SP 5870, SPI 5872, SPX 5871, XP 5854
GTS 5814, GTX 5862, EXPLORER 5821

Shop Manual

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SHOP MANUAL

Legal deposit :

National Library of Quebec

1st trimester 1994

National Library of Canada

Printed in Canada

SAFETY NOTICE

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

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

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

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

Torque wrench tightening specifications must be strictly adhered to. Locking devices (e locking disk, lock nut) must be installed or replaced with new ones, where specified. If 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 seric personal injury including possibility of death.

▼ CAUTION : Denotes an instruction which, if not followed, could severely dama watercraft components.

○ NOTE : Indicates supplementary information needed to fully complete an instructic

Although the mere reading of such information does not eliminate the hazard, yc understanding of the information will promote its correct use. Always use common sh safety practice.

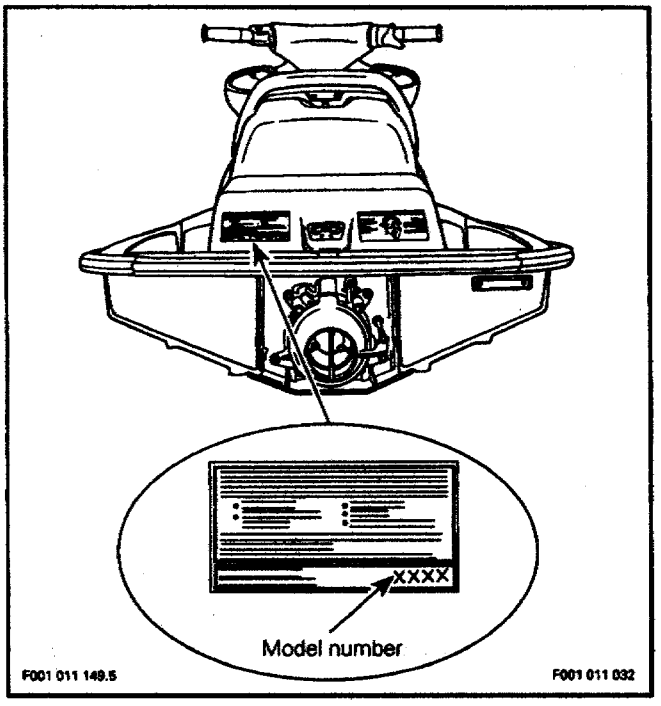
This information relates to the preparation and use of Bombardier watercraft and has be utilized safely and effectively by Bombardier Inc.. However, Bombardier Inc. disclai liability for all damages and / or injuries resulting from the improper use of the conter We strongly recommend that any services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

INTRODUCTION

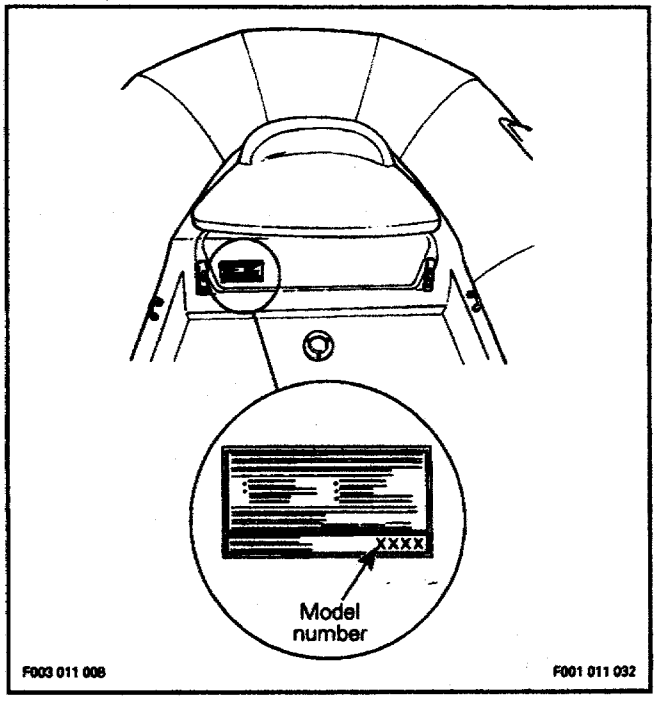
This *Shop Manual* covers BOMBARDIER made SEA-DOO® watercraft models SP 5870, SPI 5872, SPX 5871, XP 5854, XPI 5855, GTS 5814, GTX 5862 and EXPLORER 5821.

WATERCRAFT MODEL NUMBER

It is located on U.S. Coast Guard approved label on left hand side of stern (rear) eyelet.

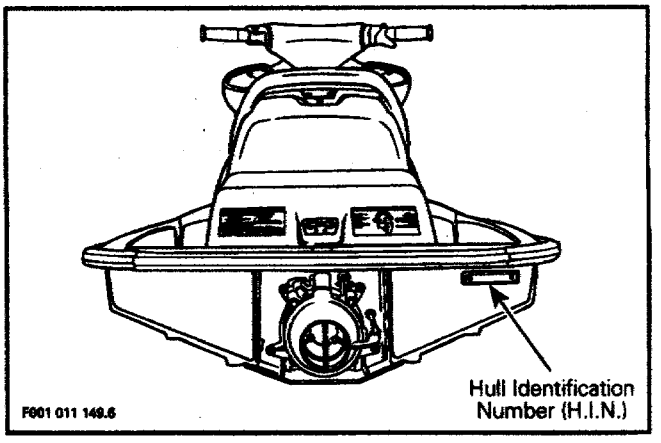


For the EXPLORER model, it is located on left hand side of front storage compartment cover.



HULL IDENTIFICATION NUMBER (H.I.N.)

It is located at right hand rear side of hull.



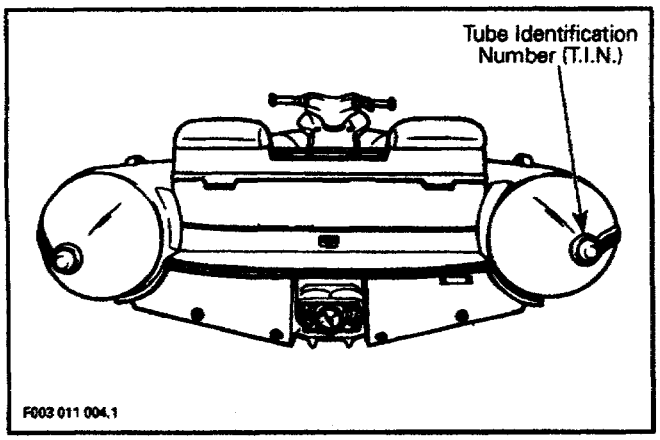
The five digits after ZZN are the watercraft serial number.

ZZN 1 2 3 4 5 X X X X

Serial number

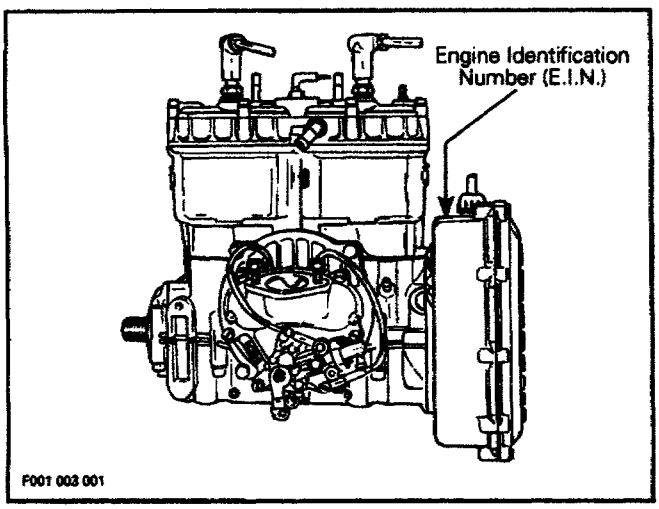
TUBE IDENTIFICATION NUMBER (EXPLORER)

It is located on right hand side cone.



ENGINE IDENTIFICATION NUMBER (E.I.N.)

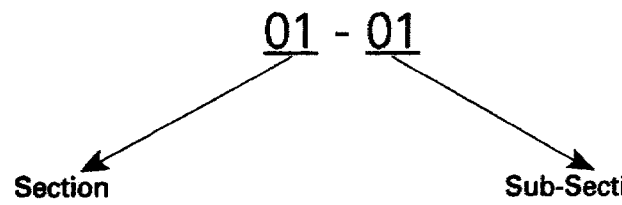
It is located on the upper side of the magneto housing.



DEFINITION OF NUMBERING SYSTEM OF THIS MANUAL

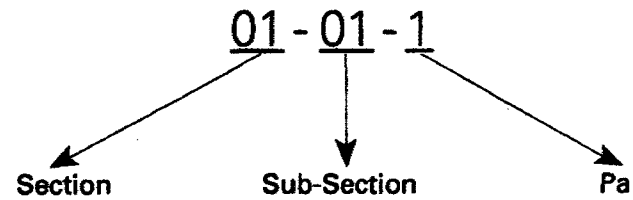
Sections and Sub-Sections System

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



Pages System

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



ARRANGEMENT OF THIS MANUA

The manual is divided into 13 major sections :

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

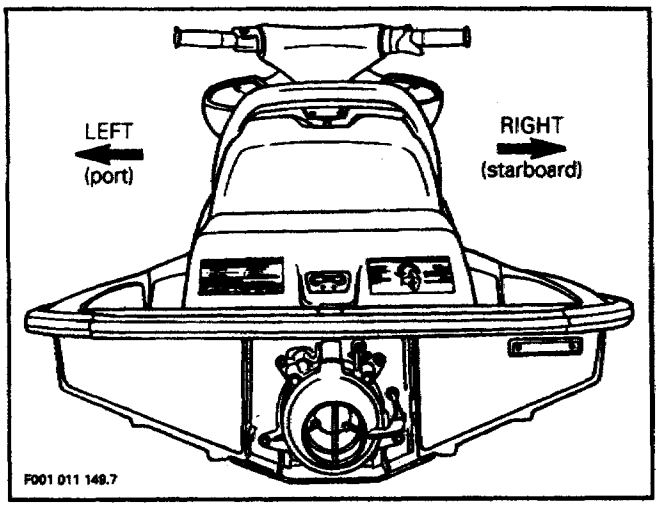
Each section is divided in various sub-sections, a again, each sub-section has one or more division.

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
07 Exhaust System

GENERAL INFORMATION

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



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.

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

When ordering parts always refer to the specific model, *parts catalogs.*

PARTS CATALOGS	
MODELS	**P / N**
SP (5870) SPI (5872) SPX (5871)	219 800 011
GTS (5814) GTX (5862)	219 800 013
XP (5854) XPI (5855)	219 800 012
EXPLORER (5821)	219 800 014

ILLUSTRATIONS AND PROCEDURES

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 : These watercraft are designed with parts dimensioned in both the metric and the imperial systems. When replacing fasteners, make sure to use only those recommended by Bombardier. 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 sub-section in which the procedure is contained.

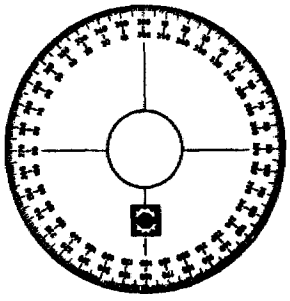
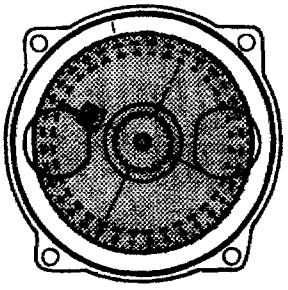
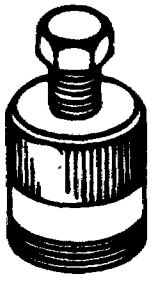
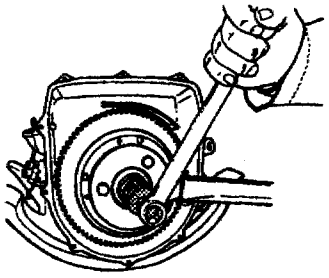
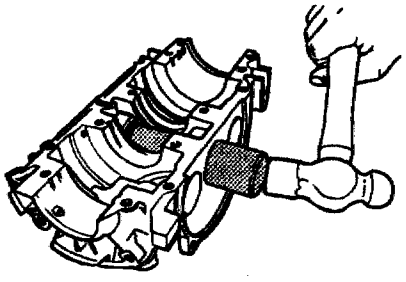
A number of procedures throughout the book require the use of special tools. Where a special tool is indicated, refer to section 01 (SERVICE TOOLS AND PRODUCTS). Before commencing any procedure, be sure that you have on hand all the tools required, or approved equivalents.

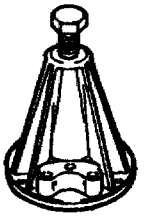
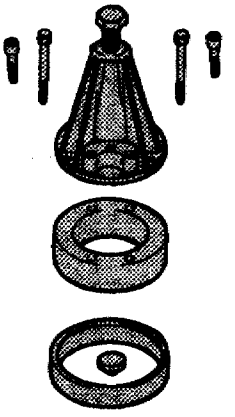
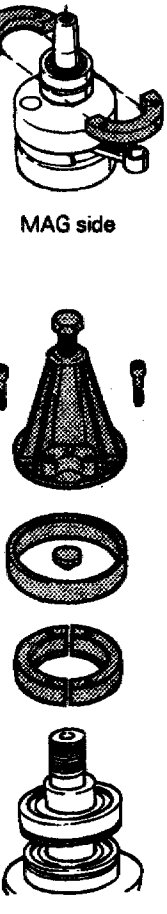
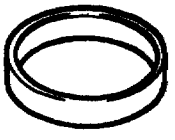
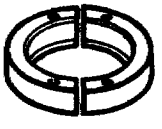
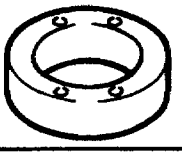
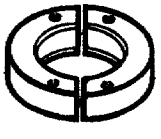
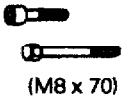
Technical Publications
Bombardier Inc.
Valcourt (Quebec), Canada

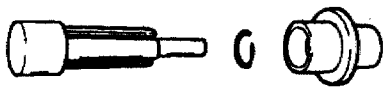
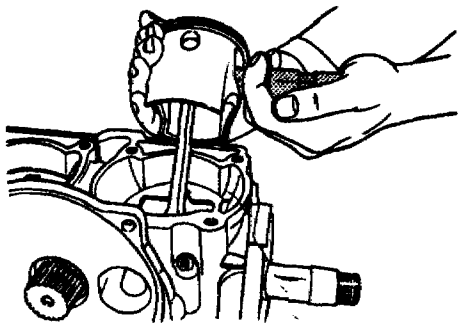
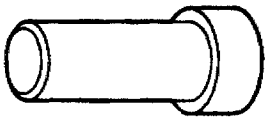
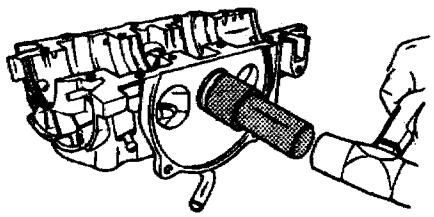
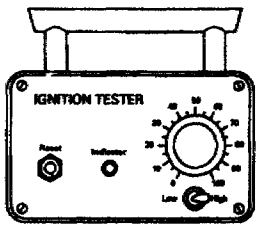
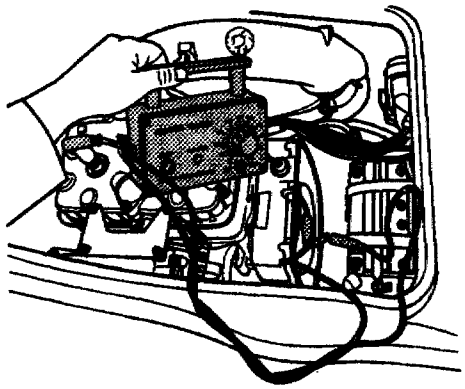
MANDATORY TOOLS

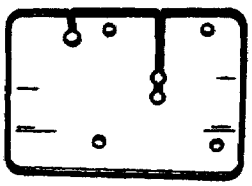
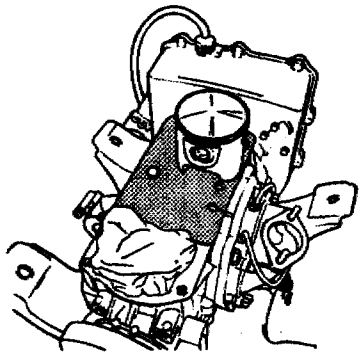
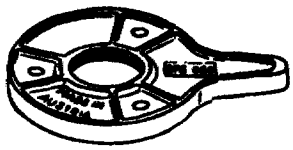
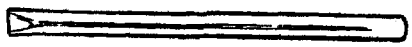
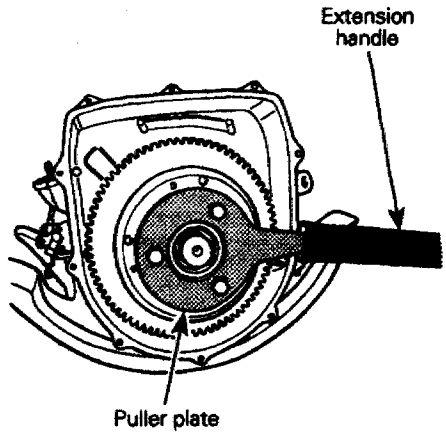
ENGINE

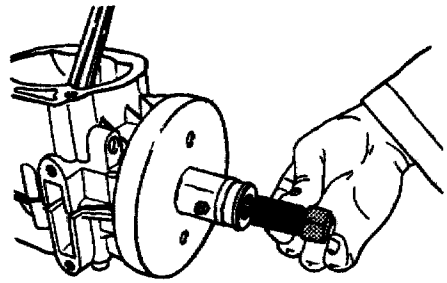
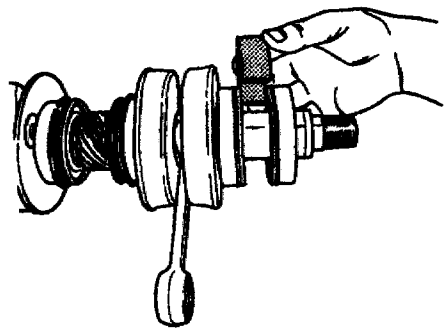
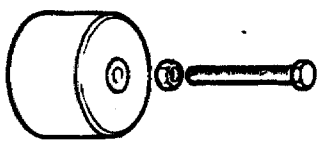
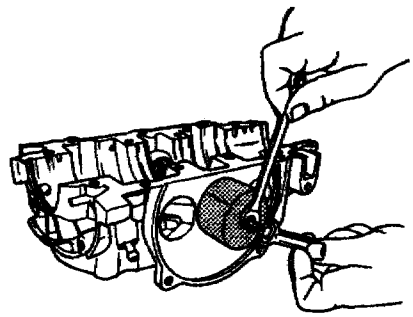
Mandatory tool kit : P/N 295 000 087.

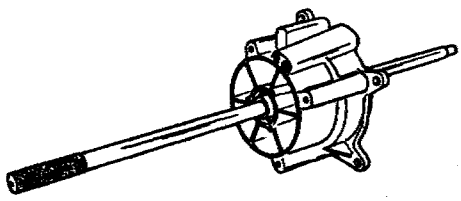
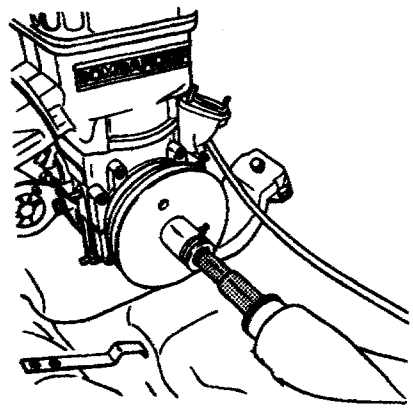
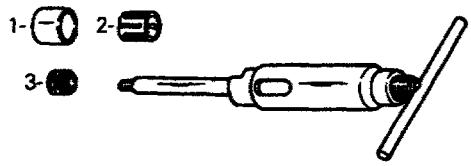
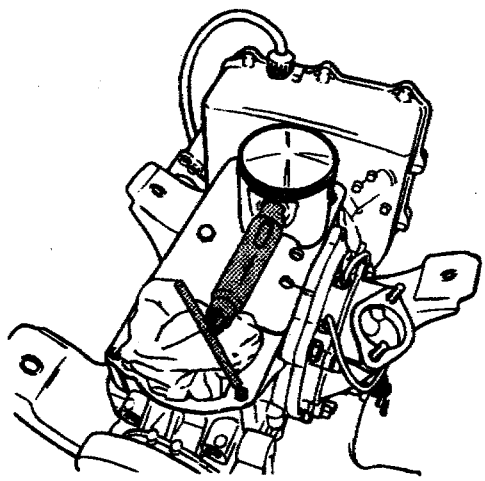
SERVICE TOOL	PURPOSE	APPLICATION
Degree wheel **1** P / N 295 000 007  A000 001 111	To mark timing position of rotary valve, to check crankshaft alignment.  F001 003 083	All models.
Puller **5** P / N 295 000 106  A000 002 046	Used with puller plate (P / N 290 876 080) and extension handle (P / N 295 000 111) to remove MAG flywheel.  F001 003 156	All models.
Pusher **12** P / N 290 876 500  A000 001 091	To install end bearing of rotary valve shaft in crankcase.  F001 003 086	All models.

SERVICE TOOL	PURPOSE	APPLICATION
Puller 200 P / N 290 876 298  F001 001 010	To remove crankshaft bearings.  MAG side  PTO side F001 003 094 F001 003 095	All models.
Protective cap (both ends) 554 P / N 290 876 557  F001 001 011		
Ring (both ends) 555 P / N 290 977 490  F001 001 013		
Ring halves (PTO) 556 P / N 290 977 475  F001 001 015		
Distance ring (MAG) 557 P / N 290 876 569  F001 001 012		
Ring halves (MAG) 558 P / N 290 276 025  F001 001 014		
Screws P / N 290 840 681 559 P / N 290 841 201 560 (M8 x 40)  (M8 x 70) F001 001 072		

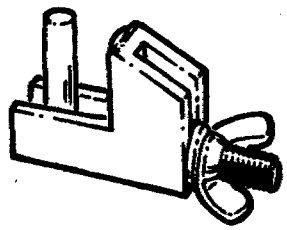
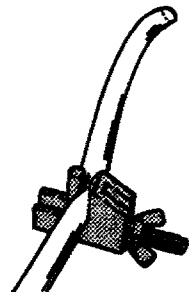
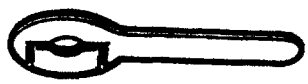
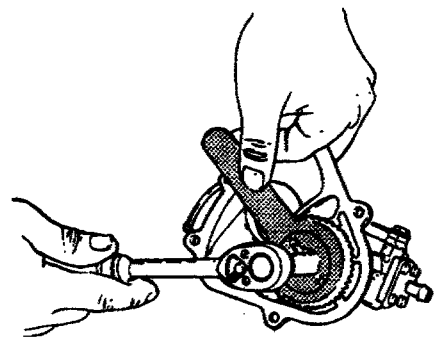
SERVICE TOOL	PURPOSE	APPLICATION
Piston circlip installer A) P / N 295 000 077 202 B) P / N 290 877 016 548  A001 001 081	To install circlips on pistons.  F001 003 034	A) 587 engine. B) 657 engine.
Pusher 229 P / N 290 876 605  A000 002 034	To install rotary valve shaft in crankcase.  F001 003 088	All models.
Bombardier ignition tester 236 P / N 295 000 008  A000 002 056	To test engine ignition system.  F001 007 100	All models.

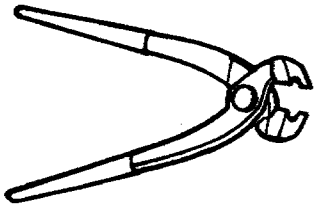
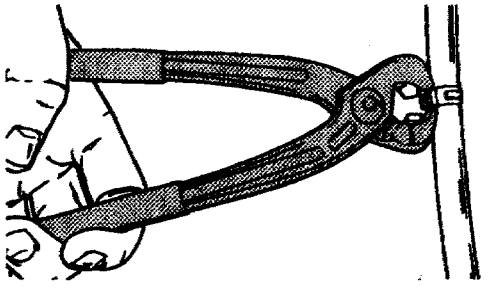
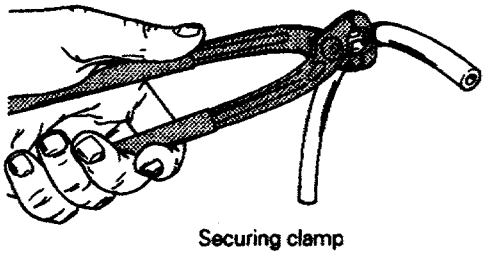
SERVICE TOOL	PURPOSE	APPLICATION
Rubber pad 547 P / N 295 000 101  F001 001 019	To avoid needles of connecting rod bearing (587 engine) and any foreign pats from falling in crankcase.  F001 003 147	All models.
Puller plate P / N 290 876 080 549  Extension handle 550 (P / N 295 000 111)  551 Screw M8 x 35 (3) (P / N 290 841 591)  Sleeve (3) 552 (P / N 290 847 220)  F001 003 151	Used with extension handle to retain crankshaft. When removing / installing PTO flywheel and loosen / tighten MAG flywheel nut.  F001 003 162	All models.

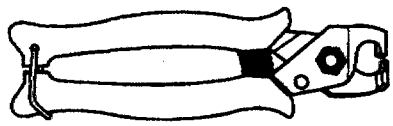
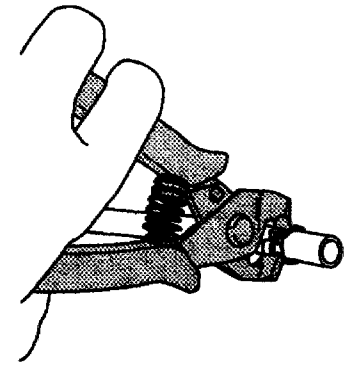
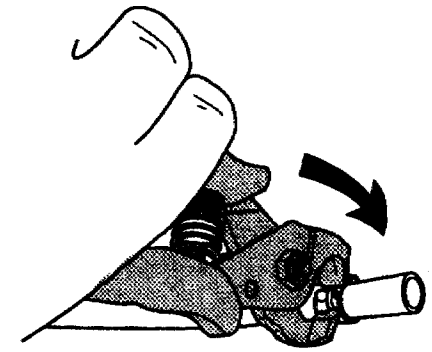
SERVICE TOOL	PURPOSE	APPLICATION
PTO flywheel remover / installer **553** P / N 295 000 001  NOTE : This tool is also used for the impeller. F001 009 029	Used to loosen / tighten PTO flywheel. Must be used in conjunction with puller plate (P / N 290 876 080) and extension handle (P / N 295 000 111).  F001 003 046	All models.
Distance gauge **561** P / N 290 876 826  F001 001 017	To position outer crankshaft bearing on PTO side.  F001 003 070	Crankshaft without a labyrinth sleeve.
Puller **562** P / N 290 876 487  F001 001 018	To remove rotary valve shaft from crankcase.  F001 003 217	All models.

SERVICE TOOL	PURPOSE	APPLICATION
Alignment tool 563 P / N 295 000 089  F001 011 089	To properly align engine with jet pump.  F001 011 101	All models.
Piston pin puller 565 P / N 295 000 105  Replacement parts : 1- Locating sleeve (P / N 290 877 180) 2- Expansion sleeve (P / N 290 877 040) 3- Extracting nut (P / N 290 877 115) F001 001 031	To remove and install piston pin.  F001 003 099	587 engine.

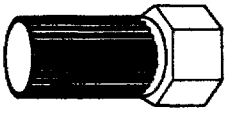
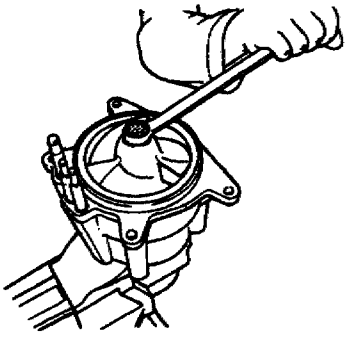
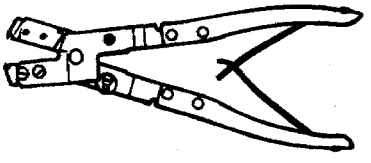
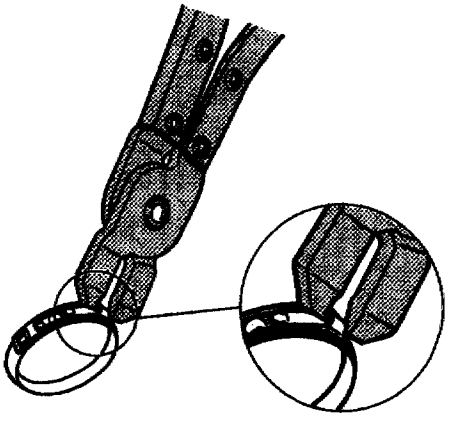
COOLING / FUEL / OIL SYSTEMS

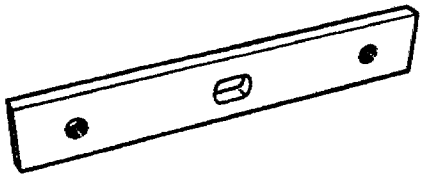
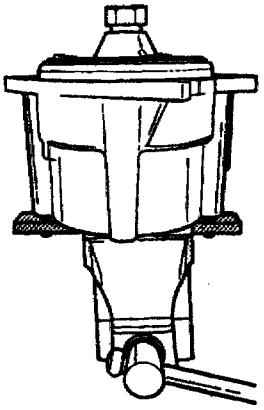
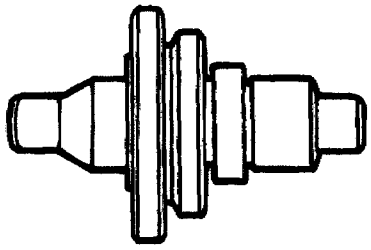
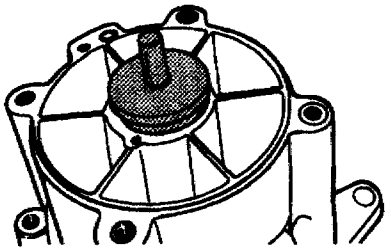
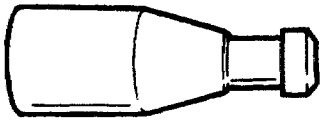
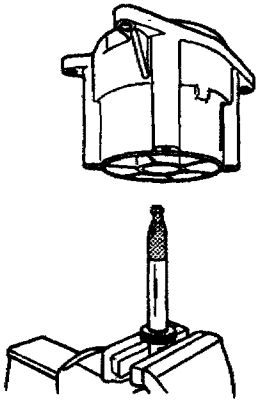
SERVICE TOOL	PURPOSE	APPLICATION
Hose pincher 2 P / N 295 000 076  A001 001 090	To avoid leaks while working on oil / fuel lines.  A001 001 091	All models.
Gear holder 235 P / N 290 277 905  A000 002 042	To remove / install lock nut of oil injection pump gear.  A000 002 043	All models.

SERVICE TOOL	PURPOSE	APPLICATION
Pliers 601 P / N 295 000 070  F001 003 043	To secure / cut non-reusable clamps of coolant hoses.  Cutting clamp  Securing clamp F001 001 003 F001 001 004	All models.

SERVICE TOOL	PURPOSE	APPLICATION
Pliers 606 P / N 295 000 054  F001 001 065	To secure or open clamps on fuel lines.  To secure clamp, place notch side of plier on clamp embossment and squeeze plier.  To open clamp, place flat side of plier on clamp embossment, squeeze and twist plier. F001 001 066 F001 001 067	All models.

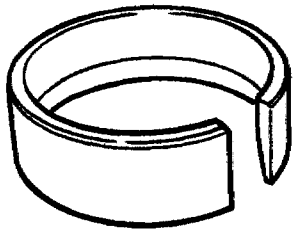
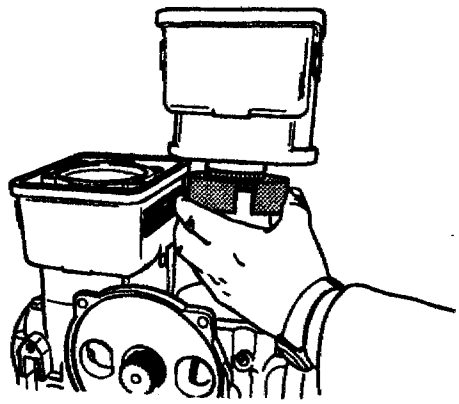
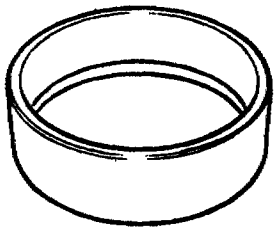
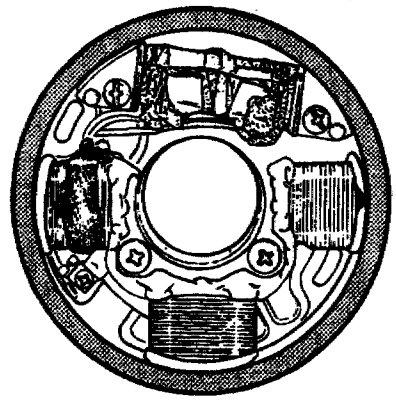
PROPULSION SYSTEM

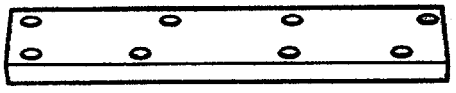
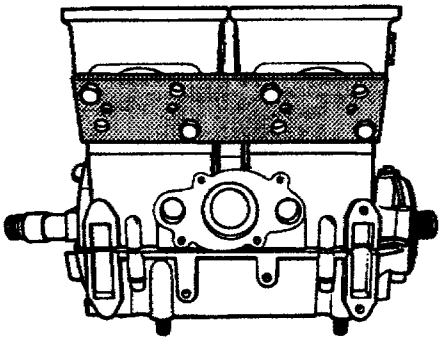
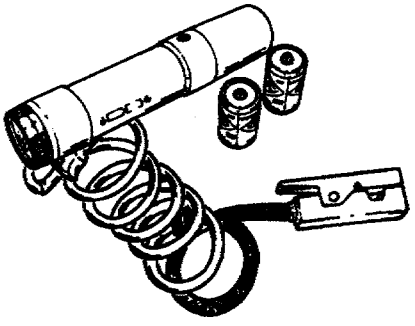
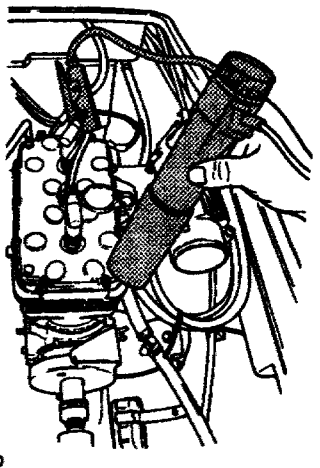
SERVICE TOOL	PURPOSE	APPLICATION
Impeller remover / installer 553 P / N 295 000 001  NOTE : This tool is also used for the PTO flywheel. F001 009 029	Used to loosen / tighten impeller on shaft.  F001 009 030	All models.
Pliers 602 P / N 295 000 069  F001 003 044	To remove / install drive shaft boot reusable stepless clamps.  F001 009 017	All models.

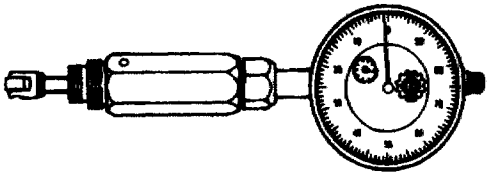
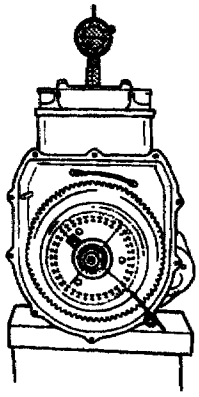
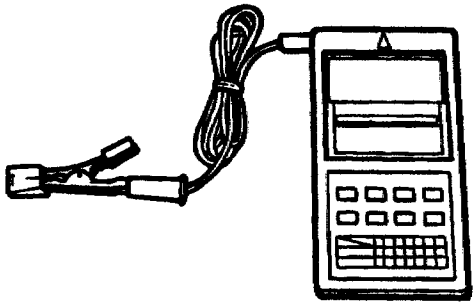
SERVICE TOOL	PURPOSE	APPLICATION
Impeller shaft holder 603 P / N 295 000 082  F001 001 032	Used to hold shaft when removing / installing impeller.  F001 009 059	All models.
Bearing / seal installer 604 P / N 295 000 107  F001 009 164	To install impeller shaft needle bearings and seal.  F001 009 054	All models.
Impeller shaft guide 605 P / N 295 000 002  F001 009 060	To protect seal lip when installing impeller shaft in its housing.  F001 009 061	All models.

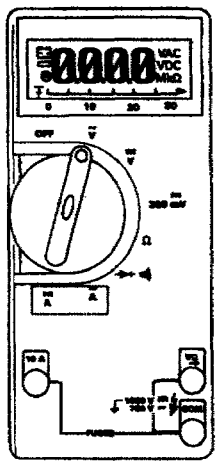
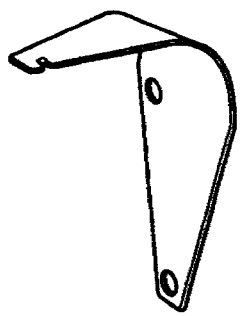
RECOMMENDED TOOLS

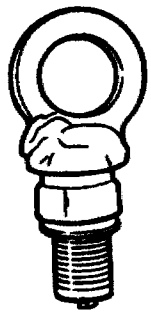
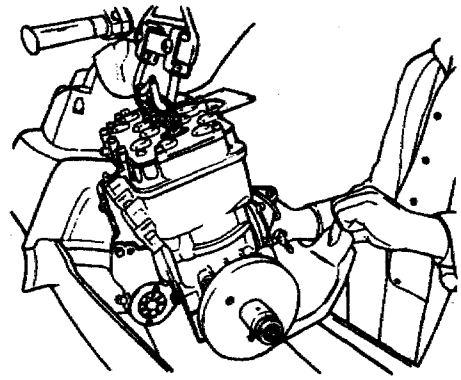
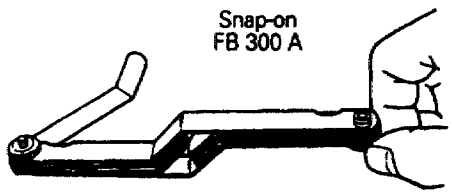
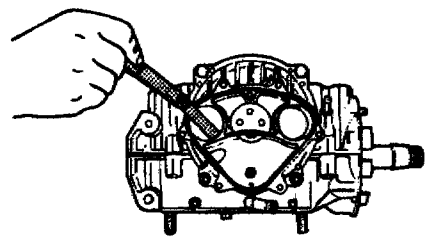
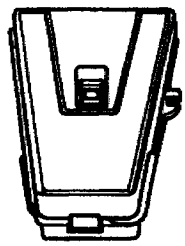
ENGINE

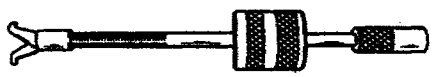
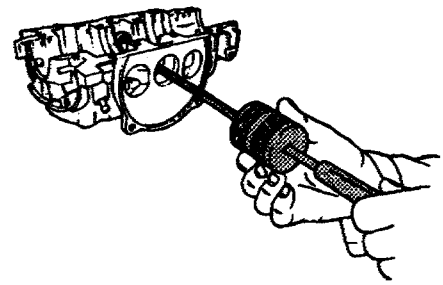
SERVICE TOOL	PURPOSE	APPLICATION
Ring compressor A) P / N 290 876 972 207 B) P / N 295 000 112 751  A001 001 085	To compress piston ring when inserting piston in cylinder.  F001 003 036	A) 587 engine. B) 657 engine.
Centering tool 209 P / N 290 876 922  A001 001 087	To position coils on armature plate at assembly.  A001 004 003	All models.

SERVICE TOOL	PURPOSE	APPLICATION
Aligning tool 220 P / N 290 876 902  A000 001 006	To align cylinders by exhaust flanges at assembly.  F001 003 037	All models.
Stroboscopic timing light 225 P / N 295 000 078  A001 001 092	To verify ignition timing.  F001 007 080	All models.

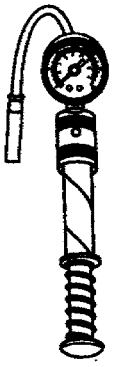
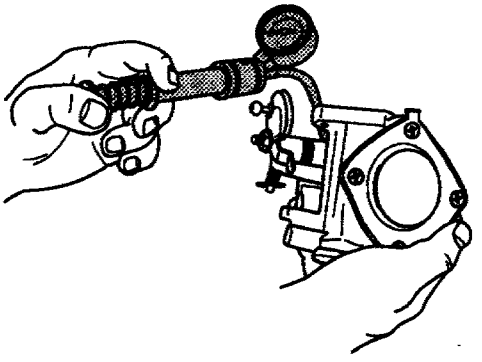
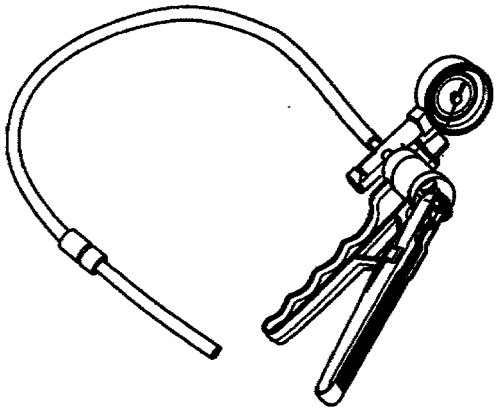
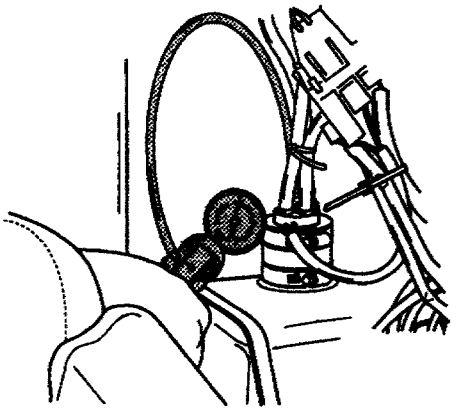
SERVICE TOOL	PURPOSE	APPLICATION
Dial indicator (TDC gauge) 230 P / N 295 000 065  A008 001 086	To find TDC position. For ignition timing and rotary valve timing. To check crankshaft alignment.  F001 003 182	All models.
Digital / induction type tachometer 237 P / N 295 000 100  F001 001 052	To verify engine RPM.	All models.

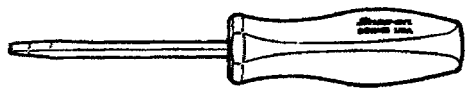
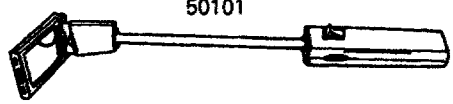
SERVICE TOOL	PURPOSE	APPLICATION
Digital multimeter 242 P / N 529 022 000  F001 001 060	To verify electrical system specifications.	All models.
Coupler hose 752 P / N 295 500 099  F001 004 036	To cool engine when watercraft is out of water. To clean cooling system.	All models.
Timing mark pointer 753 P / N 295 000 102  F001 007 127	Align mark on PTO flywheel with pointer to verify engine timing. F001 007 109	All models.

SERVICE TOOL	PURPOSE	APPLICATION
Engine lifting device Not sold by Bombardier Do it yourself Refer to *Shop Manual* section 03-02  F001 003 010	To lift engine out of watercraft.  F001 003 144	All models.
Feeler gauge 45° Not sold by Bombardier  F001 001 056	To measure rotary valve cover clearance.  F001 003 183	All models.
Spark tester Not sold by Bombardier Superex Canada Ltd No. 15-785  F001 001 063	To verify spark at spark plug cap outlet.	All models.

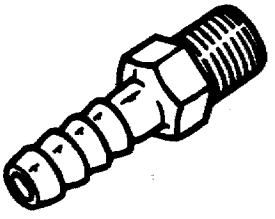
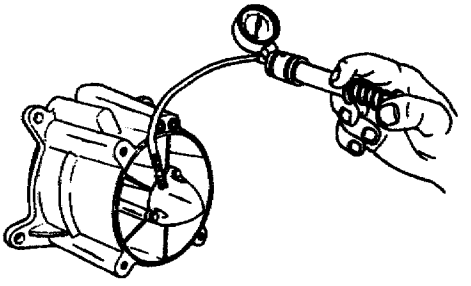
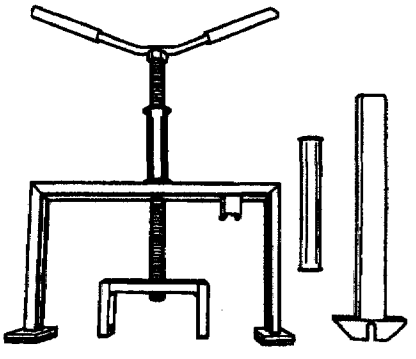
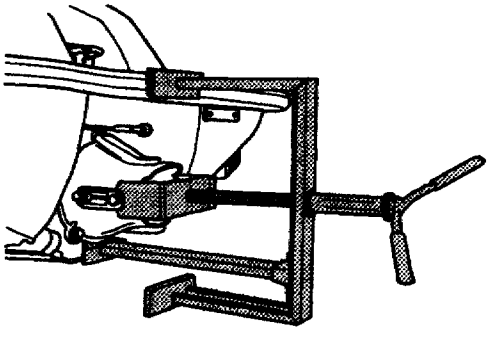
SERVICE TOOL	PURPOSE	APPLICATION
Terminal remover Not sold by Bombardier Snap-on TT600-4  F001 001 055	Remove connectors from housing in electrical circuit.	All models.
Slide hammer puller Not sold by Bombardier Snap-on : Handle CJ93-1 Hammer CJ125-6 Claws CJ93-4  NOTE : This tool is also used to pull out impeller shaft seal. F001 009 035	Pull out rotary valve shaft end bearing.  F001 003 080	All models.

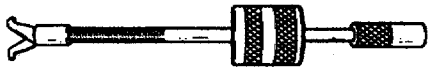
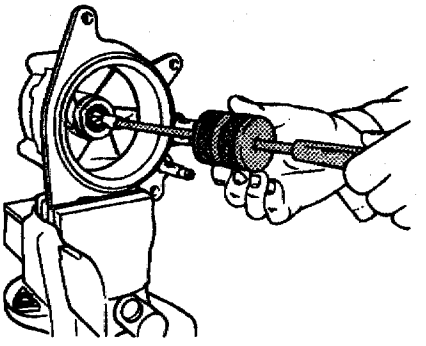
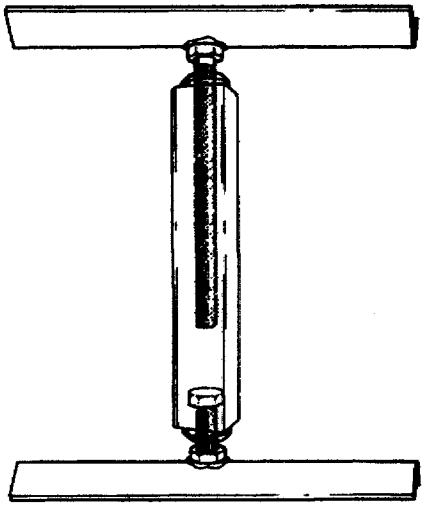
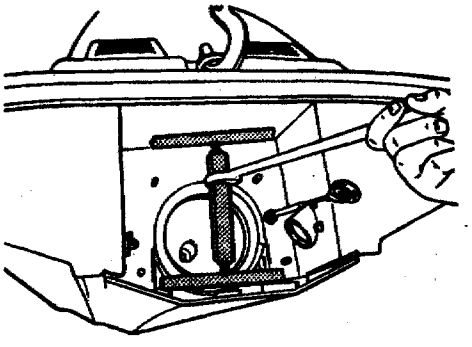
COOLING / FUEL / OIL SYSTEMS

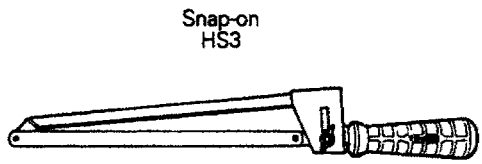
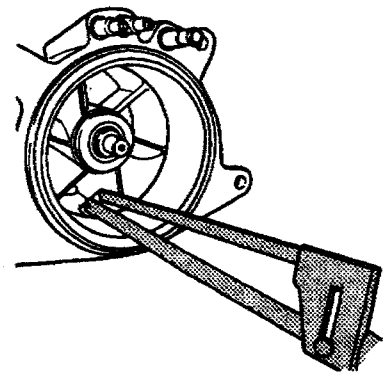
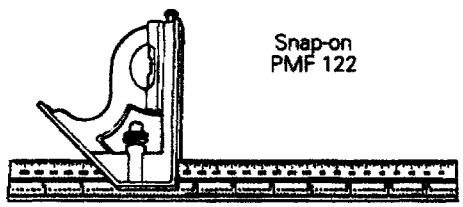
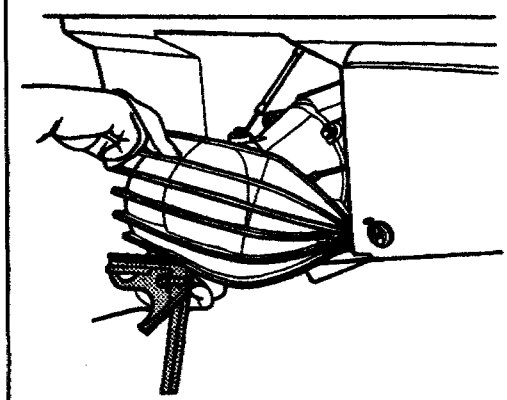
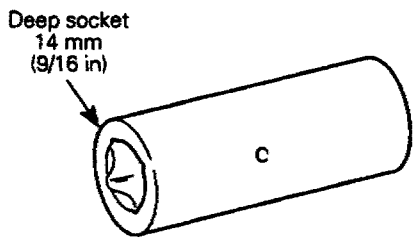
SERVICE TOOL	PURPOSE	APPLICATION
Pump gauge tester **826** P / N 295 000 114  F001 001 033	To verify release pressure and leak at carburetor.  F001 005 014	All models.
Pump gauge tester **827** P / N 295 000 085  F001 001 034	To make sure there is no leak by pressurizing the fuel system or oil system.  F001 005 018	All models.

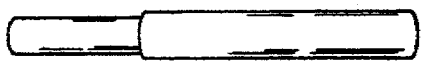
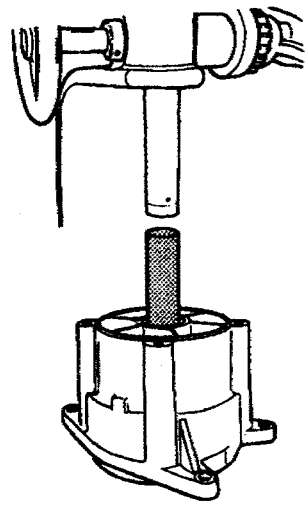
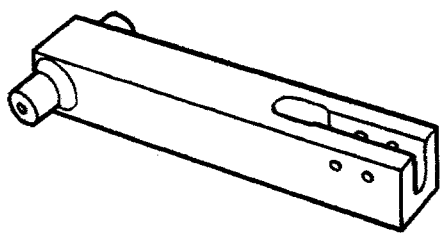
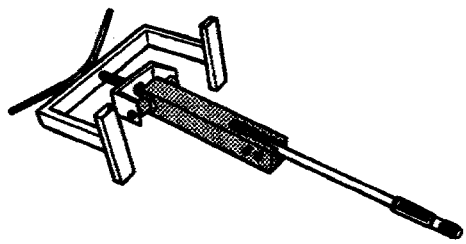
SERVICE TOOL	PURPOSE	APPLICATION
Screw driver Not sold by Bombardier Snap-on SDD-143  F001 001 061	To remove / install carburetor pilot jet and main jet.	All models.
Lighted adjustable mirror Not sold by Bombardier Snap-on 50101  F001 001 064	Oil injection pump adjustment.	All models.

PROPULSION SYSTEM

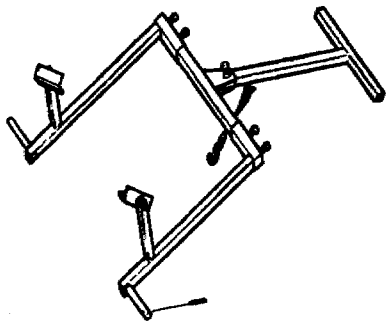
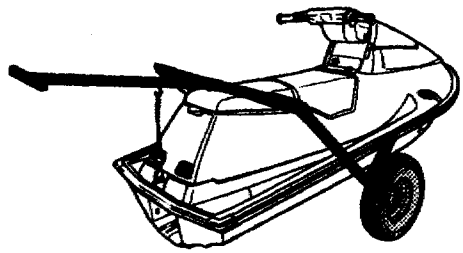
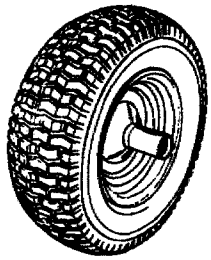
SERVICE TOOL	PURPOSE	APPLICATION
Fitting 828 P / N 295 000 086  F001 001 035	To pressurize pump assembly before installation, to verify if any leak. Use with pump gauge tester (P / N 295 000 114).  F001 009 090	All models.
Impeller housing remover 829 P / N 295 000 113  F001 011 086	To remove impeller housing.  F001 011 087	All models.

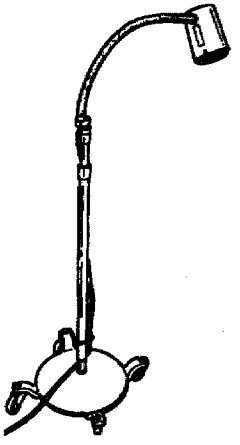
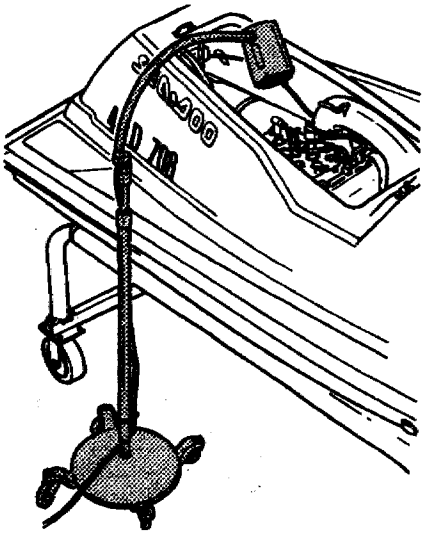
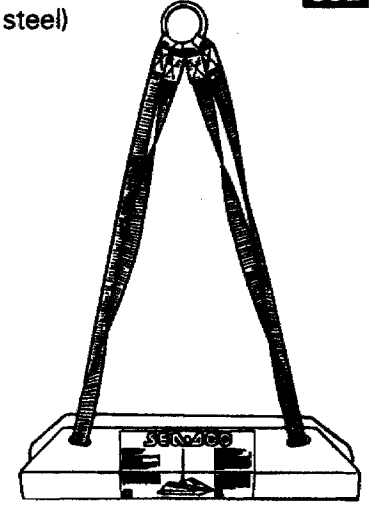
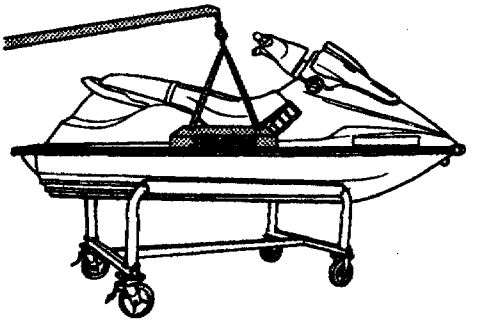
SERVICE TOOL	PURPOSE	APPLICATION
Slide hammer puller Not sold by Bombardier Snap-on : Handle CJ93-1 Hammer CJ125-6 Claws CJ93-4  NOTE : This tool is also used to remove rotary valve shaft bearing. F001 009 035	Pull out impeller shaft seal.  F001 009 036	All models.
Ride shoe remover Not sold by Bombardier Do it yourself Refer to *Shop Manual* section 08-01  F001 009 025	Remove ride shoe.  F001 009 026	All models.

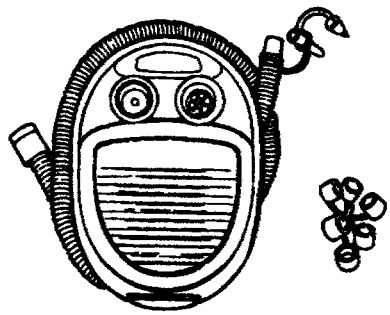
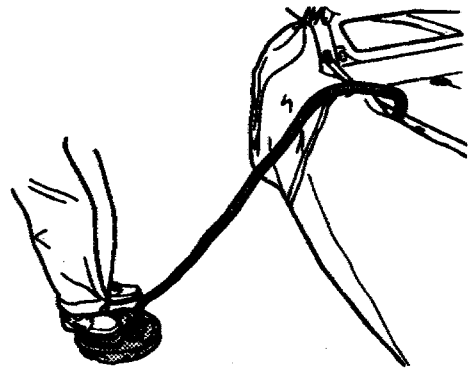
SERVICE TOOL	PURPOSE	APPLICATION
Hacksaw Not sold by Bombardier  F001 001 058	Cut wear ring.  F001 008 032	All models.
Machinist's square Not sold by Bombardier  F002 001 006	Adjust reverse gate.  F002 009 015	Models equipped with reverse.
Fitting remover Not sold by Bombardier Do it yourself Refer to *Shop Manual* 08-01 Deep socket 14 mm (9/16 in)  F001 009 099	Remove impeller housing fittings.	All models.

SERVICE TOOL	PURPOSE	APPLICATION
Bearing remover Not sold by Bombardier Do it yourself Refer to *Shop Manual* section 08-01  F001 009 037	Remove impeller housing bearings.  F001 009 038	All models.
Drive shaft puller Not sold by Bombardier Do it yourself Refer to *Shop Manual* section 08-01  F001 008 005	Remove drive shaft.  NOTE : Use with impeller housing remover (P / N 295 000 113). F001 008 006	All models.

WATERCRAFT HANDLING

SERVICE TOOL	PURPOSE	APPLICATION
Dolley (without wheels) 876 P / N 295 000 004  F001 001 001	To handle watercraft in shop or on beach.  F001 001 008	All models except Explorer.
Beach wheels 877 P / N 295 000 005  F001 001 007		

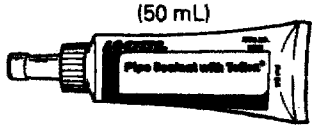
SERVICE TOOL	PURPOSE	APPLICATION
Shop lamp 878 P / N 295 000 081 ◆ **WARNING : Never use electric powered tools on watercraft unless first verifying no gasoline leaks / fumes are present.**  F001 001 021	To facilitate repair when working inside the hull.  F001 001 030	All models.
Lift kit A) P / N 298 760 040 879 B) P / N 298 776 040 880 C) P / N 298 780 090 (nickel-plated) 881 D) P / N 298 790 040 (stainless steel) 882  F001 001 059	To handle watercraft in shop.  F001 009 148	A) SP / XP series. B) GTS / GTX models. C) Explorer model. D) Explorer model.

SERVICE TOOL	PURPOSE	APPLICATION
Foot pump kit 883 P / N 204 000 047  F003 015 001	To inflate tube.  F003 011 034	Explorer model.
Tie-down 884 1.50 m (5 ft) long P / N 298 752 040	To tie watercraft to both bow and stern eyelets so that it is firmly retained on the trailer.	All models.
Tie-down with ratchet 885 3.60 m (12 ft) long P / N 298 753 040	To tie watercraft to both bow and stern eyelets so that it is firmly retained on the trailer.	All models.

SERVICE PRODUCTS

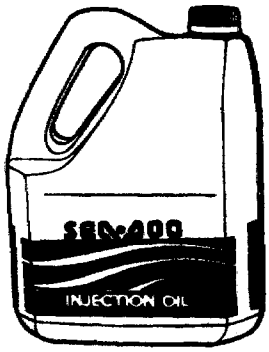
SERVICE PRODUCT	PURPOSE	APPLICATION
Removable threadlocker 154 P / N 293 800 015 Loctite 242 (blue) (10 mL)  A000 001 110	A medium-strength adhesive for threadlocking and threadsealing. Vibration-proof nuts, bolts and screws.	Cylinder head cover screws (587 engine). Exhaust manifold studs and screws. Engine rubber mount screws. Armature plate screws. Magneto flywheel / crankshaft. Carburetor mount nuts / screws. Magneto coil screws. Impeller housing cover screws. Venturi / impeller housing screws. Grill screws. Engine support screws. Impeller housing / hull nuts. Steering nozzle screws. Reverse gate screws.
High strength threadlocker 155 P / N 293 800 005 Loctite 271 (red) (10 mL)  A000 001 102	Hi-strength threadlocking thread-sealing adhesive. NOTE : Apply heat to ease disassembly.	Starter screws / engine. Impeller shaft thread. Steering stem / stem arm screw (GTS / GTX).
High temperature threadlocker 359 P / N 290 899 788 Loctite 648 (green) (5 g)  A000 001 121	Hi-strength threadlocking thread-sealing adhesive that resists high temperature.	Crankcase / plug at end of rotary valve shaft. Ring gear / MAG flywheel.

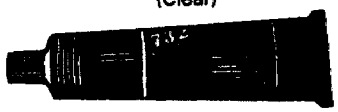
SERVICE PRODUCT	PURPOSE	APPLICATION
Paste gasket **152** P / N 293 800 007  Loctite 515 (50 mL) A000 001 101	Makes, dresses and repairs gaskets.	Cylinder sleeve / O-ring groove. Crankcase halves mating surface. Impeller housing cover. Impeller shaft seal. Venturi / impeller housing. Seal carrier. Crankcase screws.
Solvent **157** P / N 293 800 019 Loctite Safety Solvent 755  A000 001 130	Clean and prepare surface before assembly.	Impeller shaft threads. Drive shaft splines. Impeller threads and splines.
Primer for paste gasket **158** P / N 293 600 012 Loctite Locquic Primer N (4 oz)  A000 001 077	General purpose primer. Primer N assures fixturing of parts in 15-30 minutes and full cure in 12 hours or less.	Crankcase halves mating surface. Impeller shaft thread. Venturi / impeller housing mating surface.

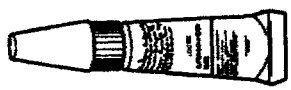
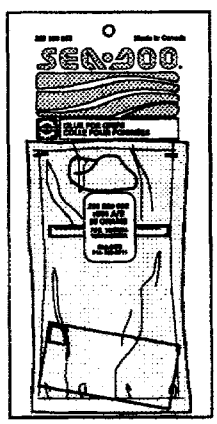
SERVICE PRODUCT	PURPOSE	APPLICATION
Gasket stripper 935 P / N 295 500 110  F001 001 088	Remove old paper gaskets.	Clean mating surfaces of cylinders and crankcase. Cylinders / crankcase mating surface.
Pipe sealant 358 P / N 293 800 018 Loctite 592 (50 mL)  A000 001 104	To seal pipe fittings. Prevents leakage and vibrational loosening.	Plug on impeller housing cover. Plastic fitting (tool P / N 295 000 086) on impeller housing cover. Engine drain plugs. Cooling system fittings.
Heat resistant sealant 374 P / N 413 709 200 Dow Corning 736  A000 001 138	To seal exhaust system.	XP model.

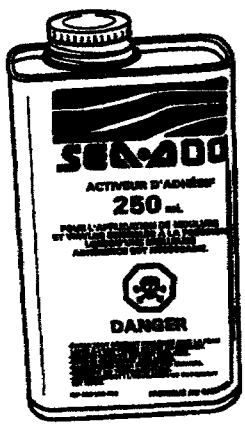
SERVICE PRODUCT	PURPOSE	APPLICATION
Dielectric grease 350 P / N 293 550 004 Dow Corning  F001 001 042	Prevents moisture and corrosion build-up in electric connections.	Battery posts and cable connectors. Thermosensor connector.
Grease 924 P / N 293 550 005 (400 g)  A000 001 093	Lubricates.	Seal carrier. PTO flywheel.
Synthetic grease 912 P / N 293 550 010  Sea-Doo (400 g) F001 001 041	Lubricates and provides great wear protection and water resistance.	Under the head of cylinder and cylinder head screws. Carburetor linkage. Impeller shaft seal lips. Both sides of impeller shaft thrust washer. Drive shaft / impeller splines. Seal carrier. PTO flywheel.
Lubricant Not sold by Bombardier G.E. Versilube G341M  or Esso Beacon 325 A000 001 065	Provides excellent lubrication over long interval of no maintenance.	Sliding surface of starter armature shaft splines.

SERVICE PRODUCT	PURPOSE	APPLICATION
Anti-seize lubricant 362 P / N 293 800 023  Loctite anti-seize lubricant 12 oz (454g) F001 001 043	Protects moving and stationary parts against high temperature seizing. Prevents rust and corrosion on parts exposed to high heat.	Crankshaft thread / PTO flywheel. Crankshaft bearing seat. Spark plug thread. Drive shaft splines. Ignition housing / crankcase screws.
Penetrating lubricant 913 P / N 293 600 006  Sea-Doo Lube F001 001 028	Prevents corrosion and sticking. Protects metallic parts.	Throttle cable. Wear ring (when new). Corroded parts. Water flooded engine. Storage.
Sea-Doo fuel stabilizer 375 P / N 413 408 600  A000 001 139	Prevents fuel deterioration during storage.	Fuel system.

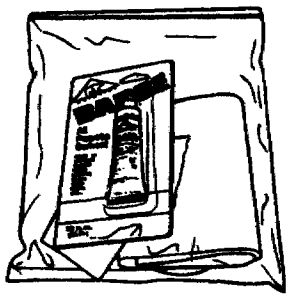
SERVICE PRODUCT	PURPOSE	APPLICATION
Injection oil 915 1 liter P / N 293 600 005  F001 001 044	Lubricates engine.	All models.
4 liters P / N 293 600 004 916  F001 001 044		

SERVICE PRODUCT	PURPOSE	APPLICATION
Jet pump oil 914 P / N 293 600 011  F001 001 025	All synthetic formula. Lubricate jet pump.	All models.
A) Silicone "Ultra Black" 901 P / N 293 800 030 B) Silicone "Ultra Black HB" 902 P / N 293 800 028  (300 mL) F001 001 046	Seal fiberglass and metal parts. A) Curing time : 6 hours. B) Curing time : 1 hour.	Ride shoe and pump.
732 Multi-purpose sealant 917 P / N 293 800 006 Dow Corning (Clear)  F001 001 048	To seal joints.	Ride shoe screws. Sponson.
Primer 918 P / N 293 530 012  F001 001 050	Clean and prepare surface for application of sealant (P / N 293 530 011).	Water tank trap / body surface (GTS / GTX models). Rear baffle / body surface (GTS / GTX models).

SERVICE PRODUCT	PURPOSE	APPLICATION
Sealant 919 P / N 293 530 011 Sikaflex Sealant 221  F001 001 049	Seal fiberglass and plastic parts. For best result use primer (P / N 293 530 012).	Water tank trap / body surface (GTS / GTX models). Rear baffle / body surface (GTS / GTX models).
Sealant adhesive 934 P / N 293 800 033 (Clear)  F001 001 064	To seal joints.	Ride shoe screws. Sponson. Rear storage compartment (Explorer).
General purpose instant adhesive 373 P / N 293 800 021 Loctite 495  A000 001 103	General purpose instant adhesive to bond rubber, metal, plastics and vinyl. Intended for use on close fitting parts with gaps not exceeding 0.08 mm (0.003 in).	Rubber to metal bonding and most hard plastic.
Epoxy glue 933 P / N 293 530 032  F001 001 070	Bonds glass to plastic and rubber to metal.	Mirrors.

SERVICE PRODUCT	PURPOSE	APPLICATION
Barge glue 943 P / N 204 000 045  (10 mL) F003 015 006	To repair inflatable tube minor punctures or to replace a broken handle.	Explorer model.
Adhesive activator 931 P / N 293 530 036  F001 001 671	For applying pressure sensitive molding and vinyls when better bonding is needed.	Decals.

SERVICE PRODUCT	PURPOSE	APPLICATION
Gelcoat spray paint A) White 921 P / N 293 500 041 B) Green 939 P / N 293 500 062 C) Teal 940 P / N 293 500 063  Sea-Doo paint F001 001 026	For small repairs of body and hull.	A) All models. B) XP model. C) SPX model.
SMC spray paint A) Teal 941 P / N 293 500 068 B) Green 942 P / N 293 500 074  Sea-Doo paint F001 001 026	For small repairs of storage cover.	A) GTS model. B) GTX model.

SERVICE PRODUCT	PURPOSE	APPLICATION
Spray paint for metallic parts only A) White 926 P / N 293 500 029 B) Charcoal 927 P / N 293 500 030 C) Purple 930 P / N 293 500 020  Sea-Doo paint F001 001 028	Protection of metallic parts.	A) Engine assembly. All models. B) Tuned pipe and muffler. SP, SPI, SPX and GTS models. C) Tuned pipe and muffler. GTX and XP models.
Vinyl protectant Not sold by Bombardier	Clean and protect vinyl.	Seat.
Gun Kote Not sold by Bombardier Kal-Gard Coating & Mfg. Corp.	To prevent corrosion.	Magneto flywheel and ring gear.
Tube Repair kit 923 P / N 204 000 046  F003 015 002	To repair inflatable tube minor punctures.	Explorer model.

SERVICE PRODUCT	PURPOSE	APPLICATION
Epoxy glue Not sold by Bombardier 3M-05900	Bonds knurled surface of aluminum hull insert.	All models.
Gelcoat kit 904 P / N 295 500 100  Sea-Doo Gelcote Repair kit F001 001 027	Gelcoat repair to body and hull.	All models.
Gelcoat paste (white) 905 P / N 293 500 016  F001 001 051	Gelcoat repair to body and hull.	All models.
Gelcoat (liquid) A) 1 liter white 906 P / N 293 500 033 B) 1 liter green 910 P / N 293 500 038 C) 1 liter teal 938 P / N 293 500 069	Gelcoat repair to body and hull.	A) All models. B) XP model. C) SPX model.

PERIODIC INSPECTION CHART

NOTE : Servicing period is given in hours. Shade area shows the maintenance frequency.

DESCRIPTION	FREQUENCY			
	Every 10 hours	Every 25 hours	Every 50 hours	Every 100 hours or seasonally
Lubrication / corrosion protection of metallic components	①			
Engine ignition timing				
Spark plug replacement				
Throttle / choke cables, inspection / lubrication	①			
Flame arrester inspection				
Carburetor adjustment including choke / throttle cable adjustments and linkage				
Oil injection pump adjustment				
Fuel filter and oil filter inspection				
Fuel filter and oil filter replacement				
Engine head screws, retorque				
Steering system				
Reverse system / reverse cable adjustment (GTS, GTX and Explorer)				
Variable trim system (XP)				
Fastener tightening (flame arrester mount screws, carburetor mount nuts or screws, engine mount screws, exhaust system, etc).				
Muffler, battery and reservoirs fastening devices				
Fuel / oil lines, check valve and hose inspection, fuel system pressurization				
Fuel vent line pressure relief valve inspection				
Inspect / clean engine drain hose	①			
Bilge system / water tank trap drain inspection (GTS / GTX)				
Battery condition				
Battery and starter cables				
Engine overheating beeper / electrical connections				
Impeller shaft reservoir oil level / oil condition				Replace
Impeller condition and impeller / wear ring clearance		②		
Drive shaft boot / splines condition (both ends)		②		
PTO flywheel lubrication				
Seal carrier lubrication				
Water intake grill condition		②		
Hull condition				
Cooling system flushing ③				
Inflatable tube condition (Explorer)				④
Zinc anode (Explorer)				
Air blower inspection (Explorer)				

① Every 10 hours in salt water use.
② These items have to be initially checked after 25 hours. Thereafter, servicing to be made as specified in this chart.
③ Daily flushing in salt water or foul water use.
④ Inflatable tube should be removed and cleaned. Also verify tube attachment condition.

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.**

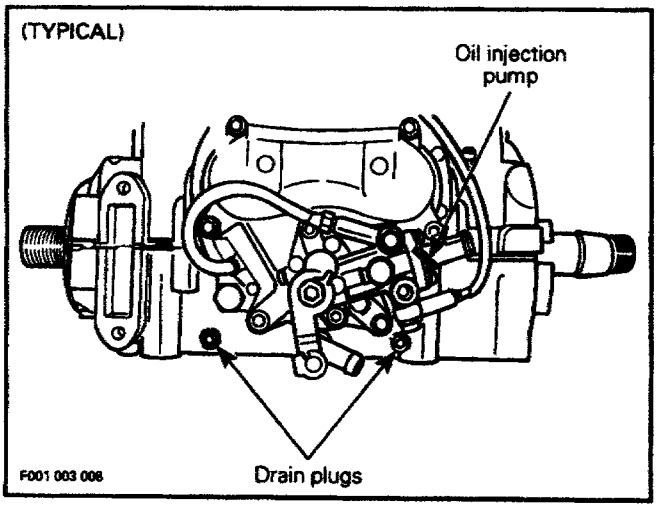
Procedure

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.

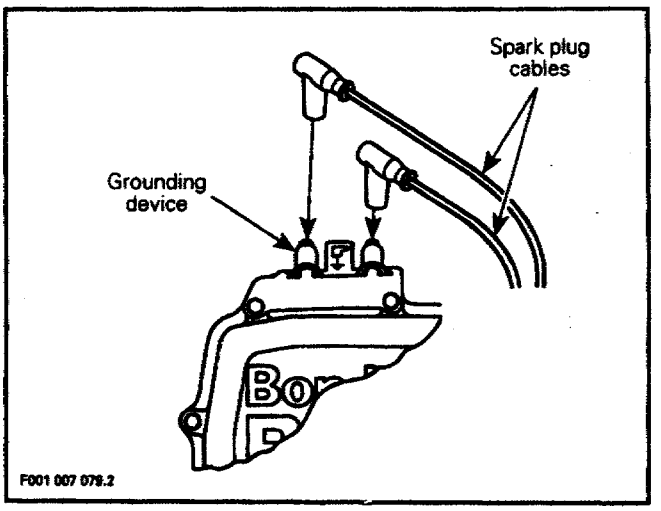
Drain bilge if water is present.

Remove engine crankcase drain plugs located underneath oil injection pump.



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

◆**WARNING : Never crank engine with spark plugs removed unless spark plug cables are connected to the grounding device.**



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

Crank engine to drain crankcase.

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

Reinstall crankcase drain plugs.

▼**CAUTION : Crankcase drain plugs must have Loctite PST 592 (P / N 293 800 018) applied to threads before reinstalling.**

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

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

Crank engine again.

Reinstall spark plugs and spark plug cables then safety lanyard 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.

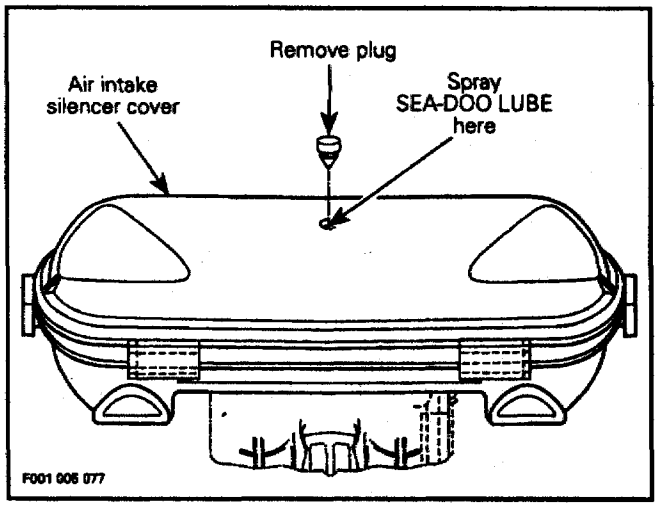
▼CAUTION : To avoid starting motor overheating, the cranking period should not exceed 5-10 seconds and a rest period of 30 seconds should be observed between cranking cycles. Never depress the starting button when the engine is running.

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

Refer to CDI AND CHARGING SYSTEMS 07-06 then refer to **ignition system testing procedure.**

Check crankshaft if needed, it can become misaligned or deflected. Refer to BOTTOM END 03-05 then refer to **crankshaft alignment.**

After engine has started, spray SEA-DOO Lube lubricant through air intake silencer while engine is running.

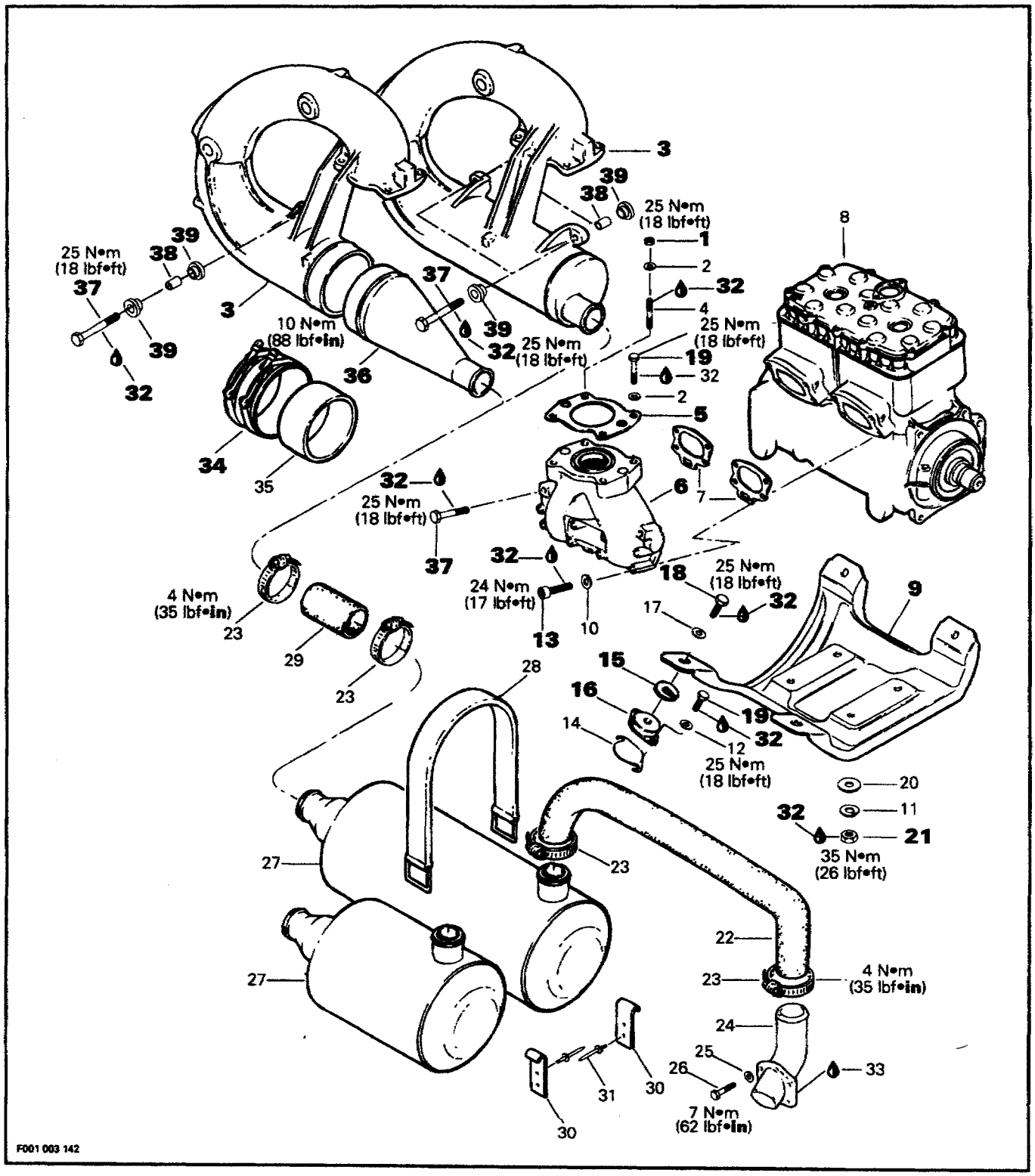


Run engine until it reaches its normal operating temperature.

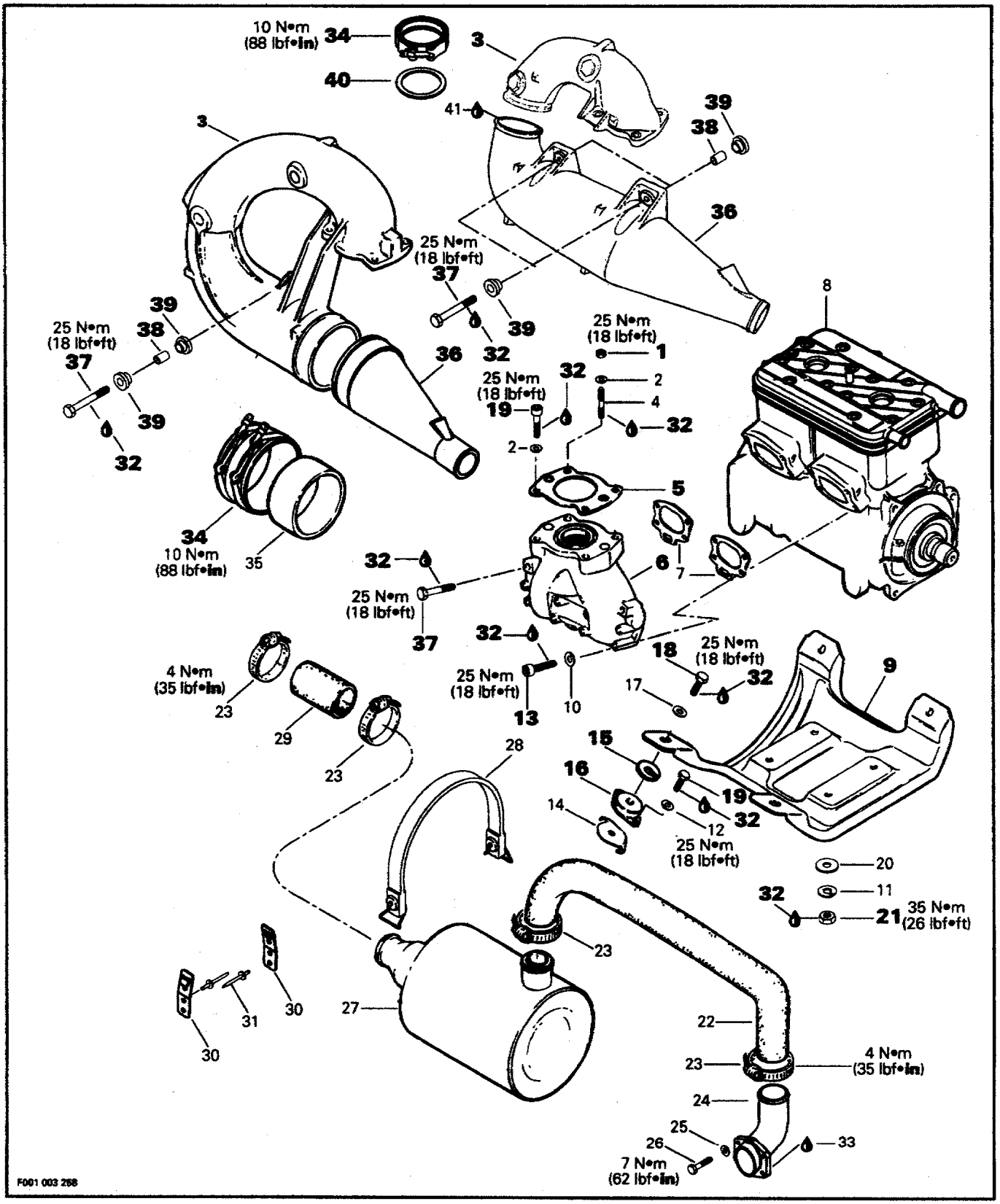
▼CAUTION : Water must be supplied to cool engine with coupler hose (P / N 295 500 099).

REMOVAL AND INSTALLATION

587 ENGINE



657 ENGINES



COMPONENTS

1. *Hexagonal nut M8*
2. *Lock washer 8 mm*
3. *Tuned pipe*
4. *Stud M8 x 26*
5. *Gasket*
6. *Exhaust manifold*
7. *Gasket*
8. *Rotax engine*
9. *Engine support*
10. *Lock washer 8 mm*
11. *Lock washer*
12. *Lock washer 8 mm*
13. *Allen screw M8 x 75*
14. *Shim*
15. *Shim*
16. *Rubber mount*
17. *Flat washer 8 mm*
18. *Hexagonal screw M8 x 20*
19. *Hexagonal screw M8 x 30*
20. *Flat washer 10 mm*
21. *Lock nut M10*
22. *Formed hose*
23. *Gear clamp*
24. *Exhaust outlet*
25. *Flat washer 6 mm*
26. *Allen screw M6 x 20*
27. *Muffler*
28. *Muffler strap*
29. *Exhaust hose*
30. *Strap clip*
31. *Rivet 3/16*
32. *Loctite 242 (blue)*
33. *Sealant Loctite 598 "Ultra Black"*
34. *Exhaust collar*
35. *Rubber strip*
36. *Tuned pipe cone*
37. *Hexagonal screw M8 x 35*
38. *Sleeve*
39. *Rubber bushing*
40. *Sealing ring*
41. *Heat resistant sealant (736)*

GENERAL

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

REMOVAL FROM WATERCRAFT

In order to remove engine from watercraft proceed as follows.

▼ **CAUTION : Whenever removing engine from watercraft, engine / jet pump alignment must be performed.**

Jet Pump Removal

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

Electrical Connections

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

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

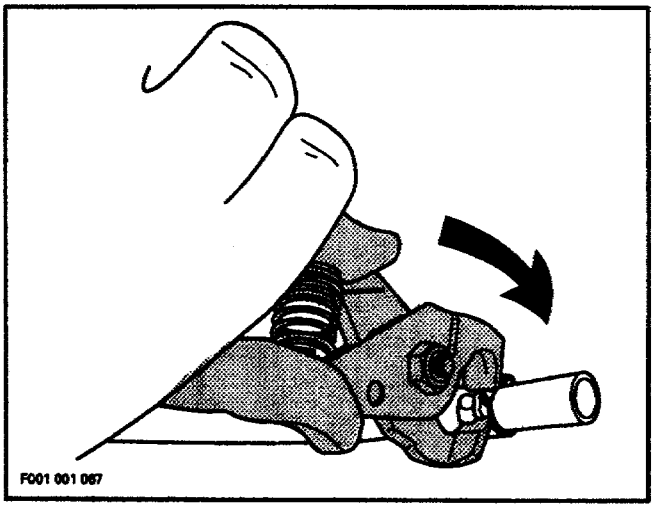
Remove battery holding straps then withdraw battery. Disconnect thermosensor wire and spark plug cables. Connect spark plug cables on grounding device.

Pull out electrical box from its support ; then, open cover and disconnect wires coming from magneto housing.

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

Tuned Pipe Removal

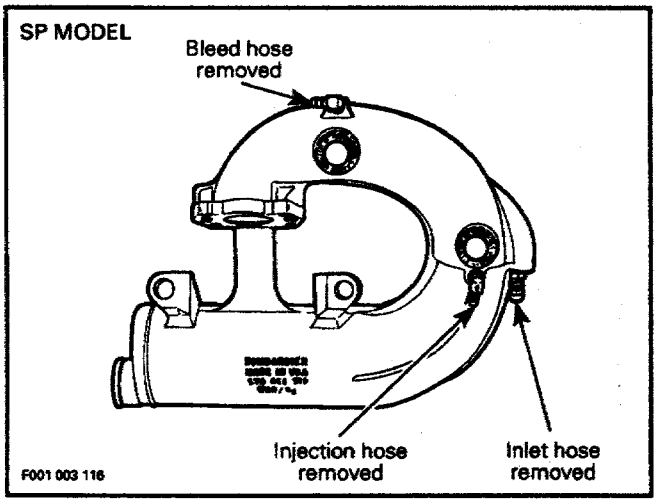
○ **NOTE :** To release a clamp from cooling hose / fuel line, use pliers (P / N 295 000 054).



○ **NOTE :** For SP / XP series, remove air vent tube support from body opening.

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

Cut tie rap retaining black negative cable to water injection hose.



Disconnect muffler from tuned pipe.

All Models Except SP Model

Remove exhaust collar on tuned pipe.

Remove cone (except XP).

All Models

NOTE : On the SP and XP models, the tuned pipe is held on exhaust manifold side by two screws. Other models have only one screw.

Remove tuned pipe retaining screw(s) from exhaust manifold side.

Remove tuned pipe mounting screws and nut from top of exhaust manifold.

NOTE : Slightly lift tuned pipe to release nut as necessary.

All Models Except XP Model

Withdraw tuned pipe in a forward and rotating movement.

XP Model Only

Remove tuned pipe head.

Withdraw tuned pipe cone from backward.

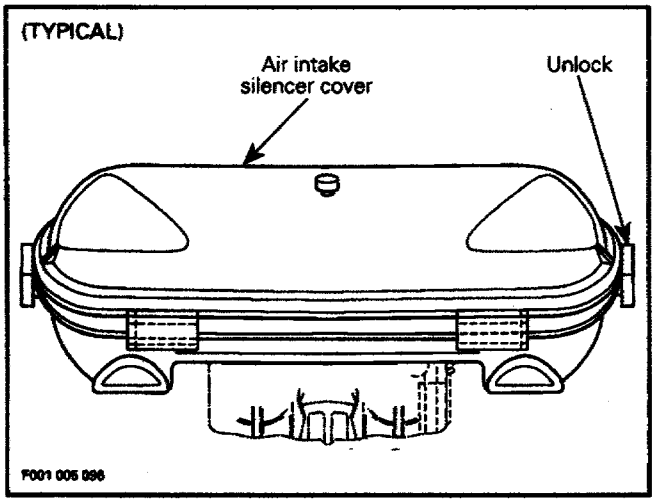
All Models

Disconnect drain hose on exhaust manifold fitting.

Remove exhaust manifold.

Air Intake Silencer Removal

Unlock retaining slides holding air intake silencer cover and remove cover.



Remove flame arrester retainer screws ; then, remove air intake silencer base.

Flame Arrester Base Removal

Remove screws holding flame arrester base support to the cylinder head cover.

Remove flame arrester.

Remove screws from flame arrester base then withdraw base.

Fuel System

Turn fuel valve to OFF position.

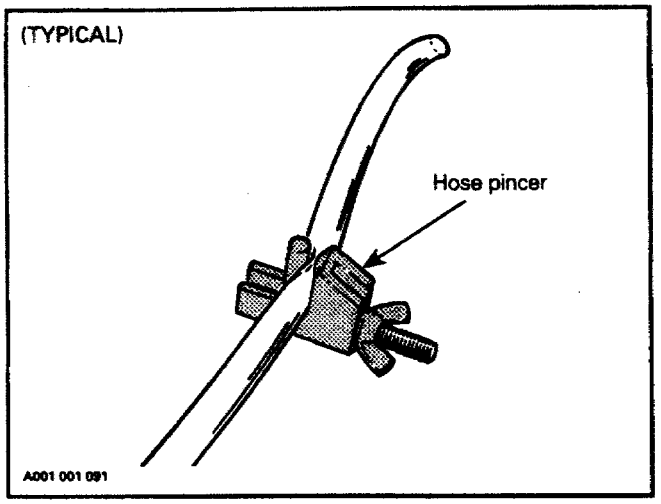
Disconnect fuel supply line from carburetor.

Disconnect fuel return line from carburetor.

Disconnect throttle and choke cables from carburetor.

Oil System

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

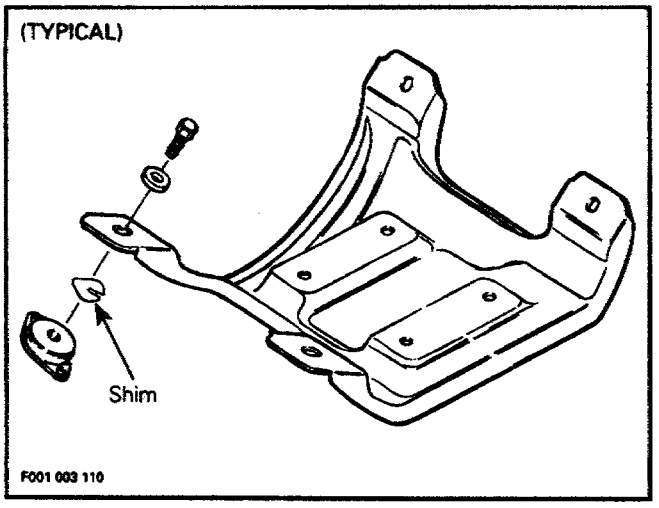


Install hose pincher on oil pump supply line then disconnect hose.

Engine Support Mounts

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. To ease engine / jet pump alignment, indicate shim location for reinstallation.

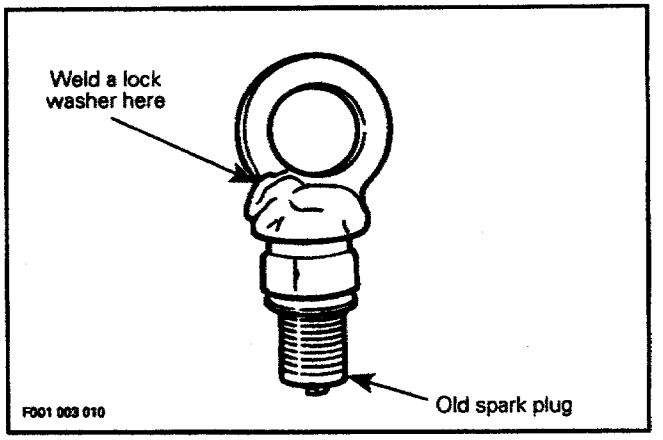


Lifting Engine

Engine can be easily lifted using the following suggested tools.

— Cut porcelain from two old spark plugs.

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



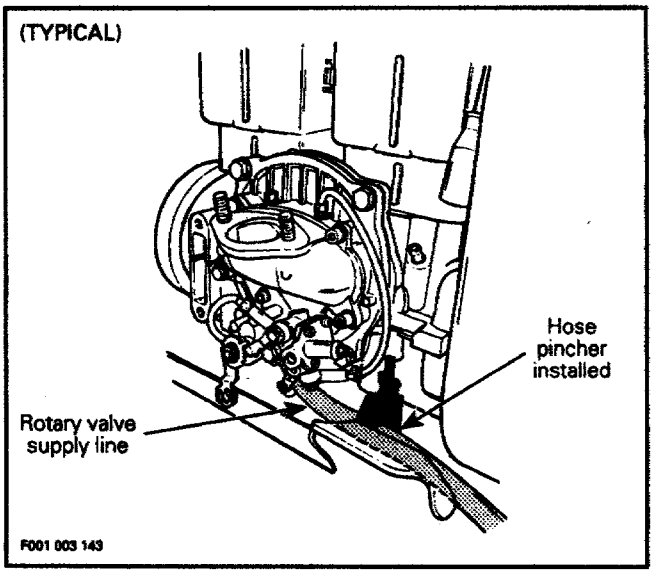
Remove spark plugs and replace by special tools.

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

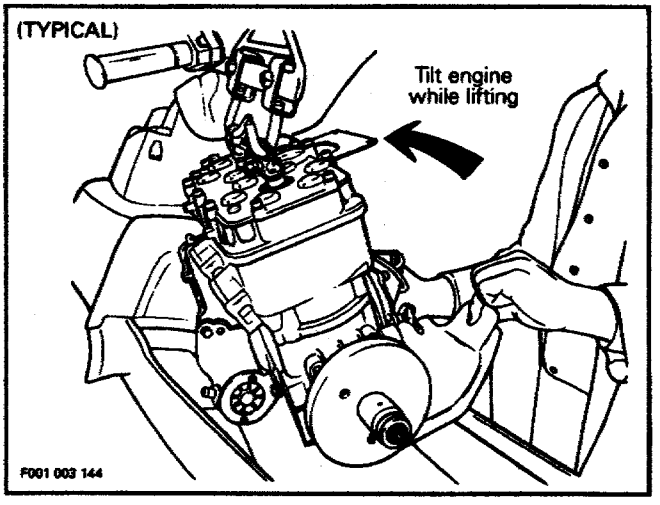
Lift it until rotary valve supply line is reachable. Install a hose pincher on the line, then disconnect.

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

Disconnect red positive cable from starter post.



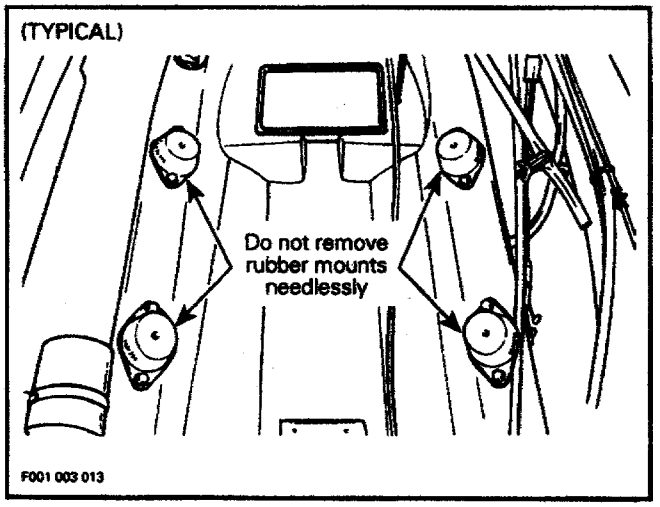
Carry on engine lifting until engine support reaches body opening then tilt engine so that it can be removed from the watercraft.



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 misaligned.

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.

16,19, Rubber Mount and Screw

Check tightness and condition of rubber mounts. If they have been removed, apply Loctite 242 (blue) 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) on threads then torque nuts in a criss-cross sequence to 35 N•m (26 lbf•ft).

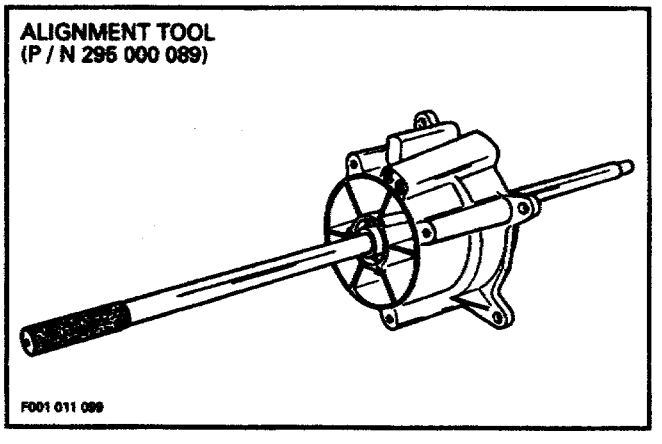
Rotary Valve Supply Line

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

NOTE : If fuel line ends are damaged, cut damaged ends before reinstallation. For fuel line clamping, use special pliers (P / N 295 000 054).

Engine / Jet Pump Alignment

Alignment is necessary to eliminate possible vibration and / or damage to components. Check alignment of engine using alignment tool.

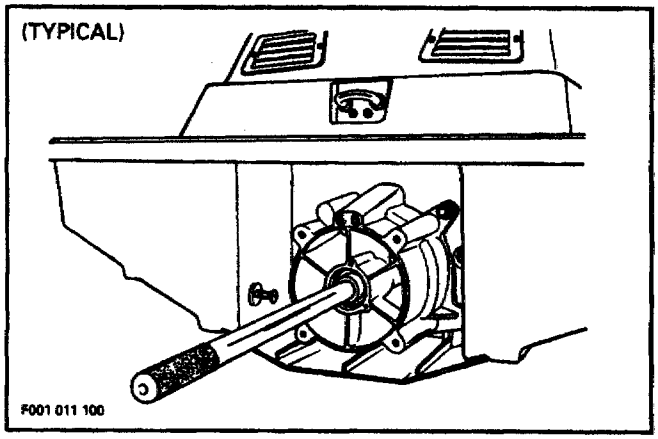


▼CAUTION : Some watercraft require a shim between hull and pump ; if shim has been removed at time of pump disassembly, ensure to reinstall it. If not reinstall, engine and jet pump alignment will be altered.

To verify alignment proceed as follows :

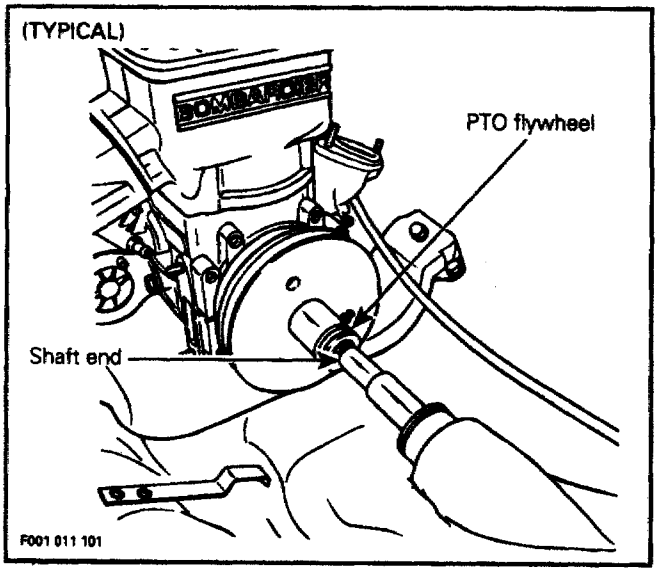
— Install housing on hull with four nuts.

— Carefully slide shaft through housing and seal carrier. Pay attention not to hit PTO flywheel.



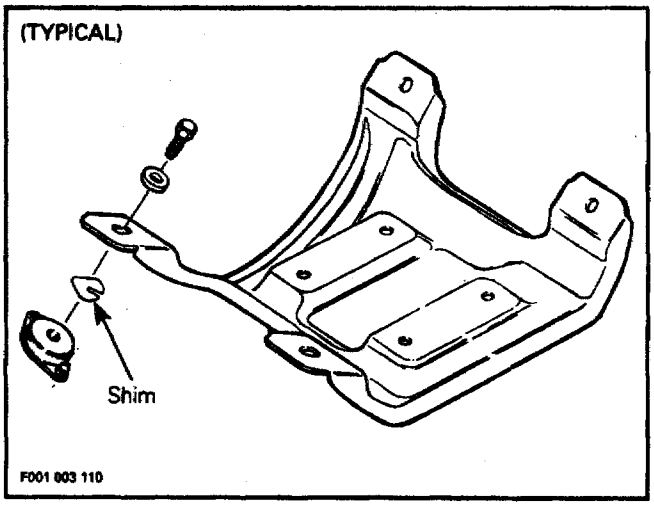
— Insert shaft end into PTO flywheel.

○ NOTE : If the alignment is correct, the shaft will slide easily without any deflection in PTO flywheel splines.



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) or (P / N 270 000 025) as necessary between engine support and rubber mounts to correct alignment.



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

18,32, Screw and Loctite 242 (Blue)

Apply Loctite 242 (blue) on screw threads.

Retorque engine support screws to 25 N•m (18 lbf•ft) when procedure is completed.

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

Electrical Connections

Install red positive cable on starter post and torque nut to 6 N•m (53 lbf•**in**).

Apply dielectric grease on connector then cover with boot.

○ NOTE : Secure black negative cable with a tie rap to water injection hose at tuned pipe.

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

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

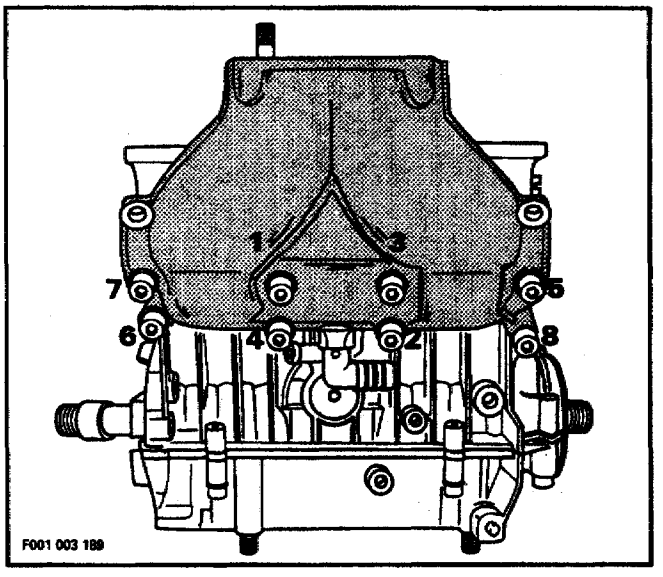
Install compression grommet and cap. It is strongly recommended to use a flare nut wrench to properly tighten cap.

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

6,13, Exhaust Manifold, Screw

Apply Loctite 242 (blue) on screw threads.

Install and torque screws to 24 N•m (17 lbf•ft) as per following illustrated sequence.



1,3,5,37,38,39, Nut, Tuned Pipe, Gasket, Screw, Sleeve and Rubber Bushing

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

Ensure rubber bushings and sleeve are not damaged and are properly installed into tune pipe support(s).

▼CAUTION : Damage to bushings and / or sleeve will eventually cause stress to tune pipe and may cause cracking.

Apply Loctite 242 (blue) on stud and retaining screw threads. Hand-tighten nut and top screws only and assure that tuned pipe bushing(s) rests against manifold.

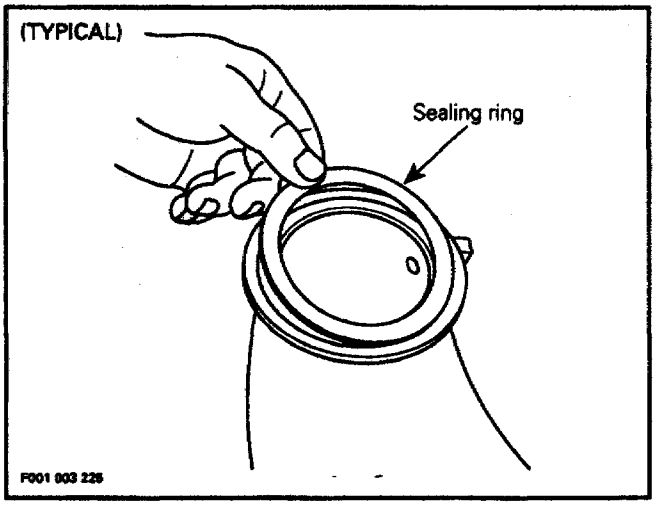
Pre-torque nut and top screws in a criss-cross sequence to about 20 N•m (15 lbf•ft).

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

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

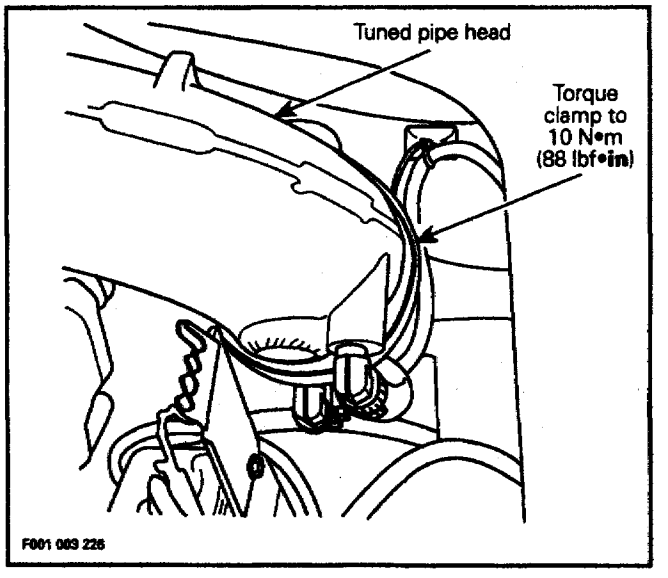
40, Sealing Ring (XP Model Only)

Make sure to install sealing ring on tuned pipe cone.



Apply a thin layer of heat resistant sealant (P / N 413 7092 00) all around sealing ring.

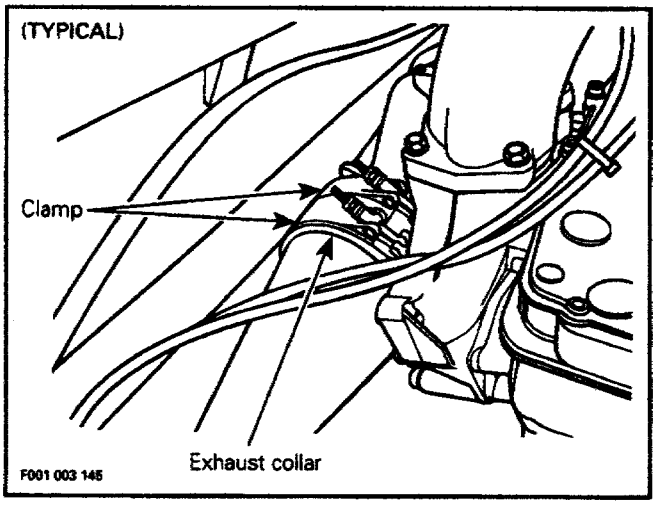
Torque clamp to 10 N•m (88 lbf•**in**).



All Models Except SP and XP

34,36, Exhaust Cone and Exhaust Collar

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



With hose removed, align cone outlet with muffler inlet.

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

Push cone until it touches tuned pipe, then tighten exhaust collar clamp and torque to 10 N•m (88 lbf•**in**).

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

NOTE : Exhaust collar clamp nuts should be tighten alternatively to assure no leakage and to obtain specified torque.

All Models

Final Inspection

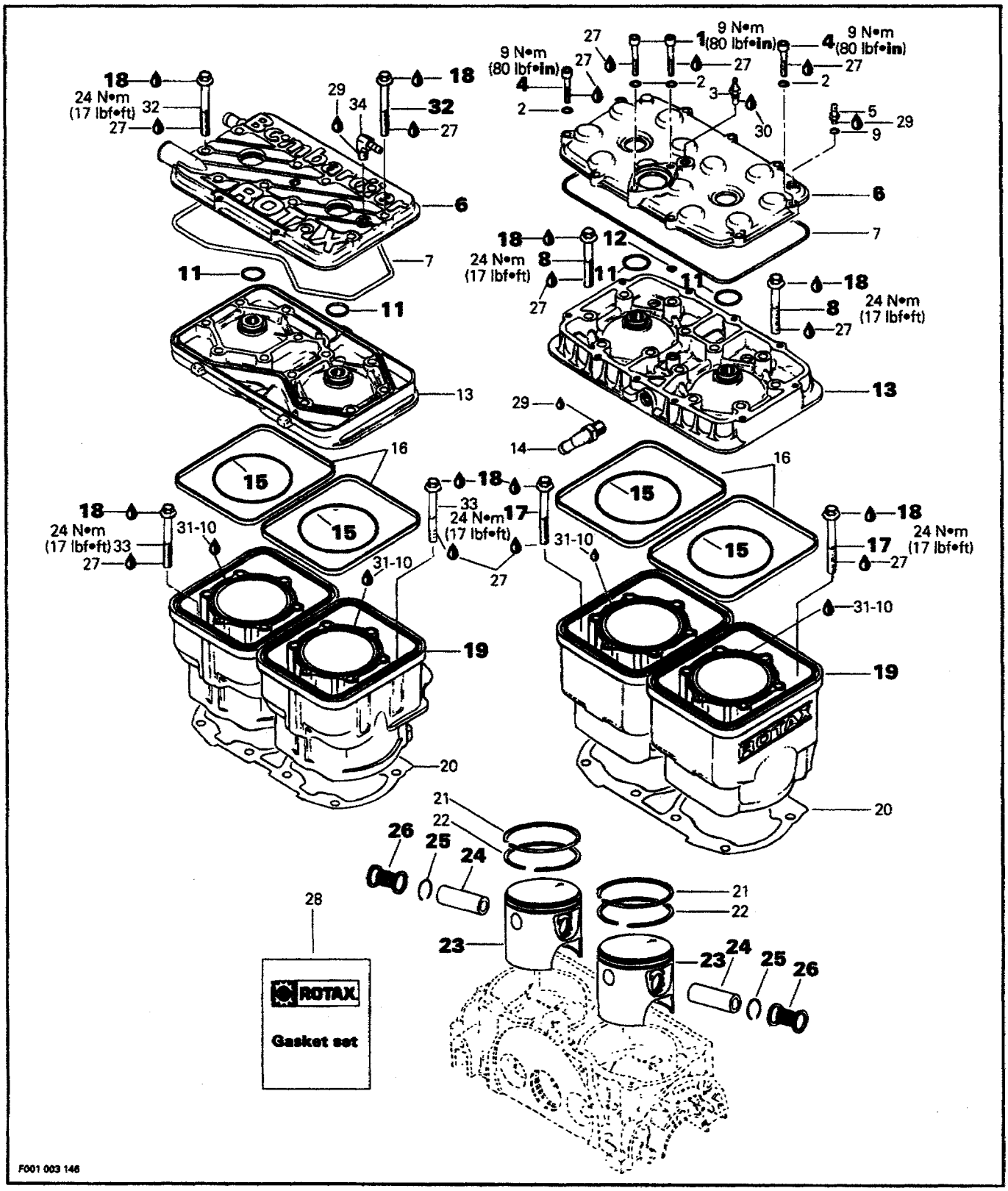
Check throttle cable condition and lubricate cable with SEA-DOO LUBE lubricant. After its installation, properly adjust and bleed oil injection pump as specified in OIL SYSTEM, 06-02.

