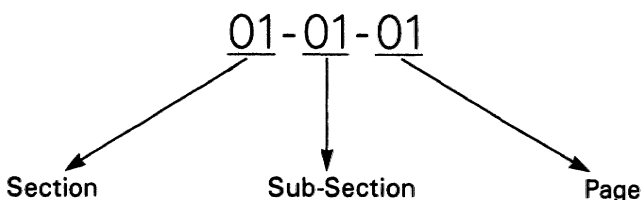
### Sections and Sub-Sections System

The manual makes use of a 2-part digital numbering system (e.g. : 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 :

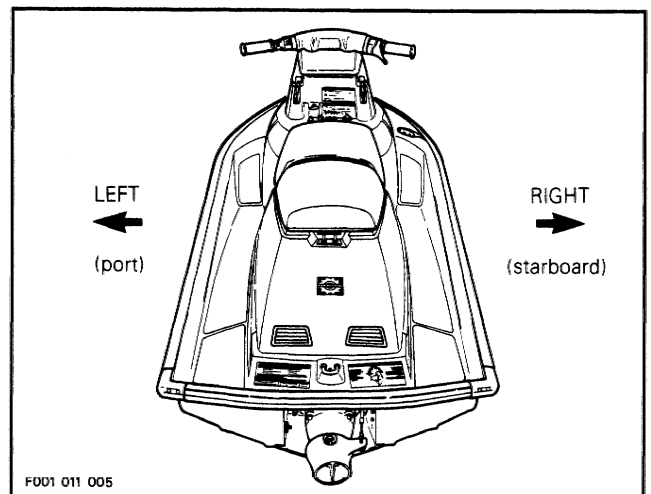
- 01 Service Tools and Products
- 02 Periodic Inspection Chart
- 03 Engine
- 04 Cooling System
- 05 Fuel System
- 06 Oil System
- 07 Electrical
- 08 Propulsion and Drive Systems
- 09 Steering System
- 10 Hull/Body
- 11 Storage
- 12 Technical Data
- 13 Troubleshooting

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 and Installation
- 03 Top End
- 04 Flywheel and Magneto
- 05 Bottom End
- 06 Rotary Valve and Reservoir
- 07 Exhaust System

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



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# BOMBARDIER WATERCRAFT SHOP MANUAL

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## 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 AND 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 specific model, *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.

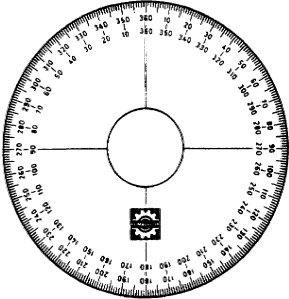
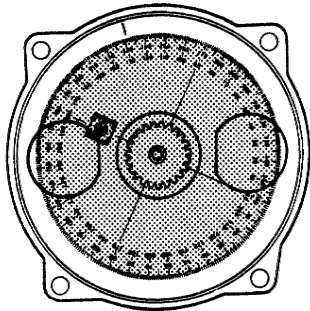
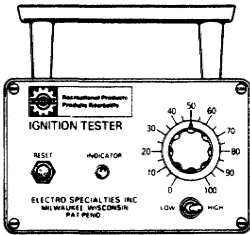
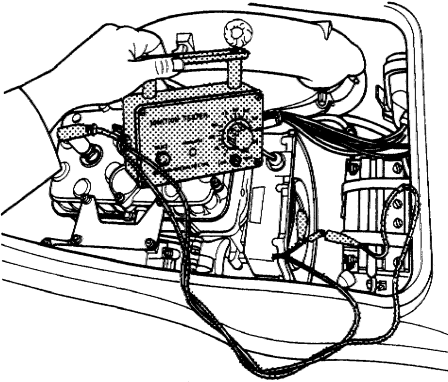
Bombardier Inc.  
SEA-DOO Watercraft After Sales Service  
Valcourt, (Quebec), Canada

**Section 01 SERVICE TOOLS AND PRODUCTS**  
 Sub-Section 01 (SERVICE TOOLS)

# SERVICE TOOLS

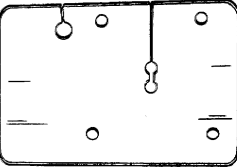
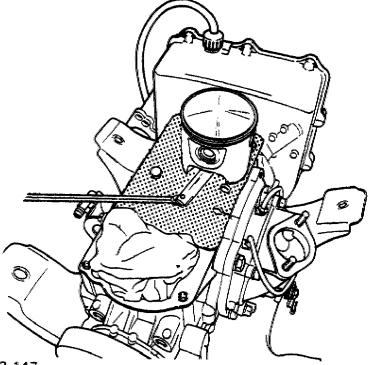
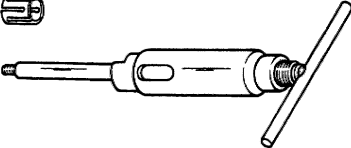
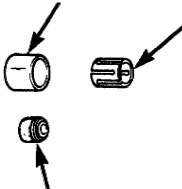
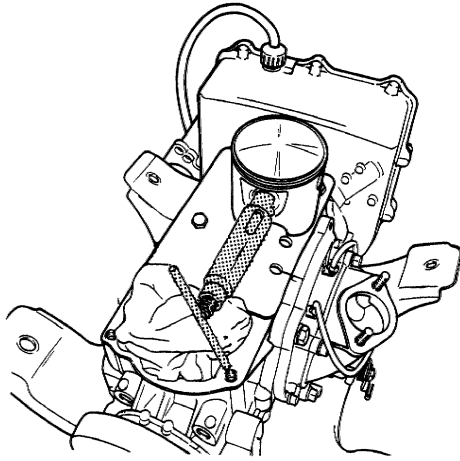
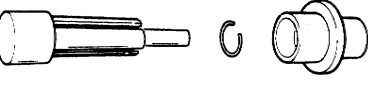
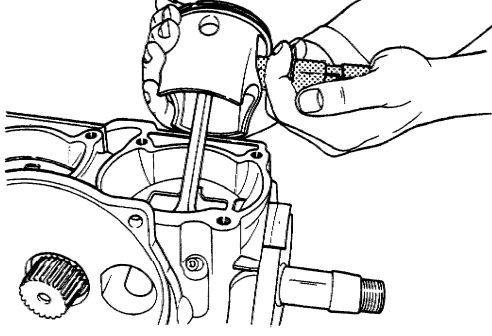
## ENGINE (Mandatory Tools)

Some of the tools are mandatory, refer to the title of each section.  
 Mandatory tool kit is available : P/N 295 000 087.

SERVICE TOOL	PURPOSE	APPLICATION
<p>Degree wheel (mandatory)            P/N 295 000 007</p>  <p>A000 001 111</p>	<p>To mark timing position of rotary valve, to check crankshaft alignment.</p>  <p>F001 003 093</p>	<p>All models.</p>
<p>Bombardier ignition tester (mandatory)            P/N 295 000 008</p>  <p>A000 002 056</p>	<p>To test engine electrical components.</p>  <p>F001 007 100</p>	<p>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

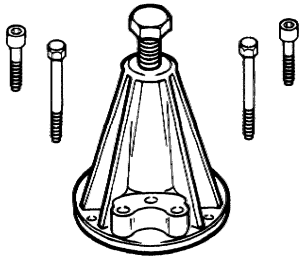
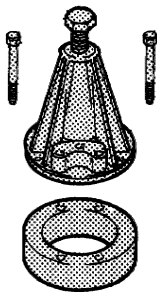


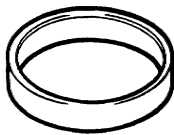
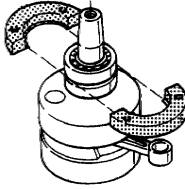
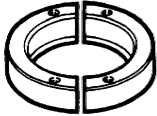
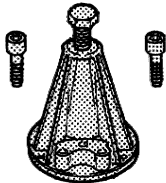
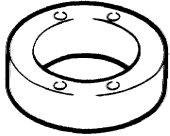
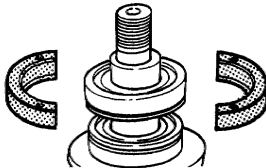

SERVICE TOOL	PURPOSE	APPLICATION
<p>Rubber pad (mandatory) P/N 295 000 079</p>  <p>F001 001 019</p>	<p>To avoid needles of connecting rod bearing from falling in crankcase.</p>  <p>F001 003 147</p>	<p>All models.</p>
<p>Piston pin puller (mandatory) P/N 290 877 090</p>  <p>Locating sleeve (P/N 290 877 180)</p> <p>Expansion sleeve (P/N 290 877 040)</p> <p>Extracting nut (P/N 290 877 155)</p>  <p>F001 001 031</p>	<p>To remove and install piston pin.</p>  <p>F001 003 099</p>	<p>All models.</p>
<p>Piston circlip installer (mandatory) P/N 295 000 077</p>  <p>A001 001 061</p>	<p>To install circlips on pistons.</p>  <p>F001 003 034</p>	<p>All models.</p>

**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 01 (SERVICE TOOLS)**

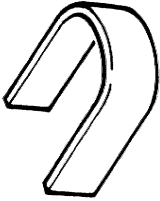
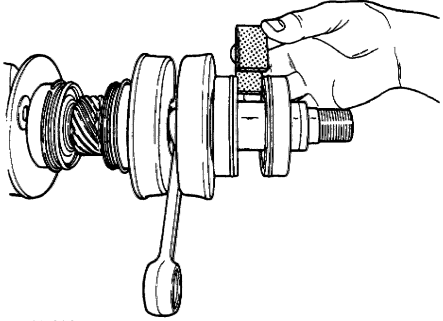
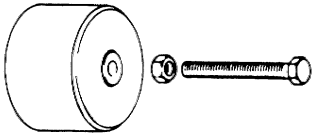
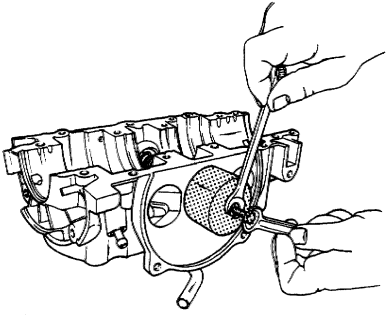

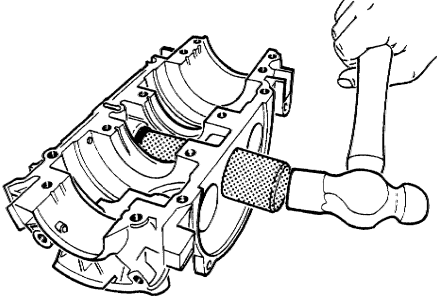
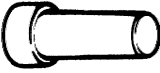
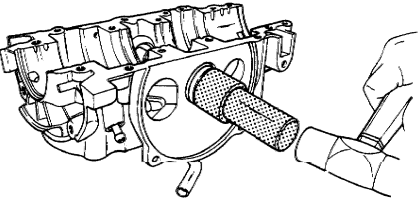
SERVICE TOOL	PURPOSE	APPLICATION
<p>Puller plate (mandatory)  P/N 290 876 080</p> <p>Screw  (P/N 290 841 591)</p> <p>Extension handle  P/N 295 000 003</p> <p>Sleeve  (P/N 290 847 220)</p> <p>F001 003 151</p>	<p>Used with extension handle to retain crankshaft. When removing/installing PTO flywheel and loosen/tighten MAG flywheel nut.</p> <p>Extension handle</p> <p>Puller plate</p> <p>F001 003 152</p>	<p>All models.</p>
<p>Impeller/PTO flywheel remover/installer (mandatory)  P/N 295 000 001</p> <p>F001 009 029</p>	<p>Used to loosen/tighten PTO flywheel and impeller. Must be used in conjunction with puller plate (P/N 290 876 080) and extension handle (P/N 295 000 003).</p> <p>F001 003 046</p>	<p>All models.</p>
<p>Puller (mandatory)  P/N 290 876 065</p> <p>A000 002 046</p>	<p>Used with puller plate (P/N 290 876 080) and extension handle (P/N 295 000 003) to remove MAG flywheel.</p> <p>F001 003 156</p>	<p>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

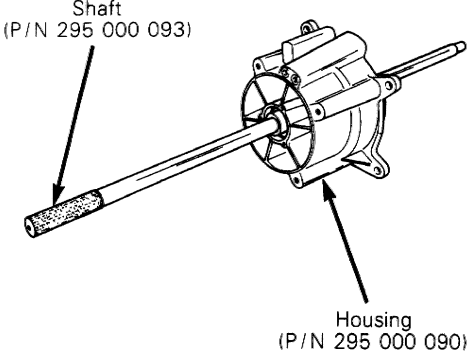
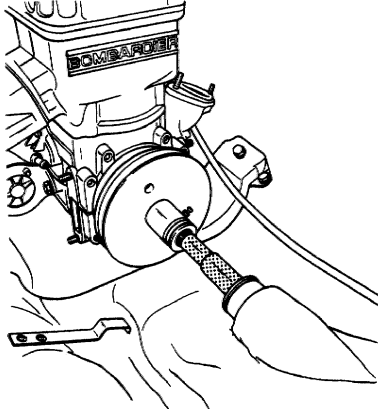
SERVICE TOOL	PURPOSE	APPLICATION
<p>Puller with screws (mandatory) P/N 290 876 298</p>  <p>F001 001 010</p>	<p>To remove crankshaft bearings.</p> 	<p>All models.</p>
<p>Protective cap (both ends) (mandatory) P/N 290 876 557</p>  <p>F001 001 011</p>		
<p>Ring (both ends) (mandatory) P/N 290 977 490</p>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

**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 01 (SERVICE TOOLS)**

SERVICE TOOL	PURPOSE	APPLICATION
<p>Distance gauge (mandatory)  P/N 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>All models.  except 5801.</p>
<p>Puller (mandatory)  P/N 290 876 487</p>  <p>F001 001 018</p>	<p>To remove rotary valve shaft from crankcase.</p>  <p>F001 003 076</p>	<p>All models.</p>
<p>Pusher (mandatory)  P/N 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>All models.</p>
<p>Pusher (mandatory)  P/N 290 876 605</p>  <p>A000 002 034</p>	<p>To install rotary valve shaft in crankcase.</p>  <p>F001 003 088</p>	<p>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

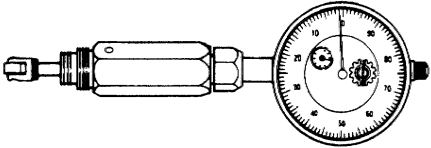
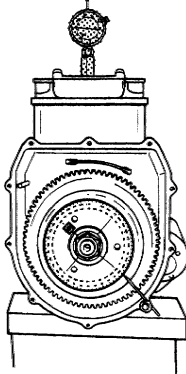
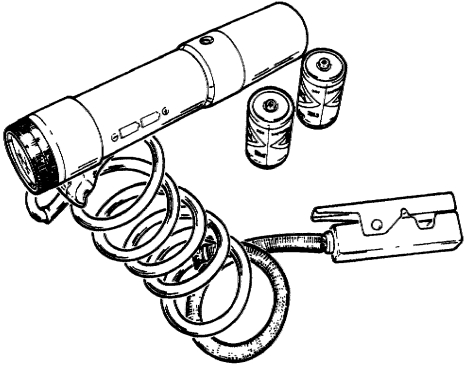
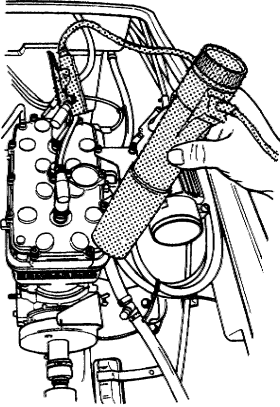
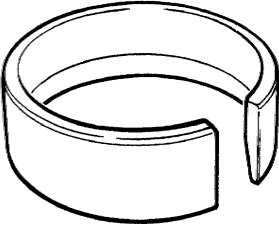
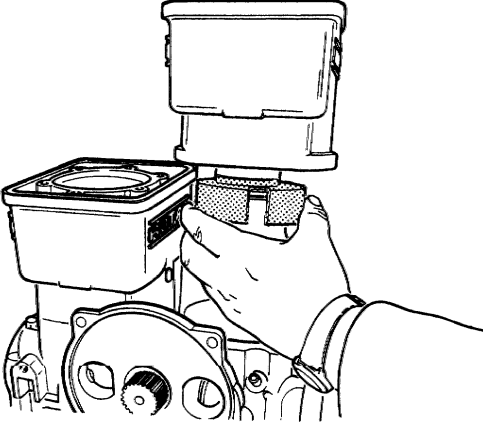
### Sub-Section 01 (SERVICE TOOLS)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Alignment tool (mandatory) P/N 295 000 089</p>  <p>Shaft (P/N 295 000 093)</p> <p>Housing (P/N 295 000 090)</p> <p>F001 011 099</p>	<p>To align engine /jet pump whenever either one is removed and reinstalled.</p>  <p>F001 011 101</p>	<p>All models.</p>



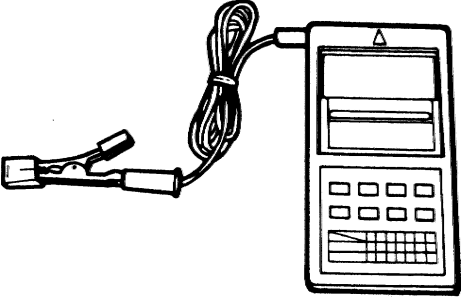
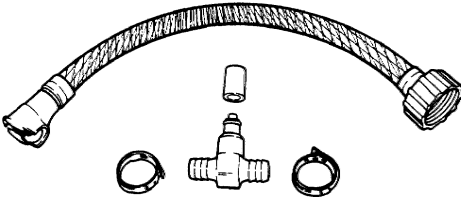
**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 01 (SERVICE TOOLS)**

**ENGINE (recommended tools)**


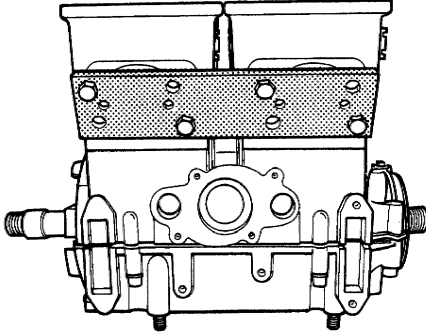
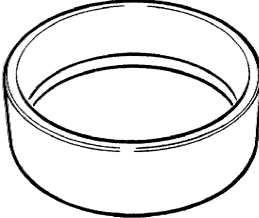
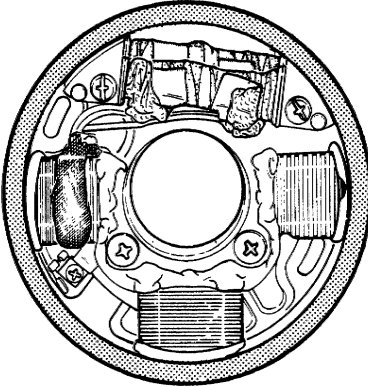
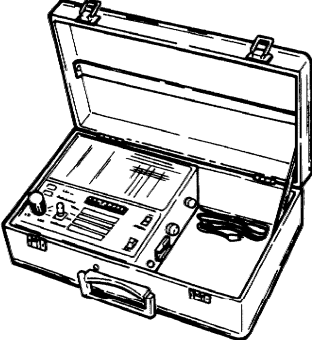
SERVICE TOOL	PURPOSE	APPLICATION
<p>Dial indicator (TDC gauge) (recommended)                      P/N 295 000 065</p>  <p>A000 001 086</p>	<p>To find TDC position. For ignition timing and rotary valve timing. To check crankshaft alignment.</p>  <p>F001 003 162</p>	<p>All models.</p>
<p>Stroboscopic timing light (recommended)                      P/N 295 000 078</p>  <p>A001 001 092</p>	<p>To verify ignition timing.</p>  <p>F001 007 090</p>	<p>All models.</p>
<p>Ring compressor (recommended)                      P/N 290 876 972</p>  <p>A001 001 065</p>	<p>To compress piston ring when inserting piston in cylinder.</p>  <p>F001 003 036</p>	<p>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

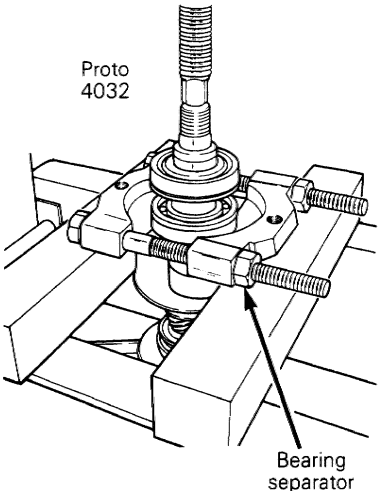
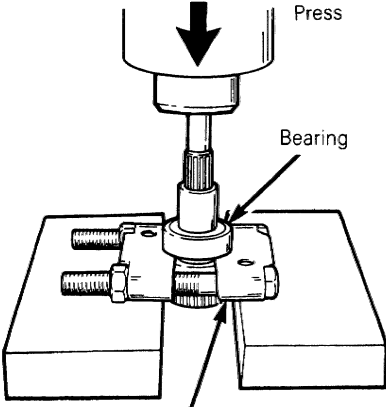
SERVICE TOOL	PURPOSE	APPLICATION
<p>Digital/induction type tachometer (recommended) P/N 295 000 100</p>  <p>F001 001 052</p>	<p>To verify engine RPM.</p>	<p>All models.</p>
<p>Flush kit (recommended) P/N 295 000 068</p>  <p>F001 004 001</p>	<p>To cool engine when watercraft is out of water. To clean cooling system.</p>	<p>All models.</p>
<p>Timing mark pointer P/N 295 000 102</p>	<p>Align mark on PTO flywheel with pointer to verify engine timing.</p>	<p>All models.</p>
<p>Spark tester Purchase locally Superex Canada Ltd No. 15-785</p>	<p>To verify spark at spark plug cap outlet.</p>	<p>All models.</p>

**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 01 (SERVICE TOOLS)**

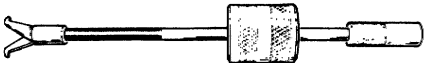
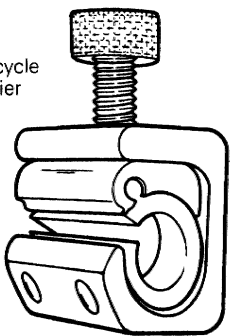
SERVICE TOOL	PURPOSE	APPLICATION
<p>Aligning tool (recommended)  P/N 290 876 902</p>  <p>A000 001 008</p>	<p>To align cylinders by exhaust flanges at assembly.</p>  <p>F001 003 037</p>	<p>All models.</p>
<p>Centering tool (recommended)  P/N 290 876 922</p>  <p>A001 001 067</p>	<p>To position coils on armature plate at assembly.</p>  <p>A001 004 003</p>	<p>All models.</p>
<p>Nippondenso CDI tester (recommended)  P/N 295 000 080</p>  <p>A000 004 020</p>	<p>To test engine ignition system components.</p> <p>○ <b>NOTE :</b> This high quality tester use power source of 115 Volts AC/60 Hz.</p>	<p>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

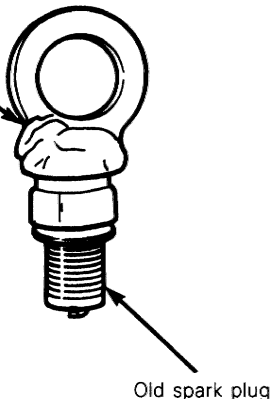
SERVICE TOOL	PURPOSE	APPLICATION
<p>Hexagonal bit socket (1/4" drive) (recommended) Not sold by Bombardier Purchase locally</p> <p>Snap-on TMAMG</p>	<p>To ease Allen screw removal and installation.</p>	<p>Tuned pipe.</p>
<p>Bearing separator (recommended) Not sold by Bombardier Purchase locally</p>  <p>Proto 4032</p> <p>Bearing separator</p> <p>F001 003 061</p>	<p>Pull out bearing.</p>	<p>Crankshaft.</p>
<p>Bearing separator (recommended) Not sold by Bombardier Purchase locally</p>  <p>Press</p> <p>Bearing</p> <p>Bearing separator Snap-on CJ-950</p> <p>F001 003 078</p>	<p>Pull out bearing.</p>	<p>Bearing beside distance sleeve on rotary valve shaft.</p>

**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 01 (SERVICE TOOLS)**

SERVICE TOOL	PURPOSE	APPLICATION
<p>Slide hammer puller (recommended)            Not sold by Bombardier            Purchase locally</p> <p>Snap-on : Handle CJ93-1            Hammer CJ125-6            Claws CJ93-4</p>  <p>F001 009 035</p>	<p>Pull out bearing.</p>	<p>Rotary valve shaft end bearing/crank-case.            Impeller shaft seal.</p>
<p>Lighted adjustable mirror (recommended)            Not sold by Bombardier            Purchase locally</p> <p align="center">Snap-on            50101</p>	<p>See in dark area.</p>	<p>Oil injection pump adjustment.</p>
<p>Cable luber (recommended)            Not sold by Bombardier            Purchase locally</p> <p>See a motorcycle parts supplier</p>  <p>F001 001 002</p>	<p>Power inject Sea-Doo Lube in throttle cable.</p>	<p>All models.</p>
<p>Terminal remover (recommended)            Not sold by Bombardier            Purchase locally</p> <p align="center">Snap-on            TT600-4</p>	<p>Remove terminals from connector housing in electrical circuit.</p>	<p>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

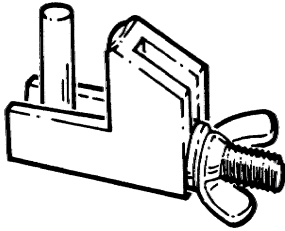
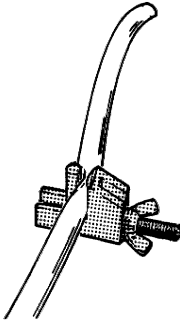
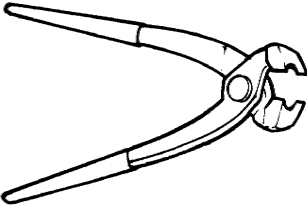
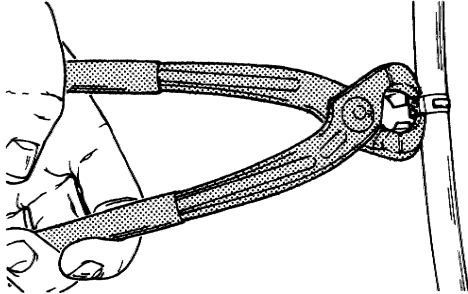
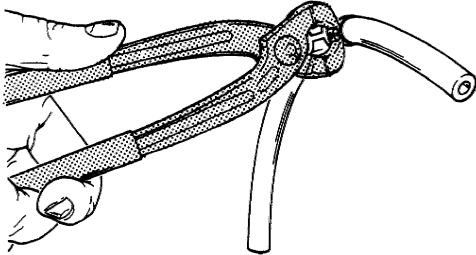
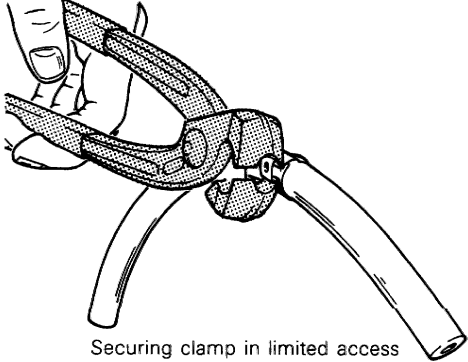
### Sub-Section 01 (SERVICE TOOLS)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Engine lifting device (recommended) Not sold by Bombardier Do it yourself Refer to <i>shop manual</i> section 03-02</p> <p>Weld a lock washer here</p>  <p>Old spark plug</p> <p>F001 003 010</p>	Lift engine out of watercraft.	All watercraft engines.

## Section 01 SERVICE TOOLS AND PRODUCTS

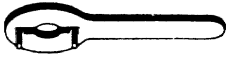
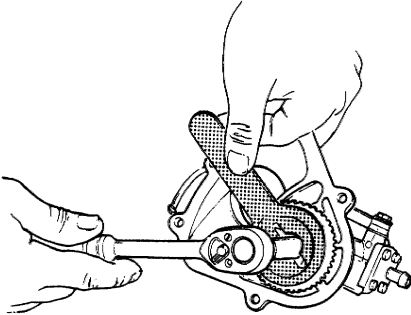
### Sub-Section 01 (SERVICE TOOLS)

### COOLING/FUEL/OIL SYSTEMS (Mandatory Tools)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Hose pincher (mandatory) P/N 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>All models.</p>
<p>Pliers (mandatory) P/N 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>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

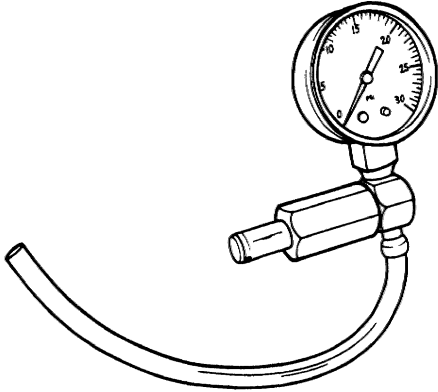
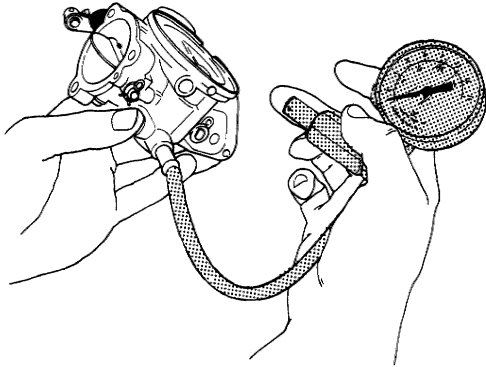
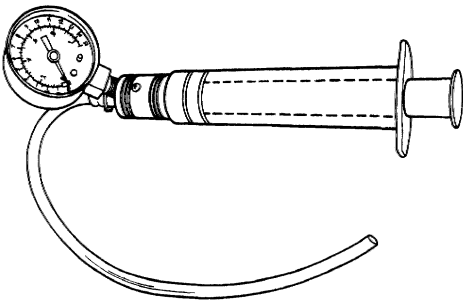
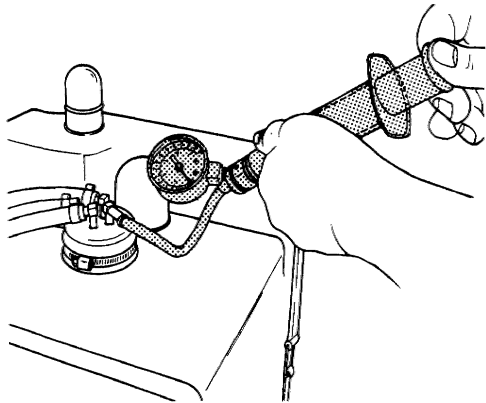
SERVICE TOOL	PURPOSE	APPLICATION
<p data-bbox="79 407 376 478">Gear holder (mandatory) P/N 290 277 905</p>  <p data-bbox="79 888 181 905">A000 002 042</p>	<p data-bbox="640 407 1128 468">To remove/install retaining nut of oil injection pump gear.</p>  <p data-bbox="640 888 740 905">A000 002 043</p>	<p data-bbox="1158 407 1290 436">All models.</p>



## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

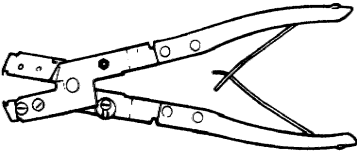
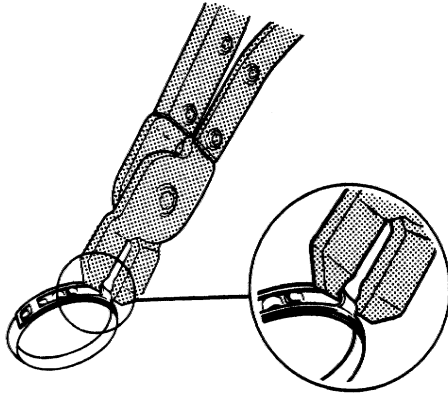
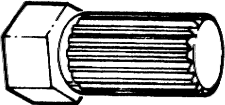
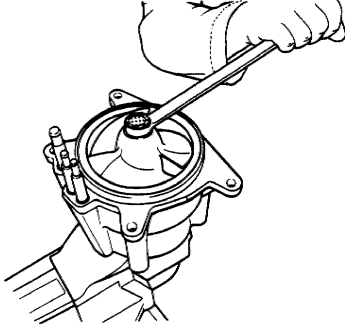
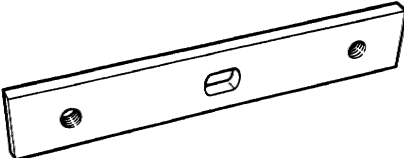
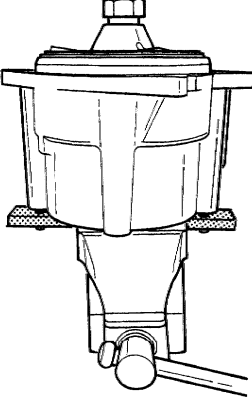
#### COOLING/FUEL/OIL SYSTEMS (Recommended Tools)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Pump gauge tester (recommended) P/N 295 000 083</p>  <p style="font-size: small;">F001 001 033</p>	<p>To verify release pressure and leak at carburetor.</p>  <p style="font-size: small;">F001 005 014</p>	<p>All models.</p>
<p>Pump gauge tester (recommended) P/N 295 000 085</p> <p>○ <b>NOTE</b> : Must maintain a pressure of 34 kPa (5 PSI) during 10 minutes. Never pressurize over 34 kPa (5 PSI).</p> <p>▼ <b>CAUTION</b> : Lubricate air pump piston seal using mild soap. Hydrocarbon lubricant destroys rubber seal.</p>  <p style="font-size: small;">F001 001 034</p>	<p>To make sure there is no leak by pressurizing the fuel system.</p>  <p style="font-size: small;">F001 005 018</p>	<p>All models.</p>

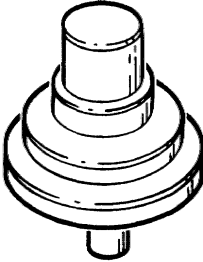
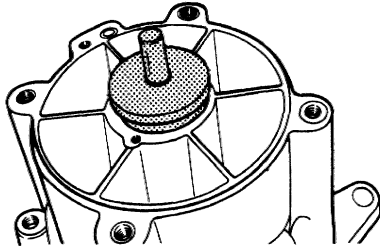
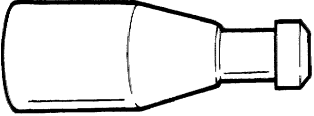
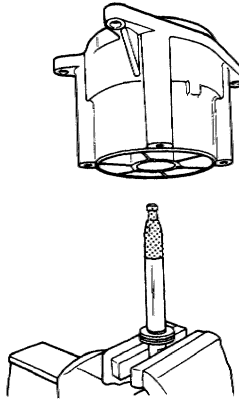
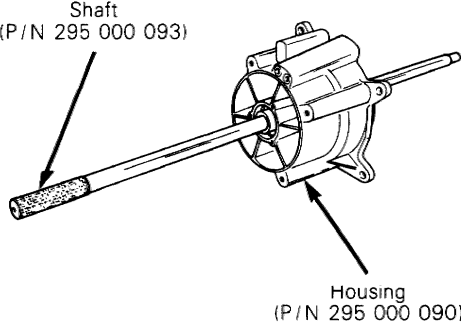
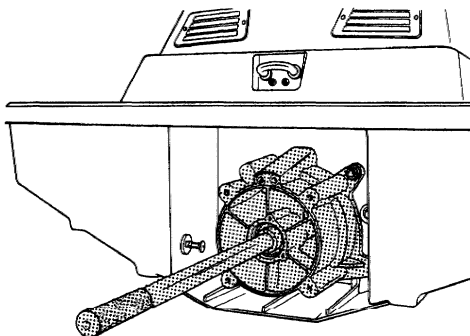
## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

#### PROPULSION SYSTEM (Mandatory Tools)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Pliers (mandatory) P/N 295 000 069</p>  <p>F001 003 044</p>	<p>To remove/install drive shaft boot reusable stepless clamps.</p>  <p>F001 009 017</p>	<p>All models.</p>
<p>Impeller/PTO flywheel remover/installer (mandatory) P/N 295 000 001</p>  <p>F001 009 029</p>	<p>Used to loosen/tighten impeller on shaft.</p>  <p>F001 009 030</p>	<p>All models.</p>
<p>Impeller shaft holder (mandatory) P/N 295 000 082</p>  <p>F001 001 032</p>	<p>Used to loosen/tighten impeller on shaft.</p>  <p>F001 009 089</p>	<p>All models.</p>

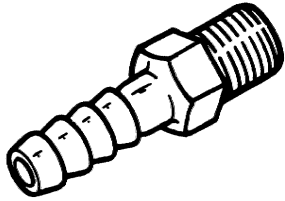
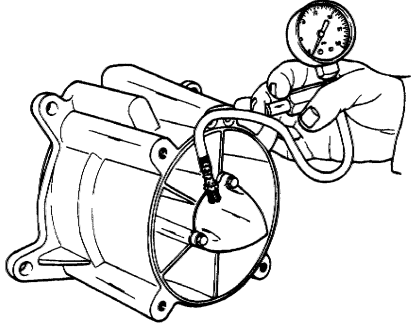
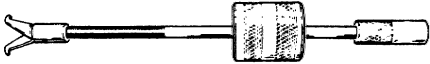

**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 01 (SERVICE TOOLS)**

SERVICE TOOL	PURPOSE	APPLICATION
<p>Bearing/seal installer (mandatory)  P/N 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>All models.</p>
<p>Impeller shaft guide (mandatory)  P/N 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>All models.</p>
<p>Alignment tool (mandatory)  P/N 295 000 089</p>  <p>F001 011 089</p>	<p>To align engine / jet pump whenever either one is removed and reinstalled.</p>  <p>F001 011 100</p>	<p>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

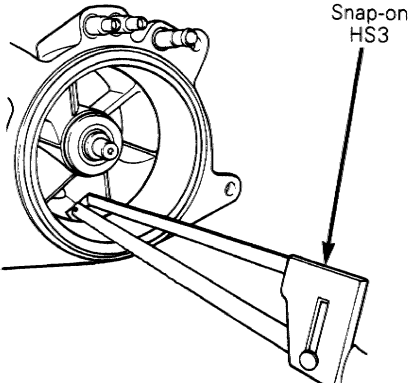
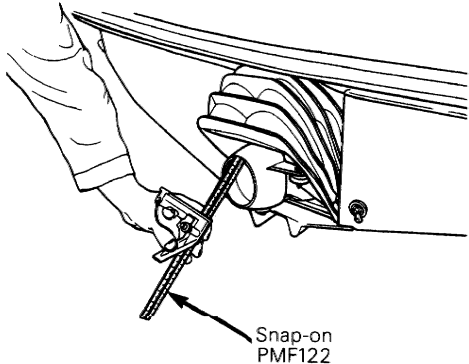
### Sub-Section 01 (SERVICE TOOLS)

#### PROPULSION SYSTEM (Recommended Tools)

SERVICE TOOL	PURPOSE	APPLICATION
<p>Fitting (recommended) P/N 295 000 086</p> <p>○ NOTE : Must maintain a pressure of 70 kPa (10 PSI) during 10 minutes. Never pressurize over 70 kPa (10 PSI).</p>  <p>F001 001 035</p>	<p>To pressurize pump assembly before installation, to verify if any leak.</p>  <p>F001 009 090</p>	<p>All models.</p>
<p>Slide hammer puller (recommended) Not sold by Bombardier Purchase locally</p>  <p>Snap-on : Handle CJ93-1 Hammer CJ125-6 Claws CJ93-4</p> <p>F001 009 035</p>	<p>Pull out bearing.</p>	<p>Rotary valve shaft end bearing/crank-case. Impeller shaft seal.</p>
<p>Seal puller (recommended) Not sold by Bombardier Purchase locally</p> <p>Snap-on #S6129</p>  <p>F001 009 033</p>	<p>Pull out seal.</p>	<p>Impeller shaft seal.</p>

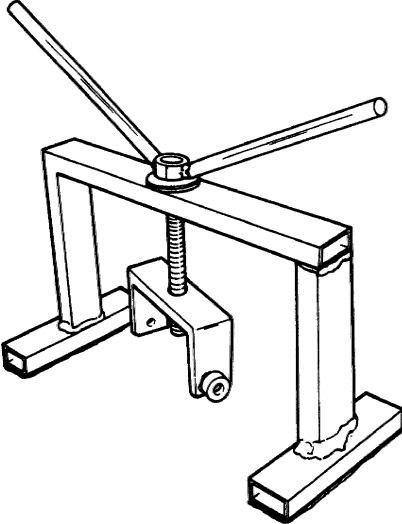
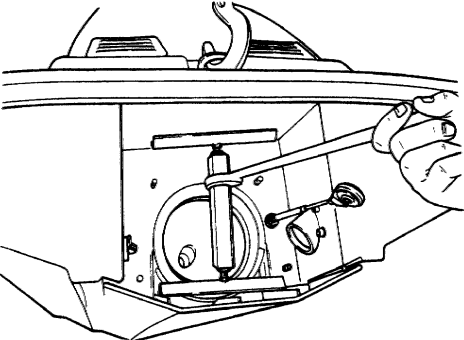
## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

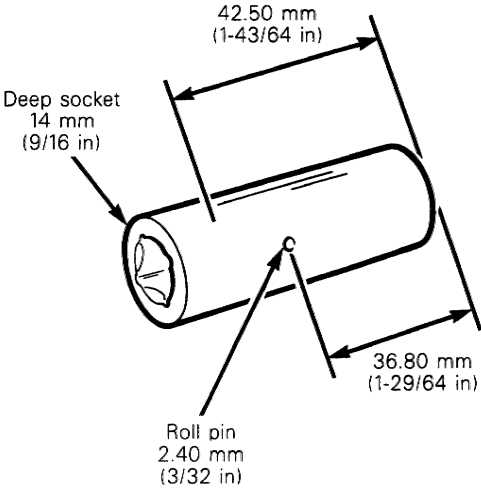
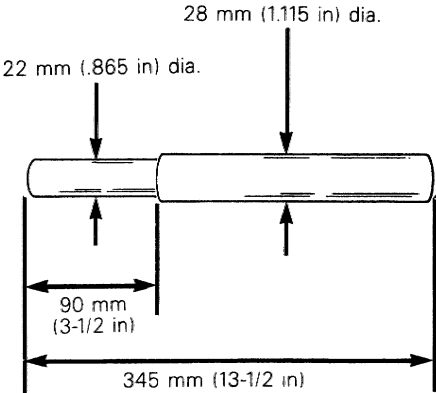
SERVICE TOOL	PURPOSE	APPLICATION
<p>Scraper (recommended) Not sold by Bombardier Purchase locally</p> <p style="text-align: center;">Snap-on CS-A12</p>	<p>Remove silicone.</p>	<p>Impeller housing.</p>
<p>Hacksaw (recommended) Not sold by Bombardier Purchase locally</p>  <p style="text-align: center;">Snap-on HS3</p> <p>F001 009 032</p>	<p>Cut wear ring.</p>	<p>All models.</p>
<p>Machinist's square (recommended) Not sold by Bombardier Purchase locally</p>  <p style="text-align: center;">Snap-on PMF122</p> <p>F002 009 017</p>	<p>Adjust reverse gate.</p>	<p>Models equipped with reverse.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

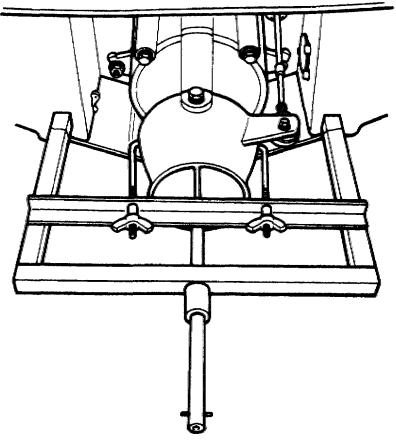
SERVICE TOOL	PURPOSE	APPLICATION
<p>Impeller housing remover (recommended) Not sold by Bombardier Do it yourself Refer to <i>shop manual</i> section 08-01</p>  <p>F001 011 096</p>	<p>Remove impeller housing.</p>	<p>All models.</p>
<p>Ride shoe remover (recommended) Not sold by Bombardier Do it yourself Refer to <i>shop manual</i> section 08-01</p>  <p>F001 009 026</p>	<p>Remove ride shoe.</p>	<p>All models.</p>

**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 01 (SERVICE TOOLS)**

SERVICE TOOL	PURPOSE	APPLICATION
<p>Fitting remover (recommended)            Not sold by Bombardier            Do it yourself            Refer to <i>shop manual</i> section 08-01</p>  <p>F001 009 099</p>	<p>Remove impeller housing fittings.</p>	<p>All models.</p>
<p>Bearing remover (recommended)            Not sold by Bombardier            Do it yourself            Refer to <i>shop manual</i> section 08-01</p>  <p>F001 009 037</p>	<p>Remove impeller housing bearings.</p>	<p>All models.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 01 (SERVICE TOOLS)

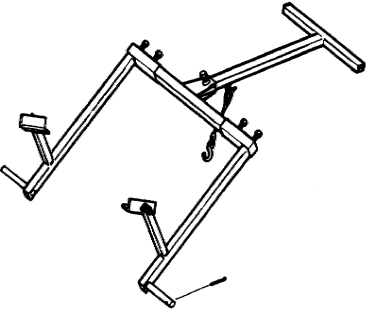
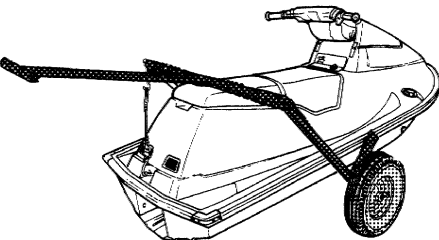

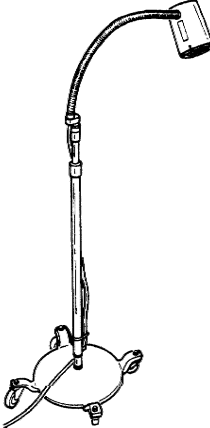
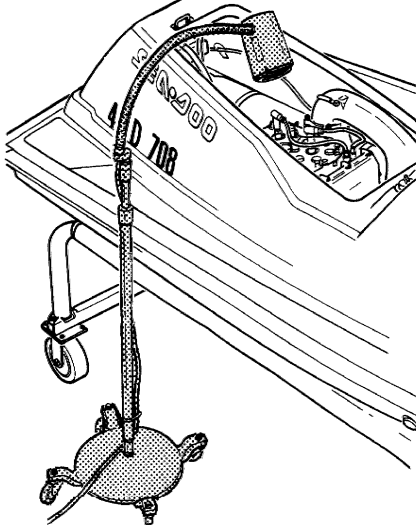
SERVICE TOOL	PURPOSE	APPLICATION
<p>Steering/jet pump alignment tool (recommended) Not sold by Bombardier Do it yourself Refer to <i>shop manual</i> section 09-01</p> 	<p>Ease steering/jet pump alignment.</p>	<p>All models.</p>

F001 010 029



**Section 01 SERVICE TOOLS AND PRODUCTS**  
 Sub-Section 01 (SERVICE TOOLS)

**WATERCRAFT HANDLING (Recommended Tools)**

SERVICE TOOL	PURPOSE	APPLICATION
<p>Dolley (recommended)            P/N 295 000 004</p>  <p>F001 001 001</p>	<p>To handle watercraft in shop or on beach.</p>  <p>F001 001 008</p>	<p>All models.</p>
<p>Beach wheels (recommended)            P/N 295 000 005</p>  <p>F001 001 007</p>		
<p>Shop lamp (recommended)            P/N 295 000 081</p> <p>◆ <b>WARNING :</b> Never use electric powered tools on watercraft unless first verifying no gasoline leaks/fumes are present.</p>  <p>F001 001 021</p>	<p>To facilitate repair when working inside the hull/body.</p>  <p>F001 001 030</p>	<p>All models.</p>

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**Section 01 SERVICE TOOLS AND PRODUCTS****Sub-Section 01 (SERVICE TOOLS)**

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SERVICE TOOL	PURPOSE	APPLICATION
Lift kit (recommended) P/N 298 760 000	To handle watercraft in shop.	All models.





**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 02 (SERVICE PRODUCTS)**

## SERVICE PRODUCTS


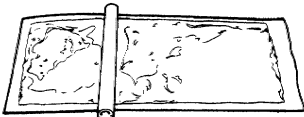


SERVICE PRODUCT	PURPOSE	APPLICATION
<p>Pipe sealant P/N 293 800 018</p> <p align="center">Loctite 592 (50 mL)</p>  <p>A000 001 104</p>	<p>To seal pipe fittings. Prevents leakage and vibrational loosening.</p>	<p>Set screw on impeller housing cover. Plastic fitting (tool P/N 295 000 086) on impeller housing.</p>
<p>Removable threadlocker P/N 293 800 015</p> <p align="center">Loctite 242 (blue) (10 mL)</p>  <p>A000 001 110</p>	<p>A medium-strength adhesive for threadlocking and threadsealing. Vibration-proof nuts, bolts and screws.</p>	<p>Cylinder head cover screws. Exhaust manifold studs and screws. Engine rubber mount screws. Ignition housing/ crankcase screws. Armature plate screws. Magneto flywheel/ crankshaft. Carburetor mount nuts. Magneto coil screws. Impeller housing cover screws. Venturi/impeller housing screws. Grill screws. Engine support screws. Impeller housing/hull nuts. Steering nozzle screws. Reverse gate screws.</p>
<p>High strength threadlocker P/N 293 800 005</p> <p align="center">Loctite 271 (red) (10 mL)</p>  <p>A000 001 102</p>	<p>Hi-strength threadlocking threadsealing adhesive. Apply heat to ease disassembly.</p>	<p>Starter screws/engine. Impeller shaft thread. Steering column screw.</p>

## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 02 (SERVICE PRODUCTS)




SERVICE PRODUCT	PURPOSE	APPLICATION
<p>High temperature threadlocker P/N 290 899 788</p> <p>Loctite 648 (green) (5 g)</p>  <p>A000 001 121</p>	<p>Hi-strength threadlocking threadsealing adhesive that resists high temperature.</p>	<p>Crankcase/plug at end of rotary valve shaft. Ring gear/MAG fly-wheel.</p>
<p>Primer for gasket eliminator P/N 293 600 012</p> <p>Loctite Locquic Primer N (4 oz)</p>  <p>A001 001 077</p>	<p>General purpose primer. Primer N assures fixturing of parts in 15-30 minutes and full cure in 12 hours or less. On part life is 30 days, but it is recommended that parts be joined within 10 minutes after adhesive is applied over primer.</p>	<p>Crankcase halves mating surface. Impeller shaft thread. Venturi/impeller housing mating surface.</p>
<p>Solvent P/N 293 800 019</p> <p>Loctite Safety Solvent 755</p>  <p>A001 001 130</p>	<p>Clean and prepare surface before assembly.</p>	<p>Impeller shaft thread and splines. Drive shaft splines. Impeller thread.</p>
<p>Silicone "Ultra Blue" P/N 293 800 016</p>  <p>Loctite 58/ (300 mL)</p> <p>F001 001 046</p>	<p>Sealant for gasketing.</p>	<p>Ride shoe/hull, pump/hull.</p>

**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 02 (SERVICE PRODUCTS)**

SERVICE PRODUCT	PURPOSE	APPLICATION
<p>Paste gasket  P/N 293 800 007</p>  <p align="center">Gasket eliminator  Loctite 515  (50 mL)</p> <p>A000 001 101</p>	<p>Makes, dresses and repairs gaskets of sizes and shapes.</p>	<p>Cylinder sleeve/O-ring groove.  Crankcase halves mating surface.  Impeller housing cover.  Impeller shaft seal.  Venturi/impeller housing.  Seal outer diameter in seal carrier.</p>
<p>Glue  P/N 293 530 032</p>  <p>F001 001 047</p>	<p>Glue.</p>	<p>Handlebar grip.</p>
<p>Gelcoat kit  P/N 295 500 009</p>  <p>Sea-Doo  Gelcote  Repair  kit</p> <p>F001 001 027</p>	<p>Gelcoat repair.</p>	<p>Body.  Hull.</p>
<p>Gelcoat paste (white)  P/N 293 500 016</p>  <p>F001 001 051</p>	<p>Gelcoat repair.</p>	<p>Body.  Hull.</p>




## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 02 (SERVICE PRODUCTS)

SERVICE PRODUCT	PURPOSE	APPLICATION
<p>Gelcoat (liquid)</p> <p>1 liter white P/N 293 500 033            1 liter mauve P/N 293 500 034            1 liter grey P/N 293 500 035</p>	<p>Gelcoat repair.</p>	<p>Body. Hull.</p>
<p>Synthetic grease P/N 293 550 010</p>  <p>Bombardier Sea-Doo</p> <p>F001 001 041</p>	<p>Lubricate and provide great wear protection and water resistance.</p>	<p>Under screw head of cylinder.            Carburetor linkage.            Impeller shaft seal lips.            Both sides of impeller shaft thrust washer.            Drive shaft/impeller splines.            Seal carrier seals and bearing.            PTO flywheel rubber boot.</p>
<p>Penetrating lubricant P/N 293 600 006</p>  <p>Sea-Doo lube</p> <p>F001 001 028</p>	<p>Prevents corrosion and sticking. Protects metallic parts.</p>	<p>In carburetor intake when engine is water flooded and before storage.            Throttle cable.            Wear ring (when new).            Corroded parts.</p>
<p>Synthetic oil P/N 293 600 011</p>  <p>Sea-Doo jet pump synthetic oil</p> <p>F001 001 025</p>	<p>Lubricate.</p>	<p>Jet pump.</p>





## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 02 (SERVICE PRODUCTS)

SERVICE PRODUCT	PURPOSE	APPLICATION
<p>Injection oil 1 liter P/N 293 600 005</p>  <p>4 liters P/N 293 600 004</p>  <p>F001 001 044</p>	<p>Lubricate engine.</p>	<p>All models.</p>
<p>Anti-seize lubricant P/N 293 550 001</p> <p>Anti-seize lubricant Loctite (12 oz)</p>  <p>F001 001 043</p>	<p>Protects moving and stationary parts against high temperature seizing. Prevents rust and corrosion on parts exposed to high heat.</p>	<p>Crankshaft thread/ PTO flywheel. Crankshaft bearing seat. Spark plug thread. Drive shaft splines.</p>




## Section 01 SERVICE TOOLS AND PRODUCTS

### Sub-Section 02 (SERVICE PRODUCTS)

SERVICE PRODUCT	PURPOSE	APPLICATION
<p>732 Multi-purpose sealant P/N 293 800 006</p> <p>Dow Corning</p>  <p>F001 001 048</p>	<p>To seal joints.</p>	<p>Ride shoe screws (inside hull).</p>
<p>Electrical insulating compound P/N 293 550 004</p> <p>Dow Corning</p>  <p>F001 001 042</p>	<p>Prevents moisture and corrosion build-up in electric connections.</p>	<p>Battery posts and cable connectors. Thermosensor con- nectors.</p>
<p>Primer P/N 293 530 012</p> <p>Sikaflex Primer 449</p>  <p>F001 001 050</p>	<p>Clean and prepare surface for application of sealant (P/N 293 530 011).</p>	<p>Water tank trap/body surface. Rear baffle/body sur- face.</p>
<p>Sealant P/N 293 530 011</p> <p>Sikaflex Sealant 221</p>  <p>F001 001 049</p>	<p>Seal fiberglass and plastic parts. For best result use primer (P/N 293 530 012).</p>	<p>Water tank trap/body surface. Rear baffle/body sur- face.</p>



**Section 01 SERVICE TOOLS AND PRODUCTS**  
**Sub-Section 02 (SERVICE PRODUCTS)**

SERVICE PRODUCT	PURPOSE	APPLICATION
<p>Paint  P/N 293 500 029 white  P/N 293 500 030 charcoal  P/N 293 500 020 mauve</p> <p align="center">Sea-Doo paint</p>  <p>F001 0001 026</p>	<p>Protection of metallic parts.</p>	<p>Metallic parts only.</p>
<p>Cleaner  P/N 298 850 000</p> <p align="center">Sea-Doo cleaner</p>  <p>F001 001 040</p>	<p>Clean easily.</p>	<p>Body and hull.</p>
<p>Lubricant  Not sold by Bombardier  Purchase locally</p> <p align="center">G.E. Versilube G341M</p>  <p align="center">or Esso Beacon 325</p> <p>A000 001 065</p>	<p>Provide excellent lubrication over long interval of no maintenance.</p>	<p>Sliding surface of starter armature shaft spline.</p>
<p>Epoxy glue  Not sold by Bombardier  Purchase locally  3M-05900</p>	<p>Glue.</p>	<p>Knurled surface of aluminum hull insert (P/N 292 000 075).</p>

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**Section 01 SERVICE TOOLS AND PRODUCTS****Sub-Section 02 (SERVICE PRODUCTS)**

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SERVICE PRODUCT	PURPOSE	APPLICATION
Fuel preservative Not sold by Bombardier Purchase locally  Sta-Bil	Prevent fuel deterioration during storage.	Fuel tank at storage.
Vinyl protectant Not sold by Bombardier Purchase locally  Armor-All	Clean and protect vinyl.	Seat.

## 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 of metallic components	①			
Engine ignition timing				
Spark plugs, cleaning/adjustment				
Throttle/choke cables, inspection/lubrication	①			
Flame arrester element, inspection				
Carburetor adjustment including choke/throttle cable adjustments and linkage				
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, fuel system pressurization				
Inspect/clean engine drain tube	①			
Bilge system/water-trap drains, inspection				
Battery, vent hose condition				
Battery and starter cables				
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 PTO flywheel				
Lubricate grease fitting at seal carrier				
Water intake grill condition		②		
Hull condition				
Cooling system flushing ③				

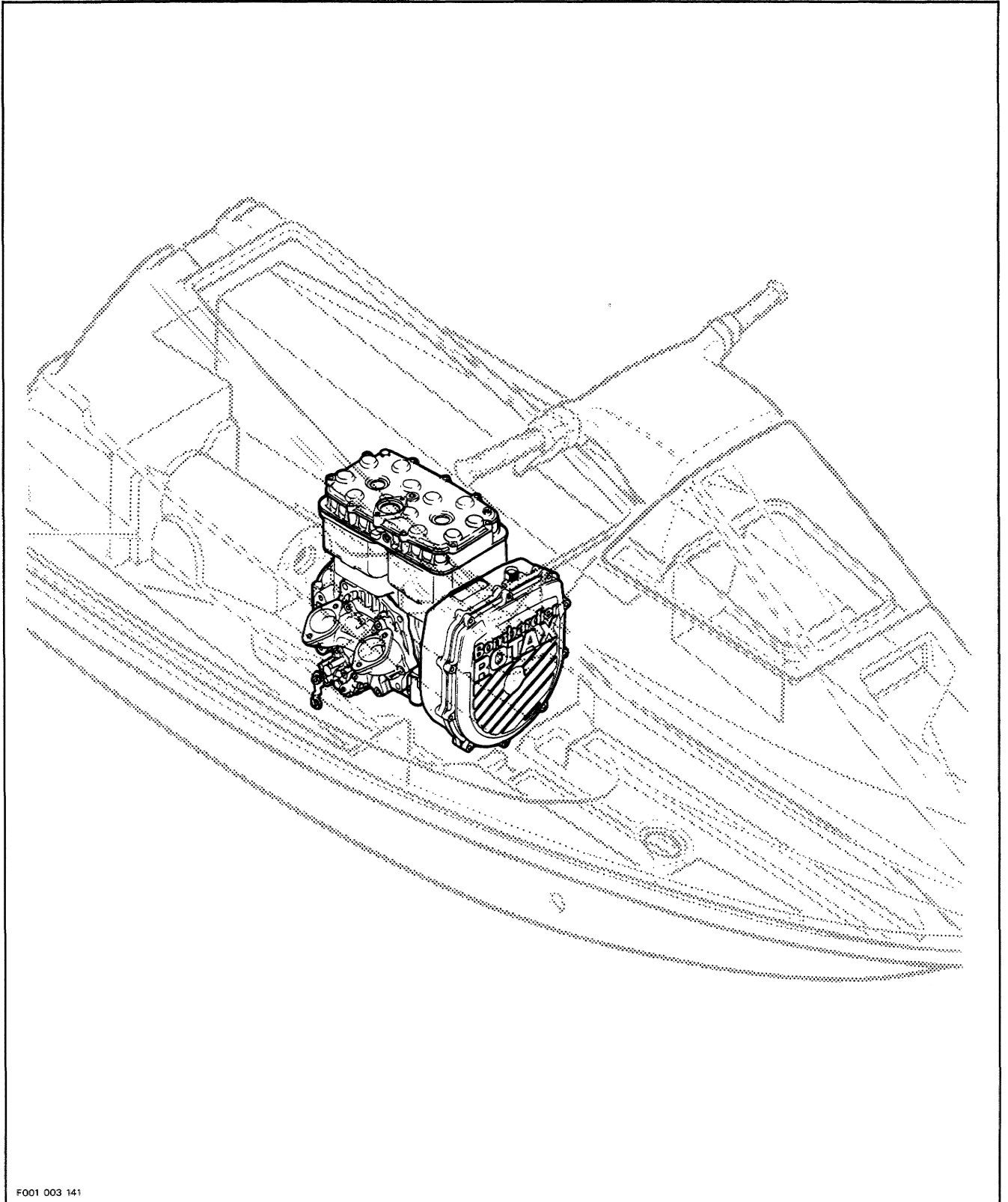
① Every month in salt water use.

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





## ENGINE DESCRIPTION

The two stroke ROTAX engine rotates counterclockwise seen from the rear (PTO flywheel). It has a rotary valve to control fuel mixture intake. Lubrication is provided by a variable oil injection pump. It is cooled by water supplied from the jet pump. It has a NIPPONDENSO Capacitor Discharge Ignition System with single coil and an integrated electronic module. The fuel is provided by diaphragm carburetor having an integrated fuel pump.

### General

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

▼ **CAUTION : A water-flooded engine must be properly lubricated, operated then lubricated again, otherwise parts will be seriously damaged.**

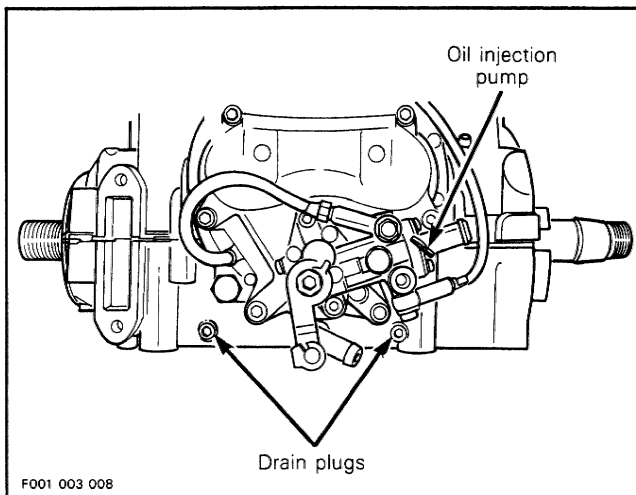
### Procedure

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.

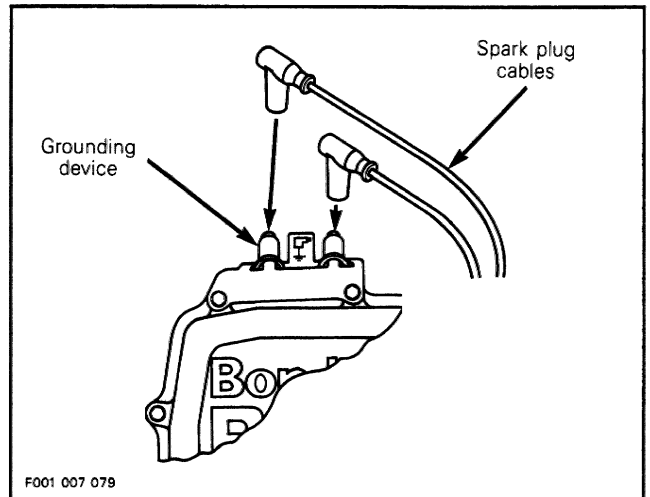
Drain bilge if water is present.

Remove engine crankcase drain plugs located underneath oil injection pump.



Remove spark plug cables and connect them on the grounding device.

## WATER-FLOODED ENGINE



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

Crank engine to drain crankcase.

○ **NOTE :** Whenever the engine is stopped more than 20 seconds with tether cord installed, the electrical system has to be reactivated by touching starter button.

▼ **CAUTION :** Be careful when cranking engine, water will spray out from spark plug holes.

Reinstall crankcase drain plugs.

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

Crank engine again to allow any remaining water to escape from spark plug holes.

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

Crank engine again.

Reinstall spark plugs and spark plug cables then tether cord cap on switch.

Turn fuel valve to ON position.

Press starting button to start engine. It may be necessary to use the choke. If engine does not start, repeat previous steps as necessary.

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## Section 03 ENGINE

### Sub-Section 01 (WATER-FLOODED ENGINE)

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▼ **CAUTION** : To avoid starting motor overheating, the cranking period should not exceed 5-10 seconds and a rest period of 30 seconds should be observed between cranking cycles. Never depress the starting button when the engine is running.

○ **NOTE** : If engine does not start after several attempts, check ignition system for spark occurrence.

Refer to CDI AND CHARGING SYSTEMS 07-06 then refer to **ignition system testing procedure**. Also a spark tester tool no. 15-785 from Superex Canada Ltd can be used. Check crankshaft if needed, it can become misaligned or deflected.

Refer to BOTTOM END 03-05 then refer to **crankshaft alignment**.

◆ **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 normal operating temperature.

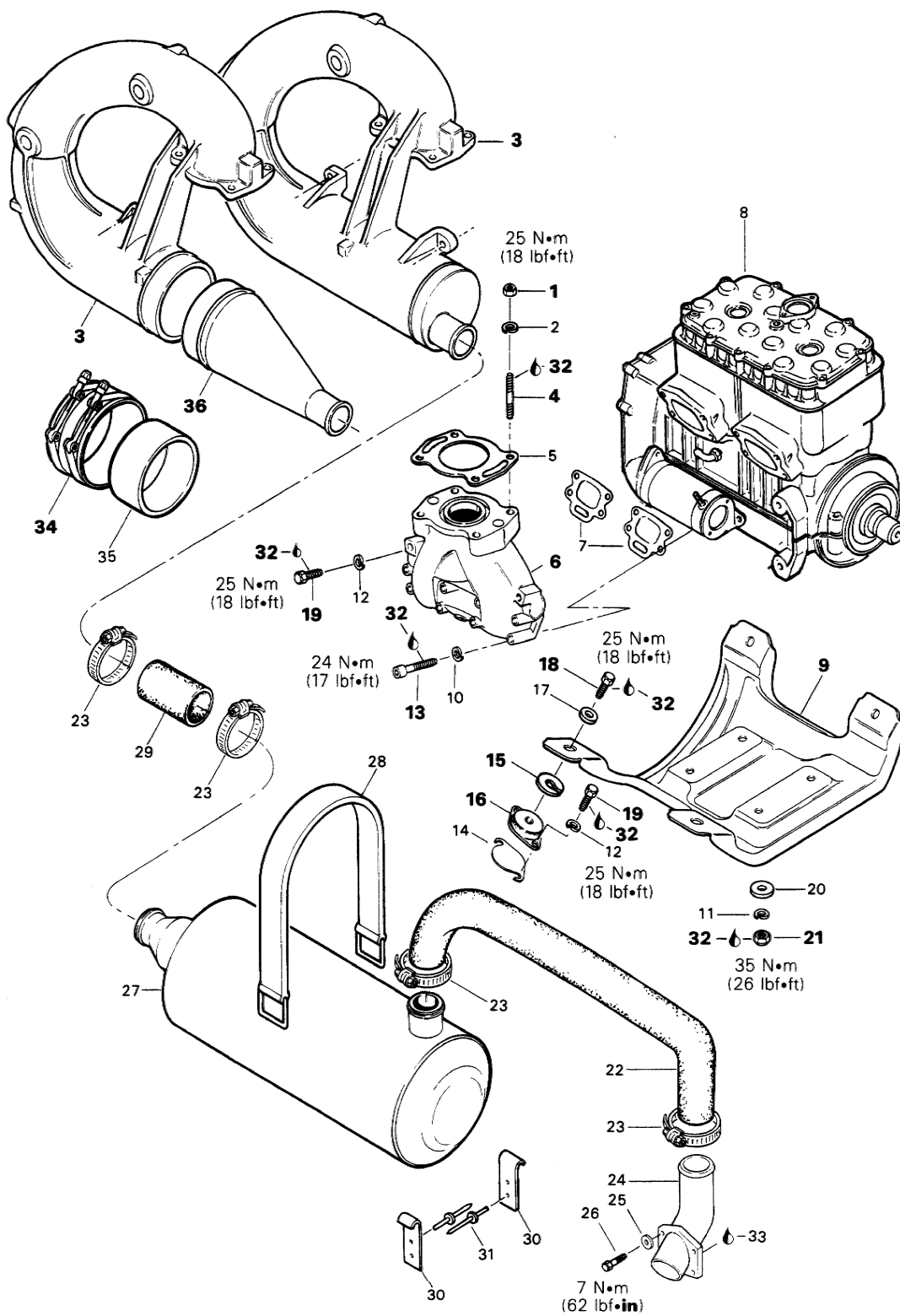
Make sure to supply water to cool engine.

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



**Section 03 ENGINE**  
**Sub-Section 02 (REMOVAL AND INSTALLATION)**

**Engine Support, Tuned Pipe and Muffler**



## Section 03 ENGINE

### Sub-Section 02 (REMOVAL AND INSTALLATION)

## COMPONENTS

1. Hexagonal nut M8 (4)
2. Lock washer M8 (4)
3. Tuned pipe
4. Stud M8 x 26 (4)
5. Gasket
6. Exhaust manifold
7. Gasket (2)
8. Rotax engine 587
9. Engine support
10. Lock washer M8 (8)
11. Lock washer (4)
12. Lock washer M8 (10)
13. Allen screw M8 x 75 (8)
14. Shim 0.40 mm (0.016 in)  
Shim 1.40 mm (0.055 in)
15. Shim 0.40 mm (0.016 in)  
Shim 1.30 mm (0.051 in)
16. Rubber mount (4)
17. Flat washer 8 mm (4)
18. Hexagonal screw M8 x 20 (4)
19. Hexagonal screw M8 x 30 (8)
20. Flat washer 10 mm (4)
21. Elastic stop nut M10 (4)
22. Formed hose
23. Tridon clamp (4)
24. Exhaust outlet
25. Flat washer 6 mm (4)
26. Allen screw M6 x 20 (4)
27. Muffler
28. Muffler strap
29. Exhaust hose
30. Strap clip (2)
31. Rivet 3/16 (4)
32. Loctite 242
33. Sealant Loctite 587 "Ultra Blue"
34. Exhaust collar
35. Rubber strip
36. Exhaust cone

## GENERAL

It is not necessary to remove engine from watercraft for TOP END nor PTO FLYWHEEL AND MAGNETO servicing. 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

To withdraw jet pump unit ass'y, refer to PROPULSION AND DRIVE SYSTEMS, 08-01 then refer to **removal** and **overhaul**.

### Electrical Connections

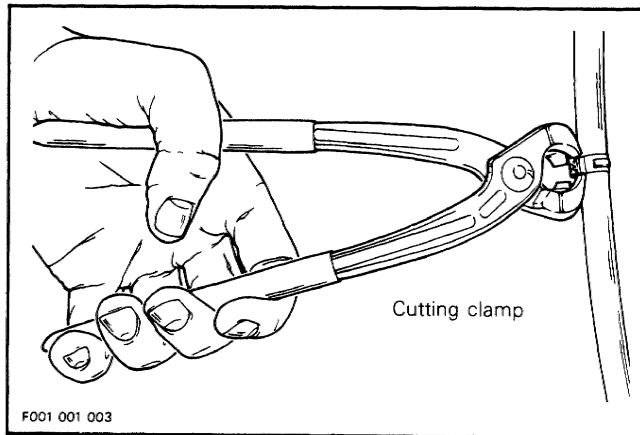
◆ **WARNING** : Always disconnect starter or battery cables exactly in the specified order, **black negative cable first**. Electrolyte or fuel vapors can be present in the engine compartment and a spark might ignite them and possibly cause personal injuries. It is recommended to disconnect electrical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

First, remove **black** negative cable from battery, then **red** positive cable.

Remove battery holding straps then withdraw battery. Disconnect thermosensor wire and spark plug cables.

### Cooling and Exhaust Systems

○ **NOTE** : To release a clamp from cooling hose / fuel line, use pliers (P/N 295 000 070).

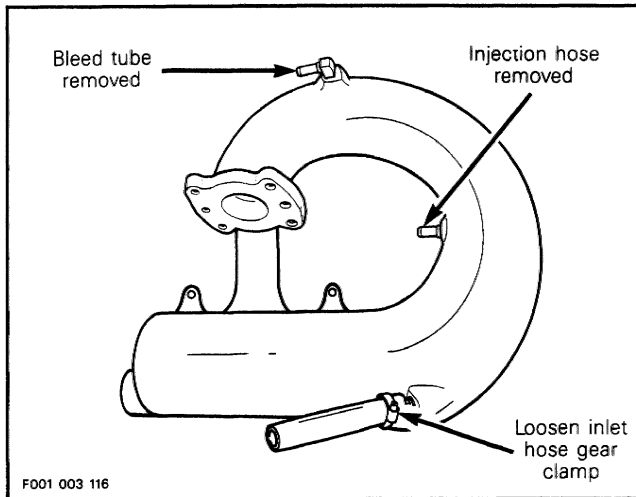


Disconnect hose from water outlet socket on engine. Disconnect inlet hose, injection hose and bleed tube from tuned pipe.

○ **NOTE** : On some models the exhaust collar holding exhaust cone and tuned pipe has to be removed first.

## Section 03 ENGINE

### Sub-Section 02 (REMOVAL AND INSTALLATION)



○ **NOTE :** The tuned pipe is held on exhaust manifold side by one or two retaining screws.

Remove tuned pipe retaining screws from exhaust manifold.

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 gaskets located on exhaust manifold.

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

#### Intake and Fuel Systems

Loosen clamp of intake silencer hose on carburetor side.

Pivot intake silencer to rear of watercraft.

Remove both retaining screws of carburetor support from engine cover.

Remove screws holding flame arrester cover, then withdraw cover.

Turn fuel valve to OFF position.

Disconnect fuel supply line from carburetor.

Disconnect fuel return line from carburetor.

Disconnect throttle and choke cables from carburetor.

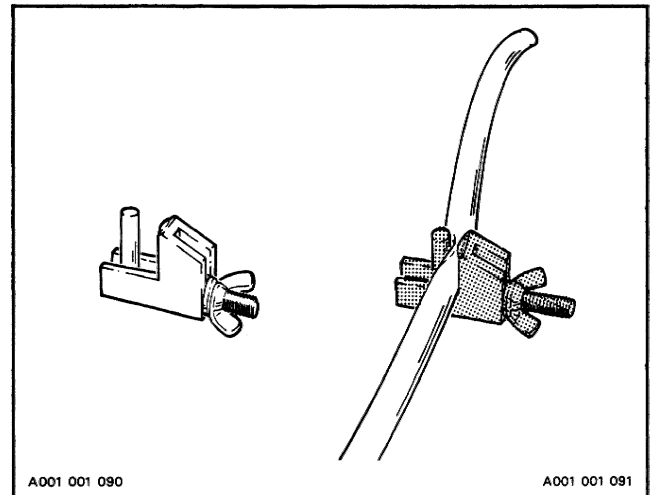
Remove screws from flame arrester base then withdraw base.

Disconnect impulse line.

Pull out electrical box then open electrical box and disconnect wires coming from magneto housing.

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

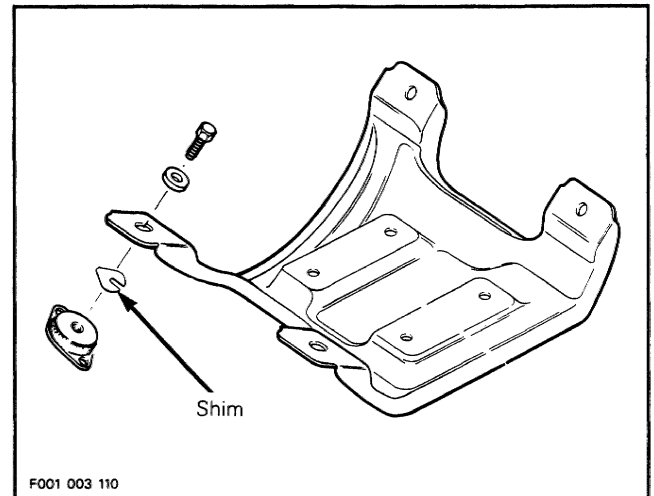
To prevent excessive oil spillage, use a hose pincher (P/N 295 000 076).



Install hose pincher on oil pump supply line then disconnect hose.

Remove engine support mount screws.

○ **NOTE :** Be careful when removing engine support mount screws, shims could have been installed between engine support and rubber mounts.



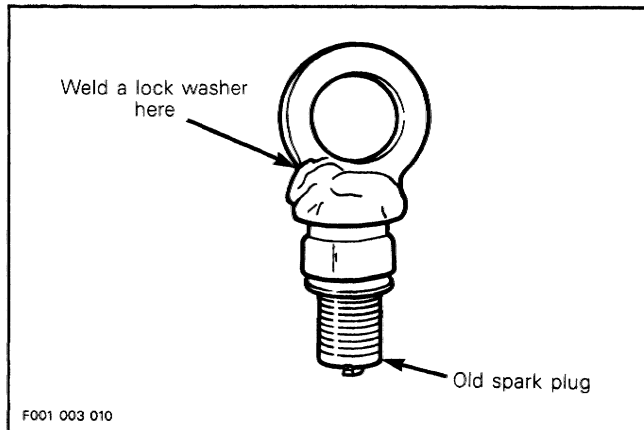
▼ **CAUTION :** Be sure to indicate shims location for reinstallation. If shims are interchanged engine and jet pump alignment will be altered.

## Section 03 ENGINE

### Sub-Section 02 (REMOVAL AND INSTALLATION)

Engine can be easily lifted using the following suggested tools.

- Cut porcelain from two old spark plugs.
- Weld a lock washer approximately 20 mm diameter on each spark plug as shown.



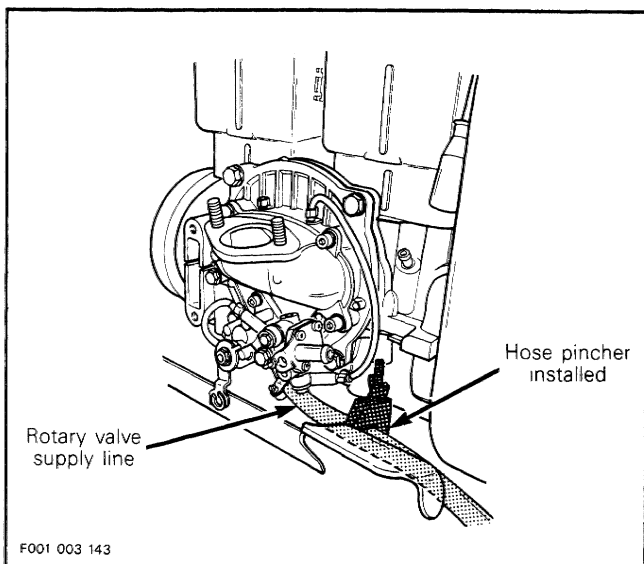
Remove spark plugs and replace by special tools.

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

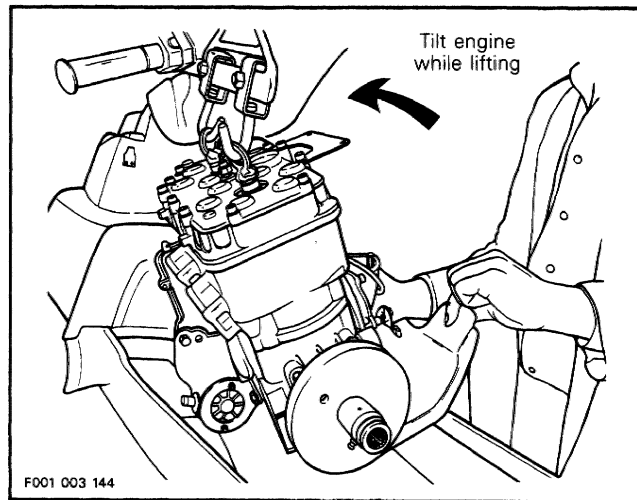
Lift it until rotary valve supply line is reachable. Install a hose pincher on hose, then disconnect.

Install hose pincher on rotary valve oil return line (on top of starter then disconnect.

Disconnect red positive cable from starter post.



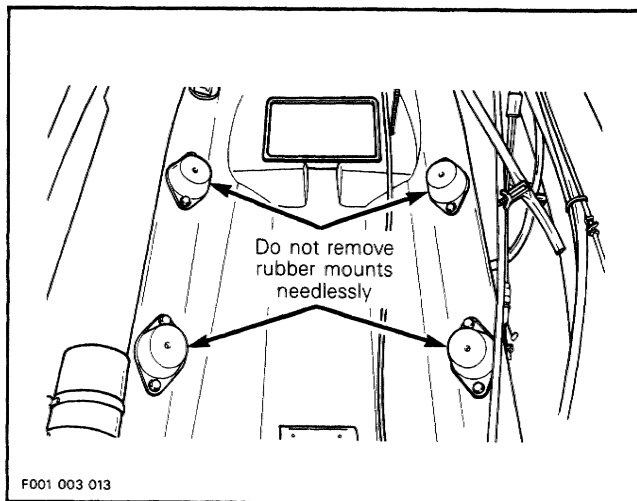
Carry on engine lifting until engine support reaches body opening then tilt engine so that it can completely leave watercraft.



**CAUTION :** Be careful not to scratch body with engine support or to hit any component.

### 15,16, Shim and Rubber Mount

Do not remove engine rubber mounts needlessly. They sit on shims which control engine / jet pump alignment. Alignment has been set at the factory. Always remove rubber mounts one at a time and reinstall each shim to its original location.



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

**NOTE :** If shims location have been mixed up or whenever removing the engine always use engine / jet pump alignment tool (P/N 295 000 089) to check alignment.

## Section 03 ENGINE

### Sub-Section 02 (REMOVAL AND INSTALLATION)

#### 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.

##### 16,19, Rubber Mount and Screw

Check tightness and condition of rubber mounts. If they have been removed, apply Loctite 242 (blue) (P/N 293 800 015) 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.

##### 9,21, Engine Support and Nut

Properly install support on crankcase so that rounded portion of support matches with MAG side of crankcase. Apply Loctite 242 (blue) (P/N 293 800 015) on threads then torque nuts in a criss-cross sequence to 35 N•m (26 lbf•ft).

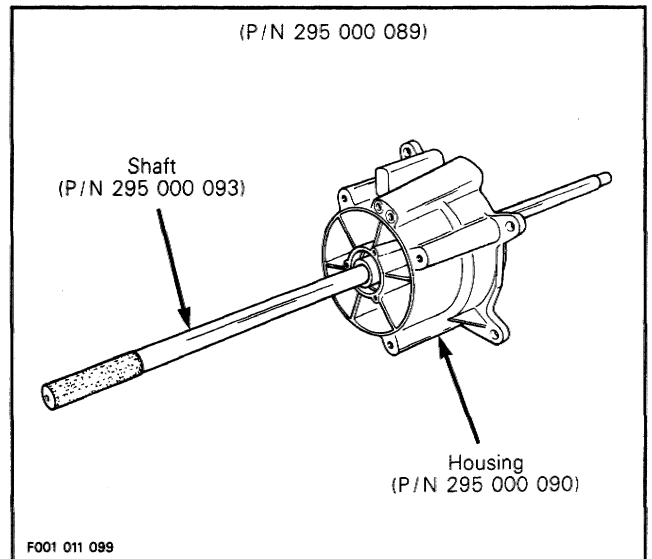
##### Rotary Valve Supply Line

Make sure to reinstall lines before completely lowering engine in bilge.

○ **NOTE** : If fuel line ends are damaged, cut damaged ends before reinstallation. For fuel line clamping, use special pliers (P/N 295 000 070).

##### Engine/Jet Pump Alignment

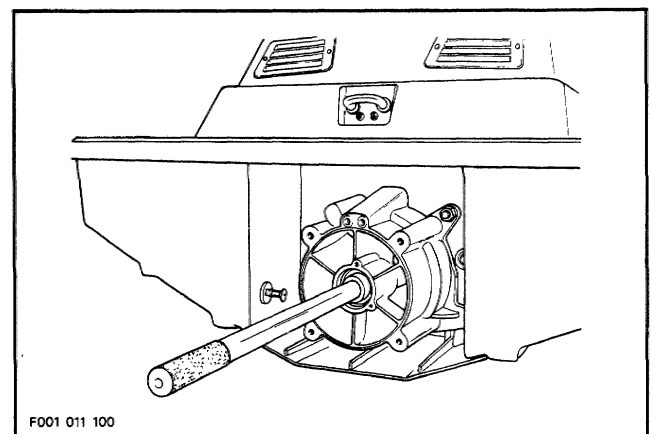
Alignment is necessary to eliminate possible vibration and/or damage to components. The engine/jet pump alignment tool (P/N 295 000 089) includes a housing (P/N 295 000 090) and a shaft (P/N 295 000 093).



▼ **CAUTION** : Some watercraft have a shim between hull and pump, if shim has been removed ensure to reinstall it. If not install, engine and jet pump alignment will be altered.

To verify alignment proceed as follows :

- Install housing on hull with four nuts.
- Slide shaft slowly thru housing. Pay attention not to hit PTO flywheel.

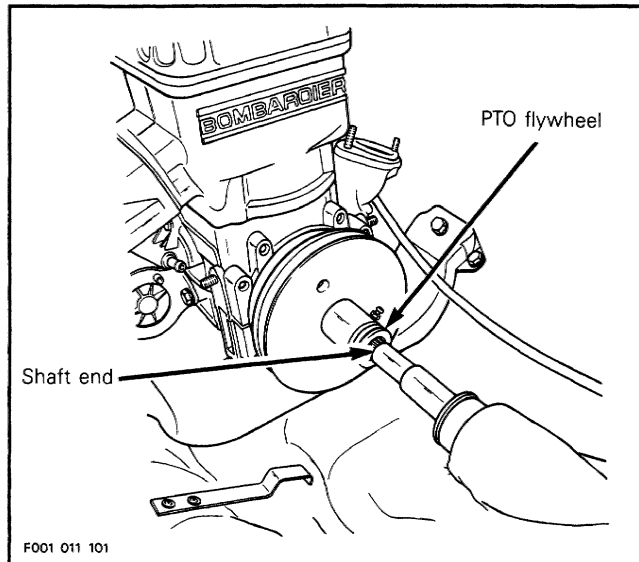


## Section 03 ENGINE

### Sub-Section 02 (REMOVAL AND INSTALLATION)

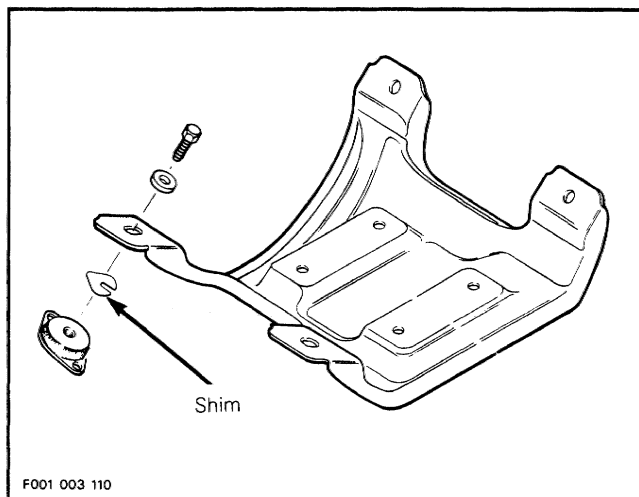
— Insert shaft end into PTO flywheel.

○ **NOTE** : The shaft should slide easily in flywheel splines if the alignment is correct.



If the alignment is incorrect loosen engine support screws to enable to align PTO flywheel with shaft end.

○ **NOTE** : Use shim(s) (P/N 270 000 024) (P/N 270 000 025) between engine support and rubber mounts to correct alignment.



▼ **CAUTION** : Whenever shims are used to correct alignment, never install more than 6 mm (0.240 in) shim thickness. If alignment cannot be obtained verify for engine support bending.

### 18,32, Screw and Loctite 242

Apply Loctite 242 (P/N 293 800 015) on screw threads. Retorque engine support screws to 25 N•m (18 lbf•ft) when procedure is completed.

○ **NOTE** : Whenever alignment tool is not utilized, apply SEA-DOO LUBE on its shaft and inside the housing to eliminate possible corrosion.

### Electrical Connections

**First**, install **red** positive cable on starter post and torque nut to 7 N•m (62 lbf•in). Install **black** negative cable on starter mounting bolt apply Loctite 271 on threads torque to 22 N•m (16 lbf•ft) if removed. Apply Neopren Grease on connectors then cover with boot.

○ **NOTE** : Install red positive cable with a tie rap located on hull right side.

◆ **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.

Install cable coming from ignition housing, into electrical box. 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.

### 6,13, Exhaust Manifold, Screw

Apply Loctite 242 (P/N 293 800 015) on screw threads. Torque screws in a criss-cross sequence to 24 N•m (17 lbf•ft).

### All Models

### 1,3,4,19, Nut, Tuned Pipe, Gasket and Screw

Make sure that gasket is properly located on exhaust manifold prior to finalizing pipe installation.

Apply Loctite 242 on stud and retaining screw threads. Hand-tighten nuts only and assure that tuned pipe support(s) rests against manifold.

▼ **CAUTION** : If a gap is left, stress will eventually occur on tuned pipe and may cause cracking.

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## Section 03 ENGINE

### Sub-Section 02 (REMOVAL AND INSTALLATION)

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Pre-torque nuts in a criss-cross sequence to about 20 N•m (15 lbf•ft).

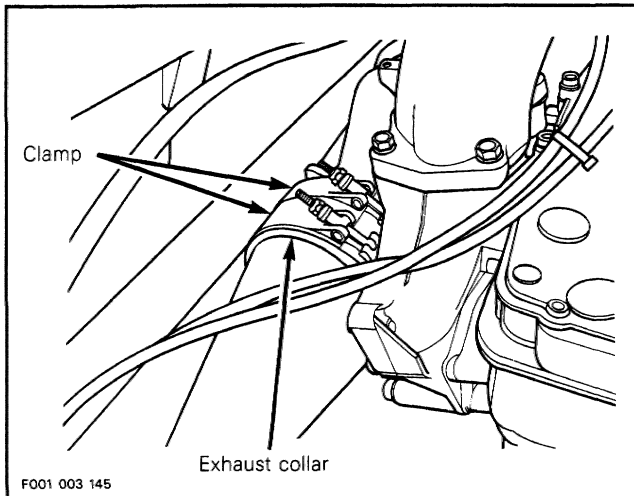
Torque side retaining screw(s) to 25 N•m (18 lbf•ft) and then torque nuts in a criss-cross sequence to 25 N•m (18 lbf•ft).

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

#### 5851 and 5860 Models

#### 34,36, Exhaust Cone and Exhaust Collar

Install exhaust cone to tuned pipe with exhaust collar. Position exhaust collar as illustrated. Do not tighten collar yet.



With hose removed, align cone outlet with muffler inlet.

○ **NOTE:** Due to exhaust cone angle, it may have to be rotated to obtain alignment.

Push cone until it touches tuned pipe, then tighten exhaust collar clamps and torque to 5.5 N•m (49 lbf•in).

▼ **CAUTION:** There must be no gap between exhaust cone and tuned pipe.

○ **NOTE:** Exhaust collar clamps should be tightened alternately to assure no leakage and to obtain specified torque.

#### All Models

#### Final Inspection

Check throttle cable condition and lubricate cable with SEA-DOO LUBE. After its installation, properly adjust and synchronize oil injection pump as specified in OIL SYSTEM, 06-02.

Bleed oil injection pump.

Pressure test fuel system, refer to FUEL SYSTEM 05-03 and look for **fuel system pressurization**. Secure vent tube to the battery. Ensure vent tube is not kinked or obstructed. Verify all connections and hoses condition.

Run engine and ensure there is no leakage.

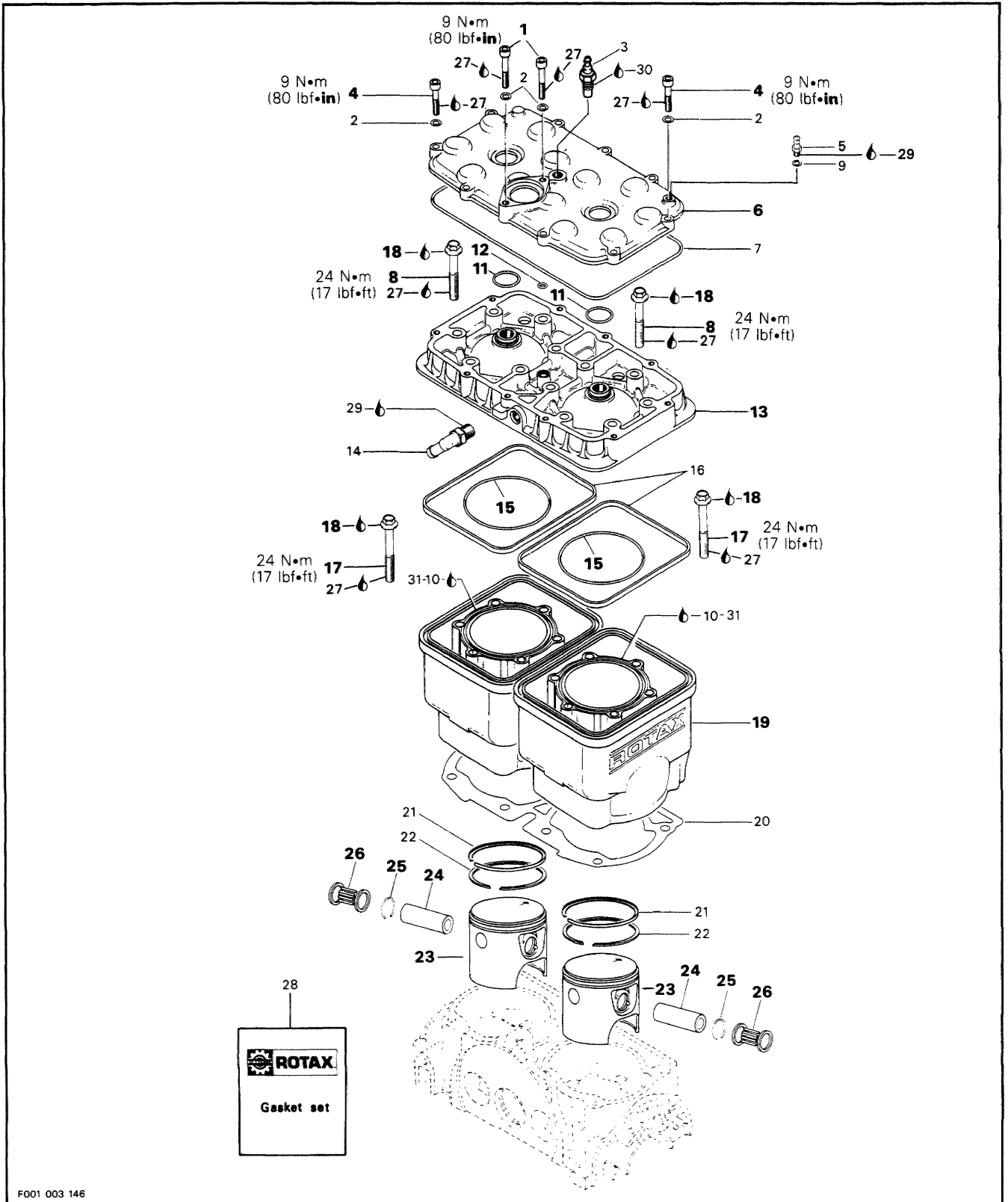
▼ **CAUTION:** Water must be supplied to cool engine with flush kit (P/N 295 000 038).





**Section 03 ENGINE**  
**Sub-Section 03 (TOP END)**

**TOP END**



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## Section 03 ENGINE

### Sub-Section 03 (TOP END)

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## COMPONENTS

1. Allen screw M6 x 35 (2)
2. Lock washer (11)
3. Sensor switch
4. Allen screw M6 x 25 (9)
5. Hose nipple
6. Cylinder head cover
7. O-ring
8. Hexagonal screw M8 x 55 (12)
9. Sealing ring
10. Loctite 515
11. O-ring (2)
12. O-ring
13. Cylinder head
14. Hose nipple (2)
15. O-ring (2)
16. O-ring (2)
17. Hexagonal screw M8 x 70 (8)
18. Synthetic grease
19. Cylinder with sleeve (2)
20. Cylinder gasket
21. Semi-trapez ring (2)
22. Rectangular ring (2)
23. Piston (2)
24. Piston pin (2)
25. Circlip (4)
26. Needle bearing (2)
27. Loctite 242
28. Gasket set
29. Loctite PST 567
30. Sealant PL-32
31. Loctite primer N

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## 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

In order to repair engine top end proceed as follows :

### Exhaust System

To withdraw tuned pipe, refer to ENGINE REMOVAL AND INSTALLATION 03-02 then look for **cooling and exhaust systems**.

### Intake System

Loosen clamp of intake silencer hose on carburetor side.

Pivot intake silencer to rear of watercraft.

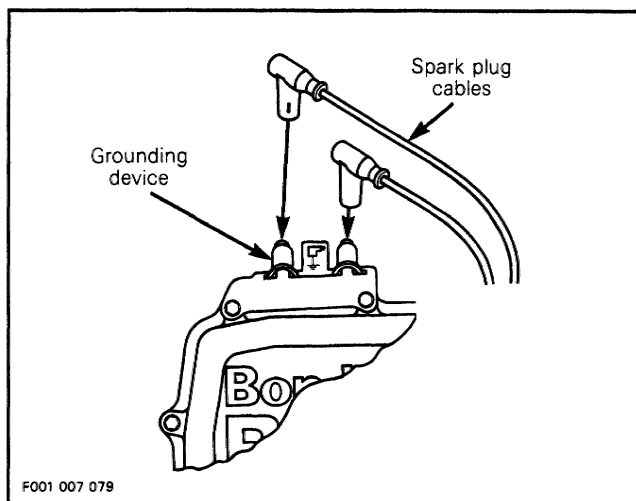
Remove both retaining screws of carburetor support from engine cover.

