SEA-DOO®

Shop Manual

1998

GS
5626
5844

GTS
5819

GSX Limited
5629
5845

GTI
5836
5841

GTX Limited
5837
5842

XP Limited
5665
5667

SPX
5838
5839

219 100 068

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Printed in Canada

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TABLE OF CONTENTS

SAFETY NOTICE

This manual was primarily published to be used by watercraft technicians trained by the manufacturer who are already familiar with all service and maintenance procedures relating to Bombardier made Sea-Doo watercraft.

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

It is understood that this manual may be translated into another language. In the event of any discrepancy, the English version shall prevail.

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

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

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

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

◆ WARNING

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

▼ CAUTION

Denotes an instruction which, if not followed, could severely damage watercraft components.

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

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

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

WHAT'S NEW

SERVICE TOOLS AND PRODUCTS 01

• Complete new section.

MAGNETO SYSTEM 04-04

• New procedure to lock crankshaft on the 947 engine.

REMOVAL AND INSTALLATION 04-03

• New service tool for engine alignment procedure.

TOP END 04-05

• New service tool to extract the piston pin for all engines.
• New piston/cylinder wall and ring end gap clearances.
• New service tool to install dogleg circlip on the 947 engine.
• New RAVE valve adjustment on the 787 engine.

BOTTOM END 04-06

• New service tools for PTO flywheel removal and installation on the 947 engine.

CARBURETOR 06-04

• Carburetors on the 947 engine are rotated 180°. There is a new calibration and the diaphragms are opened all the time to the atmosphere. There is no more need for a throttle position switch, amplifier and solenoid.
• Use of Loctite 242 (blue) to carburetor mounting screws is replaced by Loctite 577 on all models.

OIL INJECTION PUMP 07-03

• New oil injection pump cable for the 947 engine.

IGNITION SYSTEM 08-03

• New testing procedures using a multimeter.

CHARGING SYSTEM 08-04

• New testing procedures using a multimeter.

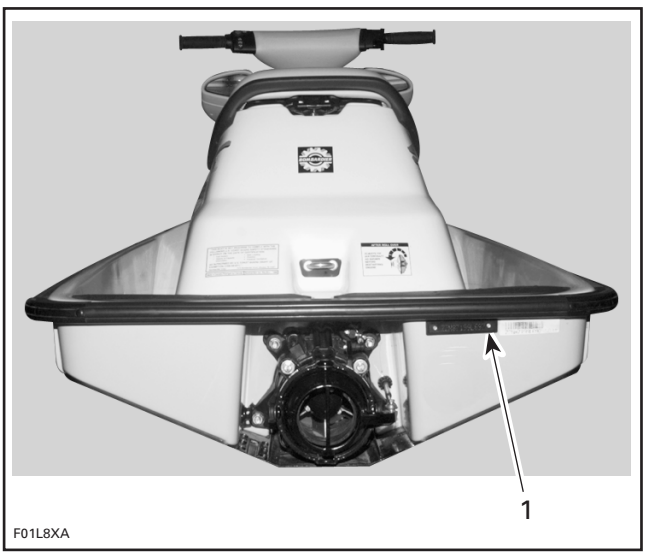
INTRODUCTION

This *Shop Manual* covers BOMBARDIER made SEA-DOO® watercraft models SPX 5838/5839, GS 5626/5844, GSX Limited 5629/5845, XP Limited 5665/5667, GTS 5819, GTI 5836/5841and GTX Limited 5837/5842.

HULL IDENTIFICATION NUMBER (H.I.N.)

SPX and GTS Models

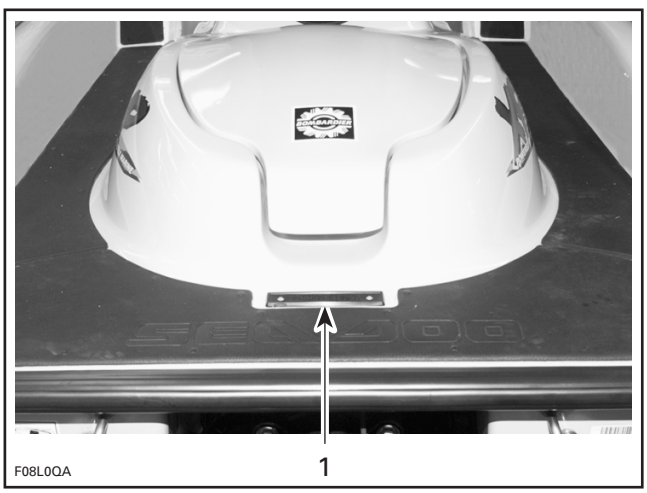
It is located at right hand rear side of hull.



1. Hull Identification Number (H.I.N.)

All Other Models

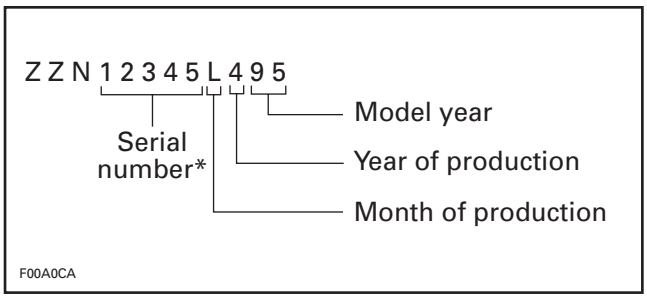
It is located on floorboard at the rear of the watercraft.



1. Hull Identification Number (H.I.N.)

All Models

The Hull Identification Number is composed of 9 digits:

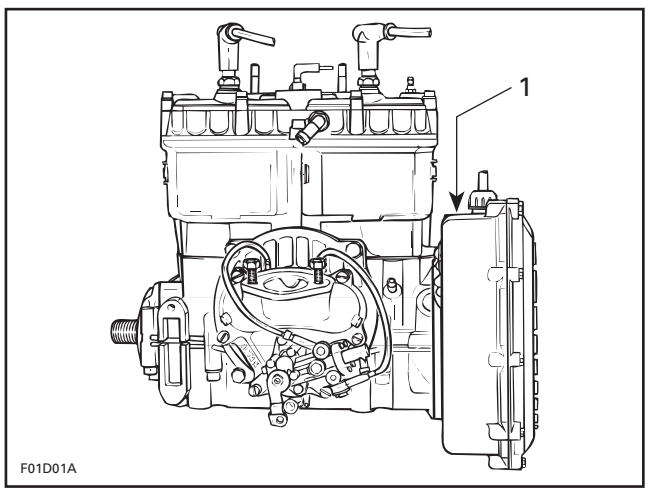


***A letter may also be used as a digit.**

ENGINE IDENTIFICATION NUMBER (E.I.N.)

717 Engine

The Engine Identification Number is located on the upper side of the magneto housing.

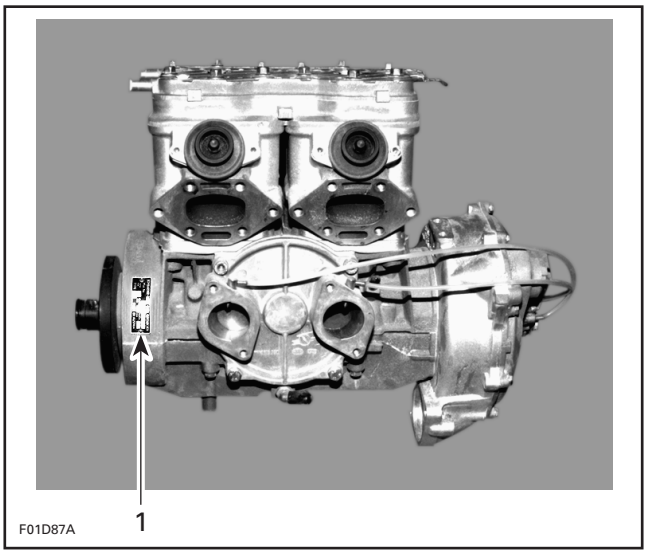


TYPICAL

1. Engine Identification Number (E.I.N.)

787 Engine

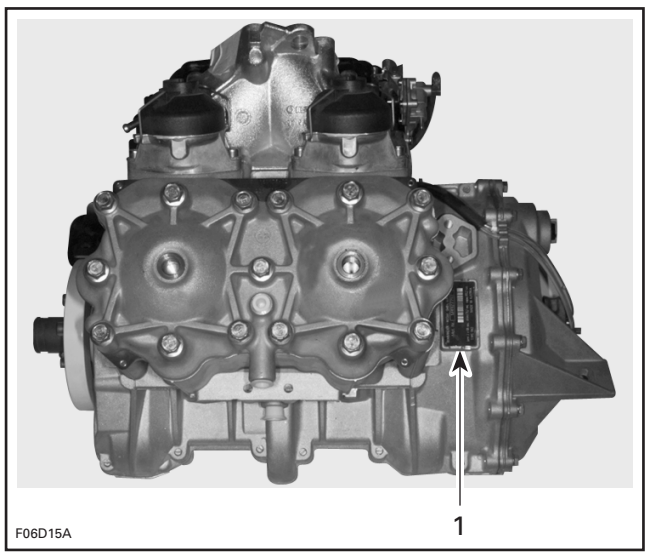
The Engine Identification Number is located on the upper crankcase on PTO side.



1. Engine Identification Number (E.I.N.)

947 Engine

The Engine Identification Number is located on the upper crankcase on MAGNETO side.



1. Engine Identification Number (E.I.N.)

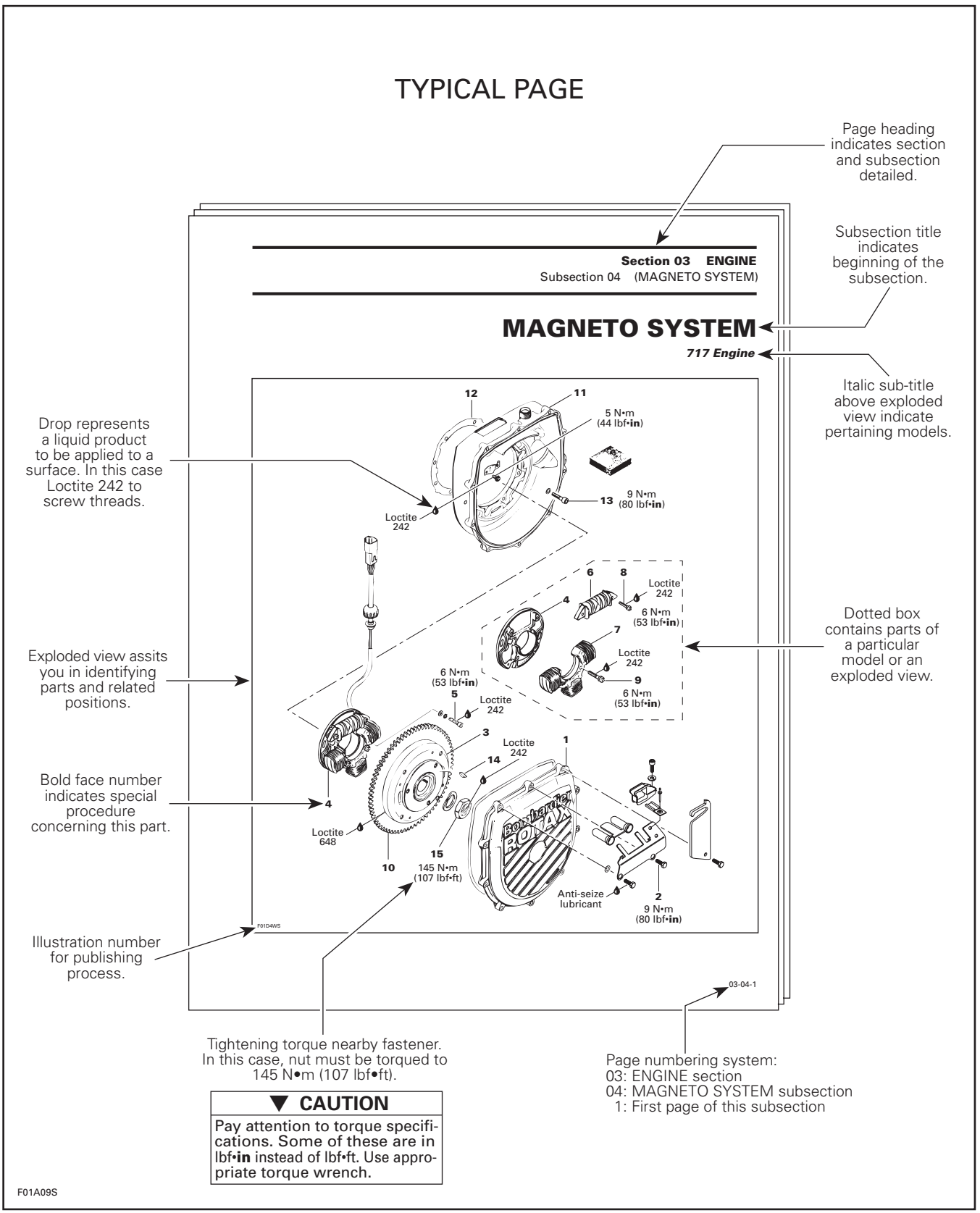
ARRANGEMENT OF THIS MANUAL

The manual is divided into 14 major sections:

01 SERVICE TOOLS AND PRODUCTS
02 MAINTENANCE
03 TROUBLESHOOTING
04 ENGINE
05 COOLING SYSTEM
06 FUEL SYSTEM
07 LUBRICATION SYSTEM
08 ELECTRICAL SYSTEM
09 PROPULSION SYSTEM
10 STEERING SYSTEM
11 SUSPENSION
12 HULL/BODY
13 TECHNICAL DATA
14 WIRING DIAGRAMS

Several sections are divided in various subsections. There is a table of contents at the beginning of many sections.

TYPICAL PAGE



TYPICAL PAGE

Sub-title with part number(s) from exploded view followed by part name(s).

Title indicates main procedure to be carried-out.

CARBURETOR REMOVAL

To remove carburetors from engine, proceed as follows:

Remove air vent tube support.

Unlock retaining slides holding 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 to front of watercraft.

Turn the valve to OFF position.

Service tool to be used to perform a certain procedure.

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

Disconnect pulse line from fuel pump.

Disconnect fuel fuel supply line from fuel pump.

Disconnect fuel return line.

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

Title in italic indicates a particular procedure concerning a model.

XP Model Only

Remove screws **no. 6** and lock washers **no. 7** retaining carburetors.

Sub-sub-title in this case indicates that particular procedure for XP is finished, so from this point, all others models are concerned.

All Others Models

Remove 4 bolts **no. 8** and lock washers **no. 12** 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 stay in place, other-wise it must be timed.

Remove carburetors from intake manifold.

Disconnect fuel bypass line between carburetors (twin carburetors).

Remove carburetor(s) from rotary valve cover.

DISASSEMBLY AND INSPECTION

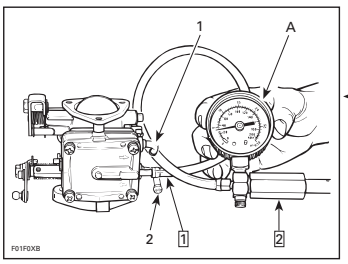
Inspect parts for corrosion dammage (shaft, butterfly, spring, screw, check valve housing, etc.).

3, 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).



TYPICAL

Step 1: Install pump gauge tester to pulse nipple
Step 2: Pump tester until it reaches the desired pressure
1. Fuel outlet nipple
2. Fuel inlet nipple
A. 28 kPa (4 PSI)

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

06-03-4

Sub-sub-title in capital indicates a particular testing, adjustment or repair procedure.

Illustration always follows text it is pertained to.

"TYPICAL" mention indicates a general view which does not represent full detail.

Numbers in a frame are used to give a sequence to be perfomed.

Letters are used for any measures.

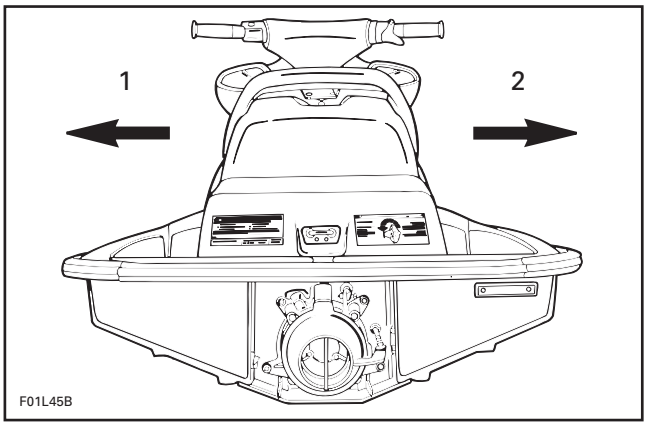
Bold numbers in the text refer to the parts shown in the exploded view at the beginning of the subsection.

Numbers are used for description of components.

F01A0AS

GENERAL INFORMATION

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



1. Left (port)
2. Right (starboard)

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*.

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.

▼ 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.

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

A number of procedures throughout the book require the use of special tools. Before undertaking any procedure, be sure that you have on hand all the tools required, or approved equivalents.

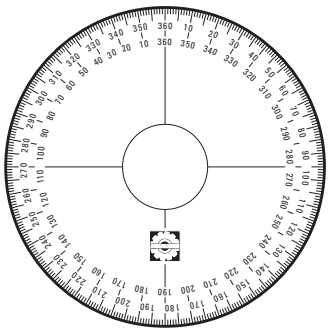
Technical Publications
Bombardier Inc.
Valcourt (Quebec), Canada

MANDATORY SERVICE TOOLS

NOTE: The numbers outlined in black (example: **1**) are reference numbers to tools from other divisions (Ski-Doo Snowmobiles and/or Sea-Doo Jet Boats). Matching reference numbers indicate the same tool is being used on both products, even if the part numbers are different.

ENGINE

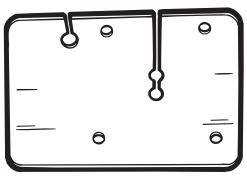
Degree wheel **1**
P/N 295 000 007



A00B334

APPLICATION
717 and 787 engines.

Rubber pad **547**
P/N 295 000 101

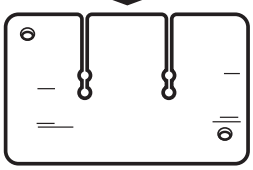


F01B0J4

APPLICATION
717 and 787 engines.

Rubber pad
P/N 290 877 032

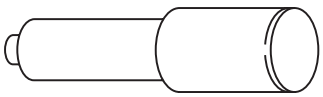
NEW



F06B064

APPLICATION
947 engine.

Bearing pusher **12**
P/N 290 876 500



A00B2J4

APPLICATION
717 engine.

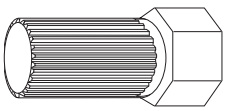
Piston circlip installer
A) P/N 290 877 016 **548**
B) P/N 290 877 517

NEW

F06B014

APPLICATION
A) 717 and 787 engines.
B) 947 engine.

PTO flywheel remover/installer **553**
P/N 295 000 001



F01J0T4

APPLICATION
717 engine.
NOTE: This tool is also used for the impeller.

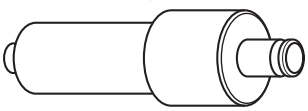
Bearing pusher
P/N 290 876 501

F00B074

APPLICATION
787 engine.

Starter drive bearing pusher
P/N 290 876 502

NEW



F06B054

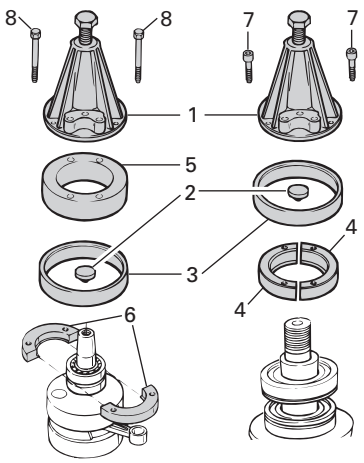
APPLICATION
947 engine.

Piston ring compressor (2)
P/N 290 876 965

NEW

F01B1T4

APPLICATION
947 engine.



F01D884

1) Puller **200**
P/N 290 876 298

2) Protective cap **554**
(both ends)
P/N 290 876 557

3) Ring (both ends) **555**
P/N 290 977 490

4) Ring halves (PTO) **556**
P/N 290 977 475 (2)

5) Distance ring (MAG) **557**
P/N 290 876 569

6) Ring halves (MAG) **558**
P/N 290 276 025 (2)

7) Screw M8 x 40 **559**
P/N 290 840 681 (2)

8) Screw M8 x 70 **560**
P/N 290 841 201 (2)

APPLICATION
717 and 787 engines.

Piston pin puller
P/N 529 035 503

NEW

F00B0T4

APPLICATION
All engines.

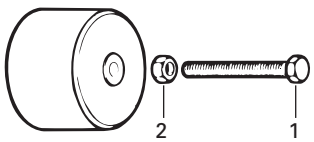
Sleeve set
A) P/N 529 035 542
(20 mm sleeve)
B) P/N 529 035 543
(21 mm sleeve)

NEW

F00B0U4

APPLICATION
A) 717 and 787 engines.
B) 947 engine.

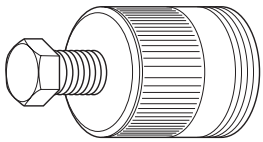
Puller **562**
P/N 290 876 488



F01B0I4

APPLICATION
717 and 787 engines.
Replacement parts:
1) P/N 290 240 860.
2) P/N 290 242 210.

Puller **5**
P/N 295 000 106



A00C1A4

Puller plate **549**
P/N 290 876 080

A00C1R4

Extension handle **550**
P/N 295 000 125

F01D164

Screw M8 x 35 (3) **551**
P/N 290 841 591

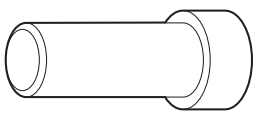
F00A094

Sleeve (3) **552**
P/N 290 847 220

F00A0A4

APPLICATION
717 engine.

Pusher **229**
P/N 290 876 605



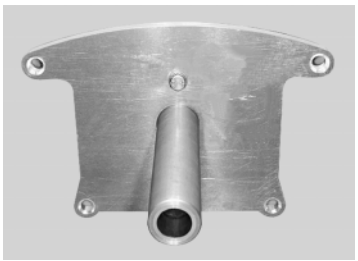
A00C0Y4

APPLICATION
717 engine.

Alignment support plate kit
P/N 529 035 506

1) Alignment plates
   A) P/N 529 035 507
   B) P/N 529 035 508
2) Support
   P/N 529 035 511
3) Screw (2)
   P/N 222 082 565
   Lock washer (2)
   P/N 213 000 001
   Flat washer (2)
   P/N 217 081 410

NEW



F00B0F4

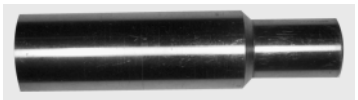
APPLICATION
All models.
A) 139.5 mm jet pump.
B) 155.6 mm jet pump.

Alignment shaft
P/N 295 000 141

F00B0G4

APPLICATION
All models.

Adapter
P/N 295 000 157



F00B054

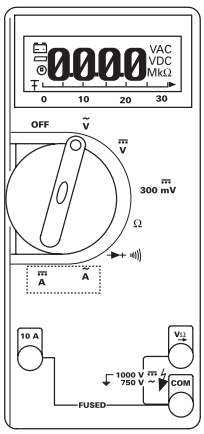
APPLICATION
XP Limited.

MPEM programmer **567**
P/N 529 035 502

A01B5B4

APPLICATION
All models.

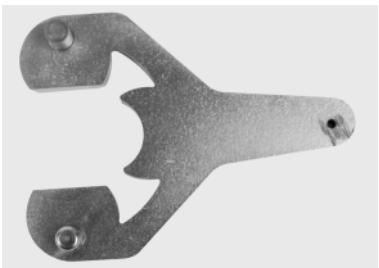
Digital multimeter **242**
P/N 529 022 000



F01B1O4

APPLICATION
All models.

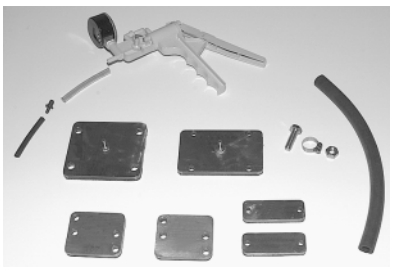
Flywheel extractor **777**
P/N 295 000 156



F00B044

APPLICATION
SPX and XP Limited.

Engine leak tester kit **778**
P/N 295 500 352



F01B2Q5

APPLICATION
717 and 787 engines.

Ring gear puller tool **569**
P/N 420 976 235

F01B294

APPLICATION
787 engine.

Ring gear blocking tool **568**
P/N 295 000 155

F01B264

APPLICATION
787 engine.

Puller plate
P/N 529 035 533

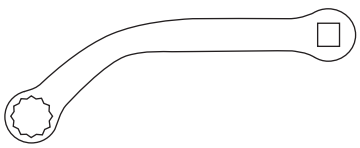
NEW

F00B0S4

APPLICATION
947 engine.

Polygonal key
P/N 529 035 505

NEW

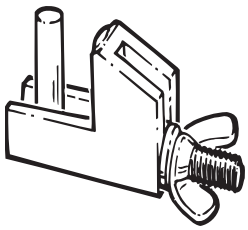


F00B0Y4

APPLICATION
Exhaust system of the 947 engine.

COOLING/FUEL/OIL SYSTEMS

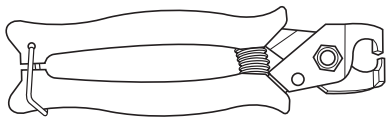
Hose pincher **2**
P/N 295 000 076



A01B2I4

APPLICATION
All models.

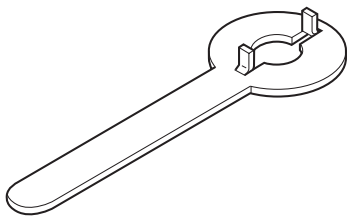
Pliers **606**
P/N 295 000 054
Caillau



F01B1T4

APPLICATION
All models.
NOTE: This tool is also used for the propulsion system.

Gear holder **235**
P/N 290 277 905



A00C164

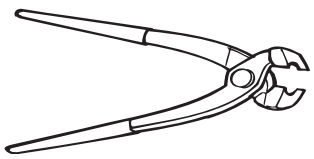
APPLICATION
717 engine.

Coupler hose **752**
P/N 295 500 258
41 cm (16 in)

F01E0Z4

APPLICATION
SPX and GTS models.

Pliers **601**
P/N 295 000 070
Oetiker 1099

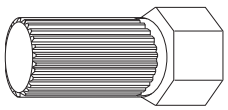


F01D174

APPLICATION
All models.

PROPULSION SYSTEM

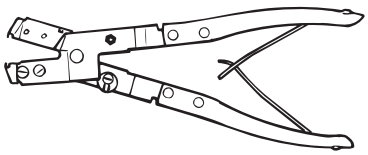
Impeller remover/installer **553**
P/N 295 000 001



F01J0T4

APPLICATION
All models.
NOTE: This tool is also used for the PTO flywheel (on some models).

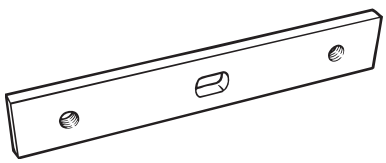
Pliers **602**
P/N 295 000 069
Oetiker 1090



F01D184

APPLICATION
All models.

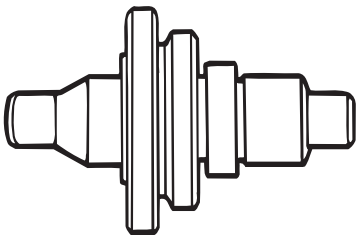
Impeller shaft holder **603**
P/N 295 000 082



F01B0W4

APPLICATION
All models.

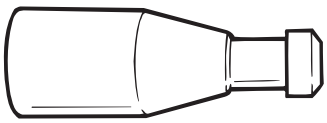
Bearing/seal installer **604**
P/N 295 000 107



F01J4K4

APPLICATION
All models.

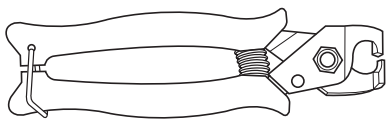
Impeller shaft guide **605**
P/N 295 000 002



F01J1O4

APPLICATION
All models.

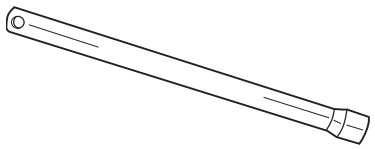
Pliers **606**
P/N 295 000 054
Caillau



F01B1T4

APPLICATION
All models.
NOTE: This tool is also used for the fuel system.

VTS tool **607**
P/N 295 000 133



F01B2P4

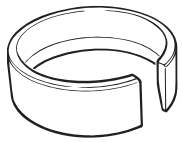
APPLICATION
SPX, GSX Limited and XP Limited.

OPTIONAL SERVICE TOOLS

NOTE: The numbers outlined in black (example: **1**) are reference numbers to tools from other divisions (Ski-Doo Snowmobiles and/or Sea-Doo Jet Boats). Matching reference numbers indicate the same tool is being used on both products, even if the part numbers are different.

ENGINE

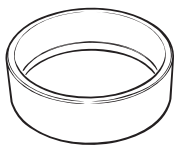
Ring compressor **751**
P/N 290 876 979



A01B1T4

APPLICATION
717 and 787 engines (82 mm).

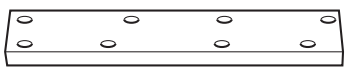
Coil centering tool **209**
P/N 290 876 922



A01B1V4

APPLICATION
717 engine.

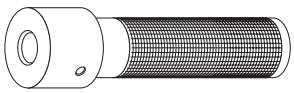
Cylinder aligning tool **220**
P/N 290 876 904



A00B084

APPLICATION
717 engine.

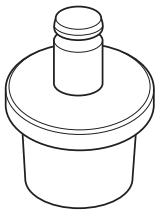
Handle **758**
P/N 290 877 650



A00C3V4

APPLICATION
Use with pushers (P/N 290 876 609 and 290 877 740).

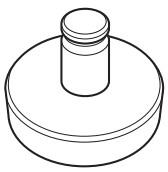
Rotary valve shaft pusher **757**
P/N 290 876 609



F01B2B4

APPLICATION
787 engine.

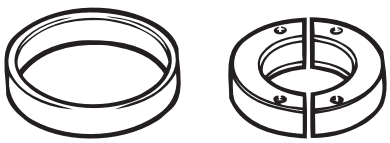
Oil seal pusher **759**
P/N 290 877 740



F01B2C4

APPLICATION
787 engine.

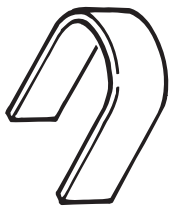
Ring halves (2) **761**
P/N 290 876 330
Ring **762**
P/N 290 977 480



F01B2D4

APPLICATION
787 and 947 engines.

Distance gauge
A) P/N 529 034 800 **760**
B) P/N 529 034 900 **561**
C) P/N 290 876 627
D) P/N 290 876 622



F01B0H4

APPLICATION
A) 717 engine.
B) 787 engine.
C) 947 engine.
D) 947 engine.

Puller and bolt
P/N 529 035 548 (puller)
P/N 529 035 549 (bolt)

NEW

F01B294

APPLICATION
947 engine.
NOTE: Bolt can be used with mandatory puller (P/N 420 976 235).

Stroboscopic timing light **225**
P/N 529 031 900

A00B4F4

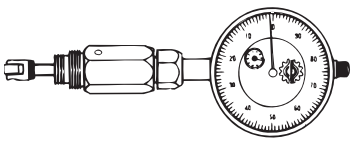
APPLICATION
All models.

A) Four-pin magneto harness **763**
P/N 295 000 131
B) Six-pin magneto harness **755**
P/N 295 000 136

F01B284

APPLICATION
A) 717 engine.
B) 787 and 947 engines.

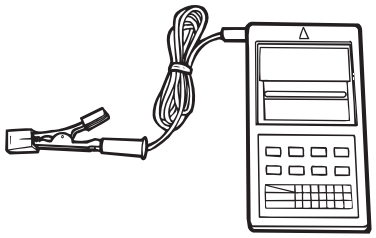
Dial indicator (TDC gauge) **230**
P/N 295 000 143



A00B4E4

APPLICATION
All models.

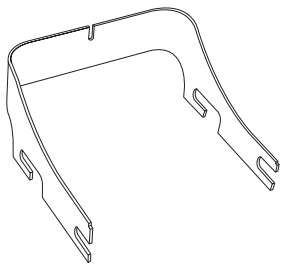
Digital/induction type tachometer **237**
P/N 295 000 100



F01B1G4

APPLICATION
All models.

Timing mark pointer **774**
P/N 295 000 130



F01B2O4

APPLICATION
717 engine.

Timing mark pointer **754**
P/N 295 000 135

F01H544

APPLICATION
787 and 947 engines.

Crimping tool
P/N 295 100 164

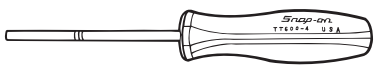
NEW

F00B0E4

APPLICATION
Contacts of AMP plug connectors.
All models except SPX and GTS.

Terminal remover
Not sold by Bombardier

Snap-on
TT 600-4



F01B1J4

APPLICATION
All models.

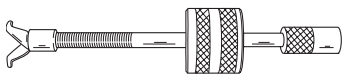
Safety lanyard switch tool **775**
P/N 295 000 121

F01B244

APPLICATION
All models.

Slide hammer puller
Not sold by Bombardier

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



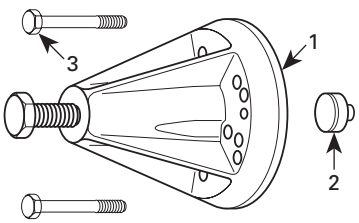
F01J0Z4

APPLICATION
717 and 787 engines.
NOTE: This tool is also used to pull out impeller shaft seal.

Protective mat **889**
P/N 295 000 128

F02B0A4

APPLICATION
All models.



F06B075

1) Puller
P/N 420 877 635

2) Protective cap
P/N 290 877 414

3) Screw
P/N 290 940 755

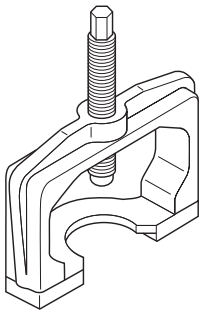
APPLICATION
947 engine.

Crankshaft protector **764**
P/N 420 876 552

F00B034

APPLICATION
For use with pullers.

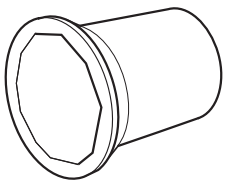
Gear/bearing puller **765**
P/N 290 877 665



F04B034

APPLICATION
787 engine.

Exhaust outlet tool **831**
P/N 295 000 132



F01B2A4

APPLICATION
All models.

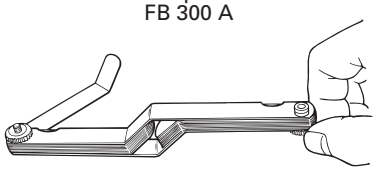
Engine lifting device
Not sold by Bombardier
Do it yourself
Refer to 04-03 then look for REMOVAL AND INSTALLATION

F01D0A4

APPLICATION
717 engine.

Feeler gauge 45°
Not sold by Bombardier

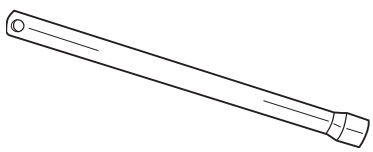
Snap-on
FB 300 A



F01B1K4

APPLICATION
717 and 787 engines.

Steering cable tool **780**
P/N 295 000 145

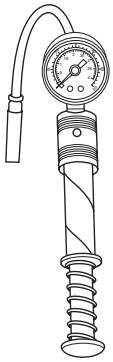


F01B2P4

APPLICATION
All models except the SPX and GTS.

COOLING/FUEL/OIL SYSTEMS

Pump gauge tester **826**
P/N 295 000 114



F01B0X4

APPLICATION
All models.

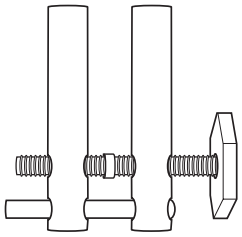
Lighted adjustable mirror
Not sold by Bombardier

Snap-on
50101

F01B1I4

APPLICATION
All models.

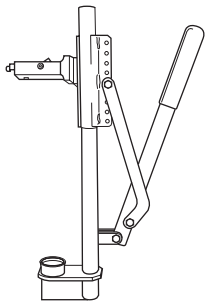
Hose pincher **773**
P/N 529 032 500



F01B234

APPLICATION
All models.

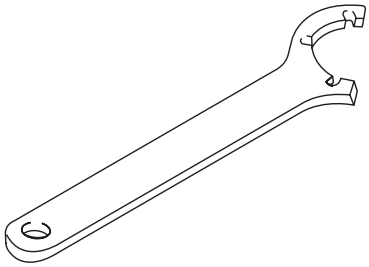
Spring compressor
P/N 529 027 100



A01B4O4

APPLICATION
XP Limited.

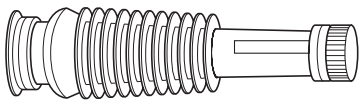
Suspension adjustment wrench **833**
P/N 529 012 200



A25A014

APPLICATION
XP Limited.

Flexible spout (oil) **834**
P/N 414 837 300



F04B044

APPLICATION
All models.

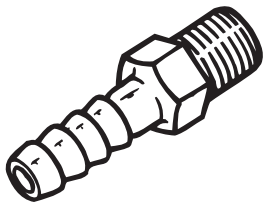
Flushing adapter
P/N 295 500 473

F00B104

APPLICATION
All models except the SPX and GTS.
Use with coupler hose (P/N 295 500 258).

PROPULSION SYSTEM

Fitting **828**
P/N 295 000 086

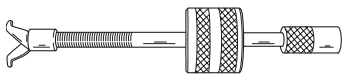


F01B0Z4

APPLICATION
All models.

Slide hammer puller
Not sold by Bombardier

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



F01J0Z4

APPLICATION
All models.
NOTE: This tool is also used to remove rotary valve shaft bearing.

Hacksaw
Not sold by Bombardier

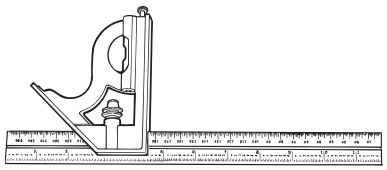
Snap-on
HS3

F01B1M4

APPLICATION
All models.

Machinist's square
Not sold by Bombardier

Snap-on
PMF 122

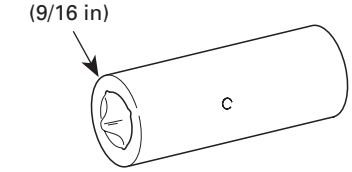


F02B064

APPLICATION
GTS model.

Fitting remover
Not sold by Bombardier
Do it yourself
Refer to JET PUMP 09-02

Deep socket
14 mm
(9/16 in)



F01J2R4

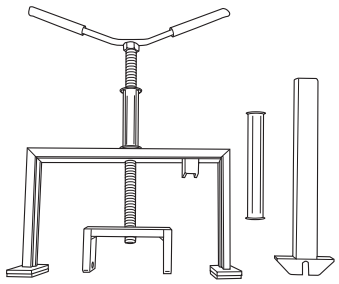
APPLICATION
SPX and GTS models.

Jet pump bearing remover **781**
P/N 295 000 144

F01J114

APPLICATION
All models.

Impeller housing remover **829**
P/N 295 000 113

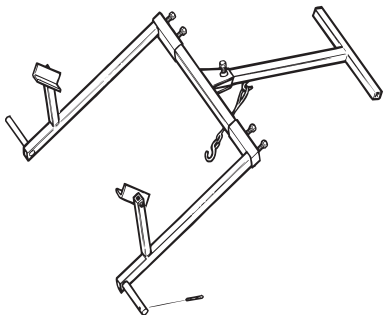


F01L2O4

APPLICATION
SPX and GTS models.

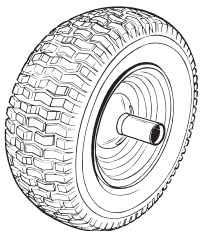
WATERCRAFT HANDLING

Dolly (with wheels) **876**
P/N 295 000 126



F01B014

Beach wheels **877**
(set of 2 wheels)
P/N 295 000 005



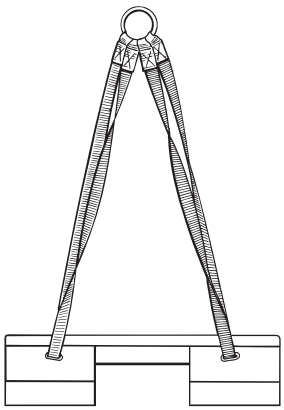
F01B074

APPLICATION
Dolly.

Tie-down with ratchet **885**
3.60 m (12 ft) long
P/N 295 100 011

APPLICATION
All models.

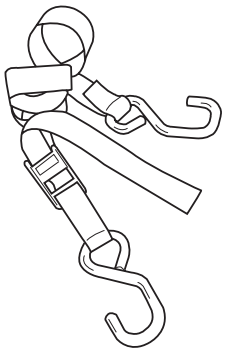
Lift kit
P/N 295 100 044



F00B0Z4

APPLICATION
All models.

Tie-down **884**
1.50 m (5 ft) long
P/N 295 100 010



F00B014

APPLICATION
All models.

SERVICE PRODUCTS

NOTE: The numbers outlined in black (example: **1**) are reference to product numbers from other divisions (Ski-Doo Snowmobiles and/or Sea-Doo Jet Boats). Matching reference numbers indicate the same product is being used, even if the part numbers are different.

Loctite® is a trademark of Loctite™ Corporation.

Permatex® is a trademark of Loctite™ Corporation.

Dow Corning® is a trademark of Dow Corning Corporation.

Medium strength threadlocker **154**

P/N 293 800 015

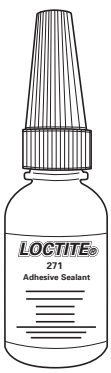
Loctite 242 (blue)
(10 mL)

A00B324

High strength threadlocker **155**

P/N 293 800 005

Loctite 271 (red)
(10 mL)



A00B2U4

High temperature threadlocker **359**

P/N 290 899 788

Loctite 648 (green)
(5 g)

A00B3D4

High temperature retaining compound **959**

P/N 293 800 039

Loctite 642
(50 mL)

F00B024

Retaining compound **151**

P/N 413 703 100

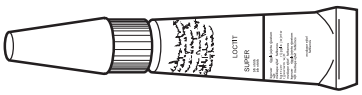
Loctite RC/609 (green)
(10 mL)

A00B2S4

General purpose instant adhesive **373**

P/N 293 800 021

Loctite 495



A00B2V4

Gasket eliminator **376**

P/N 293 800 038

Loctite 518
(50 mL)

F01B124

Gasket stripper **935**
P/N 295 000 110
(500 mL)

F01B1W4

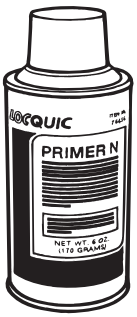
Thread sealant
P/N 293 800 050
Loctite 577
(250 mL)

F00B0W4

Solvent **157**
P/N 293 800 019
Loctite Safety
Solvent 755
340 g (12 oz)

A00B3M4

Primer for gasket eliminator **158**
P/N 293 800 041
Loctite
764



A00B3N4

Pipe sealant
A) P/N 293 800 018 **358**
B) P/N 293 800 013 **960**
A) Loctite 592 (50 mL)
B) Loctite 567 (250 mL)

A00B2W4

Hylomar sealant **369**
P/N 293 800 001
PL-32
(100 g)

A00B3F4

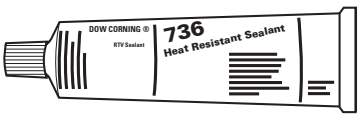
Sealant **919**
P/N 293 530 011
Sikaflex 221
(350 mL)

F01B1D4

Sikaflex primer 449 **918**
P/N 293 530 012
(475 mL)

F01B1E4

Heat resistant sealant **374**
P/N 413 709 200
Dow Corning 736
(90 mL)



A00B3U4

High temp RTV silicone gasket maker **961**
P/N 413 710 300
(85 g)

A02B044

Dielectric grease **350**
P/N 293 550 004
Dow Corning
(150 g)

F01B164

Deoxit contact lubricant
P/N 293 550 015
(200 mL)

NEW

F00B0X4

Grease **924**
P/N 293 550 005
(400 g)

A00B2L4

Synthetic grease **912**
P/N 293 550 010
(400 g)

F01B154

Super Lube grease **932**
P/N 293 550 014

A00B474

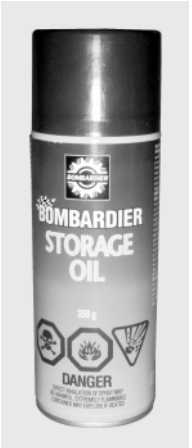
Anti-seize lubricant **362**
P/N 293 800 023
Loctite anti-seize lubricant
454 g (16 oz)

F01B174

BOMBARDIER LUBE **913**
P/N 293 600 016
(12 x 14 oz)

F01B0S4

Bombardier storage oil
P/N 413 711 600
(12 x 350 g)

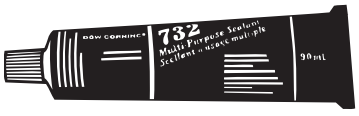


A02B054

Sea-Doo fuel stabilizer **375**
P/N 413 408 600
236 mL (8 oz)

A00B3V4

732 Multi-purpose sealant **917**
P/N 293 800 006
Dow Corning (90 mL)
(clear)



F01B1C4

BOMBARDIER-ROTAX injection oil **915**

P/N 413 802 900

(12 x 1 L)

F01B184

BOMBARDIER-ROTAX injection oil

P/N 413 803 000 (3 x 4 L) **916**

P/N 413 803 200 (205 L) **962**

F01B2H4

BOMBARDIER-ROTAX Formula XP-S synthetic injection oil **937**

P/N 413 710 500 (12 x 1 L)

F01B2G4

BOMBARDIER-ROTAX Formula XP-S synthetic injection oil

P/N 413 711 000 (3 x 4 L) **969**

P/N 413 710 700 (205 L) **970**

F01B354

Sealant adhesive **934**

P/N 293 800 033

Adchem 4511
(clear)

F01B1S4

The Righ Stuff

P/N 293 800 053

Permatex®
(198 g)

F00B0V4

Adhesive activator **931**

P/N 293 530 036

(250 mL)

F01B1Z4

Jet pump oil **914**

P/N 293 600 011
(12 x 6 oz)

Sea-Doo
synthetic jet pump oil

F01B0P4

Sea-Doo Cleaner

P/N 293 110 001 (400 g) **946**

P/N 293 110 002 (4 L) **947**

F01B2J4

SMC spray paint

A) Purple night metallic
P/N 293 500 120

B) Norwegian sea metallic
P/N 293 500 121

C) Titanium pearl
P/N 293 500 123

D) Colorado pearl
P/N 293 500 124

Sea-Doo paint for SMC

F01B0Q4

APPLICATION

Storage cover.

A) GTS model.

B) GTI model.

C) XP limited.

D) GTX limited.

Sea-Doo spray paint for gelcoat

A) Super white (140 g) **956**
P/N 293 500 082

B) Viper red (140 g)
P/N 293 500 114

C) Marine green (140 g)
P/N 293 500 115

D) Amethyst (140 g)
P/N 293 500 122

E) Ice white (140 g)
P/N 293 500 125

F) Aztec red (140 g)
P/N 293 500 126

F01B1Q4

APPLICATION

A) SPX (body).
GTS (body/hull).
GTI (body).

B) GSX Limited (body/hull).

C) GTI (hull).

D) GSI (hull).

E) GTX Limited (body).

F) GTX Limited (hull).

Gelcoat (liquid)

A) Super white (1 L) **943**
P/N 293 500 075

B) Marine green (1L)
P/N 293 500 097

APPLICATION

A) SPX (body).
GTS (body/hull).
GTI (body).

B) GTI (hull).

Gelcoat repair kit

P/N 295 500 590

F01B0R4

APPLICATION

All 1998 models.

TABLE OF CONTENTS

PERIODIC INSPECTION CHART

NOTE: Servicing period is given in hours. Shaded 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 (717 and 787 engines)				
Carburetor adjustment including choke/throttle cable adjustments and linkage				
RAVE valve cleaning (787 and 947 engines)				
Engine counterbalance shaft oil level (787 and 947 engines)				
Water flow regulator valve inspection (787 and 947 engines)				
Oil injection pump adjustment				
Fuel filter and oil filter inspection				
Fuel filter and oil filter replacement				
Engine head bolts or nuts, retorque				
Steering system inspection				
Reverse system/reverse cable adjustment (if applicable)				
Variable trim system (if applicable)				
Fastener tightening (flame arrester support, carburetor(s), engine mount, exhaust system, etc.)				
Muffler, battery and reservoir 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			
Water tank trap drain inspection (GTS)				
Bailer pick up inspection				
Battery condition				
Electrical connections (starter, battery, etc.)				
Monitoring beeper				
Jet pump reservoir oil level/oil condition				
Jet pump oil replacement				
Jet pump cover pusher inspection				
Impeller condition and impeller/wear ring clearance		②		
Drive shaft boot/spline condition (both ends)		②		
PTO flywheel and seal carrier lubrication (if applicable)				
Water intake grate condition		②		
Hull condition				
Cooling system flushing	③			

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.

FLUSHING AND LUBRICATION

GENERAL

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 clean up sand, salt, shells or other particles in water jackets (engine, exhaust manifold, tuned pipe) and/or hoses.

Flushing and engine lubrication 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.

PROCEDURE

◆ WARNING

Perform this operation in a well ventilated area. 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 and then spray BOMBARDIER 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.

SPX and GTS Models

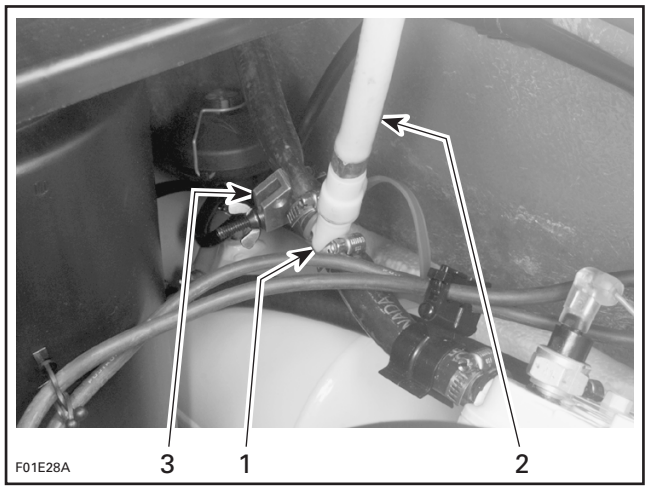
Remove seat to allow access to cooling system.

Remove dust cap from fitting spigot and attach coupler hose (P/N 295 500 258). Make sure coupler hose is properly locked to fitting spigot.

Install a hose pincher on water outlet hose.

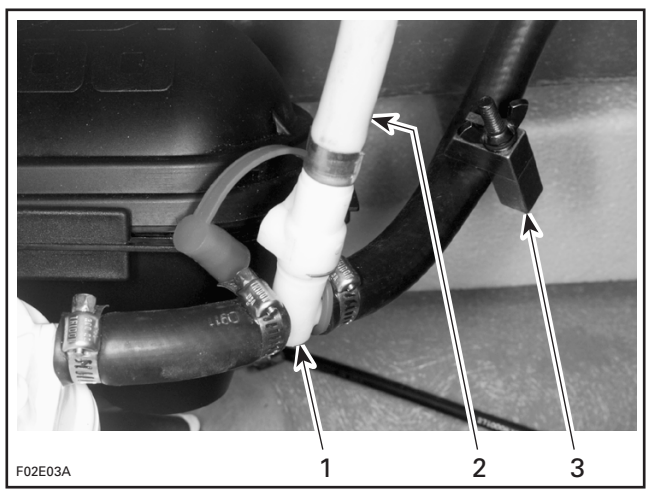
▼ CAUTION

This prevents water from exiting through outlet socket. Remove hose pincher after flushing operation.



SPX MODEL

1. *Fitting spigot*
2. *Coupler hose*
3. *Hose pincher*



GTS MODEL

1. *Fitting spigot*
2. *Coupler hose*
3. *Hose pincher*

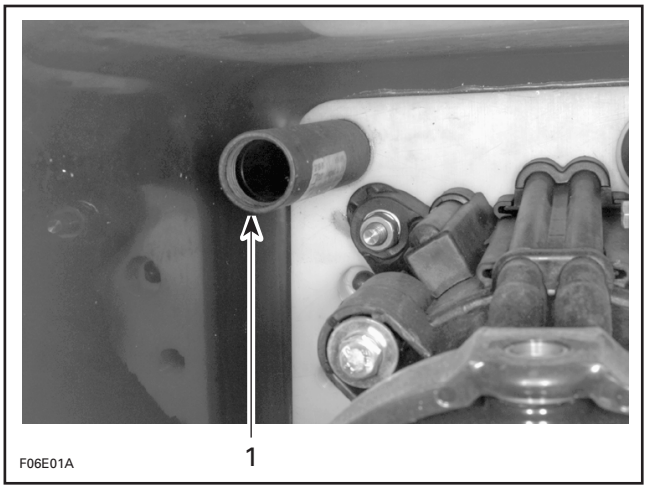
Attach other end of coupler hose to a garden hose.

▼ CAUTION

Do not open water tap yet.

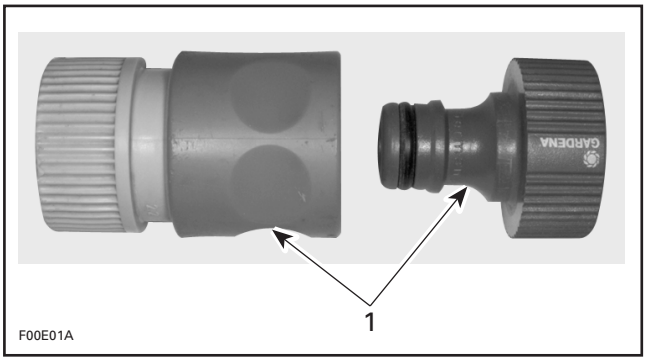
All Models Except SPX and GTS

Connect a garden hose to the water outlet located at the rear of the watercraft.

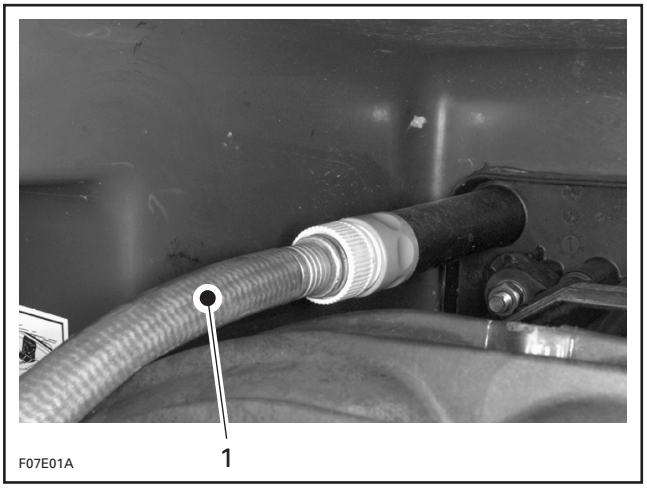


1. Water outlet

NOTE: A quick connect adapter can be used to ease garden hose installation.



1. Quick connect adapter



1. Garden hose installed

All Models

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

◆ WARNING

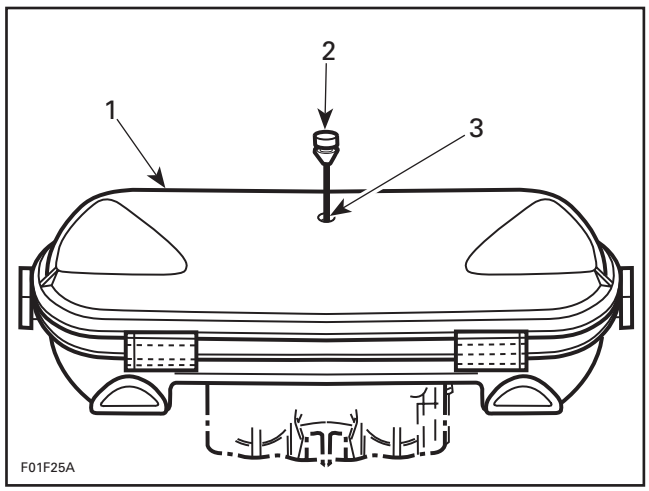
Do not touch any electrical parts or jet pump area when engine is running.

▼ CAUTION

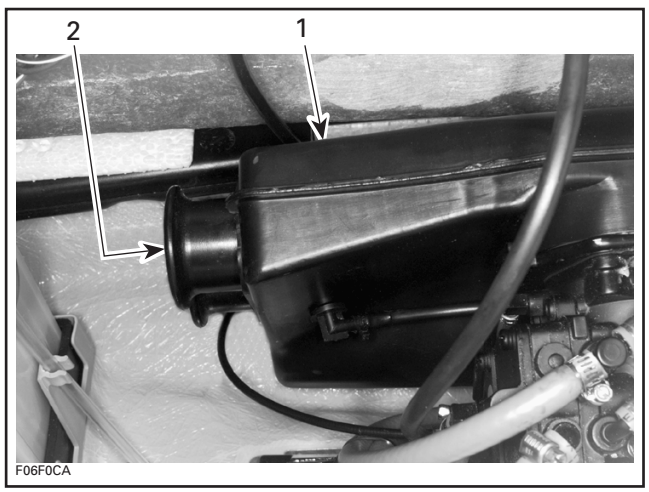
Never flush a hot engine. Always start the engine before opening the water tap. Open water tap immediately after engine is started to prevent overheating.

Run the engine about 3 minutes at a fast idle around 3500 RPM.

Spray BOMBARDIER LUBE lubricant through air intake silencer keeping engine at fast idle.



SPX, GS, GTS AND GTI MODELS
1. *Air intake silencer*
2. *Pull plug*
3. *Spray BOMBARDIER LUBE here*



GSX LIMITED, XP LIMITED AND GTX LIMITED
1. *Air intake silencer*
2. *Spray BOMBARDIER LUBE here*

NOTE: 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 close the water tap to stop water flow before engine dies.

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

▼ CAUTION

Always close the water tap before stopping the engine.

Disconnect the garden hose.

SPX and GTS Models

Unlock and remove coupler hose. Reinstall dust cap over fitting spigot.

Remove hose pincher from water outlet hose.

▼ CAUTION

Serious engine damage can occur if hose pincher is not removed.

All Models Except SPX and GTS Models

▼ CAUTION

Remove quick connect adapter after flushing operation (if used).

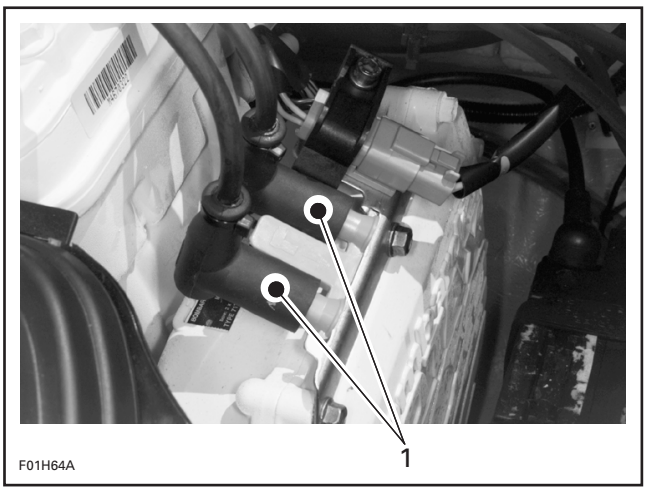
All Models

Wipe up any residual water from the engine.

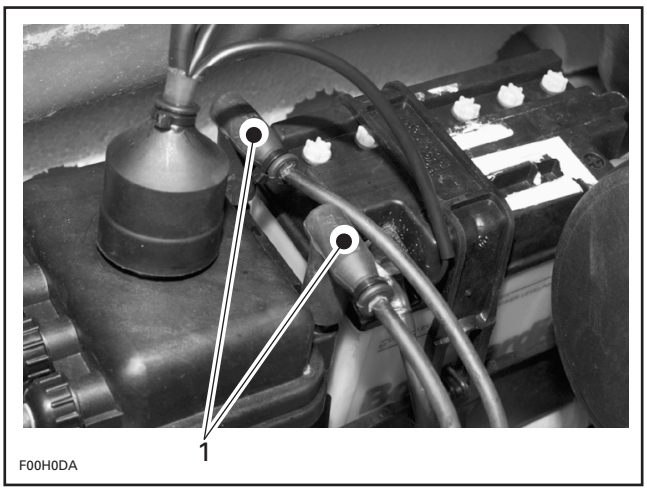
Remove spark plug cables and connect them on the grounding device.

◆ WARNING

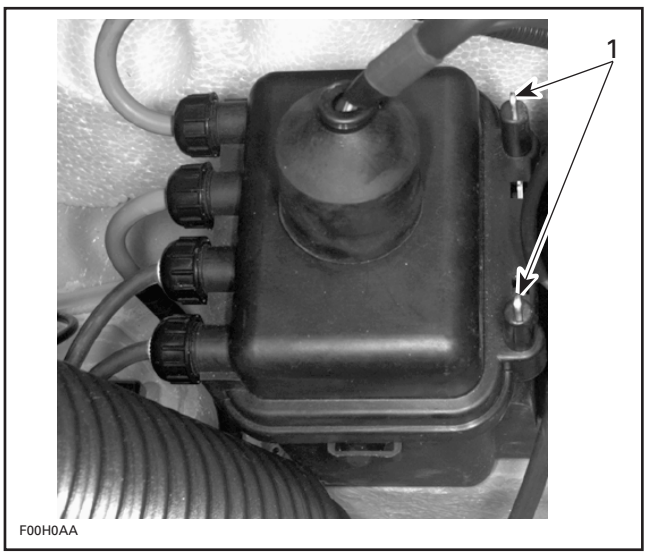
Always use spark plug cable grounding device when removing spark plugs.



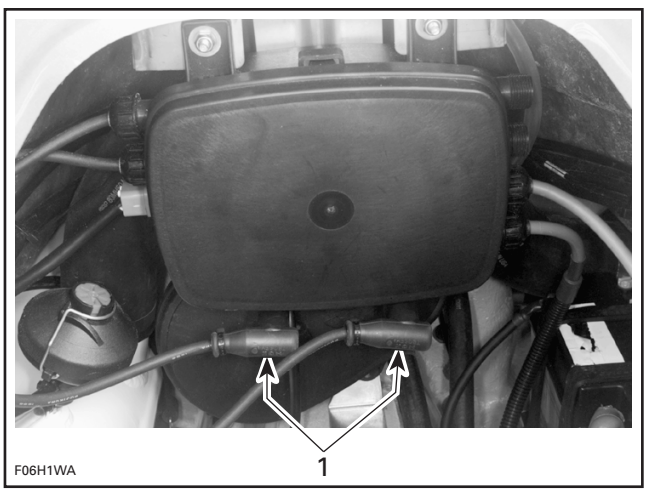
GTS MODEL
1. Spark plug cables on grounding device



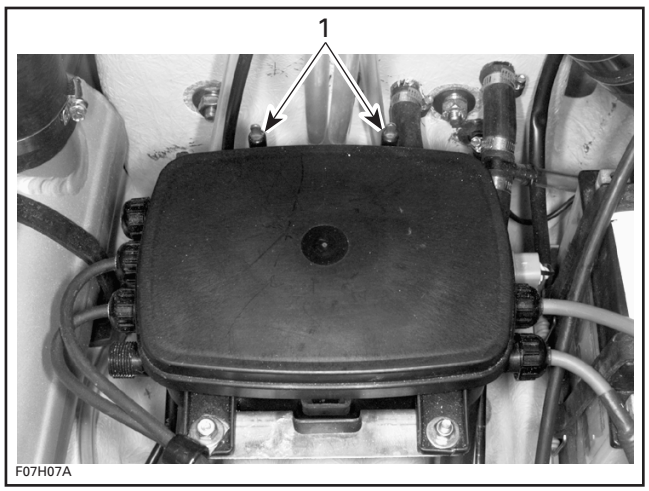
SPX, GS AND GTI MODELS
1. Spark plug cables on grounding device



XP LIMITED
1. Grounding device



GSX LIMITED
1. Spark plug cables on grounding device



GTX LIMITED
1. Grounding device

Remove both spark plugs and spray BOMBARDIER LUBE lubricant into each cylinder.

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

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

Reinstall plug on air intake silencer cover (SPX, GS, GTS and GTI models).

NOTE: Engine fogging should be done with BOMBARDIER LUBE lubricant whenever the watercraft is to be stored for a few days or a long period.

▼ CAUTION

Never leave rags or tools in the engine compartment or in the bilge.

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. Refer to FUEL CIRCUIT 06-02.

Drain bilge if water is present.

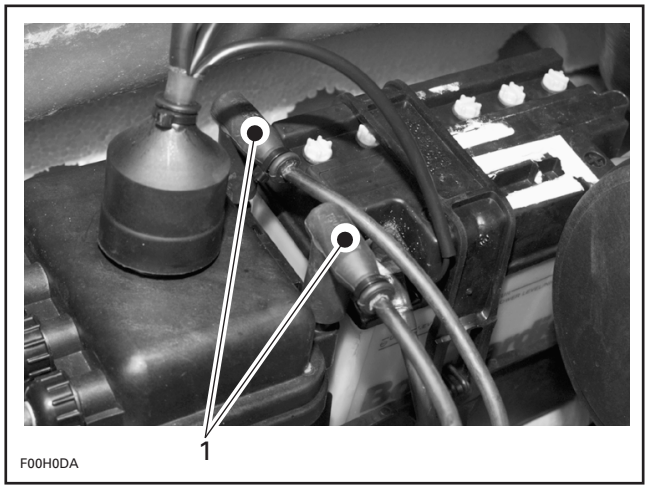
Remove spark plug cables and connect them on the grounding device.

◆ WARNING

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

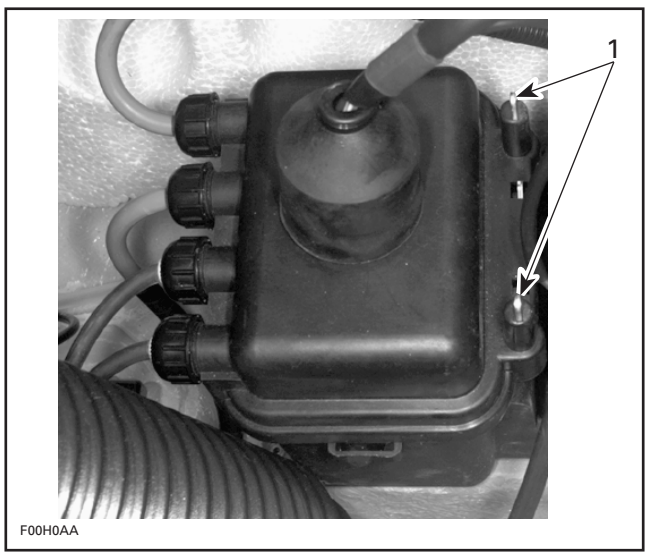
GTS MODEL

1. Spark plug cables on grounding device



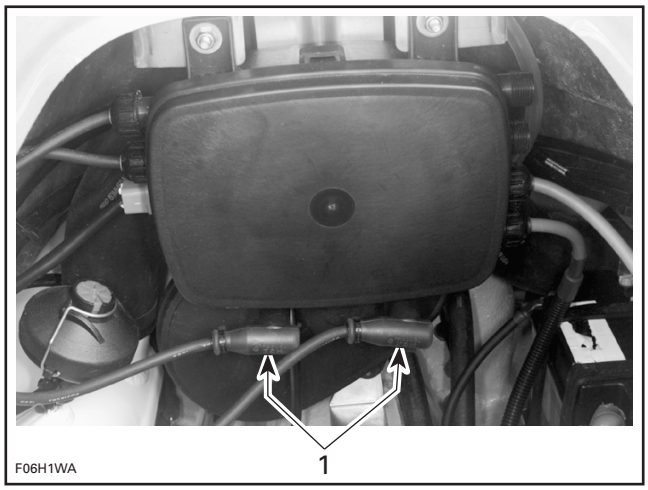
SPX, GS AND GTI MODELS

1. Spark plug cables on grounding device

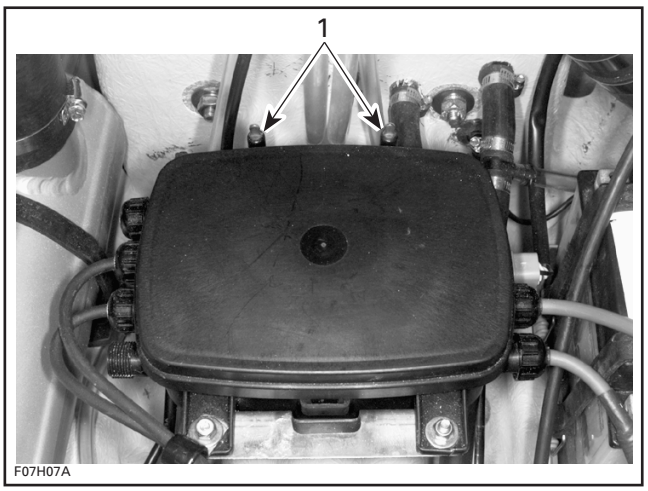


XP LIMITED

1. Grounding device



GSX LIMITED
1. Spark plug cables on grounding device



GTX LIMITED
1. Grounding device

Remove spark plugs and dry them with a clean 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.

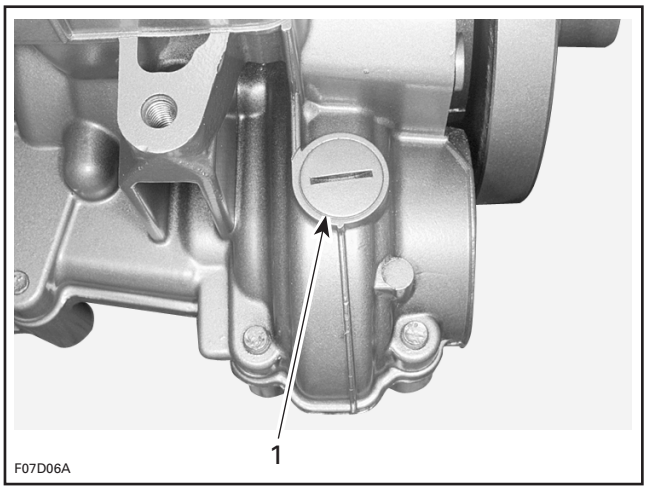
Spray BOMBARDIER LUBE lubricant (P/N 293 600 016) into spark plug holes.

Crank engine again.

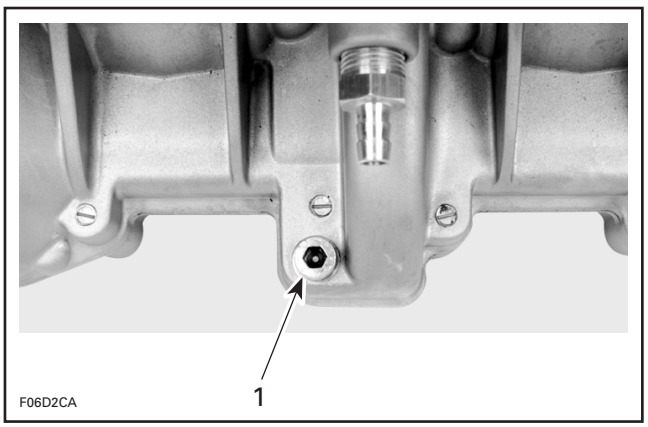
Reinstall spark plugs and spark plug cables.

787 and 947 Engines

Remove the filler plug of the counterbalance shaft on the engine crankcase.



787 ENGINE
1. Remove filler plug

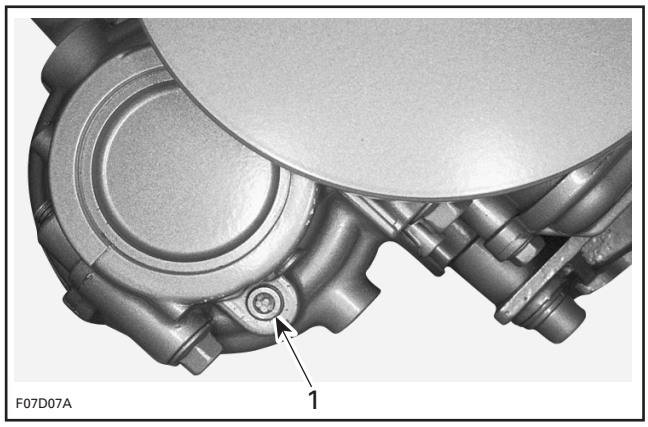


947 ENGINE
1. Remove filler plug

Insert a wire through oil level hole to check oil condition. A whitish oil indicates water contamination and must be replaced.

787 Engine

In order to replace the oil, remove the drain plug of the counterbalance shaft located on the PTO side of the lower crankcase.



1. Drain plug

Drain completely the crankcase oil of the counterbalance shaft. Reinstall drain plug with Loctite 515.

Add 30 mL (1 oz) of SAE 30 motor oil.

Reinstall filler plug.

947 Engine

Siphon the oil and add 40 mL (1.35 oz) of SAE 30 motor oil.

Reinstall filler plug.

All Models

Turn fuel valve to ON position.

Start engine; It may be necessary to use the choke. If engine does not start, repeat previous steps as necessary.

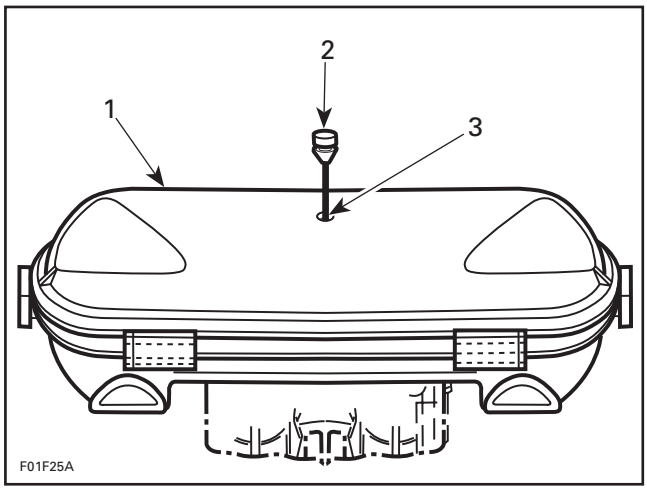
▼ CAUTION

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.

NOTE: If engine does not start after several attempts, check ignition system for spark occurrence. Refer to IGNITION SYSTEM 08-02.

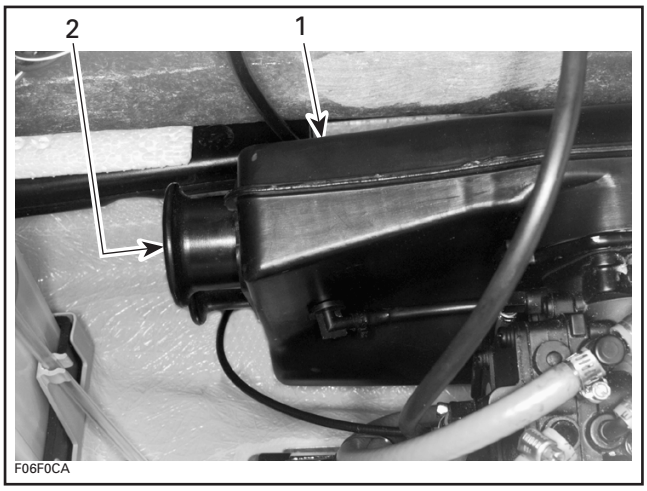
Check crankshaft if needed, it may be misaligned or deflected. Refer to BOTTOM END 04-06.

After engine has started, spray BOMBARDIER LUBE lubricant through air intake silencer while engine is running.



717 AND 787 ENGINES

1. Air intake silencer
2. Pull plug
3. Spray BOMBARDIER LUBE here



947 ENGINE

1. Air intake silencer
2. Spray BOMBARDIER LUBE here

Run engine until it reaches its normal operating temperature.

▼ CAUTION

Engine must be cooled using the flush kit.

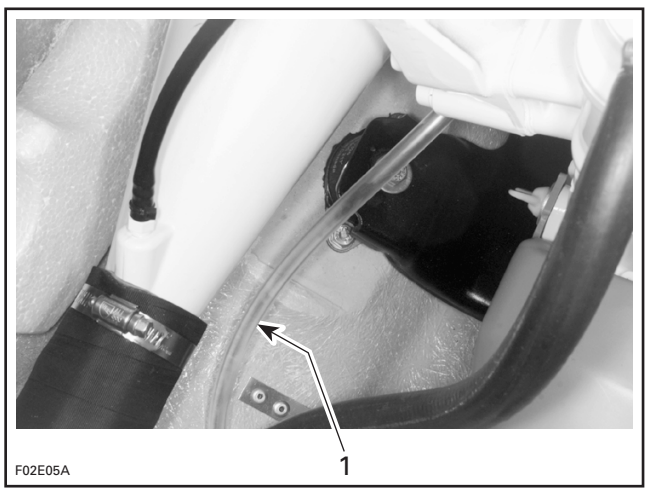
STORAGE

Engine Draining

Check engine drain hose (lowest hose of engine). 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 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.



TYPICAL

1. Engine drain hose

Fuel System

Sea-Doo Fuel Stabilizer (P/N 413 408 600) should be added in fuel tank to prevent fuel deterioration and carburetor gumming. Follow manufacturer's instructions for proper use.

NOTE: 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.

Always turn the fuel valve to OFF position when storing 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.

Engine must be lubricated to prevent corrosion on internal parts.

For proper procedure, refer to FLUSHING AND LUBRICATION 02-03.

Propulsion System

JET PUMP

Lubricant in impeller shaft reservoir should be drained. Reservoir should be cleaned and refilled with SEA-DOO synthetic 75W90 GL5 polyolester oil. Refer to JET PUMP 09-02 for proper procedure.

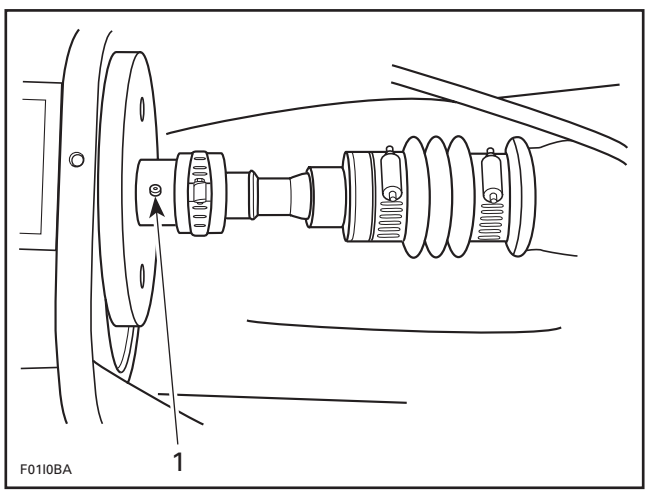
PTO FLYWHEEL

All Models Except XP Limited

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.



1. Grease PTO flywheel

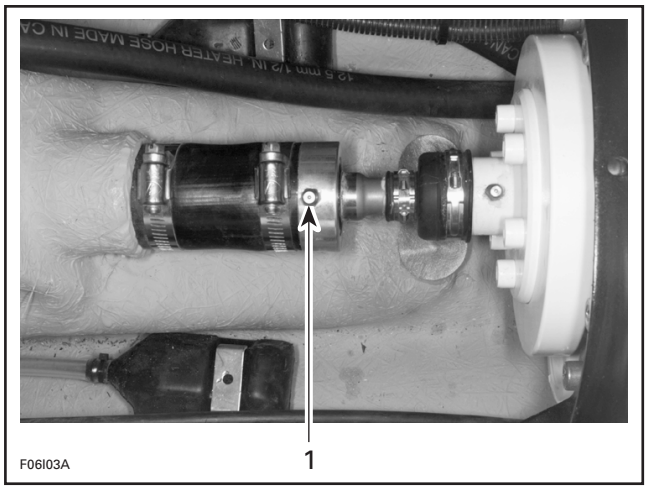
▼ CAUTION

Never leave any clothing, tool or other objects near PTO flywheel and drive shaft.

SEAL CARRIER

GSX Limited, XP Limited and GTX Limited

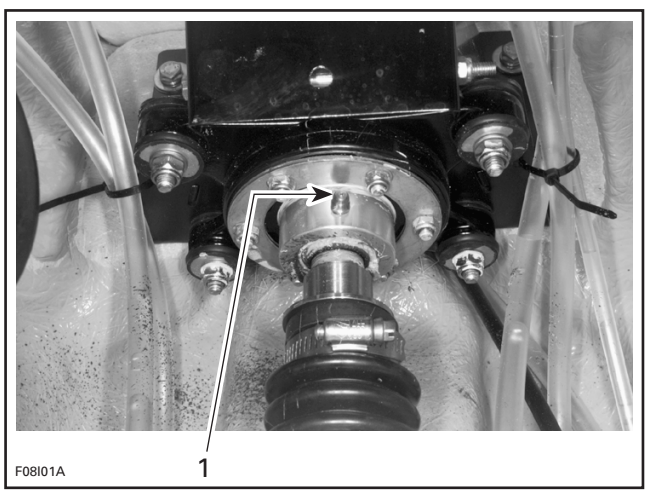
Lubricate seal carrier of thru hull fitting with synthetic grease (P/N 293 550 010). Stop lubricating when grease is just coming out of seal.



1. Grease seal carrier

XP Limited

Lubricate seal carrier of drive shaft support with synthetic grease. Stop lubricating when grease is just coming out of seal.



1. Grease seal carrier

Battery

For battery removal, cleaning and storage, refer to CHARGING SYSTEM 08-03.

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. 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 fiberglass and plastic parts with strong detergent, degreasing agent, paint thinner, acetone, etc.

If the watercraft is to be stored outside, cover it with an opaque tarpaulin to prevent sun rays and grime from affecting the plastic components, watercraft finish as well as preventing dust accumulation.

▼ CAUTION

The watercraft must never be left in water for storage. Never leave the watercraft stored in direct sunlight.

Anticorrosion Treatment

Wipe off any residual water in the engine compartment.

Spray BOMBARDIER LUBE lubricant over all metallic components in engine compartment.

Lubricate the throttle cable with BOMBARDIER LUBE lubricant.

The seat should be partially left opened during storage (the engine cover for the XP model). This will avoid engine compartment condensation and possible corrosion.

Additional Recommended Protection

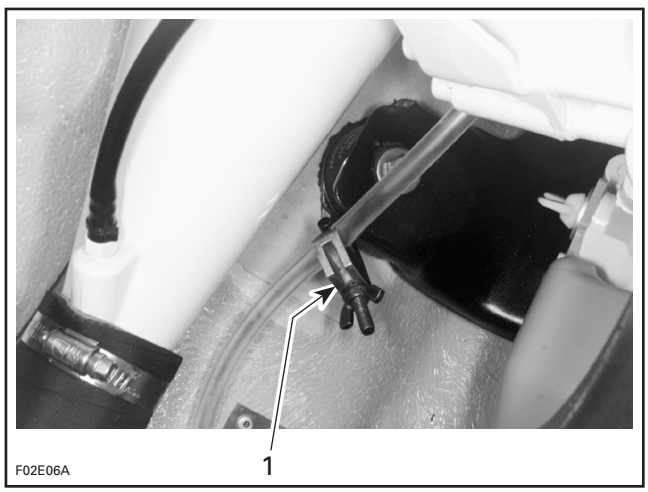
In cool regions (where freezing point may be encountered), cooling system should be filled with water and antifreeze solution.

▼ CAUTION

Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

SPX and GTS Models

Install a hose pincher to engine drain hose near the PTO flywheel guard.

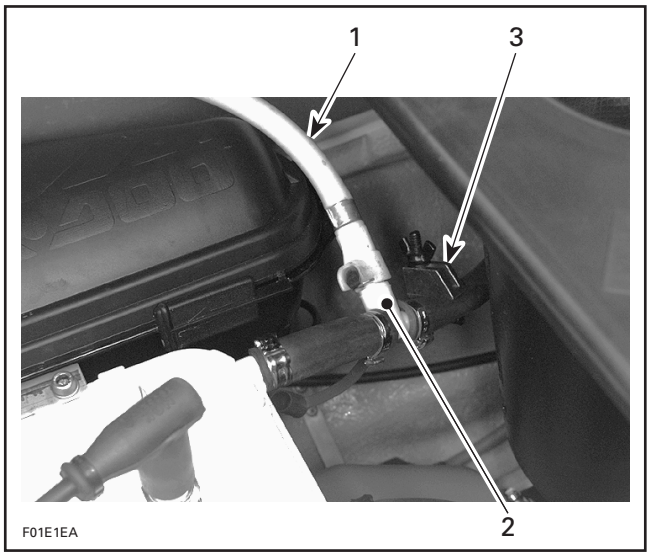


TYPICAL

1. Hose pincher installed on engine drain hose

Install coupler hose to fitting spigot.

Install a hose pincher to engine water return hose (beside fitting spigot).



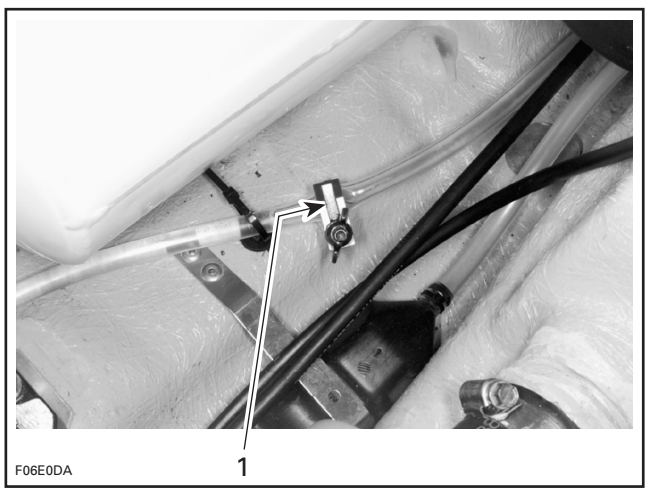
1. Coupler hose
2. Fitting Spigot
3. Hose pincher

Pour the antifreeze slowly mixed with water in coupler hose until the colored solution appears in the engine drain hose.

Remove hose pincher(s).

All Models Except SPX and GTS

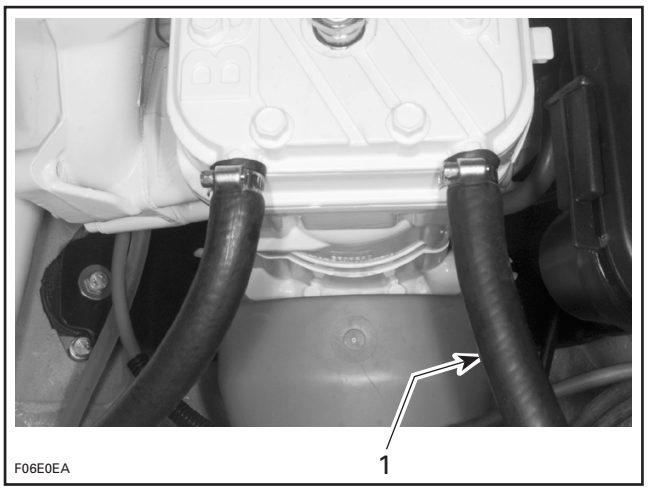
Install a hose pincher to engine drain hose.



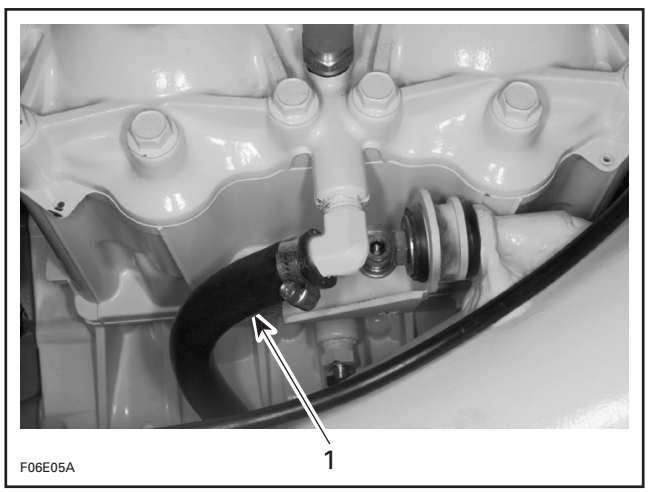
TYPICAL

1. Hose pincher installed on engine drain hose

Disconnect engine water return hose.

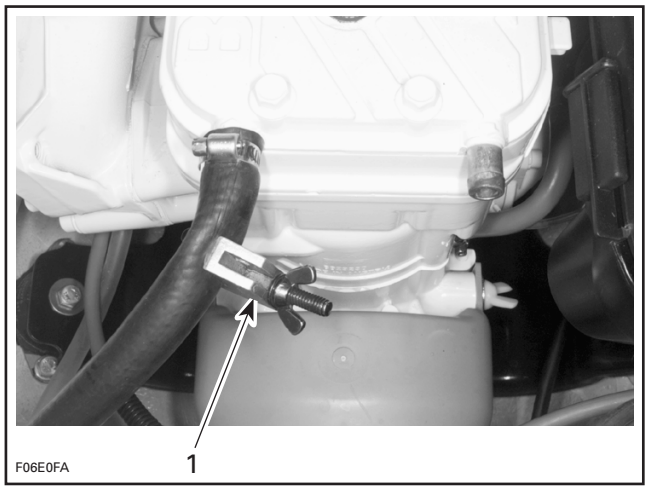


717 AND 787 ENGINES
1. Disconnect engine water return hose



947 ENGINE
1. Disconnect engine water return hose

Install a hose pincher to engine water supply hose (except the 947 engine).



717 AND 787 ENGINES
1. Hose pincher installed on the engine water supply hose

Temporarily install a short piece of hose to engine water outlet at cylinder head.

Insert a funnel into hose and pour antifreeze mixed with water in engine until the colored solution appears in the engine drain hose.

Remove temporary hose and reconnect engine water return hose.

Remove hose pinchers.

All Models

Most of the antifreeze will drain out when removing hose pincher(s). Use a container to recover it. Dispose of antifreeze as per your local laws and regulations.

NOTE: Although antifreeze will mainly drain out, the antifreeze has mixed with the water that was possibly trapped in the cylinder water jackets and thus preventing freezing problems.

At pre-season preparation, drain the remaining antifreeze from cooling system prior using the watercraft.

TROUBLESHOOTING CHART

The following 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	• DESS operation non functional	• If 2 short beeps are not heard when installing safety lanyard, refer to DIGITALLY ENCODED SECURITY SYSTEM 08-06
	• Safety lanyard switch or harness damaged	• Replace
	• Burnt 5 A fuse	• Check wiring then replace fuse
	• 5 A fuse keeps on burning	• Check wiring, solenoid and MPEM
	• Discharged battery	• Check/recharge
	• Battery connections	• Check/clean/tighten
	• Water/fuel hydrolock	• Check, refer to subsection 02-04
	• Starter	• Check, refer to subsection 08-04
	• Seized engine	• Check/repair as needed
	• Seized jet pump	• Check, refer to subsection 09-02
Engine turns slowly	• Discharged/weak battery	• Check/charge/replace
	• Restriction in jet pump	• Check/clean pump
	• Seizure in jet pump	• Inspect, refer to subsection 09-02
	• Partial engine hydrolock	• Check, refer to subsection 02-04
	• Partial engine seizure	• Check compression, refer to subsection 04-05
	• Worn starter	• Check, refer to subsection 08-04
Engine turns over	• Fuel water-contaminated	• Check/siphon and refill
	• Dirty fuel filter	• Clean/replace
	• Fouled spark plugs	• Replace
	• Water in engine	• Check, refer to subsection 02-04
	• Carburetion	• Check, refer to subsection 06-04
	• Ignition	• Check, refer to subsection 08-02
	• Flooded engine	• Check, refer to subsection 06-04
	– Carburetor needle valve stuck open	
	• Excessive rotary valve clearance (if applicable)	• Check, refer to subsection 04-07
	• Internal engine damage	• Check, refer to subsections 04-05 and 04-06
	• Sheared flywheel key	• Check timing mark, refer to subsection 08-02
	• Incorrect rotary valve timing (if applicable)	• Check, refer to subsection 04-07
No spark at spark plugs	• Faulty rev limiter	• Replace MPEM
	• Faulty ignition module	• Replace MPEM or ignition module depending upon the model

ENGINE MISFIRES, RUNS IRREGULARLY

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	• Fouled, defective, worn spark plugs	• Check/verify heat range/gap/replace
	• Faulty rev limiter or ignition module	• Check, refer to subsection 08-02
	• Sheared flywheel key	• Check timing mark, refer to subsection 08-02
Lean fuel mixture Dry spark plug (except when water fouled)	• Low fuel level	• Check/refill
	• Stale or water fouled fuel	• Check/siphon and refill
	• Fuel filter dirty or restricted	• Check/clean/replace
	• Carburetion dirty or out of adjustment	• Check/clean/adjust, refer to subsection 06-04
	• Leaking crankshaft seal(s), intake or rotary valve cover O-ring	• Pressure check engine, refer to subsection 04-02
	• Restricted fuel valve	• Check/replace
	• Loose carburetor	• Tighten carburetor(s)
Rich fuel mixture Fouled spark plug	• Partially closed choke	• Check/adjust choke cable
	• Flame arrester dirty or restricted	• Check/replace
	• Carburetor adjustment	• Check/adjust, refer to subsection 06-04
	• Loose main jet	• Check, refer to subsection 06-04
	• Rotary valve shaft seal leaking (if applicable)	• Check/replace, refer to subsection 04-07
	• Oil pump adjustment	• Check/adjust, refer to subsection07-03
	• Worn needle(s) and seal(s)	• Check, refer to subsection 06-04
	• Excessive rotary valve clearance (if applicable)	• Check, refer to subsection04-07
Difficult to start	• Incorrect rotary valve timing (if applicable)	• Check/adjust, refer to subsection 04-07
	• Excessive rotary valve clearance (if applicable)	• Check, refer to subsection 04-07

ENGINE OVERHEATS

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Monitoring beeper sounds continuously	• Restricted jet pump water intake	• Check/clean
	• Cooling system restriction	• Check/flush, refer to subsection 02-03
	• Grounded temperature sensor or sensor wire	• Check/repair/replace

ENGINE CONTINUALLY BACKFIRES

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Weak spark	• Fouled, defective spark plugs	• Clean/replace
	• Malfunction of rev limiter	• Clean/replace, refer to subsection 08-02
Ignition timing	• Incorrect setting	• Check/reset, refer to subsection 08-02
	• Sheared flywheel key	• Check/replace, refer to subsections 08-02 and 04-04
Rotary valve (if applicable)	• Incorrect timing	• Check/reset, refer to subsection 04-07
Carburetor	• Carburetion to lean	• Check/adjust, refer to subsection 06-04
Engine	• Intake leak/crankshaft seal failure	• Pressure check engine, refer to subsection 04-02

ENGINE DETONATION OR PINGING

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Ignition	• Timing too far advanced	• Check/reset
	• Spark plug heat range too high	• Check/change to correct range
	• Defective ignition module or MPEM	• Check/replace, refer to subsection 08-02
Engine temperature	• Engine overheats	• Check, see engine overheats
	• Fuel of poor quality	• Use good quality fuel

ENGINE LACKS ACCELERATION OR POWER

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	• Weak spark	• Check/replace, refer to subsection 08-02
	• Carburetion, jetting too rich/lean	• Check/adjust, refer to subsection 06-04
	• Throttle does not open fully	• Check/readjust, refer to subsection 06-04
	• Low compression	• Check/repair, refer to subsection 04-05
	• Exhaust system restriction	• Check/clean
	• Water in fuel or oil	• Check/siphon/replace
	• Debris in carburetor needle valve	• Check/clean, refer to subsection 06-04
	• Impeller leading edge damaged	• Check/replace, refer to subsection 09-02
	• Twisted crankshaft	• Check, refer to subsection 04-06
Engine revs lower than its maximum operational RPM (787 and 947 engines)	• RAVE valve does not open	• Check, refer to subsection 04-05
Peak performance is delayed until higher RPM range is reached (787 and 947 engines)	• RAVE valve is stuck opened	• Check, refer to subsection 04-05

ENGINE RUNS TOO FAST

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
Engine RPM too high	• Faulty rev limiter	• Check, refer to subsection 08-02
	• Improper impeller pitch (too low)	• Check/replace, refer to subsection 09-02
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.
	• Sealing of ride plate, jet pump support or jet pump	• Check/reseal, refer to subsection 09-02 or 12-02

ABNORMAL NOISE FROM PROPULSION SYSTEM

OTHER OBSERVATION	POSSIBLE CAUSE	REMEDY
	• Weeds/debris caught in intake grate or impeller	• Check/clean
	• Low oil level in jet pump	• Check/troubleshoot source of leak/refill supply, refer to subsection 09-02
	• Worn anti-knock system	• Check/replace pusher in cover, refer to subsection 09-02
	• Damaged or bent drive shaft	• Check/replace, refer to subsection 09-03
	• Broken motor mounts	• Check/replace, refer to subsection 04-03

TABLE OF CONTENTS

LEAK TEST

GENERAL

NOTE: The leak test kit was not upgraded for the 947 engine at time of printing. A *Service Bulletin* will be issued.

A Sea-Doo Engine Leak Test Kit (P/N 295 500 352) is available to help diagnose engine problems such as engine seizure, poor performance, oil leakage, etc.

Before disassembling any components of the engine, it is important to perform a leakage test to determine which part is defective.

It is also very important after servicing the engine, even for a complete engine rebuilt, to perform another leakage test; at this stage, it may avoid further engine problems and minimizing the risk of having to remove and reinstall the engine again.

Static bench testing is the most effective way to conduct a leakage test. Inboard testing does not allow complete access to, and observation of all engine surfaces and should be avoided whenever possible.

On the 717 engine, cylinders can not be verified individually due to leakage from one cylinder to another through a common intake manifold.

When installing hoses of the Engine Leak Test Kit, use the collars provided in the kit to ensure a proper sealing.

When pressurizing the engine, first confirm that the components of the Engine Leak Test Kit are not leaking by spraying a solution of soapy water on all hoses, connections, fittings, plates, etc. If there is a leak, bubbles will indicate leak location.

Three areas of the engine will be tested in sequence as per the diagnostic flow chart (see the end of this sub-section).

1. Engine Cooling System
2. Bottom End and Top End
3. Rotary Valve Shaft

NOTE: If a leak is found, it is important to continue testing as there is the possibility of having more than one leak. Continue pumping to compensate for the air lost to find another leak.

PREPARATION

Verify fuel system for leaks.

◆ WARNING

If any fuel leak is found, do not start the engine. Correct the leak and wipe off any fuel spillage. Do not use electric powered tools unless fuel system has passed pressure test.

Disconnect battery BLACK negative cable.

◆ WARNING

Always disconnect battery cables in the specified order, BLACK negative cable first.

Disconnect battery RED positive cable.

TESTING PROCEDURE

Engine Cooling System

Remove the tuned pipe.

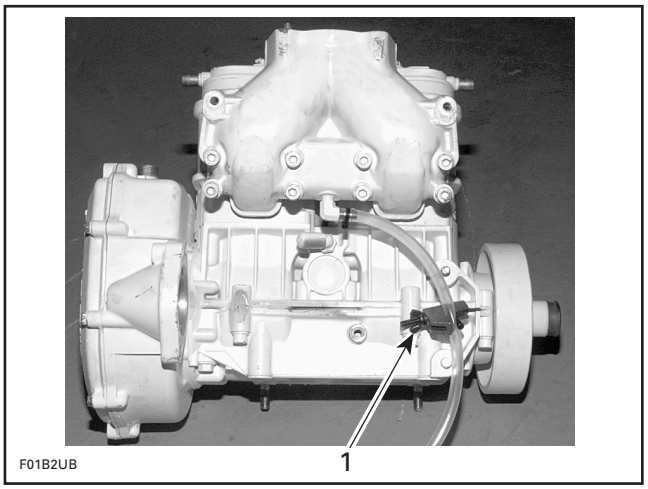
Remove the exhaust manifold gasket and ensure the surface is cleaned.

Disconnect engine cooling hoses.

Install the appropriate exhaust manifold plate (**no. 1** for the 787 engine and **no. 2** for 717 engine) from the Engine Leak Test Kit. Tighten plate using fasteners provided in the kit.

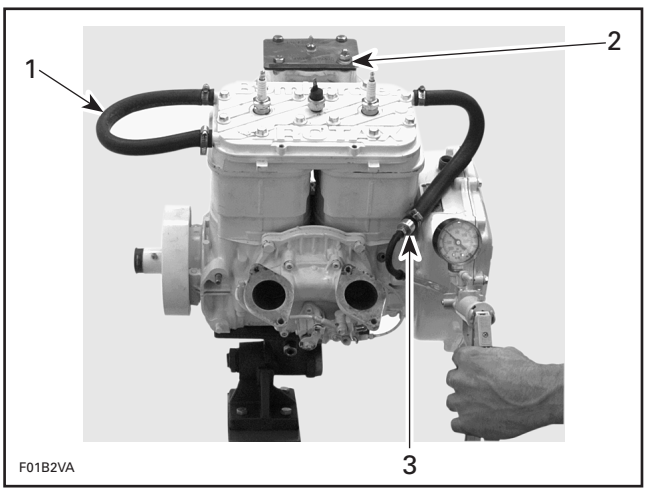
Use hoses provided in the kit and install them on the engine.

Install pump using reducer and appropriate tube(s) as necessary.



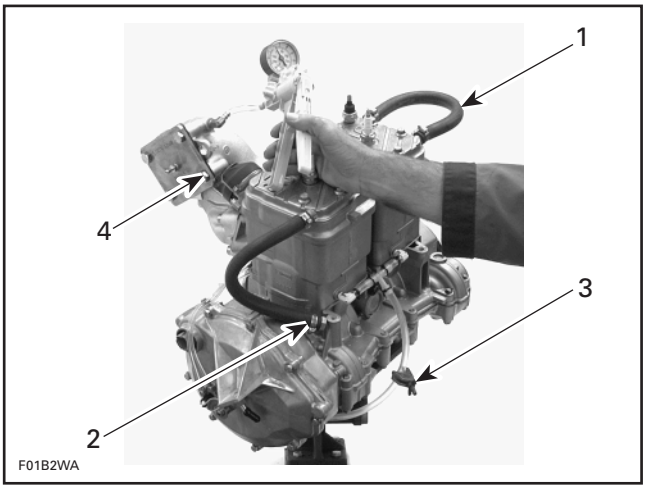
717 ENGINE — REAR VIEW

1. *Engine drain hose blocked with a hose pincher*



717 ENGINE — FRONT VIEW

1. *Loop hose and use clamps*
2. *Use 2 washers with exhaust manifold stud*
3. *Hose with adapter and nipple*



787 ENGINE

1. *Loop hose and use clamps*
2. *Hose with clamps. Plug end with a screw*
3. *Block engine drain hose with a hose pincher*
4. *Use 2 washers with exhaust manifold stud*

NOTE: Water is not required for testing.

Activate pump and pressurize engine cooling system to 34 kPa (5 PSI).

Wait 3 minutes and check if pressure drops; if so, verify all testing components.

– If kit components are not leaking and pressure drops, verify all external jointed surfaces, temperature sensor and the O-ring between the spark plug area and the engine cylinder head cover. If none of these components are leaking, there is an internal leak and it can be detected with Bottom End and Top End testing.

Bottom End and Top End

Remove the carburetor(s) and gasket(s). Make sure the surface of the intake manifold (717 engine) or rotary valve cover (787 engine) are clean.

Install the intake plate(s) **no. 3** with fasteners from the kit and tighten adequately.

On engines with the RAVE system, remove the RAVE valves and gaskets.

Install plates **no. 4** with fasteners from the kit and tighten adequately.

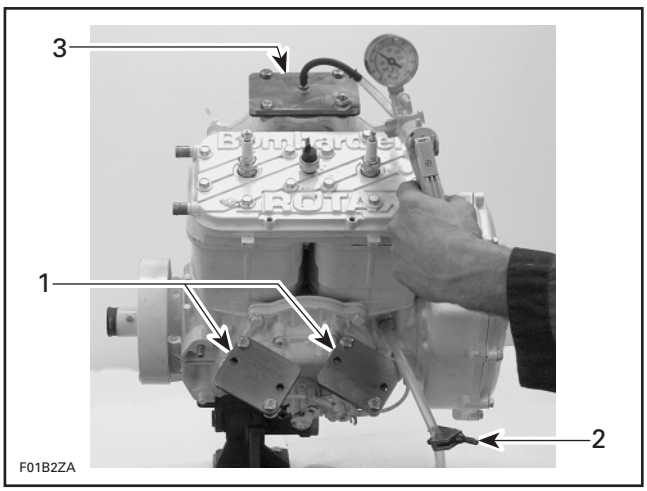
NOTE: On engines with the RAVE system, the boot and O-ring can be checked for leakage with the valve in place. Simply remove the cover to expose the boot.

Make sure the spark plugs are installed and tighten.

Block pulse hose using a hose pincher.

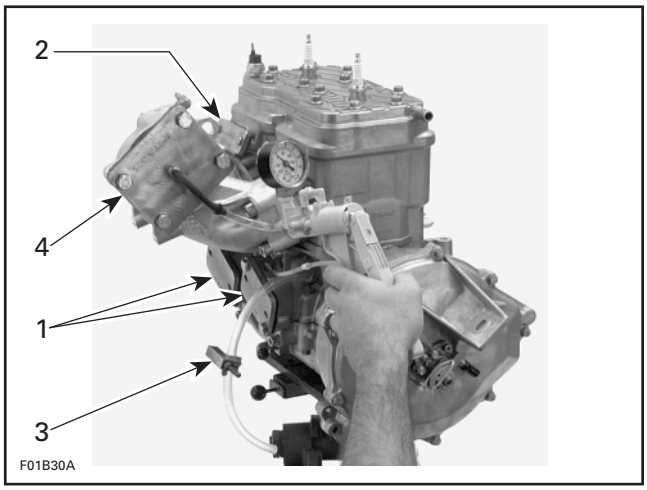
NOTE: Do not block the rotary valve shaft hoses.

Install pump to the exhaust plate fitting.



717 ENGINE

1. *Intake plates*
2. *Pulse hose blocked with a hose pincher*
3. *Exhaust plate*



787 ENGINE

1. *Intake plates*
2. *RAVE valve plates*
3. *Pulse hose blocked with a hose pincher*
4. *Exhaust plate*

Activate pump and pressurize engine to 34 kPa (5 PSI).

▼ CAUTION

Do not exceed this pressure.

Wait 3 minutes and check if pressure drops; if so, verify all testing components.

If kit components are not leaking, verify engine jointed surfaces as per following areas:

- spark plugs
- cylinder head gasket
- cylinder base gasket
- crankcase halves
- rotary valve cover
- engine plugs
- exhaust manifold
- intake manifold (717 engine)
- oil injection pump (717 engine)

Check also small oil injection pump lines and fittings; check for air bubbles or oil column going toward pump, which indicate a defective check valve.

If the above mentioned components are not leaking, block both oil hoses of the rotary valve shaft using hose pinchers.

NOTE: If leakage stops at this point, proceed with **Rotary Valve Shaft** testing.

If there is still some leakage, remove the PTO flywheel to verify outer seal.

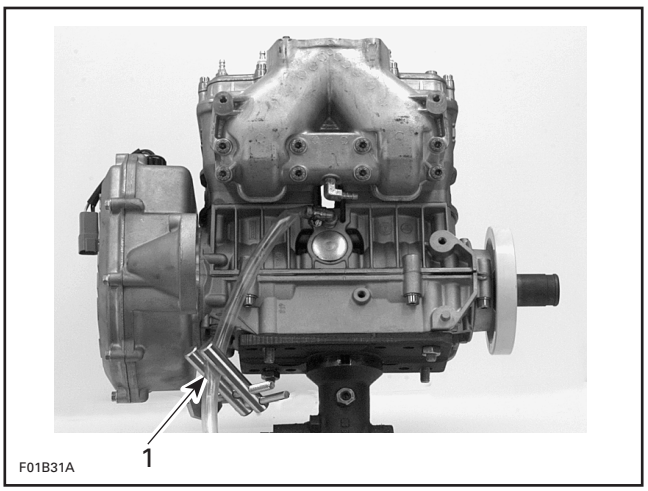
If no leak is found on the PTO side outer seal, remove magneto flywheel and verify crankshaft outer seals.

Proceed with the **Rotary Valve Shaft** testing if the crankshaft outer seals are not leaking.

Rotary Valve Shaft

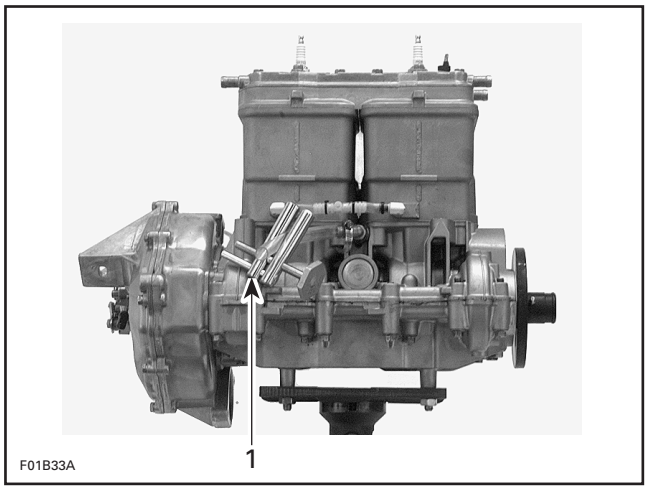
NOTE: It is preferable to drain the injection oil from the rotary valve shaft, but it is not mandatory.

Block oil return hose of the rotary valve shaft with a hose pincher.



717 ENGINE

1. *Oil return hose blocked with hose pincher*



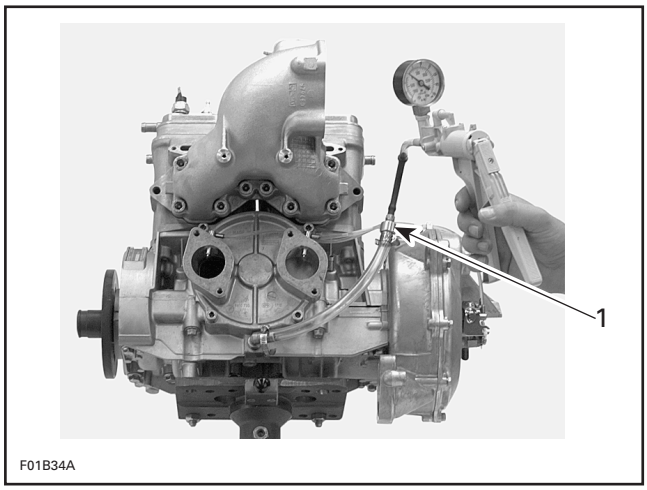
787 ENGINE

1. *Oil return hose blocked with hose pincher*

Install pump with reducer and nipple to the oil supply hose of the rotary valve shaft.

717 ENGINE

1. *Pump with reducer and nipple*



787 ENGINE
1. Pump with reducer and nipple

Activate pump and pressurize to 5 PSI (34 kPa).

Check plug of the rotary valve shaft in crankcase.

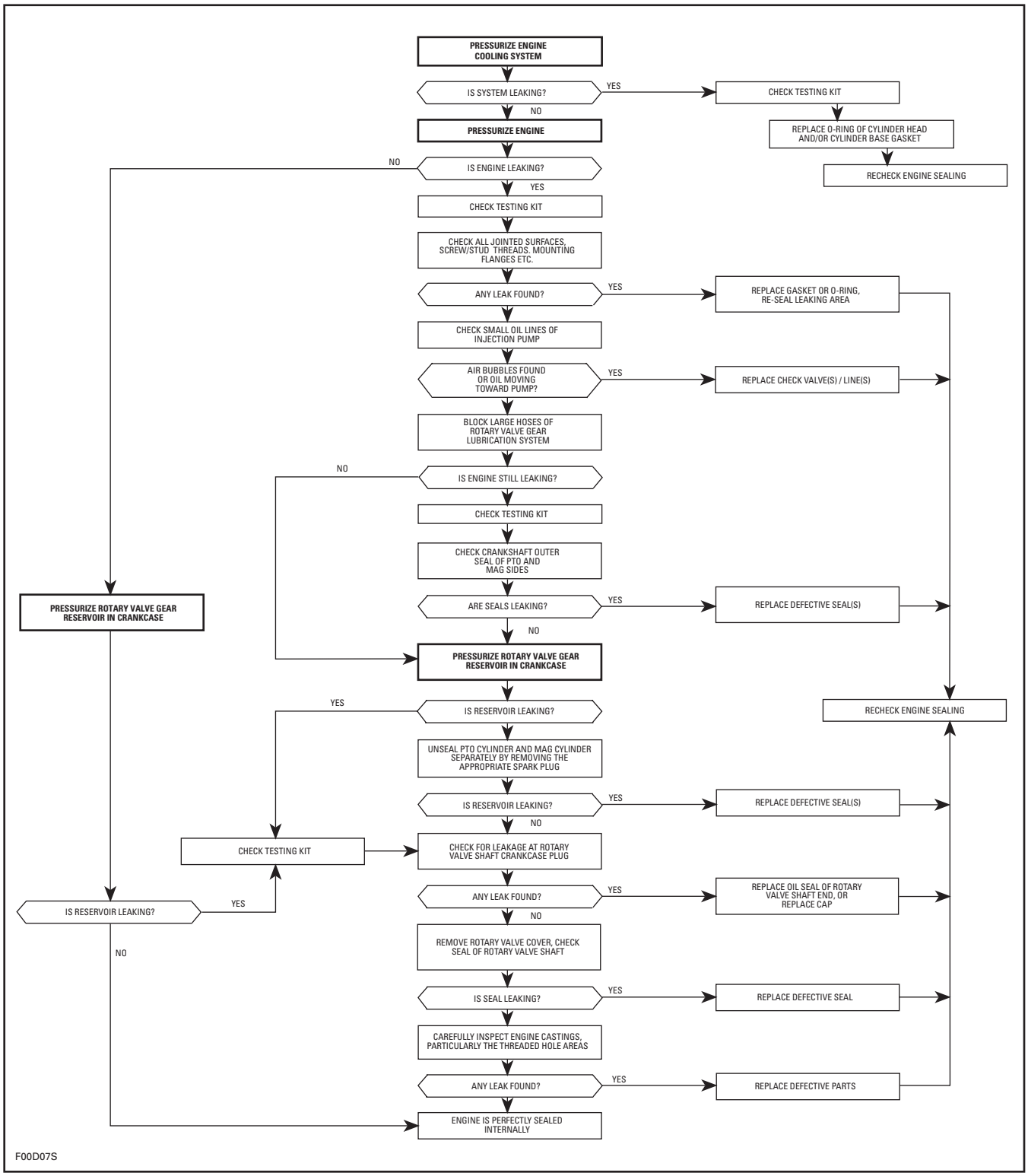
Remove PTO side spark plug. If pressure drops, it indicates a defective PTO side crankshaft inner seal.

Remove MAG side spark plug. If pressure drops, it indicates a defective MAG side crankshaft inner seal.

If the above mentioned components are not leaking and there is a pressure drops, remove the rotary valve cover. Check the seal of the rotary valve shaft.

If the rotary valve shaft is not leaking, it could indicates a defective engine casting. Disassemble engine and carefully check for defects in castings. Pay attention to tapped holes which may go through sealed areas of engine and thus lead to leakage.

ENGINE LEAKAGE DIAGNOSTIC FLOW CHART



REMOVAL AND INSTALLATION

GENERAL

It is not necessary to remove engine from watercraft to service TOP END, PTO FLYWHEEL or MAGNETO. However, engine removal is necessary to repair BOTTOM END.

ENGINE REMOVAL

In order to remove engine from watercraft proceed as follows.

▼ CAUTION

Whenever removing engine from watercraft, engine/jet pump alignment must be performed at reinstallation.

Jet Pump Removal

To withdraw jet pump, refer to JET PUMP 09-02.

Drive System

To withdraw driveshaft(s), refer to DRIVE SYSTEM 09-03.

All Models

Electrical Connections

First, remove BLACK negative cable from battery, then RED positive cable.

◆ WARNING

Always disconnect starter or battery cables exactly in the specified order, BLACK negative cable first. It is recommended to disconnect electrical connections prior to disconnecting fuel lines.

GTS Model

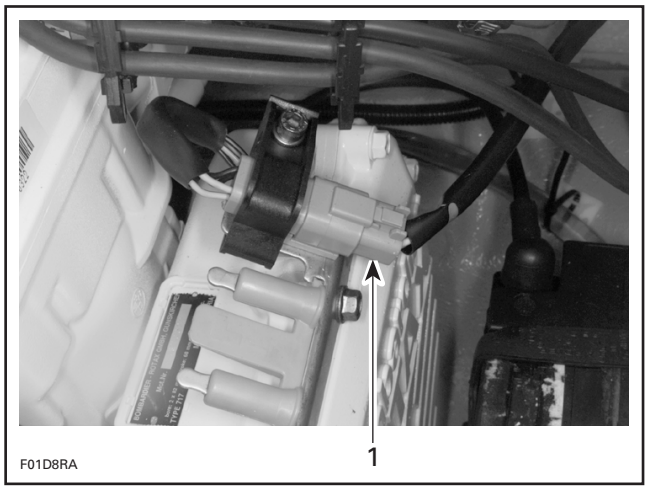
Remove battery holding straps and disconnect vent tube from battery.

Remove battery.

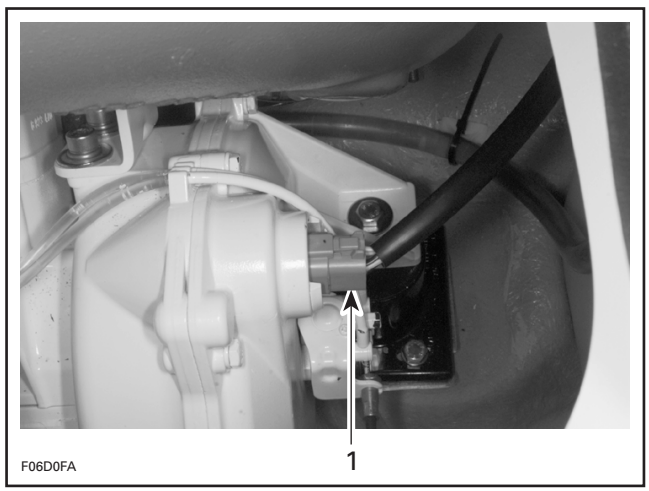
All Models

Disconnect temperature switch wire and spark plug cables.

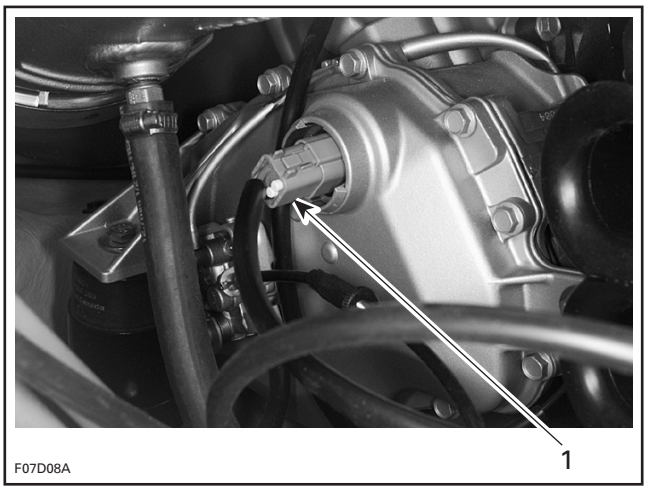
Disconnect magneto wiring harness.



717 ENGINE
1. Unplug connector



787 ENGINE
1. Unplug connector



947 ENGINE
1. Unplug connector

Cooling System

Disconnect the engine water supply hose.

Disconnect the engine water return hose.

Tuned Pipe

To remove tuned pipe, refer to EXHAUST SYSTEM 04-08.

Air Intake Silencer

To remove air intake silencer, refer to AIR INTAKE 06-03.

Carburetor

All Models Except the XP Limited

To remove carburetor(s), refer to CARBURETOR 06-04.

XP Limited

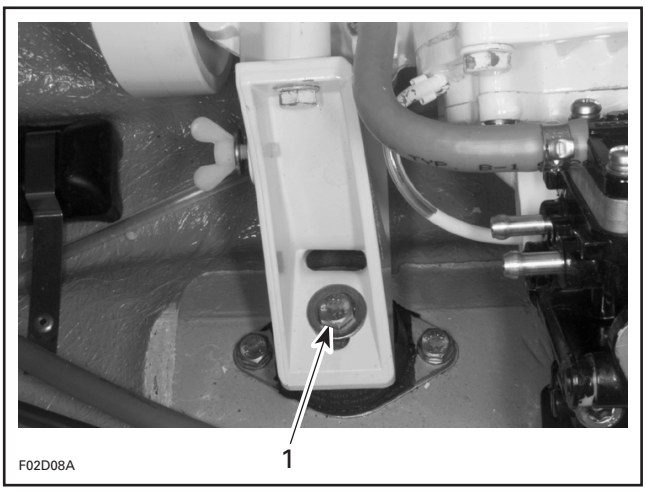
Disconnect choke and throttle cables from carburetor linkage.

Disconnect fuel supply and fuel return hoses.

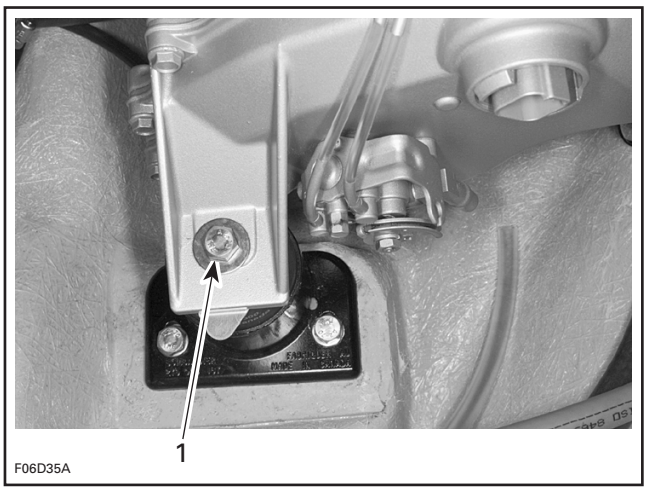
Engine Support

NOTE: Be careful when removing engine support(s) or rubber mount adapters, shims could have been installed underneath. Shims control engine/jet pump alignment. Always note position of shims for reinstallation, to avoid altering engine alignment.

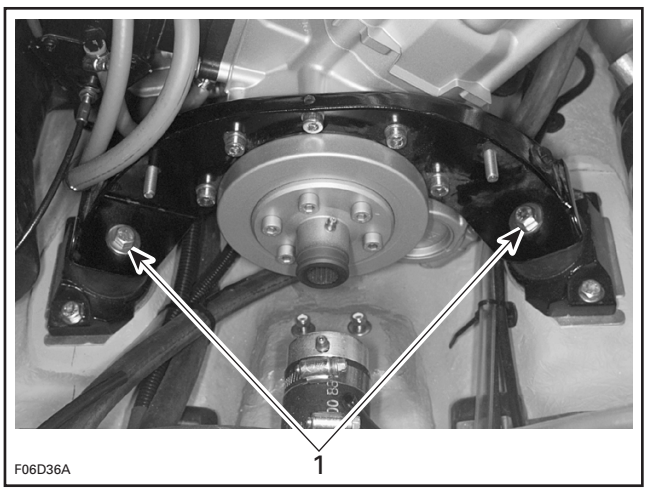
Remove engine support mount screws.



717 ENGINE
1. Remove screw of each engine support



787 AND 947 ENGINES — FRONT SUPPORT
1. Remove screw



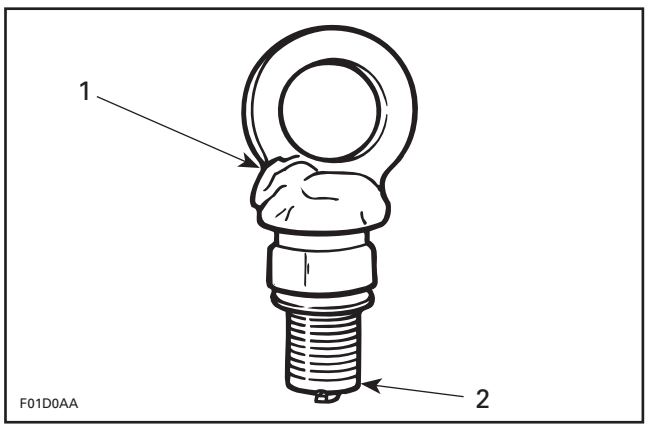
787 AND 947 ENGINES — REAR SUPPORT
1. Remove screws

Lifting Engine

717 Engine

Engine can be easily lifted using the following suggested tools:

– Cut porcelain from 2 old spark plugs.
– Weld a lock washer approximately 20 mm diameter on each spark plug as shown.



1. Weld a lock washer
2. Old spark plug

Remove spark plugs and replace by special tools.

Hook a sling into holes of special tools.

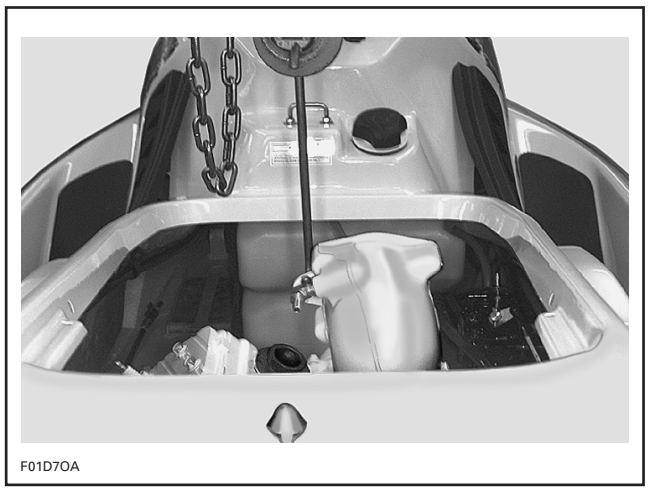
Using a chain block, a hoist or other suitable equipment, slightly lift engine to ease the remaining component removal.

▼ CAUTION

Take care not to damage cable or oil injection hoses.

787 and 947 Engines

Engine can be easily lifted by inserting a hook into exhaust manifold eyelet.



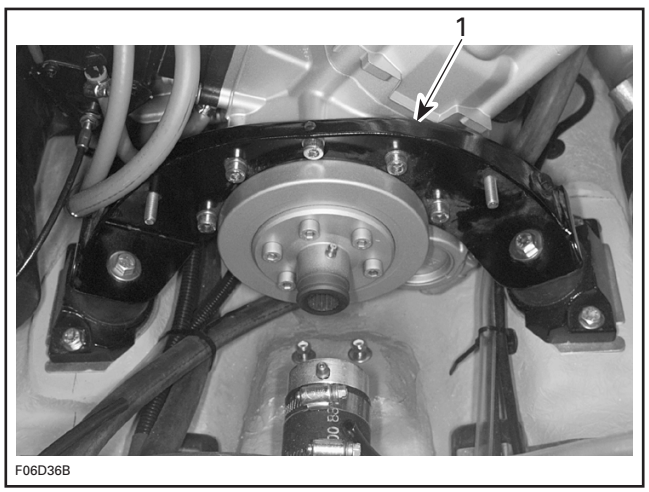
TYPICAL

Using a chain block, a hoist or other suitable equipment, slightly lift engine to ease the remaining component removal.

▼ CAUTION

Take care not to damage cable or oil injection hoses.

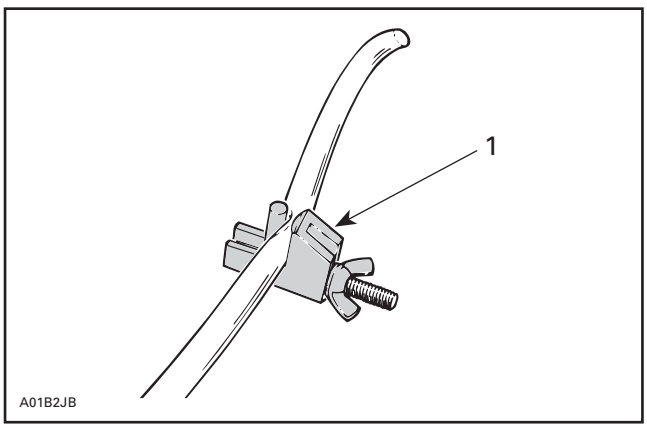
Remove rear engine support.



1. Rear support

All Engines

Install a hose pincher to oil supply hoses of oil injection pump and rotary valve shaft (except the 947 engine); then, disconnect hoses.

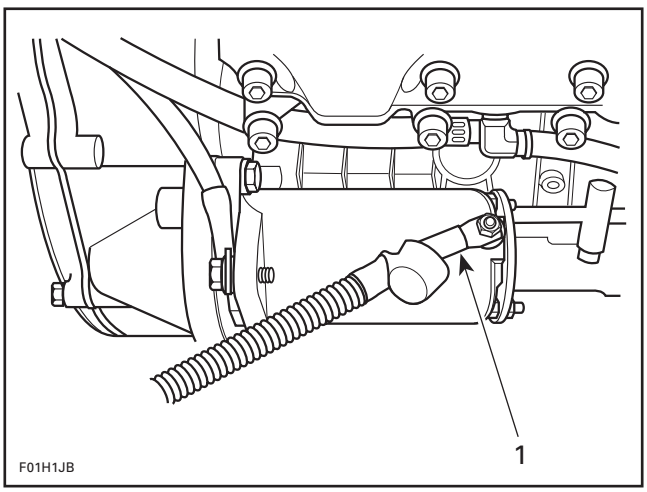


TYPICAL

1. Hose pincher (P/N 295 000 076)

Install a hose pincher to oil return hose of rotary valve shaft (except the 947 engine); then, disconnect hose.

Disconnect RED positive cable from starter post.



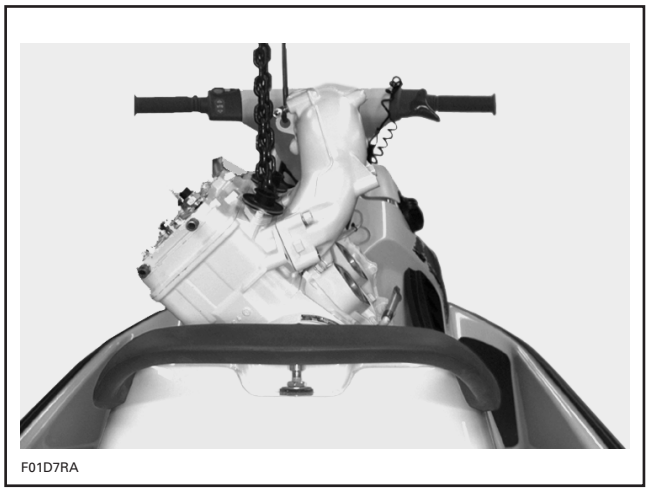
TYPICAL

1. Disconnect RED positive cable

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

▼ CAUTION

Be careful not to scratch body or to hit any component.



TYPICAL

CLEANING

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

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.

Rubber Mount, Shim 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).

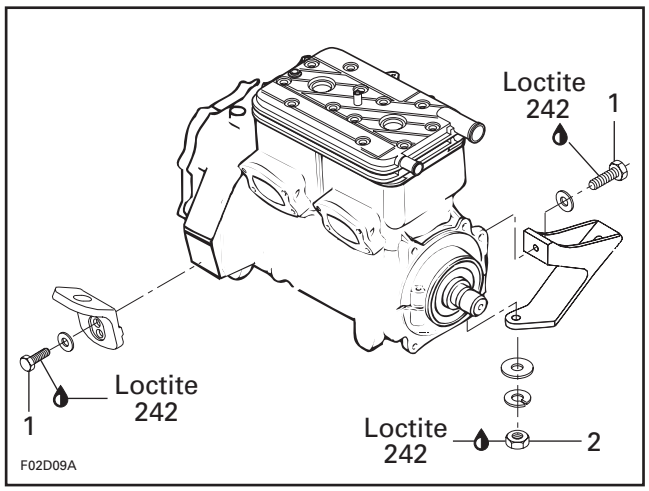
▼ CAUTION

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

Engine Support

717 Engine

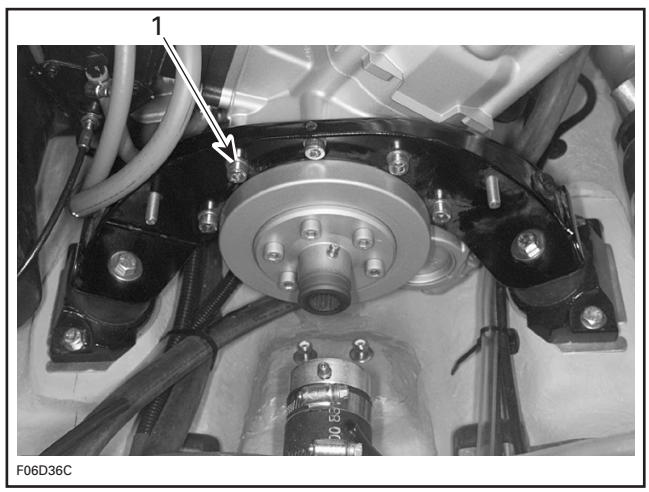
Torque front and rear engine supports as shown in the following illustration.



1. *Torque screws to 22 N•m (16 lbf•ft)*
2. *Torque nuts to 39 N•m (29 lbf•ft)*

787 and 947 Engines

Apply Loctite 242 (blue) to rear engine support screws and torque to 24 N•m (17 lbf•ft).



1. *Torque engine support screws to 24 N•m (17 lbf•ft)*

Oil Injection Hoses

717 and 787 Engines

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

Positive Starter Cable

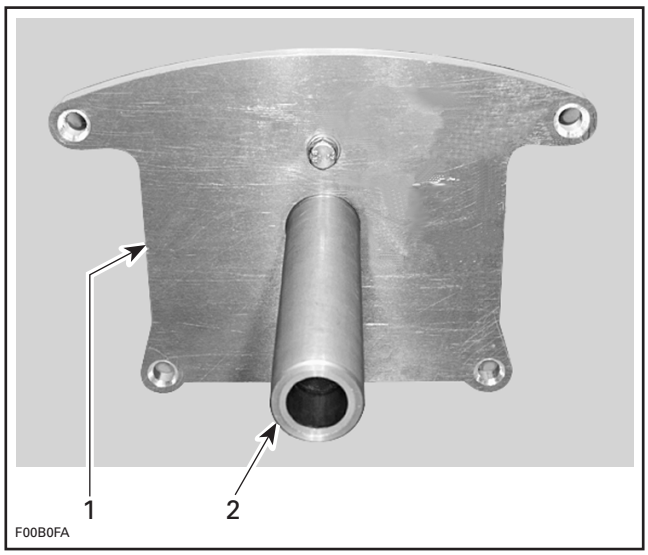
Torque nut of positive starter cable to 6 N•m (53 lbf•**in**). Apply dielectric grease on nut.

Engine/Jet Pump Alignment

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

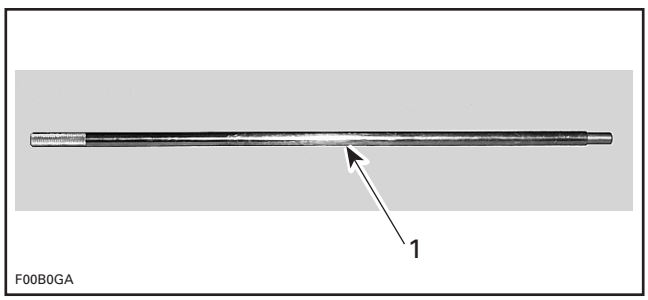
Support plate kit (P/N 529 035 506).

NOTE: Use plate (P/N 529 035 508) for the 139.5 mm (5-1/2 in) jet pump and plate (P/N 529 035 507) for the 155.6 mm (6-1/8 in) jet pump.



1. *Plate (P/N 529 035 507 or 529 035 508)*
2. *Support (P/N 529 035 511)*

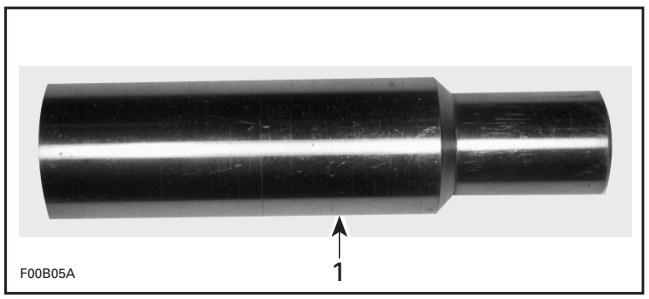
Alignment shaft (P/N 295 000 141).



1. *Alignment shaft*

XP Limited

On this model, the PTO flywheel adapter (P/N 295 000 157) must be used in conjunction with the alignment shaft.



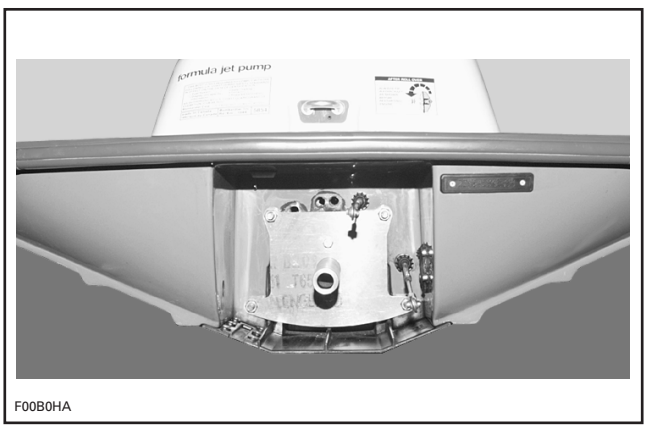
1. Adapter (P/N 295 000 157)

NOTE: Ensure the mid bearing is removed to check engine alignment.

All Models

To verify alignment proceed as follows:

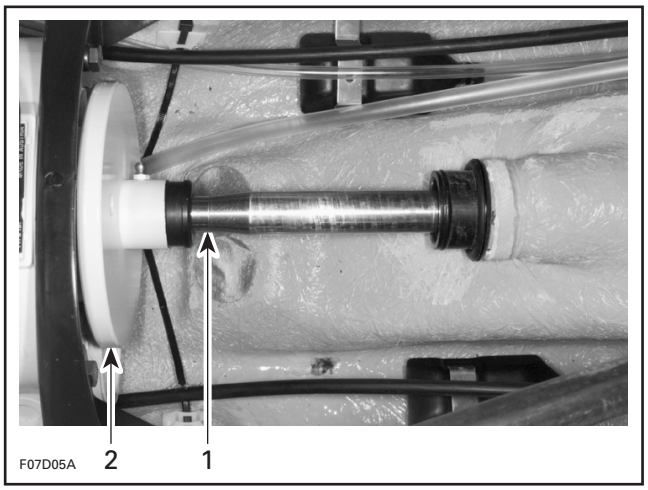
– Install the appropriate plate with the support to hull with 4 nuts.



– Carefully slide shaft through support.

– Insert shaft end into PTO flywheel.

NOTE: Ensure the protective hose and carbon ring (or seal carrier) is removed to check engine alignment. If the alignment is correct, the shaft will slide easily without any deflection in PTO flywheel.

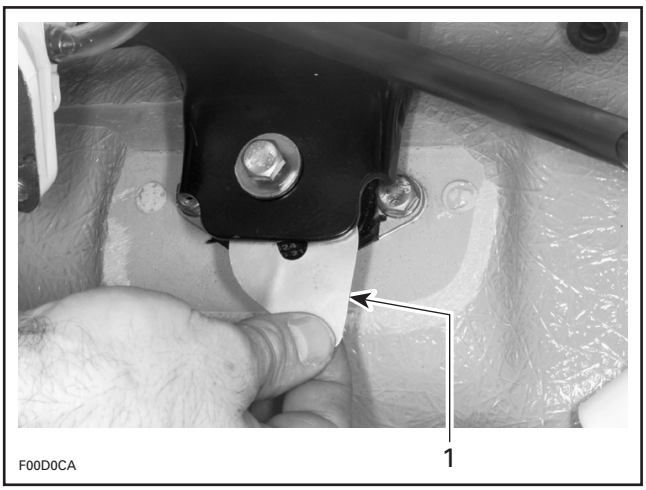


TYPICAL

1. Alignment shaft
2. PTO flywheel

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 supports and rubber mounts to correct alignment.



TYPICAL

1. Shim

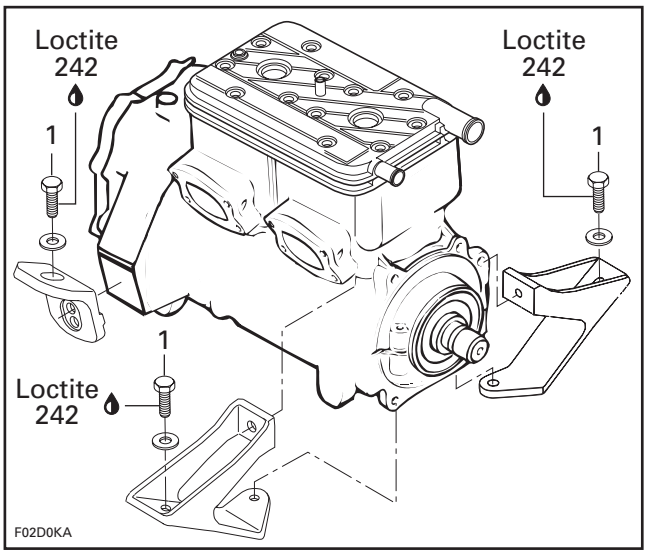
▼ CAUTION

Whenever shims are used to correct alignment, never install more than 1.3 mm (0.051 in) shim thickness.

Engine Support Screws

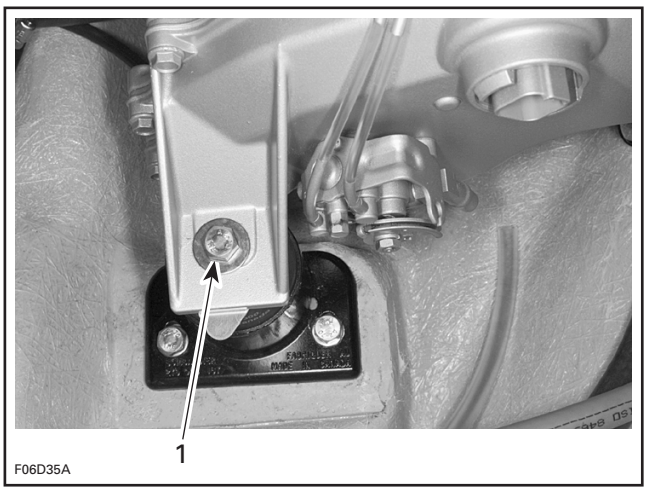
Apply Loctite 242 (blue) on screw threads.

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



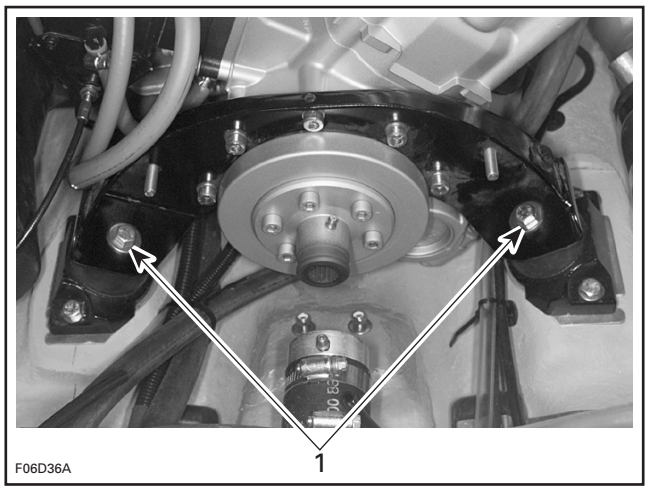
717 ENGINE

1. *Torque to 25 N•m (18 lbf•ft)*



FRONT ENGINE SUPPORT — 787 AND 947 ENGINES

1. *Torque to 25 N•m (18 lbf•ft)*



REAR ENGINE SUPPORT — 787 AND 947 ENGINES

1. *Torque to 25 N•m (18 lbf•ft)*

Final Inspection

Check throttle cable condition and lubricate cable with BOMBARDIER LUBE lubricant.

After its installation, properly adjust and bleed oil injection pump as specified in OIL INJECTION PUMP 07-03.

Check hose condition and pressure test fuel system, refer to FUEL CIRCUIT 06-02.

◆ 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.

Verify all electrical connections.

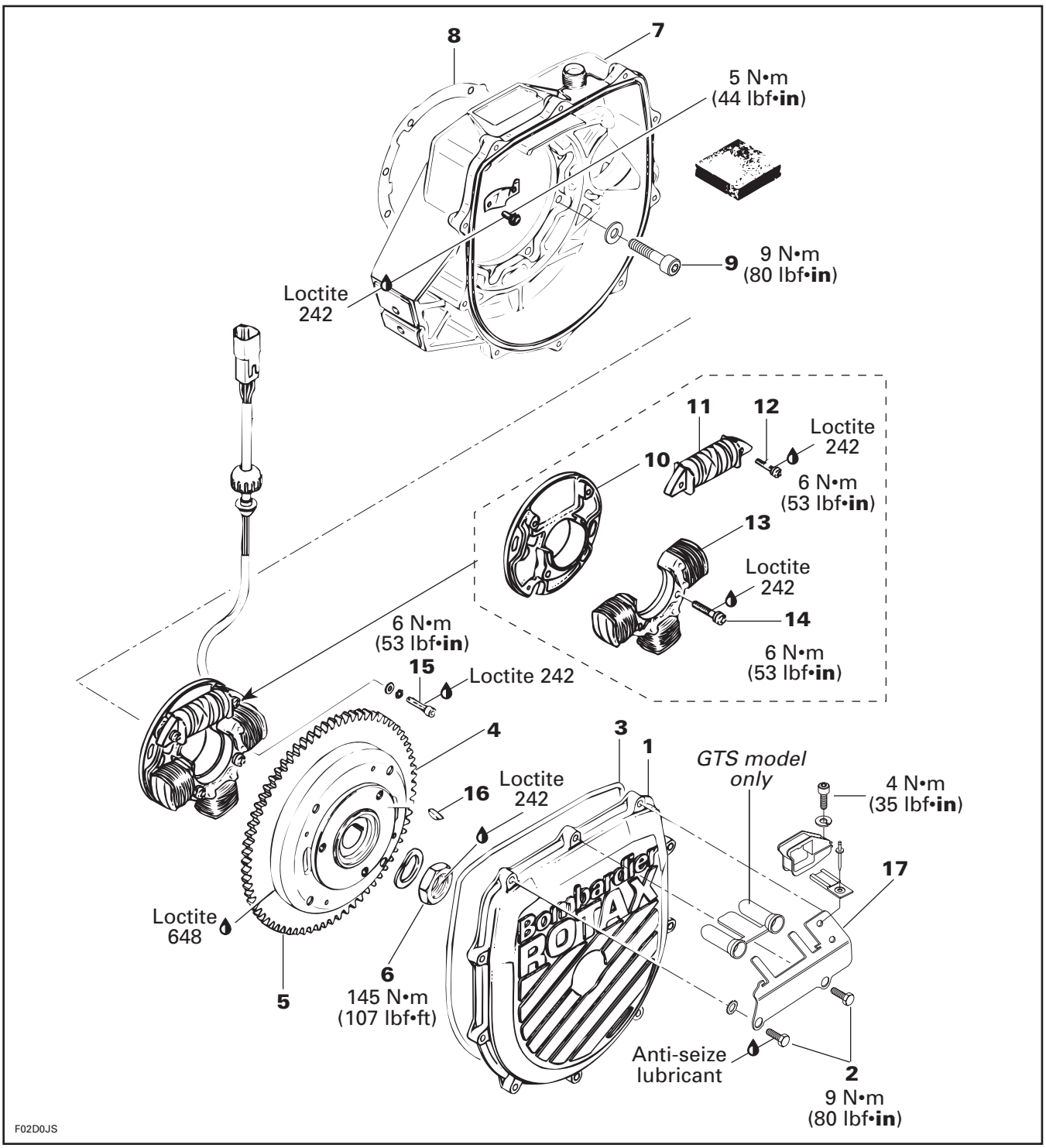
Run engine and ensure there is no leakage.

▼ CAUTION

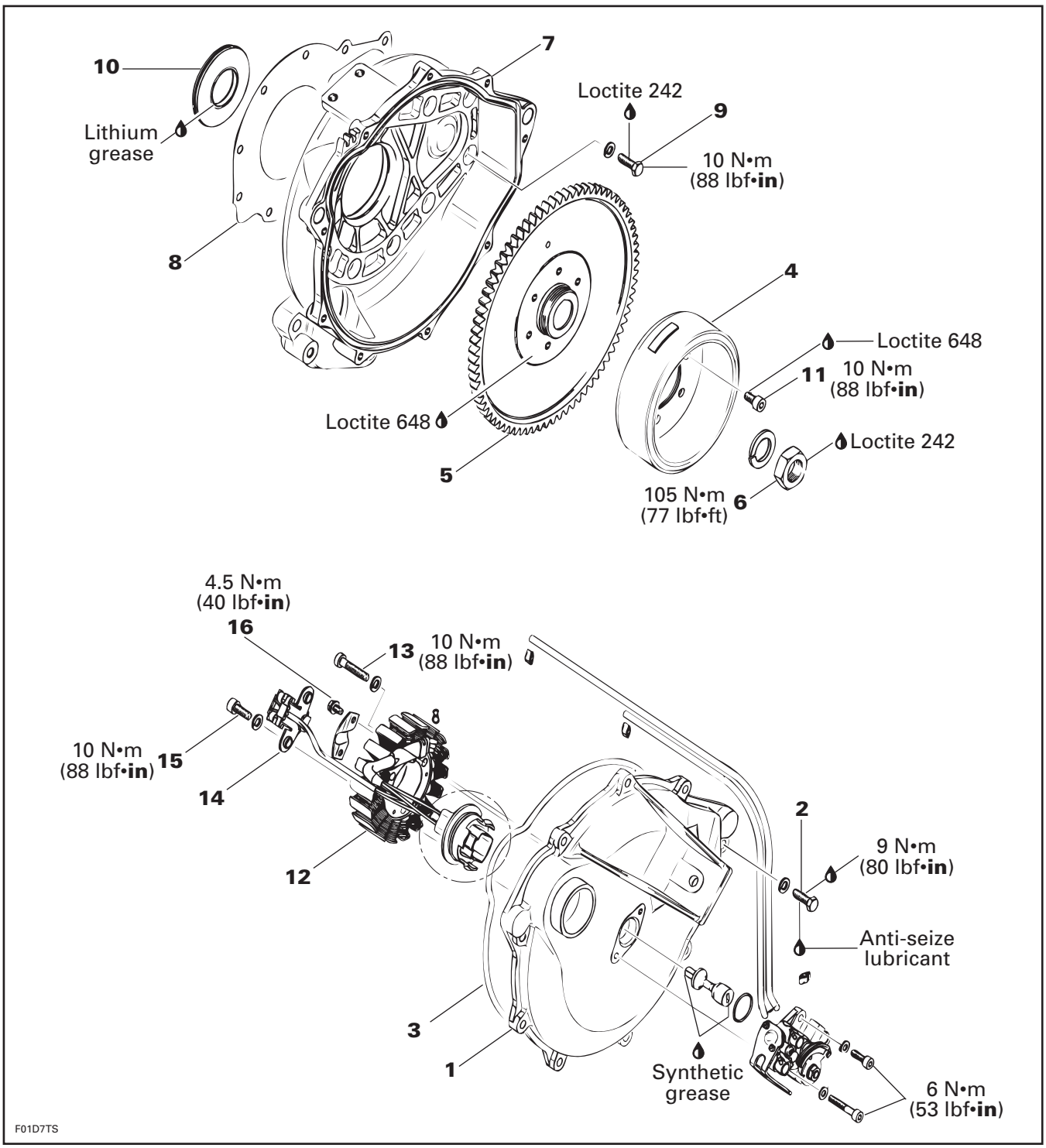
If watercraft is out of water, engine must be cooled using the flush kit.

MAGNETO SYSTEM

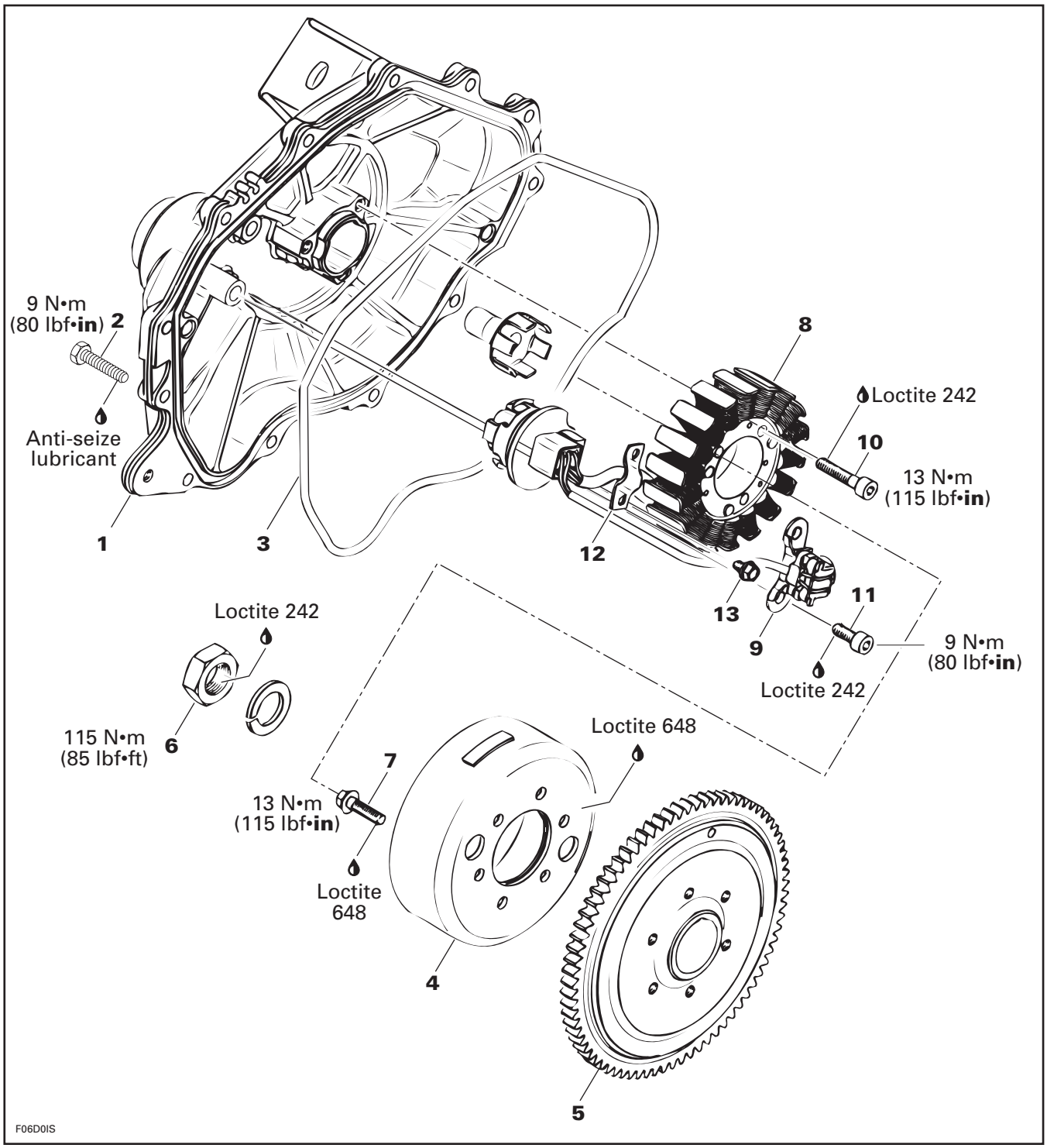
717 Engine



787 Engine


10
Lithium grease
7
Loctite 242
9
10 N•m (88 lbf•in)
8
4
Loctite 648
11
10 N•m (88 lbf•in)
Loctite 648
5
Loctite 242
105 N•m (77 lbf•ft)
6
4.5 N•m (40 lbf•in)
16
13
10 N•m (88 lbf•in)
10 N•m (88 lbf•in)
15
14
12
2
9 N•m (80 lbf•in)
Anti-seize lubricant
3
1
Synthetic grease
6 N•m (53 lbf•in)
F01D7TS

947 Engine


9 N•m
(80 lbf•in)
2
Anti-seize
lubricant
1
3
8
Loctite 242
10
13 N•m
(115 lbf•in)
12
13
11
9
9 N•m
(80 lbf•in)
Loctite 242
Loctite 242
115 N•m
(85 lbf•ft)
6
Loctite 648
7
13 N•m
(115 lbf•in)
Loctite
648
4
5
F06D0IS

GENERAL

The following procedures can be performed without removing engine from watercraft.

DISASSEMBLY

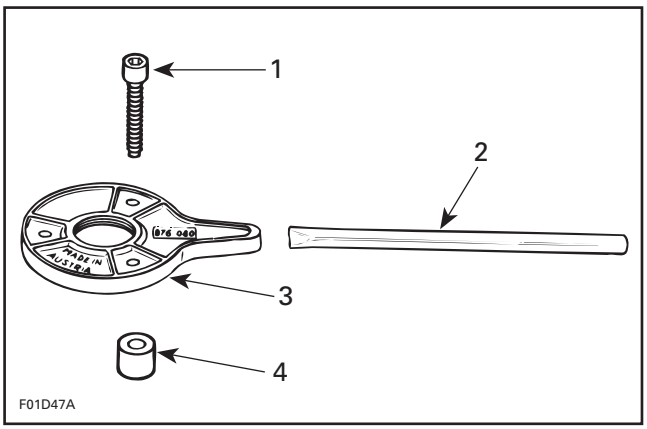
717 Engine

1, Magneto Housing Cover

Remove screws **no. 2** and wire support **no. 17**, then withdraw cover.

4,5, Magneto Flywheel and Ring Gear

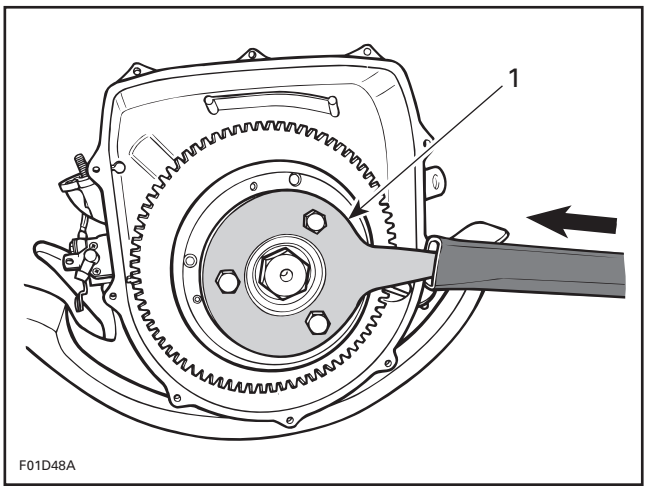
Magneto flywheel is locked with puller plate (P/N 290 876 080), sleeves (P/N 290 847 220) and extension handle (P/N 295 000 111).



1. Screw
2. Extension handle
3. Puller plate
4. Sleeve

Using 3 M8 x 35 screws (P/N 290 841 591), install screws through puller plate and slide sleeves on screws then secure puller plate on magneto flywheel so that sleeves are against flywheel.

Install extension handle on end of puller plate.

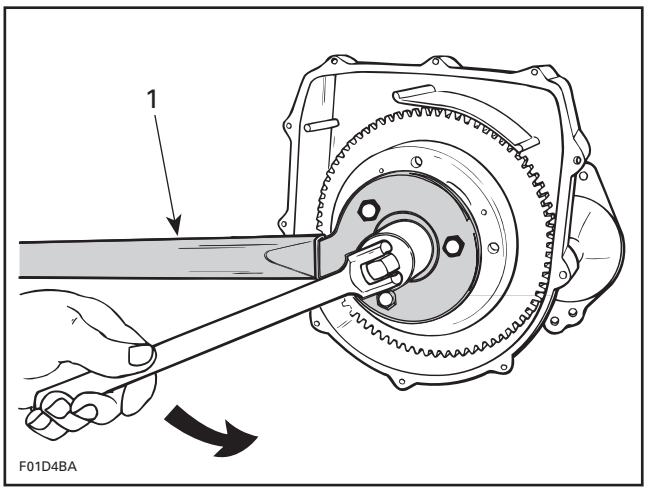


TYPICAL

1. Sleeves on opposite side

Using a suitable socket, unscrew retaining nut **no. 6** 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.

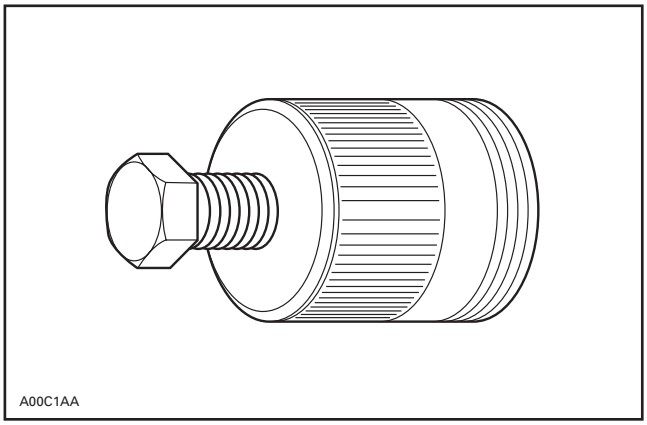


TYPICAL

1. Extension handle locking crankshaft

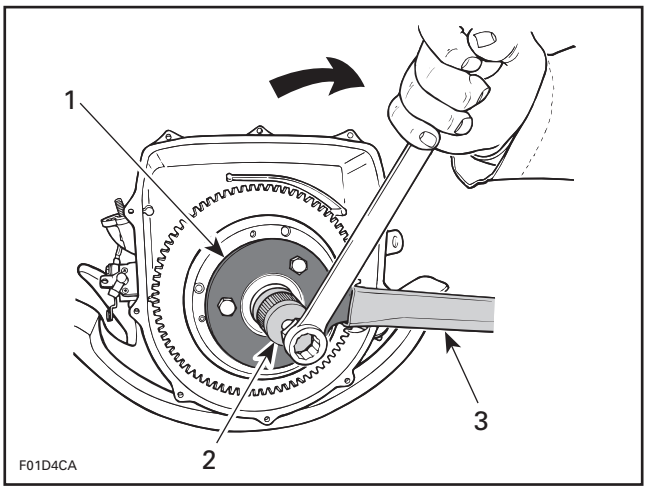
Remove nut and lock washer from magneto flywheel.