Pressure test fuel system, refer to FUEL SYSTEM 05-03 and look for **fuel system pressurization.** Secure vent line to the battery. Ensure vent line 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 coupler hose (P / N 295 500 099).

TOP END



COMPONENTS

1. *Allen screw M6 x 35*
2. *Lock washer*
3. *Sensor switch*
4. *Allen screw M6 x 25*
5. *Hose nipple*
6. *Cylinder head cover*
7. *O-ring*
8. *Hexagonal screw M8 x 55*
9. *Sealing ring*
10. *Loctite 515*
11. *O-ring*
12. *O-ring*
13. *Cylinder head*
14. *Hose nipple*
15. *O-ring*
16. *O-ring*
17. *Hexagonal screw M8 x 70*
18. *Synthetic grease*
19. *Cylinder with sleeve*
20. *Cylinder gasket*
21. *Semi-trapeze ring*
22. *Rectangular ring*
23. *Piston*
24. *Piston pin*
25. *Circlip*
26. *Needle bearing*
27. *Loctite 242 (blue)*
28. *Gasket set*
29. *Loctite PST 592*
30. *Loctite 515*
31. *Loctite primer N*
32. *Hexagonal screw*
33. *Hexagonal screw*
34. *Elbow fitting*

ENGINE DESCRIPTION

— 587 Engine

— 657 Engine

— 657 X Engine

The 2-stroke ROTAX engine rotates counterclockwise seen from the rear (PTO flywheel). It has a rotary valve to control fuel mixture intake. Lubrication is provided by a variable oil injection pump. It is cooled by water supplied from the jet pump. It has a NIPPONDENSO Capacitor Discharge Ignition System. The fuel is provided by diaphragm MIKUNI carburetor having an integrated fuel pump.

▼ **CAUTION : No engine components can be interchanged between engines.**

GENERAL

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

DISASSEMBLY

In order to repair engine top end proceed as follows :

Electrical Connections

Refer to ENGINE REMOVAL AND INSTALLATION 03-02, then look for **electrical connections.**

Exhaust System

To withdraw tuned pipe, refer to ENGINE REMOVAL AND INSTALLATION 03-02, then look for **Tuned Pipe Removal**.

Intake System

To remove air intake silencer, refer to ENGINE REMOVAL AND INSTALLATION 03-02, then look for **Air Intake Silencer Removal.**

6,13, Cylinder Head Cover, Cylinder Head

Remove cylinder head cover.

○ **NOTE :** With 657 engines, cylinder head screws secure also cylinder head cover.

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

Remove cylinder head.

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

Remove cylinders, being careful that connecting rods do not hit crankcase edge.

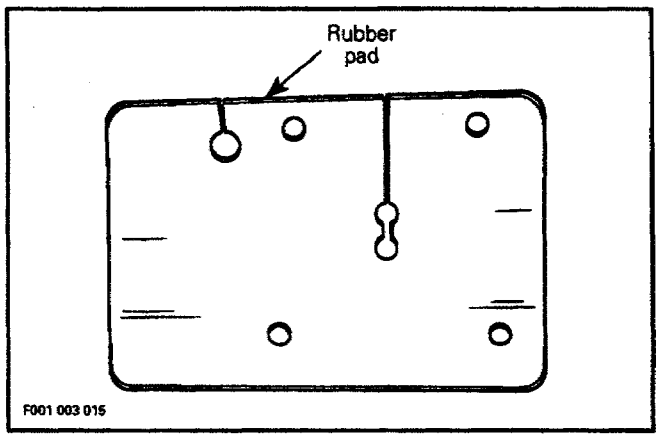
◆ **WARNING : If screws need to be heated for removal when engine is in watercraft, fuel system pressurization must be done first. Do not use open flame ; use a heat gun. An explosion might occur since vapors can be present in engine compartment.**

○ **NOTE :** Even if only 1 cylinder needs repair, both cylinders should be lifted to allow 1-piece cylinder base gasket replacement.

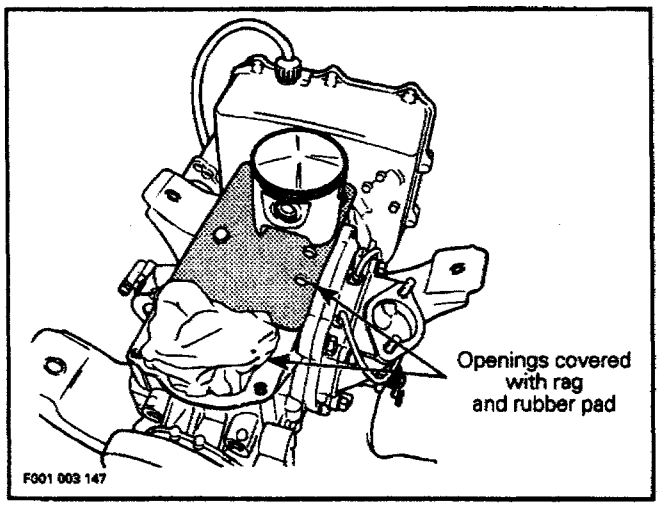
23,24,25,26, Piston, Piston Pin, Circlip and Needle Bearing

○ **NOTE :** The 587 engine features cageless piston pin bearing.

Bring piston to Top Dead Center and install rubber pad (P / N 295 000 101) over crankcase opening. Secure with screws. Lower piston until it sits on pad.

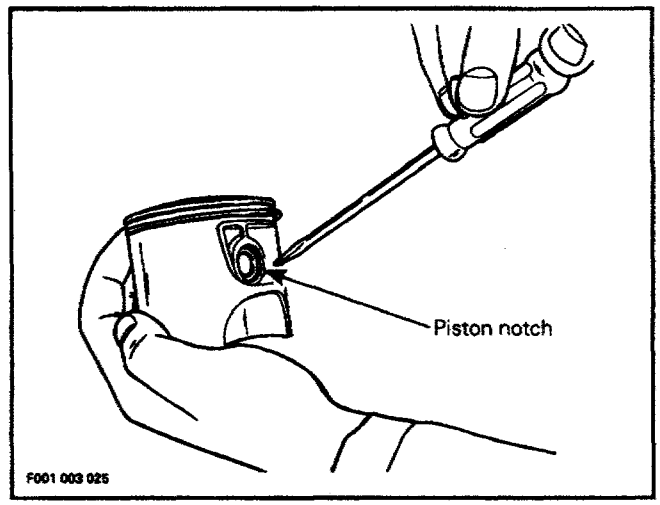


If other cylinder has been removed, completely cover its opening with a clean rag.



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

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



587 Engine

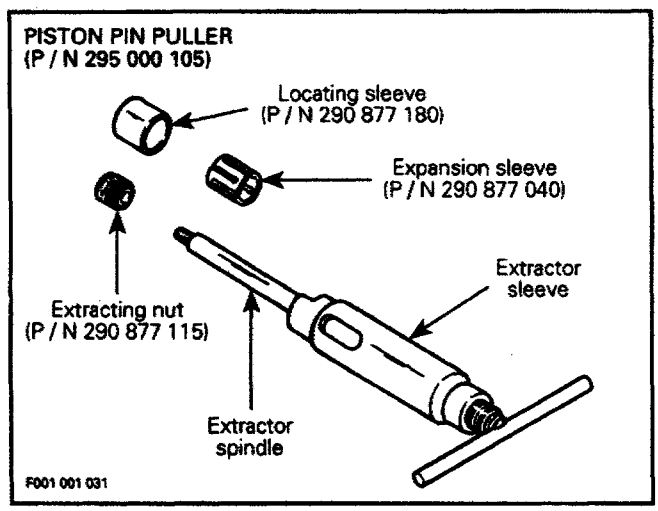
To extract piston pin, use piston pin puller (P / N 295 000 105) as follows :

— Fully thread on puller handle.

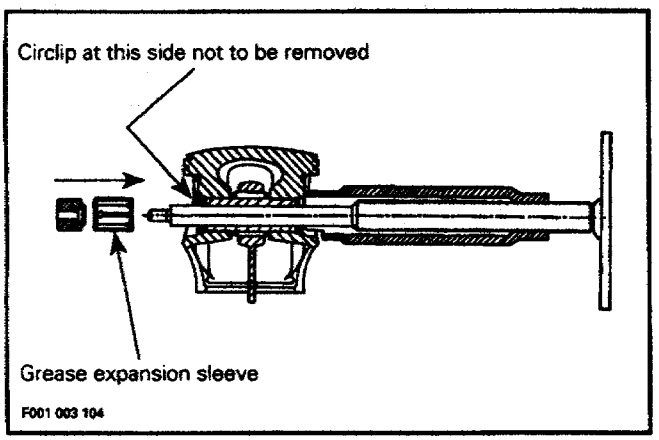
— Insert extractor spindle into the piston pin.

— Slide the expansion sleeve (P / N 290 877 040) onto the spindle.

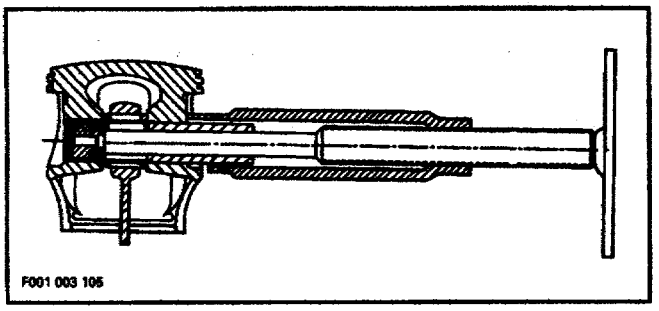
— Screw in extracting nut (P / N 290 877 115) with the movable extracting ring towards spindle.



— Firmly hold puller and rotate handle to pull piston pin.



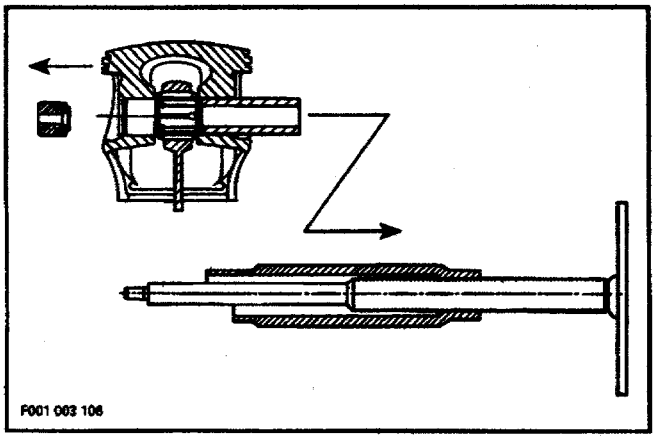
— By turning the spindle, pull out piston pin until it is completely removed from bearing.



— Rotate spindle until extracting nut can be removed.

— Remove spindle and extractor sleeve from piston pin.

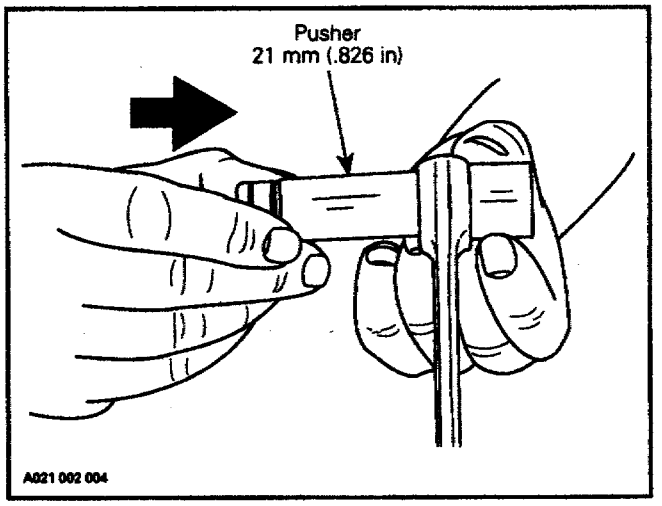
— Carefully remove the piston.



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

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 21 mm (.826 in) diameter pusher.

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



657 Engines

To extract piston pin, it is possible to use piston pin puller (P / N 295 000 105) as follows :

— Fully thread on puller handle.

— Insert extractor spindle into the piston pin.

— Screw extracting nut (P / N 290 877 115) with the movable extracting ring towards spindle.

— Hold puller firmly and rotate puller handle to pull piston pin.

CLEANING

Discard all gaskets and O-rings.

Clean all metal components in a solvent.

Clean water passages and make sure they are not clogged.

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

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

INSPECTION

Visually inspect all parts for corrosion damage.

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

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

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

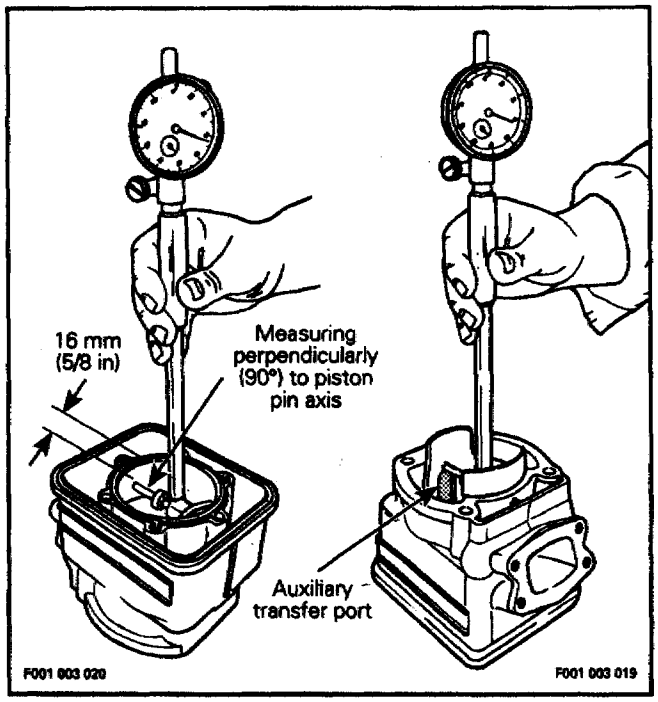
ENGINE MEASUREMENT	TOLERANCES (ALL ENGINES)		
	NEW PARTS (min.)	(max.)	WEAR LIMIT
Cylinder Taper	N.A.	N.A.	0.08 mm (.0031 in)
Cylinder Out of Round	N.A.	N.A.	0.05 mm (.0020 in)
Piston / Cylinder Clearance for 587 Engine	0.05 mm (.002 in)	0.07 mm (.0028 in)	0.20 mm (.008 in)
Piston / Cylinder Clearance for 657 Engine	0.05 mm (.002 in)	0.07 mm (.0028 in)	0.15 mm (.006 in)
Ring / Piston Groove Clearance	0.05 mm (.002 in)	0.08 mm (.003 in)	0.20 mm (.008 in)
Ring End Gap	0.25 mm (.010 in)	0.40 mm (.016 in)	1.0 mm (.039 in)

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

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

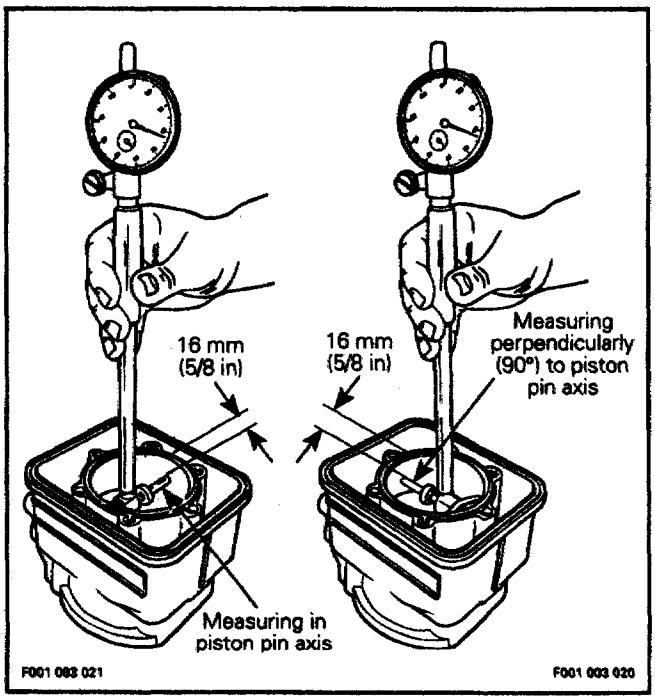
Cylinder Taper

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



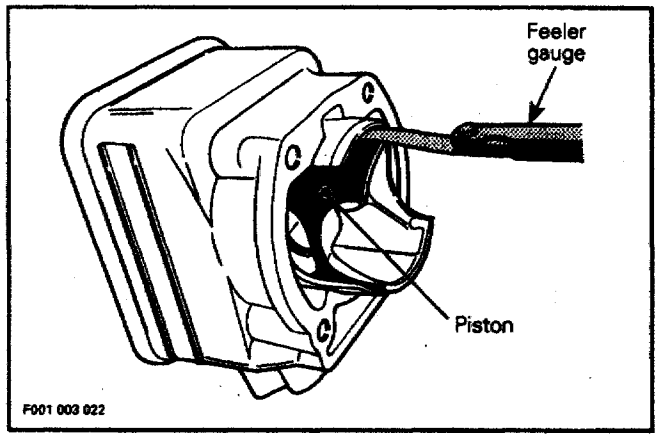
Cylinder Out of Round

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



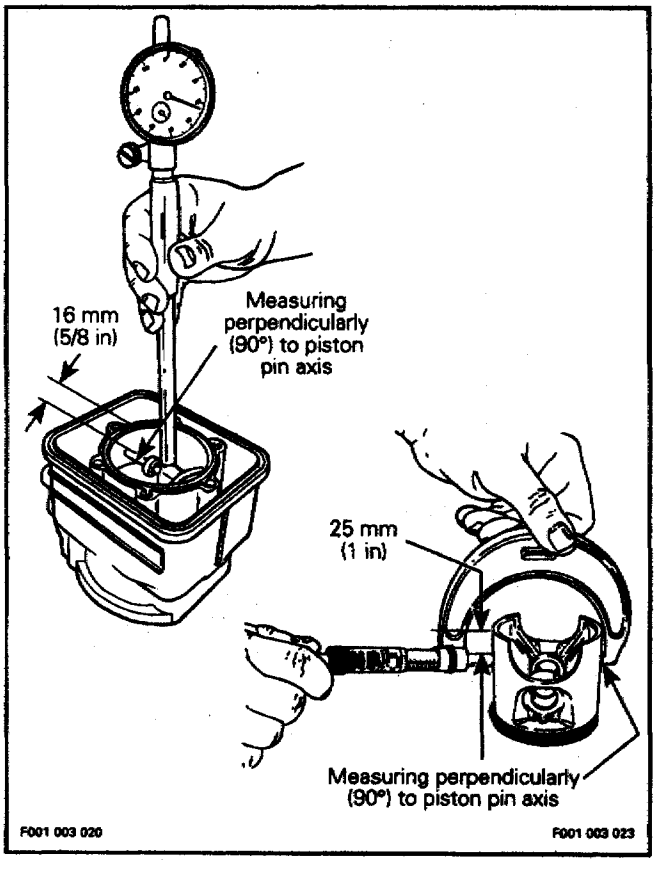
Piston / Cylinder Clearance

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



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

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

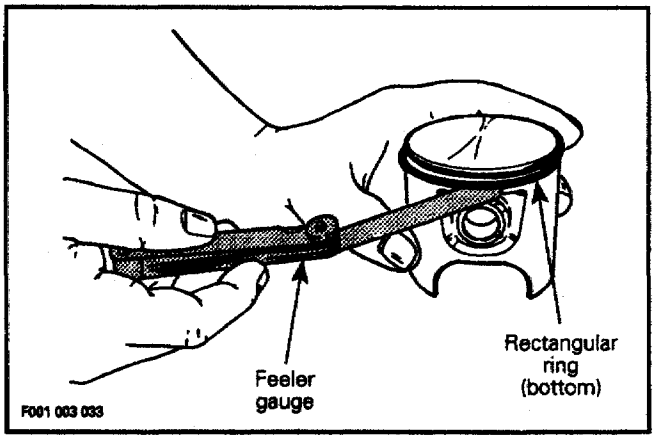


The difference between these 2 measurements should be within specified tolerance.

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.

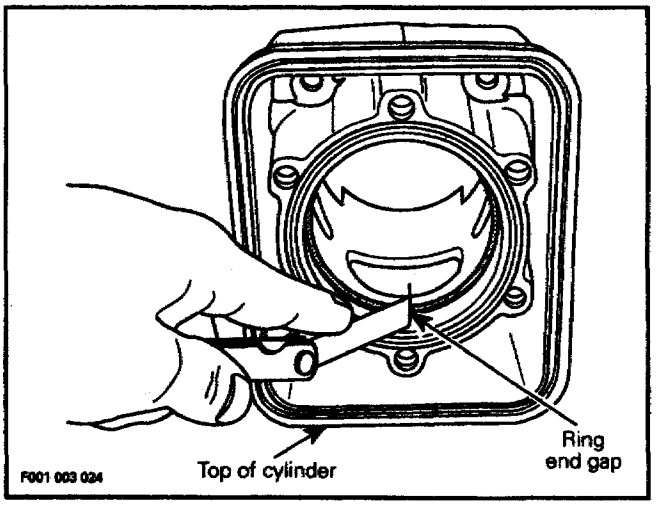


Ring End Gap

Position ring halfway between exhaust port and 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.

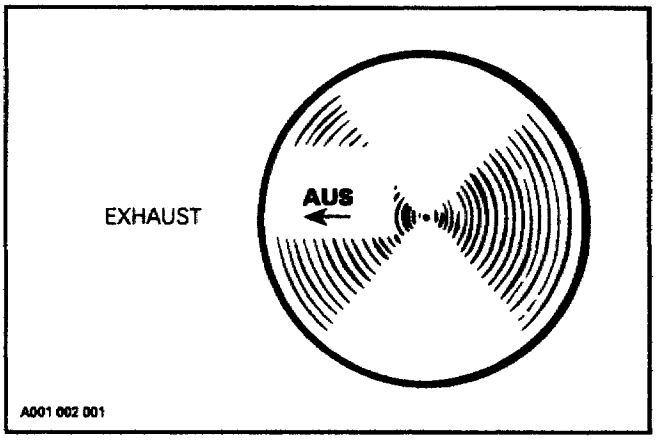


ASSEMBLY

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

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

At assembly, place the pistons over the connecting rods with the letters "AUS" (over an arrow on the piston dome) facing in direction of the exhaust port.



Carefully cover crankcase opening as for disassembly.

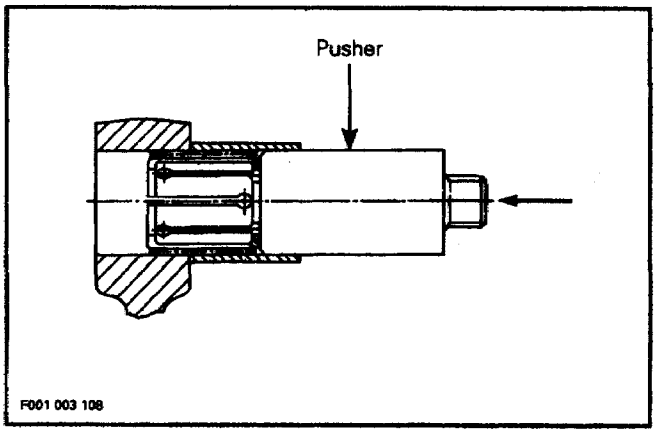
587 Engine

To install roller bearing and piston pin use piston pin puller (P / N 295 000 105), proceed as follows :

— Replacement bearings are held in place by a locating sleeve outside and 2 plastic cage halves inside.

— Push needle bearing together with inner halves out of the locating sleeve into the connecting rod bore.

— Use any suitable 21 mm (.826 in) diameter pusher as a tool. Make sure thrust washers are present each side of needles.

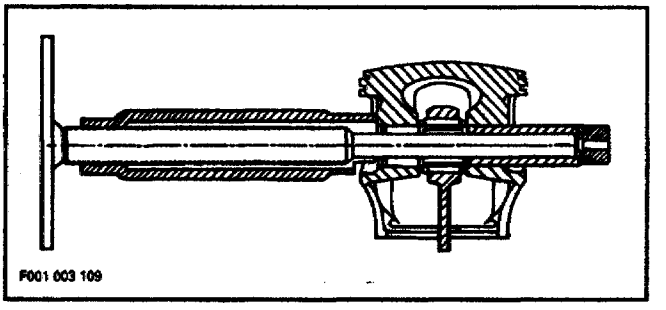


— Insert piston pin into piston until it comes flush with inward edge of piston hub.

— 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 to pull piston pin carefully into the piston.



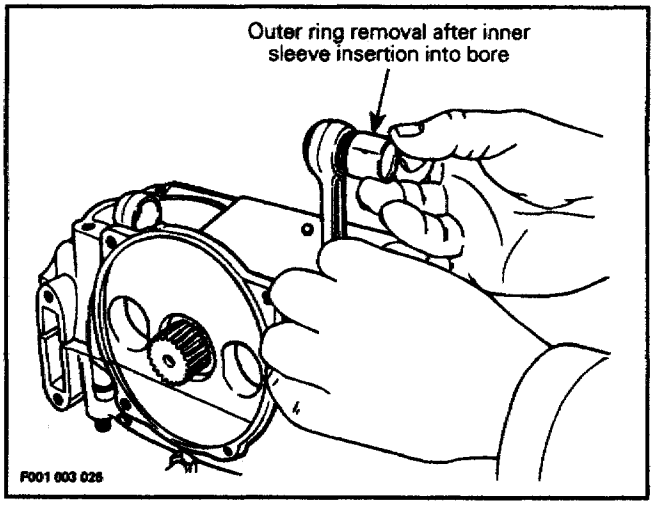
Plastic Mounting Device Method

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

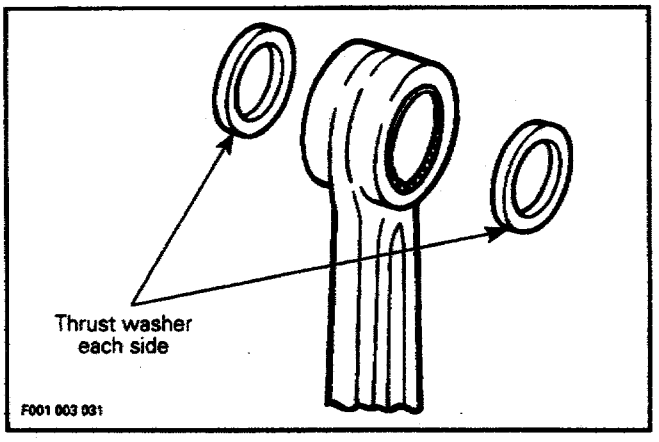
Replacement roller bearings are delivered in a convenient plastic mounting device. For installation, proceed as follows :

— Align replacement roller bearing with connecting rod bore.

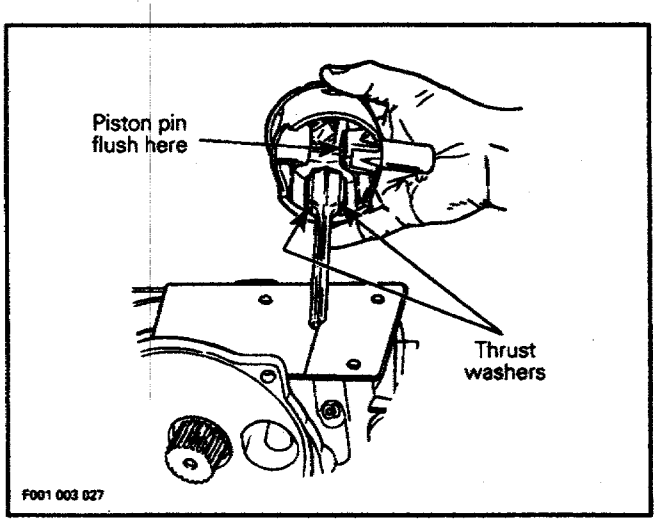
— Carefully push inner plastic sleeve into connecting rod bore ; outer plastic ring will release rollers.



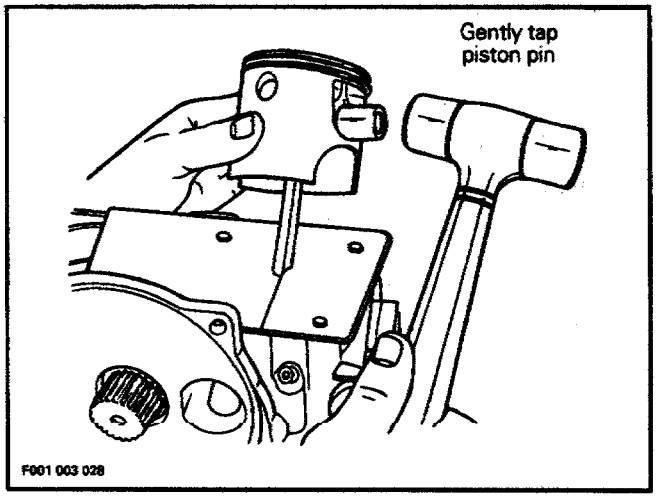
— Make sure thrust washers are present each side of rollers.



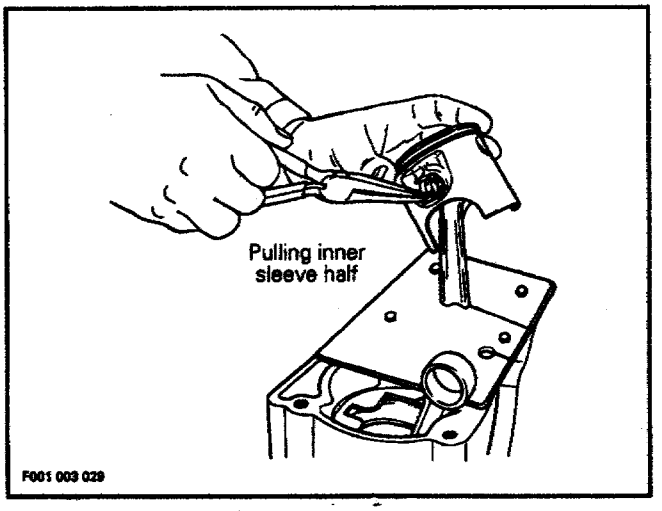
— Insert piston pin into piston until it comes flush with inward edge of piston hub.



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



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

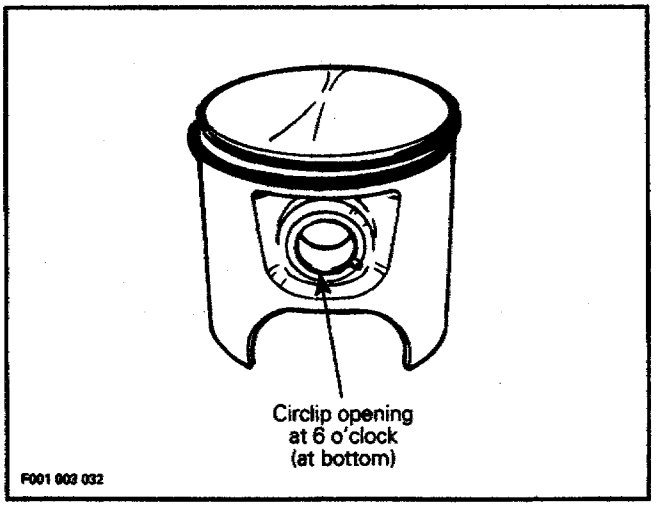


All Engines

25, Circlip

Secure remaining circlip taking into consideration the following.

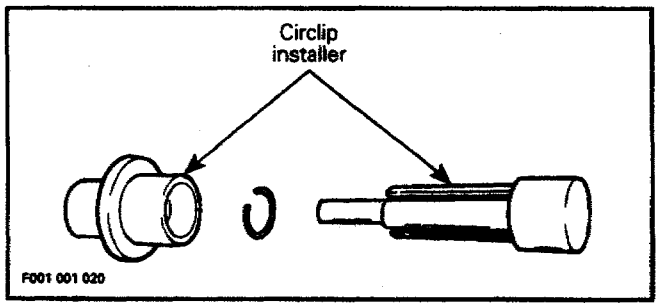
▼CAUTION : To minimize the stress on the circlips, install them so that their openings are located at 6 o'clock (at bottom).



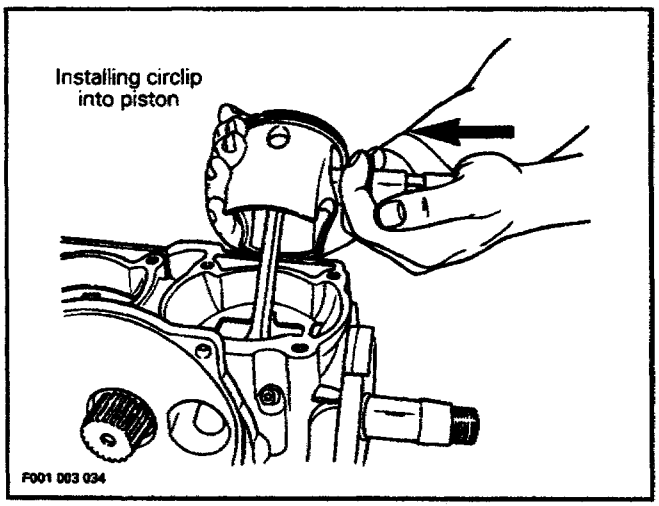
◆WARNING : Always wear safety glasses when installing piston circlips.

▼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) for 587 engine or (P / N 290 877 016) for 657 engines.

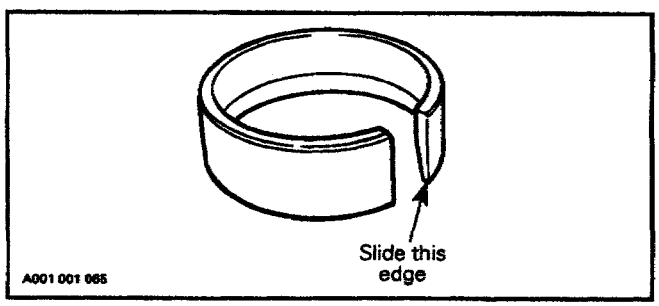


— Remove pusher from tool then insert circlip into its bore.
— Reinstall pusher into tool and push until circlip comes in end of tool.
— Position end of tool against piston pin opening.
— Firmly hold piston against tool and push tool pusher to insert circlip into its groove.



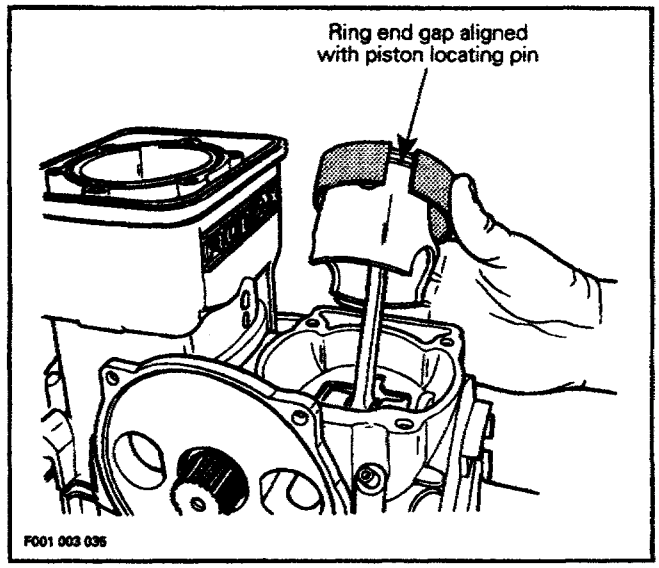
19, Cylinder

To easily slide cylinder over piston, install ring compressor (P / N 290 876 972) for 587 engine or (P / N 295 000 112) for 657 engines over rings.

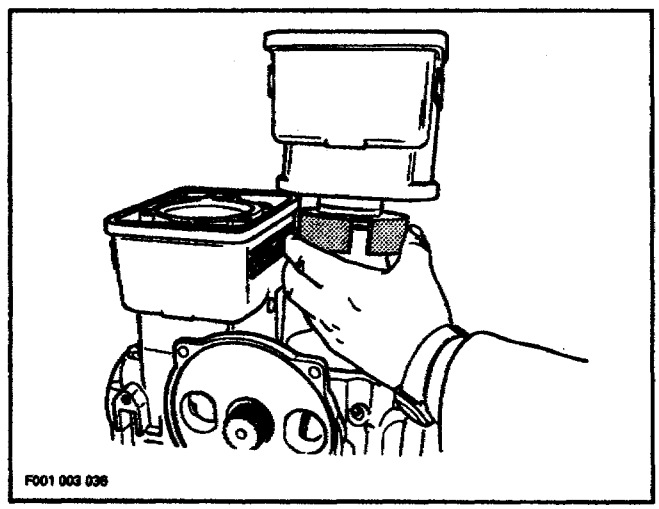


NOTE : Ring compressor will not fit on oversize piston / rings.

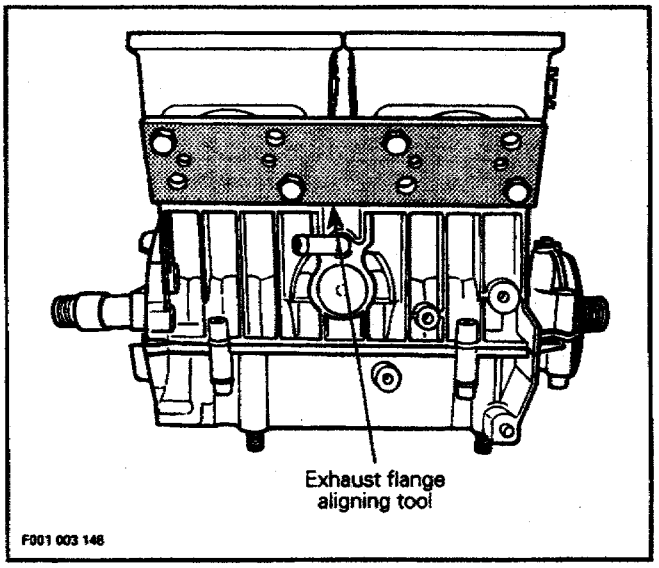
Make sure to align ring end gap with piston locating pin. Slide tool over rings.

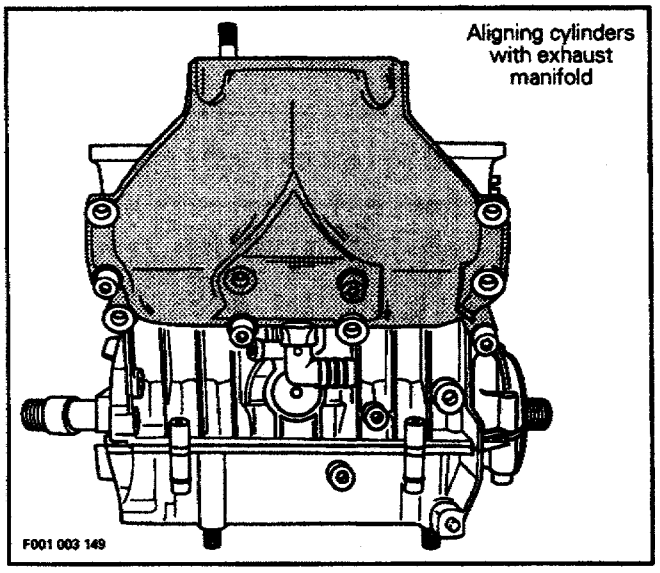


Install cylinder gasket and slide cylinder over piston.



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

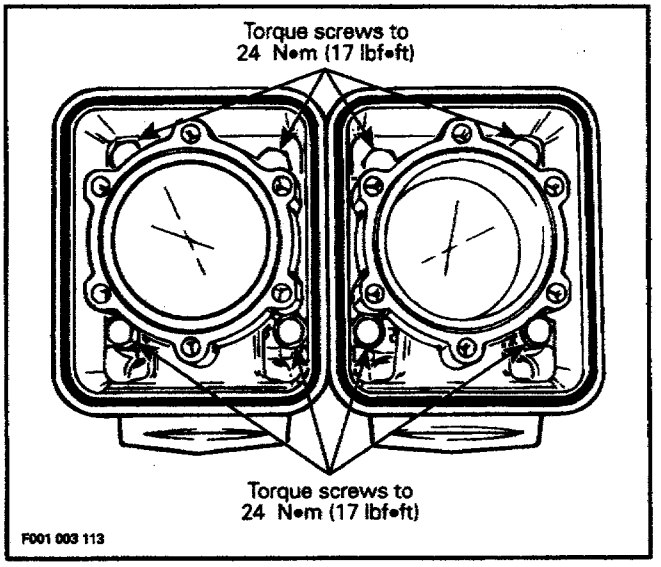




NOTE : If manifold has been used for exhaust flange alignment, remove it for engine installation in watercraft (except Explorer model).

17,18,19, Screw, Grease and Cylinder

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

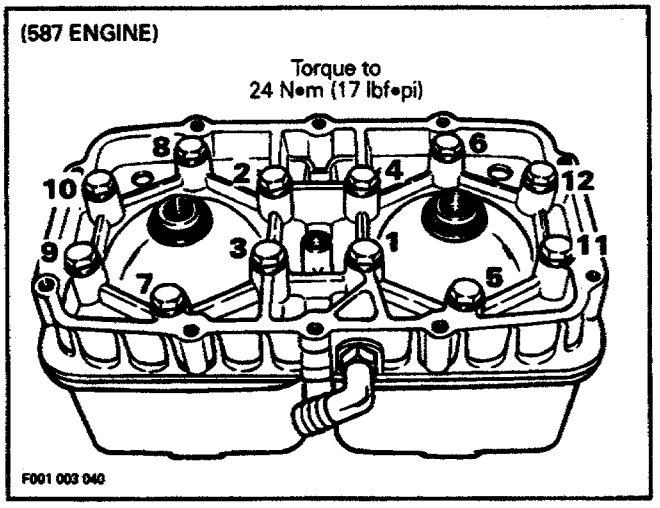


587 Engine

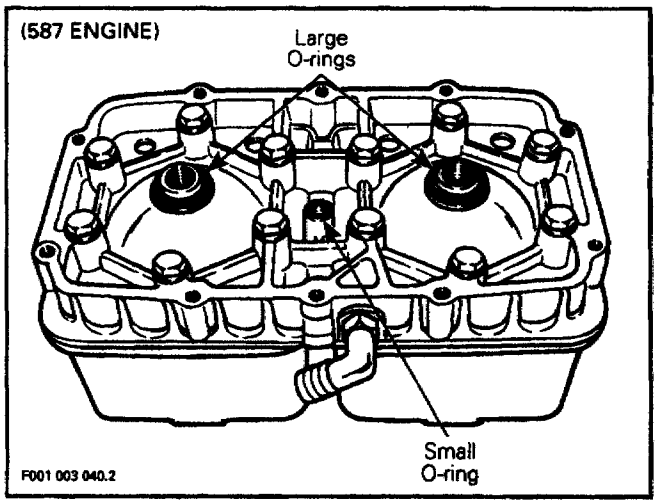
8,11,12,13,15, Screw, O-ring and Cylinder Head

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

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



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

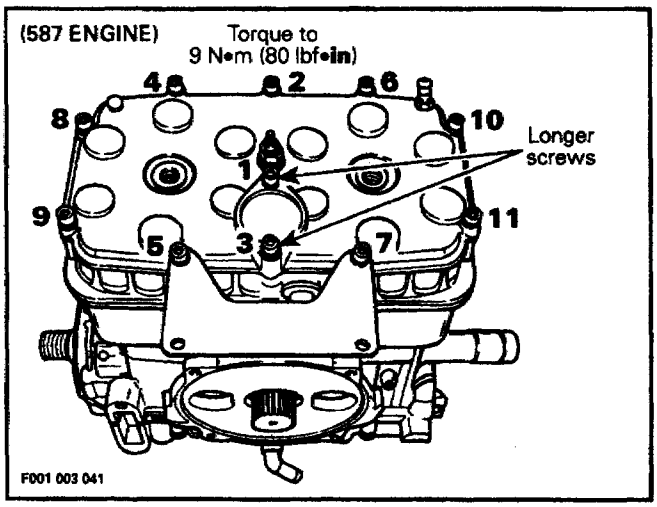


1,4,6, Screw and Cylinder Head Cover

Install cover over cylinder head. Apply Loctite 242 (blue) on screw threads. The 2 longer screws must be installed on oval-shaped housing. Make sure to install flame arrester support.

NOTE : Hand-tighten screws only. Final torque should be carried on after flame arrester / carburetor installation.

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

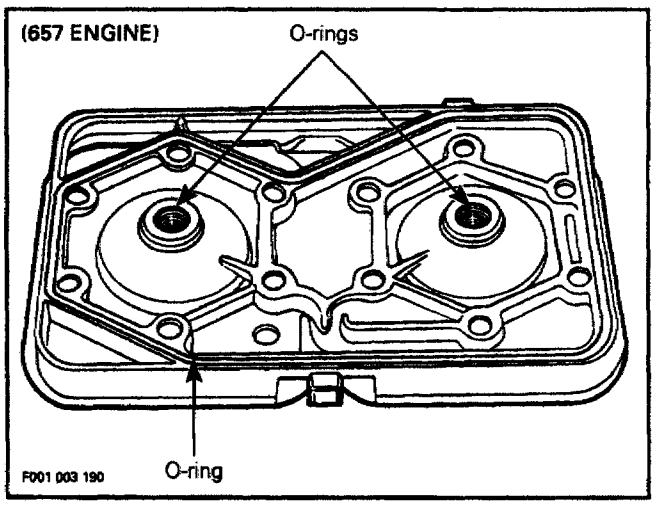


657 Engines

11,13, O-ring and Cylinder Head

Apply Loctite 515 Gasket Eliminator (P / N 293 800 007) in cylinder sleeve O-ring groove.

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

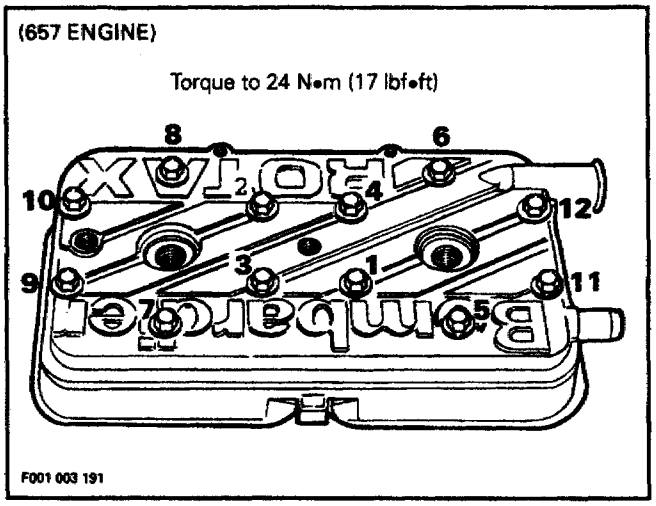


6,18, Cylinder Head Cover and Screw

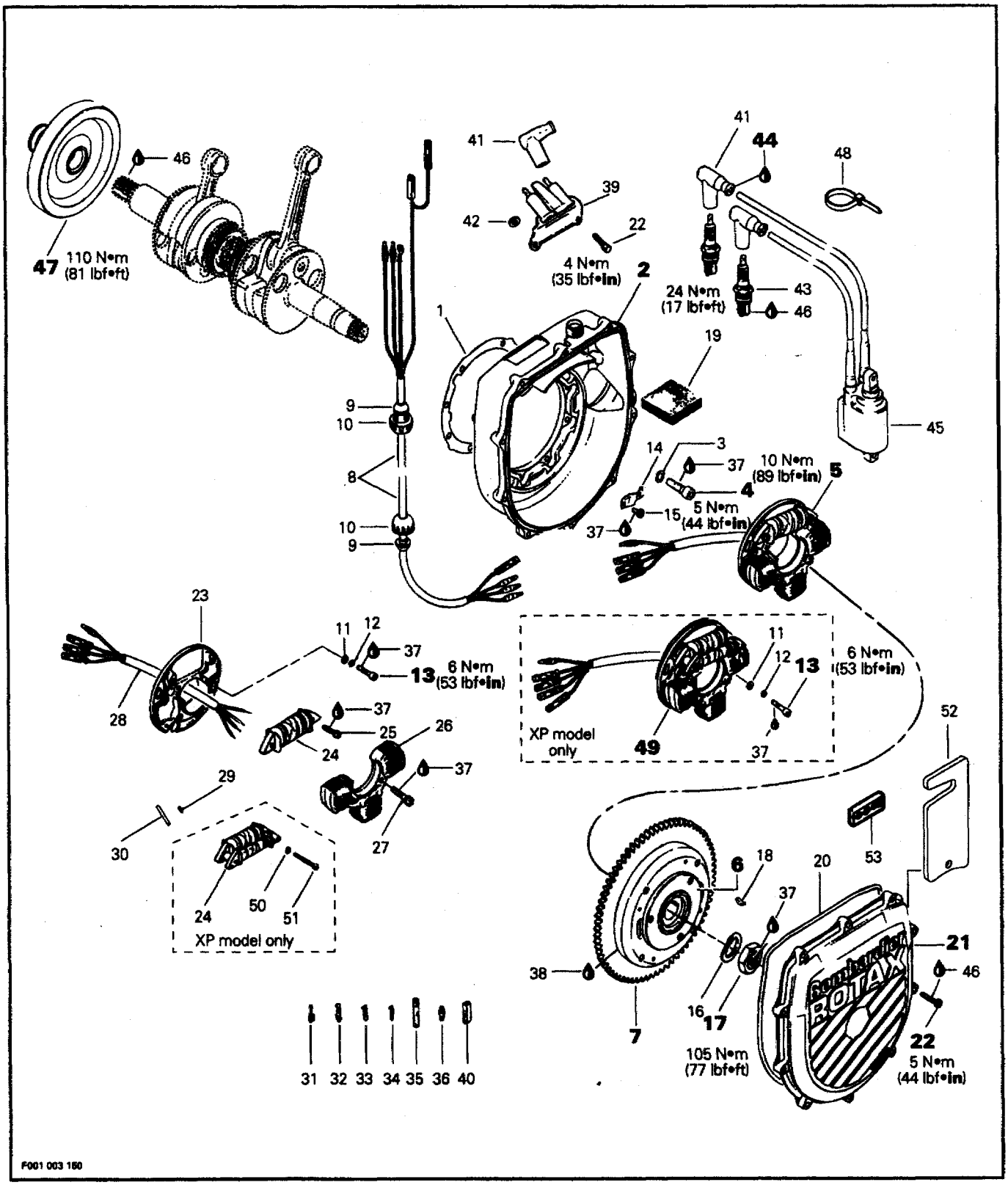
Apply synthetic grease (P / N 293 550 010) below screw head.

Install cover over cylinder head. Apply Loctite 242 (blue) on screw threads.

Torque cylinder head screws to 24 N•m (17 lbf•ft) as per following illustrated sequence.



PTO FLYWHEEL AND MAGNETO



COMPONENTS

1. *Gasket*
2. *Ignition housing*
3. *Lock washer M8*
4. *Allen screw M8 x 25*
5. *Armature plate assembly*
6. *Magneto flywheel*
7. *Ring gear (77 teeth)*
8. *Harness assembly*
9. *Grommet*
10. *Cap nut*
11. *Washer 5.5 mm*
12. *Lock washer 5 mm*
13. *Allen screw M5 x 18*
14. *Retainer plate*
15. *Taptite screw M5 x 8*
16. *Lock washer 22 mm*
17. *Hexagonal nut M22*
18. *Woodruff key*
19. *Protection mat*
20. *O-ring*
21. *Ignition housing cover*
22. *Self tapping screw M5 x 25*
23. *Armature plate*
24. *Generating coil*
25. *Phillips screw M5 x 22*
26. *Battery charging coil*
27. *Screw M6 x 25*
28. *Harness assembly*
29. *Terminal clip*
30. *Shrink tube 30 mm*
31. *Female connector*
32. *Ring terminal*
33. *Female terminal*
34. *Male terminal*
35. *Insulation sheath*
36. *Insulation sheath*
37. *Loctite 242 (blue)*
38. *Loctite 648 (green)*
39. *Ground plate*
40. *Protection cap*
41. *Insulator cap*
42. *Star washer 5 mm*
43. *Spark plug*
44. *Dielectric grease*
45. *Ignition coil*
46. *Anti-seize lubricant*
47. *PTO flywheel*
48. *Tie rap*
49. *Armature plate assembly (double generating coil XP model only)*
50. *Lock washer*
51. *Slotted head screw M5 x 35*
52. *Wire support*
53. *Wire Clip*

GENERAL

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

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

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

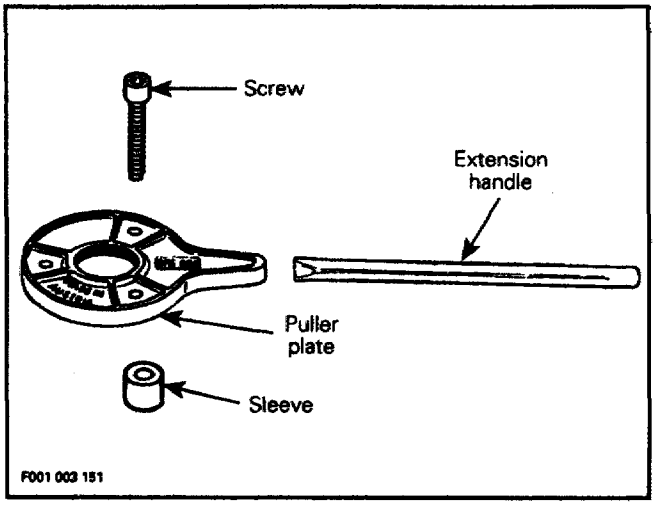
REMOVAL

21,22, Ignition Cover and Screw

Remove screws, wire support and spark plug grounding device then withdraw cover.

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

For removal of both flywheels, MAG flywheel is locked with puller plate (P / N 290 876 080), sleeves (P / N 290 847 220) and extension handle (P / N 295 000 111).

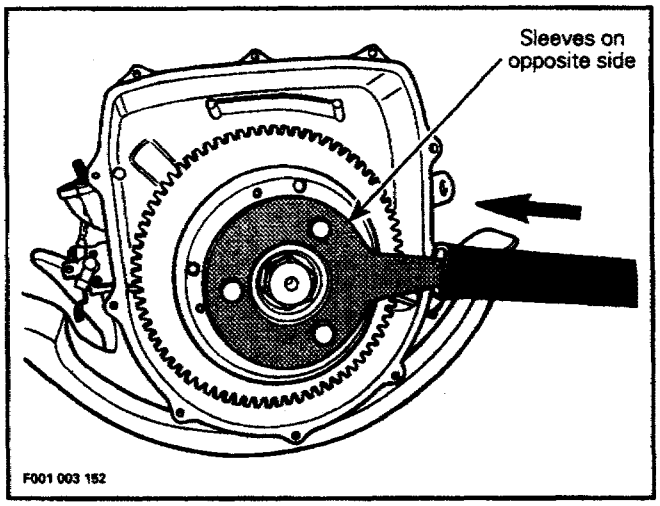


▼ **CAUTION : Never lock crankshaft by inserting any tool through connecting rod bores nor through impulse fitting.**

47, PTO Flywheel

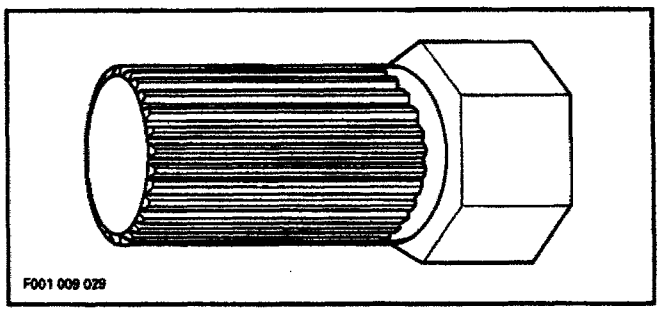
Using three M8 x 35 screws (P / N 290 841 591), install screws through puller plate and slide sleeves on screws then secure puller plate on MAG flywheel so that sleeves are against flywheel.

Install extension handle on end of puller plate.

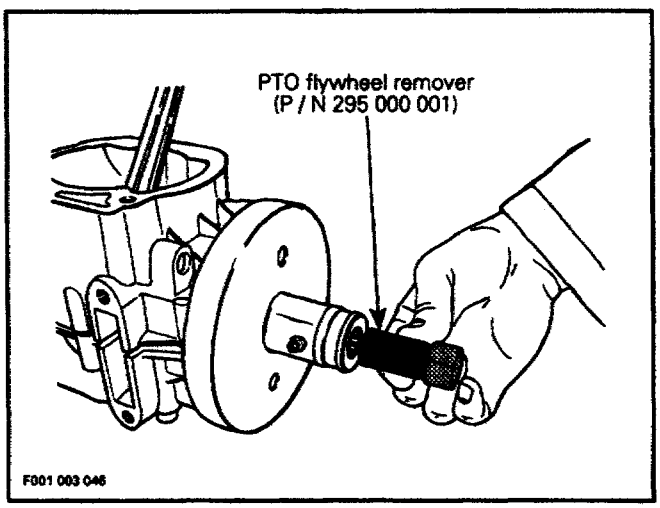


Rotate MAG flywheel so that extension handle end can be held easily before PTO flywheel loosening.

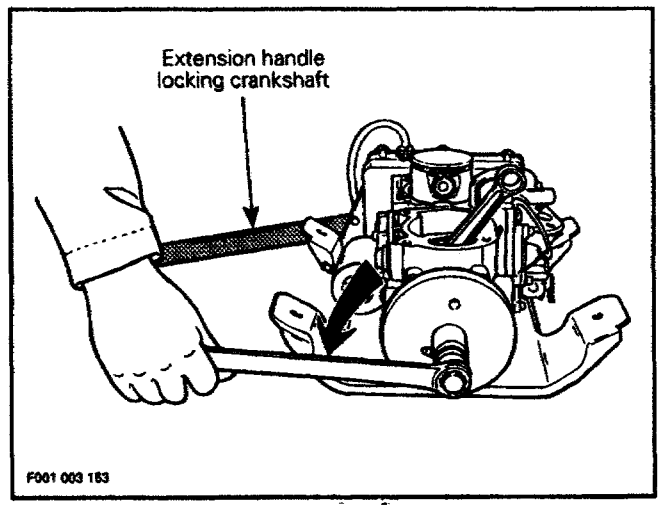
PTO flywheel is loosen using PTO flywheel remover (P / N 295 000 001).



Insert special tool in PTO flywheel splines.

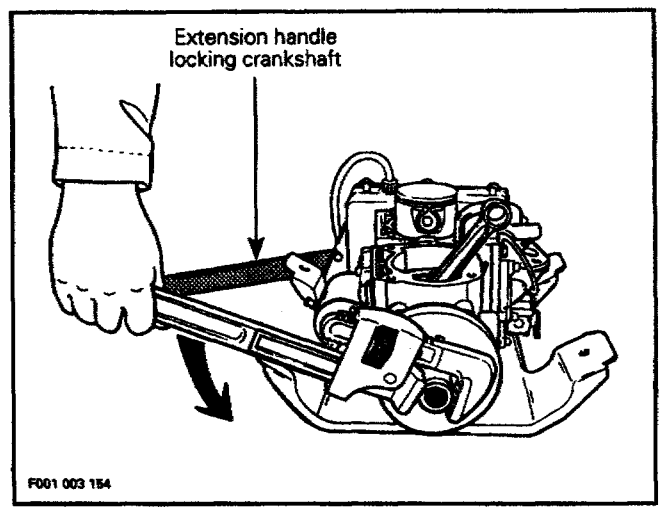


Using a suitable wrench or socket, unscrew PTO flywheel COUNTERCLOCKWISE when facing it.



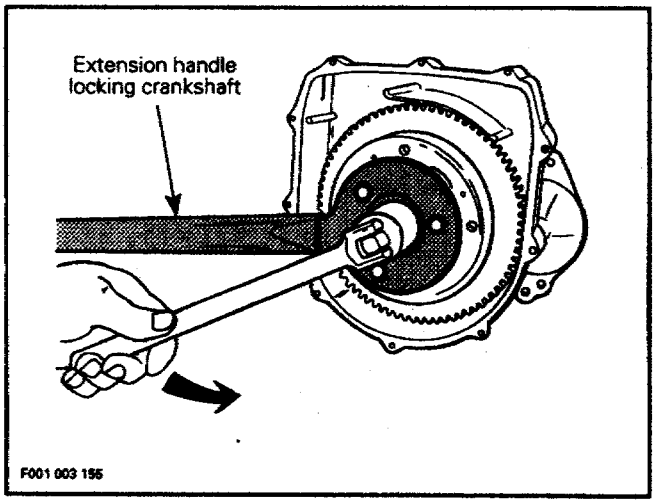
As an alternate method to remove PTO flywheel when PTO flywheel splines are worn out and PTO flywheel remover cannot be used.

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



6, Magneto Flywheel

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

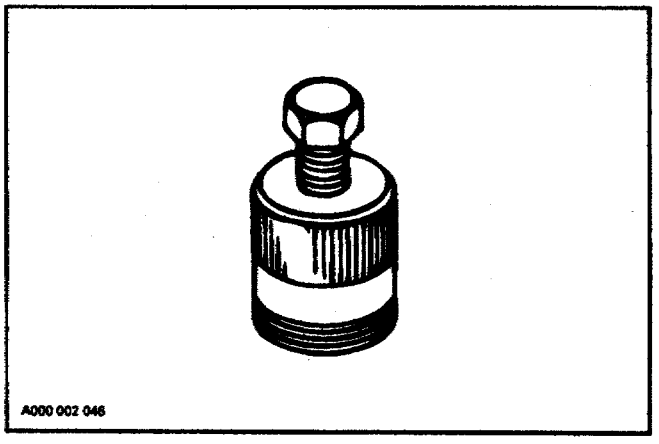


Using a suitable socket, unscrew retaining nut COUNTERCLOCKWISE when facing it.

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

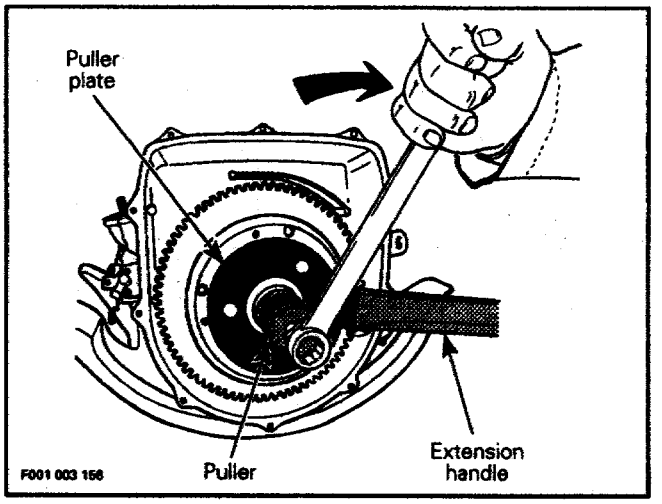
Remove nut and lock washer from MAG flywheel.

MAG flywheel is easily freed from crankshaft with puller (P / N 295 000 106).



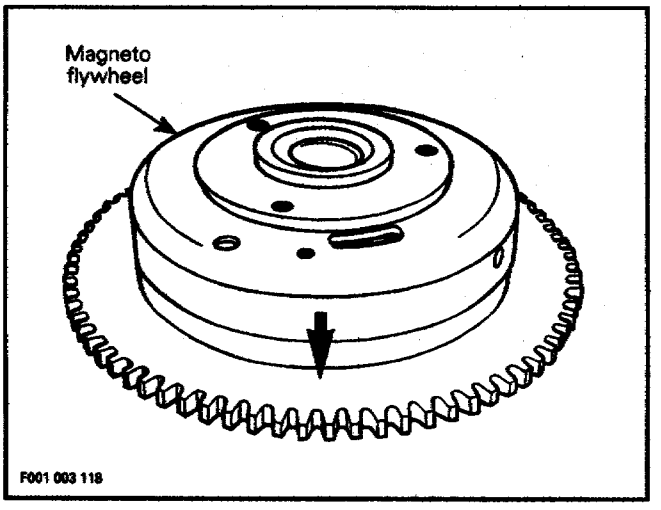
Fully thread on puller in puller plate.

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



6,7, MAG Flywheel and Ring Gear

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



5,13,49, Screw and Armature Plate Ass'y

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

Remove three retaining screws and withdraw armature plate.

Crankcase Replacement

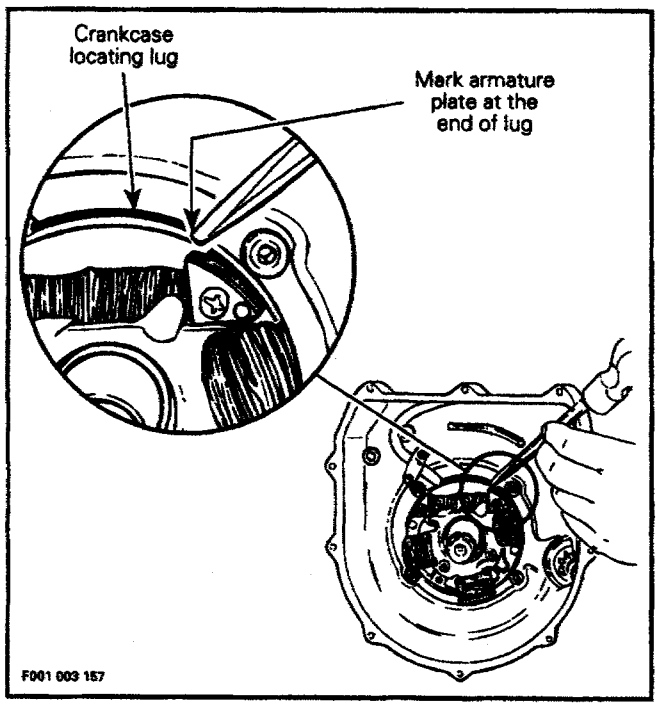
Since replacement crankcases do not have timing mark for armature plate location, indexing marks should be made on armature plate and crankcase to ease reassembly and further ignition timing.

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

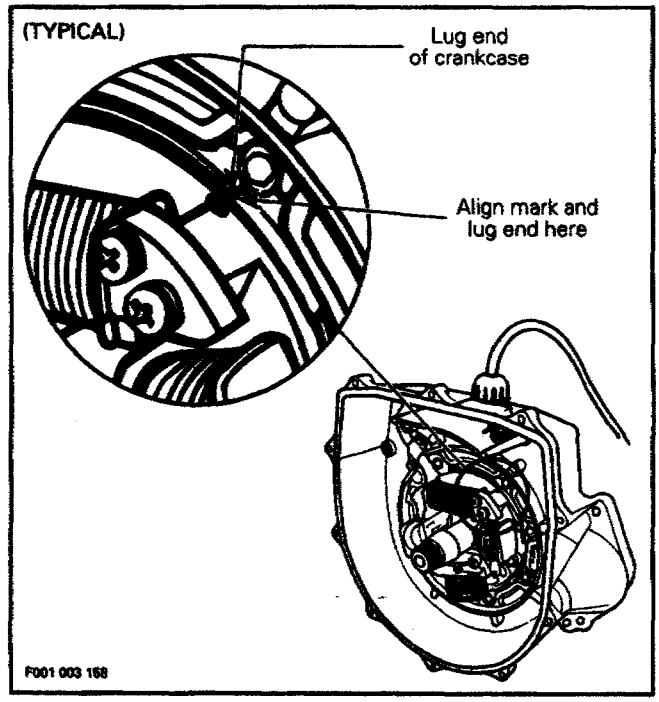
Proceed as follows :

— Find a crankcase locating lug (the top one in this example).

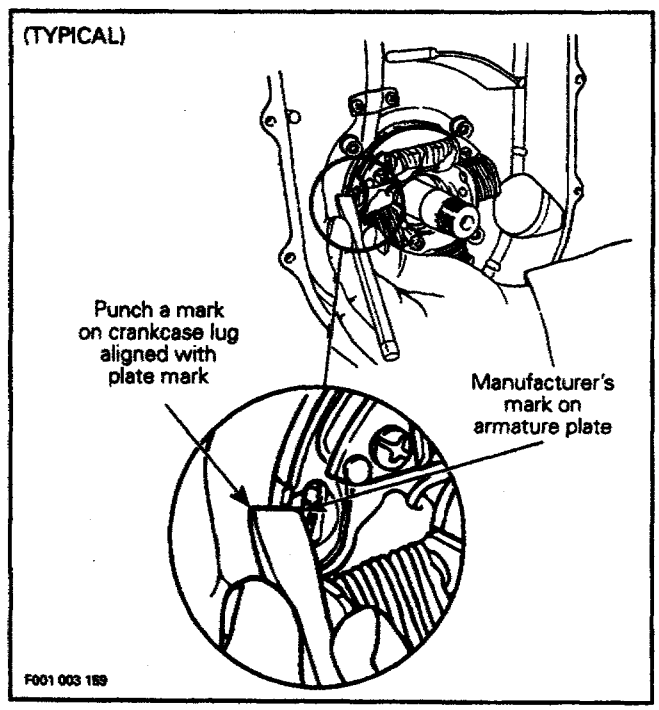
— Place a cold chisel at the end of choosen lug, then punch a mark on armature plate at this point.



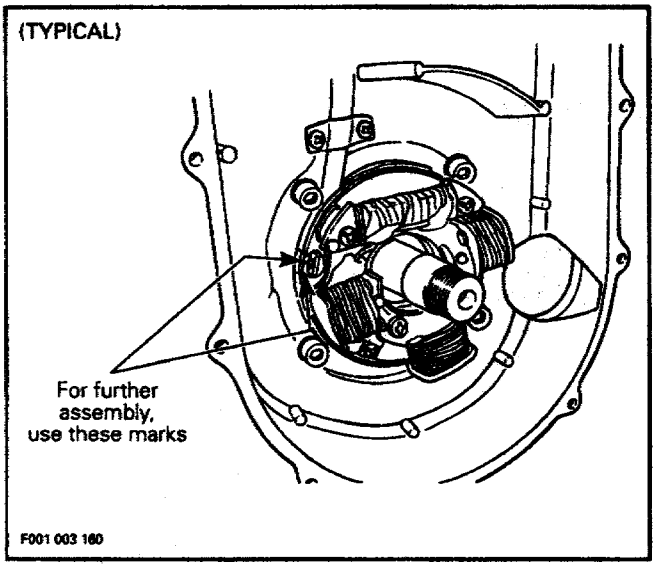
— At assembly, align armature plate mark (previously punched) with the end of the same locating lug on the new crankcase.



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



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



2,4, Ignition Housing and Screw

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

Unscrew retaining screws, then withdraw housing.

CLEANING

Clean all metal components in a solvent.

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

Clean crankshaft taper and threads.

INSTALLATION

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

2,4, Ignition Housing and Screw

Install gasket on housing / crankcase mating surfaces.

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

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

5,13, Screw and Armature Plate Ass'y

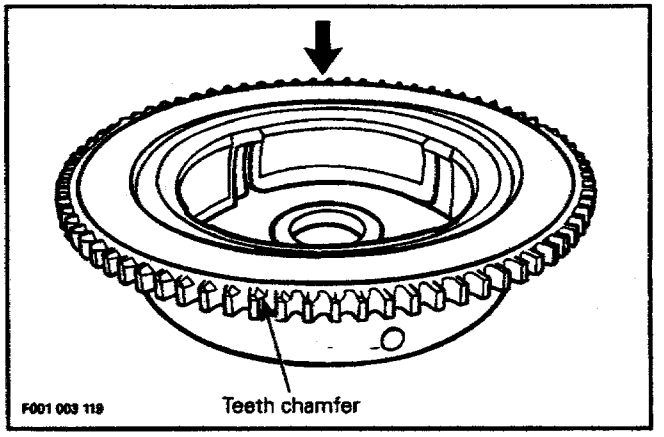
Position armature plate on crankcase, aligning previously traced marks on both parts.

Apply a drop of Loctite 242 (blue) on screw threads and torque to 6 N•m (53 lbf•**in**).

6,7, MAG Flywheel and Ring Gear

Apply Loctite 648 (green) 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.

Whenever replacing either ring gear or MAG flywheel, Gun Kote must be applied to prevent possible corrosion.

▼CAUTION : Always assemble MAG flywheel and ring gear prior to apply Gun Kote. If not done correctly, ring gear won't contact MAG flywheel flange.

To apply Gun Kote proceed as follows:

1. Clean thoroughly and degrease replacement part using a non oil base solvent.
2. Apply coating in light thin coats using a spray gun.

NOTE : Do not spray Gun Kote into MAG flywheel threaded holes.

3. Bake parts in oven at 175 °C (350 °F) for one hour to cure Gun Kote.

▼CAUTION : Do not eliminate Gun Kote heat curing time because it will lose all its resistance and it won't give any protection.

▼CAUTION : At installation of magneto, ring gear teeth chamfer and starter clutch should be facing each other.

6,17, Magneto and Nut

Apply Loctite 242 (blue) on crankshaft taper.

Position Woodruff key, magneto, apply Loctite 242 (blue) on nut threads and install fasteners on crankshaft.

Torque nut to 105 N•m (77 lbf•ft).

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

47, PTO Flywheel

Apply Loctite 767 Anti-Seize on crankshaft threads then screw on PTO flywheel.

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

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

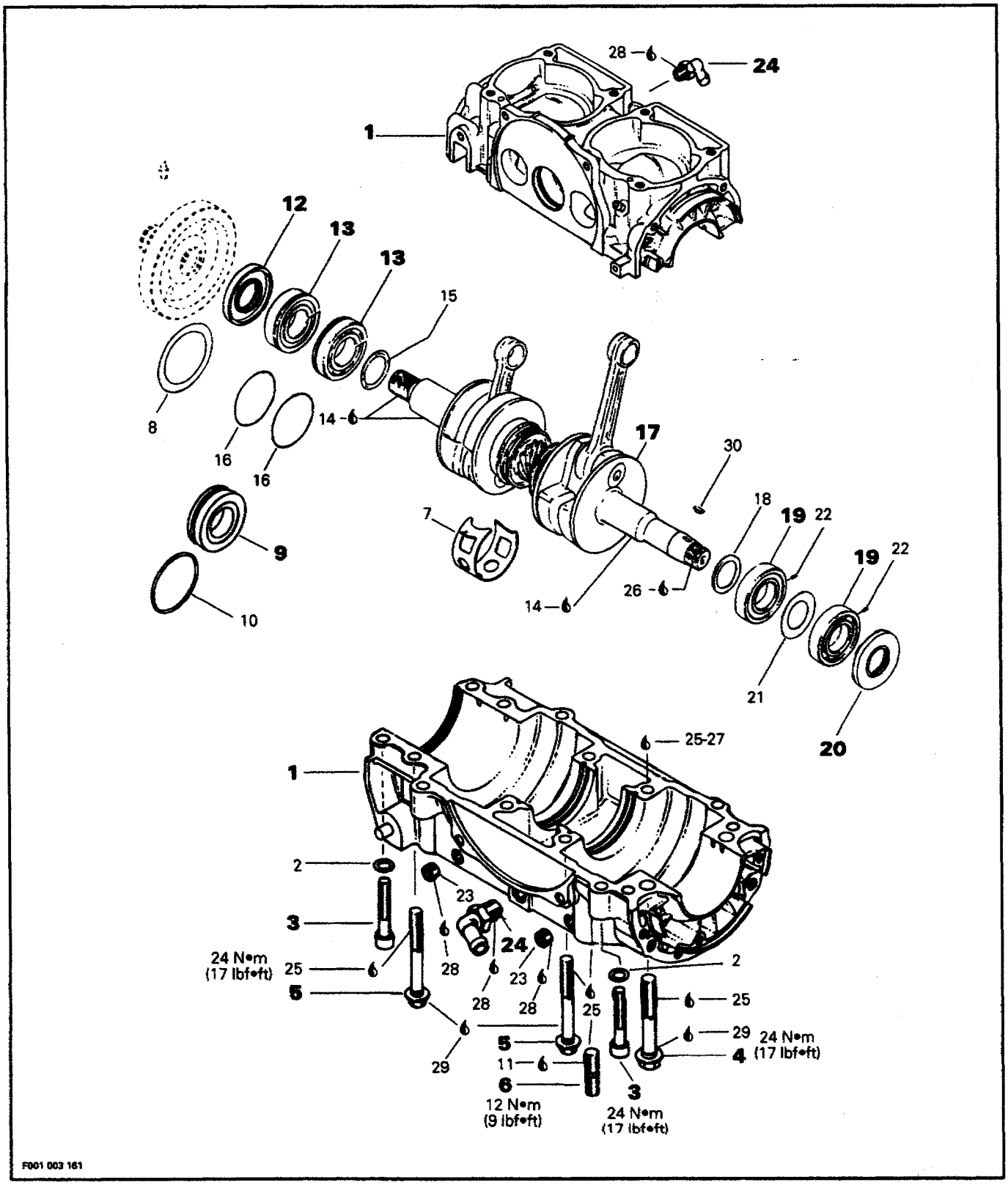
Ignition Timing

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

21,22, Ignition Housing Cover and Screw

Properly install O-ring in ignition housing. Apply Loctite 767 Anti-Seize on screw threads, install cover, wire support and spark plug grounding device then torque screws in a criss-cross sequence to 5 N•m (44 lbf•**in**).

BOTTOM END



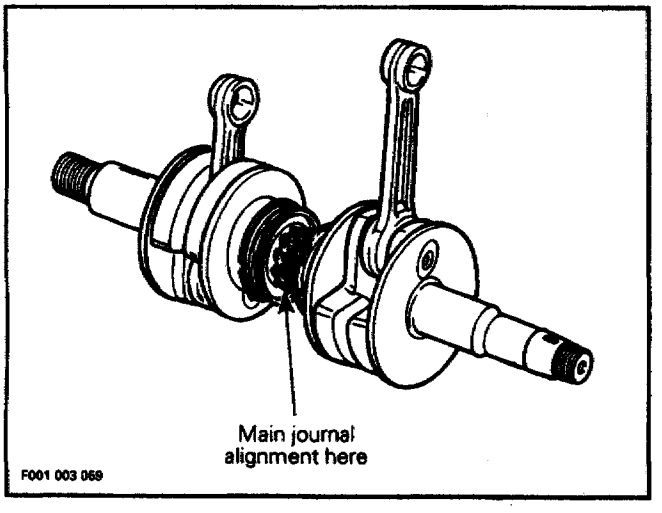
F001 003 161

COMPONENTS

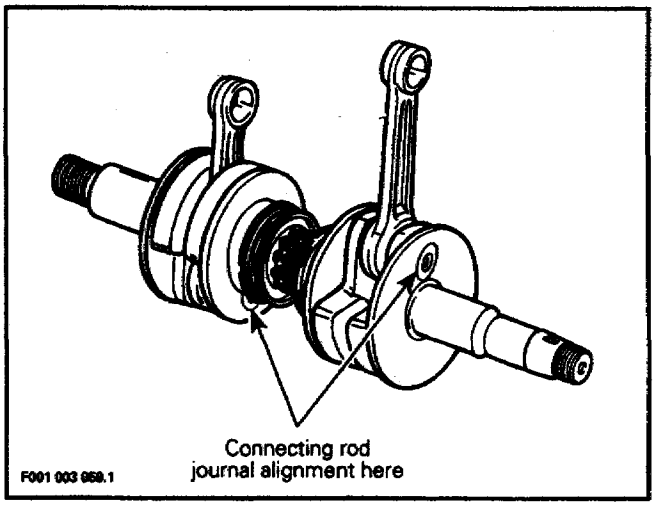
1. *Crankcase assembly*
2. *Lock washer 8 mm*
3. *Allen screw M8 x 45*
4. *Hexagonal head screw M10 x 75*
5. *Hexagonal head screw M8 x 70*
6. *Stud M10 x 25 / 18*
7. *Retaining ring*
8. *Retaining shim*
9. *Labyrinth sleeve*
10. *O-ring*
11. *Loctite 271 (red)*
12. *Oil seal*
13. *Ball bearing*
14. *Anti-seize lubricant*
15. *Distance ring*
16. *O-ring*
17. *Crankshaft*
18. *Distance ring*
19. *Ball bearing*
20. *Oil seal*
21. *Shim 30.4 / 51 / 1*
22. *Drive pin*
23. *Drain plug*
24. *Oil outlet fitting*
25. *Loctite 515*
26. *Loctite 242 (blue)*
27. *Primer "N"*
28. *Loctite PST 592*
29. *Synthetic grease*
30. *Woodruff key*

CRANKSHAFT MISALIGNMENT AND DEFLECTION

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



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



Crankshaft Alignment at Center Main Journal

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

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

— Remove PTO flywheel guard.

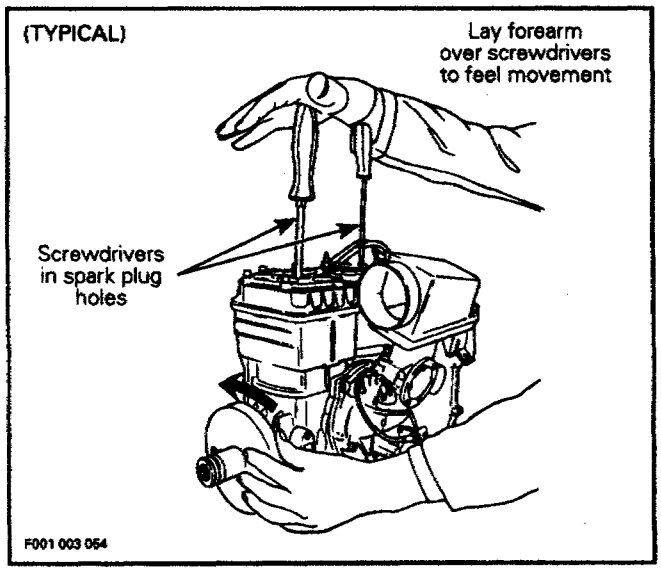
— Remove spark plugs.

— Insert a screwdriver in one spark plug hole.

— Insert a longer screwdriver in the other hole.

— Lay a forearm over both screwdriver handles to feel piston displacements.

— 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.

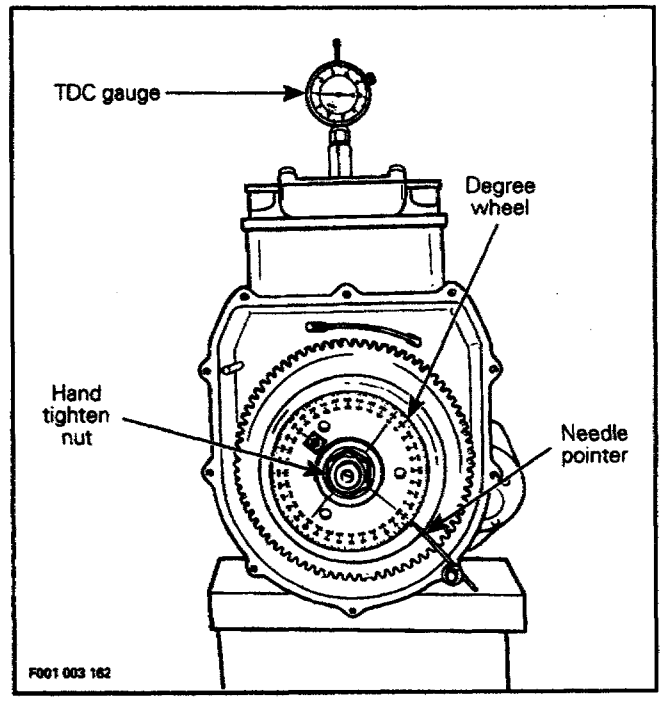
— Remove both spark plugs.

— 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° - 180° = 180°).

Any other reading indicates a misaligned crankshaft.

Crankshaft Alignment at Connecting Rod Journal

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

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

GENERAL

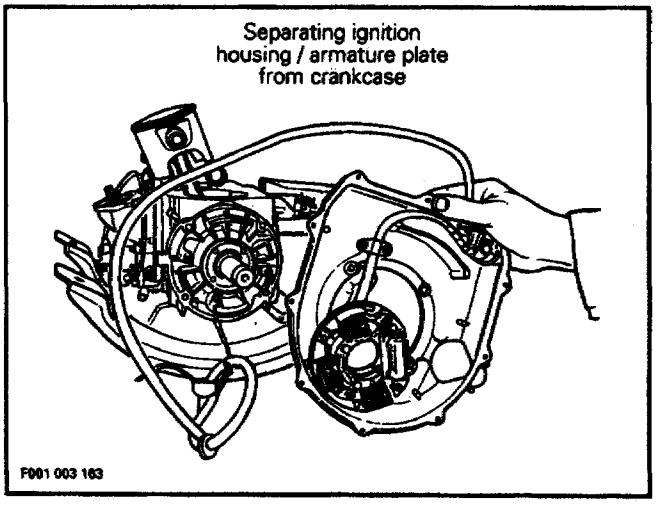
Engine has to be removed from watercraft to open bottom end.

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

DISASSEMBLY

Remove the following parts :

— Ignition housing and PTO flywheel on opposite side.

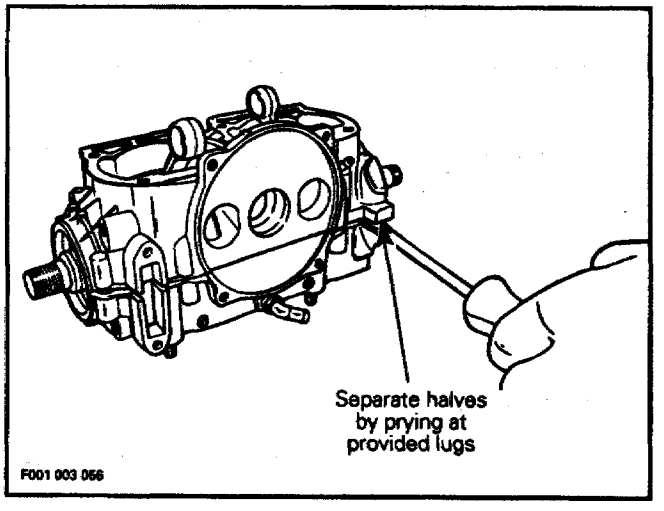


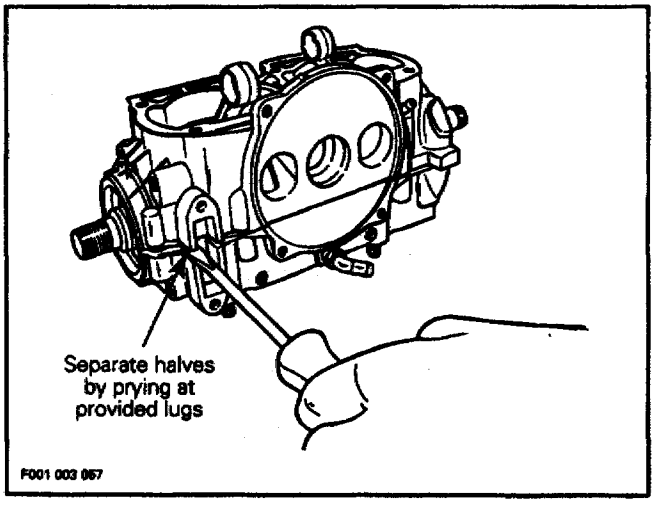
— Rotary valve cover and valve.

— Engine support.

— Crankcase retaining screws.

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





12,13,19,20, Seal and Bearing

NOTE : Do not needlessly remove crankshaft bearings.

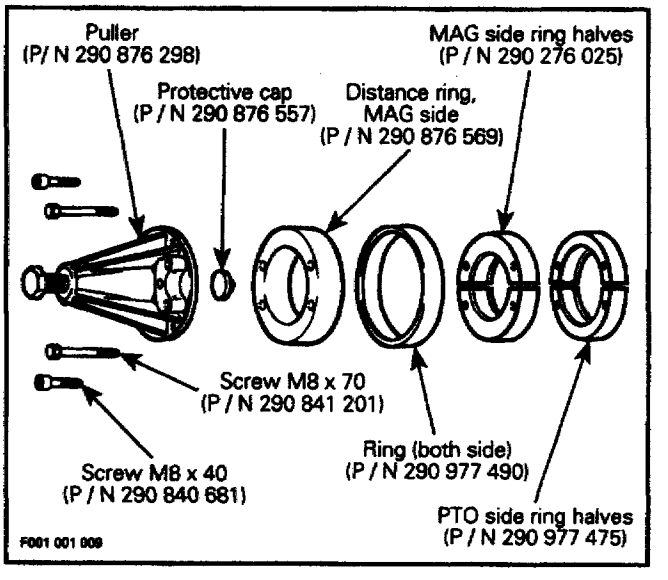
Remove end seals.

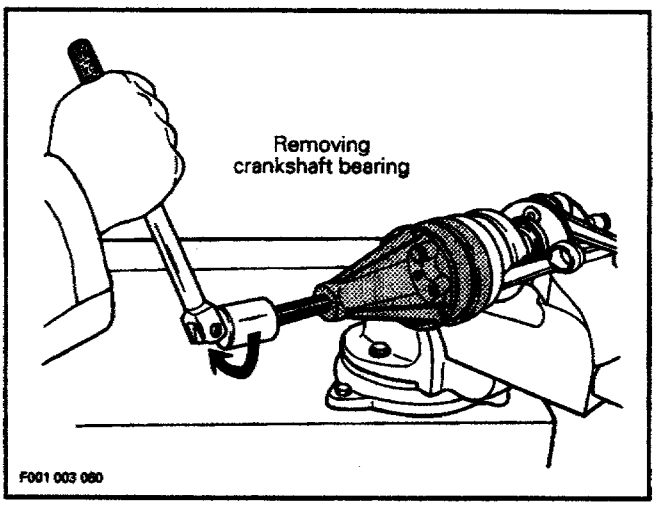
To remove end bearings from crankshaft, use crankshaft end protective cap (P / N 290 876 557) and puller (P / N 290 876 298).

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

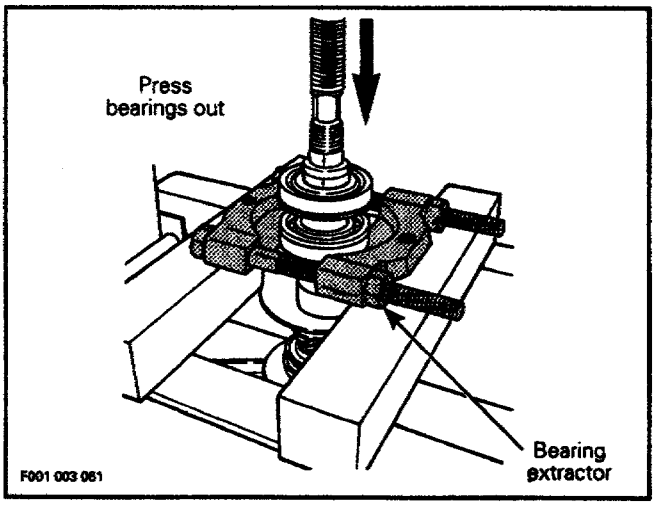
On MAG side, use distance ring (P / N 290 876 569) and ring (P / N 290 977 490) with ring halves (P / N 290 276 025).

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





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



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

CLEANING

Discard all oil seals, gaskets, O-rings and sealing rings.

Clean water and oil passages and make sure they are not clogged.

Clean all metal components in a solvent.

Remove old Loctite from crankcase mating surfaces with stripper (P / N 295 500 110).

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.

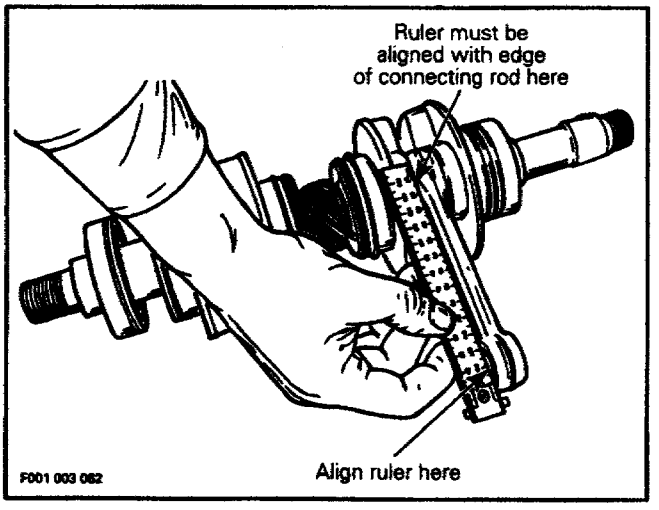
If crankshaft and / or components are found defective, it must be repaired by a specialized shop or replaced.

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

MEASUREMENTS	TOLERANCES		
	NEW PARTS (min.)	NEW PARTS (max.)	WEAR LIMIT
Crankshaft deflection	N.A.	N.A.	0.08 mm (.0031 in)
Connecting rod big end axial play	0.39 mm (.015 in)	.737 mm (.029 in)	1.2 mm (.047 in)

Connecting Rod Straightness

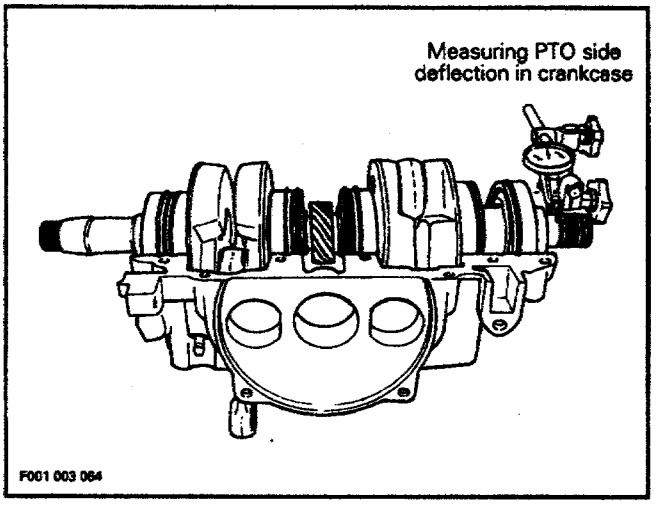
Align a steel ruler on edge of small end connecting rod bore. Check if ruler is perfectly aligned with edge of big end.

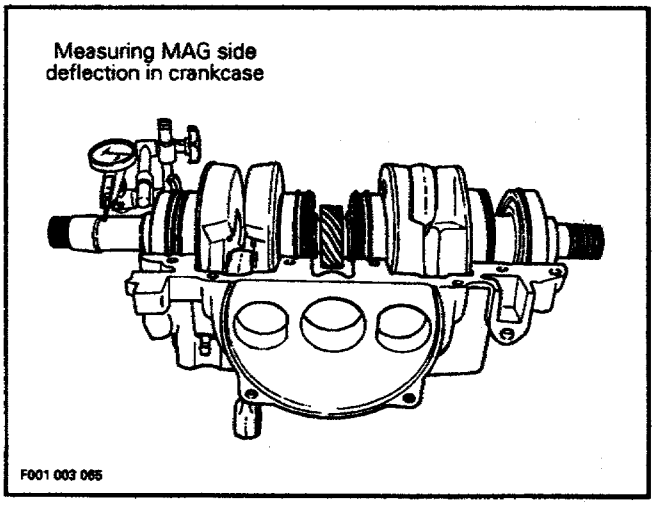


Crankshaft Deflection

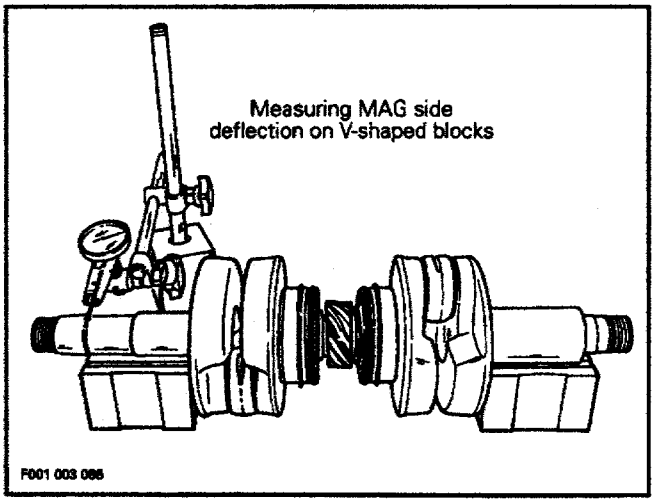
Crankshaft deflection is measured each end with a dial indicator.

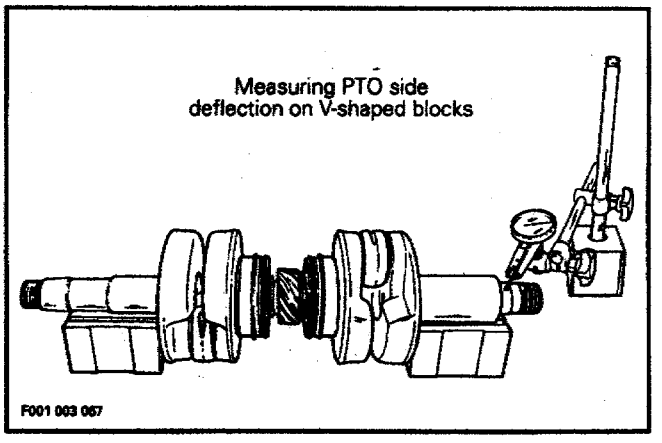
First, check deflection with crankshaft in crankcase. If deflection exceeds the specified tolerance, it can be either ball bearings wear, bent or twisted crankshaft at connecting rod journal.





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

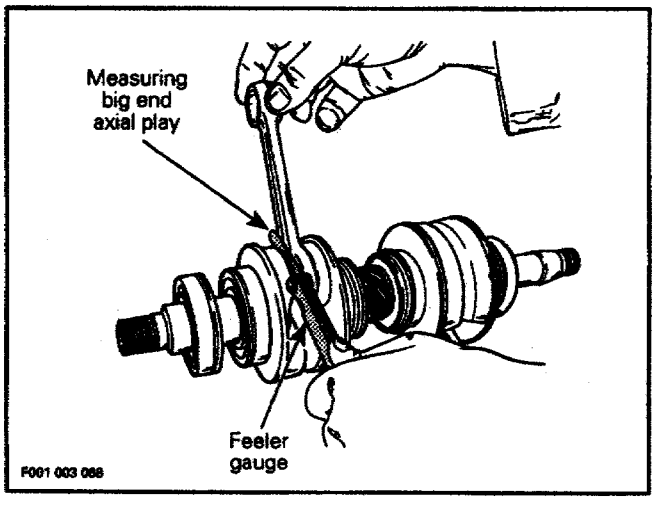




NOTE : Crankshaft deflection can not be correctly measured between centers of a lathe.

Connecting Rod Big End Axial Play

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



ASSEMBLY

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

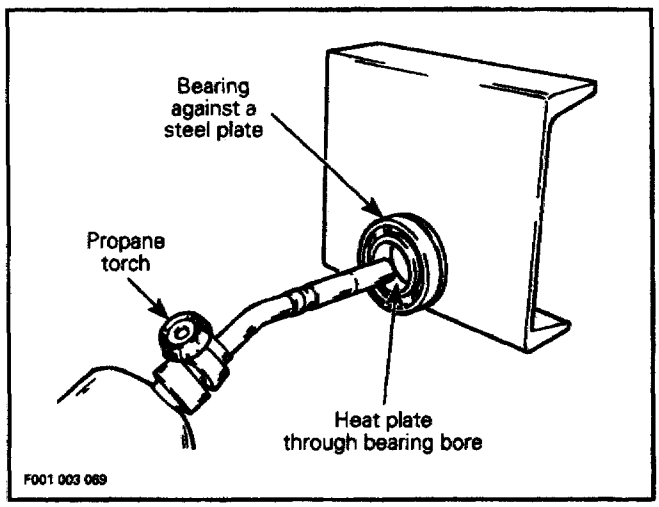
9,13,17,19, Bearing, Crankshaft and Labyrinth Sleeve

Apply Loctite 767 Anti-Seize on part of crankshaft where bearing fits.

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.

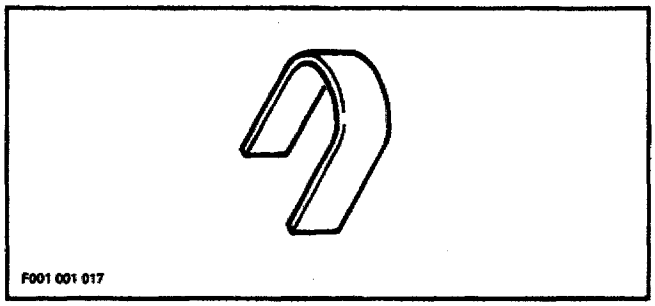
Or, as an alternate method, apply heat with a propane torch. Lay bearing on a steel plate, then **heat plate** through bearing bore until smoke is noticed from bearing. Install bearing carefully on crankshaft.

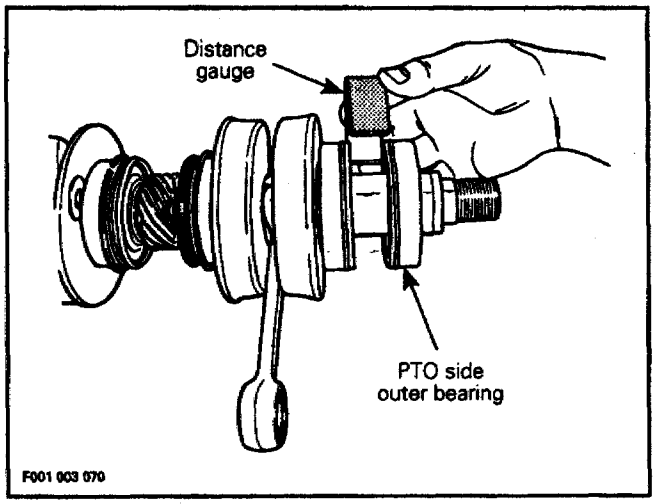
▼CAUTION : Immediately stop heating as soon as smoke is noticed. Overheating bearing will melt plastic cage. Practice with used bearings on first try.



Crankshaft without a Labyrinth Sleeve

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.

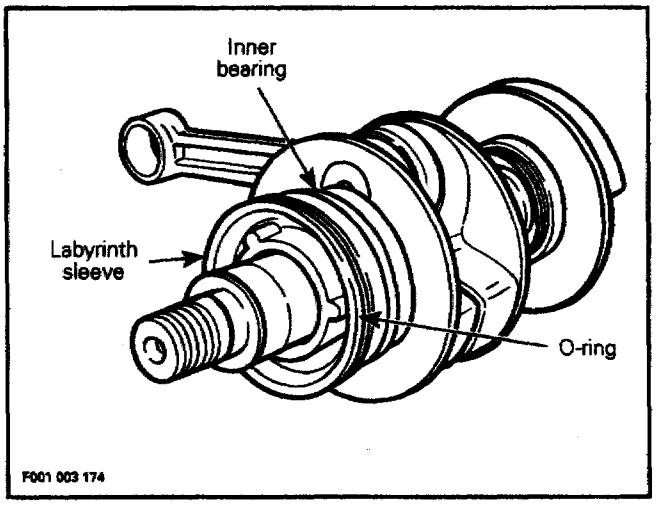




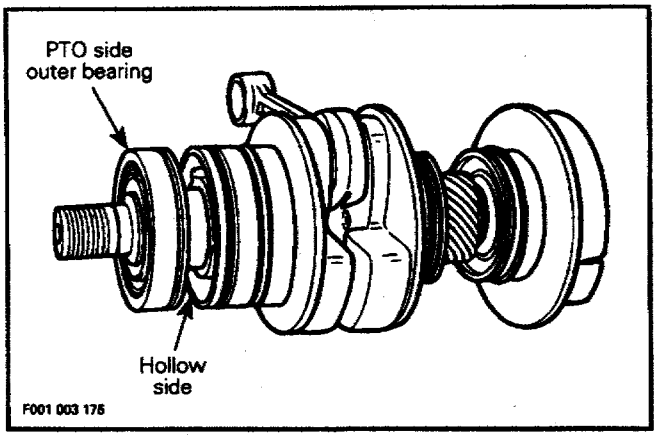
Crankshaft with a Labyrinth Sleeve

NOTE : Only crankshaft of a twin carburetor engine is provided with a labyrinth sleeve.

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

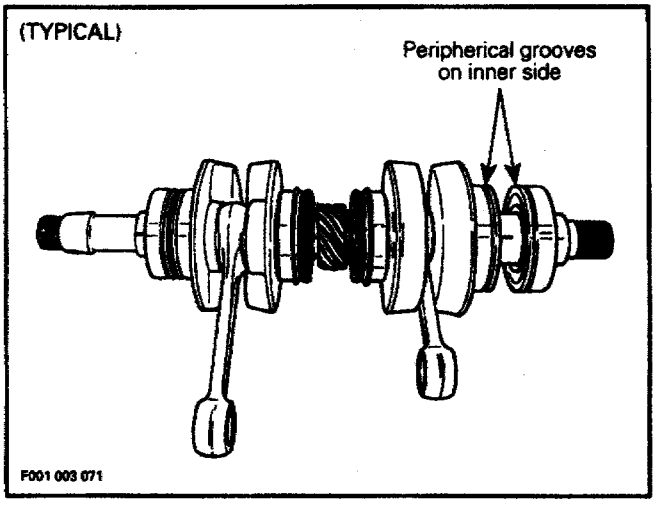


NOTE : Be sure to install labyrinth sleeve with its hollow side facing PTO side outer bearing.



Slide outer bearing until it touches sleeve.

Install bearings so that their peripherical 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 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 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. Make sure drive pins of bearings are properly installed in crankcase recesses.

Position crankcase halves together and hand-tighten bolts.

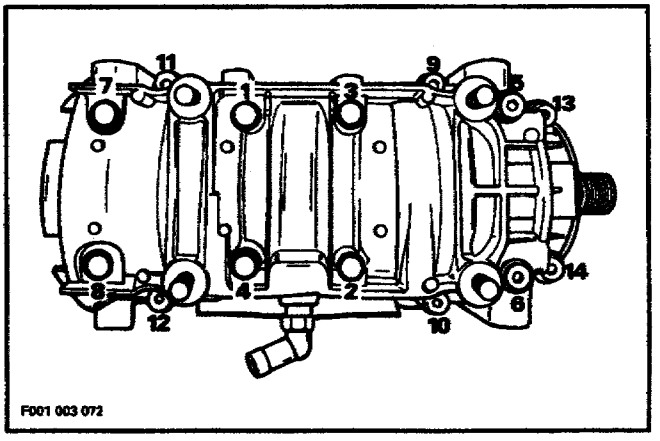
CAUTION : Temporarily install armature plate to align crankcase halves with each other.

4,5, Screw

Apply Loctite 515 on screw threads and synthetic grease below head screws.

3,4,5, Screw

Torque crankcase screws to 24 N•m (17 lbf•ft) as per following illustrated sequence.



6, Stud

At assembly in crankcase, apply Loctite 271 (red) on stud threads. Torque to 12 N•m (9 lbf•ft)

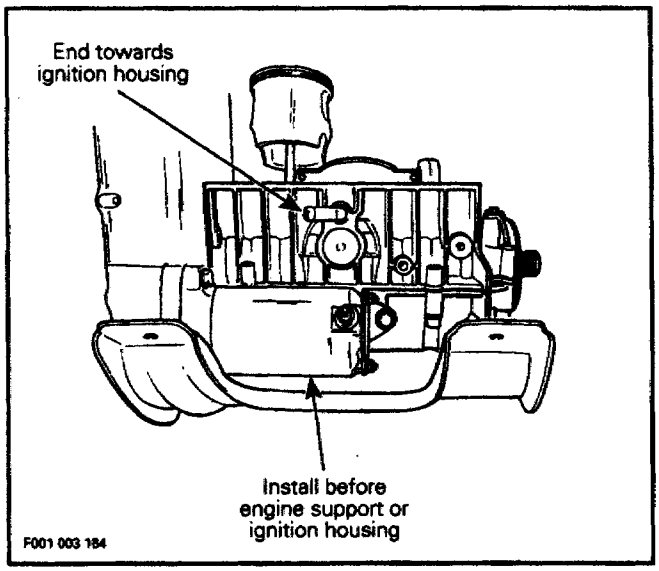
Finalizing Assembly

24, Oil Outlet Fitting

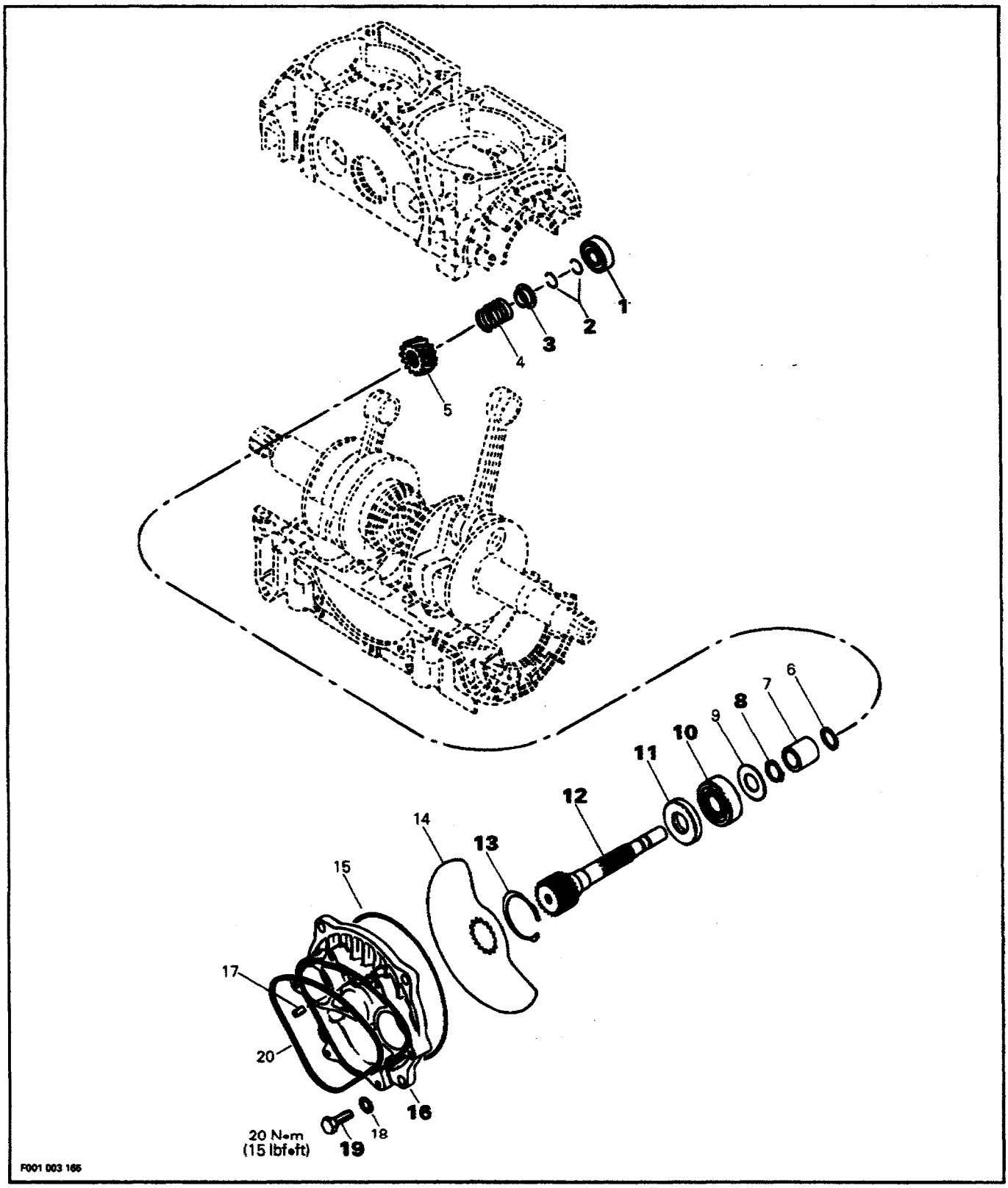
If oil outlet fitting has been removed from crankcase, reinstall it with its end pointing towards ignition housing. Apply Loctite PST 592 on fitting threads.