Remove screws holding flame arrester cover, then withdraw cover.

Remove throttle and choke cables from flame arrester base.

Remove screws from flame arrester base, then withdraw base.

Remove spark plug cables and connect them on the grounding device.



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 water 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, fuel system pressurization must be done first. Do not use open flame ; use a heat gun. An explosion might occur since vapors can be present in engine compartment.

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

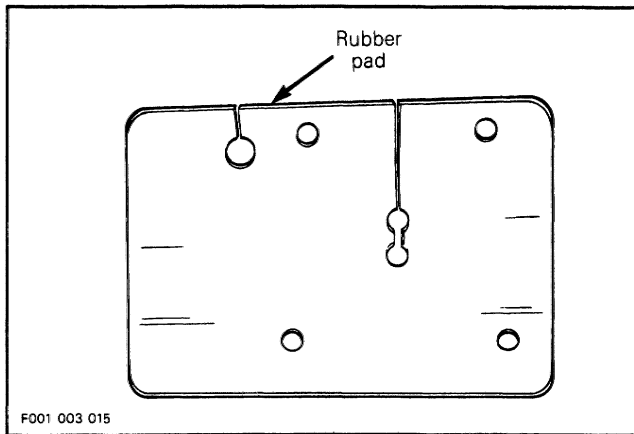
## Section 03 ENGINE

### Sub-Section 03 (TOP END)

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

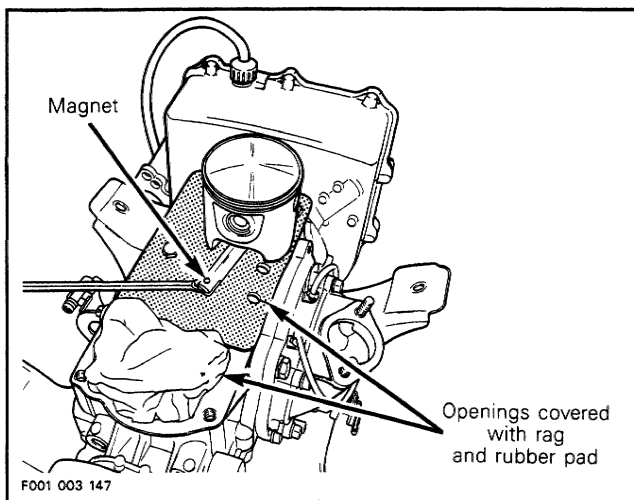
**CAUTION :** This engine design features cageless piston pin bearing. At piston disassembly, rollers may fall out, use rubber pad to prevent rollers from dropping in crankcase.

Bring piston to Top Dead Center and install rubber pad (P/N 295 000 079) over crankcase opening. Secure with screws. Lower piston until it sits on pad.



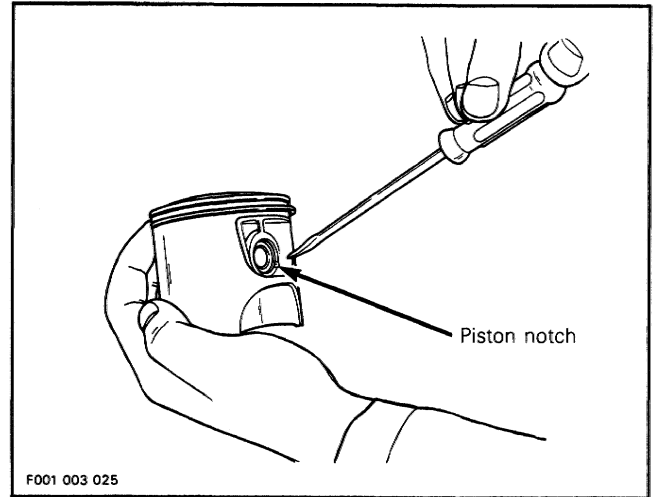
If other cylinder has been removed, completely cover its opening with a clean rag.

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



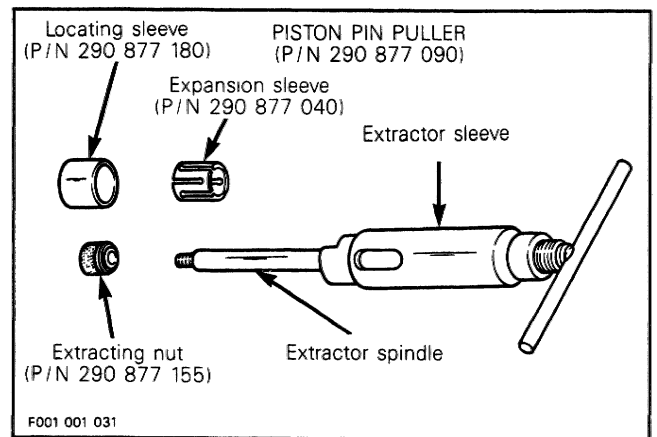
To remove circlip, insert a pointed tool in piston notch then pry it out and discard

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



To extract piston pin, use piston pin puller (P/N 290 877 090) as follows :

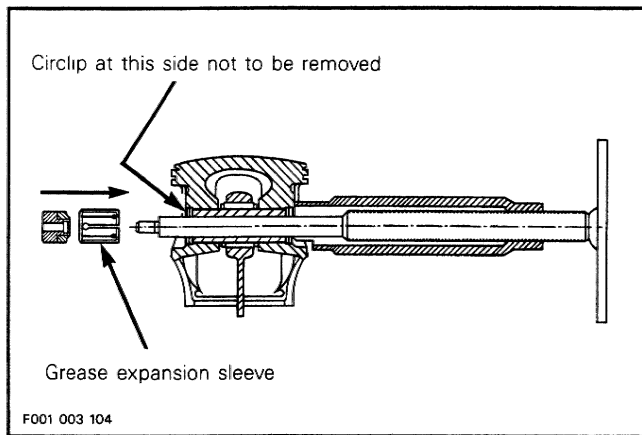
- Fully thread on puller handle.
- Insert extractor spindle into the piston pin.
- Slide the expansion sleeve (P/N 290 877 040) onto the spindle.
- Screw in extractor nut (P/N 290 877 155) with the movable extracting ring towards spindle.



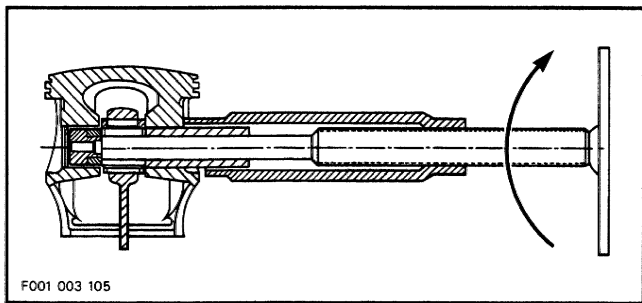
## Section 03 ENGINE

### Sub-Section 03 (TOP END)

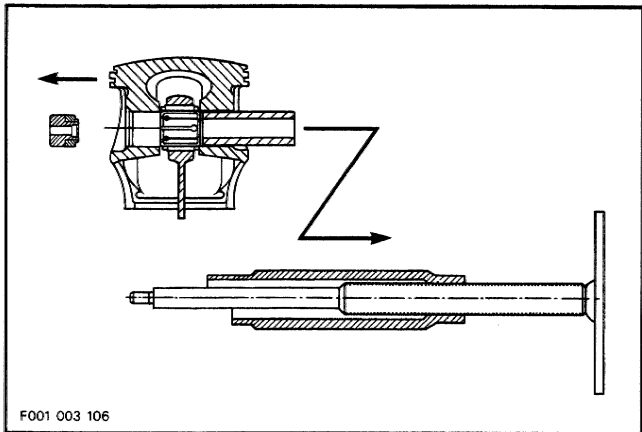
- Firmly hold puller and rotate handle clockwise to pull piston pin.



- By turning the spindle, pull out piston pin until it aligns with the reference mark 587 on the extractor sleeve.



- Rotate spindle counterclockwise until extracting nut can be removed.
- Remove spindle and extractor sleeve from piston pin.
- Carefully remove the piston.



- The needles, thrust washers and the expansion sleeve remain in the connecting rod bore and may be used again.

## REMOVAL OF NEEDLE BEARING

To remove needles with the thrust washers from the connecting rod bore, push them together with the expansion sleeve into the locating sleeve (P/N 290 877 180) using any suitable pusher 21 mm (.826 in) dia.

▼ **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 a piece of broken ring.

## INSPECTION

- Visually inspect all 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.

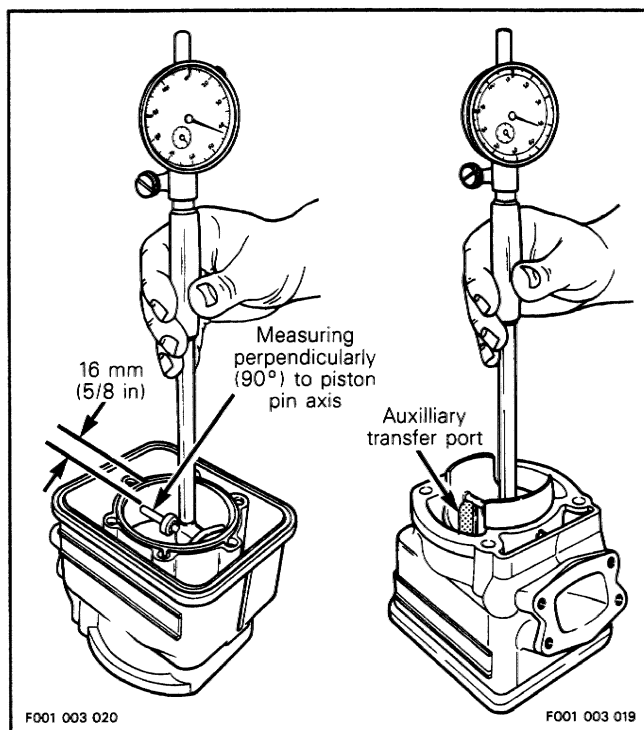
MEASUREMENTS	TOLERANCES		
	NEW PARTS (min.)	NEW PARTS (max.)	WEAR LIMIT
Cylinder Taper	N.A.	N.A.	0.08 mm (.0031 in)
Cylinder Out of Round	N.A.	N.A.	0.05 mm (.0020 in)
Cylinder/Piston Clearance	0.05 mm (.002 in)	0.07 mm (.0028 in)	0.20 mm (.008 in)
Ring/Piston Groove/Clearance	0.05 mm (.002 in)	0.08 mm (.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. Consult a specialized shop for installation.

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

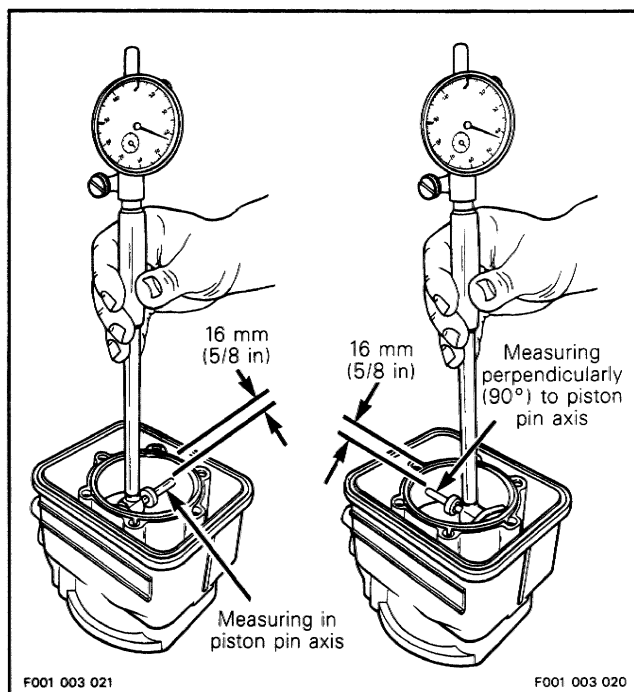
### Cylinder Taper

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.



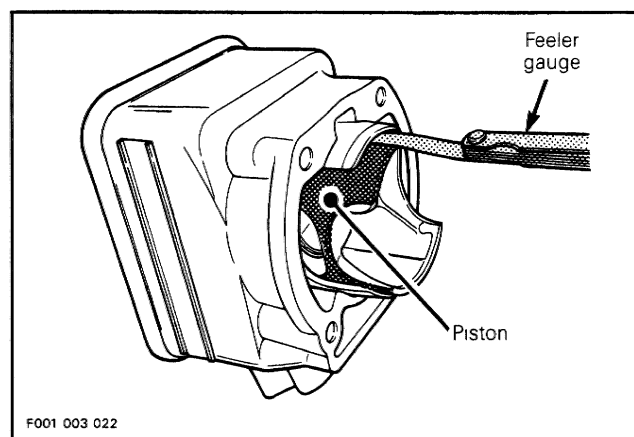
### Cylinder Out of Round

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.

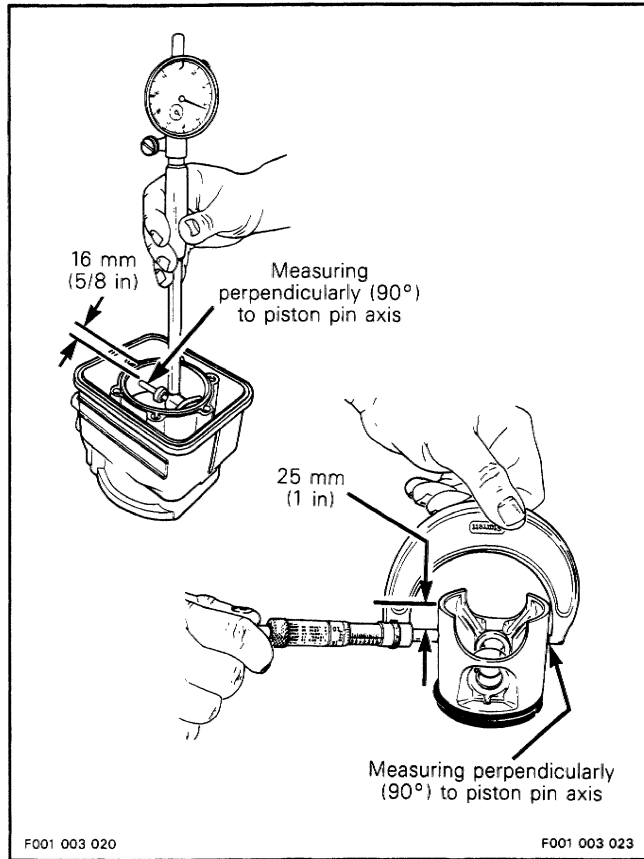


## Section 03 ENGINE

### Sub-Section 03 (TOP END)

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

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

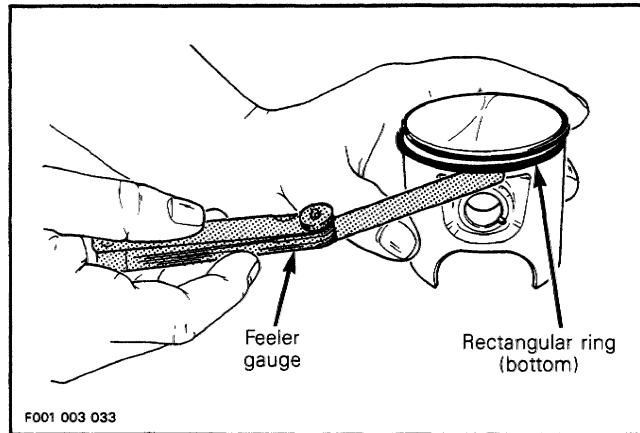


The difference between these two measurements should be within specified tolerance.

### 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.

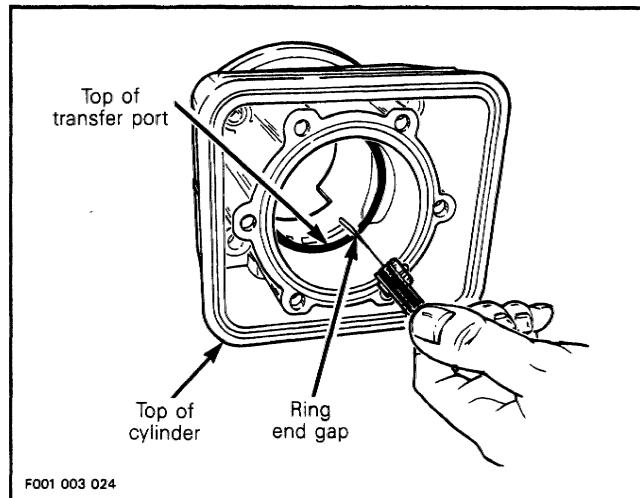


### Ring End Gap

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.

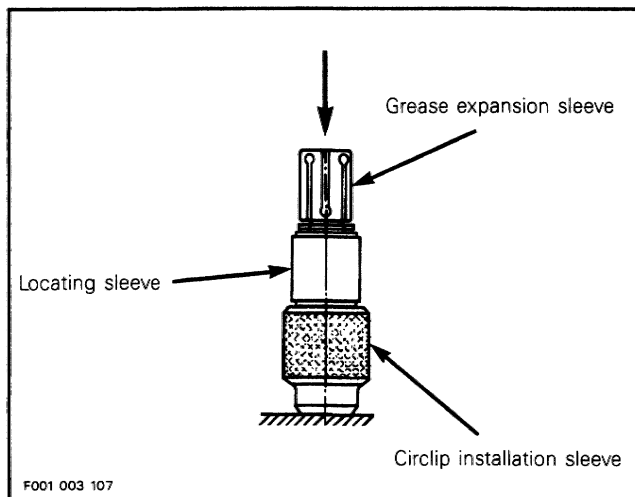
### 23,24,26, Piston, Piston Pin and Roller Bearing

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

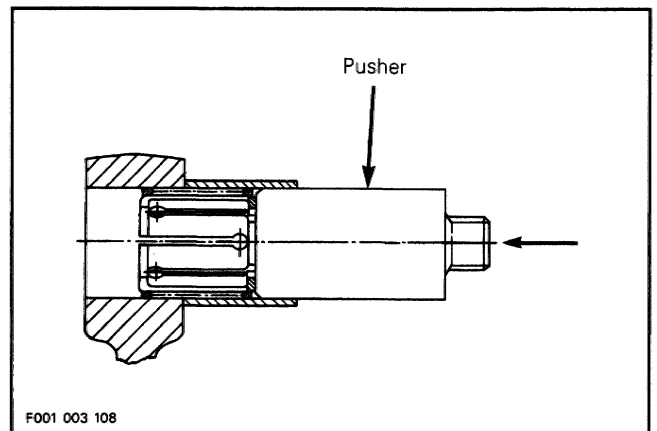
Carefully cover crankcase opening as for disassembly.

Installation of roller bearing and piston pin using proper service tool piston pin puller (P/N 290 877 090), proceed as follows :

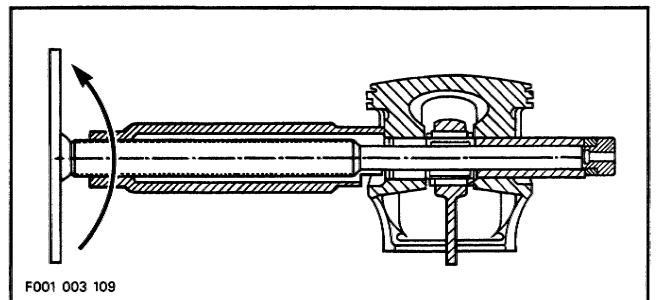
- Replacement bearings are held in place by a locating sleeve outside and two plastic cage halves inside.
- Push the inner halves out of the bearing as per following illustration.



- Push needle bearing together with expansion sleeve out of the locating sleeve into the connecting rod bore.
- Use any suitable pusher 21 mm (.826 in) dia. as a tool. 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.
- Warm piston to approximately 50-60°C (122-140°F) and install it over connecting rod.
- Insert extractor spindle into the piston pin, screw on extracting nut.
- Rotate handle counterclockwise to pull piston pin carefully into the piston.



### Plastic Mounting Device Method

As an alternate method when no service tool is available proceed as follows :

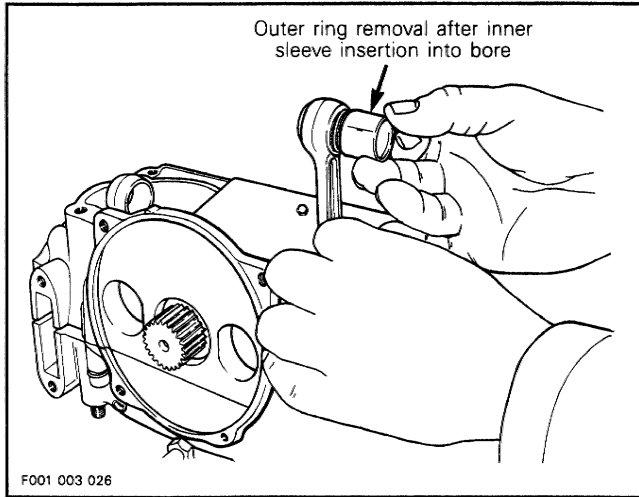
Replacement roller bearings are delivered in a convenient plastic mounting device. For installation, proceed as follows :

- Align replacement roller bearing with connecting rod bore.

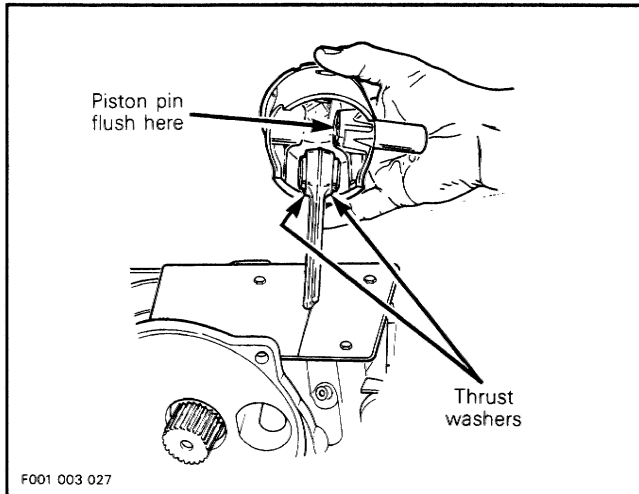
## Section 03 ENGINE

### Sub-Section 03 (TOP END)

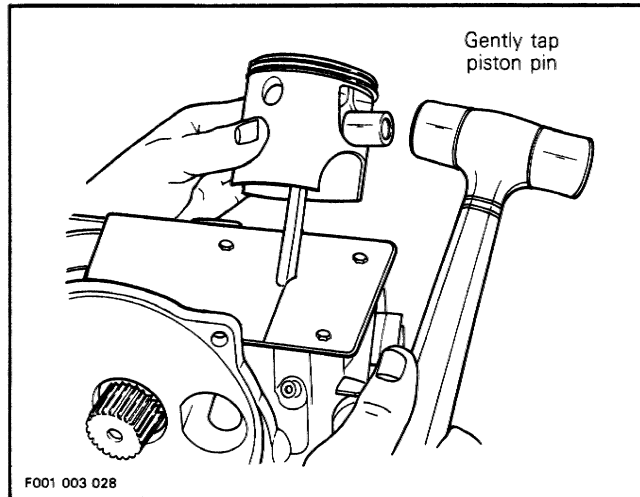
- Carefully push inner plastic sleeve into connecting rod bore ; outer plastic ring will release rollers.



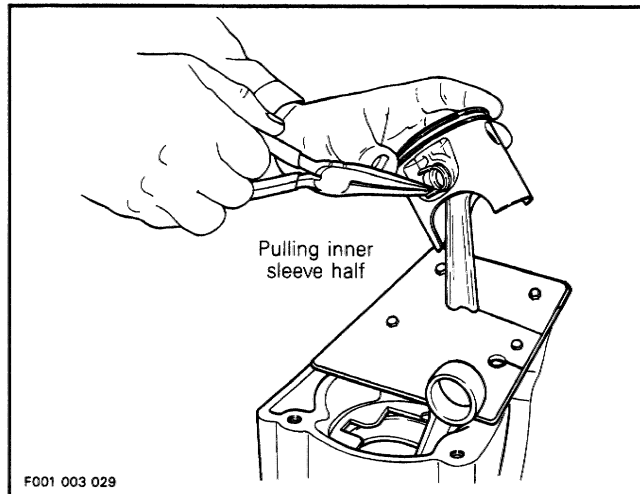
- Make sure thrust washers are present each side of rollers.
- Insert piston pin into piston until it comes flush with inward edge of piston hub.



- 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.



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

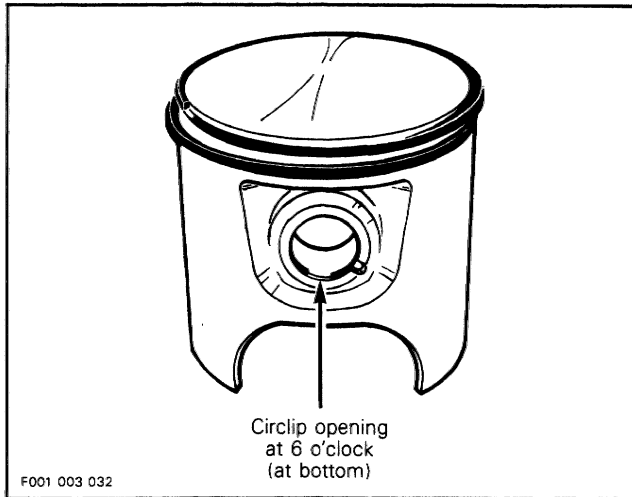




## 25, Circlip

Secure remaining circlip taking into consideration the following.

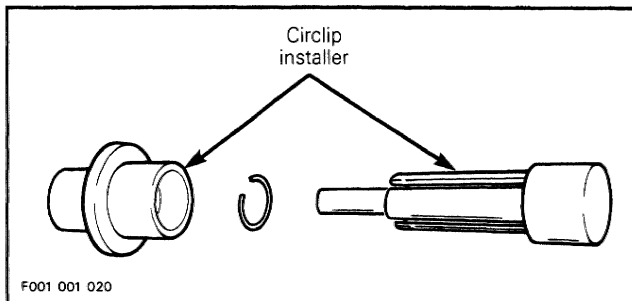
▼ **CAUTION :** To minimize the stress on the circlips, install them so that their openings are located at 6 o'clock (at bottom).



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

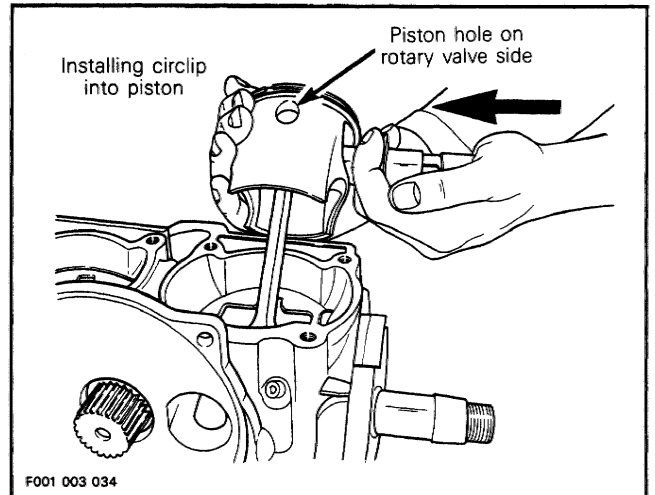
▼ **CAUTION :** Always use new circlips. At installation, take care not to deform them. Overstressed circlips will come loose and will damage engine. Circlips must not move freely after installation, replace if circlip rotates after installation.

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



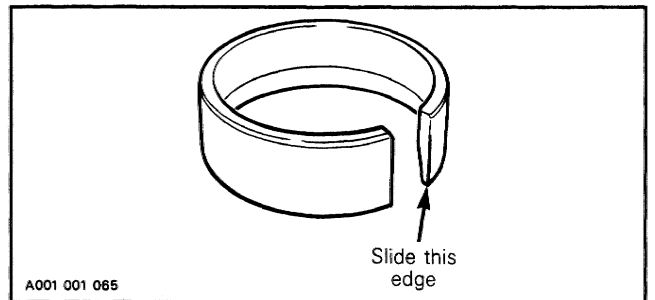
— Remove pusher from tool then insert circlip into its bore.

- Reinstall pusher into tool and push until circlip comes in end of tool.
- Position end of tool against piston pin opening.
- 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.

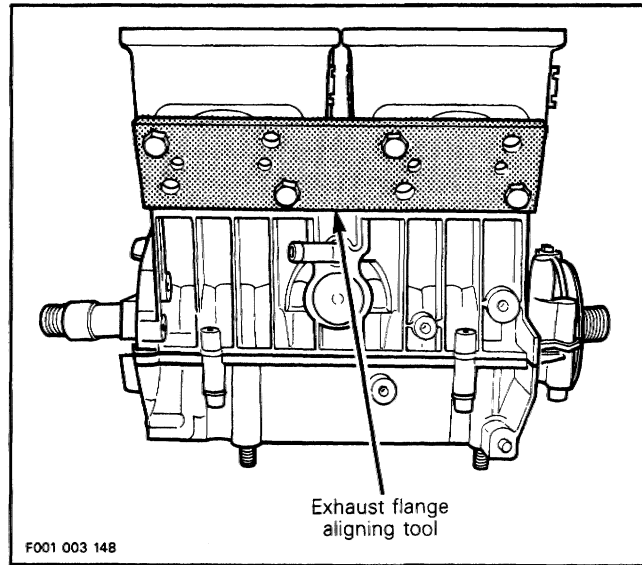
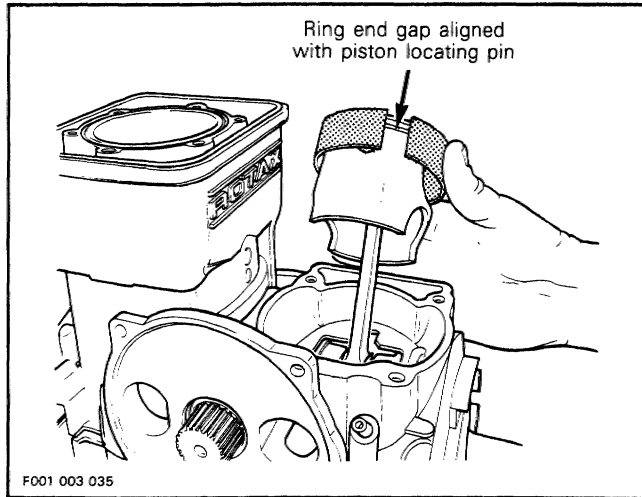


○ **NOTE :** Ring compressor will not fit on oversize piston/rings.

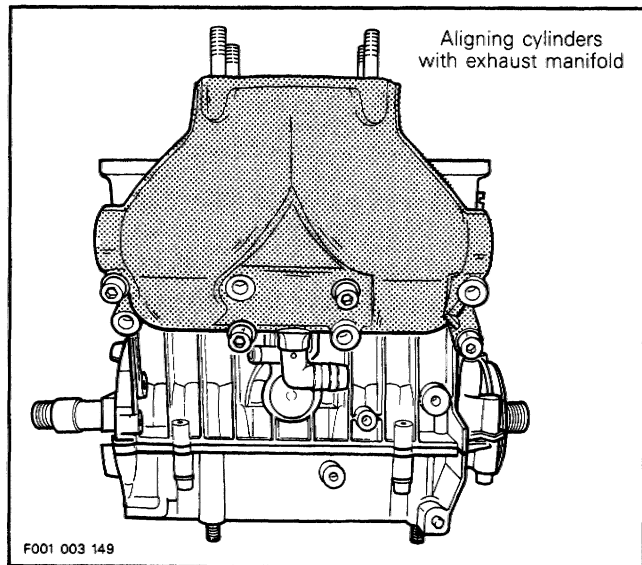
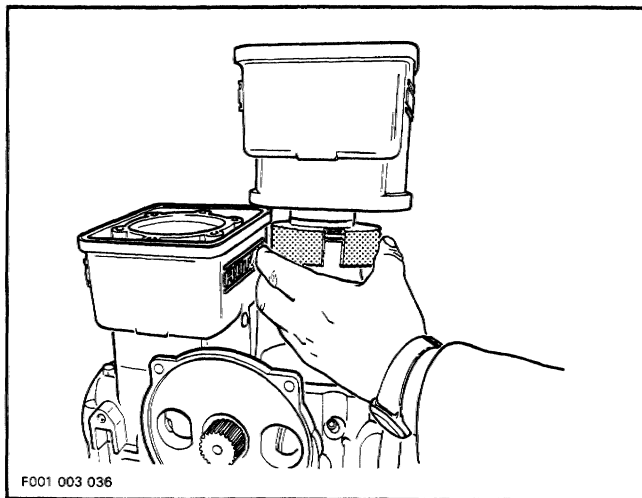
## Section 03 ENGINE

### Sub-Section 03 (TOP END)

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



Install cylinder gasket and slide cylinder over piston.

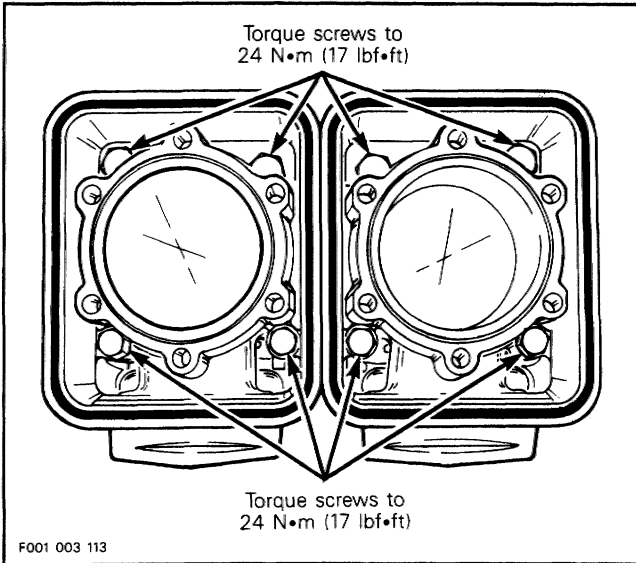


When reassembling cylinders to crankcase, it is important to have them properly aligned so that exhaust flanges properly match up with exhaust manifold. Use aligning tool (P/N 290 876 902) or exhaust manifold itself.

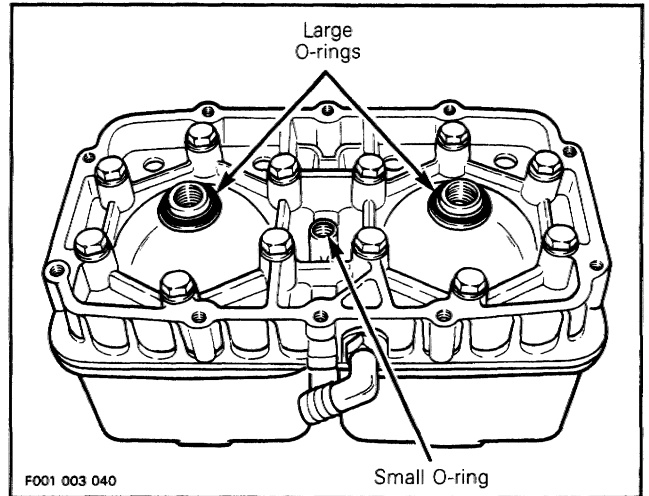
○ NOTE: If manifold has been used for exhaust flanges alignment, remove it for engine installation in watercraft.

**17,18,19, Screw, Grease and Cylinder**

Apply synthetic grease (P/N 293 550 010) below screw head. Apply Loctite 242 (P/N 293 800 015) on screw threads. Install and torque screws in a criss-cross sequence for each cylinder to 24 N•m (17 lbf•ft).



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



**1,4,6, Screw and Cylinder Head Cover**

Install cover over cylinder head. Apply Loctite 242 (P/N 293 800 015) on screw threads. The two longer screws must be installed on oval-shaped housing. Make sure to install flame arrester support.

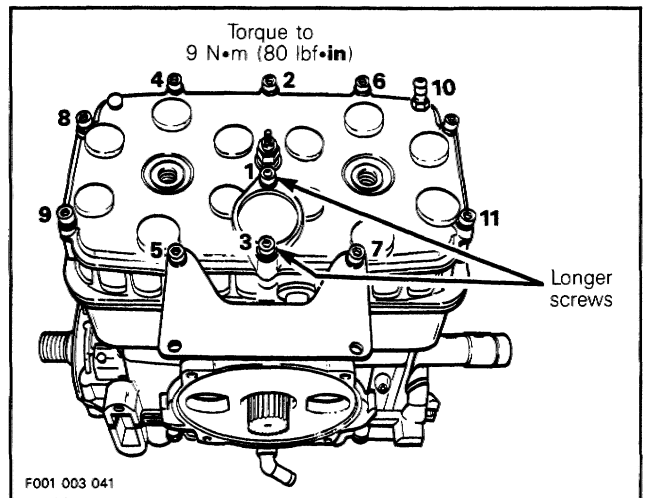
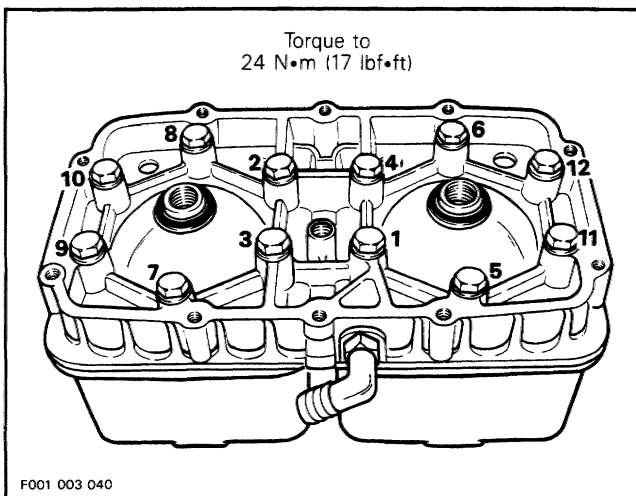
**NOTE:** Hand-tighten screws only. Final torque should be carried on after flame arrester/carburetor installation, once engine is in the watercraft.

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

**8,11,12,13,15, Screw, O-ring and Cylinder Head**

Apply synthetic grease (P/N 293 550 010) below screw head.

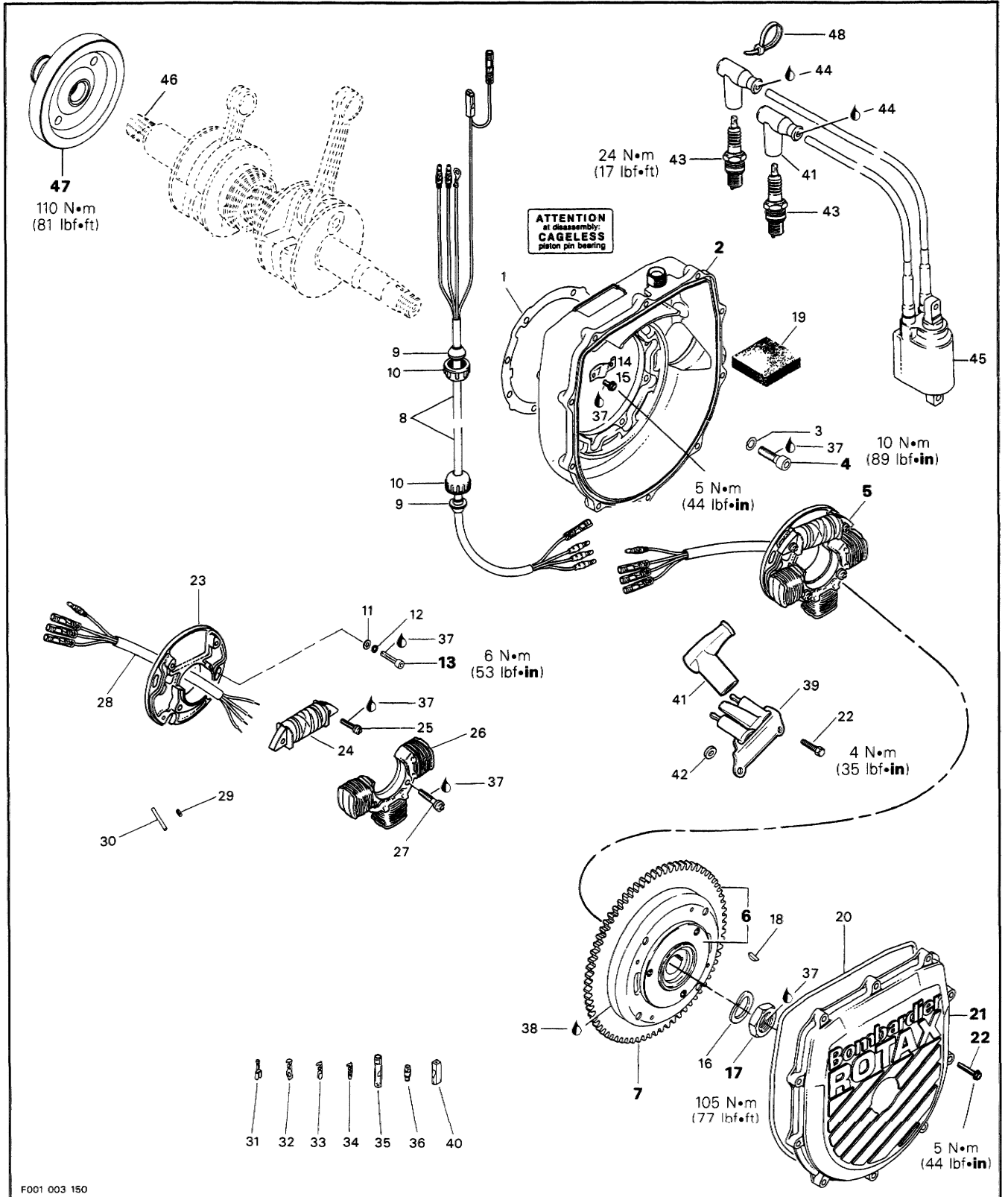
Apply Loctite 515 Gasket Eliminator (P/N 293 800 007) in cylinder sleeve O-ring groove. Apply Loctite 242 (P/N 293 800 015) on screw threads. Install and torque screws to 24 N•m (17 lbf•ft) as per following illustrated sequence.





**Section 03 ENGINE**  
**Sub-Section 04 (PTO FLYWHEEL AND MAGNETO)**

**PTO FLYWHEEL AND MAGNETO**



F001 003 150

## Section 03 ENGINE

### Sub-Section 04 (PTO FLYWHEEL AND MAGNETO)

## COMPONENTS

1. Gasket
2. Ignition housing
3. Lock washer M8 (8)
4. Allen screw M8 x 25 (8)
5. Armature plate assembly
6. Magneto flywheel assembly
7. Ring gear 77 teeth
8. Harness assembly
9. Grommet (2)
10. Cap (2)
11. Washer M5.5 (3)
12. Lock washer M5 (3)
13. Allen screw M5 x 18 (3)
14. Retainer plate
15. Taptite screw M5 x8 (2)
16. Lock washer M22
17. Hexagonal nut M22
18. Woodruff key
19. Protection mat
20. O-ring
21. Ignition housing cover
22. Self tapping screw M5 x 25 (12)
23. Armature plate
24. Generating coil
25. Phillips screw M5 x 22 (2)
26. Battery charging coil
27. Screw M6 x 25 (2)
28. Harness assembly
29. Terminal clip (4)
30. Shrink tube 30 mm (4)
31. Female connector
32. Ring terminal
33. Female terminal
34. Male terminal
35. Insulation sheath
36. Insulation sheath
37. Loctite 242
38. Loctite 648
39. Ground plate
40. Protection cap
41. Insulator (2)
42. Star washer M5
43. Spark plug (2)
44. Dielectric grease
45. Ignition coil
46. Anti-seize lubricant
47. PTO flywheel
48. Tie rap (2)

## GENERAL

The following procedures can be performed without removing engine from watercraft. However, battery removal will be required. For only PTO flywheel removal withdraw jet pump unit ass'y, refer to PROPULSION AND DRIVE SYSTEMS 08-01 then refer to **removal** and **overhaul**.

To ease the removal of PTO flywheel heat center of flywheel with a heat gun to break bond. Always pressurize fuel system first.

**WARNING :** Never use a torch in the engine compartment. Electrolyte or fuel vapors can be present it may ignite.

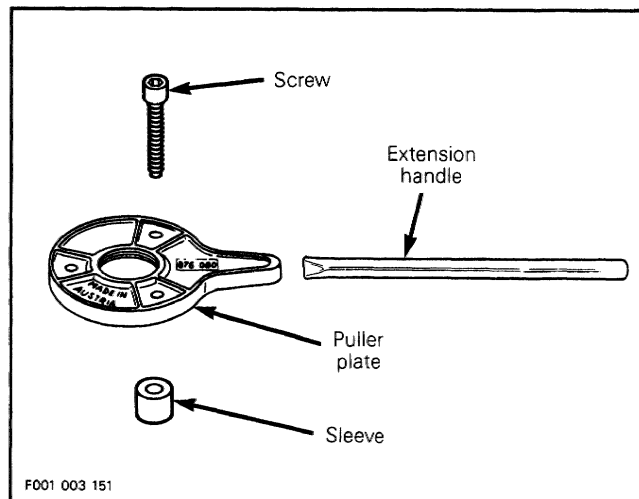
## REMOVAL

### 21,22, Ignition Cover and Screw

Remove screws and spark plug grounding device then withdraw cover.

**NOTE :** PTO side flywheel must be removed prior to removing MAG 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), sleeves (P/N 290 847 220) and extension handle (P/N 295 000 003).

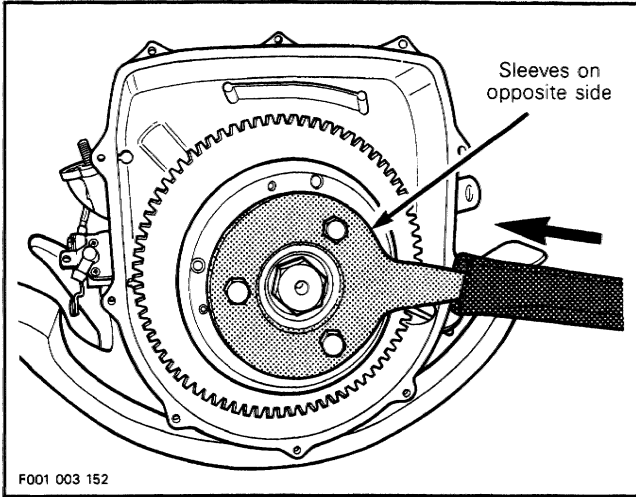


**CAUTION :** Never lock crankshaft by inserting any tool through connecting rod bores nor through impulse fitting.

**47, PTO Flywheel**

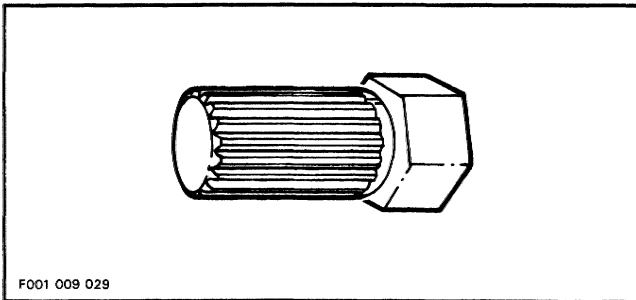
Using three M8 x 35 mm screws (P/N 290 841 591), install screws three puller plate and slide sleeves on screws then secure puller plate on MAG flywheel so that sleeves are against flywheel.

Install extension handle on end of puller plate.

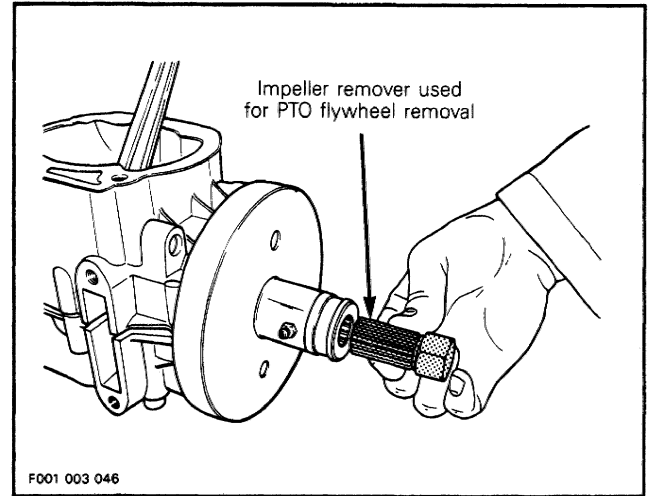


Rotate MAG flywheel so that extension handle end can be held easily before PTO flywheel loosening.

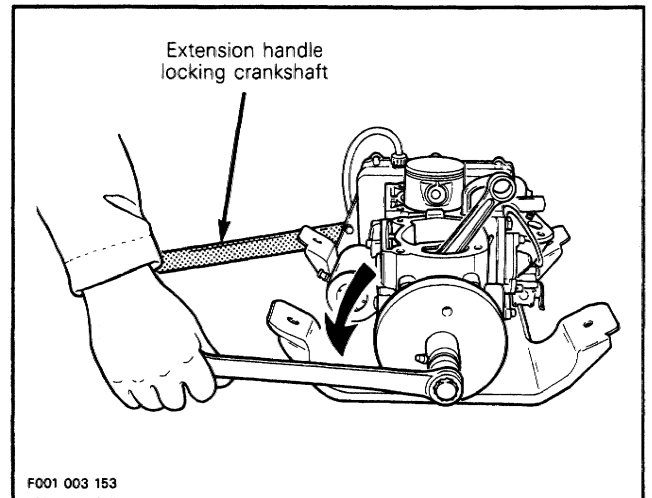
PTO flywheel is loosen using impeller remover (P/N 295 000 001).



Insert special tool in PTO flywheel splines.



Using a suitable wrench or socket, unscrew PTO flywheel COUNTERCLOCKWISE when facing it.

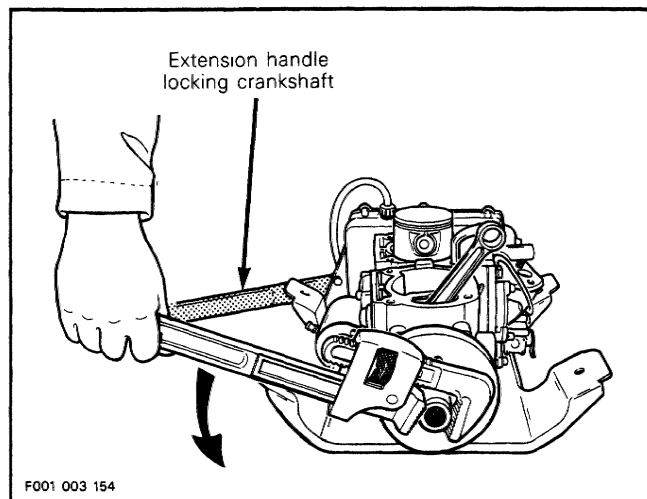


## Section 03 ENGINE

### Sub-Section 04 (PTO FLYWHEEL AND MAGNETO)

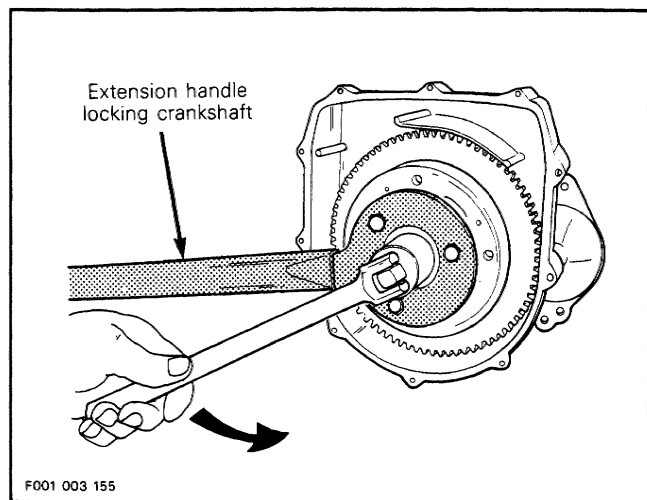
As an alternate method to remove PTO flywheel when PTO flywheel splines are worn out and PTO flywheel remover cannot be used.

Use a pipe wrench and install it on PTO flywheel as illustrated.



## 6, Magneto Flywheel

With puller plate properly secured as for PTO flywheel removal, rotate MAG flywheel so that extension handle end can be held easily before loosening.

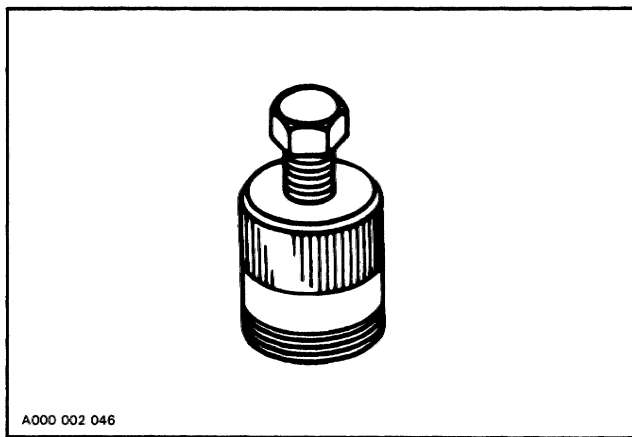


Using a suitable socket, unscrew retaining nut COUNTERCLOCKWISE when facing it.

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

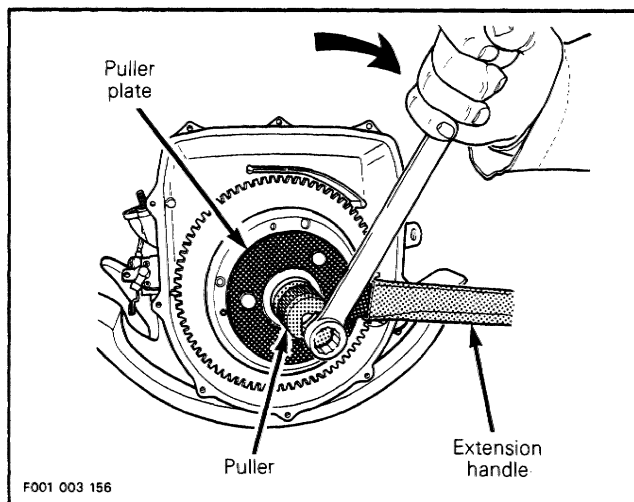
Remove nut and lock washer from MAG flywheel.

MAG flywheel is easily freed from crankshaft with puller (P/N 290 876 065).



Fully thread on puller in puller plate.

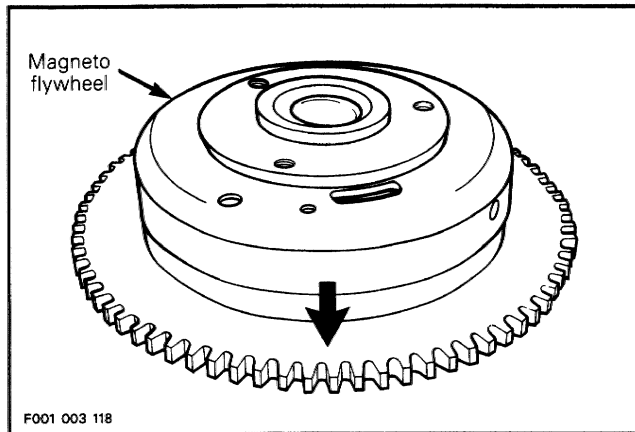
Tighten puller bolt and at the same time, tap on bolt head using a hammer to release MAG flywheel from its taper.





**7, Ring Gear**

Lay MAG flywheel on a steel plate, then to ease removal heat ring gear with a propane torch to approximately 150°C (300°F) to break the Loctite bond. Tap lightly on ring gear using a hammer to release it from MAG flywheel.



**5,13, Screw and Armature Plate Ass'y**

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

Remove three retaining screws and withdraw armature plate.

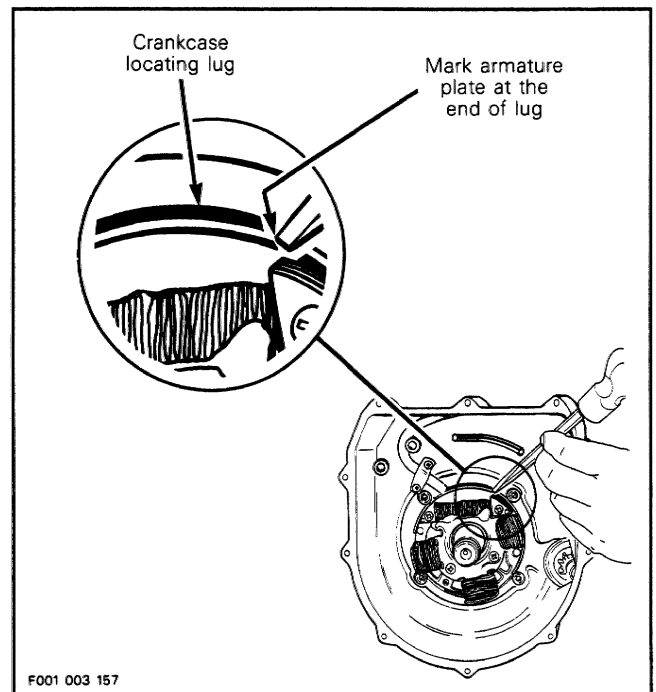
**Crankcase Replacement**

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.

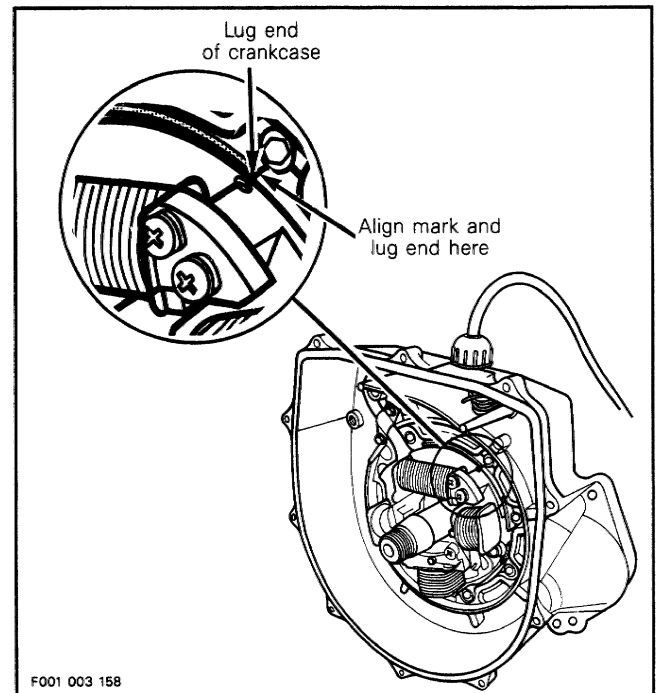
The following procedure is to find a common reference point on both crankcases (old and new) to position armature plate.

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.



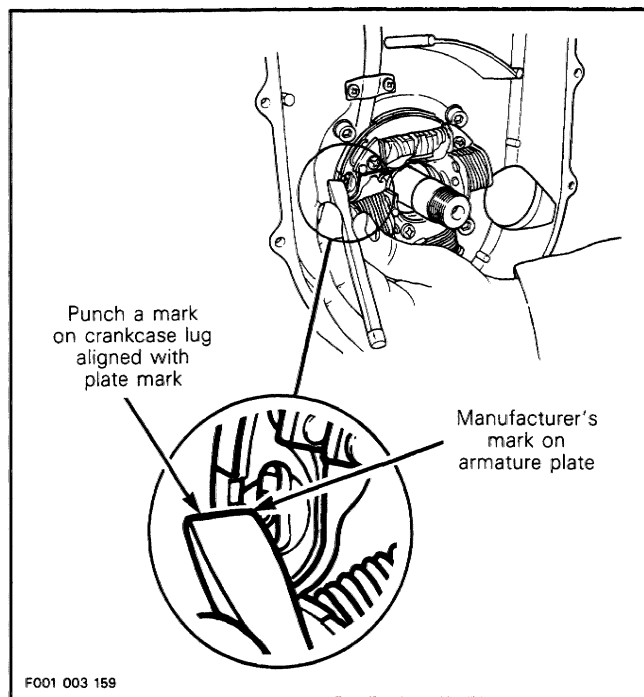
- At assembly, align armature plate mark (previously punched) with the end of the same locating lug on the new crankcase.



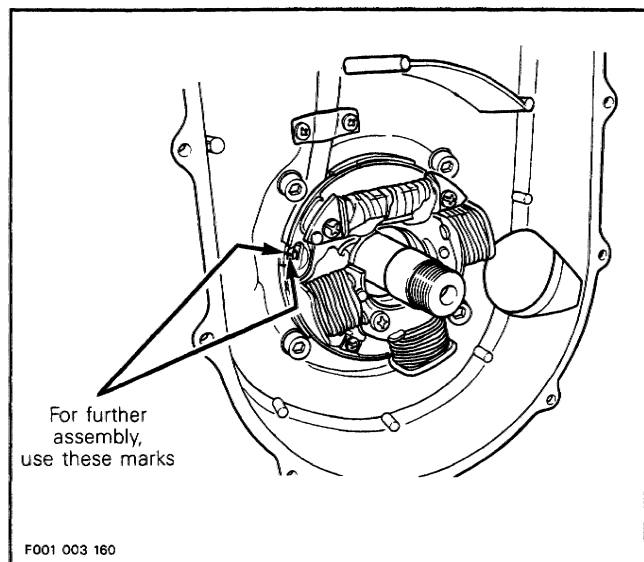
## Section 03 ENGINE

### Sub-Section 04 (PTO FLYWHEEL AND 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.



#### 2,4, Ignition Housing and Screw

To remove ignition housing, starter has to be removed. Refer to ELECTRICAL 07-04 under **electric starter** 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.

#### 2,4, Ignition Housing and Screw

Install gasket on housing/crankcase mating surfaces.

Apply Loctite 242 (blue) (P/N 293 800 015) on screw threads then torque them in a criss-cross sequence to 10 N•m (89 lbf•in).

After housing installation, make sure before reinstalling electric starter, that oil outlet fitting is installed on crankcase.

#### 5,13, Screw and Armature Plate Ass'y

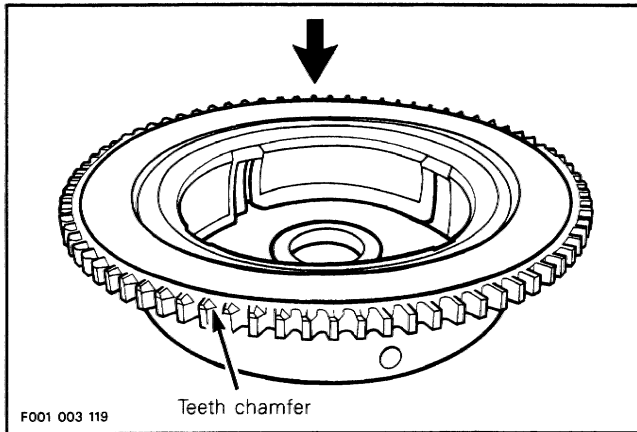
Position armature plate on crankcase, aligning previously traced marks on both parts.

Apply a drop of Loctite 242 (blue) (P/N 293 800 015) on screw threads and torque to 6 N•m (53 lbf•in).

### 7, Ring Gear

Apply Loctite 648 (P/N 290 899 788) to MAG flywheel mating surface. Lay ring gear on a steel plate, then heat with a propane torch in order to install it on MAG flywheel.

Pay particular attention to position ring gear teeth chamfer side as per following illustration.



○ **NOTE** : Ensure that ring gear contacts MAG flywheel flange. Scribe a new mark on ring gear for further ignition timing.

▼ **CAUTION** : At MAG flywheel installation, ring gear teeth chamfer and starter clutch should be facing each other.

### 6,17, MAG Flywheel and Nut

Apply Loctite 242 (blue) (P/N 293 800 015) on crankshaft taper.

Position Woodruff key, MAG flywheel, apply Loctite 242 on nut threads and install fasteners on crankshaft.

Torque nut to 105 N•m (77 lbf•ft).

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

### 47, PTO Flywheel

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

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

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

### Ignition Timing

For procedures, refer to ELECTRICAL 07-02 under ignition timing.

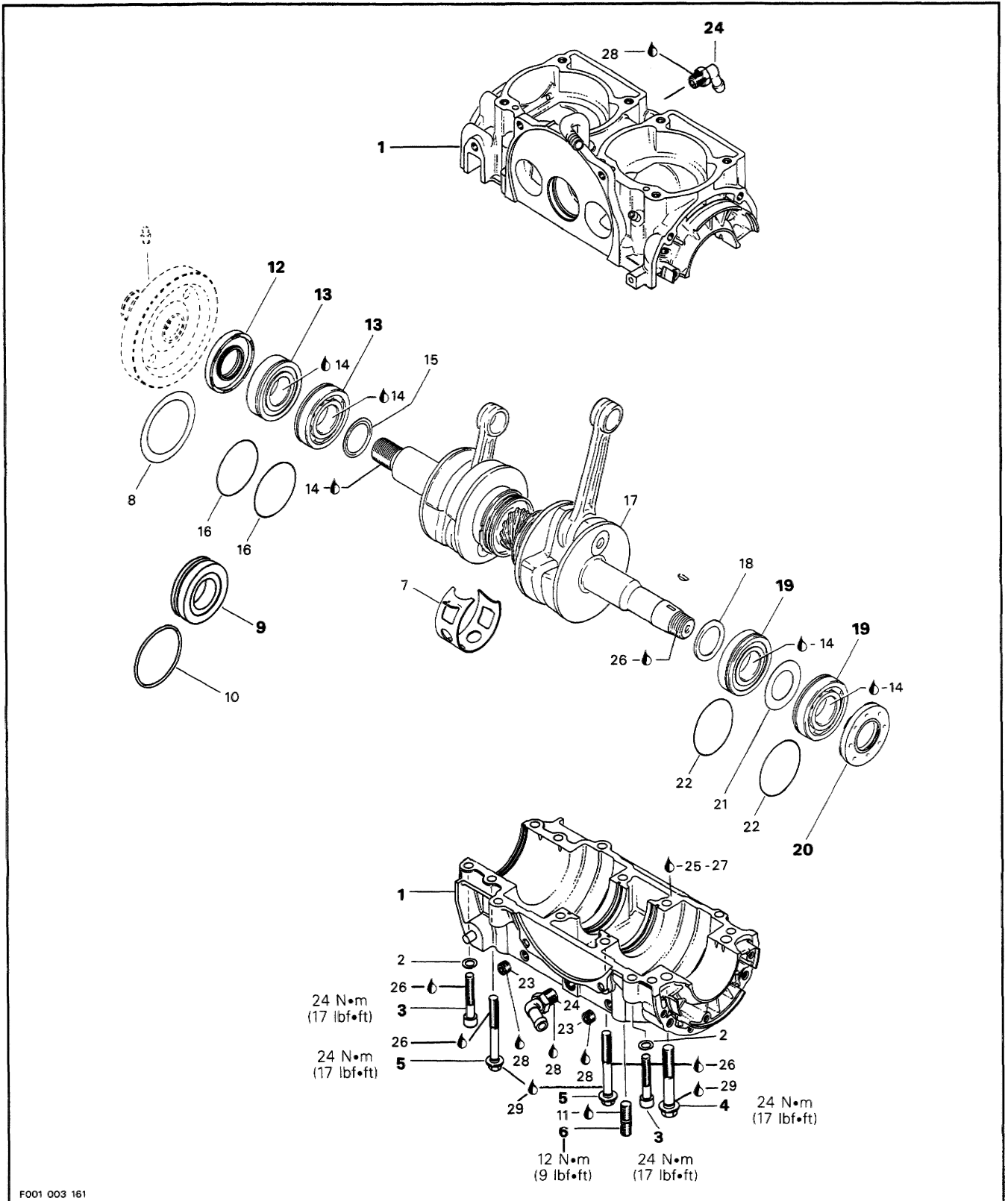
### 21,22, Ignition Housing Cover and Screw

Properly install O-ring in ignition housing. Install cover and spark plug grounding device then torque screws in a criss-cross sequence to 5 N•m (44 lbf•in).



**Section 03 ENGINE**  
**Sub-Section 05 (BOTTOM END)**

**BOTTOM END**



## Section 03 ENGINE

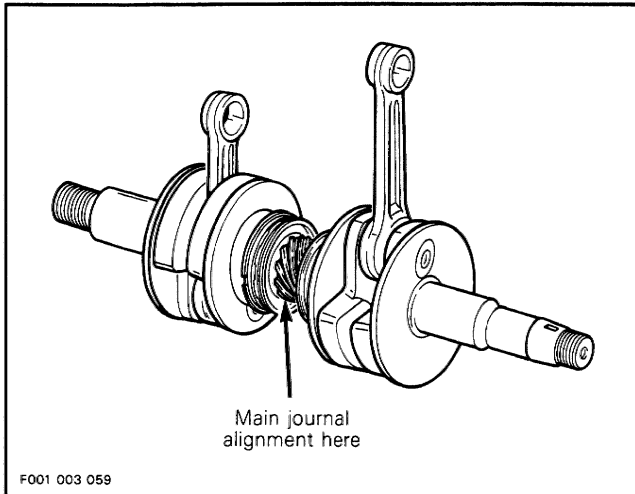
### Sub-Section 05 (BOTTOM END)

## COMPONENTS

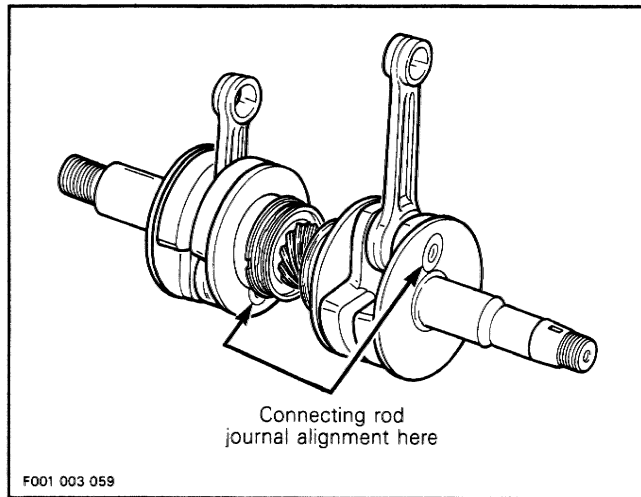
1. Crankcase ass'y
2. Lock washer 8 mm (6)
3. Allen screw M8 x 45 (6)
4. Hexagonal head screw M10 x 75 (2)
5. Hexagonal head screw M8 x 70 (6)
6. Stud M10 x 25/18 (4)
7. Retaining ring
8. Retaining shim
9. Labyrinth sleeve
10. O-ring
11. Loctite 271
12. Oil seal
13. Ball bearing 6207 (2)
14. Anti-seize lubricant
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. Drain plug (2)
24. Oil outlet fitting (2)
25. Loctite 515
26. Loctite 242
27. Primer "N"
28. Loctite PST 567
29. Synthetic grease

## CRANKSHAFT MISALIGNMENT AND 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 also be twisted on connecting rod journal on any or both cylinder(s).



### Crankshaft Alignment at Center Main Journal

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

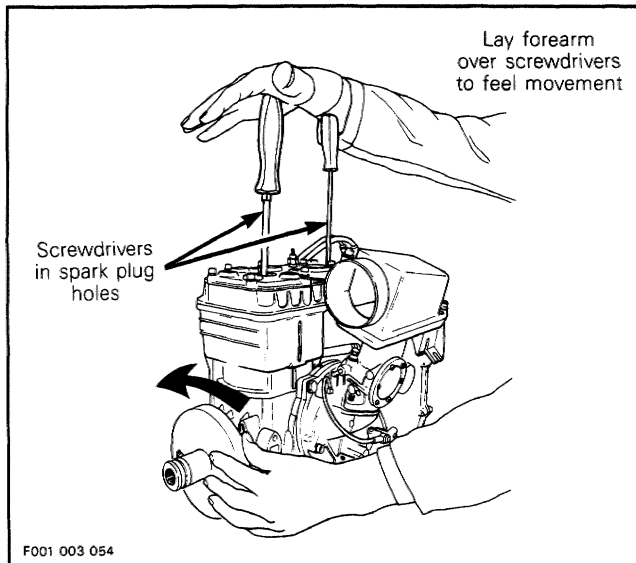
To quickly check, without accuracy, if crankshaft is twisted on center main journal, proceed as follows:

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

## Section 03 ENGINE

### Sub-Section 05 (BOTTOM END)

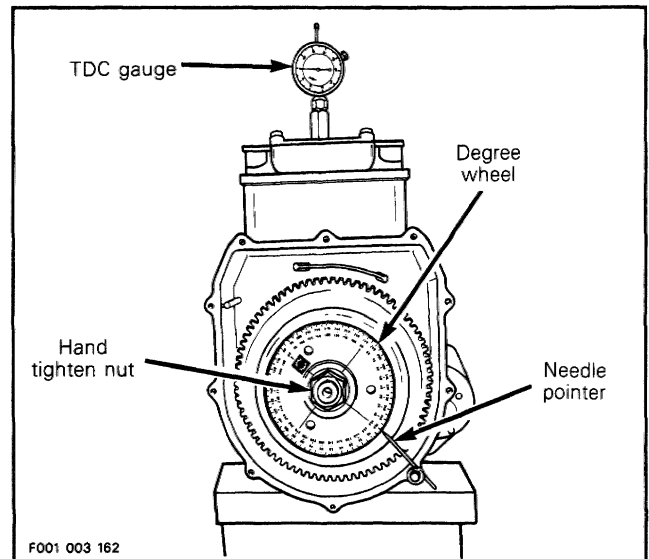
- With the other hand, slowly rotate engine by PTO flywheel.



As soon as one piston starts 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 PTO FLYWHEEL AND MAGNETO 03-04 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° (360° - 180° = 180°).

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.

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

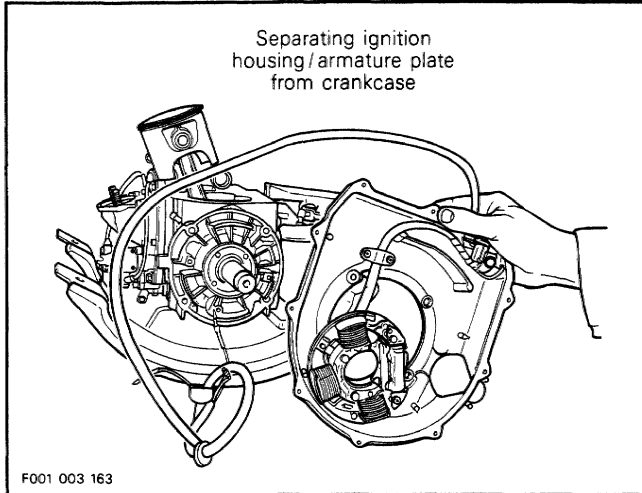
## Section 03 ENGINE

### Sub-Section 05 (BOTTOM END)

## DISASSEMBLY

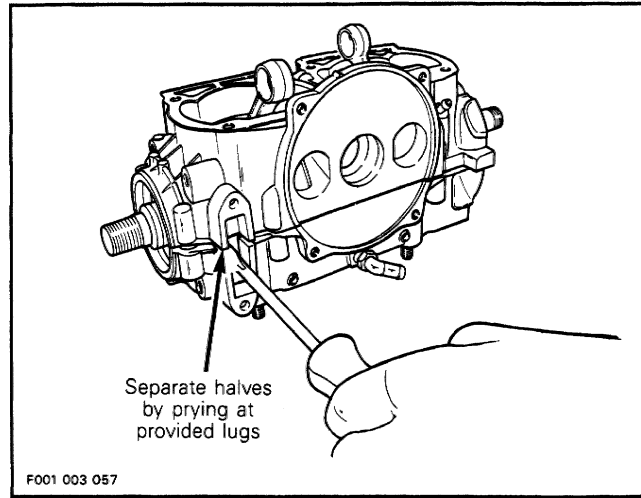
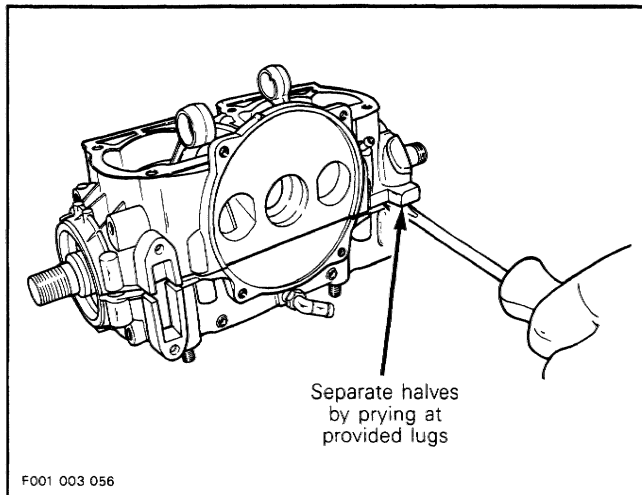
Remove the following parts :

- 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 machined surfaces.



## 12,13,19,20, Seal and Bearing

NOTE : Do not needlessly remove crankshaft bearings.

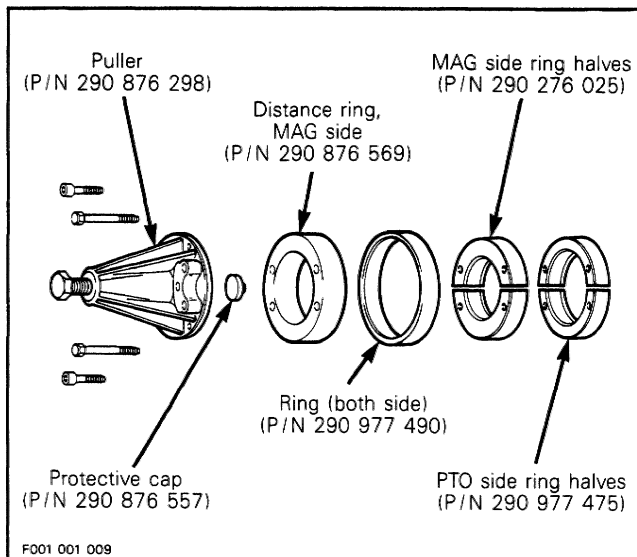
Remove end seals.

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).

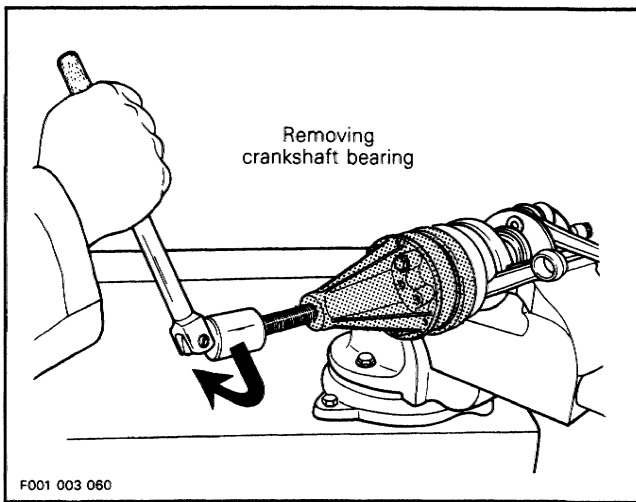
NOTE : To facilitate ring or distance ring installation lubricate their inside diameters.



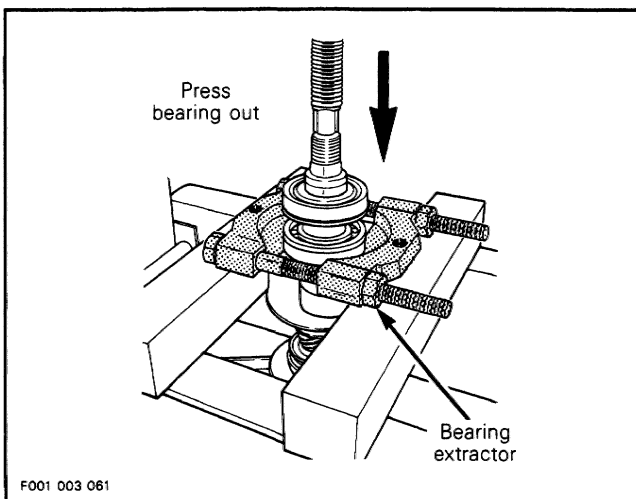


## Section 03 ENGINE

### Sub-Section 05 (BOTTOM END)



Or, use a bearing extractor such as Proto #4332 and a press to remove two bearings at a time.



○ **NOTE** : If bearings are to be replaced, 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 warp. 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.

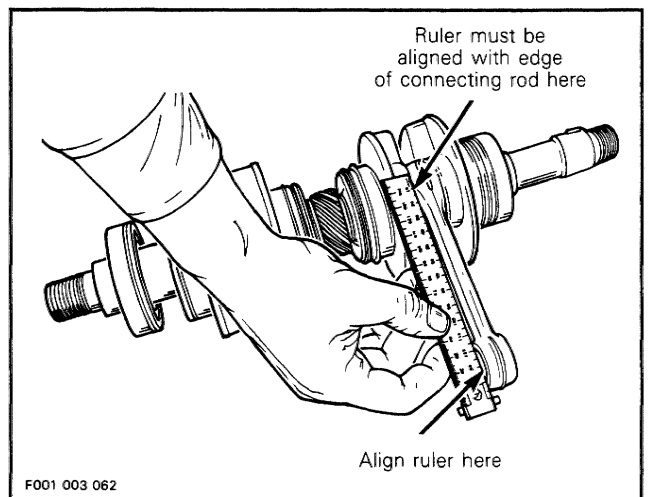
If crankshaft and/or components are found defective, it must be repaired by a specialized shop or replaced.

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

MEASUREMENTS	TOLERANCES		
	NEW PARTS (min.)	NEW PARTS (max.)	WEAR LIMIT
Crankshaft deflection	N.A.	N.A.	0.08 mm (.0031 in)
Connecting rod big end axial play	0.39 mm (.015 in)	.737 mm (.029 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.



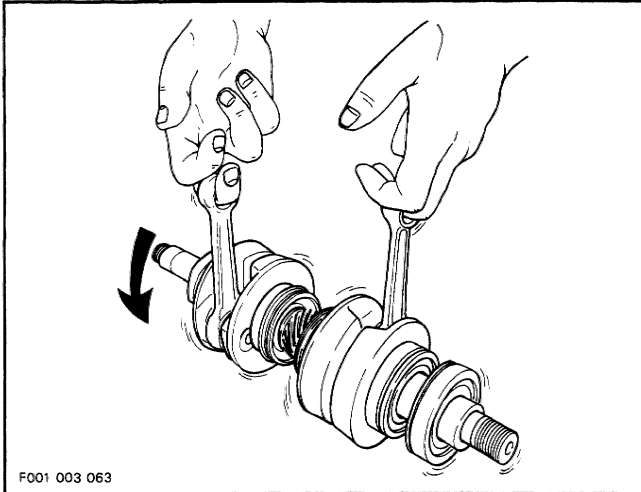
## Section 03 ENGINE

### 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.

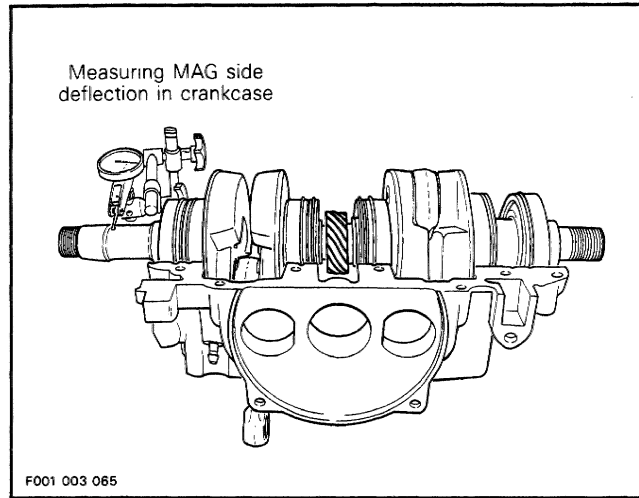
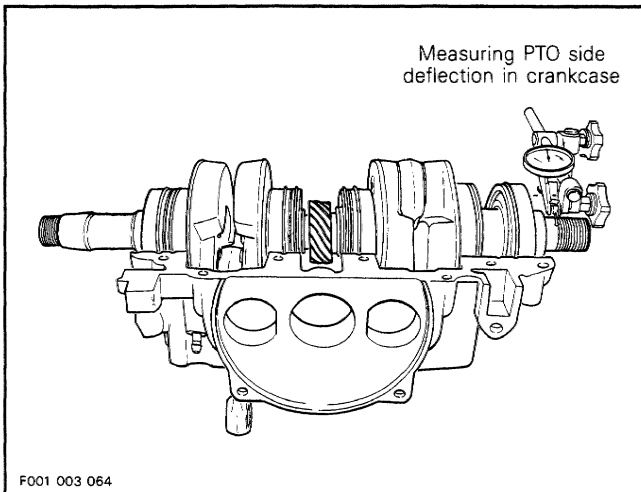


A twisted crankshaft will turn irregularly in an out of round motion.

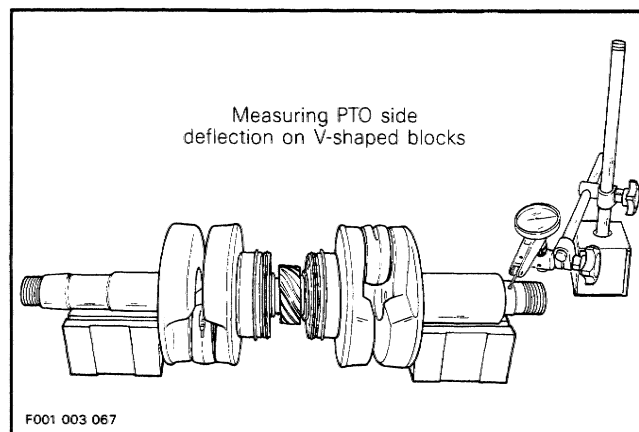
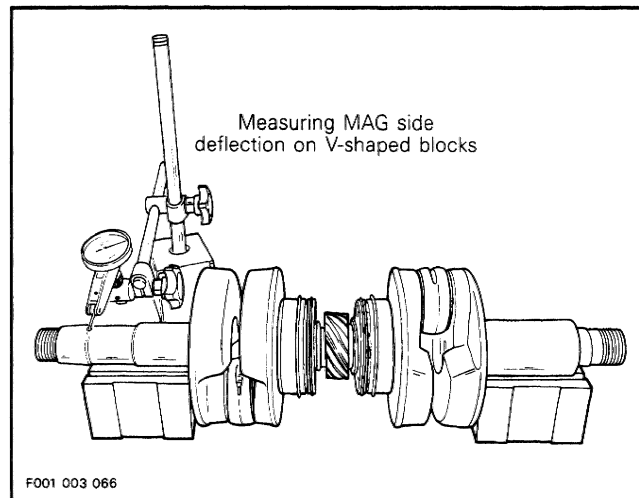
#### Crankshaft Deflection

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.



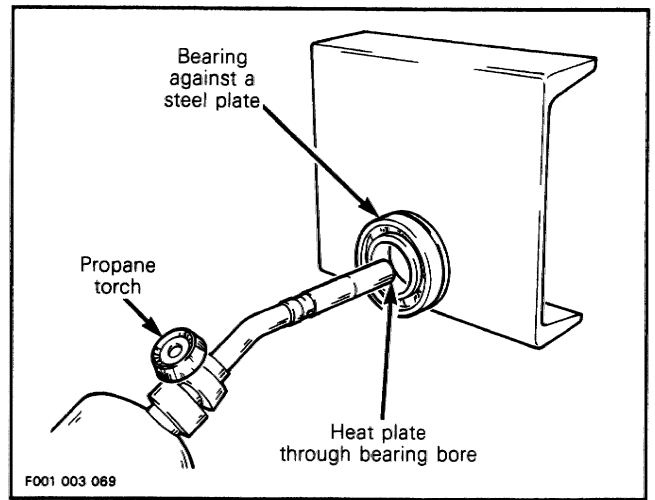
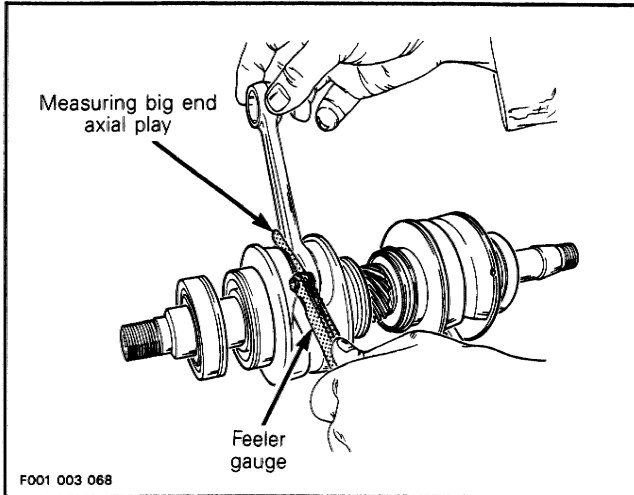
Remove crankshaft bearings and check deflection again on V-shaped blocks as illustrated.



○ 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.

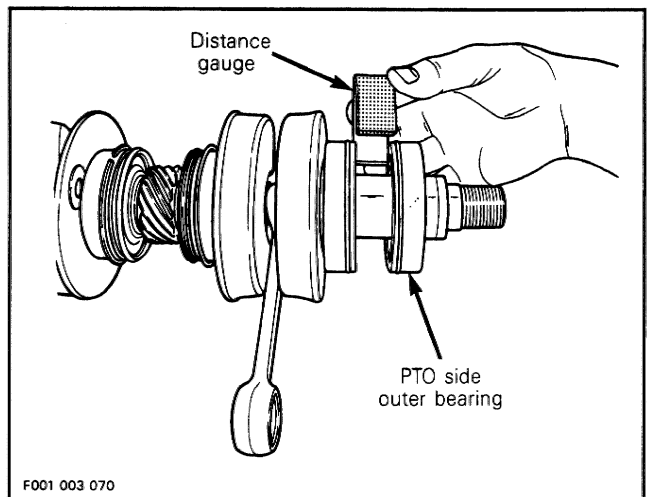
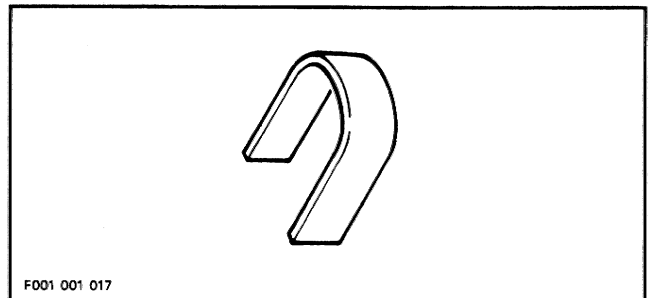
### 13,19, Bearing

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.

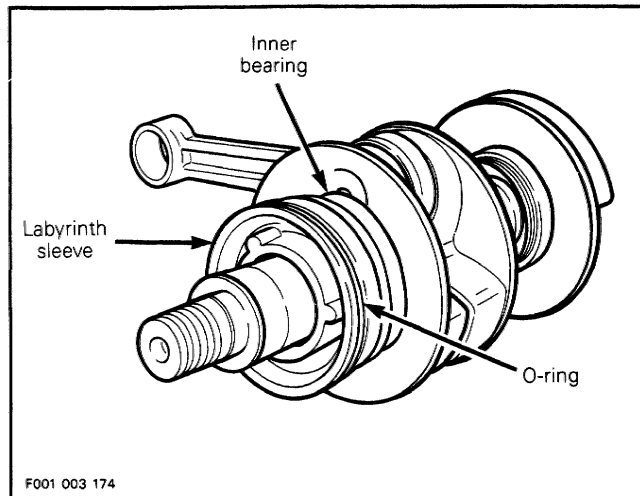


## Section 03 ENGINE

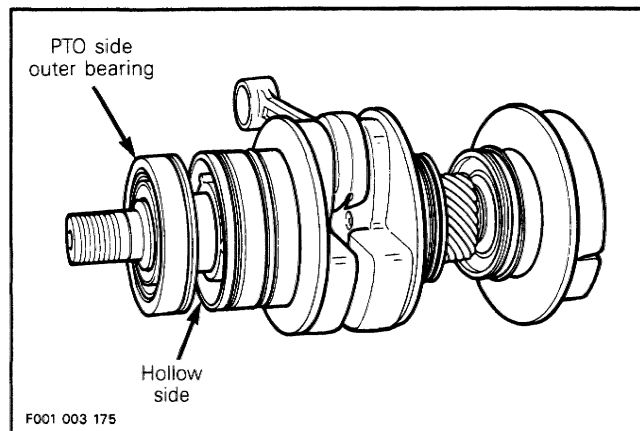
### Sub-Section 05 (BOTTOM END)

#### 9, Labyrinth Sleeve (5851 and 5860 models)

To properly locate outer PTO bearing, install labyrinth sleeve against inner bearing side.

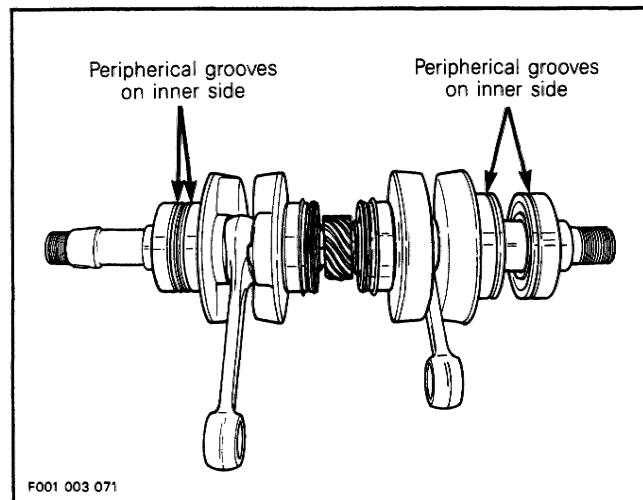


○ **NOTE** : Be sure to install labyrinth sleeve with its hollow side facing PTO side outer bearing.



Slide outer bearing until it touches sleeve.

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 reduce curing time and increase gap filling capability. Refer to manufacturer's instructions.

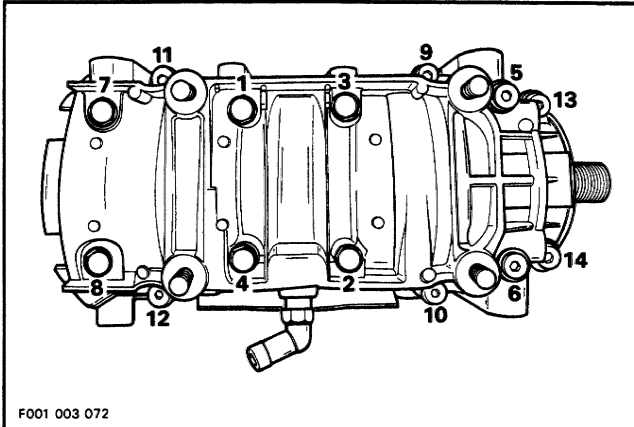
▼ **CAUTION** : Rotary valve shaft must be installed in crankcase before closing halves. Before joining crankcase halves, make sure that crankshaft gear is well engaged with rotary valve shaft gear.

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 (P/N 293 800 015) on screw threads. Torque crankcase screws to 24 N•m (17 lbf•ft) as per following illustrated sequence.



### 6, Stud

At assembly in crankcase, apply Loctite 271 (P/N 293 800 005) on stud threads.

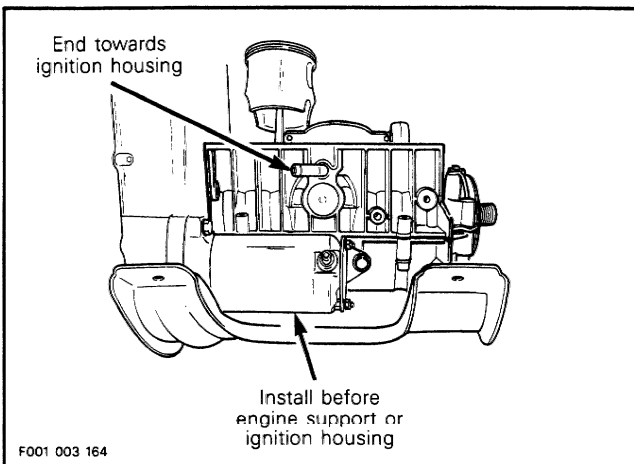
## Finalizing Assembly

### 24, Oil Outlet Fitting

If oil outlet fitting has been removed from crankcase, re-install it with its end pointing towards ignition housing. Apply Loctite PST 567 (P/N 293 800 013) on fitting threads.

