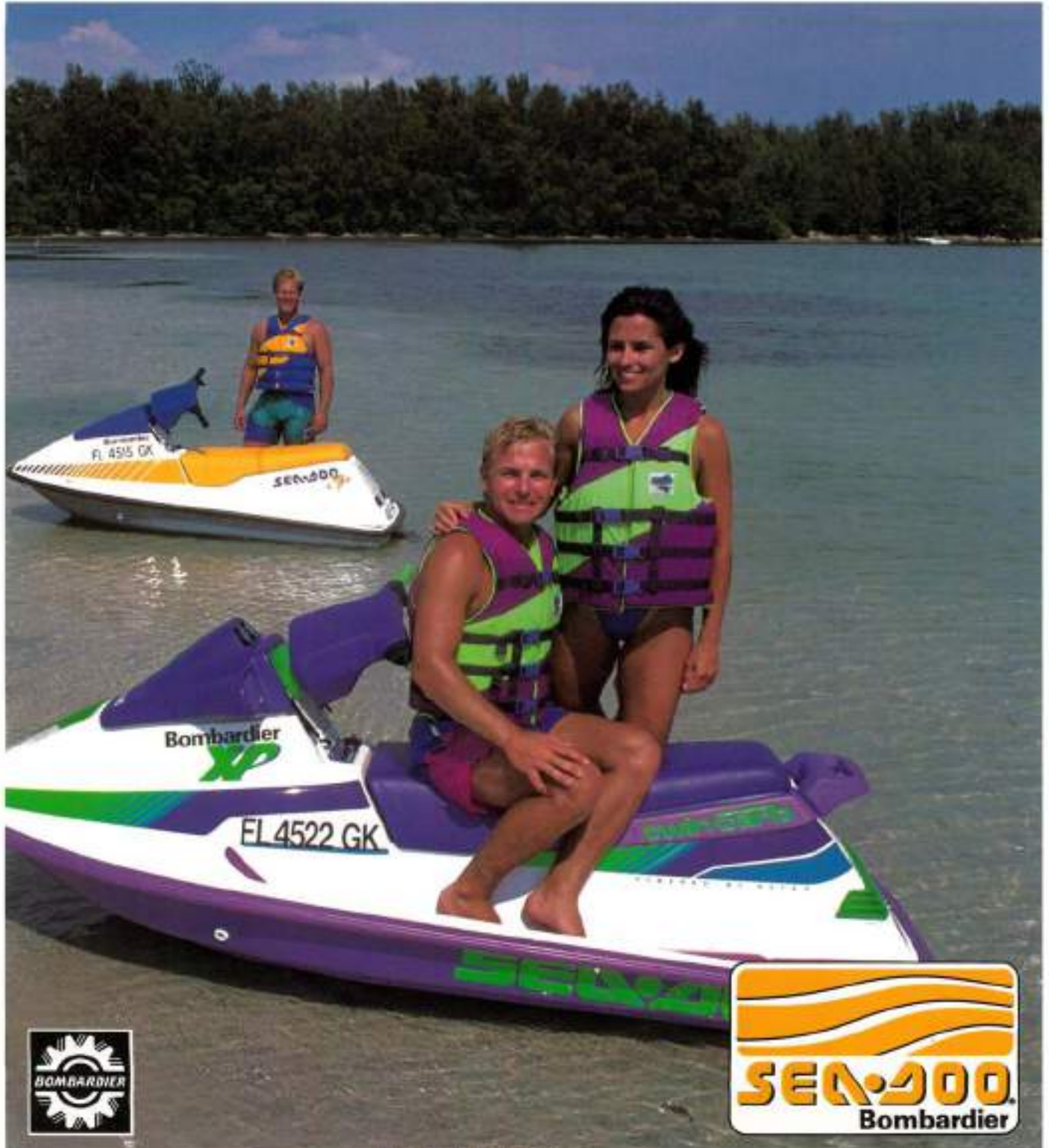


SP-GT-XP MODELS

5804 5811 5850

S H O P M A N U A L



SHOP MANUAL

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SAFETY NOTICE

This manual has been prepared as a guide to service the SEA-DOO, models 5804 (SP), 5811 (GT), 5850 (XP).

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.

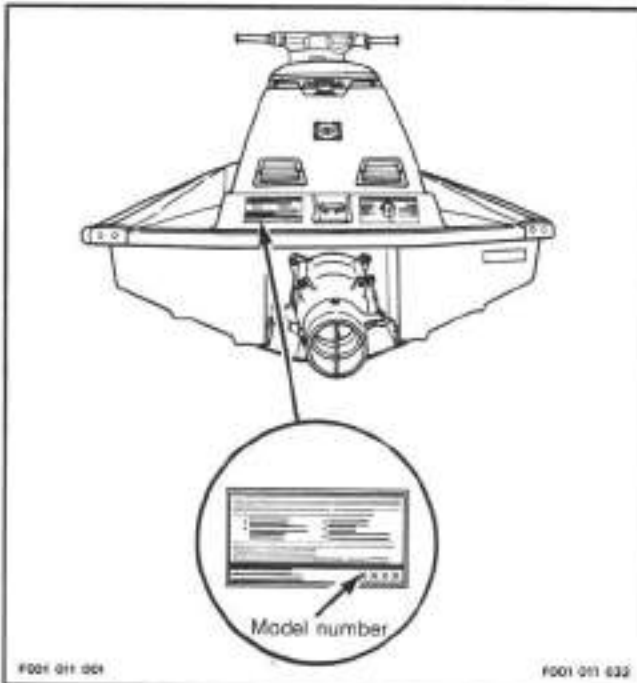
BOMBARDIER WATERCRAFT SHOP MANUAL

INTRODUCTION

This *Shop Manual* covers BOMBARDIER made SEA-DOO® watercraft models 5804-5811-5850.

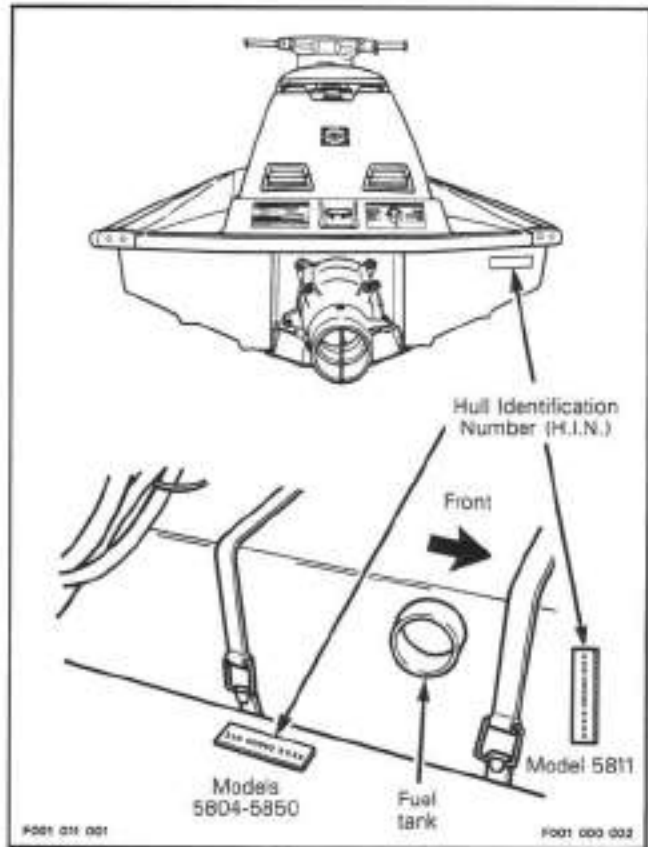
WATERCRAFT MODEL NUMBER

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



HULL IDENTIFICATION NUMBER (H.I.N.)

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

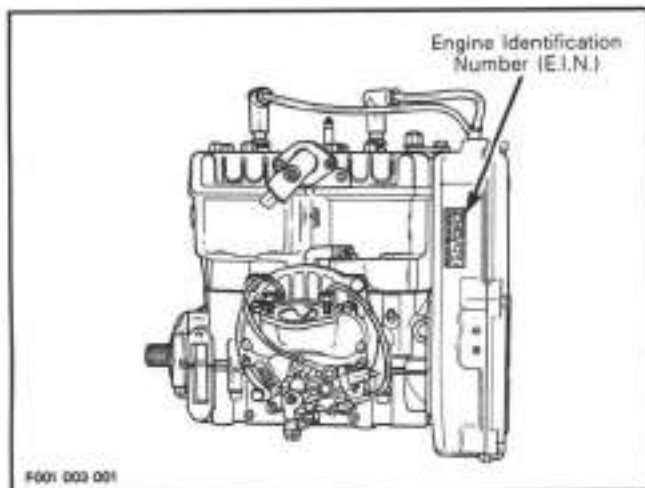


The five digits after "ZZN" are the watercraft serial number.

ZZN 1 2 3 4 5 X X X X
Serial number

ENGINE IDENTIFICATION NUMBER (E.I.N.)

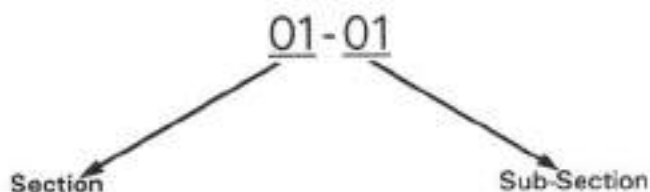
It is located on the upper side of the magneto housing.



DEFINITION OF NUMBERING SYSTEM

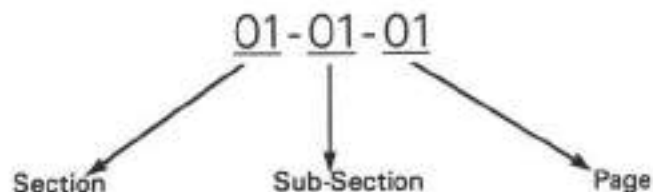
Sections and Sub-Sections System

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



Pages System

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



ARRANGEMENT OF THIS MANUAL

The manual is divided into 13 major sections :

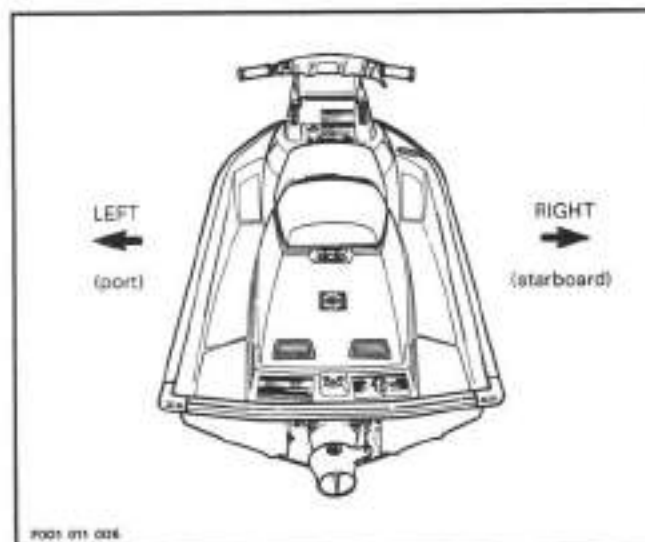
- 01 Service Tools
- 02 Periodic Inspection Chart
- 03 Engine
- 04 Cooling System
- 05 Fuel System
- 06 Oil System
- 07 Electrical
- 08 Propulsion and Drive Systems
- 09 Steering System
- 10 Hull/Body
- 11 Storage
- 12 Technical Data
- 13 Troubleshooting

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

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



BOMBARDIER WATERCRAFT SHOP MANUAL

GENERAL

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

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

ILLUSTRATIONS 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.


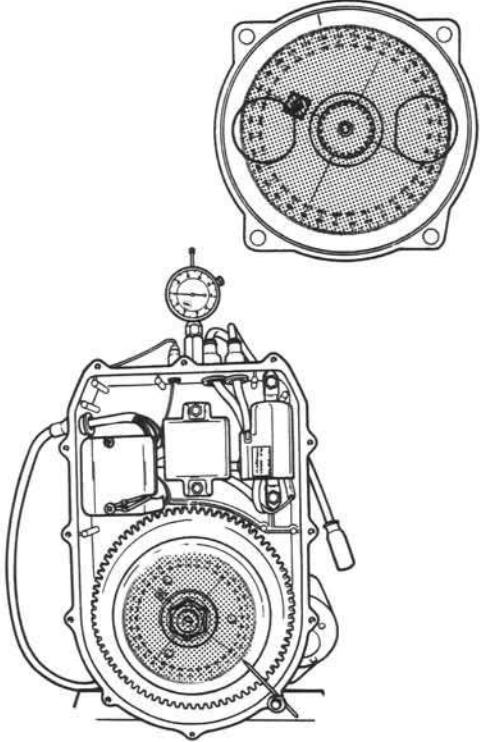
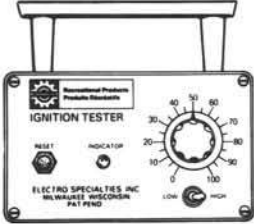
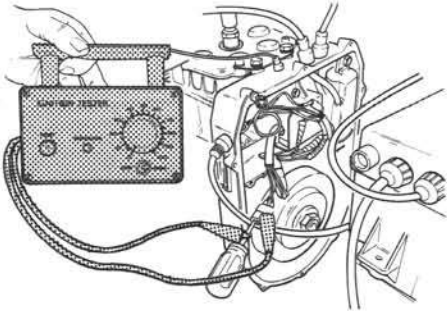
As many of the procedures in this manual are interrelated, we suggest, that before undertaking any task, you read and thoroughly understand the entire section or subsection in which the procedure is contained.

A number of procedures throughout the book require the use of special tools. Where a special tool is indicated, refer to section O1. Before commencing any procedure, be sure that you have on hand all the tools required, or approved equivalents.

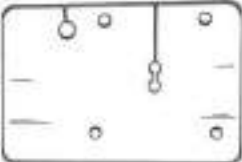



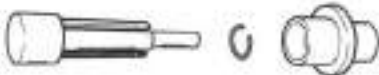
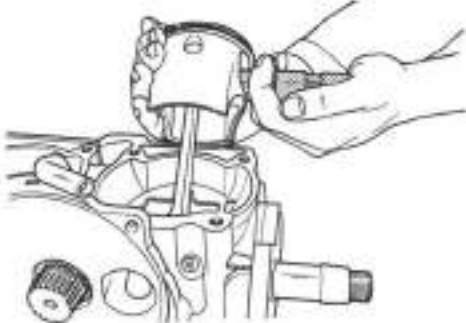
Technical Publications
Bombardier Inc.
Valcourt (Quebec) Canada

SERVICE TOOLS


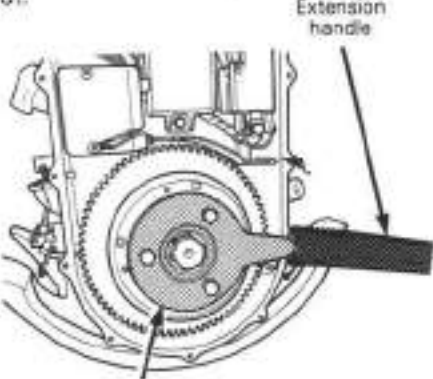

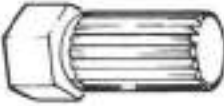
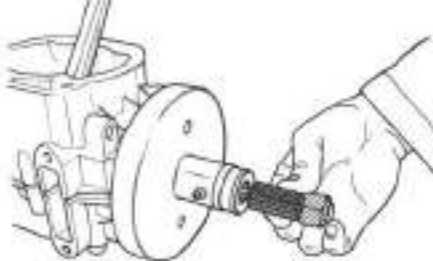
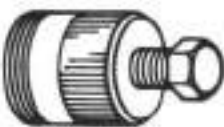
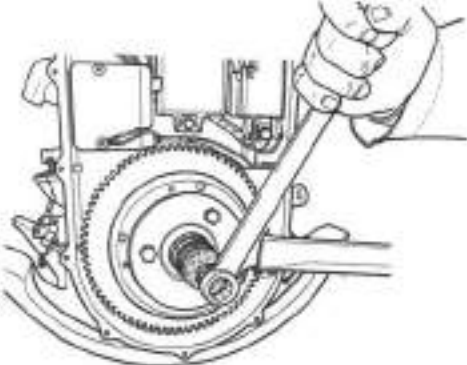
ENGINE

SERVICE TOOL	PURPOSE	APPLICATION
<p>Degree wheel (mandatory) 295 000 007</p>  <p>A000 001 111</p>	<p>To mark timing position of rotary valve, to check crankshaft alignment.</p>  <p>F001 003 055</p> <p>F001 003 093</p>	<p>All models</p>
<p>BOMBARDIER ignition tester (mandatory) 295 000 008</p>  <p>A000 002 056</p>	<p>To test engine electrical components.</p>  <p>F001 007 041</p>	<p>All models</p>












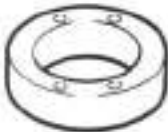

Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Rubber pad (mandatory) 295 000 079</p>  <p>F001 001 019</p>	<p>To avoid needles of connecting rod bearing from falling in crankcase.</p>  <p>F001 003 018</p>	<p>All models</p>
<p>Piston pin puller ass'y (mandatory) 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 piston pin.</p>  <p>F001 003 099</p>	<p>All models</p>
<p>Piston circlip installer (mandatory) 295 000 077</p>  <p>A001 001 061</p>	<p>To install circlips on pistons.</p>  <p>F001 003 334</p>	<p>All models</p>






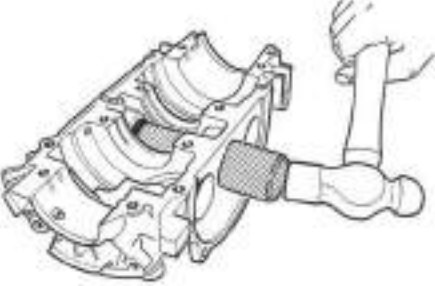


Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Puller plate (mandatory) 290 876 080</p>  <p>A000 001 083</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 003 045</p>	<p>All models</p>
<p>Extension handle (mandatory) 295 000 003</p>  <p>F001 003 042</p>		<p>All models</p>
<p>Impeller / PTO flywheel remover/installer (mandatory) 295 000 001</p>  <p>F001 008 029</p>	<p>Used to loosen/tighten PTO flywheel and impeller. Hold flywheel with puller plate and extension handle above.</p>  <p>F001 003 046</p>	<p>All models</p>
<p>Puller (mandatory) 290 876 065</p>  <p>A000 062 046</p>	<p>Used with puller plate and extension handle to remove MAG flywheel.</p>  <p>F001 003 048</p>	<p>All models</p>

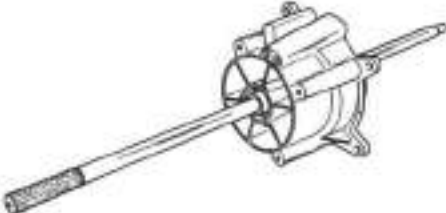
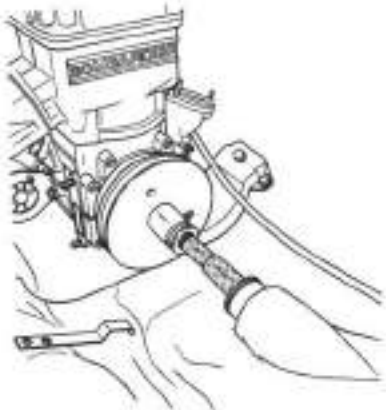
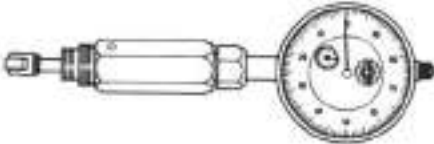


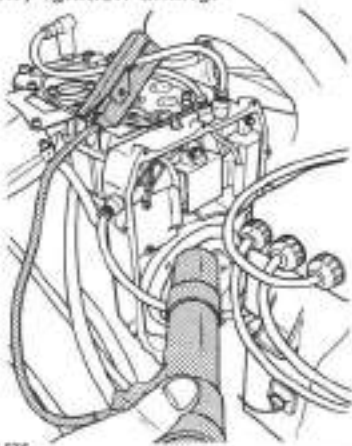
Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Puller with screws (mandatory) 290 876 298</p>  <p>F001 001 010</p>	<p>To remove crankshaft bearings.</p>     <p>MAG side</p>    <p>PTO side</p> <p>F001 003 094</p> <p>F001 003 096</p>	<p>All models</p>
<p>Protective cap (both ends) (mandatory) 290 876 557</p>  <p>F001 001 011</p>		
<p>Ring (both ends) (mandatory) 290 977 490</p>  <p>F001 001 013</p>		
<p>Ring halves (PTO) (mandatory) 290 977 475</p>  <p>F001 001 015</p>		
<p>Distance ring (MAG) (mandatory) 290 876 569</p>  <p>F001 001 012</p>		
<p>Ring halves (MAG) (mandatory) 290 278 025</p>  <p>F001 001 014</p>		




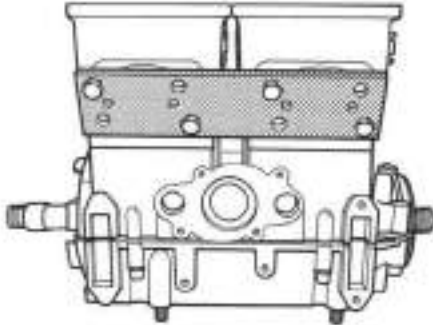
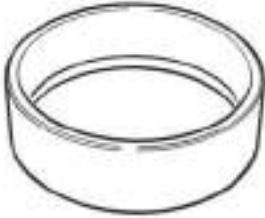
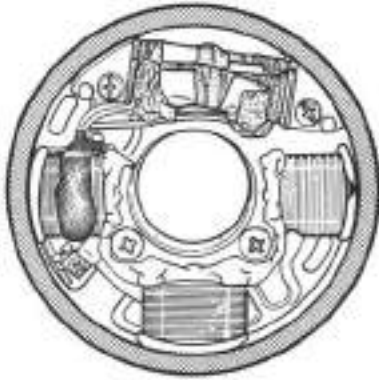
Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Distance gauge (mandatory) 290 876 826</p>  <p>FD01 001 017</p>	<p>To position outer crankshaft bearing on PTO side.</p>  <p>FD01 003 079</p>	<p>All models except 5801</p>
<p>Puller (mandatory) 290 876 487</p>  <p>FD01 001 018</p>	<p>To remove rotary valve shaft from crankcase.</p>  <p>FD01 003 078</p>	<p>All models</p>
<p>Pusher (mandatory) 290 876 500</p>  <p>X000 001 081</p>	<p>To install end bearing of rotary valve shaft in crankcase.</p>  <p>FD01 003 089</p>	<p>All models</p>
<p>Pusher (mandatory) 290 876 805</p>  <p>A000 003 034</p>	<p>To install rotary valve shaft in crankcase.</p>  <p>FD01 003 088</p>	<p>All models</p>


Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Alignment tool (mandatory) 295 000 089</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>
<p>Dial indicator (TDC gauge) (recommended) 295 000 065</p>  <p>A000 001 000</p>	<p>To find TDC position. For ignition timing and rotary valve timing.</p>  <p>F001 003 058</p>	<p>All models</p>
<p>Stroboscopic timing light (recommended) 295 000 078</p>  <p>A001 001 092</p>	<p>To verify ignition timing.</p>  <p>F001 007 024</p>	<p>All models</p>

Section 01 SERVICE TOOLS


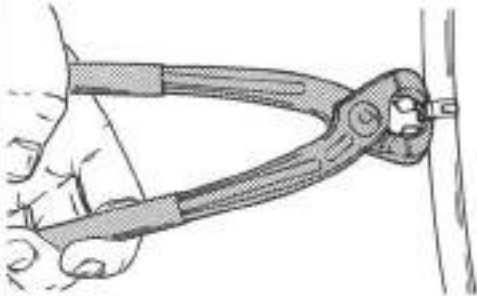
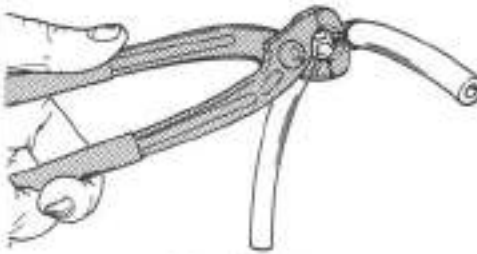
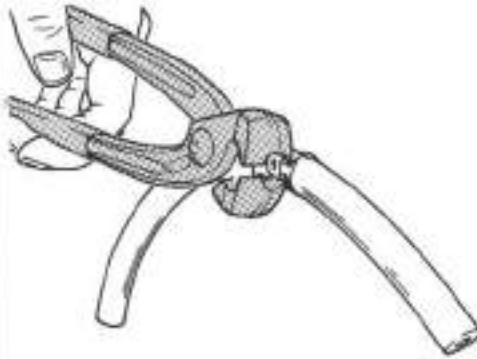
SERVICE TOOL	PURPOSE	APPLICATION
<p>Ring compressor (recommended) 290 876 972</p>  <p>A001 001 066</p>	<p>To compress piston ring when inserting piston in cylinder.</p>  <p>F001 003 038</p>	<p>All models</p>
<p>Aligning tool (recommended) 290 876 900</p>  <p>A000 001 008</p>	<p>To align cylinders by exhaust flanges at assembly.</p>  <p>F001 003 037</p>	<p>All models</p>
<p>Centering tool (recommended) 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>

Section 01 SERVICE TOOLS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Nippondenso CDI tester (recommended) 295 000 080</p>  <p>A000 004 020</p>	<p>To test engine ignition system components.</p> <p>○ NOTE : This high quality tester use power source of 115 volts AC / 60 Hz.</p>	<p>All models</p>

Section 01 SERVICE TOOLS

COOLING/FUEL/OIL SYSTEMS

SERVICE TOOL	PURPOSE	APPLICATION
<p>Pliers (mandatory) 295 000 070</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>All models.</p>

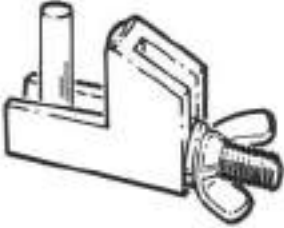


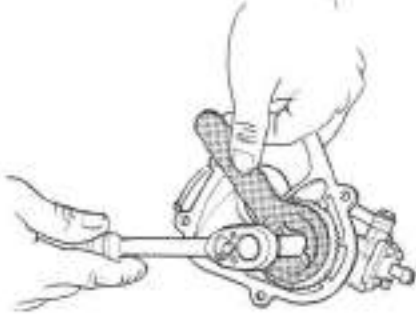

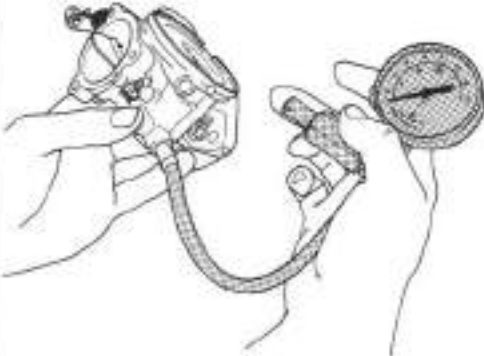
F001 003 043

F001 001 003

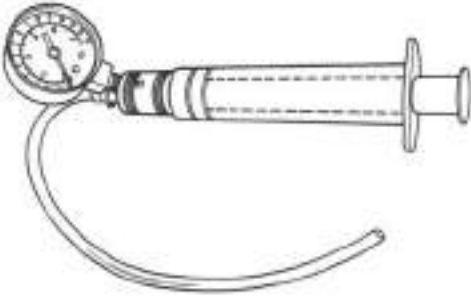
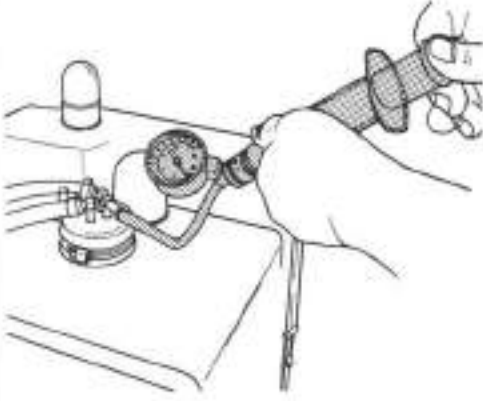
F001 001 004

F001 001 005

Section 01 SERVICE TOOLS

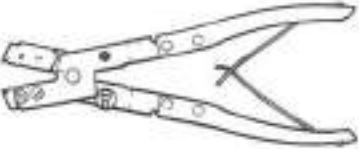
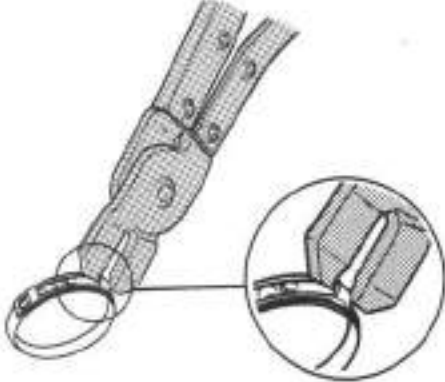


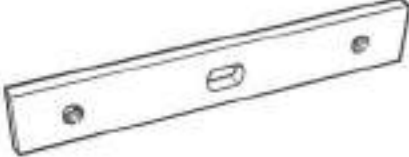
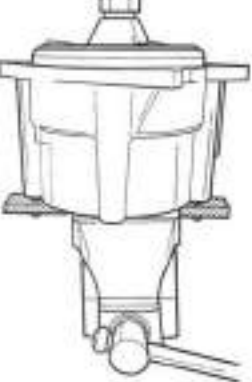
SERVICE TOOL	PURPOSE	APPLICATION
<p>Hose pincher (mandatory) 295 000 076</p>  <p>A001 001 090</p>	<p>To avoid leaks while working on oil/fuel lines.</p>  <p>A001 001 091</p>	<p>All models</p>
<p>Gear holder (mandatory) 290 277 905</p>  <p>A000 002 042</p>	<p>To remove/install retaining nut of oil injection pump gear.</p>  <p>A000 002 043</p>	<p>All models</p>
<p>Pump gauge tester (recommended) 295 000 083</p>  <p>F001 001 053</p>	<p>To verify release pressure and leak at carburetor.</p>  <p>F001 005 016</p>	<p>All models</p>

Section 01 SERVICE TOOLS


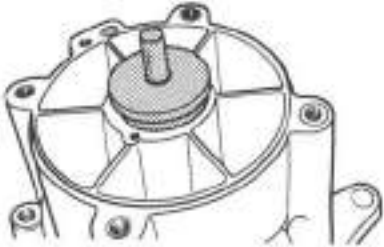
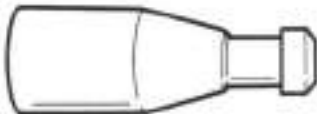
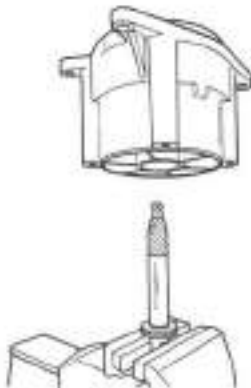
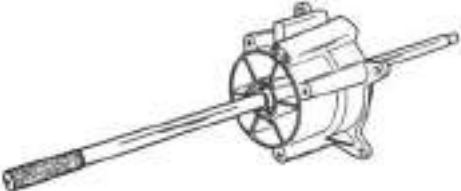
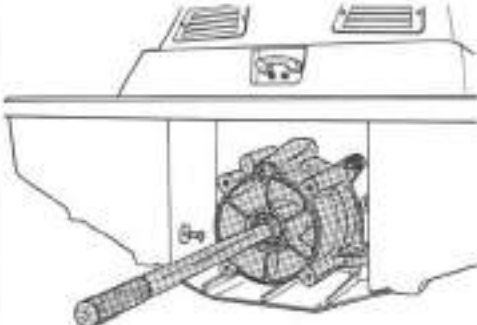
SERVICE TOOL	PURPOSE	APPLICATION
<p>Pump gauge tester (recommended) 295 000 085</p> <p>○ NOTE : Must maintain a pressure of 34 kPa (5 PSI) during 10 minutes. Never pressurize over 34 kPa (5 PSI).</p> <p>▼ CAUTION : Lubricate air pump piston seal using mild soap. Using hydrocarbon lubricant will destroy rubber seal.</p>  <p style="font-size: small;">F001 001 034</p>	<p>To pressurize fuel system ; to verify any leak.</p>  <p style="font-size: small;">F001 006 018</p>	<p>All models</p>

Section 01 SERVICE TOOLS



PROPULSION SYSTEM

SERVICE TOOL	PURPOSE	APPLICATION
<p>Pliers (mandatory) 295 000 069</p>  <p>F001 003 044</p>	<p>To remove/install drive shaft boot reusable stepless clamps.</p>  <p>F001 008 081</p>	<p>All models</p>
<p>Impeller/PTO flywheel remover/installer (mandatory) 295 000 001</p>  <p>F001 009 029</p>	<p>Used to loosen/tighten impeller on shaft.</p>  <p>F001 008 030</p>	<p>All models</p>
<p>Impeller shaft holder (mandatory) 295 000 082</p>  <p>F001 001 032</p>	<p>Used to loosen/tighten impeller on shaft.</p>  <p>F001 006 069</p>	<p>All models</p>

Section 01 SERVICE TOOLS





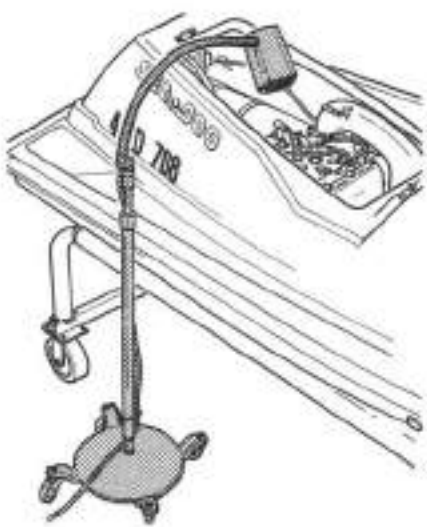
SERVICE TOOL	PURPOSE	APPLICATION
<p>Bearing/seal installer (mandatory) 295 000 014</p>  <p>F001 008 002</p>	<p>To install impeller shaft needle bearings and seal.</p>  <p>F001 008 004</p>	<p>All models</p>
<p>Impeller shaft guide (mandatory) 295 000 002</p>  <p>F001 008 000</p>	<p>To protect seal lip when installing impeller shaft in its housing.</p>  <p>F001 008 001</p>	<p>All models</p>
<p>Alignment tool (mandatory) 295 000 089</p>  <p>F001 011 000</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

SERVICE TOOL	PURPOSE	APPLICATION
<p>Fitting (recommended) 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 03E</p>	<p>To pressurize pump assembly before installation, to verify if any leak.</p>  <p>F001 009 090</p>	<p>All models</p>


Section 01 SERVICE TOOLS

WATERCRAFT HANDLING

SERVICE TOOL	PURPOSE	APPLICATION
<p>Dolley (recommended) 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) 295 000 005</p>  <p>F001 001 007</p>		
<p>Shop lamp (recommended) 295 000 081</p> <p>◆ WARNING : Never use electric powered tools on watercraft unless first verifying that 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>

Section 02 PERIODIC INSPECTION CHART

PERIODIC INSPECTION CHART

 NOTE : Shade area shows the maintenance frequency.

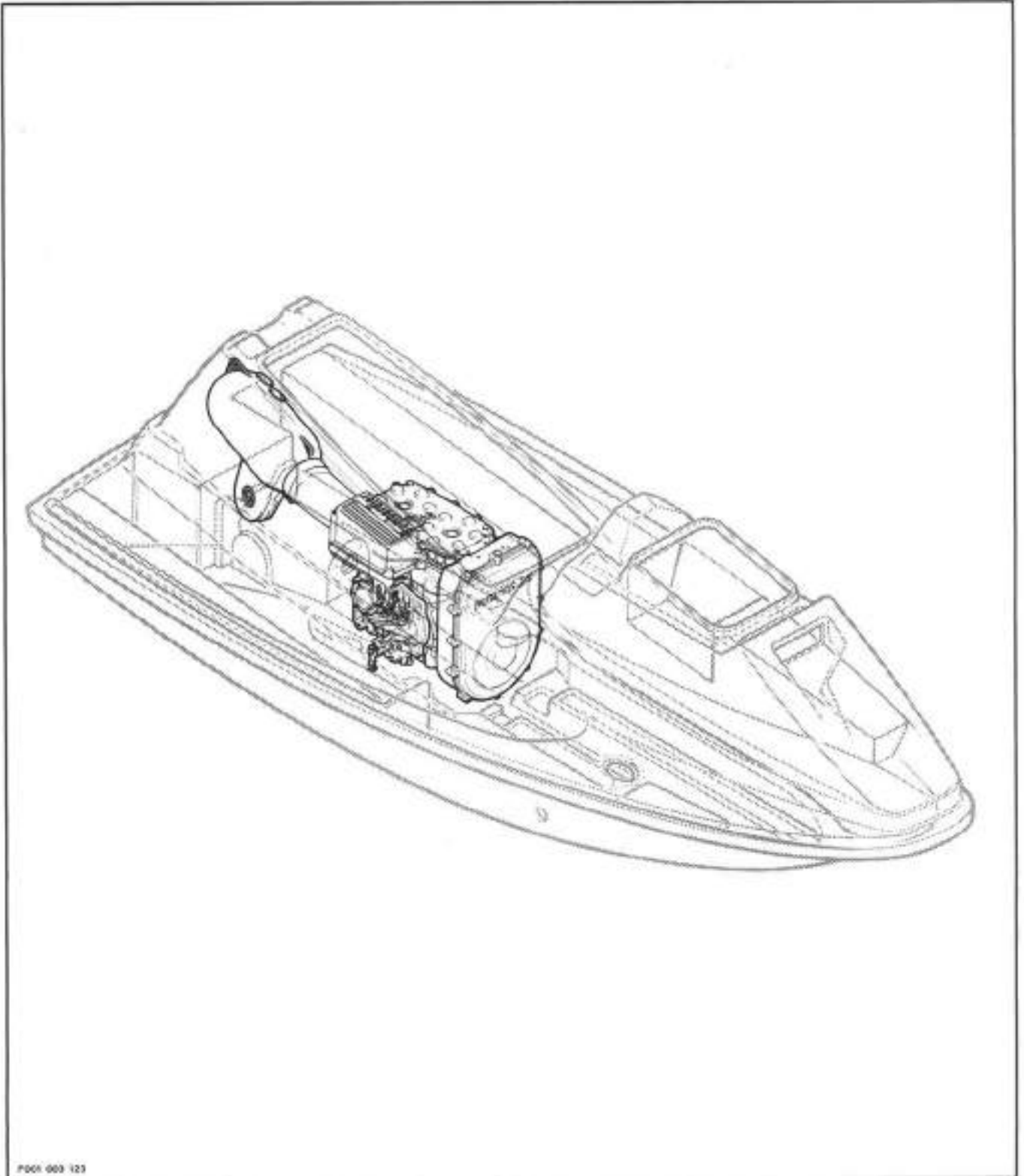
DESCRIPTION	FREQUENCY			
	Monthly	3 Months	6 Months	Yearly
Lubrication/corrosion protection of metallic components	①			
Engine ignition timing				
Spark plugs, cleaning/adjustment				
Throttle/choke cables, inspection/lubrication	①			
Flame arrester element, inspection				
Carburetor adjustment including 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		③		
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



FD001 003 123

WATER-FLOODED ENGINE

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.

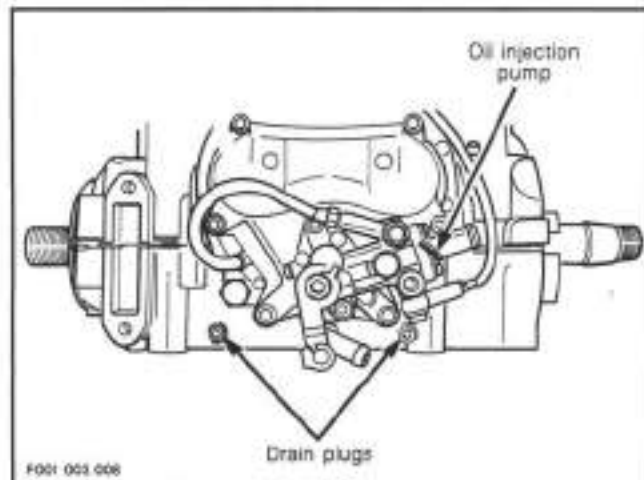
Procedure

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 plugs, crank engine to drain crankcase.

▼ **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.

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

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

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

Crank engine again.

Reinstall spark plugs, 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.

▼ **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. Check crankshaft end seals, hydraulic lock may have pushed them out. Consider that center seals may have slipped out too. Refer to BOTTOM END 03-05 then look for crankshaft alignment.

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

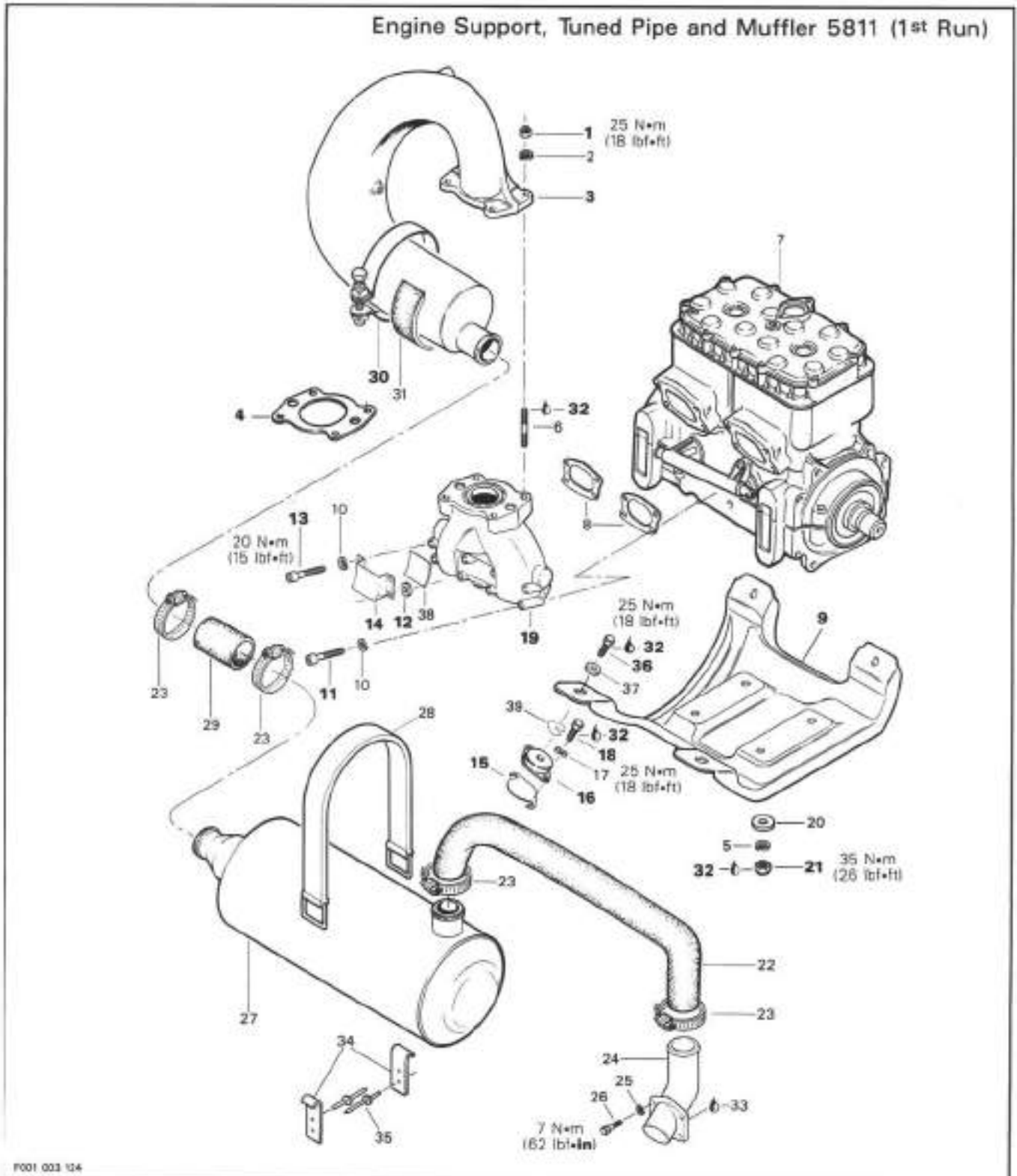
After engine has started, spray SEA-DOO lube through carburetor intake while engine is running.

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).

REMOVAL AND INSTALLATION



Section 03 ENGINE

Sub-Section 02 (REMOVAL AND INSTALLATION)

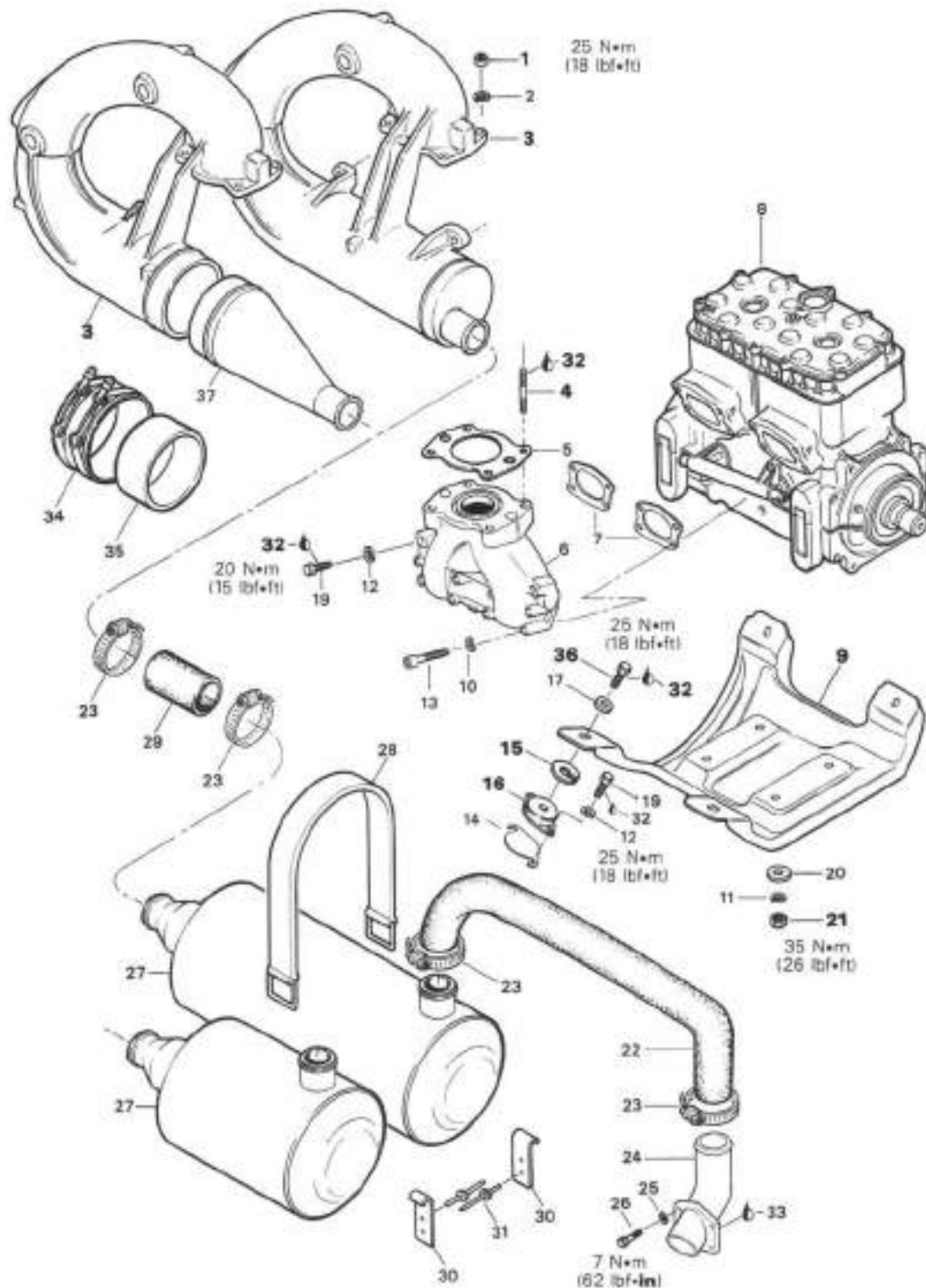
COMPONENTS

- | | |
|---|---|
| 1. Hexagonal nut M8 (4) | 21. Nut M10 (4) |
| 2. Lock washer M8 (4) | 22. Hose formed |
| 3. Tuned pipe | 23. Clamp (4) |
| 4. Gasket | 24. Exhaust outlet |
| 5. Lock washer M10 (4) | 25. Lock washer M6 (8) |
| 6. Stud M8 x 26/16 (4) | 26. Hexagonal head screw M6 x 25 (4) |
| 7. Engine Rotax 587 | 27. Muffler |
| 8. Gasket (2) | 28. Muffler strap |
| 9. Engine support | 29. Hose 90 mm |
| 10. Lock washer (8) | 30. Clamp (1) |
| 11. Allen screw M8 x 70 (4) | 31. Rubber strip (2) |
| 12. Washer M8 (4) | 32. Loctite 242 |
| 13. Allen screw M8 x 75 (4) | 33. Loctite 587 "Ultra Blue" |
| 14. Saddle | 34. Anchor (2) |
| 15. Shim .40 mm (0.016 in) (3)
Shim 1.40 mm (0.055 in) (3) | 35. Rivet (4) |
| 16. Rubber mount (4) | 36. Hexagonal head screw M8 x 20 (4) |
| 17. Washer M8 (8) | 37. Washer (4) |
| 18. Hexagonal head screw M8 x 30 (8) | 38. Rubber pad (1) |
| 19. Exhaust manifold | 39. Shim .40 mm (0.016 in) (2)
Shim 1.30 mm (0.051 in) (2) |
| 20. Flat washer M10 (4) | |
-

Section 03 ENGINE

Sub-Section 02 (REMOVAL AND INSTALLATION)

Engine Support, Tuned Pipe and Muffler 5804,
5811 (2nd Run), 5850



Section 03 ENGINE

Sub-Section 02 (REMOVAL AND INSTALLATION)

COMPONENTS

1. Hexagonal nut M8 (4)
2. Lock washer M8 (4)
3. Tuned pipe extension
4. Gasket
5. Stud M8 x 26 (4)
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 30 (8)
19. Hexagonal screw M8 x 20 (4)
20. Flat washer 10 mm (4)
21. Elastic stop nut M10 (4)
22. Hose formed
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, 10 mL
33. Sealant Loctite 587 "Ultra Blue", 300 mL
34. Clamp
35. Rubber strip
36. Hexagonal screw M8 x 20 (4)
37. Exhaust cone

GENERAL

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

REMOVAL FROM WATERCRAFT

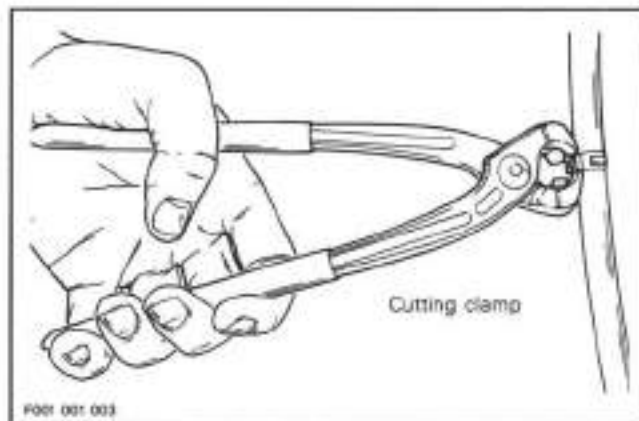
In order to remove engine from watercraft proceed as follows.

Propulsion System

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

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, injection hose and vent tube from tuned pipe.

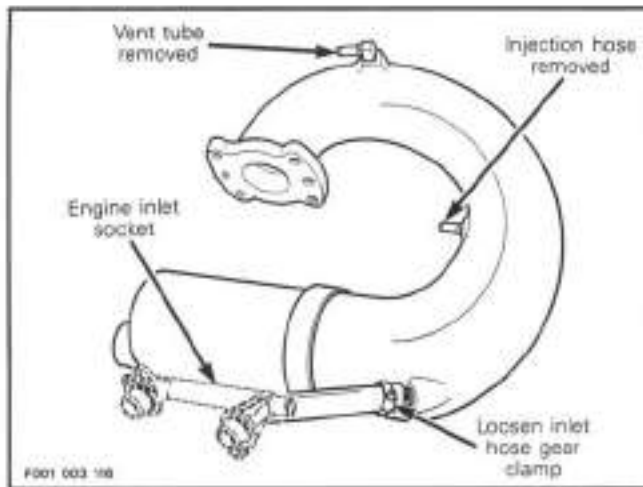
Loosen gear clamp from hose between bottom of tuned pipe and engine water inlet socket; insert a screwdriver through opening between tuned pipe, cylinder and magneto housing.

Loosen gear clamp on tuned pipe outlet.

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

Section 03 ENGINE

Sub-Section 02 (REMOVAL AND INSTALLATION)



NOTE : On some models the tuned pipe is held on exhaust manifold side by one or two retaining screws.

Remove tuned pipe retaining screws from exhaust manifold move battery box to the right side to allow tuned pipe removal.

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 gasket located on exhaust manifold.

NOTE : On some watercrafts, the engine support might have to be loosened in order to remove tuned pipe.

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

Electrical Connections

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

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

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

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

Intake 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.

Turn fuel valve to OFF position.

Disconnect fuel supply line from carburetor.

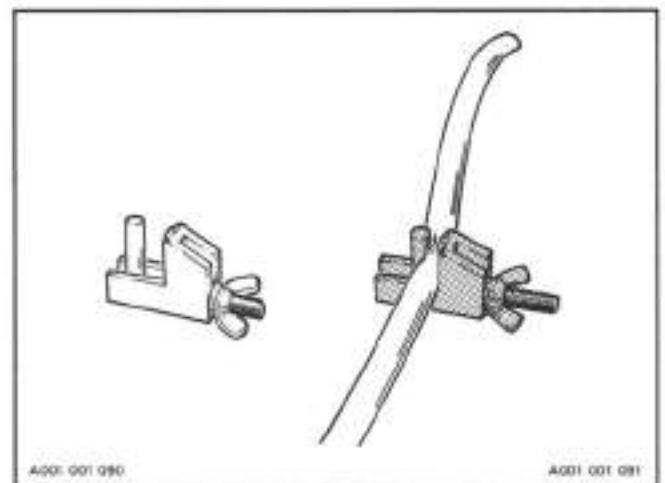
Disconnect fuel return line from carburetor. Be careful not to drop any part.

Disconnect throttle and choke cables from carburetor. Unscrew carburetor support from flame arrester cover.

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

Disconnect impulse line.

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



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

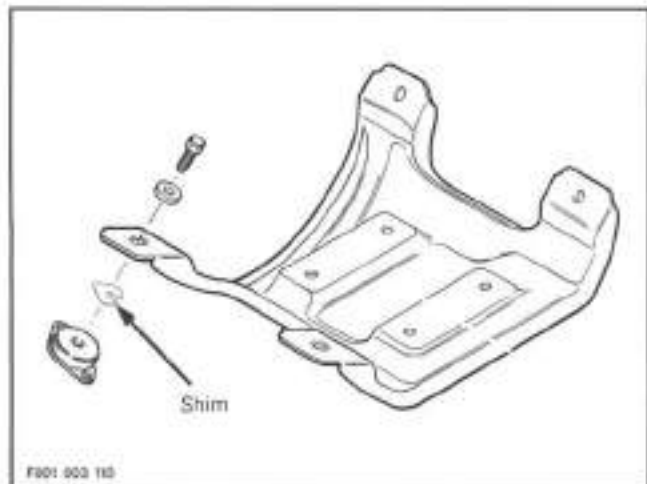
Remove throttle cable from oil injection pump.

Section 03 ENGINE

Sub-Section 02 (REMOVAL AND INSTALLATION)

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.

Engine can be easily lifted using the following suggested tool.

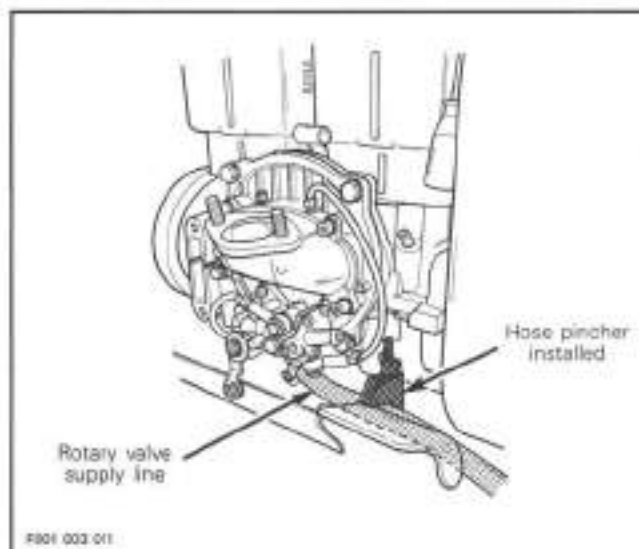
- Cut porcelain from two old spark plugs.
- Weld a lock washer approximately 20 mm diameter on each spark plug as shown.



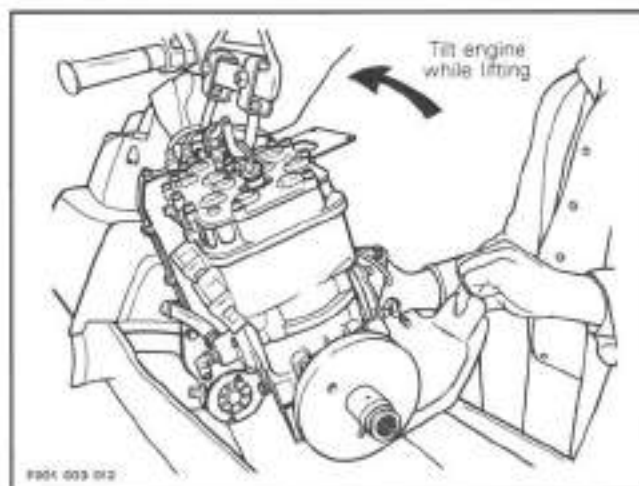
Remove spark plugs and replace by special tools.

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.



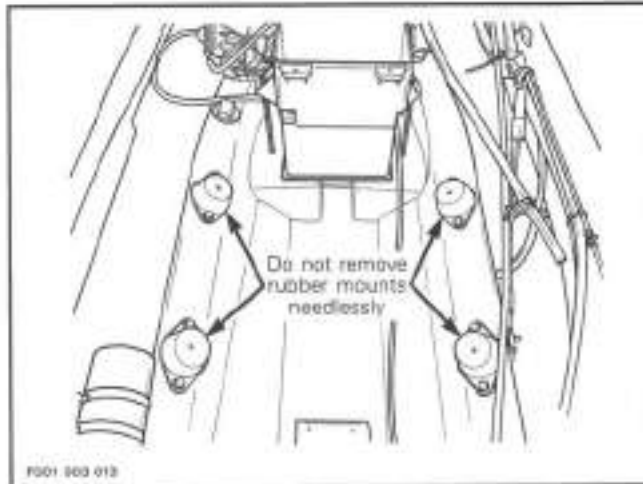
Carry on engine lifting until engine support reaches body opening then tilt engine so that it can completely leave watercraft.



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.

CLEANING

Wipe off any spillage in bilge. Clean with a bilge cleaner. Discard all gaskets and O-rings. Clean external parts of engine.

INSTALLATION

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

16,18, Rubber Mount 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 line 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).

32,36, Loctite 242 and Screw

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

○ **NOTE** : Always use the engine /jet pump alignment tool (P/N 295 000 089) to check alignment for reinstallation.

Electrical Connections

First, install **red** positive cable on starter post and torque nut to 7 N•m (62 lbf•in) then **black** negative cable on starter mounting bolt apply Loctite 271 on threads torque to 22 N•m (16 lbf•ft). Apply Dielectric Grease (P/N 293 550 004) on connectors then cover with boot.

◆ **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 cover. Connect wires making sure to match wire colors.

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

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

Torque cover screws to 2 N•m (18 lbf•in).

Section 03 ENGINE

Sub-Section 02 (REMOVAL AND INSTALLATION)

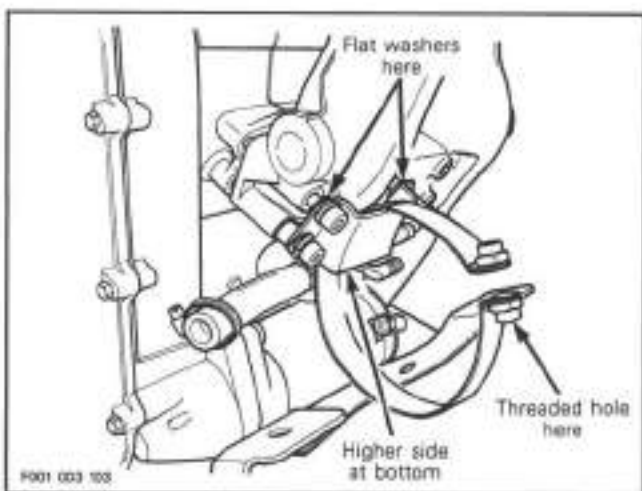
5811 Model (1st Run) Only

19,11,12,13,14,30, Exhaust Manifold, Screw, Washer, Saddle and Clamp

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

Position saddle so that its higher side is at bottom.

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



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

All Models

1,3,4, 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 is against the saddle or the support rests on manifold.

To ease tuned pipe retaining screw installation a hexagonal bit socket such as Snap-on TMAM6 can be used.

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

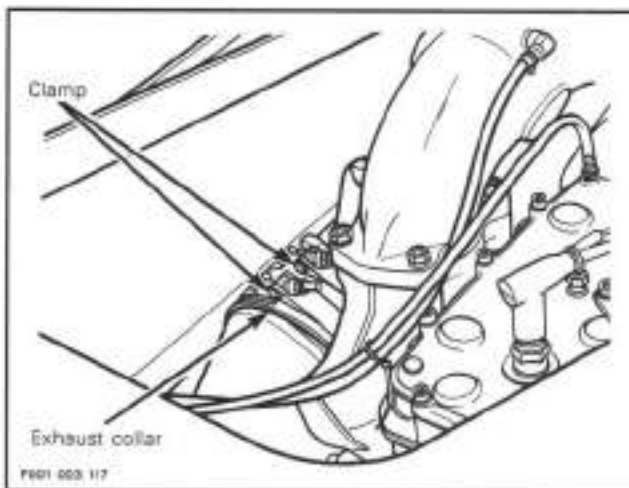
Torque nuts in a criss-cross sequence and screws to 25 N•m (18 lbf•ft).

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

5850 Model Only

Tuned Pipe Extension

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



With hose removed, align extension outlet with muffler inlet.

○ **NOTE** : Due to tuned pipe extension angle, it may have to be rotated to obtain alignment.

Push extension until it touches tuned pipe, then slightly pull extension from tuned pipe to leave a small gap 2 mm (5/64 in) approximately between both.

▼ **CAUTION** : This gap is important to eliminate possible cracks due to vibration.

Tighten exhaust collar and torque to 2.5 N•m (22 lbf•in).

○ **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 then 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).

TUNED PIPE REPAIR

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

Procedure

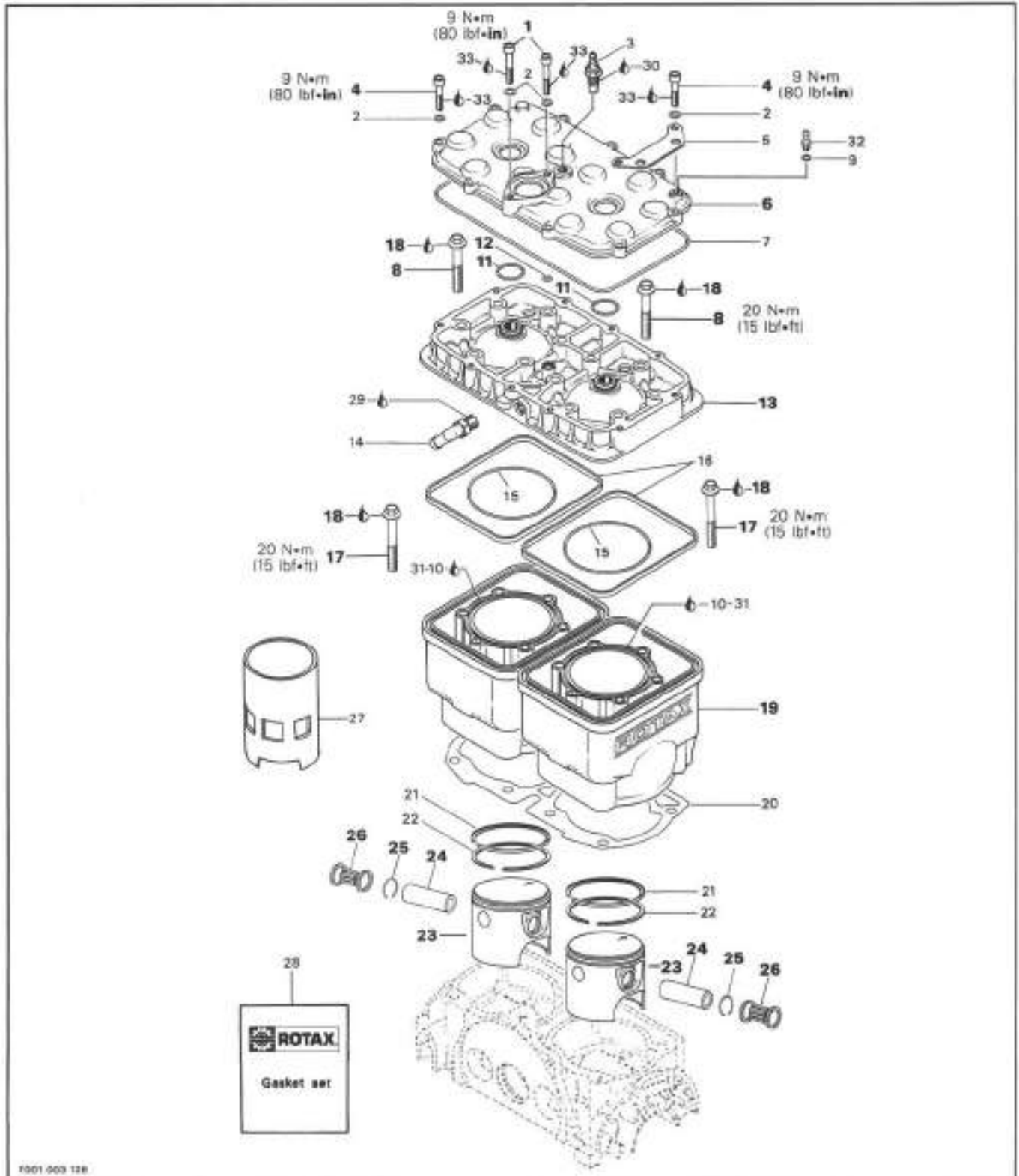
- Sand the cracked area to obtain bare metal.
- Perform a 1.50 mm (1/16 in) depth chamfer over crack.
- Use pure argon gas with 5.55 mm (3/32 in) tungsten electrode (puretung "green", zirtung "brown") and AC current or use aluminum welding rod 5.55 mm (3/32 in) (#4043) to fill crack.
- Sand welding slightly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

To verify leaks plug all holes and pressurize tuned pipe using compressed air at 124 kPa (18 PSI) while immersing it in water.

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

Section 03 ENGINE
Sub-Section 03 (TOP END)

TOP END



Section 03 ENGINE

Sub-Section 03 (TOP END)

COMPONENTS

1. Allen screw M6 x 35 (2)
2. Lock washer (11)
3. Sensor switch
4. Allen screw M6 x 25 (9)
5. Bracket
6. Cylinder head cover
7. O-ring
8. Hexagonal screw M8 x 55 (12)
9. 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. 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. Cylinder sleeve
28. Gasket set
29. Loctite PST 567
30. Sealant PL-32
31. Loctite primer N
32. Hose nipple
33. Loctite 242

GENERAL

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

DISASSEMBLY

Disconnect thermosensor wire.

Remove cylinder head cover.

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

Remove screws then cylinder head.

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

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

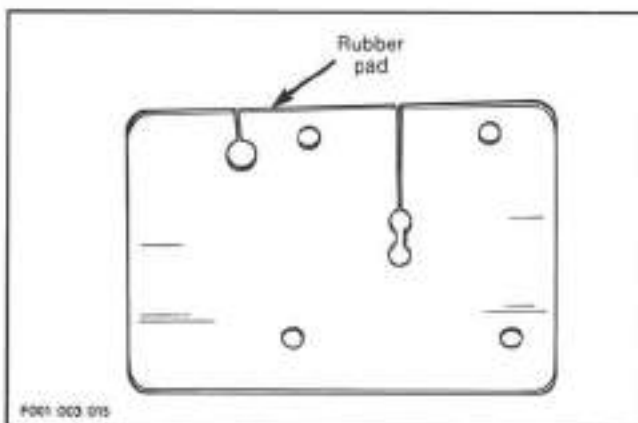
WARNING : If screws need to be heated for removal when engine is in watercraft, do not use open flame ; use a heat gun. An explosion might occur since vapors can be present in engine compartment.

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

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.

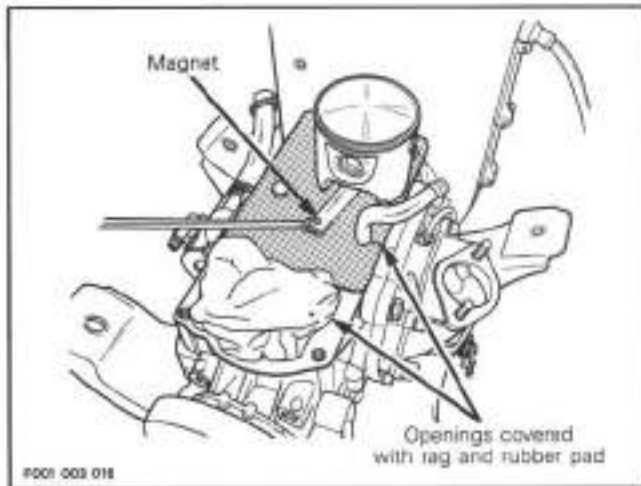


If other cylinder has been removed, completely cover its opening with a clean rag.

Section 03 ENGINE

Sub-Section 03 (TOP END)

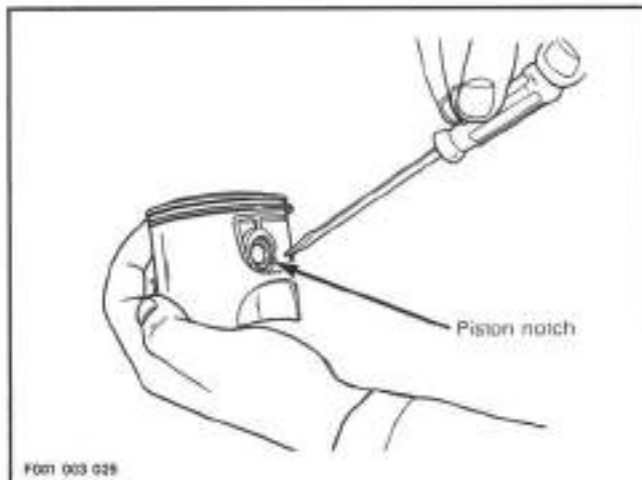
As an additional precautionary measure, a magnet can be installed under piston to catch rollers for removal.



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

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

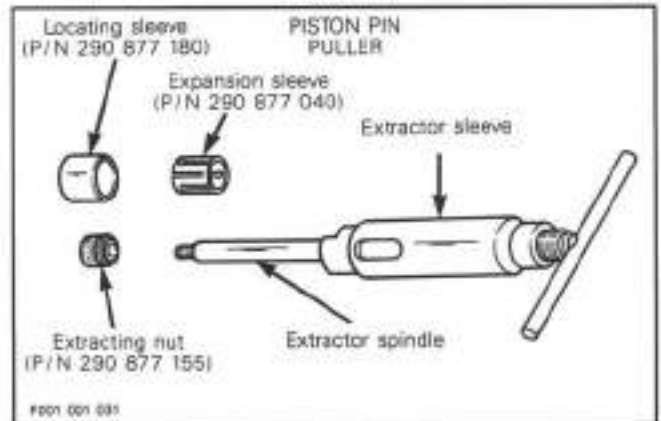
WARNING: Always wear safety glasses when removing piston circlips.



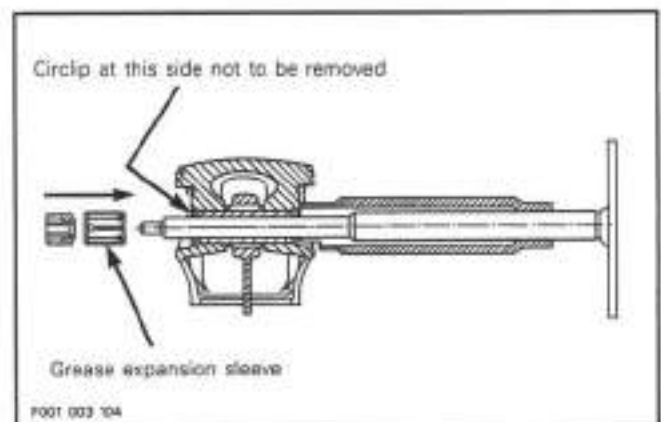
To extract piston pin, use piston pin puller (P/N 290 877 090) as follows:

- Fully thread on puller handle.
- Insert extractor spindle into the piston pin.
- Slide the expansion sleeve (P/N 290 877 040) onto the spindle.

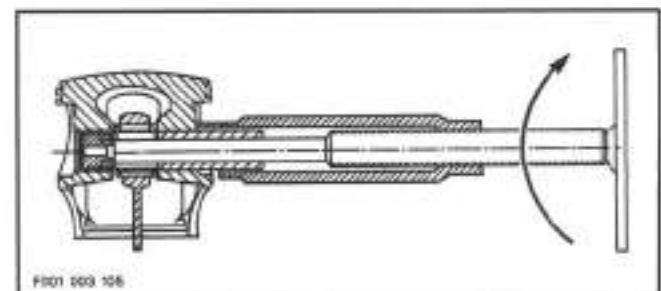
- Screw in extractor nut (P/N 290 877 155) with the movable extracting ring towards spindle.



- 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.

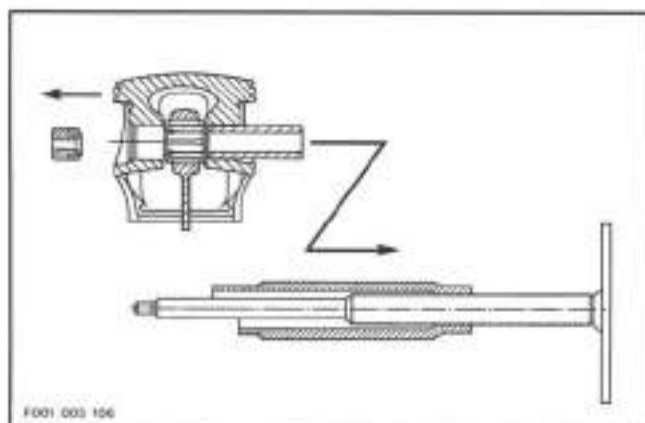


- Rotate spindle counterclockwise until extracting nut can be removed.

Section 03 ENGINE

Sub-Section 03 (TOP END)

- 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 will 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 with 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.