Magneto 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 magneto flywheel from its taper.



1. *Puller plate*
2. *Puller*
3. *Extension handle*

10, Armature Plate

Remove 3 retaining screws **no. 15** and withdraw armature plate.

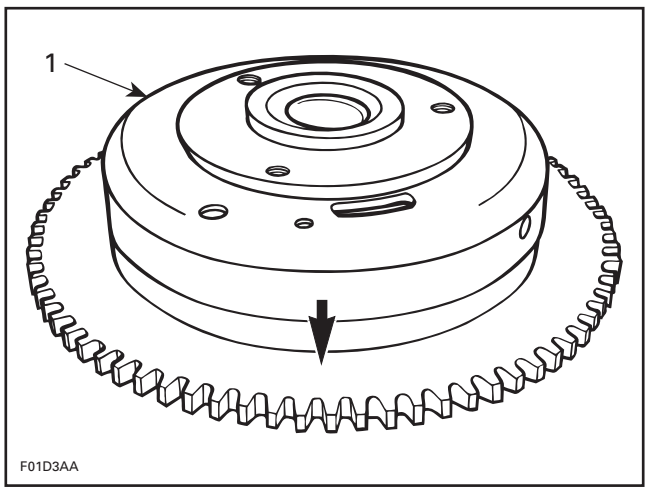
7, Magneto Housing

To remove magneto housing, starter has to be removed. Refer to STARTING SYSTEM 08-04.

Unscrew retaining screws **no. 9**, then withdraw housing.

4,5, Magneto Flywheel and Ring Gear

Lay magneto flywheel on a steel plate. Tap lightly on ring gear using a hammer to release it from magneto flywheel.

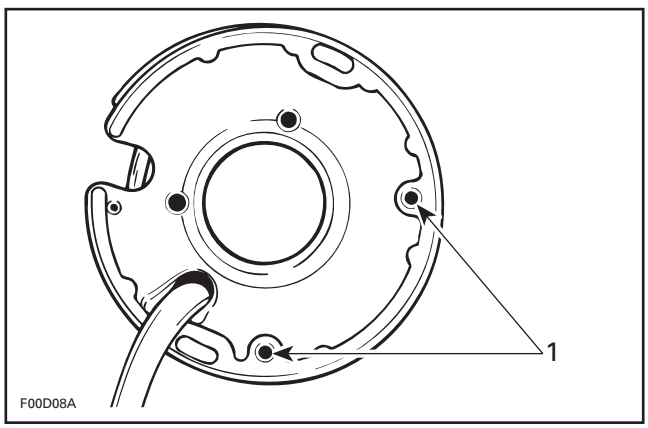


1. *Magneto flywheel*

11, Generating Coil

To replace generating coil:

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



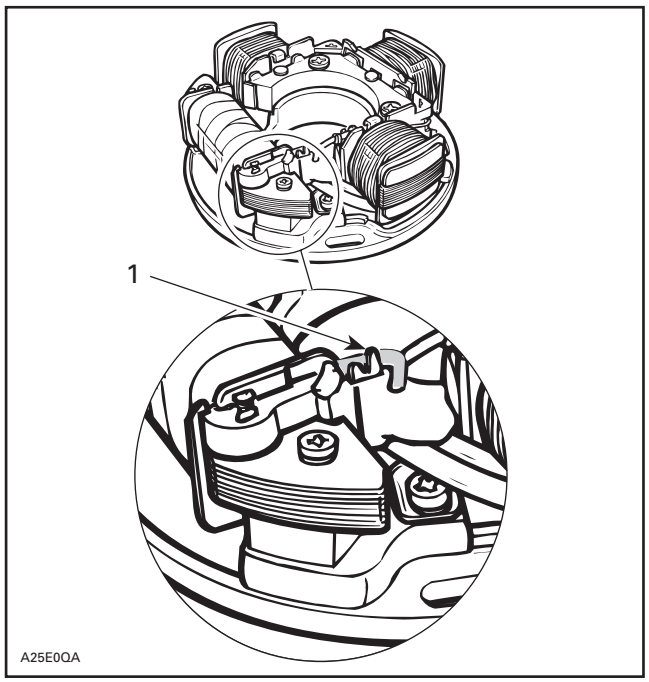
1. *Heat the armature plate*

▼ CAUTION

Protect harness from flame.

– Remove screws.

– Uncrimp and unsolder BLACK/RED wire from coil.

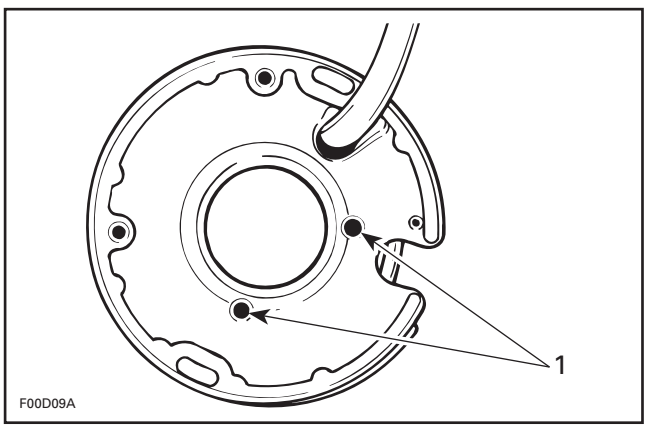


1. Uncrimp and unsolder wire here

13, 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.



1. Heat the armature plate

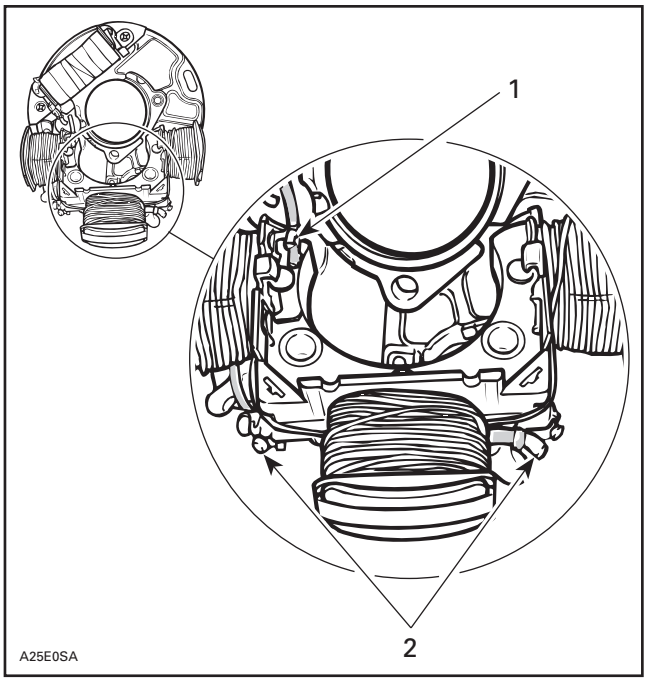
▼ CAUTION

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.



1. Uncrimp and unsolder ground wire (BLACK)
2. Uncrimp and unsolder YELLOW and YELLOW/BLACK wires

Engine Crankcase Replacement

717 Engine Only

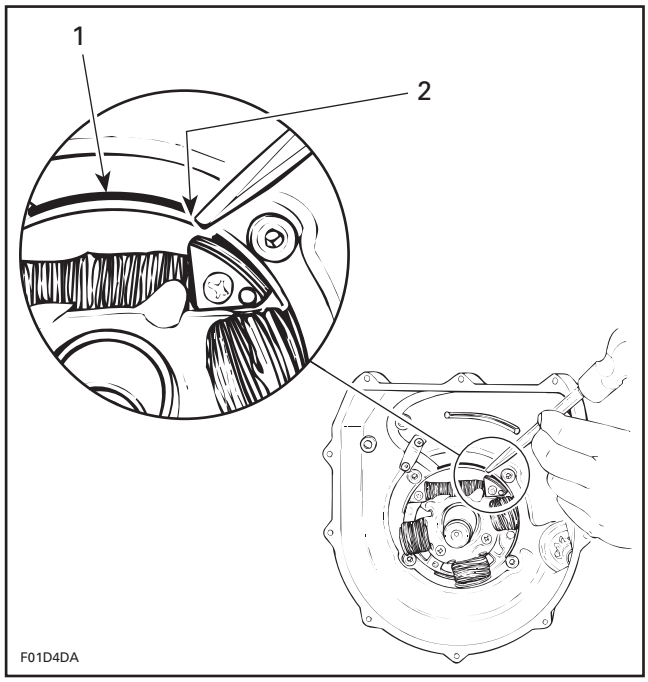
Since replacement crankcases do not have timing mark for armature plate location, indexing marks should be made on armature plate and crankcase to ease reassembly and further ignition timing.

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

Proceed as follows:

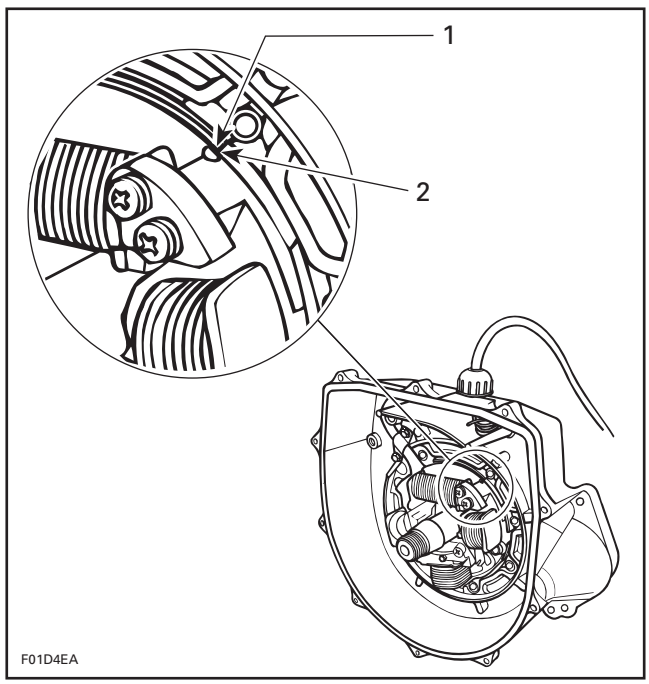
– Find a crankcase locating lug (the top one in this example).

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



1. *Crankcase locating lug*
2. *Mark armature plate at the end of lug*

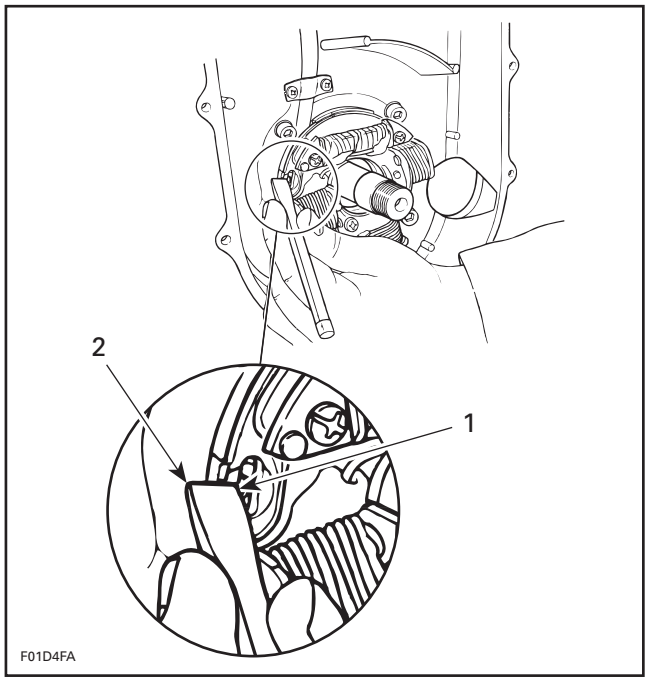
– At assembly, align armature plate mark (previously punched) with the end of the same locating lug on the new crankcase.



TYPICAL

1. *Lug end of crankcase*
2. *Align mark and lug end here*

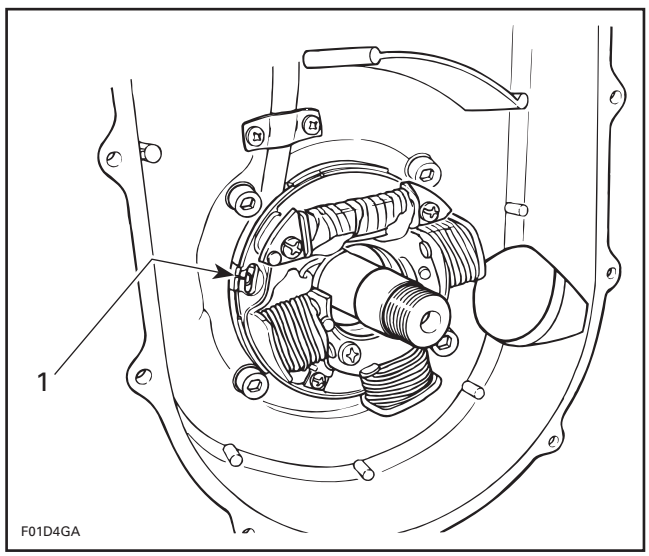
– Find manufacturer's mark on armature plate. In line with this mark, punch another mark on adjacent crankcase lug.



TYPICAL

1. *Manufacturer's mark on armature plate*
2. *Punch a mark on crankcase lug aligned with plate mark*

The new mark on crankcase will be used for further assembly positioning as a pre-timing position.



TYPICAL

1. *For further assembly, use these marks*

787 Engine

1, Magneto Housing Cover

Loosen screws **no. 2**. Remove engine magneto cover.

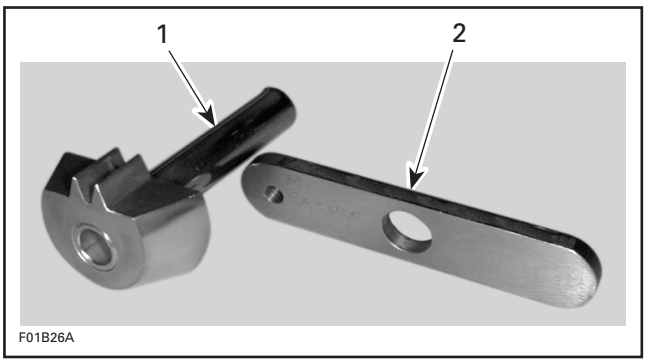
Remove oil pump shaft from flywheel nut.

4,5, Rotor and Flywheel

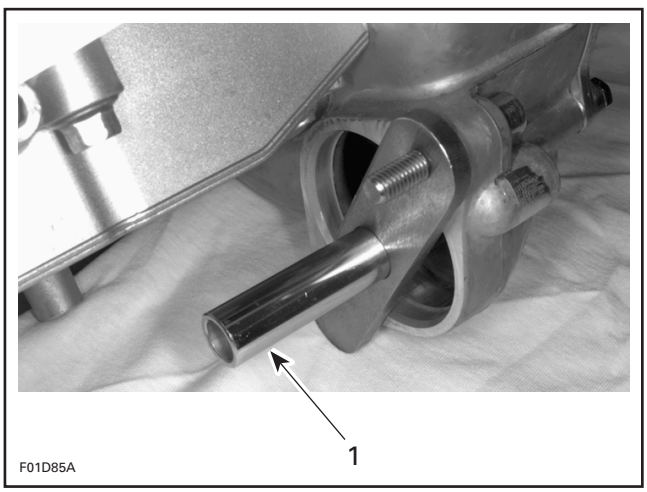
Remove starter. Refer to STARTING SYSTEM 08-04.

NOTE: Crankshaft can also be locked by using the PTO flywheel. For procedure, refer to BOTTOM END 04-06.

Lock ring gear using special tool.

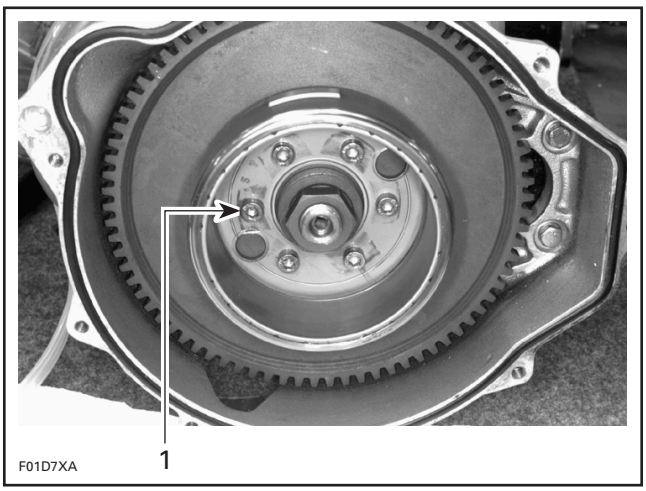


1. Ring gear blocking tool (P/N 295 000 134)
2. Retaining plate (P/N 295 000 154)



1. Ring gear blocking tool with retaining plate

If desired, magneto rotor can be removed without the engine flywheel. Remove the 6 screws **no. 11**.



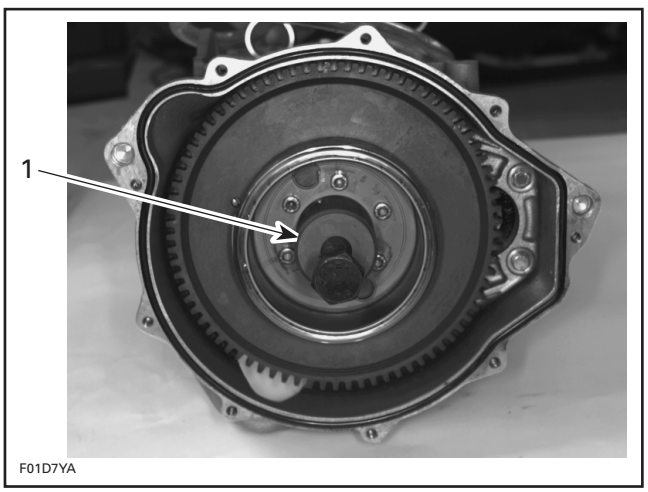
1. Screw

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

Remove special tool locking ring gear.

Engine flywheel is easily freed from crankshaft with puller (P/N 420 976 235) and crankshaft protective cap (P/N 290 876 557).

Insert crankshaft protector to outer end of crankshaft and fully thread puller in engine flywheel.



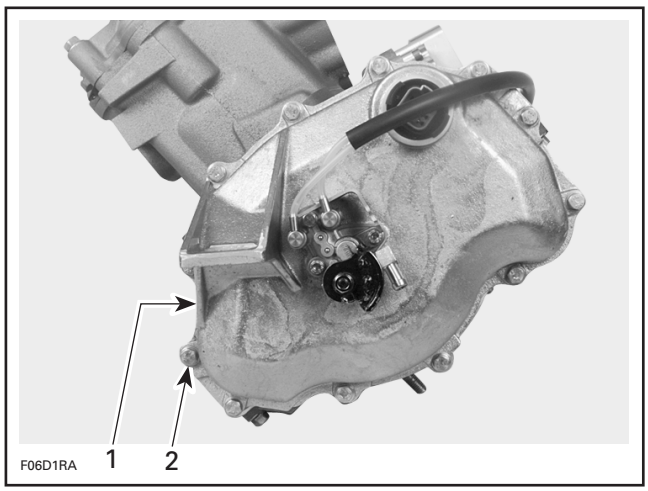
1. Puller

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

947 Engine

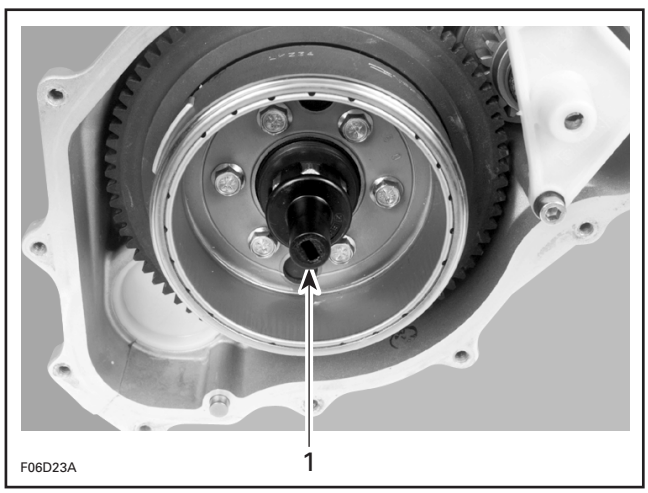
1, Cover

Loosen screws **no. 2**. Remove engine magneto cover.



1. Cover
2. Screw

Remove oil pump shaft from flywheel nut.

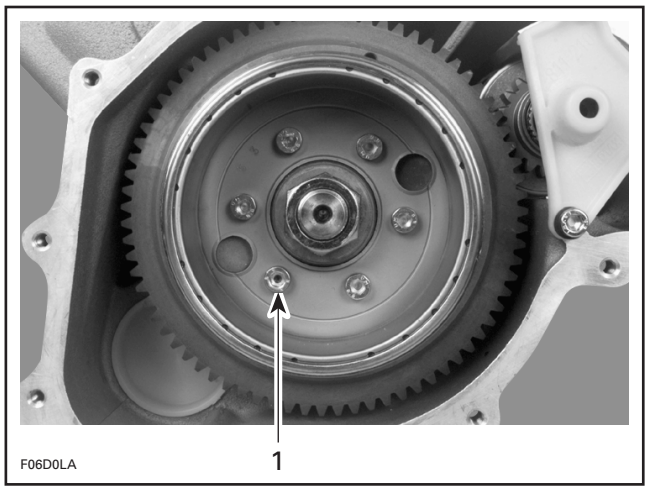


1. Remove oil pump shaft

4,5, Rotor and Flywheel

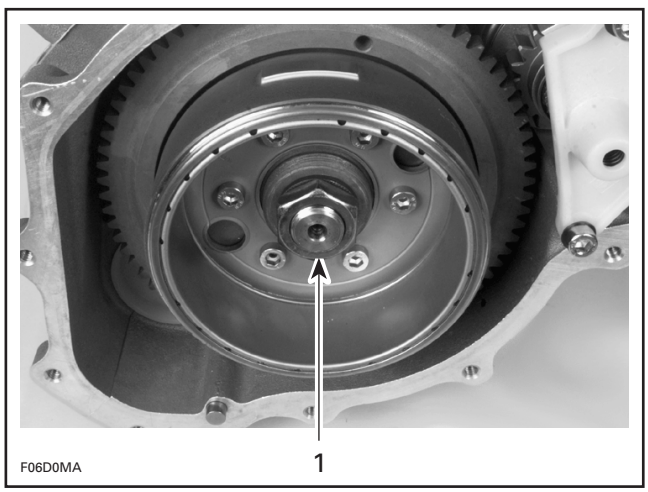
To remove the rotor or the flywheel, the crankshaft must be locked. For procedure, refer to BOTTOM END 04-06.

If necessary, the magneto rotor can be removed without the engine flywheel. Remove the 6 screws **no. 7**.



1. Screw

To remove the flywheel/rotor assembly, unscrew nut **no. 6** counterclockwise when facing it.

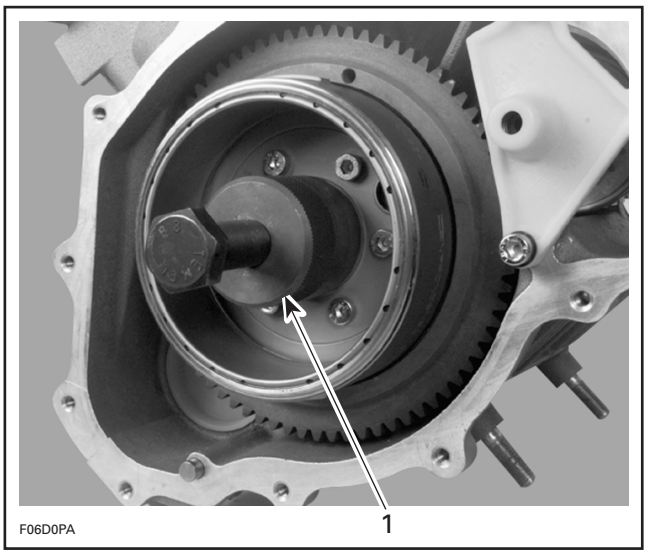


1. Nut

The flywheel is easily freed from crankshaft with puller (P/N 420 976 235).

Install protective cap (P/N 290 877 414) to crankshaft.

Fully thread puller in engine flywheel.

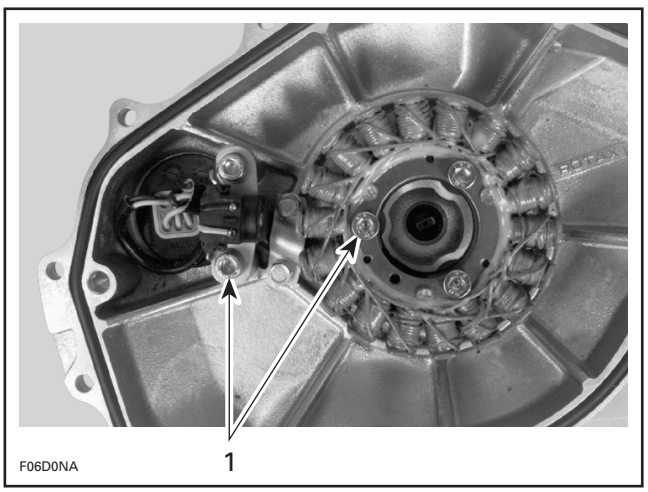


1. Puller

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

8,9, Stator and Trigger Coil

Loosen screws **no. 10** and **no. 11** to remove the stator and trigger coil from the engine magneto cover.



1. Screws

CLEANING

Clean all metal components in a solvent.

▼ CAUTION

Clean coils and magnets using only a clean cloth.

Clean crankshaft taper and threads.

ASSEMBLY

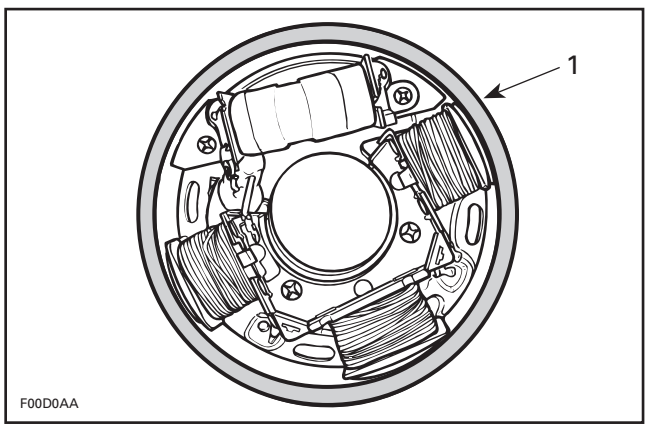
717 Engine

11, Generating Coil

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

Apply Loctite 242 (blue) to screws **no. 12** 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.



1. Magneto coil centering tool (P/N 290 876 922)

▼ CAUTION

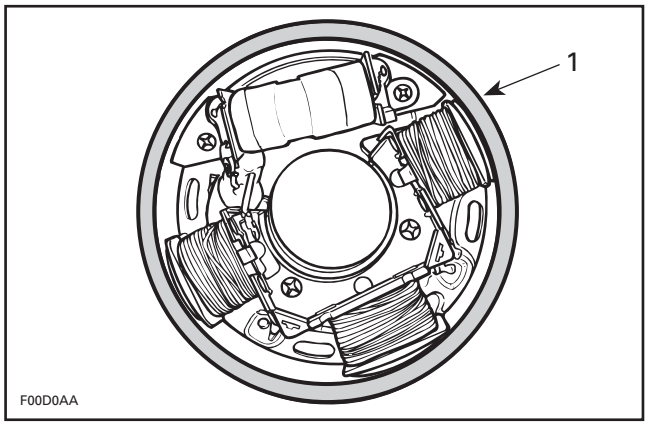
Before reinstalling the magneto, remove the loose epoxy from harness.

13, Battery Charging Coil

Position new coil, crimp and solder all wires.

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 **no. 14**.

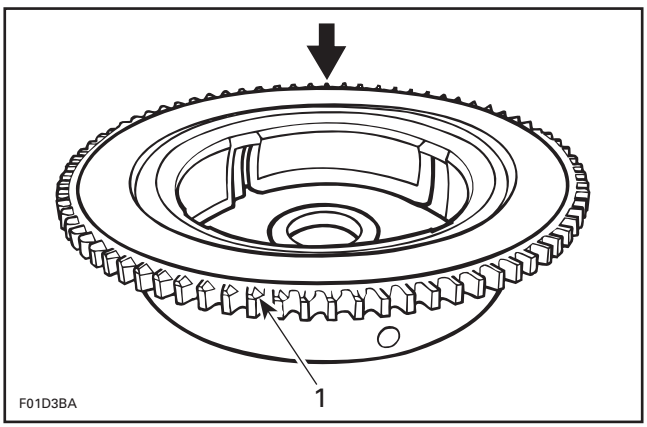


1. Magneto coil centering tool (P/N 290 876 922)

4,5, Magneto Flywheel and Ring Gear

Apply Loctite 648 (green) to magneto flywheel mating surface. Lay ring gear on a steel plate, then heat with a propane torch in order to install it on magneto flywheel.

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



1. Teeth chamfer

NOTE: Ensure that ring gear contacts magneto flywheel flange.

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

▼ CAUTION

Always assemble magneto flywheel and ring gear prior to apply Gun Kote. If not done correctly, ring gear won't contact magneto 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 magneto flywheel threaded holes.

3. Bake parts in oven at 175° (350°F) for 1 hour to cure Gun Kote.

▼ CAUTION

Do not eliminate Gun Kote heat curing time because it will lose all its resistance and it will not give any protection.

7, Magneto Housing

Install gasket **no. 8** between magneto housing and engine crankcase.

Install magneto housing and torque screws **no. 9** to 9 N•m (80 lbf•**in**).

10, Armature Plate

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

Apply a drop of Loctite 242 (blue) on threads of screws **no. 15** and torque to 6 N•m (53 lbf•**in**).

4, Magneto Flywheel

Apply Loctite 242 (blue) on crankshaft taper.

Position Woodruff key **no. 16** and magneto flywheel. Apply Loctite 242 (blue) on nut **no. 6**. Install nut with lock washer and torque to 145 N•m (107 lbf•ft).

▼ CAUTION

Never use any type of impact wrench at magneto installation.

Ignition Timing

For ignition timing procedures of the 717 engine, refer to IGNITION SYSTEM 08-02.

1, Magneto Housing Cover

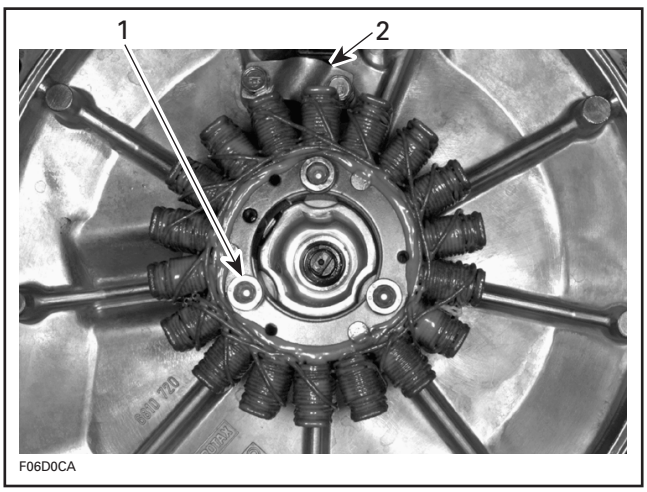
Properly install O-ring **no. 3** in magneto housing. Apply Loctite 767 anti-seize on screws **no. 2**, install cover and wire support **no. 17**. Torque screws **no. 2** in a criss-cross sequence to 9 N•m (80 lbf•**in**).

787 Engine

12, Stator

Install the stator in magneto housing cover **no. 1** and torque screws **no. 13** to 10 N•m (88 lbf•**in**).

Replace wiring harness bracket **no. 16** of stator and torque screws to 4.5 N•m (40 lbf•**in**).

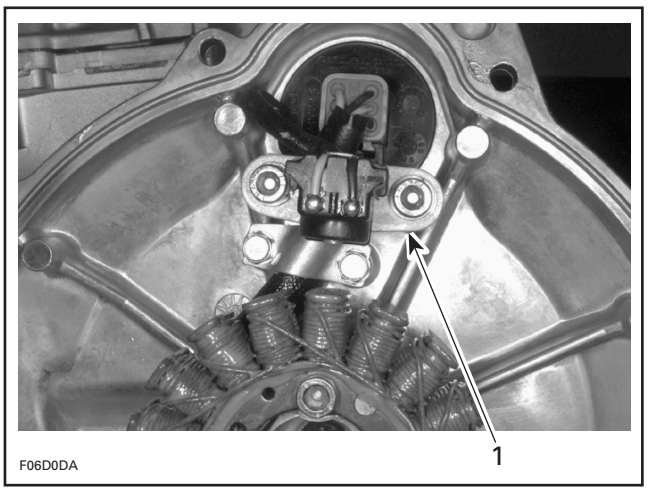


1. Stator screws
2. Bracket

14, Trigger Coil

Install the trigger coil in magneto housing cover **no. 1** and torque screws **no. 15** to 10 N•m (88 lbf•**in**).

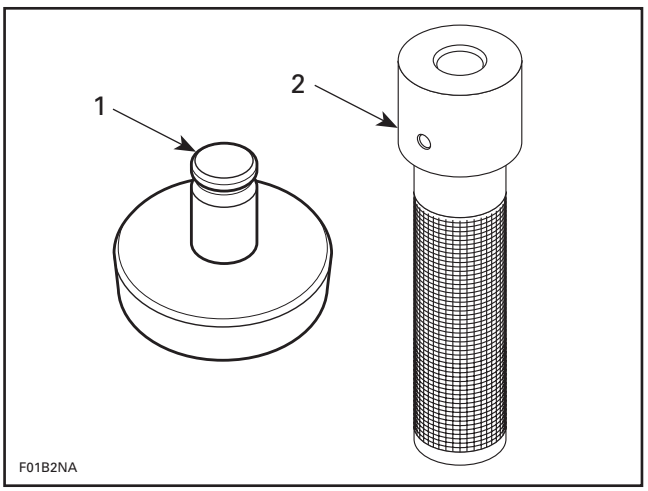
NOTE: The trigger coil is not adjustable.



1. Trigger coil

7, Magneto Housing

To install oil seal **no. 10** of magneto housing, use pusher (P/N 290 877 740) and handle (P/N 290 877 650).



1. Pusher
2. Handle

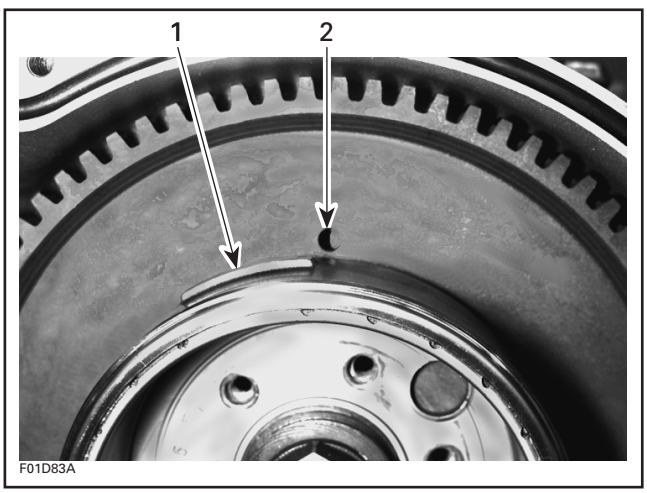
Install gasket **no. 8** between magneto housing and engine crankcase.

Install magneto housing and torque screws **no. 9** to 9 N•m (80 lbf•**in**).

4,5, Rotor and Flywheel

When reinstalling magneto rotor to engine flywheel, apply Loctite 648 to mating surfaces.

One of the protusion end of magneto rotor must align with hole of engine flywheel.



1. Protusion
2. Hole

Apply Loctite 648 (green) on screws **no. 11** and torque to 10 N•m (88 lbf•**in**).

Apply Loctite 242 (blue) on crankshaft taper.

Apply Loctite 242 (blue) on nut **no. 6**. Install nut with lock washer and torque to 105 N•m (77 lbf•ft).

▼ CAUTION

Never use any type of impact wrench at magneto installation.

1, Cover

Before installation, properly install O-ring **no. 3** in engine magneto cover.

Apply Loctite 767 anti-seize compound on screws **no. 2**. Torque screws in a criss-cross sequence to 9 N•m (80 lbf•**in**).

947 Engine

8,9, Stator and Trigger Coil

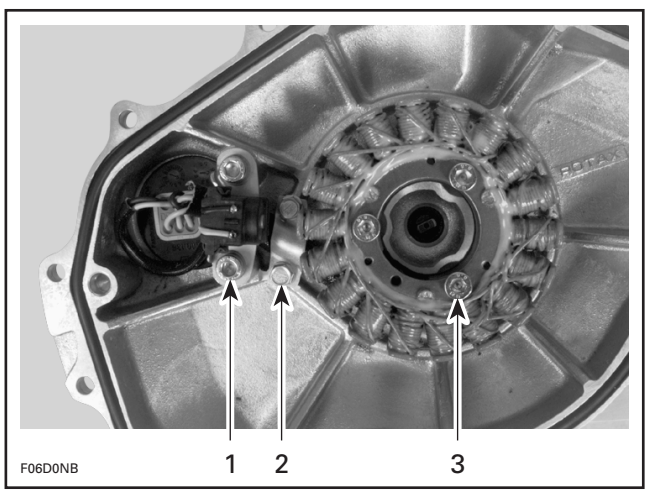
Install the stator and trigger coil in engine magneto cover. Torque screws to 9 N•m (80 lbf•**in**).

Reinstall wiring harness bracket **no. 12** using taptite screws **no. 13**.

Torque trigger coil screws **no. 11** to 9 N•m (80 lbf•**in**).

Torque stator screws **no. 10** to 13 N•m (115 lbf•**in**).

NOTE: The trigger coil is not adjustable.

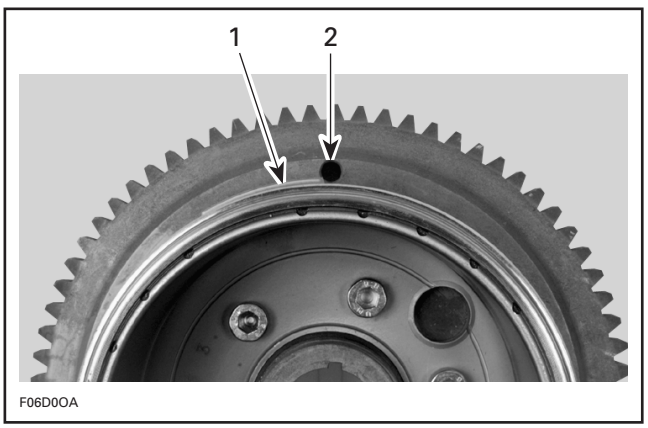


*1. Torque to 9 N•m (80 lbf•**in**)*
2. Taptite screws
*3. Torque to 13 N•m (115 lbf•**in**)*

4,5, Rotor and Flywheel

Apply Loctite 648 (green) on mating surface of the rotor no. 4.

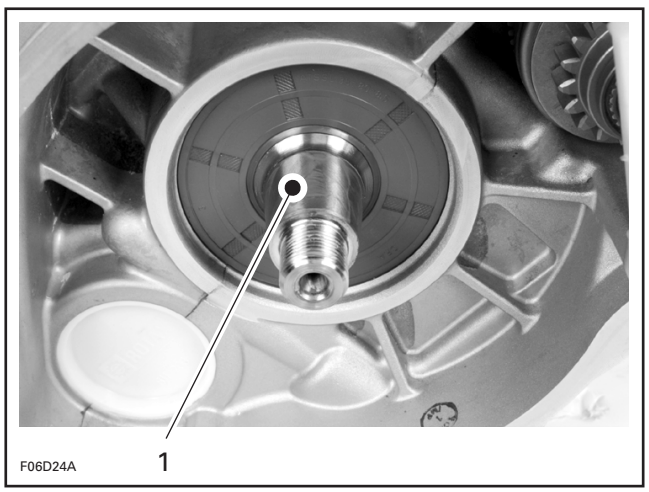
When reinstalling rotor to flywheel, one of the protrusion end of rotor must be aligned with hole in flywheel.



1. Protrusion
2. Hole

Apply Loctite 648 (green) on screws no. 7 retaining rotor to flywheel and torque screws in a criss-cross sequence to 13 N•m (115 lbf•**in**).

Apply Loctite 242 (blue) on crankshaft taper.



1. Loctite 242 (blue) on crankshaft taper

Install flywheel and make sure to align keyway with the crankshaft Woodruff key.

Apply Loctite 242 (blue) on nut no. 6. Install nut with lock washer and torque to 115 N•m (85 lbf•ft).

▼ CAUTION

Never use any type of impact wrench.

Unlock crankshaft. Reinstall pulse fitting with washer and torque to 19 N•m (14 lbf•ft).

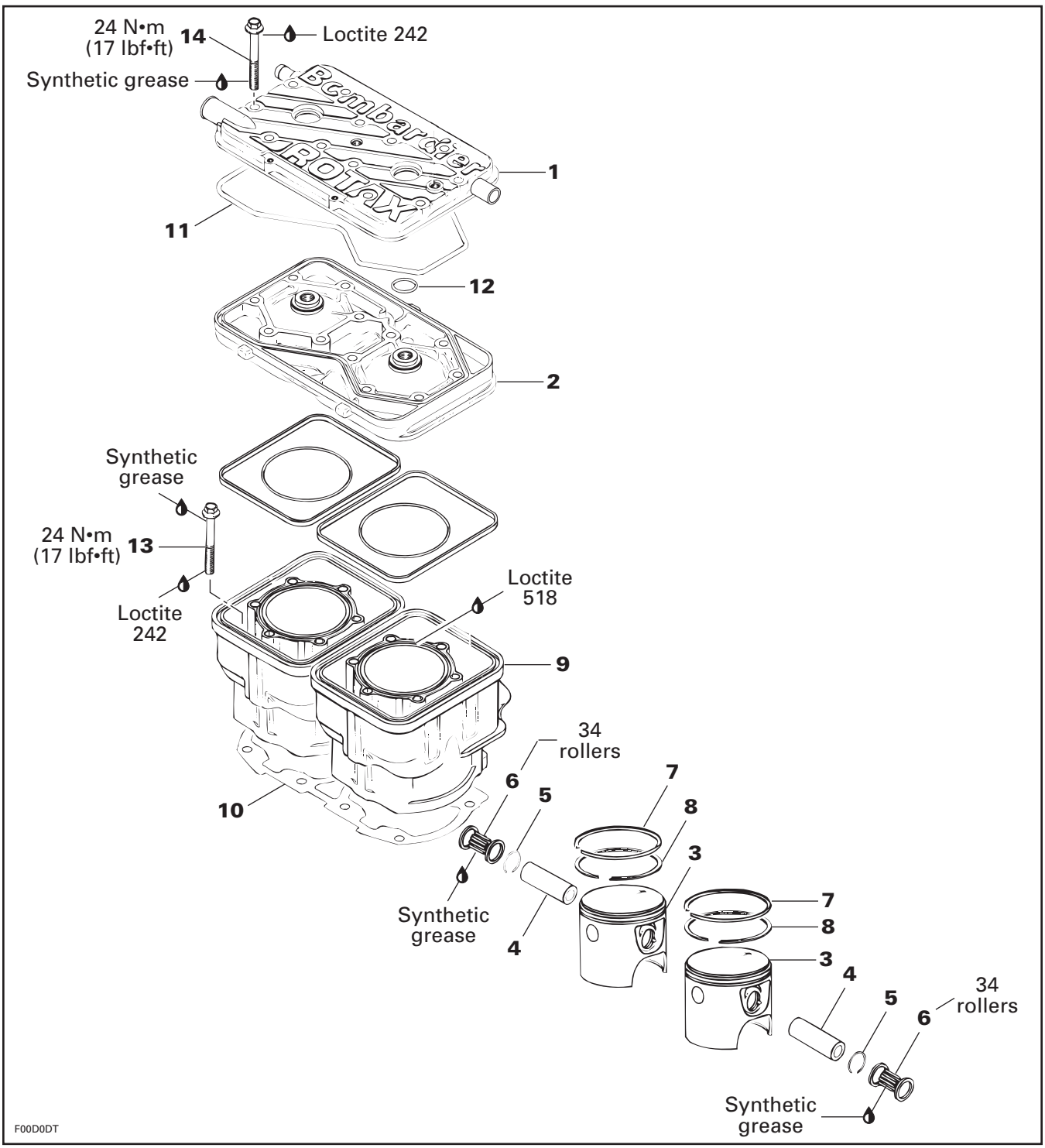
1, Cover

Before installation, properly install O-ring no. 3 in engine magneto cover.

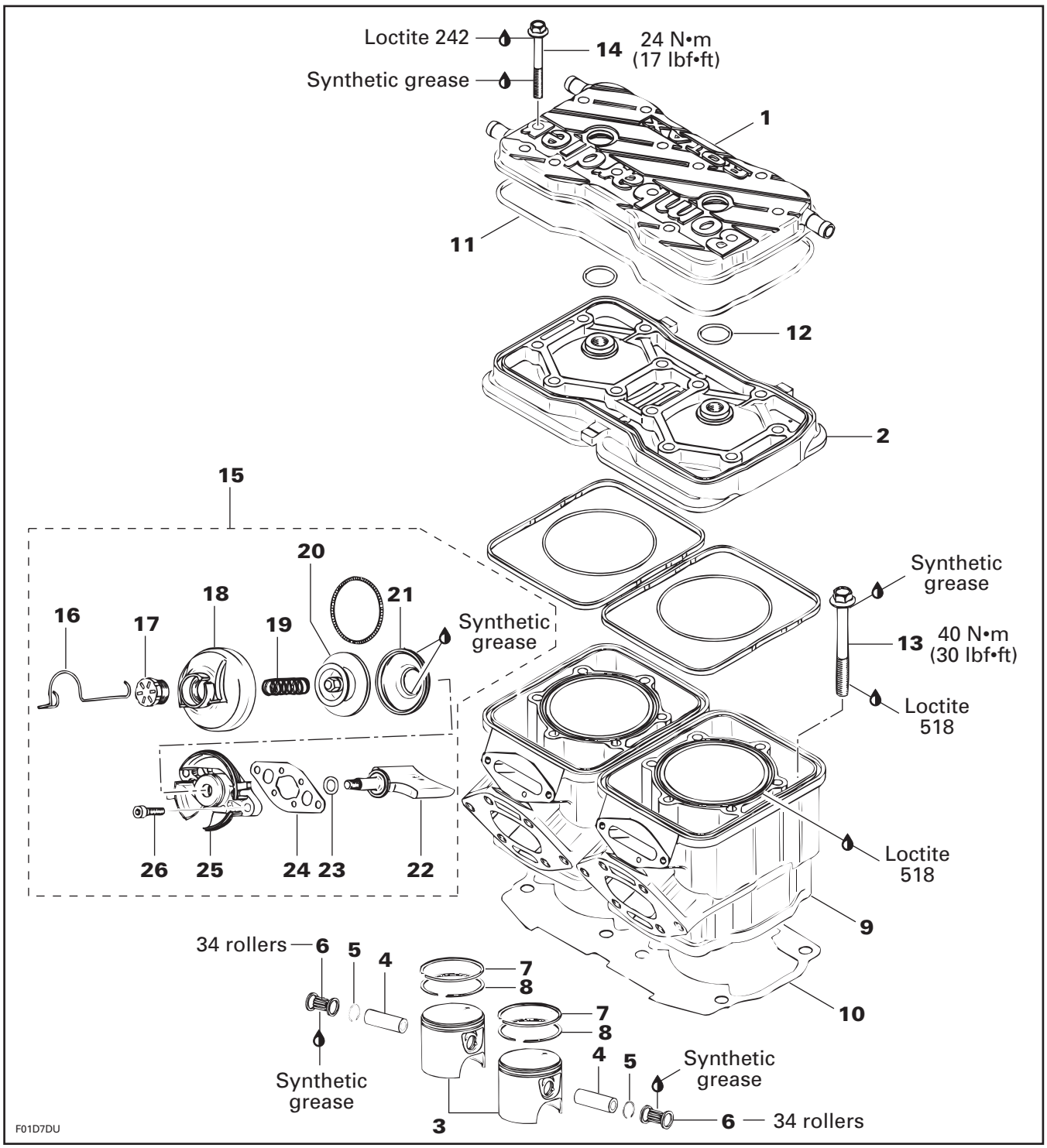
Apply Loctite 767 anti-seize compound on screws no. 2. Torque screws in a criss-cross sequence to 9 N•m (80 lbf•**in**).

TOP END

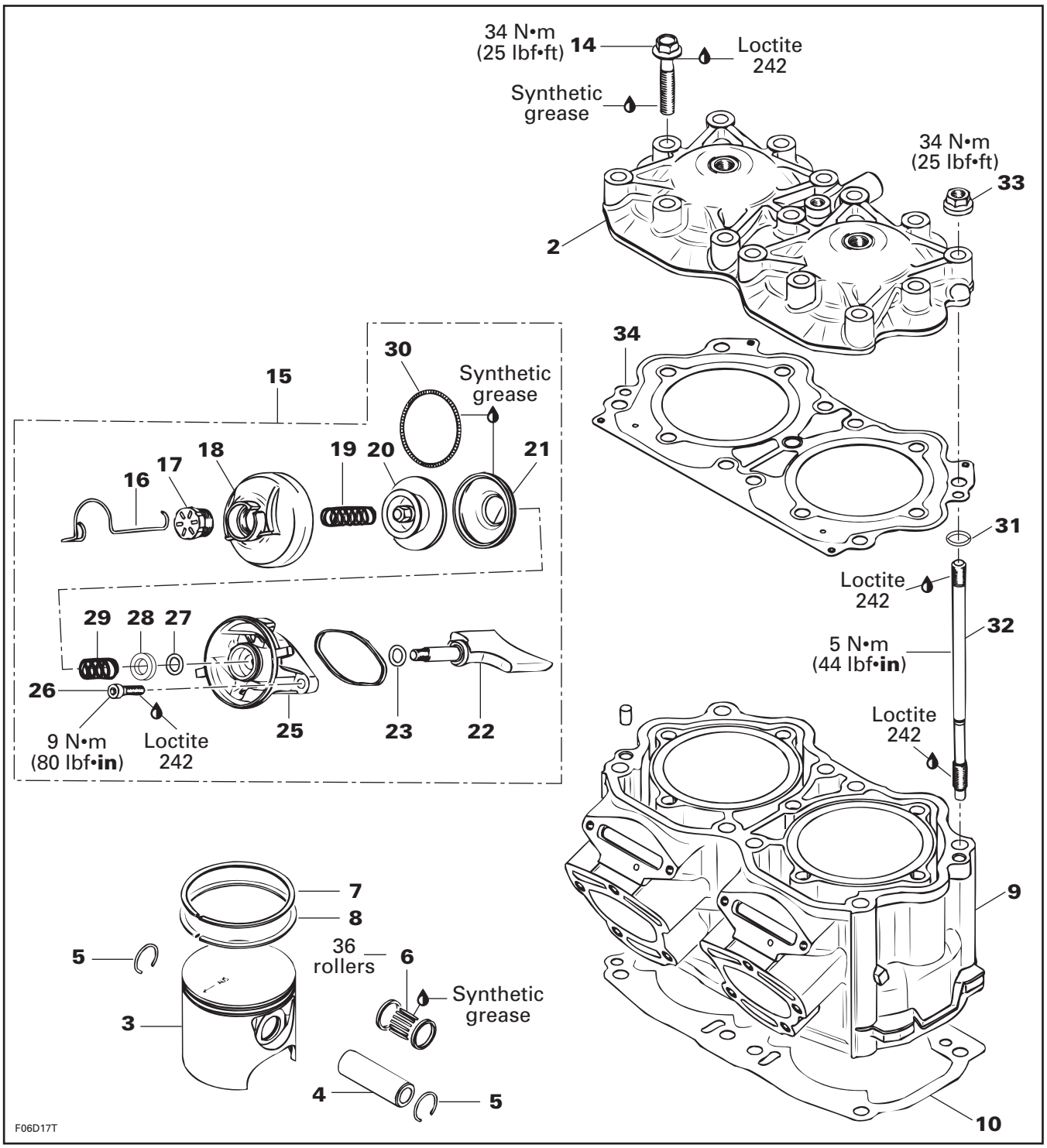
717 Engine



787 Engine



947 Engine


34 N•m
(25 lbf•ft)
14
Loctite
242
Synthetic
grease
34 N•m
(25 lbf•ft)
33
2
34
30
Synthetic
grease
15
16
17
18
19
20
21
31
Loctite
242
29
28
27
32
5 N•m
(44 lbf•in)
26
Loctite
242
9 N•m
(80 lbf•in)
Loctite
242
25
23
22
7
8
9
5
36
rollers
6
3
Synthetic
grease
4
5
10
F06D17T

GENERAL

The 2-stroke ROTAX engine rotates counterclockwise seen from the rear (PTO flywheel).

The 717 and 787 engines have a rotary valve to control opening and closing of the intake. The 947 engine uses reed valves in the crankcase.

The 787 and 947 engines are also equipped with the RAVE system (Rotax Adjustable Variable Exhaust).

▼ CAUTION

No engine components can be interchanged between engines.

787 and 947 Engines

These engines are canted at a 30 degree angle (they are not canted on the same side), lowering the center of gravity of the watercraft. Cylinder exhaust ports are located on the same side of the intake, allowing a high volume tuned pipe design.

RAVE System

THEORY

For a 2-stroke-cycle engine to have high power capacity at high crankshaft speeds, a high volumetric or breathing efficiency is required and the fresh charge losses must be minimized. The result is achieved by opening the exhaust port early and utilizing the resonant effects of the tuned exhaust system to control fresh charge losses.

When an engine of this design is run at a medium speed, efficiency falls off quickly. The relatively high exhaust port effectively shortens the useful power stroke and because the exhaust system is tuned for maximum power, there is a large increase of fresh charge losses. As a result, the torque decreases along with a dramatic increase of the specific fuel consumption. Higher torque along with lower fuel consumption can be obtained at lower engine speeds if the time the exhaust port is open is shortened.

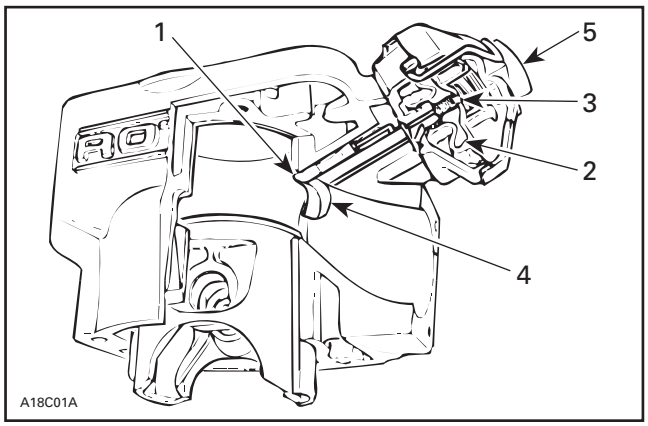
BOMBARDIER-ROTAX has patented a remarkably simple system to automatically change the exhaust port height based on pressure in the exhaust system (and RPM for the 947 engine).

Located above the exhaust port is a guillotine-type slide valve. This rectangular valve is connected by a shaft to a diaphragm which is working against the return spring.

To the outside of the return spring is a red plastic adjustment knob. Turning the adjustment in or out changes the preload on the return spring which, in turn, will change the RPM at which the RAVE valve opens and closes.

787 Engine

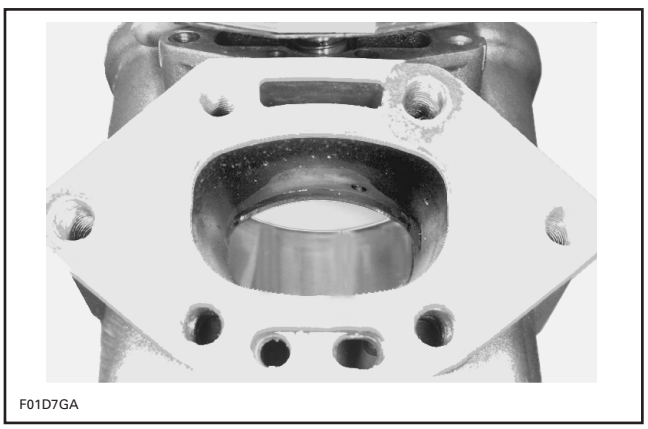
One small passage in the cylinder just outside the exhaust port allows exhaust gas pressure to reach the diaphragm.



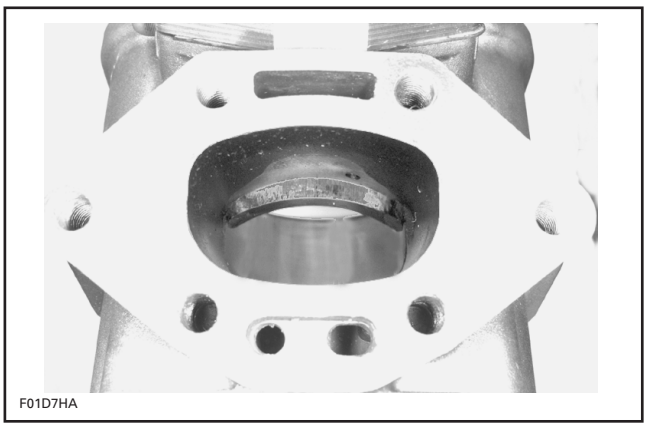
TYPICAL

1. *Sliding valve*
2. *Diaphragm*
3. *Spring*
4. *Exhaust port*
5. *Adjustment knob*

As the throttle is opened and the engine begins producing more power, the pressure against the diaphragm will overcome the pressure of the return spring and the RAVE valve will open.



VALVE FULLY OPENED



VALVE FULLY CLOSED

947 Engine

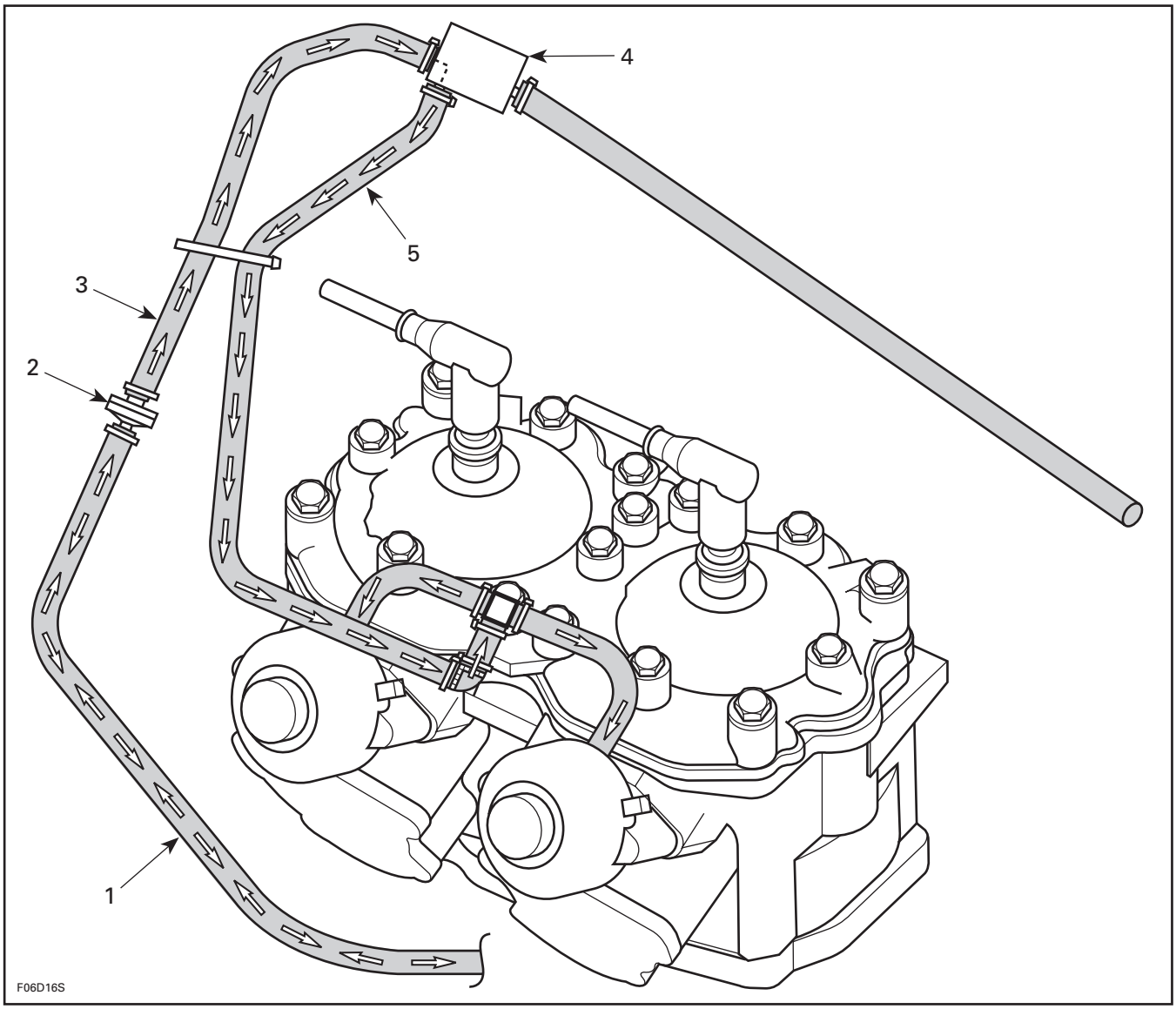
On this engine, the RAVE valves are controlled by the Multi-Purpose Electronic Module (MPEM).

The MPEM measures 2 factors to control the RAVE valves: engine speed (RPM) and its rate of acceleration.

To open the RAVE valves, the MPEM activates a solenoid which directs the positive pressure from engine crankcase to the valves.

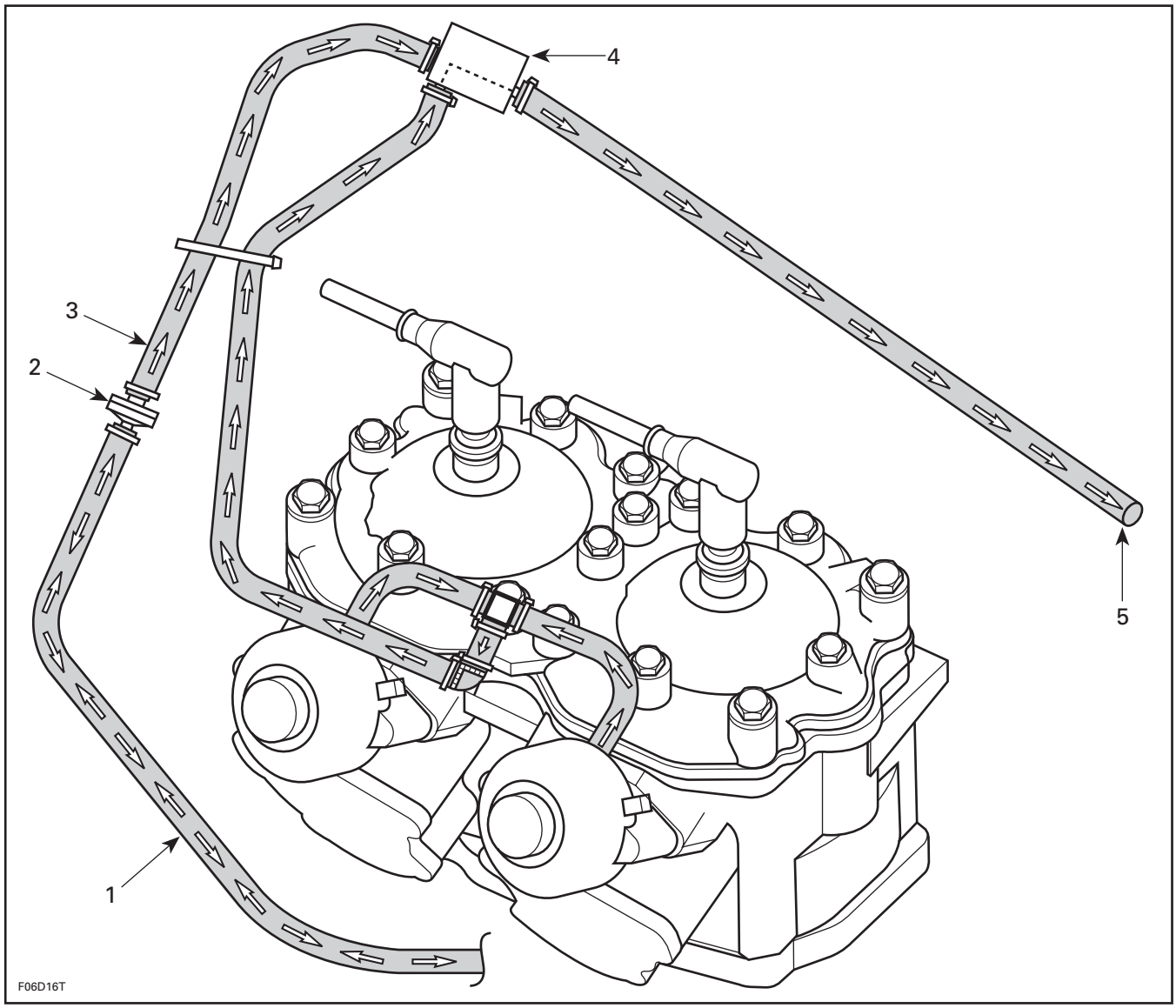
NOTE: A check valve on the pressure line eliminates the negative pressure from the crankcase.

To close the RAVE valves, the MPEM deactivates the solenoid which blocks the crankcase positive pressure. The RAVE valves are opened to the atmosphere.



RAVE VALVE OPENED

1. *Pulse from crankcase*
2. *Check valve*
3. *Positive pressure to solenoid*
4. *Solenoid activated*
5. *Positive crankcase pressure to RAVE valves*



RAVE VALVE CLOSED

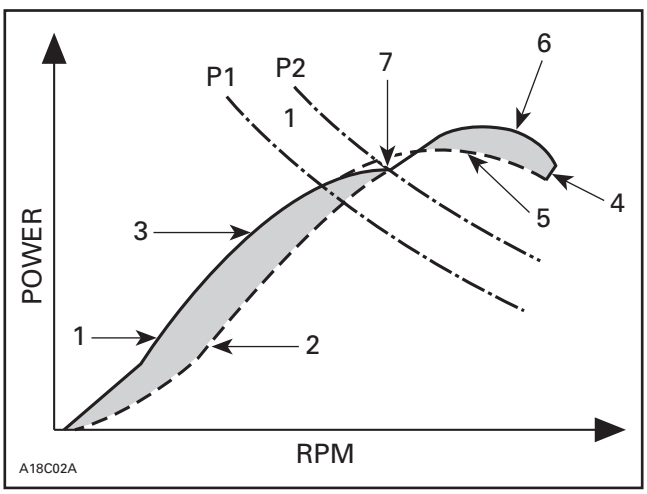
1. *Pulse from crankcase*
2. *Check valve*
3. *Positive pressure blocked by the solenoid*
4. *Solenoid deactivated*
5. *RAVE valves are opened to atmosphere*

787 and 947 Engines

The RAVE valve does not allow an engine to make higher peak horsepower than an engine not so equipped, it can make moving the peak horsepower higher practical because of its effect on the rest of the power curve. Item 2 in the following figure is the power curve of an engine with the RAVE valve held fully open through its entire RPM range. Item 6 notes the peak power produced. That peak will not change if the exhaust port time of a similar engine without a RAVE valve was the same (with all other features equal).

Item 1 is the power curve of the engine with the RAVE valve closed through its entire RPM range. The shaded area (item 3) is the improvement in power at lower engine speeds that is gained because of the lower exhaust port. If the port remains at this height, however, the power would peak as noted in item 5. Raising the exhaust port at the proper RPM (item 7) will allow the engine peak power to continue to rise (item 6).

Item P1 in figure is the force of the return spring against the diaphragm. The exhaust pressure must be high enough to overcome this force before the valve begins opening. Item P2 is the pressure required to completely open the RAVE valve. Between P1 and P2, the usable power curve of the engine is moving from power curve 1 to power curve 2. This transition takes place very rapidly at full throttle and from a practical standpoint can be considered to be instantaneous at item 7. Gradual application of the throttle, however, will result in the RAVE valve opening much later.



MAINTENANCE

There are no wear parts anywhere in the system and there are no adjustments to be periodically checked. The only possible maintenance required would be cleaning of carbon deposits from the guillotine slide. Cleaning intervals would depend upon the user's riding style and the quality of the oil used. Using FORMULA XP-S synthetic injection oil, we would suggest annual cleaning of the valve. If a customer uses a lower quality oil, more frequent cleaning may be required.

No special solvents or cleaners are required when cleaning the valve.

BORING PRECAUTION

In its stock configuration the RAVE valve guillotine has a minimum of 0.5 mm (.020 in) clearance to the cylinder bore measured at the center line of the cylinder. This is the minimum production clearance.

There is only a first oversize piston available for the 787 and 947 engines. That piston is 0.25 mm (.010 in) larger in diameter than the stock piston. When the oversize is installed, the guillotine will have a minimum clearance of 0.375 mm (.015 in) with the cylinder bore. This is the minimum operating clearance the guillotine should be used with. Clearance less than 0.375 mm (.015 in) will require reworking of the guillotine to achieve the proper clearance and radius.

DISASSEMBLY

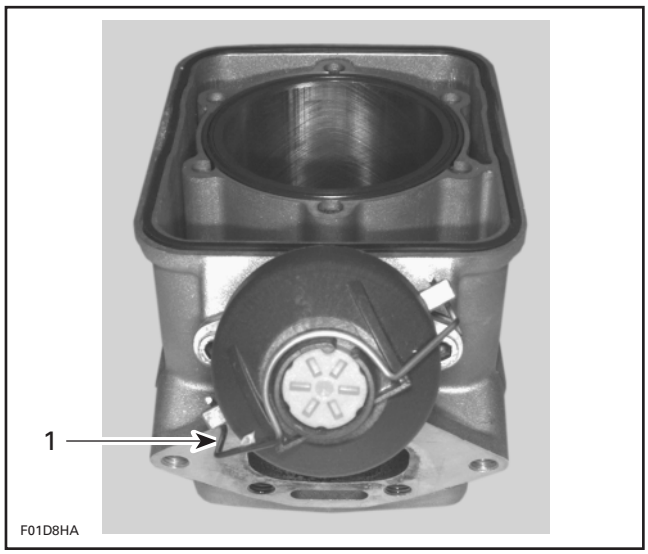
15, RAVE Valve

787 Engine

Remove the cover **no. 18** of the valve by releasing the spring **no. 16**.

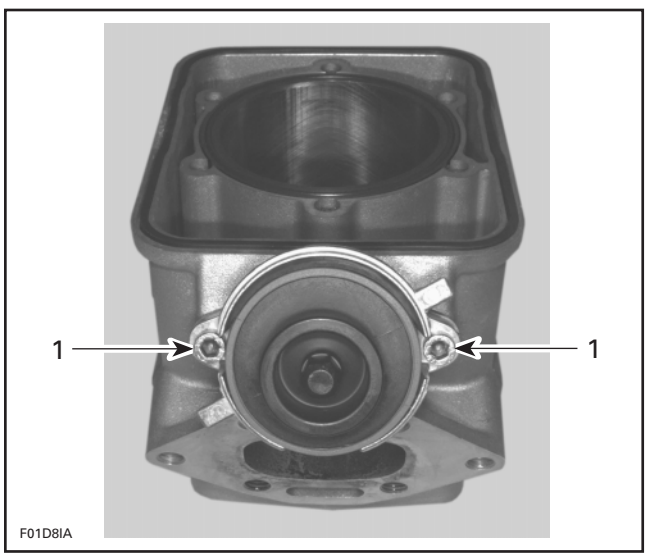
◆ WARNING

Firmly hold cover to valve base. The spring inside the valve is applying a pressure against the cover.



1. Spring

Loosen Allen screws **no. 26** and remove RAVE valve.

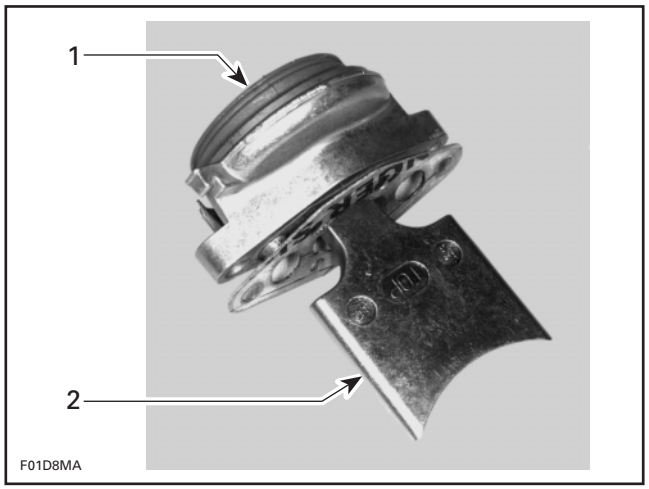


1. Allen screws

Remove bellow **no. 21** from valve piston **no. 20**.

Unscrew valve piston **no. 20** from sliding valve **no. 22**.

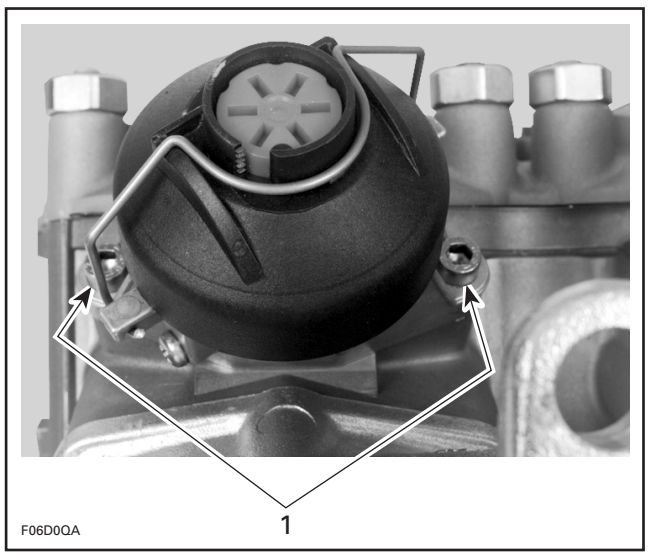
NOTE: Hold the sliding valve to prevent it from turning.



1. Unscrew piston
2. Hold sliding valve

947 Engine

Loosen Allen screws **no. 26** each side of RAVE valve.



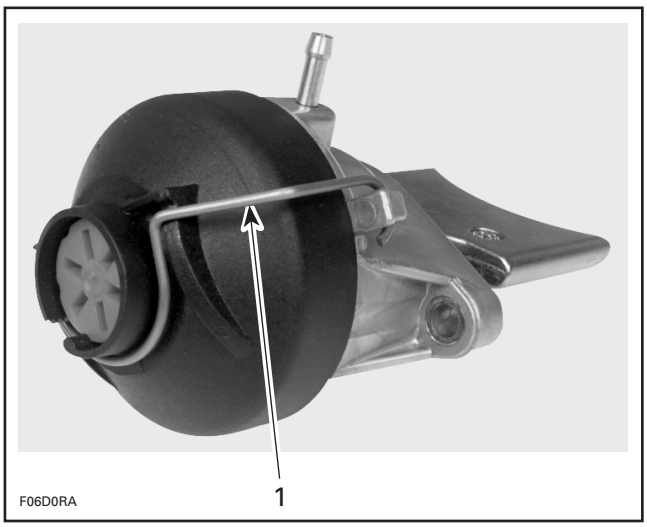
1. Remove screws

Remove RAVE valve **no. 15**.

Remove the cover **no. 18** of the valve by releasing the spring **no. 16**.

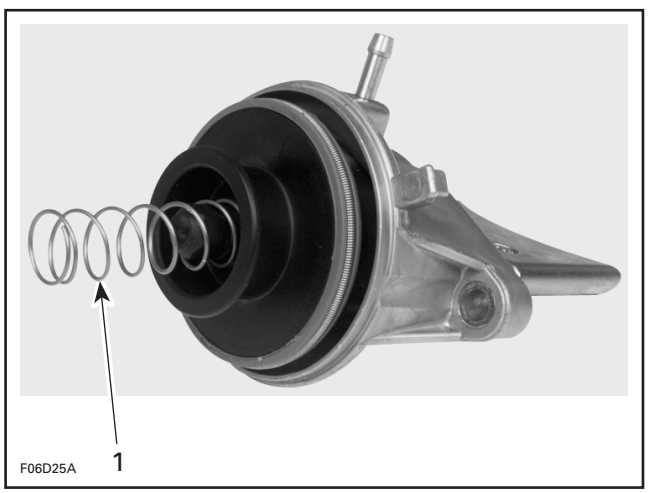
◆ WARNING

Firmly hold cover to valve base. The compression spring inside the valve is applying pressure against the cover.



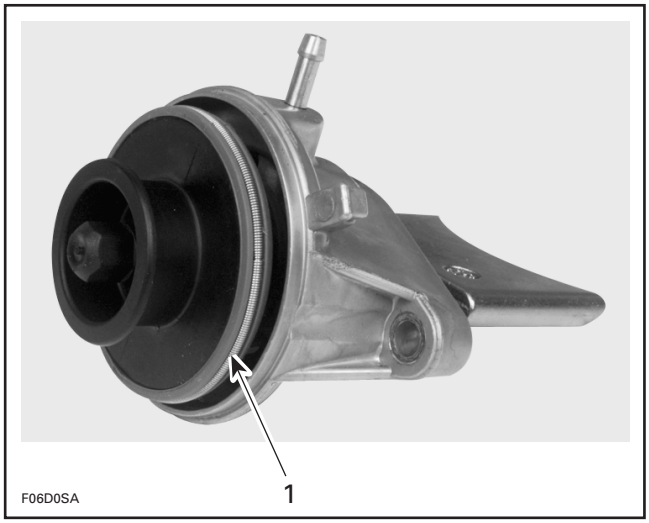
1. Spring

Remove the compression spring **no. 19**.



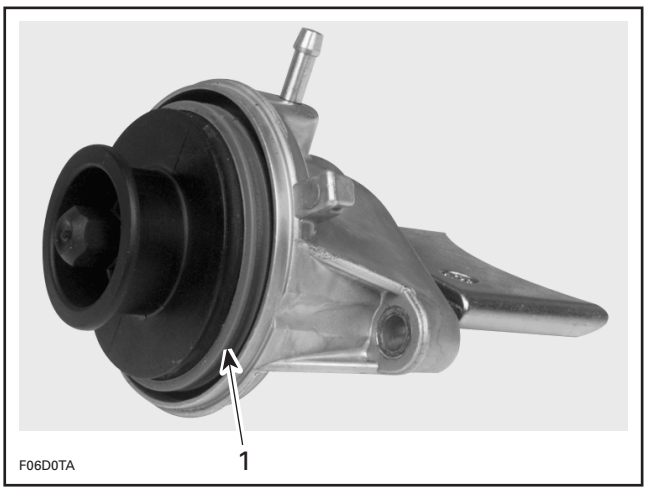
1. Remove spring

Remove spring **no. 30** retaining bellows **no. 21** to valve piston **no. 20**.



1. Spring

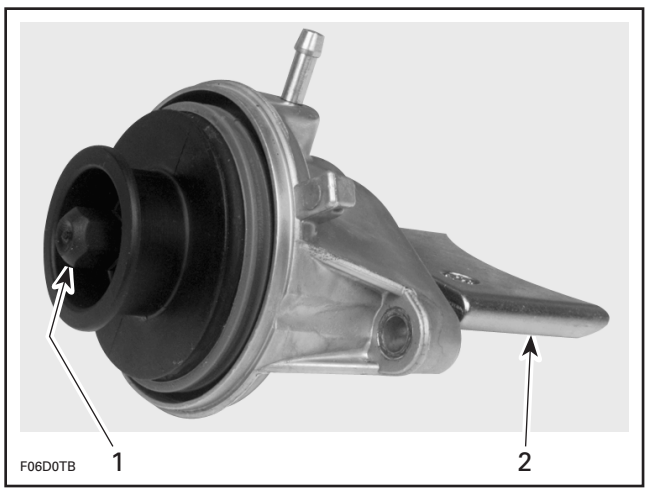
Free bellows **no. 21** from valve piston **no. 20**.



1. Bellows removed from piston

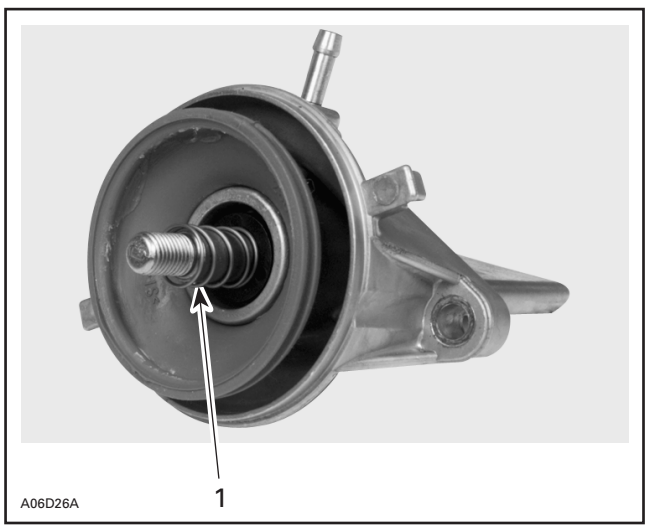
Unscrew valve piston **no. 20** from sliding valve **no. 22**.

NOTE: Hold the sliding valve to prevent it from turning.



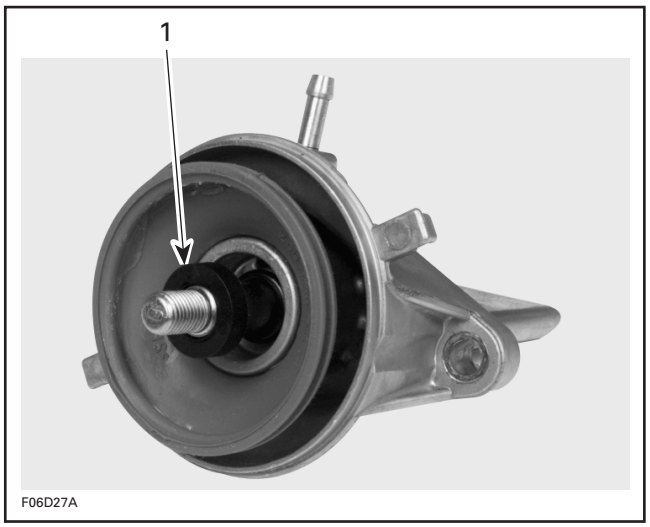
1. Unscrew piston
2. Hold sliding valve

Remove compression spring **no. 29**.



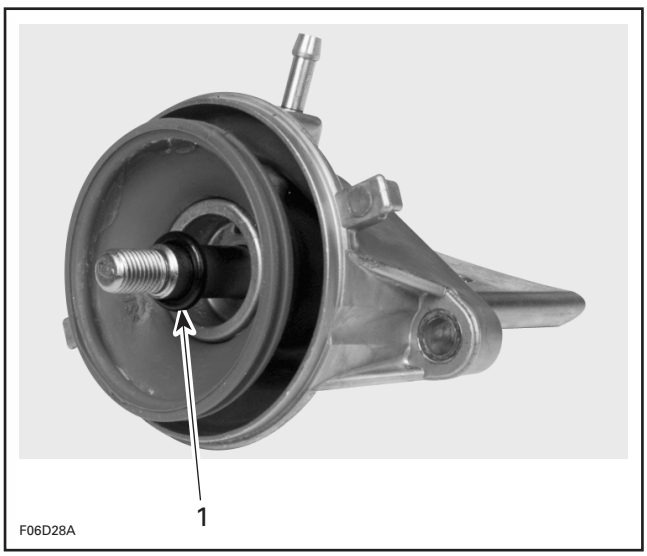
1. Remove spring

Remove supporting ring **no. 28**.



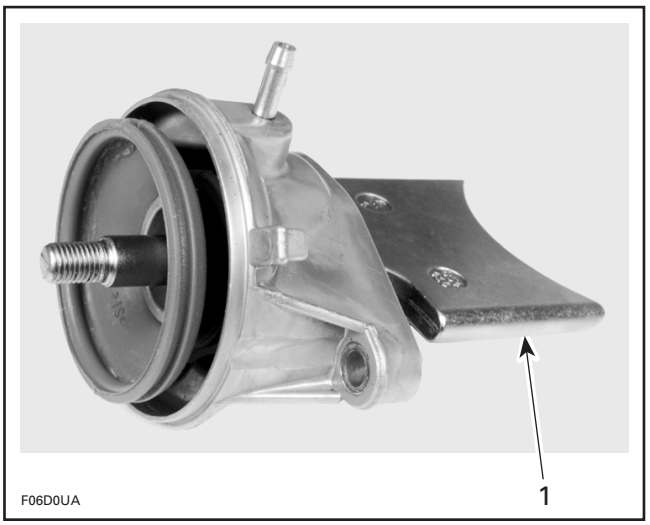
1. Remove supporting ring

Remove O-ring **no. 23**.



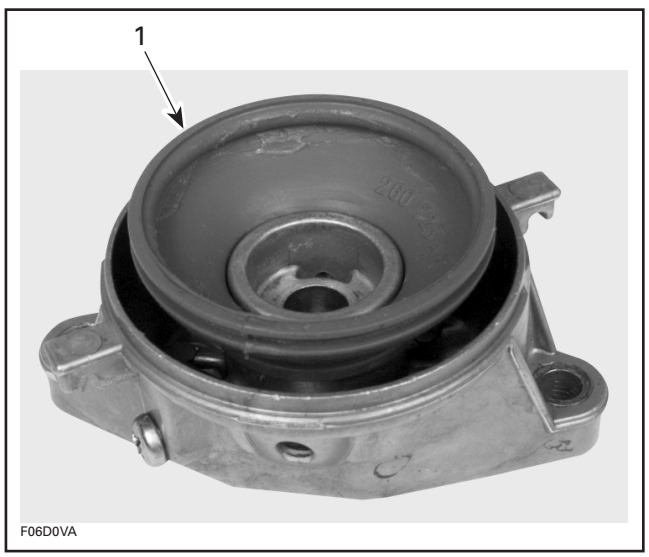
1. Remove O-ring

Remove sliding valve **no. 22**.



1. Remove sliding valve

Remove bellows **no. 21**.



1. Remove bellows

1,2, Cylinder Head Cover and Cylinder Head

Disconnect temperature sensor wire and spark plug cables.

Connect spark plug cables on grounding device.

717 Engine

Remove air intake silencer and support, refer to AIR INTAKE 06-03.

717 and 787 Engines

Remove screws **no. 14**.

Remove cylinder head cover **no. 1**.

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

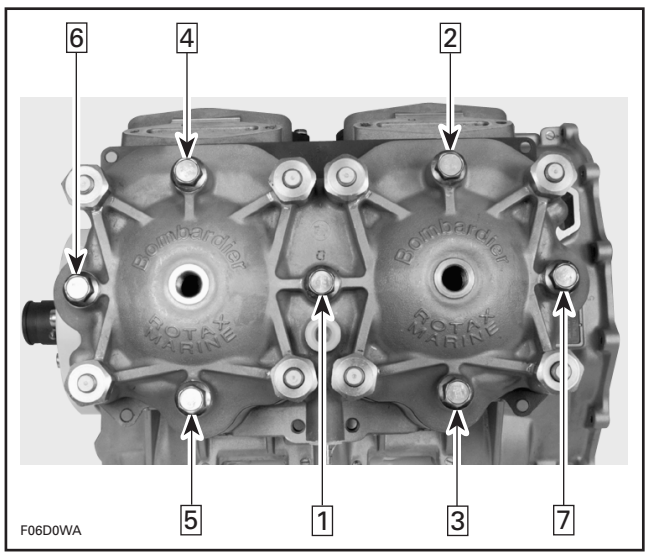
Remove cylinder head **no. 2**.

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

947 Engine

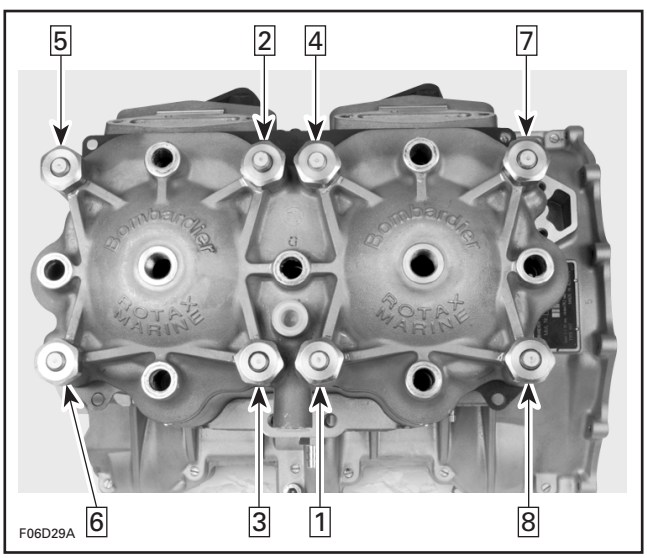
Disconnect hose of RAVE valves.

Loosen cylinder head bolts **no. 14** following the sequence shown in the next photo.



UNTORQUING SEQUENCE FOR THE CYLINDER HEAD BOLTS

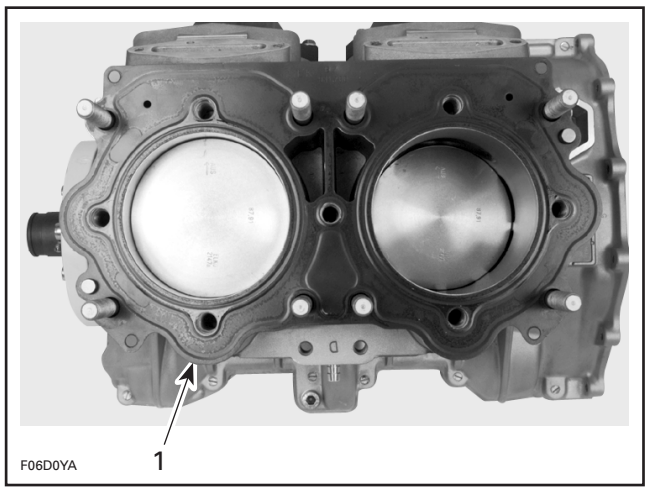
Loosen nuts **no. 33** following the sequence shown in the next photo.



UNTORQUING SEQUENCE FOR THE NUTS

Remove cylinder head no. 2.

Remove cylinder head gasket no. 34.



1. Remove gasket

9, Cylinder

787 Engine

Remove air intake silencer and support, refer to AIR INTAKE 06-03.

717 and 787 Engines

Remove tuned pipe and exhaust manifold, refer to EXHAUST SYSTEM 04-08.

Remove screws no. 13.

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

◆ WARNING

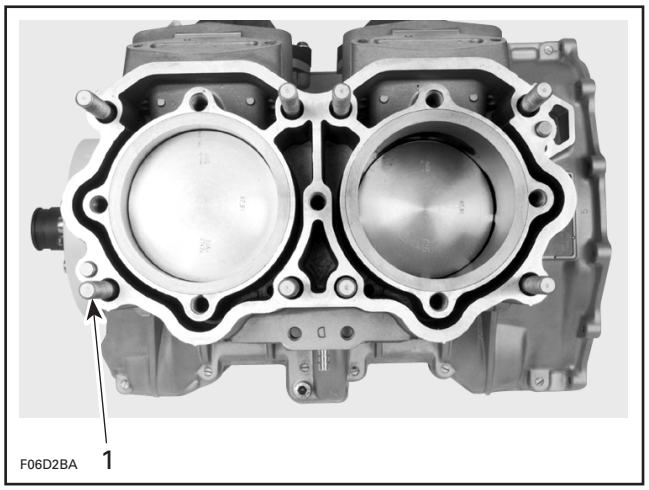
If screws need to be heated for removal when engine is in watercraft, fuel system pressurization must be done first. Do not use open flame; use a heat gun.

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

947 Engine

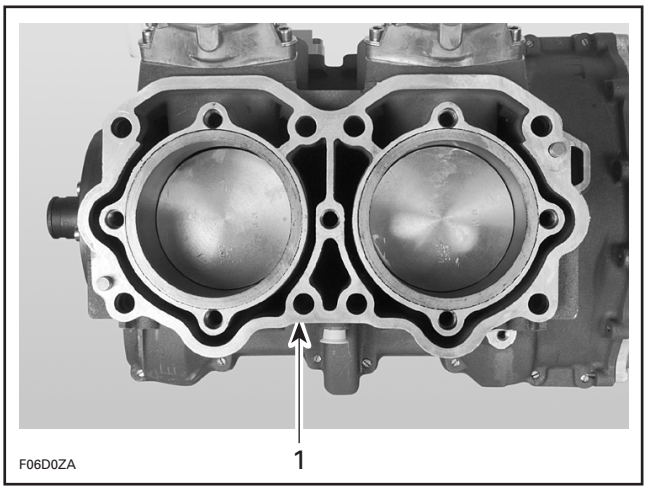
Remove studs no. 32.

NOTE: Studs must be removed prior cylinder block.



1. Remove studs

Remove cylinder block no. 9.



1. Remove cylinder block

NOTE: To ease removal, a plastic tip hammer can be used.

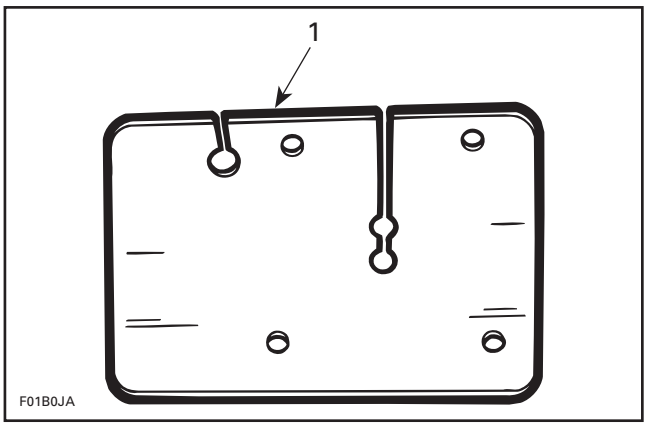
Remove cylinder base gasket no. 10.

3, Piston

NOTE: All engines feature cageless piston pin bearings.

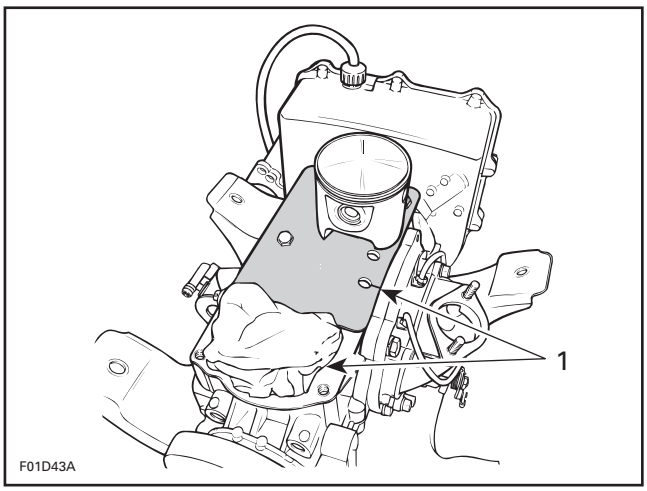
717 and 787 Engines

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.



1. Rubber pad (P/N 295 000 101)

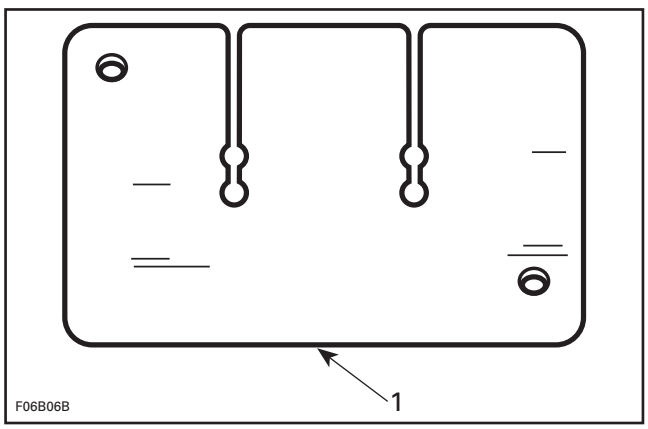
If the other cylinder has been removed, completely cover its opening with a clean rag.



1. Openings covered with rag and rubber pad

947 Engine

Install rubber pad (P/N 290 877 032) to crankcase. Secure with screws. Lower piston to be removed until it sits on pad.



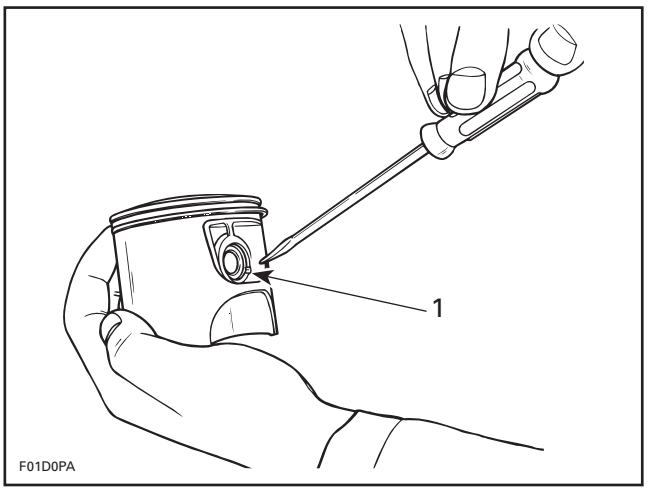
1. Rubber pad (P/N 290 877 032)

All Engines

To remove circlip no. 5, insert a pointed tool in piston notch then pry it out and discard.

◆ WARNING

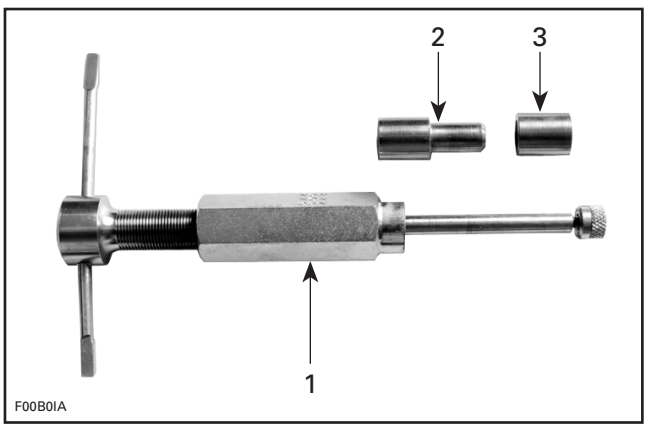
Always wear safety glasses when removing piston circlips.



TYPICAL
1. Piston notch

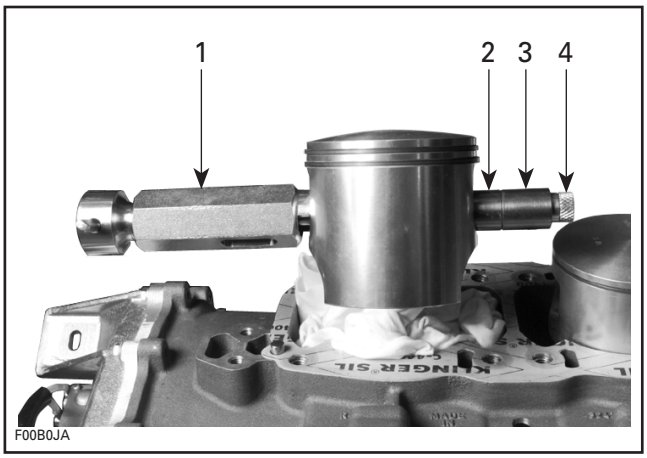
To extract piston pin no. 4, use piston pin puller (P/N 529 035 503) with the appropriate set of sleeves.

ENGINE	SLEEVE SET
717/787	P/N 529 035 542
947	P/N 529 035 543



1. Puller
2. Shoulder sleeve
3. Sleeve

– Fully thread on puller handle.
– Insert extractor spindle into the piston pin.
– Slide the sleeve and shoulder sleeve onto the spindle.
– Screw in extracting nut with the movable extracting ring towards spindle.

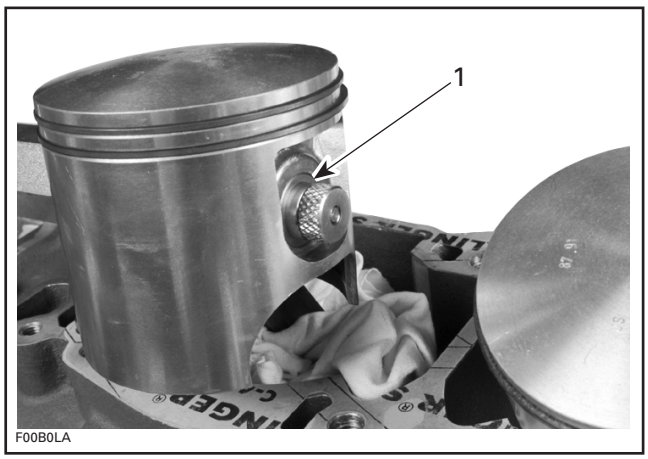


1. *Puller*
2. *Sleeve*
3. *Shoulder sleeve*
4. *Extracting nut*

NOTE: The tool cutout must be positioned toward the bottom of the piston.

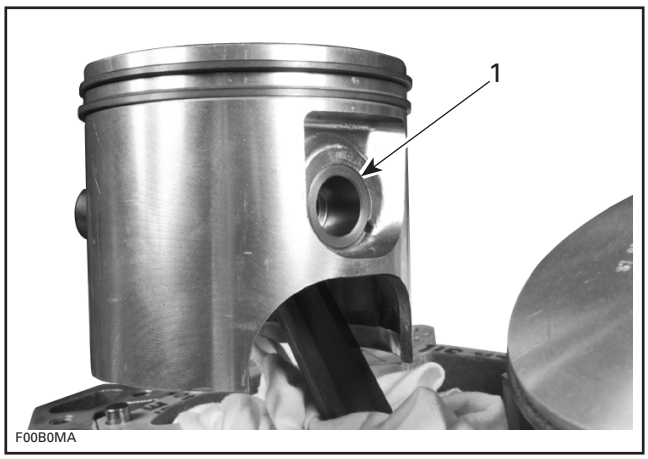
1. *Tool cutout toward bottom of piston*

– Firmly hold puller and rotate handle to pull piston pin **no. 4**.
– Rotate spindle until the shoulder sleeve is flushed with the piston recess.



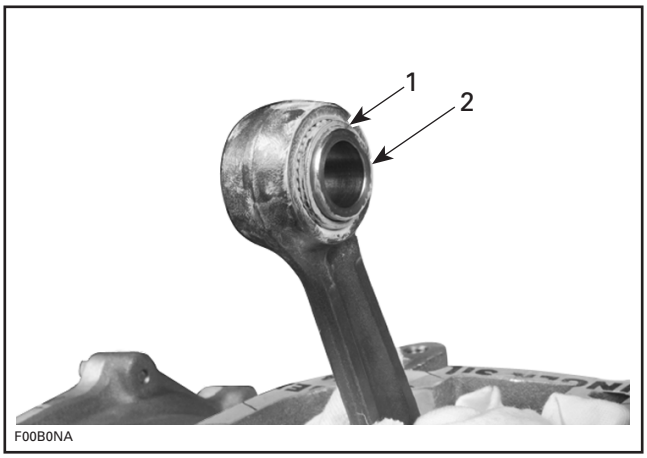
1. *Shoulder sleeve flush with piston recess*

– Loosen the extracting nut and remove puller.
– Remove the shoulder sleeve from piston.



1. *Remove shoulder sleeve*

– Carefully remove the piston **no. 3**.
– The needles, thrust washers and the sleeve remain in the connecting rod bore and may be used again.



1. Needles and thrust washer
2. Sleeve

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, RAVE valve (787 and 947 engines), 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.

NOTE: When repairing a seized engine, connecting rods should be checked for straightness and crankshaft for deflection/misalignment. Refer to BOTTOM END 04-06 for procedures.

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.

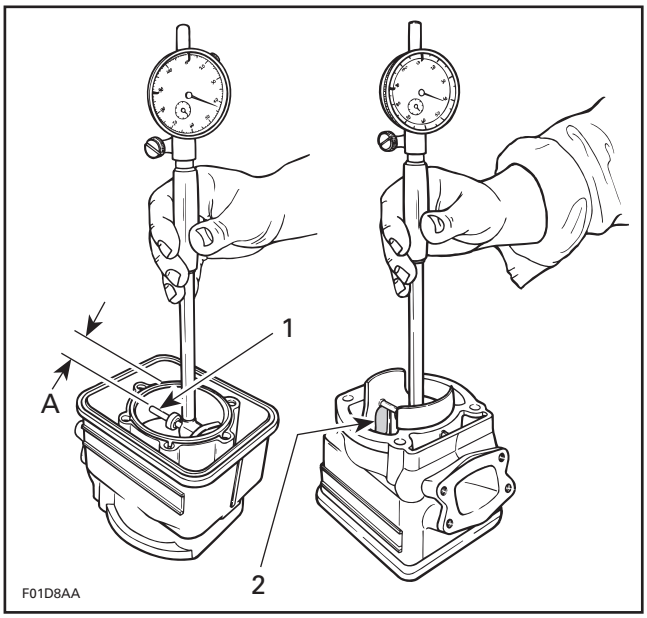
ENGINE MEASUREMENT	TOLERANCES		
	NEW PARTS (min.)	(max.)	WEAR LIMIT
Cylinder Taper	N.A.	0.05 mm (.002 in)	0.1 mm (.004 in)
Cylinder Out of Round	N.A.	0.008 mm (.0003 in)	0.08 mm (.003 in)
Piston/Cylinder Wall Clearance for the 717 Engine	0.10 mm (.0039 in)	N.A.	0.20 mm (.008 in)
Piston/Cylinder Wall Clearance for the 787 Engine	0.11 mm (.0043 in)	N.A.	0.20 mm (.008 in)
Piston/Cylinder Wall Clearance for the 947 Engine	0.09 mm (.0035 in)	N.A.	0.20 mm (.008 in)
Ring/Piston Groove Clearance	0.03 mm (.001 in)	0.07 mm (.003 in)	0.20 mm (.008 in)
Ring End Gap	0.40 mm (.016 in)	0.55 mm (.022 in)	1.0 mm (.039 in)

N.A.: Not Applicable

NOTE: Replacement cylinder sleeves are available if necessary. Also, oversize pistons of 0.25 mm (.010 in) are available for all engines and oversize pistons of 0.5 mm (.020 in) are available for the 717 engine.

Cylinder Taper

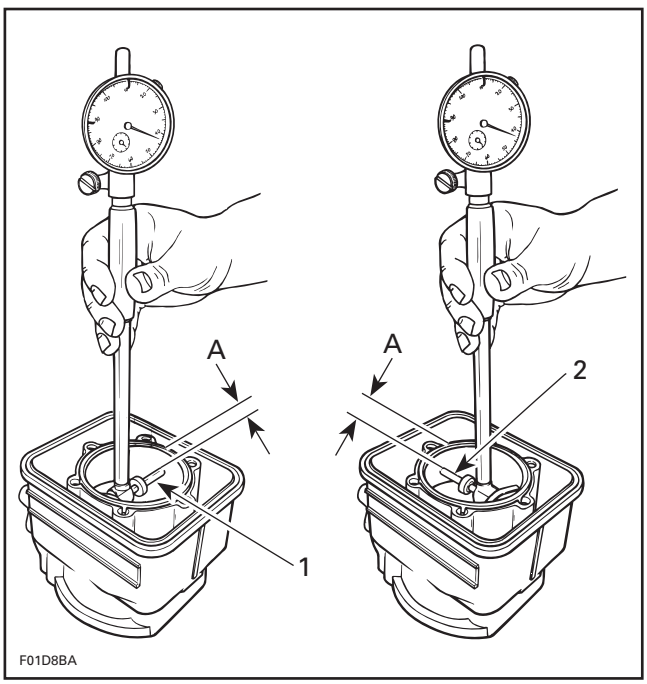
Using a cylinder bore gauge, measure cylinder diameter at 16 mm (5/8 in) from top of cylinder just below auxiliary transfer port, facing exhaust port. If the difference between readings exceed specification, cylinder should be rebored and honed or replaced.



1. Measuring perpendicularly (90°) to piston pin axis
2. Auxiliary transfer port
A. 16 mm (5/8 in)

Cylinder Out of Round

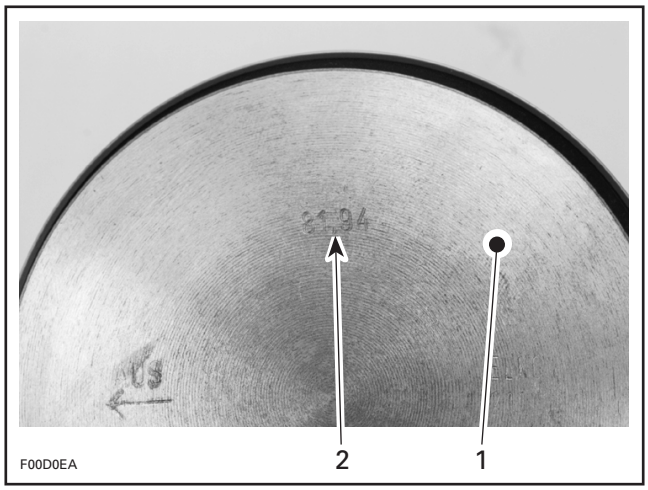
Using a cylinder bore gauge, measure cylinder diameter at 16 mm (5/8 in) from top of cylinder. Measure diameter in piston pin axis direction then perpendicularly (90°) to it. If the difference between readings exceed specification, cylinder should be rebored and honed or replaced.



1. Measuring in piston pin axis
2. Measuring perpendicularly (90°) to piston pin axis
A. 16 mm (5/8 in)

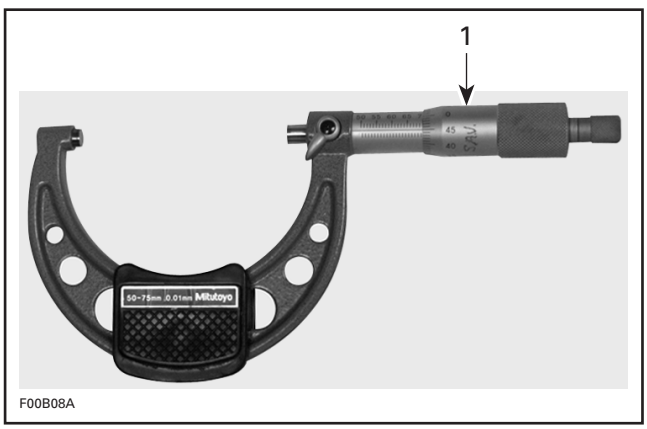
Piston/Cylinder Wall Clearance

To determine the piston dimension, take the measurement on the piston dome.



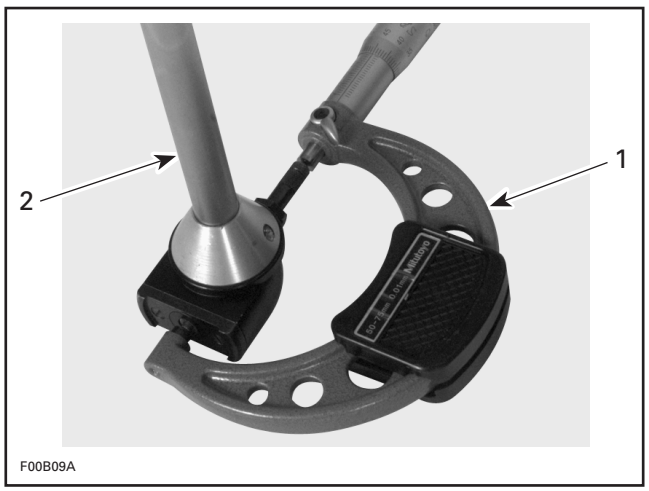
1. Piston dome
2. Piston measurement

Adjust and lock a micrometer to the specified value on the piston dome.

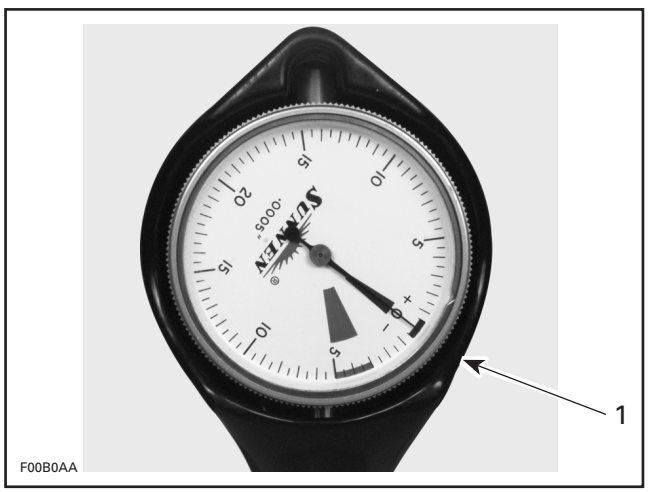


1. Micrometer set to the piston dimension

With the micrometer set to the piston dimension, adjust a cylinder bore gauge to the micrometer dimension and set the indicator to zero.

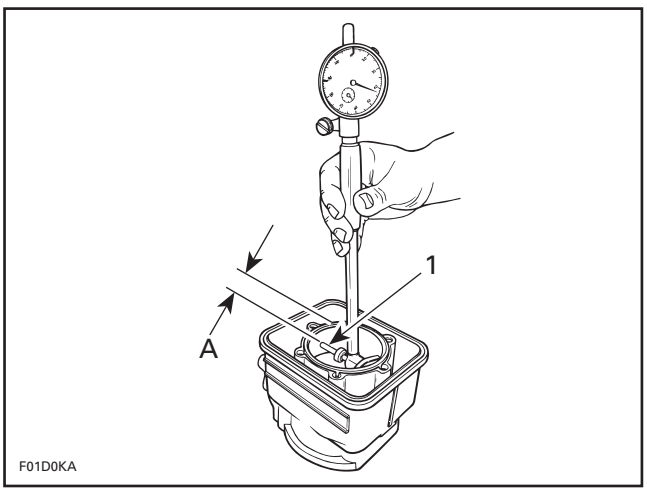


1. Use the micrometer to set the cylinder bore gauge
2. Dial bore gauge



1. Indicator set to zero

Position the dial bore gauge at 16 mm (5/8 in) below cylinder top edge.



1. Measuring perpendicularly (90°) to piston pin axis
A. 16 mm (5/8 in)

Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance.

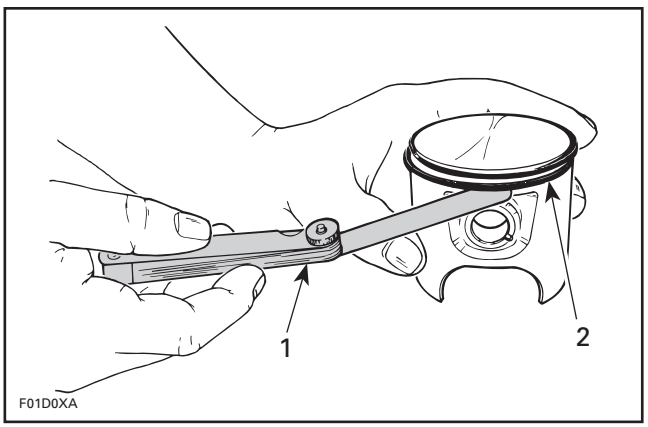
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

Ring/Piston Groove Clearance

717 and 787 Engines

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.



1. Feeler gauge
2. Rectangular ring (bottom)

947 Engine

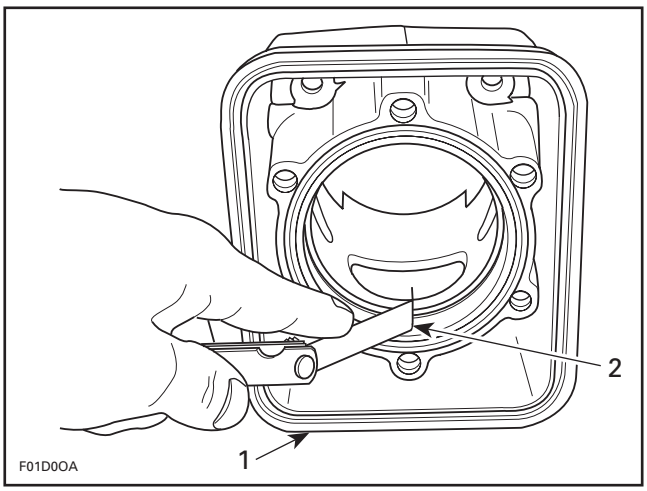
Due to the semi-trapez rings, it is not possible to accurately measure ring/piston groove clearance.

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.

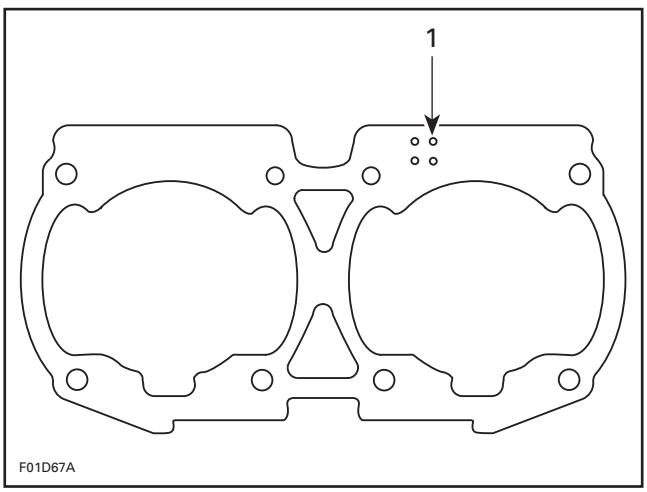


1. *Top of cylinder*
2. *Ring end gap*

10, Cylinder Base Gasket

Different thicknesses of cylinder base gaskets are available for a precise adjustment of the combustion chamber volume.

To determine gasket thickness, refer to the identification holes on the gasket.



TYPICAL

1. *Identification holes*

717 Engine

GASKET THICKNESS	IDENTIFICATION HOLES
0.3 mm (.012 in)	3
0.5 mm (.020 in)	5
0.6 mm (.024 in)	6

787 Engine

GASKET THICKNESS	IDENTIFICATION HOLES
0.3 mm (.012 in)	3
0.4 mm (.016 in)	4
0.6 mm (.024 in)	6

947 Engine

GASKET THICKNESS	IDENTIFICATION HOLES
0.5 mm (.020 in)	5
0.6 mm (.024 in)	6
0.8 mm (.031 in)	8

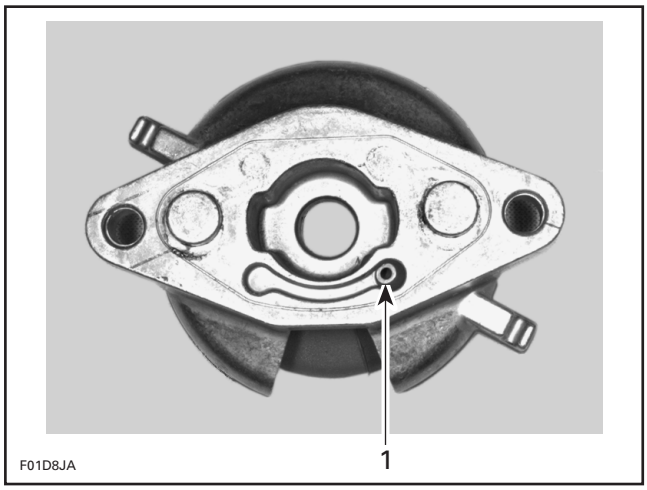
15, RAVE Valve

787 and 947 Engines

Check RAVE valve bellow **no. 21** for cracks.

787 Engine Only

Check if passages of valve housing **no. 25** and cylinder **no. 10** are not obstructed.



1. Passage of valve housing

ASSEMBLY

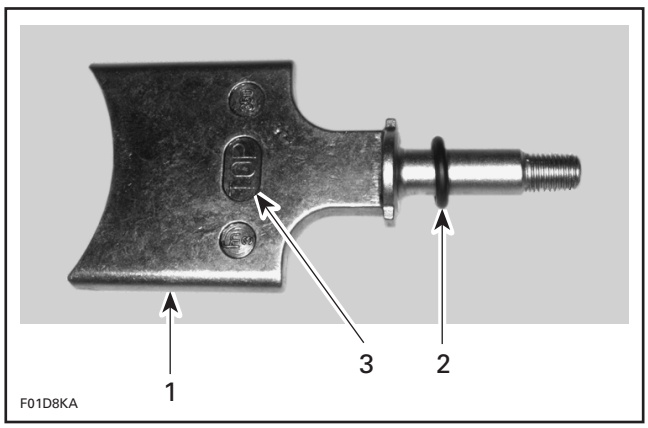
Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

15, RAVE Valve

787 Engine

Make sure to insert O-ring **no. 23** onto rod of sliding valve **no. 22**.

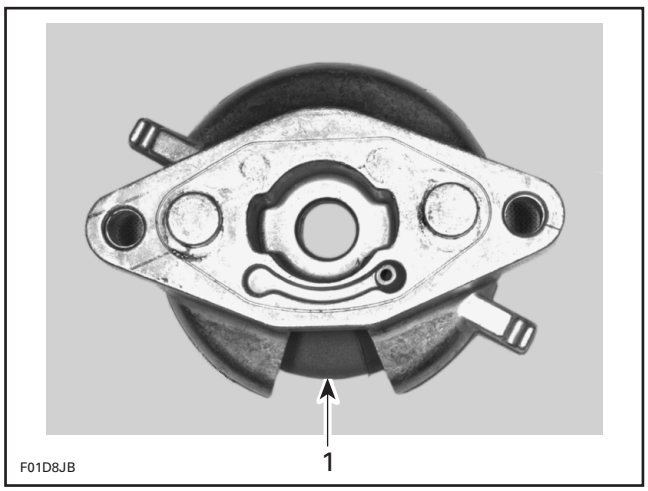
The TOP position of the sliding valve **no. 22** is indicated on one side.



1. Sliding valve
2. O-ring
3. TOP

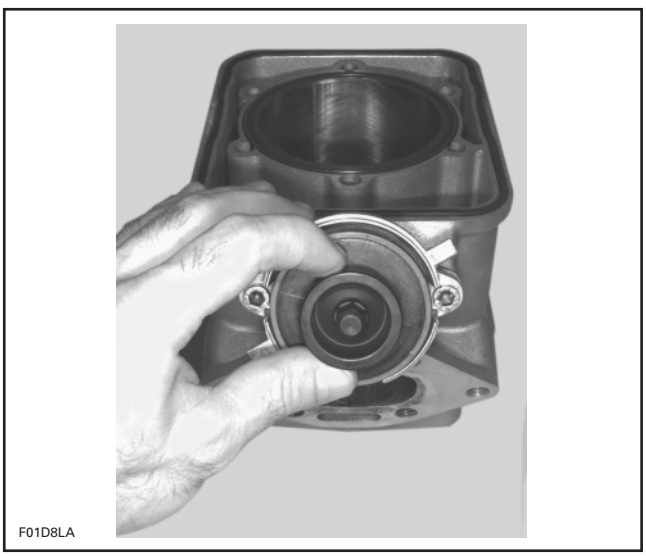
Install a new gasket **no. 24**. It must be installed at the same time as the sliding valve **no. 22**.

Position the valve housing **no. 25** onto the cylinder so that its opening is toward the bottom.



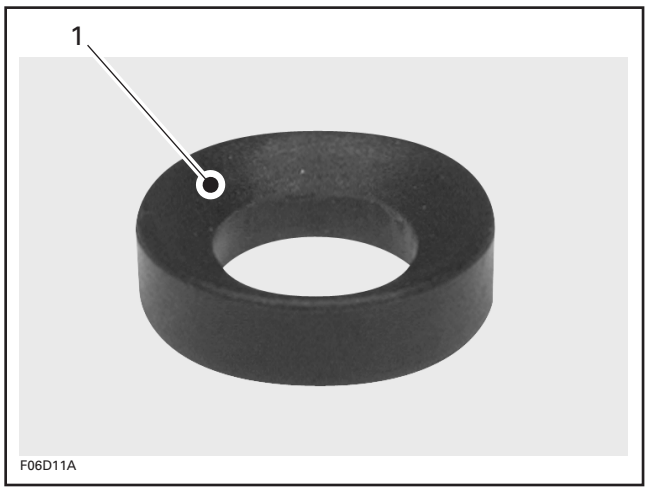
1. Bottom of valve housing

When the valve is mounted onto the cylinder, move the valve piston **no. 20** to ensure the sliding valve **no. 22** moves easily and doesn't stick.



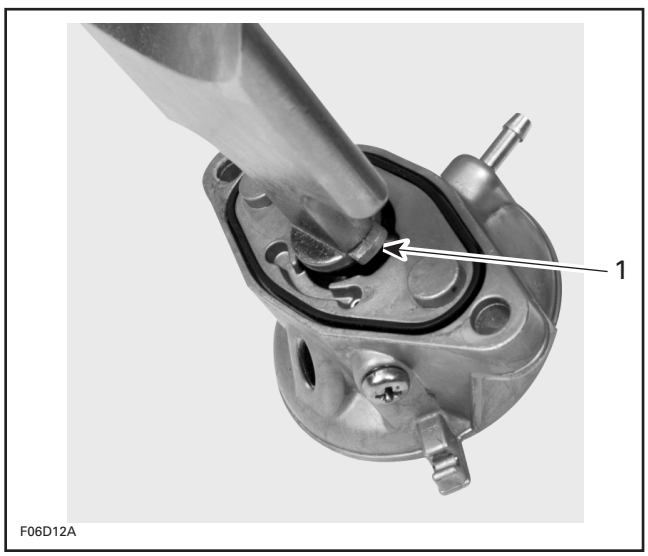
947 Engine

Install the supporting ring **no. 28** with the bevel side facing the O-ring **no. 27**.



1. Bevel facing the O-ring

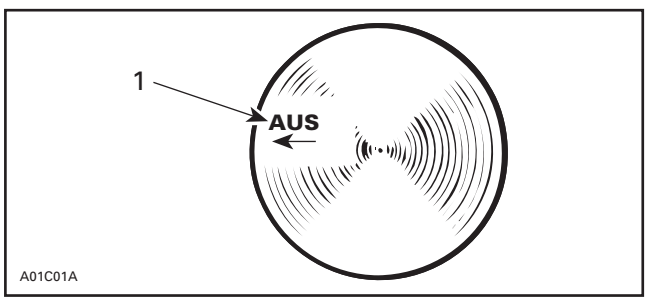
There is only one way to insert the sliding valve no. 22 in valve housing no. 25.



1. Sliding valve ridge toward housing groove

3, Piston

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



1. Exhaust side

NOTE: On the 787 and 947 engines, the exhaust ports are located on the same side as the intake.

Carefully cover crankcase opening as for disassembly.

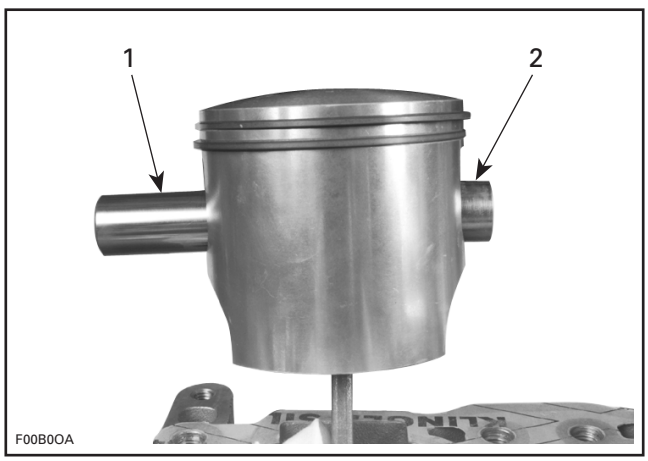
4,6, Piston Pin and Roller Bearing

To install roller bearing and piston pin use, piston pin puller (P/N 529 035 503) with the appropriate set of sleeves as for disassembly.

- 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.
- Replace the inner halves by the appropriate sleeve tool in the connecting rod bore.
- 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.

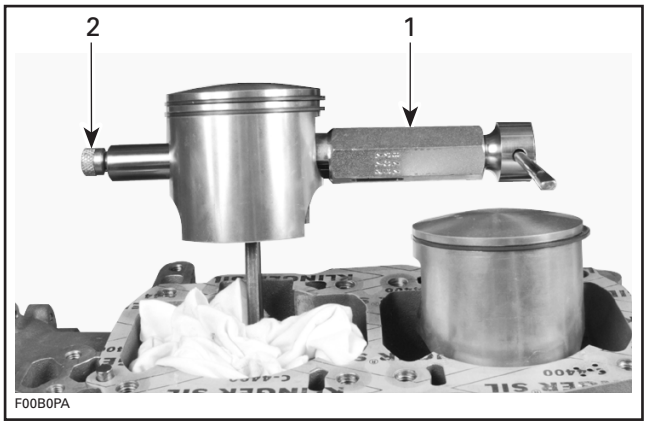
NOTE: Make sure thrust washers are present each side of needles.

- Install the shoulder sleeve tool on the opposite side of the piston pin.



1. Piston pin
2. Shoulder sleeve

– Insert extractor spindle into the piston pin, screw on extracting nut.



1. Puller installed on the opposite side of the piston pin
2. Tighten extracting nut

– Rotate handle to pull piston pin carefully into the piston.

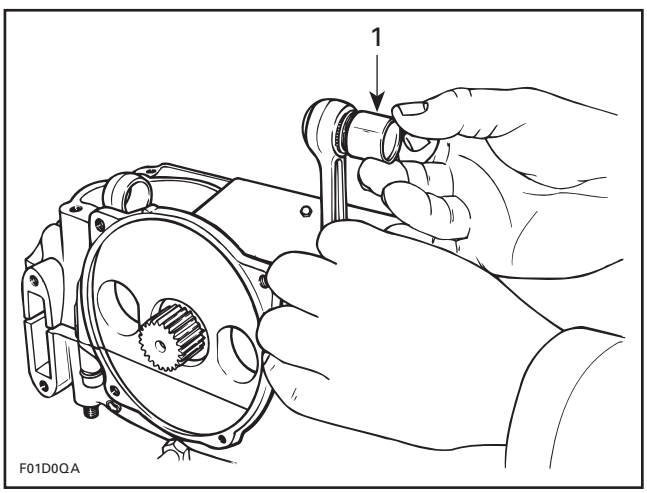
Plastic Mounting Device Method

This is an alternate method when no service tool is available.

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

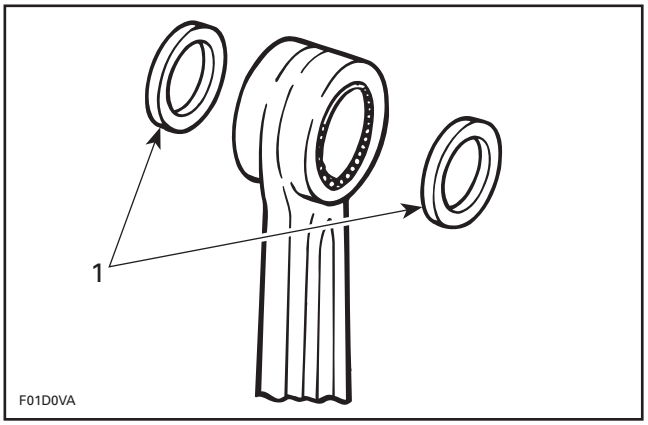
– Align replacement roller bearing with connecting rod bore.

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



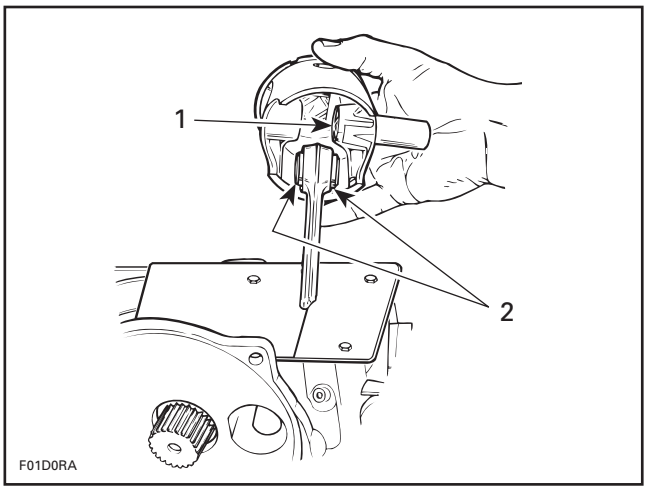
1. Outer ring removal after inner sleeve insertion into bore

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



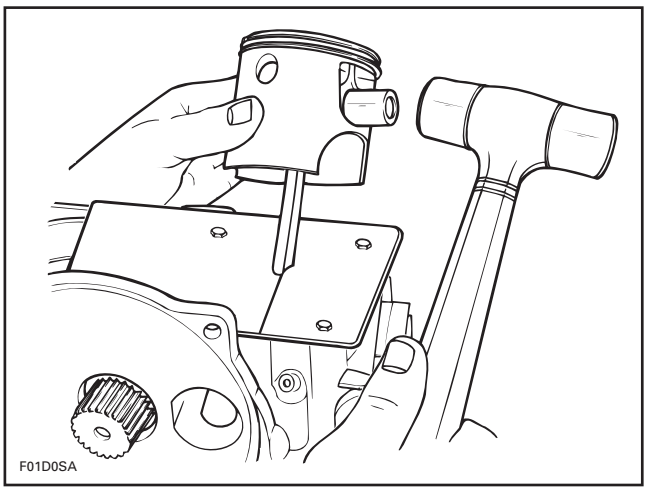
1. Thrust washer each side

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

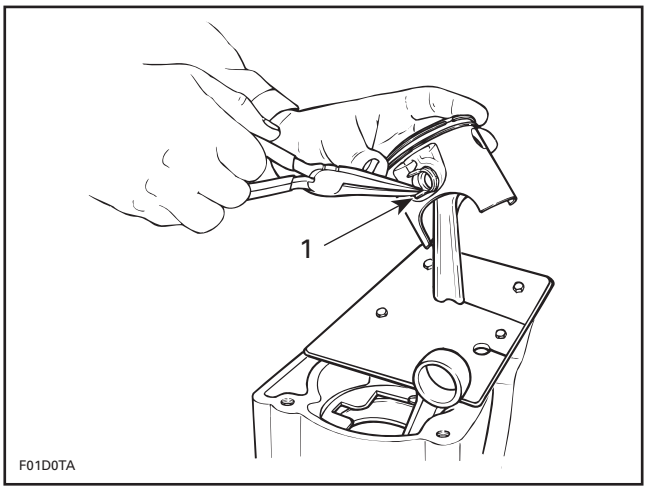


1. Piston pin flush here
2. Thrust washers

– 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.



1. Pulling inner sleeve half

5, Circlip

Always use new circlips.

▼ CAUTION

Always use new circlips. At installation, take care not to deform them. Circlips must not move freely after installation.

◆ WARNING

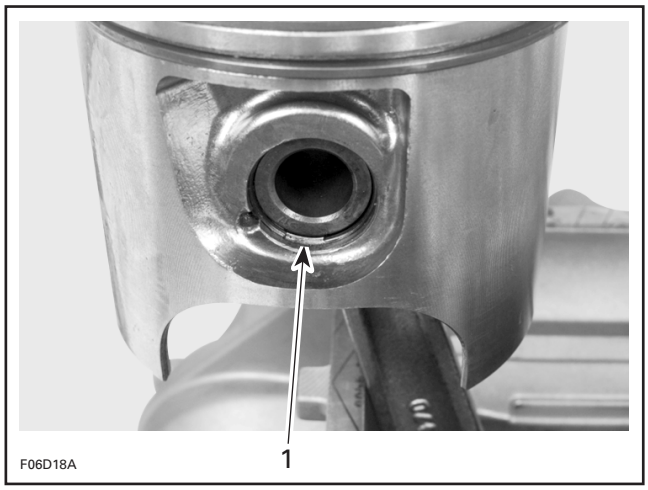
Always wear safety glasses when installing piston circlips.

717 and 787 Engines

Secure circlip with its opening located at the bottom of the piston.

▼ CAUTION

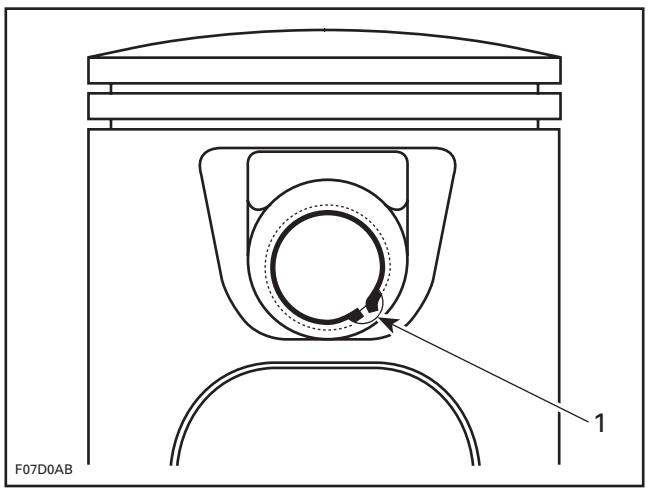
To minimize the stress on the circlips, it is important to install them as described.



1. Circlip opening at 6 o'clock (at bottom)

947 Engine

Secure circlip in piston groove with its bent end in piston notch as shown.

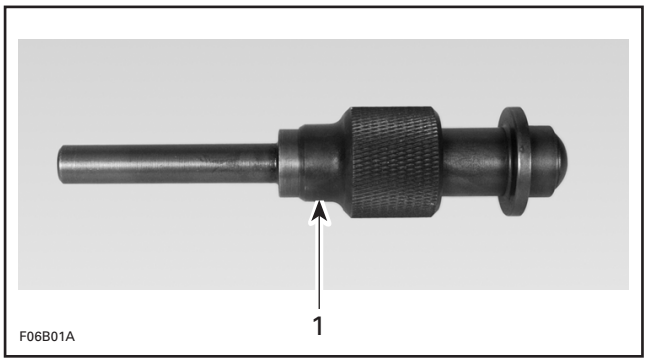


1. Circlip end in piston notch

All Engines

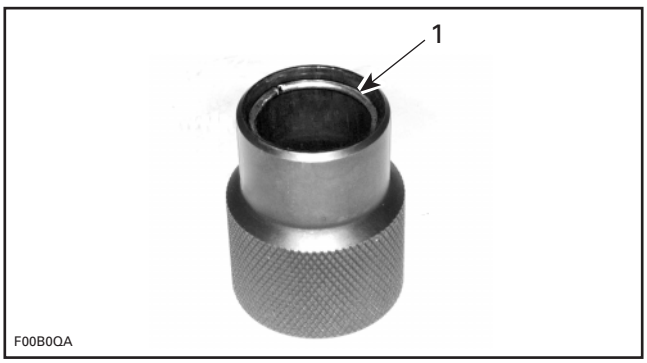
To easily insert circlip into piston, use circlip installer.

ENGINE	TOOL P/N
717 and 787	290 877 016
947	290 877 518



1. Circlip installer

– Remove sleeve from pusher then insert circlip into its bore.
– Reinstall sleeve onto pusher and push until circlip comes in end of tool.



TYPICAL
1. Circlip near end of tool

– Position end of tool against piston pin opening.
– Firmly hold piston against tool and tap tool with a plastic tip hammer to insert circlip into its groove.

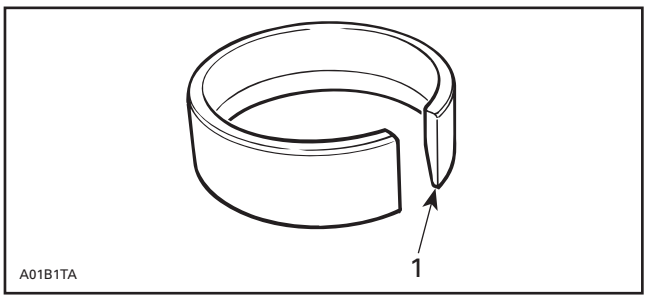
▼ CAUTION

The hand retaining the piston should absorb the energy to protect the connecting rod.

9, Cylinder

717 and 787 Engines

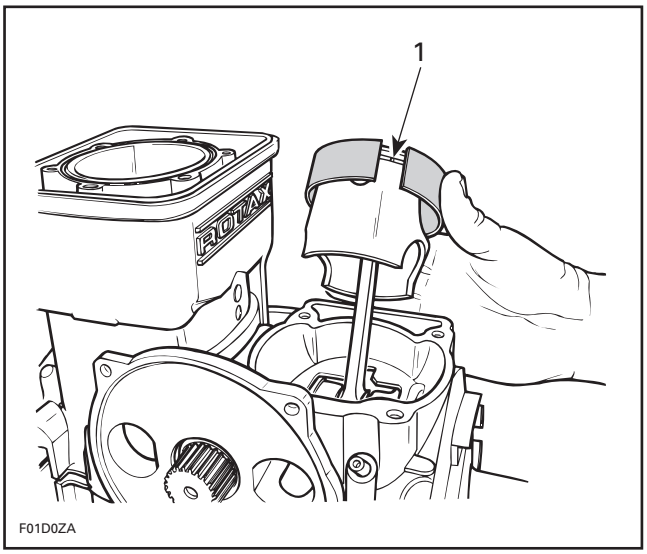
To easily slide cylinder over piston, install on piston ring compressor (P/N 290 876 979).



1. Slide this edge

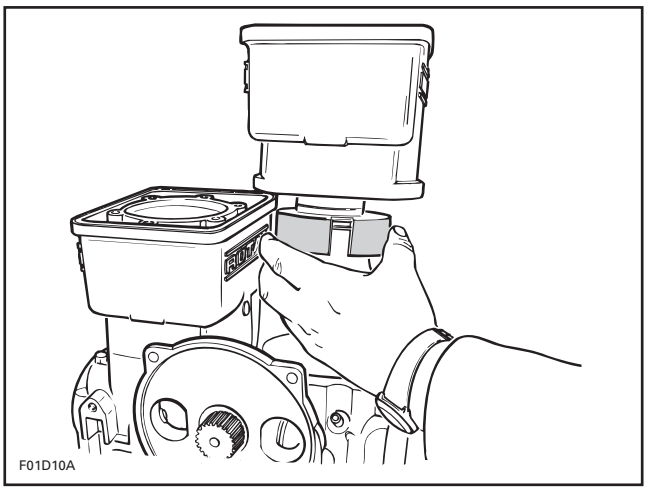
NOTE: Ring compressor will not fit on oversize parts.

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



1. Ring end gap aligned with piston locating pin

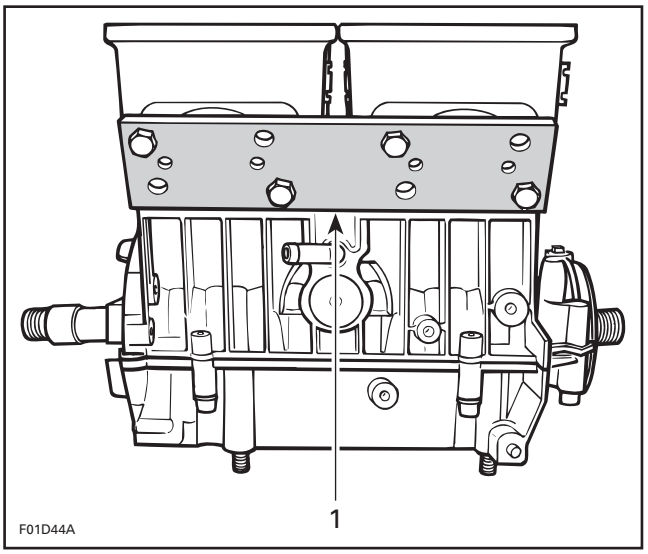
Slide cylinder over piston.



When reassembling cylinders to crankcase, it is important to have them properly aligned so that exhaust flanges properly match up with exhaust manifold.

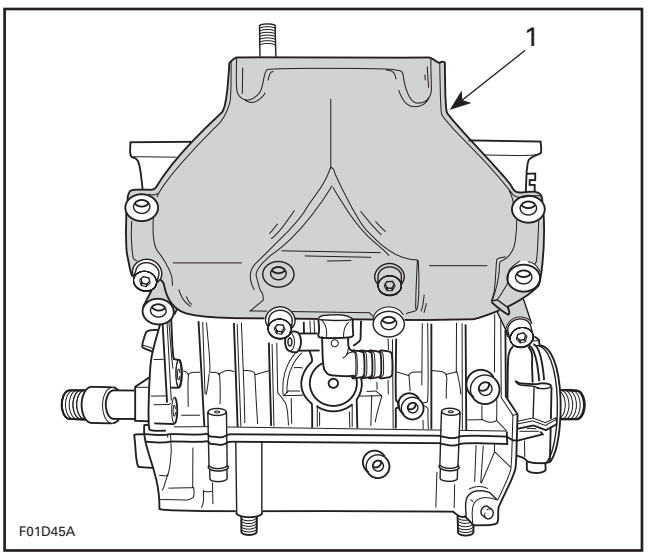
717 Engine

The aligning tool (P/N 290 876 902) or the exhaust manifold can be used to align cylinders.



717 ENGINE

1. Exhaust flange aligning tool

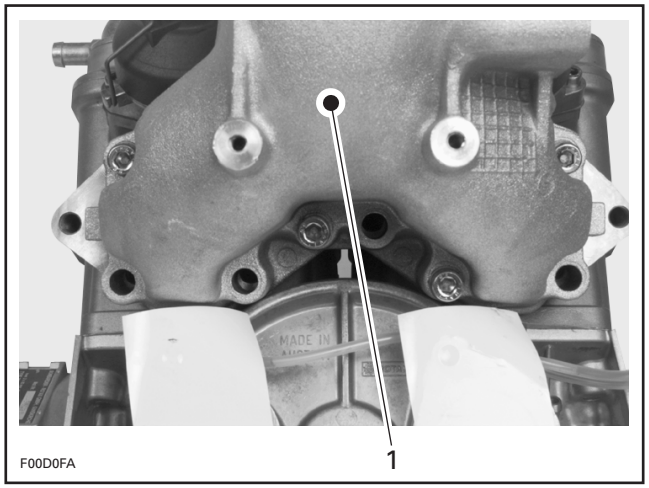


717 ENGINE

1. Aligning cylinders using exhaust manifold

787 Engine

The exhaust manifold is used to align cylinders.



787 ENGINE

1. Aligning cylinders using exhaust manifold

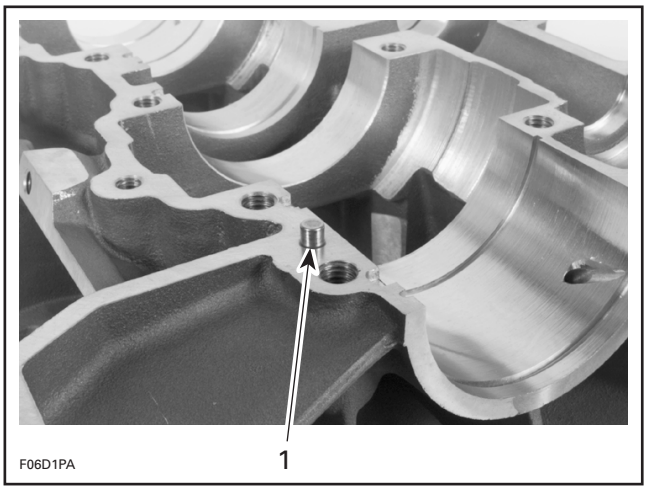
9, Cylinder Block

947 Engine

Install studs **no. 32**. Apply Loctite 242 to threads and torque studs to 5 N•m (44 lbf•**in**).

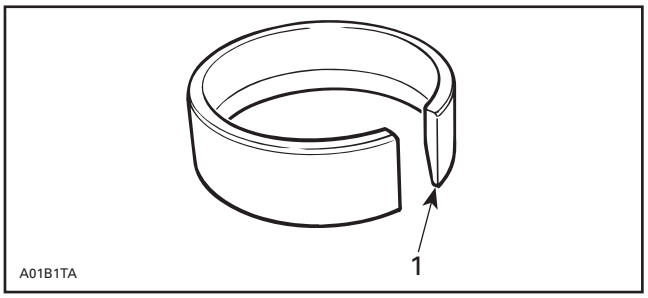
Install cylinder base gasket **no. 10**. There is only one way to install gasket.

The cylinder block is positioned with locating dowels.



1. Dowel

To easily slide cylinder block over pistons, use ring compressor (P/N 290 876 965).



1. Slide this edge

NOTE: For each ring, make sure to align ring end gap with piston locating pin.

Install cylinder block.

Install O-rings **no. 31**.

▼ CAUTION

The O-rings must be installed and properly positioned in the cylinder block. The O-rings are meant to dampen stud vibration.

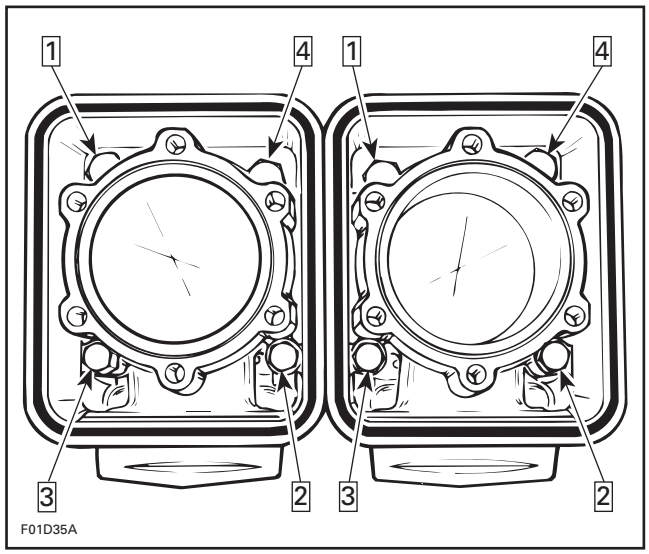
13, Cylinder Screw

717 Engine

Apply synthetic grease below the screw head.

Apply also 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). Refer to the following illustration.

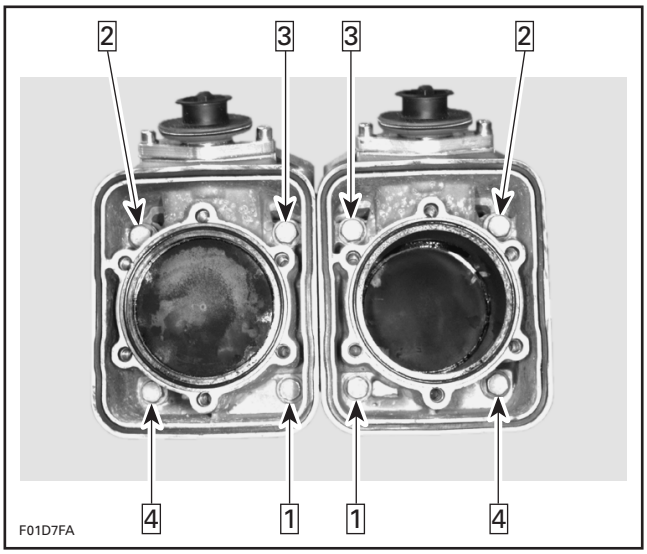


787 Engine

Prior installation, apply synthetic grease below screw head and Loctite 518 on screw threads.

Install M10 x 105 screws on exhaust side and the M10 x 73.5 on opposite side.

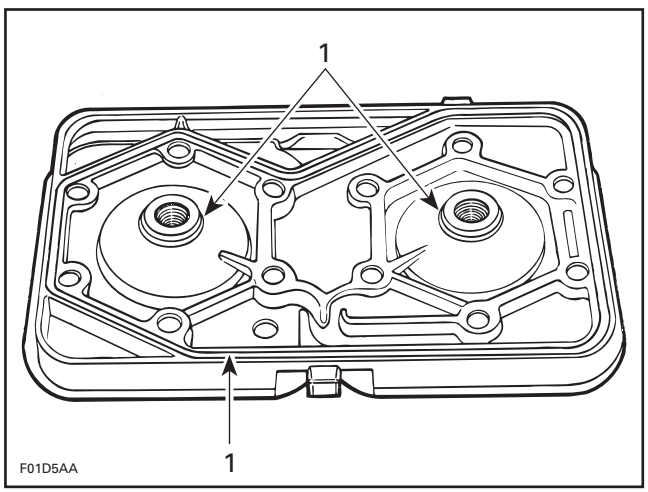
Torque screws in a criss-cross sequence for each cylinder to 20 N•m (15 lbf•ft). Repeat the procedure, retightening all cylinder screws to 40 N•m (30 lbf•ft).



2, Cylinder Head

717 and 787 Engines

Make sure to install O-rings **no. 12** around spark plug holes and O-ring **no. 11** of cylinder head as shown in the following illustration.



1. O-rings

Apply Loctite 518 in O-ring groove of cylinder sleeves.

Install cylinder head.

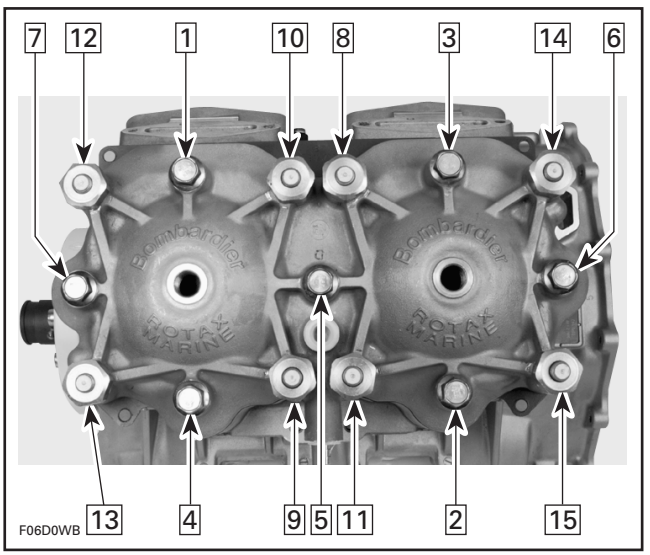
947 Engine

Apply Loctite 242 (blue) on the threads of the cylinder block studs **no. 32**.

Apply Loctite 242 (blue) below head of cylinder head bolts **no. 14**.

Apply synthetic grease on threads of cylinder head bolts **no. 14**.

Torque bolts and nuts to 15 N•m (11 lbf•ft) as per following sequence in the next picture. Repeat the torquing sequence by retightening to 34 N•m (25 lbf•ft).



TORQUING SEQUENCE

1, Cylinder Head Cover

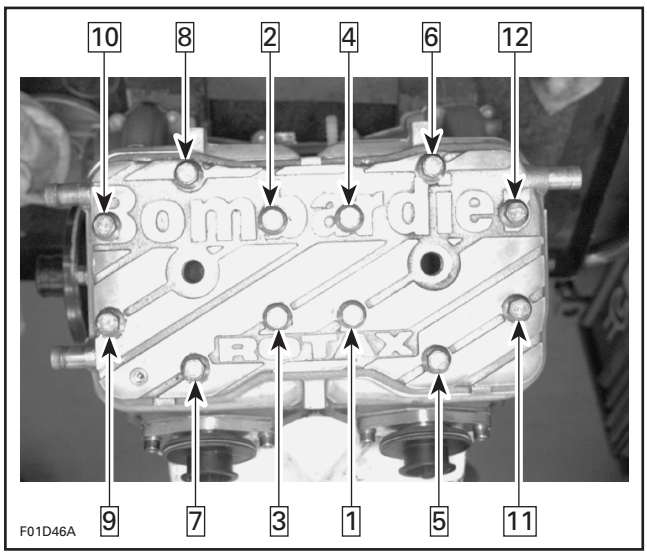
717 and 787 Engines

Install cylinder head cover.

Apply Loctite 242 (blue) below head of screws **no. 14**.

Apply also synthetic grease on threads of screws **no. 14**.

Torque cylinder head screws **no. 14** to 12 N•m (9 lbf•ft) as per following illustrated sequence. Repeat the procedure, retightening all screws to 24 N•m (17 lbf•ft).



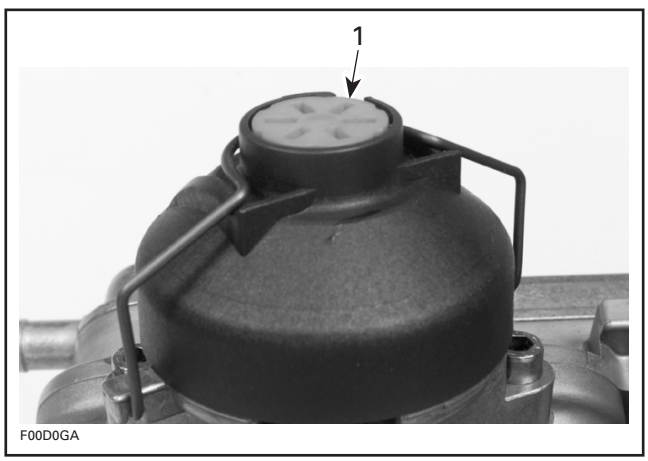
TORQUING SEQUENCE

ADJUSTMENT

RAVE Valve

787 Engine

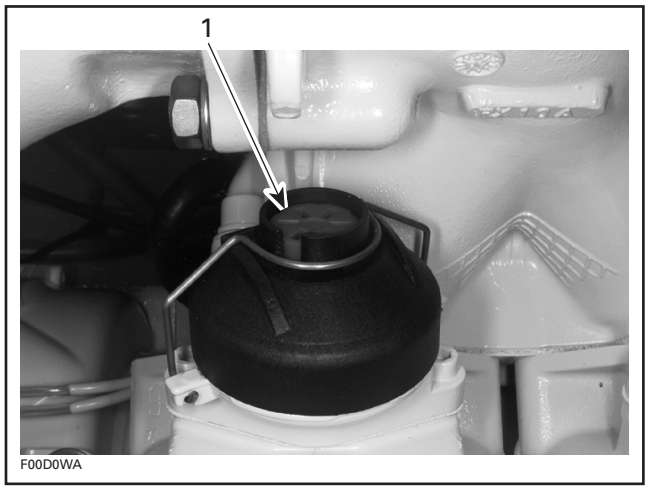
Turn the red plastic knob **no. 17** until it is flush to the valve cover.



1. Knob flush with the cover

947 Engine

Turn the red plastic knob **no. 17** until it is fully tightened.

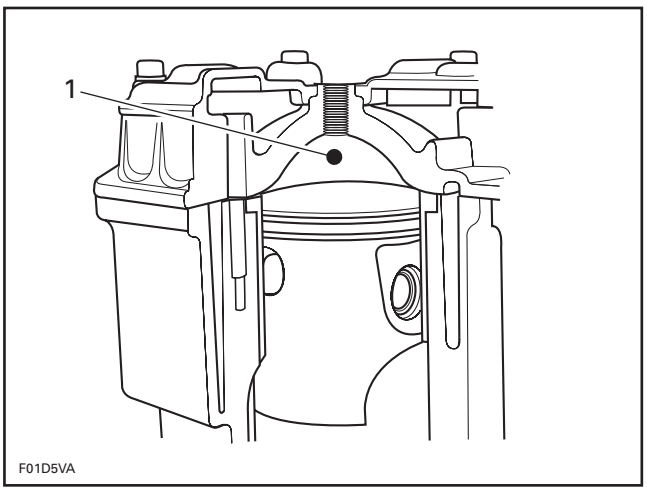


1. Knob fully tightened

This will ensure the correct preload on the return spring **no. 19** in order to open and close the RAVE valve at the proper RPM.

Combustion Chamber Volume Measurement

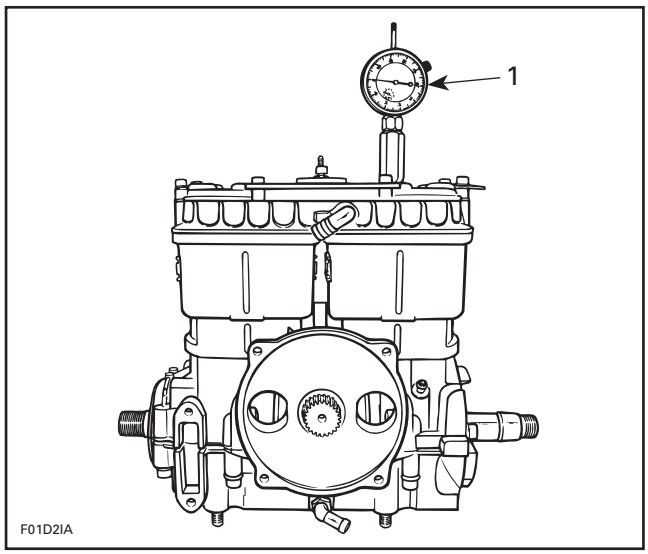
The combustion chamber volume is the region in the cylinder head above the piston at Top Dead Center. It is measured with the cylinder head installed on the engine.