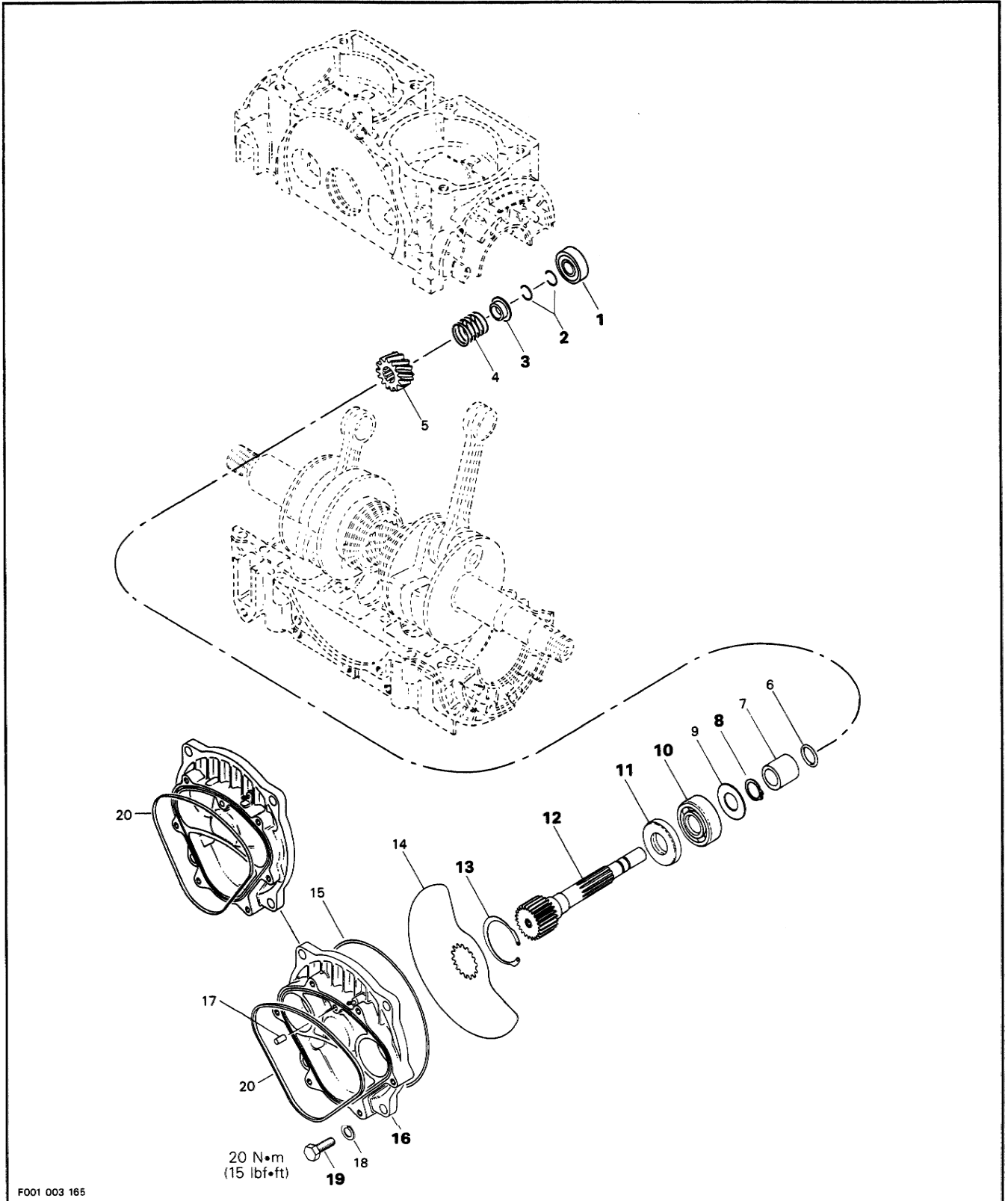
For rotary valve timing and assembly, refer to ROTARY VALVE AND RESERVOIR 03-06 procedures.

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





**ROTARY VALVE**



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## **Section 03 ENGINE**

### **Sub-Section 06 (ROTARY VALVE AND RESERVOIR)**

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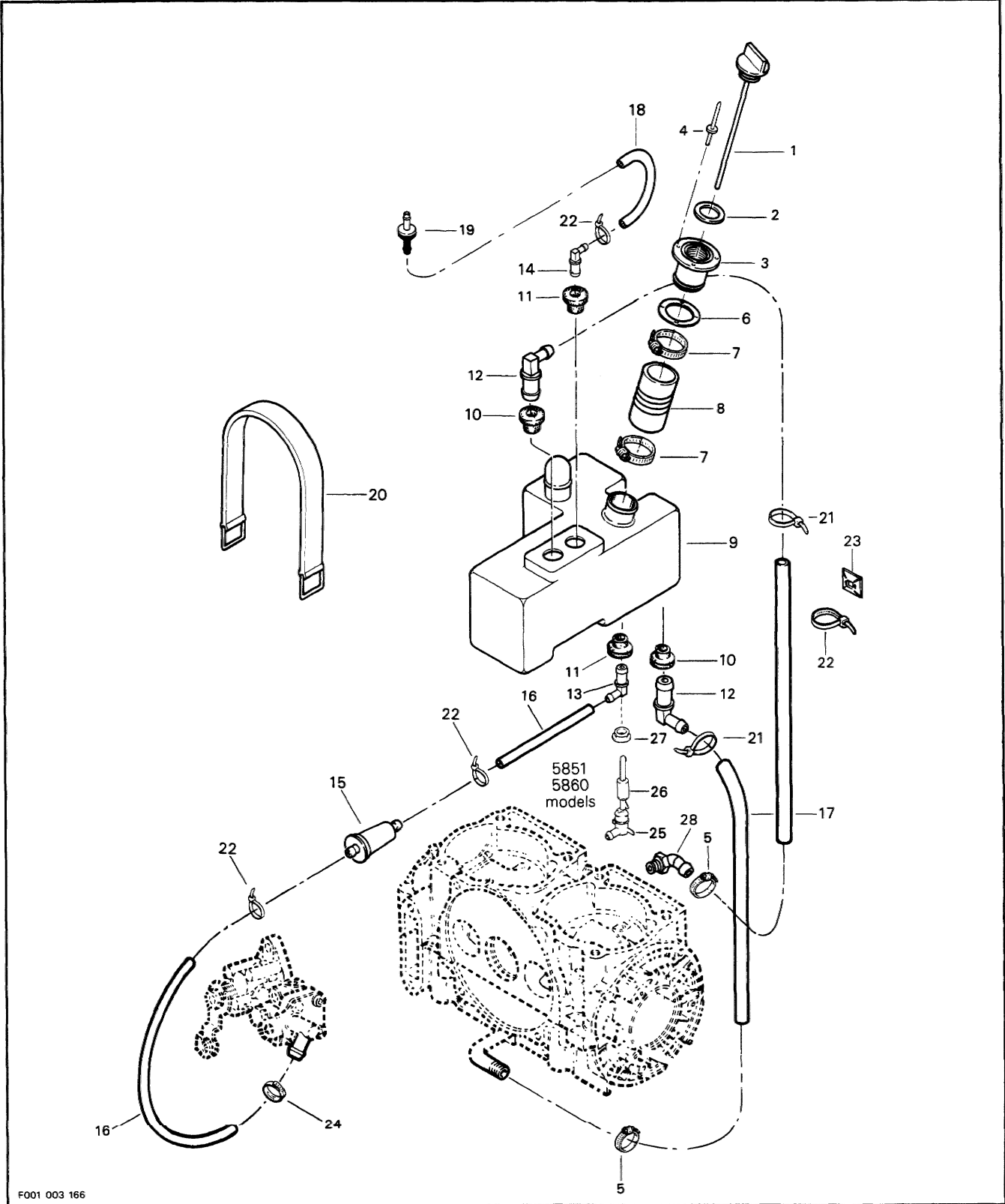
#### **COMPONENTS**

- |                                   |                                             |
|-----------------------------------|---------------------------------------------|
| 1. <i>Ball bearing 6201</i>       | 11. <i>Oil seal</i>                         |
| 2. <i>Circlip (2)</i>             | 12. <i>Rotary valve shaft</i>               |
| 3. <i>Spring seat</i>             | 13. <i>Snap ring</i>                        |
| 4. <i>Spring</i>                  | 14. <i>Rotary valve</i>                     |
| 5. <i>Sprocket 14 teeth</i>       | 15. <i>O-ring</i>                           |
| 6. <i>O-ring</i>                  | 16. <i>Rotary valve cover</i>               |
| 7. <i>Distance sleeve 24.5 mm</i> | 17. <i>Dowel pin</i>                        |
| 8. <i>Snap ring</i>               | 18. <i>Lock washer 8 mm (4)</i>             |
| 9. <i>Shim</i>                    | 19. <i>Hexagonal head screw M8 x 20 (4)</i> |
| 10. <i>Ball bearing 6203</i>      | 20. <i>Rubber ring</i>                      |
-



**Section 03 ENGINE**  
**Sub-Section 06 (ROTARY VALVE AND RESERVOIR)**

**RESERVOIR**



## Section 03 ENGINE

### Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

## COMPONENTS

1. Oil level indicator cap
2. O-ring
3. Adaptor
4. Rivet (4)
5. Tridon clamp (2)
6. Gasket
7. Tridon clamp (2)
8. Hose
9. Oil tank
10. Grommet (2)
11. Grommet (2)
12. 90° Elbow (2)
13. 90° Elbow
14. 90° Elbow
15. Filter
16. Hose 8 mm
17. Hose 12 mm
18. Hose 6 mm
19. One way check valve
20. Strap
21. Tie rap
22. Tie rap
23. Tie-mount
24. Oetiker clamp
25. Oil level sensor
26. Float
27. Grommet
28. Hose fitting

## GENERAL

The following verification procedures such as clearance between rotary valve and rotary valve cover or crankshaft and rotary valve shaft gear backlash can be performed without removing engine from watercraft. Refer to INSPECTION further in this section.

However engine must be removed from watercraft to work on rotary valve shaft / components. Refer to REMOVAL AND INSTALLATION 03-02 for procedures.

Bottom end must be opened to remove rotary valve shaft.

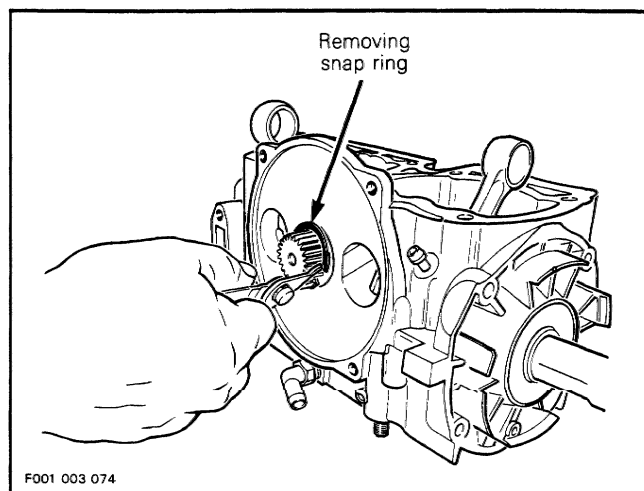
## DISASSEMBLY

### 16,19, Rotary Valve Cover and Screw

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

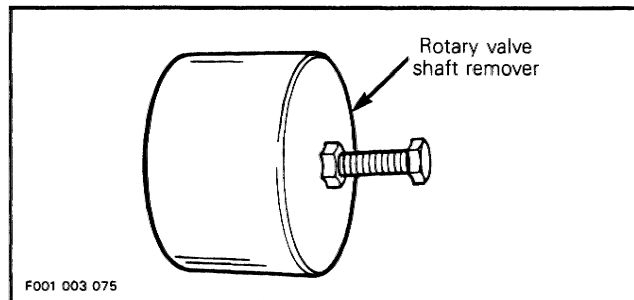
### 12,13, Rotary Valve Shaft and Snap Ring

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

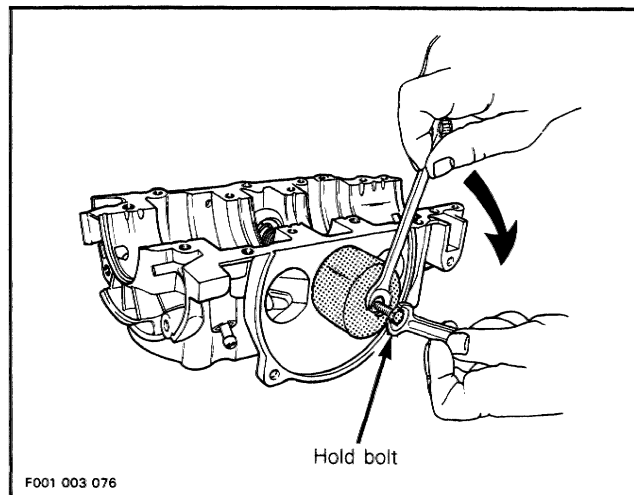


**CAUTION :** Bottom end must be opened to remove rotary valve shaft.

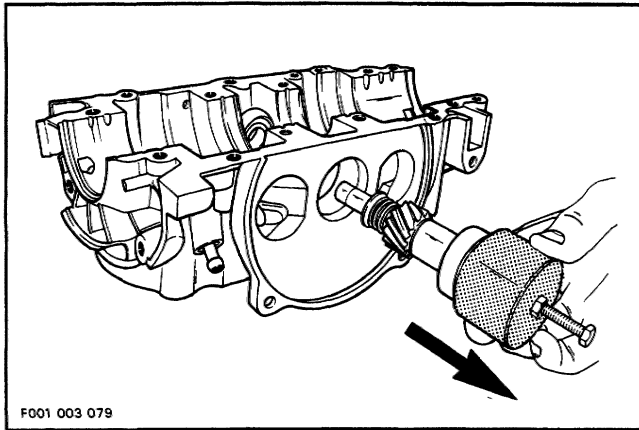
To remove rotary valve shaft, use a remover (P/N 290 876 487).



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

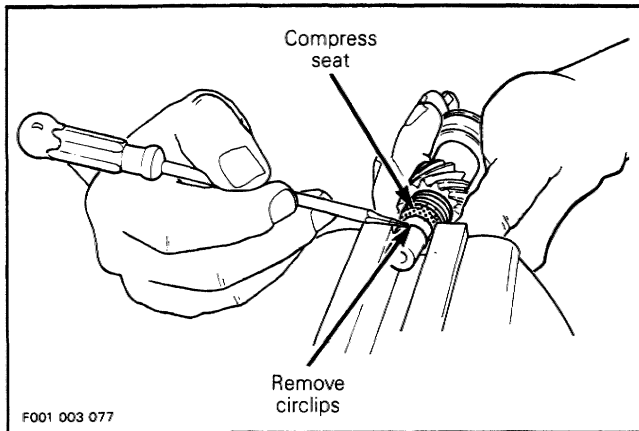


**Section 03 ENGINE**  
**Sub-Section 06 (ROTARY VALVE AND RESERVOIR)**



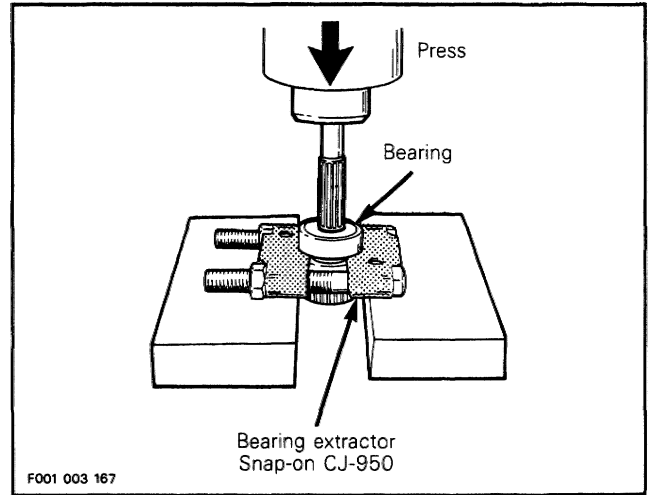
### 2,3, Circlip and Spring Seat

If it is necessary to disassemble components of rotary valve shaft assembly, compress spring by seat to remove circlips.



### 8,10, Snap Ring and Bearing

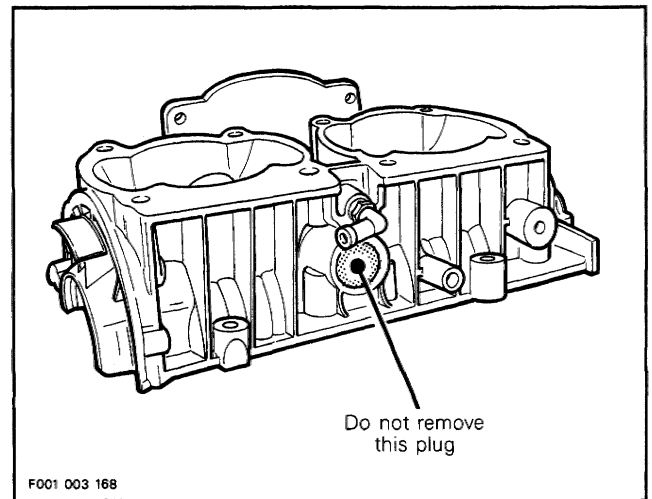
To remove bearing use a bearing extractor such as Snap-on #CJ-950 as illustrated. Slide off distance sleeve, remove snap ring and press shaft out.



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

### 1, Bearing

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

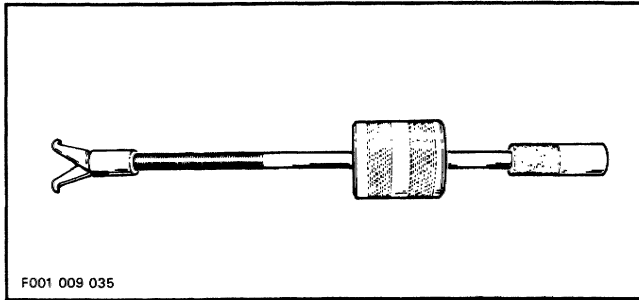


## Section 03 ENGINE

### Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

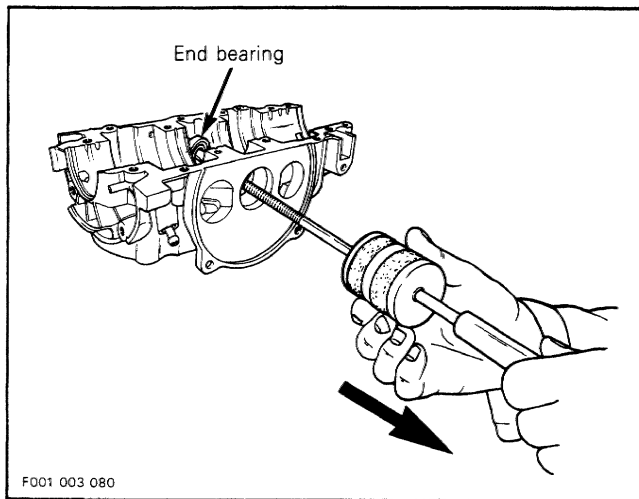
End bearing can be easily removed using the following suggested tool.

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.

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.

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

MEASUREMENTS	TOLERANCES	
	NEW PARTS	WEAR LIMIT
Rotary Valve Cover and Valve Gap	N.A.	0.22-0.34 mm (.009 - .013 in)
Rotary Valve Shaft Deflection	N.A.	0.08 mm (.003 in)

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

### Rotary Valve and Rotary Valve Cover Clearance

There is a choice of two measuring methods.

One with solder, the other one with a depth micrometer.

The clearance between the rotary valve and the rotary valve cover must be  $0.28 \pm 0.06$  mm ( $0.011 \pm 0.002$  in).

○ **NOTE :** If the clearance is below 0.22 mm (0.009 in) this could create an overheating situation and if the clearance is over 0.34 mm (0.013 in) this could create a hard starting situation.

## Section 03 ENGINE

### Sub-section 06 (ROTARY VALVE AND RESERVOIR)

#### Solder Method

Remove rotary valve cover and its O-ring.

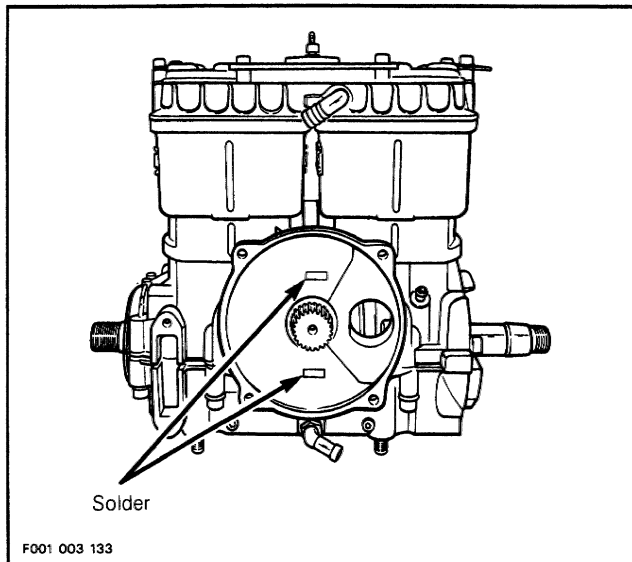
Use the following type of solder :

- rosin core
- diameter : 0.8 mm (0.032 in)
- electronic application (available at electronic stores)

Install two short pieces (13 mm (1/2 in) long) of solder directly on rotary valve, one above and one below rotary valve gear. Apply grease to hold solder in position.

Reinstall cover in place WITHOUT its O-ring and torque screws to 20 N•m (15 lbf•ft).

Remove cover then clean and measure compressed solder thickness, it must be within the specified tolerance  $0.28 \pm 0.06$  mm ( $0.011 \pm .002$  in).

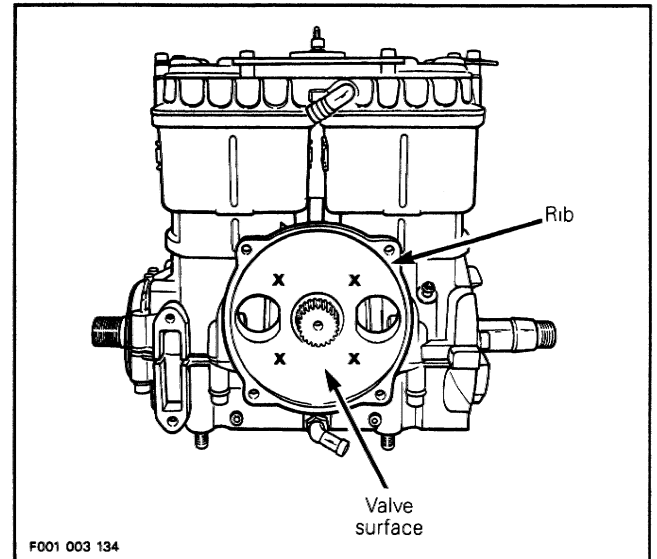


#### Depth Micrometer Method

Remove rotary valve cover.

Using a depth micrometer measure the distance from the crankcase rib to the valve surface of the crankcase.

Measure at **four** different places.

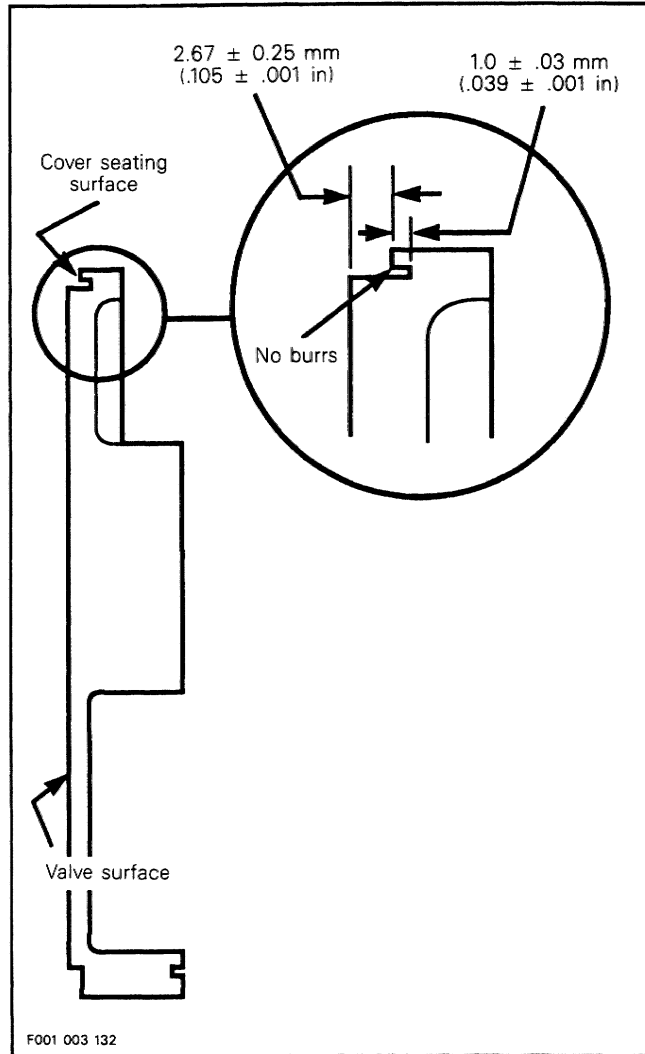


Add the four measurements and divide by 4 to obtain an average. A typical reading should be around 3.5 mm (0.138 in).

## Section 03 ENGINE

### Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

Using the depth micrometer again, measure the distance between the rotary valve cover seating surface and the valve surface of the cover.



Measure at **four** different places around the cover.

Add the four measurements and divide by 4 to obtain an average. A typical reading should be around 2.67 mm (.105 in). Knowing that the thickness of the rotary valve is .58 mm (.023 in) the clearance between rotary valve and rotary valve cover can be found using the following formula.

EXAMPLE :

Crankcase rib depth	.138 in
Depth of cover seating surface	– .104 in
	.034 in
Rotary valve thickness	– .023 in
Clearance between rotary valve and cover	<b>.011 in</b>

Your result must be within the specified tolerance  $0.28 \pm 0.06$  mm ( $0.011 \pm .002$  mm).

If rotary valve/rotary valve cover clearance is out of specification, machine rotary valve cover seating surface or replace the cover.

#### Machining Information

The amount of **mm (in)** over tolerance must be removed from the rotary valve cover seating surface.

Also cut the O-ring groove and equal amount to obtain  $1.0 \pm .03$  mm ( $.039 \pm .001$  in) between the bottom of the groove and the seating surface.

Remove burrs on the edges of the seating surface and O-ring groove.

Reverify the clearance.

At assembly the rotary valve timing must remain as per original setting.

#### Crankshaft and rotary 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).

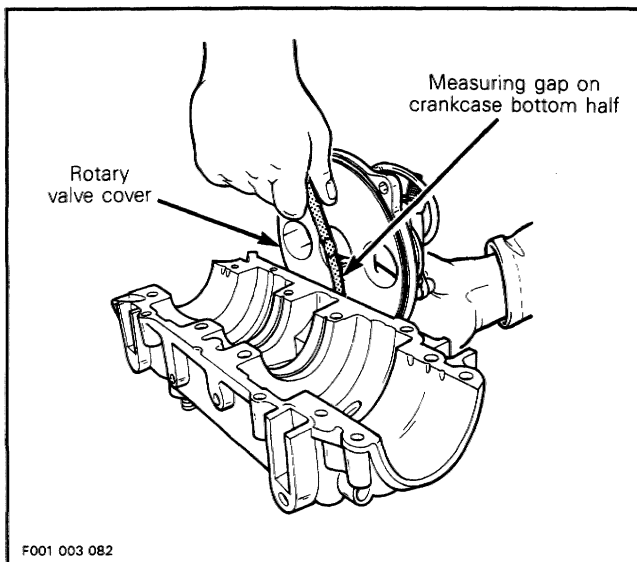
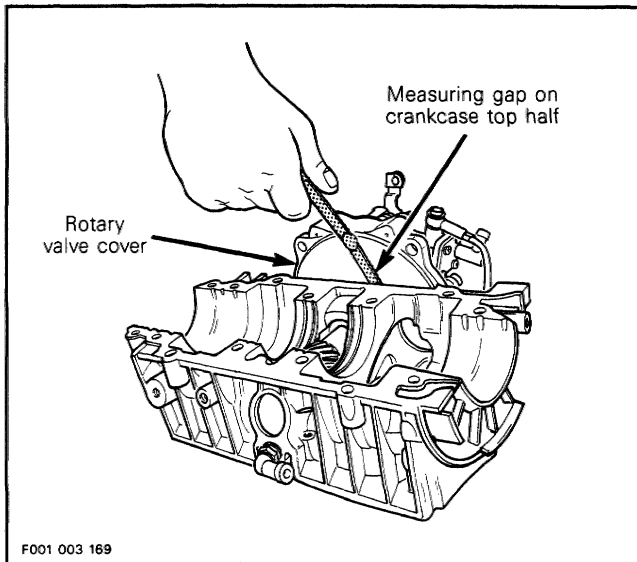
**Section 03 ENGINE**  
**Sub-Section 06 (ROTARY VALVE AND RESERVOIR)**

### Rotary Valve Cover and Valve Gap

A gap must be maintained between rotary valve and crankcase.

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

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

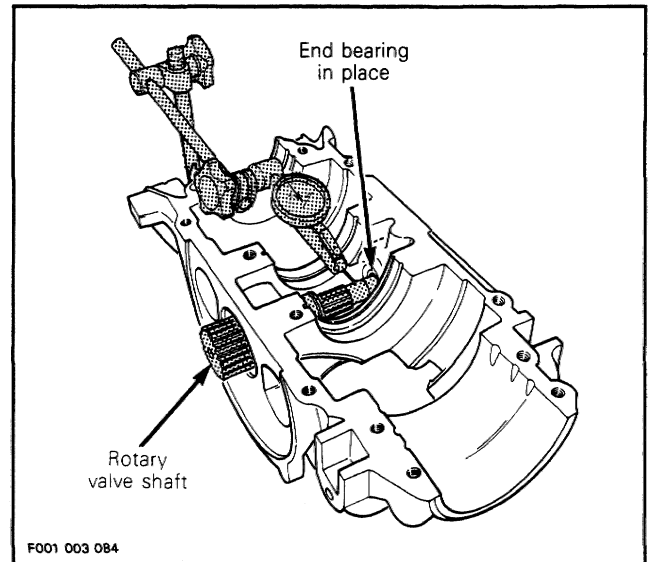


### Rotary Valve Shaft Deflection

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 near gear mounting area.



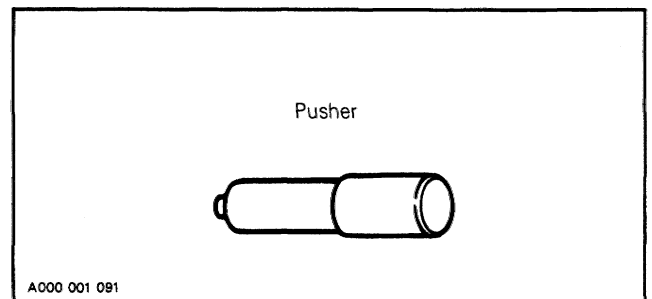
Deflection must not exceed specified value. Replace shaft as necessary.

### ASSEMBLY

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

#### 1, Bearing

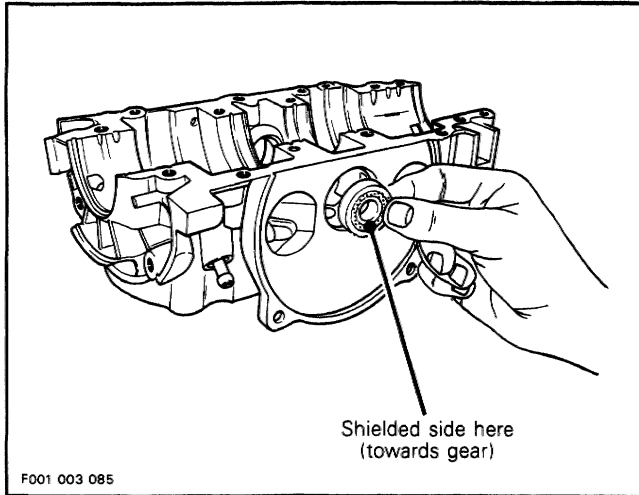
To install end bearing in crankcase, use a pusher (P/N 290 876 500).



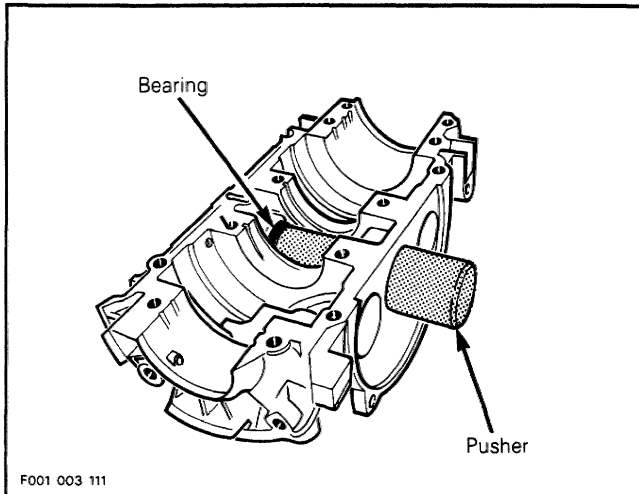
## Section 03 ENGINE

### Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

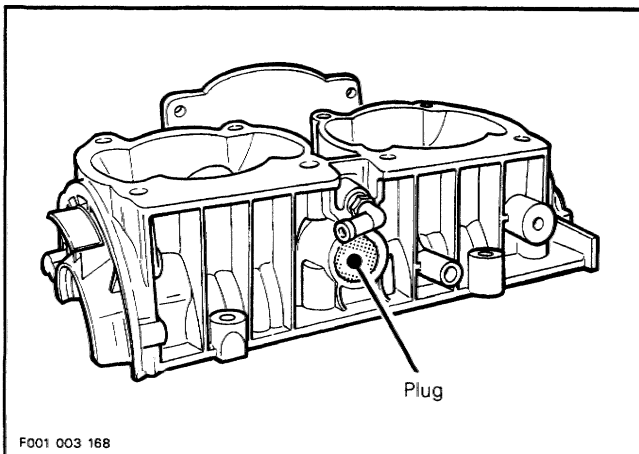
Position ball bearing shielded side towards rotary valve.



Push bearing until it stops on its seat.



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



If plug has been removed, clean plug and crankcase hole with Loctite Safety Primer (P/N 293 800 019).

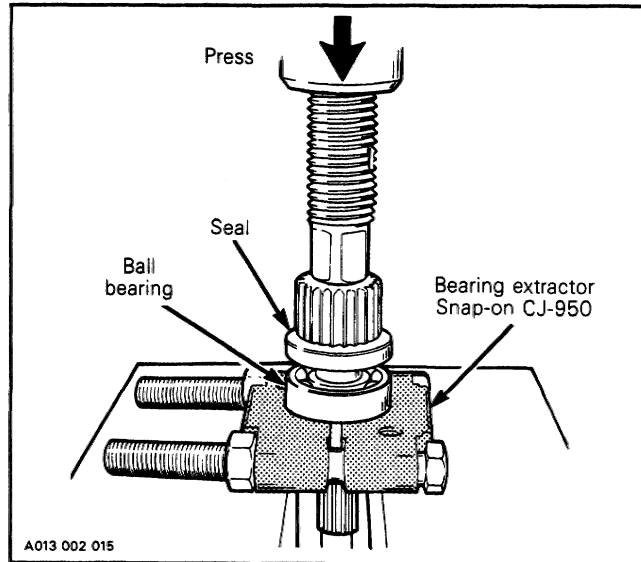
Apply Loctite Primer "T" and Loctite 648 (green) (P/N 290 899 788) inside crankcase hole, then press plug into crankcase.

#### 11,12, Seal, Rotary Valve Shaft

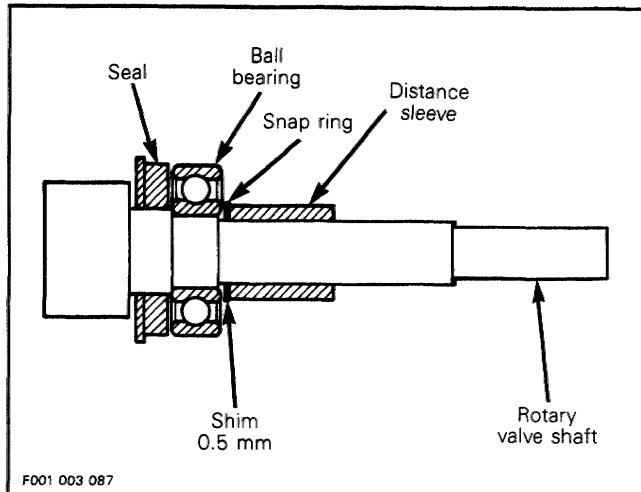
Apply lithium grease on seal lips. Position seal with shielded portion against shaft splines.

#### 8,10,12, Snap Ring Bearing and Rotary Valve Shaft

Install ball bearing as illustrated.



Install shim, snap ring and slide distance sleeve on shaft.

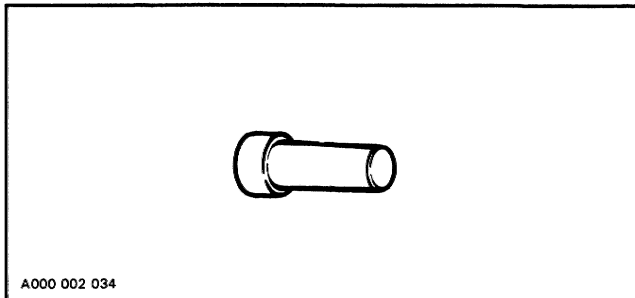




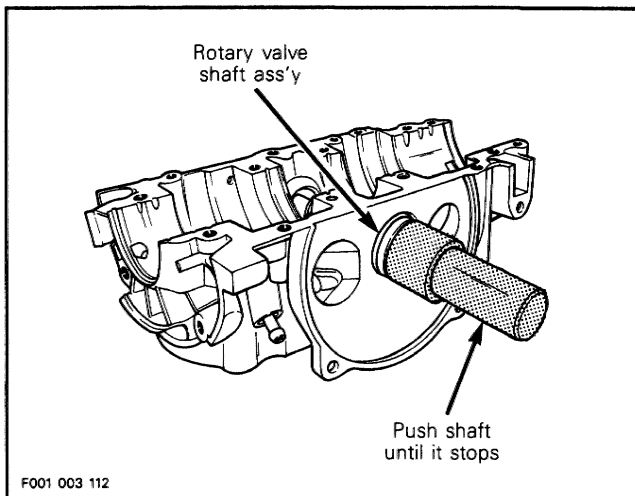
**12,13, Rotary Valve Shaft Ass'y and Snap Ring**

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

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



Push shaft until its stops on bearing seat.



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

**ROTARY VALVE**

The rotary valve controls the opening and closing of the inlet ports. Therefore its efficiency will depend on the precision of its installation.

**Identification of the rotary valves**

Watercraft Model no.	Rotary Valve P/N	Valve Cut-out Angle
5801 5802 5803 5810 5811 5850	290 924 504	132°
5804 5805 5812 5851 5860	290 924 508	147°

There is no identification code on the valve. To find out which is which, place an angle finder on the valve and measure the valve cut-out angle or use the following templates.

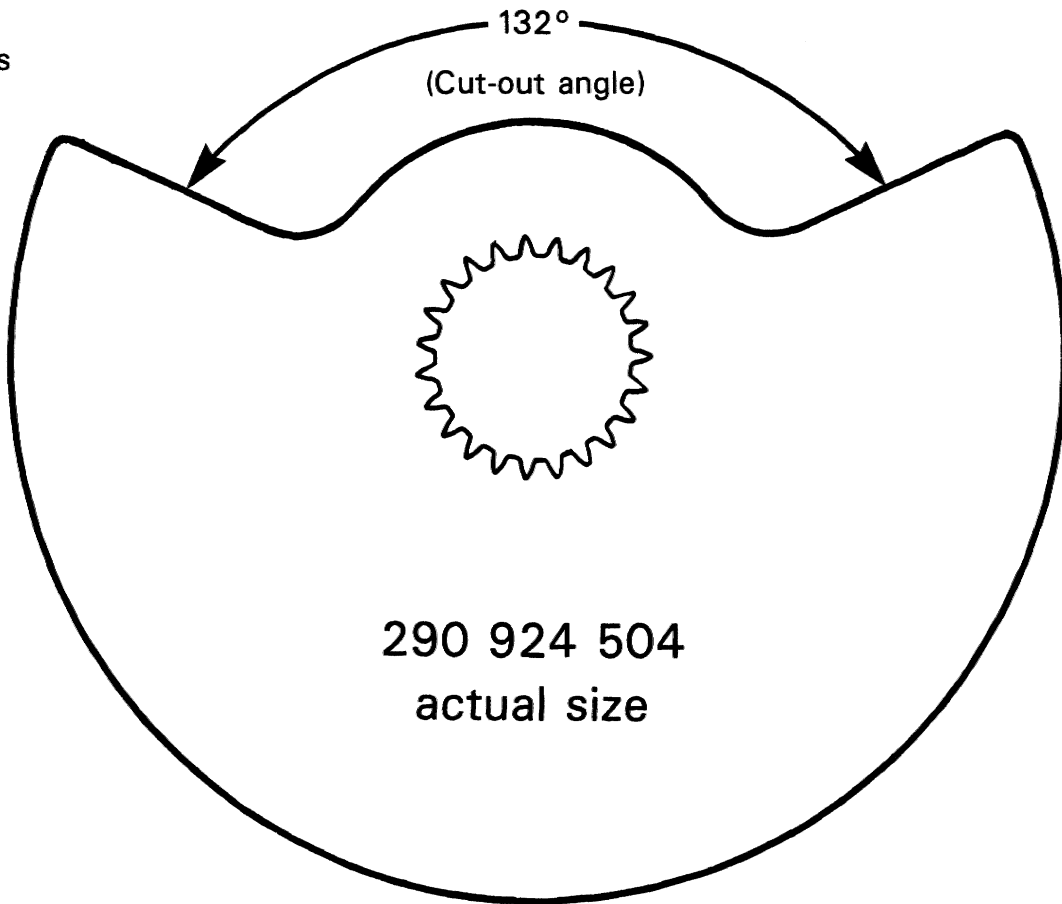
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**Section 03 ENGINE**

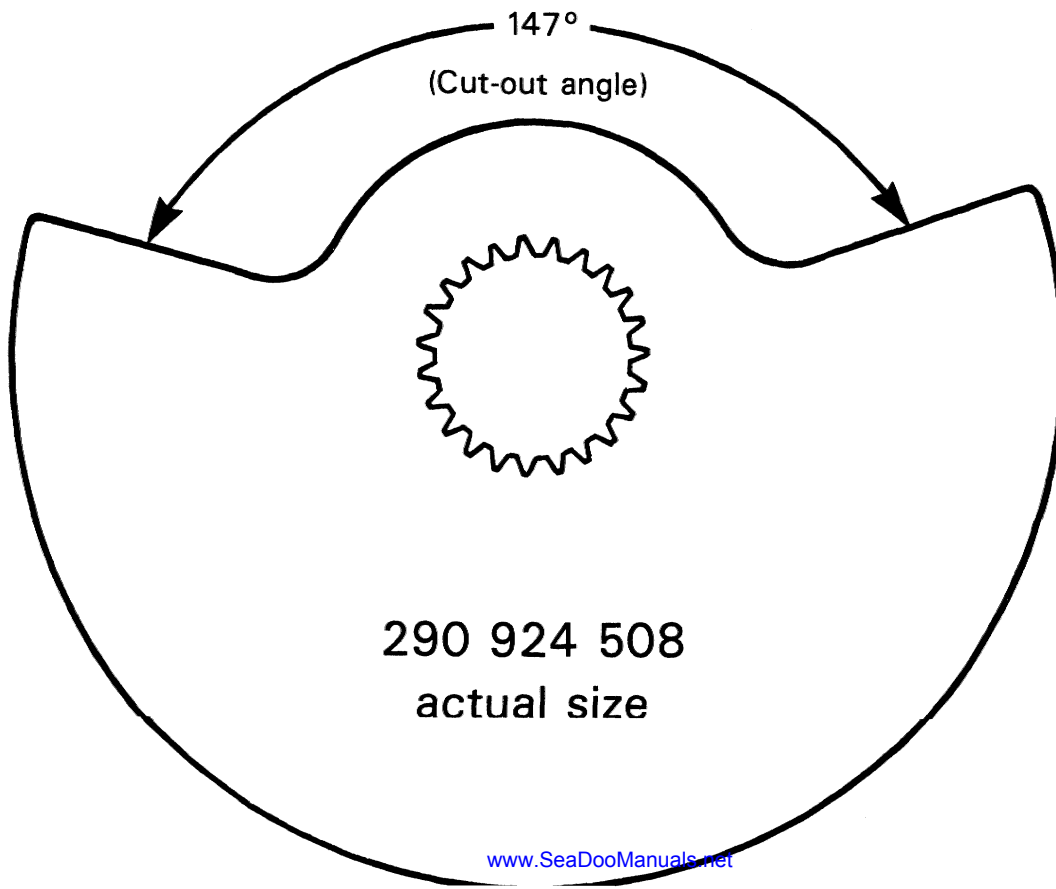
**Sub-Section 06 (ROTARY VALVE AND RESERVOIR)**

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Templates



A000 000 036



A000 000 004

**Rotary Valve Cover and Valve Clearance**

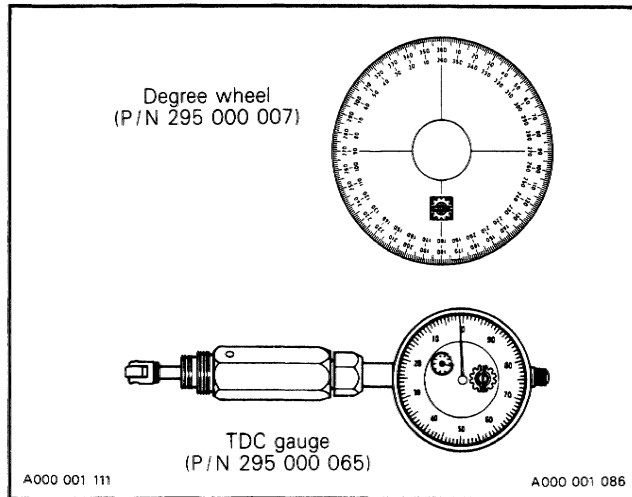
The clearance between rotary valve cover and valve must be  $0.28 \pm 0.06$  mm ( $0.011 \pm 0.002$  in).

**NOTE** : If clearance is below 0.22 mm (0.009 in) it could create an overheating situation and if clearance is over 0.34 mm (0.013 in) it could create a hard starting situation.

**Rotary Valve Timing**

**CAUTION** : Never use the ridge molded in crankcase as a timing mark.

The following tools are required to measure rotary valve opening and closing angles in relation with MAG side piston.



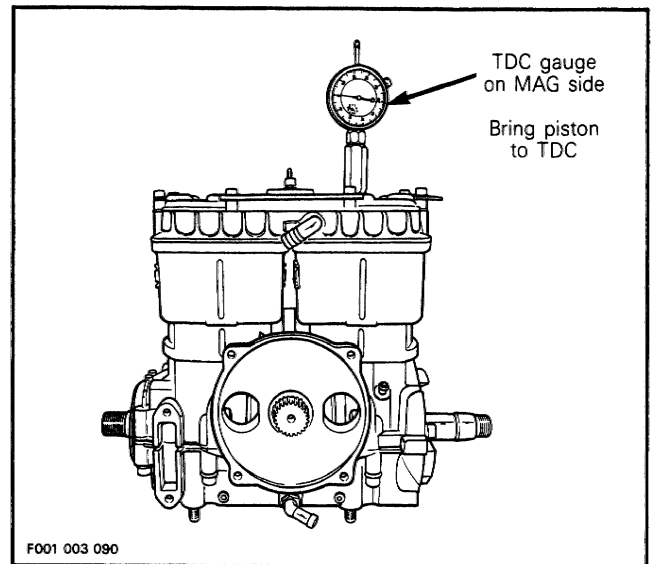
For the following instructions, let's use these specifications as example :

OPENING :  $115^\circ$  BTDC

CLOSING :  $80^\circ$  ATDC

Proceed as follows :

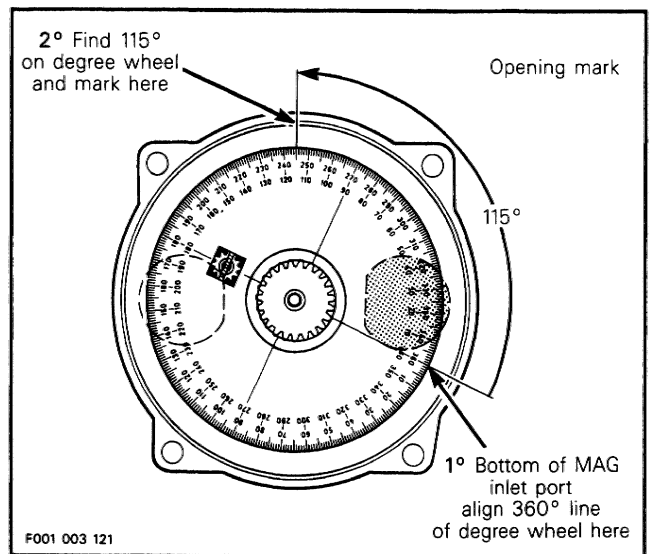
— Turning crankshaft, bring **MAG side** piston to Top Dead Center using a TDC gauge.



— For **opening** mark, first align  $360^\circ$  line of degree wheel with **BOTTOM** of **MAG side** inlet port. Then, find  $115^\circ$  line on degree wheel and mark crankcase at this point.

Rotary valve must be set so that timing occurs as follows

WATERCRAFT MODEL NO.	TIMING	
	OPENING BTDC	CLOSING ATDC
5801 5802 5803 5810	$132^\circ \pm 4$	$52^\circ \pm 4$
5811 5850	$115^\circ + 3$ $- 5$	$65^\circ + 5$ $- 3$
5804 5805 5812	$115^\circ + 3$ $- 5$	$80^\circ + 5$ $- 3$
5851 5860	$130^\circ + 3$ $- 5$	$65^\circ + 5$ $- 3$

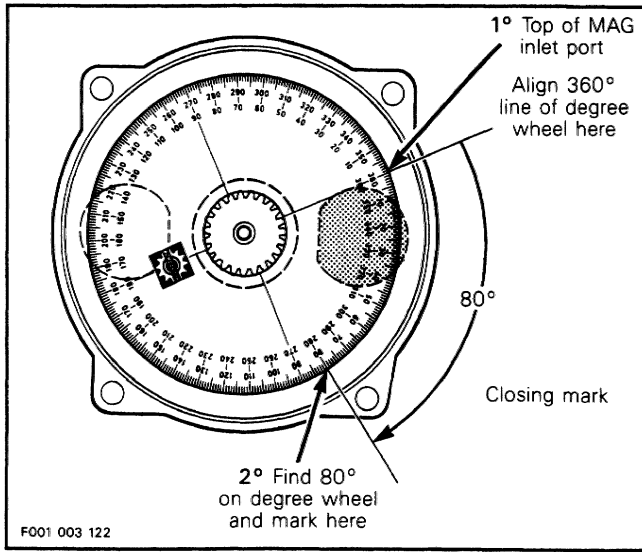


## Section 03 ENGINE

### Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

○ **NOTE** : Do not rotate the crankshaft.

- For **closing** mark, first align 360° line of degree wheel with TOP of **MAG side** inlet port. Then, find 80° line on degree wheel and mark crankcase at this point.



- Remove degree wheel.
- Position rotary valve on shaft splines to have edges as close as possible to these marks with the MAG piston at TDC.

○ **NOTE** : Rotary valve is asymmetrical. Therefore, try flipping it over then reinstall on splines to obtain best installation position.

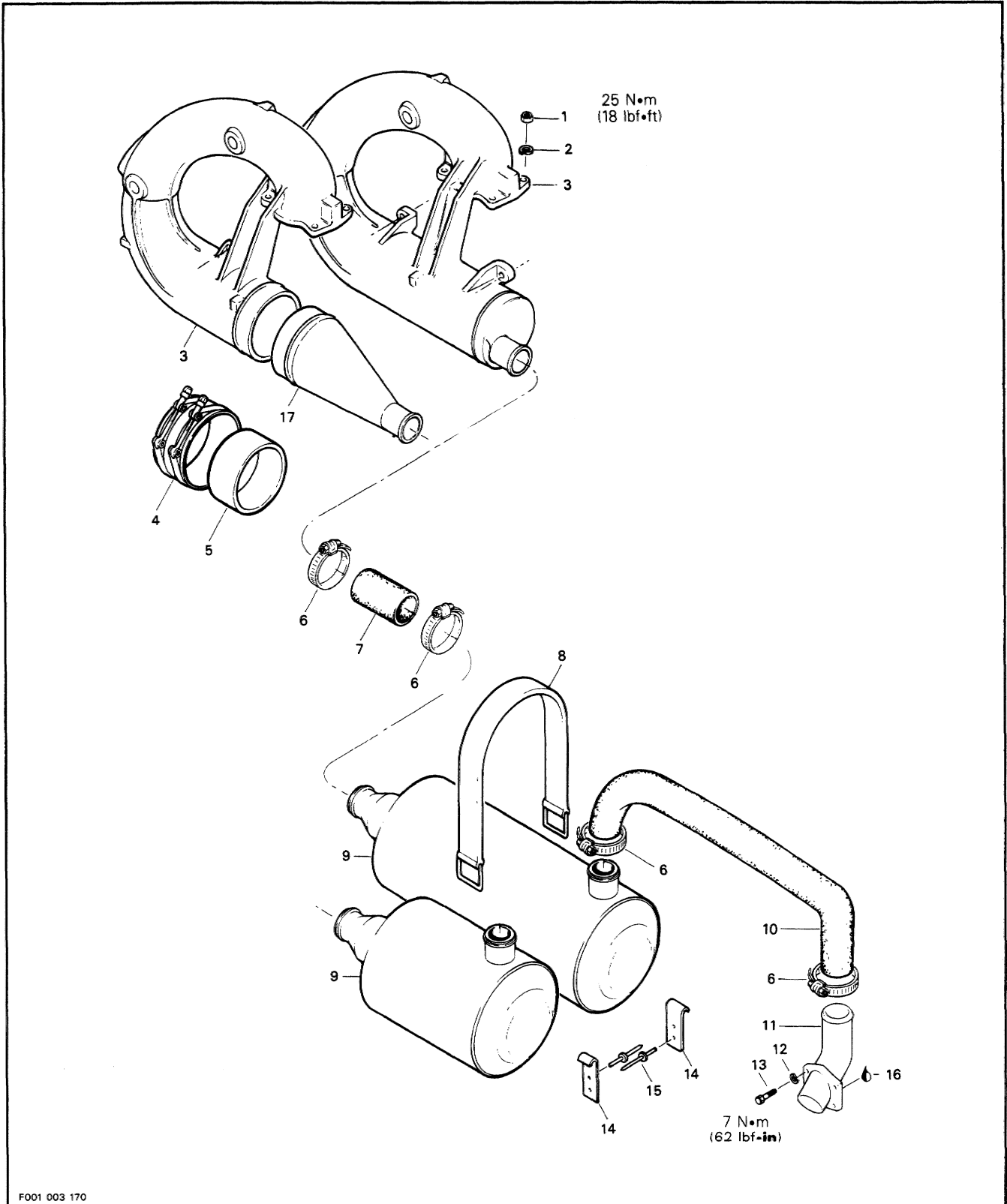
Apply SEA-DOO injection oil on rotary valve before reassembling rotary valve cover.

- Remove TDC gauge.

#### 16,19, Rotary Valve Cover and Screw

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

**EXHAUST SYSTEM**



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## Section 03 ENGINE

### Sub-Section 07 (EXHAUST SYSTEM)

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## COMPONENTS

1. Hexagonal nut M8 (4)
2. Lock washer M8 (4)
3. Tuned pipe
4. Exhaust clamp
5. Rubber collar
6. Tridon clamp (4)
7. Exhaust hose
8. Muffler strap
9. Muffler

10. Formed hose
11. Exhaust outlet
12. Flat washer 6 mm (4)
13. Allen screw M6 x 20 (4)
14. Strap clip (2)
15. Rivet 3/16 (4)
16. Loctite 587 "Ultra Blue"
17. Exhaust cone

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## TUNED PIPE REPAIR

This procedure is given to repair tuned pipe cracks using T.I.G. welding process.

### Procedure

- Sand the cracked area to obtain bare metal.
- Perform a 1.50 mm (1/16 in) depth chamfer over crack.
- Use pure argon gas with 5.55 mm (3/32 in) tungsten electrode (puretung "green", zirtung "brown") and AC current.
- Use aluminum welding rod 5.55 (3/32 in) (#4043), to fill crack.
- Sand welding slightly to remove material surplus.

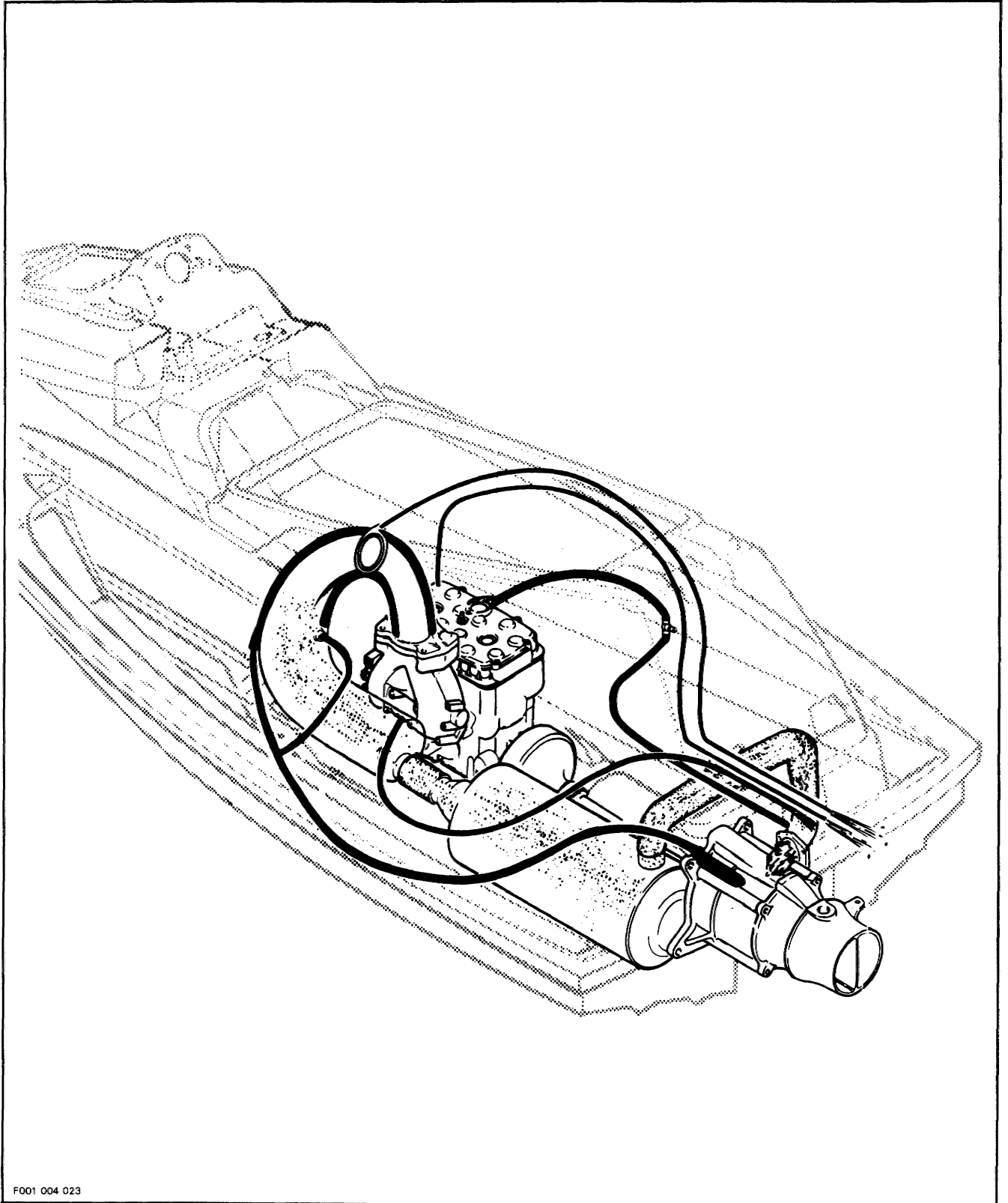
### Test :

- Use compressed air at 124 kPa (18 PSI) to pressurize tuned pipe.

○ **NOTE :** Prior to verify leaks plug all holes and pressurize tuned pipe while immersing it in water.

▼ **CAUTION :** Always ensure water passages are not blocked partially or completely while welding tuned pipe.

# COOLING SYSTEM



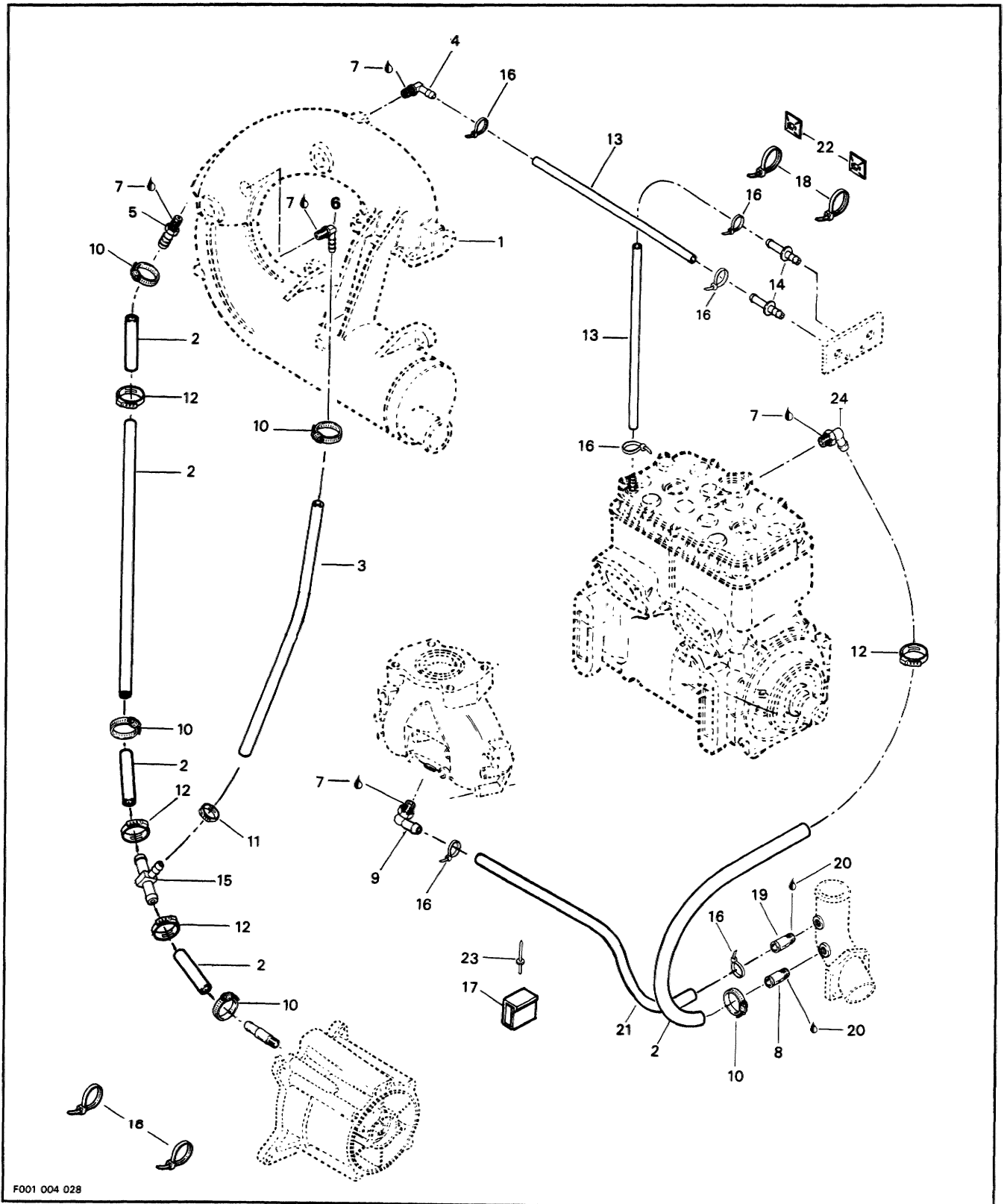
F001 004 023





**Section 04 COOLING SYSTEM**  
Sub-Section 01 (COMPONENTS)

**COMPONENTS**



F001 004 028

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## Section 04 COOLING SYSTEM

### Sub-Section 01 (COMPONENTS)

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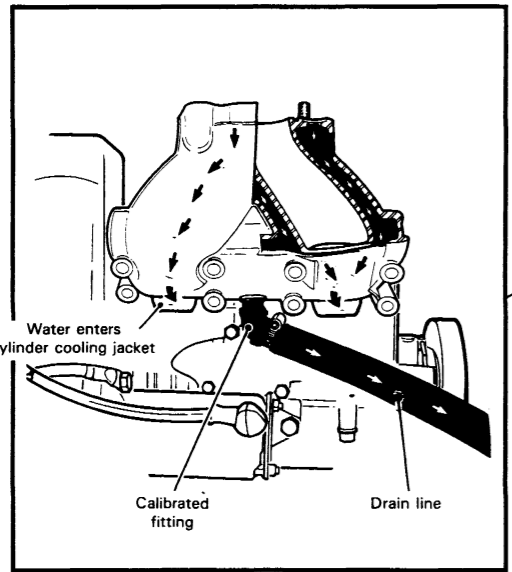
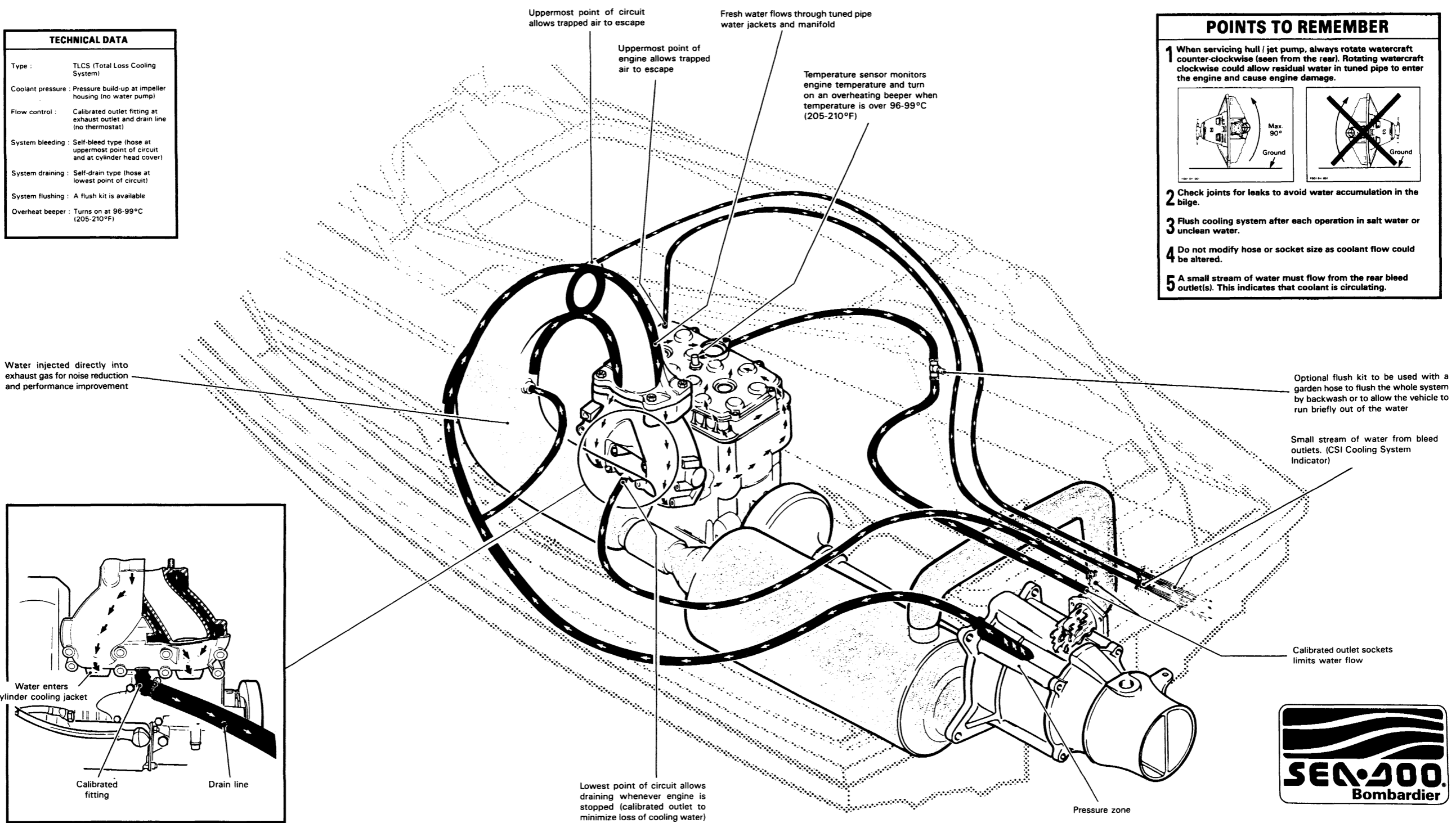
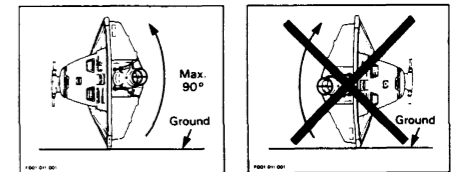
#### COMPONENTS

- |                       |                       |
|-----------------------|-----------------------|
| 1. Tuned pipe         | 13. Hose 6 mm         |
| 2. Hose 12.5 mm       | 14. Bleed fitting (2) |
| 3. Hose 8 mm          | 15. T-fitting         |
| 4. Elbow fitting 90°  | 16. Tie rap           |
| 5. Male connector     | 17. Tie rap mount     |
| 6. Elbow fitting 90°  | 18. Tie rap           |
| 7. Loctite *PST 567   | 19. Male connector    |
| 8. Male connector     | 20. Loctite 592       |
| 9. Elbow fitting 90°  | 21. Hose 8 mm         |
| 10. Tridon clamp (6)  | 22. Tie rap mount (2) |
| 11. Oetiker clamp     | 23. Rivet             |
| 12. Oetiker clamp (3) | 24. Elbow fitting 90° |
-

SEA-DOO® WATERCRAFT COOLING SYSTEM

TECHNICAL DATA	
Type :	TLCS (Total Loss Cooling System)
Coolant pressure :	Pressure build-up at impeller housing (no water pump)
Flow control :	Calibrated outlet fitting at exhaust outlet and drain line (no thermostat)
System bleeding :	Self-bleed type (hose at uppermost point of circuit and at cylinder head cover)
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)

- POINTS TO REMEMBER**
- 1 When servicing hull / jet pump, always rotate watercraft counter-clockwise (seen from the rear). Rotating watercraft clockwise could allow residual water in tuned pipe to enter the engine and cause engine damage.
  - 2 Check joints for leaks to avoid water accumulation in the bilge.
  - 3 Flush cooling system after each operation in salt water or unclean water.
  - 4 Do not modify hose or socket size as coolant flow could be altered.
  - 5 A small stream of water must flow from the rear bleed outlet(s). This indicates that coolant is circulating.



## Section 04 COOLING SYSTEM

### Sub-Section 03 (FLUSHING AND CARE)

▼ **CAUTION :** All hoses and fittings of the cooling system have calibrated inside diameters to assure proper cooling of the engine. Always replace using appropriate Bombardier part number.

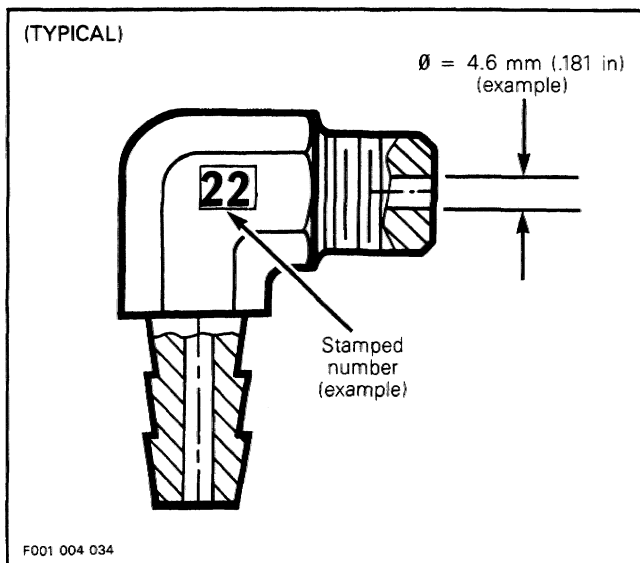
#### 6, Elbow Fitting

Water injection used on exhaust system cools the exhaust gases to obtain maximum performance from the tuned pipe. The water intake elbow fitting has a calibrated inside diameter to optimize water flow in each model.

The water injection also helps in reducing noise level and cools components of the exhaust system.

▼ **CAUTION :** The water intake elbow fittings are calibrated for each model and can not be interchange with one of a different size as severe engine damage could result.

The elbow fitting can be identified by using the two digits number stamped onto the fitting or by measuring its inside diameter. Refer to the following illustration and chart.



Watercraft model no.	Stamped number on fitting	Fitting P/N	Fitting inside diameter
SP	16	293 700 016	5.5 mm (.217 in)
GTS, GTX, XP	22	293 700 022	4.6 mm (.181 in)

## FLUSHING

When the watercraft is operated in unclean water and/or 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 corrode components.

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

Flushing is necessary when the watercraft is operated in :

- salt water
- debris filled water
- shallow water where the bottom is sandy and/or shell 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 clear 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 295 000 068) can permanently be installed on the watercraft to ease flushing.

For flush kit installation and flushing procedure refer to instruction sheet included with the kit.

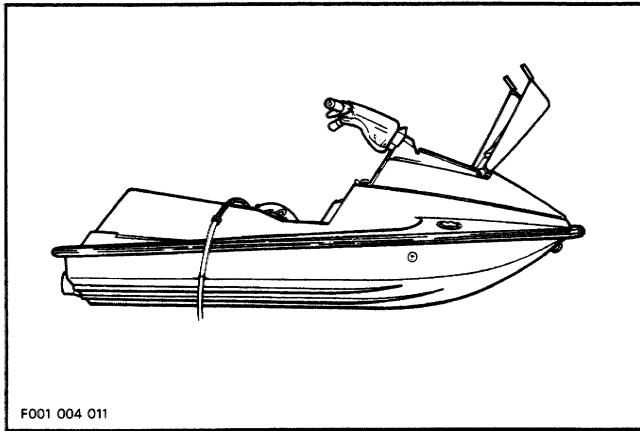
## Section 04 COOLING SYSTEM

### Sub-Section 03 (FLUSHING AND CARE)

○ **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. Disconnect outlet hose at exhaust socket and insert garden hose nozzle into hose end. **Do not open water tap yet.**



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 five minutes at a fast idle around 3500 RPM.

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

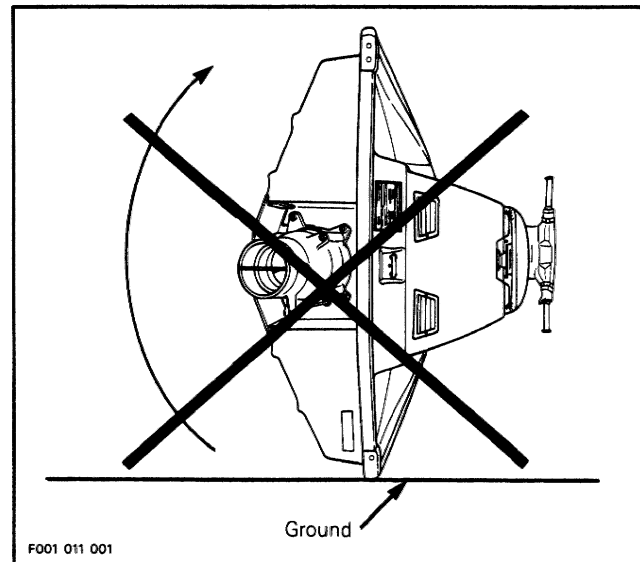
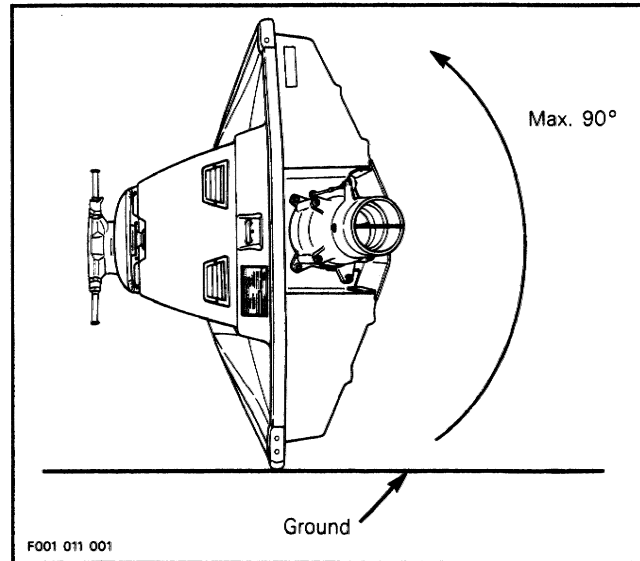
5. Close the water tap **then** stop the engine.

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

6. Disconnect garden hose from outlet hose and connect hose to exhaust socket.
7. Wipe off any residual water on the engine.
8. Reinstall seat and properly latch.

## 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.

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## Section 04 COOLING SYSTEM

### Sub-Section 03 (FLUSHING AND CARE)

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5. For hose clamp installation, use special pliers (P/N 295 000 070).
6. When installing hoses onto fittings or when troubleshooting for water intake in the bilge area, confirm that all hoses are properly/tightly secured to the fittings.
7. Check overheating beeper operation by jumping terminal of thermosensor wire to ground. Beeper must operate.

○ **NOTE** : Engine has to be started to test beeper operation.

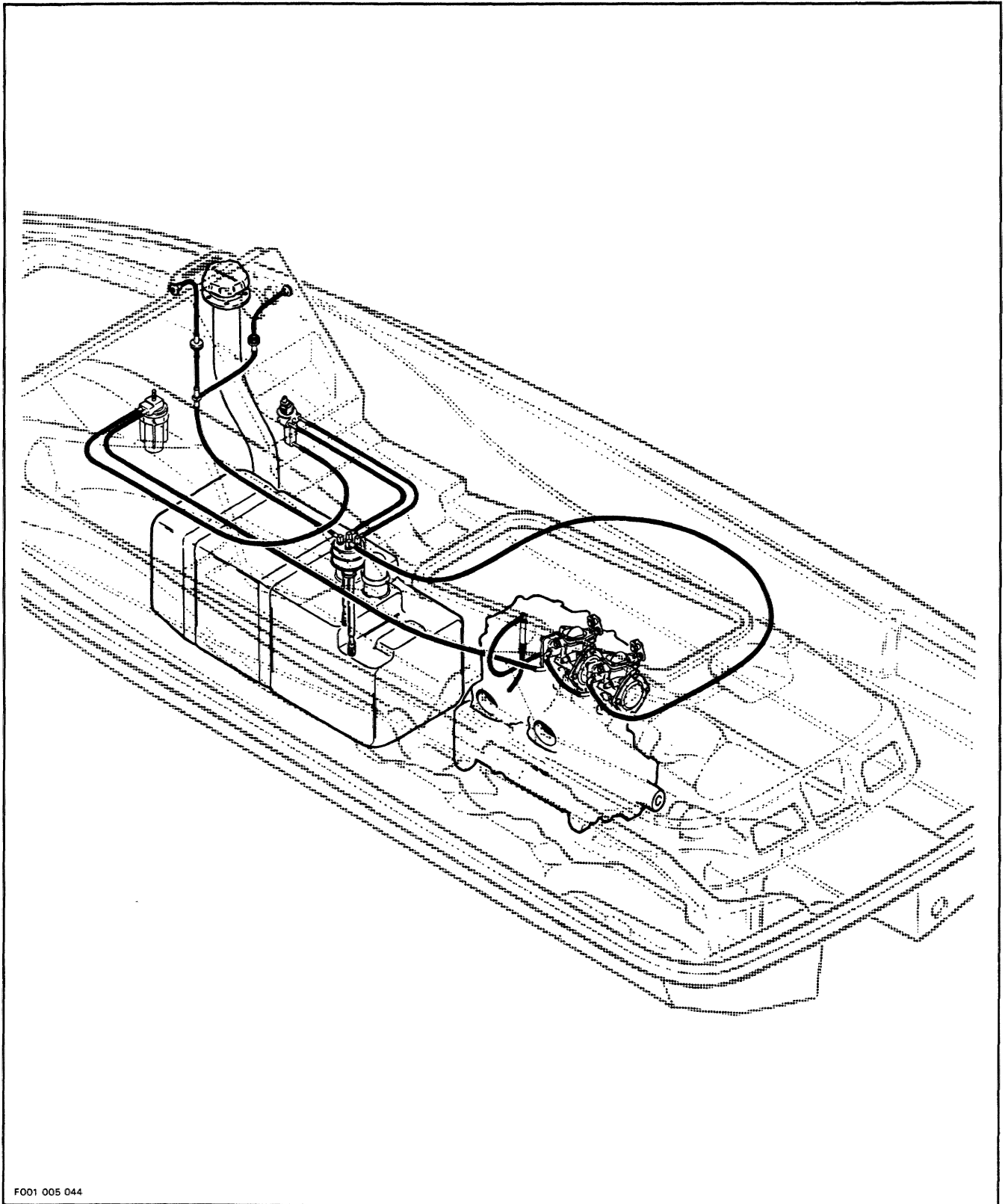
At every verification of overheating beeper always apply dielectric grease (P/N 293 550 004) on thermosensor connector.

Verify wire terminal on connector for tightness. If too loose, squeeze terminal slightly at installation.

▼ **CAUTION** : When investigating for no water flow in the cooling system, check all elbows and straight fittings as well as all hoses for blockage.



# FUEL SYSTEM



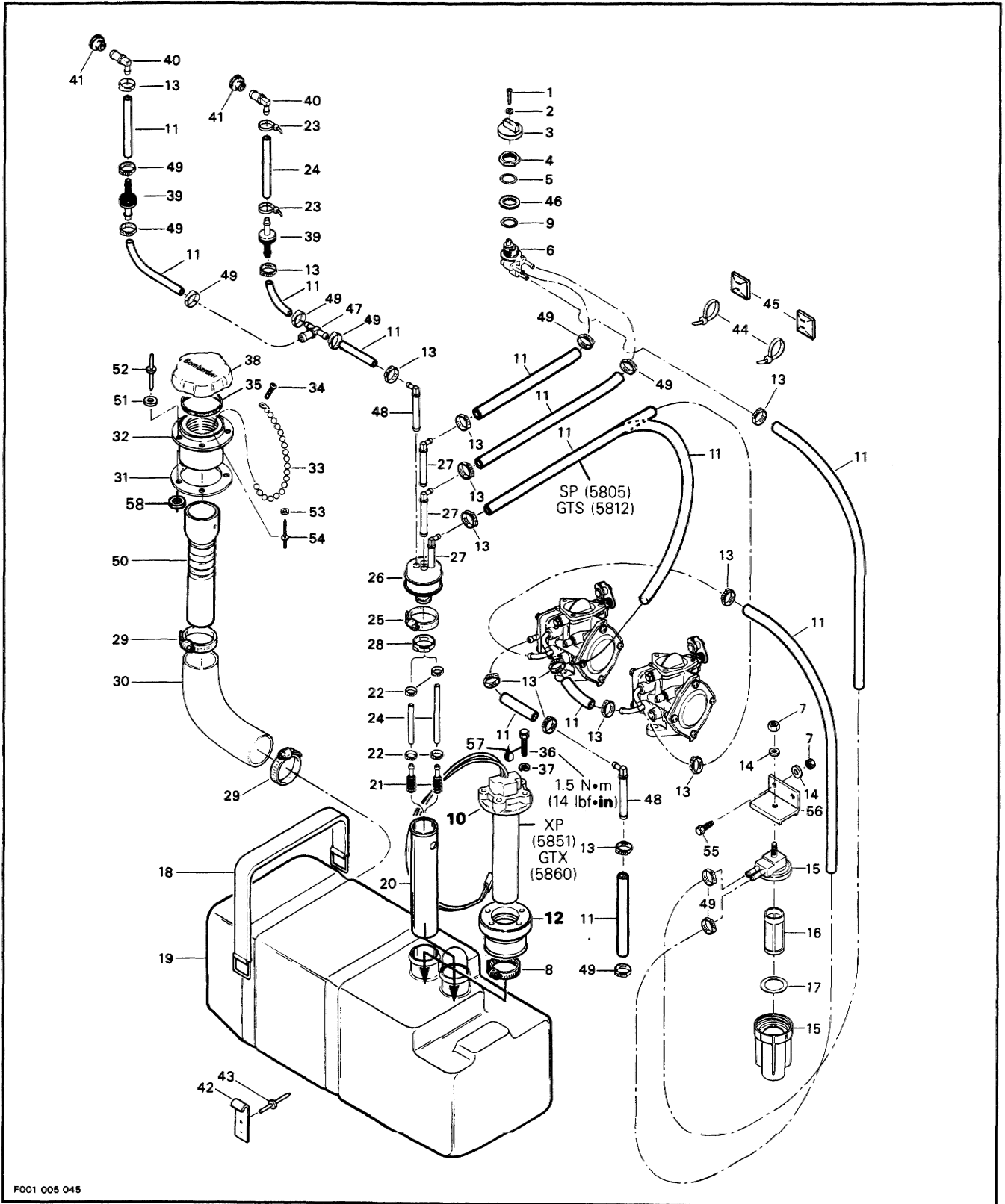
F001 005 044





**Section 05 FUEL SYSTEM**  
**Sub-Section 01 (FUEL CIRCUIT)**

**FUEL CIRCUIT**



F001 005 045

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## Section 05 FUEL SYSTEM

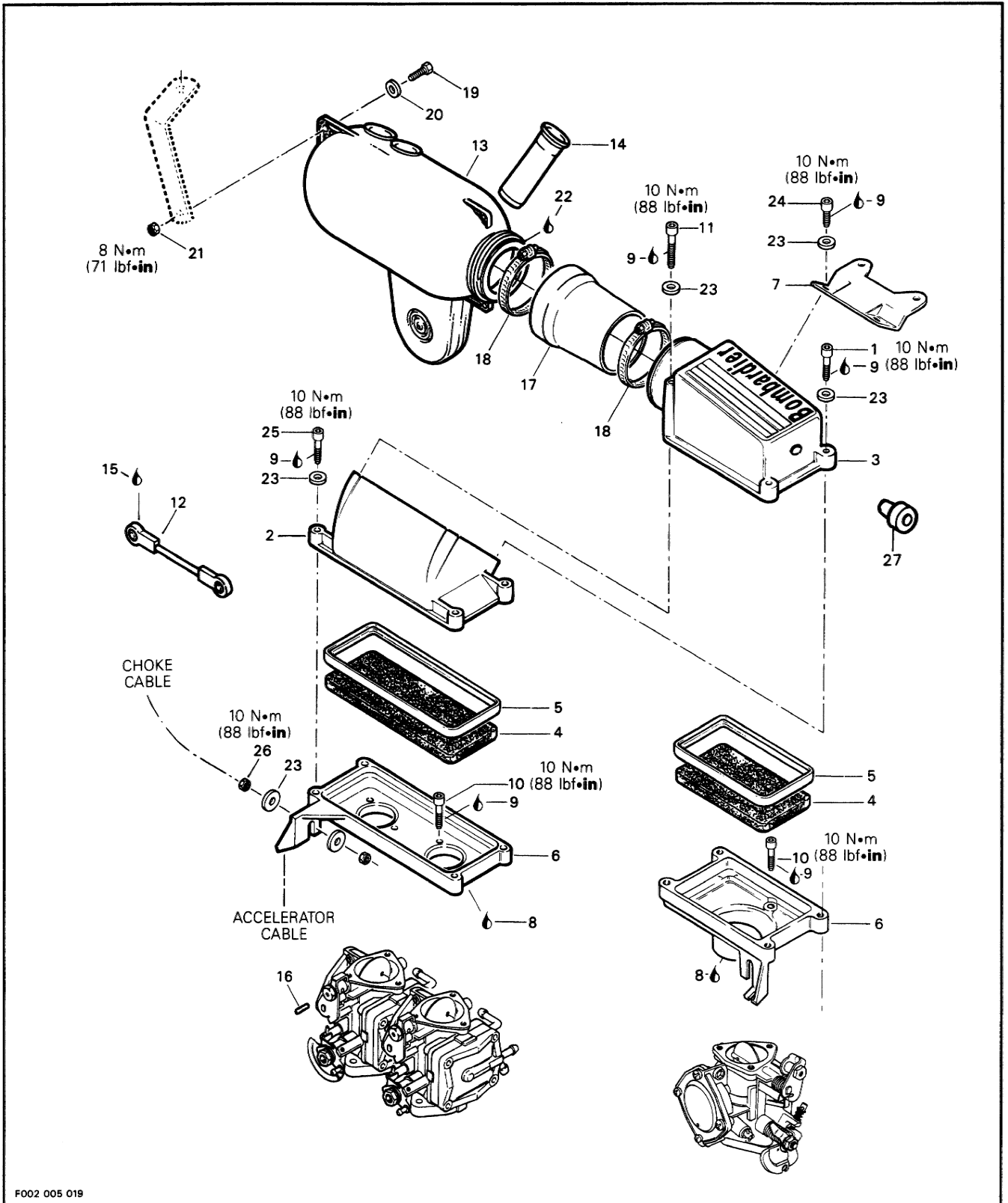
### Sub-Section 01 (FUEL CIRCUIT)

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1. Countersunk Phillips screw M4 x 8
  2. Flat washer M4
  3. Fuel valve knob
  4. Nut M22
  5. Gasket
  6. Fuel valve
  7. Elastic stop nut M6 (3)
  8. Clamp XP (5851) GTX (5860)
  9. Valve gasket
  10. Fuel sensor XP (5851) GTX (5860)
  11. Hose 6 mm
  12. Fuel sensor adaptor XP (5851) GTX (5860)
  13. Oetiker clamp
  14. Flat washer M6
  15. Fuel filter housing
  16. Fuel filter
  17. O-ring
  18. Fuel tank strap (2)
  19. Fuel tank
  20. Baffle
  21. Fuel filter screen (2)
  22. Oetiker clamp (4)
  23. Tie rap
  24. Hose 6 mm
  25. Tridon clamp
  26. Tube adapter
  27. Pick up tube (3)
  28. Tridon clamp
  29. Tridon clamp (2)
  30. Filler neck hose
  31. Gasket
  32. Filler neck
  33. Chain
  34. Cylindrical Phillips screw M3.9 x 9.5
  35. Gasket
  36. Hexagonal screw M5 x 25 XP (5851) GTX (5860)
  37. Flat washer M5 XP (5851) GTX (5860)
  38. Fuel tank cap
  39. Check valve (2)
  40. Elbow fitting 90° (2)
  41. Grommet (2)
  42. Strap clip (6)
  43. Rivet 3/16 x .565 (12)
  44. Tie rap
  45. Tie mount (6)
  46. Washer
  47. "Tee" fitting
  48. Pick up tube (2)
  49. Oetiker clamp
  50. Inner filler neck hose
  51. O-ring (8)
  52. Rivet 1/8 x .690 (8)
  53. Flat washer M3 (2)
  54. Rivet 1/8 x .502 (2)
  55. Hexagonal screw M6 x 16 (2)
  56. Filter support
  57. Loctite 242
  58. Washer (8)
-

**Section 05 FUEL SYSTEM**  
**Sub-Section 02 (AIR INTAKE)**

**AIR INTAKE**



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## Section 05 FUEL SYSTEM

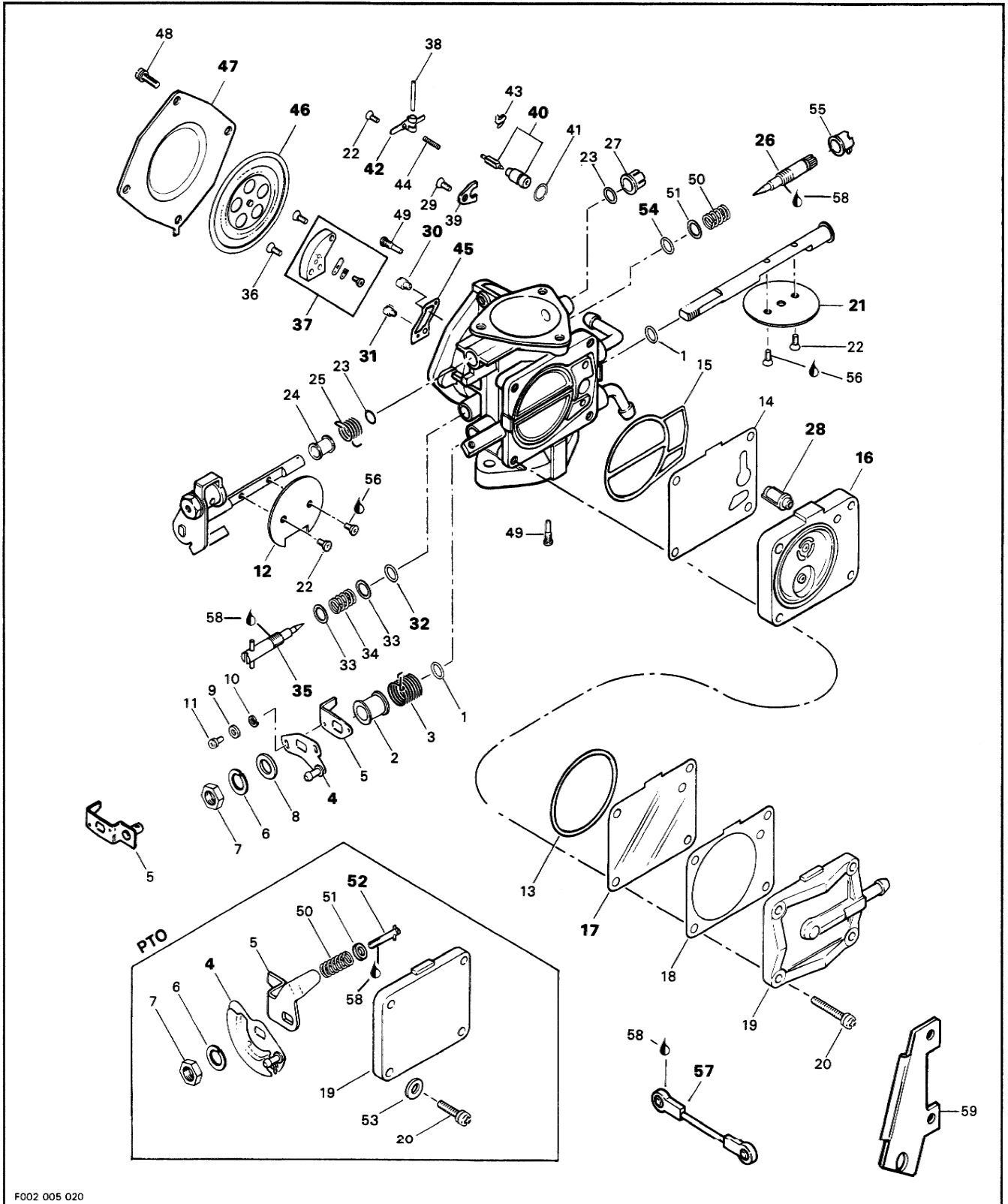
### Sub-Section 02 (AIR INTAKE)

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#### AIR INTAKE

1. Allen screw M6 x 25 (2)
  2. Cover adaptor
  3. Flame arrester cover
  4. Flame arrester foam
  5. Isolator
  6. Base
  7. Support
  8. Loctite 515
  9. Loctite 242
  10. Allen screw M6 x 16 (6)  
Allen screw M6 x 30 (3)
  11. Allen screw M6 x 80 (2)
  12. Carburetor linkage
  13. Air intake silencer
  14. Inlet tube (2)
  15. Synthetic grease
  16. Screw M4 x 6
  17. Performed hose
  18. Clamp (2)
  19. Hexagonal Screw M6 x 20
  20. Flat washer M6
  21. Hexagonal nut M6
  22. Silicone 732 RTV
  23. Flat washer M6 (8)
  24. Allen screw M6 x 12 (2)
  25. Allen screw M6 x 30 except SP (5805) GTS (5812) (4)
  26. Nut M6 (2)
  27. Rubber plug
-

**CARBURETORS**



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## Section 05 FUEL SYSTEM

### Sub-Section 03 (CARBURETORS)

---

## CARBURETORS

1. Sealing ring (2)
2. Sleeve
3. Spring
4. Throttle lever
5. Throttle lever stopper
6. Lock washer
7. Nut
8. Ring
9. Washer
10. Lock washer
11. Screw
12. Choke valve
13. O-ring
14. Gasket
15. O-ring
16. Pump body
17. Diaphragm
18. Gasket
19. Pump cover
20. Screw (4)
21. Throttle valve
22. Screw and spring washer (5)
23. Sealing ring (2)
24. Sleeve
25. Spring
26. Main jet screw (locked)
27. Ring
28. Filter
29. Screw and spring washer
30. Main jet
31. Pilot jet
32. O-ring
33. Washer (2)
34. Spring
35. Low speed mixture screw
36. Screw (2)
37. Check valve housing
38. Pin
39. Plate
40. Needle valve
41. O-ring
42. Needle valve lever
43. Clip
44. Spring
45. Gasket
46. Diaphragm
47. Cover
48. Screw (4)
49. Screw (2)
50. Spring (2)
51. Washer (2)
52. Screw
53. Washer (4)
54. O-ring
55. Cap
56. Loctite 242
57. Carburetor linkage
58. Synthetic grease
59. Bracket (twin carburetor only)

---

## REMOVAL FROM ENGINE

To remove carburetors from engine, proceed as follows :

### Intake and Fuel Systems (Single Carburetor)

Loosen clamp of air intake silencer hose on flame arrester cover.

Move air intake silencer hose to rear of watercraft. Remove screws holding flame arrester cover to engine, then remove screws from cover and withdraw cover. Remove throttle cable from flame arrester base and unhook cable from throttle rope lever. Unscrew Allen screw holding choke cable rod to choke shaft lever then remove cable rod.

○ **NOTE** : Choke cable does not need to be removed from flame arrester base.

Unscrew base retaining screws then remove base from carburetor and move it to front of watercraft.

Turn fuel valve to OFF position.

Disconnect impulse line, fuel supply line and fuel return line from fuel pump.

Remove two nuts, lock washers from carburetor base and withdraw carburetor.

○ **NOTE** : For easier access to right carburetor base nut, throttle rope lever should be removed from throttle shaft.

### Intake and Fuel Systems (Twin Carburetors)

Loosen clamp of air intake silencer hose on flame arrester cover.

Move air intake silencer hose to rear of watercraft. Remove screws holding flame arrester cover to engine, then remove screws from cover and flame arrester adaptor. Remove cover and adaptor from watercraft. Remove throttle cable from flame arrester base and unhook cable from throttle rope lever. Unscrew Allen screws holding choke cable rod to choke shaft lever then remove cable rod.

○ **NOTE** : Choke cable does not need to be removed from flame arrester base.

Unscrew base retaining screws then remove base from carburetors and move it to front of watercraft.

## Section 05 FUEL SYSTEM

### Sub-Section 03 (CARBURETORS)

Turn fuel valve to OFF position.

Disconnect impulse line from fuel pump.

Disconnect fuel supply line from fuel pump.

Disconnect fuel return line from PTO side carburetor.

Remove oil injection cable bracket from fuel pump cover.

Remove four bolts, lock washers from rotary valve cover then move carburetors and rotary valve cover together on top of engine.