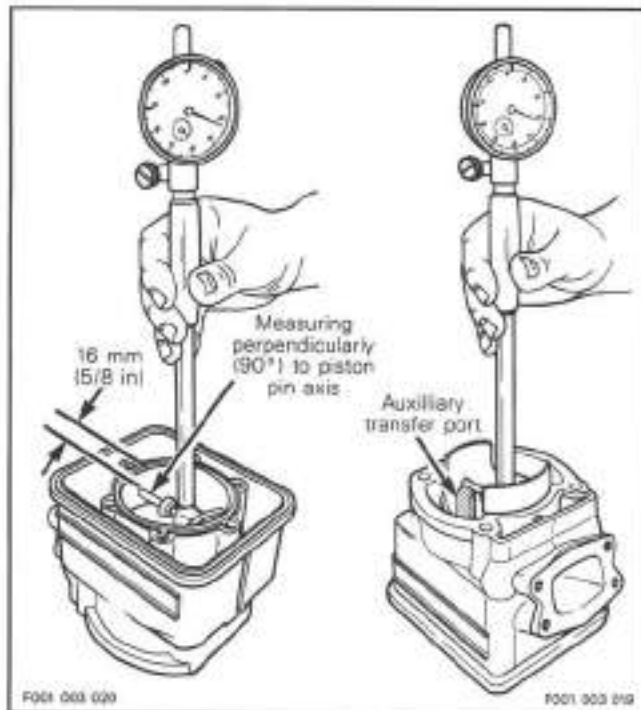
MEASUREMENTS	TOLERANCES		
	NEW PARTS (min.)	NEW PARTS (max.)	WEAR LIMIT
Cylinder Taper	N.A.	N.A.	0.08 mm (.0031 in)
Cylinder Out of Round	N.A.	N.A.	0.05 mm (.0020 in)
Cylinder/Piston Clearance	0.06 mm (.0024 in)	0.07 mm (.0028 in)	0.20 mm (.008 in)
Ring/Piston Groove/ Clearance	0.03 mm (.001 in)	0.08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

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

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

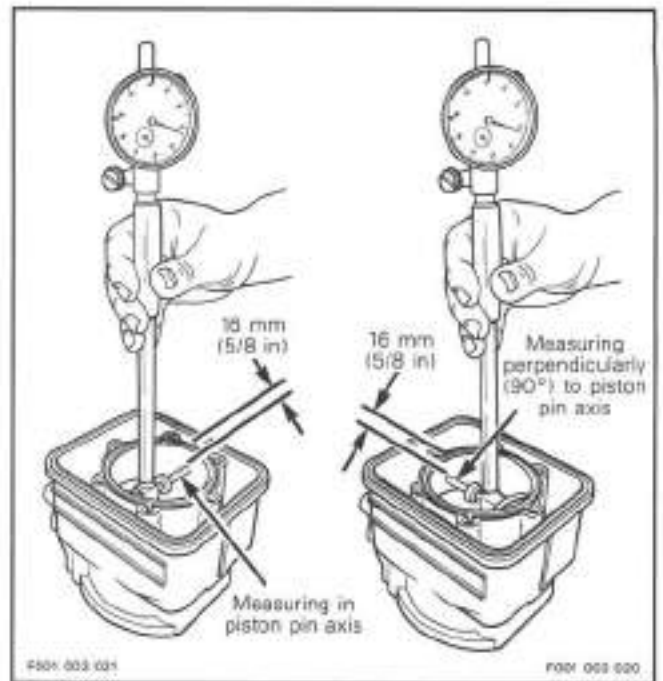
Cylinder Taper

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.



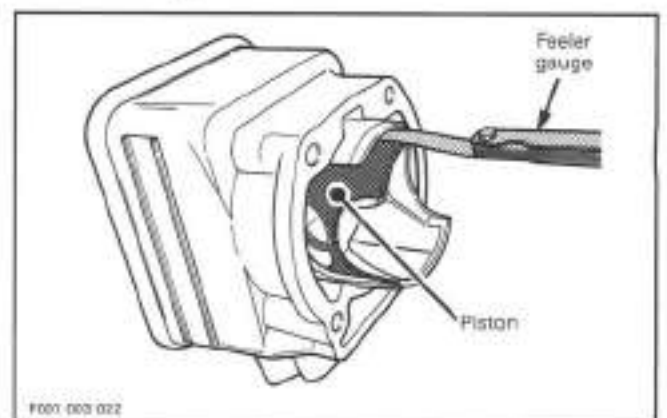
Cylinder Out of Round

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.

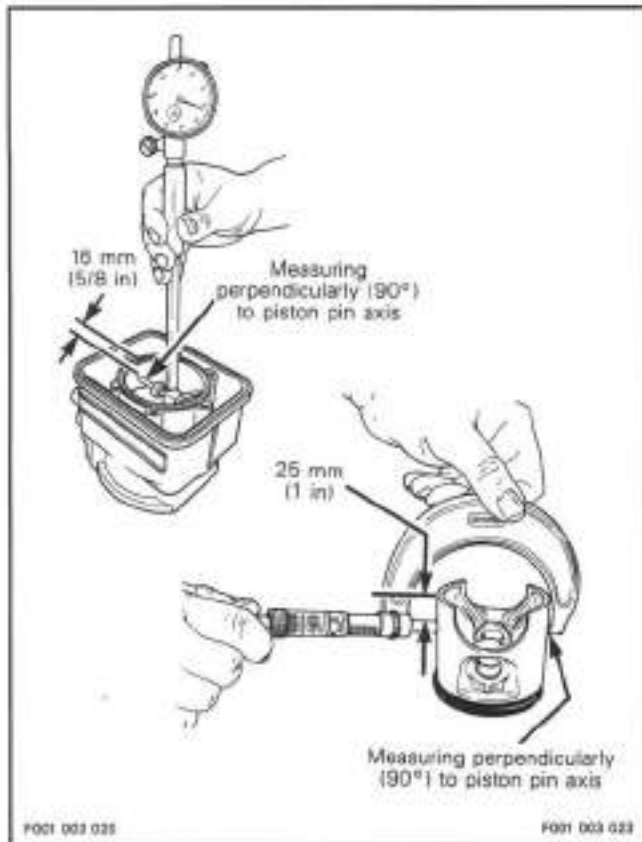


Section 03 ENGINE

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.

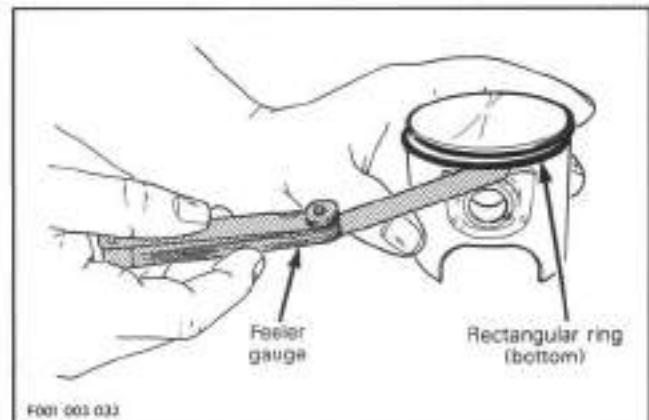


The difference between these two measurements should be within specified tolerance.

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.

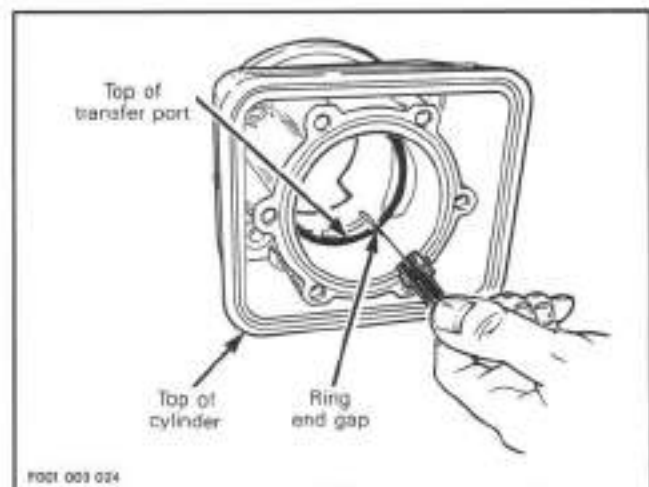


Ring End Gap

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

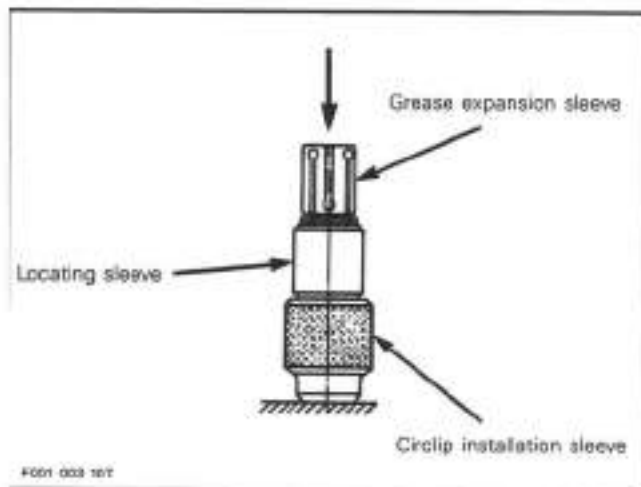
Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

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

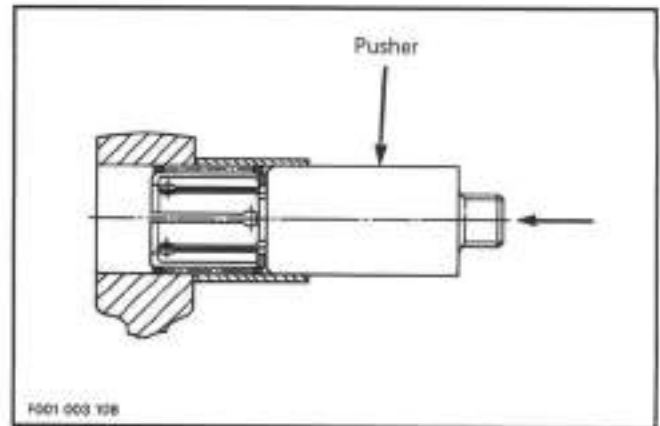
At assembly, locate piston so that intake hole is on rotary valve side.

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:

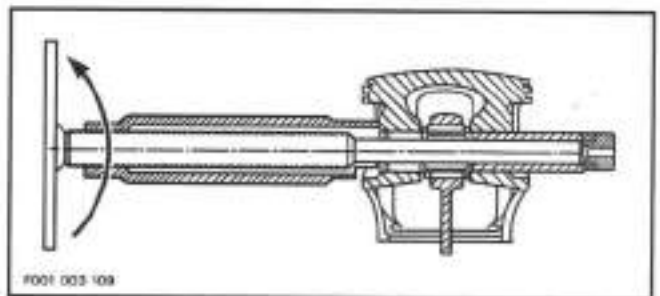
- Replacement bearings are held in place by a locating sleeve outside and two plastic cage halves inside.
- Push the inner halves out of the bearing as per following illustration.



- 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:

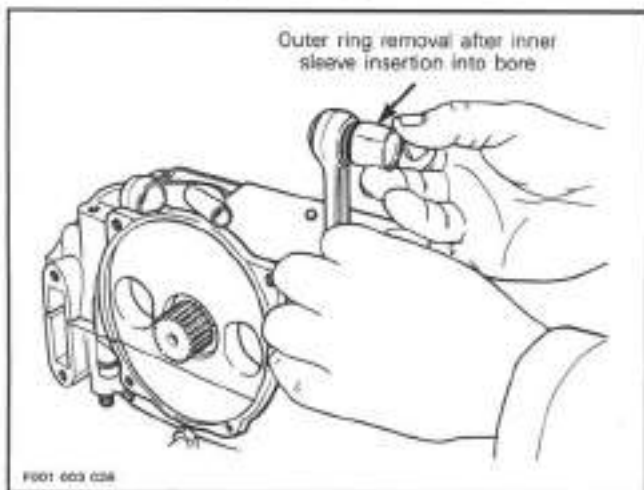
Replacement roller bearings are delivered in a convenient plastic mounting device. For installation, proceed as follows:

- Align replacement roller bearing with connecting rod bore.

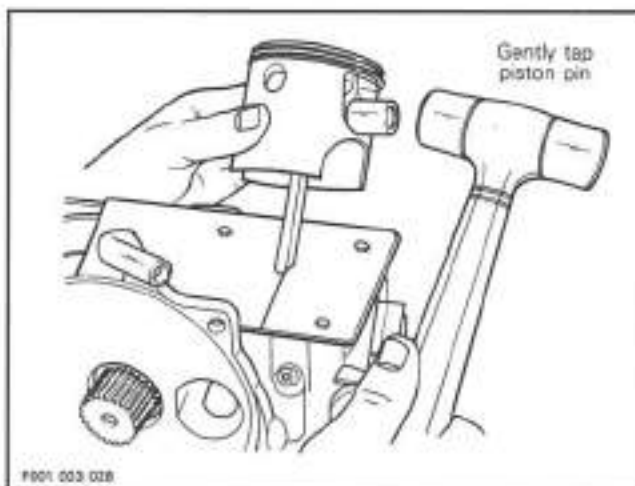
Section 03 ENGINE

Sub-Section 03 (TOP END)

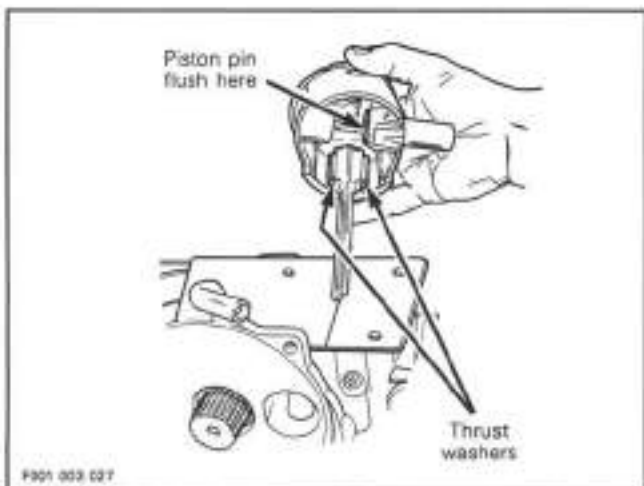
- Carefully push inner plastic sleeve into connecting rod bore; outer plastic ring will release rollers.



- 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.



- 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.



25, Circlip

Secure remaining circlip taking into consideration the following.

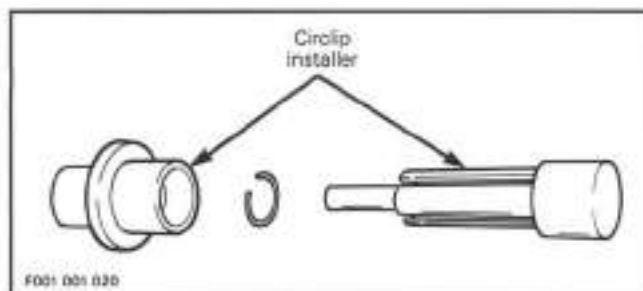
▼ **CAUTION** : To minimize the stress on the circlips, install them so that their openings are located at 6 o'clock (at bottom).



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

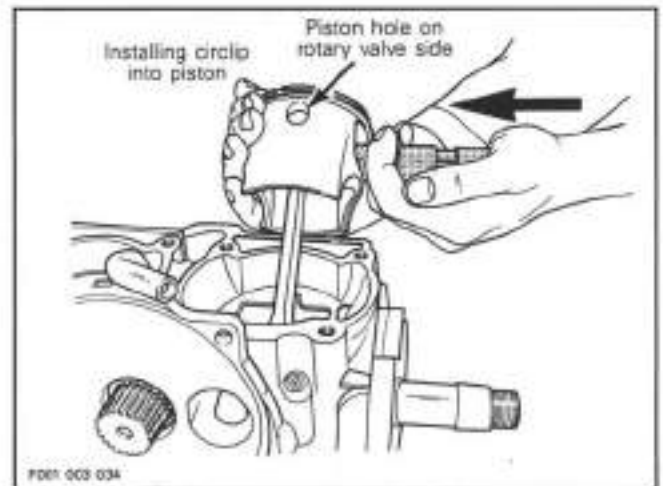
▼ **CAUTION** : Always use new circlips. At installation, take care not to deform them. Overstressed circlips will come loose and will damage engine. Circlips must not move freely after installation, replace if circlip rotates after installation.

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.

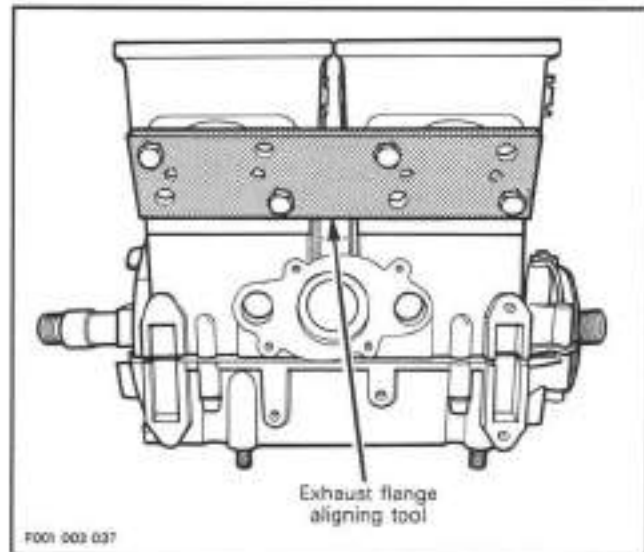
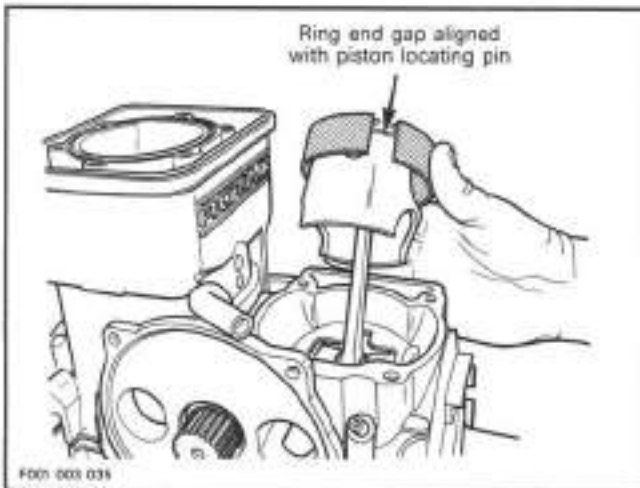


○ **NOTE** : Ring compressor will not fit on oversize piston/rings.

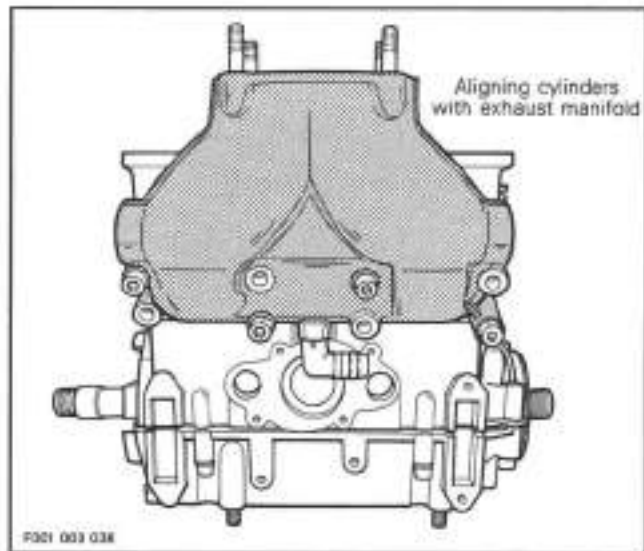
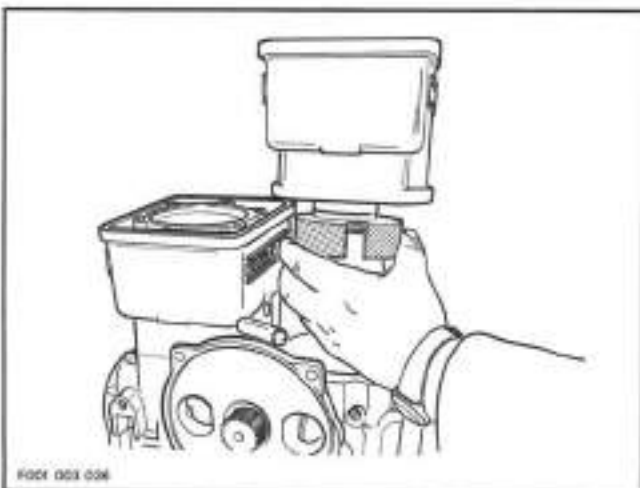
Section 03 ENGINE

Sub-Section 03 (TOP END)


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



Slide cylinder over piston.

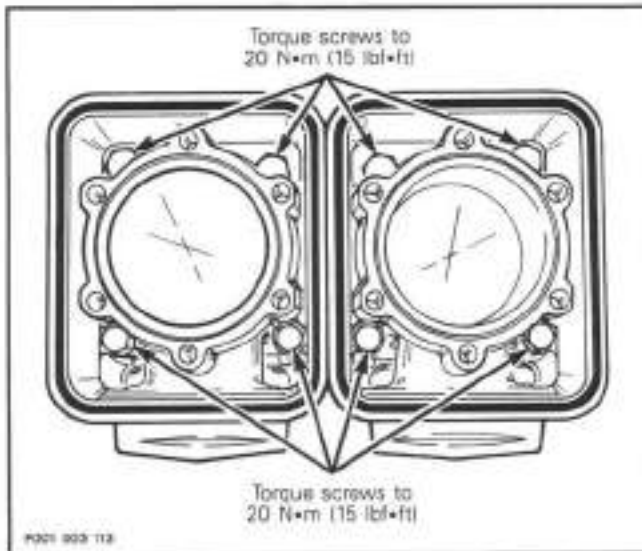


When reassembling cylinders to crankcase, it is important to have them properly aligned so that exhaust flanges properly match up with exhaust manifold. Use aligning tool (P/N 290 876 900) or exhaust manifold itself.

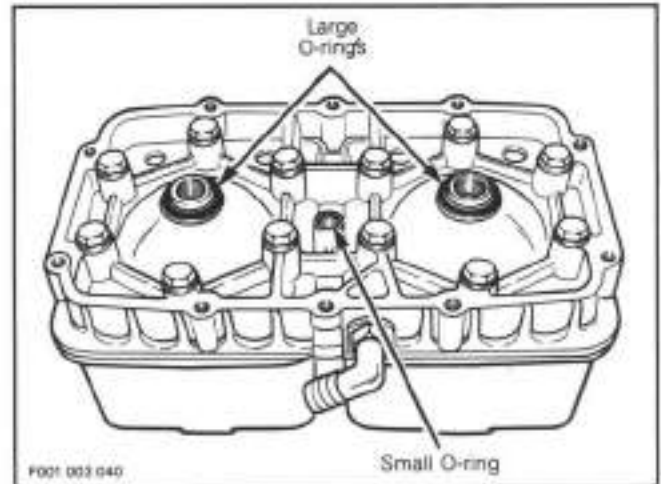
 **NOTE:** If manifold has been used for exhaust flanges alignment, remove it for engine installation in watercraft.

17,18,19, Screw, Grease and Cylinder

Apply grease (P/N 293 550 010) below screw head. Install and torque screws in a criss-cross sequence for each cylinder to 20 N•m (15 lbf•ft).

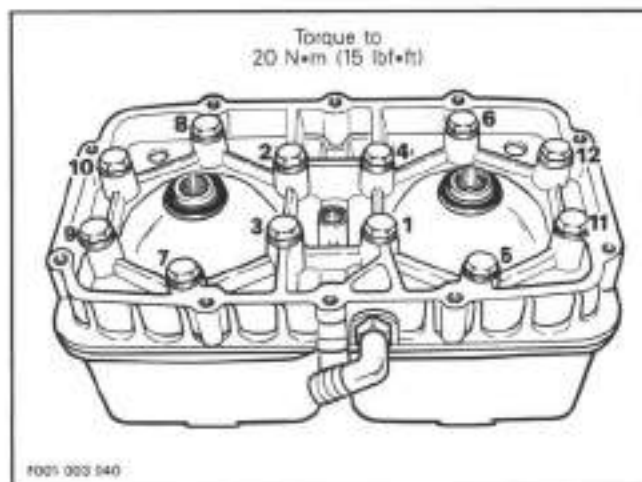


Make sure to install large O-rings around spark plug holes and small O-ring where shown.



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

Apply 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. Install and torque screws to 20 N•m (15 lbf•ft) as per following illustrated sequence.

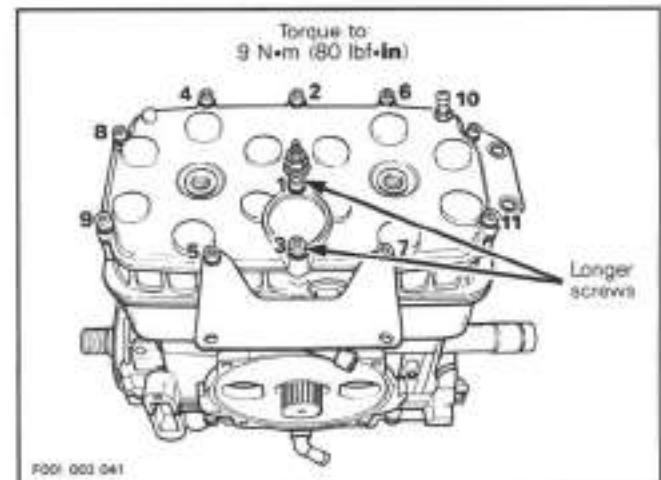


1,4,6, Screw and Cylinder Head Cover

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 ignition housing support and flame arrester support.

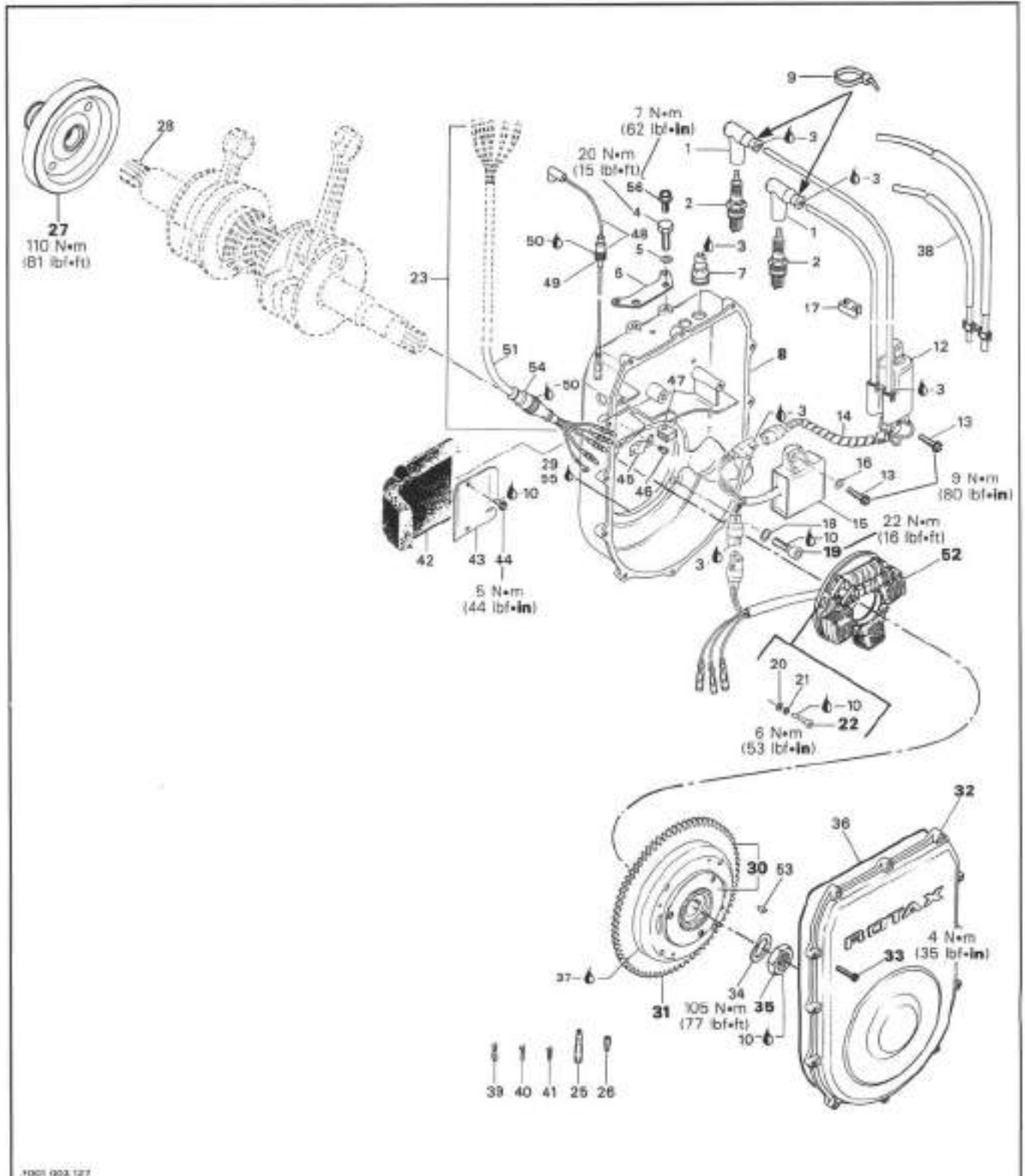
NOTE: Hand-tighten screws only. Final torque should be carried on after flame arrester/carburetor and ignition housing installation, once engine is in the watercraft.

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



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

PTO FLYWHEEL AND MAGNETO



Section 03 ENGINE

Sub-Section 04 (PTO FLYWHEEL AND MAGNETO)

COMPONENTS

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

GENERAL

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

To ease the removal of PTO flywheel heat center of flywheel with a heat gun to break bond.

WARNING : Never use a torch in the engine compartment. Electrolyte or fuel vapors can be present it may ignite and possibly cause personal injuries.

REMOVAL

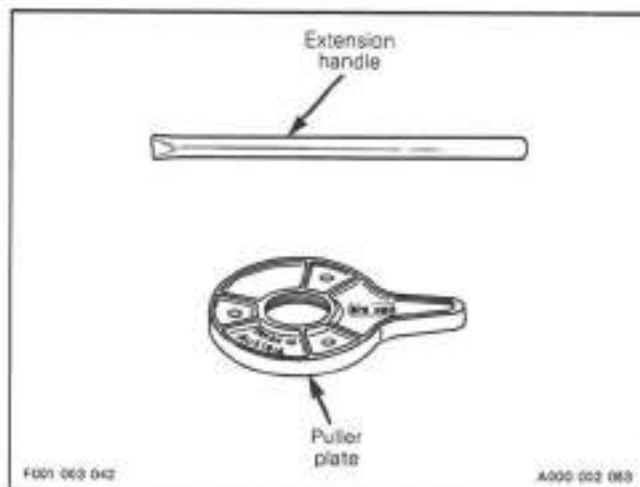
Remove ignition housing support (if applicable).

32,33, Ignition Cover and Screw

Remove screws and withdraw cover.

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

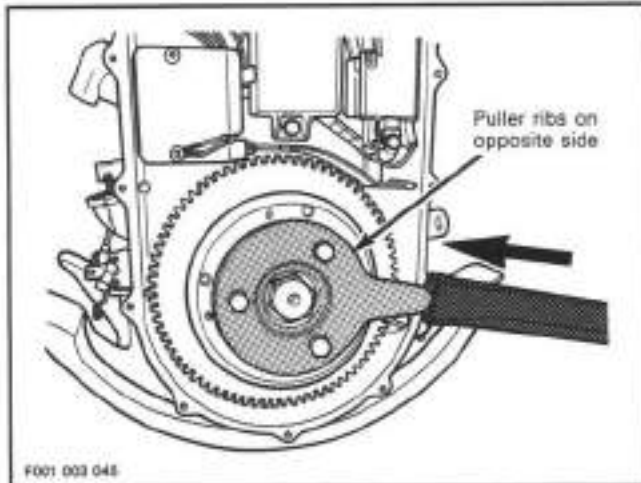
For removal of both flywheels, MAG flywheel is locked with puller plate (P/N 290 876 080) and extension handle (P/N 295 000 003).



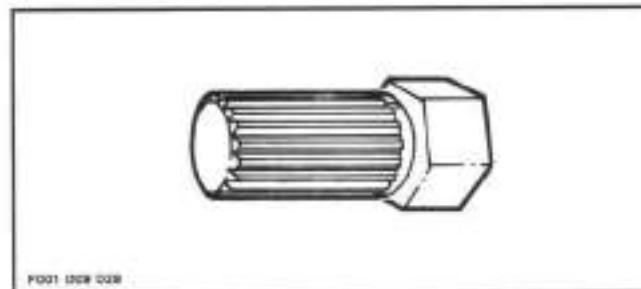
CAUTION : Never lock crankshaft by inserting any tool through connecting rod bores nor through impulse fitting.

27. PTO Flywheel

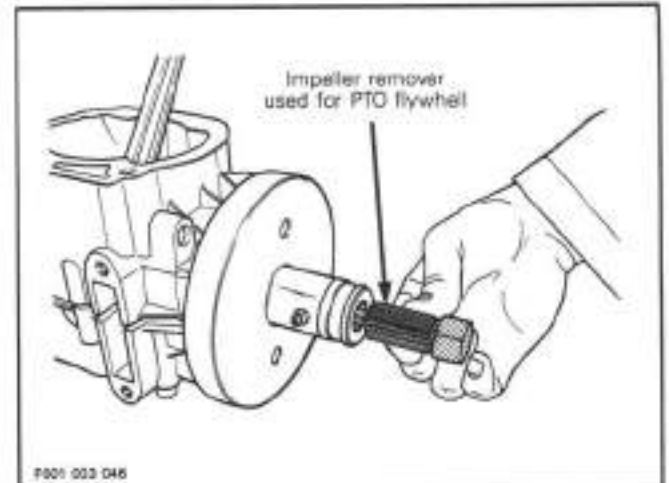
Using three M8 x 25 mm screws, secure puller plate on MAG flywheel so that puller ribs are against flywheel. Install extension handle on end of puller plate.



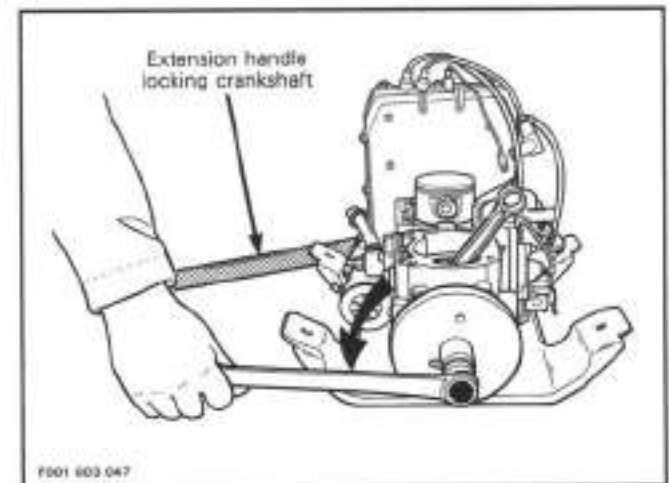
Rotate MAG flywheel so that extension handle end stops on work table for PTO flywheel loosening. PTO flywheel is loosen using impeller remover (P/N 295 000 001).



Insert special tool in PTO flywheel splines.



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

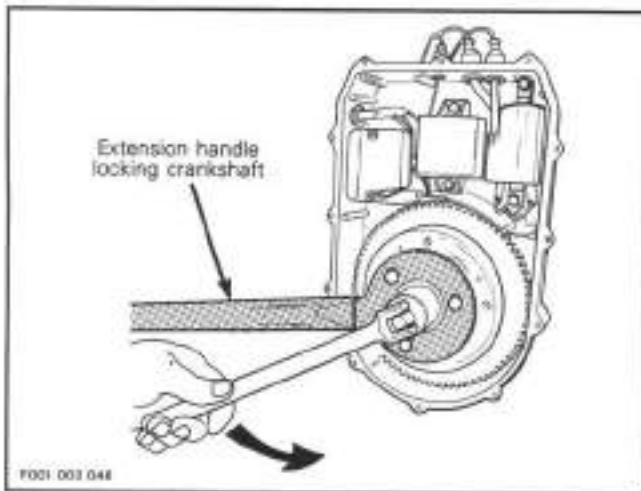


Section 03 ENGINE

Sub-Section 04 (PTO FLYWHEEL AND MAGNETO)

30, Magneto Flywheel

With puller plate properly secured as for PTO flywheel removal, rotate MAG flywheel so that extension handle end stops on work table for loosening.

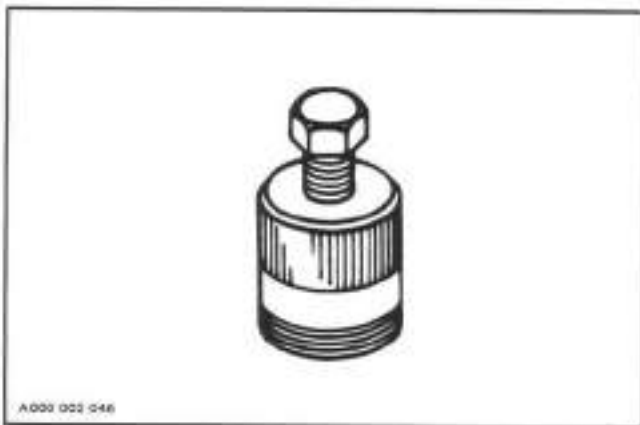


Using a suitable socket, unscrew retaining nut COUNTERCLOCKWISE when facing it.

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

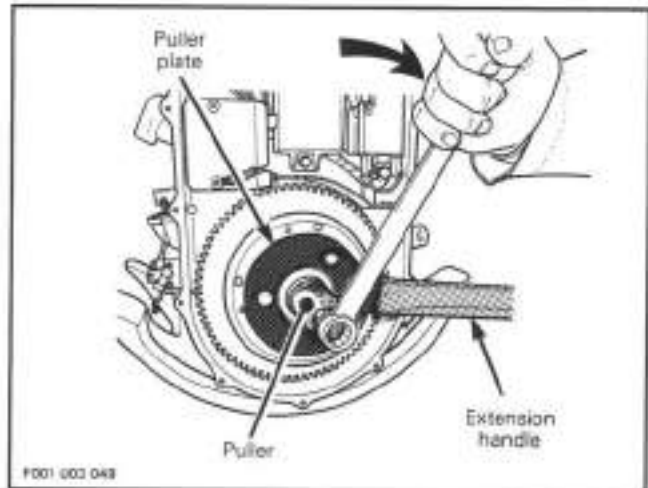
Remove nut and lock washer from MAG flywheel.

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



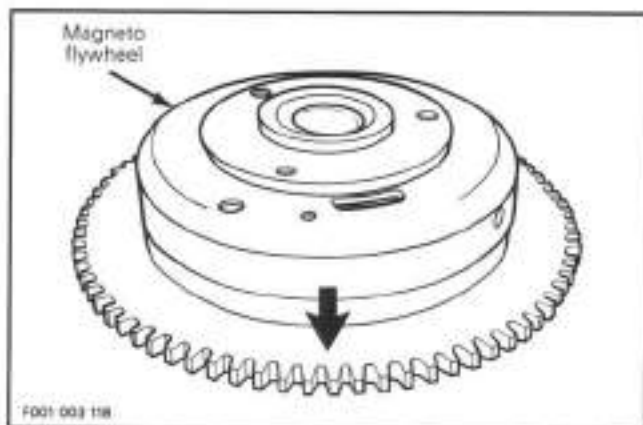
Fully thread on puller in puller plate.

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



31, 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.



22,52, Screw and Armature Plate Ass'y

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

Remove both retaining screws and withdraw armature plate.

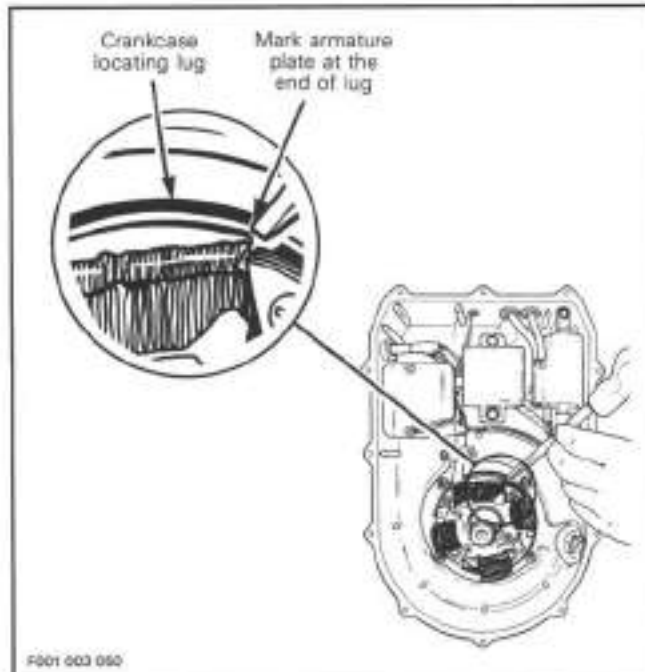
Crankcase Replacement

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

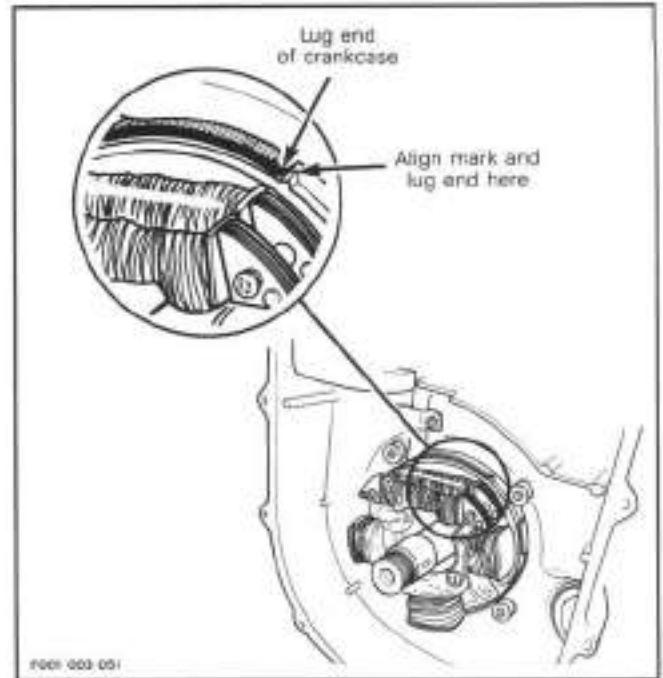
The following procedure is to find a common reference point on both crankcases (old and new) to position armature plate.

Proceed as follows :

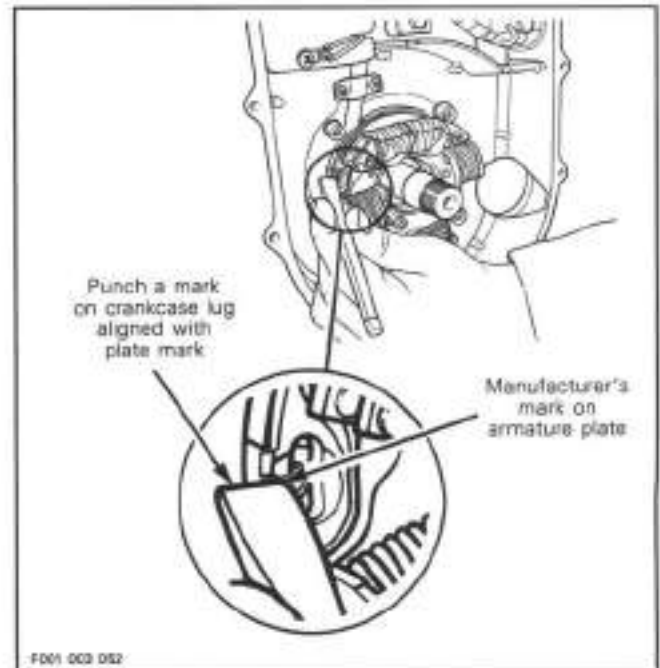
- Find a crankcase locating lug (the top one in this example).
- Place a cold chisel at the end of chosen lug, then punch a mark on armature plate at this point.



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



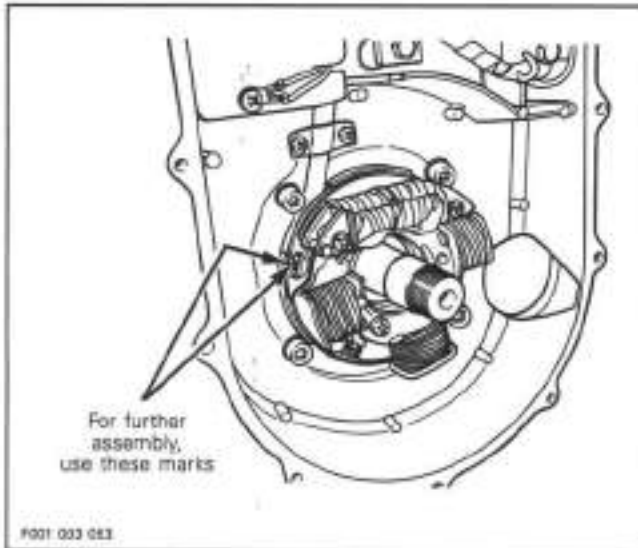
- Find manufacturer's mark on armature plate. In line with this mark, punch another mark on adjacent crankcase lug.



Section 03 ENGINE

Sub-Section 04 (PTO FLYWHEEL AND MAGNETO)

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



8,19, 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.

8,19, Ignition Housing and Screw

Apply Loctite 515 Gasket Eliminator (P/N 293 800 007) on housing/crankcase mating surfaces. Some engines may have a gasket.

○ **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.

Apply Loctite 242 (blue) (P/N 293 800 015) on screw threads then torque them in a criss-cross sequence to 22 N•m (16 lbf•ft).

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

22,52, Screw and Armature Plate Ass'y

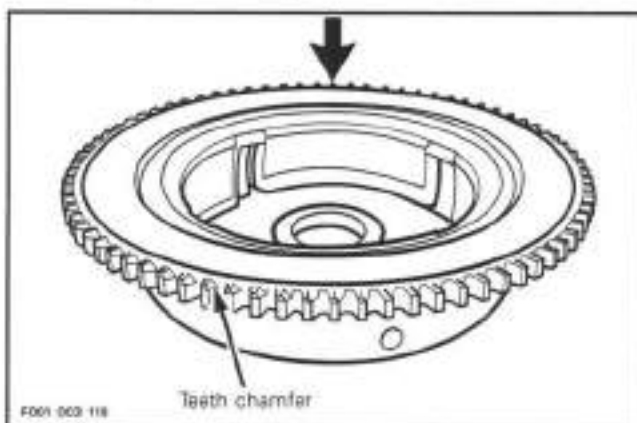
Position armature plate on crankcase, aligning previously traced marks on both parts.

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

31, 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.

30,35, MAG Flywheel and Nut

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

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

Torque nut to 105 N•m (77 lbf•ft).

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

27, 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**.

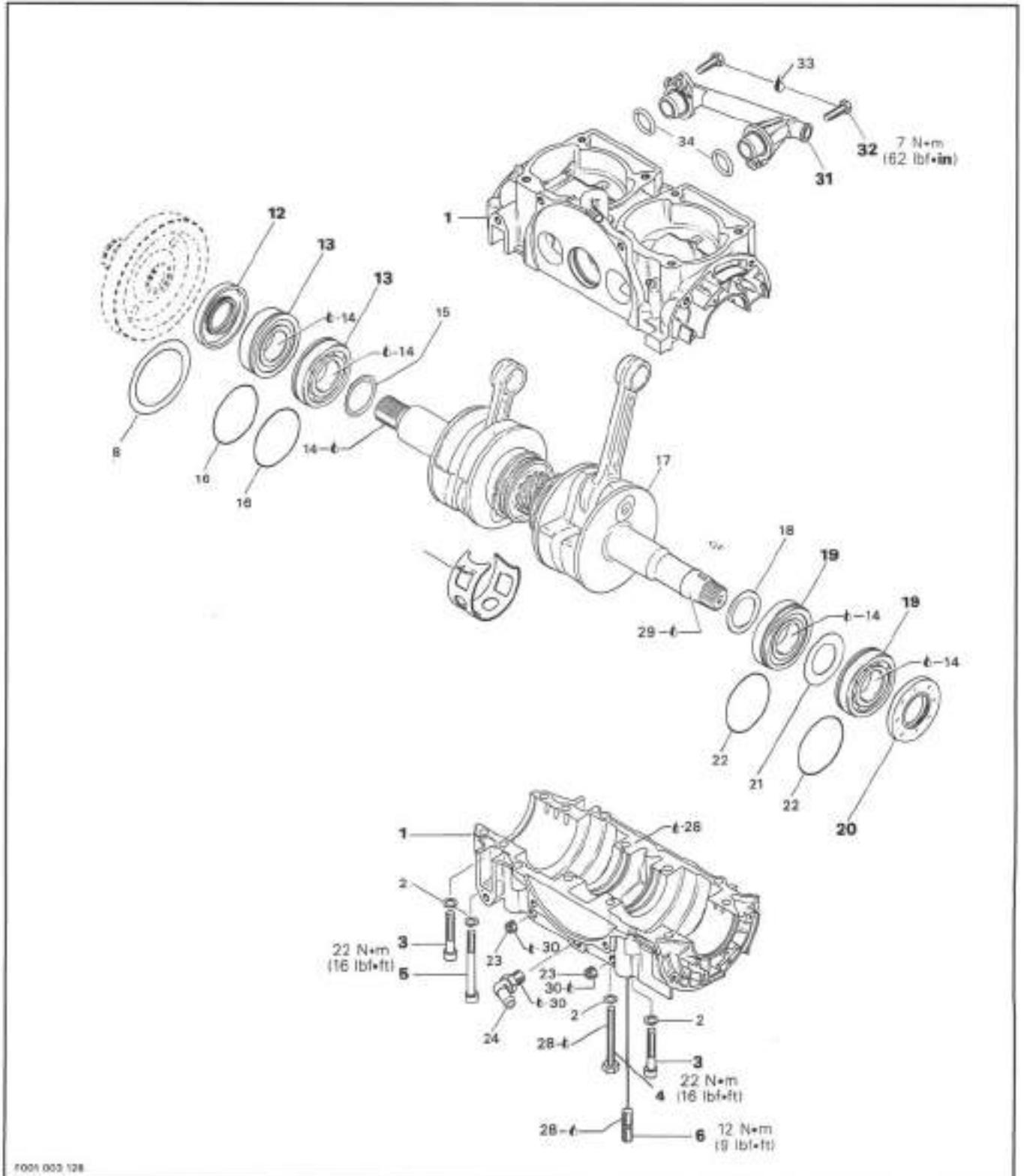
32,33, Ignition Housing Cover and Screw

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

○ **NOTE** : Use silicone 732 RTV on the O-ring and wipe off silicone excess.

Section 03 ENGINE
Sub-Section 05 (BOTTOM END)

BOTTOM END



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Section 03 ENGINE

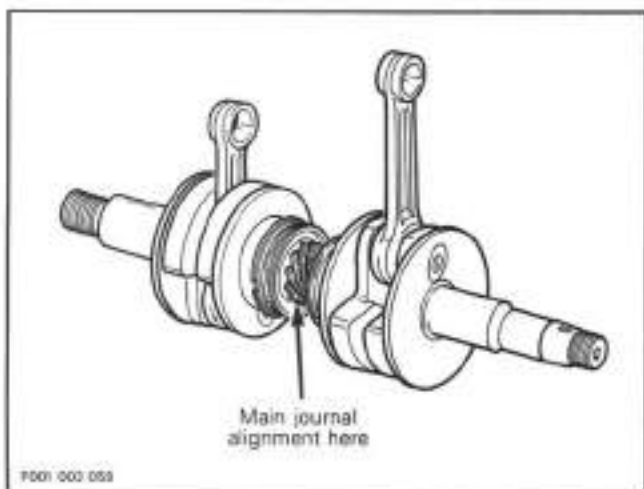
Sub-Section 05 (BOTTOM END)

COMPONENTS

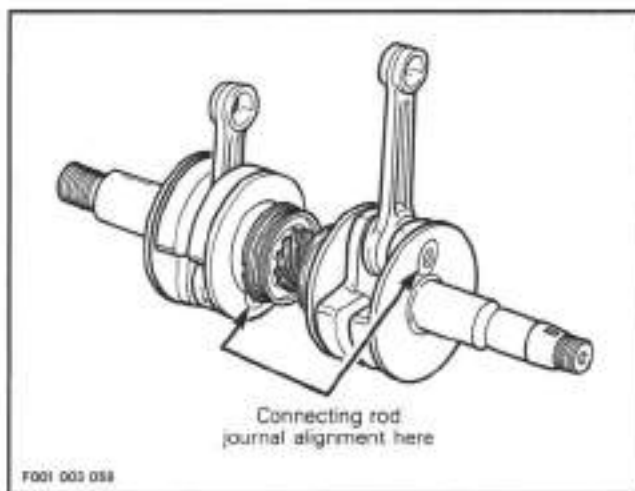
1. Crankcase ass'y
2. Lock washer 8 mm (14)
3. Hexagonal socket head cap screw M8 x 45 (6)
4. Hexagonal head screw M8 x 65 (6)
5. Allen screw M8 x 75 (2)
6. Stud M10 x 25/18 (4)
7. Retaining ring
8. Retaining shim
12. Oil seal
13. Ball bearing 6207 (2)
14. Anti-seize lubricant, 355 mL
15. Distance ring
16. O-ring (2)
17. Crankshaft
18. Distance ring
19. Ball bearing 6206 (2)
20. Oil seal
21. Shim 30.4/51/1
22. O-ring (2)
23. Drain plug
24. Hose nipple
28. Loctite 515, 50 mL
29. Loctite 242, 10 mL
30. Loctite PST 567
31. Water inlet socket
32. Hexagonal head screw M6 x 20 (2)
33. Loctite 242, 10 mL
34. O-ring

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



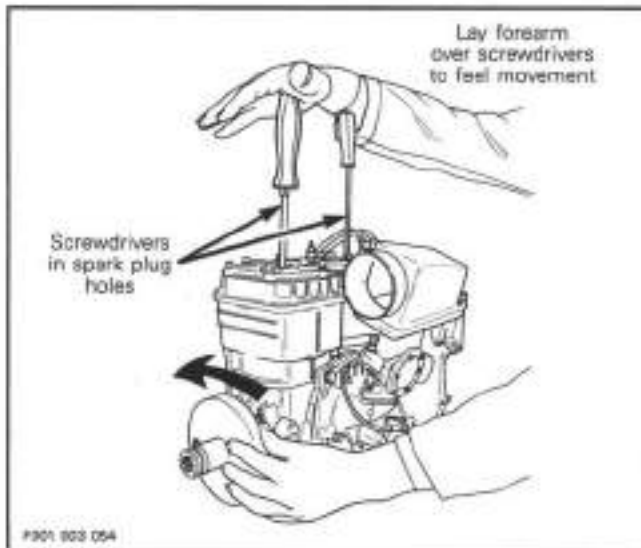
Crankshaft Alignment at Center Main Journal

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

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

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

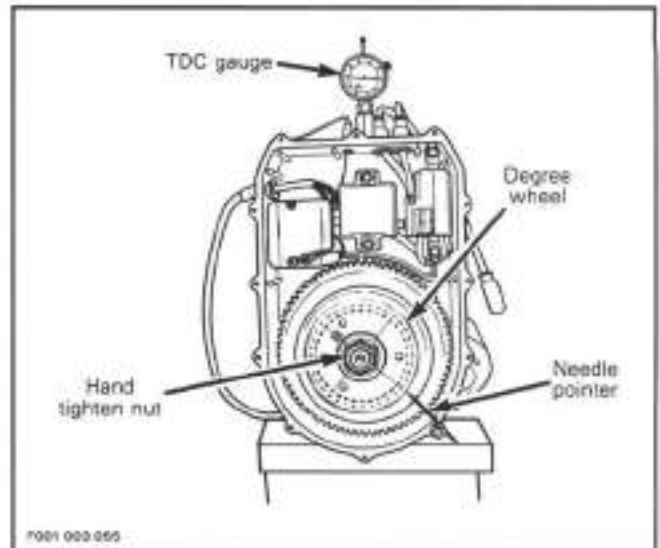
- With the other hand, slowly rotate engine by PTO flywheel.



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° on degree wheel ($360^\circ - 180^\circ = 180^\circ$).

Any other reading indicates a misaligned crankshaft.

Crankshaft Alignment at Connecting Rod Journal

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

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

GENERAL

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

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

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

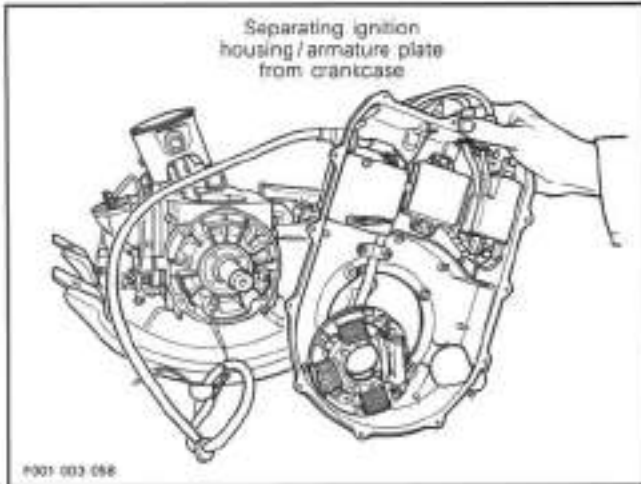
Section 03 ENGINE

Sub-Section 05 (BOTTOM END)

DISASSEMBLY

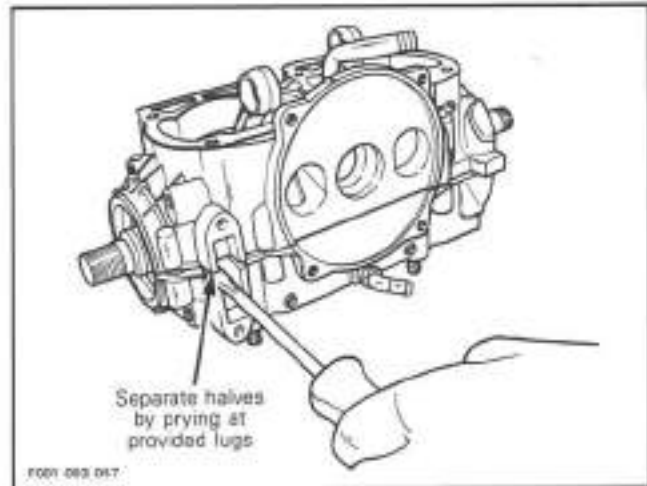
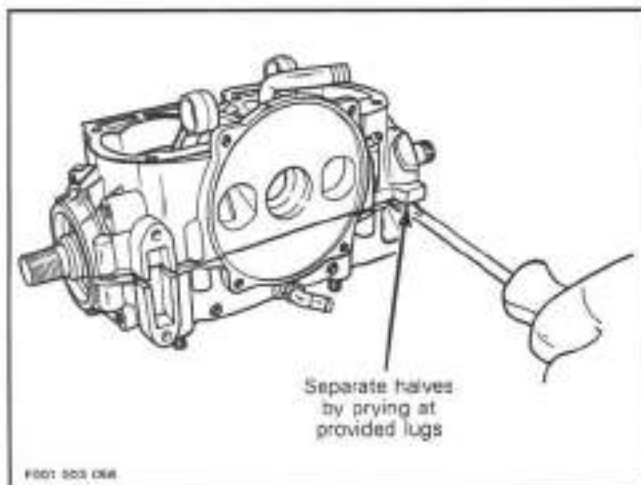
Remove the following parts :

- ignition housing and PTO flywheel on opposite side



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

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



12,13,19,20, Seal and Bearing

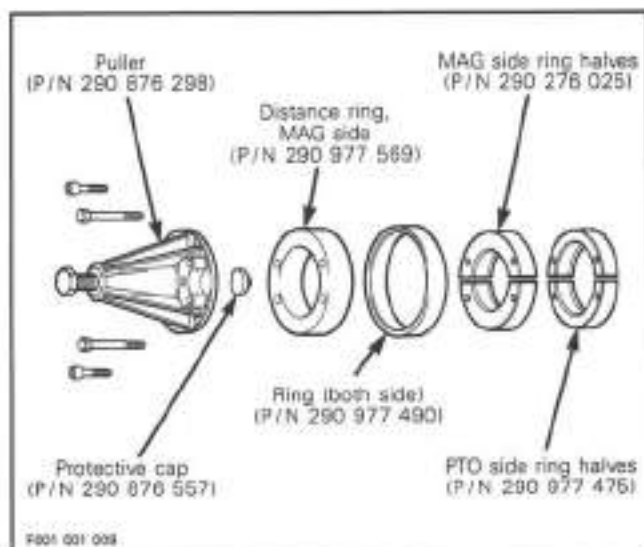
NOTE : Do not needlessly remove crankshaft bearings.

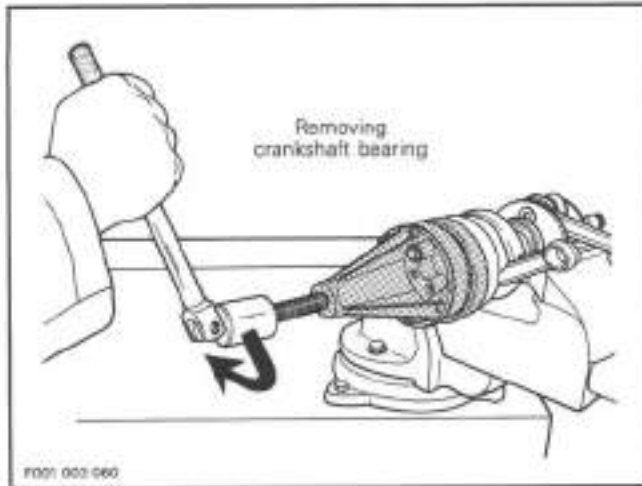
Remove end seals.

To remove end bearings from crankshaft, use crankshaft end protective cap (P/N 290 876 557) and puller (P/N 290 876 298).

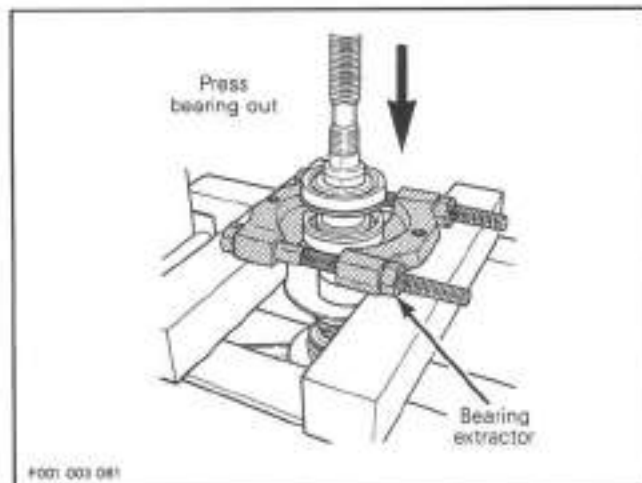
On PTO side, use ring (P/N 290 977 490) with ring halves (P/N 290 977 475).

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).





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



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

CLEANING

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

Clean all metal components in a solvent.

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

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

INSPECTION

Visually inspect parts for corrosion damage.

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

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

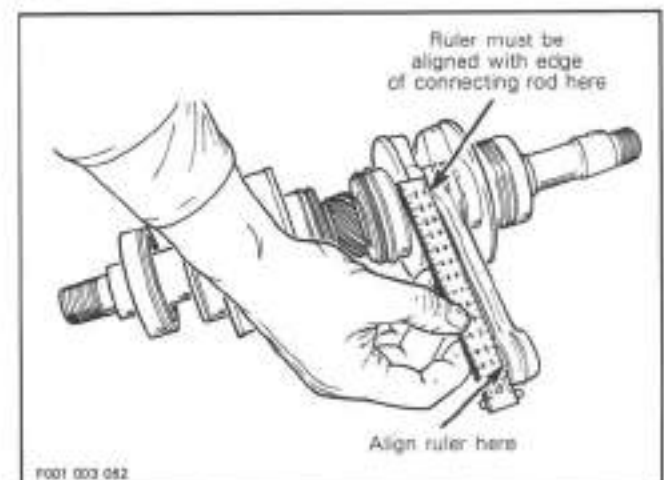
If crankshaft and/or components are found defective, it must be repaired by a specialized shop or replaced.

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

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

Connecting Rod Straightness

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



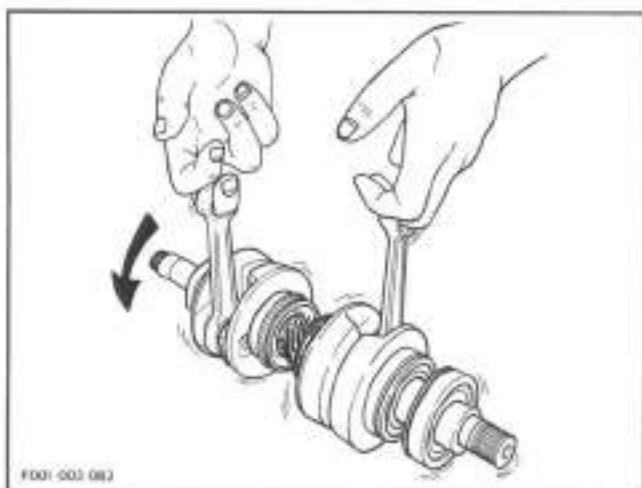
Section 03 ENGINE

Sub-Section 05 (BOTTOM END)

Crankshaft Alignment

A quick check can be made as follows :

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

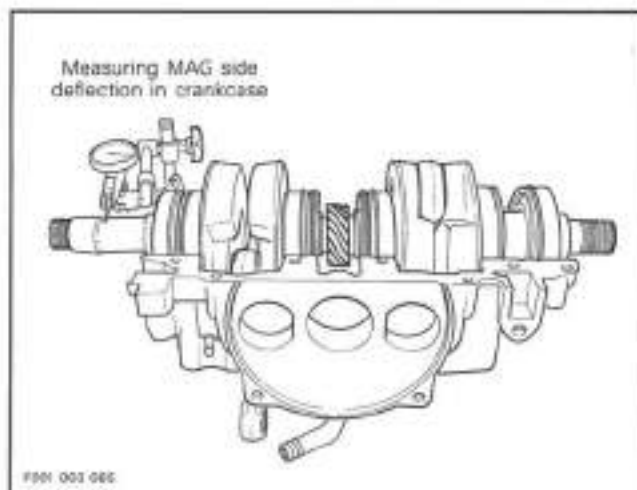
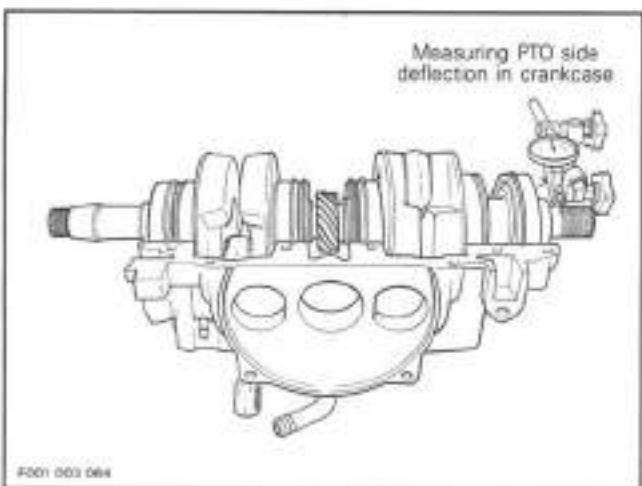


A twisted crankshaft will turn irregularly in an out of round motion.

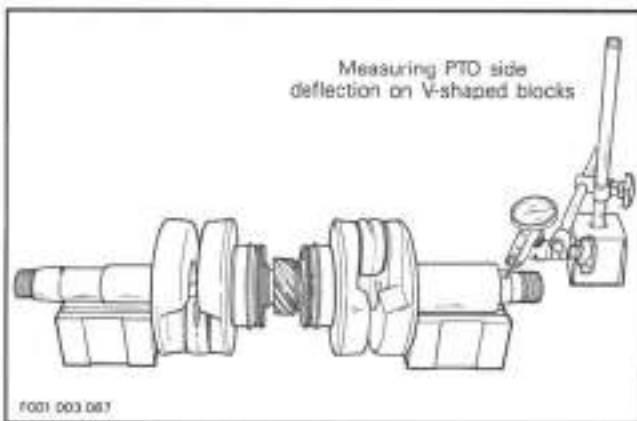
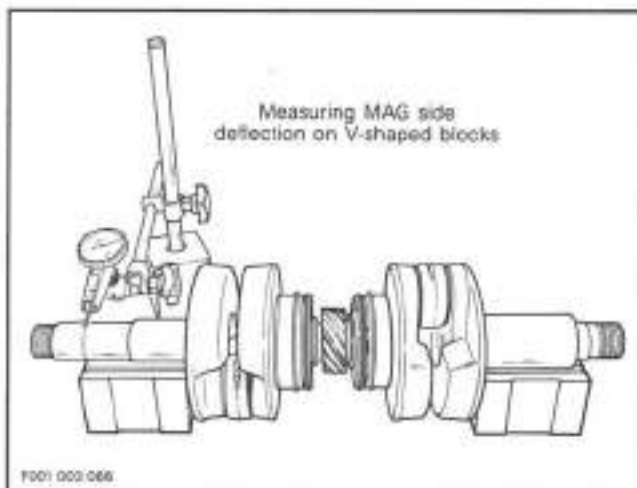
Crankshaft Deflection

Crankshaft deflection is measured each end with a dial indicator.

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



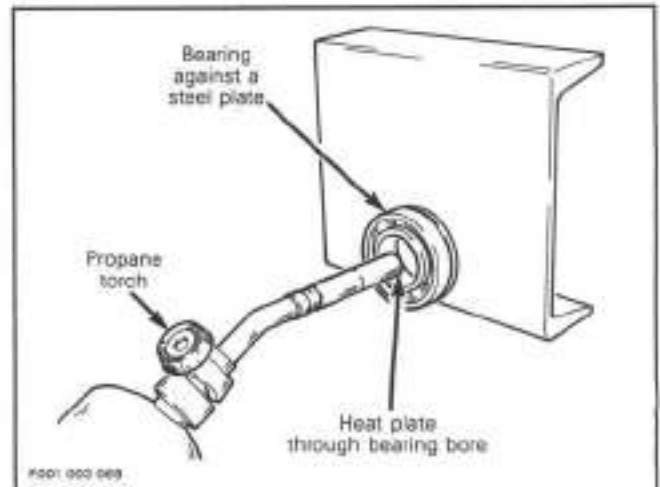
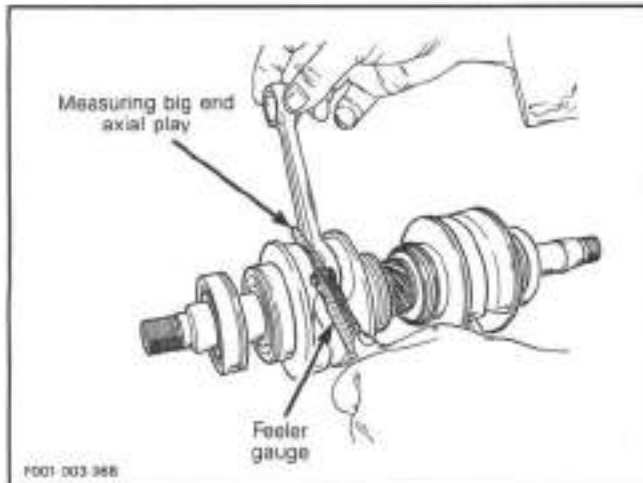
Remove crankshaft bearings and check deflection again on V-shaped blocks as illustrated.



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

Connecting Rod Big End Axial Play

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



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

ASSEMBLY

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

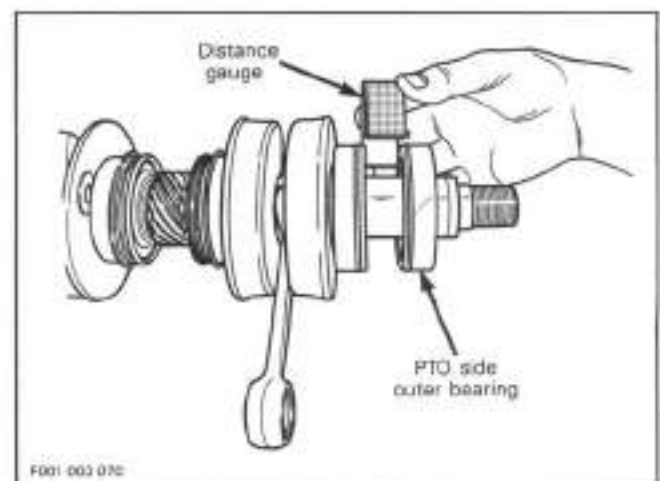
13,19, Bearing

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

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

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

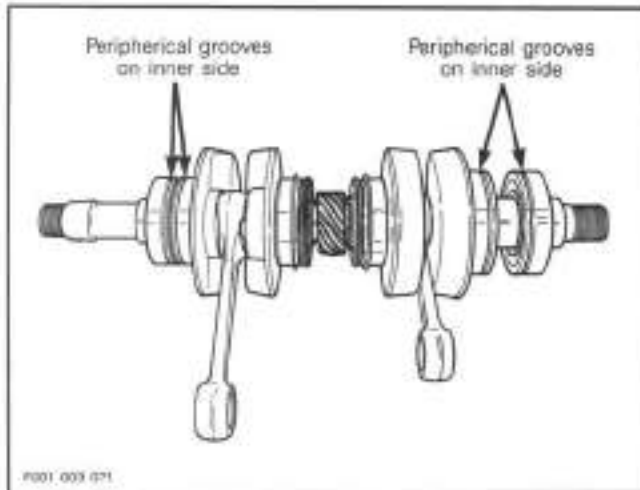
CAUTION : Immediately stop heating as soon as smoke is noticed. Overheating bearing will melt plastic cage. Practice with used bearings on first try.



Section 03 ENGINE

Sub-Section 05 (BOTTOM END)

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



12,20, Seal

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

1, Crankcase

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

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

NOTE: On aluminum material it is recommended to use Loctite Primer N (P/N 293 600 012) to 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.

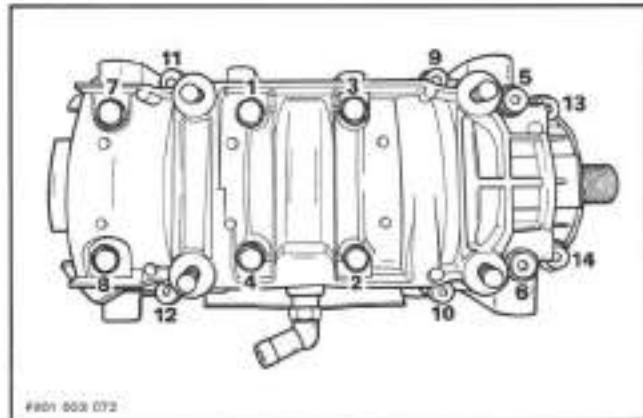
CAUTION: Temporarily install armature plate to align crankcase halves with each other.

3,5, Screw

Torque crankcase screws to 22 N•m (16 lbf•ft) as per following illustrated sequence.

4, Screw

Apply Loctite 515 (P/N 293 800 007) on screw threads.



6, Stud

At assembly in crankcase, apply Loctite 515 (P/N 293 800 007) on stud threads.