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

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



ROTARY VALVE



COMPONENTS

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

GENERAL

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

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

Bottom end must be opened to remove rotary valve shaft.

DISASSEMBLY

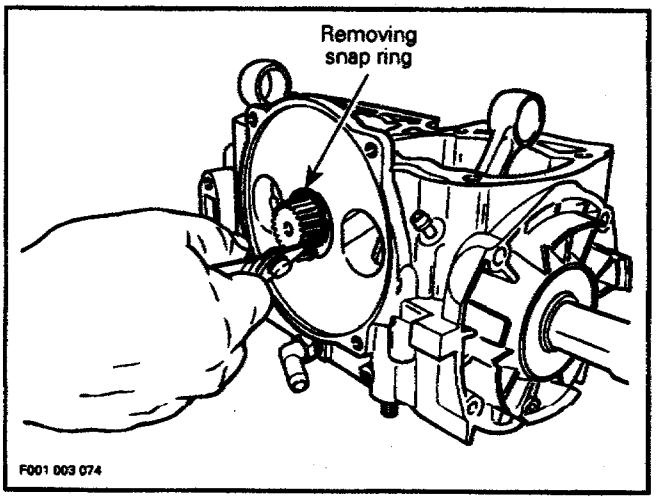
16,19, Rotary Valve Cover and Screw

Unscrew 4 retaining screws and withdraw rotary valve cover and valve.

NOTE : On XP model, it is necessary to withdraw carburetors prior removing rotary valve cover. Refer to FUEL SYSTEM 05-03 then refer to **carburetor removal**.

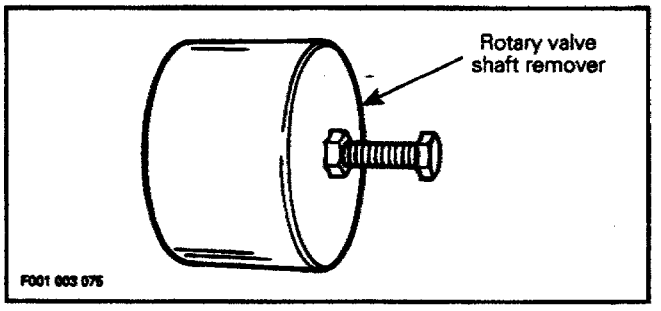
12,13, Rotary Valve Shaft and Snap Ring

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

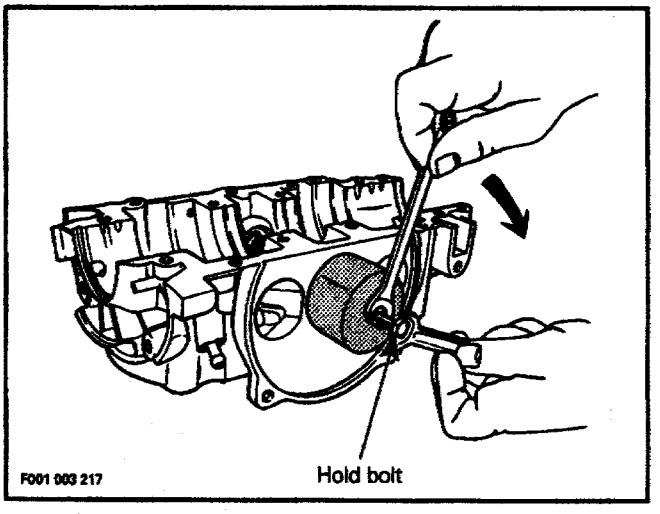


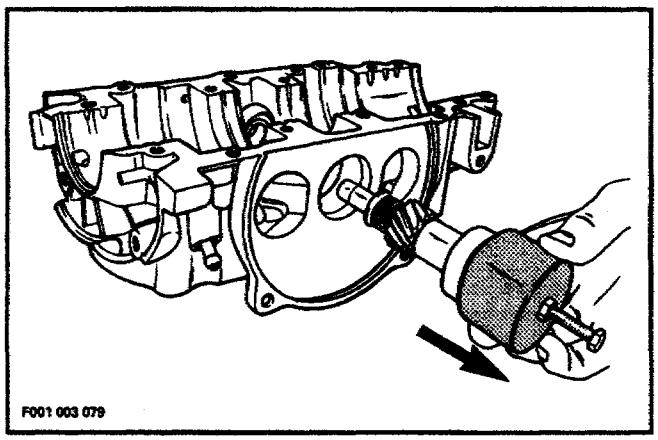
CAUTION : Bottom end must be opened to remove rotary valve shaft.

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



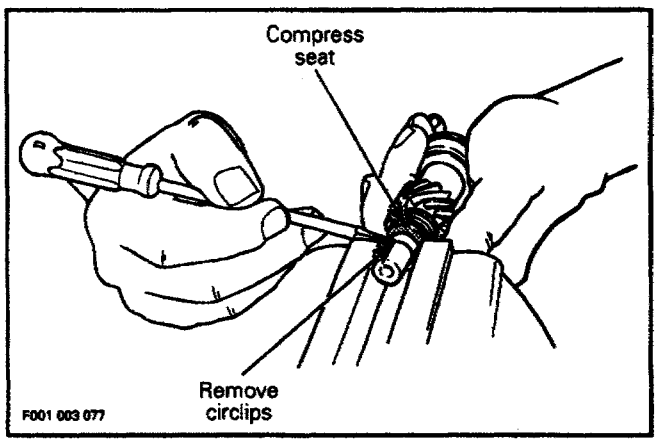
Place puller over rotary valve shaft end and screw on puller bolt into shaft. While retaining bolt with a wrench, turn puller nut CLOCKWISE until shaft comes out.





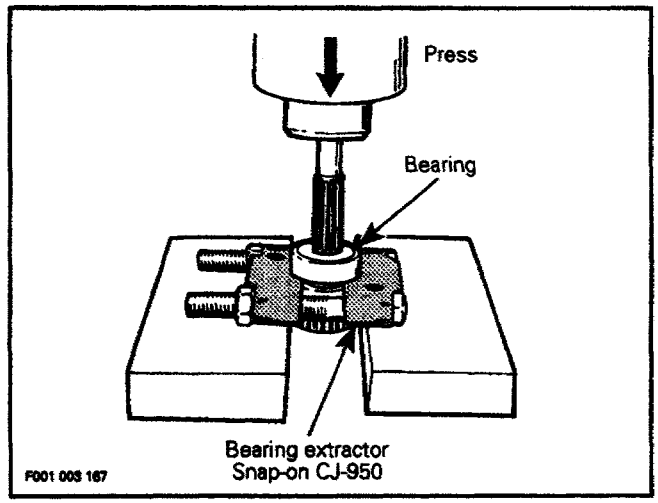
2,3, Circlip and Spring Seat

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



8,10, Snap Ring and Bearing

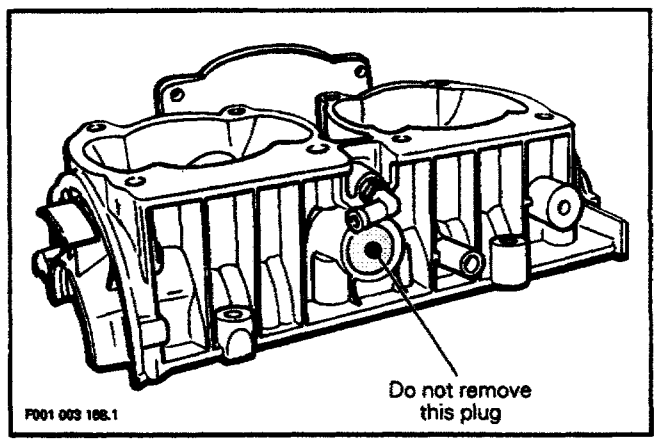
To remove bearing use a bearing extractor such as Snap-on # CJ-950 as illustrated. Slide off distance sleeve, remove snap ring and press shaft out.



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

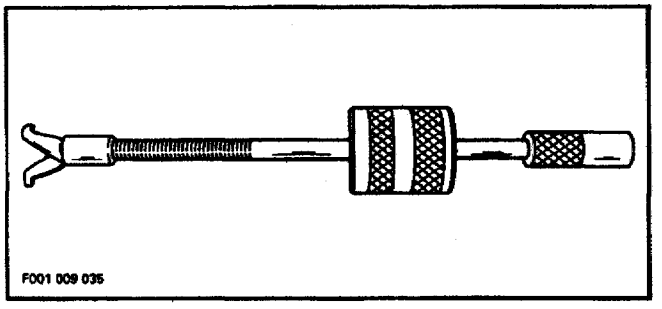
1, Bearing

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



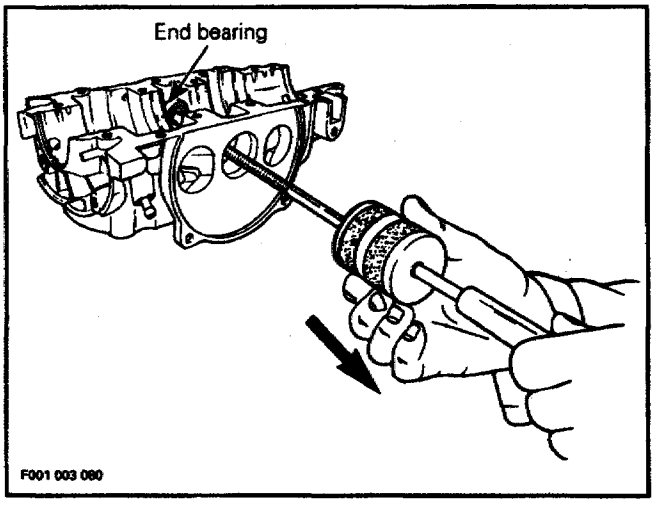
End bearing can be easily removed using the following suggested tool.

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 Clearance	0.25-0.35 mm (.010-.014 in)	0.35 mm (.014 in)
Rotary Valve Shaft Deflection	N.A.	0.08 mm (.003 in)

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

Rotary Valve / Cover Clearance

There is a choice of 2 measuring methods.

One with a 45° feeler gauge, the other one with solder.

The clearance between the rotary valve and the cover must be 0.30 ± 0.05 mm (0.012 ± 0.002 in).

NOTE : If the clearance is below 0.25 mm (0.010 in) this could create an overheating situation and if the clearance is over 0.35 mm (0.014 in) this could create a hard starting situation.

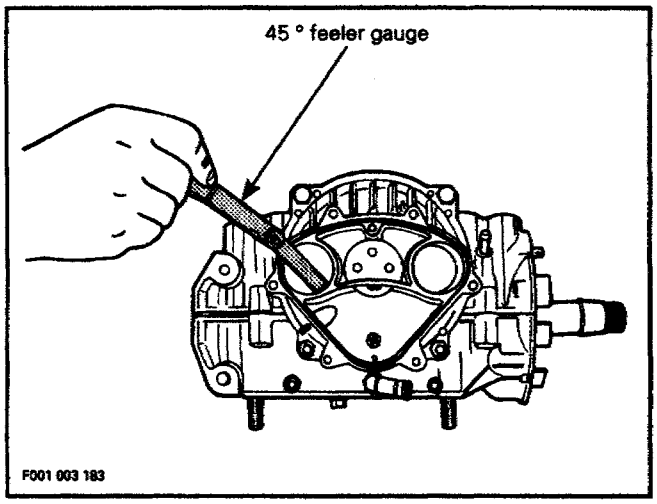
45° Feeler Gauge Method

Remove rotary valve cover and its O-ring.

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

Feeler gauge blade from 0.25 mm (.010 in) to 0.35 mm (.014 in) thickness should fit between rotary valve and cover.

Insert feeler gauge blade through cover inlet ports to verify clearance. At least verify clearance at 2 different places in each port.



Solder Method

Remove rotary valve cover and its O-ring.

Use the following type of solder :

— rosin core

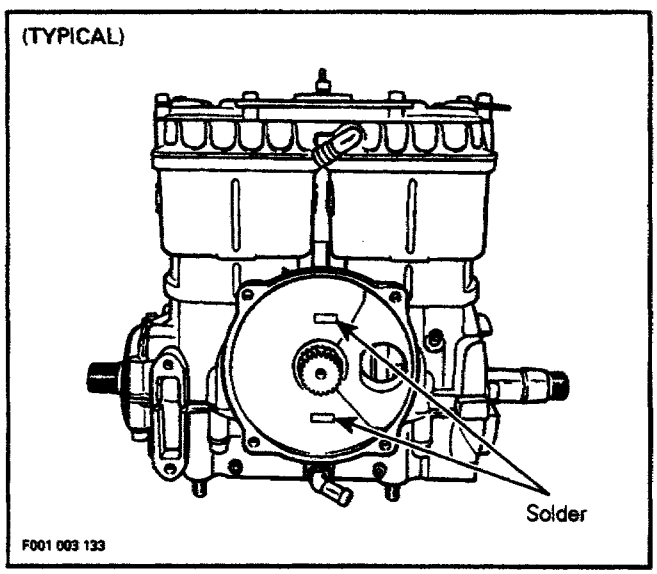
— diameter : 0.8 mm (0.032 in)

— electronic application (available at electronic stores)

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

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

Remove cover then clean and measure compressed solder thickness, it must be within the specified tolerance 0.30 ± 0.05 mm (0.012 ± .002 in).



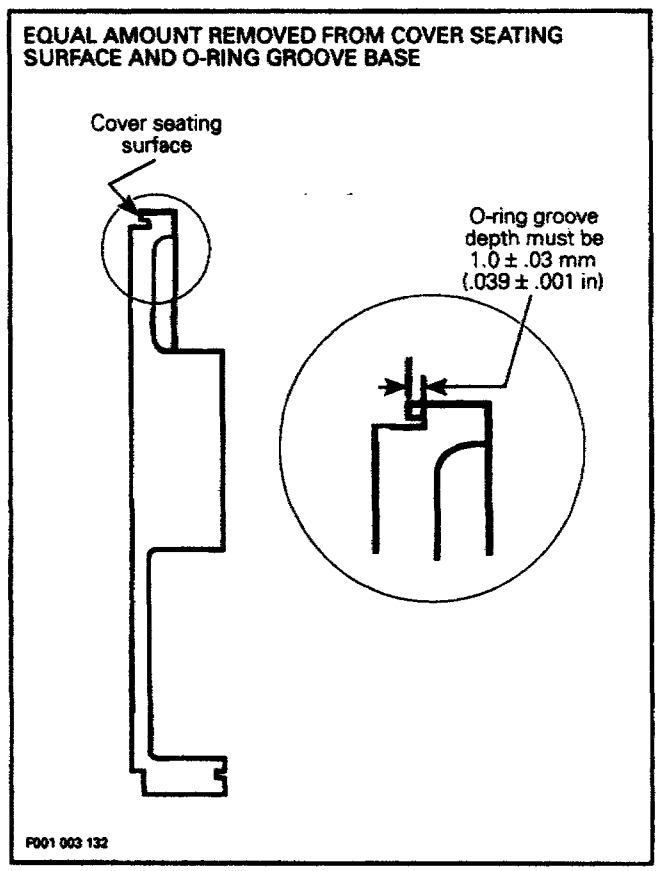
If rotary valve cover clearance is out of specification, machine rotary valve cover seating surface or replace the cover.

Machining Information

The amount of material over tolerance must be removed from the rotary valve cover seating surface.

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

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



Reverify the clearance.

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

NOTE : If rotary valve crankcase surface is worn, it is possible to have it rework at the factory. Contact your dealer or distributor.

Rotary Valve Shaft Gear Backlash

Remove PTO flywheel guard.

Remove spark plugs, rotary valve cover and valve.

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

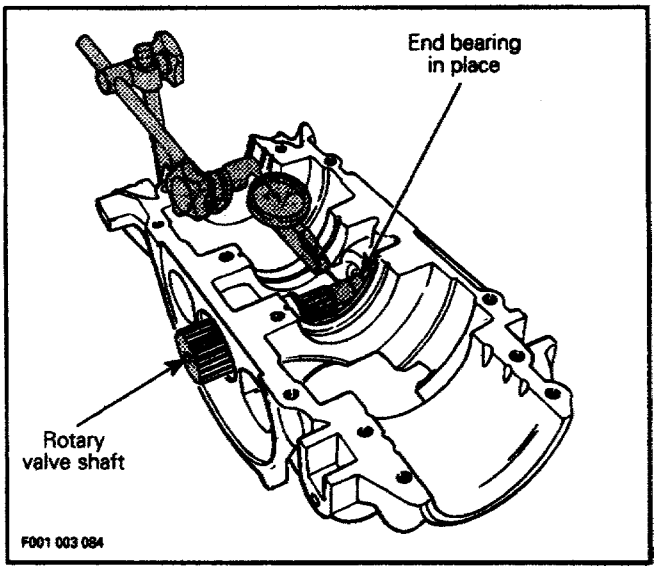
Backlash must be even at all positions. Otherwise overhaul engine to find which part is faulty (gear, rotary valve shaft or crankshaft with excessive deflection).

Rotary Valve Shaft Deflection

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

NOTE : End bearing must be in crankcase half.

Measure shaft deflection near gear mounting area.



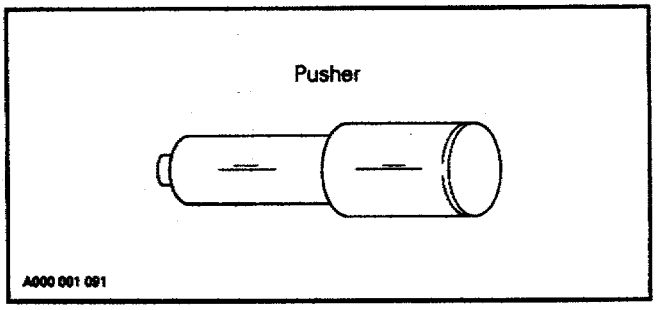
Deflection must not exceed specified value. Replace shaft as necessary.

ASSEMBLY

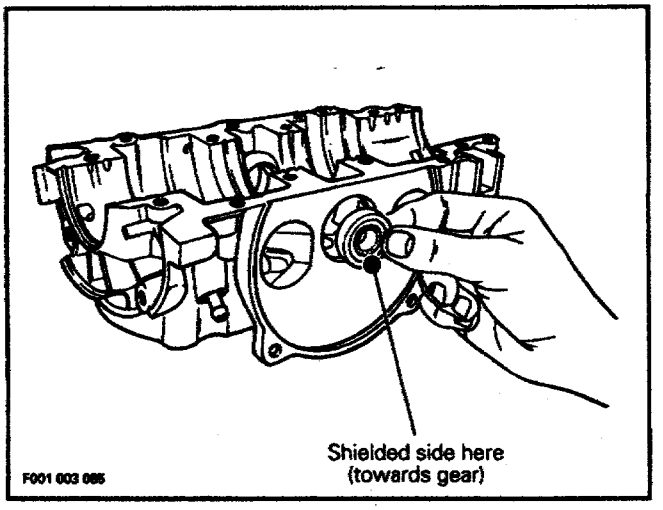
Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

1, Bearing

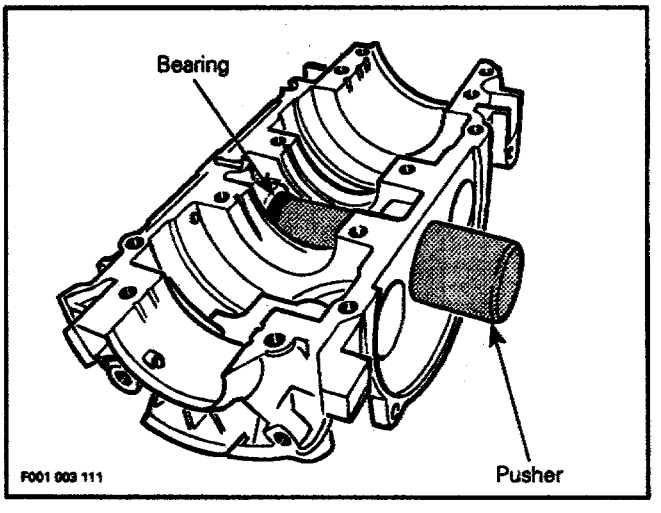
To install end bearing in crankcase, use a pusher (P / N 290 876 500).



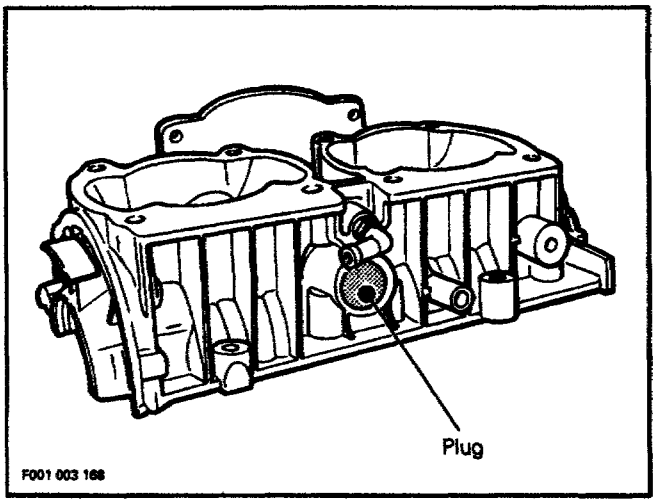
Position ball bearing shielded side towards rotary valve.



Push bearing until it stops on its seat.



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



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

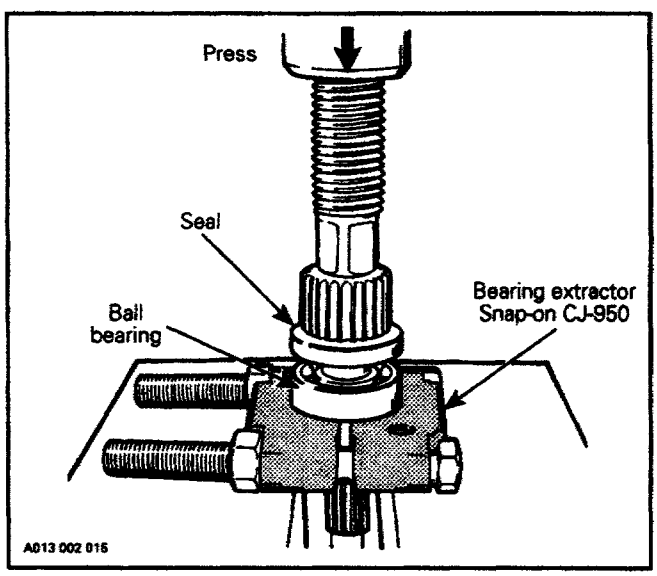
Apply Loctite Primer "T" and Loctite 648 (green) inside crankcase hole, then press plug into crankcase.

11,12, Seal, Rotary Valve Shaft

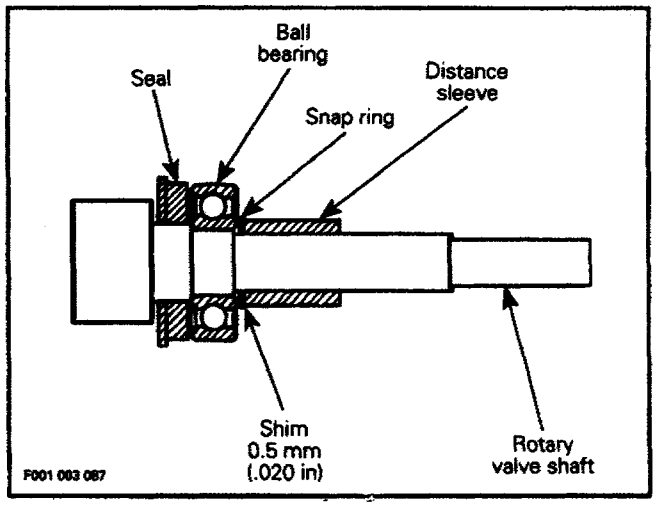
Apply lithium grease on seal lips. Position seal with shielded portion against shaft splines.

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

Install ball bearing as illustrated.



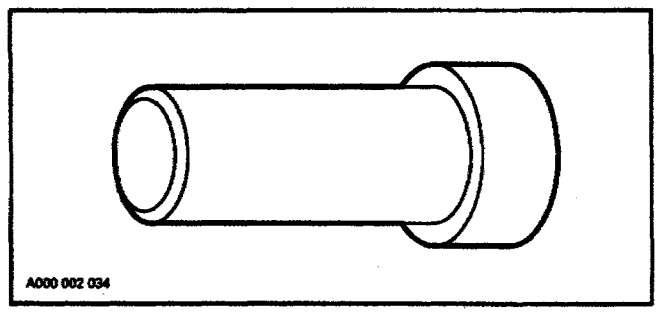
Install shim, snap ring and slide distance sleeve on shaft.



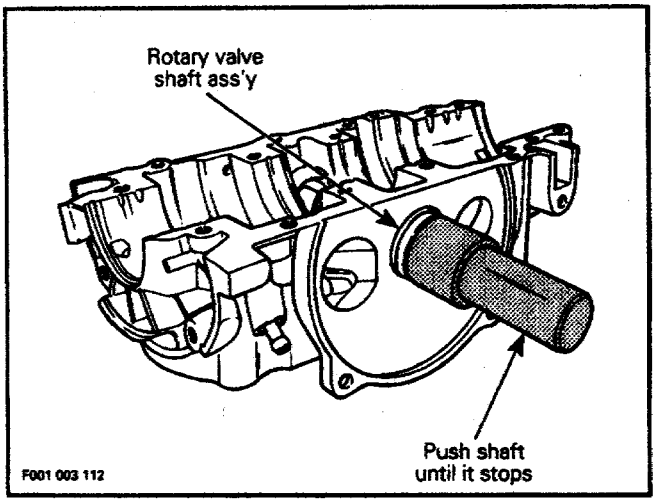
12,13, Rotary Valve Shaft Ass'y and Snap Ring

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

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



Push shaft until its stops on bearing seat.



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

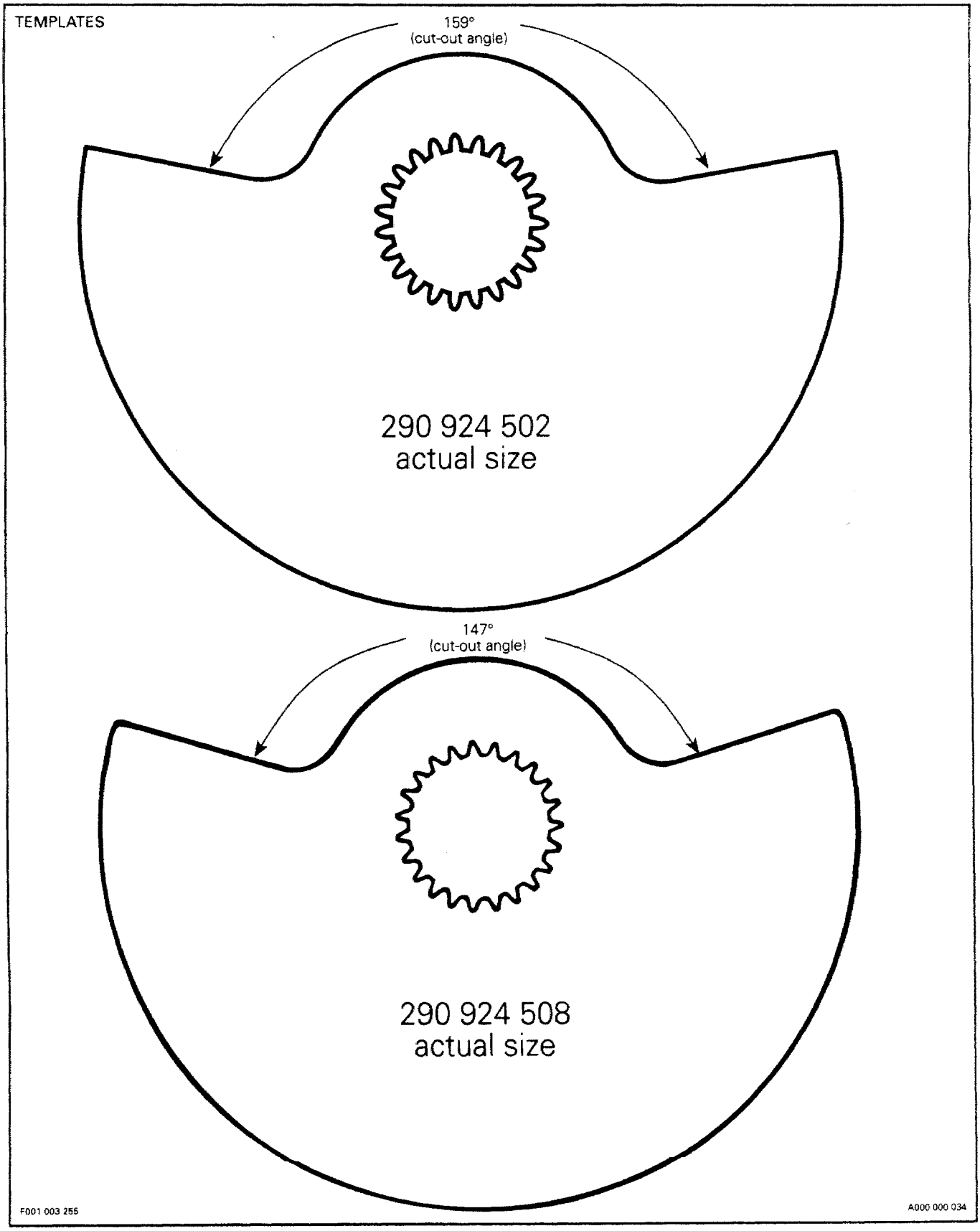
ROTARY VALVE

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

Identification of the rotary valve

Watercraft Model	Rotary Valve P / N	Valve Duration
SP (5870) SPI (5872) SPX (5871) XPI (5855) GTS (5814) GTX (5862) EXPLORER (5821).	290 924 508	147°
XP (5854)	290 924 502	159°

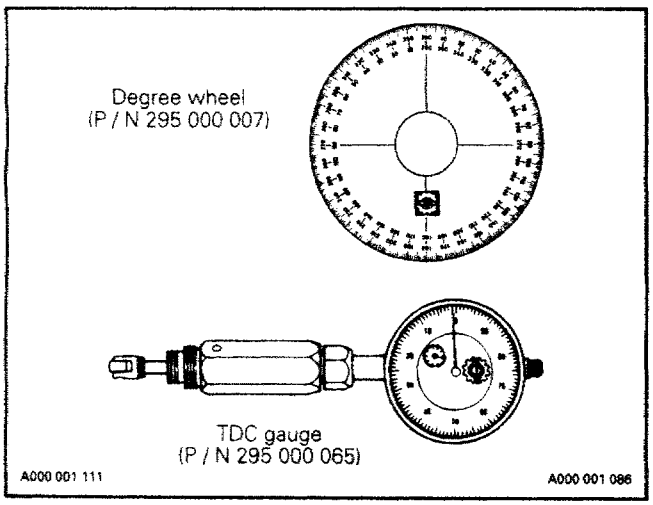
There is no identification code on the valves. To find out the duration, place an angle finder on the valve and measure the valve cut-out angle or use the following templates.



Rotary Valve Timing

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

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



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

WATERCRAFT MODEL	TIMING	
	OPENING BTDC	CLOSING ATDC
SP (5870) SPI (5872) SPX (5871) XPI (5855) GTS (5814) GTX (5862) EXPLORER (5821)	130° ± 5	65° ± 5
XP (5854)	149° ± 5	

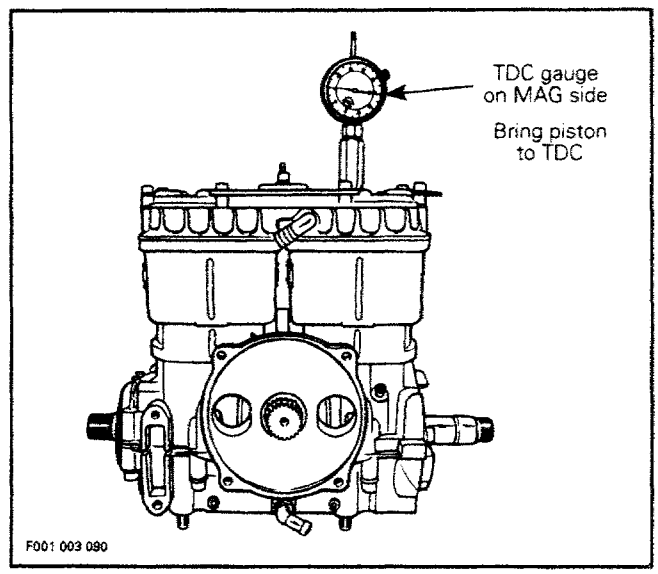
For the following instructions, let's use these specifications as example :

OPENING : 130° BTDC

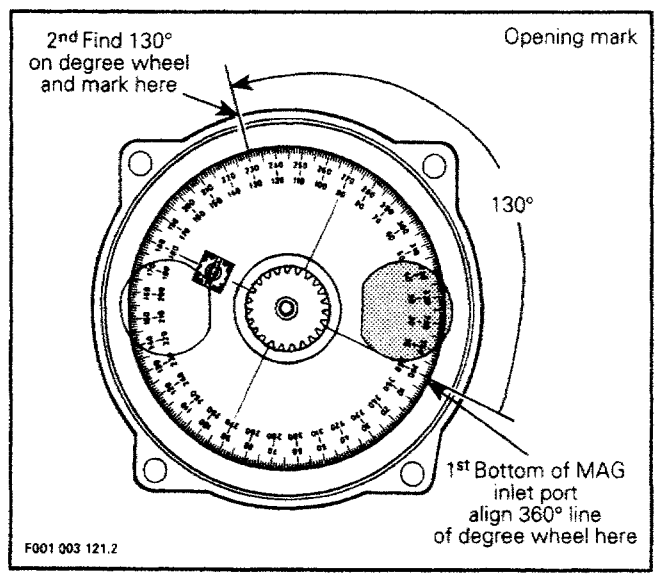
CLOSING : 65° ATDC

Proceed as follows :

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

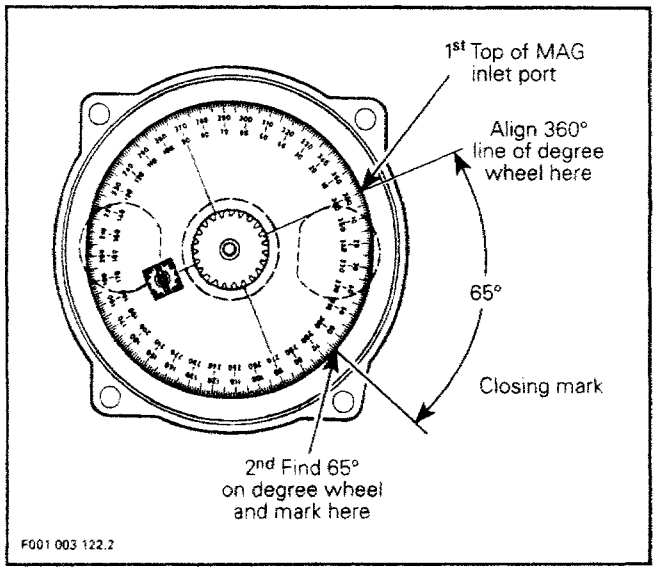


— For **opening** mark, first align 360° line of degree wheel with BOTTOM of **MAG side** inlet port. Then, find 130° line on degree wheel and mark crankcase at this point.



○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 65° line on degree wheel and mark crankcase at this point.



— Remove degree wheel.

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

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

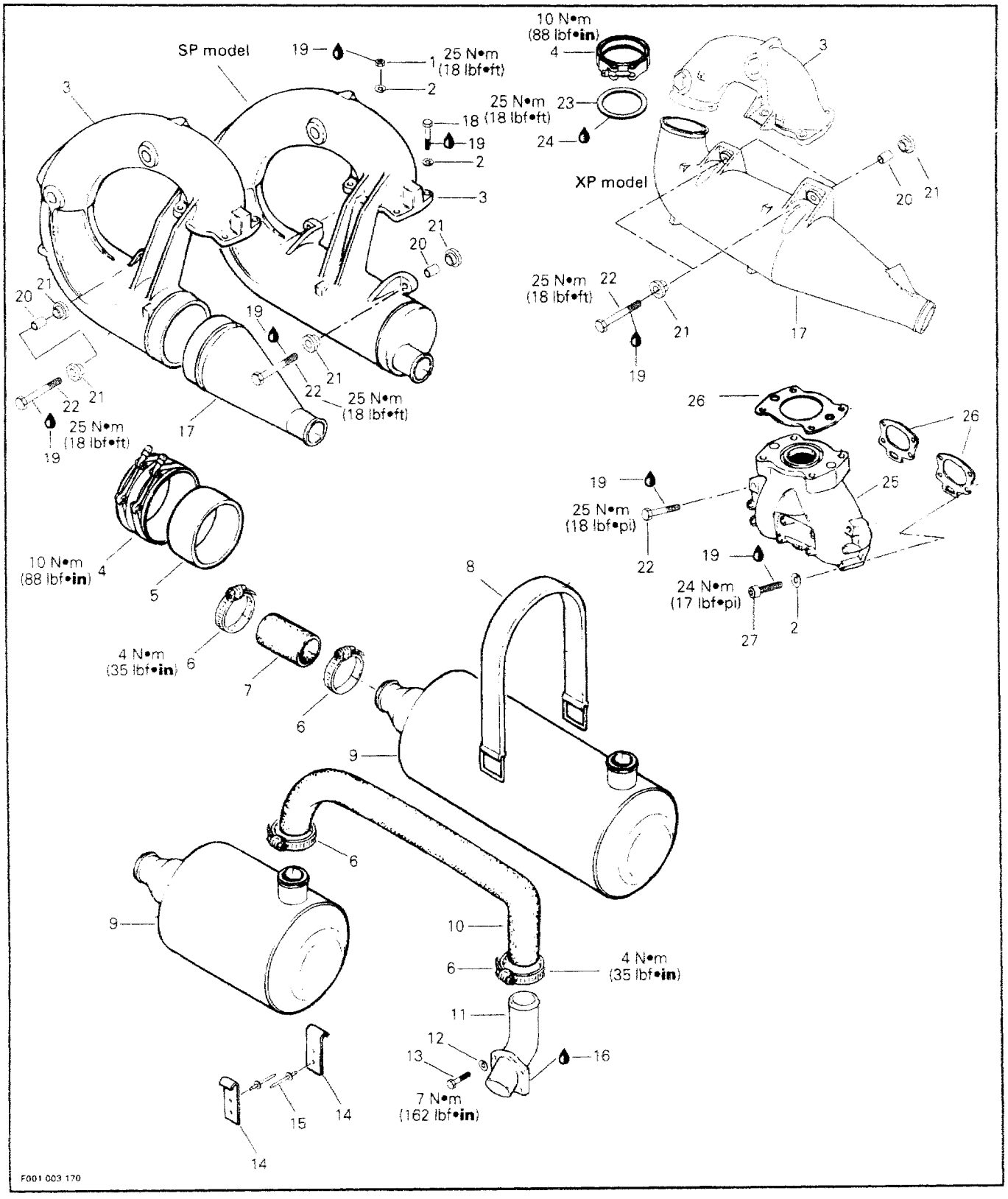
Apply SEA-DOO injection oil on rotary valve before reassembling rotary valve cover.

— Remove TDC gauge.

16,19, Rotary Valve Cover and Screw

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

EXHAUST SYSTEM



COMPONENTS

1. *Hexagonal nut M8*
2. *Lock washer M8*
3. *Tuned pipe*
4. *Exhaust clamp*
5. *Rubber collar*
6. *Gear clamp*
7. *Exhaust hose*
8. *Muffler strap*
9. *Muffler*
10. *Formed hose*
11. *Exhaust outlet*
12. *Flat washer 6 mm*
13. *Allen screw M6 x 20*
14. *Strap clip*
15. *Rivet 3/16*
16. *Loctite 598 "Ultra Black"*
17. *Tuned pipe cone*
18. *Hexagonal screw M8 x 30*
19. *Loctite 242 (blue)*
20. *Sleeve*
21. *Rubber bushing*
22. *Hexagonal screw M8 x 35*
23. *Sealing ring*
24. *Heat resistant sealant (763)*
25. *Exhaust manifold*
26. *Gasket*
27. *Allen screw M8 x 75*

TUNED PIPE REMOVAL

To withdraw tuned pipe, refer to ENGINE 03-02, then refer to **tuned pipe removal**.

TUNED PIPE REPAIR

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

Procedure

— Sand the cracked area to obtain bare metal.

— Perform a 1.50 mm (1/16 in) depth chamfer over crack.

— Use pure argon gas with 5.55 mm (3/32 in) tungsten electrode (puretung "green", zirtung "brown") and AC current.

— Use aluminum welding rod 5.55 mm (3/32 in) (# 4043), to fill crack.

— Sand welding slightly to remove material surplus.

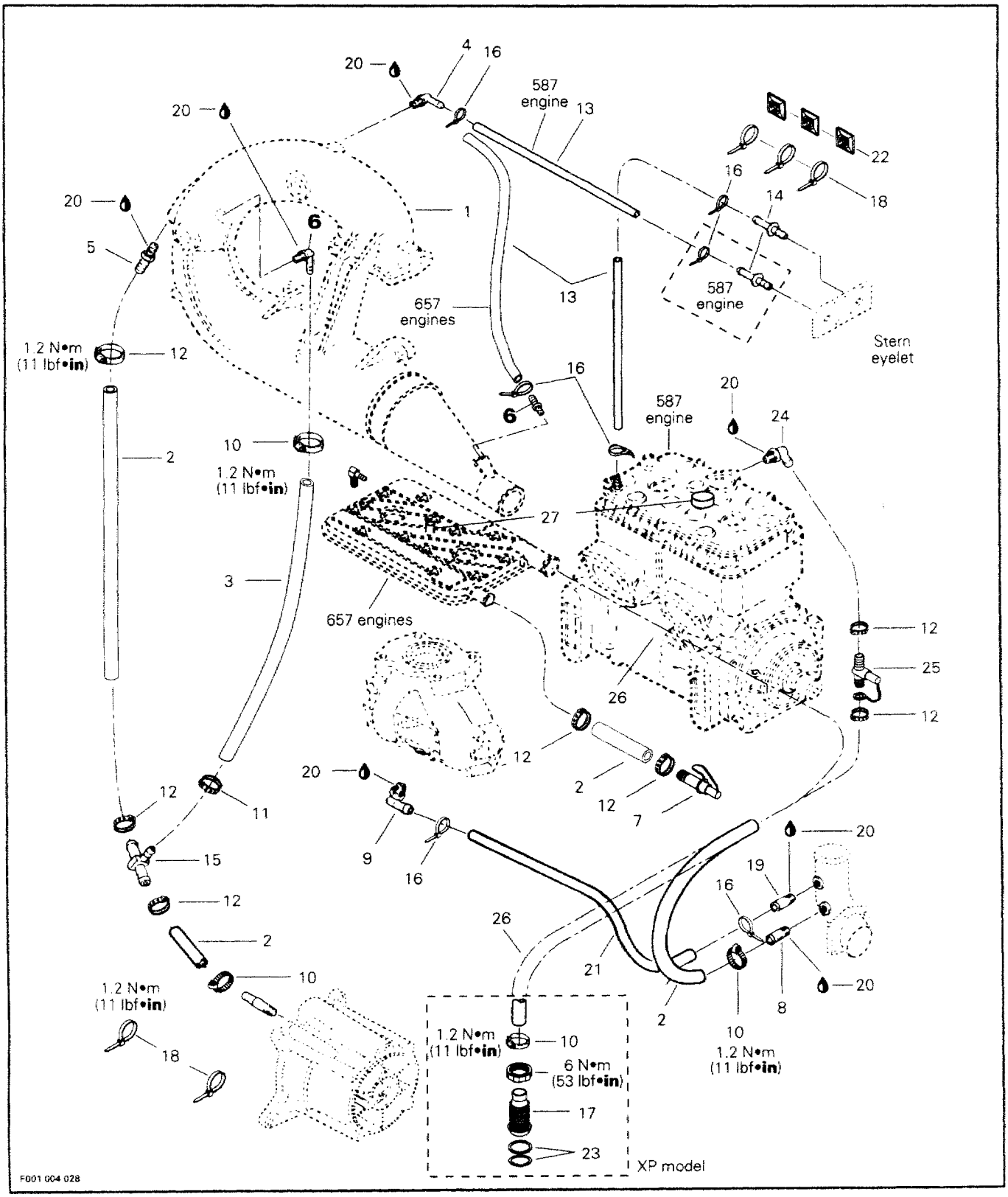
Test :

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

NOTE : Prior to verify leaks, plug all holes and pressurize tuned pipe while immerging it in water.

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

COMPONENTS



COMPONENTS

1. *Tuned pipe*
2. *Hose 12.5 mm*
3. *Hose 8 mm*
4. *Elbow fitting 90°*
5. *Male connector*
6. *Elbow fitting 90°*
7. *Flushing fitting (657 engines)*
8. *Male connector*
9. *Elbow fitting 90°*
10. *Gear clamp*
11. *Oetiker clamp*
12. *Oetiker clamp*
13. *Hose 6 mm*
14. *Bleed fitting*
15. *Tee fitting*
16. *Tie rap*
17. *Fitting (XP model)*
18. *Tie rap*
19. *Male connector*
20. *Loctite 592*
21. *Hose 8 mm*
22. *Tie-mount*
23. *Gasket*
24. *Elbow fitting 90°*
25. *Tee flushing fitting (587 engine)*
26. *Hose 20 mm (657 engines)*
27. *Thermosensor*

TECHNICAL DATA

Type :
TLCS (Total Loss Cooling System).

Coolant flow :
Pressure build-up at impeller housing (no water pump).

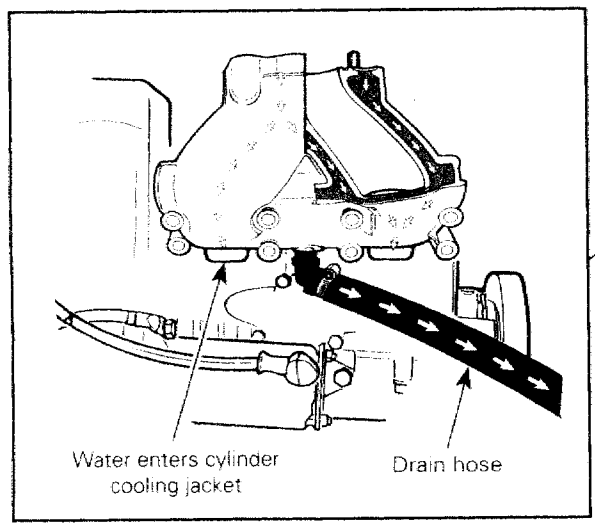
Temperature control :
Calibrated outlet fittings (no thermostat).

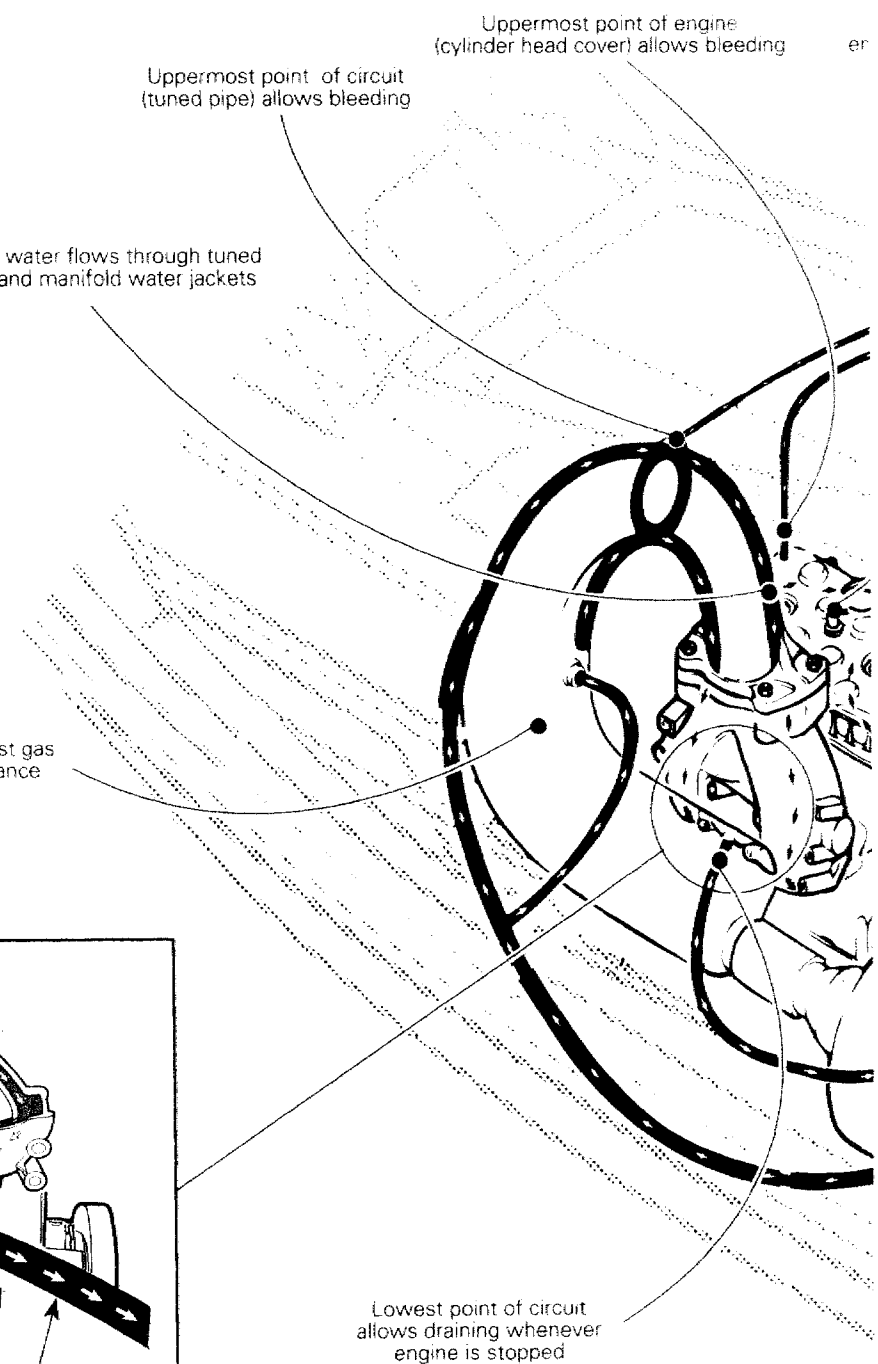
System bleeding :
Self-bleed type (hose at uppermost point of circuit and at cylinder head cover).

System draining :
Self-drain type (hose at lowest point of circuit).

System flushing :
Fitting spigot on engine water outlet hose.

Overheating beeper :
Turns on at 96-99°C (205-210°F).

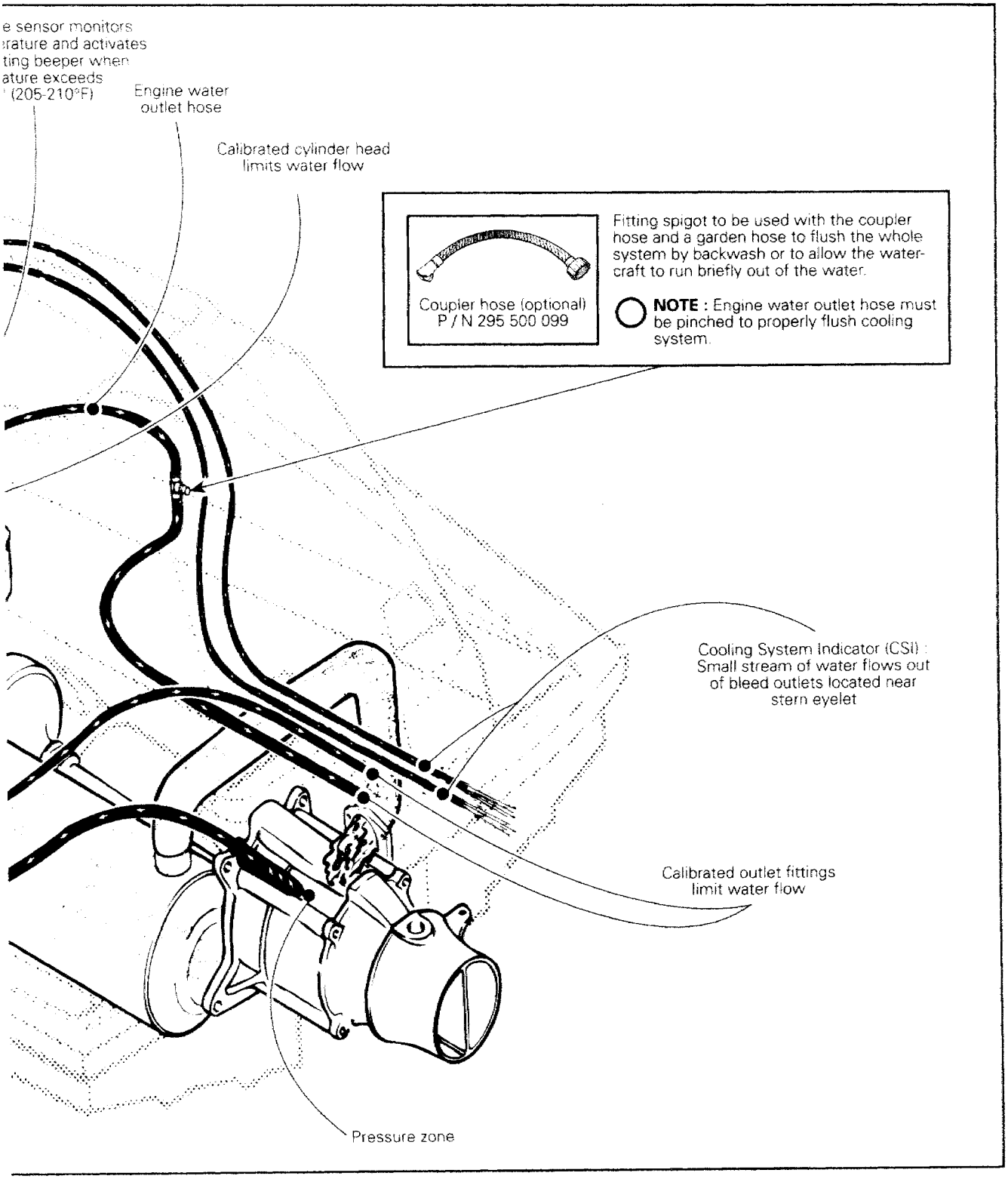




F001 004 025

CIRCUIT

587 ENGINE COOLING SYSTEM



TECHNICAL DATA

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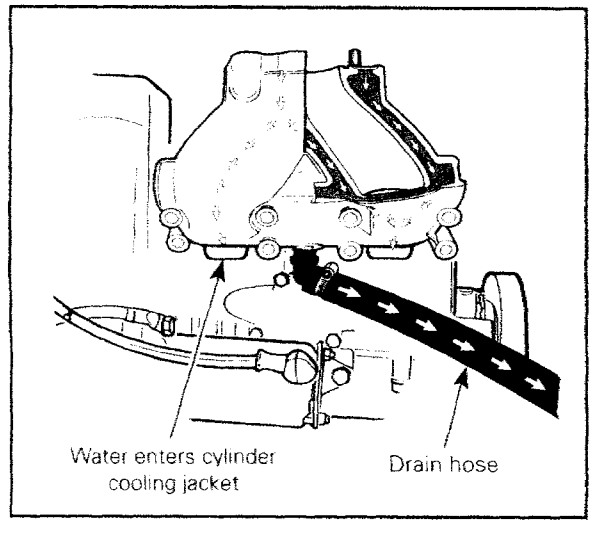
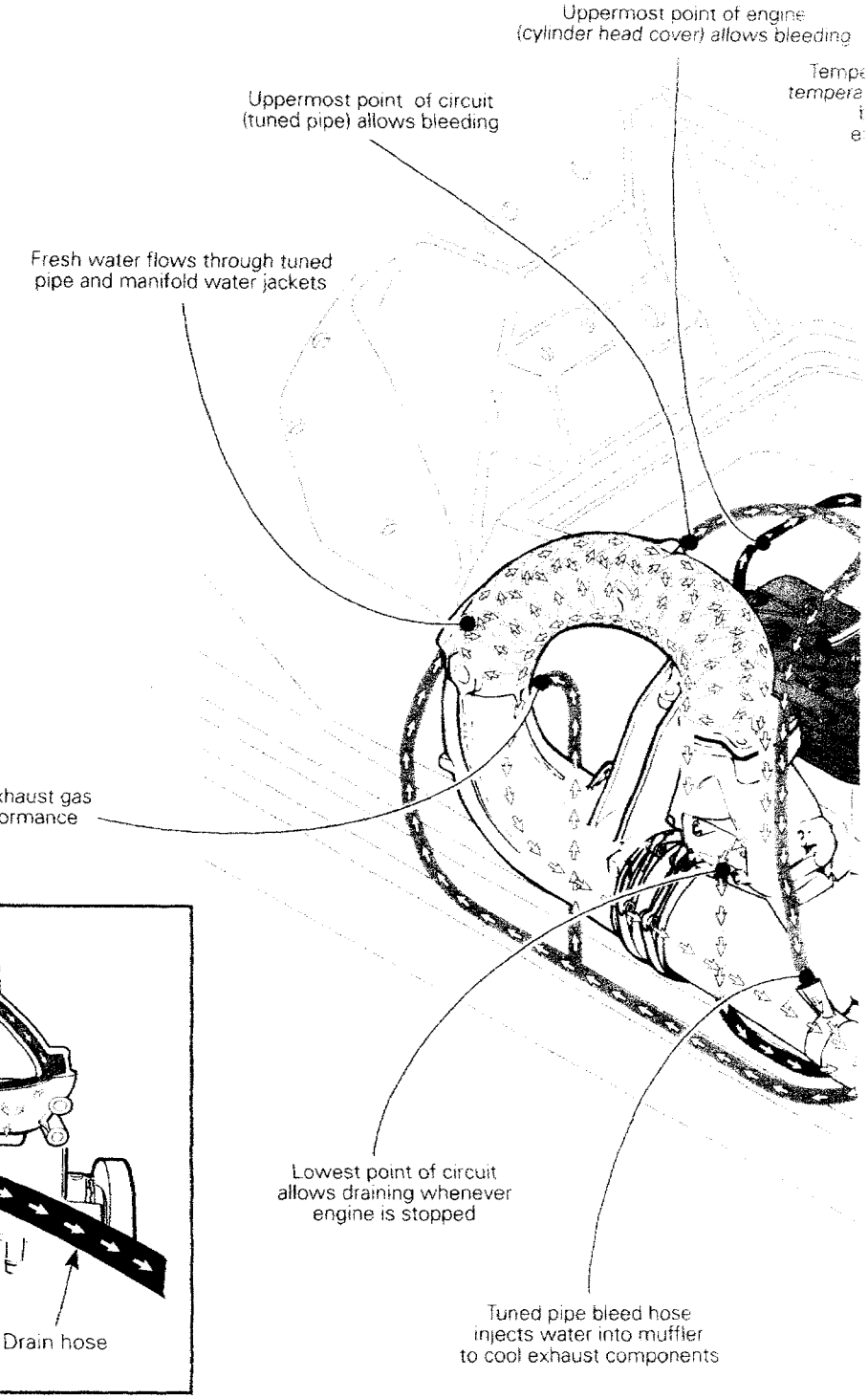
Self-drain type (hose at lowest point of circuit).

System flushing :
Fitting spigot at cylinder head.

Overheating beeper :
Turns on at 96-99°C (205-210°F).





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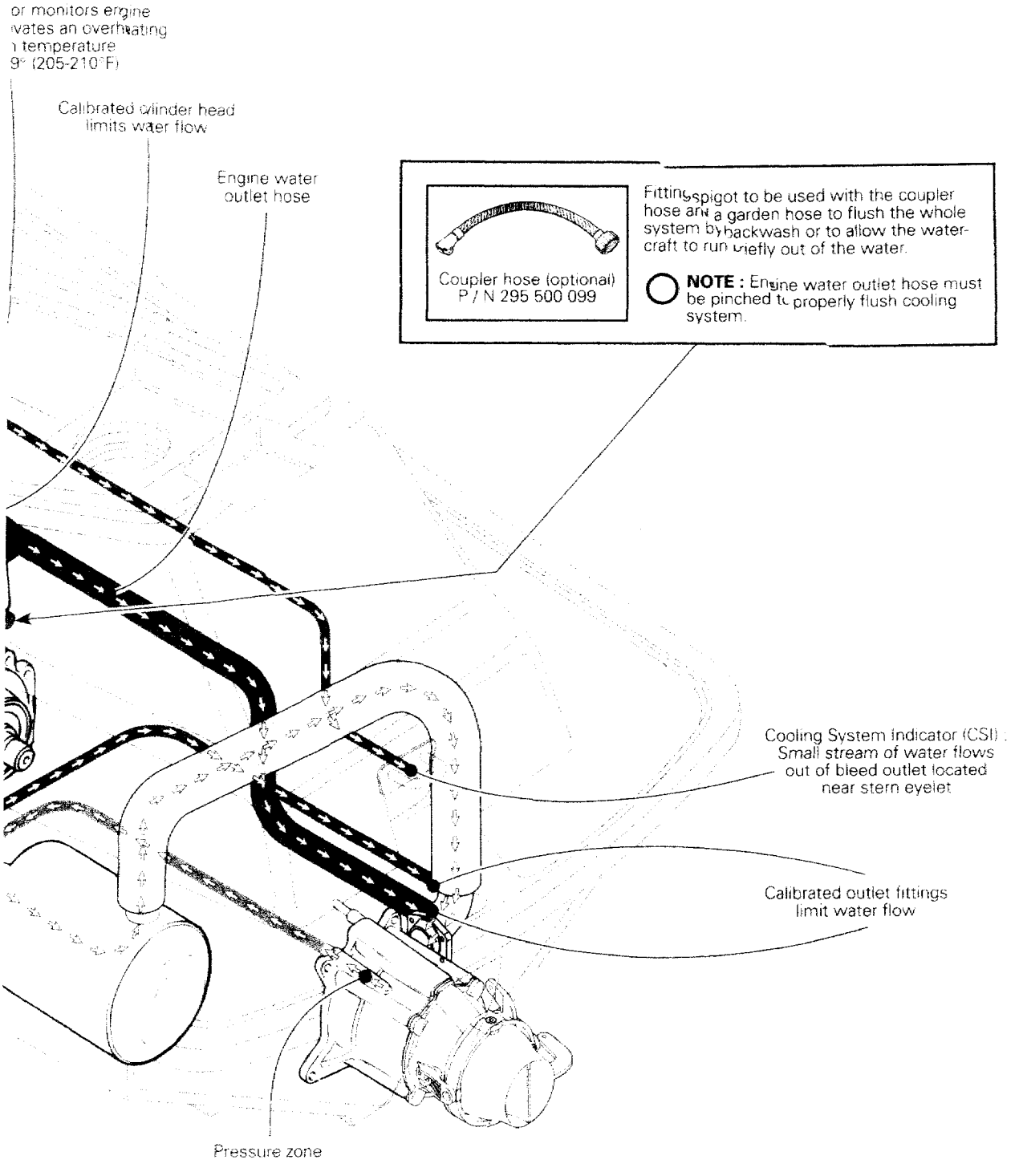
657 ENGINE COOLING SYSTEM



FLUSHING AND CARE

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

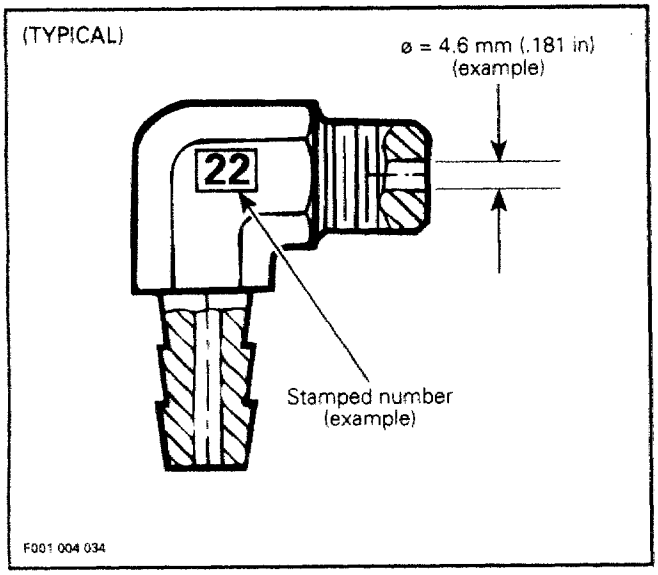
6, Elbow Fitting

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

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

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

The elbow fitting can be identified by using the 2 digits number stamped onto the fitting or by measuring its inside diameter. Refer to the following illustration and chart.



Engine model	Stamped number on fitting	Fitting P / N	Fitting inside diameter	Fitting location
587 engine	22	293 700 022	4.6 mm (.181 in)	Tuned pipe
657 engine	37	293 710 037	3.5 mm (.139 in)	Tuned pipe / tuned pipe cone

FLUSHING

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

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

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

◆WARNING : Do not touch any electrical parts or jet pump area when engine is running.

Clean jet pump by spraying water in its inlet and outlet.

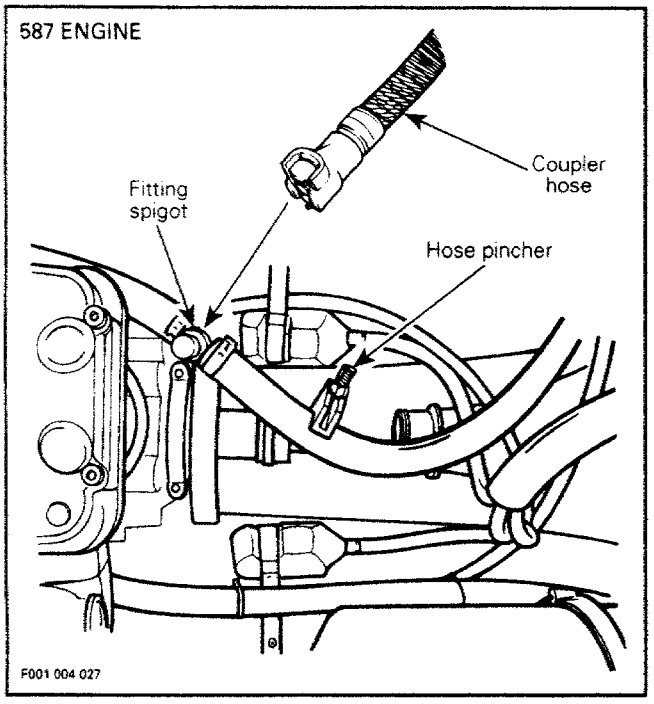
◆WARNING : Always remove safety lanyard cap from switch to prevent accidental engine starting before cleaning the jet pump area. Engine must not be running for this operation.

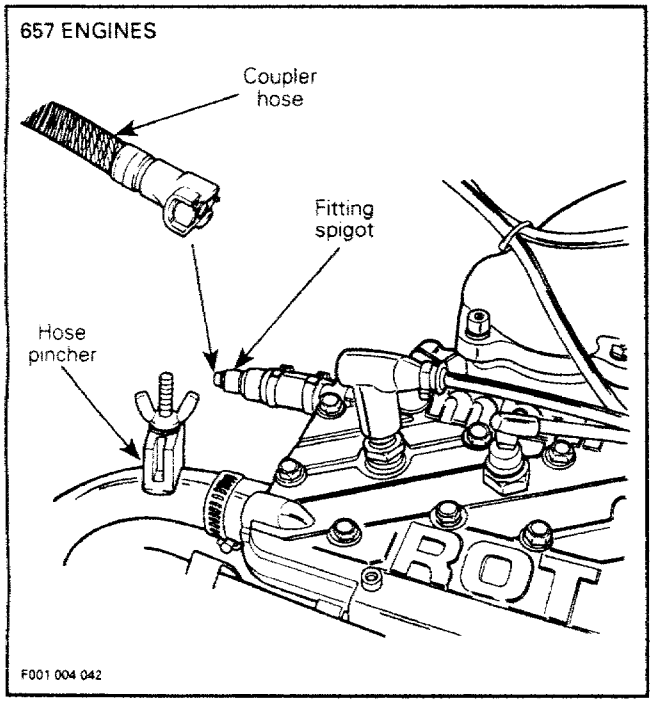
A convenient coupler hose (P / N 295 500 099) can be installed on the watercraft for flushing.

Proceed as follows :

1. Remove seat to allow access to cooling system.
2. Remove dust cap from fitting spigot and attach coupler hose. Make sure coupler hose is properly locked to fitting spigot.
3. Attach other end of coupler hose to a garden hose. **Do not open water tap yet.**
4. Install a hose pincher on water outlet hose.

○NOTE : This prevents water from exiting through exhaust socket. Remove hose pincher after flushing operation.





5. 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.

6. Run the engine about 5 minutes at a fast idle around 3500 RPM.

CAUTION : Never run engine longer than 5 minutes. Drive line seal has no cooling when watercraft is out of water.

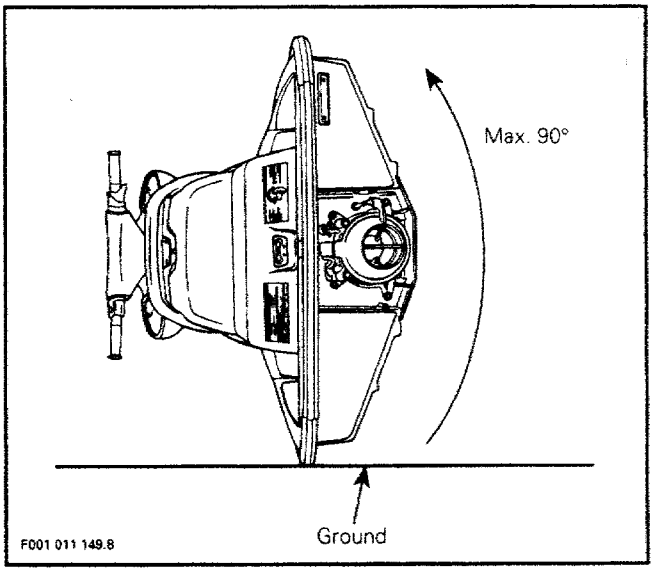
7. Close the water tap **then** stop the engine.

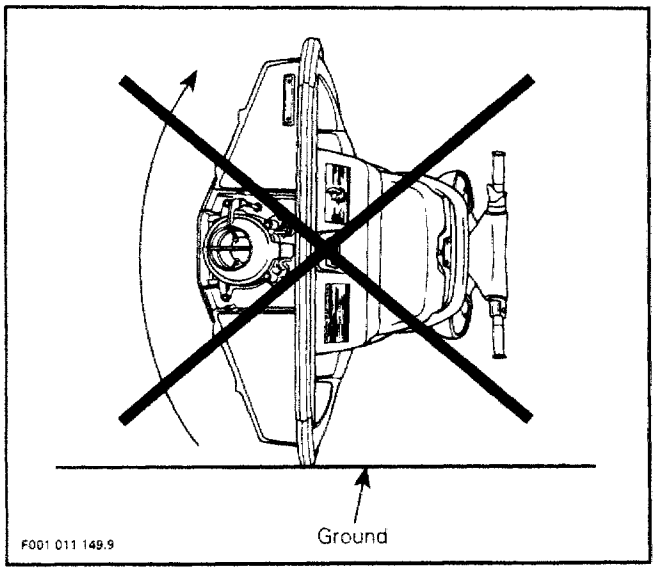
CAUTION : Always close the water tap before stopping the engine. Follow this procedure exactly otherwise severe engine damage could occur.

8. Unlock and remove coupler hose. Reinstall dust cap over fitting spigot.
9. Wipe off any residual water on the engine.
10. Reinstall seat and properly latch.

CARE

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





2. Check joints for leaks to avoid water accumulation in the bilge.
3. Do not modify hose or socket size as coolant flow could be altered.
4. When engine is running, water must flow from bleed outlet(s) indicating that water circulates.
5. For hose clamp installation, use special pliers (P / N 295 000 070).
6. When installing hoses onto fittings or when troubleshooting for water intake in the bilge area, confirm that all hoses are properly secured to the fittings.
7. Check overheating beeper operation by jumping terminal of thermosensor wire to ground. Beeper must operate.

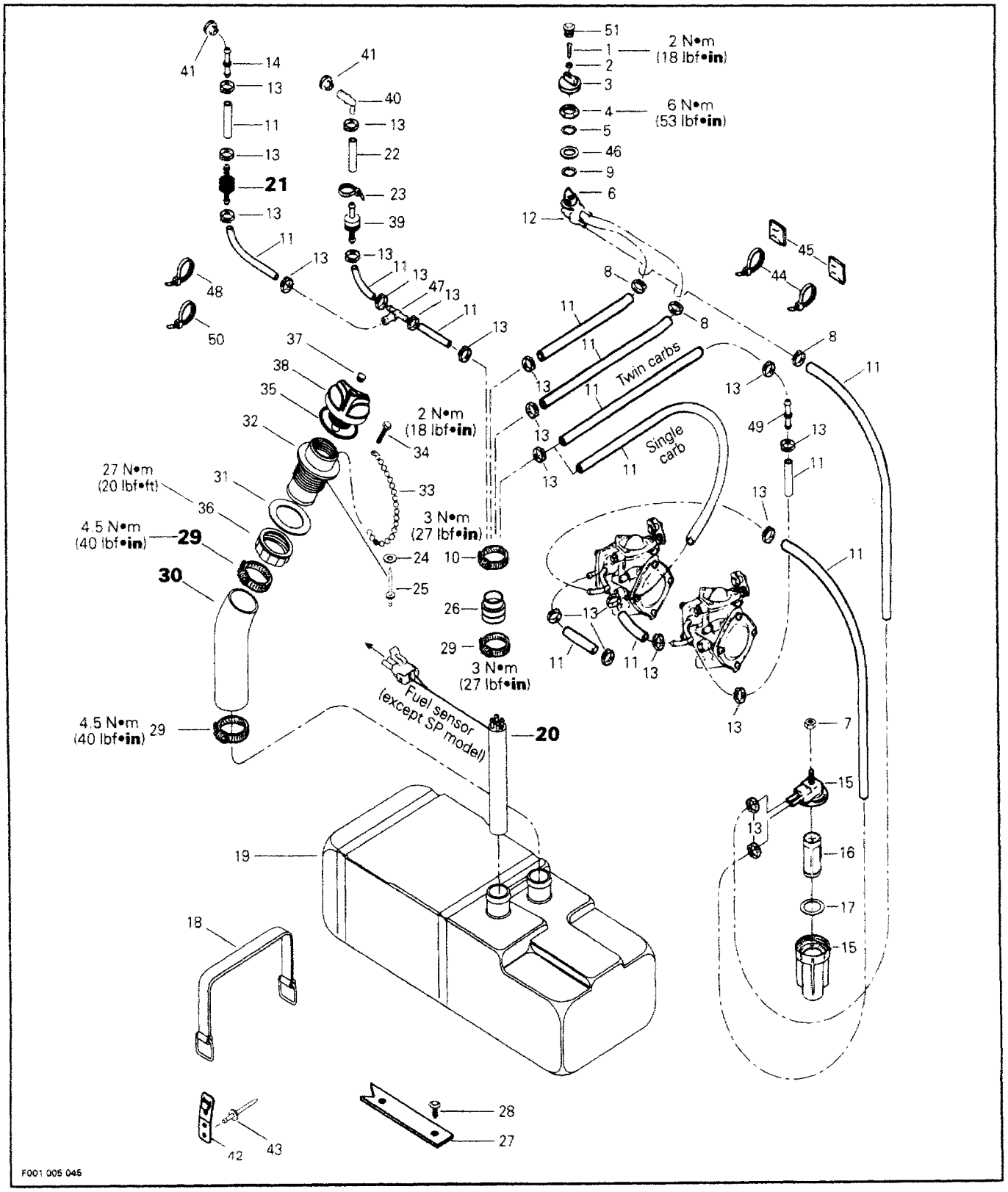
NOTE : With the safety lanyard removed, electrical system can be activated for approximately 30 seconds by depressing the starting button.

At every verification of overheating beeper always apply dielectric grease on thermosensor connector.

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

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

FUEL CIRCUIT



COMPONENTS

1. *Countersunk Phillips screw M4 x 8*
2. *Flat washer 4 mm*
3. *Fuel valve knob*
4. *Nut M22*
5. *Gasket*
6. *Fuel valve*
7. *Lock nut M6*
8. *Oetiker clamp*
9. *Valve gasket*
10. *Gear clamp*
11. *Hose 6 mm*
12. *Valve plate*
13. *Oetiker clamp*
14. *Straight fitting*
15. *Fuel filter housing*
16. *Fuel filter*
17. *O-ring*
18. *Fuel tank strap*
19. *Fuel tank*
20. *Baffle pick up*
21. *Pressure relief valve*
22. *Hose 6 mm*
23. *Tie rap*
24. *Flat washer 3 mm*
25. *Rivet*
26. *Adapter*
27. *Rubber pad*
28. *Dart*
29. *Gear clamp*
30. *Filler neck hose*
31. *Gasket*
32. *Filler neck*
33. *Chain*
34. *Phillips screw M3.9 x 9.5*
35. *Gasket*
36. *Filler neck nut*
37. *Cap*
38. *Fuel tank cap*
39. *Check valve*
40. *Elbow fitting 90°*
41. *Grommet*
42. *Strap clip*
43. *Rivet 3/16 x .565*
44. *Tie rap*
45. *Tie mount*
46. *Washer*
47. *Tee fitting*
48. *Tie rap*
49. *Straight fitting*
50. *Tie rap*
51. *Plug*

GENERAL

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

29, 30, Gear Clamp and Filler Neck Hose

Verify fuel filler neck hose for damage. Always ensure that clamps are well positioned and tightened. Torque clamps to 4.5 N•m (40 lbf•**in**).

21, Pressure Relief Valve

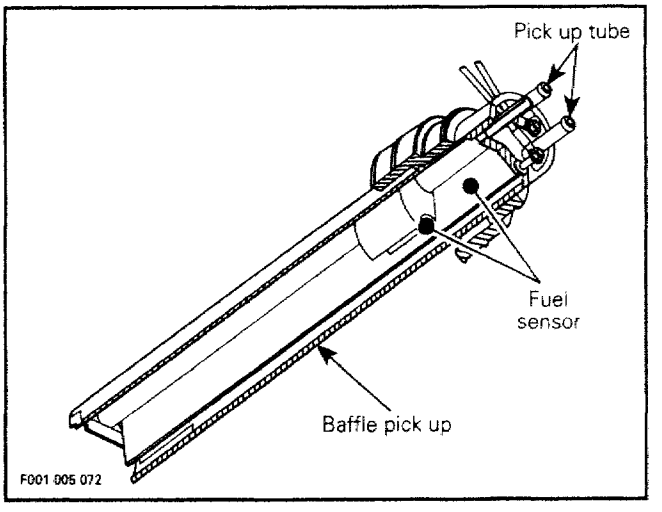
This valve will eliminate fuel spillage when the watercraft is upside down. If pressure is built up in fuel system the valve should open at 10 kPa (1.5 PSI) to release the pressure.

◆ **WARNING : If pressure relief valve is stuck, the pressure in fuel system will build up and it may cause fuel leakage in engine compartment.**

NOTE : It is a one way valve with an arrow to indicate the air flow.

20, Baffle Pick Up

NOTE : The baffle pick up has an integrated fuel sensor on models which have a fuel gauge.



Disconnect black negative cable, then red positive cable of battery.

◆ WARNING : Always disconnect battery cables exactly in the specified order, black negative cable first. Electrolyte or fuel vapors can be present in the engine compartment and a spark might ignite them and possibly cause personal injuries.

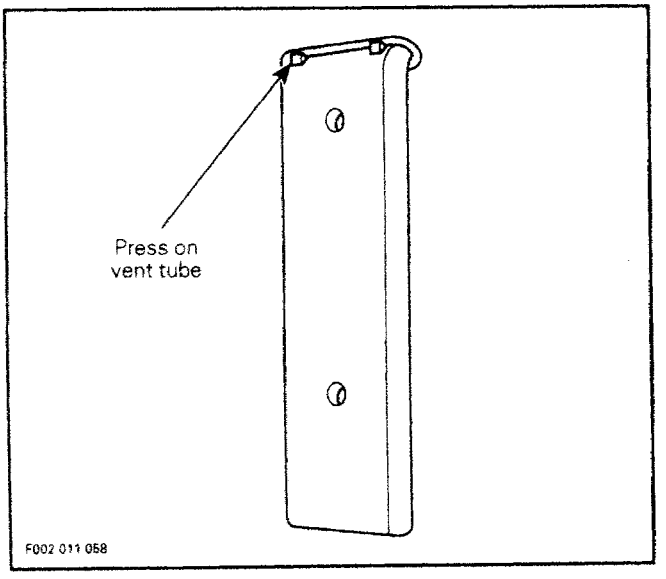
Empty fuel tank.

◆ WARNING : Fuel is inflammable 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 storage basket from watercraft.

GTS and GTX Models Only

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



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

All Models Except Explorer

Disconnect filler neck hose from fuel tank.

Remove retaining straps from fuel tank and move tank forward.

Explorer Model Only

Remove windscreen from console.

Remove steering stem arm and then remove steering cable from steering support.

Disconnect reverse cable.

Disconnect engine overheating beeper and engine stop switch wiring harnesses.

Remove 4 screws and 8 washers which hold console to body then move console aside.

Remove air blower motor.

Disconnect filler neck hose from fuel tank.

Remove battery and its support.

Remove retaining strap from oil reservoir.

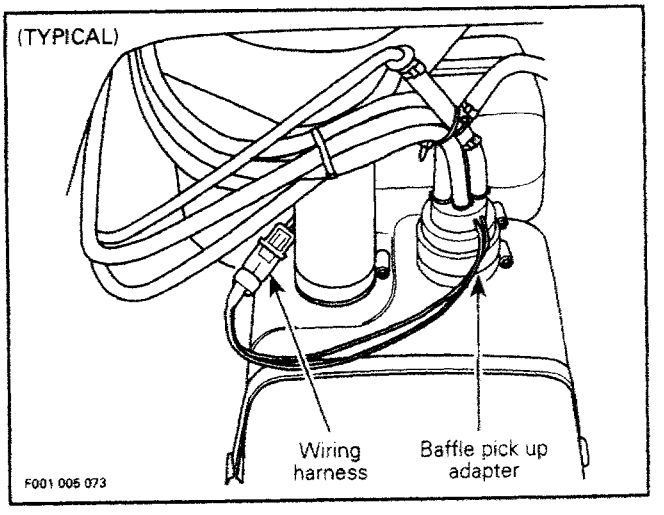
Pull oil reservoir, disconnect wiring harness and move reservoir rearward.

Remove retaining straps from fuel tank and pull tank rearward.

All Models

Remove hoses from baffle pick up and disconnect fuel sensor wiring harness if applicable.

Remove lower clamp from baffle pick up adapter and pull out baffle from fuel tank.



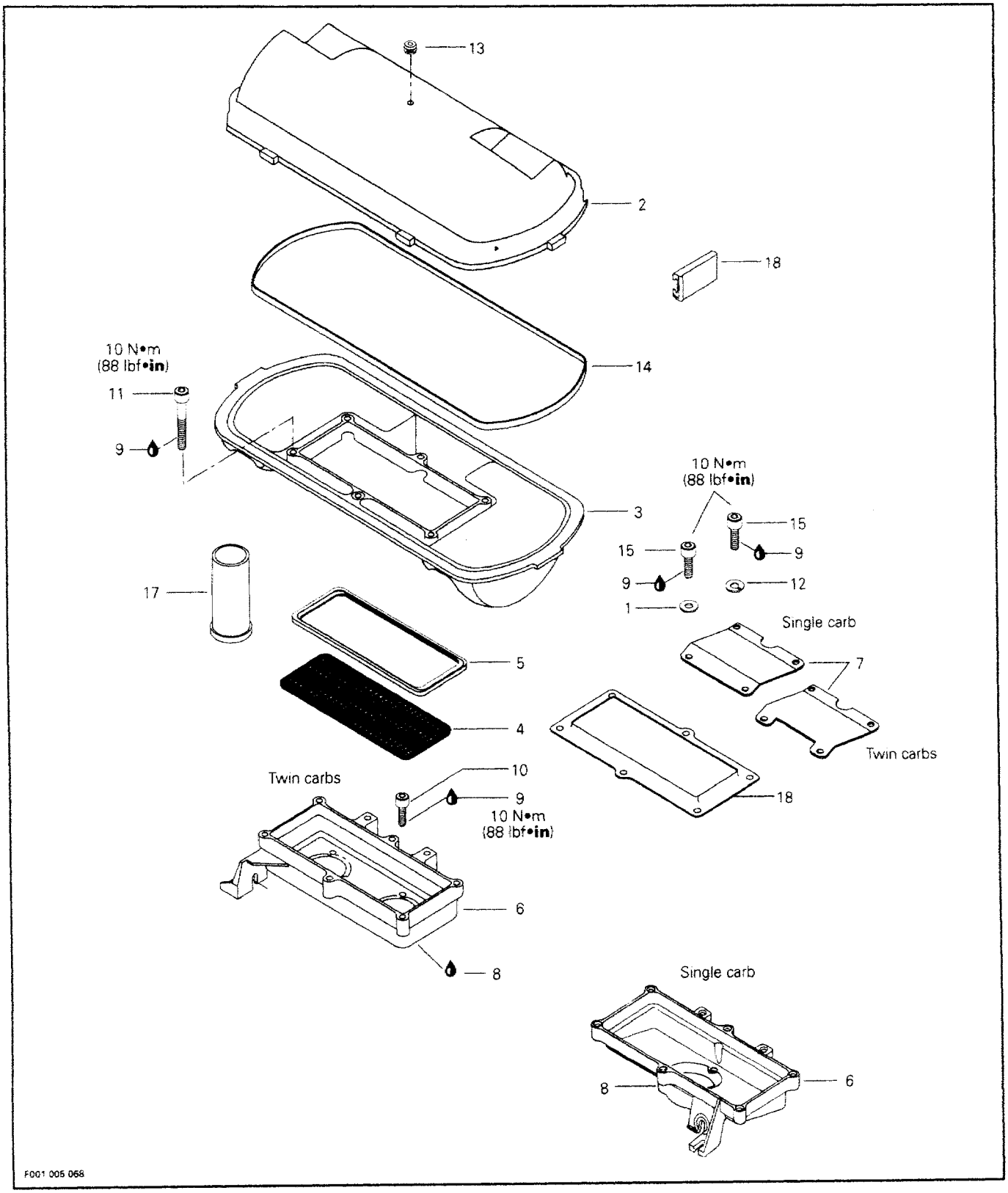
Remove upper clamp from adapter and slide adapter from baffle.

NOTE : Assembly is essentially the reverse of disassembly procedures.

Slide adapter onto baffle pick up until it stops on rib. Install clamp.

Install baffle pick up into fuel tank and push it until it sits on fuel tank neck. Install clamp and torque both clamps to 3 N•m (27 lbf•**in**).

AIR INTAKE

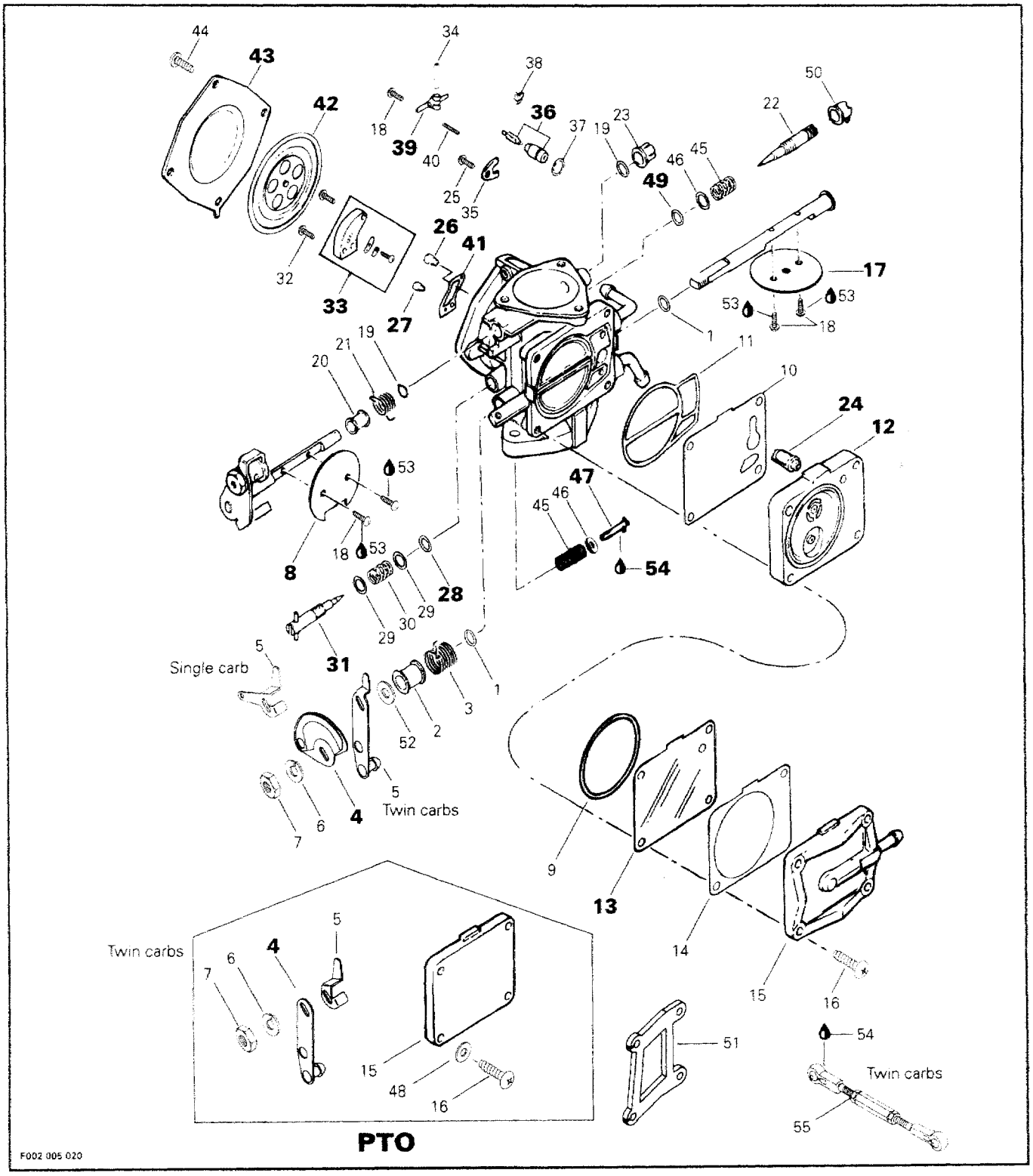


COMPONENTS

1. *Flat washer 6 mm*
2. *Air silencer cover*
3. *Air silencer base*
4. *Flame arrester*
5. *Isolator*
6. *Base*
7. *Support*
8. *Loctite 515*
9. *Loctite 242 (blue)*
10. *Allen screw M6 x 16*
11. *Allen screw M6 x 25*
12. *Lock washer 6 mm*
13. *Rubber plug*
14. *Gasket*
15. *Allen screw M6 x 12*
16. *Screw M4 x 6*
17. *Inlet tube*
18. *Retaining slide*
19. *Retainer*

CARBURETORS

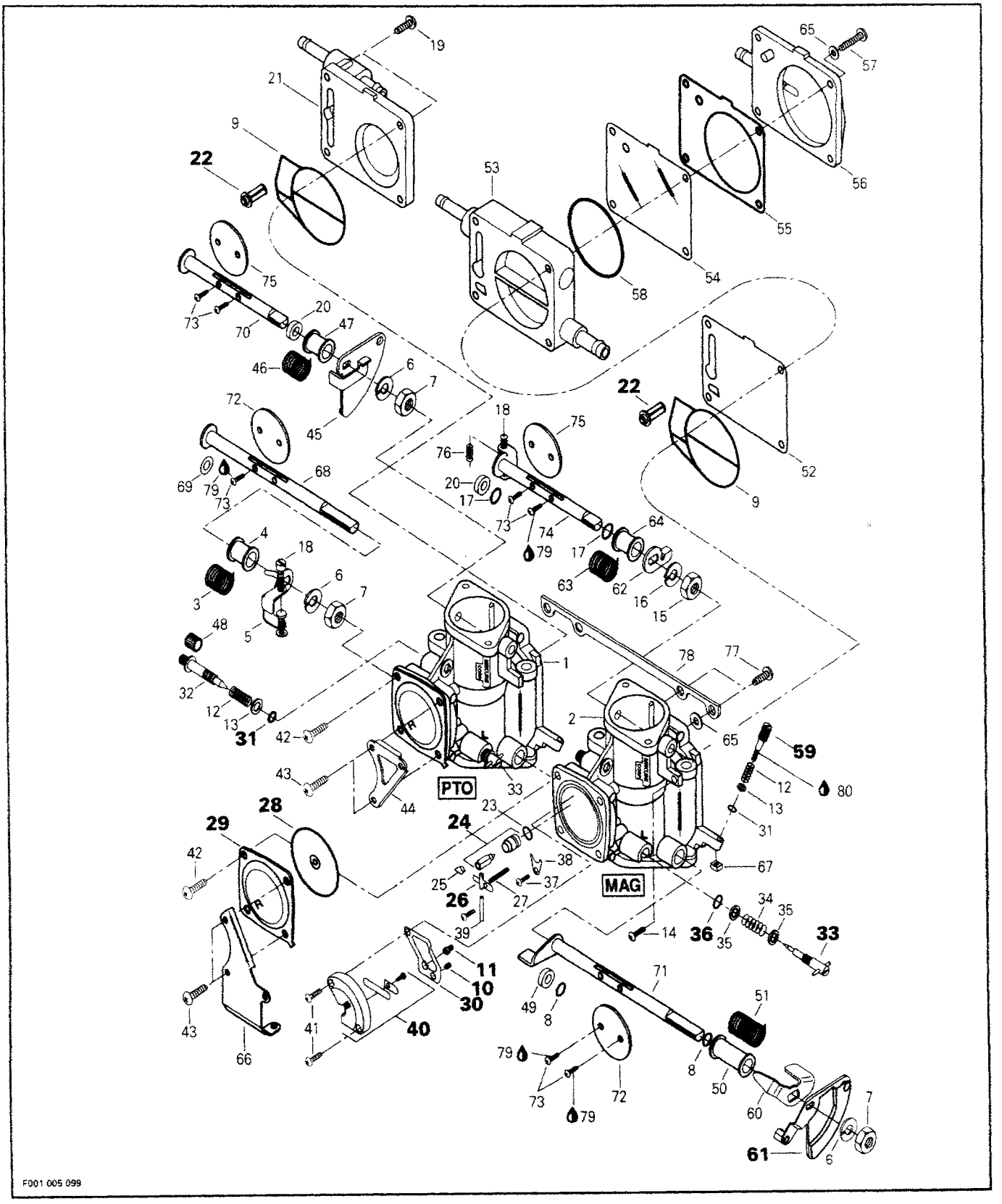
ALL MODELS EXCEPT XP



COMPONENTS

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

XP MODEL



COMPONENTS

1. *PTO carburetor*
2. *MAG carburetor*
3. *Spring*
4. *Sleeve*
5. *PTO throttle lever stopper*
6. *Lock washer*
7. *Nut*
8. *Sealing ring*
9. *O-ring*
10. *Pilot jet*
11. *Main jet*
12. *Spring*
13. *Washer*
14. *Screw*
15. *Nut*
16. *Lock washer*
17. *Sealing ring*
18. *Synchronizing screw*
19. *Screw*
20. *Ring*
21. *Cover*
22. *Filter*
23. *O-Ring*
24. *Needle valve*
25. *Clip*
26. *Needle valve lever*
27. *Spring*
28. *Diaphragm*
29. *Cover*
30. *Gasket*
31. *O-ring*
32. *High speed screw*
33. *Low speed screw*
34. *Spring*
35. *Washer*
36. *O-ring*
37. *Screw and spring washer*
38. *Plate*
39. *Pin*
40. *Check valve assembly*
41. *Screw*
42. *Screw*
43. *Screw*
44. *Bracket*
45. *Choke lever*
46. *Spring*
47. *Sleeve*
48. *Cap*
49. *Ring*
50. *Sleeve*
51. *Spring*
52. *Gasket*
53. *Pump body*
54. *Diaphragm*
55. *Gasket*
56. *Pump cover*
57. *Screw*
58. *O-ring*
59. *Idle speed screw*
60. *Throttle lever stopper*
61. *Throttle lever*
62. *Choke lever stopper*
63. *Spring*
64. *Sleeve*
65. *Washer*
66. *Bracket*
67. *Nut*
68. *PTO throttle shaft*
69. *Plastic washer*
70. *PTO choke shaft*
71. *MAG throttle shaft*
72. *Throttle plate*
73. *Screw*
74. *MAG choke shaft*
75. *Choke plate*
76. *Spring*
77. *Screw*
78. *Plate*
79. *Loctite 242 (blue)*
80. *Synthetic grease*

CARBURETOR REMOVAL

To remove carburetors from engine, proceed as follows :

Intake and Fuel Systems

Remove air vent tube support.

Unlock retaining slides holding air intake silencer cover and remove cover.

Remove screws holding retainer and air intake silencer base. Remove air intake silencer base from watercraft.

Remove screws holding flame arrester base support to cylinder head cover.

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

Turn fuel valve to OFF position.

NOTE : For fuel line removal, use pliers (P / N 295 000 054).

Disconnect pulse line from fuel pump.

Disconnect fuel supply line from fuel pump.

Disconnect fuel return line.

Disconnect oil injection pump cable, throttle cable and choke cable.

XP Model Only

Remove screws and lock washers retaining carburetors.

Remove carburetors from engine.

All Other Models

Remove 4 bolts and lock washers from rotary valve cover then move carburetors and rotary valve cover on top of engine.

NOTE : When removing rotary valve cover, pay attention that the rotary valve will stay in place, otherwise it must be timed.

Remove carburetor linkage (twin carburetors).

Disconnect fuel bypass line between carburetors (twin carburetors).

Remove carburetor(s) from rotary valve cover.

CLEANING

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

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

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

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

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

Discard O-rings, diaphragms and gaskets.

DISASSEMBLY AND INSPECTION

Inspect parts for corrosion damage (shaft, butterfly, spring, screw, check valve housing, etc.).

24,36, Needle Valve

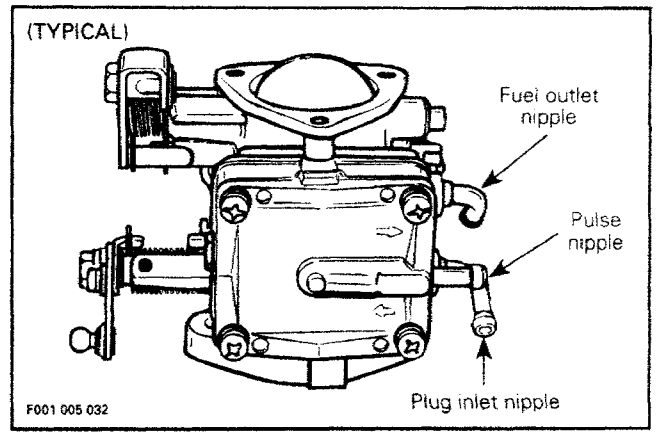
Inspect needle valve tip for a grooved condition. If worn, needle and seat must be replaced as a matched set.

31,33, Low Speed Screw

Check tip for a grooved condition. Replace if necessary.

PUMP VERIFICATION

Plug carburetor inlet nipple.



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.

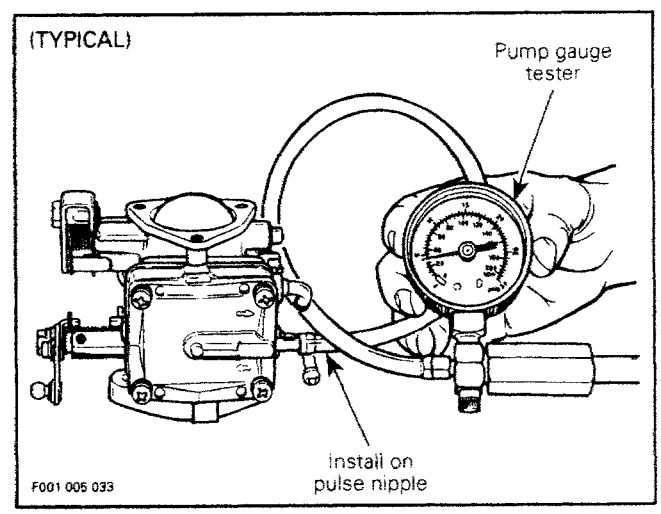
28,42, Diaphragm

Pump Diaphragm Leak Test

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

— Install pump gauge tester (P / N 295 000 083) on pulse nipple.

— Pump tester until it reaches 28 kPa (4 PSI).



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

12,53, Pump Body

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

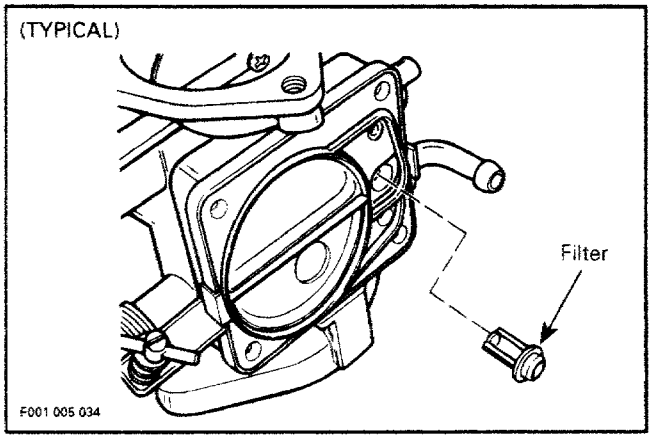
22,24, Filter

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.



CARBURETOR ASSEMBLY

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

8,17,72,75, Choke Plate and Throttle Plate

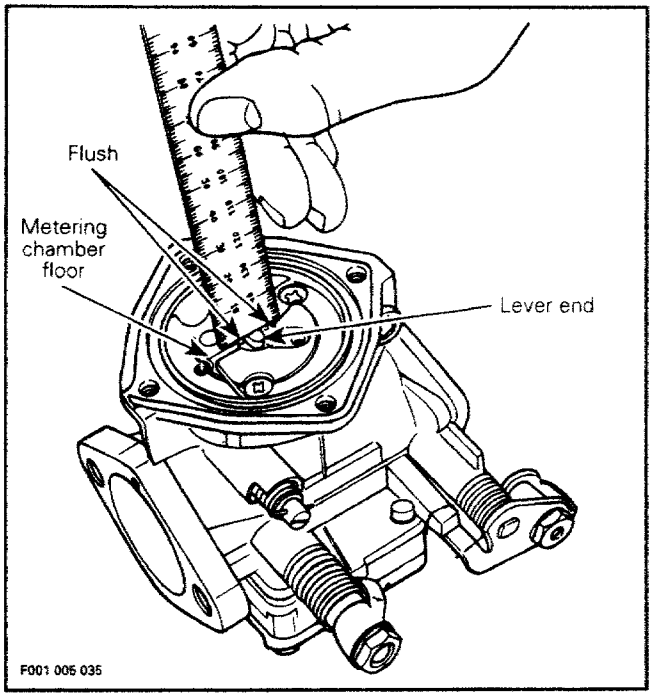
When installing butterfly onto shaft, close butterfly so that it centers into carburetor bore. Firmly tighten screws.

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

26,39, Needle Valve Lever

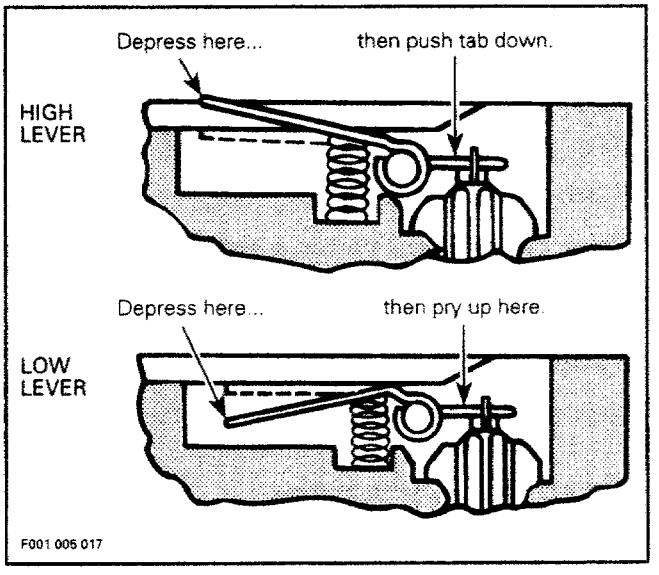
Inlet Control Lever

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



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 :

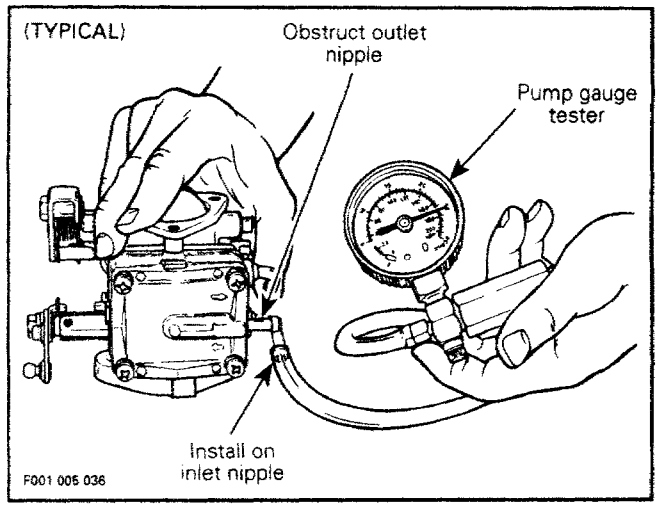
— Install pump gauge tester on carburetor inlet nipple.

— Obstruct outlet nipple with a finger.

— Pump tester until inlet release pressure is reached (seen by a sudden pressure drop). This must occur within 150-200 kPa (22-29 PSI) or 110-145 kPa (16-21 PSI) for XP carburetors.

The pressure drop will vary, but it should not go less then 100 kPa (15 PSI) or 83 kPa (12 PSI) for XP carburetors.

NOTE : Pressure test should be performed 3 times to obtain a valid reading.



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

CAUTION : Do not stretch or cut spring.

Leak Test

Needle valve must stand a pressure of 69 kPa (10 PSI) for 30 seconds. Otherwise, hold carburetor upside down, pour oil over needle valve and apply pressure.

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

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

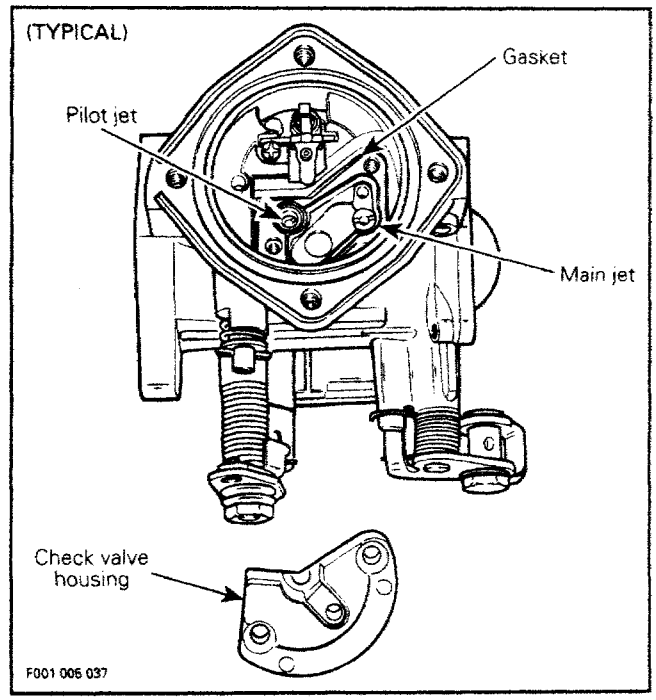
If bubbles come from needle, replace needle and seat.

10,11,26,27, Main Jet and Pilot Jet

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

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

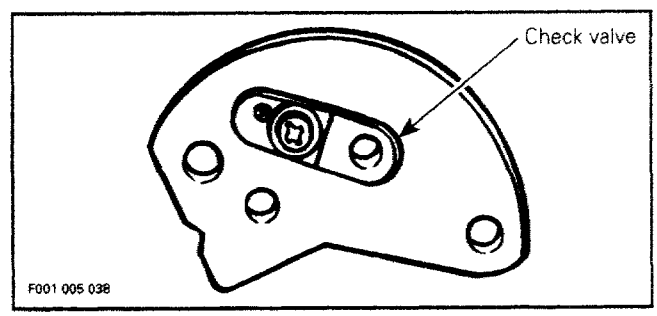
NOTE : To have access to pilot jet or main jet, check valve housing must be removed.



33,40, Check Valve Assembly

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.



NOTE : Prior to check valve assembly installation, remember to set gasket.

28,29,42,43, 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.

28,31,36,49, O-ring

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

CARBURETOR INSTALLATION

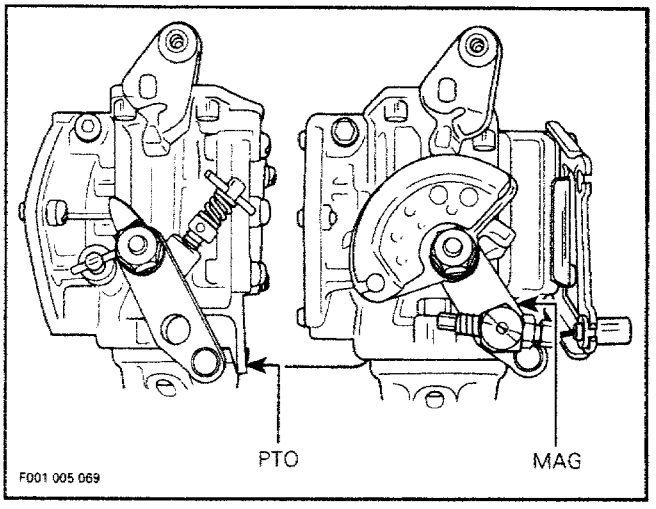
At installation, pay attention to the following :

Install carburetor(s) with gasket(s) to intake manifold.

NOTE : On XP model, synchronize carburetor before installation. Refer to **twin carburetor synchronization (XP model)**.

MAG Carburetor and PTO Carburetor

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



Return Line Orifice

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

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

Carburetor Mount Nuts (Except XP Model)

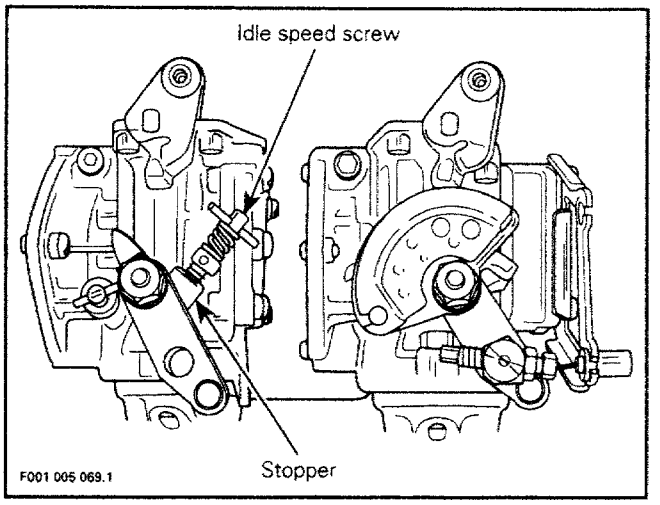
Install lock washers and apply Loctite 242 (blue) on threads then torque nuts to 25 N•m (18 lbf•ft).