○ **NOTE** : Oil lines from oil pump don't need to be removed and don't disconnect oil injection cable from oil pump lever.

## CLEANING

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

▼ **CAUTION** : Be careful at carburetor cleaning not to remove paint. Paint removal will cause carburetor to rust very rapidly. Repaint if necessary.

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

◆ **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, screw, check valve housing, etc).

### 40, Needle Valve

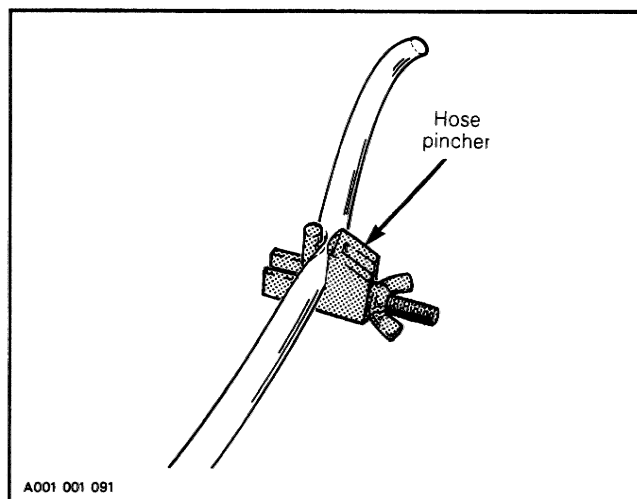
Inspect needle valve tip for a grooved condition. If worn, needle and seat must be replaced as a matched set.

### 35, Low-Speed Mixture Screw

Check tip for a grooved condition. Replace if necessary.

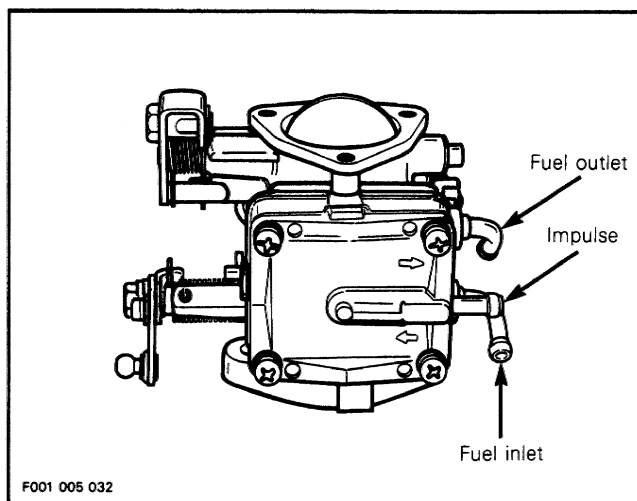
## PUMP VERIFICATION

Install a hose pincher (P/N 295 000 076) on fuel supply line close to pump inlet. Disconnect fuel inlet line.



Disconnect fuel outlet line.

Disconnect impulse line.





## Section 05 FUEL SYSTEM

### Sub-Section 03 (CARBURETORS)

Check fuel pump valves operation as follows :

Connect a clean plastic tubing to the inlet nipple and alternately apply pressure and vacuum with the mouth. The inlet valve should release with pressure and hold under vacuum.

Repeat the same procedure at the outlet nipple. This time the outlet valve should hold with pressure and release under vacuum.

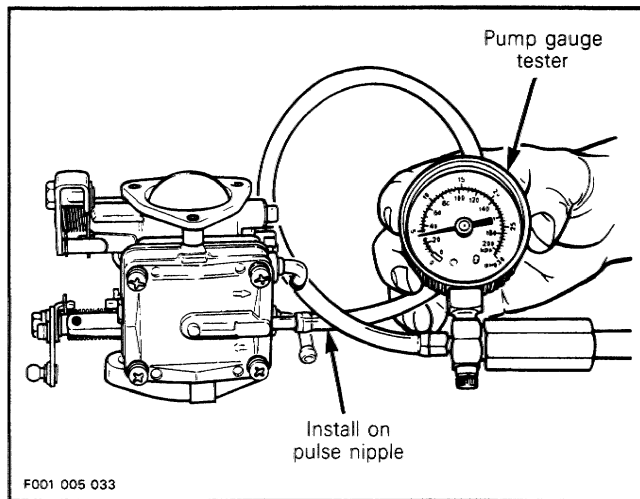
◆ **WARNING :** Some fuel may be present in fuel pump. Be careful not to swallow fuel when under vacuum.

#### 17, Diaphragm

##### Pump Diaphragm Leak Test

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

- Install pump gauge tester (P/N 295 000 083) on pulse nipple.
- Pump tester until it reaches 28 kPa (4 PSI).



Diaphragm must stand pressure for 10 seconds. If pressure drops, replace diaphragm.

#### 16, Pump Body

Inspect valves. The pumping area should be free of holes, tears or imperfections. Replace as needed.

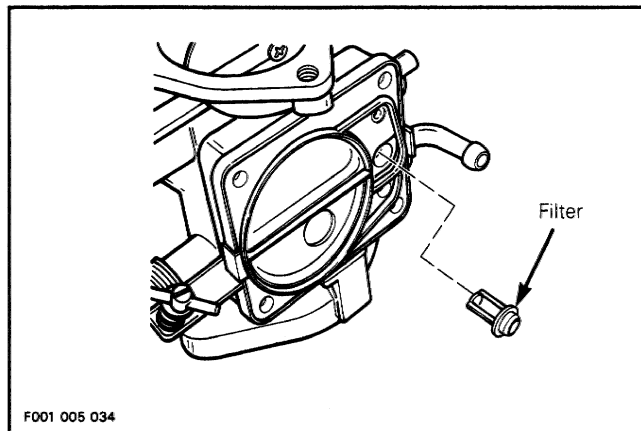
#### 28, Filter

To verify filter condition proceed as follows :

Remove pump cover, gasket, diaphragm and then pump body and gasket.

Remove filter from carburetor body then clean filter and blow carefully with compressed air (low pressure).

Replace filter if damaged.



#### ASSEMBLY

When assembling pump, ensure to properly position components together. Refer to previous illustration if necessary.

#### 12,21, Choke Valve and Throttle Valve

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

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

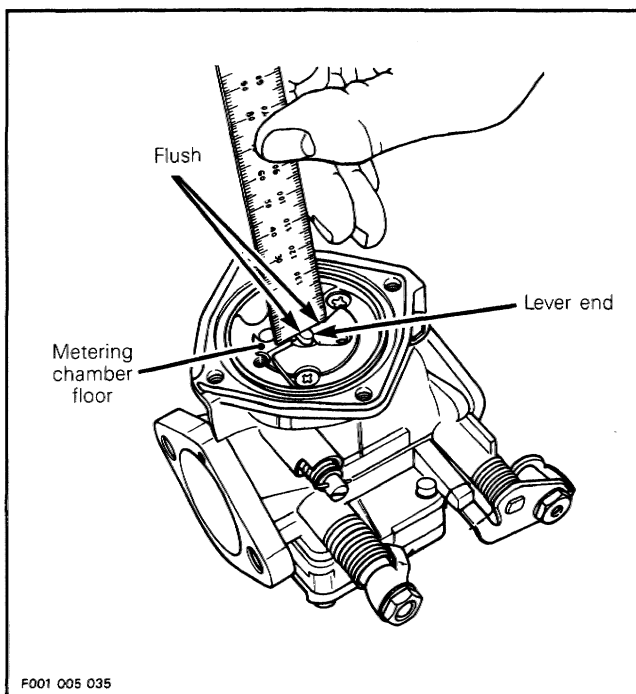
#### 42, Needle Valve Lever

##### Inlet Control Lever

Rounded end of needle valve lever must be flush with surrounding metering chamber floor and not with body assembly. Place the end of a ruler over lever to check adjustment.

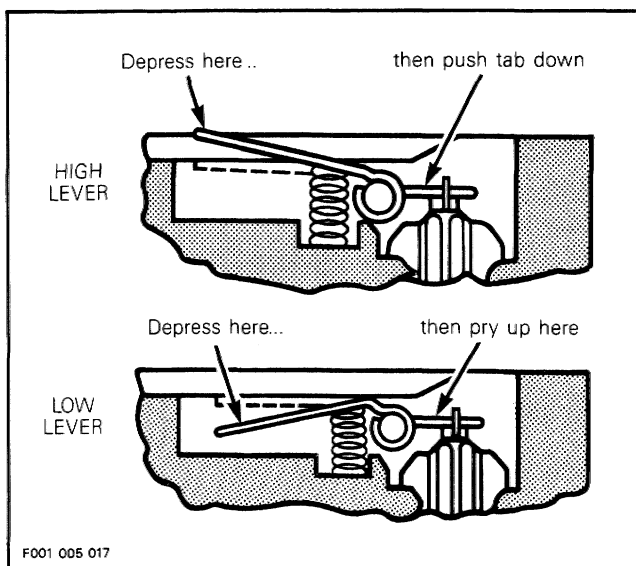
## Section 05 FUEL SYSTEM

### Sub-Section 03 (CARBURETORS)



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.



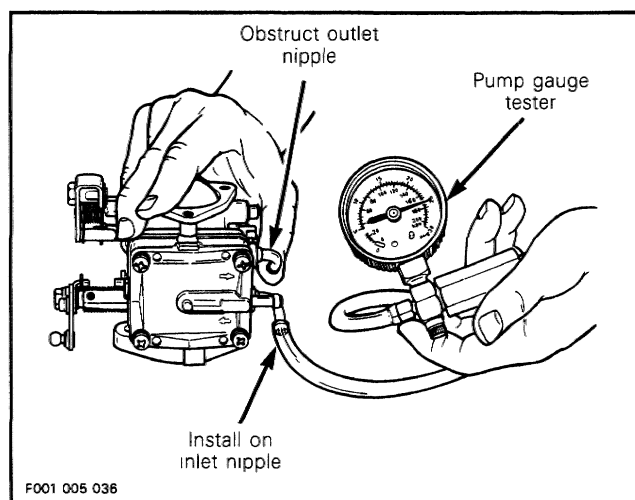
#### Pressure Test

Proceed as follows :

- Install pump gauge tester on carburetor inlet nipple.
- Obstruct outlet nipple with a finger.
- Pump tester until inlet release pressure is reached (seen by a sudden pressure drop). This must occur within 150-225 kPa (21-32 PSI) then pressure will drop.

The pressure drop will vary, but it should not go less than 100 kPa (15 PSI).

○ **NOTE:** Pressure test should be performed three times to obtain a valid reading.



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

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

#### Leak Test

Needle valve must stand a pressure of 69 kPa (10 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 O-ring, bubbles will exit around seat. Retighten as necessary.

If it still leaks remove needle and seat and replace O-ring.

If bubbles come from needle, replace needle and seat.

## Section 05 FUEL SYSTEM

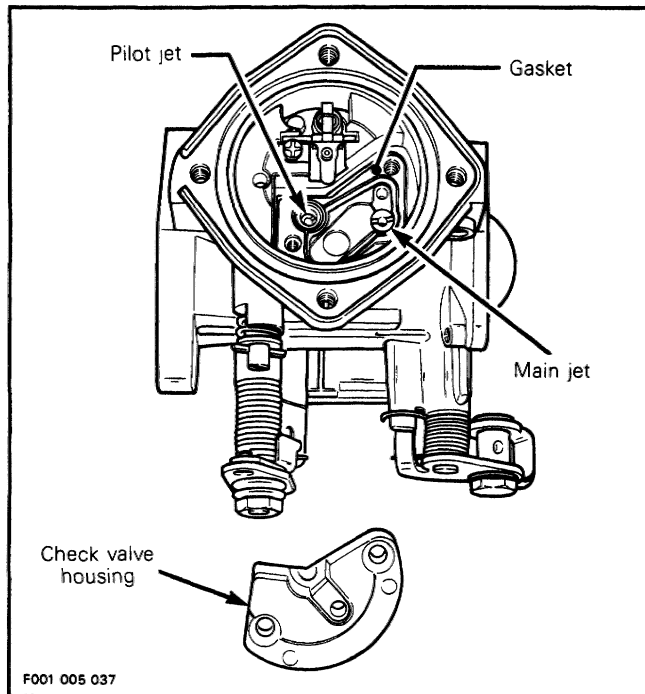
### Sub-Section 03 (CARBURETORS)

#### 30,31, Main Jet and Pilot Jet

Pilot jet and main jet are replaceable. Different jet sizes are available to suit temperature and altitude conditions. Always inspect spark plug tip condition when dealing with pilot jet and main jet. Spark plug tip condition gives a good indication of carburetor mixture setting.

**CAUTION :** Adjustments vary with temperature and altitude. Always observe spark plug condition for proper jetting.

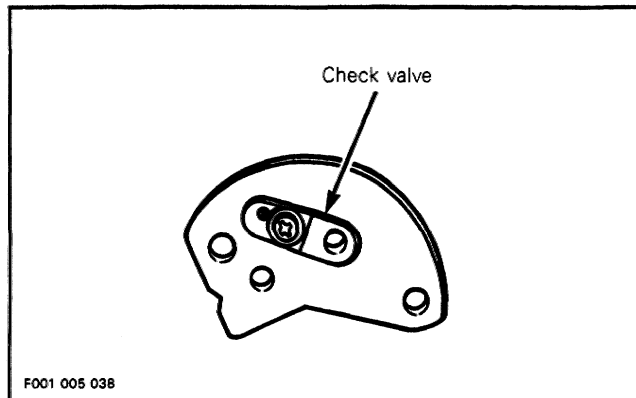
**NOTE :** To have access to pilot jet or main jet, check valve housing must be removed.



#### 37,45, Check Valve, Gasket and Check Valve Housing

The check valve is needed if a back pressure occurs into carburetor. It will prevent fuel from flowing back into carburetor lower portion.

Inspect check valve, it should be free of holes, tears or imperfections. Replace as needed.



Prior to check valve housing installation, remember to set gasket.

#### 46,47, Diaphragm and Cover

Install diaphragm with its integrated O-ring into carburetor groove. Make sure that the tab of cover is inserted into carburetor notch.

#### 32,54, O-ring

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

#### Carburetor Mount Nuts

Install lock washers and apply Loctite 242 (P/N 293 800 015) on threads then torque nuts to 25 N•m (18 lbf•ft).

#### Fuel lines and Hose Clamps

If fuel line ends are damaged, cut damaged end before reinstallation.

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

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

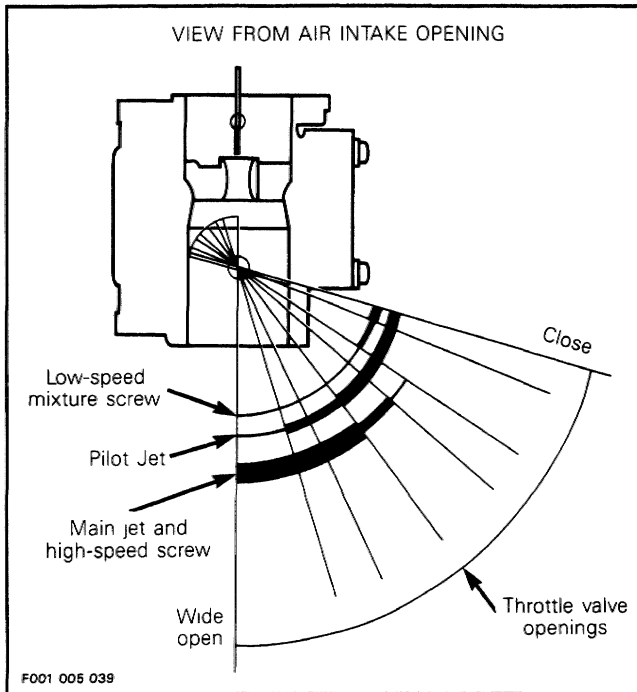
Refer to **fuel system pressurization**.

#### Flame Arrester

Always verify if flame arrester is dirty or restricted.

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

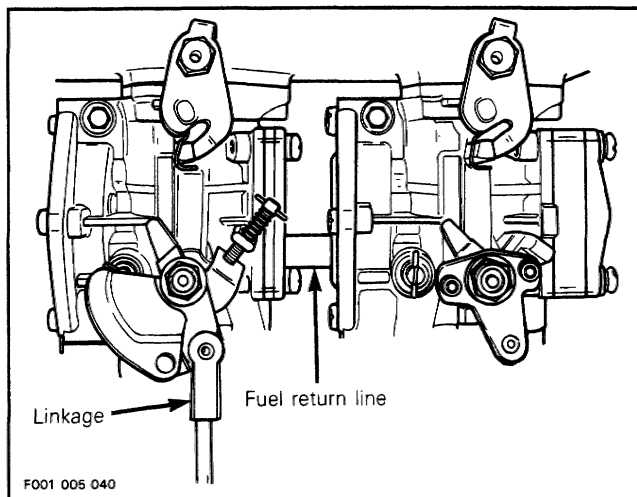
The following illustration shows which part of the carburetor begins to function at different throttle valve openings.



**DISASSEMBLY**  
**(Twin Carburetor)**

**57, Carburetor Linkage**

Disconnect fuel return line between carburetors and disconnect linkage from carburetor. Unscrew carburetor mount nuts and remove carburetor.

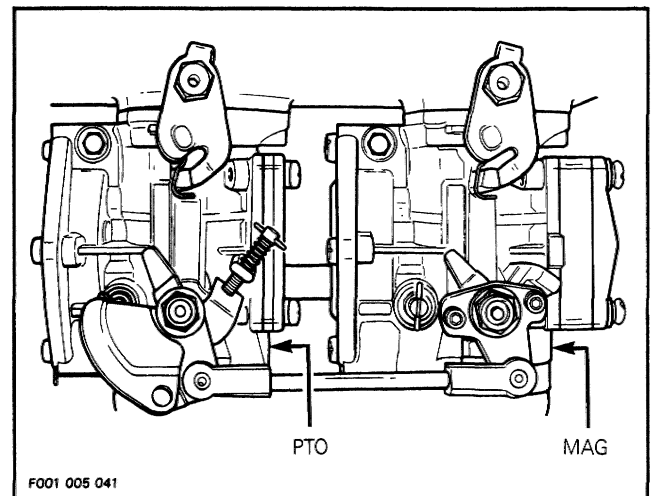


**ASSEMBLY**  
**(Carburetor Synchronization)**

At assembly, pay attention to the following.

**MAG Carburetor and PTO Carburetor**

When installing carburetors pay attention on which side of oil pump mounting flange carburetors are to be located. To ensure proper installation, carburetors are identified on the side with MAG or PTO. Refer to following illustration.

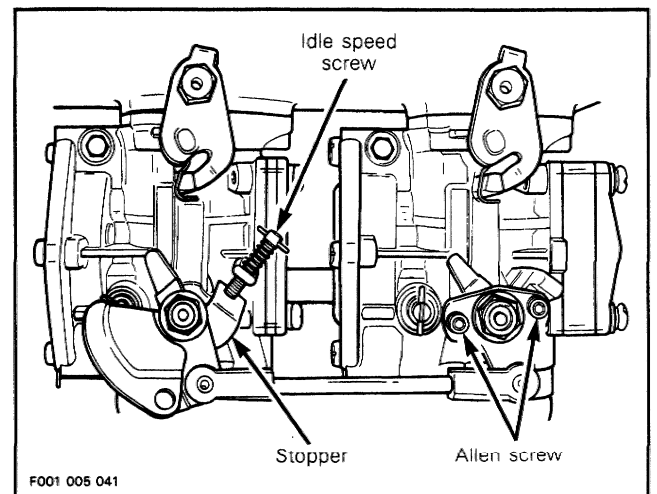


**4,52, Throttle Levers and Idle Speed Screw**

With idle speed screw not touching stopper on PTO carburetor, both throttle levers are in closed position.

Loosen Allen screws on MAG carburetor throttle lever.

○ **NOTE :** Ensure throttle lever is released. Paint could possibly hold lever.



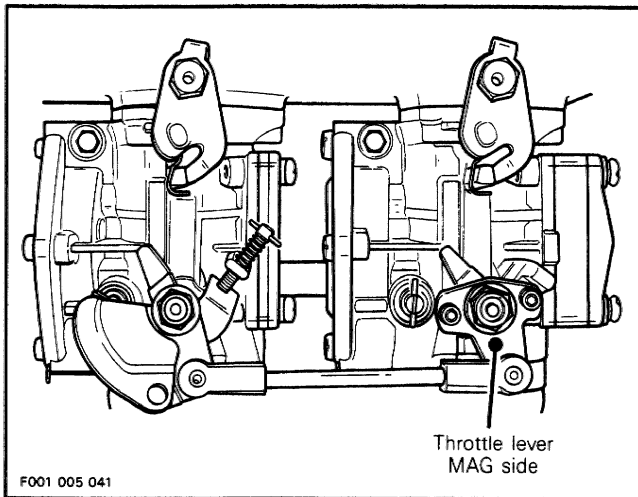
## Section 05 FUEL SYSTEM

### Sub-Section 03 (CARBURETORS)

○ **NOTE** : Grease carburetor linkage at both ends with synthetic grease (P/N 293 550 010).

Connect linkage between both carburetors and fully tighten Allen screws on carburetor throttle lever MAG side. Be careful not to rotate lever while tightening it.

▼ **CAUTION** : This set-up is done to ensure good synchronization between carburetor throttle levers when throttle lever is pushed at handlebar grip.



▼ **CAUTION** : Throttle valves must open simultaneously. Otherwise this will cause engine to vibrate and/or back fire.

#### Return Line Orifice

The fuel return line orifice of carburetor MAG side is 3.0 mm (.118 in) and the one on carburetor PTO side is 0.5 mm (.020 in).

▼ **CAUTION** : If carburetors are installed on wrong side, the carburetor PTO side will run very lean because of low fuel flow.

◆ **WARNING** : Always verify tightness of clamps and hoses.

#### Carburetor Mount Nuts

Install lock washers and apply Loctite 242 (P/N 293 800 015) on threads then torque nuts to 25 N•m (18 lbf•ft).

#### Rotary Valve Cover and Screws

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

#### 10,12, Fuel Sensor and Fuel Sensor Adapter

◆ **WARNING** : Always disconnect 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.

Disconnect the red positive cable last.

Empty fuel tank.

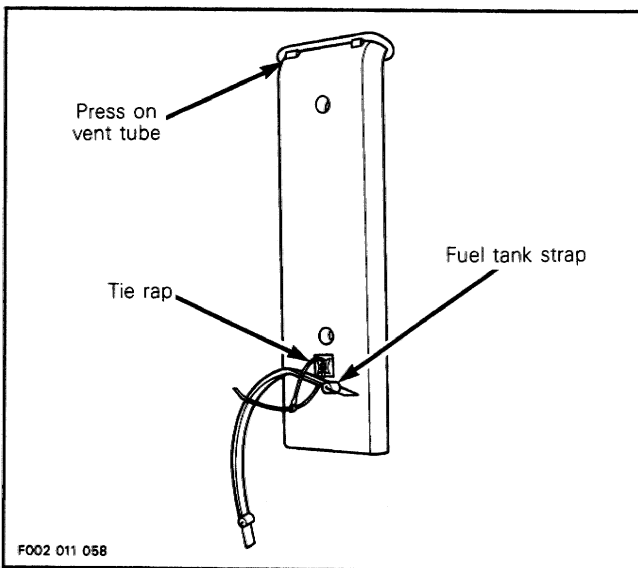
◆ **WARNING** : Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity. Always wipe off fuel spillage from the watercraft.

Remove storage basket from watercraft.

#### GTX Model (5860) only

Unhook fuel tank strap slide it off through tie rap behind vent tube.

Press on vent tube upper part to enable to withdraw tube from body.



◆ **WARNING** : Vent tube must be in place to provide proper bilge ventilation.

Disconnect filler neck hose from fuel tank.

Remove strap retaining fuel tank and move tank forward.

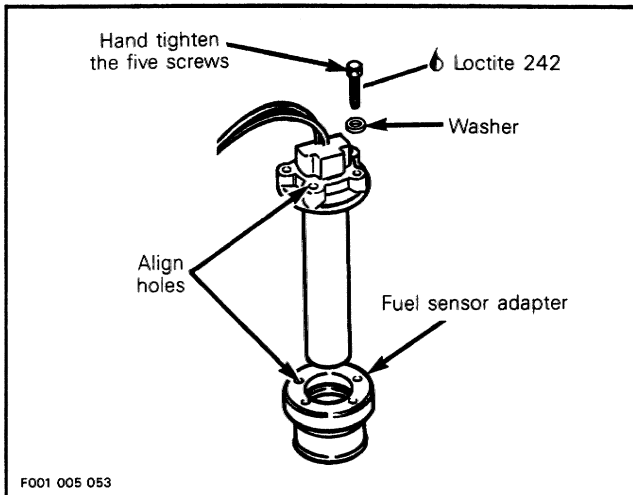
**Section 05 FUEL SYSTEM**  
**Sub-Section 03 (CARBURETORS)**

**XP Model (5851) GTX Model (5860)**

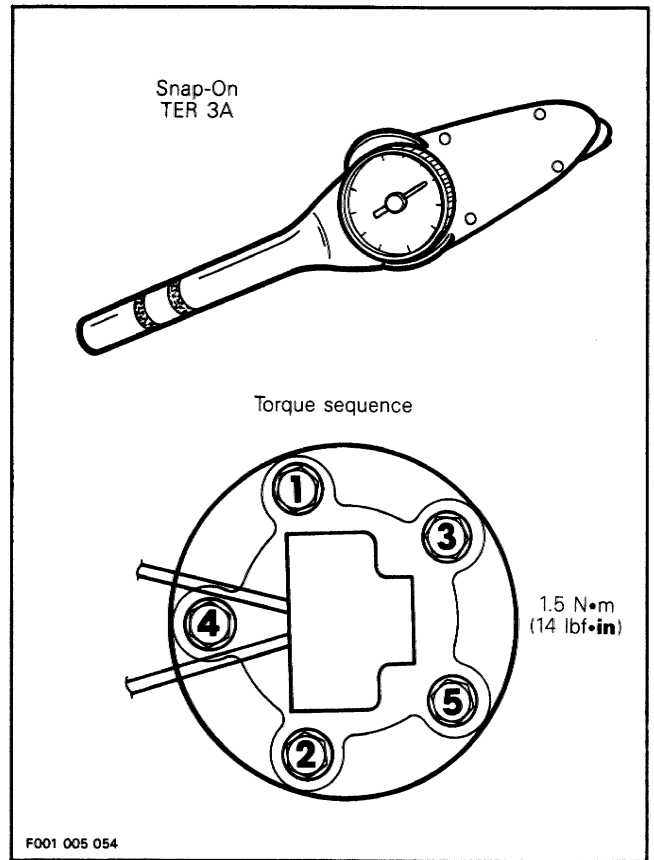
Disconnect and remove fuel sensor from fuel tank.  
Remove fuel sensor adapter from fuel sensor.  
Make sure there is no obstructions in threaded holes of fuel sensor adapter.  
Slide fuel sensor adapter on fuel sensor.  
Align sensor holes with adapter holes.

◆ **WARNING : A good hole alignment is necessary.**

Apply some Loctite 242 (blue) on the five screws, install washers and hand tighten to eliminate play between sensor and adapter.

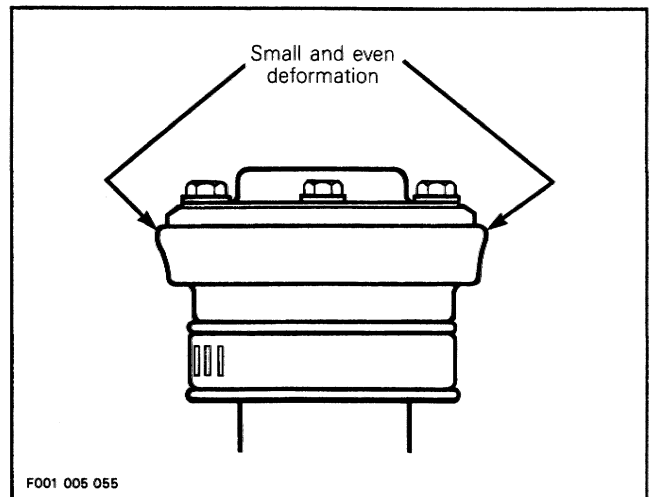


Torque screws in a criss-cross sequence to 1.5 N•m (14 lbf•in) using an appropriate torque wrench such as Snap-On TER 3A.



◆ **WARNING : Do not over torque. Torque wrench tightening specifications must be strictly adhere to.**

○ **NOTE :** It is normal to have a small and even deformation all around fuel sensor adapter.



## Section 05 FUEL SYSTEM

### Sub-Section 03 (CARBURETORS)

Torque applied to materials such as rubber, plastic and fiberglass will decrease automatically. The torque reduction is caused by material creeping. This situation is normal and should not cause any installation problem.

▼ **CAUTION** : Do not retorque after a while, this could lead to an excessive deformation and/or components damages.

## ADJUSTMENTS

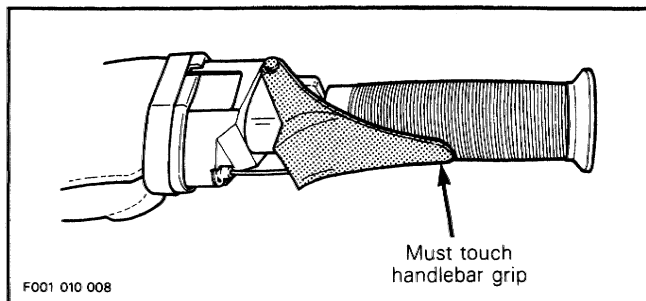
### (Single Carburetor)

#### Throttle Cable

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

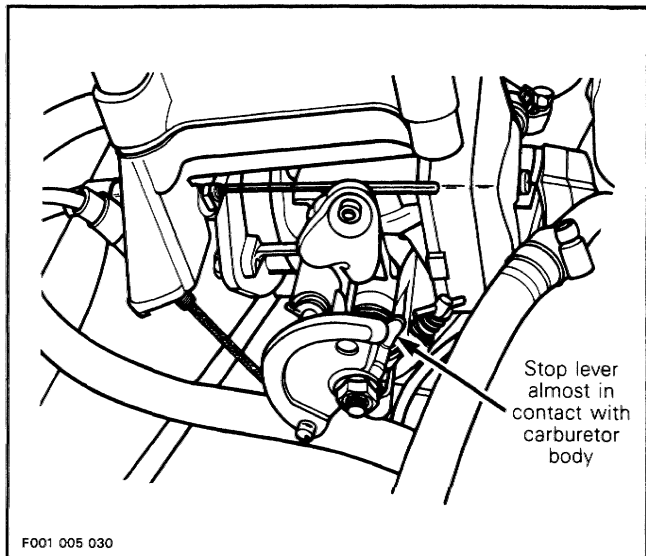
Lubricate cable with SEA-DOO LUBE.

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



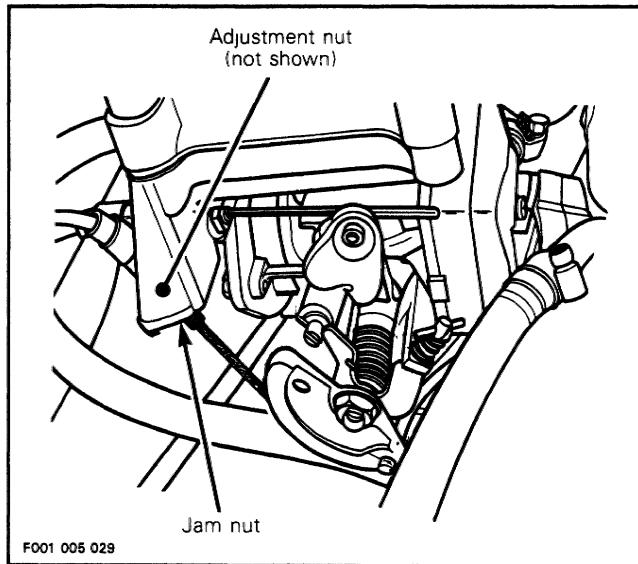
Insure carburetor butterfly is fully open at full throttle position. At this position throttle stop lever is almost in contact (0.5 mm (1/64 in)) with carburetor body.

○ **NOTE** : Insure lock tab on throttle handle is installed over cable barrel opening.



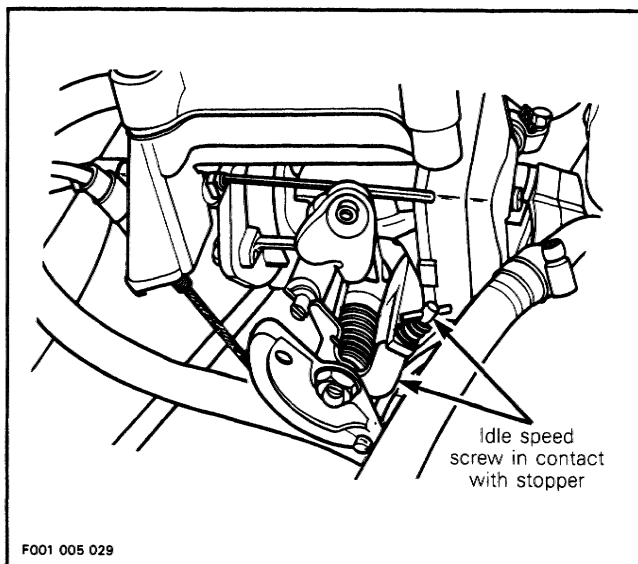
▼ **CAUTION** : Improper cable full throttle adjustment will cause strain on cable and/or damage cable bracket or throttle lever at handlebar.

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



Tighten jam nut and recheck adjustment.

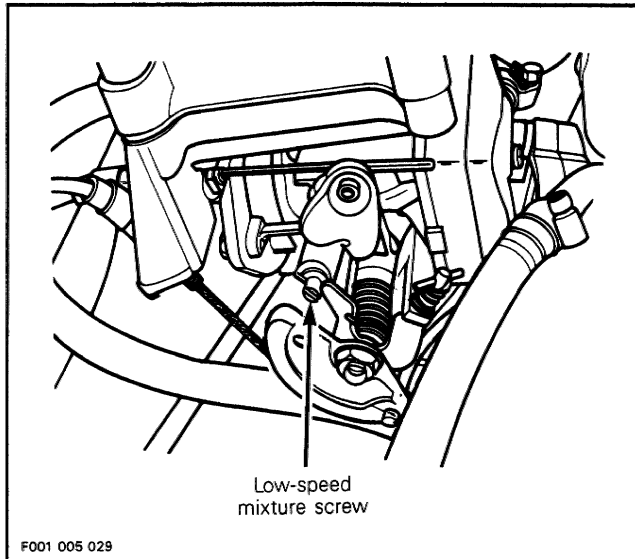
◆ **WARNING** : Make sure idle speed screw contacts stopper when throttle lever is fully released at handlebar.



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

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

### 35, 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 3/4 to 1-1/4 turn.

Start and warm engine.

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

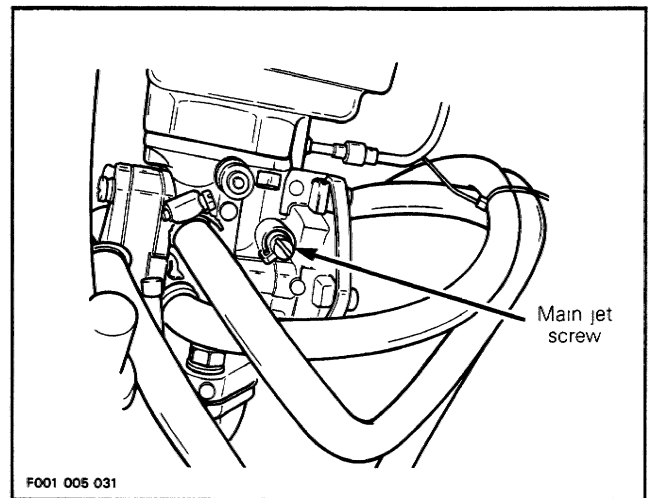
Turning screw clockwise leans mixture and turning screw counterclockwise enriches mixture.

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.

### 26, Main Jet Screw

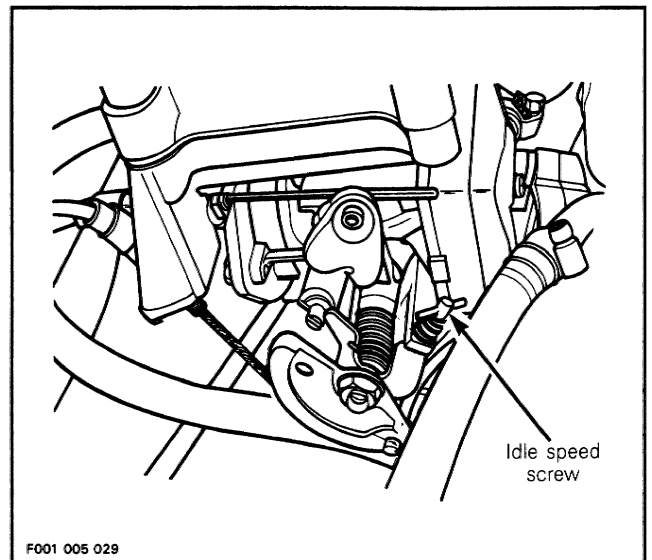
The main jet screw is sealed with a plastic cap that allows an adjustment of 1/4 turn.

○ **NOTE:** Turning screw 1/4 turn counterclockwise enriches mixture and turning screw clockwise leans mixture.



▼ **CAUTION:** Do not attempt to adjust main jet screw. Severe engine damage can occur.

### 52, Idle Speed Screw



Turning screw clockwise increases engine idle speed and turning screw counterclockwise decreases engine idle speed.

Connect an induction-type tachometer (P/N 295 000 100) on spark plug wire of magneto side to measure engine speed.

Start engine and bring to normal operating temperature.



## Section 05 FUEL SYSTEM

### Sub-Section 03 (CARBURETORS)

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

Turn screw so that engine idles between 1300 to 1500 RPM (in water) or 2400 to 2600 RPM (out of water).

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

▼ **CAUTION** : Oil injection pump adjustment must be checked each time carburetor is adjusted. Improper oil pump adjustment can cause severe engine damage.

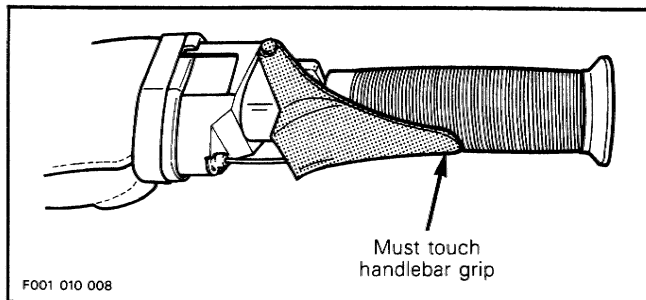
## ADJUSTMENTS (Twin Carburetors)

### Throttle Cable

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

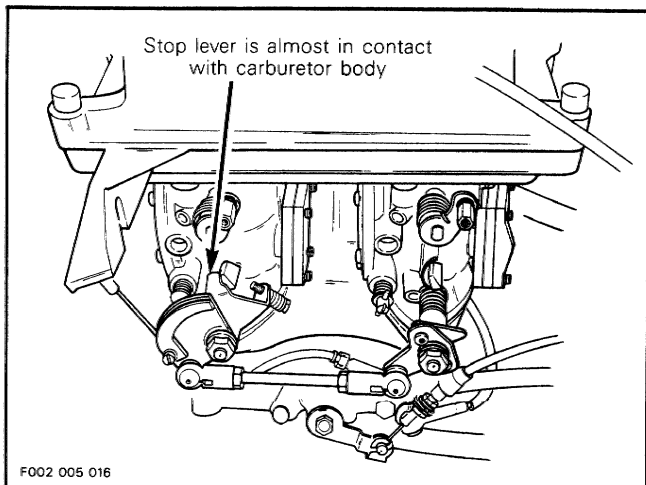
Lubricate cable with SEA-DOO LUBE.

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



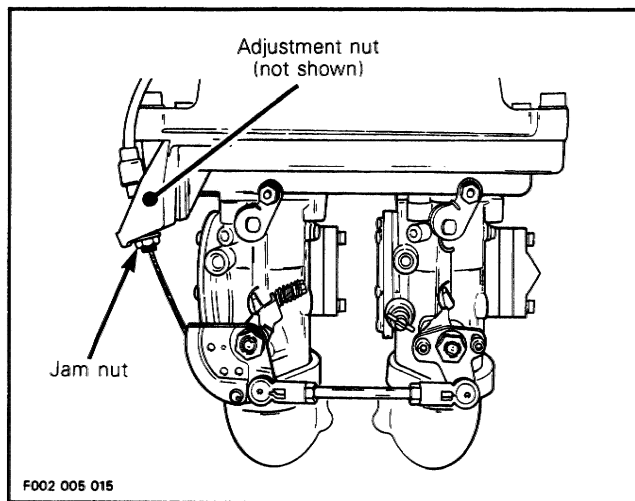
Insure carburetor butterflies are fully open at full throttle position. At this position throttle stop lever is almost in contact (0.5 mm (1/64 in)) with carburetor body.

○ **NOTE** : Insure lock tab on throttle handle is installed over cable barrel opening.



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

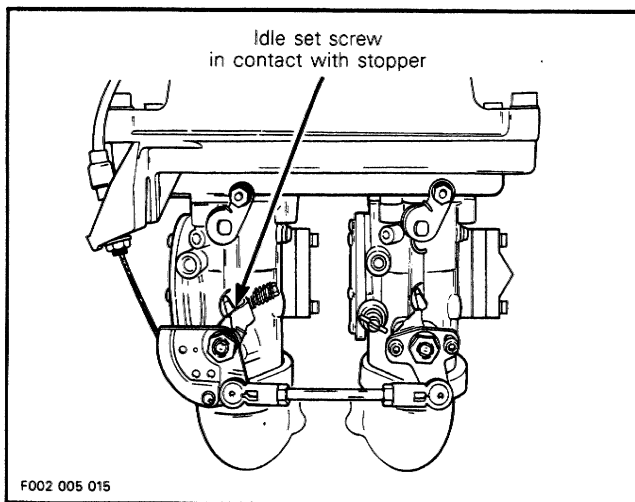
To adjust, loosen jam nut then turn adjustment nut as necessary.



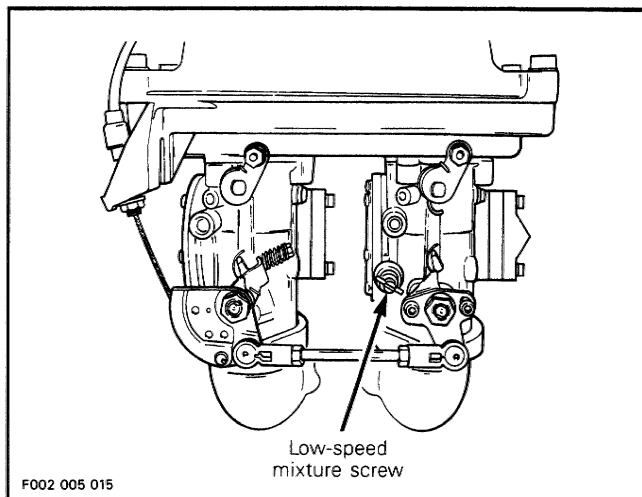
Tighten jam nut and recheck adjustment.

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

○ **NOTE** : There is only one idle set screw for both carburetors. It is located on the PTO side carburetor.



### 35, 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 to 1-1/2 turn.

Start and warm engine.

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

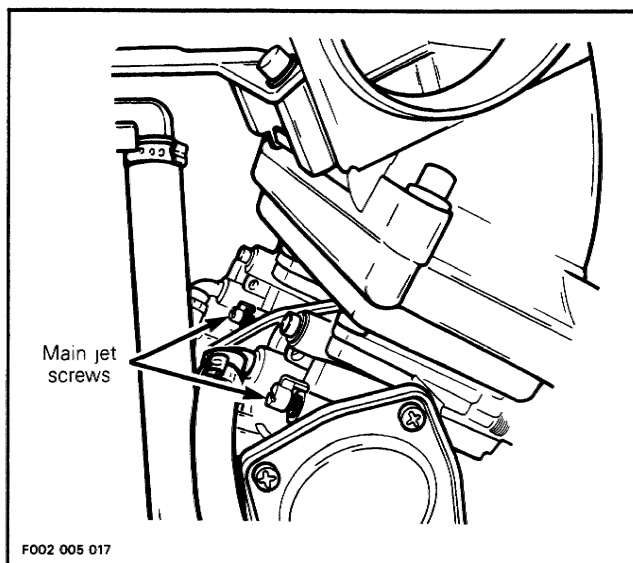
Turning screw clockwise leans mixture and turning screw counterclockwise enriches mixture.

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.

### 26, Main Jet Screw

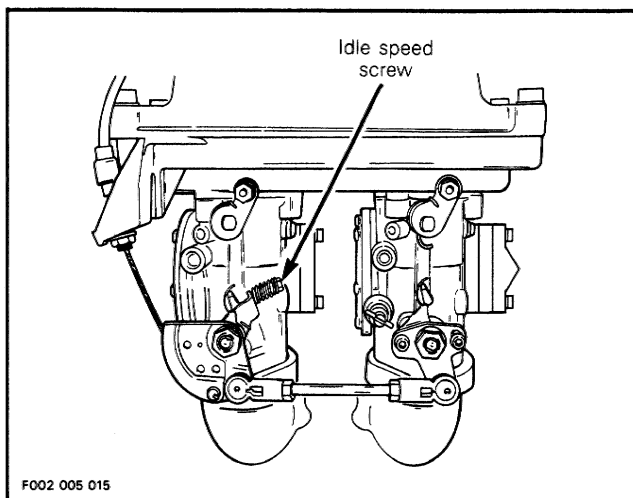
The main jet screw is sealed with a plastic cap that allows an adjustment of 1/4 turn.

○ **NOTE:** Turning screw 1/4 turn counterclockwise enriches mixture and turning clockwise leans mixture.



▼ **CAUTION:** Do not attempt to adjust main jet screw. Severe engine damage can occur.

### 52, Idle Speed Screw (on PTO side carburetor only)



Turning screw clockwise increases engine idle speed and turning screw counterclockwise decreases engine idle speed.

Connect an induction tachometer (P/N 295 000 100) on spark plug wire of magneto side to measure engine speed.

## Section 05 FUEL SYSTEM

### Sub-Section 03 (CARBURETORS)

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 between 1300 to 1500 RPM (in water) or 2800 to 3000 RPM (out of water).

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

▼ **CAUTION** : Oil injection pump adjustment must be checked each time carburetors are adjusted. Improper oil pump adjustment can cause severe engine damage.

### FUEL SYSTEM PRESSURIZATION

◆ **WARNING** : Whenever doing any type of repair on watercraft or if any components of the fuel system are disconnected, a pressure test must be done before starting engine and/or releasing watercraft to customer.

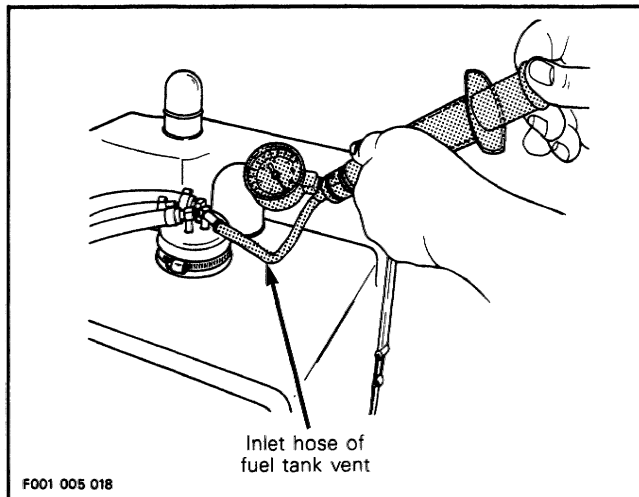
▼ **CAUTION** : Ensure to verify fuel line ends for damage. Always cut damaged end before reinstallation.

#### Pressure Test

Proceed as follows :

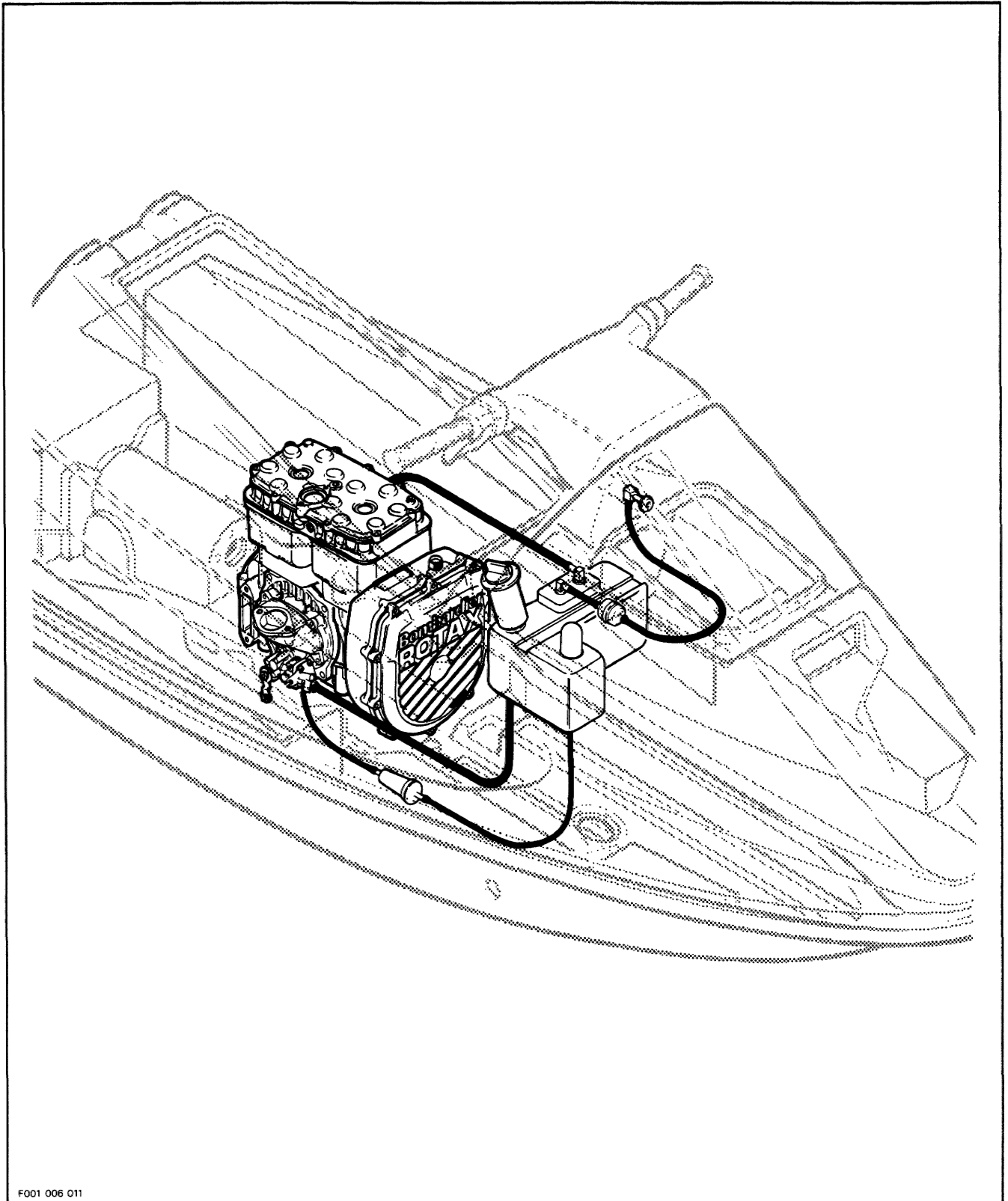
- Fill up fuel tank.
- Remove inlet hose of fuel tank vent from body.
- Install a hose pincher (P/N 295 000 076) on outlet hose of fuel tank vent.
- Connect pump gauge tester (P/N 295 000 085) to inlet hose.
- Turn fuel valve to OFF and pressurize fuel system to 34 kPa (5 PSI). If no leaks are found, turn fuel valve to ON and pressurize once more.
- If pressure is not maintained locate leak and repair / replace component leaking. To ease leak search spray a solution of soapy water on components, bubbles will indicate leak location.

○ **NOTE** : To minimize time of fuel system pressurization the fuel tank should be quite full. The system must maintain a pressure of 34 kPa (5 PSI) during 10 minutes. Never pressurize over 34 kPa (5 PSI).



◆ **WARNING** : If any leak is found, do not start the engine and wipe off any fuel leakage. Failure to correct a leak could lead to an explosion. Do not use electric powered tools on watercraft unless system has been verified for no leaks.

# OIL SYSTEM

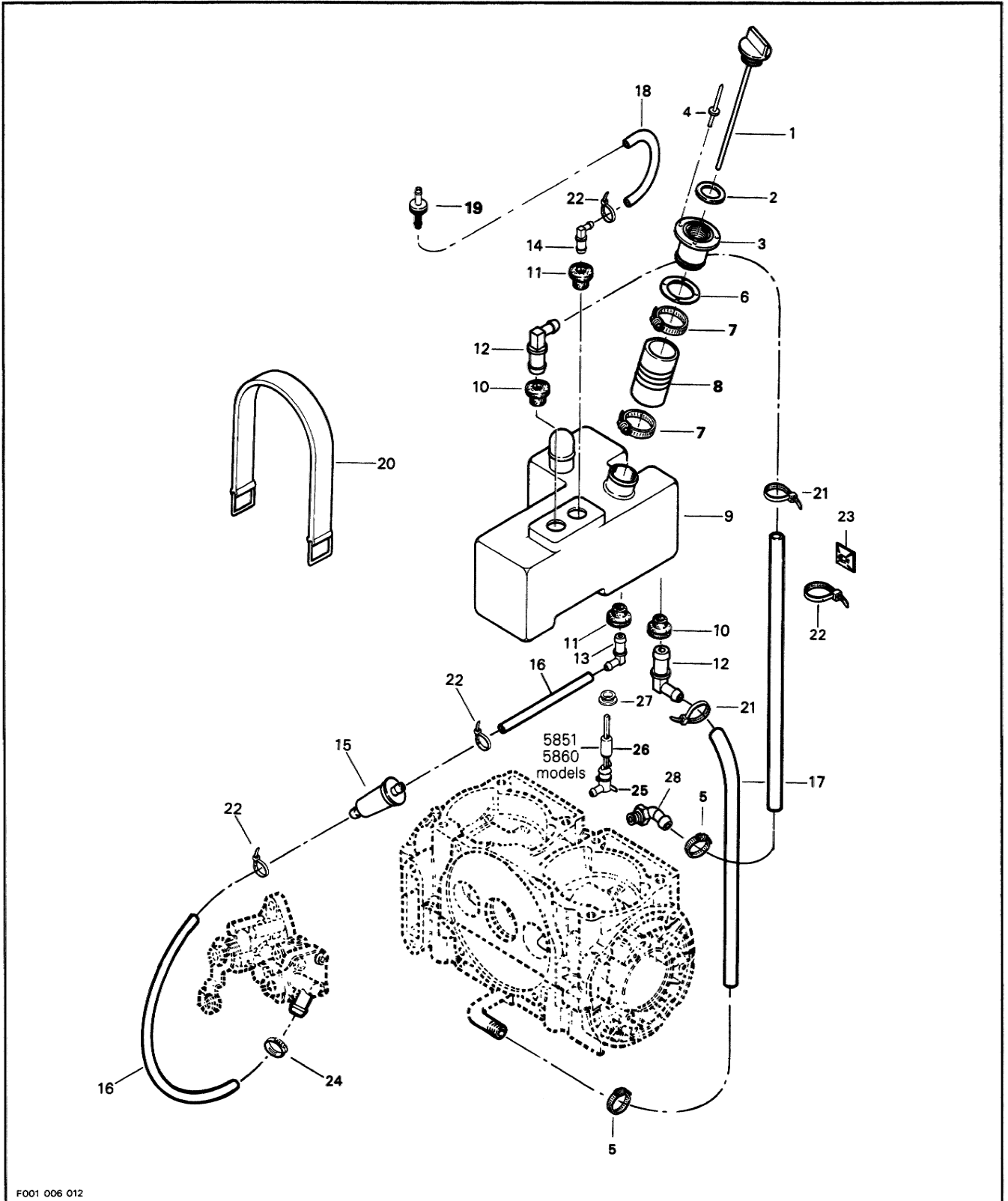


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**Section 06 OIL SYSTEM**  
**Sub-Section 01 (OIL INJECTION RESERVOIR)**

**OIL INJECTION RESERVOIR**



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## Section 06 OIL SYSTEM

### Sub-Section 01 (OIL INJECTION RESERVOIR)

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#### COMPONENTS

- |                         |                                          |
|-------------------------|------------------------------------------|
| 1. Oil gauge            | 15. Oil filter                           |
| 2. O-ring               | 16. Hose 8 mm                            |
| 3. Filler neck          | 17. Hose 12 mm                           |
| 4. Rivet 1/8 x .640 (4) | 18. Hose 6 mm                            |
| 5. Clamp (2)            | 19. Check valve                          |
| 6. Gasket               | 20. Strap                                |
| 7. Clamp (2)            | 21. Tie rap                              |
| 8. Filler neck hose     | 22. Tie rap                              |
| 9. Oil tank             | 23. Tie mount (2)                        |
| 10. Grommet (2)         | 24. Oetiker clamp                        |
| 11. Grommet (2)         | 25. Oil level sender (5851, 5860 models) |
| 12. Elbow fitting (2)   | 26. Float (5851, 5860 models)            |
| 13. Elbow fitting       | 27. Grommet (5851, 5860 models)          |
| 14. Elbow fitting       | 28. Hose fitting                         |
- 

#### GENERAL

Whenever repairing the oil injection system, always verify for water infiltration in reservoir.

#### 7,8, Clamp and Hose

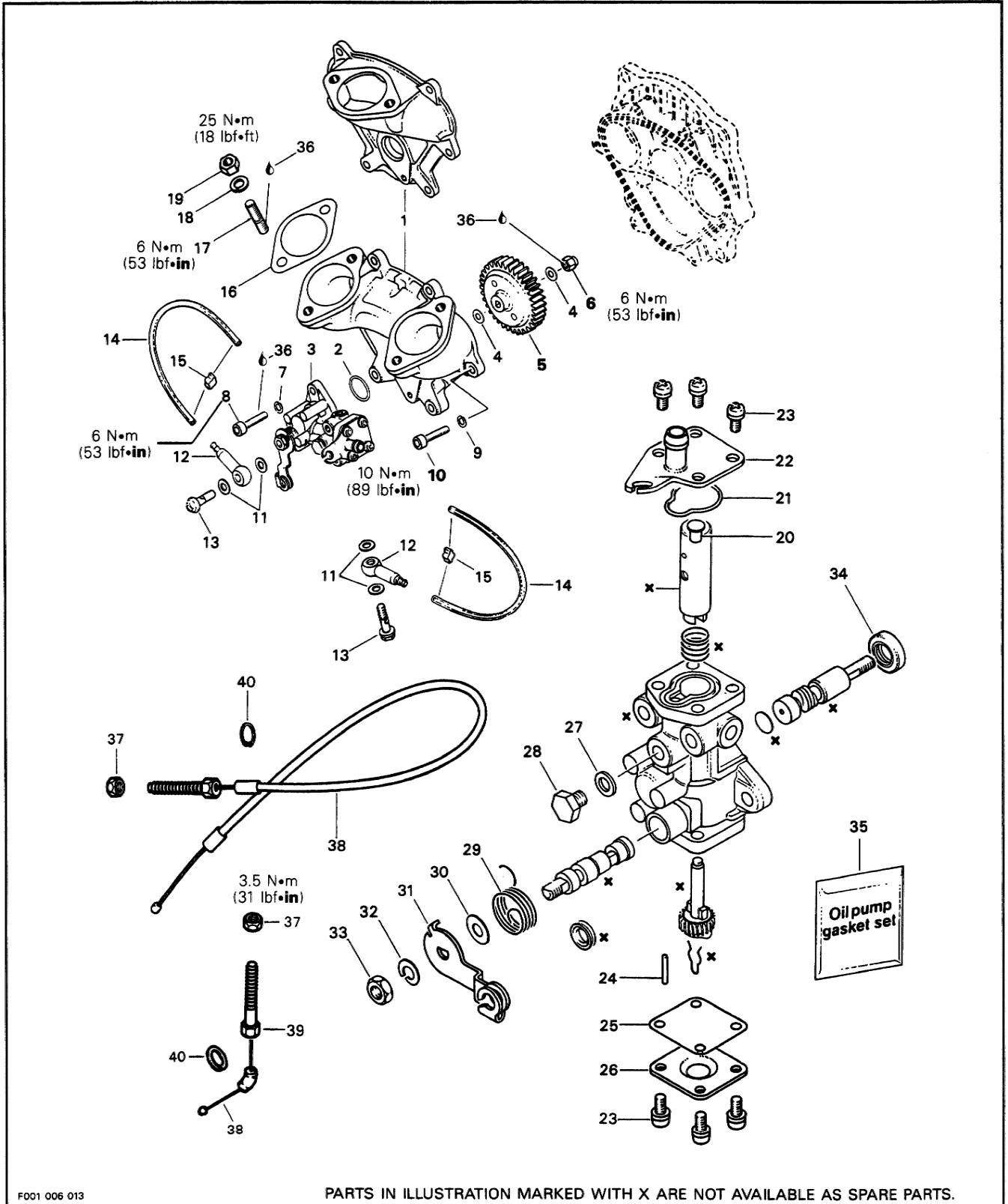
Verify oil filler neck hose for damage. Always ensure that clamps are well positioned and tightened.

#### 19, Check Valve

Black side of check valve is the valve outlet.

**Section 06 OIL SYSTEM**  
**Sub-Section 02 (OIL INJECTION PUMP, REPAIR AND ADJUSTMENT)**

**OIL INJECTION PUMP, REPAIR AND ADJUSTMENT**





## Section 06 OIL SYSTEM

### Sub-Section 02 (OIL INJECTION PUMP, REPAIR AND ADJUSTMENT)

## COMPONENTS


1. Oil pump flange
2. O-ring
3. Oil pump
4. Washer (2)
5. Oil pump gear 41 teeth
6. Lock nut M6
7. Lock washer (2)
8. Allen screw M5 x 16 (2)
9. Lock washer M6 (6)
10. Allen screw M6 x 20 (6)
11. Oil banjo gasket (4)
12. Check valve (2)
13. Valve bolt M6 x 16 (2)
14. Oil line
15. Clamp (4)
16. Gasket
17. Stud M8 x 19 (2)
18. Lock washer M8 (2)
19. Nut M8 (2)
20. Retainer
21. O-ring
22. Upper plate
23. Screw with lock washer M4 x 8 (8)
24. Stop pin
25. Gasket
26. Pump lower plate
27. Gasket
28. Hexagonal screw M6 x 8
29. Spring
30. Flat washer M6
31. Lever
32. Lock washer M6
33. Nut M6
34. Seal
35. Gasket set
36. Loctite "242"
37. Nut M6
38. Injection cable
39. Cable guide
40. Circlip

Parts in illustration marked with X are not available as spare parts.

## CLEANING

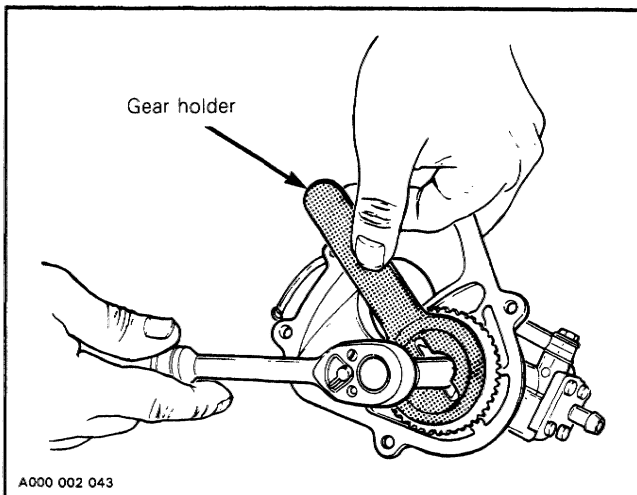
Discard all seals and O-rings. Clean metal components in a solvent.

## DISASSEMBLY

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

### 5,6, Oil Pump Gear and Lock Nut

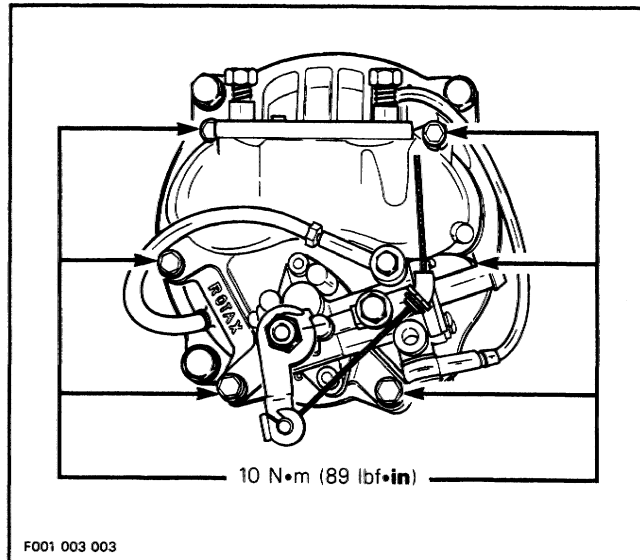
To remove retaining nut, lock gear using gear holder (P/N 290 277 905).



## ASSEMBLY

### 10, Screw

Torque to 10 N•m (89 lbf•in).



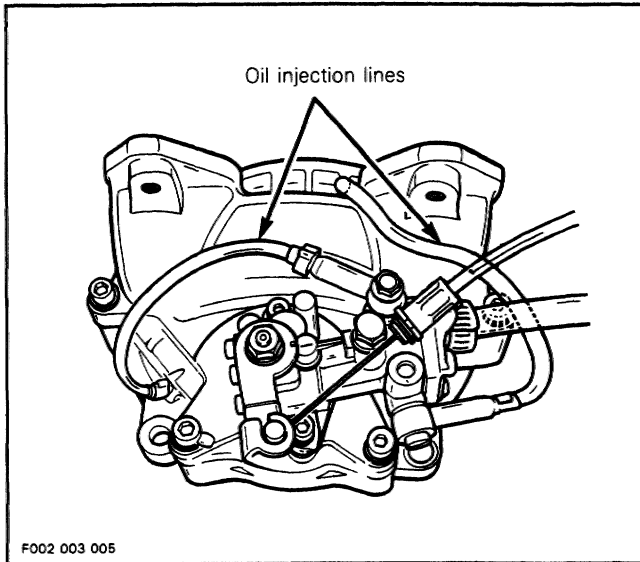
## Section 06 OIL SYSTEM

### Sub-Section 02 (OIL INJECTION PUMP, REPAIR AND ADJUSTMENT)

#### 6, Lock Nut

Apply Loctite 242 (P/N 293 800 015) on nut threads and torque to 6 N•m (53 lbf•in).

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



### ADJUSTMENTS

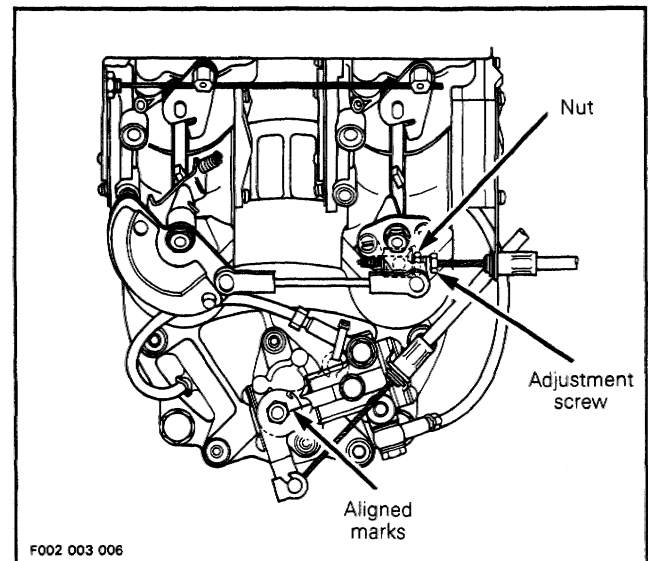
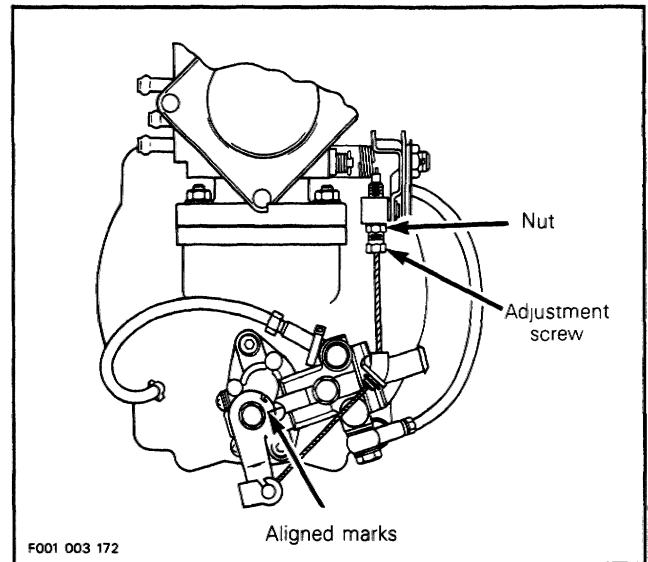
#### Synchronization

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

Eliminate throttle cable free-play by 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 adjustment screw to obtain pump mark alignment.



Tighten nut 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.

## Section 06 OIL SYSTEM

### Sub-Section 02 (OIL INJECTION PUMP, REPAIR AND ADJUSTMENT)

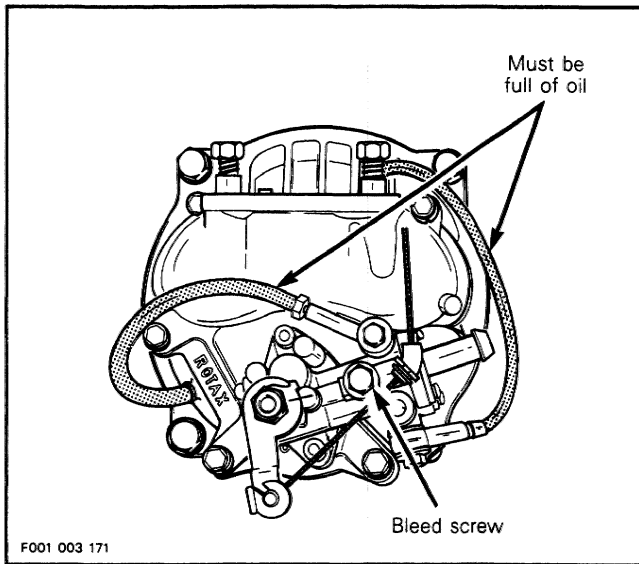
#### Bleeding

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

Ensure oil injection reservoir is sufficiently filled.

Install a dry rag below oil injection pump.

Remove bleed screw to allow oil to flow.



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

Reinstall 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, run 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

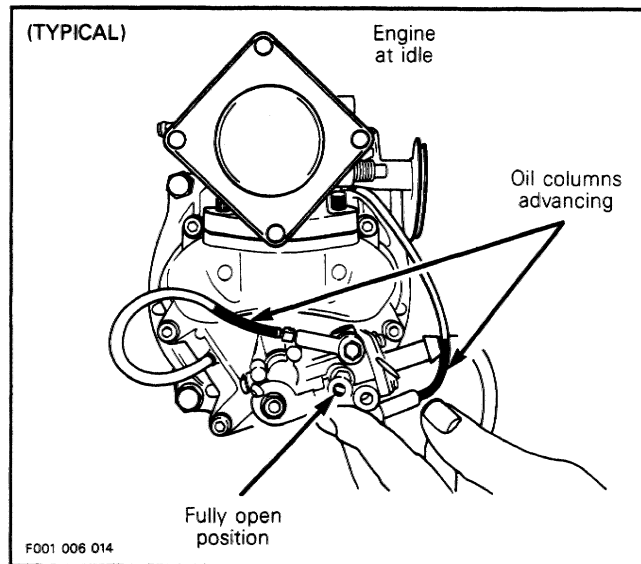
##### On Watercraft

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

Unscrew banjo fittings from pump. Start engine and stop it as soon as it fires.

Ensure that oil level in small oil lines is passed banjo fitting by about 25 mm (1 in) (oil lines are clear tube, therefore the verification can be done easily). 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.



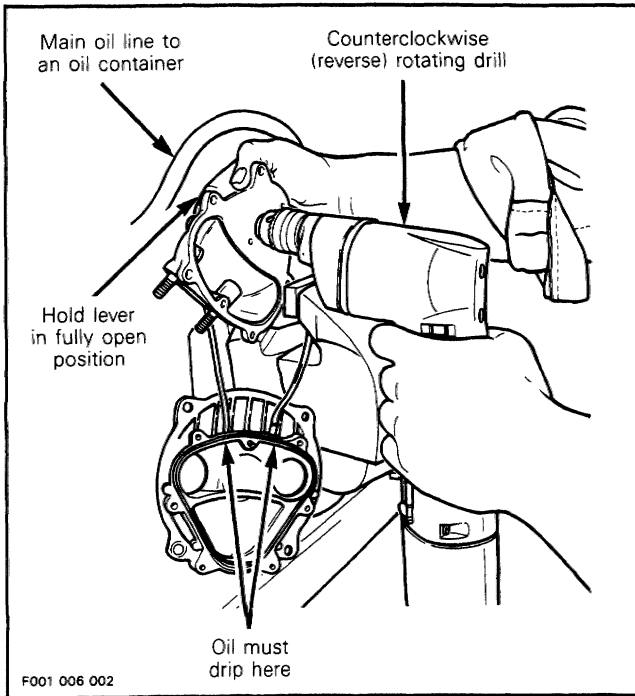
If not remove pump assembly and check the pump gear and drive shaft (if applicable) for defects, replace as necessary. Test pump as describes below :

○ **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**

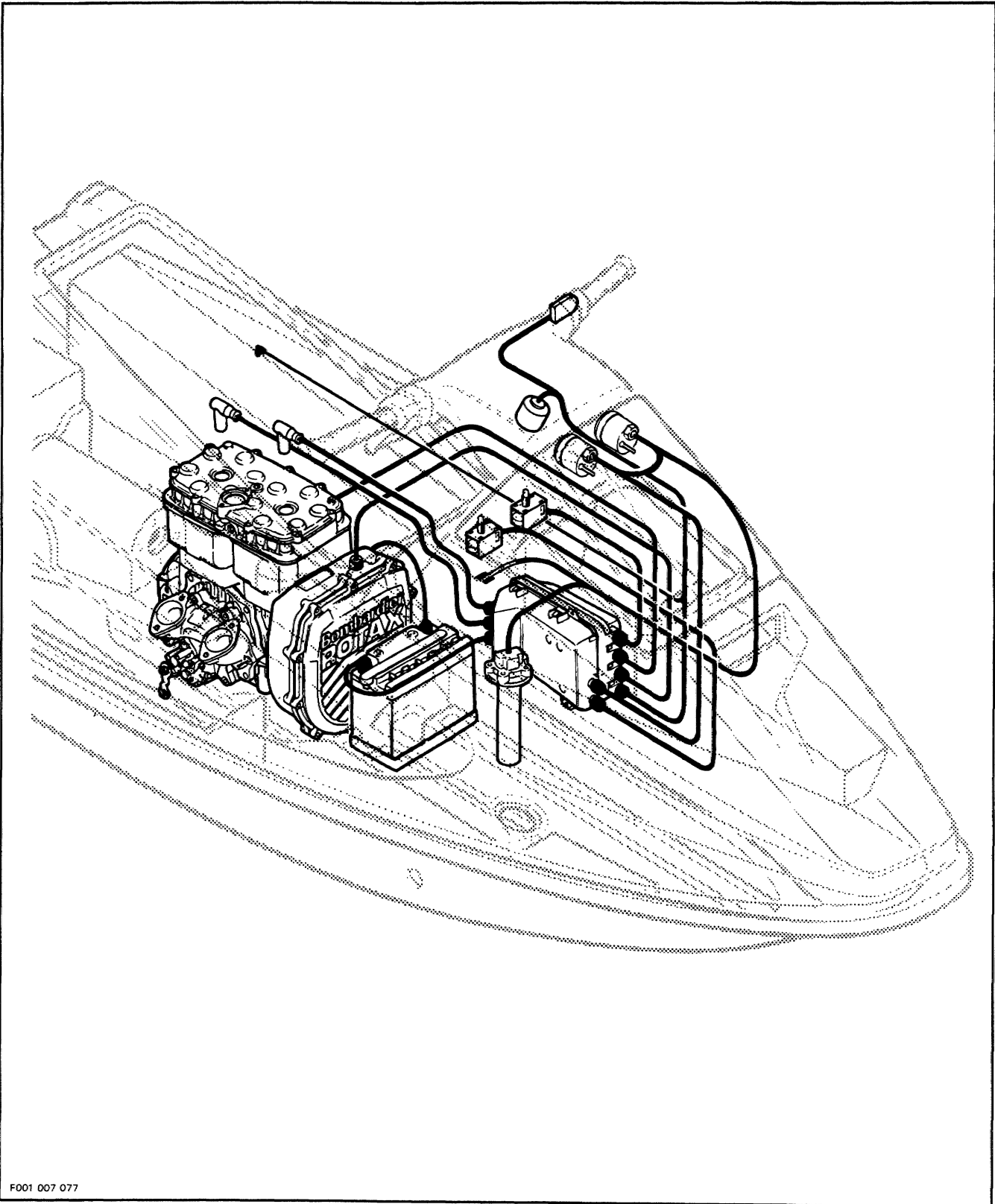
The oil pump must be removed out of watercraft.

Connect a hose filled with injection oil to main line fitting. Insert other hose end in an injection oil container. Using a counterclockwise (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



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## 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 watertight.

### WIRE TERMINAL REMOVAL

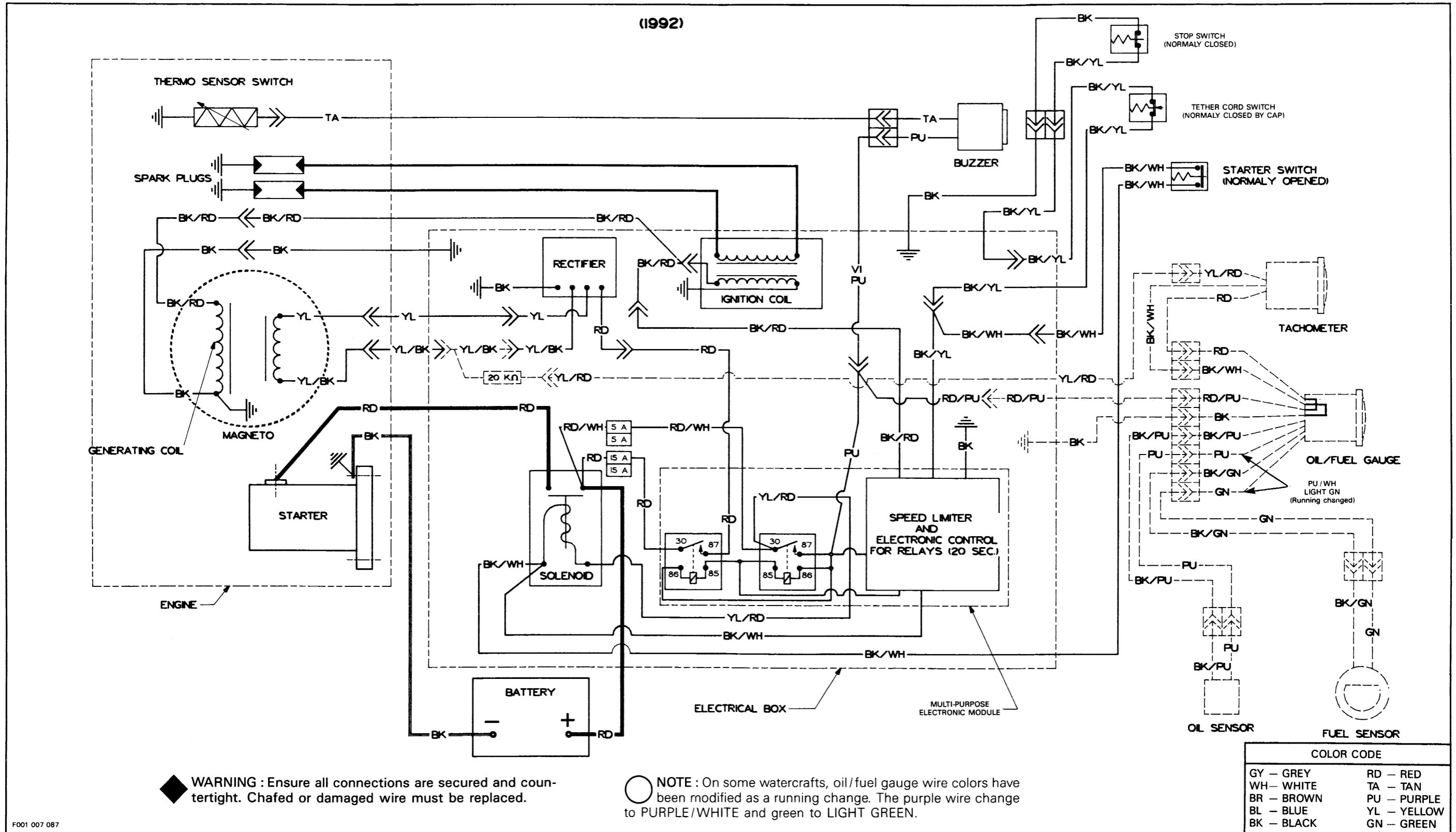
To remove terminal from connector housing use Snap-on TT600-4 tool.



**Section 07 ELECTRICAL**

Sub-Section 01 (WIRING DIAGRAM)

WIRING DIAGRAM FOR 5805, 5812, 5851 AND 5860 MODELS



## IGNITION TIMING

### ELECTRONIC IGNITION SYSTEM

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

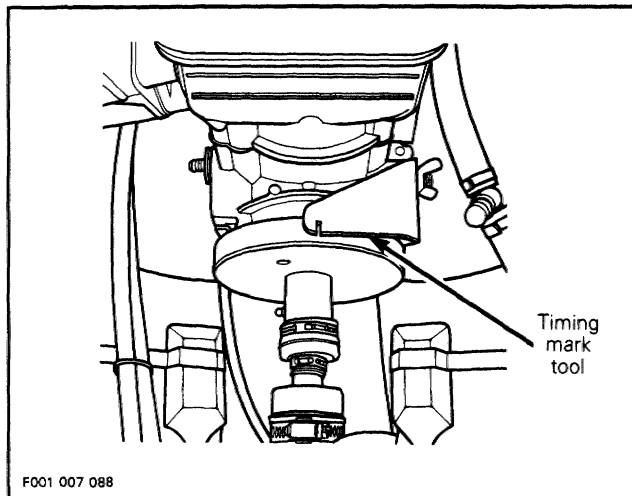
Flywheel timing mark position verification is required to :

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

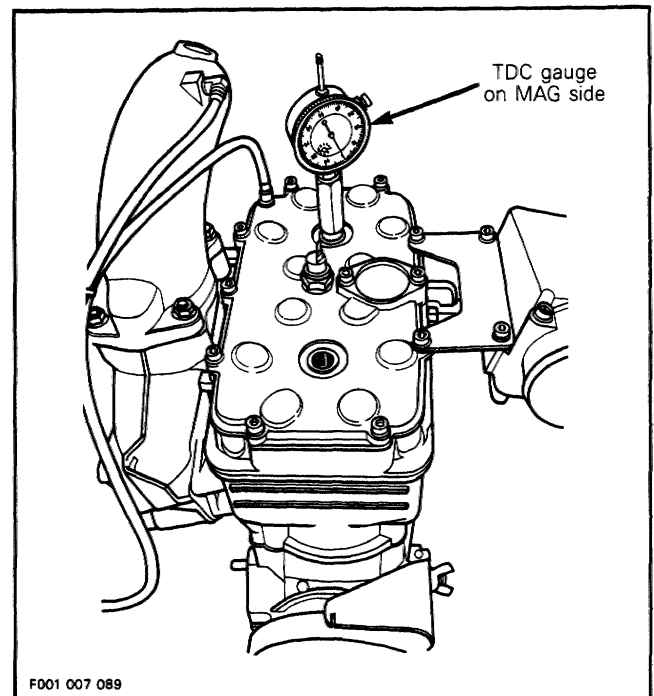
Always verify PTO flywheel timing mark position before checking ignition timing.

#### Verifying PTO Flywheel Timing Mark Position

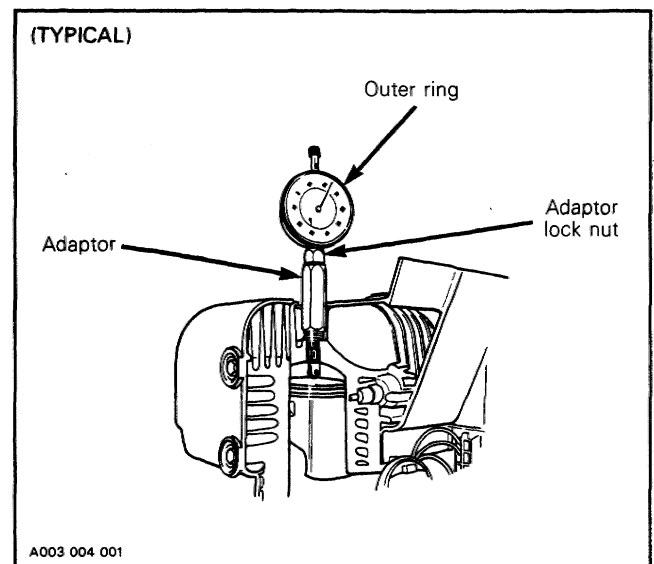
1. Disconnect MAG side spark plug wire and connect wire to grounding device then remove spark plug.
2. Remove PTO flywheel guard.
3. Install timing mark tool (P/N 295 000 102) on engine right side using wing nut previously removed.



4. Install and adjust a TDC gauge (P/N 295 000 065) in spark plug hole as follows :



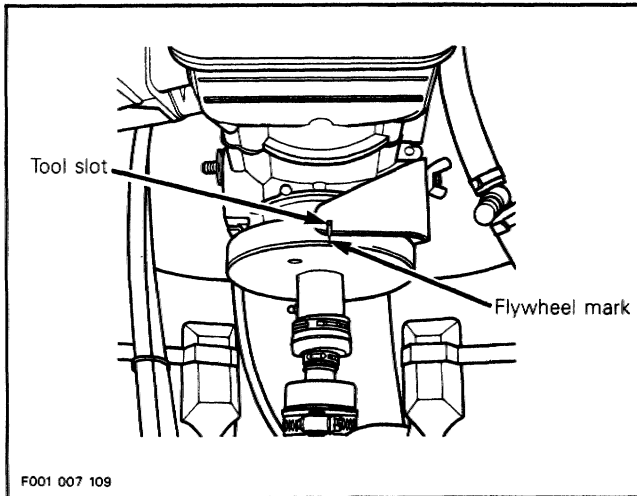
Rotate PTO flywheel counterclockwise (when facing it) until piston is just before top dead center.



## Section 07 ELECTRICAL

### Sub-Section 02 (IGNITION TIMING)

- Loosen adaptor lock nut then holding gauge with dial facing toward PTO, screw adaptor in spark plug hole.
  - Slide gauge far enough into adaptor to obtain a reading then finger tighten adaptor lock nut.
  - Rotate PTO flywheel counterclockwise until piston is at Top Dead Center.
  - Unlock outer ring of dial and turn it until zero (0) on dial aligns with pointer.
  - Lock outer ring in position.
5. From this point, rotate flywheel back 1/4 turn then rotate it counterclockwise to reach 2.65 mm (.104 in) BTDC (Before Top Dead Center).
  6. Using timing tool slot as reference mark, scribe in middle of tool slot a mark onto PTO flywheel.



This 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

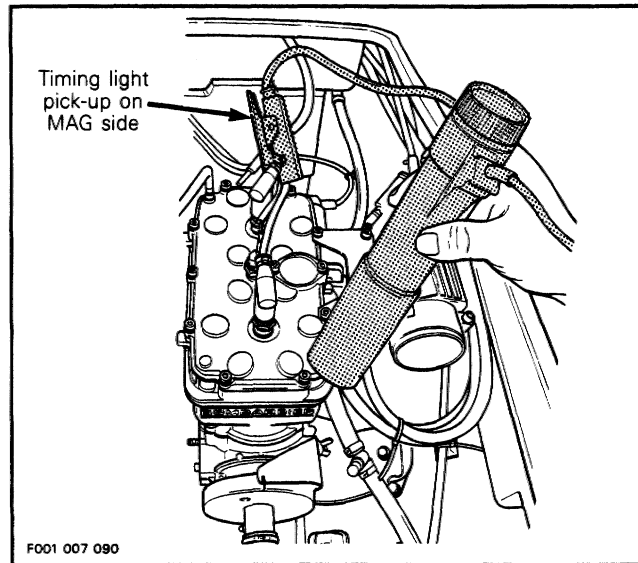
○ **NOTE :** To perform this procedure it is recommended to use a stroboscopic timing light rated to work up to 6000 RPM.

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 timing tool slot. 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 PTO flywheel mark (or reference one previously scribed) aligns with timing tool slot.

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

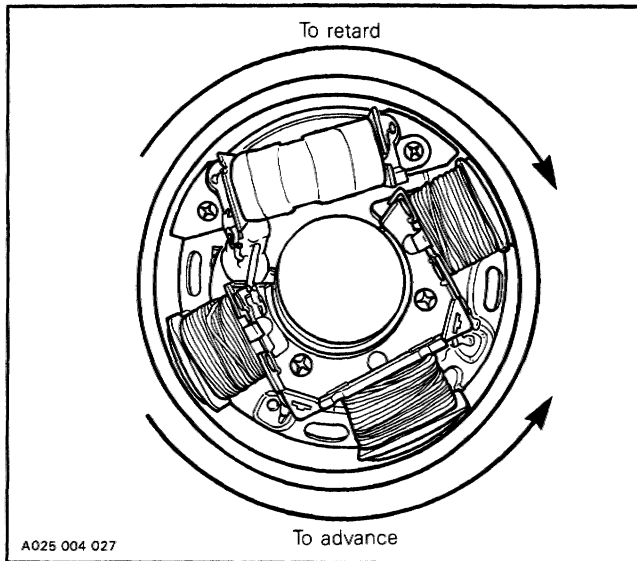
If timing marks align, timing is correct.

**Section 07 ELECTRICAL**  
**Sub-Section 02 (IGNITION TIMING)**

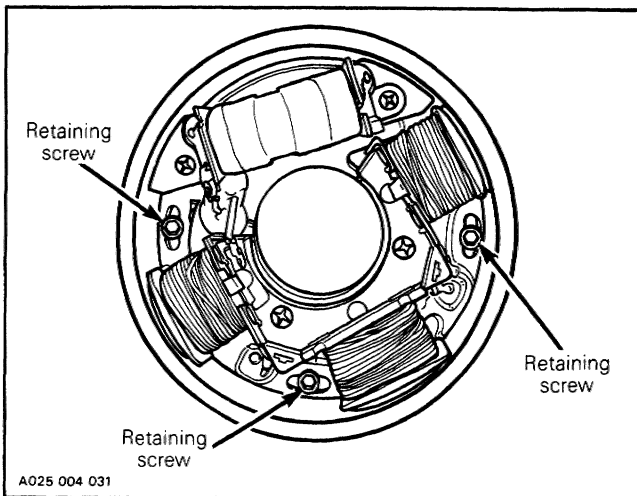
▼ **CAUTION** : Always verify timing marks with TDC gauge before checking the timing. Particularly if PTO flywheel has been replaced, it could possibly move slightly.

**IGNITION TIMING ADJUSTMENT**

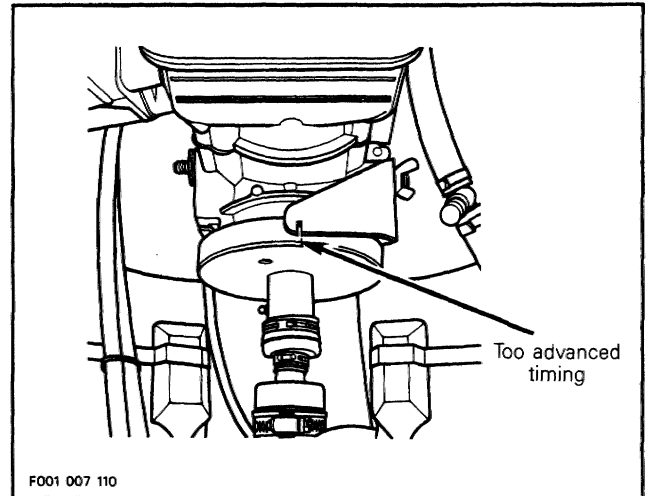
Timing is performed by moving armature plate, clockwise to retard spark occurrence or counterclockwise to advance.



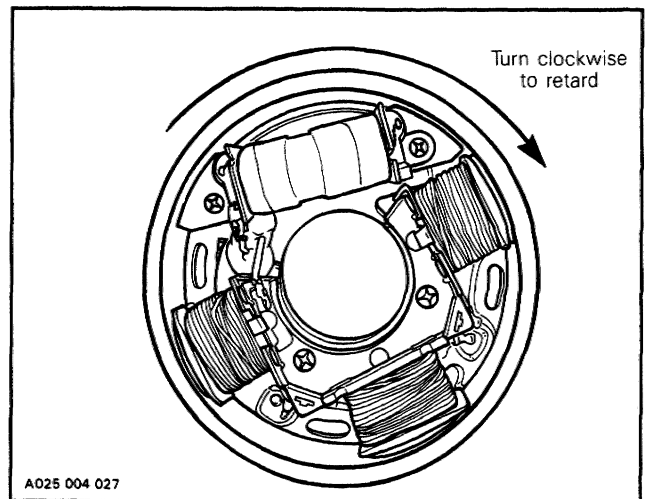
To adjust, loosen three armature plate retaining screws and slightly rotate armature plate in proper direction.



When PTO flywheel mark is on **right** side of timing tool slot, it indicates **advanced** timing.



In this case, turn armature plate clockwise.



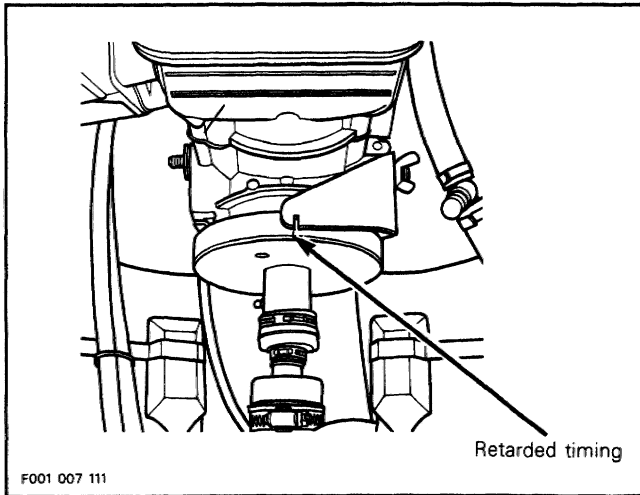
When PTO flywheel mark is on **left** side of timing tool slot, it indicates **retarded** timing.

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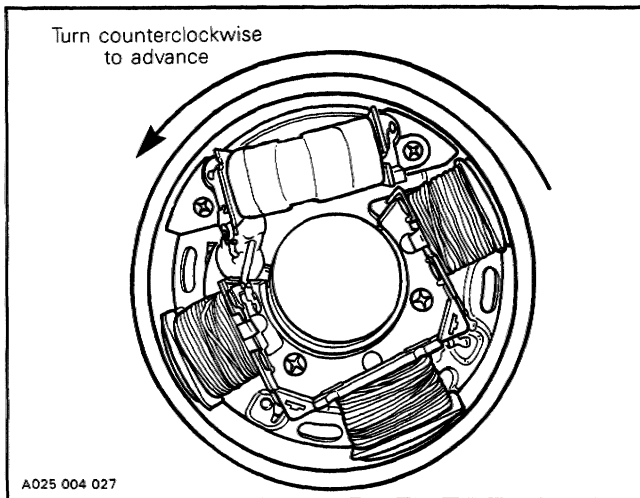
## Section 07 ELECTRICAL

### Sub-Section 02 (IGNITION TIMING)

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In this case, turn armature plate counterclockwise.



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 293 800 015) applied before tightening.

Reinstall removed parts.

Recheck ignition timing (make sure engine is cold).

# BATTERY

## TROUBLESHOOTING

Symptom	Cause	Remedy
Discharged or weak battery	1. Battery posts and/or cable terminal oxidized	Clean and coat with dielectric grease
	2. Loose or bad connections	Check wiring and connectors : cleanliness, damaged or short circuit
	3. Faulty battery (sulfated, doesn't keep a full charge, damaged casing, loose post)	Replace
	*4. Faulty rectifier or relay	First check charging coil. If it is in good condition replace rectifier or relay
	**5. Faulty charging coil	Replace

\* To test charging system, refer to CDI AND CHARGING SYSTEMS 07-06 then look for **current test**.

\*\* To test charging coil, refer to CDI AND CHARGING SYSTEMS 07-06 then look for **battery charging coil**.

## REMOVAL

◆ **WARNING** : Battery black negative cable must always be disconnected first and connected last. Never charge or boost battery while installed on vehicle. Electrolyte or fuel vapors can be present in engine compartment and a spark might ignite them and possibly cause personal injuries.

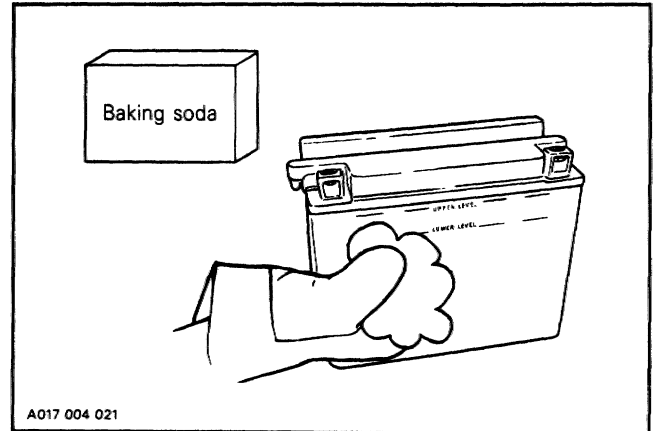
Withdraw battery from vehicle being careful not lean it so that electrolyte flows out of vent tube.