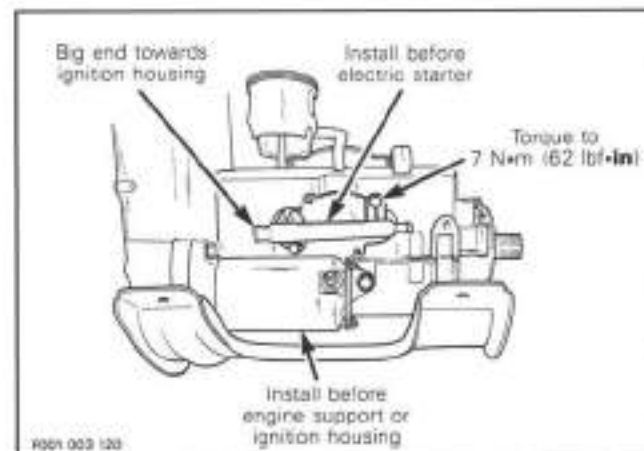
Finalizing Assembly

31,32, Water Inlet Socket and Screw

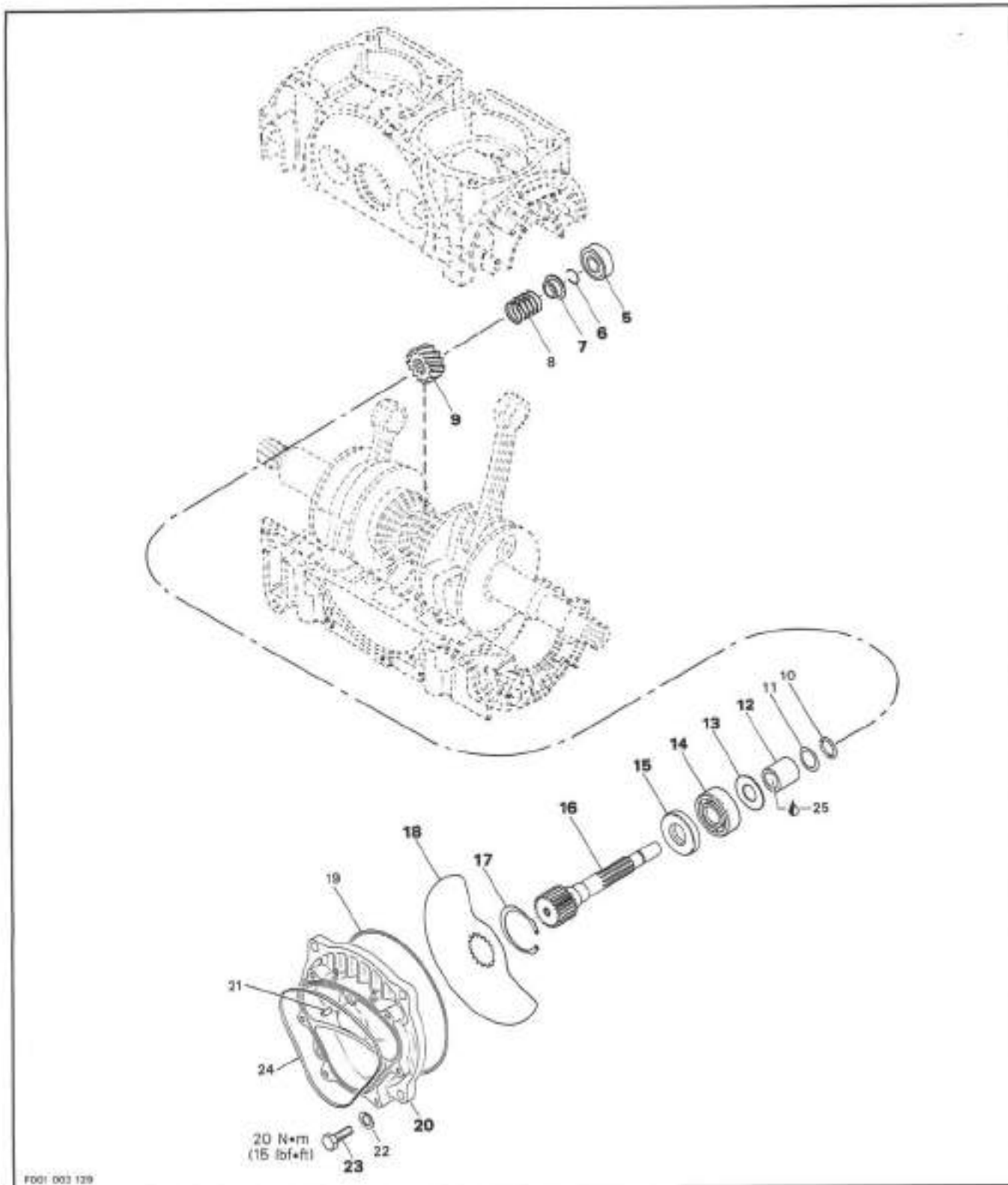
If water inlet socket has been removed from crankcase, reinstall it with its bigger end (inlet) pointing towards ignition housing.

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

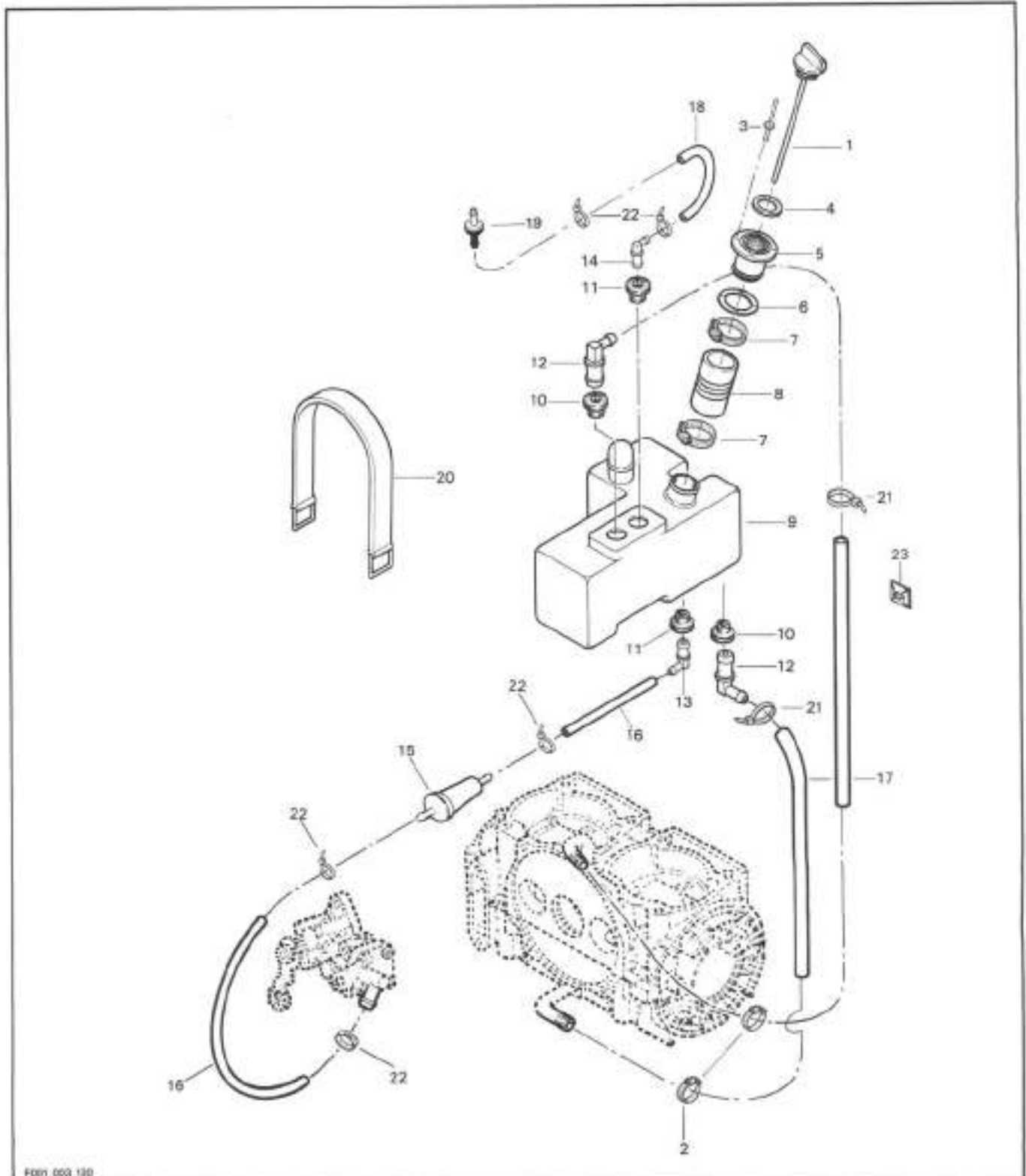
Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

COMPONENTS

- | | |
|-----------------------------|--------------------------------------|
| 5. Ball bearing 6201 | 16. Rotary valve shaft |
| 6. Circlip | 17. Snap ring |
| 7. Spring holder cup | 18. Rotary valve |
| 8. Spring | 19. O-ring |
| 9. Gear 14 teeth | 20. Rotary valve cover |
| 10. O-ring | 21. Dowel pin |
| 11. Shim 0.5 mm | 22. Lock washer 8 mm (4) |
| 12. Distance sleeve 24.5 mm | 23. Hexagonal head screw M8 x 20 (4) |
| 13. Shim 0.5 mm | 24. Rubber ring |
| 14. Ball bearing 6203 | 25. Loctite 648 |
| 15. Oil seal | |

 **NOTE** : Some reference numbers are deliberately missing.

RESERVOIR



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Section 03 ENGINE

Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

COMPONENTS

1. Oil level indicator cap
2. Clamp (2)
3. Rivet (4)
4. O-ring
5. Adapter
6. Gasket
7. Clamp (2)
8. Hose
9. Oil tank
10. Grommet (2)
11. Grommet (2)
12. 90° Elbow (2)

13. 90° Elbow
14. 90° Elbow (1)
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

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

ROTARY VALVE COVER AND VALVE GAP

A gap of 0.2 - 0.3 mm (.008 in - .013 in) must be maintained between rotary valve and crankcase.

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

Using soldering wire for electronic applications (tin with resin core, approximately 0.8 mm (.030 in) dia.), install three short pieces 13 mm (1/2 in) long over rotary valve. If necessary, apply grease to hold 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 tin thickness, it must be within specified tolerance. Otherwise check cover for wear/warpage and crankcase; renew defective parts.

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

CRANKSHAFT 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).

GENERAL

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

Bottom end must be opened to remove rotary valve shaft.

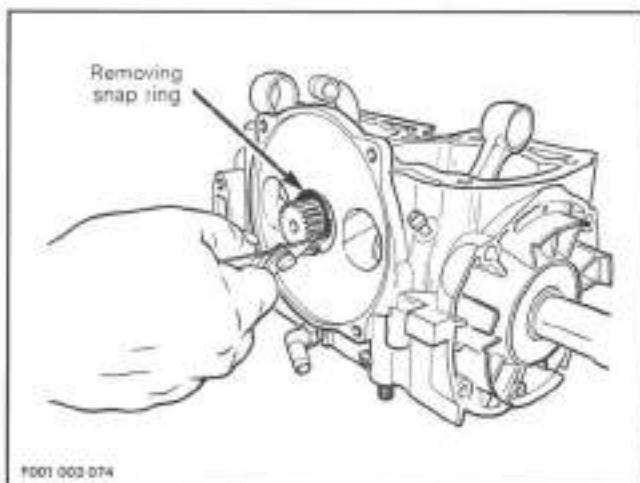
DISASSEMBLY

20,23, Rotary Valve Cover and Screw

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

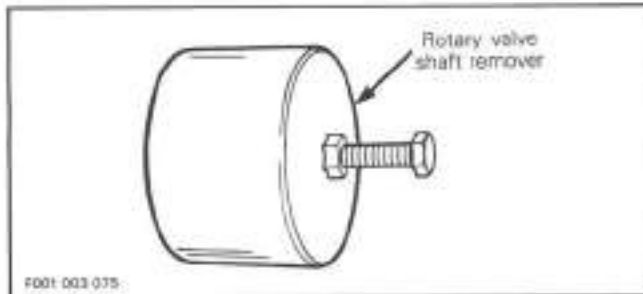
16,17, Snap Ring and Rotary Valve Shaft

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

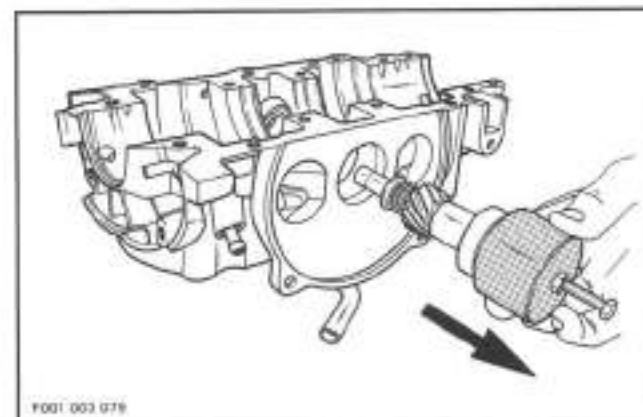
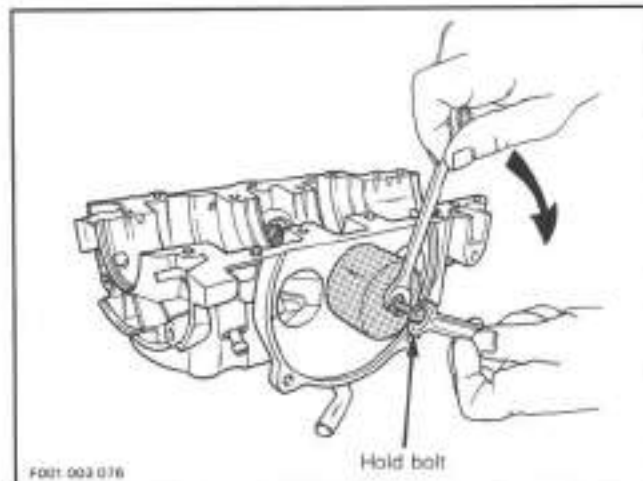


▼ **CAUTION** : Bottom end must be opened to remove rotary valve shaft.

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

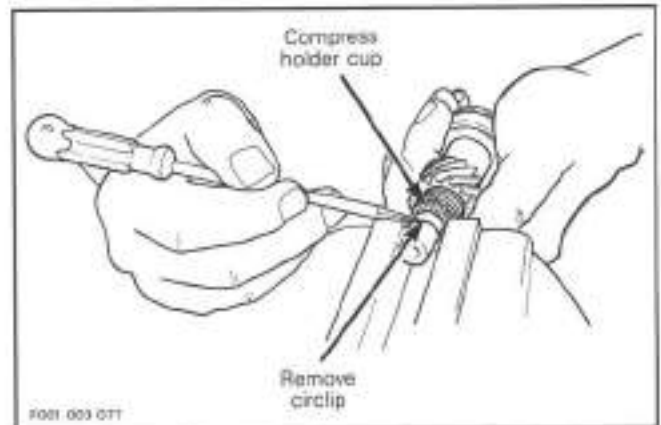


Place puller over rotary valve shaft end and screw on puller bolt into shaft. While retaining bolt with a wrench, turn puller nut **CLOCKWISE** until shaft comes out.



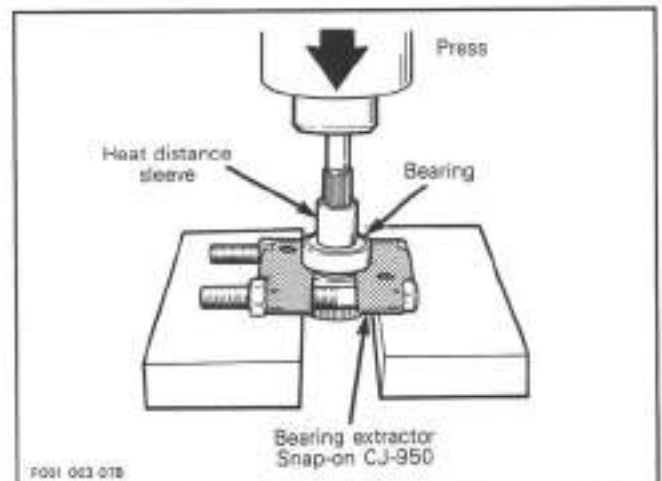
6,7, Circlip and Spring Holder Cup

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



12, Distance Sleeve

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



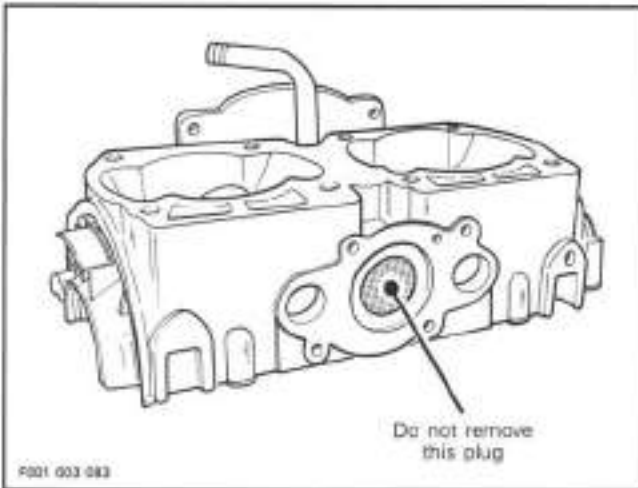
▼ **CAUTION** : Ensure that rotary valve shaft is perfectly perpendicular with press tip or damage will occur.

Section 03 ENGINE

Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

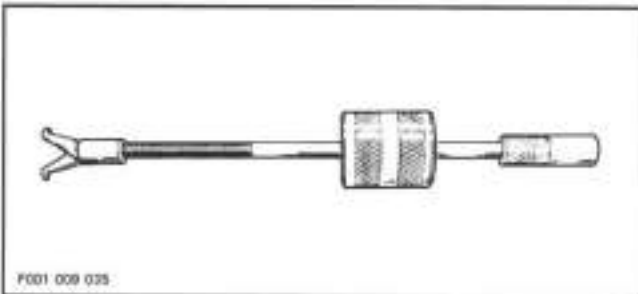
5. Bearing

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



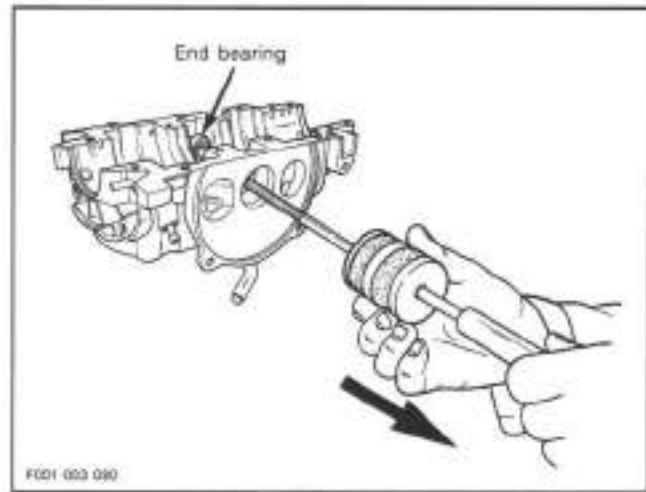
End bearing can be easily removed using the following suggested tool.

Snap-on hammer puller including : Handle CJ93-1
Hammer CJ125-6
Claws CJ93-4



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

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



CLEANING

Discard all seals and O-rings.

Clean all metal components in a solvent.

Clean oil passages and make sure they are not clogged.

Clean rotary valve shaft and inside of distance sleeve.

INSPECTION

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

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

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.

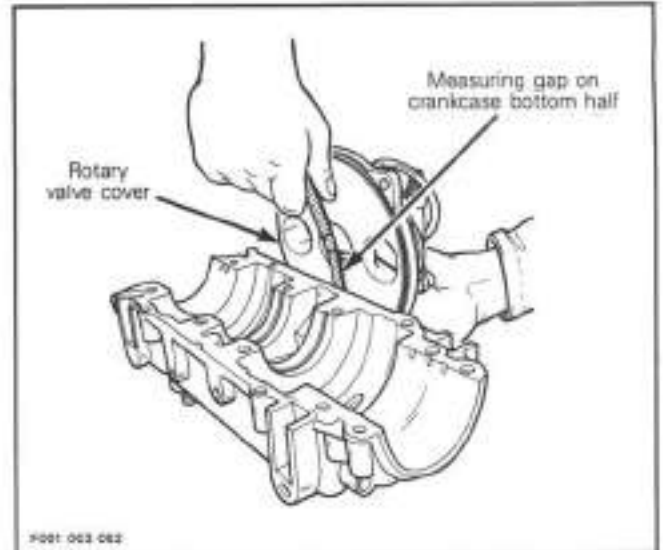
MEASUREMENTS	TOLERANCES	
	NEW PARTS	WEAR LIMIT
Rotary Valve Cover and Valve Gap	N.A.	0.2 - 0.3 mm (.008 - .013 in)
Rotary Valve Shaft Deflection	N.A.	0.08 mm (.003 in)

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.

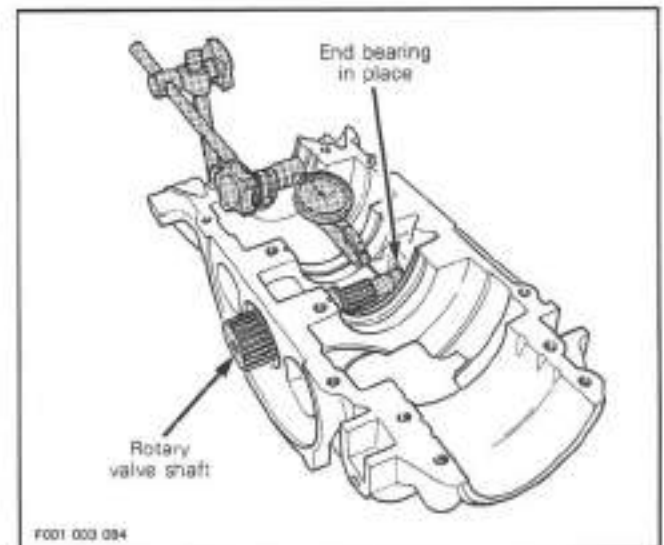
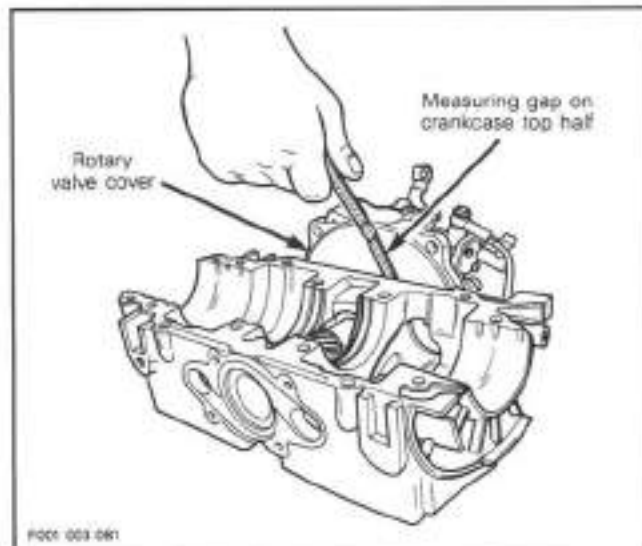


Rotary Valve Shaft Deflection

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.

Section 03 ENGINE

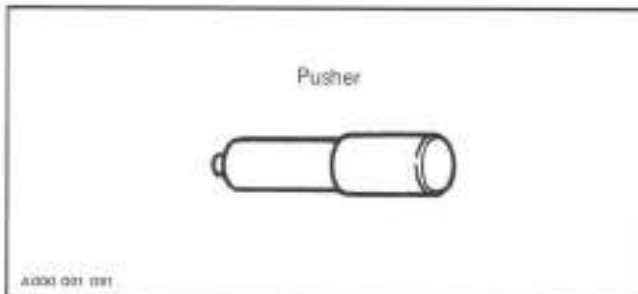
Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

ASSEMBLY

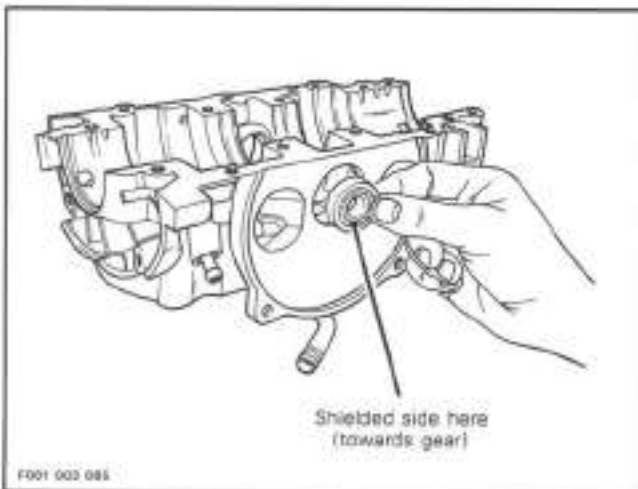
Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

5, Bearing

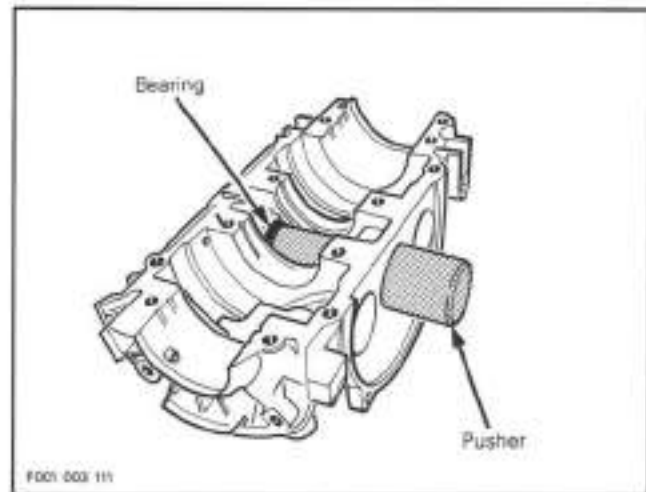
To install end bearing in crankcase, use a pusher (P/N 290 876 500).



Position ball bearing shielded side towards rotary valve.



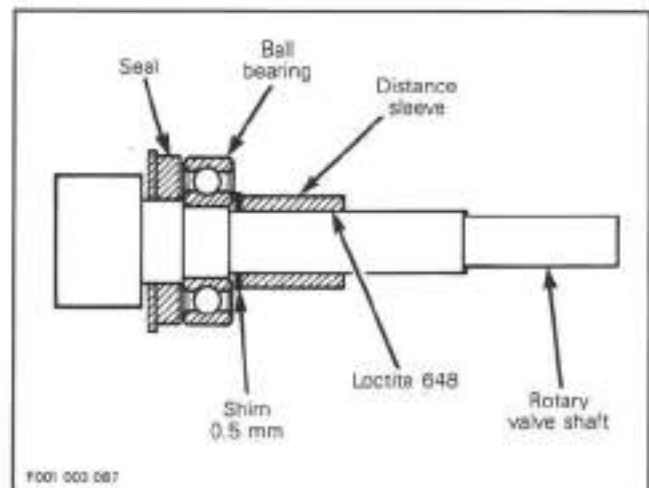
Push bearing until it stops on its seat.



15,16, Seal, Rotary Valve Shaft

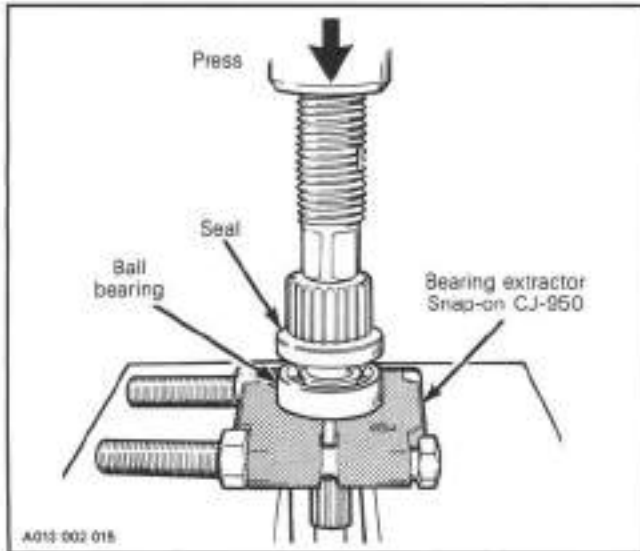
Apply lithium grease on seal lips. Position seal with shielded portion against shaft splines.

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



14,16, Bearing and Rotary Valve Shaft

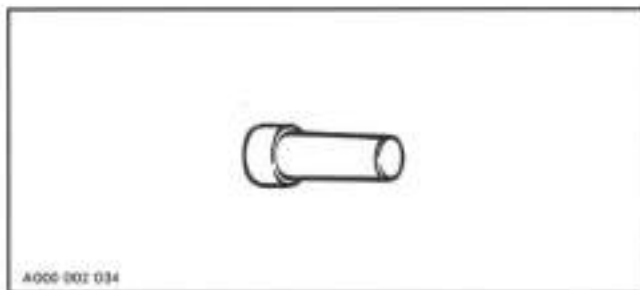
Install ball bearing as illustrated.



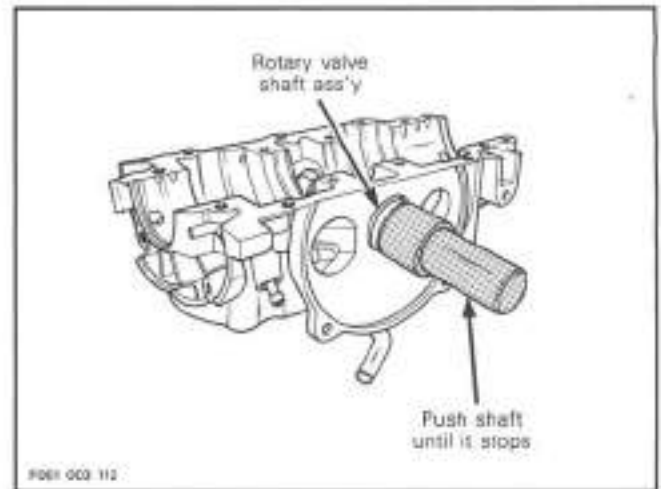
16,17, Rotary Valve Shaft Ass'y and Snap Ring

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 it stops on bearing seat.



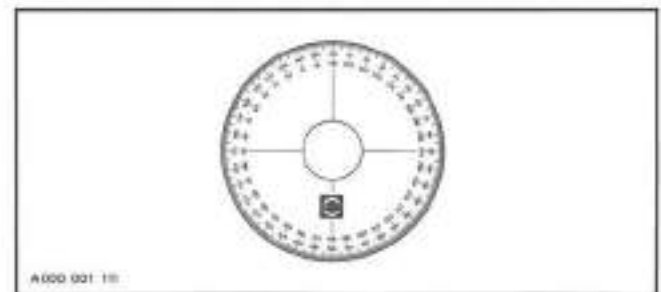
At snap ring installation, position it so that its sharp edge faces outwards.

ROTARY VALVE TIMING

When the same crankcase is reassembled or a replacement crankcase is installed, **never** use timing mark (ridge) if any for timing method. For rotary valve timing a TDC gauge (P/N 295 000 065) is required.

Installation on Same Crankcase or Replacement Crankcase

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



Section 03 ENGINE

Sub-Section 06 (ROTARY VALVE AND RESERVOIR)

Rotary valve must be set so that timing occurs as follows :

WATERCRAFT MODEL	OPENING BTDC	CLOSING ATDC
5804	$115 \pm \frac{3}{5}$	$80 \pm \frac{5}{3}$
5811	$115 \pm \frac{3}{5}$	$65 \pm \frac{5}{3}$
5850	$115 \pm \frac{3}{5}$	$65 \pm \frac{5}{3}$

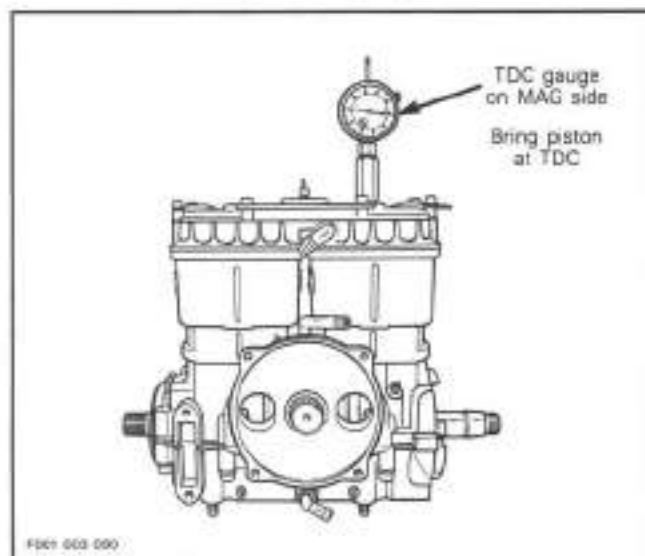
For the following instructions, let's use these specifications as example :

OPENING : 115° BTDC

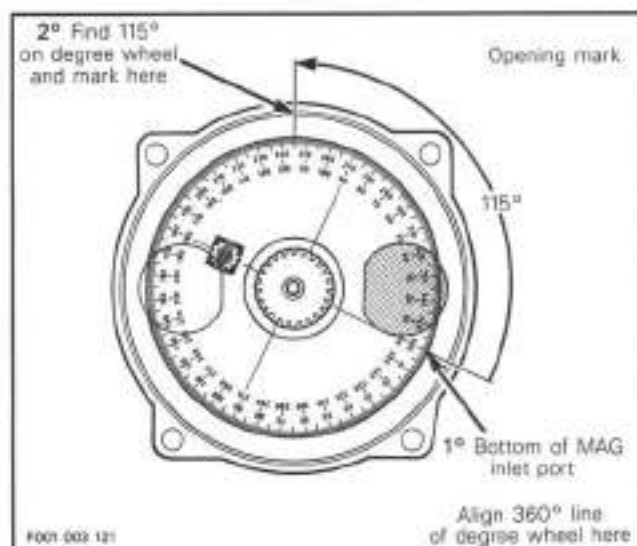
CLOSING : 80° ATDC

Proceed as follows :

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

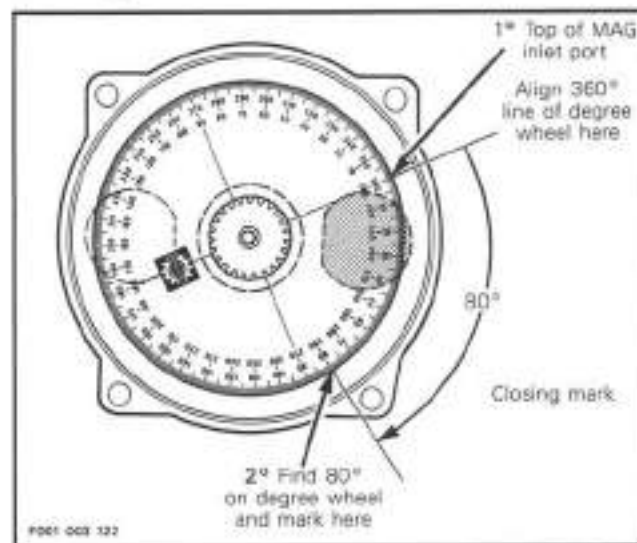


- For **opening mark**, first align 360° line of degree wheel with **BOTTOM** of **MAG side** inlet port. Then, find 115° line on degree wheel and mark crankcase at this point.



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.



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

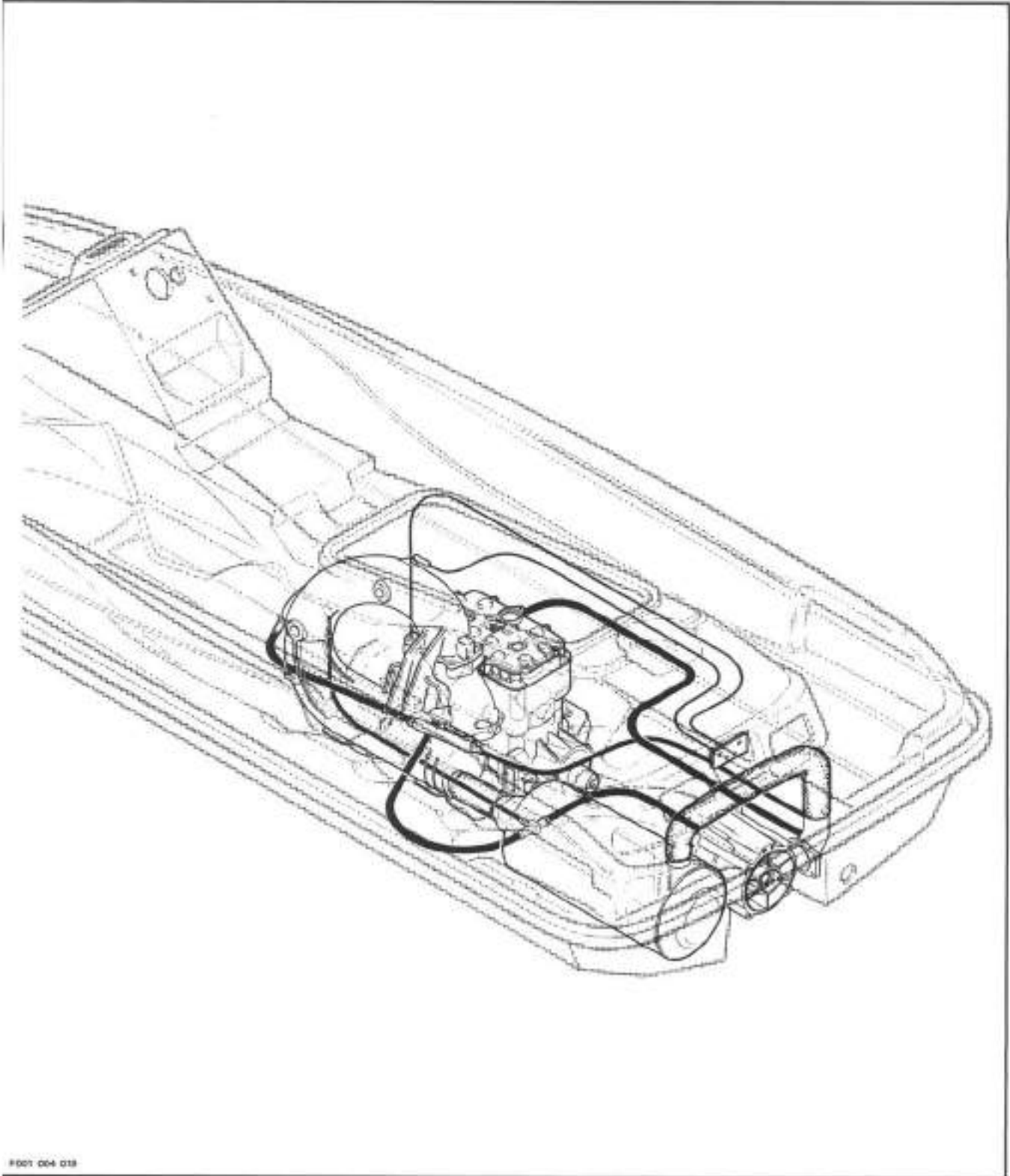
NOTE : Rotary valve is asymmetrical. Therefore, try flipping it over then reinstall on splines to determine best installation position.

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

20,23, Rotary Valve Cover and Screw

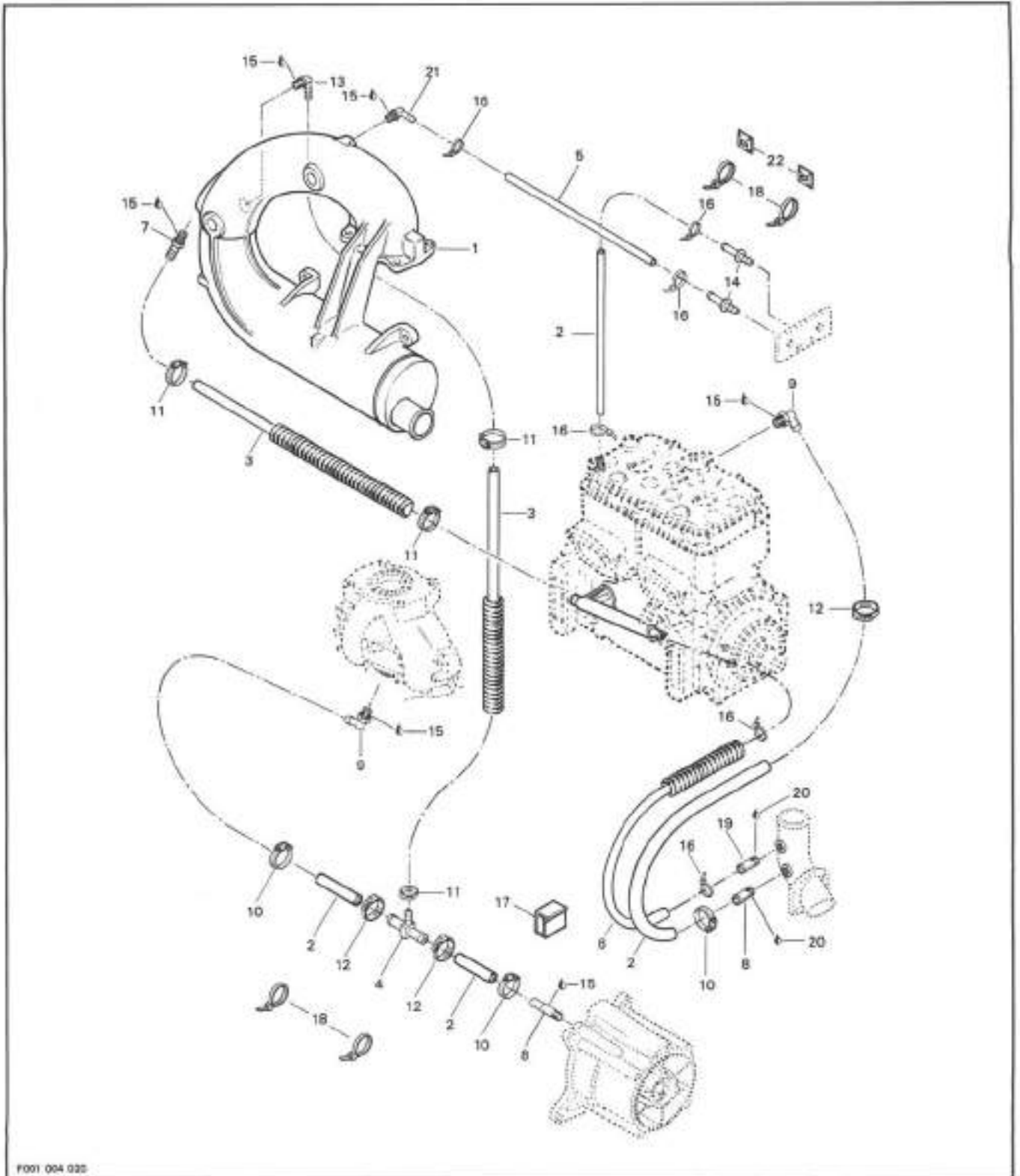
Install O-ring and cover then torque screws to 20 N•m (15 lb•ft) in a criss-cross sequence.

COOLING SYSTEM



Section 04 COOLING SYSTEM
Sub-Section 01 (COMPONENTS)

COMPONENTS



F001 004 020

Section 04 COOLING SYSTEM

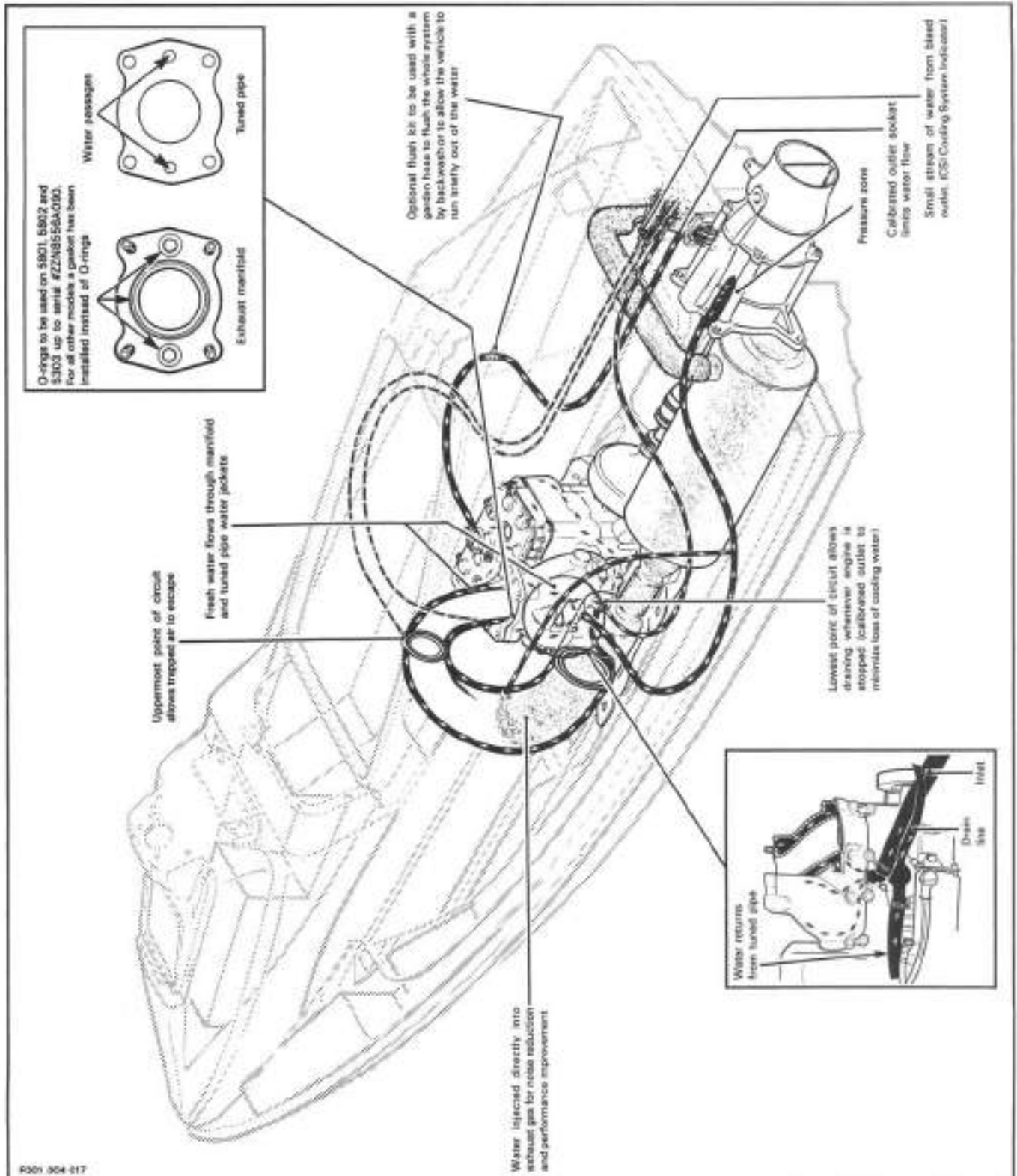
Sub-Section 01 (COMPONENTS)

COMPONENTS

- | | |
|--------------------|---------------------|
| 1. Tuned pipe | 12. Clamp (3) |
| 2. Hose 12.5 mm | 13. Fitting |
| 3. Hose 8 mm | 14. Fitting |
| 4. Tee | 15. Loctite PST 567 |
| 5. Hose 6 mm | 16. Tie rap (4) |
| 6. Hose | 17. Tie pandut |
| 7. Fitting | 18. Tie rap (6) |
| 8. Fitting | 19. Fitting |
| 9. Fitting 90° (2) | 20. Loctite 592 |
| 10. Clamp (6) | 21. Fitting 90° |
| 11. Clamp | 22. Tie mount |
-

Section 04 COOLING SYSTEM
Sub-Section 02 (CIRCUIT)

CIRCUIT



Section 04 COOLING SYSTEM

Sub-Section 02 (CIRCUIT)

TECHNICAL DATA

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

Section 04 COOLING SYSTEM

Sub-Section 03 (FLUSHING AND CARE)

FLUSHING

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

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

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

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

Flushing is necessary when the watercraft is operated in:

- salt water
- unclean water
- shallow water where underwater ground is sandy and / or 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 evacuate sand, salt, shells or other particles in water jackets (engine, exhaust manifold, tuned pipe) and / or hoses.

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

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

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

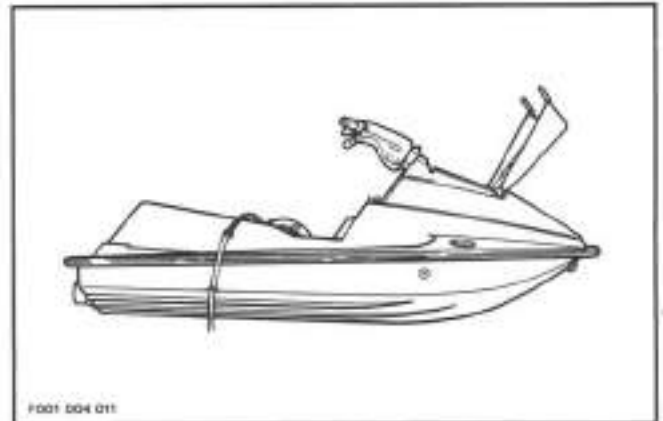
A convenient flush kit (P/N 295 000 038) can permanently be installed on the watercraft to ease flushing.

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

○ **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.

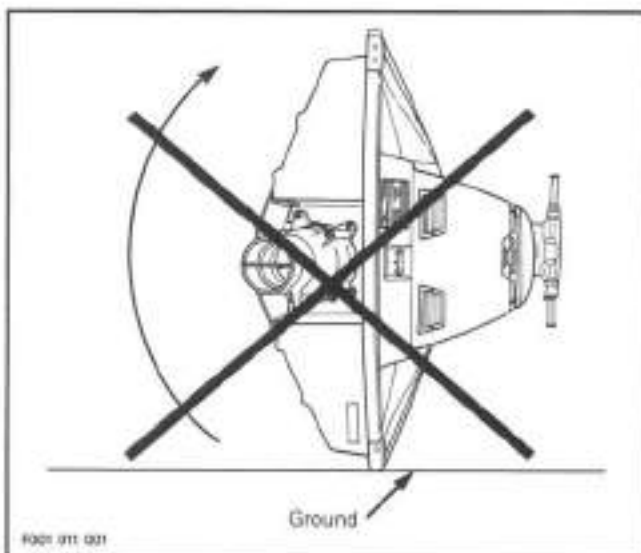
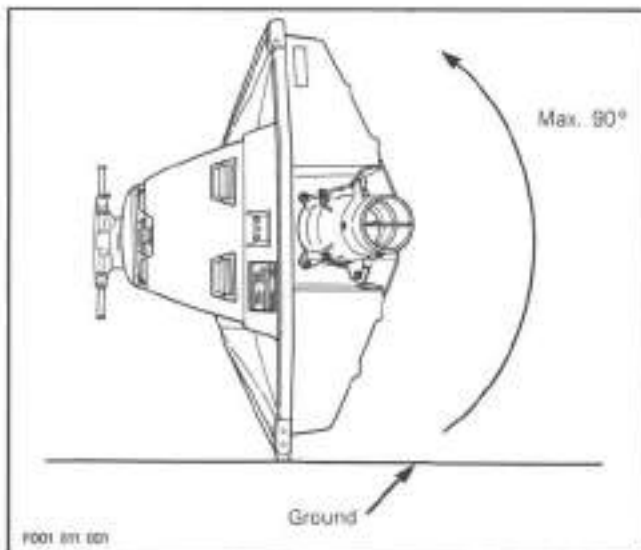
6. Disconnect garden hose from outlet hose and connect hose to exhaust socket.
7. Wipe off any residual water on the engine.
8. Reinstall seat and properly latch.

Section 04 COOLING SYSTEM

Sub-Section 03 (FLUSHING AND CARE)

CARE

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



2. Check joints for leaks to avoid water accumulation in the bilge.
3. Do not modify hose or socket size as coolant flow could be altered.
4. When engine is running, water must flow from bleed outlet indicating that water circulates.

5. For hose clamp installation, use special pliers (P/N 295 000 070).

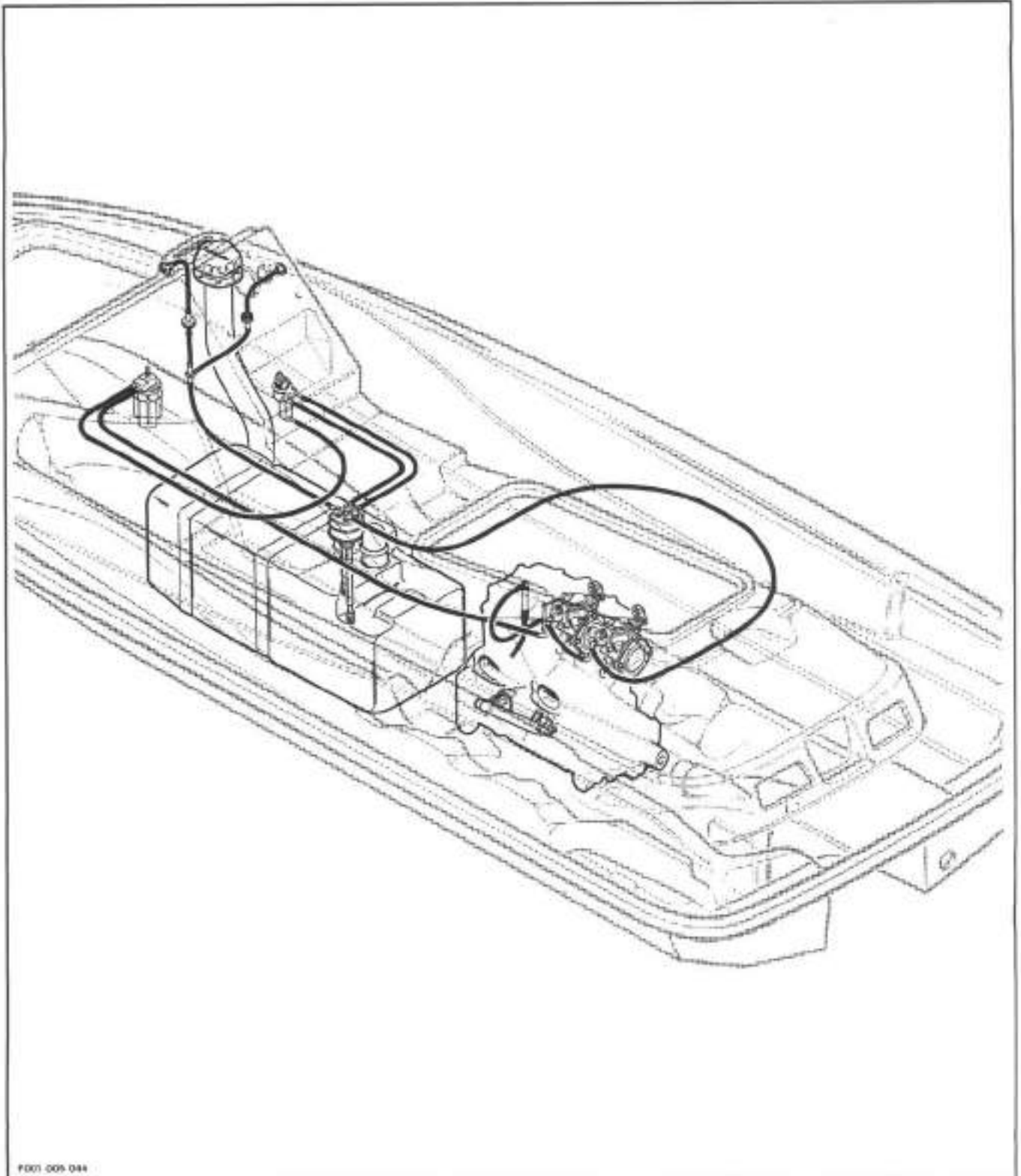
6. Check overheating beeper operation by jumping terminal of thermosensor wire to ground. Beeper must operate.

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

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.

FUEL SYSTEM



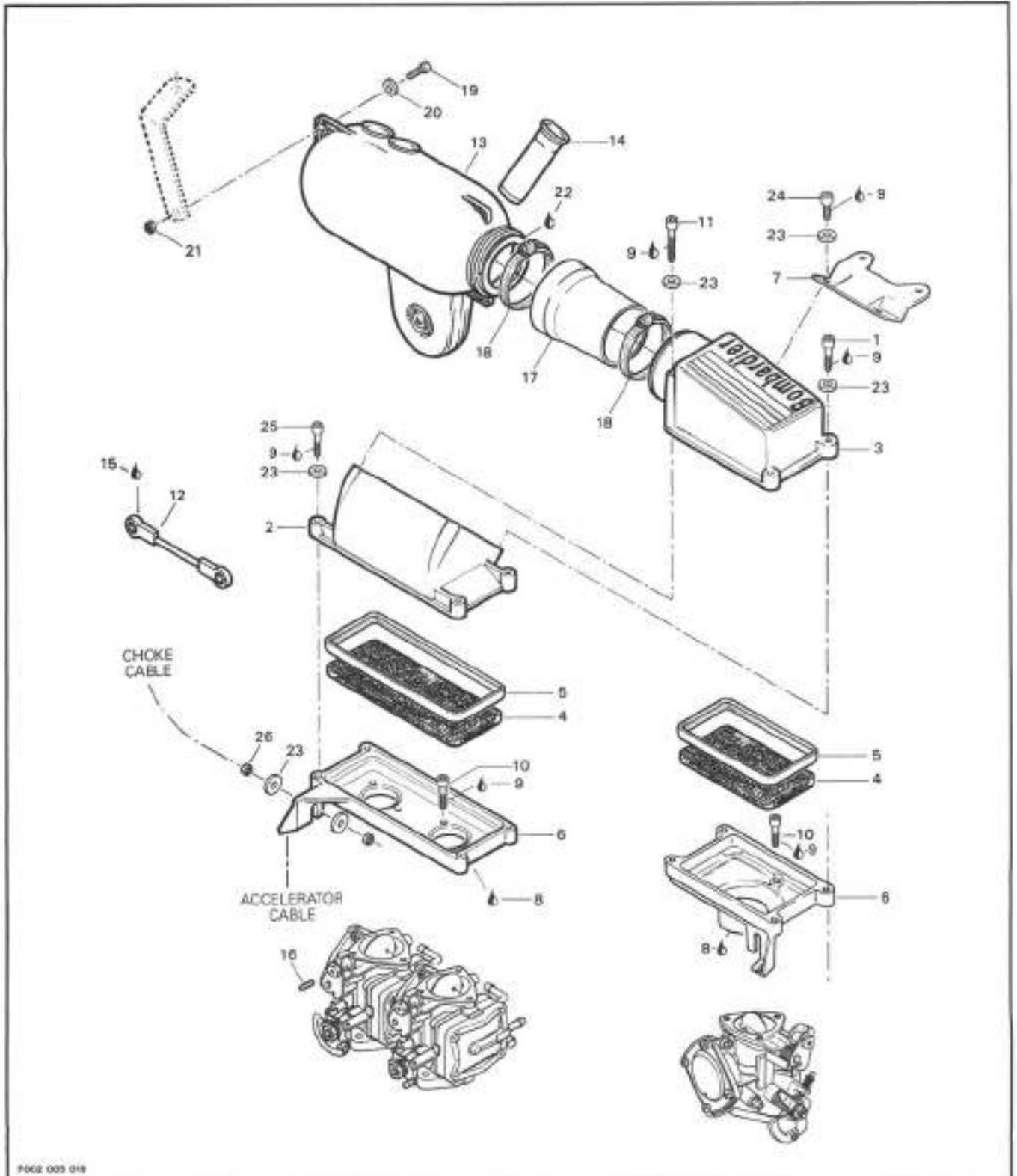
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Section 05 FUEL SYSTEM

Sub-Section 01 (FUEL CIRCUIT)

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 (5850) only
 9. Valve gasket
 10. Fuel sensor XP (5850) only
 11. Hose 6 mm
 12. Fuel sensor adaptor XP (5850) only
 13. Detiker 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. Detiker 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. Filter neck hose
 31. Gasket
 32. Filter neck
 33. Chain
 34. Cylindrical Phillips screw M3.9 x 9.5
 35. Gasket
 36. Hexagonal screw M5 x 25 XP (5850) only
 37. Flat washer M5 XP (5850) only
 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 rap mount (6)
 46. Washer
 47. "Tee" fitting
 48. Pick up tube (2)
 49. Detiker clamp
 50. Inner filter neck hose
 51. Washer (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
-

AIR INTAKE



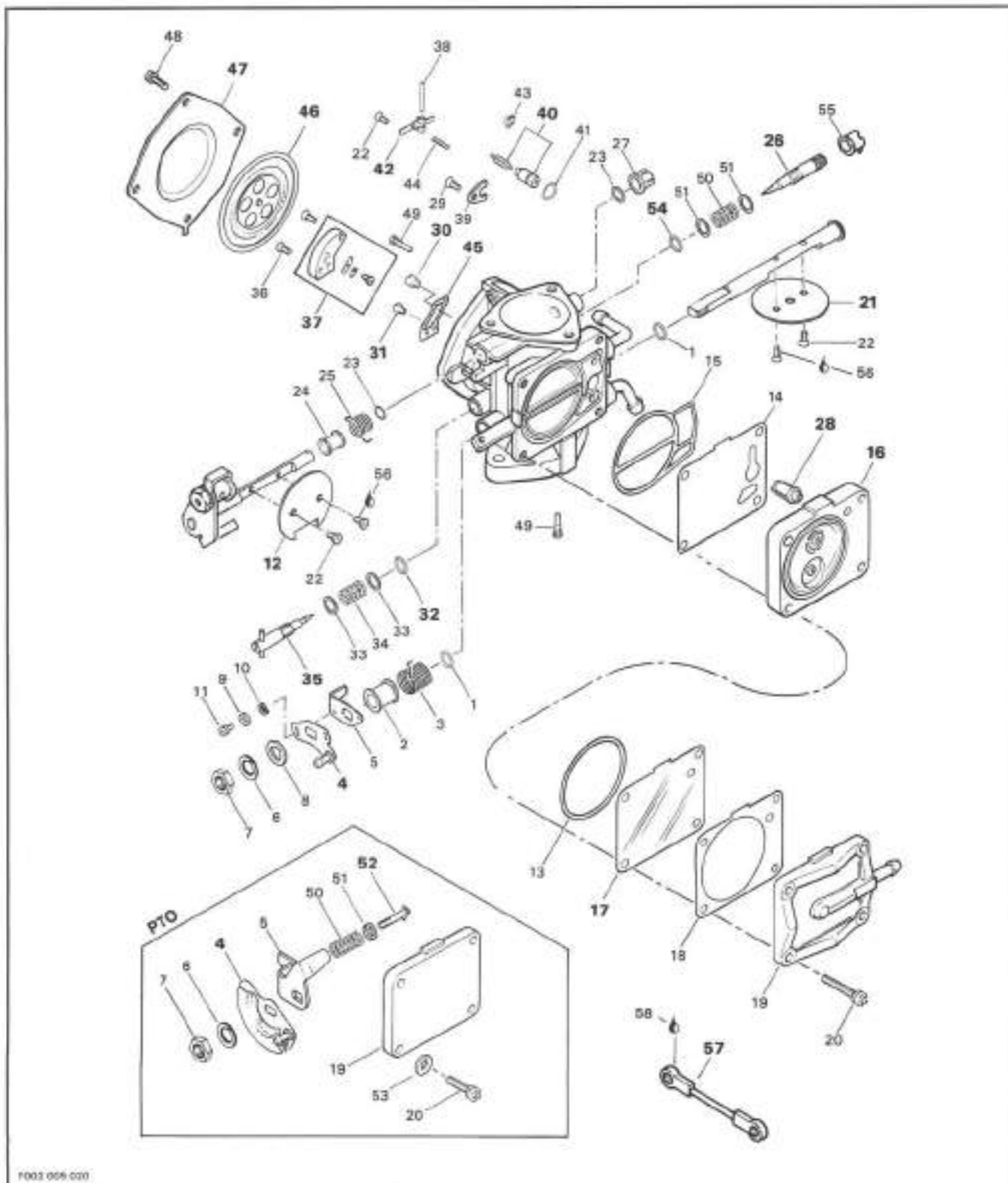
Section 05 FUEL SYSTEM

Sub-Section 02 (AIR INTAKE)

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 silencer
 14. Inlet tube (2)
 15. Synthetic grease
 16. Screw M4 x 8
 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 (5804) (4)
 26. Nut M6 (2)
-

CARBURETORS



FD03 056 020

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

CLEANING

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

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

40, Needle Valve

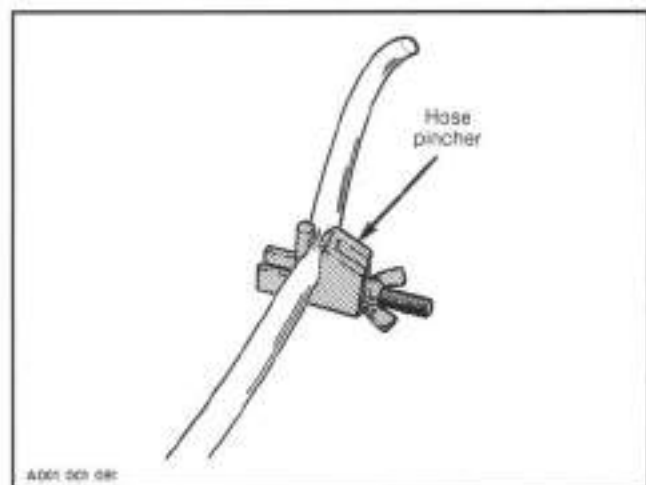
Inspect needle valve tip for a grooved condition. If worn, needle and seat must be replaced as a matched set.

35, Low-Speed Mixture Screw

Check tip for a grooved condition. Replace if necessary.

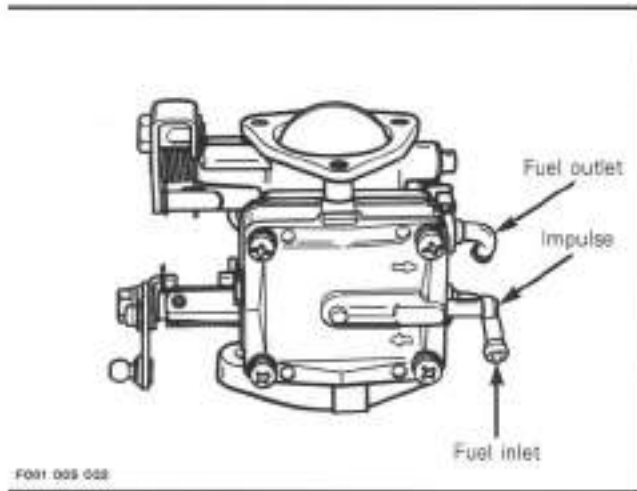
PUMP VERIFICATION

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



Disconnect fuel outlet line.

Disconnect impulse line.



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.

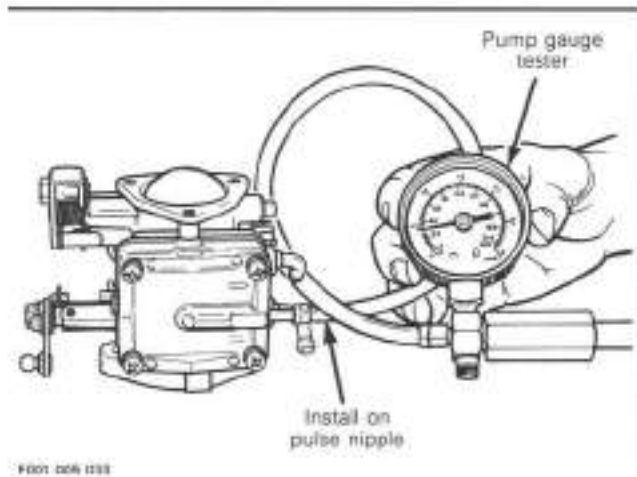
WARNING : Some fuel may be present in fuel pump. Be careful not to swallow fuel when under vacuum.

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 PSII).



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.

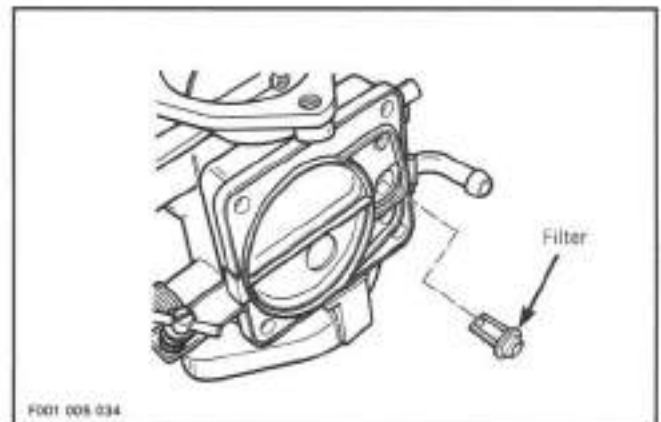
28, Filter

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.

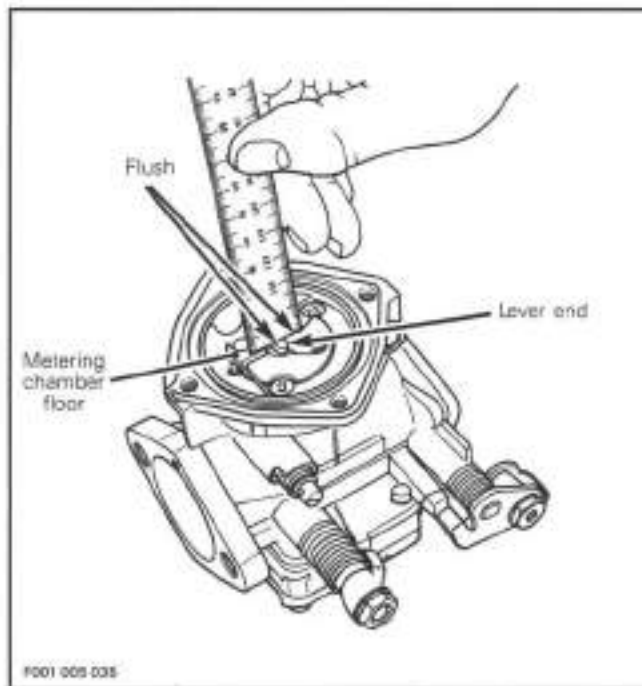
CAUTION : Always apply Loctite 242 (blue) on screw threads prior to installing screws.

42, Needle Valve Lever

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.

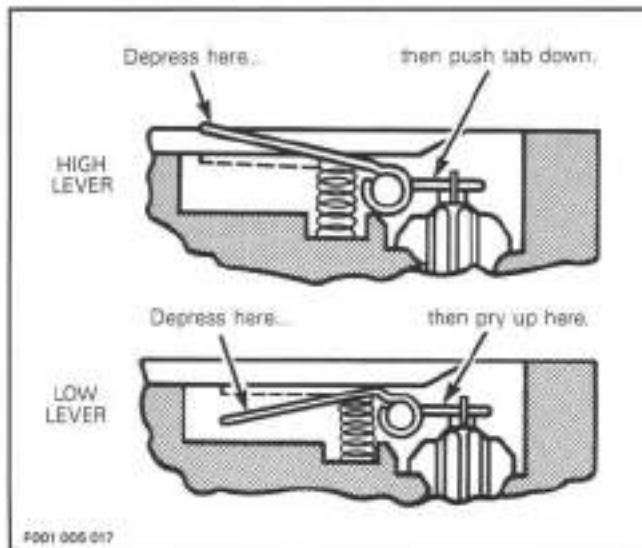
Section 05 FUEL SYSTEM

Sub-Section 03 (CARBURETORS)



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

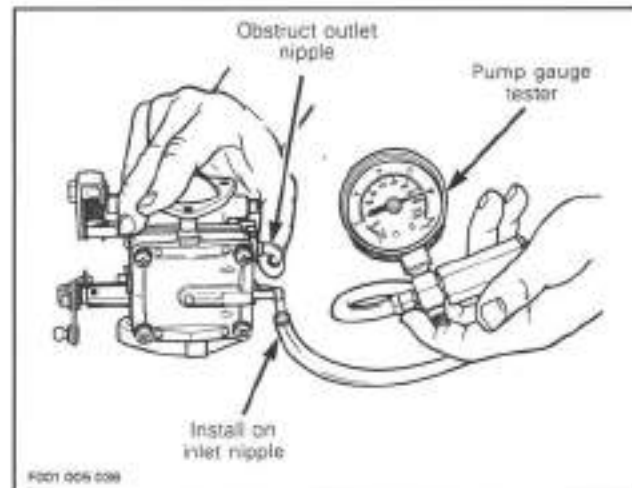
▼ **CAUTION:** When adjusting lever, do not pry it so that it applies pressure on needle. This could damage valve seat/needle.



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 150-170 kPa (21-25 PSI), pressure will drop to approximately 97-110 kPa (14-16 PSI) then stop.



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 PS) for 30 seconds. Otherwise, hold carburetor upside down pour oil over needle valve and apply pressure.

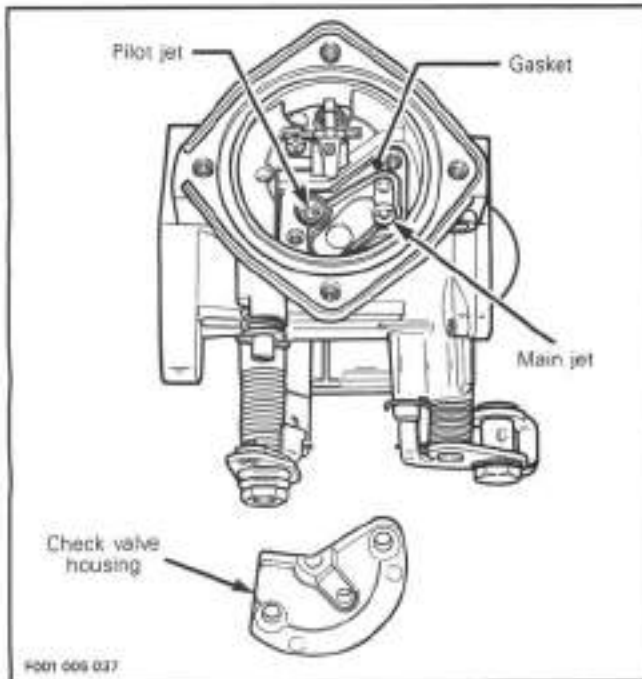
Check for bubbles. If they come from seat O-ring, bubbles will exit around seat. Retighten as necessary.

If it still leaks remove needle and seat and replace O-ring. If bubbles come from needle, replace needle and seat.

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.

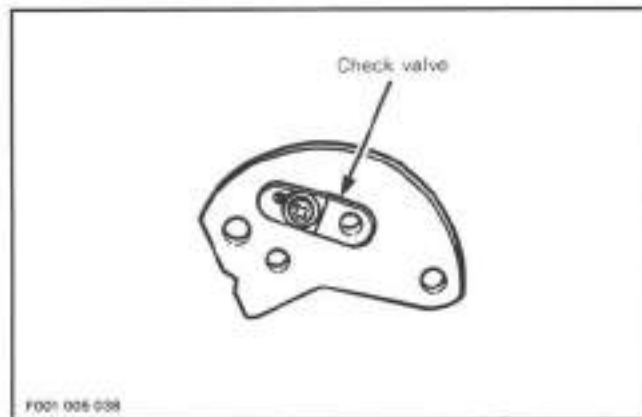
NOTE : To have access to pilot jet or main jet, check valve housing must be removed.



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.

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.

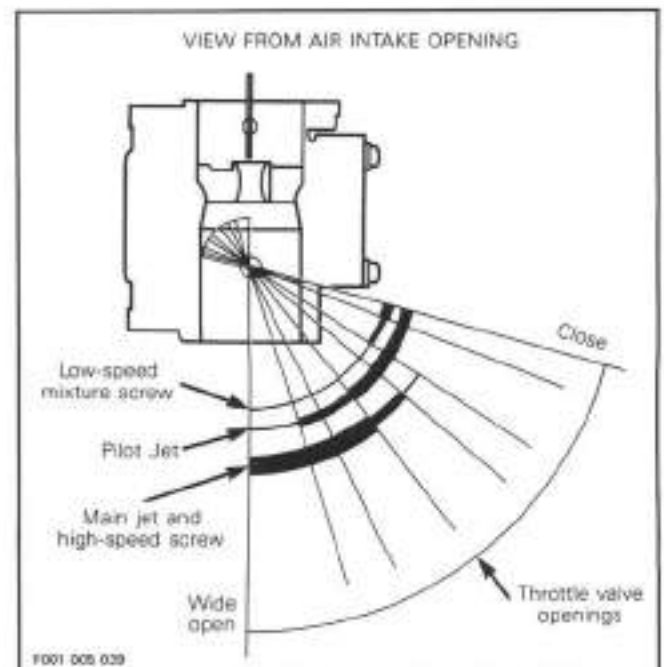
Refer to fuel system pressurization.

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.



Section 05 FUEL SYSTEM

Sub-Section 03 (CARBURETORS)

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.