Carburetor Mount Screws (XP Model)

Apply Loctite 242 (blue) on screw threads. Then, install screws with lock washers and torque to 20 N•m (15 lbf•ft).

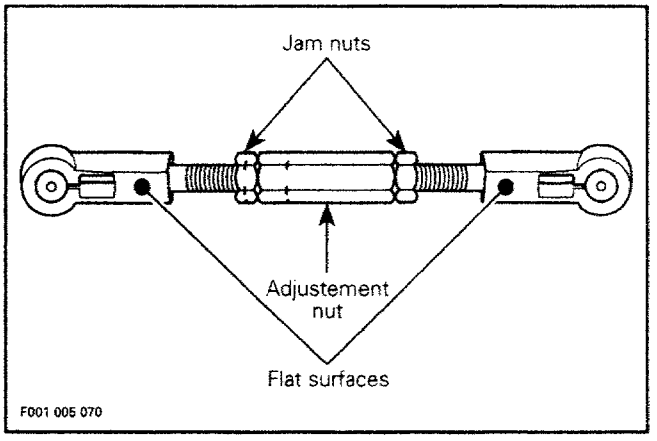
Twin Carburetor Synchronization (Except XP Model)

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



Loosen jam nuts on carburetor linkage and adjust linkage with adjustment nut.

Make sure threads length is the same on each side of linkage and flat surfaces of both ends are parallel with each other.



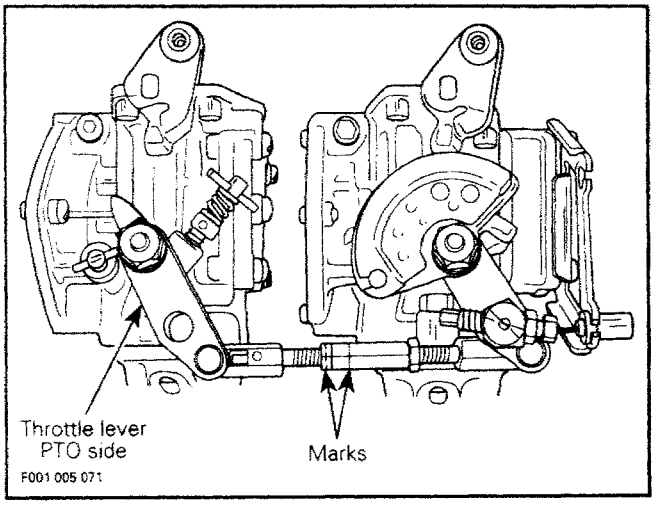
Tighten jam nuts and torque to 3 N•m (27 lbf•**in**).

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

Connect linkage between both carburetor levers and ensure that marks on jam nut and adjustment nut are located near PTO carburetor throttle lever side.

Ensure both throttle plates are still in closed position.

▼CAUTION : This set-up is done to ensure good synchronization between carburetor throttle plates.

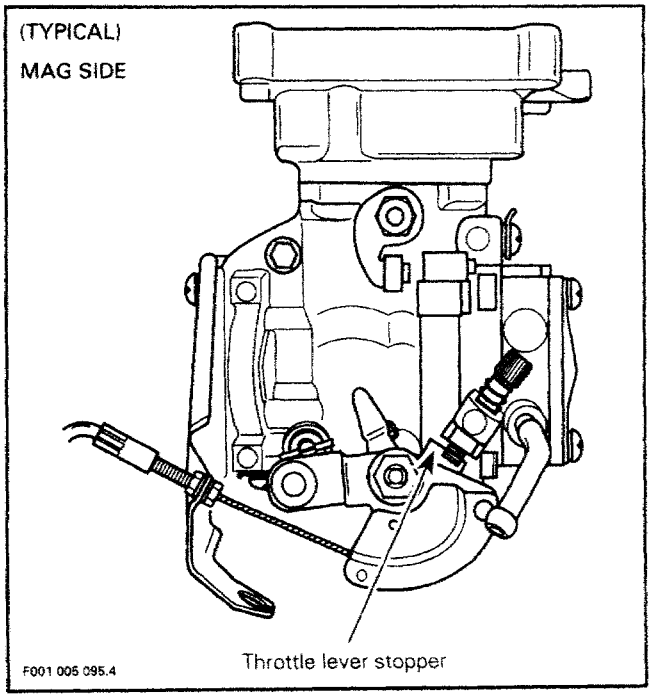


○NOTE : The linkage installation is done with the marks located near PTO carburetor throttle lever to ease adjustment if to be performed in the watercraft.

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

Twin Carburetor Synchronization (XP Model)

With idle speed screw not touching throttle lever stopper on MAG carburetor, both throttle plates are in closed position.



If not properly adjusted, turn synchronizing screw between carburetors accordingly.

Turn idle speed screw until it contacts throttle lever stopper. Then, turn 2 additional turns.

Ensure throttle plates are properly synchronized. Repeat above procedure as required.

▼CAUTION : This set-up is done to ensure good synchronization between carburetor throttle plates.

Rotary Valve Cover and Screws (Except XP Model)

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 pliers (P / N 295 000 054).

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

Refer to fuel system pressurization.

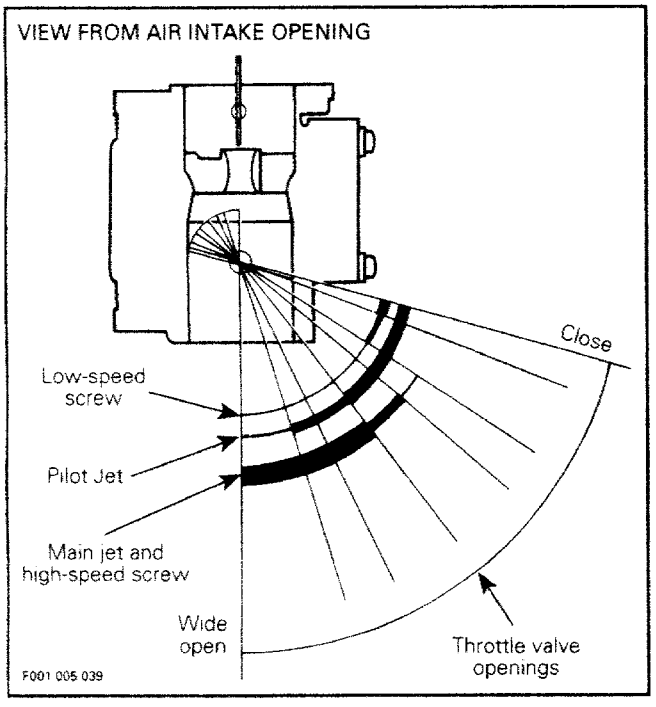
Flame Arrester

Always verify if flame arrester is dirty or restricted.

◆ WARNING : Never operate watercraft without flame arrester.

ADJUSTMENTS

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

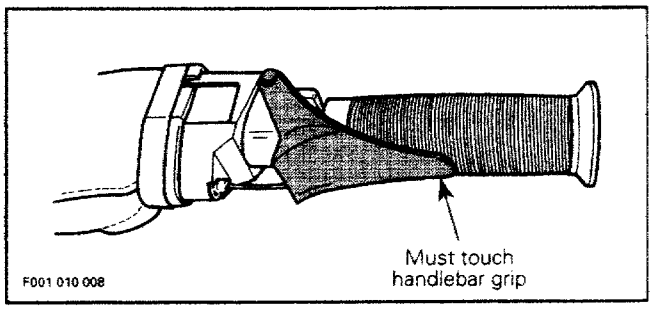


Throttle Cable

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

Lubricate cable with SEA-DOO LUBE lubricant.

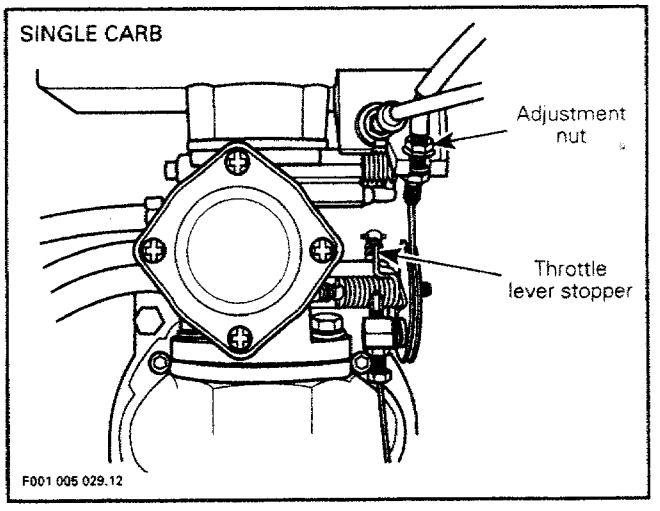
Throttle lever must reach handlebar grip without causing strain to cable or carburetor cable bracket.

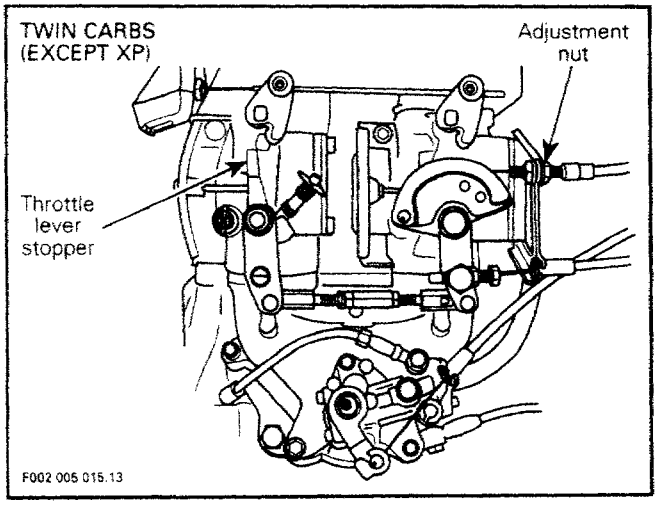


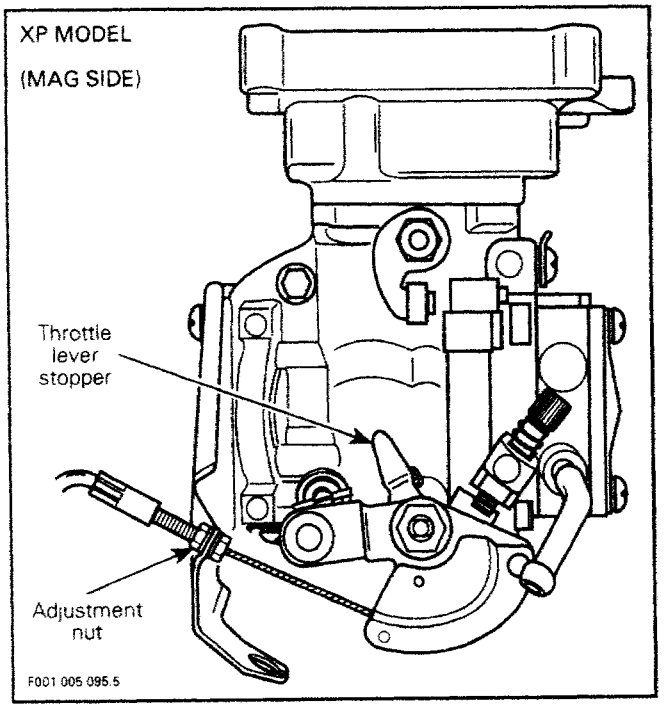
Ensure carburetor butterfly is fully open at full throttle position. At this position throttle lever stopper is almost in contact (0.5 mm (1/64 in)) with carburetor body.

▼ 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.







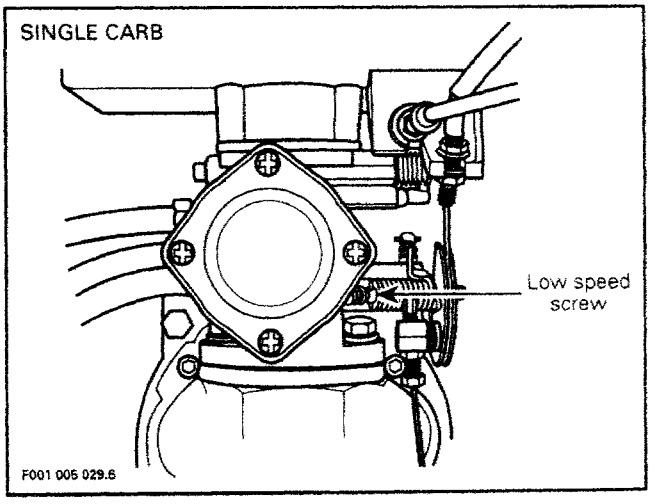
Tighten jam nut and recheck adjustment.

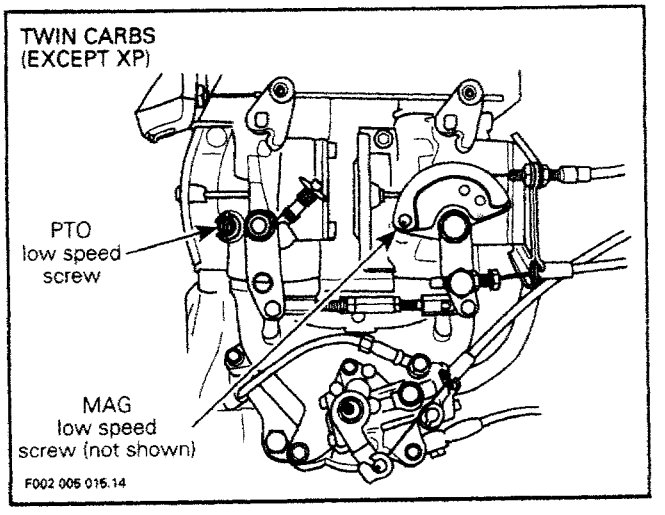
◆ WARNING : Make sure idle speed screw contacts stopper when throttle lever is fully released at handlebar.

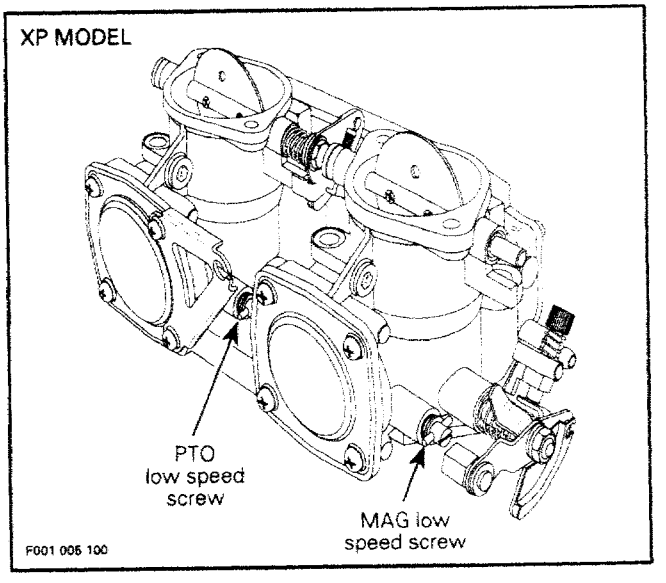
After throttle cable adjustment, always proceed with oil injection pump adjustment.

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

31,33, Low Speed Screw







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

As a preliminary set-up, tighten screw in until a slight resistance is felt then back off 3/4 to 1-1/4 turn for a single carburetor engine and 1 to 1-1/2 turn for twin carburetor engines.

Start and warm up engine.

▼CAUTION : Water must be supplied to cool engine with coupler hose (P / N 295 500 099).

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

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

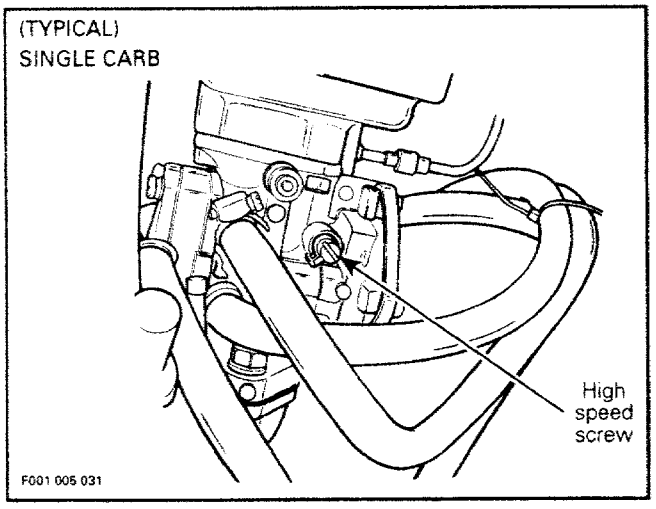
○NOTE : On twin carburetor engines both low speed screws must be adjusted exactly the same way. Never adjust screws more than 1/4 turn at a time.

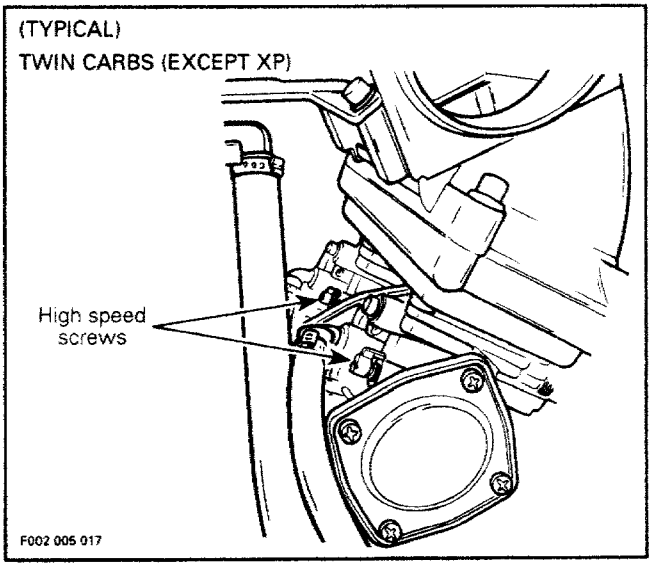
22,32, High Speed Screw

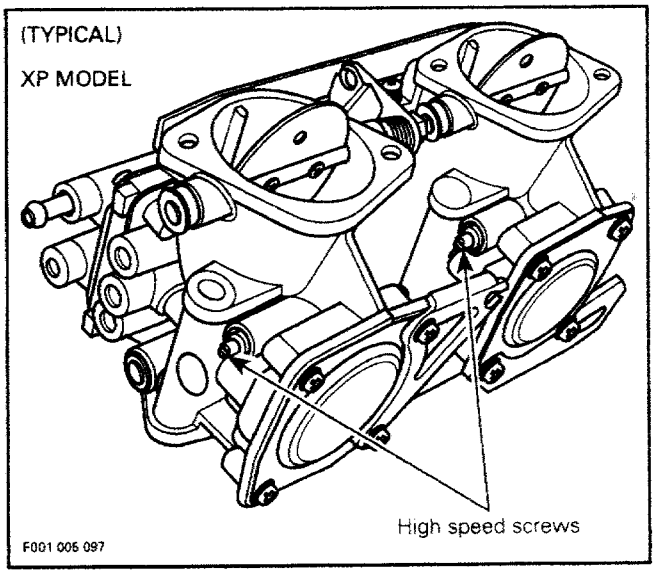
The high speed screw is sealed with a plastic cap that allows an adjustment of 1/4 turn.

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

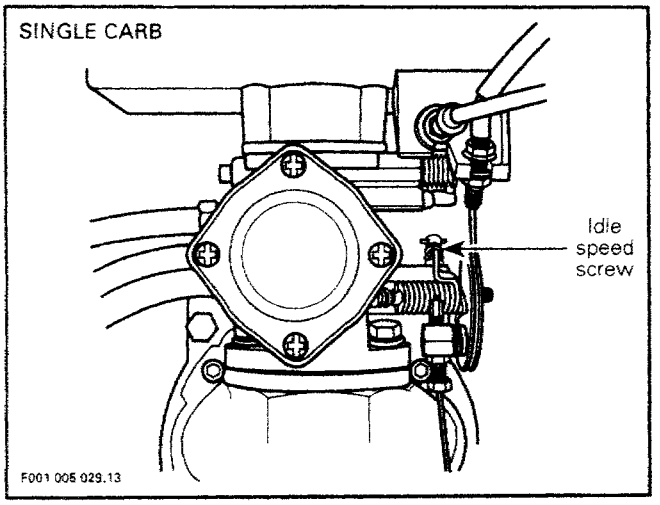
▼CAUTION : Do not attempt to adjust high speed screw. Severe engine damage can occur.



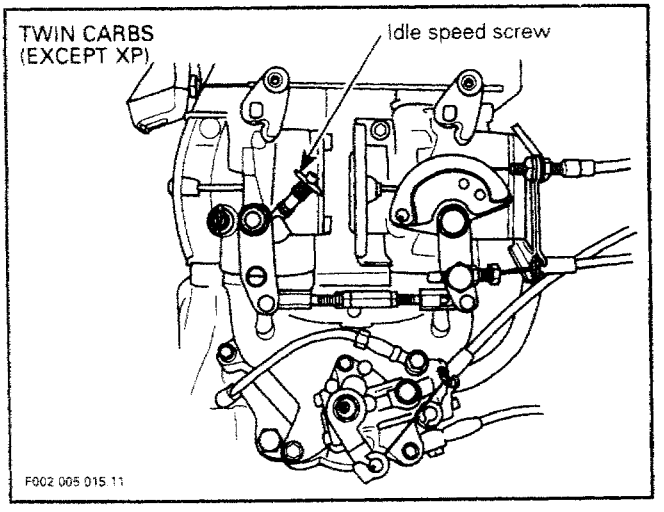


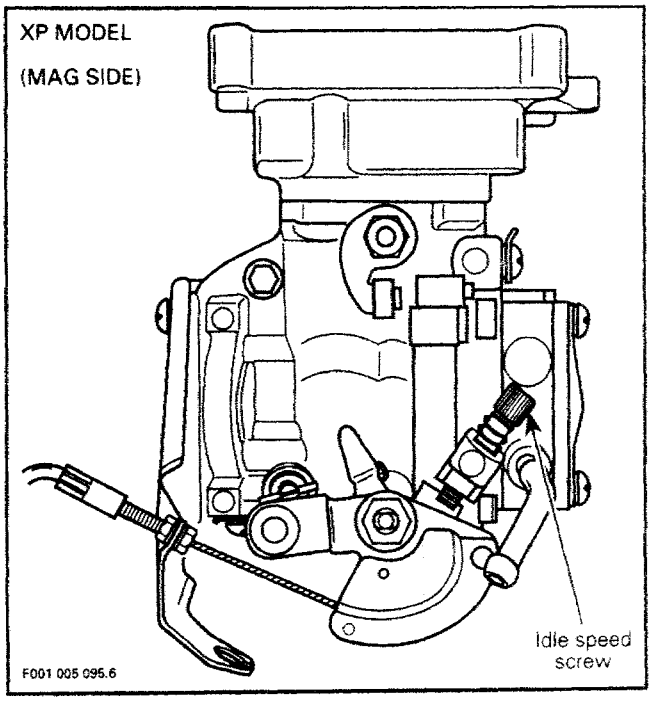


47,59, Idle Speed Screw



NOTE : On twin carburetor engines, there is only one 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 cable of magneto side to measure engine speed.

Start engine and bring to normal operating temperature.

CAUTION : Water must be supplied to cool engine with coupler hose (P / N 295 500 099).

Turn screw so that engine idles at 1400 RPM (1500 RPM for the XP model) if watercraft is in water.

If watercraft is out of water, refer to TECHNICAL DATA for idle speed specification of each model.

FUEL SYSTEM PRESSURIZATION

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

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

Pressure Test

Proceed as follows :

— Fill up fuel tank.

— Remove inlet hose of fuel tank vent from body.

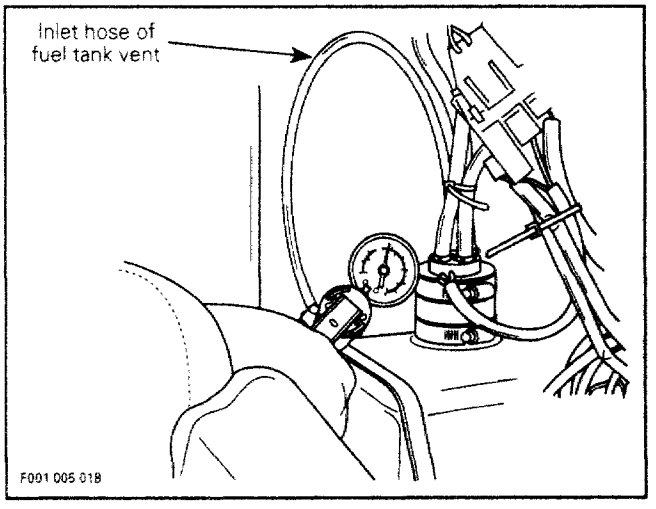
— Install a hose pincher (P / N 295 000 076) on outlet hose of fuel tank vent.

— Connect pump gauge tester (P / N 295 000 085) to inlet hose.

— Turn fuel valve to OFF and pressurize fuel system to 34 kPa (5 PSI). If no leaks are found, turn fuel valve to ON and pressurize once more.

— If pressure is not maintained locate leak and repair / replace component leaking. To ease leak search spray a solution of soapy water on components, bubbles will indicate leak location.

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



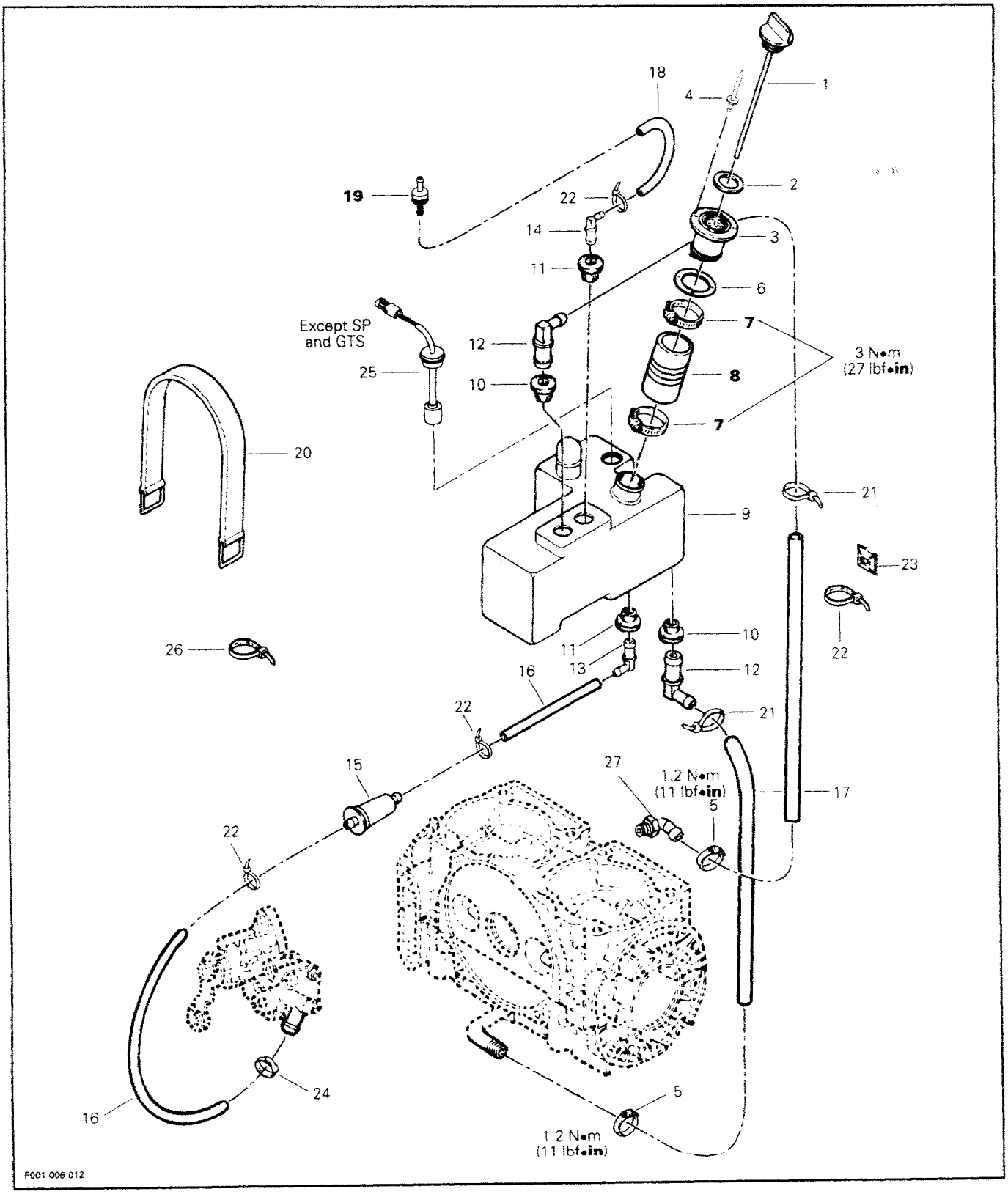
WARNING : If any leak is found, do not start the engine and wipe off any fuel leakage. Failure to correct a leak could lead to an explosion. Do not use electric powered tools on watercraft unless system has been verified for no leaks.

Reconnect inlet hose of fuel tank vent on body.

NOTE : Before removing the hose pincher, block with your finger, the outlet hole to feel if air is coming out when removing hose pincher. This will indicate that pressure relief valve and the outlet fitting are not blocked.

Remove hose pincher from outlet hose of fuel tank vent.

OIL INJECTION RESERVOIR



COMPONENTS

1. *Oil cap / dipstick*
2. *O-ring*
3. *Filler neck*
4. *Rivet 1/8 x .640*
5. *Gear clamp*
6. *Gasket*
7. *Gear clamp*
8. *Filler neck hose*
9. *Reservoir*
10. *Grommet*
11. *Grommet*
12. *Elbow fitting*
13. *Elbow fitting*
14. *Elbow fitting*
15. *Oil filter*
16. *Hose 8 mm*
17. *Hose 12 mm*
18. *Hose 6 mm*
19. *Check valve*
20. *Strap*
21. *Tie rap*
22. *Tie rap*
23. *Tie mount*
24. *Oetiker clamp*
25. *Oil sensor (except SP and GTS)*
26. *Tie rap*
27. *Hose fitting*

GENERAL

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

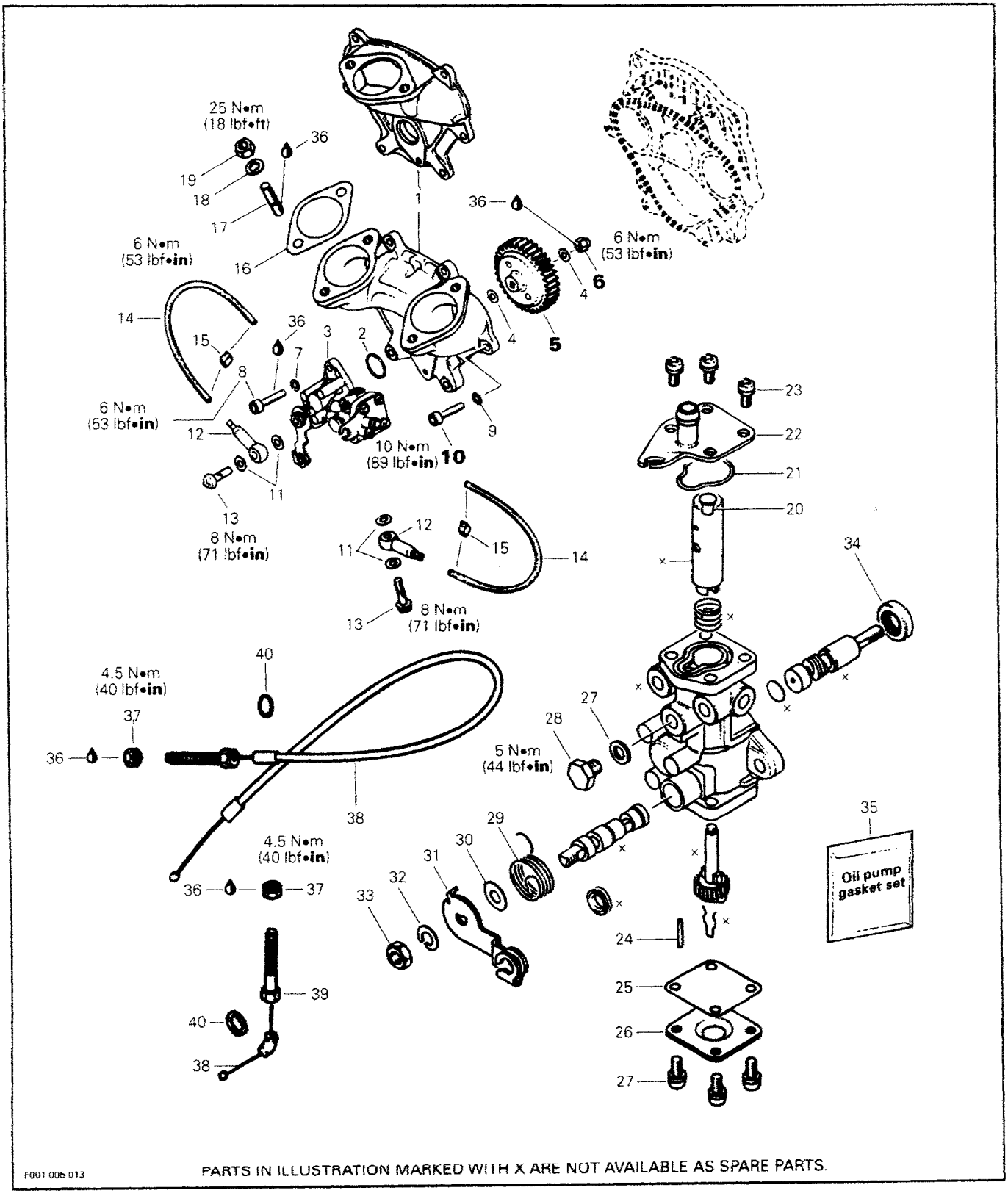
7,8, Clamp and Hose

Verify oil filler neck hose for damage. Always ensure that clamps are well positioned and tightened. Torque clamps to 3 N•m (27 lbf•**in**).

19, Check Valve

Black side of the one-way check valve is the valve outlet. It allows air to get in reservoir.

OIL INJECTION PUMP



F001 006 013

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

COMPONENTS

1. *Oil pump flange*
2. *O-ring*
3. *Oil pump*
4. *Washer*
5. *Oil pump gear (41 teeth)*
6. *Lock nut M6*
7. *Lock washer*
8. *Allen screw M5 x 16*
9. *Lock washer 6 mm*
10. *Allen screw M6 x 20*
11. *Oil banjo gasket*
12. *Check valve*
13. *Valve bolt M6 x 16*
14. *Oil line*
15. *Clamp*
16. *Gasket*
17. *Stud M8 x 19*
18. *Lock washer 8 mm*
19. *Nut M8*
20. *Retainer*
21. *O-ring*
22. *Upper plate*
23. *Screw with lock washer M4 x 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 (blue)*
37. *Nut M6*
38. *Pump cable*
39. *Cable guide*
40. *Circlip*

CLEANING

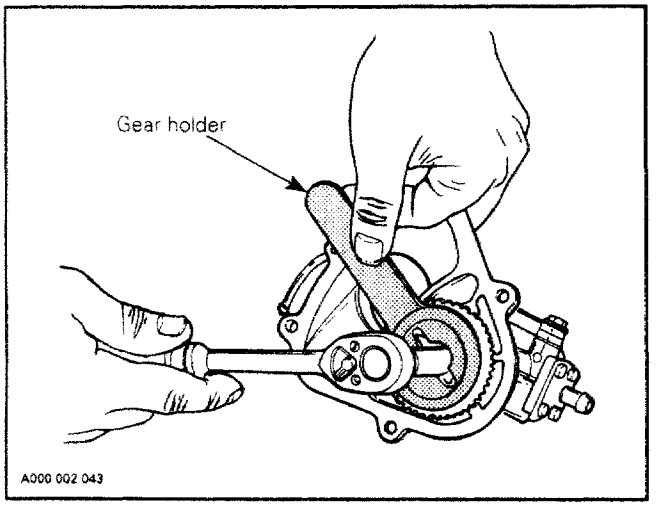
Discard all seals and O-rings. Clean metal components in a solvent.

DISASSEMBLY

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

5,6, Oil Pump Gear and Lock Nut

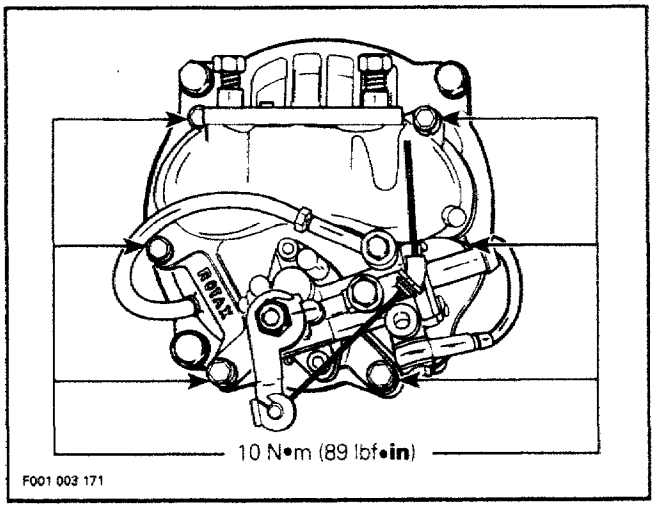
To remove retaining nut, lock gear using gear holder (P / N 290 277 905).



ASSEMBLY

10, Screw

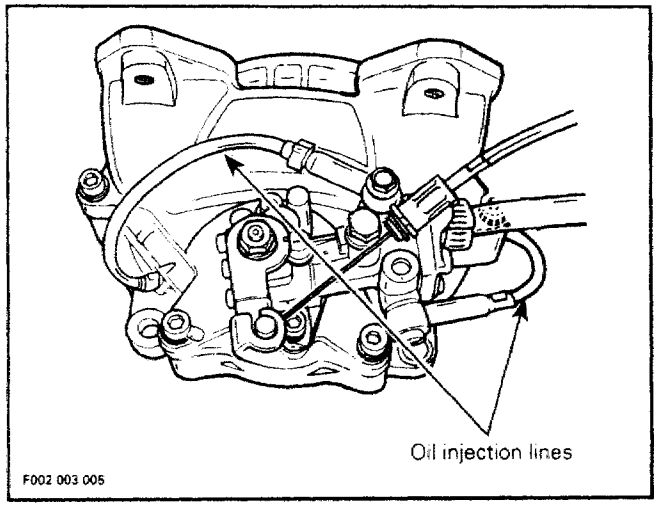
Torque to 10 N•m (89 lbf•**in**).



6, Lock Nut

Apply Loctite 242 (blue) on nut threads and torque to 6 N•m (53 lbf•**in**).

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



ADJUSTMENTS

Synchronization

Ensure carburetor butterfly(ies) is (are) in closed position.

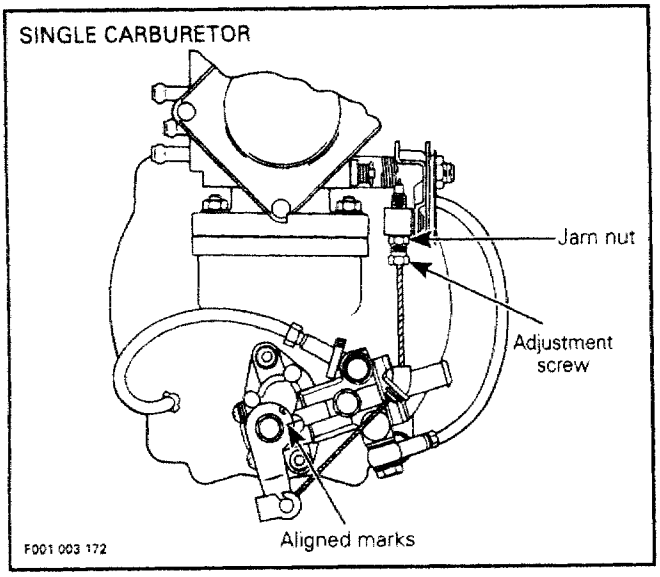
NOTE : On a twin carburetor engine, make sure carburetors are properly synchronized. If necessary, refer to FUEL SYSTEM 05-03, then look for **carburetor synchronization**.

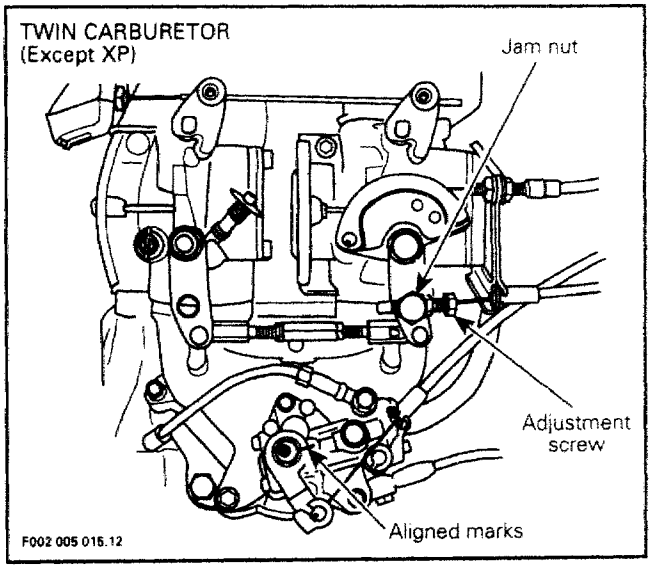
Turn idle speed screw until it contacts stopper.

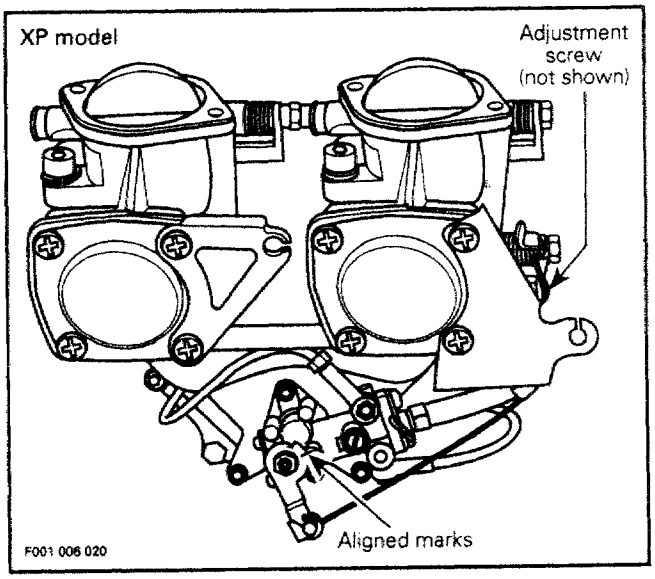
Turn idle speed screw 2 turns.

Turn cable adjustment screw to align marks on pump.

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







Tighten jam nut and recheck alignment marks.

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

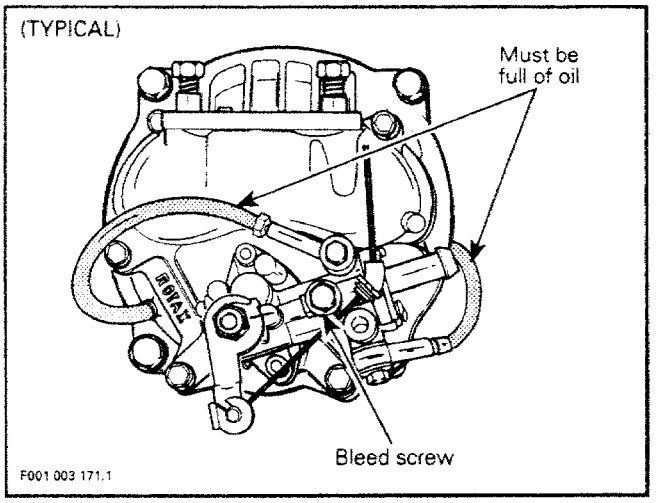
Bleeding

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

Ensure oil injection reservoir is sufficently filled.

Install a dry rag below oil injection pump.

Remove bleed screw to allow oil to flow.



Keep 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 coupler hose (P / N 295 500 099).**

CHECKING OPERATION

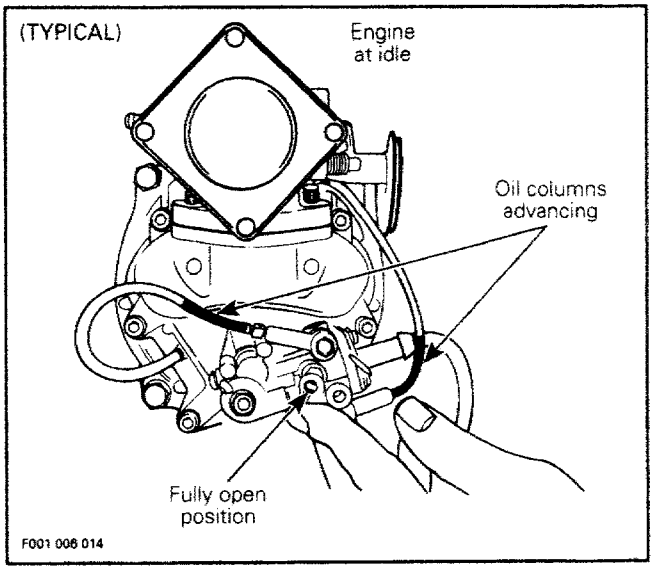
On Watercraft

○ NOTE : Oil line supply must be full of oil. See bleeding procedure above.

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

Ensure that oil level in small oil lines is passed the unpainted area. Repeat the procedure until this condition is attained.

Reconnect banjo fittings with a washer on each side and torque screws to 8 N•m (71 lbf•**in**). Start engine and run at idle while holding the pump lever in fully open position. Oil columns must advance into small oil lines.



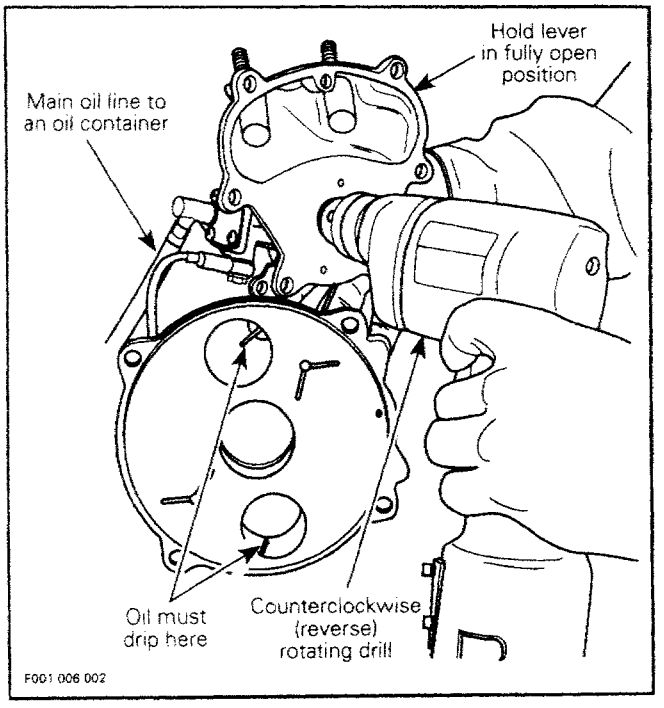
If not, remove pump assembly and check the pump gear for defects, replace as necessary. Test pump as describes below :

○ 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 fittings in parts of rotary valve cover while holding lever in a fully open position. If not replace pump.



OIL SYSTEM PRESSURIZATION

▼CAUTION : Whenever oil system components are disconnected or replaced, a pressure test must be done before starting engine and / or releasing watercraft to customer. Ensure to verify oil line ends for damage. Always cut damaged end before reinstallation.

Pressure Test

Proceed as follows :

— Fill up oil reservoir.

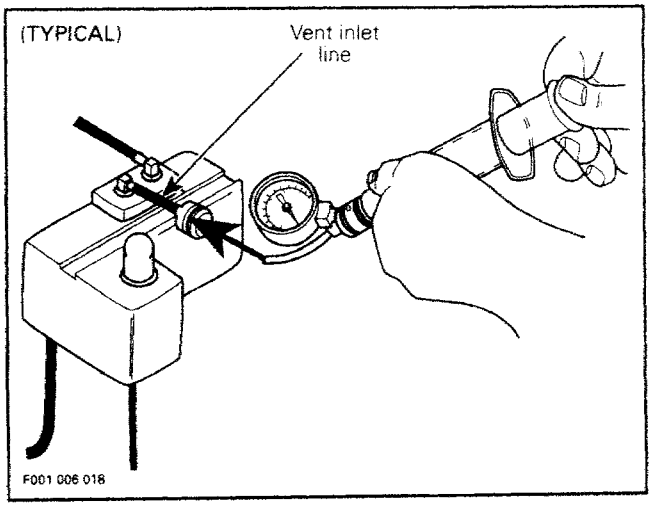
— Install hose pinchers on oil inlet lines close to oil pump and to rotary valve.

— Install a hose pincher on oil return line.

— Connect pump gauge tester to oil reservoir vent inlet line.

— Pressurize oil system to 21 kPa (3 PSI). 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 oil system pressurization the oil reservoir should be quite full. The system must maintain a pressure of 21 kPa (3 PSI) for at least 10 minutes. Never pressurize over 21 kPa (3 PSI).



▼CAUTION : If any leak is found, do not start the engine and wipe off any oil leakage. Failure to correct a leak could cause serious damage to engine components.

Remove hose pinchers from inlet lines and return line.

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.

Color Codes

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

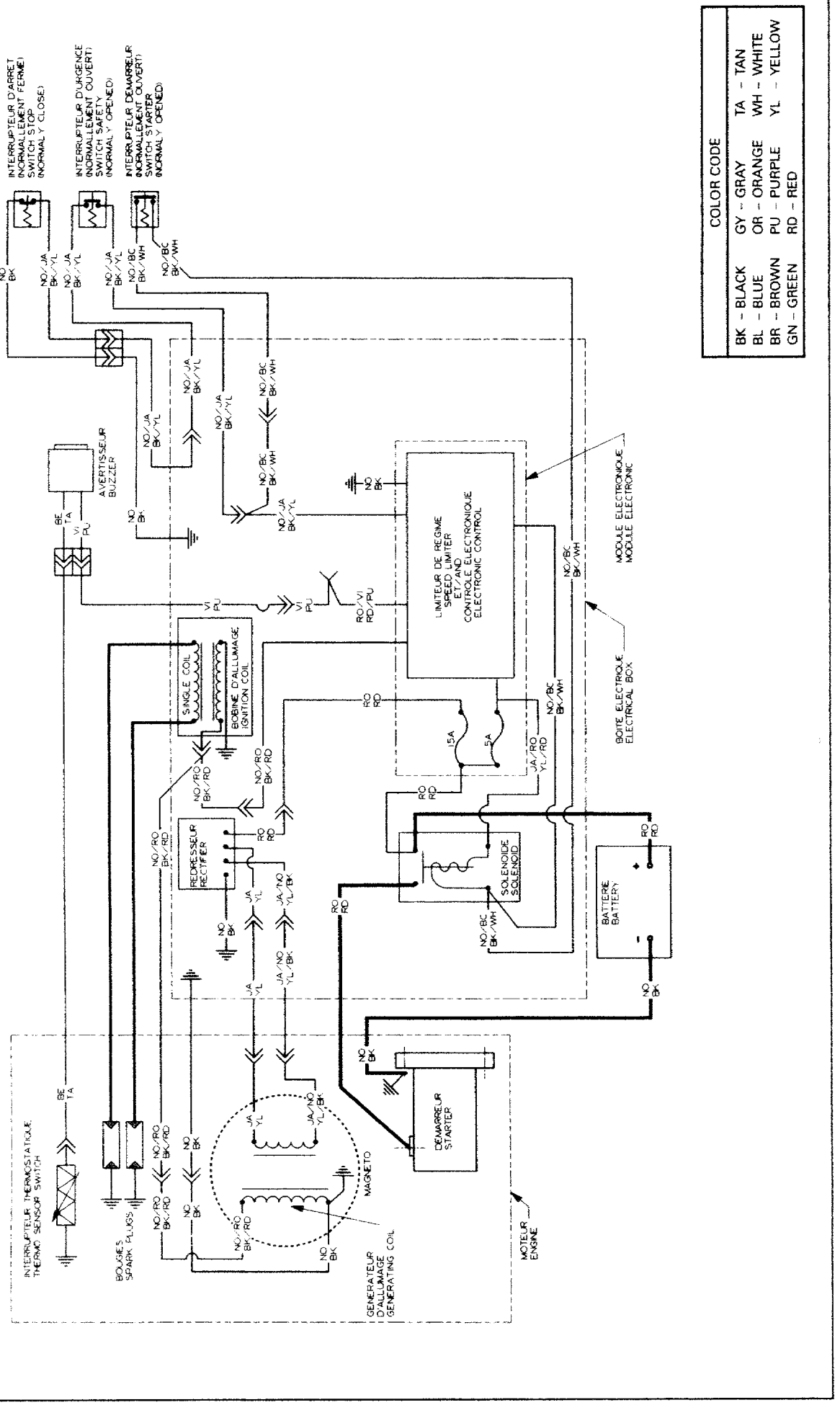
◆ WARNING : Ensure all terminals are properly crimped on wires and connector housings are properly fastened. Ensure electrical box is watertight.

WIRE TERMINAL REMOVAL

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

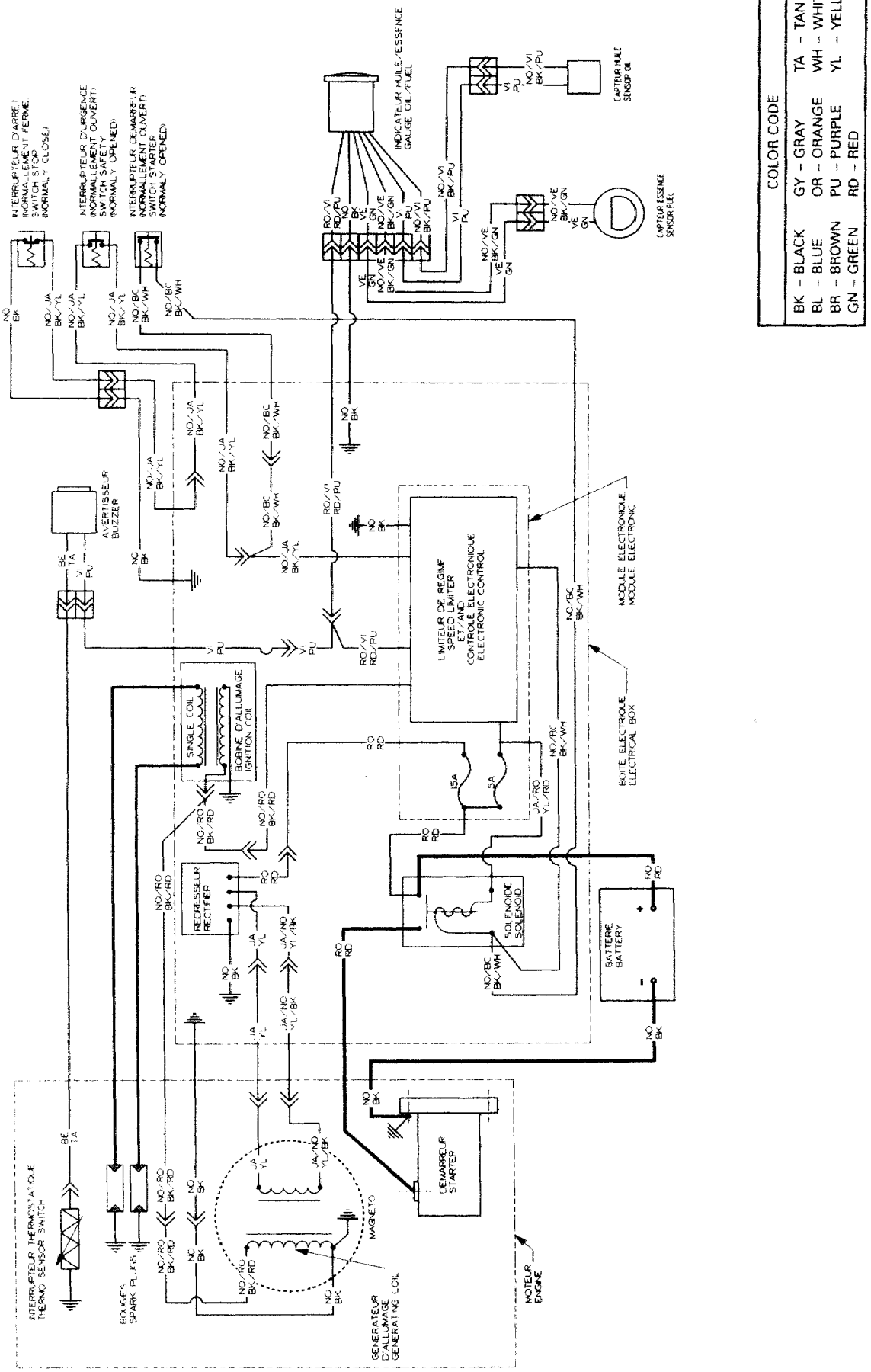
SP AND GTS MODELS

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



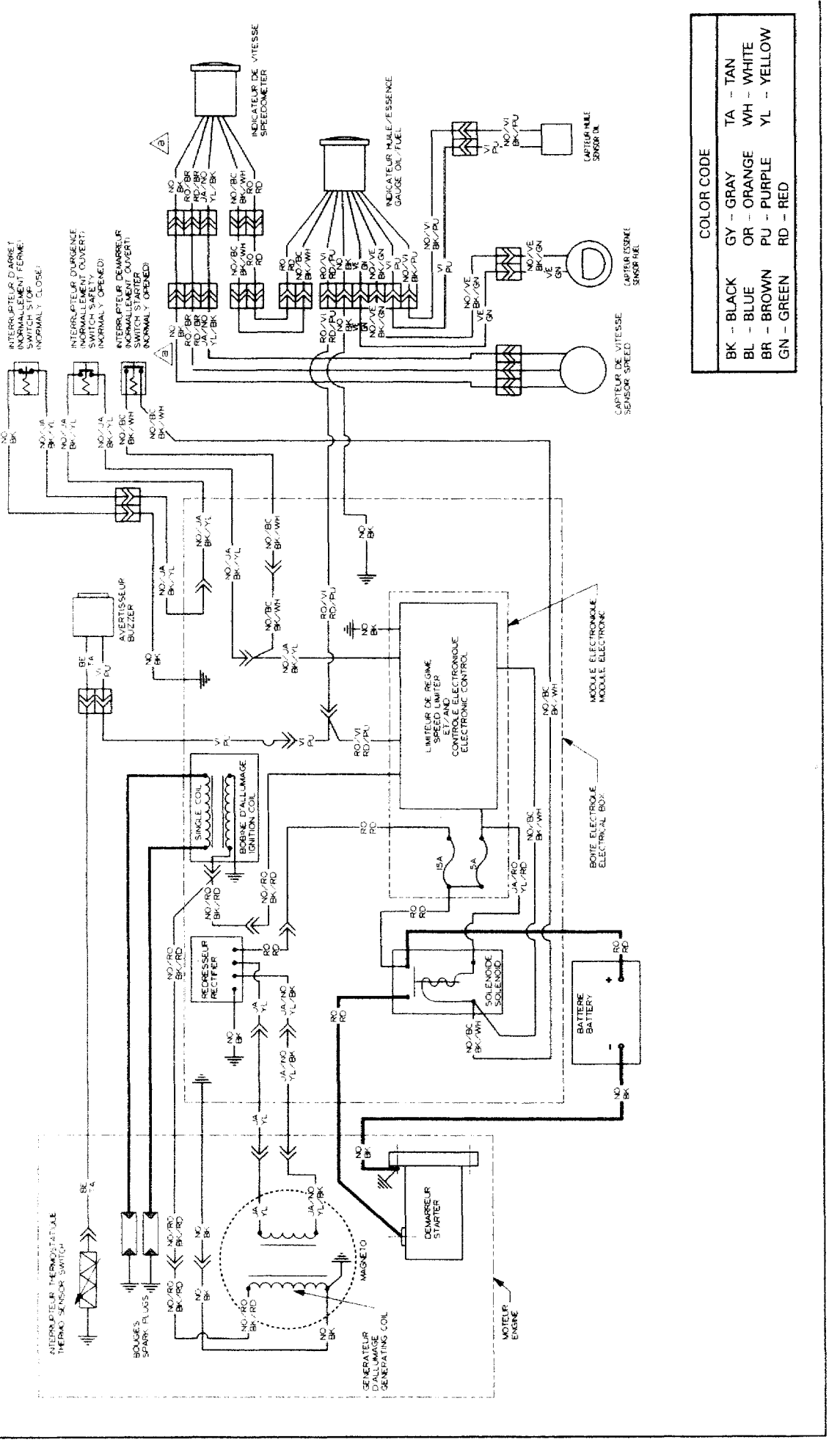
SPI AND SPX MODELS

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



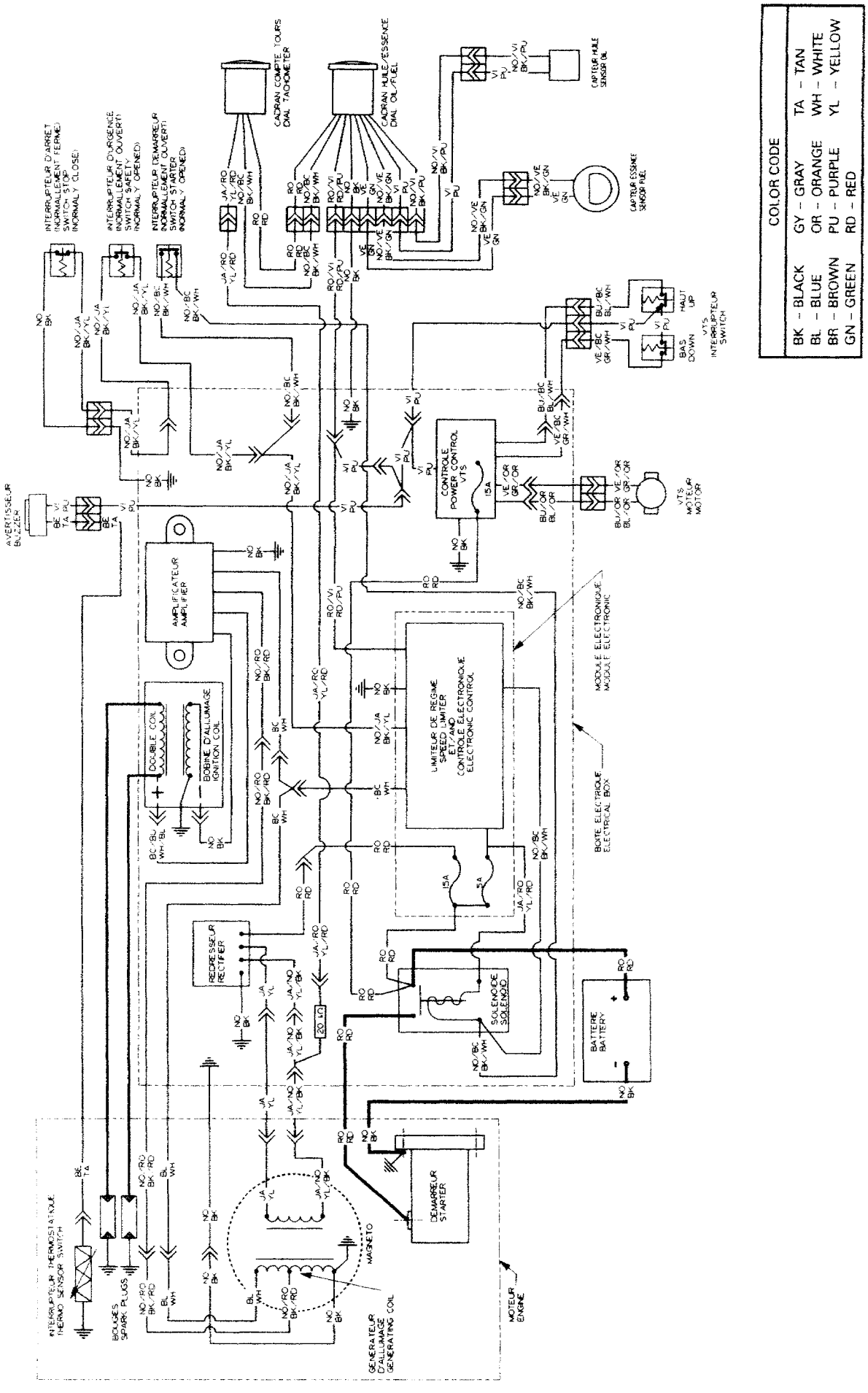
GTX MODEL

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



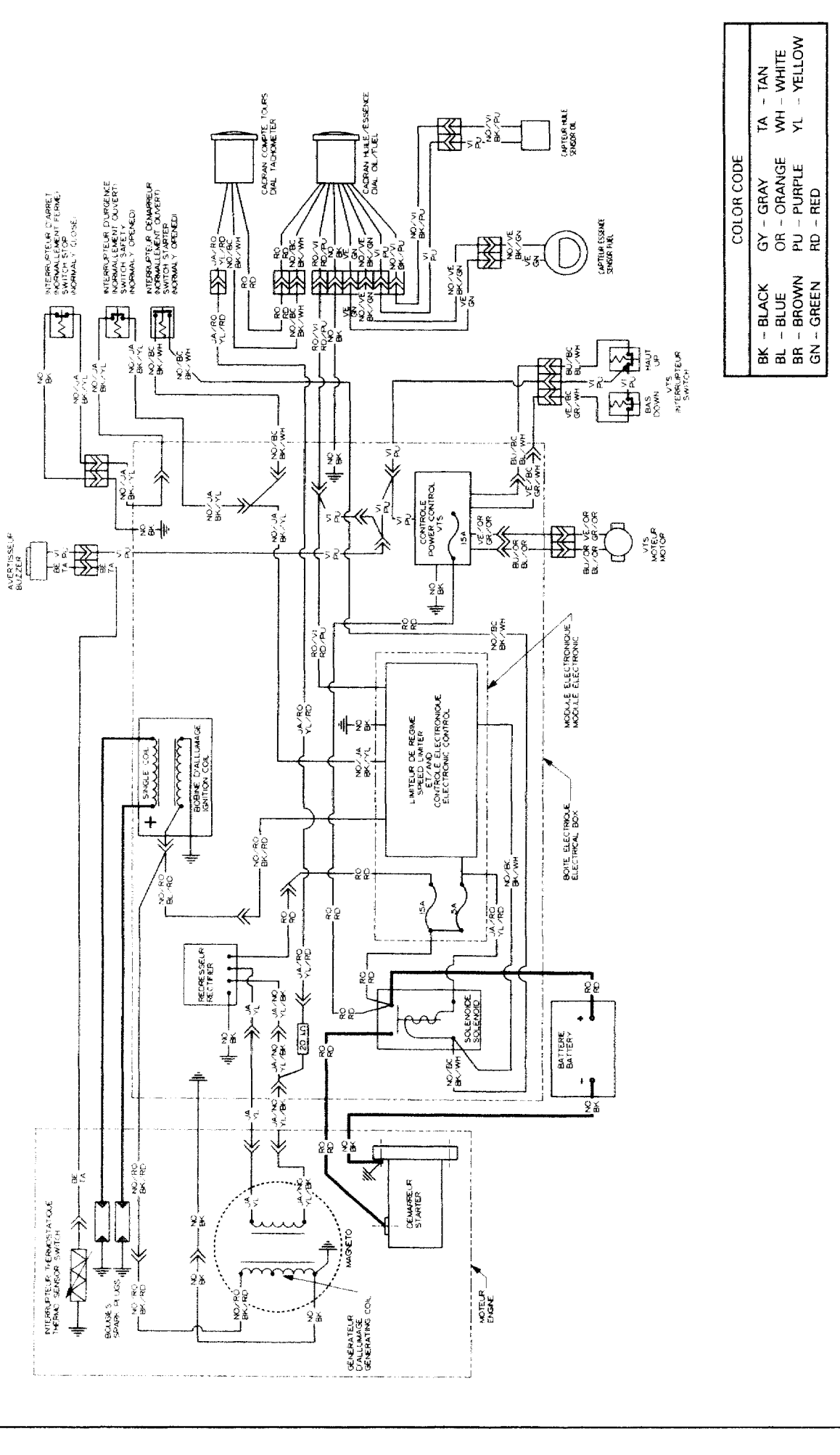
XP MODEL

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



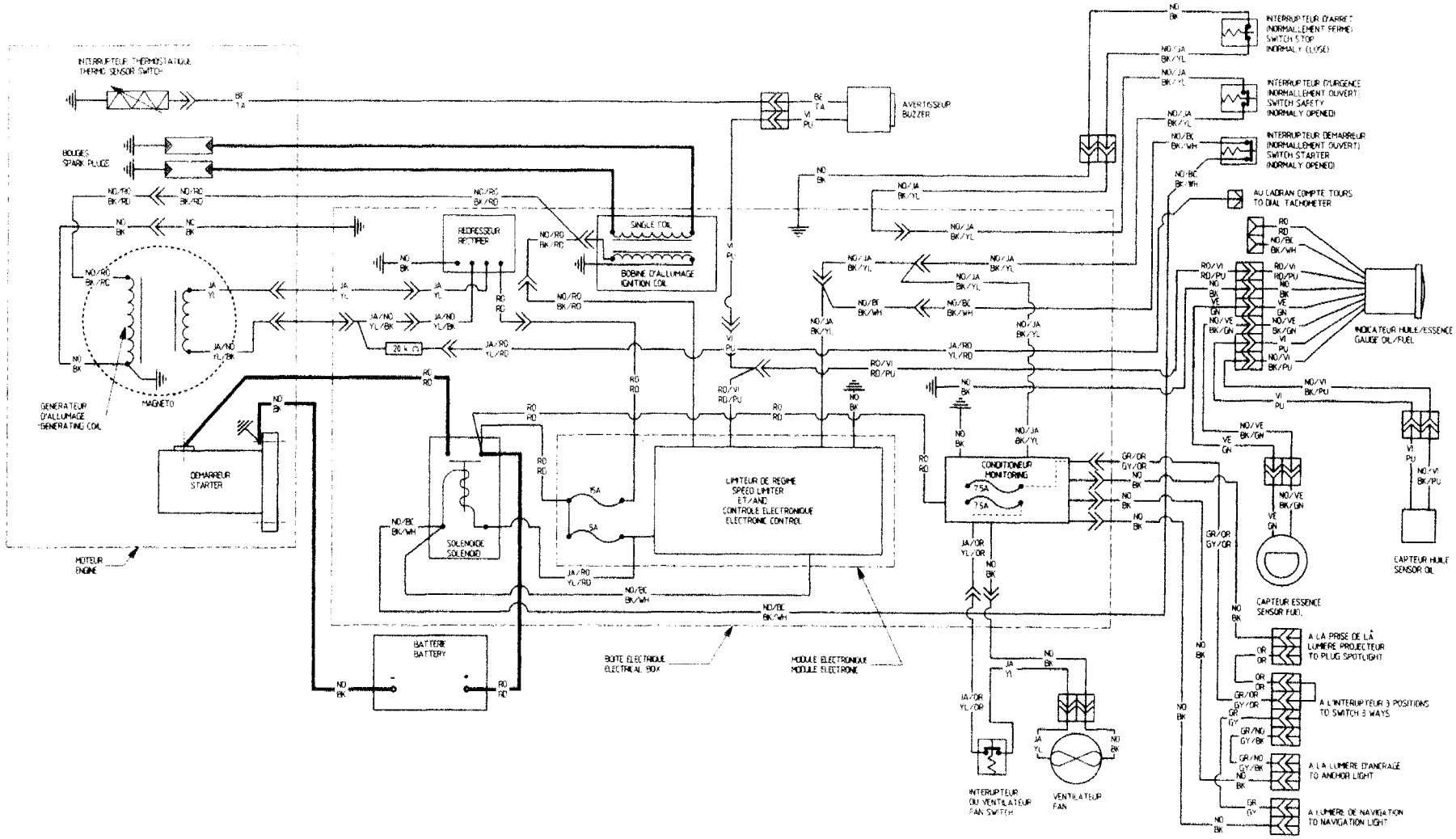
XPI MODEL

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



EXPLORER MODEL

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



COLOR CODE		
BK - BLACK	GY - GRAY	TA - TAN
BL - BLUE	OR - ORANGE	WH - WHITE
BR - BROWN	PU - PURPLE	YL - YELLOW
GN - GREEN	RD - RED	

IGNITION TIMING

This section is mainly divided in 2 parts, the first one using a top dead center (TDC) gauge **to verify PTO flywheel timing mark position**. The second one using a stroboscopic timing light **to check ignition timing**.

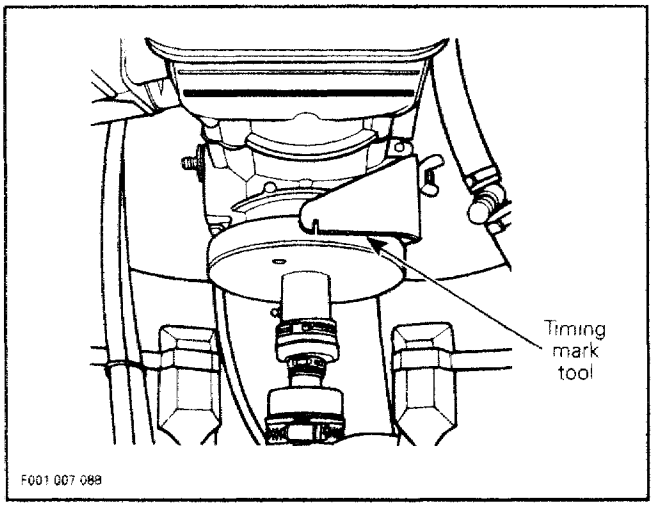
Flywheel timing mark position verification is required to :

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

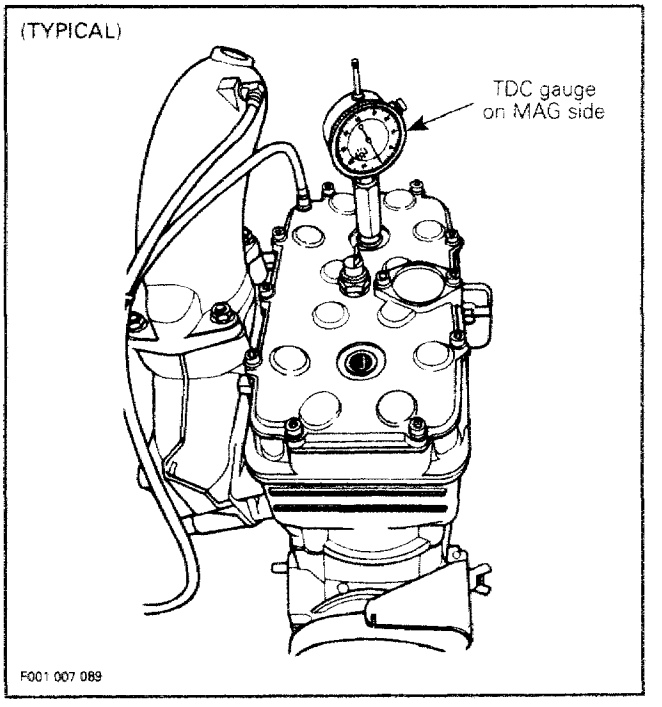
Always verify PTO flywheel timing mark position before checking ignition timing.

Verifying PTO Flywheel Timing Mark Position

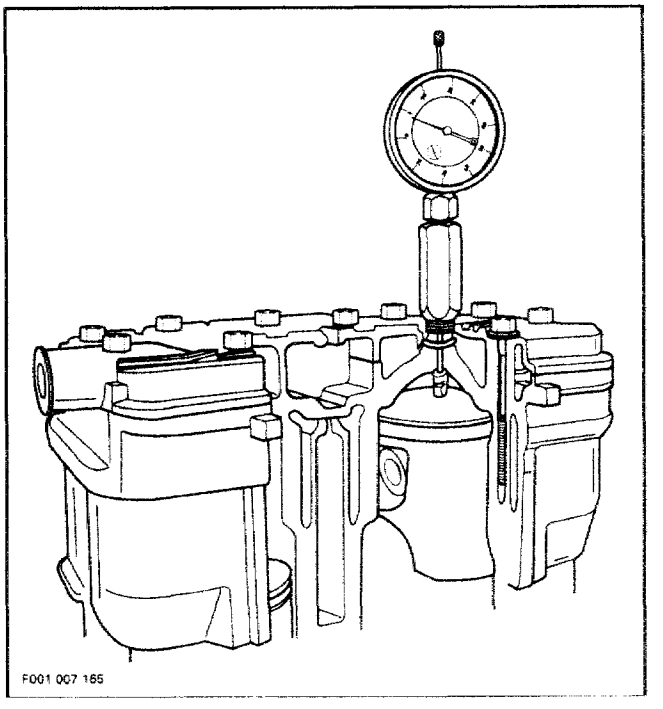
1. Disconnect MAG side spark plug wire and connect wire to grounding device then remove spark plug.
2. Remove PTO flywheel guard.
3. Install timing mark tool (P / N 295 000 102) on engine right side using wing nut previously removed.



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



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



— Loosen adapter lock nut then holding gauge with dial facing toward PTO, screw adapter in spark plug hole.

— Slide gauge far enough into adapter to obtain a reading then finger tighten adapter lock nut.

— Rotate PTO flywheel counterclockwise until piston is at Top Dead Center.

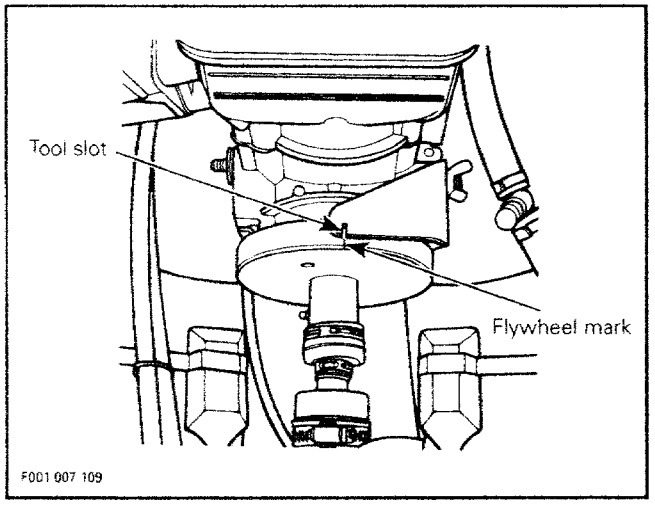
— Unlock outer ring of dial and turn it until zero (0) on dial aligns with pointer.

— Lock outer ring in position.

5. From this point, rotate flywheel back 1/4 turn then rotate it counterclockwise to reach proper specification according to watercraft model. Refer to the following chart.

IGNITION TIMING (BTDC)		
SP, SPI, GTS	SPX, XPI, GTX, EXPLORER	XP
2.65 mm (0.104 in)	2.85 mm (0.112 in)	2.59 mm (0.102 in)

6. Using timing tool slot as reference mark, scribe in middle of tool slot a mark onto PTO flywheel.



This mark becomes the reference when using stroboscopic timing light.

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

Checking Ignition Timing

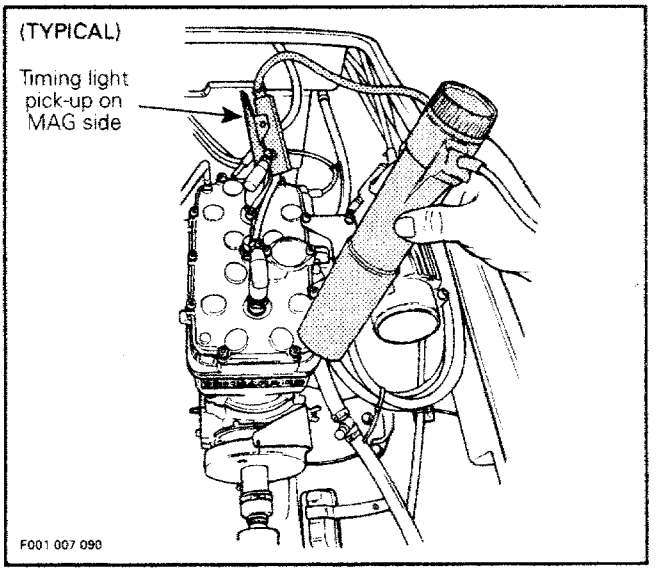
NOTE : To perform this procedure it is recommended to use a stroboscopic timing light rated to work up to 6000 RPM.

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

NOTE : This timing light is battery powered (2 batteries, type C) and therefore needs no auxiliary power source.

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

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



2. Connect an induction-type tachometer to spark plug wire.
3. Start engine and point timing light straight in line with timing tool slot. Bring engine to 6000 RPM for a brief instant.

NOTE : On this NIPPONDENSO system, timing advance decreases as engine speed increases. When marks are aligned at 6000 RPM, spark occurrence is still Before Top Dead Center.

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

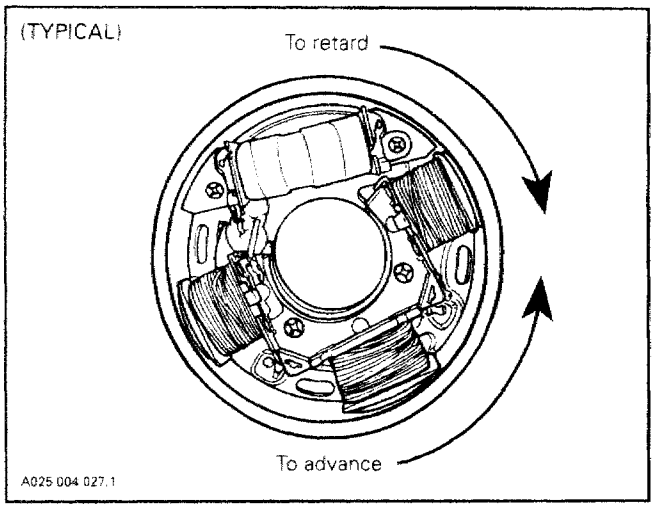
▼CAUTION : If engine is to be run more than a few minutes, connect coupler hose (P / N 295 500 099) to properly cool engine.

If timing marks align, timing is correct.

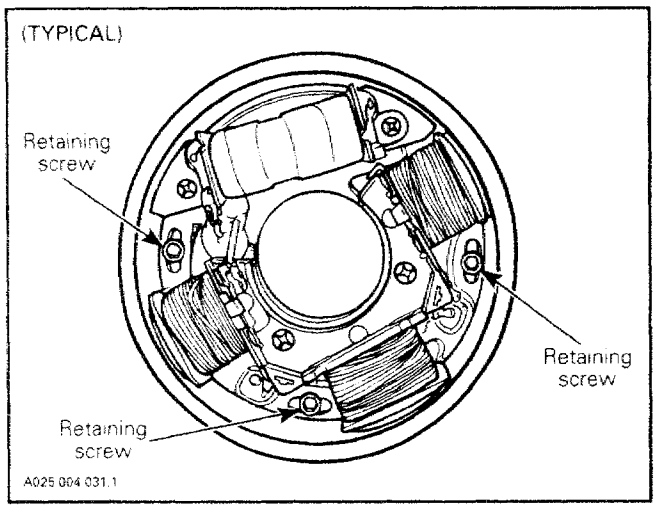
▼CAUTION : Always verify timing marks with TDC gauge before checking the timing. Particularly if PTO flywheel has been replaced, it could possibly move slightly.

IGNITION TIMING ADJUSTMENT

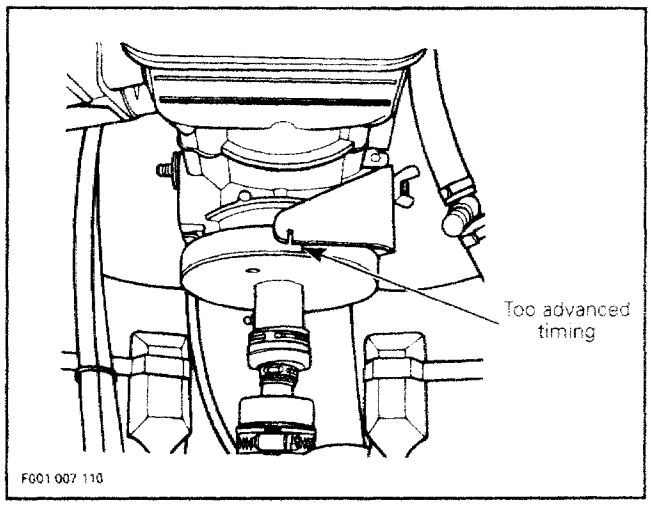
Timing is performed by moving armature plate, clockwise to retard spark occurrence or counterclockwise to advance.



To adjust, loosen 3 armature plate retaining screws and slightly rotate armature plate in proper direction.

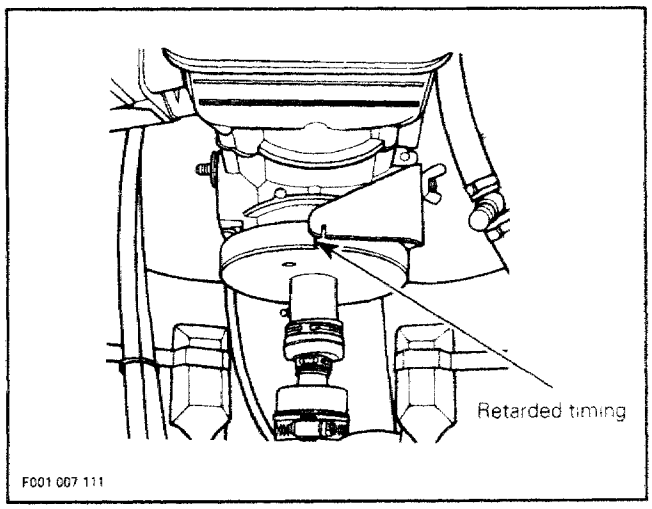


When PTO flywheel mark is on **right** side of timing tool slot, it indicates **advanced** timing.



In this case, turn armature plate **clockwise.**

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



In this case, turn armature plate **counterclockwise.**

After adjustment, tighten armature plate retaining screws.

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

Reinstall removed parts.

Recheck ignition timing (make sure engine is cold).

BATTERY

TROUBLESHOOTING

SYMPTOM : DISCHARGED OR WEAK BATTERY	
CAUSE	REMEDY
1. Battery posts and /or cable terminal oxidized.	Clean and coat with dielectric grease.
2. Loose or bad connections.	Check wiring and connector cleanliness, damaged or short circuit.
3. Faulty battery (sulfated, doesn't keep a full charge, damaged casing, loose post).	Replace.
*4. 15 amp fuse burnt or faulty rectifier.	First check charging coil. If it is in good condition replace fuse or rectifier.
**5. Faulty charging coil.	Replace.

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

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

REMOVAL

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

Proceed as follows :

1. Disconnect the black negative cable first.
2. Then disconnect the red cable last.
3. Remove the vent line from the battery.
4. Remove the holding straps.
5. Withdraw battery from watercraft being careful not lean it so that electrolyte flows out of vent elbow.

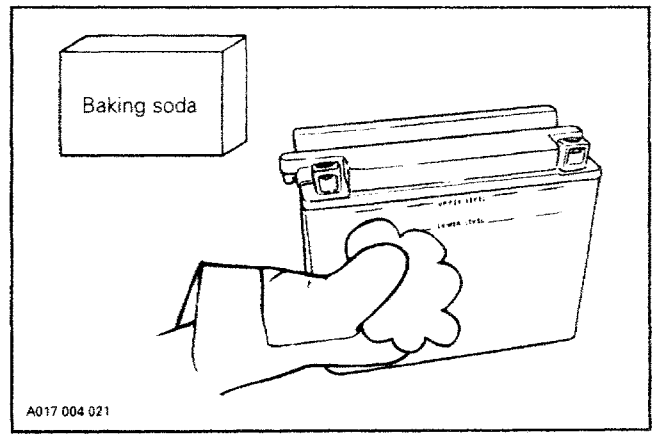
▼CAUTION : Should any electrolyte spillage occur, immediately wash off with a solution of baking soda and water to prevent damage to watercraft components.

◆ WARNING : Electrolyte is poisonous, dangerous and explosive. It contains sulfuric acid and can cause severe burns. Avoid contact with eyes, skin and clothing.

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 chemical properties.



Remove corrosion from battery cable terminals and battery posts using a firm wire brush. Rinse with clear water and dry well.

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.

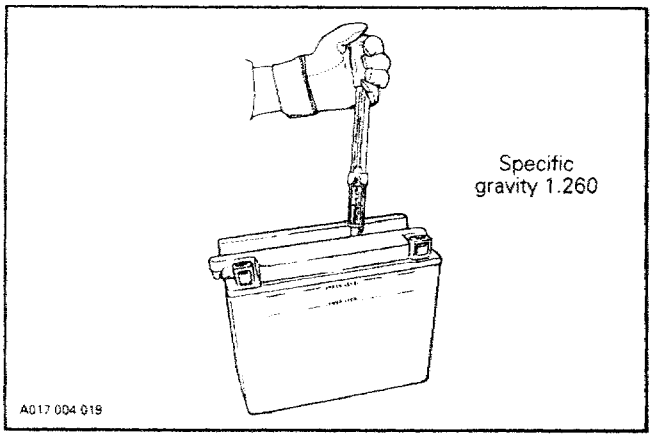
◆ WARNING : Should the battery casing be damaged, wear a suitable pair of non-absorbent gloves when removing the battery by hand.

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 line is not obstructed.

HYDROMETER TEST



A hydrometer measures the charge of a battery in terms of specific gravity of the electrolyte. Most hydrometers give a true reading at 21°C (70°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** 21°C (70°F) and by **subtracting** .004 point for every 5.5°C (10°F) **below** 21°C (70°F).

This chart will be useful to find the correct reading.

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

EXAMPLE NO. 1

Temperature below 21°C (70°F) :
Hydrometer reading : 1.250
Electrolyte temperature : −1°C (30°F)
Subtract .016 Sp. Gr.
Corrected Sp. Gr. is 1.234

EXAMPLE NO. 2

Temperature above 21°C (70°F) :
Hydrometer reading : 1.235
Electrolyte temperature : 38°C (100°F)
Add .012 Sp. Gr.
Corrected Sp. Gr. is 1.247

BATTERY STORAGE

Disconnect and remove battery from watercraft.

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 on terminals.

Clean battery casing and caps using a solution of baking soda and water.

CAUTION : 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. Keep battery away from dew, high moisture and direct sunlight.

During the storage period, recheck electrolyte level and specific gravity readings at least every month. If 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 in watercraft.

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

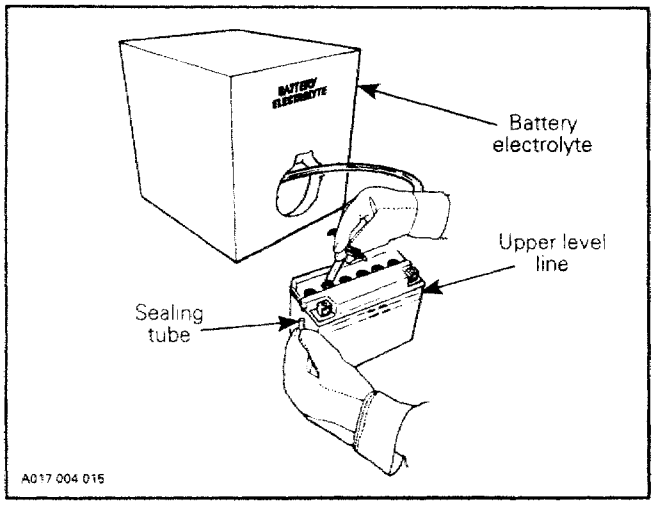
CAUTION : Do not remove the sealing tube or loosen battery caps unless activation is desired.

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

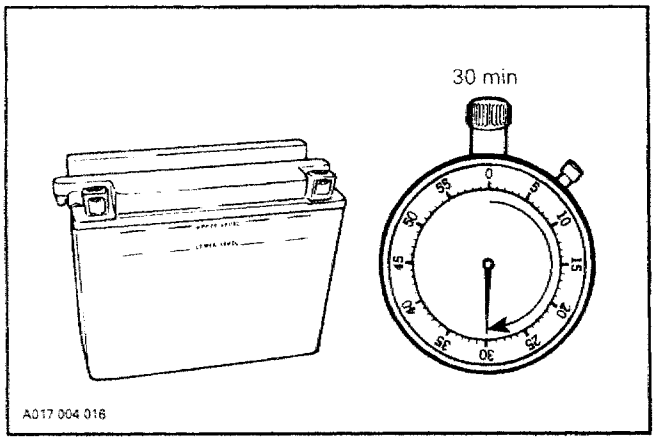
Perform the following operations anytime a new battery is to be installed.

1. Remove the sealing tube from the vent elbow.

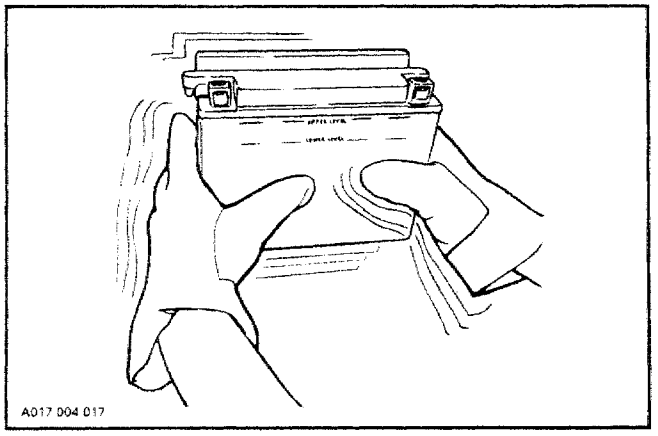
WARNING : Failure to remove the sealing tube could result in an explosion.



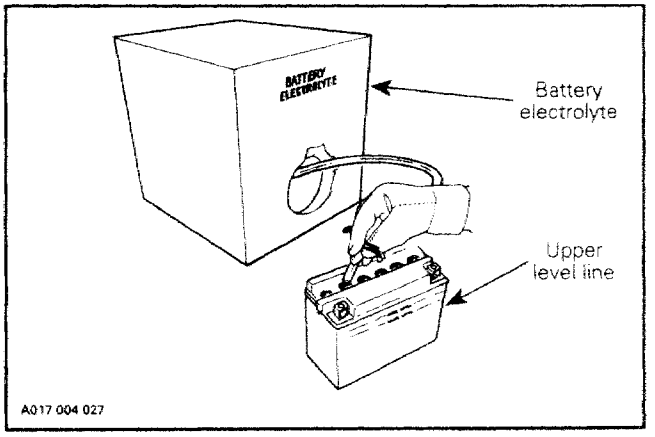
2. Remove caps and fill battery to UPPER LEVEL line with electrolyte (specific gravity : 1.260 at 21°C (70°F)).
3. Allow the battery to stand for 30 minutes MINIMUM so that electrolyte soak through battery cells.



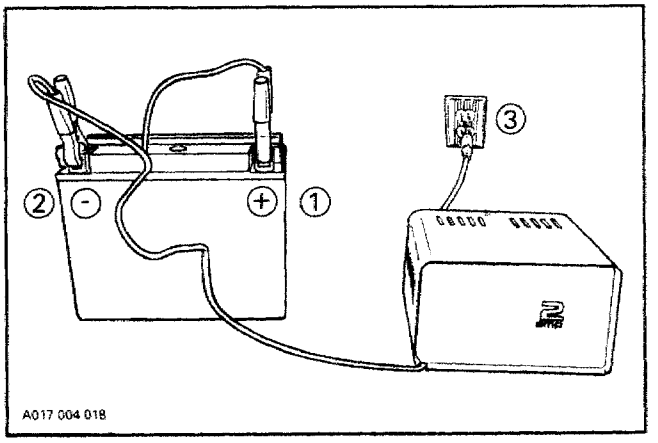
4. Allow gas bubbles to escape by lightly shaking battery by hand.



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



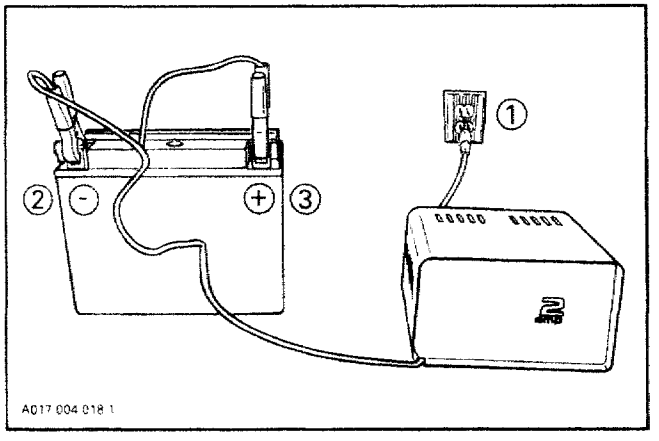
6. Connect a 2 A battery charger for 3 to 5 hours.



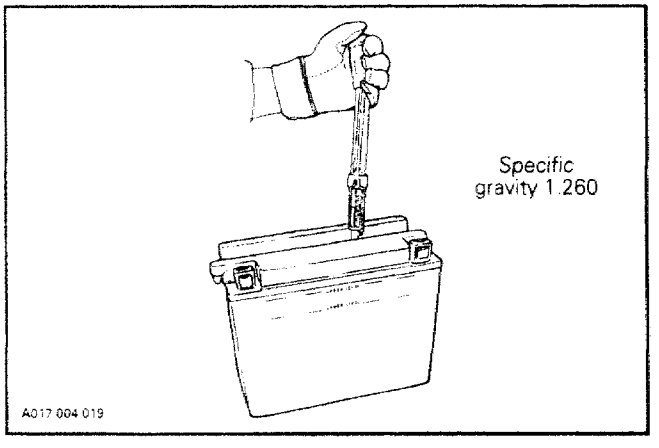
▼CAUTION : If charging rate raises higher than 2.4 A reduce it immediately. If cell temperature rises higher than 50°C (122°F) or if the casing feels hot, discontinue charging temporarily or reduce the charging rate.

◆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.

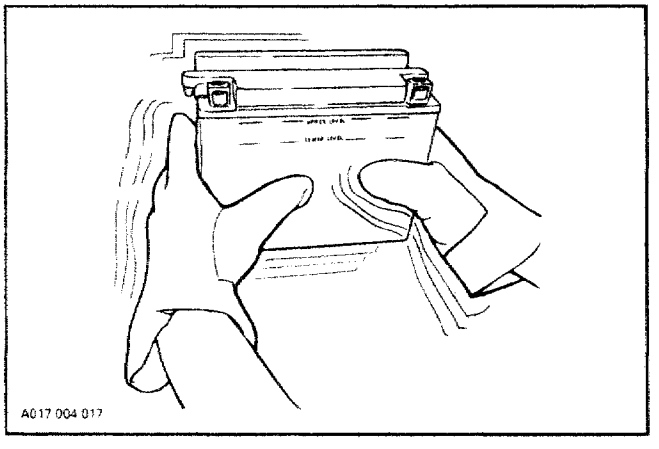
7. Disconnect battery charger.



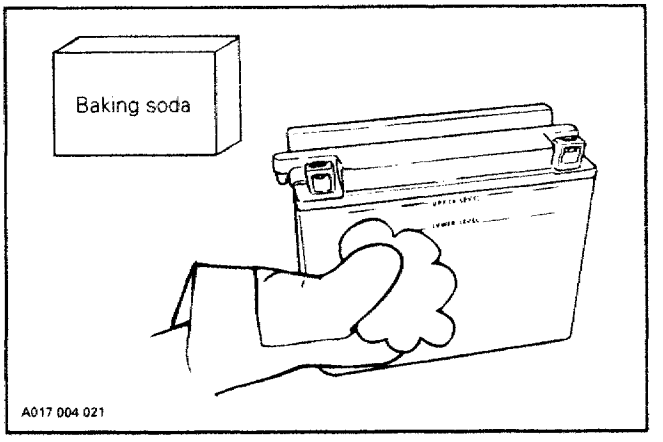
8. Test battery state of charge. Use a hydrometer.



9. Allow gas bubbles to escape by slightly shaking battery.



10. If electrolyte level has dropped after charging, fill with distilled water to UPPER LEVEL line. After water is added, continue charging for 1 to 2 hours to mix water with electrolyte.
11. Reinstall caps and clean any electrolyte spillage using a solution of baking soda and water.



12. Reinstall battery. Hook up battery cables observing correct polarity and coat terminals with dielectric grease.

Install vent line.

NOTE : On SP / XP series, a check valve is installed on vent line to prevent water infiltration into battery.

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

WARNING : Vent line must be free and open. A kinked or bent line 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 watercraft 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 a 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 2 hours before charging.

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

The time required to charge a battery will vary depending on 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 warms 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.

— Exceptionally 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 on 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 approximately 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.

BATTERY CHARGING EQUIPMENT

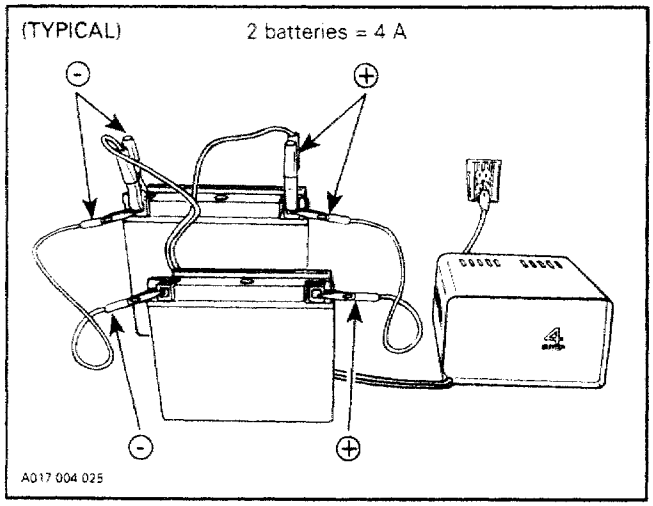
The battery charger should have an adjustable charging rate. Variable adjustment is preferred, but a unit which can be adjusted in small increments is acceptable.

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

Charging 2 or More Batteries at a Time

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

For example : Charging 5 batteries at a time requires a 10 A rated charger (5 x 2 A = 10 A).



INSTALLATION OF BATTERY

◆ **WARNING : Always connect battery cables exactly in the specified order, red positive cable first black negative cable last.**

Proceed as follows :

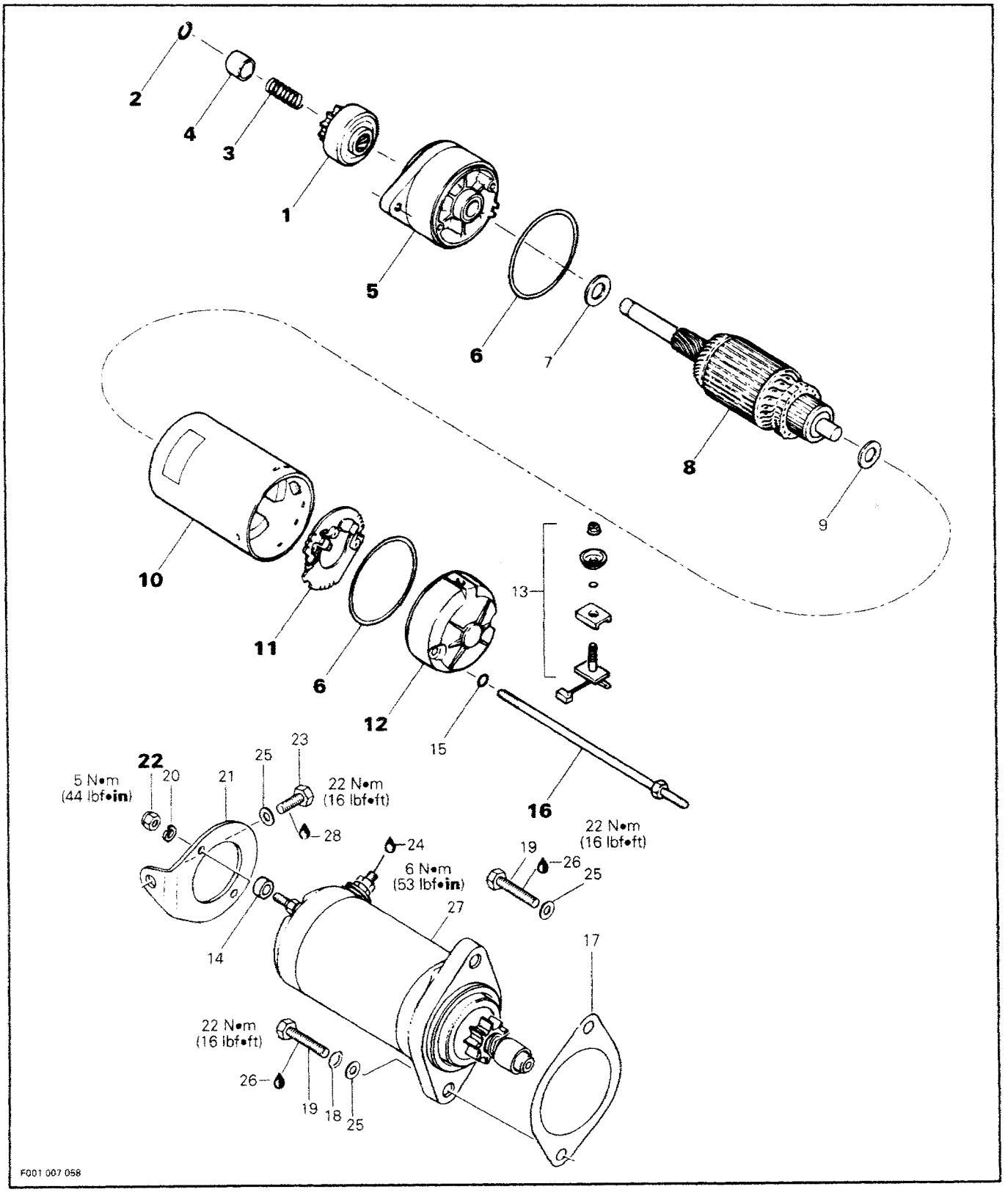
1. Install battery in its emplacement.
2. Secure vent line to the battery. Ensure vent line is not kinked or obstructed.

○ NOTE : On SP / XP series, ensure check valve is not blocked.

◆ **WARNING : Vent line 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.**

3. First connect red positive cable.
4. Then connect black negative cable last.
5. Apply anticorrosion product (salt water resistant) such as dielectric grease on battery posts.
6. Verify cable routing and attachment.

ELECTRIC STARTER



COMPONENTS

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

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

TROUBLESHOOTING

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

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

STARTING SYSTEM TROUBLESHOOTING

SYMPTOM	CAUSE	REMEDY
Starter does not turn.	Burnt fuse 5A.	Check wiring condition and replace fuse.
	Weak battery.	Recharge battery.
	Poor contact of starter switch contact points.	Repair or replace switch.
	Open circuit between starter switch / safety lanyard switch / stop switch and solenoid switch.	Repair.
Starter turns ; but does not crank the engine.	Poor contact of battery terminal(s).	Clean and tighten terminal(s).
	Poor battery ground cable connection.	Clean and tighten.
	Burnt or poor contact of solenoid switch contact disc.	Replace solenoid switch.
	Poor contact of brush.	Straighten commutator and brush.
	Burnt commutator.	Turn commutator in lathe.
	Worn commutator segments.	Undercut mica.
	Shorted armature.	Repair or replace armature.
	Weak brush spring tension.	Replace brush holder or spring.
	Weak magnet.	Replace yoke assembly.
	Worn bushings.	Replace bushings.
	Weak battery.	Recharge battery.
	Shorted battery cell(s).	Replace battery.
Starter turns, but overrunning clutch pinion does not mesh with ring gear.	Worn clutch pinion gear.	Replace clutch.
	Defective clutch.	Replace clutch.
	Poor movement of clutch on splines.	Clean and correct.
	Worn clutch bushing.	Replace clutch.
	Worn starter bushing(s).	Replace bushing(s).
	Worn ring gear.	Replace ring gear.
Starter motor keeps running.	Shorted solenoid switch winding.	Replace solenoid switch.
	Melted solenoid switch contacts.	Replace solenoid switch.
	Starter switch returns poorly.	Verify if rubber cap holds switch button down or replace starter switch.
	Sticking or defective starter clutch.	Lubricate or replace.
	Presence of salt water in the electrical box which gives continuity.	Verify electrical box watertightness.

REMOVAL

Disconnect black cable ground connection from battery.

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

Disconnect red cable connection from battery.

Remove the following parts.

— cables from starter

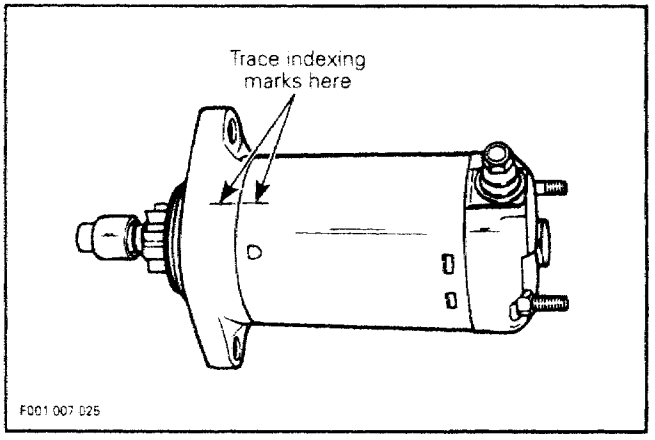
— screw of starter rear support (item #23)

— starter mount screws (item #19)

DISASSEMBLY

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

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



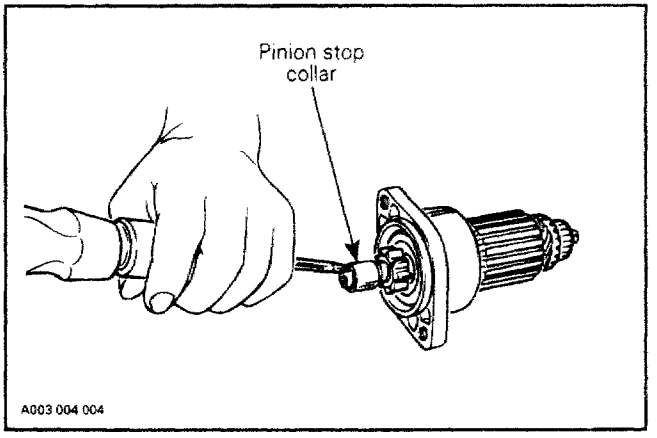
Remove starter support nuts then through bolts. Separate end frame from yoke assembly. Withdraw yoke assembly from armature.

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

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

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

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



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

Turn assembly clockwise to remove it from armature assembly.

Pull housing from armature.

CLEANING

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

Discard all O-rings and gasket.

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

Blow brush holders clean using compressed air.

◆ WARNING : Always wear safety 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.