▼ **CAUTION** : Should any electrolyte spillage occur, immediately wash off with a solution of baking soda and water to prevent damage to vehicle components.

## CLEANING

Clean the battery casing, caps, cables and battery posts using a solution of baking soda and water.

▼ **CAUTION** : Do not allow cleaning solution to enter battery interior since it will destroy the electrolyte.



Remove corrosion from battery cable terminals and battery posts using a firm wire brush.

## INSPECTION

Visually inspect battery casing for cracks or other possible damage. If casing is damaged, replace battery and thoroughly clean battery tray and close area with water and baking soda.

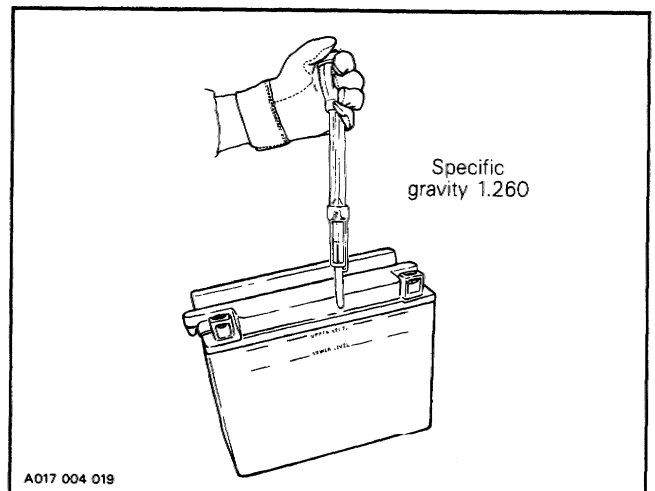
◆ **WARNING** : Should the battery casing be damaged, wear a suitable pair of non-absorbent gloves when removing the battery by hand.

Inspect battery posts for security of mounting.

Inspect for cracked or damaged battery caps, replace defective caps.

◆ **WARNING** : Battery caps do not have vent holes. Make sure that vent tube is not obstructed.

## HYDROMETER TEST



## Section 07 ELECTRICAL

### Sub-Section 03 (BATTERY)

A hydrometer measures the charge of a battery in terms of specific gravity of the electrolyte. Most hydrometers give a true reading at 27°C (80°F).

In order to obtain correct readings, adjust the initial reading by **adding** .004 points to the hydrometer readings for each 5.5°C (10°F) **above** 27°C (80°F) and by **subtracting** .004 point for every 5.5°C (10°F) **below** 27°C (80°F).

This chart will be useful to find the correct reading.

ELECTROLYTE TEMPERATURE		OPERATION TO PERFORM
°C	°F	
38	100	add .008 to the reading .004
32	90	
27	80	correct reading
21	70	subtract .004 .008 .012 .016 .020 .024 from the reading
16	60	
10	50	
4	40	
-1	30	
-7	20	

EXAMPLE NO 1

Temperature below 27°C (80°F) :  
Hydrometer reading : 1.250  
Electrolyte temperature : -7°C (20°F)  
Subtract .024 Sp. Gr.  
Corrected Sp. Gr. is 1.226

EXAMPLE NO 2

Temperature above 27°C (80°F) :  
Hydrometer reading : 1.235  
Electrolyte temperature : 38°C (100°F)  
Add .008 Sp. Gr.  
Corrected Sp. Gr. is 1.243

## BATTERY STORAGE

Disconnect and remove battery from the vehicle.

Check electrolyte level in each cell, add distilled water up to upper level line.

▼ **CAUTION** : Do not overfill.

The battery must always be stored in fully charged condition. If required, charge until specific gravity of 1.260 is obtained.

▼ **CAUTION** : Battery electrolyte temperature must not exceed 50°C (122°F). The casing should not feel hot.

Clean battery terminals and cable connections using a wire brush. Apply a light coat of dielectric grease (P / N 293 550 004) or petroleum jelly on terminals.

Clean battery casing and caps using a solution of baking soda and water. (Do not allow cleaning solution to enter battery, otherwise it will destroy the electrolyte). Rinse battery with clear water and dry well using a clean cloth.

Store battery on a wooden shelf in a cool dry place. Such conditions reduce self-discharging and keep fluid evaporation to a minimum.

During the storage period, recheck electrolyte level and specific gravity readings at least every 40 days. As necessary, keep the battery at its upper level line and near full charge as possible (trickle charge).

## ACTIVATION OF NEW BATTERY

◆ **WARNING** : Never charge or boost battery while installed on vehicle.

A new battery is factory fresh dry charged. For storage purposes, it is fitted with a temporary sealing tube.

Do not remove the sealing tube or loosen battery caps unless activation is desired.

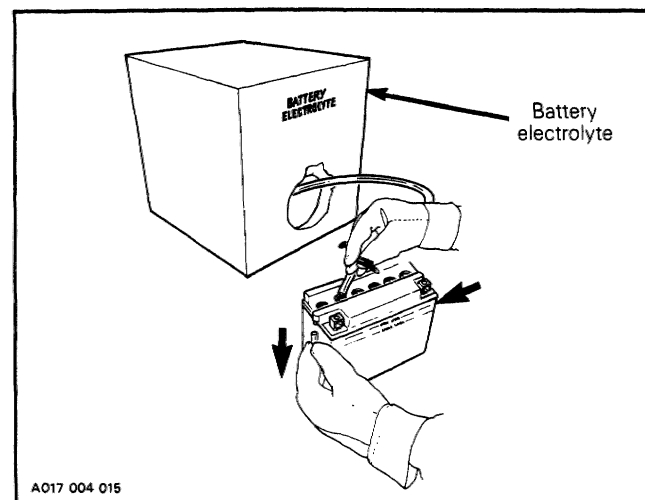
▼ **CAUTION** : Do not leave a new battery standing on a shelf without its sealing tube.

In case of accidental premature removal of caps or sealing tube, battery should be given a full charge.

Perform the following operations anytime a new battery is to be installed.

1. Remove the sealing tube from the vent elbow. Install vent tube, included in the battery kit, to battery elbow.

◆ **WARNING** : Failure to remove the sealing tube could result in an explosion.

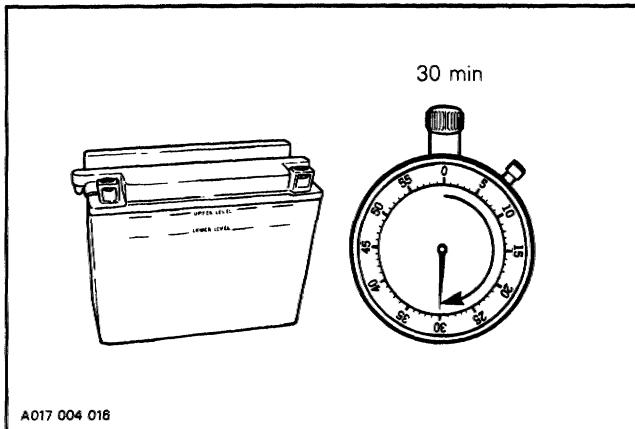


2. Remove caps and fill battery to UPPER LEVEL line with electrolyte (specific gravity : 1.260 at 27°C (80°F)).

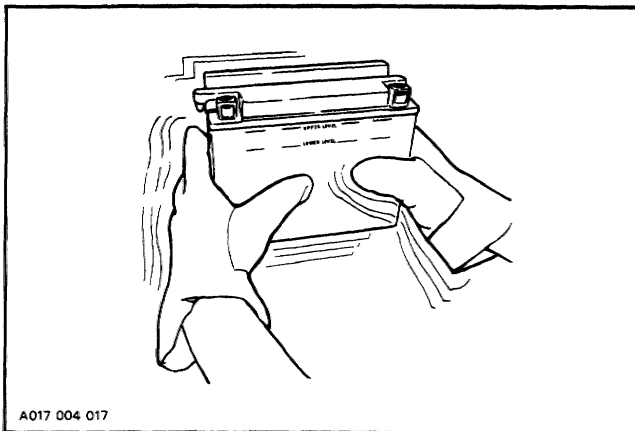
## Section 07 ELECTRICAL

### Sub-Section 03 (BATTERY)

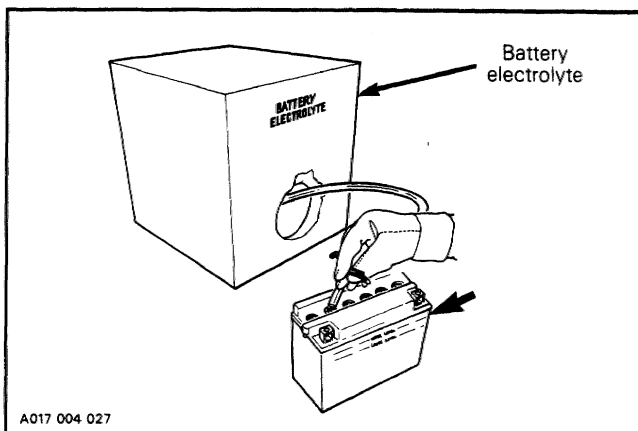
3. Allow the battery to stand for 30 minutes **MINIMUM** so that electrolyte soak through battery cells.



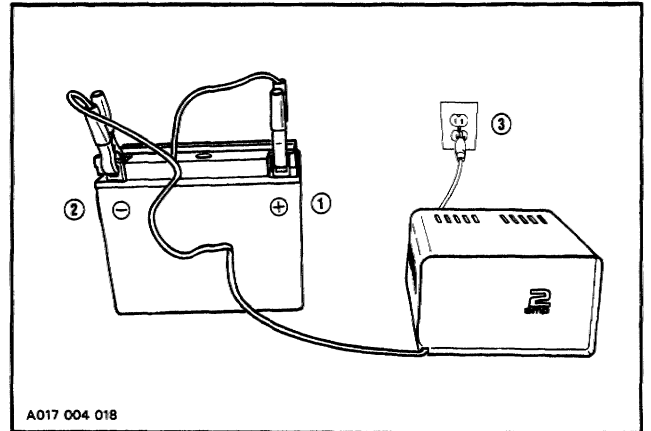
4. Allow gas bubbles to escape by lightly shaking battery by hand.



5. Readjust the electrolyte level to the **UPPER LEVEL** line.



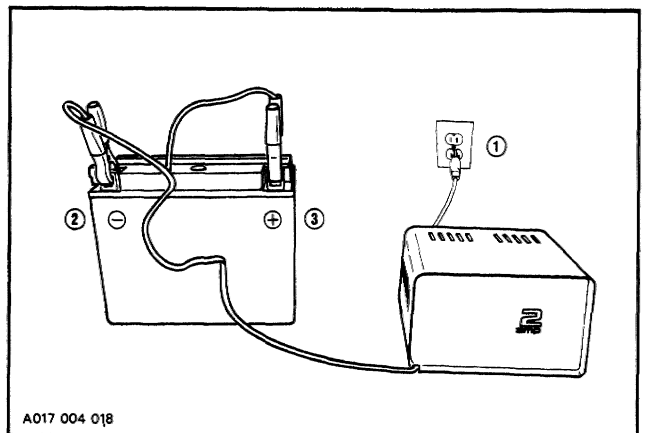
6. Connect a 2 A battery charger for 10 to 20 hours.



▼ **CAUTION** : If charging rate raises higher than 2.4 A reduce it immediately. If cell temperature rises higher than 50°C (122°F) or if the casing feels hot, discontinue charging temporarily or reduce the charging rate.

◆ **WARNING** : Gases given off by a battery being charged are highly explosive. Always charge in a well ventilated area. Keep battery away from cigarettes or open flames. Always turn battery charger off **prior to** disconnecting cables. Otherwise a spark will occur and battery might explode.

7. Disconnect battery charger.

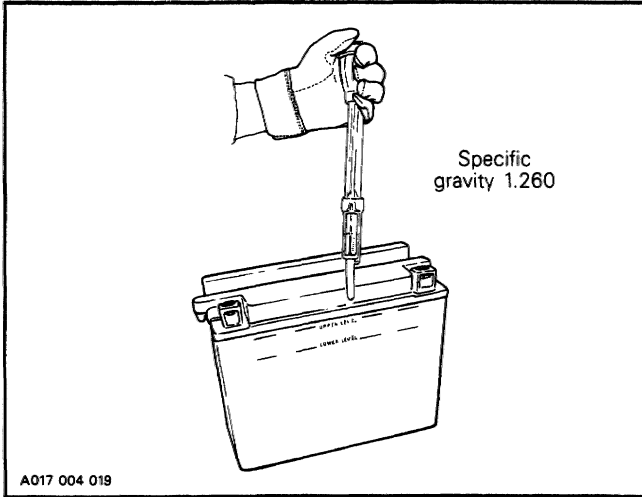




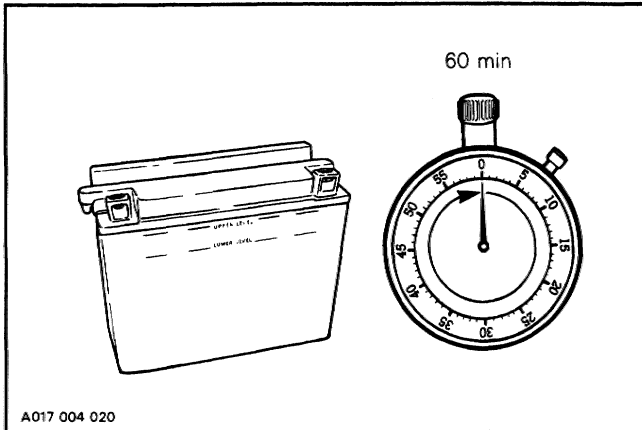
## Section 07 ELECTRICAL

### Sub-Section 03 (BATTERY)

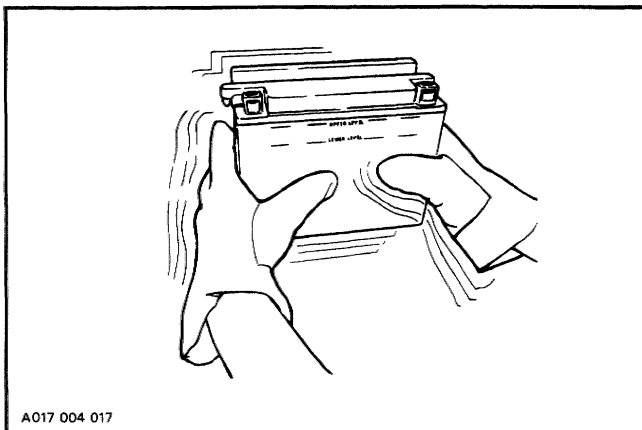
8. Test battery state of charge. Use a hydrometer.



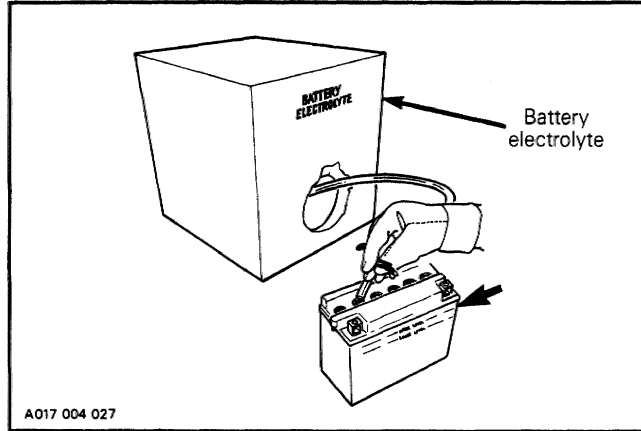
9. Let battery settles for one hour.



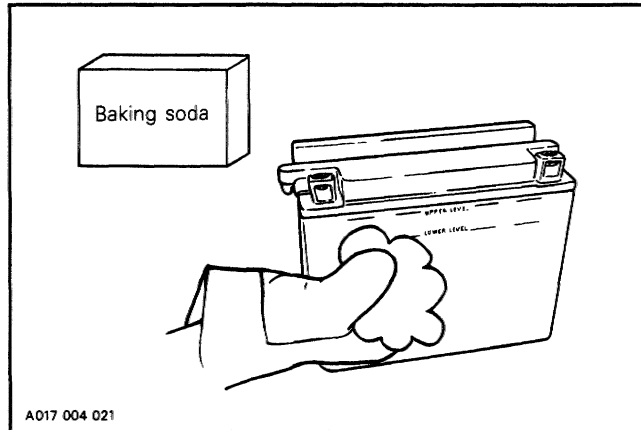
10. Allow gas bubbles to escape by lightly shake battery.



11. Readjust electrolyte level.



12. Reinstall caps and clean any electrolyte spillage using a solution of baking soda and water.



**CAUTION :** Do not allow cleaning solution to enter battery interior since it will destroy the electrolyte.

13. Reinstall battery. Hook up battery cables observing correct polarity and coat terminals with silicone dielectric grease (P/N 293 550 004) or petroleum jelly. Install vent tube.

▼ **CAUTION** : Negative battery terminal should always be disconnected **FIRST** and reconnected **LAST**.

◆ **WARNING** : Vent tube must be free and open. A kinked or bent tube will restrict ventilation and create gas accumulation that might result in an explosion.

○ **NOTE** : It is recommended to verify the battery charge once a month. If necessary, fully charge battery.

## SERVICING

### Electrolyte Level

Since a battery has been activated (see above), add distilled water to top up electrolyte.

## TIPS FOR CHARGING A USED BATTERY

▼ **CAUTION** : Prior to charging the battery, always remove it from the vehicle to prevent electrolyte spillage.

For best results, battery should be charged when the electrolyte and the plates are at room temperature. A battery that is cold may not accept current for several hours after charging begun.

Do not charge frozen battery. If the battery charge is very low, the battery may freeze. If it is suspected to be frozen, keep it in a heated area for about two hours before charging.

◆ **WARNING** : Do not place battery near open flame.

The time required to charge a battery will vary depending some factors such as :

- Battery temperature : The charging time is increased as the temperature goes down. The current accepted by a cold battery will remain low. As the battery warm up, it will accept a higher rate of charge.
- State of charge : Because the electrolyte is nearly pure water in a completely discharged battery, it cannot accept current as well as electrolyte. This is the reason the battery will not accept current when the charging cycle first begins. As the battery remains on the charger, the current from the charger causes the electrolytic acid content to rise which makes the electrolyte a better conductor and then, the battery will accept a higher charging rate.

- Type of charger : Battery chargers vary in the amount of voltage and current that they can supply. Therefore, the time required for the battery to begin accepting measurable current will also vary.

### Charging a Very Flat or Completely Discharged Battery :

Unless this procedure is properly followed, a good battery may be needlessly replaced.

- Measure the voltage at the battery posts with an accurate voltmeter. If it is below 10 volts, the battery will accept current at very low rate, in term of milliamperes, because electrolyte is nearly pure water as explained above. It could be some time before the charging rate increases. Such low current flow may not be detectable on some charger ammeters and the battery will seem not to accept any charge.
- Exceptionnally for this particular case, set the charger to a high rate.

○ **NOTE** : Some chargers have a polarity protection feature which prevents charging unless the charger leads are connected to the correct battery terminals. A completely discharged battery may not have enough voltage to activate this circuitry, even though the leads are connected properly. This will make it appear that the battery will not accept a charge. Follow the charger manufacturer's instruction telling how to bypass or override this circuitry so that the charger will turn on and charge a low-voltage battery.

- Since the battery chargers vary in the amount of voltage and current they provide, the time required for the battery to accept measurable charger current might be up to approximatively 10 hours or more.
- If the charging current is not up to a measurable amount at the end of about 10 hours, the battery should be replaced.
- If the charging current is measurable before the end or at the end of about 10 hours, the battery is good and charging should be completed in the normal manner as specified in **Activation of a new battery**.
- It is recommended that any battery recharged by this procedure be load tested prior to returning it to service.

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## Section 07 ELECTRICAL

### Sub-Section 03 (BATTERY)

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## BATTERY CHARGING EQUIPMENT

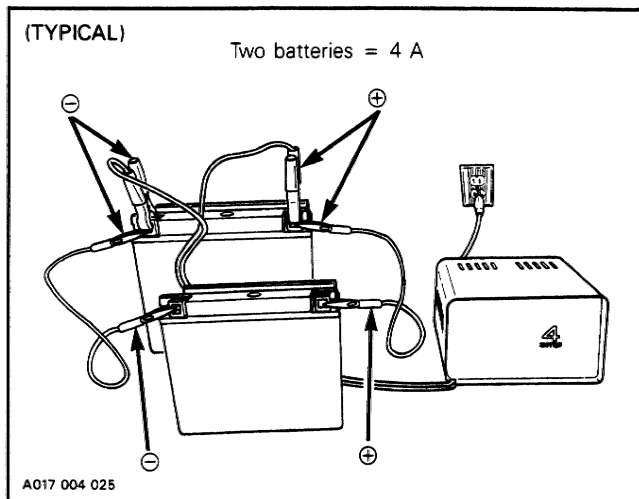
The battery charger should have an adjustable charging rate. Variable adjustment is preferred, but a unit which can be adjusted in small increments is acceptable.

The battery charger must be equipped with an ammeter capable of accurately measuring current of less than one ampere.

### Charging Two or More Batteries at a Time

Connect all positives together and use a charger with a capacities (rated) equal to : number of battery to be charged multiply by 2 A.

For example : Charging five batteries at a time requires a 10 A rated charger ( $5 \times 2 \text{ A} = 10 \text{ A}$ ).



## INSTALLATION OF BATTERY

Install battery, connect red positive cable then black negative cable.

◆ **WARNING : Battery black negative cable must always be disconnected first and connected last.**

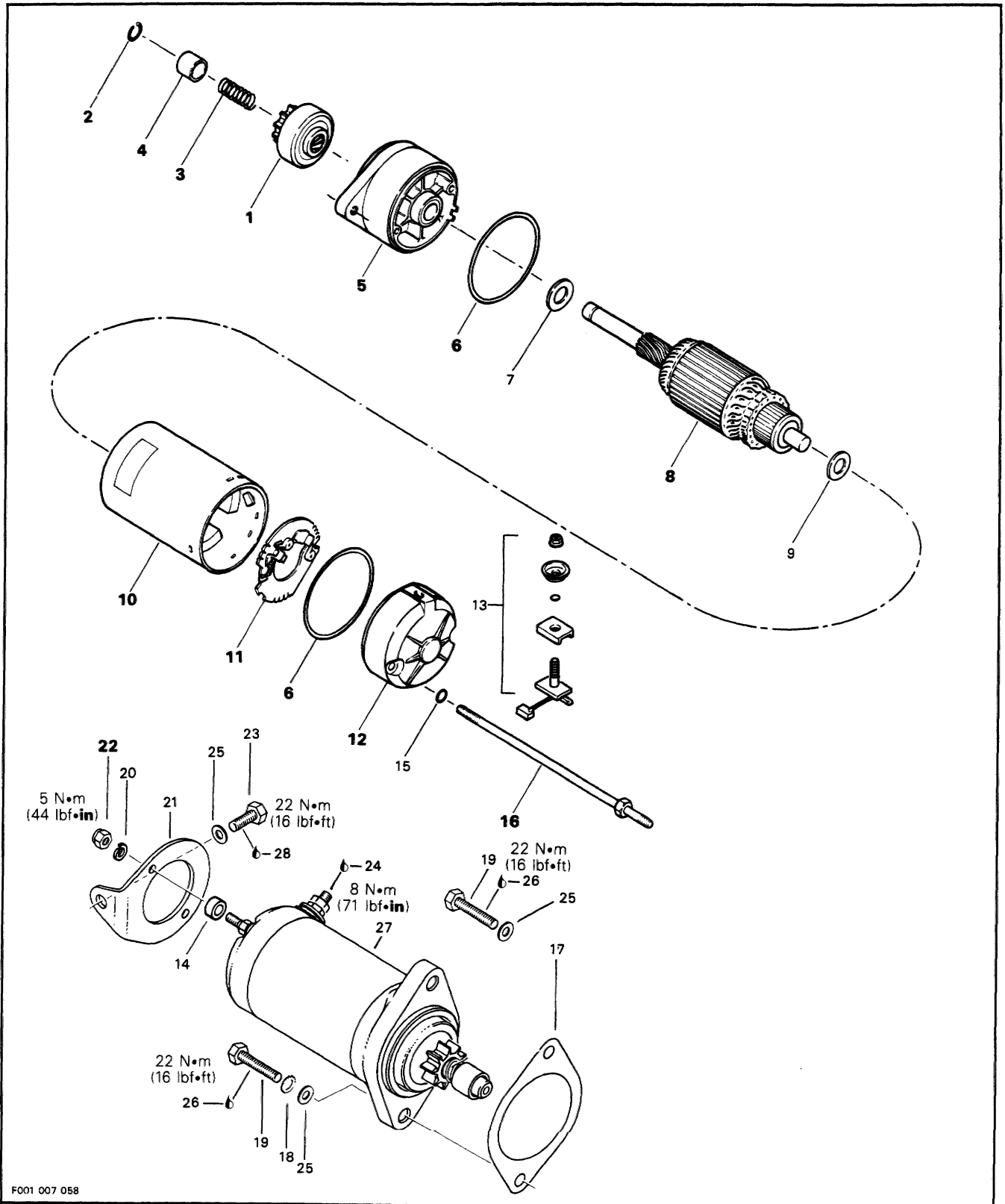
Apply silicone dielectric grease (P/N 293 550 004) or petroleum jelly on battery posts and connectors.

Ensure vent tube is properly installed on battery elbow and that it is not kinked or blocked.

◆ **WARNING : Vent tube must be free and open. If not, it will restrict ventilation and create a gas accumulation that could result in an explosion. Gases given off by a battery being charged are highly explosive. Always charge in a well ventilated area. Keep battery away from cigarettes or open flames. Avoid skin contact with electrolyte.**

**Section 07 ELECTRICAL**  
**Sub-Section 04 (ELECTRIC STARTER)**

**ELECTRIC STARTER**



F001 007 058

## Section 07 ELECTRICAL

### Sub-Section 04 (ELECTRIC STARTER)

## COMPONENTS

- |                            |                                      |
|----------------------------|--------------------------------------|
| 1. Starter clutch assembly | 15. O-ring (2)                       |
| 2. Circlip                 | 16. Through bolt (2)                 |
| 3. Spring                  | 17. Gasket                           |
| 4. Pinion stop collar      | 18. External tooth lock washer 8 mm  |
| 5. Starter clutch housing  | 19. Hexagonal head screw M8 x 30 (2) |
| 6. O-ring (2)              | 20. Lock washer 5 mm (2)             |
| 7. Washer                  | 21. Starter support                  |
| 8. Armature                | 22. Elastic stop nut M5 (2)          |
| 9. Thrust washer           | 23. Hexagonal head screw M8 x 16     |
| 10. Yoke assembly          | 24. Grease dielectric                |
| 11. Brush holder           | 25. Washer 8 mm (3)                  |
| 12. Commutator end frame   | 26. Loctite 271 (red)                |
| 13. Brush kit              | 27. Starter                          |
| 14. Spacer                 | 28. Loctite 242 (blue)               |

## STARTER SPECIFICATION

Nominal output	0.6 kW				
Voltage	12 V				
Rated time	30 seconds				
Rotation	Counterclockwise (viewed from pinion side)				
Weight	Approx. 2 kg (4.4 lb)				
Performance	Test condition				
Spec. at 20°C (68°F)	No load	11.5 V	20 A max.	5500 RPM	
	Load	8.5 V	170 A max.	2200 RPM	2 N•m (18 lbf•in)
	Stall	5 V	350 A max.	0 RPM	3 N•m (27 lbf•in)
Battery	19 Ah				

## 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 04 (ELECTRIC STARTER)**

**STARTING SYSTEM TROUBLESHOOTING TABLE**

SYMPTOM	CAUSE	REMEDY
<b>Starter does not turn.</b>	Burnt fuse. Weak battery. Poor contact of starter switch contact points. Open circuit between starter switch and solenoid switch.	Check wiring condition and replace fuse. Recharge battery. Repair or replace switch. Repair.
<b>Starter turns ; but does not crank the engine.</b>	Burnt or poor contact of solenoid switch contact disc. Poor contact of brush. Burnt commutator. Worn commutator segments. 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.
<b>Starter turns, but overrunning clutch pinion does not mesh with ring gear.</b>	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.
<b>Starter motor keeps running.</b>	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 04 (ELECTRIC STARTER)

#### REMOVAL

Disconnect black cable ground connection from battery.

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

Disconnect red cable connection from battery.

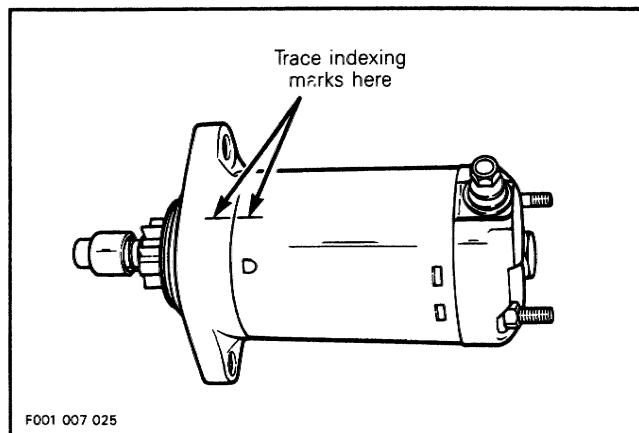
Remove the following parts.

- cables from starter
- screw of starter rear support (item #23)
- starter mount screws (item #19)

#### DISASSEMBLY

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

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



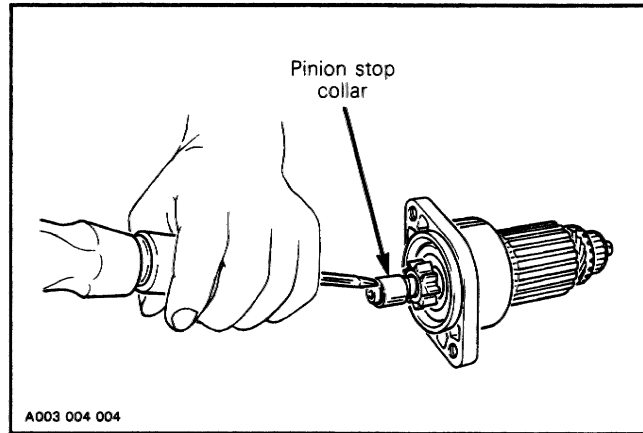
Remove starter support nuts then through bolts. Separate end frame from yoke assembly. Withdraw yoke assembly from armature.

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.

##### 2,3,4, Circlip, Spring and Pinion Stop Collar

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



##### 1,5,6,8, Clutch Ass'y, Housing, O-ring and Armature

Turn assembly counterclockwise 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 glasses 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 ring 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.

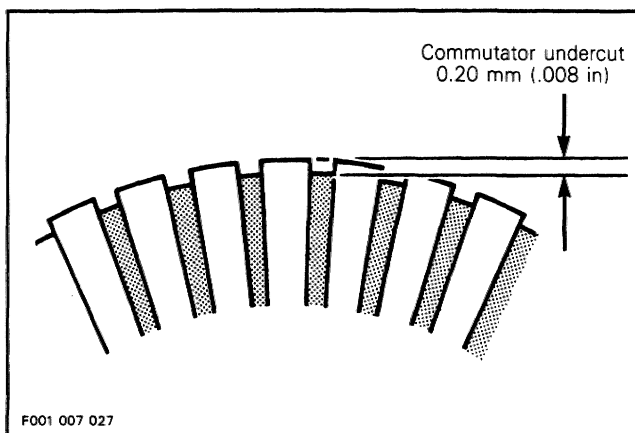
## INSPECTION

### Armature

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

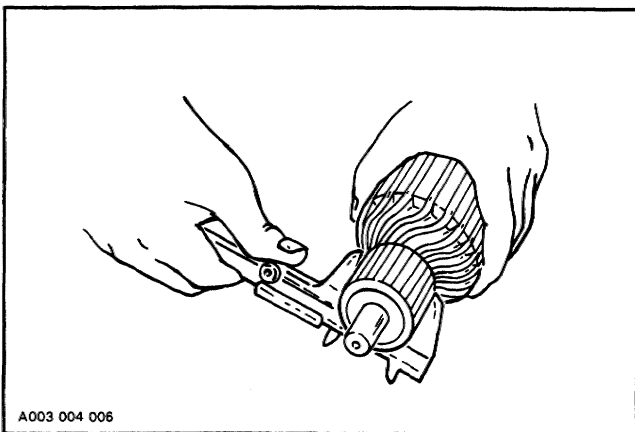
Check commutator for roughness, burnt or scored surface. If necessary, turn commutator on a lathe, enough to resurface only.

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 27 mm (1.063 in), replace.



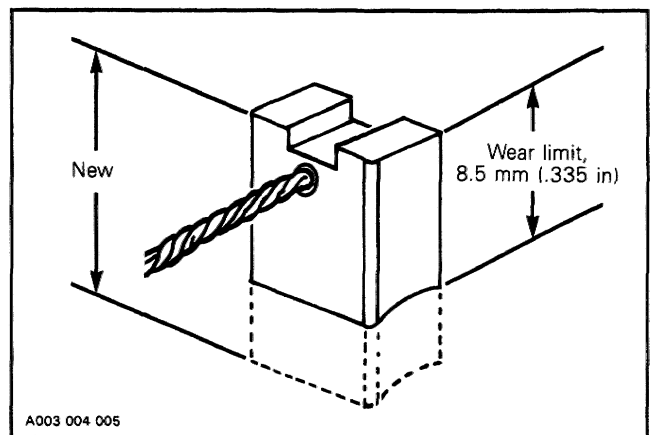
### Brush Holder

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.

○ **NOTE** : Always check engine ring gear teeth for wear and damage. If defective replace ring gear. Refer to ENGINE 03-04 then refer to ring gear.

### Starter Switch

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



**Section 07 ELECTRICAL**  
**Sub-Section 04 (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 ; +12 V on YELLOW/RED wire and negative (-) on BLACK/WHITE 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**

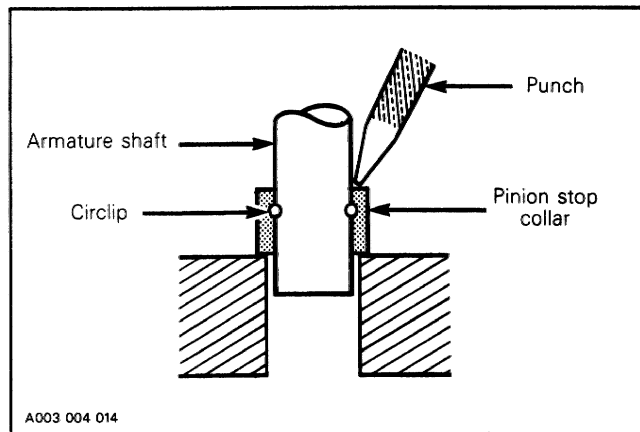
Reverse the order of disassembly to reassemble starter. However, attention should be paid to the following operations.

Prior to assembling, coat sliding surfaces on armature shaft splines, overrunning clutch and bushing with G.E. Versilube G 341 M or ESSO Beacon 325 lubricant or equivalent.

Apply motor oil on metal bushings.

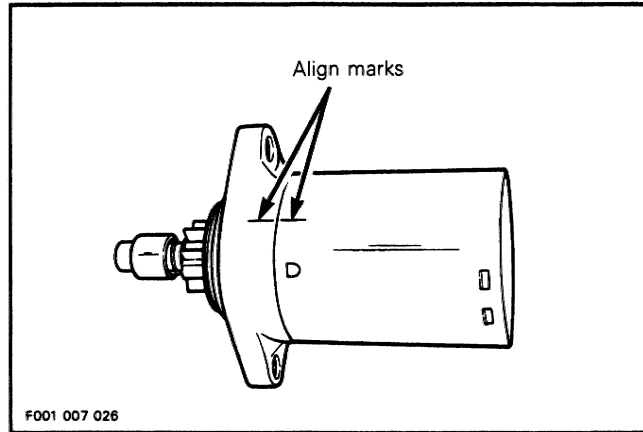
**2,4, Circlip and Pinion Stop Collar**

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 and Yoke Ass'y**

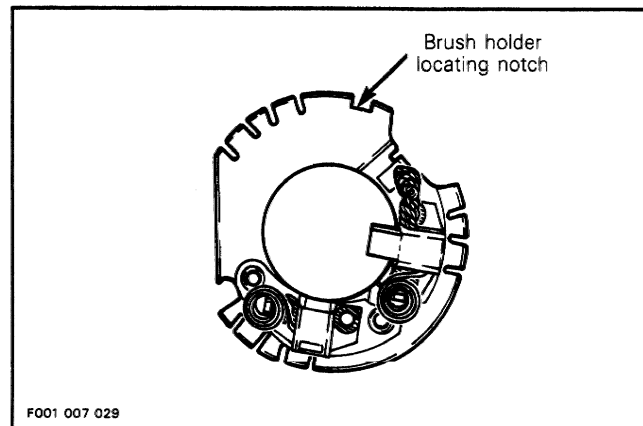
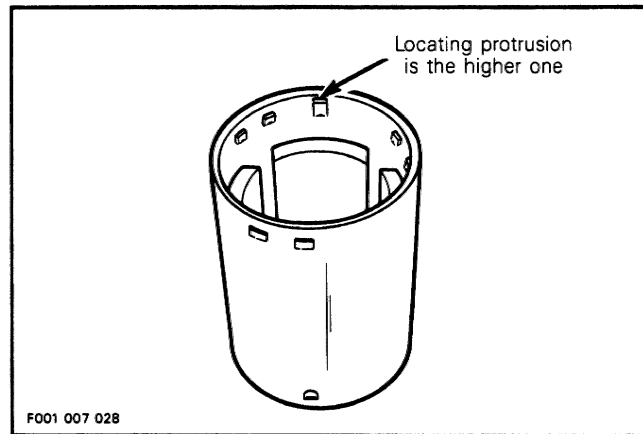
Align previously traced indexing marks.



**10,12,16, Yoke Ass'y, End Frame and Through Bolt**

Open brushes and slide over commutator.

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

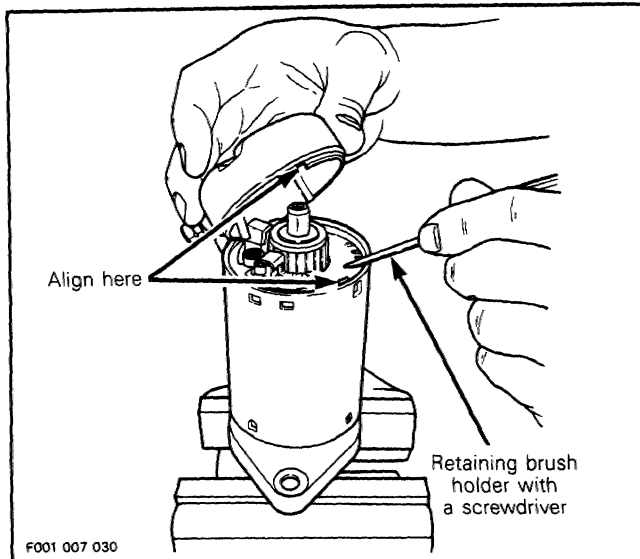


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**Section 07 ELECTRICAL**  
**Sub-Section 04 (ELECTRIC STARTER)**

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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.

○ **NOTE** : Make sure to install stater screws in their proper holes of ignition housing. Install upper screw in lower hole and lower screw in upper hole.

Install starter apply Loctite 242 on starter support screw threads and torque screw to 22 N•m (16 lbf•ft).

Connect the red battery cable to the starter and torque nut to 8 N•m (71 lbf•in). Apply Neopren grease on terminal and nut.

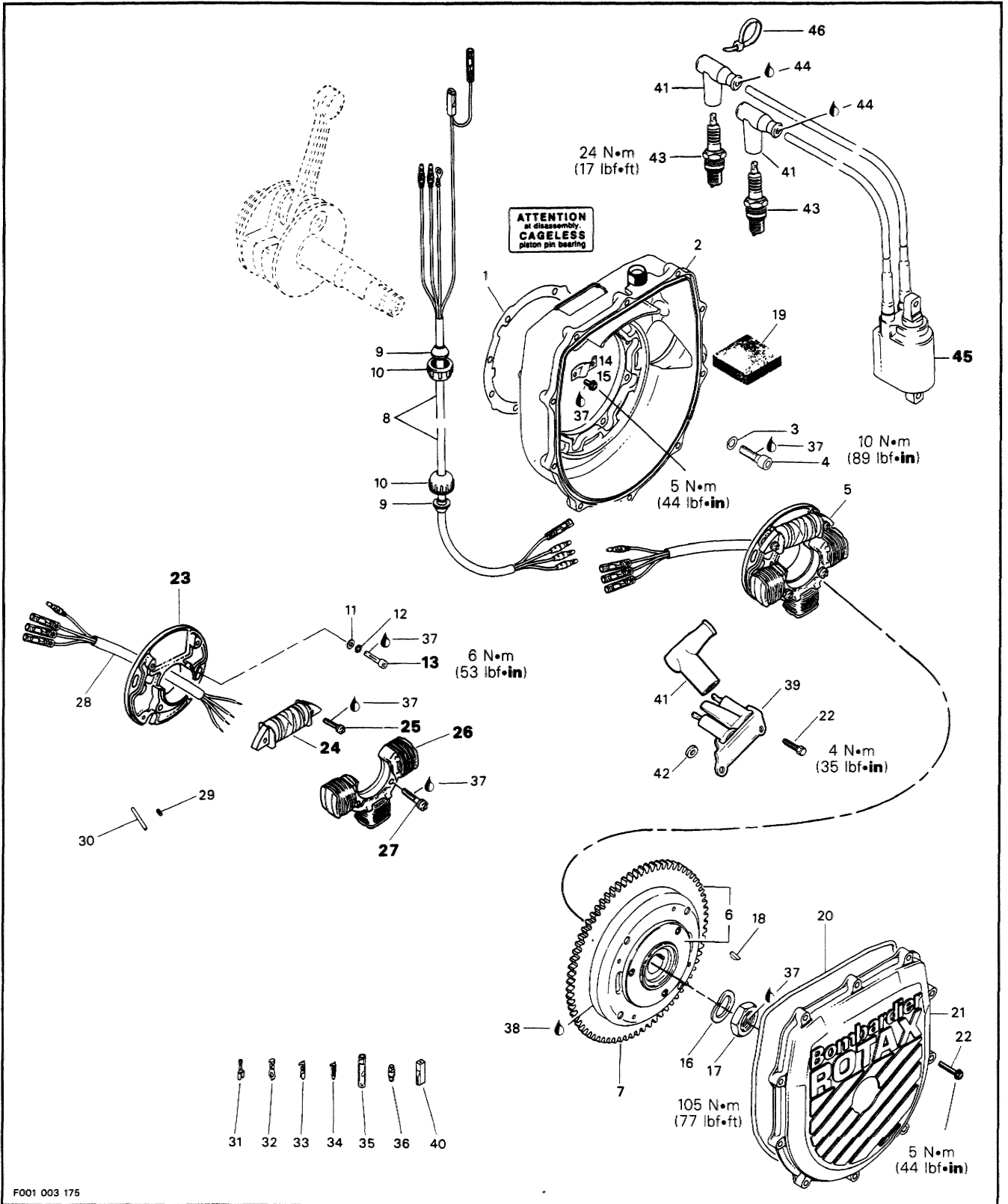
Then connect black cable to starter using a flat washer, a tooth washer and a screw with Loctite 271 on threads. Torque screws to 22 N•m (16 lbf•ft). Apply Neopren grease on terminal and screw.

◆ **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 05 (MAGNETO SYSTEM)**

**MAGNETO SYSTEM, REPAIR**



## Section 07 ELECTRICAL

### Sub-Section 05 (MAGNETO SYSTEM)

## COMPONENTS

1. Gasket
2. Ignition housing
3. Lock washer M8 (8)
4. Allen screw M8 x 25 (8)
5. Armature plate assembly
6. Magneto flywheel assembly
7. Ring Gear 77 teeth
8. Harness assembly
9. Grommet (2)
10. Cap (2)
11. Washer M5.5 (3)
12. Lock washer M5 (3)
13. Allen screw M5 x 18 (3)
14. Retainer plate
15. Taptite screw M5 x 8 (2)
16. Lock washer M22
17. Hexagonal nut M22
18. Woodruff key
19. Protection mat
20. O-ring
21. Ignition housing cover
22. Self tapping screw M5 x 25 (10)
23. Armature plate
24. Generating coil
25. Phillips screw M5 x 22 (2)
26. Battery charging coil
27. Screw M6 x 25 (2)
28. Harness assembly
29. Terminal clip (4)
30. Shrink tube 30 mm (4)
31. Female connector
32. Ring terminal
33. Female terminal
34. Male terminal
35. Insulation sheath
36. Insulation sheath
37. Loctite 242
38. Loctite 648
39. Ground plate
40. Protection cap
41. Insulator (2)
42. Star washer M5 (2)
43. Spark plug (2)
44. Dielectric grease
45. Ignition coil
46. Tie rap (2)

## REMOVAL

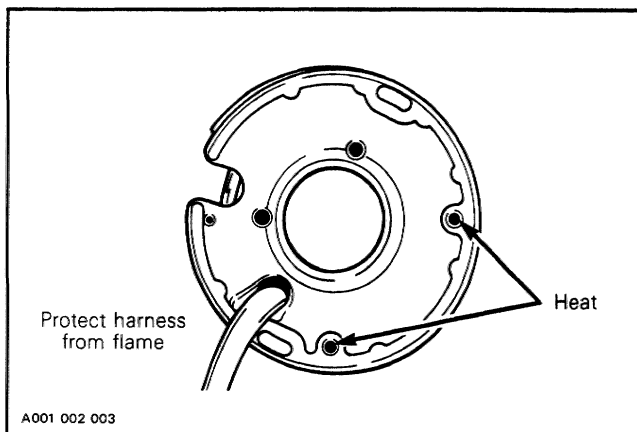
Refer to ENGINE section 03-04 then look for PTO flywheel and magneto for parts removal.

## DISASSEMBLY

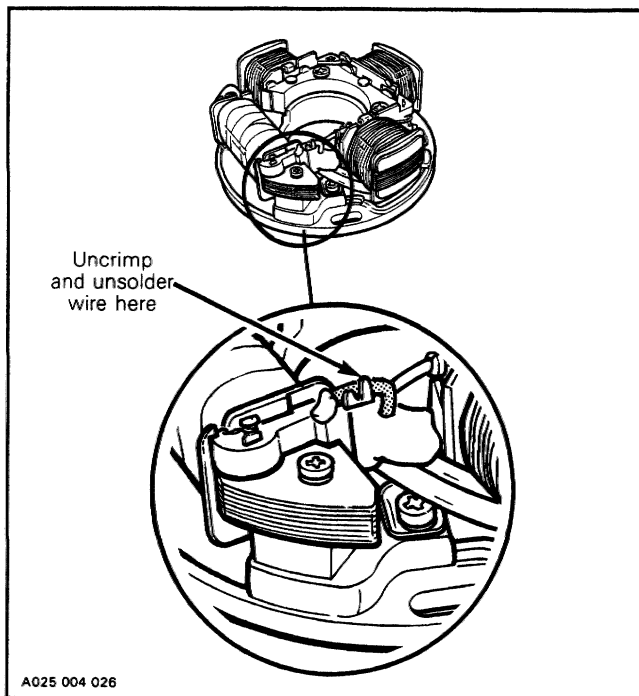
### 24, Generating Coil

To replace generating coil :

- Heat the armature plate to 93°C (200°F) around the screw holes to break the threadlocker bond.



- Remove screws.
- Uncrimp and unsolder BLACK/RED wire from coil terminal.



▼ CAUTION : Protect harness from flame.

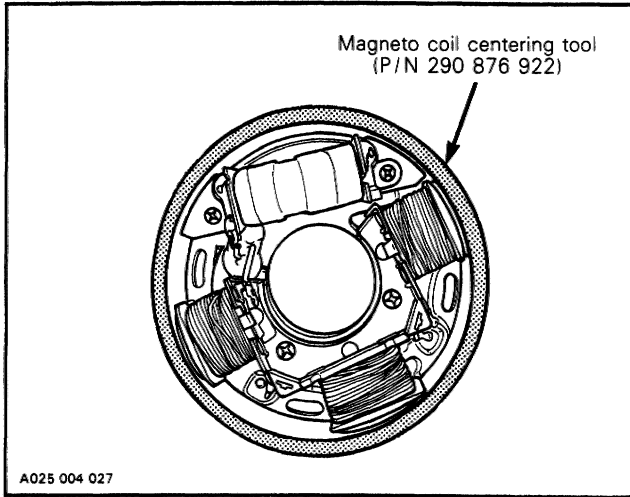
- Strip end of old wire then crimp and solder on new coil.

**Section 07 ELECTRICAL**  
**Sub-Section 05 (MAGNETO SYSTEM)**

**24,25, Generating Coil and Screw**

Apply Loctite 242 (blue, medium strength) to screws and install the new coil on armature plate.

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

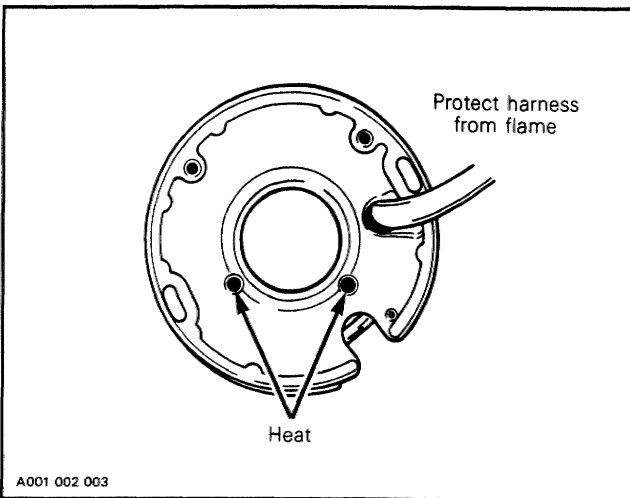


**CAUTION:** Before reinstalling the magneto, remove the loose epoxy from harness.

**26, Battery Charging Coil**

To replace battery charging coil :

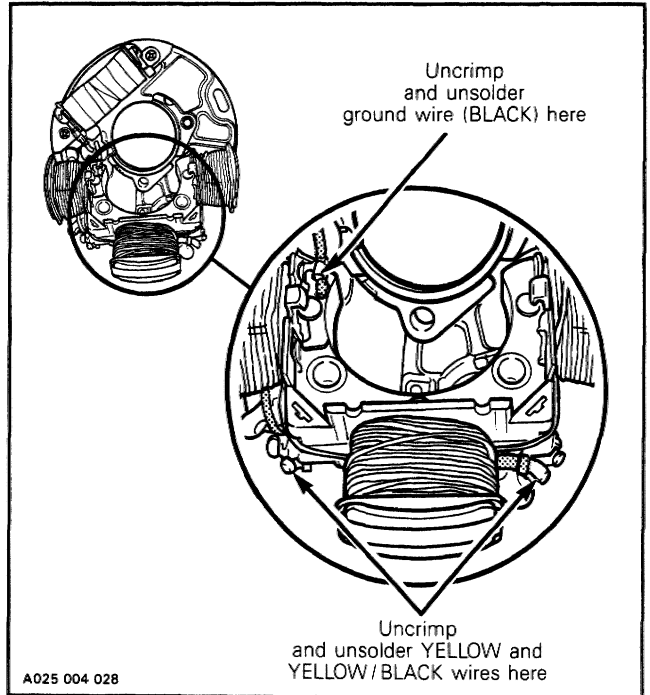
- Heat the armature plate to 93°C (200°F) around the screw holes to break the threadlocker bond.



**CAUTION:** Protect harness from flame.

- Remove screws.

- Uncrimp and insolder YELLOW and YELLOW/BLACK wires from coil terminals.
- Uncrimp and unsolder ground wire (BLACK) from coil core.

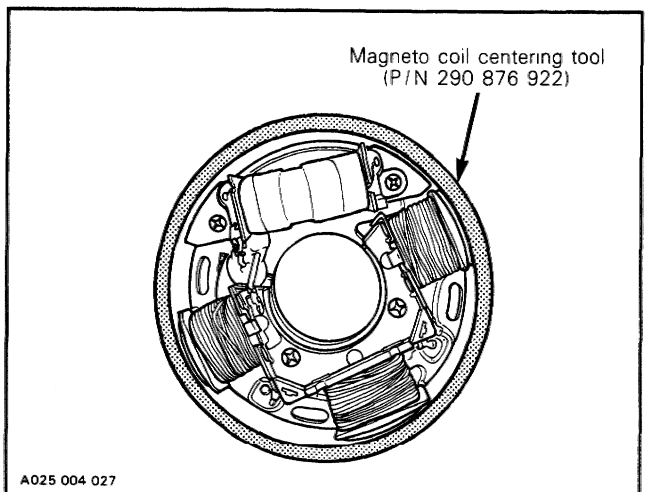


- Position new coil, crimp and solder all wires.

**26,27, Battery Charging Coil and Screw**

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.



## Section 07 ELECTRICAL

### Sub-Section 05 (MAGNETO SYSTEM)

## ASSEMBLY

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

### 13,23, Screw and Armature Plate

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

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

### 45, Ignition Coil

Connect BLACK/RED wire to coil terminal.

### Identification of Magneto Flywheels

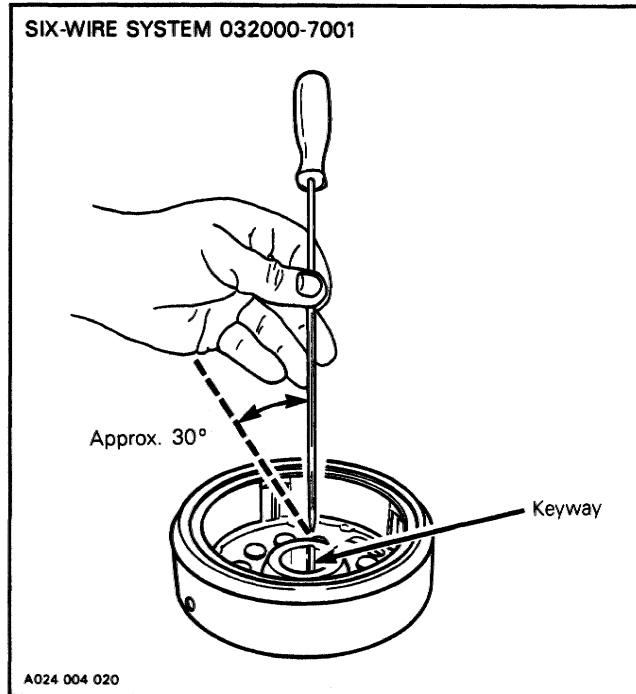
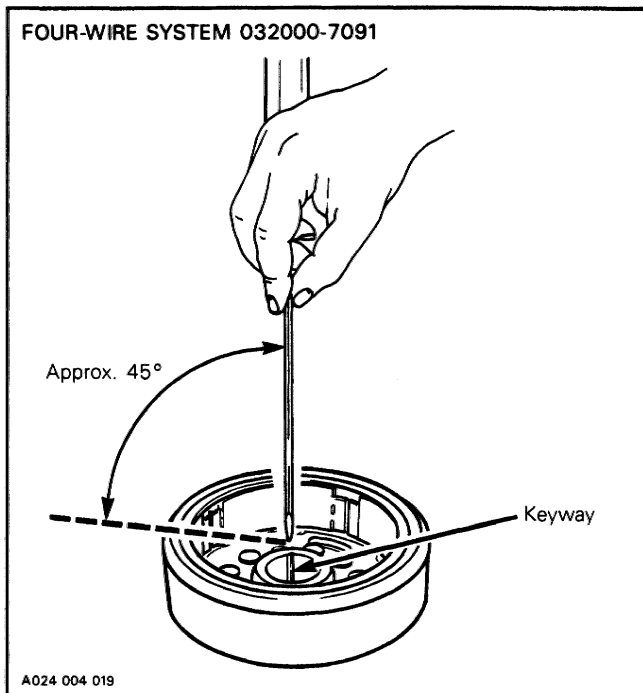
There are two ways to differentiate the two magneto flywheels :

1. Nippondenso part number stamped on flywheel is different for each system :

Four-wire system flywheel : (P/N 290 995 119) - Nippondenso P/N is 032000-7091 ;

Six-wire system flywheel : (P/N 290 995 114) - Nippondenso P/N is 032000-7001 ;

2. The glued-in magnets have a different angle towards the keyway.



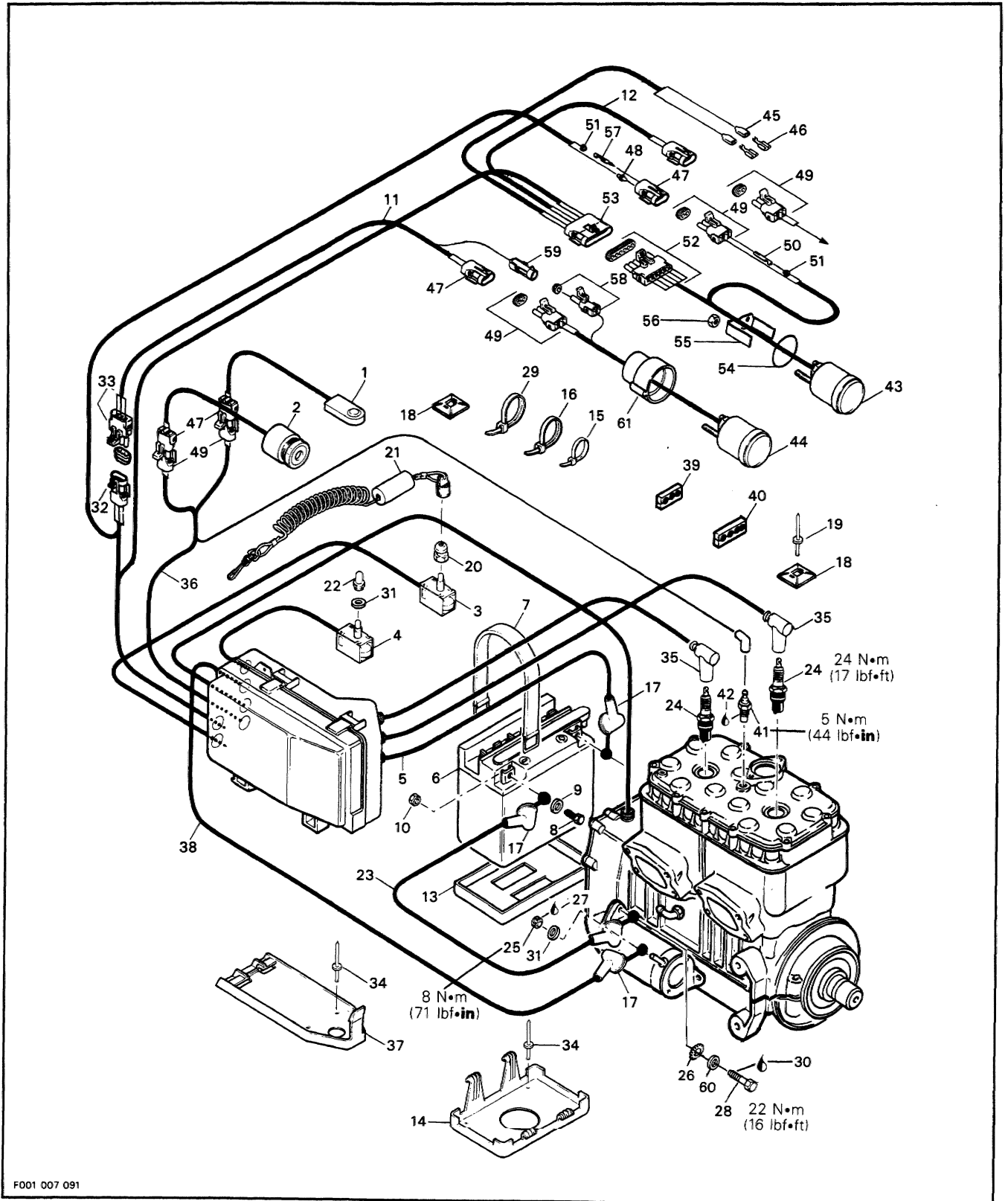
## INSTALLATION

Refer to ENGINE section 03-04 then look for **PTO flywheel** and **magneto** for installation.

Perform ignition timing.

**Section 07 ELECTRICAL**  
**Sub-Section 06 (CDI AND CHARGING SYSTEMS)**

**CDI AND CHARGING SYSTEMS; TESTING PROCEDURES**



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## Section 07 ELECTRICAL

### Sub-Section 06 (CDI AND CHARGING SYSTEMS)

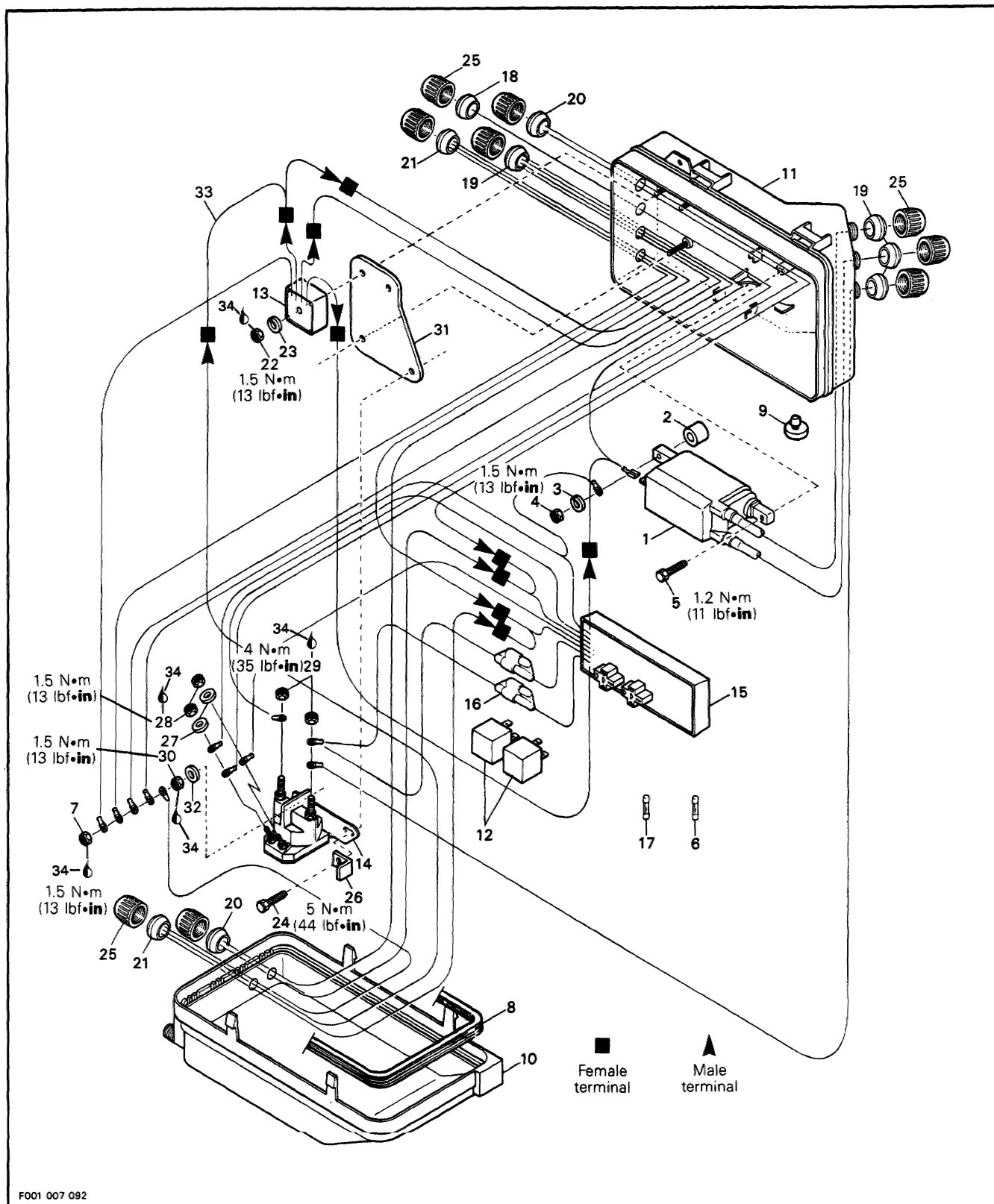
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#### COMPONENTS

1. Stop switch assembly
  2. Buzzer assembly
  3. Tether cord switch
  4. Ignition starter switch
  5. Red battery cable (positive)
  6. Battery
  7. Strap
  8. Screw M6 x 16 (2)
  9. Washer M6 (2)
  10. Nut M6 (2)
  11. Harness (3 ways) assembly
  12. Harness (4 ways) assembly
  13. Battery lower pad
  14. Battery support
  15. Tie rap
  16. Tie rap
  17. Protector cap (3)
  18. Tie mount
  19. Rivet 1/8" x .640"
  20. Switch nut
  21. Tether cord
  22. Cap
  23. Battery ground cable
  24. Spark plug (2)
  25. Lock nut M6
  26. External tooth lock washer M8
  27. Dielectric grease
  28. Hexagonal screw M8 x 16 (2)
  29. Tie rap
  30. Loctite 271
  31. Washer
  32. Male tab housing (3 ways)
  33. Female tab housing (3 ways)
  34. Rivet
  35. Spark plug cap (2)
  36. Buzzer/stop switch harness assembly
  37. Electrical box support
  38. Starter cable
  39. Four wires support (2)
  40. Three wires support
  41. Temperature sensor
  42. Loctite 515
  43. Oil/fuel gauge
  44. Tachometer
  45. Sheath (2)
  46. Female terminal (2)
  47. Female tab housing (2 ways) (5)
  48. Wire seal (2)
  49. Male tab housing (2 ways) (5)
  50. Female terminal
  51. Wire seal
  52. Male tab housing (6 ways)
  53. Tab housing (6 ways)
  54. O-ring (1)
  55. Gauge support (1)
  56. Plastic nut (2)
  57. Male terminal
  58. Male tab housing (1 way)
  59. Tab housing (1 way)
  60. Flat washer M8
  61. Gauge support
-

**Section 07 ELECTRICAL**  
**Sub-Section 06 (CDI AND CHARGING SYSTEMS)**

**ELECTRICAL BOX**



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## Section 07 ELECTRICAL

### Sub-Section 06 (CDI AND CHARGING SYSTEMS)

## COMPONENTS

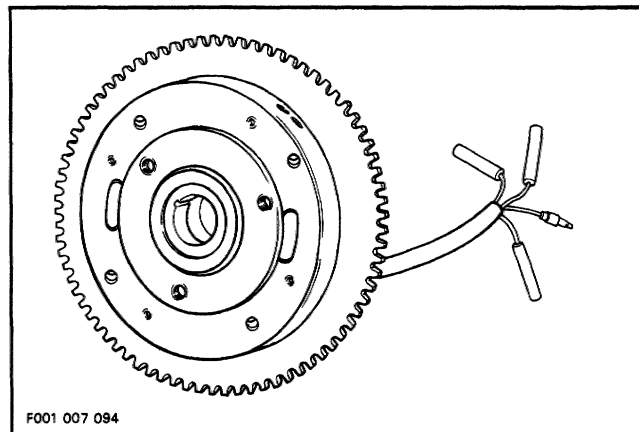
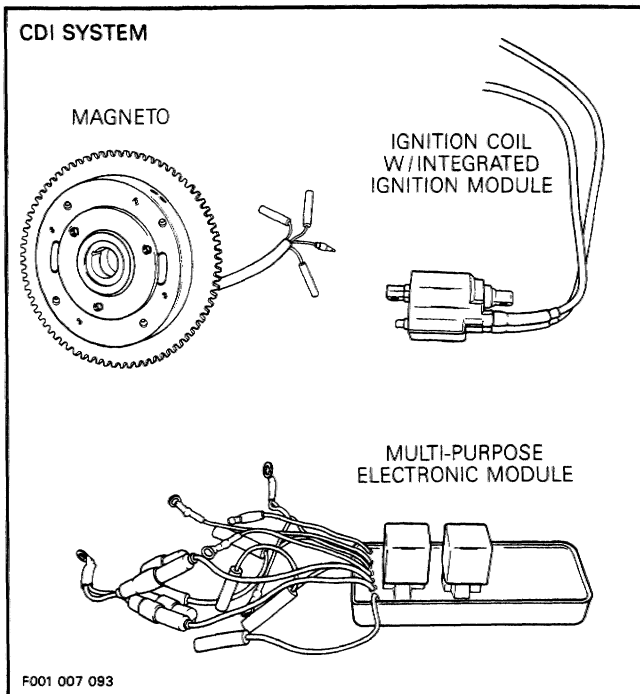
1. Ignition coil
2. Spacer
3. Lock washer M6
4. Nut M6
5. Tapping screw M6.3 x 25
6. Fuse 15 Amp.
7. Elastic stop nut M6
8. Gasket
9. Rubber bumper (4)
10. Cover
11. Electric box base
12. Relay (2)
13. Rectifier
14. Solenoid
15. Multi-purpose electronic module
16. Fuse holder assembly
17. Fuse 5 Amp.
18. Grommet
19. Grommet (2)
20. Grommet (6)
21. Grommet (2)
22. Nut M6
23. Lock washer M6
24. Self tapping screw M6.3 x 13
25. Cap (9)
26. Support plate
27. Flat washer M5 (2)
28. Elastic stop nut 10-32 (2)
29. Elastic nut 1/4-20 (2)
30. Nut M6
31. Mounting plate
32. Washer M6 (2)
33. "Y" wire
34. Dielectric grease

## GENERAL

The Capacitor Discharge Ignition system includes the following components :

## Magneto

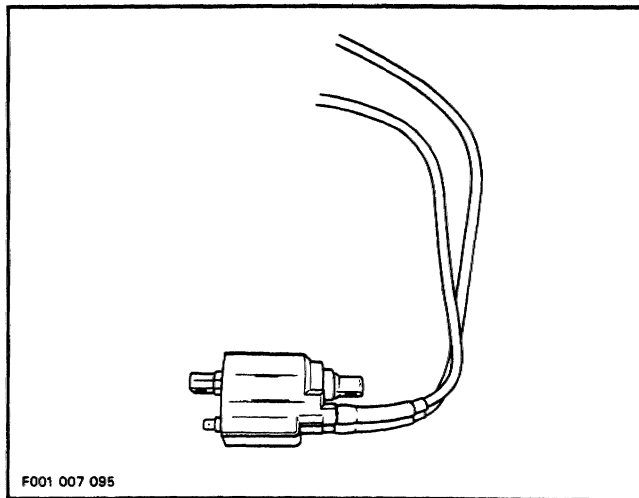
It is the primary source of electrical energy. It transforms magnetic field into electric current through a generating coil.



### Ignition Coil

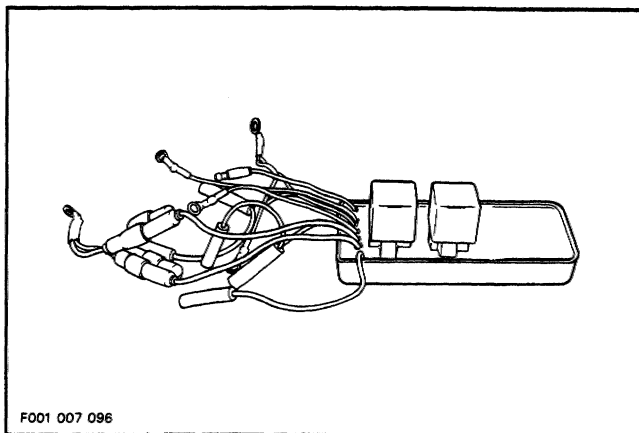
It receives its energy from generating coil via a BLACK/ RED wire. The generating coil allows a current flow through ignition coil with its integrated CDI module and through primary windings.

Ignition coil induces voltage to a high level in secondary windings to produce a spark at spark plug.



### Multi-purpose Electronic Module

It receives its current from the battery. It includes two relays, one is used for the ignition system and the other one for charging system. Also integrated in the module a 20 second timer delay and the engine speed limiter.



### Engine Speed Limiter

It has three functions :

- Keeps high voltage away from tether cord switch.
- Provides engine stop by grounding the primary coil.
- Limits engine RPM to prevent over-revving.

○ **NOTE** : It is integrated in the multi-purpose electronic module.

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  $6550 \pm 100$  RPM.

### 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. Ignition relay.
6. Multi-purpose electronic module (MPEM).
7. Magneto output.
8. Ignition coil output.

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

○ **NOTE** : Spark occurrence can be checked with tester from Superex Canada Ltd part number 15-785.

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

## Section 07 ELECTRICAL

### Sub-Section 06 (CDI AND CHARGING SYSTEMS)

#### Engine Stop/Tether Cord Switches Verification

##### Engine Stop Switch

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

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

##### Tether Cord Switch

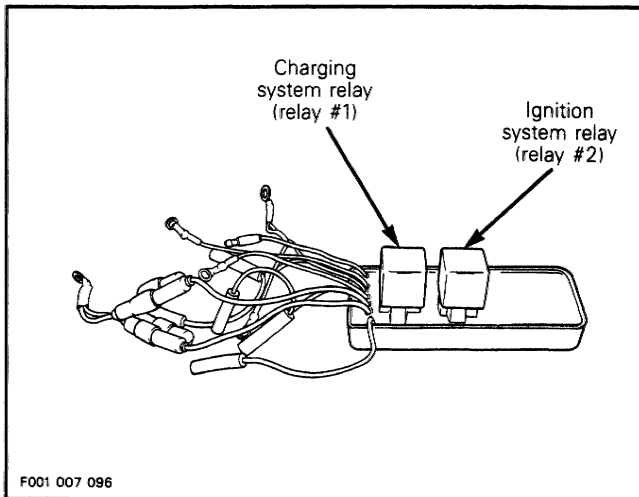
Disconnect the BLACK/YELLOW wires in the electrical box. Using an ohmmeter, connect test probes to switch BLACK/YELLOW wires.

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

#### Ignition Relay Verification

The relays which are installed on MPEM are identical, but they are different in function. The one located near the module center is the one for the ignition system.

The ignition relay is working off a 20 second timer delay and could be the problem of some faulty ignition situations.



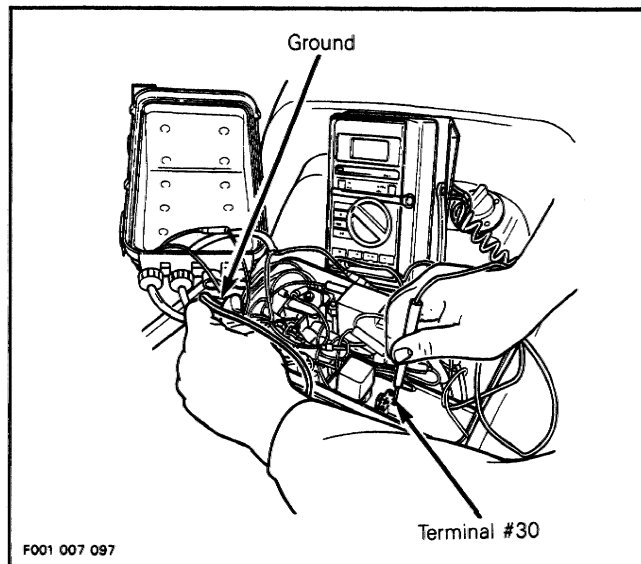
A voltage test can be performed to verify if power is going to the relay and through the relay.

Always confirm first that the fuses are in good condition.

○ **NOTE** : The relays can be interchanged with each other, because they are identical in construction. If the relays exchanging brings ignition again then simply replace the faulty one.

#### Voltage test

Remove ignition relay. Using a multimeter, connect one test probe to terminal #30 and the other one to ground. Reading from terminal #30 should be battery power source.



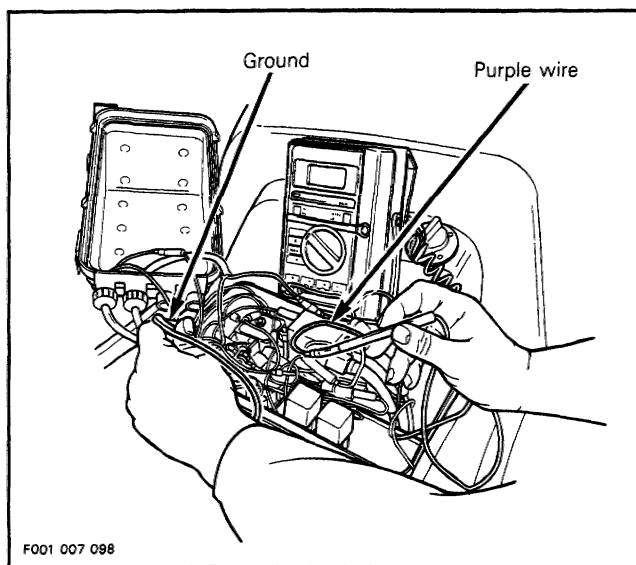
Reinstall ignition relay to verify if current goes through the relay.

Connect multimeter test probes, one into PURPLE wire and the other to ground.

Install tether cord and touch starter button. A reading should be supplied to multimeter through the PURPLE wire from relay power source (battery voltage).

▼ **CAUTION** : To measure voltage at PURPLE wire, BLACK/WHITE wire must be connected to solenoid negative and YELLOW/RED wire connected to solenoid positive.

**Section 07 ELECTRICAL**  
Sub-Section 06 (CDI AND CHARGING SYSTEMS)



○ **NOTE :** To confirm the relay function, it should stay on for about 20 seconds and then turn off.

### Multi-Purpose Electronic Module (MPEM) Verification

The multi-purpose electronic module testing must be done with all wires disconnected from circuit. Otherwise testing equipment (ohmmeter) could be damaged.

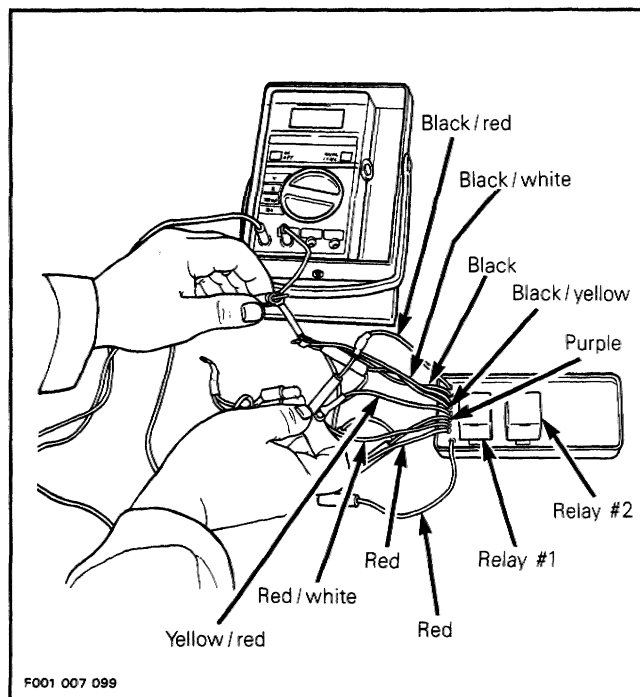
▼ **CAUTION :** When disconnecting wires, **BLACK / RED** wire must never touch solenoid positive terminal.

MPEM testing equipment :

Use an ohmmeter with an input impedance up to 10 mega ohm (1 000 000 ohm).

Refer to the following chart for MPEM testing. Always respect polarity in chart.

Meter (-) lead	Meter (+) lead	Approx. value	Wires will be connected to :
Black	Black/red	87 kΩ	MPEM/Engine speed limiter
Black	Black/white	∞	Solenoid
Black	Black/yellow	68 kΩ	Stop switch/Tether cord switch
Black	Yellow/red	∞	Solenoid
Black	Purple	69 kΩ	Buzzer
Black	Red/White (5 A fuse)	∞	Battery (+)
Black	Red (15 A fuse)	∞	Battery (+)
Black	Red	∞	Rectifier
Purple	Black/red	150 kΩ	CDI module



Most of circuit can be tested with an ohmmeter but a 100% test doesn't mean the MPEM is in perfect condition.

○ **NOTE :** Sometimes only parts replacement can solve the problem.

▼ **CAUTION :** Whenever connecting MPEM, always have battery disconnected from circuit. If MPEM must be connected when circuit is activated, always connect **BLACK/RED** wire first to ignition coil/CDI module to prevent wire from touching solenoid positive terminal.

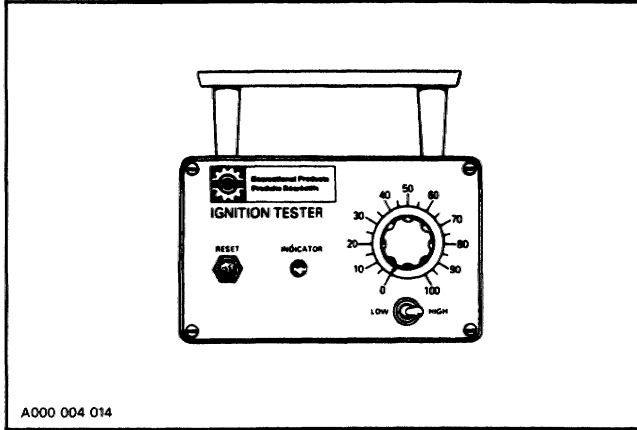
▼ **CAUTION :** Whenever connecting wires, never connect **RED/PURPLE** and **RED** wires together. Damage could occur to multi-purpose electronic module.

## Section 07 ELECTRICAL

### Sub-Section 06 (CDI AND CHARGING SYSTEMS)

#### BOMBARDIER IGNITION TESTER

The remaining items can be easily checked with Bombardier ignition tester (P/N 295 000 008).



For more information concerning operation and maintenance of the tester, refer to its instruction manual.

#### Use of Bombardier Ignition Tester

This tester can verify generating coil, ignition coil and battery charging coil.

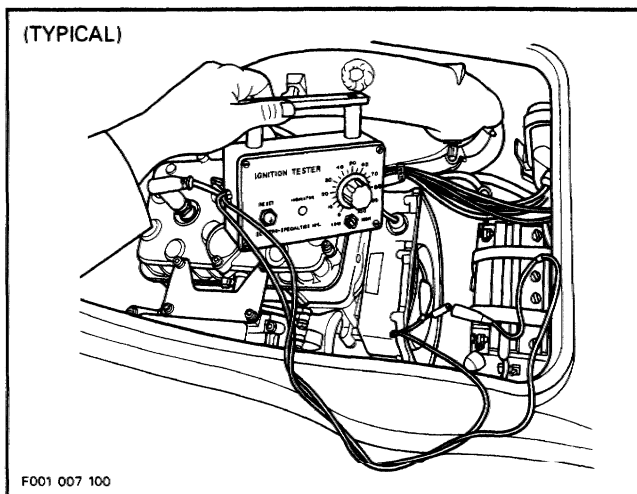
Always make sure that tester batteries are in good condition.

#### 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.
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.

##### 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. Ventilate bilge at least two minutes prior to performing any test.

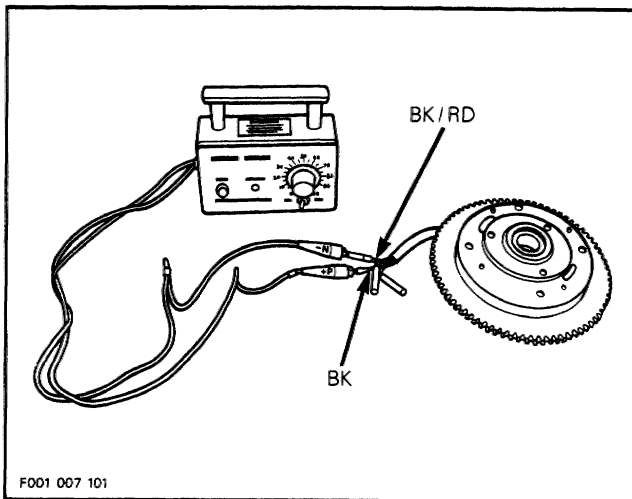
## TESTS

### Magneto and Generating Coil Output

1. Disconnect BLACK/RED wire between ignition coil/ CDI module and magneto. Disconnect BLACK ground wire.
2. Connect tester wires then set switch and dial as follows :

○ **NOTE** : BLACK wire must be connected to ground in order to start engine.

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



3. Start engine and observe indicator.
4. Push reset button and repeat step 3 twice.

#### Results :

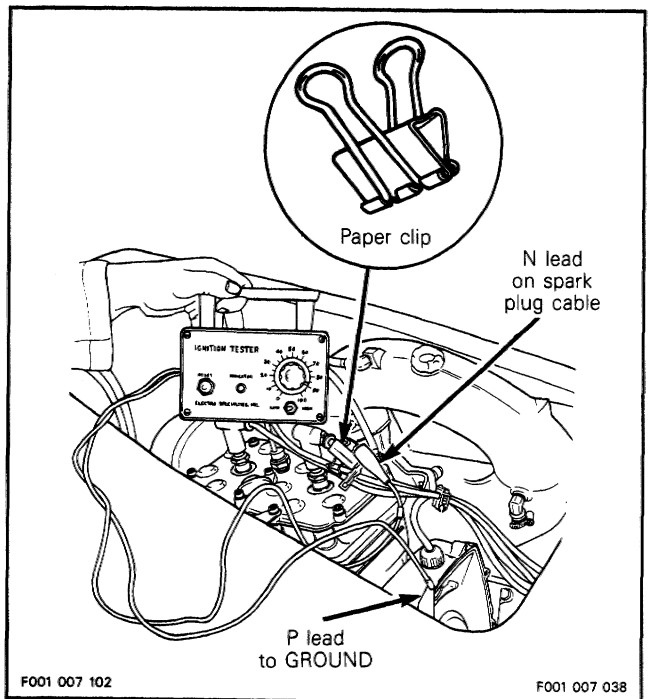
- a) **Indicator lamp lights** : Ignition generating coil output is up to specifications.
- b) **Indicator lamp does not light** : The problem is a faulty ignition generating coil. Replace it.

### Ignition Coil Output

A paper clip of approximately 20 mm (3/4 in) will be used as a test adapter for the following test.

1. Install the test adapter to spark plug cable close to MAG side spark plug.
2. Connect tester wires then set switch and dial as follows :

Tester wires	Component wires	Tester switch position	Tester dial position
N	Tester adapter (paper clip) on spark plug cable	LOW	35
P	Engine Ground		



3. Start engine and observe indicator.

○ **NOTE** : If engine starts, allow it to idle while observing indicator. Then, shut engine off.

4. Push reset button and repeat step 3 twice.

#### 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.

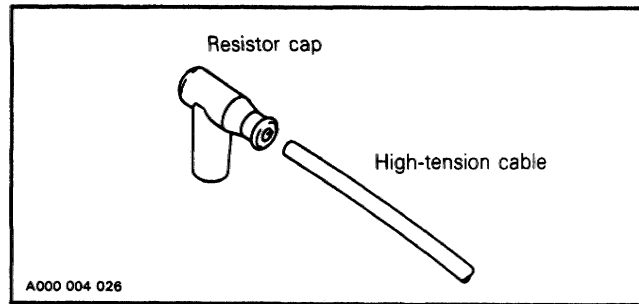


## Section 07 ELECTRICAL

### Sub-Section 06 (CDI AND CHARGING SYSTEMS)

#### SUMMARY TABLE

Test to perform	Tester wires	Component wires	Switch	Dial
Generating coil output	N	BLACK/RED of magneto harness	LOW	85
	P	BLACK of magneto harness		
Ignition coil output	N	Test adapter on MAG spark plug cable	LOW	35
	P	Engine 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 coil then ignition coil/ignition module.

Disconnect connectors at ignition coil and magneto junction. Check resistance 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.

MAGNETO		
PART NAME	WIRE COLOR	RESISTANCE (OHM) ( $\Omega$ )
Generating coil	BLACK with BLACK/RED	40 - 76
IGNITION COIL		
PART NAME	WIRE COLOR	RESISTANCE (OHM) ( $\Omega$ )
Secondary winding	End of each spark plug cable, spark plug caps removed	9 - 15 K

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

The spark plug caps must be removed from high tension cables, because they are resistor caps. The cap resistance is 4.48 K ohms.

## 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, multi-purpose electronic module/engine speed limiter, engine overheat beeper and accessories.

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

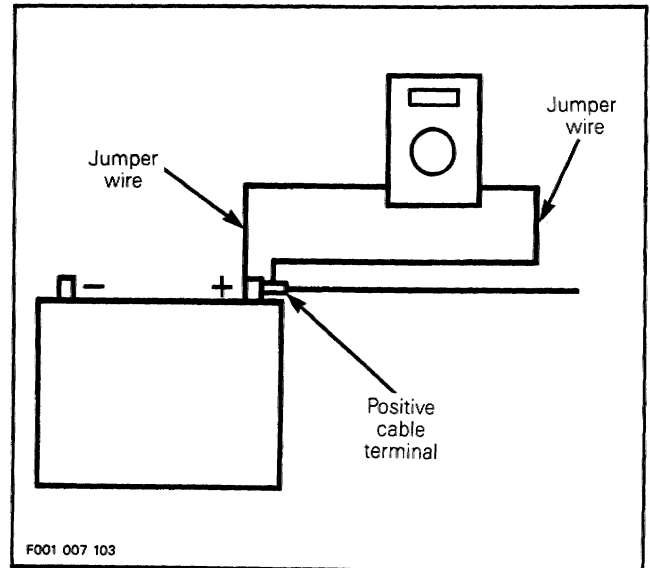
Proceed as follows :

— Start engine.

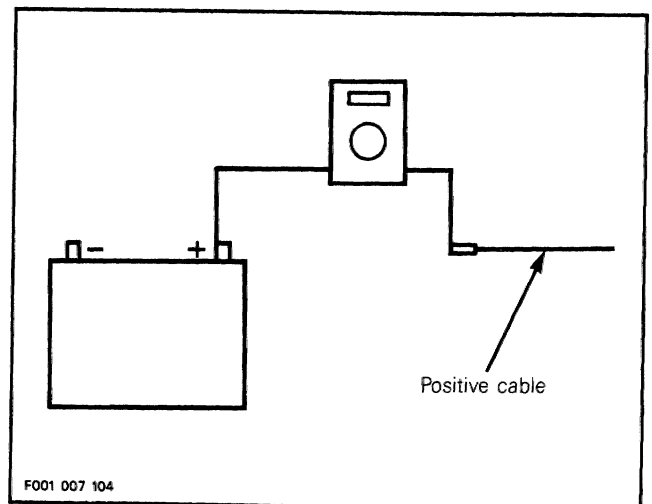
○ **NOTE** : Start engine before connecting cables. Otherwise ammeter may be damaged as current flow is much higher at starting.

— Connect jumper wire between battery positive post and ammeter.

— Connect a second jumper wire between ammeter and positive cable terminal.



— Disconnect positive cable from battery.



— 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.

## Section 07 ELECTRICAL

### Sub-Section 06 (CDI AND CHARGING SYSTEMS)

#### 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.

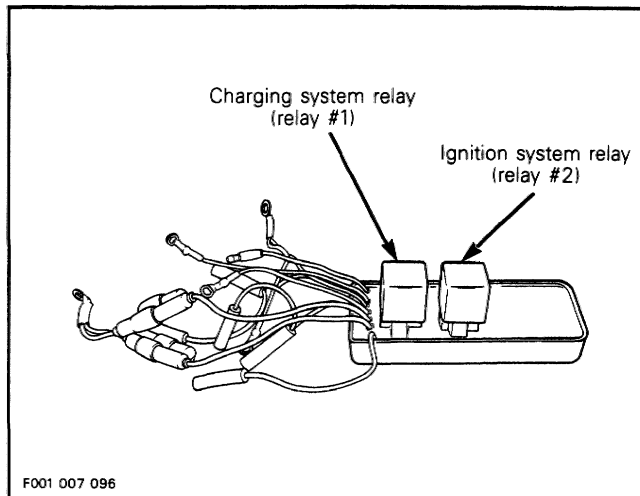
**NOTE :** Whatever the voltmeter type used (peak voltage or RMS), the voltage must not exceed 15 V. A faulty regulator will allow voltage to exceed 15 V as engine speed is increased.

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

#### Charging System Relay

The relay is located on multi-purpose electronic module near the side.

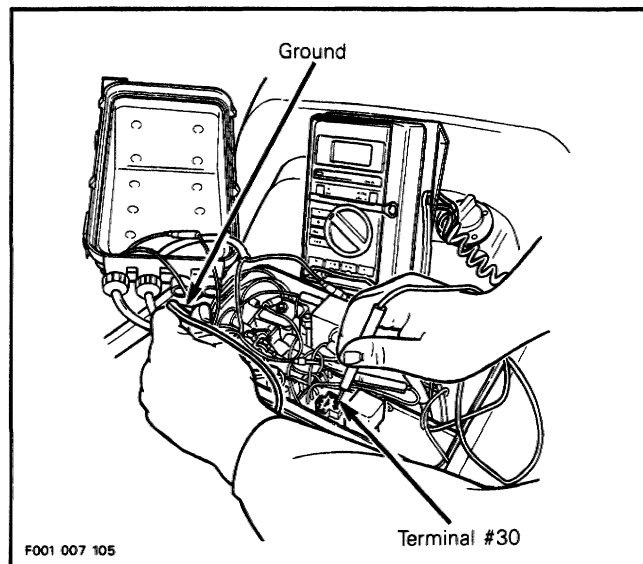
If the system is not charging the battery, the relay could be the problem.



A voltage test can be performed to verify if power is going to the relay. Always confirm first that the fuses are in good condition.

#### Voltage Test

Remove charging relay. Using a multimeter connect one test probe to terminal #30 and the other one to ground. Reading from terminal #30 should be battery power source.



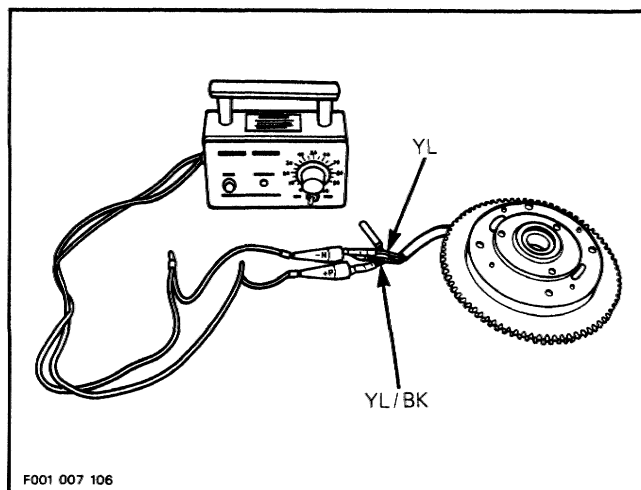
#### Magneto, Battery Charging Coil

##### With Bombardier Ignition Tester

Operate it as for ignition system verifications.

1. Disconnect wires coming from magneto wiring 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	70
P	YELLOW/BLACK of magneto harness		



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**Section 07 ELECTRICAL**  
**Sub-Section 06 (CDI AND CHARGING SYSTEMS)**

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3. Start engine and observe indicator.
4. Push reset button and repeat step 3 twice.

**Results :**

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

**Resistance Measurement**

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

Use the following table :

<b>MAGNETO</b>		
PART NAME	WIRE COLOR	RESISTANCE (OHM) ( $\Omega$ )
Battery charging coil	YELLOW with YELLOW/BLACK of magneto harness	0.05 - 0.6

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



## DESIGN SYMBOLS USED ON NGK SPARK PLUGS

First letter prefix for thread and hexagon size

Second and third letter prefix for construction feature, except single prefix

Heat rating number

First letter suffix for thread reach

Second letter suffix for construction feature, etc.

Letter	Thread size	Hexagon size	Letter	Construction feature	Heat rating number	Letter	Thread reach	Letter	Construction feature, etc.
A	18 mm	25.4 mm	B	Hexagon size 20.6 mm	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 5px;">Hotter Type ↑</div> <div style="margin-bottom: 5px;">↑</div> <div style="margin-bottom: 5px;">4</div> <div style="margin-bottom: 5px;">5</div> <div style="margin-bottom: 5px;">6</div> <div style="margin-bottom: 5px;">7</div> <div style="margin-bottom: 5px;">8</div> <div style="margin-bottom: 5px;">(85)</div> <div style="margin-bottom: 5px;">(95)</div> <div style="margin-bottom: 5px;">9</div> <div style="margin-bottom: 5px;">10</div> <div style="margin-bottom: 5px;">(105)</div> <div style="margin-bottom: 5px;">11</div> <div style="margin-bottom: 5px;">12</div> <div style="margin-bottom: 5px;">13</div> <div style="margin-bottom: 5px;">14</div> <div style="margin-bottom: 5px;">↓ Colder type</div> <div style="margin-bottom: 5px;">↓ Ordinary plugs</div> <div style="margin-bottom: 5px;">↓ Racing plugs</div> </div>	None	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 5px;">12.0 mm (thread dia. 18 mm)</div> <div style="margin-bottom: 5px;">9.5 mm (thread dia. 14 mm)</div> <div style="margin-bottom: 5px;">22.5 mm (thread dia. PF1/2 in-14 mm)</div> <div style="margin-bottom: 5px;">16.0 mm (thread dia. 7/8 in-18 mm)</div> <div style="margin-bottom: 5px;">L 11.2 mm</div> <div style="margin-bottom: 5px;">H 12.7 mm (racing type 12.5 mm)</div> <div style="margin-bottom: 5px;">E 19.0 mm (racing type 18.0 mm)</div> <div style="margin-bottom: 5px;">F Conical seat type</div> <div style="margin-bottom: 5px;">A - F 10.9 mm</div> <div style="margin-bottom: 5px;">B - F 11.2 mm</div> <div style="margin-bottom: 5px;">BM - F 7.8 mm</div> <div style="margin-bottom: 5px;">BE - F 17.5 mm</div> </div>	A	Specials
B	14 mm	20.6 mm	C	Hexagon size 16.0 mm		B		Special plug for Honda vehicles	
C	10 mm	16.0 mm	G	Hexagon size 23.8 mm		C		Competition type	
D	12 mm	18.0 mm	L	Compact type (SHORTY)		G		Racing plugs, center electrode of nickel alloy	
F	7/8 in-18	23.8 mm	M	Compact type (BANTAM)		GV		Racing plugs, center electrode of precious metal	
G	PF1/2 in-14	23.8 mm	P	Projected insulator nose type		N		Racing plugs, nickel electrode	
			R	Resistor type		P		Racing plugs, platinum ground electrode	
			S	Shielded type		R		Shielded resistor plugs	
			U	Surface discharge type		S		Copper core center electrode (super)	
						V		Center electrode of precious metal	
						W		Tungsten electrode	
						X		Series gap plugs	
						Y		V-Grooved center electrode	
						Multiple ground electrodes type			
					K	2 T 3			
					M	2 Q 4			
					Others Except for above letters, there are special plugs of J, L, Z, etc.				