1. Combustion chamber

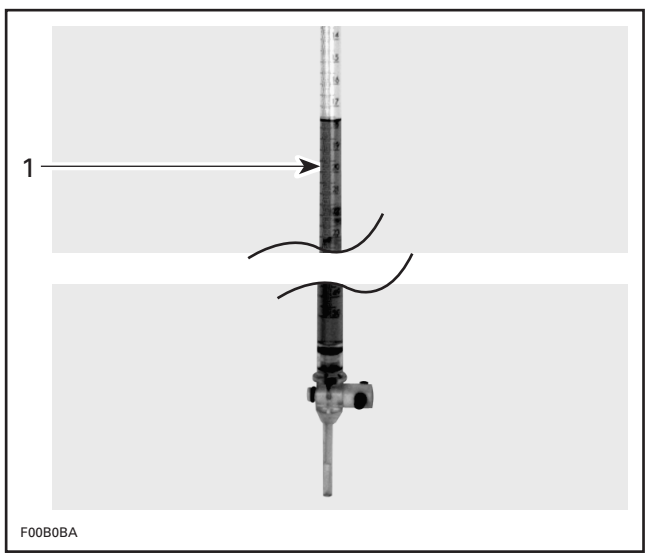
NOTE: When checking the combustion chamber volume, engine must be cold, piston must be free of carbon deposit and cylinder head must be leveled.

1. Remove both spark plugs and bring one piston to Top Dead Center a using a TDC gauge.



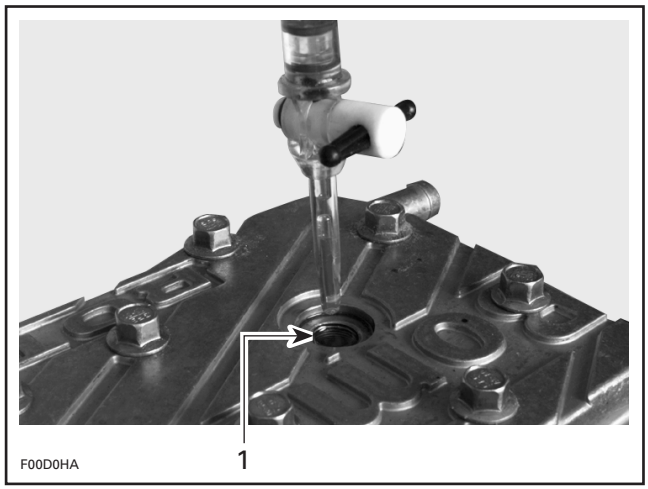
1. Bring piston to TDC

2. Obtain a graduated burette (capacity 0-50 cc) and fill with an equal part (50/50) of gasoline and injection oil.



1. Graduated burette (0-50 cc)

3. Open burette valve to fill its tip. Add liquid in burette until level reaches 0 cc.
4. Inject the burette content through the spark plug hole until liquid touches the top spark plug hole.



1. Top of spark plug hole

NOTE: The liquid level in cylinder must not drop for a few seconds after filling. If so, there is a leak between piston and cylinder. The recorded volume would be false.

5. Let burette stand upward for about 10 minutes, until liquid level is stabilized.
6. Read the burette scale to obtain the quantity of liquid injected in the combustion chamber. Compare the obtained value with the table below. The volume should be in the allowable range.

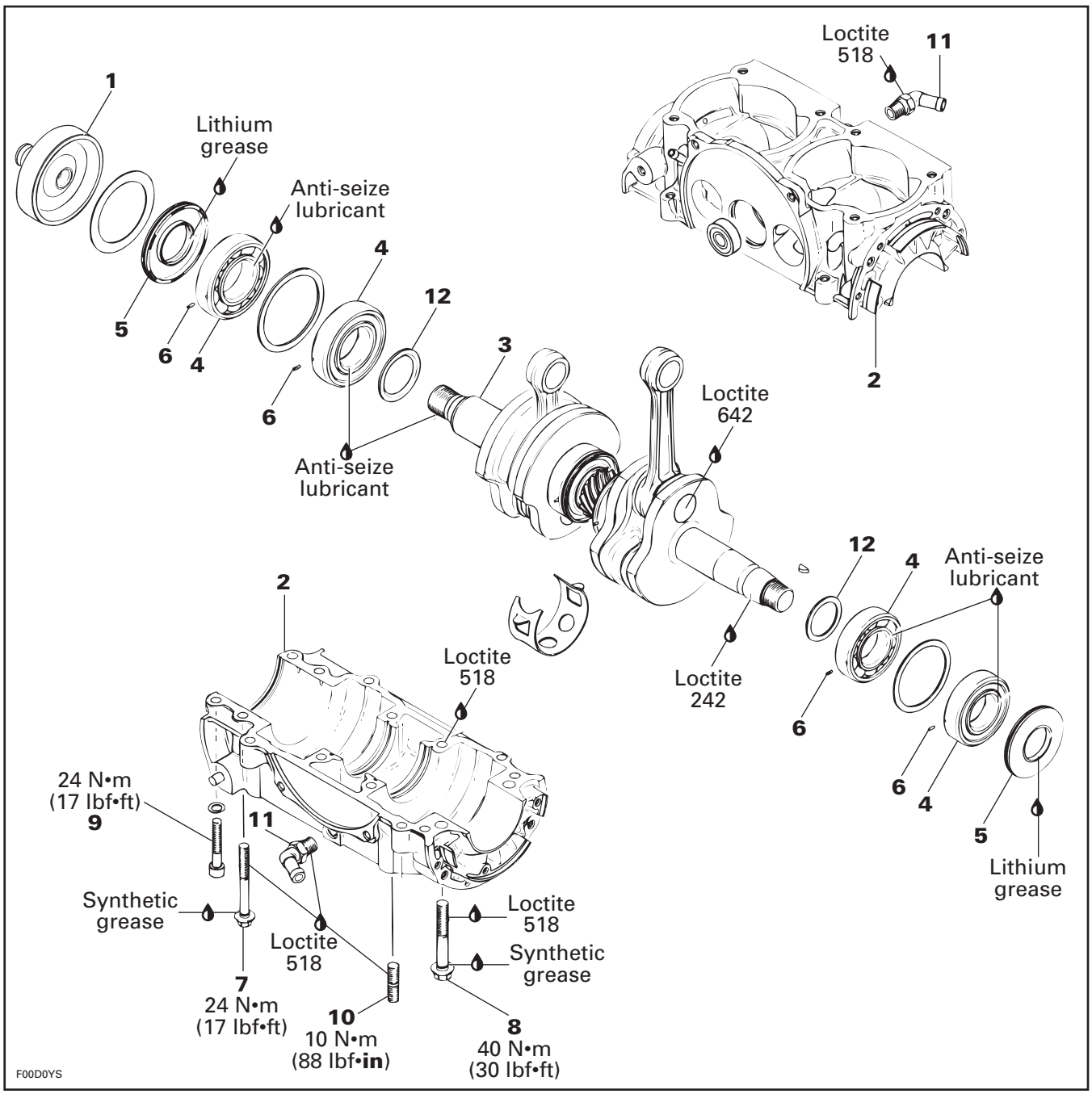
NOTE: When the combustion chamber is filled to top of spark plug hole, it includes an amount of 2.39 cc corresponding to the spark plug tip. The following table of combustion chamber volume includes this value.

ENGINE	COMBUSTION CHAMBER VOLUME
717	31.2 - 34.0 cc
787	34.7 - 37.9 cc
947	43.3 - 47.3 cc

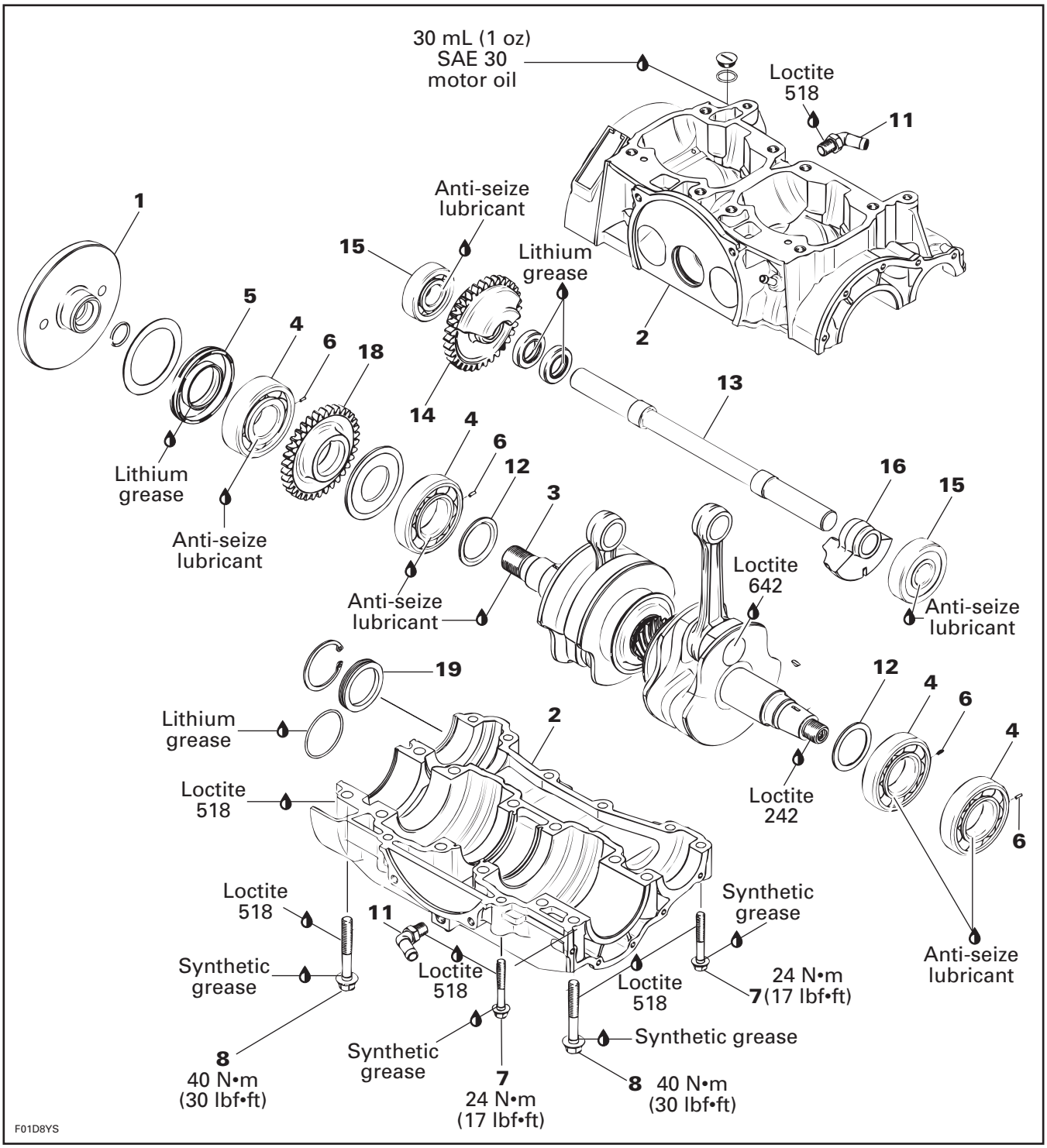
7. Repeat the procedure for the other cylinder.

BOTTOM END

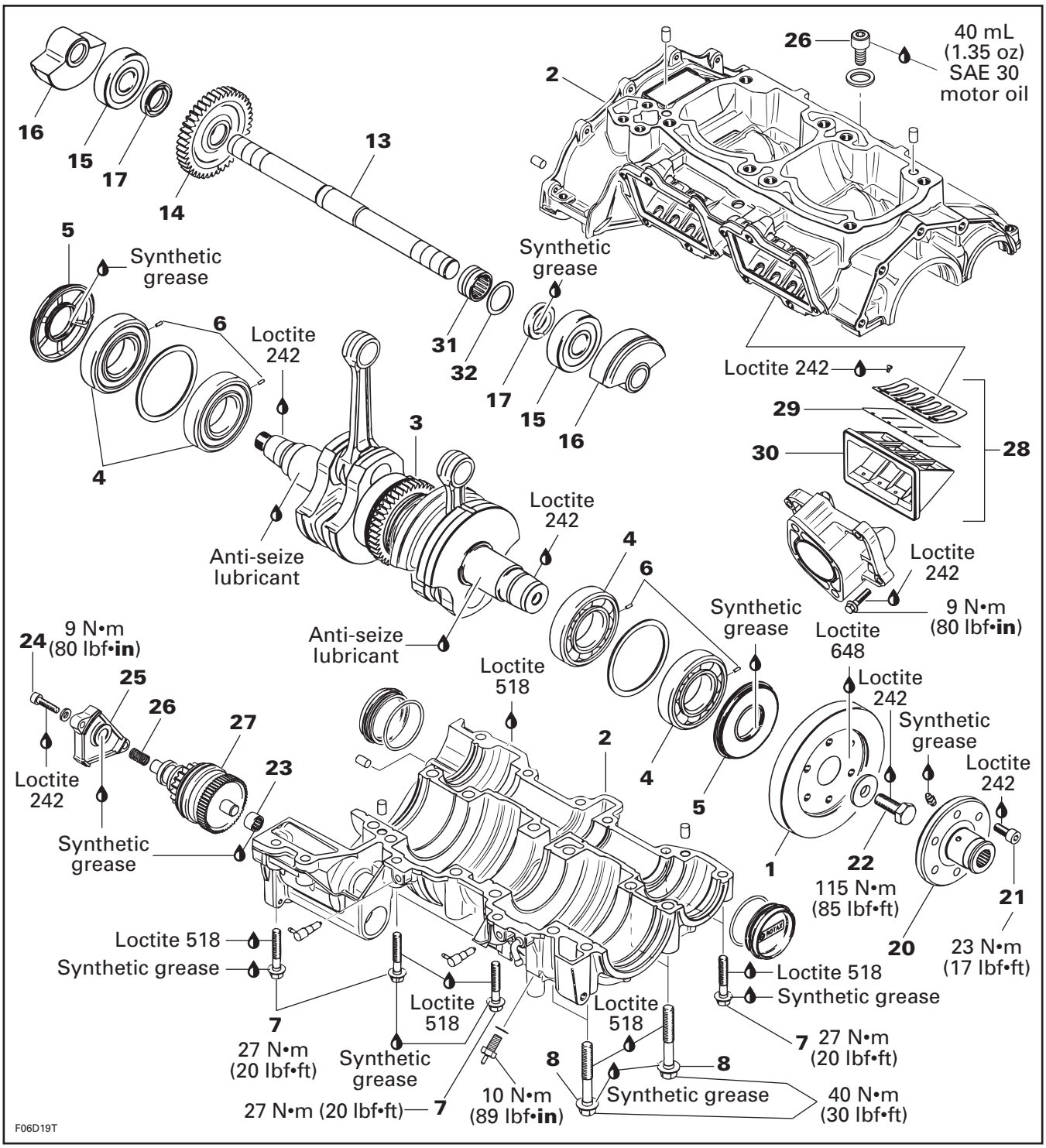
717 Engine



787 Engine



947 Engine


16
15
17
14
13
5
Synthetic grease
6
Loctite 242
4
31
32
3
Anti-seize lubricant
Loctite 242
4
6
Anti-seize lubricant
24
9 N•m (80 lbf•in)
25
26
27
23
Loctite 242
Synthetic grease
Loctite 518
2
Loctite 518
Synthetic grease
7
27 N•m (20 lbf•ft)
Synthetic grease
27 N•m (20 lbf•ft)
7
10 N•m (89 lbf•in)
Loctite 518
Loctite 518
8
8
Synthetic grease
40 N•m (30 lbf•ft)
2
26
40 mL (1.35 oz) SAE 30 motor oil
Synthetic grease
17
15
16
Loctite 242
29
30
28
Loctite 242
9 N•m (80 lbf•in)
Loctite 242
Synthetic grease
Loctite 648
4
5
Loctite 242
Synthetic grease
Loctite 242
1
22
115 N•m (85 lbf•ft)
20
21
23 N•m (17 lbf•ft)
Loctite 518
Synthetic grease
7
27 N•m (20 lbf•ft)
F06D19T

DISASSEMBLY

Engine has to be removed from watercraft to open bottom end. Refer to REMOVAL AND INSTALLATION 04-03.

NOTE: Before proceeding with the disassembly of the engine, it is possible to make a few verifications. See INSPECTION in this subsection.

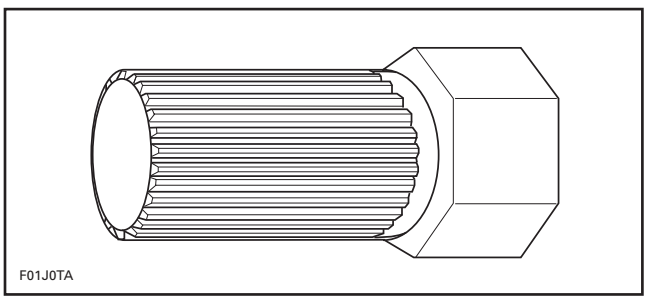
1, PTO Flywheel

717 and 787 Engines

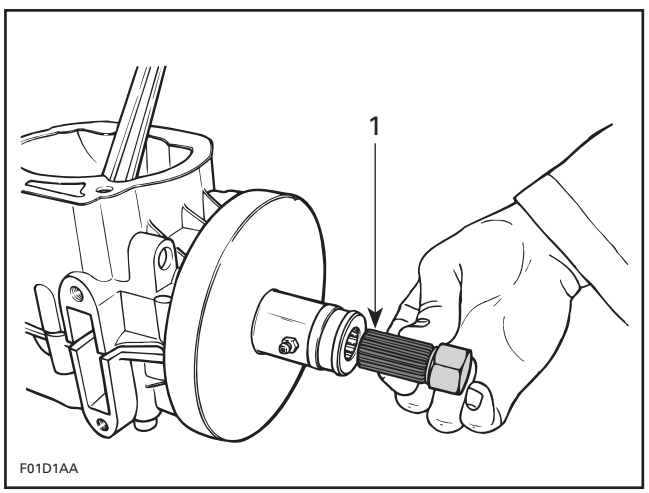
To remove PTO flywheel, the crankshaft must be locked. Refer to MAGNETO SYSTEM 04-04 and follow the procedure to lock the magneto flywheel.

GS, GTS and GTI Models

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

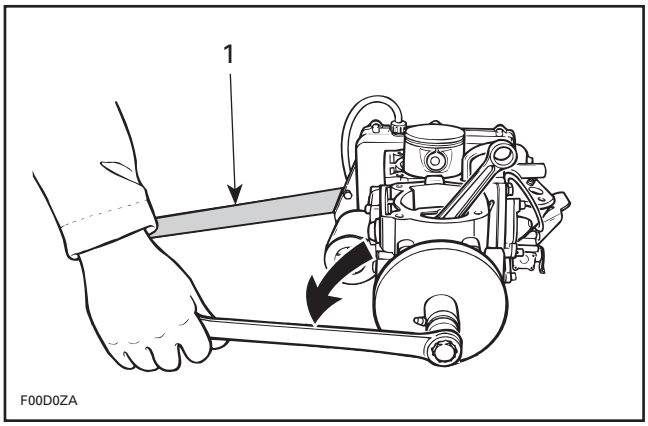


Insert special tool in PTO flywheel splines.



TYPICAL
1. PTO flywheel remover (P/N 295 000 001)

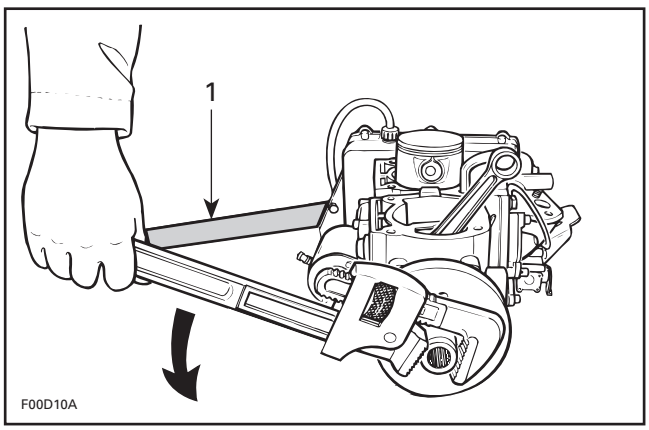
Using a suitable wrench or socket with a breaker bar, unscrew PTO flywheel COUNTERCLOCKWISE when facing it and hold extension handle locking the magneto flywheel.



TYPICAL
1. Extension handle locking crankshaft

NOTE: When splines of PTO flywheel are worn out and special tool cannot be used, proceed with the following alternate method.

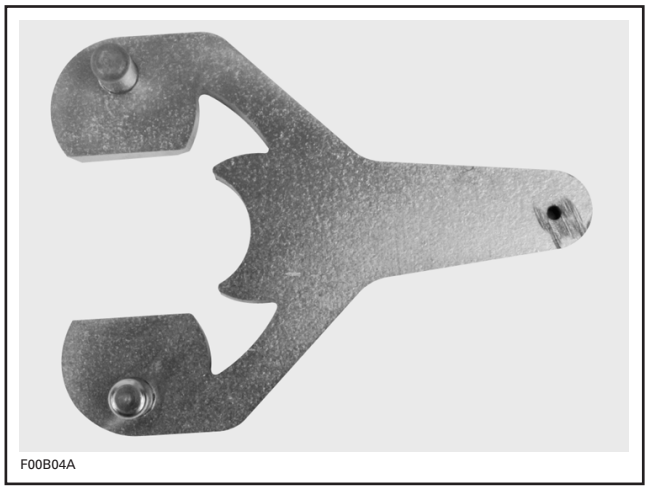
Use a pipe wrench and install it on PTO flywheel as illustrated.



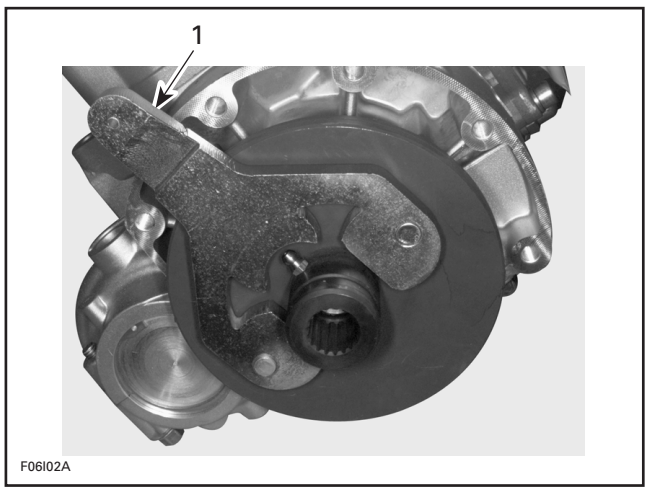
TYPICAL
1. Extension handle locking crankshaft

SPX Model

PTO flywheel is loosened using PTO flywheel remover (P/N 295 000 156).



Install special tool.



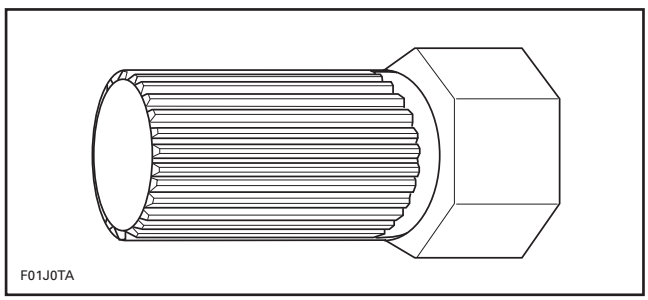
SPX MODEL

1. PTO flywheel remover

Install the extension handle (P/N 295 000 125) on the PTO flywheel remover. Loosen PTO flywheel COUNTERCLOCKWISE when facing it.

GSX Limited and GTX Limited

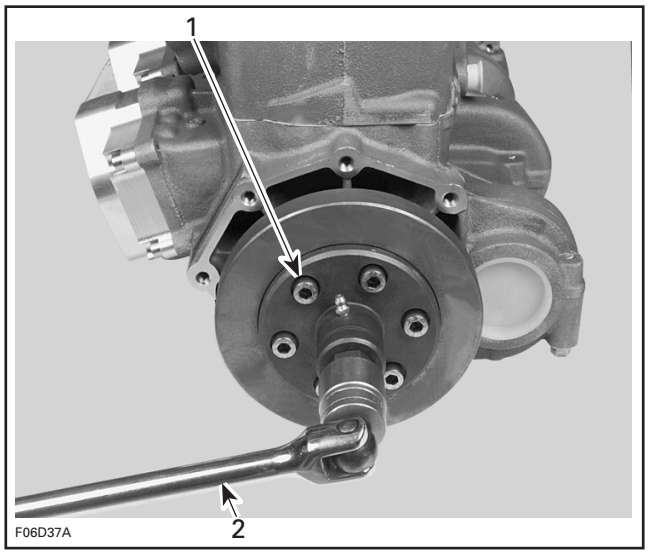
Insert PTO flywheel remover (P/N 295 000 001) in coupler splines.



PTO FLYWHEEL REMOVER TOOL

Using a suitable socket with a breaker bar, lock crankshaft.

Loosen Allen screws **no. 21** of coupler **no. 20**.



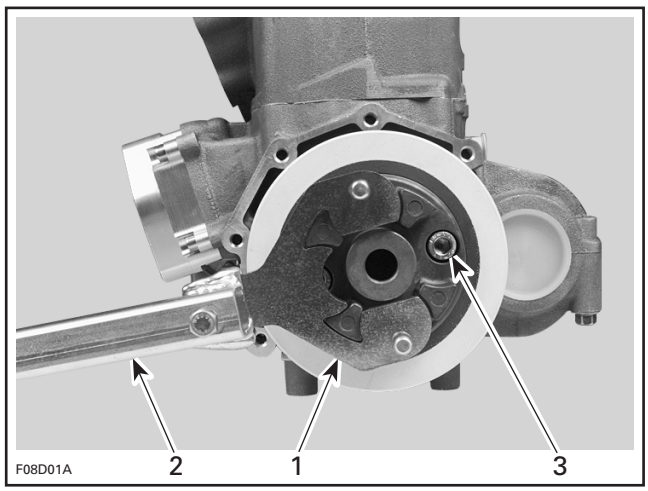
1. Loosen Allen screws
2. Breaker bar locking crankshaft

Remove the coupler **no. 20**.

XP Limited

Lock crankshaft using the PTO flywheel remover (P/N 295 000 156) and extension handle (P/N 295 000 125).

Loosen Allen screw **no. 21**.



1. PTO flywheel remover tool
2. Extension handle
3. Loosen Allen screw

Rotate tool to remove the other 3 Allen screws **no. 21**.

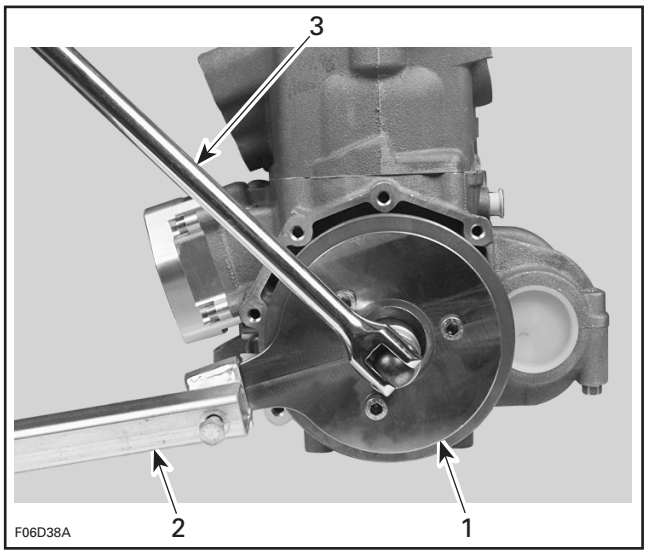
Remove coupler **no. 20**.

GSX Limited, XP Limited and GTX Limited

Install puller plate (P/N 529 035 533) and extension handle (P/N 295 000 125) to PTO flywheel.

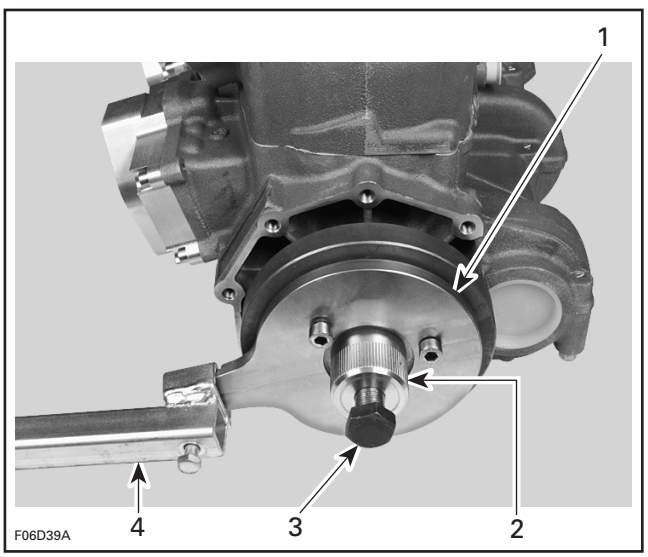
NOTE: Puller plate can be used without the extension handle.

Loosen bolt no. 22 retaining the PTO flywheel to the crankshaft using a suitable socket and breaker bar.



1. *Puller plate*
2. *Extension handle*
3. *Loosen bolt with socket and breaker bar*

Remove the PTO flywheel using puller plate (P/N 529 035 533), puller (P/N 529 035 548) and bolt (P/N 529 035 549).



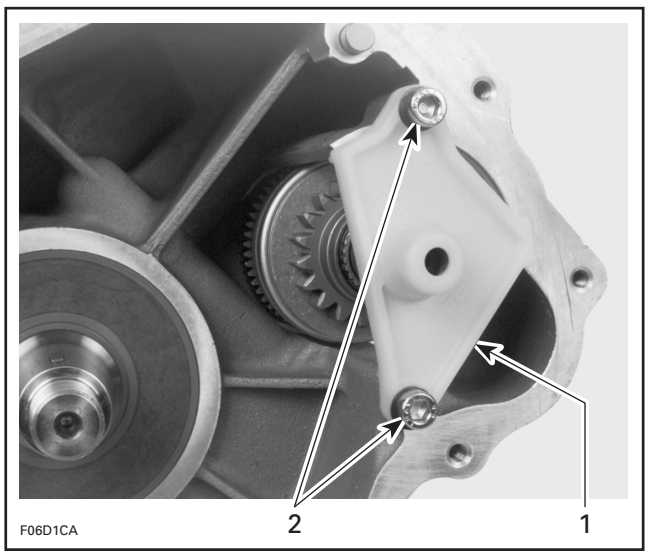
1. *Puller plate*
2. *Puller*
3. *Bolt*
4. *Extension handle*

NOTE: Puller plate can be used without the extension handle.

27, Starter Drive Assembly

947 Engine Only

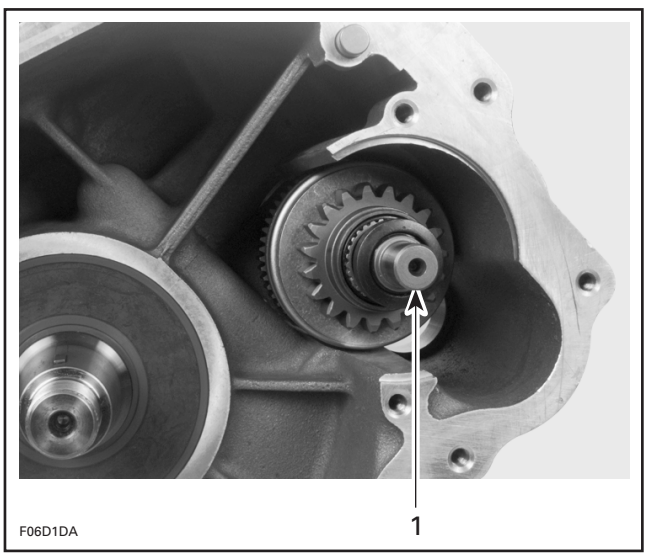
Loosen 2 Allen screws no. 24 retaining starter drive cover no. 25.



1. *Cover*
2. *Allen screw*

Remove starter drive cover no. 25 and spring no. 9.

Remove starter drive assembly no. 27.

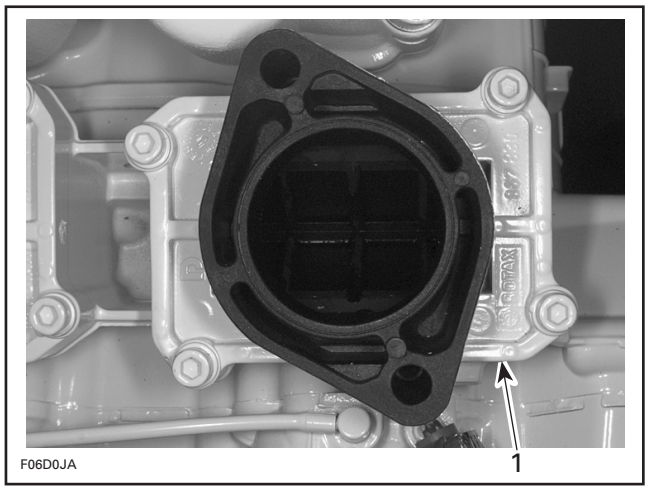


1. *Starter drive assembly*

28, Reed Valve

947 Engine Only

Remove both carburetor flanges.



1. Carburetor flange

Remove reed valves from crankcase.

5, Seal

If a crankshaft end seal has to be replaced, bottom end must be opened (except for the MAG side seal on the 787 engine, which is mounted on the magneto housing).

2, Crankcase

Remove the following parts:

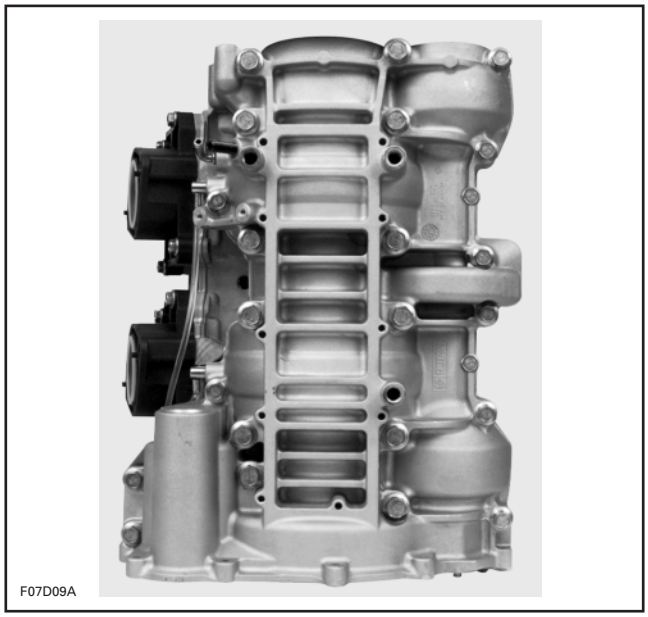
– engine supports (717 engine)
– magneto flywheel, refer to MAGNETO SYSTEM 04-04
– magneto housing (except 947 engine)
– starter
– rotary valve cover and valve (except 947 engine)
– Starter drive assembly (947 engine)
– Reed valves (947 engine)

717 and 787 Engines

Put engine on a trestle. Loosen crankcase screws.

947 Engine

Place engine upright on crankcase magneto side. Loosen crankcase screws.

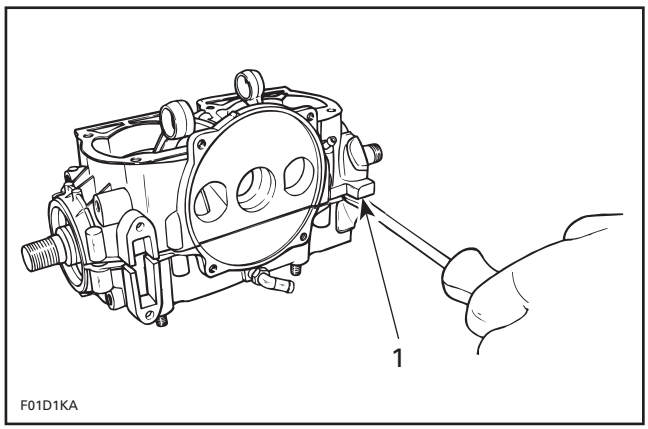


All Engines

Put engine back on a support. Insert a pry bar between crankcase lugs to separate halves.

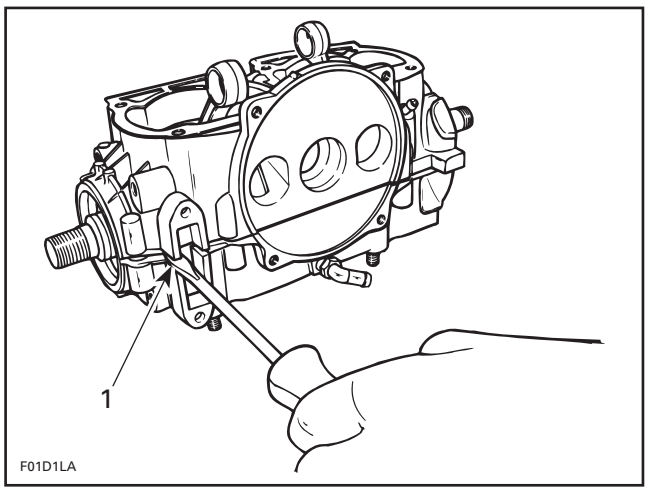
▼ CAUTION

Be careful to precision machined surfaces.



TYPICAL

1. Separate halves by prying at provided lugs



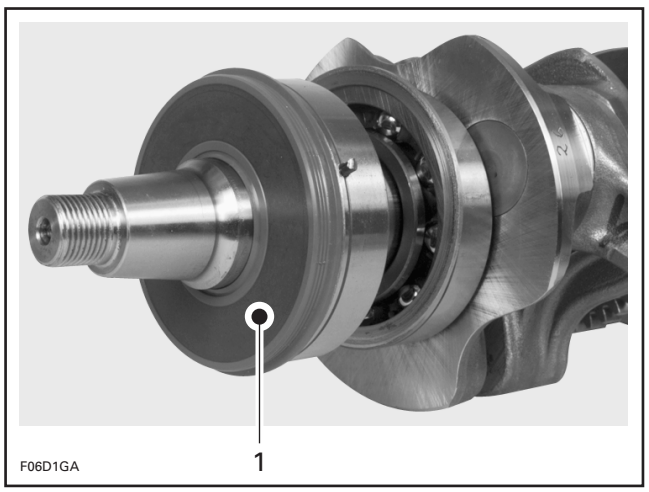
TYPICAL
1. Separate halves by prying at provided lugs

Remove crankshaft and counterbalance shaft (787 and 947 engines).

4,5, Bearing and Seal

NOTE: Do not needlessly remove crankshaft bearings.

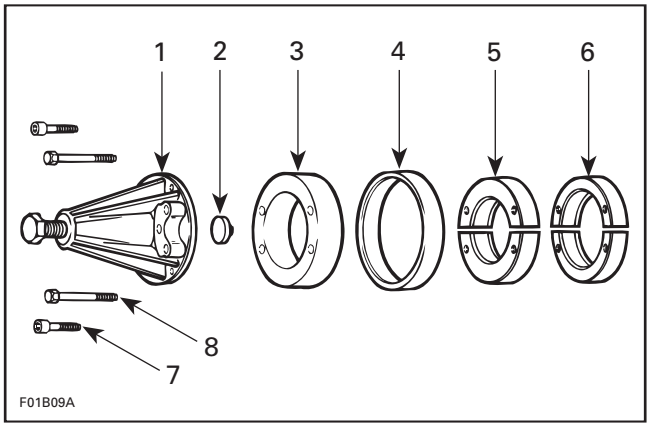
Remove end seal(s).



TYPICAL
1. End seal

717 Engine

To remove end bearings from crankshaft, use the following tools.



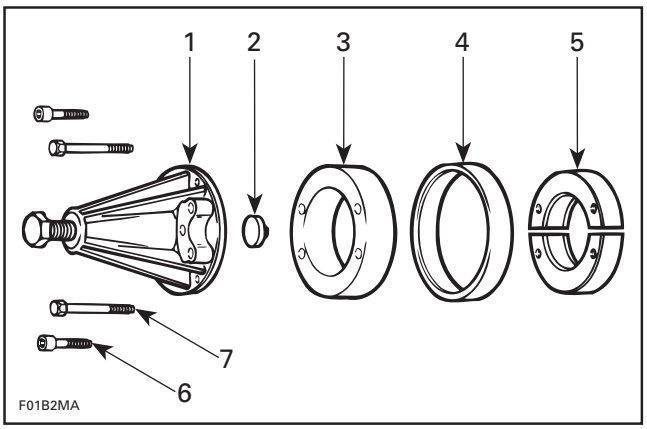
717 ENGINE
1. Puller (P/N 290 876 298)
2. Protective cap (P/N 290 876 557)
3. Distance ring, MAG side only (P/N 290 876 569)
4. Ring (both side) (P/N 290 977 490)
5. MAG side ring halves (P/N 290 276 025)
6. PTO side ring halves (P/N 290 977 475)
7. Screw M8 x 40 (P/N 290 840 681)
8. Screw M8 x 70 (P/N 290 841 201)

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

787 Engine

To remove end bearings from crankshaft, use the following tools.

NOTE: The outer PTO bearing and crankshaft gear can be removed in one step using another puller. See Crankshaft Gear no. 18.

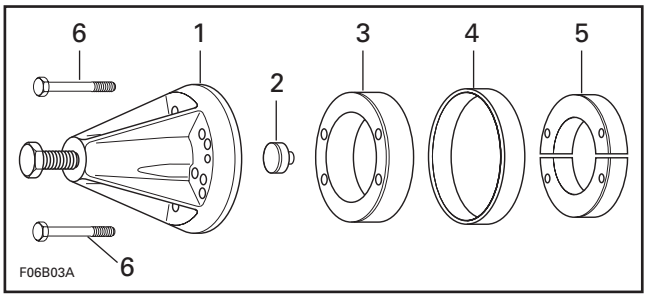


787 ENGINE
1. Puller (P/N 290 876 298)
2. Protective cap (P/N 290 876 557)
3. Distance ring (P/N 290 876 569)
4. Ring (P/N 290 977 490)
5. Ring halves (P/N 290 977 475)
6. Screw M8 x 40 (P/N 290 840 681)
7. Screw M8 x 70 (P/N 290 841 201)

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

947 Engine

To remove end bearings from crankshaft, use the following tools.

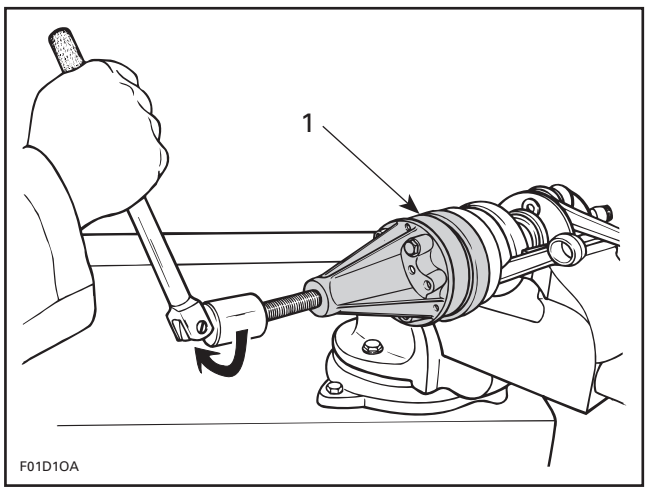


947 ENGINE

1. *Puller (P/N 420 877 635)*
2. *Protective cap (P/N 290 877 414)*
3. *Distance ring (P/N 290 876 569)*
4. *Ring (P/N 290 977 480)*
5. *Ring halves (P/N 290 876 330)*
6. *Screw (P/N 290 940 755)*

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

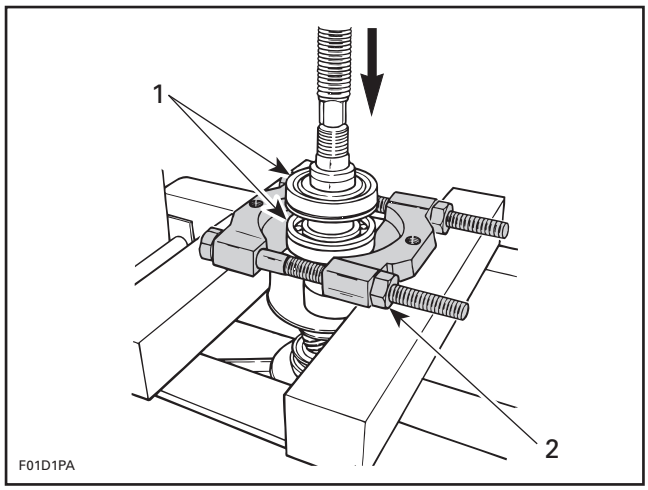
All Engines



TYPICAL

1. *Removing crankshaft bearing*

Or, use a bearing extractor such as Proto no. 4332 and a press to remove two bearings at a time (except on PTO side for the 787 engine).

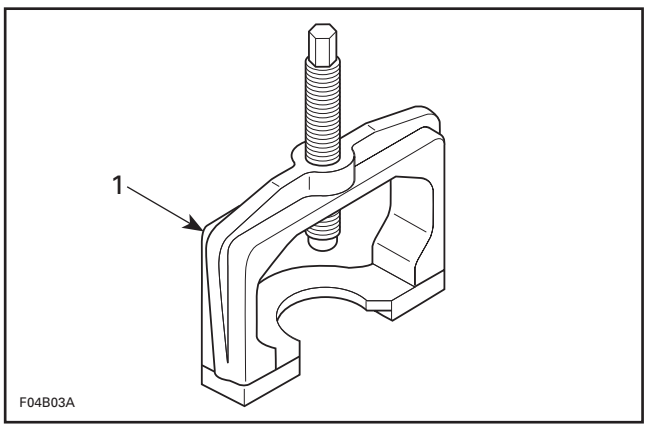


1. *Press bearings out*
2. *Bearing extractor*

18, Crankshaft Gear

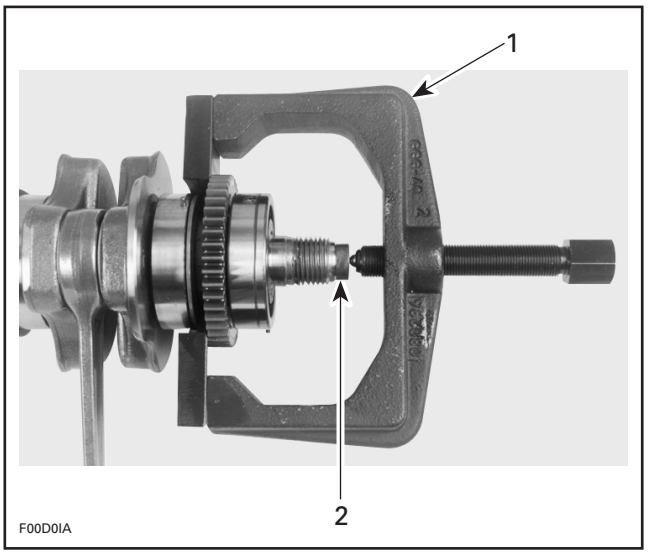
787 Engine

The crankshaft gear and bearing no. 5 can be removed in one step using the following puller.



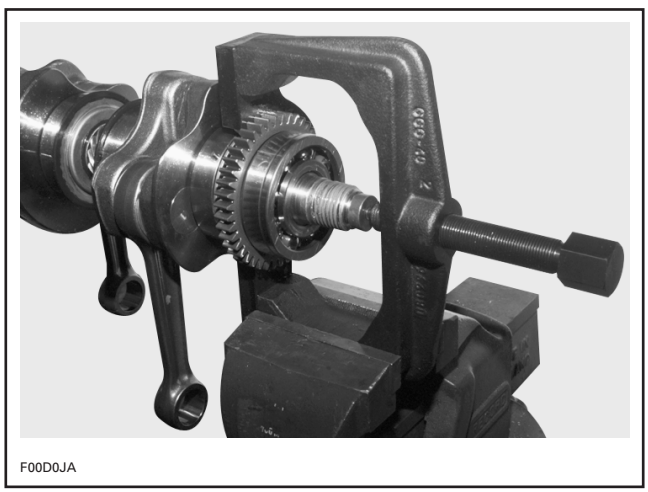
1. *Puller (P/N 290 877 665)*

Install the puller as per following illustration.



1. Puller
2. Protective cap

Secure puller in a vise and remove gear and bearing.

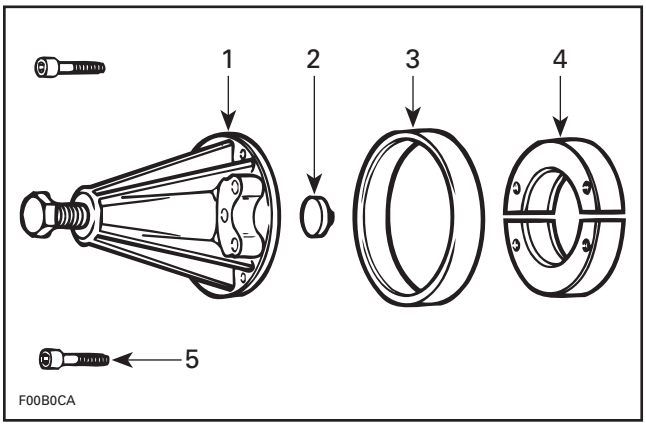


NOTE: If the inner PTO bearing needs to be replaced, remove the Woodruff key on the crankshaft.

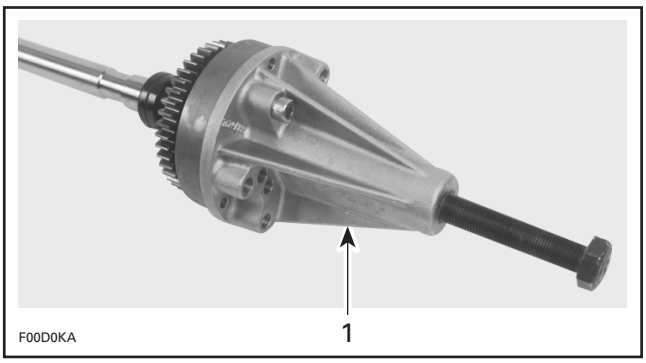
13, Counterbalance Shaft

787 Engine

Bearings **no. 15** can be removed by using the following tools:



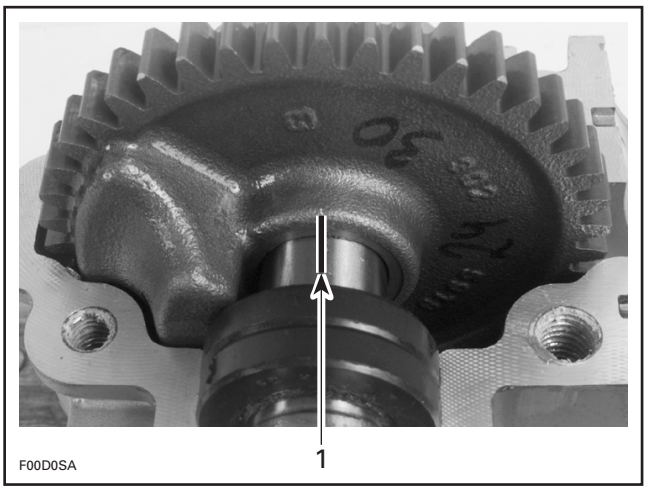
1. Puller (P/N 290 876 298)
2. Protective cap (P/N 290 876 557)
3. Ring (P/N 290 977 480)
4. Ring halves (P/N 290 876 330)
5. Screw M8 x 40 (P/N 290 840 681)



1. Tool installed

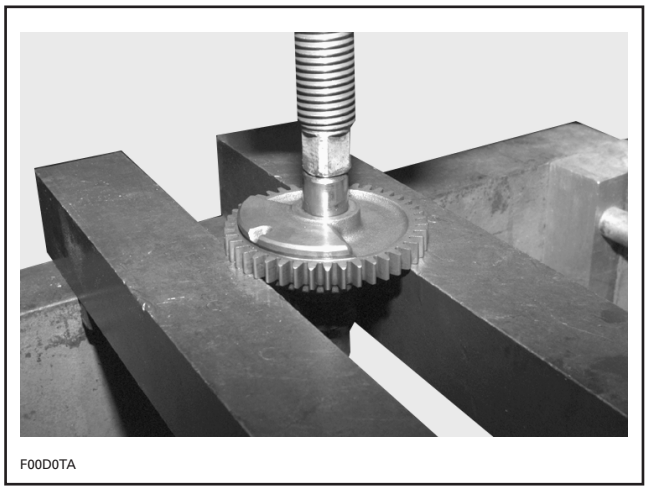
To remove gear **no. 14**, first trace an index mark on the gear and counterbalance shaft.

NOTE: There is no Woodruff key to position the gear on the counterbalance shaft. An index mark must be traced to ease assembly procedure.



1. Index mark

Use a press to remove the gear no. 14 from the counterbalance shaft.

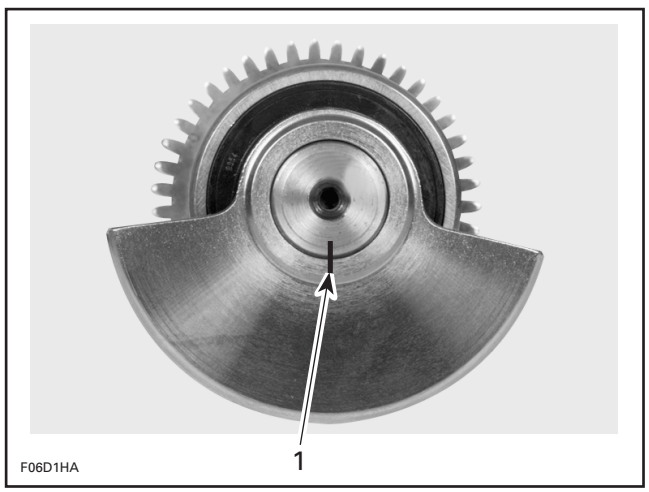


947 Engine

Use a press to remove counterweights no. 16 and bearings no. 15.

▼ CAUTION

There is no woodruff key to position the counterweights. An index mark must be traced to retain the proper position of the counterweight.



1. Trace an index mark

Remove seals no. 17.

Remove bearing no. 31 and washer no. 32.

Use a press to remove gear no. 14.

CLEANING

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

Clean oil passages and make sure they are not clogged.

Clean all metal components in a solvent.

Remove old Loctite from crankcase mating surfaces with gasket remover (P/N 295 000 110).

▼ CAUTION

Be careful not to spray cleaner on the painted surface of the engine. Never use a sharp object to scrape away old sealant as score marks incurred are detrimental to crankcase sealing.

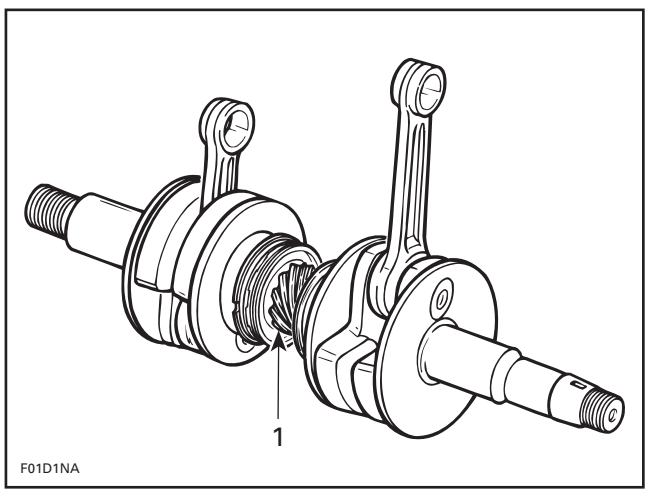
INSPECTION

Assembled Engine

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

Crankshaft Alignment at Center Main Journal

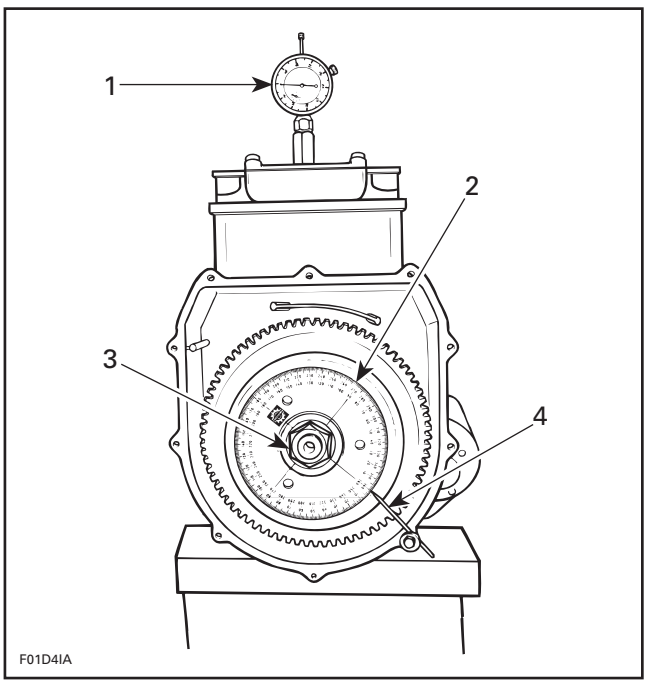
Since it is an assembled crankshaft it can become misaligned or deflected. Crankshaft can be twisted on center main journal, changing timing of one cylinder in relation with the other.



1. Main journal alignment here

To accurately check if crankshaft is twisted on center main journal, proceed as follows:

– Remove magneto housing cover.
– Remove flywheel nut (and magneto rotor for the 787 and 947 engines). Refer to MAGNETO SYSTEM 04-04 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 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°.



TYPICAL

1. *TDC gauge*
2. *Degree wheel*
3. *Hand tighten nut*
4. *Needle pointer*

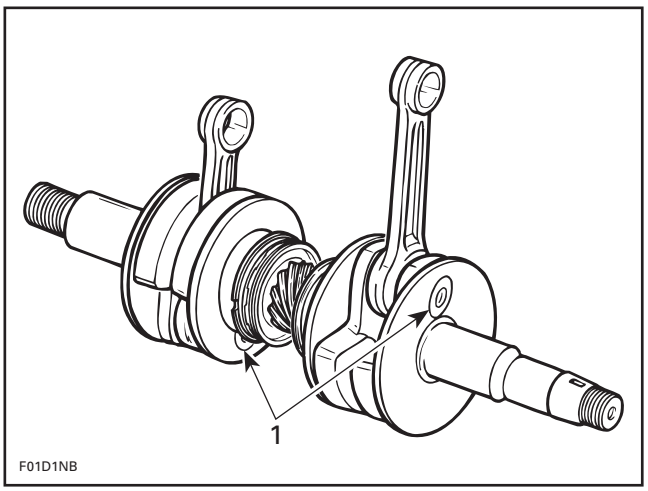
– Remove TDC gauge and install on **PTO side**.
– Bring **PTO** piston at Top Dead Center.

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

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



1. *Connecting rod journal alignment here*

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

If deflection is found greater than specified tolerance, this indicates worn bearing(s), bent and/or disaligned crankshaft. Proceed with the disassembly of the engine.

Disassembled Engine

The following verifications can be performed with the engine disassembled.

2, Crankcase

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

4, Bearing

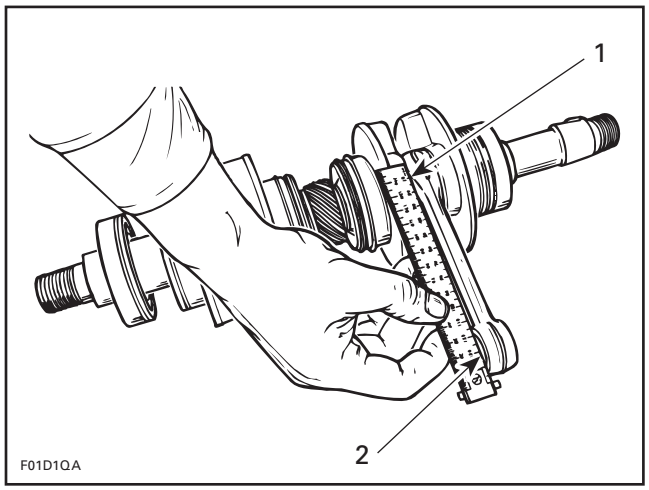
Inspect crankshaft bearings. Check for corrosion, scoring, pitting, chipping or other evidence of wear. Make sure plastic cage is not melted. Rotate and make sure they turn smoothly.

3, Crankshaft

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

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.



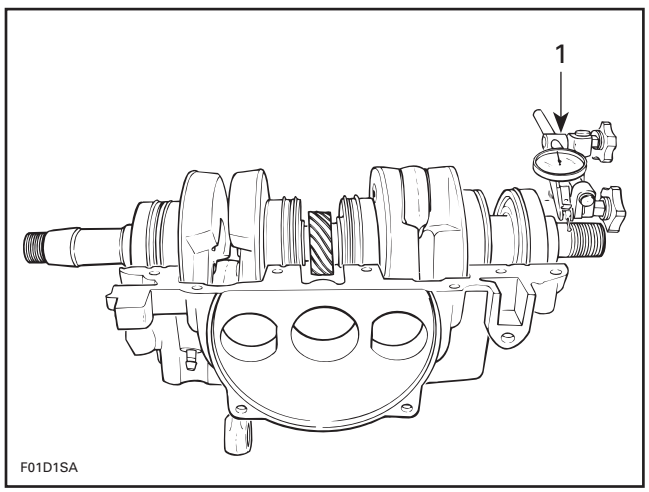
1. *Ruler must be aligned with edge of connecting rod here*
2. *Align ruler here*

Crankshaft Deflection

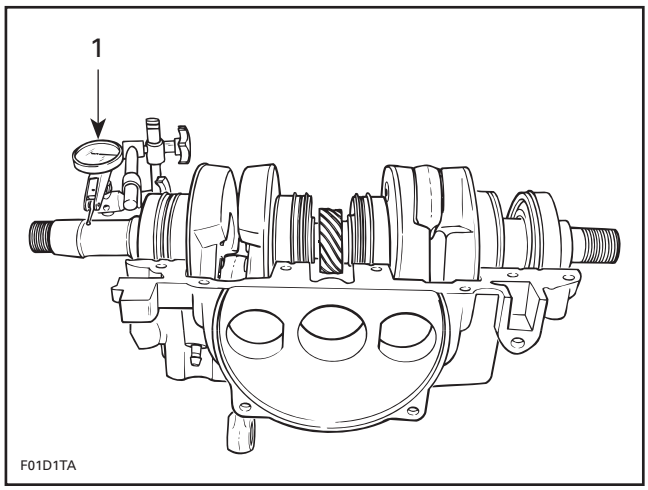
MEASUREMENT	MAG SIDE	PTO SIDE
Crankshaft deflection (max.)	0.050 mm (.002 in)	0.030 mm (.001 in)

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.

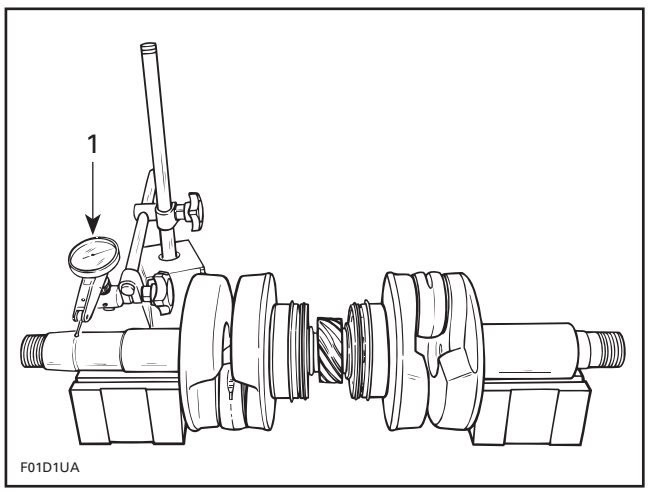


1. *Measuring PTO side deflection in crankcase*

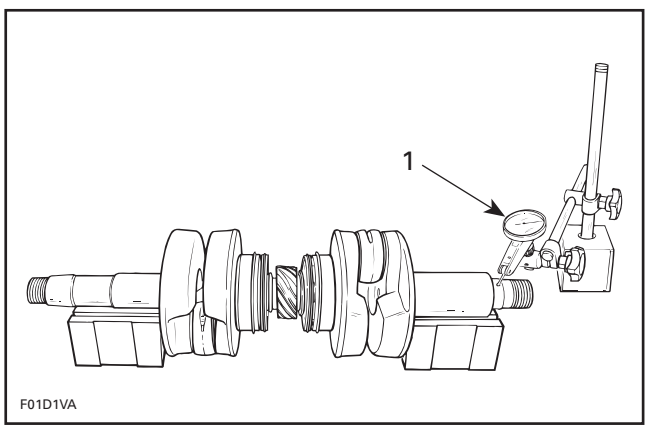


1. *Measuring MAG side deflection in crankcase*

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



1. *Measuring MAG side deflection on V-shaped blocks*



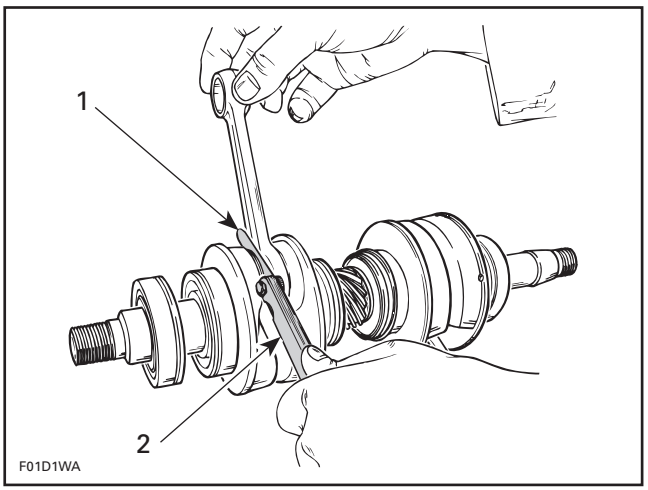
1. *Measuring PTO side deflection on V-shaped blocks*

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

Connecting Rod Big End Axial Play

MEASUREMENT	NEW PARTS (min.)	NEW PARTS (max.)	WEAR LIMIT
Connecting rod big end axial play	0.390 mm (.015 in)	0.737 mm (.029 in)	1.2 mm (.047 in)

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

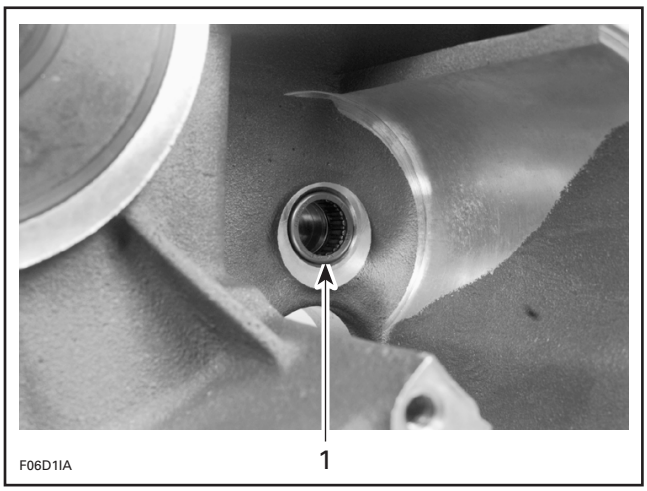


1. Measuring big end axial play
2. Feeler gauge

23, Bearing

947 Engine

Check bearing **no. 23** of starter drive assembly **no. 27** in crankcase.

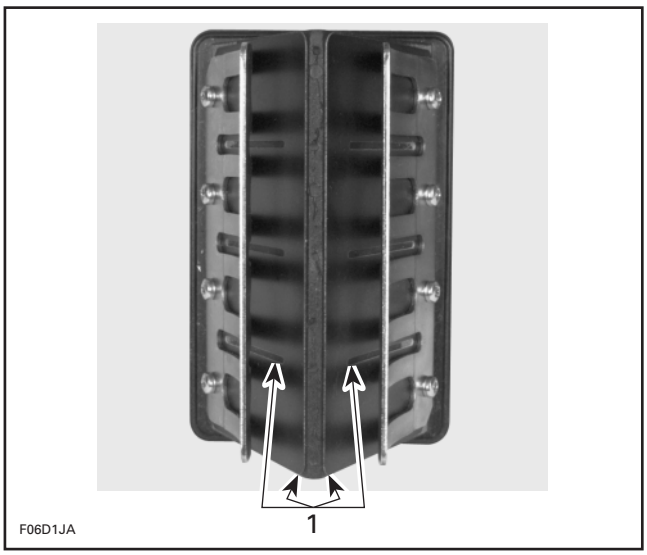


1. Bearing of starter drive assembly

28, Reed Valve

947 Engine

Check reed valve petals **no. 29** for cracks or other defects. The reed petals must lie completely flat against the reed valve body **no. 30**. To check, hold against light.

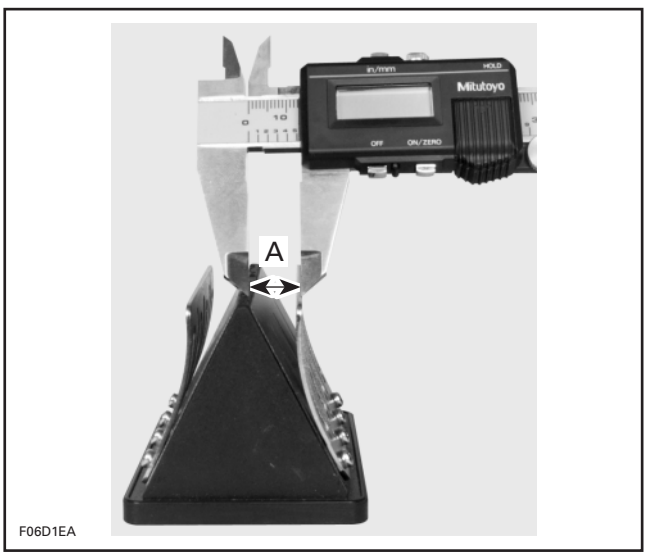


1. No play

In case of a play, turn reed petals upside down and recheck. If there is still a play, replace petals.

Check perfect condition of rubber coating on reed valve body.

Check stopper distance from center of reed valve block.



A. 13 ± 0.25 mm (.512 ±.010 in)

NOTE: Distance should be the same on both sides.

Bent stopper as required to obtain the proper distance.

ASSEMBLY

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

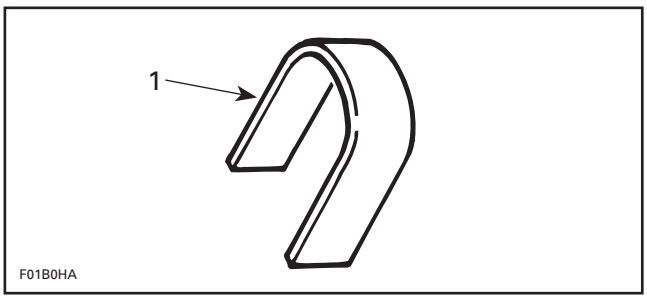
3,4, Crankshaft and Bearing

Apply Loctite 767 anti-seize on part of crankshaft where bearing fits.

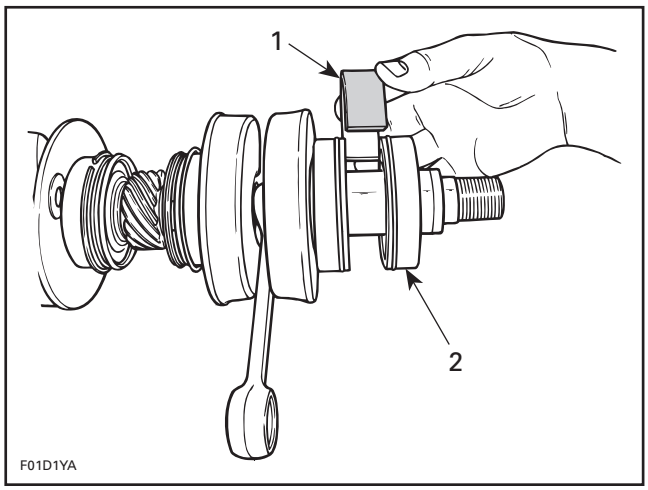
Prior to installation, place bearings into a container filled with oil, previously heated to 75°C (167°F). This will expand bearing and ease installation.

To properly position the outer bearing(s), a distance gauge must be temporarily installed against the inner bearing. Slide the outer bearing until stopped by the distance gauge, then remove it.

ENGINE	DISTANCE GAUGE
717	P/N 529 034 800 (PTO)
787	P/N 529 034 900 (MAG)
947	P/N 290 876 627 (MAG) P/N 290 876 622 (PTO)



1. Distance gauge



TYPICAL

1. Distance gauge
2. Outer bearing

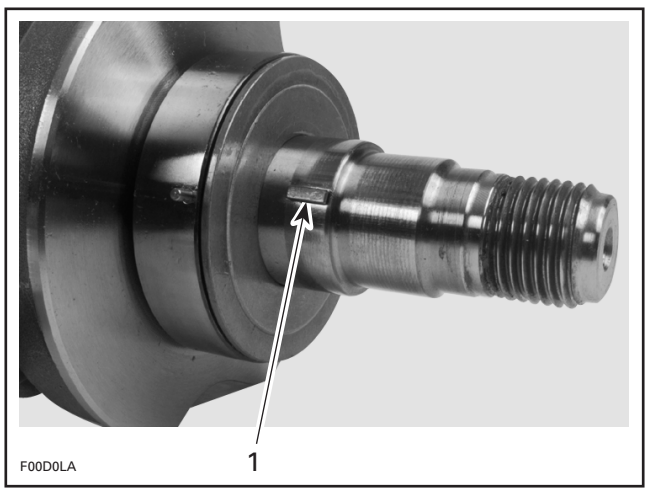
12, Distance Ring

When installing the distance ring, make sure to position it with its chamfer toward the counterweight of the crankshaft.

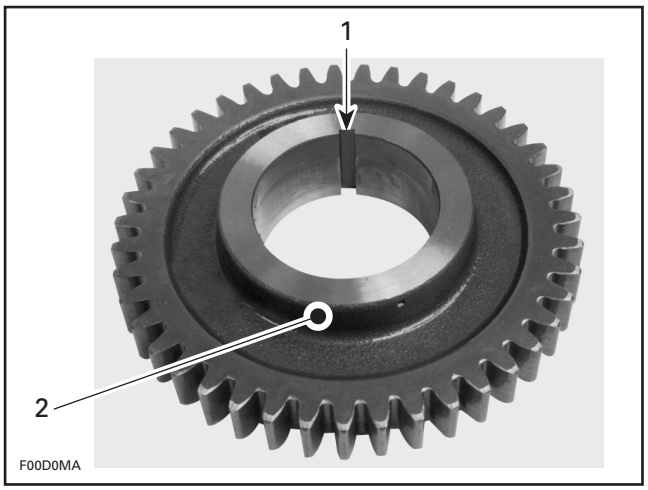
18, Crankshaft Gear

787 Engine

Position the long flange of the gear toward the counterweight of the crankshaft. Also, make sure to align the gear keyway with the Woodruff key on the crankshaft.



1. Woodruff key on the crankshaft



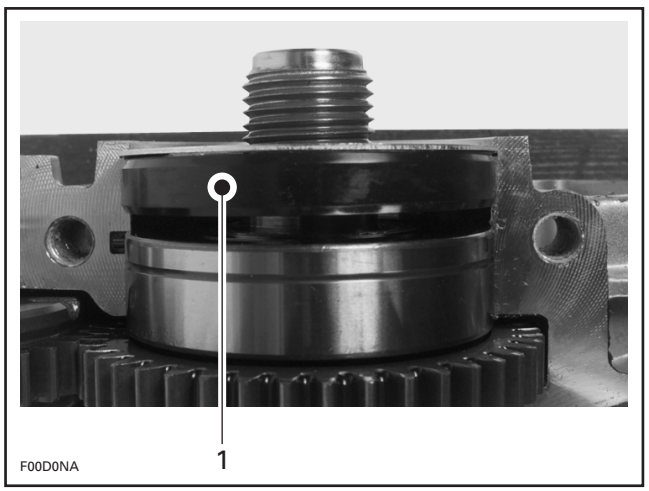
1. Keyway
2. Long flange toward the crankshaft counterweight

5, Seal

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

787 Engine

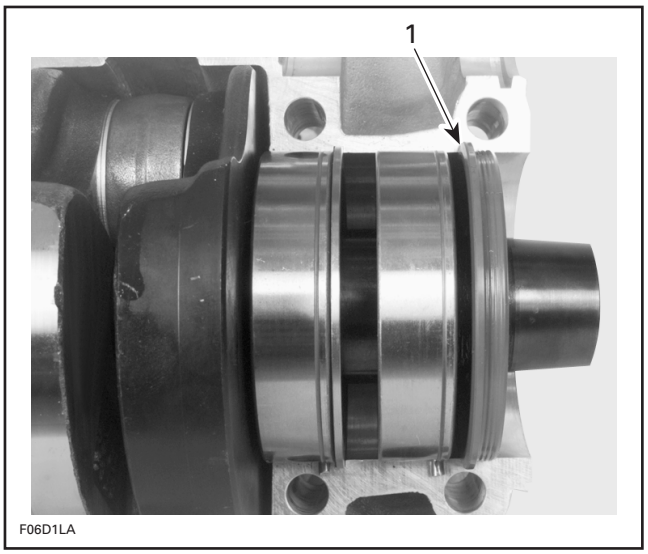
Position PTO seal against the retaining shim; the gap between the seal and bearing will ensure proper lubrication of the bearing.



1. Seal against the retaining shim

947 Engine

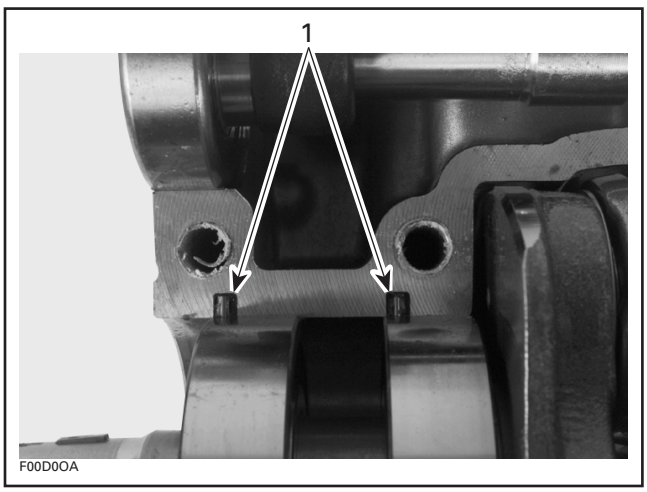
Seals are positioned with the outer lip in the crankcase recess.



1. Seal lip in crankcase recess

6, Drive Pin

Make sure drive pins of bearings are properly installed in crankcase recesses at assembly.



1. Drive pins

13, Counterbalance Shaft

787 Engine

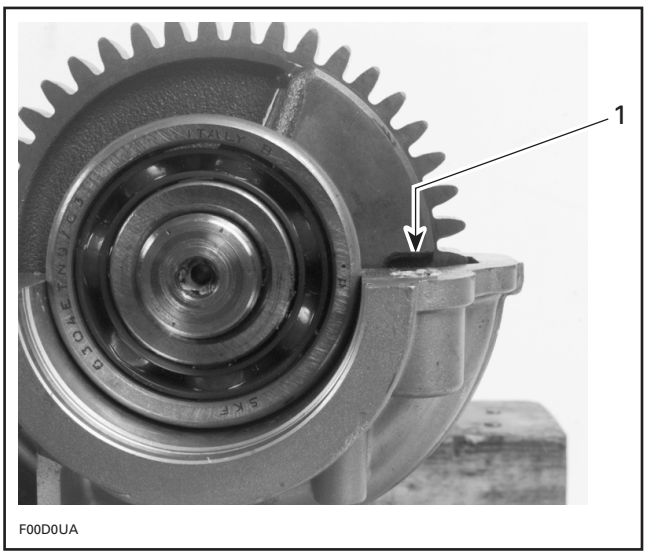
Press gear no. 14 onto counterbalance shaft taking care to align both marks previously traced.

▼ CAUTION

Counterbalance shaft must be properly assembled, otherwise engine will vibrate and premature wear will occur.

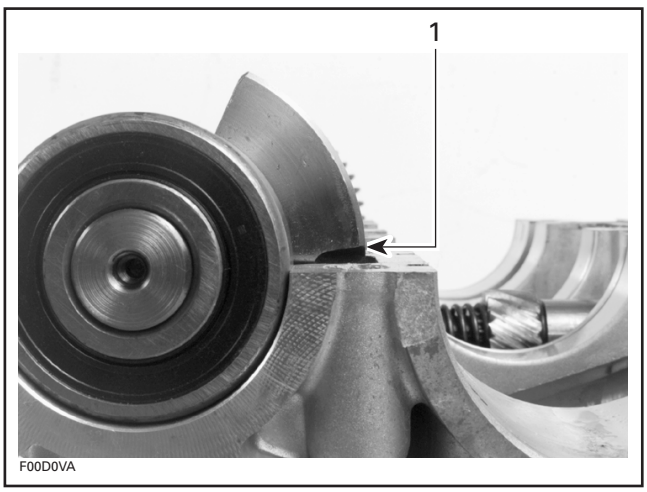
Proceed as follows to check if the gear no. 14 is properly positioned on the counterbalance shaft:

– Temporarily install the counterbalance shaft in the crankcase.
– Rotate the counterbalance shaft to align the notch of the gear with the crankcase.



1. Gear notch aligned with the crankcase

– The notch of the couterweight on the opposite end of the counterbalance shaft must also be aligned with the cranckcase.



1. Counterweight notch aligned with the crankcase

If notches are not aligned with the crankcase, remove the gear and repeat the procedure until the notches are properly aligned.

947 Engine

Install bearing no. 31 and washer no. 32.

When installing seals no. 17, apply a light coat of synthetic grease on seal lips.

Prior to installation, place bearings no. 15 into a container filled with oil, previously heated to 75°C (167°F). This will expand bearings and ease their installation.

Reinstall counterweights no. 16 using a press and take care to align index marks previously traced.

3,13, Crankshaft and Counterbalance Shaft

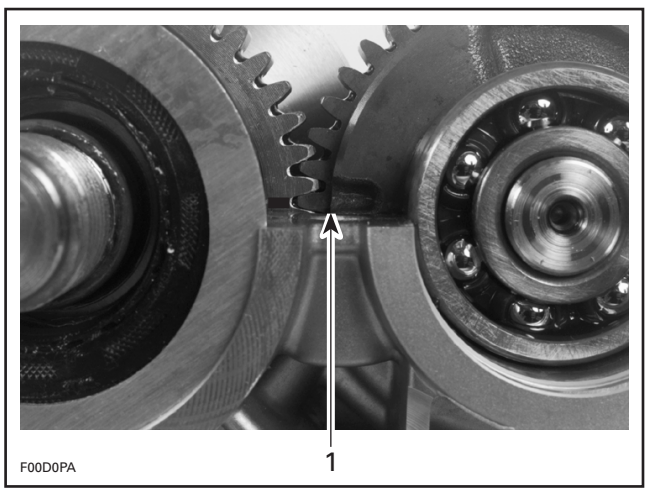
787 and 947 Engines

Install crankshaft first in crankcase.

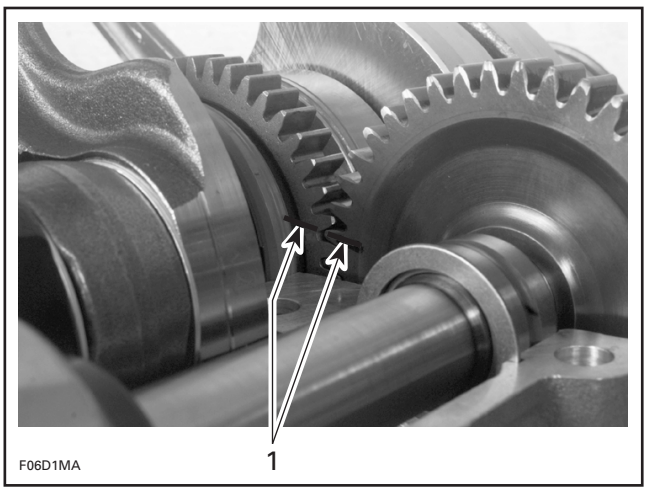
After crankshaft installation, install counterbalance shaft. Make sure to properly index crankshaft and counterbalance shaft by aligning marks of gears.

▼ CAUTION

Marks on the crankshaft and counterbalance shaft must be aligned, otherwise engine will vibrate and premature wear will occur.



787 ENGINE
1. Marks must be aligned

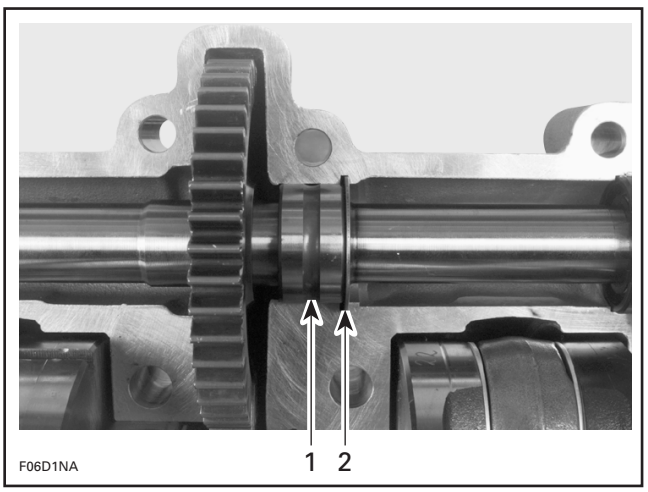


947 ENGINE
1. Marks must be aligned

Turn by hand the crankshaft and counterbalance shaft. Make sure they do not interfere with the crankcase.

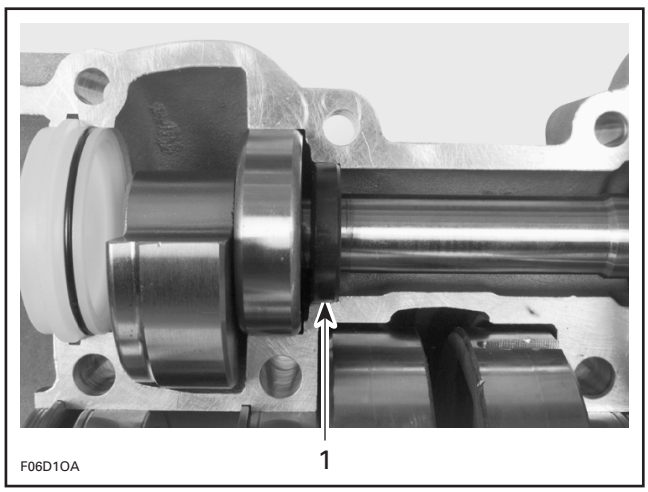
947 Engine

Properly position bearing no. 31 and washer no. 32.



1. Bearing
2. Washer in crankcase groove

Place seals no. 17 in their respective positions.



1. Seal in place

2, Crankcase

All Engines

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 518 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.

717 and 787 Engines

Rotary valve shaft must be installed in crankcase before closing halves.

▼ CAUTION

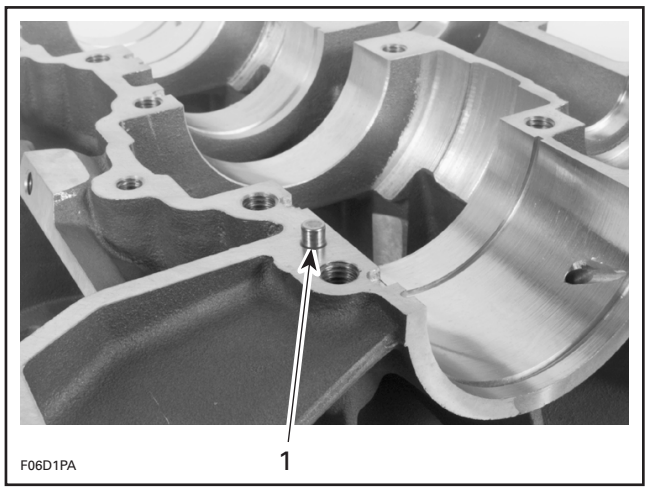
Before joining crankcase halves, make sure that crankshaft gear is well engaged with rotary valve shaft gear.

717 Engine

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

947 Engine

Make sure all locating dowels are in place.

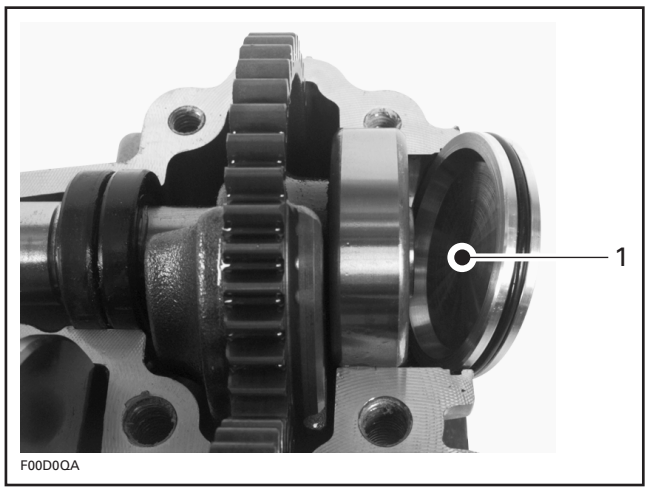


1. Dowel

19, Bearing Cover

787 Engine

Install the bearing cover with its hollow side toward the bearing.



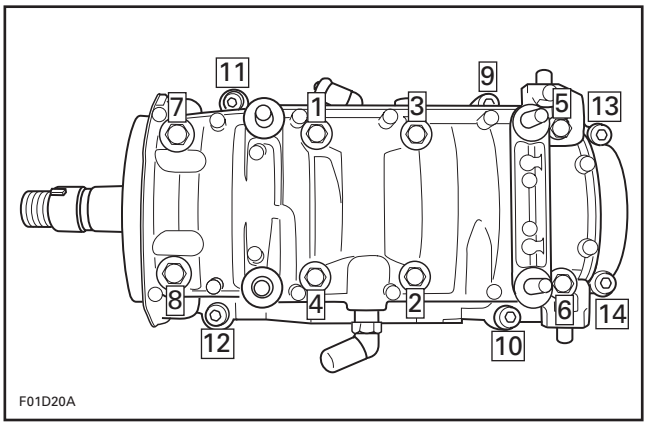
1. Hollow side facing bearing

7,8,9, Crankcase Screw

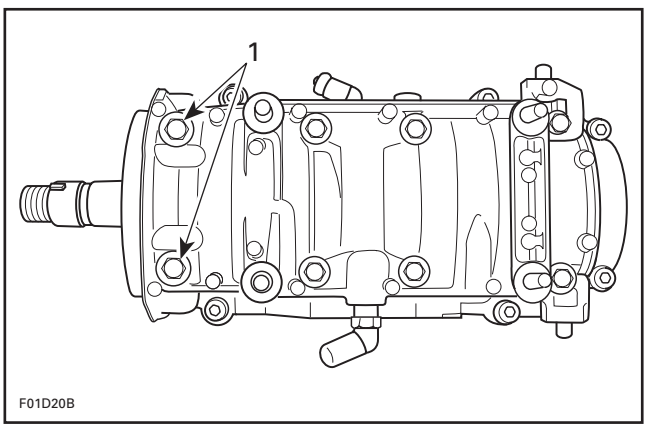
717 Engine

Apply Loctite 518 on screw threads and synthetic grease below head screws.

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



Torque 2 M10 crankcase screws to 40 N•m (30 lbf•ft).

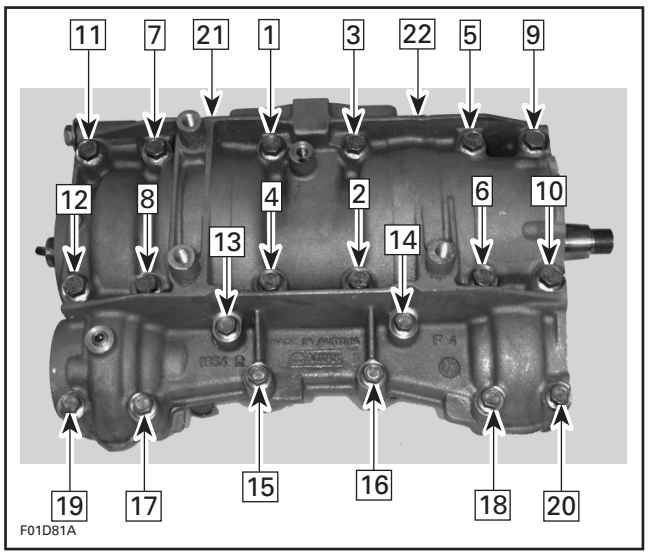


1. Torque to 40 N•m (30 lbf•ft)

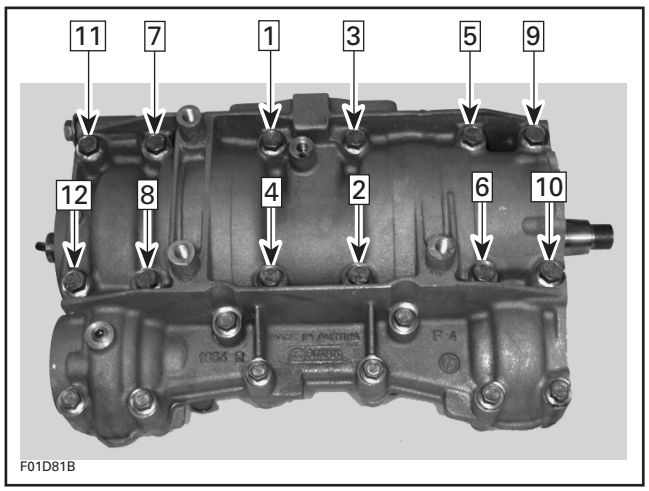
787 Engine

Apply Loctite 518 on screw threads and synthetic grease below head screws.

Torque crankcase screws to 12 N•m (9 lbf•ft) as per following sequence. Repeat procedure, retightening all screws to 24 N•m (17 lbf•ft).



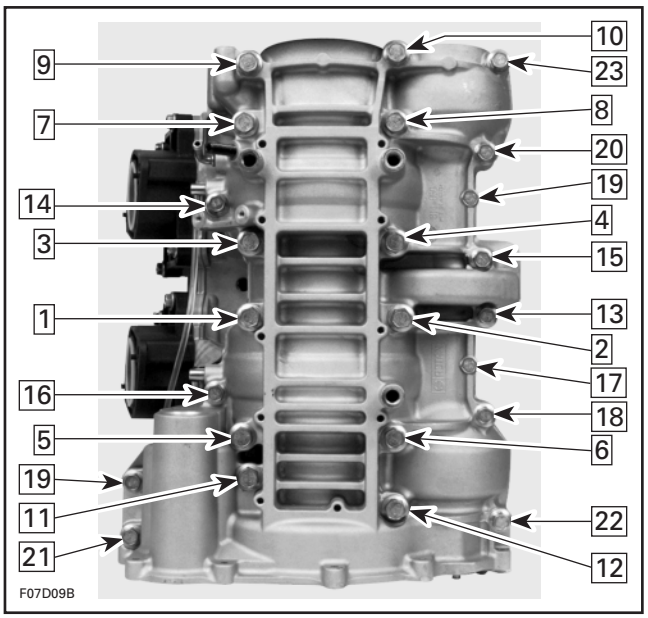
As a final step, torque only M10 screws **no. 8** of crankcase to 40 N•m (30 lbf•ft) as per following sequence.



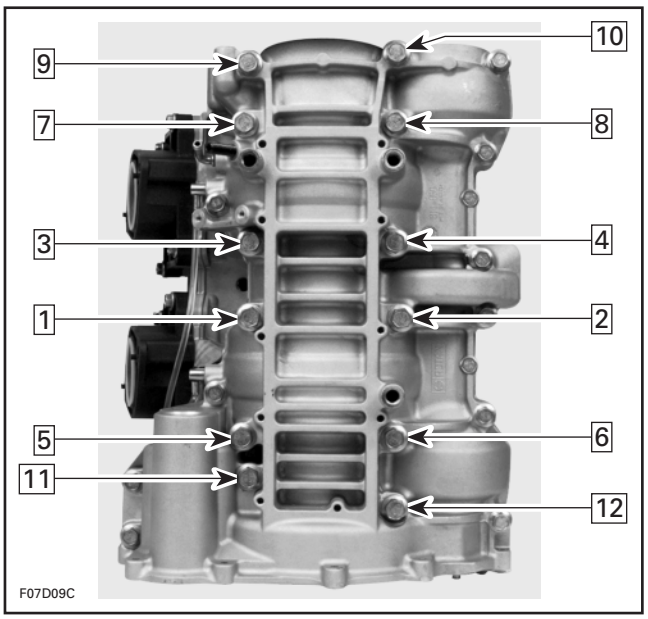
947 Engine

Apply synthetic grease below head of screws and Loctite 518 on threads.

Torque crankcase screws to 12 N•m (9 lbf•ft) as per following sequence. Repeat procedure, re-tightening all screws to 27 N•m (20 lbf•ft).



As a final step, torque only the M10 x 73.5 bolts to 40 N•m (30 lbf•ft) as per following sequence.



11, Fitting

717 and 787 Engines

If inlet and outlet oil fittings of rotary valve shaft have been removed from crankcase, reinstall them with their ends pointing toward ignition housing. Apply Loctite 518 on threads of fittings.

10, Stud

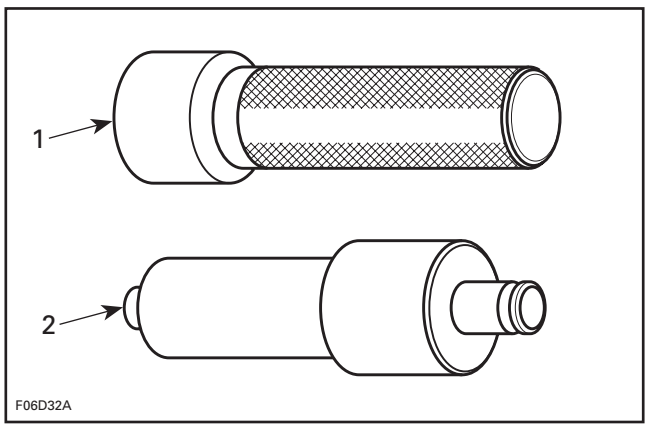
717 Engine

At assembly in crankcase, apply Loctite 518 on stud threads. Torque to 10 N•m (88 lbf•**in**).

23, Starter Drive Bearing

947 Engine

To install bearing **no. 23** of starter drive assembly, use pusher (P/N 290 876 502) and handle (P/N 290 877 650).

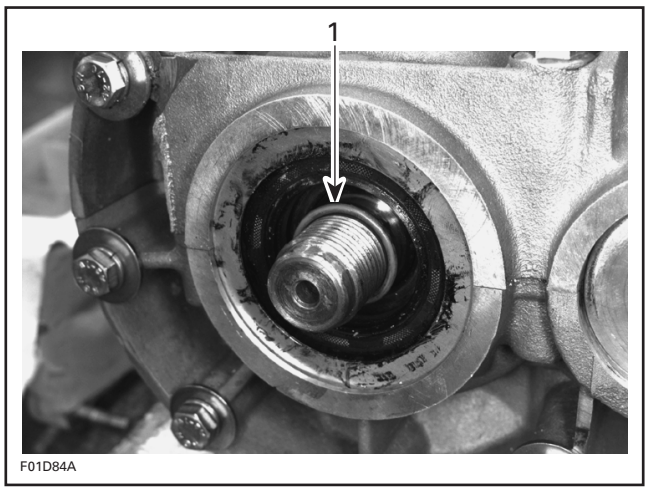


1. Handle
2. Pusher

1, PTO Flywheel

787 Engine

Install O-ring onto crankshaft.



1. O-ring

717 and 787 Engine

Apply Loctite anti-seize lubricant (P/N 293 800 023) to crankshaft threads.

Using the same tools as for disassembly procedure, torque PTO flywheel to 110 N•m (81 lbf•ft).

947 Engine

Apply Loctite 242 (blue) on bolt **no. 22**.

Using the same tools as for disassembly procedure, torque bolt **no. 22** to 115 N•m (85 lbf•ft).

Apply Loctite 648 on mating surface of PTO flywheel and coupler.

Apply Loctite 242 (blue) to Allen screws **no. 21** of coupler and torque to 23 N•m (17 lbf•ft).

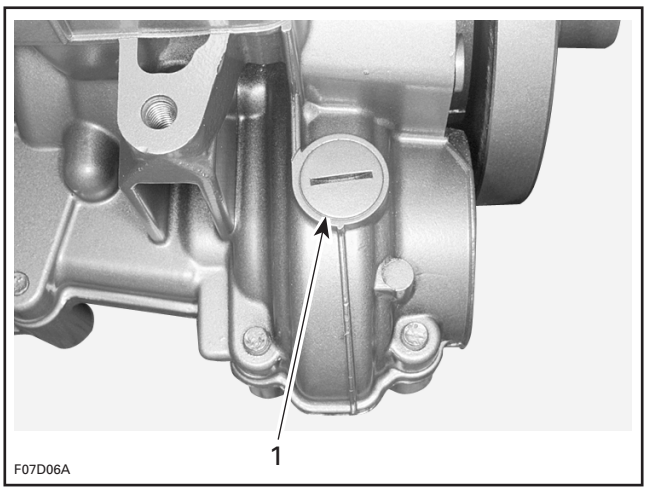
Final Assembly

717 and 787 Engines

For rotary valve timing and assembly procedures, refer to ROTARY VALVE 04-07.

787 Engine

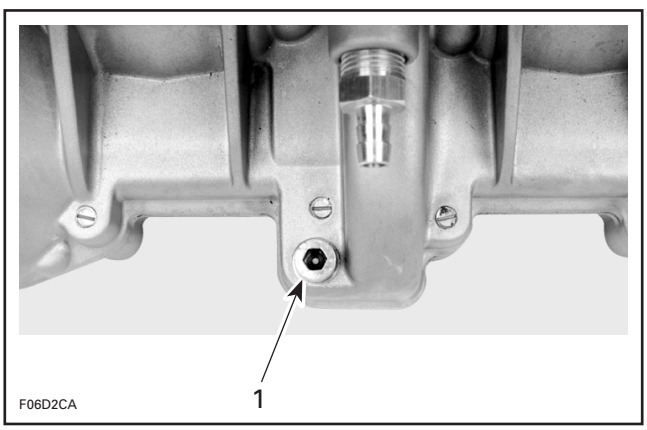
When engine assembly is completed, add 30 mL (1oz) of motor oil SAE 30 to the counterbalance shaft gear through the crankcase filler plug.



1. Remove plug and add SAE 30 motor oil

947 Engine

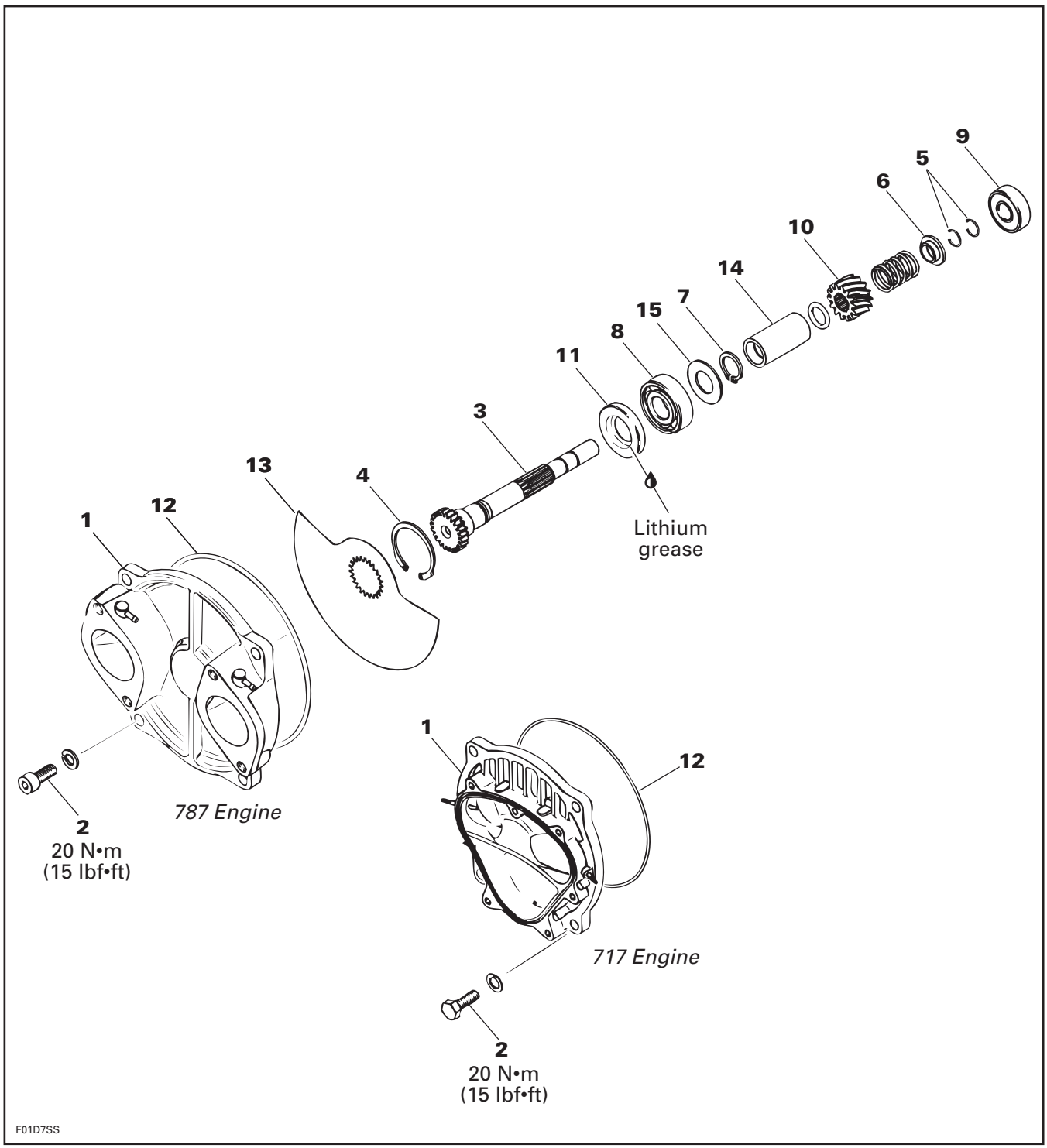
When engine assembly is completed, add 40 mL (1.35 oz) of motor oil SAE 30 to the counterbalance shaft gear through the crankcase filler plug.



1. Remove plug and add SAE 30 motor oil

ROTARY VALVE

717 and 787 Engines



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.

However engine must be removed from watercraft to work on rotary valve shaft/components. Refer to REMOVAL AND INSTALLATION 04-03 for engine removal procedure.

Bottom end must be opened to remove rotary valve shaft. Refer to BOTTOM END 04-06.

INSPECTION ON WATERCRAFT

Remove carburetor(s). Refer to CARBURETOR 06-04.

1, Rotary Valve Cover

Unscrew 4 screws **no. 2** and withdraw rotary valve cover and valve **no. 13**.

Rotary Valve/Cover Clearance

The clearance between the rotary valve and the cover must be 0.30 ± 0.05 mm (.012 ± .002 in).

NOTE: If the clearance is below 0.25 mm (.010 in) this could create an overheating situation and if the clearance is over 0.35 mm (.014 in) this could create a hard starting situation.

There is 2 methods to verify rotary valve/cover clearance. One with a 45° feeler gauge, the other one with a solder.

45° FEELER GAUGE METHOD

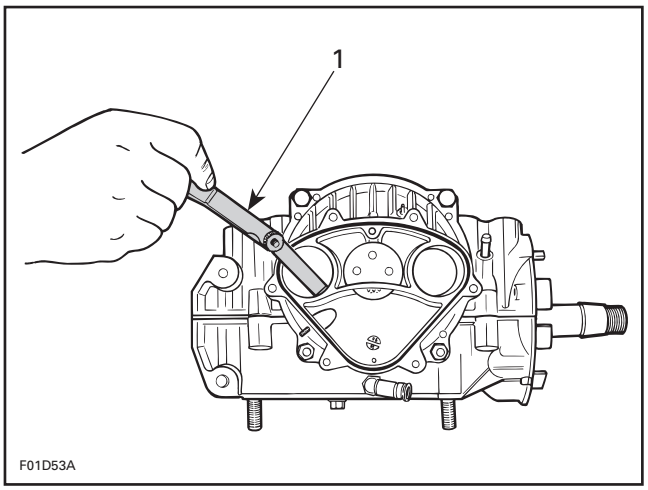
Remove O-ring from rotary valve cover.

Remove intake manifold from rotary valve cover (except 787 engine).

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 two different places in each port.



1. 45° feeler gauge

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

SOLDER METHOD

Remove O-ring from rotary valve cover.

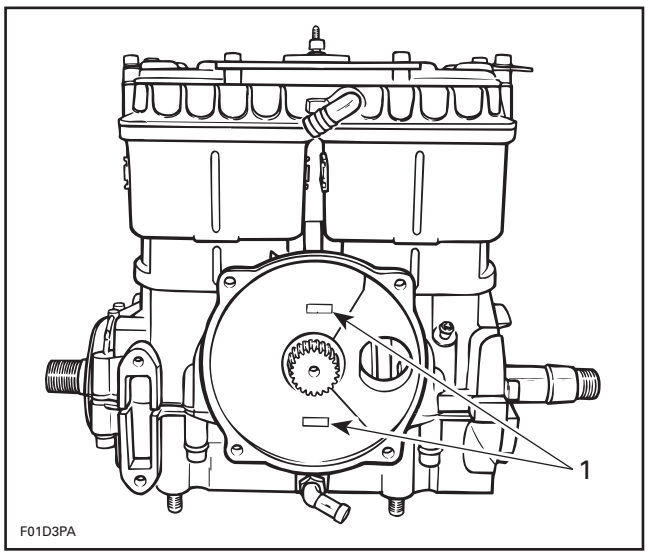
Use the following type of solder:

– rosin core
– diameter: 0.8 mm (.032 in)
– electronic application (available at electronic stores)

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

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

Remove cover then clean and measure compressed solder thickness, it must be within the specified tolerance 0.30 ± 0.05 mm (.012 ± .002 in).



TYPICAL
1. Solder

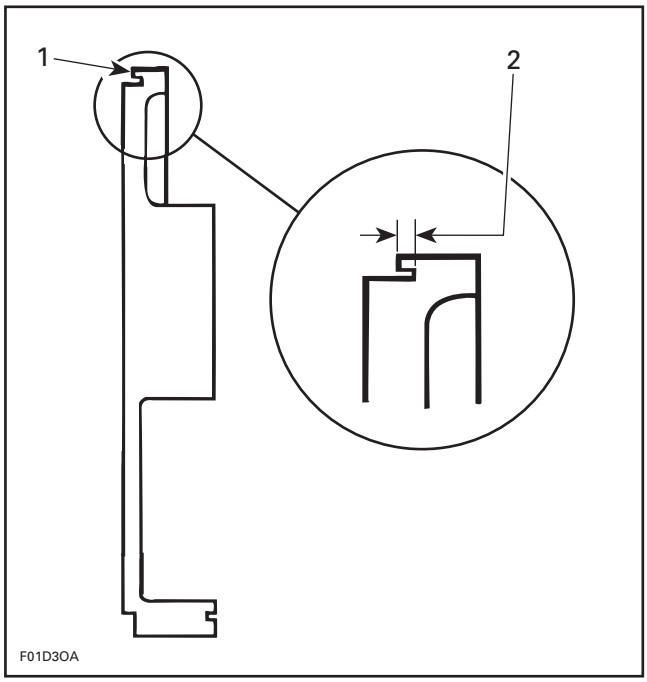
If rotary valve cover clearance is out of specification, machine rotary valve cover seating surface or replace the cover.

MACHINING INFORMATION

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

Also cut the O-ring groove the same amount to keep the 1.0 ± 0.03 mm (.039 ± .001 in) depth between the bottom of the groove and the seating surface.

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



SAME AMOUNT REMOVED FROM COVER SEATING SURFACE AND O-RING GROOVE BASE
1. Cover seating surface
2. O-ring groove depth must be 1.0 ± 0.03 mm (.039 ± .001 in)

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 reworked 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.

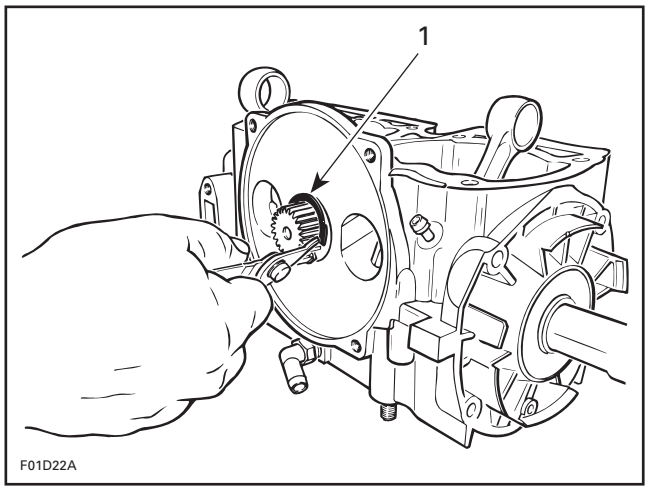
Manually feel backlash at one position, then turn crankshaft about 1/8 turn and recheck. Continue this way to complete one revolution.

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

DISASSEMBLY

3, Rotary Valve Shaft

To remove the rotary valve shaft assembly, first remove snap ring **no. 4** from crankcase.

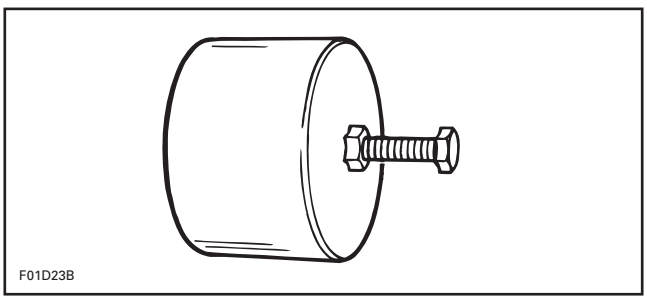


1. Removing snap ring

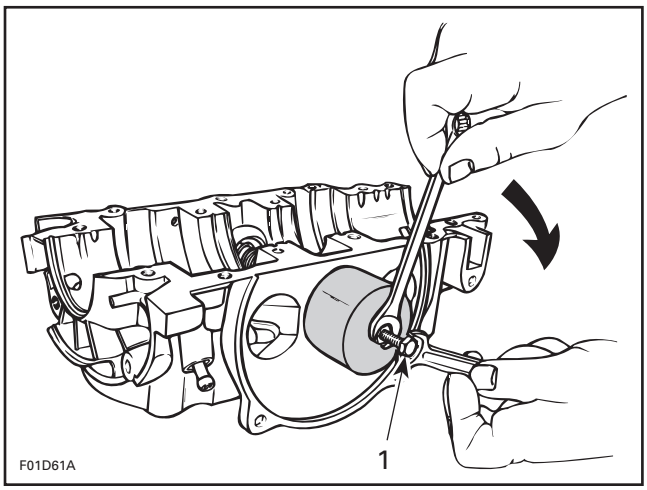
▼ CAUTION

Bottom end must be opened to remove rotary valve shaft.

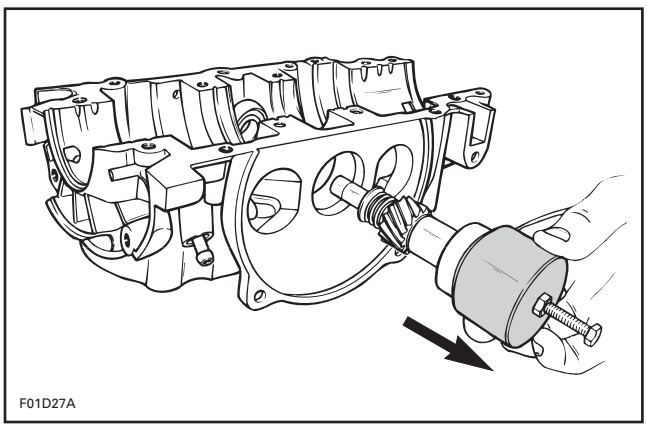
To remove rotary valve shaft, use the appropriate puller (P/N 290 876 488).



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.

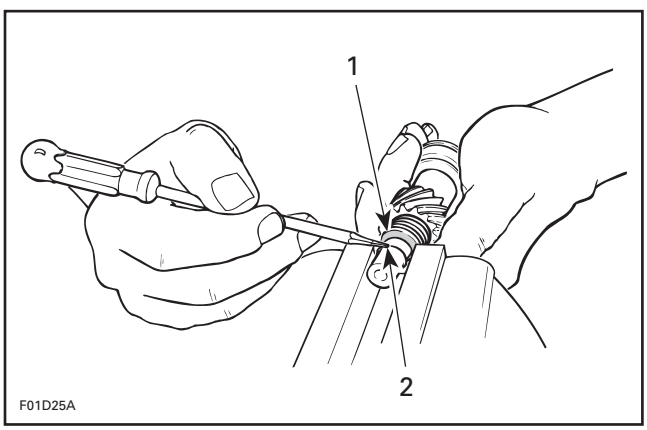


1. Hold bolt



5,6, Circlip and Spring Seat

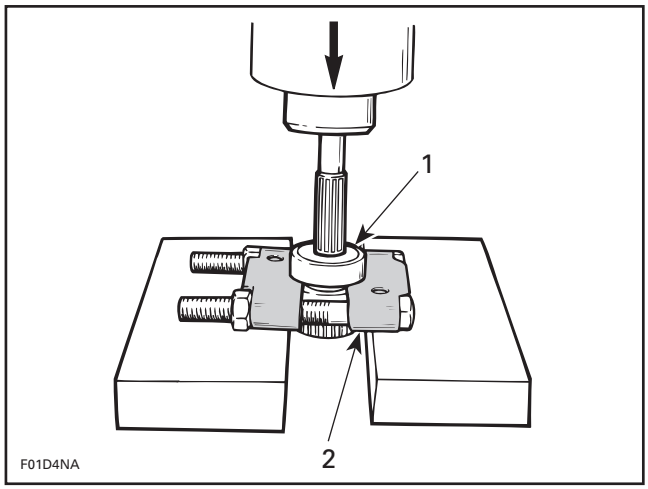
If it is necessary to disassemble components of rotary valve shaft assembly, use seat to compress spring and remove circlips.



1. Compress seat
2. Remove circlips

8, Bearing

To remove bearing use a bearing extractor such as Snap-on no CJ-950 as illustrated. Slide off distance sleeve, remove snap ring **no. 7** and press shaft out.



1. Bearing
2. Bearing extractor Snap-on CJ-950

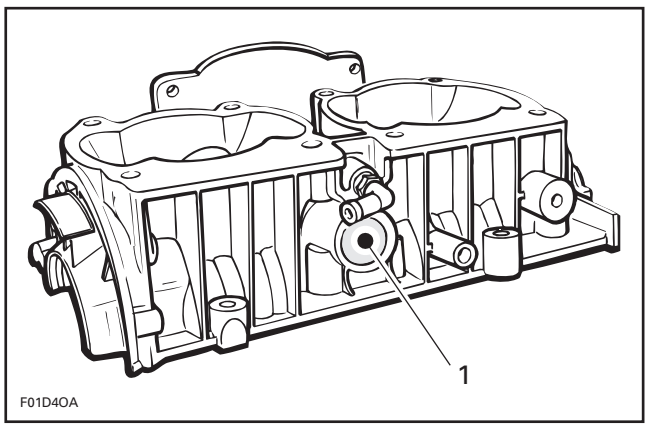
▼ CAUTION

Ensure that rotary valve shaft is perfectly perpendicular with press tip.

9, Bearing

▼ CAUTION

Do not remove plug against bearing in upper crankcase half.

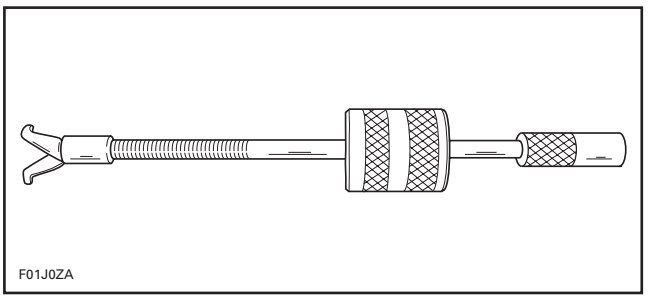


1. Do not remove this plug

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

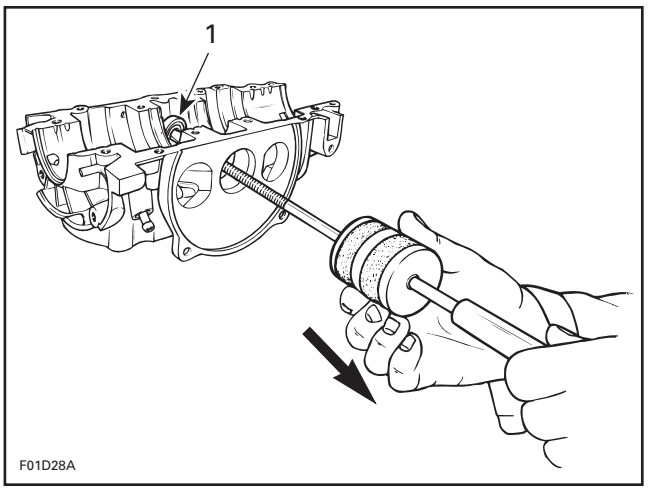
Snap-on hammer puller including:

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.



1. End bearing

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 **no. 14**.

INSPECTION

1, Rotary Valve Cover

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.

8,9, Bearing

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.

10, Gear

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.

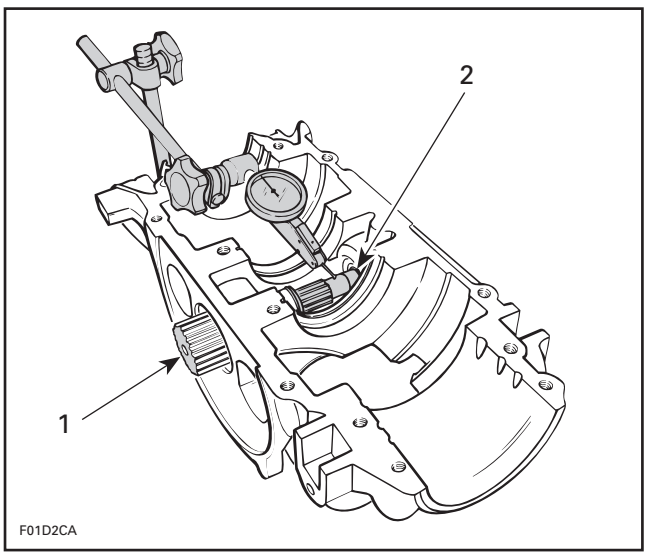
Check for presence of brass filings in gear housing.

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 next to gear splines.



1. Rotary valve shaft
2. End bearing in place

Deflection must not exceed 0.08 mm (.003 in). Replace shaft as necessary.

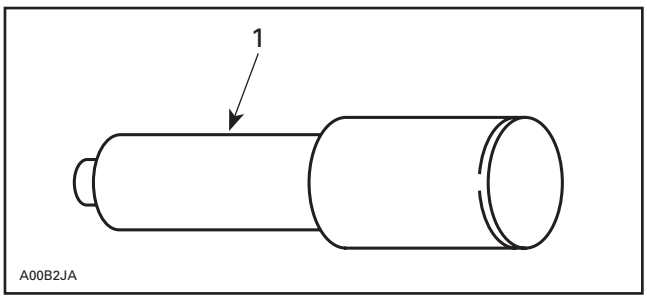
ASSEMBLY

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

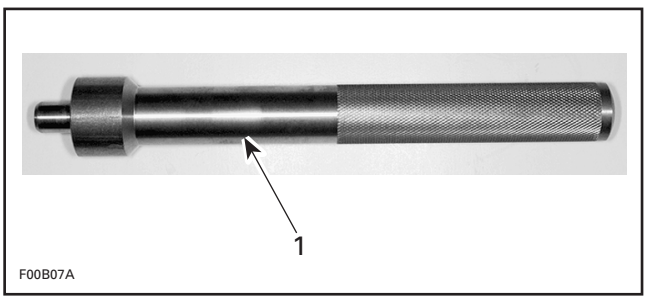
9, Bearing

To install end bearing in crankcase, use the appropriate pusher according to the engine.

ENGINE	PUSHER
717	P/N 290 876 500
787	P/N 290 876 501

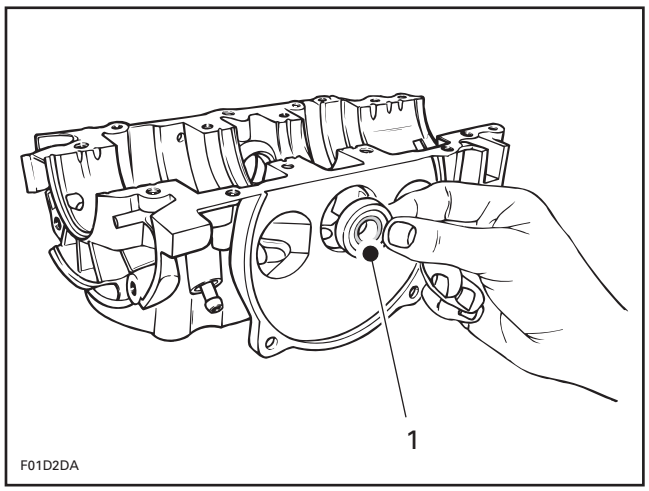


1. Pusher (P/N 290 876 500)



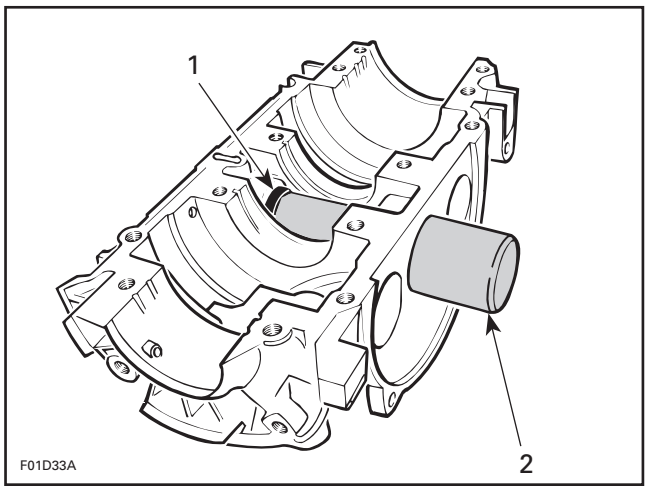
1. Pusher (P/N 290 876 501)

Position ball bearing shielded side towards rotary valve.



1. Shield side (toward gear)

Push bearing until it stops on its seat.



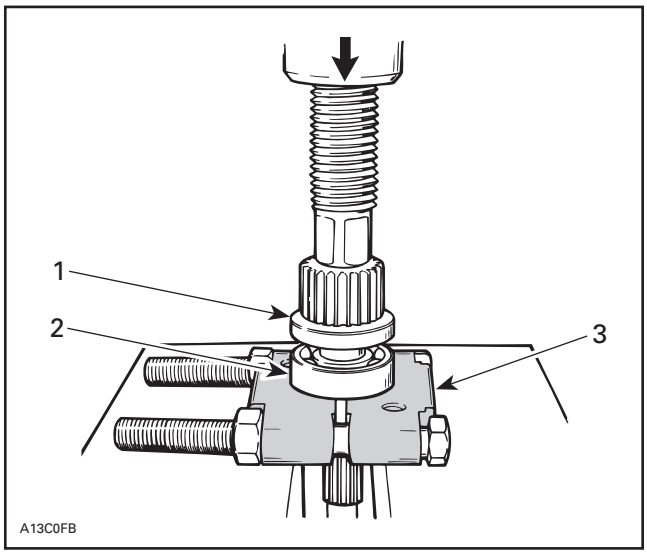
1. Bearing
2. Pusher

11, Seal

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

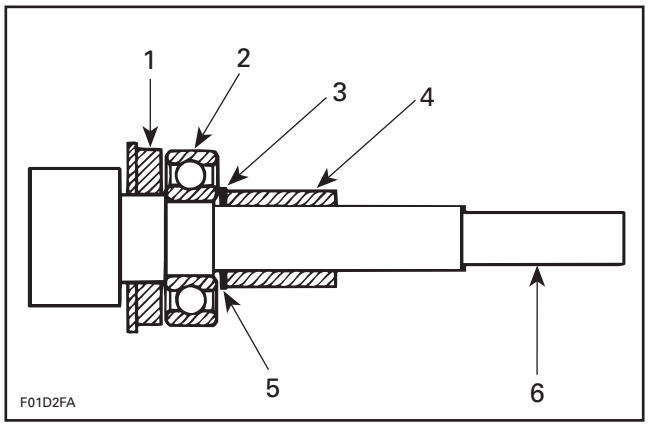
8, Bearing

Install ball bearing as illustrated.



1. Seal
2. Ball bearing
3. Bearing extractor Snap-on CJ-950

Install shim **no. 15**, snap ring **no. 7** and slide distance sleeve **no. 14** on shaft.



1. Seal
2. Ball bearing
3. Snap ring
4. Distance sleeve
5. Shim 0.5 mm (.020 in)
6. Rotary valve shaft

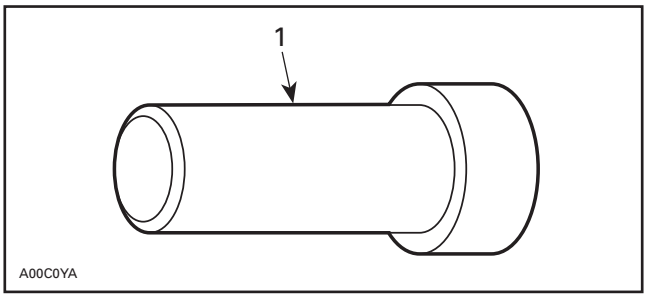
3, Rotary Valve Shaft Assembly

▼ CAUTION

Crankcase halves must be separated and crankshaft must not be present to install rotary valve shaft assembly in crankcase.

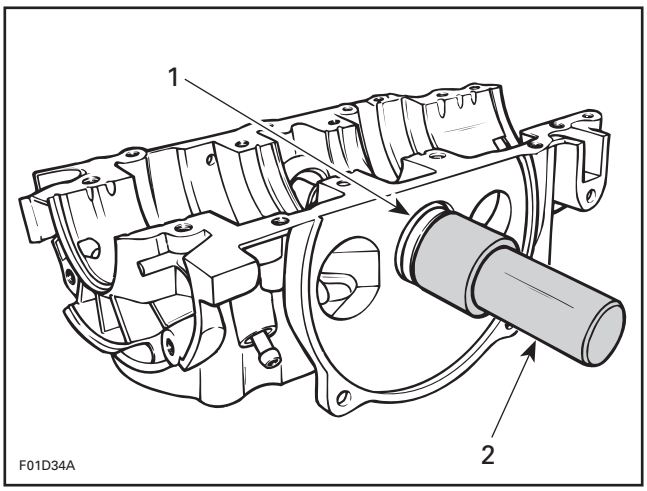
717 Engine

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



1. Pusher

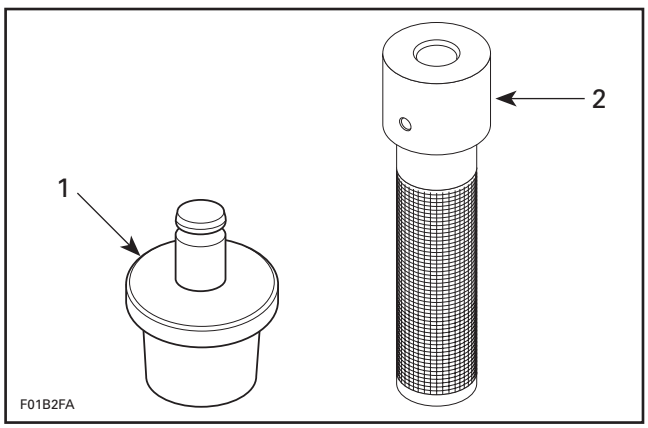
Push shaft until its stops on bearing seat.



1. Rotary valve shaft
2. Push shaft until it stops

787 Engine

To install rotary valve shaft in crankcase, use a pusher (P/N 290 876 609) and handle (P/N 290 877 650).



1. Pusher
2. Handle

Push shaft until it stops on bearing seat.

717 and 787 Engines

4, Snap Ring

Position snap ring so that its sharp edge faces outwards.

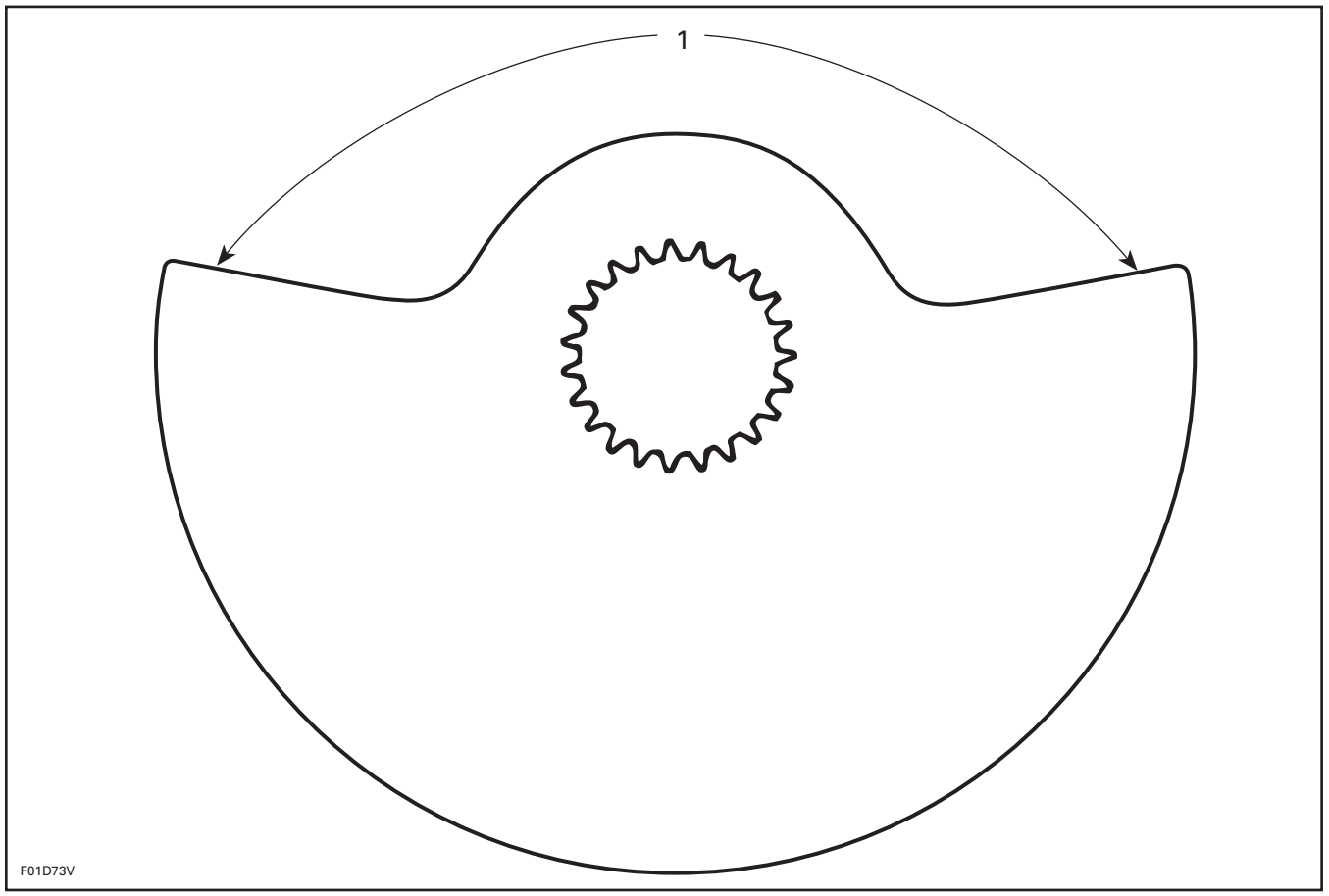
13, Rotary Valve

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

ENGINE	ROTARY VALVE P/N	VALVE DURATION
717/787	290 924 502	159°

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



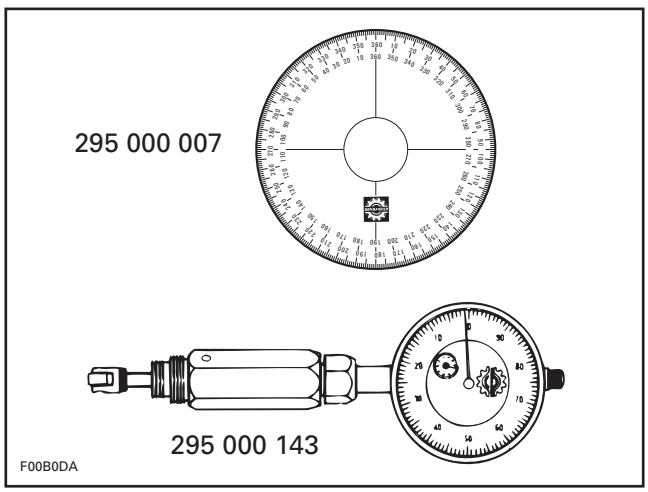
1. 159°

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:

ENGINE	TIMING	
	OPENING BTDC	CLOSING ATDC
717	147° ± 5	65.5° ± 5
787	147° ± 5	63.5° ± 5

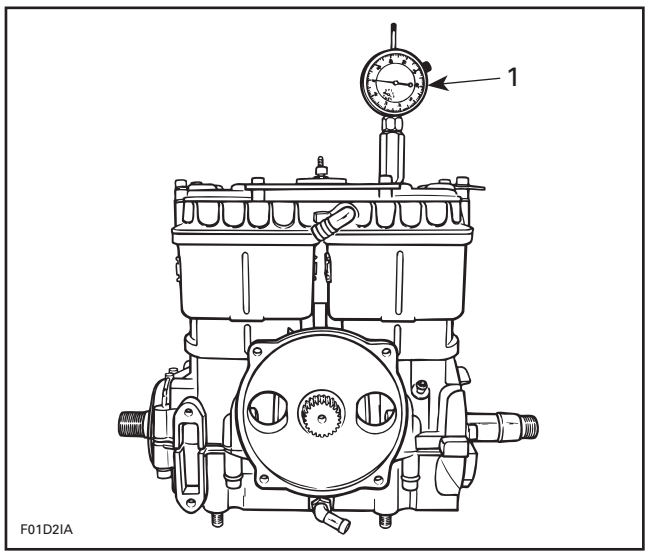
For the following instructions, let's use these specifications as example:

OPENING: 147° BTDC

CLOSING: 65° ATDC

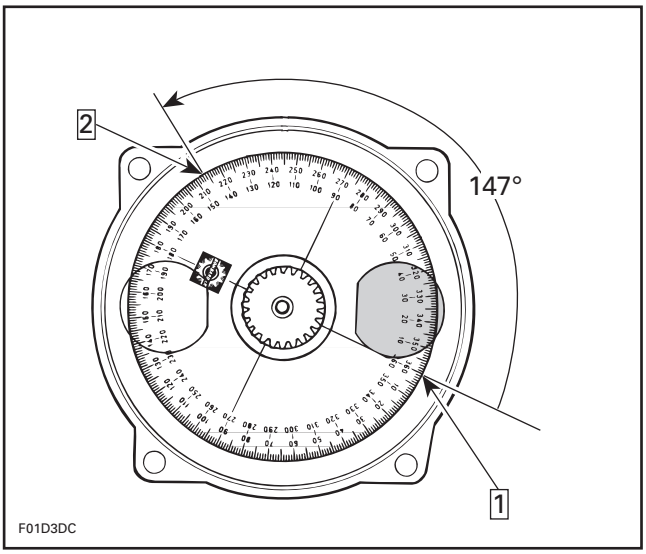
Proceed as follows:

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



1. Bring piston to TDC

– For **opening** mark, first align 360° line of degree wheel with BOTTOM of **MAG side** inlet port. Then, find 147° line on degree wheel and mark crankcase at this point.

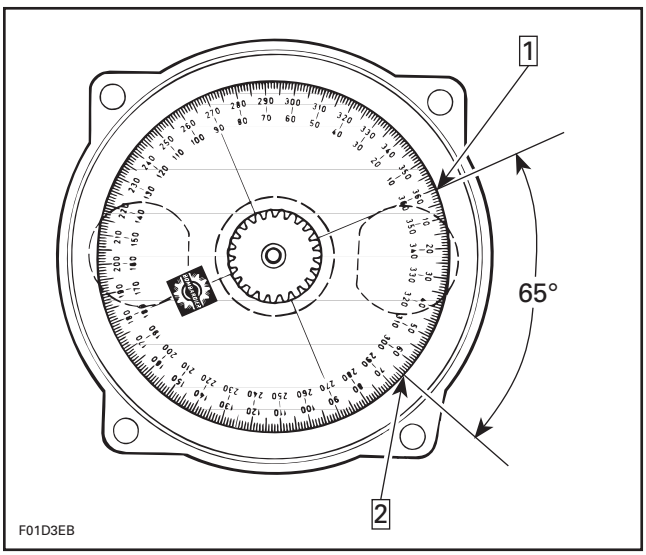


OPENING MARK

Step 1 : Bottom of MAG inlet port.
Align 360° line of degree wheel
Step 2 : Find 147° on degree wheel and mark here

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.



CLOSING MARK

Step 1 : Top of MAG inlet port.
Align 360° line of degree wheel
Step 2 : Find 65° on degree wheel and mark here

– 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 BOMBARDIER-ROTAX injection oil on rotary valve before reassembling rotary valve cover.

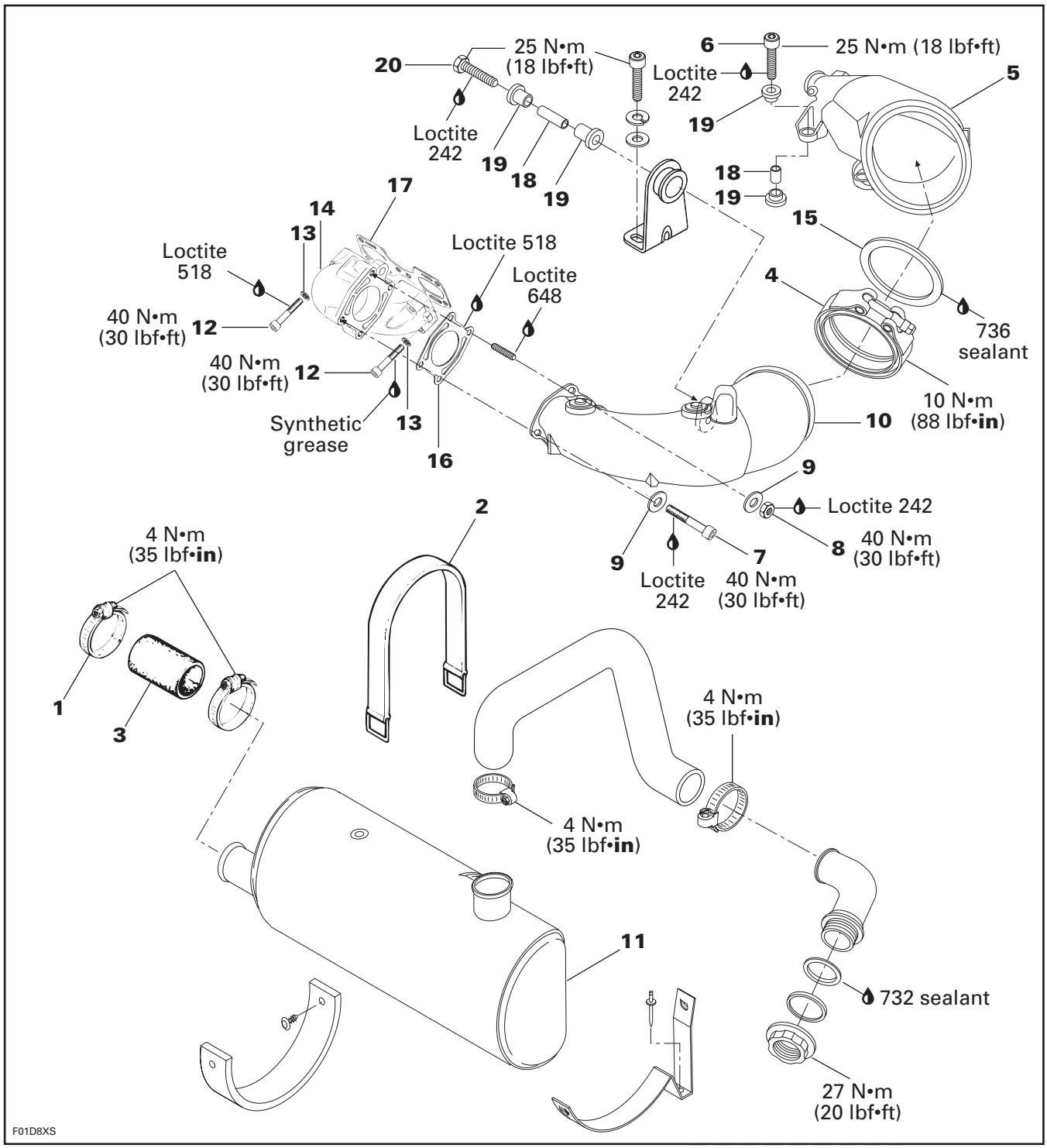
– Remove TDC gauge.

1, Rotary Valve Cover

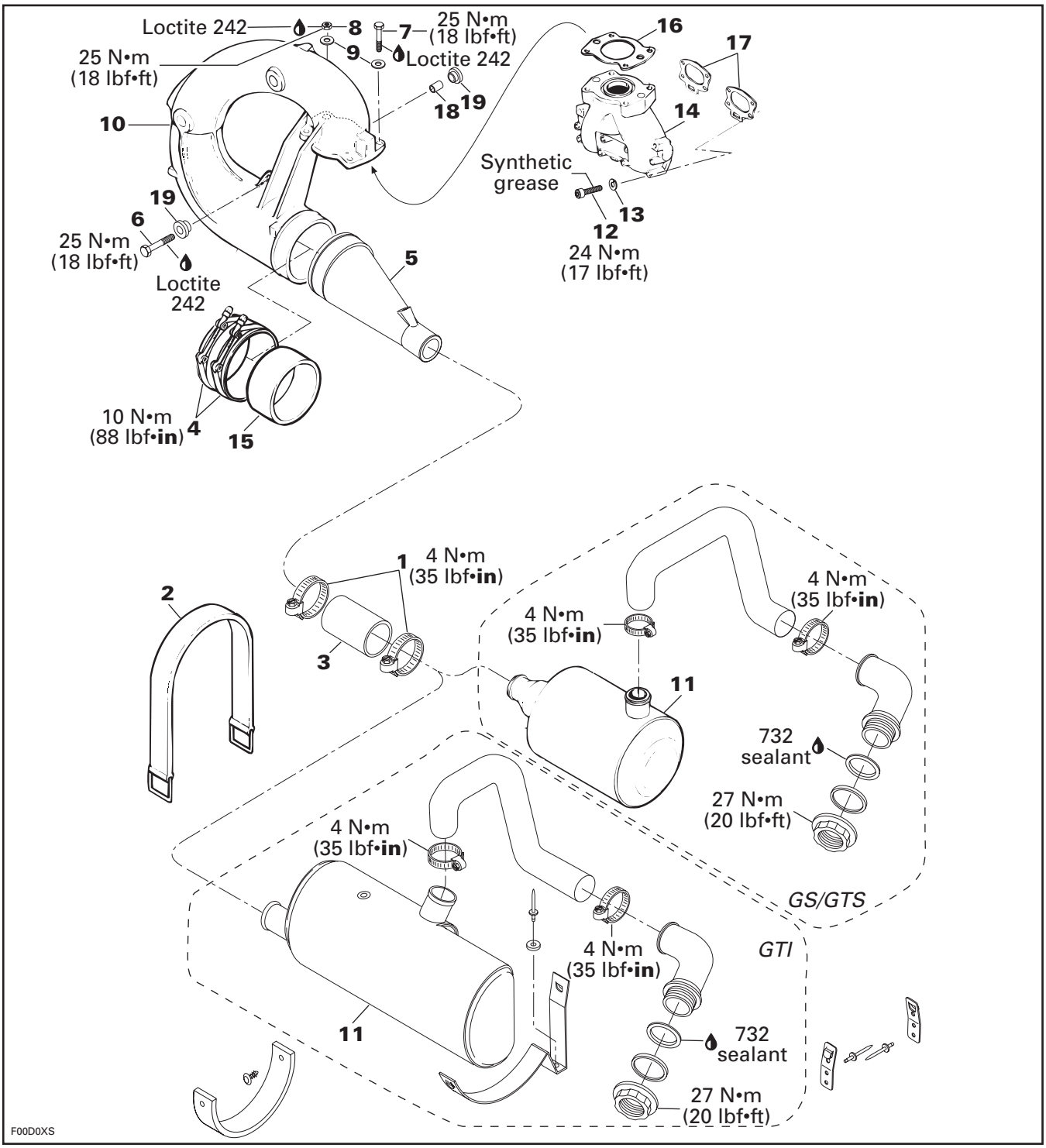
Install O-ring **no. 12** and cover then torque screws **no. 2** to 20 N•m (15 lbf•ft) in a criss-cross sequence.

EXHAUST SYSTEM

SPX Model

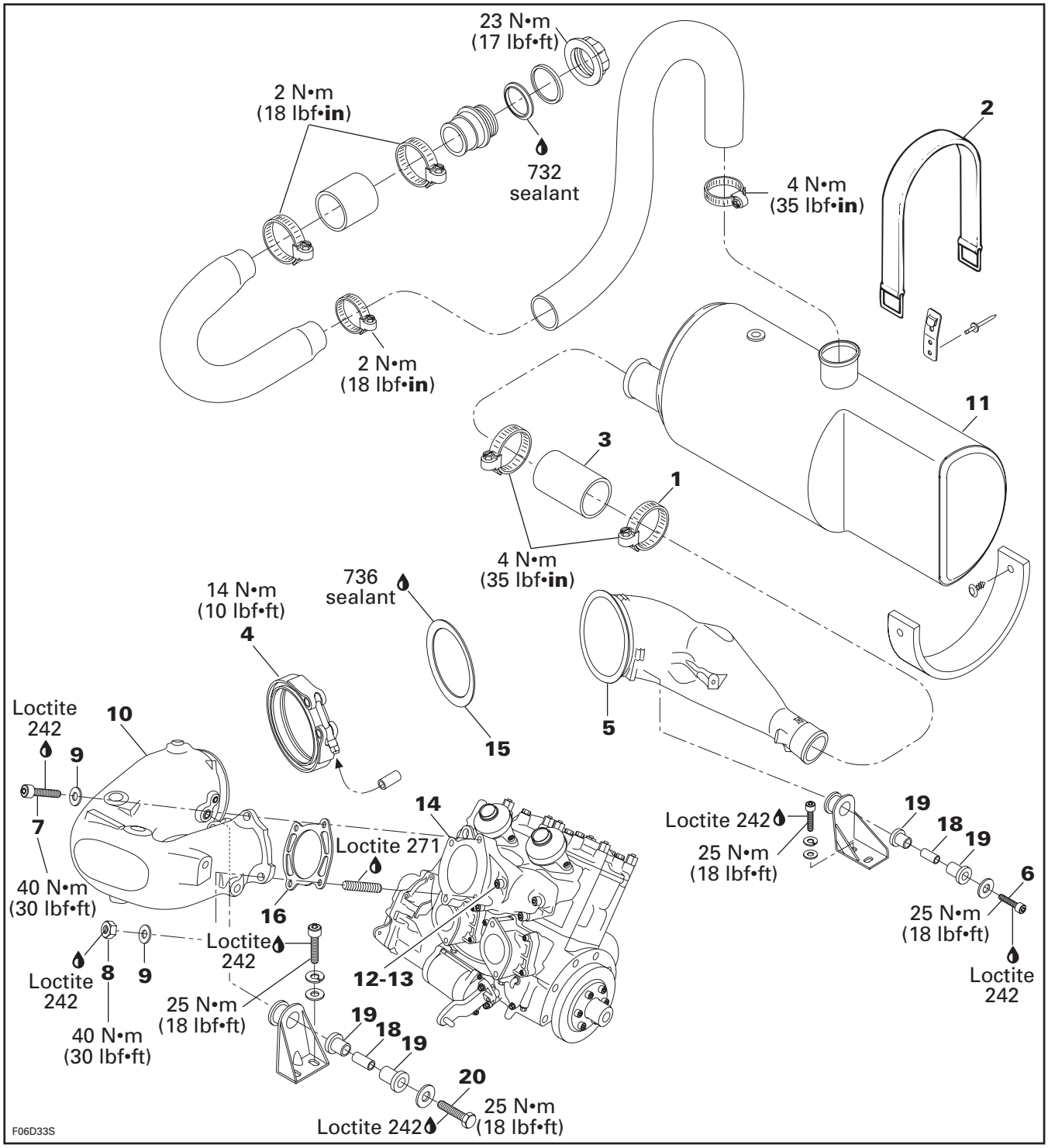


GS, GTS and GTI Models



PARTS FLAT RATE

GSX Limited, XP Limited and GTX Limited



REMOVAL

Tuned Pipe

SPX, GS and GSX Limited

Remove seat.

Remove air vent tube support from body opening.

XP Limited

Open engine cover.

Remove storage basket.

GTS, GTI and GTX Limited

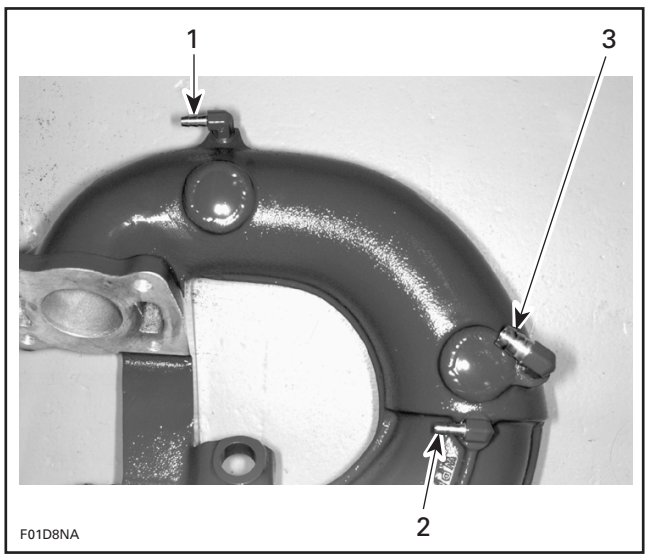
Remove seat(s).

Remove seat support (GTI and GTX Limited).

GS, GTS and GTI Models

Disconnect water supply hose and water injection hose.

Disconnect tuned pipe bleed hose.



TYPICAL

1. *Bleed hose removed*
2. *Injection hose removed*
3. *Supply hose removed*

Loosen exhaust hose collar **no. 1** at tuned pipe outlet.

Disconnect strap **no. 2** retaining muffler **no. 11**.

Remove exhaust hose **no. 3** from tuned pipe by pulling muffler.

Remove clamp **no. 4** from tuned pipe.

Remove tuned pipe cone **no. 5**.

Remove tuned pipe retaining screw **no. 6** from exhaust manifold side.

Remove screws **no. 7**, nut **no. 8** and flat washers **no. 9** from tuned pipe flange.

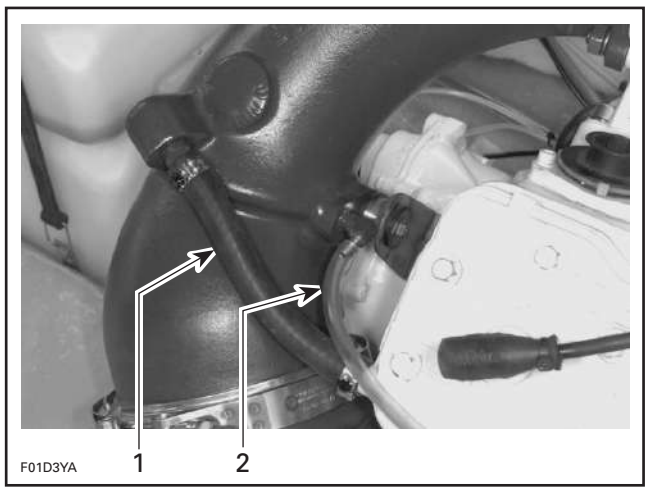
NOTE: Slightly lift tuned pipe to release nut as necessary. Take care not drop nut and flat washer.

Withdraw tuned pipe head **no. 10** in a forward and rotating movement.

SPX Model

Remove electrical box from watercraft.

Disconnect water supply hose and water injection hose at tuned pipe head.

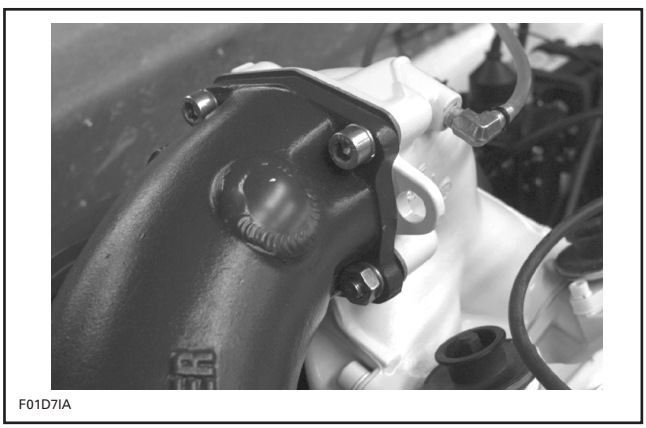


1. *Water supply hose*
2. *Water injection hose*

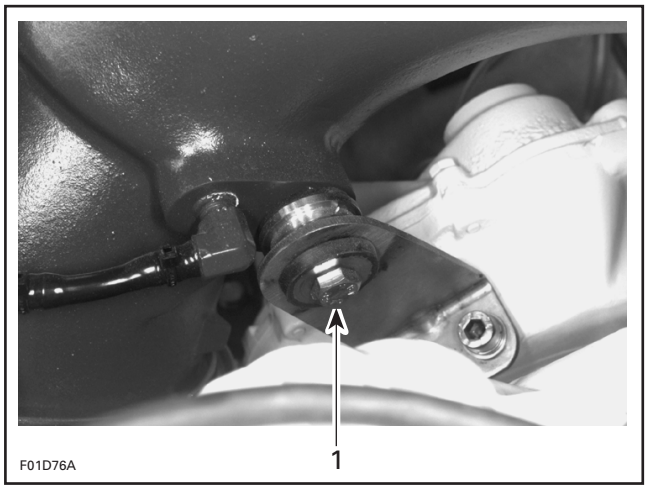
Loosen exhaust hose collar **no. 1** at tuned pipe cone outlet.

Remove clamp **no. 4** securing tuned pipe cone to tuned pipe head.

Remove screws **no. 7** and nut **no. 8** with flat washers **no. 9** at tuned pipe head flange.



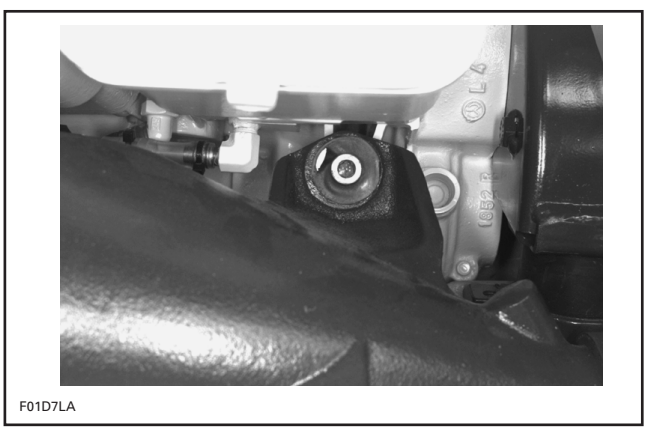
Remove retaining screw **no. 20** of tuned pipe head.



1. Screw

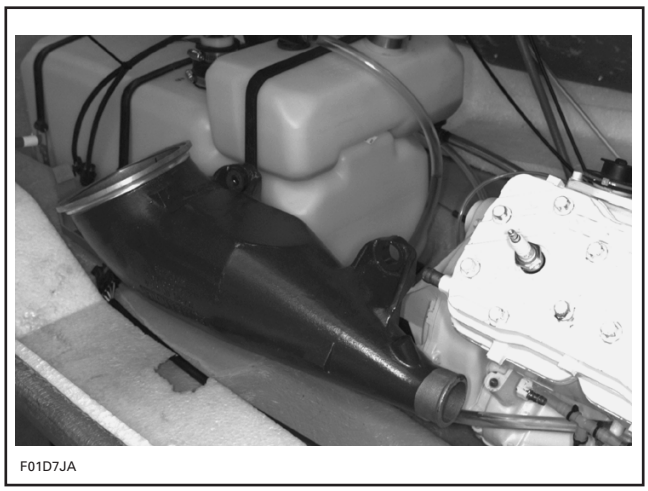
Remove tuned pipe head **no. 10**.

Remove both screws **no. 6** retaining tuned pipe cone to engine.



Remove exhaust hose **no. 3** from tuned pipe cone **no. 5**.

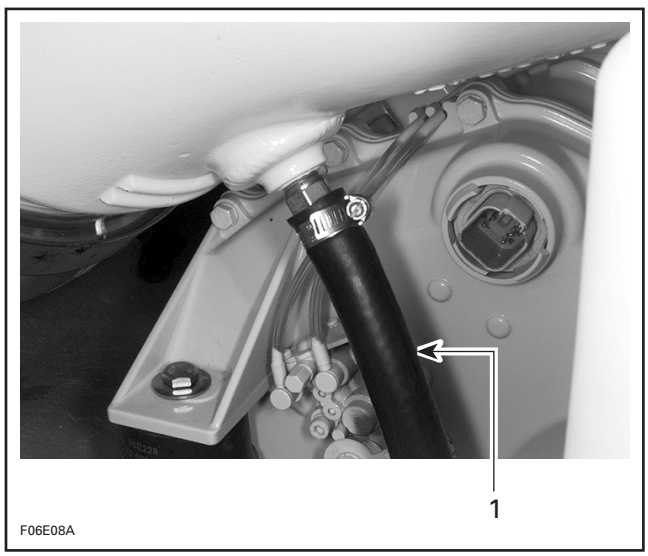
Move tuned pipe cone **no. 5** in front of bilge between body and fuel tank.