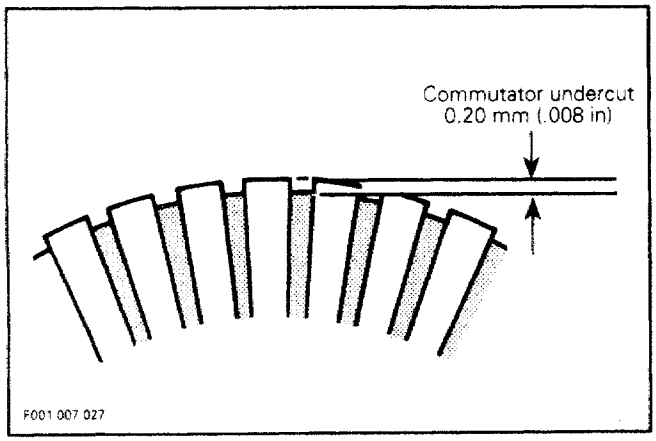
INSPECTION

Armature

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

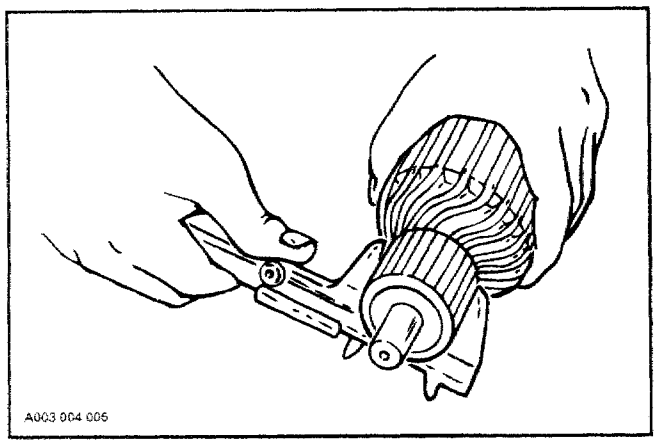
Check commutator for roughness, burnt or scored surface. If necessary, turn commutator on a lathe, enough to resurface only.

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.



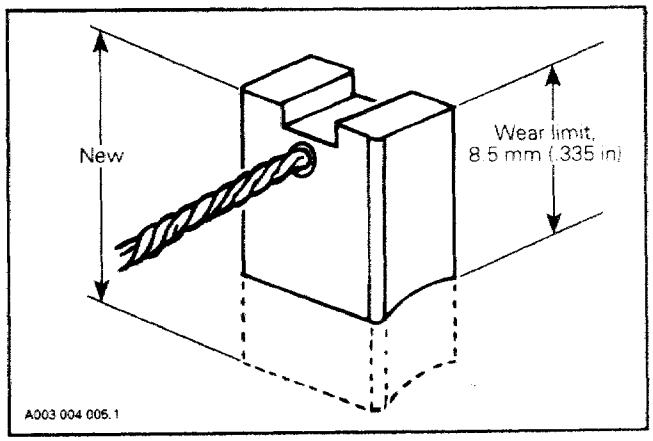
Brush Holder

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 counterclockwise direction. If defective, replace.

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

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

Starter Switch

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

Solenoid

NOTE : Solenoid is located in electrical box.

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

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

ASSEMBLY

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

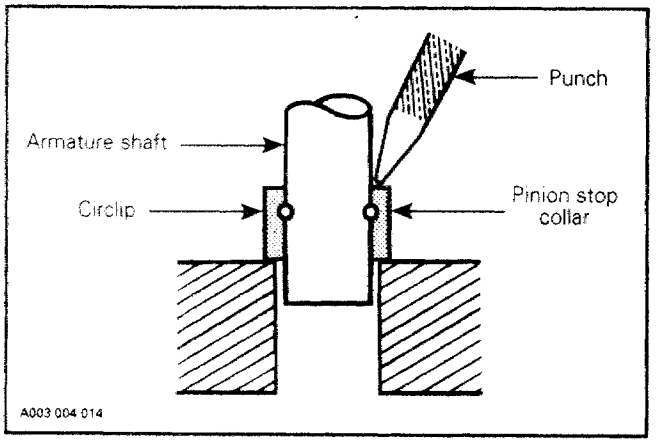
Prior to assembling, coat sliding surfaces on armature shaft splines, overrunning clutch and bushing with G.E. Versilube G 341 M or ESSO Beacon 325 lubricant or equivalent.

Apply motor oil on metal bushings.

2,4, Circlip and Pinion Stop Collar

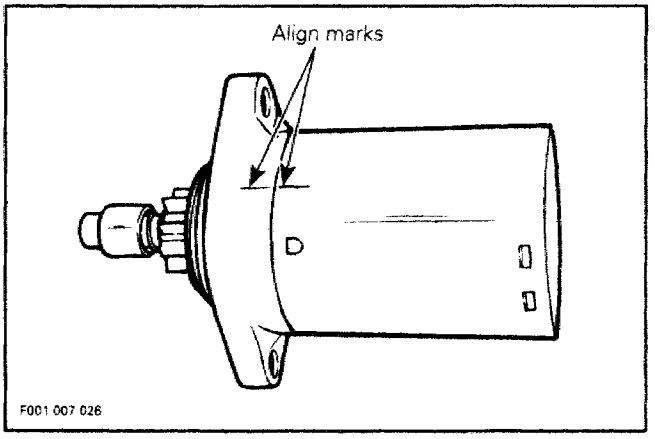
After placing stop collar on armature shaft, fit circlip into armature shaft, then make sure that it is properly secured.

Slide stop collar over circlip and secure in place by punching it at 2 or 3 places.



5,10, Housing and Yoke Ass'y

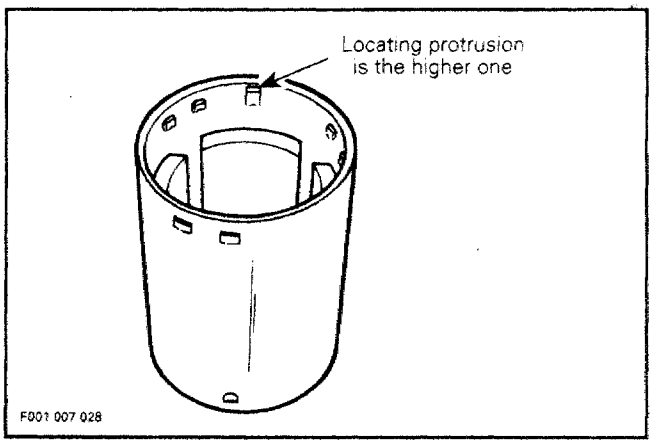
Align previously traced indexing marks.

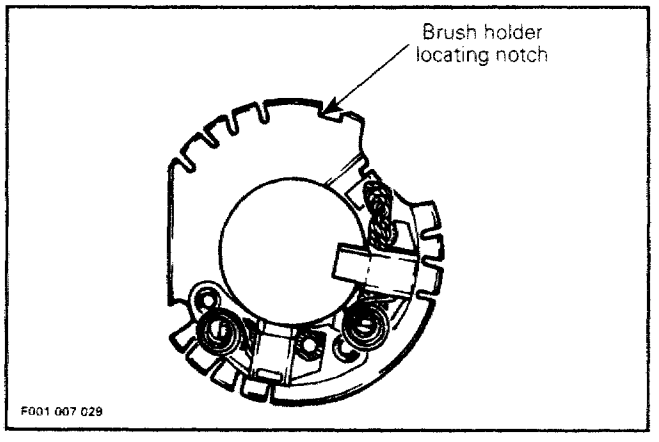


10,12,16, Yoke Ass'y, End Frame and Through Bolt

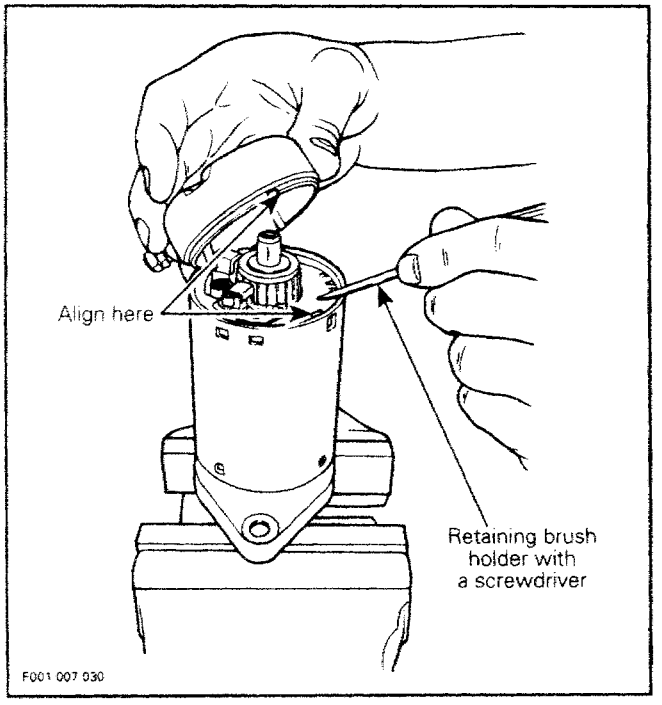
Open brushes and slide over commutator.

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





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



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

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

INSTALLATION

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

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

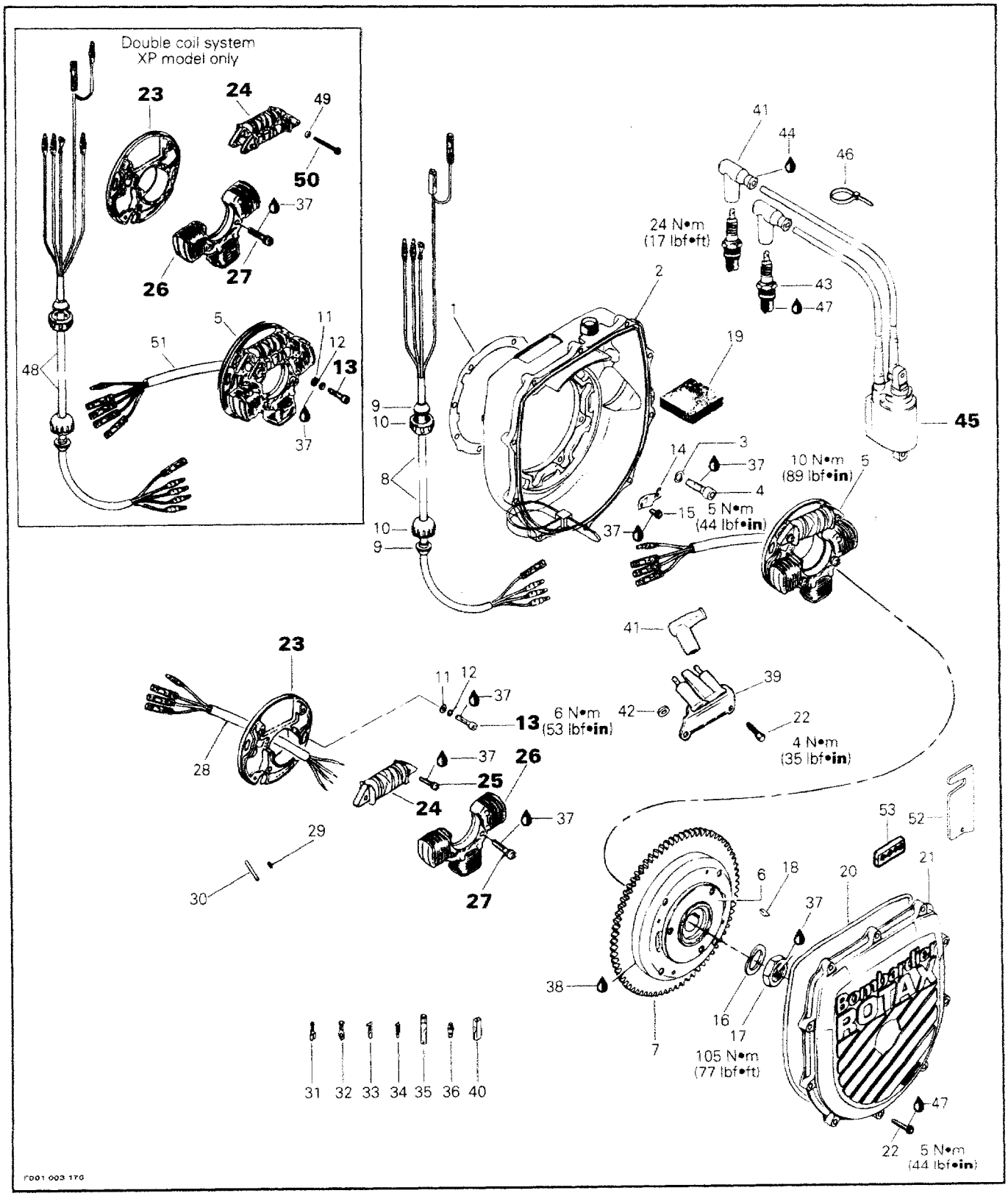
Install starter, apply Loctite 242 (blue) on starter support screw threads and torque screw to 22 N•m (16 lbf•ft).

Connect the red battery cable to the starter and torque nut to 6 N•m (53 lbf•**in**). Apply dielectric grease on terminal and nut.

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

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

MAGNETO SYSTEM



COMPONENTS

1. *Gasket*
2. *Ignition housing*
3. *Lock washer 8 mm*
4. *Allen screw M8 x 25*
5. *Armature plate assembly*
6. *Magneto flywheel*
7. *Ring gear 77 teeth*
8. *Harness assembly*
9. *Grommet*
10. *Nut cap*
11. *Washer 5.5 mm*
12. *Lock washer 5 mm*
13. *Allen screw M5 x 18*
14. *Retainer plate*
15. *Taptite screw M5 x 8*
16. *Lock washer M22*
17. *Hexagonal nut M22*
18. *Woodruff key*
19. *Protection mat*
20. *O-ring*
21. *Ignition housing cover*
22. *Self tapping screw M5 x 25*
23. *Armature plate*
24. *Generating coil*
25. *Phillips screw M5 x 22*
26. *Battery charging coil*
27. *Screw M6 x 25*
28. *Harness assembly*
29. *Terminal clip*
30. *Shrink tube 30 mm*
31. *Female connector*
32. *Ring terminal*
33. *Female terminal*
34. *Male terminal*
35. *Insulation sheath*
36. *Insulation sheath*
37. *Loctite 242 (blue)*
38. *Loctite 648 (green)*
39. *Ground plate*
40. *Protection cap*
41. *Insulator*
42. *Star washer 5 mm*
43. *Spark plug*
44. *Dielectric grease*
45. *Ignition coil*
46. *Tie rap*
47. *Anti-seize lubricant*
48. *Harness assembly*
49. *Lock washers*
50. *Slotted head screw M5 x 35*
51. *Harness assembly*
52. *Cable support*
53. *Clip*

REMOVAL

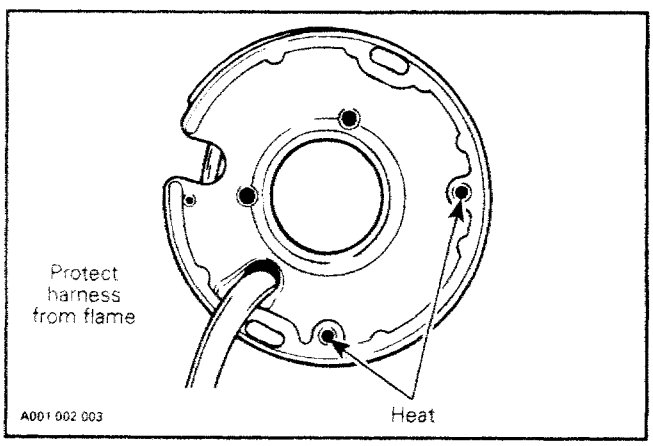
Refer to ENGINE section 03-04 then look for **PTO flywheel** and **magneto** for parts removal.

DISASSEMBLY

24, Generating Coil (Single)

To replace generating coil :

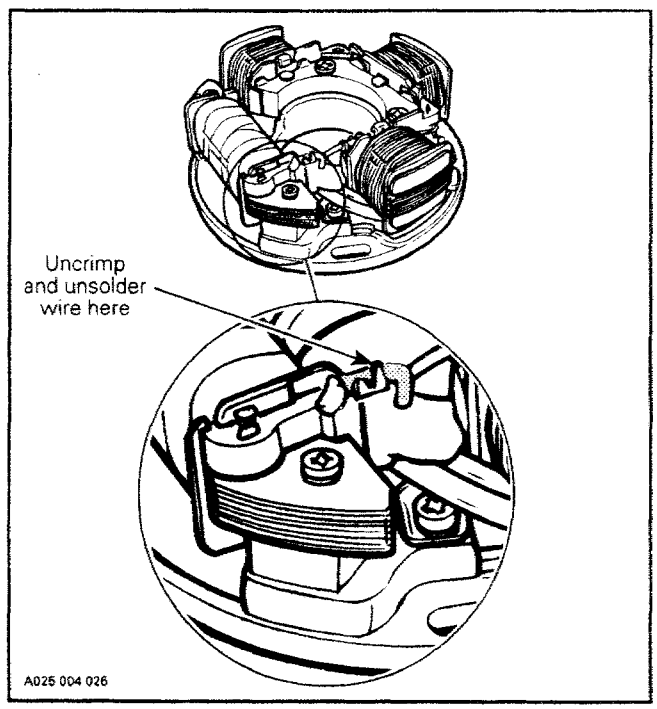
— Heat the armature plate to 93 °C (200 °F) around the screw holes to break the threadlocker bond.



CAUTION : Protect harness from flame.

— Remove screws.

— Uncrimp and unsolder BLACK / RED wire from coil.

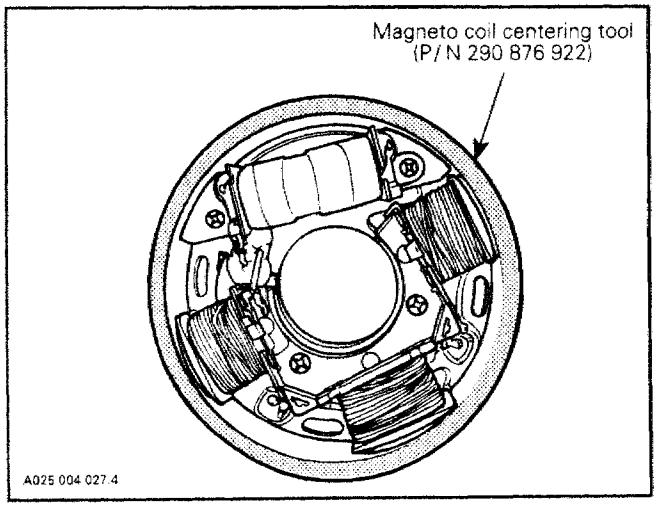


— Strip end of old wire then crimp and solder on new coil.

24,25, Generating Coil and Screw

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

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

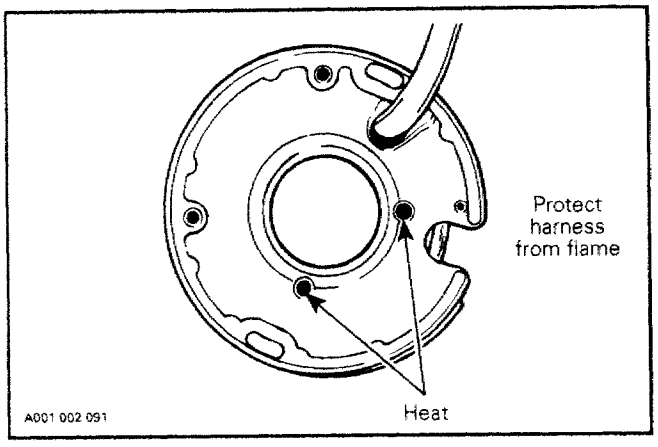


▼CAUTION : Before reinstalling the magneto, remove the loose epoxy from harness.

26, Battery Charging Coil

To replace battery charging coil :

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

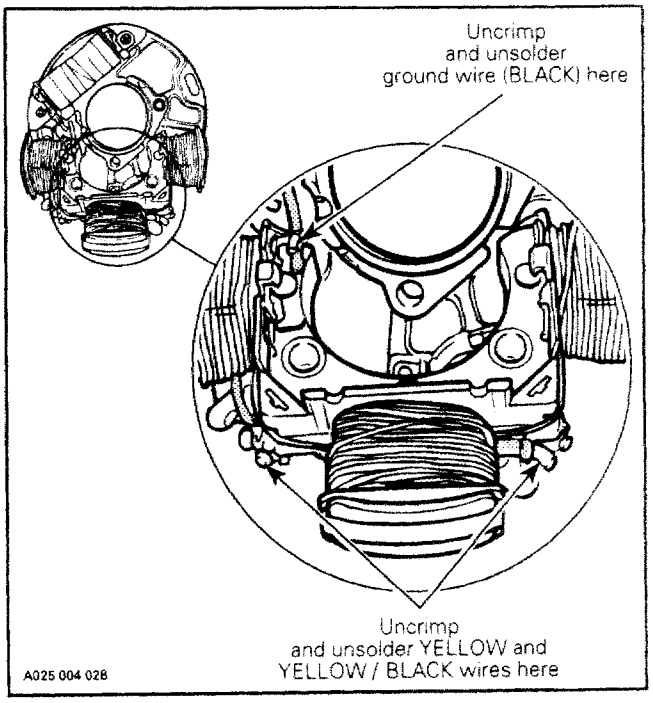


▼CAUTION : Protect harness from flame.

— Remove screws.

— Uncrimp and unsolder YELLOW and YELLOW / BLACK wires from coil.

— Uncrimp and unsolder ground wire (BLACK) from coil core.

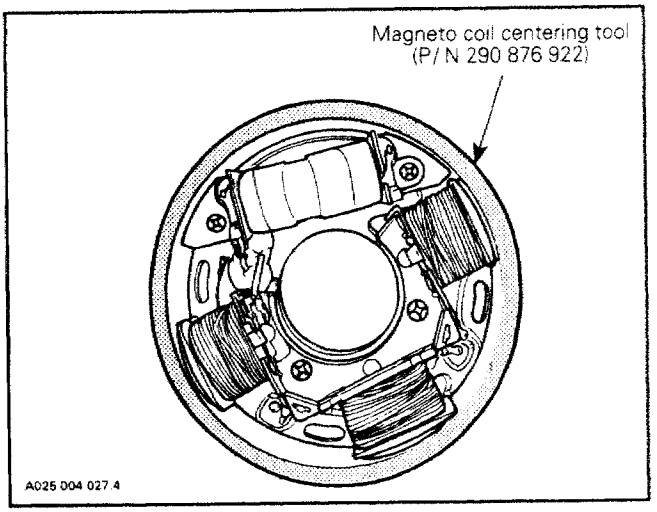


— Position new coil, crimp and solder all wires.

26,27, Battery Charging Coil and Screw

Prior to assembly, apply Loctite 242 (blue).

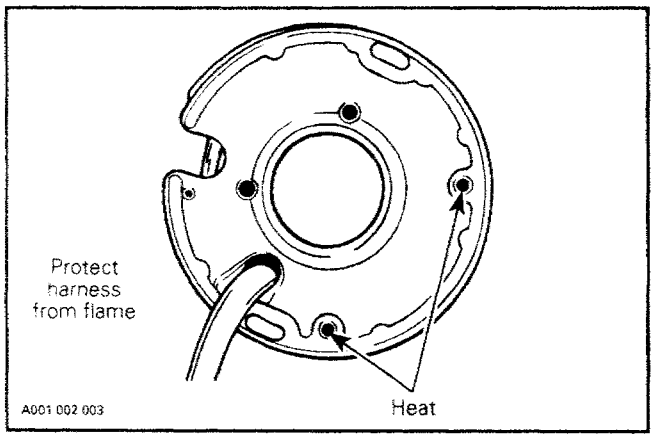
Use magneto coil centering tool (P / N 290 876 922) and install it so that it fits around armature plate before tightening screws.



24, Generating Coil (Double)

To replace generating coil :

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



CAUTION : Protect harness from flame.

— Remove screws.

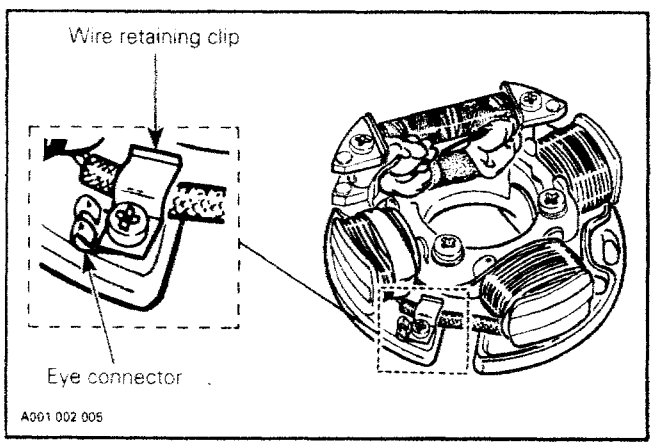
— Cut the 3 wires as close as possible to the coil body.

— 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.

— Strip end of old wires and solder on new coil wires.

— 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.

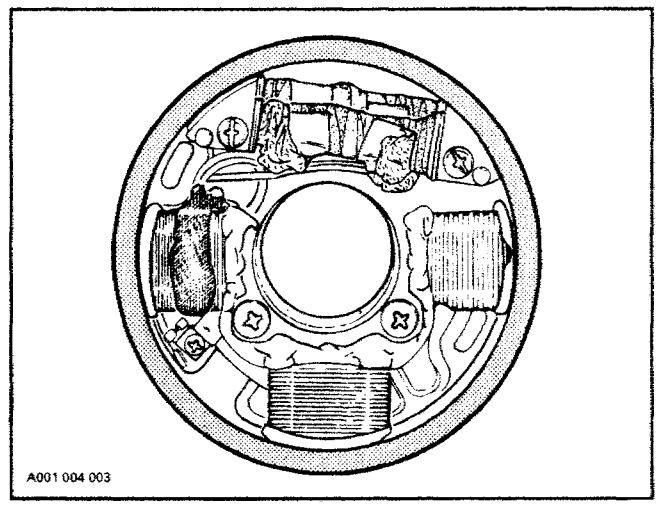
— Solder an eye connector to the lead and fasten it under the wire retaining clip.



24,50, Generating Coil and Screw

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

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

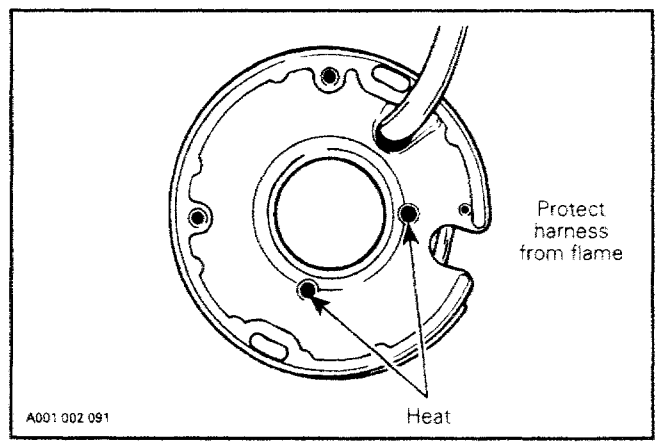


CAUTION : Before reinstalling the magneto, remove the loose epoxy from harness.

26, Battery Charging Coil

To replace battery charging coil :

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



CAUTION : Protect harness from flame.

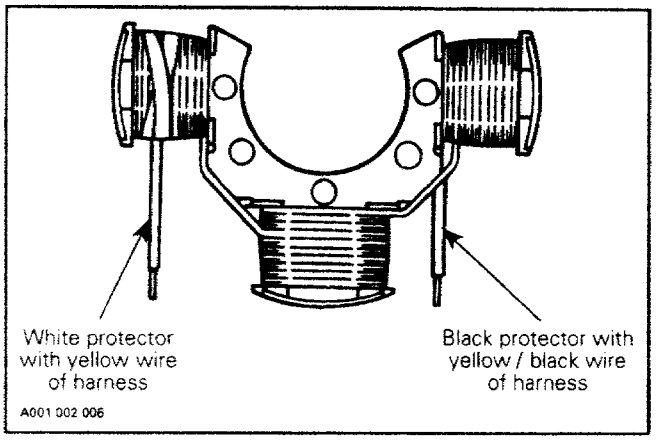
— Remove screws.

— 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.



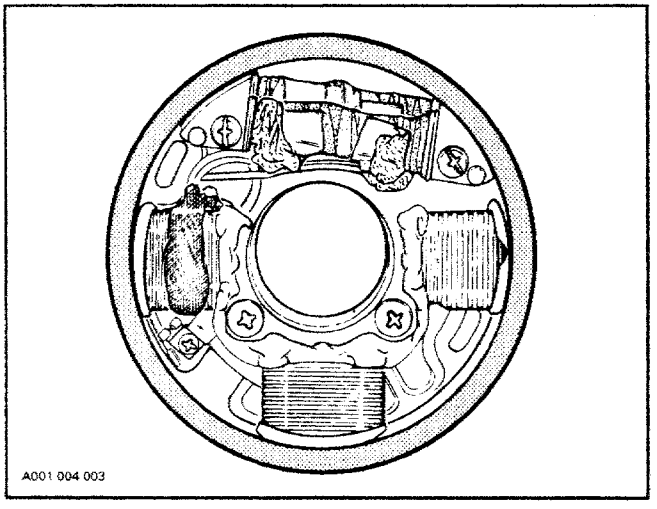
Protector Tube

Position protector tubes over connections.

26,27, Battery Charging Coil and Screw

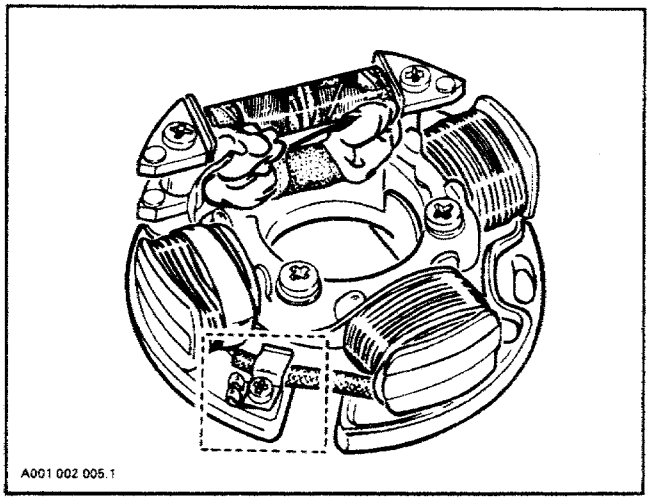
Prior to assembly, apply Loctite 242 (blue).

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 the magneto, remove the loose epoxy from harness.

ASSEMBLY

NOTE : Always apply dielectric grease on all electrical connections.

13,23, Screw and Armature Plate

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

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

45, Ignition Coil

Single Generating Coil

Connect BLACK / RED wire to ignition coil terminal.

Double Generating Coil

Connect BLACK wire to ignition coil negative (-) terminal.

Connect WHITE / BLUE wire to ignition coil positive (+) terminal.

Identification of Magneto Flywheels

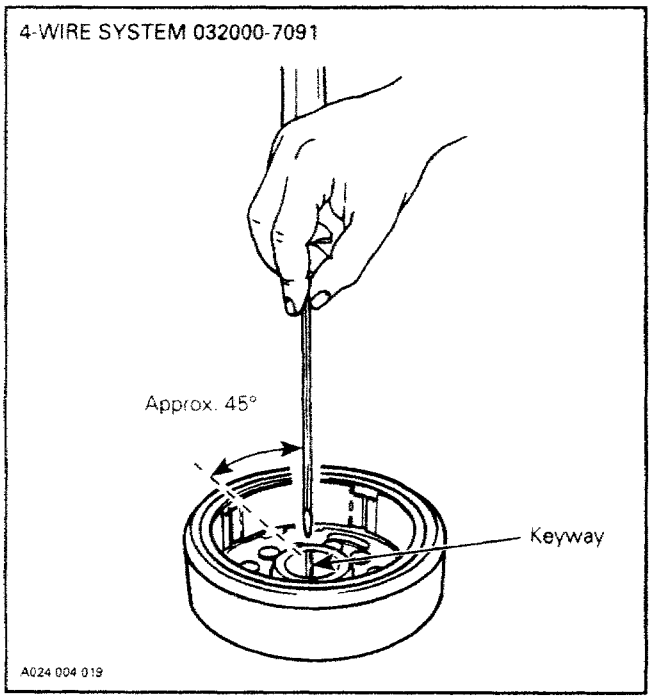
There are 2 ways to differentiate the 2 magneto flywheels :

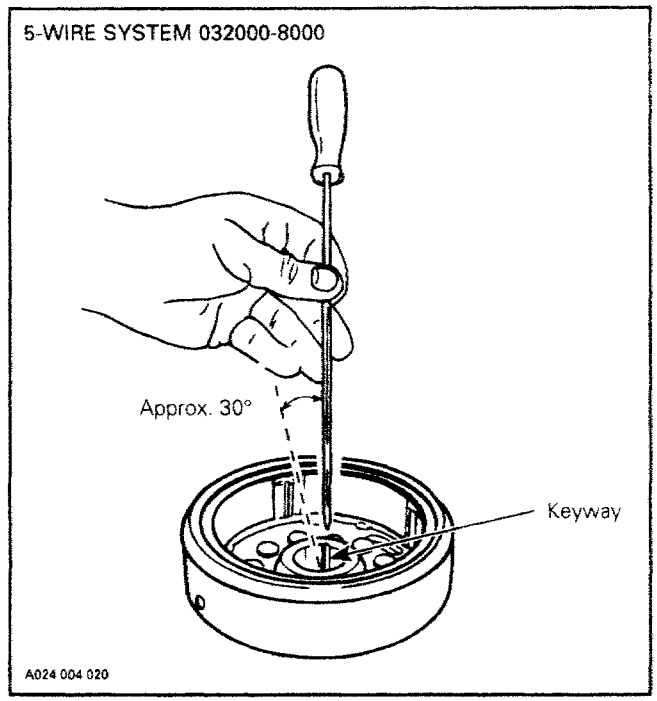
1. Nippondenso part number stamped on flywheel is different for each system :

   4-wire system flywheel : (P / N 290 995 118) - Nippondenso P / N is 032000-7091 ;

   5-wire system flywheel : (P / N 290 995 113) - Nippondenso P / N is 032000-8000 ;

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





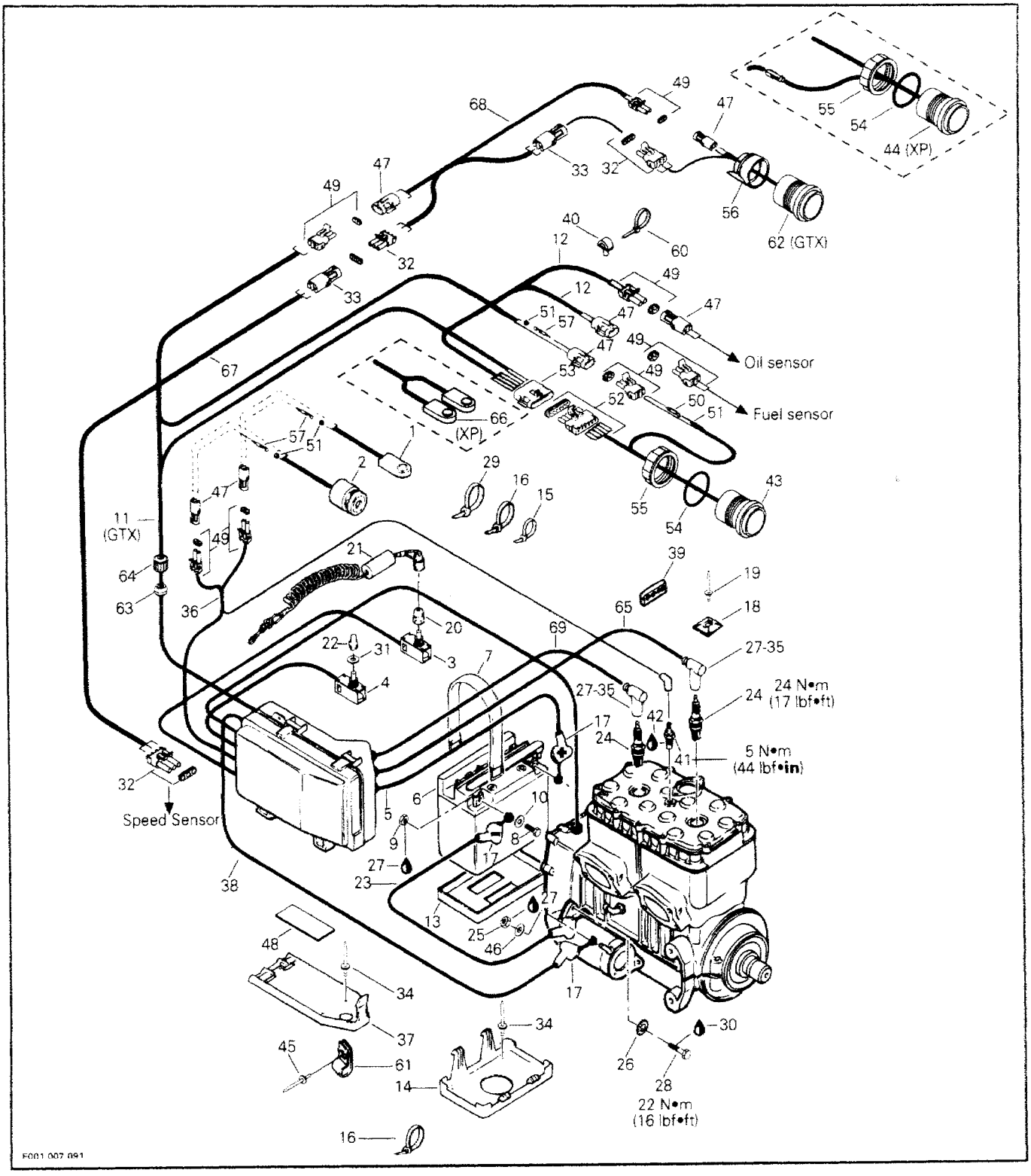
INSTALLATION

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

Perform ignition timing.

CDI AND CHARGING SYSTEMS

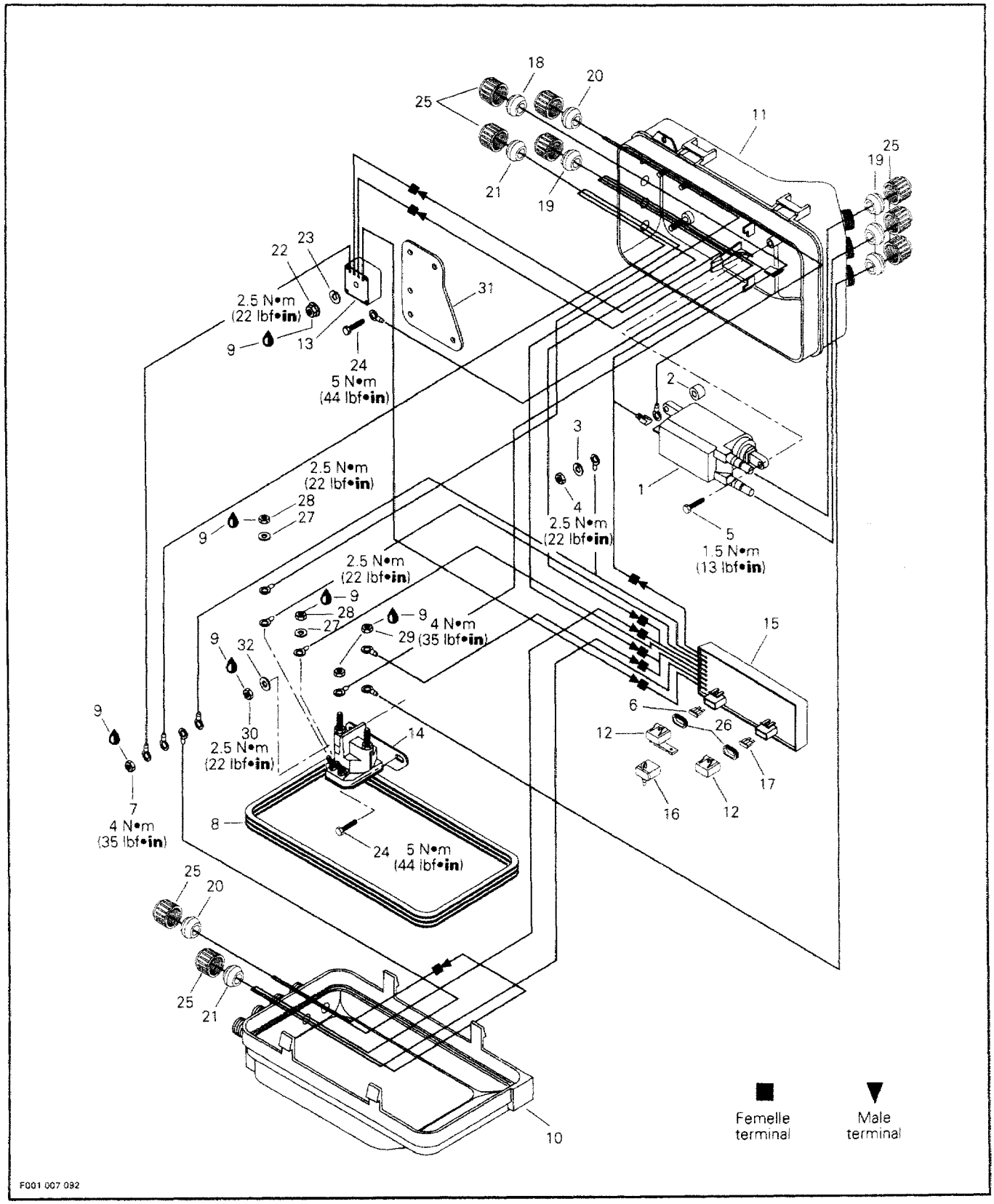
ELECTRICAL COMPONENTS



COMPONENTS

1. *Stop switch assembly*
2. *Buzzer assembly*
3. *Safety lanyard switch*
4. *Ignition starter switch*
5. *Red battery cable (positive)*
6. *Battery*
7. *Strap*
8. *Screw M6 x 16*
9. *Washer 6mm*
10. *Nut M6*
11. *Wiring harness (3 circuits)*
12. *Wiring harness (4 circuits)*
13. *Battery lower pad*
14. *Battery support*
15. *Tie rap*
16. *Tie rap*
17. *Protector cap*
18. *Tie mount*
19. *Rivet 1/8" x .640"*
20. *Switch nut*
21. *Safety lanyard*
22. *Cap*
23. *Battery ground cable (negative)*
24. *Spark plug*
25. *Lock nut M6*
26. *External teeth lock washer 8mm*
27. *Dielectric grease*
28. *Hexagonal screw M8 x 16*
29. *Tie rap*
30. *Loctite 271 (red)*
31. *Washer*
32. *Tab housing (3 circuits)*
33. *Receptacle housing (3 circuits)*
34. *Rivet*
35. *Spark plug cap*
36. *Buzzer / stop switch harness assembly*
37. *Electrical box support*
38. *Starter cable*
39. *Wire clip*
40. *Tie mount*
41. *Thermo sensor*
42. *Loctite 515*
43. *Fuel / oil gauge (except SP model)*
44. *Tachometer (XP model)*
45. *Rivet*
46. *Washer 6 mm*
47. *Receptacle housing (2 circuits)*
48. *Rubber strip*
49. *Tab housing (2 circuits)*
50. *Female terminal*
51. *Wire seal*
52. *Tab housing (6 circuits)*
53. *Receptacle housing (6 circuits)*
54. *O-ring*
55. *Gauge nut*
56. *Gauge support*
57. *Male terminal*
58. *Tab housing (1 circuit)*
59. *Receptacle housing (1 circuit)*
60. *Tie rap*
61. *Clip*
62. *Speedometer (GTX model)*
63. *Grommet*
64. *Nut cap*
65. *Spark plug wire (PTO side)*
66. *VTS switch*
67. *Wiring harness (5 circuits)*
68. *Wiring harness (3 circuits)*
69. *Spark plug wire (MAG side)*

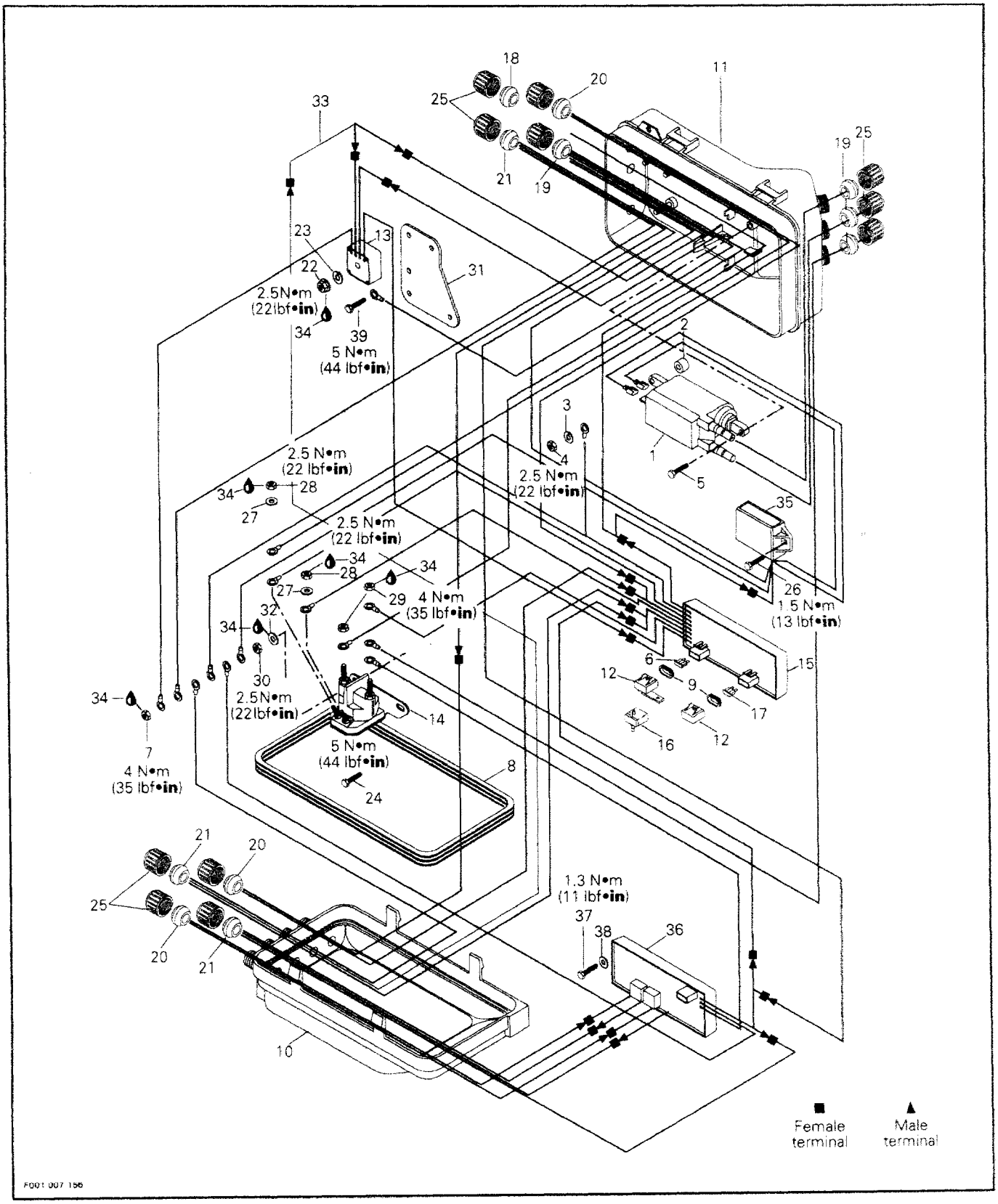
ELECTRICAL BOX (EXCEPT XP MODEL)



COMPONENTS

1. *Ignition coil (with integrated ignition module)*
2. *Spacer*
3. *Lock washer 6 mm*
4. *Nut M6*
5. *Tapping screw M6.3 x 25*
6. *Fuse 15 A*
7. *Lock nut M6*
8. *Gasket*
9. *Dielectric grease*
10. *Cover*
11. *Electrical box base*
12. *Fuse cap*
13. *Rectifier*
14. *Solenoid*
15. *Multi-purpose electronic module*
16. *Spare fuse holder*
17. *Fuse 5 A*
18. *Grommet*
19. *Grommet*
20. *Grommet*
21. *Grommet*
22. *Nut M6*
23. *Lock washer 6 mm*
24. *Self tapping screw M6.3 x 13*
25. *Nut cap*
26. *Seal*
27. *Flat washer 5 mm*
28. *Lock nut 10-32*
29. *Lock nut 1/4-20*
30. *Nut M6*
31. *Mounting plate*
32. *Washer 6 mm*
33. *Self tapping screw M6 x 10*

ELECTRICAL BOX (XP MODEL)

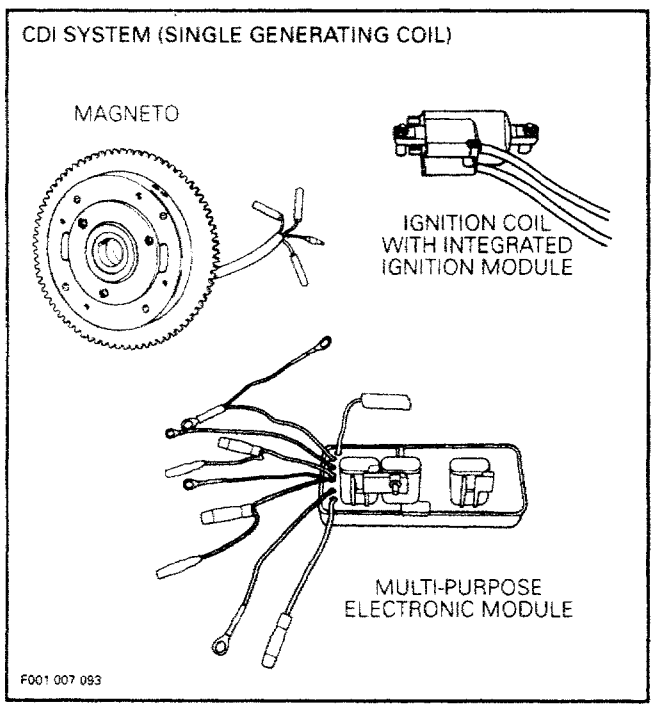


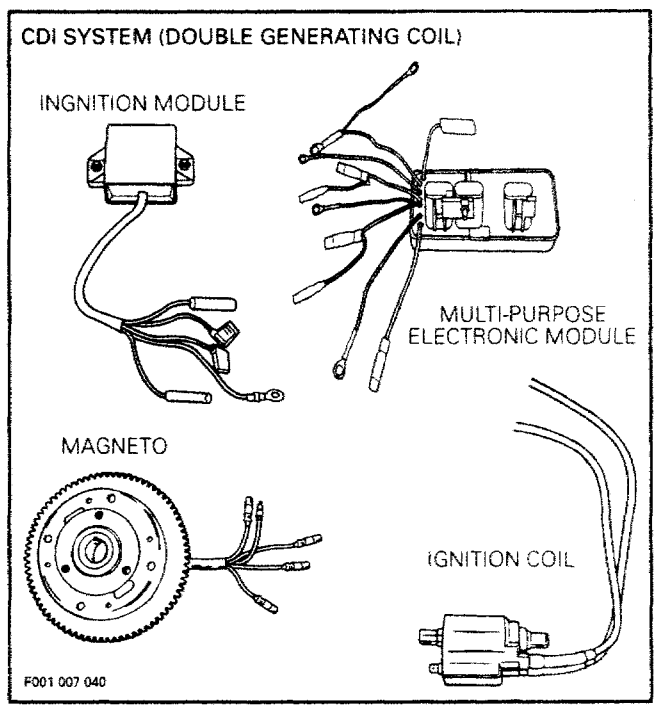
COMPONENTS

1. *Ignition coil*
2. *Spacer*
3. *Lock washer 6 mm*
4. *Nut M6*
5. *Tapping screw M6.3 x 38*
6. *Fuse 15 A*
7. *Lock nut M6*
8. *Gasket*
9. *Seal*
10. *Cover*
11. *Electrical box base*
12. *Fuse cap*
13. *Rectifier*
14. *Solenoid*
15. *Multi-purpose electronic module*
16. *Spare fuse holder*
17. *Fuse 5 A*
18. *Grommet*
19. *Grommet*
20. *Grommet*
21. *Grommet*
22. *Nut M6*
23. *Lock washer 6 mm*
24. *Self tapping screw M6.3 x 13*
25. *Nut cap*
26. *Self tapping screw M6.3 x 25*
27. *Flat washer 5 mm*
28. *Lock nut 10-32*
29. *Lock nut 1/4-20*
30. *Nut M6*
31. *Mounting plate*
32. *Washer 6 mm*
33. *"Y" wire*
34. *Dielectric grease*
35. *Ignition module*
36. *Variable trim system control module*
37. *Self tapping screw M6.3 x 13*
38. *Flat washer 6 mm*
39. *Self tapping screw M6 x 10*

GENERAL

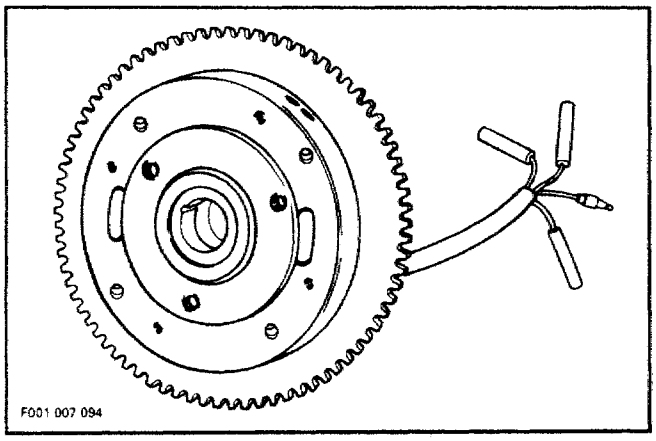
The Capacitor Discharge Ignition system includes the following components :





Magneto

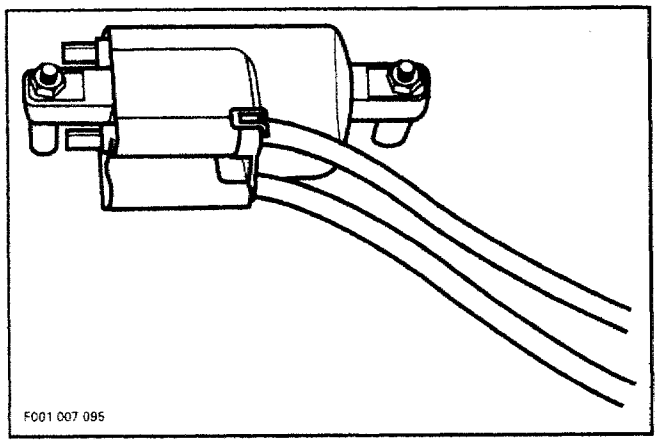
It is the primary source of electrical energy. It transforms magnetic field into electric current through a generating coil.



Ignition Coil (Single Generating Coil)

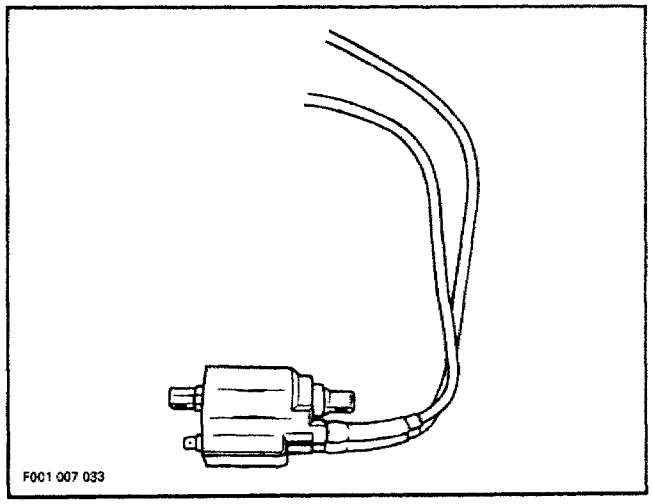
It receives its energy from generating coil via a BLACK / RED wire. The generating coil allows a current flow through ignition coil with its integrated CDI module and through primary windings.

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



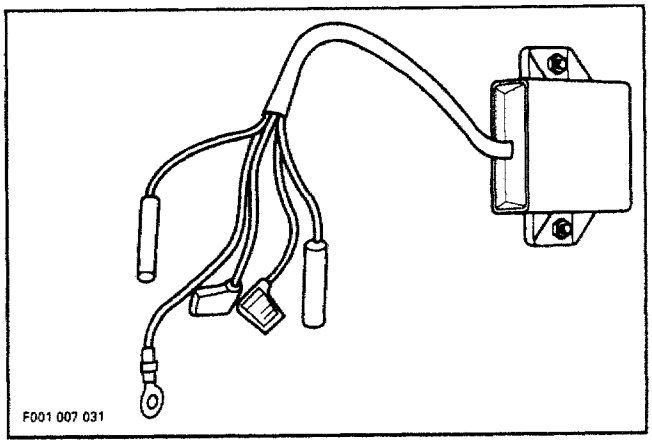
Ignition Coil (Double Generating Coil)

It receives its energy from ignition module via two wires. It induces voltage to a high level in secondary windings to produce a spark at spark plug.



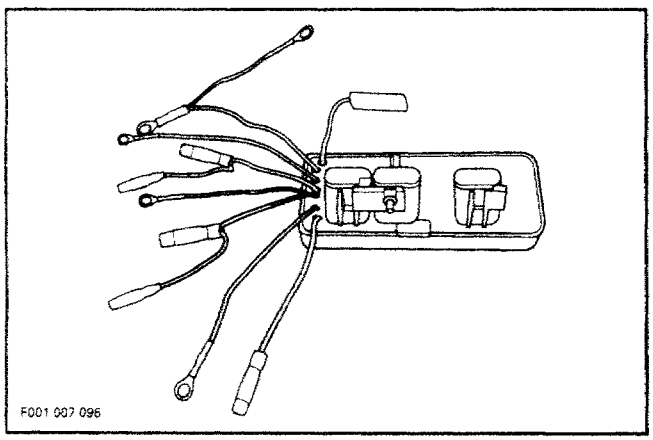
Ignition Module (Double Generating Coil)

It receives its primary electric current from magneto via 2 wires which charges a capacitor. It controls spark occurence by discharging capacitor to primary windings of ignition coil.



Multi-Purpose Electronic Module

It receives its current from the battery. It includes the engine rev limiter and also an integrated timer delay which cut off the electrical circuit after approximately 30 seconds of non-use when the safety lanyard cap is on switch.



NOTE : The fuse connectors are directly mounted onto the MPEM.

Engine Rev Limiter

It has three functions :

— Keeps high voltage away from safety lanyard switch.

— Provides engine stop by grounding the primary coil.

— Limits engine RPM to prevent over-reving.

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

A defective rev limiter may cause the following problems :

— No spark.

— Uninterruption of spark when engine stop / safety lanyard switch is used.

— Incorrectly controlled engine maximum RPM.

— Misfiring / black fouled spark plugs.

To check engine rev limitation function, run engine and check its maximum speed, it should be around 6550 ± 100 RPM for 587 engine and 7000 (+100, –50) RPM for 657 engines.

IGNITION SYSTEM TESTING PROCEDURE

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

1. Spark occurence / spark plug condition.
2. Battery condition.
3. Electrical connections.
4. Engine stop / safety lanyard switches.
5. Ignition relay.
6. Multi-purpose electronic module (MPEM).
7. Variable trim system (VTS) switches (XP model only).
8. VTS control module (XP model only).
9. Magneto output.
10. Ignition coil output.

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

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

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

NOTE : To perfom verification a good quality multimeter such as Fluke 73 (P / N 529 022 000) can be used.

Engine Stop / Safety Lanyard Switche Verification

Both switches can be verified together because they are connected in series. Disconnect stop switch BLACK wire in electrical box. Disconnect safety lanyard switch BLACK / YELLOW wire from MPEM BLACK / YELLOW wire in electrical box. Using an ohmmeter connect test probes to BLACK and BLACK / YELLOW wires. Install safety lanyard cap over the switch and if the reading is infinity (∞), verify both switches separately. Proceed as follows :

Engine Stop Switch

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

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

Safety Lanyard Switch

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

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

Ignition Relay Verification

The relay is integrated into the MPEM.

The ignition relay is working off an approximately 30 seconds timer delay and could be the problem of some faulty ignition situations.

Always confirm first that the fuses are in good condition.

NOTE : To confirm the relay function, it should stay on for about 30 seconds and then turn off.

Multi-Purpose Electronic Module (MPEM) Verification

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

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

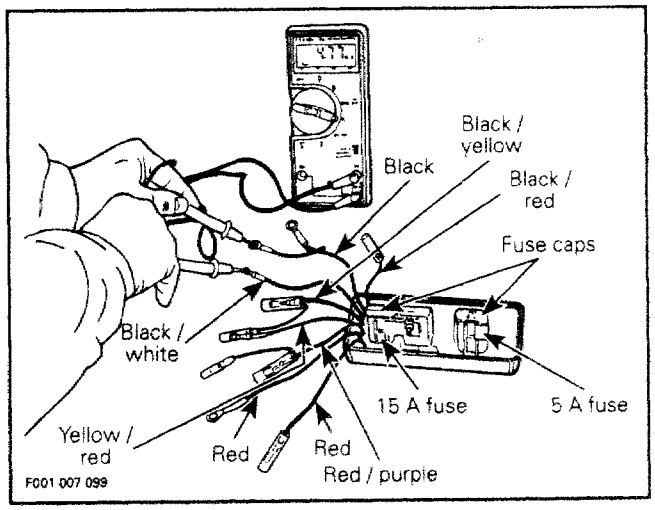
CAUTION : When replacing a MPEM, make sure to replace it with the right model, or damage could occur to components.

MPEM testing equipment :

Use an ohmmeter with an input impedance up to 20 mega ohm (2 000 000 ohm).

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

Meter (–) lead	Meter (+) lead	Minimum value	Maximum value
Yellow / red	Red (ring terminal)	150 kΩ	1 MΩ
Red (ring terminal)	Yellow / red	∞	∞
Black (ring terminal)	Purple	100 Ω	1.2 MΩ
Red (ring terminal)	Red (female terminal)	0 Ω	1 Ω
Black (ring terminal)	Yellow / red	150 kΩ	500 kΩ
Black	Black or Black / red (male terminal)	200 kΩ	1 MΩ
Black (ring terminal)	Black / Yellow	30 kΩ	40 kΩ



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

NOTE : Sometimes only parts replacement can solve the problem.

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

Variable Trim System (VTS) Switche Verification (XP Model Only)

Disconnect the PURPLE wire, BLUE / WHITE wire and GREEN / WHITE wire in the electrical box. Using an ohmmeter, connect test probes to switch PURPLE and BLUE / WHITE wires ; then, connect test probes to switch PURPLE and GREEN / WHITE wires.

Measure resistance ; in both test, it should be high when button is released and must be close to zero when activated.

Always confirm first that the fuse is in good condition. Make sure that color code match with color code of the VTS module.

Whenever pushing on UP and DOWN button simultaneously, the nozzle should not move. However a vibration should be noticed, but it should stop immediately.

NOTE : Pushing simultaneously on both switches, GREEN / ORANGE and BLUE / ORANGE wires will be at +12 volts in relation to battery negative terminal.

VTS Control Module Verification (XP Model Only)

It receives its current from the battery. It is protected by its own 15 A fuse. Also integrated in the module, 2 relays which trigger when motor is overloaded.

Voltage test

Disconnect motor wires from the VTS module. Using a voltmeter, connect positive test probe to BLUE / ORANGE wire. Connect negative test probe to GREEN / ORANGE wire.

Push on VTS switch UP button, the reading should be +12 V. Push on DOWN button, the reading should be (–)12 V.

If readings are different the VTS module could be defective.

NOTE : Ensure VTS switches connections were not reversed.

The VTS control module testing must be done with all wires disconnected from circuit. Otherwise testing equipment (ohmmeter) could be damaged.

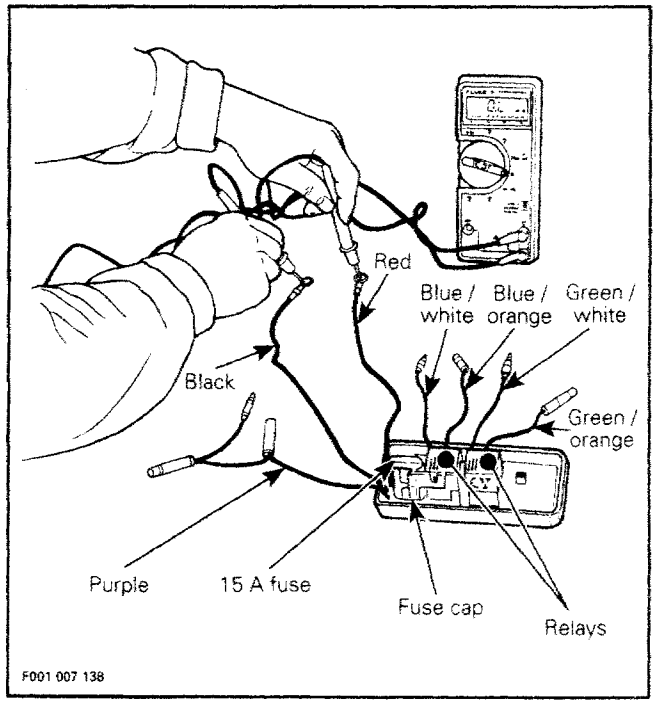
CAUTION : When disconnecting wires other then RED wire, wires must never touch solenoid positive terminal.

VTS control module testing equipment :

Use an ohmmeter with an input impedance up to 20 mega ohm (2 000 000 ohm).

Refer to the following chart for VTS control module testing. Always respect polarity in chart.

Meter (–) lead	Meter (+) lead	Minimum value	Wires will be connected to :
Black	Red	1 MΩ	Solenoid
Red	Black	1 MΩ	
Black	Purple	200 kΩ	VTS Switch / buzzer / Starter switch
Purple	Black	1 MΩ	
Black	Blue / white	140 kΩ	VTS Switch position "UP"
Blue / white	Black	140 kΩ	
Black	Green / white	140 kΩ	VTS Switch position "DOWN"
Green / white	Black	140 kΩ	
Black	Blue / orange	0 Ω	Motor position "UP"
Blue / orange	Black	0 Ω	
Black	Green / orange	0 Ω	Motor position "DOWN"
Green / orange	Black	0 Ω	
Green / orange	Blue / orange	0 Ω	Motor
Blue / orange	Green / orange	0 Ω	



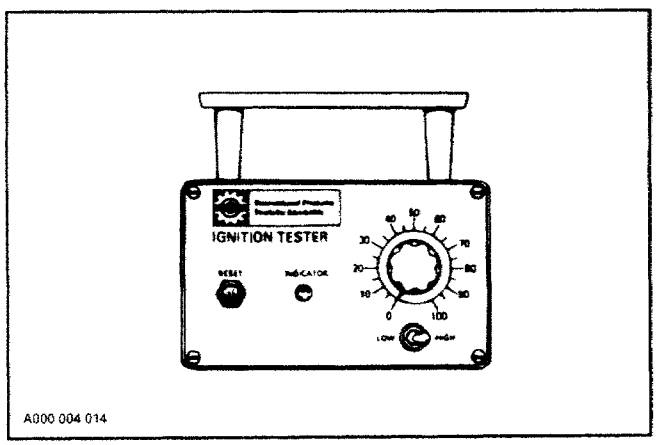
Most of circuit can be tested with an ohmmeter but a 100 % test doesn't mean the VTS control module in perfect condition.

NOTE : Sometimes only parts replacement can solve the problem.

CAUTION : Whenever connecting VTS control module, always have battery disconnected from circuit. If VTS control module must be connected when circuit is activated, always connect RED wire last to solenoid positive terminal.

BOMBARDIER IGNITION TESTER

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



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

Use of Bombardier Ignition Tester

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

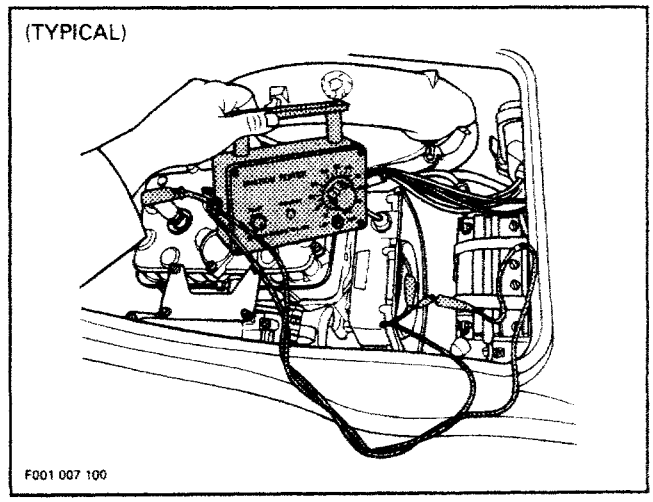
Always make sure that tester batteries are in good condition.

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 safety lanyard switch and depress starting button until light turns on, or otherwise, for a maximum of five seconds.
4. If engine starts when performing some test, allow it to idle while observing indicator. Then, shut engine off.
5. After every test that lights the indicator lamp, RESET the indicator circuit by depressing the reset button.

Analysis of Test Results

Indicator Lamp Lights at Specific Setting

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

Indicator Lamp Lights at Lower Setting

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

Indicator Lamp Does Not Light

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

Intermittent Ignition Problems

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

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

Multiple Problems

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

Safety Precautions

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

TESTS

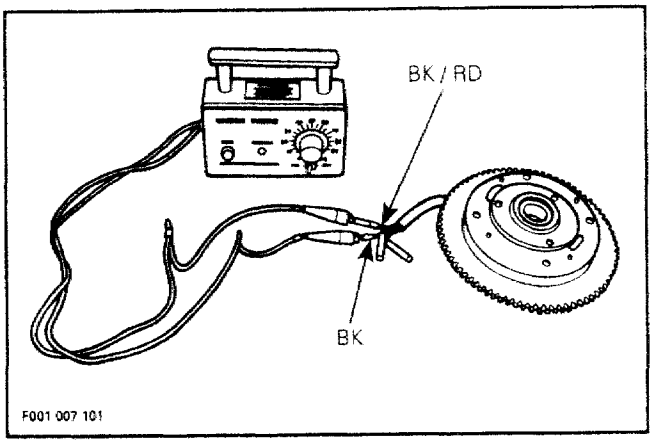
SINGLE GENERATING COIL SYSTEM

Magneto and Generating Coil Output

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

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

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



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

Results :

a) **Indicator lamp lights :** Ignition generating coil output is up to specifications.

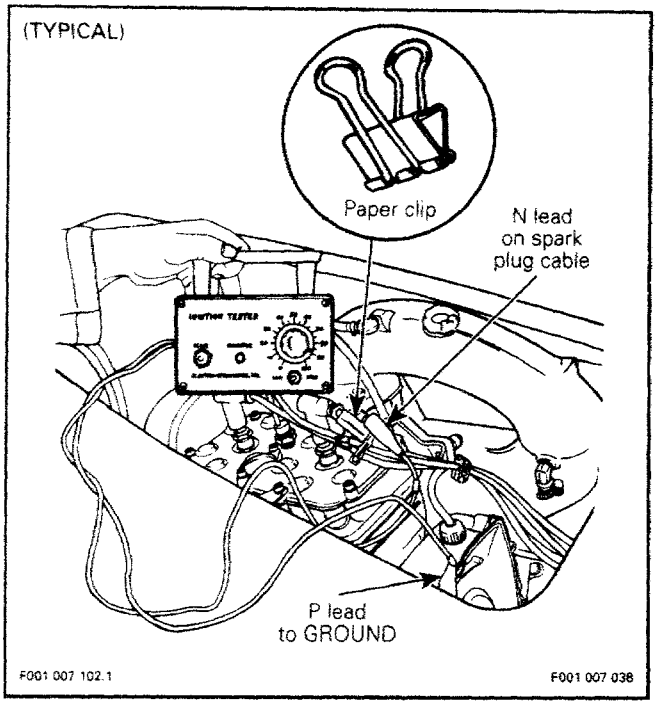
b) **Indicator lamp does not light :** The problem is a faulty ignition generating coil. Replace it.

Ignition Coil Output

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

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

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



3. Start engine and observe indicator.

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

4. Push reset button and repeat step 3 twice.

Results :

a) **Indicator lamp lights** : Ignition coil is OK.

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

Summary Table

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

Ignition Components Resistance Measurement

As an alternate method, ignition components can be checked with an ohmmeter (preferably a digital one). Proceeding by elimination, check magneto generating coil then ignition coil / ignition module.

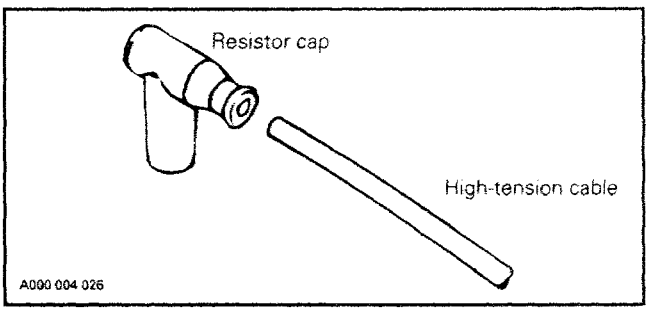
Disconnect connectors at ignition coil and magneto junction. Check resistance between each terminal with a high-sensitivity ohmmeter. Refer to the following table for values and wire colors.

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

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

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

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



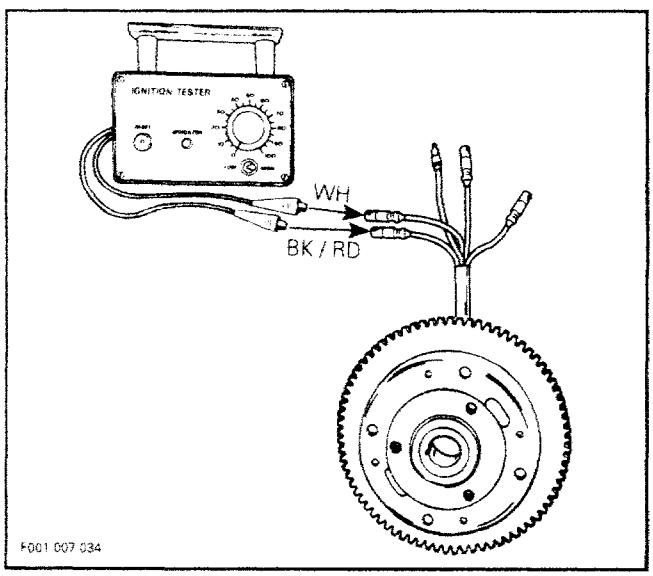
TESTS

DOUBLE GENERATING COIL SYSTEM

Magneto and High Speed Generating Coil Output

1. Disconnect BLACK / RED and WHITE wires between ignition module and magneto.
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	WHITE of magneto harness		



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

Results :

a) **Indicator lamp lights :** High speed generating coil is OK. Proceed with low speed generating coil test.

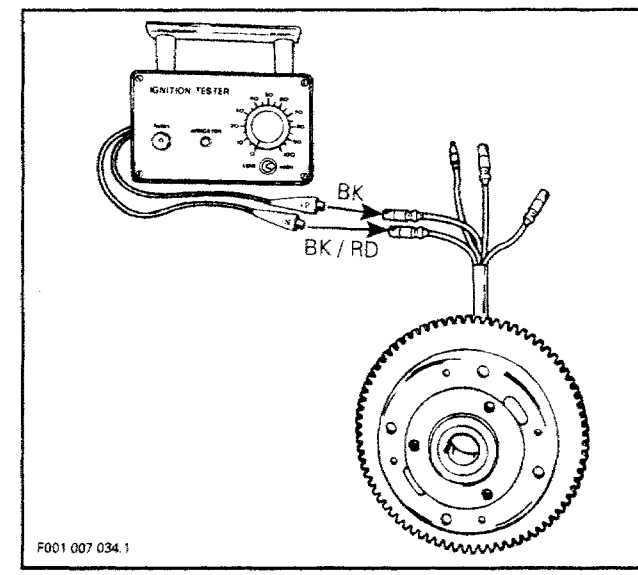
b) **Indicator lamp does not light :** The problem is a faulty high speed generating coil. Replace it.

Magneto and Low Speed Generating Coil

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

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

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



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

Results :

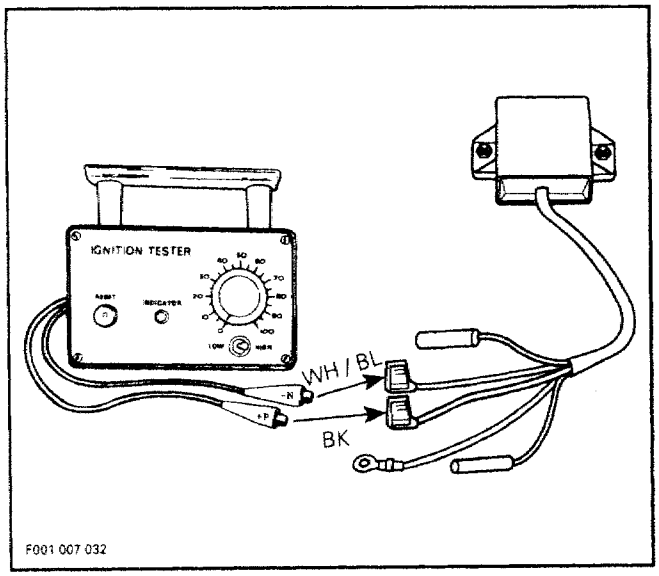
a) **Indicator lamp lights :** Low speed generating coil is OK. Proceed with ignition module test.

b) **Indicator lamp does not light :** Low speed generating coil is faulty. Replace it.

Ignition Module

1. Disconnect WHITE / BLUE and BLACK wires 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. Start engine and observe indicator.
4. Push reset button and repeat step 3 twice.

Results :

a) **Indicator lamp lights** : Ignition module is OK. Proceed with ignition coil test.

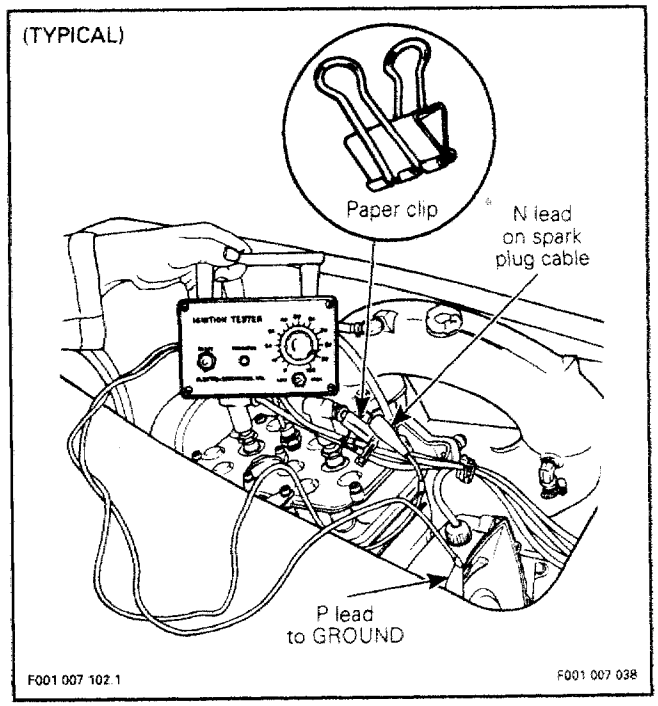
b) **Indicator lamp does not light** : Ignition module is faulty. Replace it.

Ignition Coil Output

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

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

Tester wires	Component wires	Tester switch position	Tester dial position
N	Tester adapter (paper clip) on spark plug cable	LOW	70
P	Engine Ground		



3. Start engine and observe indicator.

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

4. Push reset button and repeat step 3 twice.

Results :

a) **Indicator lamp lights** : Ignition coil is OK.

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

Summary Table

Test to perform	Tester wires	Component wires	Switch	Dial
High speed generating coil	N	BLACK / RED of magneto harness	LOW	85
	P	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	Test adapter on MAG spark plug cable	LOW	70
	P	Engine ground		

Ignition Component 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.

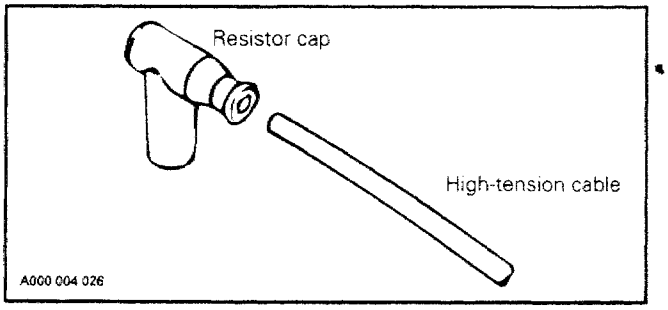
Disconnect wires at ignition module, ignition coil and magneto junction. Check resistance or continuity between each terminal with a high-sensitivity ohmmeter. Refer to the following table for values and wire colors.

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

PART NAME		WIRE COLOR	RESISTANCE (OHM) (Ω)
MAGNETO	High speed generating coil	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 caps 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 0 ohm (or close to) on ohmmeter.

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



BATTERY CHARGING SYSTEM

GENERAL

Magneto

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

Rectifier / Regulator

A half-wave rectifier receives magneto AC current and transforms it into Direct Current DC to allow battery charging. Battery is the DC source for electric starter, multi-purpose electronic module / engine rev 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 using current indicator such as Snap-on MT 110.

Current Test

Proceed as follows :

— Start engine.

— Install tester over battery positive cable.

— Bring engine to approximately 5500 RPM.

Depending on battery charge, current reading should be approximately 5 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.

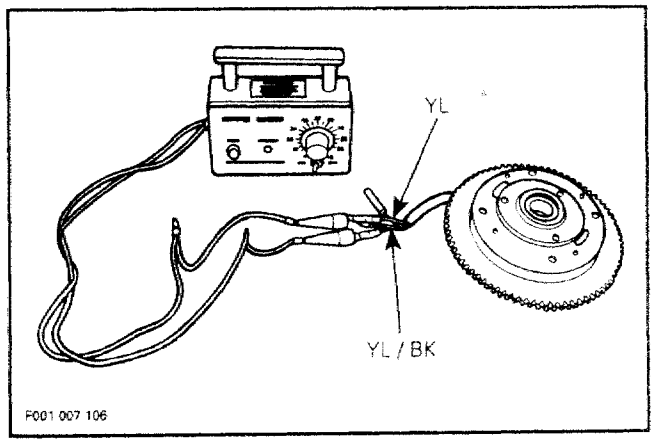
Magneto, Battery Charging Coil (Single Generating Coil System)

With Bombardier Ignition Tester

Operate it as for ignition system verifications.

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

Tester wires	Component wires	Tester switch position	Tester dial position
N	YELLOW of magneto harness	LOW	70
P	YELLOW / BLACK of magneto harness		



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

Results :

a) Indicator lamp lights : Battery charging coil output is up to specifications.

b) Indicator lamp does not light : Battery charging coil is faulty. Replace it.

Resistance Measurement

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

Use the following table :

MAGNETO		
PART NAME	WIRE COLOR	RESISTANCE (OHM) (Ω)
Battery charging coil	YELLOW with YELLOW / BLACK of magneto harness	0.05 - 0.6

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

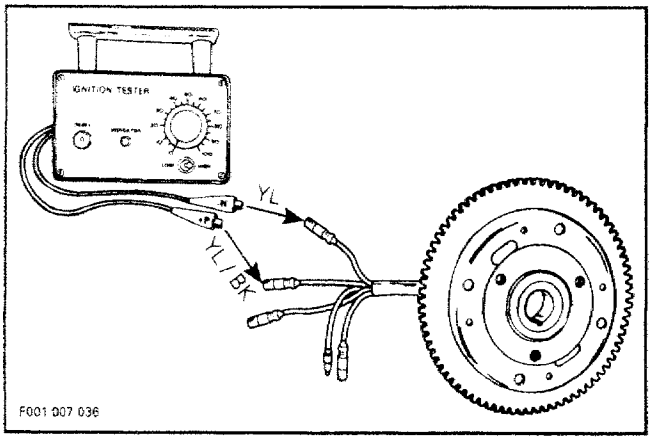
Magneto, Battery Charging Coil (Double Generating Coil System)

With Bombardier Ignition Tester

Operate it as for ignition system verifications.

1. Disconnect YELLOW and YELLOW / BLACK 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		



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

Results :

a) **Indicator lamp lights :** Battery charging coil output is up to specifications.

b) **Indicator lamp does not light :** Battery charging coil is faulty. Replace it.

Resistance Measurement

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

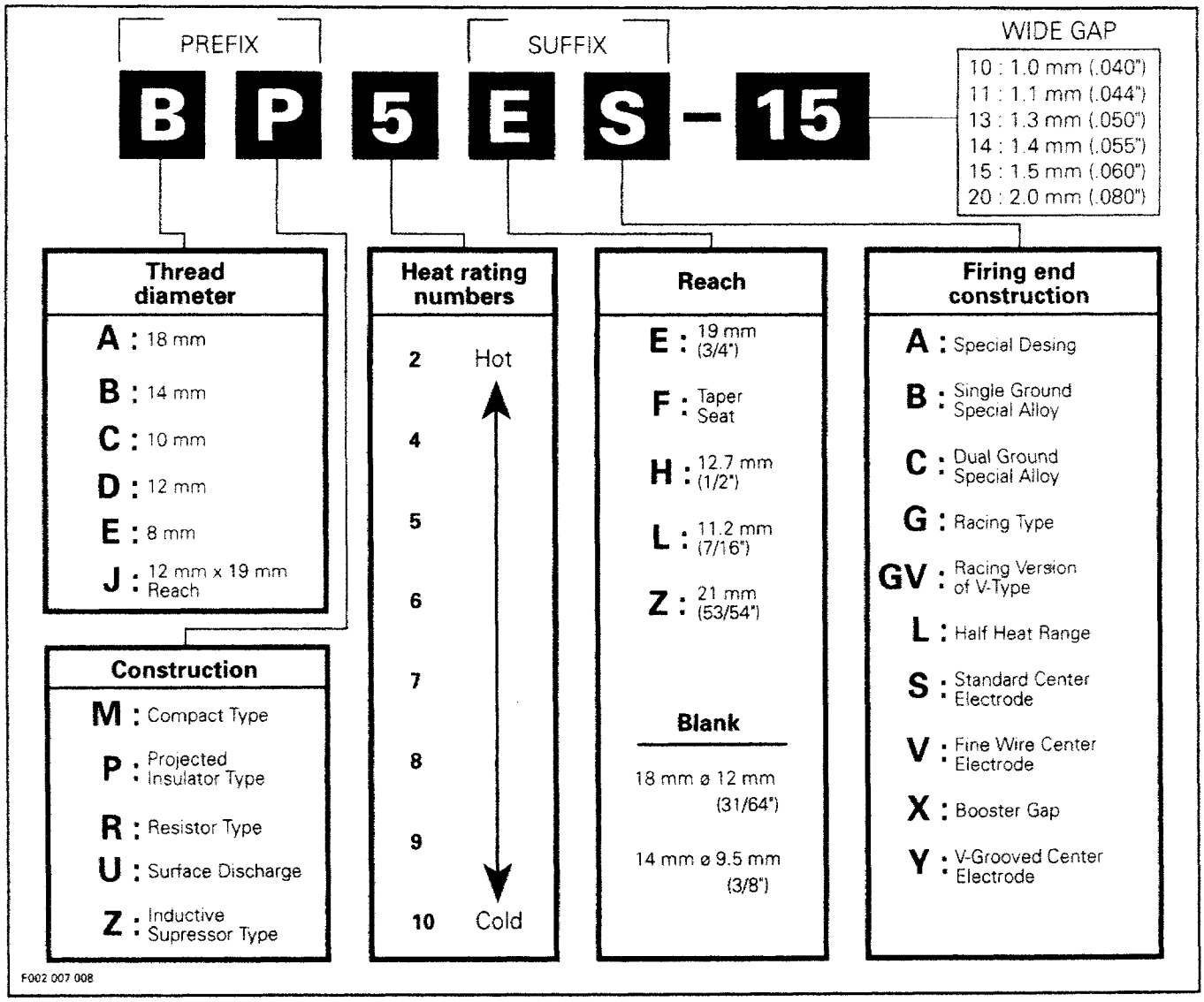
Use the following table :

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 (∞)

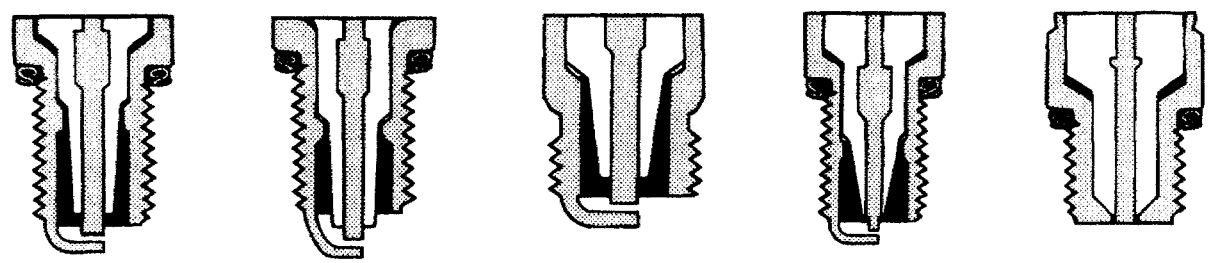
NOTE : A short circuit will read 0 ohm (or close to) on ohmmeter.

SPARK PLUGS

SPARK PLUG SYMBOL EXPLANATION



CROSSCUTS AND GAP STYLES OF SPARK PLUGS



DISASSEMBLY

First unscrew the spark plug one turn.

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

HEAT RANGE

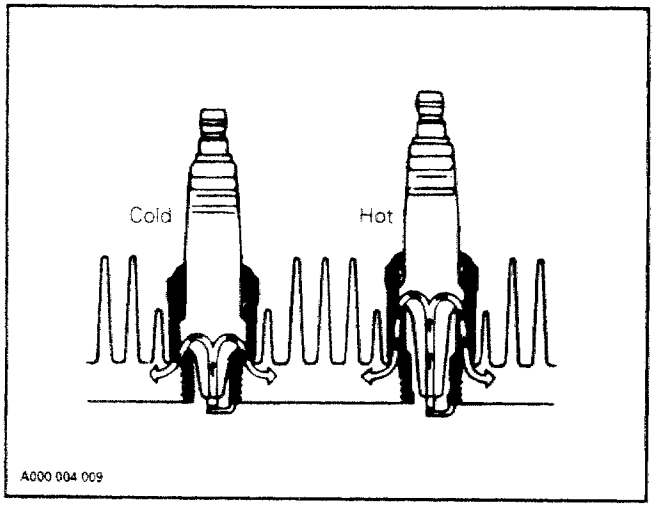
The proper heat range of the spark plugs is determined by the spark plugs ability to dissipate the heat generated by combustion.

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.

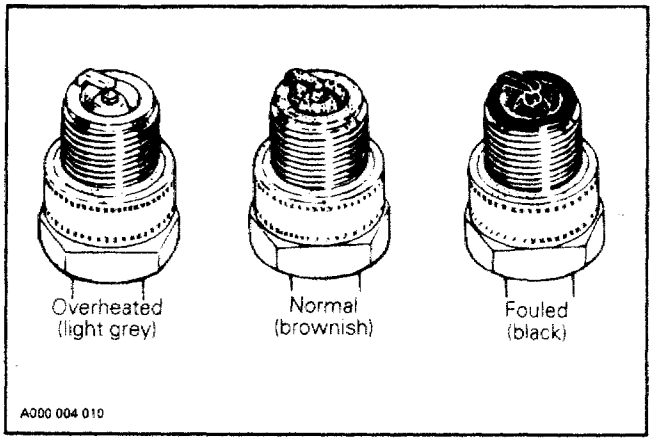
A too "hot" plug will result in overheating and pre-ignition, etc.

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 misfiring, 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. The plug face of a fouled spark plug has either a dry coating of soot or an oily, glossy coating given by an excess either of oil or of oil with soot. Such coatings form a conductive connection between the center electrode and ground.

SPARK PLUG ANALYSIS

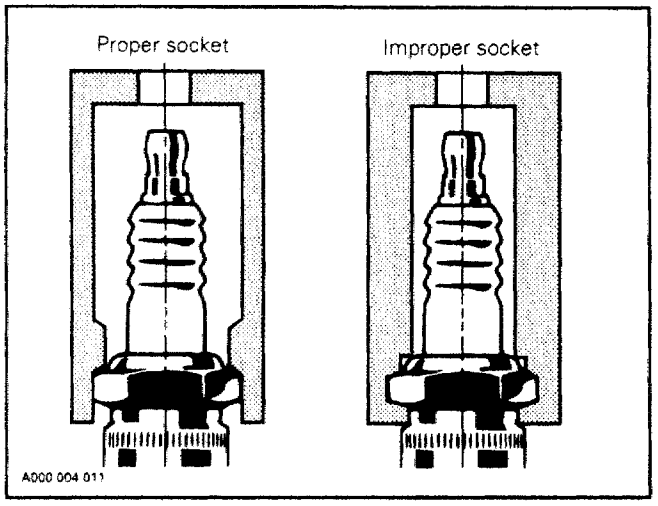


The plug face (and piston dome) reveals the condition of the engine, operating condition, method of driving and fuel mixture. For this reason it is advisable to inspect the spark plug at regular intervals, examining the plug face (i.e. the part of the plug projecting into the combustion chamber) and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

SPARK PLUG INSTALLATION

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

1. Using a wire feeler gauge, set electrode gap according to the following chart.
2. Apply antiseize lubricant 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

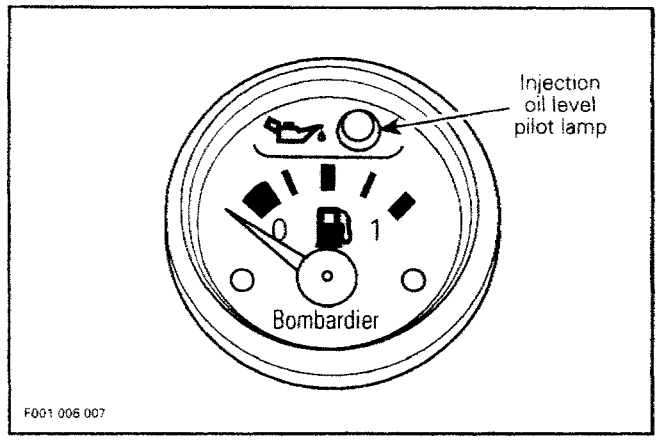
Watercraft models	Engine type	Spark plugs	Torque N•m (lbf•ft)	Gap mm (inch)
SP SPI GTS	587	NGK BR7ES	24 (17)	0.50 (0.020)
SPX XP GTX EXPLORER	657	NGK BR8ES	24 (17)	0.50 (0.020)

INSTRUMENTS

FUEL / OIL GAUGE

The fuel / oil gauge has a pointer which indicates fuel level. To verify if fuel pointer works, first touch starter switch button (with safety lanyard removed) to activate electrical system for about 30 seconds.

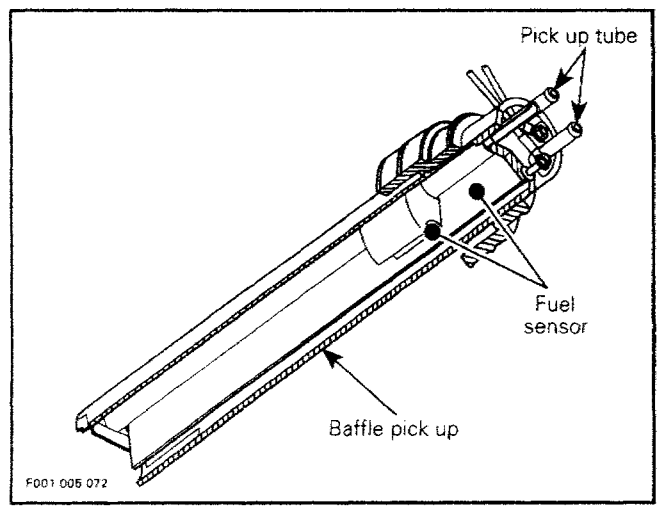
The oil level pilot lamp is part of the fuel gauge. It will light when injection oil level is low.



Fuel Baffle Pick Up Sensor Verification

The baffle pick up has an integrated fuel sensor on models which are provided with an fuel / oil level gauge.

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



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

FUEL LEVEL AND RESISTANCE (SPI, SPX, XP)		
FUEL LEVEL mm	(in)	RESISTANCE (Ω)
From 46.6 @ 68.6	(1-27/32 @ 2-45/64)	0 ± 0.1
From 68.6 @ 92.3	(2-45/64 @ 3-41/64)	17.8 ± 0.2
From 92.3 @ 116.0	(3-41/64 @ 4-37/64)	27.8 ± 0.3
From 116.0 @ 139.7	(4-37/64 @ 5-1/2)	37.8 ± 0.4
From 139.7 @ 163.4	(5-1/2 @ 6-7/16)	47.8 ± 0.5
From 163.4 @ 187.1	(6-7/16 @ 7-3/8)	57.8 ± 0.6
From 187.1 @ 210.8	(7-3/8 @ 8-19/64)	67.8 ± 0.7
From 210.8 @ 234.5	(8-19/64 @ 9-15/64)	77.8 ± 0.8
From 234.5	(9-15/64) and more	89.8 ± 0.9

FUEL LEVEL AND RESISTANCE (GTX, EXPLORER)		
FUEL LEVEL mm	(in)	RESISTANCE (Ω)
From 33.6 @ 55.6	(1-5/16 @ 2-3/16)	0 ± 0.1
From 55.6 @ 79.3	(2-3/16 @ 3-1/8)	17.8 ± 0.2
From 79.3 @ 103	(3-1/8 @ 4-1/16)	27.8 ± 0.3
From 103 @ 126.7	(4-1/16 @ 5)	37.8 ± 0.4
From 126.7 @ 150.4	(5 @ 5-15/16)	47.8 ± 0.5
From 150.4 @ 174.1	(5-15/16 @ 6-13/16)	57.8 ± 0.6
From 174.1 @ 197.8	(6-13/16 @ 7-3/4)	67.8 ± 0.7
From 197.8 @ 221.5	(7-3/4 @ 8-11/16)	77.8 ± 0.8
From 221.5	(8-11/16) and more	89.8 ± 0.9

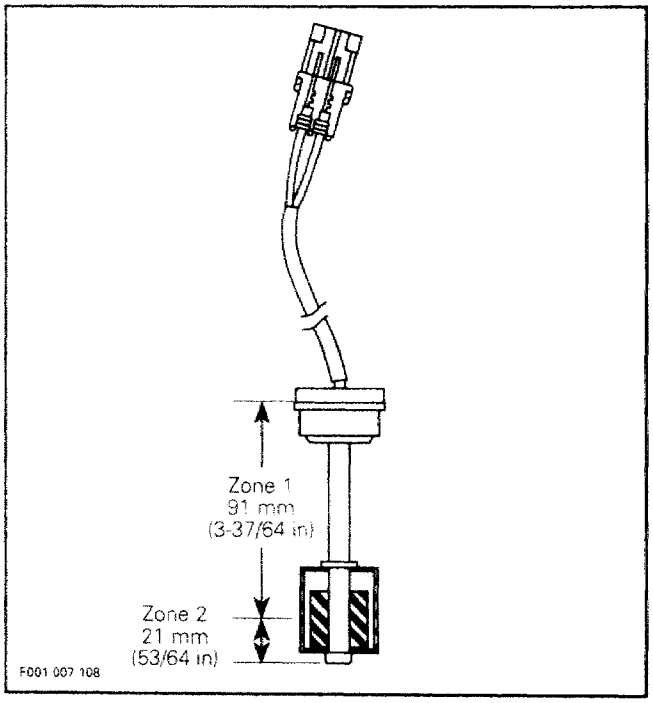
Oil Sensor Verification

The oil sensor completes the ground for the oil injection pilot lamp.

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

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

Refer to the following illustration and chart for oil sensor testing.

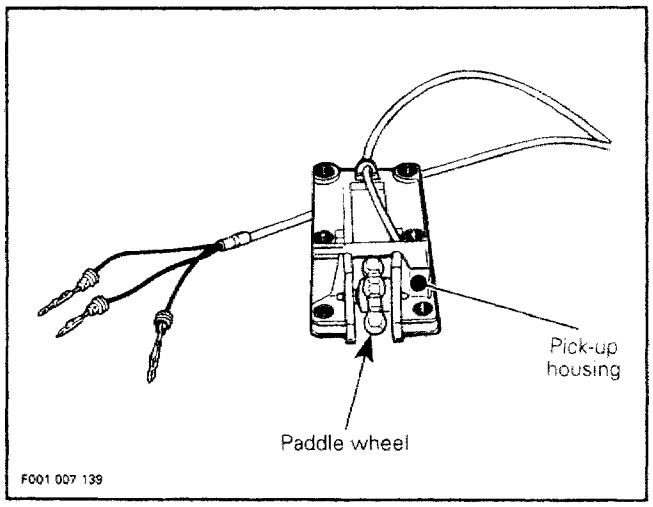


OIL LEVEL	RESISTANCE (Ω)
Zone 1	∞
Zone 2	0

Speed Sensor Verification

The speedometer gives a reading through a speed sensor. Speed sensor is installed on ride shoe. It works with the water flow which turns a magnetic paddle wheel that triggers on electronic pick-up that in turn sends a speed signal to the speedometer.

The paddle wheel is protected by the pick-up housing.



To verify speed sensor, a resistance test should be performed with an ohmmeter. Disconnect speed sensor wires from inside bilge.

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

METER (–) LEAD	METER (+) LEAD	APPROX. VALUE
red / brown	black / brown	∞
black / brown	red / brown	21.8 MΩ
yellow / black	black / brown	3.6 MΩ
black / brown	yellow / black	∞
red / brown	yellow / black	∞
yellow / black	red / brown	3 MΩ

VTS Motor

Motor condition can be checked with an ohmmeter. Disconnect wiring harness, install test probes on both BLUE / ORANGE and GREEN / ORANGE wires. Measure resistance, it should be close to 1.5 ohm.

Ensure motor wire connections to the VTS module are not reversed. If so, when pushing on VTS switch UP button the nozzle will go down and vice versa.

If motor seems to jam and it has not reached the end of its stroke, the following test could be performed.

First remove motor, refer to PROPULSION AND DRIVE SYSTEMS 08-03 then refer to **disassembly**. Then manually rotate worm to verify VTS system actuating mechanism for free operation.

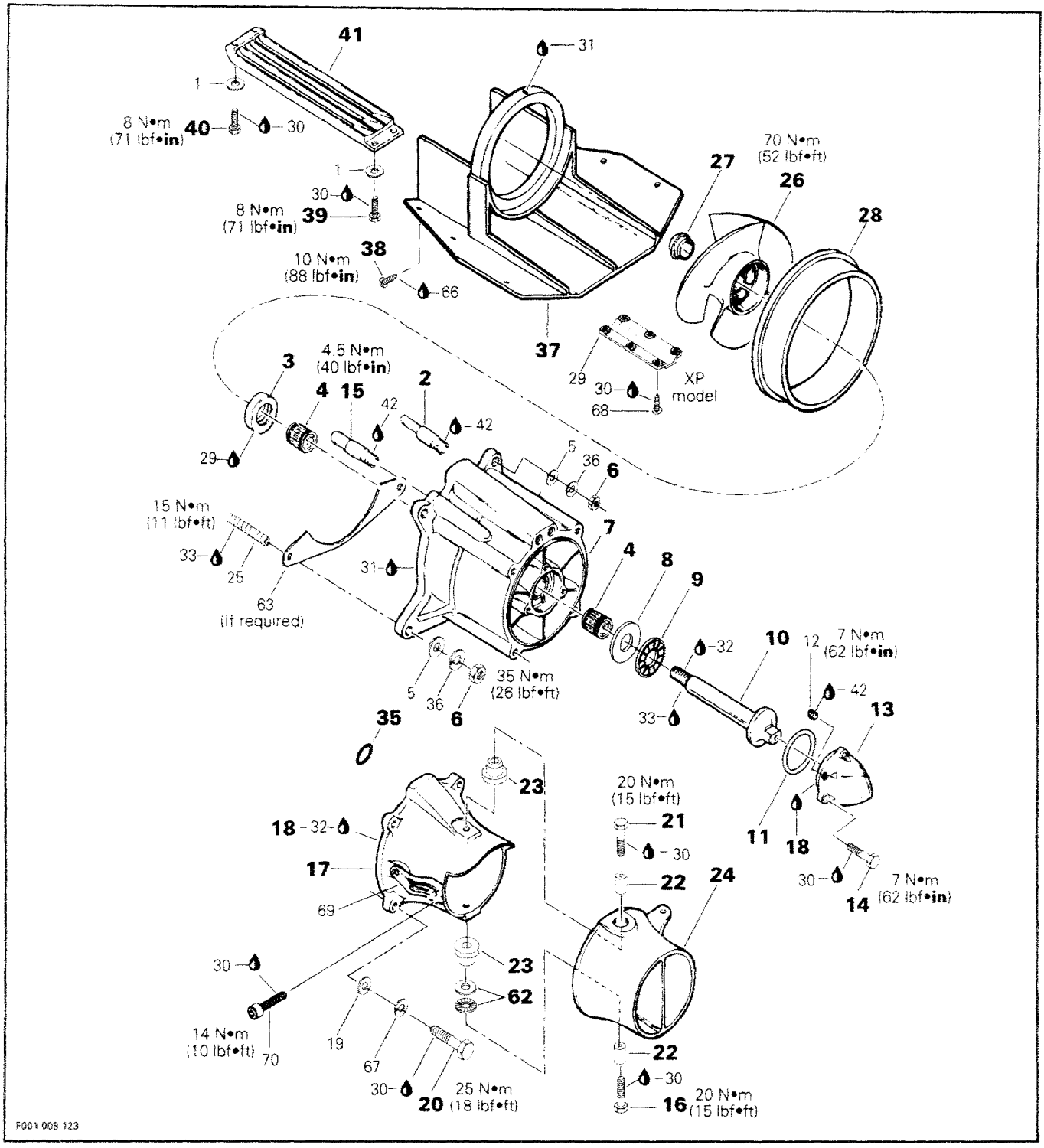
Connect motor through a 15 A fuse directly to the battery.

Connect wires one way then reverse polarities to verify motor rotation in both ways.

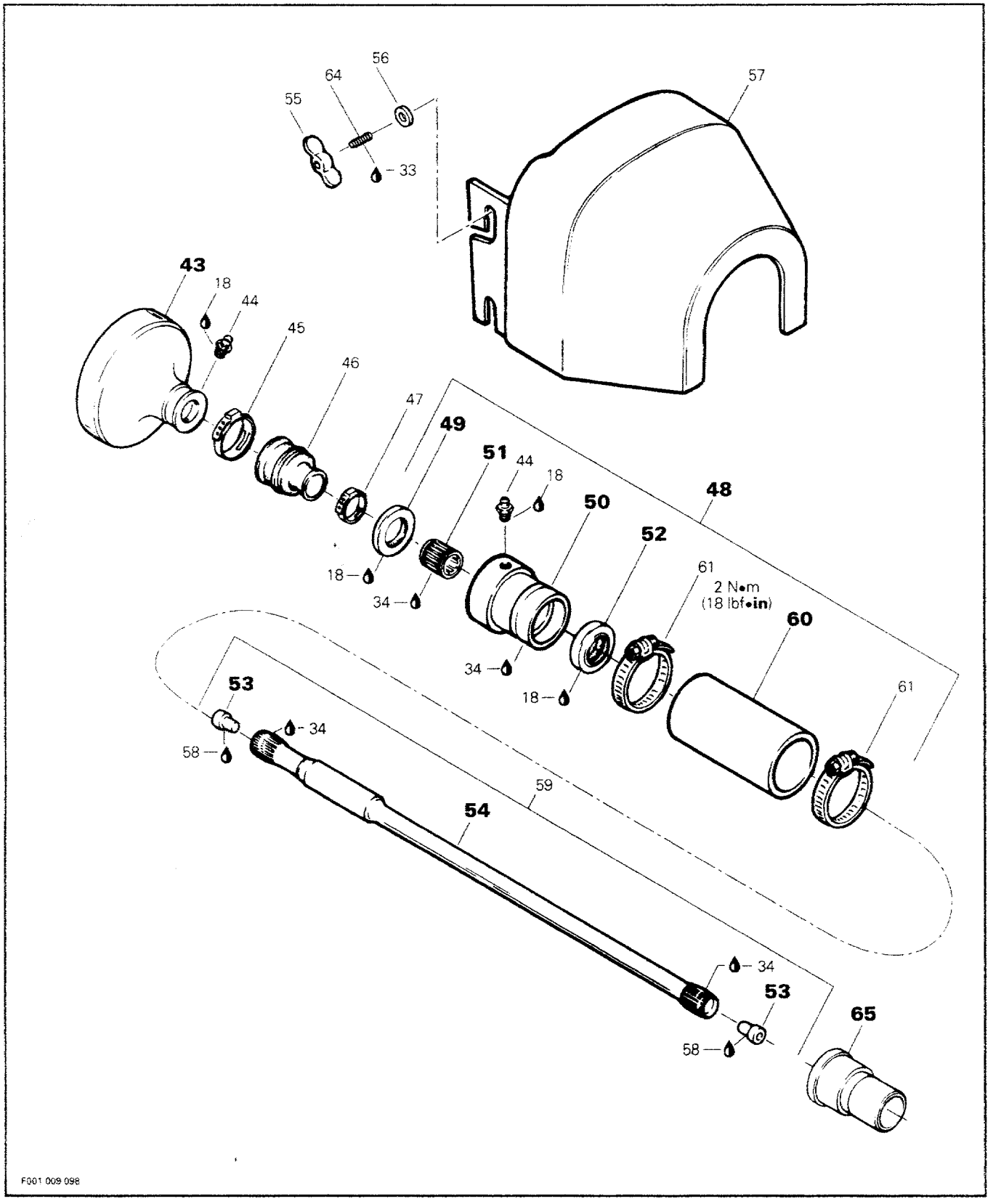
If VTS actuating mechanism is correct and the motor turns freely in both ways, VTS module could be defective.

PROPULSION AND DRIVE SYSTEMS

JET PUMP UNIT



DRIVE SHAFT AND SEAL CARRIER



COMPONENTS

1. *Flat washer 6 mm*
2. *Fitting (bailer pick-up)*
3. *Double lip seal*
4. *Needle bearing*
5. *Flat washer 10 mm*
6. *Nut M10*
7. *Impeller housing*
8. *Thrust washer*
9. *Thrust bearing*
10. *Impeller shaft*
11. *O-ring*
12. *Plug*
13. *Housing cover*
14. *Hexagonal head screw M5 x 20*
15. *Fitting (pump)*
16. *Hexagonal head screw M8 x 30*
17. *Venturi*
18. *Loctite 515*
19. *Flat washer 8 mm*
20. *Hexagonal head screw M8 x 35*
21. *Hexagonal head screw M8 x 25 (except XP)*
22. *Sleeve (except XP)*
23. *Bushing (except XP)*
24. *Nozzle*
25. *Stud M10 x 45*
26. *Impeller*
27. *Boot*
28. *Wear ring*
29. *Ride shoe plate (XP model)*
30. *Loctite 242 (blue)*
31. *Loctite 598 ultra black*
32. *Loctite primer N*
33. *Loctite 271 (red)*
34. *Synthetic grease*
35. *O-ring*
36. *Lock washer 10 mm*
37. *Ride shoe*
38. *Countersunk Phillips screw M6 x 35*
39. *Hexagonal head screw M6 x 16*
40. *Hexagonal head screw M6 x 20*
41. *Grill*
42. *Loctite PST 592*
43. *PTO flywheel*
44. *Grease fitting*
45. *Clamp*
46. *Rubber boot*
47. *Clamp*
48. *Seal carrier assembly*
49. *Double lip seal*
50. *Seal carrier*
51. *Needle bearing*
52. *Double lip seal*
53. *Damper*
54. *Drive shaft*
55. *Wing nut M8*
56. *Flat washer 8 mm*
57. *PTO Flywheel guard*
58. *Loctite 495 instant adhesive*
59. *Drive shaft assembly*
60. *Protective hose*
61. *Gear clamp*
62. *Locking disk (SP, SPI and SPX models)*
63. *Shim*
64. *Stud M8 x 15*
65. *Hull insert*
66. *Sealant 732*
67. *Lock washer 8 mm*
68. *Countersunk Phillips screw M5 x 10 (XP model)*
69. *Arm (XP model)*
70. *Allen screw M8 x 8*

Disconnect battery.