(\*Standard regulation is drawn here. There also exist a few extraordinary symbols.)

Wide gap type (mm)



## Section 07 ELECTRICAL

### Sub-Section 07 (SPARK PLUGS)

#### DISASSEMBLY

First unscrew the spark plug one turn.

Clean the spark plug and cylinder head with pressurize air then completely unscrew.

#### HEAT RANGE

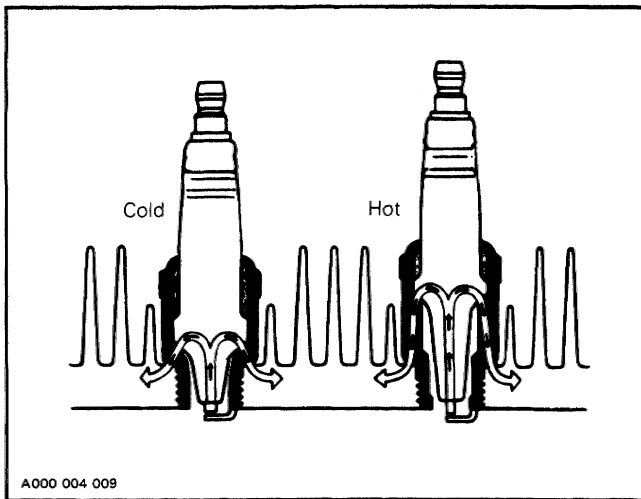
The proper operating temperature or heat range of the spark plugs is determined by the spark plug ability to dissipate the heat generated by combustion.

The longer the heat path between the electrode tip to the plug shell, the hotter the spark plug operating temperature will be — and inversely, the shorter the heat path, the colder the operating temperature will be.

A "cold" type plug has a relatively short insulator nose and transfers heat very rapidly into the cylinder head.

Such a plug is used in heavy duty or continuous high speed operation to avoid overheating.

The "hot" type plug has a longer insulator nose and transfers heat more slowly away from its firing end. It runs hotter and burns off combustion deposits which might tend to foul the plug during prolonged idle or low speed operation.



**CAUTION** : Severe engine damage might occur if a wrong heat range plug is used.

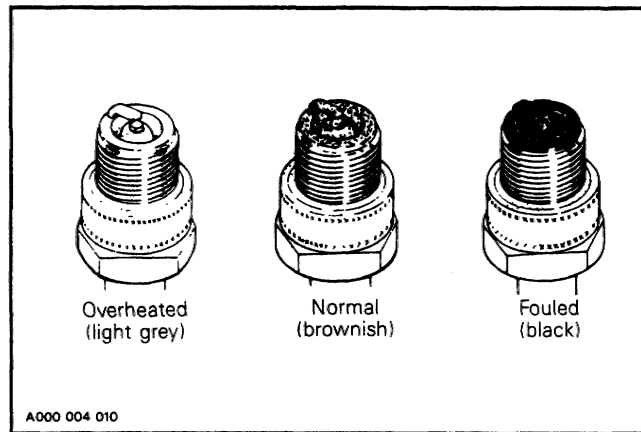
A too "hot" plug will result in overheating and pre-ignition, etc.

A too "cold" plug will result in fouling (shorting the spark plug) or may create carbon build up which can heat up red-hot and cause pre-ignition or detonation.

#### FOULING

Fouling of the spark plug is indicated by irregular running of the engine, decreased engine speed due to mis-firing, reduced performance, and increased fuel consumption. This is due to a loss of compression. Other possible causes are : prolonged idling, or running on a too rich mixture due to a faulty carburetor adjustment or incorrect fuel and/or fuel mixing. The plug face of a fouled spark plug has either a dry coating of soot or an oily, glossy coating given by an excess either of oil or of oil with soot. Such coatings form a conductive connection between the center electrode and ground.

#### SPARK PLUG ANALYSIS

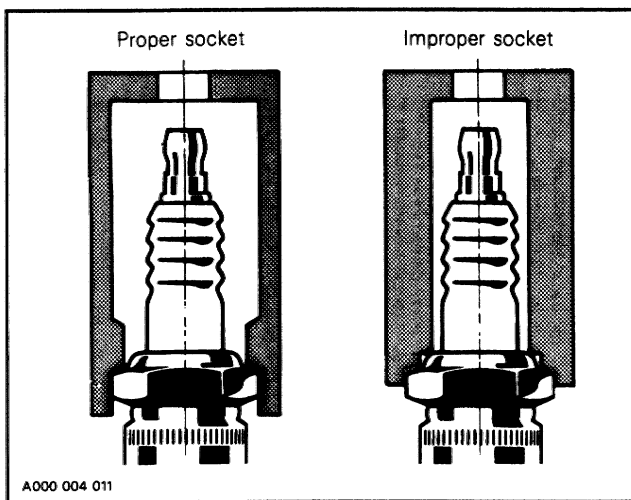


The plug face (and piston dome) reveals the condition of the engine, operating condition, method of driving and fuel mixture. For this reason it is advisable to inspect the spark plug at regular intervals, examining the plug face (i.e. the part of the plug projecting into the combustion chamber) and the piston dome.

## SPARK PLUG INSTALLATION

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

1. Using a wire feeler gauge, set electrode gap according to chart below.
2. Apply antiseize lubricant (P/N 293 550 001) over the spark plug threads to prevent possible seizure.
3. Hand screw spark plug into cylinder head and tighten with a torque wrench and a proper socket.



## SPARK PLUG CHART

Models	Engine type	Spark plugs	Torque N•m (lbf•ft)	Gap mm (inch)
5804 (SP) 5811 (GT) 5850 (XP) 5805 (SP) 5812 (GTS) 5851 (XP) 5860 (GTX)	587	NGK BR7ES	24 (17)	0.60 (0.024)

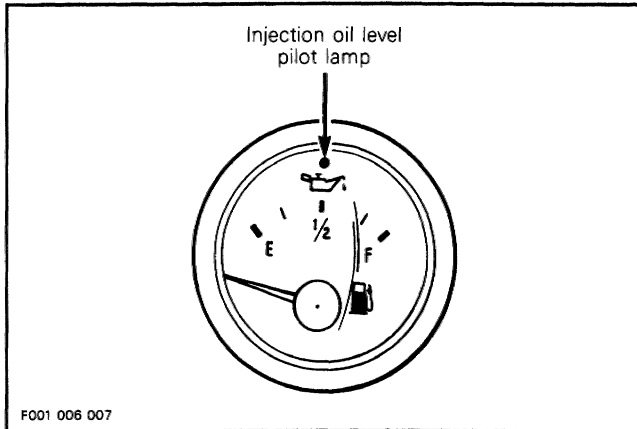




**GENERAL**

The oil/fuel level gauge has a pointer which indicates fuel level.

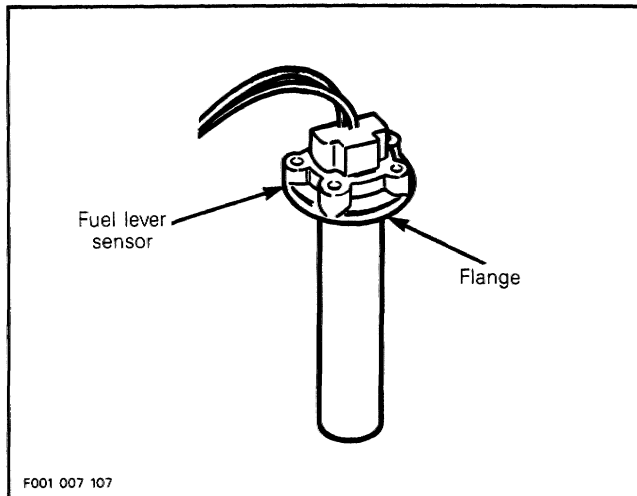
The oil level pilot lamp is part of the fuel level gauge. It will light when injection oil level is low.



**Fuel Level Sensor Verification**

The fuel level sensor with its integrated float gives to fuel gauge its reading.

To verify fuel sensor a resistance test should be performed with an ohmmeter allowing the float to move up through a sequence.



The resistance measured between BLACK/GREEN and GREEN wires must be in accordance with fuel level (measured from under the flange) as specified in the following chart.

<b>FUEL LEVEL AND RESISTANCE</b>	
<b>FUEL LEVEL</b>	<b>RESISTANCE</b>
<b>mm (in)</b>	<b>(Ω)</b>
55.0 (2-1/8) (Full)	0. ± 0.1
78.4 (3-1/16)	17.8 ± 0.2
101.8 (4)	27.8 ± 0.3
125.2 (4-15/16)	37.8 ± 0.4
148.6 (5-7/8)	47.8 ± 0.5
172.0 (6-3/4)	57.8 ± 0.6
195.4 (7-11/16)	67.8 ± 0.7
218.8 (8-5/8)	77.8 ± 0.8
242.2 (9-1/2) (Empty)	89.8 ± 0.9

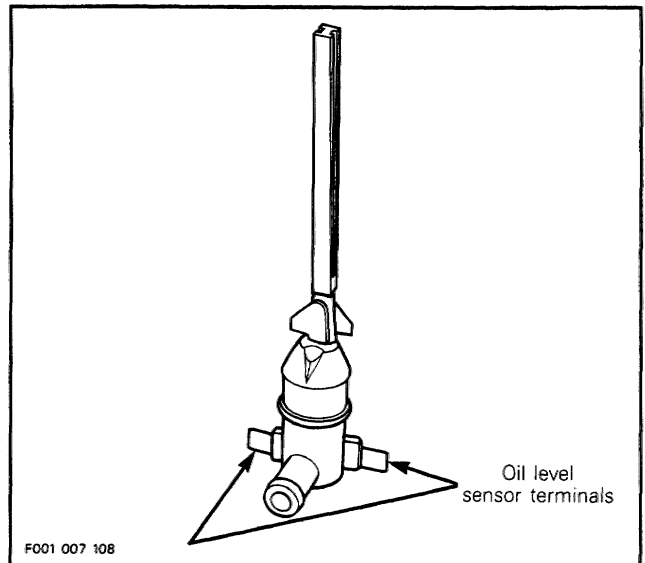
**Oil Level Sensor Verification**

The oil level sensor completes the ground for the oil injection pilot light.

With the oil down to caution level, contacts are made to complete the ground circuit.

To verify oil level sensor a resistance test should be performed with an ohmmeter between BLACK/PURPLE and PURPLE wire terminals.

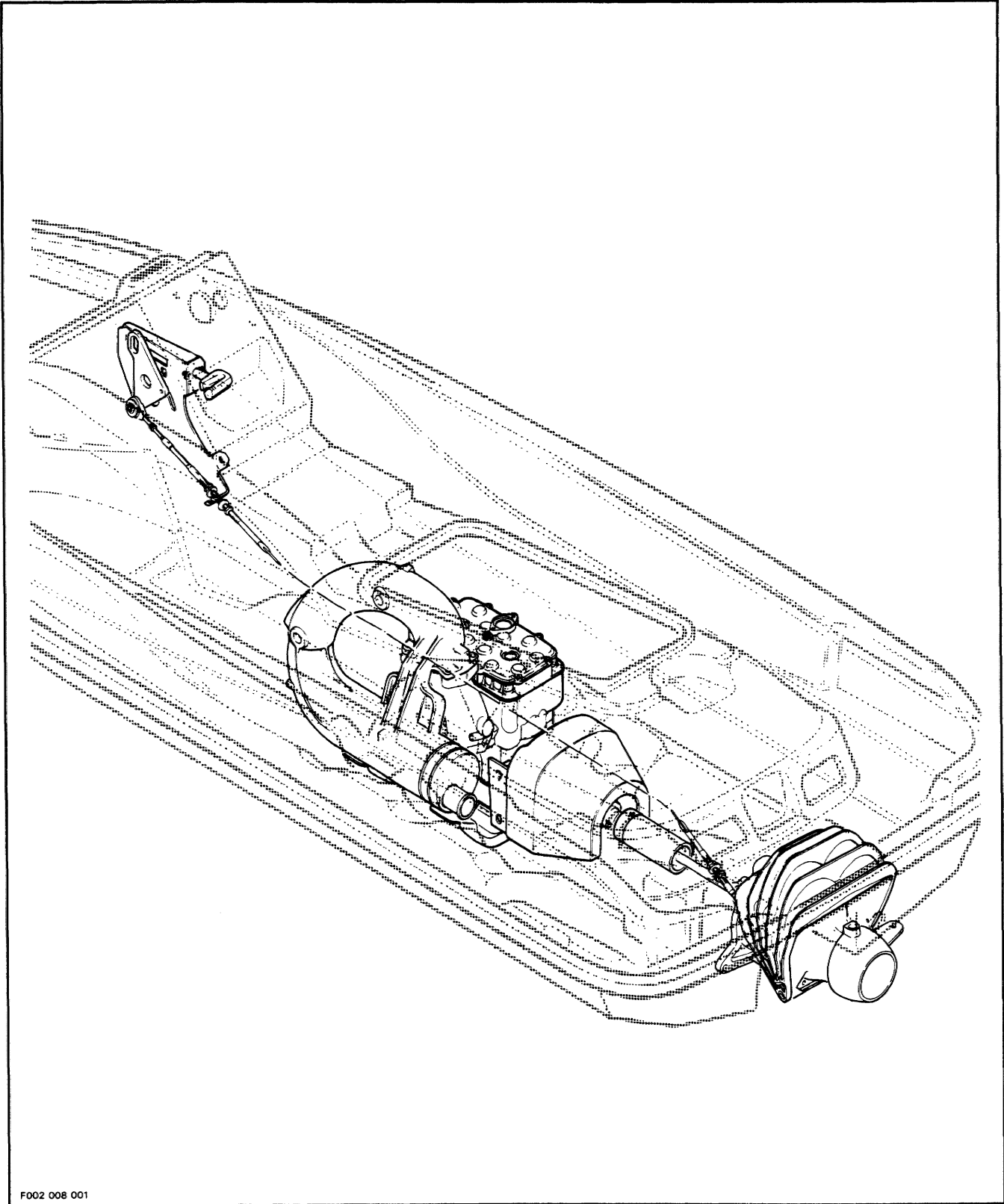
There should be no resistance (0 ohm) between terminals. If a resistance is noticed sensor is defective.



**CAUTION :** Whenever connecting wires, never connect RED/PURPLE and RED wires together. Damage could occur to multi-purpose electronic module.



# PROPULSION AND DRIVE SYSTEMS

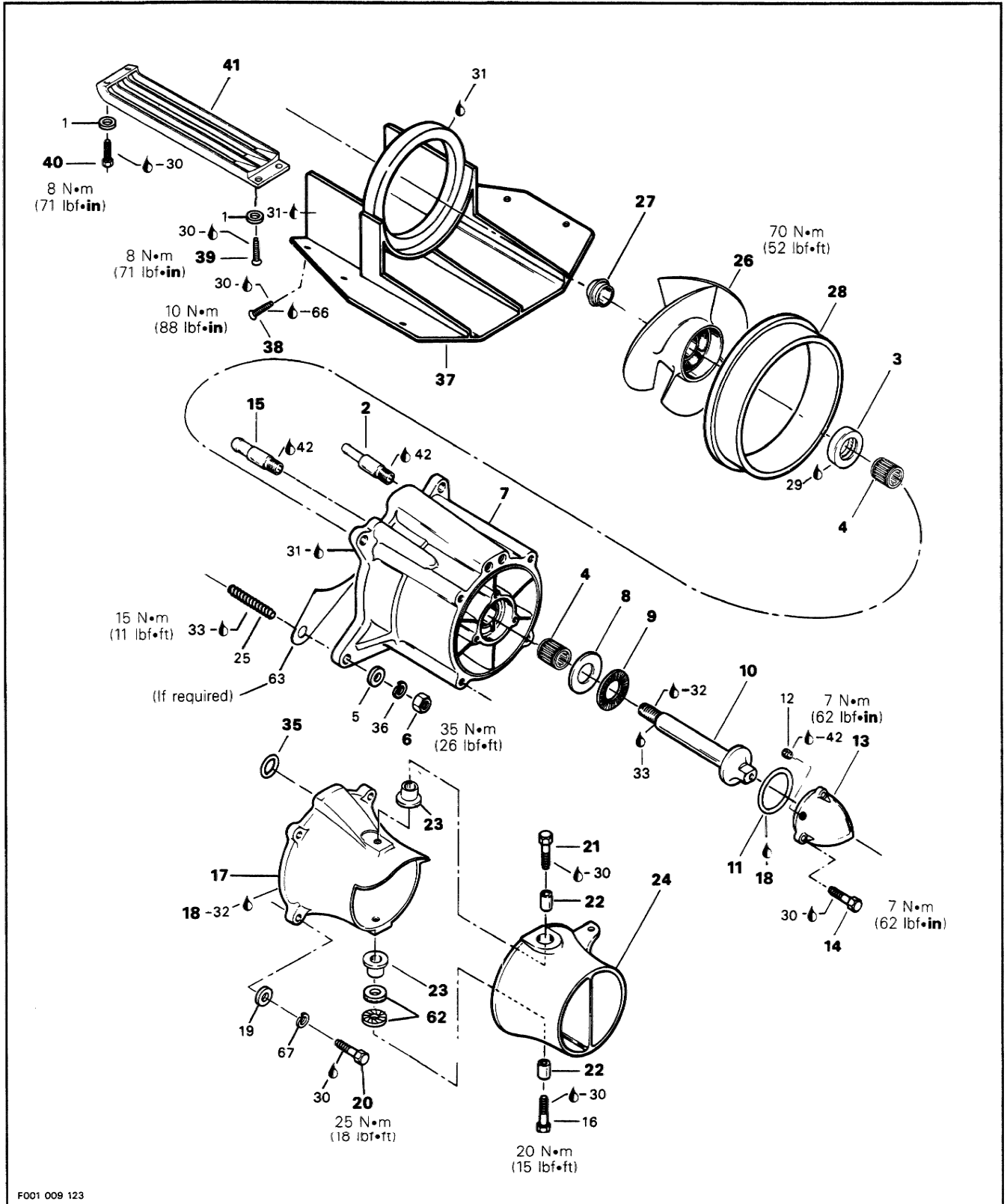


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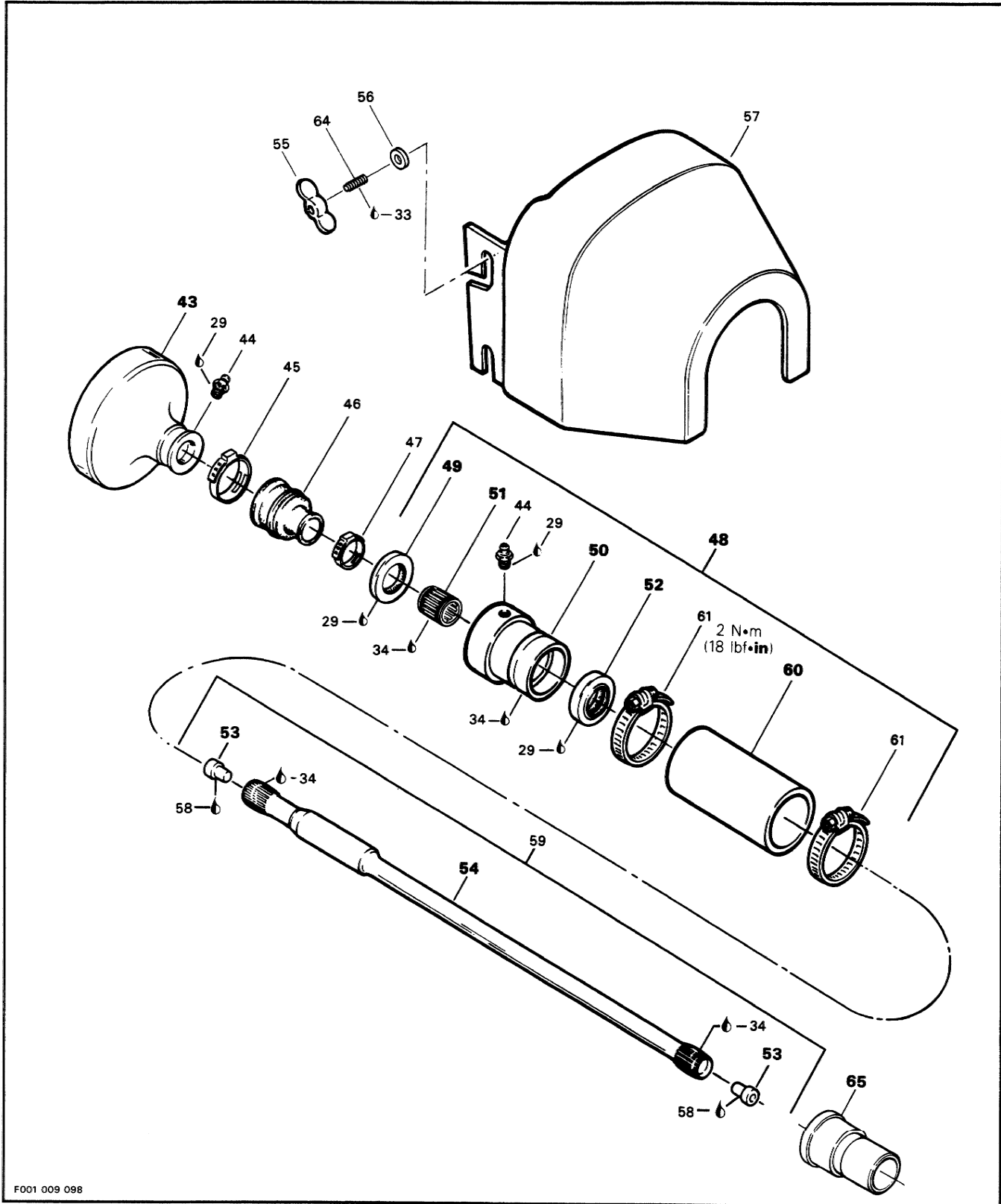
**Section 08 PROPULSION AND DRIVE SYSTEMS**  
**Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)**

**JET PUMP UNIT**



**Section 08 PROPULSION AND DRIVE SYSTEMS**  
**Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)**

**DRIVE SHAFT AND SEAL CARRIER**



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

## COMPONENTS

1. Flat washer M6 (4)
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. Plug
13. Housing cover
14. Hexagonal head screw M5 x 20 (3)
15. Fitting (pump)
16. Hexagonal head screw M8 x 30 (1)
17. Venturi
18. Loctite 515
19. Flat washer M8 (4)
20. Hexagonal head screw M8 x 35 (4)
21. Hexagonal head screw M8 x 25 (1)
22. Sleeve (2)
23. Bushing (2)
24. Nozzle
25. Stud M10 x 45 (4)
26. Impeller
27. Boot
28. Wear ring
29. Loctite 515
30. Loctite 242 (blue)
31. Loctite 587 superflex ultra blue
32. Loctite primer N
33. Loctite 271 (red)
34. Synthetic grease
35. O-ring (2)
36. Lock washer M10 (4)
37. Ride shoe
38. Countersunk phillips screw M6 x 35 (6)
39. Hexagonal head screw M6 x 16 (2)
40. Hexagonal head screw M6 x 20 (2)
41. Grill
42. Loctite PST 592
43. PTO flywheel
44. Grease fitting (2)
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. Damper
54. Drive shaft
55. Wing nut M8 (2)
56. Flat washer M8 (8)
57. Flywheel guard
58. Loctite 414 super bonder
59. Drive shaft assembly
60. Protective hose
61. Gear clamp (2)
62. Locking disk (2)
63. Shim
64. Stud M8 x 15
65. Hull insert
66. Loctite 732 RTV silicone
67. Lock washer M8 (4)

Disconnect battery.

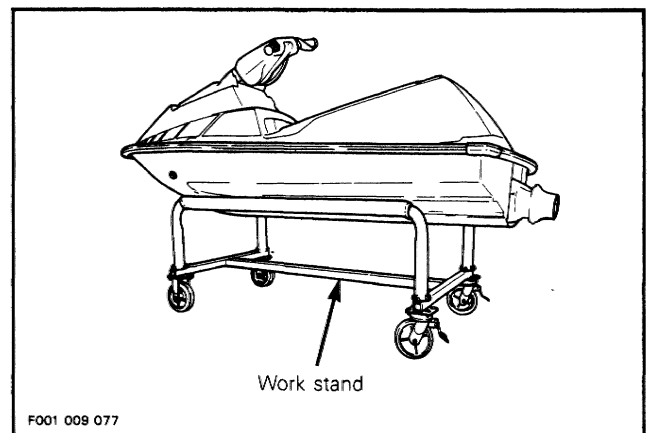
◆ **WARNING** : Battery black negative cable must always be disconnected first and connected last.

## 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, securely install it on a stand. 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.

A lift kit (P/N 298 760 000)) can be use to install watercraft on a stand.



## Impeller Condition and Impeller/Wear Ring Clearance

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

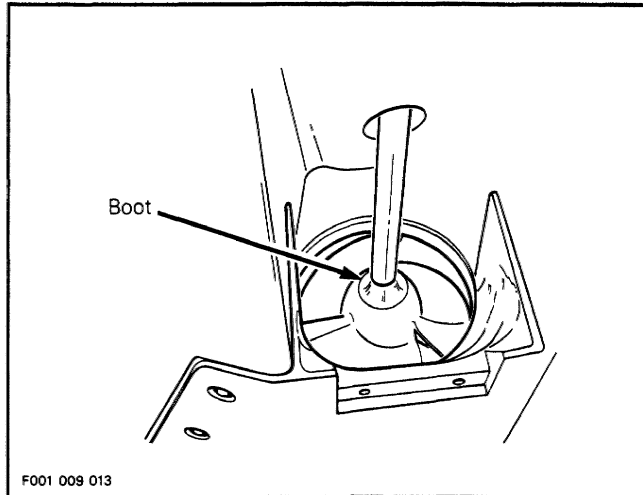


## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

#### Impeller Condition

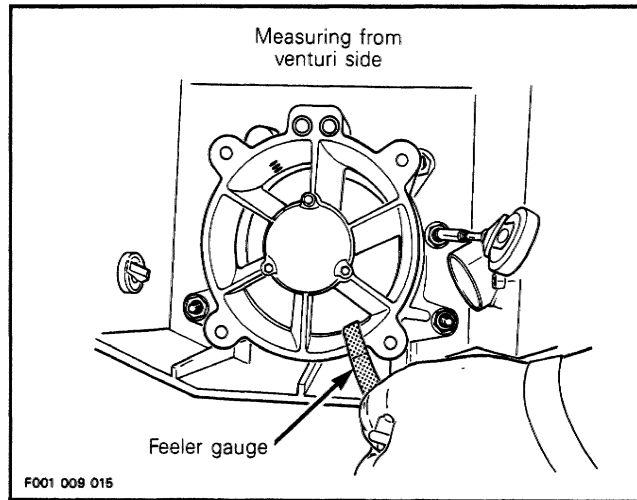
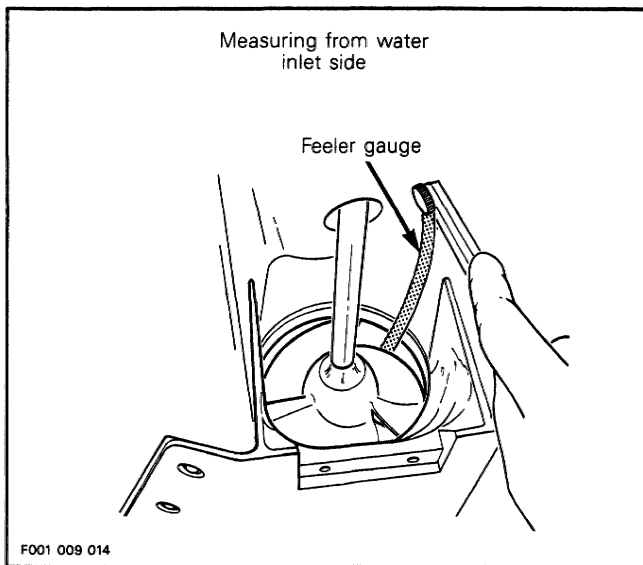
Impeller and boot condition can be quickly checked from underside of the watercraft. Remove grill and look through water inlet opening.



#### Impeller/Wear Ring Clearance

This clearance is critical for jet pump performance.

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



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 .5 mm (.020 in). If clearance is greater, disassemble jet pump and inspect impeller and wear ring. Renew worn parts.

#### Oil Inspection/Replacement

Detach ball joint of steering cable from nozzle.

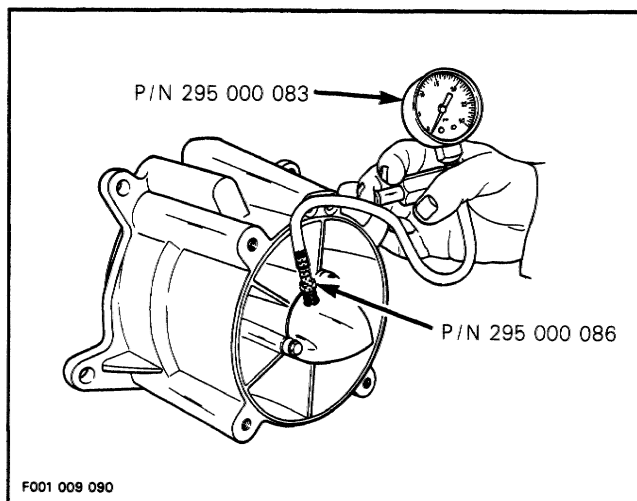
Remove four retaining screws from venturi.

Pull venturi and nozzle assembly apart.

Remove housing cover plug.

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

If oil level is low, check impeller shaft housing for leaks. Drain oil and use the following tools.



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

Pressurize to a maximum of 70 kPa (10 PSI) during 10 minutes. If there is no pressure drop impeller housing does not leak.

If there is a pressure drop spray soapy water around housing cover. If bubbles are noticed, replace housing cover O-ring and/or housing cover. If there are no bubbles, impeller shaft, impeller shaft seal, bushing or impeller housing is leaking through porosity and has to be replaced. Jet pump unit has to be overhauled.

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 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.

Thoroughly clean reservoir and inside of cover with a solvent.

Reinstall cover with its O-ring and Loctite 515 and remove plug from cover.

Pour approximately 65 mL (2.2 oz) of oil through hole until oil reaches the bottom of hole threads. Use SEA-DOO JET PUMP SYNTHETIC OIL (P/N 293 600 011) only. Oil will penetrate slowly in housing, wait a few minutes and readjust oil level.

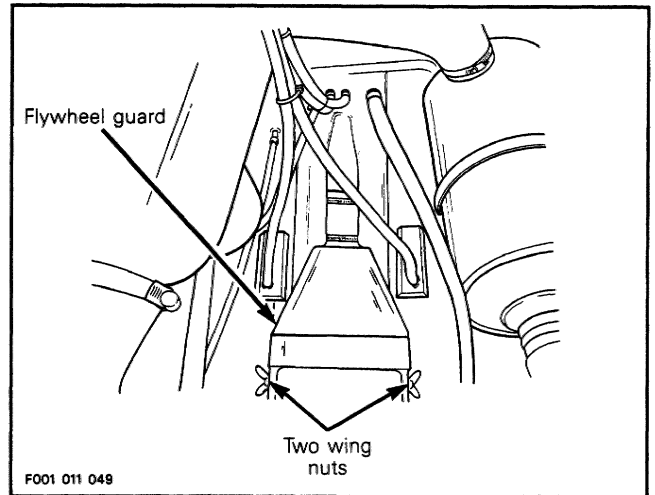
**CAUTION:** This is a synthetic oil. Do not mix with mineral based oil. Do not mix oil brands.

Properly reinstall removed parts.

## REMOVAL AND OVERHAUL

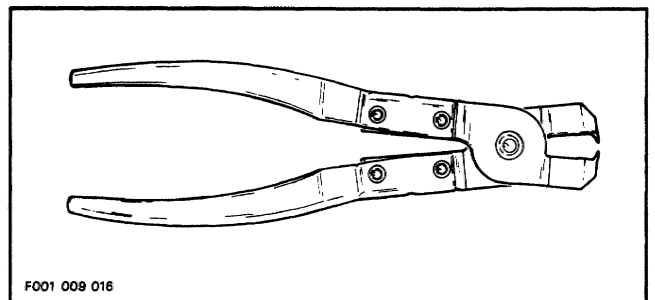
**NOTE:** Whenever removing a part, visually check for damage such as : corrosion, crack, split, break, porosity, cavitation, deformation, distortion, heating discoloration, wear pattern, missing plating, missing or broken needle on needle bearing, water damage diagnosed by black-colored spots, etc.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

Remove flywheel guard.

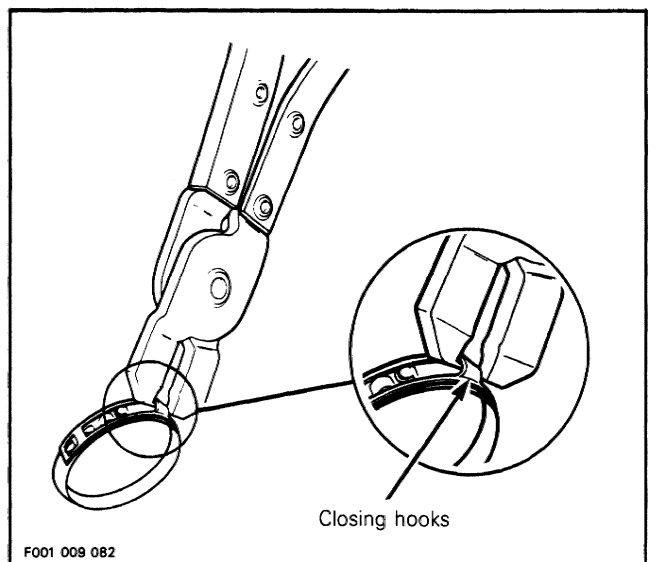


Unfasten **small** clamp on drive shaft boot as follows :

— Use pliers (P/N 295 000 069).



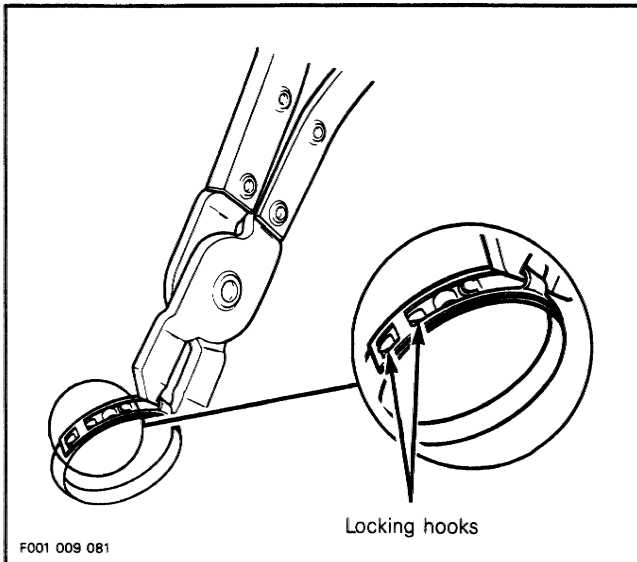
— Insert pointed tips of pliers in closing hooks.



## Section 08 PROPULSION AND DRIVE SYSTEMS

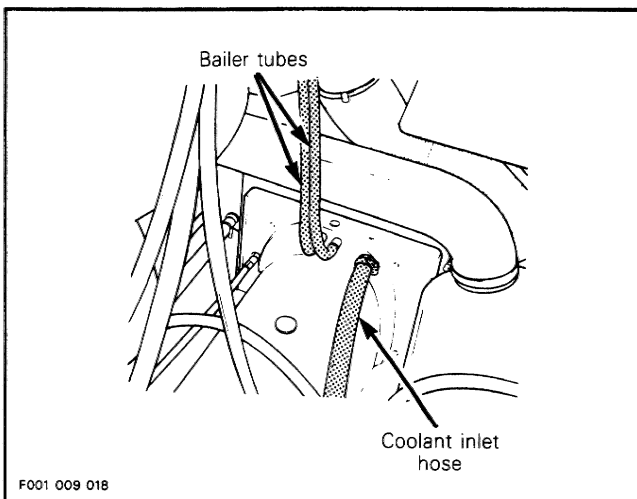
### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

- Squeeze pliers 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.



Remove ball joint fasteners to release steering cable from nozzle.

#### 21,22,23,24,62, Screw, Sleeve, Bushing, Nozzle and Locking Disk (if applicable)

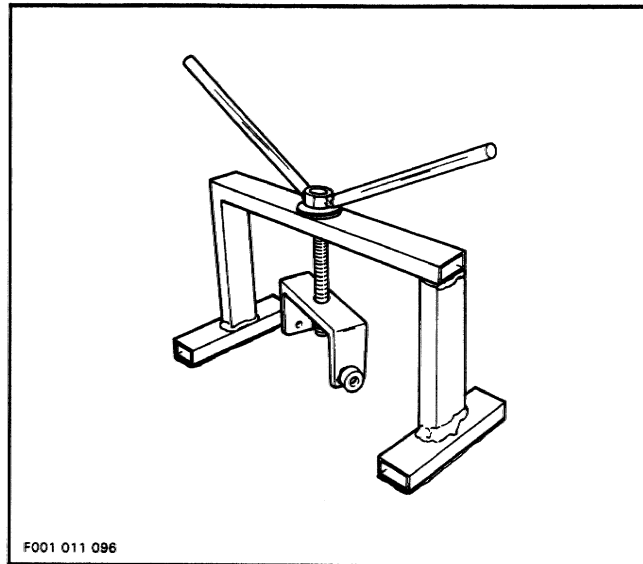
Remove two retaining screws, locking disks (if applicable) and withdraw nozzle.

Push sleeves and bushings out of nozzle.

#### 6,7, Nut and Impeller Housing

Remove nuts retaining impeller housing to hull.

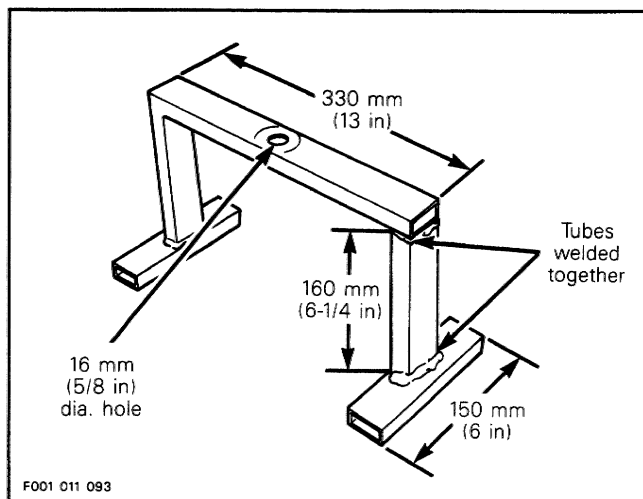
Make the following tool to easily separate impeller housing from hull.



- Use rectangular tube 38 x 19 x 1.5 mm (1-1/2 x 3/4 x 1/16 in) thick. Five pieces of rectangular tube are needed. One piece 330 mm (13 in) long, two pieces 160 mm (6-1/4 in) long and two other pieces 150 mm (6 in) long.

- Drill one 16 mm (5/8 in) diameter hole in center of the 330 mm (13 in) tube.

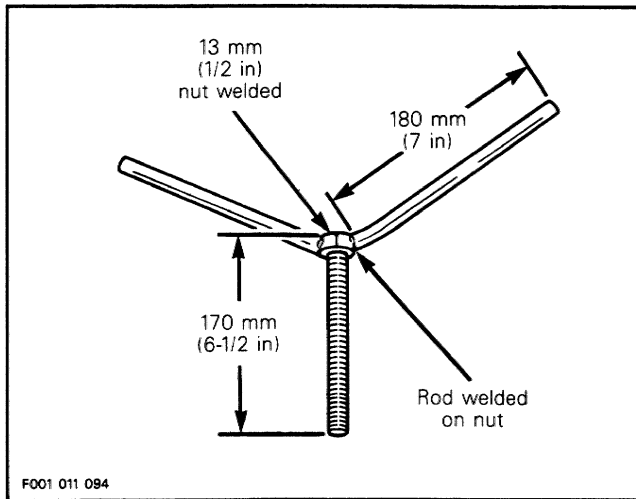
- Weld rectangular tubes together as shown in the following illustration.



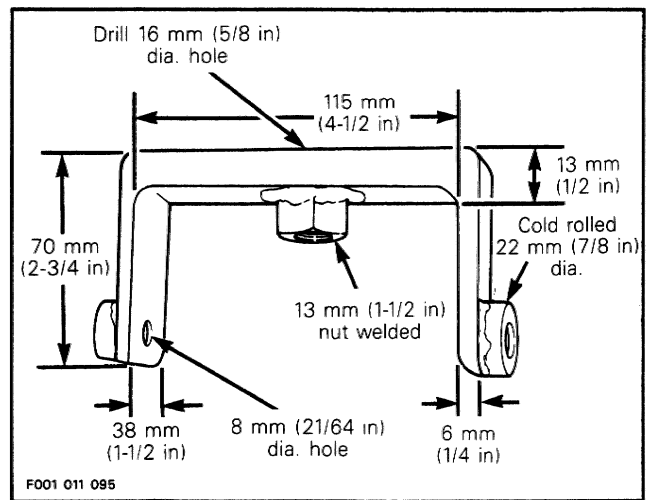
## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

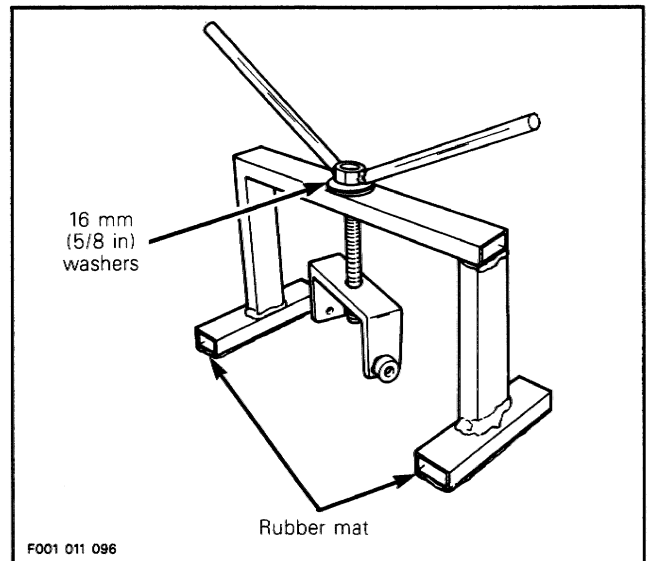
- Use threaded rod 13 x 170 mm (1/2 N.C. x 6-1/2 in) long. On one end install a 13 mm (1/2 in) diameter nut flush with the end and weld it.
- Weld two cold rolled rods 10 x 180 mm (3/8 x 7 in) long on the nut as shown in the following illustration.



- Use one steel flat bar 38 x 13 mm (1-1/2 x 1/2 in) thick x 115 mm (4-1/2 in) long or two flat bars 6 mm (1/4 in) thick welded together.
- Drill one 16 mm (5/8 in) diameter hole in center of flat bar.
- Align a 13 mm (1/2 in N.C.) diameter nut over the hole already drilled in flat bar and weld it in place.
- Use two steel flat bars 38 x 6 mm (1-1/2 x 1/4 in) thick x 70 mm (2-3/4 in) long.
- Weld two pieces of cold rolled steel 22 mm (7/8 in) diameter x 10 mm (3/8 in) thick on each flat bar at the center end.
- Drill one 8 mm (21/64 in) diameter hole in center of each cold rolled bushing thru flat bar.
- Weld flat bars together as shown in the following illustration.



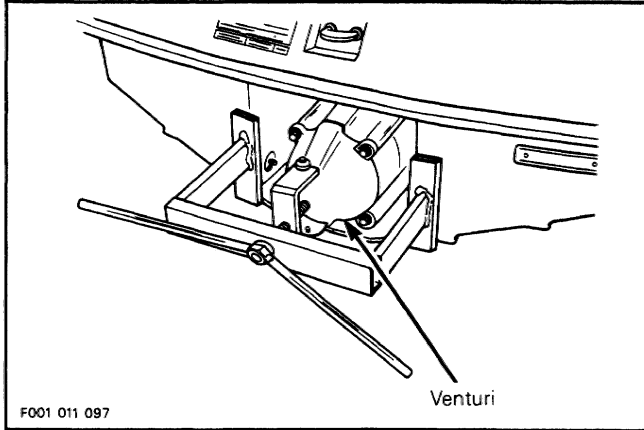
- Install two 16 mm (5/8 in) washers on threaded rod before final assembly.
- Glue a rubber mat or similar protective material on support to prevent scratching hull rear section.



## Section 08 PROPULSION AND DRIVE SYSTEMS

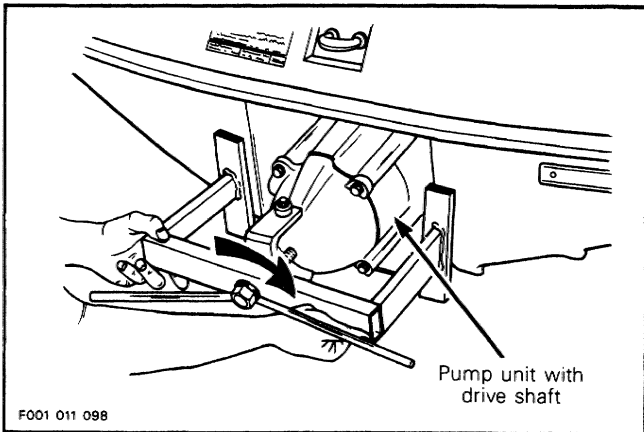
### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

Using screws previously removed from nozzle, install pump remover on venturi.



Rotate handle clockwise to remove jet pump. Withdraw pump unit and drive shaft together.

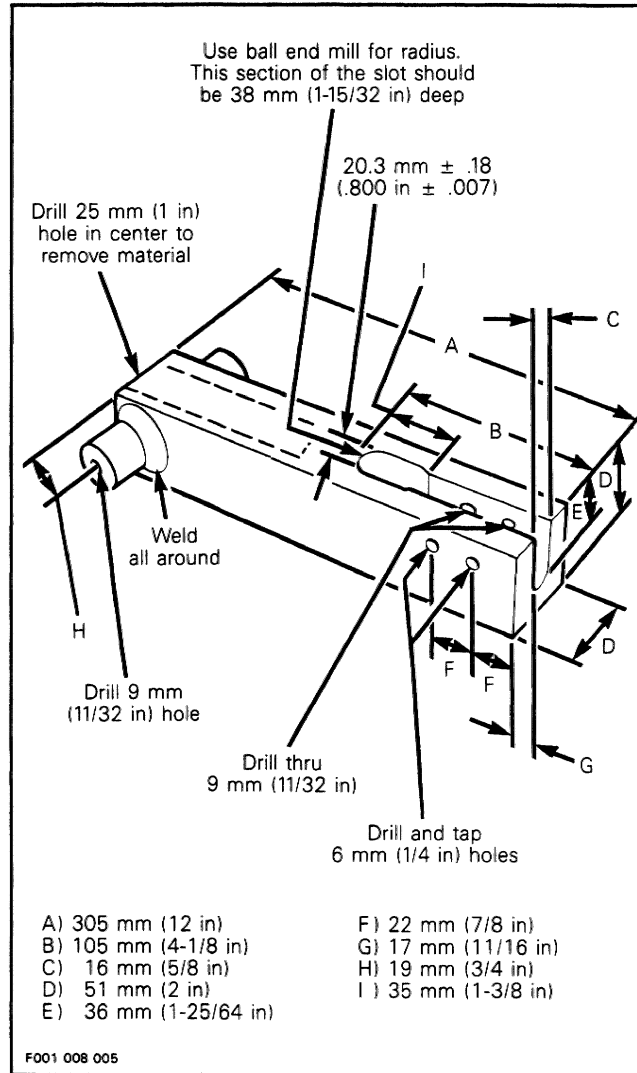
**CAUTION:** When removing pump unit a shim could have been installed between hull and pump housing be careful not to damage shim. If shim is not reinstalled engine and jet pump alignment will be altered.



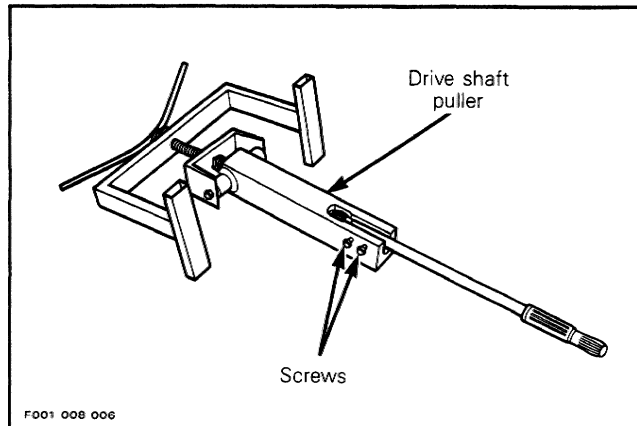
If the drive shaft is jammed into PTO flywheel or if bearing is seized on shaft at seal carrier level, make the following tool and use it in conjunction with pump remover to withdraw drive shaft.

#### Raw material:

- 1 aluminum alloy square 51 mm (2 in) x 305 mm (12 in).
- 2 aluminum rod 28.5 mm (1-1/8 in) dia. x 30 mm (1-3/16 in).



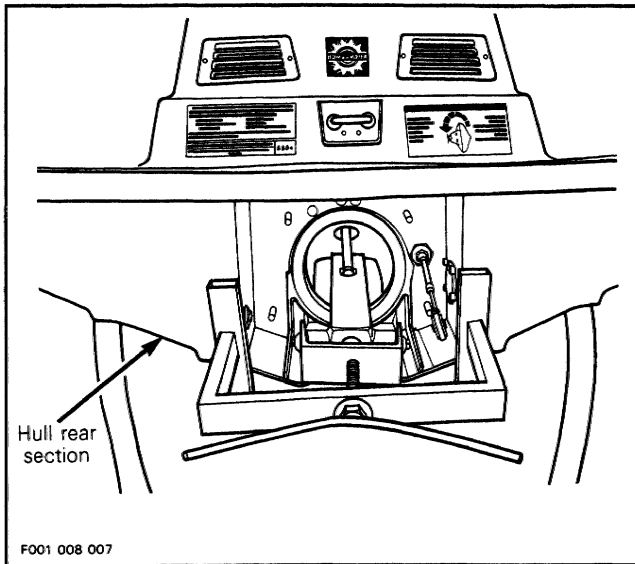
Mount on pump unit remover drive shaft puller, then install assembly on drive shaft using screws.



## Section 08 PROPULSION AND DRIVE SYSTEMS

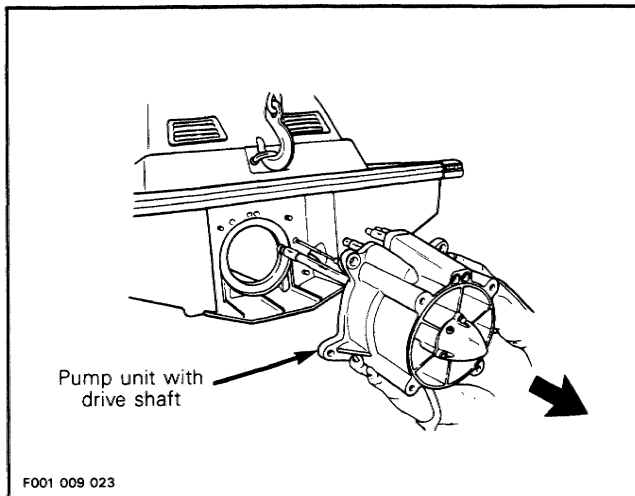
### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

**CAUTION :** Be careful not to damage hull rear section or engine rubber mounts.



#### 17,20,35, Venturi, Screw and O-ring

Remove four retaining screws and withdraw venturi. Keep O-ring for future use.

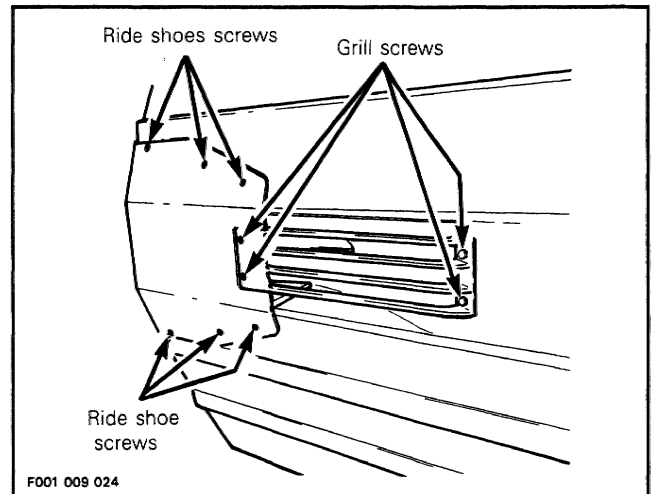


#### 37,38,39,40,41, Ride Shoe, Screw and Grill

**NOTE :** Grill 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 loosen tight screws.

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



Make the following tool to easily separate ride shoe from hull.

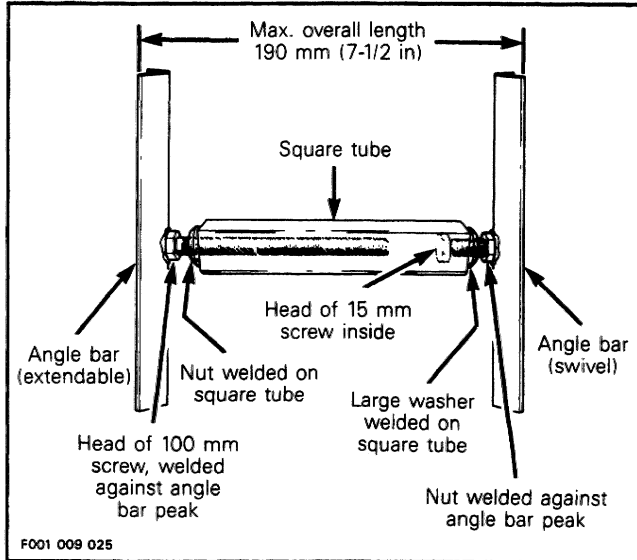
**CAUTION :** Prying ride shoe is likely to be damageable. Use special tool when ride shoe needs to be removed without damage.

- 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.

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

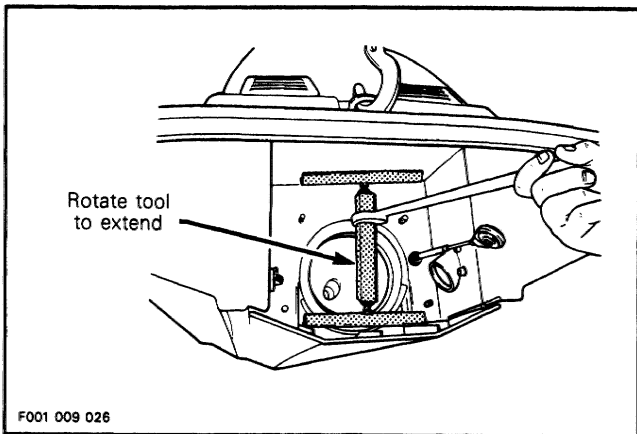
— Weld the washer to the remaining end of square tube.



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 and Protective Hose

○ **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.

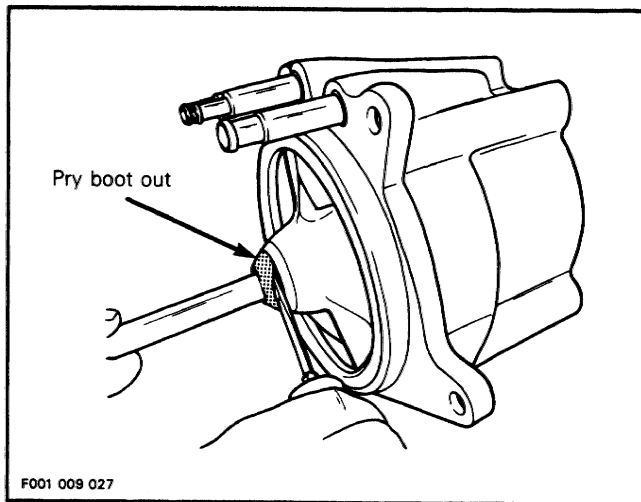
Loosen gear clamp holding seal carrier protective hose, then carefully pull hose and seal carrier from hull insert.

## 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.

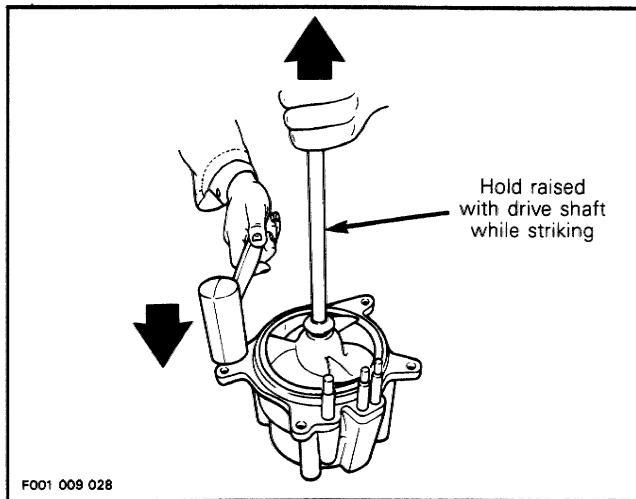


Withdraw drive shaft.

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

**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).

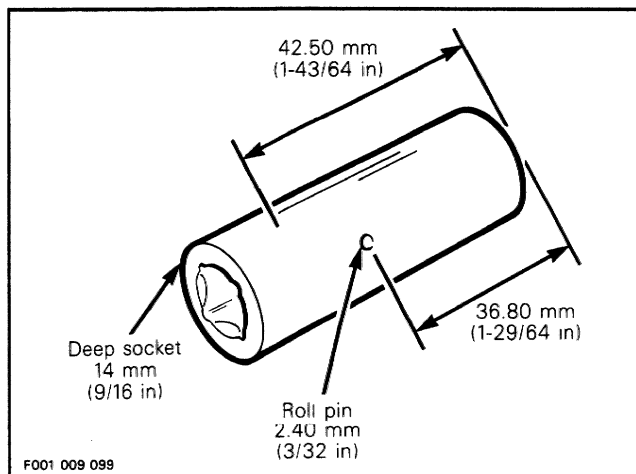


#### 2,15, Fitting

Fittings can be removed with deep socket or vise grip. Do not contact hose mounting area.

Fitting can be removed from pump housing with following suggested tool :

- Use a deep socket 14 mm (9/16 in).
- Drill deep socket with a 14 mm (9/16 in) drill bit, starting at hexagone head end as shown in following illustration.
- Drill one 2.40 mm (3/32 in) hole in center of deep socket as shown in following illustration.
- Install 2.40 mm (3/32 in) roll pin in the center hole.



#### 13,14, Housing Cover and Screw

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

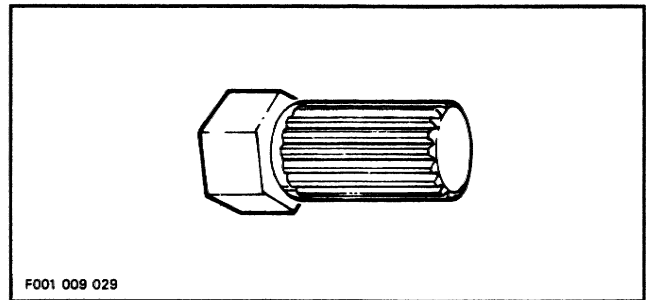
Place container under cover to catch oil.

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

Insert impeller shaft holder (P/N 295 000 082) on flat end of impeller shaft.

Using two screws previously removed from venturi, secure shaft holder to housing. To ease removal heat impeller center with a propane torch to approximately 150°C (300°F) to break the Loctite bond.

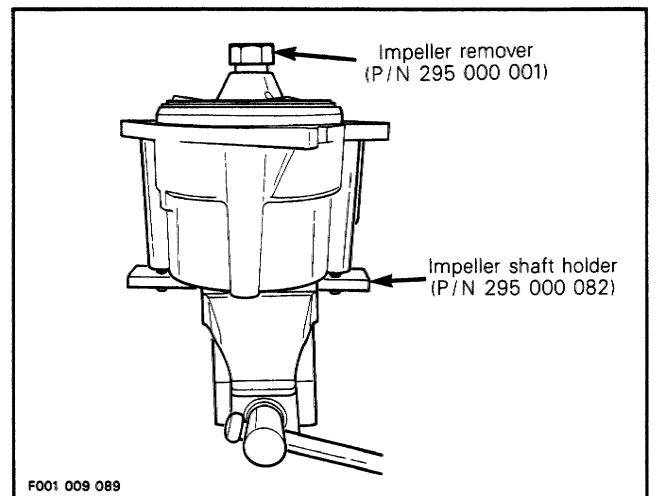
Impeller is loosen using impeller remover (P/N 295 000 001).



Install shaft holder in a vice.

Insert special tool in impeller splines.

Rotate counterclockwise and completely unscrew impeller.



**CAUTION :** Never use any impact wrench to loosen impeller.



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

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

Remove two screws holding impeller housing to shaft holder.

Lift impeller housing away from impeller shaft.

Slide thrust washer and thrust bearing off of shaft.

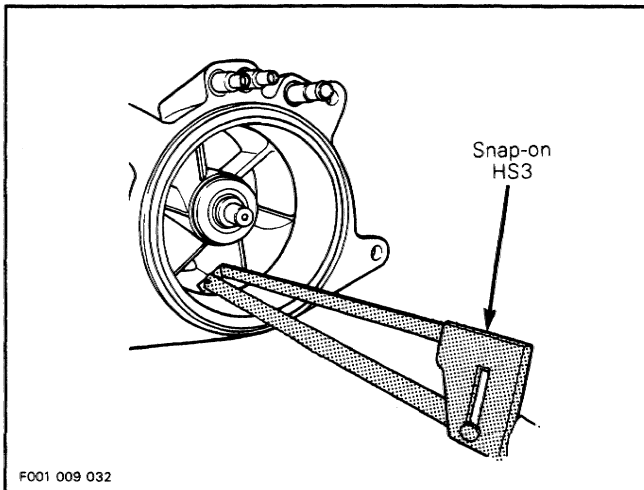
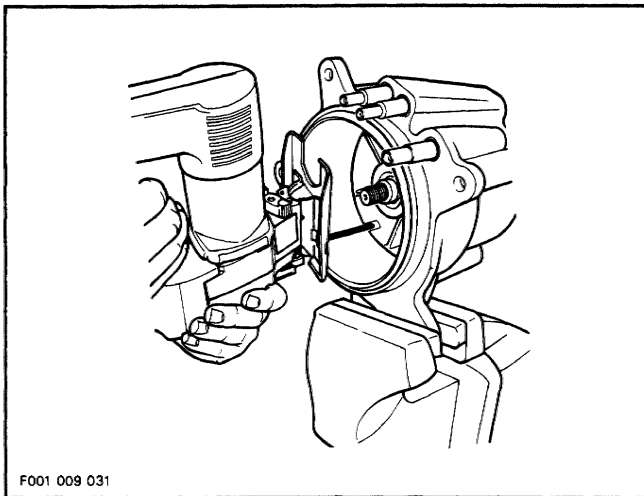
### 28, Wear Ring

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

Cut wear ring.

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

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



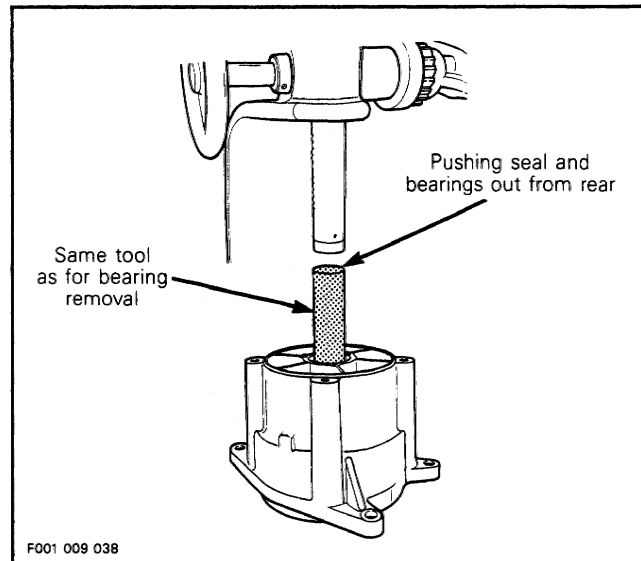
After cutting ring, insert a screwdriver blade between impeller housing and one end of ring.

Lift ring end so that both ends overlap each other.

Pull 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.

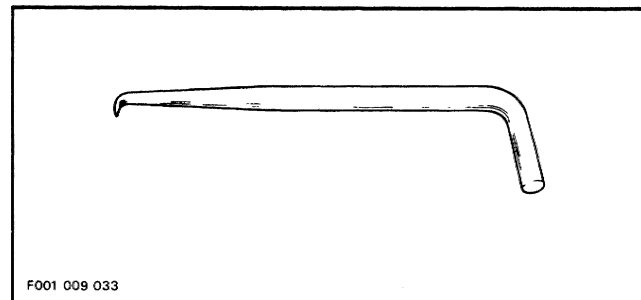


If only seal needs to be renewed, proceed as follows.

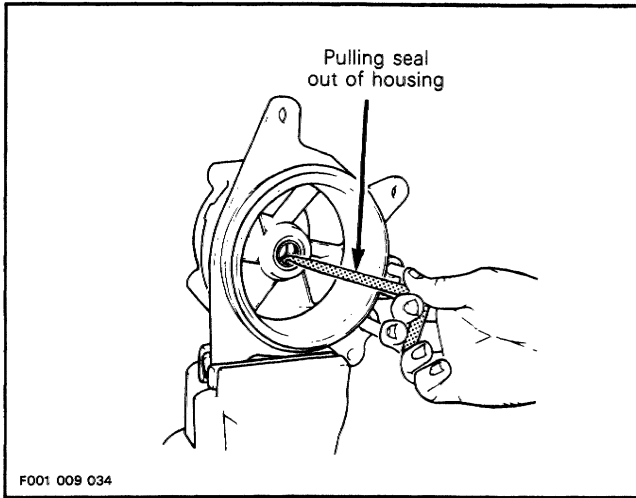
▼ **CAUTION** : It is not recommended to push seal out with a punch. Housing and/or bearing(s) could be damaged.

Seal should be removed using the following suggested tool.

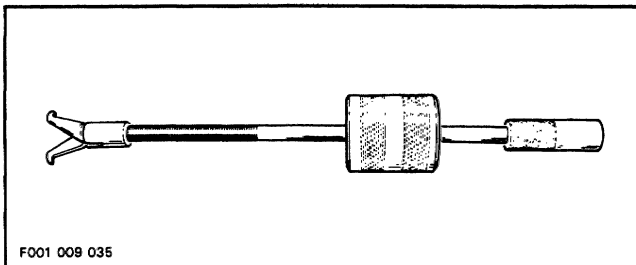
Seal puller, Snap-on #S6129.



**Section 08 PROPULSION AND DRIVE SYSTEMS**  
**Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)**

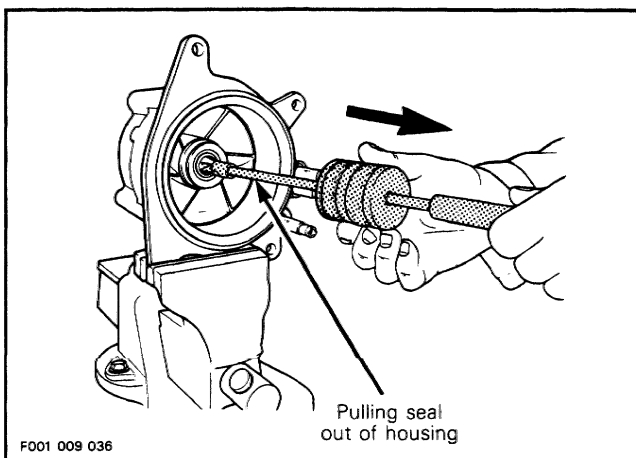


Or, use a Snap-on hammer puller including :  
 Handle CJ93-1  
 Hammer CJ125-6  
 Claws CJ93-4



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.

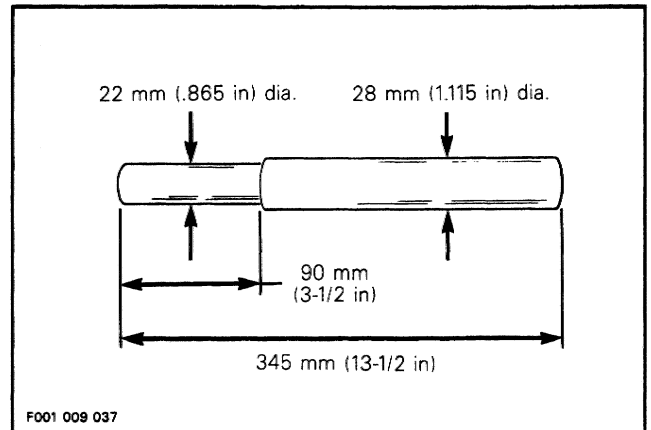
Slide puller sleeve outwards and **gently tap** puller end. Work with small strikes otherwise claws will slip out. As soon as seal begins to slide out, retighten claws to always maintain them tight against seal. Continue pulling until seal is out.



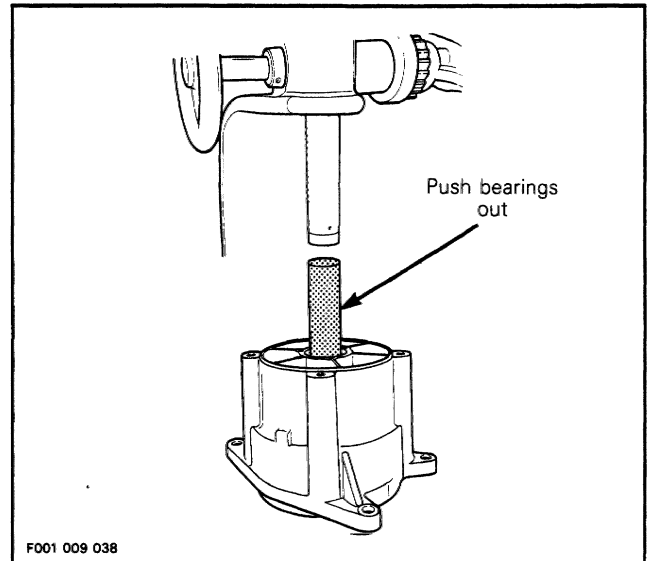
**4, Needle Bearing**

**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.



Insert pusher into one bearing then push tool using a arbor press until bearings are out. 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.

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

#### 49,50,51,52, Seal, Seal Carrier and Needle Bearing

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

Properly support seal carrier 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.

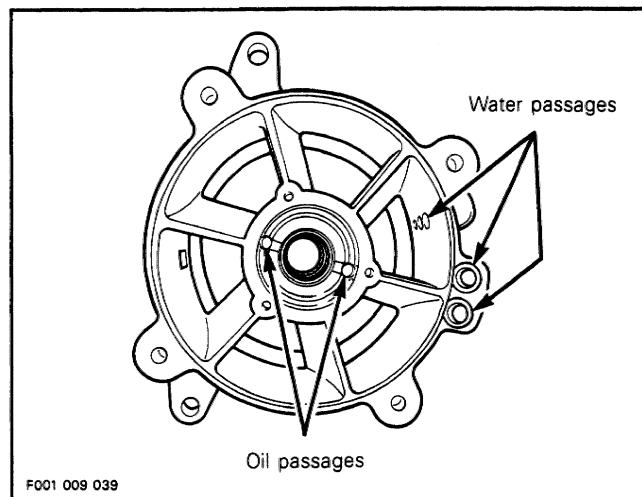
Remaining silicone can be removed with a steel brush (disc) mounted on a drill motor.

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

#### 26,43,54, Impeller, PTO Flywheel and Drive Shaft

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

○ **NOTE** : If PTO flywheel splines are very worn, a pipe wrench can be used to remove PTO flywheel instead of tool (P/N 295 000 001). Refer to ENGINE 03-04 then look for **PTO flywheel and magneto**.

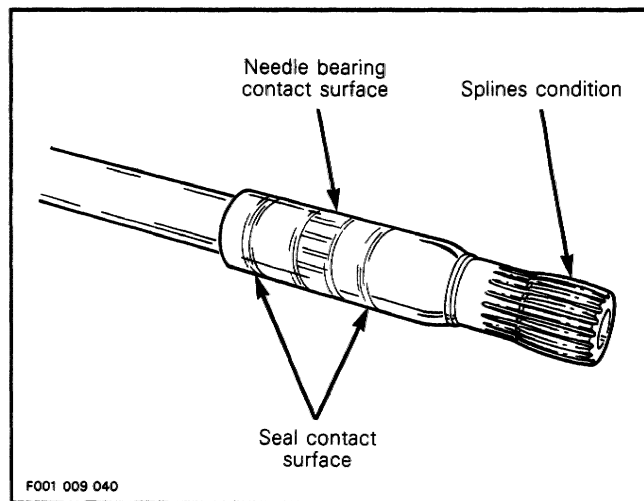
#### 51,53,54, Needle Bearing, Damper and Drive Shaft

##### 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.



##### Deflection

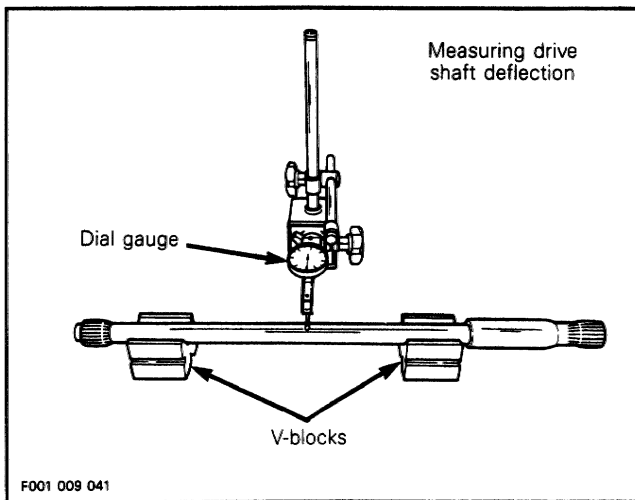
Excessive deflection could cause vibration and damage splines of drive shaft, impeller, flywheel or seal carrier.

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.

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

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

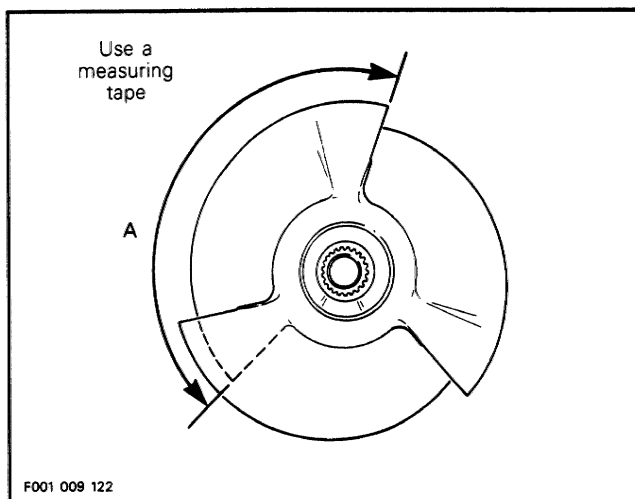


## 26, Impeller

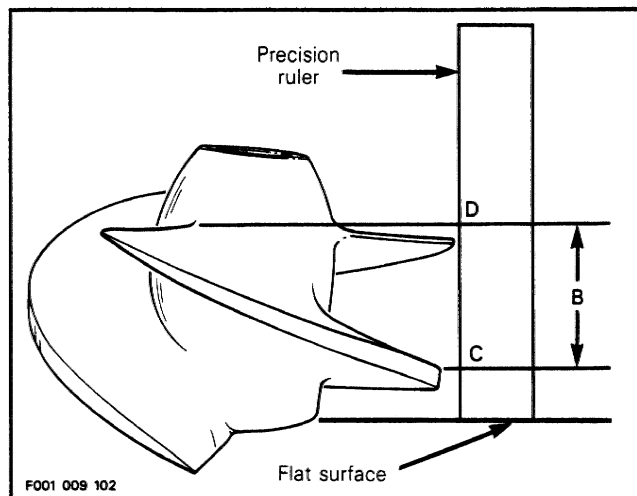
### Identification

To identify the impellers refer to the following illustrations and chart.

Measure distance A and B.



Place impeller on a flat surface and using a precision ruler measure at each end of the same blade. Measurement D minus measurement C equals B.



Refer to the following chart to identify impellers.

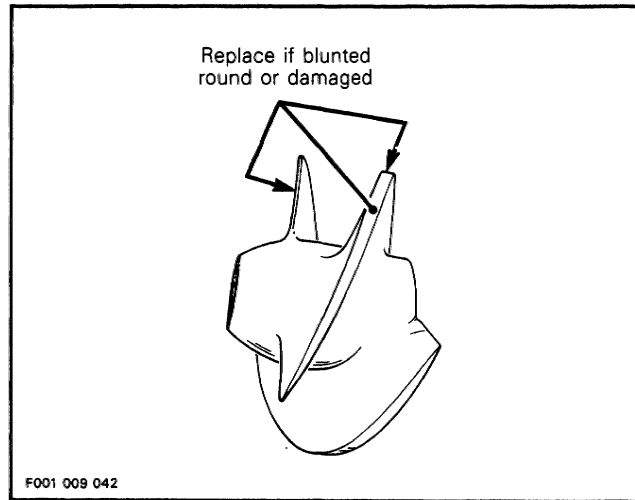
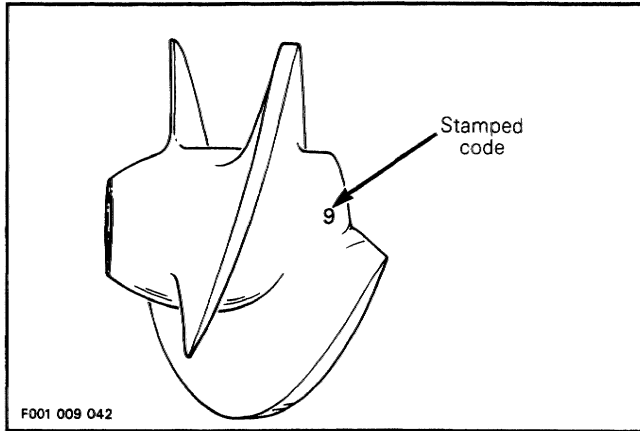
VEHICLE MODEL NO.	IMPELLER P/N	MATERIAL	DEGREE	MEASUREMENTS	
				A	B
5801 5802 5803	271 000 028	Aluminum	18°	178 mm (7")	53 mm (2-3/32")
5804 5805	271 000 086	Aluminum	18°	192 mm (7-9/16")	58 mm (2-9/32")
5810 5811 5812	271 000 052	Stainless steel	17°	186 mm (7-21/64")	56 mm (2-13/64")
5850 5851	271 000 115	Stainless steel	19°	174 mm (6-27/32")	57 mm (2-1/4")
5860	271 000 123	Stainless steel	18.3°	175 mm (6-57/64")	56 mm (2-13/64")
All models except 5850 5851	271 000 046 (optional)	Polished stainless steel	17.7°	186 mm (7-21/64")	59 mm (2-21/64")

Stainless steel impeller can also be identified with a stamped code.

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

Refer to following illustration and chart.



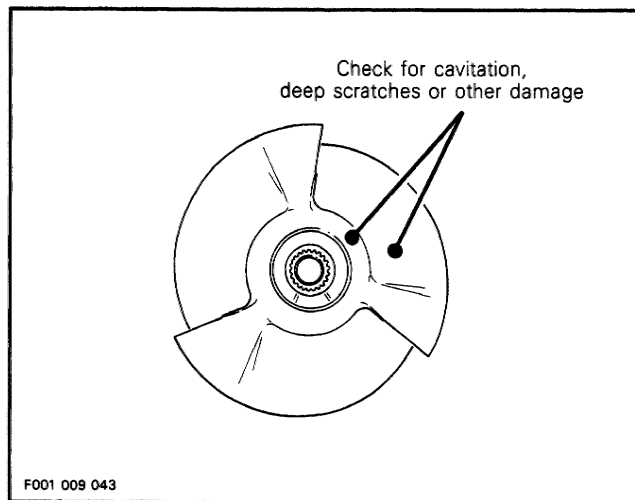
VEHICLE MODEL NO.	IMPELLER P/N	MATERIAL	DEGREE	CODE
5810 5811	271 000 052	Stainless steel	17°	7
5812				052
5850	271 000 115	Stainless steel	19°	9
5851				9 or 115
5860	271 000 123	Stainless steel	18.3°	83
All models except 5850 5851	271 000 046 (optional)	Polished stainless steel	17.7°	77

### 26,28, Impeller and 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 and 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 impeller shaft.

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

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

#### Radial Play

Radial play is critical for jet pump unit life span.

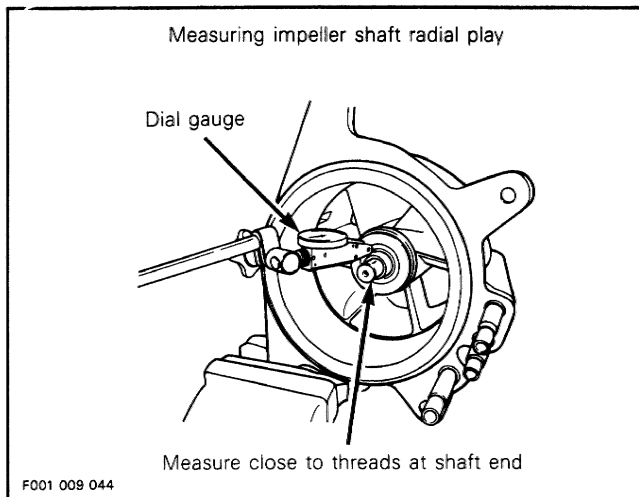
Radial play of impeller shaft is checked with shaft in housing, without impeller.

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

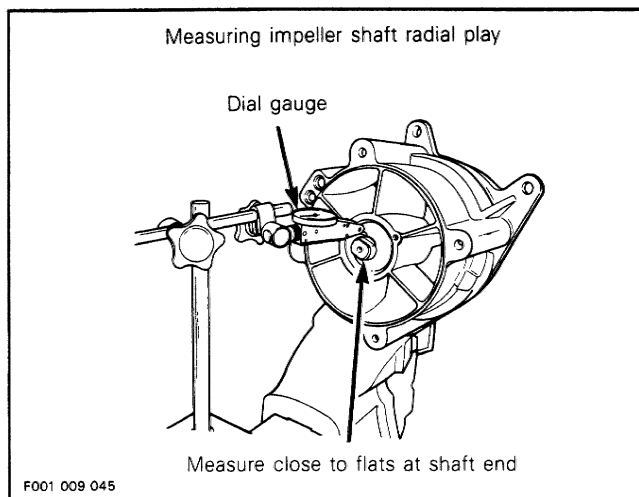
Set a dial gauge and position its tip onto end of shaft, close to end of threads.

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).



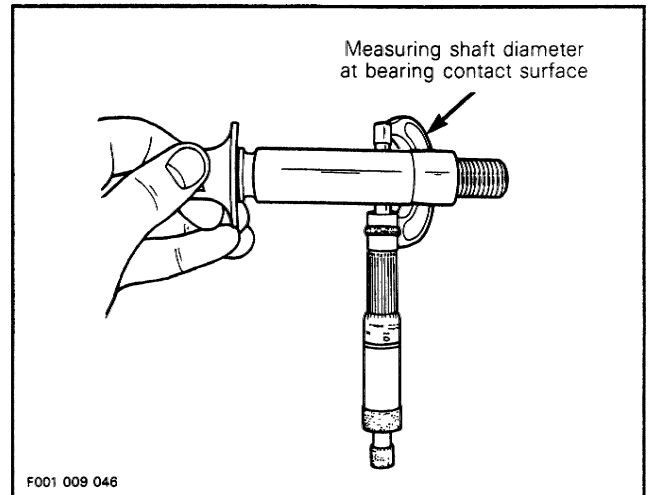
To check both bearings, proceed the same way with other end of shaft. Position tip of gauge on diameter, close to flats on shaft.



Excessive play can come either from worn bearings or impeller shaft or damaged impeller housing bearing surfaces.

Measuring shaft diameters will determine defective part.

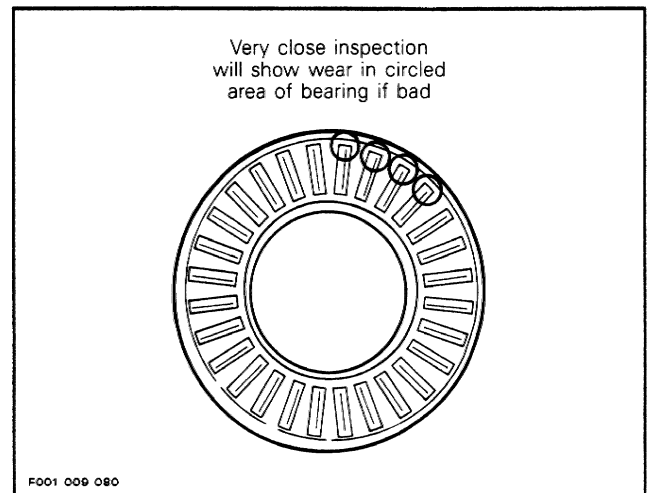
Using a micrometer, measure diameters on bearing contact surfaces. **Minimum** shaft diameter should be 22.24 mm (.876 in). A shaft within tolerance indicates worn bearings. Replace both bearings.



**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 and Thrust Bearing

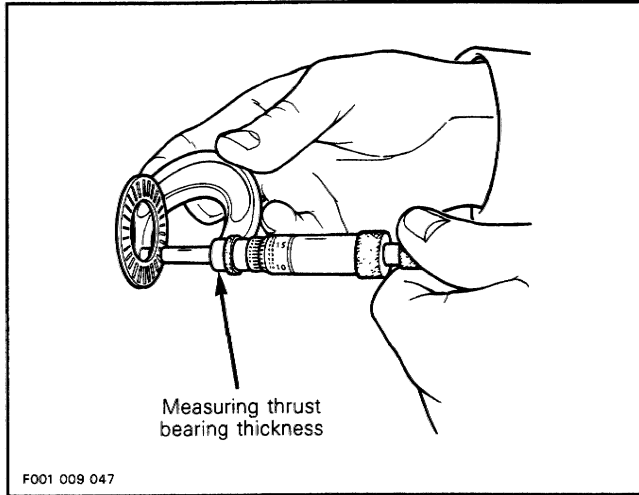
Visually inspect thrust washer, thrust bearing and their contact surface. Check for scoring, pitting, chipping or other evidence of wear.



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

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



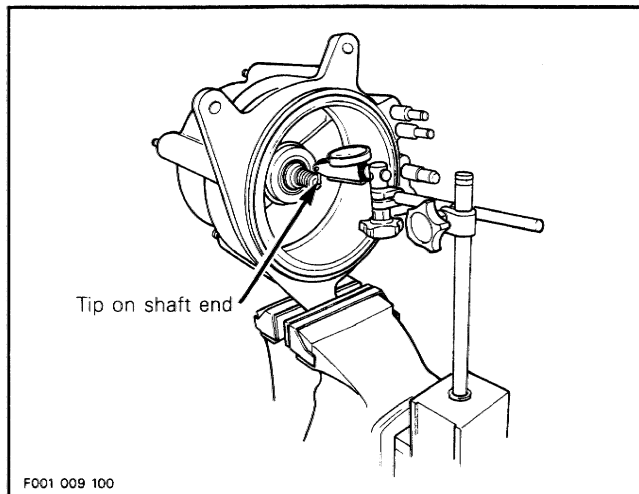
○ **NOTE :** When replacing either washer or bearing, it is recommended to renew both.

### 13, Housing Cover

#### End Play

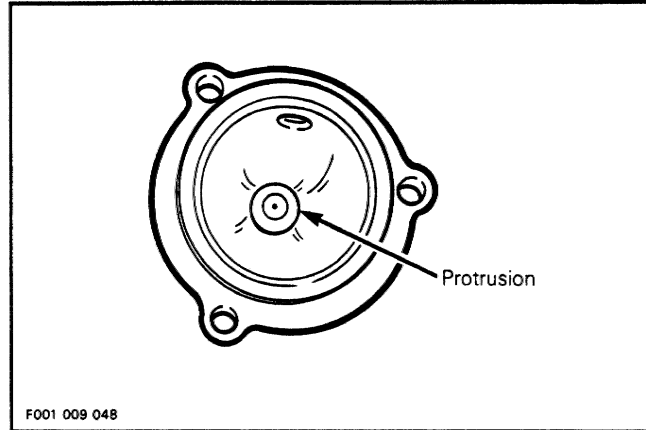
End play of impeller shaft is checked with shaft in housing, without impeller and with housing cover installed.

Retain housing in a brass jaw vise making sure not to damage housing lug. Set a dial gauge and position its tip on the end of shaft. Move shaft end by pulling and pushing. Difference between highest and lowest dial gauge reading is end play. Maximum permissible end play (new) is 0.12 - 0.54 mm (.005 - .021 in).



Excessive play come from worn protrusion inside 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 damages. Renew as necessary.

## ASSEMBLY

### 28, Wear Ring

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

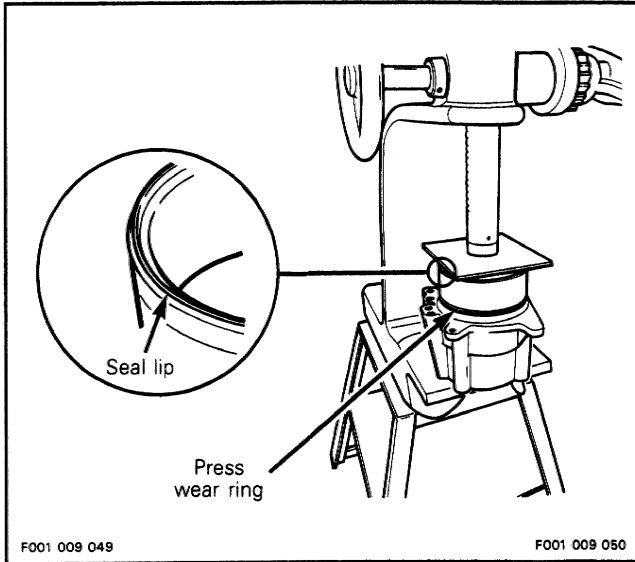
To ease insertion into housing, apply SEA-DOO LUBE (P/N 293 600 006) onto outside circumference of wear ring.

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.

## Section 08 PROPULSION AND DRIVE SYSTEMS

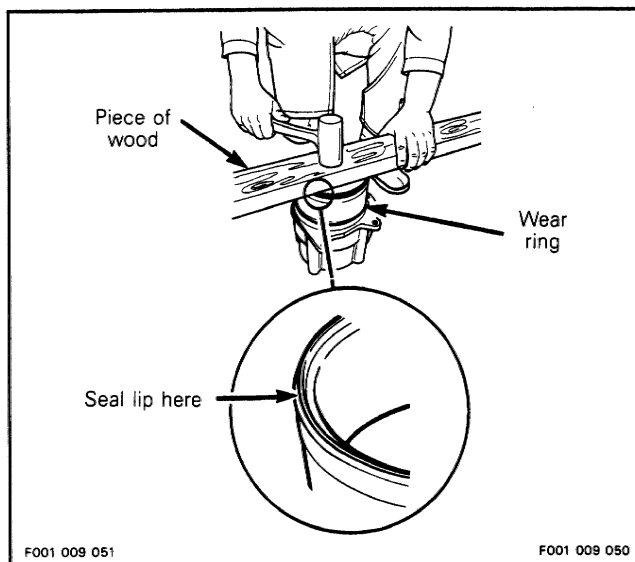
### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

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



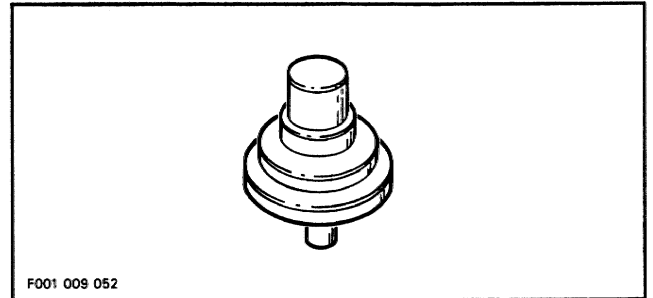
If a press is not readily available, a piece of wood such as a 2 x 4 x 12 in. long, can be used.

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.



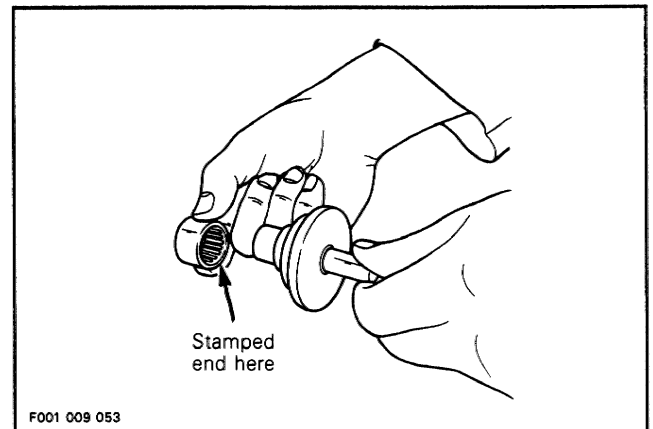
### 3,4, Seal and Needle Bearing

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

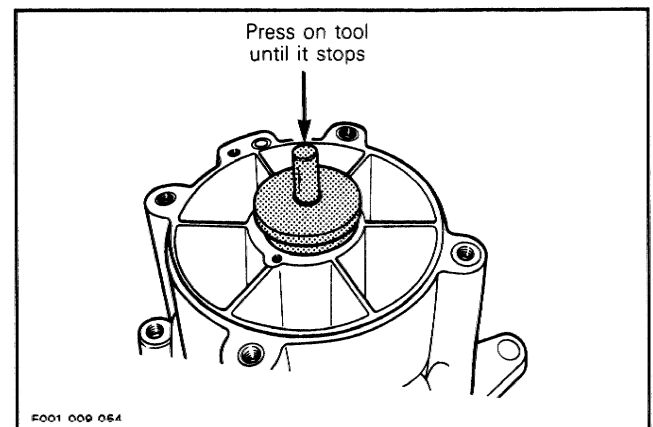


Stamped end of bearings (showing identification markings) must be located toward outside of housing.

Properly insert bearing on tool. Using an arbor press only, push tool until tool flange contacts housing. Proceed the same for both bearings.



**CAUTION:** Never hammer the bearing into its housing.



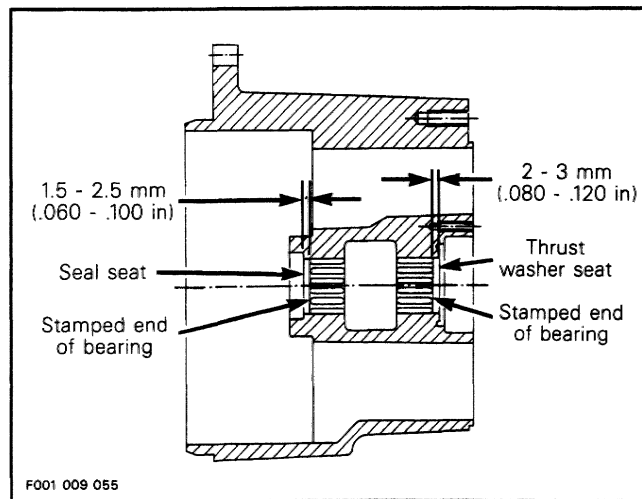


## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

▼ **CAUTION :** This tool has been designed to properly position bearings and seal, thus providing space for lubrication purposes. The tool flanges allow 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.



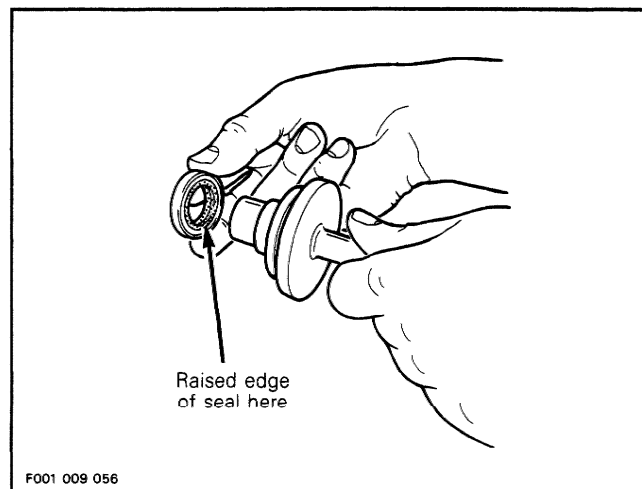
Same tool will be used to install seal in housing.

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

Apply Loctite 515 (P/N 293 800 007) in seal housing, all around outer diameter and on seal seat.

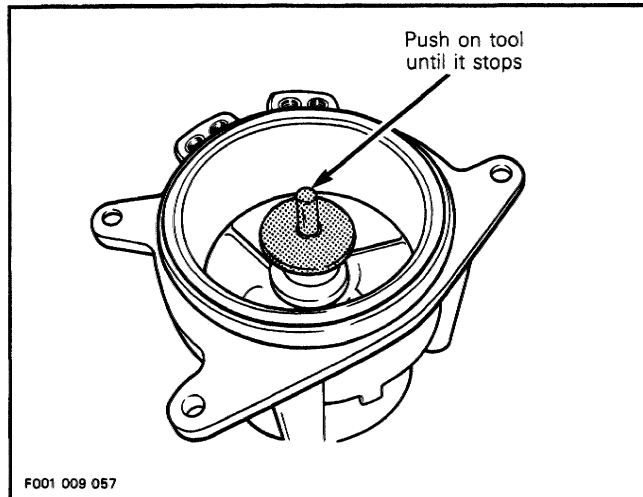
Properly insert seal on tool.

○ **NOTE :** Be careful when installing seals to pack seal with grease before inserting bearing/ seal installer tool. Properly insert tool in seal with a rotating movement.