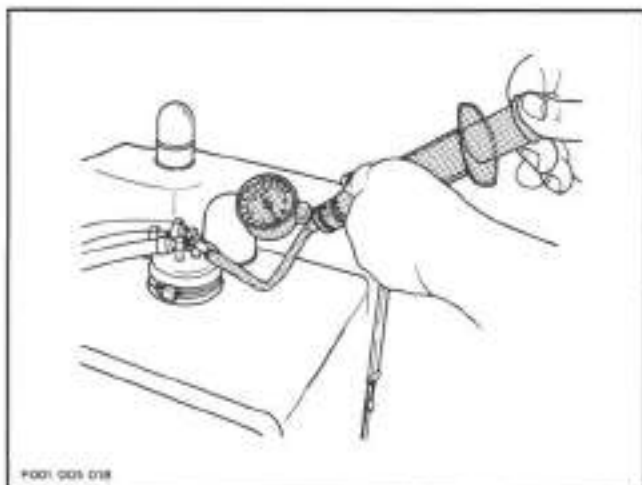
▼ **CAUTION** : Ensure to verify fuel line ends for damage. Always cut damaged end before reinstallation.

Pressure Test

Proceed as follows :

- Open storage compartment cover and remove basket.
- Remove vent hose from tube at adapter.
- Connect pump gauge tester (P/N 295 000 085) to tube adapter.
- 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.

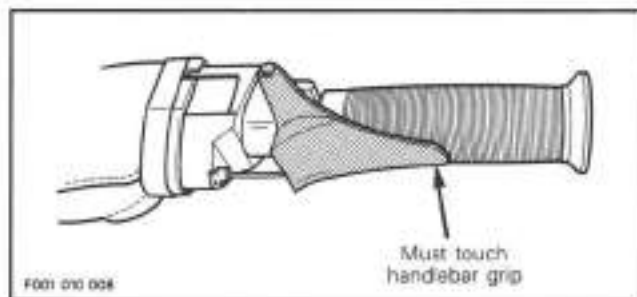
ADJUSTMENTS

Throttle Cable

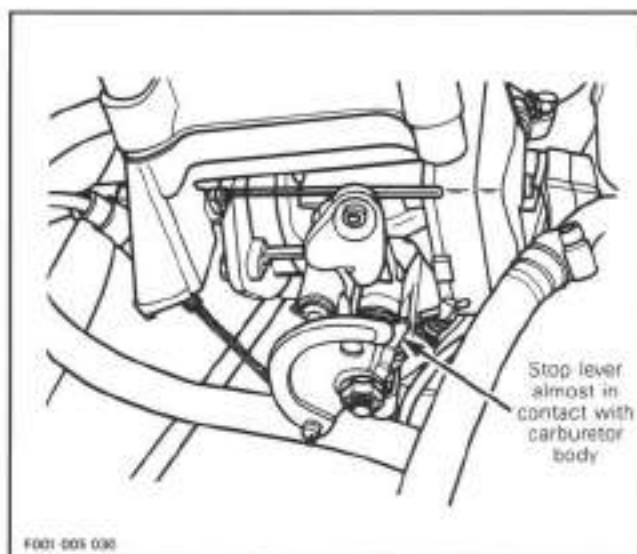
▼ **CAUTION** : Make sure engine is turned off before adjusting throttle cable.

Lubricate cable with SEA-DOO LUBE.

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

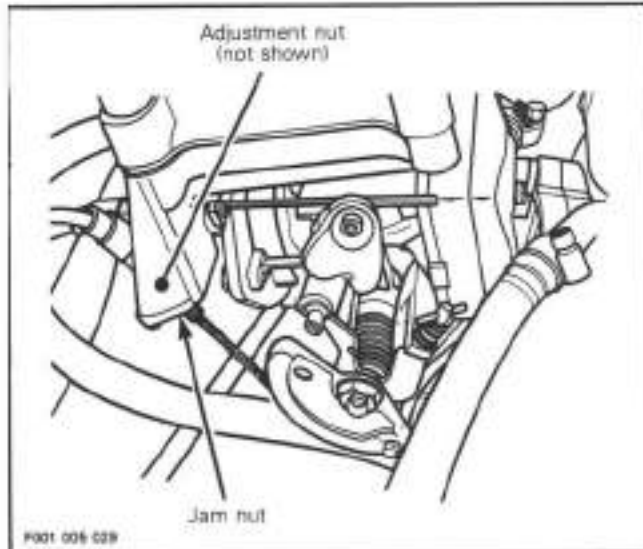


Ensure carburetor butterfly are fully open at full throttle position. At this position throttle stop lever is almost in contact (0.5 mm (1/64 in)) with carburetor body.



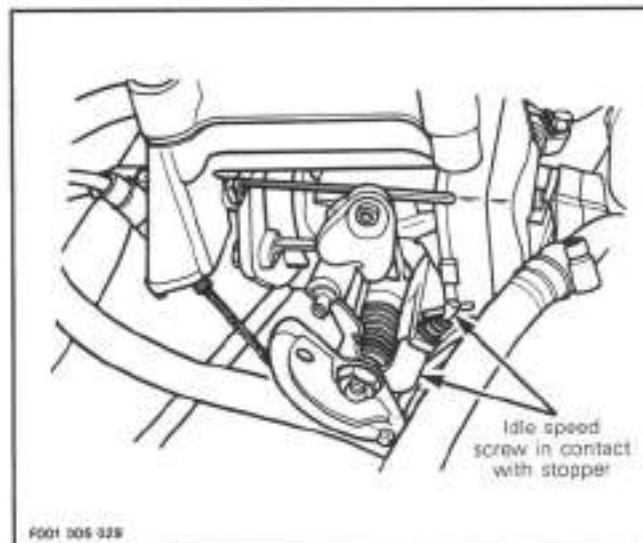
▼ **CAUTION** : Improper cable full throttle adjustment will cause strain on cable and/or damage cable bracket or throttle lever at handlebar.

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



Tighten jam nut and recheck adjustment.

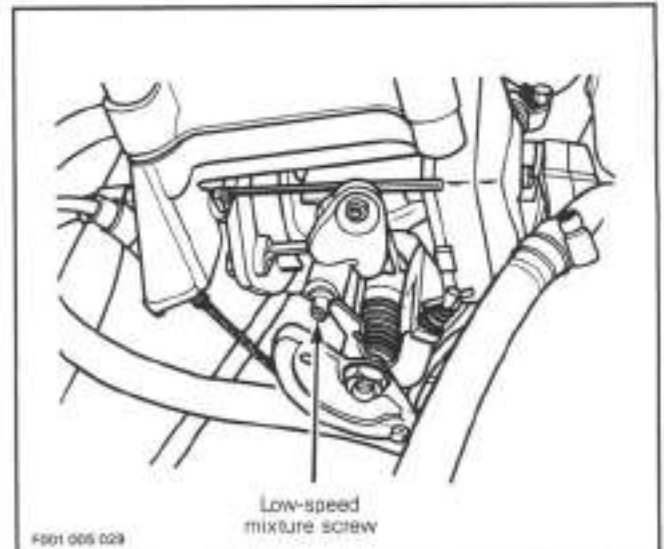
◆ **WARNING** : Make sure idle speed screw contacts stopper when throttle lever is fully released at handlebar.



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 1-1/2 to 2 turns.

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.

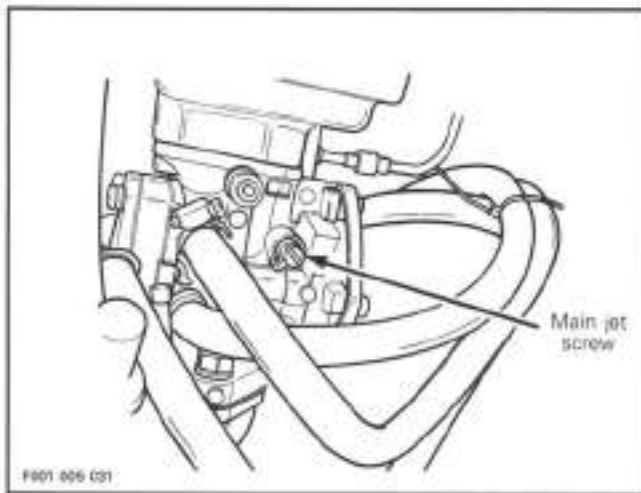
26, Main Jet Screw

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.

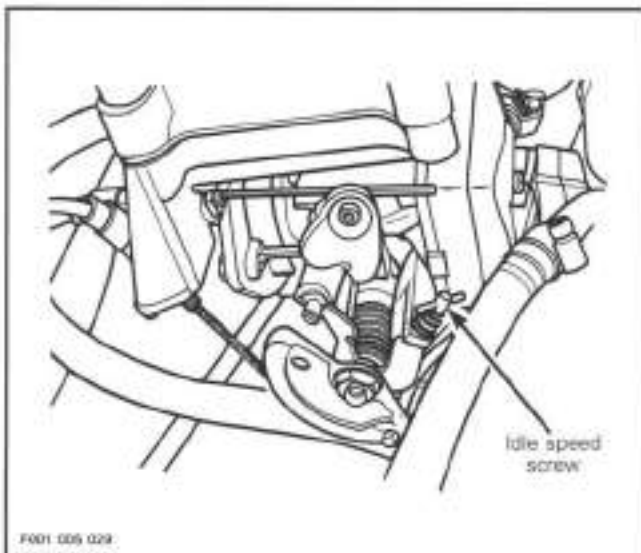
Section 05 FUEL SYSTEM

Sub-Section 03 (CARBURETORS)



▼ **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.

▼ **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.

TWIN CARBURETORS

REMOVAL FROM ENGINE

To remove carburetors from engine, proceed as follows :

Air Intake and Fuel Systems

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 carburetor 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.

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.

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

○ **NOTE :** To avoid oil spillage, block oil fitting with a plastic cap.

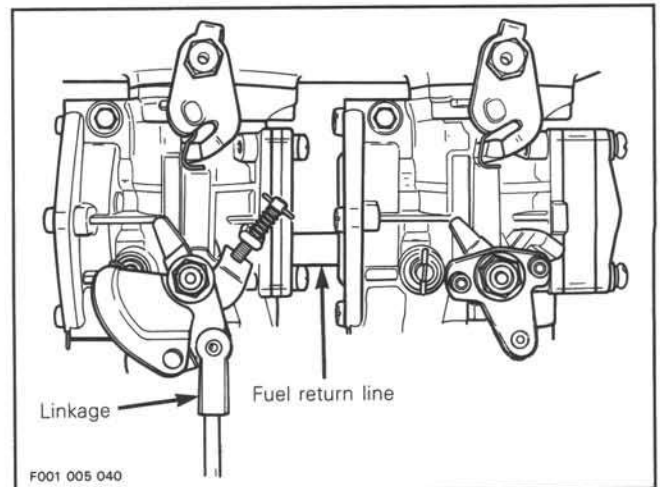
Remove four bolts, lock washers from rotary valve cover then move carburetors and rotary valve cover together on top of engine.

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

DISASSEMBLY

57, Carburetor Linkage

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

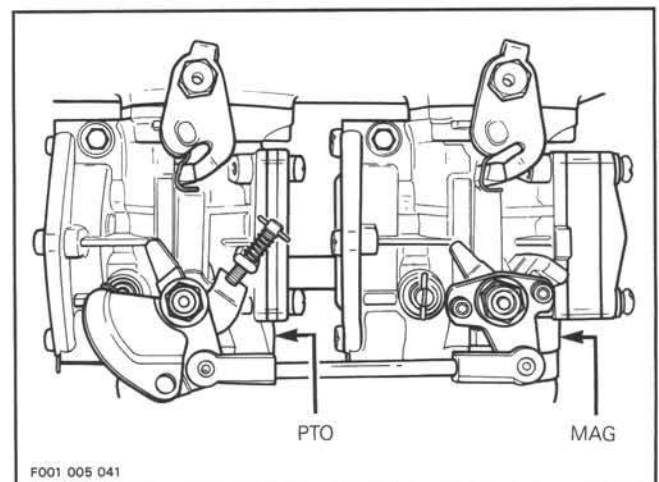


ASSEMBLY

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.



Section 05 FUEL SYSTEM

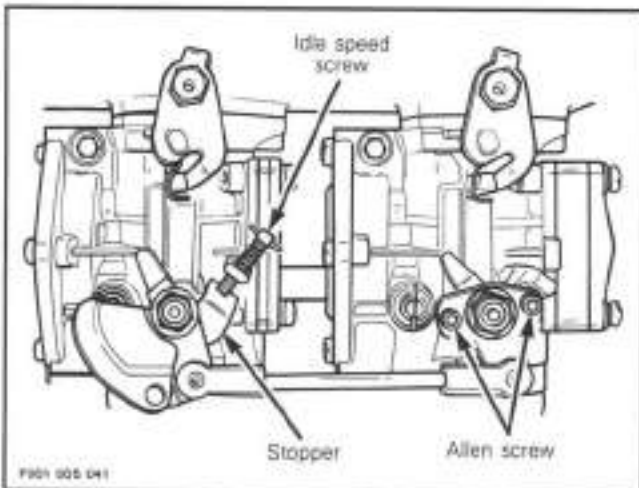
Sub-Section 01 (CARBURETORS)

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.

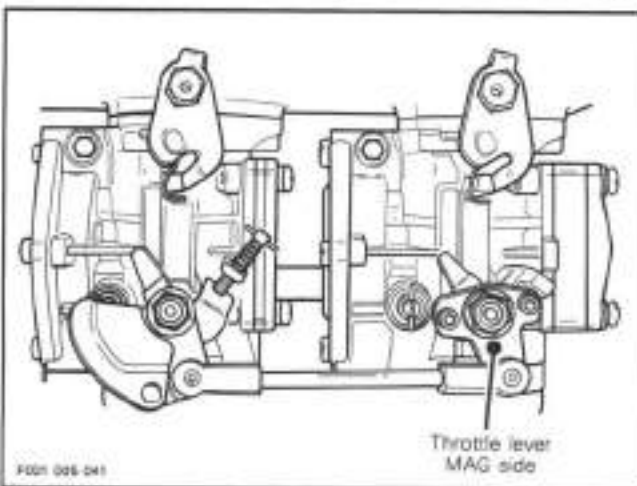
○ **NOTE** : Ensure throttle lever is released. Paint could possibly hold lever.



○ **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.



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 0.8 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.

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.

Flame Arrester

Always verify if flame arrester is dirty or restricted.

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

ADJUSTMENTS

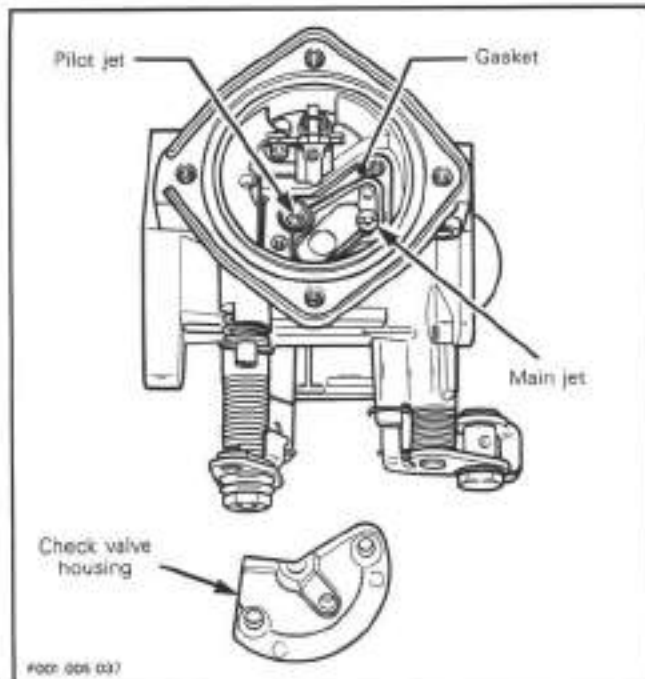
30,31, Main Jet and Pilot Jet

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.

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

Section 05 FUEL SYSTEM
Sub-Section 03 (CARBURETORS)



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

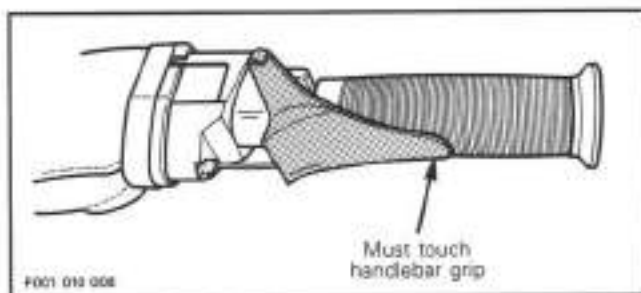
To adjust, loosen jam nut then turn adjustment nut as necessary.

Throttle Cable

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

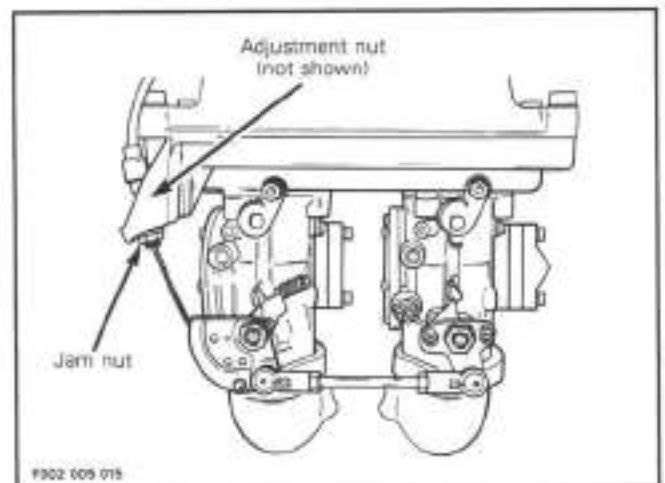
Lubricate cable with SEA-DOO LUBE.

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.



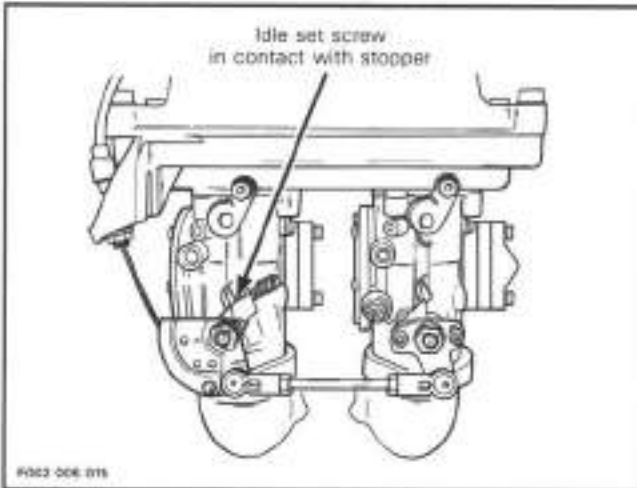
Tighten jam nut and recheck adjustment.

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

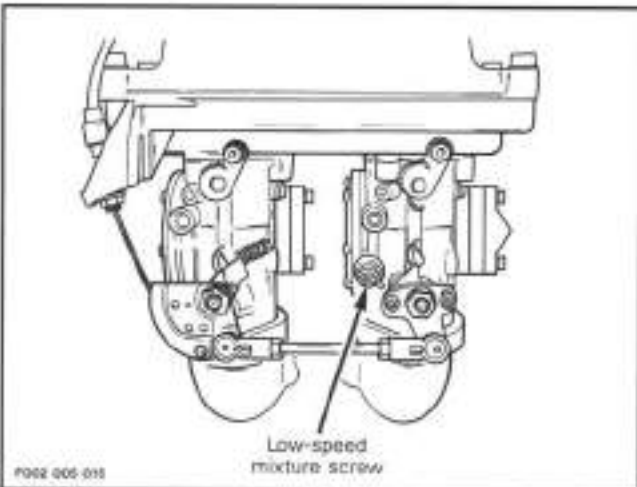
Section 05 FUEL SYSTEM

Sub-Section 03 (CARBURETORS)

○ 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.

Start and warm engine.

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

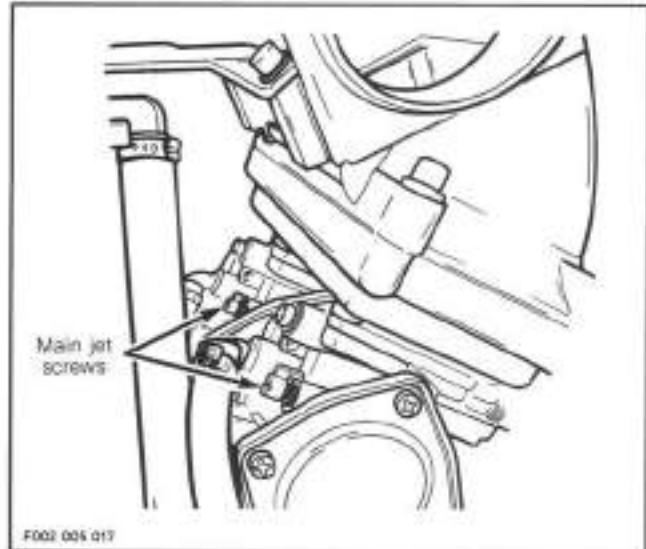
Turning screw clockwise leans mixture and turning screw counterclockwise enrichens mixture.

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

26, Main Jet Screw

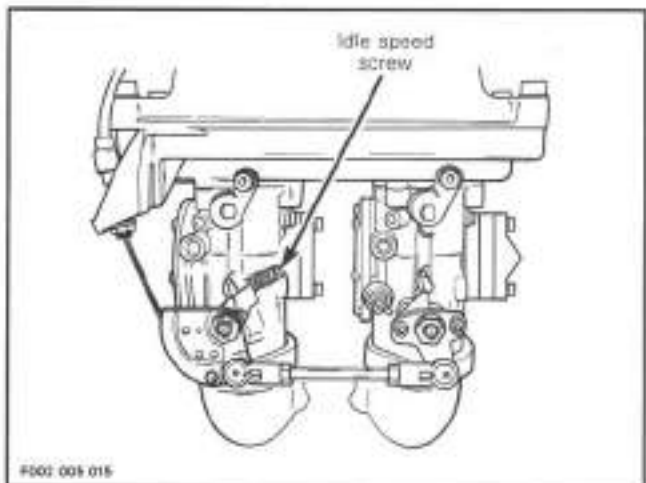
The main jet screw is sealed with a plastic cap that allows an adjustment of 1/4 turn.

○ 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.

Start engine and bring to normal operating temperature.

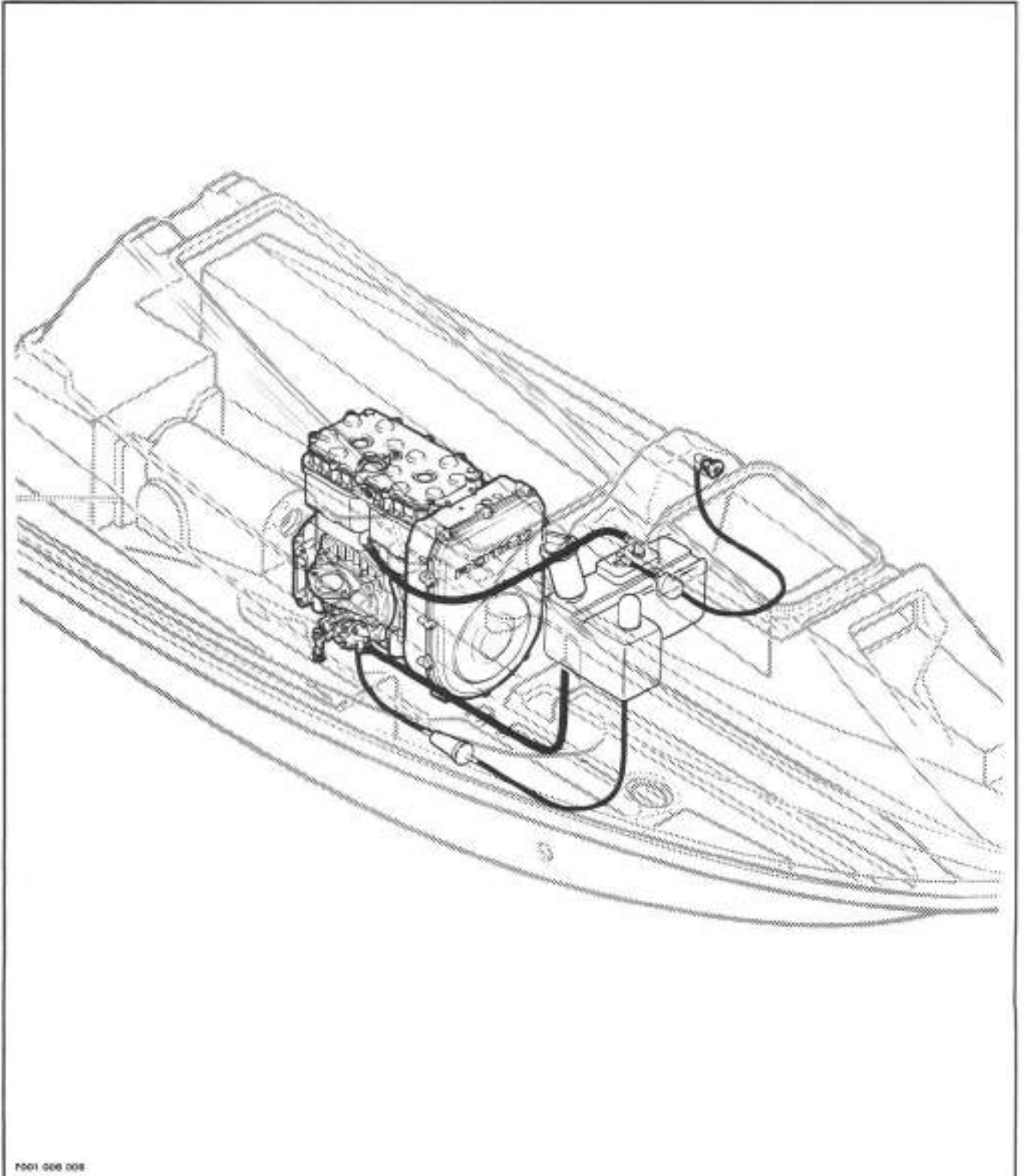
▼ **CAUTION** : Water must be supplied to cool engine with flush kit (P/N 295 000 038).

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.

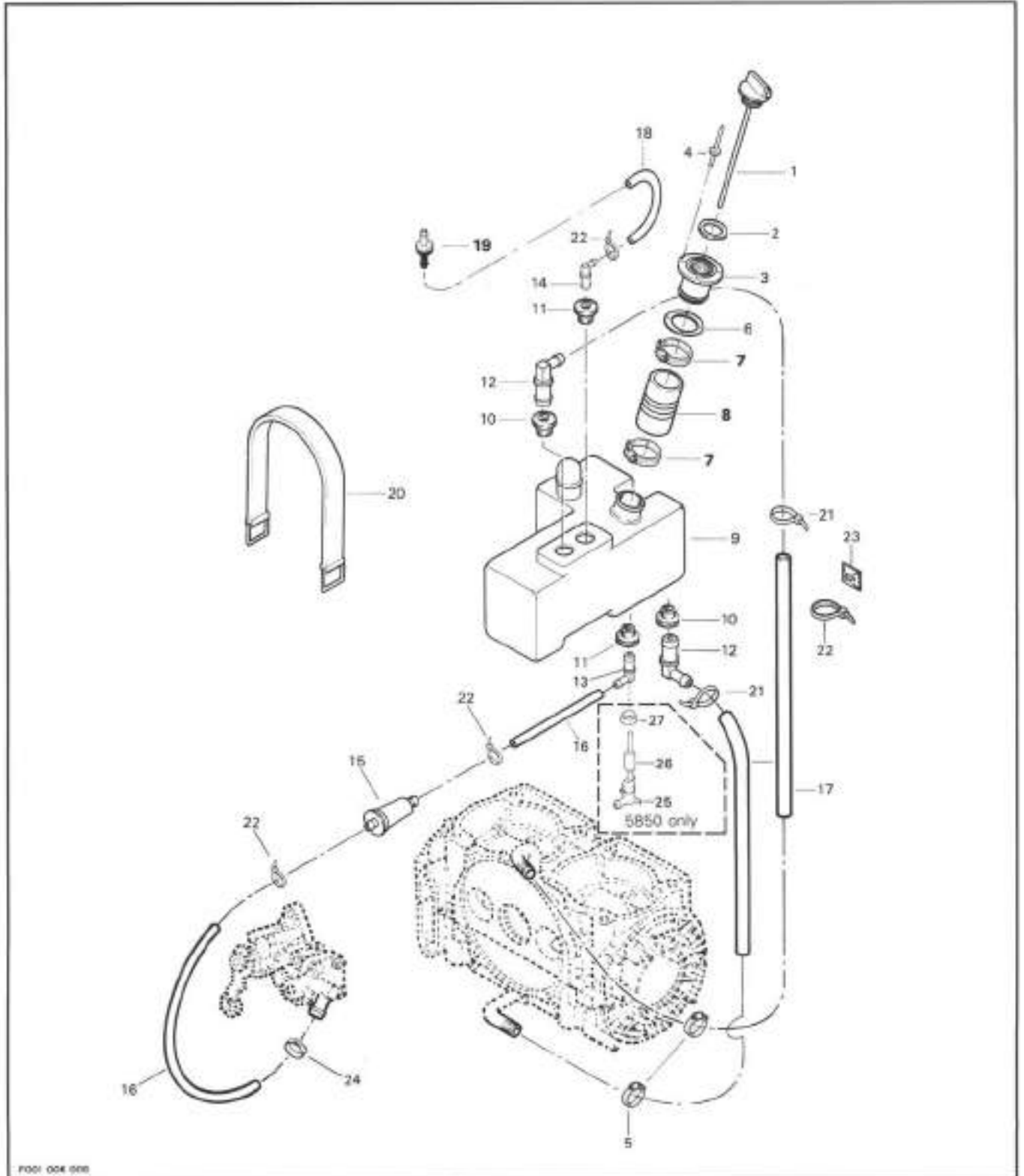
▼ **CAUTION** : Oil injection pump adjustment must be checked each time carburetors are adjusted. Improper oil pump adjustment can cause severe engine damage.

OIL SYSTEM



P001 000 008

OIL INJECTION RESERVOIR



FD001 004 000

Section 06 OIL SYSTEM

Sub-Section 01 (OIL INJECTION RESERVOIR)

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. Grammet (2) | 24. Oetiker clamp |
| 11. Grammet (2) | 25. Oil level sender 5850 only |
| 12. Elbow fitting (2) | 26. Float 5850 only |
| 13. Elbow fitting | 27. Grammet 5850 only |
| 14. Elbow fitting | |
-

GENERAL

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

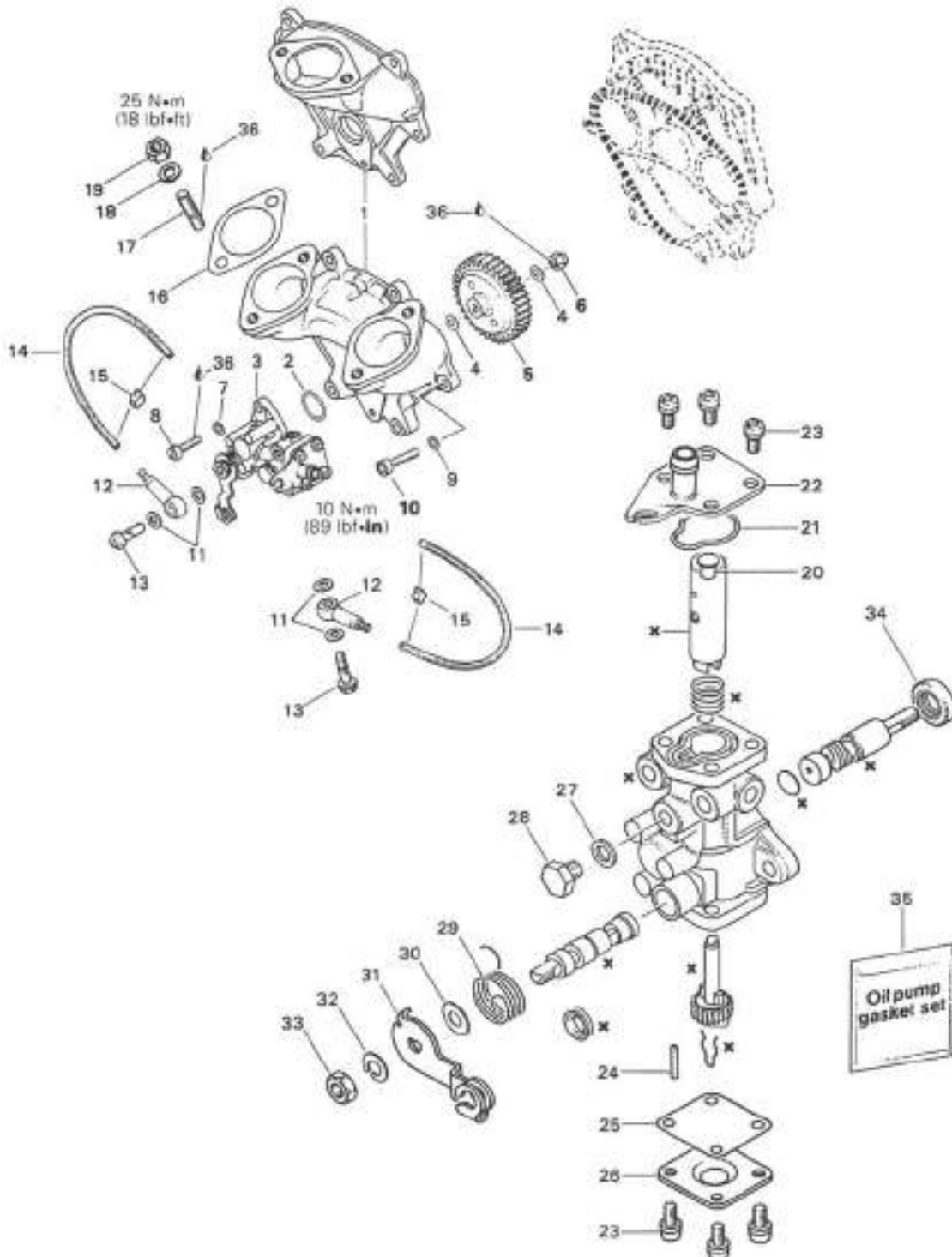
7,8, Clamp and Hose

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.

OIL INJECTION PUMP, REPAIR AND ADJUSTMENT



Section 06 OIL SYSTEM

Sub-Section 02 (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. Cylindrical slotted 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 M6 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"

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

CLEANING

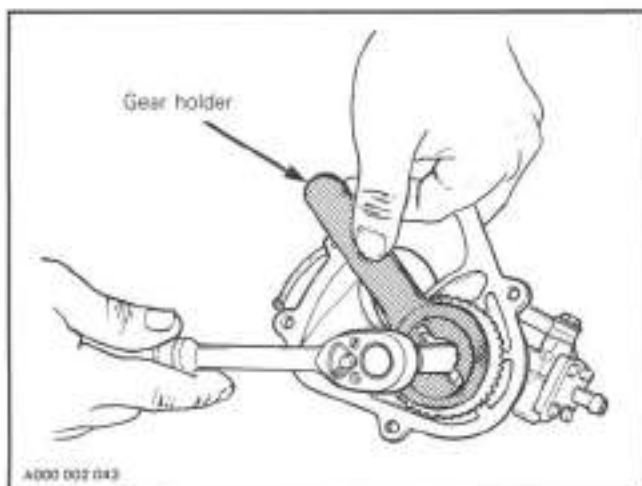
Discard all seals and O-rings. Clean metal components in a solvent.

DISASSEMBLY

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

5,6, Oil Pump Gear and Lock Nut

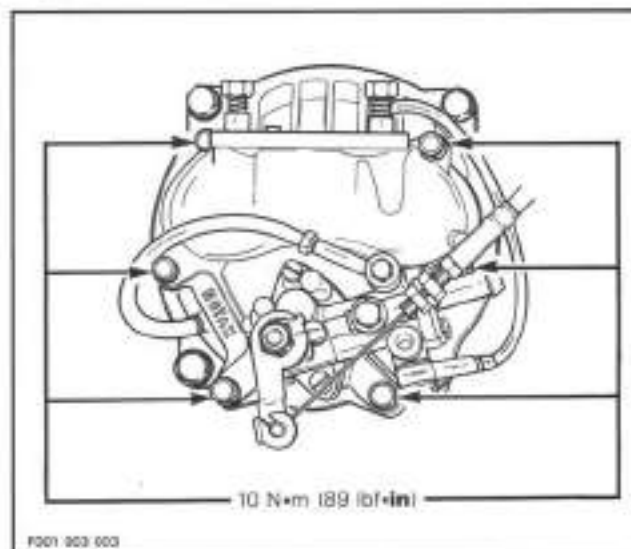
To remove retaining nut, lock gear using gear holder (P/N 290 277 905).



ASSEMBLY

10, Screw

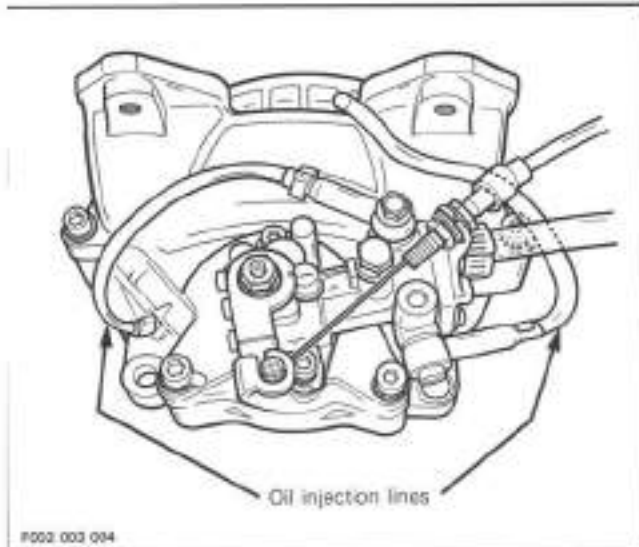
Torque to 10 N•m (89 lbf•in).



Section 06 OIL SYSTEM

Sub-Section 02 (REPAIR AND ADJUSTMENT)

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



ADJUSTMENTS

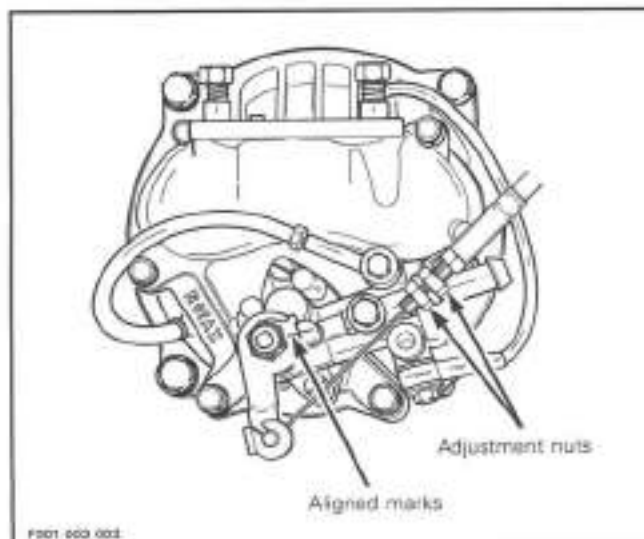
Synchronization

▼ **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 nuts to obtain pump mark alignment.



Tighten adjustment nuts and recheck alignment marks.

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

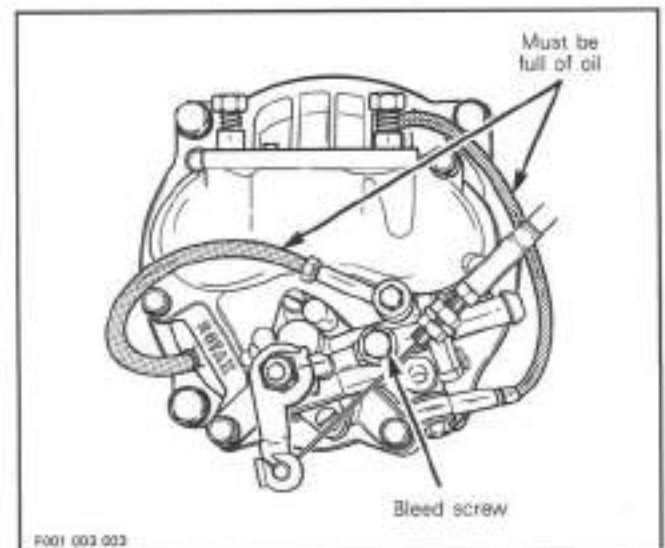
Bleeding

▼ **CAUTION:** Oil injection system must be bled and 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).

Section 06 OIL SYSTEM

Sub-Section 02 (REPAIR AND ADJUSTMENT)

CHECKING OPERATION

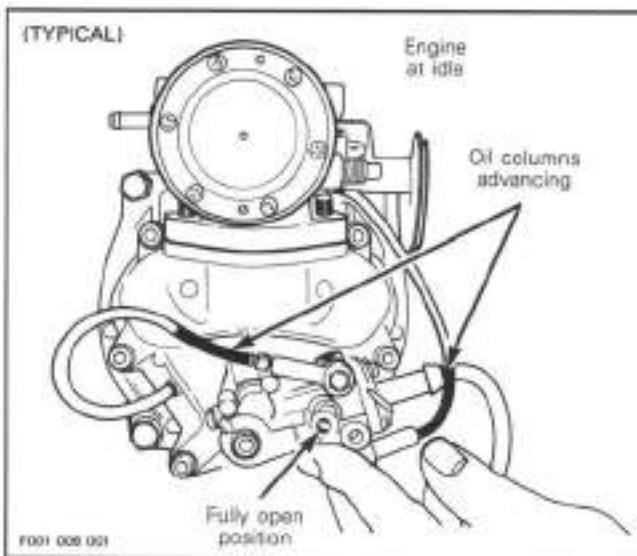
On Watercraft

○ **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.

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

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



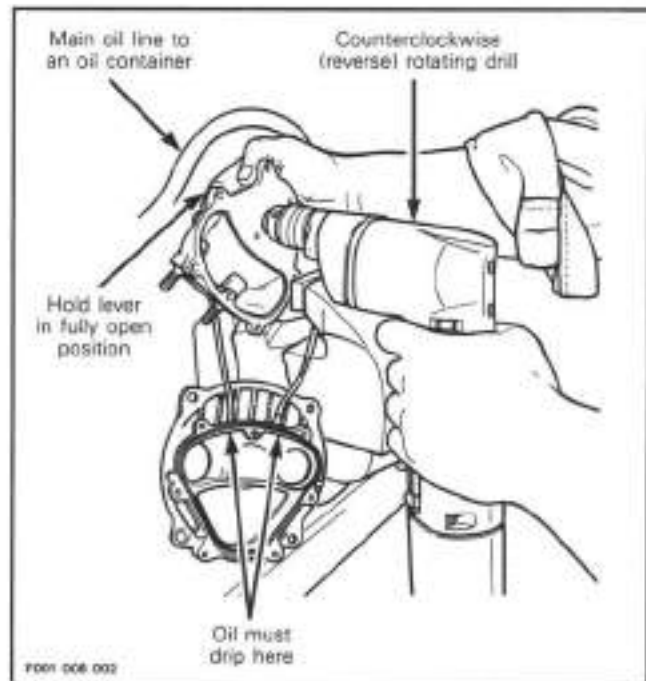
If not remove pump assembly and check the pump gear and drive shaft (if applicable) for defects; replace as necessary. Test pump as describes below :

○ **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.

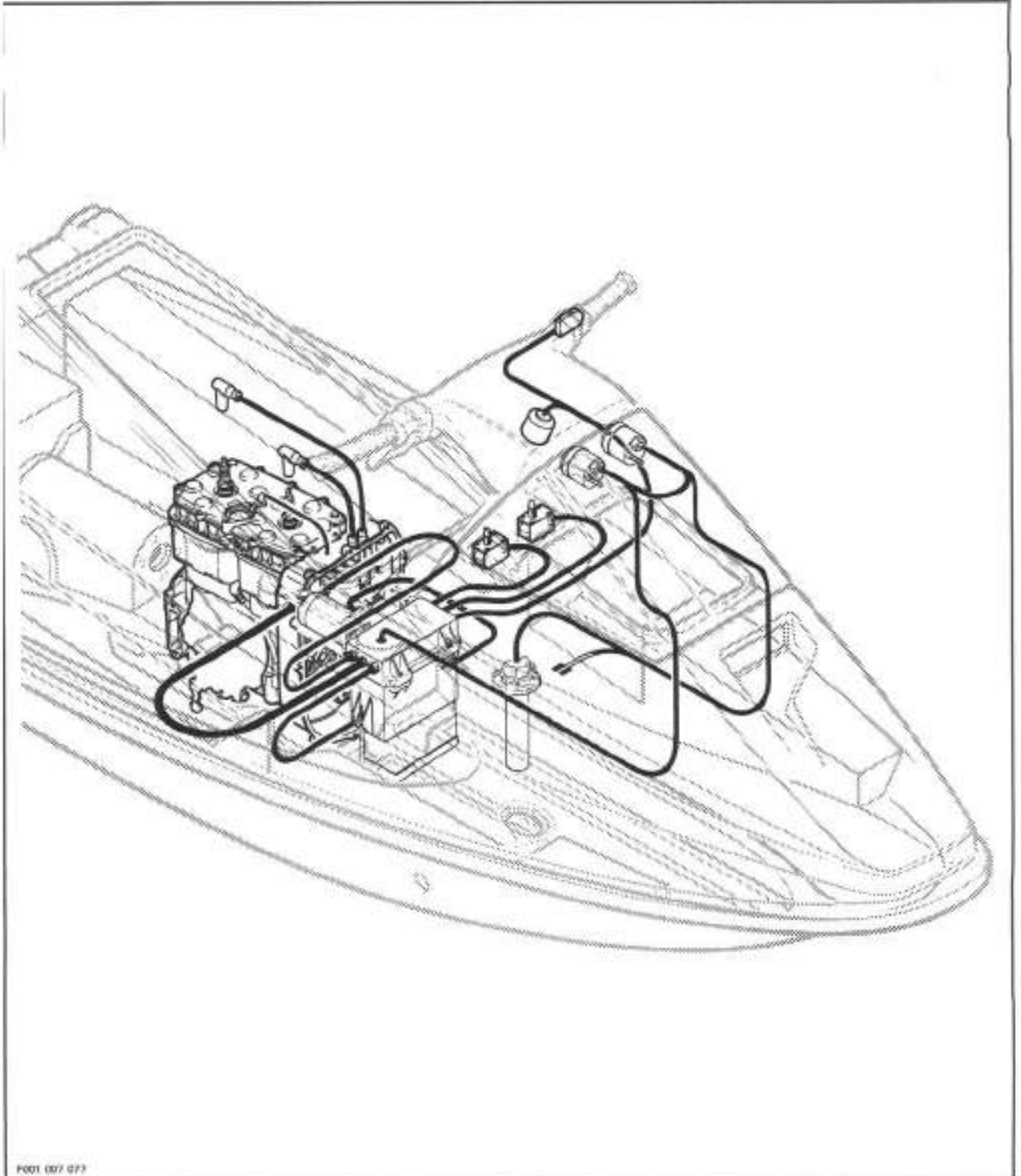
Bench Test

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



F001 007 077

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.

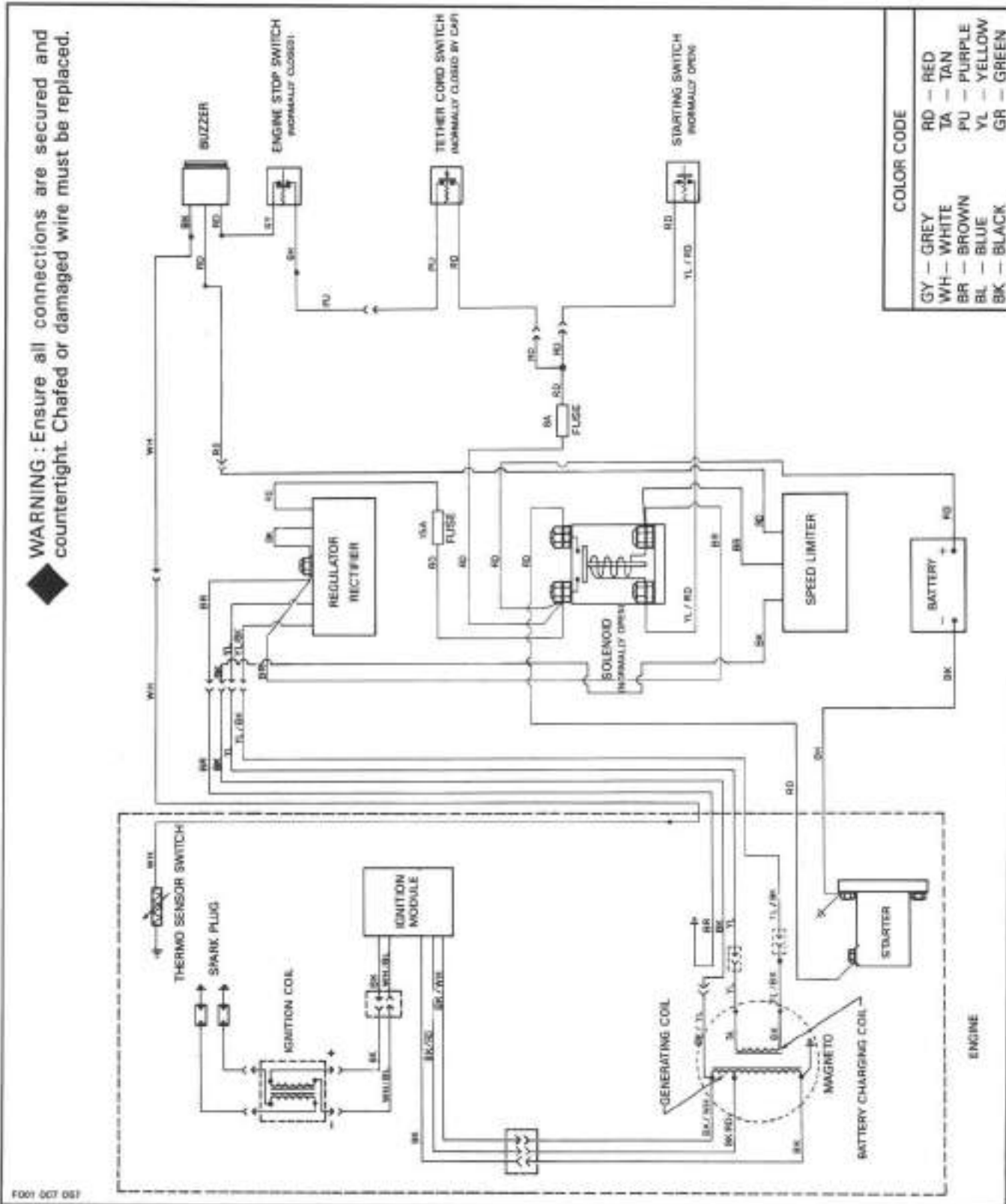
WIRE TERMINAL REMOVAL

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

Section 07 ELECTRICAL

Sub-Section 01 (WIRING DIAGRAM)

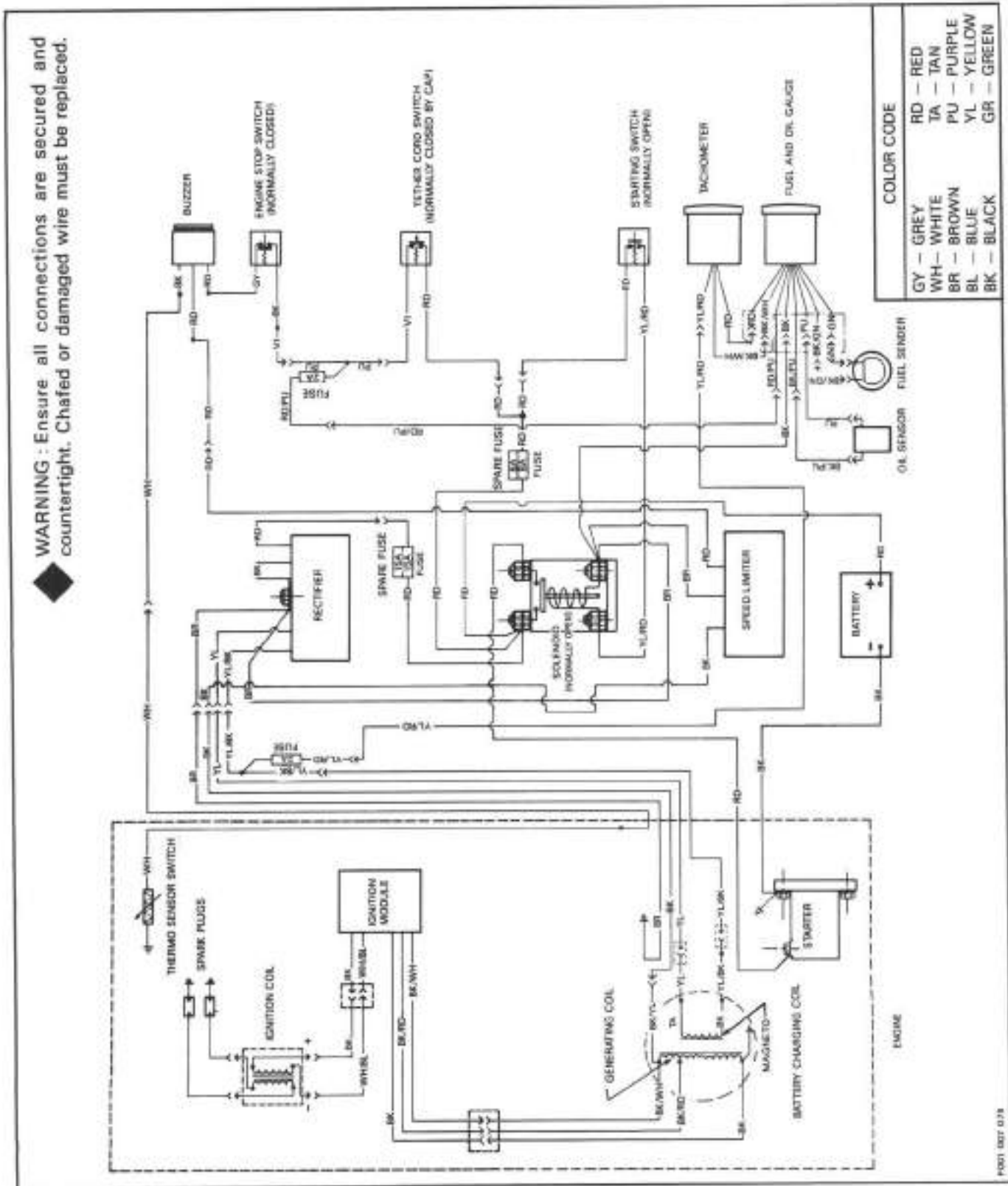
WIRING DIAGRAM FOR 5804 AND 5811 MODELS



Section 07 ELECTRICAL
 Sub-Section 01 (WIRING DIAGRAM)

WIRING DIAGRAM FOR 5850 MODEL

WARNING: Ensure all connections are secured and countertight. Chafed or damaged wire must be replaced.



IGNITION TIMING

ELECTRONIC IGNITION SYSTEM

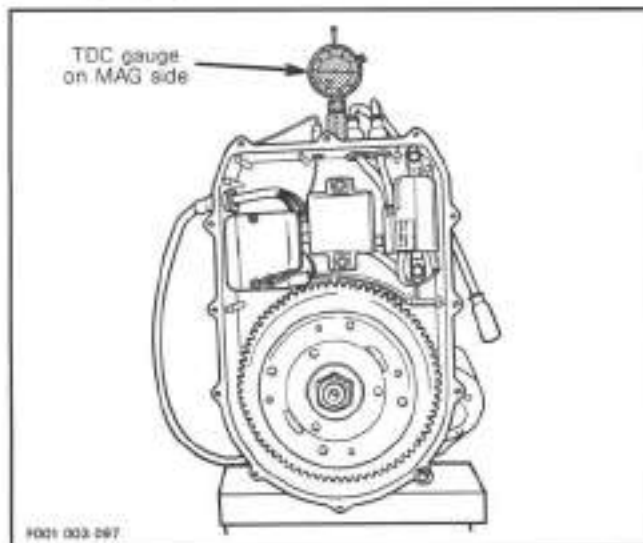
This section is mainly divided in two parts, the first one using a top dead center gauge to verify flywheel timing mark position. The second one using a stroboscopic timing light to check ignition timing.

Flywheel timing mark position verification is required to:

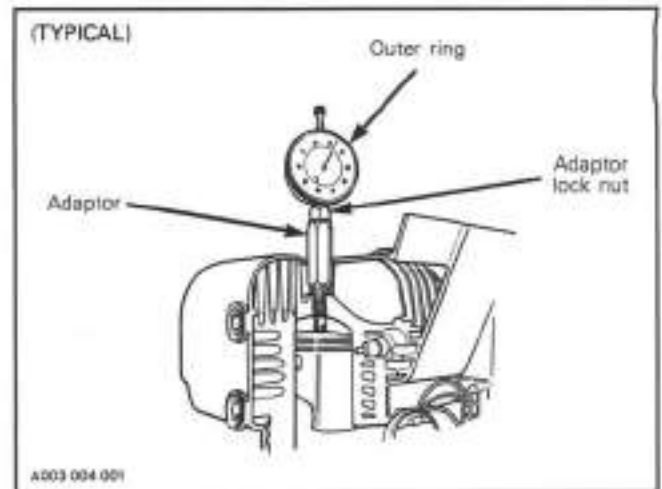
1. Troubleshoot a missing or broken flywheel woodruff key.
 2. Troubleshoot a flywheel corresponding to a different engine type.
 3. Scribe the timing mark on a new service flywheel.
- Always verify flywheel timing mark position before checking ignition timing.

Verifying Flywheel Timing Mark Position

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



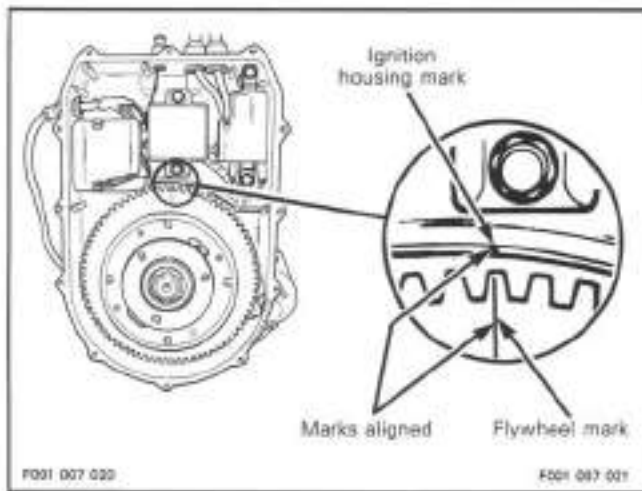
Rotate MAG flywheel clockwise (when facing it) until piston is just before top dead center.



- Loosen adaptor lock nut then holding gauge with dial facing toward magneto, screw adaptor in spark plug hole.
 - Slide gauge far enough into adaptor to obtain a reading then finger tighten adaptor lock nut.
 - Rotate MAG flywheel clockwise until piston is at Top Dead Center.
 - Unlock outer ring of dial and turn it until 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 clockwise to reach 2.18 mm (.086 in) BTDC (Before Top Dead Center).
 6. Check if flywheel mark aligns with mark on ignition housing.

Section 07 ELECTRICAL

Sub-Section 02 (IGNITION TIMING)



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

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

Checking Ignition Timing

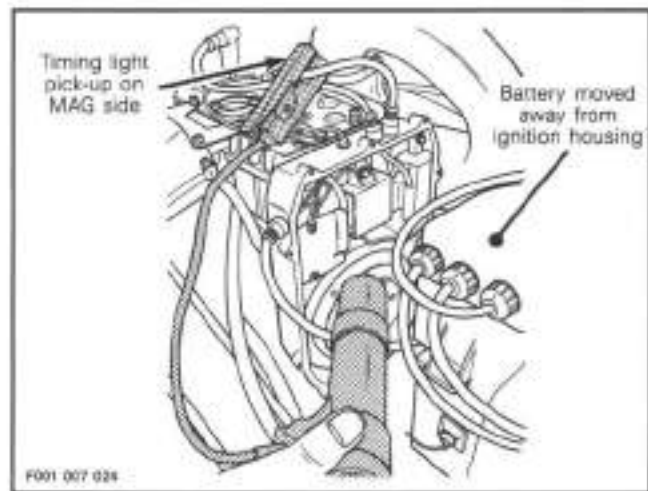
○ **NOTE:** To perform this procedure it is recommended to use a stroboscopic timing light rated to work up to 6000 RPM.

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

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

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

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



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

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

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

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

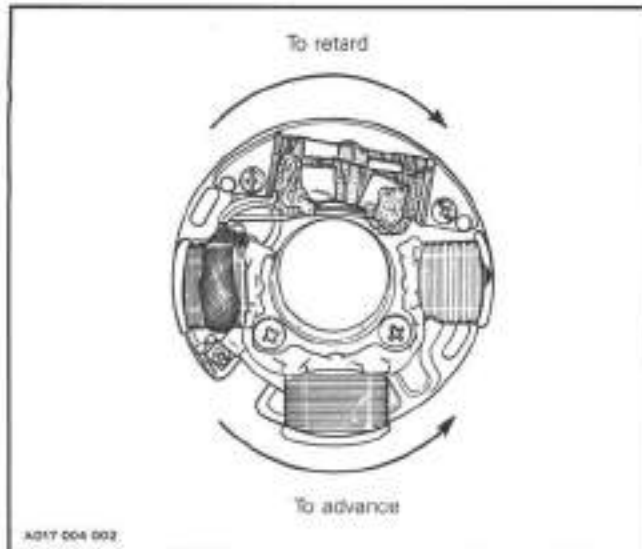
▼ **CAUTION:** If engine is to be run more than a few minutes, connect flush kit (P/N 295 000 038) to properly cool engine.

If timing marks align, timing is correct.

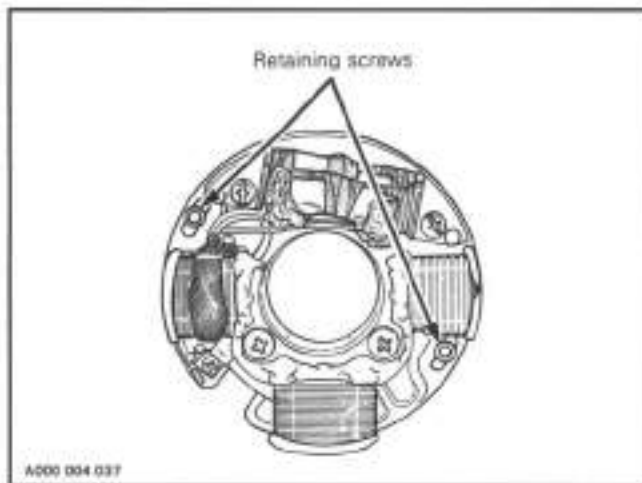
IGNITION TIMING ADJUSTMENT

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

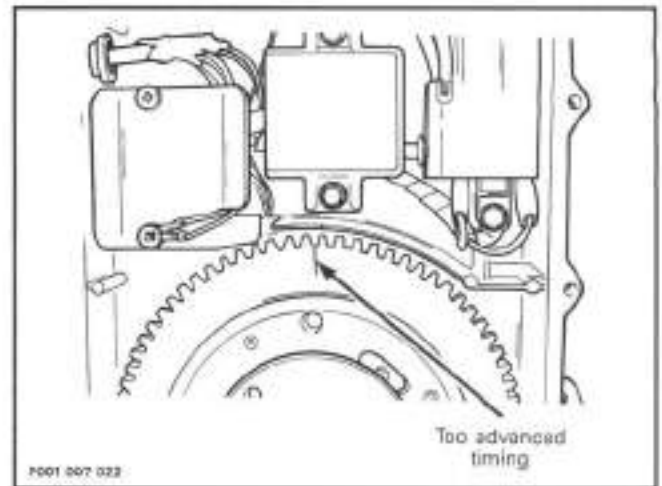
Section 07 ELECTRICAL
Sub-Section 02 (IGNITION TIMING)



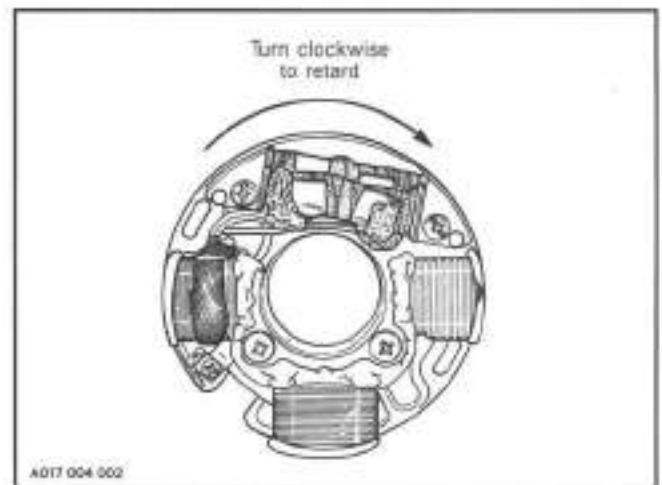
To adjust, loosen both armature plate retaining screws and slightly rotate armature plate in proper direction.



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



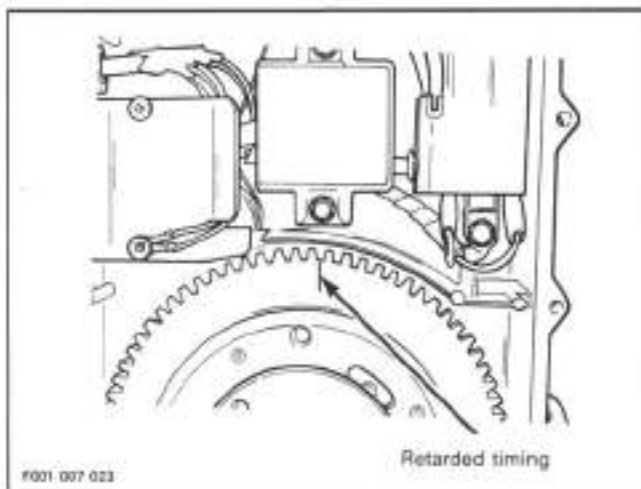
In this case, turn armature plate clockwise.



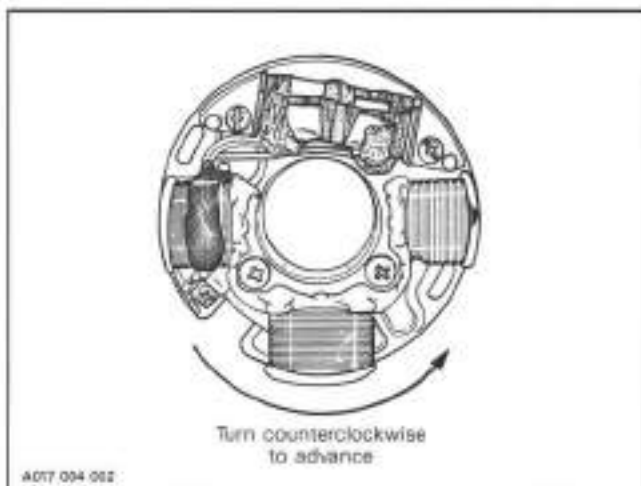
When flywheel mark is on **right** side of ignition housing mark, it indicates **retarded** timing.

Section 07 ELECTRICAL

Sub-Section 02 (IGNITION TIMING)



In this case, turn armature plate 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	First check charging coil. If it is in good condition replace rectifier
	**5. Faulty charging coil	Replace

* To test charging system, disconnect positive cable from battery and connect an ammeter between cable and battery post. Depending on battery charge, current draw will be about 0.5 A with a fully charged battery and 4 A for a discharged one.

** 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.

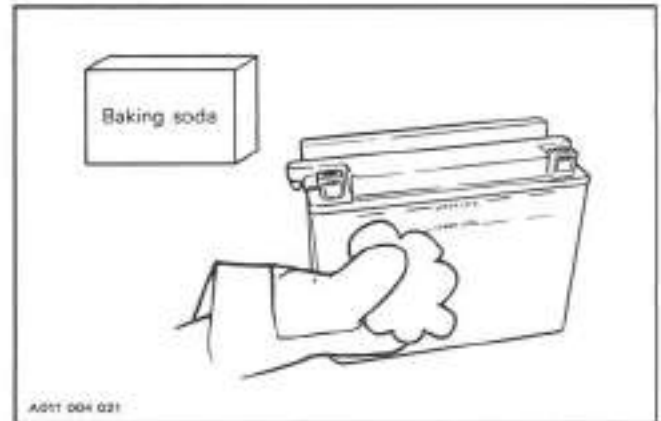
Withdraw battery from vehicle being careful not lean it so that electrolyte flows out of vent tube.

▼ **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.

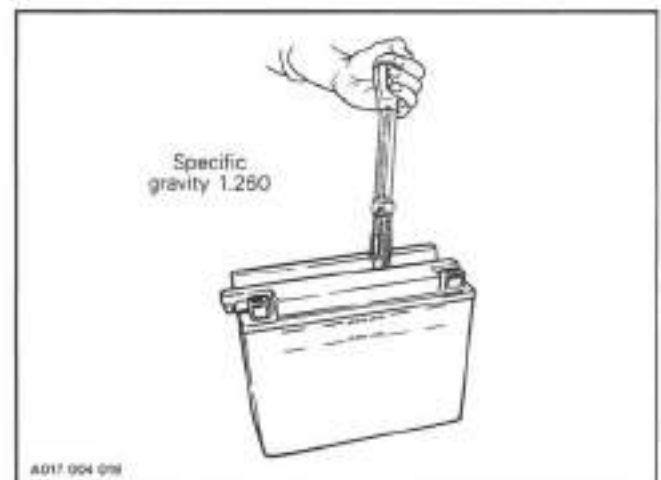
◆ **WARNING :** Should the battery casing be damaged, wear a suitable pair of non-absorbent gloves when removing the battery by hand.

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	
32	90			.004
27	80	correct reading		
21	70	subtract	.004 from the reading	
16	60			.008
10	50			.012
4	40			.016
-1	30			.020
-7	20			.024

EXAMPLE NO. 1

Temperature below 27°C (80°F):
Hydrometer reading : 1.290
Electrolyte temperature : -7°C (20°F)
Subtract .024 Sp. Gr.
Corrected Sp. Gr. is 1.266

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.

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

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

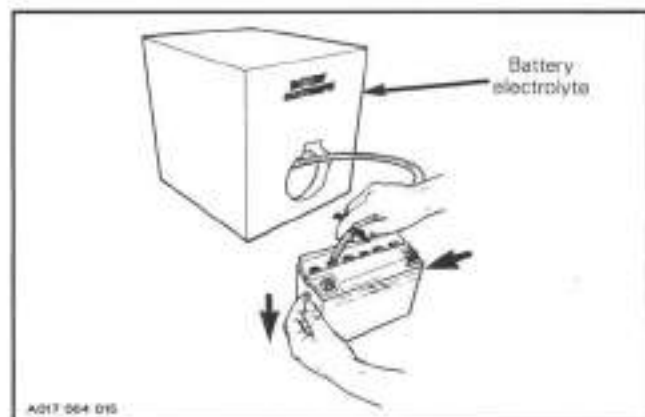
Do not remove the sealing tube or loosen battery caps unless activation is desired.

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.

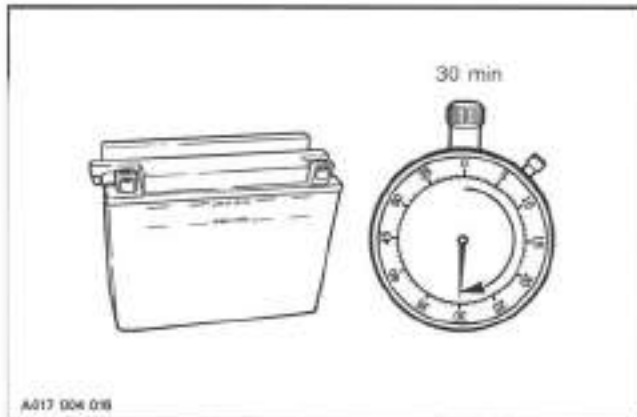
◆ **WARNING** : Failure to remove the sealing tube could result in an explosion.



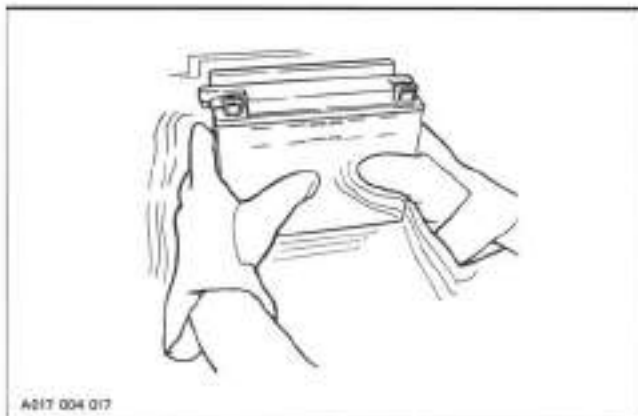
2. Remove caps and fill battery to UPPER LEVEL line with electrolyte (specific gravity : 1.260 at 20°C (68°F)).

Section 07 ELECTRICAL
Sub-Section 03 (BATTERY)

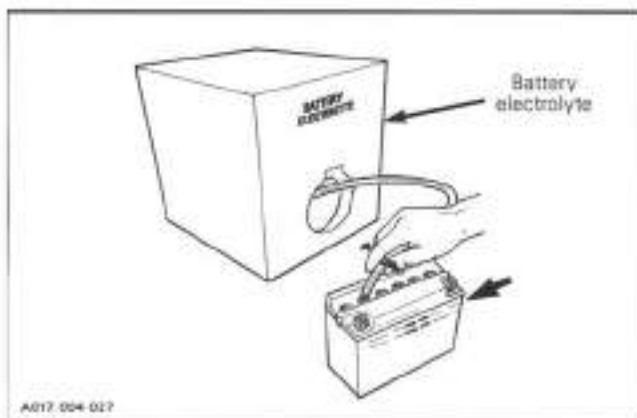
3. Allow the battery to stand for 30 minutes MINIMUM so that electrolyte soak through battery cells.



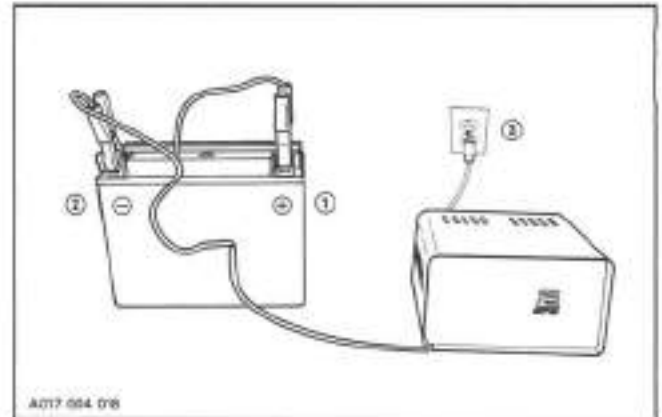
4. Allow gas bubbles to escape by lightly shaking battery by hand.



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



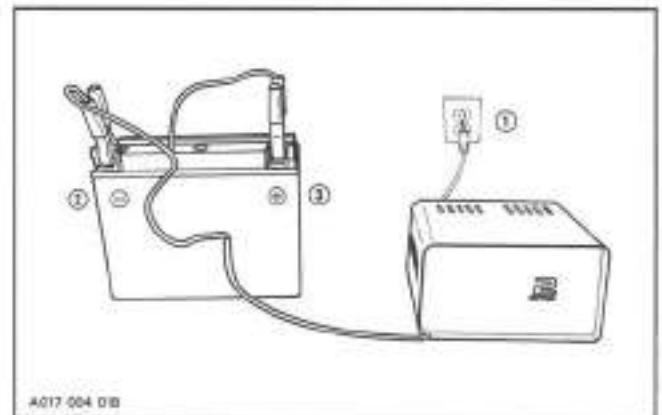
6. Connect a 2 A battery charger for 10 to 20 hours.



▼ **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.