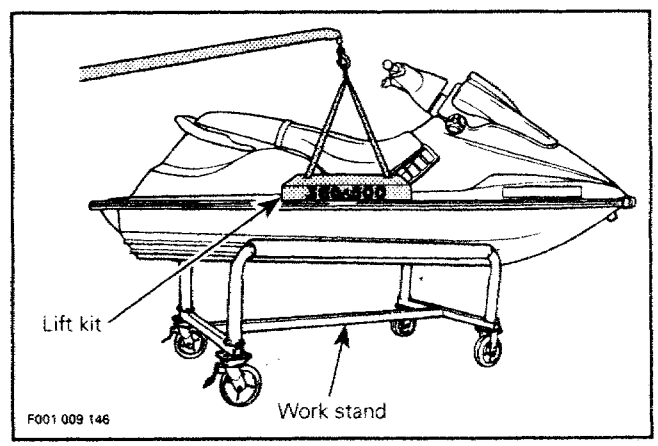
◆ **WARNING : Battery black negative cable must always be disconnected first and connected last.**

JET PUMP INSPECTION ON WATERCRAFT

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 water intake grill, jet pump, ride shoe, etc., can be done by simply blocking the rear of watercraft above work stand.

A lift kit can be use to install watercraft on a stand. Refer to the following chart.

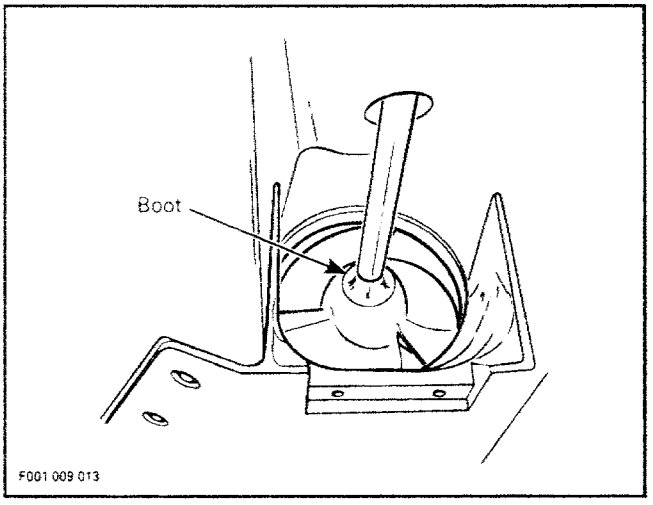
LIFT KIT P / N	WATERCRAFT MODEL
298 760 040	SP / XP series
298 776 040	GTS / GTX models
298 780 090 (nickel-plated)	EXPLORER
298 790 040 (stainless steel)	EXPLORER



Impeller Condition and Impeller / Wear Ring Clearance

Impeller Condition

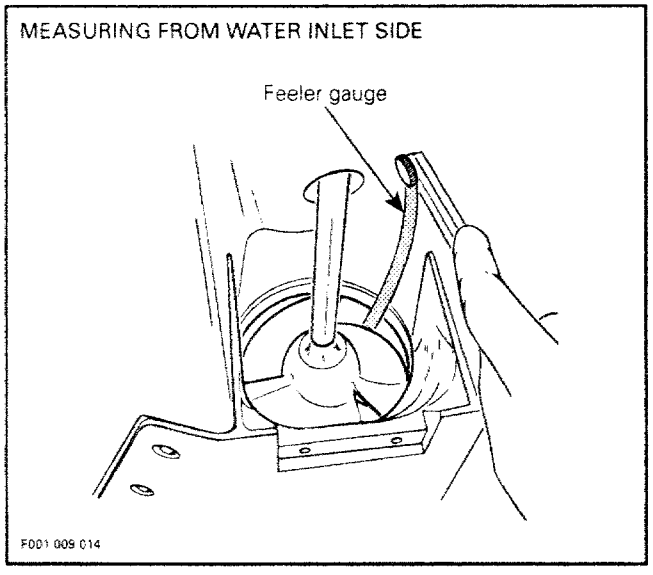
Impeller and boot condition can be quickly checked from underneath of the watercraft. Remove grill and look through water inlet opening.

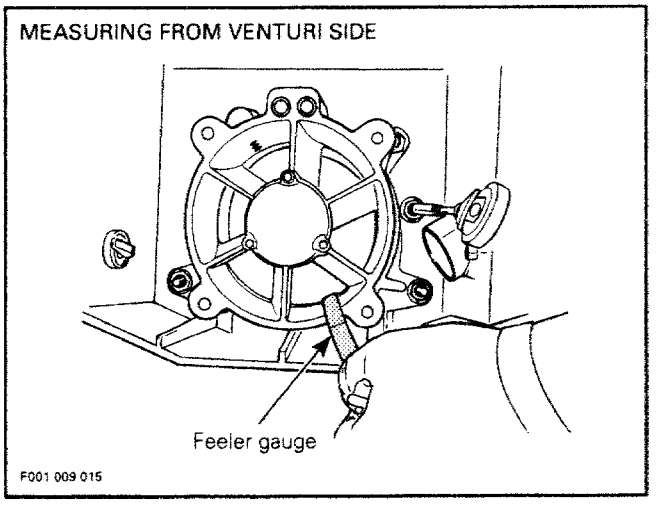


Impeller / Wear Ring Clearance

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 1.02 mm (.040 in). If clearance is greater, disassemble jet pump and inspect impeller and wear ring. Renew worn parts.

Oil Inspection

Detach ball joint of steering cable from nozzle.

Detach ball joint of trim cable from trim ring (XP model).

Detach spring of reverse gate (GTS, GTX and Explorer models).

Remove 4 retaining screws from venturi.

Pull venturi and nozzle assembly from impeller housing.

Remove housing cover plug.

Check oil level, it should be at bottom of hole threads.

If oil level is low, check impeller shaft housing for leaks. A pressure test must be performed. Refer to **pump pressurization** in this section.

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 replace seal.

If everything is correct, apply Loctite PST 592 on plug and reinstall it on cover. Properly reinstall removed parts.

Oil Replacement

Detach ball joint of steering cable from nozzle.

Detach ball joint of trim cable from trim ring (XP model).

Detach spring of reverse gate (GTS, GTX and Explorer models).

Remove 4 retaining screws from venturi.

Pull venturi and nozzle assembly from impeller housing.

Remove 3 screws retaining cover.

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

Thoroughly clean reservoir and inside of cover with a solvent.

Apply Loctite 515 and reinstall cover with its O-ring. 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.**

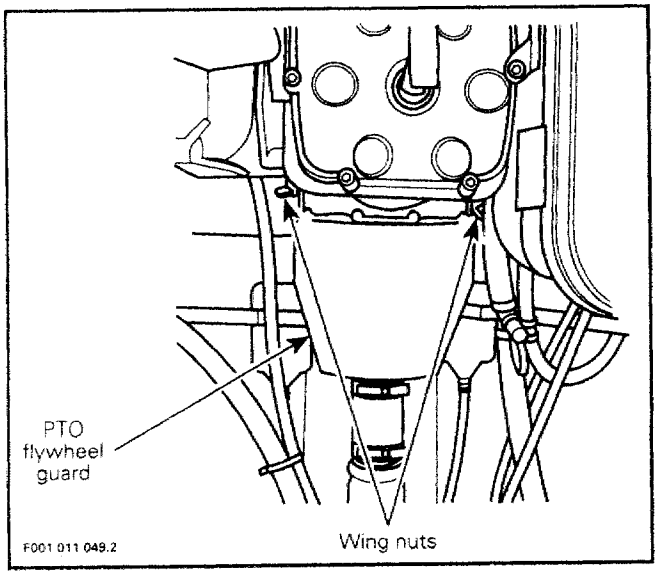
Apply Loctite PST 592 on plug and reinstall it on cover.

Properly reinstall removed parts.

JET PUMP REMOVAL

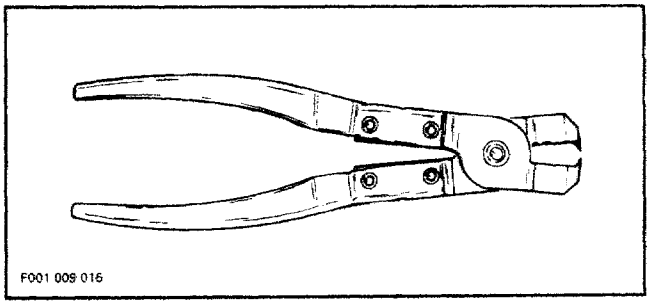
Remove air vent tube support from body opening (SP / XP series).

Remove PTO flywheel guard.

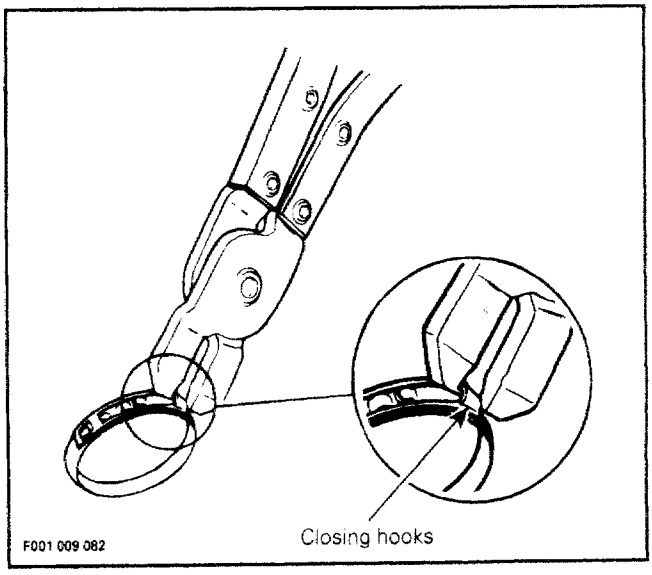


Unfasten **small** clamp on drive shaft boot as follows :

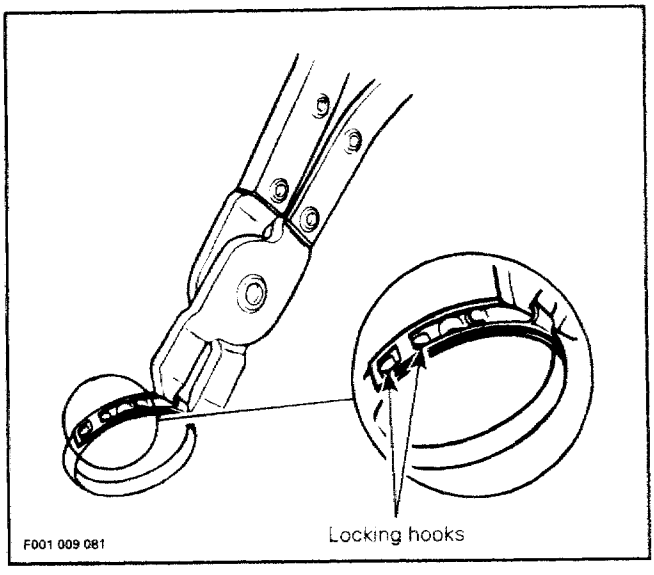
— Use pliers (P / N 295 000 069).



— Insert pointed tips of pliers in closing hooks.

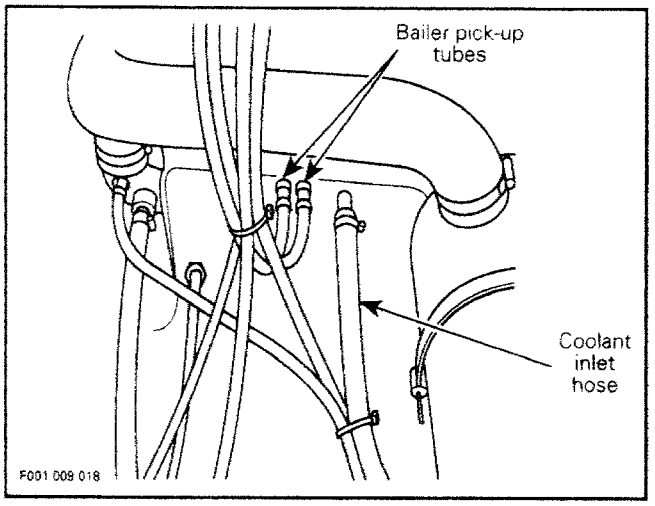


— Squeeze pliers to draw hooks together and disengage windows from locking hooks.



— Keep clamp for later use.

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



Remove ball joint fasteners to release steering cable from nozzle.

Remove ball joint fasteners to release trim cable from trim ring (XP model).

Remove ball joint fasteners to release reverse cable from reverse gate (GTS, GTX and Explorer models).

16,21,22,23,24,62, Screw, Sleeve, Bushing, Nozzle and Locking Disk (if applicable)

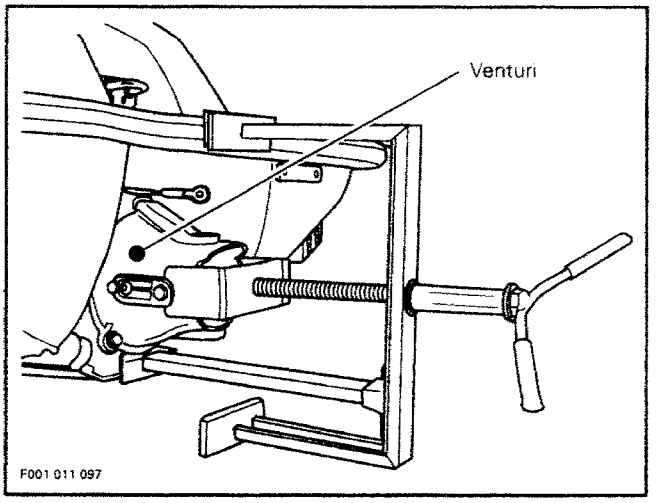
Remove 2 retaining screws, locking disks (if applicable) and withdraw nozzle.

Push sleeves and bushings out of nozzle.

6,7, Nut and Impeller Housing

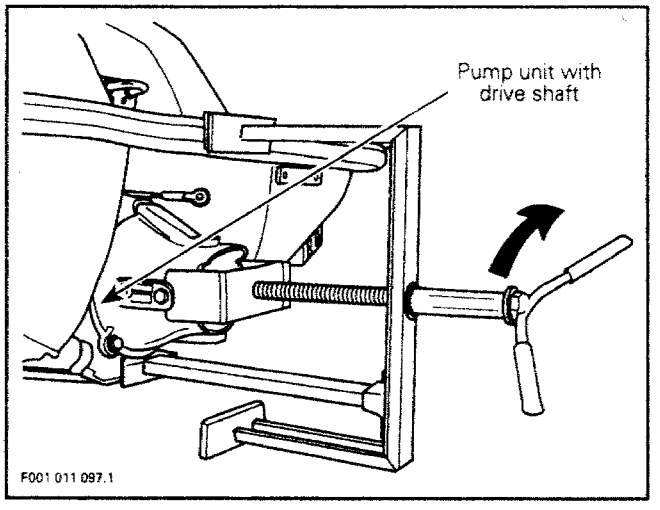
Remove nuts retaining impeller housing to hull.

Using screws previously removed from nozzle, install impeller housing remover tool (P / N 295 000 113) on venturi.



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

▼ CAUTION : When removing pump unit,a shim could have been installed between hull and pump housing, be careful not to damage shim. If shim is not reinstalled engine and jet pump alignment will be altered.

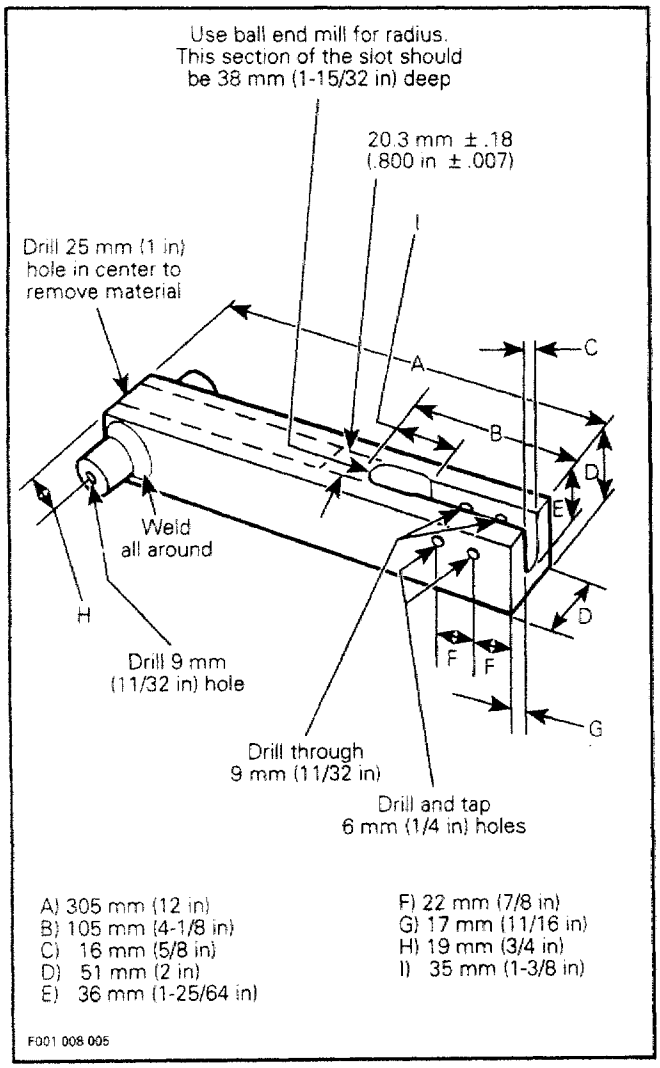


If the drive shaft is jammed into PTO flywheel or if bearing is seized on shaft at seal carrier level, make the following tool and use it in conjunction with pump remover to withdraw drive shaft.

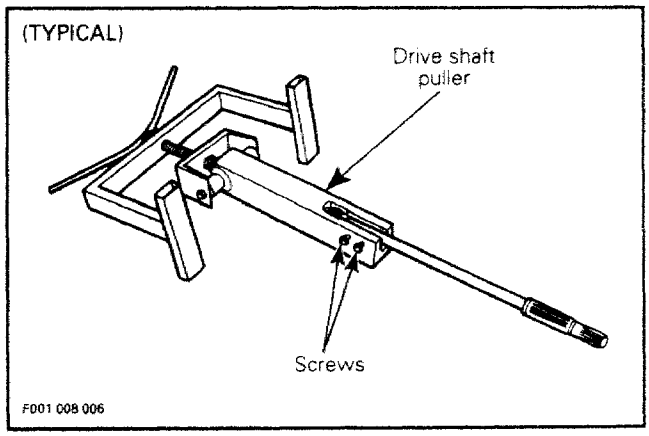
Raw Material :

— 1 aluminum alloy square 51 mm (2 in) x 305 mm (12 in).

— 2 aluminum rod 28.5 mm (1-1/8 in) dia. x 30 mm (1-3/16 in).



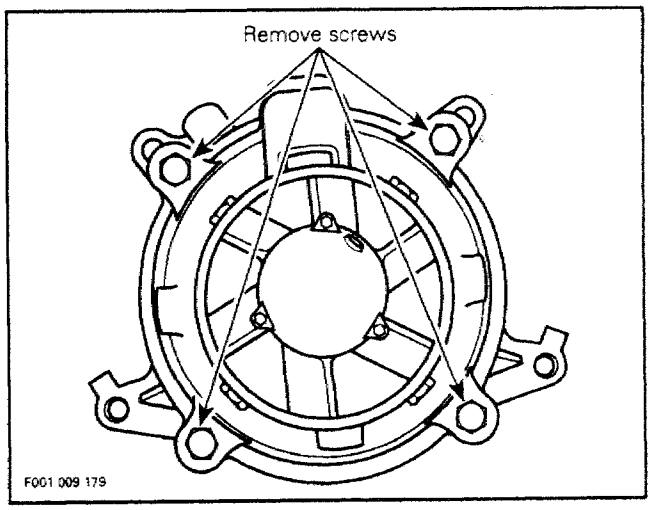
Mount on impeller housing remover drive shaft puller, then install assembly on drive shaft using screws.



▼ CAUTION : Be careful not to damage hull rear section or engine rubber mounts.

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

Remove 4 retaining screws and withdraw venturi.



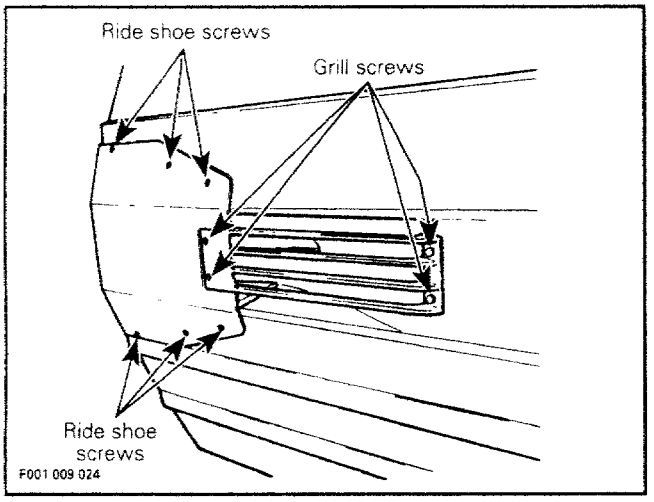
37,38,39,40,41, Ride Shoe, Screw and Grill

NOTE : Grill and impeller housing must be removed prior to ride shoe removal.

NOTE : An impact screwdriver can be used to loosen tight screws.

Remove 4 retaining screws of grill then withdraw it.

Remove 6 retaining screws of ride shoe then withdraw it.



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

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

— Use two steel angle bars 25 x 25 x 3 mm (1 x 1 x 1/8 in) thick x 225 mm (9 in) long.

— A kind of turnbuckle is needed to apply extension force between ride shoe and hull. Use a 25 mm (1 in) square tube by approximately 125 mm (5 in) long so that, with all parts welded, its overall length will not exceed 190 mm (7-1/2 in).

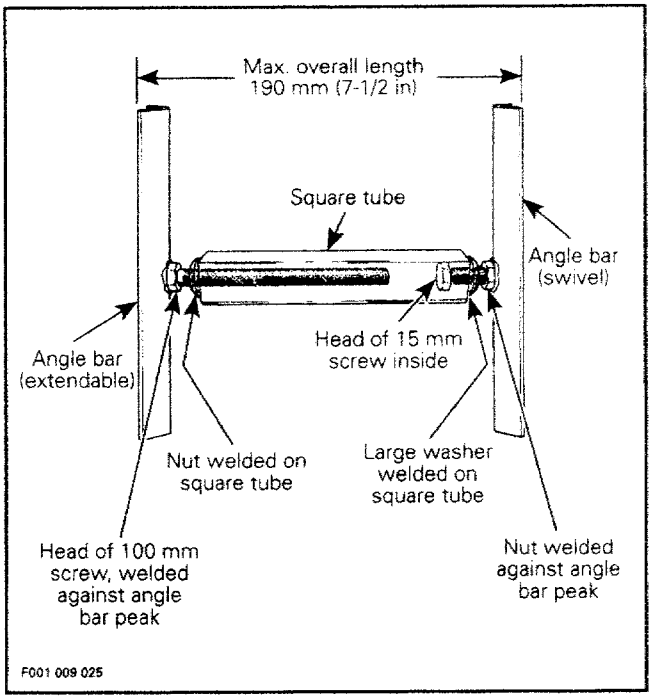
— On one end, weld a 10 mm (3/8 in) dia. nut.

— Weld the head of a 10 x 100 mm (3/8 x 4 in) screw on top of one angle bar then screw in square tube.

— Insert a 10 x 15 mm (3/8 x 1/2 in) screw through a large and thick washer or a suitable sleeve.

— Install a nut on screw. Do not fully tighten, ensure screw can easily rotate into washer. Weld the top of other angle bar to nut.

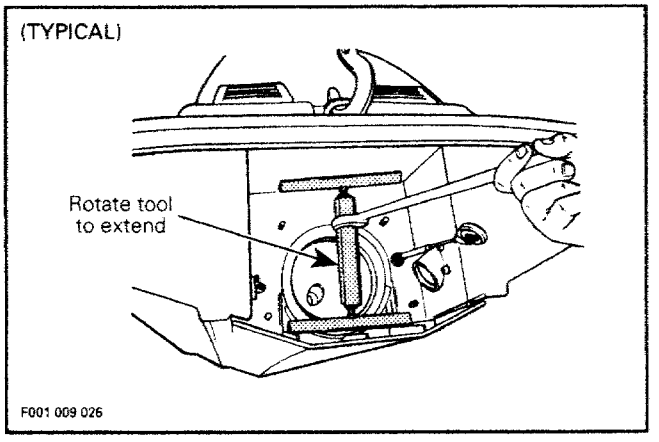
— Weld the washer to the remaining end of square tube.



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 must be removed to allow removal of seal carrier ass'y.

Since it is sealed to prevent water intrusion 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.

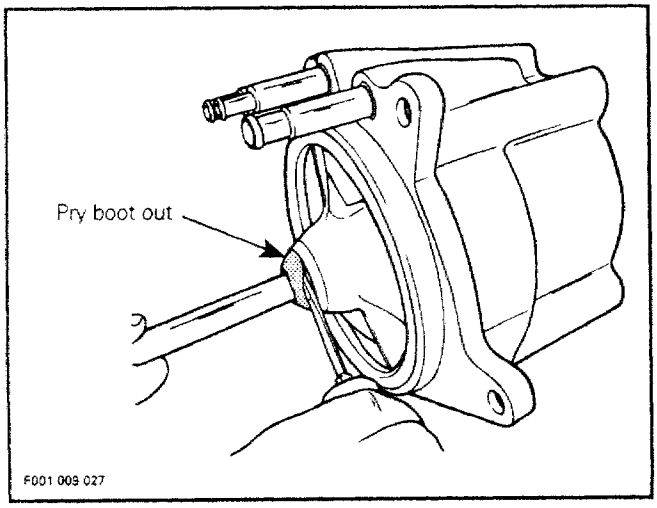
JET PUMP DISASSEMBLY

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.

27, Boot

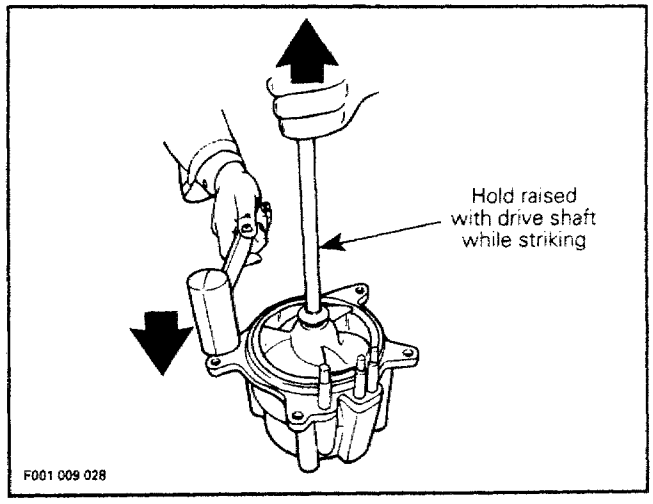
CAUTION : Do not pull drive shaft to release it from impeller, this could damage boot. Boot must be slipped out of impeller before removing drive shaft.

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



Withdraw drive shaft.

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



2,15, Fitting

Fittings can be removed with deep socket or vise grip. Do not contact hose mounting area.

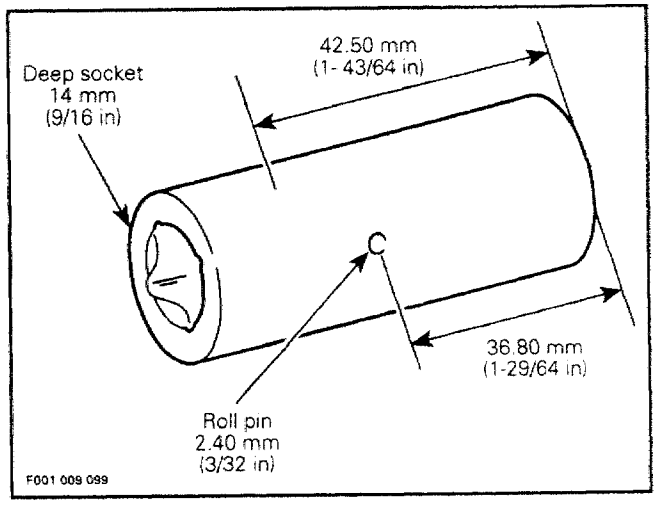
Fitting can be removed from pump housing with following suggested tool :

— Use a 14 mm (9/16 in) deep socket.

— Drill deep socket with a 14 mm (9/16 in) drill bit, starting at hexagone head end as shown in following illustration.

— Drill a 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

With pump assembly in horizontal position, remove 3 retaining screws.

Place container under cover to catch oil.

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

26, Impeller

Insert impeller shaft holder (P / N 295 000 082) on impeller shaft flat end.

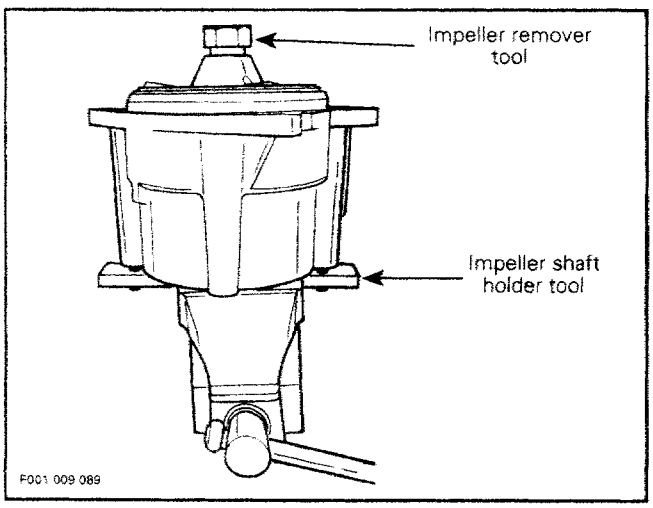
Using 2 screws previously removed from venturi, secure shaft holder to housing. To ease removal heat impeller center with a propane torch to approximately 150°C (300°F) to break the Loctite bond.

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

Install shaft holder in a vice.

Insert special tool in impeller splines.

Rotate impeller remover tool counterclockwise and unscrew completely impeller.



CAUTION : Never use any impact wrench to loosen impeller.

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

Remove 2 screws holding impeller housing to shaft holder.

Lift impeller housing away from impeller shaft.

Slide thrust washer and thrust bearing off from shaft.

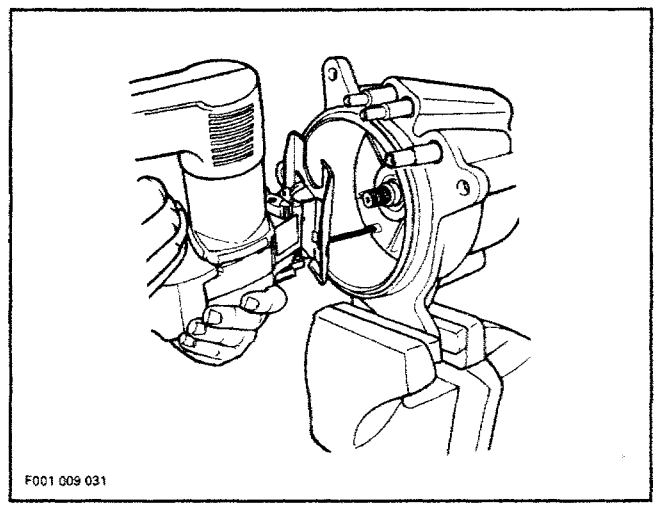
28, Wear Ring

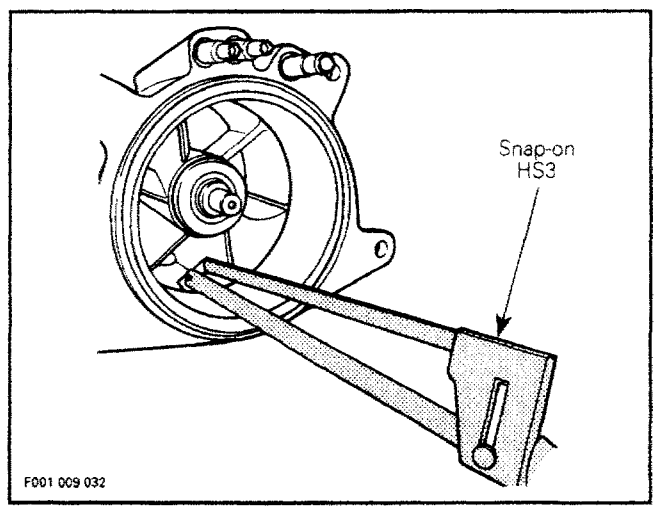
Place impeller housing in a brass jaw vise so that it is firmly retained by a lug.

Cut wear ring.

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

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





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

Lift ring end so that both ends overlap each other.

Pull ring out.

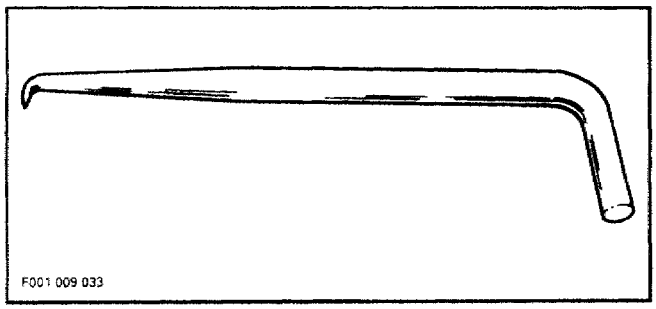
3, Seal

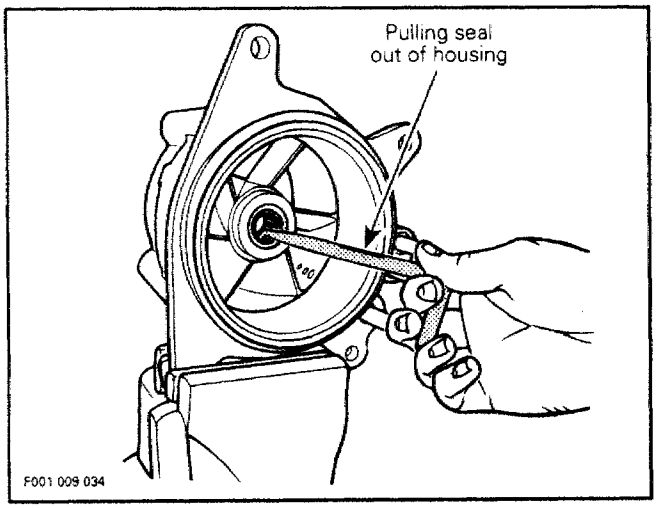
To remove seal, proceed as follows :

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

Seal should be removed using the following suggested tool.

Seal puller, Snap-on #S6129.



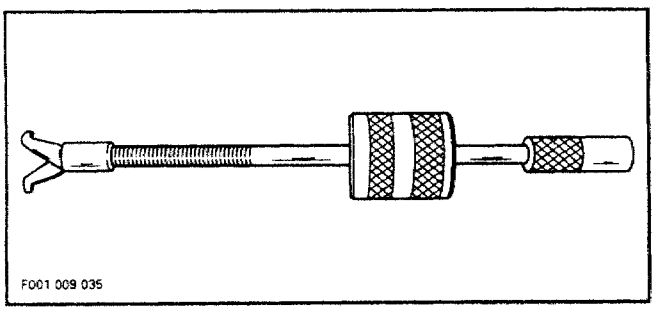


Or, use a Snap-on hammer puller including :

Handle CJ93-1

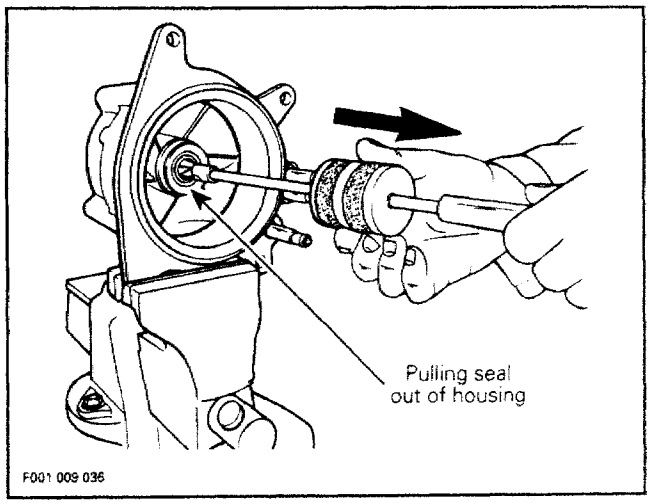
Hammer CJ125-6

Claws CJ93-4

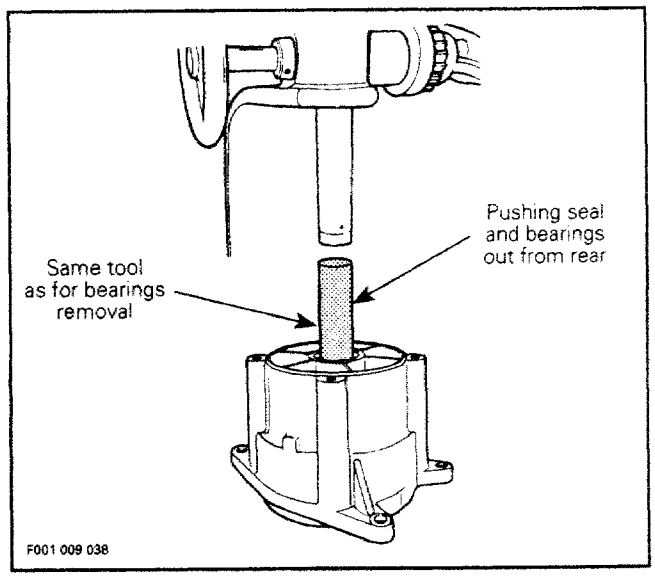


Close puller claws so that they can be inserted between seal and bearing. Holding claws, turn puller shaft clockwise so that claws open and tighten against seal.

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



NOTE : If bearings and seal need to be renewed, the special pusher described further on in **bearing removal** can be used. Simply insert pusher from the rear and push towards the front.

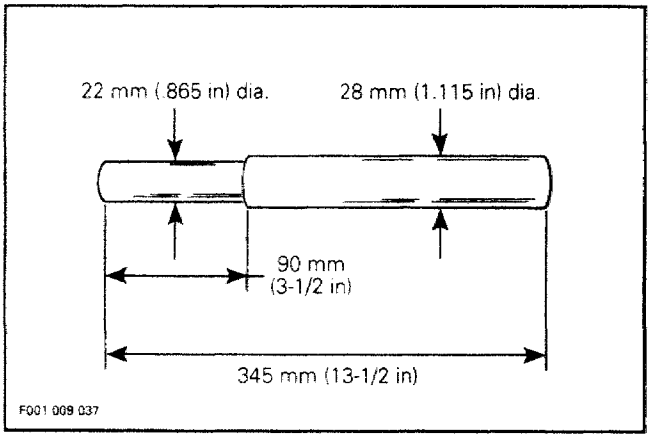


4, Needle Bearing

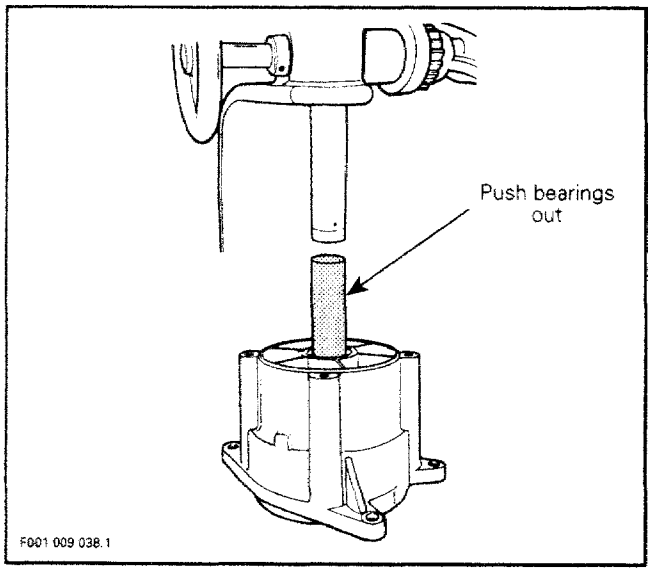
NOTE : It is always recommended to renew both bearings, even if only one needs to be replaced.

Bearings can be easily removed with the following suggested pusher.

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



Insert pusher into one bearing then push tool using a arbor press until bearings are out. However, care should be taken not to damage bearing journals.



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.

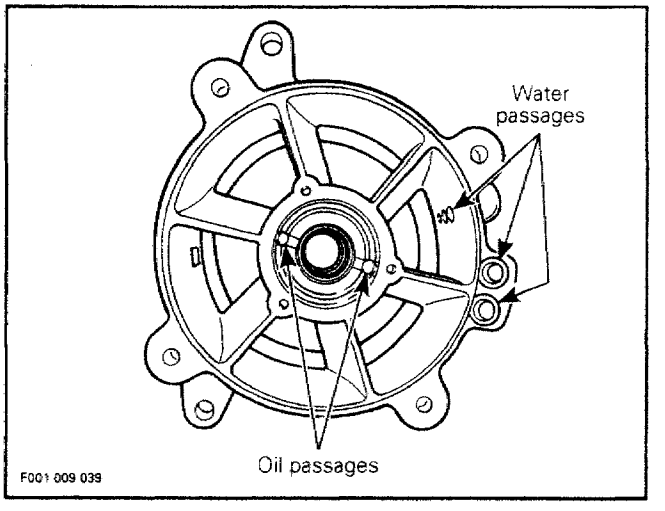
Sealant can be removed with a steel brush (disc) mounted on a drill or a scraper.

Bombardier stripper (P / N 295 500 110) can be used to remove remaining sealant. Carefully apply on mating surface taking care not to exceed this area because paint will be damaged. Let product dissolve sealant then scrape it.

Properly clean all threads.

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

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



PARTS INSPECTION

26,43,54, Impeller, PTO Flywheel and Drive Shaft

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

NOTE : If PTO flywheel splines are very worn, a pipe wrench can be used to remove PTO flywheel instead of special tool (P / N 295 000 001). Refer to ENGINE 03-04 then look for **PTO flywheel and magneto**.

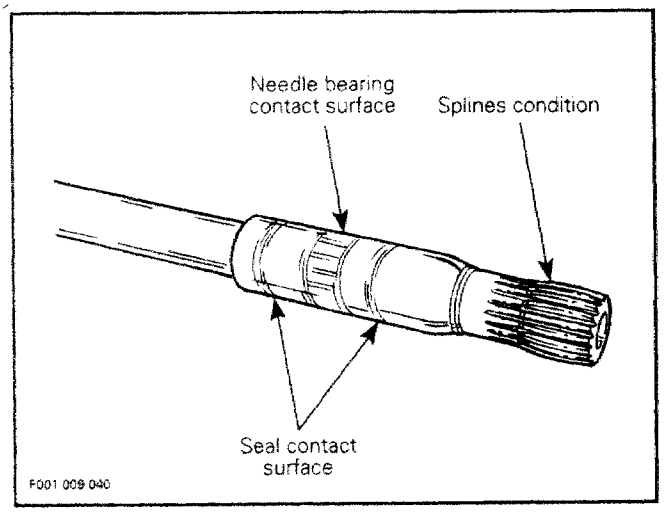
51,53,54, Needle Bearing, Damper and Drive Shaft

Wear

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

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

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



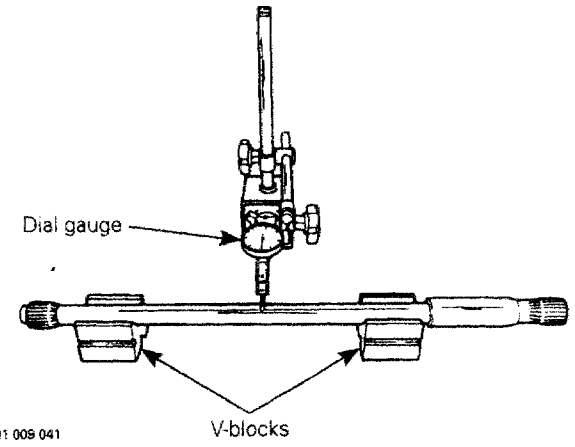
Deflection

Excessive deflection could cause vibration and damage to drive shaft splines, 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).

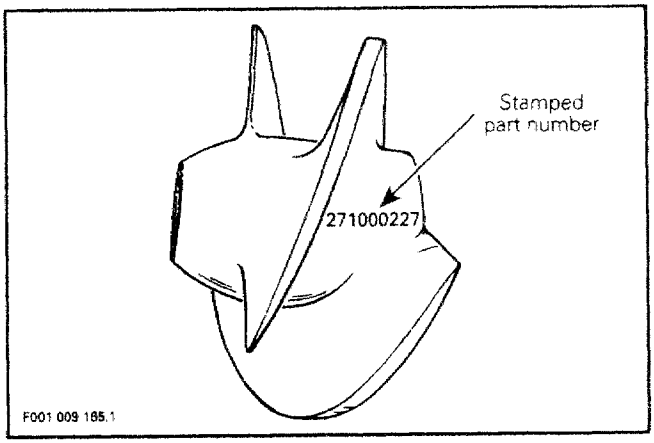
MEASURING DRIVE SHAFT DEFLECTION



26, Impeller

Identification

To identify the impellers refer to the following illustration and chart.

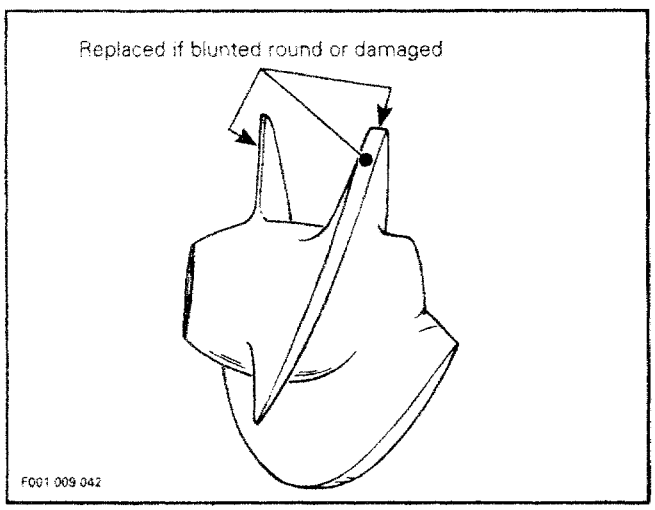


WATERCRAFT MODEL	IMPELLER P / N	MATERIAL	PITCH
SP	271 000 016	Aluminum	18°
SPI	271 000 030	Stainless steel	Progressive pitch 14°-21°
SPX / XPI	271 000 182	Stainless steel	Progressive pitch 14°-22°
GTS	271 000 299	Stainless steel	Progressive pitch 14°-20°
XP	271 000 367	Stainless steel	Progressive pitch 16°-24°
GTX / EXPLORER	271 000 280	Stainless steel	Progressive pitch 15°-21°

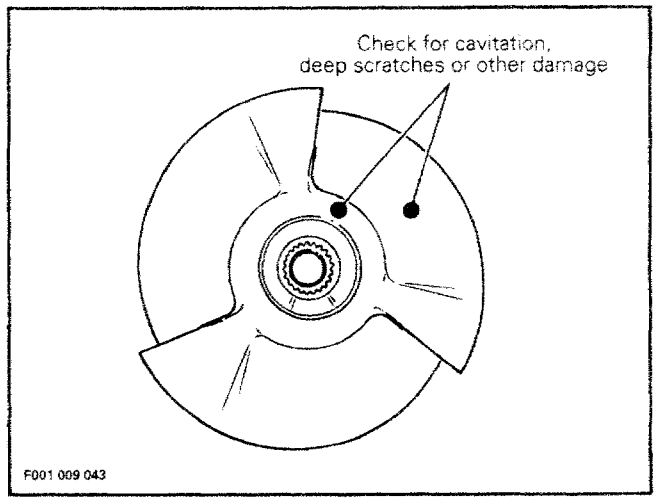
26,28, Impeller and Wear Ring

Examine impeller in wear ring for distortion.

Check if blade tips 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 nail, feel contact surface of seal. If any irregular surface is found, renew impeller shaft.

Install bearings then install impeller shaft and rotate it. Make sure it turns smoothly.

Radial Play

Radial play is critical for jet pump unit life span.

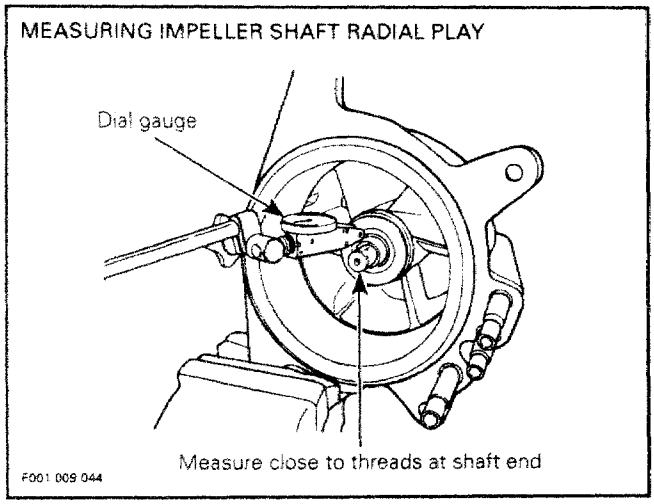
Radial play of impeller shaft is checked with shaft in housing, without impeller.

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

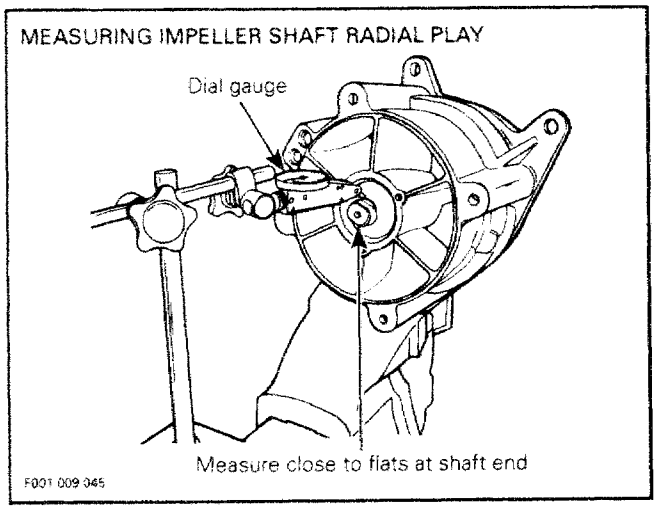
Set a dial gauge and position its tip onto shaft end, close to end of threads.

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

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



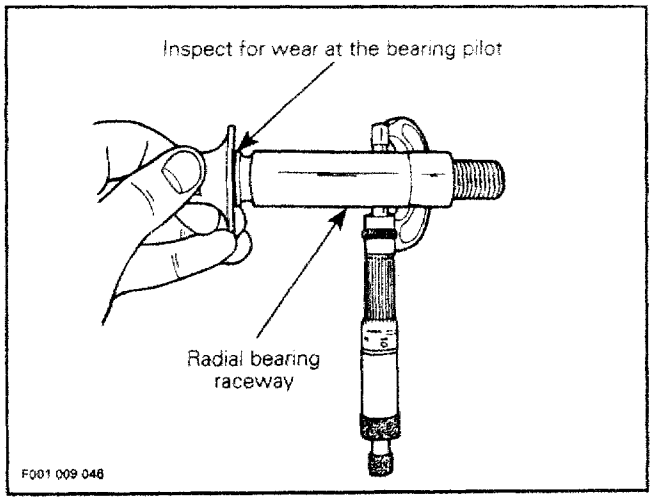
To check both bearings, proceed the same way with other shaft end. Position gauge tip on diameter, close to flats on shaft.



Excessive play can come either from worn bearings or impeller shaft or damaged impeller housing bearing surfaces.

Measuring shaft diameter will determine defective part.

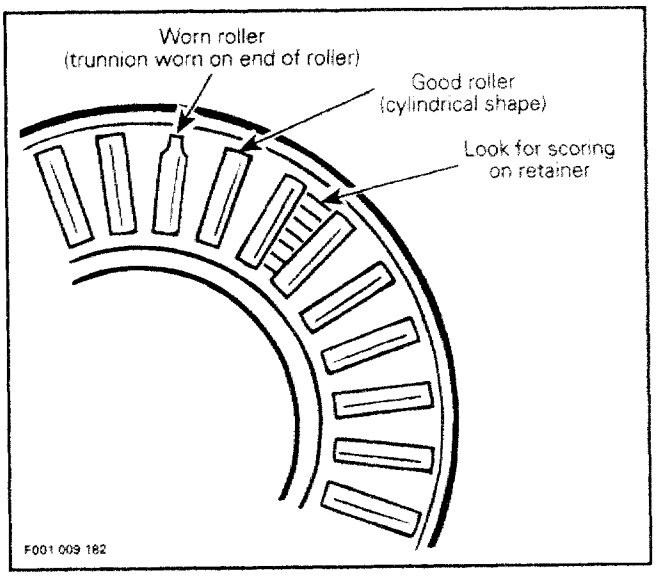
Using a micrometer, measure diameter on bearing contact surfaces. **Minimum** shaft diameter should be 22.24 mm (.876 in).



NOTE : If shaft is to be replaced, it is recommended to replace both bearings at the 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, flaking, discoloration or other evidence of wear.



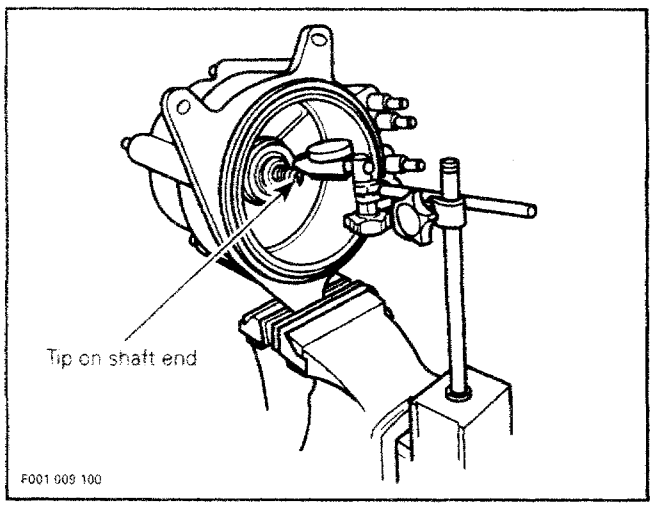
NOTE : When replacing either washer or bearing, it is recommended to renew both.

10,13, Impeller Shaft and Housing Cover

End Play

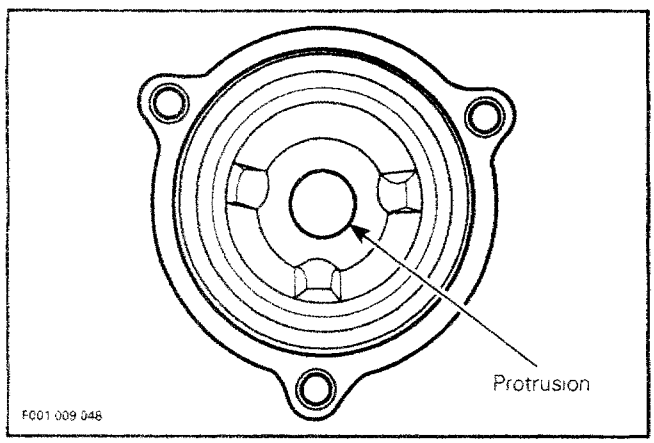
End play of impeller shaft is checked with shaft in housing, without impeller and with housing cover installed.

Retain housing in a brass jaw vise making sure not to damage housing lug. Set a dial gauge and position its tip on the end of shaft. Move shaft end by pulling and pushing. Difference between highest and lowest dial gauge reading is end play. Maximum permissible end play (new) is 0.12 - 0.54 mm (.005 - .021 in).

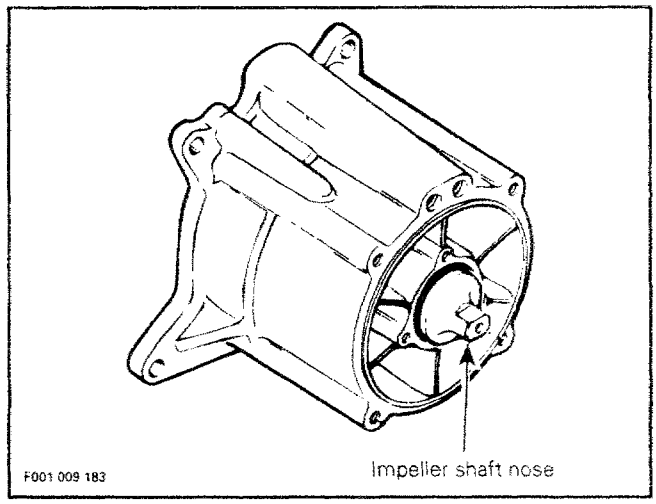


Excessive play comes from worn protrusion inside housing cover and wear of impeller shaft nose.

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



Inspect impeller shaft nose for wear.



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.

JET PUMP ASSEMBLY

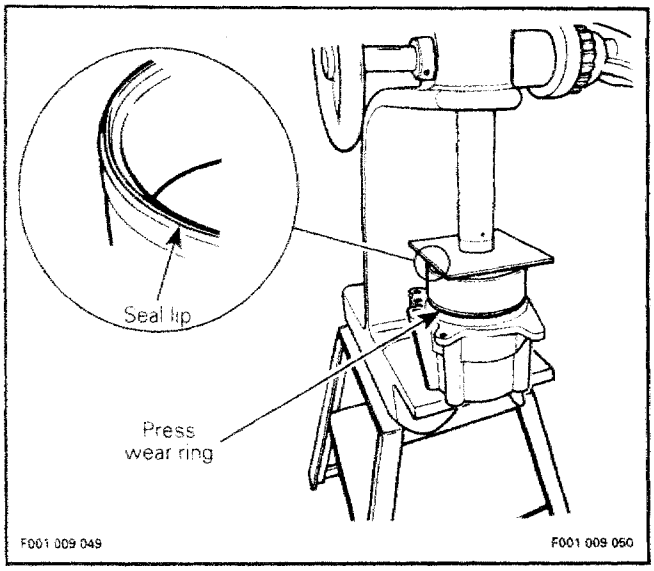
28, Wear Ring

The wear ring features a lip on one edge ; position lip outwards of housing.

NOTE : To ease insertion into housing, apply SEA-DOO LUBE lubricant (P / N 293 600 006) onto outside circumference of wear ring.

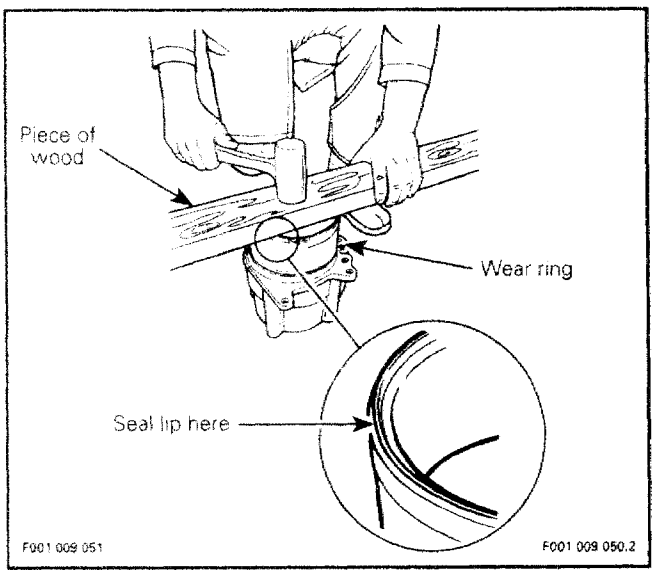
To install ring in housing, use a square steel plate approx. 180 x 180 mm x 6 mm thick (7 x 7 in x 1/4 in) and a press.

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



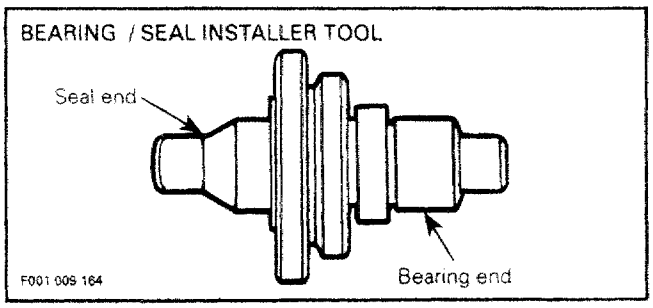
If a press is not readily available, a piece of wood such as a 2 x 4 x 12 in. long, can be used.

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



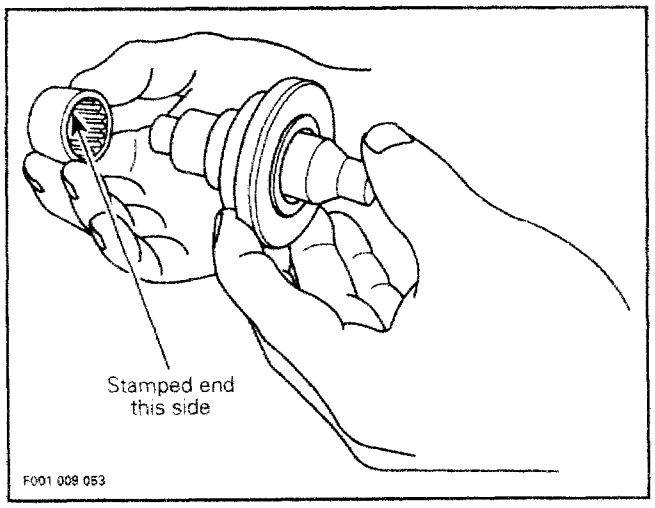
3,4, Seal and Needle Bearing

Bearings and seal will be properly installed in housing using bearing / seal installer tool (P / N 295 000 107).

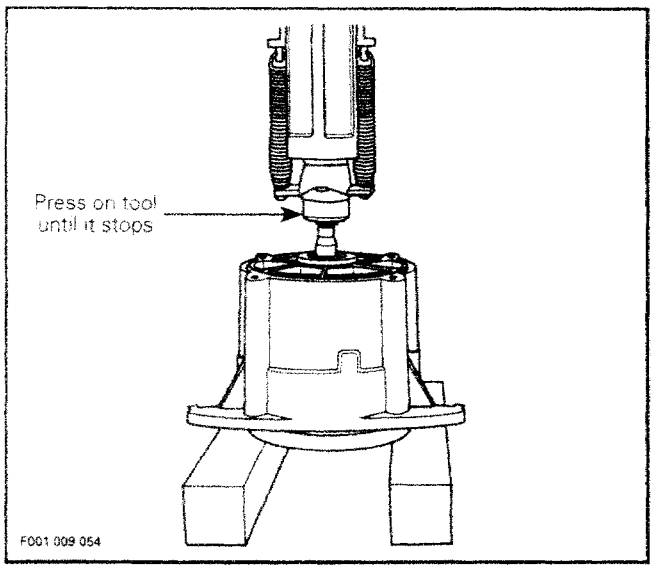


Stamped end of bearings (showing identification markings) must be located toward outside of housing.

Properly insert bearing on tool. Using an arbor press only, push tool until tool flange contacts housing. Proceed the same way for both bearings.

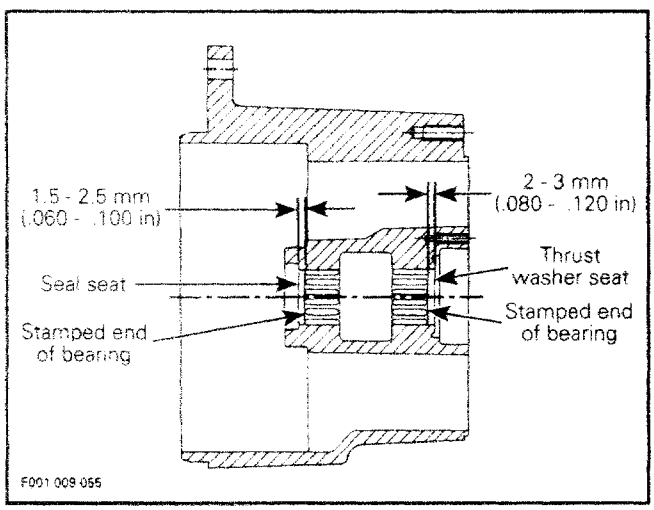


▼ CAUTION : Never hammer the bearing into its housing.



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

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

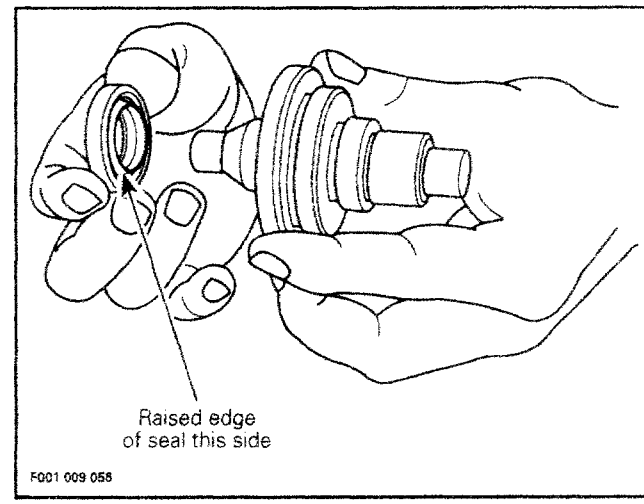


Seal must be installed so that lips raised edges are toward outside of housing (toward impeller).

Apply Loctite 515 (P / N 293 800 007) in seal housing, all around outer diameter and on seal seat.

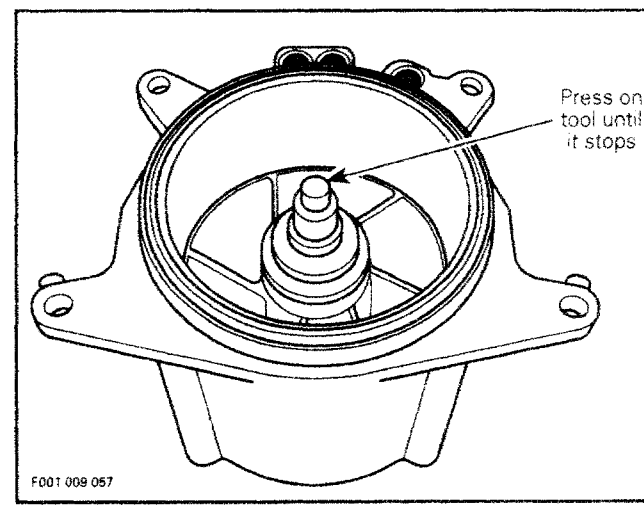
Properly insert seal on tool.

NOTE : Be careful when installing seals to pack seal with grease before inserting bearing / seal installer tool. Properly insert tool in seal with a rotating movement.

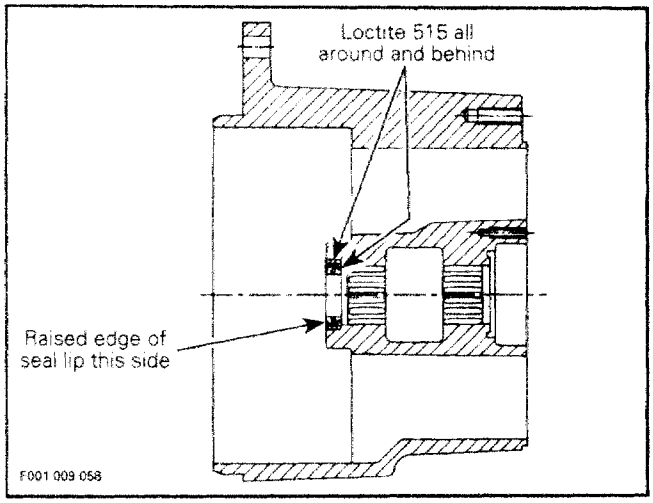


▼ CAUTION : Take care that no sealant contacts any roller of bearing.

Push on tool end with a press until tool flange contacts housing.



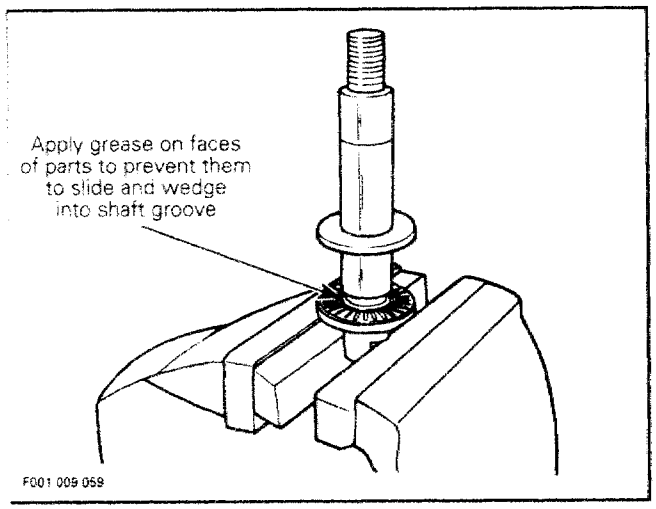
Apply synthetic grease (P / N 293 550 010) between seal lips.



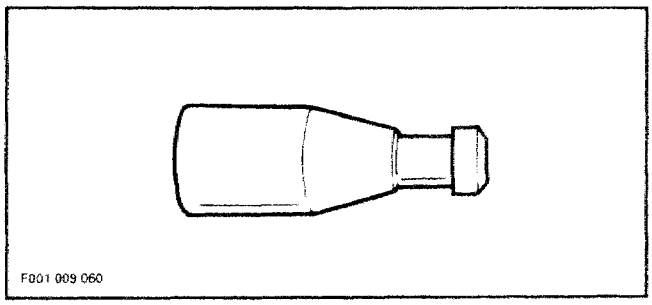
7,8,9,10,26, Impeller Housing, Thrust Washer, Thrust Bearing, Impeller Shaft and Impeller

Insert impeller shaft flats in a vise so that shaft is vertical.

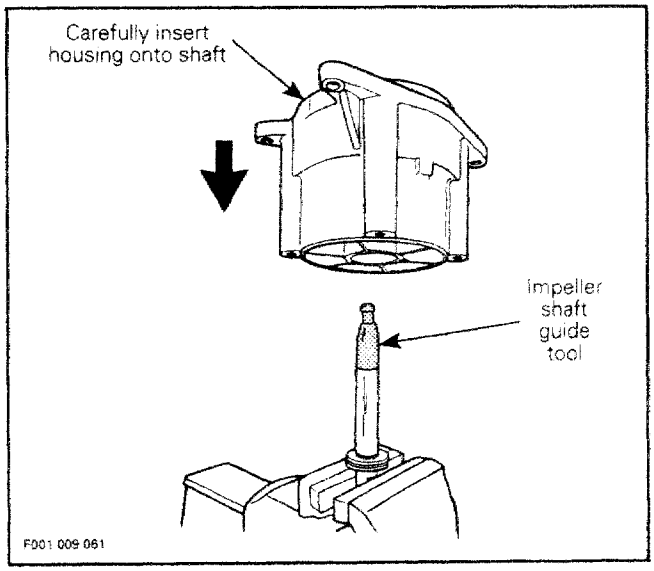
Apply synthetic grease (P / N 293 550 010) on both sides of thrust bearing then insert onto shaft followed by thrust washer. Make sure bearing is leaning against shaft flange and washer is properly centered. Grease will prevent parts from sliding at installation and thus possibly wedging thrust bearing into shaft groove.



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



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



Remove special tool.

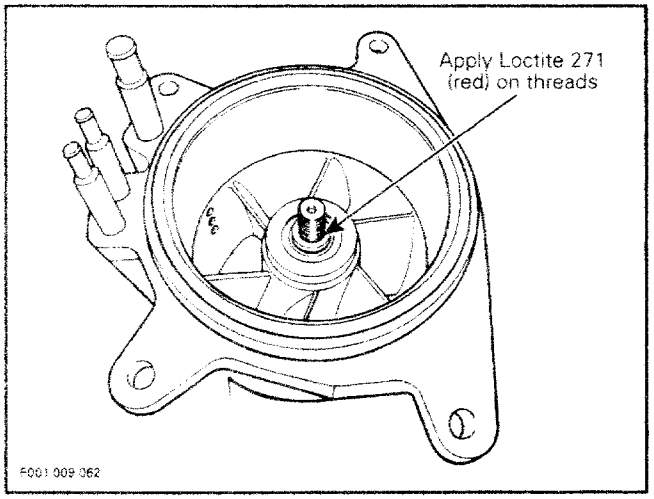
Brush and clean impeller shaft threads and impeller splines with Loctite Safety solvent 755 (P / N 293 800 019) or equivalent. Free threads and splines from any residue. Allow solvent to dry thoroughly.

▼ **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 2 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 6 hours, if not, 24 hours is needed.

Apply Loctite 271 (red) to shaft threads.



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

Using 2 screws previously removed from venturi, secure impeller shaft holder tool to housing. Install shaft holder tool in a vice.

○ NOTE : Pump pressurization should be performed at this time. If it leaks, it is easier to determine where. Refer to **pump pressurization** further in this section.

To ease impeller installation, apply liquid soap or Sea-Doo Lube lubricant on wear ring.

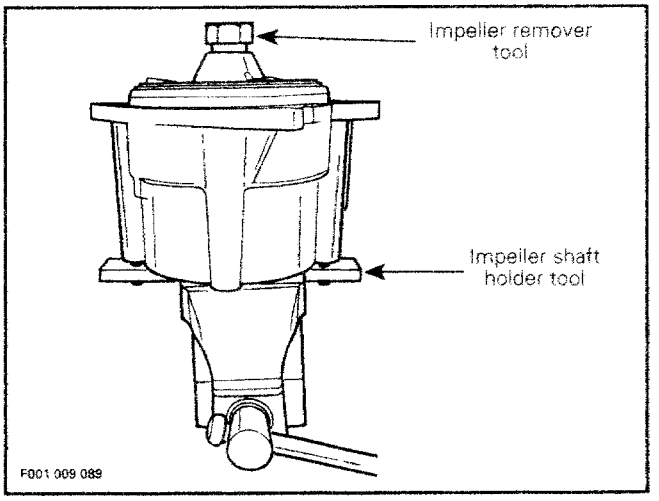
Insert impeller into wear ring. Manually rotate impeller and push so that it slides on impeller shaft threads. Carefully engage threads making sure they are well aligned.

Install impeller remover tool into impeller splines and tighten.

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

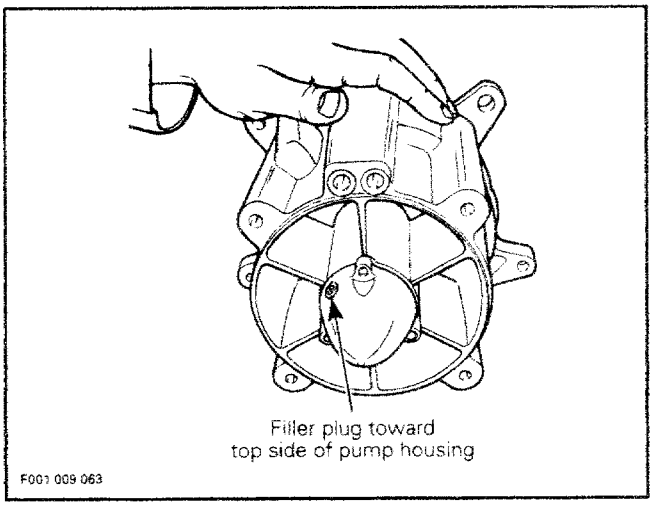
Torque impeller to 70 N•m (52 lbf•ft) then remove tools.

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



11,13,18, O-ring, Housing Cover, Loctite 515

Apply Loctite 515 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) on screw threads and evenly tighten cover screws. Torque to7 N•m (62 lbf•**in**).

PUMP PRESSURIZATION

Whenever doing any type of repair on the pump, pressure test should be done to check for any leakage.

Pressure Test

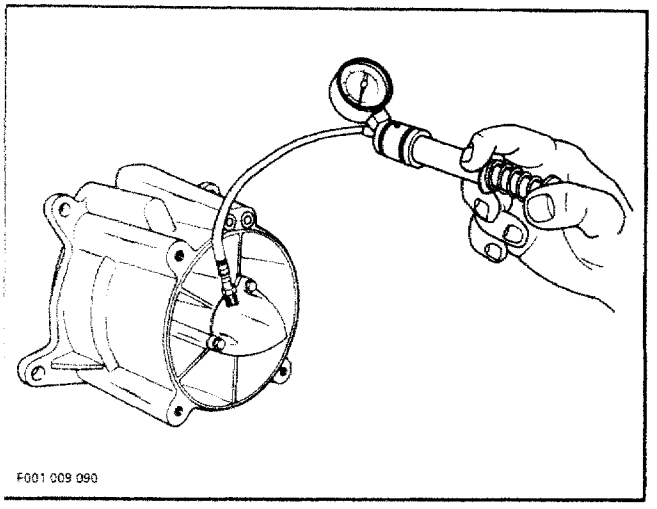
Proceed as follows :

— Remove plug from housing cover. Drain oil.

— Apply Loctite PST 592 on threads fitting tool (P / N 295 000 086) then secure on cover.

— Connect pump gauge tester (P / N 295 000 083) to fitting.

— Pressurize pump to a maximum of 70 kPa (10 PSI). Pump must maintain this pressure for 10 minutes.



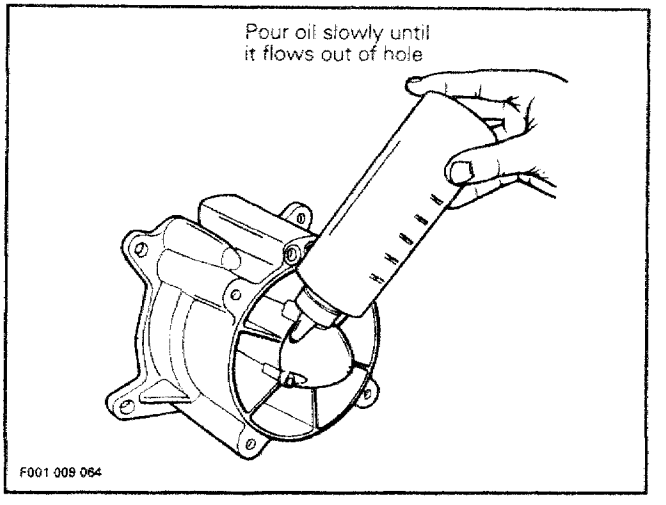
CAUTION : Repair any leak, failure to correct a leak will lead to premature wear of pump components.

If there is a pressure drop spray soapy water around housing cover. If there are no bubbles, impeller shaft, impeller shaft seal, or impeller housing is leaking through porosity and has to be replaced. Jet pump unit has to be overhauled.

Place housing horizontally as in its operating position so that fitting in cover is located in top. Remove fitting from cover. Pour SEA-DOO JET PUMP SYNTHETIC OIL (P / N 293 600 011) in reservoir until oil comes level with bottom of hole. Let oil penetrates in housing and after a few minutes pour oil again until it is level with bottom of hole. Oil capacity is 65 mL (2.2 oz).

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

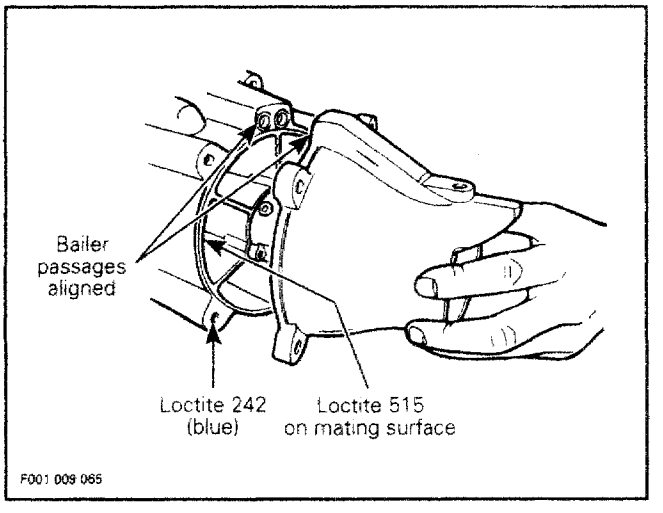
NOTE : When filling, oil must be poured into cover quite slowly to allow complete housing fill.



Apply Loctite PST 592 on plug threads then secure it 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 on mating surface. Apply Loctite 242 (blue) on threads and install screws and washers then torque to 25 N•m (18 lbf•ft) in a criss-cross sequence.



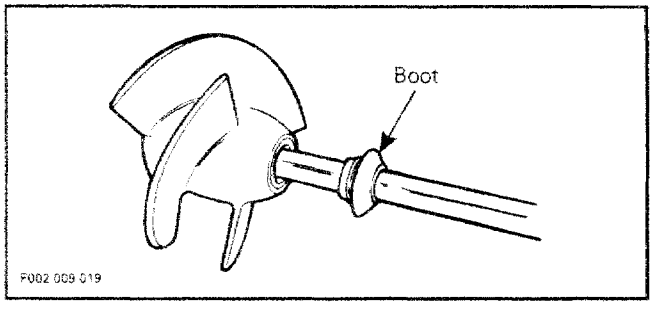
NOTE : On aluminum material it is recommended to use Loctite primer N to reduce curing time and to increase gap filling capability. Refer to manufacturer's instructions.

2,15, Fitting

Apply Loctite PST 592 on plastic fitting threads. Then thread fitting 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.

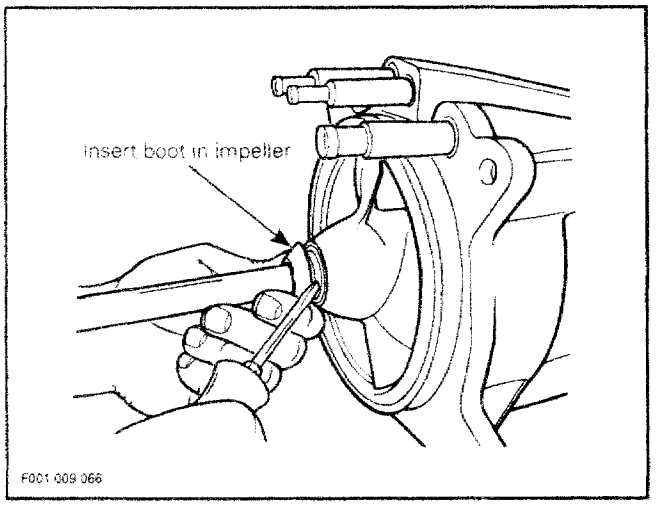


Clean drive shaft splines with Loctite solvent 755. Free splines from any residue. Allow solvent to dry thoroughly.

Generously apply synthetic grease (P / N 293 550 010) on drive shaft splines and impeller splines.

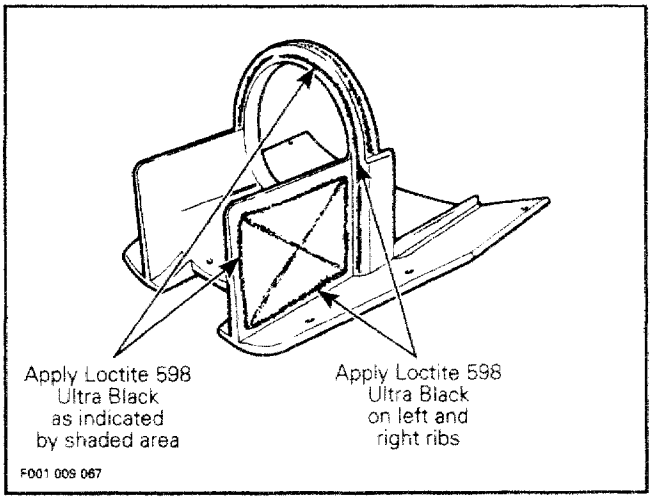
Make sure rubber damper is on drive shaft end.

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



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

Apply Loctite 598 Ultra Black on ride shoe as shown in the following illustration.



Carefully install ride shoe on hull. Apply Loctite 242 (blue) on screw threads, install and tighten in a criss-cross sequence. Torque to 10 N•m (88 lbf•**in**).

From inside of bilge, apply 732 sealant (P / N 293 800 006 or P / N 293 800 003) on end of screws to completely seal hull.

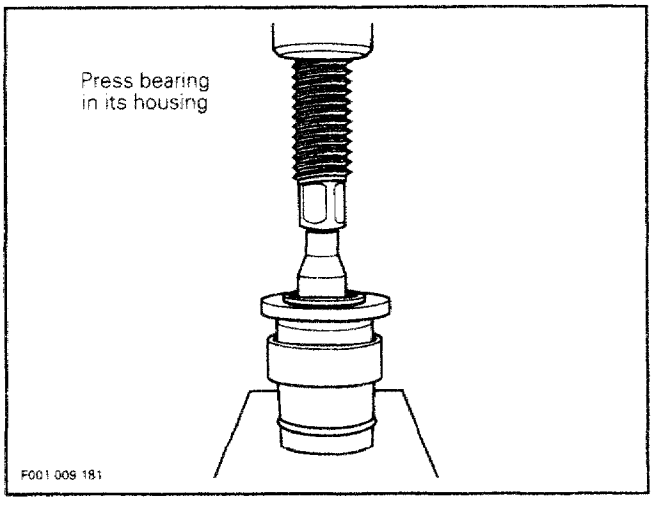
Apply Loctite 242 (blue) on grill screw threads, install and tighten. Torque screws to 8 N•m (71 lbf•**in**).

50,51, Seal Carrier and Needle Bearing

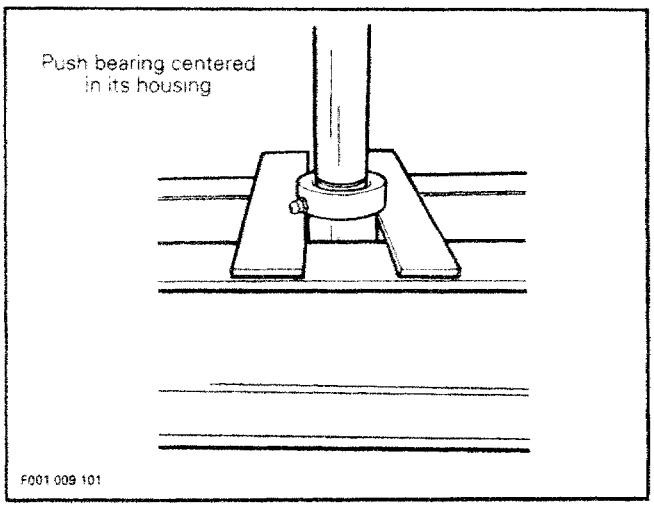
Properly support seal carrier when installing seals and bearing.

▼ **CAUTION : Ensure to install stamped end of bearing (showing identification markings) first on tool. Bearing damage will occur if not done properly. Never hammer the bearing into its housing.**

Install bearing with the bearing / seal installer tool (P / N 295 000 107).



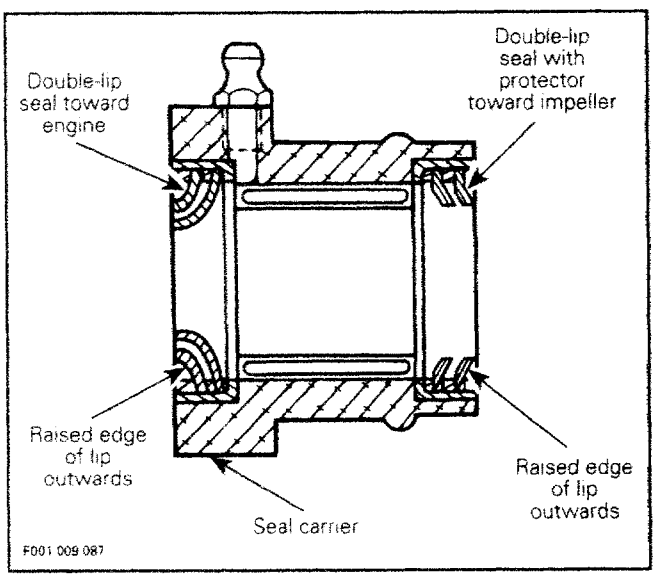
NOTE : Bearing can also be installed with the same pusher used at disassembly. Center bearing in longitudinal axis of housing.



49,50,52, Seal and Seal Carrier

Install double-lip seal with protector toward impeller side.

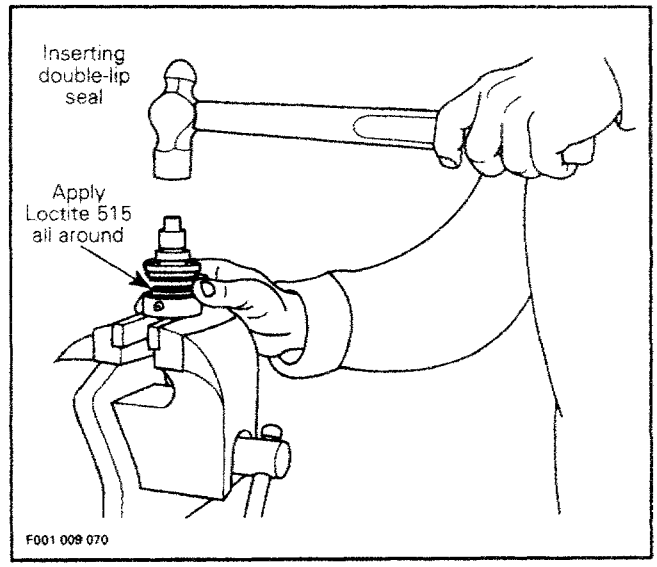
On both seals, raised edge of lip must be located outwards of seal carrier.

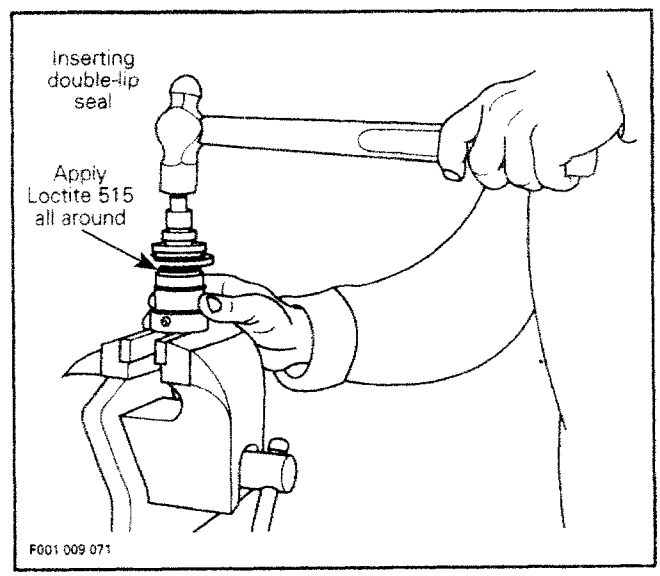


Apply Loctite 515 all around seals outside diameter.

Seals can be carefully installed in housing using bearing / seal installer tool (P / N 295 000 107).

Push seals until tool comes in contact with housing.

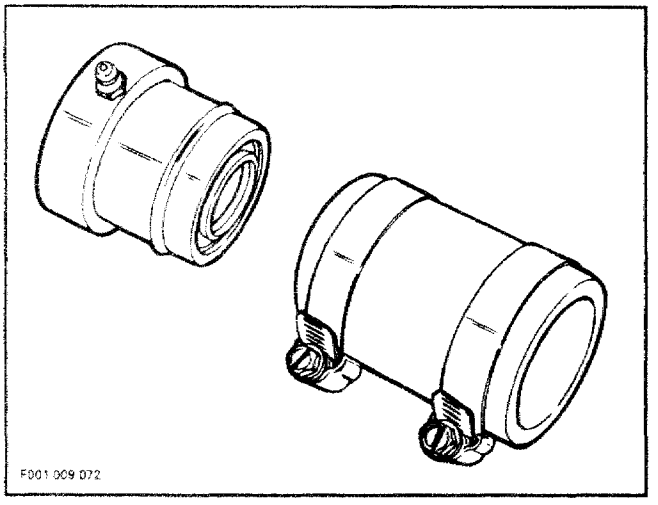




NOTE : Always install seal with its protector facing the impeller.

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 jet pump is installed, to ensure perfect alignment.

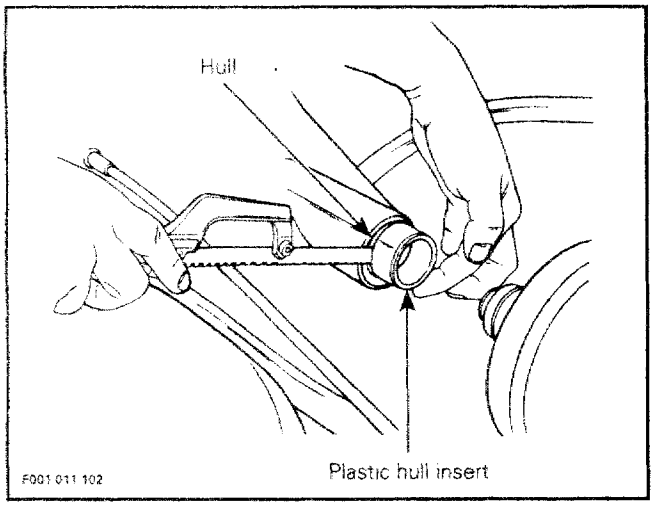
JET PUMP INSTALLATION

65, Hull Insert

Repair

For hull insert repair proceed as follows :

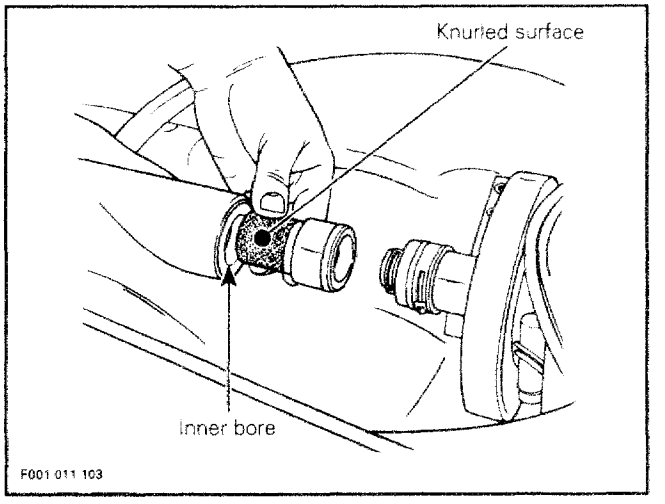
Cut plastic hull insert flush with hull using a saw.



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

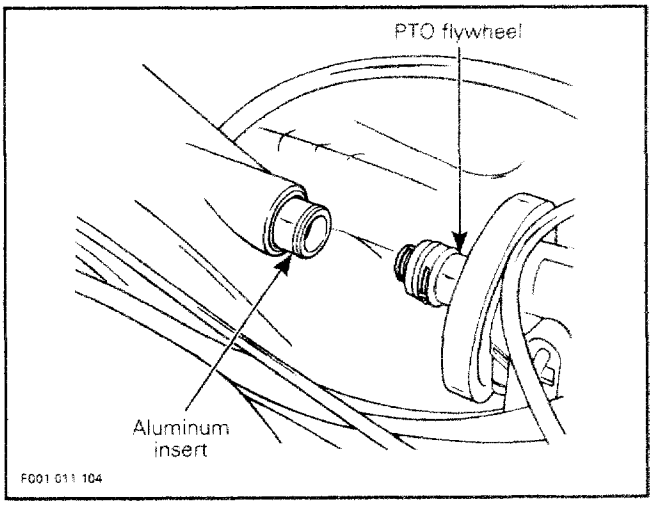
Apply epoxy glue on aluminum insert (P / N 292 000 075) knurled surface and on plastic insert inner bore.

CAUTION : A clearance between plastic insert and aluminum insert could possibly be noticed. If so, ensure to fill gap with epoxy glue to obtain aluminum insert adhesion.



Install insert into plastic hull insert.

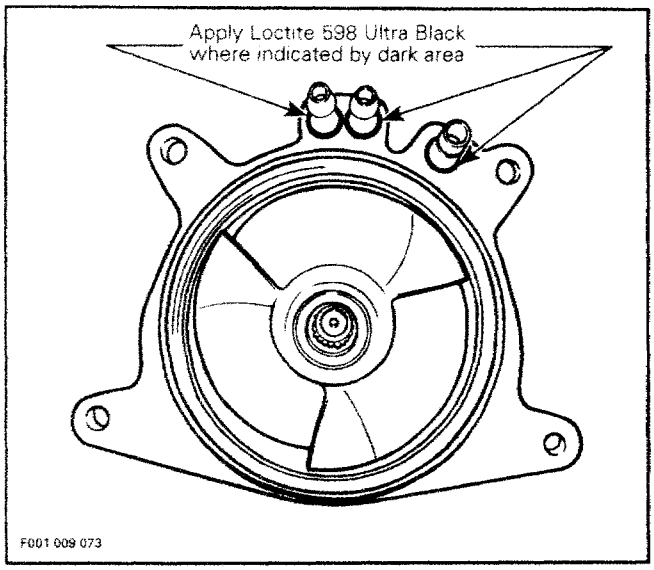
NOTE : Align aluminum insert as much as possible with PTO flywheel.



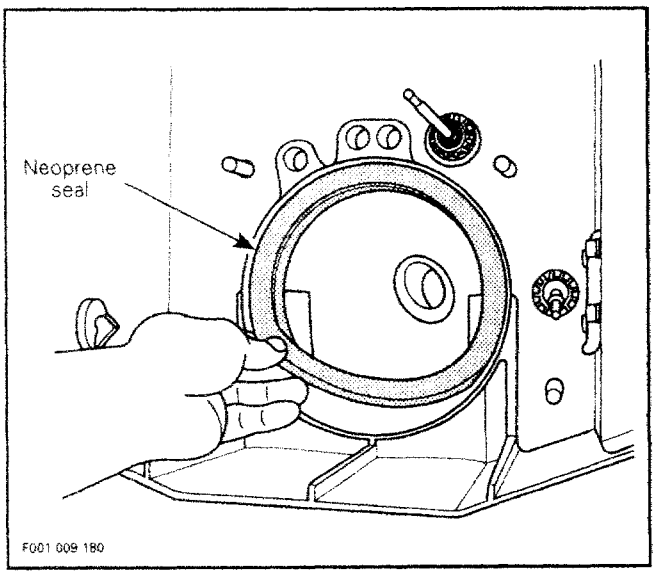
NOTE : The epoxy glue curing time is 30 minutes.

Jet Pump Unit

Apply Loctite 598 Ultra black on pump as shown in the following illustration.



Install a new neoprene seal on ride shoe.



Generously apply synthetic grease (P / N 293 550 010) on drive shaft splines.

Make sure rubber damper is on drive shaft end.

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

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

▼ CAUTION : When sliding the drive shaft through seal carrier, the double lip seal could be folded over. This could cause a seal carrier bearing failure.

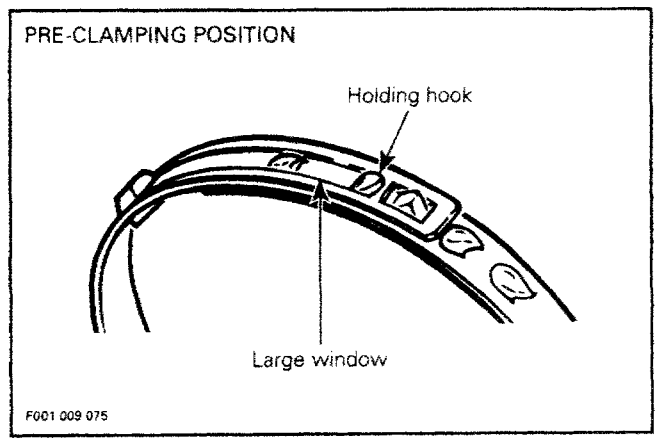
While holding pump, guide and engage shaft splines in PTO flywheel. Rotate shaft to properly index splines. Make sure boot is well positioned over shaft end.

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

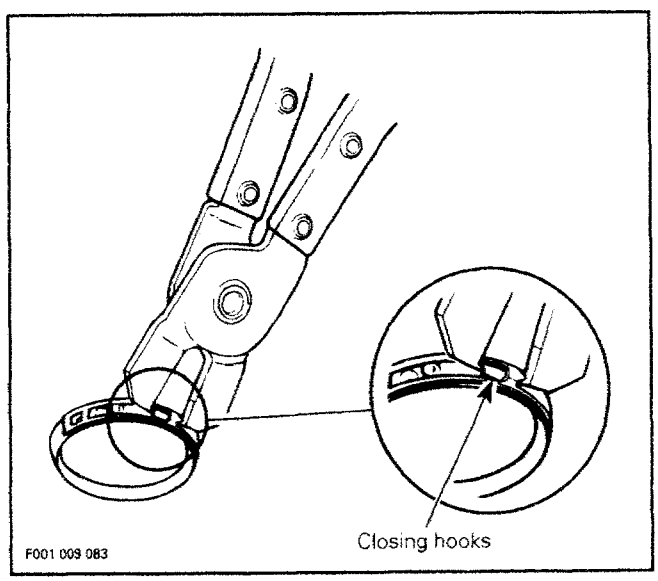
Secure boot clamp as follows :

— Use pliers (P / N 295 000 069) as for removal.

— Manually engage holding hook in large window. This is a pre-clamping position only.



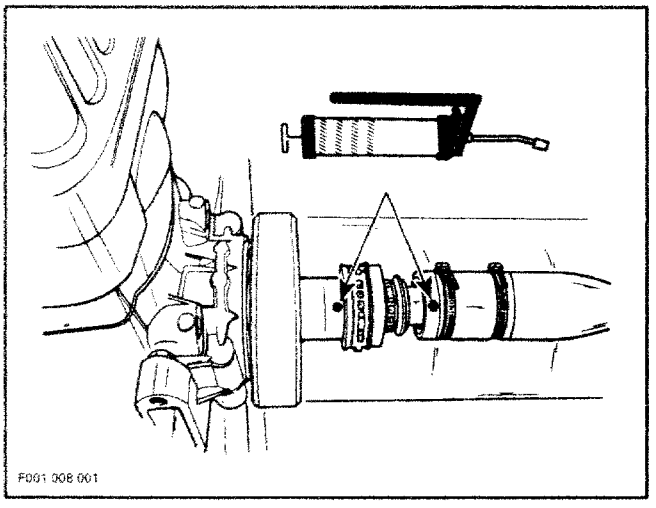
— Insert pointed tips of pliers first in closing hooks.



— Squeeze pliers. When both large and small windows are directly over the 2 locking hooks, press those windows down to engage hooks in windows.

Secure seal carrier protective hose to hull insert with gear clamps. Using a grease gun, carefully lubricate PTO flywheel with synthetic grease (P / N 293 550 010), until boot is just beginning to expand. From this point, immediately stop.

Lubricate seal carrier until grease is just coming out. From this point immediately stop.



Secure flywheel guard to engine studs with washers and wing nuts.

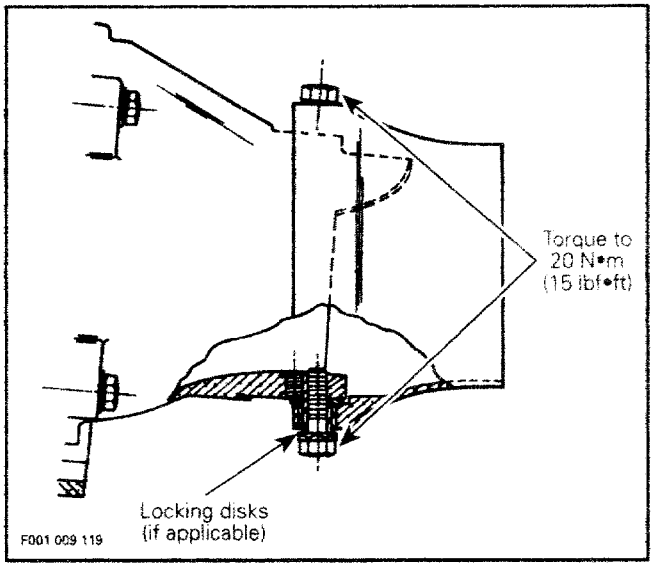
Secure coolant inlet hose and both bailer tubes to impeller housing using tie raps.

Reinstall air vent tube support onto body (SP / XP series).

16,21,22,23,24, Screw, Sleeve, Bushing and Nozzle (Except XP Model)

Insert bushings in nozzle, positioning their flanges from inside of nozzle. Apply SEA-DOO LUBE lubricant (P / N 293 600 006) on outer circumference of sleeve then insert in nylon bushings.

Install nozzle on venturi, position its steering arm on RH side. Apply Loctite 242 (blue) on threads. Install screws position bottom screw in one of the holes with **locking disks** (except GTS / GTX models) then torque to 20 N•m (15 lbf•ft).



◆ **WARNING : Whenever removing screw always renew both locking disks. The recommended Loctite must be applied on screw threads and screw must be torqued as specified.**

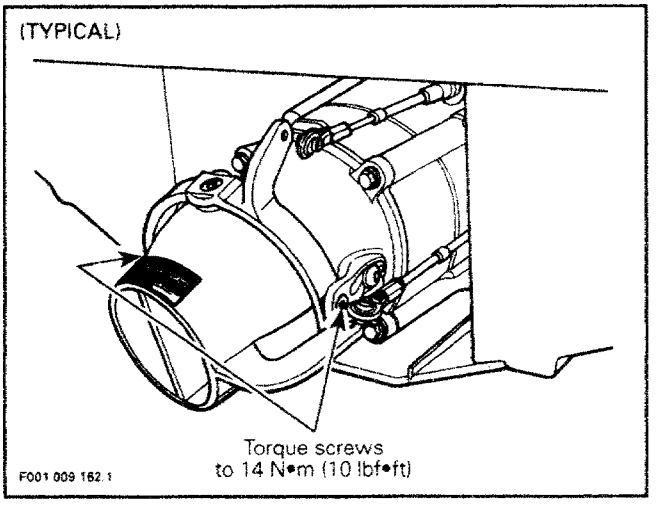
24, Nozzle (XP Model)

Apply Loctite 242 (blue) on threads of socket screws.

Install nozzle / trim ring.

Torque screws to 14 N•m (10 lbf•ft).

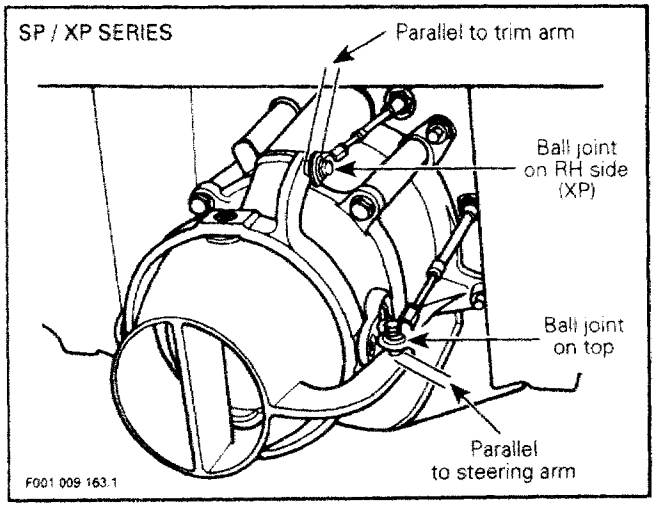
NOTE : Trim ring has a tight fit ; to install, insert both sides at the same time, taking care not to break plastic bushings. Carefully use a plastic tip hammer if necessary.

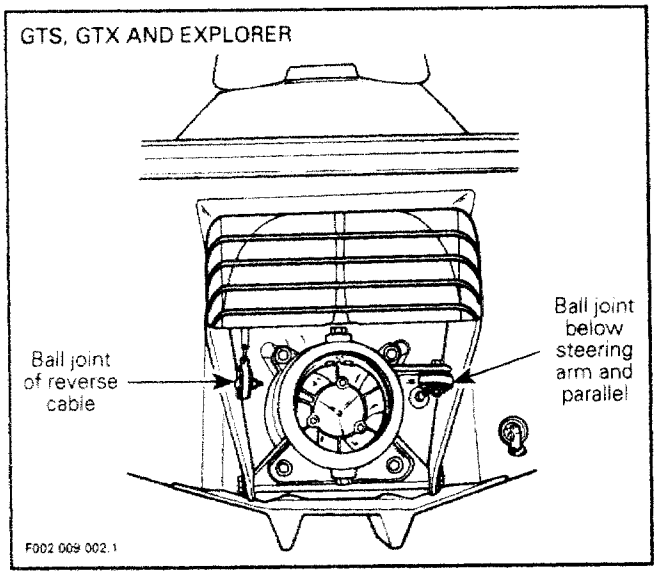


NOTE : Make sure steering arm of jet pump is on right side and trim arm is above venturi housing.

All Models

Reinstall ball joints of steering cable, trim cable (XP model) and reverse cable (GTS, GTX and EXPLORER models). Torque bolts to 7 N•m (63 lbf•**in**).





NOTE : Ball joint must be parallel. If not, slacken jam nut and adjust ball joint. Torque jam nut to 2.5 N•m (23 lbf•**in**).

Check steering alignment. Refer to STEERING SYSTEM 09-01 then refer to **adjustment**.

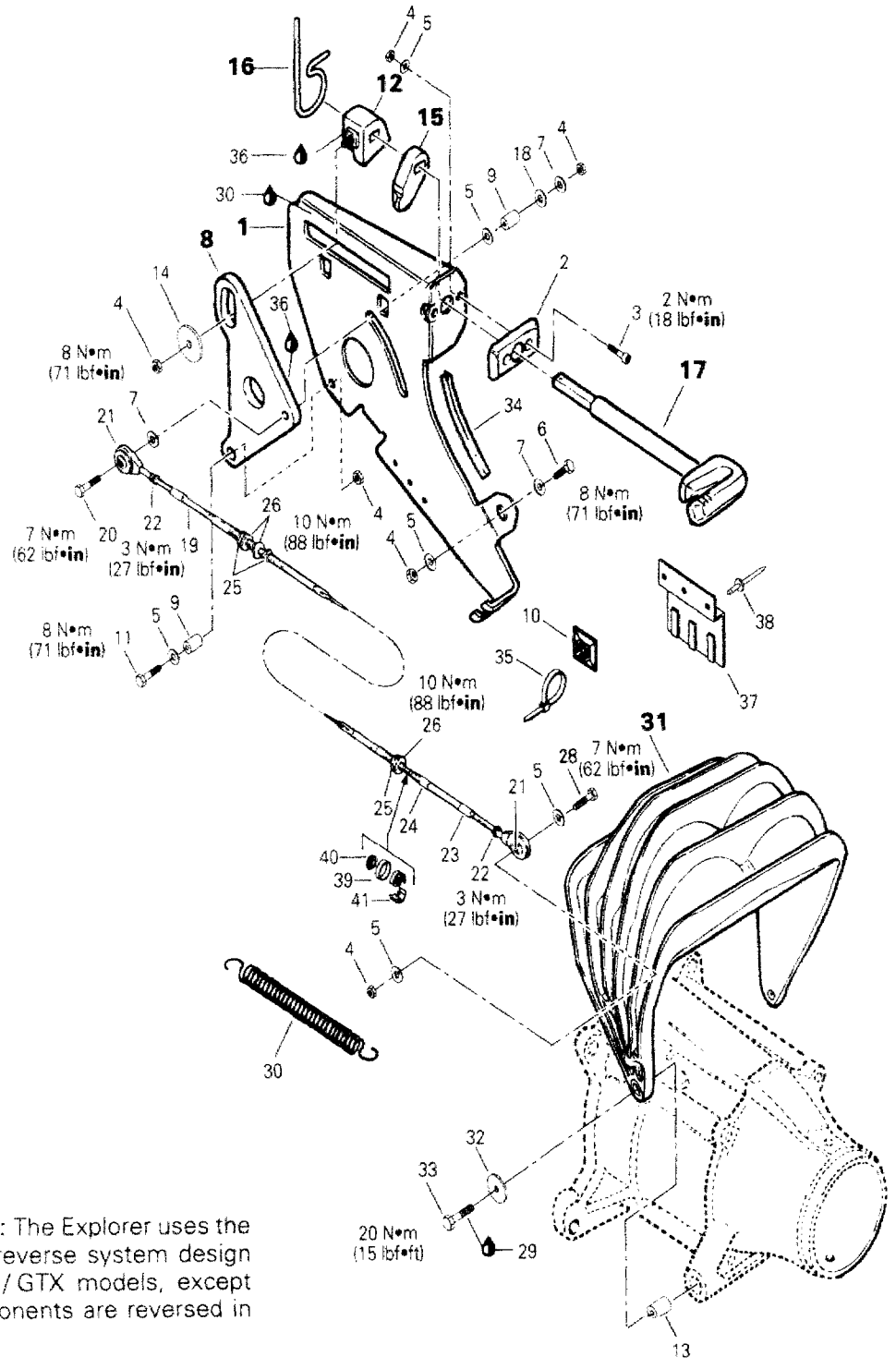
Slightly lubricate wear ring with SEA-DOO LUBE lubricant before starting to minimize friction during initial start.