Open storage cover and remove basket. Then, pull out tuned pipe cone **no. 5** through storage compartment opening.

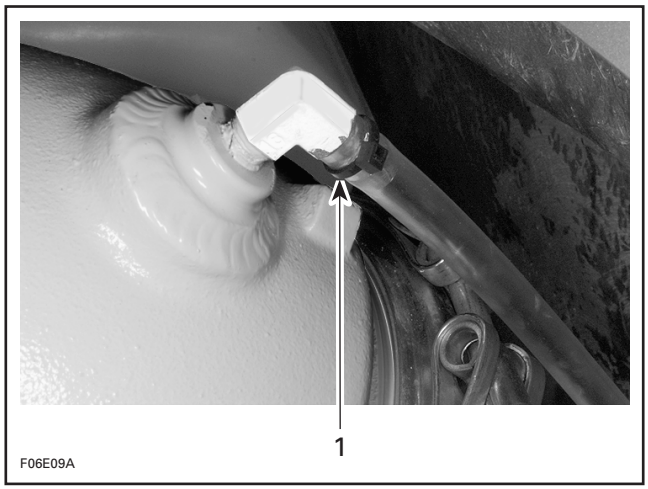
GSX Limited, XP Limited and GTX Limited

Disconnect water supply hose at tuned pipe head **no. 10**.



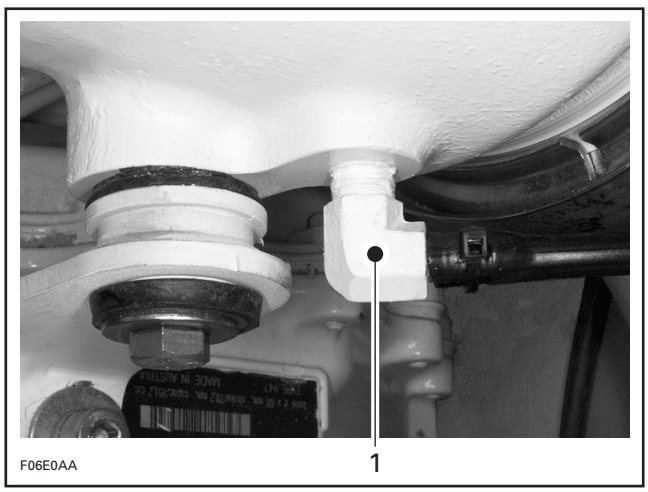
1. Water supply hose

Disconnect at the tuned pipe head **no. 10** the water supply hose of the water flow regulator valve.



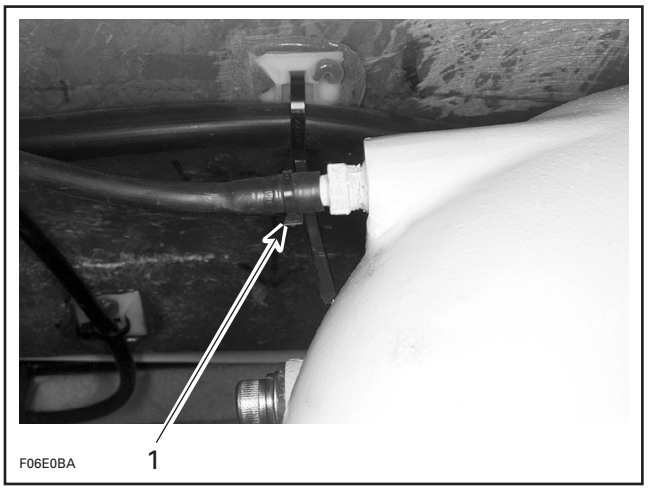
1. Water supply hose for the regulator valve

Disconnect the water injection hose at tuned pipe head **no. 10**.



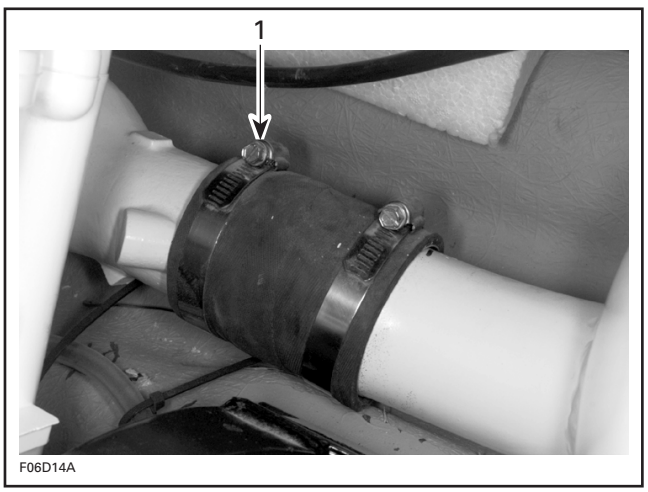
1. Water injection hose

Disconnect the water bleed hose.



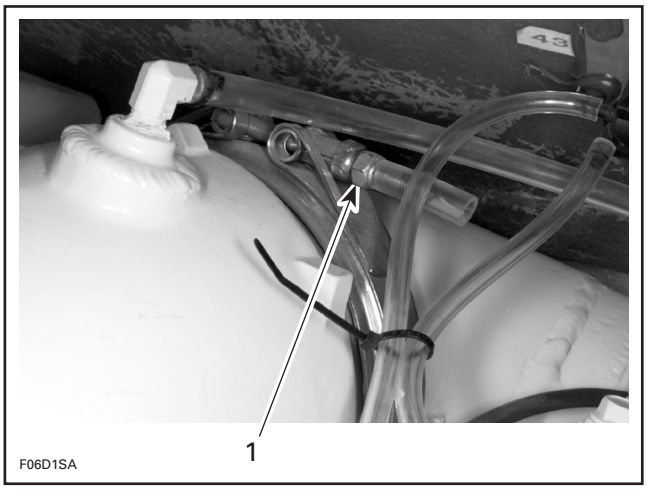
1. Water bleed hose

Loosen clamp **no. 1** retaining exhaust hose **no. 3** to tuned pipe cone **no. 5**.



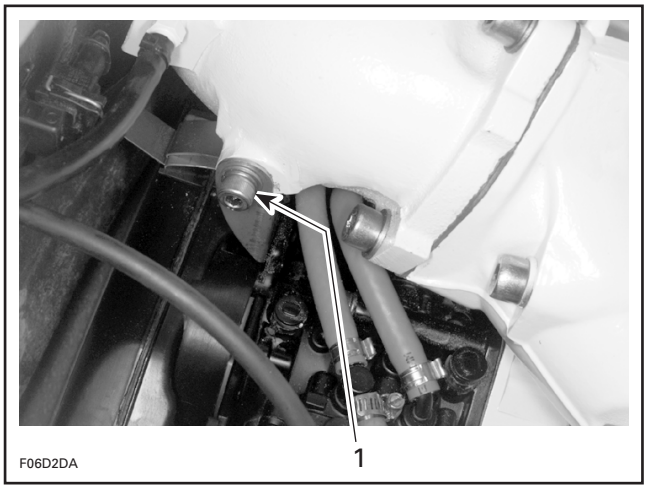
1. Loosen clamp

Loosen and remove clamp **no. 4** retaining tuned pipe head **no. 10** to tuned pipe cone **no. 5**.



1. Loosen and remove clamp

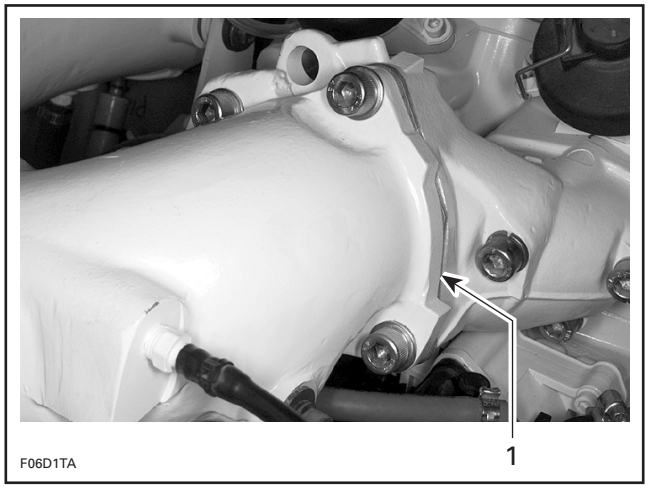
Loosen Allen screw of carburetor bracket.



1. Loosen Allen screw

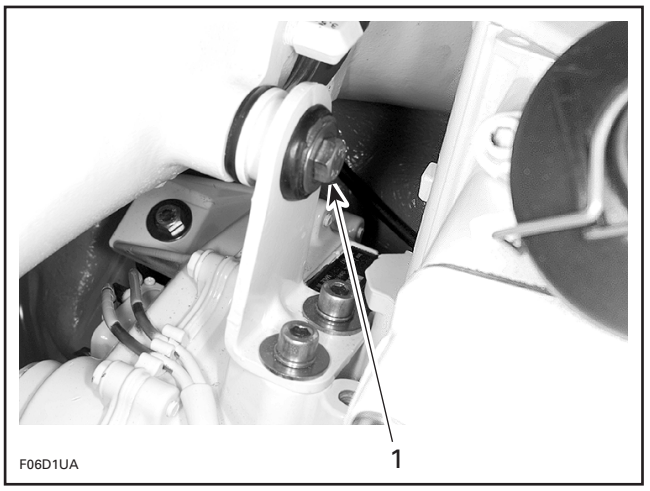
Loosen Allen screws **no. 7** and nut **no. 8** at tuned pipe flange.

NOTE: To loosen nut, use polygonal key (P/N 529 035 505).



1. Tuned pipe flange

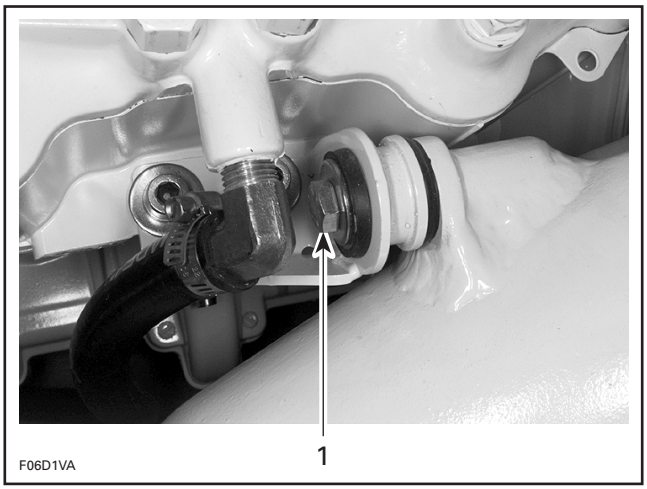
Loosen bolt **no. 20** of tuned pipe head above the engine magneto.



1. Remove bolt

Remove tuned pipe head **no. 10**.

Loosen bolt **no. 6** of tuned pipe cone beside the engine water return hose.



1. Loosen bolt

Remove tuned pipe cone **no. 5**.

Exhaust Manifold

SPX Model

Remove air intake silencer and carburetors. Refer to AIR INTAKE 06-03 and CARBURETOR 06-04 for proper procedures.

All Models

Remove 8 Allen screws **no. 12** and lock washers **no. 13** then withdraw exhaust manifold.

Muffler

Disconnect hoses from muffler **no. 11**.

Disconnect hoses of the water flow regulator valve (except 717 engine).

Disconnect retaining strap **no. 2** of muffler.

Pull muffler **no. 11** out of bilge.

NOTE: On the GSX Limited and the XP Limited, remove the VTS motor. Refer to VARIABLE TRIM SYSTEM 09-05.

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 a 5.55 mm (3/32 in) aluminum welding rod (no. 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.

INSTALLATION

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

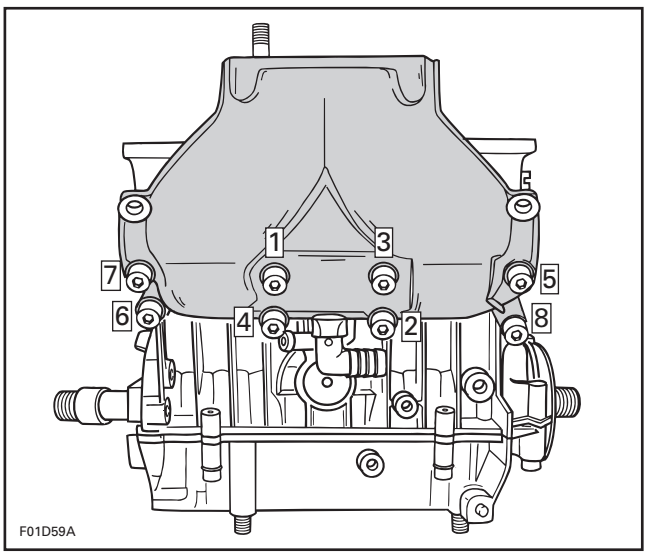
Exhaust Manifold

Make sure gasket(s) **no. 17** are properly positioned prior to finalizing manifold installation.

717 Engine

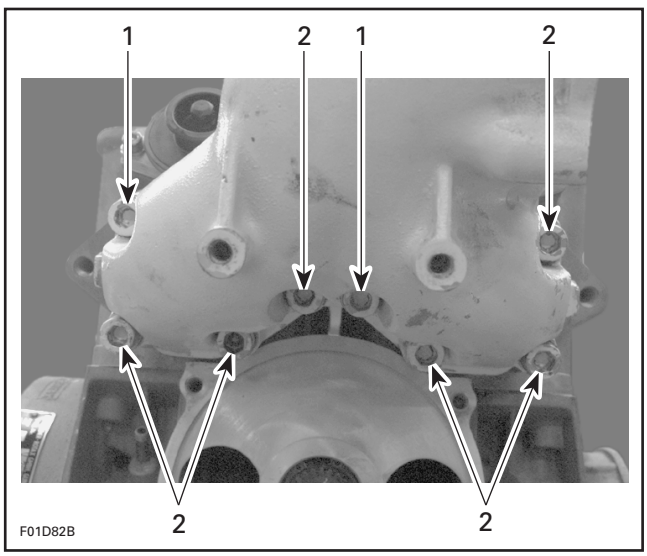
Apply synthetic grease on threads of screws no. 12.

Install exhaust manifold no. 14 and torque screws no. 12 to 24 N•m (17 lbf•ft) as per following illustrated sequence.



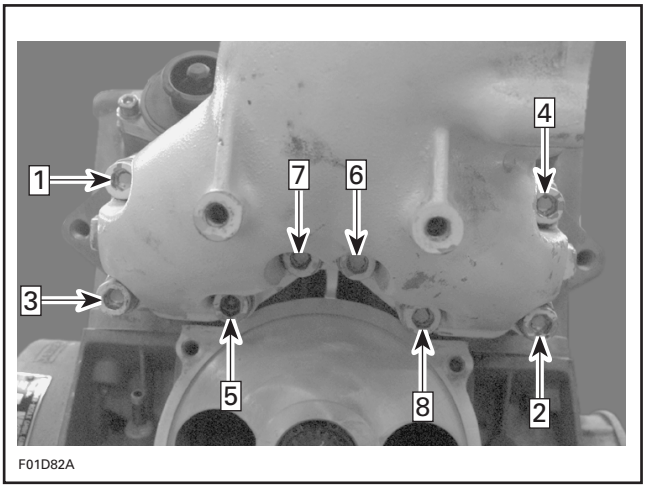
787 Engine

Apply Loctite 518 on 2 screws no. 12. On the other screws no. 12, apply synthetic grease on threads. Install screws. Refer to the following illustration for proper position of screws.



1. Screw with Loctite 518
2. Screw with synthetic grease

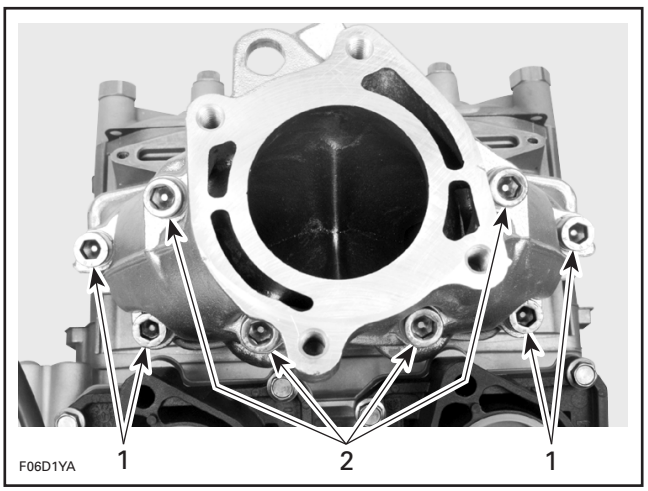
Torque exhaust manifold screws to 24 N•m (17 lbf•ft) as per following illustrated sequence. Repeat the procedure, retightening screws to 40 N•m (30 lbf•ft).



947 Engine

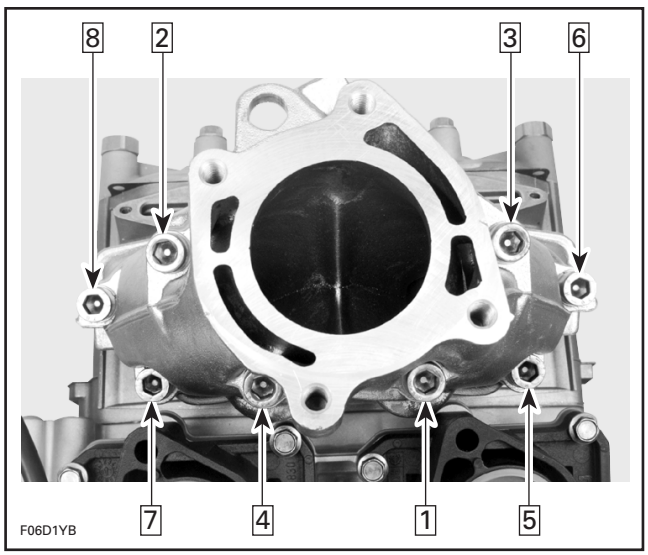
Apply synthetic grease on threads of Allen screws no. 12.

Install and hand tighten Allen screws no. 12 as per following picture.



1. M10 x 60 Allen screws
2. M10 x 110 Allen screws

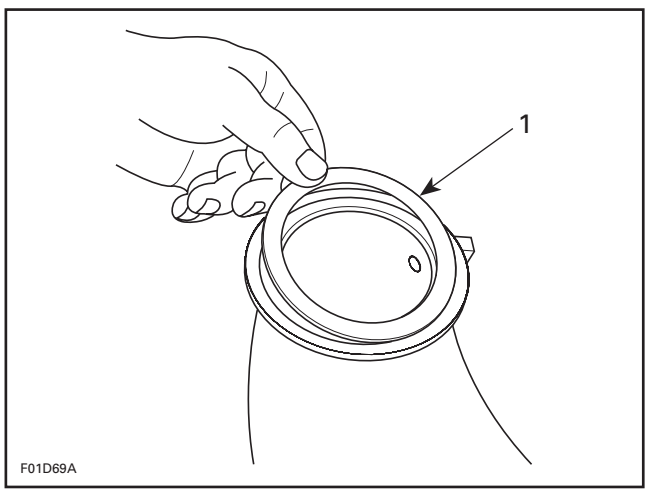
Torque Allen screws to 24 N•m (17 lbf•ft) as per following illustrated sequence. Repeat the procedure, retightening Allen screws to 40 N•m (30 lbf•ft).



Tuned Pipe

787 and 947 Engines

Make sure to install the sealing ring **no. 15** on tuned pipe cone if it was removed.



TYPICAL
1. Sealing ring

Apply a thin layer of heat resistant 736 sealant (P/N 413 709 200) all around sealing ring **no. 15**.

All Models

Ensure rubber bushings **no. 19** and sleeve **no. 18** 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.

Make sure that gasket **no. 16** is properly located on exhaust manifold prior to finalizing pipe installation.

Apply Loctite 242 (blue) on nut **no. 8** and screws **no. 6** and **no. 7**.

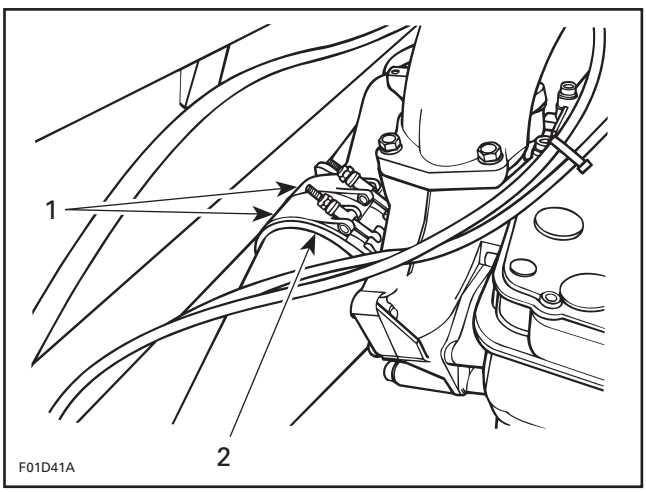
Hand tighten all fasteners before torquing any of them.

For torquing specifications, see the main illustrations at the beginning of this subsection.

717 Engine

Install tuned pipe cone **no. 5** with collar **no. 15** and clamp **no. 4**.

Position clamp **no. 4** as illustrated. Do not tighten clamp yet.



1. Clamp
2. Exhaust collar

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 **no. 5** until it touches tuned pipe, then tighten exhaust clamp **no. 4** and torque to 10 N•m (88 lbf•**in**).

CAUTION

There must be no gap between tuned pipe cone and tuned pipe head.

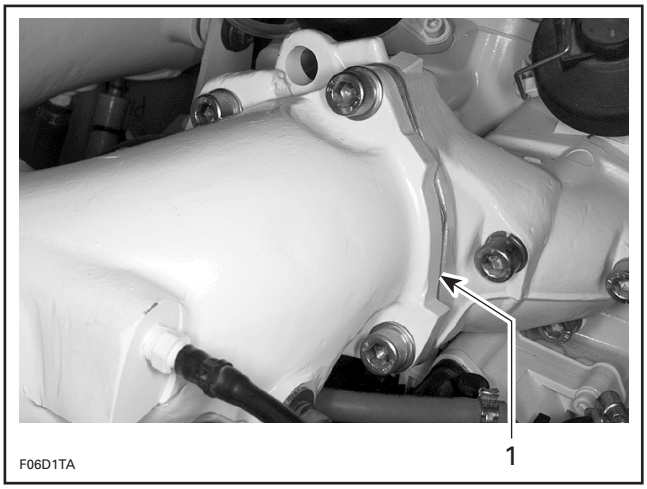
NOTE: Exhaust clamp nuts should be tightened alternately to assure no leakage and to obtain specified torque.

947 Engine

Torquing Sequence

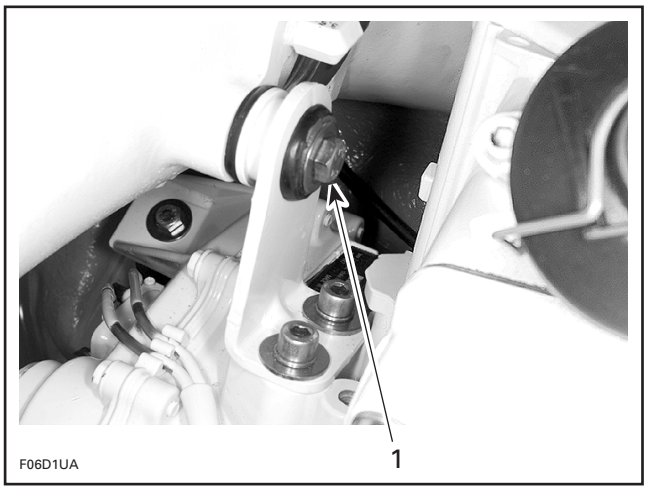
Torque Allen screws **no. 7** at tuned pipe head flange to 25 N•m (18 lbf•ft).

NOTE: Torque nut **no. 8** only to 18 N•m (13 lbf•ft) using the polygonal key (P/N 529 035 505).



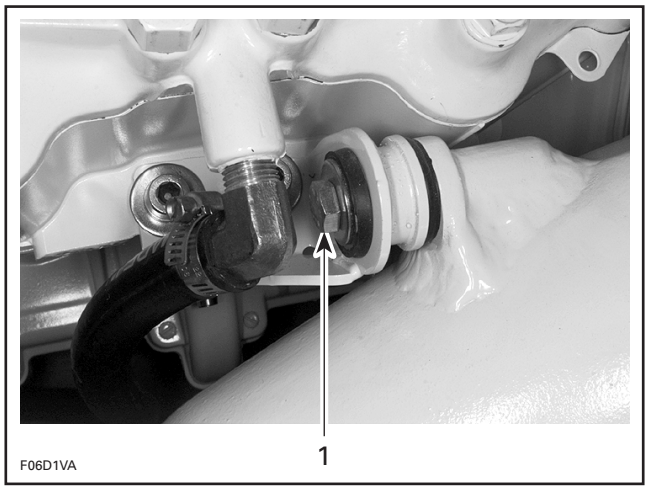
1. Torque Allen screws and nut to 25 N•m (18 lbf•ft)

Torque bolt of tuned pipe head above the engine magneto to 25 N•m (18 lbf•ft).



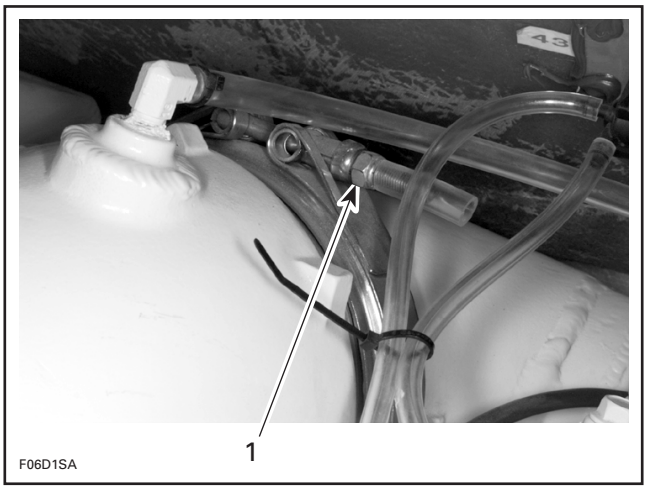
1. Torque bolt to 25 N•m (18 lbf•ft)

Torque bolt of tuned pipe cone beside the engine water return hose to 25 N•m (18 lbf•ft).



1. Torque bolt to 25 N•m (18 lbf•ft)

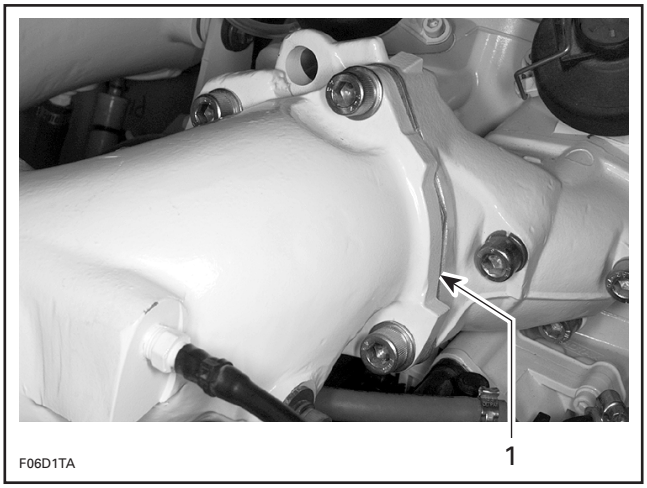
Torque clamp of tuned pipe head to 14 N•m (10 lbf•ft).



1. Torque clamp to 14 N•m (10 lbf•ft)

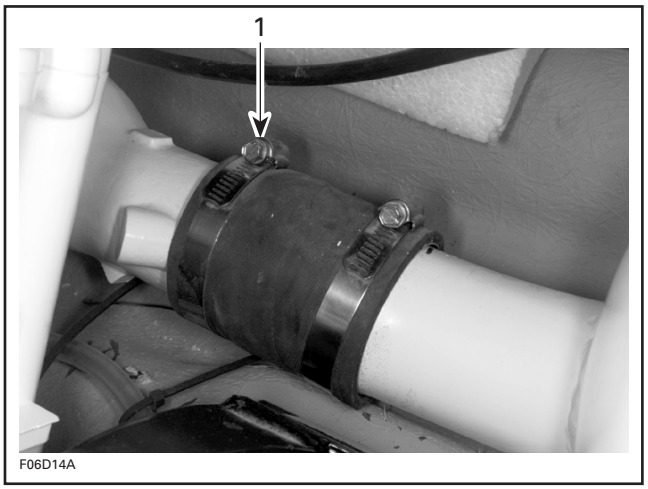
As a final step, torque Allen screws at tuned pipe head flange to 40 N•m (30 lbf•ft).

NOTE: Torque nut only to 28 N•m (21 lbf•ft) using the polygonal key (P/N 529 035 505). The nut will be at the same torque as the screws.



1. Torque Allen screws and nut to 40 N•m (30 lbf•ft)

Torque exhaust hose clamp **no. 1** of tuned pipe cone to 4 N•m (35 lbf•**in**).



*1. Torque clamp to 4 N•m (35 lbf•**in**)*

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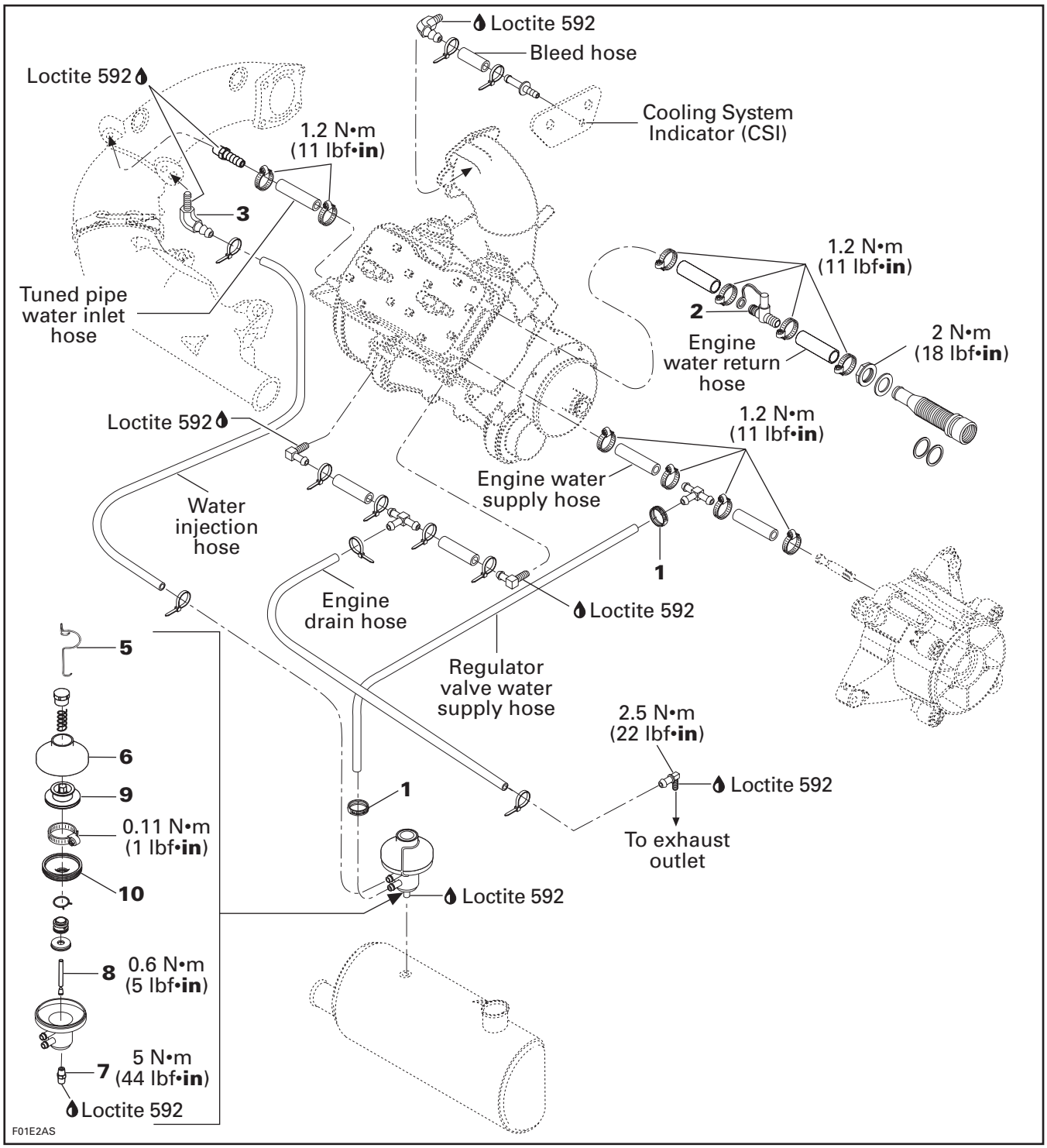
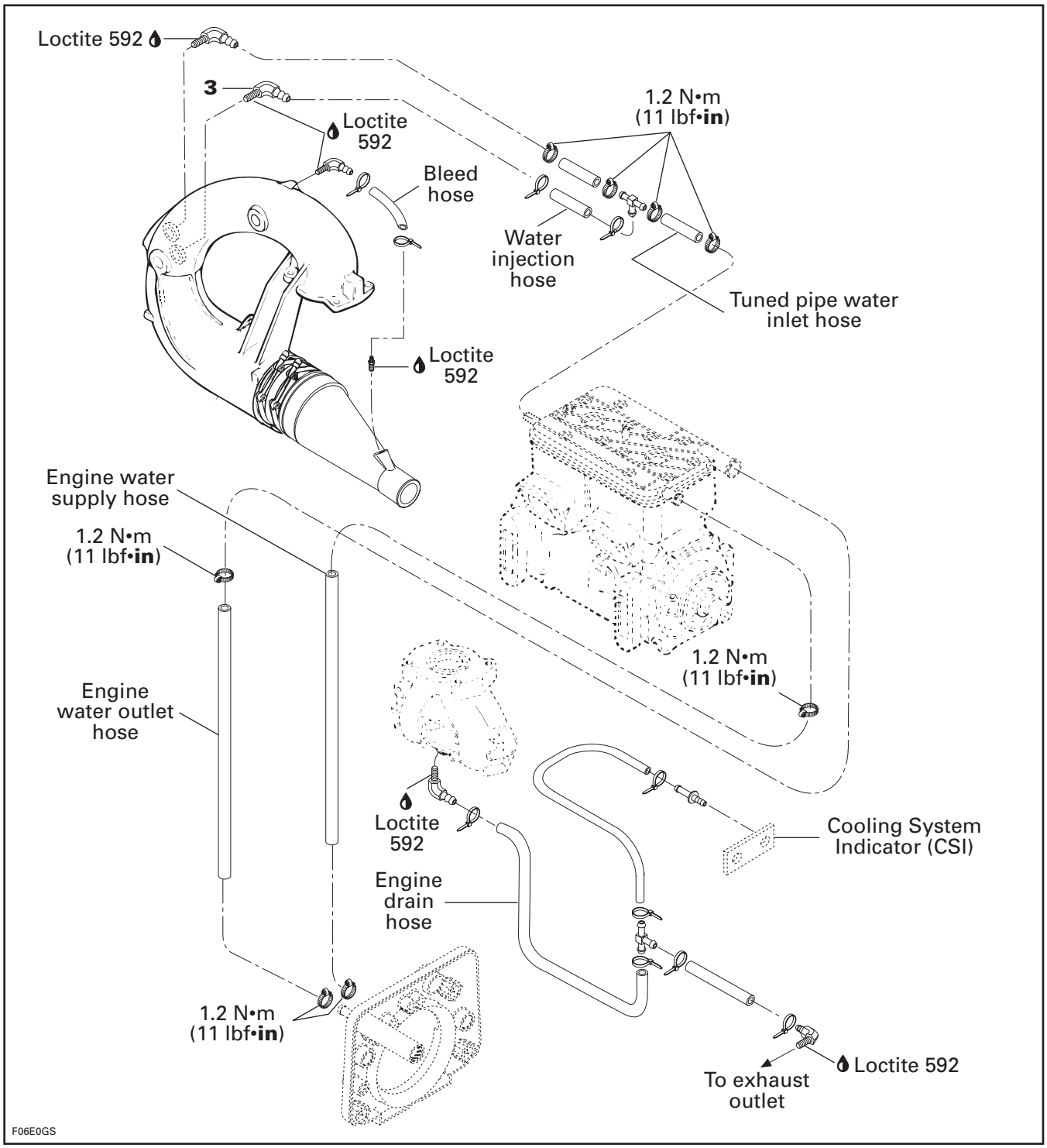
CIRCUIT, COMPONENTS AND CARE

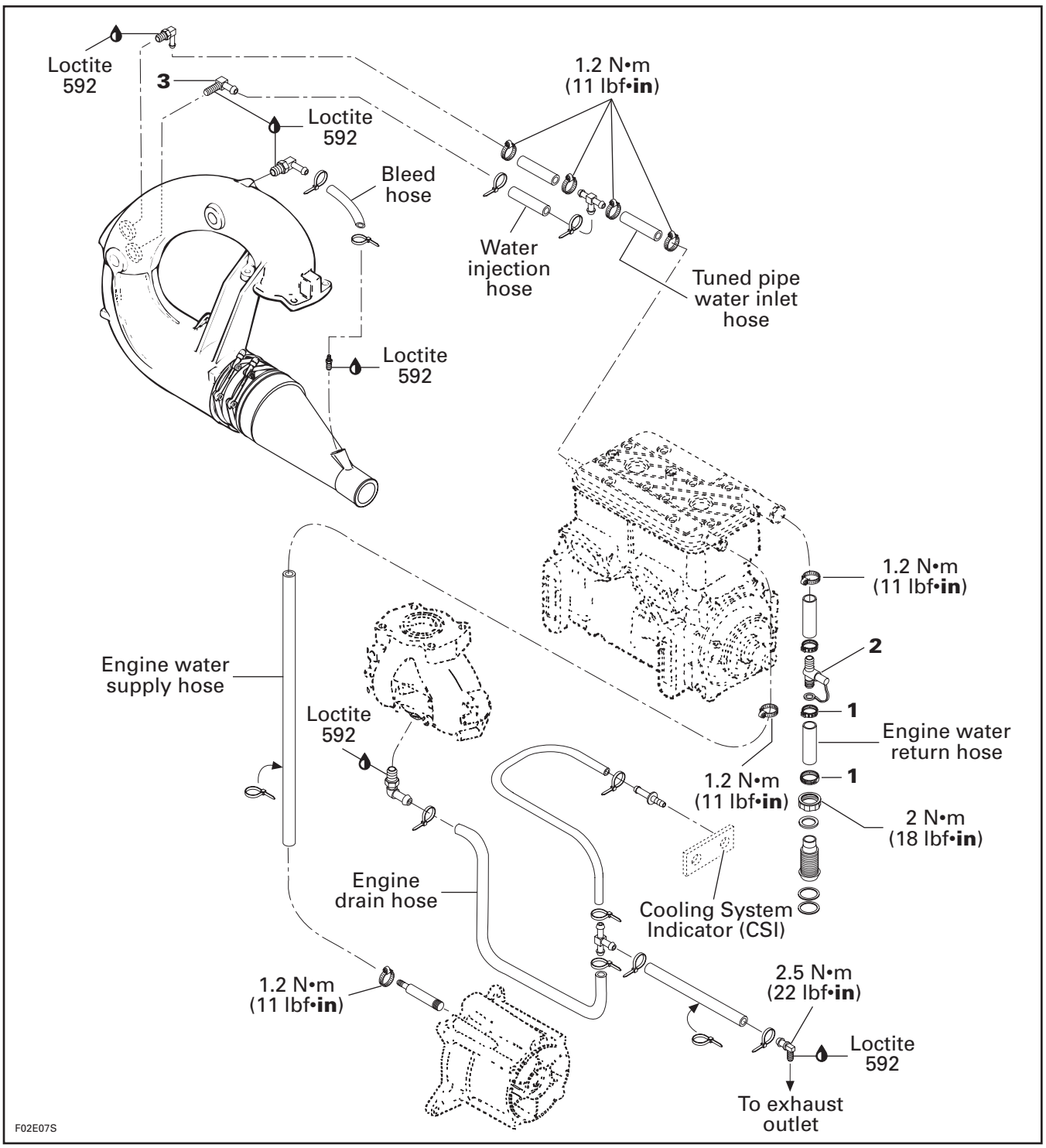
SPX Model



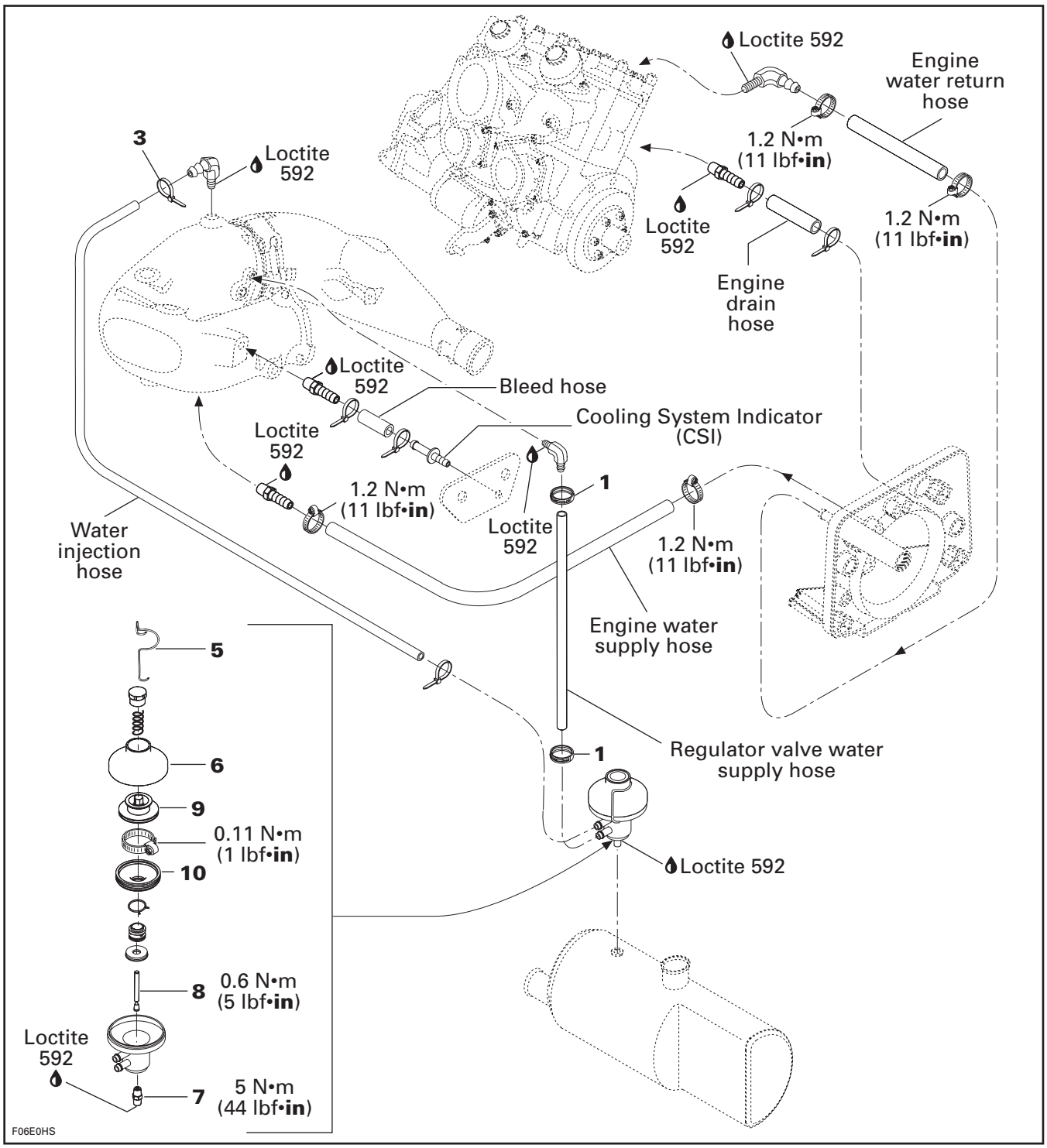
GS and GTI Models



GTS Model


Loctite 592
3
Loctite 592
Bleed hose
1.2 N•m (11 lbf•in)
Water injection hose
Tuned pipe water inlet hose
Loctite 592
1.2 N•m (11 lbf•in)
2
1
Engine water return hose
1
1.2 N•m (11 lbf•in)
2 N•m (18 lbf•in)
Engine water supply hose
Loctite 592
Engine drain hose
Cooling System Indicator (CSI)
1.2 N•m (11 lbf•in)
2.5 N•m (22 lbf•in)
Loctite 592
To exhaust outlet
F02E07S

GSX Limited, XP Limited and GTX Limited



CIRCUIT

▼ CAUTION

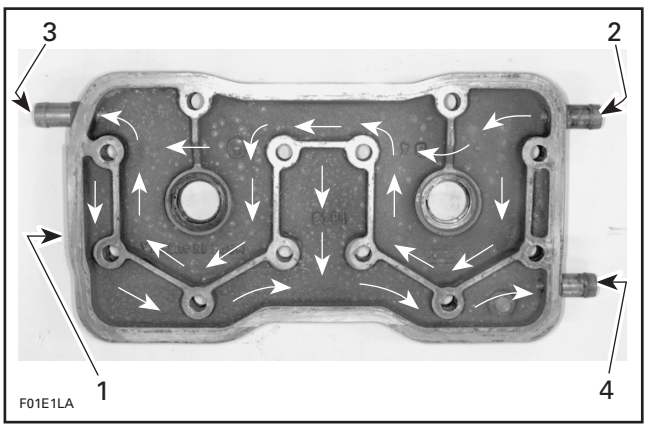
All hoses and fittings of the cooling system have calibrated inside diameters to assure proper cooling of the engine. Always replace using appropriate Bombardier part number.

717 and 787 Engines

A Serial Cooling System is utilized on the 717 and 787 engines, which offers an efficient cooling of the combustion chamber to prevent the possibilities of detonation.

The water supply is taken from a pressurized area in the jet pump between the impeller and venturi.

Water enters the cylinder head, cooling the combustion chamber to prevent detonations. Then, water exits cylinder head toward tuned pipe.

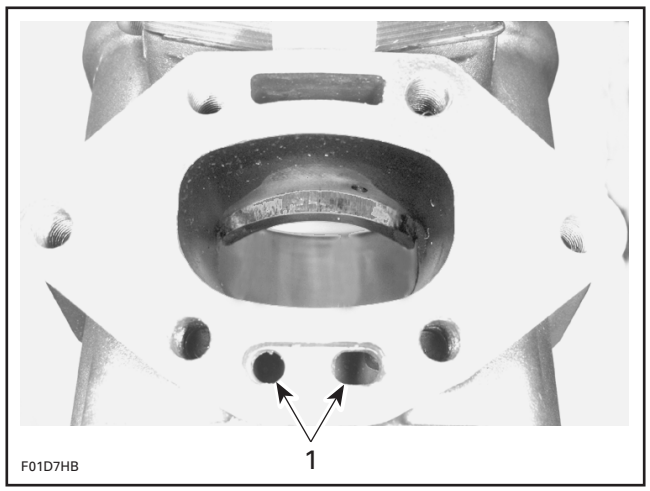


1. *Cylinder head cover*
2. *Fresh water from jet pump*
3. *Water exiting head assembly to tuned pipe, exhaust manifold and cylinders*
4. *Water from cylinder water jackets exiting engine*

The tuned pipe and exhaust manifold are designed with a double wall to allow water circulation.

Water is pre-heated by the exhaust system before entering the cylinder cooling jackets.

Water enters cylinder cooling jacket through passages located below exhaust ports from tuned pipe.



1. *Water passages*

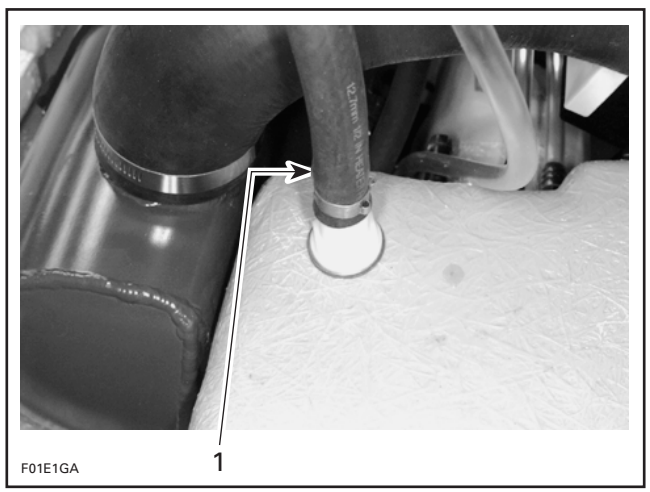
No water enters crankcase.

When engine is running, water must flow from bleed outlet indicating that water circulates.

▼ CAUTION

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

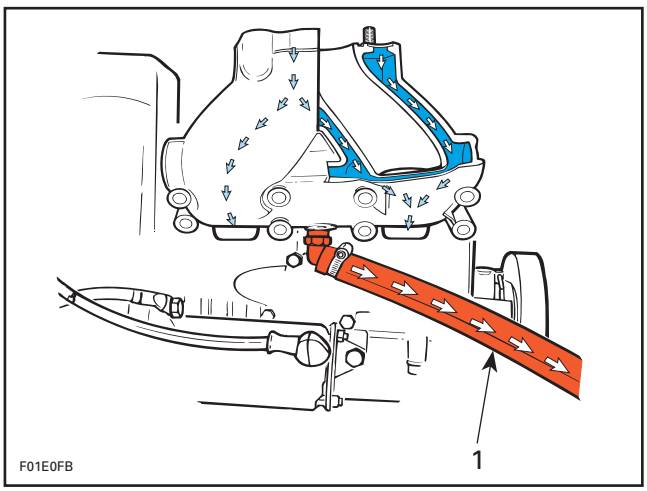
For a minimum back pressure in the exhaust, engine water outlet hose is not connected to the exhaust. It has its own outlet at the rear of the hull.



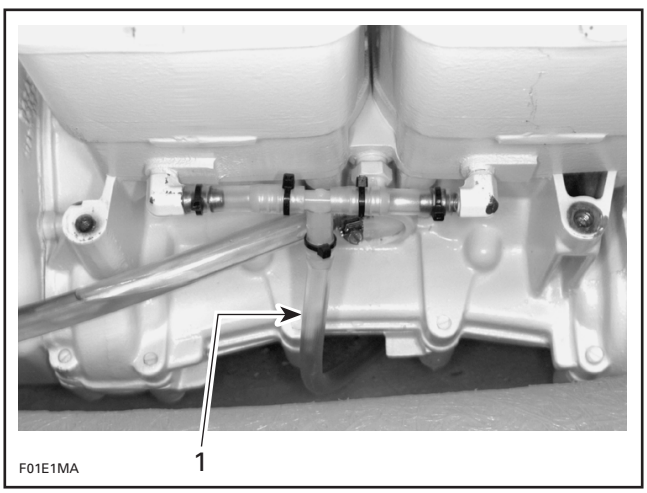
TYPICAL

1. *Engine water outlet hose*

Draining of the cooling system is accomplished by a drain hose located at the lowest point of the circuit.



717 ENGINE
1. Drain hose



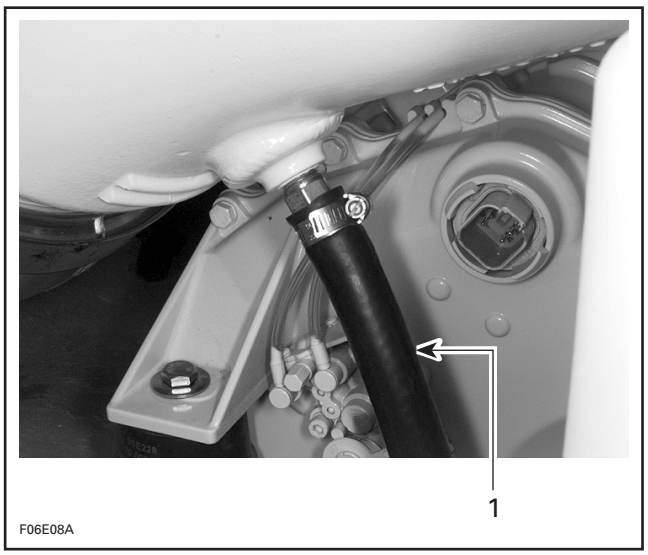
787 ENGINE
1. Drain hose

947 Engine

The 947 engine has a conventional cooling system. The water is pre-heated in the tuned pipe water jacket before entering the engine or cylinder head.

As with other models, the water supply is provided by a pressurized area in the jet pump between the impeller and venturi.

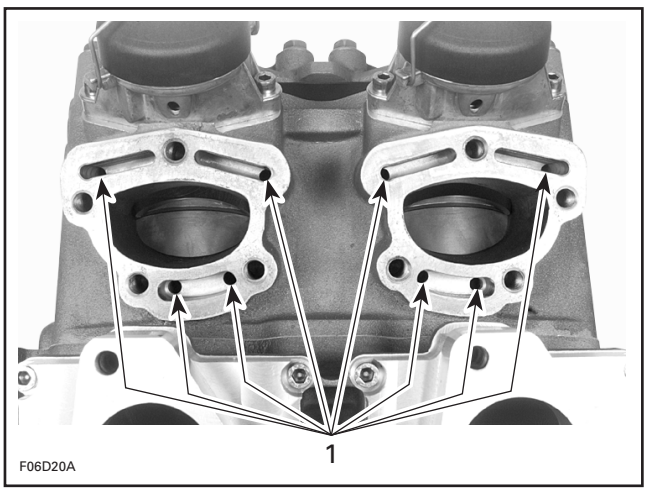
Water is directed to the water jacket of the tuned pipe head.



1. Water supply hose

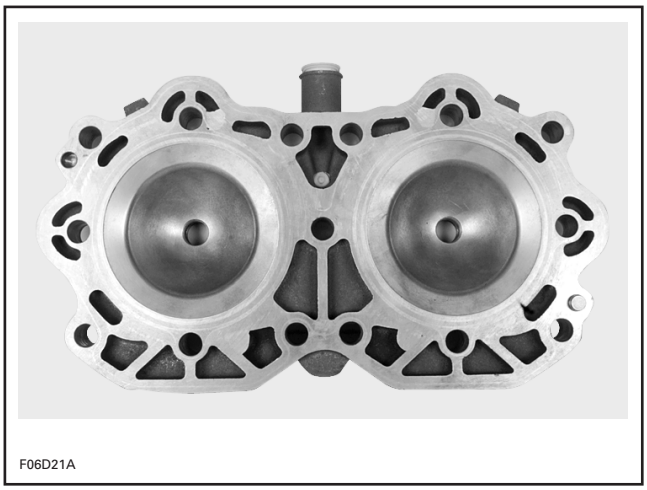
Water circulates in the jackets of the tuned pipe head and the exhaust manifold. It is consequently pre-heated by the exhaust system.

Then, water enters the cylinder-block water jackets through passages located above and below exhaust ports.

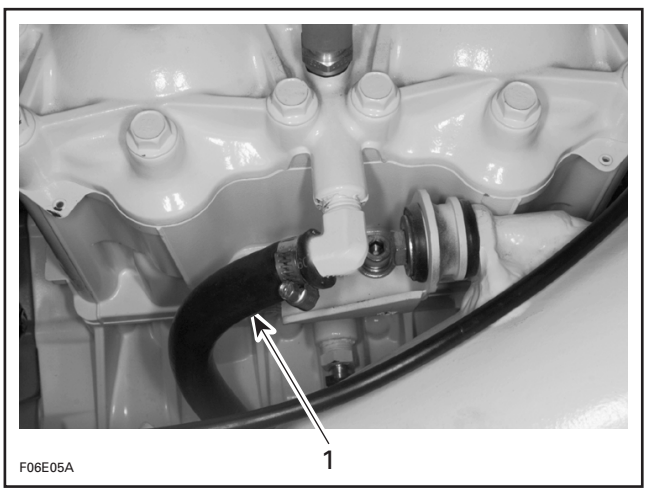


1. Water passages

After water has circulated in the cylinder-block water jackets, it is directed in the 1 piece cylinder head which features improved combustion chamber and spark plug cooling.


F06D21A

Water exits cylinder head water jackets through an outlet fitting.

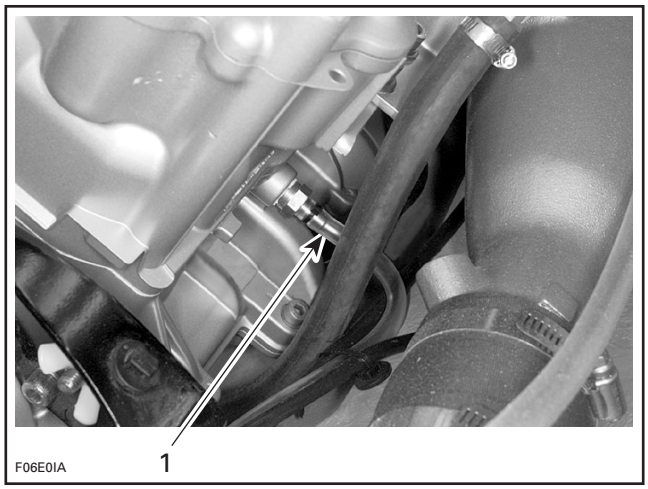


F06E05A

1. Engine water outlet

Water circulates in the water outlet hose and is expelled out of the cooling system through a fitting located in the jet pump support on the transom of the watercraft.

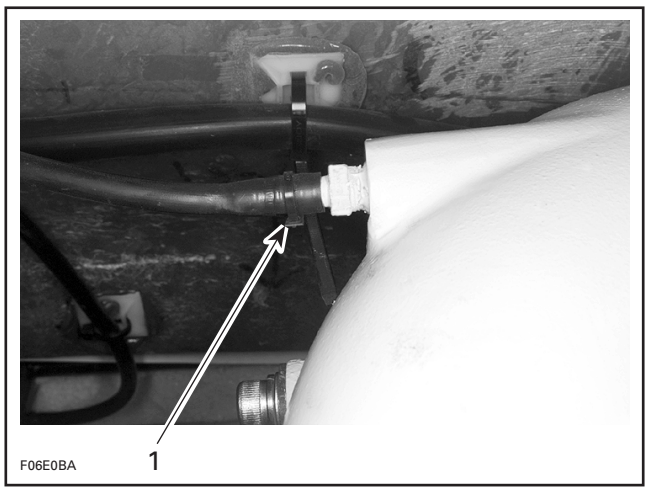
Draining of the cooling system is accomplished by the drain hose connected to a fitting at the bottom of the cylinder-block, on tuned pipe side.



F06E0IA

1. Drain hose

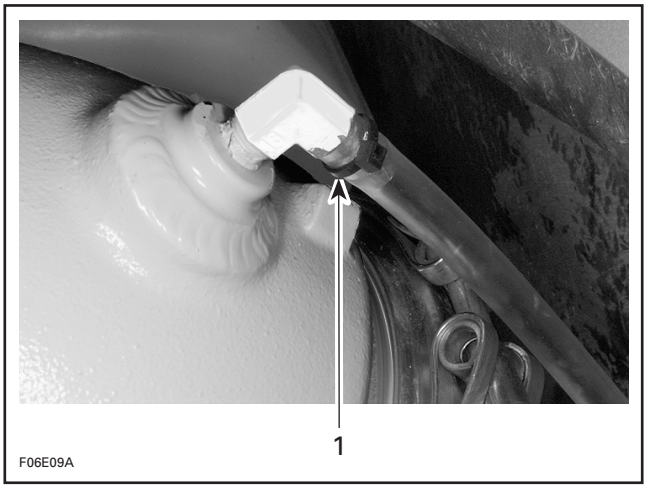
Bleeding of the cooling system is accomplished by the bleed hose located at the uppermost point of the circuit at the tuned pipe. The bleed hose also serves as the Cooling System Indicator (CSI).



F06E0BA

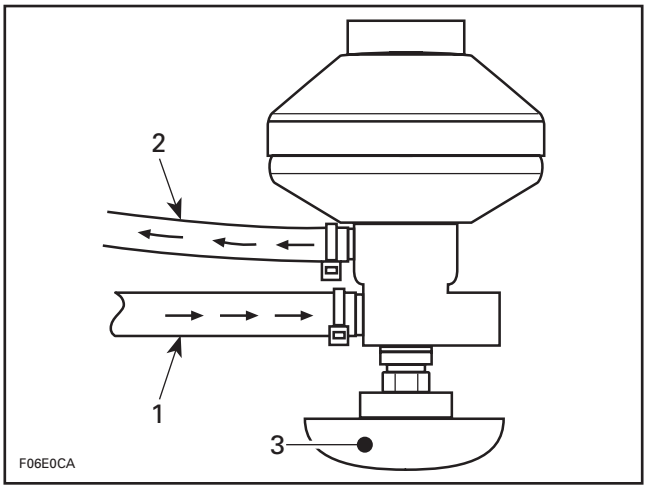
1. Bleed hose

The water supply of the water flow regulator is provided by the water jacket of the tuned pipe head.



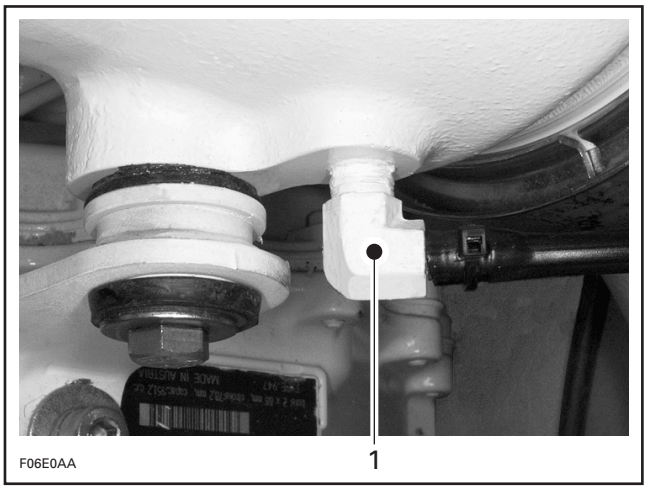
1. Water supply of the water flow regulator valve

The lower hose of the valve is the water supply and the upper hose is the regulated injection water for the tuned pipe.



1. Water supply from tuned pipe water jacket
2. Regulated injection water to the tuned pipe
3. Muffler

Regulated water is injected in the tuned pipe by a calibrated fitting.



1. Injection fitting

All Models

▼ CAUTION

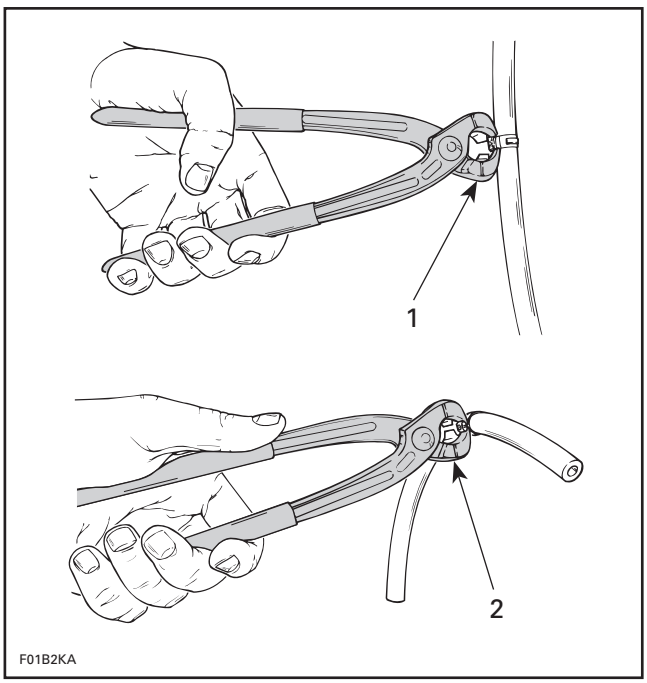
Never modify cooling system arrangement, otherwise serious engine damage could occur.

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).
SYSTEM DRAINING: Self-drain type (hose at lowest point of circuit).
SYSTEM FLUSHING: Fitting spigot or hose adapter.
MONITORING BEEPER: Turns on at 86-94°C (187-201°F).

COMPONENTS

1, Clamp

To cut or secure non-reusable Oetiker clamps of cooling system hoses, use pliers (P/N 295 000 070).



1. Cutting clamp
2. Securing clamp

2, Fitting Spigot

The fitting spigot is used on some models to flush cooling system. Refer to FLUSHING AND LUBRICATION 02-03.

3, Elbow Fitting

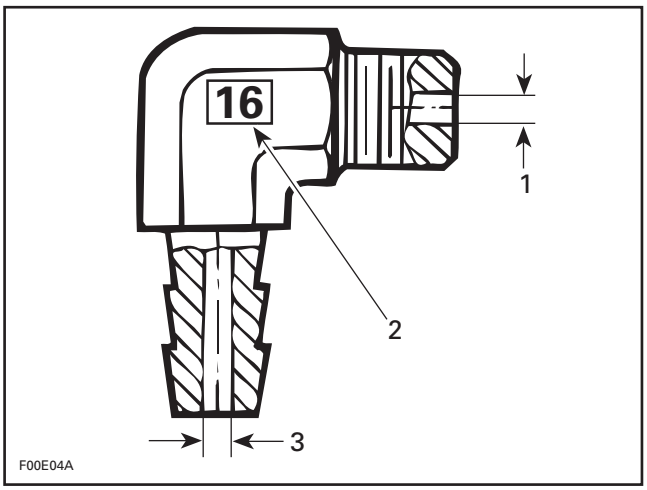
Water injection used on exhaust system cools the exhaust gases to obtain maximum performance from the tuned pipe. The elbow fitting has a calibrated inside diameter to optimize water flow in tuned pipe.

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

▼ CAUTION

The elbow fittings are calibrated 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 number stamped onto the fitting or by measuring its inside diameter. Refer to the following illustration and chart.



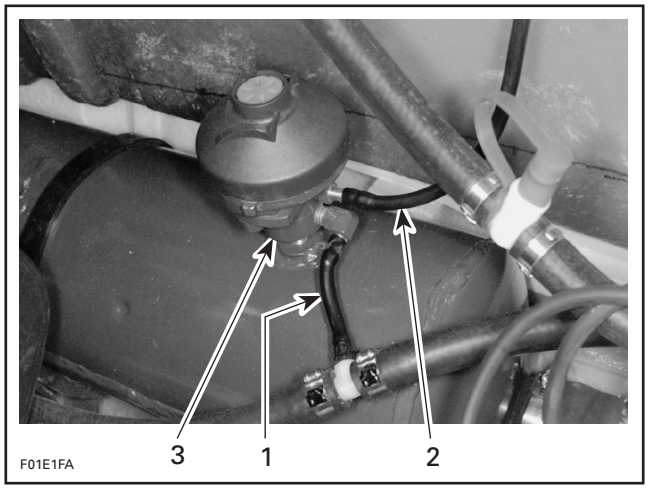
1. Outlet diameter = 4.6 mm (.181 in)
2. Stamped number
3. Inlet diameter = 5.5 mm (.219 in)

Stamped Number on Fitting	Fitting P/N	Inlet Diameter	Outlet Diameter
16	293 700 016	5.5 mm (.219 in)	4.6 mm (.181 in)
48	293 710 048	4.0 mm (.157 in)	3.5 mm (.139 in)

4, Water Flow Regulator Valve

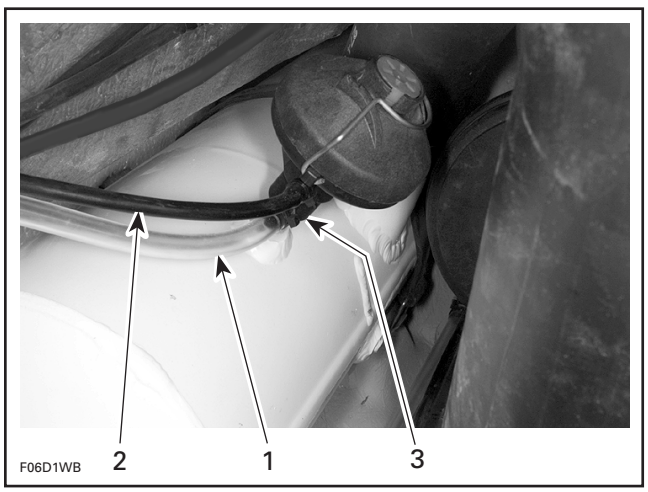
A water flow regulator valve is mounted on models with the 787 and 947 engines so that they can produce the maximum horsepower output and yet maintain the necessary diameter of the injection fitting at the tuned pipe head for unobstructed water flow.

The water flow regulator valve is mounted directly onto the muffler.



SPX MODEL

1. *Water supply hose of regulator valve*
2. *Regulated water to injection fitting*
3. *Water injected into the muffler*



GSX LIMITED, XP LIMITED AND GTX LIMITED

1. *Water supply from tuned pipe water jacket*
2. *Regulated water to injection fitting*
3. *Water injected into the muffler*

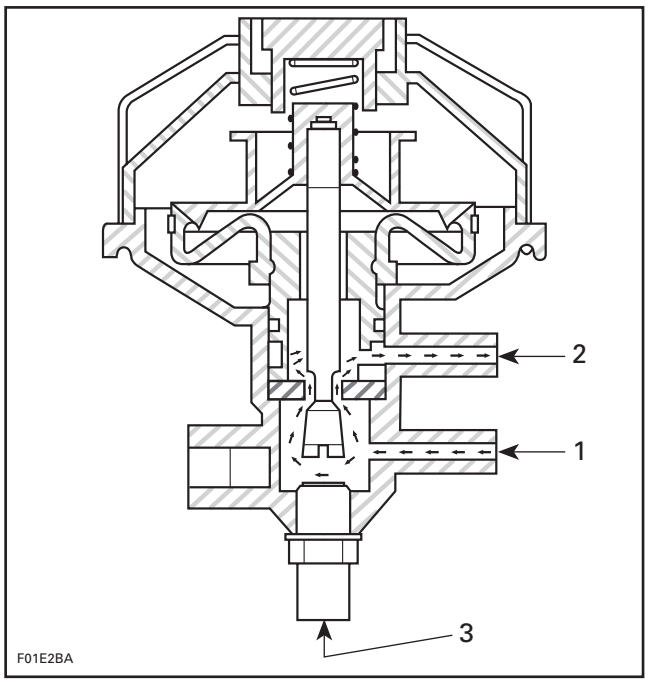
NOTE: The water injected into the muffler is not regulated by the valve. A calibrated water injection fitting of 3.0 mm (.118 in) inside diameter limits water flow into the muffler.

The water flow regulator valve has a calibrated spring and a tapered needle which regulate the injected water in the tuned pipe.

▼ CAUTION

Do not change the calibration of the spring, otherwise serious engine damage can occur.

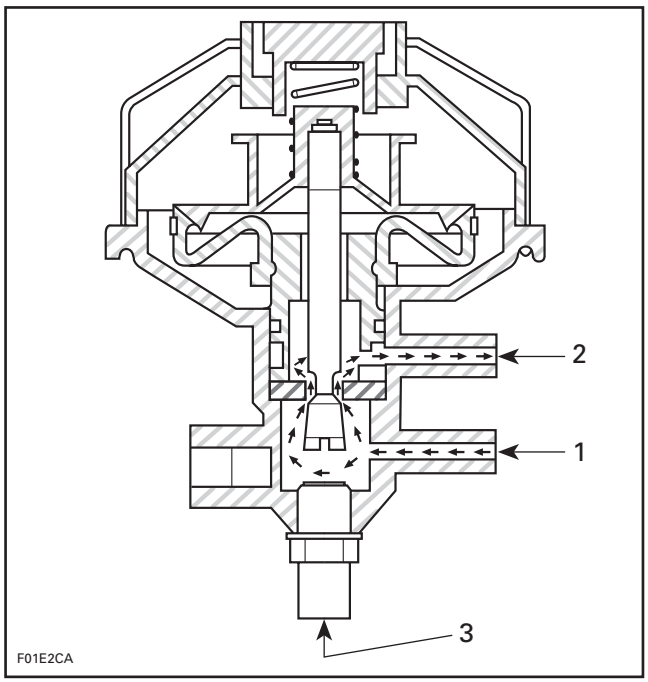
At low speed, water pressure in the supply hose of the regulator valve is not sufficient to overcome the spring of the regulator valve; more water is being delivered to the injection fitting at the tuned pipe.



LOW SPEED OPERATION

1. *Water entering regulator valve*
2. *Water exiting regulator valve (less restriction)*
3. *Water injected in the muffler*

At higher speed, water pressure increases in the supply hose of the regulator valve and gradually overcomes the return spring of the regulator valve. Less water is being delivered to the injection fitting at the tuned pipe.



HIGH SPEED OPERATION

1. *Water entering regulator valve*
2. *Water exiting regulator valve (more restriction)*
3. *Water injected in the muffler*

Adjustment

The water flow regulator valve has been calibrated at the factory and should not be modified.

NOTE: Water flow regulator valves ordered from the parts channel are also calibrated.

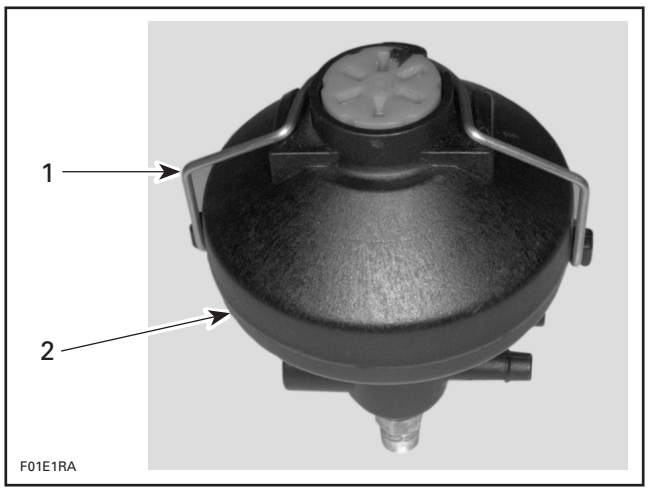
If the maximum engine speed cannot be attained or if the engine has poor performance, the water flow regulator valve should be considered in the troubleshooting of the problem.

Disassembly

Remove the cover **no. 6** of the valve by releasing the spring **no. 5**.

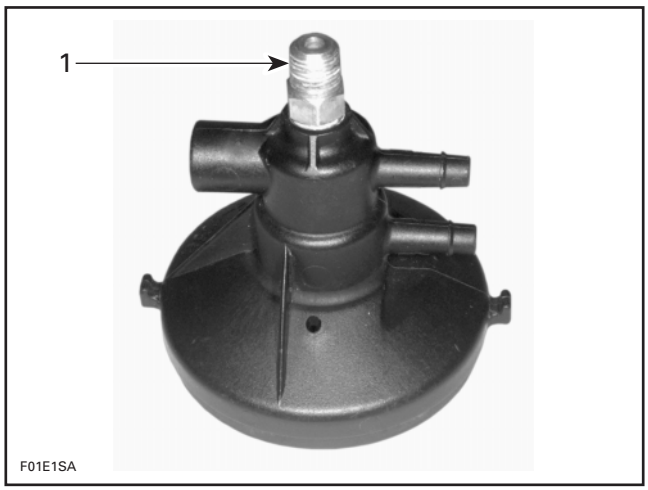
◆ WARNING

Firmly hold cover to valve base. The spring inside the valve is applying a pressure against the cover.



1. *Spring*
2. *Cover*

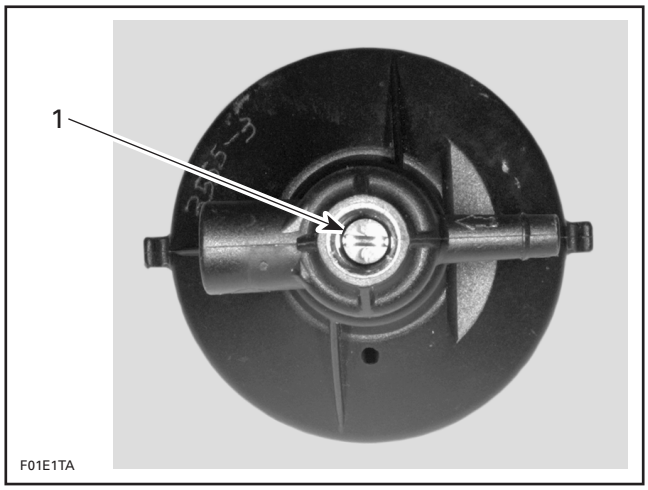
Remove fitting **no. 7** from valve housing.



1. *Fitting*

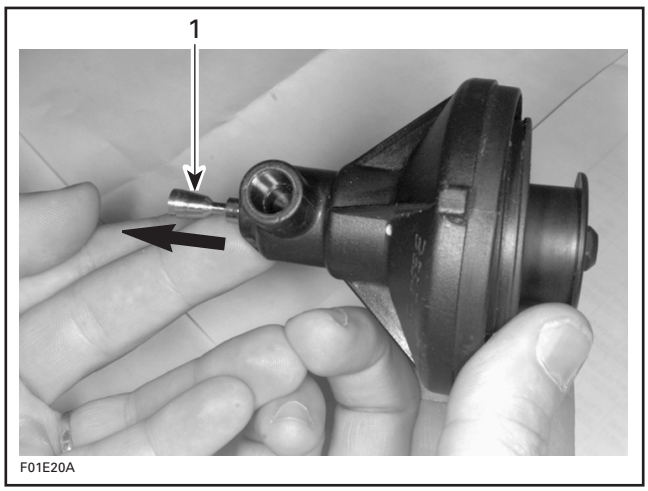
Unscrew the tapered needle **no. 8**.

NOTE: Hold the valve to prevent it from turning.



1. Tapered needle

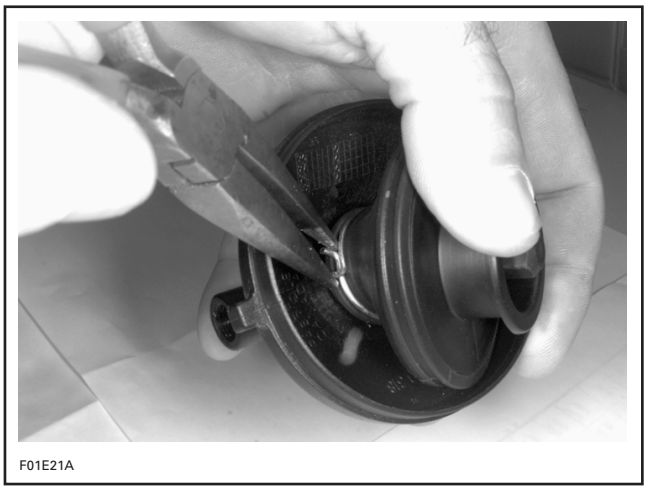
Remove the tapered needle from valve housing.



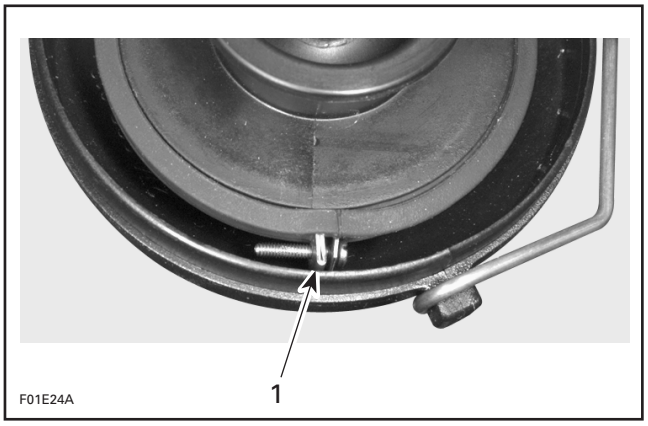
1. Remove tapered needle

Pull the valve slightly. Using pliers, release the clamp which retains the bellows **no. 10**.

Remove valve **no. 9** and bellows **no. 10**.



Loosen clamp to separate valve from bellows.



1. Clamp

Inspection

Inspect parts for damage. Verify especially bellows for cracks.

Assembly

Assembly is essentially the reverse of disassembly procedures.

CARE

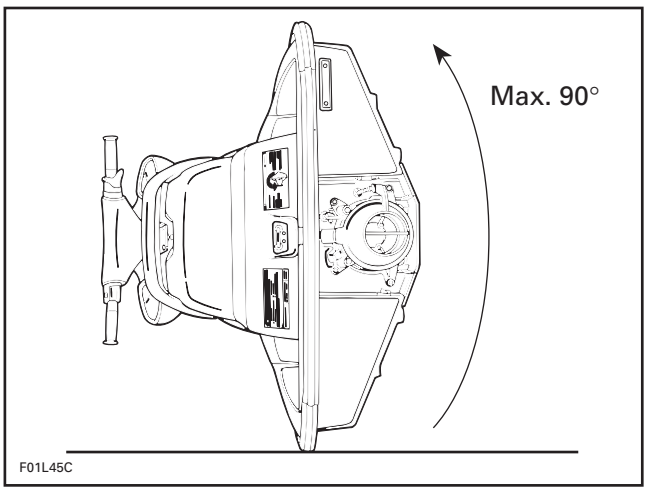
For flushing purposes, the cooling system is equipped with either a fitting spigot or a hose adapter depending upon the model.

For flushing operation, a coupler hose is available (unnecessary for models with the hose adapter) to connect to the fitting spigot. A garden hose is used to flush the whole system by backwash. For flushing procedure, refer to FLUSHING AND LUBRICATION 02-03.

For winterization of cooling system, refer to STORAGE 02-05.

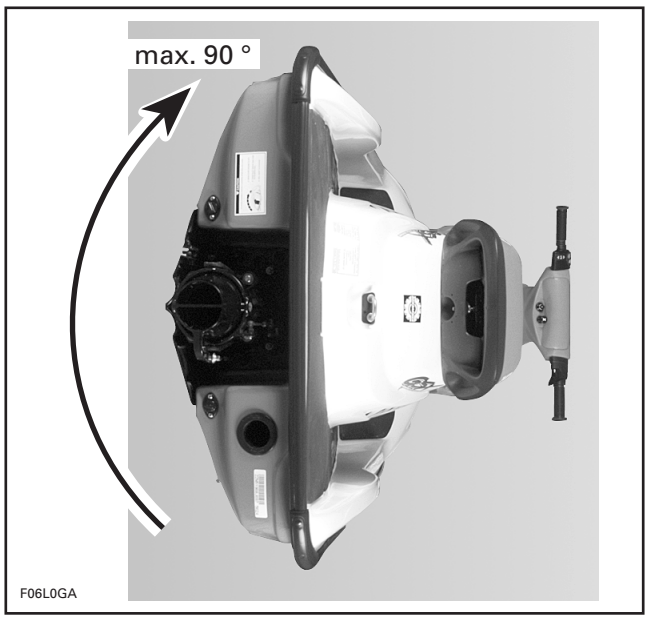
SPX, GS, GTS and GTI Models

When servicing the hull, always rotate watercraft counterclockwise (seen from the rear). Rotating watercraft on the opposite side could allow residual water in tuned pipe to enter the engine and cause damage.



GSX Limited, XP Limited and GTX Limited

When servicing the hull, always rotate watercraft clockwise (seen from the rear). Rotating watercraft on the opposite side could allow residual water in tuned pipe to enter the engine and cause damage.



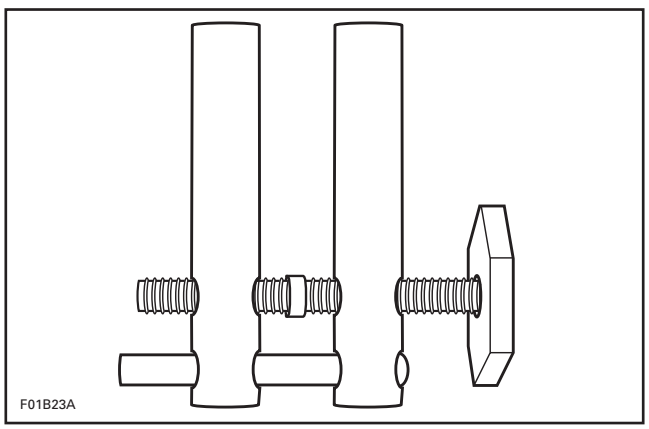
TYPICAL

Towing the Watercraft in Water

Special precautions should be taken when towing a Sea-Doo watercraft in water.

Maximum recommended towing speed is 24 km/h (15 MPH).

When towing your watercraft in water, pinch the water supply hose from the jet pump housing to the engine with a large Hose Pincher (P/N 529 030 400).

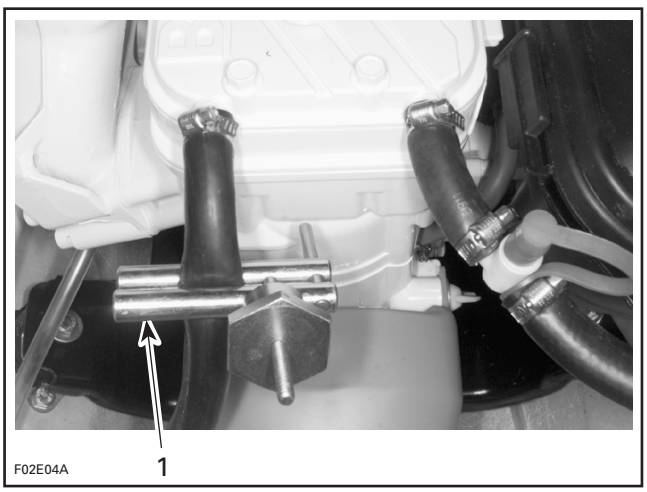


This will prevent the cooling system from filling which may lead to water being injected into and filling the exhaust system. Without the engine running there isn't any exhaust pressure to carry the water out the exhaust outlet.

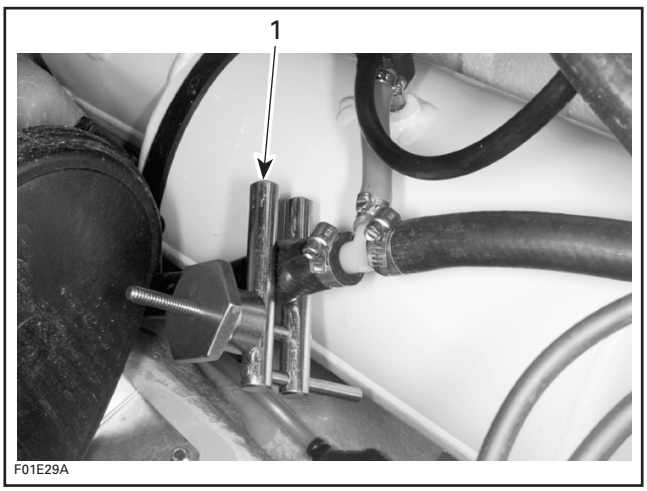
▼ CAUTION

Failure to do this may result in damage to the engine. If you must tow a stranded watercraft in water and do not have a hose pincher be sure to stay well below the maximum towing speed of 24 km/h (15 MPH).

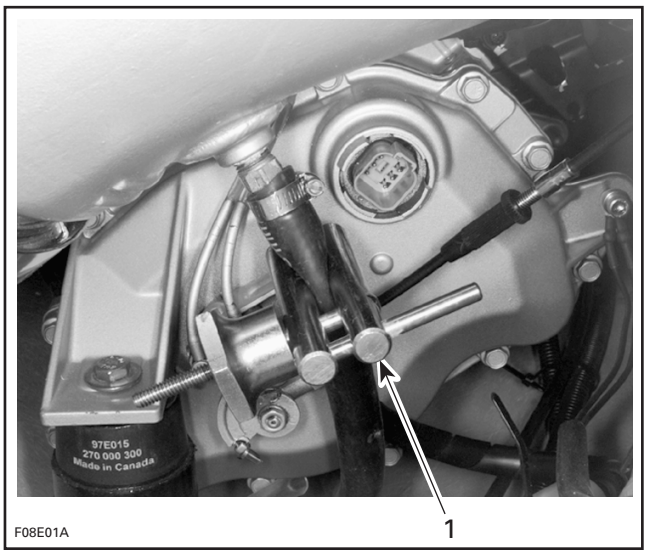
Snugly install the hose pincher on the water supply hose as shown in the following illustrations.



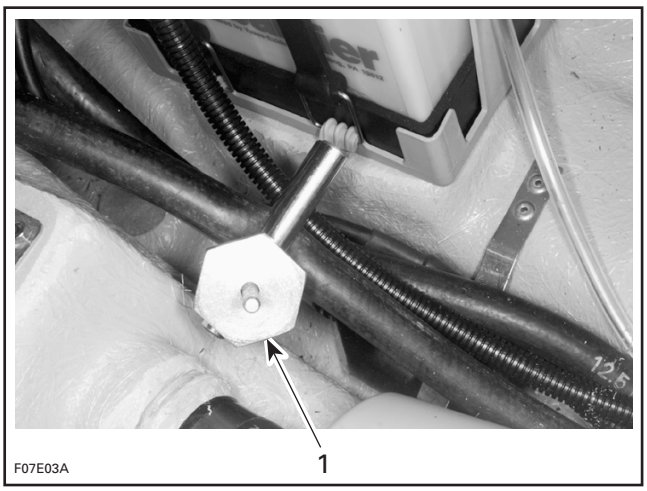
GS, GTS AND GTI MODELS
1. Hose pincher



SPX MODEL
1. Hose pincher



XP LIMITED
1. Hose pincher



GSX LIMITED AND GTX LIMITED
1. Hose pincher

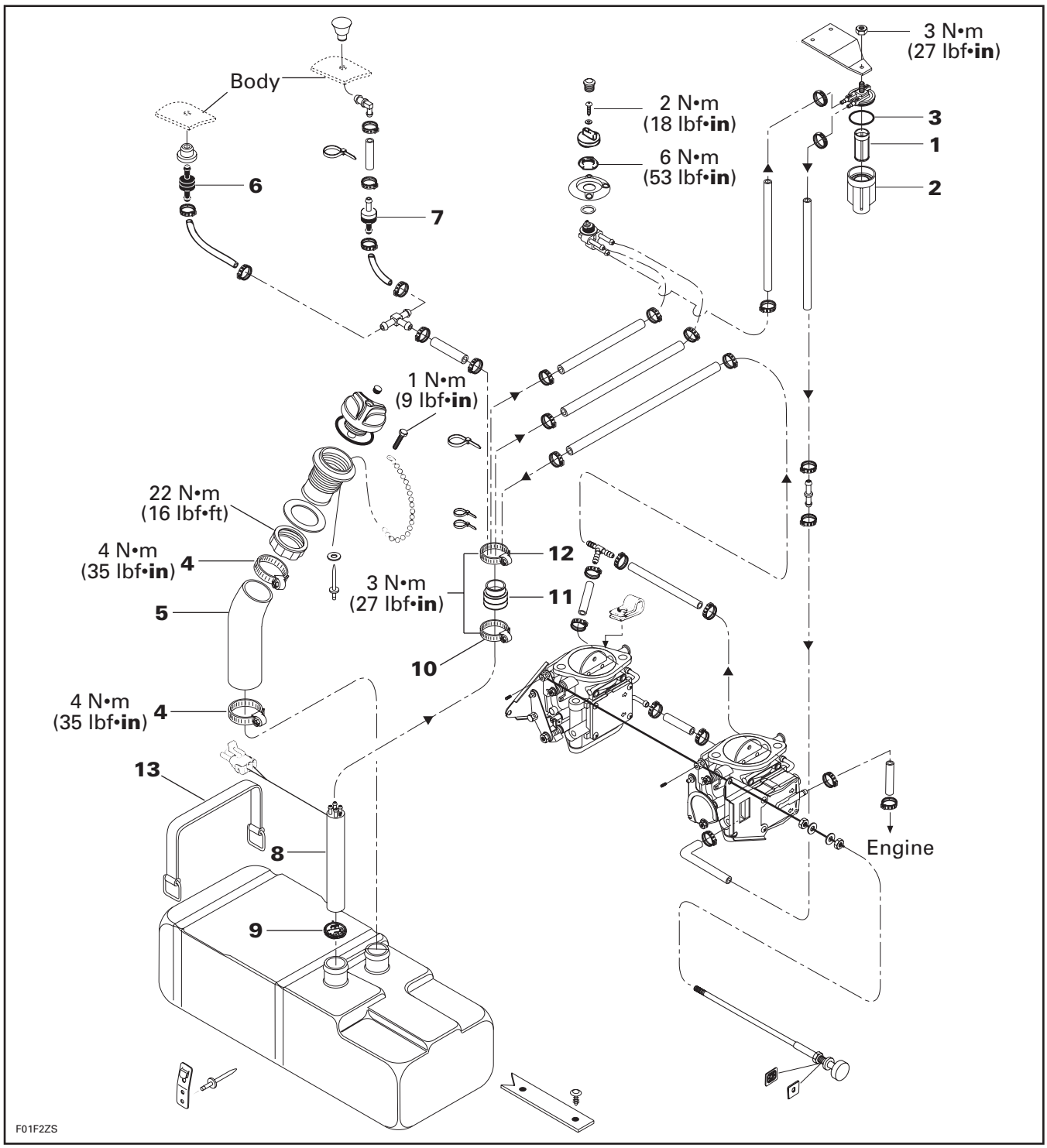
▼ CAUTION

When finished towing the watercraft, the hose pincher must be removed before operating it.

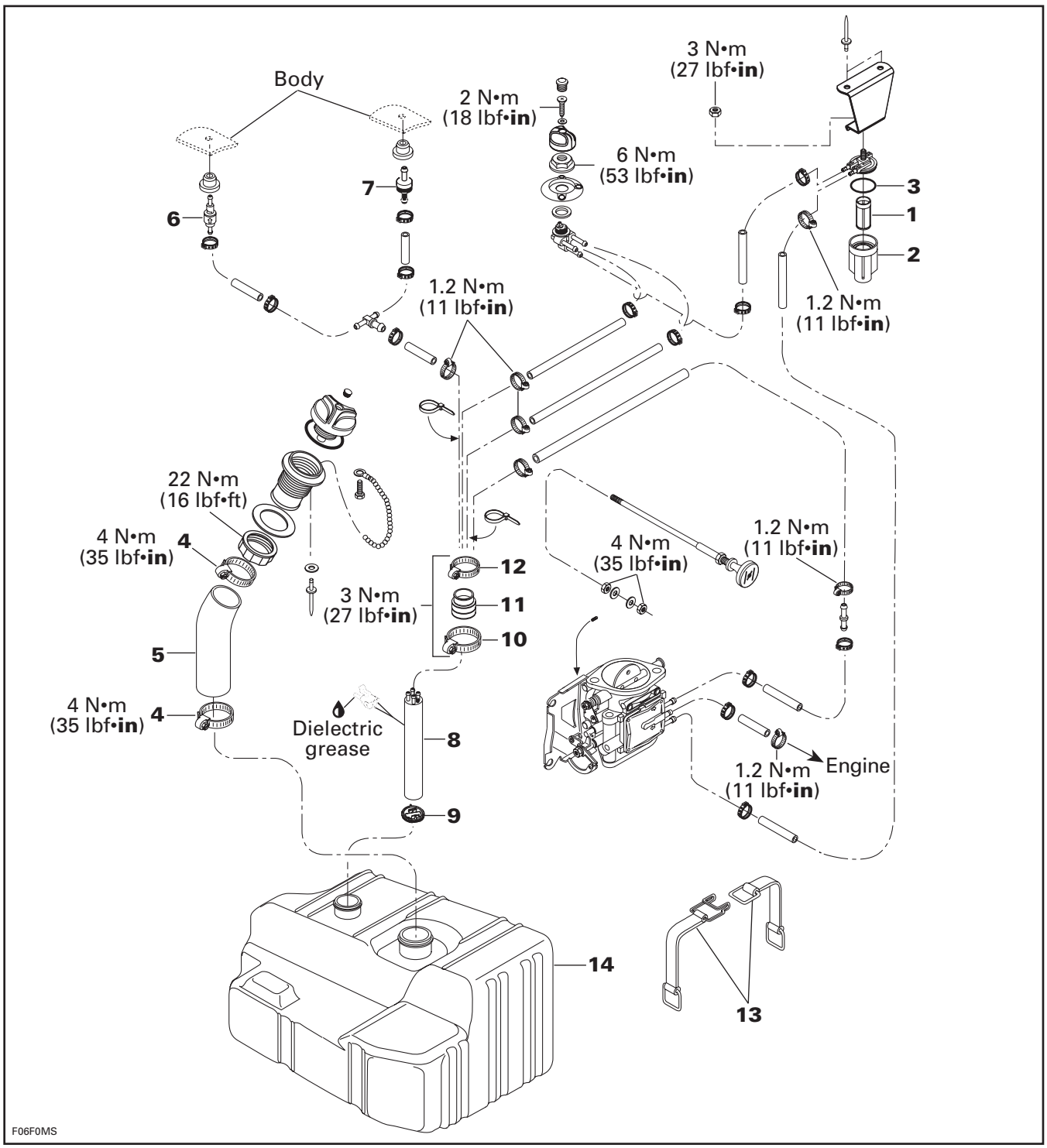
TABLE OF CONTENTS

FUEL CIRCUIT

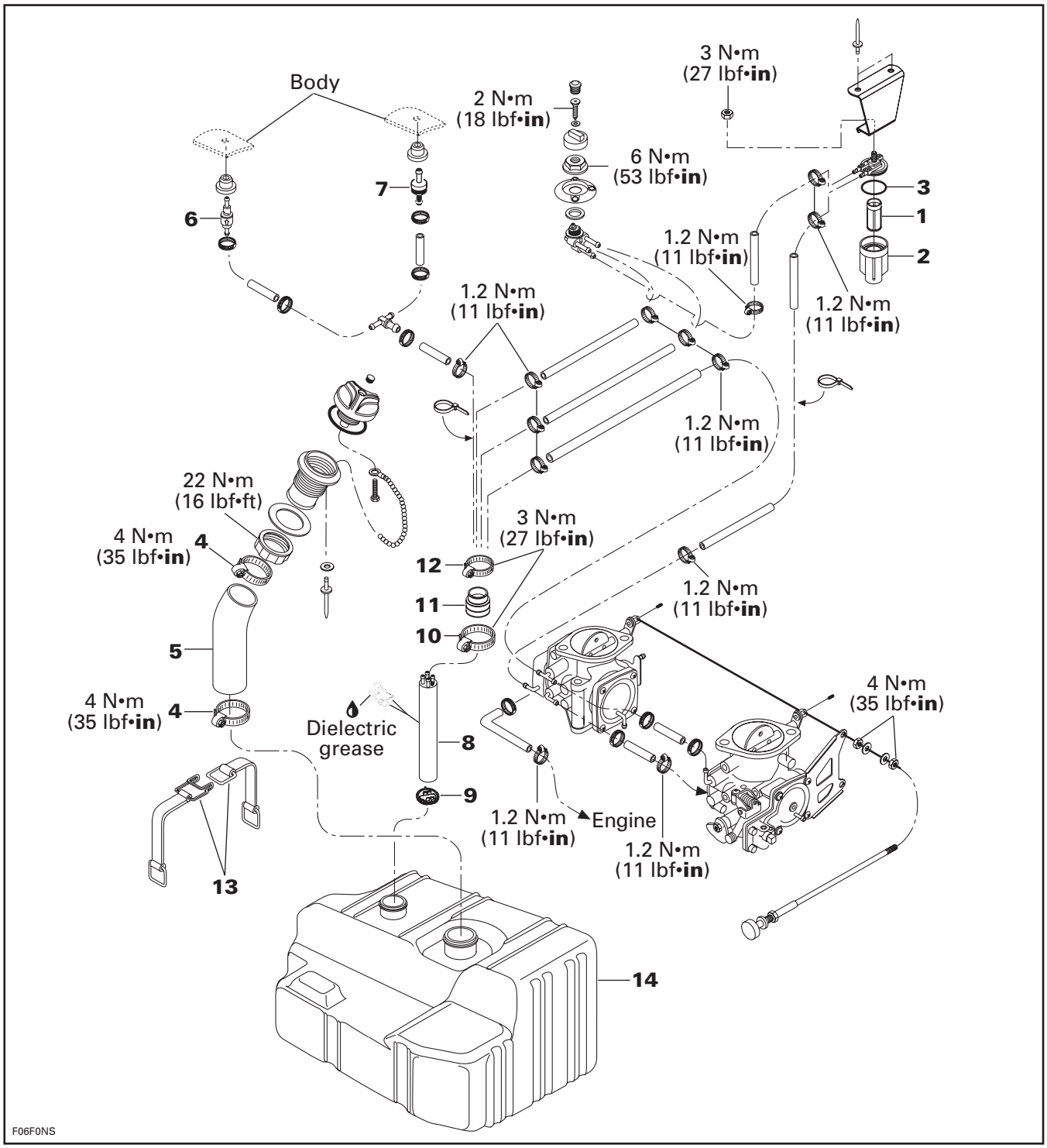
SPX Model



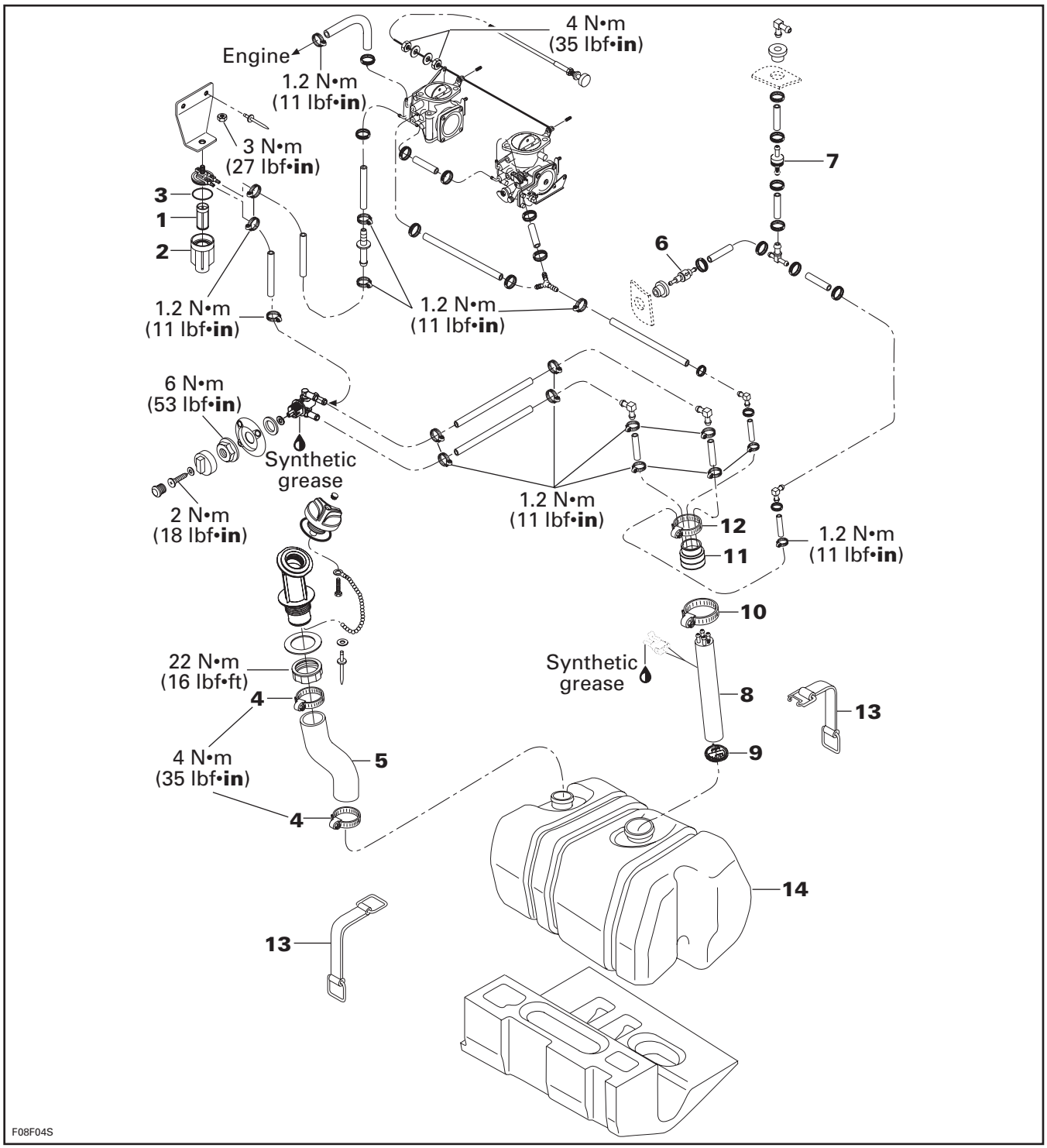
GS and GTI Models



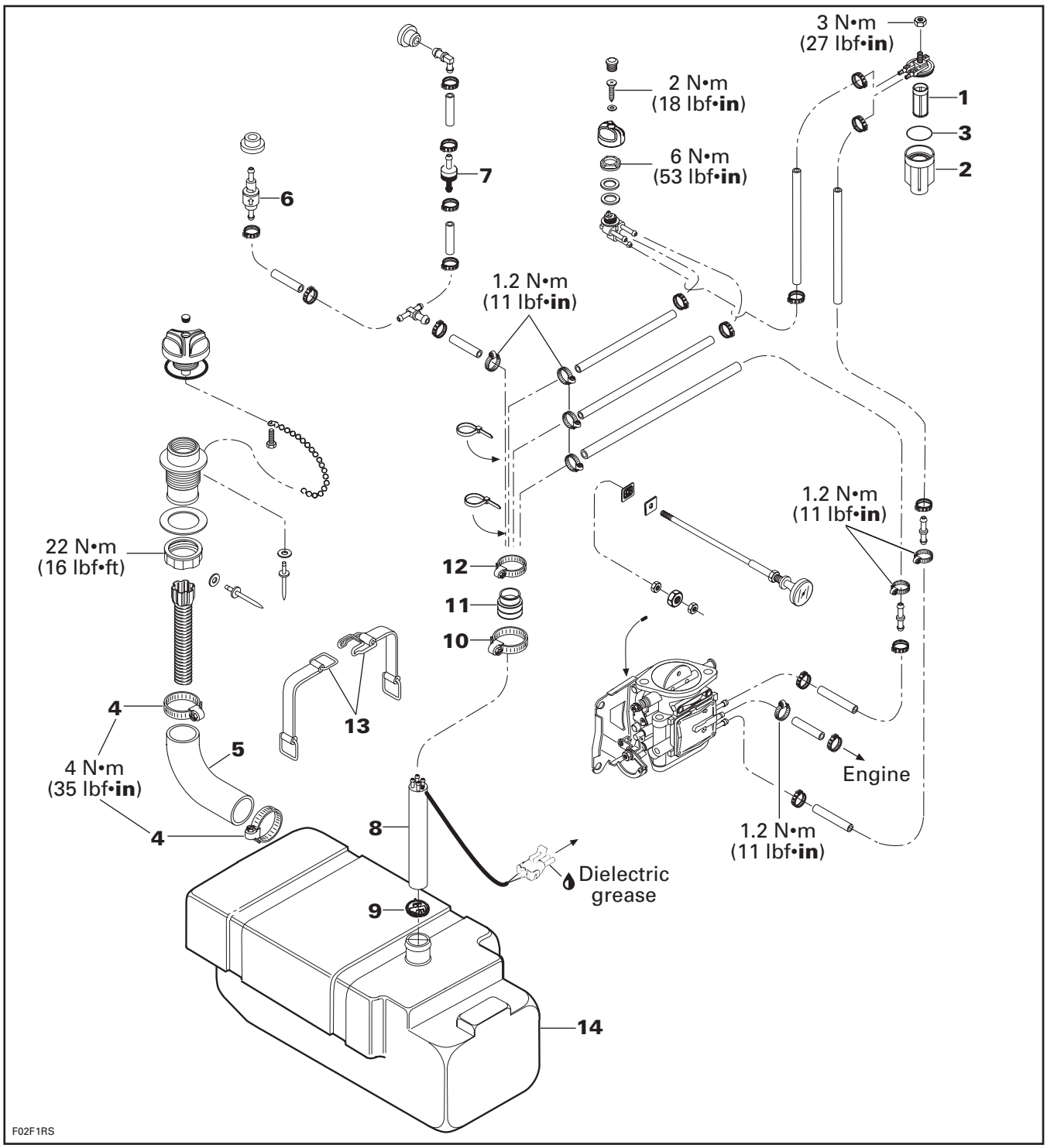
GSX Limited and GTX Limited



XP Limited


Engine
1.2 N•m
(11 lbf•in)
4 N•m
(35 lbf•in)
3 N•m
(27 lbf•in)
3
1
2
7
6
1.2 N•m
(11 lbf•in)
1.2 N•m
(11 lbf•in)
6 N•m
(53 lbf•in)
Synthetic
grease
2 N•m
(18 lbf•in)
1.2 N•m
(11 lbf•in)
12
11
1.2 N•m
(11 lbf•in)
10
22 N•m
(16 lbf•ft)
4
Synthetic
grease
8
13
4 N•m
(35 lbf•in)
5
9
4
14
13
F08F04S

GTS Model

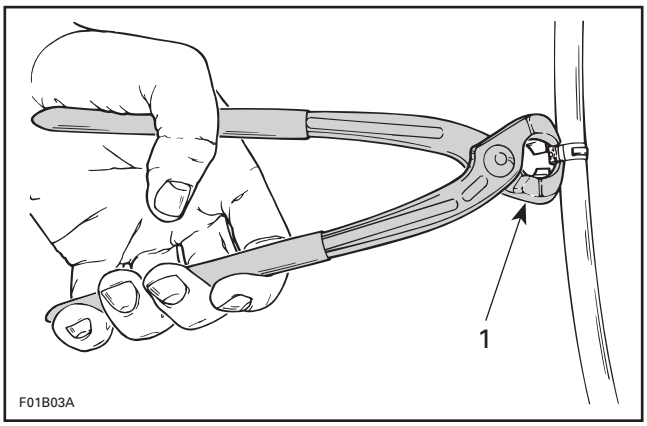

3 N•m
(27 lbf•in)
2 N•m
(18 lbf•in)
6 N•m
(53 lbf•in)
1
3
2
7
6
1.2 N•m
(11 lbf•in)
1.2 N•m
(11 lbf•in)
22 N•m
(16 lbf•ft)
12
11
10
13
4
4 N•m
(35 lbf•in)
5
4
8
9
Dielectric
grease
Engine
1.2 N•m
(11 lbf•in)
14
F02F1RS

GENERAL

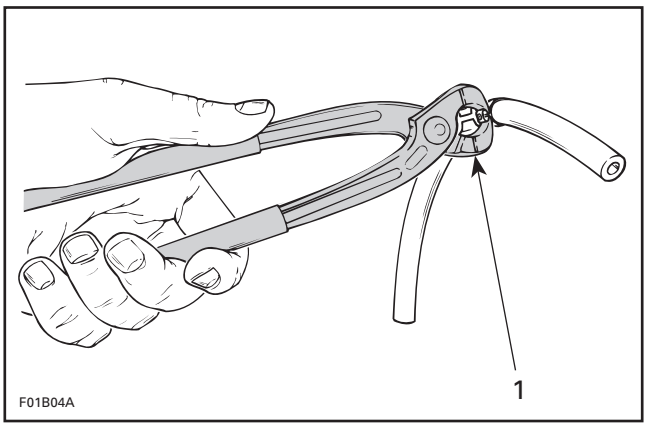
◆ WARNING

Whenever repairing the fuel system, always verify for water infiltration in reservoir. Replace any damaged, leaking or deteriorated fuel lines.

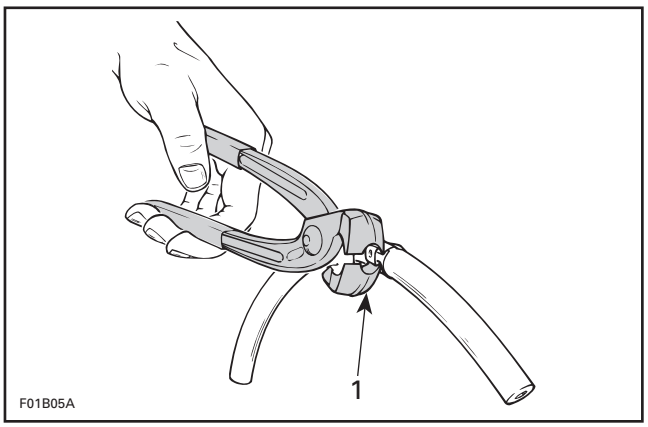
To secure or cut Oetiker clamps on fuel lines, use pliers (P/N 295 000 070).



1. Cutting clamp



1. Securing clamp



1. Securing clamp in limited access

When replacing fuel lines on SEA-DOO watercraft, be sure to use "B1" hoses as available from Bombardier parts department. This will ensure continued proper and safe operation.

◆ WARNING

Use of improper fuel lines could compromise fuel system integrity.

REMOVAL

1, Fuel Filter

All Models Except the XP Limited

Open storage compartment cover.

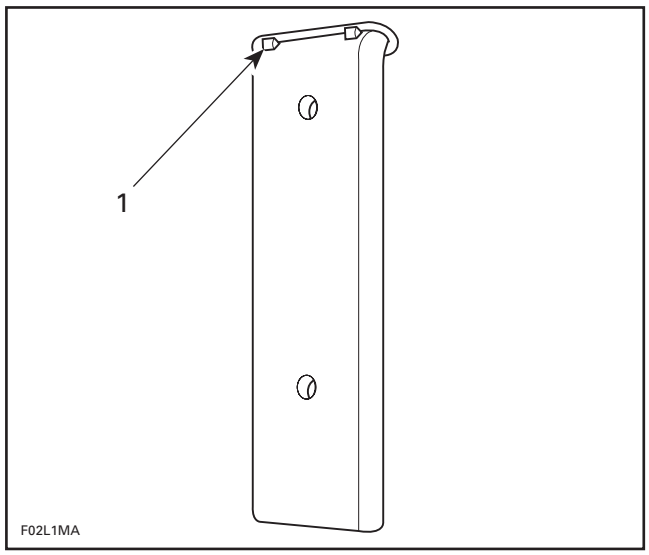
Remove basket.

XP Limited

Open engine cover and remove basket.

GTS Model

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



TYPICAL
1. Press on vent tube

All Models

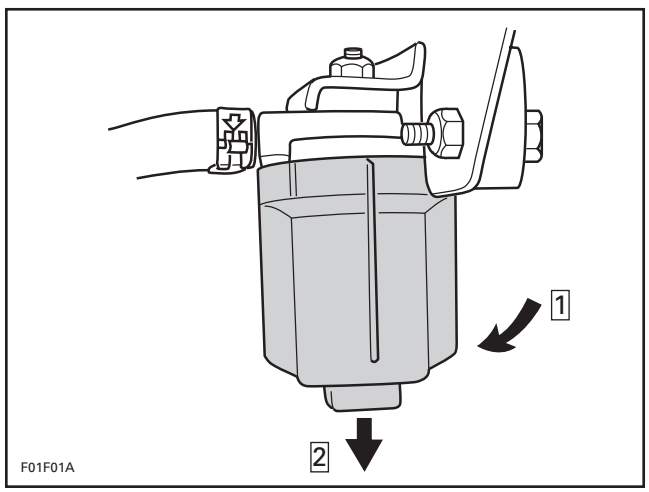
Turn the fuel valve to OFF position.

◆ WARNING

The engine must not be running and fuel valve must be set to OFF position. Gasoline is flammable and explosive under certain conditions. Always work in a well ventilated area.

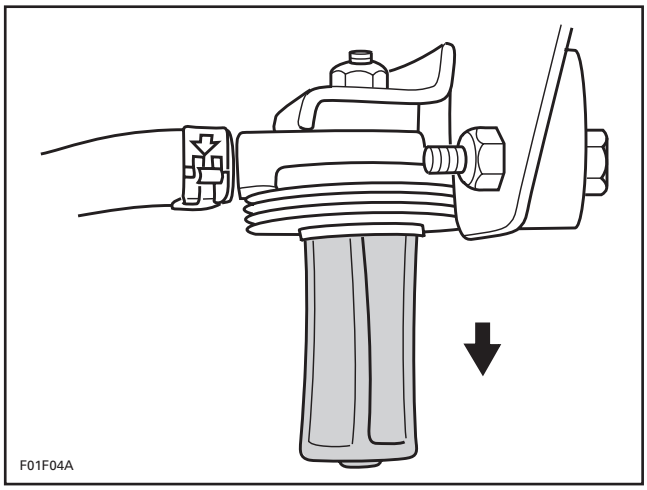
Unscrew fuel filler cap to remove any fuel pressure in system.

Unscrew the fuel filter bowl **no. 2** counterclockwise then pull toward the bottom.



TYPICAL
Step [1] : Loosen counterclockwise
Step [2] : Pull

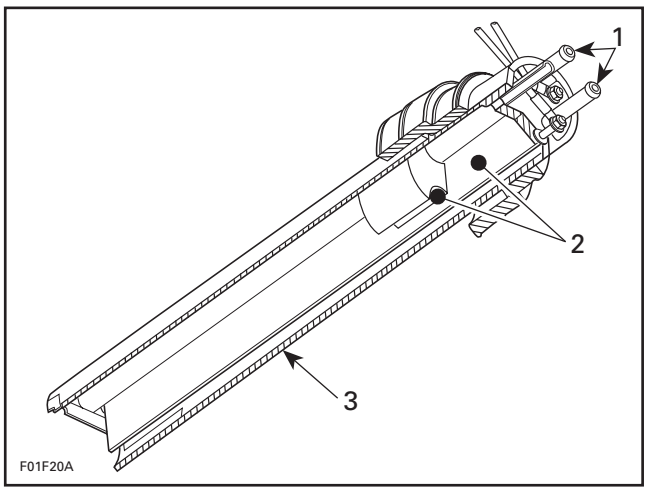
Pull fuel filter **no. 1** toward the bottom.



TYPICAL

8, Fuel Baffle Pick Up

NOTE: The baffle pick up has an integrated fuel sender for the fuel gauge.



1. Pick up tube
2. Fuel sensor
3. Baffle pick up

Disconnect BLACK negative cable, then RED positive cable of battery.

◆ WARNING

Always disconnect battery cables exactly in the specified order, BLACK negative cable first.

Empty fuel tank.

◆ WARNING

Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area. Always wipe off any fuel spillage from the watercraft.

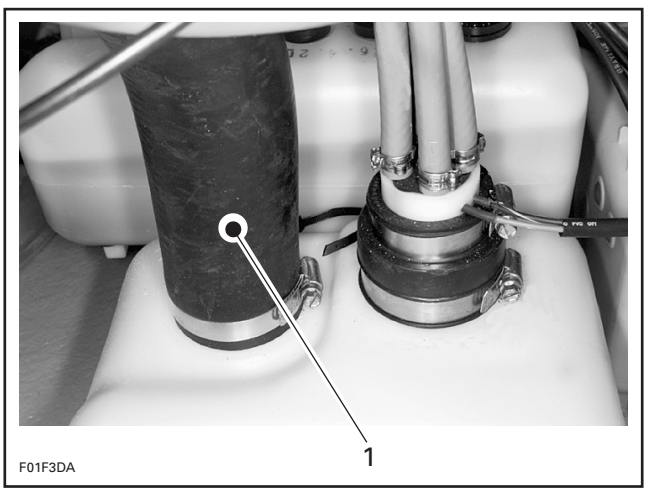
SPX Model

Open storage compartment cover.

Remove storage basket from watercraft.

Siphon fuel tank.

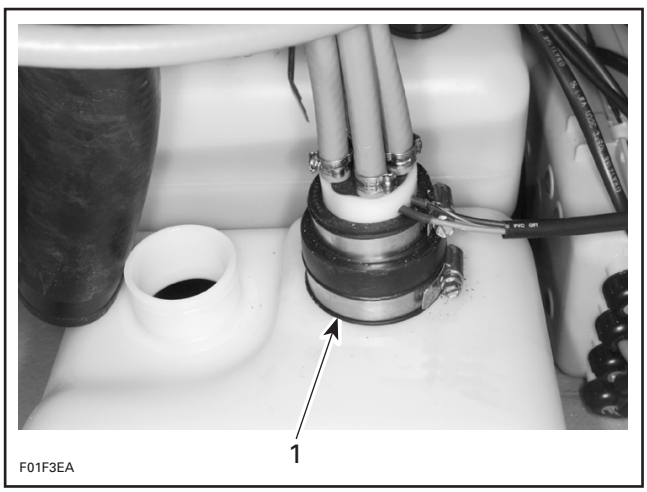
Loosen clamp **no. 4** and disconnect fuel filler hose **no. 5**.



1. Disconnect fuel filler hose

Disconnect fuel sender of baffle pick up.

Loosen lower clamp **no. 10** and remove fuel baffle pick up.



1. Remove fuel baffle pick up

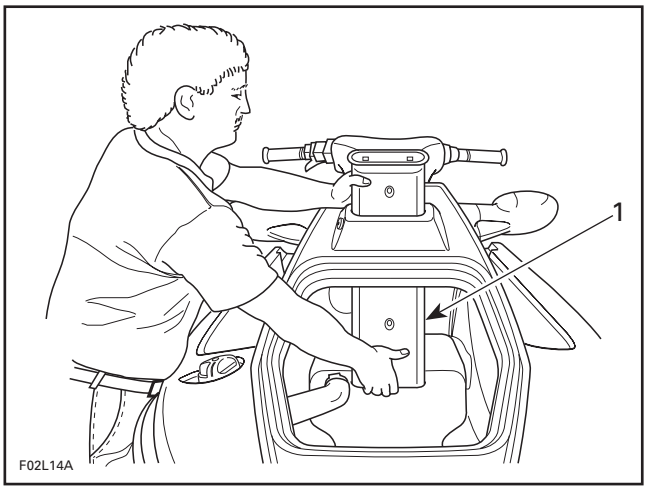
GTS Model

Open storage compartment cover.

Remove storage basket from watercraft.

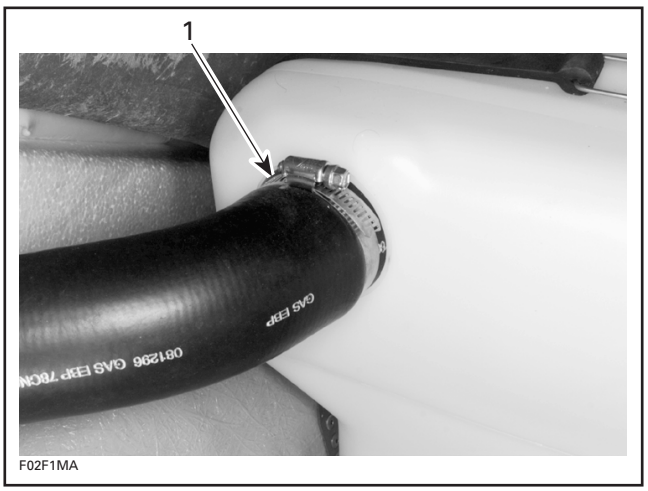
Siphon fuel tank.

Remove vent tube.



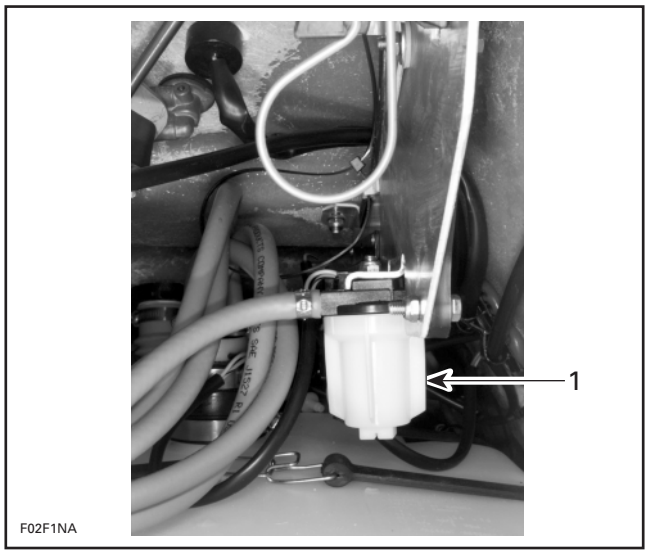
1. Remove vent tube

Disconnect fuel filler hose **no. 5** from fuel tank.



1. Disconnect fuel filler hose

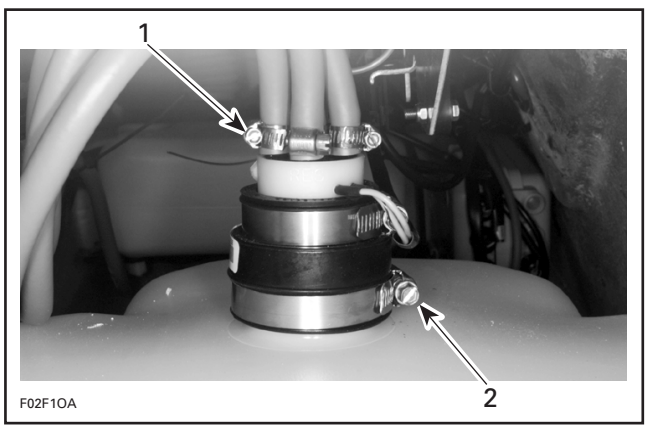
Loosen lock nut and remove fuel filter from reverse system support.



1. Remove fuel filter

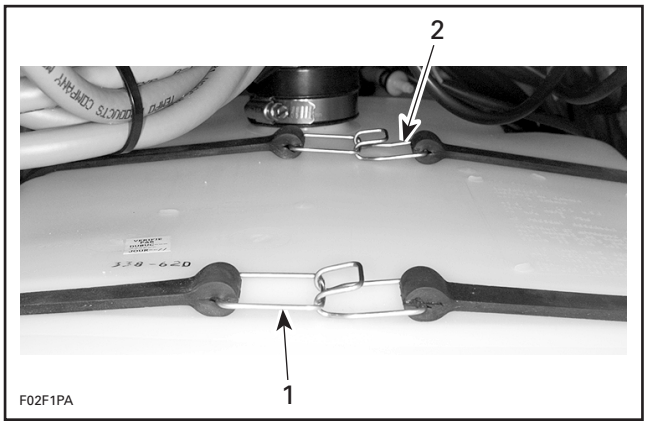
Disconnect the fuel lines from baffle pick up and loosen lower clamp no. 10.

NOTE: Identify fuel line positions to ease reassembly.



1. Disconnect fuel hoses
2. Loosen lower clamp

Disconnect the middle and front fuel tank straps no. 13.



1. Front fuel tank strap
2. Middle fuel tank strap

From the engine compartment, disconnect the strap retaining the oil injection reservoir and fuel tank.

NOTE: It is not necessary to remove the oil injection reservoir.

Move fuel tank forward until the fuel baffle pick up can be removed from the storage compartment opening.

GS and GSX Limited

Open storage compartment cover.

Remove storage basket from watercraft.

Siphon fuel tank.

Remove steering assembly. Refer to STEERING SYSTEM for procedure.

GTI and GTX Limited

Syphon fuel tank.

Remove glove box.

XP Limited

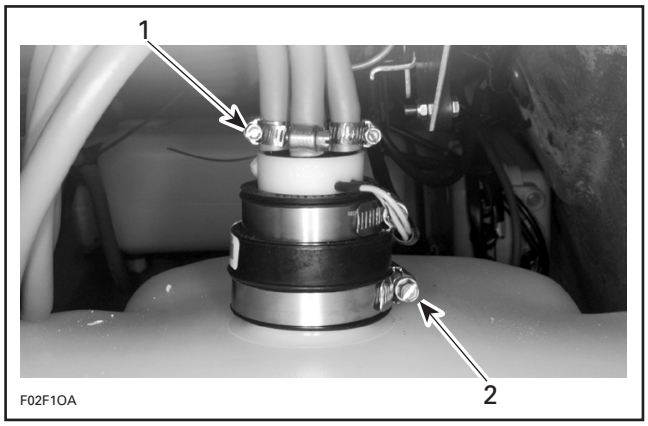
Tilt seat. Refer to HULL/BODY for procedure.

Remove access plug on body.

Syphon fuel tank.

GS, GSX Limited, GTI and GTX Limited

Disconnect fuel lines from baffle pick up and loosen lower clamp no. 10.



TYPICAL

1. *Disconnect fuel hoses*
2. *Loosen lower clamp*

Disconnect wiring harness of fuel sender.

Remove baffle from fuel tank.

All Models

Remove upper clamp no. 12 from adapter no. 11 and slide adapter from baffle.

Push inward on the 3 clips at the base of the baffle in order to remove the filter. Pry base off using a small slotted screwdriver (if necessary).

INSPECTION

1, Fuel Filter

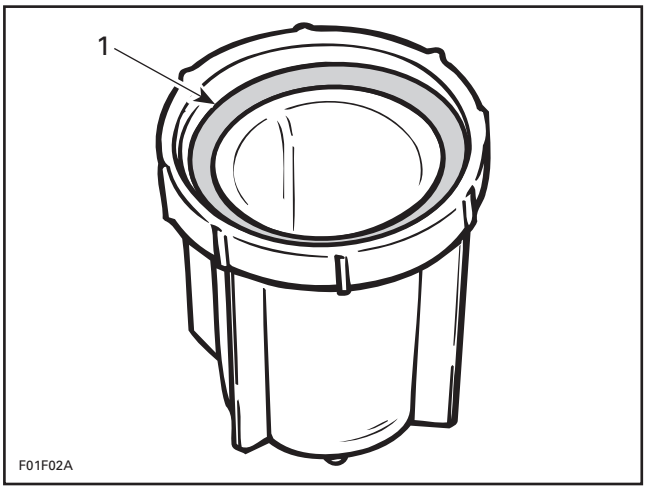
Inspect fuel filter condition. Carefully use low pressure compressed air to clean fuel filter. Replace filter if permanently clogged or damaged.

2, Fuel Filter Bowl

Check filter bowl for water contamination.

3, Gasket

Inspect gasket condition. Make sure gasket is well positioned into the filter bowl no. 2.



1. *Gasket in bowl*

◆ WARNING

Ensure that there is no leakage from the fuel filter.

5, Fuel Filler Hose

Verify fuel filler hose for damage. Always ensure that clamps no. 4 are well positioned and tightened. Torque clamps to 4 N•m (35 lbf•**in**).

6, 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.

7, Check Valve

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

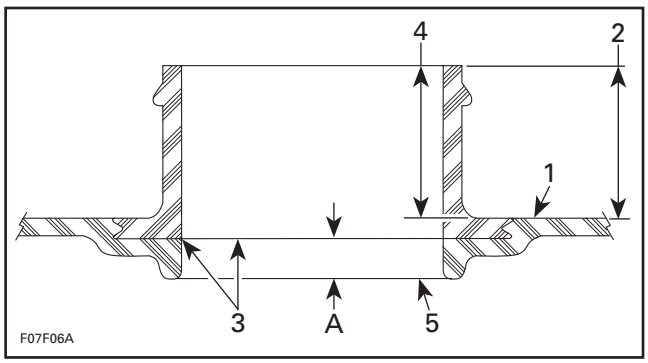
9, Baffle Pick Up Filter

Inspect filter **no. 9** of baffle pick up. Clean or replace as necessary.

14, Fuel Tank

Visually inspect the inside and outside of the fuel tank necks for crack(s). If crack(s) are existing, **replace fuel tank**.

Check with your finger to feel the inside and outside surfaces of fuel tank. Flex fuel tank necks to ensure there are no hidden cracks.



1. Tank upper surface
2. Inspect outside, above upper surface
3. Normal molding seam
4. Inspect inside, above upper surface
5. Base of the neck
A. Approx. 4mm (5/32 in)

NOTE: A fuel tank is comprised of 3 components: the tank, the fuel pick up neck and the filler neck. The necks are injection molded and the tank is then blow molded over the necks. During the molding process, a **small molding seam** may appear on the inner side of the necks at approximately 4 mm (5/32 in) from the base of the neck. It is a normal situation to have a molding seam and it should not be confused with a crack.

ASSEMBLY

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

8, Baffle Pick Up

Slide adapter **no. 11** onto baffle pick up **no. 8** until it stops on rib. Install clamp **no. 12**.

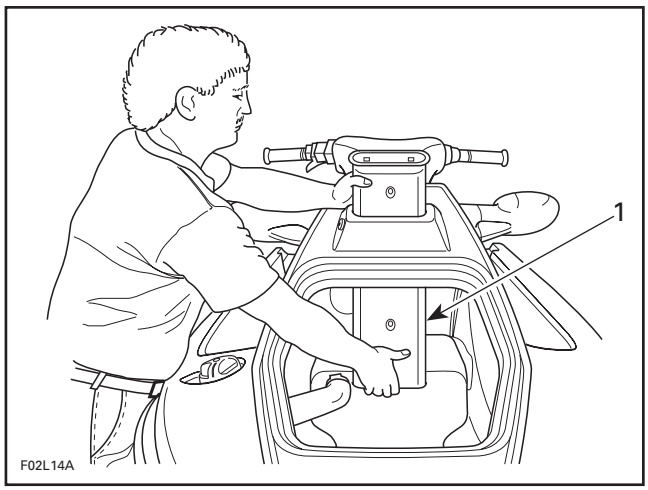
Install baffle pick up **no. 8** into fuel tank and push it until it sits on fuel tank neck. Install clamp **no. 10** and torque both clamps to 3 N•m (27 lbf•**in**).

GTS Model Only

Insert vent tube in body and clip it in place.

◆ WARNING

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



1. Install vent tube

FUEL SYSTEM PRESSURIZATION

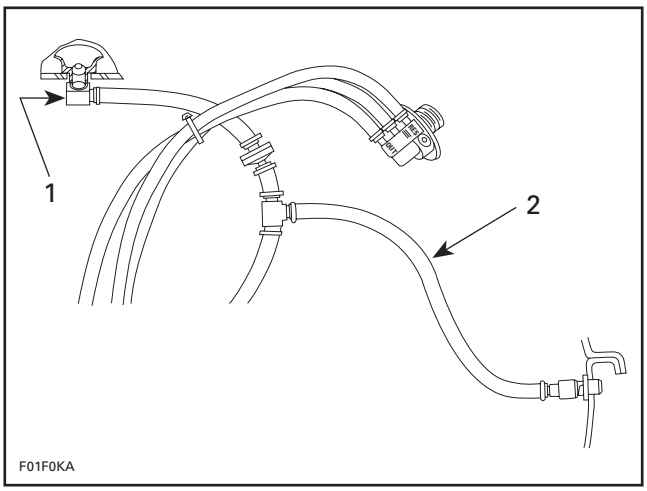
◆ WARNING

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

Pressure Test

Proceed as follows:

– Fill up fuel tank.
– Disconnect air inlet hose of fuel tank from body.
– Install a hose pincher (P/N 295 000 076) on fuel tank vent hose.



TYPICAL

1. *Disconnect air inlet hose*
2. *Install a hose pincher to vent hose*

– Connect pump gauge tester (P/N 295 021 800) to air inlet hose.

NOTE: This pump is included in the ENGINE LEAK TESTER KIT (P/N 295 500 352).

– Turn fuel valve to OFF position and pressurize fuel system to 34 kPa (5 PSI). If no leaks are found, turn fuel valve to ON position 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: The system must maintain a pressure of 34 kPa (5 PSI) during 10 minutes. Never pressurize over 34 kPa (5 PSI).

Reconnect air inlet hose of fuel tank to body.

◆ WARNING

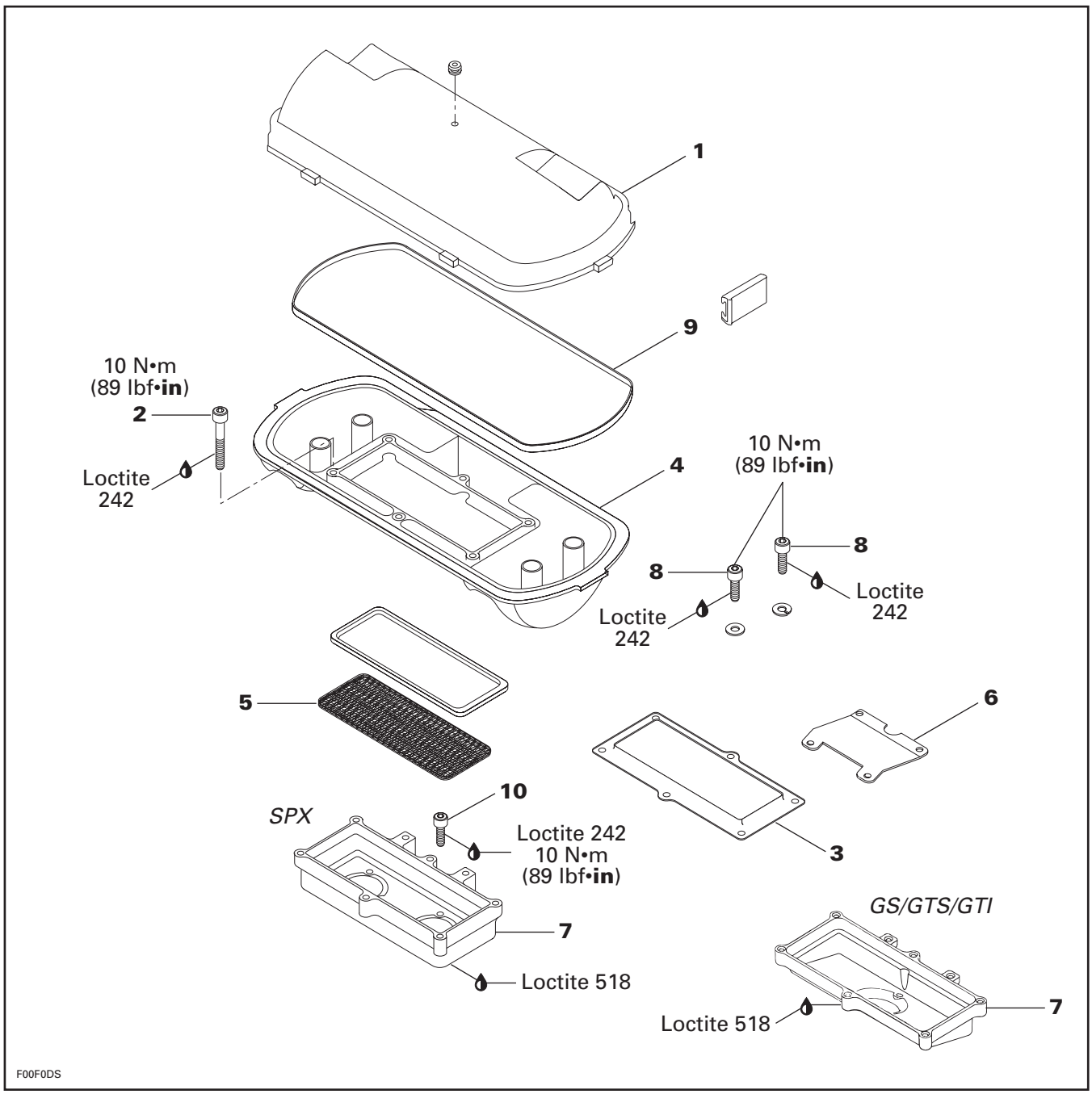
If any leak is found, do not start the engine and wipe off any fuel leakage. Do not use electric powered tools on watercraft unless system has passed pressure test.

NOTE: Before removing the hose pincher, block with your finger the outlet fitting 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.

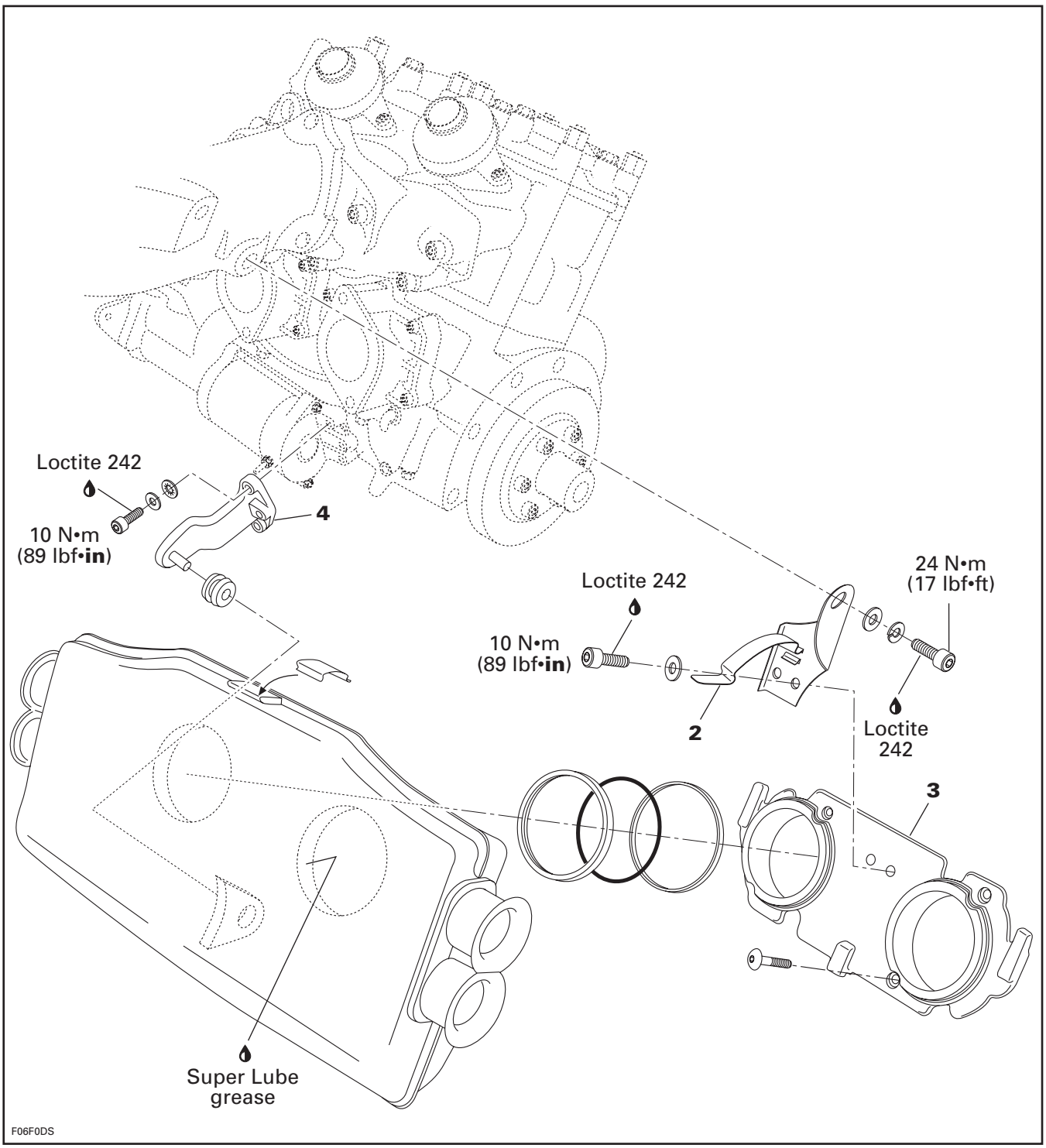
Remove hose pincher from fuel tank vent hose.

AIR INTAKE

SPX, GS, GTS and GTI Models



GSX Limited, XP Limited and GTX Limited

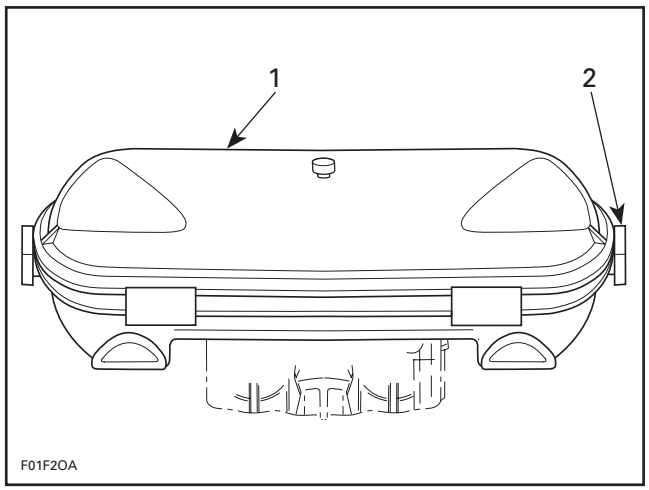


REMOVAL

SPX, GS, GTS and GTI Models

1, Air Intake Silencer Cover

Unlock the 6 retaining slides holding air intake silencer cover and remove cover.



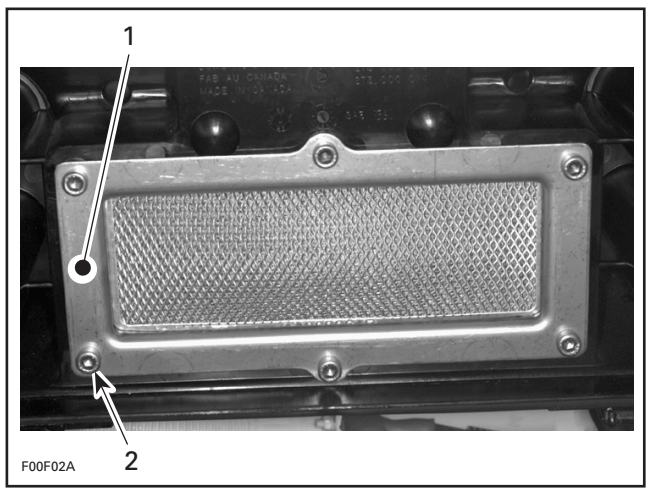
TYPICAL

1. *Air intake silencer cover*
2. *Unlock*

4, Air Intake Silencer Base

Remove screws no. 2 of retaining plate no. 3.

Pull out retaining plate no. 3 and air intake silencer base no. 4.

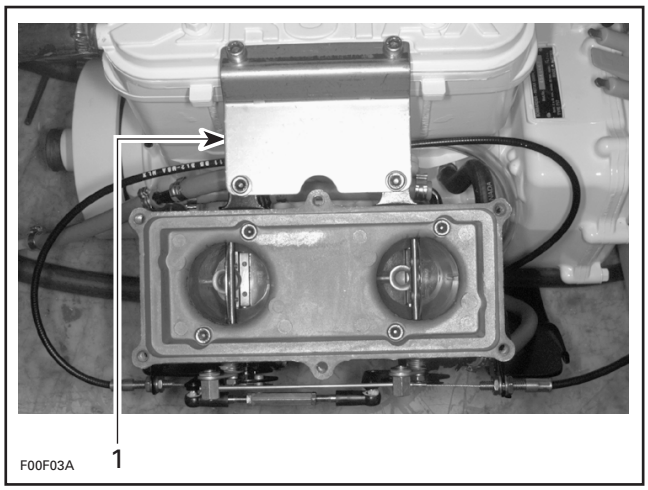


1. *Retaining plate*
2. *Remove screws*

7, Flame Arrester Base

Remove flame arrester no. 5.

Remove screws no. 8 retaining support no. 6 of flame arrester base to the cylinder head cover (717 engine) or to the exhaust manifold (787 engine).



1. *Remove support*

Remove screws no. 10 from flame arrester base then withdraw base.

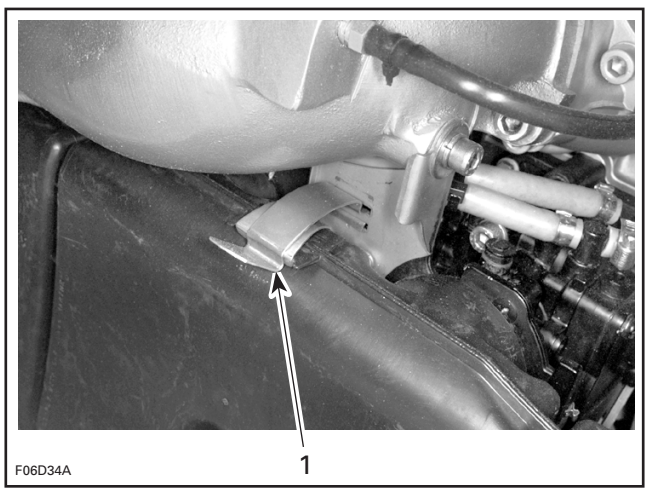
GSX Limited, XP Limited and GTX Limited

1, Air Intake Silencer

Remove the air vent tube support from body opening (GSX Limited).

Remove seat support (GTX Limited).

Unlock the clip no. 2 on top of air intake silencer.



1. *Clip*

Push the air intake silencer out of the carburetor adapter no. 3.

Pull the air intake silencer rearward to remove it from the lower bracket no. 4 and remove it in a rotating movement.

The air intake silencer is a molded piece and it can not be opened. It has an integrated flame arrester.

ASSEMBLY

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

▼ CAUTION

Do not modify air intake system, otherwise calibration will be affected.

SPX, GS, GTS and GTI Models

7, Flame Arrester Base

Apply Loctite 518 on mating surfaces of flame arrester base.

Apply Loctite 242 (blue) on screws no. 10 and torque to 10 N•m (88 lbf•**in**).

5, Flame Arrester

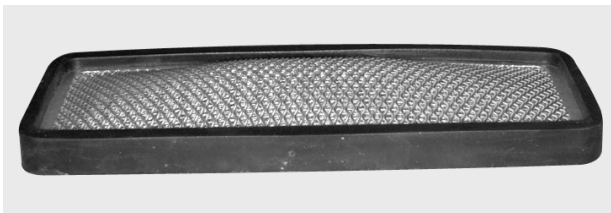
Inspect condition of flame arrester. Replace or clean as necessary.

◆ WARNING

Do not operate watercraft without flame arrester.

SPX Model

Position the flame arrester with its embossment toward TOP.



F00F04A

9, Gasket

Inspect condition of gasket. Make sure to properly installed gasket.

GSX Limited, XP Limited and GTX Limited

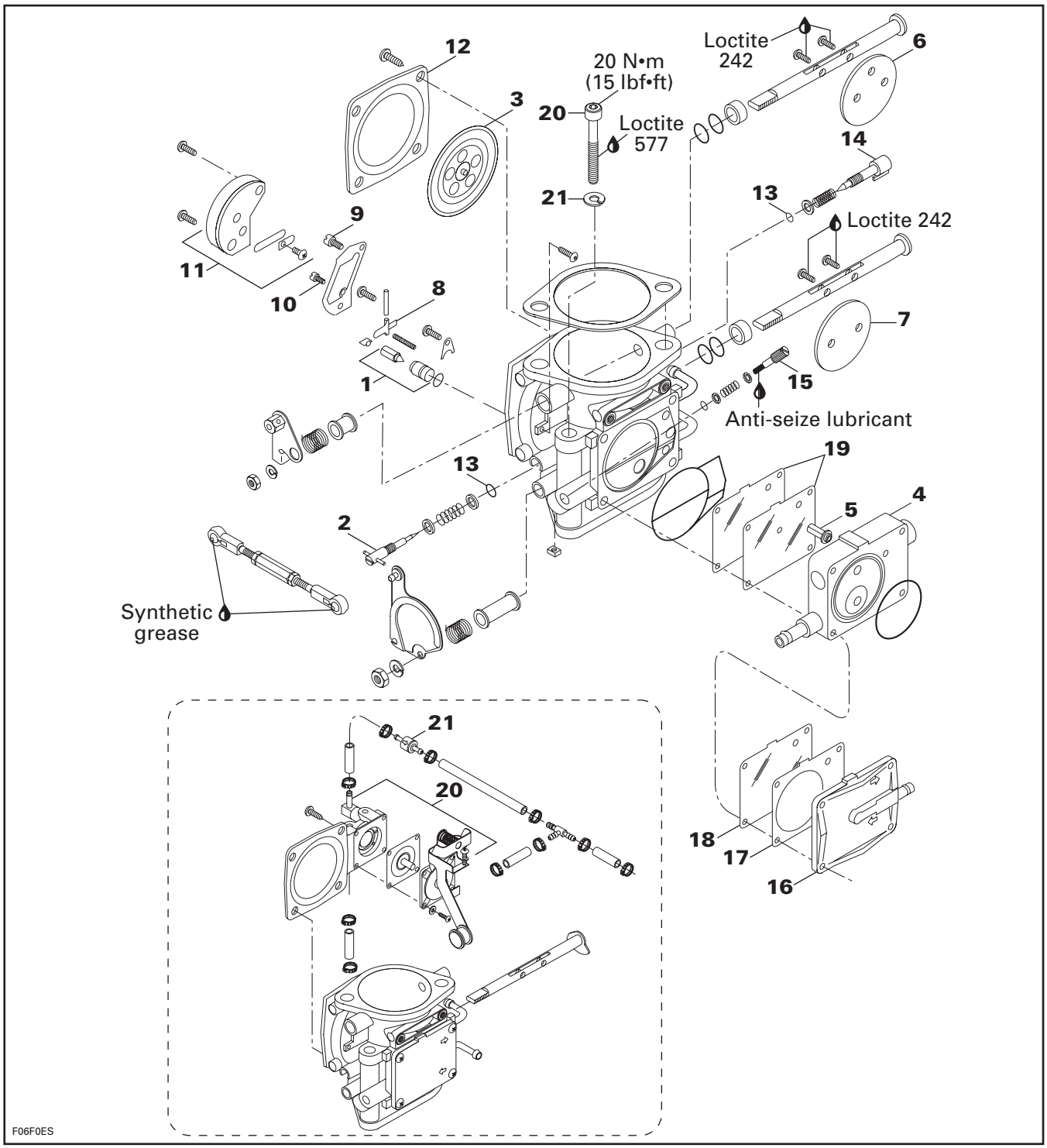
1, Air Intake Silencer

Apply Super Lube grease (P/N 293 550 014) to mating surface of air intake silencer.

Make sure the air intake silencer is retained by the lower bracket no. 4.

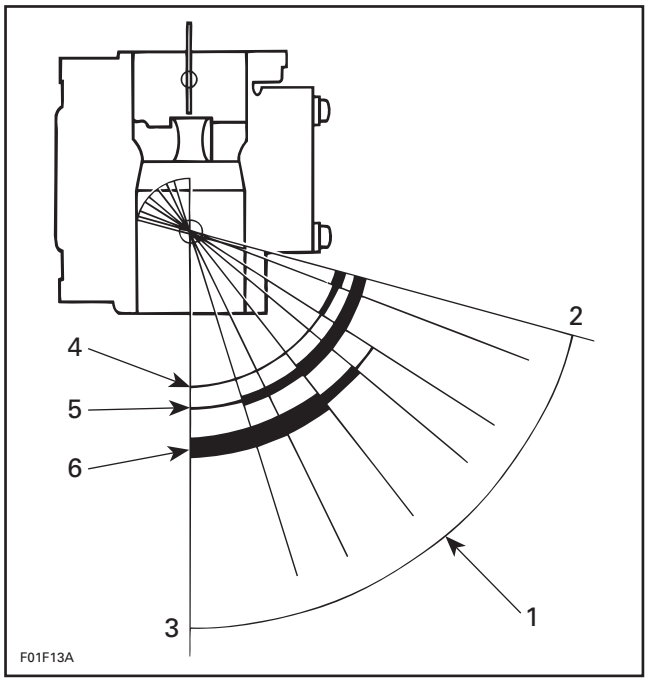
CARBURETOR

Mikuni BN-38I, BN-40I and BN-46I



GENERAL

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



VIEW FROM AIR INTAKE OPENING

1. *Throttle plate openings*
2. *Throttle plate closed*
3. *Throttle plate wide opened*
4. *Low-speed screw*
5. *Pilot jet*
6. *Main jet and high-speed screw*

The carburetor(s) is (are) equipped with a fuel accelerator pump.

The fuel accelerator pump is linked to the throttle valve via a linkage.

A metering jet in the fuel inlet hose controls fuel flow to the pump.

A check valve **no. 21** on the fuel outlet hose helps to prime the system.

REMOVAL

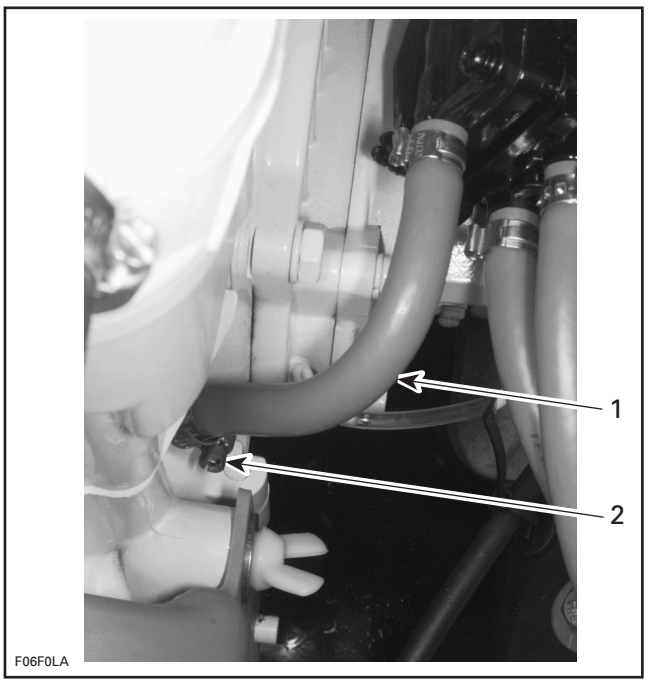
To remove carburetor(s) from engine, proceed as follows:

Remove air vent tube support (SPX, GSI and GSX Limited.

Remove air intake silencer. Refer to AIR INTAKE 06-03.

Turn fuel valve to OFF position.

Disconnect pulse line.



TYPICAL

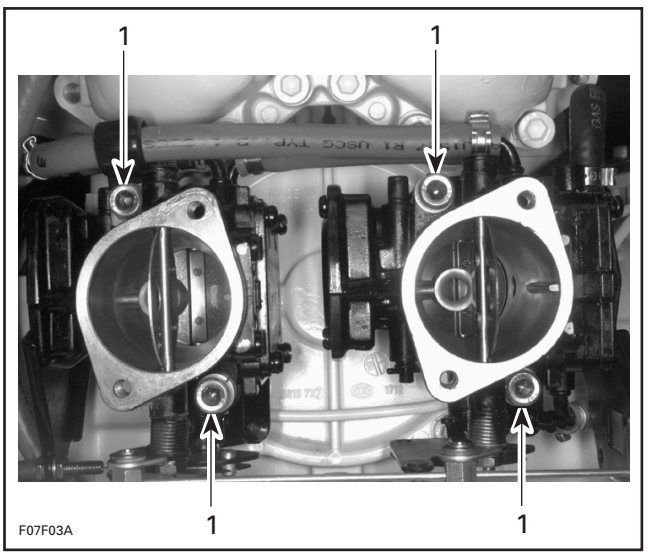
1. *Pulse line*
2. *Loosen gear clamp*

Disconnect fuel supply line from fuel pump.

Disconnect fuel return line.

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

Remove screws **no. 20** and lock washers **no. 21** retaining carburetor(s).



TYPICAL

1. *Screw*

Remove carburetor(s).

CLEANING

The carburetor exterior surfaces 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 with a carburetor cleaner. Follow manufacturer's instructions.

◆ WARNING

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

▼ CAUTION

Heavy duty carburetor cleaner may be harmful to the rubber parts, O-rings, etc. Therefore, it is recommended to remove these parts prior to cleaning.

Inspect O-rings, diaphragms and gaskets.

DISASSEMBLY AND INSPECTION

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

1, Needle Valve

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

2, Low Speed Screw

Check tip for a grooved condition. Replace if necessary.

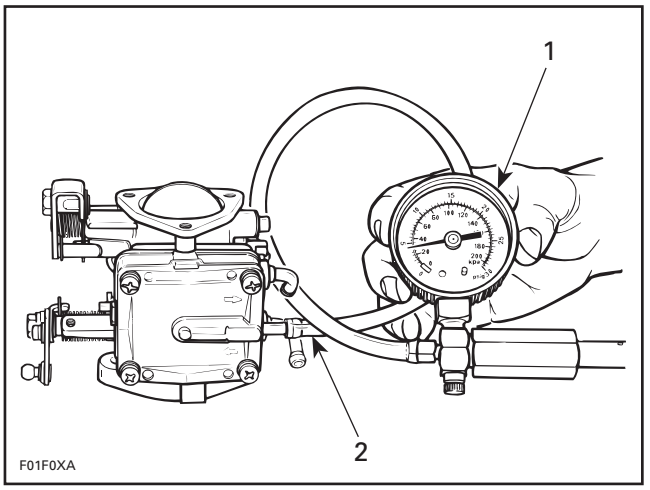
3, Diaphragm

PUMP DIAPHRAGM LEAK TEST

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

– Install pump gauge tester (P/N 295 000 114) on pulse nipple.

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



TYPICAL

1. *Pump gauge tester*
2. *Install on pulse nipple*

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

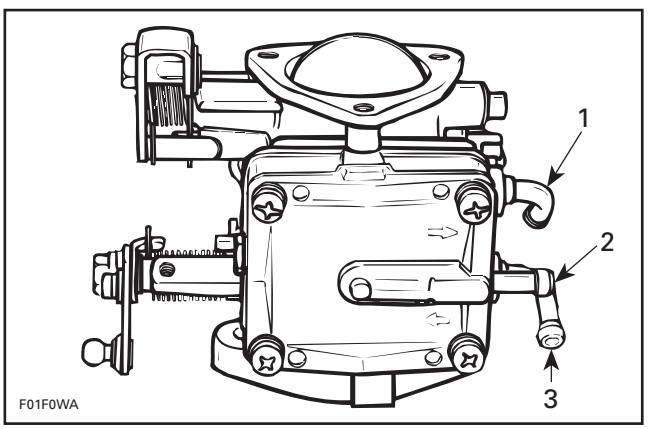
4, Pump Body

Check fuel pump valve 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.