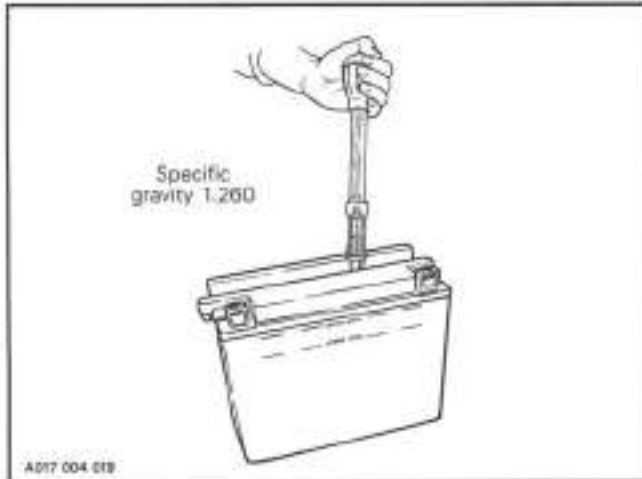
7. Disconnect battery charger.



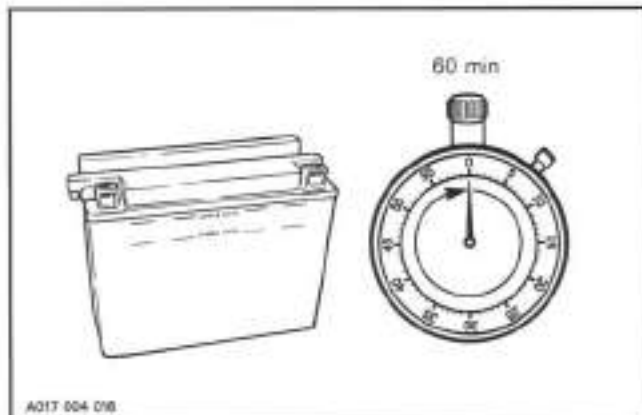
Section 07 ELECTRICAL

Sub-Section 03 (BATTERY)

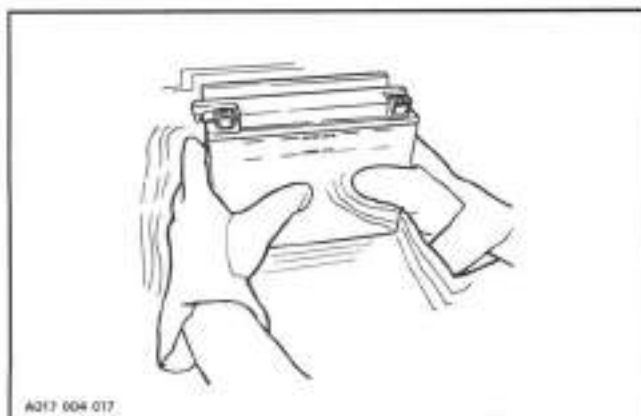
8. Test battery state of charge. Use a hydrometer.



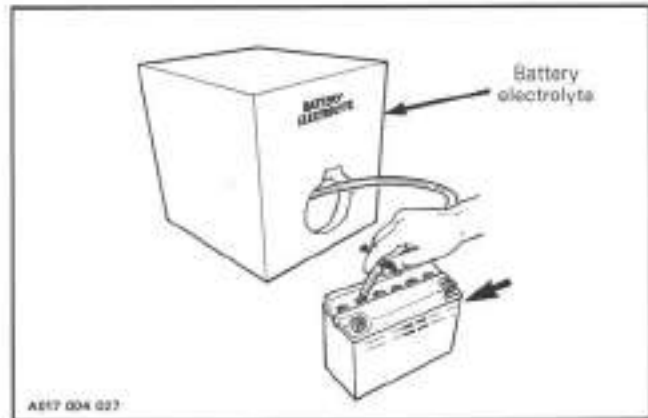
9. Let battery settle for one hour.



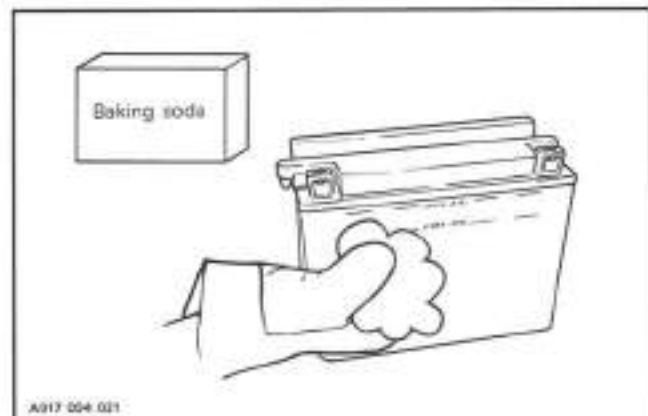
10. Allow gas bubbles to escape by lightly shake battery.



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.

Section 07 ELECTRICAL

Sub-Section 03 (BATTERY)

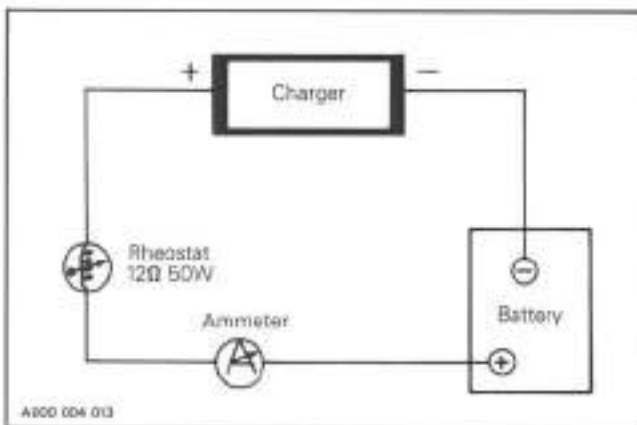
BATTERY CHARGING EQUIPMENT

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.

If the present charger is not adjustable to the proper current values, a rheostat can be connected in series with the battery to provide adjustment. 12 Ohm, 50 watt rheostats, such as OHMITE - 0314 or MALLORY 50K 12P, are available from electronic parts supply shops and they are suitable for use with most chargers if the peak current is to be held below 2 A.

If you need an accurate ammeter, we recommend the use of : SHURITE - 5202 (0 to 3 A or - 5203 (0 to 5 A) available from electronic parts supply shops.



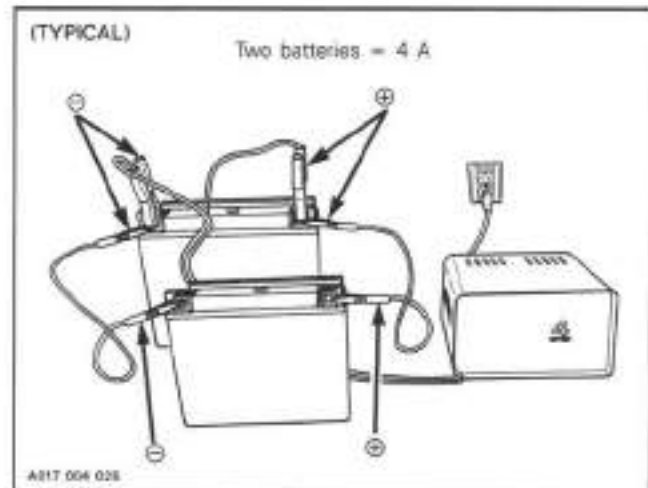
For a service application and a permanent installation, both ammeter and rheostat can be built into a small box adjacent to your charger.

▼ **CAUTION** : Adequate ventilation **MUST** be provided to cool the rheostat.

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 x 2 A = 10 A).



INSTALLATION OF BATTERY

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

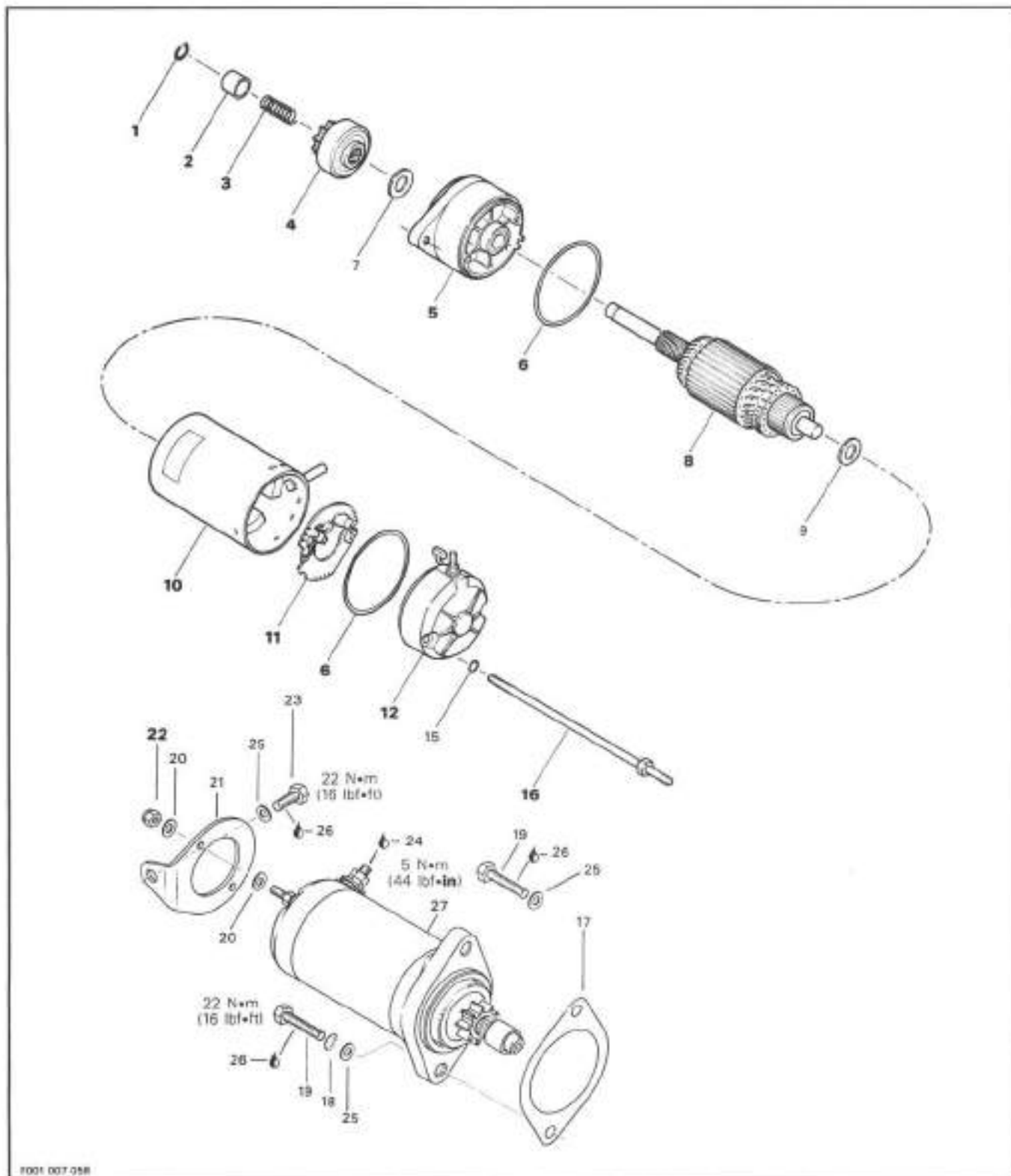
◆ **WARNING** : Battery black negative cable must always be disconnected first and connected last.

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.

ELECTRIC STARTER



FD01 007-058

Section 07 ELECTRICAL

Sub-Section 04 (ELECTRIC STARTER)

COMPONENTS

1. Circlip
2. Pinion stop collar
3. Spring
4. Starter clutch assembly
5. Starter clutch housing
6. O-ring
7. Washer
8. Armature
9. Thrust washer
10. Yoke assembly
11. Brush holder
12. Commutator end frame
15. Waved washer (2)
16. Through bolt (2)
17. Gasket
18. External tooth lock washer 8 mm
19. Hexagonal head screw M8 x 30 (2)
20. Washer 5 mm (4)
21. Starter support
22. Elastic stop nut M5 (2)
23. Hexagonal head screw M8 x 16
24. Grease dielectric, 150 g
25. Washer 8 mm (3)
26. Loctite 271 (red)
27. Starter

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	20 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
Starter does not turn.	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.
Starter turns ; but does not crank the engine.	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.
Starter turns, but overrunning clutch pinion does not mesh with ring gear.	Worn clutch pinion gear. Defective clutch. Poor movement of clutch on splines. Worn clutch bushing. Worn starter bushing(s). Worn ring gear.	Replace clutch. Replace clutch. Clean and correct. Replace clutch. Replace bushing(s). Replace ring gear.
Starter motor keeps running.	Shorted solenoid switch winding. Melted solenoid switch contacts. Starter switch returns poorly. Sticking or defective starter clutch.	Replace solenoid switch. Replace solenoid switch. Replace starter switch. Lubricate or replace.

Section 07 ELECTRICAL

Sub-Section 04 (ELECTRIC STARTER)

REMOVAL

Unfasten electrical box from hull.

Disconnect black cable ground connection from battery.

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

Disconnect red cable connection from battery.

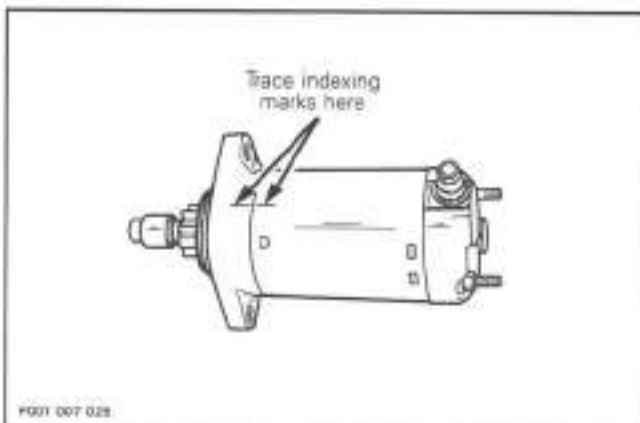
Remove the following parts.

- tuned pipe
- 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.



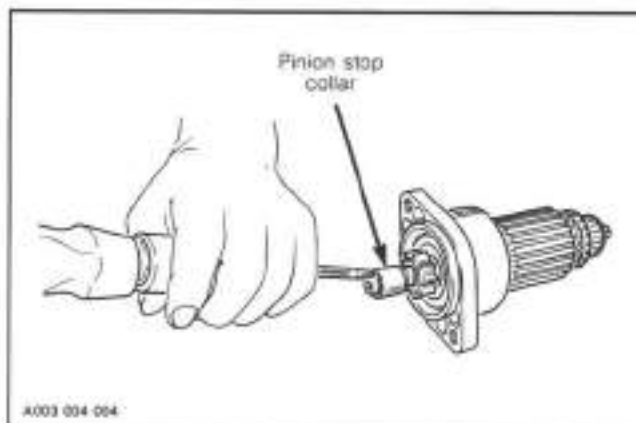
Remove starter support nuts then through bolts. Separate end frame from yoke assembly. Withdraw yoke assembly from armature.

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.

1,2,3, Circlip, Pinion Stop Collar and Spring

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



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

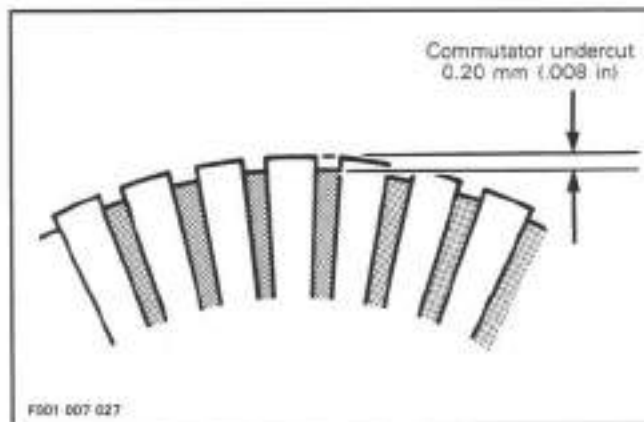
INSPECTION

Armature

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

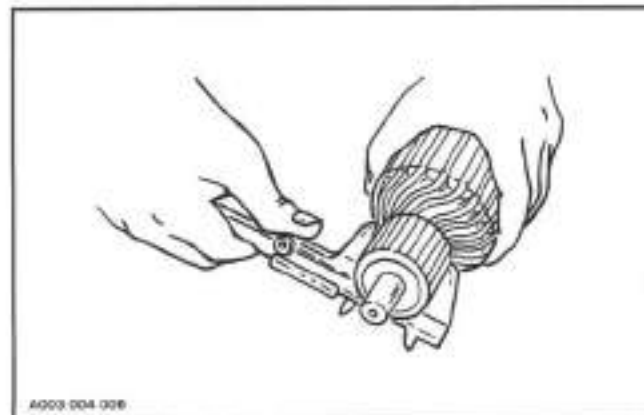
Check commutator for roughness, burnt or scored surface. If necessary, turn commutator on a lathe, enough to resurface only.

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.



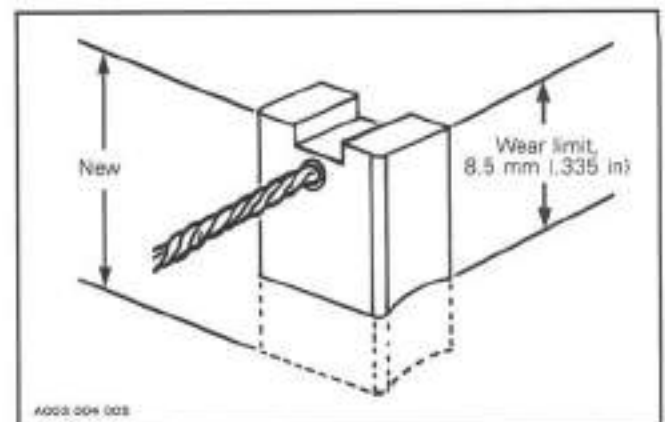
Brush Holder

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 look for ring gear.

Starter Switch

Switch condition can be checked with an ohmmeter. Install test probes on RED and YELLOW/RED wires of switch. Measure resistance, it should be high when button is released and must be close to zero (0) ohms 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 -12 V on BROWN wire. If it is more than a few ohms, replace solenoid switch.

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

ASSEMBLY

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

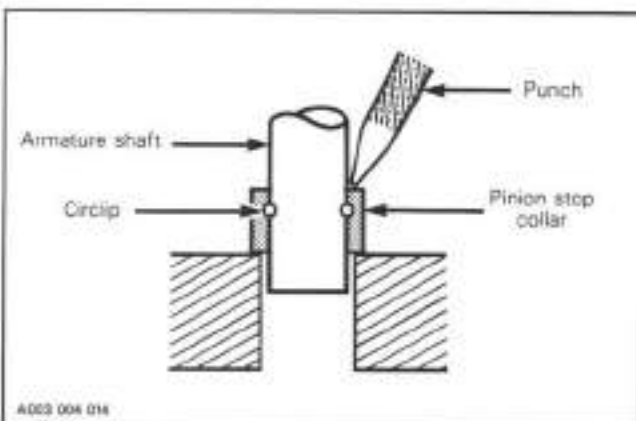
Prior to assembling, coat sliding surfaces on armature shaft splines, overrunning clutch and bushing with G.E. Versilube G 341 M or ESSO Beacon 325 lubricant or equivalent.

Apply motor oil on metal bushings.

1,2, Circlip and Pinion Stop Collar

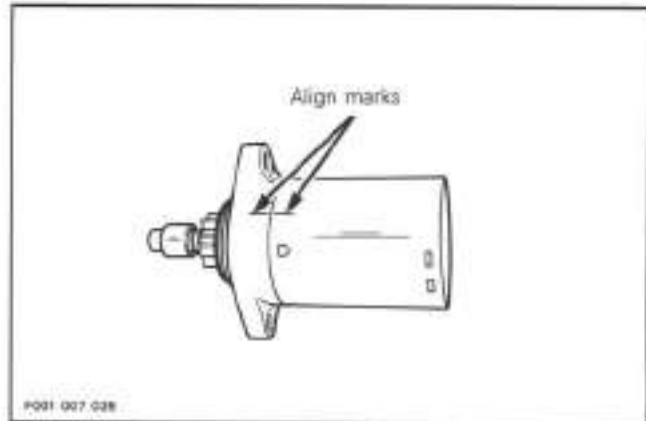
After placing stop collar on armature shaft, fit circlip into armature shaft, then make sure that it is properly secured.

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.



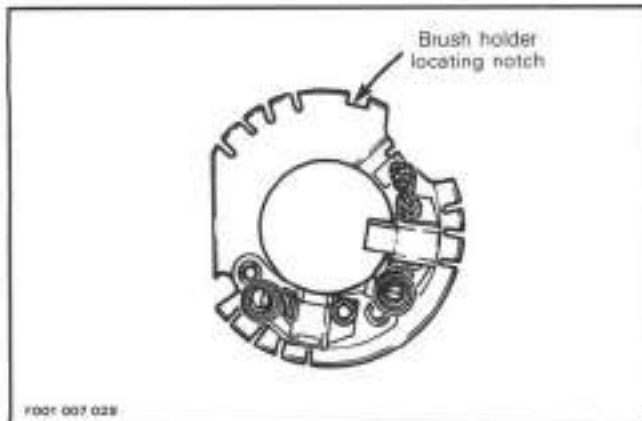
10,12,16, Yoke ass'y, End Frame and Through Bolt

Open brushes and slide over commutator.

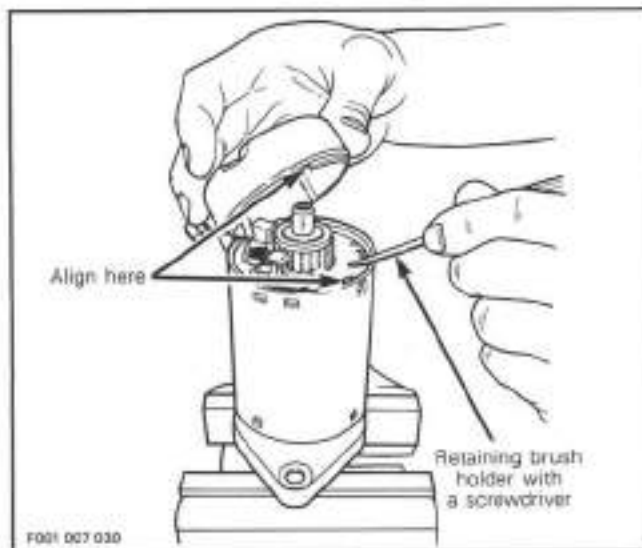
Align end frame locating notch with yoke locating protrusion and properly sit brush holder into yoke.



Section 07 ELECTRICAL
Sub-Section 04 (ELECTRIC STARTER)



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



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

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

INSTALLATION

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

Install starter apply Loctite 271 on screw threads and torque screw to 22 N•m (16 lbf•ft).

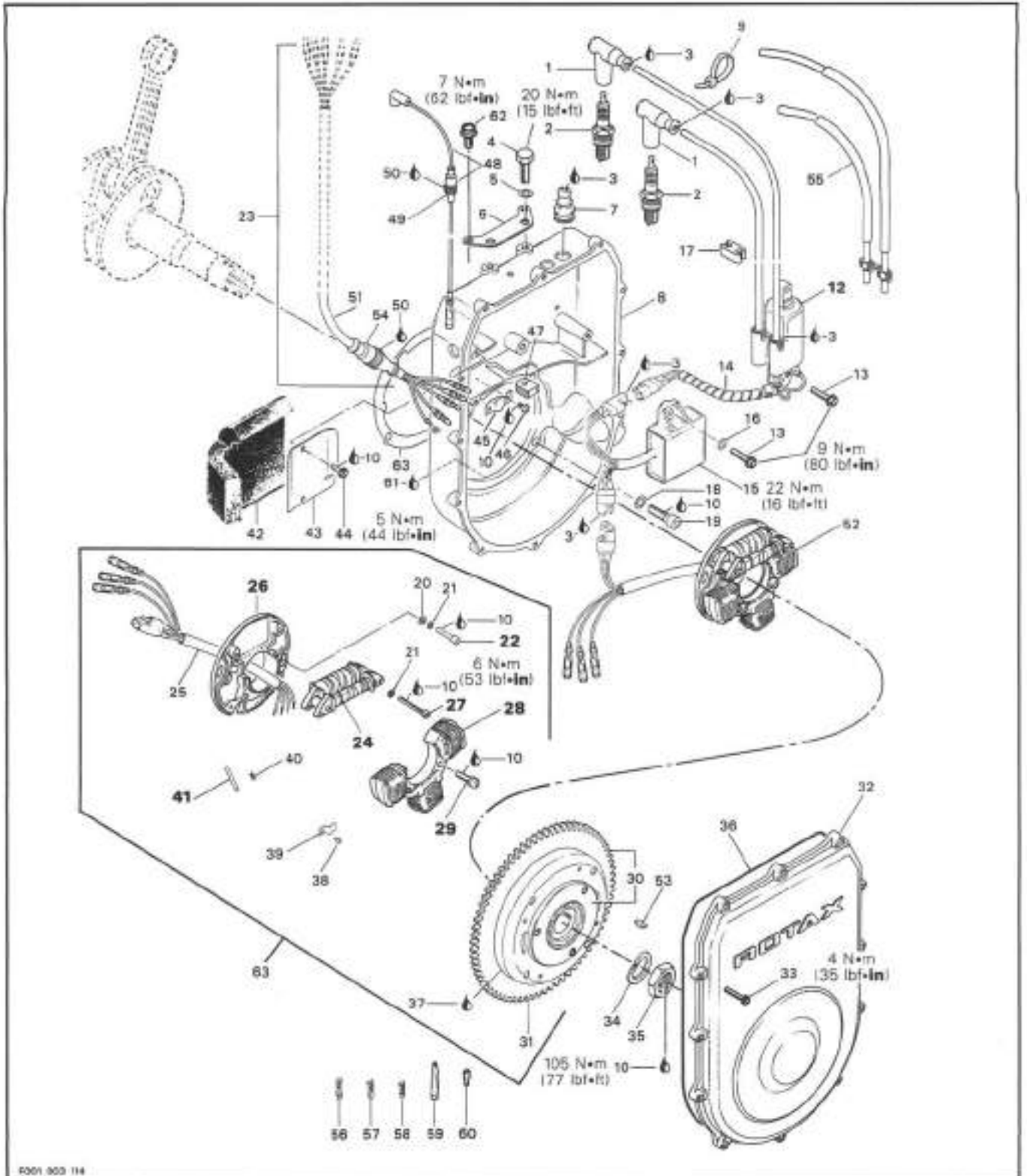
Connect the red battery cable to the starter and torque nut to 5 N•m (44 lbf•in).

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

◆ **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



8001 903 114

Section 07 ELECTRICAL

Sub-Section 05 (MAGNETO SYSTEM)

COMPONENTS

1. Spark plug protector (2)
2. Spark plug (2)
3. Grease dielectric, 150 g
4. Hexagonal head screw M8 x 20 (2)
5. Lock washer 8 mm (2)
6. Support
7. Protection cap (2)
8. Ignition housing
9. Tie rap (2)
10. Loctite 242, 10 mL
12. Ignition coil
13. Screw tapite M6 x 25 (4)
14. Helical tape 130 mm
15. Ignition module
16. Washer 6 mm (2)
17. Cable holder
18. Lock washer 8 mm (4)
19. Allen screw M8 x 25 (4)
20. Washer 5.5 (3)
21. Lock washer 5 mm (5)
22. Allen screw M5 x 18 (3)
23. Wiring harness assembly
24. Generating coil
25. Harness ass'y
26. Armature plate
27. Slotted head screw M5 x 35 (2)
28. Battery charging coil
29. Screw M6 x 25 (2)
30. Magneto flywheel ass'y
31. Ring gear 77 teeth
32. Ignition cover
33. Self tapping screw M5 x 25 (12)
34. Lock washer 22 mm
35. Hexagonal nut M22
36. O-ring
37. Loctite 648
38. Combined screw M4 x 8
39. Cable clamp
40. Splice connector (6)
41. Shrink tube 30 mm (6)
42. Protection mat
43. Protection cover
44. Screw tapite M5 x 16 (2)
45. Holding strip
46. Screw tapite M4 x 8 (2)
47. Cable grammet
48. Sensor wire with grammet assembly
49. Grammet
50. Silicone 732 RTV, 90 mL
51. Harness (without connector)
52. Armature plate assembly
53. Woodruff key 3 x 3.7
54. Grammet
55. High tension cable set
56. Ring terminal (2)
57. Female connector 3.96 (4)
58. Male connector 3.96 (4)
59. Insulation sheath
60. Insulation sheath
61. Loctite 515 and primer N
62. Screw tapite M6 x 16 (2) (2nd serie)
63. Gasket

REMOVAL

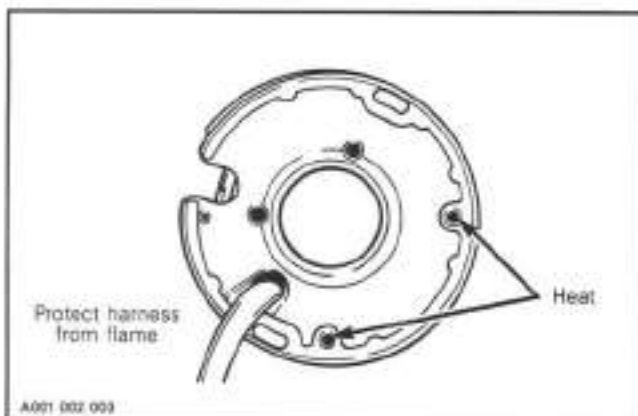
Refer to ENGINE section 03-04 then look for PTO flywheel and magneto for parts removal.

DISASSEMBLY

24, Generating Coil

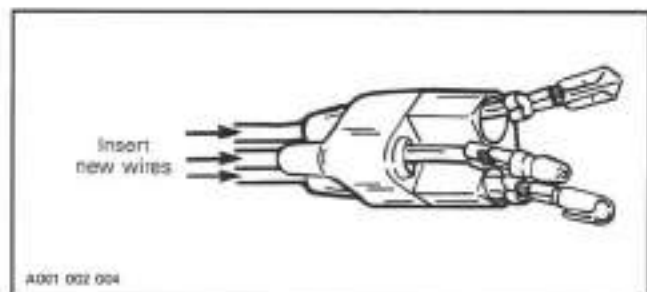
To replace generating coil :

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



▼ CAUTION : Protect harness from flame.

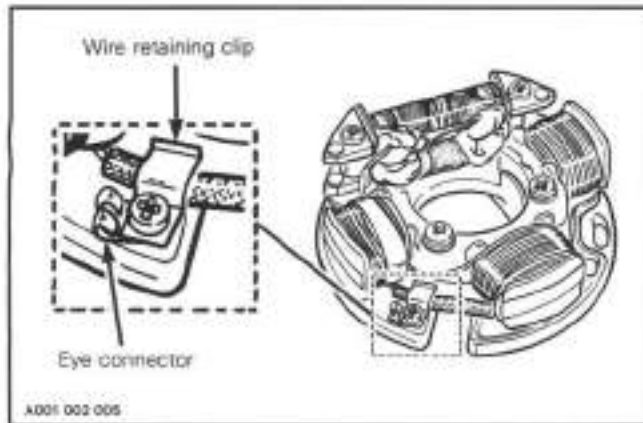
- Remove screws.
- Cut the four wires as close as possible to the coil body.
- To pass new coil wires in harness, tape the old wires to the end of new wires and pull them through the harness protector tube.
- Insert the new wires into the old connector housing and install connectors.



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

Section 07 ELECTRICAL
Sub-Section 05 (MAGNETO SYSTEM)

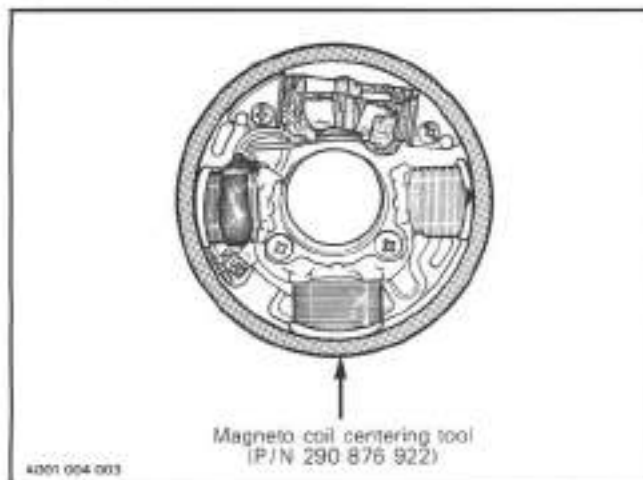
- Install a new receptacle connector to the black/yellow striped wire.
- To install the ground connector to the armature plate, tape the new black lead to the old one and pull it under the charging coil with the old wire.
- Solder an eye connector to the lead and fasten it under the wire retaining clip.



24,27. Generating Coil and Screw

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

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

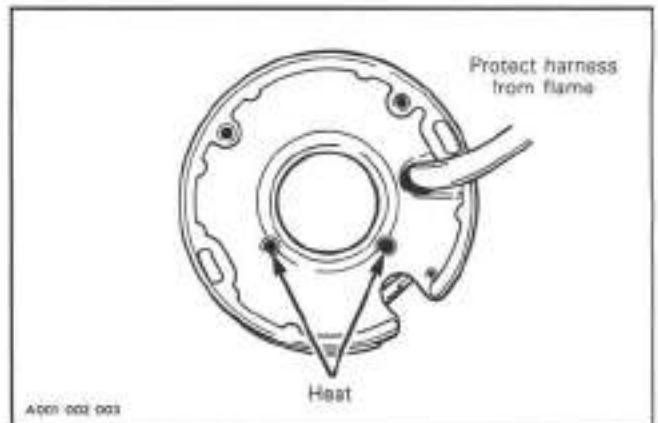


▼ **CAUTION** : Before reinstalling the magneto, remove the loose epoxy from harness.

28. Battery Charging Coil

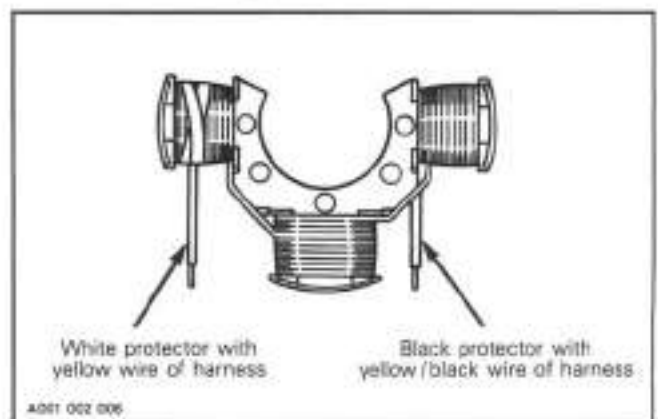
To replace battery charging coil :

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



▼ **CAUTION** : Protect harness from flame.

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



41. Protector Tube

Position protector tubes over connections.

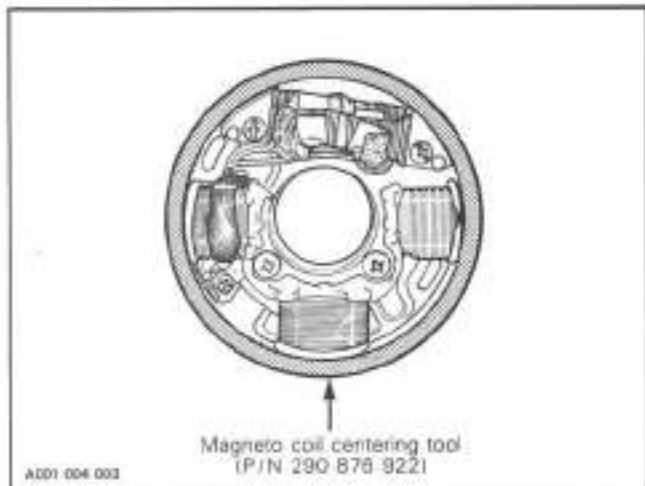
Section 07 ELECTRICAL

Sub-Section 05 (MAGNETO SYSTEM)

28,29, Battery Charging Coil and Screw

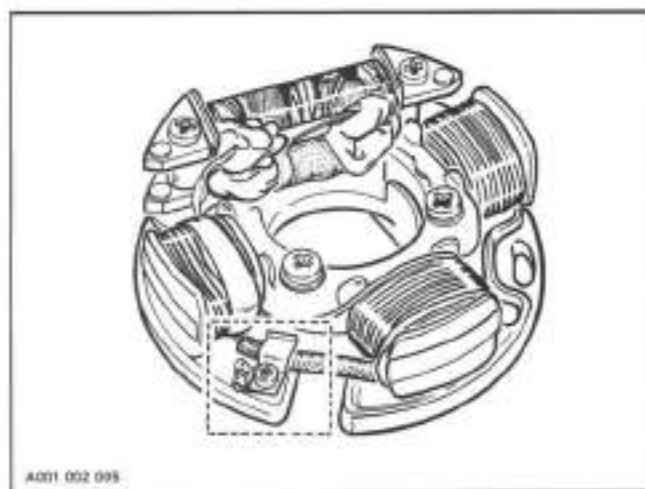
Prior to assembly, apply Loctite 242 (blue, medium strength).

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




— Fasten retaining clip onto protector tubes.

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



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

ASSEMBLY

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

22,26, Screw and Armature Plate

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

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

12, Ignition Coil

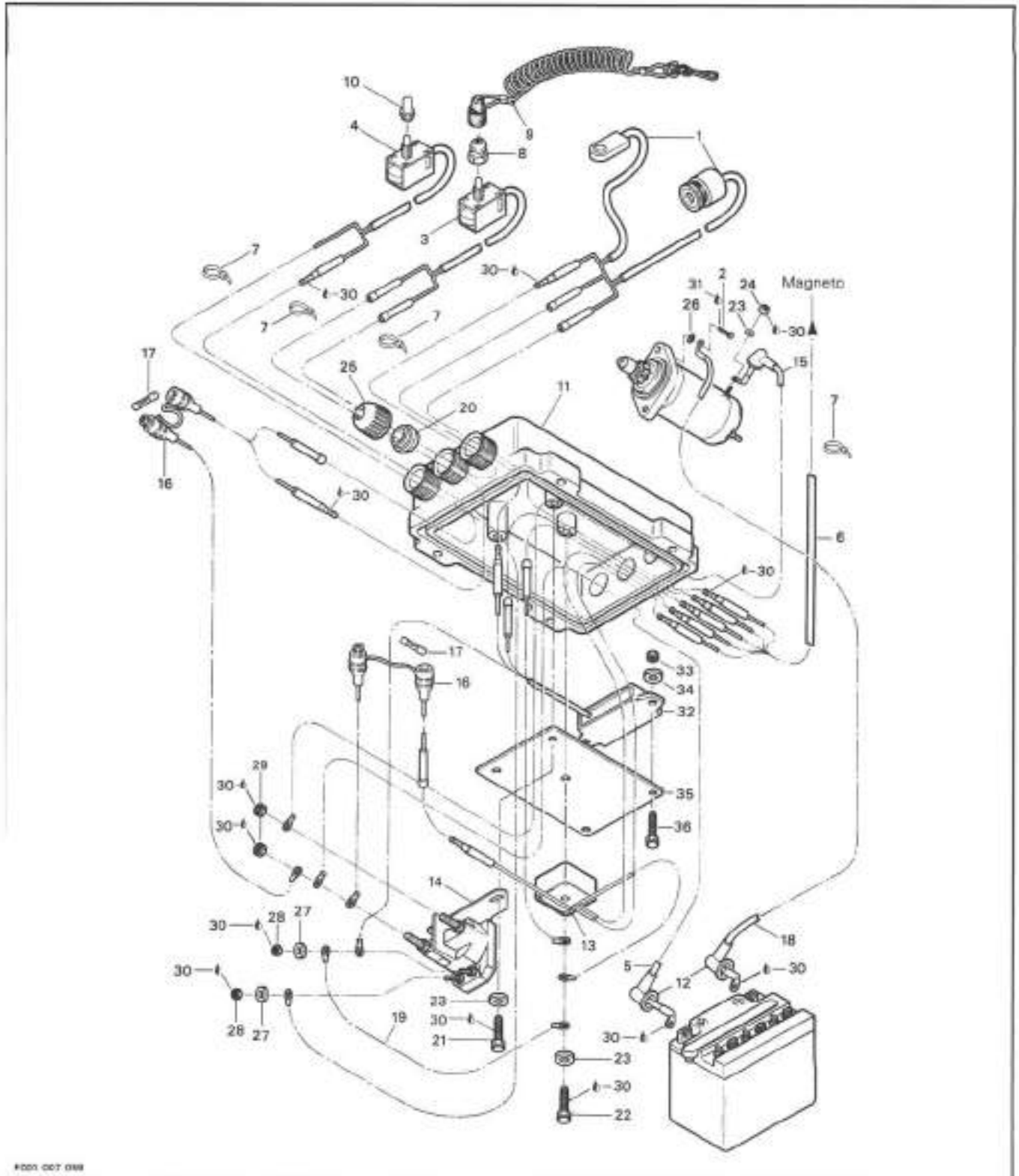
When connecting wires to ignition coil, connect BLACK wire with " + " symbol underneath coil and WHITE/BLUE wire with " - " symbol.

INSTALLATION

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

Perform ignition timing.

CDI AND CHARGING SYSTEMS; TESTING PROCEDURES



Section 07 ELECTRICAL

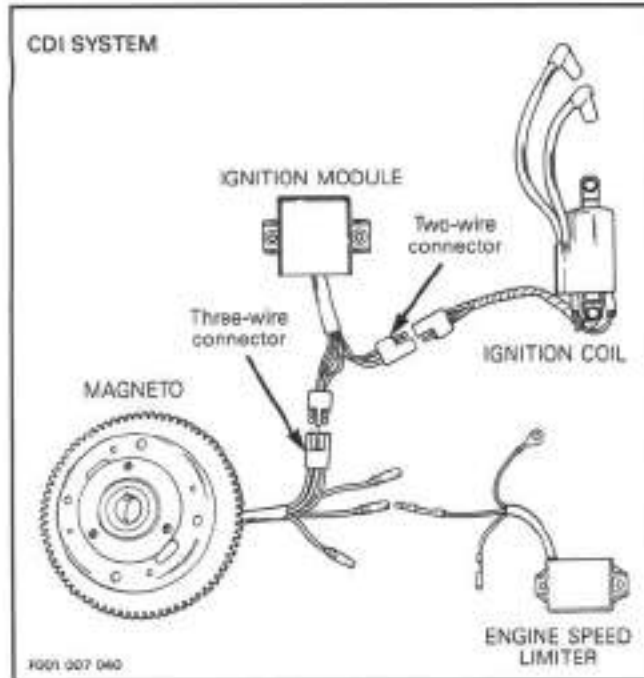
Sub-Section 06 (CDI AND CHARGING SYSTEMS)

COMPONENTS

- | | |
|-------------------------------------|--------------------------------------|
| 1. Buzzer and stop switch assembly | 19. Ground cable |
| 2. Hexagonal head screw M8 x 30 (2) | 20. Grommet (6) |
| 3. Tether cord switch | 21. Self tapping screw M6.3 x 16 (2) |
| 4. Ignition switch-starter | 22. Self tapping screw M6.3 x 38 |
| 5. Red battery cable (positive) | 23. Washer (4) |
| 6. Wiring harness | 24. Lock nut M6 |
| 7. Tie rap | 25. Cap (6) |
| 8. Switch nut | 26. External tooth lock washer |
| 9. Tether cord | 27. Washer (2) |
| 10. Cap | 28. Elastic stop nut 10-32 (2) |
| 11. Cover | 29. Elastic stop nut 1/4-20 (2) |
| 12. Protector cap (2) | 30. "Dielectric" grease, 150 g |
| 13. Rectifier | 31. Loctite 271 (red) |
| 14. Solenoid | 32. Engine speed limiter |
| 15. Starter cable | 33. Nut M5 (2) |
| 16. Fuse holder (2) | 34. Flat washer (2) |
| 17. Fuse (2) | 35. Mounting plate |
| 18. Ground cable | 36. Self tapping screw M5 x 12 (2) |
-

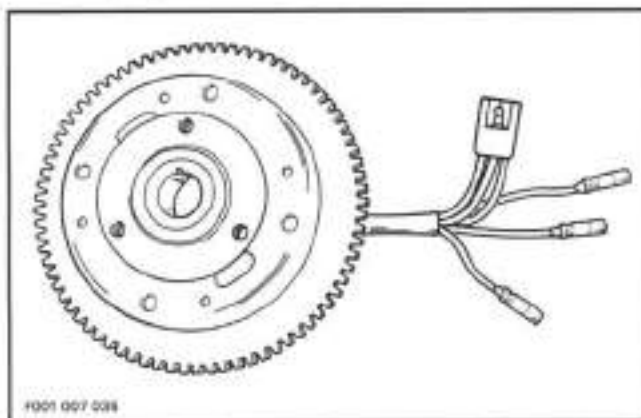
GENERAL

The Capacitor Discharge Ignition system includes the following components :



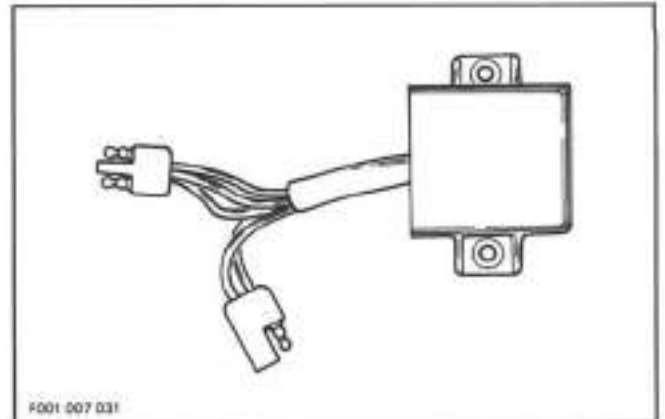
Magneto

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



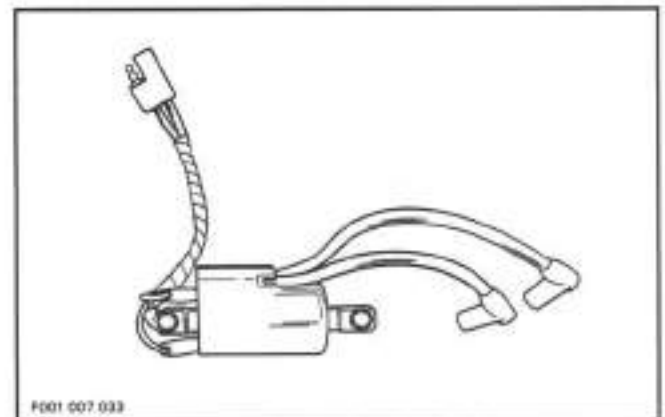
Ignition Module

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



Ignition Coil

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



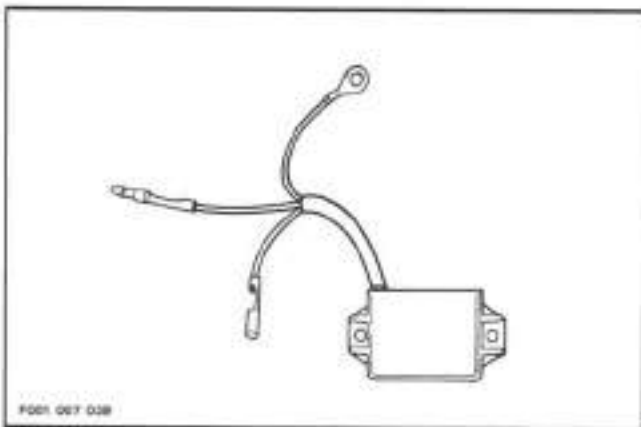
Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)

Engine Speed Limiter

It has three functions :

- Keeps high voltage away from tether cord switch.
- Provides engine stop by connecting YELLOW/BLACK wire with BROWN wire (ground).
- Limits engine RPM to prevent over-revving.



IGNITION SYSTEM TESTING PROCEDURE

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

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

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

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

Engine Stop/Tether Cord Switches Verification

Engine Stop Switch

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

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

Tether Cord Switch

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

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

Engine Speed Limiter

○ **NOTE :** It is located in the electric box cover underneath mounting plate.

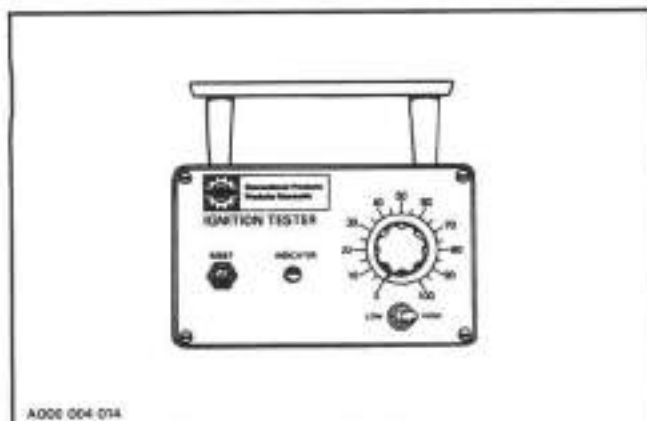
A defective speed limiter may cause the following problems :

- 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 6500 ± 200 RPM. If not, replace limiter.

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

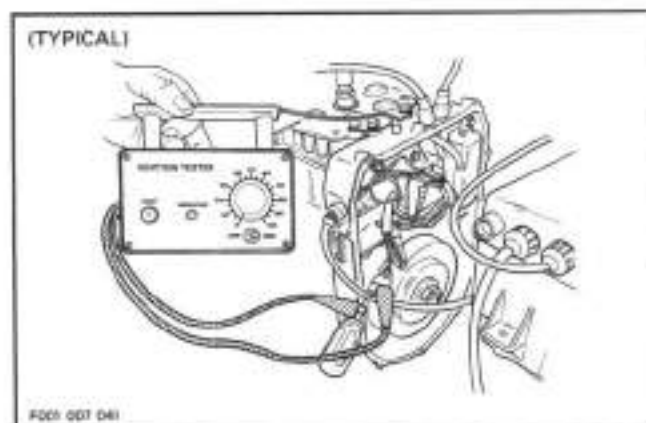
This tester can verify generating coil (low/high speed), ignition module, ignition coil and battery charging coil. Always make sure that tester batteries are in good condition.

Test Condition

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

Always proceed in the following order :

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



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

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

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

Analysis of Test Results

Indicator Lamp Lights at Specific Setting

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

Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)

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

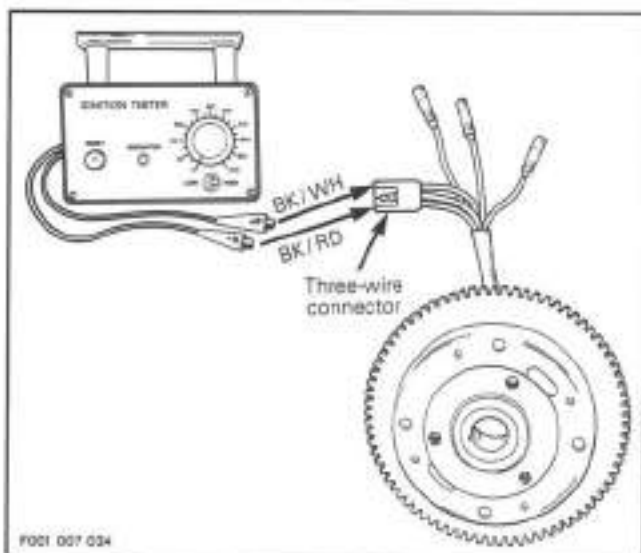
WARNING : To prevent powerful electric shocks while cranking engine, neither touch any electronic ignition components (ignition coil, high tension wire, wire harness, etc.) nor tester lead clips. Also make sure that tester leads do not touch any metallic object. Ventilate bilge at least two minutes prior to performing any test.

TESTS

Magneto and High Speed Generating Coil Output

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

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



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

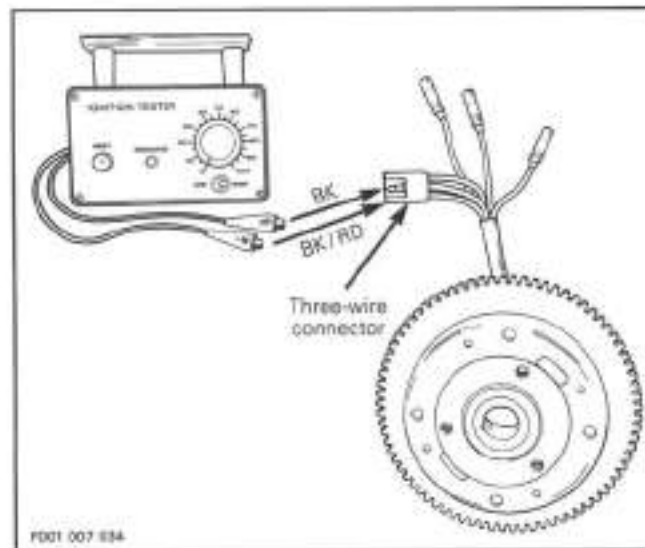
Results

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

Magneto and Low Speed Generating Coil

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

Tester wires	Component wires	Tester switch position	Tester dial position
N	BLACK/RED of magneto harness	HIGH	From 20 to 35
P	BLACK of magneto harness		



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

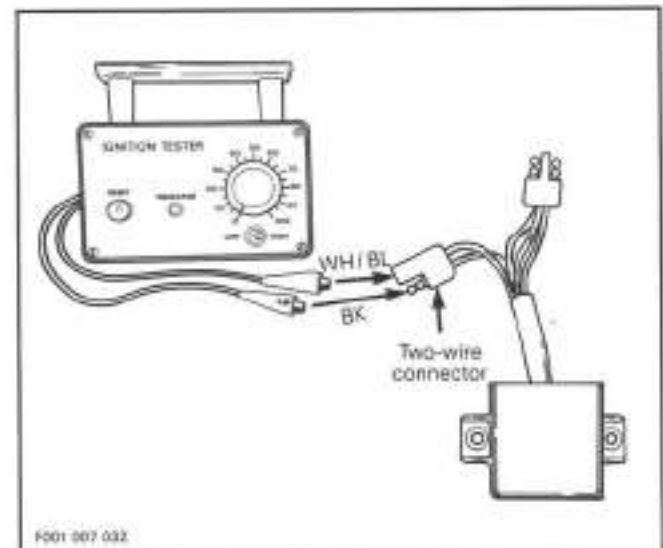
Results

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

Ignition Module

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

Tester wires	Component wires	Tester switch position	Tester dial position
N	WHITE/BLUE of ignition module	HIGH	From 70 to 75
P	BLACK of ignition module		



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

Results

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

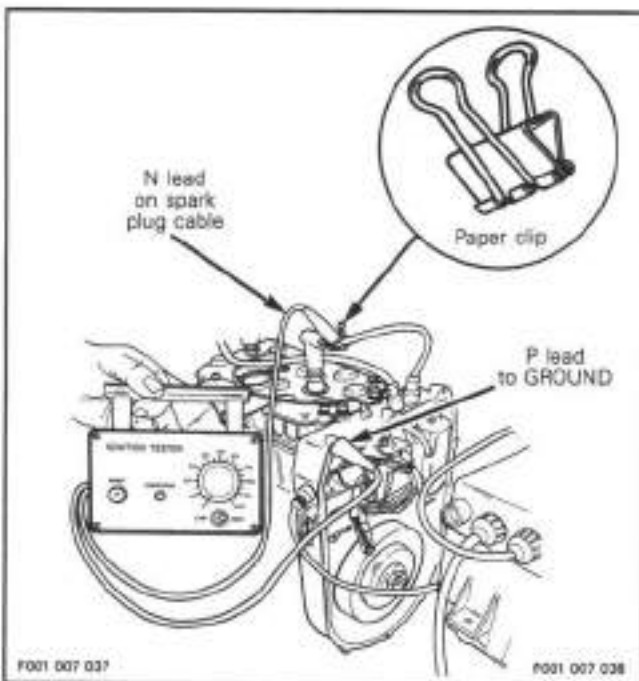
Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)

Ignition Coil Output

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

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



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

Results

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

SUMMARY TABLE

Test to perform	Tester wires	Component wires	Switch	Dial
High speed generating coil	N	BLACK / RED of magneto harness	LOW	85
	P	BLACK / WHITE of magneto harness		
Low speed generating coil	N	BLACK / RED of magneto harness	HIGH	From 20 to 35
	P	BLACK of magneto harness		
Ignition module	N	WHITE / BLUE of ignition module	HIGH	From 70 to 75
	P	BLACK of ignition module		
Ignition coil	N	paper clip on spark plug	LOW	70
	P	Ground		

IGNITION COMPONENTS RESISTANCE MEASUREMENT

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

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

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

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

PART NAME		WIRE COLOR	RESISTANCE OHM (Ω)
MAGNETO	High speed generating coil	BLACK / WHITE with BLACK / RED	2.8 - 4.2
	Low speed generating coil	BLACK with BLACK / RED	120 - 180
IGNITION COIL	Primary winding	BLACK with WHITE / BLUE	0.23 - 0.43
	Secondary winding	End of each spark plug cable, spark plug protectors removed	5.85 - 6.50 K
	Insulation	Check each wire of primary and secondary windings with ground for short circuit	open circuit (∞)

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

Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)

BATTERY CHARGING SYSTEM

GENERAL

Magneto

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

Rectifier/Regulator

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

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

– Bring engine to approximately 5500 RPM.

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

Voltage Test

Proceed as follows :

– Start engine.

– Connect a voltmeter (set on DC volt scale) on battery posts.

– Bring engine to approximately 5500 RPM.

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

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

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

Magneto, Battery Charging Coil

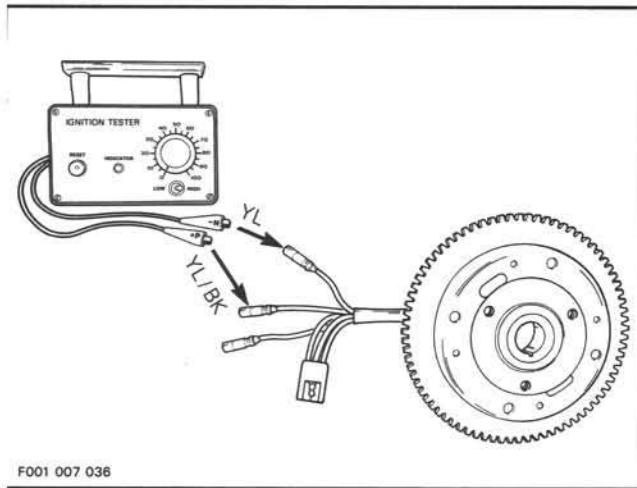
With Bombardier Ignition Tester

Operate it as for ignition system verifications.

1. Disconnect wires coming from magneto 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	85
P	YELLOW/BLACK of magneto harness		

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



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

RESULTS

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

Resistance Measurement

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

Use the following table :

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

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

Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)

NIPPONDENSO IGNITION TESTER



○ **NOTE** : This tester can test generating coil (high, low speed), ignition module (including diode test) and spark test.

TEST CONDITION

Generating Coil Test (HI and LO)

This test is performed on the vehicle at cranking speed. The two generating coils are called high and low speed generating coils. The tester indicates the output of these coils by switching HI and LO positions as follows.

HI : Output of high speed generating coil.

LO : Output of high and low speed generating coil.

Analysis of this test is diagnosed by the number of LED lit on the indicator.

CDI Module Test

The CDI tester bypasses the generating coil by sending its own alternating current to the ignition module.

The output of the ignition module will be indicated on the LED level indicator. Analysis of this test is diagnosed by the LED level indicator.

CDI Module Diode Test

The ignition module includes the diode which controls the output of the generating coil according to the engine speed. This tester can diagnose this diode. The result will be indicated on the LED level indicator.

Spark Test

Uses the ignition coil on vehicle to test the high tension circuit.

BEFORE TESTING

To prevent engine from starting and erroneous indication on the LED level indicator, remove the spark plug(s).

▼ **CAUTION** : To prevent dust or foreign matter from being introduced inside the cylinder(s) when cranking the engine, install a clean rag over the cylinder head.

Connect the power cord to the power source (115 volts AC/60 Hz).

▼ **CAUTION** : To prevent any damage to the tester, do not try other power source than the above mentioned one and ensure that the tester is installed on a plane surface, away from vehicle vibrations.

CONNECTION OF TEST WIRE HARNESS

○ **NOTE** : A few terms found on the function selector of the Nippondenso CDI tester are different from the ones used in this section. Control unit and control unit diode will be described as ignition module and ignition module diode respectively, generator coil will be generating coil.

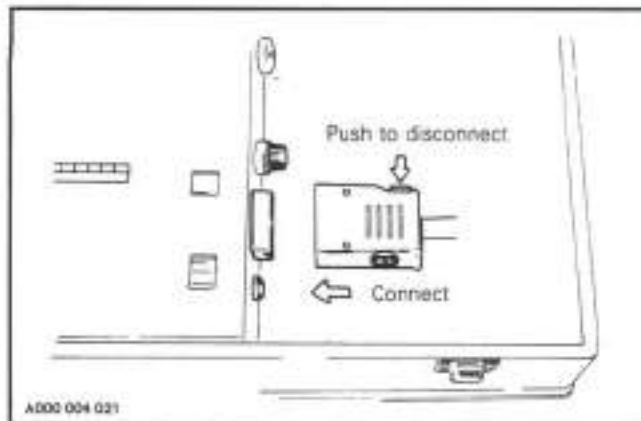
All CDI systems are designated as 4-5P ignition type. Therefore harness B from CDI tester kit must be used to perform all test (it matches with code no. 2 from CDI tester chart).

Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)

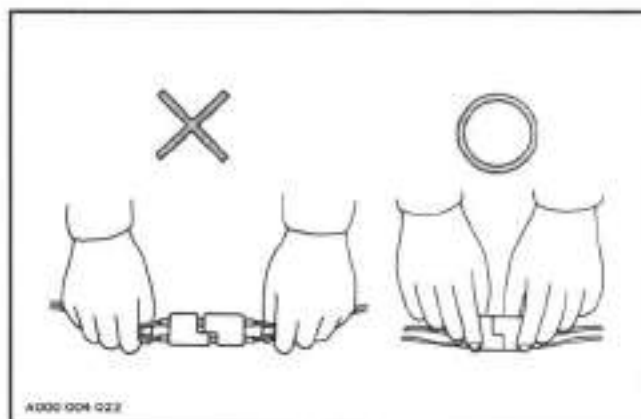
CODE NO.	IGNITION TYPE	ENGINE TYPE	TEST WIRE HARNESS
2	4-5P	587	B

- a) Connect the test wire harness to the tester aligning the arrow marks.



- b) Disconnect the connectors between magneto and ignition module.

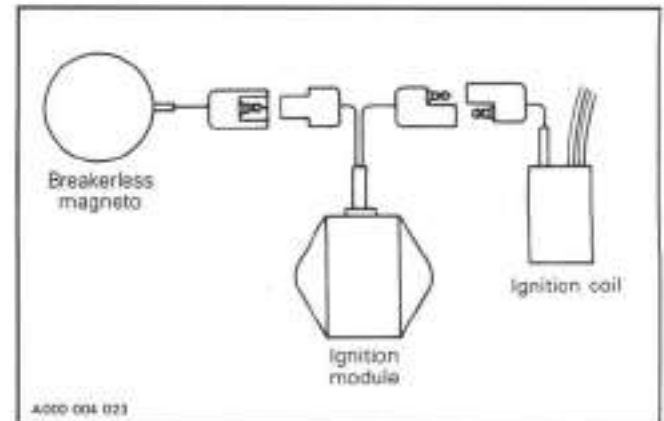
CAUTION: Never pull the wire harness to disconnect.



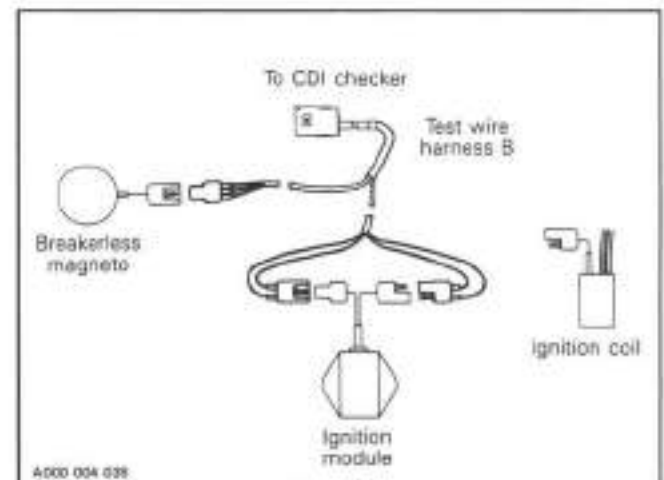
- c) Securely connect the connectors of test wire harness B according to the following figures.

CAUTION: When connecting, be sure that the test wire harness does not interfere with moving part of engine.

Vehicle Wiring



Test Wire Harness Linked with Vehicle Wiring



TEST

- a) Turn the power switch on. Then one LED or two LED will light to indicate the tester is operating. Reset the indication circuit by depressing the reset switch. One LED will remain to indicate the checker is operating.

NOTE: After every test when the LED level indicator holds its indication a few minutes, reset the indication circuit by depressing the reset switch.

- b) Set the selector to the desired position.
c) Perform each test.

Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)

d) If the test results are over or lower than the limit, see "Analysis of test".

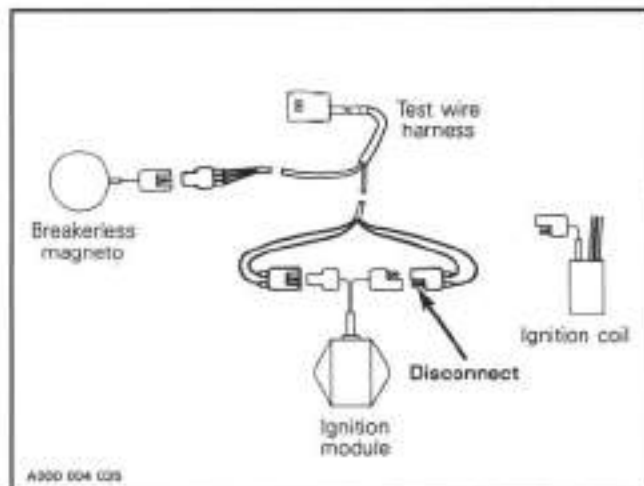
○ **NOTE** : Test should be repeated two or three times. If reading does not repeat, output is erratic and cause should be investigated. (Loose connection of components, etc.).

Spark Test

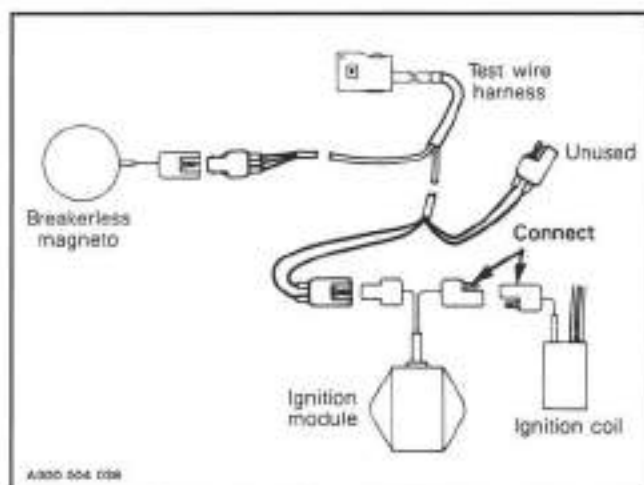
a) Before performing this test, ensure that the ignition module and its diode have been checked.

○ **NOTE** : Ensure that brown ground wire has been connected.

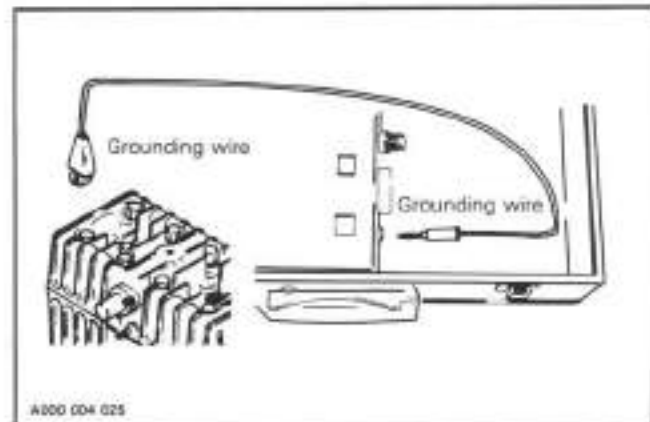
b) Disconnect the checker test wire harness from the ignition module output side.



c) Connect the ignition coil connector to the ignition module connector.

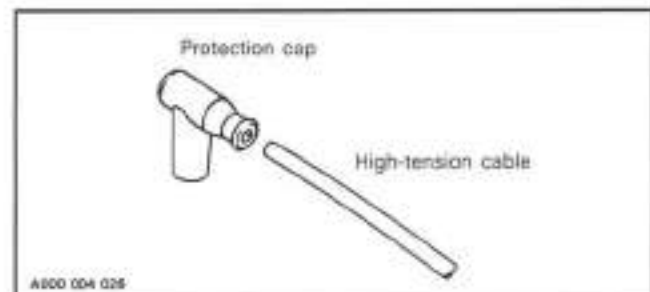


d) Connect the grounding wire to the CDI checker and to a bare surface of the engine.



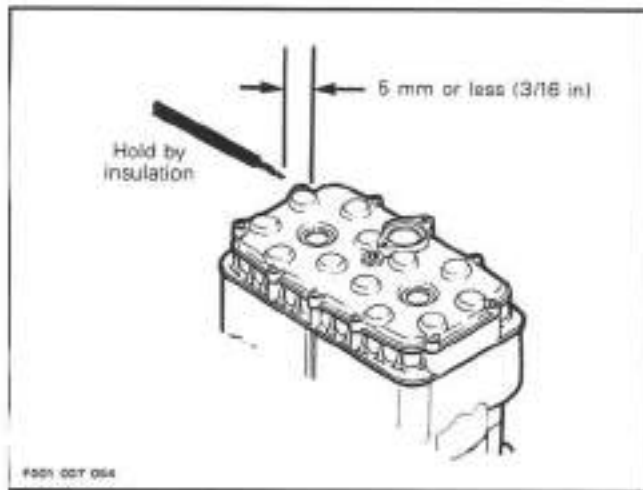
e) Set the selector to CONTROL UNIT position.

f) Remove the protection cap from the end of high-tension wire.



g) Keep a distance of 5 mm (3/16 in) or less between bare surface of the engine and end of high-tension cable and depress the START SWITCH. Then spark will take place between them.

◆ **WARNING** : Ensure the area is well ventilated and that there is no flammable fumes.



WARNING : Do not touch the high tension wire while doing the procedure. Hold high tension wire with an insulator.

Generating Coil Test

- a) This test should be performed at both HI and LO switch positions. Switch LO position and set the selector to GENERATOR COIL position.
- b) Crank the engine and read the LED level indicator.
Reading should be from **2** to **8**.
- c) Switch to HI position and repeat procedure.
Reading should be from **2** to **8**.

Ignition Module Test

- a) To perform this test, switch can be at LO or HI position.
- b) Set the selector to CONTROL UNIT position.
- c) Depress START switch for **five seconds** minimum and read LED level indicator.

Reading should be from **4** to **5**.

Ignition Module Diode Test

- a) Set the selector to CONTROL UNIT DIODE position. Then, four or five LED will light. If four or five LED do not light, check the power source and that the selector and switches are positioned correctly.

- b) Depress the START switch and read LED level indicator.

Reading should be from **6** to **8**.

Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)

ANALYSIS OF TEST RESULT

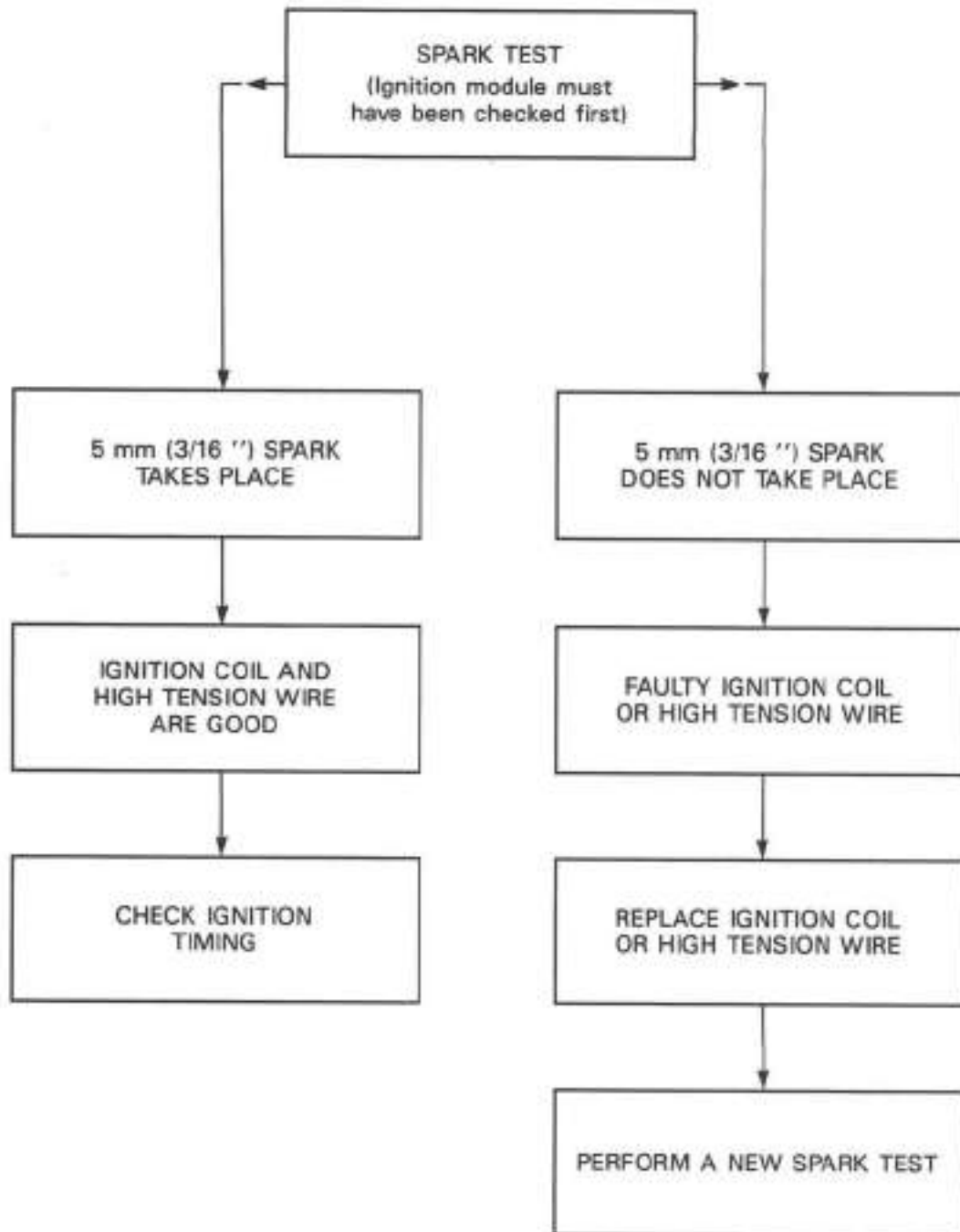
After every test, perform the diagnosis comparing with the diagnostic chart as shown below (as found on CDI checker).