To allow impeller adjustment into wear ring, start engine to let impeller rotate for a few seconds.

CAUTION : Water must be supplied to cool engine with coupler hose (P / N 295 500 099).

REVERSE SYSTEM

GTS, GTX AND EXPLORER MODELS



NOTE : The Explorer uses the same reverse system design as the GTS / GTX models, except some components are reversed in position.

F002 009 023

COMPONENTS

1. *Reverse support*
2. *Guide plate*
3. *Allen screw M6 x 20*
4. *Lock nut M6*
5. *Flat washer 6 mm*
6. *Hexagonal screw M6 x 20*
7. *Flat washer 6 mm*
8. *Triangular lever*
9. *Bushing*
10. *Tie-mount*
11. *Hexagonal screw M6 x 25*
12. *Sliding block*
13. *Bushing*
14. *Flat washer*
15. *Locking lever*
16. *Spring*
17. *Reverse handle*
18. *Plastic washer 10 mm*
19. *Reverse cable*
20. *Hexagonal screw M6 x 40*
21. *Ball joint*
22. *Jam nut 10-32*
23. *Small boot*
24. *Large boot*
25. *Jam nut 1/2*
26. *Flat washer 1/2*
27. *Loctite 598 Ultra Black*
28. *Hexagonal screw M6 x 45*
29. *Loctite 242 (blue)*
30. *Spring*
31. *Reverse gate*
32. *Flat washer 8 mm*
33. *Screw M8 x 35*
34. *Edge protector*
35. *Tie rap*
36. *Synthetic grease*
37. *Wiring harness support (GTS / GTX)*
38. *Rivet*
39. *Ring retainer*
40. *Grommet*
41. *Half-ring*

GENERAL

It is not necessary to remove reverse system from watercraft for servicing. However reverse system removal is necessary to replace reverse support.

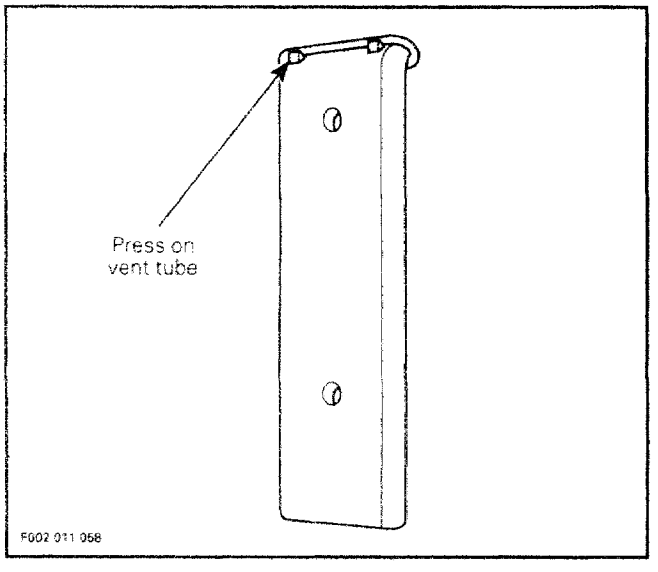
NOTE : The Explorer uses the same reverse system design as the GTS / GTX models, except some components are reversed in position.

DISASSEMBLY

GTS / GTX Models

Remove storage basket from watercraft.

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



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

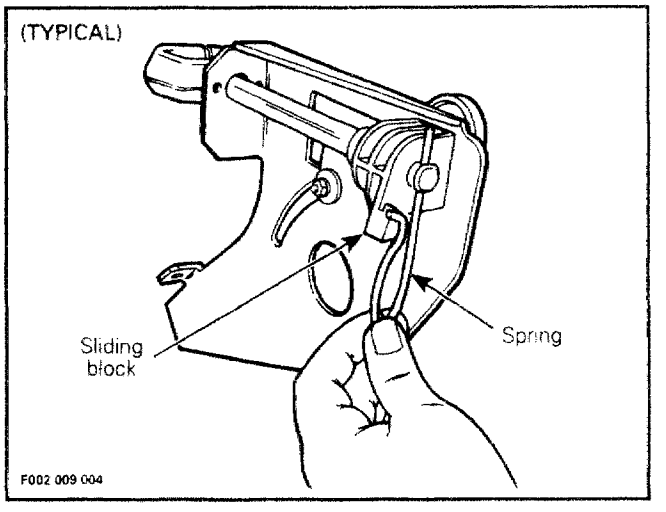
Explorer Model

Remove windscreen.

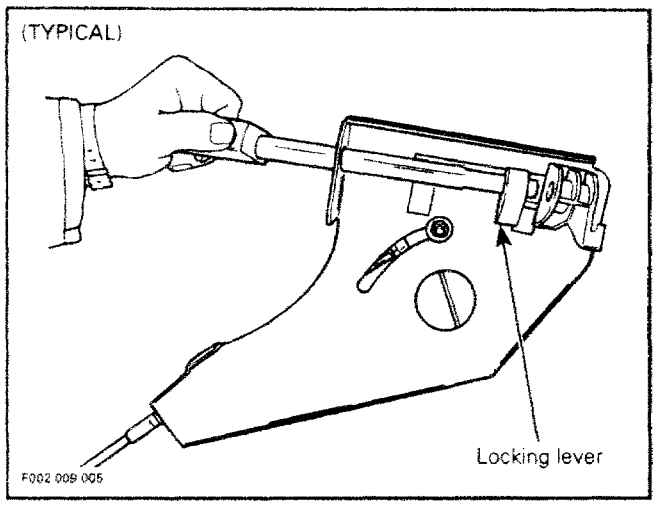
Remove soundproofing foam.

15,16,17, 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.



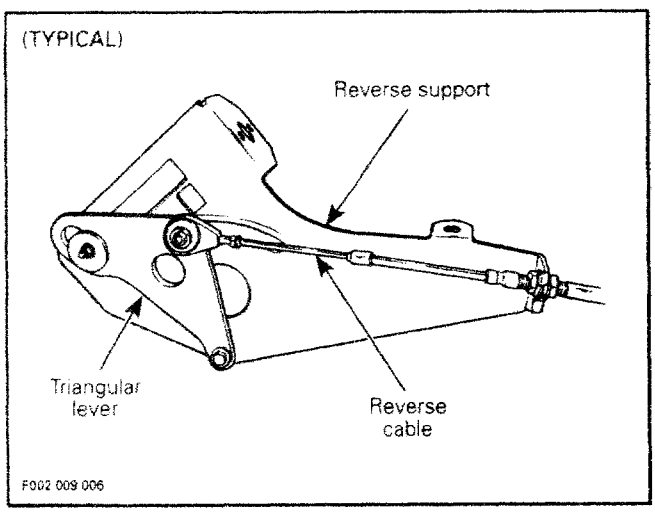
8,12, Triangular Lever and Sliding Block

NOTE : On the Explorer, console must be removed to withdraw triangular lever and reverse support.

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.

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



1, Reverse Support

GTS / GTX models

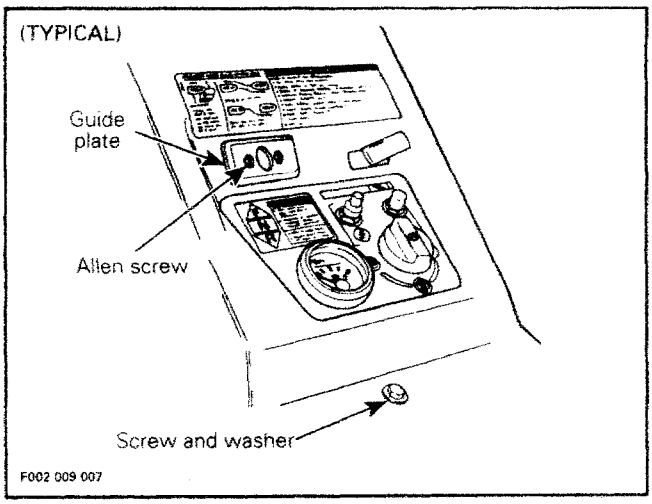
In order to have access to screw holding lower part of reverse support, remove front seat by pulling on each side to release it from body.

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

All Models

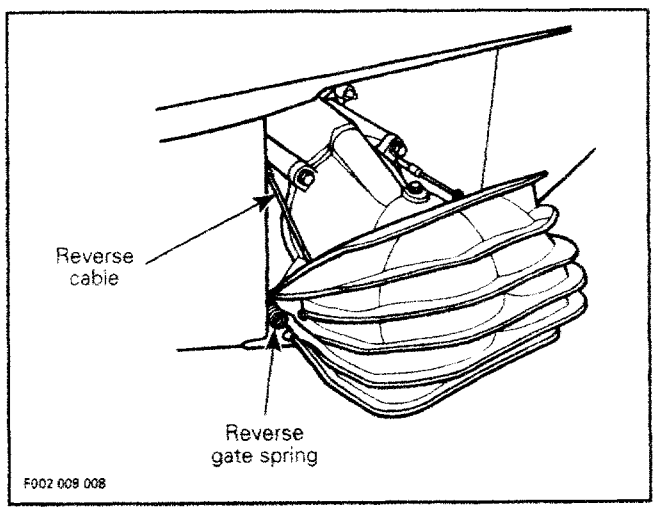
Remove reverse cable from support.

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

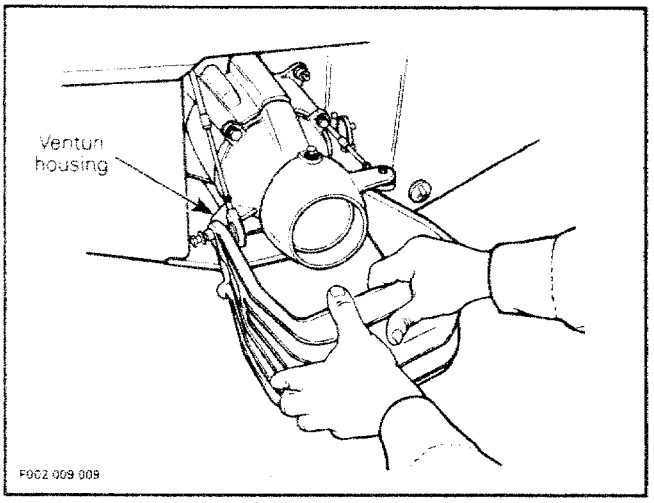


31, Reverse Gate

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



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



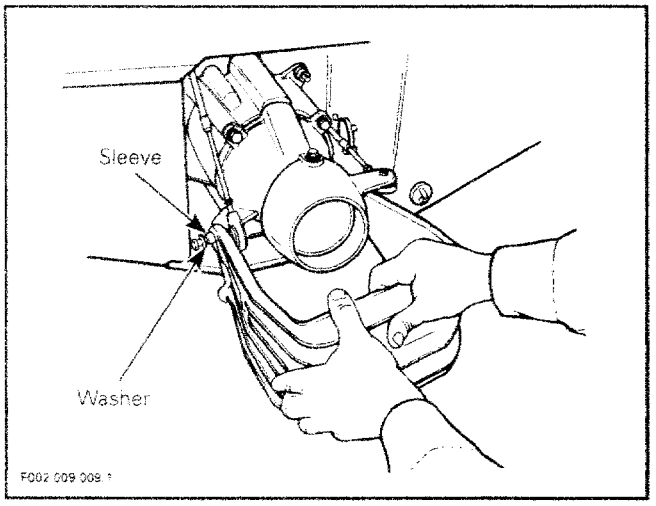
ASSEMBLY

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

31, Reverse Gate

Install reverse gate with sleeve and washer. Apply Loctite 242 (blue) 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

For reverse support installation torque screw (GTS / GTX models only) to 8 N•m (71 lbf•**in**) and Allen screws to 2 N•m (18 lbf•**in**).

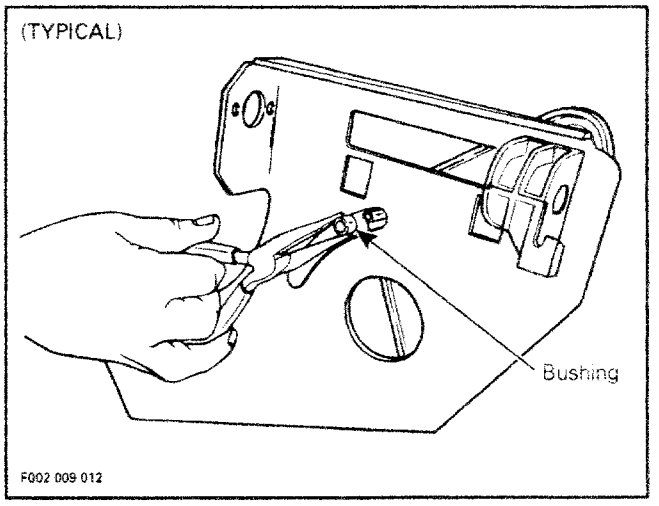
8,12, Triangular Lever and Sliding Block

Insert bushing in triangular lever and then install lever to reverse support. Install reverse cable to triangular lever with bushing , plastic washer(s) and flat washers.

Torque cable screw to 7 N•m (62 lbf•**in**).

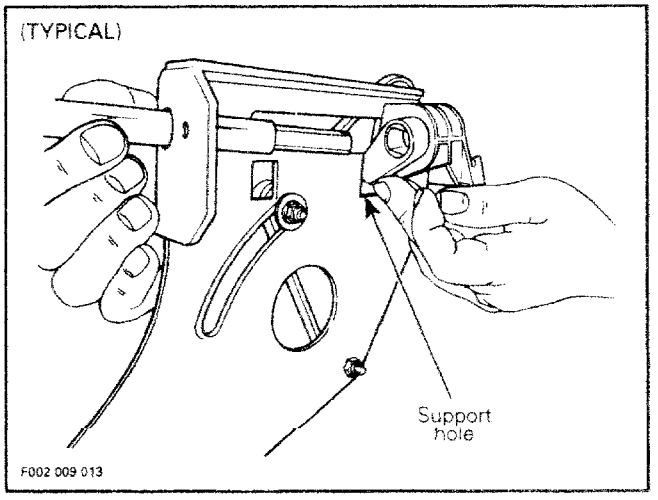
Torque triangular lever screw to 8 N•m (71 lbf•**in**).

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

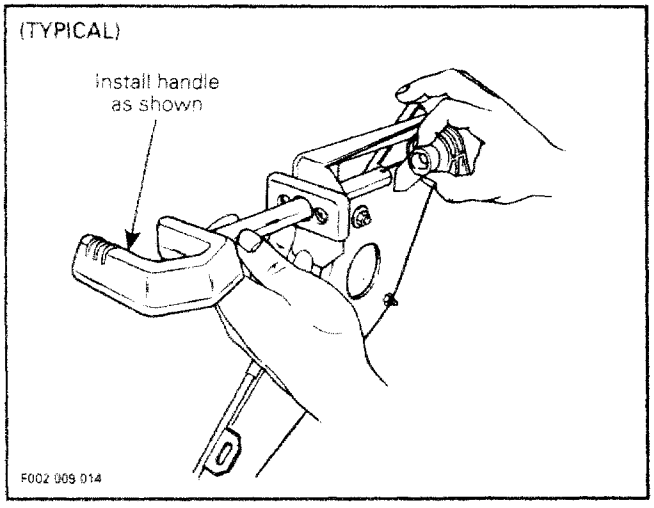


15,16,17, Locking Lever, Spring and Reverse Handle

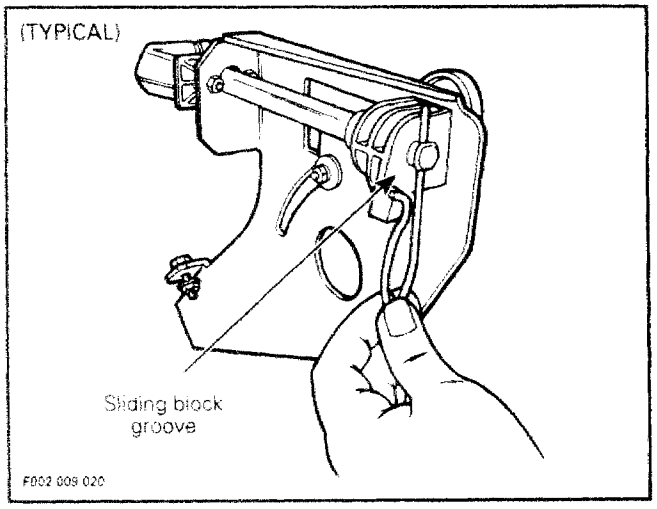
Insert locking lever end in support hole then align lever and sliding block holes.



NOTE : Always install reverse handle with its open end facing left side of watercraft, then push handle stem through lever and sliding block holes.

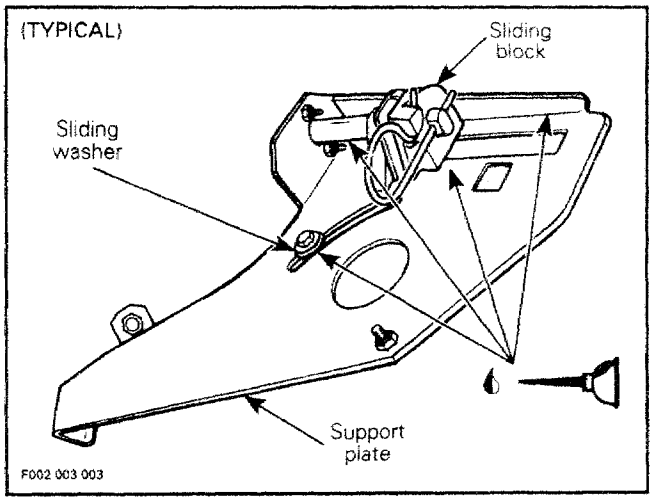


Insert spring in handle stem hole and then install curved end in sliding block groove.



Reverse Handle System Lubrication

Lubricate sliding block support sliding area and triangular lever with synthetic grease (P / N 293 550 013). Also lubricate sliding washer and reverse handle stem.

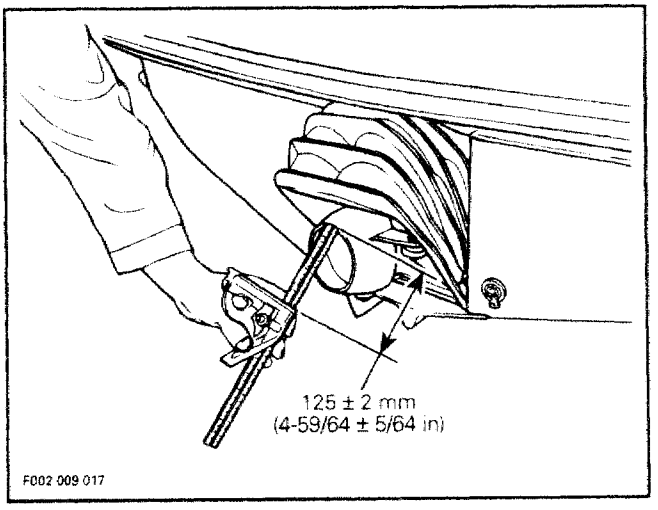


ADJUSTMENTS

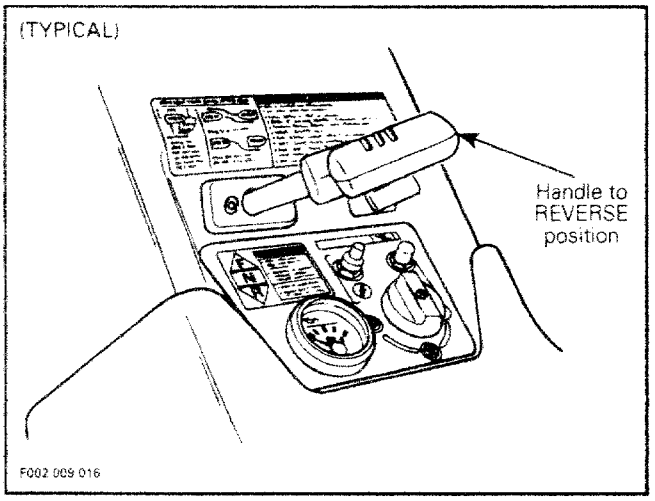
Reverse Gate

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

Using a square, set it to 125 ± 2 mm (4-59/64 ± 5/64 in), then position square end at the top middle of nozzle.

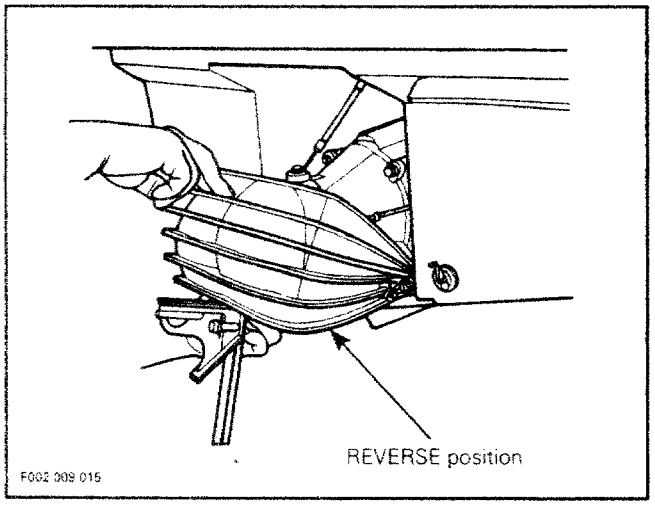


Pull reverse handle to REVERSE position.



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

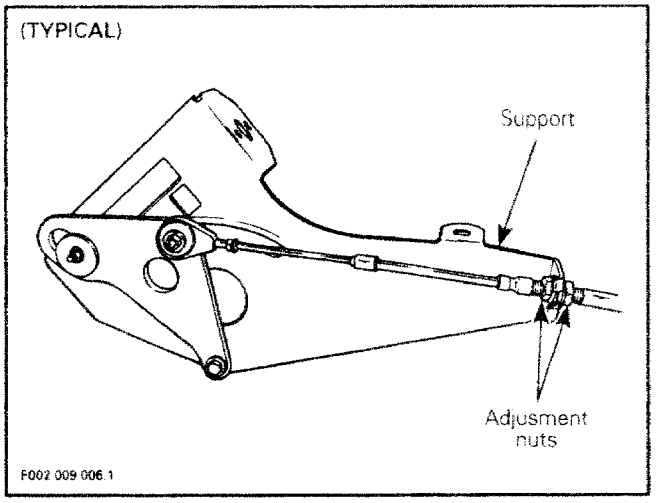
NOTE : Push slightly on the gate in order to recover spring tension and to obtain proper position of the gate.



If reverse gate needs to be readjusted, it can be done at support with adjustment nut(s). Turn cable nut(s) to obtain position.

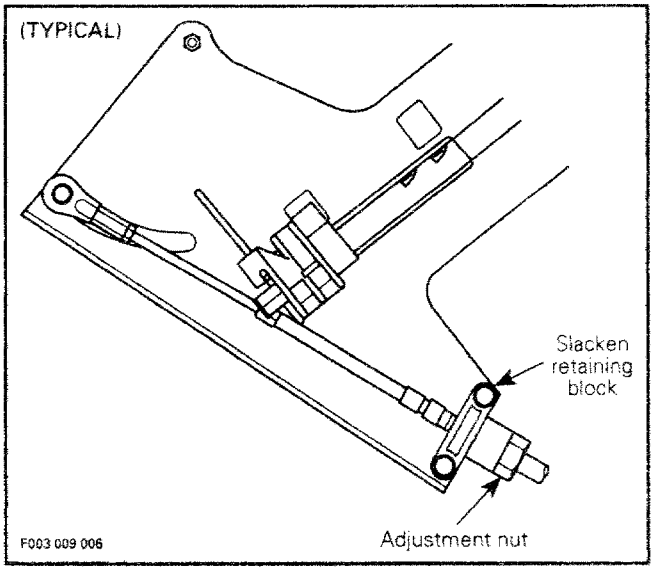
NOTE : If reverse gate adjustment is not done adequately, performance and steering control will be reduced at reverse position.

GTS / GTX Models



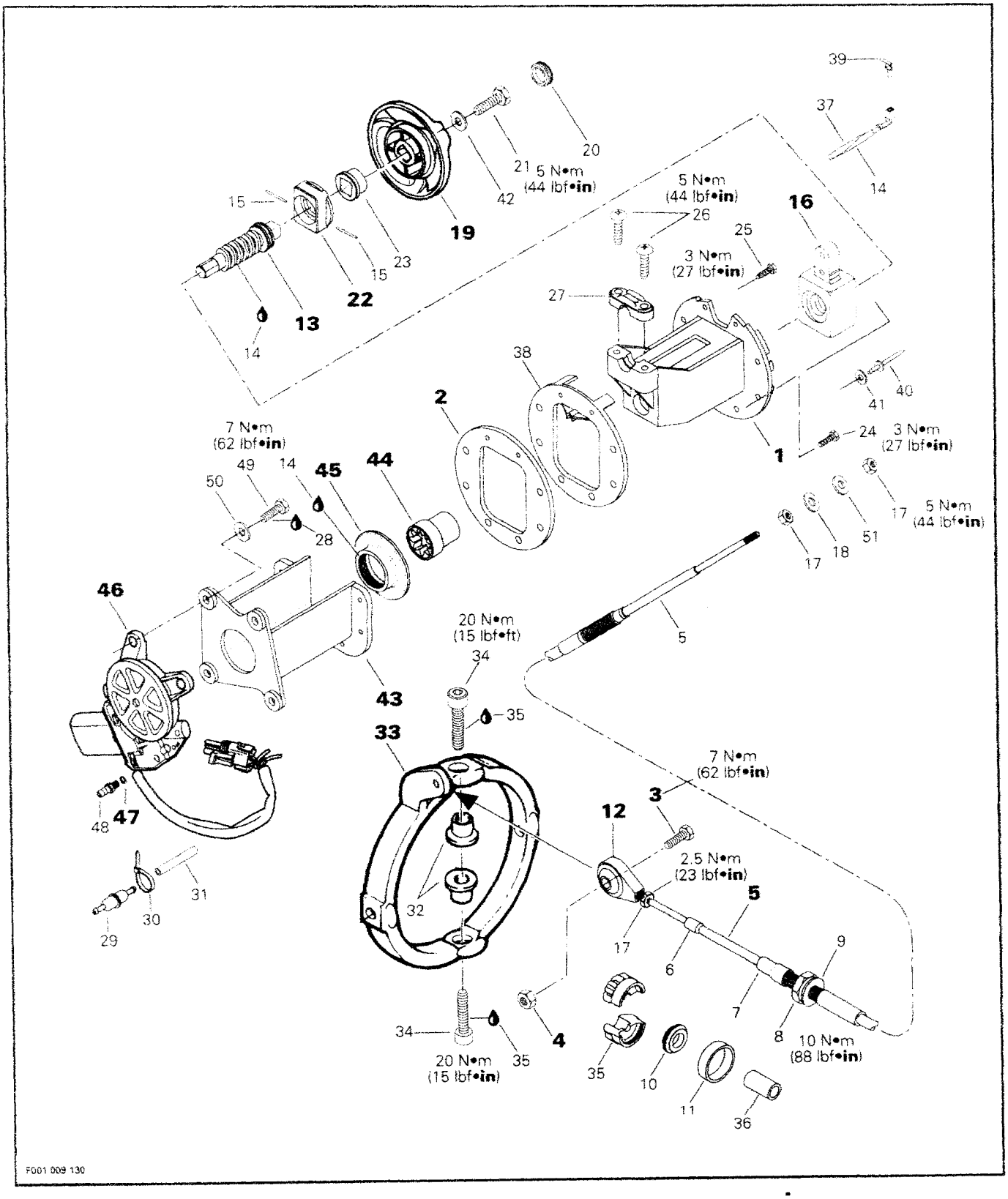
Tighten adjustment nuts and recheck gate position.

Explorer Model



Tighten retaining block to 6 N•m (53 lbf•**in**) and recheck gate position.

VARIABLE TRIM SYSTEM



COMPONENTS

1. *Housing*
2. *Gasket*
3. *Hexagonal bolt M6 x 30*
4. *Lock nut M6*
5. *Trim cable*
6. *Small boot*
7. *Large boot*
8. *Jam nut*
9. *Flat washer*
10. *Rubber washer*
11. *Ring retainer*
12. *Ball joint*
13. *Worm*
14. *Synthetic grease*
15. *Retaining pin*
16. *Sliding collar*
17. *Jam nut*
18. *Flat washer 5 mm*
19. *Trim cover*
20. *Snap cap*
21. *Hexagonal screw M6.3 x 35*
22. *Retaining block*
23. *Cover adapter*
24. *Tapping screw*
25. *Tapping screw*
26. *Phillips screw*
27. *Retaining plate*
28. *Loctite 242 (blue)*
29. *Water eliminator valve*
30. *Tie rap*
31. *Hose 6 mm*
32. *Plastic bushing*
33. *Trim ring*
34. *Allen screw M8 x 10*
35. *Half ring*
36. *Spacer*
37. *Twisted rod*
38. *Spacer*
39. *Position indicator*
40. *Rivet*
41. *Washer*
42. *Washer*
43. *Motor support*
44. *Motor adapter*
45. *Seal*
46. *Electric motor*
47. *Seal washer (not illustrated)*
48. *Fitting*
49. *Hexagonal screw M6 x 16*
50. *Lock washer 6 mm*
51. *Lock washer 5 mm*

GENERAL

It is not necessary to remove variable trim system (VTS) from watercraft for servicing. However, variable trim system removal is necessary to replace either worm, sliding collar, housing gasket and housing.

DISASSEMBLY

In order to obtain an easy access to either trim cable or electric motor, remove storage basket from watercraft.

Disconnect battery.

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

Electric Motor

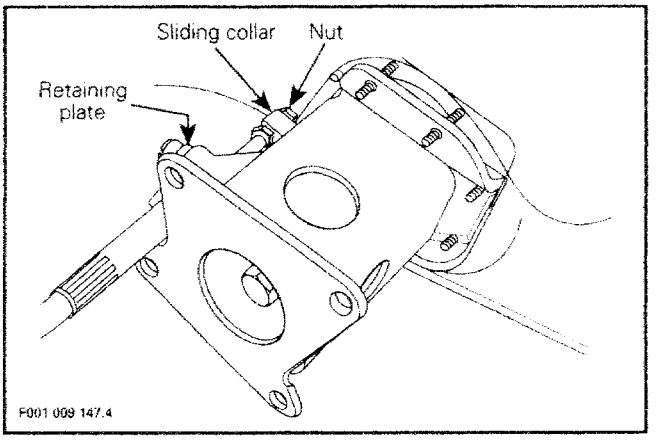
To replace motor, disconnect wiring harness and remove screws holding motor to motor support.

NOTE : At removal, the motor adapter and its seal might come off.

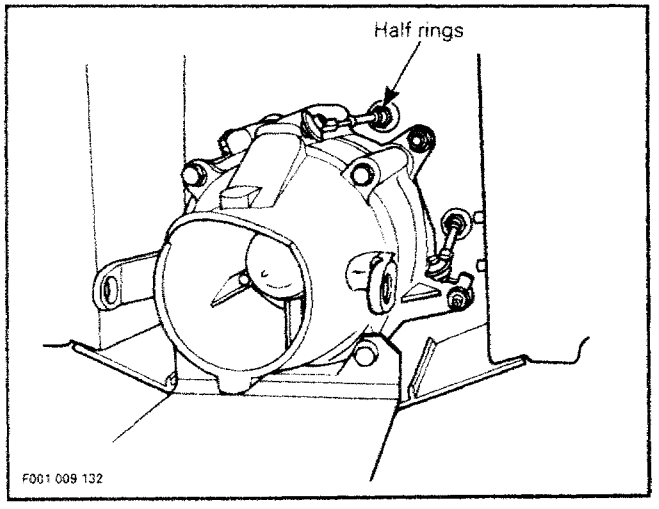
5, Trim Cable

To replace trim cable, remove nut from the end of cable at sliding collar. Untighten screws from retaining plate and slide off cable from housing.

NOTE : To ease cable removal and installation the motor should be removed.



Remove ball joint from trim ring then unscrew ball joint from cable. Remove half rings, ring retainer and grommet from cable at the outside of hull. Pull out cable from inside the hull.



1,2,19, Housing, Gasket and Trim Cover

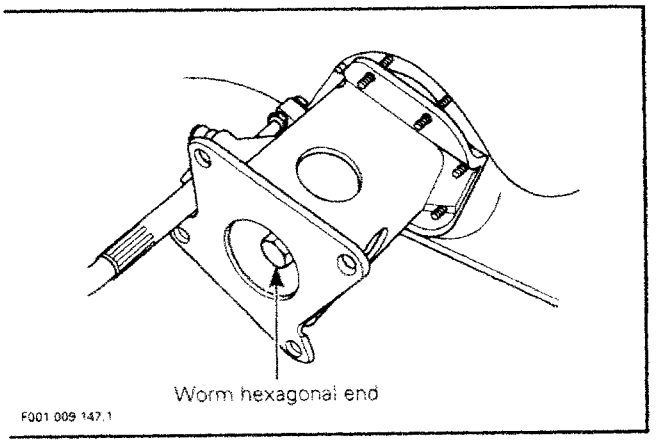
To remove housing, remove motor and withdraw trim cable from sliding collar and from housing.

Remove snap cap from trim cover center, remove screw then pull cover and remove cover adapter from worm.

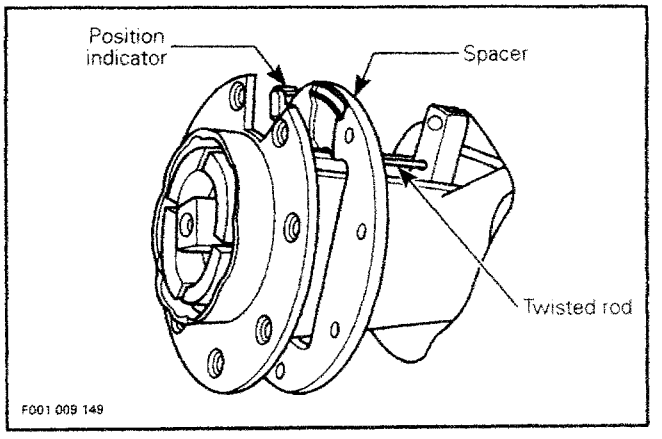
Drill rivets which hold housing to body, remove screws holding housing and motor support to body then pull out housing from body.

NOTE : To withdraw housing from body, the sliding collar must be moved towards motor end.

To move sliding collar, install a 13 mm (1/2 in) socket on worm hexagonal end.



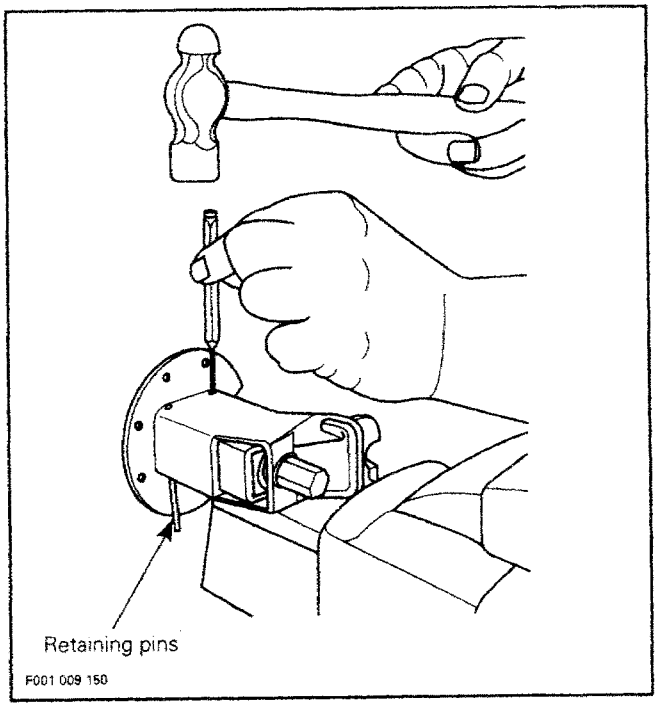
Remove position indicator from twisted rod end and slide off spacer from housing. Pull twisted rod from sliding collar.

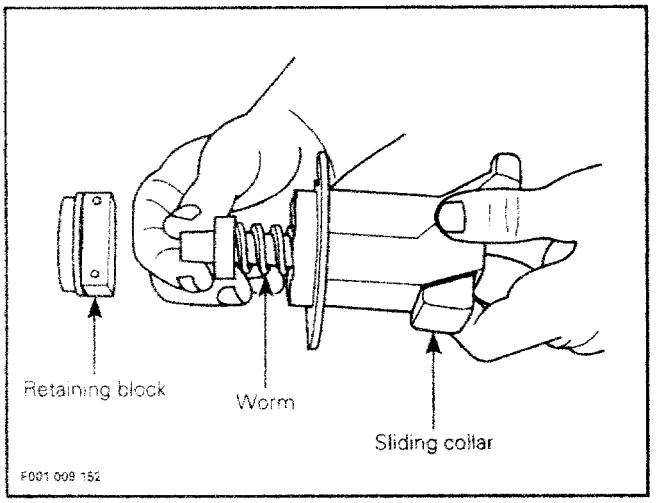


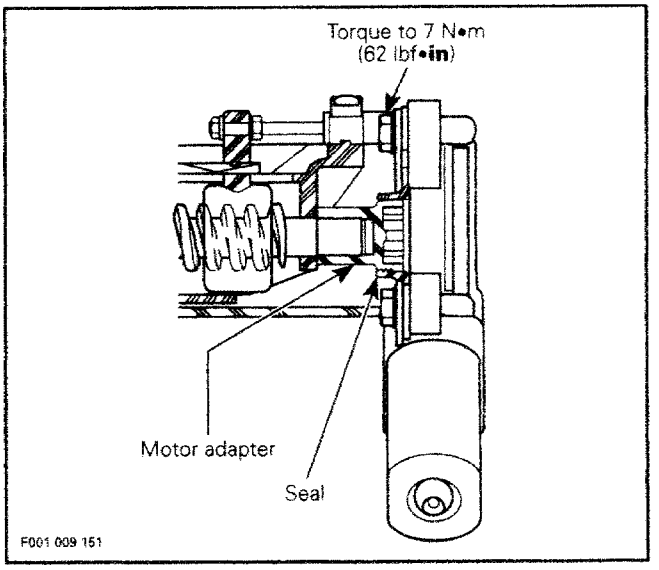
13,16, Retaining block, Worm and Sliding Collar

Remove retaining pins from retaining block and housing then remove retaining block.

Unscrew worm and remove sliding collar from housing.







ASSEMBLY

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

13,16, Worm and Sliding Collar

Whenever replacing either worm or sliding collar, always lubricate worm with synthetic grease (P / N 293 550 010).

1,43, Housing and Motor Support

At housing and motor support installation, position the long screws on motor support recess edge side. Torque all screws to 3 N•m (27 lbf•**in**).

44,45,46, Motor Adapter, Seal and Electric Motor

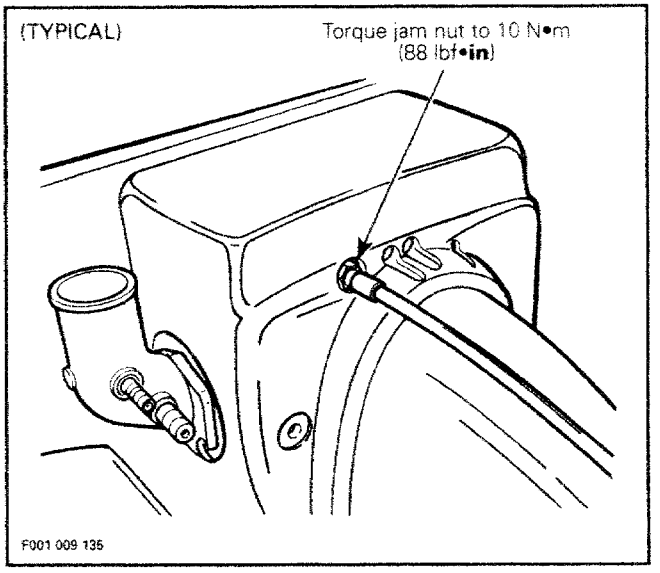
Install motor with the motor adapter, ensure to position seal on adapter to eliminate possible water intrusion in motor.

NOTE : Always lubricate adapter gear side and seal with synthetic grease (P / N 295 550 010).

Apply Loctite 242 (blue) on screw threads and install screws with lock washers and torque to 7 N•m (62 lbf•**in**).

5, Trim Cable

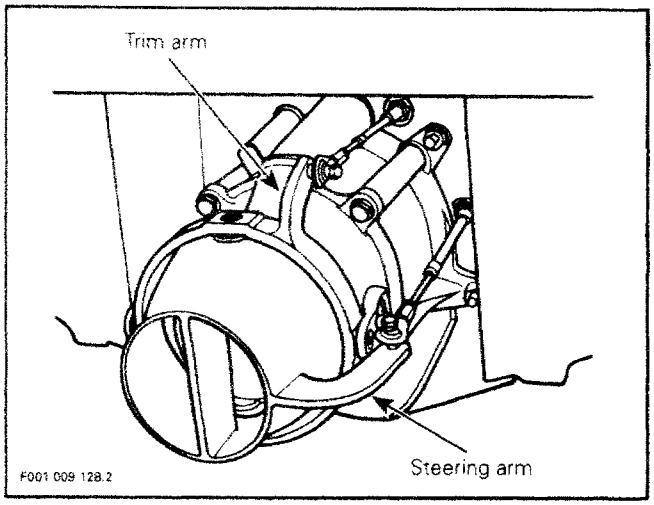
Install cable from inside the hull with flat washer and torque jam nut to 10 N•m (88 lbf•**in**).



ADJUSTMENTS

33, Trim Ring

Make sure jet pump nozzle steering arm is on right side and that trim arm is above venturi housing.

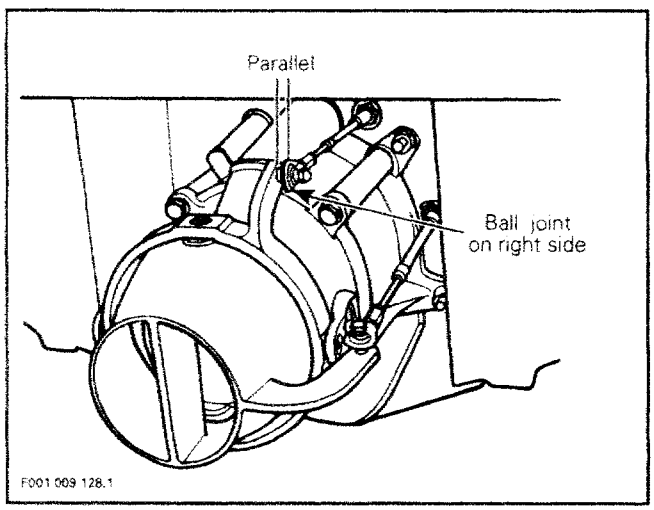


3,4,5,12, Bolt, Lock Nut, Trim Cable and Ball Joint

Install ball joint and thread it in completely.

Secure ball joint on right side of trim arm using bolt and lock nut. Make sure bolt is installed on right side of trim arm and that ball joint is parallel to trim arm.

Torque bolt to 7 N•m (62 lbf•**in**).

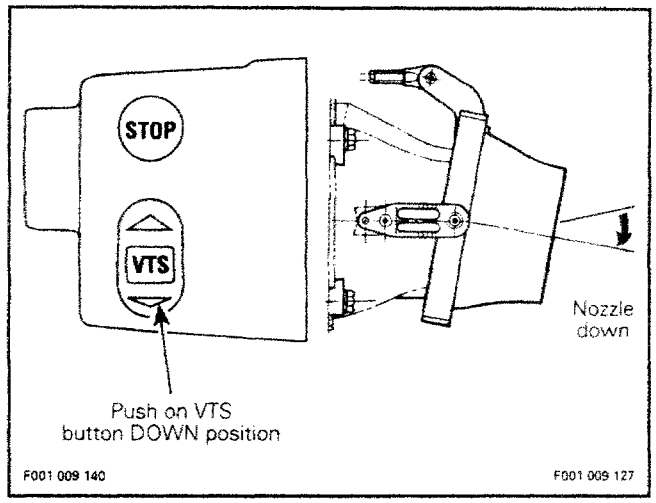


Torque ball joint jam nut to 2.5 N•m (23 lbf•**in**).

▼CAUTION : Ball joints must be installed face to face. Damage to cables could result if not done properly.

16, Sliding Collar

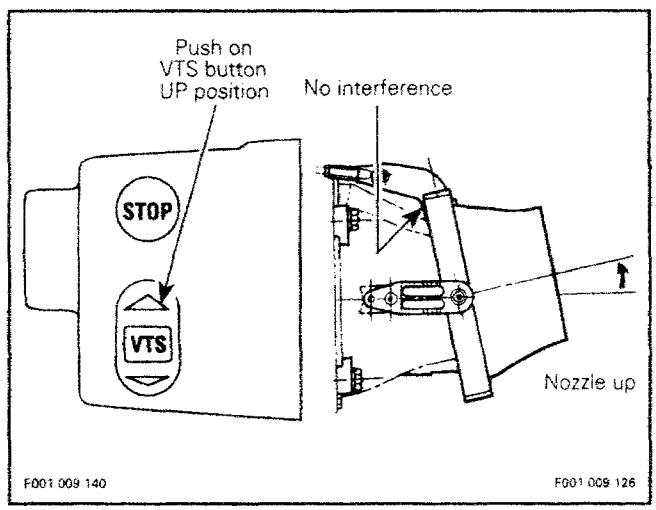
Push on VTS button down position, the sliding collar must move towards motor end until it stops. Make sure the nozzle is in down position.



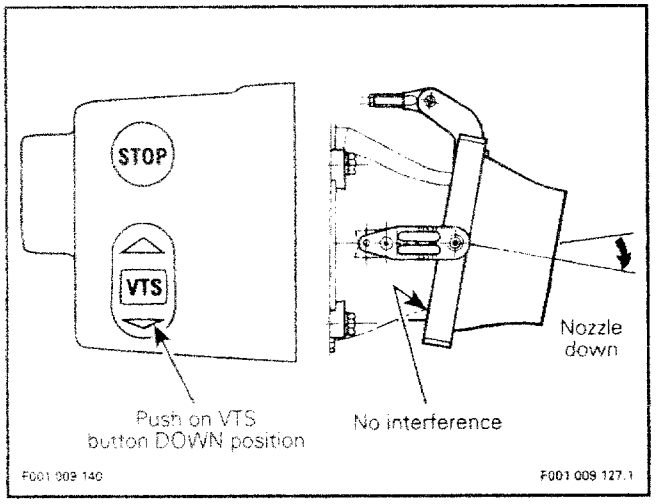
Install cable in sliding collar with washer and nut on each side. Torque nut to 5 N•m (44 lbf•**in**). Install retaining plate over cable housing.

NOTE : Push cable as far as possible in sliding collar without moving trim ring from its down position.

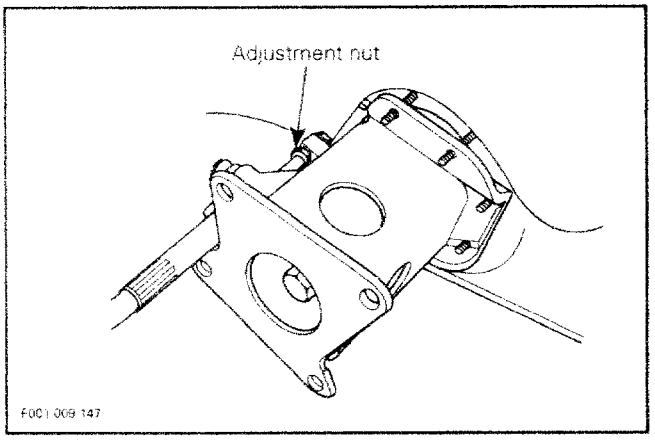
Push on VTS button up position until the sliding collar stops. The nozzle should be up (10°) without interfering with venturi housing.



Push on VTS button down position until sliding collar stops. The nozzle must be down (10°) and it must not interfere with venturi housing.

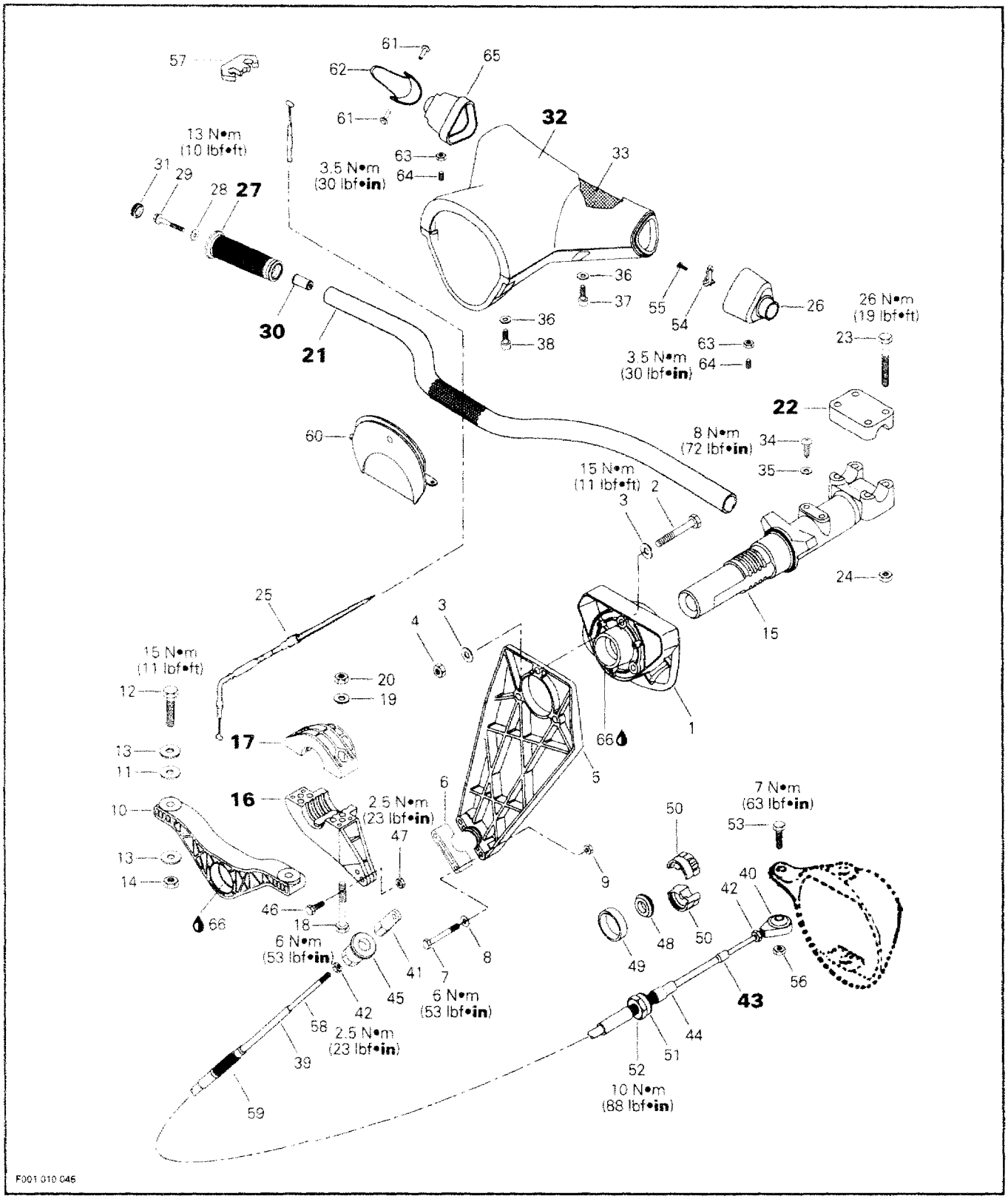


If trim ring needs to be readjusted, it can be done at sliding collar with adjustment nut.



▼CAUTION : Trim ring and / or nozzle must not interfer at any position. Damage to cables and / or venturi housing will occur if adjustments are not done adequately.

SP / XP SERIES



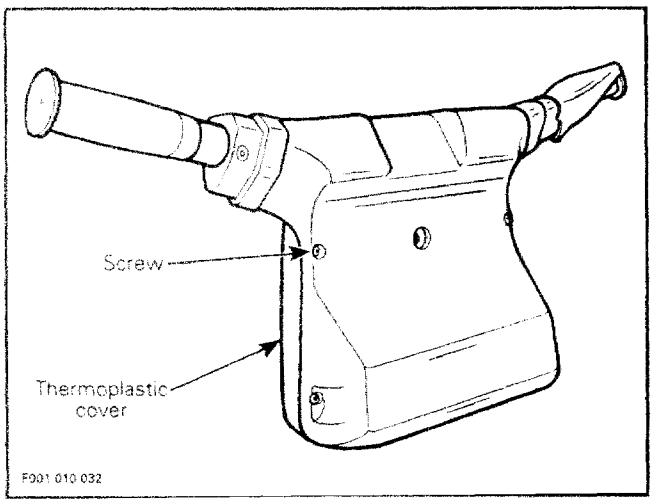
COMPONENTS

1. *Rear support*
2. *Hexagonal screw M8 x 65*
3. *Flat washer 8 mm*
4. *Lock nut M8*
5. *Steering cable bracket*
6. *Retaining plate*
7. *Hexagonal screw M6 x 50*
8. *Flat washer 6 mm*
9. *Lock nut M6*
10. *Front support*
11. *Plastic washer*
12. *Hexagonal screw M8 x 40*
13. *Flat washer 8 mm*
14. *Lock nut M8*
15. *Steering stem*
16. *Steering stem arm*
17. *Steering stem arm support*
18. *Allen screw M6 x 25*
19. *Flat washer 6 mm*
20. *Lock nut M6*
21. *Handlebar*
22. *Steering clamp*
23. *Hexagonal screw M8 x 50*
24. *Lock nut M8*
25. *Throttle cable*
26. *Left housing*
27. *Grip*
28. *Flat washer 6 mm*
29. *Hexagonal screw M6 3 x 2 2 x 45*
30. *Grip insert*
31. *Cap*
32. *Cover*
33. *Top foam*
34. *Taptite hexagonal screw 1/4-20*
35. *Flat washer 6 mm*
36. *Flat washer 5 mm*
37. *Allen screw*
38. *Allen screw*
39. *Steering cable*
40. *Ball joint*
41. *Joint*
42. *Nut 10-32*
43. *Small boot*
44. *Large boot*
45. *Adjustment nut*
46. *Hexagonal screw M6 x 25*
47. *Lock nut M6*
48. *Rubber washer*
49. *Retaining ring*
50. *Half ring*
51. *Flat washer*
52. *Jam nut 1/2-20*
53. *Hexagonal screw M6 x 30*
54. *Retaining plate*
55. *Tapping screw*
56. *Nut M6*
57. *Lock tab*
58. *Small boot*
59. *Large boot*
60. *Plate*
61. *Pin*
62. *Throttle lever*
63. *Lock nut M6*
64. *Set screw M6 x 12*
65. *Right housing*
66. *Synthetic grease*

REMOVAL AND ASSEMBLY

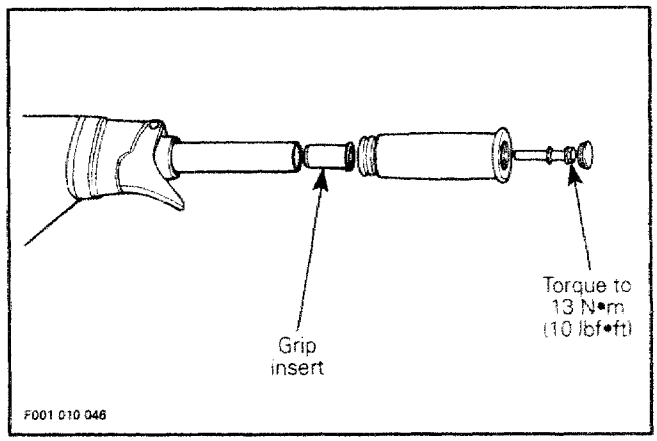
32, Cover

To replace the cover, just remove and reinstall four screws and washers.



27,30, Grip and Grip Insert

To remove grip, just pull out cap from grip end and remove screw. To verify grip insert for damage, remove it from handlebar.



Install flat washer and screw, torque screw to 13 N•m (10 lbf•ft).

▼ CAUTION : Ensure to install flat washer because screw will damage grip end.

16,17,21, Steering Stem Arm, Steering Stem Arm Support and Handlebar

To remove handlebar assembly :

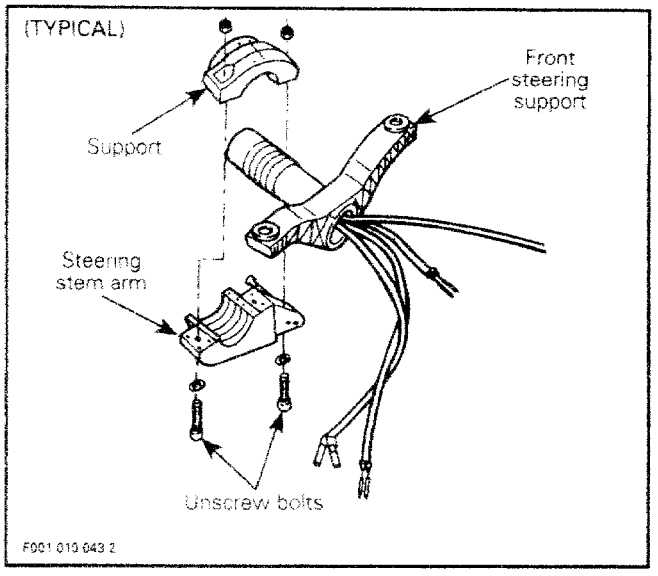
Disconnect wiring harnesses leading out of steering stem.

Disconnect throttle cable at carburetor.

Open tie-block on right side of bilge and remove throttle cable.

Cut tie raps retaining throttle cable alongside bilge.

Unscrew bolts retaining support to steering stem arm.



Remove support and steering stem arm from steering stem.

NOTE : It is not necessary to remove steering cable from steering stem arm.

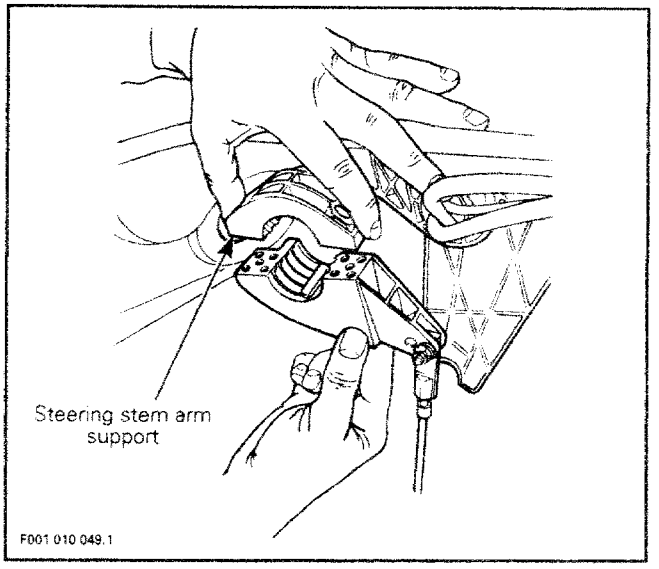
Pull out handlebar assembly.

CAUTION : While performing this procedure, take precautions to avoid damaging throttle cable and wiring harnesses.

To install handlebar assembly :

For handlebar assembly installation, first install support onto steering stem arm.

NOTE : Engage only a few threads of the bolts.

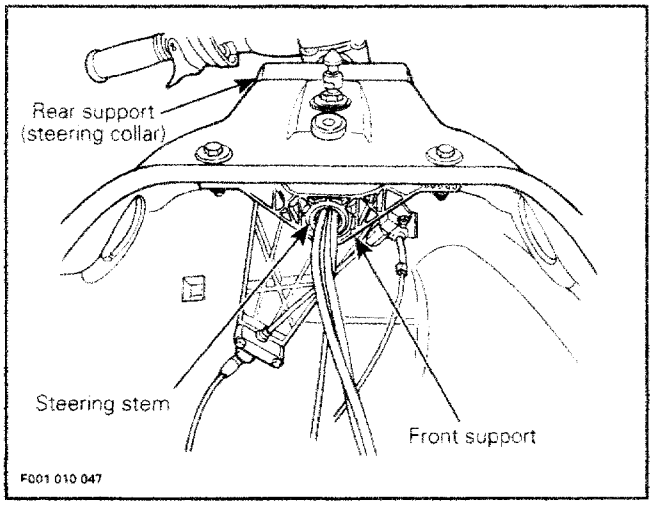


Apply synthetic grease into front and rear steering supports.

Install handlebar assembly into rear support, taking care at the same time to insert throttle cable and wiring harnesses.

From bilge, route throttle cable and wiring harnesses into steering stem arm and front steering support. Push handlebar assembly until steering stem is well seated into steering supports.

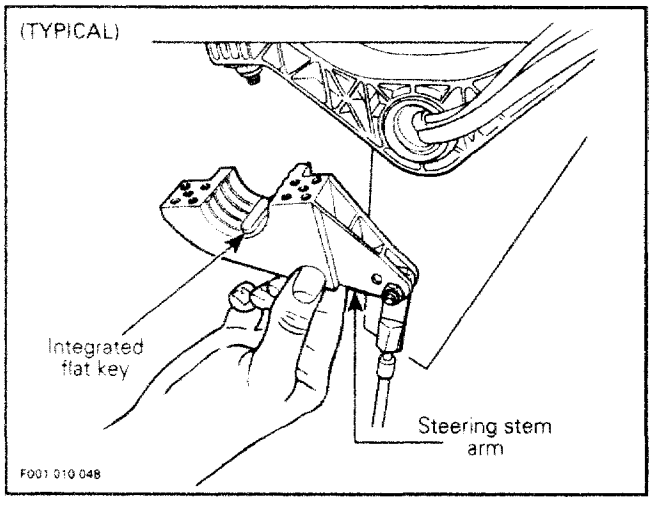
CAUTION : While performing this procedure, take precautions to avoid damaging throttle cable and wiring harnesses.



Install properly steering stem arm onto steering stem.

Torque bolts to 6 N•m (53 lbf•**in**).

WARNING : Always ensure to insert steering stem arm integrated flat key into steering stem groove.



Connect wiring harnesses.

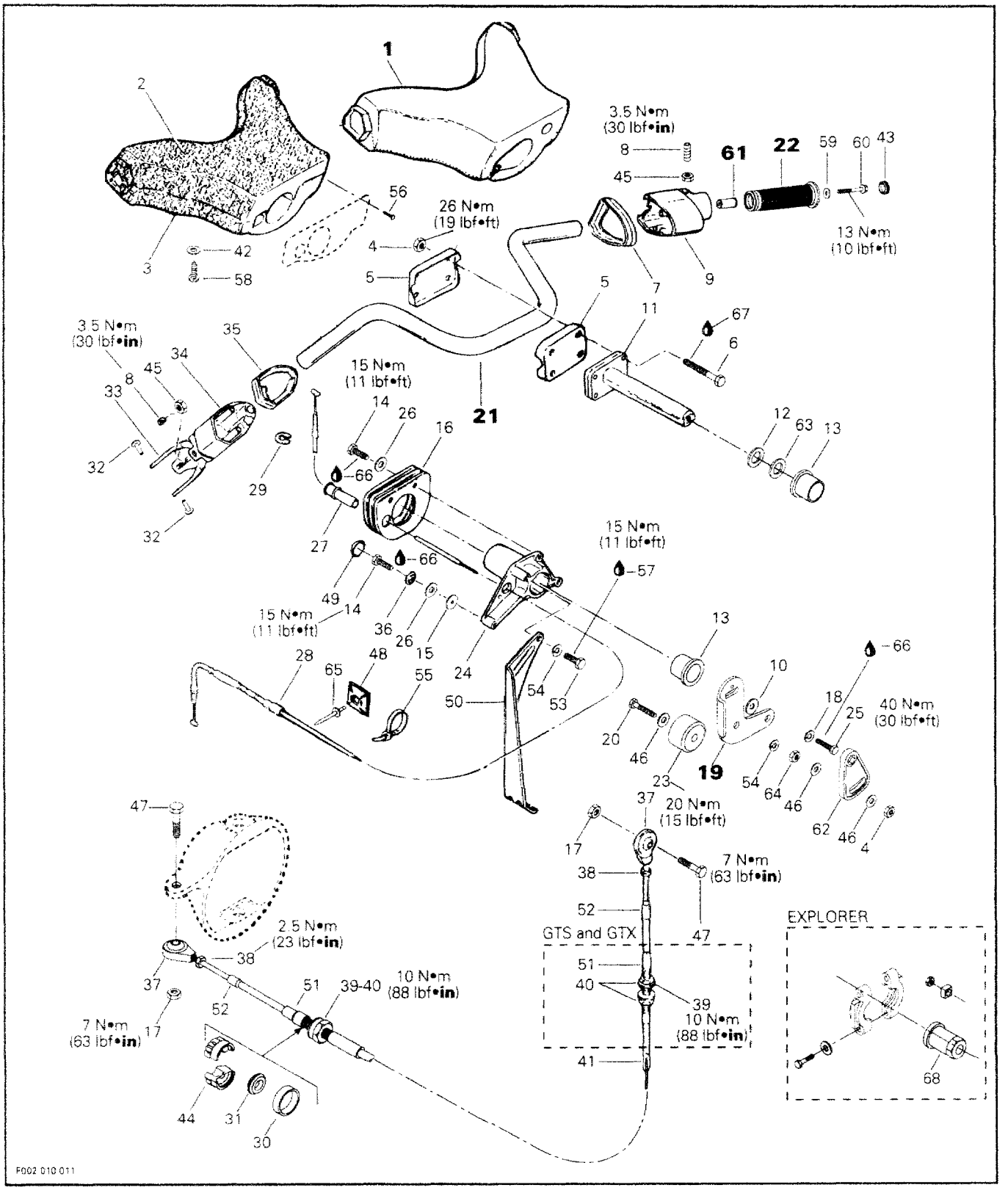
Route throttle cable alongside bilge. Insert cable barrel into carburetor throttle lever.

Secure fuel hose, choke cable and throttle cable in tie-mount in front of bilge on right side using a tie rap.

Insert throttle cable in tie-block.

For throttle cable adjustment, refer to FUEL SYSTEM 05-03 then refer to **adjustments**.

GTS, GTX AND EXPLORER MODELS



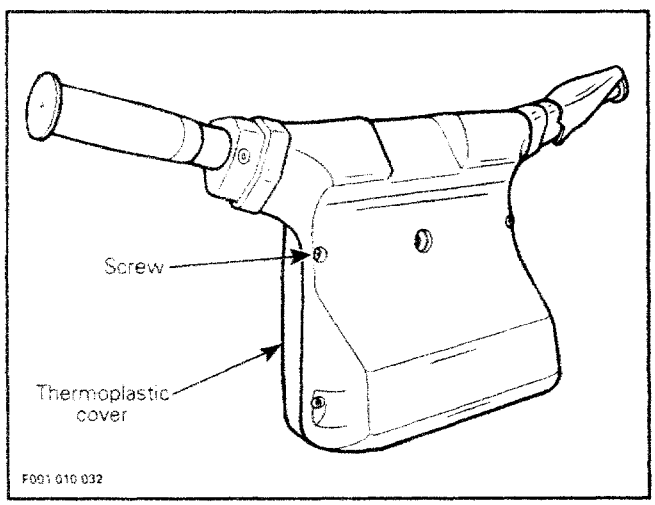
COMPONENTS

1. *Cover*
2. *Foam (top)*
3. *Foam (bottom)*
4. *Lock nut M8*
5. *Steering clamp*
6. *Hexagonal screw M8 x 55*
7. *Adapter*
8. *Set screw*
9. *Left handle housing*
10. *Large flat washer*
11. *Steering Stem*
12. *Spring washer*
13. *Bushing*
14. *Hexagonal screw M8 x 25*
15. *Plastic washer*
16. *Collar*
17. *Lock nut M6*
18. *Lock washer 8 mm*
19. *Steering stem arm*
20. *Hexagonal screw M8 x 45*
21. *Handlebar*
22. *Grip*
23. *Stopper bushing*
24. *Steering support*
25. *Hexagonal screw M8 x 25*
26. *Flat washer 8 mm*
27. *Grommet*
28. *Throttle cable*
29. *Circlip*
30. *Retaining ring*
31. *Rubber Washer*
32. *Pin*
33. *Throttle handle*
34. *Throttle handle housing*
35. *Adapter*
36. *Retaining washer*
37. *Ball joint*
38. *Nut 10-32*
39. *Jam nut 1/2-20*
40. *Flat washer*
41. *Steering cable*
42. *Flat washer*
43. *Cap*
44. *Half ring*
45. *Nut M6*
46. *Flat washer 8 mm*
47. *Hexagonal screw M6 x 30*
48. *Tie-mount*
49. *Snap cap*
50. *Cable support*
51. *Large boot*
52. *Small boot*
53. *Hexagonal screw M8 x 16*
54. *Lock washer 8 mm*
55. *Tie rap*
56. *Self tapping screw*
57. *Loctite 242 (blue)*
58. *Phillips screw*
59. *Flat washer 6 mm*
60. *Screw M6.3 x 45*
61. *Grip insert*
62. *Locking plate*
63. *Washer (shim)*
64. *Nut*
65. *Rivet*
66. *Loctite 271 (red)*
67. *Antiseize lubricant*
68. *Adjustment nut*

REMOVAL AND ASSEMBLY

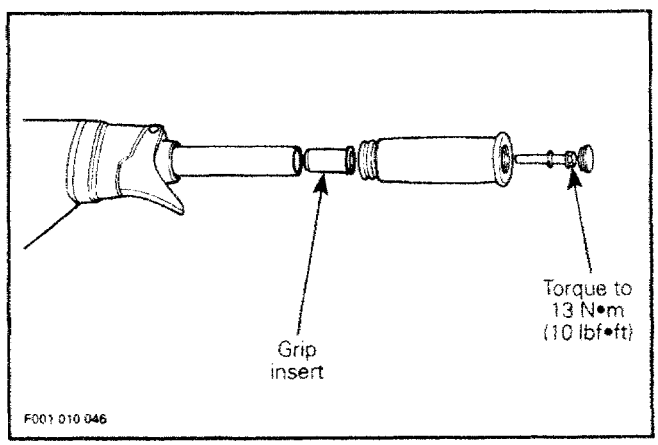
1, Cover

To replace the cover, just remove and reinstall 4 screws and washers.



22,61, Grip and Grip Insert

To remove grip, just pull out cap from grip end and remove screw. To verify grip insert for damage, remove it from handlebar.



19,21, Steering Stem Arm and Handlebar

To remove handlebar assembly :

Disconnect wiring harnesses leading out of dashboard hole.

Disconnect throttle cable at carburetor.

Open tie-block on right side of bilge and remove throttle cable.

Cut tie rap retaining throttle cable alongside bilge.

Unscrew nut retaining locking plate, then remove locking plate and washers.

Unscrew screw of steering stem arm.

Pull out handlebar assembly.

To install handlebar assembly :

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

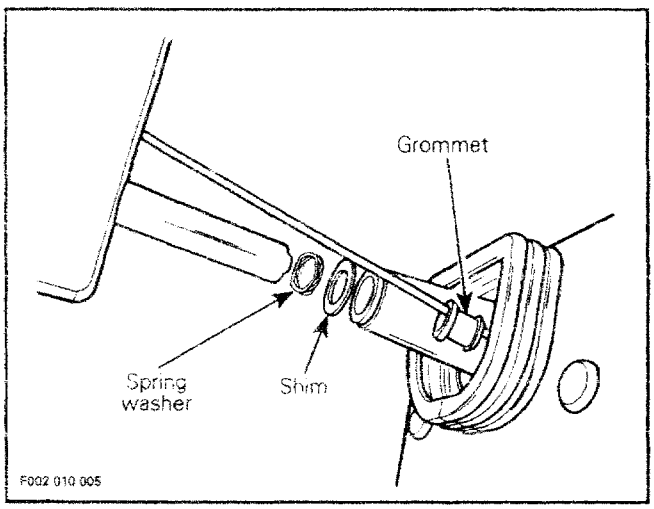
Insert grommet in dashboard hole and pull it from inside bilge.

NOTE : To ease installation, apply water on grommet.

Insert wires of engine overheating beeper / engine stop switch through grommet.

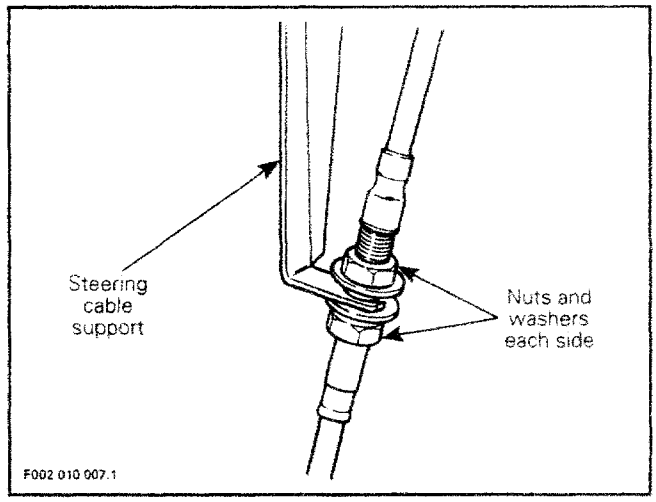
Insert spring washer and the shim onto steering stem.

Insert handlebar ass'y into steering stem support.



GTS / GTX Models

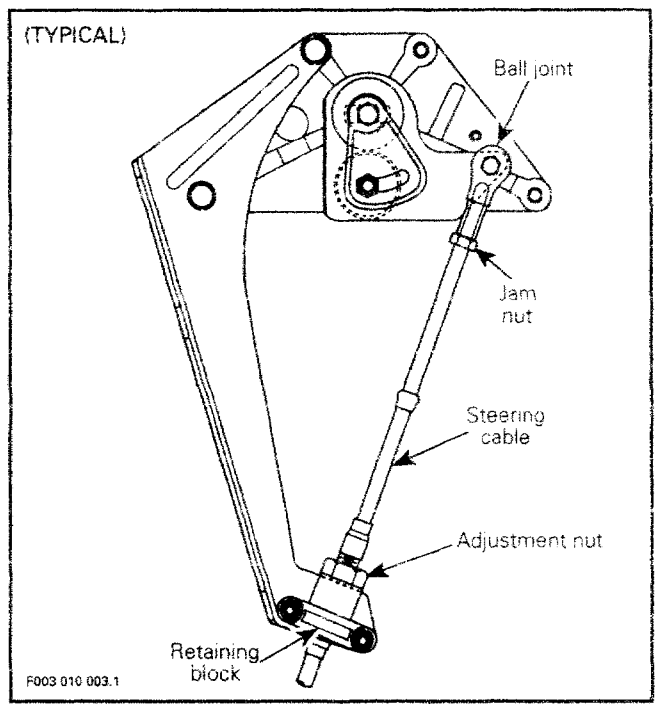
Install steering cable in its support with 1 washer and 1 nut each side of bracket.



Ensure to interlock nuts prior to torque to 10 N•m (88 lbf•in) using a crowfoot wrench such as Snap-on FRH220S.

Explorer Model

Insert steering cable in retaining block. Screw cable adjustment nut to engage cable properly.



Screw jam nut on cable end.

Screw ball joint to cable end.

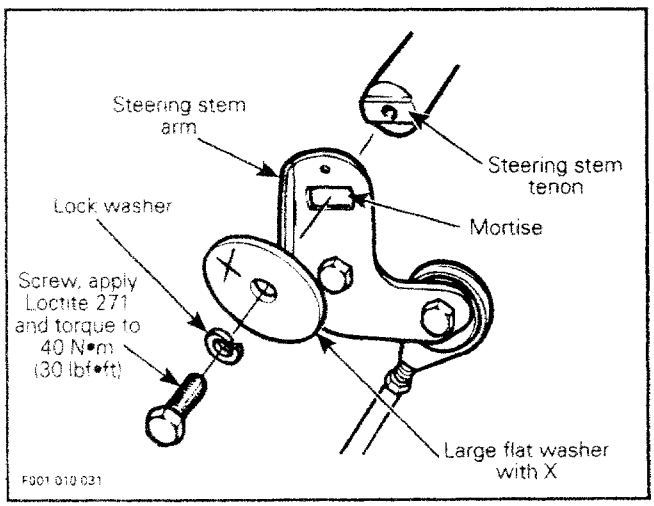
Tighten jam nut to 2 5 N•m (23 lbf•in).

All Models

Properly position steering stem arm on steering stem. Make sure to insert stem tenon into arm mortise. Apply Loctite 271 (red) on screw threads, install large flat washer, lock washer and screw. Torque to 40 N•m (30 lbf•ft).

▼ CAUTION : Always install large flat washer with the X stamped side facing the lock washer.

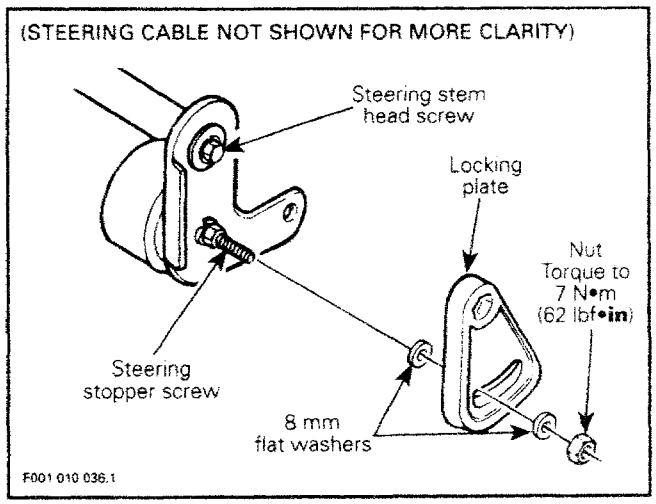
◆ WARNING : The recommended torque and Loctite must be applied on screw. Steering arm mortise must seat properly on steering stem tenon.

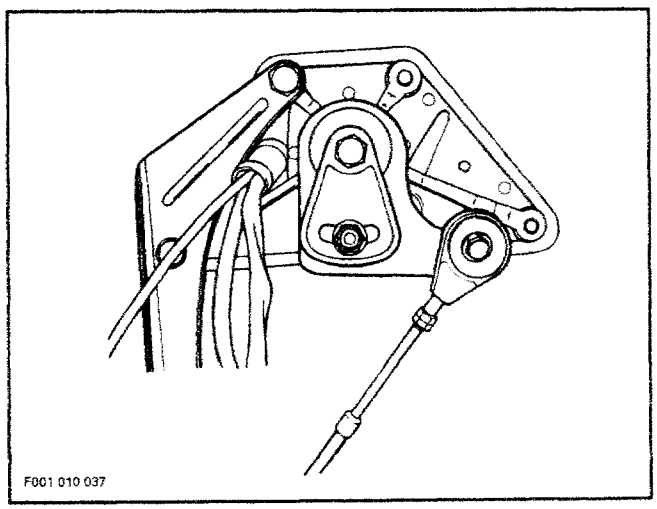


Position 8 mm flat washer on steering stopper screw then install locking plate over steering stem head screw.

○ NOTE : Ensure locking plate slot is inserted in steering stopper screw.

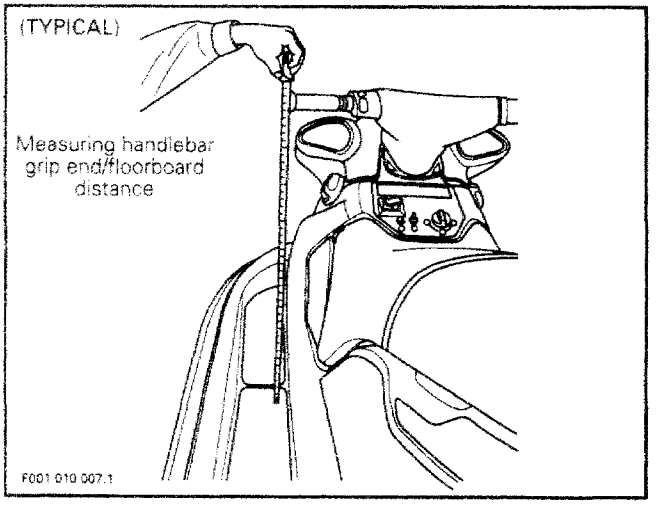
Install 8 mm flat washer and secure locking plate using a jam nut. Torque to 7 N•m (62 lbf•**in**).



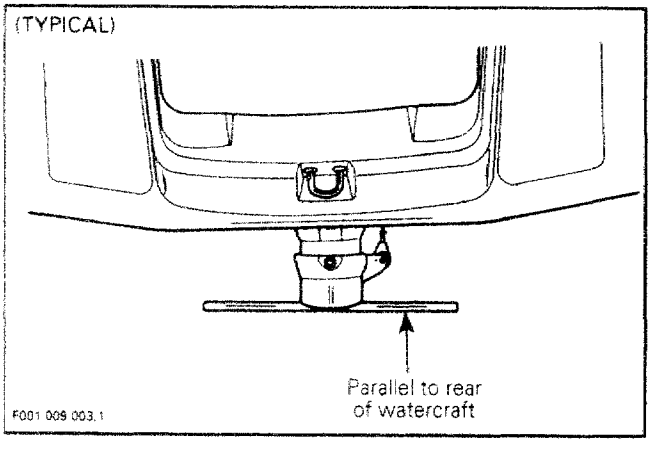


ALIGNMENT

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



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



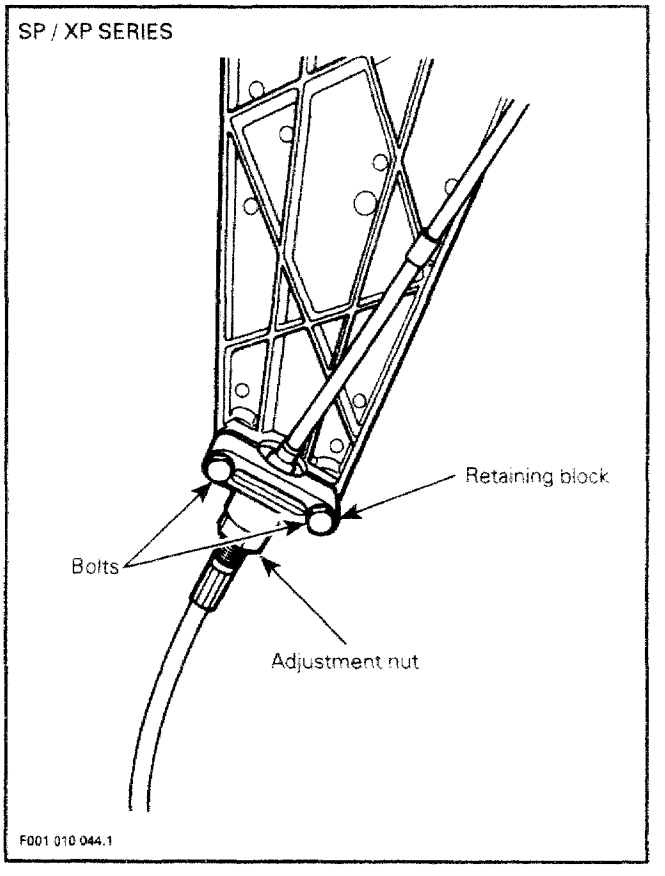
▼ CAUTION : Verify when the handlebar is turned completely to the left and right side that there is no interference with venturi housing.

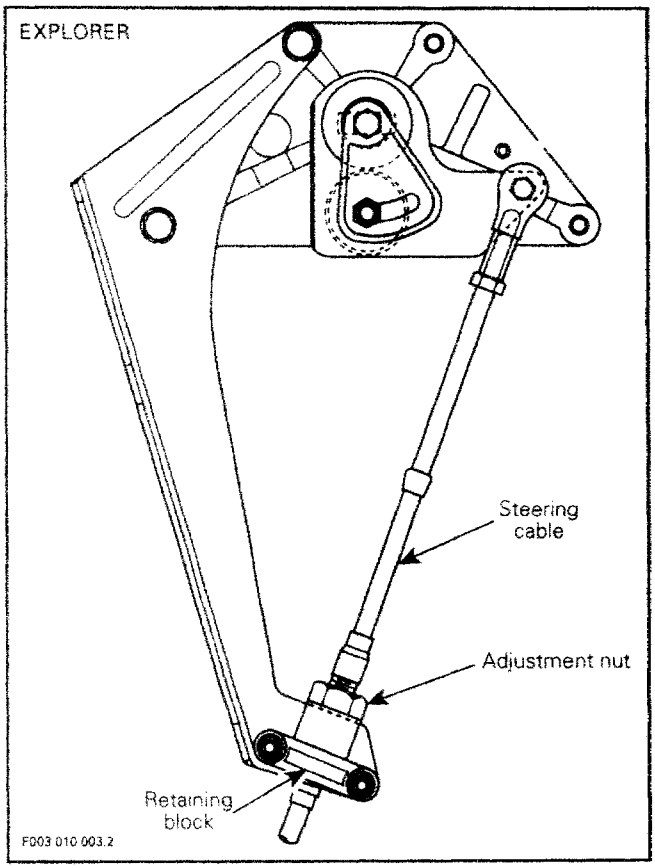
SP / XP Series and Explorer Model

If necessary, steering alignment should be performed at steering cable support.

Slacken retaining block at cable support.

Turn adjustment nut as required

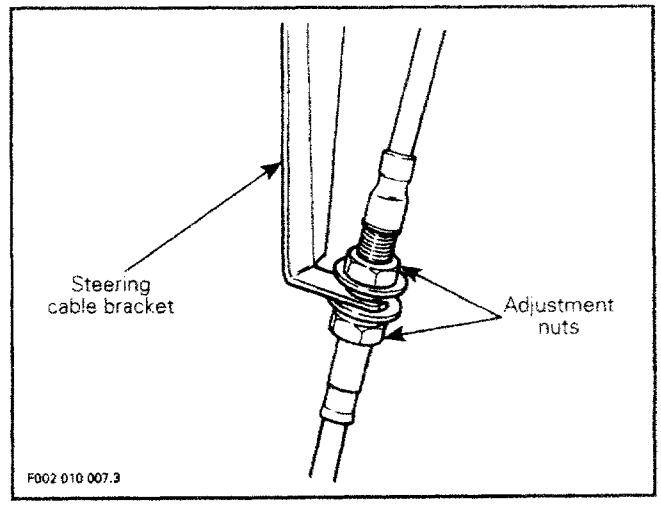




After adjustment, torque retaining block bolts to 6 N•m (53 lbf•**in**)

GTS / GTX Models

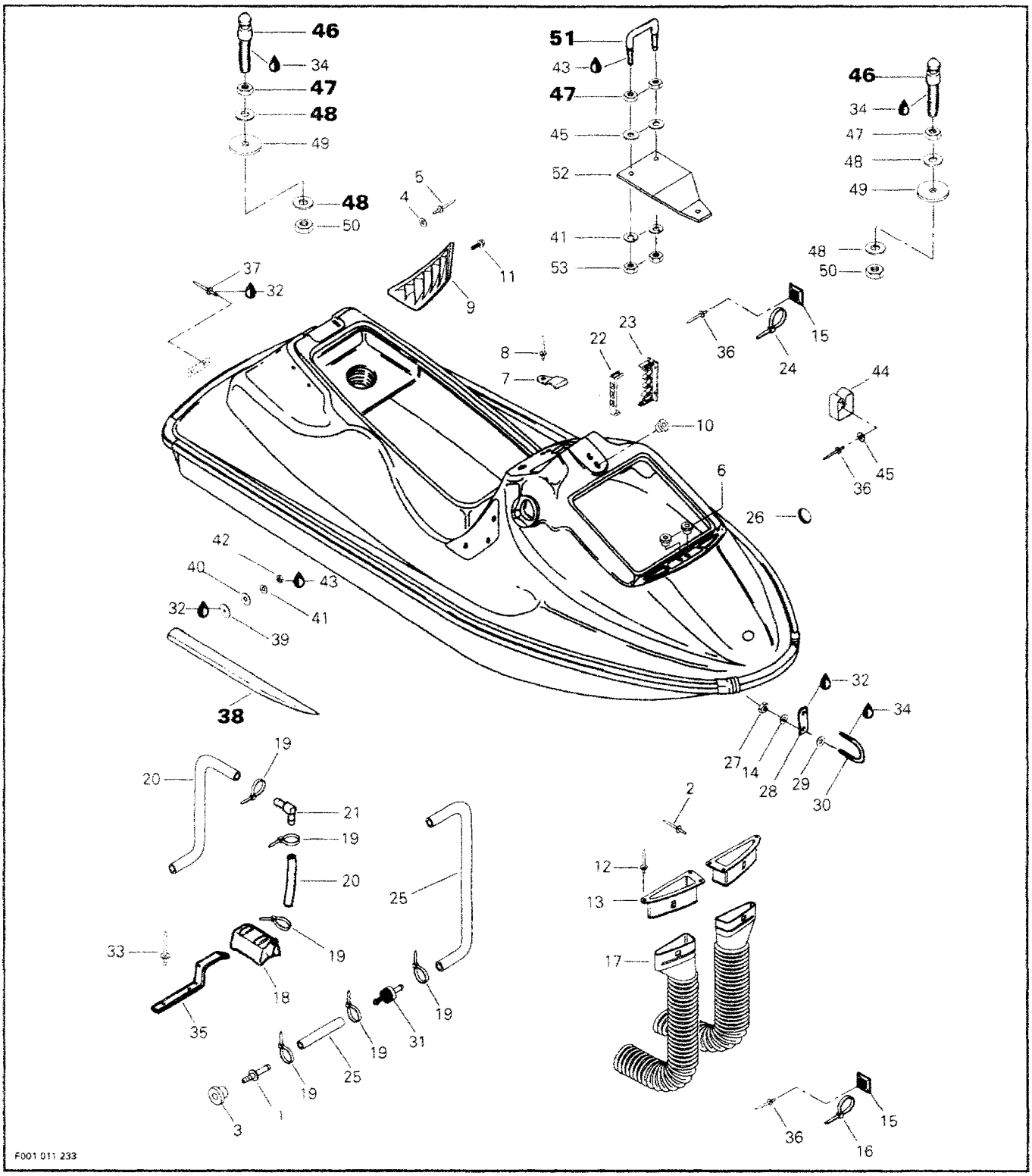
Steering alignment, if necessary, should be performed on outer cable adjustment nuts on steering cable bracket.

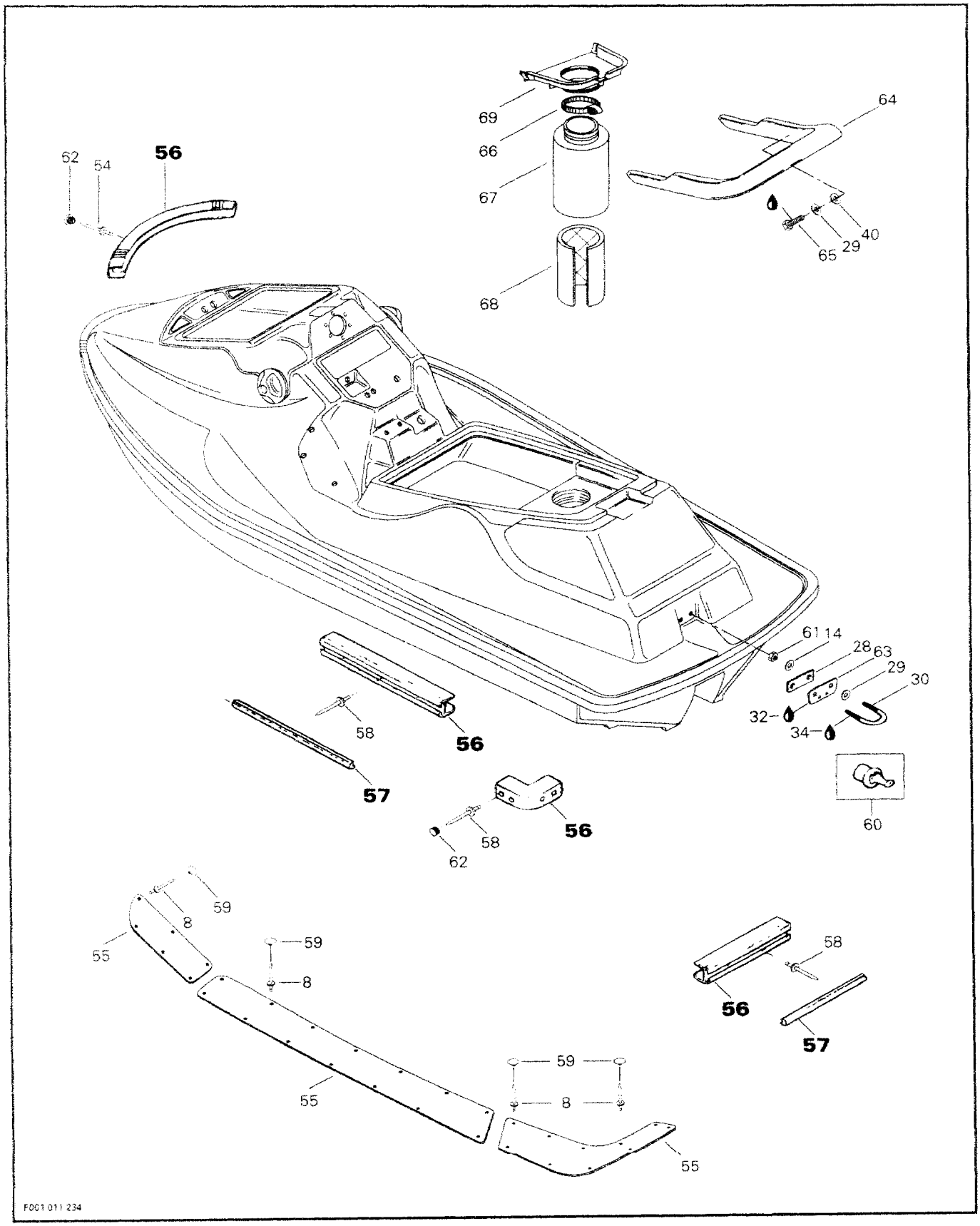


After adjustment torque nuts to 10 N•m (88 lbf•**in**).

COMPONENTS

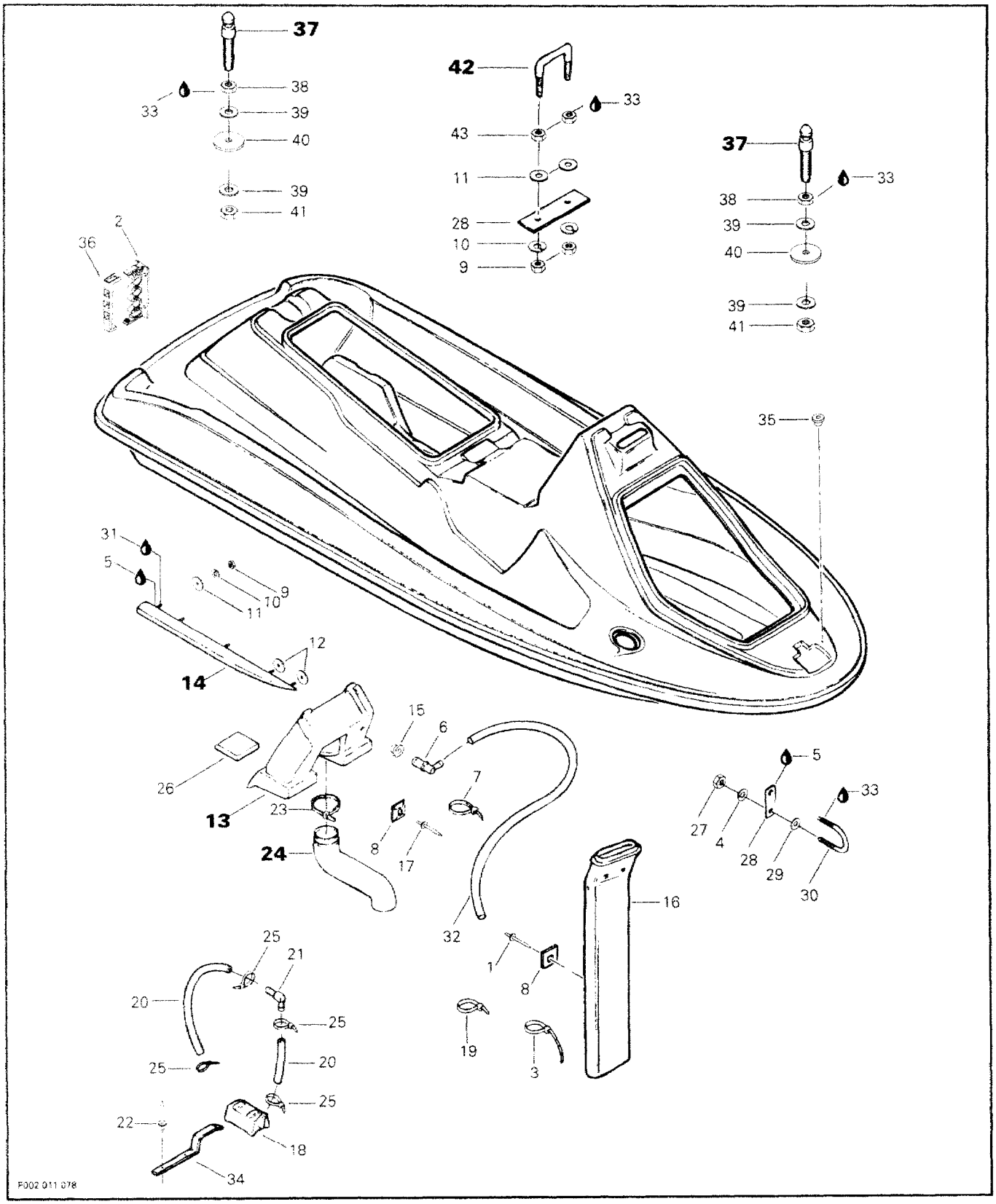
SP / XP SERIES

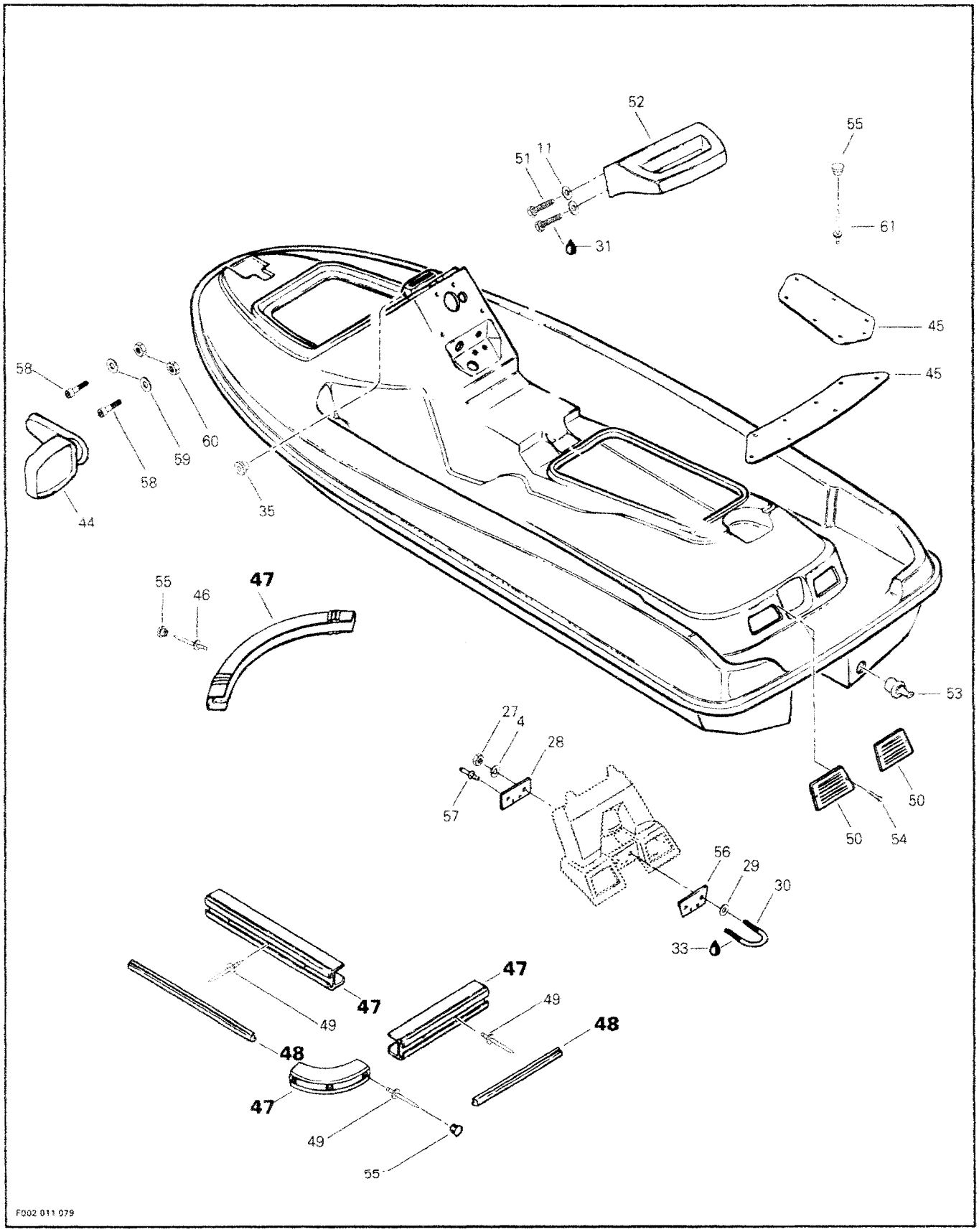




1. *Straight fitting*
2. *Rivet 5/32*
3. *Grommet*
4. *Flat washer 4 mm*
5. *Rivet 1/8*
6. *Grommet*
7. *Clip*
8. *Rivet 1/8*
9. *Grill*
10. *Rubber washer*
11. *Screw*
12. *Rivet 1/8*
13. *Vent adapter*
14. *Lock washer 8 mm*
15. *Tie-mount*
16. *Tie rap*
17. *Vent tube*
18. *Bailer pick-up*
19. *Tie rap*
20. *Hose 8 mm*
21. *Elbow fitting 90°*
22. *Tie-block clip*
23. *Tie-block*
24. *Tie rap*
25. *Hose 6 mm*
26. *Bombardier logo*
27. *Lock nut M8*
28. *Retaining plate*
29. *Flat washer 8 mm*
30. *Eyelet*
31. *Check valve*
32. *Sealant 732*
33. *Rivet 3/16*
34. *Loctite 271 (red)*
35. *Spring clip*
36. *Rivet 1/8*
37. *Rivet 1/8*
38. *Sponson*
39. *Gasket*
40. *Flat washer 6 mm*
41. *Lock washer 6 mm*
42. *Lock nut M6*
43. *Loctite 242 (blue)*
44. *Tie-mount*
45. *Flat washer 6 mm*
46. *Lock pin*
47. *Nut M10*
48. *Flat washer 10 mm*
49. *Rubber washer*
50. *Lock nut M10*
51. *Hook*
52. *Support*
53. *Nut M6*
54. *Rivet*
55. *Carpet*
56. *Bumper*
57. *Trim*
58. *Rivet 3/16*
59. *Cap*
60. *Drain plug*
61. *Lock nut M8*
62. *Plug*
63. *Finition plate*
64. *Grab handle*
65. *Hexagonal screw M8 x 14*
66. *Gear clamp*
67. *Vent tube*
68. *Insulator*
69. *Support*

GTS / GTX MODELS



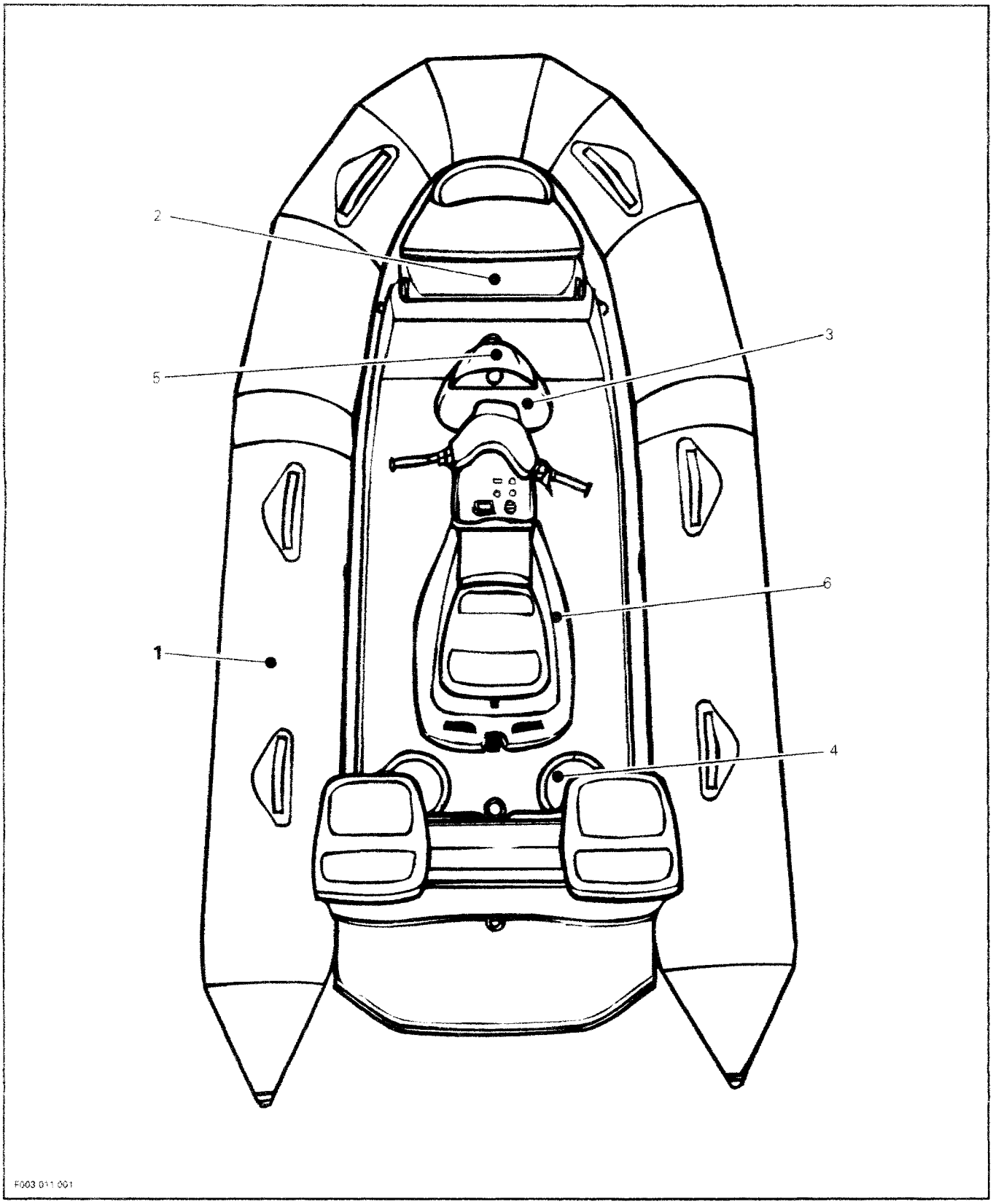


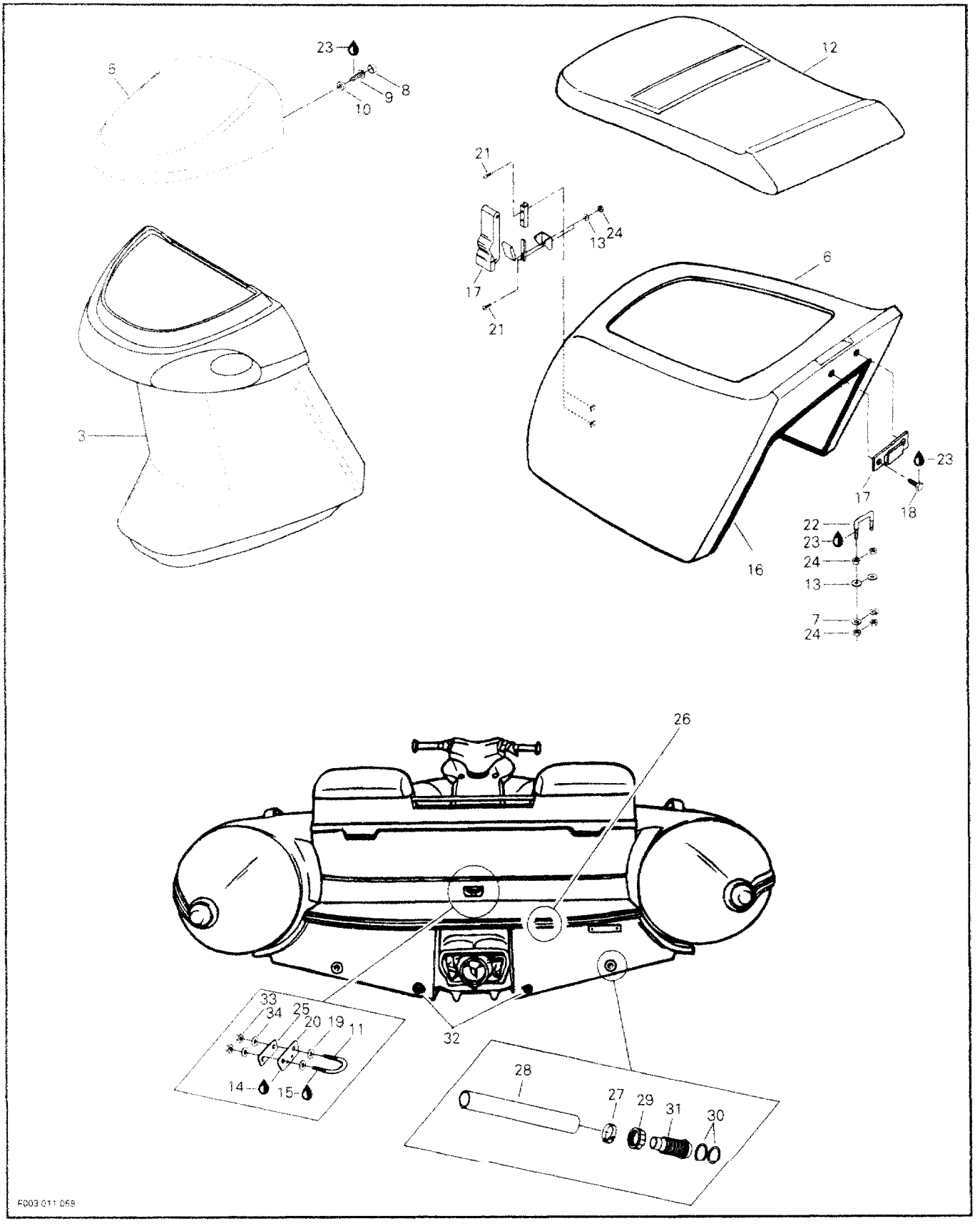
Section 10 HULL / BODY

Sub-Section 01 (COMPONENTS)

1. *Rivet 5/32*
2. *Tie-block*
3. *Tie rap*
4. *Lock washer 8 mm*
5. *Sealant 732*
6. *Elbow fitting 90°*
7. *Tie rap*
8. *Tie-mount*
9. *Lock nut M6*
10. *Lock washer 6 mm*
11. *Flat washer 6 mm*
12. *Gasket*
13. *Baffle*
14. *Sponson*
15. *Grommet*
16. *Vent tube*
17. *Rivet 5/32*
18. *Bailer pick-up*
19. *Tie rap*
20. *Hose 8 mm*
21. *Elbow fitting*
22. *Rivet 3/16 x 0.565*
23. *Tie rap*
24. *Vent hose*
25. *Tie rap*
26. *Floater*
27. *Lock nut M8*
28. *Retaining plate*
29. *Flat washer 8 mm*
30. *Eyelet*
31. *Loctite 242 (blue)*
32. *Hose 6 mm*
33. *Loctite 271 (red)*
34. *Spring clip*
35. *Grommet*
36. *Tie-block clip*
37. *Lock pin*
38. *Jam nut M10*
39. *Flat washer 10 mm*
40. *Rubber washer*
41. *Lock nut M10*
42. *Hook*
43. *Nut M6*
44. *Mirror*
45. *Carpet*
46. *Rivet 3/16 x 1.190*
47. *Bumper*
48. *Trim*
49. *Rivet 3/16 x 0.940*
50. *Grill*
51. *Hexagonal screw M6 x 20*
52. *Grab handle*
53. *Drain plug*
54. *Rivet*
55. *Plug*
56. *Finition plate*
57. *Fitting*
58. *Allen screw M5 x 16*
59. *Flat washer 5 mm*
60. *Lock nut M5*

EXPLORER MODEL





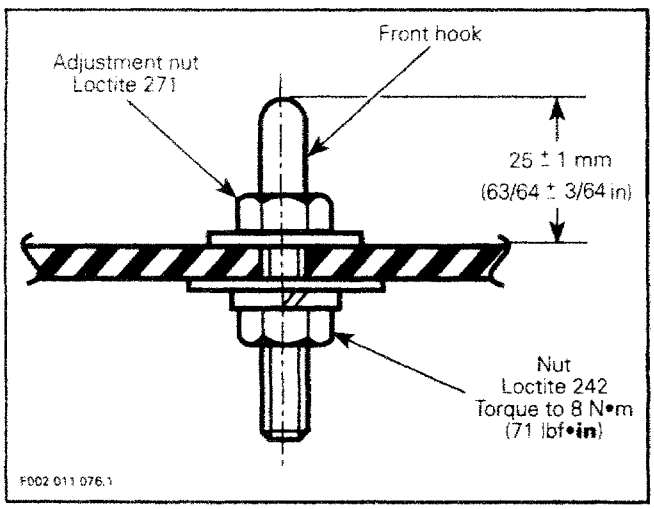
1. *Inflatable tube*
2. *Front storage compartment*
3. *Console*
4. *Access cover*
5. *Windscreen*
6. *Engine cover*
7. *Lock washer 6 mm*
8. *Cap*
9. *Screw M4 x 12*
10. *Cap retainer*
11. *Eyelet*
12. *Seat*
13. *Flat washer 6 mm*
14. *Sealant 732*
15. *Loctite 271 (red)*
16. *Seal*
17. *Latch*
18. *Screw M6 x 20*
19. *Flat washer 8 mm*
20. *Finition plate*
21. *Screw M5 x 10*
22. *Hook*
23. *Loctite 242 (blue)*
24. *Nut*
25. *Retaining plate*
26. *Bumper*
27. *Gear clamp*
28. *Hose*
29. *Plastic nut*
30. *Gasket*
31. *Fitting*
32. *Drain plug*
33. *Lock nut M8*
34. *Lock washer 8 mm*

SEAT ADJUSTMENT

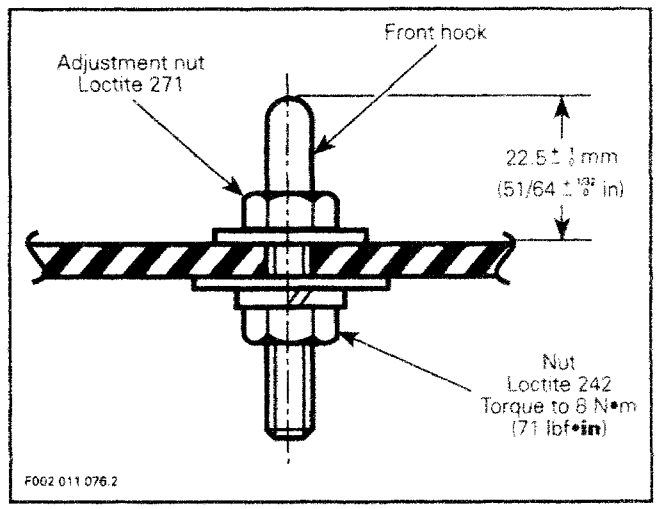
42,51, Front Hook

Adjust front hook as per following specifications :

SP / XP Series



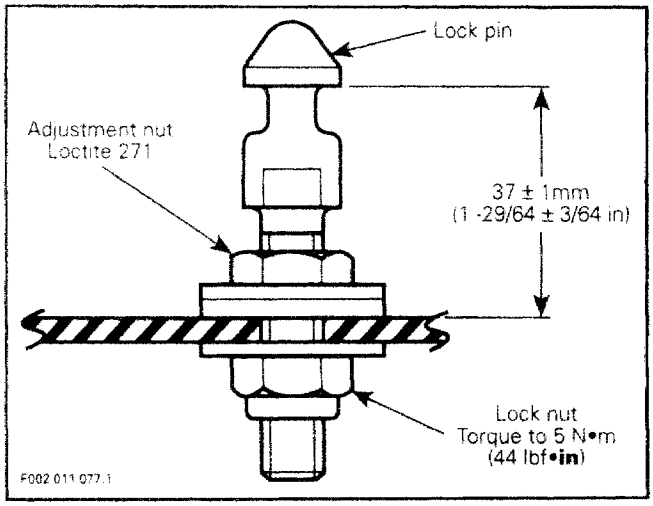
GTS / GTX Models



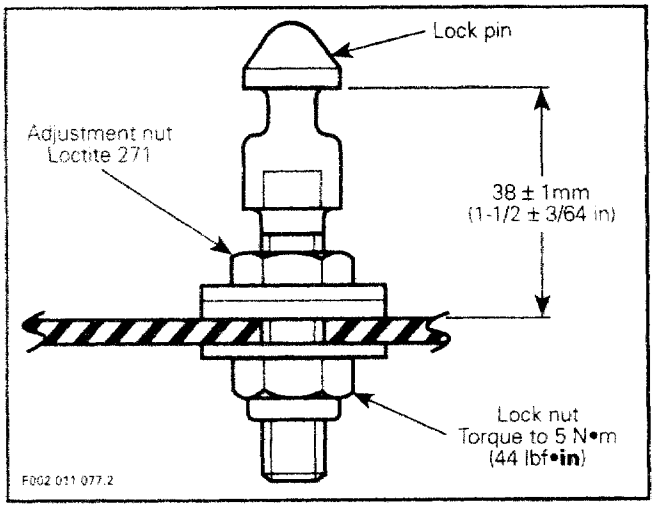
46, Lock Pin

◆ WARNING : Make sure seat is securely latched.