◆ WARNING

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



TYPICAL

1. *Fuel outlet nipple*
2. *Pulse nipple*
3. *Inlet nipple*

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

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

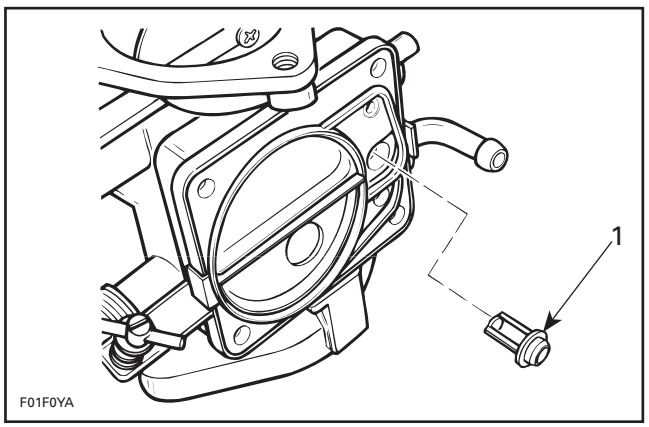
5, Filter

To verify filter condition proceed as follows:

Remove pump cover **no. 16**, gasket **no. 17**, diaphragm **no. 18** and then pump body **no. 4** and diaphragm **no. 19**.

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

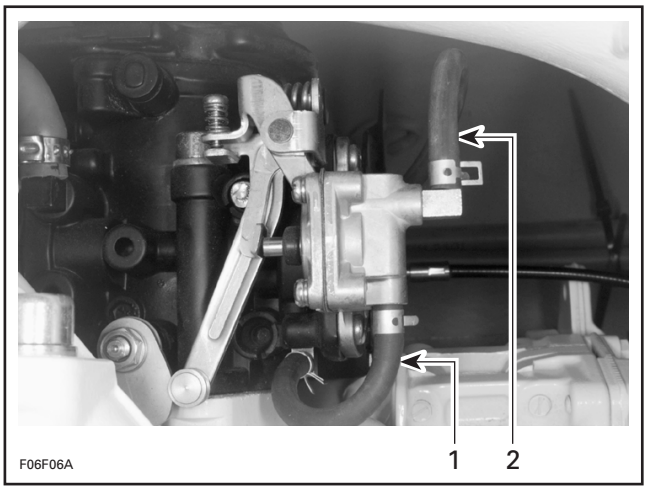
Replace filter if damaged.



TYPICAL
1. Filter

20, Fuel Accelerator Pump

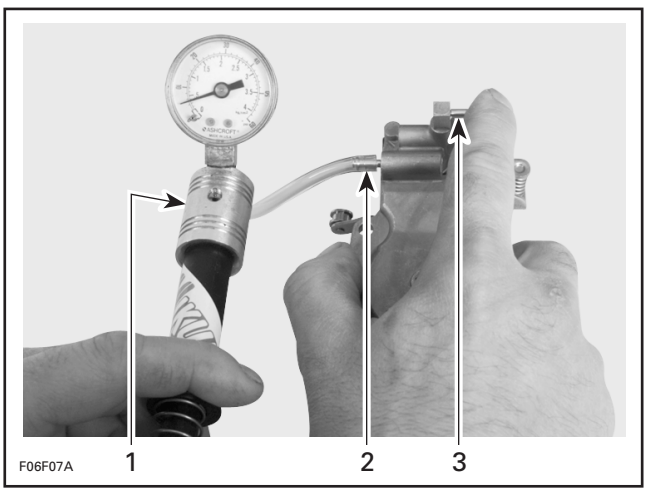
Disconnect inlet and outlet hoses from accelerator pump nipples.



TYPICAL
1. Fuel inlet hose
2. Fuel outlet hose

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

– Install pump gauge tester (P/N 295 000 083) on inlet nipple.
– Obstruct outlet nipple with a finger and hold while pumping.
– Pump tester until it reaches 28 kPa (4 PSI).



1. Pump gauge tester
2. Hose installed to inlet nipple
3. Outlet nipple obstructed

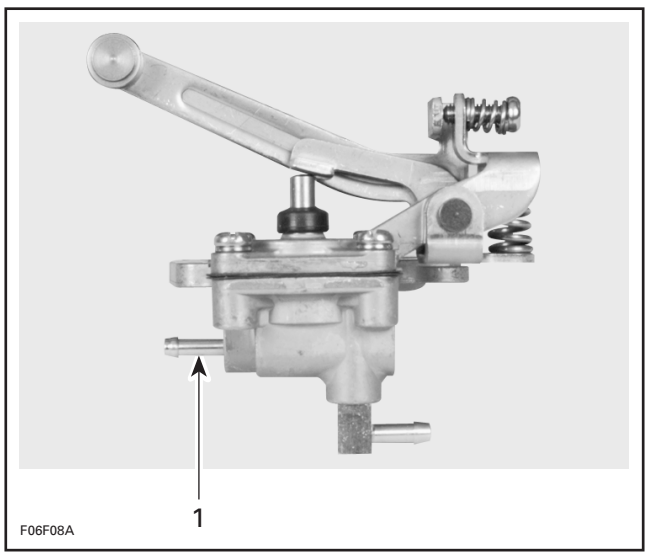
Diaphragm must stand pressure for 10 seconds. If pressure drops, replace diaphragm.

Verify accelerator pump check valves operation as follows:

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

◆ WARNING

Some fuel may be present in fuel pump.

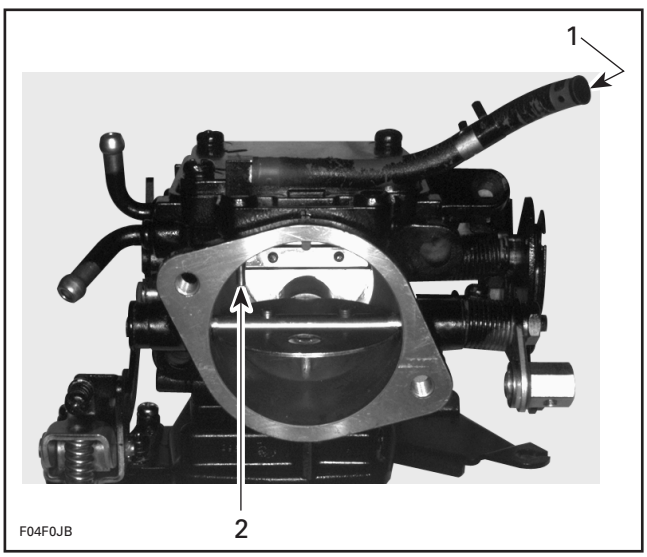


TYPICAL

1. Apply pressure and vacuum at inlet nipple

To check the injector, install pump gauge tester to the injector hose.

NOTE: Injectors are also equipped with check valves.



TYPICAL

1. Install pump gauge tester to injector hose
2. Injector

Pump tester. Injector check valve should open at 13 ± 3 PSI.

NOTE: If the obtained valve is too low, the check valve is leaking. If it is too high, less fuel will be delivered which may lead to engine hesitation under acceleration.

ASSEMBLY

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

6,7, Choke Plate and Throttle Plate

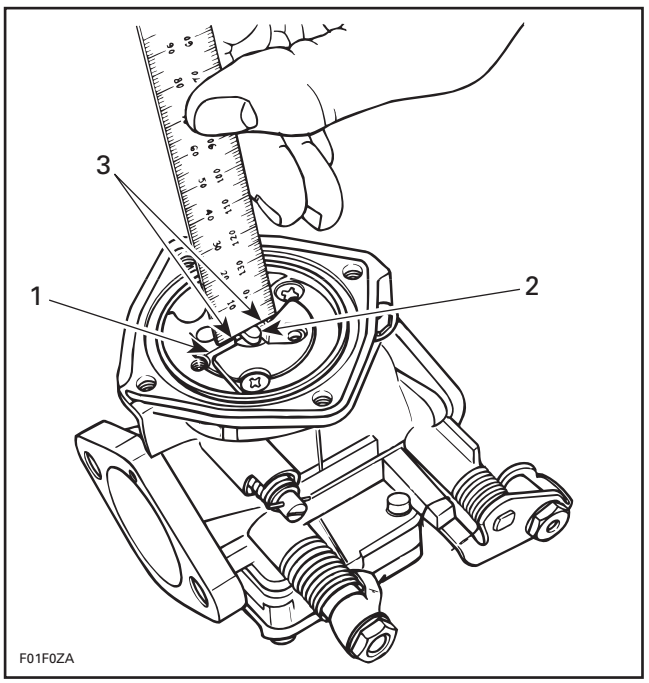
When installing plate onto shaft, close plate so that it centers into carburetor bore. Firmly tighten screws.

▼ CAUTION

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

8, Needle Valve Lever

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

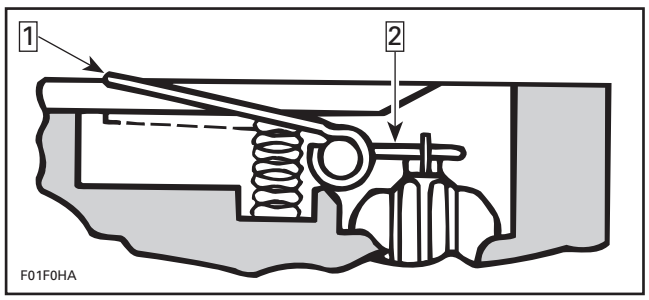


1. Metering chamber floor
2. Lever end
3. Flush

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

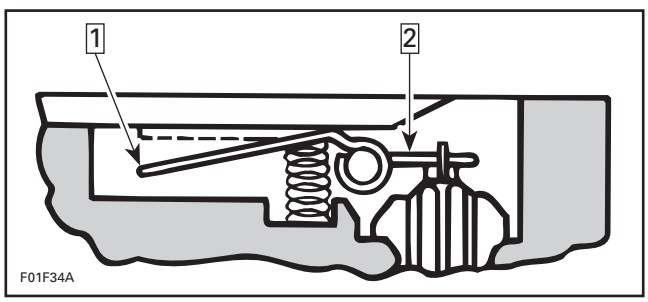
▼ CAUTION

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



HIGH LEVER

Step 1 : Depress here
Step 2 : Push tab down



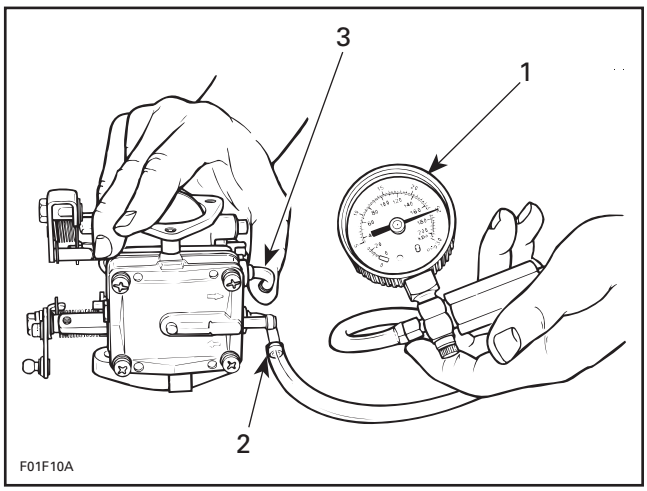
LOW LEVER

Step 1 : Depress here
Step 2 : Pry up here

POP-OFF PRESSURE TEST

Proceed as follows:

– Install pump gauge tester on carburetor fuel inlet nipple.
– Obstruct fuel return nipple with a finger.
– Pump tester until inlet release pressure is reached (seen by a sudden pressure drop).



TYPICAL

1. Pump gauge tester
2. Install on inlet nipple
3. Obstruct outlet nipple

Refer to the following table for pop-off pressure specifications:

MODELS	V.S. (mm)	SPRING (g)	POP OFF (min.)	POP OFF (max.)
SPX	1.5	95	36	40
GS	1.5	95	36	40
GSX Ltd	2.0	95	19	23
XP Ltd	2.0	95	19	23
GTS	1.5	95	36	40
GTI	1.5	95	36	40
GTX Ltd	2.0	95	19	23

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

If pop-off 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 or 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.

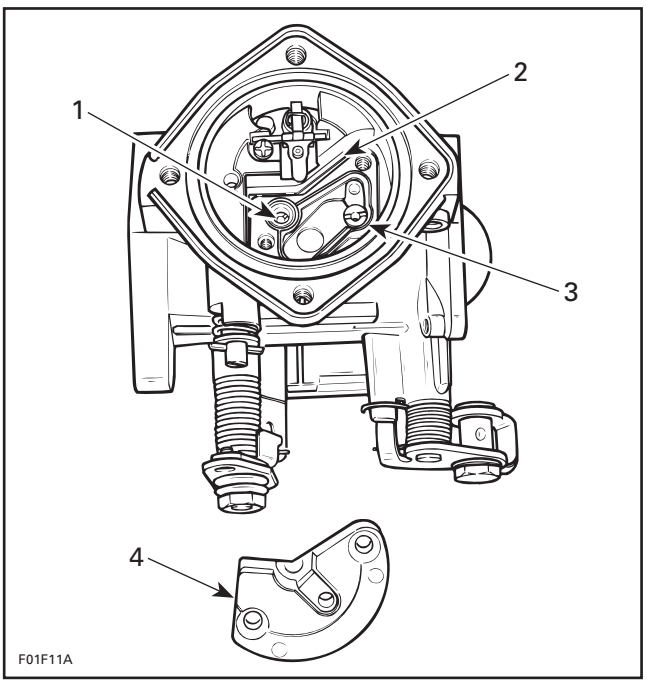
9,10, Main Jet and Pilot Jet

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.



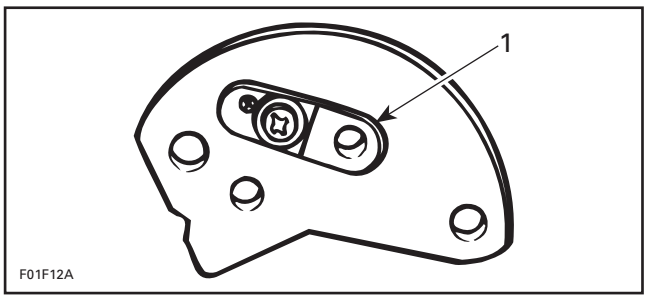
TYPICAL

1. *Pilot jet*
2. *Gasket*
3. *Main jet*
4. *Check valve housing removed*

11, 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.



1. *Check valve*

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

3,12, Diaphragm and Cover

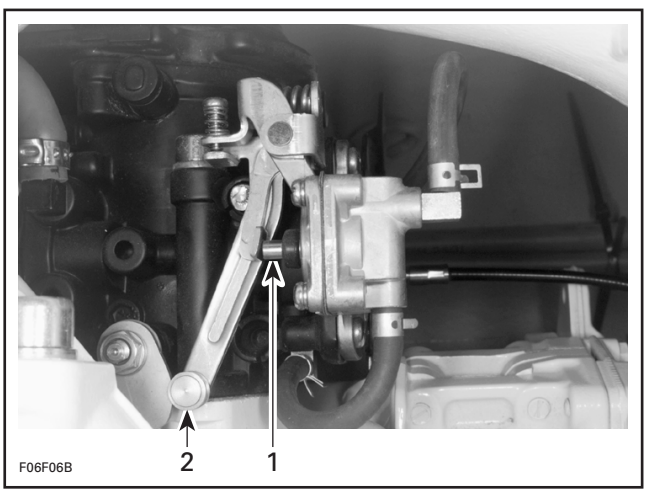
Install diaphragm with its integrated O-ring into carburetor groove. Make sure that the tab of cover is inserted into carburetor notch.

13, O-ring

When installing O-rings of low speed and high speed screws, apply some BOMBARDIER LUBE (P/N 293 600 016) to prevent sticking.

20, Fuel Accelerator Pump

Lubricate pump plunger, roller and cam with synthetic grease (P/N 293 550 010) and roller shaft with BOMBARDIER LUBE (P/N 293 600 016).



TYPICAL

1. *Apply synthetic grease to plunger*
2. *Apply BOMBARDIER LUBE on roller shaft*

INSTALLATION

At installation, pay attention to the following:

Install carburetor(s) with gasket(s) to intake manifold (rotary valve cover for the 787 engine).

Apply Loctite 577 on screws **no. 20**. Then, install screws **no. 20** with lock washers **no. 21** and torque to 20 N•m (15 lbf•ft).

Fuel Lines and Hose Clamps

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

Properly install clamps.

◆ WARNING

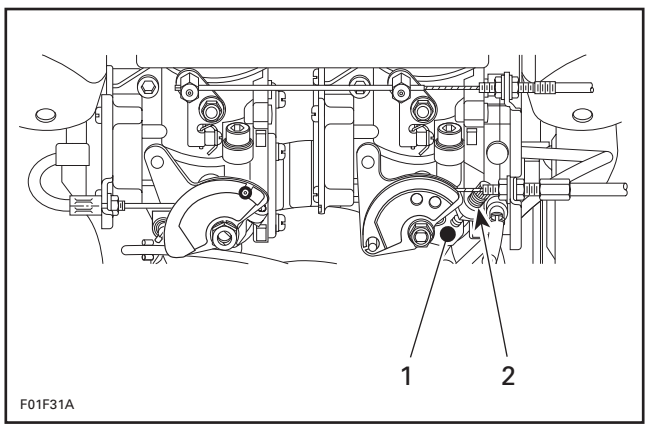
Make sure there is no leak in fuel system.

For fuel system pressurization, refer to FUEL CIRCUIT 06-02.

ADJUSTMENTS

Twin Carburetor Synchronization

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

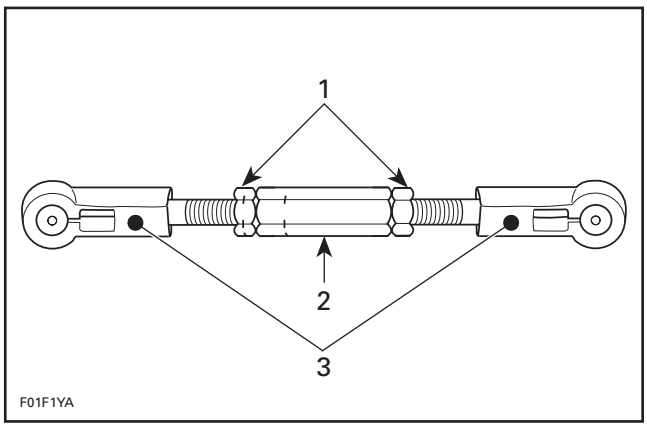


787 ENGINE SHOWN

1. *Stopper*
2. *Idle speed screw*

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.



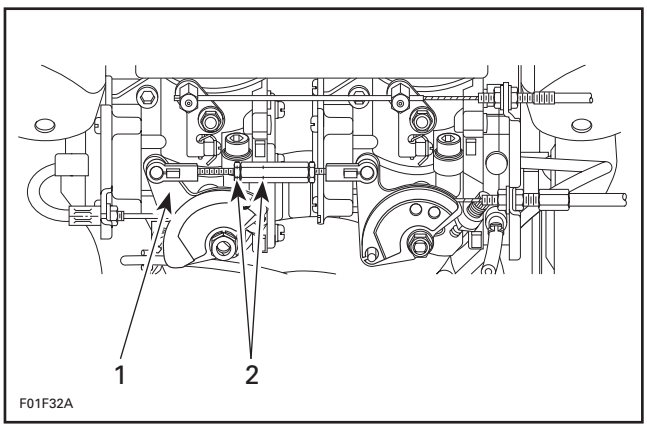
1. *Jam nuts*
2. *Adjustment nut*
3. *Flat surfaces*

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. Ensure both throttle plates are still in closed position.

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.



787 ENGINE SHOWN

1. *Throttle lever PTO side*
2. *Marks*

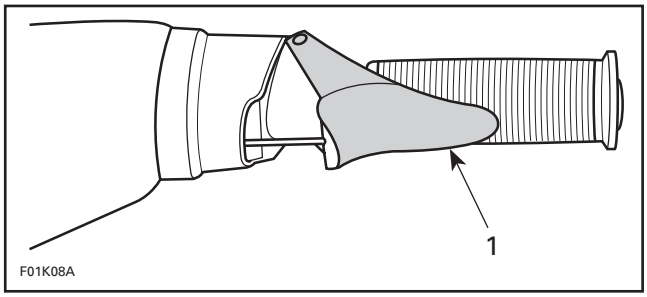
▼ CAUTION

Throttle plates must open simultaneously, otherwise this will cause engine to vibrate and/or misfire.

Throttle Cable

Lubricate cable with BOMBARDIER LUBE lubricant.

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



1. Must touch handlebar grip

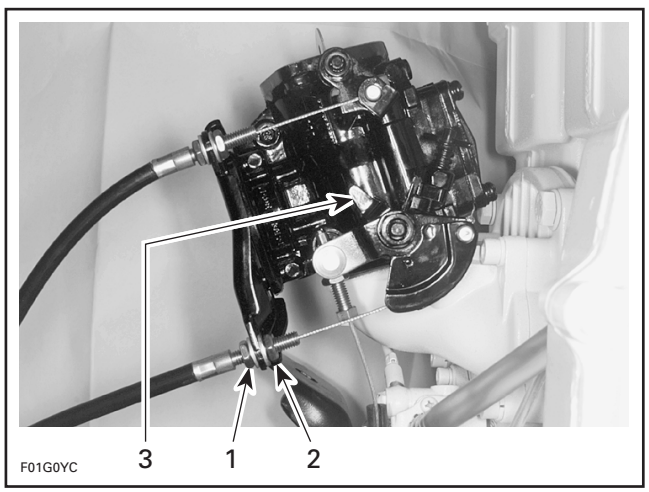
Ensure carburetor throttle plate(s) is (are) fully open at full throttle position. At this position, throttle lever stopper is almost in contact (0.5 mm (1/64 in)) with carburetor body.

NOTE: Apply a light pressure on the throttle plate(s), a slight play should be obtained.

▼ CAUTION

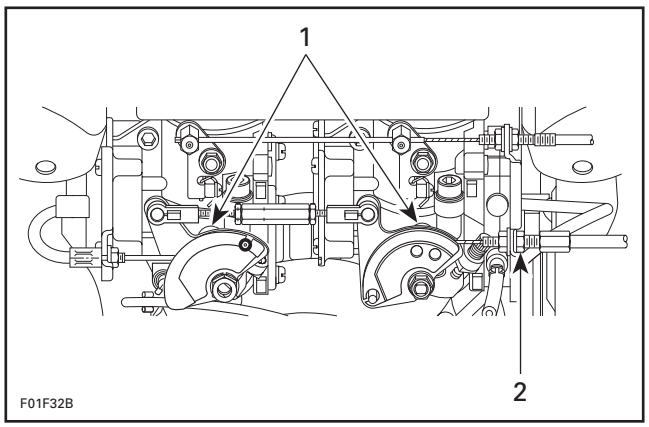
Improper cable adjustment will cause strain on cable and/or damage cable bracket or throttle lever at handlebar.

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



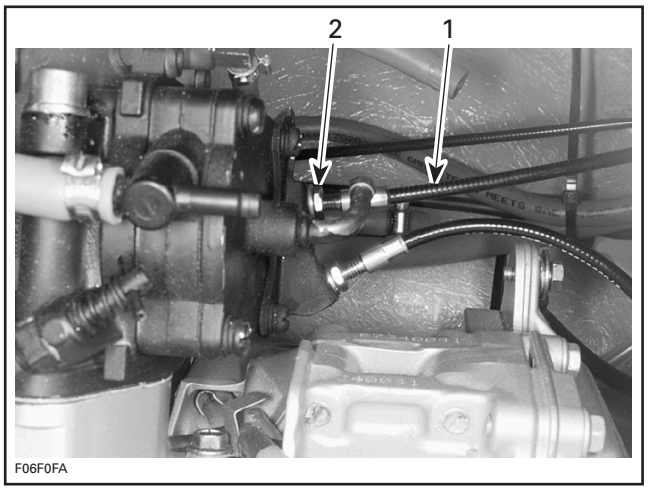
717 ENGINE

1. Adjustment nut
2. Jam nut
3. Throttle lever stopper



787 ENGINE

1. Throttle lever stoppers (behind levers)
2. Adjustment nut



947 ENGINE

1. Throttle cable
2. Adjustment nut

Tighten jam nut and recheck adjustment.

◆ WARNING

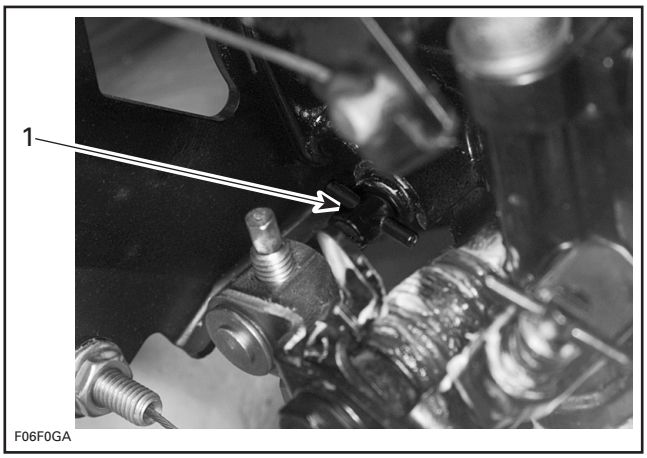
Make sure idle speed screw contacts stopper when throttle lever is fully released at handlebar.

After throttle cable adjustment, always proceed with the oil injection pump cable adjustment. Refer to OIL INJECTION PUMP 07-03.

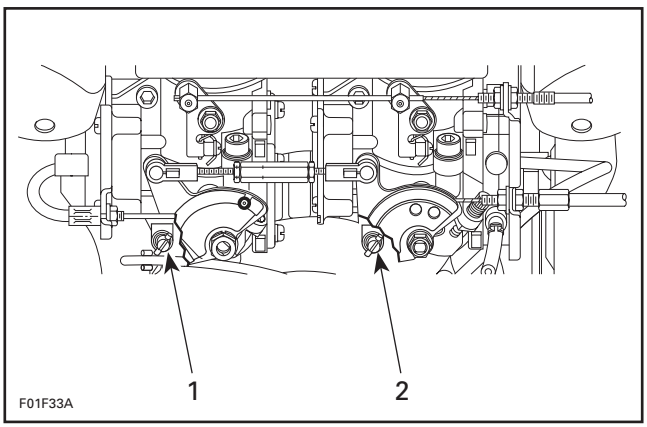
▼ CAUTION

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

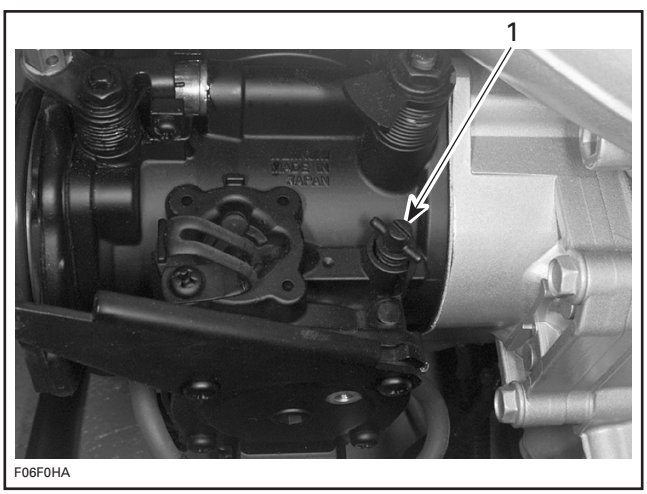
2, Low Speed Screw



717 ENGINE
1. *Low speed screw*



787 ENGINE
1. *Low speed screw (PTO)*
2. *Low speed screw (MAG)*



947 ENGINE
1. *Low speed screw (PTO side shown)*

▼ CAUTION

Do not attempt to set engine idle speed with low-speed screw.

Tighten low speed screw until a slight resistance is felt. Then, back it off to the specification as per following chart.

WATERCRAFT MODEL	LOW SPEED SCREW
SPX	1.5 turns
GS/GTS/GTI	1.25 turns
GSX Limited/ XP Limited/GTX Limited	2 turns

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

Start and warm up engine.

▼ CAUTION

If watercraft is out of water, engine must be cooled using the flush kit.

Check that engine idles and runs smoothly. Make sure engine reacts quickly to throttle lever depression. If necessary, readjust low speed screw (± 1/4 turn).

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.

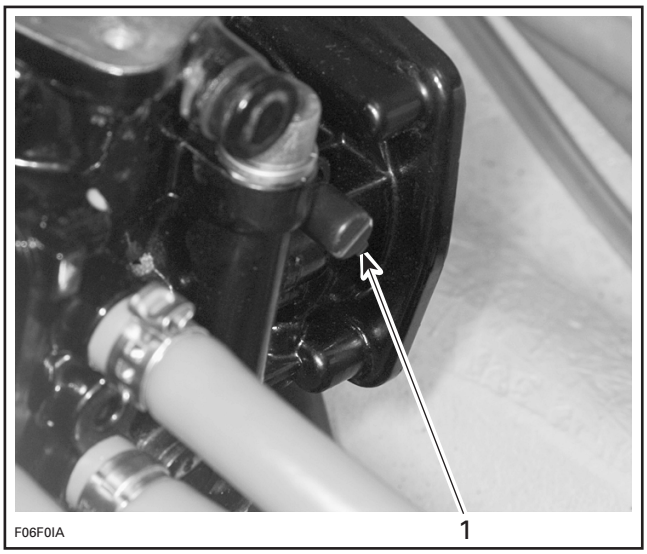
14, High Speed Screw

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

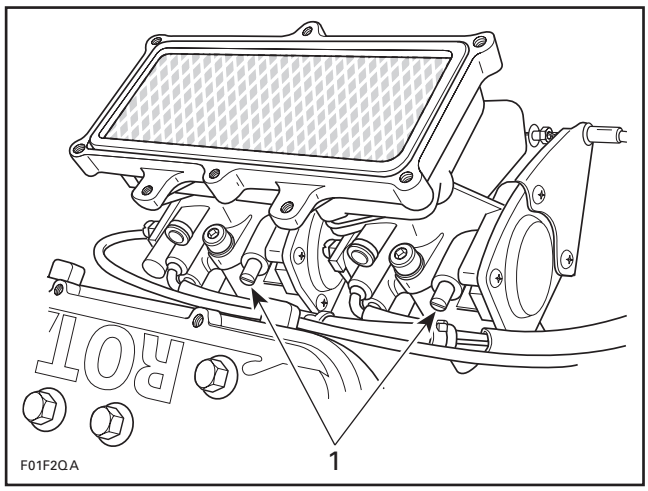
NOTE: Turning screw 1/4 turn counterclockwise enriches mixture and turning screw clockwise leans mixture.

▼ CAUTION

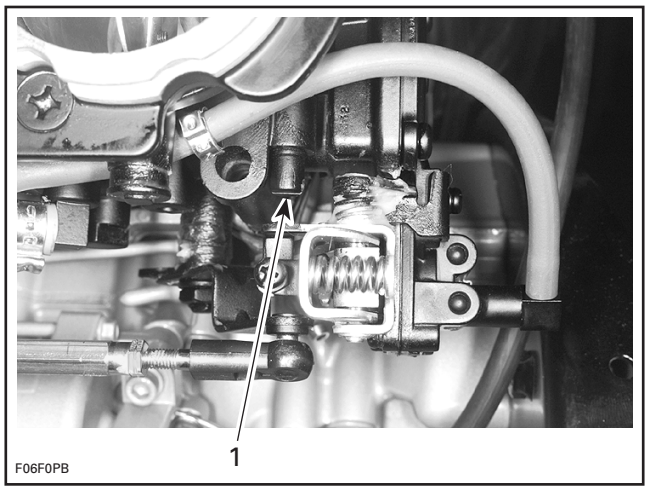
Do not attempt to adjust high speed screw by removing plastic cap.



717 ENGINE
1. High speed screw



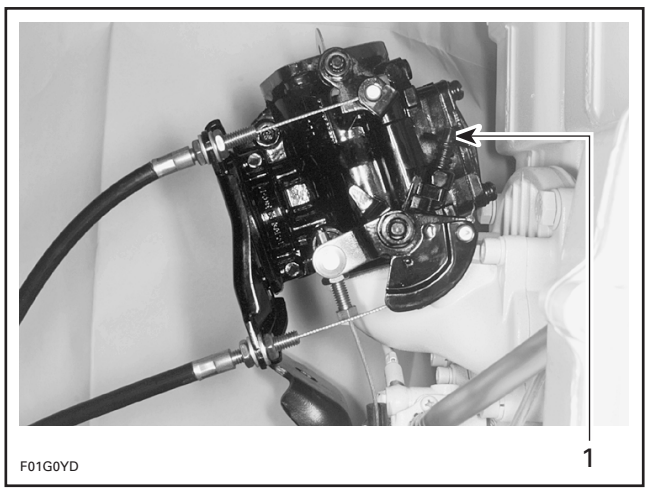
787 ENGINE
1. High speed screws



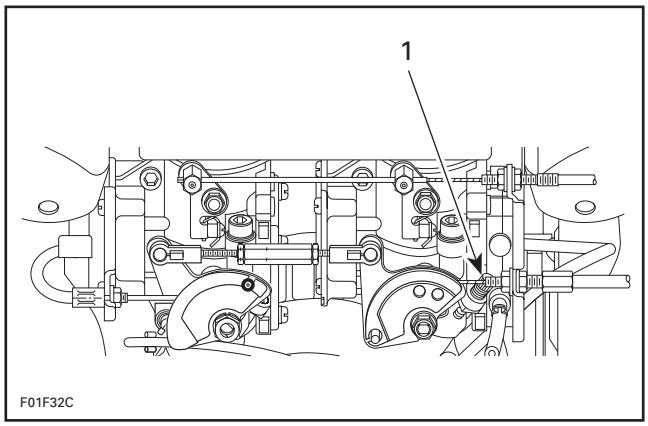
947 ENGINE
1. High speed screw (PTO side shown)

15, Idle Speed Screw

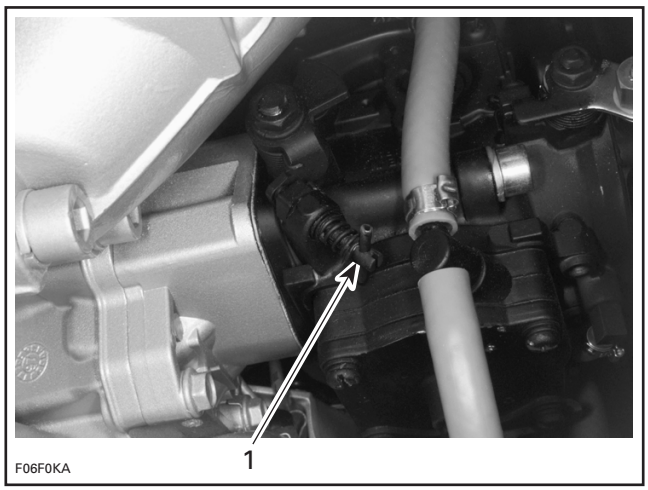
Turning screw clockwise increases engine idle speed and turning screw counterclockwise decreases engine idle speed.



717 ENGINE
1. Idle speed screw



787 ENGINE
1. Idle speed screw



947 ENGINE
1. Idle speed screw

NOTE: On twin carburetor engines, there is only one idle speed screw.

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

NOTE: To adjust idle speed, ensure flame arrester and air intake silencer are installed.

Start engine and bring to normal operating temperature.

▼ CAUTION

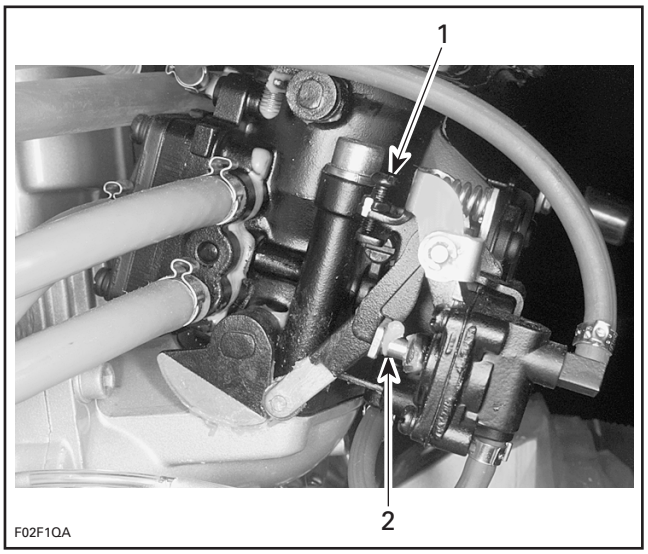
If watercraft is out of water, engine must be cooled using the flush kit.

Turn screw so that engine idles at 1500 RPM in water or 3000 RPM out of water.

20, Fuel Accelerator Pump

Ensure throttle cable is properly adjusted and idle speed is set at 1500 RPM in water.

With the engine not running, start adjustment by loosening adjustment screw until there is a small gap between lever tab and pump plunger.



717 ENGINE SHOWN
1. Adjustment screw
2. Small gap

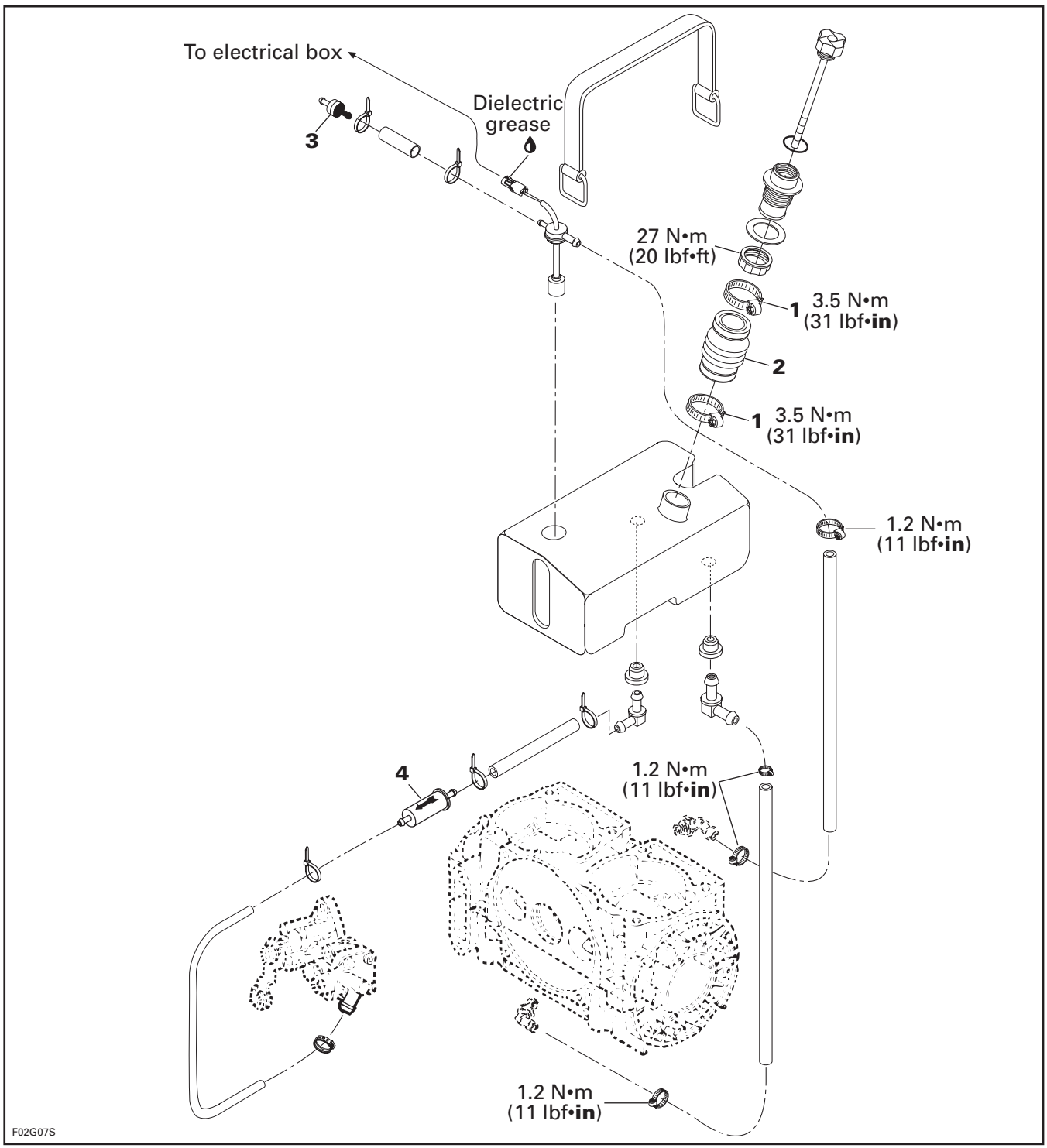
Turn adjustment screw clockwise until lever tab touches plunger.

Then, turn adjustment screw an additional 1/4 turn clockwise. The adjustment is now completed.

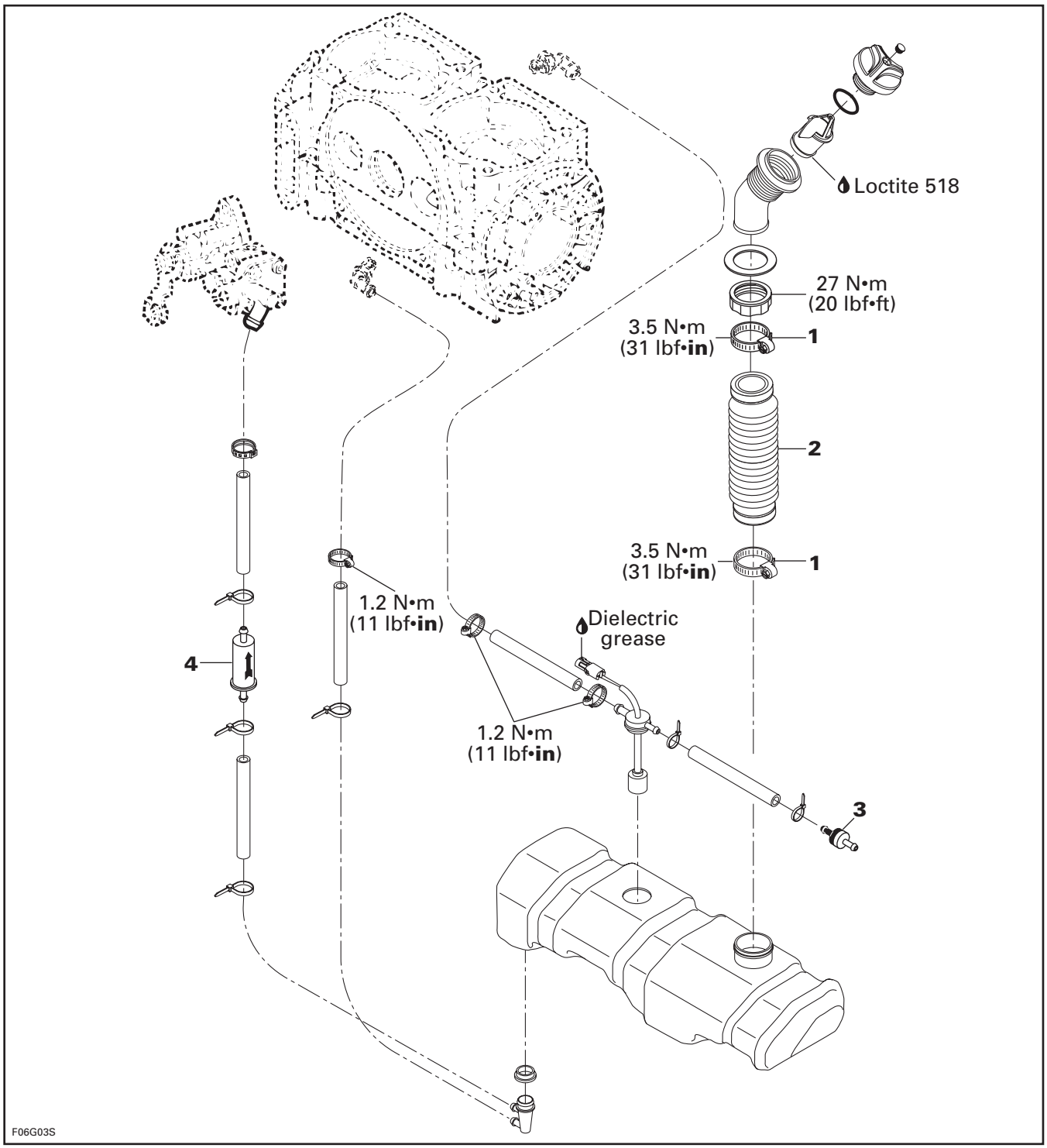
TABLE OF CONTENTS

OIL INJECTION SYSTEM

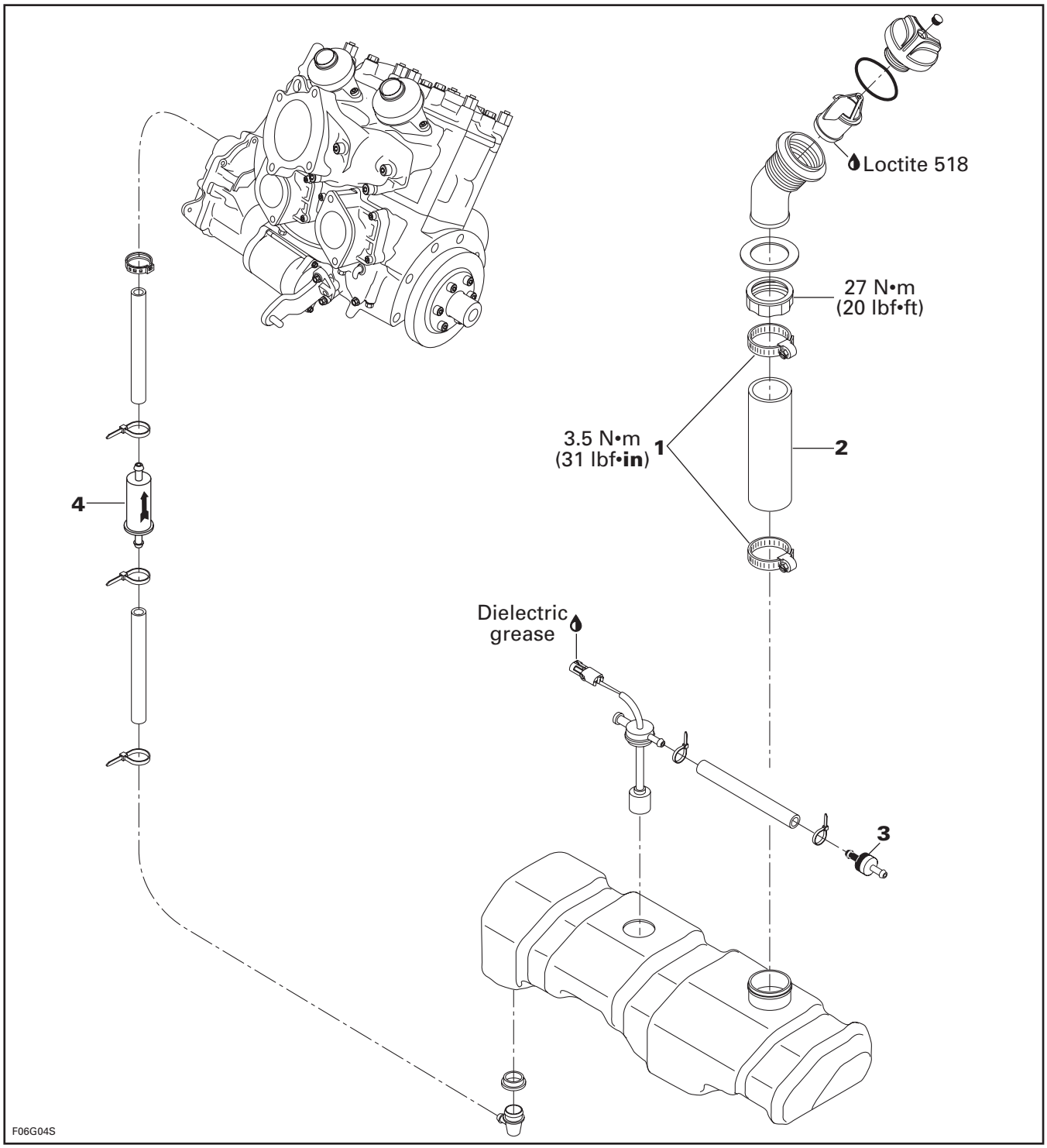
SPX and GTS Models



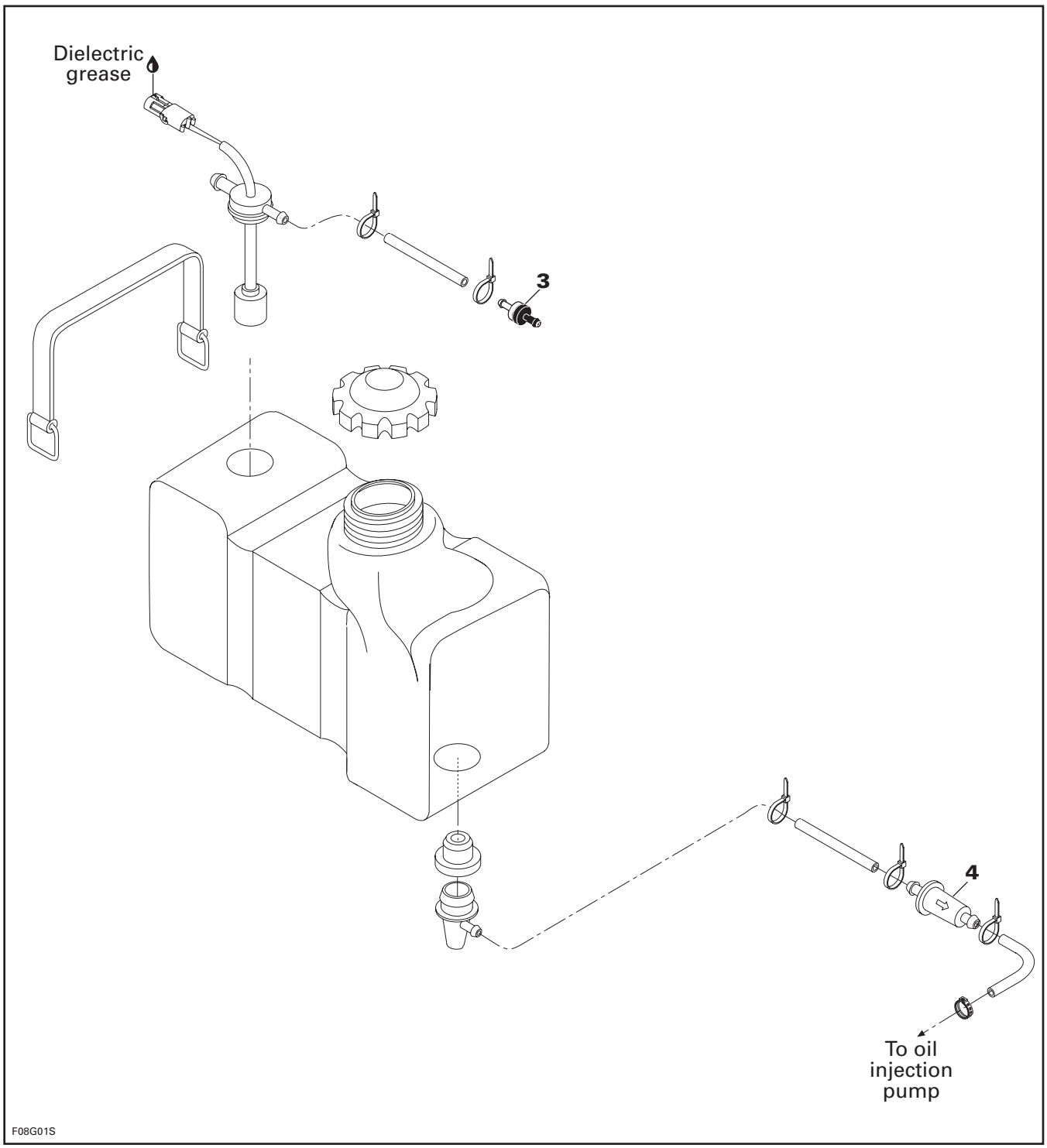
GS Model


Loctite 518
27 N•m
(20 lbf•ft)
3.5 N•m
(31 lbf•in)
1
2
3.5 N•m
(31 lbf•in)
1
1.2 N•m
(11 lbf•in)
Dielectric
grease
4
1.2 N•m
(11 lbf•in)
3
F06G03S

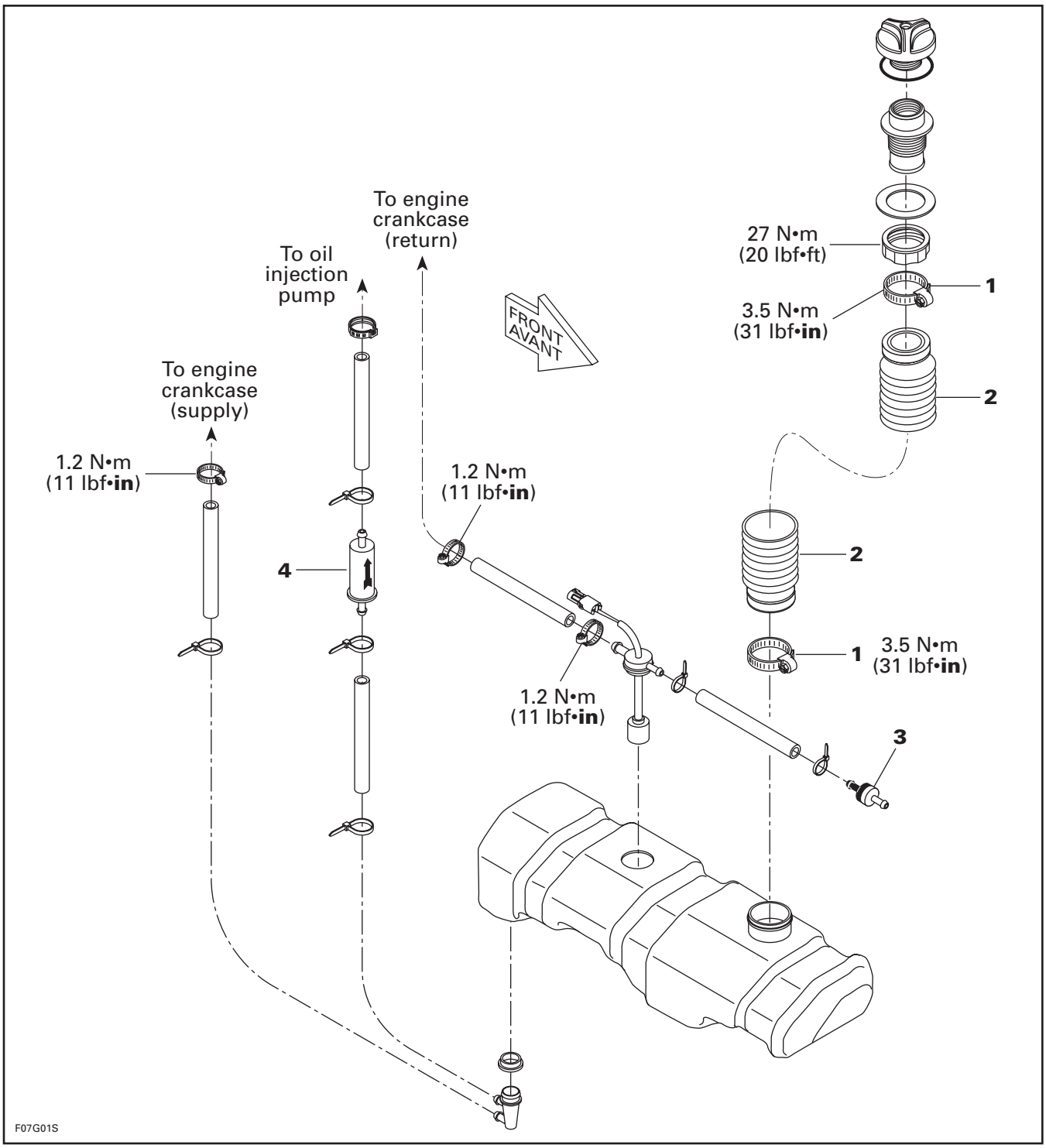
GSX Limited


Loctite 518
27 N•m
(20 lbf•ft)
3.5 N•m
(31 lbf•in)
1
2
4
Dielectric
grease
3
F06G04S

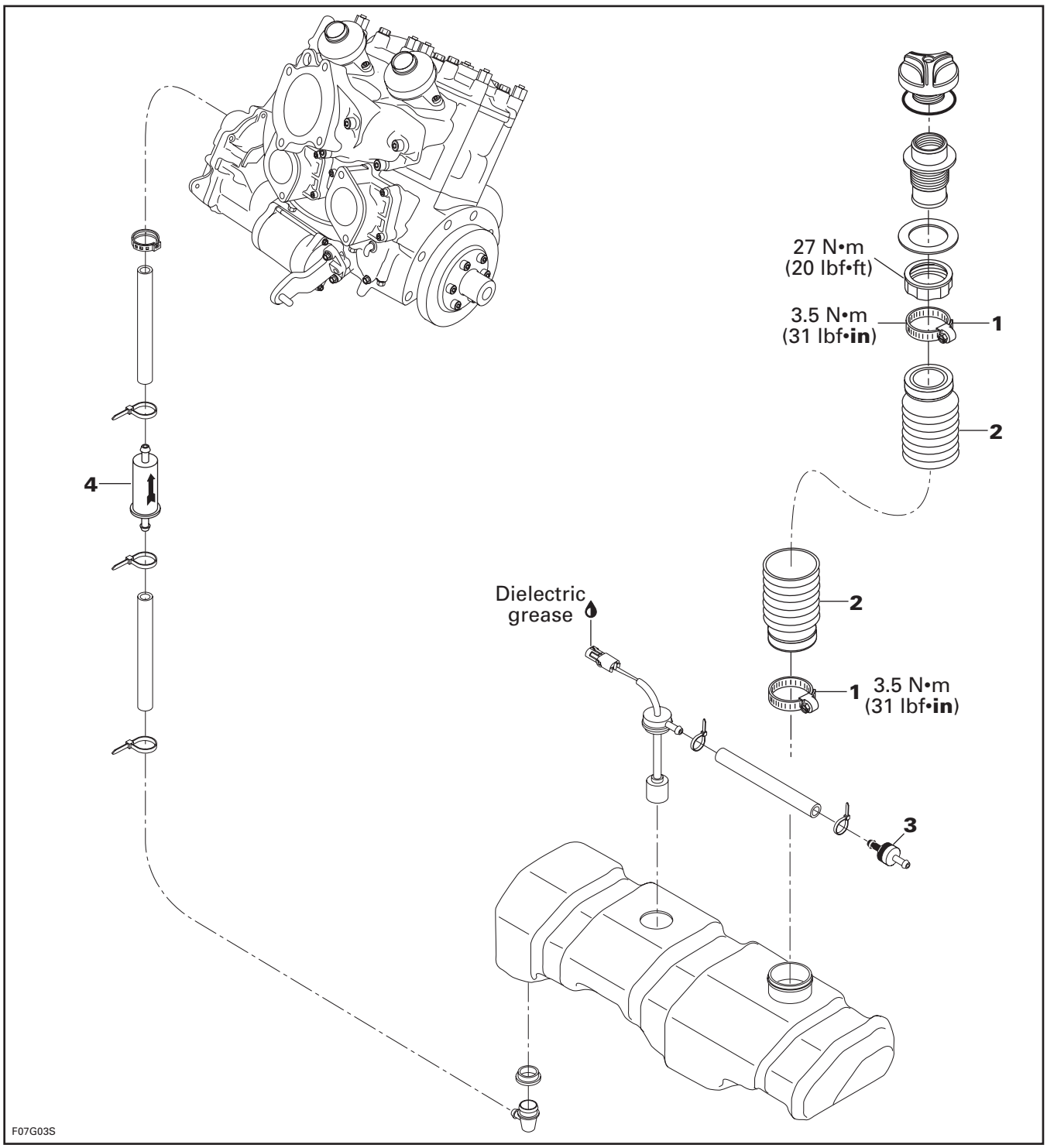
XP Limited



GTI Model


To engine crankcase (return)
To oil injection pump
To engine crankcase (supply)
FRONT
AVANT
27 N•m (20 lbf•ft)
3.5 N•m (31 lbf•in)
1
2
1.2 N•m (11 lbf•in)
4
2
1
3.5 N•m (31 lbf•in)
1.2 N•m (11 lbf•in)
3
1.2 N•m (11 lbf•in)
F07G01S

GTX Limited



GENERAL

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

Perform also a pressure test of the oil injection system.

All Models Except the XP Limited

1,2, Clamp and Hose

Verify oil filler neck hose for damage. Always ensure that clamps are well positioned and tightened. Torque clamps to 3.5 N•m (31 lbf•**in**).

All Models

3, Check Valve

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

4, Oil Filter

Oil filter should be replaced annually.

OIL SYSTEM PRESSURIZATION

◆ WARNING

Whenever oil system components are disconnected or replaced, a pressure test must be done before starting engine. Ensure to verify oil line ends for damage. Always cut damaged end before reinstallation.

Pressure Test

Proceed as follows:

– Fill up oil reservoir.

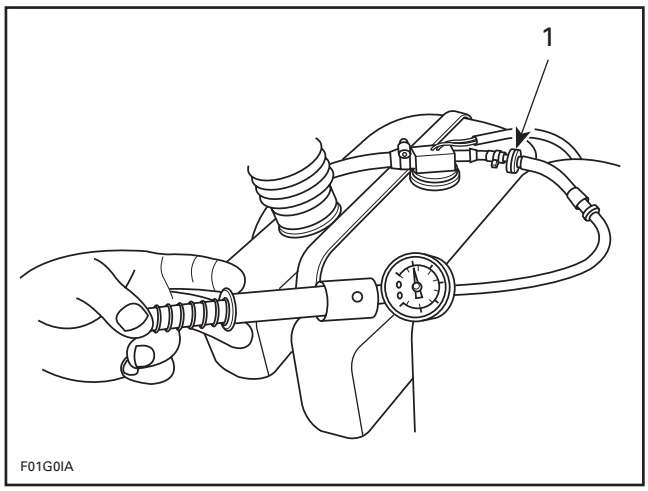
– Install a hose pincher to rotary valve shaft oil supply hose (except the 947 engine).

– Install a hose pincher to rotary valve shaft oil return hose (except the 947 engine).

– Install a hose pincher to oil injection pump supply hose.

– Connect pump gauge tester (P/N 529 021 800) to check valve of oil injection reservoir vent.

NOTE: Use the same pump included in the ENGINE LEAK TESTER KIT (P/N 295 500 352).



TYPICAL

1. Connect pump to check valve

– 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: The system must maintain a pressure of 21 kPa (3 PSI) for at least 10 minutes. Never pressurize over 21 kPa (3 PSI).

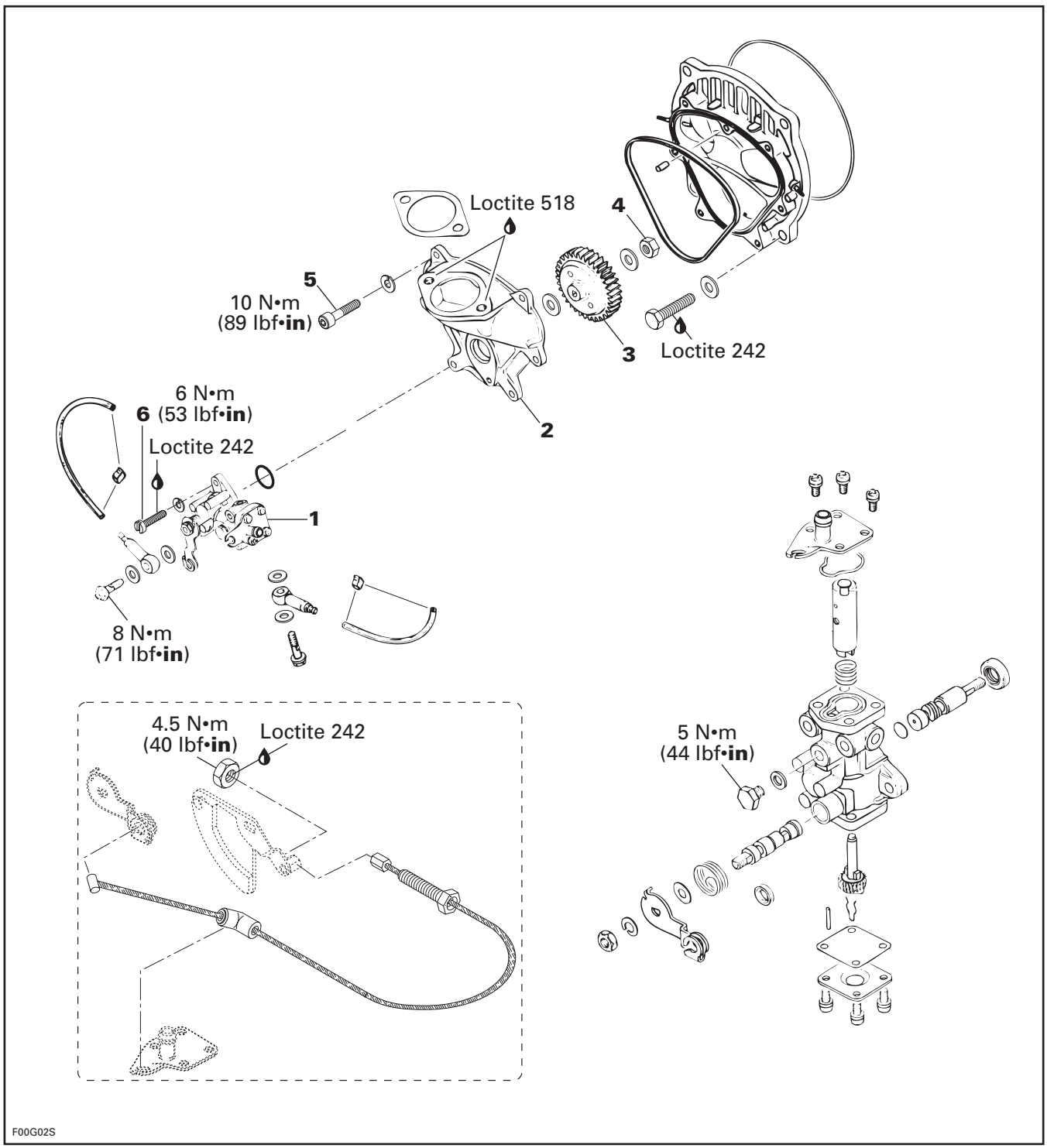
▼ CAUTION

If any leak is found, do not start the engine and wipe off any oil leakage.

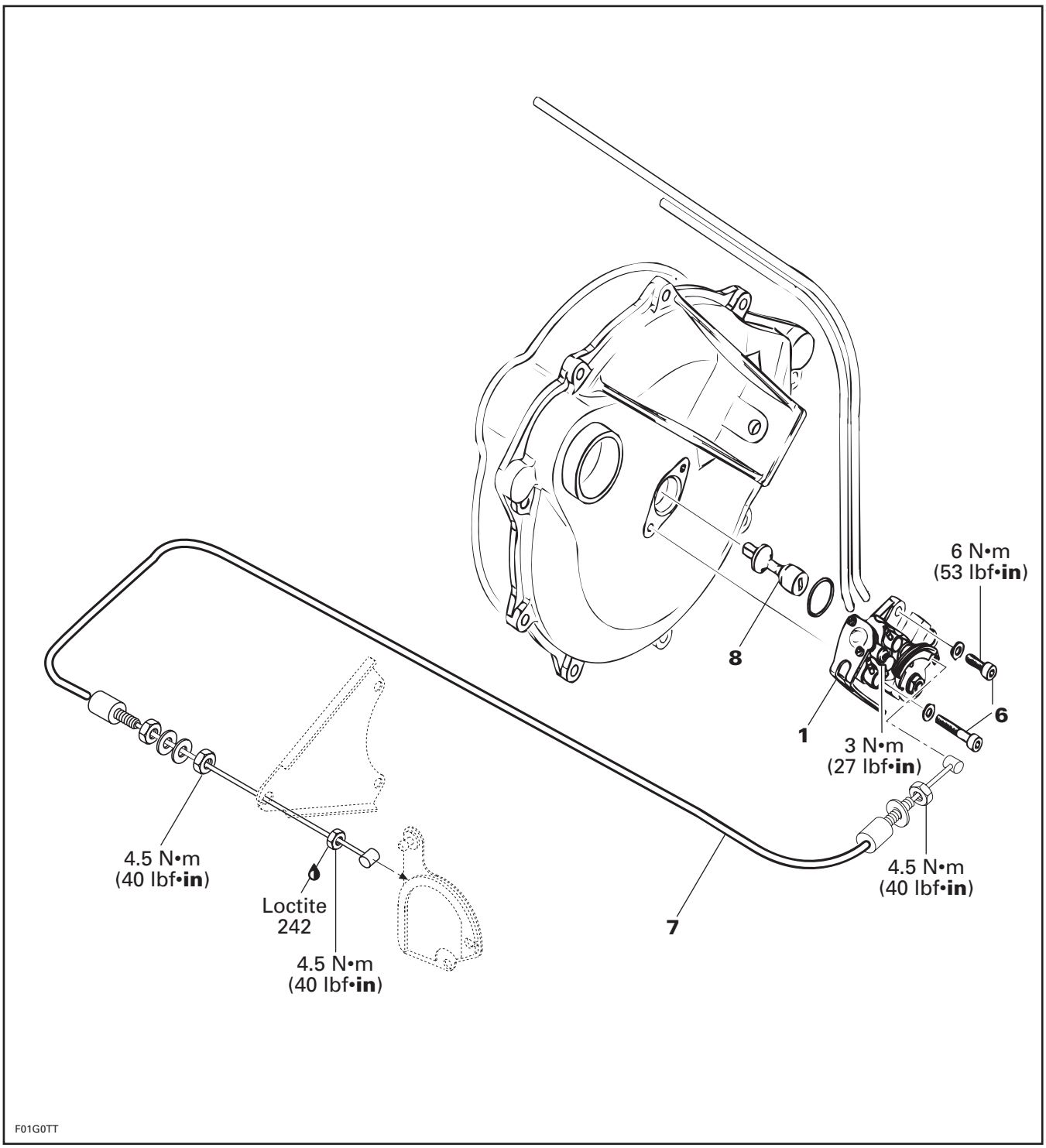
– Disconnect pump gauge tester and remove hose pinchers.

OIL INJECTION PUMP

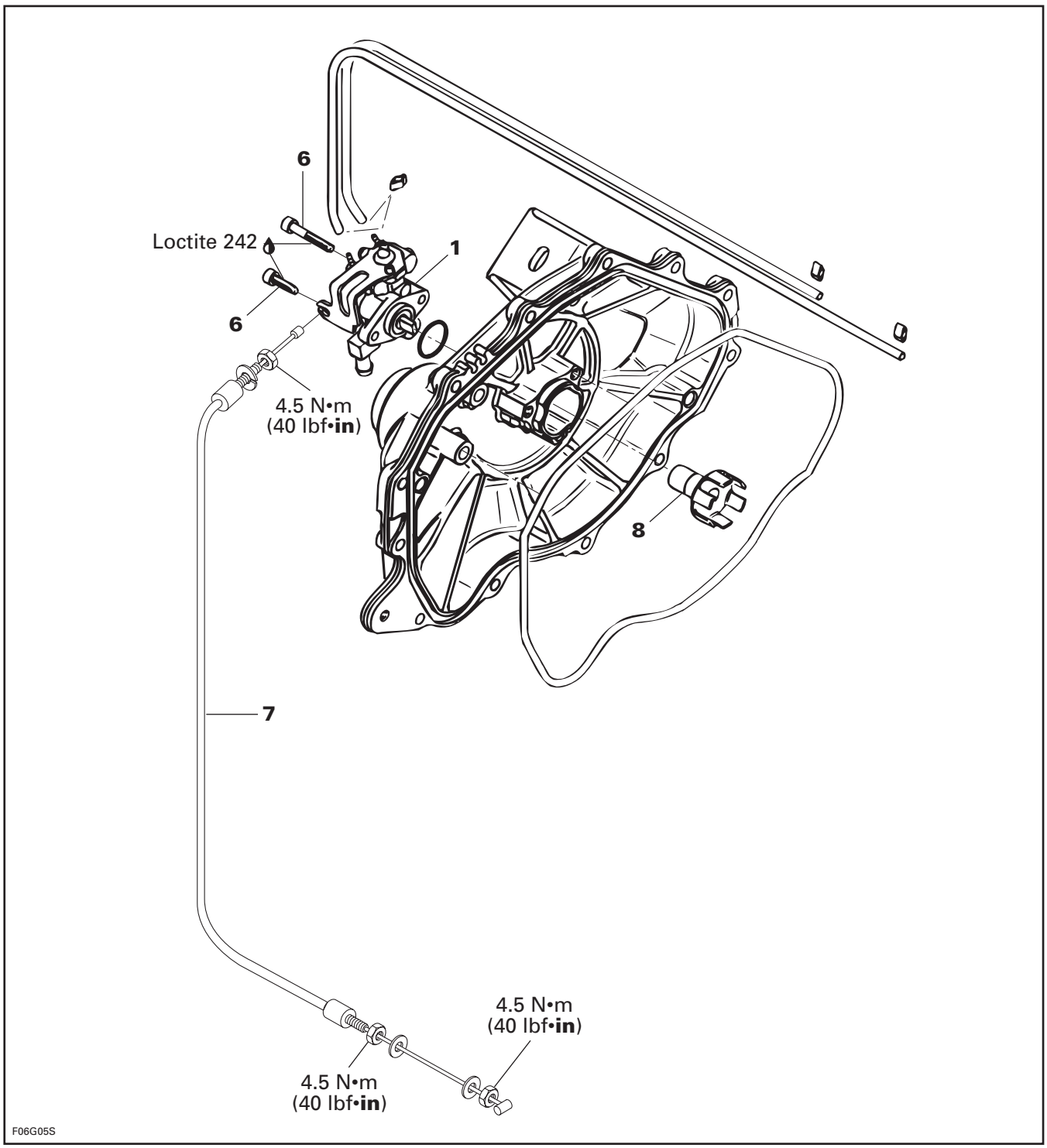
717 Engine



787 Engine


6 N•m
(53 lbf•in)
8
1
6
3 N•m
(27 lbf•in)
4.5 N•m
(40 lbf•in)
Loctite
242
4.5 N•m
(40 lbf•in)
7
4.5 N•m
(40 lbf•in)
F01G0TT

947 Engine


6
Loctite 242
1
6
4.5 N•m
(40 lbf•in)
8
7
4.5 N•m
(40 lbf•in)
4.5 N•m
(40 lbf•in)
F06G05S

REMOVAL

1, Oil Injection Pump

717 Engine

Remove air intake silencer (refer to AIR INTAKE 06-03).

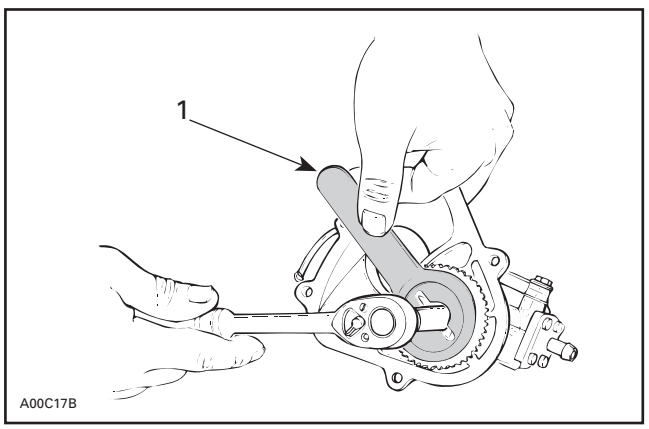
Remove carburetor (refer to CARBURETOR 06-04).

Remove rotary valve cover (refer to ROTARY VALVE 04-07).

Remove Allen screws **no. 5** retaining intake manifold **no. 2** to rotary valve cover.

Separate intake manifold from rotary valve cover.

To separate oil pump from intake manifold **no. 2**, remove oil pump gear **no. 3** using gear holder (P/N 290 277 905) and unscrew lock nut **no. 4**.



1. Gear holder

Remove 2 Allen screws **no. 6** with flat washers retaining oil injection pump to intake manifold **no. 2**.

Remove pump.

947 Engine

Remove tuned pipe head. Refer to EXHAUST SYSTEM 04-08.

787 and 947 Engines

Disconnect oil injection pump cable **no. 7**.

Remove 2 Allen screws **no. 6** with flat washers retaining oil injection pump to magneto housing cover.

Pull pump.

Disconnect oil hoses from fittings of oil injection pump.

DISASSEMBLY

NOTE: Some oil pump parts are not available in single parts. A gasket set is available for the pump.

If the pump is found defective, it should be replaced by a new one.

CLEANING

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

ASSEMBLY

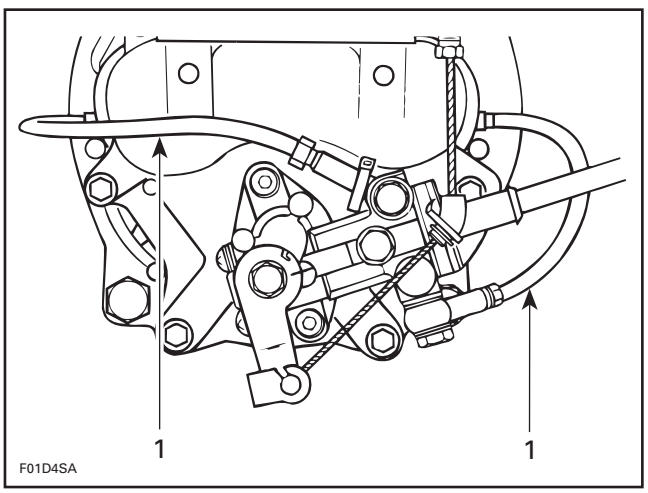
717 Engine

1,2, Oil Injection Pump and Intake Manifold

Install oil injection pump to intake manifold. Torque screws **no. 5** to 6 N•m (53 lbf•**in**).

▼ CAUTION

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



TYPICAL

1. Small oil line

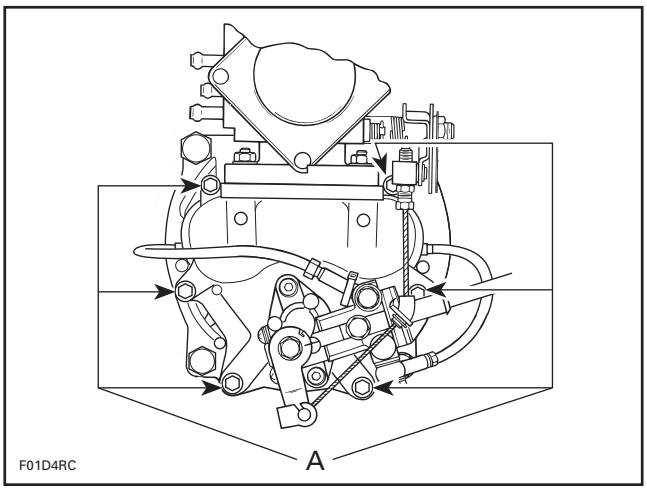
3, Oil Pump Gear

Install gear to oil injection pump shaft. Torque lock nut **no. 4** to 6 N•m (53 lbf•**in**).

NOTE: Make sure 1 washer is installed on each side of gear.

2, Intake Manifold

Install intake manifold to rotary valve cover and torque screws **no. 5** to 10 N•m (89 lbf•**in**).



TYPICAL
*A. 10 N•m (89 lbf•**in**)*

787 and 947 Engines

1,8, Oil Injection Pump and Shaft

Make sure shaft **no. 8** is installed in crankshaft end.

Install pump. Secure with flat washers and screws **no. 6**. Torque to 6 N•m (53 lbf•**in**).

Install oil injection pump cable.

ADJUSTMENT

▼ CAUTION

As oil injection pump adjustment is dependent on throttle cable position, make sure to perform throttle cable adjustment first.

Preliminary Synchronization

NOTE: To check synchronization of pump as a routine maintenance, see **Final Synchronization**. Make sure idle speed of engine is properly adjusted.

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 CARBURETOR 06-04.

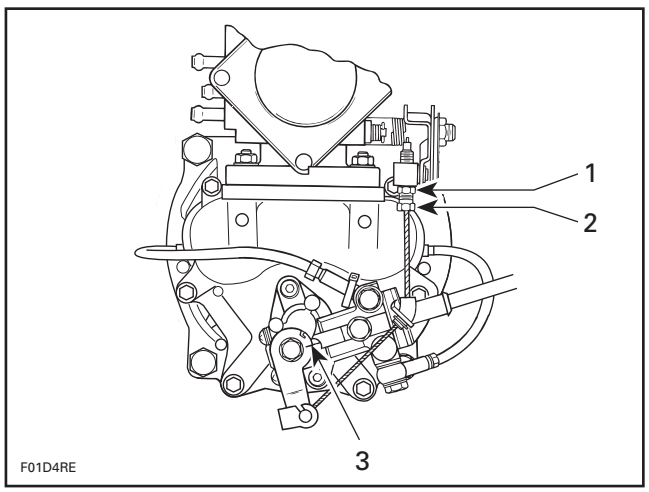
Turn idle speed screw until it contacts stopper.

Turn idle speed screw 2 turns.

Turn cable adjustment nut to align marks on pump.

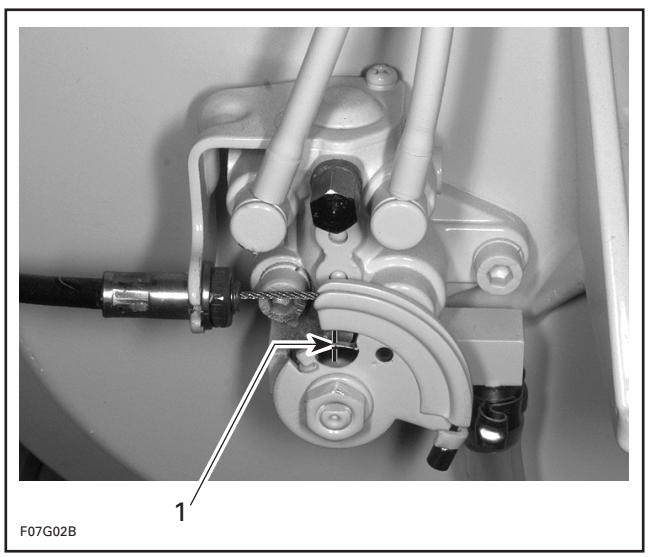
NOTE: A mirror may be used to facilitate this verification.

717 Engine



TYPICAL
1. Jam nut
2. Adjustment nut
3. Aligned marks

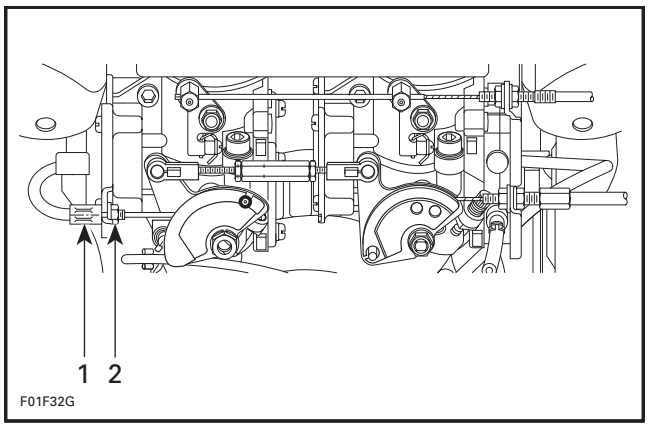
787 and 947 Engines



1. Aligned marks

787 Engine

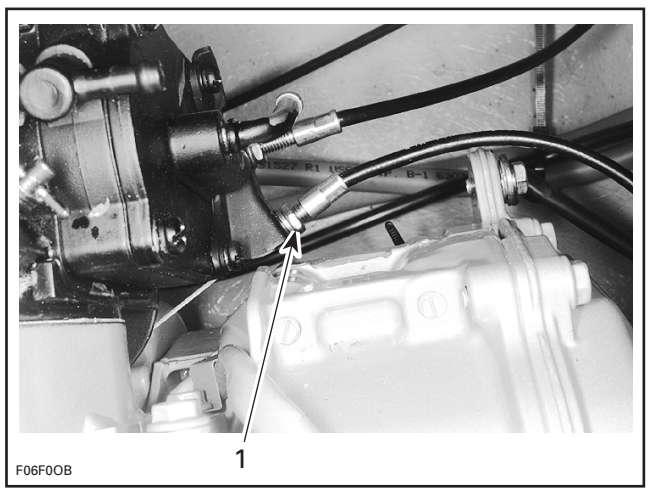
NOTE: The adjustment nut and jam nut for the oil injection pump cable are located at the cable support on PTO side carburetor.



1. Adjustment nut on this side
2. Jam nut

947 Engine

NOTE: The adjustment nut and jam nut for the oil injection pump cable are located at the cable support on MAG side carburetor.



1. Adjustment nut

All Engines

Start and bring engine to normal operating temperature.

▼ CAUTION

If watercraft is out of water, engine must be cooled using the flush kit. If air bubbles are present in the oil injection system, bleed system before operating engine.

Adjust idle speed to specification. Refer to CARBURETOR 06-04.

Stop engine.

Final Synchronization

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

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

If necessary, turn cable adjustment nut to obtain pump mark alignment. Refer to above illustrations.

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

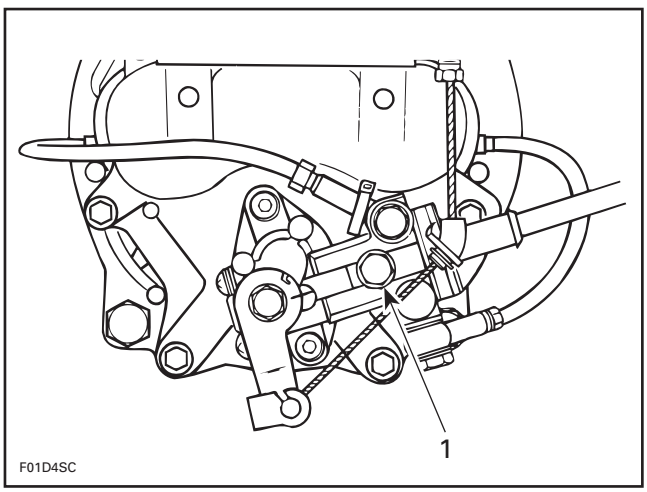
▼ CAUTION

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

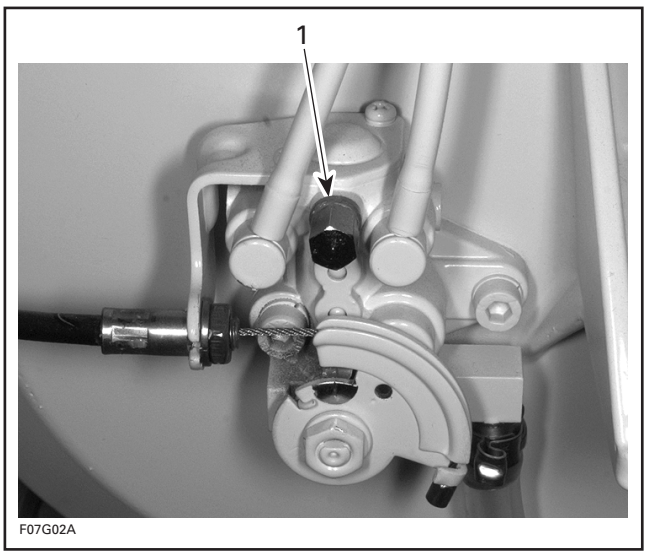
Ensure oil injection reservoir is sufficiently filled.

Install a dry rag below oil injection pump.

Loosen bleed screw to allow oil to flow.



717 ENGINE
1. Bleed screw



787 and 947 ENGINES
1. Bleed screw

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

Tighten bleed screw.

Wipe any oil spillage.

Check small oil lines of pump. 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

If watercraft is out of water, engine must be cooled using the flush kit.

CHECKING OPERATION

On Watercraft

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

Start engine and run at idle while holding the pump lever in fully open position. Oil must advance into small oil lines.

NOTE: The engine should have a rich mixture, idling irregularly and emitting smoke at exhaust outlet.

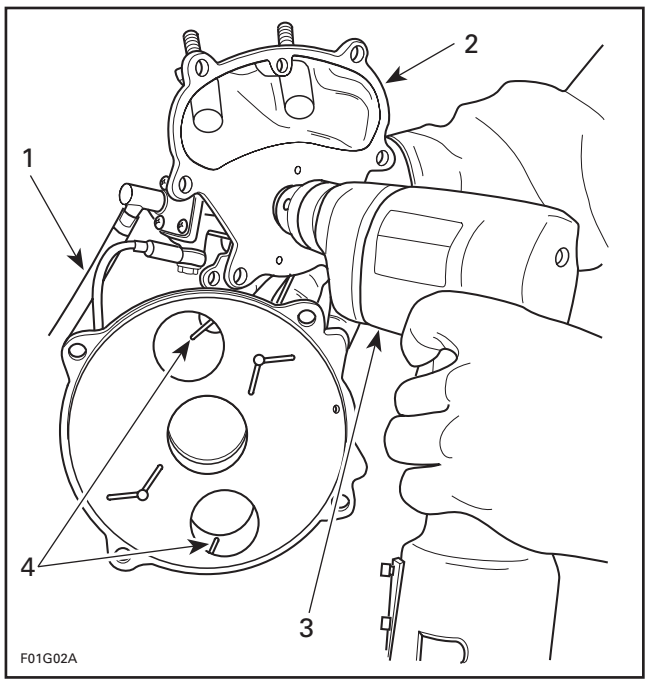
If not, remove pump assembly and check the pump gear (717 engine) or shaft (787 and 947 engines) for defects, replace as necessary. Test pump as describes below:

NOTE: Through normal use, oil level must not drop in small tubes. If oil drops, verify check valve operation. 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.



TYPICAL
1. Supply oil line to an oil container
2. Hold lever in fully open position
3. Counterclockwise (reverse) rotating drill
4. Oil must drip here

For an accurate test, each port should be checked separately to ensure equal delivery on both ports.

To obtain a precise result of the oil pump delivery rate, rotate it counterclockwise at 1500 RPM for a total time of 30 seconds.

NOTE: To ensure accuracy of test, oil lines should be completely filled before starting test.

Compare the results with the chart below. If oil pump is out of specification, replace it.

ENGINE	OIL PUMP FLOW RATE AT 1500 RPM (30 SECONDS)
717	1.24 - 1.51 mL (each port)
787	0.71 - 0.87 mL (each port)
947	0.83 - 1.01 mL (each port)

NOTE: Test can also be done at 3000 RPM. Double quantities in chart.

TABLE OF CONTENTS

IGNITION SYSTEM

GENERAL

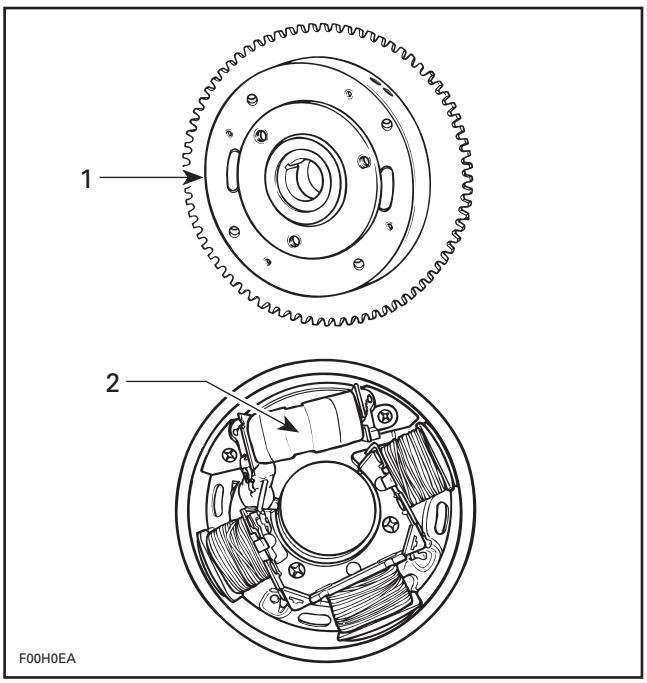
717 Engine

The digital Capacitor Discharge Ignition (CDI) system includes the following components:

Magneto

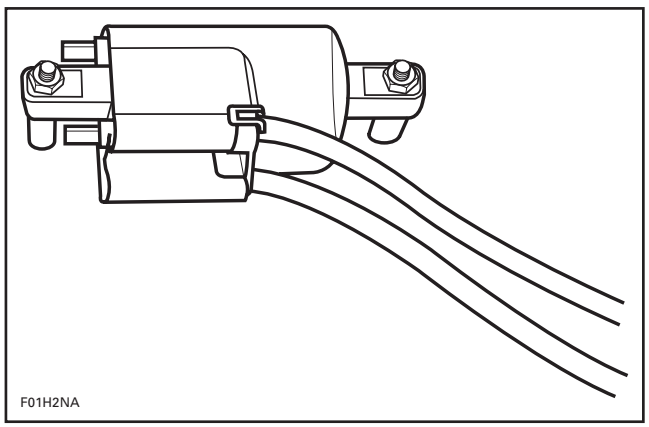
It is the primary source of electrical energy. It transforms magnetic field into electric current.

The flywheel contains 4 permanent magnets and spins around the generating coil. This electric current flows to the ignition coil (GTS model) or the Multi-Purpose Electronic Module (GS and GTI models).



1. *Flywheel*
2. *Generating coil*

Ignition Coil



TYPICAL

GTS Model

The ignition coil performs two functions:

It has an integrated capacitor discharged ignition (CDI) module, which controls the spark occurrence (ignition timing curve).

Every half revolution of the flywheel, a critical point occurs when the position of the magnets changes the polarity of the current flowing from the generating coil.

The CDI module detects the change of polarity and signals at the right time the primary winding of the ignition coil.

The secondary winding of the ignition coil steps up the voltage input to high voltage current for both spark plugs.

GS and GTI Models

The ignition coil steps up the voltage input from the Multi-Purpose Electronic Module to high voltage current for both spark plugs.

The ignition coil is located in the rear electrical box, on right side of watercraft.

Multi-Purpose Electronic Module (MPEM)

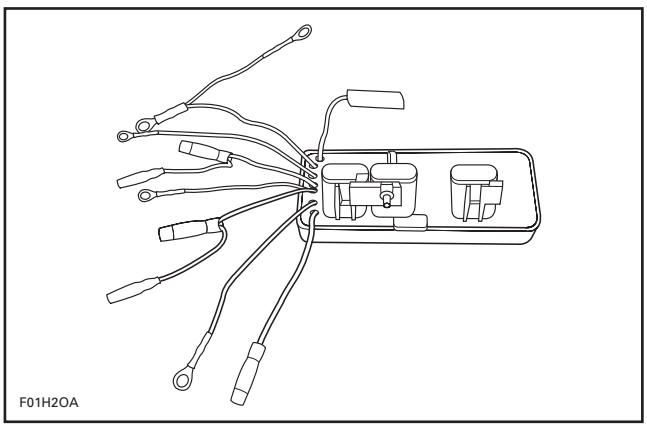
The MPEM is directly powered by the battery. It has a micro-processor inside of its sealed case.

The MPEM is responsible of the following electrical functions:

– interpreting information
– distributing information
– start/stop function
– timer
– Digitally Encoded Security System
– ignition (GS and GTI models)
– engine rev limiter

Fuses are directly mounted onto the MPEM.

GTS Model



TYPICAL

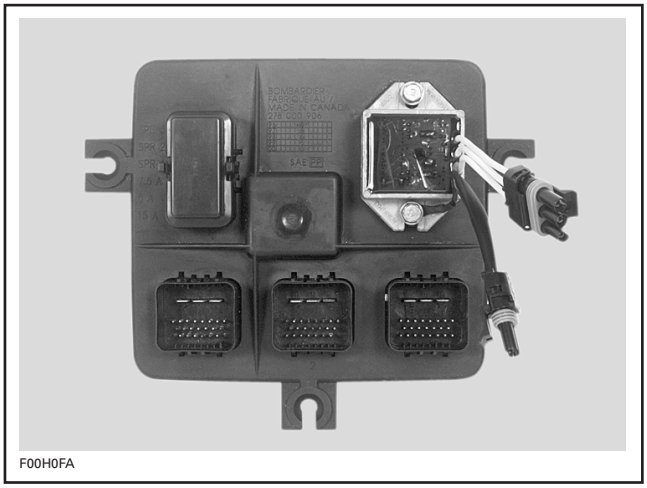
GS and GTI Models

On these models, the MPEM is also used as a junction box, eliminating the need of an electrical box.

All electrical components or accessories are directly linked to the MPEM.

Wire position are identified with a series of number on the MPEM. AMP plug connectors are used.

The regulator/rectifier is also mounted on the MPEM.



TYPICAL

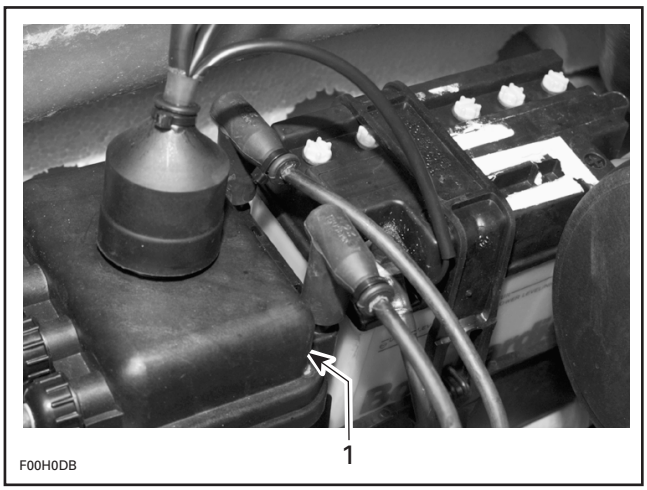
787 and 947 Engines

The 787 and 947 engines have a digital Direct Current-Capacitor Discharge Ignition (DC-CDI) system.

Compared to the magneto system, the DC-CDI system offers a more powerful and stable ignition at low RPM.

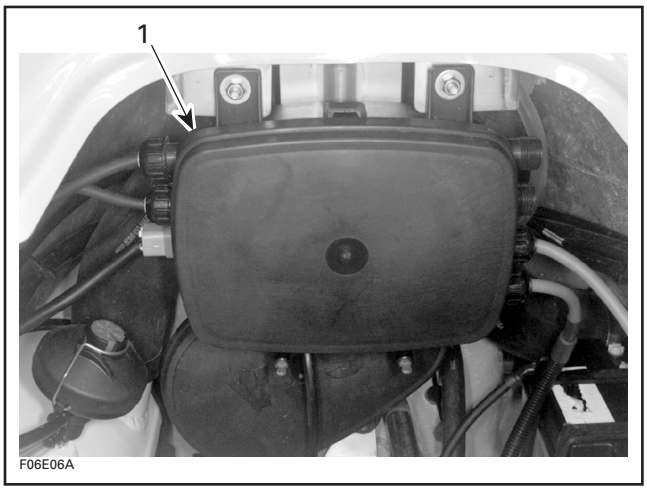
SPX, GSX Limited and GTX Limited

The high amperage/voltage components are located into a rear electrical box.

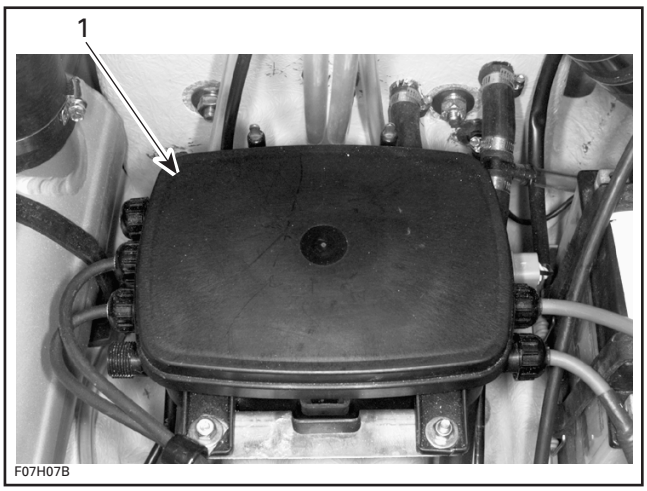


SPX MODEL

1. Rear electrical box



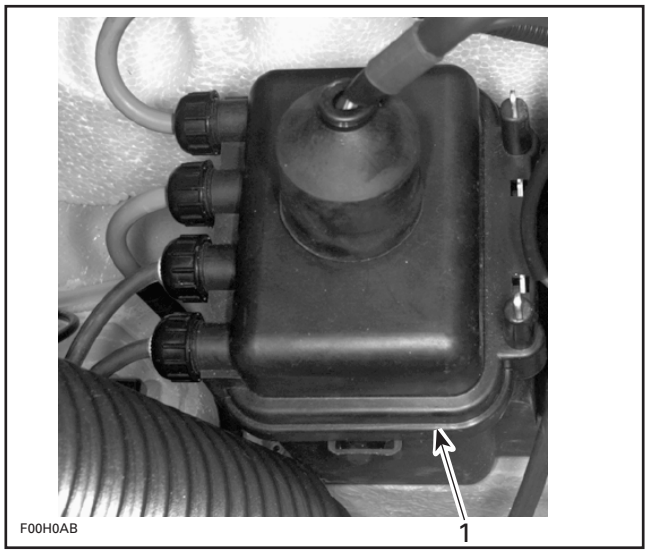
GSX LIMITED
1. Electrical box



GTX LIMITED
1. Electrical box

XP Limited

The high amperage/voltage components are located into a front electrical box.



XP LIMITED
1. Electrical box

SPX Model

The other components are located in the conventional electrical box.

GSX Limited, XP Limited and GTX Limited

The other components are integrated to the Multi-Purpose Electronic Module (MPEM).

SPX, GSX Limited, XP Limited and GTX Limited

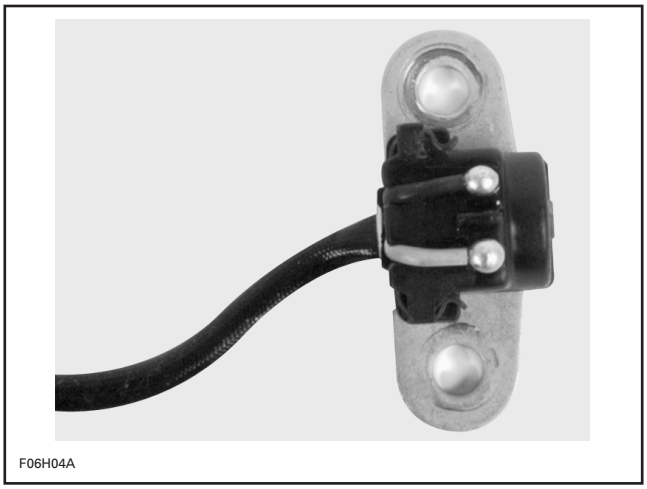
The ignition system includes the following components:

Battery

The battery is the primary power source for this system.

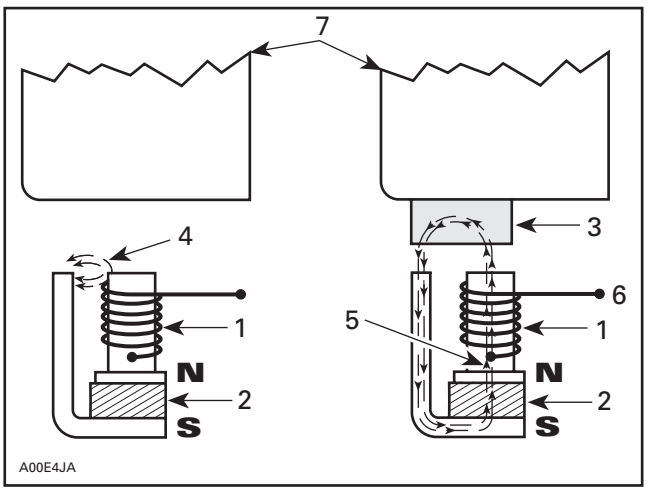
Trigger Coil

The trigger coil is mounted outside the rotor (inside the magneto housing of the engine) and is not adjustable.



F06H04A

Its purpose is to signal the engine position to the Multi-Purpose Electronic Module. The rotor has two protrusions (180 degrees apart) that, when coupled with the trigger coil, accomplish the signaling.



A00E4JA

1. *Coil*
2. *Magnet*
3. *Rotor protrusion*
4. *Magnetic field outside of coil*
5. *Magnetic field crossing coil*
6. *Current to MPEM*
7. *Rotor*

Multi-Purpose Electronic Module (MPEM)

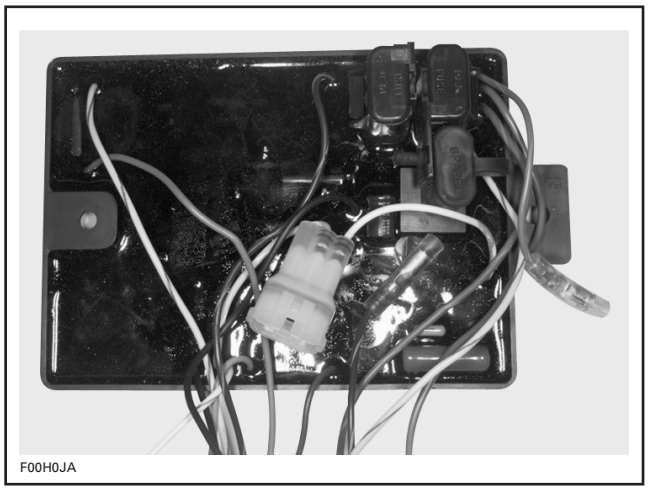
The MPEM is directly powered by the battery. It has a micro-processor inside of its sealed case.

The MPEM is responsible of the following electrical functions:

– interpreting information
– distributing information
– start/stop function
– timer
– Digitally Encoded Security System
– ignition
– engine rev limiter

Fuses are directly mounted onto the MPEM.

SPX Model



F00H0JA

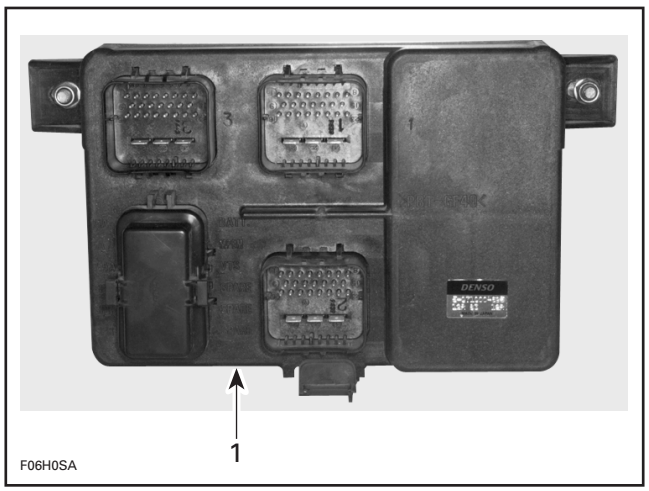
GSX Limited, XP Limited and GTX Limited

On these models, the MPEM is also used as a junction box, eliminating the need of an electrical box.

All electrical components or accessories are directly linked to the MPEM.

Wire position are identified with a series of number on the MPEM. AMP plug connectors are used.

The regulator/rectifier is also mounted on the MPEM.



1. Multi-Purpose Electronic Module

Ignition Coil

The ignition coil steps up the voltage input from the Multi-Purpose Electronic Module to high voltage current for both spark plugs.

IGNITION TIMING

Before checking ignition timing with a stroboscopic timing light (dynamic test), it is mandatory to scribe a timing mark on the PTO flywheel (static test) corresponding to the specific engine.

Also, the timing mark scribed on the PTO flywheel can be used to troubleshoot a broken magneto woodruff key.

NOTE: Do not use the factory mark found on the PTO flywheel to check ignition timing or troubleshoot any problems.

▼ CAUTION

The relation between the PTO flywheel mark position and crankshaft position may change as the PTO flywheel might tighten/loosen on the crankshaft. As an example, when the engine is accelerated out of water, PTO flywheel may tighten then loosen when the engine is decelerated. This will result in a false ignition timing reading. Always verify PTO flywheel mark position before checking ignition timing with an appropriate timing light. If mark does not align with tool, repeat static test to ensure flywheel has not loosen before changing the ignition timing.

787 and 947 Engines

Normally ignition timing adjustment should not be required. It has been set at factory and it should remain correctly adjusted since every part is fixed and not adjustable. The only time the ignition timing might have to be changed would be when replacing the crankshaft, the magneto rotor, the trigger coil and the MPEM. If the ignition timing is found incorrect, you should first check for proper crankshaft alignment. This might be the indication of a twisted crankshaft.

With this DC-CDI system, the ignition timing can be checked with either the engine hot or cold. Also, the ignition timing is to be checked at 3500 RPM with the timing light.

NOTE: Between 3000 and 4000 RPM, the spark advance does not change. So when checking ignition timing at 3500 RPM, a change in engine speed within ± 500 RPM will not affect the timing mark when checked with the timing light.

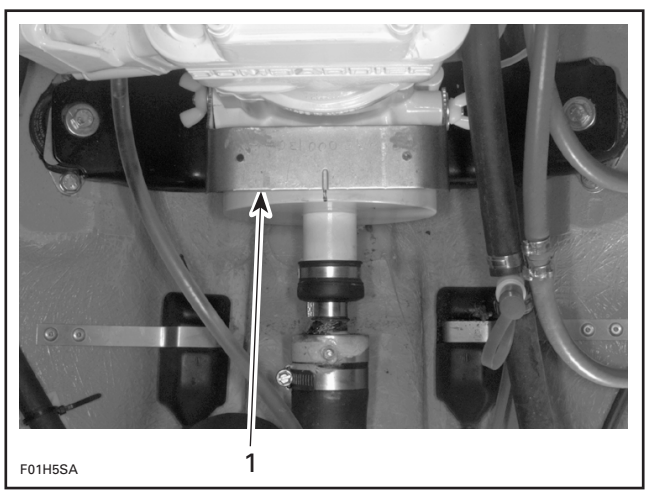
Static Test

All Engines

1. Disconnect MAG side spark plug wire and connect wire to grounding device then remove spark plug.
2. Remove PTO flywheel guard.

717 Engine

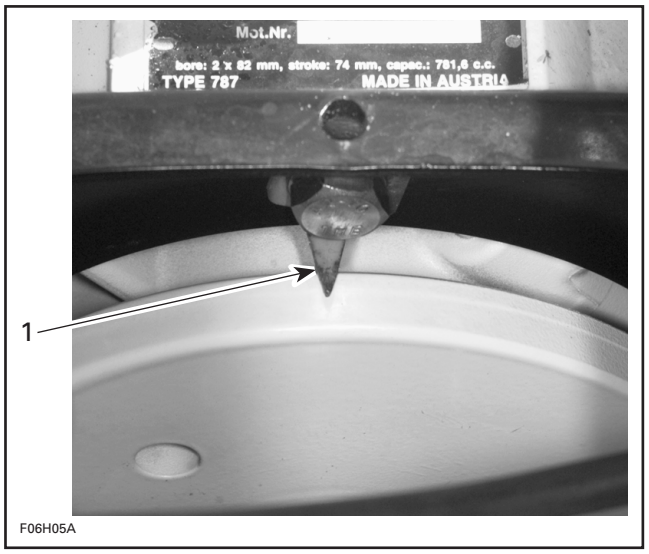
3. Install timing mark pointer tool on engine using wing nuts previously removed.



1. Timing mark pointer tool (P/N 295 000 130)

787 and 947 Engines

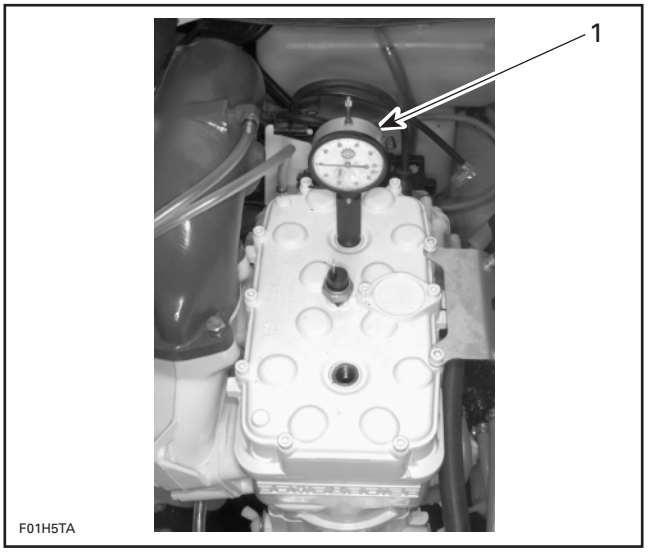
4. Remove middle screw securing the engine to the rear engine mount. Reinstall screw with timing mark pointer tool.



1. Timing mark pointer tool (P/N 295 000 135)

All Engines

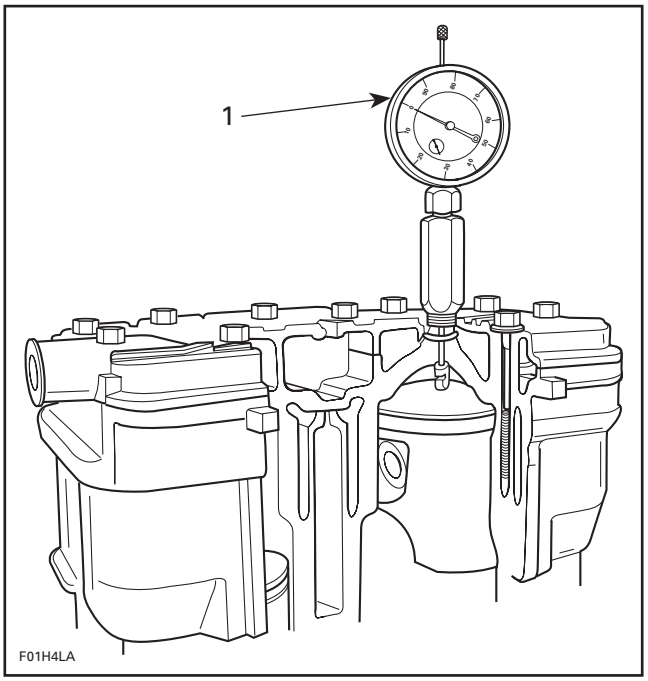
5. Install and adjust a TDC gauge (P/N 295 000 143) in MAG side spark plug hole.



TYPICAL

1. TDC gauge on MAG side

6. Rotate PTO flywheel counterclockwise (when facing it) until piston is at Top Dead Center.



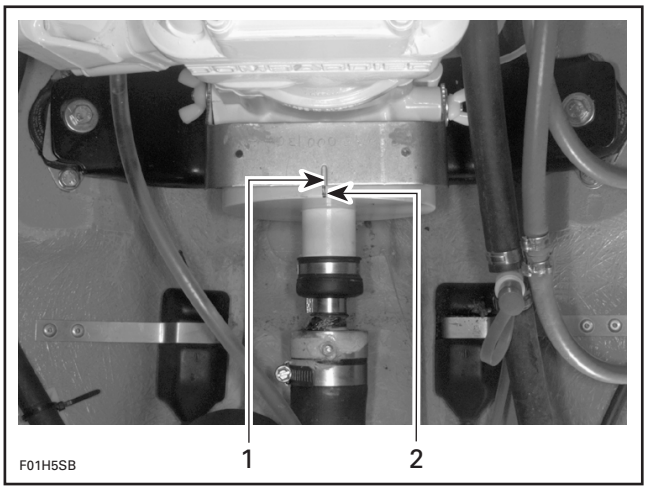
TYPICAL

1. Adjust gauge dial at zero

7. From this point, rotate flywheel clockwise to reach proper specification according to engine. Refer to the following chart.

ENGINE	IGNITION TIMING (BTDC)
717	2.59 mm (.102 in)
787	3.38 mm (.133 in)
947	3.60 mm (.142 in)

8. Scribe a thin mark on PTO flywheel in the middle of tool slot (717 engine) or aligned with timing mark pointer tool (787 and 947 engines).



TYPICAL

1. *Tool slot*
2. *Flywheel mark*

NOTE: This mark becomes the reference when using the stroboscopic timing light.

▼ CAUTION

The static test cannot be used as a timing procedure, therefore, always check the timing with a stroboscopic timing light.

9. Remove TDC gauge.
10. Reinstall spark plug and connect wire.

Dynamic Test

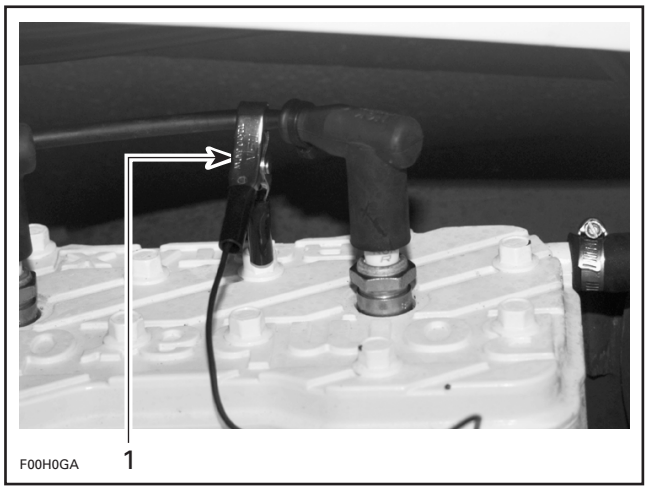
To check ignition timing, use Bombardier timing light (P/N 529 031 900).

717 Engine

NOTE: To perform this procedure, make sure to use a stroboscopic timing light rated up to 6000 RPM. Otherwise, an inaccurate reading will be obtained.

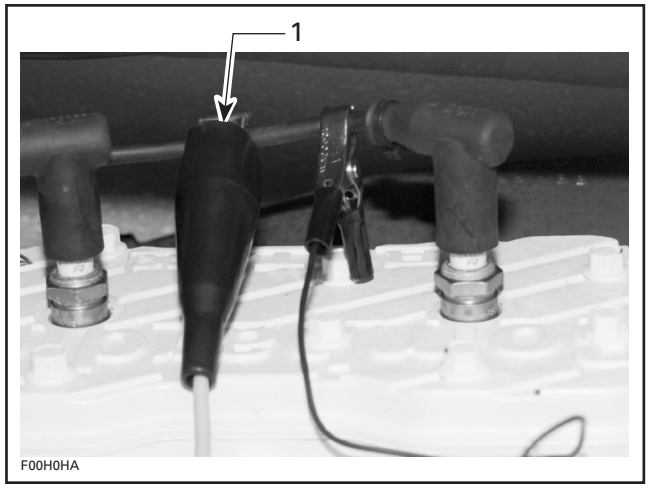
The ignition components are affected by temperature variation, therefore, timing must be checked when engine is cold, after idling for a MAXIMUM of 20 seconds.

1. Connect an induction-type tachometer (P/N 295 000 100) to spark plug wire.



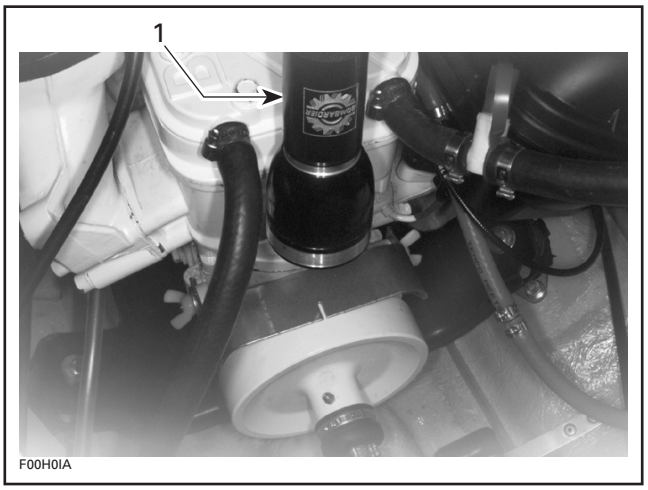
1. Tachometer pick-up

2. Connect timing light pick-up to MAG side spark plug wire.



1. Timing light pick-up

3. Start engine and point timing light straight in line with timing tool slot. Bring engine to 6000 RPM.



1. Timing light straight in line with tool slot

▼ CAUTION

If engine is to be run more than a few seconds, engine must be cooled using the flush kit.

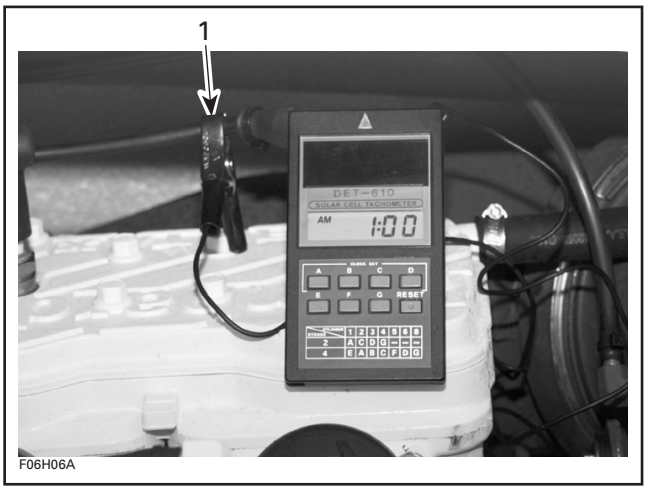
4. Check if PTO flywheel mark aligns with timing tool slot.

NOTE: On this system, timing advance decreases as engine speed increases.

If timing mark aligns with tool slot, timing is properly set. If mark does not align with tool slot, recheck PTO flywheel mark before adjusting ignition timing to ensure PTO flywheel has not loosen.

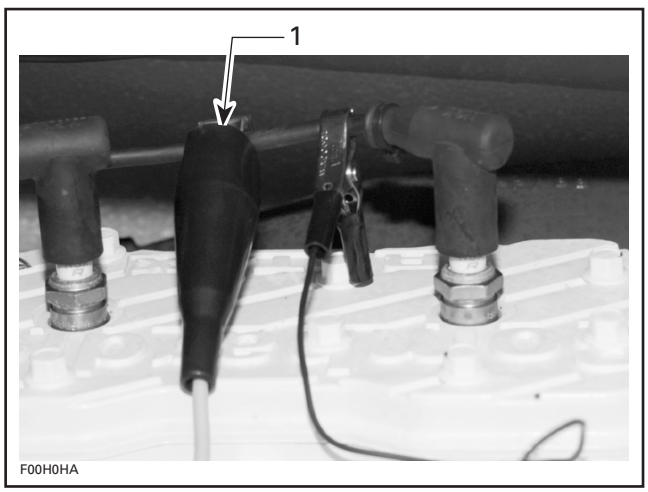
787 and 947 Engines

1. Connect an induction-type tachometer (P/N 295 000 100) to spark plug wire.



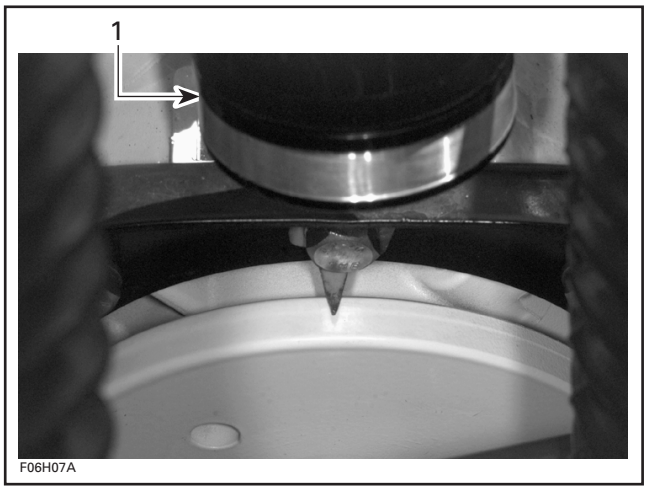
1. Tachometer pick-up

2. Connect timing light pick-up to MAG side spark plug wire.



1. Timing light pick-up

3. Rev the engine to 3500 RPM and point beam of timing light straight in line with timing mark pointer.



1. Timing light straight in line with tool slot

▼ CAUTION

If engine is to be run more than a few seconds, engine must be cooled using the flush kit.

NOTE: If mark on PTO flywheel is perfectly aligned with timing mark pointer, no adjustment is required. If mark does not align with pointer, recheck PTO flywheel mark before adjusting ignition timing to ensure PTO flywheel has not loosen.

Ignition Timing Adjustment

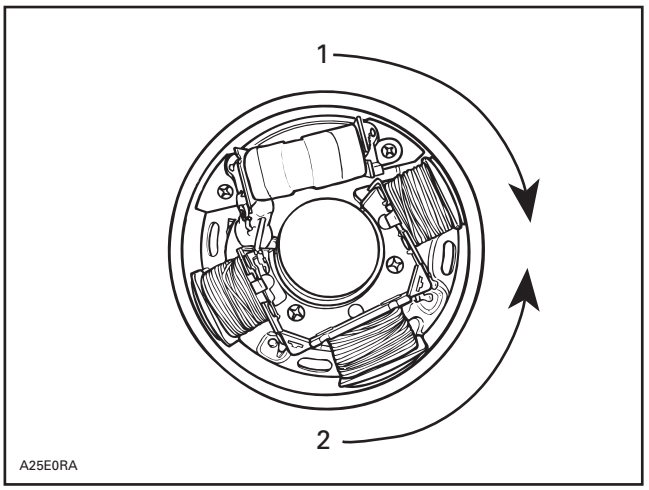
717 Engine

Remove battery (GTS model).

Remove magneto housing cover and wire support.

For removal of magneto, refer to MAGNETO SYSTEM 04-04.

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

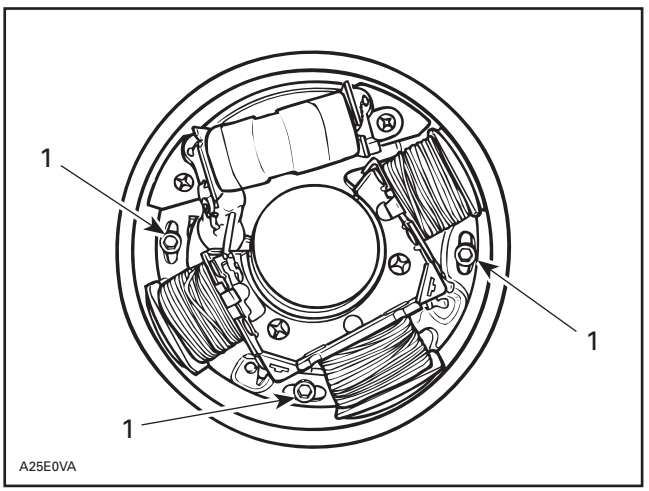


TYPICAL

1. To retard
2. To advance

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

NOTE: As a guideline, turn the armature plate the same amount needed to align mark on PTO flywheel.

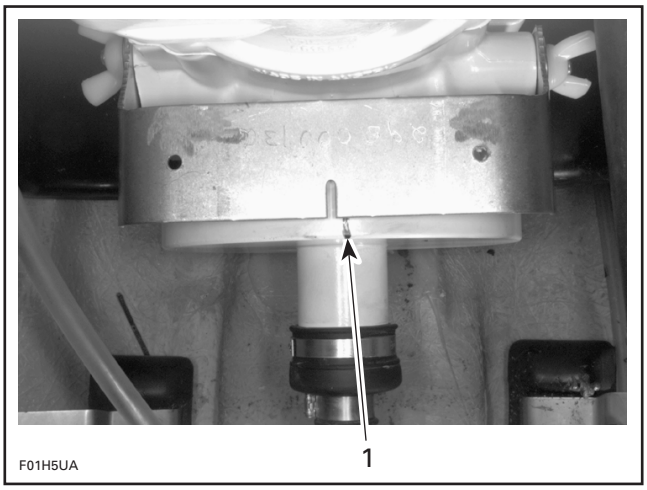


TYPICAL

1. Retaining screw

Example 1

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

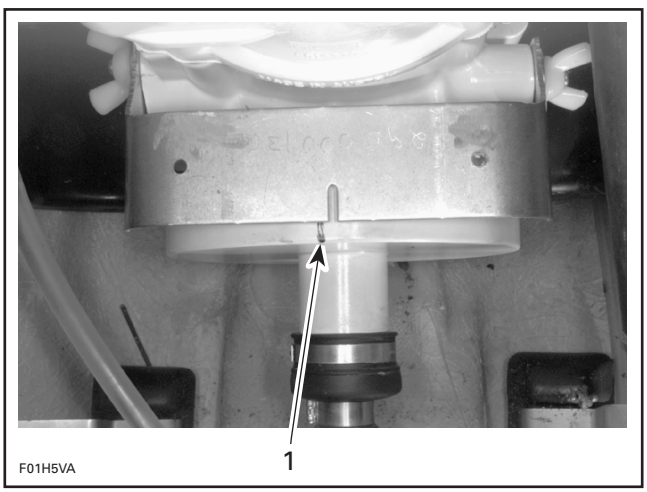


1. Too advanced timing

In this case, turn armature plate clockwise when facing it.

Example 2

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



1. Retarded timing

In this case, turn armature plate counterclockwise when facing it.

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. Refer to MAGNETO SYSTEM 04-04.

Recheck ignition timing (make sure engine is cold).

Repeat armature plate positioning procedure if timing mark position is not adequate.

787 and 947 Engines

To correct the ignition timing, the data of the MPEM is changed using the MPEM programmer (P/N 295 000 127).

NOTE: For more information on the programmer, refer to its guide.

Through the MPEM programmer, the ignition timing can be advanced up to 3° or retarded up to 4°.

▼ CAUTION

If the ignition timing is adjusted too advanced, this will cause serious damage to the engine.

The timing mark refer to the physical component position when the spark must occur. The MPEM must be synchronized with the mark. For instance, on a particular engine, the timing correction may need to be advanced to 2° so that the mark aligns with timing mark pointer tool. This is not the real spark advance, just a correction for the tolerances of the mechanical components.

Knowing that, you select with the programmer the higher or lower number to advance or retard the actual timing correction by referring to the following chart.

TIMING CORRECTION CHART	
PROGRAMMER NUMBER (MPEM)	IGNITION TIMING CORRECTION
2	3°
3	2°
4	1°
1	0
5	-1°
6	-2°
7	-3°
8	-4°

Examples:

a. You found the flywheel mark advanced. You must retard the ignition timing.
   – The programmer gives you the number 3. Referring to the chart, number 3 returns a correction of 2° (advanced) and this is too much in this case.
   – You estimate the correction should be set to 1° (advanced) to align flywheel mark. Back in the chart, look to find 1° (advanced). This gives number 4. Enter this number with the programmer.
   – You recheck the timing with the timing light and if the mark is aligned, ignition timing is properly set.

b. You found the flywheel mark advanced. You must retard the ignition timing.
   – The programmer gives you the number 3. Referring to the chart, number 3 returns a correction of 2° (advanced) and this is too much in this case.
   – You estimate the correction should be set to 1° (advanced) to align flywheel mark. Back in the chart, look to find 1° (advanced). This gives number 4. Enter this number with the programmer.
   – You recheck the timing with the timing light and found that the flywheel mark is still too advanced. You know now that the correction made previously was not enough and you estimate the correction should be set to - 2° (retarded) to align flywheel mark. Back in the chart, look to find - 2° (retarded). This gives number 6. Enter this number with the programmer.
   – You recheck the timing with the timing light and if the mark is aligned, ignition timing is properly set.

c. You found the flywheel mark retarded. You must advance the ignition timing.
   – The programmer gives you the number 4. Referring to the chart, number 4 returns a correction of 1° (advanced) and this is not enough in this case.
   – You estimate the correction should be set to 2° (advanced) to align flywheel mark. Back in the chart, look to find 2° (advanced). This gives number 3. Enter this number with the programmer.
   – You recheck the timing with the timing light and if the mark is aligned, the ignition timing is properly set.

Proceed as Follows to Adjust the Ignition Timing with the MPEM Programmer:

1. Connect the communication cable to the MPEM programmer and the other end to the safety lanyard switch on the craft.
2. Press the ***ON/C*** button on programmer and enter your password.
3. Press ***3*** to choose ***Vehicle info*** in programmer.
4. Press ***4*** to choose ***Engine param***.
5. Press ***2*** to choose ***Timing adjust***.
6. The programmer display a number that is stored in the MPEM.
7. Press ⇔ to choose ***yes*** for modify then press ***Enter***.
8. Now punch in the number that corresponds to the degree you want for the ignition timing then press ***Enter***.
9. Press ***Menu*** to go back one level.
10. Press ***8*** to choose ***Save + Quit*** (even if item no. 8 is not visible on the display, it is active when you select it).
11. Press ***Enter*** to confirm yes you want to ***save modifications*** to the MPEM.
12. You must see ***Operation successful***. This confirms that the new timing data has been stored in the MPEM.
13. Unplug communication cable from safety lanyard switch on craft.
14. Press ***Off*** to close the programmer.

At this point, you can install the watercraft safety lanyard and start the engine to check the effect of the correction on the ignition timing. If further adjustment is required, repeat the procedure.

NOTE: The MPEM features a permanent (non-volatile) memory and keeps the ignition timing programmed even when the watercraft battery is disconnected.

IGNITION SYSTEM TESTING PROCEDURE

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

1. Spark occurrence/spark plug condition.
2. Battery condition.
3. Electrical connections.
4. Engine start/stop switch.
5. Safety lanyard switch.
6. Timer.
7. Multi-Purpose Electronic Module (MPEM).
8. Magneto output (717 engine).
9. Ignition coil output.

▼ CAUTION

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

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

Engine Start/Stop Switch Verification

Disconnect the YELLOW/RED wire of the start/stop switch. Using an ohmmeter, connect test probes to YELLOW/RED wire and to ground.

Measure resistance, it must be an open circuit (switch is normally open). Depress and hold switch, the ohmmeter should read close to 0 ohm.

Safety Lanyard Switch Verification

If 2 short beeps are not heard when installing the safety lanyard, refer to DIGITALLY ENCODED SECURITY SYSTEM 06-06.

The following continuity tests can also be performed using an ohmmeter:

Disconnect switch wires.

Safety Lanyard Removed

Connect test probes to switch BLACK and BLACK/YELLOW wires. Measure resistance, there should be no continuity (open circuit).

Connect one test probe to the WHITE/GRAY wire and the other test probe to the switch terminal. Measure resistance, it must be close to 0 ohm.

Connect one test probe to the BLACK wire and the other test probe to the switch ring. Measure resistance, it must be close to 0 ohm.

Safety Lanyard on Switch

Connect test probes to switch BLACK and BLACK/YELLOW wires. Measure resistance, it must be close to 0 ohm.

Timer Verification

The timer is integrated into the MPEM.

Always confirm first that the fuses are in good condition.

To confirm operation of timer, remove safety lanyard from switch. After a 5 seconds delay, depress start/stop button once. The timer should stay on for about 33 seconds (for example, gauge(s) will be activated) and then turn off.

Rev Limiter Verification

To check engine rev limiter, connect an induction tachometer (P/N 295 000 100), start engine and check its maximum speed; it should be at 7000 ± 50 RPM for a 717 engine, and 7200 ± 50 RPM for 787 and 947 engines.

Multi-Purpose Electronic Module (MPEM) Verification

GTS Model

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

▼ CAUTION

When disconnecting wires, BLACK/RED wire must never touch solenoid positive terminal. When replacing a MPEM, make sure to replace it with the right model.

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

METER (+) LEAD	METER (-)	VALUE
RED (ring terminal)	RED (female terminal)	< 1Ω
RED (ring terminal)	RED/PURPLE (female terminal)	< 1Ω
RED (ring terminal)	BLACK (ring terminal)	> 20 kΩ
BLACK/RED	BLACK (ring terminal)	> 10 kΩ
WHITE/GREY	BLACK (ring terminal)	> 100 kΩ
TAN/BLACK	BLACK (ring terminal)	> 200 kΩ
YELLOW/RED (female terminal)	BLACK (ring terminal)	> 10 kΩ
YELLOW/RED (male terminal)	BLACK (ring terminal)	> 50 kΩ
BLACK (ring terminal)	RED (ring terminal)	> 10 kΩ

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

▼ CAUTION

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

All Other Models

It is not possible to accurately check the MPEM condition without specialized tools. Therefore, replace MPEM with a good known unit to conduct testing.

NOTE: Before replacing the MPEM, make sure all connectors are properly secured and there is no water in connectors. Check also the signal and power contacts in the AMP plug connectors. See WIRING DIAGRAMS 14-01.

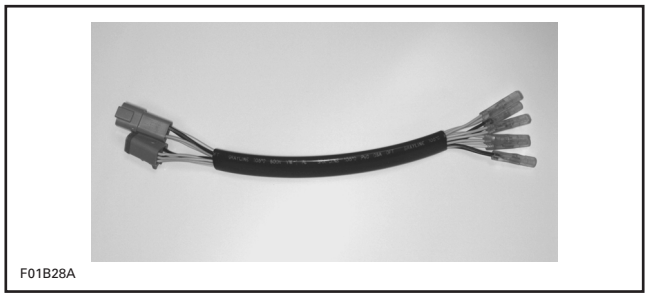
Generating Coil Verification

717 Engine

STATIC TEST

Disconnect magneto wiring harness connector.

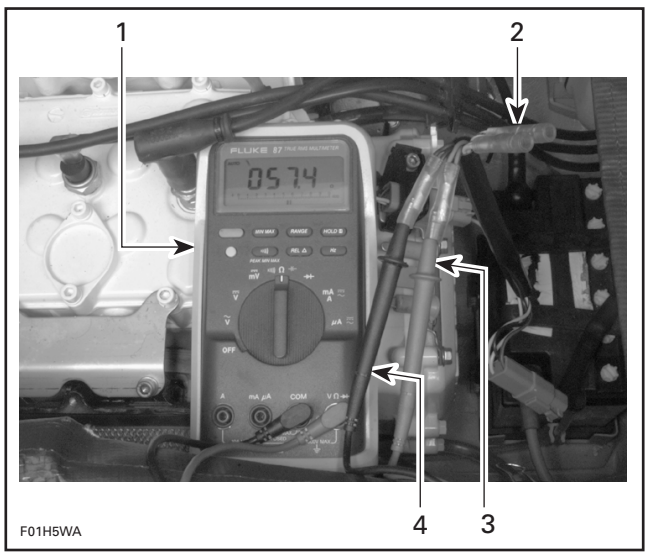
Install the 4-pin magneto harness adapter (P/N 295 000 131).



TYPICAL

Check resistance with a multimeter. Refer to the following table for values and wire colors.

PART NAME	ADAPTER WIRE	RESISTANCE
Generating coil	BLACK with RED/BLACK	40-76 Ω



1. *Multimeter*
2. *Four-pin magneto harness adapter*
3. *RED/BLACK wire*
4. *BLACK wire*

DYNAMIC TEST

1. Connect spark plug cables to grounding device.
2. Disconnect magneto wiring harness connector.
3. Install the 4-pin magneto harness adapter (P/N 295 000 131).
4. Connect positive test probe of the multimeter to the RED/BLACK wire of the 4-pin magneto harness adapter.
5. Connect negative test probe of the multimeter to BLACK wire of the 4-pin magneto harness adapter.
6. Set multimeter to Vac scale.
7. Crank engine and note result. The obtained value should be between 18 and 25 Vac.
8. If the generating coil is out of specification, replace it.

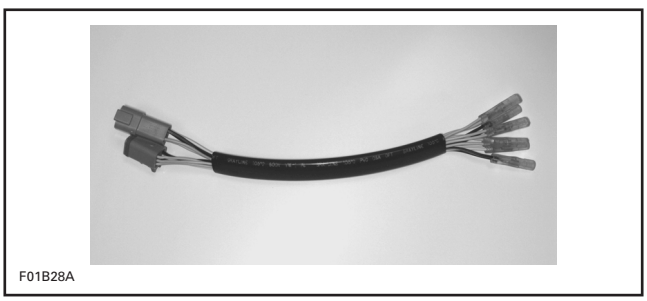
NOTE: If the generating coil tests good, disconnect the primary wires of the ignition coil. Crank engine and check voltage at primary wires. It should be at least 20 Vdc. If there is insufficient or no voltage, either the MPEM or wiring harness is defective.

Trigger Coil Verification

787 and 947 Engines

STATIC TEST: CONTINUITY

1. Disconnect magneto wiring harness connector.
2. Install the 6-pin magneto harness adapter (P/N 295 000 136).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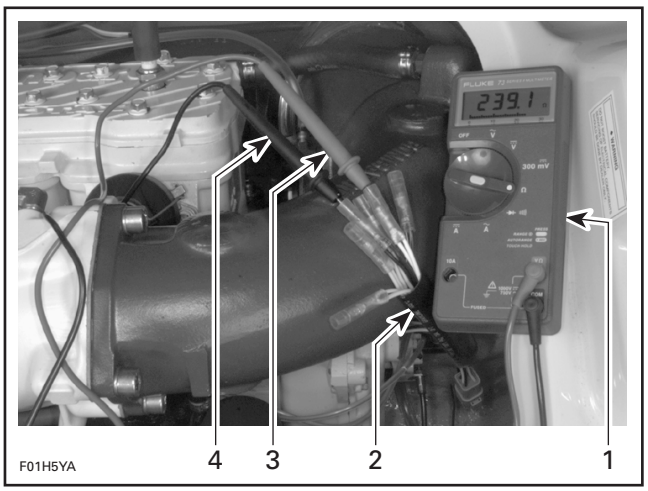
3. Connect one of the multimeter probes to the WHITE wire of the 6-pin magneto harness adapter.
4. Connect the other multimeter probe to the BLACK/YELLOW wire of the 6-pin magneto harness adapter.
5. Measure resistance; it should be between 190-300 ohms.



1. Multimeter
2. Six-pin magneto harness adapter
3. WHITE wire
4. BLACK/YELLOW wire

DYNAMIC TEST

1. Disconnect magneto wiring harness connector.
2. Install the 6-pin magneto harness adapter (P/N 295 000 136).
3. Connect one of the multimeter probes to the WHITE wire of the 6-pin magneto harness adapter.
4. Connect the other multimeter probe to the BLACK/YELLOW wire of the 6-pin magneto harness adapter.
5. Crank engine and note result. The obtained value should be between 0.2 and 0.5 Vac.
6. If the trigger coil is out of specification, replace it.

Ignition Coil Verification

All Engines

Before conducting any testing on the ignition coil, make sure there is at least 20 Vdc at the primary wires. If there is insufficient voltage, the ignition problem is occurring before the ignition coil.

STATIC TEST

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.

Primary Winding

GTS Model

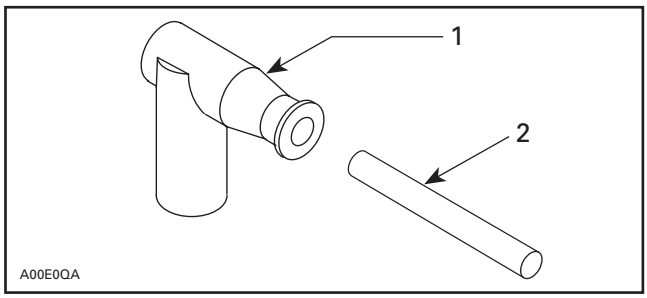
Due to the integrated CDI module, it is not possible to take any resistance measurement.

All Other Models

1. Remove the 2 female spade connectors from the primary side of the ignition coil.
2. With the multimeter set on the resistance scale, connect the meter probes to the primary terminals of the coil.
3. Resistance should be between 0.34 - 0.62 ohm.

Secondary Winding

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



1. Resistor cap
2. High-tension cable

IGNITION COIL		
PART NAME	WIRE	RESISTANCE
Secondary winding (GTS model)	End of each spark plug cable, spark plug caps removed	9 - 15 kΩ
Secondary winding (all other models)	End of each spark plug cable, spark plug caps removed	8.4 - 15.6 kΩ

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

DYNAMIC TEST

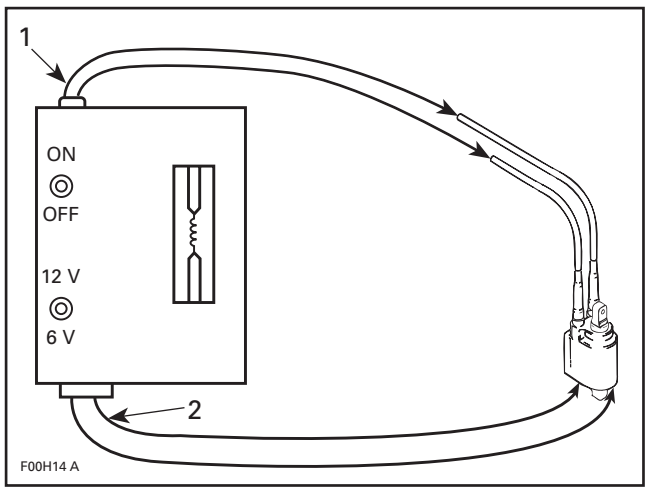
All Models Except GTS

Use an ignition coil tester, available from aftermarket tool/equipment suppliers.

▼ CAUTION

Do NOT use coil tester on metal work bench. Follow manufacturer instructions.

1. With ignition coil removed from craft, disconnect spark plug caps from high tension cables.
2. Hook high tension leads from tester to ignition coil high tension cables.
3. Connect 2 smaller tester leads to primary of ignition coil.



TYPICAL
1. Leads to secondary
2. Leads to primary

4. Turn power switch to 12 volts and you should observe spark jumping at a predetermined gap of 7 to 8 mm (.276 to .311 in).

If there is no spark, if it is weak or intermittent, the coil is defective and should be replaced.

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

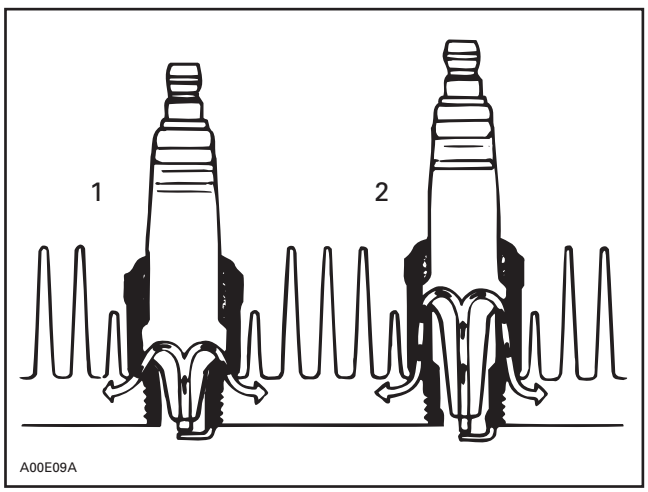
The proper heat range of the spark plugs is determined by the spark plugs ability to dissipate the heat generated by combustion.

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.



1. Cold
2. Hot

▼ CAUTION

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

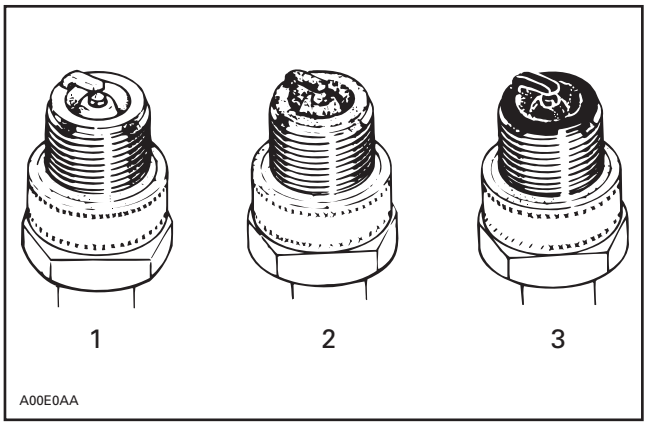
A too "hot" plug will result in overheating and pre-ignition, etc.

A too "cold" plug will result in fouling 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



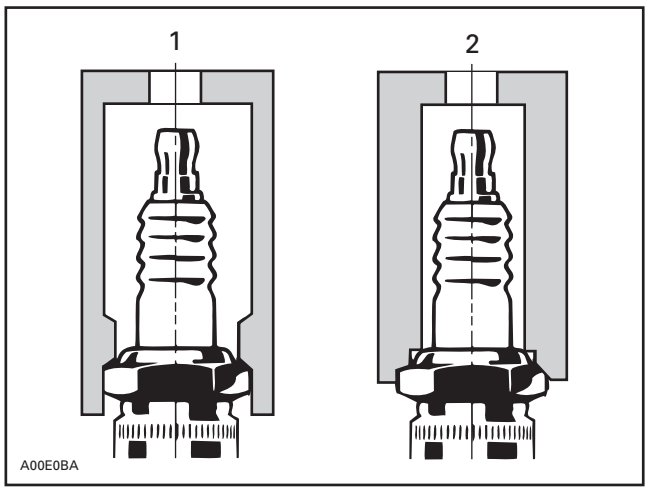
1. Overheated (light grey)
2. Normal (brownish)
3. Fouled (black)

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 anti-seize 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.



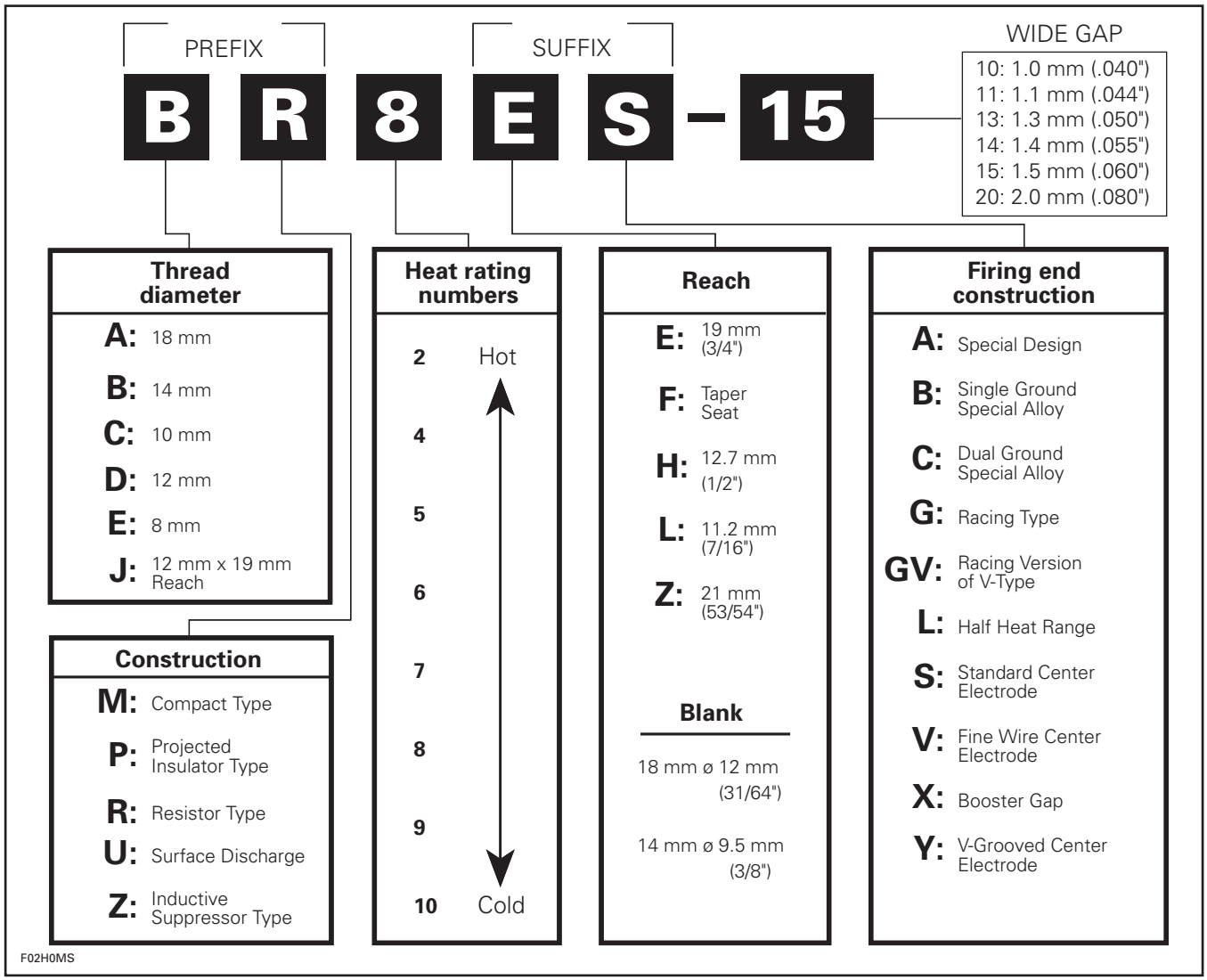
1. Proper socket
2. Improper socket

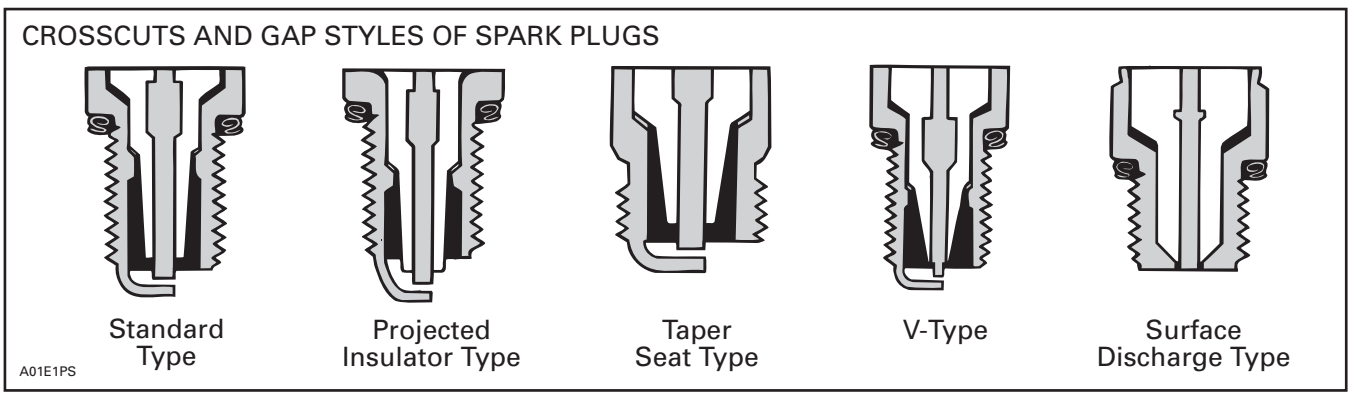
Spark Plug Chart

ENGINE	SPARK PLUG	TORQUE N•m (lbf•ft)	GAP mm (inch)
717 787 947	NGK BR8ES	24 (17)	0.5-0.6 (.020-.024)

NOTE: Refer to next page for **NGK Spark Plug Symbol Explanation.**

NGK Spark Plug Symbol Explanation





CHARGING SYSTEM

GENERAL

Magneto

The purpose of the charging system is to keep the battery at a full state of charge.

The magneto is the primary source of electrical energy. It transforms magnetic field into electric current (AC).

717 Engine

The magneto has a three-pole coil. Capacity is 160 watts.

787 and 947 Engines

The magneto has a 3 phase, "Y" wound stator on 18 poles. Capacity is 180 watts.

Rectifier/Regulator

717 Engine

A half-wave rectifier receives magneto AC current and transforms it into direct current (DC) to allow battery charging.

Included in the same unit, a regulator keeps voltage at a steady level (14.5 to 14.8 volts) to prevent any damage to components.

787 and 947 Engines

A dual 1/2 wave series rectifier receives the magneto AC current and transforms it into direct current (DC) to allow battery charging.

Included in the same unit, a regulator keeps voltage at a steady level (14.5 to 14.8 volts) to prevent any damage to components.

Battery

The battery is the DC source for the electric starter, the Multi-Purpose Electronic Module and all accessories.

Fuse

GTS Model

A 15 A fuse protects the charging system.

All Models Except GTS and XP Limited

Two 15 A fuses protect the charging system. The first one is mounted on the MPEM and the other one is located in the rear electrical box.

XP Limited

Two 15 A fuses protect the charging system. The first one is mounted on the MPEM and the other one is located in the front electrical box.

All Models

If the battery is regularly discharged, check fuse condition.

The rectifier/regulator could be the culprit of a blown fuse. To check, simply disconnect the rectifier/regulator from the circuit.

If the fuse still burns, check for a defective wire.

▼ CAUTION

Do not use a higher rated fuse as this cause severe damage.

TESTING PROCEDURE

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

Rectifier/Regulator

NOTE: All models with a 947 engine, the rectifier/regulator is integrated in the MPEM.

STATIC TEST: CONTINUITY

1. Due to internal circuitry, there is no static test available.

DYNAMIC TEST

Current Test

Proceed as follows:

– Start engine.

– Lay an inductive ammeter on positive cable of battery.

– Bring engine to approximately 5500 RPM.

Depending on battery charge, current reading should be approximately 4 amperes for the 717 engine or 5 amperes for the 787 and 947 engines. If not, check magneto output prior to concluding that rectifier is faulty.

Voltage Test

Proceed as follows:

– Start engine.
– Connect a multimeter to battery posts. Set multimeter to Vdc scale.
– Bring engine to approximately 5500 RPM.

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

NOTE: If it is continually necessary to add distilled water to the battery, this indicates an over voltage situation, requiring replacement of the rectifier/regulator. If, on the other hand, the battery will not stay charged, the problem can be any of the charging circuit components. If these all check good, you would be accurate in assuming the problem to be in the rectifier/regulator.

SPX, GS, GTS and GTI Models

If there is no charging at the battery with the preceding voltage test, the following test can also be performed.

SPX and GTS Models

Open the electrical box.

Disconnect the RED and BLACK wires of the rectifier/regulator.

GS and GTI Models

Disconnect the connector housing of the rectifier/regulator.

Using an appropriate terminal remover (Snap-on TT600-4), remove the RED and BLACK wires from the tab housing of the rectifier/regulator.

Reconnect the connector housing.

SPX, GS, GTS and GTI Models

Connect the positive probe of a multimeter to the RED wire and the negative probe to the BLACK wire.

Set multimeter to Vdc scale.

Start and rev engine to 3500 RPM. The obtained value should be between 12 and 25 Vdc.

NOTE: If the rectifier/regulator is within the specification, either the MPEM or wiring harness between the rectifier and battery is defective. If the rectifier/regulator is out of specification and the battery charging coil (or stator) test good, the rectifier/regulator is defective.

Battery Charging Coil

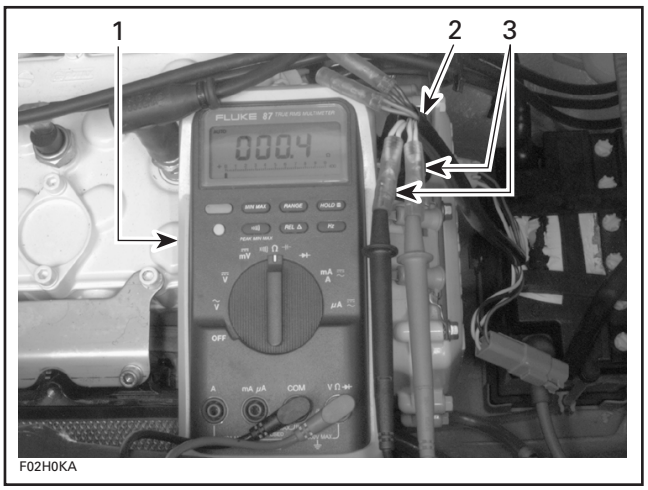
717 Engine

STATIC TEST: CONTINUITY

1. Disconnect the magneto wiring harness connector.
2. Install the 4-pin magneto harness adapter (P/N 295 000 131).
3. Check resistance between the YELLOW and YELLOW/BLACK wires of the magneto harness adapter. Refer to the following table.

PART NAME	ADAPTER WIRE COLOR	RESISTANCE (Ω)
Battery charging coil	YELLOW with YELLOW/BLACK	0.05-0.6

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



1. Multimeter
2. Magneto harness adapter
3. YELLOW and YELLOW/BLACK wires

DYNAMIC TEST

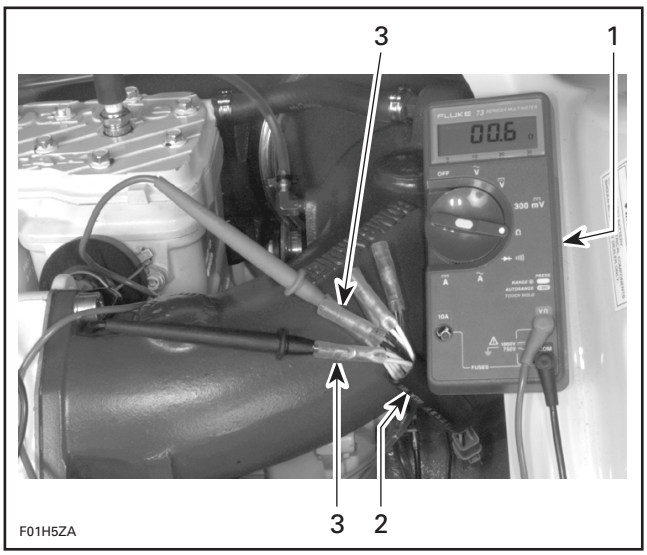
1. Disconnect the magneto wiring harness connector.
2. Install the 4-pin magneto harness adapter (P/N 295 000 131).
3. Connect test probes of the multimeter to the YELLOW and YELLOW/BLACK wires of the 4-pin magneto harness adapter.
4. Start and rev engine to 3500 RPM. The obtained value should be between 25 and 40 Vac.
5. If the battery charging coil is out of specification, replace it.

Stator

787 and 947 Engines

STATIC TEST: CONTINUITY

1. Disconnect the magneto wiring harness connector.
2. Install the 6-pin magneto harness adapter (P/N 295 000 136).
3. Check resistance between two of the YELLOW wires. The resistance should be between 0.1 to 1.0 ohm.