CODE NO.	IGNITION TYPE	CHECK PART		LEVEL INDICATOR									NG*	OK	HARNESS	ENGINE TYPE	
				0	1	2	3	4	5	6	7	8					9
2	4-SP	Generator coil	HI												B	587	
			LO														
		Control unit															
		Control unit diode															
				0	1	2	3	4	5	6	7	8	9				

*NG = Not good

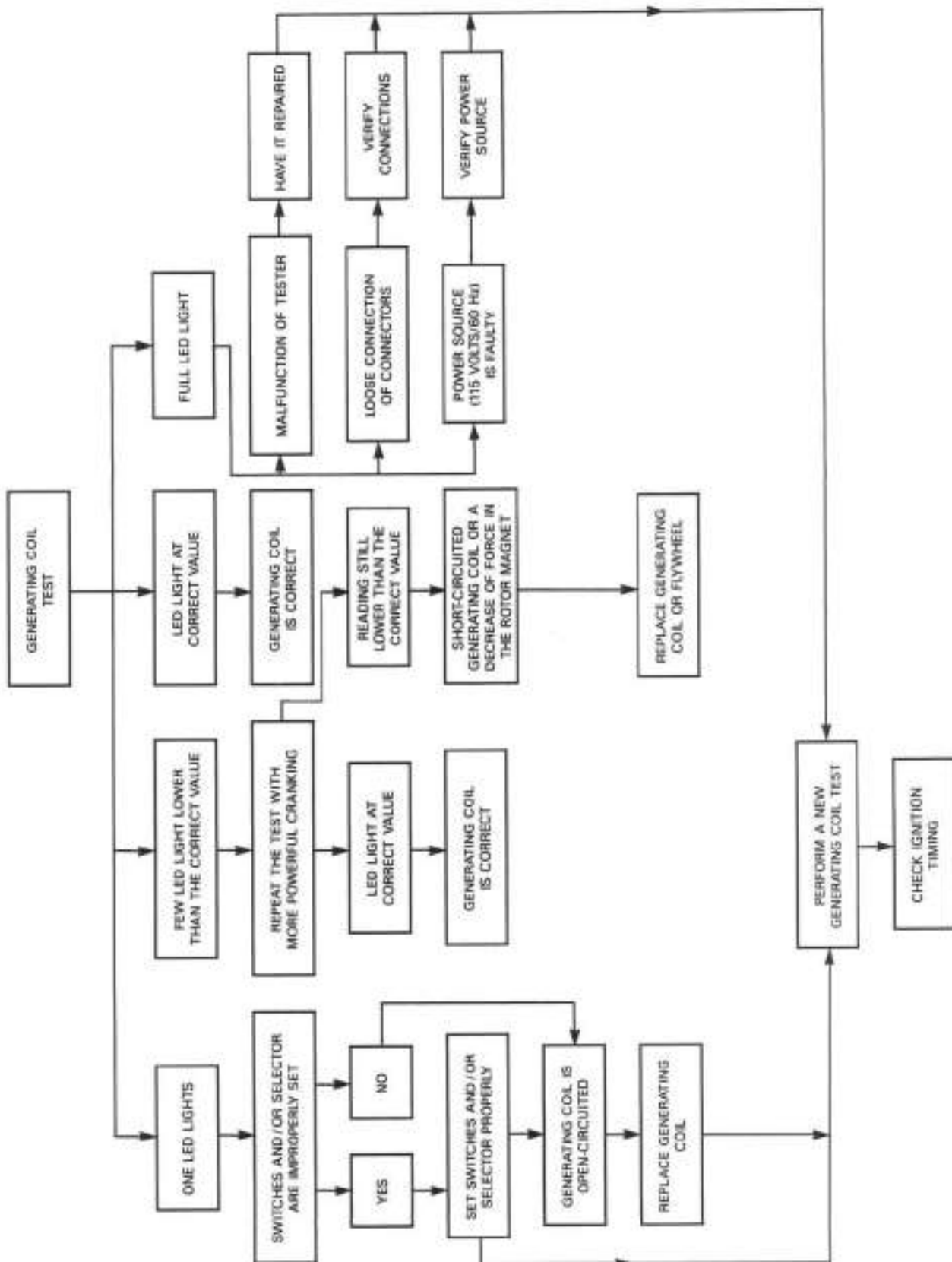
If the reading of the LED level indicator is outside of the shaded OK range, refer to "Analysis of test result" as described hereafter.

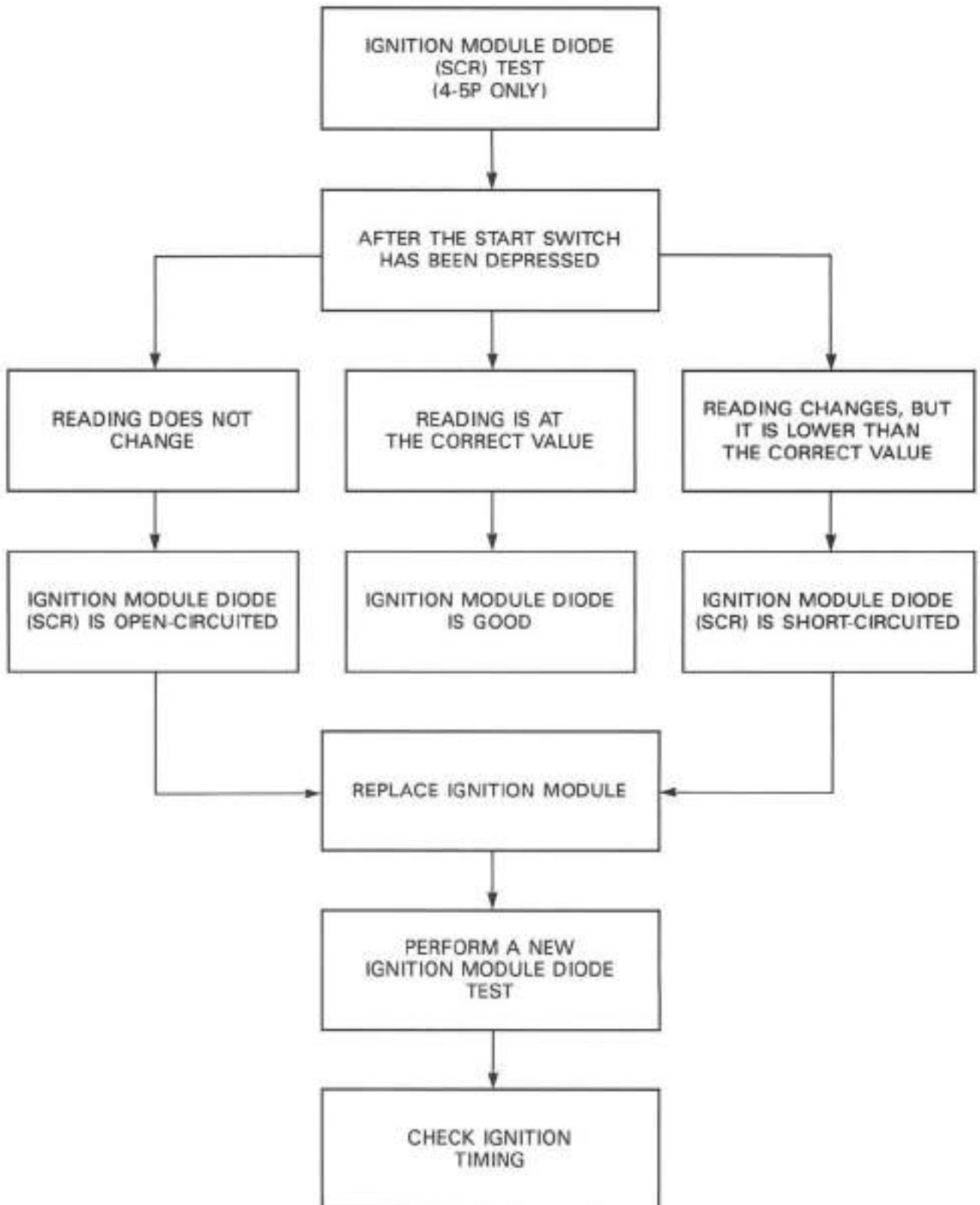
TROUBLESHOOTING CHART — NIPPONDENSO CDI SYSTEM



Section 07 ELECTRICAL

Sub-Section 06 (CDI AND CHARGING SYSTEMS)





NGK SPARK PLUG

NGK SPARK PLUG NUMBERING SYSTEM

Bombardier is using the BR7ES NGK spark plug type on the 1991 watercraft.

The heat range identification system is :

High number → cold plug
Low number → hot plug

Section 07 ELECTRICAL
Sub-Section 07 (SPARK PLUGS)

DESIGN SYMBOLS USED ON NGK SPARK PLUGS

First letter prefix for thread and hexagon size

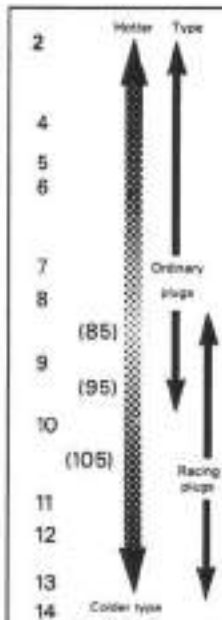
Second and third letter prefix for construction feature, except single prefix

Heat rating number

First letter suffix for thread reach

Letter	Thread size	Hexagon size
A	18 mm	25.4 mm
B	14 mm	20.6 mm
C	10 mm	16.0 mm
D	12 mm	16.0 mm
F	7/8 in-18	22.8 mm
G	9/16 in-14	22.8 mm

Letter	Construction feature
B	Hexagon size 20.6 mm
C	Hexagon size 16.0 mm
G	Hexagon size 23.8 mm
L	Compact type (SHORTY)
M	Compact type (BANDM)
P	Registered insulator nose type
R	Resistor type
S	Shielded type
U	Surface discharge type



Letter	Thread reach
None	12.0 mm (thread dia. 18 mm)
	8.5 mm (thread dia. 14 mm)
	22.5 mm (thread dia. 9/16 in-14 mm)
L	16.0 mm (thread dia. 7/8 in-18 mm)
	11.2 mm
H	12.7 mm (racing type 12.5 mm)
E	15.0 mm (racing type 16.0 mm)
F	Critical seat type
	A - F 10.9 mm
	B - F 11.2 mm
	BM - F 7.4 mm
	BC - F 11.5 mm

Letter	Construction features, etc.
A	Special
B	Special plug for Honda vehicle
C	Concession type
G	Racing plugs, center electrode of nickel alloy
GV	Racing plugs, center electrode of precious metal
N	Racing plugs, nickel electrode
P	Racing plugs, platinum ground electrode
R	Shielded resistor plugs
S	Copper core center electrode (super)
V	Center electrode of precious metal
W	Tungsten electrode
X	Seize free plugs
Y	V-Grooved center electrode
Multiple ground electrodes type	
K	± T ±
M	± Q ±
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)



DISASSEMBLY

First unscrew the spark plug one turn.

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

HEAT RANGE

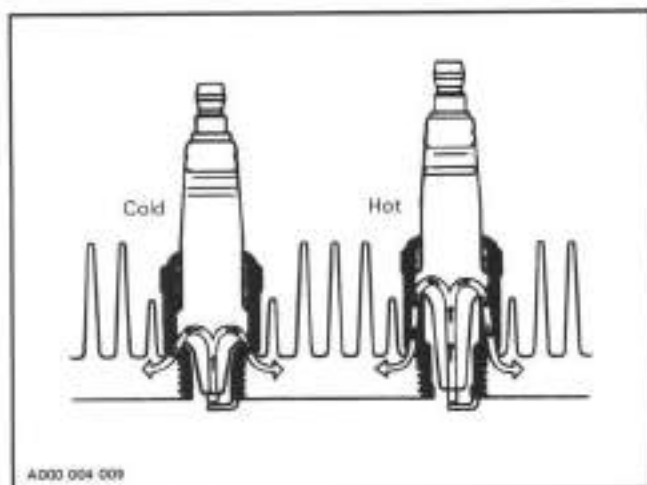
The proper operating temperature or heat range of the spark plugs is determined by the spark plug ability to dissipate the heat generated by combustion.

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 :

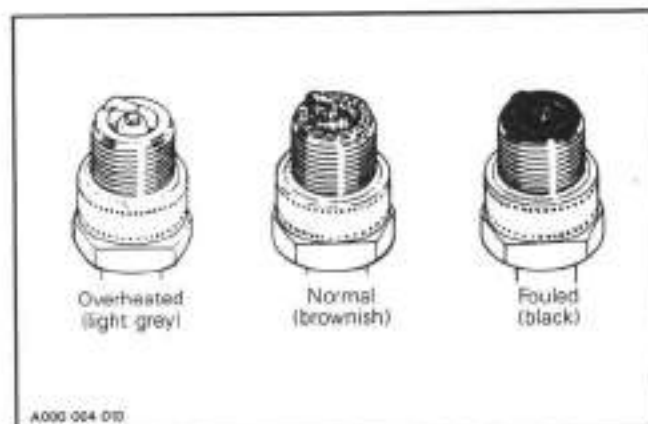
A too "hot" plug will result in overheating and pre-ignition, etc.

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.

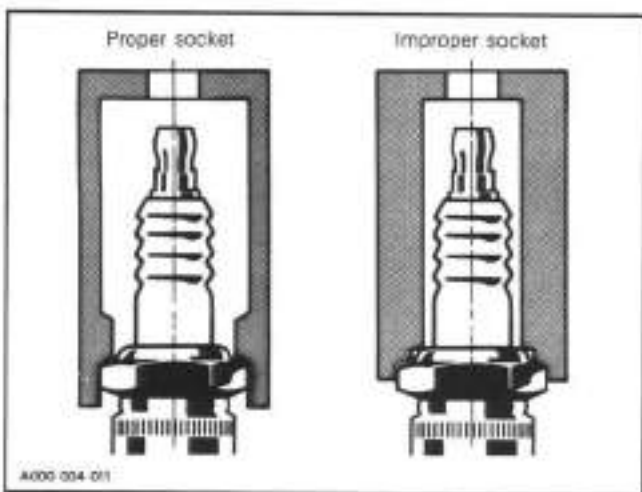
Section 07 ELECTRICAL

Sub-Section 07 (SPARK PLUGS)

SPARK PLUG INSTALLATION

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

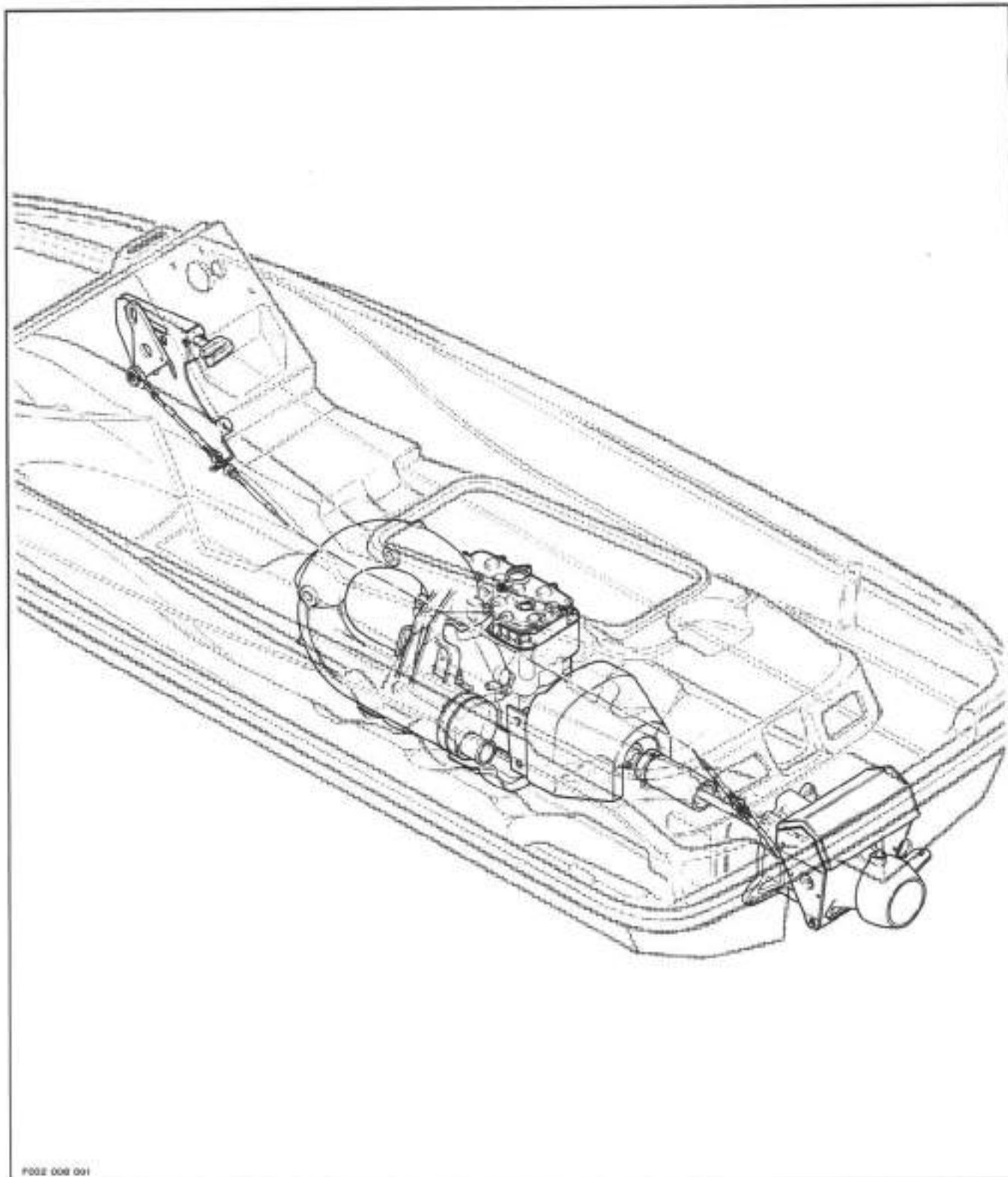
1. Using a wire feeler gauge, set electrode gap according to chart below.
2. Apply antiseize lubricant (P/N 293 550 001) over the spark plug threads to prevent possible seizure.
3. Hand screw spark plug into cylinder head and tighten with a torque wrench and a proper socket.



SPARK PLUG CHART

Models	Engine type	Spark plugs	Torque N·m (lb·ft)	Gap mm (inch)
5804 (SP) 5811 (GT) 5850 (XP)	587	NCK BR7ES	27 (20)	0.60 (0.024)

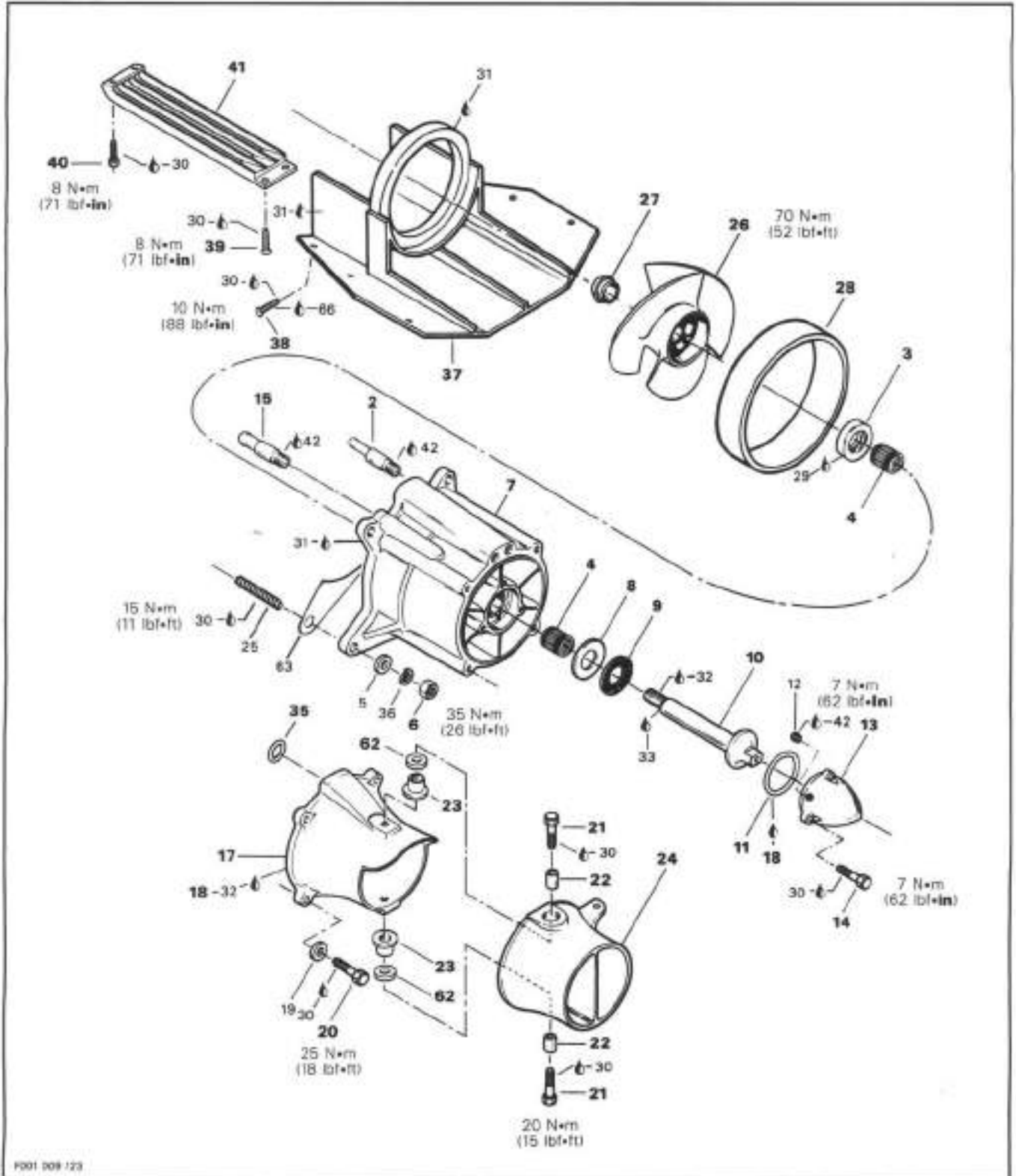
PROPULSION AND DRIVE SYSTEMS



P032 008 001

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

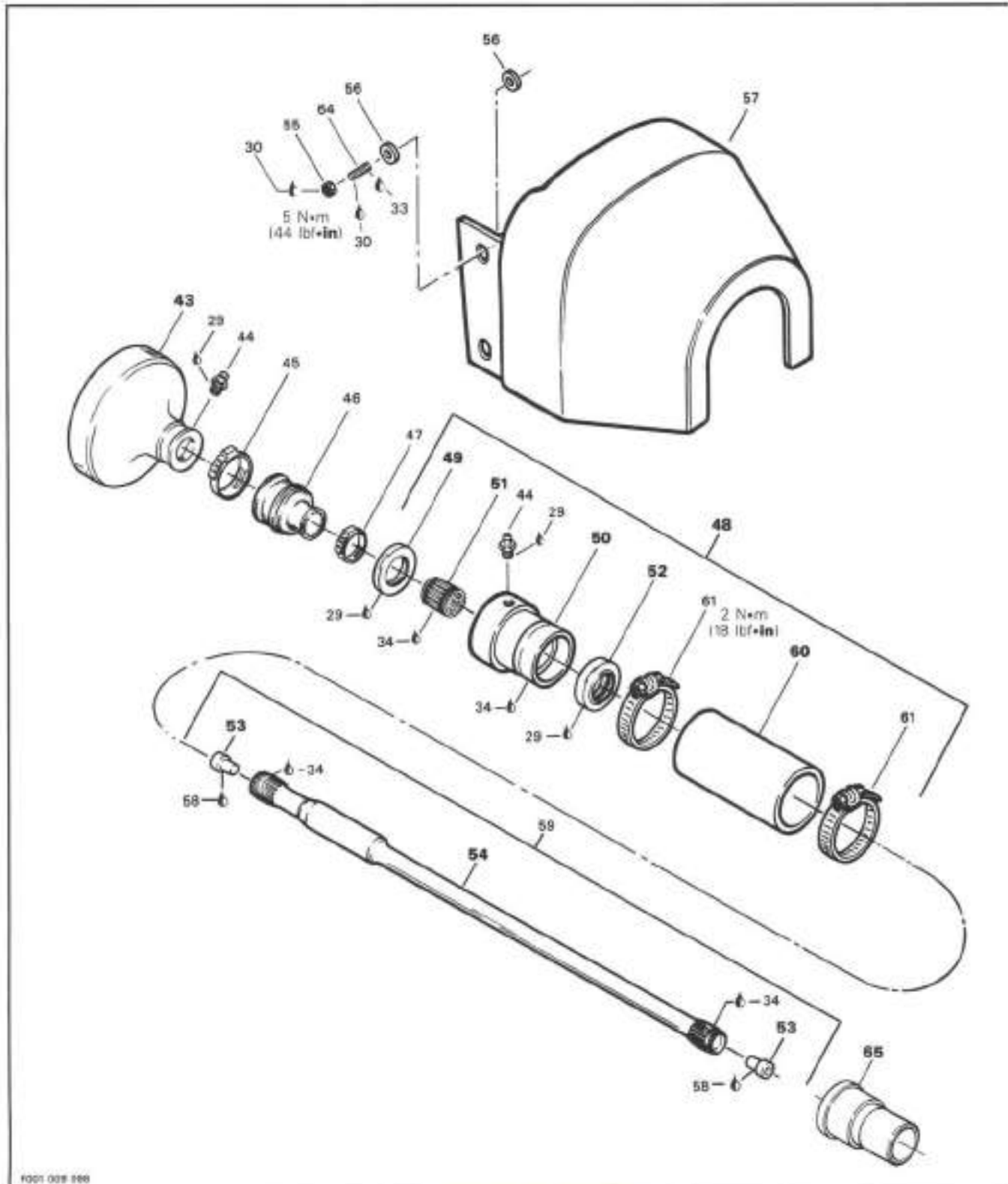
JET PUMP UNIT



Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

DRIVE SHAFT AND SEAL CARRIER



FD01 008 000

Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

COMPONENTS

2. Fitting (baler) (2)
3. Seal (double lip)
4. Needle bearing (2)
5. Flat washer M10 (4)
6. Nut M10 (4)
7. Impeller housing
8. Thrust washer
9. Thrust bearing
10. Impeller shaft
11. O-ring
12. Allen set screw (2)
13. Housing cover
14. Hexagonal head screw M5 x 20 (3)
15. Fitting (pump)
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 (2)
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. Countersunk phillips screw M8 x 15 (2)
40. Hexagonal head screw M6 x 20 (2)
41. Grill
42. Loctite PST 592
43. 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. Nut M8 (4)
56. Flat washer M8 (8)
57. Flywheel guard
58. Loctite 414 super bond
59. Drive shaft assembly
60. Protective hose
61. Gear clamp (2)
62. Washer
63. Shim
64. Stud M8 x 15
65. Hull insert
66. Loctite 732 RTV silicone

○ **NOTE** : Some reference numbers are deliberately missing.

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

JET PUMP SERVICING

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

To work on watercraft, 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.



Impeller Condition and Impeller/Wear Ring Clearance

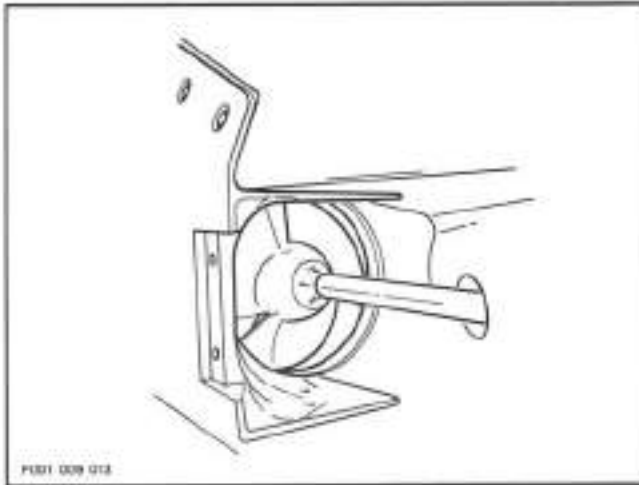
○ **NOTE** : These verifications can be performed without removing impeller housing and thus, avoiding cleaning and sealing pump to hull.

Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

Impeller Condition

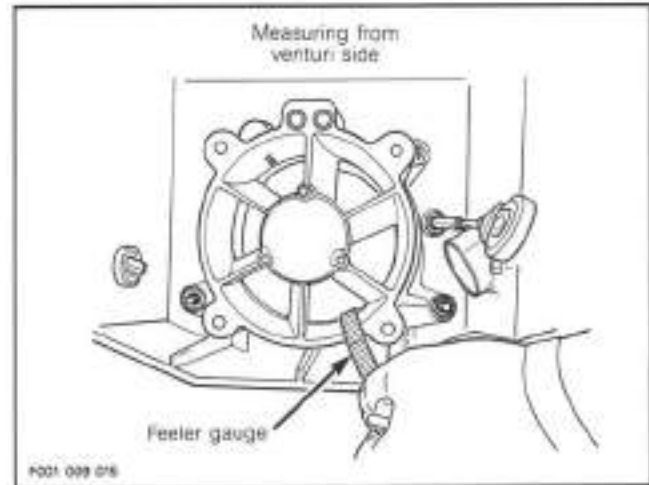
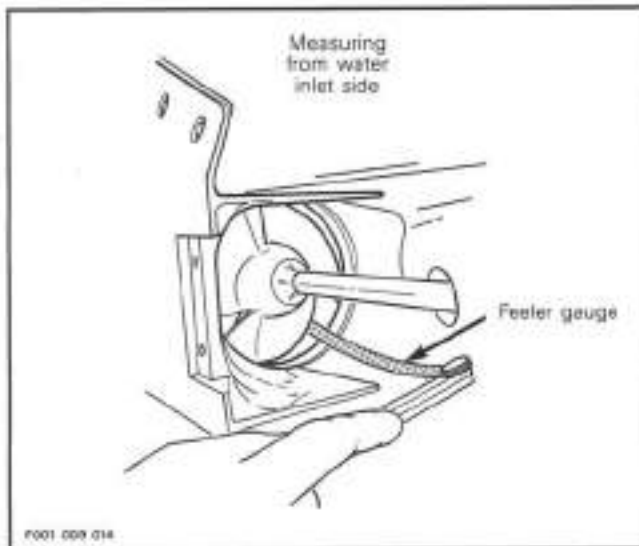
Impeller and boot condition can be quickly checked from underside of the watercraft. Remove grill and look through water inlet opening.



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.

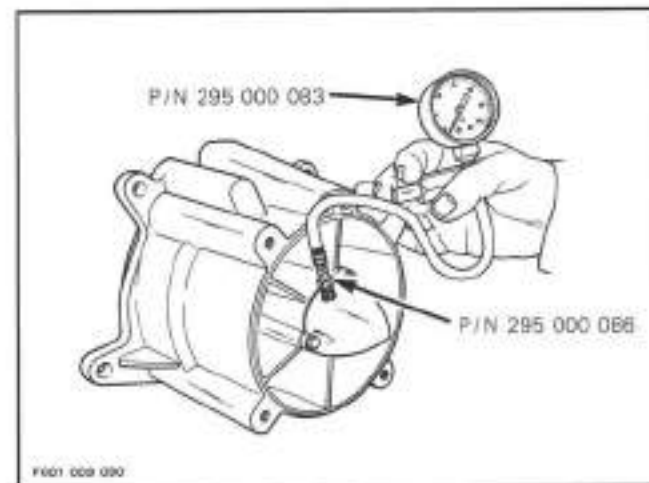
Remove four retaining screws from venturi.

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 seal and/or housing cover O-ring for leaks using 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 seals, O-ring, impeller shaft bushing located at seal level and metal porosity of impeller housing do not leak.

If there is a pressure drop spray soapy water around housing cover. If there is no bubbles, impeller shaft seal, bushing or impeller housing is leaking 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.

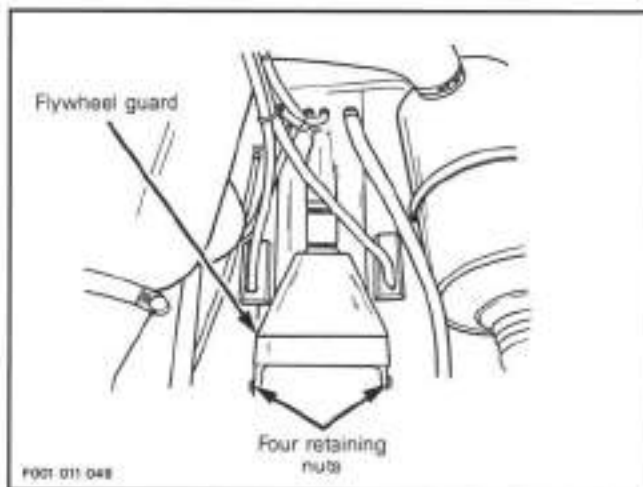
CAUTION: This is a synthetic oil. Do not mix with mineral based oil. Do not mix oil brands.

Properly reinstall removed parts.

REMOVAL AND OVERHAUL

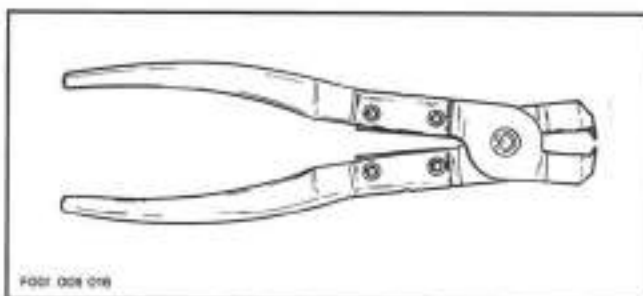
NOTE: Whenever removing a part, visually check for damage such as: corrosion, crack, split, break, porosity, cavitation, deformation, distortion, heating discoloration, wear pattern, missing plating, missing or broken needle on needle bearing, water damage diagnosed by black-colored spots, etc. Renew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

Remove flywheel guard.

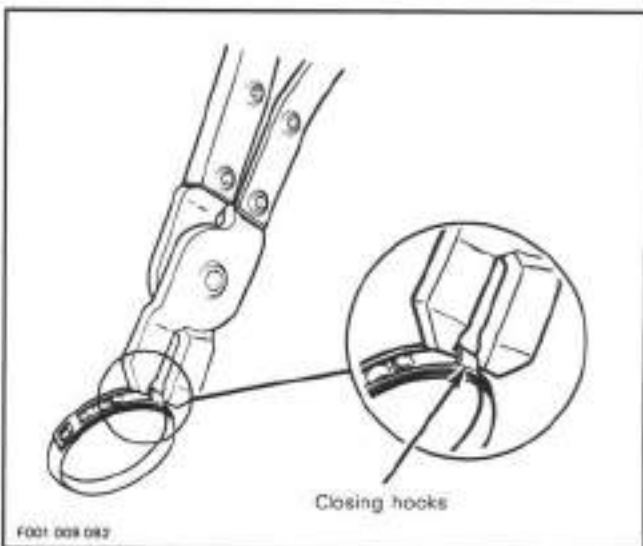


Unfasten **small** clamp on drive shaft boot as follows:

— Use pliers (P/N 295 000 069).



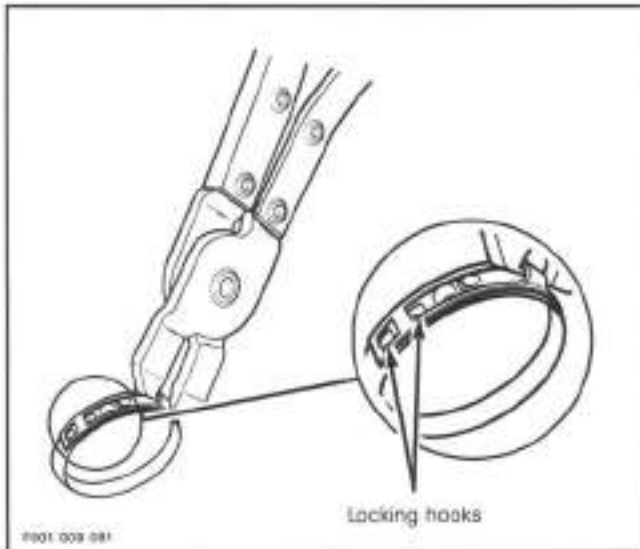
— Insert pointed tips of pliers in closing hooks.



Section 08 PROPULSION AND DRIVE SYSTEMS

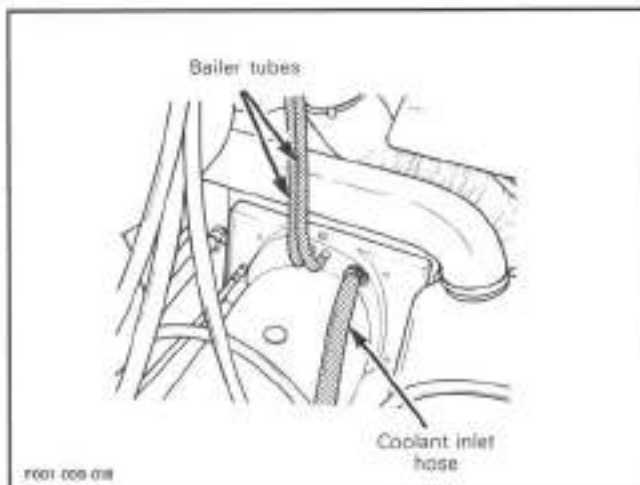
Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

- 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.

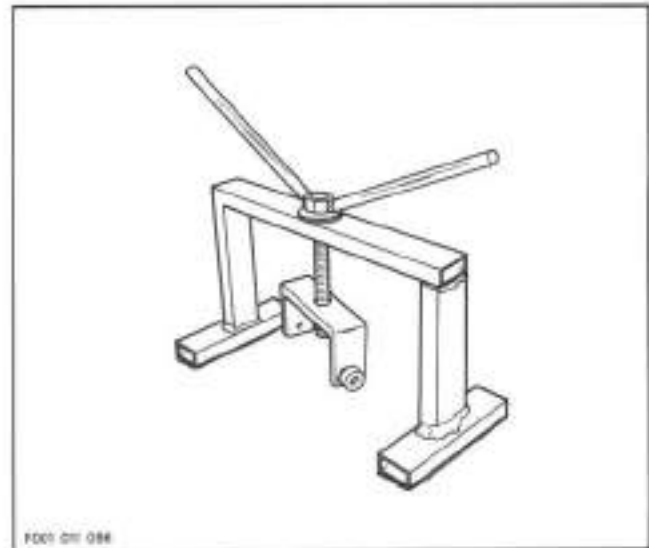
21,22,23,24,62, Screw, Sleeve, Bushing, Nozzle and Washer

Remove two retaining screws and withdraw nozzle. Push sleeves and bushings out of nozzle.

6,7, Nut and Impeller Housing

Remove nuts retaining impeller housing to hull.

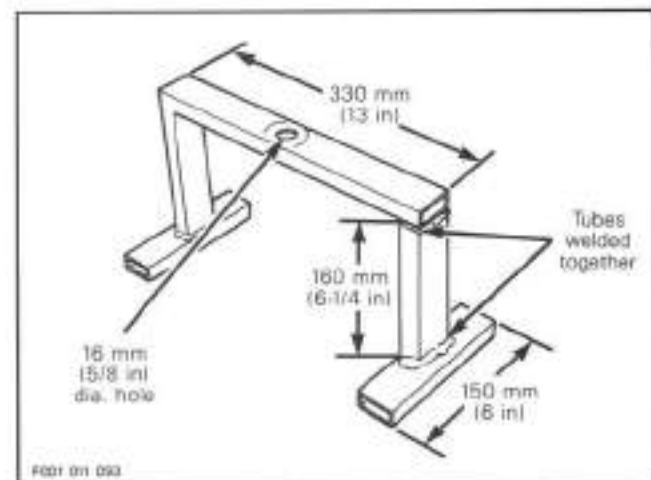
Make the following tool to easily separate impeller housing from hull.



- 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.

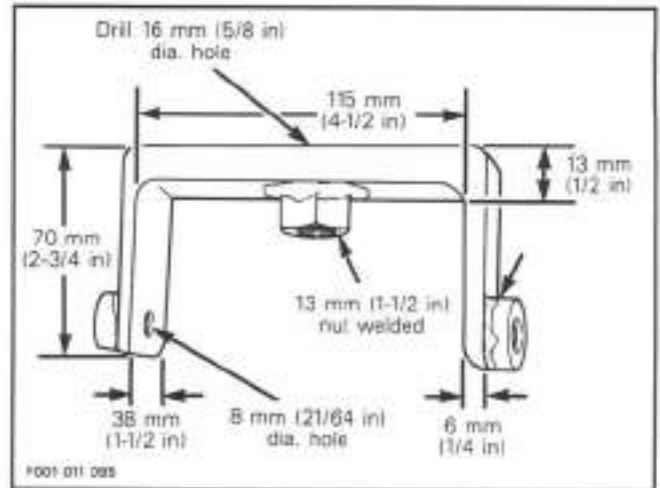
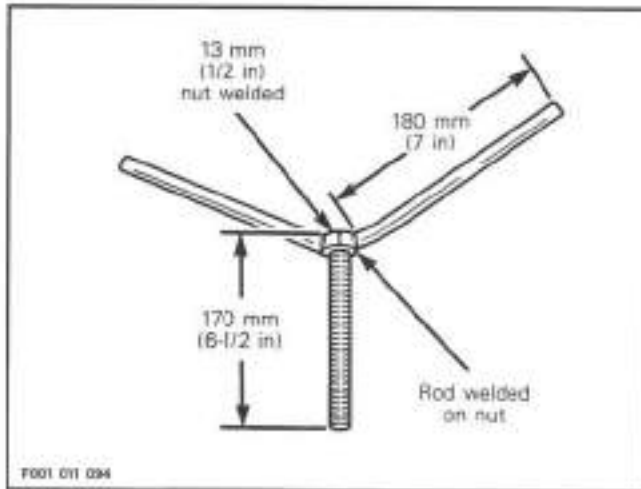
- Weld rectangular tubes together as shown in the following illustration.



Section 08 PROPULSION AND DRIVE SYSTEMS

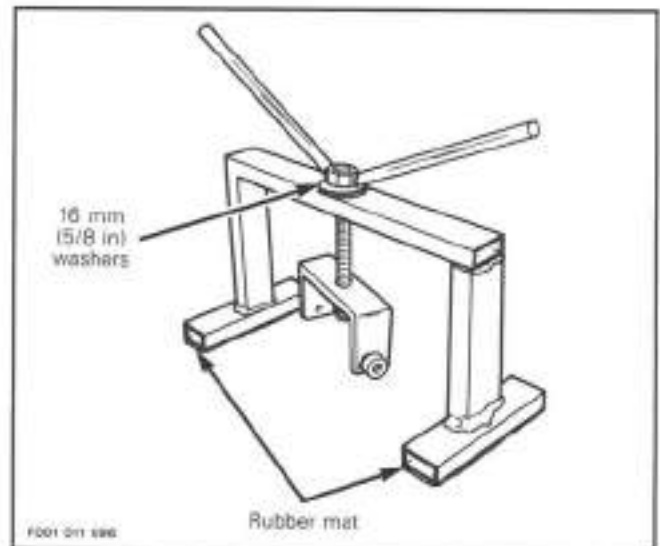
Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

- 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.



- Install two 18 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.

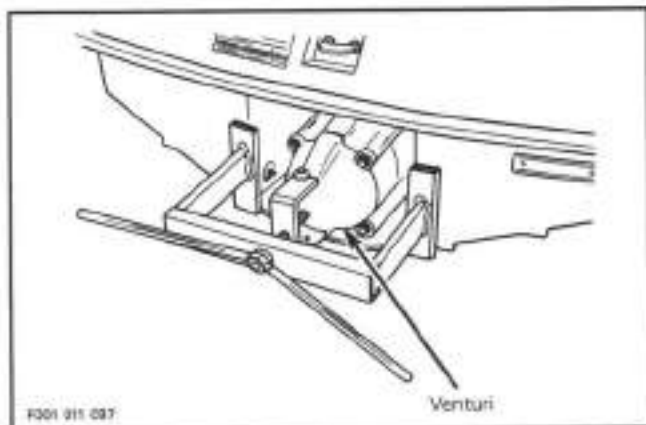
- Use one steel flat bar 38 x 13 mm (1-1/2 x 1/2 in) thick x 115 mm (4-1/2 in) long or two flat bars 6 mm (1/4 in) thick welded together.
- Drill one 16 mm (5/8 in) diameter hole in center of flat bar.
- Align a 13 mm (1/2 in N.C.) diameter nut over the hole already drilled in flat bar and weld it in 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.



Section 08 PROPULSION AND DRIVE SYSTEMS

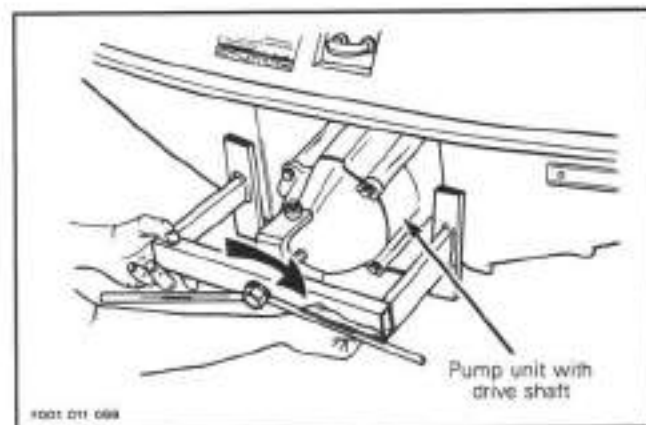
Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

Using screws previously removed from nozzle, install pump remover on venturi.



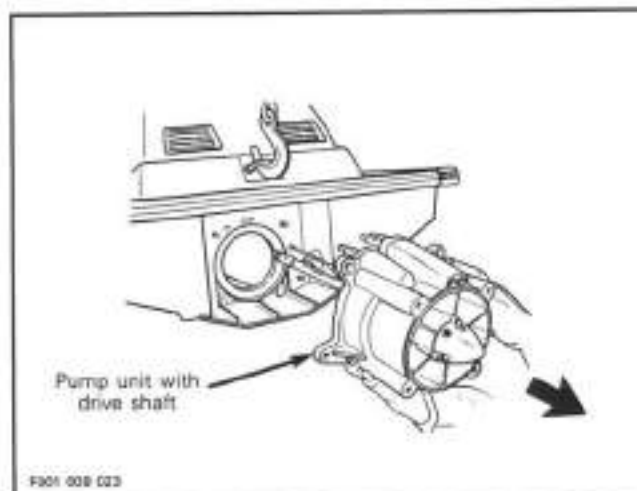
Rotate handle clockwise to remove jet pump. Withdraw pump unit and drive shaft together.

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.



17,20,35, Venturi, Screw and O-ring

Remove four retaining screws and withdraw venturi. Keep O-ring for future use.

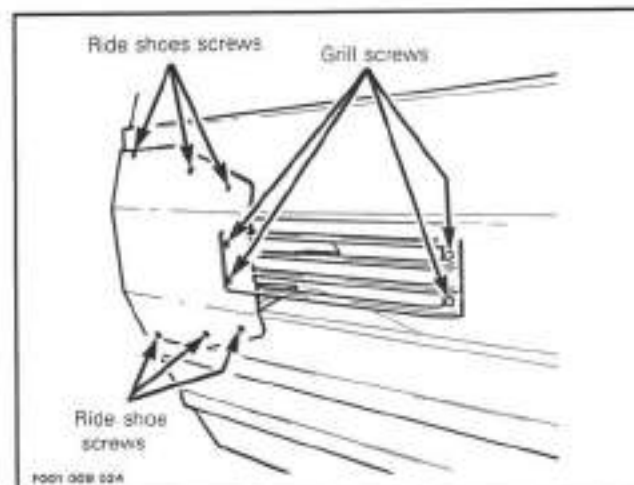


37,38,39,40,41, Ride Shoe, Screw and Grill

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.



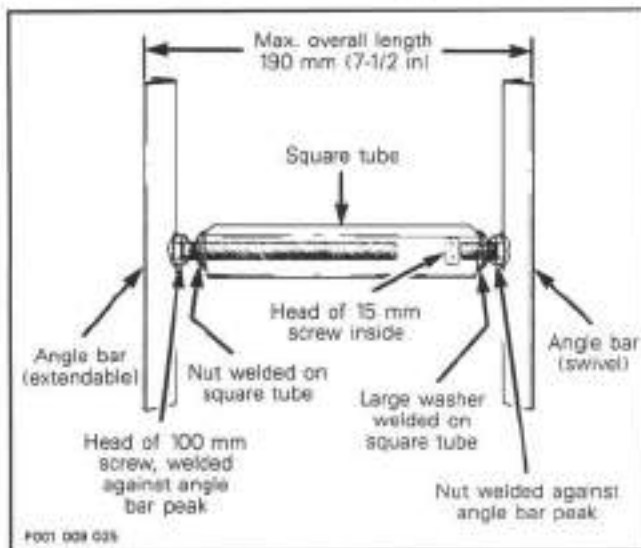
Make the following tool to easily separate ride shoe from hull.

Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

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

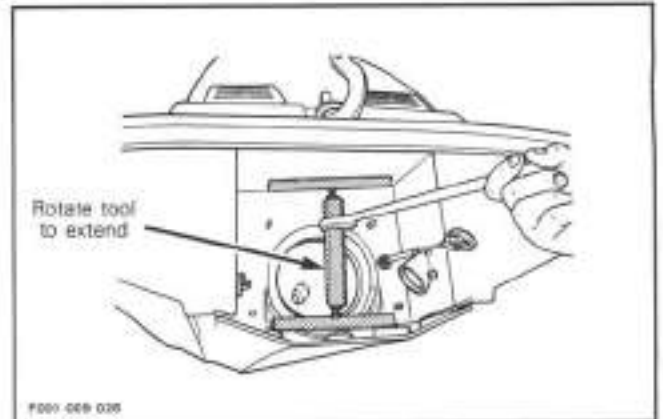
- Use two steel angle bars 25 x 25 x 3 mm (1 x 1 x 1/8 in) thick x 225 mm (9 in) long.
- A kind of tumbuckle is needed to apply extension force between ride shoe and hull. Use a 25 mm (1 in) square tube by approximately 125 mm (5 in) long so that, with all parts welded, its overall length will not exceed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



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.

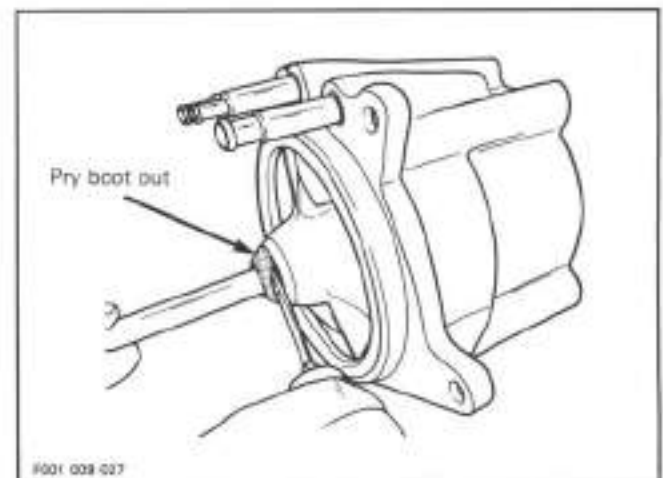
Loosen gear clamp holding seal carrier protective hose, then carefully pull hose and seal carrier from hull insert.

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.

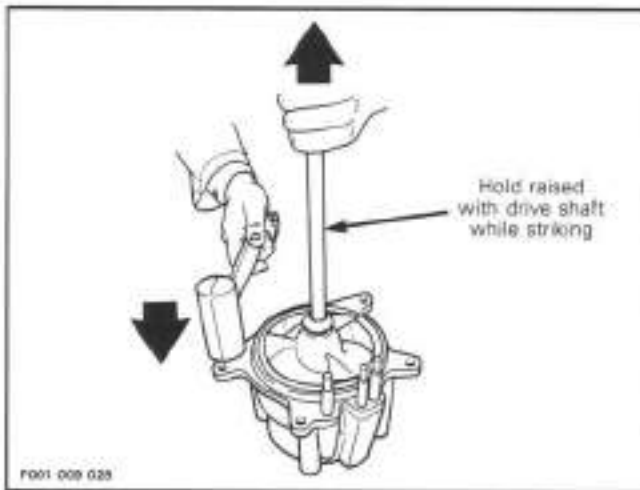


Section 08 PROPULSION AND DRIVE SYSTEMS

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Withdraw drive shaft.

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

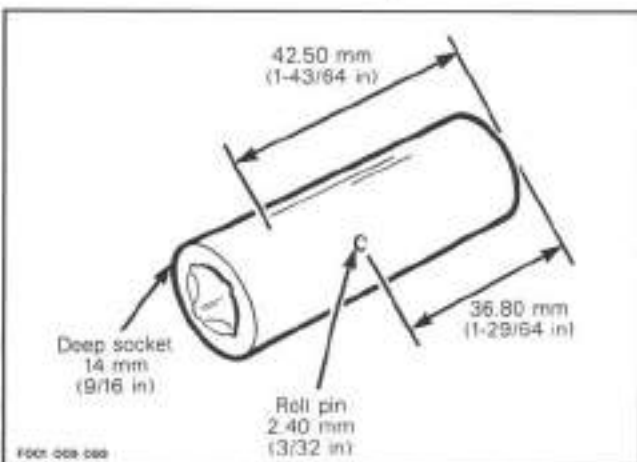


2,15, Fitting

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.

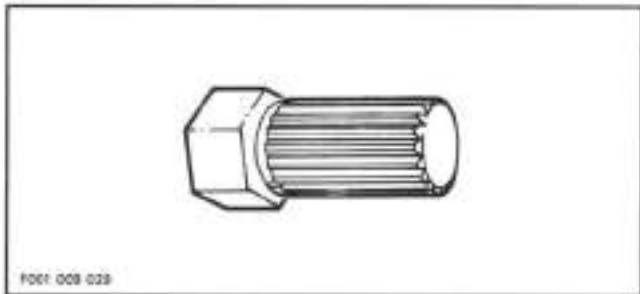
Place container under cover to catch oil.

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.

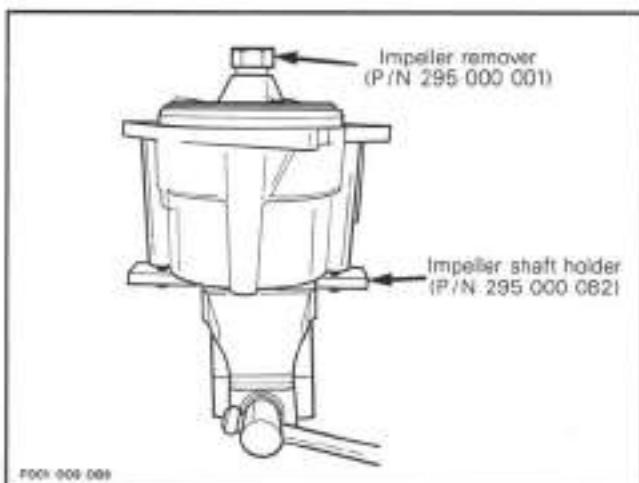
Impeller is loosened using impeller remover (P/N 295 000 001).



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

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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 shaft.

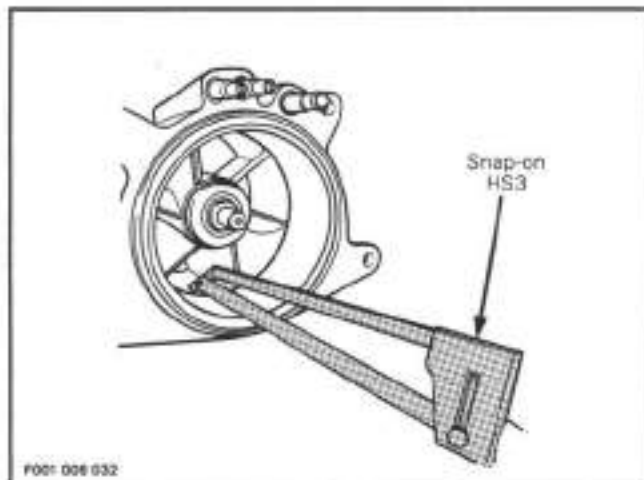
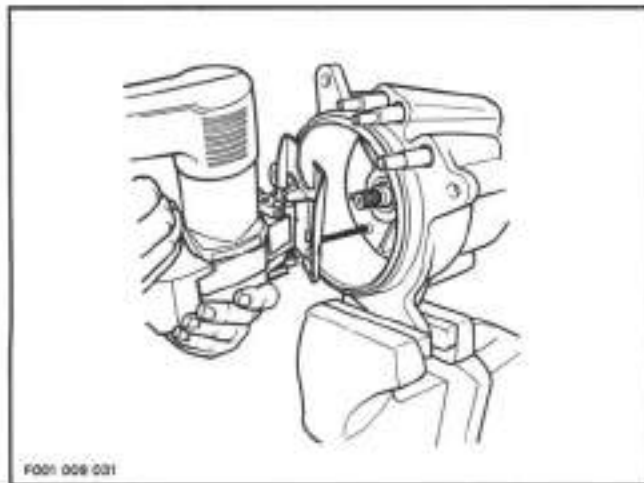
28, Wear Ring

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.

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




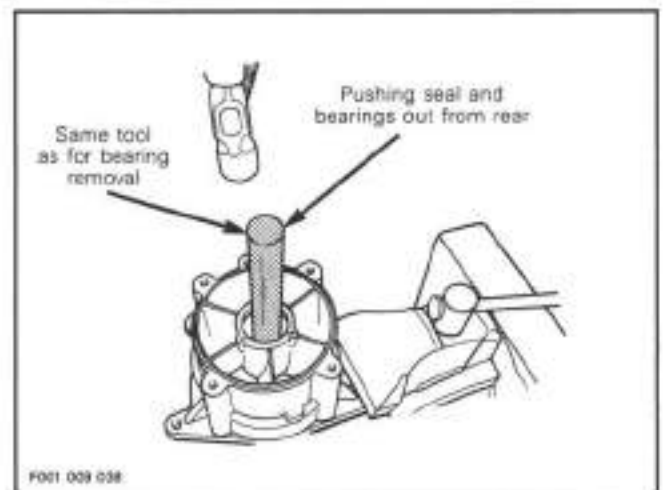
After cutting ring, insert a screwdriver blade between impeller housing and one end of ring.

Lift ring and 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.

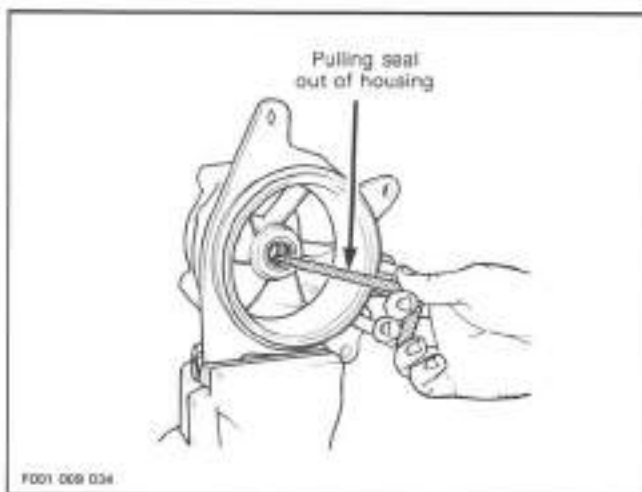
Seal should be removed using the following suggested tool.

Seal puller, Snap-on #S6129.



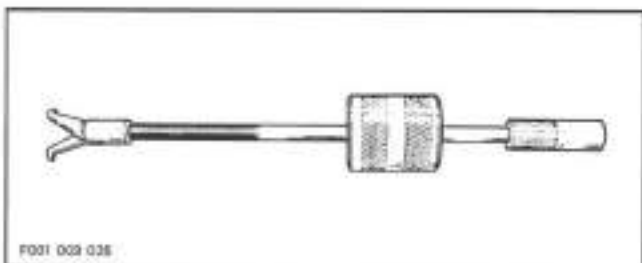
Section 08 PROPULSION AND DRIVE SYSTEMS

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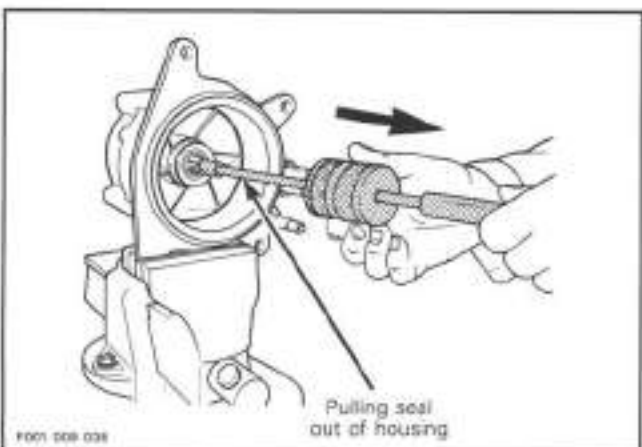
Or, use a Snap-on hammer puller including:

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.

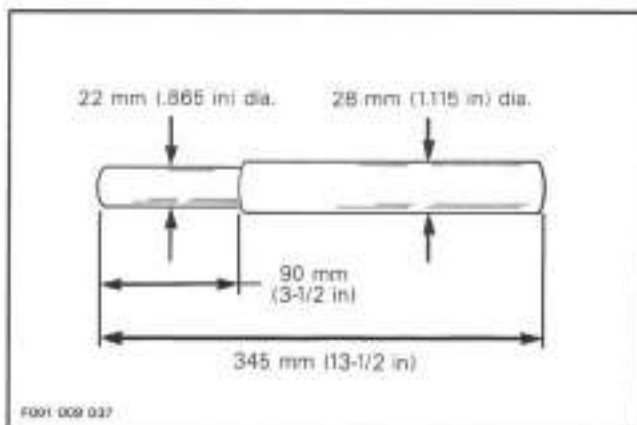
Slide puller sleeve outwards and **gently tap** puller end. Work with small strikes otherwise claws will slip out. As soon as seal begins to slide out, retighten claws to always maintain them tight against seal. Continue pulling until seal is out.



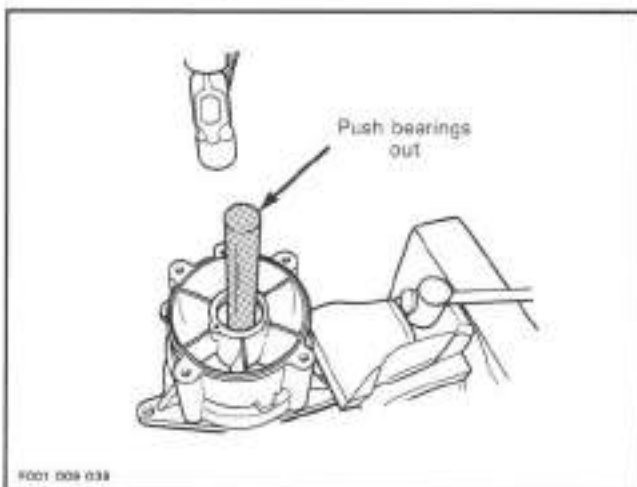
4, Needle Bearing


 **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. This remover tool may also be used with a hammer. However, care should be taken not to damage bearing journals.



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

Section 08 PROPULSION AND DRIVE SYSTEMS

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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.

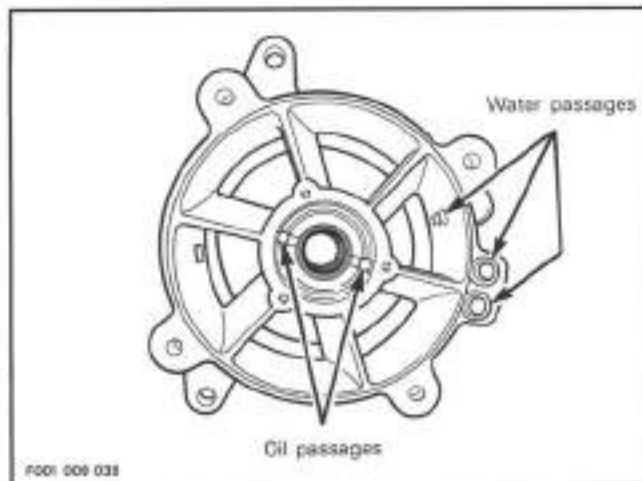
Remaining silicone can be removed with a steel brush (disc) mounted on a drill motor.

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, Flywheel and Drive Shaft

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

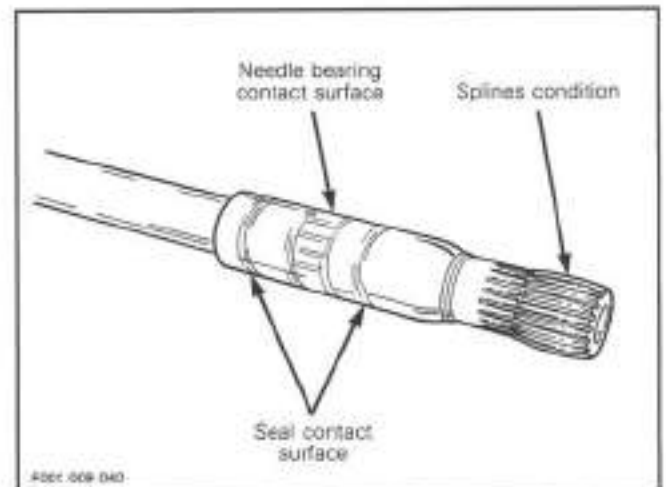
51,53,54, Needle Bearing, Damper and Drive Shaft

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.

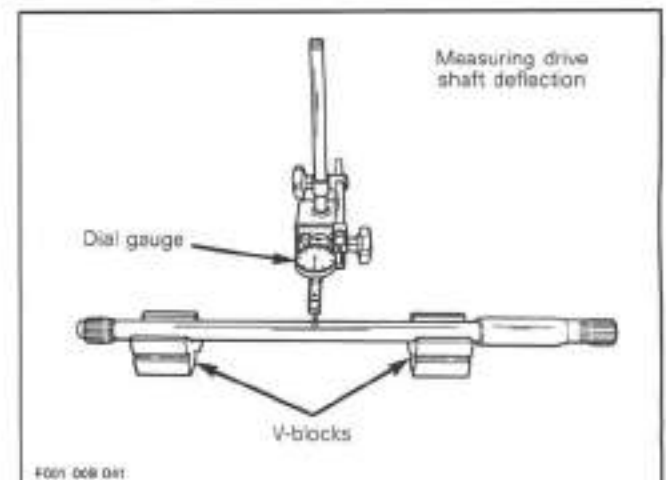


Deflection

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.

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



Section 08 PROPULSION AND DRIVE SYSTEMS

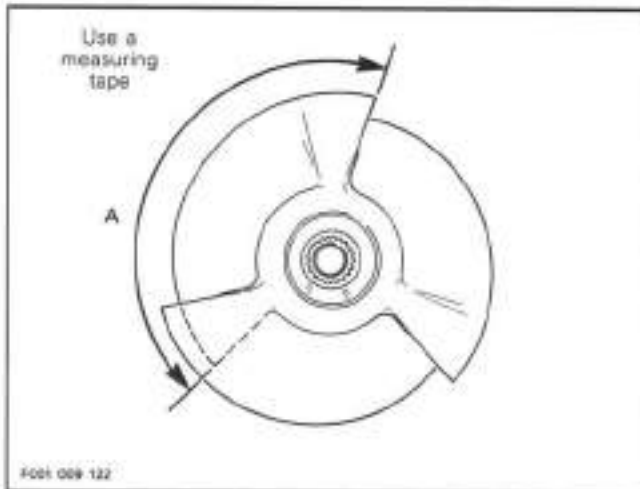
Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

26, Impeller

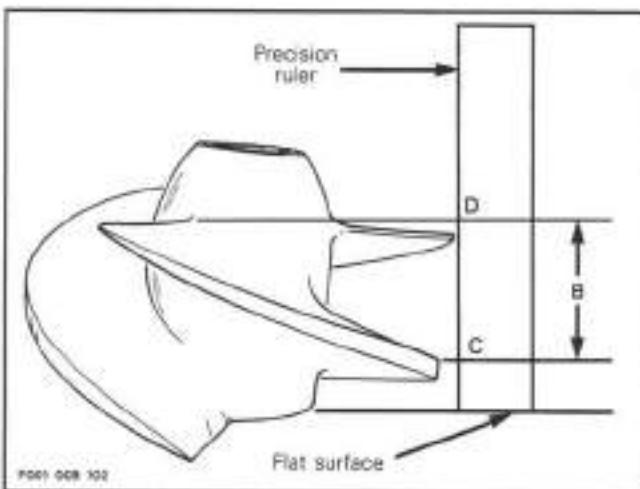
Identification

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.

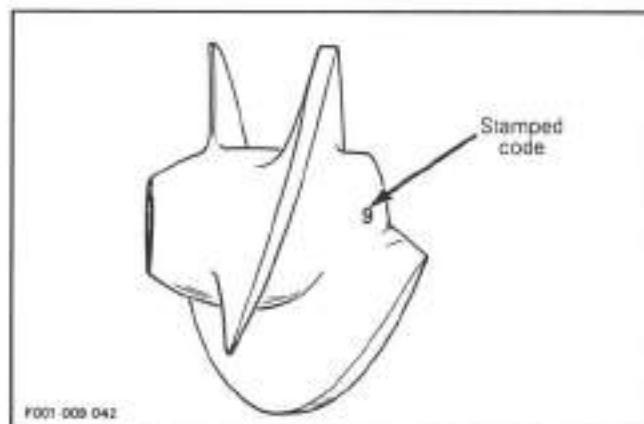


Refer to the following chart to identify impellers.

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	271 000 066	Aluminum	18°	192 mm (7-9/16")	58 mm (2-9/32")
5810 5811	271 000 052	Stainless steel	17°	186 mm (7-21/64")	56 mm (2-13/64")
5850	271 000 115	Stainless steel	19°	174 mm (6-27/32")	57 mm (2-1/4")
All models except 5850	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.

Refer to following illustration and chart.



VEHICLE MODEL NO.	IMPELLER P/N	MATERIAL	DEGREE	CODE
5810 5811	271 000 052	Stainless steel	17°	7
5850	271 000 115	Stainless steel	19°	9
All models except 5850	271 000 046 (optional)	Polished stainless steel	17.7°	77

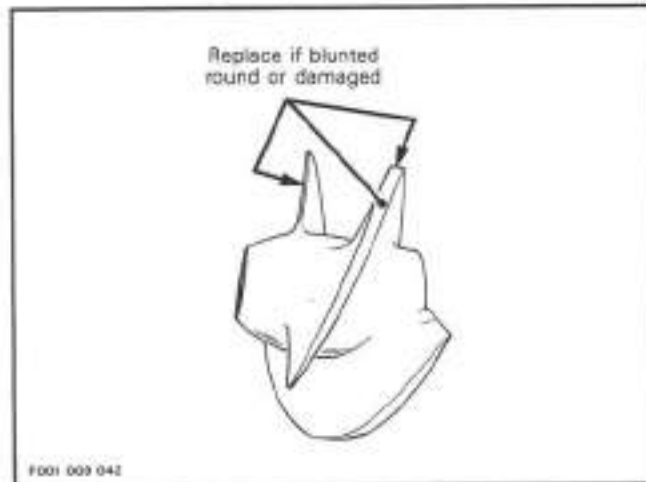
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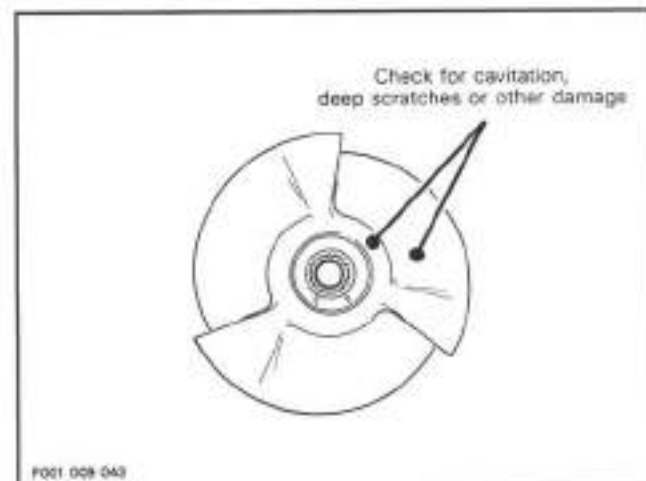
26,28, Impeller and Wear Ring

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.

Radial Play

Radial play is critical for jet pump unit life span.

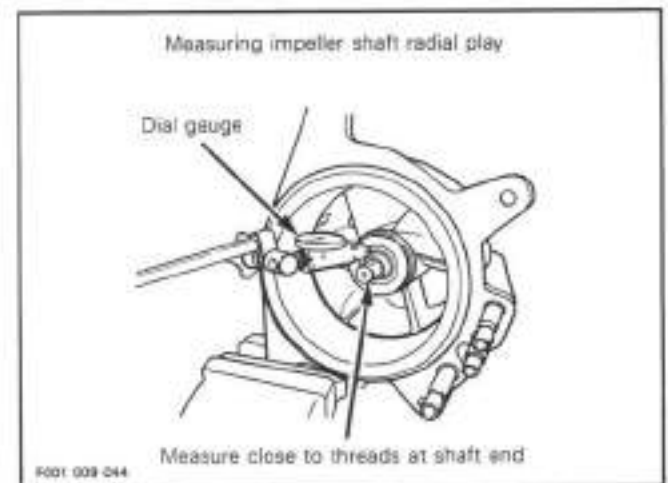
Radial play of impeller shaft is checked with shaft in housing, without impeller.

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.

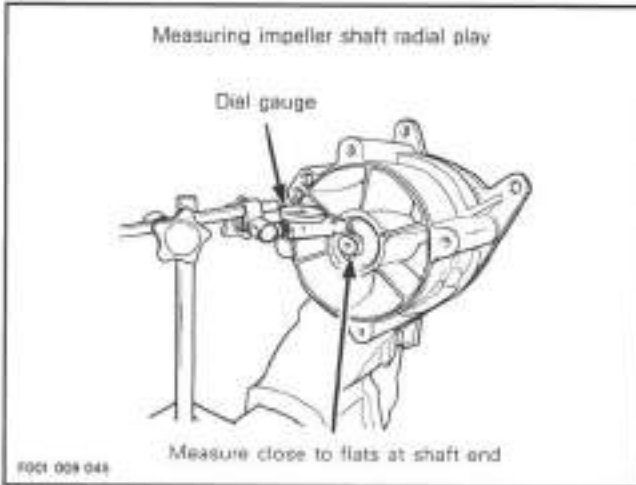
Maximum permissible radial play is 0.05 mm (0.002 in).



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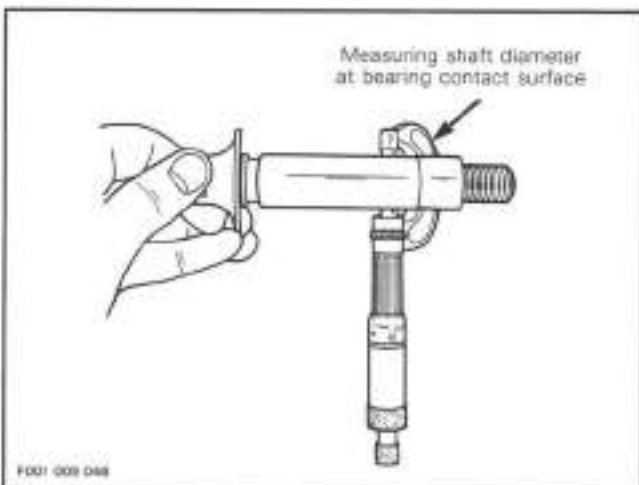
Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

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



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

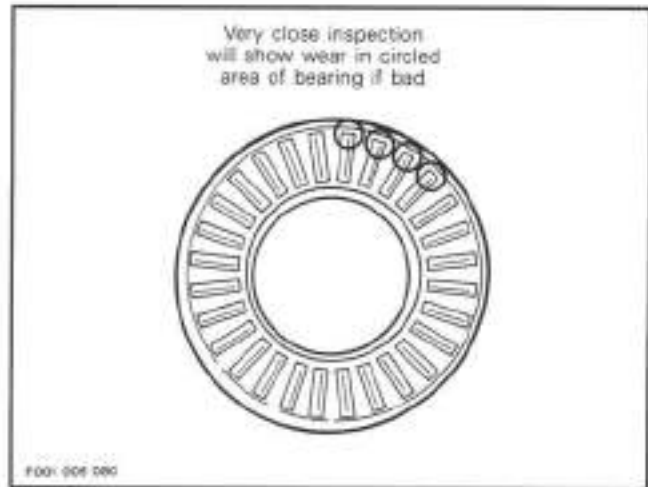
Measuring shaft diameters will determine defective part. Using a micrometer, measure diameters on bearing contact surfaces. **Minimum** shaft diameter should be 22.23 mm (.8753 in). A shaft within tolerance indicates worn bearings. Replace both bearings.