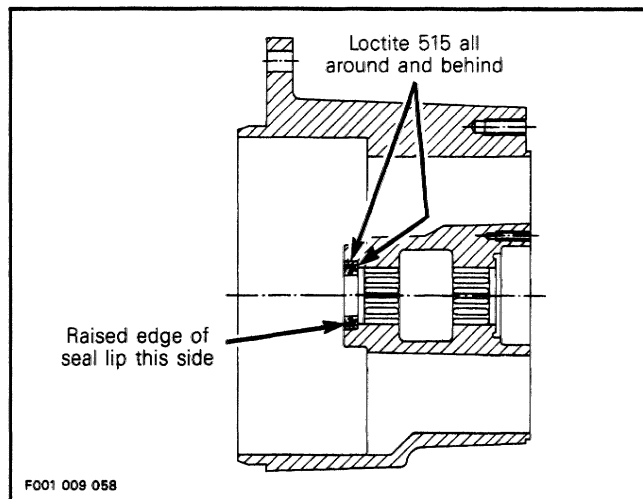


▼ **CAUTION :** Take care that no sealant contacts any roller of bearing.

Push on tool end with a press until tool flange contacts housing.



Apply synthetic grease (P/N 293 550 010) between seal lips.



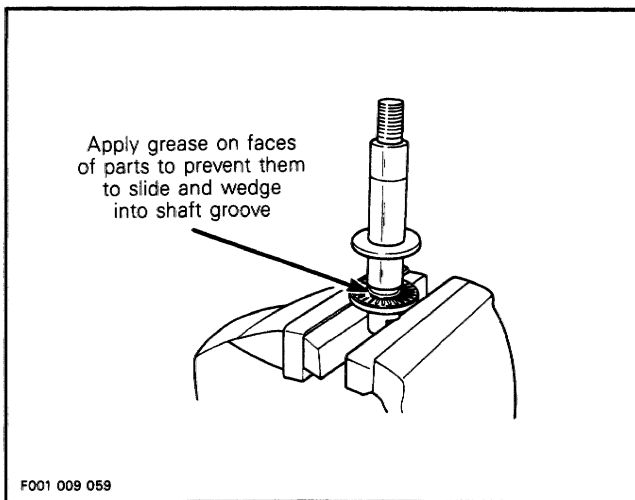
### 7,8,9,10,26, Impeller Housing, Thrust Washer, Thrust Bearing, Impeller Shaft and Impeller

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

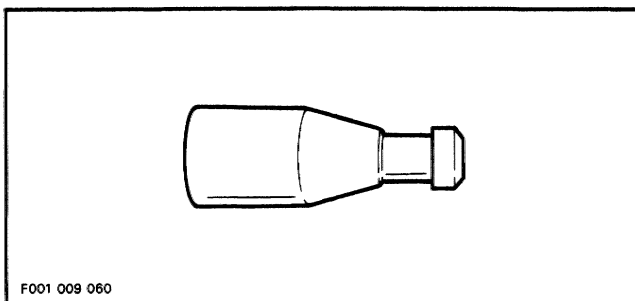
Apply synthetic grease (P/N 293 550 010) both sides of thrust bearing then insert onto shaft followed by thrust washer. Properly center washer and bearing with shaft flange. Grease will prevent parts from sliding at installation and thus possibly wedging thrust bearing into shaft groove.

## Section 08 PROPULSION AND DRIVE SYSTEMS

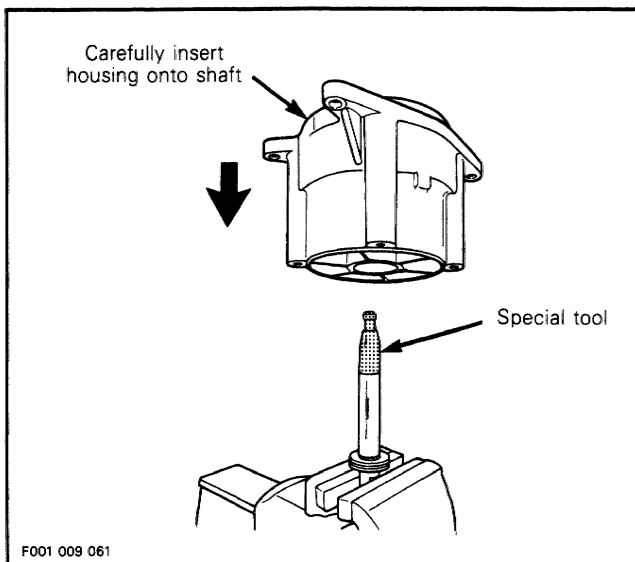
### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)



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.

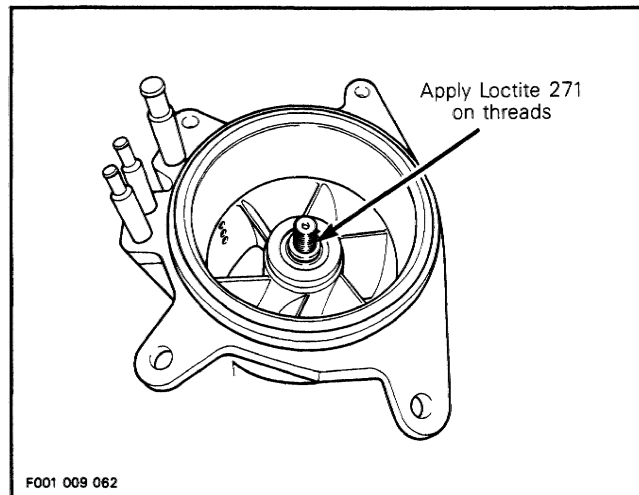
Brush and clean impeller shaft threads and impeller splines with Loctite Safety solvent 755 (P/N 293 800 019) or equivalent. Free threads and splines from any residue. Allow solvent to dry thoroughly.

**CAUTION:** Be careful not to damage impeller shaft diameter.

Apply Loctite primer N (P/N 293 600 012) on impeller shaft threads. Allow to dry for two minutes.

**NOTE:** Loctite primer is used to reduce Loctite 271 curing time and to activate stainless steel and aluminum surfaces for better bonding action. If applied, complete curing time is six hours, if not, 24 hours is needed.

Apply Loctite 271 red (P/N 293 800 005) to shaft threads.



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

Using two screws previously removed from venturi, secure impeller shaft holder (P/N 295 000 082) to housing. Install shaft holder in a vice.

**NOTE:** Pump pressurization should be performed at this time. If it leaks, it is easier to determine where. Refer to **pump pressurization** further in this section.

To ease impeller installation, apply liquid soap or Sea-Doo lube (P/N 293 600 006) on wear ring.

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

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

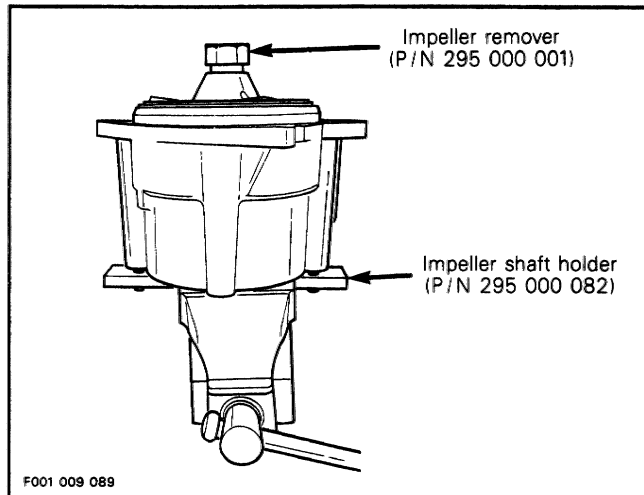
**CAUTION:** Make sure thrust washer and bearing are not wedged in shaft groove. To check, manually pull and push impeller housing, an axial play must be felt.

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

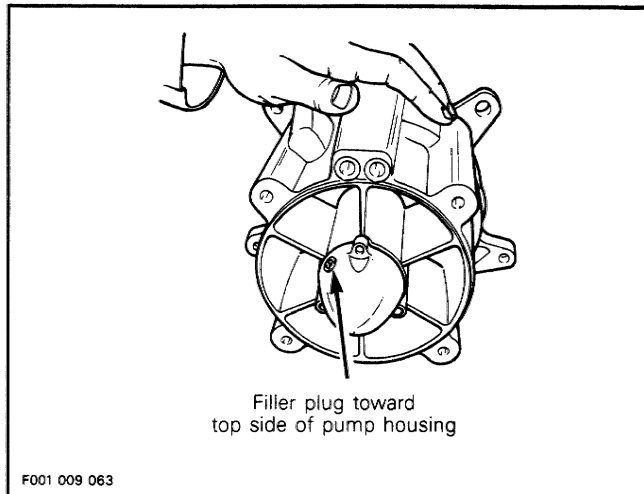
Torque impeller to 70 N•m (52 lbf•ft) then remove tools.

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



#### 11,13,18, O-ring, Housing Cover, Loctite 515

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



Apply Loctite 242 (blue) (P/N 293 800 015) on screw threads and evenly tighten cover screws. Torque to 7 N•m (62 lbf•in).

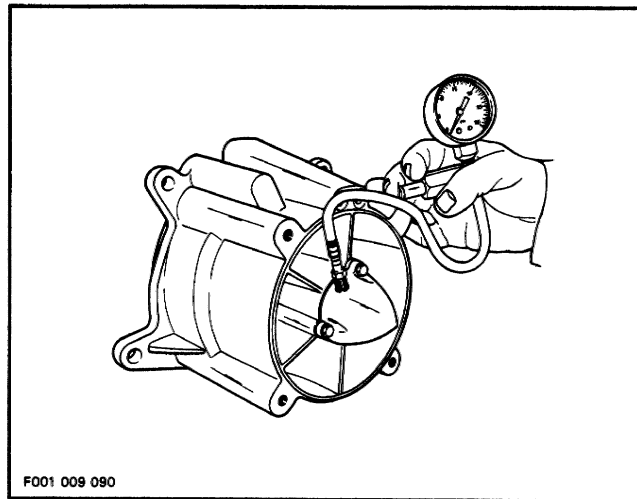
## PUMP PRESSURIZATION

Whenever doing any type of repair on the pump, pressure test should be done to check for any leakage.

### Pressure Test

Proceed as follows :

- Remove plug from housing cover. Drain oil.
- Apply Loctite PST 592 (P/N 293 800 018) on threads fitting (P/N 295 000 086) then secure on cover.
- Connect pump gauge tester (P/N 295 000 083) to fitting.
- Pressurize pump to a maximum of 70 kPa (10 PSI). Pump must maintain this pressure for 10 minutes.



▼ **CAUTION:** Repair any leak, failure to correct a leak will lead to premature wear of pump components.

If there is a pressure drop spray soapy water around housing cover. If there are no bubbles, impeller shaft, impeller shaft seal, bushing or impeller housing is leaking through porosity and has to be replaced. Jet pump unit has to be overhauled.

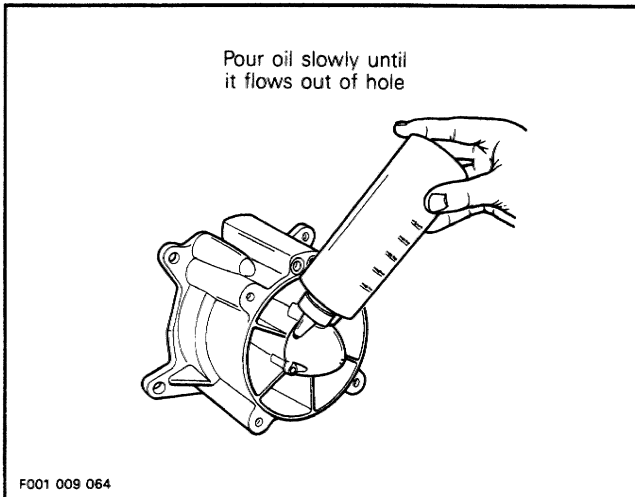
Place housing horizontally as in its operating position so that fitting in cover is located in top. Remove fitting from cover. Pour SEA-DOO JET PUMP SYNTHETIC OIL (P/N 293 600 011) in reservoir until oil comes level with bottom of hole. Let oil penetrates in housing and after a few minutes pour oil again until it is level with bottom of hole. Oil capacity is 65 mL (2.2 oz).

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

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

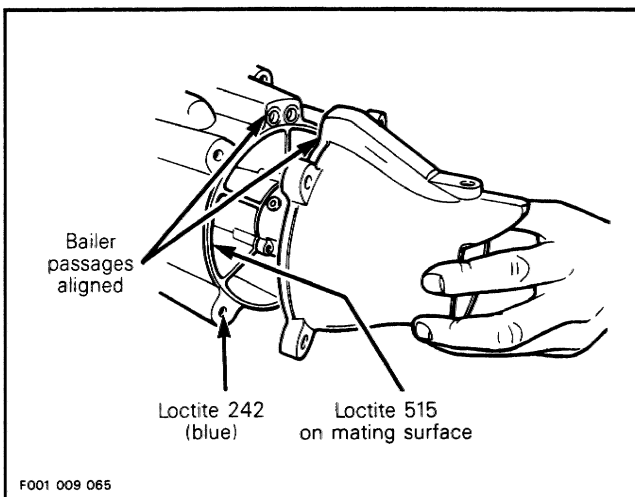
○ **NOTE:** When filling, oil must be poured into cover quite slowly to allow complete housing fill.



Apply Loctite PST 592 (P/N 293 800 018) on plug then secure on cover.

#### 17,20,35, Venturi, Screw and 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 293 800 015) on threads and install screws and washers then torque to 25 N•m (18 lbf•ft) in a criss-cross sequence.



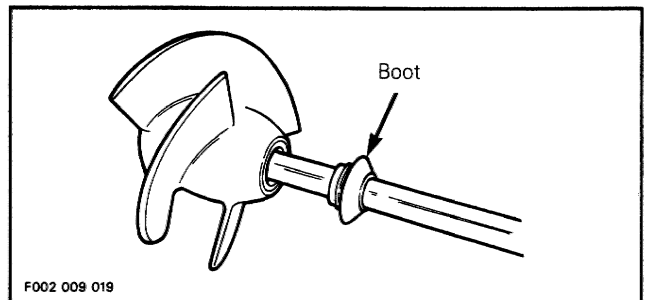
○ **NOTE:** On aluminum material it is recommended to use Loctite primer N (P/N 293 600 012) to reduce curing time and to increase gap filling capability. Refer to manufacturer's instructions.

#### 2,15, Fitting

Apply Loctite PST 592 (P/N 293 800 018) on plastic fitting threads. Then thread fittings into pump housing until threads are bottomed.

#### 27, Boot

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

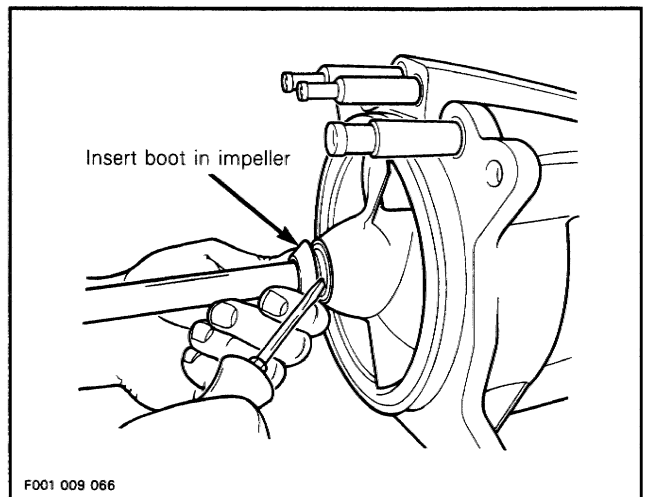


Clean drive shaft splines with Loctite solvent 755 (P/N 293 800 019). Free splines from any residue. Allow solvent to dry thoroughly.

Generously apply synthetic grease (P/N 293 550 010) 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.

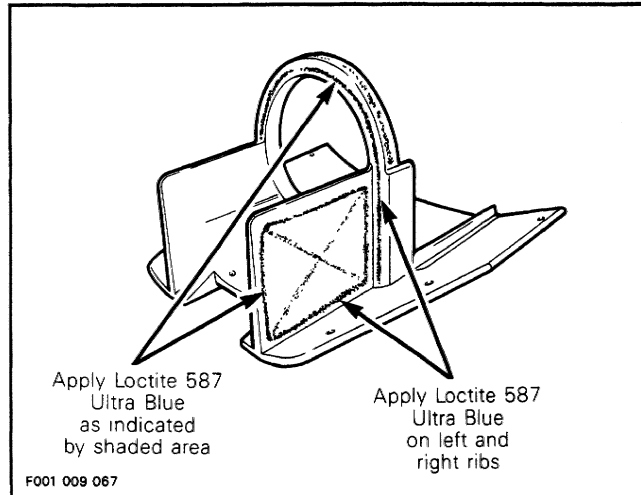


## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

#### 37,38,39,40,41, Ride Shoe, Screw and Grill

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 242 (blue) (P/N 293 800 015) on screw threads, install and tighten in a criss-cross sequence. Torque to 10 N•m (88 lbf•in).

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

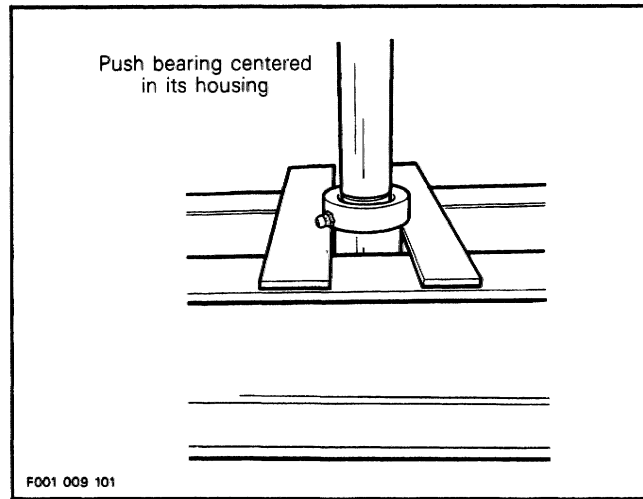
Apply Loctite 242 (blue) (P/N 293 800 015) on threads of grill screws, install and tighten. Torque screws to 8 N•m (71 lbf•in).

#### 50,51, Seal Carrier and Needle Bearing

Properly support seal carrier when installing seals and bearing.

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

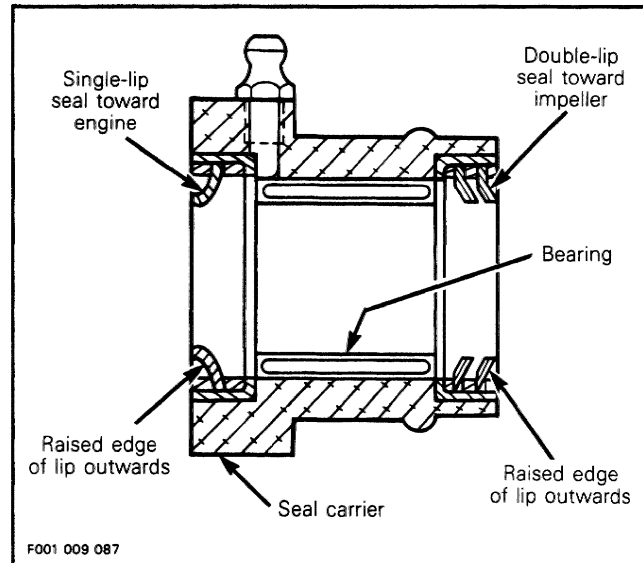
**CAUTION:** Never hammer the bearing into its housing.



#### 49,50,52, Seal and 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.

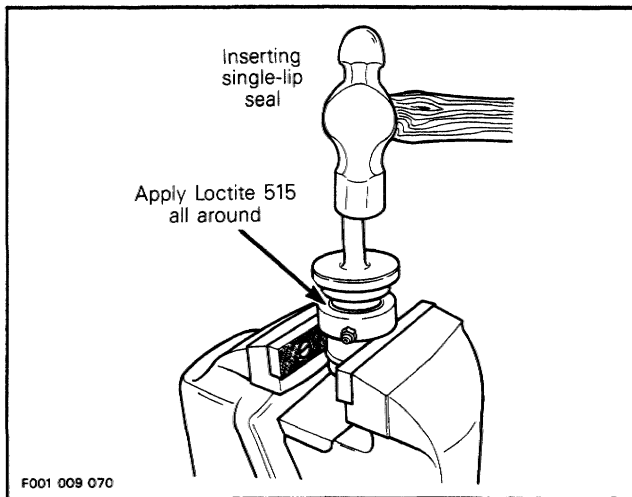


Apply Loctite 515 (P/N 293 800 007) all around outside diameter of seals.

Single-lip seal can be carefully inserted, using special tool (P/N 295 000 014) to avoid seal damage. Push seal until it comes flush with its housing.

## Section 08 PROPULSION AND DRIVE SYSTEMS

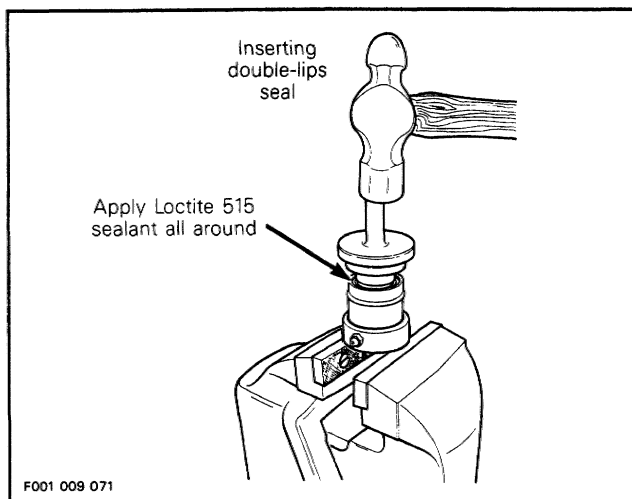
### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)



It is recommended to use a special tool (P/N 295 000 014) to avoid lip damage on double-lip seal.

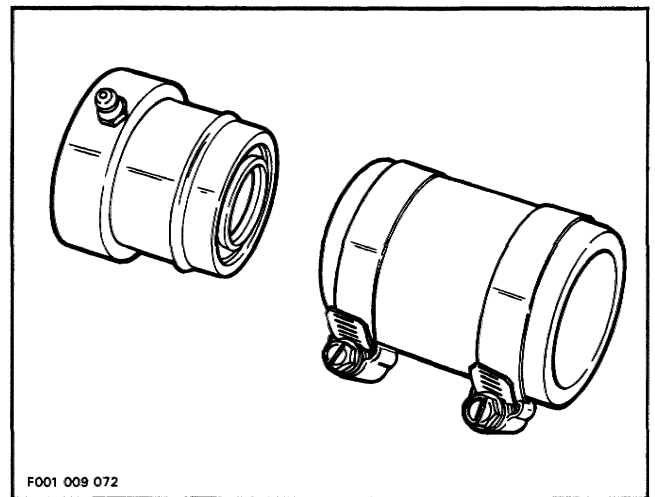
Push seal until it comes flush with its housing.

○ **NOTE** : Whenever replacing the double lip seal, an hydrodynamic seal should be installed. Always install seal with the protector facing the impeller.



Pack seals and bearing with synthetic grease (P/N 293 550 010).

Install seal carrier and protective hose to hull insert with gear clamps.

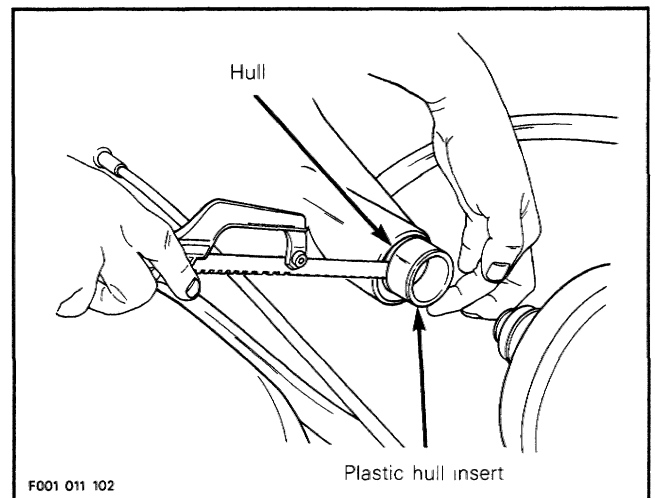


○ **NOTE** : Seal carrier gear clamps should not be tightened until pump is installed, to insure perfect alignment.

## INSTALLATION

### 65, Hull Insert

Cut plastic hull insert flush with hull using a saw.



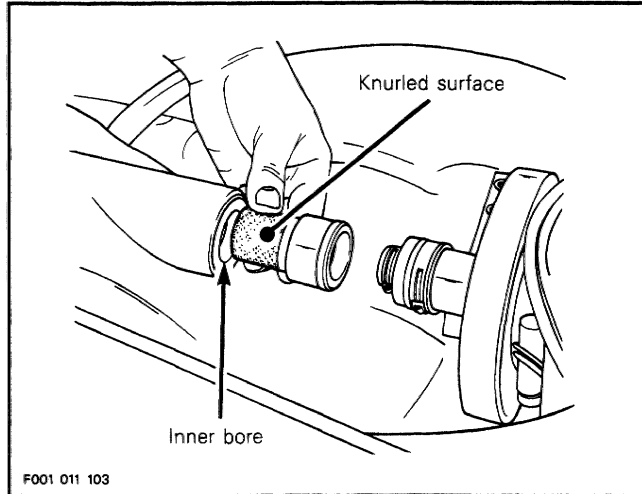
Mix epoxy glue (3M-05900), follow manufacturer instructions.

Apply epoxy glue on aluminum insert (P/N 292 000 075) knurled surface and on plastic insert inner bore.

## Section 08 PROPULSION AND DRIVE SYSTEMS

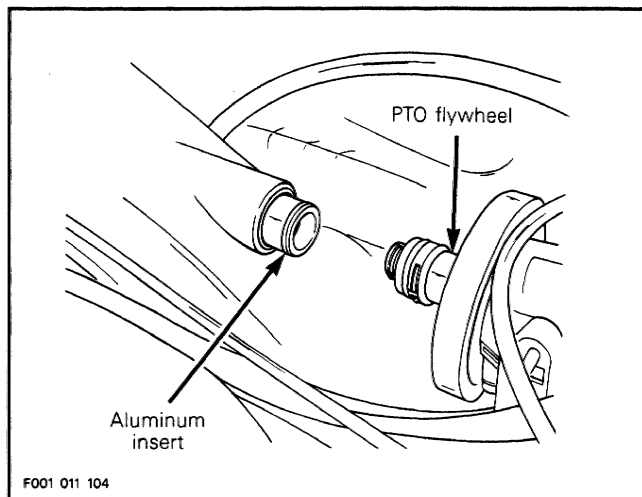
### Sub-section 01 (PROPULSION AND DRIVE SYSTEMS)

▼ **CAUTION:** A clearance between plastic insert and aluminum insert could possibly be noticed. If so, ensure to fill gap with epoxy glue to obtain aluminum insert adhesion.



Install insert into plastic hull insert.

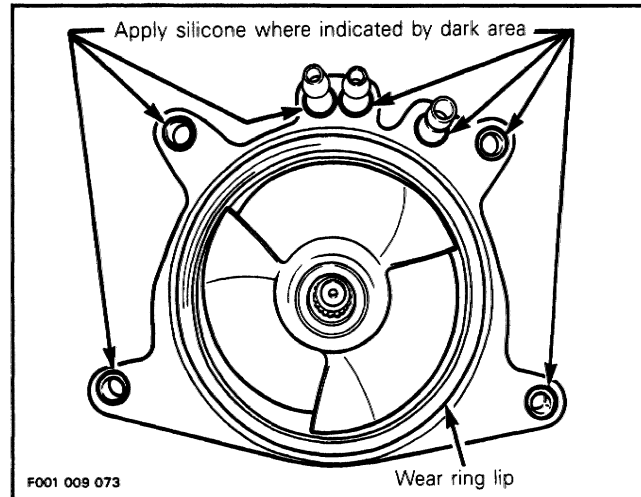
○ **NOTE:** Align aluminum insert as much as possible with PTO flywheel.



○ **NOTE:** The epoxy glue curing time is 30 minutes.

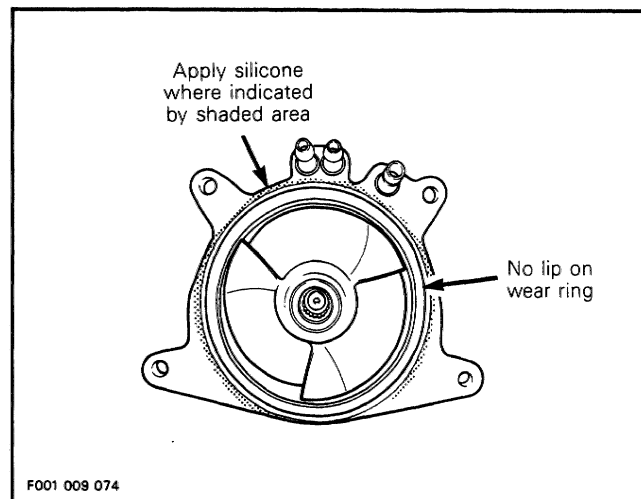
### Pump Unit

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.

▼ **CAUTION:** Seal the wear ring to ride shoe contact area with Loctite 587 Superflex (P/N 293 800 016).



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

Make sure rubber damper is on drive shaft end.

▼ **CAUTION** : Some watercraft have a shim between hull and pump, if shim has been removed ensure to reinstall it. If not install, engine and jet pump alignment will be altered.

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 PTO flywheel.

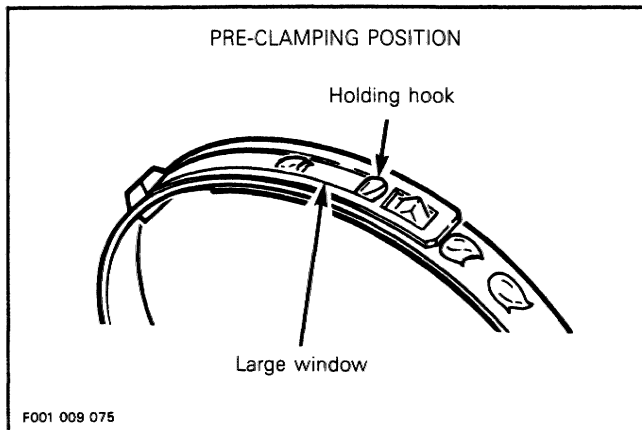
▼ **CAUTION** : When sliding the drive shaft through seal carrier, the double lip seal (P/N 293 200 009) could be folded over. This could cause a seal carrier bearing failure.

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

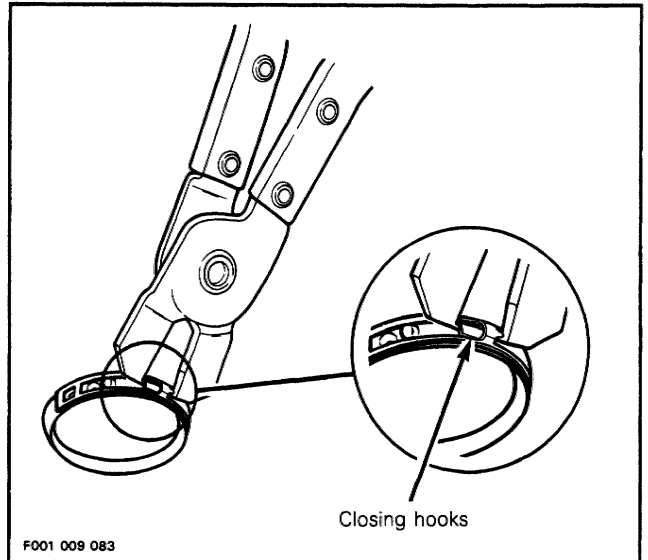
If necessary, tap pump end with a rubber hammer until retaining nuts and washers can be installed. Apply Loctite 242 (blue) (P/N 293 800 015) on threads and equally tighten nuts in a criss-cross sequence and torque to 35 N•m (26 lbf•ft).

Secure boot clamp as follows :

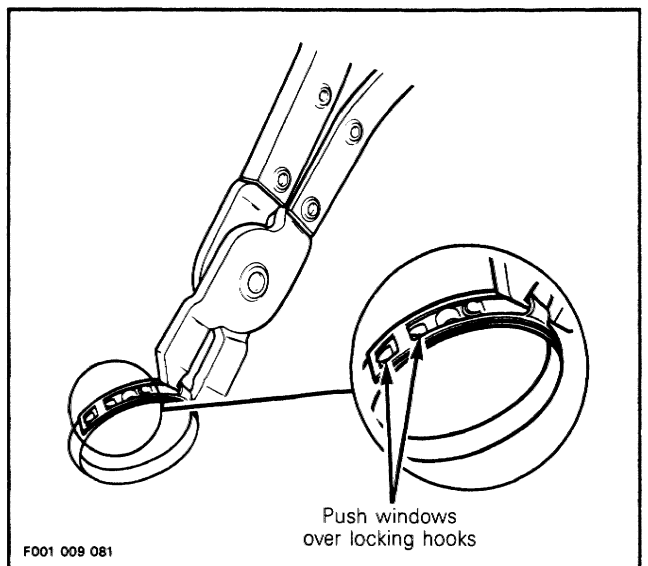
- Use pliers (P/N 295 000 069) as for removal.
- Manually engage holding hook in large window. This is a pre-clamping position only.



- Insert pointed tips of pliers first in closing hooks.



- Squeeze pliers 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.



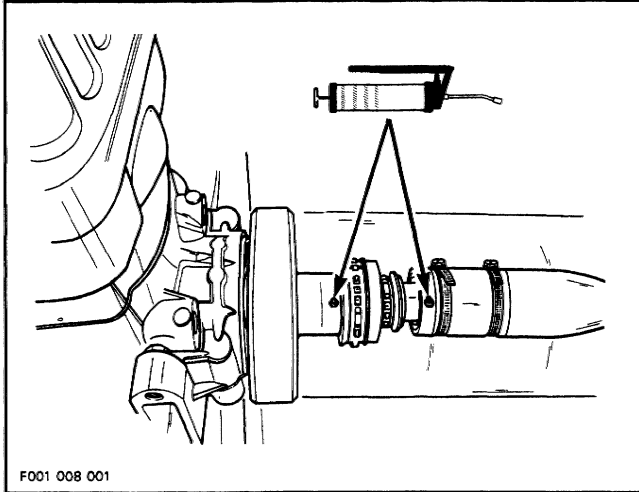
Using a grease gun, carefully lubricate, with synthetic grease (P/N 293 550 010), at grease fitting until boot is just beginning to expand. From this point, immediately stop.



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

Secure seal carrier protective hose to hull insert with gear clamps. Lubricate at seal carrier grease fitting until grease is just coming out on engine side. From this point immediately stop.



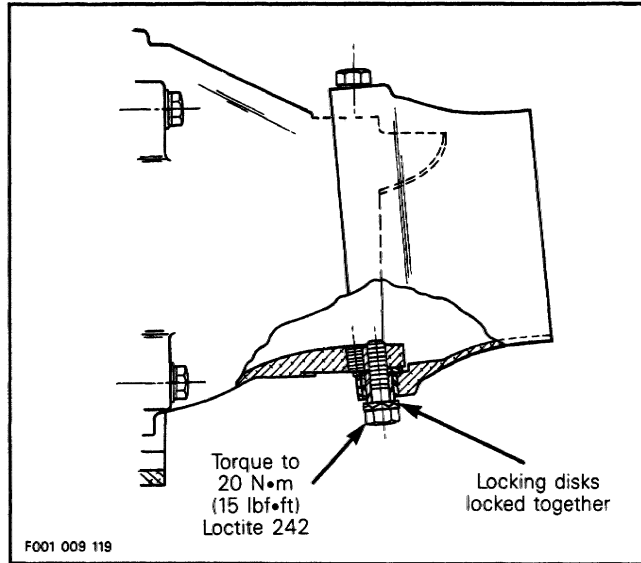
Secure flywheel guard to engine studs with washers and wing nuts.

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

#### 21,22,23,24, Screw, Sleeve, Bushing and Nozzle

Insert bushings in nozzle, positioning their flanges from inside of nozzle. Apply SEA-DOO LUBE (P/N 293 600 006) 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. Install screws position bottom screw in one of the holes with **locking disks** (if applicable) then torque to 20 N•m (15 lbf•ft).



**WARNING:** Whenever removing screw always renew both locking disks. The recommended Loctite must be applied on screw threads and screw must be torqued as specified.

Reinstall steering cable ball joint on nozzle and check handlebar/nozzle alignment.

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).

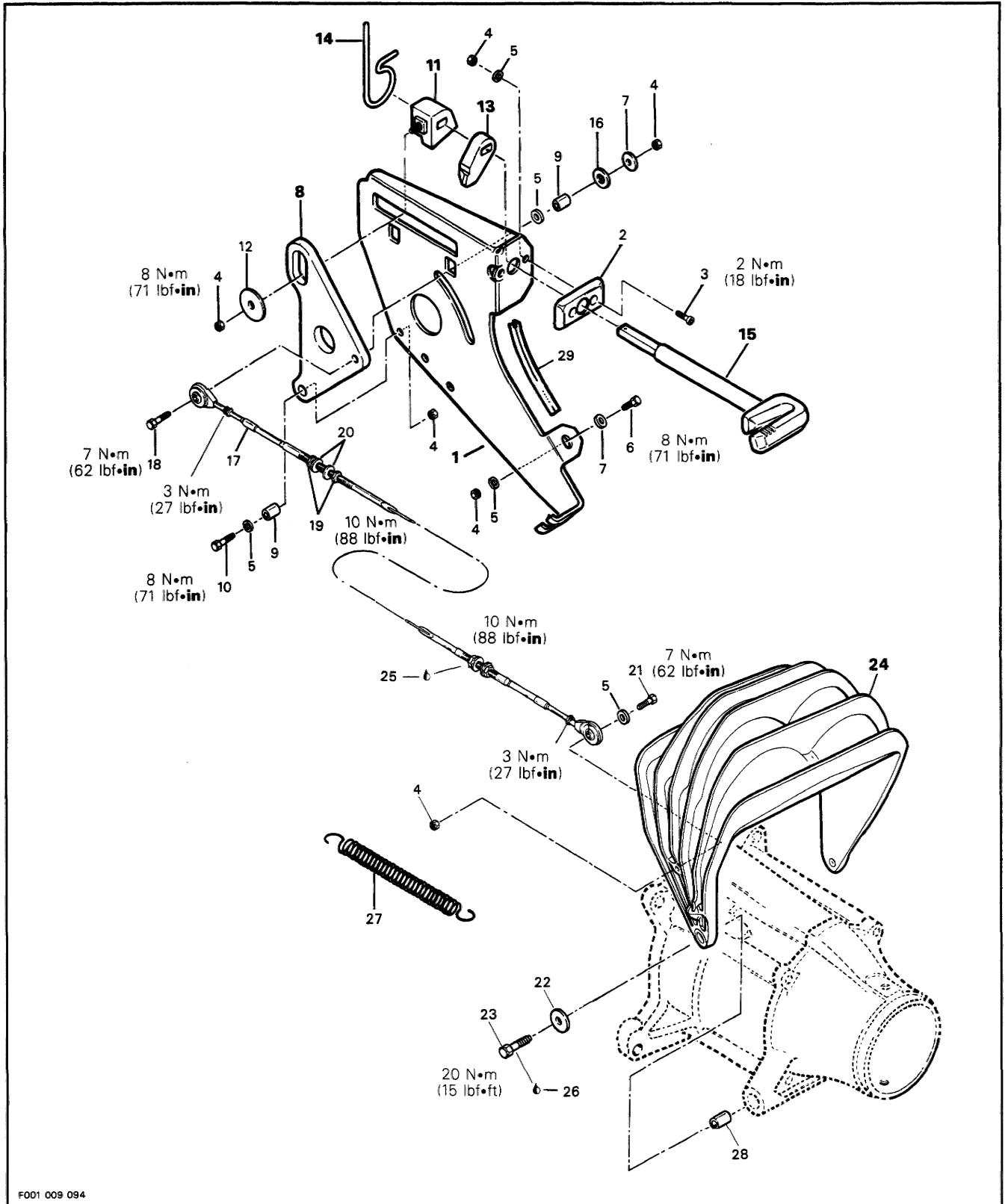
Slightly lubricating wear ring with SEA-DOO LUBE (P/N 293 600 006) before starting insures no friction during initial start.

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

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

**Section 08 PROPULSION AND DRIVE SYSTEMS**  
**Sub-Section 02 (REVERSE SYSTEM)**

**REVERSE SYSTEM**



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 02 (REVERSE SYSTEM)

## COMPONENTS

1. Reverse support plate
2. Guide plate
3. Allen screw M6 x 20 (2)
4. Elastic stop nut M6 (7)
5. Flat washer M6 (6)
6. Hexagonal head screw M6 x 20
7. Flat washer M6 (2)
8. Triangular lever
9. Bushing (2)
10. Hexagonal head screw M6 x 25
11. Sliding block
12. Flat washer M6
13. Locking lever
14. Spring
15. Reverse handle

16. Plastic washer M10
17. Reverse cable
18. Hexagonal head screw M6 x 40
19. Adjustment nut (2)
20. Washer (2)
21. Hexagonal head screw M6 x 45
22. Flat washer M8 (2)
23. Hexagonal head screw M8 x 35 (2)
24. Reverse gate
25. Loctite 587 Superflex Ultra Blue
26. Loctite 242
27. Reverse gate spring (2)
28. Sleeve (2)
29. Protector

## GENERAL

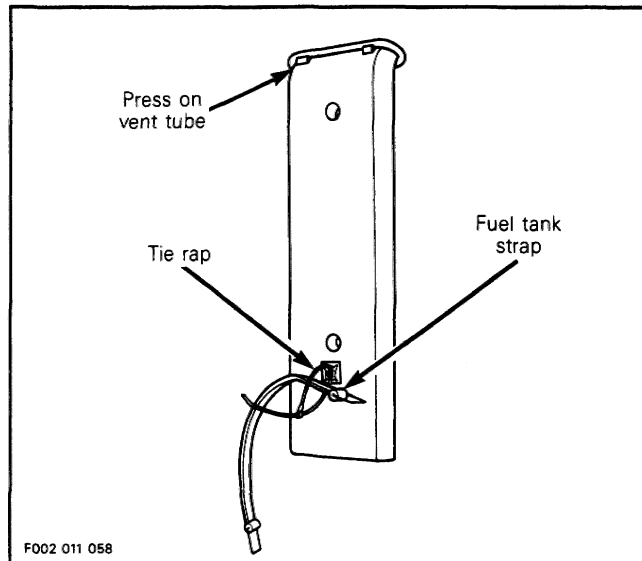
It is not necessary to remove reverse system from watercraft for servicing. However reverse system removal is necessary to replace reverse support plate.

## DISASSEMBLY

Remove storage basket from watercraft.

Unhook fuel tank strap, slide it off through tie rap behind vent tube.

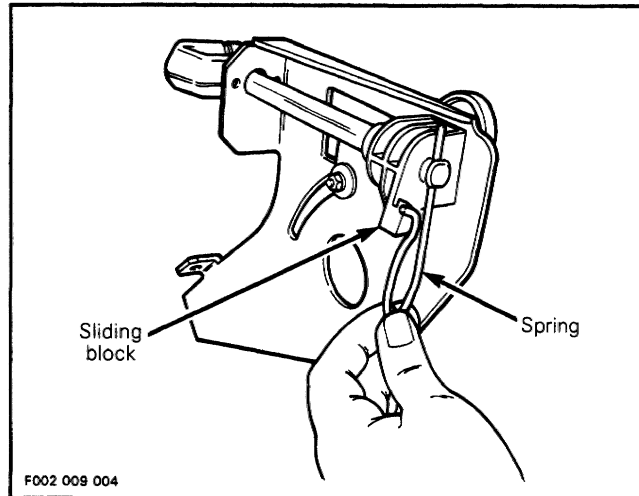
Press on vent tube upper part to enable to withdraw tube from body.



**WARNING :** Vent tube must be in place to provide proper bilge ventilation.

## 11,13,14,15, Sliding Block, Locking Lever, Spring and Reverse Handle

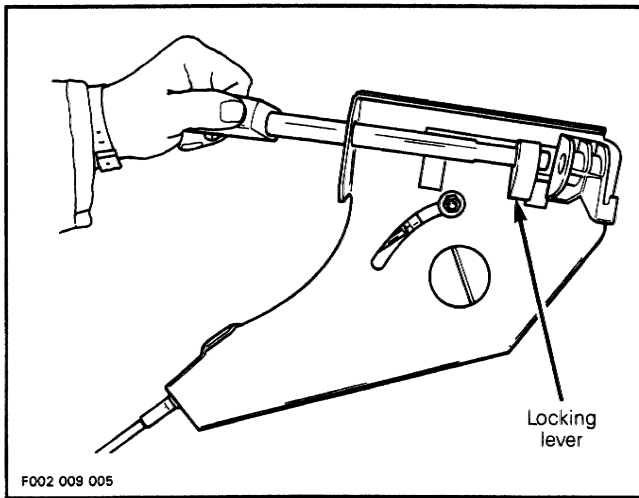
To remove reverse handle, unhook spring from sliding block and pull spring from reverse handle stem.



Withdraw reverse handle stem and locking lever from sliding block, then slide off locking lever from stem.

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 02 (REVERSE SYSTEM)

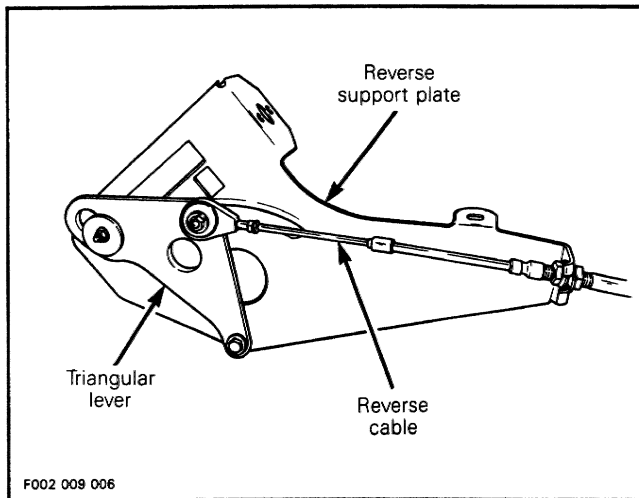


#### 8,11, Triangular Lever and Sliding Block

Remove screw, lock nut, washers and bushing holding reverse cable to triangular lever.

Remove lock nut and washer holding sliding block to triangular lever and to support plate.

Remove screw, lock nut, washer and bushing holding triangular lever to reverse support plate.

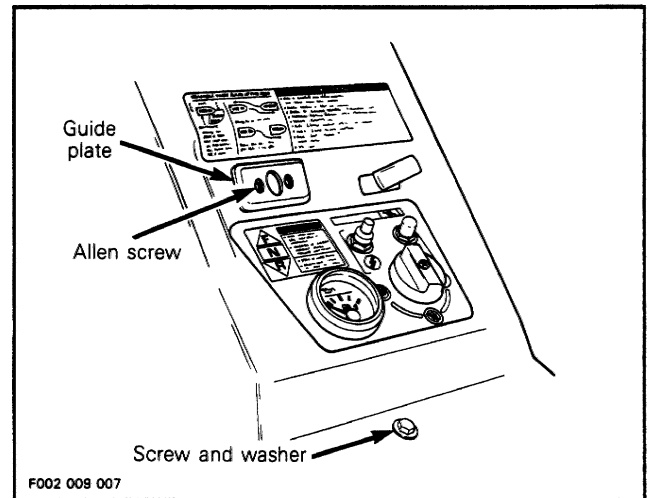


#### 1, Reverse Support Plate

In order to have access to screw holding lower part of reverse support plate, remove front seat by pulling on each side to release it from body.

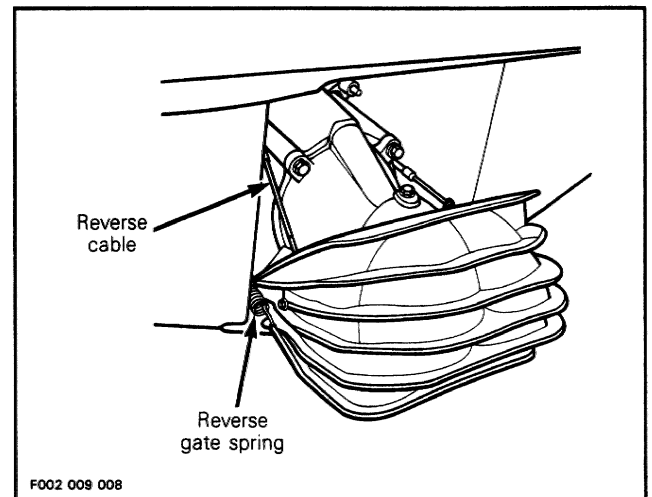
Remove screw, lock nut and washers holding support plate lower part.

Remove two Allen screws, lock nut and washer holding guide plate and support plate.



#### 24, Reverse Gate

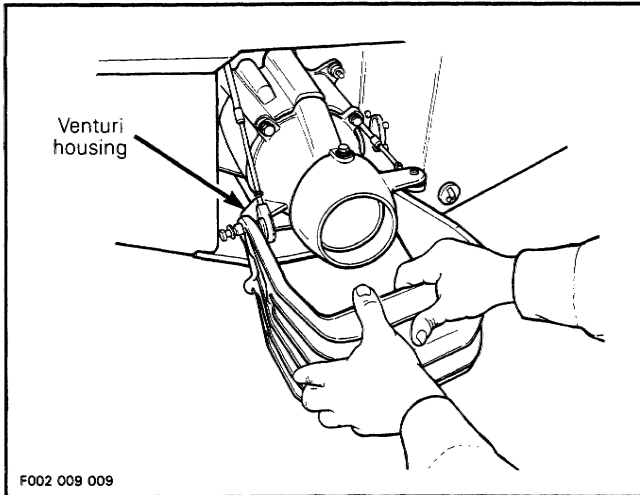
Unhook reverse gate springs and remove reverse cable from left side of reverse gate.



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 02 (REVERSE SYSTEM)

Unscrew from both sides of venturi housing reverse gate retaining screws, then remove gate.



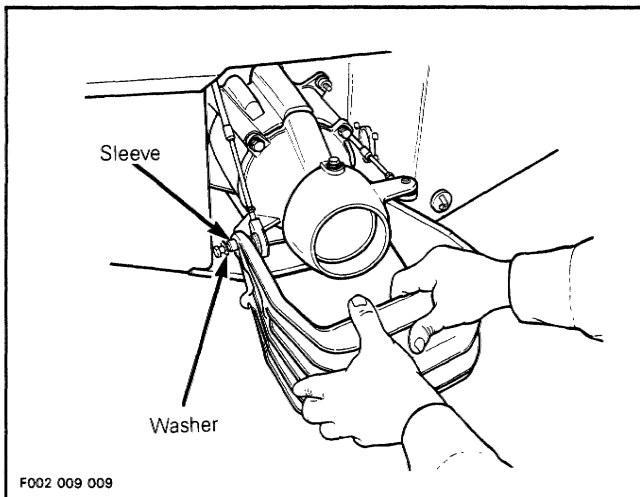
## ASSEMBLY

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

### 24, Reverse Gate

Install reverse gate with sleeve and washer. Apply Loctite 242 (P/N 293 800 015) on threads and torque to 20 N•m (15 lbf•ft).

**CAUTION :** Always hook reverse gate springs in order to ease reverse gate operation.



### 1, Reverse Support Plate

For reverse support plate installation torque screw to 8 N•m (71 lbf•in) and Allen screws to 2 N•m (18 lbf•in).

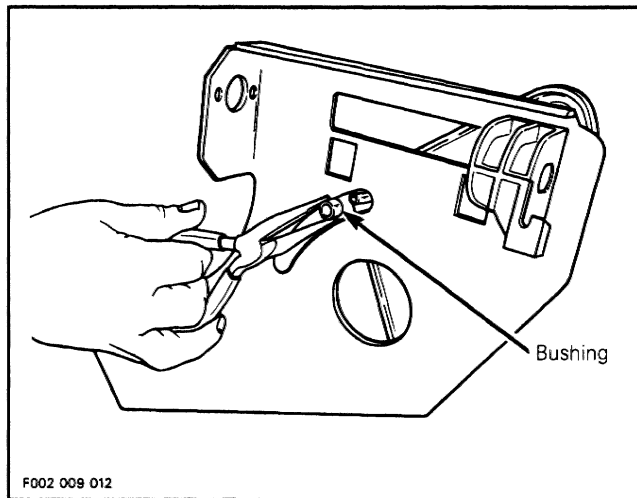
### 8,11, Triangular Lever and Sliding Block

Insert bushing to triangular lever and then install lever to reverse support. Install reverse cable to triangular lever with bushing and plastic washer which is installed to opposite side of reverse cable on reverse support.

Torque cable screw to 7 N•m (62 lbf•in).

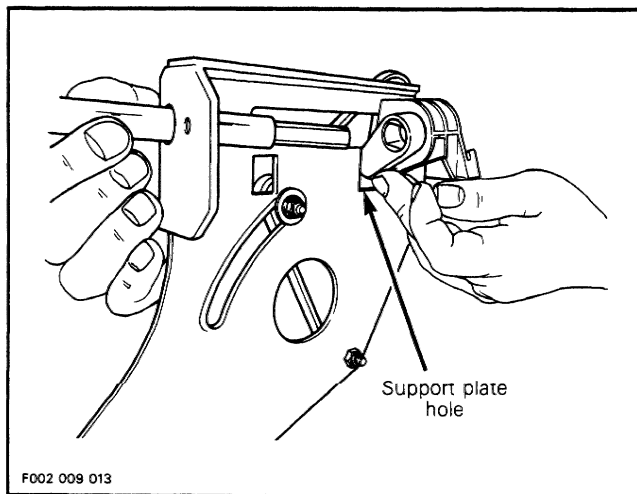
Torque lower screw of triangular lever to 8 N•m (71 lbf•in).

Install sliding block to lever and torque nut to 8 N•m (71 lbf•in).



### 13,14,15, Locking Lever, Spring and Reverse Handle

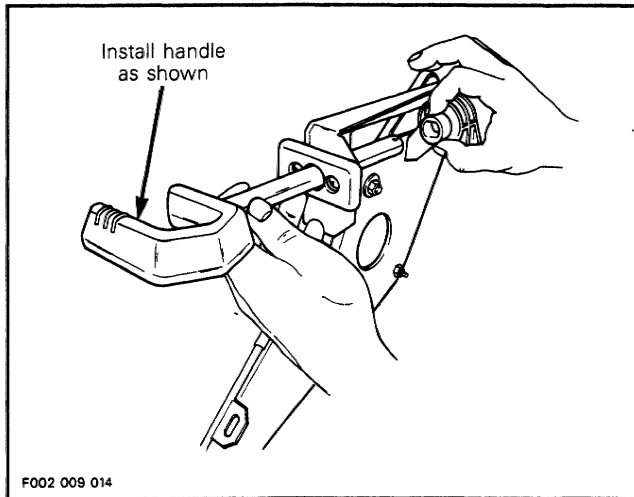
Insert locking lever end in support plate hole then align lever and sliding block holes.



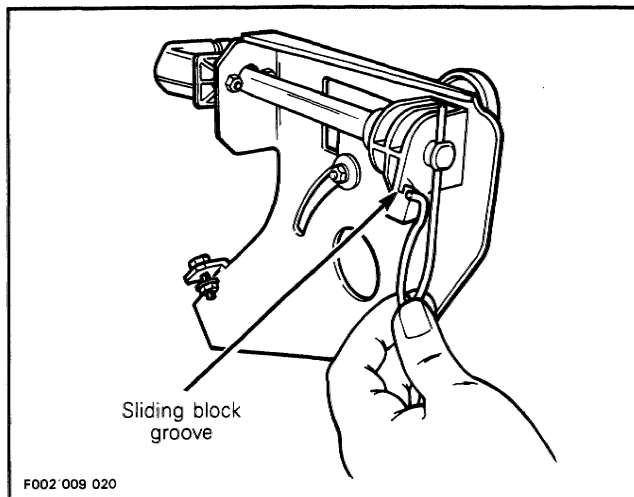
## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 02 (REVERSE SYSTEM)

**NOTE :** Always install reverse handle with open end facing left side of watercraft, then push handle stem through lever and sliding block holes.

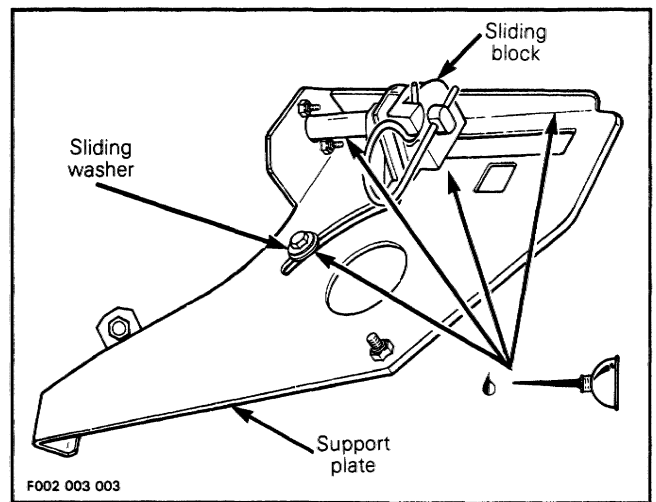


Insert spring in handle stem hole and then install curved end in sliding block groove.



#### Reverse Handle System Lubrication

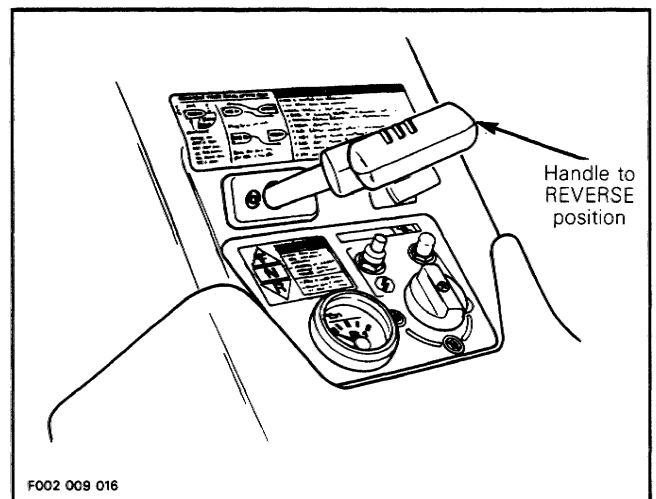
Lubricate support plate sliding area of sliding block and triangular lever, also lubricate sliding washer and reverse handle stem.



#### ADJUSTMENTS

##### 15, Reverse Handle

Pull reverse handle to REVERSE position.



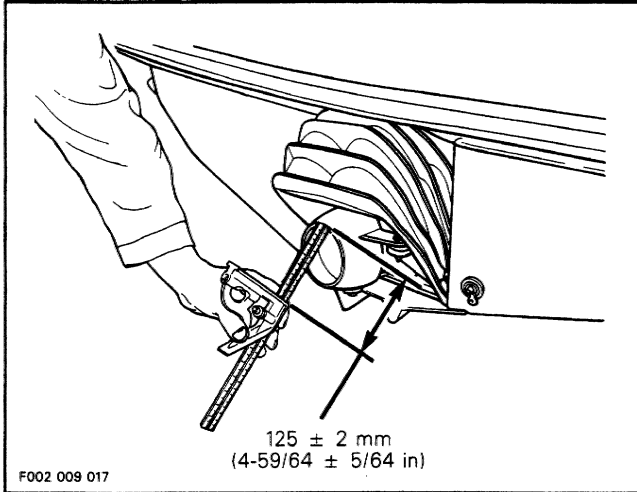
## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 02 (REVERSE SYSTEM)

#### 24, Reverse Gate

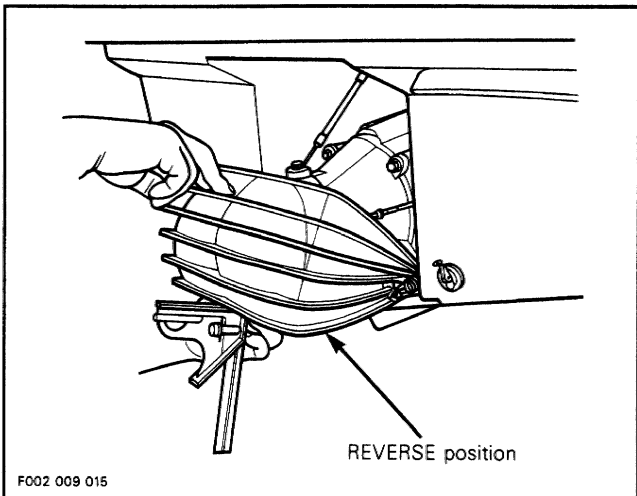
Position handlebar in a straight ahead position, nozzle should be parallel to rear of watercraft.

Using a square set it to  $125 \pm 2$  mm ( $4-59/64 \pm 5/64$  in), then position square end at the top middle of nozzle.

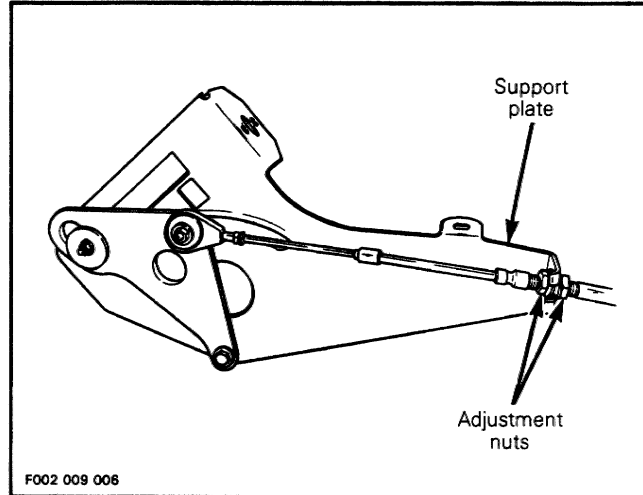


With the gate down to REVERSE position it should be at the specification.

○ NOTE : Push slightly on the gate in order to recover spring tension and to obtain proper position of the gate.



If reverse gate needs to be readjusted, it can be done at support plate with adjustment nuts. Turn cable nuts to obtain position.

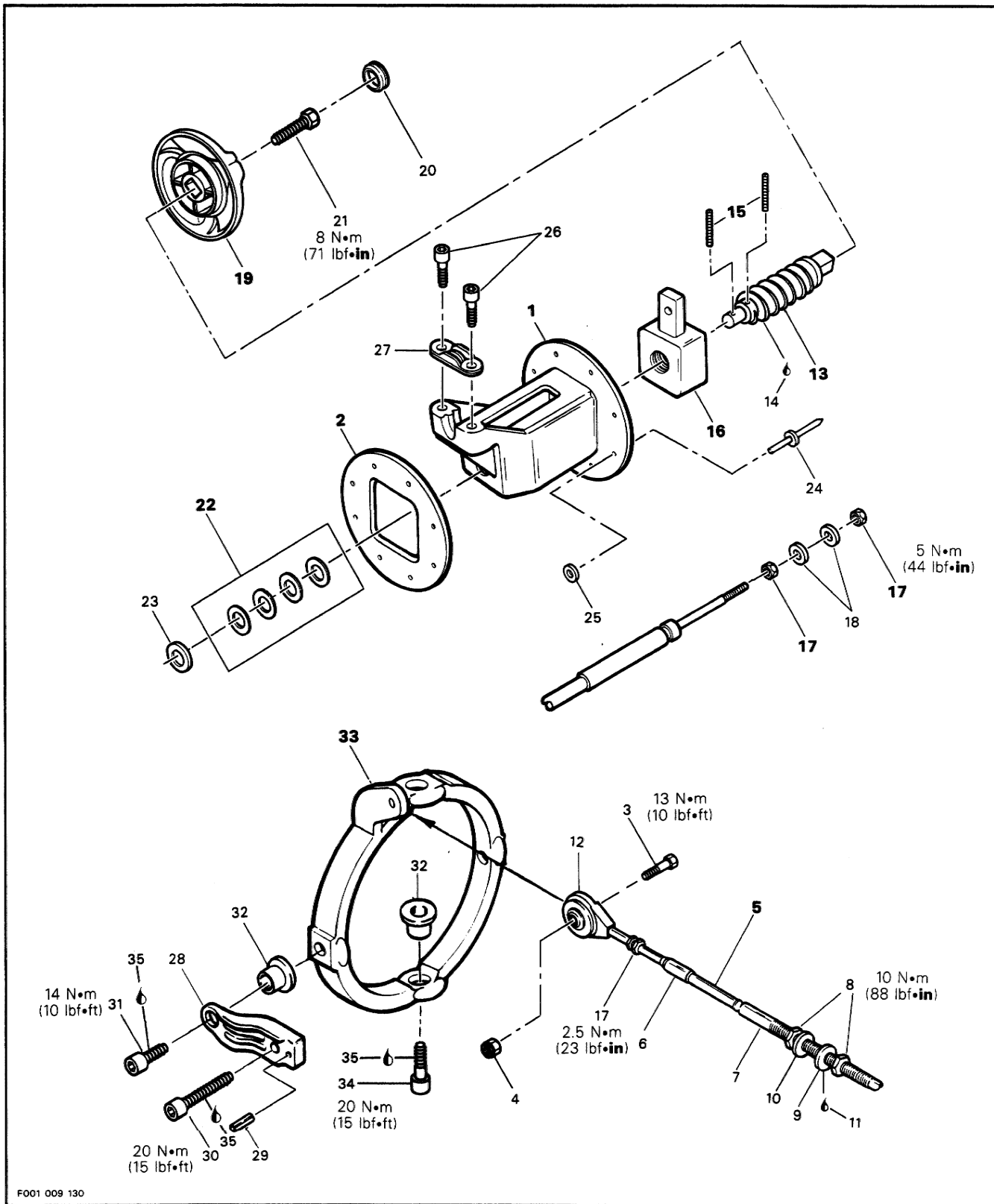


Tighten adjustment nuts and recheck gate position.

○ NOTE : If reverse gate adjustment is not done adequately, performance and steering control will be reduced at reverse position.

**Section 08 PROPULSION AND DRIVE SYSTEMS**  
**Sub-Section 03 (VARIABLE TRIM SYSTEM (VTS))**

**VARIABLE TRIM SYSTEM**



F001 009 130



## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 03 (VARIABLE TRIM SYSTEM (VTS))

## COMPONENTS

1. Housing
2. Gasket
3. Hexagonal screw M6 x 30
4. Elastic stop nut M6
5. Trim cable
6. Small boot
7. Large boot
8. Jam nut (2)
9. Washer
10. Flat washer
11. Loctite 587 sealant U-blue
12. Ball joint
13. Worm
14. Synthetic grease
15. Set screw M3 x 20 (2)
16. Sliding collar
17. Nut (3)
18. Flat washer M5 (2)
19. Trimming knob
20. Snap cap
21. Hexagonal screw M6.3 x 20
22. Spring washer M20 (4)
23. Flat washer M10
24. Rivet 1/8 (8)
25. Washer 1/8 (8)
26. Phillips (2)
27. Retaining
28. Arm (2)
29. Spring pin (2)
30. Allen screw M8 x 20 (2)
31. Allen screw M8 x 8 (2)
32. Plastic bushing (4)
33. Trimming ring
34. Allen screw M8 x 10 (2)
35. Loctite 242

## GENERAL

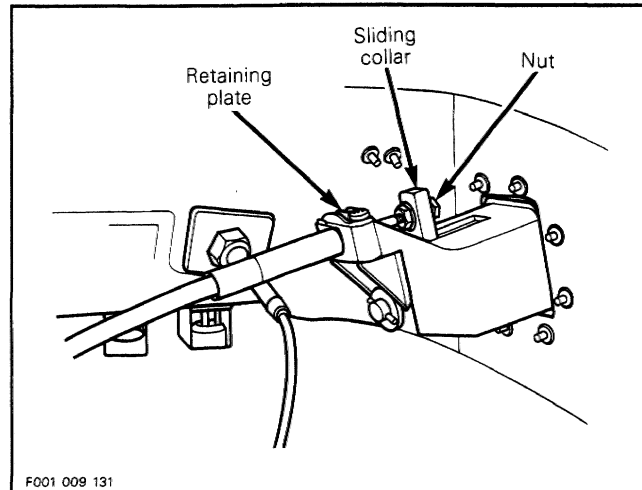
It is not necessary to remove variable trim system (VTS) from watercraft for servicing. However variable trim system removal is necessary to replace either worm, sliding collar, housing gasket and housing.

## DISASSEMBLY

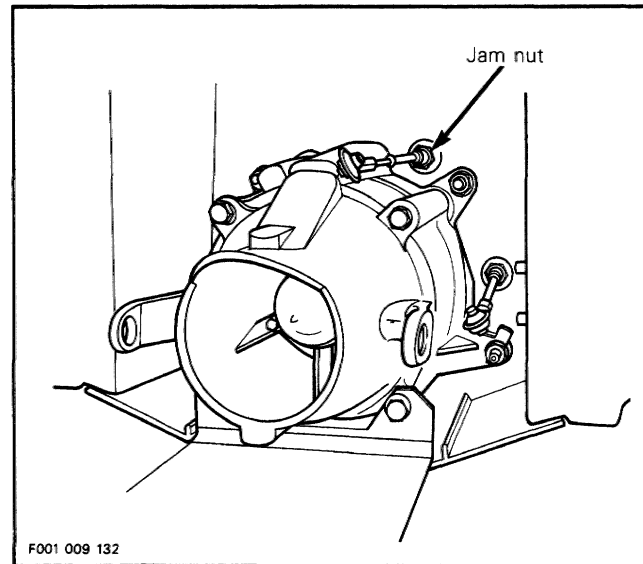
In order obtain an easy access to either trim cable or to worm spring washers, remove storage basket from watercraft.

### 5, Trim cable

To replace trim cable, remove nut from the end of cable at sliding collar. Untighten screws from retaining plate and slide off cable from housing.



Remove ball joint from trim ring then unscrew ball joint from cable. Remove jam nut and flat washer from cable at the outside of hull. Pull out cable from inside the hull.

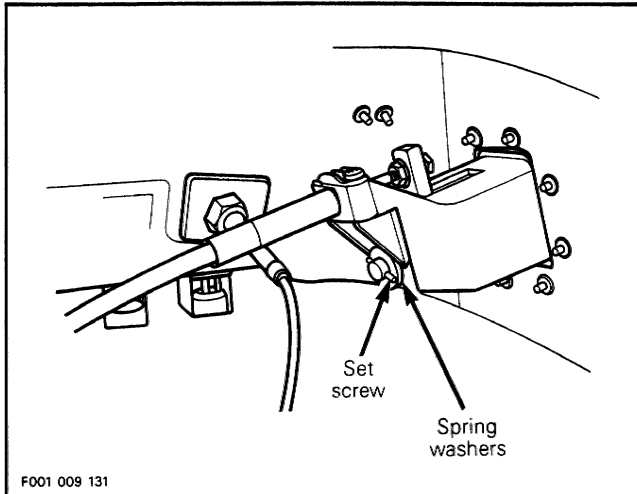


## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 03 (VARIABLE TRIM SYSTEM (VTS))

#### 15,22, Set Screw and Spring Washer

Remove set screw from the end of worm then slide off flat washer and spring washers.



#### 1,2,19, Housing Ass'y, Gasket and Trimming Knob

To remove housing assembly, withdraw trim cable from sliding collar and from housing.

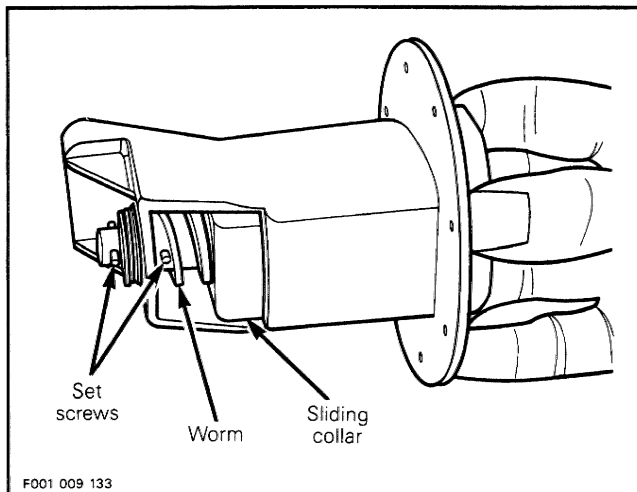
Remove snap cap from trimming knob center, remove screw then pull knob from worm.

Drill rivets then pull out housing assembly from body.

#### 13,16, Worm and Sliding Collar

Remove both set screws from worm then slide off flat washer and spring washers.

Unscrew worm and remove sliding collar from housing.



#### ASSEMBLY

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

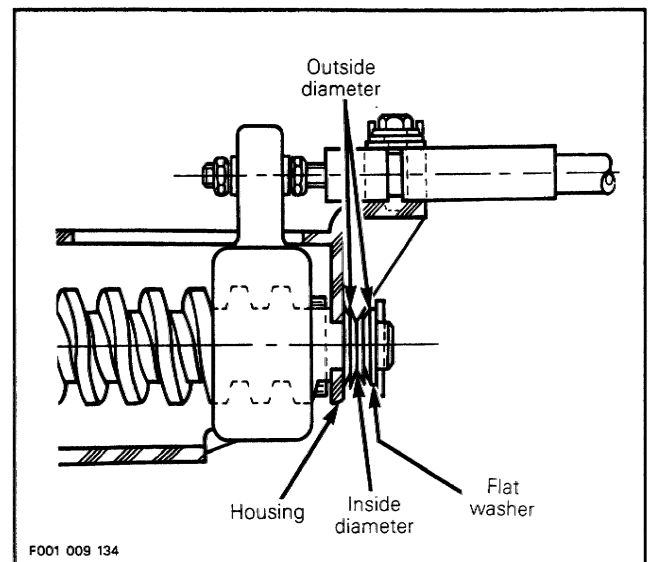
#### 13,16, Worm and Sliding Collar

Whenever replacing either worm or sliding collar, install set screw which acts as a stopper for the sliding collar.

NOTE: Always lubricate worm with synthetic grease (P/N 293 550 010).

#### 22, Spring washer

Install middle spring washers the way their inside diameters are touching each other. Install outside spring washers the way their outside diameters are contacting housing and flat washer.

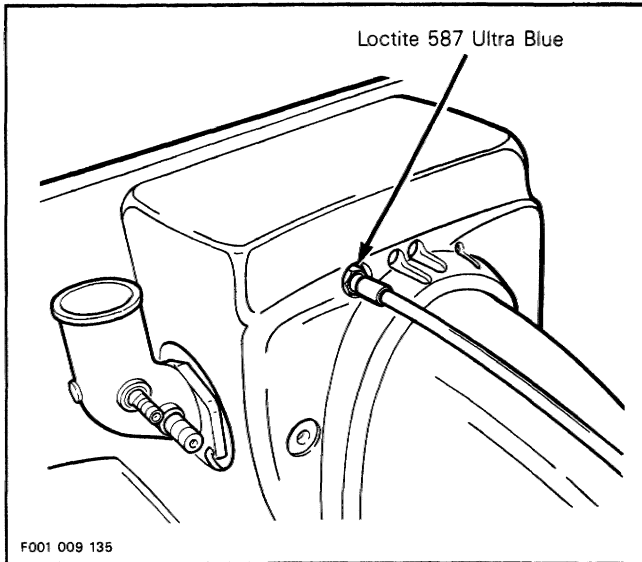


## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 03 (VARIABLE TRIM SYSTEM (VTS))

#### 5, Trim cable

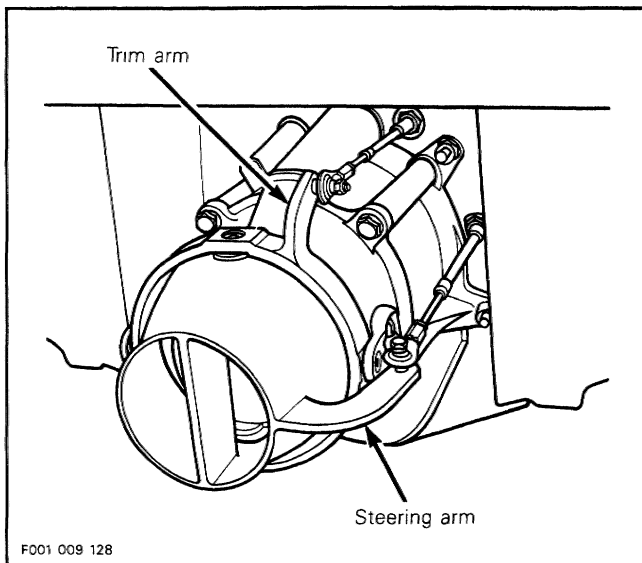
Install cable from inside the hull, apply Loctite 587 Ultra Blue (P/N 293 800 016) all around cable hole to ensure no leakage. Install flat washers and torque nuts to 10 N•m (88 lbf•in).



## ADJUSTMENTS

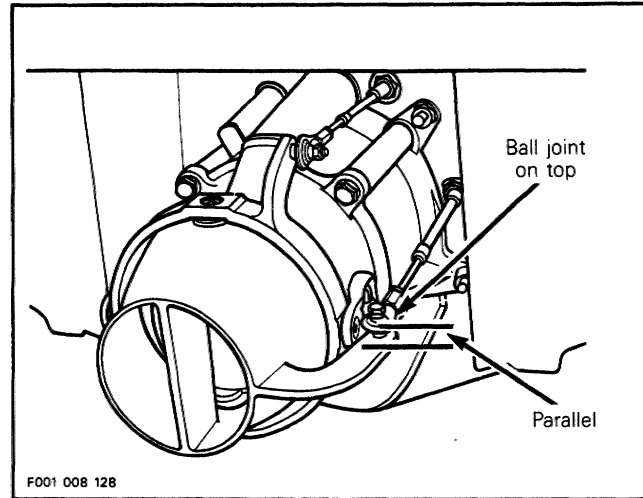
#### 33, Trim Ring

Make sure steering arm of jet pump nozzle is on right side and that trim arm is above venturi housing.



Ensure ball joint is on top of steering arm.

Make sure screw is installed on top of ball joint and that ball joint is parallel to steering arm.

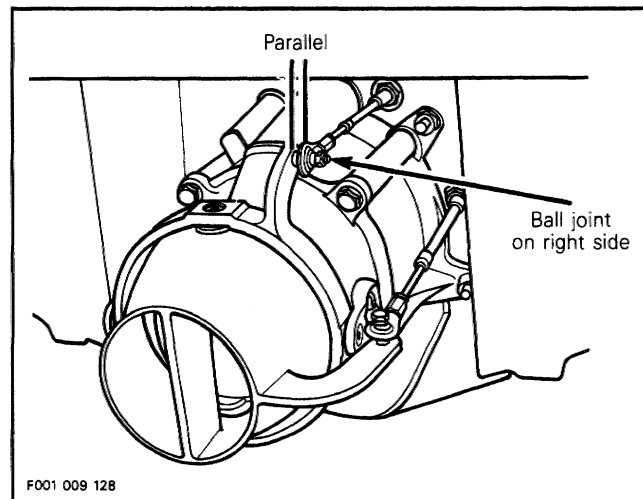


#### 5, Trim Cable

Install ball joint and screw it in completely.

Secure ball joint on right side of trim arm using screw and nut. Make sure screw is installed on right side of trim arm and that ball joint is parallel to trim arm.

Torque screw to 13 N•m (10 lbf•ft).



Torque lock nut of ball joint to 2.5 N•m (23 lbf•in).

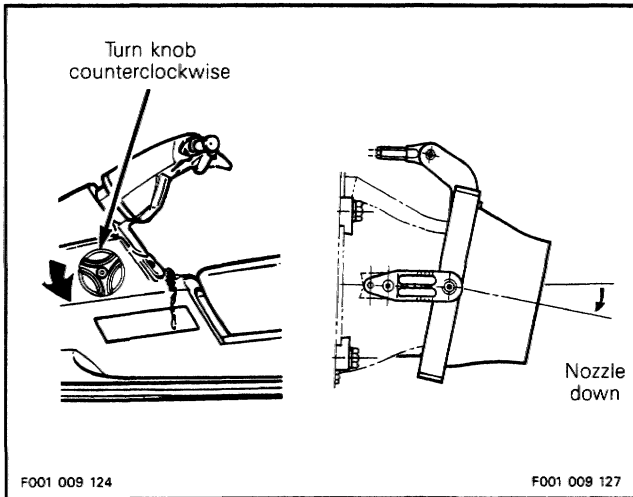
▼ **CAUTION** : Ball joints must be installed face to face. Damage to cables could result if not done properly.

## Section 08 PROPULSION AND DRIVE SYSTEMS

### Sub-Section 03 (VARIABLE TRIM SYSTEM (VTS))

#### 16, Sliding Collar

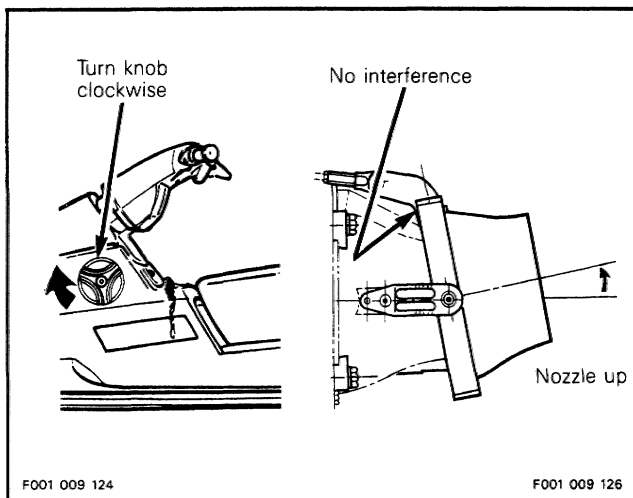
Turn trim knob counterclockwise until sliding collar touches the set screw. Make sure the nozzle is in down position.



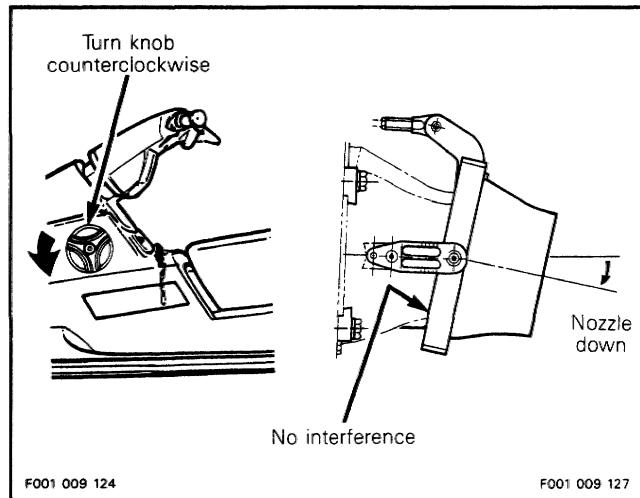
Install cable in sliding collar with washer and nut on each side. Torque nuts to 5 N•m (44 lbf•in). Install retaining plate over cable housing.

**NOTE :** Push cable as far as possible in sliding collar without moving trim ring from its down position.

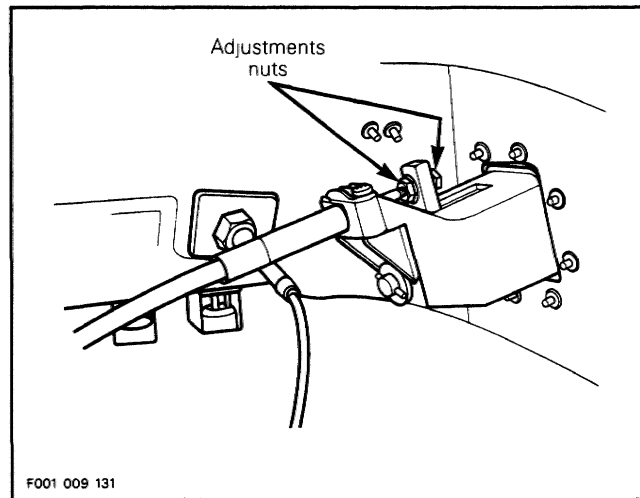
Verify if when turning trim knob clockwise to the end the nozzle is up (10°) without interfering with venturi housing.



When the trim knob is turned counterclockwise the nozzle must be down (10°) and it must not interfere with venturi housing.



If trim ring needs to be readjusted, it can be done at sliding collar with adjustment nuts.



**CAUTION :** Trim ring and/or nozzle must not interfere. Damage to cables and/or venturi housing will occur if adjustments are not done adequately.

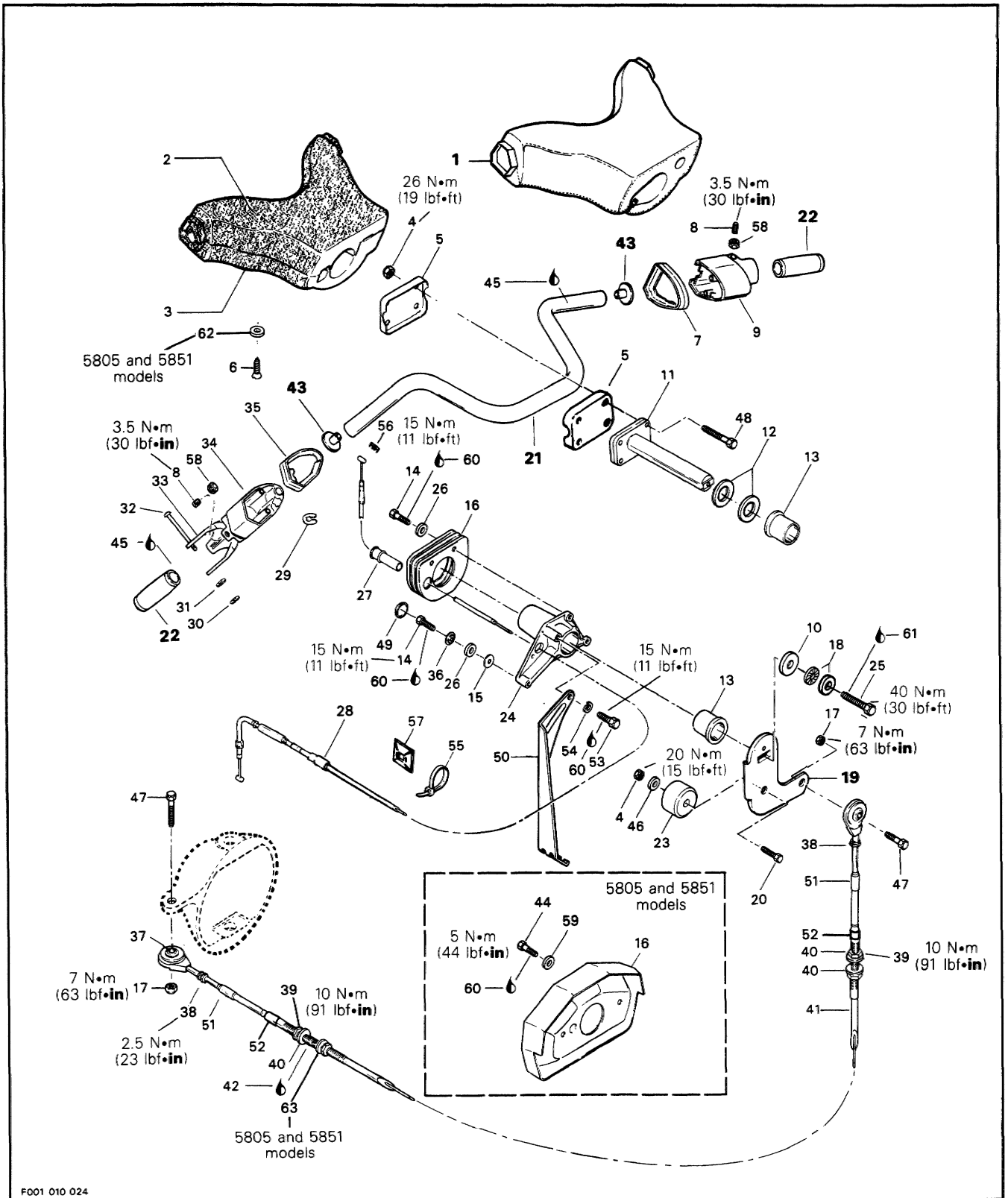






**Section 09 STEERING SYSTEM**  
**Sub-Section 01 (STEERING SYSTEM)**

**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 (2)
6. Phillips screw (4)
7. Adapter
8. Set screw (2)
9. Left handle housing
10. Large flat washer
11. Stem steering
12. Washer (shim)
13. Bushing (2)
14. Hexagonal head screw M8 x 25 (4)
15. Plastic washer (2)
16. Collar
17. Elastic stop nut M6 (2)
18. Washer
19. Steering stem arm
20. Hexagonal screw M8 x 35
21. Handle bar
22. Grip (2)
23. Stopper bushing
24. Steering support
25. Hexagonal head screw M8 x 25
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. Retaining washer (2)
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
43. Cap
44. Hexagonal screw M6 x 20 (2)
45. Glue
46. Flat washer M8
47. Hexagonal head screw M6 x 30 (2)
48. Hexagonal head screw M8 x 55 (4)
49. Snap cap (2)
50. Cable support
51. Small boot
52. Large boot
53. Hexagonal screw M8 x 16 (2)
54. Lock washer M8 (2)
55. Tie rap
56. Locking tab
57. Tie mount
58. Hexagonal nut M6 (2)
59. Flat washer M6 (2)
60. Loctite 242
61. Loctite 271
62. Flat washer M6 (4)
63. Flat washer 7/16

## ASSEMBLY

### 1, Cover (1<sup>st</sup> Run)

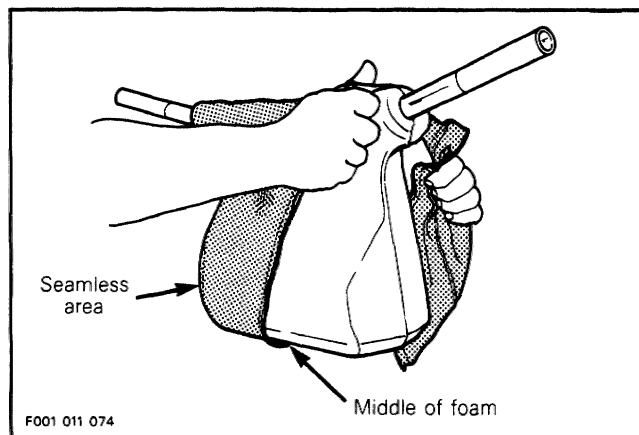
Prior to installation, soak handlebar cover in hot water. This allows even heating of cover and makes installation much easier.

○ **NOTE** : During installation the cover might have to be warmed again using a heat gun.

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

Slide cover over the left side handlebar until it reaches the middle of foam.

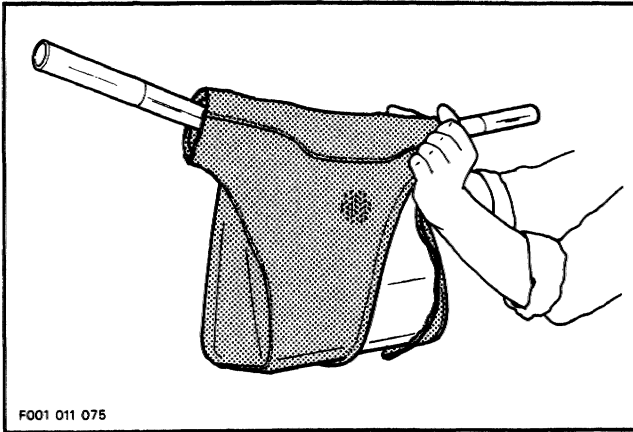
▼ **CAUTION** : Never pull on vinyl cover seamless area.



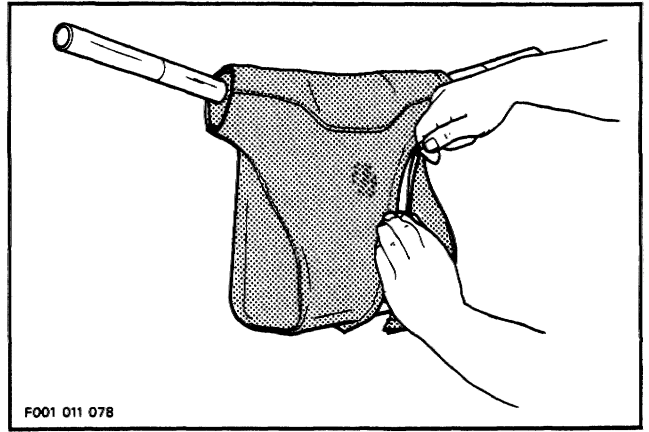
## Section 09 STEERING SYSTEM

### Sub-Section 01 (STEERING SYSTEM)

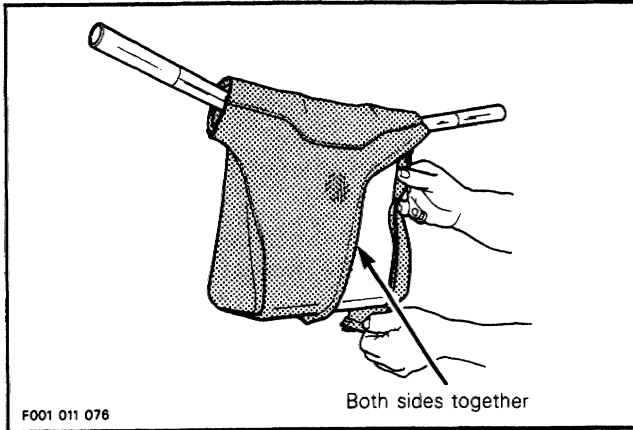
Pull cover over the right side handlebar taking care to grab it as illustrated.



Zip cover taking care to bring both sides together. Refer to following illustration.

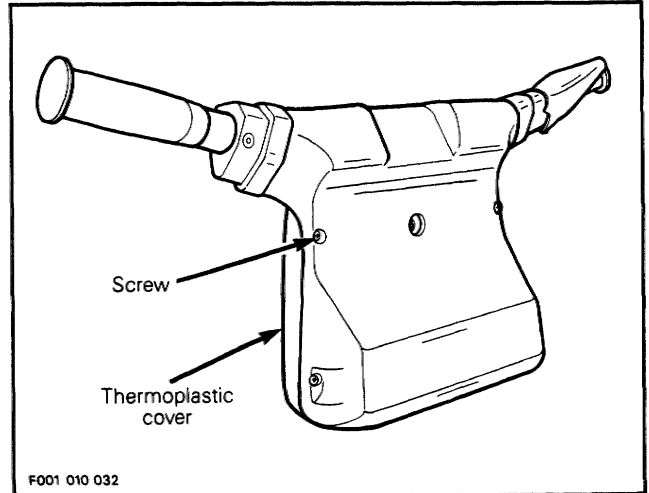


Pull both sides of cover together before trying to zip it.

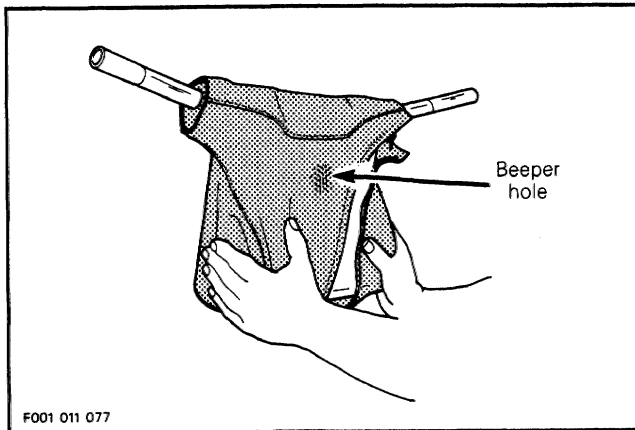


#### 1, Cover (2<sup>nd</sup> Run)

To replace the cover, just remove and reinstall four screws and washers.



▼ **CAUTION:** Never pull on cover around beeper hole.



#### 22,43, Grip and Cap

Remove adhesive left on handlebar by peeling off old glue.

Apply glue (P/N 293 530 032) inside handlebar grip and install cap and grip. Rotate grip to evenly spread glue.

▼ **CAUTION:** Allow at least 30 minutes for glue to cure.

## Section 09 STEERING SYSTEM

### Sub-Section 01 (STEERING SYSTEM)

#### 19,21, Steering Stem Arm and Handlebar

Insert throttle cable through dashboard hole and slide grommet on cable.

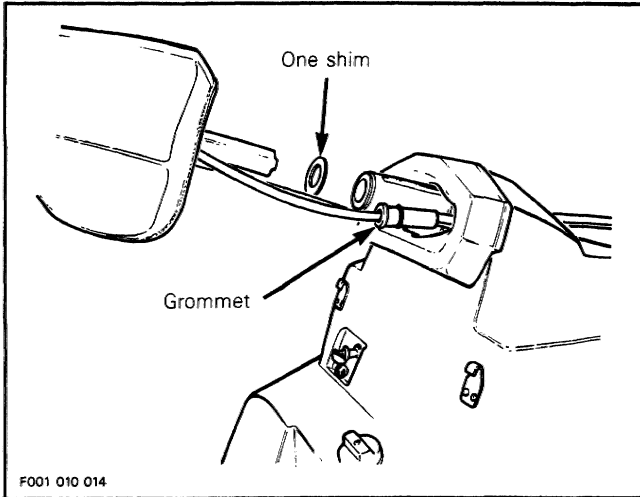
Insert grommet in dashboard hole and pull it from inside bilge.

○ **NOTE** : To ease installation, apply water on grommet.

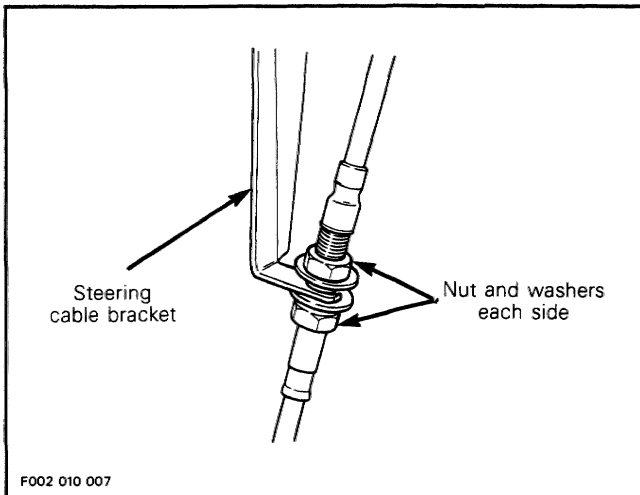
Insert wires of engine overheating beeper / engine stop switch through grommet.