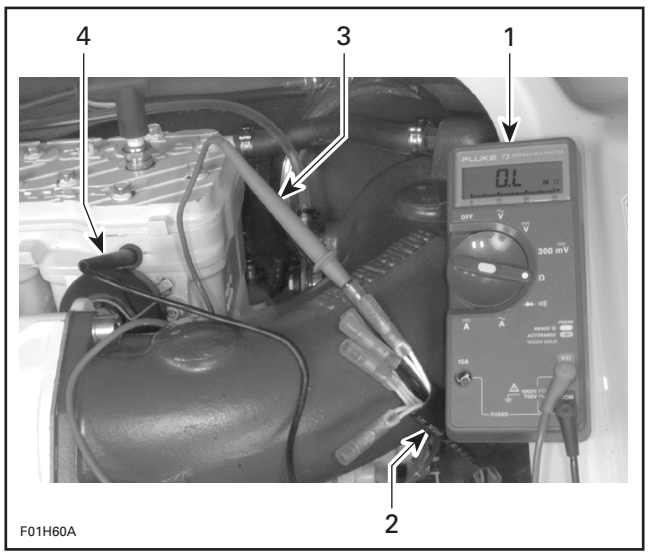


1. Multimeter
2. Magneto harness adapter
3. YELLOW wires

4. Place either meter lead into the remaining YELLOW wire and note the resistance (same as step no. 3). If the readings are out of specification, the stator will need to be replaced.

STATIC TEST: INSULATION

1. Disconnect the magneto wiring harness connector.
2. Install the 6-pin magneto harness adapter (P/N 295 000 136).
3. Insert multimeter positive (+) probe to one of the YELLOW wire of the 6-pin magneto harness adapter.
4. Ground the multimeter negative (-) probe to the engine or the stator iron core and note the reading.



1. Multimeter
2. Magneto harness adapter
3. Positive (+) probe to YELLOW wire
4. Negative (-) probe to ground

5. Repeat test with the other two YELLOW wires of the 6-pin magneto harness adapter.

NOTE: There should be no continuity (infinity) between the stator insulated coils and ground. If there is a reading, the stator coils and/or the wiring from the coils is grounded and needs to be replaced or repaired.

DYNAMIC TEST

1. Disconnect the magneto wiring harness connector.
2. Install the 6-pin magneto harness adapter (P/N 295 000 136).
3. Connect test probes of the multimeter to two of the YELLOW wires of the 6-pin magneto harness adapter.
4. Set multimeter to Vac scale.
5. Start and rev engine to 3500 RPM. The obtained value should be between 45 and 70 Vac.
6. If the stator is out of specification, replace it.

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(s) burnt or faulty rectifier.	First check fuse. If it is in good condition, check rectifier/regulator.
5. Faulty battery charging coil (or stator).	Replace.

Removal

◆ WARNING

Battery BLACK negative cable must always be disconnected first and connected last. Never charge or boost battery while installed in watercraft.

Proceed as follows:

1. Disconnect the BLACK negative cable first.
2. Disconnect the RED positive cable last.
3. Remove the vent line from the battery.
4. Remove the holding strap(s).
5. Withdraw battery from watercraft being careful not lean it so that electrolyte flows out of vent elbow.

◆ WARNING

Electrolyte is poisonous and dangerous. Avoid contact with eyes, skin and clothing. Wear a suitable pair of non-absorbent gloves when removing the battery by hand.

▼ CAUTION

Should any electrolyte spillage occur, immediately wash off with a solution of baking soda and water.

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.

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.

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.

Electrolyte Level

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

▼ CAUTION

Add only distilled water in an activated battery.

Battery Testing

There are 2 types of battery tests: unloaded and loaded. An unloaded test is made on a battery without discharging current. It is the simplest and commonly used. A loaded test gives more accuracy of the battery condition.

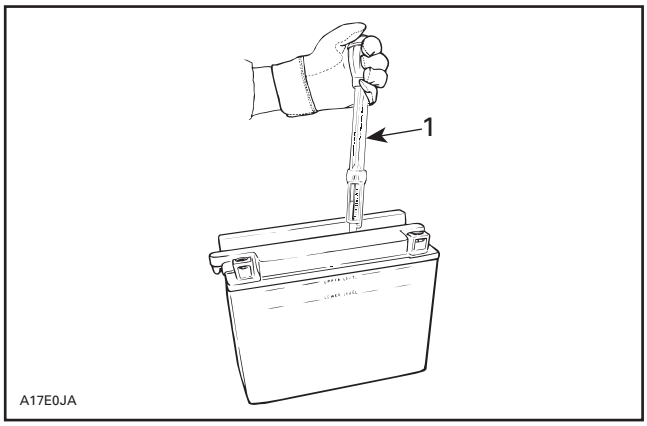
Unload Test

Check charge condition using either a hydrometer or multimeter.

With a multimeter, voltage readings appear instantly to show the state of charge. Always respect polarity. A fully charge battery will have a reading of 12.6 Vdc.

A hydrometer measures the charge of a battery in terms of specific gravity of the electrolyte. A fully charge battery will have a specific gravity between 1.265 to 1.280.

Most hydrometers give a true reading at 21°C (70°F).



1. Specific gravity 1.265

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 32 27	100 90 80	.012 .008 .004	Add to the reading
21	**70**	**correct reading**	
16 10 4 -1	60 50 40 30	.004 .008 .012 .016	Subtract from the reading

EXAMPLE NO. 1

Temperature above 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

Load Test

This is the best test of battery condition under a starting load. Use a load testing device that has an adjustable load.

Apply a load of 3 times the ampere-hour rating of the battery. At 14 seconds into the test, check battery voltage; if battery is in good condition, it will have at least 10.5 Vdc.

Battery Storage

Disconnect and remove battery from watercraft as explained in **Removal**.

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 1.265 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.

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 a 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.

NOTE: 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.

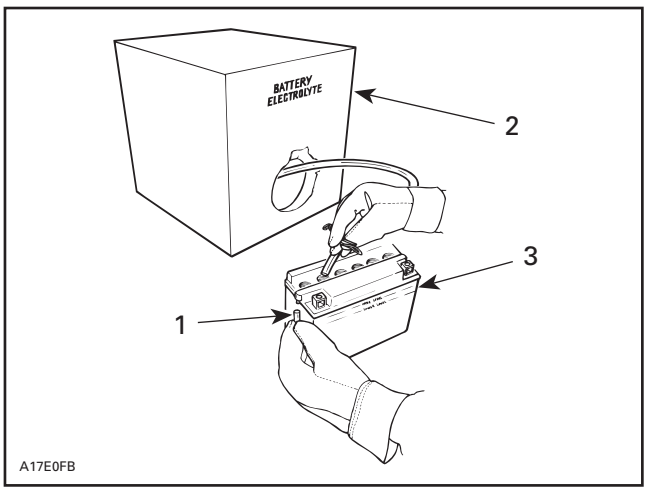
1. Remove the sealing tube from the vent elbow.

◆ WARNING

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

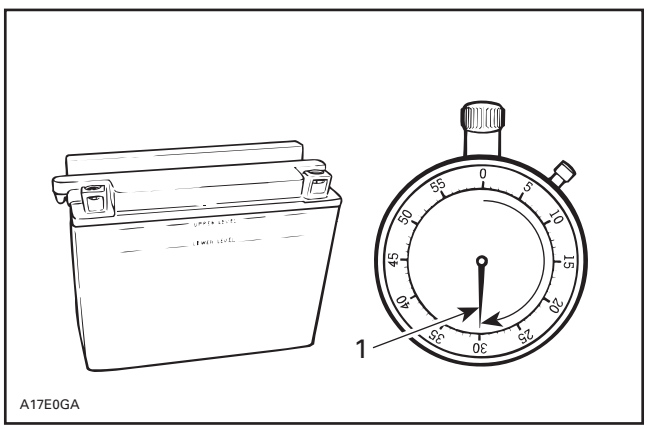
2. Remove caps and fill battery to UPPER LEVEL line with electrolyte (specific gravity: 1.265 at 21°C (70°F)).

NOTE: This battery may fill slower than others due to the anti-spill check ball design.



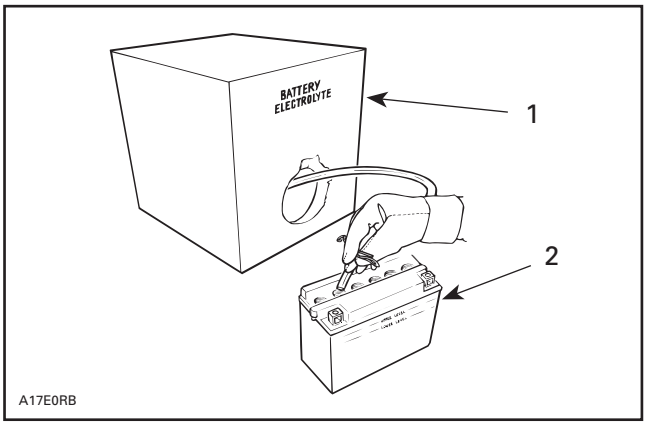
1. Sealing tube removed
2. Battery electrolyte
3. Upper level line

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



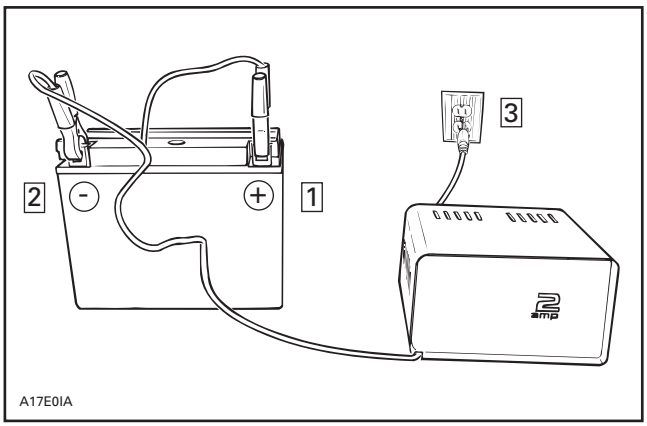
1. 30 minutes

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



1. Battery electrolyte
2. Upper level line

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



Step 1 : Connect + lead to battery + post
Step 2 : Connect - lead to battery - post
Step 3 : Plug battery charger

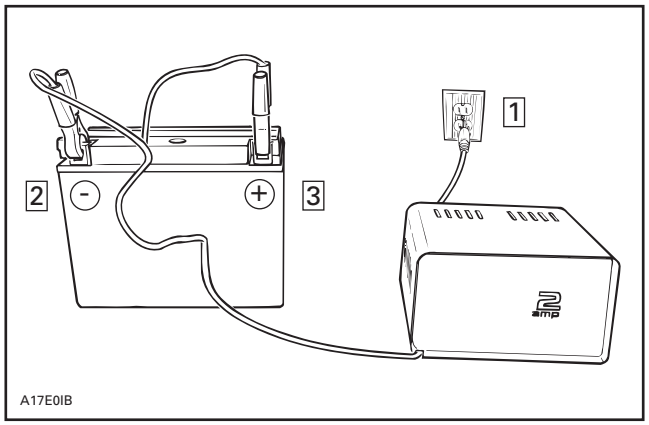
▼ CAUTION

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

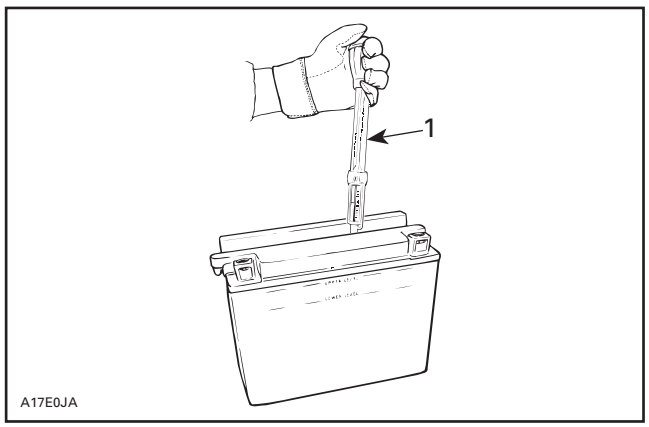
Always charge in a well ventilated area. Always turn battery charger off prior to disconnecting cables.

6. Disconnect battery charger.



Step 1 : Unplug battery charger
Step 2 : Disconnect - lead
Step 3 : Disconnect + lead

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



1. Specific gravity 1.265

8. 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.
9. Reinstall caps and clean any electrolyte spillage using a solution of baking soda and water.

Charging a Used Battery

◆ WARNING

Never charge battery while installed in watercraft.

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

Always charge battery in a well ventilated area.

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

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 1 ampere.

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.

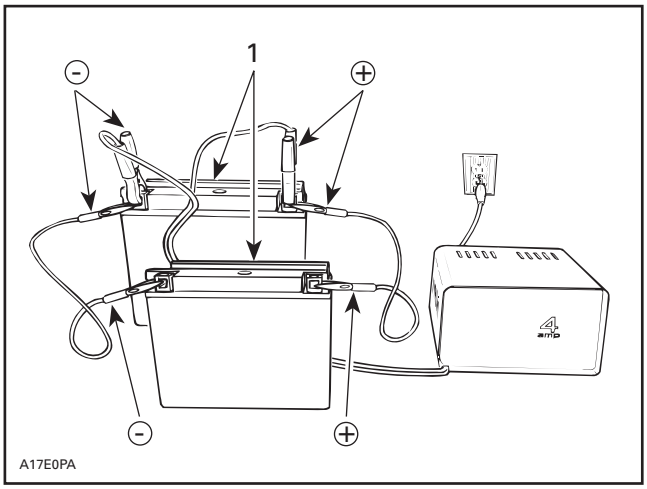
– If the charging current is measurable before the end or at the end of about 10 hours, the battery is good and charging should be completed in the normal manner as specified in **Activation of a new battery**.

– It is recommended that any battery recharged by this procedure be load tested prior to returning it to service.

Charging Two 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).



TYPICAL
1. Two batteries = 4 A

◆ WARNING

Always charge battery(ies) in a well ventilated area.

Battery Installation

◆ WARNING

Always connect battery cables exactly in the specified order, RED positive cable first BLACK negative cable last.

Proceed as follows:

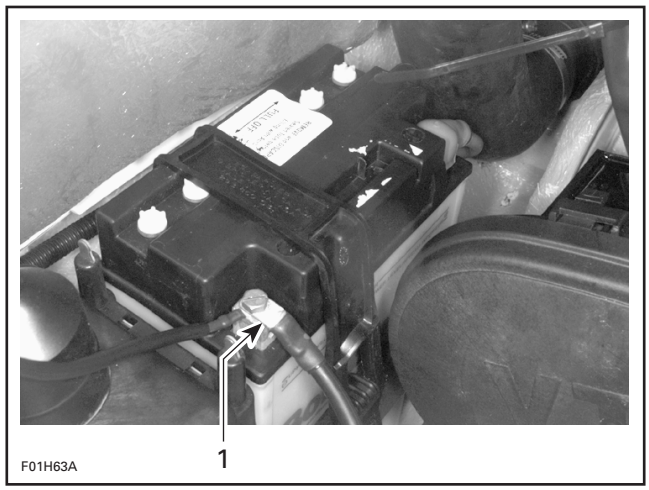
1. Install battery in its emplacement.
2. Secure vent line to the battery and support. Ensure vent line is not kinked or obstructed.

◆ WARNING

Vent line must be free and open. Avoid skin contact with electrolyte.

3. **First** connect RED positive cable.
4. Connect BLACK negative cable **last**.

NOTE: On the SPX model, secure the negative battery cable on top of the small ground wire without using a washer.

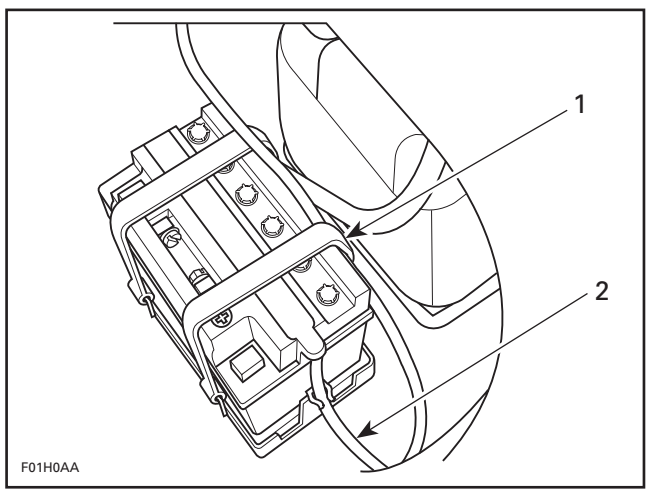


SPX MODEL
1. Negative battery cable on top of small ground wire

5. Apply dielectric grease on battery posts.
6. Verify cable routing and attachment.

GTS Model

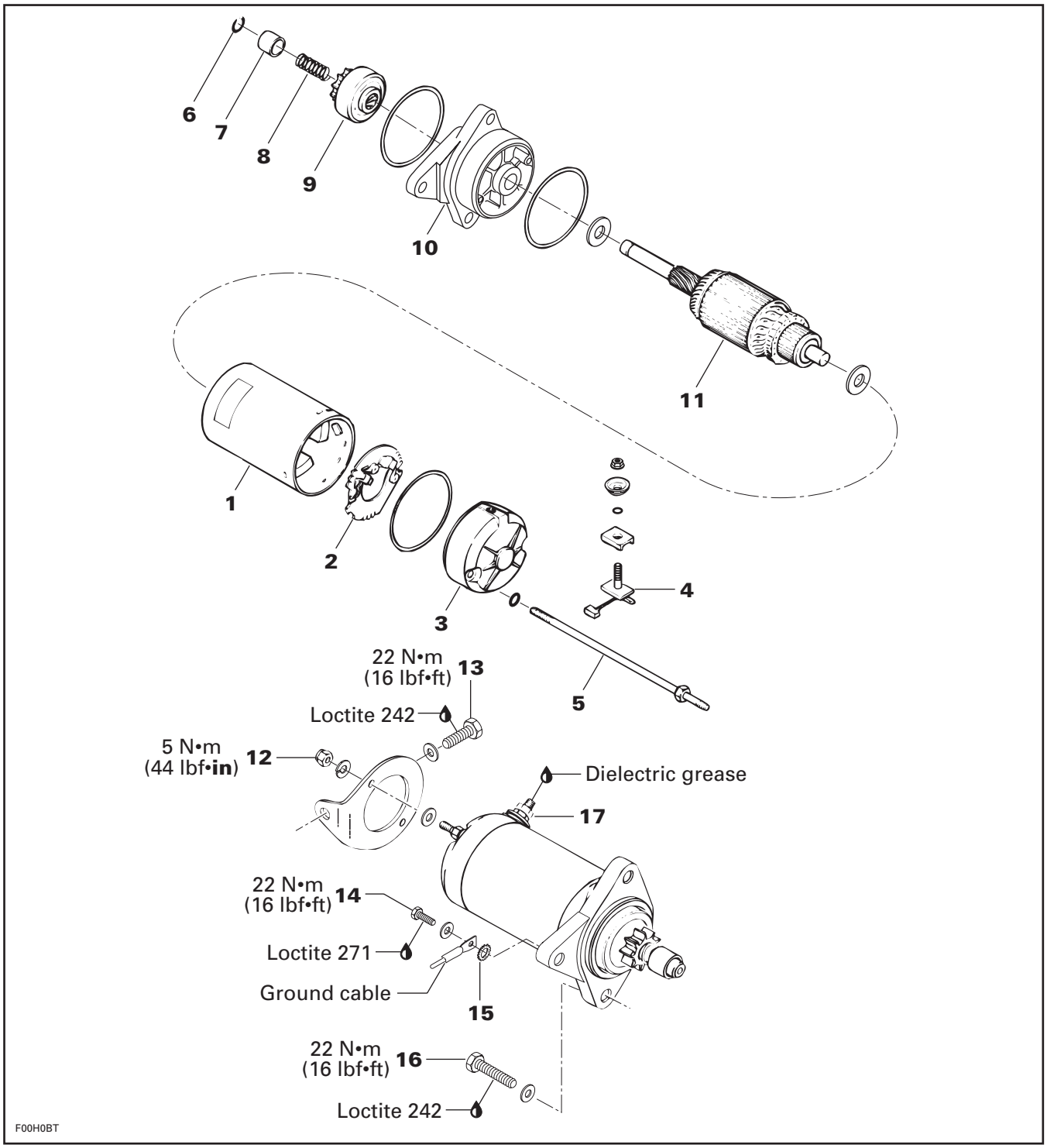
Secure RED positive battery cable using right strap of battery.



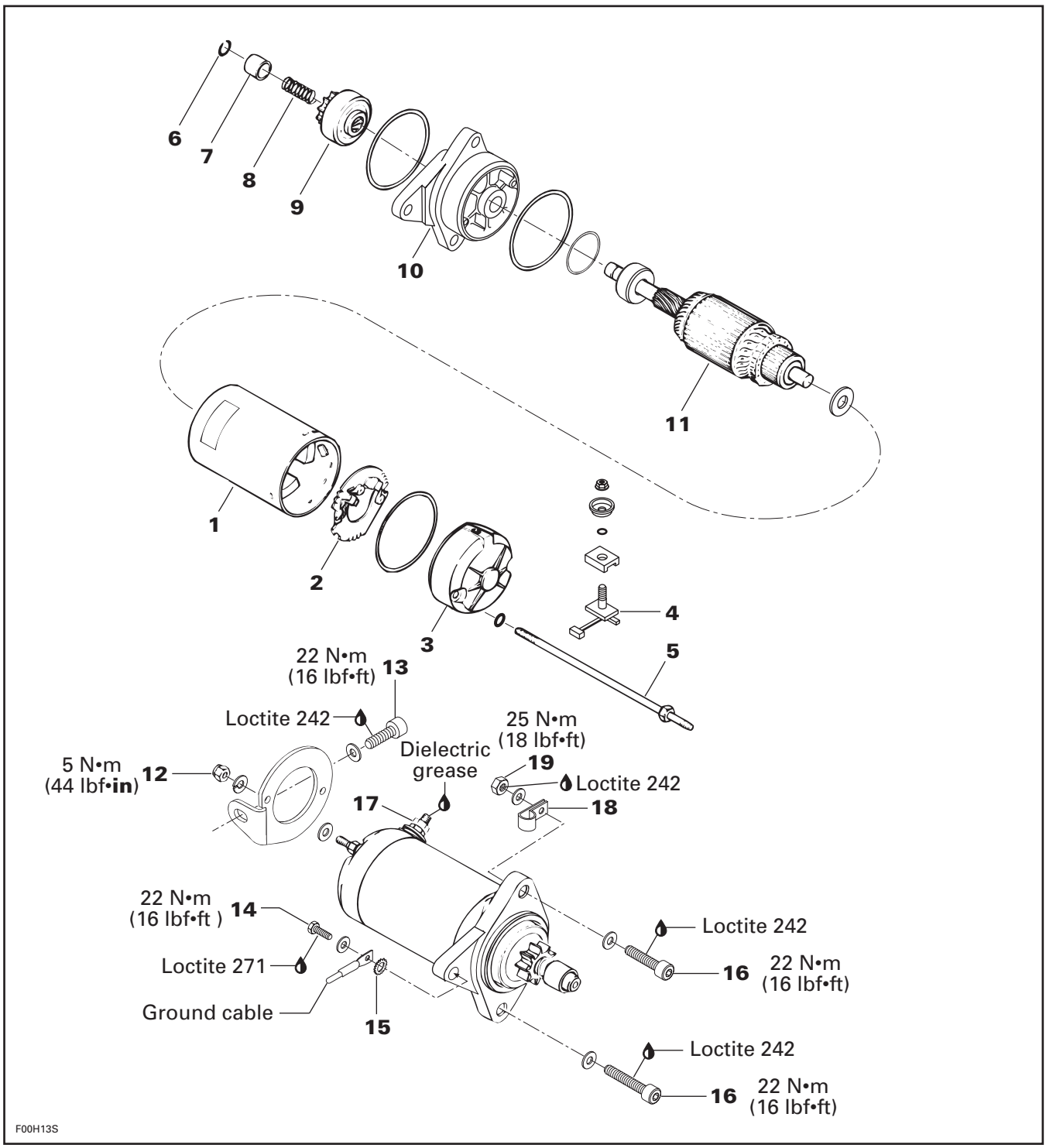
GTS MODEL
1. Strap retaining RED positive cable
2. Vent tube connected and secured in support

STARTING SYSTEM

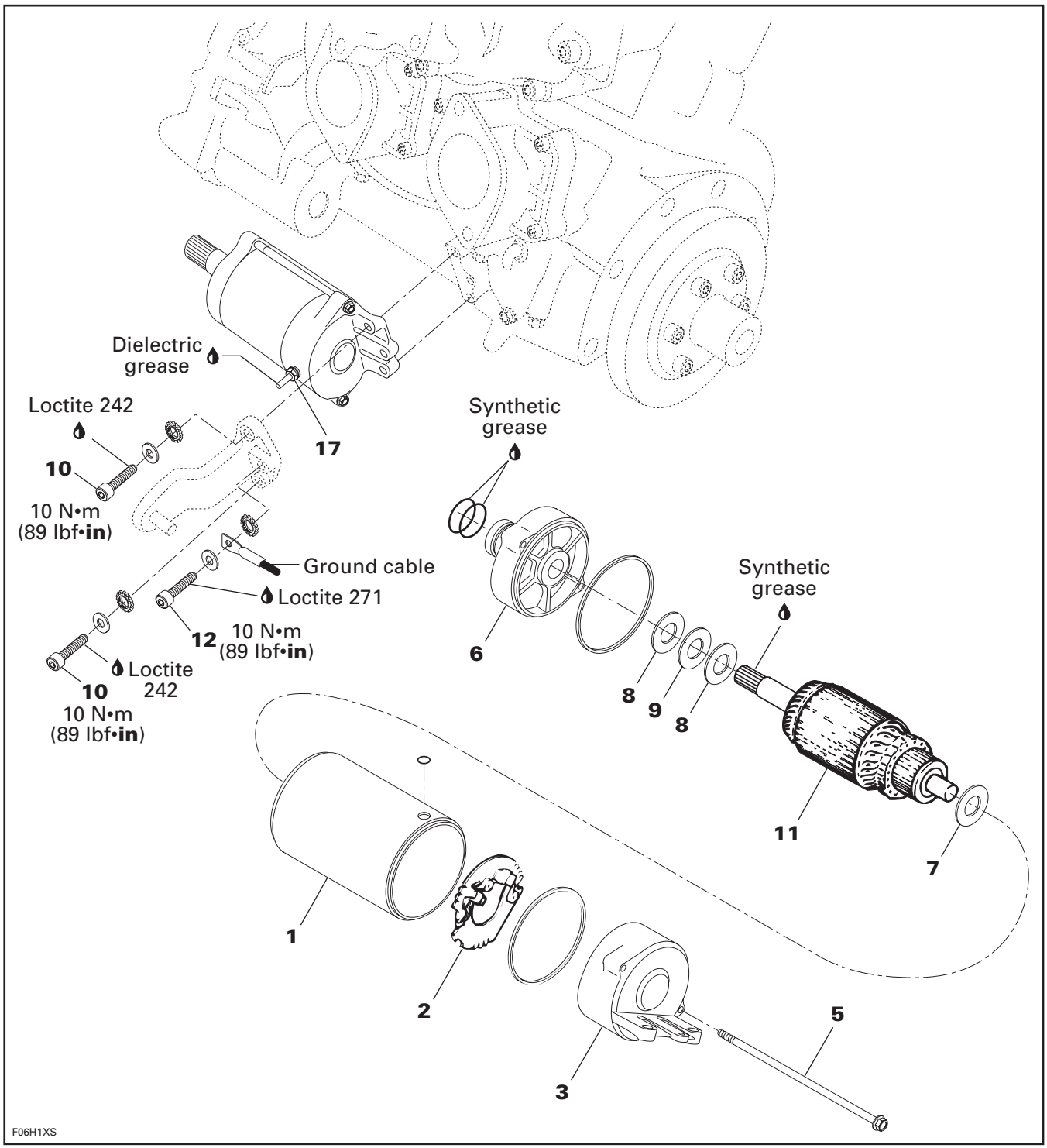
717 Engine



787 Engine


6
7
8
9
10
11
1
2
3
4
5
22 N•m
(16 lbf•ft)
13
Loctite 242
25 N•m
(18 lbf•ft)
Dielectric
grease
19
Loctite 242
5 N•m
(44 lbf•in)
12
17
18
22 N•m
(16 lbf•ft)
14
Loctite 271
Ground cable
15
Loctite 242
16
22 N•m
(16 lbf•ft)
Loctite 242
16
22 N•m
(16 lbf•ft)
F00H13S

947 Engine


Dielectric grease
Loctite 242
10
10 N•m (89 lbf•in)
17
Ground cable
Loctite 271
12
10 N•m (89 lbf•in)
Loctite 242
10
10 N•m (89 lbf•in)
Synthetic grease
6
8
9
8
Synthetic grease
11
7
1
2
3
5
F06H1XS

GENERAL

Causes of troubles are not necessarily related to starter but may be due to a burnt fuse, faulty battery, start/stop switch, safety lanyard switch, MPEM, solenoid, electrical cables or connections.

Check these components before removing starter. Consult also the starting system troubleshooting table on next page for a general view of possible problems.

◆ 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.

Fuse

Make sure 5 A fuse on MPEM is in good condition.

The solenoid may be the cause of a burnt fuse. If the solenoid checks good, one of the accessory may be defective.

Battery

To check battery condition, refer to STARTING SYSTEM 08-04.

MPEM

If 2 short beeps are not heard when installing the safety lanyard, refer to DIGITALLY ENCODED SECURITY SYSTEM 08-06.

Engine Start/Stop Switch

Switch condition can be checked with an ohmmeter.

Disconnect the switch YELLOW/RED wire. Connect 1 test probe to the YELLOW/RED wire and the other test probe to ground.

Measure resistance, it must be an open circuit (switch is normally open). Depress and hold switch, the ohmmeter should read close to 0 ohm.

Safety Lanyard Switch

The following continuity tests can be performed using an ohmmeter:

Disconnect switch wires.

Safety Lanyard Removed

Connect test probes to switch BLACK and BLACK/YELLOW wires. Measure resistance, there should be no continuity (open circuit).

Connect one test probe to the WHITE/GRAY wire and the other test probe to the switch terminal. Measure resistance, it must be close to 0 ohm.

Connect one test probe to the BLACK wire and the other test probe to the switch ring. Measure resistance, it must be close to 0 ohm.

Safety Lanyard on Switch

Connect test probes to switch BLACK and BLACK/YELLOW wires. Measure resistance, it must be close to 0 ohm.

Solenoid

NOTE: Solenoid is located in the electrical box.

Inspect connections and clean as necessary.

Static Test: Continuity

With a multimeter, check primary winding resistance. It should be approximately 5 ohms.

There should be no continuity between the positive posts of the solenoid.

Dynamic Test

Depress start/stop button and measure the voltage on the solenoid positive posts with a multimeter.

If there is no voltage and battery is in good condition, replace the solenoid.

Electrical Cables or Connections

Check all connections, cables and wires. Tighten any loose cables. Replace any chafe wires.

STARTING SYSTEM TROUBLESHOOTING

SYMPTOM	CAUSE	REMEDY
Starter does not turn.	Burnt 5 A fuse.	Check wiring condition and replace fuse.
	Poor contact of battery terminal(s).	Clean and tighten terminal(s).
	Poor battery ground cable connection.	Clean and tighten.
	Weak battery.	Recharge or replace battery.
	Poor contact of start/stop switch, safety lanyard switch or solenoid.	Replace.
	Open circuit: start/stop switch or solenoid.	Replace.
	Safety lanyard or MPEM.	Refer to DIGITALLY ENCODED SECURITY SYSTEM 08-06.
Starter engages; but does not crank the engine.	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 clutch.
	Weak battery.	Recharge or 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 ring gear.	Replace ring gear.
Starter motor keeps running.	Shorted solenoid winding.	Replace solenoid.
	Melted solenoid contacts.	Replace solenoid.
	Sticking or defective starter clutch.	Lubricate or replace.
	Presence of salt water in the electrical box which gives continuity.	Verify electrical box watertightness.

STARTER REMOVAL

Disconnect BLACK cable ground connection from battery.

◆ WARNING

Always disconnect ground cable first and reconnect last.

Disconnect RED cable connection from battery.

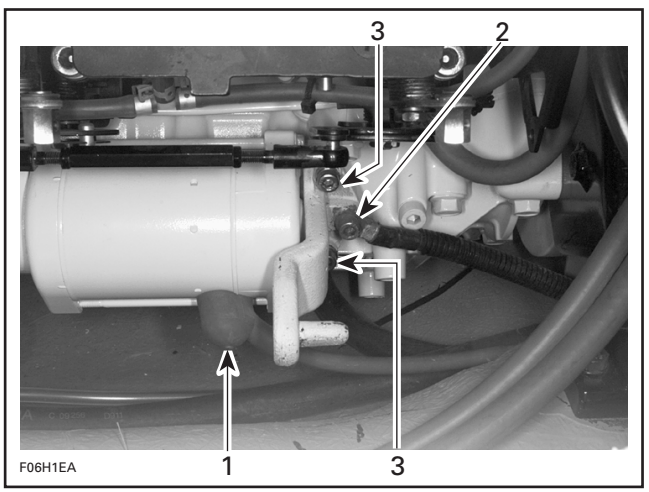
717 and 787 Engines

Remove the following parts:

– cables from starter
– screw no. 13 of starter rear support
– starter mount screws no. 16

947 Engine

Disconnect starter cables and loosen Allen screws no. 16 retaining starter bracket to engine.



1. Positive starter cable
2. Negative starter cable
3. Allen screw

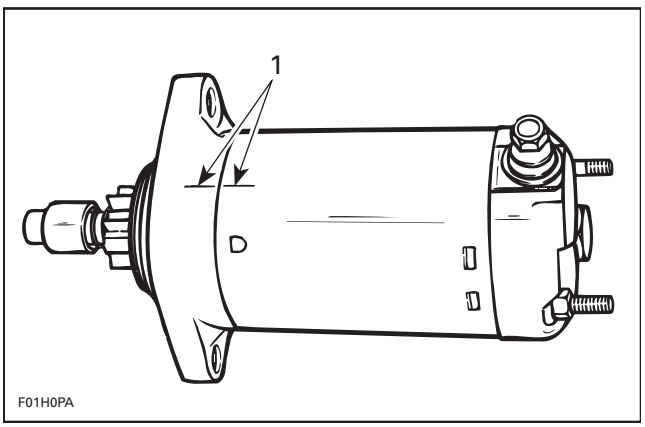
Remove bracket and starter.

NOTE: To remove the starter drive assembly, magneto flywheel has to be removed. Refer to MAGNETO SYSTEM 04-04 and BOTTOM END 04-06.

STARTER DISASSEMBLY

717 and 787 Engines

Before disassembling, trace index marks on yoke no. 1 and clutch housing no. 10 to ease further assembly.



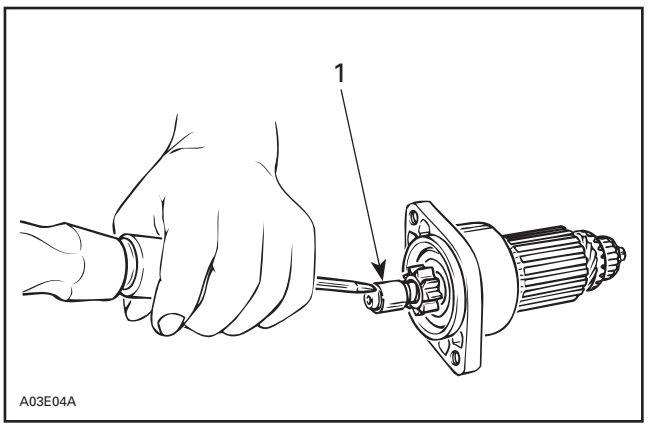
TYPICAL
1. Trace indexing marks

Remove starter support nuts no. 12 then through bolts no. 5. Separate end frame no. 3 from yoke assembly no. 1. Withdraw yoke assembly from armature no. 11.

Brush holder no. 2 can be removed from end frame no. 3 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.

Tap the pinion stop collar no. 7 using a screwdriver. Remove circlip no. 6. Disassemble pinion stop collar no. 7 and spring no. 8.



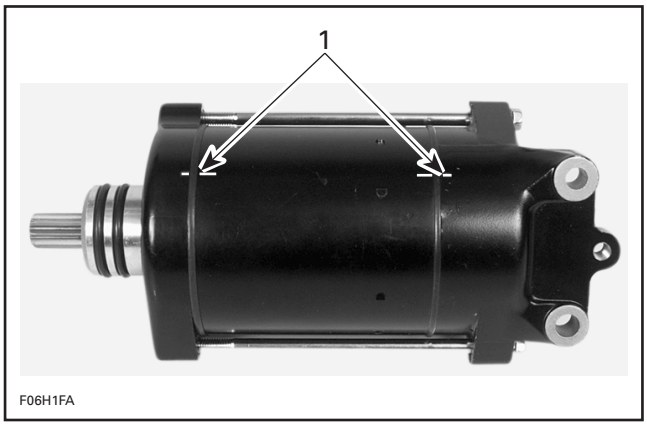
1. Pinion stop collar

Turn clutch assembly **no. 9** clockwise to remove it from armature assembly **no. 11**.

Pull housing from armature.

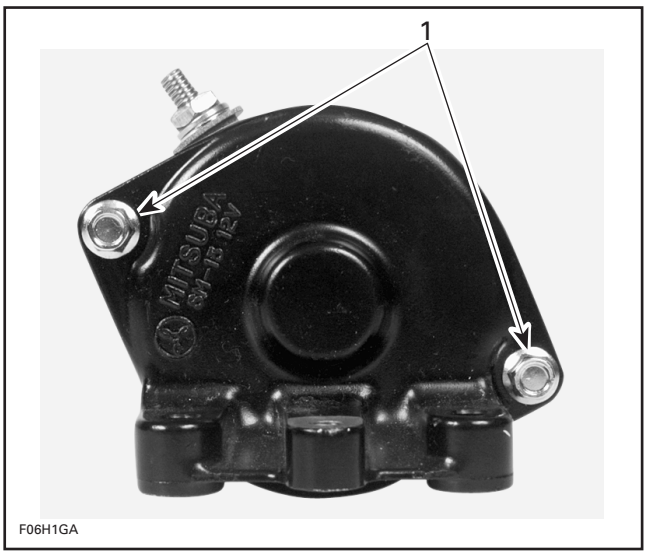
947 Engine

Locate index marks on yoke **no. 1** and end covers **no. 3** and **no. 6**.



1. Index marks

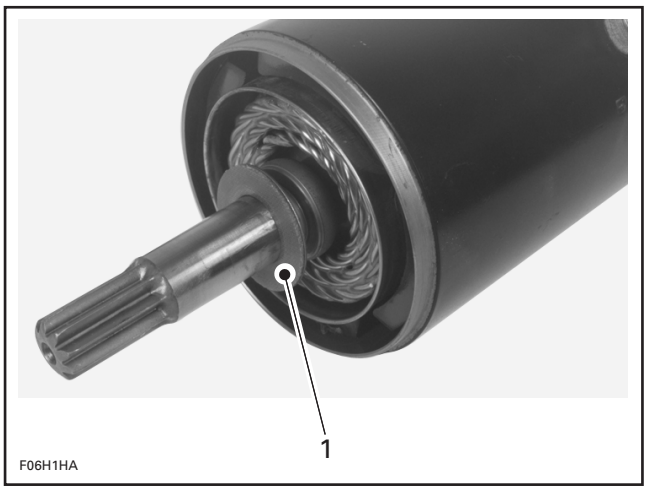
Loosen through bolts **no. 5**.



1. Through bolts

Remove end cover **no. 3** and gasket on armature shaft side.

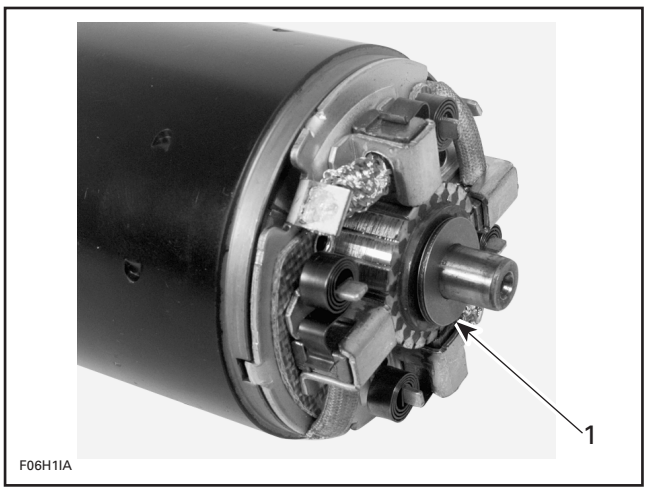
Remove thrust washer **no. 7** from armature shaft.



1. Thrust washer

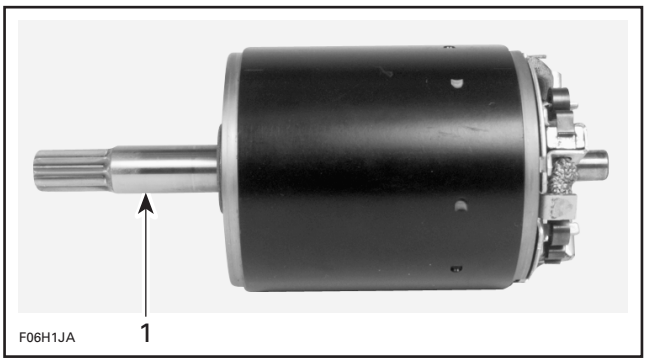
Remove the other end cover **no. 6** and gasket.

Remove the 3 washers **no. 8** and **no. 9** from armature shaft.



1. Washers

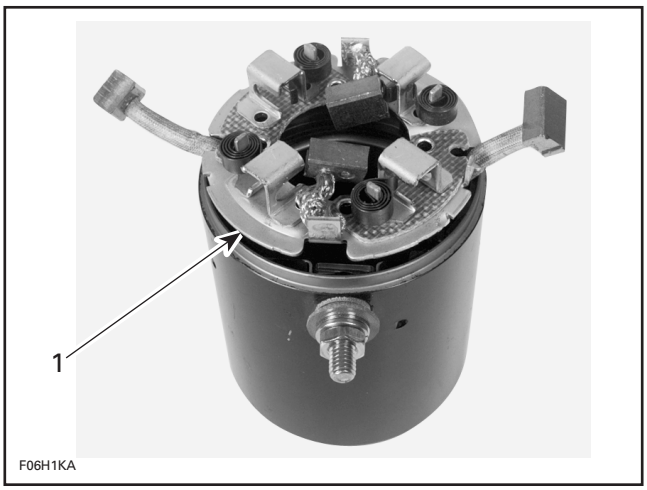
Remove armature **no. 11**.



1. Pull armature shaft

Release brush wires of yoke from brush holder no. 2.

Remove brush holder no. 2.



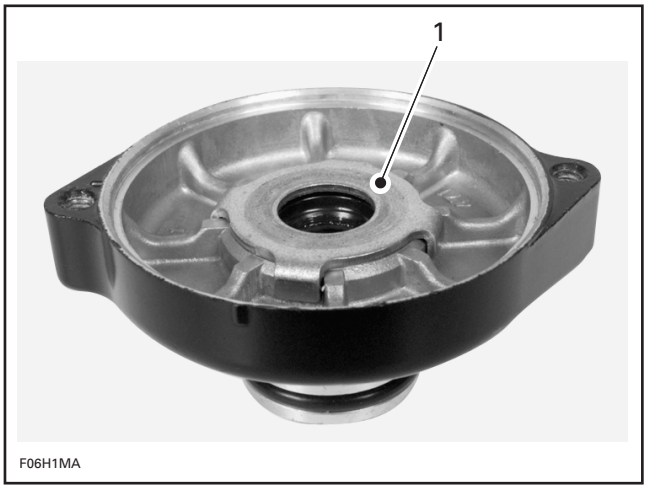
1. Remove brush holder

To remove brushes from yoke no. 1, loosen nut and remove washers.

1. Loosen nut and remove washers

Remove brushes.

To remove bearing and seal in end cover, release tabs of retainer.



1. Retainer

CLEANING

▼ CAUTION

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

Discard all O-rings.

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 or bearings must not be cleaned with grease dissolving agents.

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

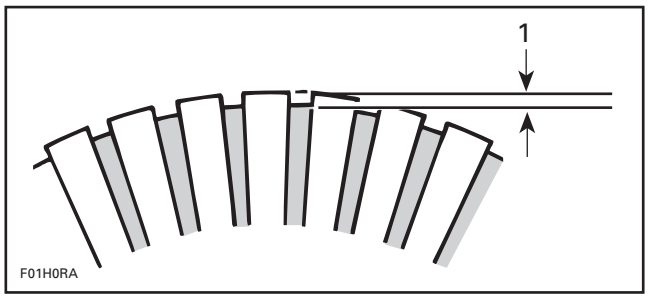
PARTS INSPECTION

11, 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.

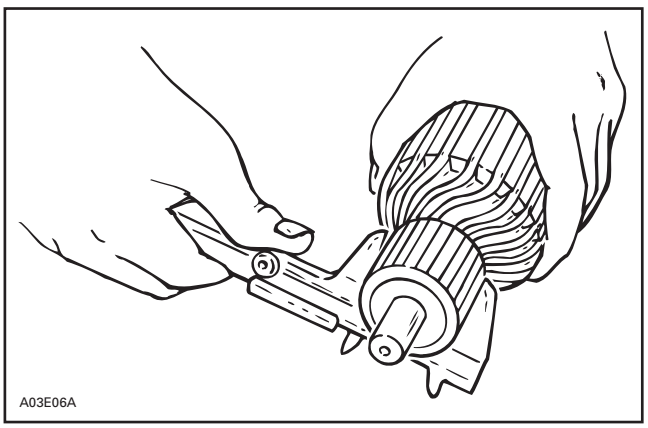
Check commutator for mica depth. If depth is less than 0.20 mm (.008 in), undercut mica. Be sure that no burrs are left and no copper dust remains between segments after undercutting operation is completed.



1. Commutator undercut 0.20 mm (.008 in)

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.



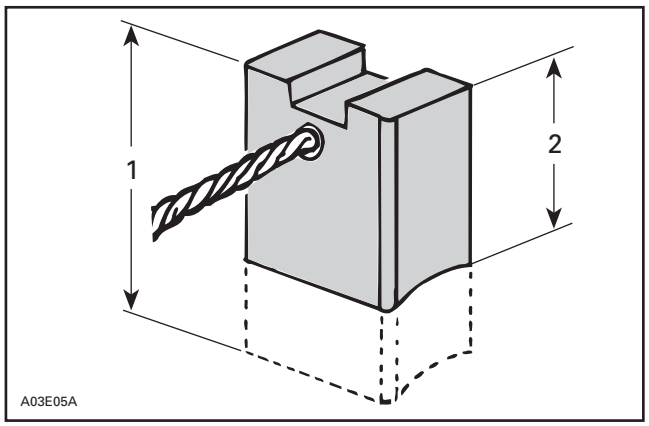
2, Brush Holder

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.

4, Brush

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

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



1. New
2. Wear limit, 8.5 mm (.335 in)

9, 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 MAGNETO 04-04.

STARTER ASSEMBLY

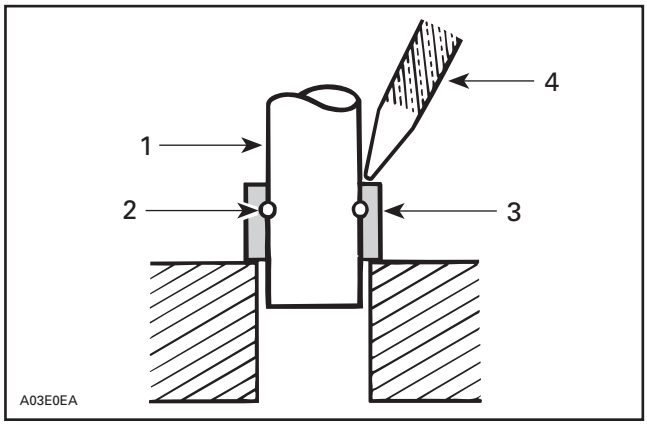
Reverse the order of disassembly to reassemble starter. However, attention should be paid to the following operations.

717 and 787 Engines

Prior to assembling, coat sliding surfaces on armature shaft splines, overrunning clutch and bushing (717 engine) with G.E. Versilube G 341 M or ESSO Beacon 325 lubricant or equivalent.

After placing pinion stop collar **no. 7** on armature shaft **no. 11**, fit circlip **no. 6** into armature shaft, then make sure that it is properly secured.

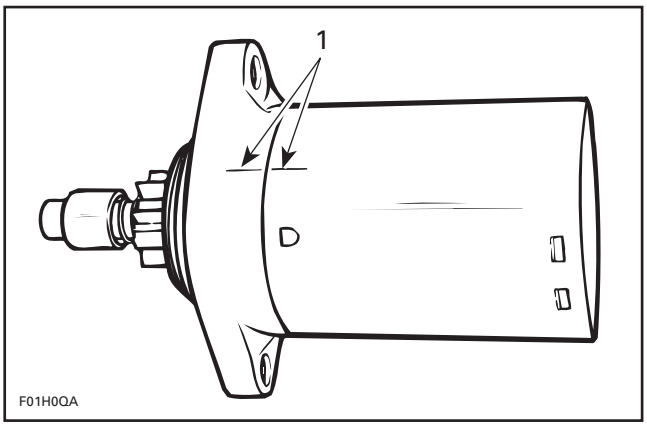
Slide stop collar no. 7 over circlip no. 6 and secure in place by punching it at 2 or 3 places.



1. *Armature shaft*
2. *Circlip*
3. *Pinion stop collar*
4. *Punch*

1,10, Yoke Assembly and Clutch Housing

Align previously traced indexing marks.

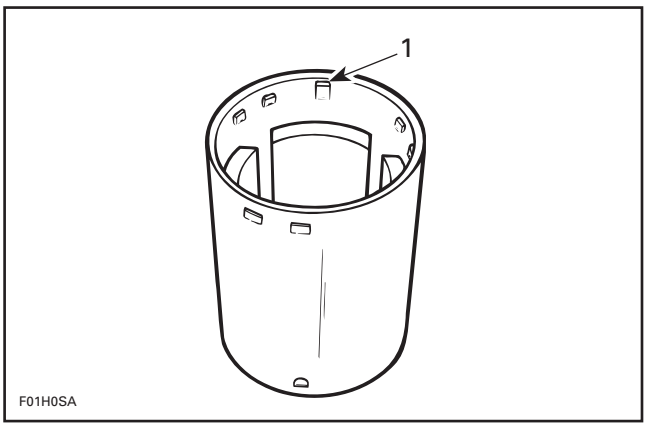


TYPICAL

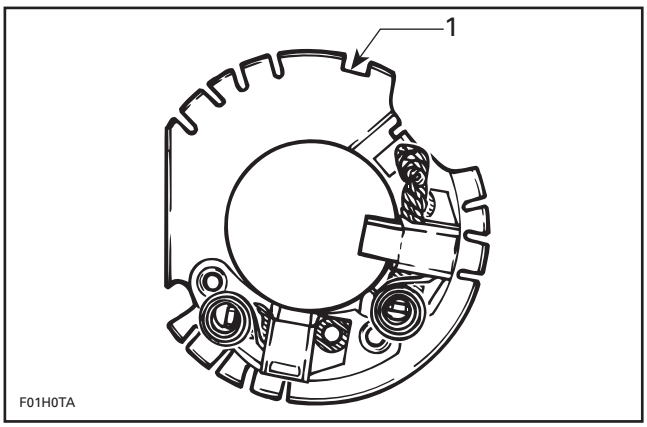
1. *Align marks*

Open brushes no. 4 and slide over commutator.

Align end frame locating notch with yoke locating protrusion and properly sit brush holder no. 2 into yoke no. 1.

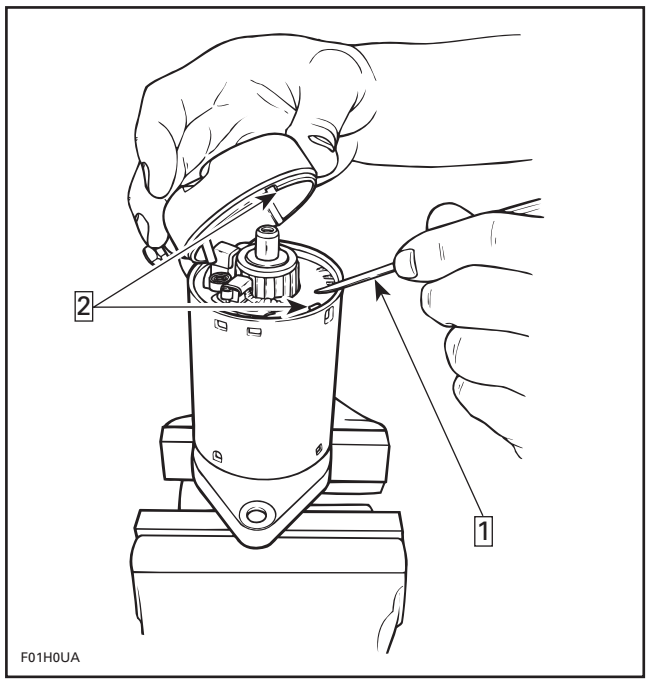


1. *Locating protrusion is the higher one*



1. *Brush holder locating notch*

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



Step 1 : Retaining brush holder with a screwdriver
Step 2 : Align here

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

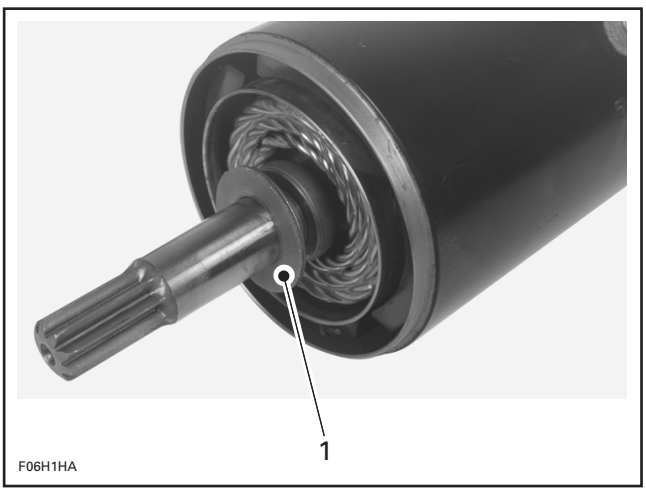
▼ CAUTION

Make sure end frame fits perfectly on yoke.

947 Engine

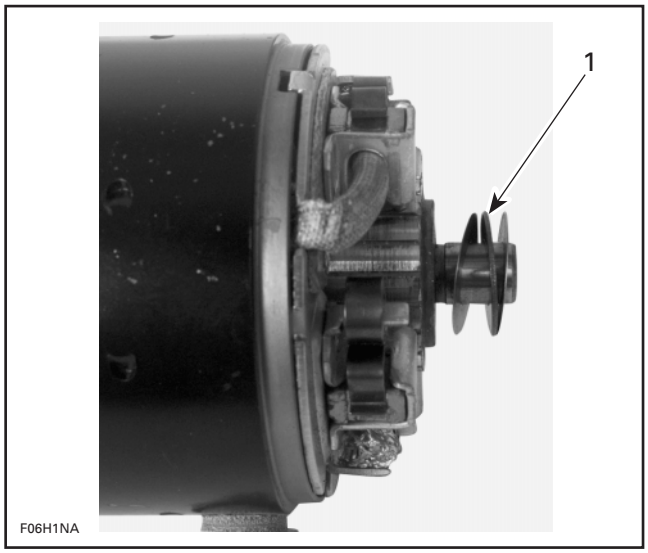
Install new O-rings and gaskets.

Insert thrust washer **no. 7** onto armature shaft with the non-metallic surface facing the end cover.



1. Non-metallic surface on this side

Install the 3 washers **no. 8** and **no. 9** onto armature shaft, with the thicker one in the middle.



1. Thick washer in the middle

When installing end covers **no. 3** and **no. 6** to yoke, align index marks.

Apply Loctite 271 (red) on through bolts **no. 5** and torque to 6 N•m (53 lbf•**in**).

STARTER INSTALLATION

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

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

717 and 787 Engines

13,16, Screw

Apply Loctite 242 (blue) on threads and torque starter screws to 22 N•m (16 lbf•ft).

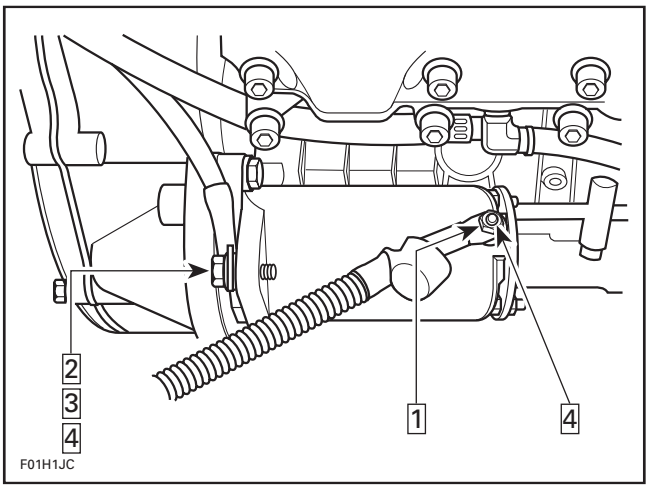
17, Nut

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

14,15, Screw and Teeth Washer

Apply Loctite 271 (red) to screw.

Connect BLACK negative cable to starter using flat washer, teeth washer and screw. Torque screw to 22 N•m (16 lbf•ft). Apply dielectric grease on terminal and screw.



717 ENGINE SHOWN

*Step 1 : Torque nut to 6 N•m (53 lbf•**in**)*
Step 2 : Apply Loctite 271 on screw
Step 3 : Torque screw to 22 N•m (16 lbf•ft)
Step 4 : Apply dielectric grease

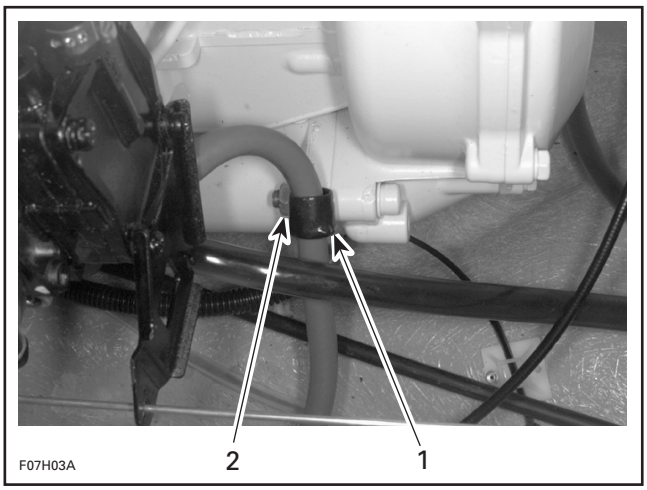
◆ WARNING

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.

787 Engine

18, Locking Collar

Install the locking collar of the fuel hose. Apply Loctite 242 (blue) on nut **no. 19** and torque to 25 N•m (18 lbf•ft).



787 ENGINE

1. *Locking collar*
2. *Nut*

947 Engine

10, Screw

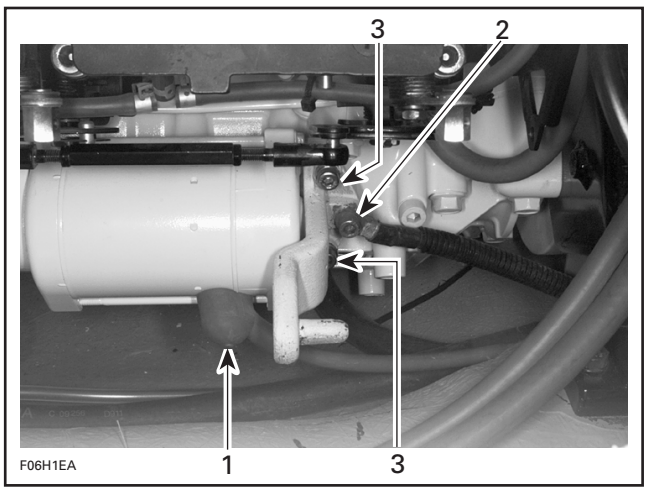
Apply Loctite 242 (blue) to Allen screws of starter bracket and torque to 10 N•m (89 lbf•**in**).

17, Nut

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

12, Screw

Apply Loctite 271 (red) to Allen screw. Connect BLACK negative starter cable using flat washer, teeth washer and screw. Torque to screw 10 N•m (89 lbf•**in**). Apply dielectric grease.



947 ENGINE

1. *Torque nut to 6 N•m (53 lbf•**in**), apply dielectric grease and install protection cover*
2. *Apply Loctite 271 to threads and torque screw to 10 N•m (89 lbf•**in**)*
3. *Apply Loctite 242 to threads and torque screw to 10 N•m (89 lbf•**in**)*

◆ 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.

STARTER SPECIFICATION

717 and 787 Engines

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
	Stall	5 V	350 A max.	0 RPM
Battery		19 Ah		

947 Engine

Nominal output		0.8 kW		
Voltage		12 V		
Rated time		30 seconds		
Rotation		Counterclockwise (viewed from pinion side)		
Weight		1.7 kg (3.7 lb)		
Performance specification at 20°C (68°F)	No load	10.9 V	45 A max.	8600 RPM
	Load	9 V	120 A max.	5350 RPM
	Stall	2.25 V	390 A max.	0 RPM
Battery		12 V, 19 Ah		

INSTRUMENTS AND ACCESSORIES

GENERAL

It is possible to activate the instruments when the engine is not running.

Make sure the safety lanyard is removed, then depress the start/stop button.

The timer of the MPEM will maintain the gauge(s) activated during a period of approximately 33 seconds.

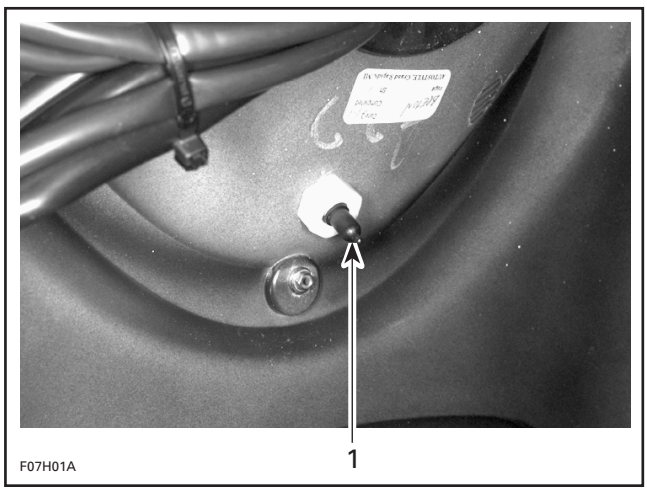
INSPECTION

Exterior Temperature Sensor

GTX Limited

The temperature sensor is located in the storage cover.

Remove the back panel of the storage cover to access the temperature sensor.



1. Temperature sensor

To check if the temperature sensor is operational, activate the Info Center and select the exterior temperature mode.

Use a heat gun to warm up the sensor. The temperature should raise rapidly on the gauge.

If not, replace the temperature sensor.

Lake Temperature Sensor

GSX Limited and GTX Limited

The lake temperature sensor is integrated with the speed sensor located on the ride plate.

To check if the lake temperature sensor is operational, activate the Info Center and select the lake temperature mode.

With a garden hose, spray the speed sensor with water. The lake temperature on the Info Center should adjust to the water temperature.

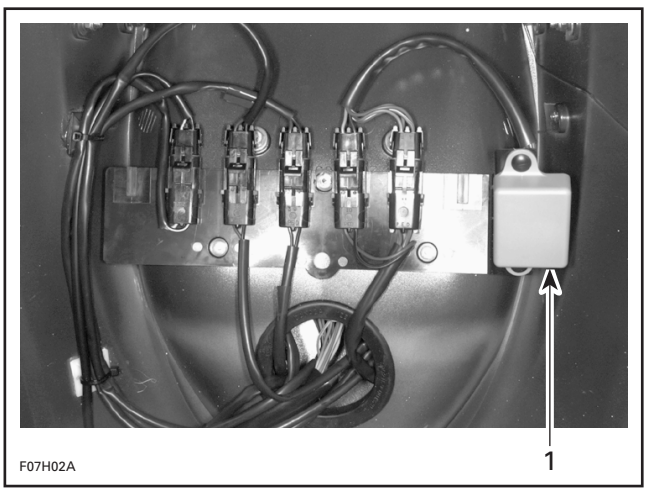
If not, replace the speed sensor.

Compass

GTX Limited

The compass is located in the storage cover.

Remove the back panel of the storage cover to access the compass.



1. Compass

Remove the compass from the support.

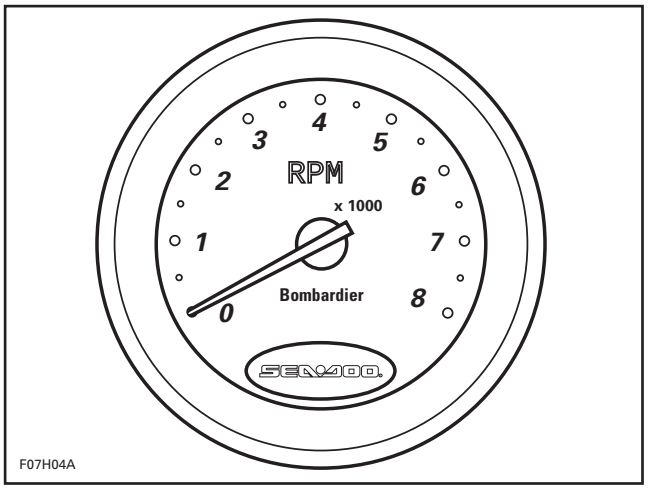
Activate the Info Center.

Change the direction of the compass and keep it horizontal (± 10°). There should be a change of direction on the Info Center.

NOTE: To check the accuracy of the compass, you can use a portable compass and point it in the same direction. Compare the given directions, they should be the same.

Tachometer

GTX Limited



The PURPLE wire is the 12 Vdc power source of the tachometer.

The BLACK wire is the ground.

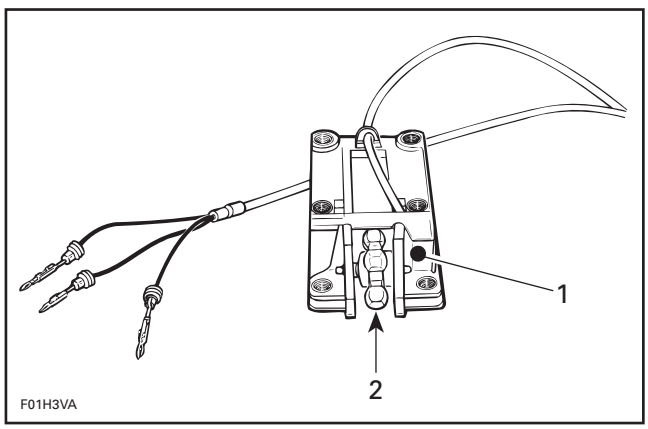
The GRAY wire is the pulse signal from the multi-purpose electronic module (MPEM).

Speed Sensor

GSX Limited, XP Limited, GTI and GTX Limited

The speedometer gives a reading through a speed sensor. Speed sensor is installed on riding plate. It works with the water flow which turns a magnetic paddle wheel that triggers an electronic pick-up that in turn sends a speed signal to the speedometer.

The paddle wheel is protected by the pick-up housing.



1. Pick-up housing
2. Paddle wheel

To check if the speed sensor is operational, disconnect the speed sensor connector housing from inside bilge.

Using an appropriate terminal remover (Snap-on TT600-4), remove the PURPLE/YELLOW and BLACK/ORANGE wires from the tab housing of the speed sensor.

Reconnect the PURPLE/YELLOW and BLACK/ORANGE wires in the receptacle housing.

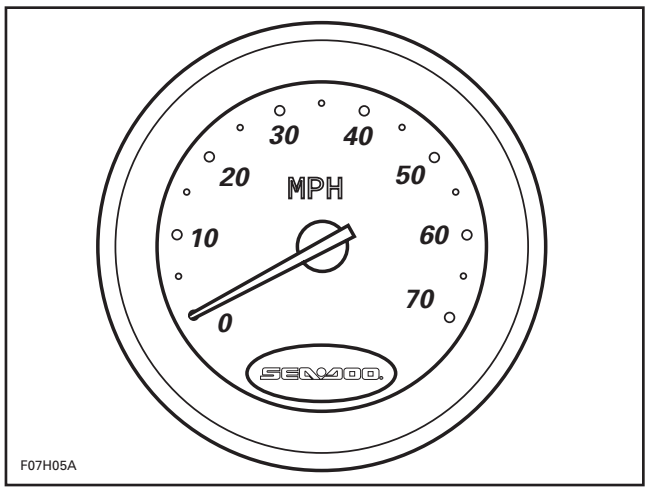
Connect the positive probe of a multimeter to speed sensor PURPLE/YELLOW wire and the negative probe to speed sensor BLACK/ORANGE wire.

With the safety lanyard removed, depress the start/stop button to activate the MPEM timer.

Slowly rotate the paddle wheel. Every 1/8 turn, the observed voltage should fluctuate between 5.5 and 8.5 Vdc.

Speedometer

GSX Limited, XP Limited, GTI and GTX Limited



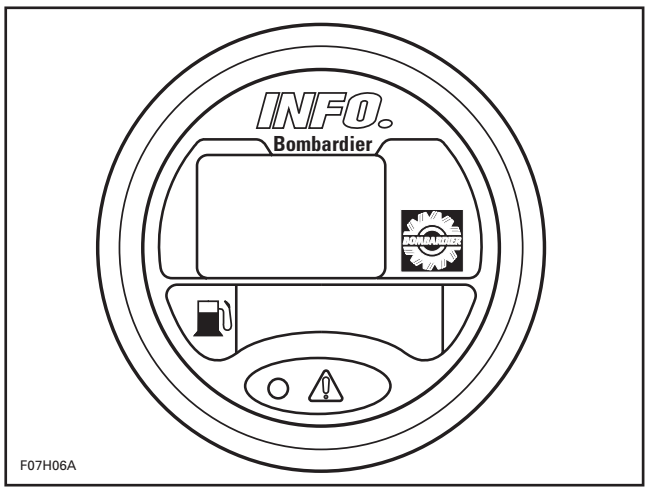
The PURPLE wire is the 12 Vdc power source of the speedometer.

The BLACK wire is the ground.

The PURPLE/YELLOW wire is the pulse signal from the speed sensor.

Info Center

GSX Limited and GTX Limited



TYPICAL

This is a LCD multifunction gauge. It features the following functions:

– fuel level
– low fuel level
– low oil level
– low voltage
– overheating
– hourmeter
– clock
– maintenance information
– chronometer
– tachometer
– speedometer
– peak speed
– average speed
– trip meter
– VTS (GSX Limited)
– compass (GTX Limited)
– exterior temperature (GTX Limited)
– lake temperature

The Info Center also features a red warning LED which blinks whenever one of the following circumstances occur: low fuel, low oil, low voltage and overheating.

For example, if the fuel level is low, the LED and the message "*LOW FUEL*" will blink.

As a self test, all LCD segments and the LED will turn on for 3 seconds each time the watercraft is started.

SCROLLING FUNCTIONS

Press the MODE button until the desired function is displayed on the Info Center.

RESET A FUNCTION

To reset a function such as the chronometer, peak speed, trip meter, etc., select the desired function using the MODE button then press and hold the SET button for 2 seconds.

DISPLAY PRIORITIES

The clock (and compass for the GTX Limited) is the basic mode of the Info Center.

The chronometer, tachometer and speedometer are the only other functions that may be chosen to replace the clock mode.

If an another function is chosen, the clock mode will be displayed again after 4 seconds.

In the event of a warning message such as low fuel is displayed, the message will blink and override any other functions.

If more than one warning message is displayed, the messages will blink and reappear every 4 seconds.

LANGUAGE OPTION

While in the clock mode, press and hold the SET button for 2 seconds. Language option will be displayed.

Press the MODE button to scroll language (English, French and Spanish).

Press the SET button to confirm the selected language and return to the clock mode.

ENGLISH/METRIC OPTION

Press and hold both MODE and SET buttons for 2 seconds. The system will be automatically changed.

CHRONOMETER

Select the chronometer mode and press the SET button to start or stop the chronometer.

Press the SET button for 2 seconds to reset the chronometer.

CLOCK SETTING

While in the clock mode, press and hold both MODE and SET buttons for 2 seconds. The clock will blink to confirm the setting mode.

Press the MODE button to adjust the hours and the SET button to adjust the minutes.

Press again on both the MODE and SET buttons to exit the setting mode (or the gauge will automatically exit the setting mode after 10 seconds).

MAINTENANCE INFORMATION

When the watercraft is due for a maintenance inspection, the message "MAINT" will blink.

To clear the "MAINT" message, press the SET button for 2 seconds during the message blinking.

Verification

The PURPLE wire is the 12 Vdc power source of the Info Center.

The BLACK wire is the ground.

The RED/PURPLE wire is the 12 Vdc from the battery protected by a 5 A fuse on the MPEM.

The accuracy of some features of the Info Center can be checked with a potentiometer.

FUEL LEVEL

Disconnect the 4-circuit connector housing of the Info Center.

Using an appropriate terminal remover, remove the PINK wire from the tab housing.

Reconnect the connector housing.

Disconnect the 2-circuit connector housing which contains a PURPLE and BLACK wires.

Remove the BLACK wire from the receptacle housing.

Reconnect the connector housing.

Connect potentiometer test probes to the PINK and BLACK wires.

Adjust potentiometer to the resistance values as per following chart to test the accuracy of the gauge.

NOTE: The gauge must be activated to obtain a reading.

RESISTANCE (Ω)	FUEL LEVEL LCD GRAPHIC	LOW FUEL LEVEL RED LIGHT
0 + 2.2	FULL	OFF
17.8 ± 2.2	7/8	OFF
27.8 ± 2.2	3/4	OFF
37.8 ± 2.2	5/8	OFF
47.8 ± 2.2	1/2	OFF
57.8 ± 2.2	3/8	OFF
67.8 ± 2.2	1/4	OFF
77.8 ± 2.2	1/8	ON
89.0 ± 2.2	EMPTY	ON

VTS

GSX Limited

Disconnect the 2-circuit connector housing of the Info Center.

Connect potentiometer test probes to the BROWN/WHITE and BROWN/BLACK wires.

Adjust potentiometer to the resistance values as per following chart to test the accuracy of the gauge.

NOTE: The gauge must be activated to obtain a reading.

RESISTANCE (Ω)	VTS LEVEL LCD GRAPHIC
167.3 ± 2.2	11/11 (UP)
153.0 ± 2.2	10/11
138.7 ± 2.2	9/11
124.4 ± 2.2	8/11
110.1 ± 2.2	7/11
95.8 ± 2.2	6/11
81.5 ± 2.2	5/11
67.2 ± 2.2	4/11
52.9 ± 2.2	3/11
38.6 ± 2.2	2/11
24.3 ± 2.2	1/11 (DOWN)

LAKE TEMPERATURE

Disconnect the 2-circuit connector housing of the Info Center which contains a BLACK/ORANGE and TAN/ORANGE wires.

Connect potentiometer test probes to the BLACK/ ORANGE and TAN/ORANGE wires.

Adjust potentiometer to the resistance values as per following chart to test the accuracy of the gauge.

NOTE: The gauge must be activated to obtain a reading.

RESISTANCE (Ω)	DISPLAY TEMPERATURE (°C)
25407.3	5 ± 2
19911.1	10 ± 2
15718.0	15 ± 2
12495.0	20 ± 2
10000.0	25 ± 2
8054.9	30 ± 2
6528.3	35 ± 2

RESISTANCE (Ω)	DISPLAY TEMPERATURE (°F)
22799.0	45 ± 4
17262.0	55 ± 4
13470.0	65 ± 4
10496.3	75 ± 4
8264.4	85 ± 4
6528.3	95 ± 4

EXTERIOR TEMPERATURE

Disconnect the 2-circuit connector housing of the Info Center which contains a TAN/WHITE and BLACK/WHITE wires.

Connect potentiometer test probes to the TAN/ WHITE and BLACK/WHITE wires.

Adjust potentiometer to the resistance values as per following chart to test the accuracy of the gauge.

NOTE: The gauge must be activated to obtain a reading.

RESISTANCE (Ω)	DISPLAY TEMPERATURE (°C)
25590.1	5 ± 2
20005.8	10 ± 2
15761.7	15 ± 2
12510.2	20 ± 2
10000.0	25 ± 2
8047.8	30 ± 2
6518.7	35 ± 2

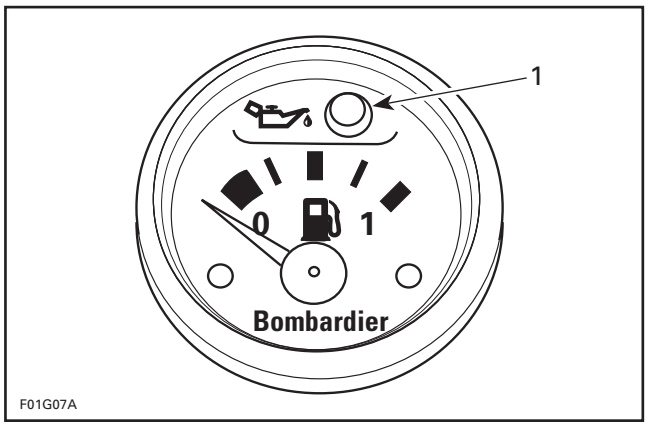
RESISTANCE (Ω)	DISPLAY TEMPERATURE (°F)
22919.8	45 ± 4
17491.7	55 ± 4
13487.5	65 ± 4
10501.5	75 ± 4
8252.0	85 ± 4
6518.7	95 ± 4

Fuel Gauge/Low Oil Warning Light

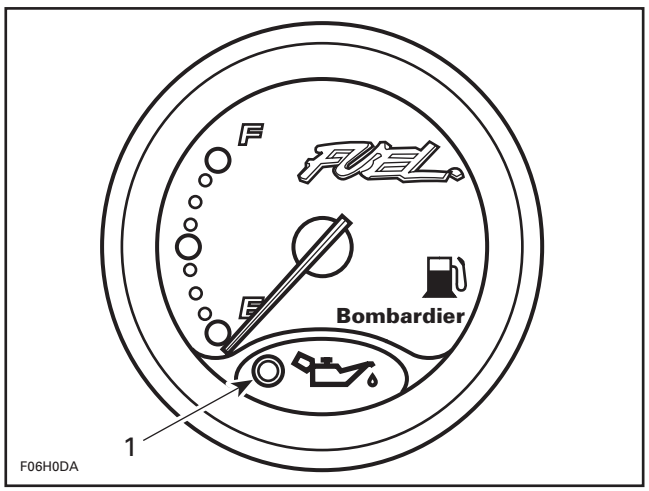
SPX, GS, GTS, GTI and XP Limited

The fuel gauge has a pointer which indicates fuel level in the tank.

The low oil warning light is part of the gauge. It will light when injection oil level is low.



SPX, GTS AND XP LIMITED
1. Low oil warning light

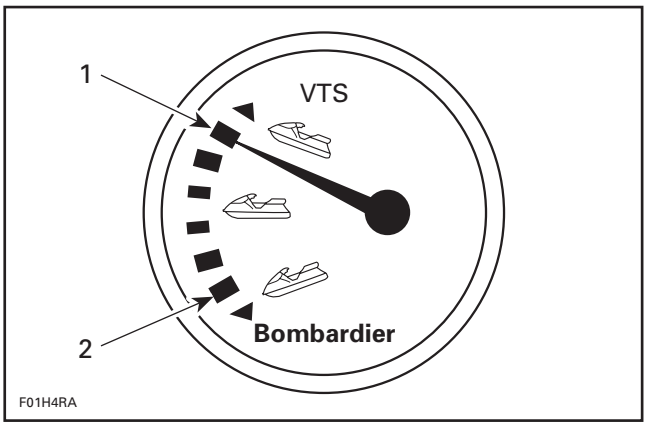


GS AND GTI MODELS
1. Low oil warning light

Variable Trim Gauge

SPX and XP Limited

The trim gauge shows the riding angle of the watercraft.



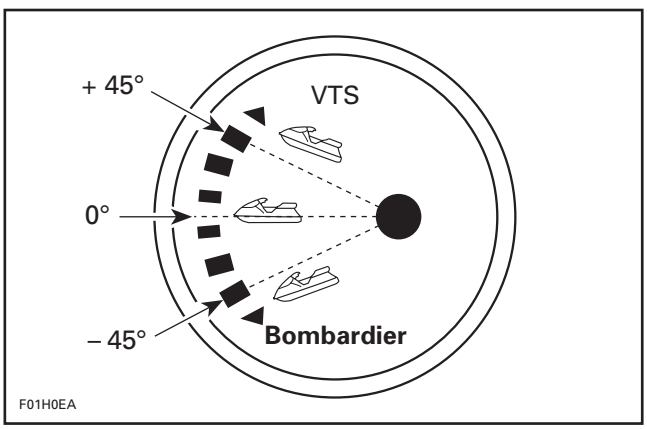
TYPICAL
1. Bow up
2. Bow down

Accuracy of gauge can be checked with a potentiometer.

– Disconnect 2-circuit connector housing of BROWN/BLACK and BROWN/WHITE wires of gauge.
– Connect potentiometer test probes to BROWN/BLACK and BROWN/WHITE wires of gauge.
– Adjust potentiometer to the resistance values as per following chart to test accuracy of gauge.

NOTE: Gauge must be activated to obtain a reading.

RESISTANCE (Ω)	GAUGE NEEDLE POSITION
10	- 45°
95	0°
180	+ 45°

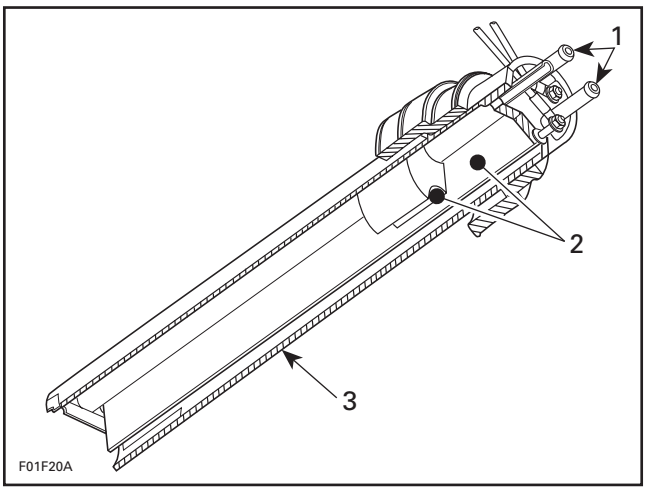


If gauge is not within the specifications, replace it.

Fuel Baffle Pick Up Sender

The baffle pick-up has an integrated fuel sender.

To verify fuel sender, a resistance test should be performed with a multimeter allowing the float to move up through a sequence.



1. Pick up tube
2. Fuel sender
3. Baffle pick-up

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

FUEL LEVEL AND RESISTANCE (SPX)	
FUEL LEVEL (mm)	RESISTANCE (Ω)
From 206.1 ± 5 and more	0 + 2.2
From 189.1 to 206 ± 5	17.8 ± 2.2
From 162.1 to 189 ± 5	27.8 ± 2.2
From 135.1 to 162 ± 5	37.8 ± 2.2
From 108.1 to 135 ± 5	47.8 ± 2.2
From 81.1 to 108 ± 5	57.8 ± 2.2
From 54.1 to 81 ± 5	67.8 ± 2.2
From 40.1 to 54 ± 5	77.8 ± 2.2
From 0 to 40 ± 5	89.8 ± 2.2

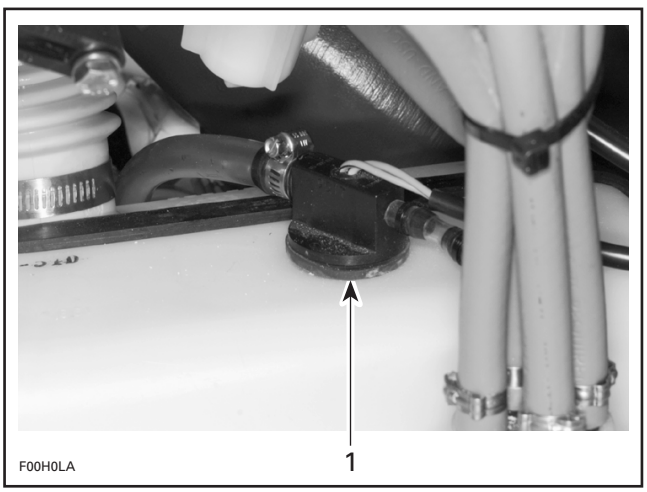
FUEL LEVEL AND RESISTANCE (GTS)	
FUEL LEVEL (mm)	RESISTANCE (Ω)
From 257.9 ± 5 and more	0 + 2.2
From 234.4 to 257.8 ± 5	17.8 ± 2.2
From 200.9 to 234.3 ± 5	27.8 ± 2.2
From 167.4 to 200.8 ± 5	37.8 ± 2.2
From 134 to 167.3 ± 5	47.8 ± 2.2
From 100.5 to 133.9 ± 5	57.8 ± 2.2
From 67 to 100.4 ± 5	67.8 ± 2.2
From 40.1 to 66.9 ± 5	77.8 ± 2.2
From 0 to 40 ± 5	89.8 ± 2.2

FUEL LEVEL AND RESISTANCE (GS, GSX Limited, GTI and GTX Limited)	
FUEL LEVEL (mm)	RESISTANCE (Ω)
From 248.9 ± 5 and more	0 + 2.2
From 234.4 to 248.8 ± 5	17.8 ± 2.2
From 200.9 to 234.3 ± 5	27.8 ± 2.2
From 167.4 to 200.8 ± 5	37.8 ± 2.2
From 134.0 to 167.3 ± 5	47.8 ± 2.2
From 100.5 to 133.9 ± 5	57.8 ± 2.2
From 67.0 to 100.4 ± 5	67.8 ± 2.2
From 40.1 to 66.9 ± 5	77.8 ± 2.2
From 0 to 40.0 ± 5	89.8 ± 2.2

FUEL LEVEL AND RESISTANCE (XP Limited)	
FUEL LEVEL (mm)	RESISTANCE (Ω)
From 325 ± 5 and more	0 + 2.2
From 294 to 325 ± 5	17.8 ± 2.2
From 263 to 294 ± 5	27.8 ± 2.2
From 225 to263 ± 5	37.8 ± 2.2
From 190 to 225 ± 5	47.8 ± 2.2
From 149 to 190 ± 5	57.8 ± 2.2
From 93 to 149 ± 5	67.8 ± 2.2
From 41 to 93 ± 5	77.8 ± 2.2
From 0 to 41 ± 5	89.8 ± 2.2

Oil Sensor

The sensor sends the signal to the low-oil level light in the fuel gauge or the LED in the Info Center.



1. Oil sensor

The bottom of the sensor has a small reservoir with two small holes underneath to let the oil enter inside and one at the top to let the air enter allowing the oil to flow out.

When there is enough oil inside the oil tank (and therefore in the sensor reservoir), the sensor detects the liquid and the light DOES NOT turn on.

When the oil level goes at critical LOW level inside the oil tank (and therefore in sensor reservoir), the sensor detects the absence of liquid and the light TURNS ON.

To check the oil sensor, unplug its connector and pull sensor out of oil tank.

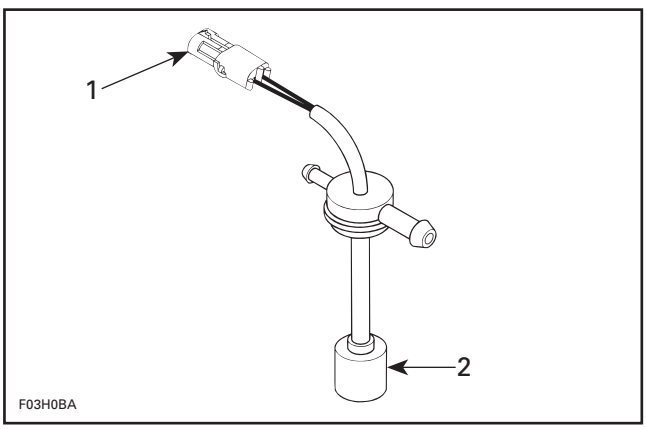
Using a multimeter, check the continuity between the BLUE and BLUE/BLACK terminals.

When sensor is out of oil tank and its reservoir is empty, resistance must be infinite (open circuit).

NOTE: Wait about 15-20 seconds before taking any reading to give the oil enough time to flow out or inside sensor reservoir.

Soak sensor in oil so that its reservoir fills up. Maximum resistance should be approximately 2 Ω (closed circuit).

TEST CONDITION	READING (Ω)
Sensor OUT of oil	∞ (open circuit)
Sensor soaked IN oil	2 Ω max. (closed circuit)



1. Measure resistance here
2. Sensor reservoir

To Reinstall Sensor:

– Remove rubber seal from sensor.
– Install seal in oil tank hole.
– Push sensor in seal.
– Plug connector.

NOTE: This sensor turns the LED to ON if the connector has been forgotten unconnected even when there is enough oil in tank.

VTS Switch

SPX, GSX Limited and XP Limited

Always confirm first that the fuse is in good condition.

Disconnect BLACK wire, BLUE/WHITE wire and GREEN/WHITE wire of VTS switch.

Using a multimeter, connect test probes to switch BLACK and BLUE/WHITE wires; then, connect test probes to switch BLACK 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.

VTS Motor

SPX, GSX Limited and XP Limited

Always confirm first that the fuse is in good condition.

Motor condition can be checked with a multimeter. Install test probes on both BLUE/ORANGE and GREEN/ORANGE wires. Measure resistance, it should be close to 1.5 ohm.

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 VARIABLE TRIM SYSTEM 09-05. 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.

If VTS motor does not stop at the end of its stroke while installed, the motor could be defective.

VTS Control Module

SPX, GSX Limited and XP Limited

It receives its current from the battery. It is protected by its own 7.5 A fuse.

RESISTANCE TEST

Disconnect BROWN/BLACK wire and BROWN/WHITE wire of VTS control module.

Connect test probes of a multimeter to BROWN/BLACK wire and BROWN/WHITE wire of VTS control module.

NOTE: To permit VTS actuation when engine is not running, remove safety lanyard from switch and depress start/stop button to activate MPEM timer.

Push on VTS switch down position until motor stops.

Read the resistance on the ohmmeter, it should indicate a resistance of 24 ohms ± 1%.

Push on VTS switch up position until motor stops.

Read the resistance on the ohmmeter, it should indicate a resistance of 167 ohms ± 1%.

RESISTANCE (Ω)	NOZZLE POSITION
167 ± 1%	UP
↕	↕
24 ± 1%	DOWN

NOTE: If the VTS control module passes this resistance test, it doesn't mean it is in perfect condition.

DIGITALLY ENCODED SECURITY SYSTEM

GENERAL

The Digitally Encoded Security System (DESS) features an anti-start protection against unauthorized use of the watercraft.

The following components are specially designed for this system: Multi-Purpose Electronic Module (MPEM), safety lanyard cap and safety lanyard switch.

The safety lanyard cap has a magnet and a ROM chip. The chip has a unique digital code.

The DESS circuitry in the watercraft MPEM is activated at the factory. Therefore, a safety lanyard must be programmed to start the engine.

NOTE: Actually, it is the memory of the MPEM which is programmed to recognize the digital code of the safety lanyard cap. This is achieved with the MPEM programmer (P/N 529 034 500). Refer to its *Guide to program* a safety lanyard.

The system is quite flexible. Up to eight safety lanyards may be programmed in the memory of the watercraft MPEM. They can also be erased.

NOTE: If desired, a safety lanyard can be used on other watercraft equipped with the DESS.

The memory of the MPEM is permanent. If the battery is disconnected, no information is lost.

The memory of the MPEM has also two self-diagnostic modes.

When ordering a new MPEM from the regular parts channel, the DESS circuitry will be activated.

Basic Self-Diagnostic Mode

It is self-activated when the safety lanyard cap is being installed on the watercraft switch. It gives immediate monitoring. Some codes may occur only when pressing the start/stop button. Refer to the following chart.

SIGNAL	CAUSE	REMEDY
2 short beeps (while installing safety lanyard on watercraft switch)	• Safety lanyard is recognized by the MPEM.	• Ignition is authorized, engine can start.
1 long beep (while installing safety lanyard on watercraft switch or when pressing start/stop button)	• Safety lanyard on switch for more than 10 minutes without starting engine.	• Remove and reinstall safety lanyard on switch.
	• Bad connection between safety lanyard cap and switch.	• Remove and replace the safety lanyard on the switch until 2 short beeps are heard to indicate the system is ready to allow engine starting.
	• Unprogrammed or defective safety lanyard.	• Use the safety lanyard that has been programmed for the watercraft. If it does not work, check safety lanyard condition with the programmer. Replace safety lanyard if reported defective. If it still does not work, enable more detail about the failure.
	• Salt water in safety lanyard cap.	• Clean safety lanyard cap to remove salt water.
	• Improper operation of MPEM or defective wiring harness.	• Enable advanced diagnostic mode to obtain more detail about the failure.
8 short beeps	• Defective MPEM (memory).	• Replace MPEM.
Continuous beep	• Engine overheating.	• Refer to TROUBLESHOOTING CHART 03-01.

Advanced Self-Diagnostic Mode

It needs to be enabled manually. Proceed as follows:

1. Remove safety lanyard cap from watercraft switch.
2. Press 5 times on the watercraft start/stop button.

NOTE: 1 short beep and 1 long beep must be heard. They validate beginning of diagnostic mode.

3. Install safety lanyard on watercraft switch.
4. Press the watercraft start/stop button again.

NOTE: If everything is correct, engine will start. Otherwise, refer to the following chart.

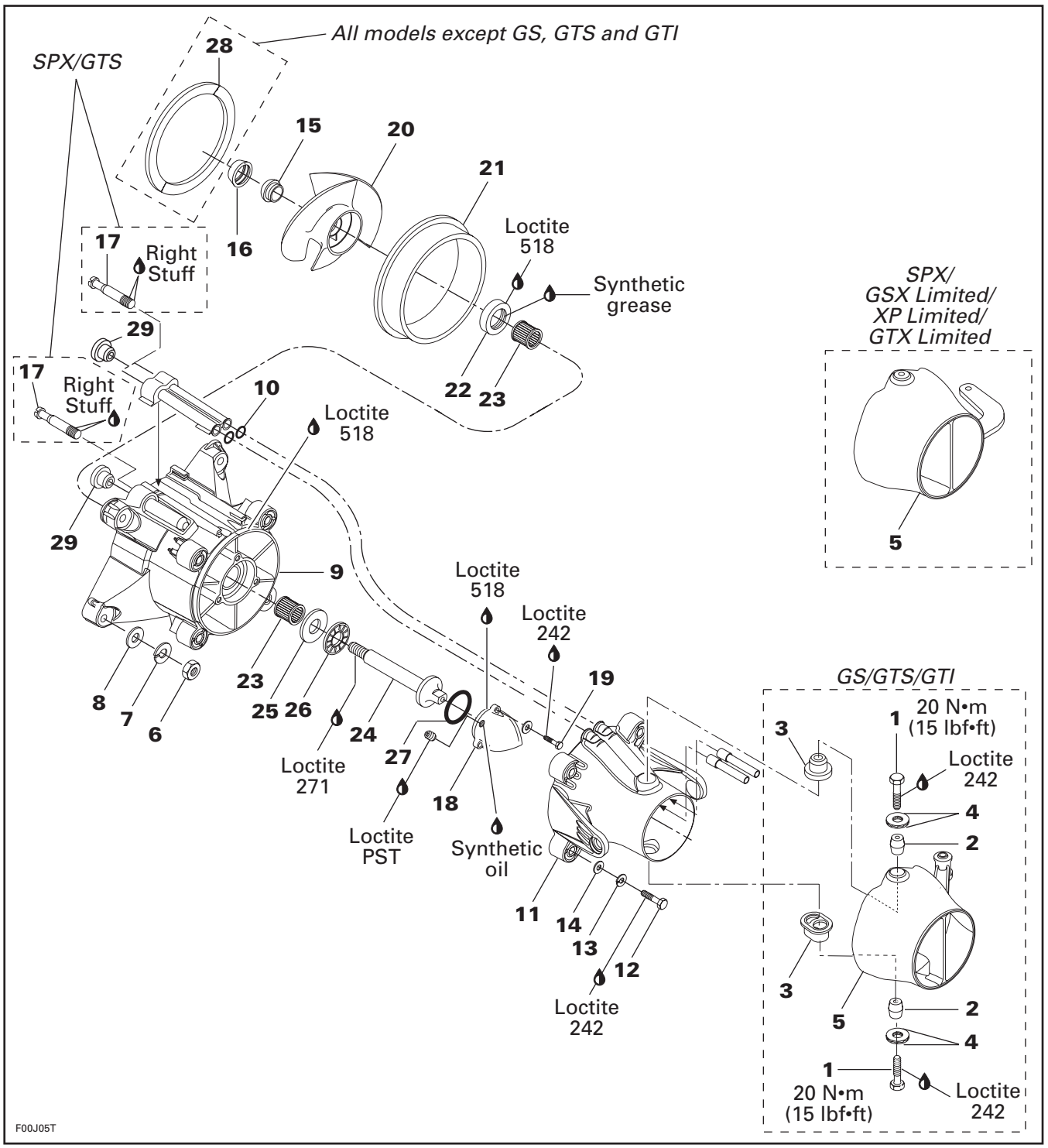
SIGNAL	CAUSE	REMEDY
No beep	• Engine actually starts.	• Everything is correct.
1 long and 1 short beeps	• No safety lanyard has ever been programmed in watercraft MPEM.	• Use programmer and program a safety lanyard. This code can occur only when you receive a new MPEM from the factory and no key has ever been programmed.
2 short beeps	• MPEM can not read the digital code of the safety lanyard cap or the magnet is defective. • Mixed wires at safety lanyard switch connectors or bad connections.	• Check safety lanyard cap condition with the MPEM programmer. Replace safety lanyard if reported defective. • Check switch wiring harness.
2 long beeps	• Wrong safety lanyard or bad connection of the DESS wires.	• Use the safety lanyard that has been programmed for the watercraft. If the problem is not resolved, check safety lanyard cap condition with the MPEM programmer. Replace safety lanyard if reported defective.
3 short beeps	• Wiring harness of DESS switch is grounded or there is a short circuit.	• Check wiring harness and safety lanyard switch.

If you need to listen again the coded beeps, remove safety lanyard and repeat the procedure to activate the diagnostic mode.

If there is more than one problem, the MPEM will send only one error code. When the problem is solved, the MPEM will send a second code and so on until all problems are resolved.

TABLE OF CONTENTS

JET PUMP


All models except GS, GTS and GTI
SPX/GTS
28
15
20
21
16
17
Right Stuff
Loctite 518
Synthetic grease
22
23
29
17
Right Stuff
10
Loctite 518
29
9
8
7
6
23
25
26
24
Loctite 271
27
Loctite PST
18
Synthetic oil
Loctite 518
Loctite 242
19
11
14
13
12
Loctite 242
SPX/ GSX Limited/ XP Limited/ GTX Limited
5
GS/GTS/GTI
3
1
20 N•m (15 lbf•ft)
Loctite 242
4
2
3
5
2
4
1
20 N•m (15 lbf•ft)
Loctite 242
F00J05T

GENERAL

The jet pump housing and venturi are made of plastic.

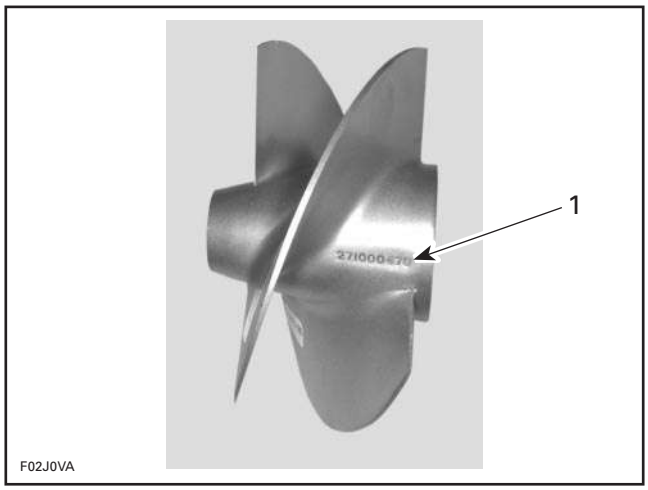
On the GS, GTS and GTI models, the jet pump housing is a one piece plastic unit, including the stator.

On other models, the jet pump housing has a stator made of bronze which offers greater strength.

The nozzle is made of plastic on the GS, GTS and GTI models, and of aluminum on the other models.

Impeller Identification

To identify the impellers refer to the following illustration and chart.



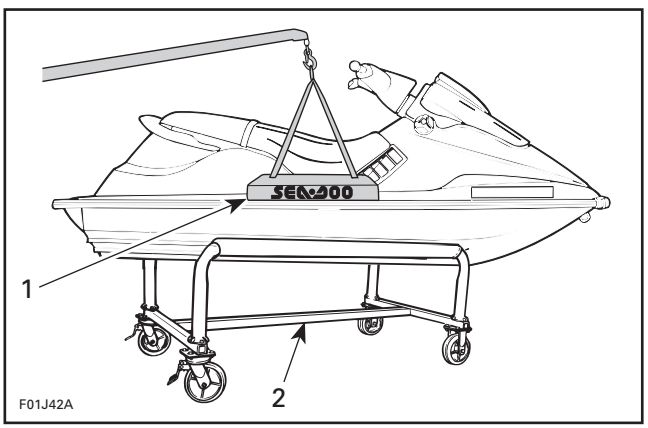
1. Stamped part number

WATERCRAFT MODEL	IMPELLER P/N	MATERIAL	PITCH
SPX	271 000 828	Stainless steel	Progressive pitch 16°-23°
GS	271 000 821	Stainless steel	Progressive pitch 11°-22°
GSX Limited	271 000 810	Stainless steel	Progressive pitch 16°-25°
XP Limited	271 000 818	Stainless steel	Progressive pitch 16°-25°
GTS	271 000 826	Stainless steel	Progressive pitch 11°-22°
GTI	271 000 885	Stainless steel	Progressive pitch 11°-22°
GTX Limited	271 000 786	Stainless steel	Progressive pitch 14°-21°

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.

A lift kit (P/N 295 100 044) can be used to install watercraft on a stand.

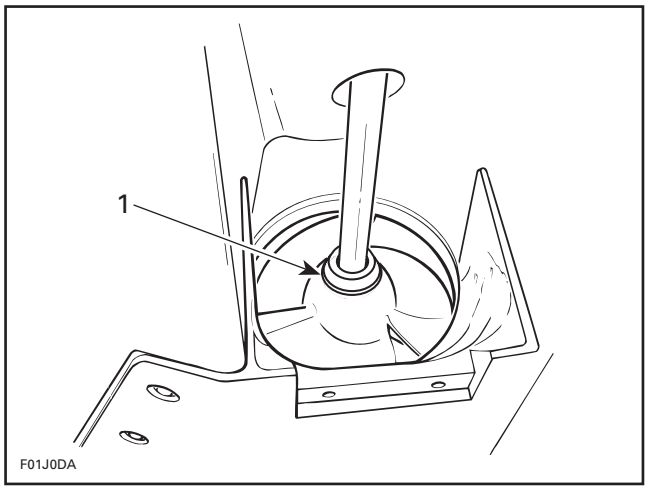


TYPICAL

1. Lift kit
2. Work stand

Impeller Condition

Condition of impeller **no. 20**, boot **no. 15** and ring **no. 16** can be quickly checked from underneath of the watercraft. Remove grate and look through water inlet opening.



TYPICAL
1. Inspect impeller and boot

Impeller/Wear Ring Clearance

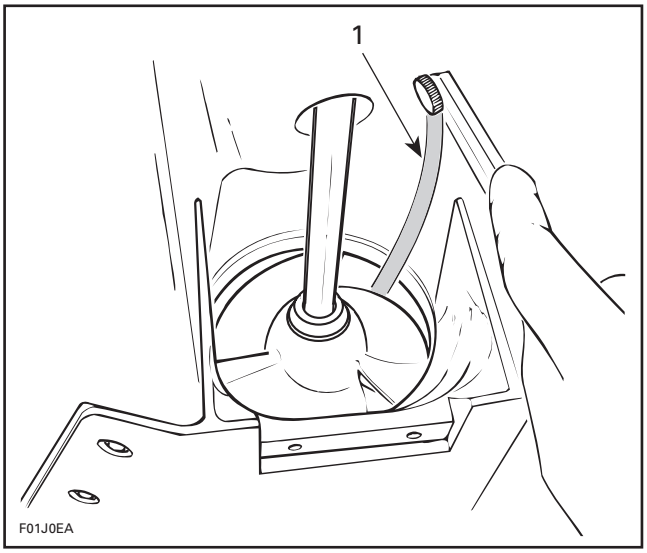
This clearance is critical for jet pump performance.

Clearance can be checked from water inlet opening or from venturi side. However, the last method requires more work.

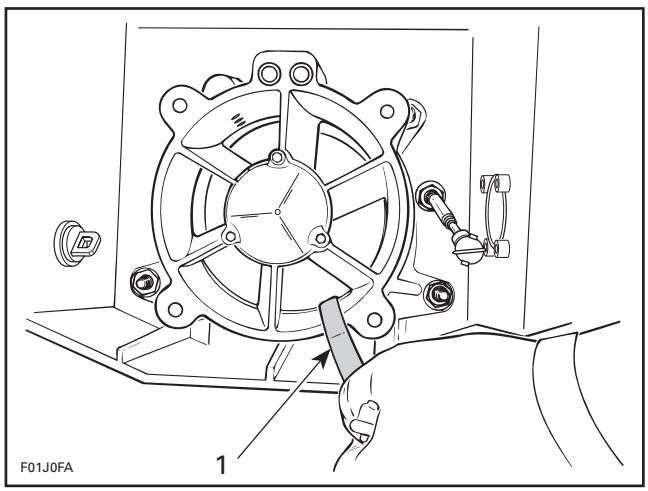
To check clearance from water inlet side, remove inlet grate.

To check clearance from venturi side, remove venturi/nozzle assembly as described in Oil Inspection in this subsection.

Using a feeler gauge with 30 cm (12 in) blades, measure clearance between impeller blade tip and wear ring. Measure each blade at its center. Clearance should not exceed 1.0 mm (.040 in). If clearance is greater, disassemble jet pump and inspect impeller and wear ring. Renew worn parts.



TYPICAL — MEASURING FROM WATER INLET SIDE
1. Feeler gauge



TYPICAL — MEASURING FROM VENTURI SIDE
1. Feeler gauge

Oil Inspection

Detach ball joint of steering cable from nozzle.

SPX, GSX Limited and XP Limited

Detach ball joint of VTS link rod.

GTS, GTI and GTX Limited

Detach ball joint of reverse cable and springs from reverse gate (GTS model only).

All Models

Remove 4 screws retaining venturi to jet pump housing.

GTI and GTX Limited

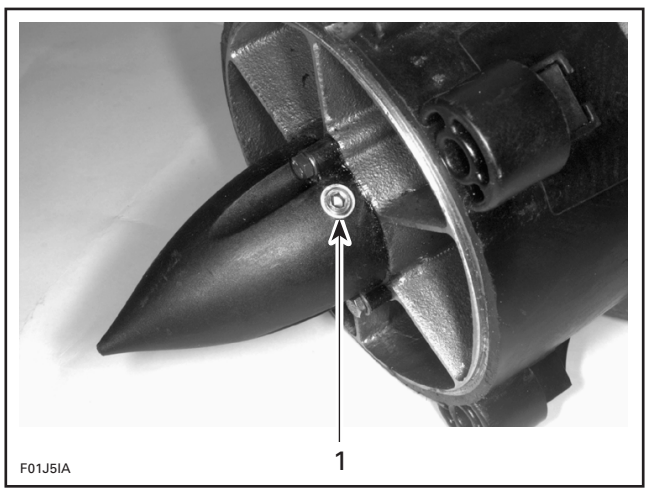
Remove reverse gate and support.

All Models

Pull nozzle and venturi from jet pump housing.

NOTE: On the GTS model, the venturi and reverse gate are removed as an assembly.

Remove plug from cover.



TYPICAL

1. Remove 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. See PUMP PRESSURIZATION in this subsection.

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

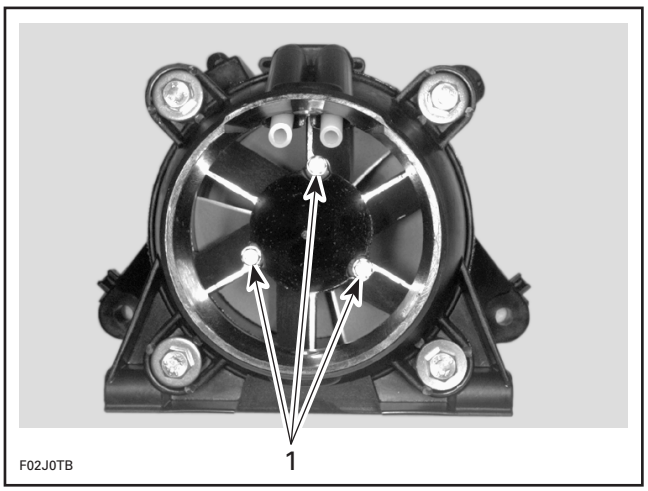
This may involve defective impeller shaft seal and/or O-ring of housing cover. Jet pump unit should be overhauled to replace seal.

If everything is correct, apply Loctite PST 592 on plug and reinstall it on cover. Properly reinstall removed parts.

Oil Replacement

Remove venturi as described in Oil Inspection.

Remove 3 screws retaining cover.



1. Screws

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

Thoroughly clean reservoir and inside of cover with a solvent. Check O-ring condition. Replace as necessary.

Apply a thin layer of Loctite 518 on mating surface of cover and reinstall it with its O-ring. Torque screws to 4 N•m (35 lbf•**in**).

Remove plug from cover.

Pour 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 drain slowly into center area of 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.

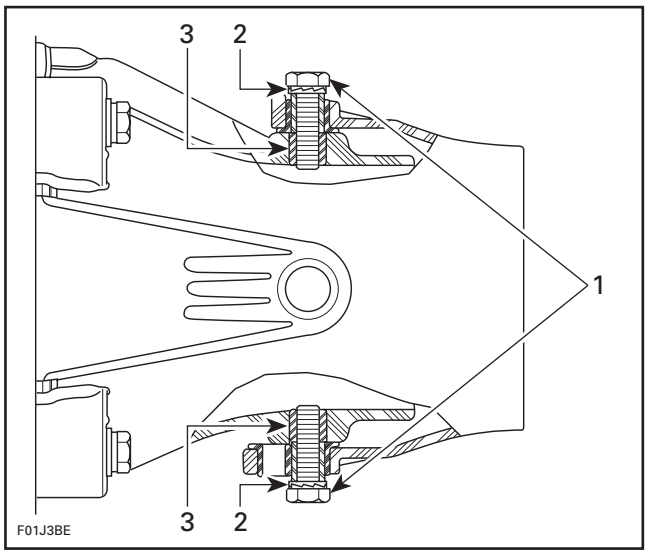
REMOVAL

5, Nozzle

Disconnect steering cable from jet pump nozzle.

GS, GTS, GTI and GTX Limited

Remove 2 retaining screws no. 1, 2 sleeves no. 2, 4 locking disks no. 4.



TYPICAL

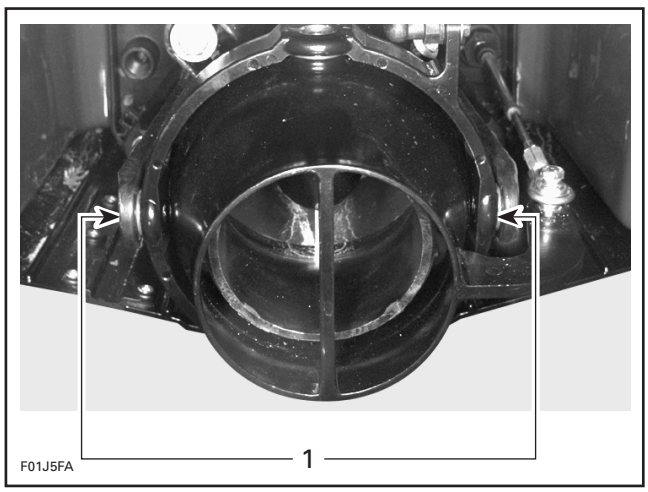
1. *Screw*
2. *Locking disks*
3. *Sleeve*

Remove nozzle.

SPX, GSX Limited and XP Limited

Disconnect ball joint of VTS link rod.

Loosen 2 screws each side of trim ring.



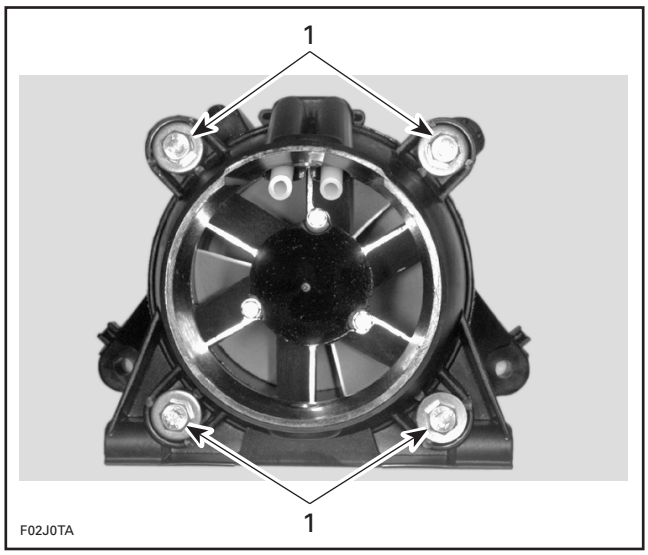
1. *Screws*

Remove nozzle.

11, Venturi

Remove nozzle no. 5 prior removing venturi.

Remove 4 retaining screws and withdraw venturi.



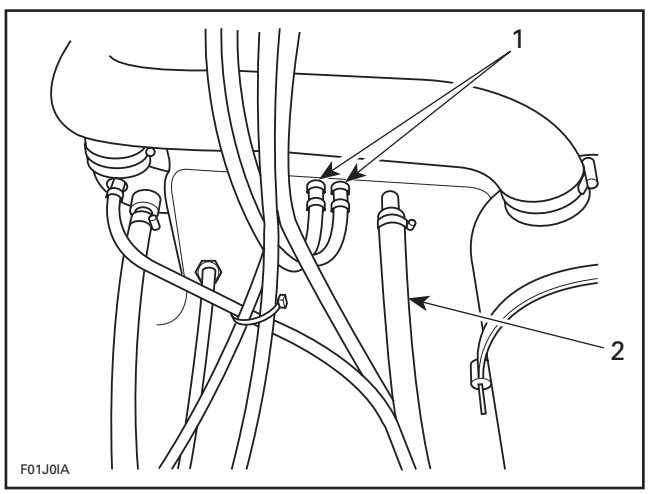
1. *Remove screws*

9, Jet Pump Housing

SPX and GTS Models

Remove air vent tube support from body opening (SPX model).

Disconnect engine water supply hose and both bailer pick-up tubes in bilge.



TYPICAL

1. *Bailer pick-up tubes*
2. *Engine water supply hose*

SPX, GSX Limited and XP Limited

Detach ball joint of VTS link rod.

GTS, GTI and GTX Limited

Detach ball joint of reverse cable and springs (GTS model) from reverse gate.

All Models except GTS

Disconnect steering cable from jet pump nozzle.

Loosen 4 hexagonal nuts no. 6 and remove flat washers and lock washers from jet pump housing.

Remove jet pump with a wiggle movement.

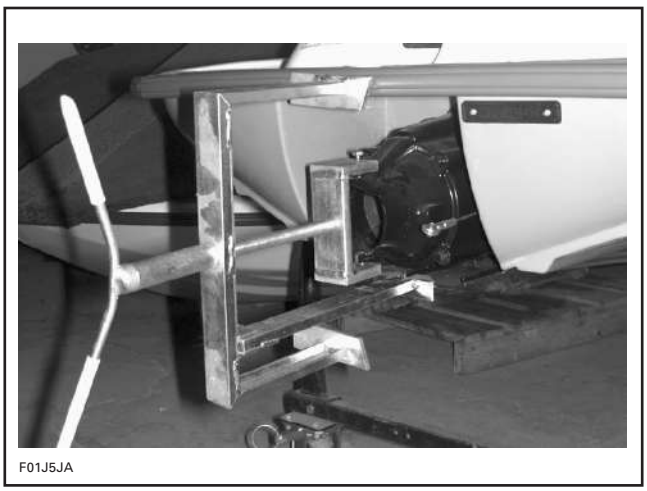
GTS Model

Disconnect steering cable from jet pump nozzle.

Remove nozzle.

Loosen 4 hexagonal nuts no. 6 and remove flat washers and lock washers from jet pump housing.

Using screws previously removed from nozzle, install jet pump housing remover tool (P/N 295 000 113) on venturi.



F01J5JA

TYPICAL

Rotate handle clockwise to remove jet pump.

All Models

▼ CAUTION

When removing pump unit, a shim could have been installed between hull and pump housing. Be sure to reinstall it otherwise engine and jet pump alignment will be altered.

NOTE: After jet pump removal, if drive shaft remains in the PTO flywheel (except XP Limited), simply pull it out. If drive shaft is seized in the PTO flywheel, refer to DRIVE SYSTEM 09-03.

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 needles in needle bearing, water damage diagnosed by black-colored spots on metal parts, etc. Renew any damaged part. As a quick check, manually feel clearance and end play, where applicable, to detect excessive wear.

SPX and GTS Models

17, Fitting

Fittings can be removed with deep socket or vise grip. Do not contact hose mounting area.

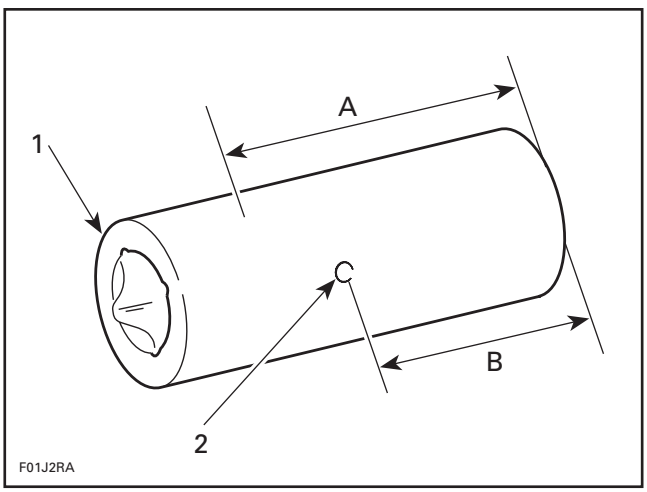
Fittings can be removed from pump housing with the following suggested tool:

– Use a 14 mm (9/16 in) deep socket.

– Drill deep socket with a 14 mm (9/16 in) drill bit, starting at hexagon 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.



F01J2RA

1. Deep socket 14 mm (9/16 in)
2. Roll pin 2.40 mm (3/32 in)
A. 42.50 mm (1-43/64 in)
B. 36.80 mm (1-29/64 in)

All Models

18, Cover

With pump assembly in horizontal position, remove 3 retaining screws **no. 19**.

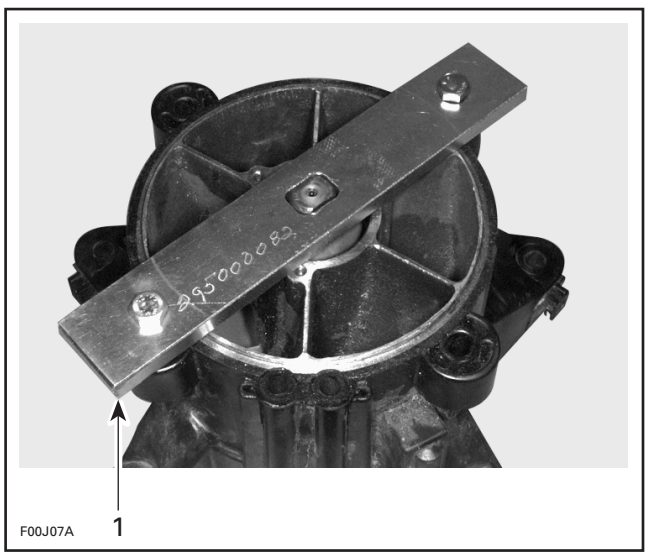
Place container under cover to catch oil.

Using a fiber hammer, gently tap cover to release it from jet pump housing.

20, Impeller

Insert impeller shaft holder (P/N 295 000 082) on impeller shaft flat end.

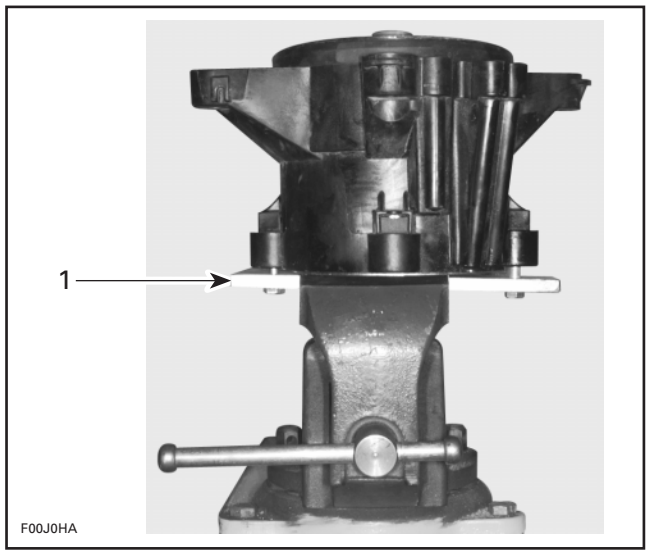
Using 2 screws previously removed from venturi, secure shaft holder to housing.



1. Shaft holder

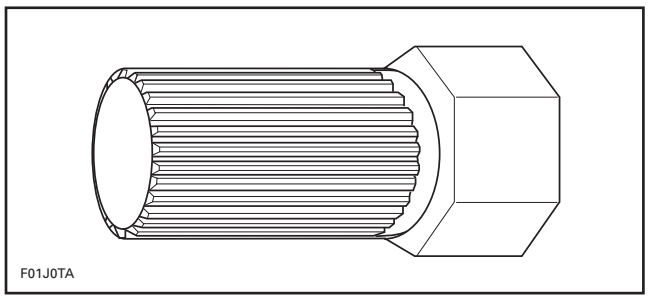
Heat impeller center with a propane torch to approximately 150°C (300°F) to break the Loctite bond.

Install shaft holder in a vice.

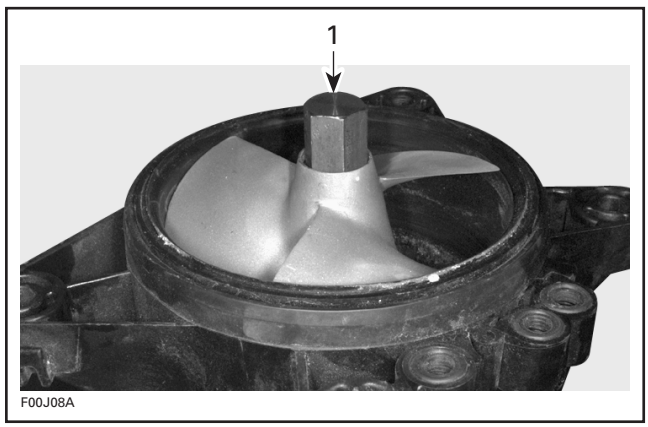


1. Shaft holder

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



Insert special tool in impeller splines.



1. Impeller remover tool

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. Remove tool from impeller.

21, Wear Ring

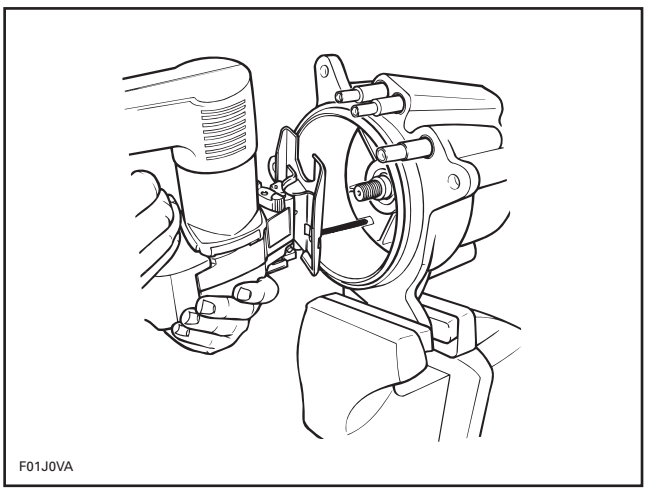
Place jet pump housing in a vise with soft jaws. It is best to clamp housing using a lower ear.

Cut wear ring at two places.

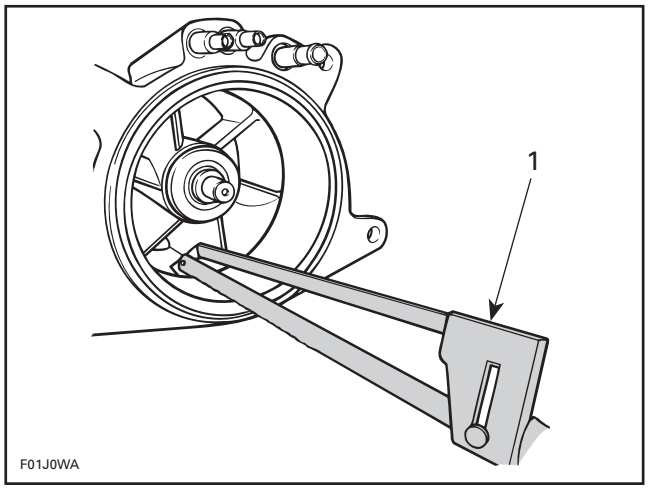
NOTE: Wear ring can be cut using a jigsaw, a small grinder or a low clearance hacksaw such as Snap-on HS3 or equivalent.

▼ CAUTION

When cutting ring, be careful not to damage jet pump housing.



TYPICAL



TYPICAL

1. Snap-on HS3

After cutting ring, insert a screwdriver blade between jet pump housing and ring outside diameter.

Push ring so that it can collapse internally.

Pull ring out.

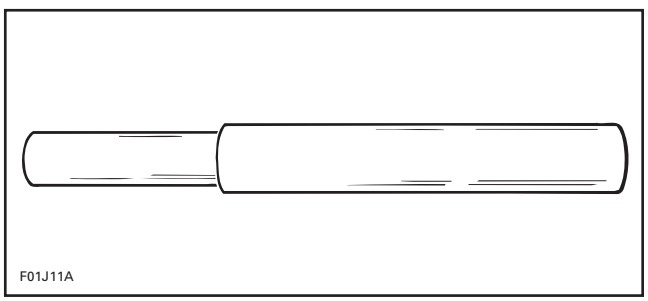
24, Impeller Shaft

Remove shaft holder tool.

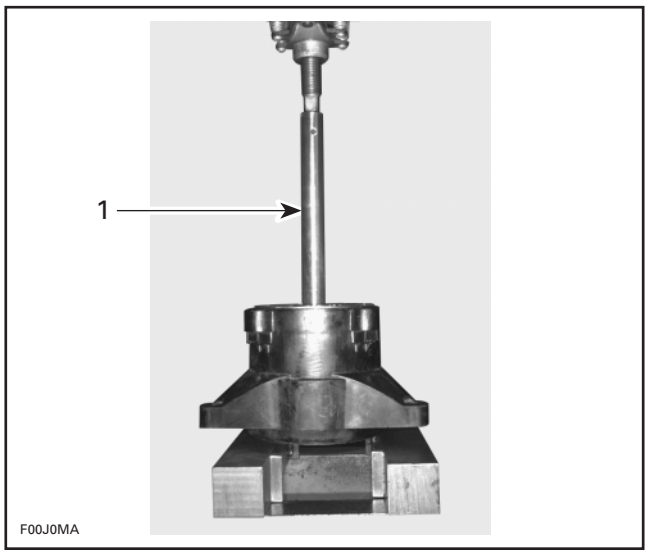
Remove impeller shaft with thrust washer and thrust bearing.

22,23, Seal and Needle Bearing

Remove seal and bearings at the same time using bearing/seal remover tool (P/N 295 000 144).



Insert bearing remover then press tool using a arbor press until seal and bearings are out. However, care should be taken not to damage bearing journals.



1. Bearing/seal remover tool

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

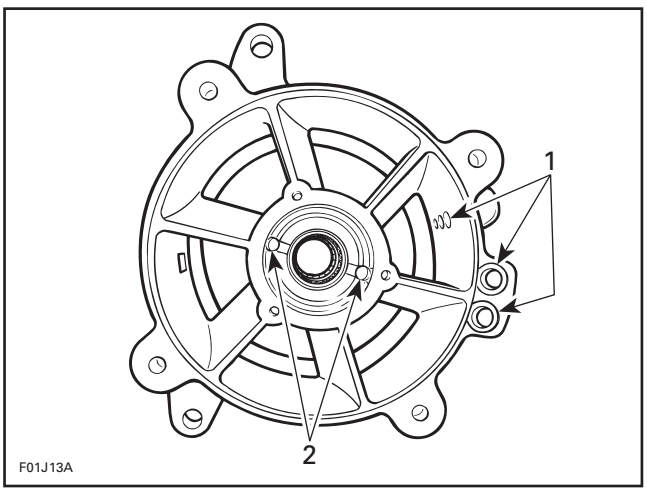
CLEANING

Sealant can be removed with a wire brush (disc) mounted on a drill or a scraper.

Properly clean all threads.

Remove all O-rings and clean parts in a solvent.

Carefully check water passages and oil passages. Blow low pressure compressed air through them and make sure they are clear.



TYPICAL

1. Water passages
2. Oil passages

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

▼ CAUTION

Be careful not to damage impeller shaft diameter.

PARTS INSPECTION

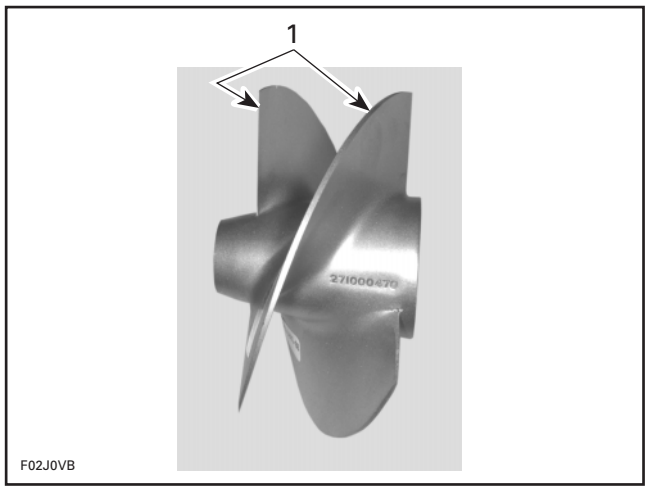
20, Impeller

Visually inspect impeller splines. Check for wear or deformation. Renew parts if damaged.

NOTE: Check also PTO flywheel and drive shaft condition. Refer to BOTTOM END 04-06 and DRIVE SYSTEM 09-03.

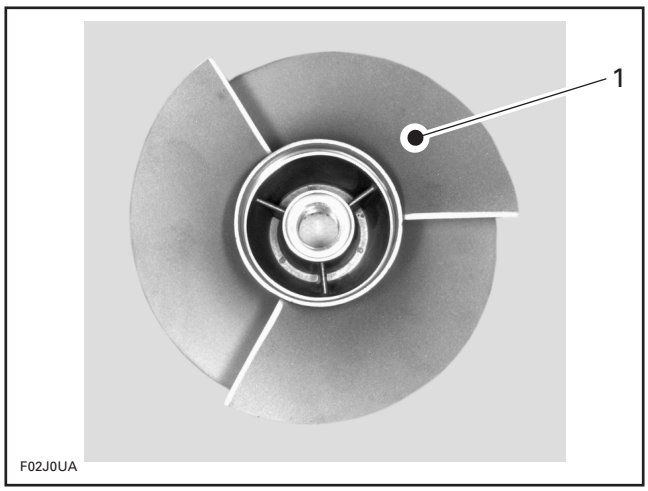
Examine impeller in wear ring for distortion.

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.



1. Replaced if blunted round or damaged

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



1. Check for cavitation, deep scratches or other damage

21, Wear Ring

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.

22,24, Needle Bearing and Impeller Shaft

WEAR

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

With your 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.

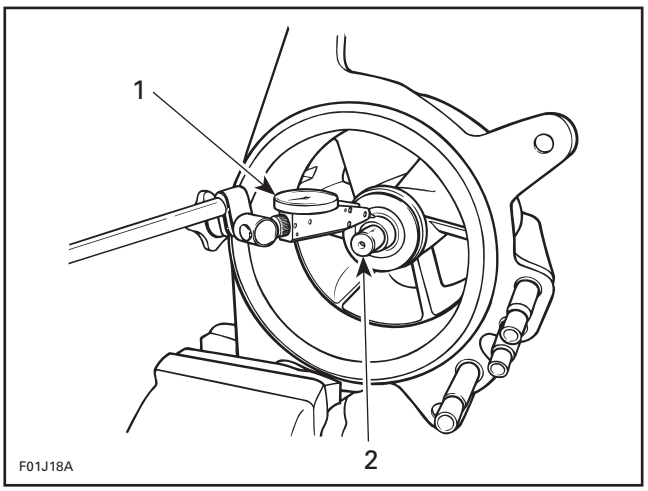
Radial play of impeller shaft is checked with shaft in housing, without impeller.

Retain housing in a soft 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.

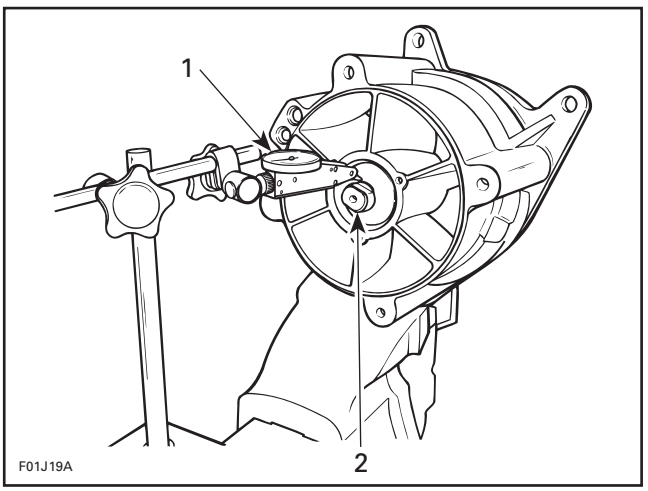
Maximum permissible radial play is 0.05 mm (.002 in).



TYPICAL — MEASURING IMPELLER SHAFT RADIAL PLAY

1. Dial gauge
2. Measure close to threads at shaft end

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



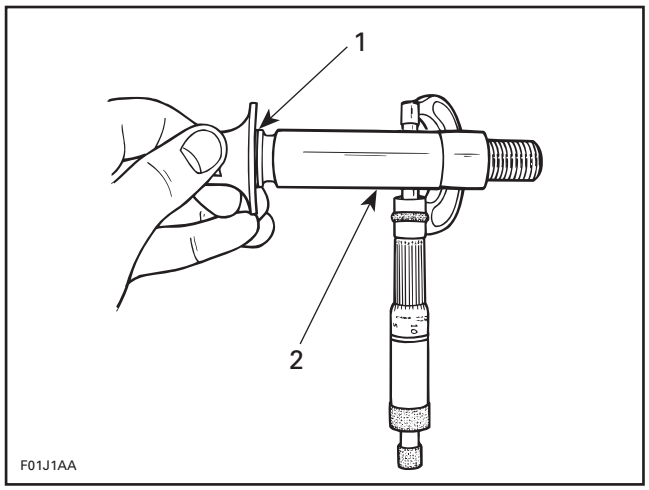
TYPICAL — MEASURING IMPELLER SHAFT RADIAL PLAY

1. Dial gauge
2. Measure close to flats at shaft end

Excessive play can come either from worn bearings or impeller shaft or damaged jet pump housing bearing surfaces.

Measuring shaft diameter will determine the defective parts.

Using a micrometer, measure diameter on bearing contact surfaces. **Minimum** shaft diameter should be 22.24 mm (.876 in).

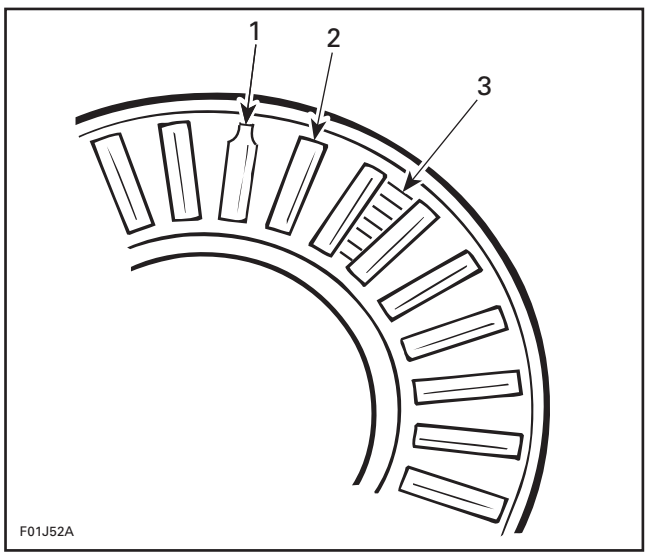


1. Inspect for wear at the bearing pilot
2. Radial bearing raceway

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.

25,26, 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. For best inspection, use a 7X magnifying glass to check wear pattern.



TYPICAL

1. Worn roller (trunnion worn on end roller)
2. Good roller (cylindrical shape)
3. Look for scoring on retainer

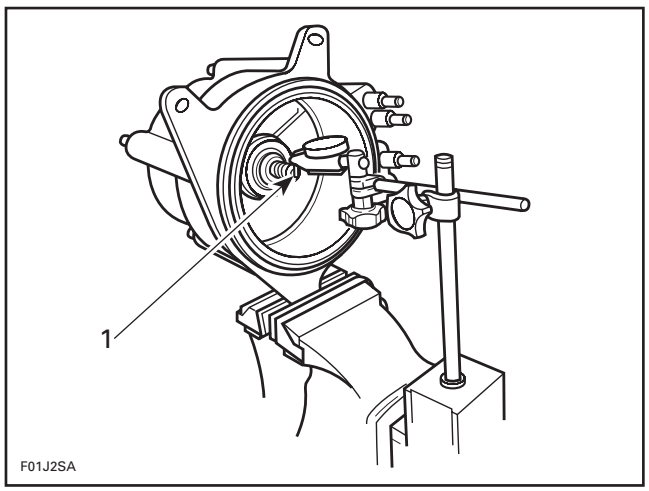
NOTE: When replacing either washer or bearing, it is recommended to renew both.

18,24, Cover and Impeller Shaft

END PLAY

End play of impeller shaft is checked with shaft in housing, without impeller and with cover installed.

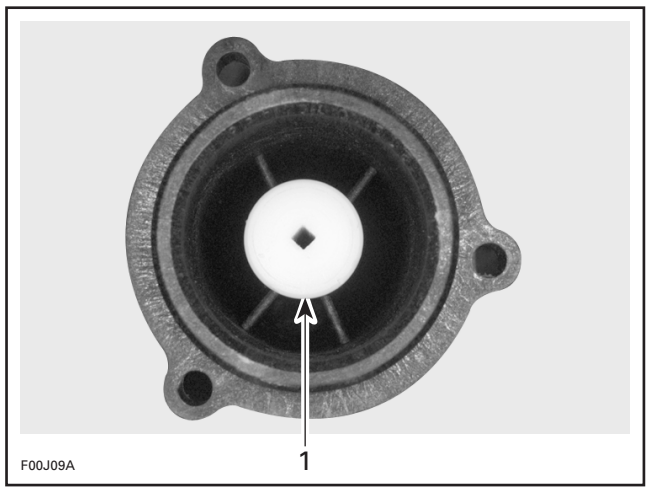
Retain housing in a soft jaw vise making sure not to damage housing lug. Set a dial gauge and position its tip on the end of shaft. Move shaft end by pulling and pushing. Difference between highest and lowest dial gauge reading is end play. Maximum permissible end play (new) is 0.12 - 0.54 mm (.005 - .021 in). Make sure vise is secured and not adding to your measurement as you move impeller shaft.



1. Tip on shaft end

Excessive play comes from a worn anti-knock pusher inside cover and wear of impeller shaft nose.

Using pliers, remove anti-knock pusher and spring from cover.

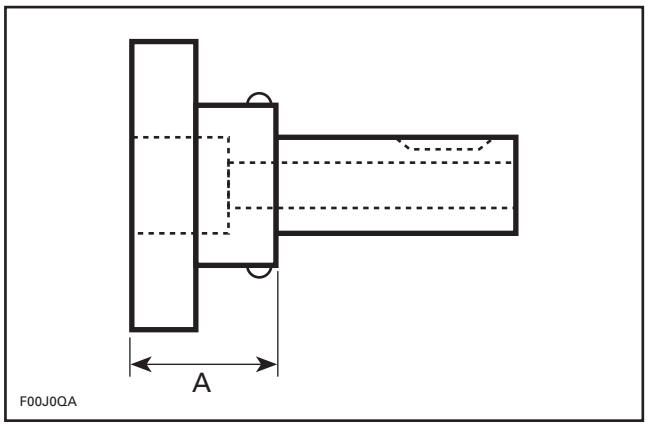


TYPICAL

1. Pusher

Inspect pusher for any damage or deterioration.

Refer to the following illustration to determine the wear limit of the pusher.

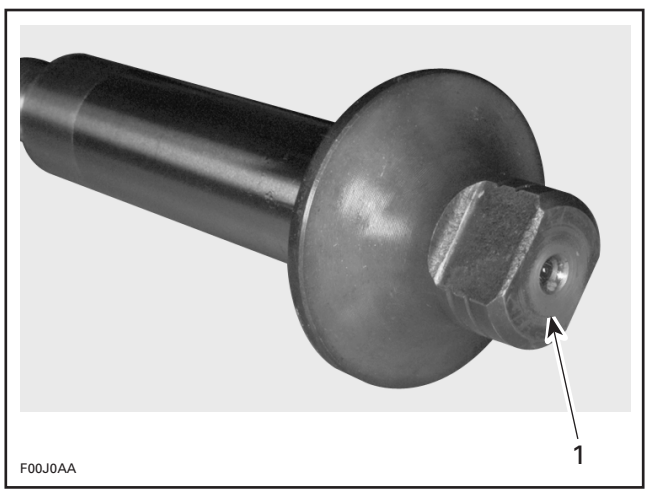


A. Wear limit 8.0 mm (.315 in)

Pusher should be replaced if it is not within specification.

Be sure to check end play after installing a new pusher (if necessary).

Inspect impeller shaft nose for wear.



1. Impeller shaft nose

22, Seal

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

ASSEMBLY

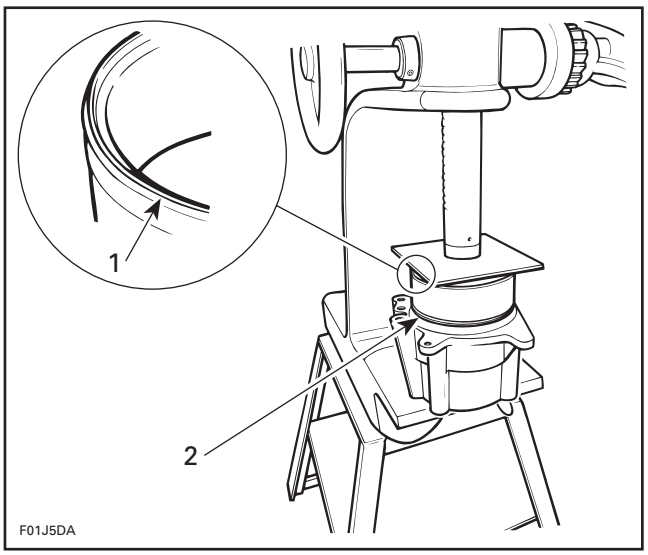
21, Wear Ring

The wear ring features a lip on one edge; position lip outwards of housing.

NOTE: To ease insertion into housing, apply BOMBARDIER LUBE lubricant (P/N 293 600 016) onto outside circumference of wear ring.

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

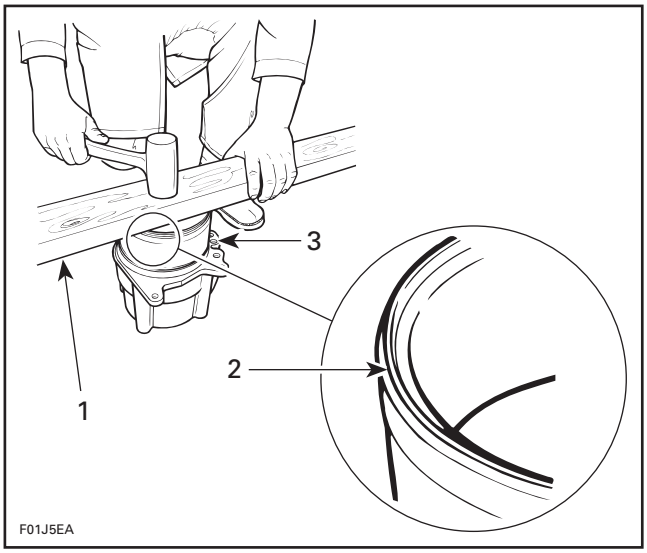
Manually engage ring in housing making sure it is equally inserted all around. Press ring until it seats into bottom of housing.



1. Seal lip
2. Press wear ring

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

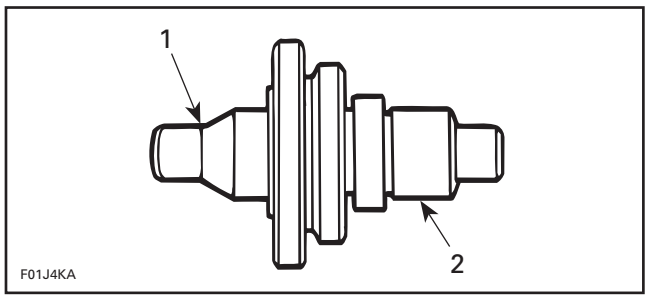
Manually engage ring in housing making sure it is equally inserted all around. Place wood piece over ring. Using a hammer, strike on wood to push ring. Strike one side then rotate wood piece about 90° and strike again. Frequently rotate wood piece so that ring slides in evenly until it seats into bottom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



1. *Piece of wood*
2. *Seal lip facing upward*
3. *Wear ring*

22,23, Seal and Needle Bearing

Bearings and seal will be properly installed in housing using bearing/seal installer tool (P/N 295 000 107).

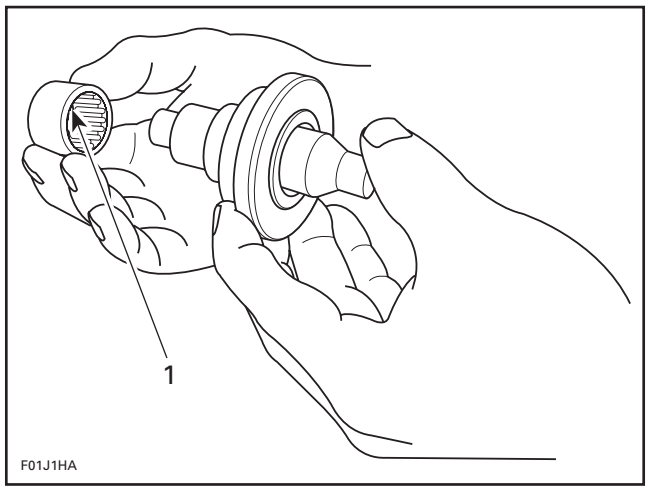


BEARING/SEAL INSTALLER TOOL

1. *Seal side*
2. *Bearing side*

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

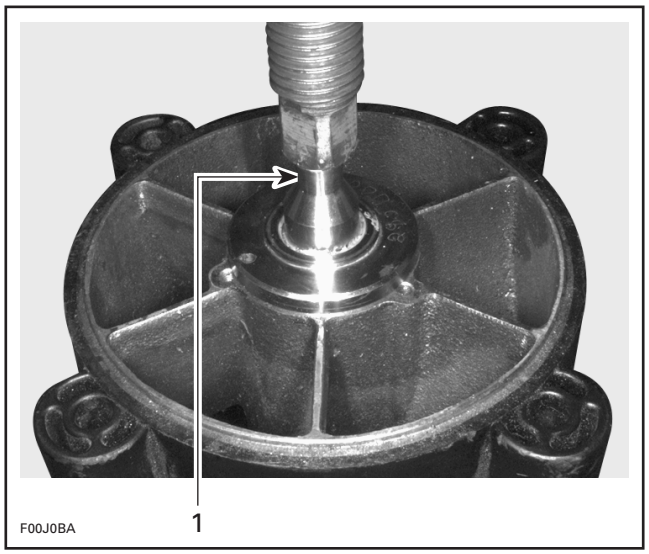
Properly insert bearing on tool. Using an arbor press only, push tool until tool flange contacts housing. Proceed the same way for both bearings.



1. *Stamped end this side*

▼ CAUTION

Never hammer the bearing into its housing.

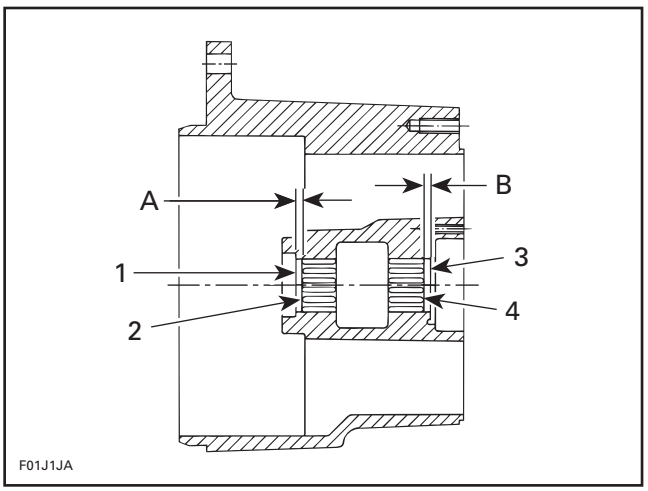


1. *Press on tool until it stops*

▼ 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.



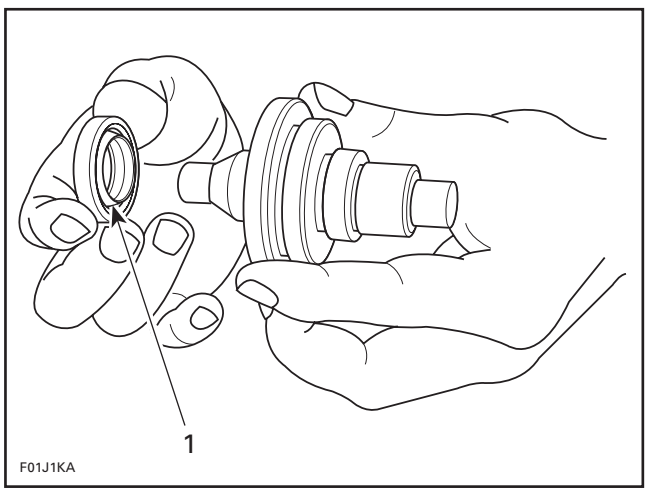
1. Seal seat
2. Stamped end of bearing
3. Thrust washer seat
4. Stamped end of bearing
A. 1.5 - 2.5 mm (.060 - .100 in)
B. 2 - 3 mm (.080 - .120 in)

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

Apply Loctite 518 (P/N 293 800 038) to seal housing, all around outer diameter and on seal seat.

Properly insert seal on tool.

NOTE: It is important when installing seals to pack seal lip with grease before inserting bearing/seal installer tool. Properly insert tool in seal with a rotating movement.

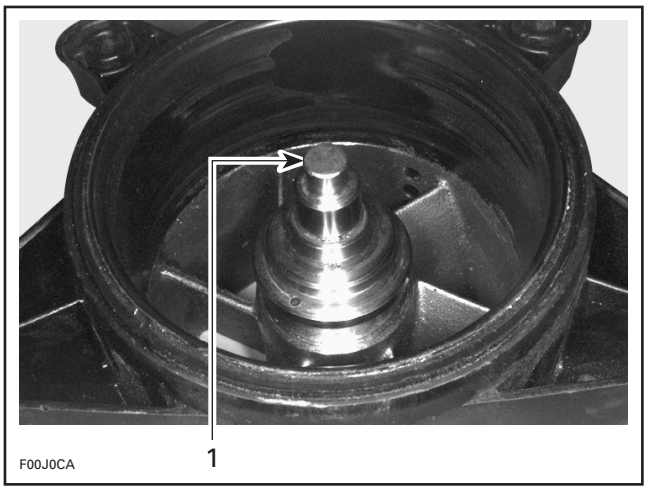


1. Raised edge of seal this side

▼ CAUTION

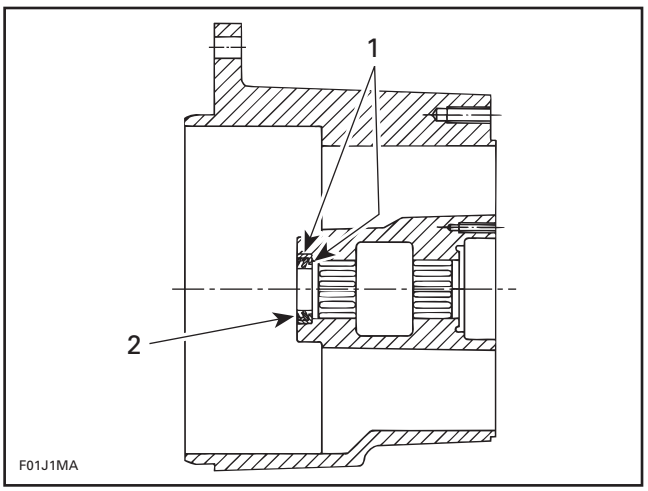
Prevent sealant from contacting any needles of bearing.

Push on tool end with a press until tool flange contacts housing.



1. Press on tool until it stops

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

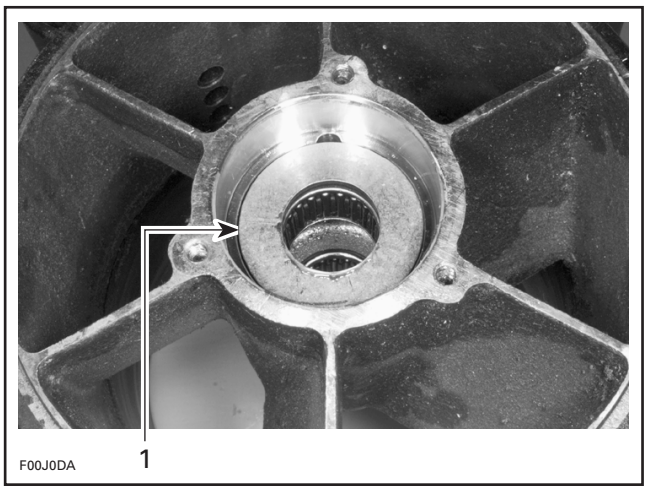


1. Loctite 518 all around and behind
2. Raised edge of seal lip this side

25, Thrust Washer

Position jet pump housing **no. 9** with the stator vanes on top.

Insert thrust washer **no. 25** in the stator seat.

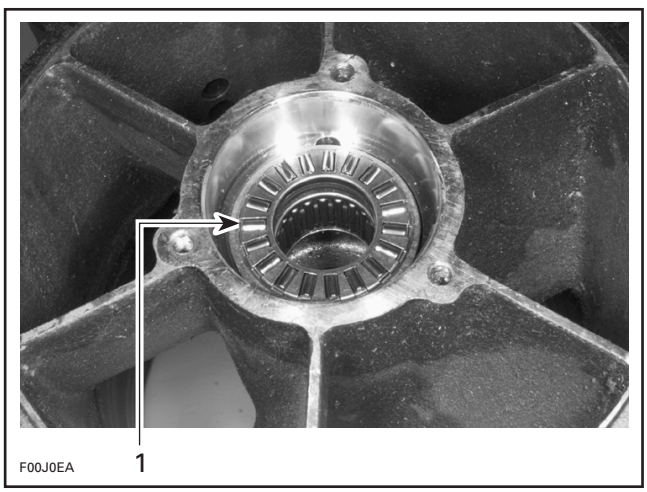


1. Thrust washer properly installed in stator seat

26, Thrust Bearing

Apply Sea-Doo jet pump synthetic oil (P/N 293 600 011) on both sides of thrust bearing.

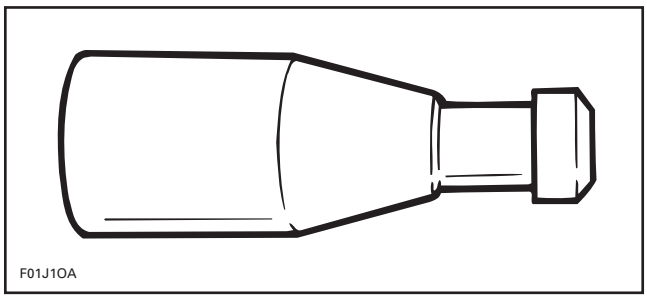
Position thrust bearing **no. 26** on thrust washer **no. 25**.



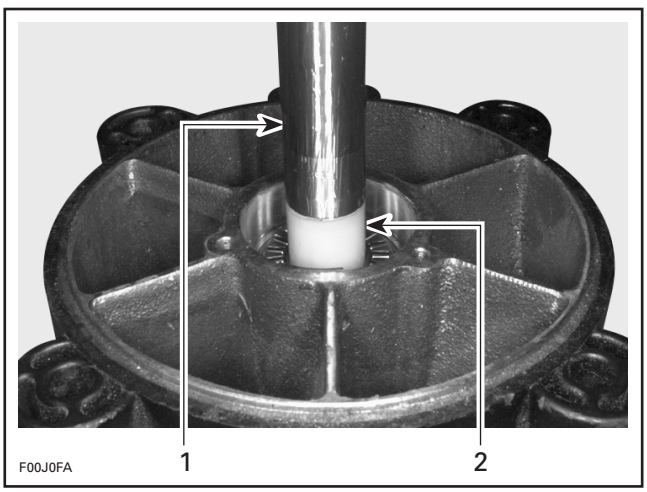
1. Thrust bearing on top of thrust washer

24, Impeller Shaft

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 install shaft in jet pump housing.



1. Impeller shaft
2. Impeller shaft guide

NOTE: If jet pump housing rest against a table, raise it slightly to allow complete shaft insertion with the shaft guide.

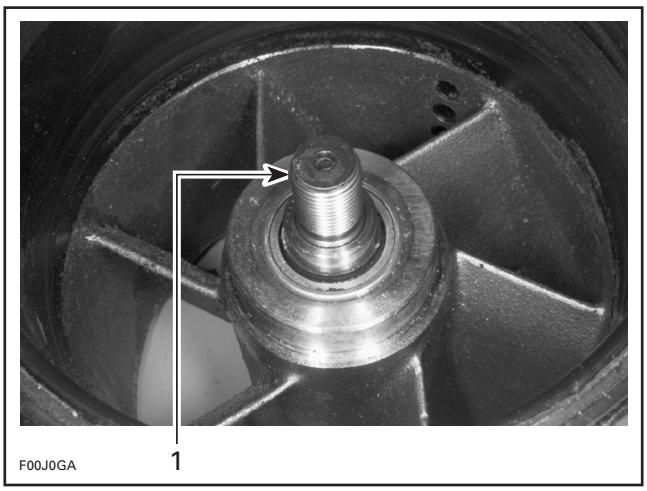
Remove shaft guide.

20, Impeller

Apply Loctite primer N (P/N 293 600 012) on threads of impeller shaft **no. 24**. 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 primer is not used, allow 24 hours for curing time.

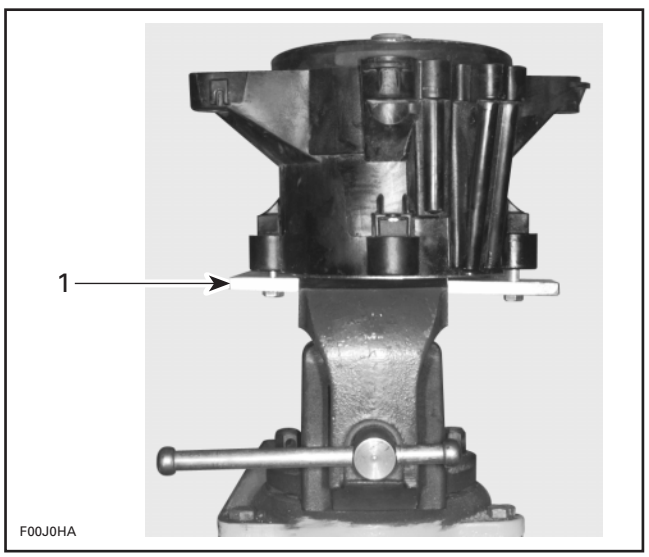
Apply Loctite 271 (red) to shaft threads.



1. Apply Loctite 271 (red) on threads

Using 2 screws previously removed from venturi, secure impeller shaft holder tool to housing.

Install shaft holder tool in a vice.

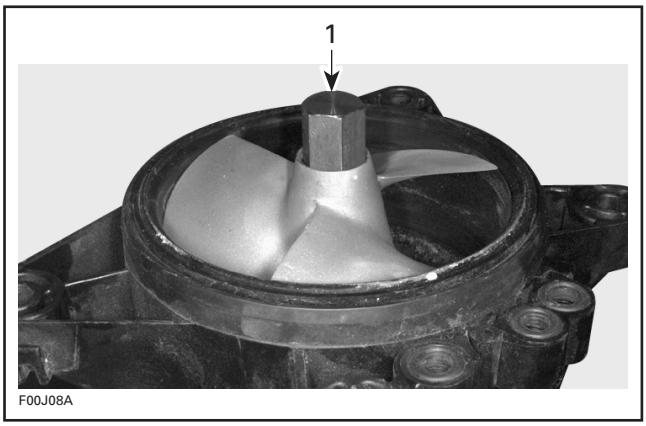


1. Impeller shaft holder secured in a vice

To ease impeller installation, apply BOMBARDIER 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/installer tool into impeller splines and tighten.