SP / XP Series



GTS / GTX Models

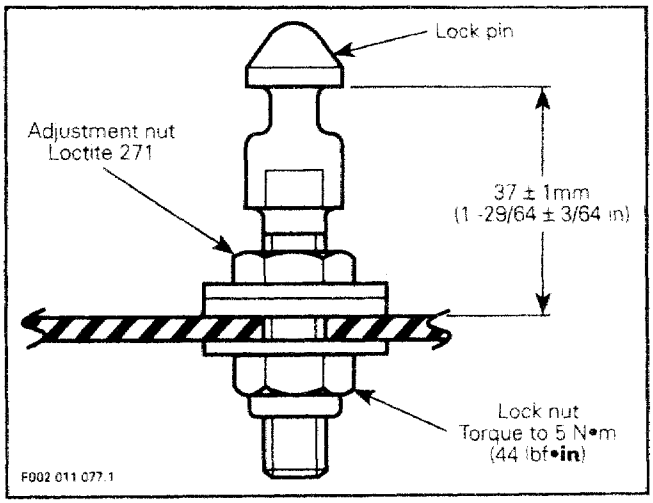


◆ WARNING : Make sure that at least 2 threads of lock pin exceed lock nut. If not, replace lock pin with a new one.

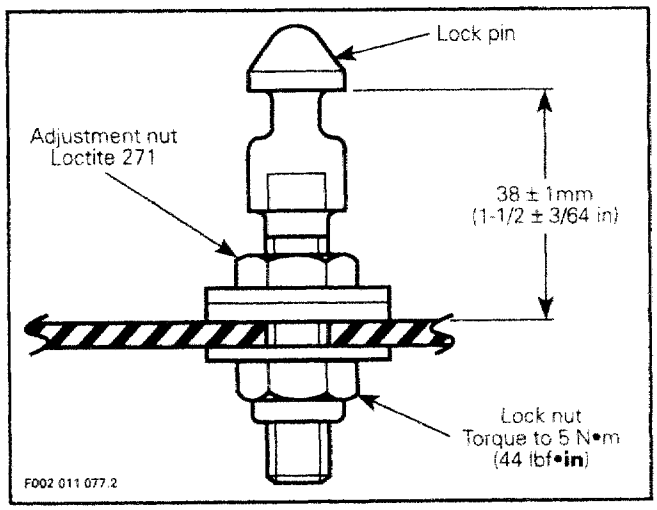
STORAGE COMPARTMENT COVER ADJUSTMENT

37,46, Lock Pin

SP / XP Series



GTS / GTX Models



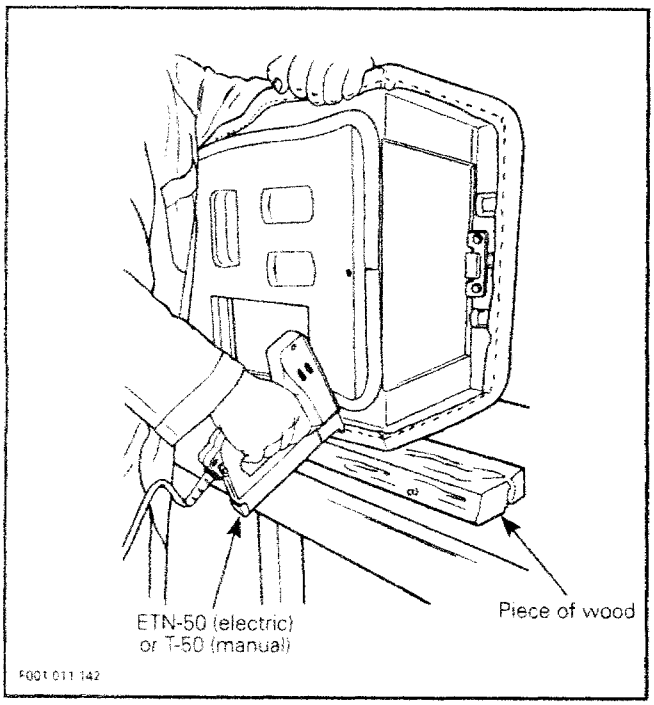
○ NOTE : With the storage compartment cover closed, there should be a gap of 11 ± 1 mm (13/16 ± 3/64 in) between cover and body, near the latch.

SEAT COVER REPLACEMENT

Install staples with an electric tacker such as Arrow tacker no. ETN-50 or with a manual tacker such as Arrow tacker no. T-50.

NOTE : For an easier installation it's highly recommended to use an electric tacker.

Ensure that the seat rest firmly against a hard surface such as a piece of wood. This is done to get the staples completely pushed in place.

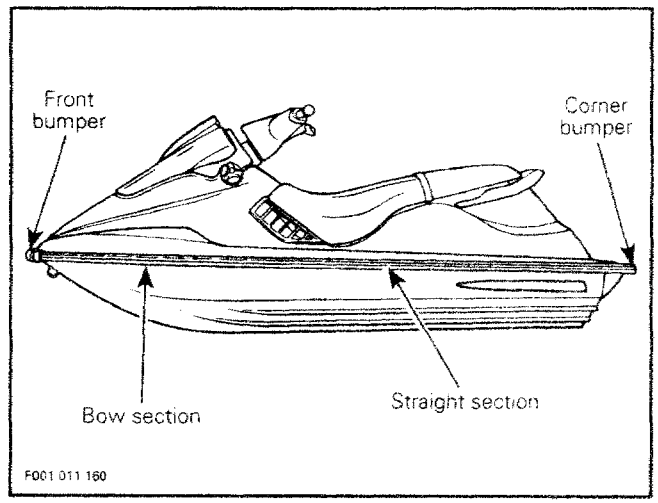


After cover installation cut all around the excess of material.

BUMPER REPLACEMENT

26,47,48,56,57, Bumper and Trim

1. Remove trim from side bumper rail.
2. Drill pop rivets to remove side bumper rail.
3. Mark hole positions on body straight and bow sections.



4. Slide bumper rail under front bumper.
5. Using a 4.80 mm (3/16 in) drill bit, drill first hole through bumper rail at front of bow section. Use locating mark as a guide. Then install a rivet.

CAUTION : When drilling, be careful not to damage bumper rail and / or hull.

6. Position bumper rail properly onto body and cut excess length if necessary.
7. Slide bumper rail in corner bumper.
8. Using hole positions previously marked on body, drill holes in bumper rail and install rivets.
9. Install trim using soapy water.
10. Repeat procedure for the other side.

SPONSON REPLACEMENT

14,38, Sponson

Remove seat.

Remove air vent tube support (SP / XP series).

Remove muffler.

From bilge, unscrew sponsons using a 10 mm deep socket with an extension.

Remove sponsons. Clean any residus of sealant adhesive on hull.

Install gaskets on new sponsons.

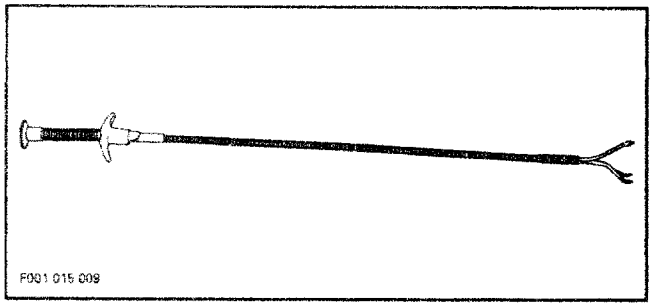
Apply sealant 732 (P / N 293 800 006) or sealant adhesive (P / N 293 800 033) around sponson studs.

Apply Loctite 242 (blue) on sponson studs.

Install sponsons on hull.

From bilge, first insert flat washers over sponson studs, then lock washers. Secure with lock nuts. Tighten to 5 N•m (44 lbf•**in**).

NOTE : To ease flat washer and lock washer installation, use a flexible 4-claw Snap-on pick-up tool.



Reinstall muffler. Tighten hose clamps to 4 N•m (35 lbf•**in**).

Reinstall air vent tube support (SP / XP series).

Reinstall seat.

Clean hull and sponsons of any sealant adhesive surplus.

WARNING : Recommended torques and use of Loctite must be strictly followed.

BAFFLE SEALING (GTS / GTX MODELS)

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.

Before using the watercraft wait 3 days for Sikaflex curing time.

DECALS REPLACEMENT

Removal

Using a heat gun warm up one end of decal for a few seconds until decal can roll off when rubbing with your finger.

Pull decal slowly and when necessary apply more heat to ease removal on the area that has to be peeled off.

If decal tears while pulling off, it has to be heated for a few seconds longer. If decal tends to stretch while pulling off, stop heating and wait a few seconds to let it cool, then peel it off.

Installation

There are 2 types of decals used on watercraft. One has a protective film on back side and the other has a protective film on both sides. They are used on 3 types of materials ; plastic, gelcoat and metal.

Decals Having a Protective Film on Back Side Only

These decals usually contain written information (ex. : warning) and are used on gelcoat or metal.

Clean surface with a good solvent such as ACRYLICLEAN DX 330 from PPG or equivalent (refer to manufacturer instructions).

Using a pencil and the decal as a template, mark the area where decal will be located.

Remove half of the decal back protective film and align decal with marks. Start sticking it from center and remove the other half of the film to stick it completely. Carefully squeegee decal beginning at center and working outward using, firm, short, overlapping strokes.

Decals Having a Protective Film on Both Sides

These decals usually contain graphics and are used on gelcoat or plastic.

Installation on Gelcoat

Clean surface with a good solvent such as ACRYLICLEAN DX 330 from PPG or equivalent (refer to manufacturer instructions).

For best result apply an activator (P / N 293 530 036) to prepare the surface using a clean cloth. After a few seconds, when the activator evaporates, the surface is ready.

Using a pencil and the decal as a template mark the area where decal will be located.

For better adhesion a dry application is recommended, however, to ease decal installation a mild solution of soapy water can be sprayed over surface where decal will be installed.

Remove back protective film from decal and align decal with marks. When well aligned squeegee decal beginning at center and working outward using, firm, short, overlapping strokes.

Remove front protective film once decal has adhered to hull.

Installation on Plastic (Storage Cover)

Clean surface with isopropyl alcohol.

Using a pencil and the decal as a template, mark the area where decal will be located.

Apply an activator (P / N 293 530 036) to prepare the surface using a clean cloth. After a few seconds, when the activator evaporates, the surface is ready.

▼CAUTION : Do not use soapy water to locate decal on plastic parts.

Remove back protective film from decal and carefully align decal with marks. When well aligned squeegee decal beginning at center and working outward using, firm, short, overlapping strokes.

Remove front protective film once decal has adhered.

INFLATABLE TUBE MAINTENANCE

1, Inflatable Tube

Cleaning

When the watercraft is operated in foul water and **particularly in salt water**, tube must be rinsed frequently with fresh water.

Occasionally, wash the tube with warm water and soap (only use mild detergent).

Stubborn stains and scuff marks may be removed using methyl ethyl ketone, toluene or acetone.

▼CAUTION : Never clean decals with strong detergent, methyl ethyl ketone, toluene or acetone. Limit application of these solvents on tube joints to avoid glue dilution.

Removal

Deflate all tube sections. Remove front and rear retaining plate screws.

Spray soapy water all along hull slots.

Pull and slide tube toward front of watercraft.

▼CAUTION : Whenever tube is folded, place a shield between lateral bumper and tube. If both parts touches for a certain period of time, permanent stains will remain on tube.

Installation

Spray soapy water all along tube cordes.

○NOTE : Tube must be deflated.

Starting with the rear of the tube, insert cordes in hull slot front openings and slide tube slowly toward the rear of the watercraft.

Once in place, secure front and rear retaining plates with screws.

Repair

For best results, repairs should be performed at temperatures ranging from 18° to 25°C (64°F to 77°F). Avoid carrying out repairs in direct sunlight, rain or in high humidity conditions.

○NOTE : Any major repair (rear bumper replacement, lateral bumper bonding, cord replacement, etc.) must be performed only at the factory.

How to Find Slow Leaks

Confirm with customer which tube section is leaking.

○NOTE : If customer complains of a general deflation of sections, it is most likely due to temperature variations that affects tube. Always adjust.

Inflate tube section to 21 kPa (3 PSI).

With valve cap removed, spray soapy water on valve. Check for air bubbles.

○NOTE : If a leak is found, it is recommended to continue testing as the possibility of more than one leak.

If air bubbles are coming out around the valve, retighten valve using pliers.

If plunger is leaking, remove valve after tube inspection. Check for dirt or damaged seal. Clean or replace valve if necessary.

Spray soapy water on tube section. Check for air bubbles.

○NOTE : Half-deflate tube section to ease inspection near hull. Wash dirt accumulation.

Tear Repair of Less than 5 cm (2 in)

Deflate completely tube section to be repaired.

Cut a patch about 75 mm (3 in) larger than the tear in every direction. Always round corners.

Using only a pencil, trace on tube the patch position.

▼CAUTION : Do not use pen or felt-tip pen as ink will permanently mark tube.

Sand thoroughly tube area with a 80 grit sandpaper.

○NOTE : Protect surface in vicinity with masking tape.

○NOTE : Supplied materials included in repair kit don't need to be sanded.

Remove masking tape.

Clean the patch and tube areas with a solvent such as methyl ethyl ketone, toluene or acetone. Allow solvent to completely evaporate.

Apply a **thin** layer of adhesive such as Bostik 2402-A with hardener 2402-B (or equivalent) to the patch and tube. Allow adhesive to dry so that it is dry to the touch.

○NOTE : Mix Bostik glue and hardener as per instruction on its package. Apply a second **thin** layer of adhesive on both parts.

Allow the second coat to dry until tacky to the touch; then, position the patch.

Smooth out the patch using a spoon-shaped tool beginning at center and working outward to remove all excess glue and air bubbles.

Allow 24 hours to dry before inflating.

Clean any glue excess.

Tear Repair of More than 5 cm (2 in)

Deflate completely tube section to be repaired.

Cut 2 patches about 75 mm (3 in) larger than the tear in every direction. Always round corners.

Using only a pencil, trace the patch position on tube.

▼ **CAUTION : Do not use pen or felt-tip pen as ink will permanently mark tube.**

Sand thoroughly tube areas (inner and outer) with a 80 grit sandpaper.

NOTE : Protect the outer surface in vicinity with masking tape.

NOTE : Supplied materials included in repair kit don't need to be sanded.

Remove masking tape.

Clean the patch and tube areas with a solvent such as methyl ethyl ketone, toluene or acetone. Allow solvent to completely evaporate.

Apply a **thin** layer of adhesive such as Bostik 2402-A with hardener 2402-B (or equivalent) to one patch and to inner section tube. Allow adhesive to dry so that it is dry to the touch.

NOTE : Mix Bostik glue and hardener as per instruction on its package. Apply a second **thin** layer of adhesive on both parts.

Allow the second coat to dry until tacky to the touch; then, position the patch.

NOTE : To ease patch installation, roll it tightly and insert it through the tube tear.

Smooth out the patch using a spoon-shaped tool beginning at center and working outward to remove all excess glue and air bubbles.

Repeat the same bonding procedure for the outer patch.

Allow 24 hours to dry before inflating.

Clean any glue excess.

Grab Handle Replacement

To replace a broken handle, proceed as follows :

Set tube section pressure to 14 kPa (2 PSI). Using a heat gun, remove handle.

Clean tube surface with a solvent such as methyl ethyl ketone, toluene or acetone.

Sand thoroughly tube area and the new handle with a 80 grit sandpaper.

NOTE : Protect tube surface in vicinity with masking tape.

Remove masking tape.

Clean the handle and tube areas with a solvent such as methyl ethyl ketone, toluene or acetone. Allow solvent to completely evaporate.

Apply a **thin** layer of adhesive such as Bostik 2402-A with hardener 2402-B (or equivalent) to the handle and tube. Allow adhesive to dry so that it is dry to the touch.

NOTE : Mix Bostik glue and hardener as per instruction on its package. Apply a second **thin** layer of adhesive on both parts.

Allow the second coat to dry until tacky to the touch ; then, position the handle.

Smooth out the handle using a spoon-shaped tool beginning at center and working outward to remove all excess glue and air bubbles.

Allow 24 hours to dry.

Clean any glue excess.

REPAIR

HULL AND BODY REPAIR

GENERAL

Gelcoat is the smooth and durable cosmetic finish which coats the fiberglass hull and body of a Sea-Doo watercraft. It also provides a protective barrier against water and sun. It consists of a mixture of resin, pigment (coloring), fillers, monomers and catalyst which is sprayed into the mold.

The body and hull of the Sea-Doo are constructed of chopped fiberglass, saturated with resin. It is sprayed on the layer of gelcoat along with pieces of fiberglass mat, cloth and woven rowing which are added at required areas. This type of construction is very accommodating for high quality repairs. With patience, the proper techniques and materials, a damaged area can be restored to an original finish.

The content is not intended to replace the use of a complete fiberglass and gelcoat repair manual. Its main purpose is to help you understand what factors are involved when making a damage assessment or estimate.

NOTE : Fiberglass repair kit is available through automotive or marine suppliers. Gelcoat repair kits are available through regular channel. Refer to SERVICE TOOLS AND PRODUCTS 01-03 section.

WARNING : Protect skin, wear gloves when in contact with resin, hardeners and gelcoat. A barrier skin cream may also be used. Do not expose area to open flame or lit cigarette. Some of the materials are flammable. Protect eyes, wear safety glasses when grinding, sanding or spraying. Use a dust mask when sanding or grinding. When spraying wear a respirator or paint mask. Always read warning labels on products.

AIR BUBBLES

Possible Cause

— Air pocket trapped between layers of laminate and gelcoat.

1) Preparation of Surface

Remove all of the damaged gelcoat surrounding the air bubble with a putty knife or preferably a carbide grinding tip. Make sure all loose and weak areas are completely removed. Sand a small area of the gelcoat surface with 220-grit sandpaper. If needed, sand the cavity itself. These areas must have a rough surface to allow the gelcoat putty to bond properly.

2) Filling the Cavity

The prepared surface must be cleaned with acetone on a cloth. Use the Bombardier gelcoat repair kit (P / N 295 500 100). Follow the mixing instructions in the kit when preparing the gelcoat putty.

Carefully mix the required amount while making sure there are no air bubbles in the mixture. With a putty knife fill the repair area and cover with plastic film. Curing time may depend on temperature, amount of putty and percentage of catalyst. After 2 hours, press lightly on the surface with fingers to test the hardness. When the area becomes hard, remove the plastic film.

3) Sanding

Begin block sanding the patch with 320-grit sandpaper until you come close to the original surface. Remove dust with a water soaked cloth and continue sanding with a 400-grit wet paper. Finish wet sanding with a 600-grit to remove deeper scratches. If needed you can wet sand with finer grit paper such as 1000-grit.

4) Buffing and Waxing

Buff the surface using a heavy duty polisher with a buffing pad. Make sure the pad is free of dirt or you may damage the gelcoat. Carefully begin buffing with a white medium compound RM 856. Finish off using a fine RM 852 compound. While buffing, pay close attention to avoid overheating the surface.

BLISTERS

Possible Causes

— Inert catalyst.

— Improper catalyst / gelcoat ratio.

A blister is a visible bump on the watercraft surface that may not necessarily come right through the gelcoat layer. In the case of only a few blisters, you may follow the same repair procedure as for air bubbles. If they are numerous and in close concentration, you may have to spray liquid gelcoat to achieve proper repair. This procedure is covered in the next problem.

MINOR GELCOAT FRACTURES

Possible Causes

— Flexing of fiberglass laminate.

— Gelcoat thickness.

— Direct result of impact.

In case of fractures which have not penetrated past the gelcoat layer, the repair concerns the gelcoat only. If flex cracking or impact are evident, then additional reinforcement may be necessary. This subject will be covered in the next problem.

1) Preparing the Surfaces

Small Fractures :

Open the cracks up with a sharp triangular can opener or preferably a carbide tipped die grinder. The V groove will provide a good bonding area for the gelcoat. With 220-grit sandpaper, sand the sides of the notched out areas.

Numerous Fractures :

Using a grinder with a 24-grit disk, remove the gelcoat. Sand the area edge with 220-grit sandpaper.

2) Filling the Repair Area

Small Fractures :

Refer to the same procedure as in the air bubbles.

Numerous Fractures Over Large Surface :

Prepare the area for spray application of liquid gelcoat. Wipe down the surface with acetone. Mask the area off to protect the watercraft from overspray.

Mix the needed quantity of gelcoat and catalyst according to suppliers recommendations. The gelcoat can be thinned with acetone up to 10%. If it needs more consistency you can add cabosil.

Make sure that the air supply is free of oil, dirt and water.

Test spray the gelcoat mixture on paper to verify its consistency and pattern. You may have to apply 5 or 6 coats to cover the area properly. Overlap each coat further than the last, leaving at least 30 seconds between passes. Avoid trying to coat the surface with only a few heavy coats, this will not allow the gelcoat to dry properly.

Apply a coat of polyvinyl alcohol to seal off the air and protect the gelcoat surface from dust. PVA speeds up the curing process because gelcoat will not cure properly when exposed to air.

3) Sanding

Wash the polyvinyl alcohol off with water. Depending on the size of the area repaired, you can either block sand as per previous procedure or you may use an air sander. Sand the surface down with progressively finer grits of sandpaper until the desired finish is achieved.

4) Buffing and Waxing

Buff the surface using a heavy duty polisher with a buffing pad. Make sure the pad is free of dirt or you may damage the gelcoat. Carefully begin buffing with a white medium compound RM 856. Finish off using a fine RM 852 compound. While buffing, pay close attention to avoid overheating the surface.

COMPOUND FRACTURES

Possible Causes

— Thickness of fiberglass laminate.

— Direct result of impact.

Compound fractures are those that have gone past the gelcoated surface and in through the layers of fiberglass laminate. Two types of repairs have to be performed. The first is to restore the structural integrity of the damaged area. Fracture types can vary from a simple crack to a large hole. Usually, fiberglass reinforcement becomes necessary, especially if the fracture can be attributed to weakness. The final part of the repair is the gelcoating, which cannot be done until the interior and exterior laminate surfaces have been repaired.

Outside :

Remove the damaged gelcoat and fiberglass with a 24-grit disk using a power sander. Grind outward at least 2 inches from the fracture to allow the patch to bond to strong material. Cut enough pieces of fiberglass mat necessary to build up the area. The pieces should be cut so they overlap each other by at least a half inch. For a smoother finish, the last layer should be fiberglass cloth. If the fracture is small enough all you may have to do is fill the area with an epoxy filler.

Inside :

For the interior repair, you can grind more. This will allow for more fiberglass material which will strengthen the area. If the fracture opening is too large after surface preparation, you may need a backing support to cover the opening. Cut alternating pieces of fiberglass mat and cloth in overlapping sizes.

Patching the Repair Area

Outside :

The outside should be done first. Wipe clean the area with acetone on a cloth, then mask off area. For a small crack use an epoxy filler in the same way you would use Bombardier's gelcoat repair putty. When laying up a larger area you will use mat, cloth and fiberglass resin and hardener. Use a clean container to mix the resin, mix only what you will need. Follow the recommended catalyst ratio.

Using a clean paintbrush, brush the mixed resin on the surface. Place the smallest piece of mat over the fracture and then wet out the mat. Follow with the remaining pieces of mat and final layer of cloth. While wetting the pieces make sure you work the air bubbles out and saturate all the pieces evenly. Try to work quickly, you may only have 15 or 20 minutes. You may clean the brush with acetone.

Wait until the repair has hardened before moving on to the interior repair. If the size of the opening is too large for the pieces to maintain the proper shape, you will have to use a backing support. It is a shaped piece of cardboard that fits flush to the interior surface and has a plastic layer on the repair side. It is held in place by tape or a support.

Inside :

Wipe down the area with acetone on a cloth. Apply the same procedure as for outside repair when laminating the alternating pieces of fiberglass material. If a backing support was used, remove it before starting the repair. After the area has hardened, remove sharp edges of material from surface. If required paint the surface.

Sanding

Outside :

This surface will have to be prepared for application of gelcoat. The size of the area will determine the gelcoating procedure to be used. Refer to the repair procedure for minor gelcoat fractures.

Buffing and Waxing

Refer to the buffing and waxing for minor gelcoat fractures. If painting the exterior is preferred, refer to **painting** sub-section 03.

TOOLS AND MATERIALS LIST

Tools

— safety glasses
— air mask
— white cloths
— sanding block
— putty knife
— plastic film
— stirring stick
— cover sheets (for Sea-Doo)
— scissors
— buffing pad
— heavy-duty polisher
— power sander
— paint brush
— plastic container (mixing)
— spray gun
— plastic squeegee

Materials

— fiberglass mat
— fiberglass cloth
— polyester resin
— cardboard
— masking tape
— sandpaper
(100-grit, 220-grit, 220-grit, 320-grit, 400-grit, 600-grit, 1000-grit)
— 24-grit sanding disks
— Bombardier gelcoat putty
— Bombardier liquid gelcoat
— acetone
— cabosil
— epoxy filler
— medium compound (white)
— fine compound (white)
— wax

PAINTING

The following was prepared in conjunction with PPG Industries Inc. It contains a list of SEA-DOO parts with their respective PPG color codes and 2 painting procedures ; CONCEPT™ the most commonly used and DELTA™ (with low VOC) mainly used in California.

PPG Industries Inc. sells paint and related products and these are **not** available through Bombardier Inc. network. To find your nearest PPG dealer, dial one of the following numbers.

NORTH AMERICA

CANADA

Phone : 1-800-363-2816

U.S.A.

Phone : (216) 572-6100

(This phone number is also good for all countries. Communications are available in english, french and spanish).

PACIFIC RIM

JAPAN

Phone : 81-3-3280-2851

KOREA

Phone : 82-32-529-8141
82-32-523-8600
82-51-624-8221
82-2-792-2477

EUROPE

DENMARK

Phone : 45-31-54-9211

FRANCE

Phone : 33-1-48-35-7777
33-27-14-9700
33-27-14-4600

GERMANY

Phone : 49-202-788-1

ITALY

Phone : 39-81-831-1222
39-2-37-701
39-131-7701

PORTUGAL

Phone : 351-230-17-43

SPAIN

Phone : 34-3-588-2000
34-3-711-51-54
34-6-154-7035
34-83-54-0400 / 04

SWEDEN

Phone : 46-479-14-445

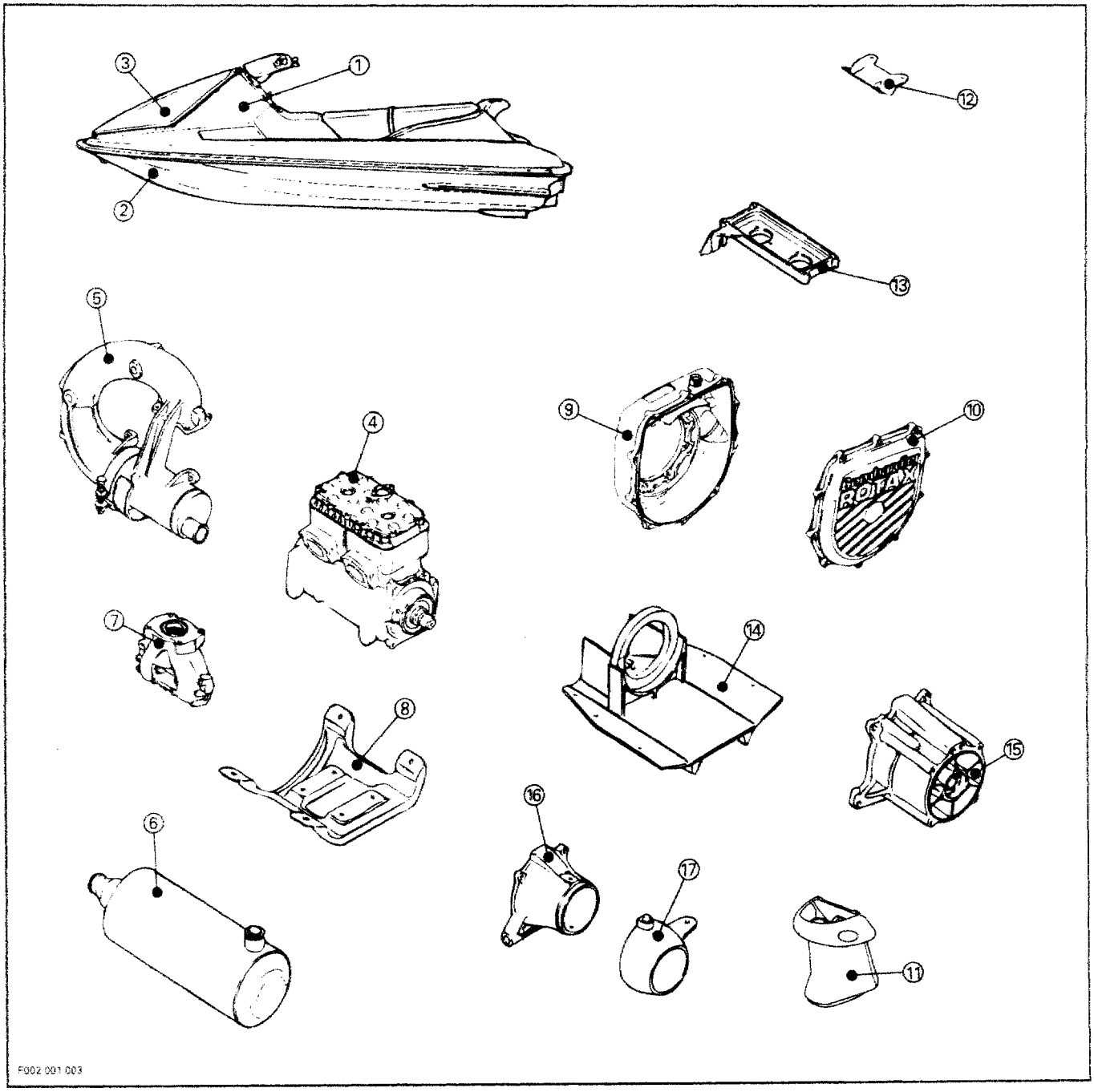
UNITED KINGDOM

Phone : 44-21-455-9866
44-926-410-255

PPG paint for Sea-Doo watercraft is not available in spray can. For best result it must be applied by a professional painter.

For fast touch up on metallic and gelcoat surfaces, refer to the appropriate Bombardier *Sea-Doo Parts Catalog*, it contains a few spray can part numbers.

PARTS THAT CAN BE PAINTED



1. *Body*
2. *Hull*
3. *Storage Cover (GTS / GTX)*
4. *Engine*
5. *Tuned Pipe*
6. *Muffler*
7. *Exhaust Manifold*
8. *Engine Support*
9. *Ignition Housing*
10. *Ignition Housing Cover*
11. *Console (Explorer)*
12. *Flame Arrester Support*
13. *Flame Arrester Base*
14. *Ride Shoe*
15. *Impeller Housing*
16. *Venturi*
17. *Steering Nozzle*

PPG COLOR CHART		SEA-DOO MODELS					
		SP / SPI	SPX	XP / XPI	GTS	GTX	EXPLORER
1. Body	COLOR PPG no.	White 98223	White 98223	White 98223	White 98223	White 98223	White 98223
2. Hull	COLOR PPG no.	White 98223	Teal 18923	Green 49580	White 98223	White 98223	White 98223
3. Storage cover	COLOR PPG no.	Not applicable	Not applicable	Not applicable	Teal 18923	Green 49580	White 98223
4. Engine	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209	White 98209	White 98209
5. Tuned pipe	COLOR PPG no.	Gray 38269	Gray 38269	Purple 59962	Gray 38269	Purple 59962	Gray 38269
6. Muffler	COLOR PPG no.	Gray 38269	Gray 38269	Purple 59962	Gray 38269	Purple 59962	Gray 38269
7. Exhaust manifold	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209	White 98209	White 98209
8. Engine support	COLOR PPG no.	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551
9. Ignition housing	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209	White 98209	White 98209
10. Ignition housing cover	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209	White 98209	White 98209
11. Console	COLOR PPG no.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	White 98223
12. Flame arrestor support	COLOR PPG no.	White 98209	White 98209	White 98209	White 98209	White 98209	White 98209
13. Flame arrestor base	COLOR PPG no.	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551
14. Ride shoe	COLOR PPG no.	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551
15. Impeller housing	COLOR PPG no.	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551
16. Venturi	COLOR PPG no.	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551
17. Steering nozzle	COLOR PPG no.	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551	Black 9551

NOTE : Due to natural discoloration it may be necessary to completely repaint the part.

CONCEPT ™ PAINTING PROCEDURE

For additional information refer to *PPG P-Bulletin* no. 168.

SURFACE PREPARATION

Prepare and clean surface consistent with good painting practices.

Primer

DP Epoxy Primer / DP 401 Catalyst ; DX 1791 / 1792 (Prime before topcoating).

Primer Surfacer

K36 / K201, K200 / K201 or DZ KONDAR® Primer Surfacers.

NOTE : KONDAR must be sealed before applying CONCEPT color.

Sealer

KTS30 2K Sealer, DP Epoxy Primer reduced as a sealer or DAS 1980 or DAS 1987.

Direct Gloss Color

How to Mix

Standard Air Dry : Mix CONCEPT Color 2:1:1 - 2 parts color with 1 part DT Reducer best suited to shop temperatures and 1 part DU 4 (below 29°C (85°F)) or DU 5 (above 29°C (85°F)) Hardener.

Standard Force Dry : Mix CONCEPT Color 2:1:1 - Application temperatures below 29°C (85°F) use DU 5 Hardener, above 29°C (85°F) use DU 6.

Medium Solids (MS) Application : For faster film build, when using solid colors, mix 2 parts CONCEPT color with half part DT Reducer and 1 part DU 5 or DU 6 Hardener. Select the DT Reducer appropriate for shop temperature.

Pot Life

Pot life of ready-to-spray CONCEPT color is 6 to 8 hours at 21°C (70°F). Medium solids option is 2 to 4 hours at 21°C (70°F).

FULL PANEL AND OVERALL REPAIRS

Application

Apply 1 medium wet coat and give 5-10 minutes flash, followed by 2 wet coats with 15 minutes flash time between each coat. Adjust metallic on the last full wet coat. If necessary, apply a mist coat. For medium solids option apply 2 full wet coats.

Air Pressure

275-345 kPa (40-50 PSI) at the gun.

Dry Time

— Dust free : 30 minutes.

— Tack free : 2 to 3 hours.

— Tape print free : 6 hours.

— Dry to handle : 6 to 8 hours at 21°C (70°F).

— Force dry : 40 minutes at 60°C (140°F).

Faster dry times may be obtained by using 15 mL (1/2 oz) of DXR 81 Accelerator per sprayable quart, however, the pot life is reduced to 2 hours.

SPOT / PANEL REPAIRS

Application

Spray medium wet coat of color on the repair area and allow 5-10 minutes flash time. Apply 2 additional full coats until hiding is achieved, extending each coat beyond the previous coat. Flash 15 minutes between each coat. For medium solids option apply 2 full wet coats.

Blending

Add DT 95 Reducer to a second gun cup. Reduce the fluid feed of the gun and lower the air pressure to 207 kPa (30 PSI). Dust the dry edge until a slight wet look appears, then stop. Or mix reduced and catalyzed color with equal parts of reduced and catalyzed CONCEPT DCU 2020 Clear.

DELTA™ PAINTING PROCEDURE

(with low VOC, mainly in California)

For additional information refer to *PPG P-Bulletin* no. 157.

SURFACE PREPARATION

Primer : DELTA™ PRIME DPU 166.

DELTA™ 2800, COLOR

How to Mix

Mix DELTA™ 2800 2:1, 2 parts Colors to 1 DU 6 Catalyst.

Application

Apply 2 coats of DELTA™ Polyurethane Color. Apply the first coat at 1.5 -1.8 wet mils. Allow a minimum of 15 minutes flash time prior application of the second coat. Apply a second coat of DELTA™ using the same technique as the first application, paying strict attention to gun set up and proper equipment choices.

RECOMMENDED SPRAY EQUIPMENT

Gun Manufacturer :	De Vilbiss	Binks	Graco	HVLP
Gun Model :	JGA	62	800N	Can Am Model 900
Fluid Tip Size :	FF 1.4 mm (0.055 in)	63D 1.5 mm (0.059 in)	02N 1.2 mm (0.047 in)	HT #9072 2.5 mm (0.098 in)
Air Cap :	797 / 264	63PW	02 / 03	C9062
Gun Distance :	25-30 cm (10-12 in)	25-30 cm (10-12 in)	25-30 cm (10-12 in)	25-30 cm (10-12 in)
Fluid Delivery :	227-340 mL / min (8-12 oz / min)	227-340 mL / min (8-12 oz / min)	227-340 mL / min (8-12 oz / min)	227-340 mL / min (8-12 oz / min)
Air Pressure (At-the-Gun) :	414-517 kPa (60-75 PSI)	414-517 kPa (60-75 PSI)	414-517 kPa (60-75 PSI)	62 kPa (9 PSI)

Dry Time (at 21°C (70°F))

— Dust free : 25-35 minutes.

— Tack free : 2-1/2 to 3 hours.

— Tape / Sand : Overnight.

Force Dry

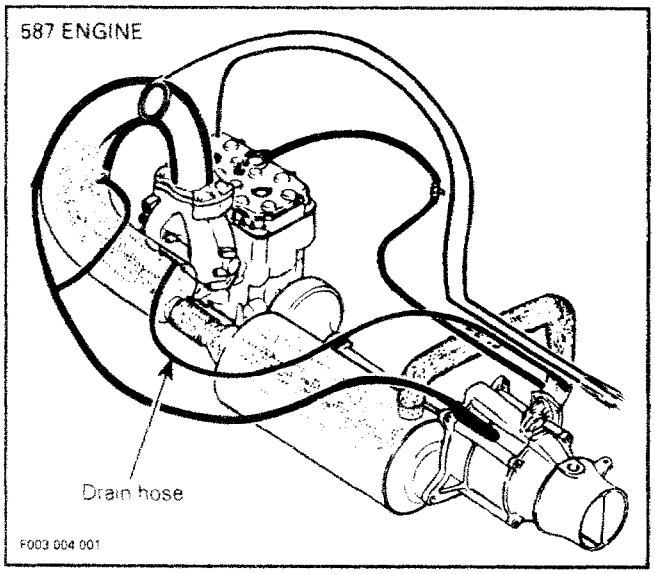
Allow 20 minutes purge time at 27-32°C (80-90°F) before bake. Bake 75 minutes at 65°C (150°F) or 40 minutes at 82°C (180°F). Allow to cool after force dry, before sanding or taping.

STORAGE

Engine Draining

Check engine drain hose running from engine manifold socket to exhaust outlet socket. Make sure there is no sand or other particles in it and that it is not obstructed so that water can leave the engine. Clean hose and fitting (on exhaust outlet) as necessary.

▼CAUTION : Water in engine drain hose must be free to flow out, otherwise water could be trapped in engine. Should water freeze in engine, severe damage will occur. Check engine drain hose for obstructions.



Fuel System

Sea-Doo Fuel Stabilizer (P / N 413 408 600) can be added in fuel tank to prevent fuel deterioration and carburetor gumming. Follow manufacturer's instructions for proper use.

▼CAUTION : Fuel stabilizer should be added prior engine lubrication to ensure carburetor protection against varnish deposit.

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

Cooling System Flushing and Engine Internal Lubrication

Cooling system has to be flushed with fresh water to prevent salt, sand or dirt accumulation which will clog water passages. This will be achieved with the coupler hose (P / N 295 500 099).

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

Procedure

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

1. Clean jet pump by spraying water in its inlet and outlet and then spray SEA-DOO LUBE lubricant.

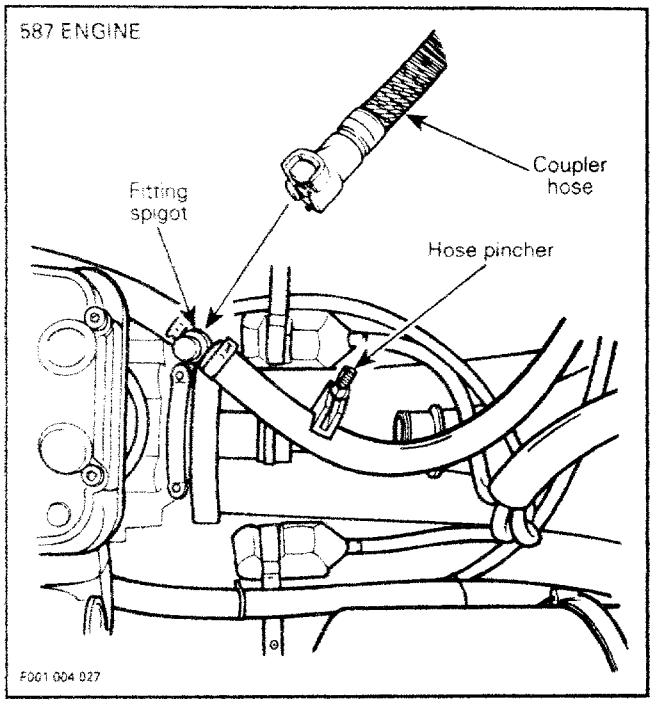
◆WARNING : Always remove safety lanyard cap from switch to prevent accidental engine starting before cleaning the jet pump area. Engine must not be running for this operation.

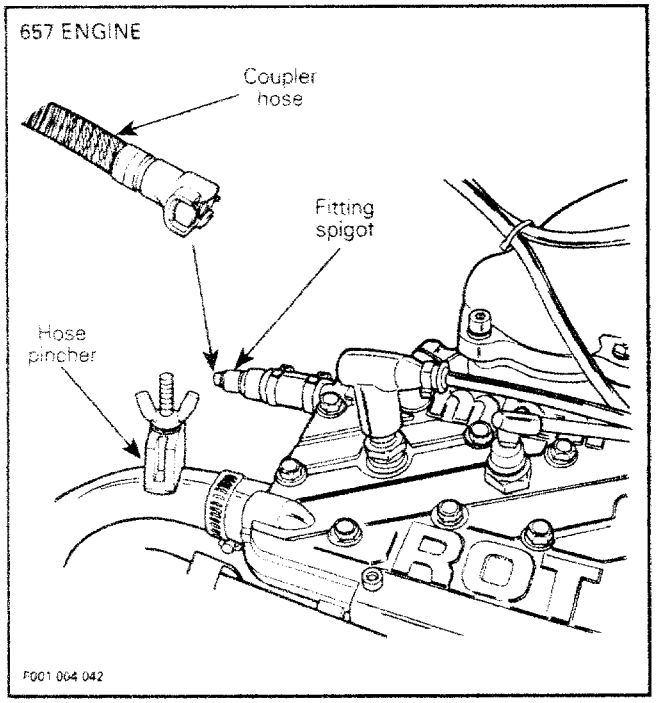
2. Remove seat to allow access of cooling system.
3. Remove dust cap from fitting spigot and attach coupler hose. Make sure coupler hose is properly locked.
4. Attach other end of coupler hose to a garden hose.

▼CAUTION : Do not open water tap yet.

5. Install a hose pincher on water outlet hose.

○NOTE : This prevents water from exiting through exhaust socket. Remove hose pincher after flushing operation.





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

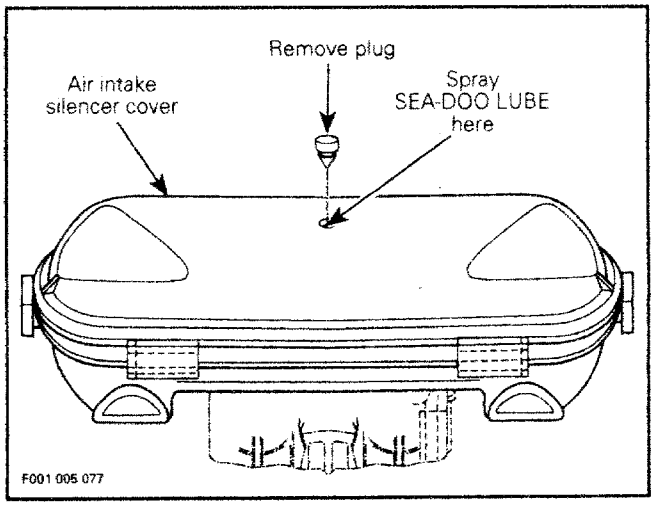
◆ WARNING : Do not touch any electrical part or jet pump area when engine is running.

▼ **CAUTION : Never flush a hot engine. Always start the engine before opening the water tap. Otherwise, water will back flow through the tuned pipe into the engine and may cause damage to internal parts. Open water tap immediately after engine is started to prevent overheating.**

7. Run the engine about 3 minutes at a fast idle around 3500 RPM.

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

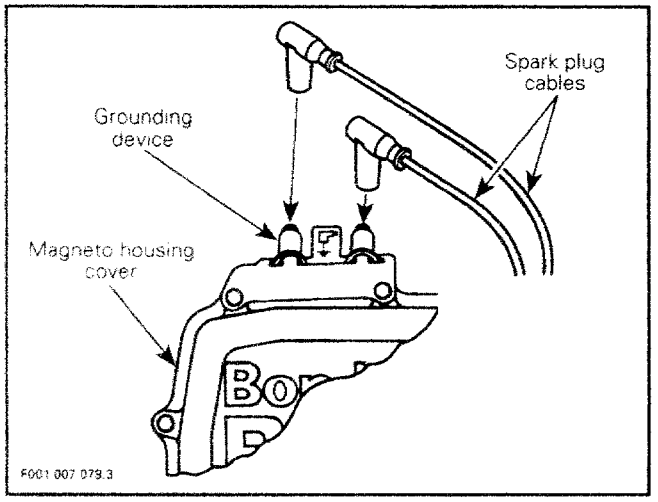
8. Remove plug from air intake silencer cover.
9. Spray SEA-DOO LUBE lubricant through air intake silencer cover keeping engine at fast idle.



Lubrication of engine should be done at least for 1 minute. After approximately half a minute, close fuel 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, otherwise severe engine damage could occur.**

10. Close the water tap then stop the engine.
11. Unlock and remove coupler hose. Reinstall dust cap over fitting spigot.
12. Wipe up any residual water from the engine.
13. Remove spark plug cables and connect them on the grounding device.



14. Remove both spark plugs and spray SEA-DOO LUBE lubricant into each cylinder.
15. Crank the engine a few turns to distribute the oil onto cylinder wall.
16. Apply antiseize lubricant (P / N 293 550 001) on spark plug threads then reinstall them.
17. Reinstall plug on air intake silencer cover.

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

Propulsion System

Lubricant in impeller shaft reservoir should be drained. Reservoir should be cleaned and refilled with 65 mL (2.2 U.S. oz) of SEA-DOO synthetic 75W 90 GL5 polyolester oil (P / N 293 600 011). Refer to PROPULSION AND DRIVE SYSTEMS 08-01 then refer to **oil replacement**.

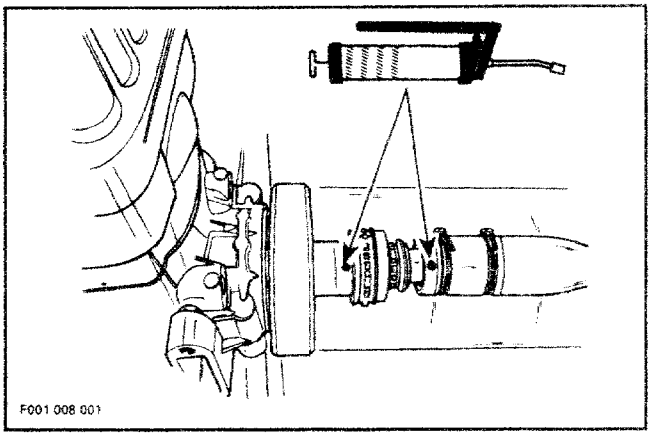
CAUTION : Use only SEA-DOO jet pump oil or equivalent synthetic gear oil, otherwise component service life could be reduced. Do not mix oil brands or types.

Lubricate PTO flywheel at grease fitting with synthetic grease (P / N 293 550 010).

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

Lubricate seal carrier at grease fitting until grease is just coming out.

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.

Battery

For battery removal, cleaning and storage, refer to ELECTRICAL 07-03 then refer to **battery storage**.

Watercraft Cleaning

Clean the bilge with hot water and mild detergent or with bilge cleaner. Rinse thoroughly. Lift front end of watercraft to completely drain bilge. If any repairs are needed to body or to the hull, touch up paint and Gelcote® repair kit are available. Refer to SERVICE TOOLS AND PRODUCTS 01-02. 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 nonabrasive wax.

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

Explorer Only

Thoroughly wash inflatable tube with fresh soapy water. Stubborn stains and scuff marks may be removed with methyl ethyl ketone, acetone or toluene.

CAUTION : Never clean decals with strong detergent, methyl ethyl ketone, toluene or acetone. Limit application of these solvents on tube joints to avoid glue dilution.

If possible, store the watercraft with the tube sections 90% inflated. If this is not possible, fold the tube into the hull and tie it loosely into this position.

Section 11 STORAGE

All Models

If the watercraft is to be stored outside, cover it with an opaque tarpaulin to prevent sun rays and grime from affecting the plastic components, watercraft finish as well as preventing dust accumulation.

▼ CAUTION : The watercraft must never be left in water for storage. Never leave the watercraft stored in direct sunlight. UV radiation will dull finishes. Keep away from rodents (Explorer).

Anticorrosion Treatment

Wipe off any residual water in the engine compartment.

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

Lubricate the throttle cable with SEA-DOO LUBE lubricant.

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(s) in order to avoid water build up in the bilge during rainfall. Tilt the watercraft to the rear so that water can flow out.

Additional Recommended Protection

In cool regions (where freezing point temperature may be encountered), cooling system should be filled with water and antifreeze solution.

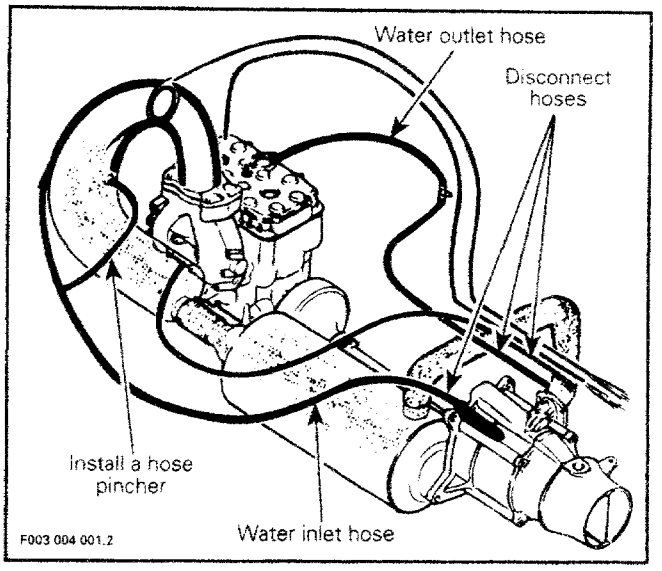
▼ CAUTION : Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

○ NOTE : The engine will not have to run during this operation.

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

Install a hose pincher on water injection hose.

Disconnect hoses where shown.

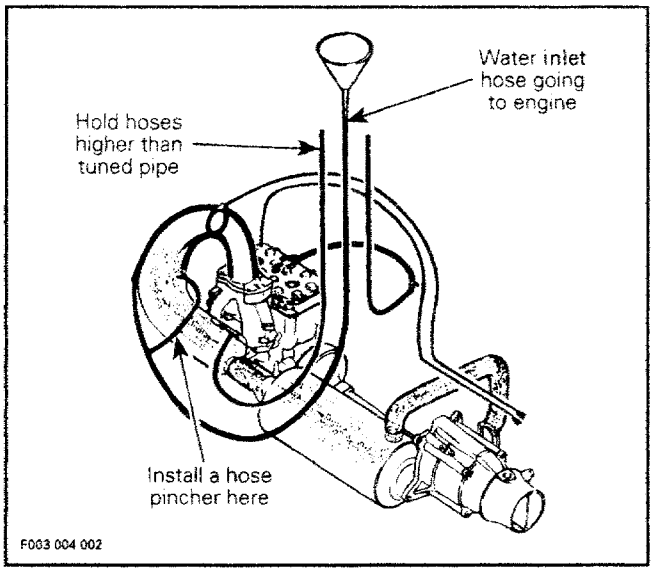


Raise all hoses above the highest point of tuned pipe and temporarily tie them together.

Insert a funnel into **inlet** hose going to the water inlet socket at tuned pipe. Pour about 2 liters (1/2 gal) of antifreeze solution through the funnel.

Tie up all hoses higher than tuned pipe.

○ NOTE : If hoses are not attached higher than tuned pipe, coolant will drain out.



The following steps should be performed to provide the watercraft enhanced protection.

Remove muffler and drain out as much water as possible. Reinstall muffler.

OR : Disconnect 1 hose from muffler and pour some antifreeze liquid inside muffler. Reconnect hose.

SP AND SPI MODELS

ENGINE		SP (5870)	SPI (5872)
Engine type		Bombardier-Rotax 587, water cooled	
Induction type		Rotary valve	
Exhaust system	Type	Water cooled, water injected	
	Water injection fitting	4.6 mm (.181 in)	
Starting system		Electric start	
Lubrication	Fuel / oil mixture	VROI (Variable Rate Oil Injection)	
	Oil injection pump	Gear driven	
	Oil type	SEA-DOO injection oil	
Number of cylinders		2	
Bore	Standard	76.0 mm (2.992 in)	
	First oversize	76.25 mm (3.002 in)	
	Second oversize	76.50 mm (3.012 in)	
Stroke		64 mm (2.520 in)	
Displacement		580.7 cm^3 (35.4 in^3)	
Compression ratio	Uncorrected	11.5 : 1	
	Corrected	5.9 : 1	
Engine maximum torque		62.7 N•m (46 lbf•ft) @ 5500 RPM	68.5 N•m (51 lbf•ft) @ 5750 RPM
Cylinder head warpage (maximum)		0.05 mm (.002 in)	
Piston ring type and quantity		1 Semi-trapez – 1 Rectangular	
Ring end gap	New	0.25 - 0.40 mm (.010 - .016 in)	
	Wear limit	1.00 mm (.039 in)	
Ring / piston groove clearance	New	0.05 - 0.08 mm (.002 - .003 in)	
	Wear limit	0.2 mm (.008 in)	
Piston / cylinder wall clearance	New	0.05 - 0.07 mm (.002 - .003 in)	
	Wear limit	0.2 mm (.008 in)	
Cylinder taper (maximum)		0.08 mm (.003 in)	
Cylinder out of round (maximum)		0.05 mm (.002 in)	
Connecting rod big end axial play	New	0.39 - 0.74 mm (.015 - .029 in)	
	Wear limit	1.2 mm (.047 in)	
Crankshaft deflection		0.08 mm (.003 in)	
Rotary valve timing	Opening	130° ± 5 BTDC	
	Closing	65° ± 5 ATDC	
Rotary valve duration		147°	
Crankcase / rotary valve gap		0.25 - 0.35 mm (.010 - .014 in)	
Connecting rod / crankshaft pin radial clearance	New	0.020 - 0.033 mm (.0008 - .0013 in)	
	Wear limit	0.050 mm (.002 in)	
Connecting rod / piston pin radial clearance	New	0.003 - 0.012 mm (.00012 - .00047 in)	
	Wear limit	0.015 mm (.00059 in)	
ADDITIONAL INFORMATION : Squish gap : 1.3 - 1.7 mm (.051 - .067 in).			

Section 12 TECHNICAL DATA
Sub-Section 01 (SP AND SPI MODELS)

ELECTRICAL		SP (5870)	SPI (5872)
Magneto generator output		160 W @ 6000 RPM or 7.2 A @ 2000 RPM	
Ignition system type		CDI	
Spark plug	Make and type	NGK BR7ES	
	Gap	0.5 mm (.020 in)	
Ignition timing (BTDC)	mm (in)	2.65 (.104)	
	Degrees	21° ± 1 ①	
Generating coil		40 - 76 Ω	
Battery charging coil		.05 - .6 Ω	
Ignition coil	Primary	.34 - .62 Ω	
	Secondary	9 - 15 kΩ	
Engine rev limiter setting		6550 ± 100 RPM	
Battery		(Yuasa) 12 V, 19 A•h	
Fuse	Starting system	5 A	
	Charging system	15 A	

ADDITIONAL INFORMATION : ① Engine cold @ 6000 RPM.

CARBURETION		SP (5870)	SPI (5872)
Carburetor	Type	Mikuni diaphragm BN-38	
	Quantity	1	
Main jet		142.5	147.5
Pilot jet		65	
Adjustment	Low-speed screw	1 turn ± 1/4	
	High-speed screw	0	
	Idle speed (in water)	1400 RPM	
	Idle speed (out of water)	2400 RPM	
Fuel	Type	Regular unleaded gasoline	
	Octane no.	87 (Ron + Mon)/2	
Fuel return line orifice		0.5 mm (.020 in) (PTO side)	

ADDITIONAL INFORMATION :

COOLING	SP (5870)	SPI (5872)
Type	Open circuit – Direct flow from jet propulsion unit	
Thermostat	None	
Overheating beeper setting	96-99°C (205-210°F)	

ADDITIONAL INFORMATION :

PROPULSION		SP (5870)	SPI (5872)
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	
Oil type		SEA-DOO JET PUMP SYNTHETIC OIL POLYOLESTER 75W90 GL5	
Steering nozzle pivoting angle		26°	
Trim nozzle pivoting angle		Not applicable	
Minimum required water level		90 cm (35 in)	
Drive shaft deflection (maximum)		0.5 mm (.020 in)	
Impeller outside diameter		139.5 mm (5.490 in)	
Impeller / wear ring clearance	New	0.18 - 0.44 mm (.007 - .017 in)	
	Wear limit	1.02 mm (.040 in)	
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)	
Impeller shaft side play		0.05 mm (.002 in)	
Impeller pitch / material		18° / aluminum	Progressive pitch 14°-21° / stainless steel
ADDITIONAL INFORMATION : Do not mix different brands or oil types.			

DIMENSIONS	SP (5870)	SPI (5872)
Number of passenger (driver incl.)	2	
Overall length	256 cm (100.8 in)	
Overall width	105 cm (41.3 in)	
Overall height	92 cm (36.2 in)	
Dry weight	176 kg (388 lb)	178 kg (392 lb)
Load limit (passenger and 10 kg (22 lb) luggage)	160 kg (352 lb)	
ADDITIONAL INFORMATION :		

CAPACITIES		SP (5870)	SPI (5872)
Fuel tank		34 L (9 U.S. gal)	
Impeller shaft reservoir	Capacity	65 mL (2.2 U.S. oz)	
	Oil level height	To bottom of cover hole	
Oil injection reservoir		4.5 L (1.2 U.S. gal)	
ADDITIONAL INFORMATION :			

MATERIALS	SP (5870)	SPI (5872)
Hull	Composite	
Air intake silencer	Thermoplastic	
Flame arrester	Multi-layer wire screen	
Exhaust muffler	Aluminum	
Steering padding	Thermoplastic elastomer with polystyrene foam	
Fuel tank	Polyethylene	
Oil injection reservoir	Polyethylene	
Seat	Polyurethane foam	
ADDITIONAL INFORMATION :		

STANDARD EQUIPMENT	SP (5870)	SPI (5872)
Safety lanyard	Standard	
Tool kit	Standard	
Fuel tank reserve	Standard	
Overheating warning device	Standard	
Electric fuel gauge	Optional	Standard
Injection oil pilot lamp	Optional	Standard
Tachometer	Optional	
Variable trim system (VTS)	Optional	
Reverse	Not applicable	
Storage compartment	Standard	
Rear grab handle	Optional	
Extinguisher holder	Standard	
ADDITIONAL INFORMATION :		

PERFORMANCE		SP (5870)	SPI (5872)
Estimated pump power		13.7 kW (18.4 hp)	15.1 kW (20.2 hp)
Maximum fuel consumption at wide open throttle		20.8 L/h (5.5 U.S. gal/h)	22.7 L/h (6 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour 45 minutes	1 hour 20 minutes
	Fuel tank reserve	20 minutes	13 minutes
ADDITIONAL INFORMATION :			

TIGHTENING TORQUES			SP (5870)	SPI (5872)	
ENGINE	Exhaust manifold screw		24 N•m	(17 lbf•ft)	(1)
	Magneto flywheel nut		105 N•m	(77 lbf•ft)	(1)
	Flywheel (PTO side)		110 N•m	(81 lbf•ft)	
	Crankcase screws	M6	9 N•m	(80 lbf•**in**)	(1)
		M8	24 N•m	(17 lbf•ft)	(3) (4)
	Crankcase / engine support nuts		35 N•m	(26 lbf•ft)	(1)
	Engine support / hull		25 N•m	(18 lbf•ft)	(1)
	Cylinder head screws		24 N•m	(17 lbf•ft)	(1) (4)
	Crankcase / cylinder screws		24 N•m	(17 lbf•ft)	(1) (4)
	Tuned pipe nut		25 N•m	(18 lbf•ft)	(1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft)	(1)
	Cylinder head cover screws		9 N•m	(80 lbf•**in**)	(1)
	Flame arrester screws		10 N•m	(88 lbf•**in**)	(1)
PUMP	Impeller		70 N•m	(52 lbf•ft)	(2)
	Pump / hull nuts		35 N•m	(26 lbf•ft)	(1)
	Venturi / pump housing screws		25 N•m	(18 lbf•ft)	(1)
	Nozzle / venturi screws		20 N•m	(15 lbf•ft)	(1)
	Pump housing cover screws		7 N•m	(62 lbf•**in**)	(1)
	Intake grill screws		8 N•m	(71 lbf•**in**)	(1)
	Ride shoe screws		10 N•m	(88 lbf•**in**)	(1)
STEERING	Cable retaining block bolts		6 N•m	(53 lbf•**in**)	
	Steering cable / stem arm bolt		3 N•m	(26 lbf•**in**)	
	Steering stem arm bolts		5 N•m	(44 lbf•**in**)	
	Handlebar clamp bolts		26 N•m	(19 lbf•ft)	
	Ball joint bolt		7 N•m	(62 lbf•**in**)	
	Front support bolts		15 N•m	(11 lbf•ft)	
	Rear support / cable bracket bolts		15 N•m	(11 lbf•ft)	(1)
ELECTRICAL	Ignition housing cover screws		5 N•m	(44 lbf•**in**)	
	Starter mounting screws		22 N•m	(16 lbf•ft)	(2)
	Starter lock nuts		7 N•m	(62 lbf•**in**)	
	Spark plugs		24 N•m	(17 lbf•ft)	(5)

ADDITIONAL INFORMATION : Apply where indicated ; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 515
(4) Synthetic grease
(5) Antiseize lubricant

◆ WARNING : Correct torques and use of Loctite must be strictly followed.

SPX AND XPI MODELS

ENGINE		SPX (5871)	XPI (5855)
Engine type		Bombardier-Rotax 657, water cooled	
Induction type		Rotary valve	
Exhaust system	Type	Water cooled, water injected	
	Water injection fittings	3.5 mm (.139 in)	
Starting system		Electric start	
Lubrication	Fuel / oil mixture	VROI (Variable Rate Oil Injection)	
	Oil injection pump	Gear driven	
	Oil type	SEA-DOO injection oil	
Number of cylinders		2	
Bore	Standard	78.0 mm (3.071 in)	
	First oversize	78.25 mm (3.081 in)	
	Second oversize	78.50 mm (3.091 in)	
Stroke		68 mm (2.68 in)	
Displacement		650 cm^3 (39.67 in^3)	
Compression ratio	Uncorrected	12.25 : 1	
	Corrected	6.9 : 1	
Engine maximum torque		78 N•m (58 lbf•ft) @ 6250 RPM	
Cylinder head warpage (maximum)		0.05 mm (.002 in)	
Piston ring type and quantity		1 Semi-trapez – 1 Rectangular	
Ring end gap	New	0.25 - 0.40 mm (.010 - .016 in)	
	Wear limit	1.00 mm (.039 in)	
Ring / piston groove clearance	New	0.05 - 0.08 mm (.002 - .003 in)	
	Wear limit	0.2 mm (.008 in)	
Piston / cylinder wall clearance	New	0.05 - 0.07 mm (.002 - .003 in)	
	Wear limit	0.15 mm (.006 in)	
Cylinder taper (maximum)		0.08 mm (.003 in)	
Cylinder out of round (maximum)		0.05 mm (.002 in)	
Connecting rod big end axial play	New	0.39 - 0.74 mm (.015 - .029 in)	
	Wear limit	1.2 mm (.047 in)	
Crankshaft deflection		0.08 mm (.003 in)	
Rotary valve timing	Opening	130° ± 5 BTDC	
	Closing	65° ± 5 ATDC	
Rotary valve duration		147°	
Crankcase / rotary valve gap		0.25 - 0.35 mm (.010 - .014 in)	
Connecting rod / crankshaft pin radial clearance	New	0.01 - 0.02 mm (.0004 - .0008 in)	
	Wear limit	0.050 mm (.002 in)	
Connecting rod / piston pin radial clearance	New	0.003 - 0.012 mm (.00012 - .00047 in)	
	Wear limit	0.015 mm (.00059 in)	
ADDITIONAL INFORMATION : Squish gap : 0.9 - 1.3 mm (.035 - .051 in).			

ELECTRICAL		SPX (5871)	XPI (5855)
Magneto generator output		160 W @ 6000 RPM or 7.2 A @ 2000 RPM	
Ignition system type		CDI	
Spark plug	Make and type	NGK BR8ES	
	Gap	0.5 mm (.020 in)	
Ignition timing (BTDC)	mm (in)	2.85 (.112)	
	Degrees	21° ± 1 ①	
Generating coil		40 - 76 Ω	
Battery charging coil		.05 - .6 Ω	
Ignition coil	Primary	.34 - .62 Ω	
	Secondary	9 - 15 kΩ	
Engine rev limiter setting		7000 (+100 / –50) RPM	
Battery		(Yuasa) 12 V, 19 A•h	
Fuse	Starting system	5 A	
	Charging system	15 A	

ADDITIONAL INFORMATION : ① Engine cold @ 6000 RPM.

CARBURETION		SPX (5871)	XPI (5855)
Carburetor	Type	Mikuni diaphragm BN-38	
	Quantity	2	
Main jet		125	
Pilot jet		60	
Adjustment	Low-speed screw	1-1/4 turn ± 1/4	
	High-speed screw	0	
	Idle speed (in water)	1400 RPM	
	Idle speed (out of water)	3000 RPM	
Fuel	Type	Regular unleaded gasoline	
	Octane no.	87 (Ron + Mon)/2	
Fuel return line orifice		MAG 3.0 mm (.118 in) PTO 0.5 mm (.020 in)	

ADDITIONAL INFORMATION :

COOLING	SPX (5871)	XPI (5855)
Type	Open circuit – Direct flow from jet propulsion unit	
Thermostat	None	
Overheating beeper setting	96-99°C (205-210°F)	

ADDITIONAL INFORMATION :

PROPULSION		SPX (5871)	XPI (5855)
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	
Oil type		SEA-DOO JET PUMP SYNTHETIC OIL Polyolester 75W90 GL5	
Steering nozzle pivoting angle		26°	
Trim nozzle pivoting angle		Not applicable	
Minimum required water level		90 cm (35 in)	
Drive shaft deflection (maximum)		0.5 mm (.020 in)	
Impeller outside diameter		139.5 mm (5.490 in)	
Impeller / wear ring clearance	New	0.18 - 0.44 mm (.007 - .017 in)	
	Wear limit	1.02 mm (.040 in)	
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)	
Impeller shaft side play		0.05 mm (.002 in)	
Impeller pitch / material		Progressive pitch 14°-22° / stainless steel	

ADDITIONAL INFORMATION : Do not mix different brands or oil types.

DIMENSIONS	SPX (5871)	XPI (5855)
Number of passenger (driver incl.)	2	
Overall length	256 cm (100.8 in)	
Overall width	105 cm (41.3 in)	
Overall height	92 cm (36.2 in)	
Dry weight	180 kg (397 lb)	187 kg (412 lb)
Load limit (passenger and 10 kg (22 lb) luggage)	160 kg (352 lb)	

ADDITIONAL INFORMATION :

CAPACITIES		SPX (5871)	XPI (5855)
Fuel tank		34 L (9 U.S. gal)	
Impeller shaft reservoir	Capacity	65 mL (2.2 U.S. oz)	
	Oil level height	To bottom of cover hole	
Oil injection reservoir		4.5 L (1.2 U.S. gal)	

ADDITIONAL INFORMATION :

MATERIALS	SPX (5871)	XPI (5855)
Hull	Composite	
Air intake silencer	Thermoplastic	
Flame arrester	Multi-layer wire screen	
Exhaust muffler	Aluminum	
Steering padding	Thermoplastic elastomer with polystyrene foam	
Fuel tank	Polyethylene	
Oil injection reservoir	Polyethylene	
Seat	Polyurethane foam	
ADDITIONAL INFORMATION :		

STANDARD EQUIPMENT	SPX (5871)	XPI (5855)
Safety lanyard	Standard	
Tool kit	Standard	
Fuel tank reserve	Standard	
Overheating warning device	Standard	
Electric fuel gauge	Standard	
Injection oil pilot lamp	Standard	
Tachometer	Optional	Standard
Variable trim system (VTS)	Optional	Standard
Reverse	Not applicable	
Storage compartment	Standard	
Rear grab handle	Standard	
Extinguisher holder	Standard	
ADDITIONAL INFORMATION :		

PERFORMANCE		SPX (5871)	XPI (5855)
Estimated pump power		20.5 kW (27 hp)	
Maximum fuel consumption at wide open throttle		29.5 L/h (7.8 U.S. gal/h)	
Cruising time at full throttle	Fuel tank without reserve	1 hour 5 minutes	
	Fuel tank reserve	10 minutes	
ADDITIONAL INFORMATION :			

TIGHTENING TORQUES			SPX (5871)	XPI (5855)
ENGINE	Exhaust manifold screw		24 N•m	(17 lbf•ft) (1)
	Magneto flywheel nut		105 N•m	(77 lbf•ft) (1)
	Flywheel (PTO side)		110 N•m	(81 lbf•ft)
	Crankcase screws	M6	9 N•m	(80 lbf•**in**) (1)
		M8	24 N•m	(17 lbf•ft) (3) (4)
	Crankcase / engine support nuts		35 N•m	(26 lbf•ft) (1)
	Engine support / hull		25 N•m	(18 lbf•ft) (1)
	Cylinder head screws		24 N•m	(17 lbf•ft) (1) (4)
	Crankcase / cylinder screws		24 N•m	(17 lbf•ft) (1) (4)
	Tuned pipe nut		25 N•m	(18 lbf•ft) (1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft) (1)
	Flame arrester screws		10 N•m	(88 lbf•**in**) (1)
PUMP	Impeller		70 N•m	(52 lbf•ft) (2)
	Pump / hull nuts		35 N•m	(26 lbf•ft) (1)
	Venturi / pump housing screws		25 N•m	(18 lbf•ft) (1)
	Nozzle / venturi screws		20 N•m	(15 lbf•ft) (1)
	Pump housing cover screws		7 N•m	(62 lbf•**in**) (1)
	Intake grill screws		8 N•m	(71 lbf•**in**) (1)
	Ride shoe screws		10 N•m	(88 lbf•**in**) (1)
STEERING	Cable retaining block bolts		6 N•m	(53 lbf•**in**)
	Steering cable / stem arm bolt		3 N•m	(26 lbf•**in**)
	Steering stem arm bolts		5 N•m	(44 lbf•**in**)
	Handlebar clamp bolts		26 N•m	(19 lbf•ft)
	Ball joint bolt		7 N•m	(62 lbf•**in**)
	Front support bolts		15 N•m	(11 lbf•ft)
	Rear support / cable bracket bolts		15 N•m	(11 lbf•ft) (1)
ELECTRICAL	Ignition housing cover screws		5 N•m	(44 lbf•**in**)
	Starter mounting screws		22 N•m	(16 lbf•ft) (2)
	Starter lock nuts		7 N•m	62 lbf•**in**)
	Spark plugs		24 N•m	(17 lbf•ft) (5)

ADDITIONAL INFORMATION : Apply where indicated ; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 515
(4) Synthetic grease
(5) Antiseize lubricant

◆ WARNING : Correct torques and use of Loctite must be strictly followed.

GTS AND GTX MODELS

ENGINE		GTS (5814)	GTX (5862)
Engine type		Bombardier-Rotax 587, water cooled	Bombardier-Rotax 657, water cooled
Induction type		Rotary valve	
Exhaust system	Type	Water cooled, water injected	
	Water injection fitting(s)	4.6 mm (.181 in)	3.5 mm (.139 in)
Starting system		Electric start	
Lubrication	Fuel / oil mixture	VROI (Variable Rate Oil Injection)	
	Oil injection pump	Gear driven	
	Oil type	SEA-DOO injection oil	
Number of cylinders		2	
Bore	Standard	76.0 mm (2.992 in)	78.0 mm (3.071 in)
	First oversize	76.25 mm (3.002 in)	78.25 mm (3.081 in)
	Second oversize	76.50 mm (3.012 in)	78.50 mm (3.091 in)
Stroke		64 mm (2.520 in)	68 mm (2.68 in)
Displacement		580.7 cm³ (35.4 in³)	650 cm³ (39.67 in³)
Compression ratio	Uncorrected	11.5 : 1	12.25 : 1
	Corrected	5.9 : 1	6.9 : 1
Engine maximum torque		68.5 N•m (51 lbf•ft) @ 5750 RPM	78 N•m (58 lbf•ft) @ 6250 RPM
Cylinder head warpage (maximum)		0.05 mm (.002 in)	
Piston ring type and quantity		1 Semi-Trapez – 1 Rectangular	
Ring end gap	New	0.25 - 0.40 mm (.010 - .016 in)	
	Wear limit	1.00 mm (.039 in)	
Ring / piston groove clearance	New	0.05 - 0.08 mm (.002 - .003 in)	
	Wear limit	0.2 mm (.008 in)	
Piston / cylinder wall clearance	New	0.05 - 0.07 mm (.002 - .003 in)	
	Wear limit	0.2 mm (.008 in)	0.15 mm (.006 in)
Cylinder taper (maximum)		0.08 mm (.003 in)	
Cylinder out of round (maximum)		0.05 mm (.002 in)	
Connecting rod big end axial play	New	0.39 - 0.74 mm (.015 - .029 in)	
	Wear limit	1.2 mm (.047 in)	
Crankshaft deflection		0.08 mm (.003 in)	
Rotary valve timing	Opening	130° ± 5 BTDC	
	Closing	65° ± 5 ATDC	
Rotary valve duration		147°	
Crankcase / rotary valve gap		0.25 - 0.35 mm (.010 - .014 in)	
Connecting rod / crankshaft pin radial clearance	New	0.20 - 0.033 mm (.0008 - .0013 in)	0.01 - 0.02 mm (.0004 - .0008 in)
	Wear limit	0.050 mm (.002 in)	
Connecting rod / piston pin radial clearance	New	0.003 - 0.012 mm (.00012 - .00047 in)	
	Wear limit	0.015 mm (.00059 in)	
ADDITIONAL INFORMATION : Squish gap : 587 engine : 1.3 - 1.7 mm (.051 - .067 in) 657 engine : 0.9 - 1.3 mm (.035 - .051 in)			

ELECTRICAL		GTS (5814)	GTX (5862)
Magneto generator output		160 W @ 6000 RPM or 7.2 A @ 2000 RPM	
Ignition system type		CDI	
Spark plug	Make and type	NGK BR7ES	NGK BR8ES
	Gap	0.5 mm (.020 in)	
Ignition timing (BTDC)	mm (in)	2.65 (.104)	2.85 (.112)
	Degrees	21° ± 1 ①	
Generating coil		40 - 76 Ω	
Battery charging coil		.05 - .6 Ω	
Ignition coil	Primary	.34 - .62 Ω	
	Secondary	9 - 15 kΩ	
Engine rev limiter setting		6550 ±100 RPM	7000 (+100 / –50) RPM
Battery		(Yuasa) 12 V, 19 A•h	
Fuse	Starting system	5 A	
	Charging system	15 A	

ADDITIONAL INFORMATION : ① Engine cold @ 6000 RPM.

CARBURETION		GTS (5814)	GTX (5862)
Carburetor	Type	Mikuni diaphragm BN-38	
	Quantity	1	2
Main jet		147.5	125
Pilot jet		65	60
Adjustment	Low-speed screw	1 turn ± 1/4	1-1/4 turn ± 1/4
	High-speed screw	0	
	Idle speed (in water)	1400 RPM	
	Idle speed (out of water)	2500 RPM	2800 RPM
Fuel	Type	Regular unleaded gasoline	
	Octane no.	87 (Ron + Mon)/2	
Fuel return line orifice		PTO 0.5 mm (.020 in)	MAG 3.0 mm (.118 in) PTO 0.5 mm (.020 in)

ADDITIONAL INFORMATION :

COOLING	GTS (5814)	GTX (5862)
Type	Open circuit – Direct flow from jet propulsion unit	
Thermostat	None	
Overheating beeper setting	96-99°C (205-210°F)	

ADDITIONAL INFORMATION :

PROPULSION		GTS (5814)	GTX (5862)
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	
Oil type		SEA-DOO JET PUMP SYNTHETIC OIL Polyolester 75W90 GL5	
Steering nozzle pivoting angle		26°	
Trim nozzle pivoting angle		Not applicable	
Minimum required water level		90 cm (35 in)	
Drive shaft deflection (maximum)		0.5 mm (.020 in)	
Impeller outside diameter		139.5 mm (5.490 in)	
Impeller / wear ring clearance	New	0.18 - 0.44 mm (.007 - .017 in)	
	Wear limit	1.02 mm (.040 in)	
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)	
Impeller shaft side play		0.05 mm (.002 in)	
Impeller pitch / material		Progressive pitch 14°-20° / stainless steel	Progressive pitch 15°-21° / stainless steel
ADDITIONAL INFORMATION : Do not mix different brands or oil types.			

DIMENSIONS	GTS (5814)	GTX (5862)
Number of passenger (driver incl.)	3	
Overall length	302 cm (119.0 in)	
Overall width	119 cm (46.8 in)	
Overall height	95 cm (37.4 in)	
Dry weight	210 kg (463 lb)	220 kg (485 lb)
Load limit (passenger and 10 kg (22 lb) luggage)	225 kg (496 lb)	
ADDITIONAL INFORMATION :		

CAPACITIES		GTS (5814)	GTX (5862)
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	
Oil injection reservoir		2.8 L (95 U.S. fl oz)	
ADDITIONAL INFORMATION :			

MATERIALS	GTS (5814)	GTX (5862)
Hull	Composite	
Air intake silencer	Thermoplastic	
Flame arrester	Multi-layer wire screen	
Exhaust muffler	Aluminum	
Steering padding	Thermoplastic elastomer with polystyrene foam	
Fuel tank	Polyethylene	
Oil injection reservoir	Polyethylene	
Seat	Polyurethane foam	
ADDITIONAL INFORMATION :		

STANDARD EQUIPMENT	GTS (5814)	GTX (5862)
Safety lanyard	Standard	
Tool kit	Standard	
Fuel tank reserve	Standard	
Overheating warning device	Standard	
Electric fuel gauge	Optional	Standard
Injection oil pilot lamp	Optional	Standard
Tachometer	Optional	
Speedometer	Optional	Standard
Variable trim system (VTS)	Not applicable	
Reverse	Standard	
Storage compartment	Standard	
Rear grab handle	Standard	
Extinguisher holder	Standard	
ADDITIONAL INFORMATION :		

PERFORMANCE		GTS (5814)	GTX (5862)
Estimated pump power		15.1 kW (20.2 hp)	20.5 kW (27 hp)
Maximum fuel consumption at wide open throttle		27.7 L/h (6 U.S. gal/h)	29.5 L/h (7.8 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour 20 minutes	1 hour 5 minutes
	Fuel tank reserve	13 minutes	10 minutes
ADDITIONAL INFORMATION :			

TIGHTENING TORQUES			GTS (5814)	GTX (5862)
ENGINE	Exhaust manifold screws		24 N•m	(17 lbf•ft) (1)
	Magneto flywheel nut		105 N•m	(77 lbf•ft) (1)
	Flywheel (PTO side)		110 N•m	(81 lbf•ft)
	Crankcase screws	M6	10 N•m	(88 lbf•in) (1)
		M8	24 N•m	(17 lbf•ft) (1) (4)
	Crankcase / engine support nuts		35 N•m	(26 lbf•ft) (1)
	Engine support / hull		25 N•m	(18 lbf•ft) (1)
	Cylinder head screws		24 N•m	(17 lbf•ft) (1) (4)
	Cylinder head cover screws (GTS)		9 N•m	(80 lbf•in) (1)
	Crankcase / cylinder screws		24 N•m	(17 lbf•ft) (1) (4)
	Tuned pipe nut		25 N•m	(18 lbf•ft) (1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft) (1)
	Flame arrester screws		10 N•m	(88 lbf•in) (1)
PUMP	Impeller		70 N•m	(52 lbf•ft) (2)
	Pump / hull nuts		35 N•m	(26 lbf•ft) (1)
	Venturi / pump housing screws		25 N•m	(18 lbf•ft) (1)
	Nozzle / venturi screws		20 N•m	(15 lbf•ft) (1)
	Pump housing cover screws		7 N•m	(62 lbf•in) (1)
	Intake grill screws		8 N•m	(71 lbf•in) (1)
	Ride shoe screws		10 N•m	(88 lbf•in) (1)
STEERING	Steering cable jam nuts		10 N•m	(88 lbf•in)
	Steering support / collar screws		15 N•m	(11 lbf•ft) (2)
	Steering stem screw		40 N•m	(30 lbf•ft) (2)
	Handlebar nuts		26 N•m	(19 lbf•ft)
	Reverse gate screws		20 N•m	(15 lbf•ft)
	Steering / cable ball joint nut		7 N•m	62 lbf•in)
	Reverse cable ball joint nut		7 N•m	62 lbf•in)
ELECTRICAL	Ignition housing cover screws		4 N•m	(35 lbf•in)
	Starter mounting screws		22 N•m	(16 lbf•ft) (2)
	Starter lock nuts		6 N•m	(53 lbf•in)
	Spark plugs		24 N•m	(17 lbf•ft) (5)

ADDITIONAL INFORMATION : Apply where indicated ; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 515
(4) Synthetic grease
(5) Antiseize lubricant

◆ WARNING : Correct torques and use of Loctite must be strictly followed.

XP MODEL

ENGINE		XP (5854)
Engine type		Bombardier-Rotax 657 X, water cooled
Induction type		Rotary valve
Exhaust system	Type	Water cooled, water injected
	Water injection fittings	3.5 mm (.139 in)
Starting system		Electric start
Lubrication	Fuel / oil mixture	VROI (Variable Rate Oil Injection)
	Oil injection pump	Gear driven
	Oil type	SEA-DOO injection oil
Number of cylinders		2
Bore	Standard	78.0 mm (3.071 in)
	First oversize	78.25 mm (3.081 in)
	Second oversize	78.50 mm (3.091 in)
Stroke		68 mm (2.68 in)
Displacement		650 cm^3 (39.67 in^3)
Compression ratio	Uncorrected	12.25 : 1
	Corrected	6.4 : 1
Engine maximum torque		85 N•m (63 lbf•ft) @ 6250 RPM
Cylinder head warpage (maximum)		0.05 mm (.002 in)
Piston ring type and quantity		1 Semi-Trapez – 1 Rectangular
Ring end gap	New	0.25 - 0.40 mm (.010 - .016 in)
	Wear limit	1.00 mm (.039 in)
Ring / piston groove clearance	New	0.05 - 0.08 mm (.002 - .003 in)
	Wear limit	0.2 mm (.008 in)
Piston / cylinder wall clearance	New	0.05 - 0.07 mm (.002 - .003 in)
	Wear limit	0.15 mm (.006 in)
Cylinder taper (maximum)		0.08 mm (.003 in)
Cylinder out of round (maximum)		0.05 mm (.002 in)
Connecting rod big end axial play	New	0.39 - 0.74 mm (.015 - .029 in)
	Wear limit	1.2 mm (.047 in)
Crankshaft deflection		0.08 mm (.003 in)
Rotary valve timing	Opening	149° ± 5 BTDC
	Closing	65° ± 5 ATDC
Rotary valve duration		158°
Crankcase / rotary valve gap		0.25 - 0.35 mm (.010 - .014 in)
Connecting rod / crankshaft pin radial clearance	New	0.01 - 0.02 mm (.0004 - .0008 in)
	Wear limit	0.050 mm (.002 in)
Connecting rod / piston pin radial clearance	New	0.003 - 0.012 mm (.00012 - .00047 in)
	Wear limit	0.015 mm (.00059 in)
ADDITIONAL INFORMATION : Squish gap : 0.9 - 1.3 mm (.035 - .051 in).		

ELECTRICAL		XP (5854)
Magneto generator output		160 W @ 6000 RPM or 7.2 A @ 2000 RPM
Ignition system type		CDI
Spark plug	Make and type	NGK BR8ES
	Gap	0.5 mm (.020 in)
Ignition timing (BTDC)	mm (in)	2.59 (.102)
	Degrees	20° ± 1 ①
Generating coil	Low speed	120 - 180 Ω
	High speed	2.8 - 4.2 Ω
Battery charging coil		.21 - .31 Ω
Ignition coil	Primary	.23 - .43 Ω
	Secondary	3.85 - 7.15 kΩ
Engine rev limiter setting		7000 (+100 / –50) RPM
Battery		(Yuasa) 12 V, 19 A•h
Fuse	Starting system	5 A
	Charging system	15 A
	VTS system	15 A
ADDITIONAL INFORMATION : ① Engine cold @ 6000 RPM.		

CARBURETION		XP (5854)
Carburetor	Type	Mikuni diaphragm BN-38
	Quantity	2
Main jet		132.5
Pilot jet		75
Adjustment	Low-speed screw	1-1/4 turn ± 1/4
	High-speed screw	0
	Idle speed (in water)	1500 RPM
	Idle speed (out of water)	3100 RPM
Fuel	Type	Regular unleaded gasoline
	Octane no.	87 (Ron + Mon)/2
Fuel return line orifice		MAG 3.0 mm (.118 in) PTO 0.5 mm (.020 in)
ADDITIONAL INFORMATION :		

COOLING	XP (5854)
Type	Open circuit – Direct flow from jet propulsion unit
Thermostat	None
Overheating beeper setting	96-99°C (205-210°F)
ADDITIONAL INFORMATION :	

PROPULSION		XP (5854)
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
Oil type		SEA-DOO JET PUMP SYNTHETIC OIL Polyolester 75W90 GL5
Steering nozzle pivoting angle		26°
Trim nozzle pivoting angle		± 10°
Minimum required water level		90 cm (35 in)
Drive shaft deflection (maximum)		0.5 mm (.020 in)
Impeller outside diameter		139.5 mm (5.490 in)
Impeller / wear ring clearance	New	0.18 - 0.44 mm (.007 - .017 in)
	Wear limit	1.02 mm (.040 in)
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)
Impeller shaft side play		0.05 mm (.002 in)
Impeller pitch / material		Progressive pitch 16°-24° / stainless steel

ADDITIONAL INFORMATION : Do not mix different brands or oil types.

DIMENSIONS	XP (5854)
Number of passenger (driver incl.)	2
Overall length	256 cm (100.8 in)
Overall width	105 cm (41.5 in)
Overall height	92 cm (36.2 in)
Dry weight	187 kg (412 lb)
Load limit (passengers and 10 kg (22 lb) luggage)	160 kg (352 lb)

ADDITIONAL INFORMATION :

CAPACITIES		XP (5854)
Fuel tank		34 L (9 U.S. gal)
Impeller shaft reservoir	Capacity	65 mL (2.2 U.S. oz)
	Oil level height	To bottom of cover hole
Oil injection reservoir		4.5 L (1.2 U.S. gal)

ADDITIONAL INFORMATION :

MATERIALS	XP (5854)
Hull	Composite
Air intake silencer	Thermoplastic
Flame arrester	Multi-layer wire screen
Exhaust muffler	Aluminum
Steering padding	Thermoplastic elastomer with polystyrene foam
Fuel tank	Polyethylene
Oil injection reservoir	Polyethylene
Seat	Polyurethane foam
ADDITIONAL INFORMATION :	

STANDARD EQUIPMENT	XP (5854)
Safety lanyard	Standard
Tool kit	Standard
Fuel tank reserve	Standard
Overheating warning device	Standard
Electric fuel gauge	Standard
Injection oil pilot lamp	Standard
Tachometer	Standard
Speedometer	Optional
Variable trim system (VTS)	Standard
Reverse	Not applicable
Storage compartment	Standard
Rear grab handle	Standard
Extinguisher holder	Standard
ADDITIONAL INFORMATION :	

PERFORMANCE		XP (5854)
Estimated pump power		23.2 kW (31 hp)
Maximum fuel consumption at wide open throttle		33.4 L/h (8.8 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	55 minutes
	Fuel tank reserve	8 minutes
ADDITIONAL INFORMATION :		

TIGHTENING TORQUES			XP (5854)		
ENGINE	Exhaust manifold screw		24 N•m	(17 lbf•ft)	(1)
	Magneto flywheel nut		105 N•m	(77 lbf•ft)	(1)
	Flywheel (PTO side)		110 N•m	(81 lbf•ft)	
	Crankcase screws	M6	9 N•m	(80 lbf•**in**)	(1)
		M8	24 N•m	(17 lbf•ft)	(3) (4)
	Crankcase / engine support nuts		35 N•m	(26 lbf•ft)	(1)
	Engine support / hull		25 N•m	(18 lbf•ft)	(1)
	Cylinder head screws		24 N•m	(17 lbf•ft)	(1) (4)
	Crankcase / cylinder screws		24 N•m	(17 lbf•ft)	(1) (4)
	Tuned pipe nut		25 N•m	(18 lbf•ft)	(1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft)	(1)
	Flame arrester screws		10 N•m	(88 lbf•**in**)	(1)
PUMP	Impeller		70 N•m	(52 lbf•ft)	(2)
	Pump / hull nuts		35 N•m	(26 lbf•ft)	(1)
	Venturi / pump housing screws		25 N•m	(18 lbf•ft)	(1)
	Nozzle / venturi screws		20 N•m	(15 lbf•ft)	(1)
	Pump housing cover screws		7 N•m	(62 lbf•**in**)	(1)
	Intake grill screws		8 N•m	(71 lbf•**in**)	(1)
	Ride shoe screws		10 N•m	(88 lbf•**in**)	(1)
STEERING	Cable retaining block bolts		6 N•m	(53 lbf•**in**)	
	Steering cable / stem arm bolt		3 N•m	(26 lbf•**in**)	
	Steering stem arm bolts		5 N•m	(44 lbf•**in**)	
	Handlebar clamp bolts		26 N•m	(19 lbf•ft)	
	Ball joint bolt		7 N•m	(62 lbf•**in**)	
	Front support bolts		15 N•m	(11 lbf•ft)	
	Rear support / cable bracket bolts		15 N•m	(11 lbf•ft)	(1)
ELECTRICAL	Ignition housing cover screws		5 N•m	(44 lbf•**in**)	
	Starter mounting screws		22 N•m	(16 lbf•ft)	(2)
	Starter lock nuts		7 N•m	(62 lbf•**in**)	
	Spark plugs		24 N•m	(17 lbf•ft)	

ADDITIONAL INFORMATION : Apply where indicated ; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 515
(4) Synthetic grease
(5) Antiseize lubricant

◆ WARNING : Correct torques and use of Loctite must be strictly followed.

EXPLORER MODEL

ENGINE		EXPLORER (5821)
Engine type		Bombardier-Rotax 657, water cooled
Induction type		Rotary valve
Exhaust system	Type	Water cooled, water injected
	Water injection fittings	3.5 mm (.139 in)
Starting system		Electric start
Lubrication	Fuel / oil mixture	VROI (Variable Rate Oil Injection)
	Oil injection pump	Gear driven
	Oil type	SEA-DOO injection oil
Number of cylinders		2
Bore	Standard	78.0 mm (3.071 in)
	First oversize	78.25 mm (3.081 in)
	Second oversize	78.50 mm (3.091 in)
Stroke		68 mm (2.68 in)
Displacement		650 cm^3 (39.67 in^3)
Compression ratio	Uncorrected	12.25 : 1
	Corrected	6.9 : 1
Engine maximum torque		78 N•m (58 lbf•ft) @ 6250 RPM
Cylinder head warpage (maximum)		0.05 mm (.002 in)
Piston ring type and quantity		1 Semi-Trapez – 1 Rectangular
Ring end gap	New	0.25 - 0.40 mm (.010 - .016 in)
	Wear limit	1.00 mm (.039 in)
Ring / piston groove clearance	New	0.05 - 0.08 mm (.002 - .003 in)
	Wear limit	0.2 mm (.008 in)
Piston / cylinder wall clearance	New	0.05 - 0.07 mm (.002 - .003 in)
	Wear limit	0.15 mm (.006 in)
Cylinder taper (maximum)		0.08 mm (.003 in)
Cylinder out of round (maximum)		0.05 mm (.002 in)
Connecting rod big end axial play	New	0.39 - 0.74 mm (.015 - .029 in)
	Wear limit	1.2 mm (.047 in)
Crankshaft deflection		0.08 mm (.003 in)
Rotary valve timing	Opening	130° ± 5 BTDC
	Closing	65° ± 5 ATDC
Rotary valve duration		147°
Crankcase / rotary valve gap		0.25 - 0.35 mm (.010 - .014 in)
Connecting rod / crankshaft pin radial clearance	New	0.01 - 0.02 mm (.0004 - .0008 in)
	Wear limit	0.050 mm (.002 in)
Connecting rod / piston pin radial clearance	New	0.003 - 0.012 mm (.00012 - .00047 in)
	Wear limit	0.015 mm (.00059 in)
ADDITIONAL INFORMATION : Squish gap : 0.9 - 1.3 mm (.035 - .051 in).		

ELECTRICAL		EXPLORER (5821)
Magneto generator output		160 W @ 6000 RPM or 7.2 A @ 2000 RPM
Ignition system type		CDI
Spark plug	Make and type	NGK BR8ES
	Gap	0.5 mm (.020 in)
Ignition timing (BTDC)	mm (in)	2.85 (.112)
	Degrees	21° ± 1 ①
Generating coil		40 - 76 Ω
Battery charging coil		.05 - .6 Ω
Ignition coil	Primary	.34 - .62 Ω
	Secondary	9 - 15 kΩ
Engine rev limiter setting		7000 (+100 / –50) RPM
Battery		(Yuasa) 12 V, 19 A•h
Fuse	Starting system	5 A
	Charging system	15 A
	Blower system	5 A
ADDITIONAL INFORMATION : ① Engine cold @ 6000 RPM.		

CARBURETION		EXPLORER (5821)
Carburetor	Type	Mikuni diaphragm BN-38
	Quantity	2
Main jet		125
Pilot jet		60
Adjustment	Low-speed screw	1-1/4 turn ± 1/4
	High-speed screw	0
	Idle speed (in water)	1400 RPM
	Idle speed (out of water)	2800 RPM
Fuel	Type	Regular unleaded gasoline
	Octane no.	87 (Ron + Mon)/2
Fuel return line orifice		MAG 3.0 mm (.118 in) PTO 0.5 mm (.020 in)
ADDITIONAL INFORMATION :		

COOLING	EXPLORER (5821)
Type	Open circuit – Direct flow from jet propulsion unit
Thermostat	None
Overheating beeper setting	96-99°C (205-210°F)
ADDITIONAL INFORMATION :	

PROPULSION		EXPLORER (5821)
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
Oil type		SEA-DOO JET PUMP SYNTHETIC OIL Polyolester 75W90 GL5
Steering nozzle pivoting angle		26°
Trim nozzle pivoting angle		Not applicable
Minimum required water level		90 cm (35 in)
Drive shaft deflection (maximum)		0.5 mm (.020 in)
Impeller outside diameter		139.5 mm (5.490 in)
Impeller / wear ring clearance	New	0.18 - 0.44 mm (.007 - .017 in)
	Wear limit	1.02 mm (.040 in)
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)
Impeller shaft side play		0.05 mm (.002 in)
Impeller pitch / material		Progressive pitch 15°-21° / stainless steel
ADDITIONAL INFORMATION : Do not mix different brands or oil types.		

DIMENSIONS	EXPLORER (5821)
Number of passenger (driver incl.)	5
Overall length	396 cm (156 in)
Overall width	206 cm (81 in)
Overall height	119 cm (46.8 in)
Weight	323 kg (712 lb)
Load limit (passengers and 10 kg (22 lb) luggage)	475 kg (1050 lb)
ADDITIONAL INFORMATION :	

CAPACITIES		EXPLORER (5821)
Fuel tank		48 L (12.7 U.S. gal)
Impeller shaft reservoir	Capacity	65 mL (2.2 U.S. oz)
	Oil level height	To bottom of cover hole
Oil injection reservoir		4.5 L (1.2 U.S. gal)
ADDITIONAL INFORMATION :		

MATERIALS	EXPLORER (5821)
Hull	Composite
Air intake silencer	Thermoplastic
Flame arrester	Multi-layer wire screen
Exhaust muffler	Aluminum
Steering padding	Thermoplastic elastomer with polystyrene foam
Fuel tank	Polyethylene
Oil injection reservoir	Polyethylene
Seat	Polyurethane foam
Inflatable tube	Hypalon neoprene, polyester reinforced
ADDITIONAL INFORMATION :	

STANDARD EQUIPMENT	EXPLORER (5821)
Safety lanyard	Standard
Tool kit	Standard
Fuel tank reserve	Standard
Overheating warning device	Standard
Electric fuel gauge	Standard
Injection oil pilot lamp	Standard
Tachometer	Optional
Variable trim system (VTS)	Not applicable
Reverse	Standard
Storage compartment (front and rear)	Standard
Rear grab handle	Standard
Extinguisher holder	Standard
ADDITIONAL INFORMATION :	

PERFORMANCE		EXPLORER (5821)
Estimated pump power		20.5 kW (27 hp)
Maximum fuel consumption at wide open throttle		29.5 L/h (7.8 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour 5 minutes
	Fuel tank reserve	10 minutes
ADDITIONAL INFORMATION :		

TIGHTENING TORQUES			EXPLORER (5821)		
ENGINE	Exhaust manifold screws		24 N•m	(17 lbf•ft)	(1)
	Magneto flywheel nut		105 N•m	(77 lbf•ft)	(1)
	Flywheel (PTO side)		110 N•m	(81 lbf•ft)	
	Crankcase screws	M6	10 N•m	(88 lbf•**in**)	(1)
		M8	24 N•m	(17 lbf•ft)	(3) (4)
	Crankcase / engine support nuts		35 N•m	(26 lbf•ft)	(1)
	Engine support / hull		25 N•m	(18 lbf•ft)	(1)
	Cylinder head screws		24 N•m	(17 lbf•ft)	(1) (4)
	Crankcase / cylinder screws		24 N•m	(17 lbf•ft)	(1) (4)
	Tuned pipe nut		25 N•m	(18 lbf•ft)	(1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft)	(1)
	Flame arrester screws		10 N•m	(88 lbf•**in**)	(1)
PUMP	Impeller		70 N•m	(52 lbf•ft)	(2)
	Pump / hull nuts		35 N•m	(26 lbf•ft)	(1)
	Venturi / pump housing screws		25 N•m	(18 lbf•ft)	(1)
	Nozzle / venturi screws		20 N•m	(15 lbf•ft)	(1)
	Pump housing cover screws		7 N•m	(62 lbf•**in**)	(1)
	Intake grill screws		8 N•m	(71 lbf•**in**)	(1)
	Ride shoe screws		10 N•m	(88 lbf•**in**)	(1)
STEERING	Steering cable jam nuts		10 N•m	(88 lbf•**in**)	
	Steering support collar screws		15 N•m	(11 lbf•ft)	(1)
	Steering stem screw		40 N•m	(30 lbf•ft)	(2)
	Handlebar nuts		26 N•m	(19 lbf•ft)	
	Reverse gate screws		20 N•m	(15 lbf•ft)	
	Steering cable ball joint nut		7 N•m	(62 lbf•**in**)	
	Reverse cable ball joint nut		7 N•m	(62 lbf•**in**)	
ELECTRICAL	Ignition housing cover screws		4 N•m	(35 lbf•**in**)	
	Starter mounting screws		22 N•m	(16 lbf•ft)	(2)
	Starter lock nuts		6 N•m	(53 lbf•**in**)	
	Spark plugs		24 N•m	(17 lbf•ft)	(5)

ADDITIONAL INFORMATION : Apply where indicated ; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 515
(4) Synthetic grease
(5) Antiseize lubricant

◆ WARNING : Correct torques and use of Loctite must be strictly followed.

TROUBLESHOOTING

The following chart is provided to help in diagnosing the probable source of troubles. It is a guideline and should not be assumed to have all causes for all problems.

ENGINE WILL NOT START

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Engine does not turn over	• Safety lanyard cap worn or removed • Burnt 5 A fuse • 5 A fuse keeps on burning • Discharged battery • Battery connections • Water / fuel hydrolock • Starter or solenoid • Seized engine • Seized jet pump • Jammed pump	• Replace / reinstall • Check wiring then replace fuse • Check wiring then replace MPEM and 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	• Discharged / weak battery • Restriction in jet pump • Seizure in jet pump • Seal carrier seizure • Partial engine hydrolock • Partial engine seizure • Worn starter • Wear ring improperly installed	• 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 • Check, refer to section 07-04 • Check / replace, refer to section 08-01
Engine turns over	• Fuel tank empty • Fuel water-contaminated • Dirty fuel filter • Fouled spark plugs • Water in engine • Misuse of choke (fuel flooded) • Carburetion • Ignition • Engine flooded — Needle valve stuck open • Choke(s) not closing completely • Excessive rotary valve clearance • Internal engine damage • Sheared flywheel key • Incorrect rotary valve timing	• 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 • Adjust for complete closure • Check, refer to section 03-06 • Check, refer to section 03-03 and 03-05 • Check timing mark, refer to section 07-02 • Check, refer to section 03-06

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Engine turns over (cont'd) • No spark at spark plugs • Sparks occur at spark plugs when disconnecting BLACK / RED or WHITE wire from MPEM • MPEM BLACK and BLACK / RED or WHITE wires have a close circuit (0 reading on ohmmeter) • Fuel / oil gauge and tachometer give a reading while cranking	• MPEM BLACK / RED or WHITE wire has touched a positive terminal (as the solenoid post)	• Replace MPEM

ENGINE MISFIRES, RUNS IRREGULARLY

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	• Fouled, defective, worn spark plugs • Faulty rev limiter / stop switch • Faulty ignition • Sheared flywheel key	• Check / verify heat range / gap / replace • Check, refer to section 07-06 • Check, refer to section 07-06 • Check timing mark, refer to section 07-02
Lean fuel mixture Dry spark plug (except when water fouled)	• Fuel level low • Stale or water fouled fuel • Fuel filter dirty or restricted • Carburetion dirty or out of adjustment • Leaking crankshaft seal(s), rotary valve cover O-ring(s) • Fuel valve restricted • Loose carburetor	• 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 and 03-06 • Check / replace • Tighten carburetor(s)
Rich fuel mixture Fouled spark plug	• 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 • Worn needle(s) and seat(s) • Excessive rotary valve clearance	• 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 • Check, refer to section 05-03 • Check, refer to section 03-06
Difficult to start	• Incorrect rotary valve timing • Excessive rotary valve clearance	• Check / adjust, refer to section 03-06 • Check, refer to section 03-06

Section 13 TROUBLESHOOTING

ENGINE OVERHEATS

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Overheating beeper sounds	• Restricted jet pump water intake • Cooling system restriction • Grounded temperature sensor or sensor wire	• Check / clean • Check / flush, refer to section 04-03 • Check / repair / replace

ENGINE CONTINUALLY BACKFIRES

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	• Fouled, defective spark plugs • Rev limiter malfunction	• Clean / replace • Check / replace, refer to section 07-06
Ignition timing	• Incorrect setting • Flywheel key sheared	• Check / reset, refer to section 07-02 • Check / replace
Rotary valve	• Timing incorrect	• Check / reset, refer to section 03-06
Carburetor	• Carburetion too lean	• Check / adjust, refer to section 05-03
Engine	• Intake leak / crankshaft seal failure	• Pressure check engine to 48 kPa (7 PSI)

ENGINE DETONATION OR PINGING

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Ignition	• Timing too far advanced • Spark plug heat range too high	• Check / reset • Check / change to correct range
Engine temperature	• Engine overheating • Poor quality fuel	• Check, refer to section 03-01 and 04-01 or to engine overheat • Use good quality fuel

ENGINE LACKS ACCELERATION OR POWER

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	• Weak spark	• Check / replace, refer to section 07-06
	• Carburetion, jetting too rich / lean	• Check / adjust, refer to section 05-03
	• Throttle does not open fully	• Check / readjust
	• Low compression	• Check / repair, refer to section 03-03
	• Exhaust system restriction	• Check / clean
	• Water in gas or oil	• Check / siphon / replace
	• Debris in needle valve	• Check / clean, refer to section 05-03
	• Impeller trailing edge damaged	• Check / replace, refer to section 08-01
	• Twisted crankshaft	• Check, refer to section 03-05

ENGINE RUNS TOO FAST

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Engine RPM too high	• Faulty rev limiter • Improper impeller pitch (too low)	• Check, refer to section 07-06 • Check / replace, refer to section 08-01
Jet pump cavitation	• Damaged leading or trailing edge of impeller	• Check / replace NOTE : Leading edge damage contributes to poor performance from start. Trailing edge damage contributes to poor top performance and stator vanes erosion.
Jet pump ventilation	• Pump housing or ride shoe air leak	• Check / reseal, refer to section 08-01

ABNORMAL NOISE FROM PROPULSION SYSTEM

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	• Weeds / debris caught in pump intake or impeller	• Check / clean
	• Low oil level in pump housing	• Check / troubleshoot source of leak / refill supply, refer to section 08-01
	• Damaged or bent drive shaft	• Check / replace, refer to section 08-01
	• Broken motor mounts	• Check / replace, refer to section 03-02
	• Rusted / worn hull seal carrier	• Check / repair, refer to section 08-01