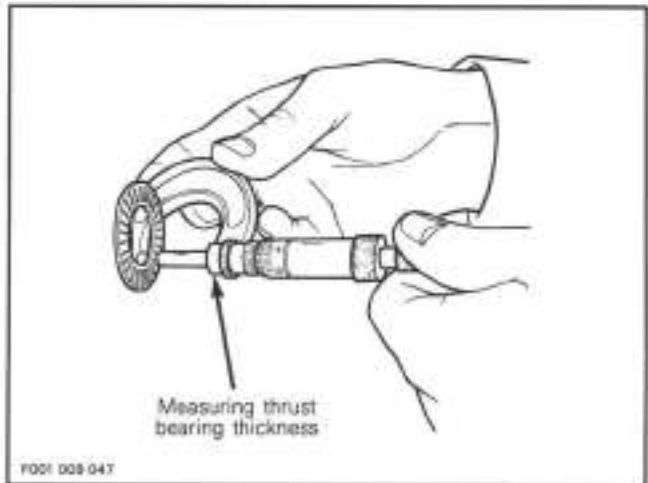
○ **NOTE** : If shaft is to be replaced, it is recommended to replace both bearings at same time. In addition, it is suggested to replace thrust bearing and thrust washer.

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.



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.

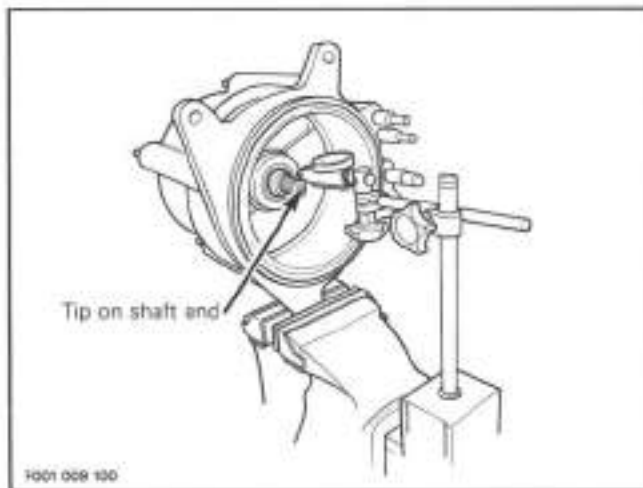
Section 08 PROPULSION AND DRIVE SYSTEMS
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13, Housing Cover

End Play

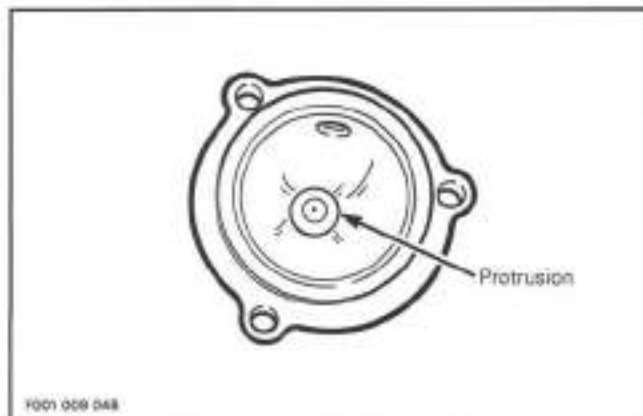
End play of impeller shaft is checked with shaft in housing, with impeller.

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

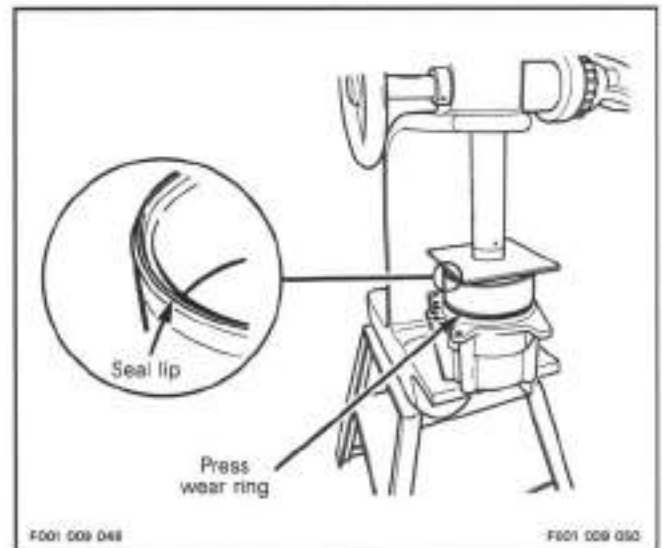
28, Wear Ring

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

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

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

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

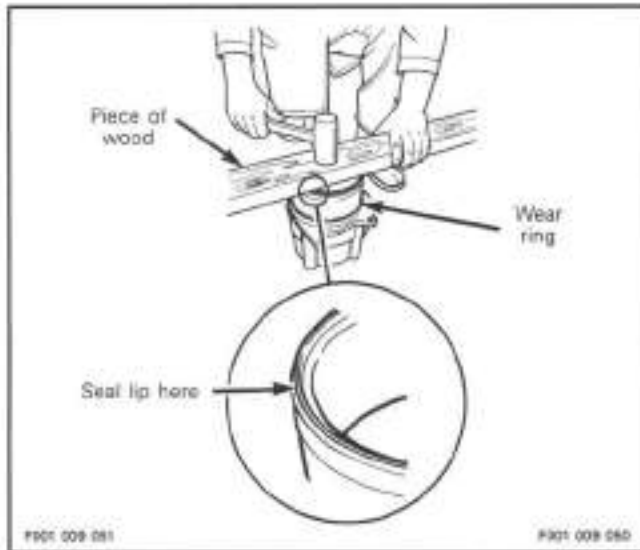


If a press is not readily available, a piece of wood such as a 2 x 4 x 12 in. long, can be used.

Section 08 PROPULSION AND DRIVE SYSTEMS

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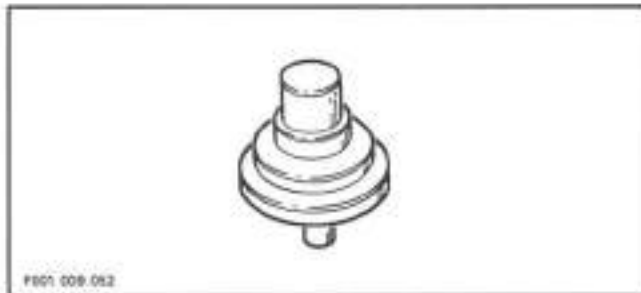
Manually engage ring in housing making sure it is equally inserted all around. Place wood piece over ring. Using a hammer, strike on wood to push ring. Strike one side then rotate wood piece about 90° and strike again. Work this way, frequently rotating wood piece so that ring slides equally all around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



3,4, Seal and Needle Bearing

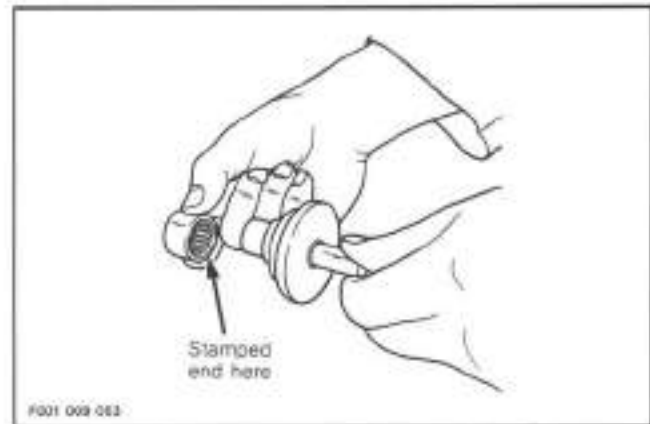
Bearings and seal will be properly installed in housing using bearing installer tool (P/N 295 000 014).

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.

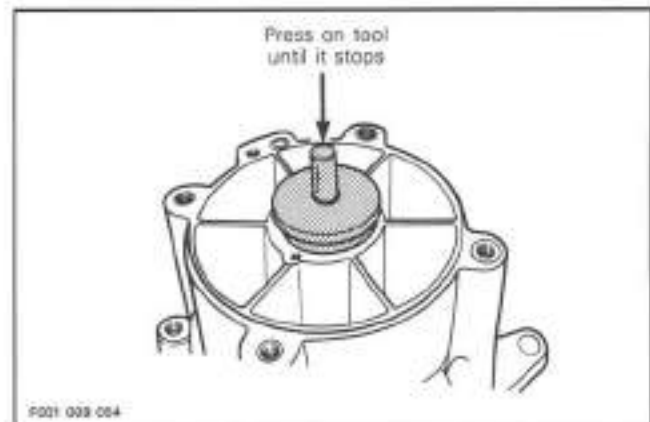


Stamped end of bearings (showing identification markings) must be located toward outside of housing.

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.

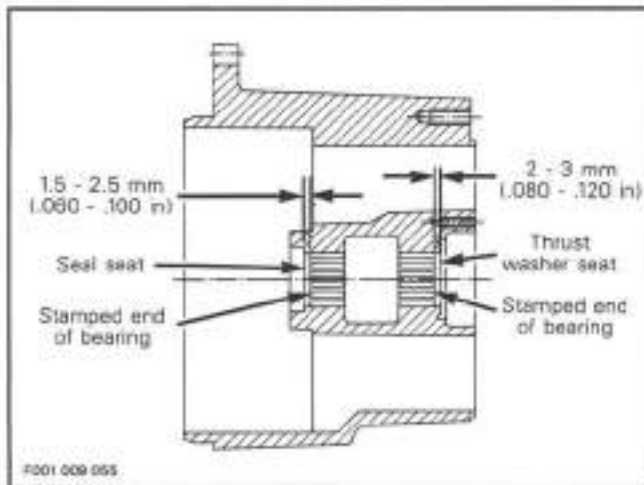


CAUTION : This tool has been designed to properly position bearings and seal thus, providing space for lubrication purposes. The tool flanges allow for this. If a different pusher type is being used, components must be properly positioned as follows.

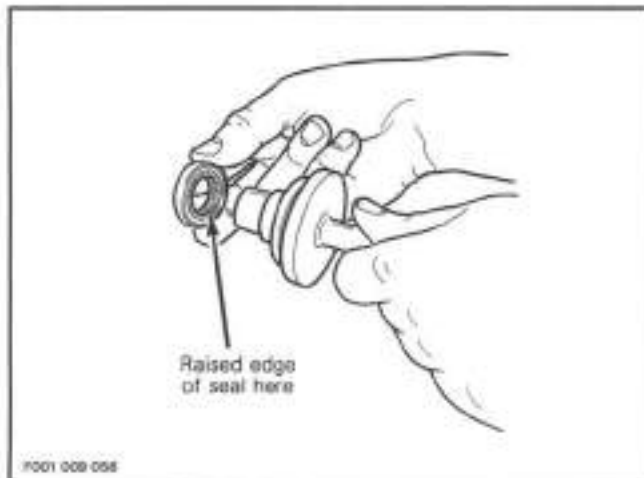
Section 08 PROPULSION AND DRIVE SYSTEMS

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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.

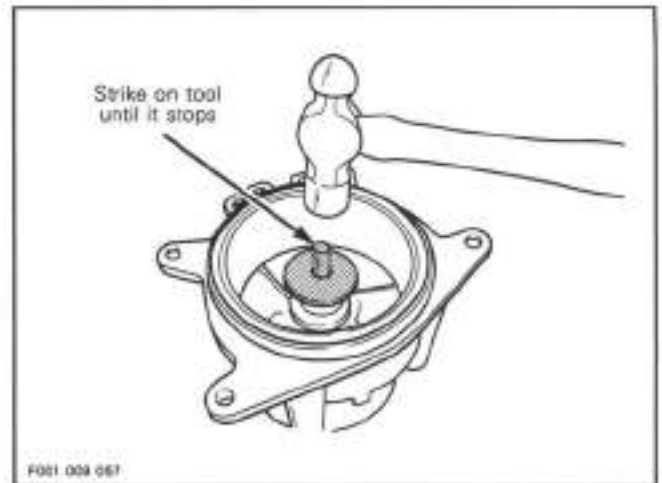


Same tool will be used to install seal in housing. Seal must be installed so that raised edges of lips are toward outside of housing (toward impeller). Apply Loctite 515 (P/N 293 800 007) in seal housing, all around outer diameter and on seal seat. Properly insert seal on tool.

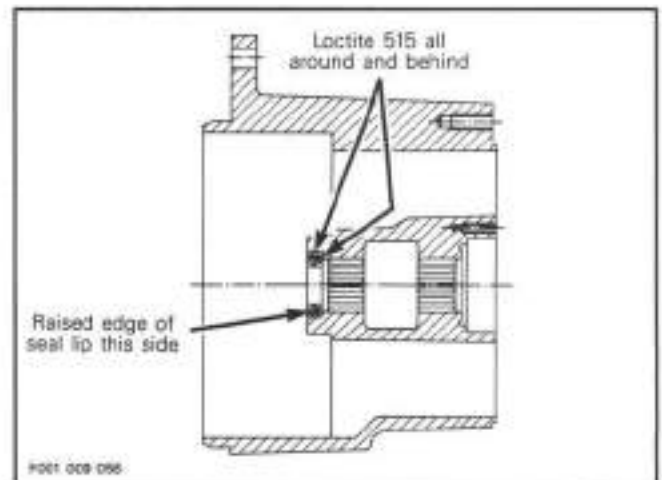


CAUTION: Take care that no sealant contacts any roller of bearing.

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



Apply synthetic grease (P/N 293 550 010) between seal lips.



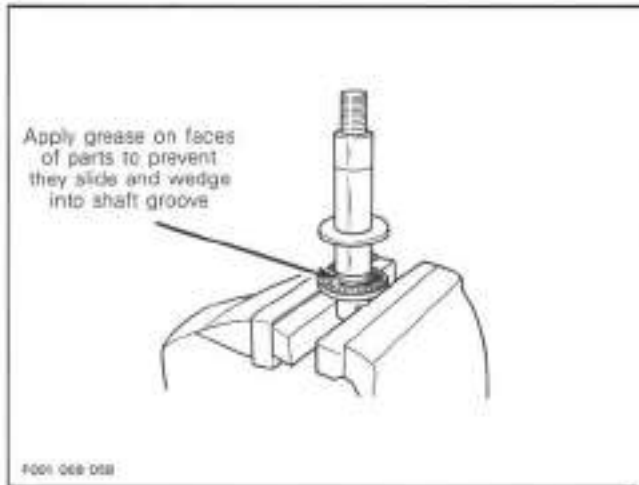
7,8,9,10,26, Impeller Housing, Thrust Washer, Thrust Bearing, Impeller Shaft and Impeller

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

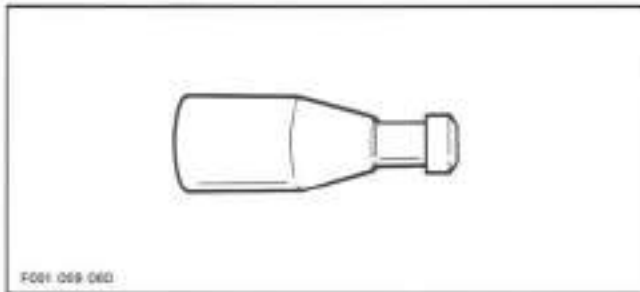
Apply synthetic grease (P/N 293 550 010) both sides of thrust bearing then insert onto shaft followed by thrust washer. Properly center washer and bearing with shaft flange. Grease will prevent parts from sliding at installation and thus possibly wedging thrust bearing into shaft groove.

Section 08 PROPULSION AND DRIVE SYSTEMS

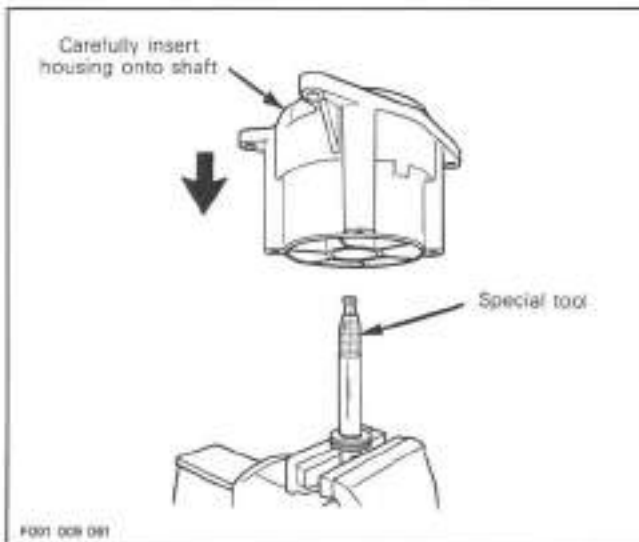
Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)



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.

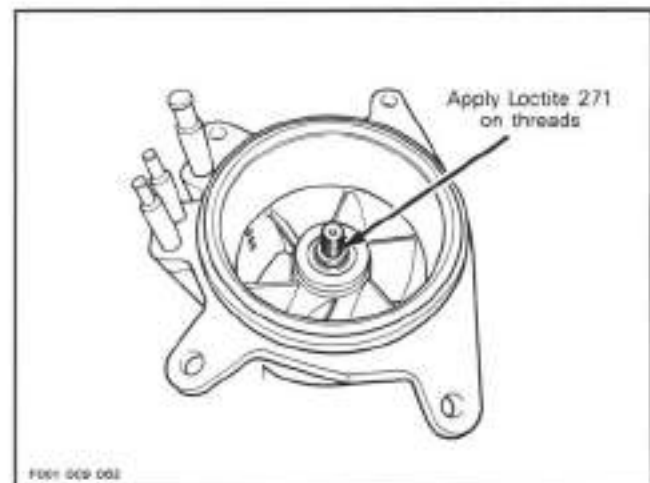
Brush and clean impeller shaft threads and impeller splines with Loctite Safety solvent 755 (P/N 293 800 019) or equivalent. Free threads and splines from any residue. Allow solvent to dry thoroughly.

▼ **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.

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 threads. Carefully engage threads making sure they are well aligned.

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

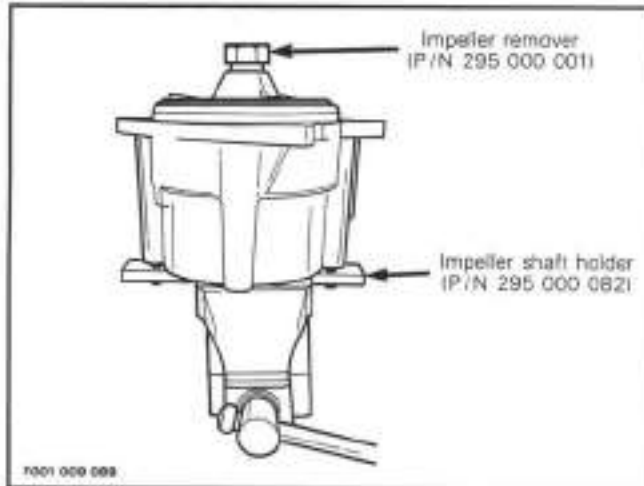
▼ **CAUTION:** Make sure thrust washer and bearing are not wedged in shaft groove. To check, manually pull and push impeller housing, an axial play must be felt.

Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

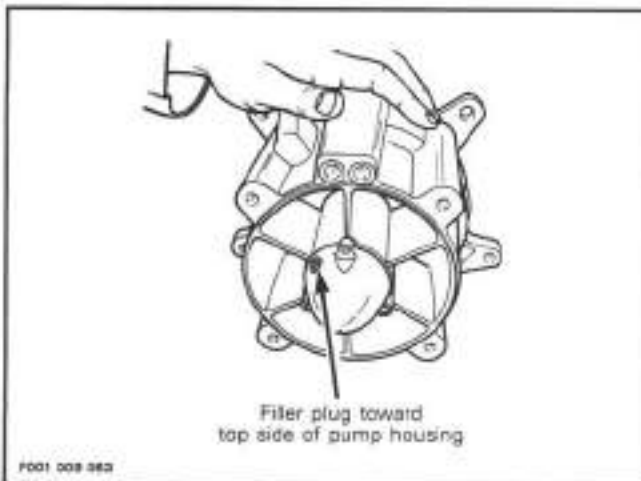
Torque impeller to 70 N•m (52 lbf•ft) then remove tools.

▼ **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).

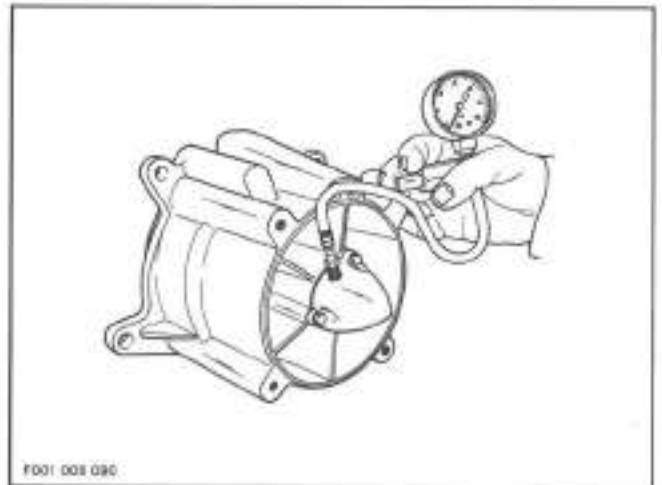
PUMP PRESSURIZATION

Whenever doing any type of repair on the pump, pressure test should be done to verify if any leak.

Pressure Test

Proceed as follows :

- Remove plug from housing cover.
- 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 during 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 is no bubbles, impeller shaft seal bushing or impeller housing is leaking 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.

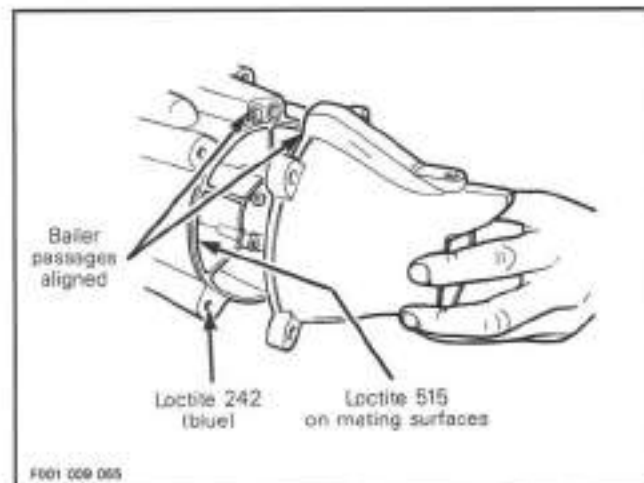
○ **NOTE** : When filling, oil must be poured into cover quite slowly to allow complete housing fill.



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.



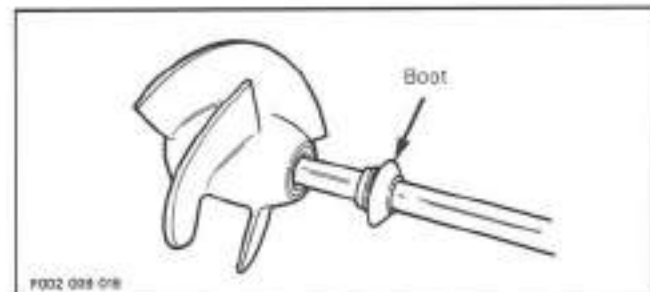
○ **NOTE** : On aluminum material it is recommended to use Loctite primer N (P/N 293 600 012) to reduce curing time and to increase gap filling capability. Refer to manufacturer's instructions;

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.

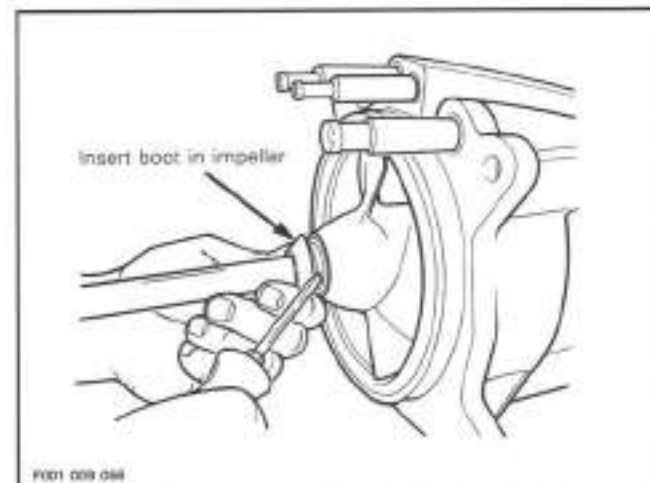


Clean drive shaft splines with Loctite solvent 755 (P/N 293 800 019). Free splines from any residue. Allow solvent to dry thoroughly.

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.

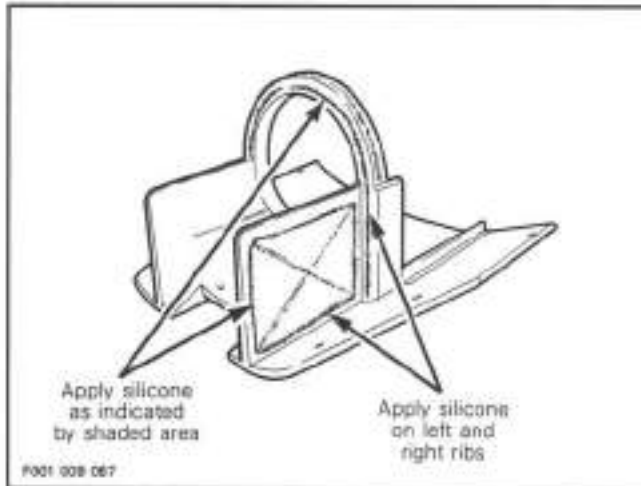


Section 08 PROPULSION AND DRIVE SYSTEMS

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.

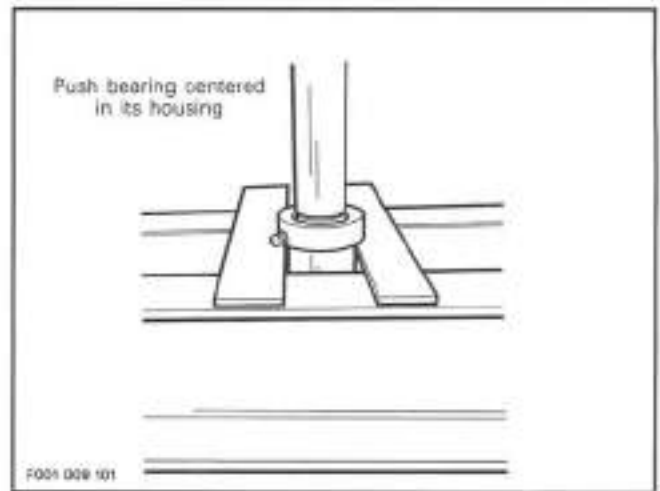
Apply Loctite 242 (blue) (P/N 293 800 015) on threads of grill screws, install and tighten. Torque both front screws (hexagonal head) to 8 N•m (71 lbf•in).

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.

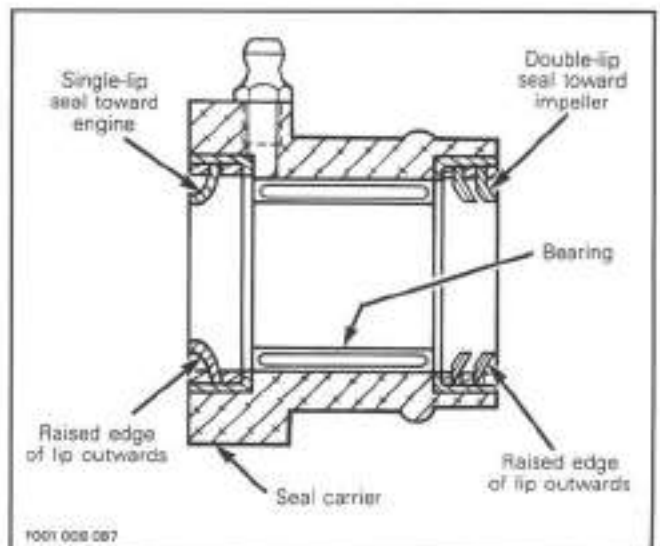
▼ **CAUTION:** Never hammer the bearing into its housing.



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.

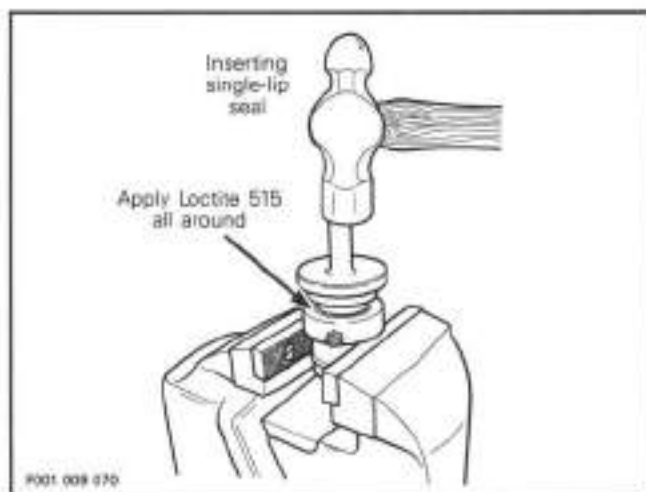


Apply Loctite 515 (P/N 293 800 007) all around outside diameter of seals.

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

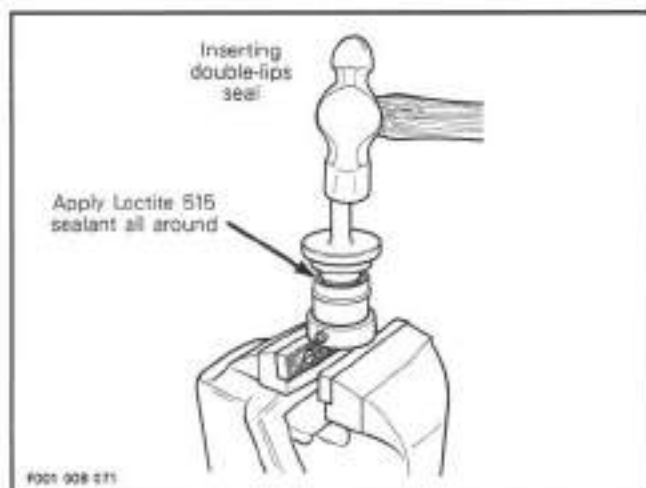
Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)



It is recommended to use a special tool (P/N 295 000 014) to avoid lip damage on double-lip seal.

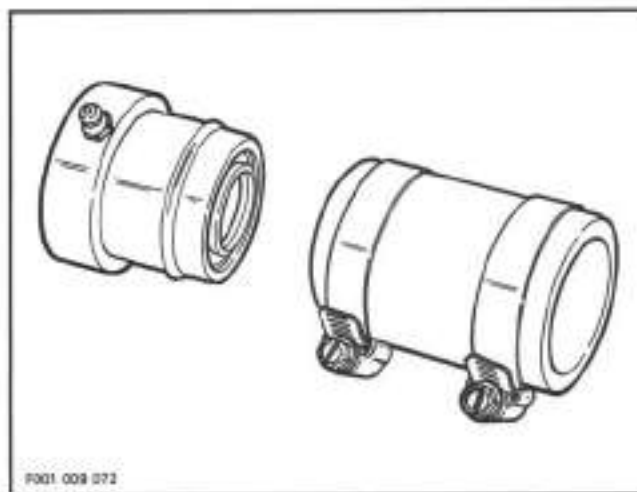
Push seal until it comes flush with its housing.

○ **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.

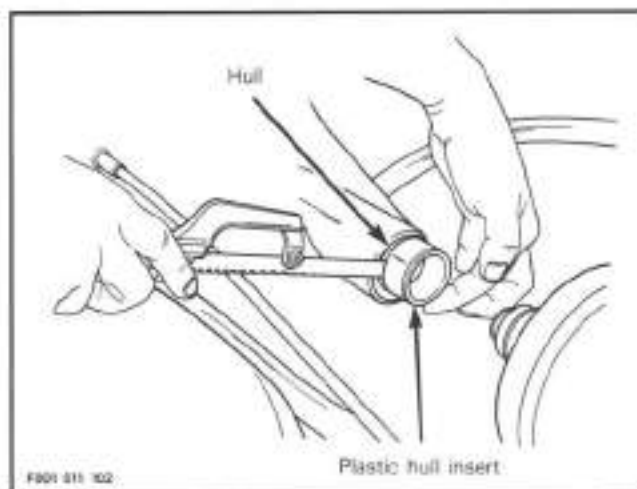


○ **NOTE** : Seal carrier gear clamps should not be tightened until pump is installed, to insure perfect alignment.

INSTALLATION

65. Hull Insert

Cut plastic hull insert flush with hull using a saw.



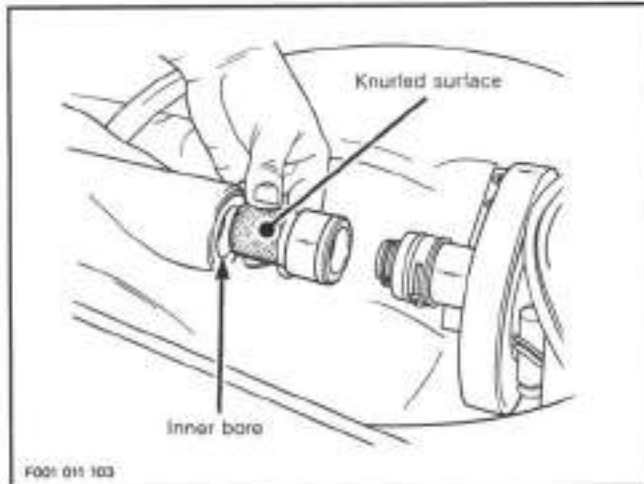
Mix epoxy glue (3M-05900), follow manufacturer instructions.

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

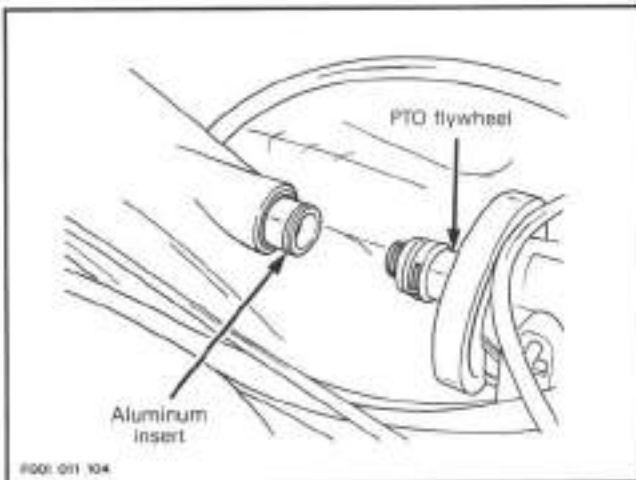
Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

▼ **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.

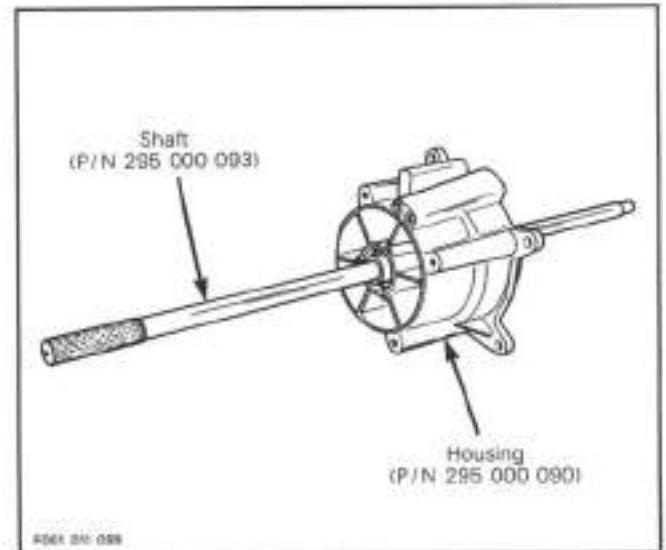
○ **NOTE:** Align aluminum insert as much as possible with PTO flywheel.



○ **NOTE:** The epoxy glue curing time is 30 minute.

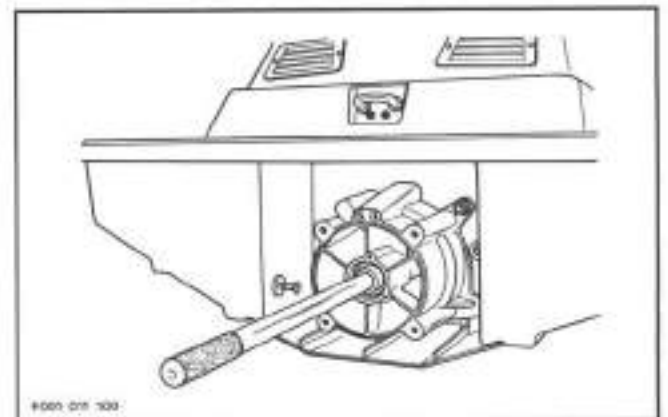
Engine/Jet Pump Alignment

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).



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.

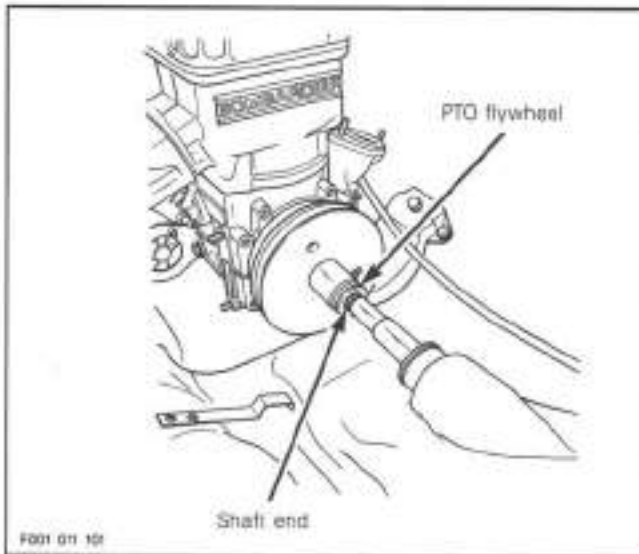


Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 01 (PROPULSION AND DRIVE SYSTEMS)

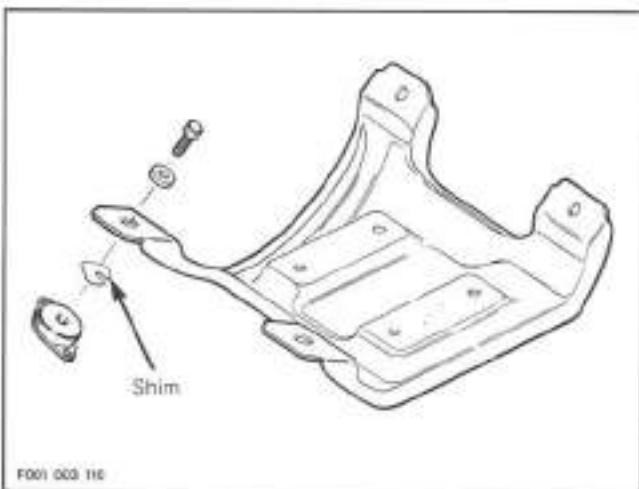
— Insert shaft end into PTO flywheel.

○ **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.



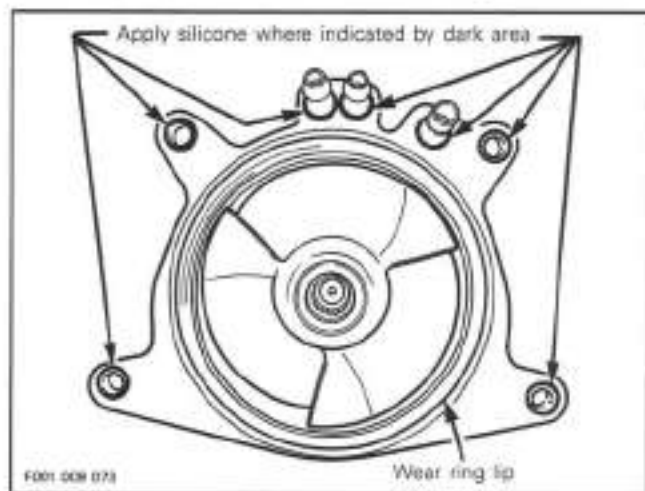
▼ **CAUTION:** Whenever shims are used to correct alignment, never install more than 6 mm (0.240 in) shim thickness. If alignment cannot be obtained verify for engine support bending.

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.

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

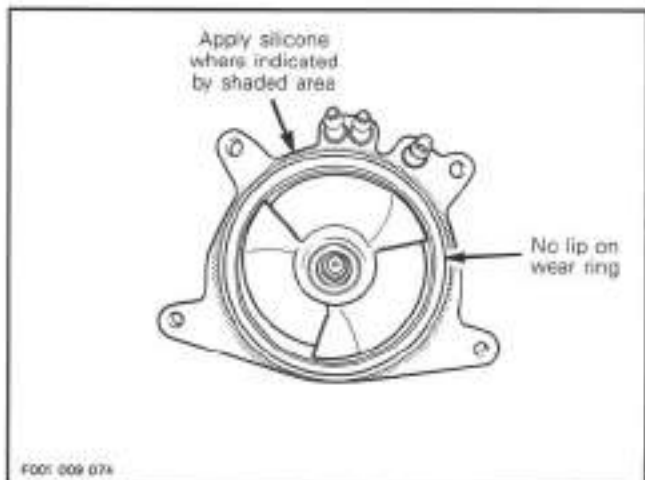
Pump Unit

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 flywheel.

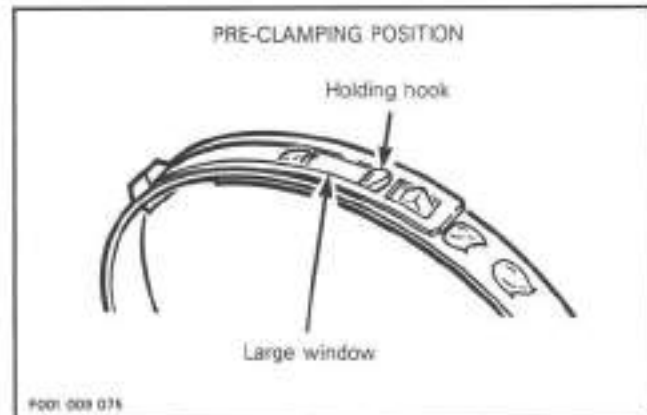
▼ **CAUTION:** When sliding the drive shaft through seal carrier, the double lip seal (P/N 293 200 009) could be folded over. This could cause a seal carrier bearing failure.

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

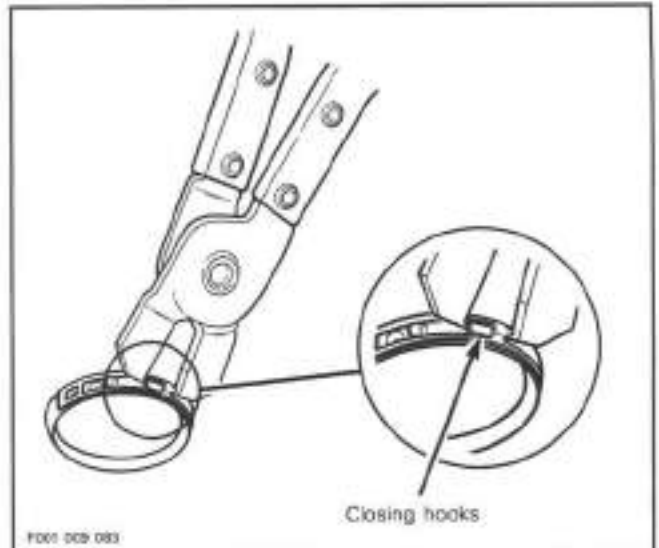
If necessary, tap pump end with a rubber hammer until retaining nuts and washers can be installed. Apply Loctite 242 (blue) (P/N 293 800 015) on threads and equally tighten nuts in a criss-cross sequence and torque to 35 N•m (26 lbf•ft).

Secure boot clamp as follows:

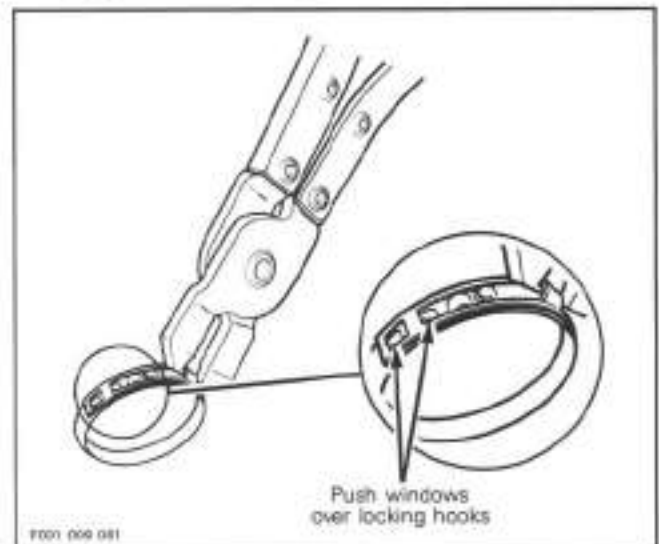
- Use pincer (P/N 295 000 069) as for removal.
- Manually engage holding hook in large window. This is a pre-clamping position only.



- Insert pointed tips of pincers first in closing hooks.



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

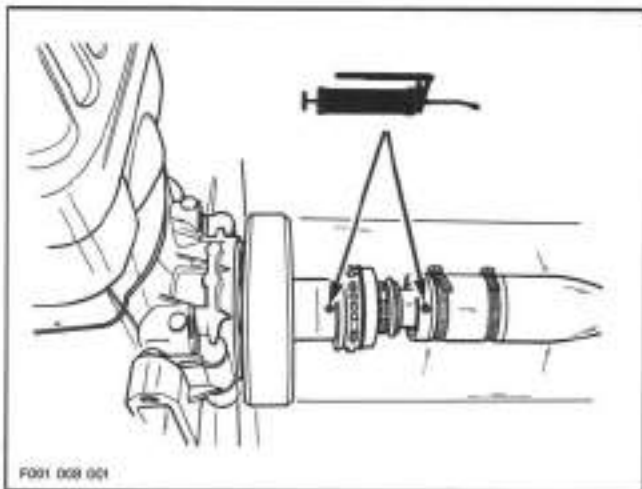


Using a grease gun, carefully lubricate, with synthetic grease (P/N 293 550 010), at grease fitting until boot is just beginning to expand. From this point, immediately stop.

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 by installing on studs a washer on each side of guard and apply Loctite 242 (P/N 293 800 015) on stud threads. Torque nuts to 5 N•m (44 lbf•in).

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 LPS #3 lubricant or equivalent on outer circumference of sleeve then insert in nylon bushings.

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

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).

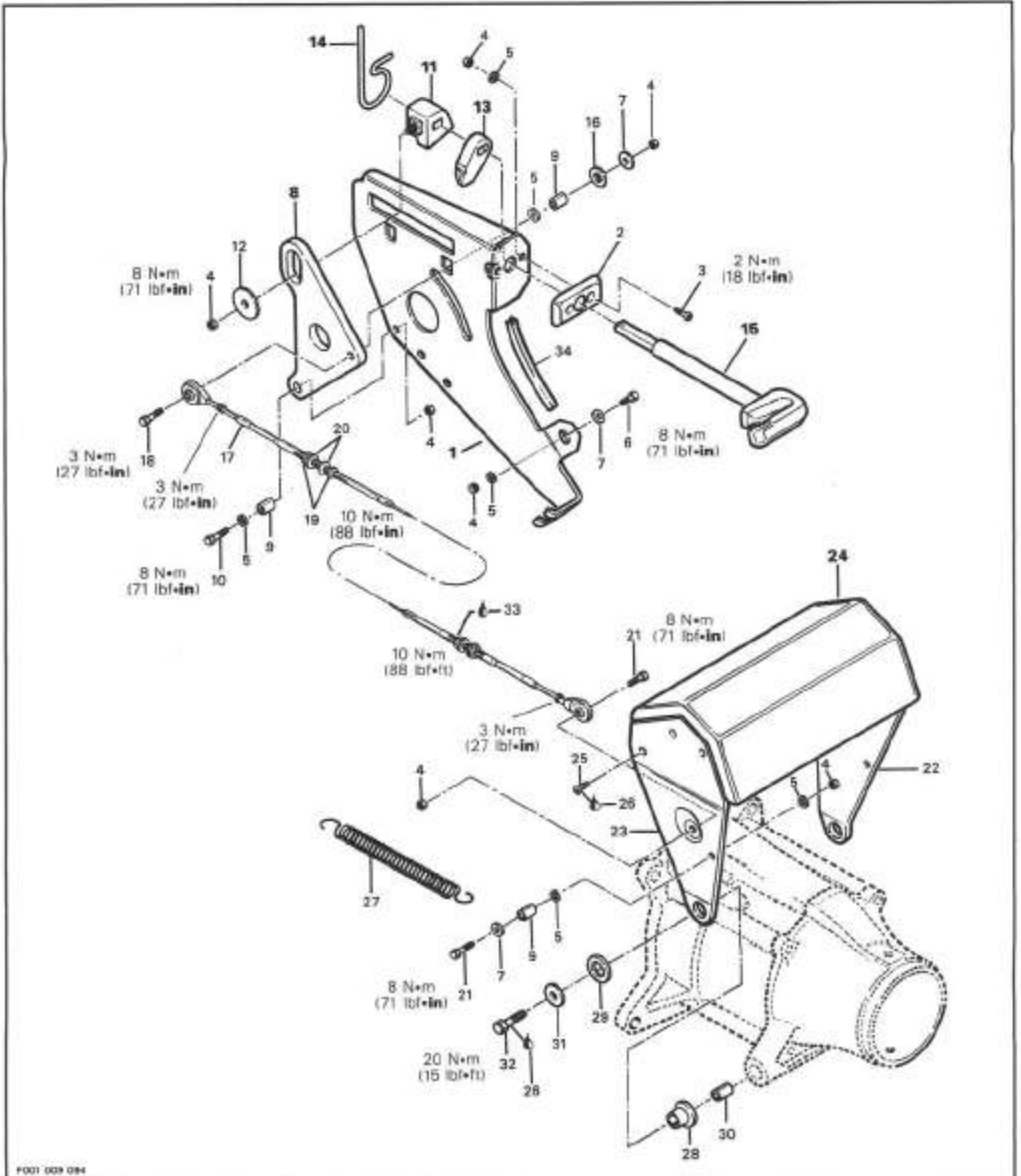
To allow impeller seats into wear ring, start engine so that impeller rotates for a moment.

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

▼ **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



FO01 009 094

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 (9)
5. Flat washer M6 (8)
6. Hexagonal head screw M6 x 20
7. Flat washer M6 (4)
8. Triangular lever
9. Bushing (4)
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 30 (2)
22. Right gate plate
23. Left gate plate
24. Reverse gate
25. Screw M6 x 20 (6)
26. Loctite 242
27. Reverse gate spring (2)
28. Sleeve (2)
29. Plastic washer (2)
30. Bushing (2)
31. Flat washer M8 (2)
32. Hexagonal head screw M8 x 30 (2)
33. Loctite 587 superflex ultra blue
34. 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.

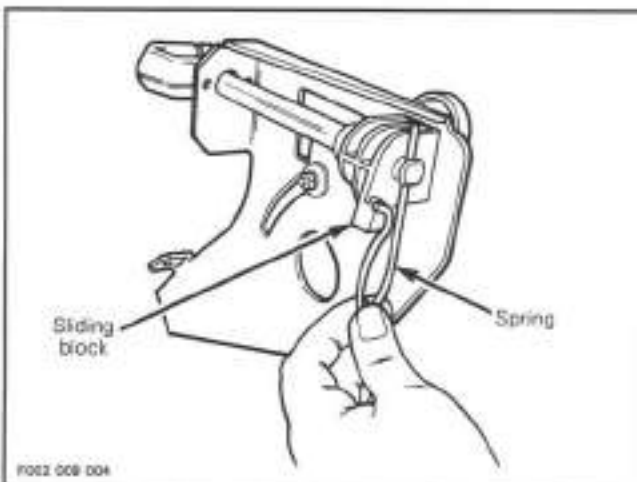
DISASSEMBLY

Remove storage basket from watercraft.

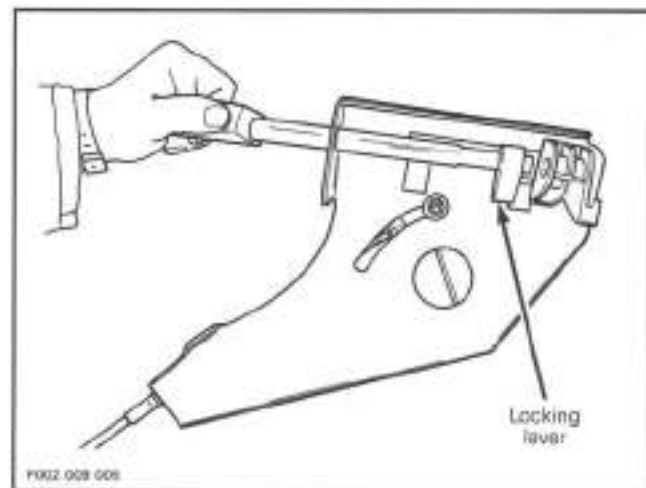
Slide off ring from lower air vent tube and remove retaining clips (dart) holding tubes together and then withdraw lower tube from upper tube.

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.



8,11, Triangular Lever and Sliding Block

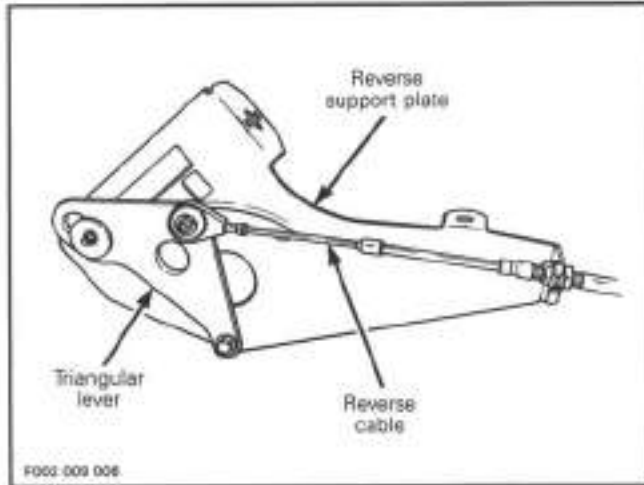
Remove screw, lock nut, washers and bushing holding reverse cable to triangular lever.

Remove lock nut and washer holding sliding block to triangular lever and to support plate.

Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 02 (REVERSE SYSTEM)

Remove screw, lock nut, washer and bushing holding triangular lever to reverse support plate.

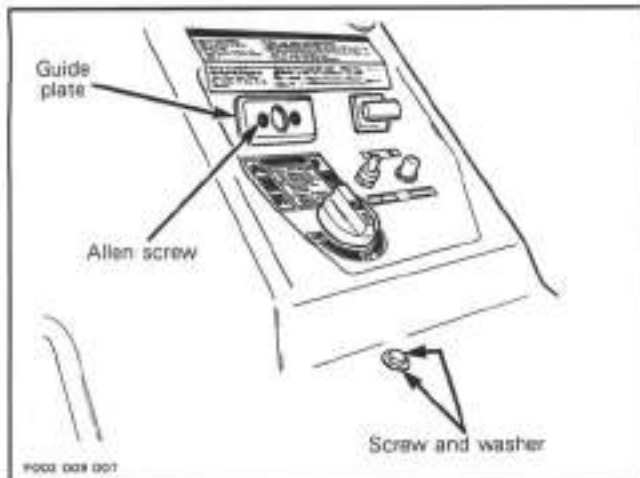


1, Reverse Support Plate

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.

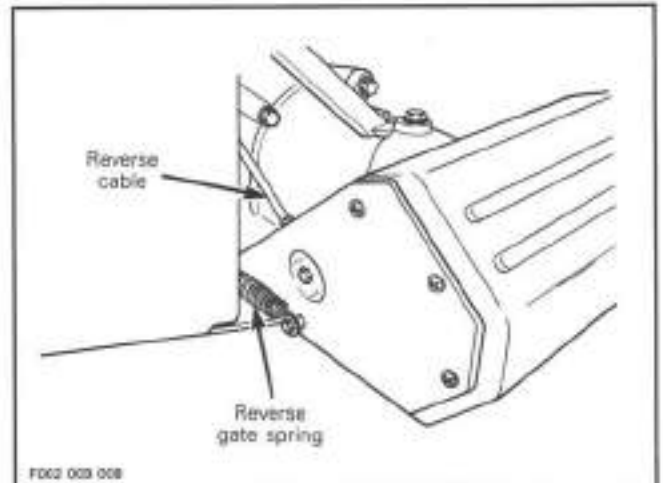
Remove screw, lock nut and washers holding support plate lower part.

Remove two Allen screws, lock nut and washer holding guide plate and support plate.

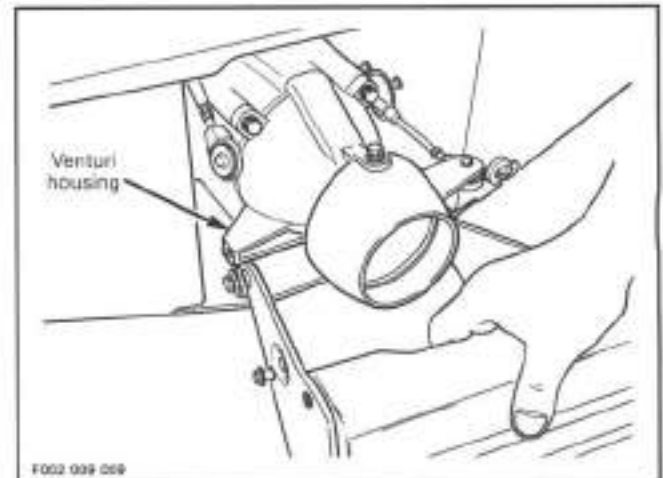


24, Reverse Gate

Unhook reverse gate springs and remove reverse cable from left side of reverse gate.



Unscrew from both sides of venturi housing reverse gate retaining screws, then remove gate.



Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 02 (REVERSE SYSTEM)

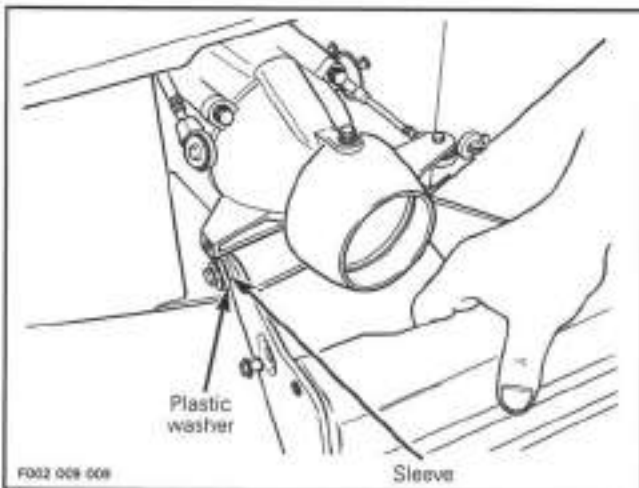
ASSEMBLY

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

24, Reverse Gate

Install reverse gate with sleeve and plastic 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).

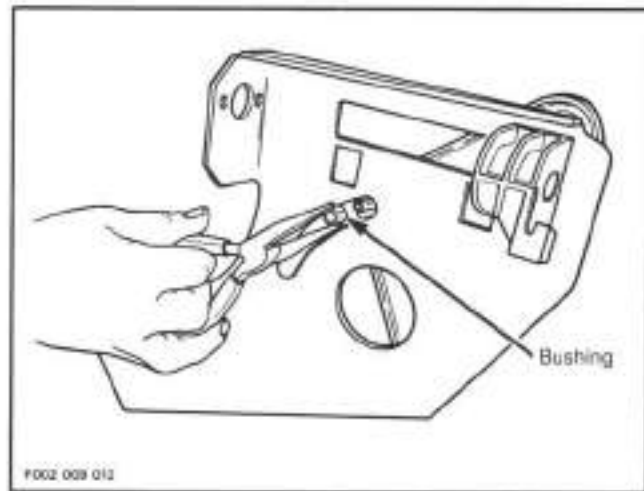
8,11, Triangular Lever and Sliding Block

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 3 N•m (27 lbf•in).

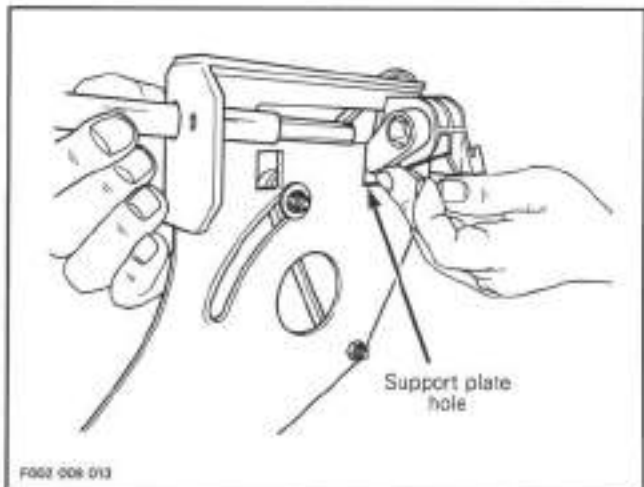
Torque lower screw of triangular lever to 8 N•m (71 lbf•in).

Install sliding block to lever and torque nut to 8 N•m (71 lbf•in).



13,14,15, Locking Lever, Spring and Reverse Handle

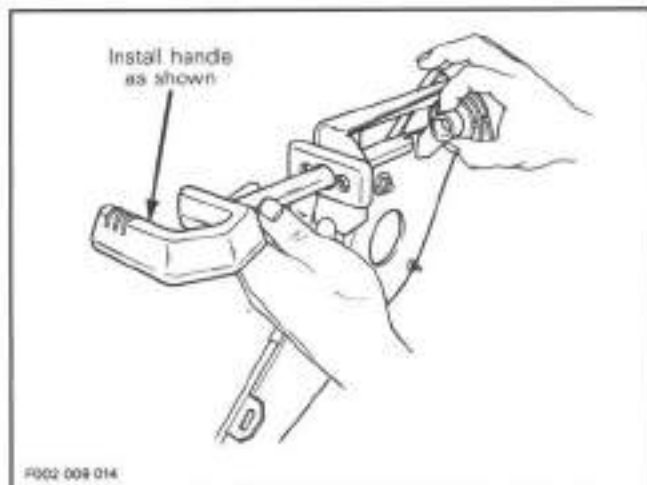
Insert locking lever end in support plate hole then align lever and sliding block holes.



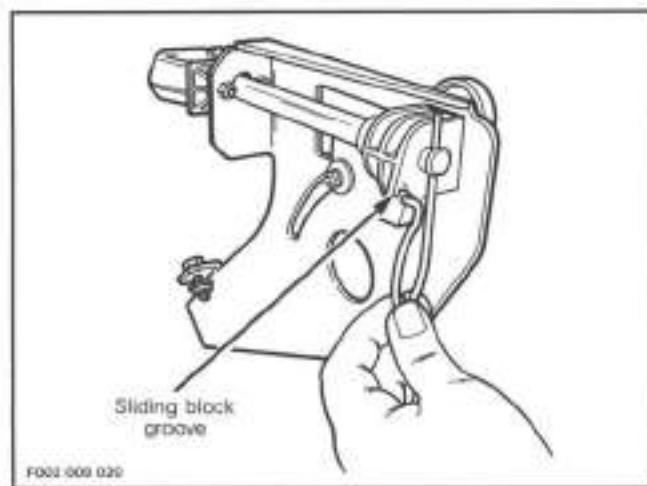
Section 08 PROPULSION AND DRIVE SYSTEMS

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.



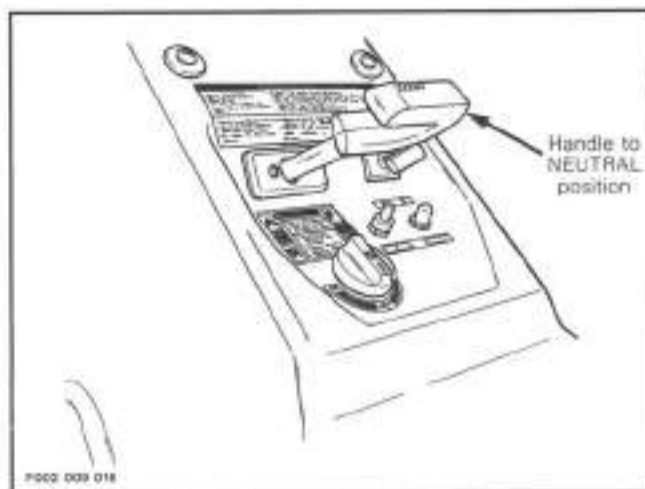
Insert spring in handle stem hole and then install curved end in sliding block groove.



ADJUSTMENTS

15, Reverse Handle

Pull reverse handle to NEUTRAL and ensure handle is locked in position.

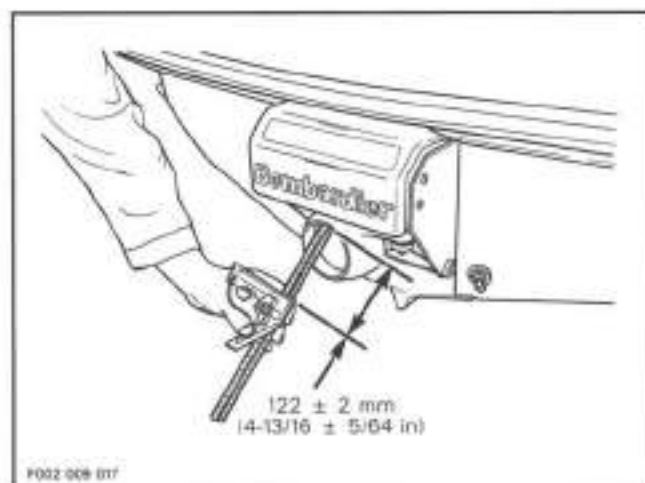


24, Reverse Gate

Position handlebar in a straight ahead position, nozzle should be parallel to rear of watercraft.

○ **NOTE** : For reverse gate adjustment, always unhook springs from reverse gate.

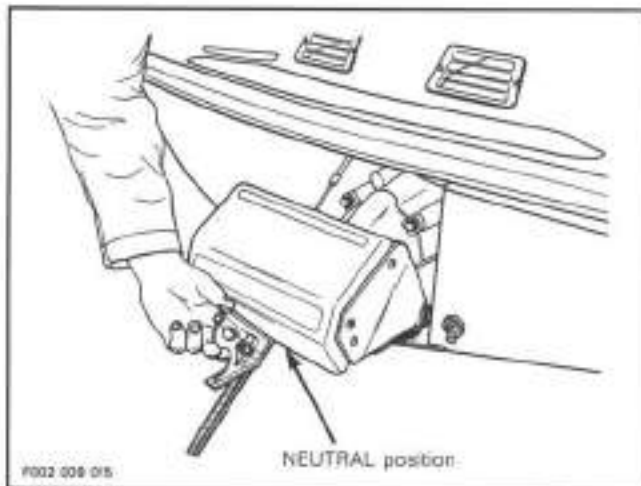
Using a square set it to 122 ± 2 mm ($4-13/16 \pm 5/64$ in), then position square end at the top middle of nozzle.



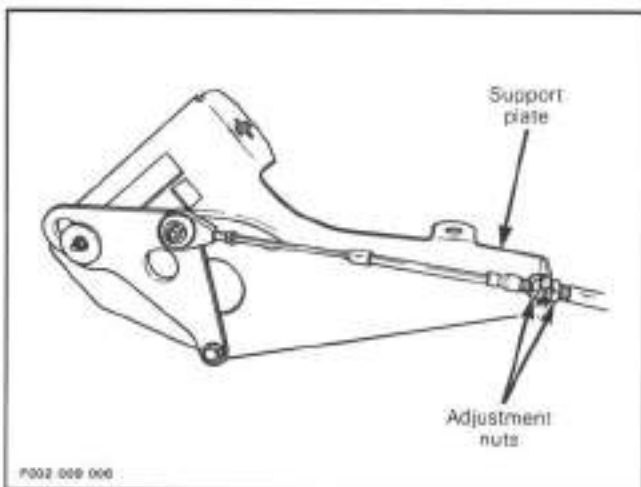
Section 08 PROPULSION AND DRIVE SYSTEMS

Sub-Section 02 (REVERSE SYSTEM)

With the gate down to NEUTRAL position it should be at the specification.



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.

STEERING SYSTEM

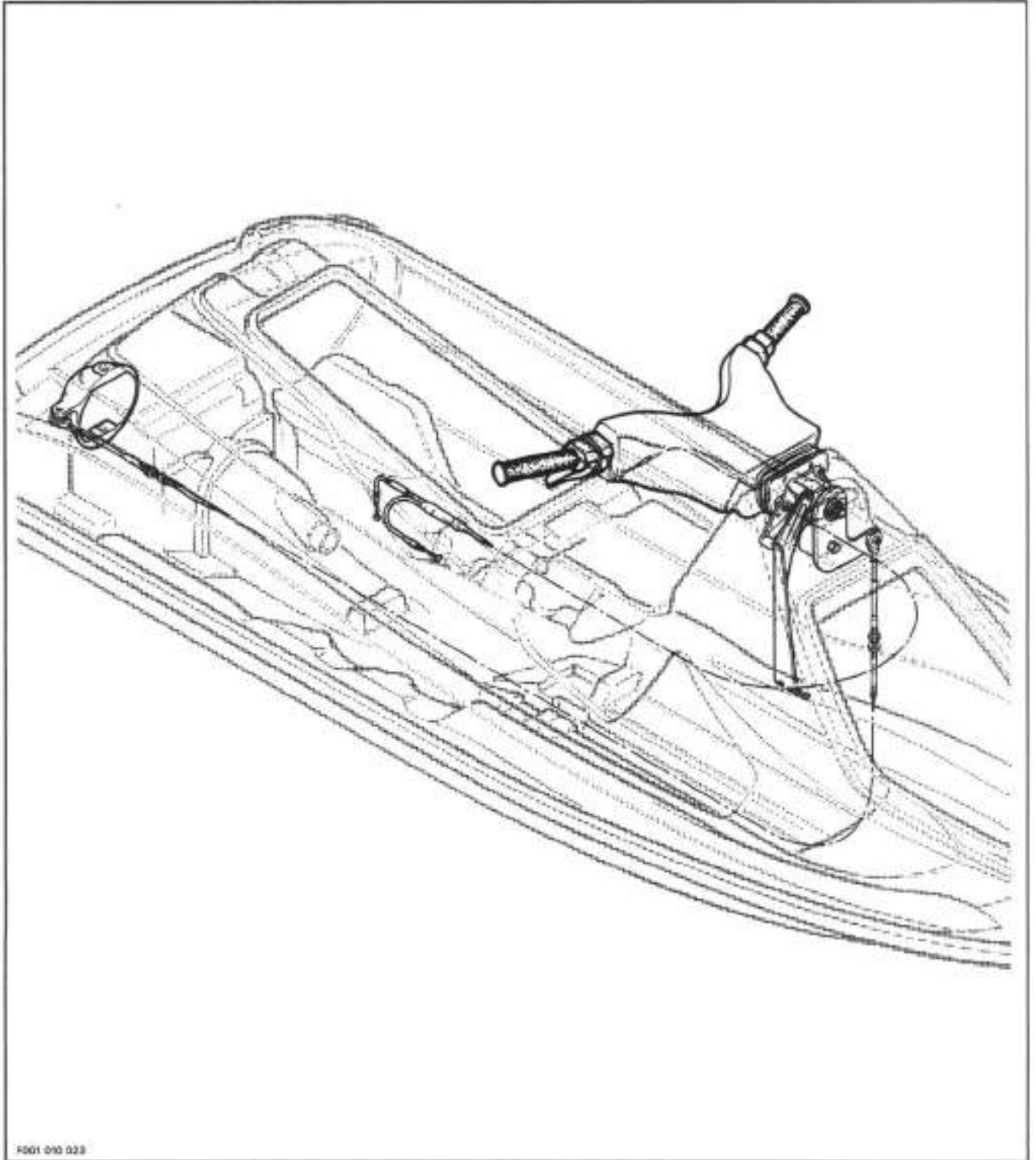
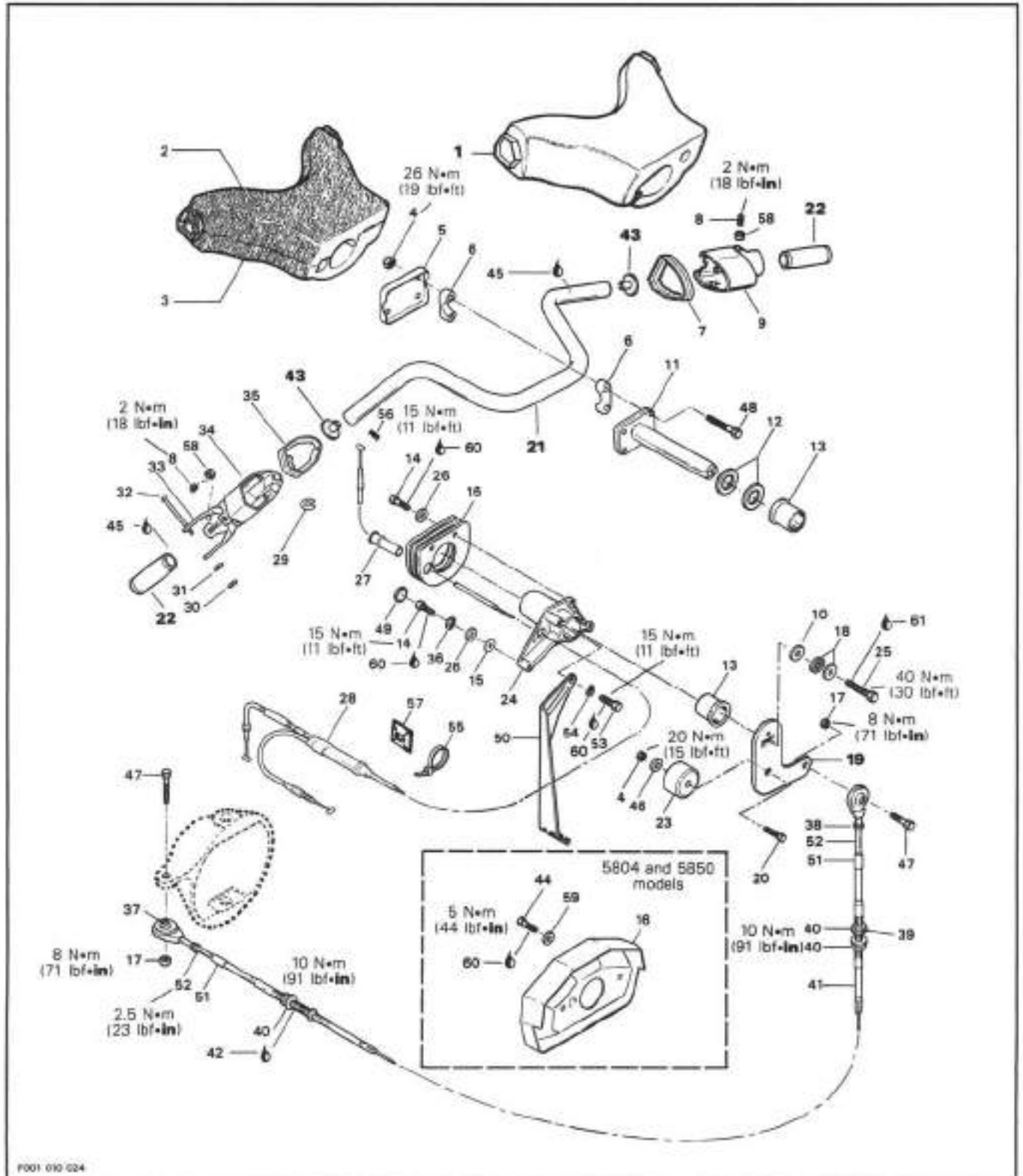


FIG 01 010 023

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

STEERING SYSTEM



F001 010 024

Section 09 STEERING SYSTEM

Sub-Section 01 (STEERING SYSTEM)

COMPONENTS

1. Cover
2. Foam (top)
3. Foam (bottom)
4. Elastic stop nut M6 (5)
5. Steering clamp
6. Steering support (4)
7. Adapter
8. Set screw (2)
9. Left handle housing
10. Tab washer
11. Stem steering
12. Washer (shim)
13. Bushing (2)
14. Hexagonal head screw M8 x 25 (4)
15. Plastic washer
16. Collar
17. Elastic stop nut M6 (2)
18. Washer
19. Steering stem arm
20. Allen screw M6 x 36
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
37. Ball joint (2)
38. Nut 10-32 (2)
39. Jam nut 7/16 (4)
40. Washer 7/16 (3)
41. Cable
42. Loctite U blue, 300 mL
43. Cap
44. Hexagonal screw M6 x 20
45. Glue
46. Flat washer M8
47. Hexagonal head screw M8 x 30 (2)
48. Hexagonal head screw M8 x 55 (4)
49. Snap cap
50. Cable support
51. Large boot
52. Small 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
59. Flat washer M6
60. Loctite 242
61. Loctite 271

ASSEMBLY

1, Cover

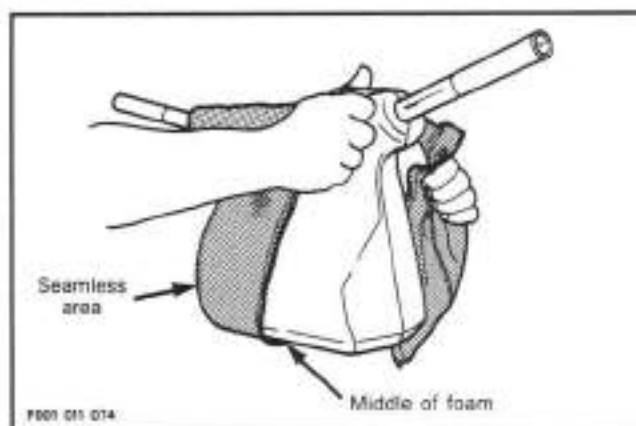
Prior to installation, soak handlebar cover in hot water. This allows even heating of cover and makes installation much easier.