1. Impeller remover/installer tool

▼ CAUTION

Make sure thrust washer and bearing are not wedged in shaft groove. To check, manually pull and push jet pump housing, some axial play must be felt.

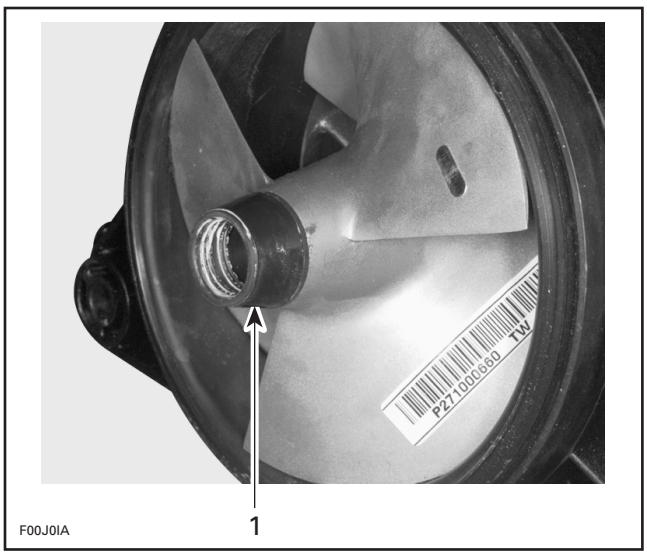
Torque impeller to 70 N•m (52 lbf•ft) then remove tools.

▼ CAUTION

Never use any impact wrench to tighten impeller.

Apply synthetic grease (P/N 293 550 010) on impeller splines.

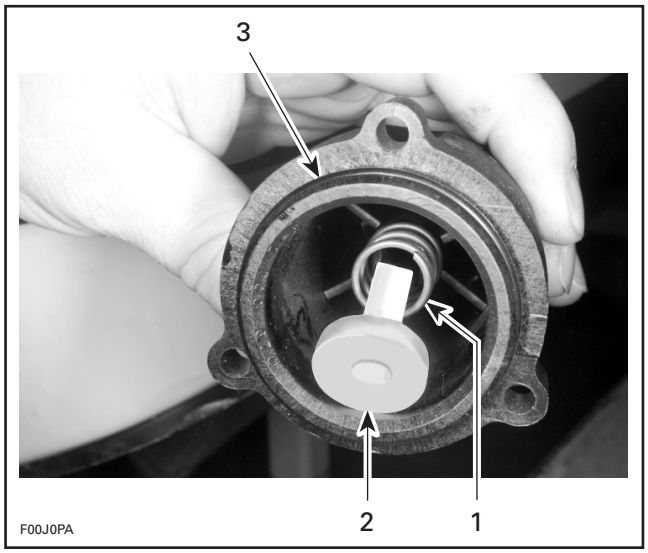
Insert a new boot **no. 15** and ring **no. 16** to impeller.



1. Boot and ring

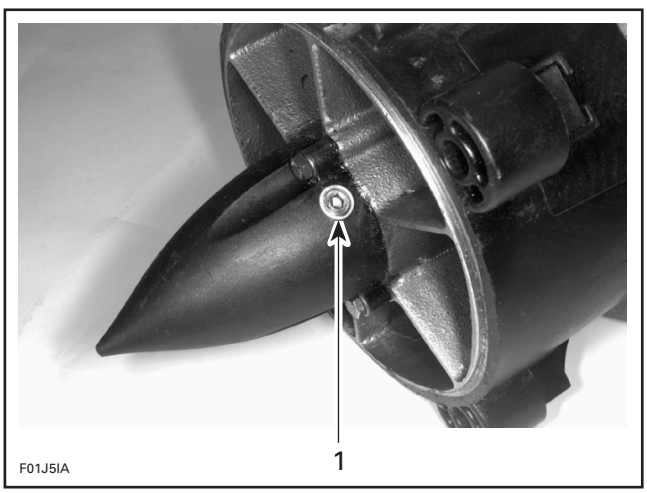
18, Cover

Install O-ring **no. 27** to cover. Apply Loctite 518 on O-ring. Make sure spring and anti-knock pusher are in place.



1. *Spring*
2. *Pusher*
3. *O-ring with Loctite 518*

Install cover to jet pump housing making sure to properly position filler plug on top side.



1. *Filler plug toward top side of pump housing*

Apply Loctite 242 (blue) on screw threads and evenly tighten cover screws. Torque to 4 N•m (35 lbf•**in**).

Oil Fill

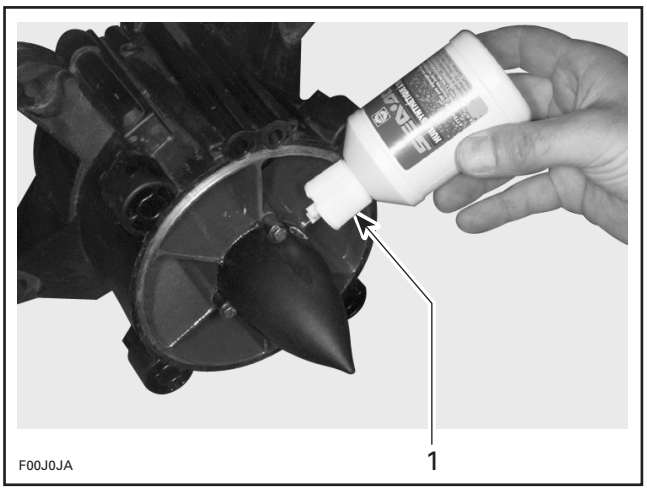
NOTE: It is highly recommended to perform a leakage test prior adding the oil. See PUMP PRESSURIZATION in this subsection.

Place housing horizontally as in its operating position so that filler plug is located on top. Remove filler plug 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 drain into housing and after a few minutes add more oil until it is level with bottom of filler hole.

▼ CAUTION

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

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

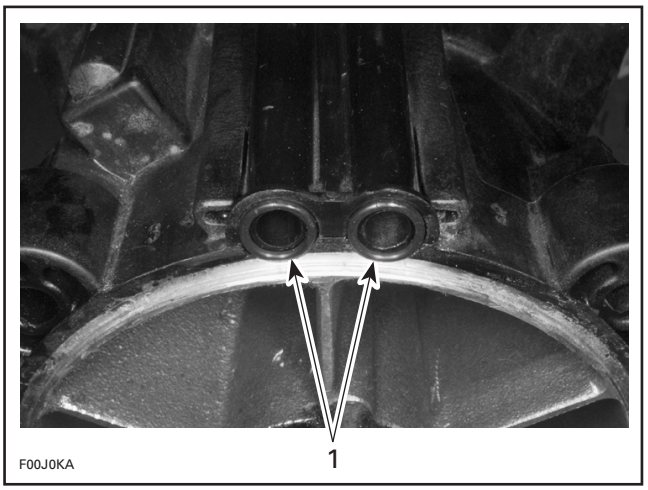


TYPICAL

1. *Pour oil slowly until it is level with bottom of filler hole*

11, Venturi

If needed, install new O-rings **no. 10** around bailer passages.



1. *O-rings*

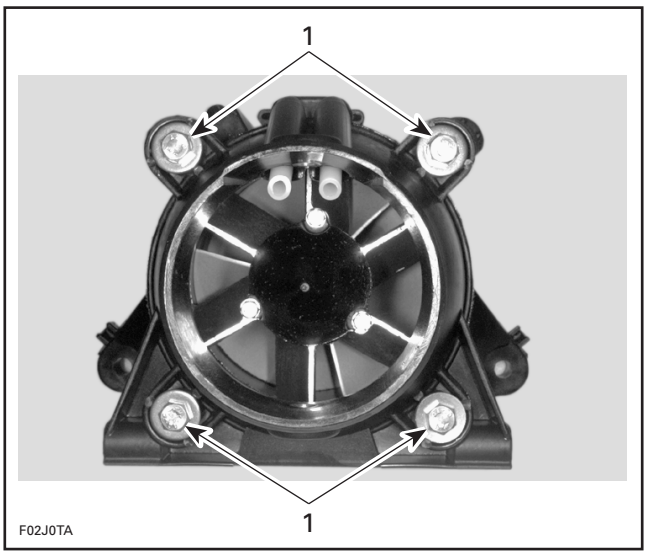
Apply Loctite 518 (Gasket Eliminator) on mating surface.

Position venturi with bailer passages on top.

Apply Loctite 242 (blue) on threads of screws no. 12.

NOTE: On the GTI and GTX models, install the reverse support with the venturi.

Install screws no. 12, lock washers no. 13 and flat washers no. 14 then torque to 21 N•m (16 lbf•ft).



1. Torque screws to 21 N•m (16 lbf•ft)

17, Fitting

SPX and GTS Models

Apply Loctite PST 592 on plastic fitting threads. Then thread fitting into pump housing until threads are bottomed.

29, O-Rings

GS, GSX Limited, XP Limited, GTI, and GTX Limited

Install O-rings no. 29 around bailer passages or make sure they are in place if they were not removed.

PUMP PRESSURIZATION

Whenever doing any type of repair on jet pump, a pressure test should be done to check for leakage.

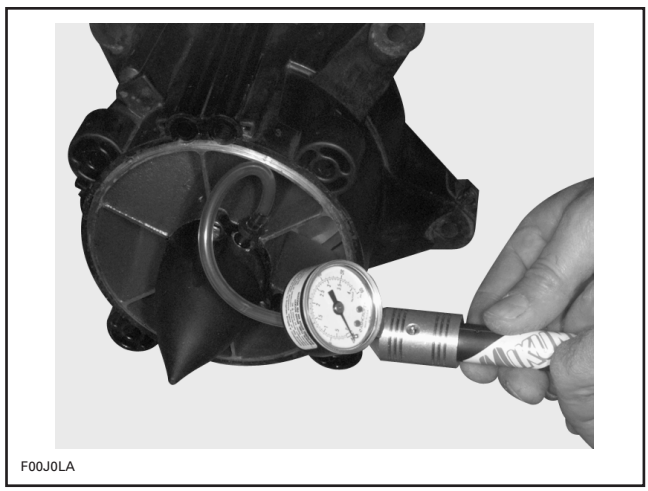
Proceed as follows:

– Remove drain plug from cover.

– Apply Loctite PST 592 on threads of fitting tool (P/N 295 000 086) then secure on cover.

– Connect pump gauge tester (P/N 295 000 085) to fitting.

– Pressurize pump to a maximum of 70 kPa (10 PSI).



– Pump must maintain this pressure for at least 10 minutes.

▼ CAUTION

Repair any leak, failure to correct a leak will lead to premature wear of pump components.

NOTE: If there is a pressure drop spray soapy water around cover. If there are no bubbles, impeller shaft, impeller shaft seal, or jet pump housing is leaking through porosity and has to be replaced. Jet pump unit has to be disassembled. If jet pump has been overhauled, the impeller shaft seal no. 22 may be leaking; Add a small quantity of Sea-Doo jet pump synthetic oil to wet the oil seal. Let soak and recheck.

– Disconnect pump gauge tester and remove fitting.

– Check oil level. Refill as necessary.

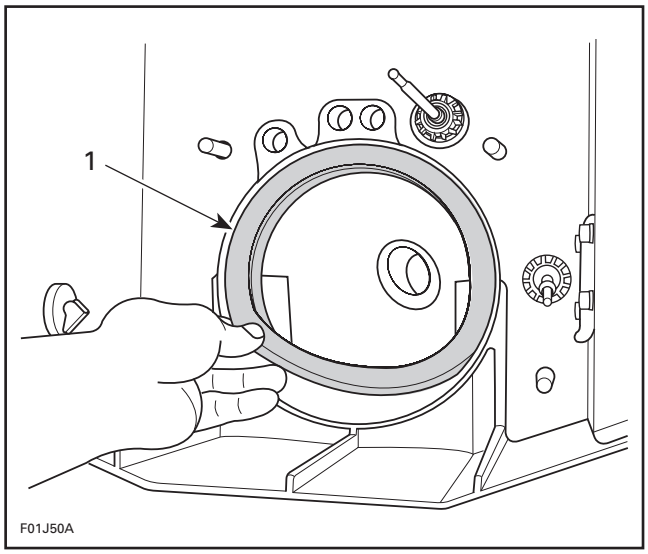
– Apply Loctite PST 592 to threads of filler plug then secure it in cover.

INSTALLATION

28, Neoprene Seal

SPX, GSX Limited, XP Limited and GTX Limited

If neoprene seal is damaged, replace it with a new one.



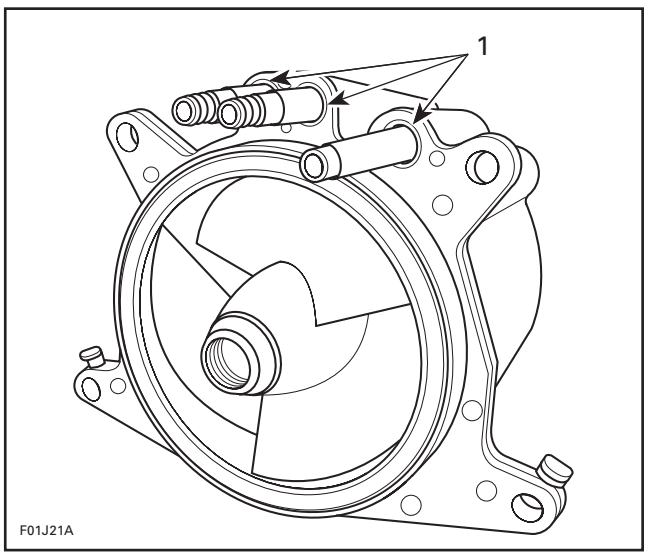
TYPICAL

1. Neoprene seal

9, Jet Pump Housing

SPX Models

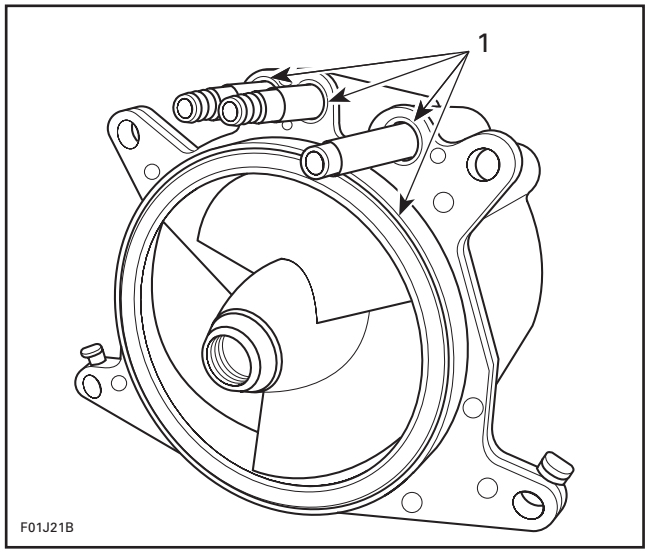
Apply Loctite Right Stuff around bailer and water supply fittings.



1. Apply Loctite Right Stuff where indicated

GTS Model

Apply Loctite Right Stuff around bailer and water supply fittings as well as around wear ring lip.



1. Apply Loctite Right Stuff where indicated

All Models

Generously apply synthetic grease on drive shaft splines.

Make sure rubber damper is on drive shaft end.

Install jet pump. If necessary, wiggle jet pump to engage drive shaft splines in impeller.

▼ CAUTION

Some watercraft require a shim between hull and pump; if shim has been removed at pump removal, be sure to reinstall it, otherwise engine alignment will be altered.

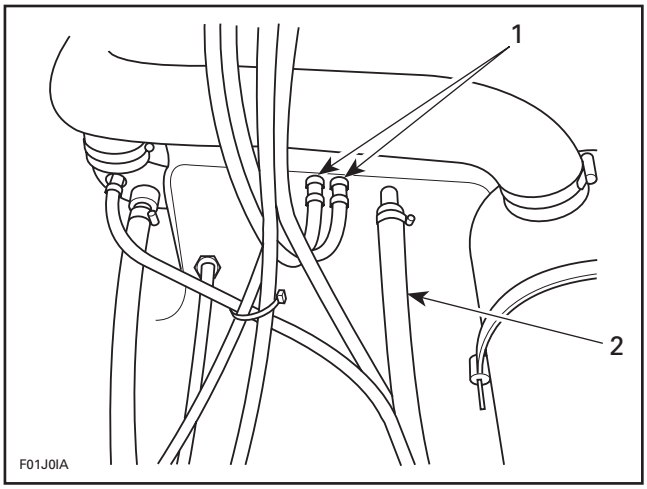
Apply Loctite 242 (blue) on stud threads of jet pump housing.

Install flat washers no. 8, lock washers no. 7 and nuts no. 6. Tighten nuts of jet pump housing in a criss-cross sequence and torque to 33 N•m (24 lbf•ft).

NOTE: Slightly lubricate wear ring with BOMBARDIER LUBE lubricant to minimize friction during initial start.

SPX and GTS Models

Secure water supply hose and both bailer tubes to jet pump housing using tie raps.



1. *Bailer tubes*
2. *Water supply hose*

Reinstall air vent tube support onto body (SPX model).

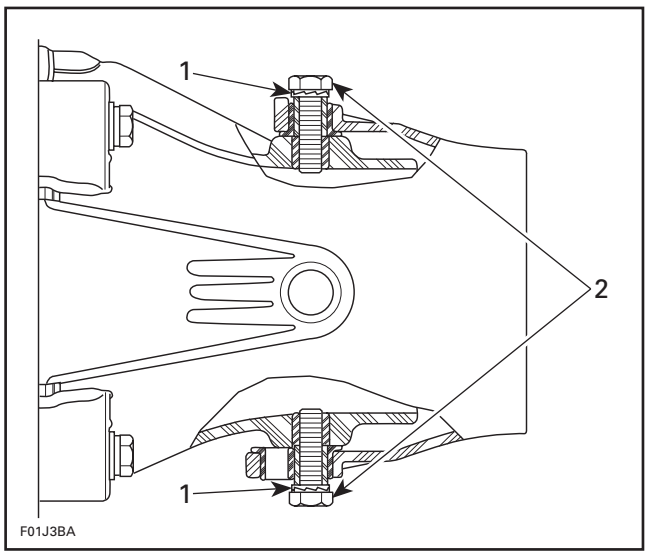
5, Nozzle

GS, GTS, GTI and GTX Limited

Insert bushings no. 3 in nozzle no. 5, positioning their flanges from inside of nozzle.

Insert sleeves no. 2 in bushings no. 3.

Install nozzle no. 5 on venturi no. 11; position its steering arm on RH side. Apply Loctite 242 (blue) on screw threads (or use new screws with pre-applied threadlocker). Install screws no. 1 and locking disks no. 4 then torque to 20 N•m (15 lbf•ft).



TYPICAL

1. *Locking disks*
2. *Torque screws to 20 N•m (15 lbf•ft)*

◆ WARNING

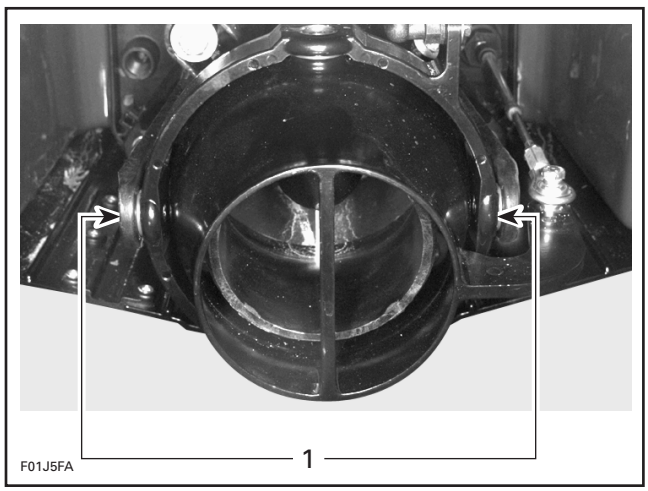
Whenever removing screw always renew locking disks. Screw must be torqued as specified.

SPX, GSX Limited, and XP Limited

Install nozzle/trim ring assembly.

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. Make sure steering arm of jet pump is on right side and trim arm is above venturi.



1. *Torque screws to 14 N•m (10 lbf•ft)*

Steering Cable

Refer to section 10, STEERING SYSTEM.

Trim System

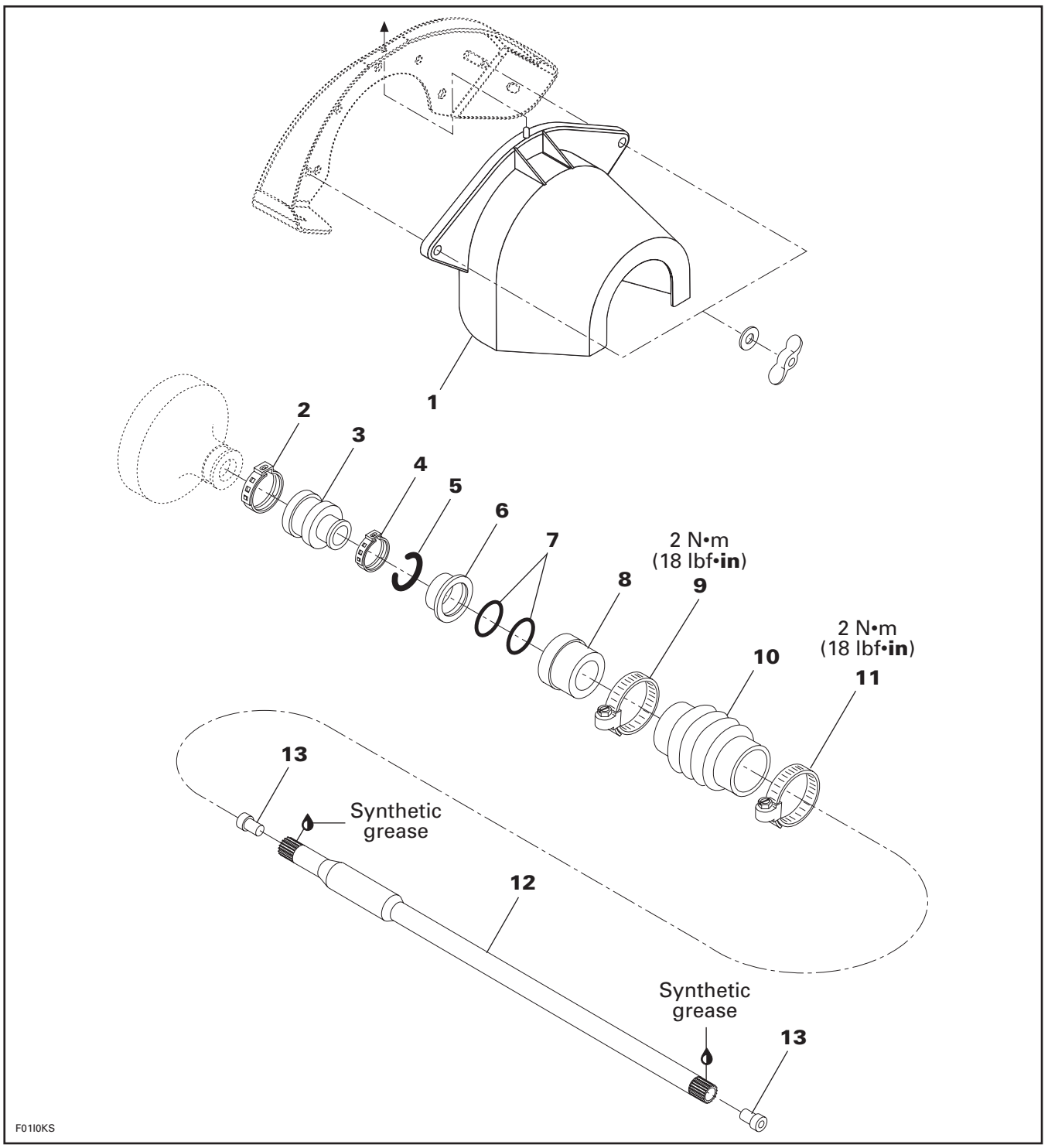
Refer to VARIABLE TRIM SYSTEM 09-05.

Reverse Cable

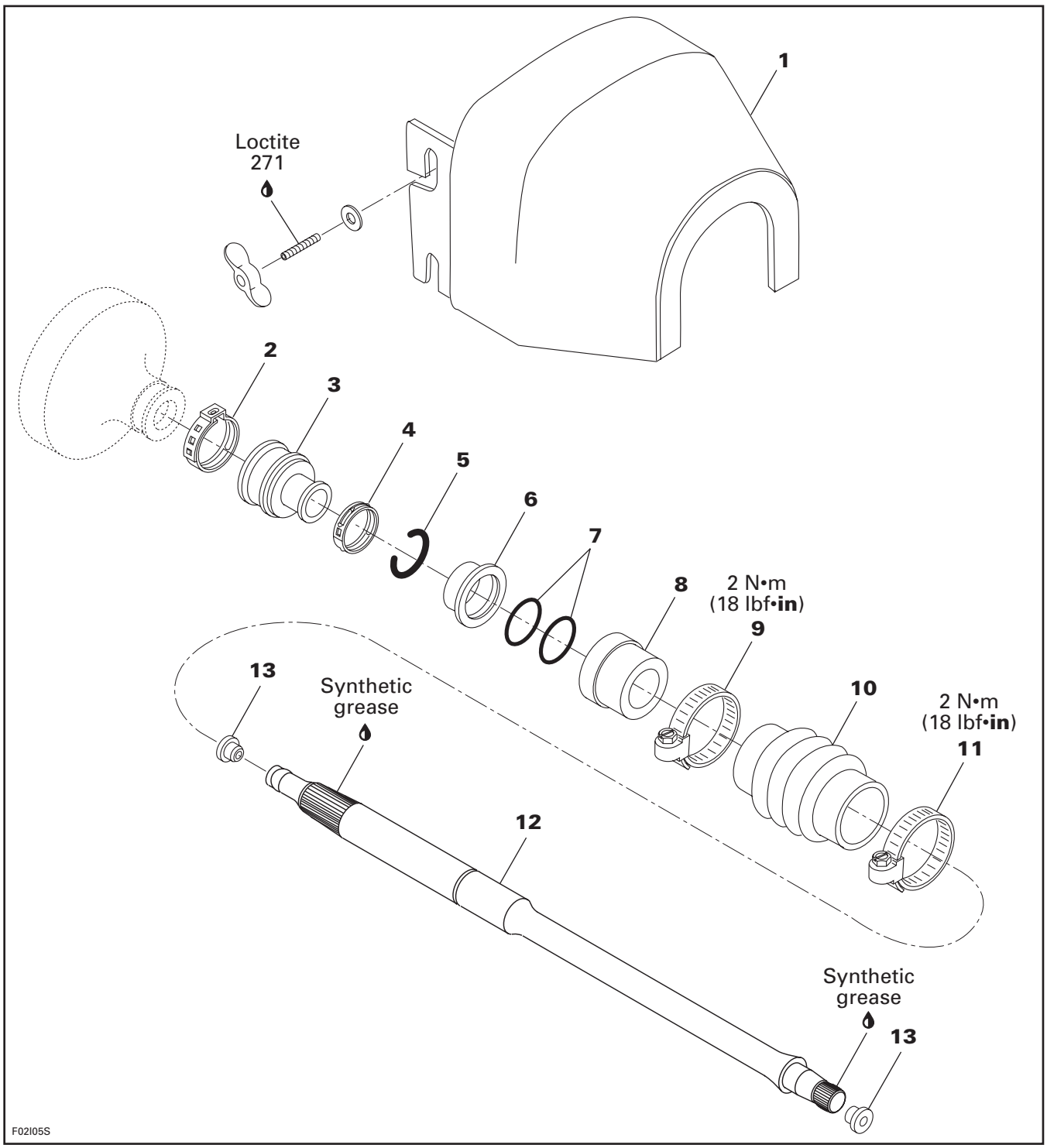
Refer to REVERSE SYSTEM 09-04.

DRIVE SYSTEM

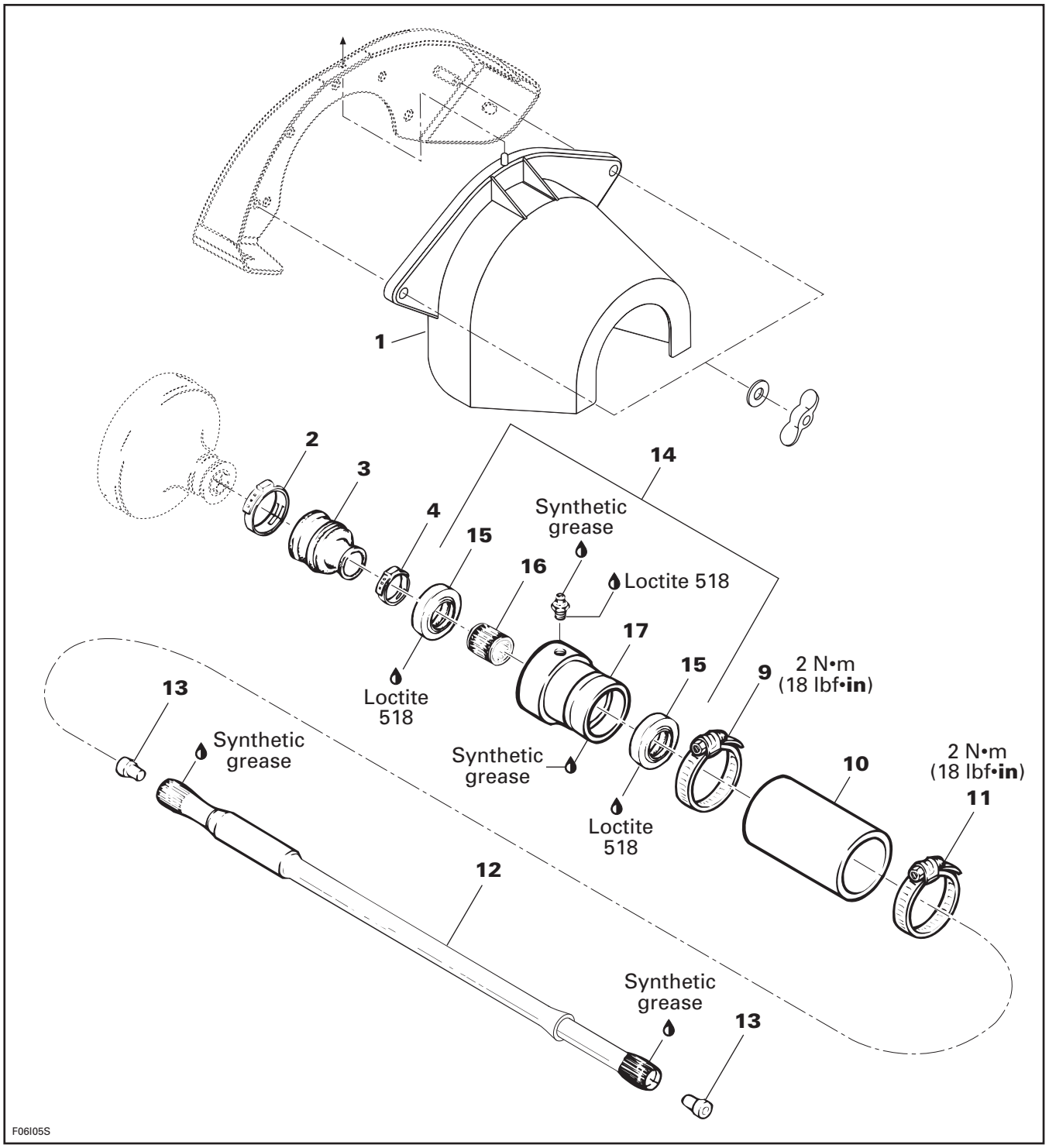
SPX Model



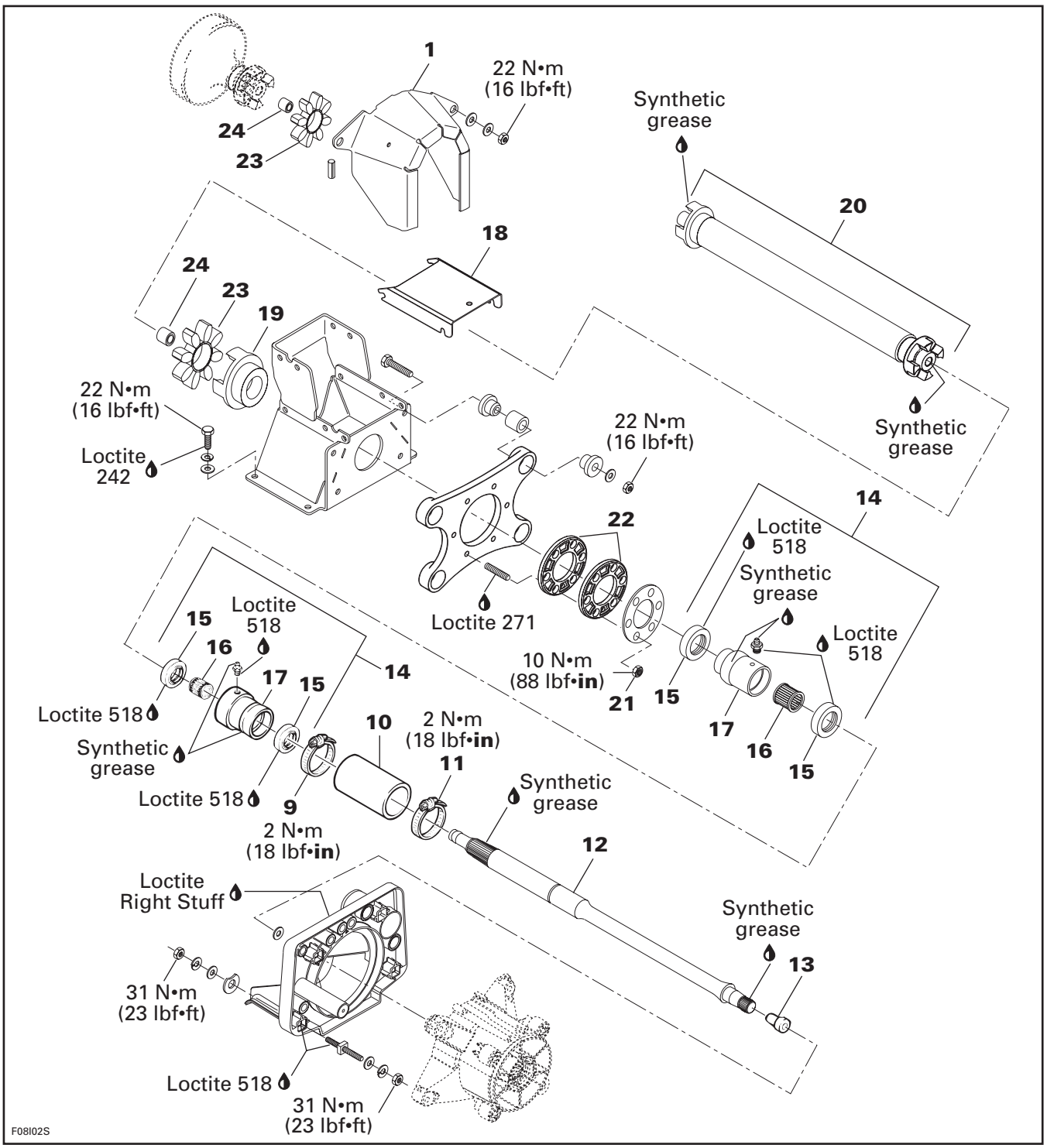
GS, GTS and GTI Models



GSX Limited and GTX Limited



XP Limited


1
22 N•m
(16 lbf•ft)
24
23
Synthetic
grease
20
18
24
23
19
22 N•m
(16 lbf•ft)
Loctite
242
22 N•m
(16 lbf•ft)
Synthetic
grease
14
22
Loctite
518
Synthetic
grease
Loctite 271
Loctite
518
15
16
17
15
14
Loctite
518
10 N•m
(88 lbf•in)
21
15
17
16
15
Loctite 518
Synthetic
grease
10
2 N•m
(18 lbf•in)
11
Loctite 518
9
2 N•m
(18 lbf•in)
Synthetic
grease
12
Loctite
Right Stuff
Synthetic
grease
13
31 N•m
(23 lbf•ft)
Loctite 518
31 N•m
(23 lbf•ft)
F08I02S

GENERAL

Jet pump must be removed to replace any components of the drive system. Refer to JET PUMP 09-02 for removal procedure.

REMOVAL

1, PTO Flywheel Guard

SPX, GS and GSX Limited

Remove seat (s).

Remove vent tube support.

Remove PTO flywheel guard.

GTS, GTI and GTX Limited

Remove seat(s).

Remove seat support (except GTS model).

Remove PTO flywheel guard.

XP Limited

Open engine cover.

Remove storage basket.

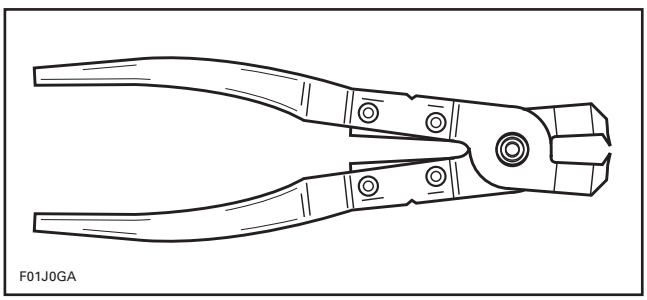
Remove vent tubes from PTO flywheel guard.

Remove PTO flywheel guard.

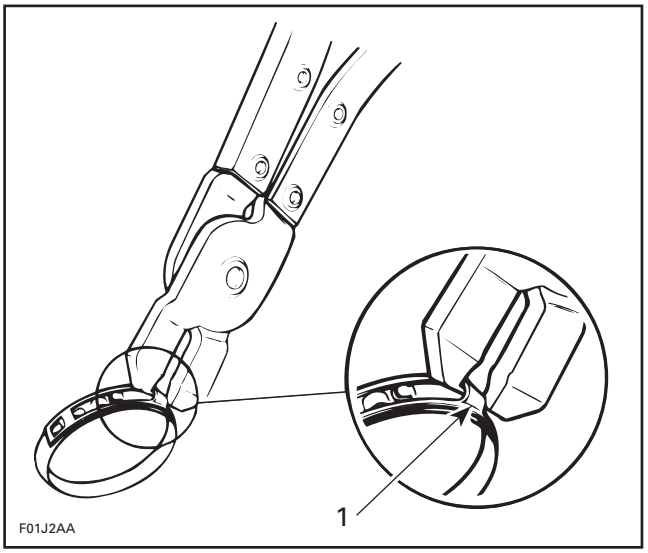
2, Large Clamp

Unfasten large clamp of PTO flywheel boot **no. 3** as follows:

– Use pliers (P/N 295 000 069).



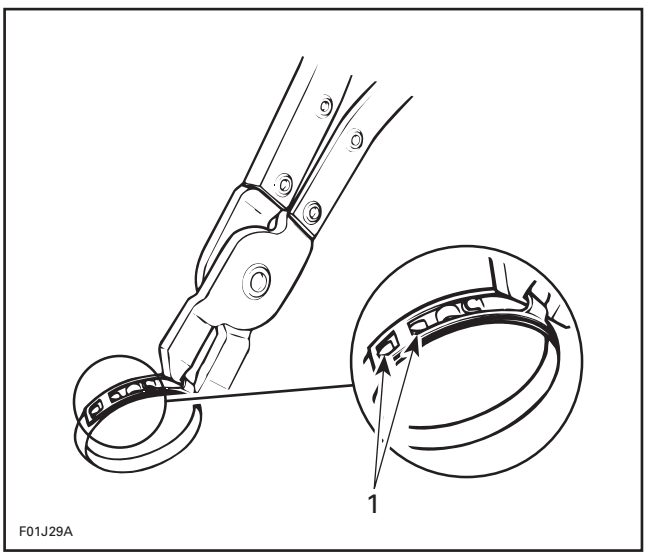
– Insert pointed tips of pliers in closing hooks.



TYPICAL

1. Closing hooks

– Squeeze pliers to draw hooks together and disengage windows from locking hooks.



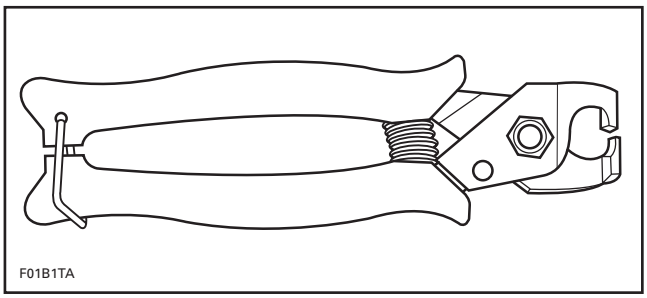
TYPICAL

1. Locking hooks

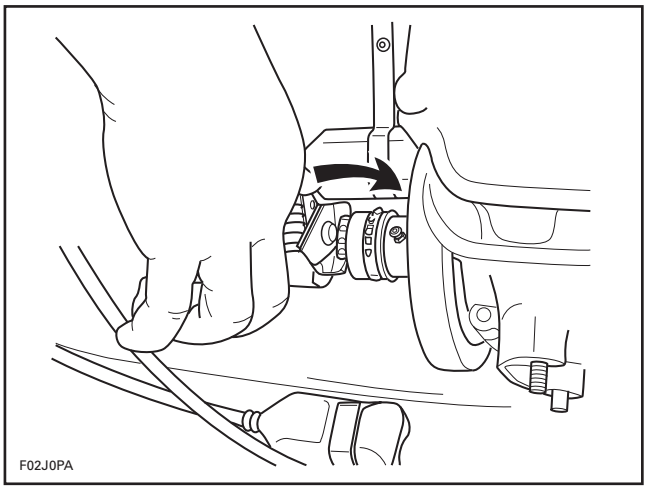
4, Small Clamp

Unfasten small clamp of PTO flywheel boot as follows:

– Use pliers (P/N 295 000 054).



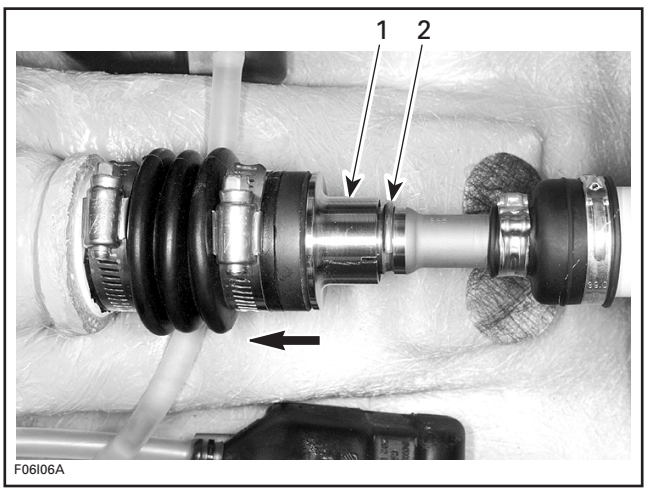
– To open clamp, place flat side of plier on clamp embossment, squeeze and twist plier.



SPX, GS, GTS and GTI Models

5,6, Circlip and Floating Ring

Hold floating ring **no. 6** and compress boot **no. 10**; then, pull out circlip **no. 5** from drive shaft groove.



1. Push floating ring
2. Remove circlip

All Models Except the XP Limited

12, Drive Shaft

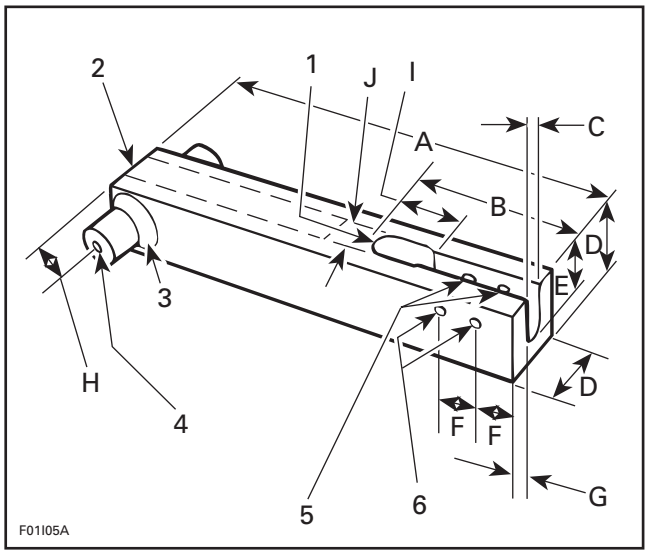
Simply pull out drive shaft.

NOTE: If the drive shaft is jammed into PTO flywheel, make the following tool and use it in conjunction with the jet pump housing remover (P/N 295 000 113) to withdraw drive shaft.

Raw Material:

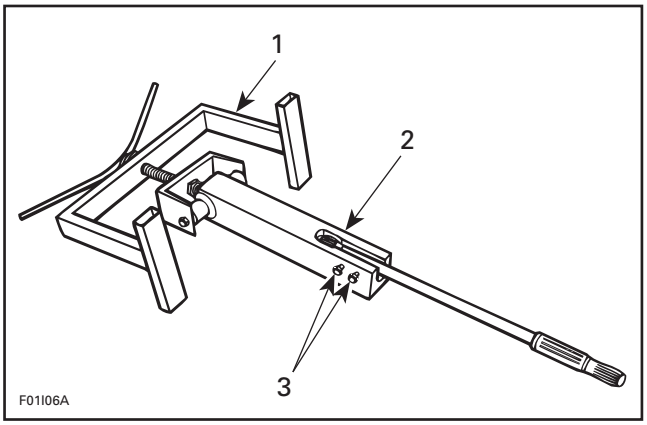
– 1 aluminum alloy square of 51 mm (2 in) × 305 mm (12 in).

– 2 aluminum rods of 28.5 mm (1-1/8 in) dia. × 30 mm (1-3/16 in).



1. Use ball end mill for radius. This section of the slot should be 38 mm (1-15/32 in) deep
2. Drill 25 mm (1 in) hole in center to remove material
3. Weld all around
4. Drill 9 mm (11/32 in) hole
5. Drill through 9 mm (11/32 in)
6. Drill and tap 6 mm (1/4 in) holes
A. 305 mm (12 in)
B. 105 mm (4-1/8 in)
C. 16 mm (5/8 in)
D. 51 mm (2 in)
E. 36 mm (1-25/64 in)
F. 22 mm (7/8 in)
G. 17 mm (43/64)
H. 19 mm (3/4 in)
I. 35 mm (1-3/8 in)
J. 20.3 mm ± .18 (.800 in ± .007)

Mount on drive shaft puller the jet pump housing remover; then, install assembly on drive shaft using screws.



TYPICAL

1. *Jet pump housing remover*
2. *Drive shaft puller*
3. *Screws*

▼ CAUTION

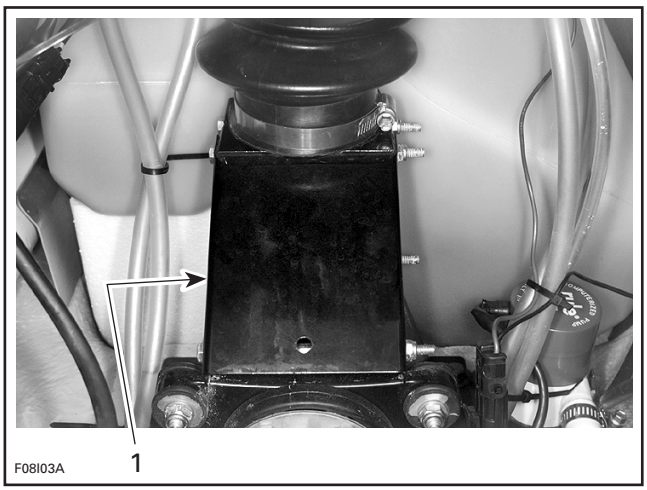
Be careful not to damage hull rear section or engine rubber mounts.

XP Limited

12, Rear Drive Shaft

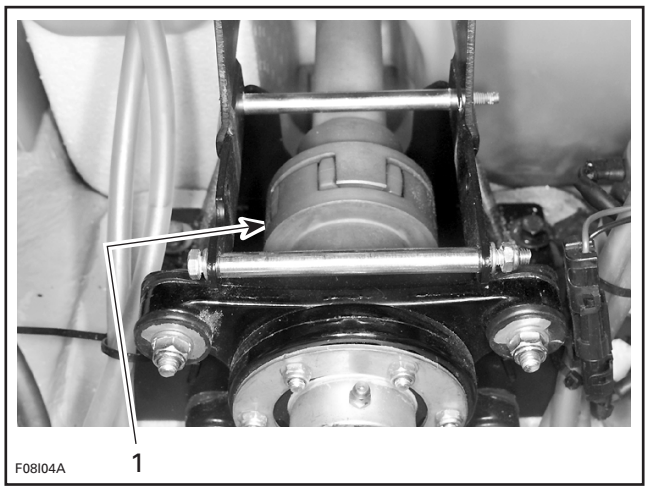
Remove rear access panel.

Remove protective plate no. 18.



1. *Remove protective plate*

Pull rear drive shaft until coupler no. 19 is disengage from splines.



1. *Pull drive shaft to disengage coupler from splines*

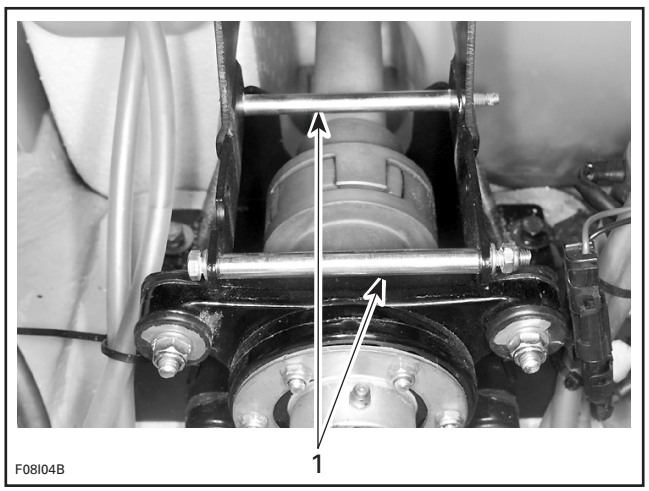
Remove rear drive shaft.

Remove coupler no. 19.

20, Front Drive Shaft

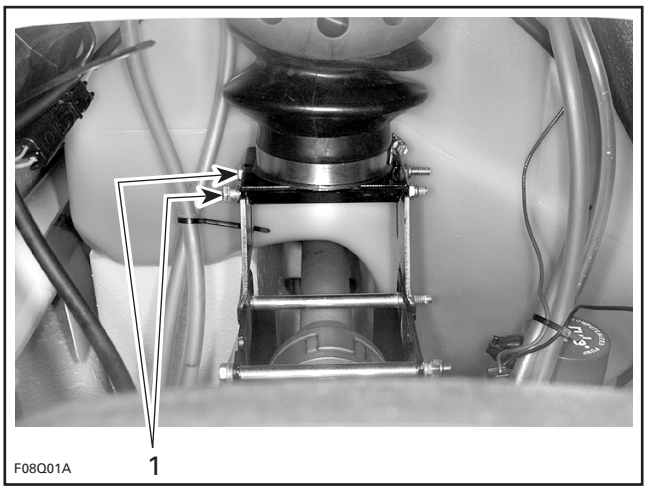
Remove PTO flywheel guard no. 1.

Remove bolts, lock nuts and sleeves from support.



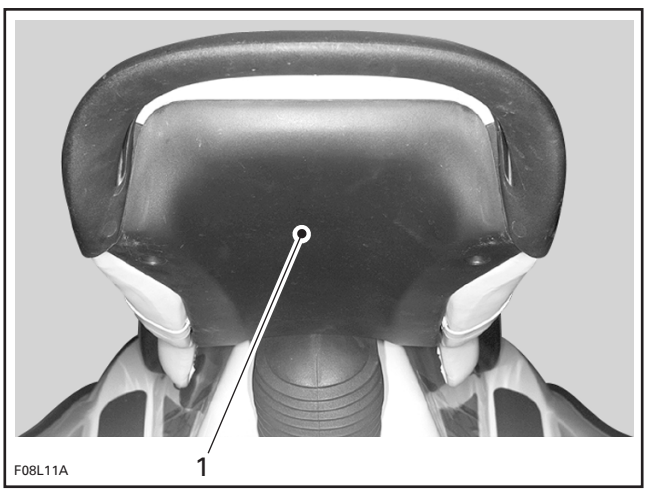
1. *Remove bolts, lock nuts and sleeves*

Loosen bolts and lock nuts retaining the lower support of the shock absorber.



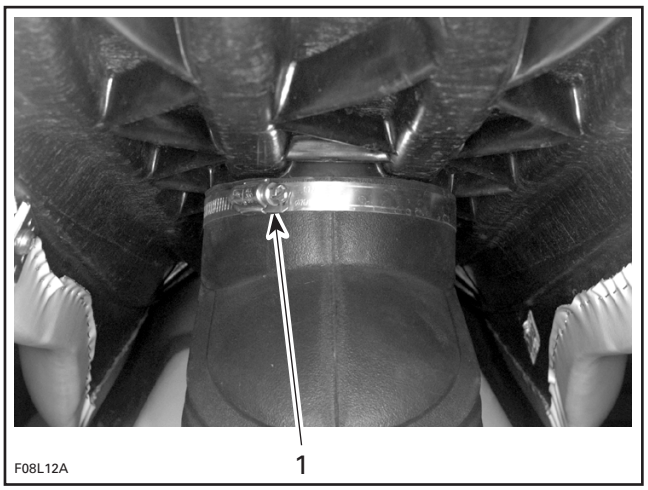
1. Remove bolts and lock nuts

Loosen 4 screws and remove bottom cover of seat.



1. Remove cover

Loosen gear clamp retaining the outer boot of the shock absorber.



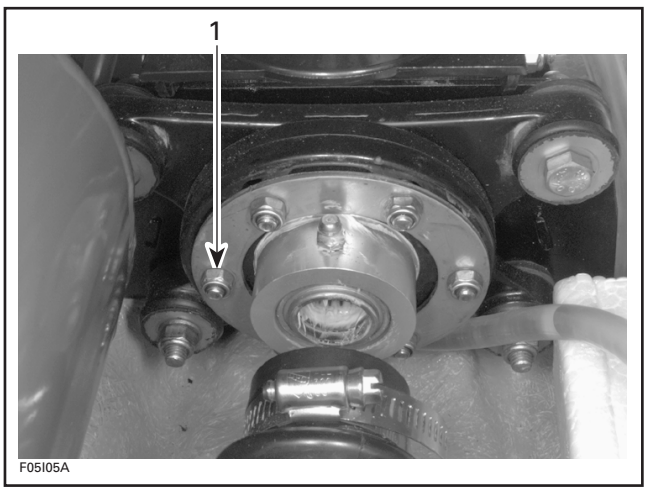
1. Loosen gear clamp

Tilt seat.

Remove front drive shaft.

14, Seal Carrier of Mid Bearing

To remove the seal carrier from support, loosen the 6 nuts **no. 21**.



1. Nut (6)

SPX, GS, GTS and GTI Models

10, Boot

Loosen gear clamp **no. 11** holding boot, then carefully pull boot and carbon ring **no. 8** from hull insert.

8, Carbon Ring

Loosen gear clamp **no. 9** then pull carbon ring from boot **no. 10**.

GSX Limited, XP Limited and GTX Limited

10, Boot

Loosen gear clamp no. 11 holding boot, then pull boot with seal carrier.

14, Seal Carrier of Thru Hull Fitting

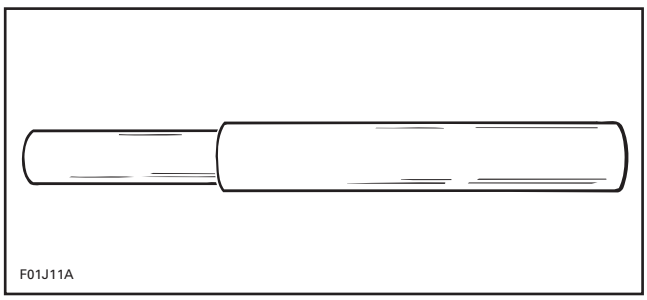
Loosen gear clamp no. 9 and remove seal carrier from boot no. 10.

DISASSEMBLY

GSX Limited, XP Limited and GTX Limited

14, Seal Carrier

Bearing no. 16 and seals no. 15 can be easily removed using the bearing/seal remover tool (P/N 295 000 144).



NOTE: The same tool is used for bearing and seal removal of jet pump.

Properly support seal carrier housing no. 17 when removing seals and bearing.

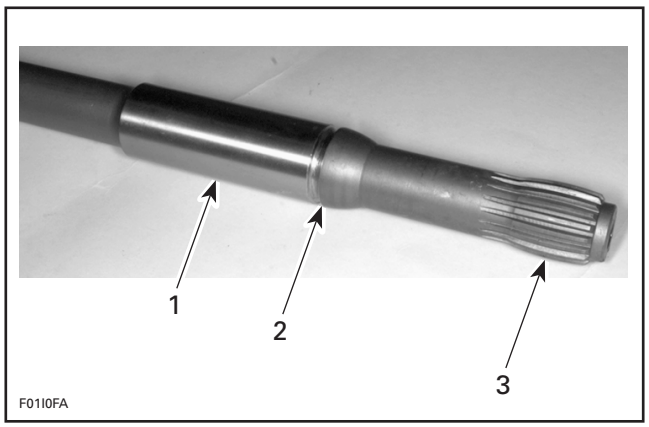
INSPECTION

12, Drive Shaft

Inspect condition of drive shaft and PTO flywheel splines.

Inspect condition of groove.

With your finger nail, feel machined surface of drive shaft. If any irregular surface is found, renew drive shaft.

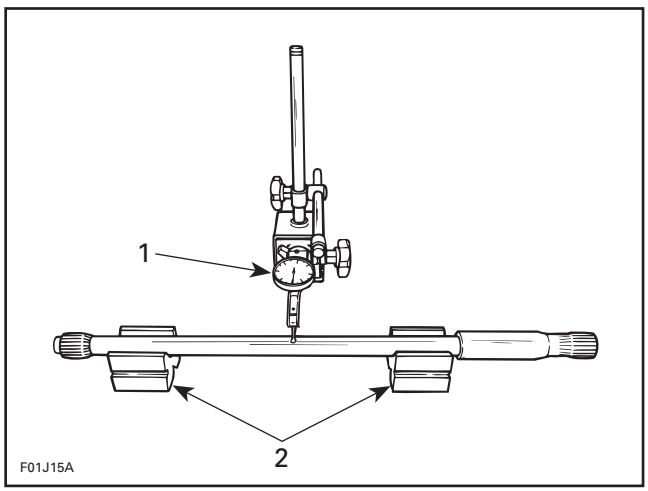


1. Surface condition
2. Groove condition
3. Splines condition

Excessive deflection could cause vibration and damage to drive shaft splines, impeller, flywheel or floating ring (seal carrier depending upon the model).

Place drive shaft on V-blocks and set-up 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

1. Dial gauge
2. V-blocks

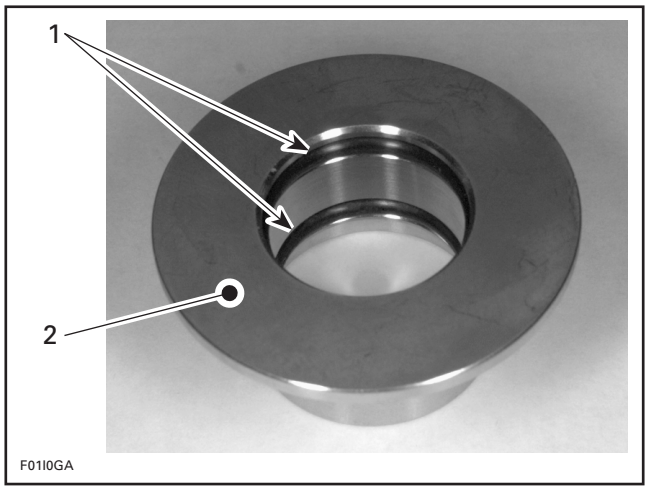
13, Damper

Visually inspect shape of dampers for deformation or other damage.

SPX, GS, GTS and GTI Models

6,7, Floating Ring and O-ring

Inspect condition of O-rings and floating ring contact surface.

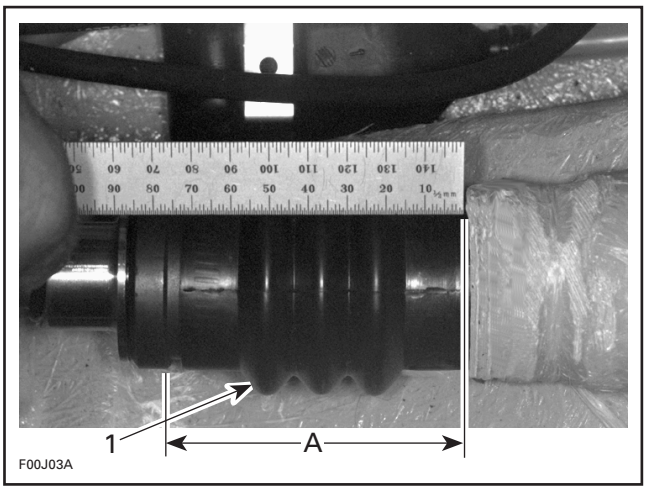


1. O-rings
2. Floating ring contact surface

10, Boot

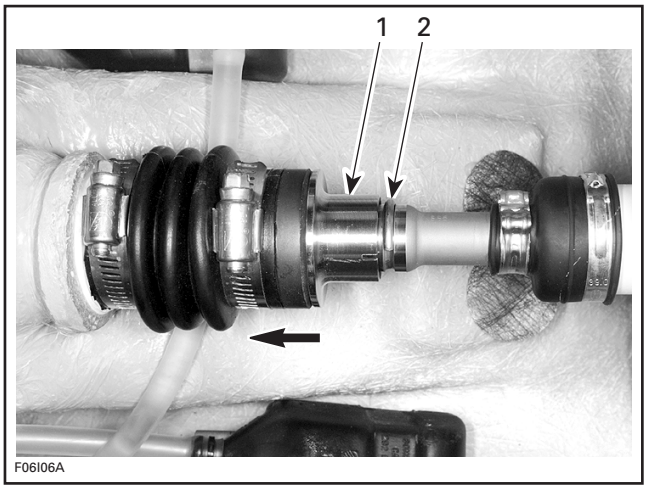
To verify the preload of the boot, proceed as follows:

Measure installed length of boot.



1. Boot
A. Measure here

Push floating ring to compress boot; then, remove circlip out of drive shaft groove.



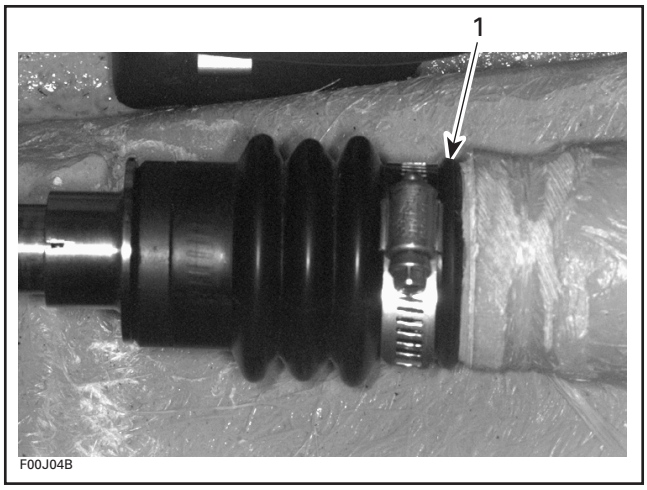
1. Push floating ring
2. Remove circlip

Slide floating ring far enough forward in order to release it from carbon ring.

Measure boot free length.

Subtract the installed length measurement from the free length measurement. A difference of 4 mm to 12 mm (5/32 in to 15/32 in) should be obtained.

If the length is less than 4 mm (5/32 in), install a spacer (P/N 293 250 017) between boot and thru hull fitting.



1. Spacer

NOTE: Drive shaft must be removed to install spacer.

GSX Limited, XP Limited and GTX Limited

16, Needle Bearing

Inspect seal carrier needle bearing. Check parts for scoring, pitting, chipping or other evidence of wear.

ASSEMBLY

GSX Limited, XP Limited and GTX Limited

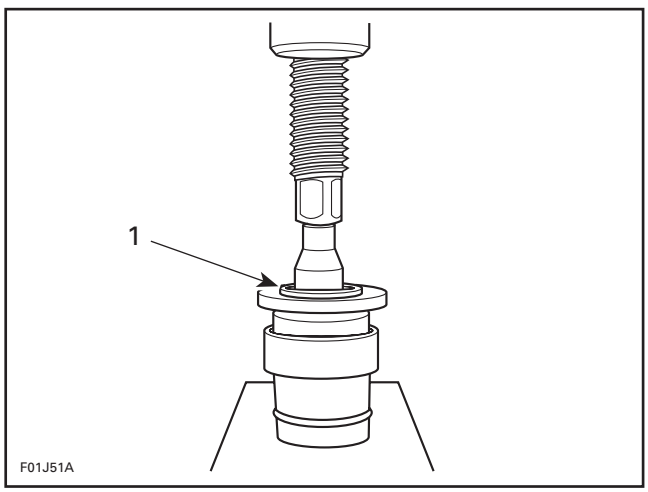
14, Seal Carrier

Properly support seal carrier housing no. 17 when installing seals and bearing.

▼ CAUTION

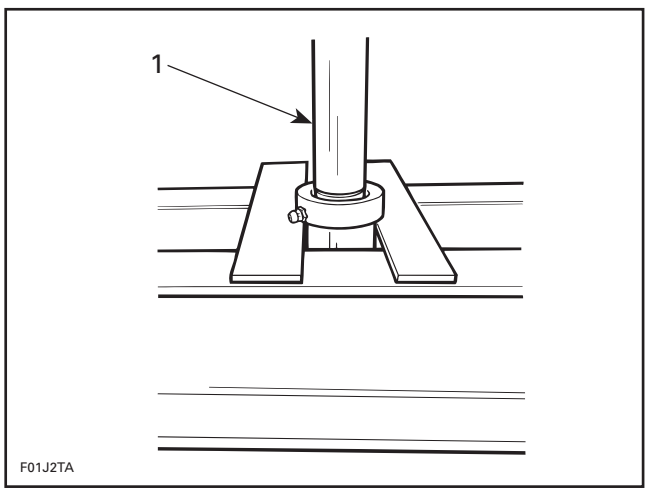
Ensure to install stamped end of bearing (showing identification markings) first on tool. Never hammer the bearing into its housing.

Install bearing no. 16 with the bearing/seal installer tool (P/N 295 000 107).



1. Press bearing in its housing

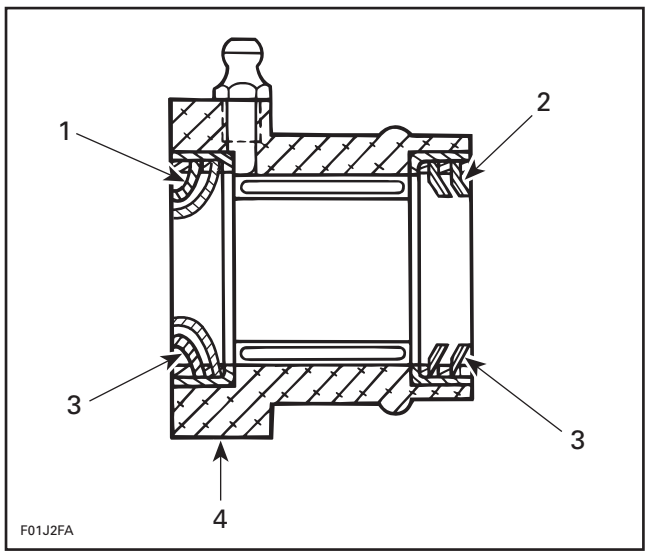
NOTE: Bearing can also be installed with the same driver used at disassembly. Center bearing in longitudinal axis of housing.



1. Push bearing centered in its housing

Install double-lip seal no. 15 with protector toward jet pump.

On both seals no. 15, raised edge of lip must be located outwards of seal carrier.

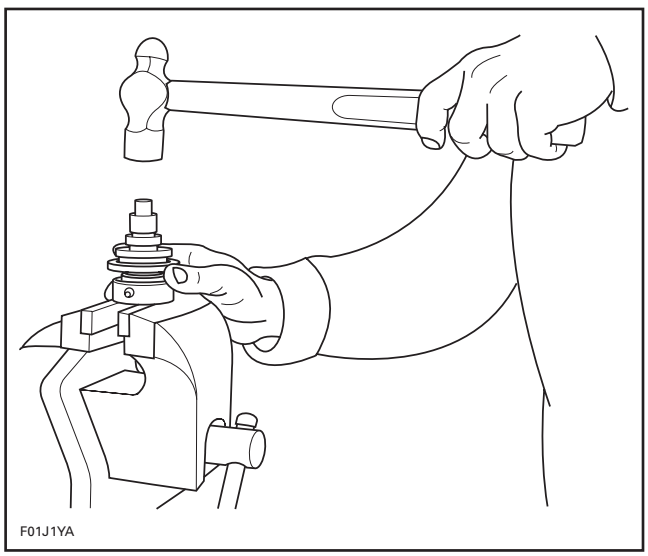


1. Double-lip seal toward engine
2. Double-lip seal with protector toward jet pump
3. Raised edge of lip outwards
4. Seal carrier

Apply Loctite 518 all around seals outside diameter.

Seals no. 15 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.



TYPICAL

Pack seals and bearing with synthetic grease (P/N 293 550 010).

INSTALLATION

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

XP Limited

14, Seal Carrier of Mid Bearing

Properly index flanges **no. 22** together.

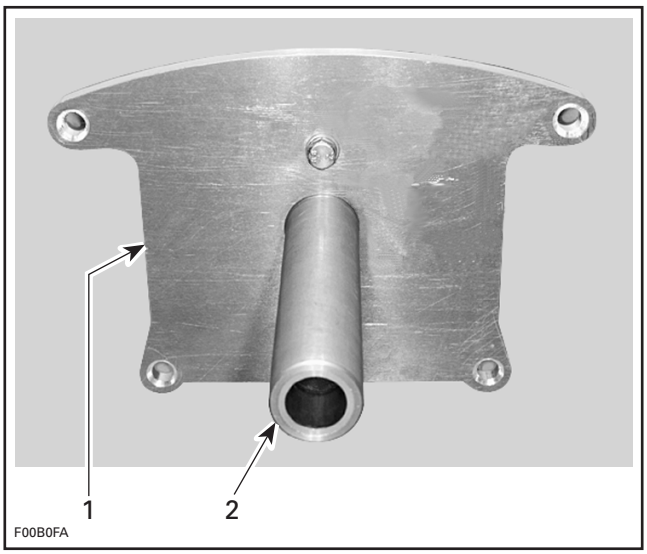
Install seal carrier and hand tighten nuts **no. 21**.

NOTE: Apply Loctite 242 (blue) on studs.

Align the seal carrier using the following tools:

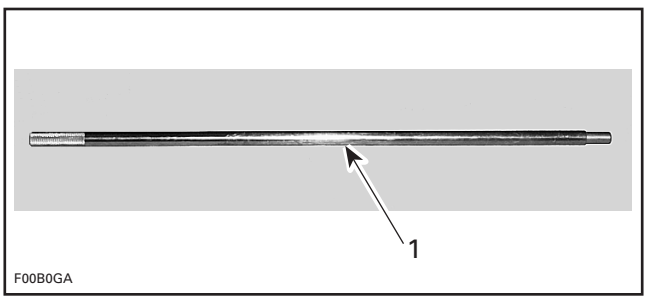
– Support plate kit (P/N 529 035 506).

NOTE: Use plate (P/N 529 035 507) for the 155.6 mm (6-1/8 in) jet pump.



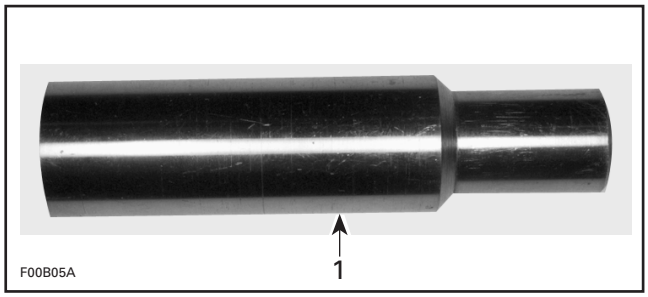
1. Plate (P/N 529 035 507)
2. Support (P/N 529 035 511)

– Alignment shaft (P/N 295 000 141).



1. Alignment shaft

– PTO flywheel adapter (P/N 295 000 157).

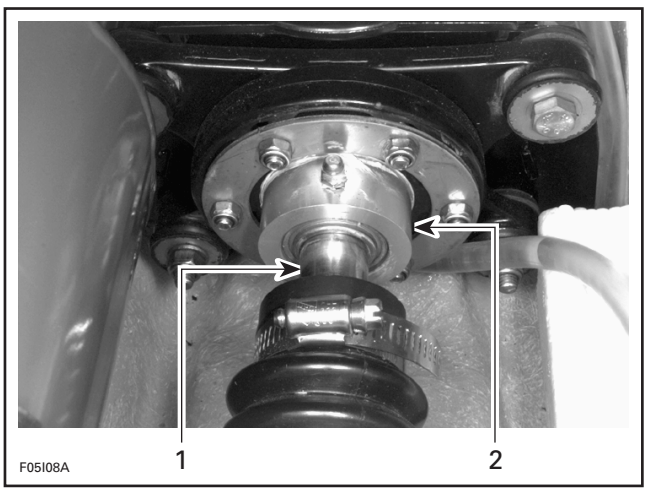


1. PTO flywheel adapter

Install support plate at rear of watercraft.

Install adapter on shaft.

Carefully slide shaft through support plate and seal carrier. Insert adapter end into PTO flywheel.

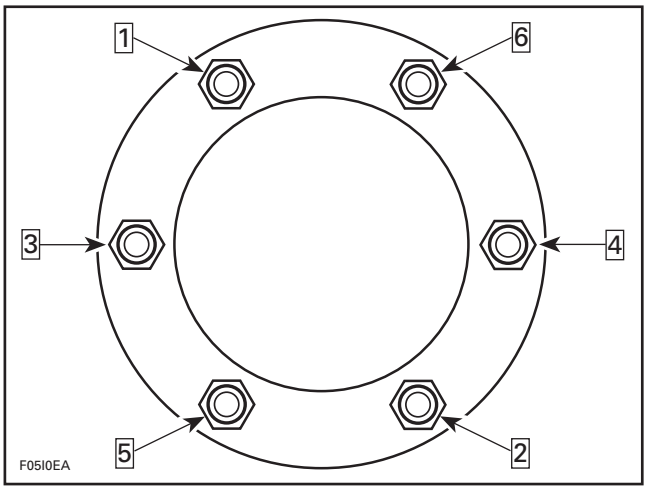


TYPICAL

1. Alignment tool
2. Seal carrier

Torque seal carrier nuts **no. 21** in a criss-cross sequence in 2 steps as per following illustration.

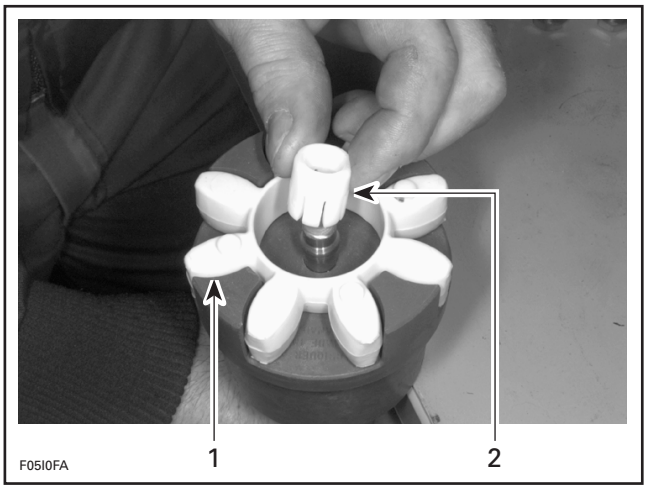
NOTE: It is very important to tighten nuts of seal carrier in a criss-cross sequence to maintain its alignment.



Step 1: *Torque to 3 N•m (26 lbf•**in**) as per sequence*
Step 2: *Torque to 10 N•m (88 lbf•**in**) as per sequence*

23,24, Damper and Bushing

Make sure to install dampers and bushing.



ENGINE SIDE SHOWN

1. *Damper*
2. *Bushing*

19,20, Coupler and Front Drive Shaft

Install front drive shaft with coupler.

12,24, Rear Drive Shaft and Damper

Install damper to rear drive shaft.

All Models Except the XP Limited

13, Damper

Install dampers **no. 13** on drive shaft **no. 12**.

NOTE: Make sure dampers were not left in PTO flywheel or impeller.

3, Drive Shaft

Install drive shaft and jet pump at the same time.

SPX, GS, GTS and GTI Models

Insert drive shaft through carbon ring **no. 8** and floating ring **no. 6**.

NOTE: Make sure to install floating ring before inserting the drive shaft in the PTO flywheel.

GSX Limited and GTX Limited

Insert drive shaft through seal carrier **no. 14** being careful not to damage seals.

▼ CAUTION

When sliding the drive shaft through seal carrier, the double lip seal can be folded over. This would cause a seal carrier bearing failure.

All Models Except the XP Limited

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

XP Limited

12, Rear Drive Shaft

Insert drive shaft through seal carrier **no. 14** being careful not to damage seals.

Engage drive shaft splines in coupler **no. 20**. Rotate shaft to properly index splines.

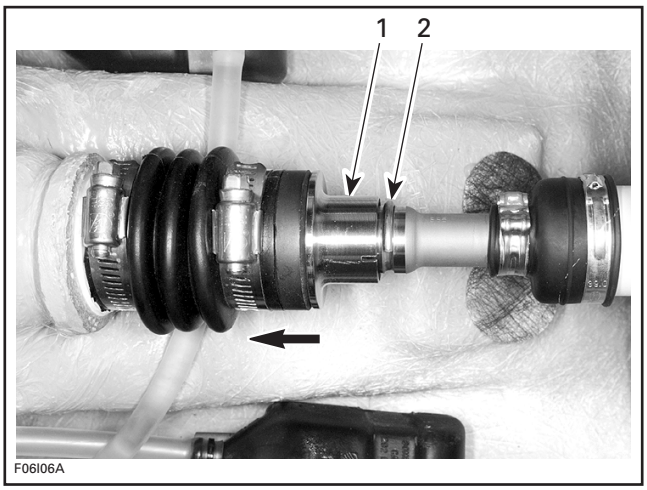
18, Protective Plate

Apply Loctite 242 (blue) on bolts and torque lock nuts to 10 N•m (88 lbf•**in**).

SPX, GS, GTS and GTI Models

5, Circlip

Push the floating ring to compress the boot. Insert the circlip in the drive shaft groove.



1. Push floating ring
2. Insert circlip in the groove

Slide the floating ring onto the circlip.

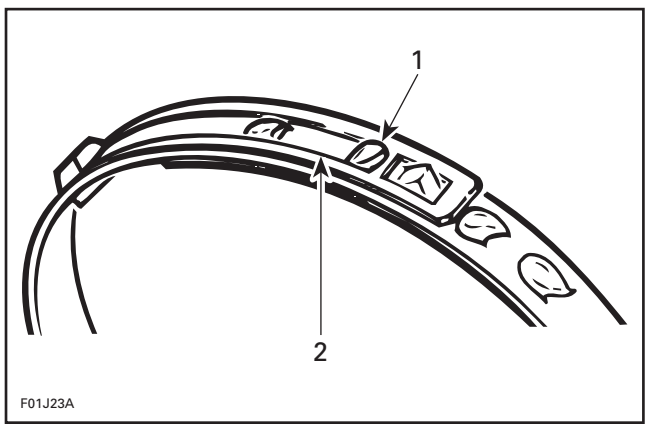
All Models Except the XP Limited

2, Large Clamp

Secure large clamp **no. 2** as follows:

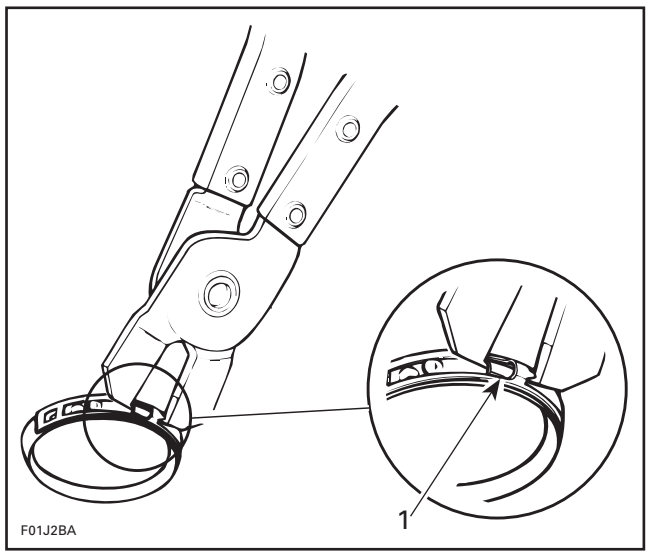
– Use pliers (P/N 295 000 069) as for removal.

– Manually engage holding hook in large window. This is a pre-clamping position only.



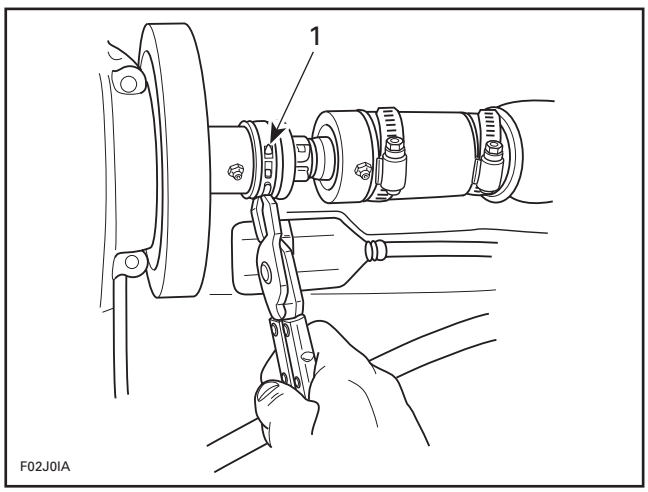
PRE-CLAMPING POSITION
1. Holding hook
2. Large window

– Insert pointed tips of pliers first in closing hooks.



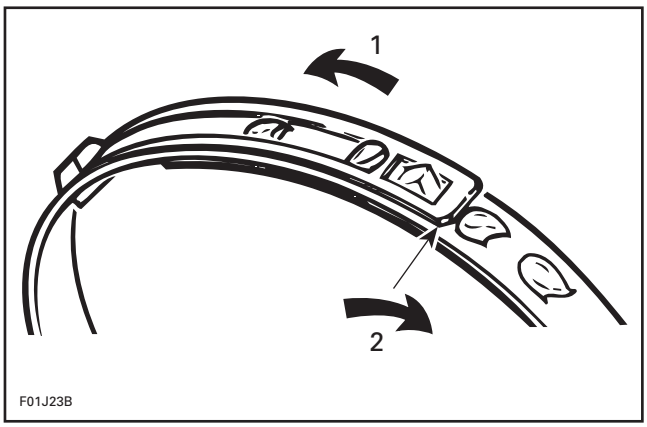
TYPICAL
1. Closing hooks

– Squeeze pliers. When both large and small windows are directly over the 2 locking hooks, press those windows down to engage hooks in windows.



1. Press to engage hooks in windows

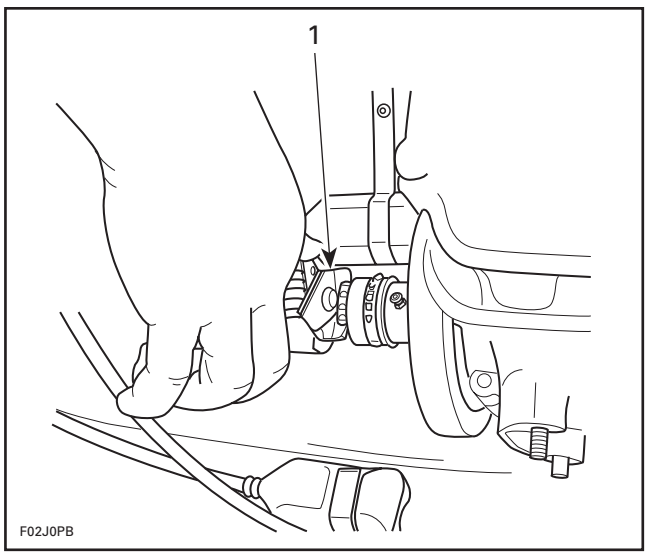
NOTE: At installation, clamp tail should be in opposite direction of engine rotation.



1. *Engine rotation (counterclockwise)*
2. *Tail in opposite direction*

4, Small Clamp

To secure small clamp no. 4, place notch side of plier on clamp embossment and squeeze plier.



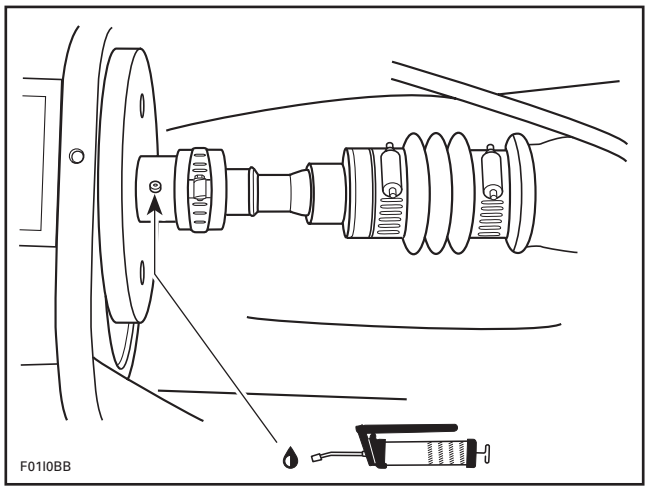
1. *Squeeze plier*

LUBRICATION

PTO Flywheel

All Models Except the XP Limited

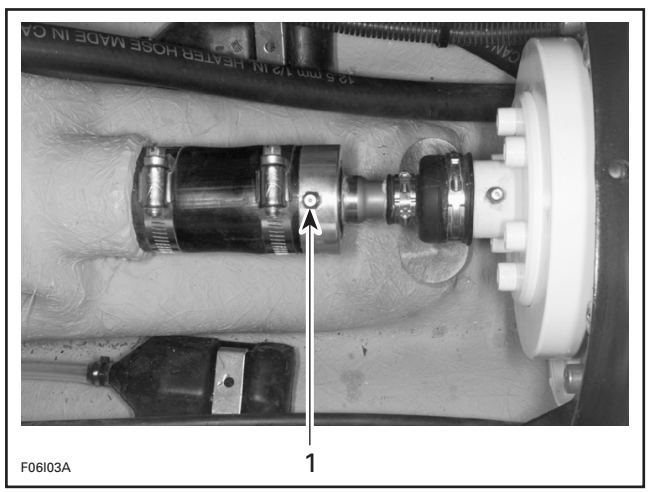
Using a grease gun, carefully lubricate PTO flywheel with synthetic grease (P/N 293 550 010), until boot is just beginning to expand. At this point, immediately stop greasing.



Seal Carrier

GSX Limited, XP Limited and GTX Limited

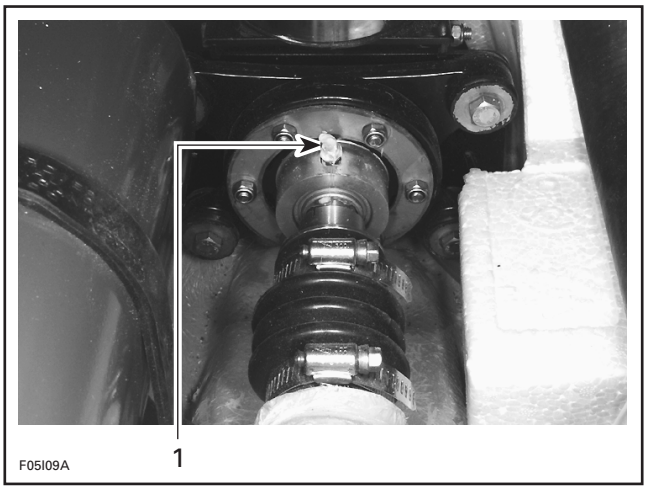
Using a grease gun, carefully lubricate seal carrier of thru hull fitting until grease is just coming out of seal.



1. *Grease seal carrier*

XP Limited

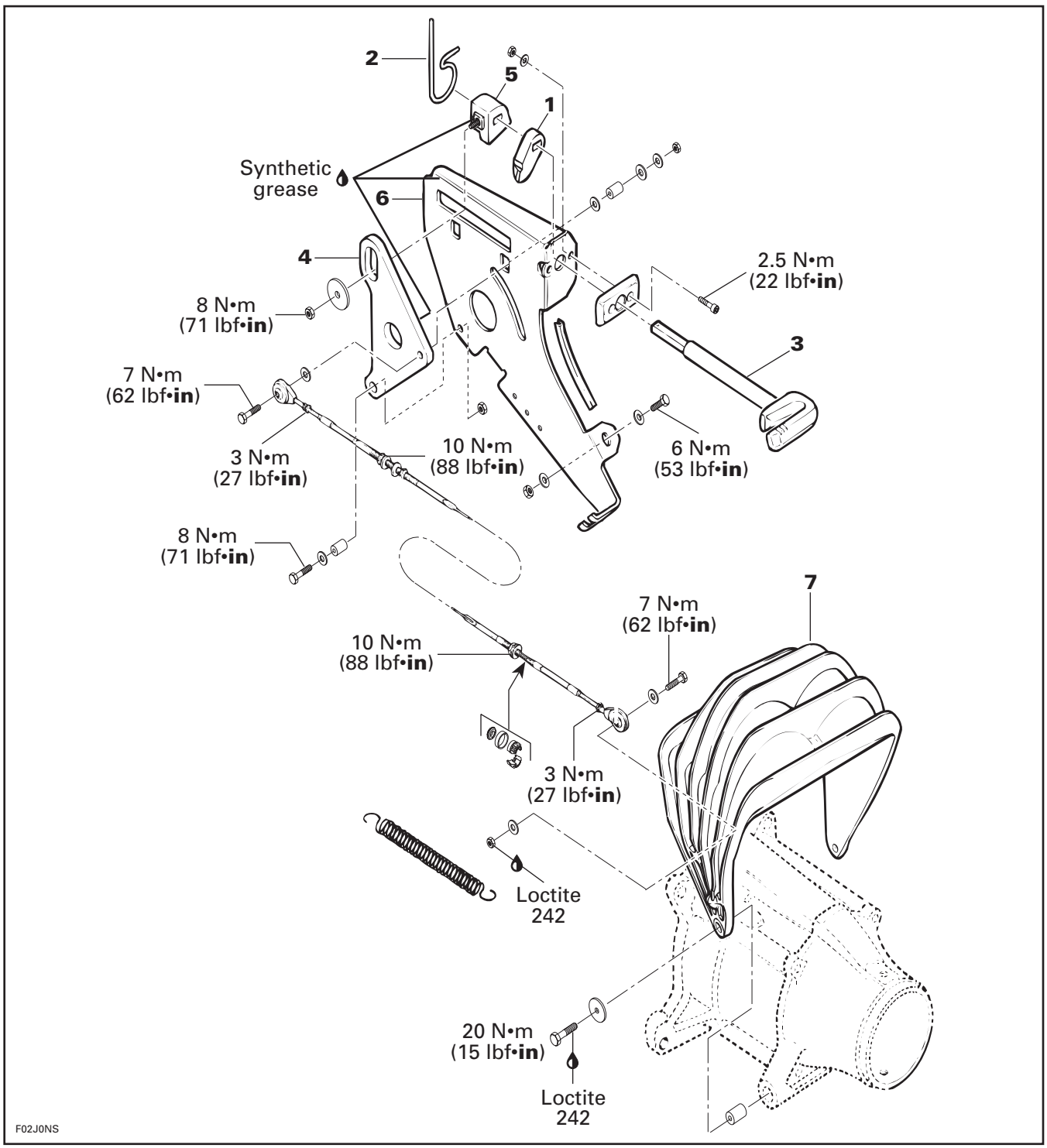
Using a grease gun, lubricate seal carrier of mid bearing with synthetic grease (P/N 293 550 010).



TYPICAL
1. Grease fitting

REVERSE SYSTEM

GTS Model



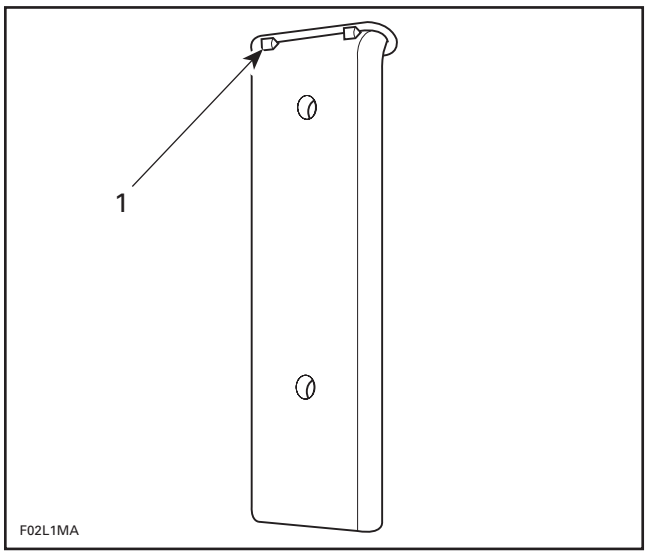
GENERAL

It is not necessary to remove reverse system from watercraft for servicing. However reverse system removal is necessary to replace reverse support.

DISASSEMBLY

Remove storage tray from watercraft.

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

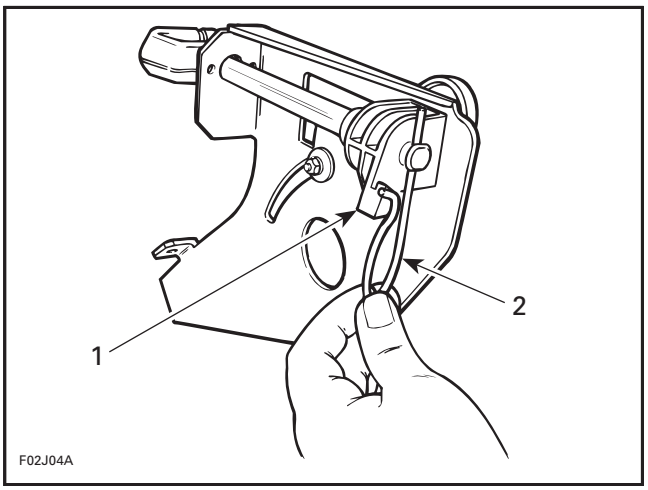


TYPICAL

1. Press on vent tube

3, Shift Lever

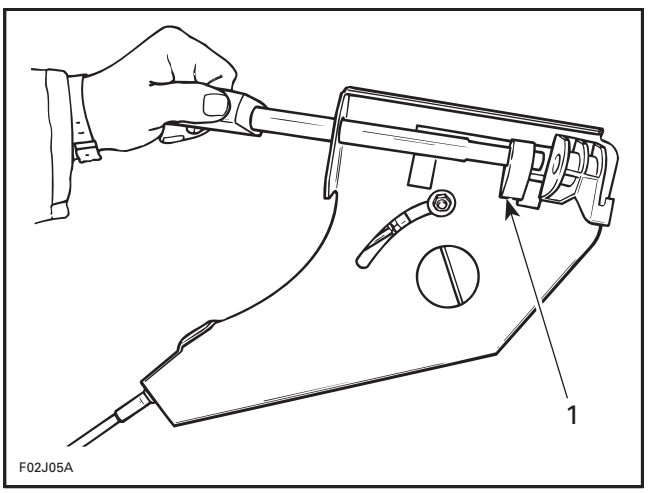
To remove shift lever, unhook spring **no. 2** from sliding block **no. 5** and pull spring from shift lever stem.



TYPICAL

1. Sliding block
2. Spring

Withdraw shift lever stem and locking lever **no. 1** from sliding block **no. 5**, then slide off locking lever from stem.



TYPICAL

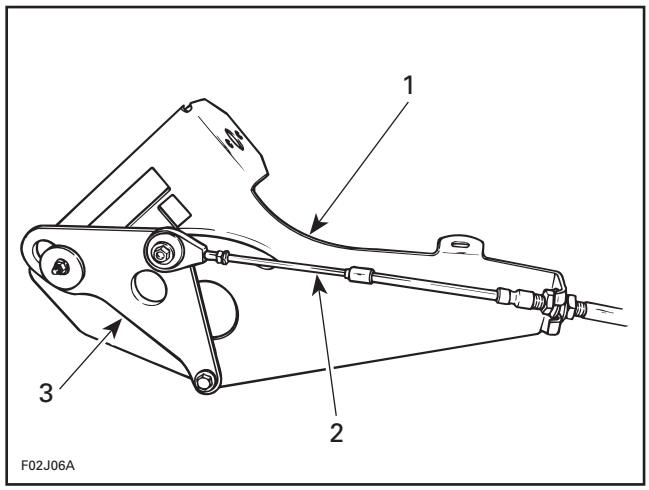
1. Locking lever

4,5, Triangular Lever and Sliding Block

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

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

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



TYPICAL

1. *Reverse support*
2. *Reverse cable*
3. *Triangular lever*

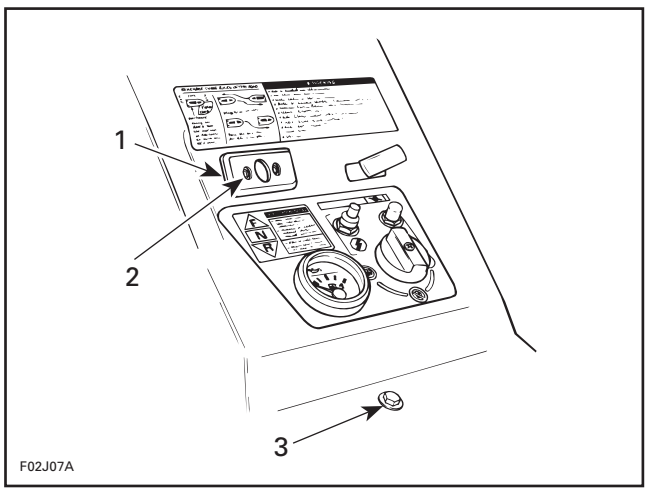
6, Reverse Support

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 lower part of support.

Remove reverse cable from support.

Remove 2 Allen screws, lock nut and washer holding guide plate and support.

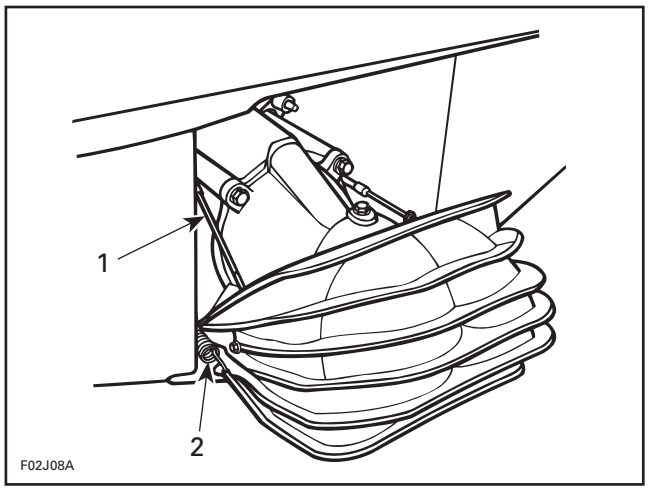


TYPICAL

1. *Guide plate*
2. *Allen screw*
3. *Screw and washer*

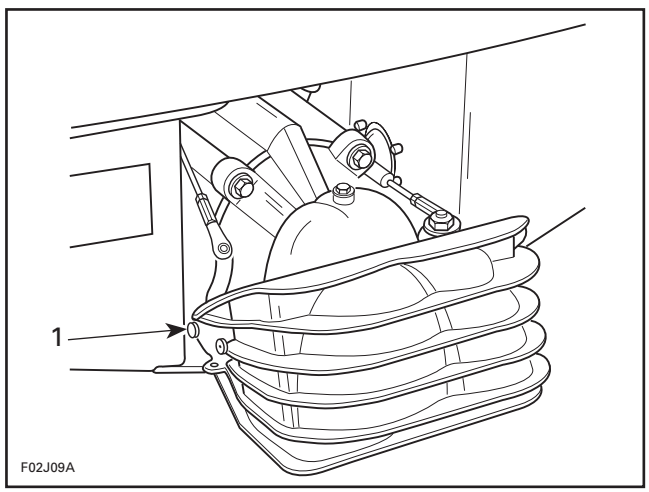
7, Reverse Gate

Unhook reverse gate springs and remove ball joint fasteners to release reverse cable from reverse gate.



1. *Reverse cable*
2. *Reverse gate spring (each side)*

Unscrew reverse gate retaining screws from venturi, then remove gate.



1. *Screw (each side)*

ASSEMBLY

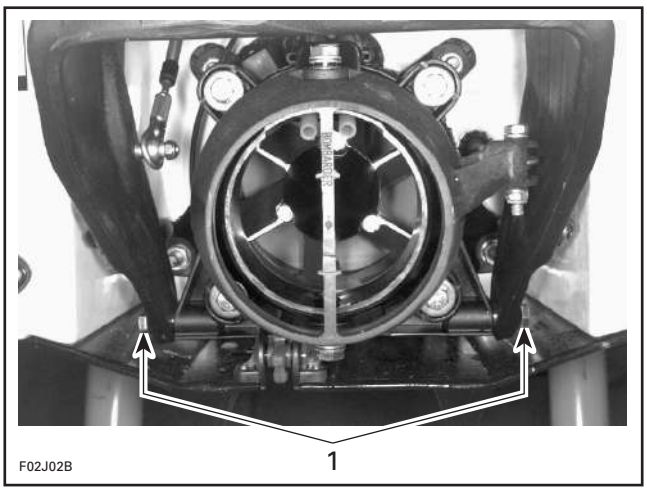
Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

7, 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.



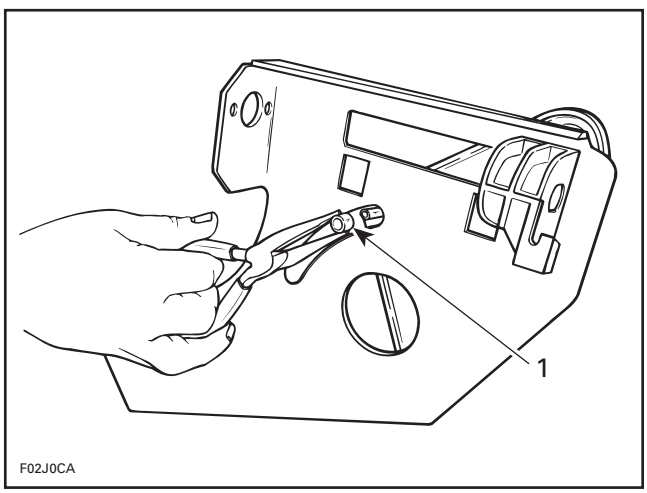
1. Screws, washers and sleeves

6, Reverse Support

For reverse support installation, torque screw to 8 N•m (71 lbf•**in**) and Allen screws to 2 N•m (18 lbf•**in**).

4,5, Triangular Lever and Sliding Block

Insert bushing in triangular lever and then install lever to reverse support.



TYPICAL
1. Bushing

Install reverse cable to triangular lever with bushing, plastic washer(s) and flat washers.

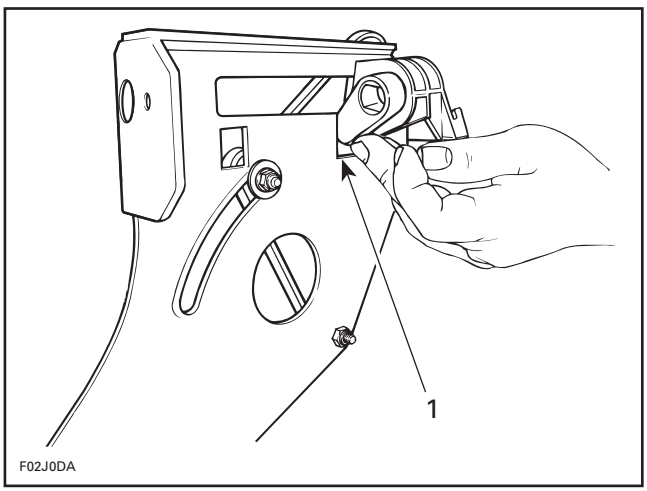
Torque cable screw to 7 N•m (62 lbf•**in**).

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**).

1,5, Locking Lever and Sliding Block

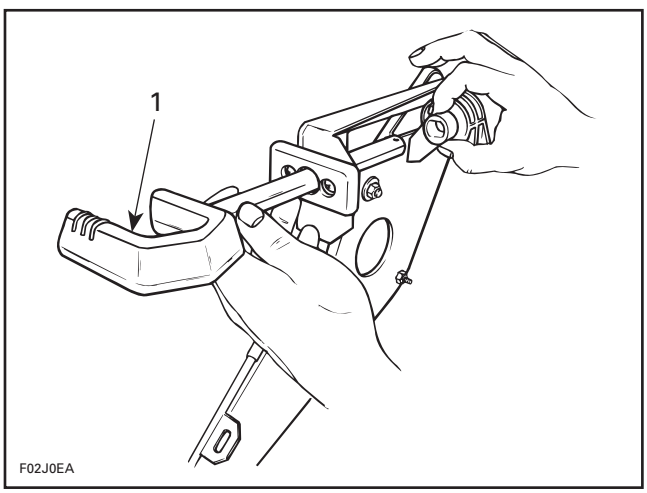
Insert locking lever end in support hole then align lever and sliding block holes.



TYPICAL
1. Support hole

3, Shift Lever

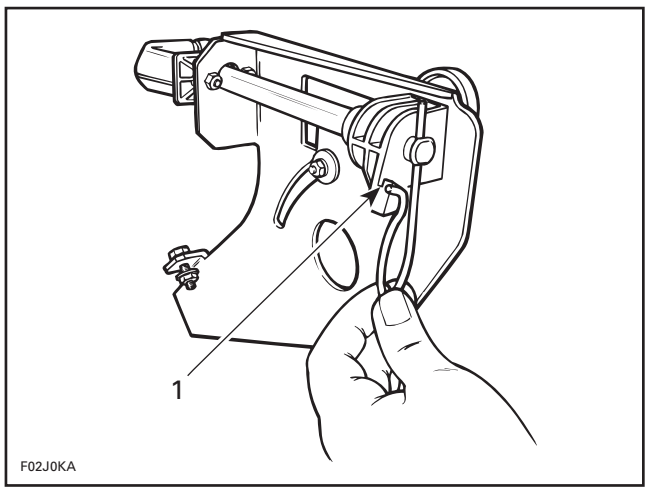
NOTE: Always install shift lever with its open end facing left side of watercraft, then push shift lever stem through locking lever **no. 1** and sliding block **no. 5** holes.



TYPICAL
1. Install shift lever as shown

2, Spring

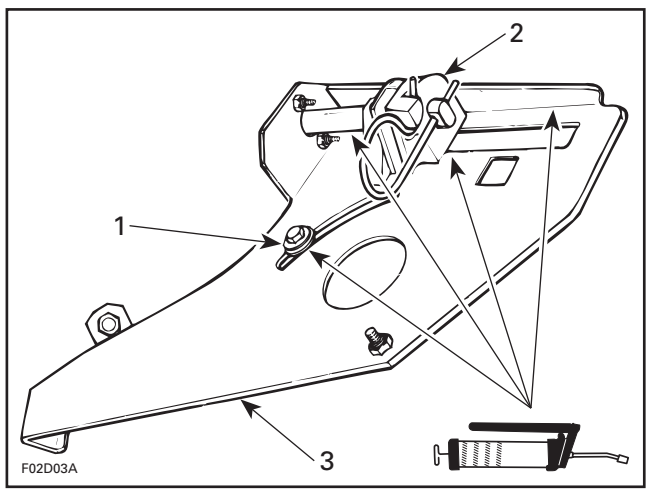
Insert spring in lever stem hole and then install curved end in sliding block groove.



TYPICAL
1. Sliding block groove

Shift Lever Lubrication

Lubricate sliding block support sliding area and triangular lever with synthetic grease. Also, lubricate sliding washer and shift lever stem.



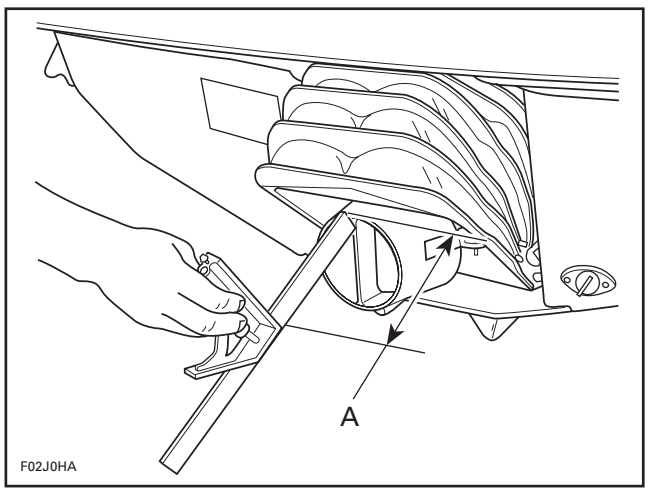
TYPICAL
1. Sliding washer
2. Sliding block
3. Support plate

ADJUSTMENT

7, Reverse Gate

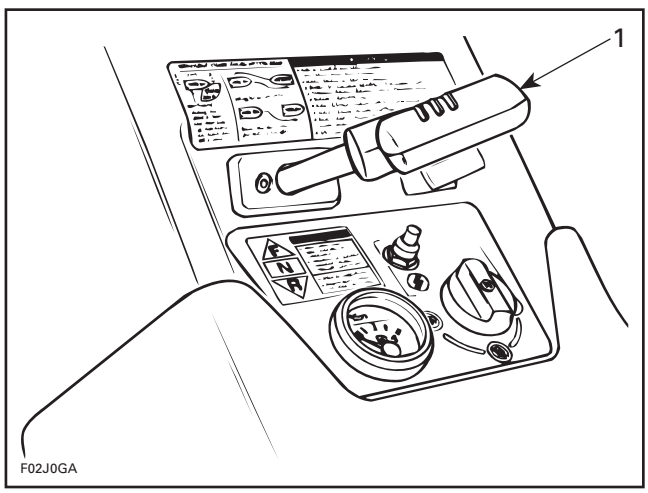
Position handlebar in a straight ahead position, nozzle should be parallel to rear of watercraft.

Using a square, set it to 129 ± 3 mm (5-5/64 ± 7/64 in), then position square end at the top middle of nozzle.



A. 129 ± 3 mm (5-5/64 ± 7/64 in)

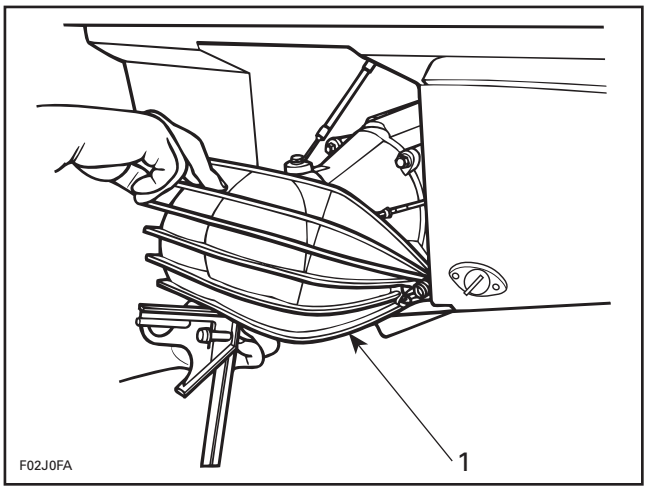
Pull shift lever in REVERSE position.



TYPICAL
1. Shift lever in REVERSE position

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

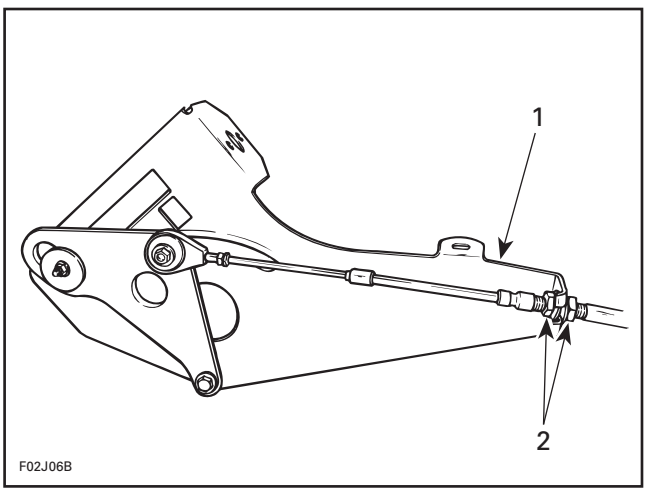
NOTE: Push slightly on the gate in order to recover spring tension and to obtain proper position of the gate.



1. REVERSE position

If reverse gate needs to be readjusted, it can be done at support with adjustment nuts. Turn cable nuts to obtain position.

NOTE: If reverse gate adjustment is not done adequately, performance and steering control will be reduced at reverse position.



TYPICAL

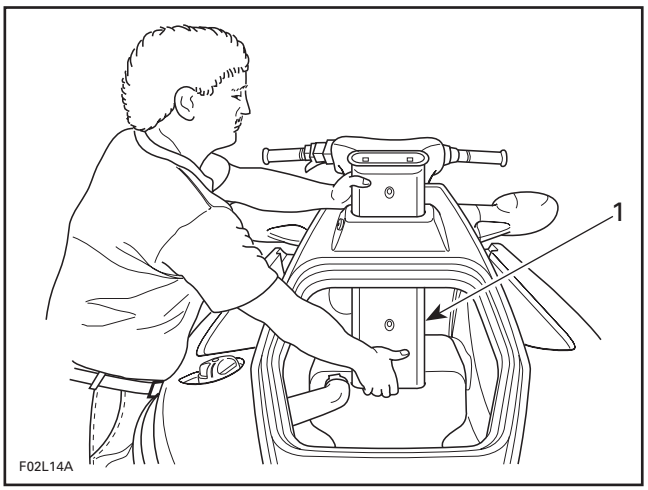
1. Support
2. Adjustment nuts

Tighten adjustment nuts and recheck gate position.

Reinstall vent tube.

◆ WARNING

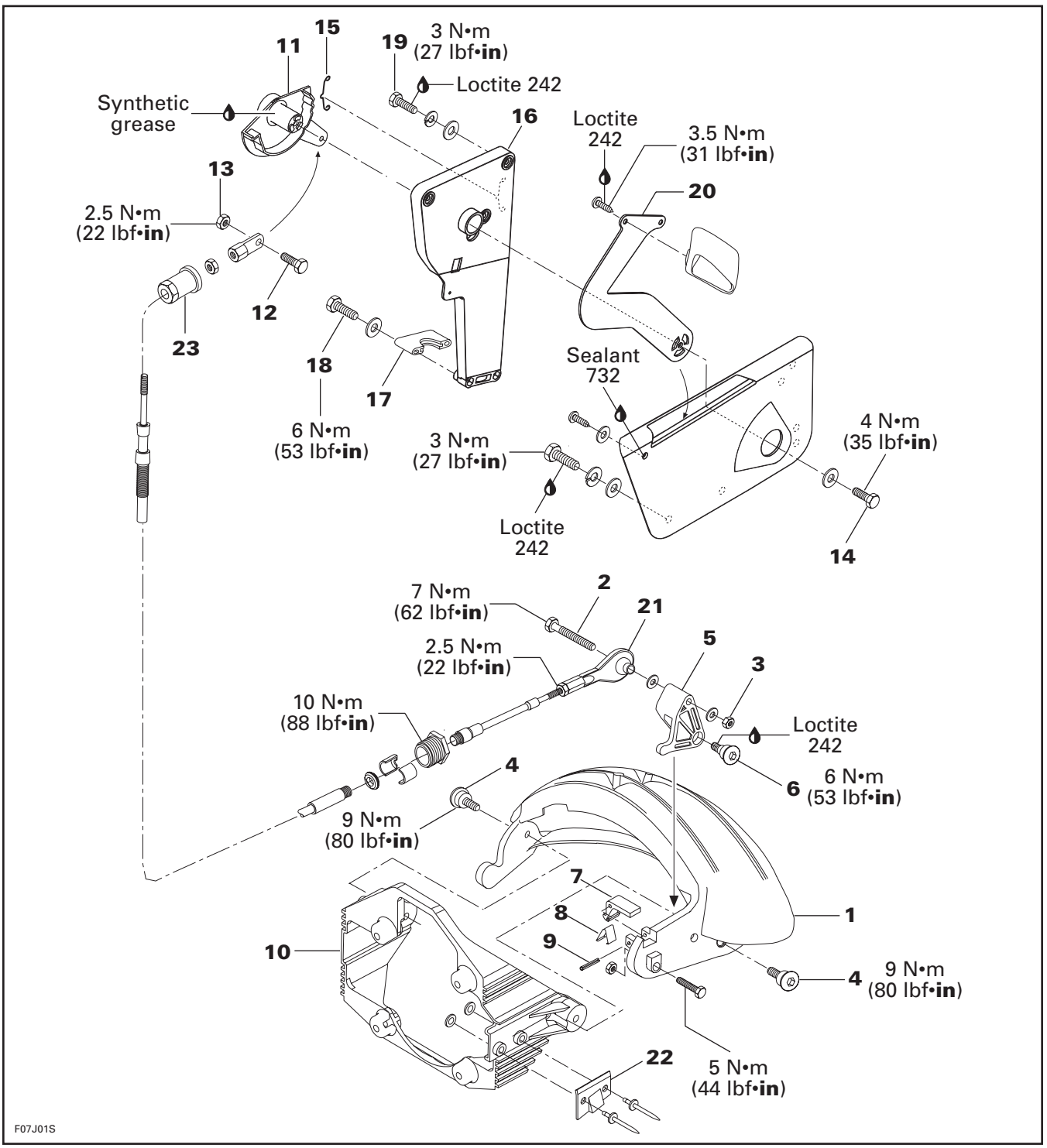
Vent tube must be in place to provide proper bilge ventilation.



1. Install vent tube

Reinstall storage tray.

GTI and GTX Limited



DISASSEMBLY

1, Reverse Gate

Put shift lever in reverse position.

Disconnect reverse cable by loosing bolt **no. 2** and lock nut **no. 3** from cable lever.

Loosen 2 Allen screws **no. 4** and remove reverse gate.

5, Cable Lever

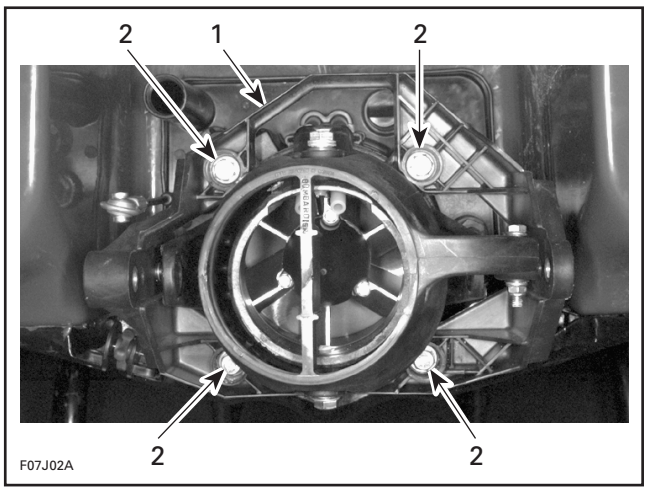
Loosen Allen screw **no. 6** and remove cable lever.

7,8, Pawl Lock and Spring

Remove roll pin **no. 9**.

10, Reverse Gate Support

Loosen 4 bolts which retains reverse gate support to venturi.

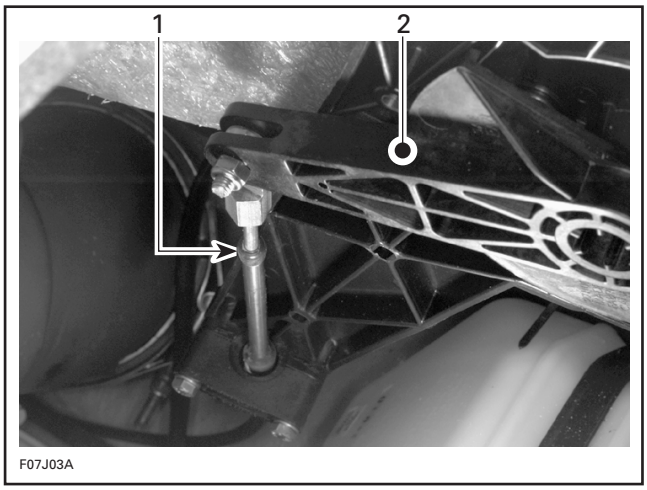


1. Support
2. Bolt

11, Interior Lever

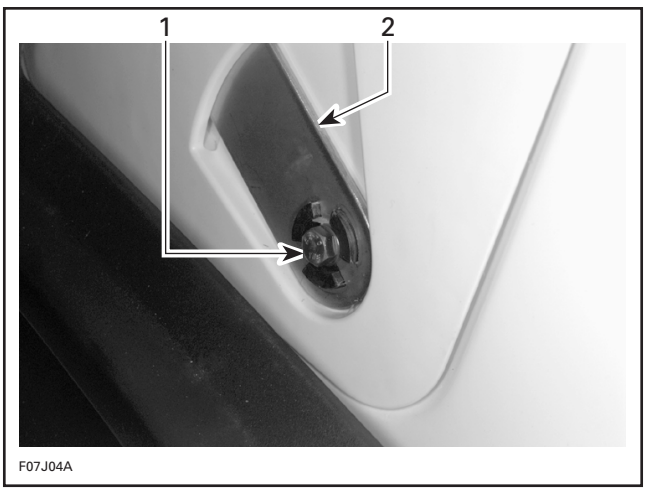
Remove glove box.

Disconnect reverse cable by loosing bolt **no. 12** and lock nut **no. 13**.



1. Reverse cable
2. Interior lever

Loosen bolt **no. 14** retaining the interior lever.



1. Bolt
2. Shift lever

Remove the interior lever and spring **no. 15**.

16, Reverse Cable Support

Remove retaining block **no. 17** of reverse cable support by loosing bolts **no. 18**.

Loosen 3 bolts **no. 19** retaining reverse cable support to body.

Remove reverse cable support.

INSPECTION

Visually inspect parts for wear or cracks. Replace parts as required.

ASSEMBLY

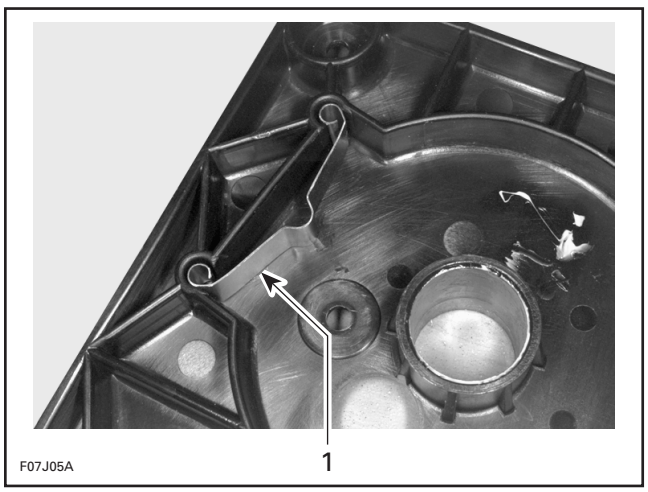
Assembly is essentially the reverse of disassembly procedures. However, pay particular attention to the following.

▼ CAUTION

Apply all specified torques and service products as per main illustration.

15, Spring

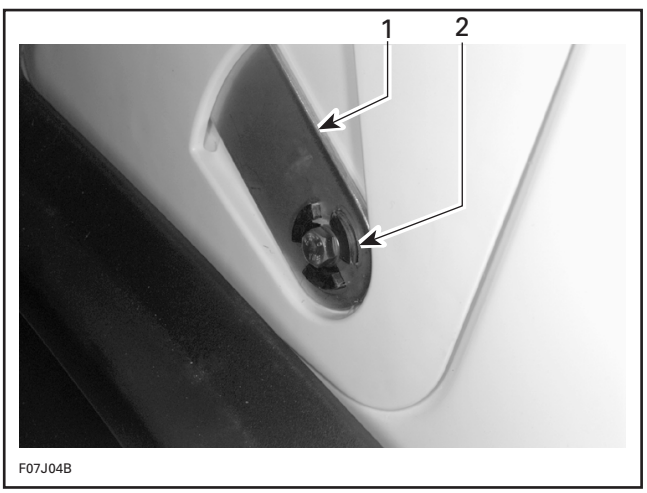
Make sure to properly installed spring in reverse cable support as per following illustration.



1. Spring

11,20, Interior Lever and Shift Lever

Install the interior lever in a rotating movement. Engage properly the interior lever tabs in the shift lever slots.

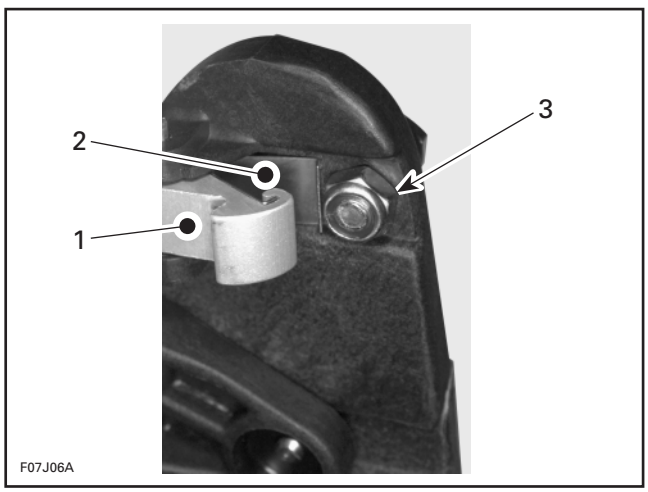


1. Shift lever
2. Interior lever tabs

Make sure the shift lever action is smooth and precise. Forward, neutral and reverse positions should be easy to select with a detent position between each.

8, Spring

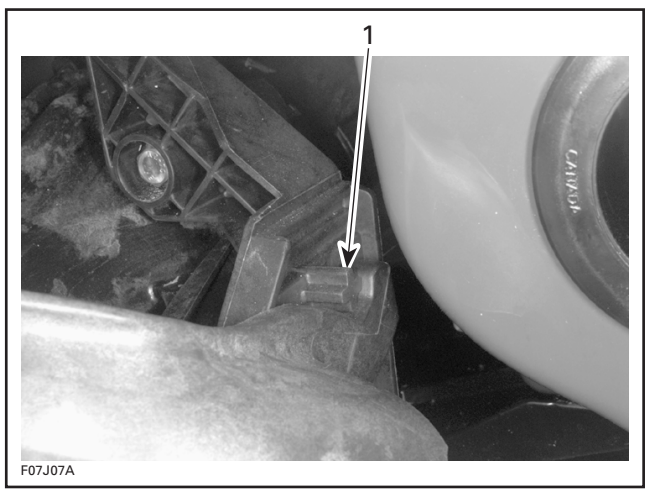
Make sure spring is properly installed. One end of the spring is hooked in the pawl lock and the other end is retained by the stopper lock nut.



1. Pawl lock
2. Spring
3. Stopper lock nut

1, Reverse Gate

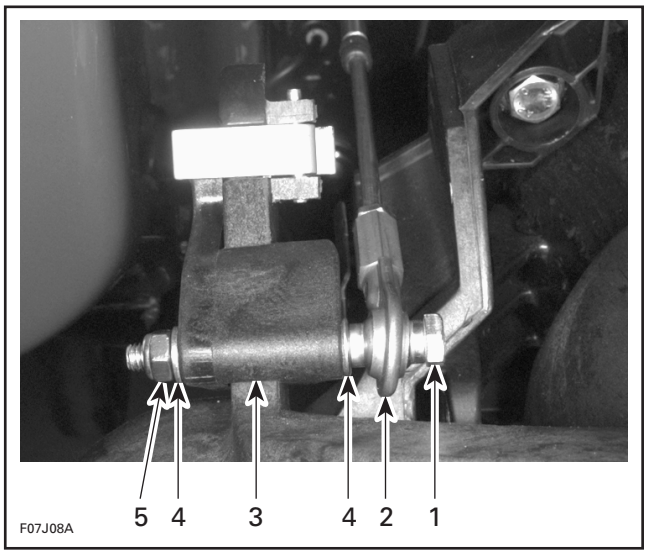
When installing the reverse gate, pay attention to position its lever behind the reverse gate support stopper.



1. Stopper

21, Reverse Cable

Install reverse cable to cable lever as per following illustration.



1. *Bolt*
2. *Ball joint*
3. *Cable lever*
4. *Flat washer*
5. *Lock nut*

▼ CAUTION

Ensure cable ball joint is parallel to cable lever (90° ± 5°) to minimize tension on cable. Adjust as required.

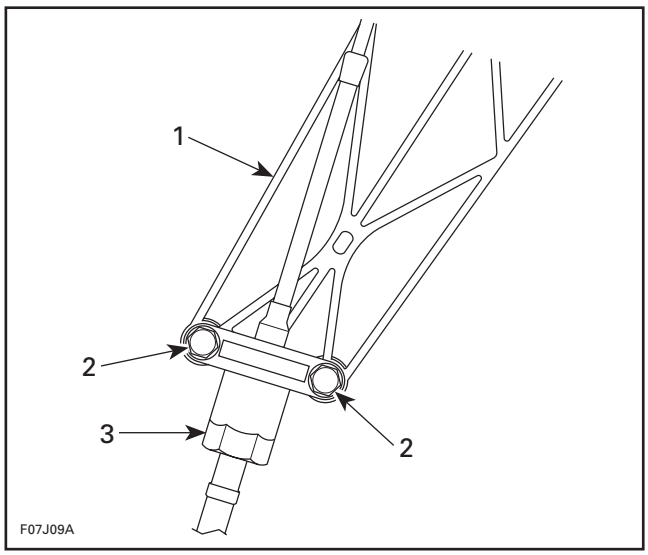
ADJUSTMENT

Put shift lever in forward position.

Pull shift lever approximately 50 mm (2 in) and push it back slowly in forward position.

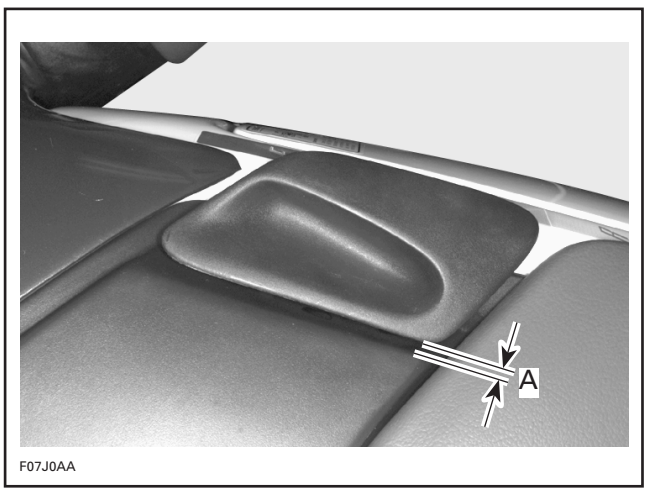
The pawl lock **no. 7** should be engaged in the anchor **no. 22**.

If not, adjust reverse cable. Loosen 2 bolts **no. 18** at reverse cable support **no. 16**. Turn adjustment nut **no. 23** as required.



1. *Reverse cable support*
2. *Loosen bolts*
3. *Adjustment nut*

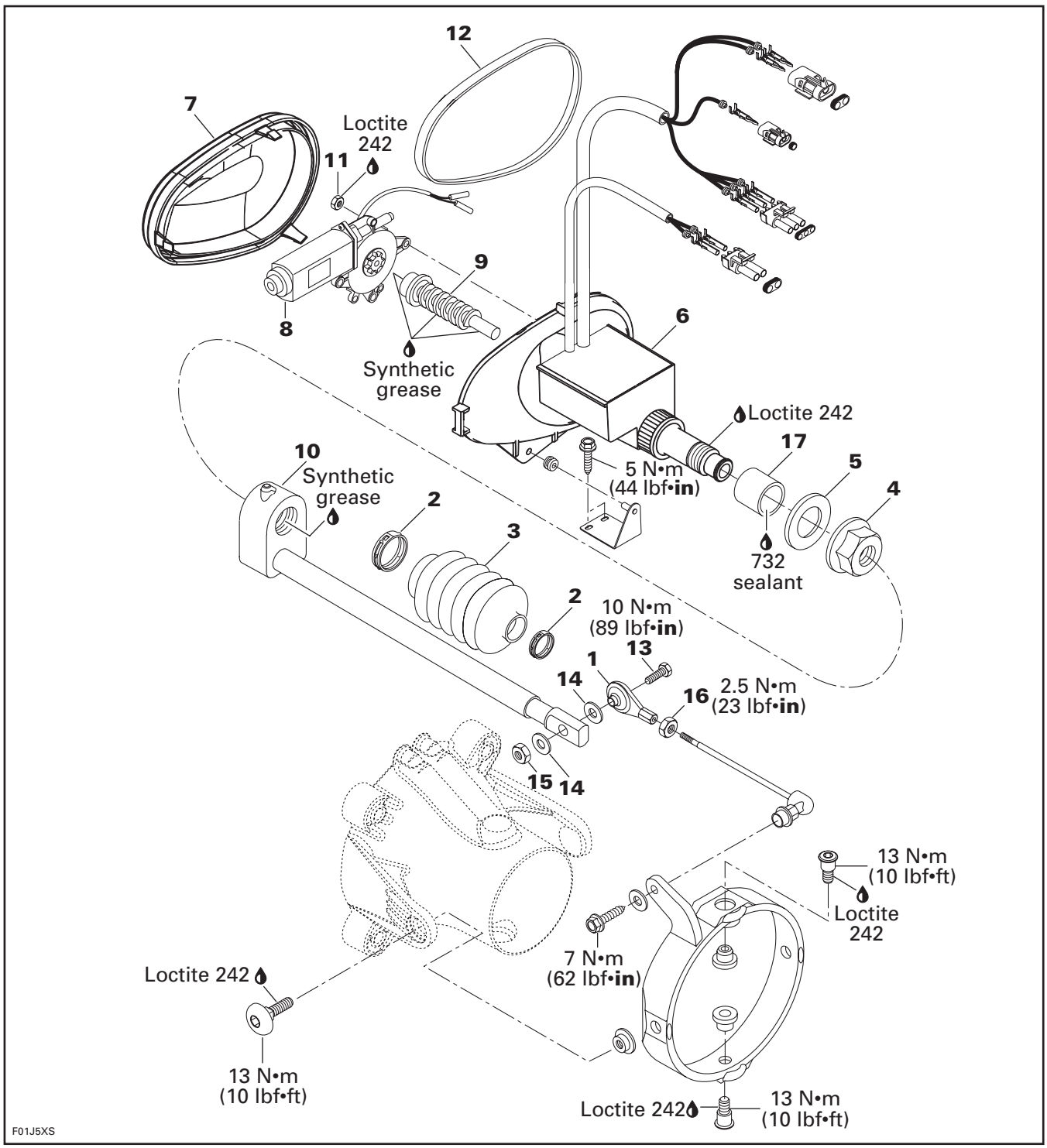
When adjustment is completed, there should be gap of 2 to 3 mm (5/64 to 7/64 in) between handle and left cover.



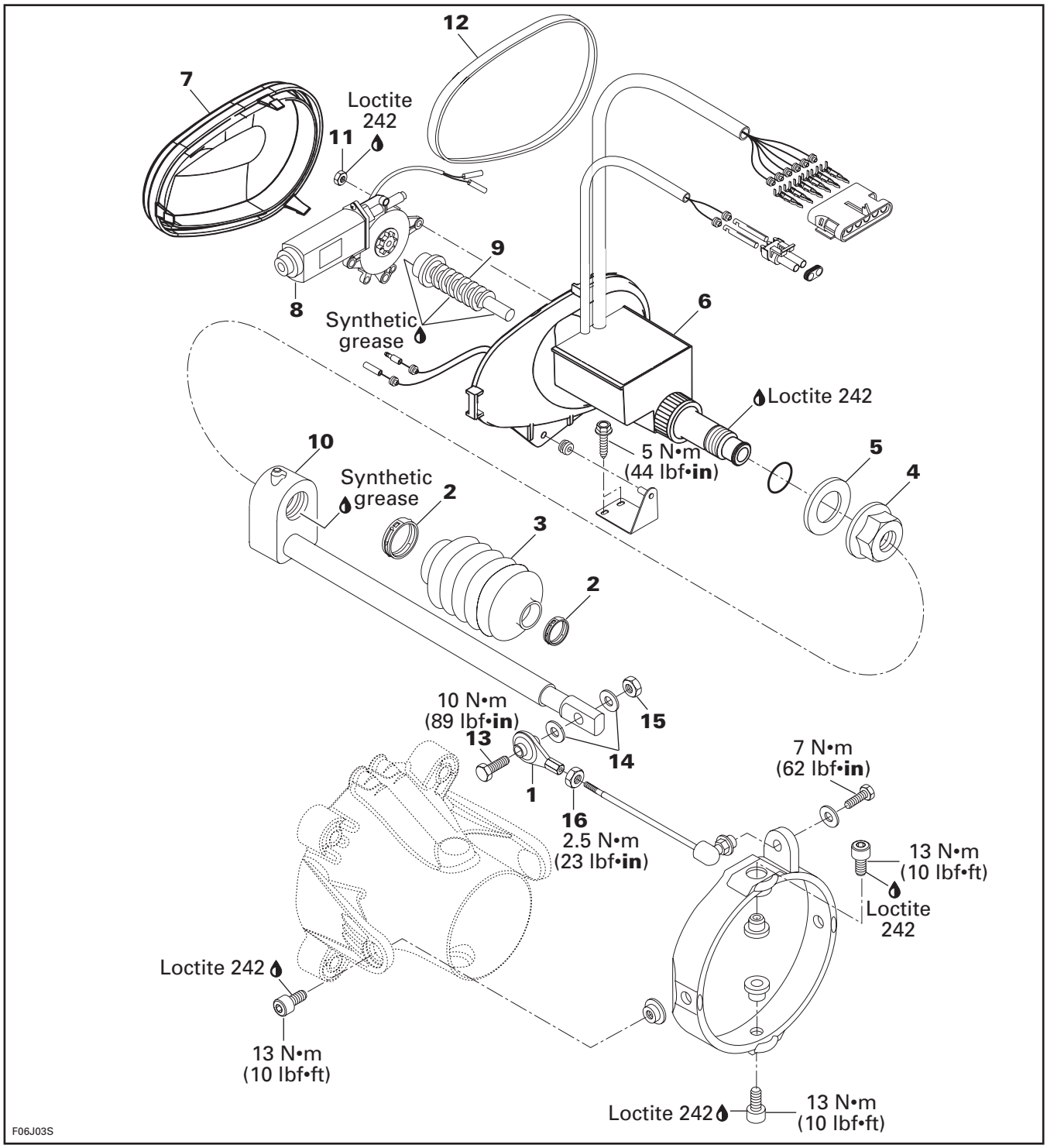
A. 2 to 3 mm (5/64 to 7/64 in)

VARIABLE TRIM SYSTEM

SPX Model



GSX Limited and XP Limited



GENERAL

To test VTS control module, motor or switch, refer to INSTRUMENTS AND ACCESSORIES 08-05.

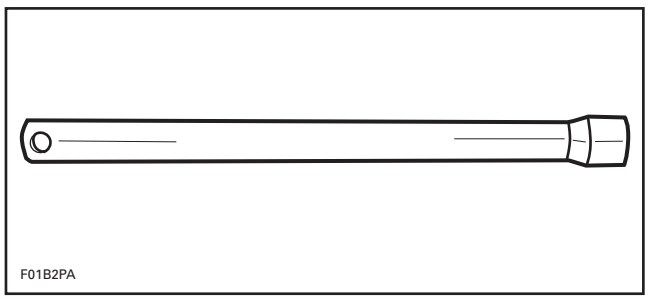
REMOVAL

Disconnect ball joint **no. 1**.

Remove clamps **no. 2**.

Remove boot **no. 3**.

To loosen nut **no. 4**, use VTS socket tool (P/N 295 000 133).



Remove sealing washer **no. 5**.

SPX Model

Remove the spacer **no. 17**.

All Models

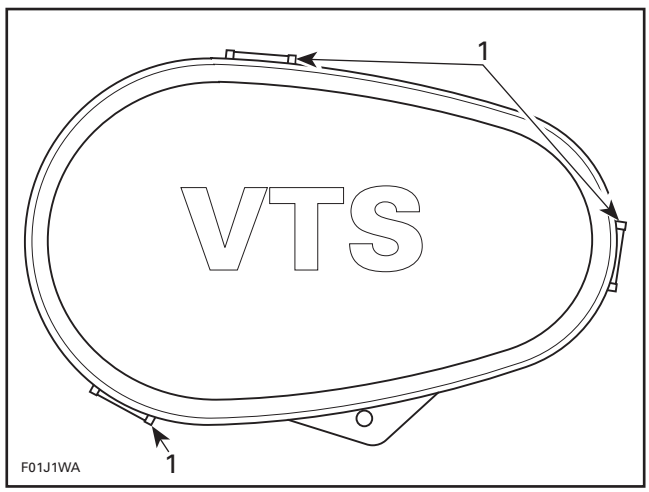
Disconnect wiring harnesses.

Pull out VTS assembly **no. 6** from bilge.

DISASSEMBLY

7, Cover

Remove VTS cover by pressing on tabs.

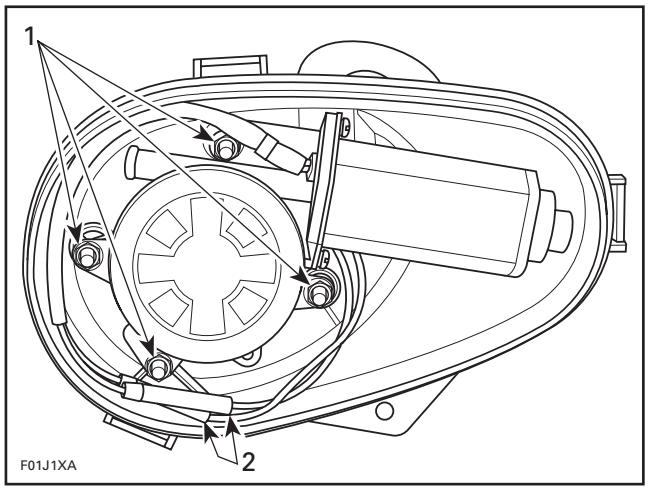


1. Press tabs to remove cover

8, Motor

Disconnect wires of motor.

Remove retaining nuts **no. 11**.



1. Remove nuts
2. Disconnect wires

Pull on motor to remove it.

9,10, Worm and Sliding Shaft

Simply pull on worm and sliding shaft in order to remove them.

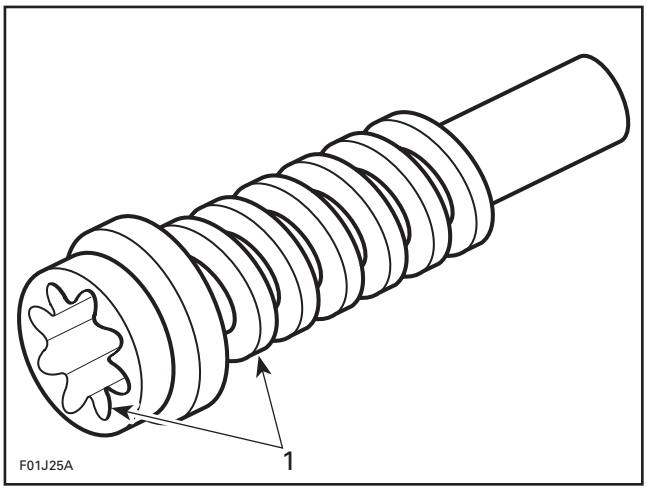
INSPECTION

3, Boot

Make sure boot is in good condition. If it is cracked or teared, replace boot.

9, Worm

Inspect threads and splines of worm for wear. If worm replacement is necessary, renew also sliding shaft.



1. Inspect threads and splines

ASSEMBLY

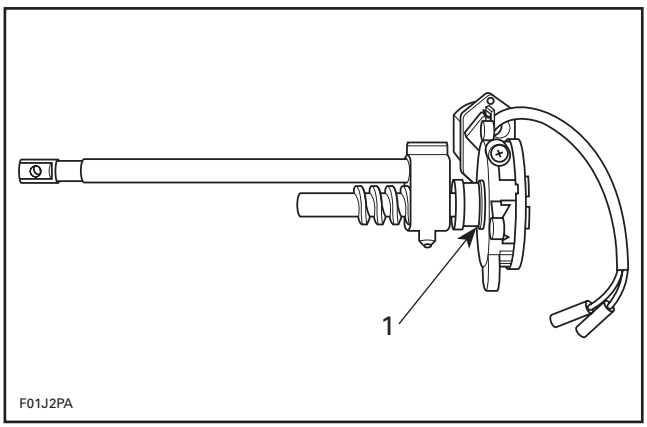
Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

8,9,10, Motor, Worm and Sliding Shaft

Apply synthetic grease to worm.

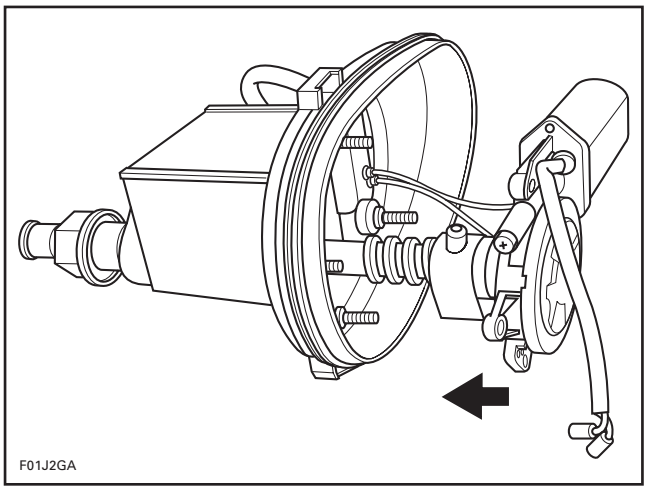
Screw worm to sliding shaft.

Mesh worm splines to gear of motor.



1. Mesh worm spline to gear of motor

Install motor, worm and sliding shaft in VTS housing.



Apply Loctite 242 (blue) to nuts **no. 11** and tighten to 7 N•m (62 lbf•**in**).

Connect wires of motor.

▼ CAUTION

Make sure wire color codes match.

Install cover **no. 7**.

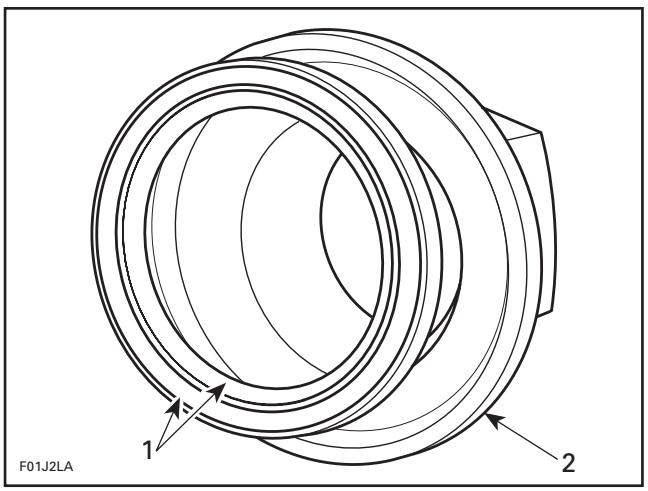
NOTE: Make sure seal **no. 12** is in place.

INSTALLATION

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

4,5, Nut and Sealing Washer

Place sealing washer on nut. Make sure seal lips are facing toward hull.



1. Seal lips facing hull
2. Nut

Apply Primer N to threads of VTS housing and Loctite 242 (blue) to nut **no. 4**.

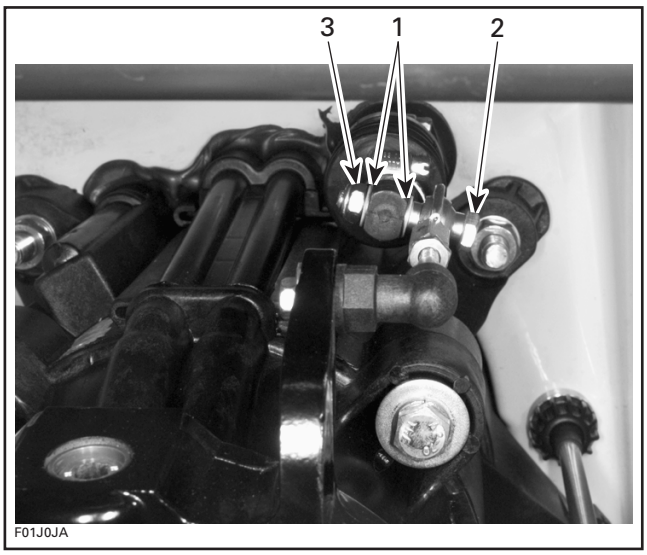
Install nut with sealing washer and torque to 6 N•m (53 lbf•**in**) using the VTS socket tool.

1, Ball Joint

SPX Model

Install ball joint on RIGHT side of sliding shaft **no. 10** using bolt **no. 13**, washers **no. 14** and nut **no. 15**. Torque nut to 10 N•m (88 lbf•**in**).

NOTE: Install boot on sliding shaft before securing ball joint.

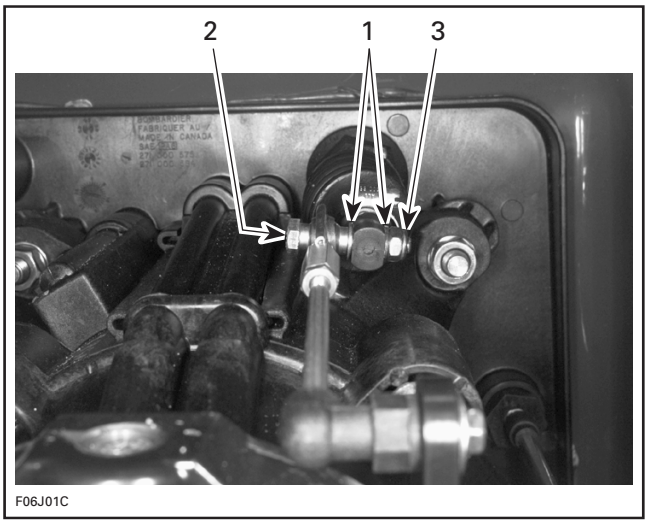


1. Washers
2. Bolt
3. Nut

GSX Limited and XP Limited

Install ball joint on LEFT side of sliding shaft **no. 10** using bolt **no. 13**, washers **no. 14** and nut **no. 15**. Torque nut to 10 N•m (88 lbf•**in**).

NOTE: Install boot on sliding shaft before securing ball joint.

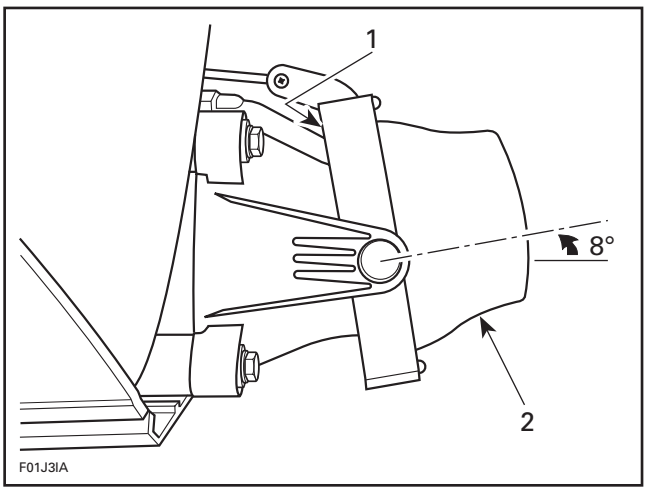


1. Washers
2. Bolt
3. Lock nut

ADJUSTMENT

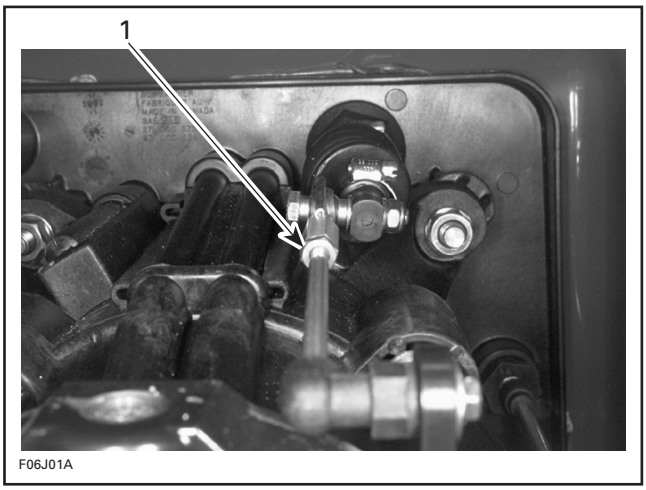
Push on VTS button up position until motor stops. When the nozzle is up (8°), nozzle edge must not interfere with venturi (there should be a gap of 1 mm (.039 in)).

NOTE: Activate timer to be able to position VTS.



1. No interference
2. Nozzle up

If an adjustment is necessary, loosen jam nut no. 16 of link rod ball joint no. 1. Turn adjustment nut of ball joint to obtain the desired gap between trim ring and venturi.



GSX LIMITED SHOWN

1. Turn adjustment nut of ball joint

Tighten jam nut of ball joint to 2.5 N•m (23 lbf•**in**) when adjustment is completed.

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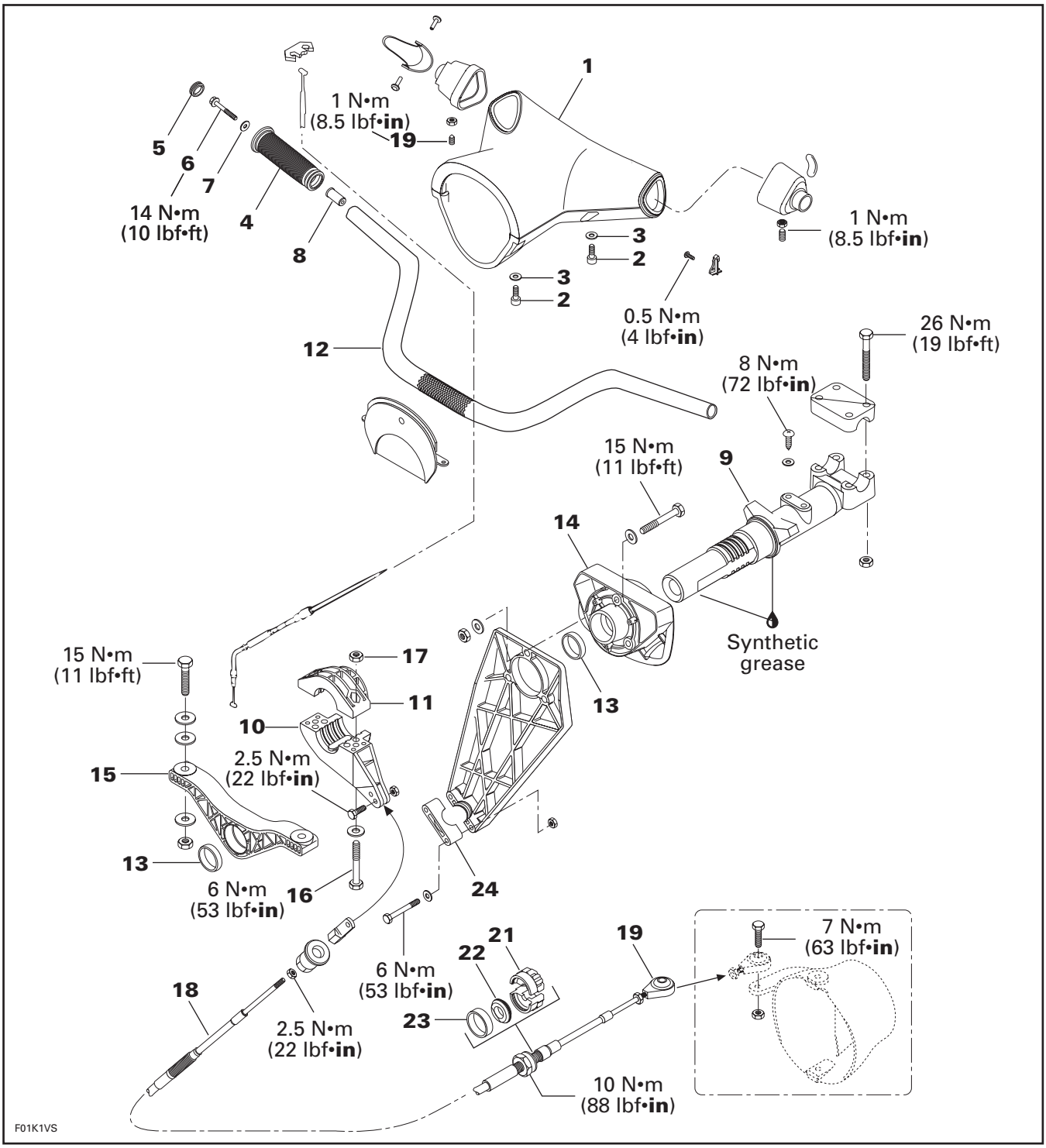
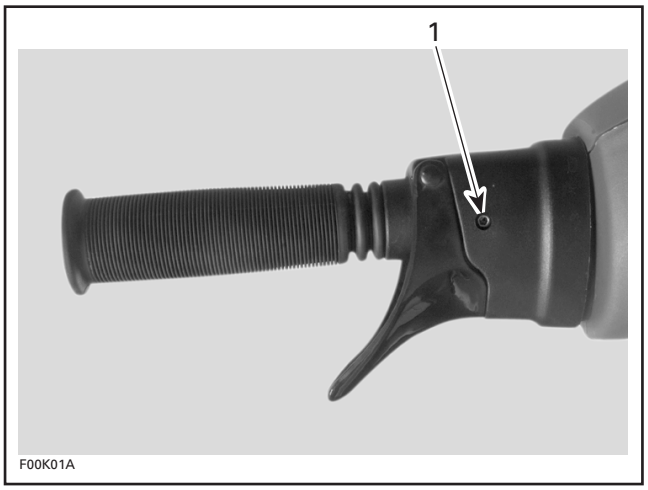
SPX MODEL


1
1 N•m
(8.5 lbf•in)
19
5
6
7
14 N•m
(10 lbf•ft)
4
8
3
2
3
2
1 N•m
(8.5 lbf•in)
0.5 N•m
(4 lbf•in)
12
26 N•m
(19 lbf•ft)
8 N•m
(72 lbf•in)
15 N•m
(11 lbf•ft)
9
14
Synthetic
grease
13
15 N•m
(11 lbf•ft)
17
11
10
2.5 N•m
(22 lbf•in)
15
13
6 N•m
(53 lbf•in)
16
24
6 N•m
(53 lbf•in)
21
22
23
19
7 N•m
(63 lbf•in)
18
2.5 N•m
(22 lbf•in)
10 N•m
(88 lbf•in)
F01K1VS

REMOVAL AND INSTALLATION

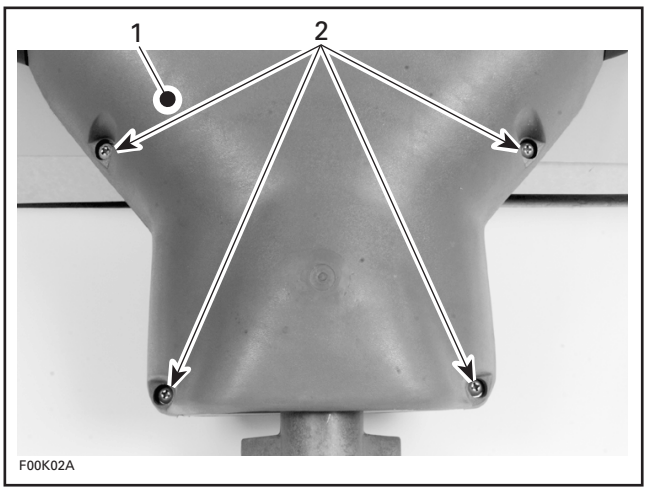
1, Cover

To replace the cover, loosen set screws **no. 19** of handlebar housing.



1. Set screw

Remove and reinstall 4 screws **no. 2** and washers **no. 3**.



1. Cover
2. Screws

4,8, Grip and Grip Insert

To remove grip, just pull out cap **no. 5** from grip end and remove screw **no. 6** and washer **no. 7**.

Pull out grip.

To verify grip insert for damage, remove it from handlebar.

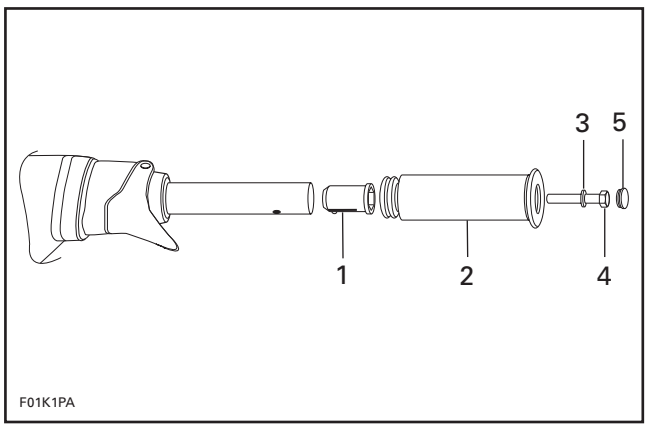
When installing the grip insert in the handlebar **no. 12**, ensure that its notch is properly inserted in the hole beneath the handlebar.