Insert one of the two shims (0.8 mm (0.030 in) or 1.3 mm (0.050 in) onto steering stem.

Insert handlebar ass'y into steering column support.

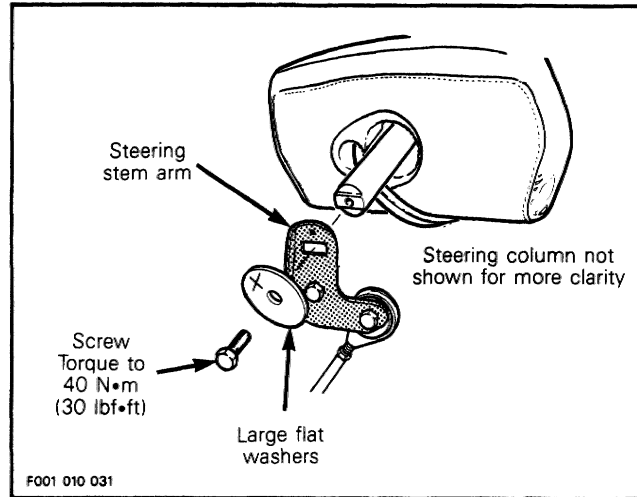


Install steering cable in its bracket with one washer and one nut each side of bracket.



Hand-tighten nut. Refer to **Shim Adjustment** further in this section for adjustment procedures.

Properly position steering stem arm on steering stem as shown. Make sure to insert stem tenon into arm mortise.



Temporarily install large flat washer and screw then tighten.

○ **NOTE** : Do not install locking disks yet since they can be used only once.

▼ **CAUTION** : Always install large flat washer with the **X** stamped side facing the locking disks.

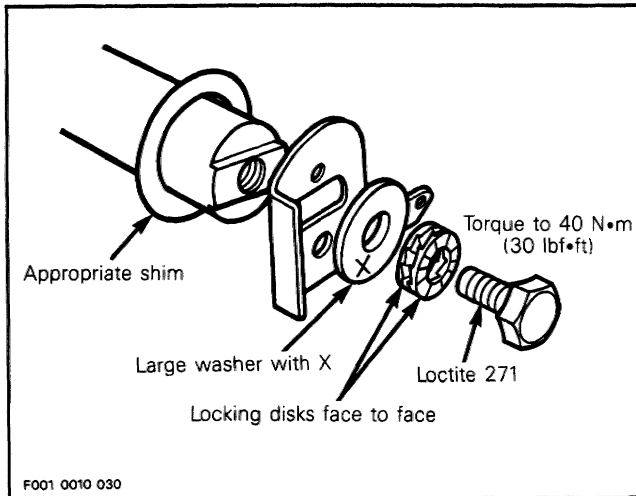
## Section 09 STEERING SYSTEM

### Sub-Section 01 (STEERING SYSTEM)

#### Shim Adjustment

Check steering column axial play. It should be between 0.25-0.75 mm (.010-.030 in). Replace shim as required.

Remove screw and apply Loctite 271 (red) (P/N 293 800 005) on screw threads, reinstall large flat washer, locking disks and screw. Torque to 40 N•m (30 lbf•ft).



**WARNING:** The recommended torque and Loctite must be applied on screw. Ensure locking disks are locked together (face to face).

#### ADJUSTMENT

##### Steering and Jet Pump Nozzle

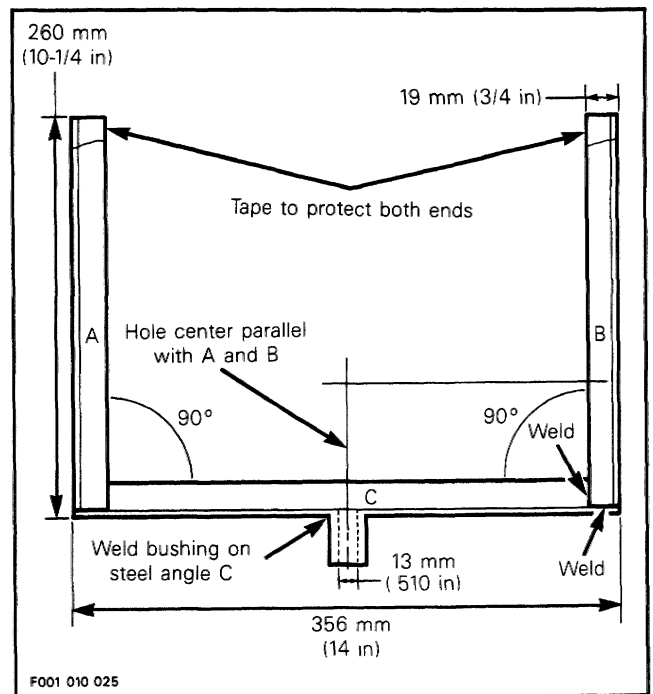
Make the following tool to ease alignment.

Raw Material :

- 2 steel angle : 19 mm x 254 mm (3/4 x 10 in).
- 2 steel angle : 19 mm x 356 mm (3/4 x 14 in).
- 1 bushing : 13 mm (.510 in) inside diameter, 19 mm (3/4 in) long.
- 1 rod : 12.7 mm x 230 mm (.500 x 9 in).
- 1 spring pin : 19 mm (3/4 in) long.
- 2 rods for hooks (bolt with head removed) : 152 mm (6 in) x 6 mm (1/4 in) with a threaded portion of at least 65 mm (2-1/2 in).
- 2 bushings : 7 mm (9/32 in) inside diameter, 10 mm (3/8 in) outside diameter, 19 mm (3/4 in) long.
- 2 wing nuts : 6 mm (1/4 in).

Weld steel angles A, B, C and bushing as per illustration and pay attention to the following :

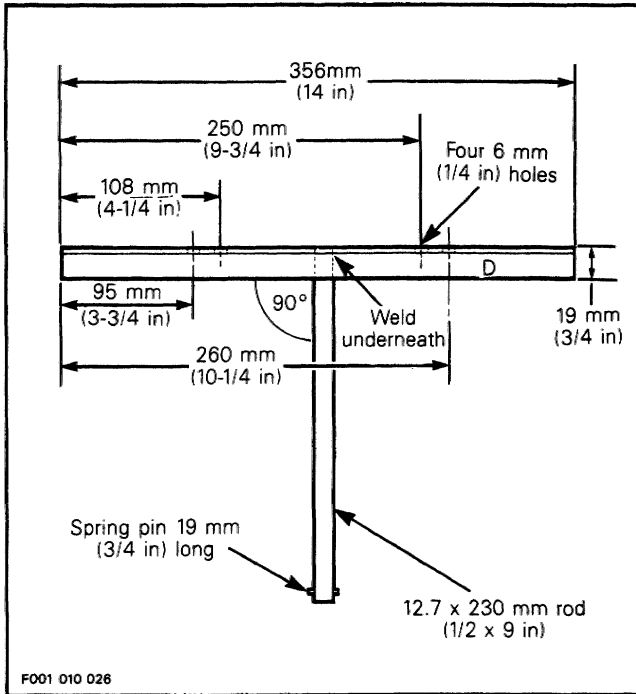
- Dimension 260 mm (10-1/4 in) must be respected on both side.
- Steel angles A and B and hole center of bushing must be parallel.
- Weld bushing on steel angle C and drill steel angle.



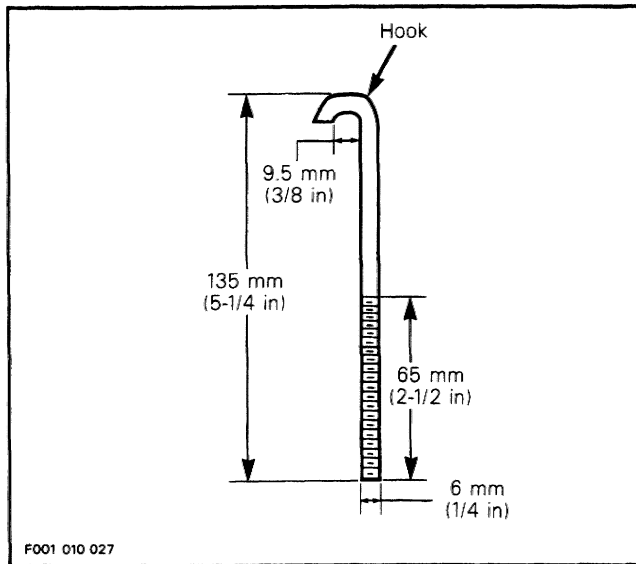
Drill four 6 mm (1/4 in) holes in steel angle D.

Weld steel angle D with the 12.7 mm (1/2 in) rod making sure both parts are at 90° :

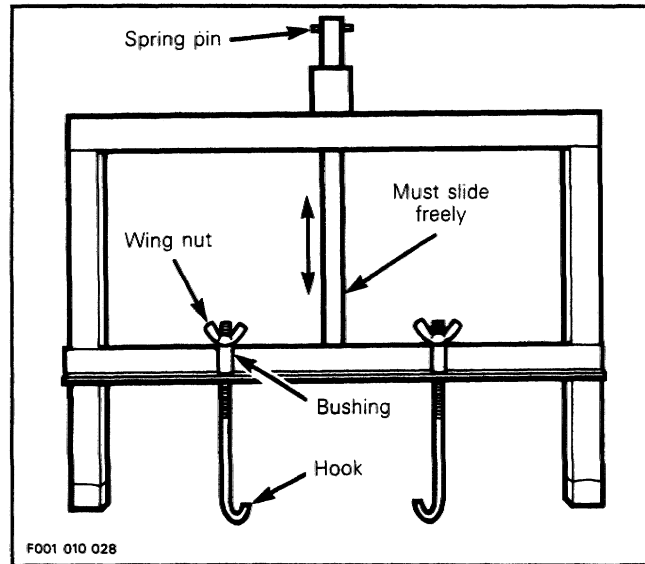
**Section 09 STEERING SYSTEM**  
**Sub-Section 01 (STEERING SYSTEM)**



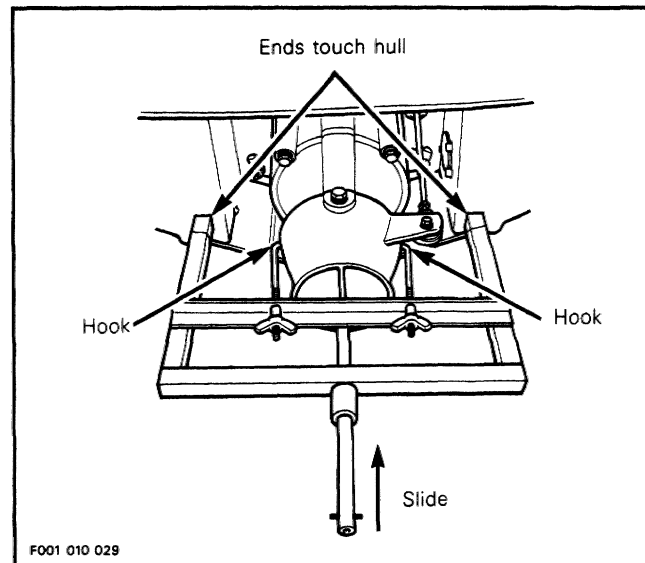
Heat the unthreaded end of the 6 mm (1/4 in) rod and bend it as per following illustration.



Assemble tool as per illustration.

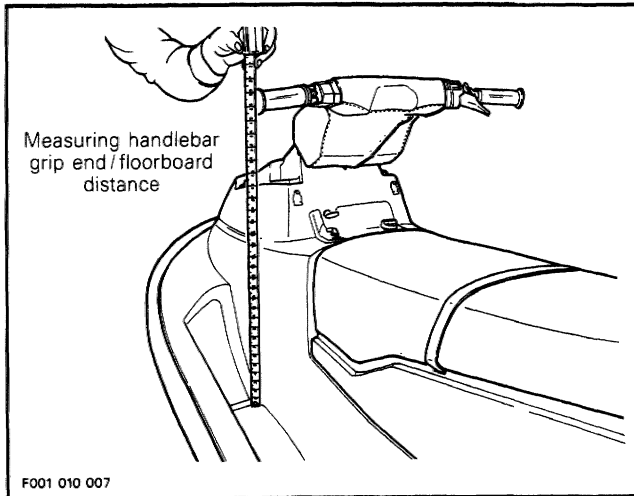


Hook tool on jet pump nozzle and slide it until both ends touch hull.

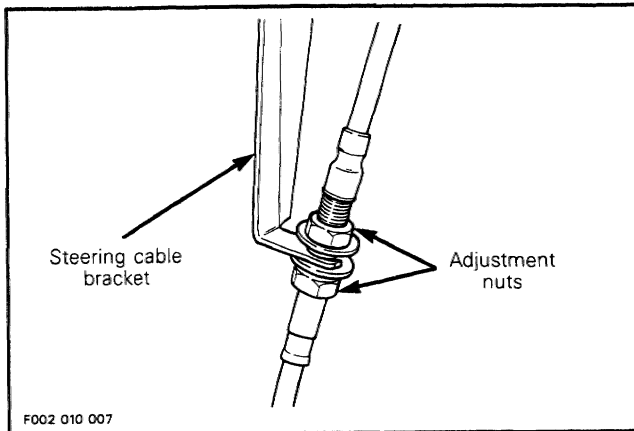


Verify handlebar position by measuring each side the distance from handlebar grip end to floorboard. They have to be equal.

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



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



Remove alignment tool and verify the following before tightening nuts.

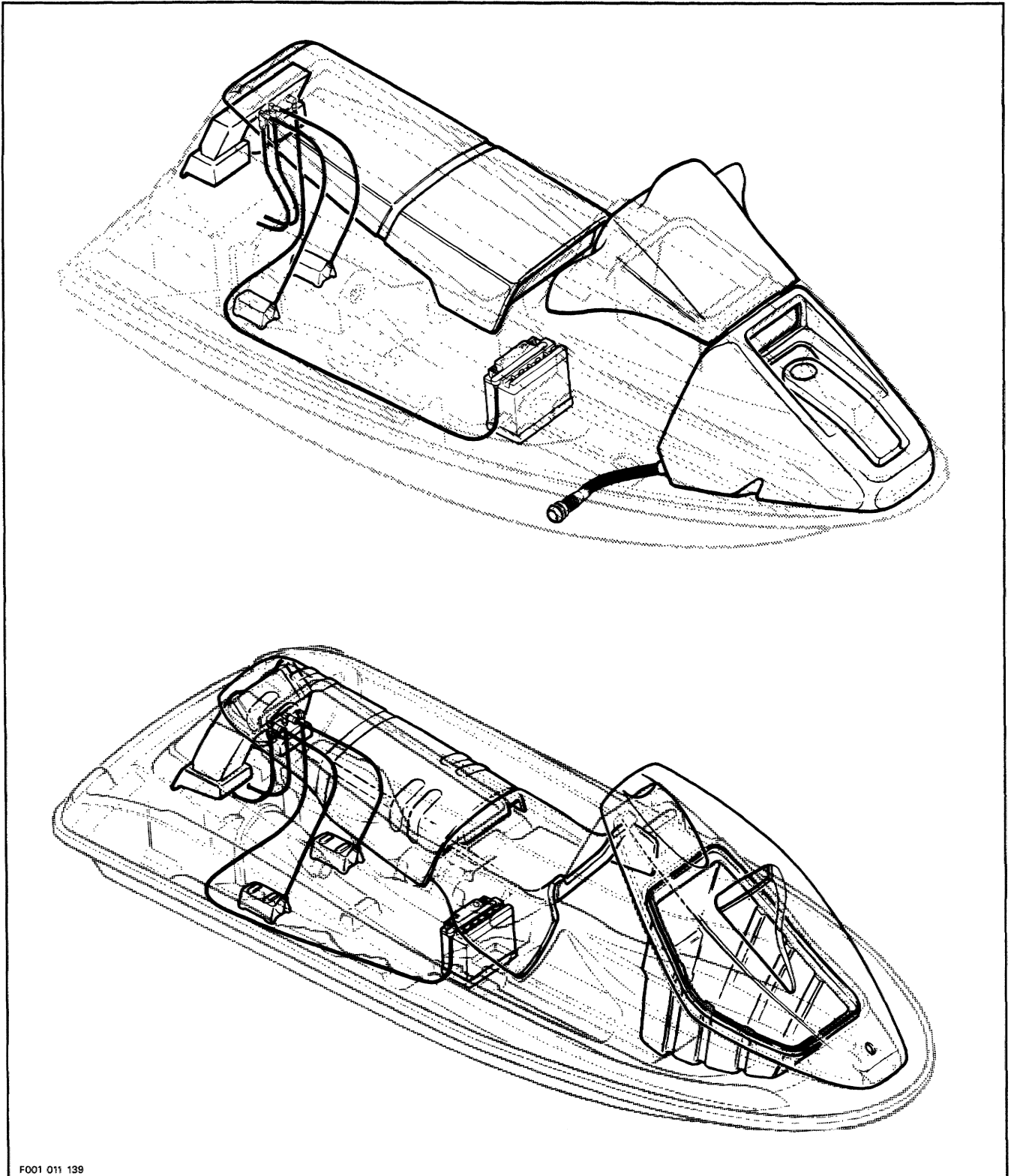
Adjust nuts so that nozzle pivots from side to side but does not contact venturi housing on either side. To verify, insert a paper sheet or a feeler gauge 0.13 mm (.005 in) between nozzle and venturi at indicated area.

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



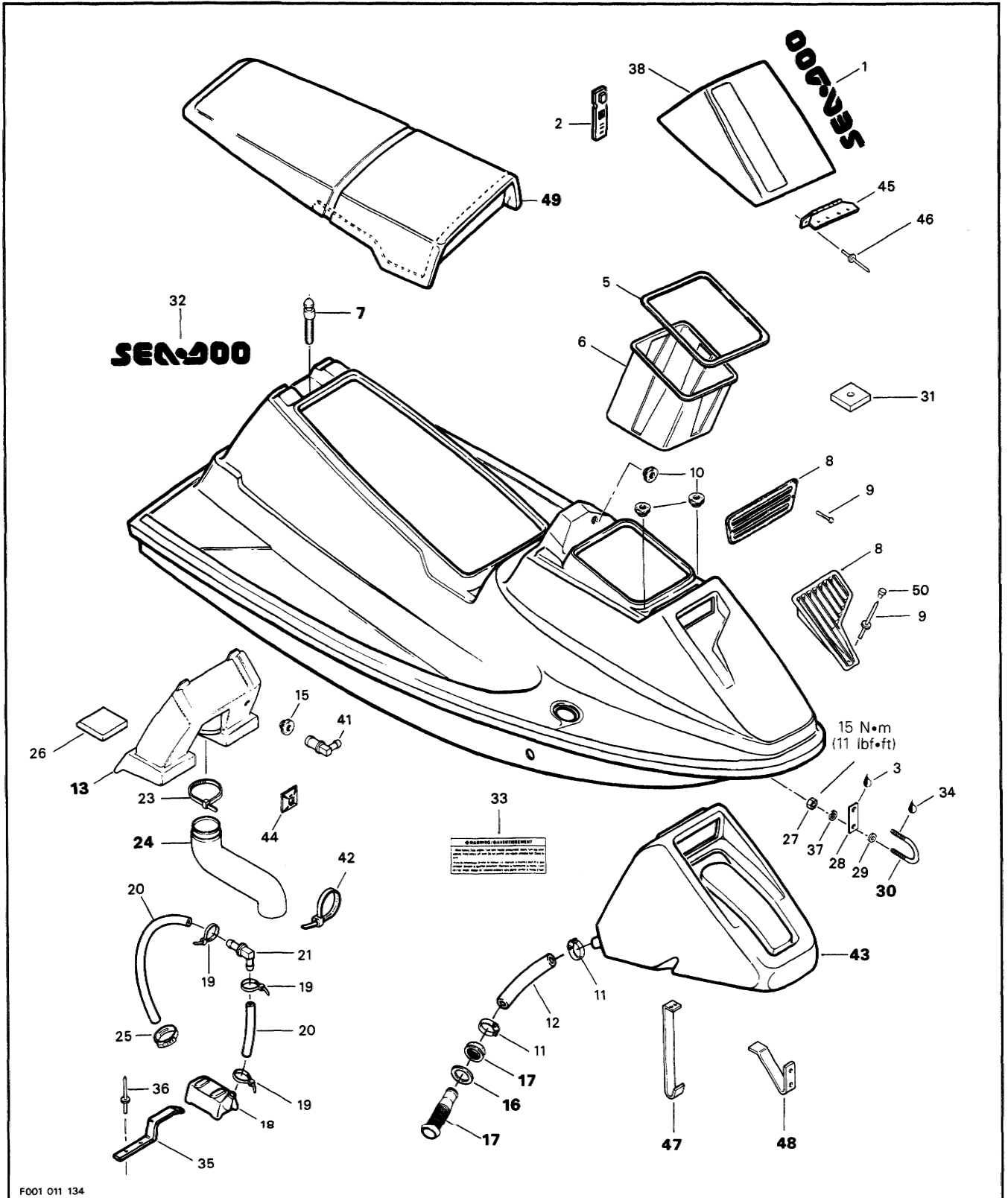
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**Section 10 HULL/BODY**  
**Sub-Section 01 (HULL/BODY)**

**HULL/BODY**



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## Section 10 HULL/BODY

### Sub-Section 01 (HULL/BODY)

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## COMPONENTS

1. "Sea-Doo" sticker
2. Latch (2)
3. Silicone 732 RTV
5. Seal
6. Storage basket
7. Lock pin
8. Grill
9. Rivet (2)
10. Grommet
11. Clamp (4)
12. Hose
13. Rear baffle
15. Grommet
16. Gasket (2)
17. Fitting (2)
18. Bailer (2)
19. Tie rap
20. Hose
21. Elbow fitting 90°
23. Tie rap (2)
24. Rear vent hose
25. Gear clamp (2)
26. Floater (2)
27. Elastic stop nut M8 (2)
28. Plate
29. Washer M8 (2)
30. Tow hook
31. Neopren pad
32. "Sea-Doo" sticker (2)
33. "Fuel" sticker
34. Loctite 271
35. Spring clip (2)
36. Rivet (4)
37. Lock washer (2)
38. Storage cover
41. Elbow fitting 90°
42. Tie rap
43. Water tank trap
44. Tie mount
45. Hinge
46. Rivet (5)
47. Rear bracket (2)
48. Front bracket
49. Seat
50. Cap

 NOTE : Some reference numbers are deliberately missing.

## Water Tank Trap

### GENERAL

In the situation when the water tank trap could possibly move from its position, the following procedures can be performed without removing jet pump unit ass'y and engine from watercraft. However if water tank trap is broken these assemblies will have to be removed from watercraft.

### REMOVAL

#### 30,43, Tow Hook and Water Tank Trap

Drill storage cover rivets and remove cover.

Remove fuel tank from watercraft and pull water tank trap from its position.

◆ **WARNING :** The fuel valve must be set to OFF. Remove fuel cap slowly. Fuel may be under pressure and might spray out when removing cap. Fuel 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.

Remove tow hook nuts.

○ **NOTE :** From this point if water tank trap is broken the jet pump unit and engine removal will be required. Withdraw jet pump unit ass'y, refer to PROPULSION AND DRIVE SYSTEMS 08-01 then look for removal.

Withdraw engine, refer to ENGINE 03-02 then look for removal.

#### 16,17, Gasket and Fitting

This procedure can be used to repair the water tank trap fittings.

Remove the air intake grill then remove gear clamp holding drain hose to fitting.

Remove fitting from water tank.

#### 13,24, Rear Baffle and Vent Hose

Remove air silencer, exhaust formed hose, rear vent hose and then the rear baffle.

○ **NOTE :** Verify if glue remains on rear baffle, if none install a new baffle.

▼ **CAUTION :** Verify if glue remaining on rear baffle comes off easily. If it does install a new baffle. If not install the same baffle. Disregarding the installation of a **new** baffle when required will result into the same situation shortly.

### CLEANING

Clean glue left on water tank trap, rear baffle (if applicable) and body surfaces.

○ **NOTE :** It is not necessary to remove all the glue but it is important to have smooth surfaces in order to get a good adherence.

### INSTALLATION

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

#### 30,43,47,48, Tow Hook, Water Tank Trap, Rear Bracket and Front Bracket

Install bracket A (P/N 291 000 214) on tow hook and apply Loctite 271 (P/N 293 800 005) on treads then re-install nuts.

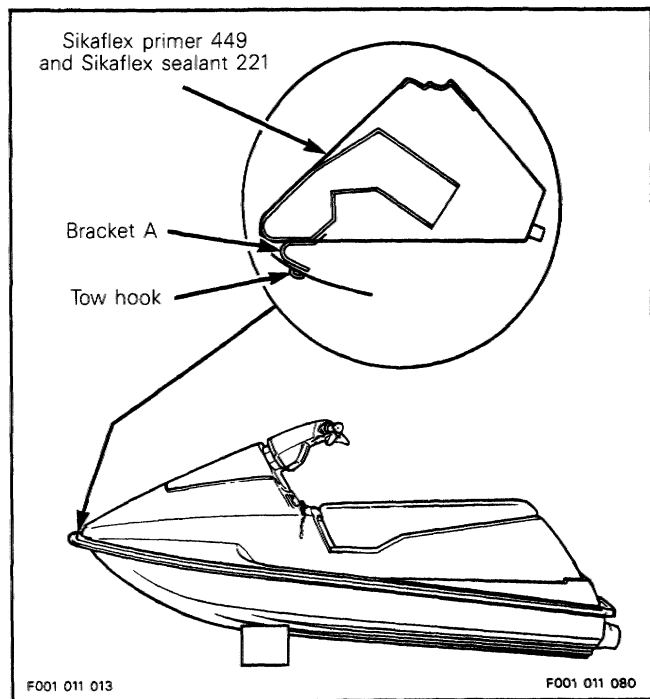
Apply Sikaflex primer 449 (P/N 293 530 012) on water tank trap and body surfaces.

## Section 10 HULL/BODY

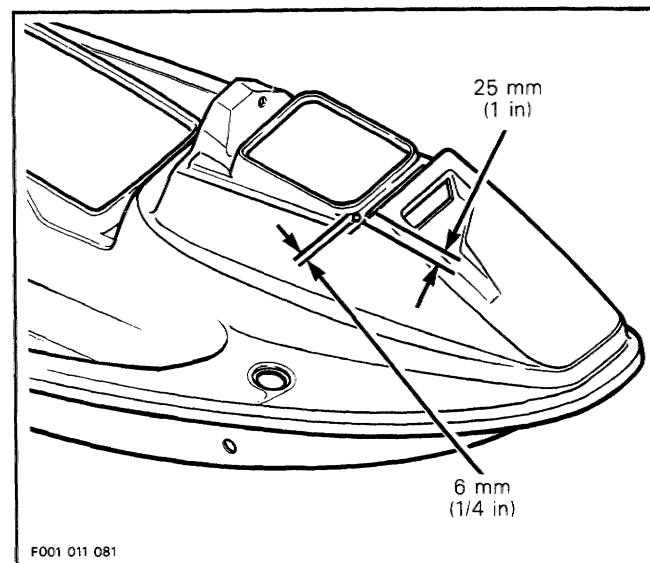
### Sub-Section 01 (HULL/BODY)

▼ **CAUTION :** Allow at least 30 minutes for primer to cure.

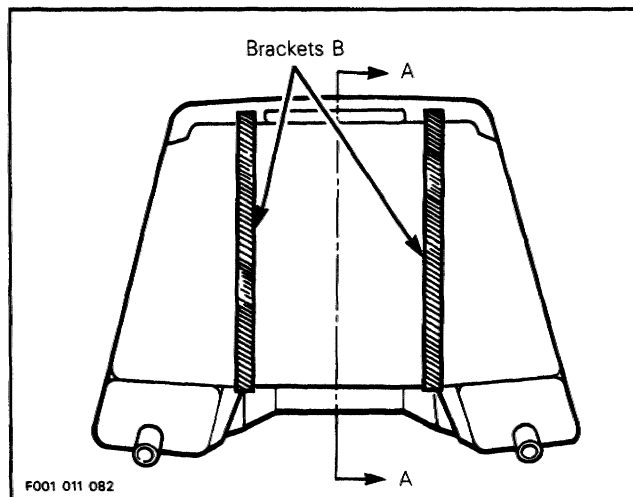
Apply Sikaflex sealant 221 (P/N 293 530 011) on water tank trap and slide it back to its position.



Drill a 6 mm (1/4 in) hole each side storage cover hinge position as illustrated.



Install brackets B (P/N 291 000 213) to support the rear section of tank and secure them with M6 stainless screws (P/N 210 000 004) and lock nuts (P/N 212 000 001).



Install fuel tank and storage cover.

To install engine, refer to ENGINE 03-02 then look for **installation**.

Install jet pump unit ass'y, refer to PROPULSION AND DRIVE SYSTEMS 08-01 then look for **installation**.

Verify tightness of all fuel lines and clamps and pressurize fuel system. For pressurization procedure refer to FUEL SYSTEM 05-03.

◆ **WARNING :** If any leak is found do not start the engine and correct the leak. Failure to correct a leak could lead to an explosion. If any fuel spillage and/or leak had occurred the bilge should be cleaned with hot water and detergent or bilge cleaner to remove fuel deposits.

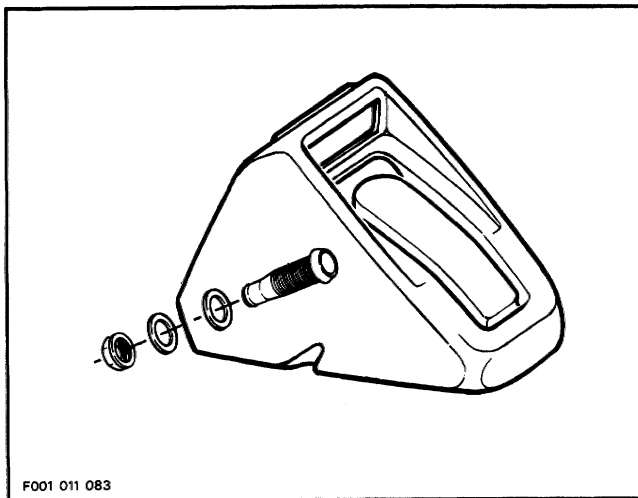
Before using watercraft wait three days for Sikaflex curing time.

**16,17, Gasket and Fitting**

Slide gasket (P/N 293 250 006) on fitting (P/N 293 710 015). Install through air intake hole the fitting in water tank trap.

Install outside the tank a second gasket on the fitting, install the nut and then tighten until the gaskets are compressed.

Install drain hose on the fitting and tighten with gear clamp.



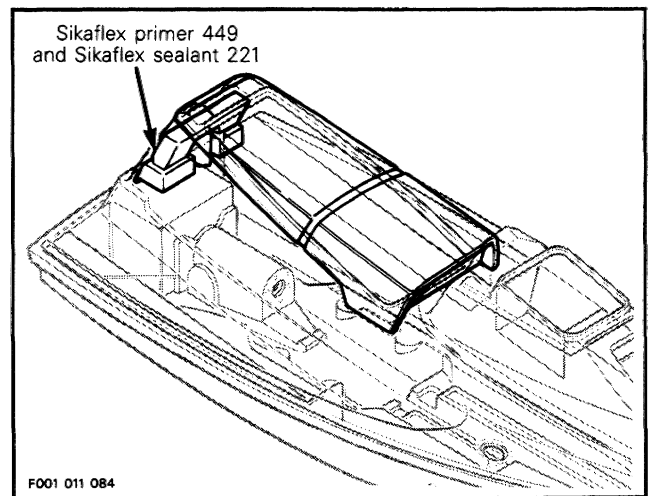
**Rear Baffle**

**13,24, Rear Baffle and Vent Hose**

Apply Sikaflex primer 449 (P/N 293 530 012) on rear baffle and body sections to be sealed.

**CAUTION :** Allow at least 30 minutes for primer to cure.

Apply Sikaflex sealant 221 (P/N 293 530 011) on rear baffle section to be sealed.



Install rear baffle on body, align properly rear inlet grill openings and hold in position with a light pressure. Reinstall rear vent hose, exhaust formed hose and air silencer.

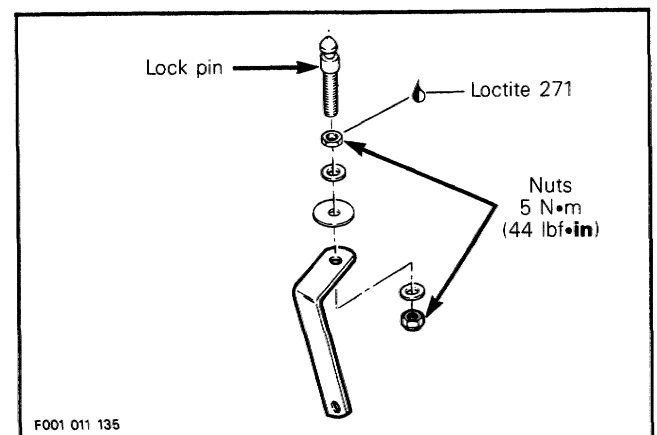
Before using the watercraft wait three days for Sikaflex curing time.

**7,49, Lock Pin and Seat**

Adjust front and rear hooks so that when seat is latched, seal is compressed to insure a water-tight fit.

To adjust untighten lock pin nuts.

Screw in or out lock pin.



Install seat and verify if seal is compressed.

Remove seat.

Torque nuts to 5 N•m (44 lbf•in).

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## Section 10 HULL/BODY

### Sub-Section 01 (HULL/BODY)

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#### Hull and 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 Gelcote layer which gives its color and smooth finish.

Fiberglass repair kit is available through automotive or marine suppliers.

Gelcoat repair kits are available through regular channel.

Gelcoat kit (small repair) : P/N 295 500 009.

Gelcoat paste (white, 300 mL (10 oz)) : P/N 293 500 016. This paste is included in kit P/N 295 500 009 but can be ordered separately.

Gelcoat, liquid (1 liter) :     white : P/N 293 500 033  
                                          mauve : P/N 293 500 034  
                                          grey : P/N 293 500 035

How to use gelcoat kit for small repair :

Clean damaged area free of wax, dirt, grease etc.

Enough paste should be mixed to make all repairs. Mix approximately 1 part pigment to 20 parts paste.

Place enough of the already matched pigmented paste on a piece of wood or cardboard. Mix four drops of hardener in 1 teaspoon of paste, mix thoroughly. This will give approximately 15 minutes of working time at 70°F or 21°C.

Apply mix to damaged area, working it into the area with a wooden or plastic spatula, squeeze off excess paste to the contour of the surrounding area. Care should be taken not to have excess paste on surrounding undamaged surface.

For higher gloss and greater smoothness, the repair should be covered with a piece of clear plastic release film and let to cure.

After approximately 2 hours remove the plastic film. Deep damage may require several applications. For a quality repair job you can sand repair area with 600 Grit Wet sand paper, then buff with a fine rubbing compound and wax.

How to use liquid gelcoat (1 liter) for large repair :

Clean damaged area making sure it is free of any dirt, grease etc.

Before spraying, all fiberglass surface repairs should be done with Bombardier Small Repair Gelcote (P/N 293 500 016 or 295 500 009) to mask cracks.

Mixing of spray Gelcote :

Mix four drops of catalyst per teaspoon of Gelcote. This will allow you 15 minutes of working time at 21°C (70°F).

To mix one liter of Gelcote, 14 mL (1/2 oz) to 21 mL (3/4 oz) of catalyst is required.

Adding too much catalyst may change Gelcote color.

Spray the work area with the mix.

To ease spraying add acetone (10% is sufficient) to the mix.

Allow to cure completely overnight.

Hand sand using a 400 - 600 grit paper.

Finish the repair area by rubbing or buffing with a fine rubbing compound. When using a power buffer, be sure not to cut through surface and do not keep buffer on the same area for a prolonged time, this prevents heat build-up and discoloration.

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**Section 10 HULL/BODY**  
**Sub-Section 01 (HULL/BODY)**

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**Painting**

○ **NOTE :** When using gelcoat it is not necessary to paint over it.

The following was prepared in conjunction with PPG Industries Inc. It contains a list of SEA-DOO parts with their respective PPG color codes and two painting procedures, CONCEPT™ the most commonly used and DELTA™ (with low VOC) mainly used in California.

PPG Industries Inc. sells paint and related products and these are **not** available through Bombardier Inc. network. To find your nearest PPG dealer dial one of the following numbers.

<p><b>AMERICA</b></p> <p><b>CANADA</b> Phone : 1-800-363-2816</p> <p><b>U.S.A.</b> Phone : (216) 572-6100 (This phone number is also good for all countries. Communications are available in english, french and spanish)</p>	<p><b>PACIFIC RIM</b></p> <p><b>JAPAN</b> Phone : 81-3-3280-2851</p> <p><b>KOREA</b> Phone : 82-32-529-8141 82-32-523-8600 82-51-624-8221 82-2-792-2477</p>
<p><b>EUROPE</b></p> <p><b>DENMARK</b> Phone : 45-31-54-9211</p> <p><b>FRANCE</b> Phone : 33-1-48-35-7777 33-27-14-9700 33-27-14-4600</p> <p><b>GERMANY</b> Phone : 49-202-788-1</p> <p><b>ITALY</b> Phone : 39-81-831-1222 39-2-37-701 39-131-7701</p>	<p><b>PORTUGAL</b> Phone : 351-230-17-43</p> <p><b>SPAIN</b> Phone : 34-3-588-2000 34-3-711-51-54 34-6-154-7035 34-83-54-0400/04</p> <p><b>SWEDEN</b> Phone : 46-479-14-445</p> <p><b>UNITED KINGDOM</b> Phone : 44-21-455-9866 44-926-410-255</p>

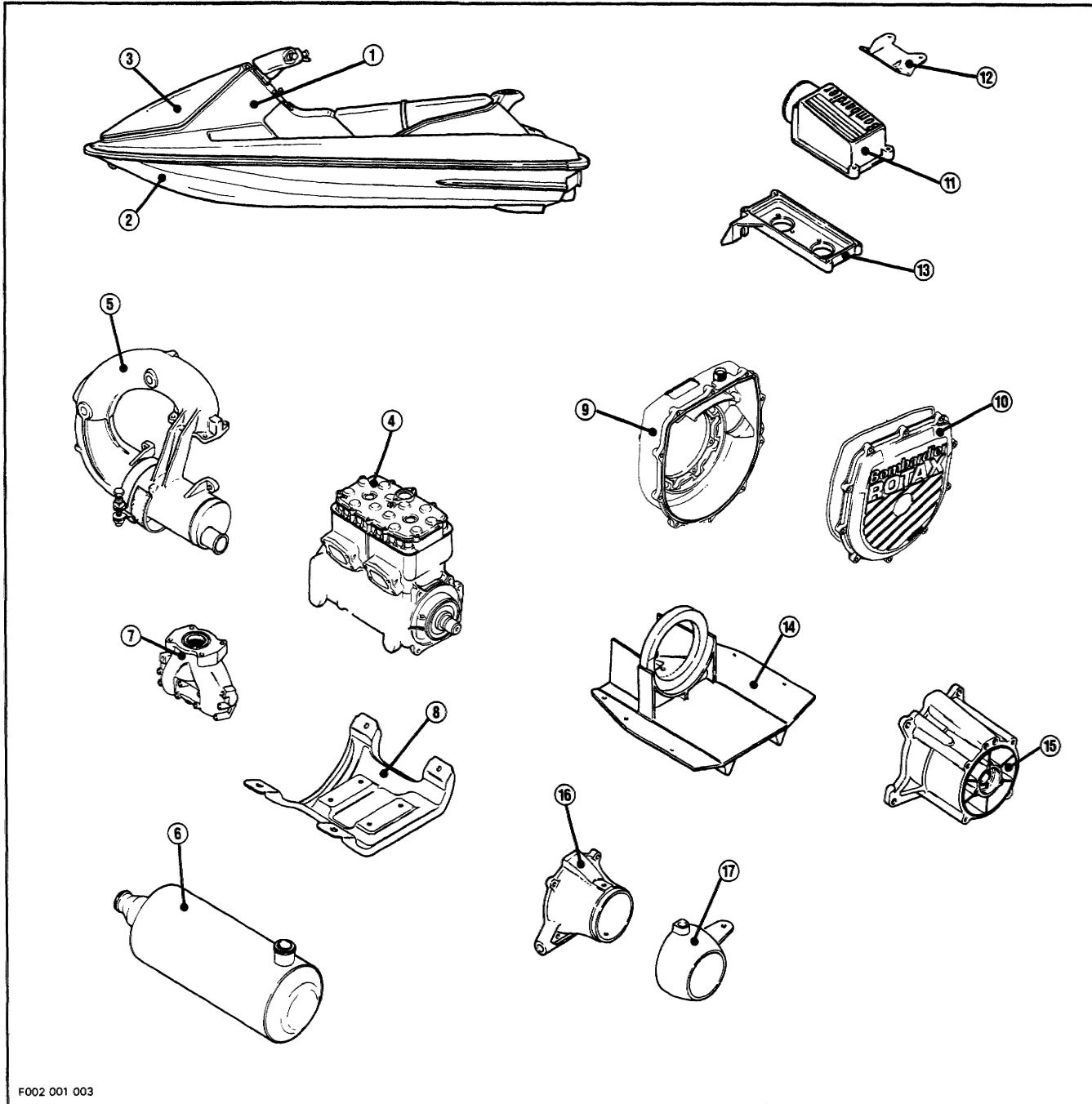
PPG paint for Sea-Doo is not available in spray can. For best result it must be applied by a professional painter. For fast touch up on **metallic parts only** refer to the appropriate Bombardier *Sea-Doo parts catalog*, it contains a few spray can part numbers.



## Section 10 HULL/BODY

### Sub-Section 01 (HULL/BODY)

#### PARTS THAT CAN BE PAINTED



F002 001 003

1. Upper body
2. Lower body
3. Storage cover
4. Engine
5. Tuned pipe
6. Muffler
7. Exhaust manifold
8. Engine support
9. Ignition housing

10. Ignition housing cover
11. Flame arrester cover
12. Flame arrester support
13. Flame arrester base
14. Shoe
15. Impeller housing
16. Venturi
17. Steering nozzle

**Section 10 HULL/BODY**  
Sub-Section 01 (HULL/BODY)

PPG COLOR CHART		SEA-DOO MODEL NUMBERS			
		SP (5805)	GTS (5812)	XP (5851)	GTX (5860)
1. Upper body	COLOR PPG no.	White 98208	White 98208	White 98208	White 98208
2. Lower body	COLOR PPG no.	Medium Dark Grey 38248	White 98208	Mauve 59962	White 98208
3. Storage cover	COLOR PPG no.	Not applicable	Lavender 59974	Not applicable	Magenta 59973
4. Engine	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209
5. Tuned pipe	COLOR PPG no.	Grey 38269	Grey 38269	Mauve 59962	Mauve 59962
6. Muffler	COLOR PPG no.	Grey 38269	Grey 38269	Mauve 59962	Mauve 59962
7. Exhaust manifold	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209
8. Engine support	COLOR PPG no.	Black 9551	Black 9551	Mauve 59962	Mauve 59962
9. Ignition housing	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209
10. Ignition housing cover	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209
11. Flame arrester cover	COLOR PPG no.	Grey 38269	Grey 38269	Mauve 59962	Mauve 59962
12. Flame arrester support	COLOR PPG no.	Grey 38269	Grey 38269	Mauve 59962	Mauve 59962
13. Flame arrester base	COLOR PPG no.	Grey 38269	Grey 38269	Mauve 59962	Mauve 59962
14. Shoe	COLOR PPG no.	Black 9551	Black 9551	Mauve 59962	Mauve 59962
15. Impeller housing	COLOR PPG no.	Black 9551	Black 9551	Mauve 59962	Mauve 59962
16. Venturi	COLOR PPG no.	Black 9551	Black 9551	Mauve 59962	Mauve 59962
17. Steering nozzle	COLOR PPG no.	Black 9551	Black 9551	Mauve 59962	Mauve 59962

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## Section 10 HULL/BODY

### Sub-Section 01 (HULL/BODY)

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## CONCEPT™ PAINTING PROCEDURE

### INSTRUCTIONS FOR SPOT/PANEL AND OVERALL JOBS

For additional information refer to *PPG P-Bulletin* no. 168.

#### SURFACE PREPARATION

Prepare and clean surface consistent with good painting practices.

##### Primer

DP Epoxy Primer/DP 401 Catalyst; DX 1791/1792 (Prime before topcoating).

##### Primer Surfacer

K36/K201, K200/K201 or DZ KONDAR® Primer Surfacers.



**NOTE:** KONDAR must be sealed before applying CONCEPT color.

##### Sealer

KTS30 2K Sealer, DP Epoxy Primer reduced as a sealer or DAS 1980 or DAS 1987.

#### Direct Gloss Color

##### How to Mix

**Standard Air Dry:** Mix CONCEPT Color 2:1:1 – two parts color with one part DT Reducer best suited to shop temperatures and one part DU 4 (below 85°F (29°C)) or DU 5 (above 85°F (29°C)) Hardener.

**Standard Force Dry:** Mix CONCEPT Color 2:1:1 – Application temperatures below 85°F (29°C) use DU 5 Hardener, above 85°F (29°C) use DU 6.

**Medium Solids (MS) Application:** For faster film build, when using solid colors, mix two parts CONCEPT color with half part DT Reducer and one part DU 5 or DU 6 Hardener. Select the DT Reducer appropriate for shop temperature.

##### Pot Life

Pot life of ready-to-spray CONCEPT color is six to eight hours at 70°F (21°C). Medium solids option is two to four hours at 70°F (21°C).

#### FULL PANEL AND OVERALL REPAIRS

##### Application

Apply one medium wet coat and give 5-10 minutes flash, followed by two wet coats with 15 minutes flash time between each coat. Adjust metallic on the last full wet coat. If necessary, apply a mist coat. For medium solids option apply two full wet coats.

##### Air Pressure

40-50 lbs. at-the-gun.

##### Dry Time

- Dust free : 30 minutes.
- Tack free : two to three hours.
- Tape print free : six hours.
- Dry to handle : six to eight hours at 70°F (21°C).
- Force dry : 40 minutes at 140°F (60°C).

Faster dry times may be obtained by using 1/2 oz (15 mL) of DXR 81 Accelerator per sprayable quart, however, the pot life is reduced to two hours.

#### SPOT/PANEL REPAIRS

##### Application

Spray medium wet coat of color on the repair area and allow 5-10 minutes flash time. Apply two additional full coats until hiding is achieved, extending each coat beyond the previous coat. Flash 15 minutes between each coat. For medium solids option apply two full wet coats.

##### Blending

Add DT 95 Reducer to a second gun cup. Reduce the fluid feed of the gun and lower the air pressure to 30 PSI. Dust the dry edge until a slight wet look appears, then stop. Or mix reduced and catalyzed color with equal parts of reduced and catalyzed CONCEPT DCU 2020 Clear.

**DELTA™ PAINTING PROCEDURE**  
(with low VOC, mainly in California)

**INSTRUCTIONS FOR SPOT/PANEL AND OVERALL REFINISHING**

For additional information refer to *PPG P-Bulletin* no. 157.

**SURFACE PREPARATION**

Primer : DELTA™ PRIME DPU 166.

**DELTA™ 2800, COLOR**

**How to Mix**

Mix DELTA™ 2800 2:1, two parts Colors to one DU 6 Catalyst.

**Application**

Apply two coats of DELTA™ Polyurethane Color. Apply the first coat at 1.5-1.8 wet mils. Allow a minimum of 15 minutes flash time prior application of the second coat. Apply a second coat of DELTA™ using the same technique as the first application, paying strict attention to gun set up and proper equipment choices.

**RECOMMENDED SPRAY EQUIPMENT**

Gun Manufacturer	DeVilbiss	Binks	Graco	HVLP
Gun Model	JGA	62	800N	Can Am Model 900
Fluid Tip Size	FF (0.055) 1.4 mm	63D (0.059) 1.5 mm	02N (0.047) 1.2 mm	HT #9072 (0.098) 2.5 mm
Air Cap	797/264	63PW	02/03	C9062
Gun Distance	10''-12''	10''-12''	10''-12''	10''-12''
Fluid Delivery oz./min.	8-12	8-12	8-12	8-12
Air Pressure (At-the-Gun)	60-75#	60-75#	60-75#	9#

**Dry Time (at 70°F (21°C))**

- Dust free : 25-35 minutes.
- Tack free : Two and a half - three hours.
- Tape/Sand : Overnight.

**Force Dry**

Allow 20 minutes purge time at 80-90°F (27-32°C) before bake. Bake 75 minutes at 150°F (65°C) or 40 minutes at 180°F (82°C). Allow to cool after force dry, before sanding or taping.

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## Section 10 HULL/BODY

### Sub-Section 01 (HULL/BODY)

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#### Decals

##### Removal

Using a heat gun warm up one end of decal for a few seconds (until decal can roll off when rubbing with your finger).

Pull decal slowly and when necessary apply more heat to ease removal on the area that has to be peeled off.

To know when decal has enough heat: if decal tears while pulling off it needs to be heated for a few seconds longer. If decal tends to stretch while pulling off stop heating and wait a few seconds to let it cool, then peel off.

##### Installation

There are two types of decals used on watercraft. One having a protective film on back side and the other one a protective film on both sides. They are used on three types of materials; plastic, gelcoat and metal.

##### INSTALLATION OF DECALS HAVING A PROTECTIVE FILM ON BACK SIDE ONLY

These decals usually contain written information (ex: warning) and are used on gelcoat or metal.

Clean surface with a good solvent such as ACRYLIC-CLEAN DX 330 from PPG or equivalent (refer to manufacturer instructions).

Using a pencil and the decal as a template, mark the area where decal will be located.

Remove from decal one half of its back protective film and align decal with marks. Start sticking it from center and remove the other half of the film to stick it completely. Carefully squeegee decal beginning at center and working outward using, firm, short, overlapping strokes.

##### INSTALLATION OF DECALS HAVING A PROTECTIVE FILM ON BOTH SIDES

These decals usually contain graphics and are used on gelcoat or plastic.

##### Installation on gelcoat

Clean surface with a good solvent such as ACRYLIC-CLEAN DX 330 from PPG or equivalent (refer to manufacturer instructions).

For best result apply an activator (P/N 293 530 036) to prepare the surface using a clean cloth. After a few seconds, when the activator evaporates, the surface is ready.

Using a pencil and the decal as a template mark the area where decal will be located.

For better adhesion a dry application is recommended, however, to ease decal installation a mild solution of soapy water can be sprayed over surface where decal will be installed.

Remove back protective film from decal and align decal with marks. When well aligned squeegee decal beginning at center and working outward using, firm, short, overlapping strokes.

Remove front protective film once decal has adhered to hull.

##### Installation on plastic (storage cover)

Clean surface with isopropyl alcohol.

Using a pencil and the decal as a template, mark the area where decal will be located.

Apply an activator (P/N 293 530 036) to prepare the surface using a clean cloth. After a few seconds, when the activator evaporates, the surface is ready.

**▼ CAUTION: Do not use soapy water to locate decal on plastic parts.**

Remove back protective film from decal and carefully align decal with marks. When well aligned squeegee decal beginning at center and working outward using, firm, short, overlapping strokes.

Remove front protective film once decal has adhered.

# STORAGE

## STORAGE

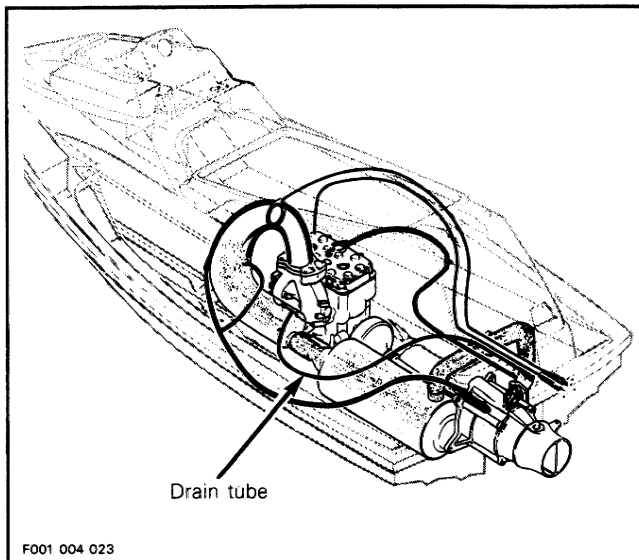
It is during winter or when the watercraft is not to be in use for a prolonged time that a proper storage is a necessity. Storage during long periods of inactivity consists of checking and replacing missing, broken or worn parts and protecting cooling system against freezing and corrosion.

Proper lubrication and treatment should be performed to insure that parts do not become corroded and in general, preparing the watercraft so that when the time comes to use it again, it will be in top condition.

### Engine Draining

Check engine drain tube running from engine manifold socket to exhaust outlet socket. Make sure there is no sand or other particles in it and that it is not obstructed so that water can leave the engine. Clean tube and fitting (on exhaust outlet) 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. Check engine drain tube for obstructions.



### Fuel System

A fuel stabilizer, such as Sta-Bil® (or equivalent), can be added in fuel tank to prevent fuel deterioration and carburetor(s) gumming. Follow manufacturer's instructions for proper use.

▼ **CAUTION :** Fuel stabilizer should be added prior engine lubrication to ensure carburetor(s) protection against varnish deposit.

◆ **WARNING :** Fuel 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.

### Cooling System Flushing and Engine Internal Lubrication

Cooling system has to be flushed with fresh water to prevent salt, sand or dirt accumulation which will clog water passages. This will be achieved with the flush kit (P/N 295 500 008).

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.

### Procedure

◆ **WARNING :** Perform this operation in a well ventilated area.

1. Clean jet pump by spraying water in its inlet and outlet and then SEA-DOO LUBE.

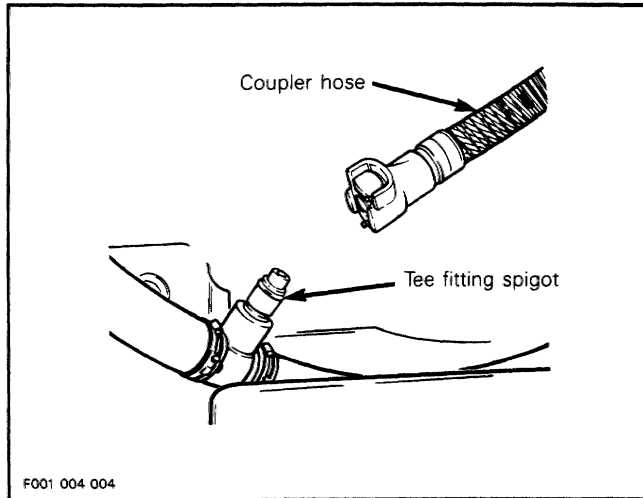
◆ **WARNING :** Always remove tether cord cap from switch to prevent accidental engine starting before cleaning the jet pump area. Engine must not be running for this operation.

2. Remove seat to allow access of cooling system.

3. Disconnect outlet hose at exhaust socket and insert garden hose nozzle into hose end.

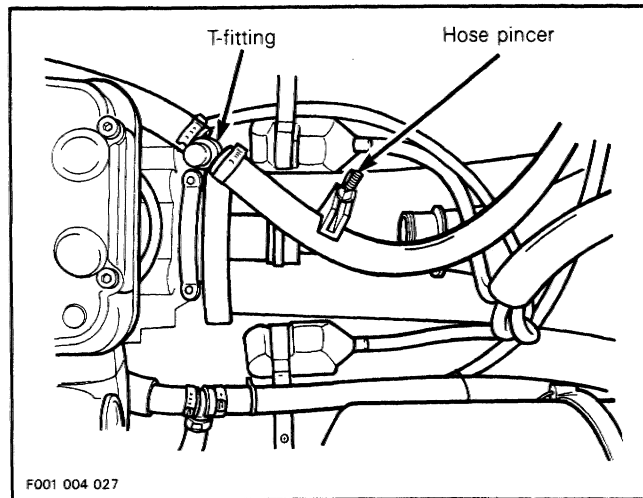
## Section 11 STORAGE

Or if equipped with a flush kit, remove dust cap from tee fitting spigot of flush kit and attach coupler hose. Make sure coupler hose is properly locked to tee fitting spigot.



Attach other end of flush kit coupler hose to a garden hose. **Do not open water tap yet.**

**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 prevents water from exiting through exhaust socket.



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

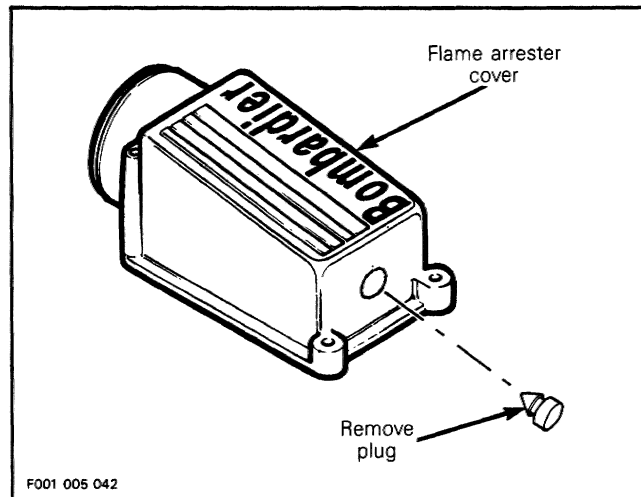
**WARNING :** Do not touch any electrical part when engine is running.

**CAUTION :** Never flush a hot engine. 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.

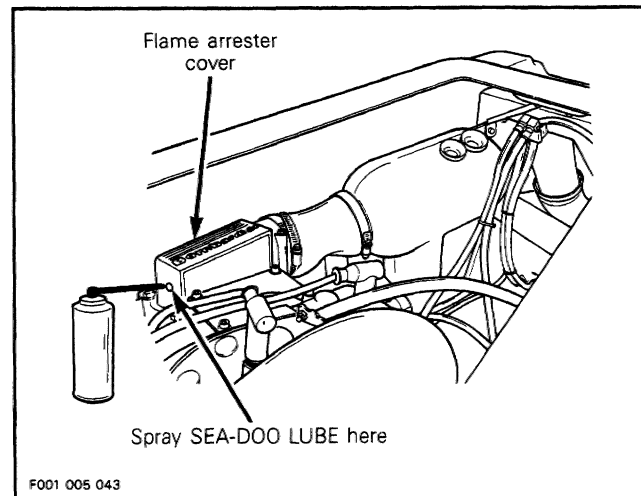
5. Run the engine about five minutes at a fast idle around 3500 RPM.

**CAUTION :** Never run engine longer than five minutes. Drive line seal has no cooling when watercraft is out of water.

6. Remove plug from flame arrester cover.



7. Spray SEA-DOO LUBE (P/N 293 600 006) through flame arrester cover keeping engine at 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 fuel while lubricating.

▼ **CAUTION** : When engine begins to run irregularly because of fuel starvation, immediately stop water flow before engine dies. Severe engine damage could result if not done in this order.

8. Close the water tap then stop the engine.

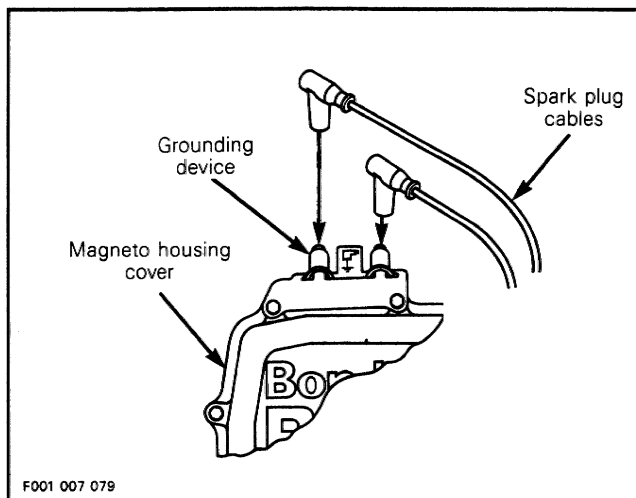
▼ **CAUTION** : Always close the water tap before stopping the engine. Follow this procedure exactly otherwise severe engine damage could occur.

9. Disconnect garden hose from outlet hose and connect hose to exhaust socket.

OR if equipped with a flush kit, press unlocking button to remove coupler hose. Reinstall dust cap over tee fitting.

10. Wipe up any residual water on the engine.

11. Remove spark plug cables and connect them on the grounding device.



Remove both spark plugs and spray SEA-DOO LUBE into each cylinder.

Crank the engine a few turns to distribute the oil onto cylinder wall.

12. Apply anti-seize lubricant on spark plug threads then reinstall them.

13. Reinstall plug on flame arrester cover.

▼ **CAUTION** : Do not run the engine during the storage period.

### Watercraft Rinsing

Thoroughly rinse the watercraft hull, bilge, engine compartment, with **fresh water**.

### Propulsion System

Lubricant in impeller shaft reservoir should be drained and reservoir cleaned refilled with 65 mL (2.2 U.S. oz) of SEA-DOO synthetic oil polyolester (P/N 293 600 011) 75W 90 GL5 type "C" gear lube. Refer to an authorized dealer for this operation.

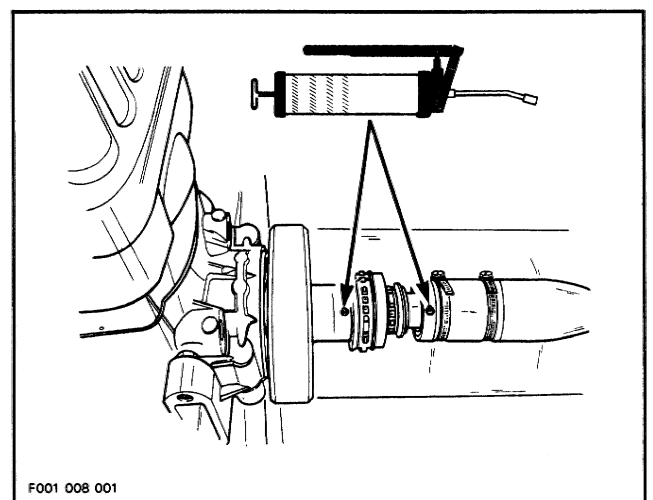
▼ **CAUTION** : Use only SEA-DOO jet pump oil or equivalent synthetic gear oil, otherwise component service life could be reduced. Do not mix oil brands or types.

Lubricate drive shaft splines through grease fitting at PTO flywheel end with synthetic grease (P/N 293 550 010).

▼ **CAUTION** : Do not lubricate excessively. Immediately stop when a slight movement is noticed on rubber boot.

Lubricate at seal carrier grease fitting until grease is just coming out on engine side.

▼ **CAUTION** : As soon as grease comes out the seal immediately stop lubricating to prevent seal damage and overheating.



▼ **CAUTION** : Never leave any clothing, tool or other objects near PTO flywheel and seal carrier.



## Section 11 STORAGE

### Battery

Refer to BATTERY 07-03 then look for **removal** to remove and clean the battery. Apply some 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.

Refer to BATTERY 07-03 then look for **charging**.

Store the battery on a wood shelf in a warm dry place away from direct sunlight.

To prevent battery sulphating and discharging, have it charged every month.

### Anticorrosion 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 water/anti-freeze solution.

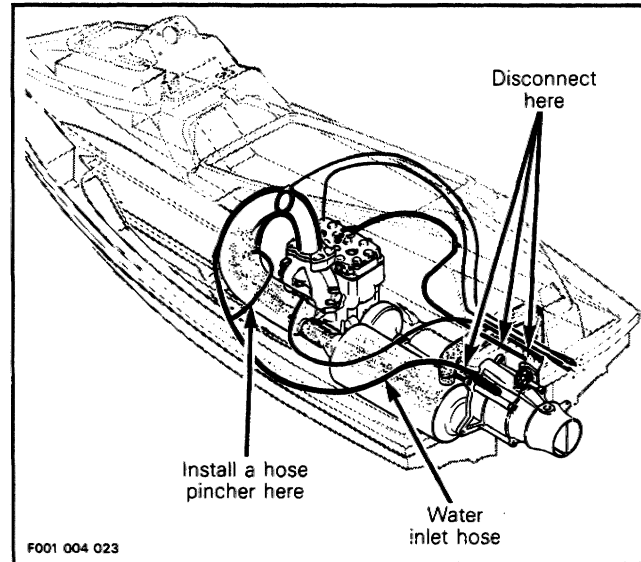
▼ **CAUTION** : Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

○ **NOTE** : The engine will not have to run during this operation.

Three hoses have to be disconnected to allow air to escape and antifreeze solution to completely fill cooling system water jackets.

Install a hose pincher on water injection hose.

Disconnect hoses where shown.

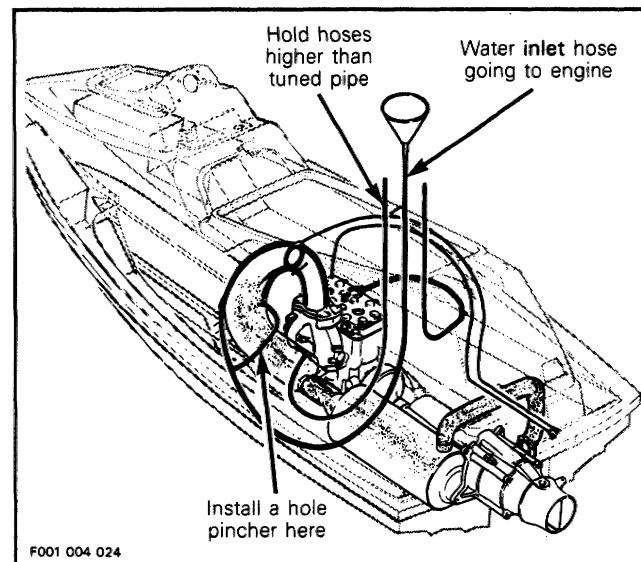


Raise all hoses above the highest point of tuned pipe and temporarily tie them together.

Insert a funnel into inlet hose going to the water inlet socket at tuned pipe. Pour about 2 liters (1/2 gal) of antifreeze solution through the funnel.

Tie up all hoses higher than tuned pipe.

○ **NOTE** : If hoses are not attached higher than tuned pipe, coolant will drain out.



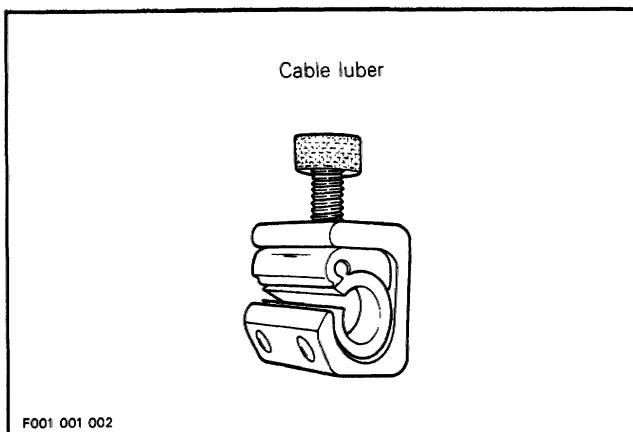
The following steps should be performed to provide the watercraft enhanced protection.

Remove muffler and drain out as much water as possible. Reinstall muffler.

**OR :** Disconnect one hose from muffler and pour some antifreeze liquid inside muffler. Reconnect hose.

Lubricate the throttle cable with SEA-DOO LUBE.

○ **NOTE :** A cable luber can be used on throttle cable end to inject SEA-DOO LUBE. Refer to a motorcycle parts supplier for availability.



Clean the bilge with hot water and mild detergent or with bilge cleaner. Rinse thoroughly. Lift front end of watercraft to completely drain bilge. If any repairs are needed to body or to the hull, touch up paint such as mauve paint (P/N 293 500 020) and Gelcote® repair kit (P/N 295 500 009) are available. Replace damaged labels/decals.

○ **NOTE :** Bilge cleaning should be done prior anticorrosion treatment.

Wash the body with SEA-DOO CLEANER (P/N 298 850 000) or soap and water solution (only use mild detergent). Rinse thoroughly with fresh water. Remove marine organisms from the hull. Apply a nonabrasive wax such as silicon wax.

▼ **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 to prevent sun rays and grime from affecting the plastic components, watercraft finish as well as preventing dust accumulation.

▼ **CAUTION :** The watercraft must never be left in water for storage.

The seat should be partially left opened during storage. This will avoid engine compartment condensation and possible corrosion.

○ **NOTE :** If the watercraft is stored outside with seat partially opened and without a tarpaulin, remove the rear drain plug in order to avoid water build up in the bilge during rainfall. Tilt the watercraft to the rear so that water can flow out of floorboard.



# TECHNICAL DATA

## SI \* METRIC INFORMATION GUIDE

LEGEND
ATDC : After top dead center
BTDC : Before top dead center
CDI : Capacitor discharge ignition
N.A. : Not available
RPM : Revolutions per minute
STD : Standard
VROI : Variable rate oil injection

BASE UNITS			
DESCRIPTION	UNIT	SYMBOL	
length	meter	m	
mass	kilogram	kg	
force	newton	N	
liquid	liter	L	
temperature	Celsius	°C	
pressure	kilopascal	kPa	
torque	newton•meter	N•m	
land velocity	kilometer per hour	km/h	
navigation velocity	knot	kn	
PREFIXES			
PREFIX	SYMBOL	MEANING	VALUE
kilo	k	one thousand	1000
centi	c	one hundredth of	0.01
milli	m	one thousandth of	0.001
micro	μ	one millionth of	0.000001
CONVERSION FACTORS			
TO CONVERT	TO ①	MULTIPLY BY	
in	mm	25.4	
in	cm	2.54	
in <sup>2</sup>	cm <sup>2</sup>	6.45	
in <sup>3</sup>	cm <sup>3</sup>	16.39	
ft	m	0.3	
oz	g	28.35	
lb	kg	0.45	
lbf	N	4.4	
<b>lbf•in</b>	<b>N•m</b>	0.11	
<b>lbf•ft</b>	<b>N•m</b>	1.36	
<b>lbf•ft</b>	<b>lbf•in</b>	12	
PSI	kPa	6.89	
imp. oz	U.S. oz	0.96	
imp. oz	mL	28.41	
imp. gal	U.S. gal	1.2	
imp. gal	L	4.55	
U.S. oz	mL	29.57	
U.S. gal	L	3.79	
knot	MPH	1.15	
MPH	km/h	1.61	
Fahrenheit	Celsius	$(^{\circ}\text{F} - 32) \times 5/9$	
Celsius	Fahrenheit	$(^{\circ}\text{C} \times 9/5) + 32$	

\*The international system of units abbreviates SI in all languages.

① To obtain the reverse sequence, divide by the given factor. To convert millimeters to inches, divide by 25.4.

○ **NOTE :** Conversion factors are rounded off to two decimals for easier use.



**Section 12 TECHNICAL DATA**  
Sub-Section 01 (SP 5805, XP 5851 MODELS)

## SP 5805, XP 5851 MODELS

ENGINE		SP (5805)	XP (5851)
Engine type		Bombardier-Rotax 587, water cooled	
Induction type		Rotary valve	
Exhaust system	Type	Water cooled, water injected	
	Water injection fitting size	5.5 mm (0.217 in)	4.6 mm (.181 in)
Starting system		Electric start	
Lubrication	Fuel/Oil mixture	VROI (Variable rate oil injection)	
	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 (3.012 in)	
Stroke		64 mm (2.520 in)	
Displacement		580.7 cm <sup>3</sup> (35.4 in <sup>3</sup> )	
Compression ratio	(uncorrected)	11.5 : 1	
	(corrected)	5.9 : 1	
Engine maximum torque		64 N•m (47 lbf•ft) @ 5500 RPM	65 N•m (48 lbf•ft) @ 5750 RPM
Cylinder head warpage		N.A.	
Piston ring type and quantity		1 Semi-Trapez — 1 Rectangular	
Ring end gap	New	0.25 - 0.40 mm (.010 - .016 in)	
	Wear limit	1.00 mm (.039 in)	
Ring/piston groove clearance	New	0.05 - 0.08 mm (.002 - .003 in)	
	Wear limit	0.2 mm (.008 in)	
Piston/cylinder wall clearance	New	0.05 - 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	0.39 - 0.74 mm (.015 - .029 in)	
	Wear limit	1.2 mm (.047 in)	
Crankshaft deflection		0.08 mm (.003 in)	
Rotary valve timing	Opening	$115^{\circ} \pm \frac{3}{5}$ BTDC	$130^{\circ} \pm \frac{3}{5}$ BTDC
	Closing	$80^{\circ} \pm \frac{5}{3}$ ATDC	$65^{\circ} \pm \frac{5}{3}$ BTDC
Rotary valve plate opening		147°	
Crankcase/rotary valve gap		0.22 - 0.35 mm (.009 - .014 in)	
Connecting rod radial clearance	New	0.020 - 0.033 mm (.0008 - .0013 in)	
	Wear limit	0.050 mm (.002 in)	

## Section 12 TECHNICAL DATA

### Sub-Section 01 (SP 5805, XP 5851 MODELS)

ELECTRICAL (engine)		SP (5805)	XP (5851)
Magneto generator output		160 W @ 6000 RPM	
Ignition system, type		CDI, 4/5 p	
Spark plug	Make and type	NGK BR7ES	
	Gap	0.5 mm (.020 in)	
Ignition timing	BTDC	2.65 mm (.104 in) (21° ± 1)	
	Engine speed (cold)	6000 RPM	
Generating coil		40 - 76 Ω	
Battery charging coil		.05 - .6 Ω	
High tension coil	Secondary	9 - 15 KΩ	
Engine RPM limiter operation		6550 ± 100	
ADDITIONAL INFORMATION :			
CARBURATION		SP (5805)	XP (5851)
Carburetor	Type	Diaphragm	
	Quantity	1	2
Main jet		125	107.5
Pilot jet		67.5	62.5
Adjustment	Low-speed mixture screw	1 turn ± 1/4	1-1/4 turn ± 1/4
	High-speed screw	0	
	Idle speed (in water)	1400 RPM	
	Idle speed (out of water)	2400 RPM	3000 RPM
Fuel	Type	Regular unleaded	
	Octane no.	87 (Ron + Mon)/2	
Fuel return line orifice		0.5 mm (0.020 in)	0.5 mm (0.020 in) (PTO side)
Leak test (pop off pressure)		150-200 kPa (22-29 PSI)	
ADDITIONAL INFORMATION :			
COOLING		SP (5805)	XP (5851)
Type		Open circuit - Direct flow from jet propulsion unit.	
Thermostat		None	
Overheating beeper setting		96-99°C (205-210°F)	
ADDITIONAL INFORMATION :			

**Section 12 TECHNICAL DATA**  
**Sub-Section 01 (SP 5805, XP 5851 MODELS)**

PROPULSION		SP (5805)	XP (5851)	
Propulsion system		Bombardier Formula pump		
Jet pump type		Axial flow single stage		
Impeller rotation (seen from rear)		Counterclockwise		
Transmission		Direct drive		
Coupling type		Crown splines		
PROPULSION UNIT	Oil type	SEA-DOO JET PUMP SYNTHETIC OIL Polyolester 75W90 GL5 (P/N 293 600 011)		
	Steering nozzle pivoting angle	26°		
	Trim nozzle pivoting angle	N.A.	± 10°	
	Minimum required water level	60 cm (24 in)		
	Drive shaft deflection maximum	0.5 mm (.020 in)		
	Impeller outside diameter	139.5 mm (5.490 in)		
	Impeller/wear ring clearance	Wear limit (performance)	0.5 (.020 in)	
		Wear limit	1.02 mm (.040 in)	
	Impeller shaft end play (new)	0.12 - 0.54 mm (.005 - .021 in)		
	Impeller shaft side play	0.05 mm (.002 in)		
	Impeller pitch/material	18°/aluminum	19°/stainless steel	
ADDITIONAL INFORMATION : Do not mix different trademarks or type of oil.				
DIMENSIONS		SP (5805)	XP (5851)	
Number of passager (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)		
MATERIALS	Hull	Composite		
	Air intake silencer	Thermoplastic		
	Flame arrester	Multi-layer wire screen		
	Exhaust muffler	Aluminum		
	Steering padding	Thermoplastic elastomer with polystyrene foam		
	Fuel tank	Polyethylene		
	Injection oil tank	Polyethylene		
Seat	Polyurethane foam			
ADDITIONAL INFORMATION :				



**Section 12 TECHNICAL DATA****Sub-Section 01 (SP 5805, XP 5851 MODELS)**

PERFORMANCE		SP (5805)	XP (5851)
Pump static thrust		170 kg (375 lb)	200 kg (441 lb)
Max. fuel consumption at wide open throttle		20.8 L/h (5.5 U.S. gal/h)	22.7 L/h (6 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reverse	1 hour 45 minutes	1 hour 20 minutes
	Fuel tank reserve	20 minutes	13 minutes
ADDITIONAL INFORMATION :			
ELECTRICAL (vehicle)		SP (5805)	XP (5851)
Battery		12 V, 19 A•h	
Starting system fuse		5 A	
Charging system fuse		15 A	
ADDITIONAL INFORMATION :			
CAPACITIES		SP (5805)	XP (5851)
Fuel tank		33 L (8.7 U.S. gal)	
Impeller shaft reservoir	Capacity	65 mL (2.2 U.S. oz)	
	Oil level height	To bottom of cover hole	
Injection oil tank		2.8 L (95 U.S. fl oz)	
ADDITIONAL INFORMATION :			
STANDARD EQUIPMENT		SP (5805)	XP (5851)
Tether cord		STD	
Tool kit		STD	
Fuel tank reserve		STD	
Overheating warning device		STD	
Electric fuel level gauge		N.A.	STD
Injection oil low level warning device		N.A.	STD
Tachometer		N.A.	STD
Variable trim system (VTS)		N.A.	STD
Reverse		N.A.	
Storage compartment		STD	
Rear grab handle		N.A.	STD
Extinguisher holder		STD	
ADDITIONAL INFORMATION :			

**Section 12 TECHNICAL DATA**  
**Sub-Section 01 (SP 5805, XP 5851 MODELS)**

TIGHTENING TORQUES		SP (5805) and XP (5851)	
E N G I N E	Exhaust manifold, screws (8)	24 N•m (18 lbf•ft)	
	Magneto ring nut	105 N•m (77 lbf•ft)	
	Flywheel (PTO side)	110 N•m (81 lbf•ft)	
	Crankcase screws	M6	9 N•m (80 lbf•in)
		M8	24 N•m (18 lbf•ft)
	Crankcase/engine support nuts	35 N•m (26 lbf•ft)	
	Engine support/hull	25 N•m (18 lbf•ft) (1)	
	Cylinder head screws	24 N•m (18 lbf•ft) (3)	
	Crankcase/cylinder screws	24 N•m (18 lbf•ft) (3)	
	Tuned pipe flange nuts	25 N•m (18 lbf•ft)	
	Tuned pipe fixation screws	25 N•m (18 lbf•ft) (1)	
	Cylinder head cover screws	9 N•m (80 lbf•in) (1)	
	Flame arrester screws	10 N•m (88 lbf•in) (1)	
P U M P	Impeller on shaft	70 N•m (52 lbf•ft) (2)	
	Pump/hull	35 N•m (26 lbf•ft) (1)	
	Venturi/housing	25 N•m (18 lbf•ft) (1)	
	Nozzle/venturi	20 N•m (15 lbf•ft) (1)	
	Housing cover	7 N•m (62 lbf•in) (1)	
	Grill	8 N•m (71 lbf•in) (1)	
	Ride shoe	10 N•m (88 lbf•in) (1)	
S T E E R I N G	Steering cable nuts	10 N•m (88 lbf•in)	
	Steering support screws	15 N•m (11 lbf•ft) (1)	
	Steering collar screws	5 N•m (44 lbf•in) (1)	
	Steering stem screw	40 N•m (29 lbf•ft) (2)	
	Handlebar saddle screws, nuts	26 N•m (19 lbf•ft)	
	Reverse gate/Venturi	N.A.	
	Cable/Reverse gate	N.A.	
E L E C T R I C A L	Ignition housing cover	4 N•m (35 lbf•in)	
	Starter mounting screws	22 N•m (16 lbf•ft) (2)	
	Starter lock nuts	7 N•m (62 lbf•in)	
	Spark plug	24 N•m (18 lbf•ft)	
ADDITIONAL INFORMATION : Apply where indicated (1) Loctite 242 (2) Loctite 271 (3) Loctite 515			



**Section 12 TECHNICAL DATA**  
Sub-Section 02 (GTS 5812, GTX 5860 MODELS)

## GTS 5812, GTX 5860 MODELS

ENGINE		GTS (5812)	GTX (5860)
Engine type		Bombardier-Rotax 587, water cooled	
Induction type		Rotary valve	
Exhaust system	Type	Water cooled, water injected	
	Water injection fitting size	4.6 mm (0.181 in)	
Starting system		Electric start	
Lubrication	Fuel/Oil mixture	VROI (Variable rate oil injection)	
	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 (3.012 in)	
Stroke		64 mm (2.520 in)	
Displacement		580.7 cm <sup>3</sup> (35.4 in <sup>3</sup> )	
Compression ratio	(uncorrected)	11.5 : 1	
	(corrected)	5.9 : 1	
Engine maximum torque		64 N•m (47 lbf•ft) @ 5500 RPM	65 N•m (48 lbf•ft) @ 5750 RPM
Cylinder head warpage		N.A.	
Piston ring type and quantity		1 Semi-Trapez — 1 Rectangular	
Ring end gap	New	0.25 - 0.40 mm (.010 - .016 in)	
	Wear limit	1.00 mm (.039 in)	
Ring/piston groove clearance	New	0.05 - 0.08 mm (.002 - .003 in)	
	Wear limit	0.2 mm (.008 in)	
Piston/cylinder wall clearance	New	0.05 - 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	0.39 - 0.74 mm (.015 - .029 in)	
	Wear limit	1.2 mm (.047 in)	
Crankshaft deflection		0.08 mm (.003 in)	
Rotary valve timing	Opening	115° $\pm$ $\frac{3}{5}$ BTDC	130° $\pm$ $\frac{3}{5}$ BTDC
	Closing	80° $\pm$ $\frac{5}{3}$ ATDC	65° $\pm$ $\frac{5}{3}$ BTDC
Rotary valve plate opening		147°	
Crankcase/rotary valve gap		0.22 - 0.35 mm (.009 - .014 in)	
Connecting rod radial clearance	New	0.020 - 0.033 mm (.0008 - .0013 in)	
	Wear limit	0.050 mm (.002 in)	

## Section 12 TECHNICAL DATA

### Sub-Section 02 (GTS 5812, GTX 5860 MODELS)

ELECTRICAL (engine)		GTS (5812)	GTX (5860)
Magneto generator output		160 W @ 6000 RPM	
Ignition system, type		CDI, 4/5 p	
Spark plug	Make and type	NGK BR7ES	
	Gap	0.5 mm (.020 in)	
Ignition timing	BTDC	2.65 mm (.104 in) (21° ± 1)	
	Engine speed (cold)	6000 RPM	
Generating coil		40 - 76 Ω	
Battery charging coil		.05 - .6 Ω	
High tension coil	Secondary	9 - 15 KΩ	
Engine RPM limiter operation		6550 ± 100	
ADDITIONAL INFORMATION :			
CARBURATION		GTS (5812)	GTX (5860)
Carburetor	Type	Diaphragm	
	Quantity	1	2
Main jet		125	107.5
Pilot jet		67.5	62.5
Adjustment	Low-speed mixture screw	1 turn ± 1/4	1-1/4 turn ± 1/4
	High-speed screw	0	
	Idle speed (in water)	1400 RPM	
	Idle speed (out of water)	2500 RPM	2800 RPM
Fuel	Type	Regular unleaded	
	Octane no.	87 (Ron + Mon) / 2	
Fuel return line orifice		0.5 mm (0.020 in)	0.5 mm (0.020 in) (PTO side)
Leak test (pop off pressure)		150-200 kPa (22-29 PSI)	
ADDITIONAL INFORMATION :			
COOLING		GTS (5812)	GTX (5860)
Type		Open circuit - Direct flow from jet propulsion unit.	
Thermostat		None	
Overheating beeper setting		96-99°C (205-210°F)	
ADDITIONAL INFORMATION :			

**Section 12 TECHNICAL DATA**  
Sub-Section 02 (GTS 5812, GTX 5860 MODELS)

PROPULSION		GTS (5812)	GTX (5860)	
Propulsion system		Bombardier Formula pump		
Jet pump type		Axial flow single stage		
Impeller rotation (seen from rear)		Counterclockwise		
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 Polyolester 75W90 GL5 (P/N 293 600 011)		
	Steering nozzle pivoting angle	26°		
	Trim nozzle pivoting angle	N.A.		
	Minimum required water level	90 cm (36 in)		
	Drive shaft deflection maximum	0.5 mm (.020 in)		
	Impeller outside diameter	139.5 mm (5.490 in)		
	Impeller/wear ring clearance	Wear limit (performance)	0.5 (.020 in)	
		Wear limit	1.02 mm (.040 in)	
	Impeller shaft end play (new)	0.12 - 0.54 mm (.005 - .021 in)		
	Impeller shaft side play	0.05 mm (.002 in)		
	Impeller pitch/material	18.3°/aluminum	17°/stainless steel	
ADDITIONAL INFORMATION : Do not mix different trademarks or type of oil.				
DIMENSIONS		GTS (5812)	GTX (5860)	
Number of passager (driver incl.)		3		
Length, overall		303 cm (119.3 in)		
Width, overall		121 cm (47.6 in)		
Height, overall		95 cm (37.4 in)		
Mass		209 kg (461 lb)		
Load limit		225 kg (496 lb)		
M A T E R I A L S	Hull	Composite		
	Air intake silencer	Thermoplastic		
	Flame arrester	Multi-layer wire screen		
	Exhaust muffler	Aluminum		
	Steering padding	Thermoplastic elastomer with polystyrene foam		
	Fuel tank	Polyethylene		
	Injection oil tank	Polyethylene		
	Seat	Polyurethane foam		
ADDITIONAL INFORMATION :				

## Section 12 TECHNICAL DATA

### Sub-Section 02 (GTS 5812, GTX 5860 MODELS)

PERFORMANCE		GTS (5812)	GTX (5860)
Pump static thrust		195 kg (429 lb)	210 kg (462 lb)
Max. fuel consumption at wide open throttle		20.8 L/h (5.5 U.S. gal/h)	22.7 L/h (6 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reverse	1 hour 45 minutes	1 hour 20 minutes
	Fuel tank reserve	20 minutes	13 minutes
ADDITIONAL INFORMATION :			
ELECTRICAL (vehicle)		GTS (5812)	GTX (5860)
Battery		12 V, 19 A•h	
Starting system fuse		5 A	
Charging system fuse		15 A	
ADDITIONAL INFORMATION :			
CAPACITIES		GTS (5812)	GTX (5860)
Fuel tank		33 L (8.7 U.S. gal)	
Impeller shaft reservoir	Capacity	65 mL (2.2 U.S. oz)	
	Oil level height	To bottom of cover hole	
Injection oil tank		2.8 L (95 U.S. fl oz)	
ADDITIONAL INFORMATION :			
STANDARD EQUIPMENT		GTS (5812)	GTX (5860)
Tether cord		STD	
Tool kit		STD	
Fuel tank reserve		STD	
Overheating warning device		STD	
Electric fuel level gauge		OPT.	STD
Injection oil low level warning device		OPT.	STD
Tachometer		N.A.	STD
Variable trim system (VTS)		N.A.	
Reverse		STD	
Storage compartment		STD	
Rear grab handle		STD	
Extinguisher holder		STD	
ADDITIONAL INFORMATION :			

**Section 12 TECHNICAL DATA**  
Sub-Section 02 (GTS 5812, GTX 5860 MODELS)

TIGHTENING TORQUES		GTS (5812) and GTX (5860)		
E N G I N E	Exhaust manifold, screws (8)	24 N•m	(18 lbf•ft)	
	Magneto flywheel nut	105 N•m	(77 lbf•ft)	
	Flywheel (PTO side)	110 N•m	(81 lbf•ft)	
	Crankcase screws	M6	9 N•m	(80 lbf•in)
		M8	24 N•m	(18 lbf•ft)
	Crankcase/engine support nuts	35 N•m	(26 lbf•ft)	
	Engine support/hull	25 N•m	(18 lbf•ft) (1)	
	Cylinder head screws	24 N•m	(18 lbf•ft) (3)	
	Crankcase/cylinder screws	24 N•m	(18 lbf•ft) (3)	
	Tuned pipe flange nuts	25 N•m	(18 lbf•ft)	
	Tuned pipe fixation screws	25 N•m	(18 lbf•ft) (1)	
	Cylinder head cover screws	9 N•m	(80 lbf•in) (1)	
	Flame arrester screws	10 N•m	(88 lbf•in) (1)	
P U M P	Impeller on shaft	70 N•m	(52 lbf•ft) (2)	
	Pump/hull	35 N•m	(26 lbf•ft) (1)	
	Venturi/housing	25 N•m	(18 lbf•ft) (1)	
	Nozzle/venturi	20 N•m	(15 lbf•ft) (1)	
	Housing cover	7 N•m	(62 lbf•in) (1)	
	Grill	8 N•m	(71 lbf•in) (1)	
	Ride shoe	10 N•m	(88 lbf•in) (1)	
S T E E R I N G	Steering cable lock nuts	10 N•m	(88 lbf•in)	
	Steering support screws	15 N•m	(11 lbf•ft) (1)	
	Steering collar screws	5 N•m	(44 lbf•in) (1)	
	Steering stem screw	40 N•m	(29 lbf•ft) (2)	
	Handlebar saddle screws, nuts	26 N•m	(19 lbf•ft)	
	Reverse gate/Venturi	20 N•m	(15 lbf•ft)	
	Cable/Reverse gate	7 N•m	(62 lbf•in)	
E L E C T R I C A L	Ignition housing cover	4 N•m	(35 lbf•in)	
	Starter mounting screws	22 N•m	(16 lbf•ft) (2)	
	Starter lock nuts	7 N•m	(62 lbf•in)	
	Spark plug	24 N•m	(18 lbf•ft)	
ADDITIONAL INFORMATION : Apply where indicated (1) Loctite 242 (2) Loctite 271 (3) Loctite 515				





# TROUBLESHOOTING

The following chart is provided to help in diagnosing the probable source of troubles.

## ENGINE WILL NOT START

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Engine does not turn over	<ul style="list-style-type: none"> <li>• Tether cord removed</li> <li>• Fuse open</li> <li>• Discharged battery</li> <li>• Battery connections</li> <li>• Water/fuel hydrolock</li> <li>• Starter or solenoid</li> <li>• Seized engine</li> <li>• Seized jet pump</li> <li>• Jammed pump</li> </ul>	<ul style="list-style-type: none"> <li>• Reinstall</li> <li>• Check wiring then replace fuse</li> <li>• Check/recharge</li> <li>• Check/clean/tighten</li> <li>• Check, refer to section 03-01</li> <li>• Check, refer to section 07-04</li> <li>• Check/repair as needed</li> <li>• Check, refer to section 08-01</li> <li>• Check/clean out debris</li> </ul>
Engine slowly turns	<ul style="list-style-type: none"> <li>• Discharged/weak battery</li> <li>• Restriction in jet pump</li> <li>• Seizure in jet pump</li> <li>• Seal carrier seizure</li> <li>• Partial engine hydrolock</li> <li>• Partial engine seizure</li> </ul>	<ul style="list-style-type: none"> <li>• Check/charge/replace</li> <li>• Check/clean pump</li> <li>• Inspect, refer to section 08-01</li> <li>• Check, refer to section 08-01</li> <li>• Check, refer to section 03-01</li> <li>• Check compression, refer to section 03-03</li> </ul>
Engine turns over	<ul style="list-style-type: none"> <li>• Fuel tank empty</li> <li>• Fuel water-contaminated</li> <li>• Dirty fuel filter</li> <li>• Fouled spark plugs</li> <li>• Water in engine</li> <li>• Misuse of choke (fuel flooded)</li> <li>• Carburation</li> <li>• Ignition</li>   <li>• Engine flooded — Needle valve stuck open</li> </ul>	<ul style="list-style-type: none"> <li>• Refill</li> <li>• Renew supply</li> <li>• Clean/replace</li> <li>• Replace</li> <li>• Check, refer to section 03-01</li> <li>• Use only with cold engine</li> <li>• Check, refer to section 05-03</li> <li>• Check, refer to section 07-02 and 07-06</li> <li>• Check, refer to section 05-03</li> </ul>

## Section 13 TROUBLESHOOTING

### ENGINE MISFIRES, RUNS IRREGULARLY

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	<ul style="list-style-type: none"> <li>Fouled, defective, worn spark plugs</li> <li>Faulty RPM limiter</li> <li>Faulty ignition</li> </ul>	<ul style="list-style-type: none"> <li>Check/verify heat range/replace</li> <li>Check, refer to section 07-06</li> <li>Check, refer to section 07-06</li> </ul>
Lean fuel mixture Dry spark plug (except when water fouled)	<ul style="list-style-type: none"> <li>Fuel level low</li> <li>Stale or water fouled fuel</li> <li>Fuel filter dirty or restricted</li> <li>Carburation dirty or out of adjustment</li> <li>Leaking crankshaft seal, magneto or PTO</li> <li>Fuel valve restricted</li> <li>Filter in fuel tank restricted</li> <li>Loose carburetor</li> </ul>	<ul style="list-style-type: none"> <li>Check/refill</li> <li>Check/siphon and refill</li> <li>Check/clean/replace</li> <li>Check/clean/adjust, refer to section 05-03</li> <li>Check/test/replace, refer to engine section 03-05</li> <li>Check/replace</li> <li>Check/replace</li> <li>Tighten carburetor</li> </ul>
Rich fuel mixture Fouled spark plug	<ul style="list-style-type: none"> <li>Partially closed choke</li> <li>Flame arrester dirty or restricted</li> <li>Carburetor adjustment or setting</li> <li>Main jet loose</li> <li>Main jet O-ring damage</li> <li>Rotary valve shaft seal leaking</li> <li>Oil pump adjustment</li> <li>Watercraft transportation</li> </ul>	<ul style="list-style-type: none"> <li>Check/adjust choke cable</li> <li>Check/clean/replace</li> <li>Check/clean/adjust, refer to section 05-03</li> <li>Check, refer to section 05-03</li> <li>Check/replace, refer to section 05-03</li> <li>Check/replace, refer to section 03-06</li> <li>Check/adjust, refer to section 06-02</li> <li>Turn fuel valve to OFF</li> </ul>
Difficult to start	<ul style="list-style-type: none"> <li>Incorrect rotary valve timing</li> </ul>	<ul style="list-style-type: none"> <li>Check/adjust, refer to section 03-06</li> </ul>

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## Section 13 TROUBLESHOOTING

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### ENGINE OVERHEATS

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Overheat beeper sounds	<ul style="list-style-type: none"><li>• Restricted jet pump water intake</li><li>• Cooling system restriction</li> <li>• Carburetor adjustment</li> <li>• Grounded temperature sensor or sensor wire</li></ul>	<ul style="list-style-type: none"><li>• Check/clean</li><li>• Check/flush, refer to section 04-03</li><li>• Check/clean/adjust, refer to section 05-03</li><li>• Check/replace/repair</li></ul>

### ENGINE CONTINUALLY BACKFIRES

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	<ul style="list-style-type: none"><li>• Fouled, defective spark plugs</li><li>• RPM limiter malfunction</li></ul>	<ul style="list-style-type: none"><li>• Clean/replace</li><li>• Check/replace, refer to section 07-06</li></ul>
Ignition timing	<ul style="list-style-type: none"><li>• Incorrect setting</li><li>• Flywheel key sheared</li></ul>	<ul style="list-style-type: none"><li>• Check/reset, refer to section 07-02</li><li>• Check/replace</li></ul>
Rotary disc valve	<ul style="list-style-type: none"><li>• Timing incorrect</li></ul>	<ul style="list-style-type: none"><li>• Check/reset, refer to section 03-06</li></ul>
Carburetor	<ul style="list-style-type: none"><li>• Carburation too lean</li></ul>	<ul style="list-style-type: none"><li>• Check/adjust, refer to section 05-03</li></ul>

### ENGINE DETONATION OR PINGING

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Ignition	<ul style="list-style-type: none"><li>• Timing too far advanced</li><li>• Spark plug heat range too high</li></ul>	<ul style="list-style-type: none"><li>• Check/reset</li><li>• Check/change to correct range</li></ul>
Engine temperature	<ul style="list-style-type: none"><li>• Engine overheating</li></ul>	<ul style="list-style-type: none"><li>• Check, refer to section 03-01 and 04-01</li></ul>
	<ul style="list-style-type: none"><li>• Poor quality fuel</li></ul>	<ul style="list-style-type: none"><li>• Use good quality fuel</li></ul>

## Section 13 TROUBLESHOOTING

### ENGINE LACKS ACCELERATION OR POWER

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none"> <li>• Weak spark</li> <li>• Carburation, jetting too rich/lean</li> <li>• Throttle does not reach full open</li> <li>• Low compression</li> <li>• Exhaust system restriction</li> <li>• Water in gas or oil</li> <li>• Debris in needle valve</li> </ul>	<ul style="list-style-type: none"> <li>• Check/replace, refer to section 07-06</li> <li>• Check/reset/rejet, refer to section 05-03</li> <li>• Check/readjust</li> <li>• Check/repair, refer to section 03-03</li> <li>• Check/clean</li> <li>• Check/siphon/replace</li> <li>• Check/clean, refer to section 05-03</li> </ul>

### ENGINE RUNS TOO FAST

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none"> <li>• Faulty RPM limiter</li> </ul>	<ul style="list-style-type: none"> <li>• Check, refer to section 07-06</li> </ul>
Jet pump cavitation	<ul style="list-style-type: none"> <li>• Damaged leading edge of impeller</li> </ul>	<ul style="list-style-type: none"> <li>• Check/replace</li> </ul> <p>○ <b>NOTE</b> : Leading edge damage contributes to poor performance from start. Trailing edge damage contributes to poor top performance and stator vane erosion.</p>
Jet pump ventilation	<ul style="list-style-type: none"> <li>• Pump housing or ride shoe air leak</li> </ul>	<ul style="list-style-type: none"> <li>• Check/reseal, refer to section 08-01</li> </ul>

### ABNORMAL NOISE FROM PROPUSION SYSTEM

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none"> <li>• Weeds/debris caught in pump intake or impeller</li> <li>• Low oil level in pump housing</li> <li>• Damaged or bent driveshaft</li> <li>• Broken motor mounts</li> </ul>	<ul style="list-style-type: none"> <li>• Check/clean</li> <li>• Check/troubleshoot source of leak/refill supply, refer to section 08-01</li> <li>• Check/replace, refer to section 08-01</li> <li>• Check/replace, refer to section 03-02</li> </ul>

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