○ **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.



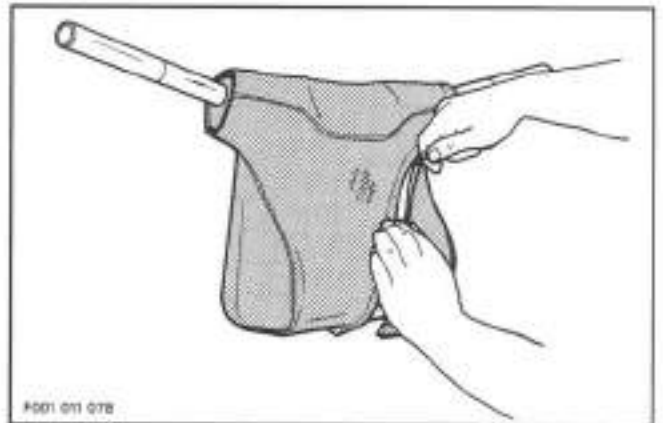
Section 09 STEERING SYSTEM

Sub-Section 01 (STEERING SYSTEM)

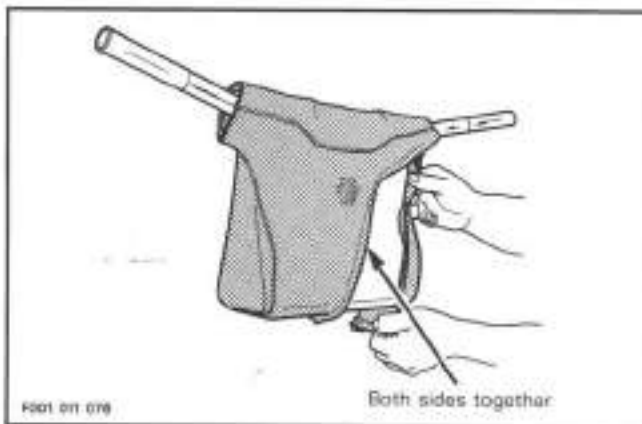
Pull cover over the right side handlebar taking care to grab it as illustrated.



Zip cover taking care to bring both sides together. Refer to following illustration.



Pull both sides of cover together before trying to zip it.



22,43, Grip and Cap

Remove adhesive left on handlebar by peeling off old glue or brushing old Sikaflex.

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.

19,21, Steering Stem Arm and Handlebar

Insert throttle cable through dashboard hole and slide grommet on cable.

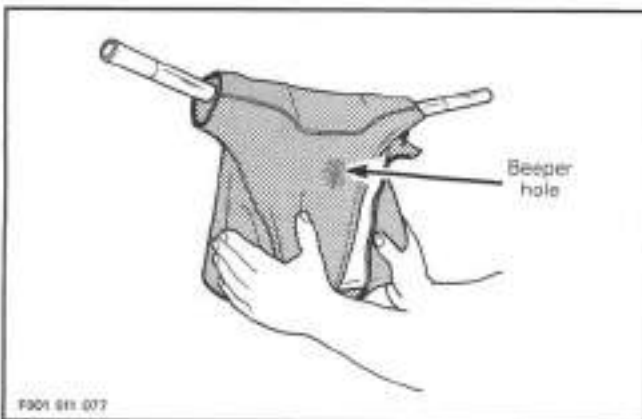
Insert grommet in dashboard hole and pull it from inside bilge.

○ **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.

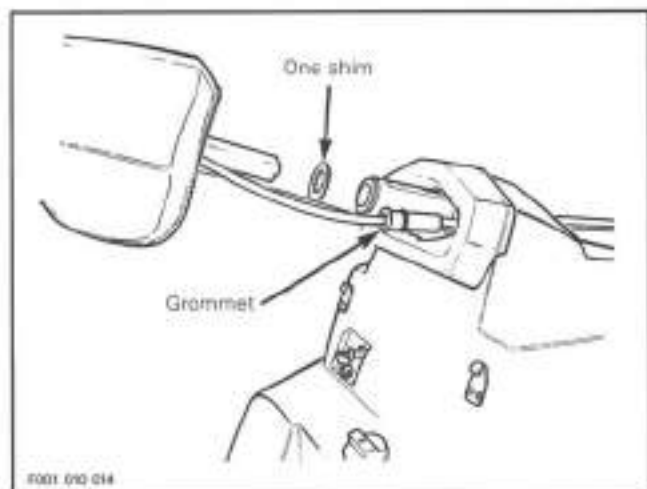
▼ **CAUTION** : Never pull on cover around beeper hole.



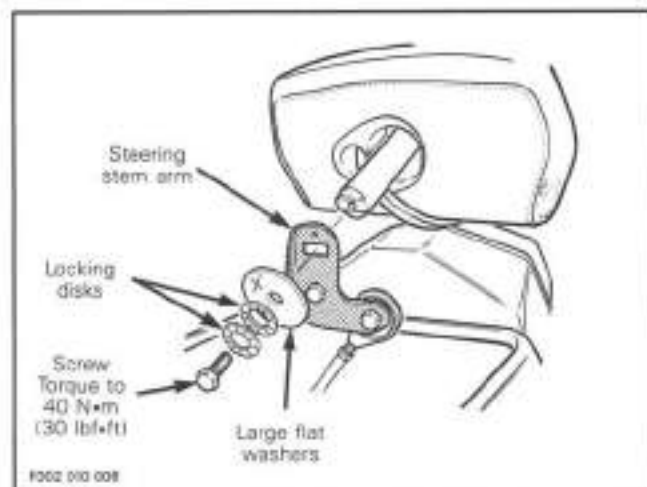
Section 09 STEERING SYSTEM

Sub-Section 01 (STEERING SYSTEM)

Insert handlebar ass'y into steering column support.



Properly position steering stem arm on steering stem as shown. Make sure to insert stem tenon into arm mortise.



Temporarily install large flat washer, locking disks and screw then tighten.

CAUTION: Always install large flat washer with the **X** stamped side facing the locking disks. Ensure locking disks are locked together.

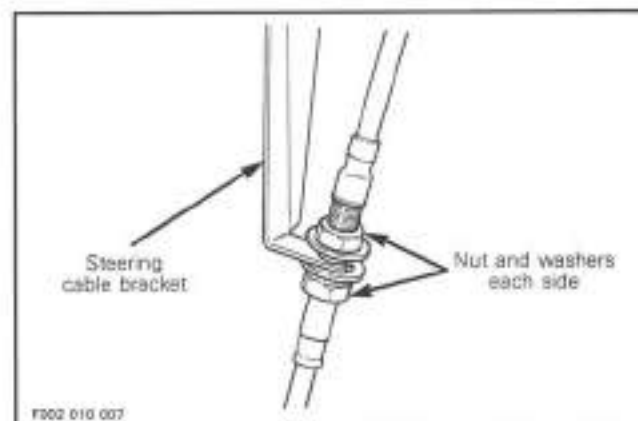
Shim adjustment

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 293 800 003) on screw threads, reinstall large flat washer, locking disks and screw. Torque to 40 N·m (30 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.

Install steering cable in its bracket with one washer and one nut each side of bracket.



Hand-tighten nut. Refer to ADJUSTMENTS for adjustment procedures.

ADJUSTMENT

Steering and Jet Pump Nozzle

Make the following tool to ease alignment.

Raw Material:

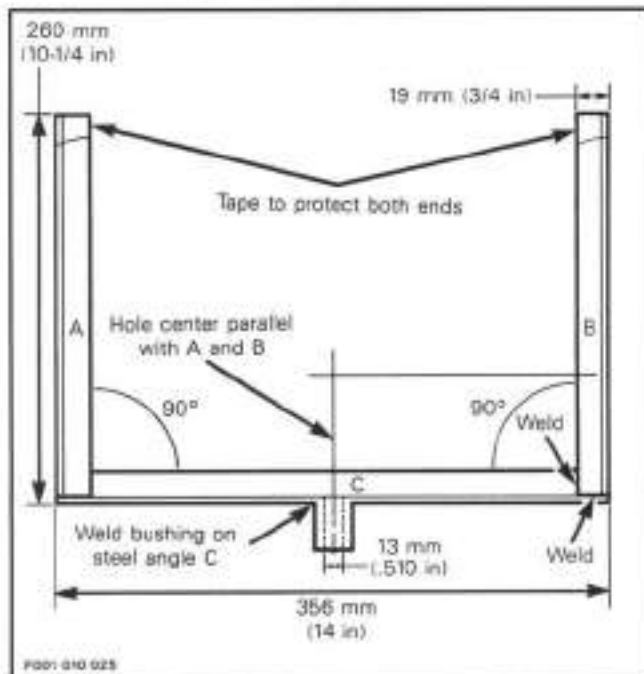
- 2 steel angle: 19 mm x 254 mm (3/4 x 10 in).
- 2 steel angle: 19 mm x 356 mm (3/4 x 14 in).
- 1 bushing: 13 mm (.510 in) inside diameter, 19 mm (3/4 in) long.
- 1 rod: 12.7 mm x 230 mm (.500 x 9 in).

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

- 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).

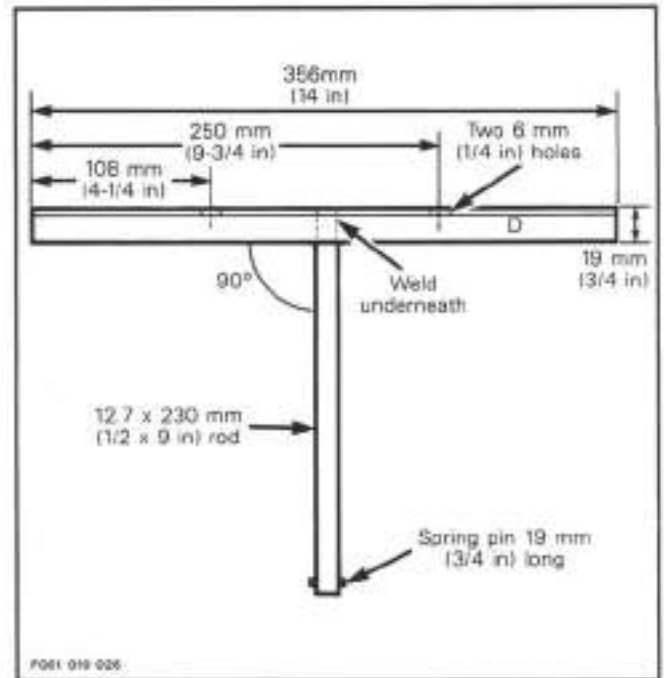
Weld steel angles A, B, C and bushing as per illustration and pay attention to the following :

- 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,

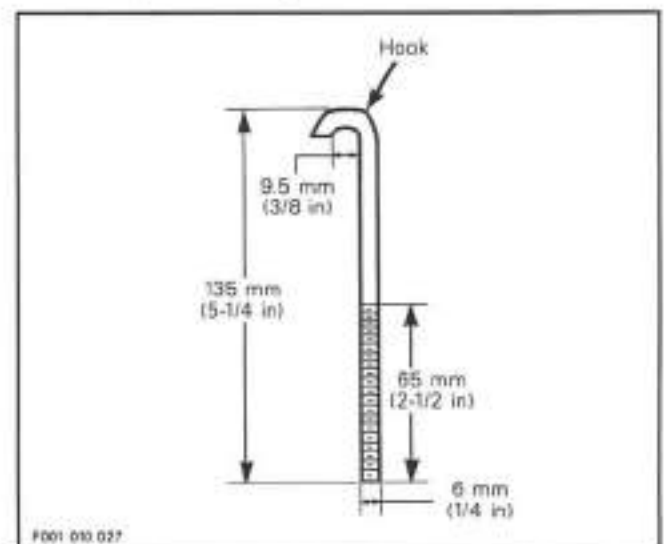


Drill two 6 mm (1/4 in) holes in steel angle D.

Weld steel angle D with the 12.7 mm (1/2 in) rod making sure both parts are at 90°.

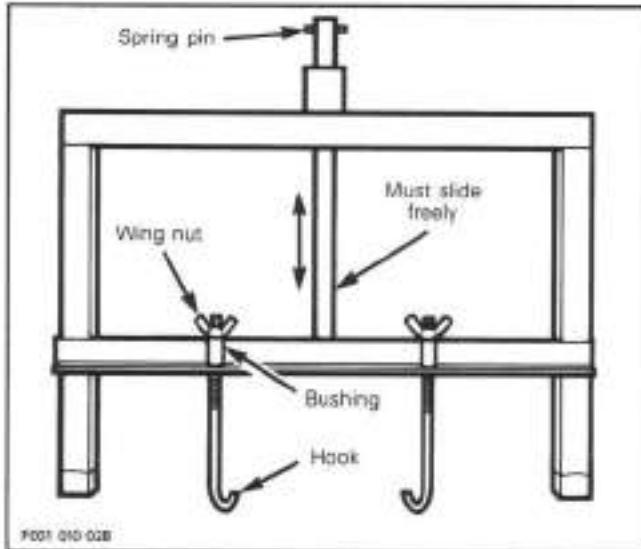


Heat the unthreaded end of the 6 mm (1/4 in) rod and bend it as per following illustration.

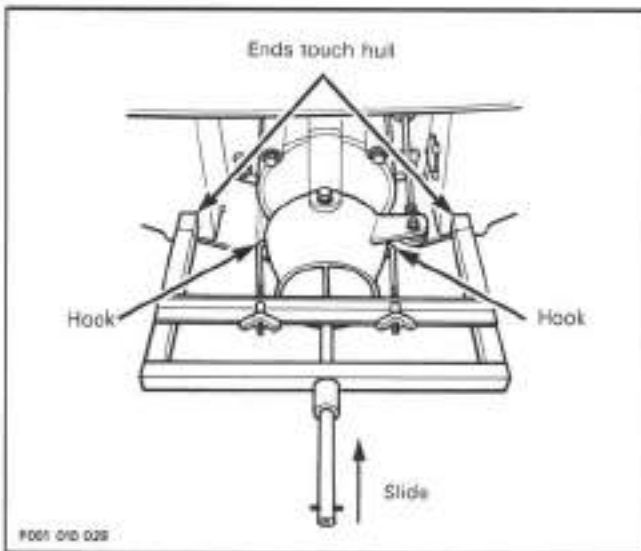


Section 09 STEERING SYSTEM
Sub-Section 01 (STEERING SYSTEM)

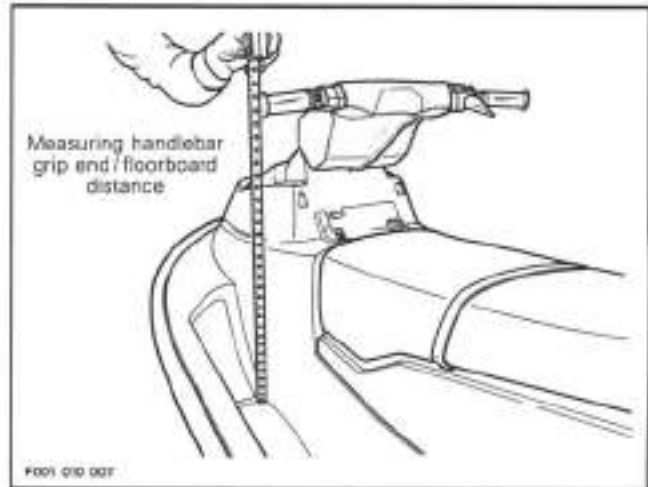
Assemble tool as per illustration.



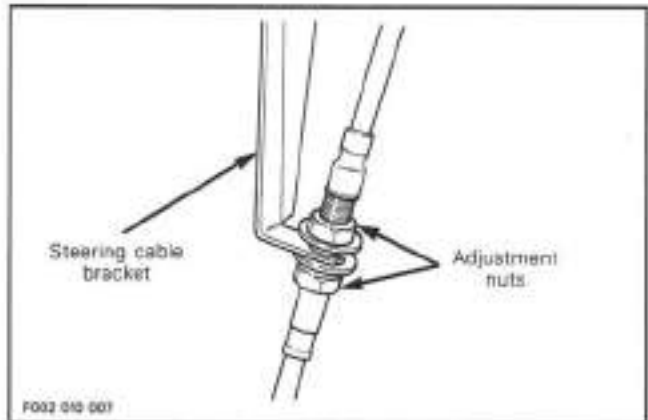
Hook tool on jet pump nozzle and slide it until both ends touch hull.



Verify handlebar position by measuring each side the distance from handlebar grip end to floorboard. They have to be equal.



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



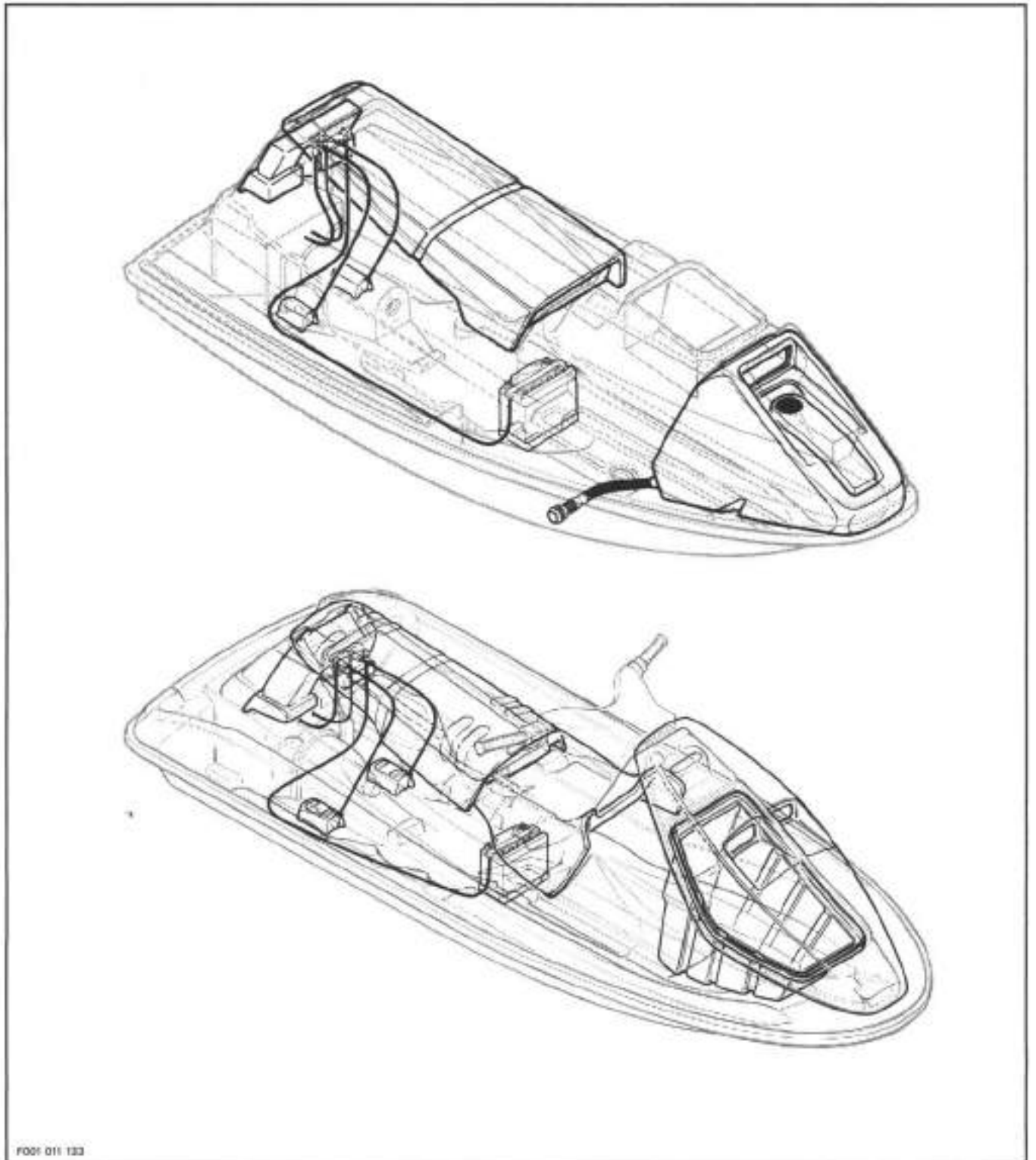
Remove alignment tool and verify the following before tightening nuts.

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.

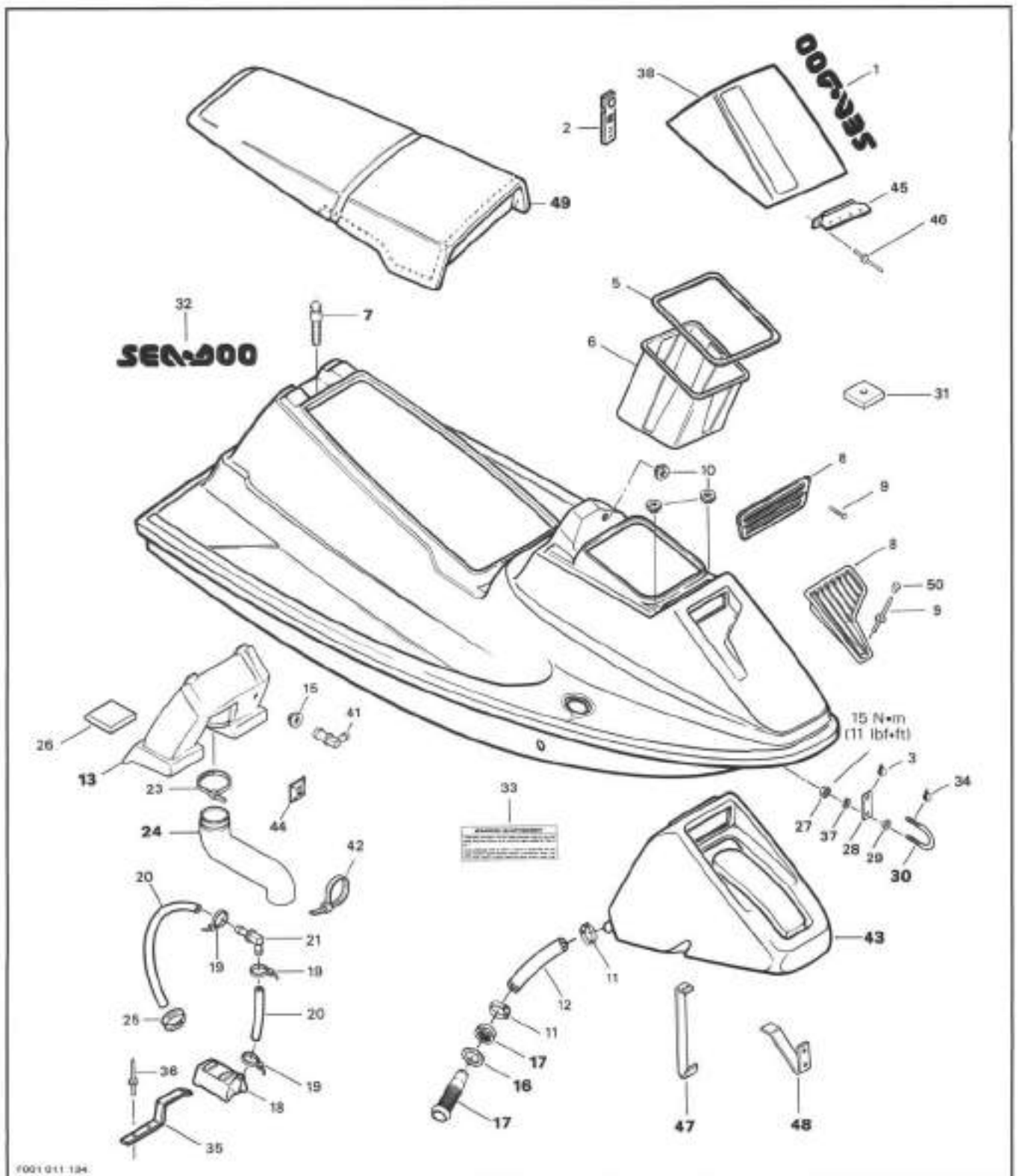
WARNING : Ensure handlebar and jet pump nozzle operate freely from side to side and that jet pump nozzle does not contact the side of venturi housing.

HULL/BODY



P001 011 133

HULL/BODY




F001011-134

Section 10 HULL/BODY

Sub-Section 01 (HULL/BODY)

COMPONENTS

1. "Sea-Doo" sticker
2. Latch (2)
3. Silicone 732 RTV, 90 mL
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. Rubber pad
32. "Sea-Doo" sticker (2)
33. "Fuel" sticker
34. Loctite 271, 10 mL
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.

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.

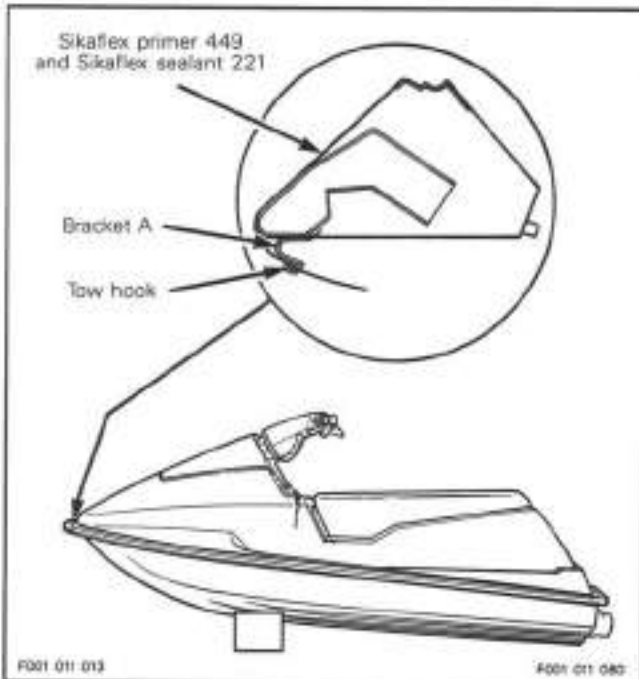
Apply Sikaflex primer 449 (P/N 293 530 012) on water tank trap and body surfaces.

Section 10 HULL/BODY

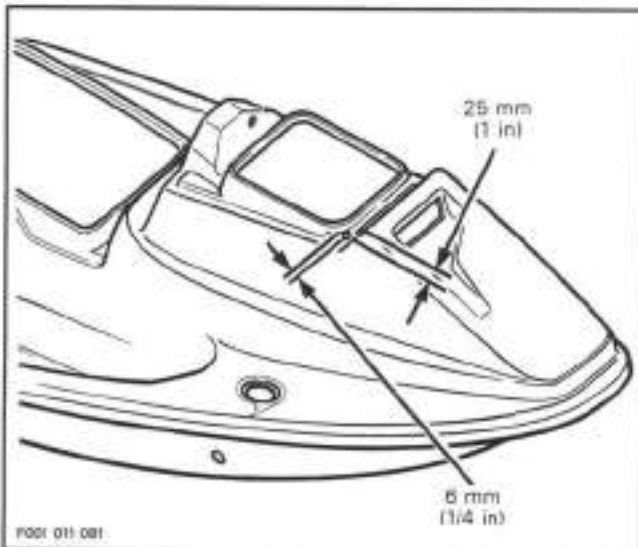
Sub-Section 01 (HULL/BODY)

▼ **CAUTION** : Allow at least 30 minutes for primer to cure.

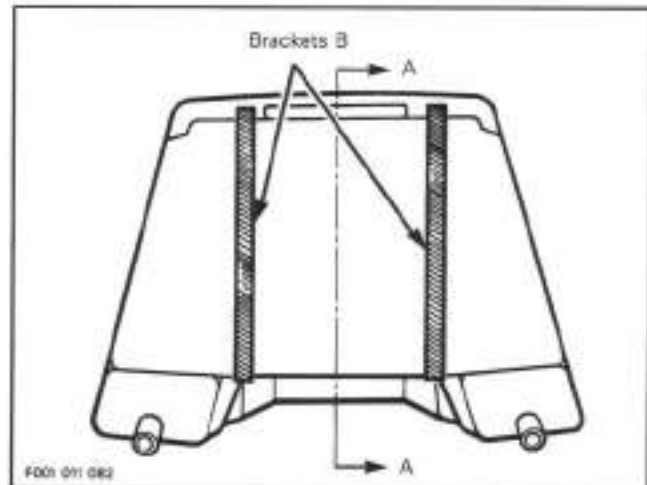
Apply Sikaflex sealant 221 (P/N 293 530 011) on water tank trap and slide it back to its position.



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.

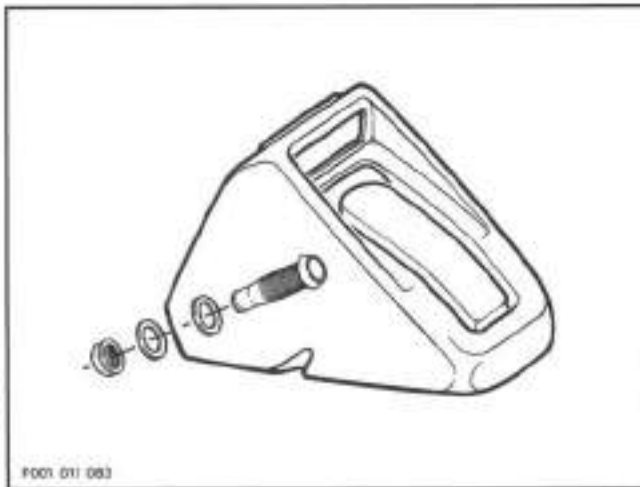
Before using watercraft wait three days for Sikaflex curing time.

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.

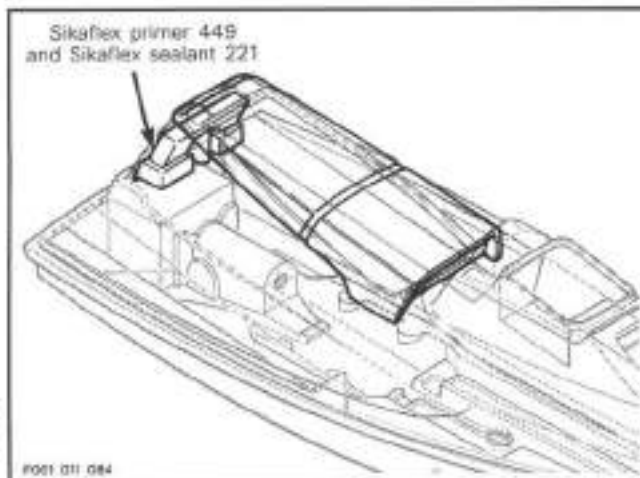


13,24, Rear Baffle and Vent Hose

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.

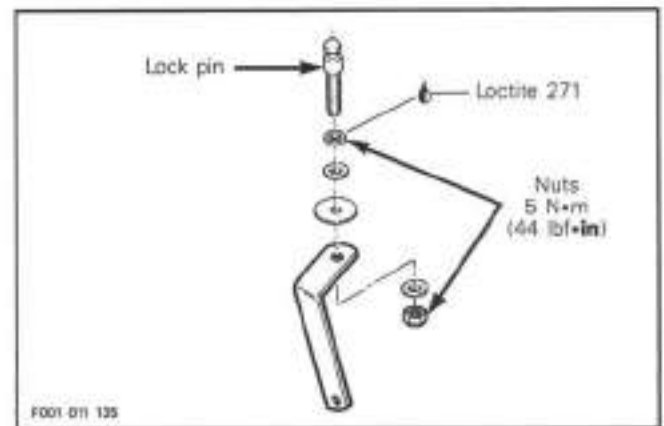
Before using the watercraft wait three days for Sikaflex curing time.

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).

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.

Gelcote repair kit (P/N 295 500 009 or P/N 293 500 016) is available through regular channel.

Fiberglass repair kit is available through automotive or marine suppliers.

STORAGE

It is during winter or when the watercraft is not to be in use for prolonged time that a proper storage is a necessity. Storage during long period of inactivity consists of checking and replacing missing, broken or worn parts and protecting cooling system against freezing and corrosion.

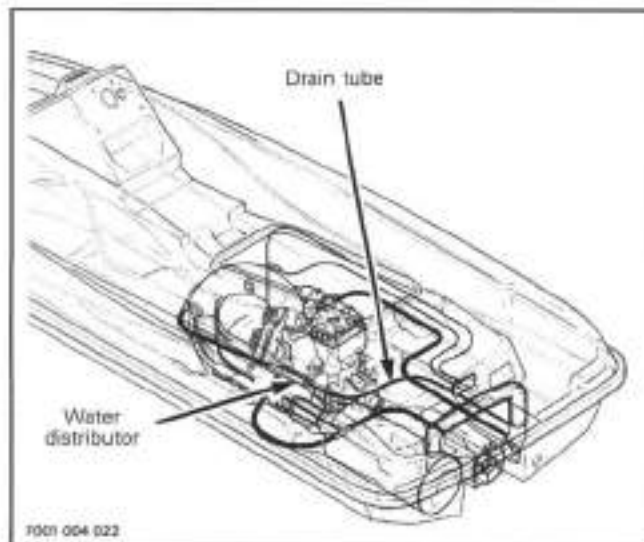
Proper lubrication and treatment should be performed to insure that parts do not become corroded and in general, preparing the watercraft so that when the time comes to use the watercraft again, it will be in top condition.

ENGINE DRAINING

Check engine drain tube running from engine water distributor to exhaust outlet socket. Make sure there is no sand or other particles and 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.

▼ **CAUTION** : Check engine drain tube for obstructions.



WATERCRAFT RINSING

Thoroughly rinse the watercraft hull, bilge, engine compartment, etc., with fresh water.

PROPULSION SYSTEM

Drain lubricant in impeller shaft reservoir. Clean with solvent then refill with 65 mL (2.2 U.S. oz) of Sea-Doo synthetic oil "polyolester" 75W90GL5 type C gear lube (P/N 293 600 011).

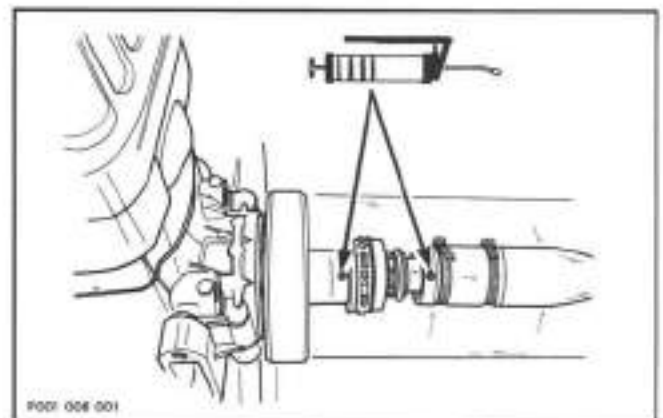
▼ **CAUTION** : Use only SEA-DOO jet pump oil or equivalent synthetic gear oil, otherwise component service life could be reduced. Do not mix oil brands or types.

Lubricate drive shaft splines through grease fitting at PTO flywheel end and with synthetic grease (P/N 293 550 010).

▼ **CAUTION** : Do not lubricate excessively. Immediately stop when a slight movement is noticed on 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

COOLING SYSTEM FLUSHING AND ENGINE INTERNAL LUBRICATION

Cooling system has to be flushed with fresh water to prevent salt, sand or dirt accumulation which might clog water passages. This will be achieved with the flush kit (P/N 295 000 038).

Engine must be lubricated to prevent corrosion on internal parts. This will be achieved by spraying some SEA-DOO LUBE (P/N 293 600 006) through air intake opening.

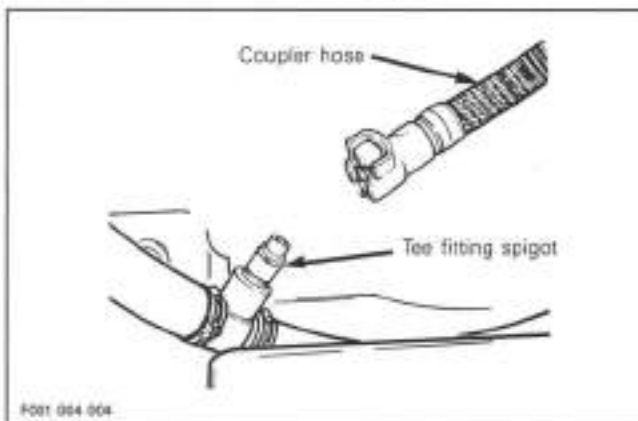
▼ **CAUTION** : Do not use outboard type storage lubricant. Using outboard lubricant may accelerate corrosion and damage engine components.

Flushing and lubrication will be done at the same time while engine is running.

If using a fuel stabilizer refer to **fuel system** before beginning procedure.

Procedure

Before using flush kit, remove dust cap from tee fitting spigot 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.

○ **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.

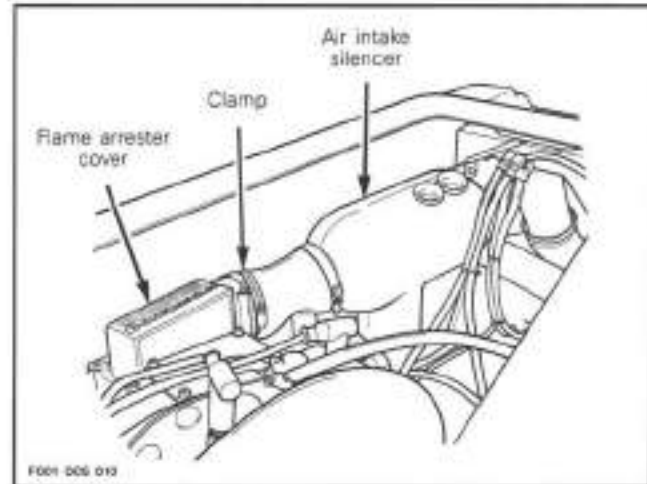
▼ **CAUTION** : Never flush a hot engine. Always start engine first then open water flow. Severe engine damage could result if not done in this order.

Start engine then open water flow. Make sure engine operates during entire procedure.

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

Spray some SEA-DOO LUBE through flame arrester cover keeping engine at a fast idle.

Remove clamp and move air intake silencer away.



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.

◆ **WARNING** : Perform this operation in a well ventilated area.

Press unlocking button to remove coupler hose. Re-install dust cap over tee fitting.

Remove both spark plugs and spray some SEA-DOO LUBE into each cylinder.

Crank the engine a few turns to distribute the oil on cylinder wall.

Apply anti-seize lubricant on spark plug threads then re-install them.

Reinstall air intake silencer.

▼ **CAUTION** : Do not run the engine during the storage period.

FUEL SYSTEM

To prevent gum and varnish formation inside components, siphon all fuel from fuel tank or a fuel stabilizer, such as STA-BIL® (or equivalent), can be added in fuel tank to prevent fuel deterioration and avoid draining fuel system for storage. 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** : Remove fuel tank cap slowly. Fuel may be under pressure and might spray out. 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.

BATTERY

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

Add distilled water if necessary then give the battery a full charge at a maximum rate of two amperes.

Store the battery on a wood shelf in a warm dry place away from direct sunlight.

To prevent battery sulphating and discharging, have it charged monthly.

ANTICORROSION TREATMENT

○ **NOTE** : Bilge cleaning should be done prior anticorrosion treatment. Refer to **additional recommended protection**.

Wipe off any residual water in the engine compartment.

Spray some SEA-DOO LUBE over all metallic components in engine compartment.

ADDITIONAL RECOMMENDED PROTECTION

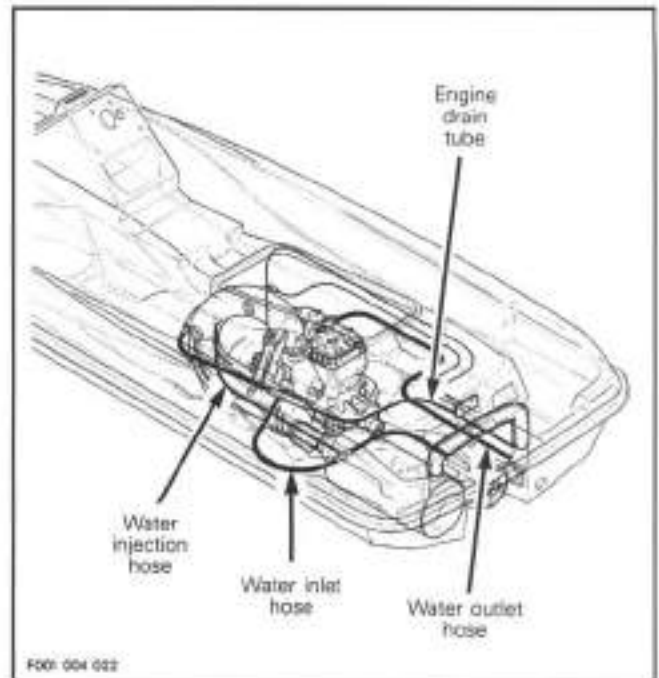
Cooling system may be filled with a 50/50 water/antifreeze solution.

▼ **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.

Four hoses have to be disconnected to allow air to escape and antifreeze solution to completely fill cooling system water jackets.

Disconnect hoses where shown.

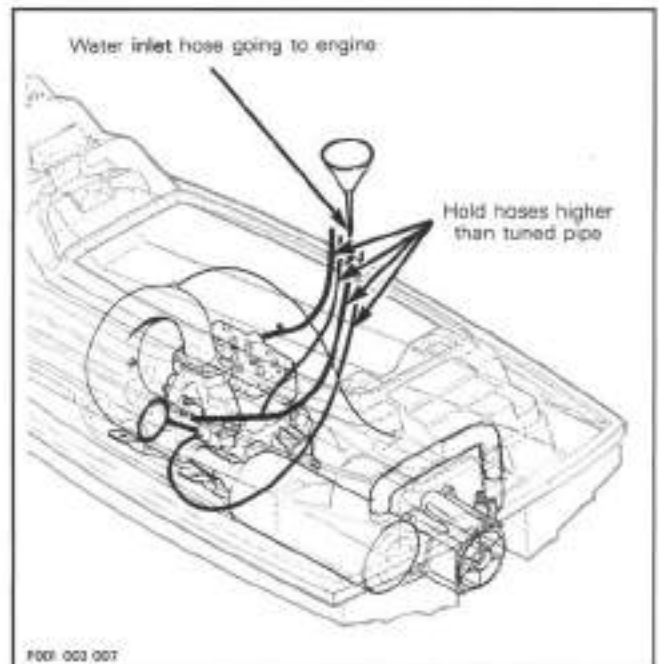


Raise all hoses above the highest point of tuned pipe and temporarily tie them together.

Insert a funnel into inlet hose going to the water inlet socket at engine. Pour about two 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.



Section 11 STORAGE

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 power inject SEA-DOO LUBE into cable. Refer to a motorcycle parts supplier for availability.



Clean the bilge with hot water and detergent or with bilge cleaner. Rinse thoroughly. 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 yellow paint (P/N 293 500 008), grey paint (P/N 293 500 009), mauve paint (P/N 293 500 020), blue paint (P/N 293 500 014) and Gelcote® repair kit (P/N 295 500 009) are available. Replace damaged labels/decals.

Wash the body with soap and water solution (only use mild detergent). Rinse thoroughly with fresh water. Remove marine organisms from the hull. Apply a non-abrasive wax such as silicon wax. Protect the seat with vinyl protectant such as Armor All® or the equivalent.

▼ **CAUTION** : Never clean apparent fiberglass and plastic parts with strong detergent, degreasing agent, paint thinner, acetone etc.

If the watercraft is to be stored outside, cover it with an opaque tarpaulin to prevent sun rays and grime 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 the water can flow out of floorboard.

TECHNICAL DATA

SI* METRIC INFORMATION GUIDE

BASE UNITS			
DESCRIPTION	UNIT	SYMBOL	
length	meter	m	
mass	kilogramme	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 ²	cm ²	6.45	
in ³	cm ³	16.39	
ft	m	0.3	
oz	g	28.35	
lb	kg	0.45	
lbf	N	4.4	
lbf•in	N•m	0.11	
lbf•ft	N•m	1.36	
lbf•ft	lbf•in	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	$(^{\circ}\text{C} \times 9/5) + 32$	
hp	kW	.75	

*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.

SP, 5804 MODELS

ENGINE			
Engine type		ROTAX 587, water cooled	
Induction type		Rotary valve	
Exhaust system		Water cooled, water injected	
Starting system		Electric start	
Lubrication	Fuel/Oil mixture	VROI	
	Oil injection pump	Gear	
	Oil type	SEA-DOO injection oil	
Number of cylinders		2	
Bore	Standard	76.0 mm	(2.992 in)
	First oversize	76.25 mm	(3.002 in)
	Second oversize	76.50 mm	(3.022 in)
Stroke		64 mm	(2.520 in)
Displacement		580.3 cm ³	(35.4 in ³)
Compression ratio	(uncorrected)	11.5 : 1	
	(corrected)	5.9 : 1	
Compression pressure		N.A.	
Engine maximum output		37 kW (50 hp) @ 5750 RPM	
Engine maximum torque		67 N•m (49 lbf•ft) @ 5000 RPM	
Cylinder head warpage		N.A.	
Piston ring type and quantity		1 ST - 1 R	
Ring end gap	New	0.25 - 0.40 mm	(.010 - .016 in)
	Wear limit	1.00 mm	(.039 in)
Ring/piston groove clearance	New	0.03 - 0.08 mm	(.001 - .003 in)
	Wear limit	0.2 mm	(.008 in)
Piston/cylinder wall clearance	New	0.06 - 0.07 mm	(.002 - .003 in)
	Wear limit	0.2 mm	(.008 in)
Cylinder taper (maximum)		0.08 mm	(.003 in)
Cylinder out of round (maximum)		0.05 mm	(.002 in)
Connecting rod big end axial play	New	0.4 mm	(.016 in)
	Wear limit	1.2 mm	(.047 in)
Crankshaft end play		N.A.	
Crankshaft deflection		0.08 mm	(.003 in)
Rotary valve timing	Opening	115° ± 4 BTDC	
	Closing	80° ± 4 ATDC	
Rotary valve plate opening		147°	
Crankcase/rotary valve gap		0.2 - 0.3 mm	(.008 - .013 in)
Connecting rod radial clearance	Min.	0.020 mm	(.001 in)
	Max.	0.033 mm	(.0015 in)

Section 12 TECHNICAL DATA**Sub-Section 01 (SP, 5804 MODELS)**

ELECTRICAL (engine)		
Magneto generator output		160 W @ 5500 RPM
Ignition system, type		CDI, 4/5 p
Spark plug	Make and type	NGK BR7ES
	Gap	0.5 mm (.020 in)
Ignition timing	BTDC	2.18 mm (.086 in) (19° ± 2)
	Engine speed	6000 RPM
Generating coil	Low speed	120 - 180 Ω
	High speed	2.8 - 4.2 Ω
Battery charging coil		0.21 - 0.31 Ω
High tension coil	Primary	0.23 - 0.43 Ω
	Secondary	5.85 - 6.50 KΩ
Engine RPM limiter operation		6500 ± 200
ADDITIONAL INFORMATION :		
CARBURATION		
Carburetor, type		Diaphragm
Carburetor number		270 500 089
Main jet		127.5
Pilot jet		75
Adjustment	Low-speed mixture screw	1-1/2 turn
	High speed screw	1/4
	Idle speed (in water)	1300-1500 RPM
Fuel	type	Regular unleaded
	octane no.	91 Ron
Fuel return line orifice		0.5 mm (0.020 in)
Leak test (pop off pressure)		150-170 kPa (22-25 PSI)
ADDITIONAL INFORMATION :		
COOLING		
Type	Total loss type - 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, 5804 MODELS)

PROPULSION			
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	28°	
	Minimum required water level	60 cm (24 in)	
	Drive shaft deflection maximum	0.5 mm (.020 in)	
	Impeller outside diameter	New	139.5 mm (5.490 in)
		Wear limit	138.33 mm (5.450 in)
	Pump wear ring inside diameter	New	140.5 mm (5.530 in)
		Wear limit	N.A.
	Impeller/wear ring clearance	Wear limit (performance)	0.5 mm (.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	18°	
ADDITIONAL INFORMATION : Do not mix different trademark or type of oil.			
DIMENSIONS			
Number of passenger (driver incl.)		2	
Length, overall		244 cm (96 in)	
Width, overall		105 cm (41.5 in)	
Height, overall		92 cm (36.2 in)	
Mass :		166 kg (365 lb)	
Load limit		160 kg (352 lb)	
M A T E R I A L S	Hull	Composite	
	Air intake silencer	Thermoplastic	
	Flame arrester	Multi-layer wire screen	
	Exhaust muffler	Aluminum	
	Steering padding	Polypropylene foam	
	Fuel tank	Polyethylene	
	Injection oil tank	Polyethylene	
Seat	Polyurethane foam		
ADDITIONAL INFORMATION :			

Section 12 TECHNICAL DATA

Sub-Section 01 (SP, 5804 MODELS)

PERFORMANCE		
Pump static thrust		167 kg (367 lb)
Max. fuel consumption at wide open throttle		16.6 L/h (4.4 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour 45 minutes
	Fuel tank reserve	20 minutes
Maximum speed		64 km/h (40 MPH) (35 kn)
ADDITIONAL INFORMATION :		
ELECTRICAL (vehicle)		
Battery		12 V, 20 A•h
Starting system fuse		8 A
Charging system fuse		15 A
ADDITIONAL INFORMATION :		
CAPACITIES		
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
Cooling system		N.A.
Injection oil tank		2.8 L (95 U.S. fl oz)
ADDITIONAL INFORMATION :		
STANDARD EQUIPMENT		
Tether cord		STD
Tool kit		STD
Fuel tank reserve		STD
Overheating warning device		STD
Electric fuel level gauge		N.A.
Injection oil low level warning device		N.A.
Speedometer		N.A.
Tachometer		N.A.
Position lights		N.A.
Voltmeter		N.A.
Reverse		N.A.
ADDITIONAL INFORMATION :		

Section 12 TECHNICAL DATA
Sub-Section 01 (SP, 5804 MODELS)

TIGHTENING TORQUES				
E N G I N E	Exhaust manifold screws	20 N•m	(15 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	22 N•m	(16 lbf•ft)
	Crankcase/engine support nuts	35 N•m	(26 lbf•ft)	
	Engine support/hull	25 N•m	(1) (18 lbf•ft)	
	Cylinder head screws	20 N•m	(3) (15 lbf•ft)	
	Crankcase/cylinder screws	20 N•m	(3) (15 lbf•ft)	
	Tuned pipe flange nuts	25 N•m	(1) (18 lbf•ft)	
	Tuned pipe fixation screws	25 N•m	(18 lbf•ft)	
	Cylinder head cover screws	9 N•m	(1) (80 lbf•in)	
	Flame arrester screws	10 N•m	(1) (88 lbf•in)	
P U M P	Impeller on shaft	70 N•m	(2) (52 lbf•ft)	
	Pump/hull	35 N•m	(1) (26 lbf•ft)	
	Venturi/housing	25 N•m	(1) (18 lbf•ft)	
	Nozzle/venturi	20 N•m	(1) (15 lbf•ft)	
	Housing cover	7 N•m	(1) (62 lbf•in)	
	Grill	8 N•m	(1) (71 lbf•in)	
	Ride shoe	10 N•m	(1) (88 lbf•in)	
	Flywheel guard nuts	5 N•m	(1) (44 lbf•in)	
S T E E R I N G	Steering cable lock nuts	10 N•m	(88 lbf•in)	
	Steering support screws	15 N•m	(1) (11 lbf•ft)	
	Steering collar screws	5 N•m	(1) (44 lbf•in)	
	Steering stem screw	40 N•m	(2) (29 lbf•ft)	
	Handlebar saddle screws, nuts	26 N•m	(19 lbf•ft)	
E L E C T R I C A L	Ignition housing cover	4 N•m	(35 lbf•in)	
	Electrical box/battery	4 N•m	(35 lbf•in)	
	Electrical box cover	2 N•m	(18 lbf•in)	
	Starter mounting screws	22 N•m	(2) (16 lbf•ft)	
	Starter lock nuts	5 N•m	(44 lbf•in)	
ADDITIONAL INFORMATION : Apply where indicated (1) Loctite 242 (2) Loctite 271 (3) Loctite 515				

GT, 5811 MODELS

ENGINE			
Engine type		ROTAX 587, water cooled	
Induction type		Rotary valve	
Exhaust system		Water cooled, water injected	
Starting system		Electric start	
Lubrication	Fuel/oil mixture	VROI	
	Oil injection pump	Gear	
	Oil type	SEA-DOO injection oil	
Number of cylinders		2	
Bore	Standard	76.0 mm	(2.992 in)
	First oversize	76.25 mm	(3.002 in)
	Second oversize	76.50 mm	(3.022 in)
Stroke		64 mm	(2.520 in)
Displacement		580.7 cm ³	(35.44 in ³)
Compression ratio	(uncorrected)	11.5 : 1	
	(corrected)	5.9 : 1	
Compression pressure		1070 kPa (155 PSI)	
Engine maximum output		41 kW (55 hp) @ 5750 RPM	
Engine maximum torque		70 N•m (51 lbf•ft) @ 5250 RPM	
Cylinder head warpage		N.A.	
Piston ring type and quantity		1 ST - 1 R	
Ring end gap	New	0.25 - 0.40 mm	(.010 - .016 in)
	Wear limit	1.00 mm	(.039 in)
Ring/piston groove clearance	New	0.03 - 0.08 mm	(.001 - .003 in)
	Wear limit	0.2 mm	(.008 in)
Piston/cylinder wall clearance	New	0.06 - 0.07 mm	(.002 - .003 in)
	Wear limit	0.2 mm	(.008 in)
Cylinder taper (maximum)		0.08 mm	(.003 in)
Cylinder out of round (maximum)		0.05 mm	(.002 in)
Connecting rod big end axial play	New	0.4 mm	(.016 in)
	Wear limit	1.2 mm	(.047 in)
Crankshaft end-play		N.A.	
Crankshaft deflection		0.08 mm	(.003 in)
Rotary valve timing	Opening	115° ± 4 BTDC	
	Closing	65° ± 4 ATDC	
Rotary valve plate opening		132°	
Crankcase/rotary valve gap		0.2 - 0.3 mm	(.008 - .013 in)
Connecting rod radial clearance	Min.	0.020 mm	(.001 in)
	Max.	0.033 mm	(.0015 in)

Section 12 TECHNICAL DATA

Sub-Section 02 (GT, 5811 MODELS)

ELECTRICAL (engine)		
Magneto generator output		160 W @ 5500 RPM
Ignition system, type		CDI 4/5 p
Spark plug	Make and type	NGK BR7ES
	Gap	0.6 mm (.024 in)
Ignition timing	BTDC	2.18 mm (.086 in) (19° ± 2)
	Engine speed	6000 RPM
Generating coil	Low speed	120 - 180 Ω
	High speed	2.8 - 4.2 Ω
Battery charging coil		0.21 - 0.31 Ω
High tension coil	Primary	0.23 - 0.43 Ω
	Secondary	5.85 - 6.50 KΩ
Engine RPM limiter operation		6500 ± 200

ADDITIONAL INFORMATION :

CARBURATION

Carburetor, type		Diaphragm
Carburetor number		(P/N 270 500 093) MAG (P/N 270 500 092) PTO
Main jet		107.5
Pilot jet		65
Adjustment	Low-speed mixture screw	1-1/8 turn
	High speed screw	1/4
	Idle speed (in water)	1300-1500 RPM
Fuel	Type	Regular unleaded
	Octane no.	91 Ron
Fuel return line orifice		3.0 mm (0.118 in) MAG 0.5 mm (0.020 in) PTO
Leak test (pop off pressure)		150-170 kPa (22-25 PSI)

ADDITIONAL INFORMATION :

COOLING

Type	Total loss type - 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 (GT, 5811 MODELS)

PROPULSION			
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°	
	Minimum required water level	60 cm (24 in)	
	Drive shaft deflection maximum	0.5 mm (.020 in)	
	Impeller outside diameter	New	139.5 mm (5.490 in)
		Wear limit	138.33 mm (5.450 in)
	Pump wear ring inside diameter	New	140.5 mm (5.530 in)
		Wear limit	N.A.
	Impeller / wear ring clearance	Wear limit (performance)	0.5 mm (.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	17°	
Impeller material	Stainless steel		
ADDITIONAL INFORMATION : Do not mix different trademark or type of oil.			
DIMENSIONS			
Number of passengers (including driver) ①		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 – passenger and luggage (10 kg)		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	Polypropylene foam	
	Fuel tank	Polyethylene	
	Injection oil tank	Polyethylene	
	Seat	Polyurethane foam	
ADDITIONAL INFORMATION : ① Refer to load limits			

Section 12 TECHNICAL DATA

Sub-Section 02 (GT, 5811 MODELS)

PERFORMANCE		
Pump static thrust		227 kg (504 lb)
Max. fuel consumption at wide open throttle		20 L/h (5.3 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour 35 minutes
	Fuel tank reserve	15 minutes
Maximum speed		58 km/h (36 MPH) (32 kn)
ADDITIONAL INFORMATION :		
ELECTRICAL (vehicle)		
Battery		12 V, 20 A•h
Starting system fuse		8 A
Charging system fuse		15 A
ADDITIONAL INFORMATION :		
CAPACITIES		
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 plug hole
Cooling system		N.A.
Injection oil tank		2.8 L (95 U.S. oz)
Storage basket		50 L (13052 in ³)
ADDITIONAL INFORMATION :		
STANDARD EQUIPMENT		
Tether cord		STD
Tool kit		STD
Fuel tank reserve		STD
Overheating warning device		STD
Electric fuel level gauge		OPT
Injection oil low level warning device		OPT
Reverse		STD
Luggage compartment		STD
Rear grab handle		STD
ADDITIONAL INFORMATION :		

Section 12 TECHNICAL DATA
Sub-Section 02 (GT, 5811 MODELS)

TIGHTENING TORQUES

E N G I N E	Exhaust manifold screw/studs		20/6 N•m	(15/4 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		22 N•m	(16 lbf•ft)
	Crankcase/engine support nuts		35 N•m	(26 lbf•ft)	
	Engine support/hull		25 N•m	(1) (18 lbf•ft)	
	Cylinder head screws		20 N•m	(3) (15 lbf•ft)	
	Crankcase/cylinder screws		20 N•m	(3) (15 lbf•ft)	
	Tuned pipe flange nuts		25 N•m	(1) (18 lbf•ft)	
	Tuned pipe fixation screws		25 N•m	(1) (18 lbf•ft)	
	Cylinder head cover screws		9 N•m	(1) (80 lbf•in)	
	Flame arrester screws		10 N•m	(1) (88 lbf•in)	
	Flywheel guard studs		9 N•m	(2) (80 lbf•in)	
P U M P	Impeller on shaft		70 N•m	(2) (52 lbf•ft)	
	Pump/hull		35 N•m	(1) (26 lbf•ft)	
	Venturi/housing		25 N•m	(1) (18 lbf•ft)	
	Nozzle/venturi		20 N•m	(1) (15 lbf•ft)	
	Housing cover		7 N•m	(1) (62 lbf•in)	
	Grill		8 N•m	(1) (71 lbf•in)	
	Ride shoe		10 N•m	(1) (88 lbf•in)	
	Flywheel guard nuts		5 N•m	(1) (44 lbf•in)	
	Reverse gate/housing		20 N•m	(1) (15 lbf•ft)	
	Cable/reverse		8 N•m	(71 lbf•in)	
S T E E R I N G	Steering cable lock nuts		10 N•m	(88 lbf•in)	
	Steering support screws		15 N•m	(1) (11 lbf•ft)	
	Steering collar screws		15 N•m	(1) (11 lbf•ft)	
	Steering stem screw		40 N•m	(2) (29 lbf•ft)	
	Handlebar saddle screws, nuts		26 N•m	(1) (19 lbf•ft)	
	Cable/nozzle		8 N•m	(71 lbf•in)	
E L E C T R I C A L	Ignition housing cover		4 N•m	(35 lbf•in)	
	Electrical box/battery		4 N•m	(35 lbf•in)	
	Electrical box cover		2 N•m	(18 lbf•in)	
	Starter mounting screws		22 N•m	(2) (16 lbf•ft)	
	Starter lock nuts		7 N•m	(62 lbf•in)	
<p>ADDITIONAL INFORMATION : Apply where indicated (1) Loctite 242 (2) Loctite 271 (3) Loctite 515</p> <p>Storage cover hinge nuts : 8 N•m (71 lbf•in)</p>					

XP, 5850 MODELS

ENGINE			
Engine type		ROTAX 587, water cooled	
Induction type		Rotary valve	
Exhaust system		Water cooled, water injected	
Starting system		Electric start	
Lubrication	Fuel/Oil mixture	VROI	
	Oil injection pump	Gear	
	Oil type	SEA-DOO injection oil	
Number of cylinders		2	
Bore	Standard	76.0 mm	(2.992 in)
	First oversize	76.25 mm	(3.002 in)
	Second oversize	76.50 mm	(3.022 in)
Stroke		64 mm	(2.520 in)
Displacement		580.3 cm ³	(35.4 in ³)
Compression ratio	(uncorrected)	11.5 : 1	
	(corrected)	5.9 : 1	
Compression pressure		N.A.	
Engine maximum output		42 kW (56 hp) @ 5750 RPM	
Engine maximum torque		69 N•m (51 lbf•ft) @ 5500 RPM	
Cylinder head warpage		N.A.	
Piston ring type and quantity		1 ST - 1 R	
Ring end gap	New	0.25 - 0.40 mm	(.010 - .016 in)
	Wear limit	1.00 mm	(.039 in)
Ring/piston groove clearance	New	0.03 - 0.08 mm	(.001 - .003 in)
	Wear limit	0.2 mm	(.008 in)
Piston/cylinder wall clearance	New	0.06 - 0.07 mm	(.002 - .003 in)
	Wear limit	0.2 mm	(.008 in)
Cylinder taper (maximum)		0.08 mm	(.003 in)
Cylinder out of round (maximum)		0.05 mm	(.002 in)
Connecting rod big end axial play	New	0.4 mm	(.016 in)
	Wear limit	1.2 mm	(.047 in)
Crankshaft end play		N.A.	
Crankshaft deflection		0.08 mm	(.003 in)
Rotary valve timing	Opening	115° ± 4 BTDC	
	Closing	65° ± 4 ATDC	
Rotary valve plate opening		132°	
Crankcase/rotary valve gap		0.2 - 0.3 mm	(.008 - .013 in)
Connecting rod radial clearance	Min.	0.020 mm	(.001 in)
	Max.	0.033 mm	(.0015 in)

Section 12 TECHNICAL DATA

Sub-Section 03 (XP, 5850 MODELS)

ELECTRICAL (engine)		
Magneto generator output	160 W @ 5500 RPM	
Ignition system, type	CDI, 4/5 p	
Spark plug	Make and type	NGK BR7ES
	Gap	0.5 mm (.020 in)
Ignition timing	BTDC	2.18 mm (.086 in) (19° ± 2)
	Engine speed	6000 RPM
Generating coil	Low speed	120 - 180 Ω
	High speed	2.8 - 4.2 Ω
Battery charging coil	0.21 - 0.31 Ω	
High tension coil	Primary	0.23 - 0.43 Ω
	Secondary	5.85 - 6.50 KΩ
Engine RPM limiter operation	6500 ± 200	
ADDITIONAL INFORMATION :		
CARBURATION		
Carburetor, type	Diaphragm	
Carburetor number	270 500 093 MAG 270 500 092 PTO	
Main jet	107.5	
Pilot jet	65	
Adjustment	Low-speed mixture screw	1-1/4 turn
	High speed screw	1/4
	Idle speed (in water)	1300-1500 RPM
Fuel	type	Regular unleaded
	octane no.	91 Ron
Fuel return line orifice	3 mm (0.118 in) MAG 0.5 mm (.020 in) PTO	
Leak test (pop off pressure)	150-170 kPa (22-25 PSI)	
ADDITIONAL INFORMATION :		
COOLING		
Type	Total loss type - 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 03 (XP, 5850 MODELS)

PROPULSION			
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	28°	
	Minimum required water level	60 cm (24 in)	
	Drive shaft deflection maximum	0.5 mm (.020 in)	
	Impeller outside diameter	New	139.5 mm (5.490 in)
		Wear limit	138.33 mm (5.450 in)
	Pump wear ring inside diameter	New	140.5 mm (5.530 in)
		Wear limit	N.A.
	Impeller/wear ring clearance	Wear limit (performance)	0.5 mm (.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	19°	
ADDITIONAL INFORMATION : Do not mix different trademark or type of oil.			
DIMENSIONS			
Number of passenger (driver incl.)		2	
Length, overall		244 cm (96 in)	
Width, overall		105 cm (41.5 in)	
Height, overall		92 cm (36.2 in)	
Mass		166 kg (365 lb)	
Load limit		160 kg (352 lb)	
M A T E R I A L S	Hull	Composite	
	Air intake silencer	Thermoplastic	
	Flame arrester	Multi-layer wire screen	
	Exhaust muffler	Aluminum	
	Steering padding	Polypropylene foam	
	Fuel tank	Polyethylene	
	Injection oil tank	Polyethylene	
	Seat	Polyurethane foam	
ADDITIONAL INFORMATION :			

Section 12 TECHNICAL DATA**Sub-Section 03 (XP, 5850 MODELS)**

PERFORMANCE		
Pump static thrust		240 kg (533 lb)
Max. fuel consumption at wide open throttle		21.7 L/h (5.7 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour 20 minutes
	Fuel tank reserve	13 minutes
Maximum speed		73 km/h (45 MPH) (39 kn)
ADDITIONAL INFORMATION :		
ELECTRICAL (vehicle)		
Battery		12 V, 20 A•h
Starting system fuse		8 A
Charging system fuse		15 A
Gauge system fuse		2 A
ADDITIONAL INFORMATION :		
CAPACITIES		
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 plug hole
Cooling system		N.A.
Injection oil tank		2.8 L (95 U.S. fl oz)
ADDITIONAL INFORMATION :		
STANDARD EQUIPMENT		
Tether cord		STD
Tool kit		STD
Fuel tank reserve		STD
Overheating warning device		STD
Electric fuel level gauge		STD
Injection oil low level warning device		STD
Speedometer		N.A.
Tachometer		STD
Position lights		N.A.
Voltmeter		N.A.
Reverse		N.A.
ADDITIONAL INFORMATION :		

Section 12 TECHNICAL DATA
Sub-Section 03 (XP, 5850 MODELS)

TIGHTENING TORQUES			
E N G I N E	Exhaust manifold screws		20 N•m (15 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	22 N•m (16 lbf•ft)
	Crankcase/engine support nuts		35 N•m (26 lbf•ft)
	Engine support/hull		25 N•m (1) (18 lbf•ft)
	Cylinder head screws		20 N•m (3) (15 lbf•ft)
	Crankcase/cylinder screws		20 N•m (3) (15 lbf•ft)
	Tuned pipe flange nuts		25 N•m (1) (18 lbf•ft)
	Tuned pipe fixation screws		25 N•m (18 lbf•ft)
	Cylinder head cover screws		9 N•m (1) (80 lbf•in)
Flame arrester screws		10 N•m (1) (88 lbf•in)	
P U M P	Impeller on shaft		70 N•m (2) (52 lbf•ft)
	Pump/hull		35 N•m (1) (26 lbf•ft)
	Venturi/housing		25 N•m (1) (18 lbf•ft)
	Nozzle/venturi		20 N•m (1) (15 lbf•ft)
	Housing cover		7 N•m (1) (62 lbf•in)
	Grill		8 N•m (1) (71 lbf•in)
	Ride shoe		10 N•m (1) (88 lbf•in)
	Flywheel guard nuts		5 N•m (1) (44 lbf•in)
S T E E R I N G	Steering cable lock nuts		10 N•m (88 lbf•in)
	Steering support screws		15 N•m (1) (11 lbf•ft)
	Steering collar screws		5 N•m (1) (44 lbf•in)
	Steering stem screw		40 N•m (2) (29 lbf•ft)
	Handlebar saddle screws, nuts		26 N•m (19 lbf•ft)
E L E C T R I C A L	Ignition housing cover		4 N•m (35 lbf•in)
	Electrical box/battery		4 N•m (35 lbf•in)
	Electrical box cover		2 N•m (18 lbf•in)
	Starter mounting screws		22 N•m (2) (16 lbf•ft)
	Starter lock nuts		5 N•m (44 lbf•in)
ADDITIONAL INFORMATION : Apply where indicated (1) Loctite 242 (2) Loctite 271 (3) Loctite 515			

Section 12 TECHNICAL DATA

LEGEND	
ATDC : After top dead center	RPM : Revolutions per minute
BTDC : Before top dead center	ST : Semi-trapez
CDI : Capacitor discharge ignition	STD : Standard
N.A. : Not available	VROI : Variable rate oil injection
R : Rectangular	

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"> • Fuse open • Discharged battery • Battery connections • Water/fuel hydrolock • Starter or solenoid • Seized engine • Seized jet pump • Jammed pump 	<ul style="list-style-type: none"> • Check wiring then replace fuse • Check/recharge • Check/clean/tighten • Check, refer to section 03-01 • Check, refer to section 07-04 • Check/repair as needed • Check, refer to section 08-01 • Check/clean out debris
Engine slowly turns	<ul style="list-style-type: none"> • Discharged/weak battery • Restriction in jet pump • Seizure in jet pump • Seal carrier seizure • Partial engine hydrolock • Partial engine seizure 	<ul style="list-style-type: none"> • Check/charge/replace • Check/clean pump • Inspect, refer to section 08-01 • Check, refer to section 08-01 • Check, refer to section 03-01 • Check compression, refer to section 03-03
Engine turns over	<ul style="list-style-type: none"> • Tether cord removed • Fuel tank empty • Fuel water-contaminated • Dirty fuel filter • Fouled spark plugs • Water in engine • Misuse of choke (fuel flooded) • Carburation • Ignition • Engine flooded — Needle valve stuck open 	<ul style="list-style-type: none"> • Reinstall • Refill • Renew supply • Clean/replace • Replace • Check, refer to section 03-01 • Use only with cold engine • Check, refer to section 05-03 • Check, refer to section 07-02 and 07-06 • Check, refer to section 05-03

Section 13 TROUBLESHOOTING

ENGINE MISFIRES, RUNS IRREGULARLY

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	<ul style="list-style-type: none">• Fouled, defective, worn spark plugs• Faulty RPM limiter• Faulty ignition	<ul style="list-style-type: none">• Check/verify heat range/replace• Check, refer to section 07-06• Check, refer to section 07-06
Lean fuel mixture	<ul style="list-style-type: none">• Fuel level low• Stale or water fouled fuel• Fuel filter dirty or restricted• Carburation dirty or out of adjustment• Leaking crankshaft seal, magneto or PTO• Fuel valve restricted• Fuel tank up screen restricted• Loose carburetor, dry spark plugs	<ul style="list-style-type: none">• Check/refill• Check/siphon and refill• Check/clean/replace• Check/clean/adjust, refer to section 05-03• Check/test/replace, refer to engine section 03-05• Check/replace• Check/replace• Tighten carburetor
Rich fuel mixture/ fouled spark plug	<ul style="list-style-type: none">• Partially closed choke• Flame arrester dirty or restricted• Carburetor adjustment or setting • Main jet loose• Main jet O-ring damage • Rotary valve shaft seal leaking • Oil pump adjustment • Watercraft transportation	<ul style="list-style-type: none">• Check/adjust choke cable• Check/clean/replace• Check/clean/adjust, refer to section 05-03• Check, refer to section 05-03• Check/replace, refer to section 05-03• Check/replace, refer to section 03-06• Check/adjust, refer to section 06-02• Turn fuel valve to OFF
Difficult to start	<ul style="list-style-type: none">• Incorrect rotary valve timing	<ul style="list-style-type: none">• Check/adjust, refer to section 03-06

Section 13 TROUBLESHOOTING

ENGINE OVERHEATS

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Overheat beeper sounds	<ul style="list-style-type: none">• Restricted jet pump water intake• Cooling system restriction• Carburetor adjustment• Grounded temperature sensor or sensor wire	<ul style="list-style-type: none">• Check/clean• Check/flush, refer to section 04-03• Check/clean/adjust, refer to section 05-03• Check/replace/repair

ENGINE CONTINUALLY BACKFIRES

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	<ul style="list-style-type: none">• Fouled, defective spark plugs• RPM limiter malfunction	<ul style="list-style-type: none">• Clean/replace• Check/replace, refer to section 07-06
Ignition timing	<ul style="list-style-type: none">• Incorrect setting• Flywheel key sheared	<ul style="list-style-type: none">• Check/reset, refer to section 07-02• Check/replace
Rotary disc valve	<ul style="list-style-type: none">• Timing incorrect	<ul style="list-style-type: none">• Check/reset, refer to section 03-06
Carburetor	<ul style="list-style-type: none">• Carburation too lean	<ul style="list-style-type: none">• Check/adjust, refer to section 05-03

ENGINE DETONATION OR PINGING

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Ignition	<ul style="list-style-type: none">• Timing too far advanced• Spark plug heat range too high	<ul style="list-style-type: none">• Check/reset• Check/change to correct range
Engine temperature	<ul style="list-style-type: none">• Engine overheating	<ul style="list-style-type: none">• Check, refer to section 03-01 and 04-01
	<ul style="list-style-type: none">• Poor quality fuel	<ul style="list-style-type: none">• Use good quality fuel

Section 13 TROUBLESHOOTING

ENGINE LACKS ACCELERATION OR POWER

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none"> • Weak spark • Carburation, jetting too rich/lean • Throttle does not reach full open • Low compression • Exhaust system restriction • Water in gas or oil • Debris in needle valve 	<ul style="list-style-type: none"> • Check/replace, refer to section 07-06 • Check/reset/rejet, refer to section 05-03 • Check/readjust • Check/repair, refer to section 03-03 • Check/clean • Check/siphon/replace • Check/clean, refer to section 05-03

ENGINE RUNS TOO FAST

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none"> • Faulty RPM limiter 	<ul style="list-style-type: none"> • Check, refer to section 07-06
Jet pump cavitation	<ul style="list-style-type: none"> • Damaged leading edge of impeller 	<ul style="list-style-type: none"> • Check/replace <p>○ NOTE : 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"> • Pump housing or ride shoe air leak 	<ul style="list-style-type: none"> • Check/reseal, refer to section 08-01

ABNORMAL NOISE FROM PROPUSION SYSTEM

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none"> • Weeds/debris caught in pump intake or impeller • Low oil level in pump housing • Damaged or bent driveshaft • Broken motor mounts 	<ul style="list-style-type: none"> • Check/clean • Check/troubleshoot source of leak/refill supply, refer to section 08-01 • Check/replace, refer to section 08-01 • Check/replace, refer to section 03-02