Install grip **no. 4** on handlebar **no. 12** matching it to the hex form on the grip insert.

Install flat washer **no. 7** and screw **no. 6**.

Torque screw to 13 N•m (10 lbf•ft).

Install cap **no. 5**.



1. Grip insert
2. Grip
3. Flat washer
4. Screw. Torque to 13 N•m (10 lbf•ft)
5. Cap

▼ CAUTION

Ensure to install flat washer otherwise screw will damage grip end.

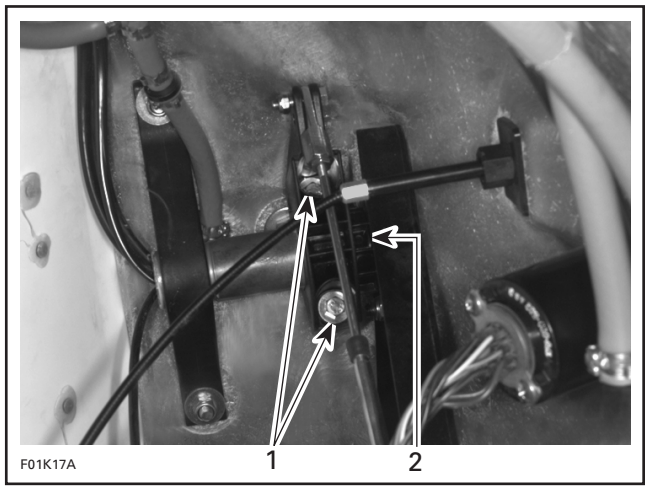
9,12, Steering Stem and Handlebar

Disconnect wiring harnesses leading out of steering stem **no. 9**.

Disconnect throttle cable at carburetor.

Remove throttle cable from tie-blocks.

Unscrew bolts **no. 16** retaining support **no. 11** to steering stem arm **no. 10**.



1. *Bolts*
2. *Steering stem arm*

Remove support **no. 11** and steering stem arm **no. 10** from steering stem.

NOTE: It is not necessary to remove steering cable from steering stem arm.

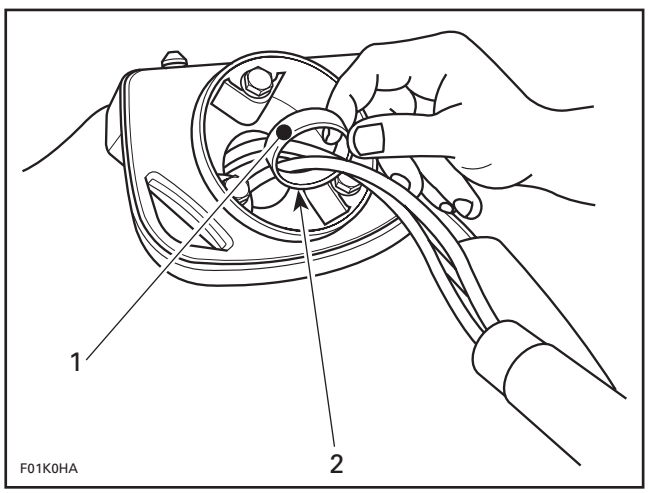
Pull out handlebar assembly.

▼ CAUTION

While performing this procedure, take precautions to avoid damaging throttle cable and wiring harnesses.

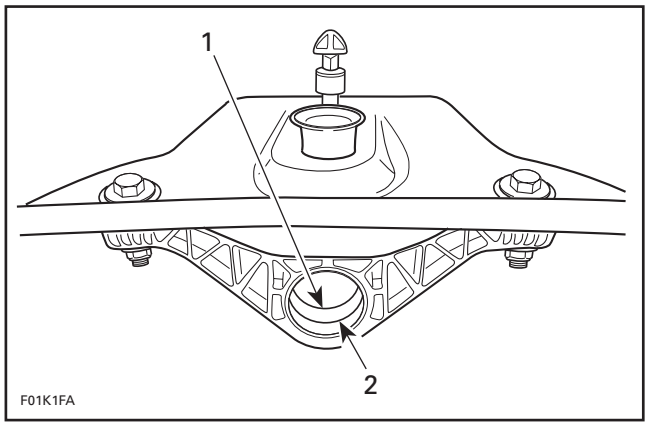
Installation is essentially the reverse of removal procedures. However, pay particular attention to the following.

Lubricate with synthetic grease thrust ring **no. 13** of rear support **no. 14** and front support **no. 15**.



REAR SUPPORT

1. *Apply synthetic grease*
2. *Thrust ring shown removed for more clarity*



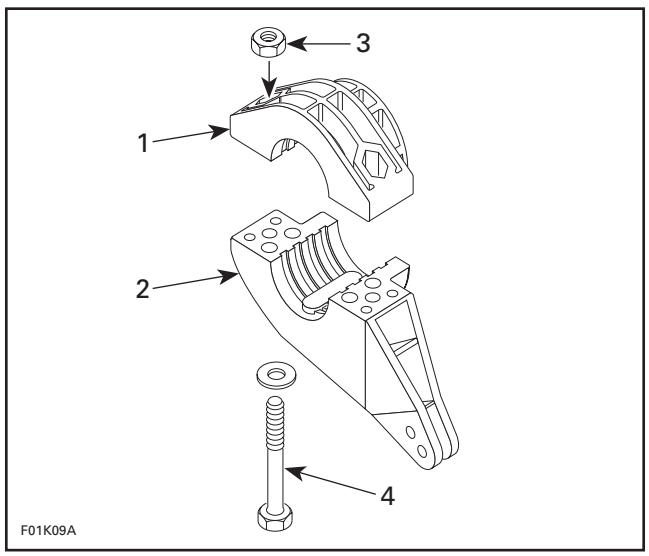
FRONT SUPPORT

1. *Apply synthetic grease*
2. *Thrust ring*

NOTE: Make sure thrust rings are properly installed.

Install support **no. 11** to steering stem arm **no. 10**.

NOTE: Insert lock nuts **no. 17** in support **no. 11**. Screw only a few threads of the bolts **no. 16**.



TYPICAL

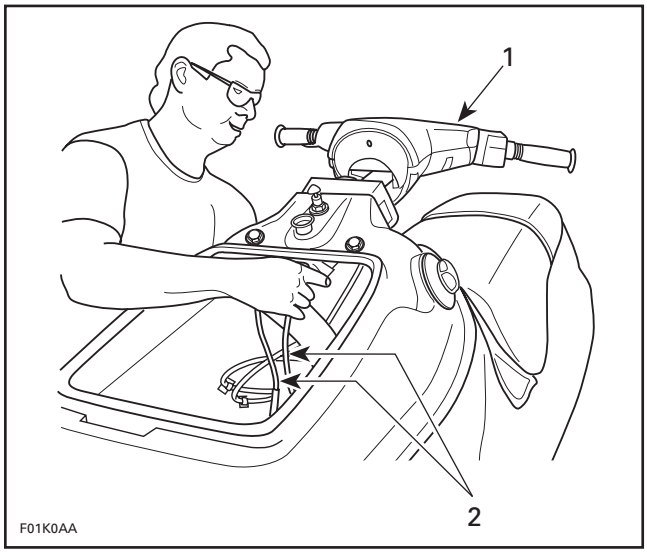
1. *Support*
2. *Steering stem arm*
3. *Insert lock nuts*
4. *Screw only a few threads of the bolts*

Install handlebar assembly into rear support **no. 14**, taking care at the same time to insert throttle cable and wiring harnesses.

From bilge, route throttle cable and wiring harnesses into support **no. 11** and steering stem arm **no. 10**, and finally in front steering support **no. 15**.

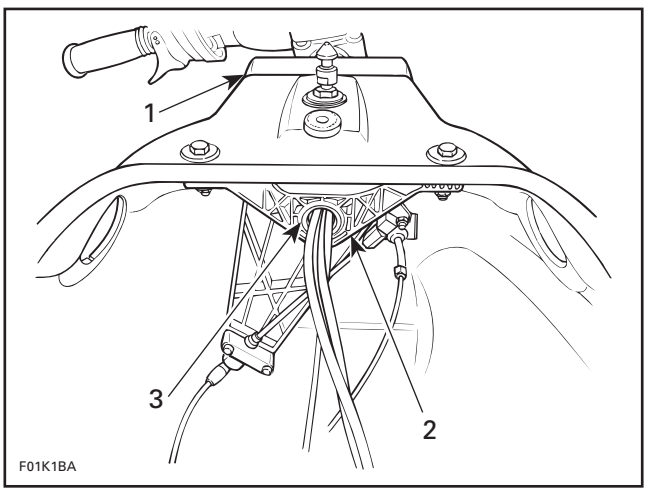
▼ CAUTION

While performing this procedure, take precautions to avoid damaging throttle cable and wiring harnesses.



1. Install handlebar assembly
2. Route throttle cable and wiring harnesses at the same time

Push handlebar assembly until steering stem **no. 9** is well seated into steering supports **no. 14** and **no. 15**.



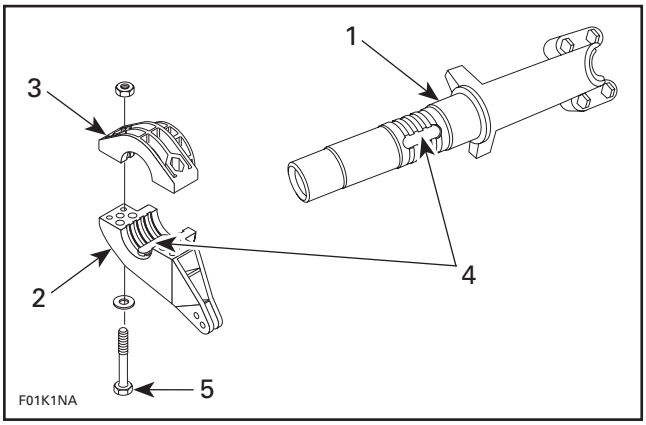
1. Rear support (steering collar)
2. Front support
3. Steering stem

Position steering stem arm **no. 10** and support **no. 11** onto steering stem.

◆ WARNING

Make sure integrated flat key of steering stem arm is properly seated in steering stem keyway. Steering stem arm must be locked in place before torquing the bolts.

Torque bolts of steering stem arm **no. 10** to 6 N•m (53 lbf•**in**).



1. Steering stem
2. Steering stem arm
3. Support
*4. Torque to 6 N•m (53 lbf•**in**)*
5. Integrated flat key must be seated in keyway and steering stem arm locked in place

NOTE: Once steering stem arm is properly tightened, look between body and front support to make sure there is no gap between steering stem arm and its support. If there is a gap, components are not properly installed.

Connect wiring harnesses.

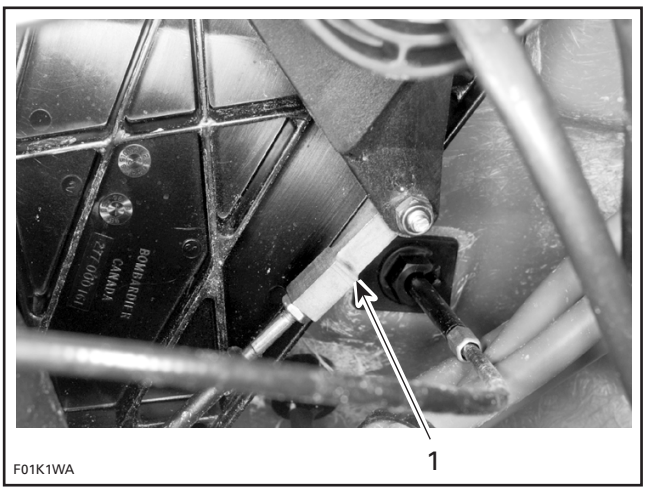
Route throttle cable alongside bilge. Insert cable barrel into carburetor throttle lever.

Insert throttle cable alongside choke cable in tie-blocks.

For throttle cable adjustment, refer to CARBURETOR 06-04.

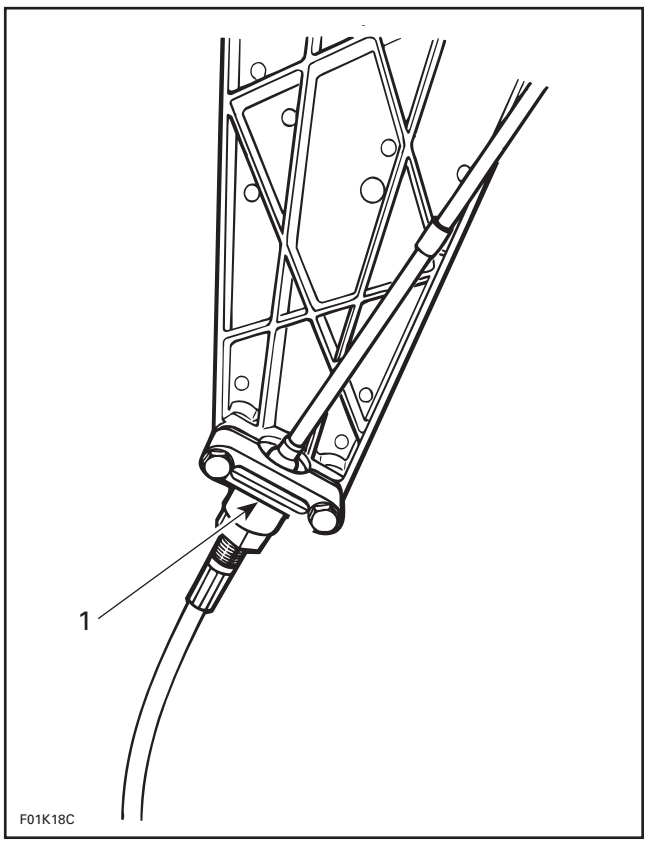
18, Steering Cable

Disconnect steering cable from steering stem arm **no. 10**.



1. Disconnect steering cable

Remove retaining block **no. 24** of cable support.



1. Remove retaining block

Disconnect ball joint **no. 19** of steering cable from jet pump nozzle.

Remove ball joint **no. 19**.

Remove battery. For procedure, refer to CHARGING SYSTEM 08-03.

Loosen nut **no. 20** of steering cable.

Pull cable from rear of watercraft and remove half rings **no. 21**, O-ring **no. 22** and retaining ring **no. 23**.

Remove steering cable.

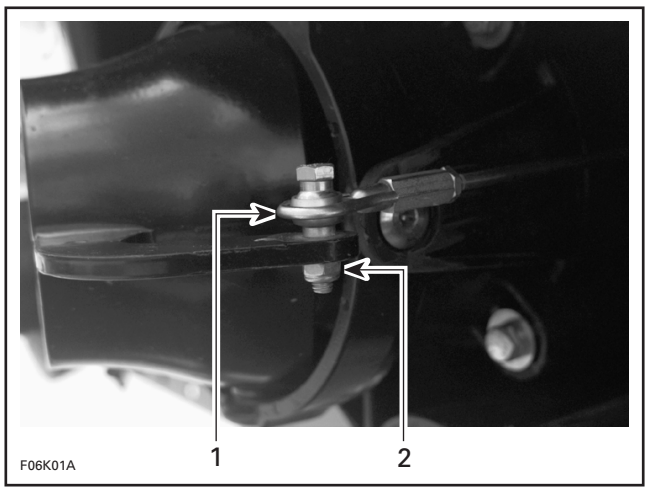
Installation is essentially the reverse of removal procedures. However, pay particular attention to the following.

Make sure to secure steering cable in bilge using tie raps.

Secure steering cable ball joint **no. 19** on top of steering arm.

▼ CAUTION

Ensure the ball joint is parallel (± 5°) to the nozzle arm.

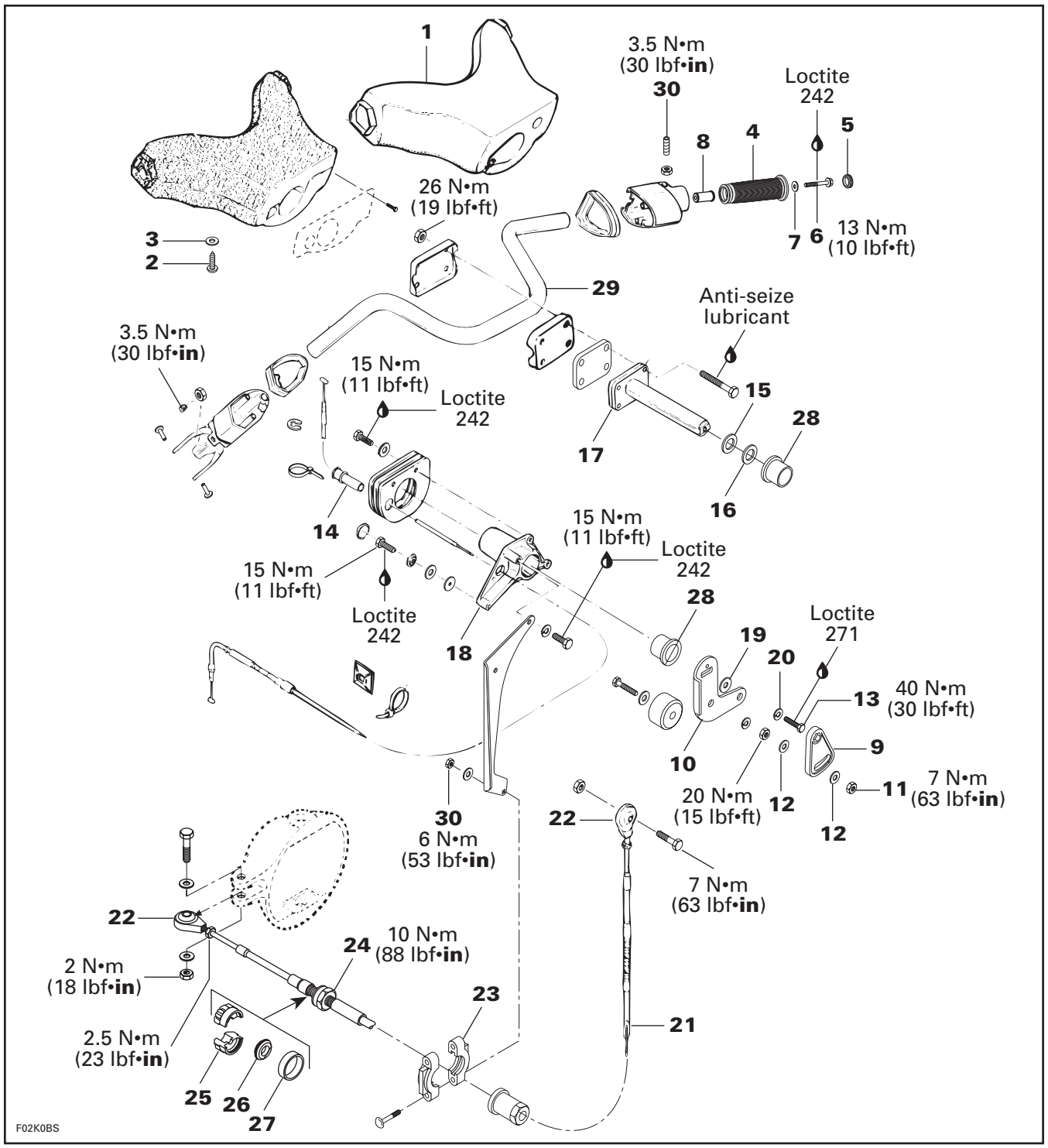


1. Ball joint on top of arm
*2. Torque nut to 7 N•m (62 lbf•**in**)*

STEERING ALIGNMENT

For steering alignment procedure, refer to ALIGNMENT 10-06.

GTS MODEL


1
3.5 N•m
(30 lbf•in)
30
Loctite
242
8
4
5
26 N•m
(19 lbf•ft)
3
2
7
6
13 N•m
(10 lbf•ft)
29
Anti-seize
lubricant
3.5 N•m
(30 lbf•in)
15 N•m
(11 lbf•ft)
Loctite
242
15
17
28
16
14
15 N•m
(11 lbf•ft)
Loctite
242
15 N•m
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Loctite
271
20
13
40 N•m
(30 lbf•ft)
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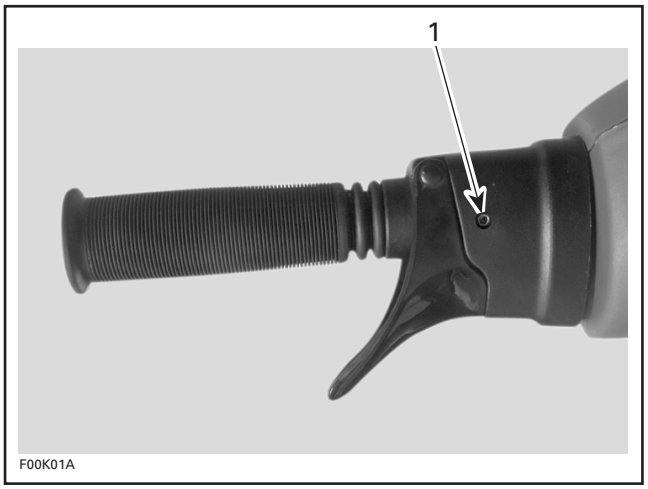
12
11
7 N•m
(63 lbf•in)
12
30
6 N•m
(53 lbf•in)
22
7 N•m
(63 lbf•in)
22
24
10 N•m
(88 lbf•in)
2 N•m
(18 lbf•in)
23
21
2.5 N•m
(23 lbf•in)
25
26
27
F02K0BS

REMOVAL AND INSTALLATION

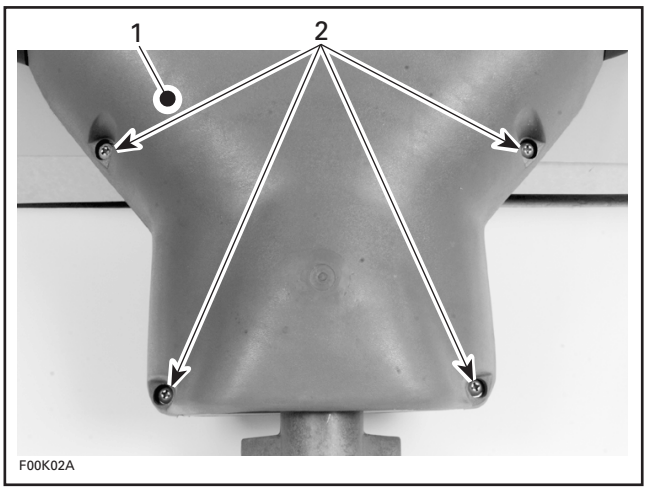
1, Cover

To replace the cover, loosen set screws **no. 30** of handlebar housing.



1. Set screw

Remove and reinstall 4 screws **no. 2** and washers **no. 3**.



1. Cover
2. Screws

4,8, Grip and Grip Insert

To remove grip, just pull out cap **no. 5** from grip end and remove screw **no. 6** and washer **no. 7**.

Pull out grip.

To verify grip insert for damage, remove it from handlebar.

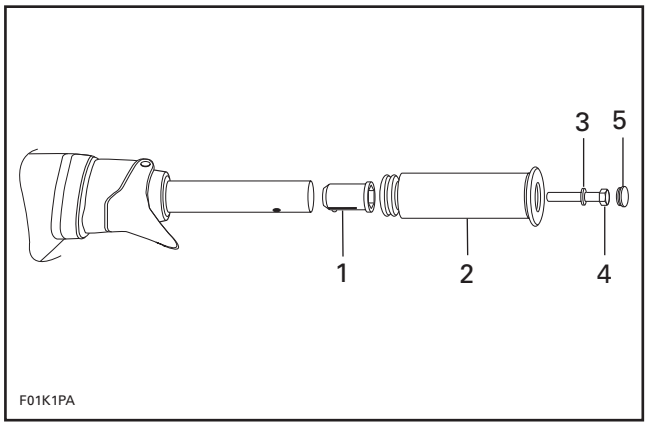
When installing the grip insert in handlebar **no. 29**, ensure that its notch is properly inserted in the hole beneath the handlebar.

Install grip **no. 4** on handlebar **no. 29** matching it to the hex form on the grip insert.

Install flat washer **no. 7** and screw **no. 6**.

Torque screw to 13 N•m (10 lbf•ft).

Install cap **no. 5**.



1. Grip insert
2. Grip
3. Flat washer
4. Screw. Torque to 13 N•m (10 lbf•ft)
5. Cap

▼ CAUTION

Ensure to install flat washer otherwise screw will damage grip end.

17,29, Steering Stem and Handlebar

Disconnect wiring harnesses leading out of dashboard hole.

Disconnect throttle cable at carburetor.

Remove throttle cable from tie-block and clip.

Unscrew nut **no. 11** retaining locking plate **no. 9**; then remove locking plate and washers **no. 12**.

Unscrew screw **no. 13** of steering stem arm **no. 10**.

Pull out handlebar and steering stem.

NOTE: It is not necessary to disconnect steering cable to remove handlebar and steering stem.

Inspect bushings **no. 28** for wear, cracks, scoring, etc. Replace as necessary.

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

Insert throttle cable through dashboard hole and slide grommet **no. 14** on cable.

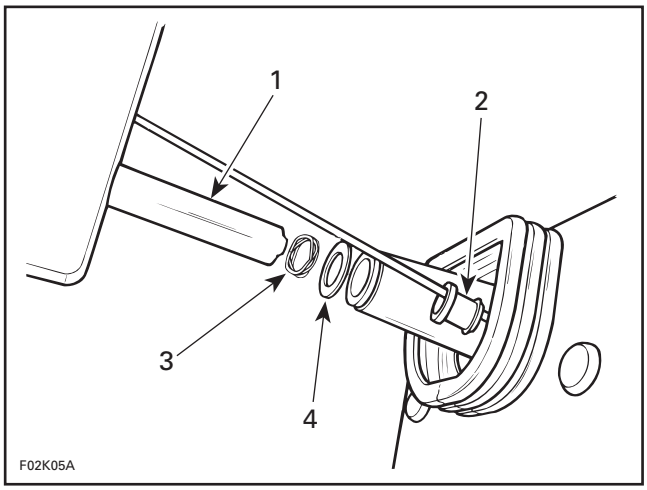
Insert grommet **no. 14** in dashboard hole and pull it from inside bilge.

NOTE: To ease installation, apply water on grommet.

Insert wires of monitoring beeper and start/stop button.

Insert spring washer **no. 15** and the shim **no. 16** onto steering stem **no. 17**.

Insert steering stem into support **no. 18**.



1. Steering stem
2. Grommet
3. Spring washer
4. Shim

Properly position steering stem arm **no. 10** on steering stem. Make sure to insert stem tenon into arm mortise.

Apply Loctite 271 (red) on threads of screw **no. 13**.

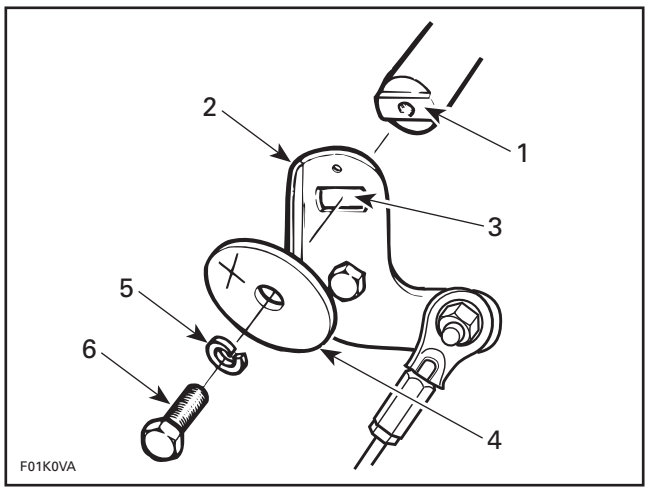
Install large flat washer **no. 19**, lock washer **no. 20** and screw **no. 13**. Torque screw to 40 N•m (30 lbf•ft).

▼ 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.



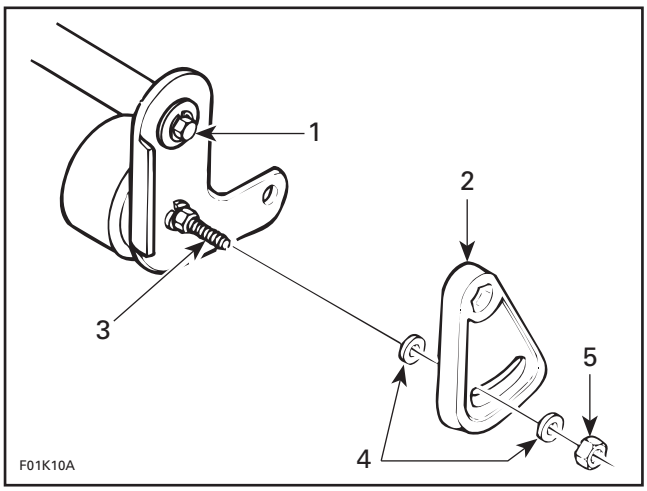
TYPICAL

1. Steering stem tenon
2. Steering stem arm
3. Mortise
4. Large flat washer with X
5. Lock washer
6. Screw, apply Loctite 271 and torque to 40 N•m (30 lbf•ft)

Position 8 mm flat washer **no. 12** on steering stopper screw then install locking plate **no. 9** over steering stem head screw.

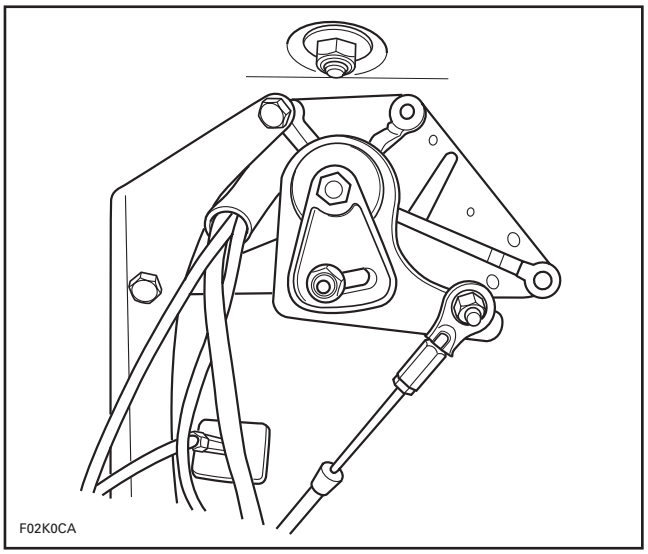
NOTE: Ensure locking plate slot is inserted in steering stopper screw.

Install a second 8 mm flat washer **no. 12** and secure locking plate using jam nut **no. 11**. Torque nut to 7 N•m (62 lbf•**in**).



STEERING CABLE NOT SHOWN FOR MORE CLARITY

1. Steering stem head screw
2. Locking plate
3. Steering stopper screw
4. 8 mm flat washers
*5. Torque nut to 7 N•m (62 lbf•**in**)*



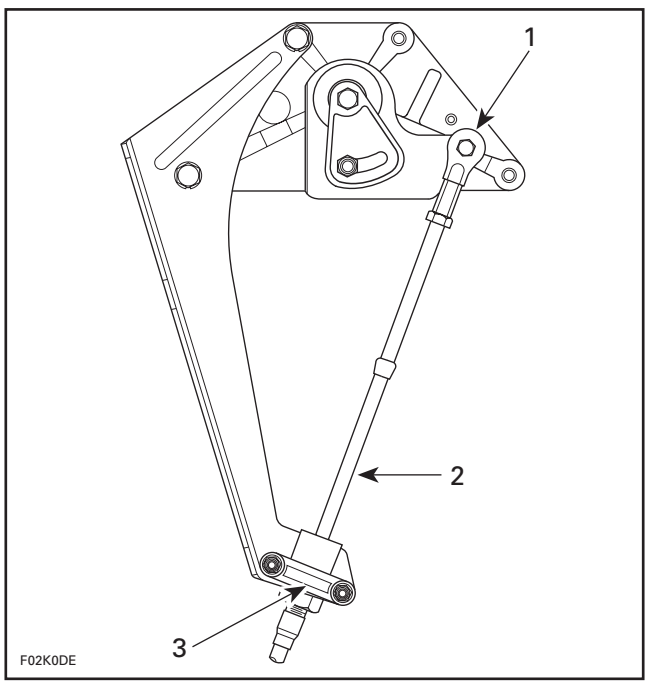
TYPICAL

21, Steering Cable

To replace steering cable, proceed as follows:

Disconnect front ball joint **no. 22** of steering cable at steering stem arm **no. 19**.

Loosen nuts **no. 30** and open retaining block **no. 23**.



TYPICAL

1. *Ball joint*
2. *Steering cable*
3. *Retaining block*

Disconnect rear ball joint **no. 22** of steering cable at jet pump nozzle; then, remove ball joint.

From bilge, unscrew nut **no. 24** retaining steering cable to hull.

Remove half rings **no. 25**, rubber washer **no. 26** and retaining ring **no. 27**.

NOTE: Move shift lever in reverse position to lower reverse gate. It will ease parts removal.

Remove steering cable from tie-block and clips.

Pull out steering cable.

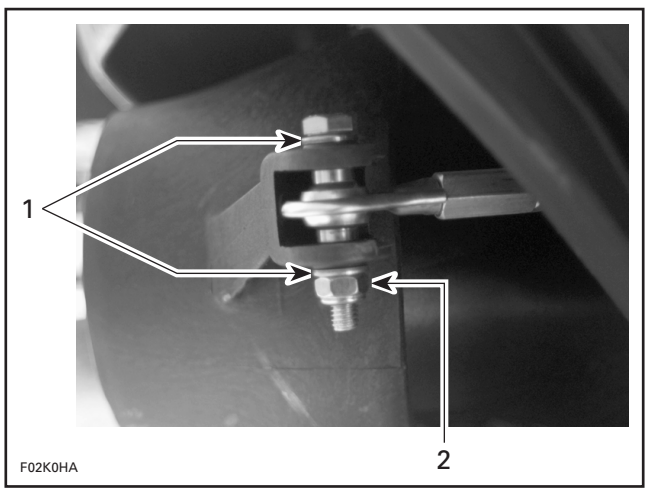
Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

Inspect and reuse ball joints **no. 22** only if they are in good condition.

Secure rear ball joint to nozzle.

▼ CAUTION

Ensure the ball joint is parallel (± 5°) to the nozzle arm.

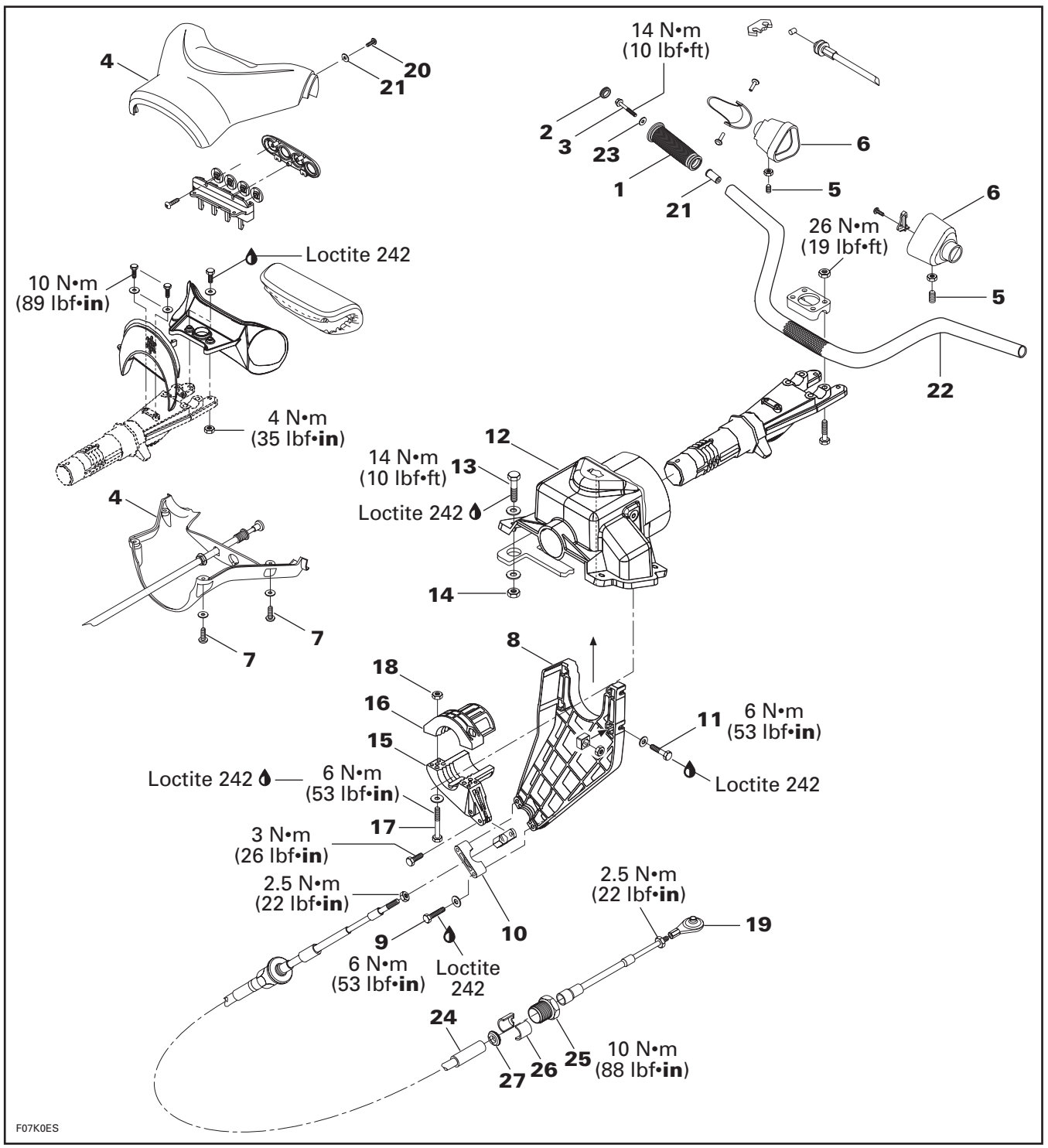


1. *One washer each side of arm*
2. *Torque nut to 2 N•m (18 lbf•**in**)*

STEERING ALIGNMENT

For steering alignment procedure, refer to ALIGNMENT 10-06.

GS, GSX LIMITED, GTI AND GTX LIMITED



DISASSEMBLY

1,21, Grip and Grip Insert

To remove grip, pull out cap **no. 2** and remove screw **no. 3**.

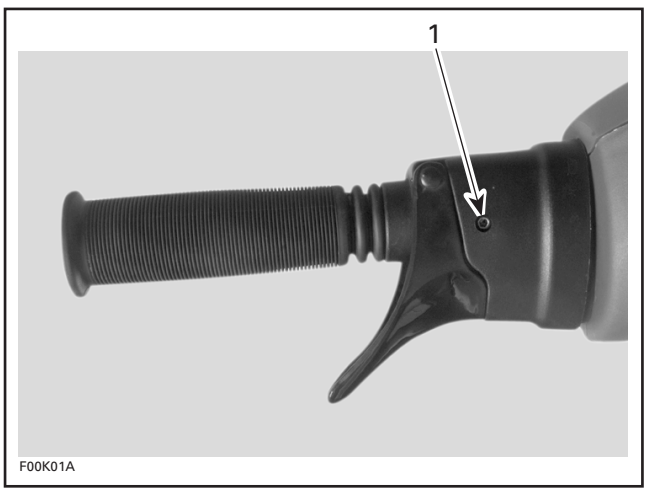
Pull out grip.

To verify grip insert for damage, remove it from handlebar **no. 22**.

4, Cover

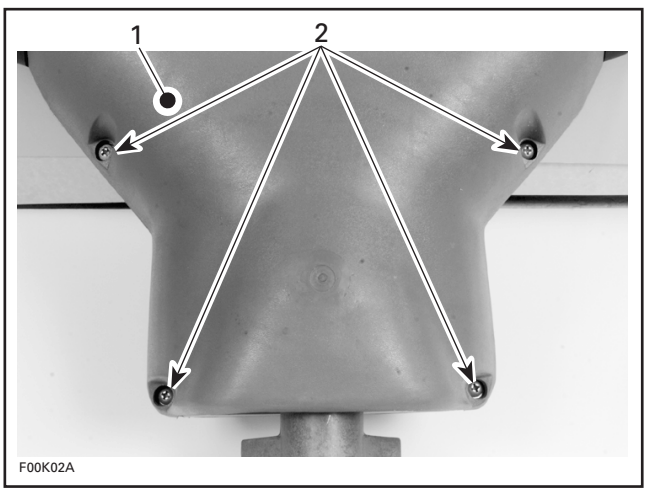
Remove grips **no. 1**.

Loosen set screws **no. 5** of handlebar housings **no. 6**.



1. Set screw

Remove 4 screws **no. 7**.



TYPICAL

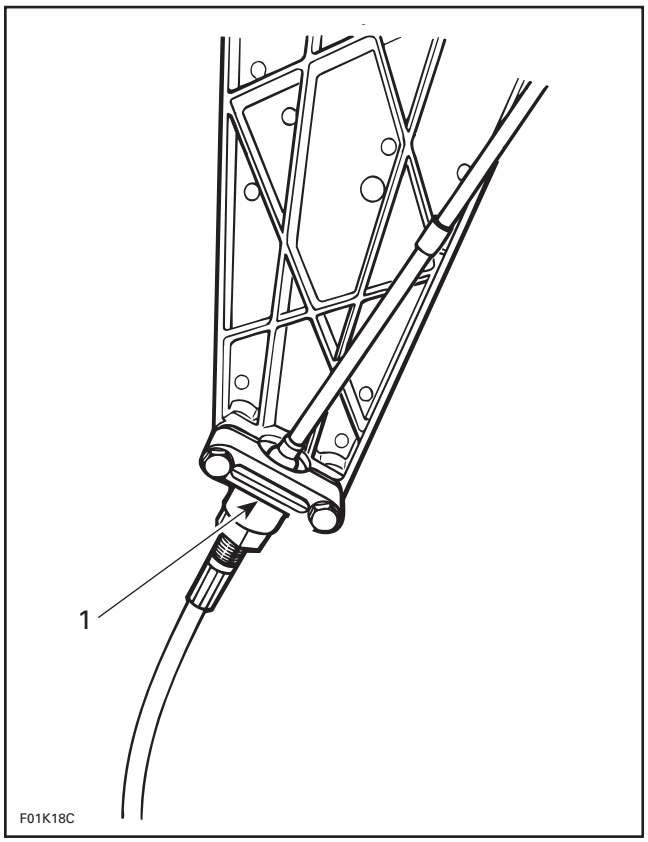
1. Cover
2. Screws

Remove 2 screws **no. 20** and flat washers **no. 21** each side of cover.

Remove cover.

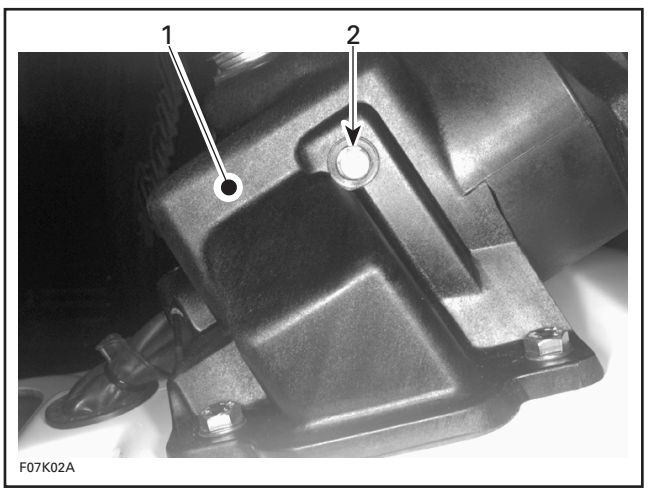
8, Cable Support

Loosen bolts **no. 9** and remove retaining block **no. 10**.

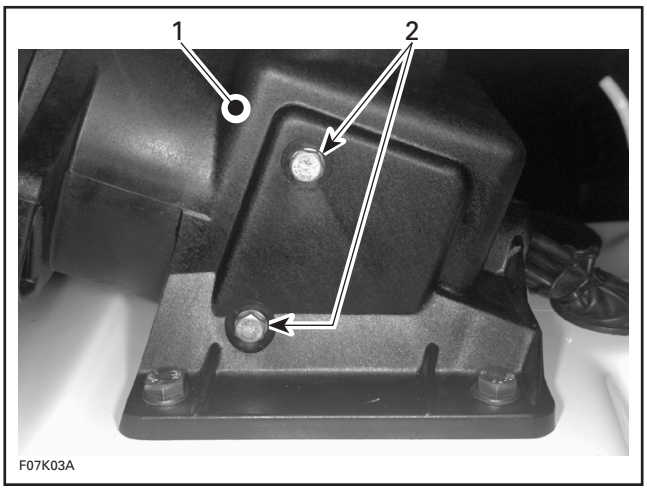


1. Retaining block

Loosen bolts **no. 11** each side of steering support **no. 12**.



1. Steering support
2. Bolt



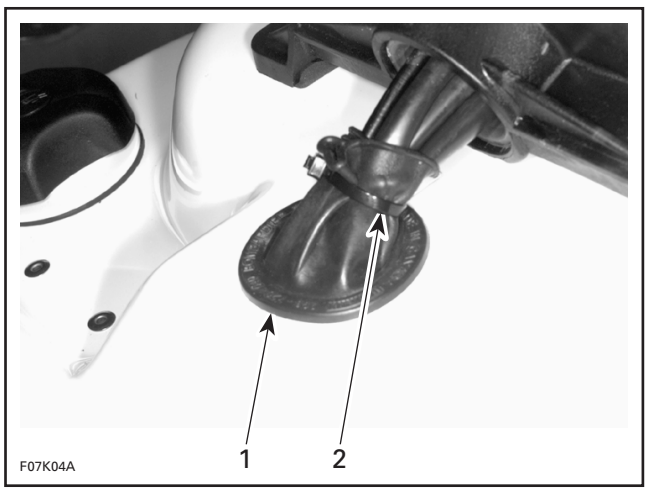
1. Steering support
2. Bolts

Remove support.

12, Steering Support

GTI and GTX Limited

Cut tie rap securing wiring harness boot.

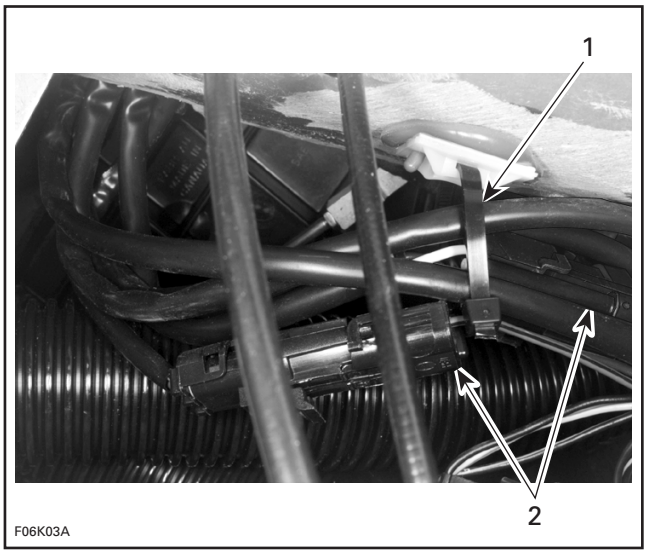


1. Boot
2. Tie rap

All Models

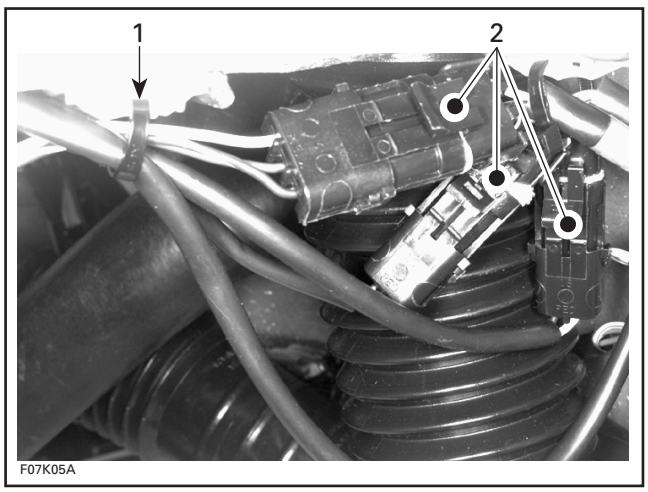
Disconnect the throttle and choke cables from carburetor levers.

Disconnect the wiring harnesses leading out of steering stem and cut tie rap.



GS AND GSX LIMITED

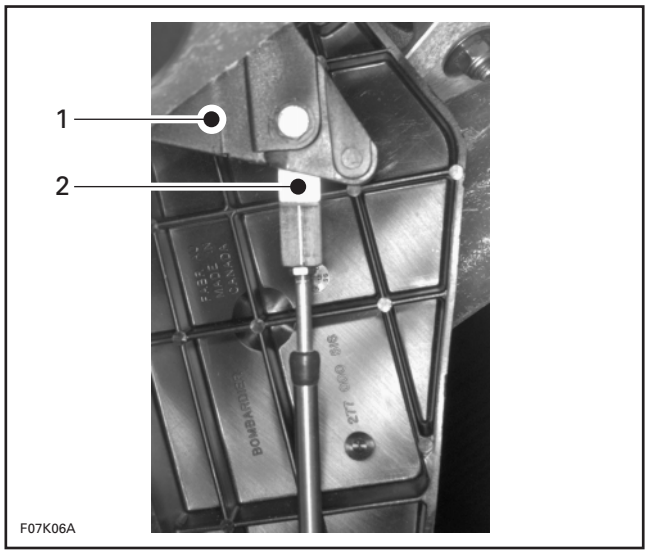
1. Tie rap
2. Connectors



GTI AND GTX LIMITED

1. Tie rap
2. Connectors

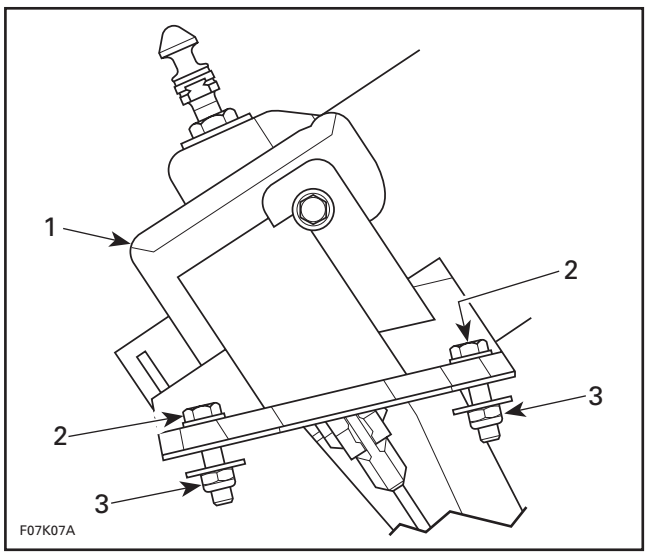
Disconnect the steering cable from the steering stem arm no. 15.



1. Steering stem arm
2. Steering cable

Loosen bolts **no. 11** retaining cable support **no. 8** to steering support **no. 12**.

Loosen bolts **no. 13** and lock nuts **no. 14**.

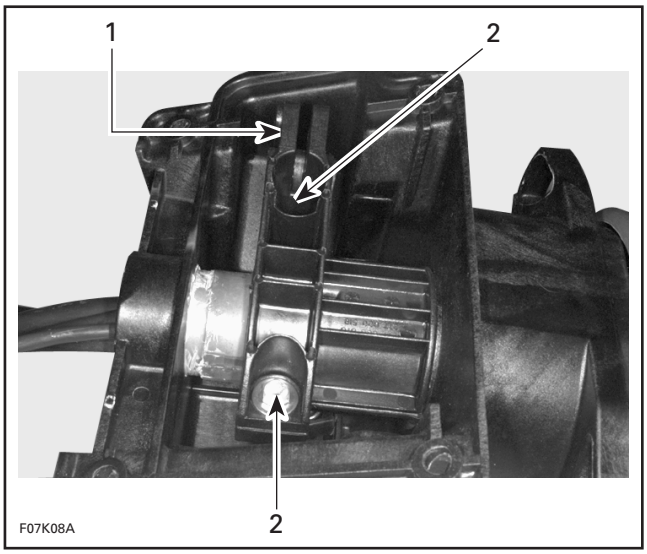


1. Steering support
2. Bolt
3. Lock nut

Remove steering support with handlebar, wiring harnesses and cables.

15,16, Steering Stem Arm and Support

Loosen bolts **no. 17** retaining steering stem arm to support.



1. Steering stem arm
2. Bolt

Remove steering stem arm and support.

24, Steering Cable

Disconnect steering cable from steering stem arm **no. 15**.

Remove retaining block **no. 10**.

Disconnect ball joint **no. 19** from jet pump nozzle.

Remove ball joint **no. 19** and jam nut from cable.

Loosen nut **no. 25**, then remove half rings **no. 26** and O-ring **no. 27**.

NOTE: To loosen nut, use steering cable tool (P/N 295 000 145).

Remove steering cable from watercraft.

ASSEMBLY

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

▼ CAUTION

Apply all specified torques and service products as per main illustration at the beginning of this sub-section.

1,21, Grip and Grip Insert

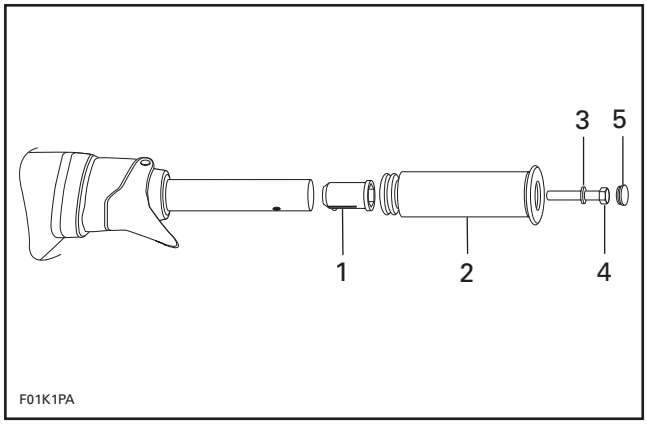
When installing the grip insert **no. 21** in the handlebar **no. 22**, ensure that its notch is properly inserted in the hole beneath the handlebar.

Install grip **no. 1** on handlebar **no. 22** matching it to the hex form on the grip insert.

Install flat washer **no. 23** and screw **no. 3**.

Torque screw to 13 N•m (10 lbf•ft).

Install cap **no. 2**.



1. Grip insert
2. Grip
3. Flat washer
4. Screw. Torque to 13 N•m (10 lbf•ft)
5. Cap

▼ CAUTION

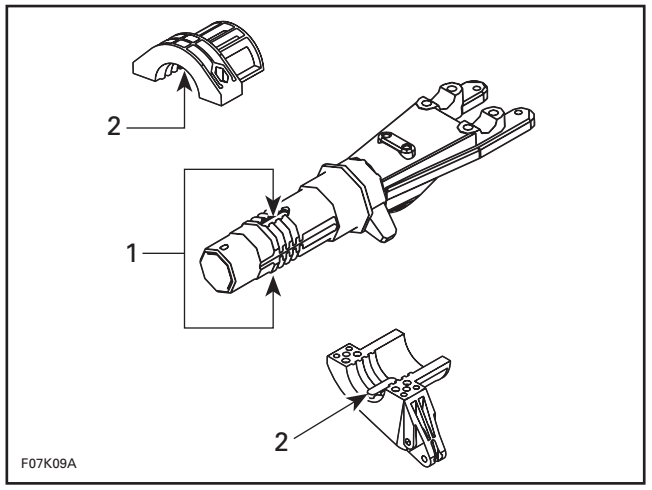
Ensure to install flat washer otherwise screw will damage grip end.

15,16, Steering Stem Arm and Support

Position steering stem arm and support onto steering stem.

◆ WARNING

Make sure the integrated flat keys of the steering stem arm and support are properly seated in steering stem keyways. Steering stem arm must be locked in place before torquing the bolts.



1. Keyways
2. Integrated flat key

Replace lock nuts **no. 18** by new ones.

Torque bolts **no. 17** of steering stem arm to 6 N•m (53 lbf•**in**).

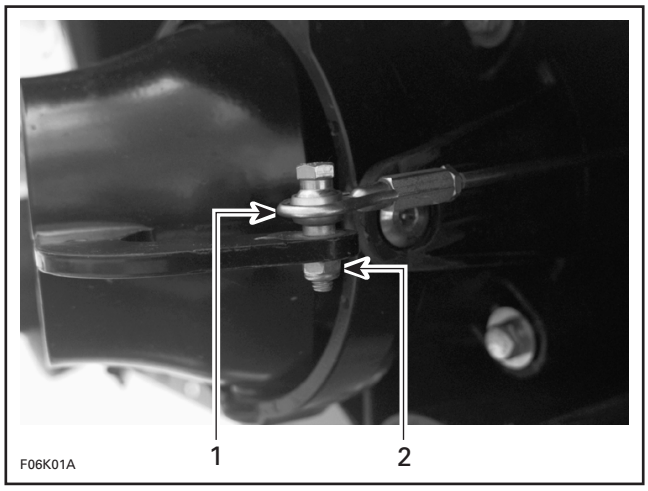
19, Ball Joint

Secure the steering cable ball joint **no. 19** to the nozzle as per following illustrations.

▼ CAUTION

Ensure the ball joint is parallel (± 5°) to the nozzle arm.

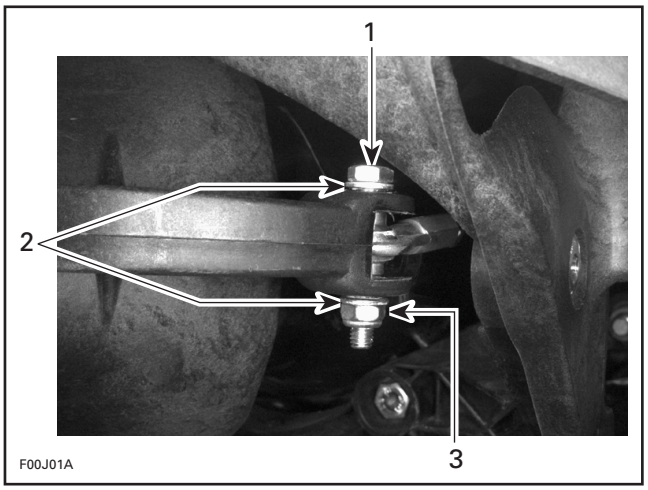
GSX Limited and GTX Limited



TYPICAL

1. Ball joint on top of steering arm
*2. Torque nut to 7 N•m (62 lbf•**in**)*

GS and GTI Models



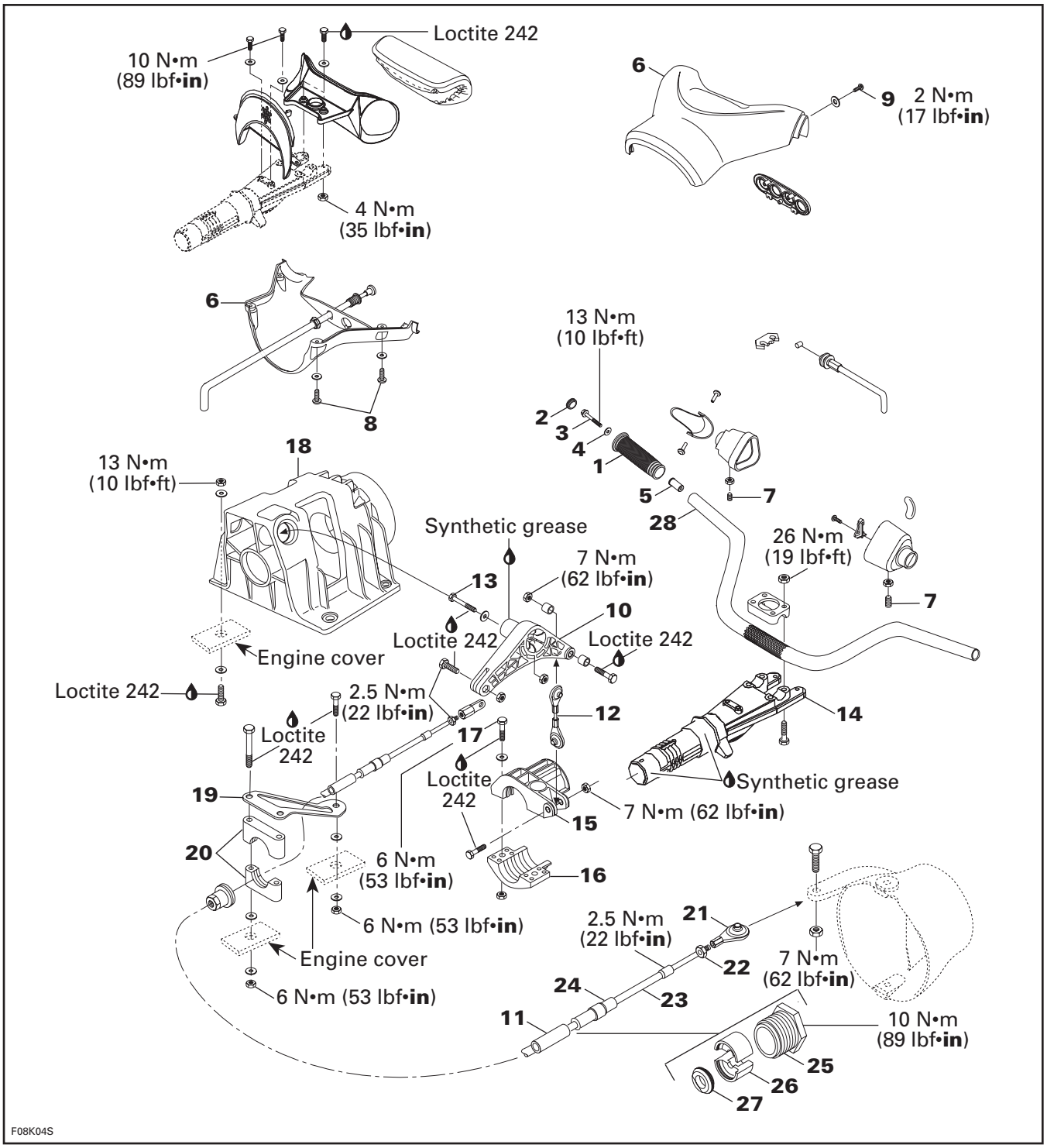
TYPICAL

1. *Bolt*
2. *Flat washers*
3. *Lock nut. Torque to 2 N•m (18 lbf•**in**)*

STEERING ALIGNMENT

For steering alignment procedure, refer to ALIGNMENT 10-06.

XP LIMITED


Loctite 242
10 N•m
(89 lbf•in)
4 N•m
(35 lbf•in)
6
9
2 N•m
(17 lbf•in)
6
8
13 N•m
(10 lbf•ft)
2
3
4
1
5
7
28
18
13 N•m
(10 lbf•ft)
Synthetic grease
7 N•m
(62 lbf•in)
13
10
Loctite 242
Loctite 242
Engine cover
Loctite 242
2.5 N•m
(22 lbf•in)
Loctite
242
17
12
19
Loctite
242
15
7 N•m (62 lbf•in)
20
6 N•m
(53 lbf•in)
16
6 N•m (53 lbf•in)
Engine cover
6 N•m (53 lbf•in)
26 N•m
(19 lbf•ft)
7
14
Synthetic grease
2.5 N•m
(22 lbf•in)
21
22
7 N•m
(62 lbf•in)
24
23
11
10 N•m
(89 lbf•in)
25
26
27
F08K04S

DISASSEMBLY

1, Grip

To remove grip, pull out cap **no. 2** from grip end and remove screw **no. 3** and washer **no. 4**.

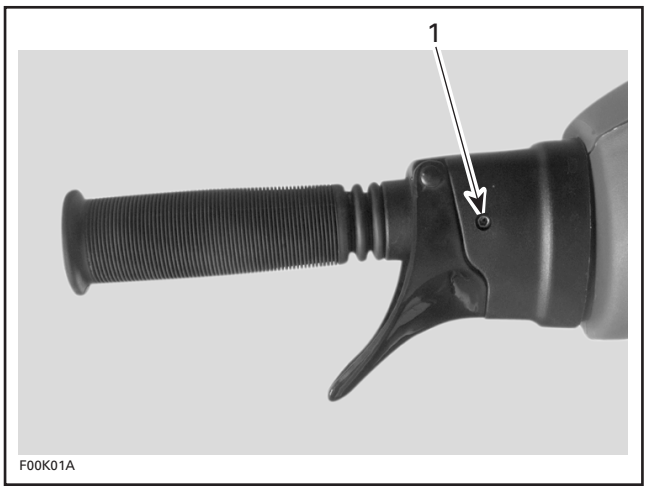
Pull out grip.

5, Grip Insert

To verify grip insert for damage, remove it from handlebar.

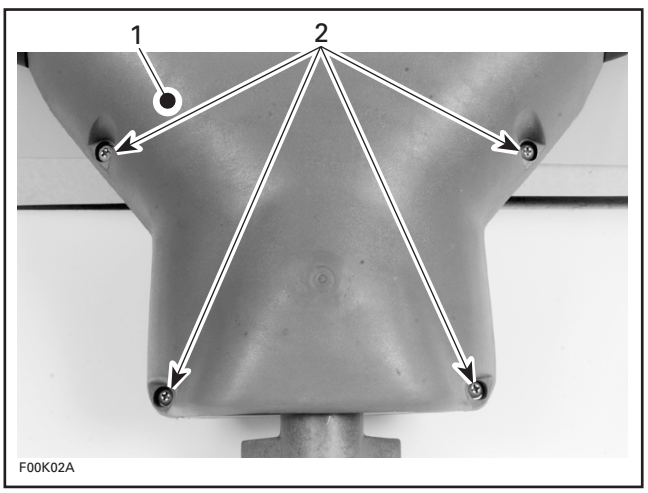
6, Cover

To remove the cover, loosen set screws **no. 7** of handlebar housing.



1. Set screws

Remove 4 screws **no. 8** and washers **no. 9**.



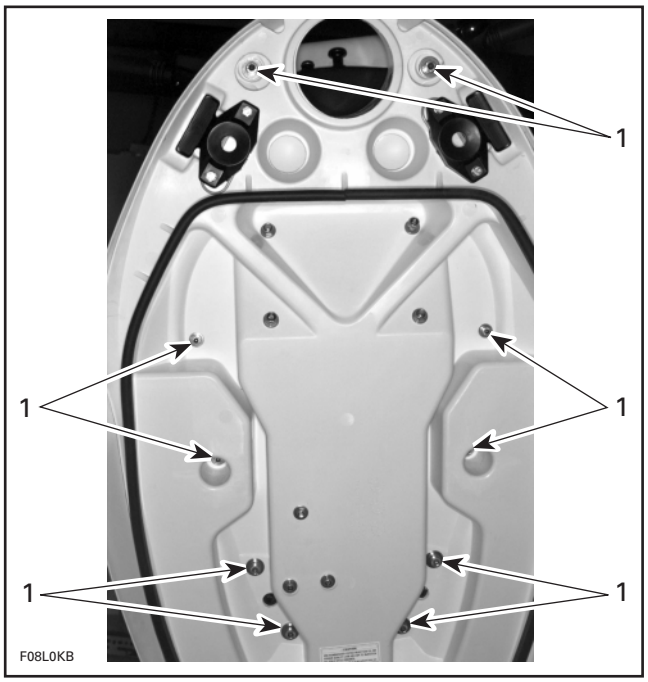
TYPICAL
1. Cover
2. Screws

Remove 2 screws **no. 9** and flat washers each side of cover.

10, Lever

Open engine cover.

Remove the top section of the engine cover by loosening the 10 Allen screws located inside the cover.

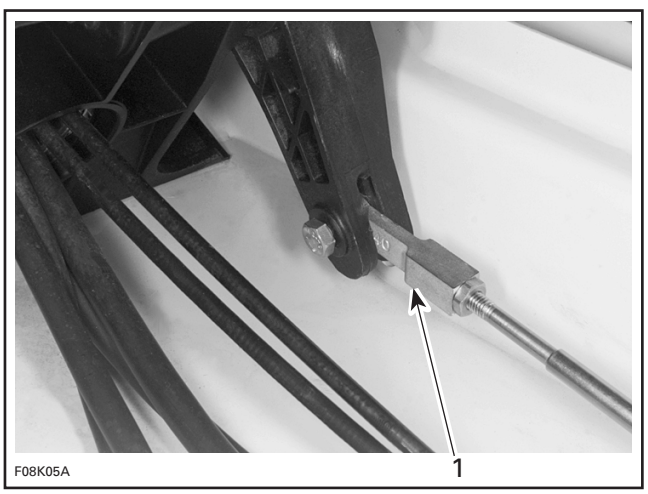


1. Loosen Allen screws

Lift the top section of the engine cover and disconnect wiring harnesses.

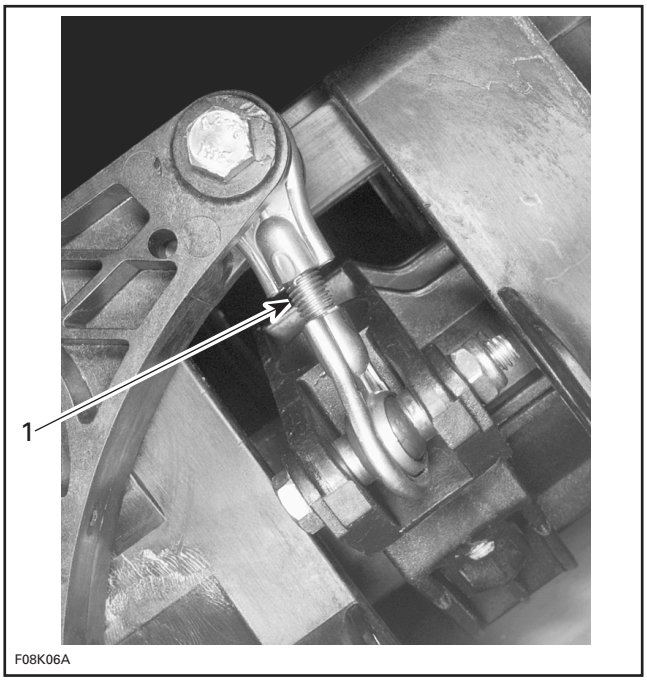
Remove the top section of the engine cover.

Disconnect steering cable **no. 11**.



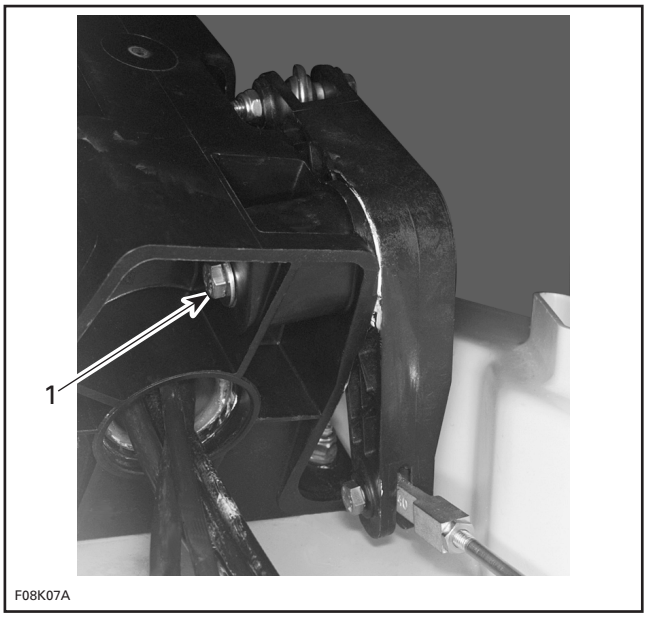
1. Disconnect steering cable

Remove link rod **no. 12**.



1. Remove link rod

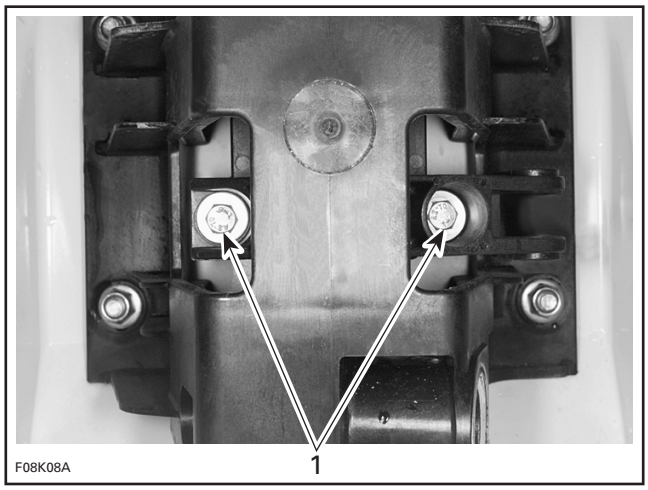
Remove bolt **no. 13** and washer.



1. Remove bolt and washer

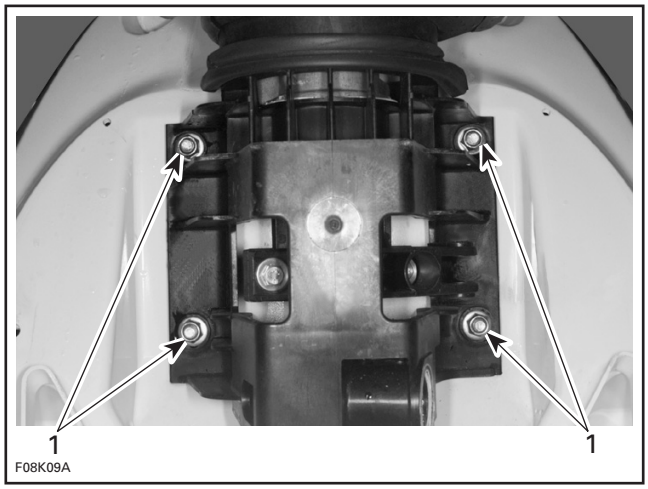
15,16, Steering Stem Arm and Support

Loosen bolts **no. 17** retaining steering stem arm **no. 15** and support **no. 16**.



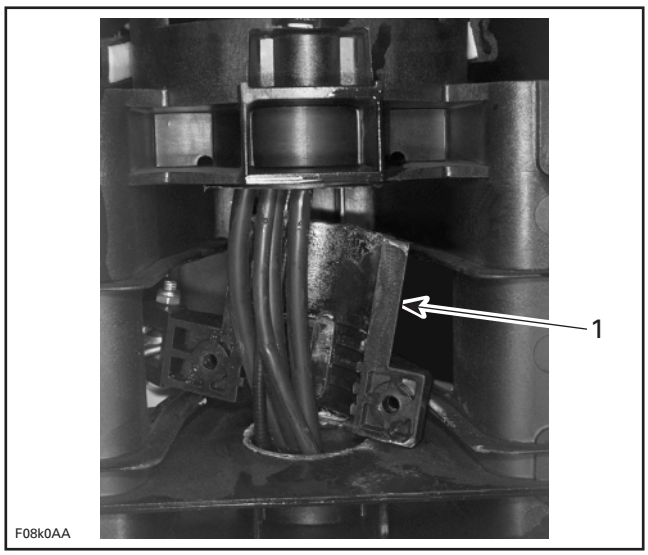
1. Loosen bolts

Loosen nuts and bolts of steering support **no. 18**.



1. Loosen nuts and bolts

Lift steering support **no. 18** and slightly pullback steering stem **no. 14** in order to remove the support **no. 16** and steering stem arm **no. 15**.



1. Remove support and steering stem arm

14, Steering Stem

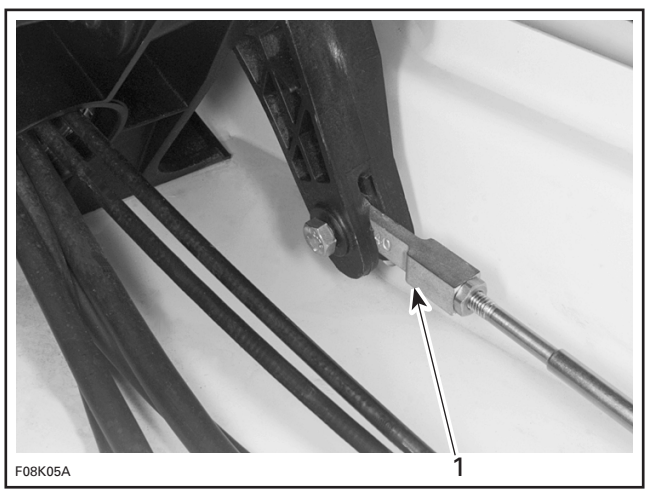
Disconnect wiring harnesses, choke and throttle cables from engine.

Remove steering stem.

11, Steering Cable

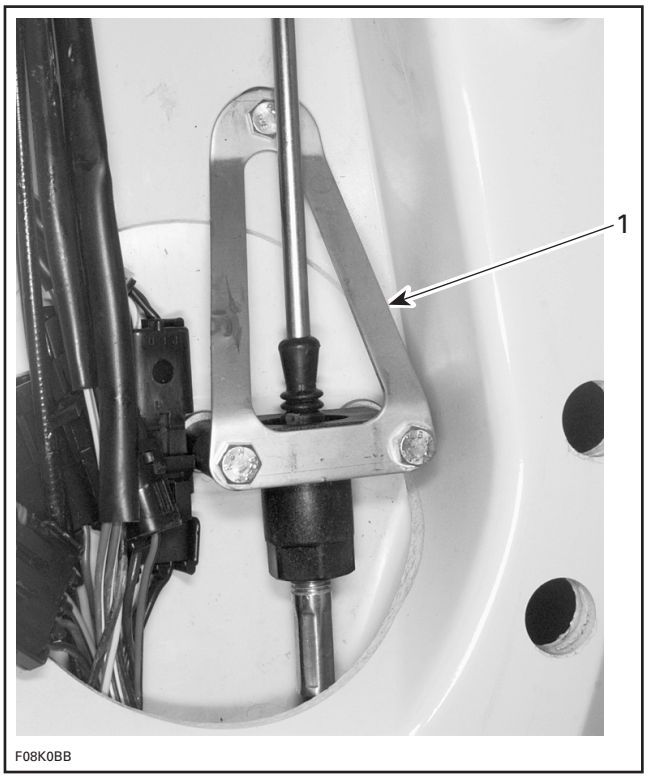
Remove glove box.

Disconnect steering cable at lever **no. 10**.



1. Disconnect steering cable

Loosen cable support **no. 19**.



1. Loosen cable support

Remove retaining block **no. 20**.

Disconnect ball joint **no. 21** of steering cable from jet pump nozzle.

Remove ball joint **no. 21**, jam nut **no. 22** and boots **no. 23** and **no. 24**.

Loosen nut **no. 25** and remove half rings **no. 26** and O-ring **no. 27**.

NOTE: To loosen nut, use steering cable tool (P/N 295 000 145).

Remove steering cable from watercraft.

ASSEMBLY

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

10, Lever

Prior installing lever, apply synthetic grease to pivot.

14, Steering Stem

Apply synthetic grease to front and rear thrust bearing surface.

15,16, Steering Stem Arm and Support

Position steering stem arm and support onto steering stem **no. 14**.

◆ WARNING

Make sure integrated flat keys of steering stem arm and support are properly seated in steering stem keyways.

1,5, Grip and Grip Insert

When installing the grip insert **no. 5** in the handlebar **no. 28**, ensure that its notch is properly inserted in the hole beneath the handlebar.

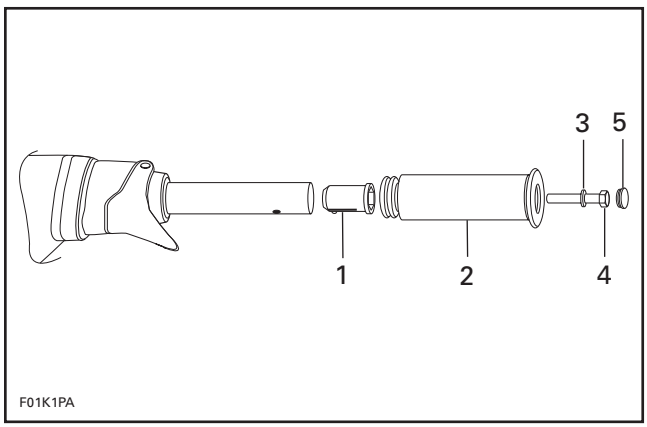
Install grip **no. 1** on handlebar **no. 28** matching it to the hex form on the grip insert **no. 5**.

Install flat washer **no. 4** and screw **no. 3**.

Torque screw to 13 N•m (10 lbf•ft).

◆ WARNING

Correct torque must be strictly followed.



1. Grip insert
2. Grip
3. Flat washer
4. Torque screw to 13 N•m (10 lbf•ft)
5. Cap

▼ CAUTION

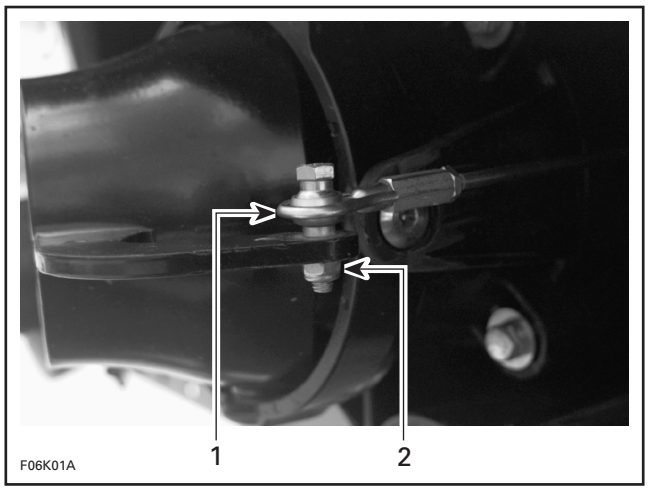
Ensure to install flat washer otherwise screw will damage grip end.

21, Ball Joint

Secure the steering cable ball joint **no. 21** to the nozzle as per following illustration.

▼ CAUTION

Ensure the ball joint is parallel (± 5°) to the nozzle arm.



TYPICAL

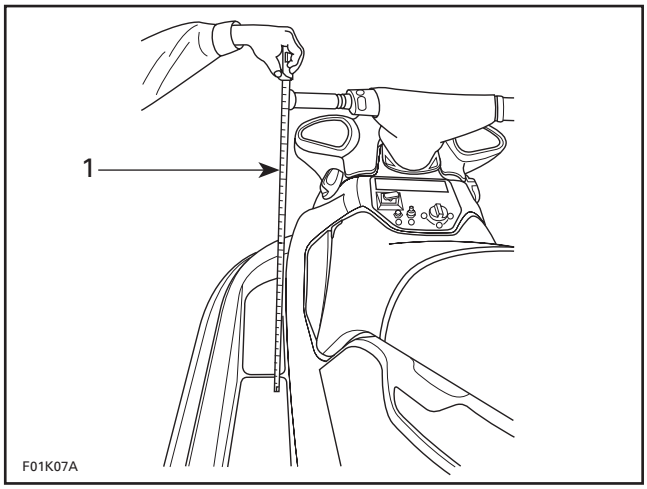
1. Ball joint on top of steering arm
*2. Torque nut to 7 N•m (62 lbf•**in**)*

STEERING ALIGNMENT

For steering alignment procedure, refer to ALIGNMENT 10-06.

ALIGNMENT

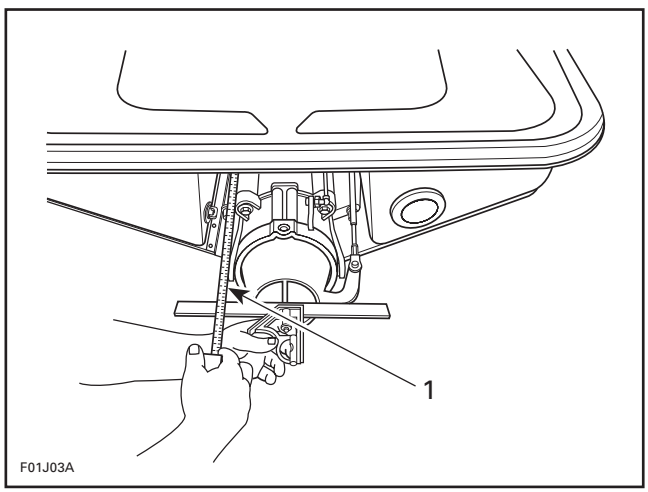
Position handlebar in straight ahead position by measuring each side the distance from handlebar grip end to floorboard.



TYPICAL

1. Measuring handlebar grip end/floorboard distance

Check jet pump nozzle position by placing a straight edge on nozzle outer end. Measure the distance on each side of the straight edge. It must be equalled.



TYPICAL

1. Measure the distance on each side of the straight edge

If necessary, steering alignment adjustment should be performed at steering cable support.

All Models Except the XP Limited

Open storage compartment cover and remove basket.

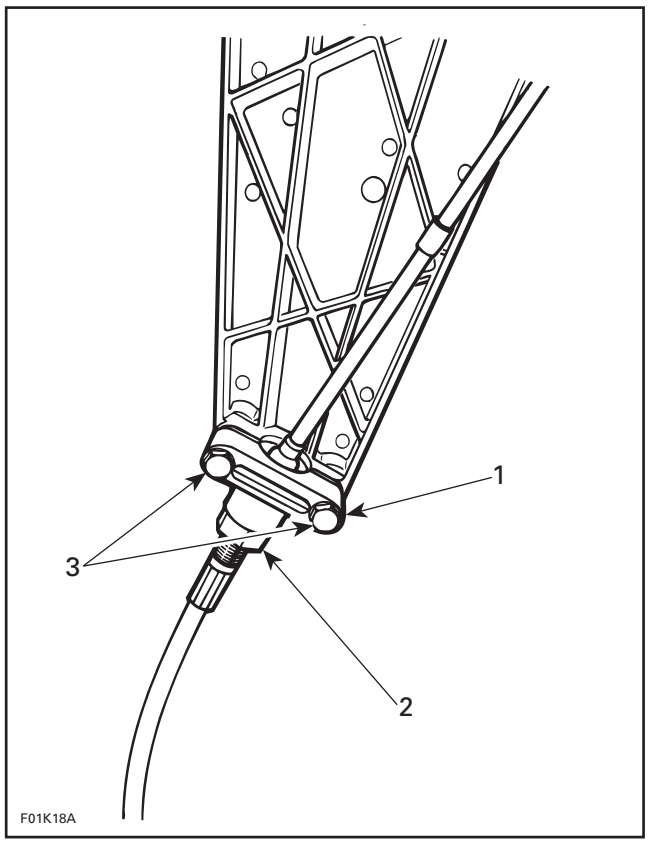
XP Limited

Remove glove box.

All Models

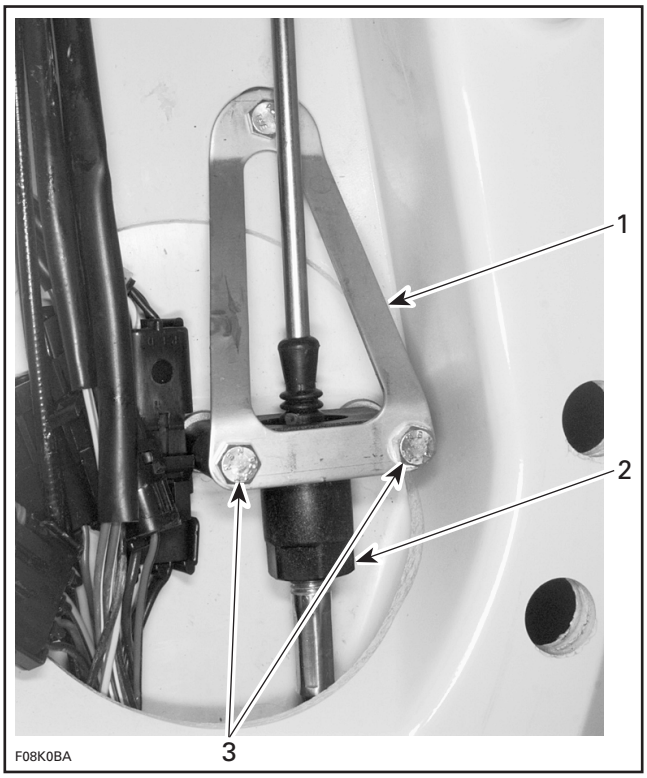
Loosen retaining block at cable support.

Turn adjustment nut as required.



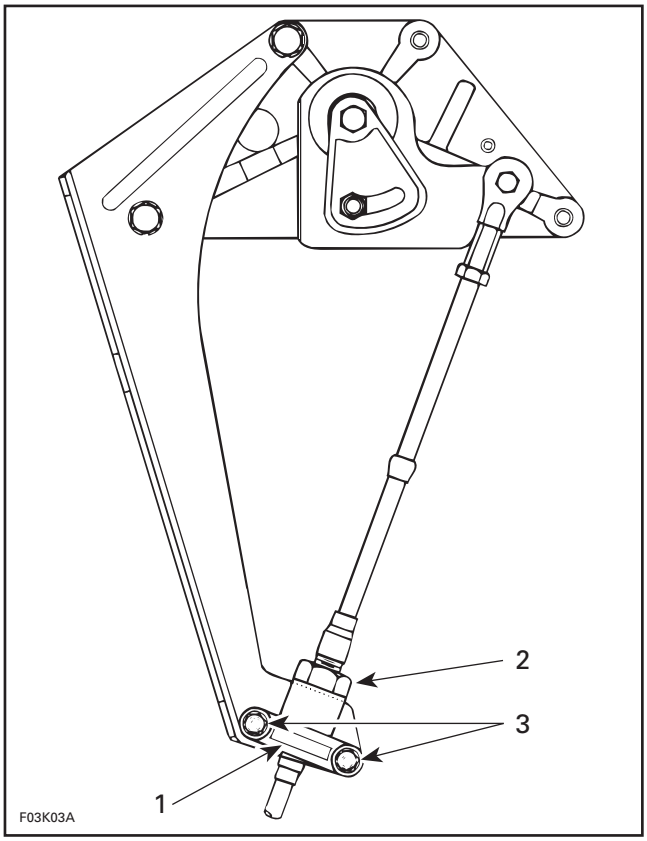
SPX, GS, GSX LIMITED, GTI AND GTX LIMITED

1. Retaining block
2. Adjustment nut
3. Bolts



XP LIMITED

1. *Support*
2. *Adjustment nut*
3. *Bolts*



GTS MODEL

1. *Retaining block*
2. *Adjustment nut*
3. *Bolts*

After adjustment, torque retaining block bolts to 6 N•m (53 lbf•**in**).

▼ CAUTION

Verify when the handlebar is turned completely to the left or right side, that there is no interference with venturi.

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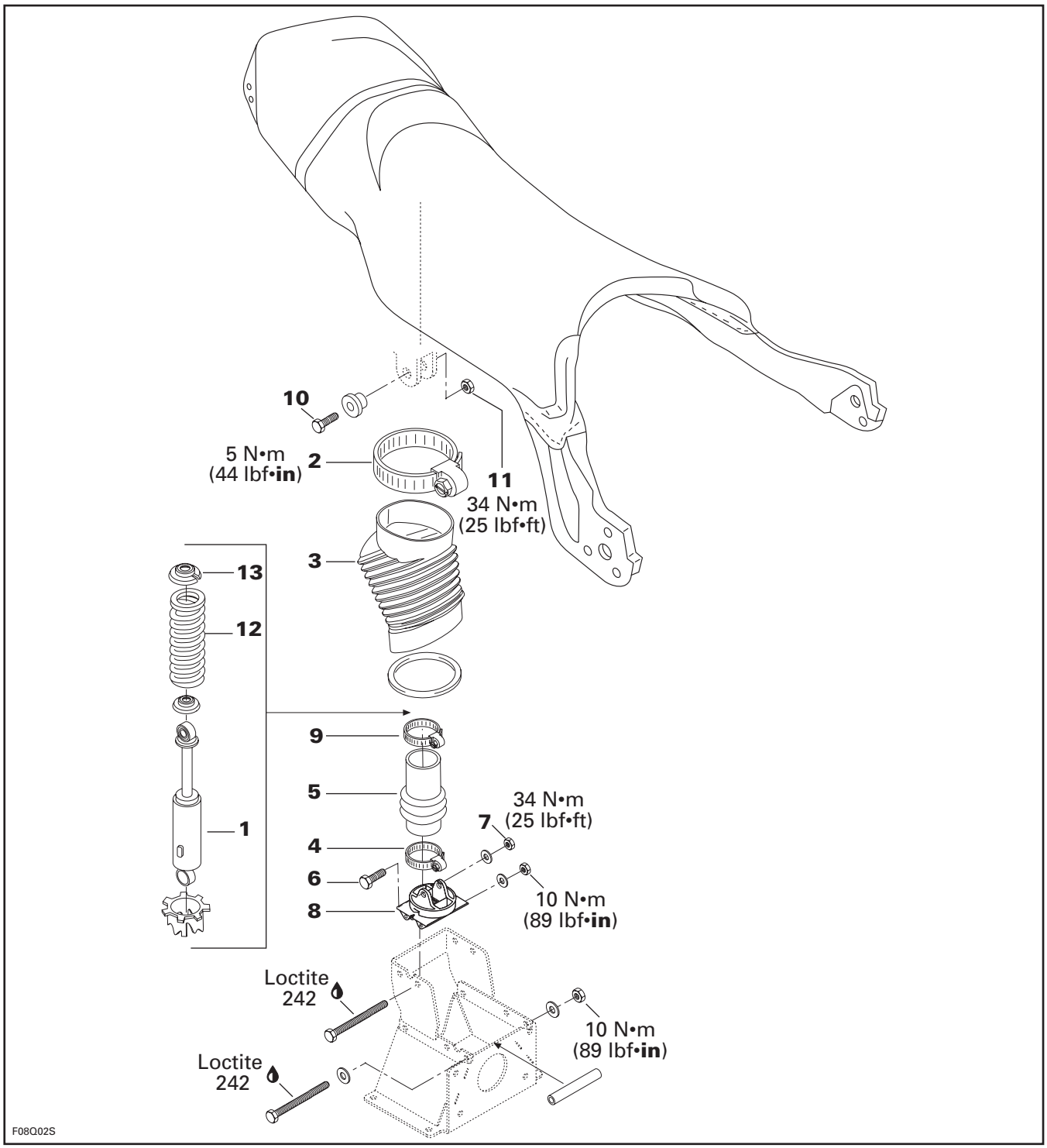
DIRECT ACTION SUSPENSION

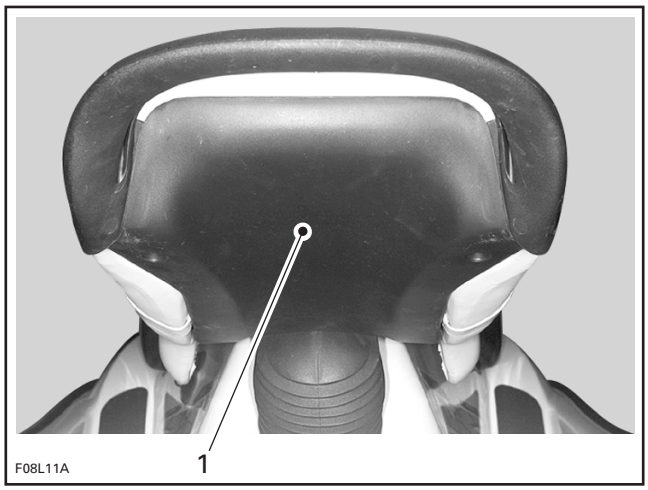
XP Limited



REMOVAL

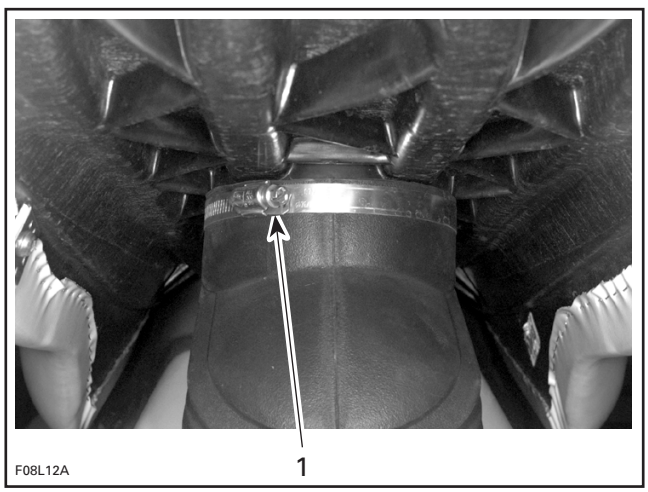
1, Shock Absorber

Loosen 4 screws and remove bottom cover of seat.



1. Remove cover

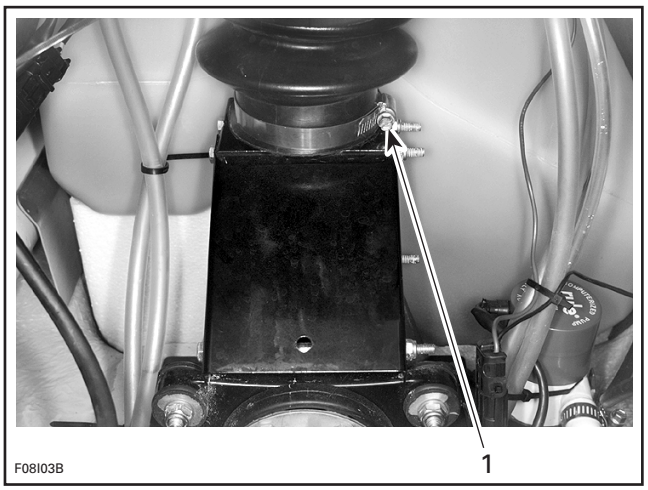
Loosen gear clamp **no. 2** of outer boot **no. 3**, then pull outer boot downward.



1. Loosen gear clamp

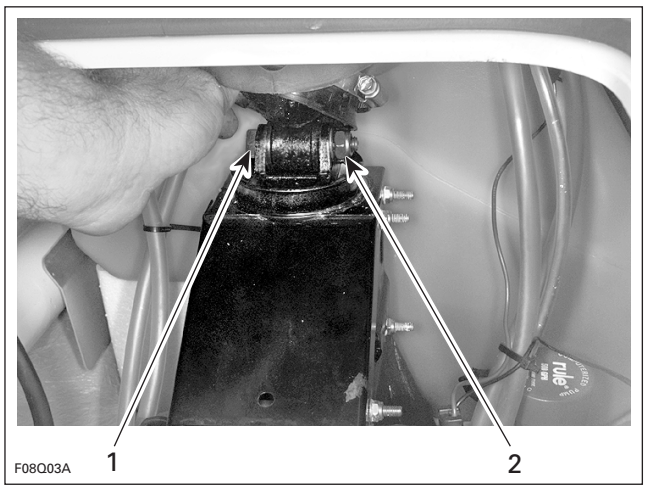
Remove rear access panel from body.

Loosen lower gear clamp **no. 4**, then push inner boot **no. 5** upward.



1. Loosen gear clamp

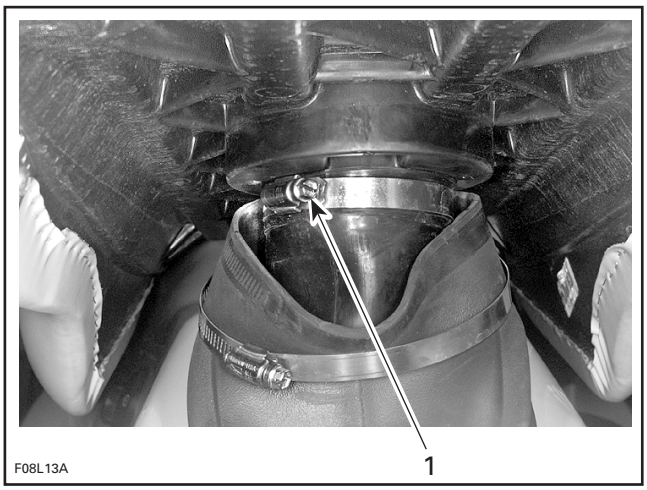
Remove bolt **no. 6** and lock nut **no. 7** from shock absorber lower support **no. 8**.



1. Bolt
2. Lock nut

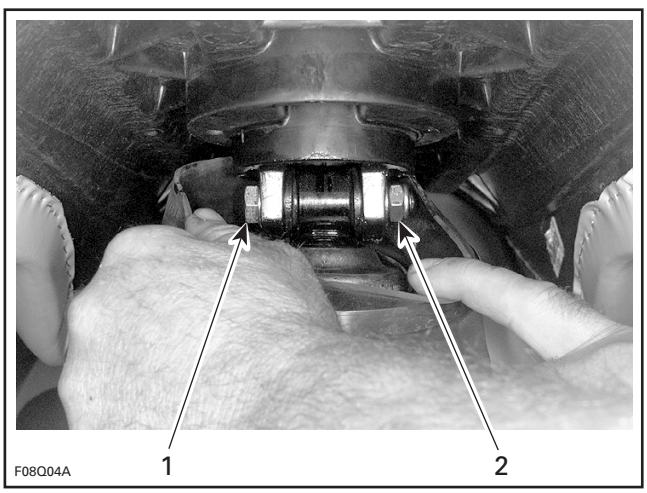
Tilt seat upward.

Loosen upper gear clamp **no. 9** of inner boot **no. 5**.



1. Loosen gear clamp

Remove bolt **no. 10** and lock nut **no. 11** from shock absorber upper support.



1. Bolt
2. Lock nut

Remove shock absorber/coil spring assembly.

3, Outer Boot

Pull outer boot to remove it from body.

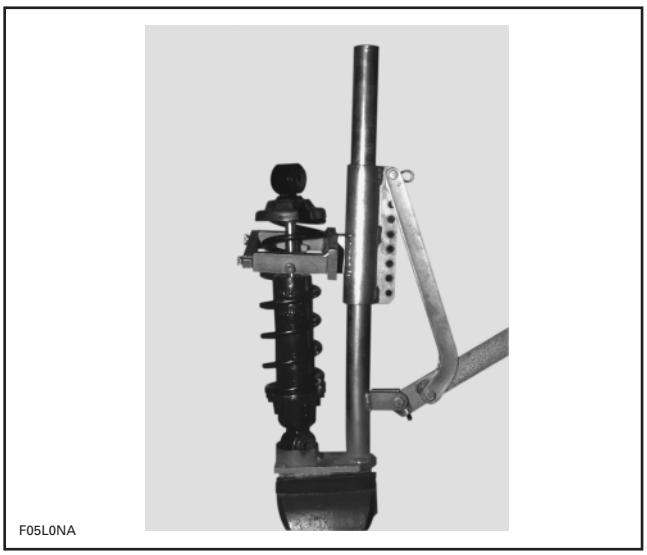
12, Coil Spring

Install spring compressor tool (P/N 529 027 100) in a vise.

◆ WARNING

Do not attempt to dismantle a spring without using the proper tool.

Install shock absorber/coil spring assembly in spring compressor tool.



Compress spring and remove cup **no. 13**.

Unload tool and remove spring from shock absorber.

INSPECTION

3,5, Boot

Inspect condition of boots. If there is any tear, renew boot(s).

1, Shock Absorber

Inspect shock absorber for wear. Extend and compress the piston several times over its entire stroke; it should move smoothly and with uniform resistance.

Pay attention to the following conditions that will denote a defective shock absorber:

– A skip or a hang back when reversing stroke at mid travel.
– Seizing or binding condition except at extreme end of either stroke.
– Oil leakage.
– A gurgling noise, after completing one full compression and extension stroke.

Renew if any defects are present.

ASSEMBLY

Assembly is essentially the reverse of disassembly procedure. Refer to the main illustration at the beginning of this sub-section for torque specifications and service products to be used.

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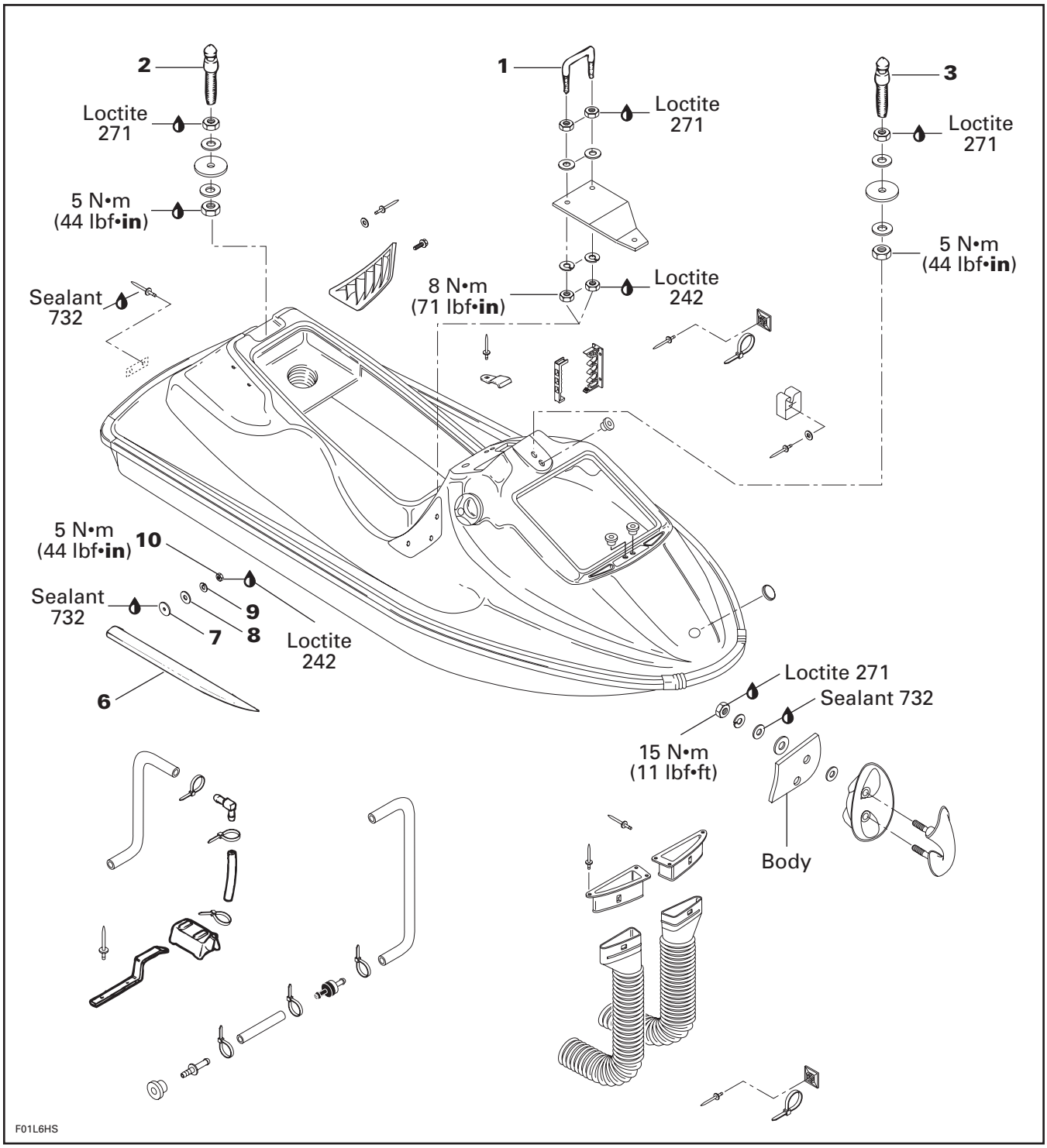
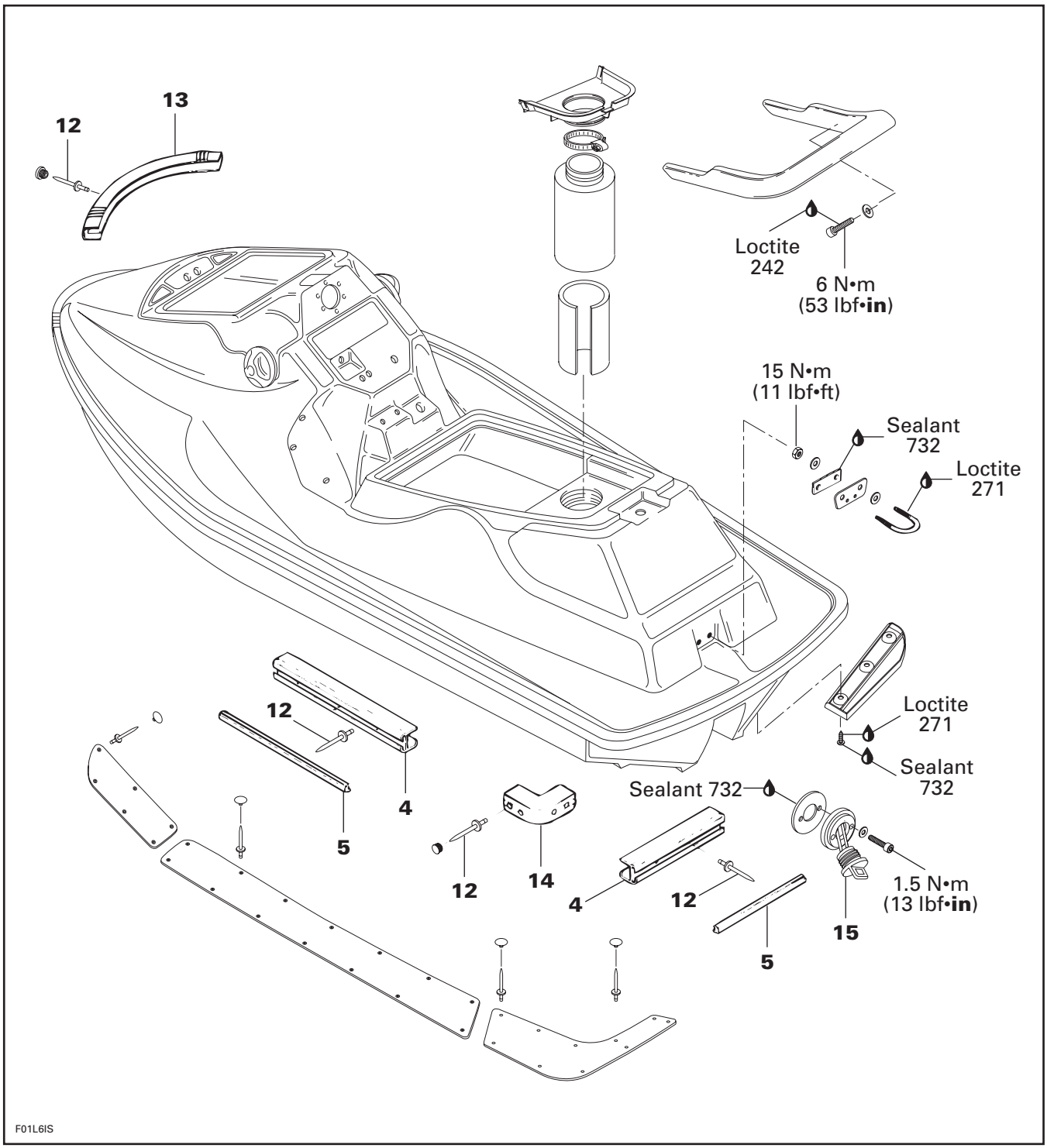
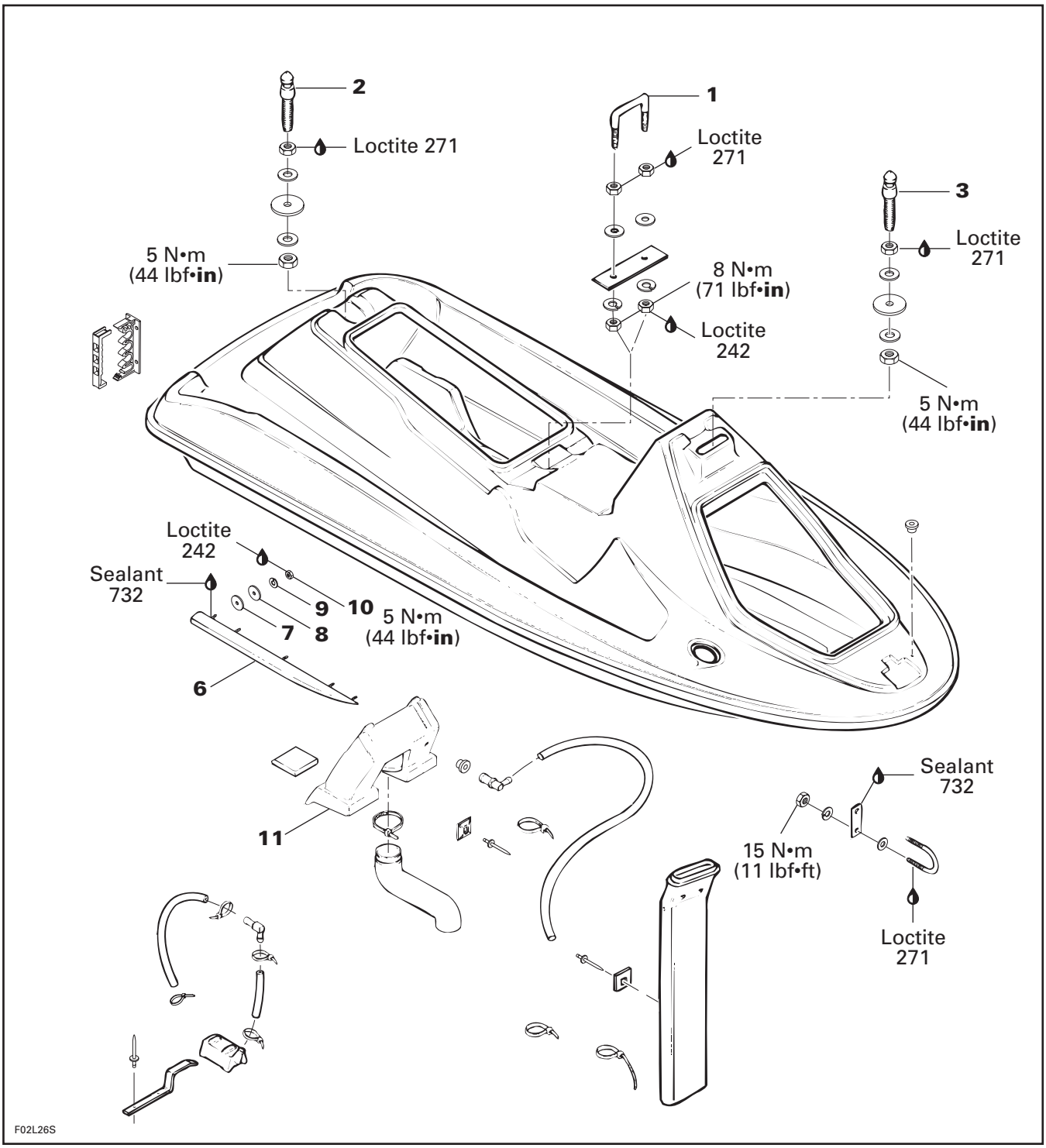
ADJUSTMENT AND REPAIR

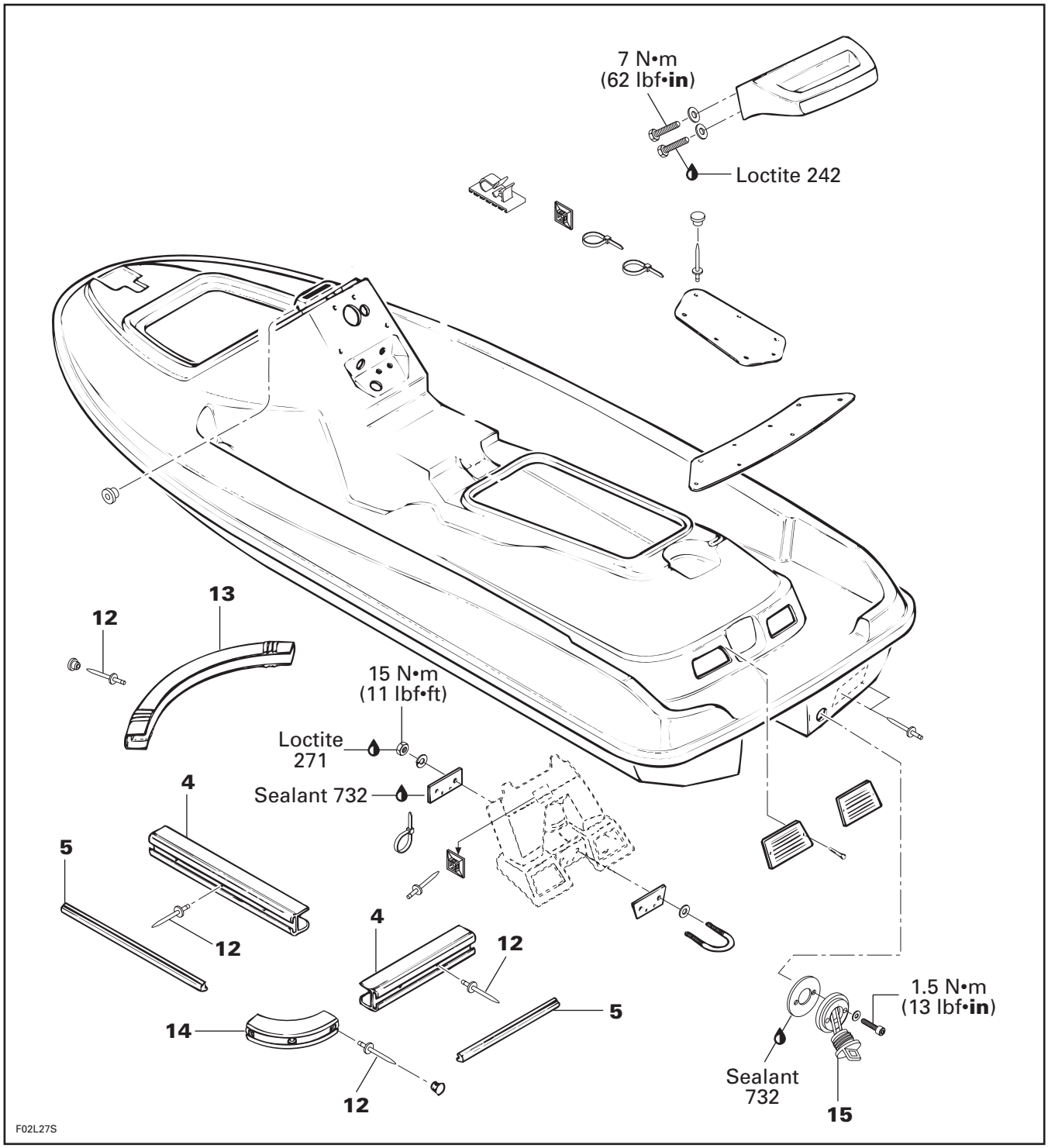
SPX Model



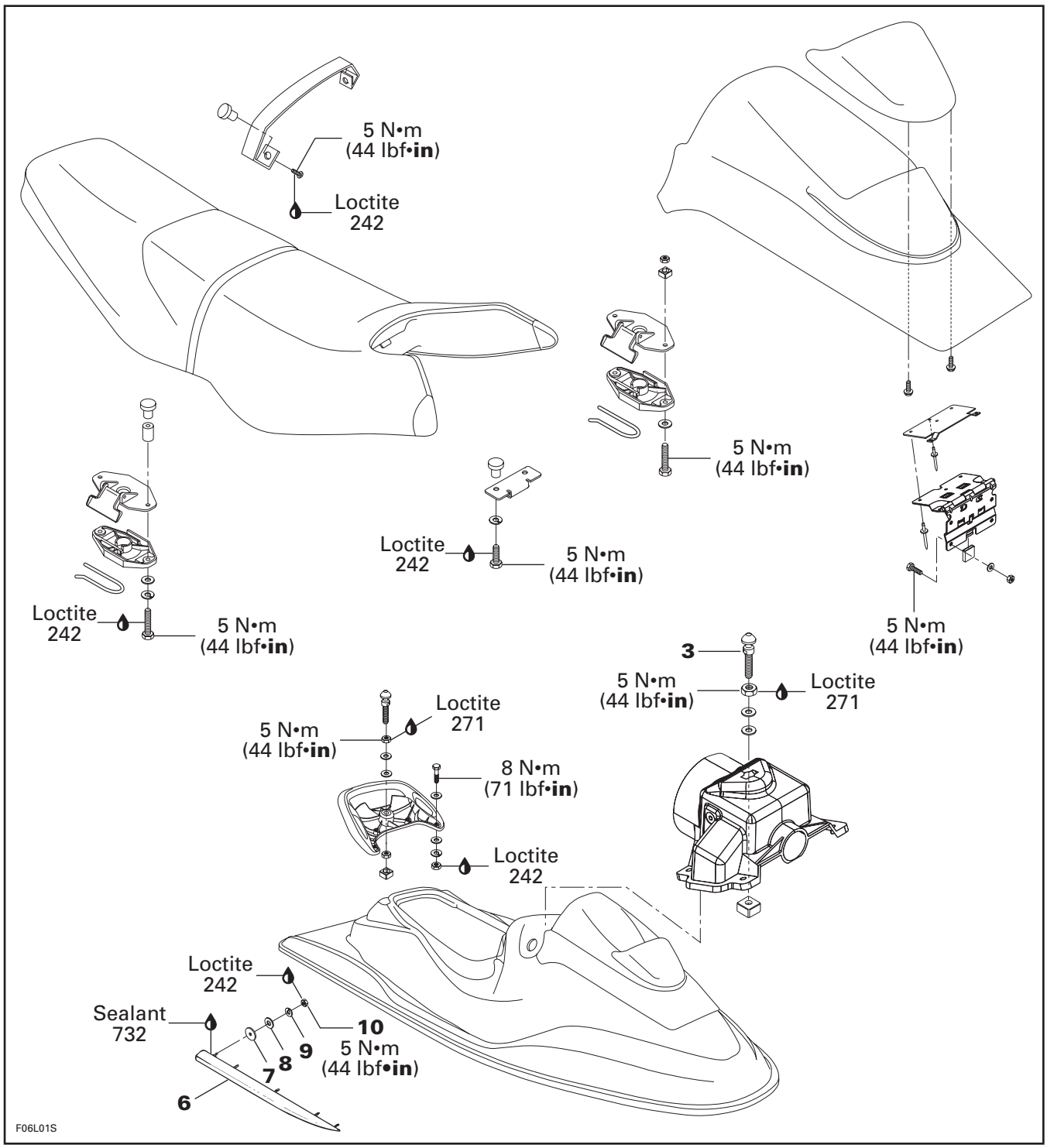

13
12
Loctite
242
6 N•m
(53 lbf•in)
15 N•m
(11 lbf•ft)
Sealant
732
Loctite
271
12
4
5
Loctite
271
Sealant
732
Sealant 732
12
14
4
12
5
15
1.5 N•m
(13 lbf•in)
F01L6IS

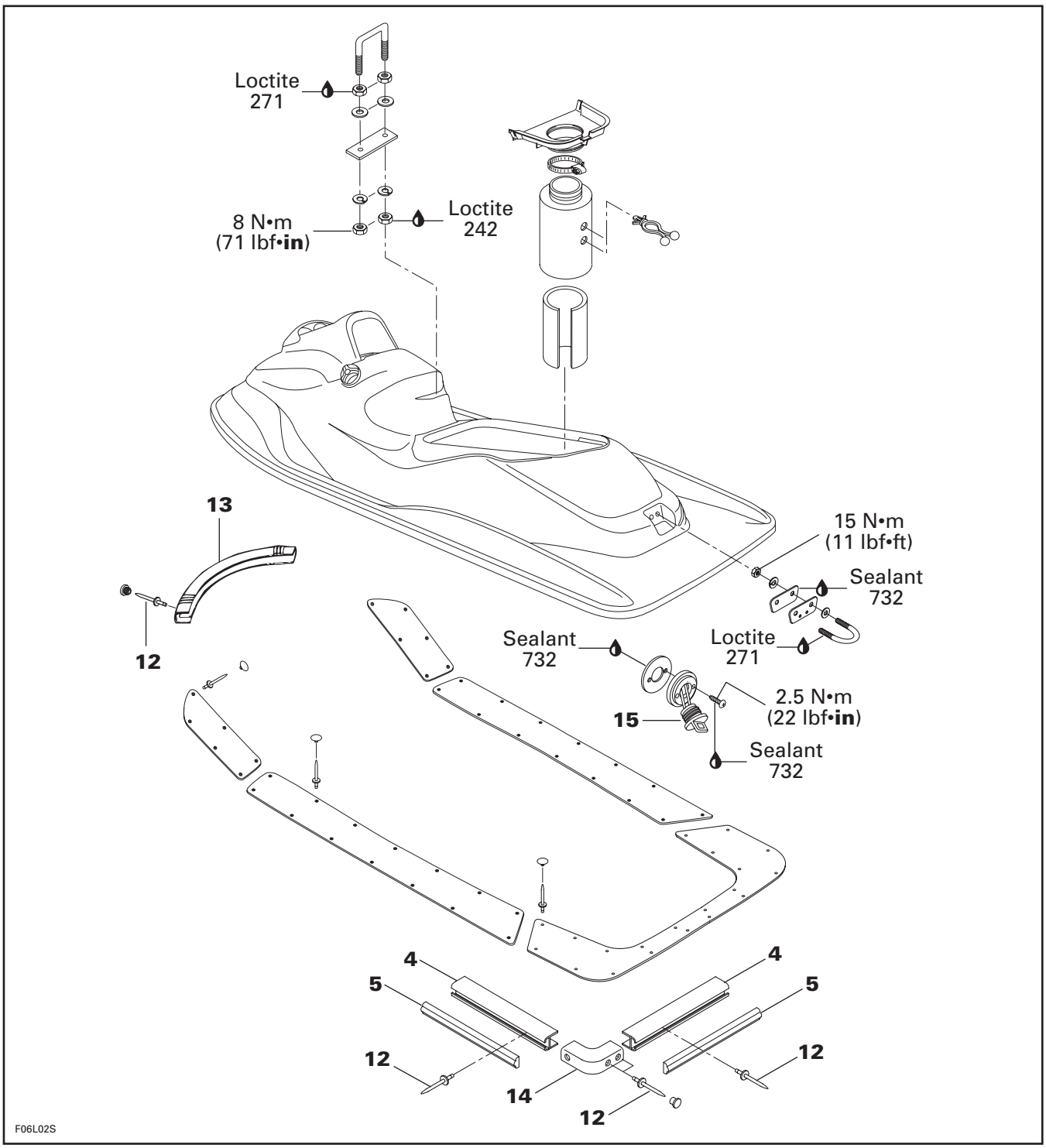
GTS Model


2
Loctite 271
5 N•m
(44 lbf•in)
1
Loctite
271
8 N•m
(71 lbf•in)
Loctite
242
3
Loctite
271
5 N•m
(44 lbf•in)
Loctite
242
Sealant
732
9
10
7
8
5 N•m
(44 lbf•in)
6
11
Sealant
732
15 N•m
(11 lbf•ft)
Loctite
271
F02L26S

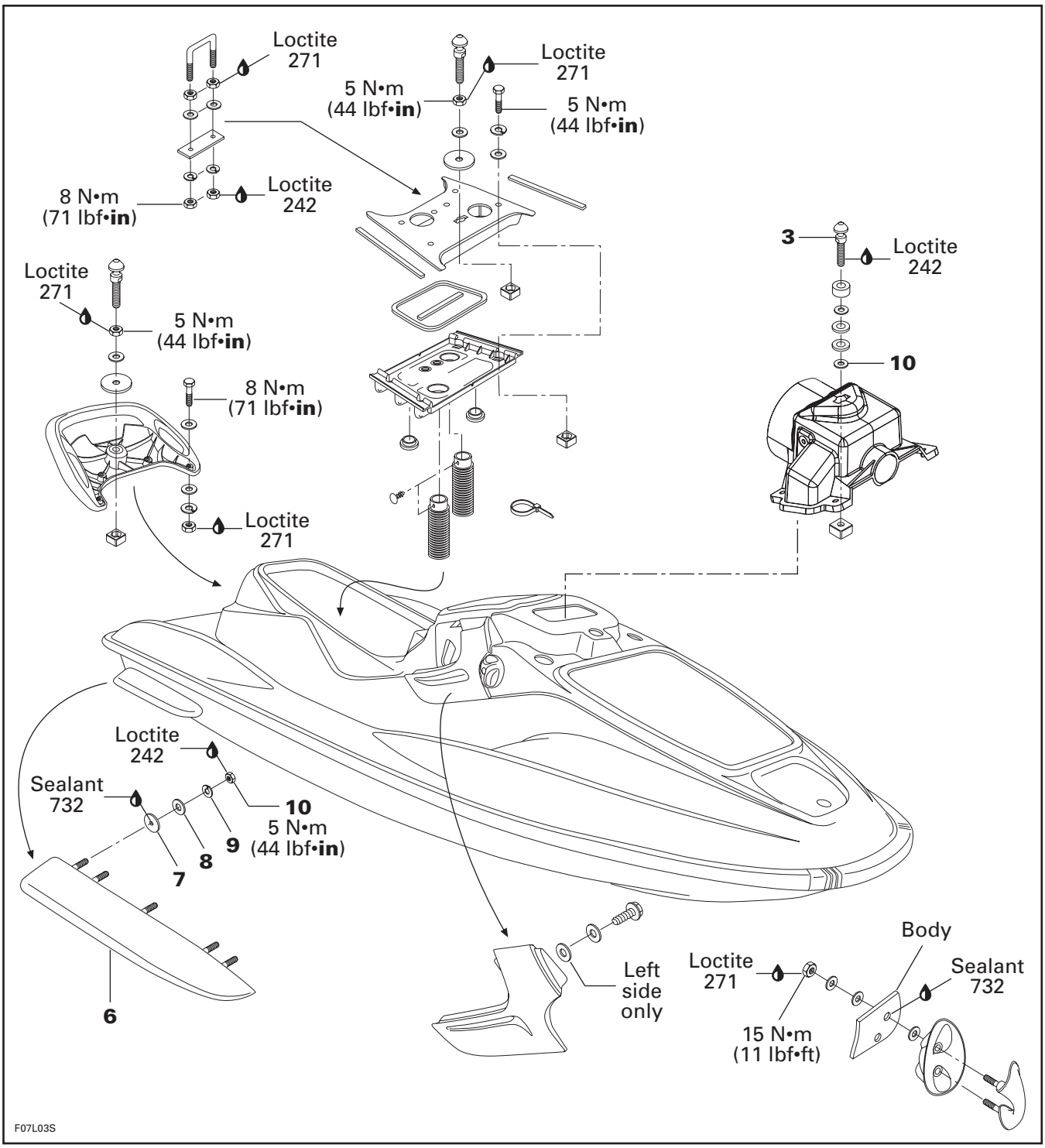

7 N•m
(62 lbf•in)
Loctite 242
13
12
15 N•m
(11 lbf•ft)
Loctite
271
Sealant 732
4
5
12
4
12
5
14
12
1.5 N•m
(13 lbf•in)
Sealant
732
15
F02L27S

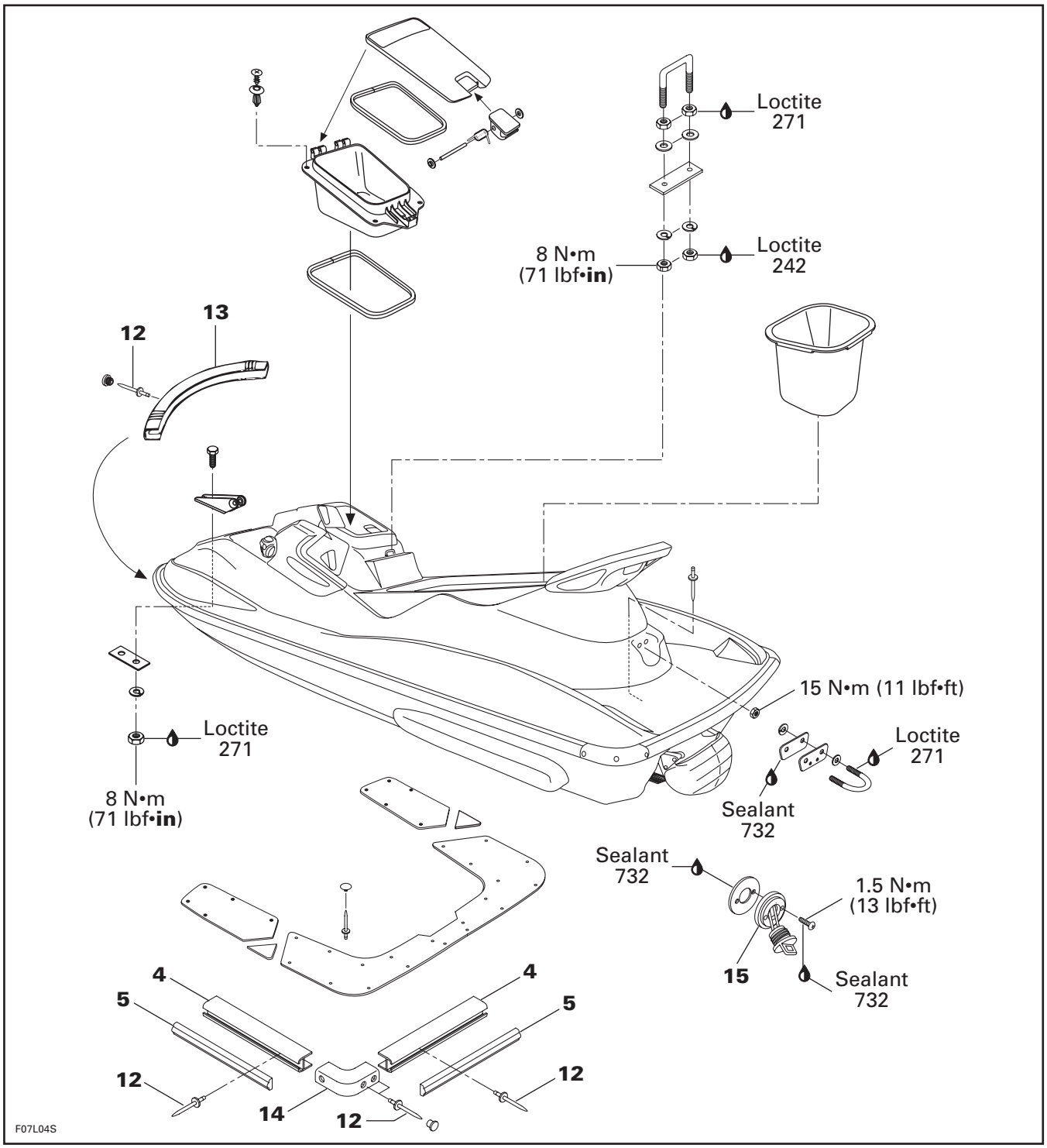
GS and GSX Limited

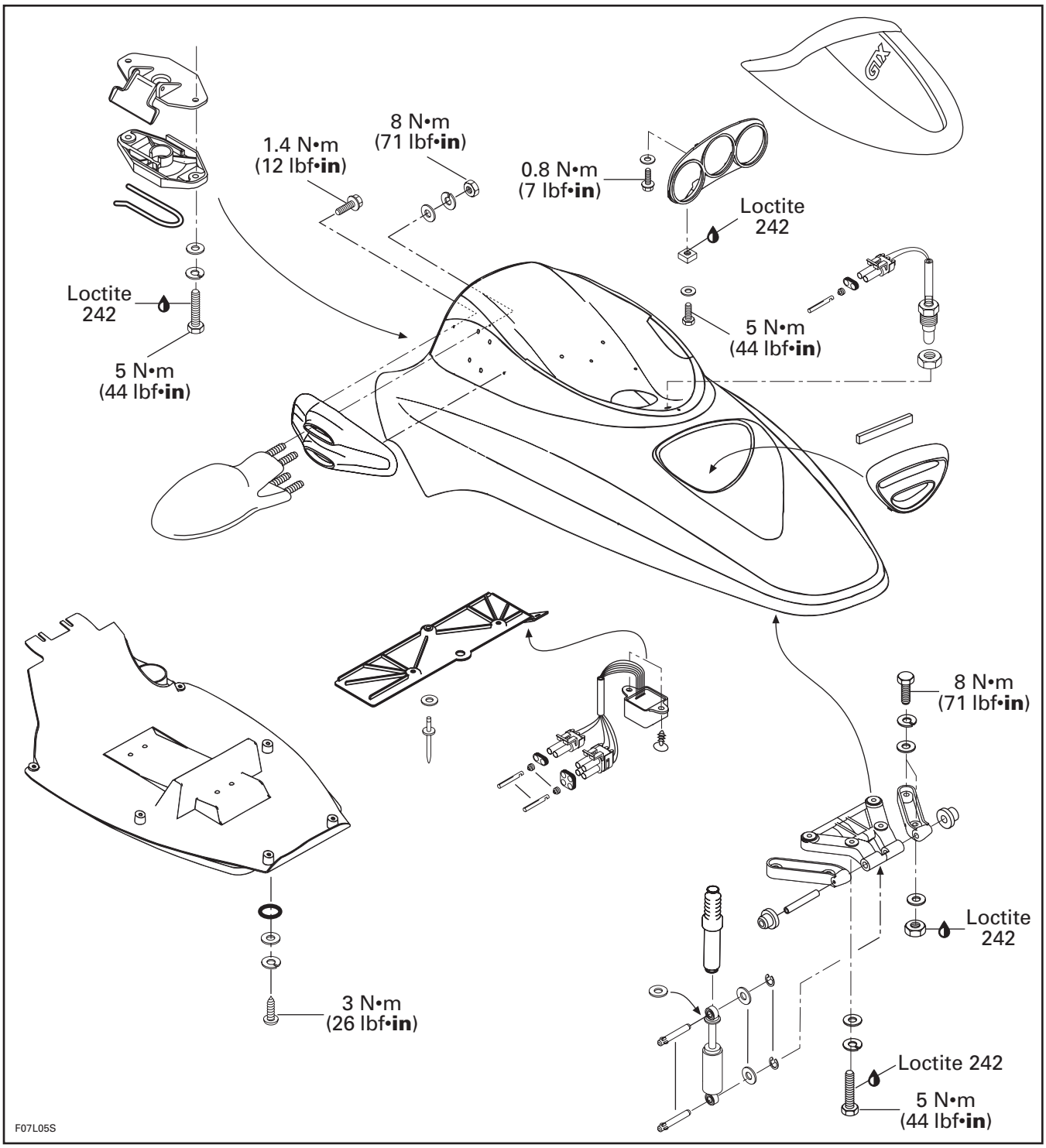


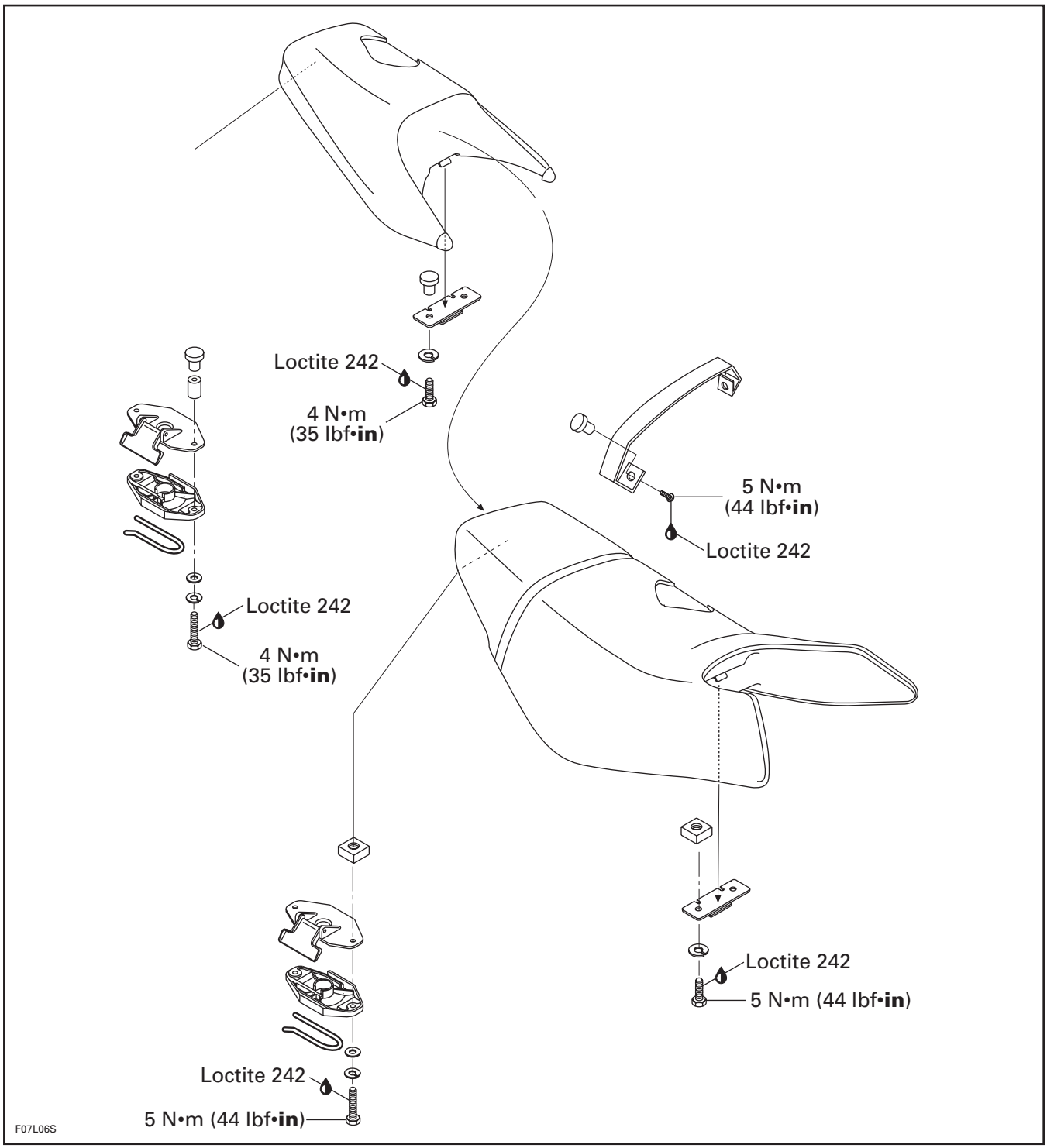

Loctite
271
8 N•m
(71 lbf•in)
Loctite
242
13
12
15 N•m
(11 lbf•ft)
Sealant
732
Loctite
271
Sealant
732
2.5 N•m
(22 lbf•in)
15
Sealant
732
4
5
12
14
12
4
5
12
F06L02S

GTI and GTX Limited

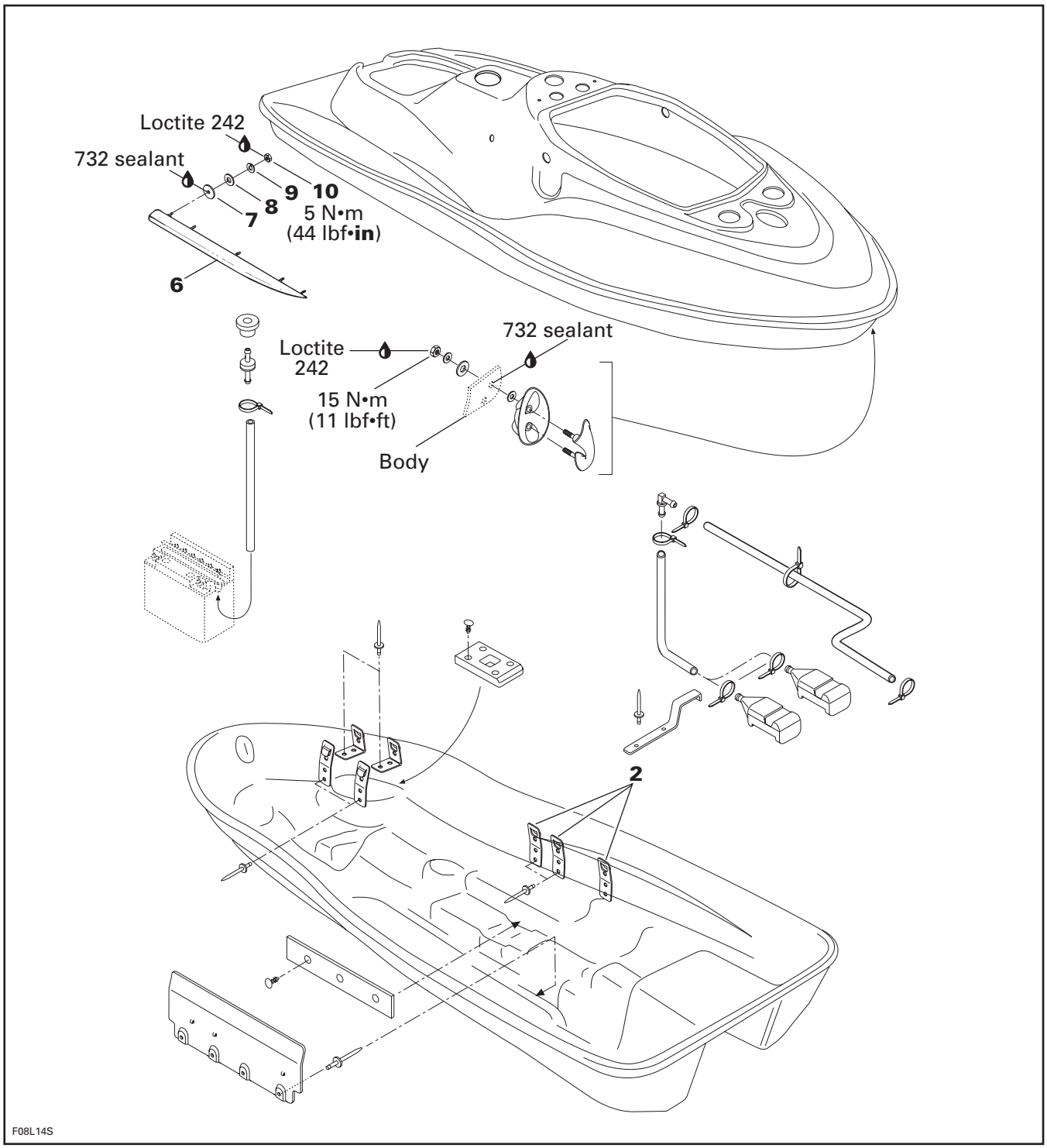


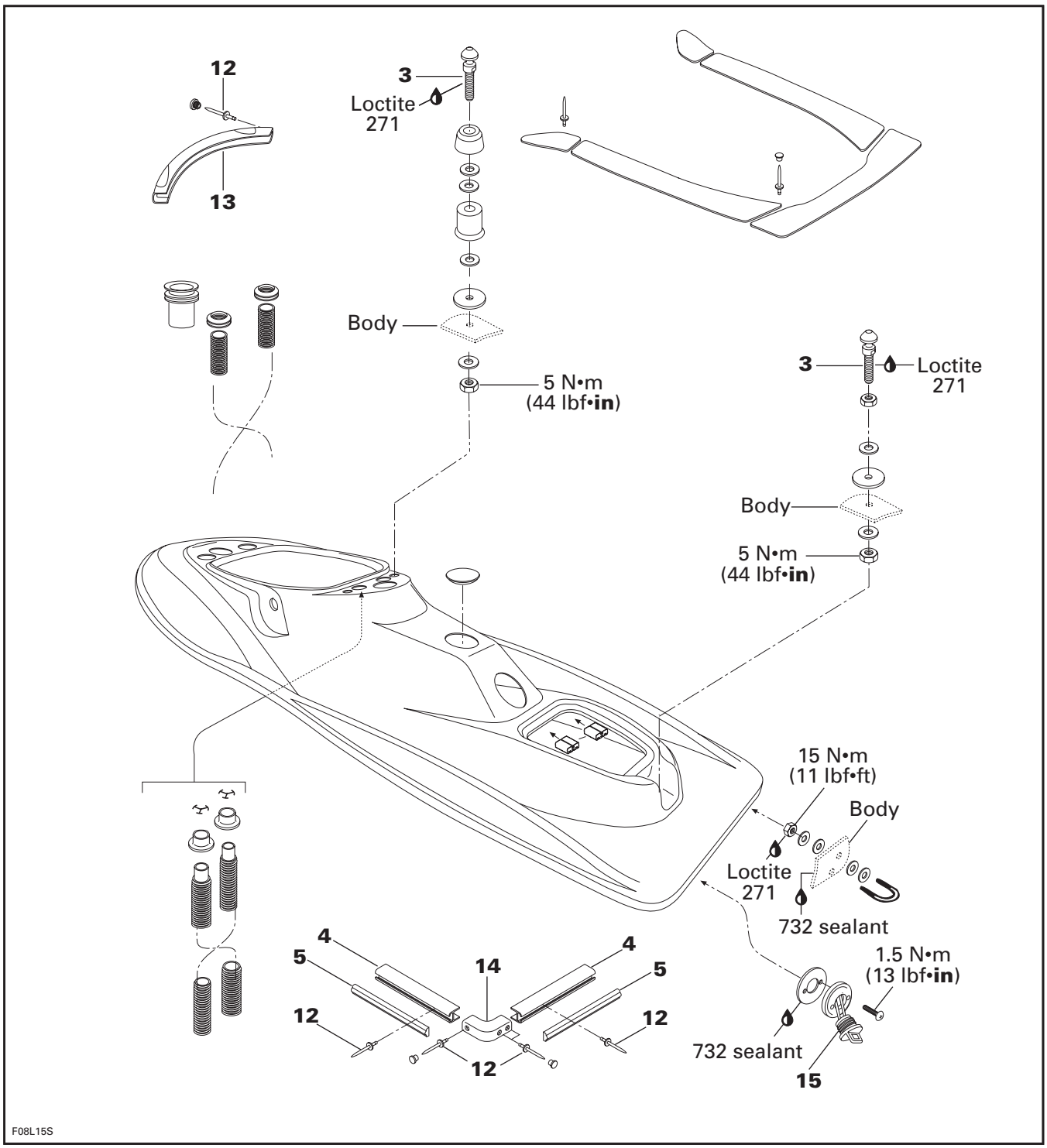

Loctite
271
8 N•m
(71 lbf•**in**)
Loctite
242
12
13
Loctite
271
8 N•m
(71 lbf•**in**)
15 N•m (11 lbf•ft)
Loctite
271
Sealant
732
Sealant
732
1.5 N•m
(13 lbf•ft)
15
Sealant
732
4
5
4
5
12
12
14
12
F07L04S

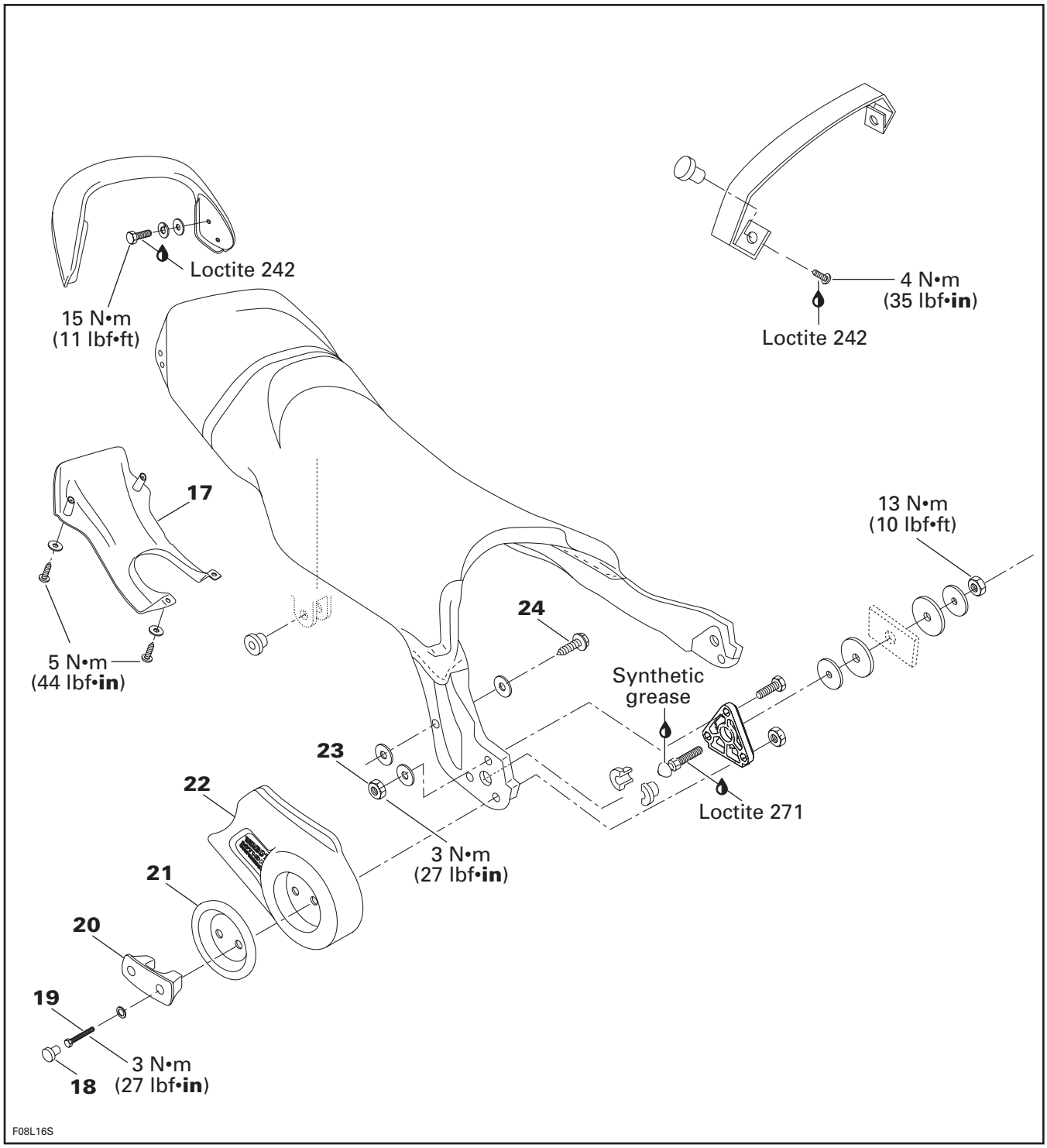

GTX
1.4 N•m
(12 lbf•in)
8 N•m
(71 lbf•in)
0.8 N•m
(7 lbf•in)
Loctite
242
Loctite
242
5 N•m
(44 lbf•in)
5 N•m
(44 lbf•in)
8 N•m
(71 lbf•in)
Loctite
242
3 N•m
(26 lbf•in)
Loctite 242
5 N•m
(44 lbf•in)
F07L05S

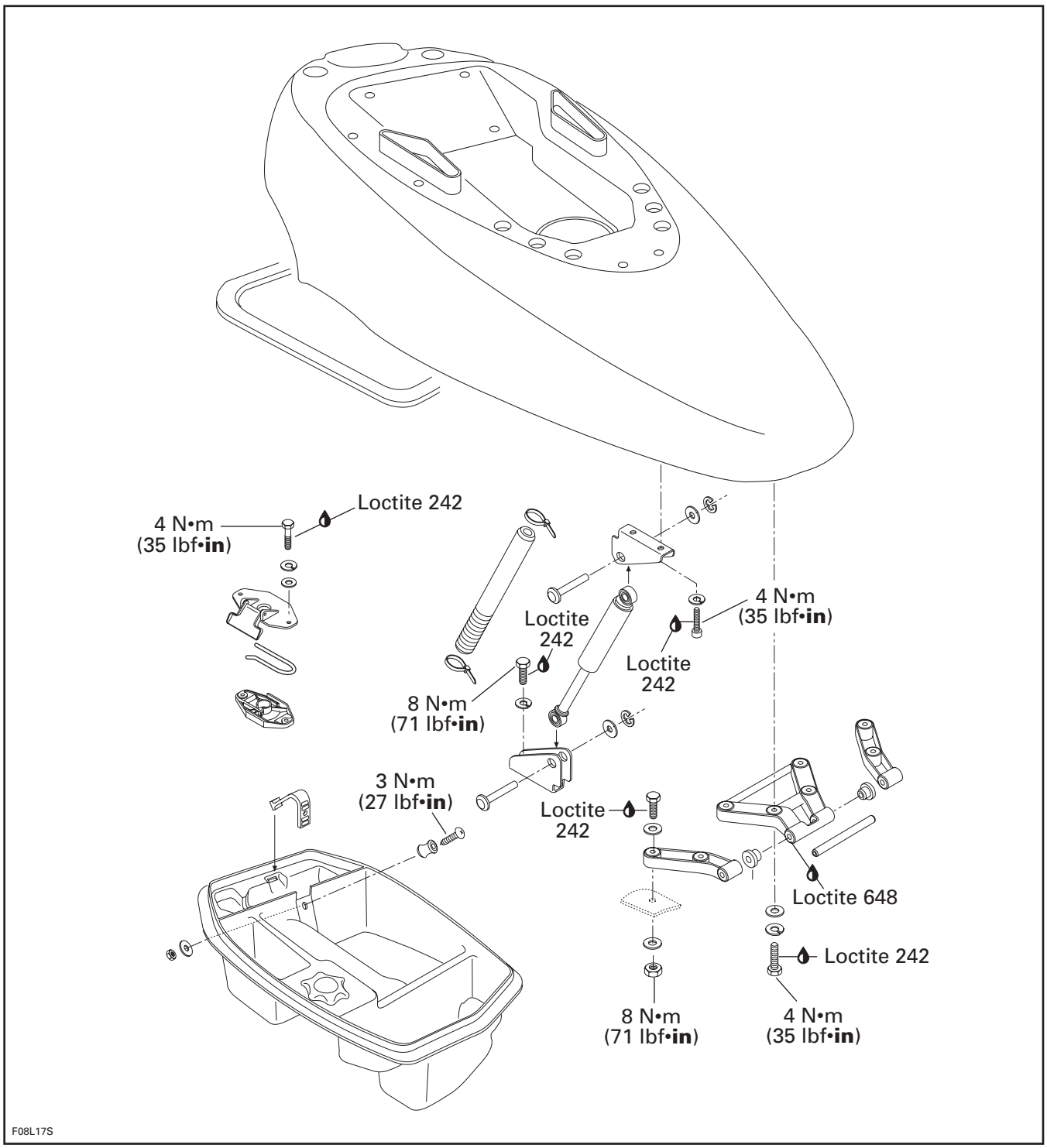

Loctite 242
4 N•m
(35 lbf•in)
5 N•m
(44 lbf•in)
Loctite 242
Loctite 242
4 N•m
(35 lbf•in)
Loctite 242
5 N•m (44 lbf•in)
Loctite 242
5 N•m (44 lbf•in)
F07L06S

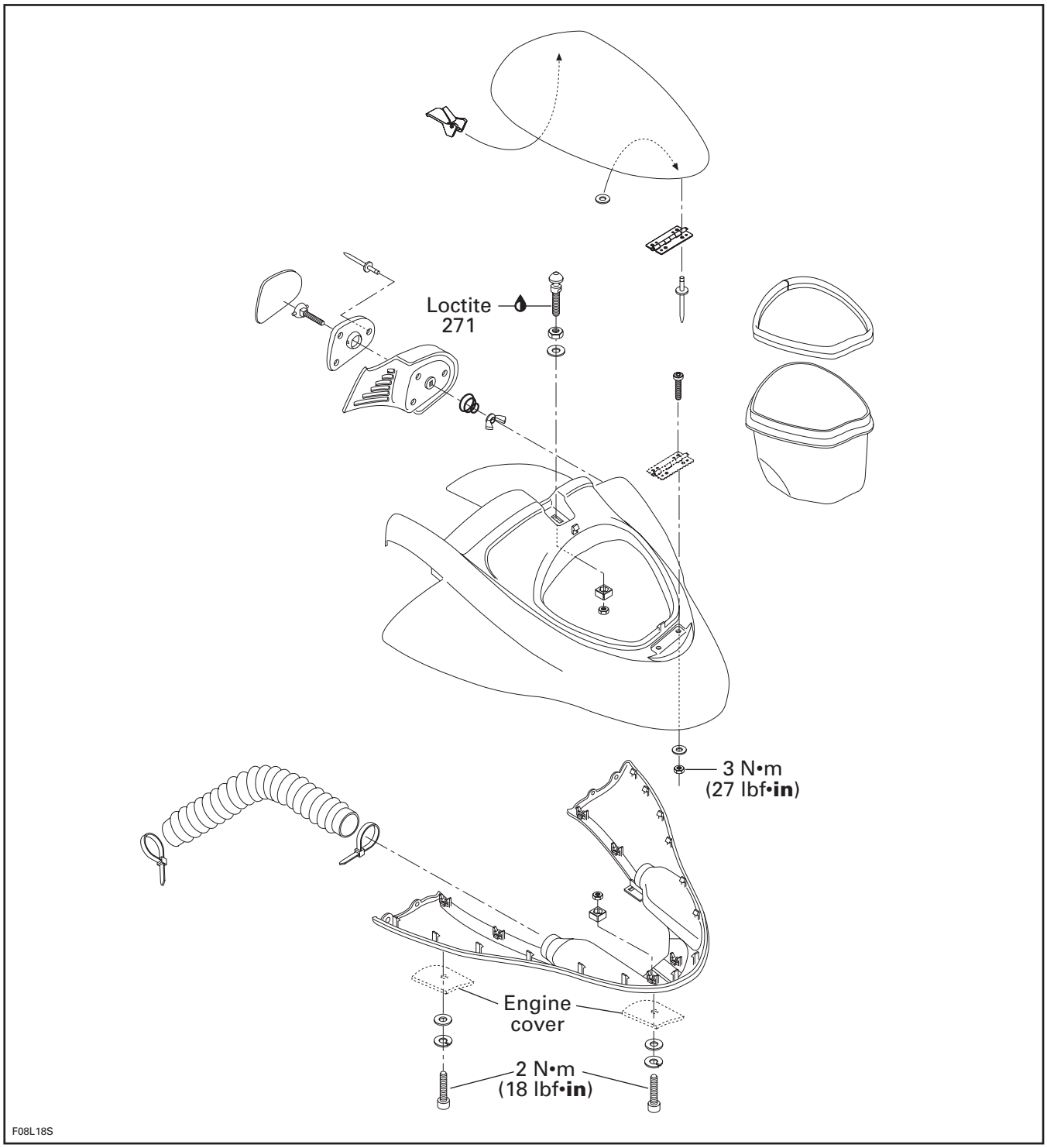
XP Limited

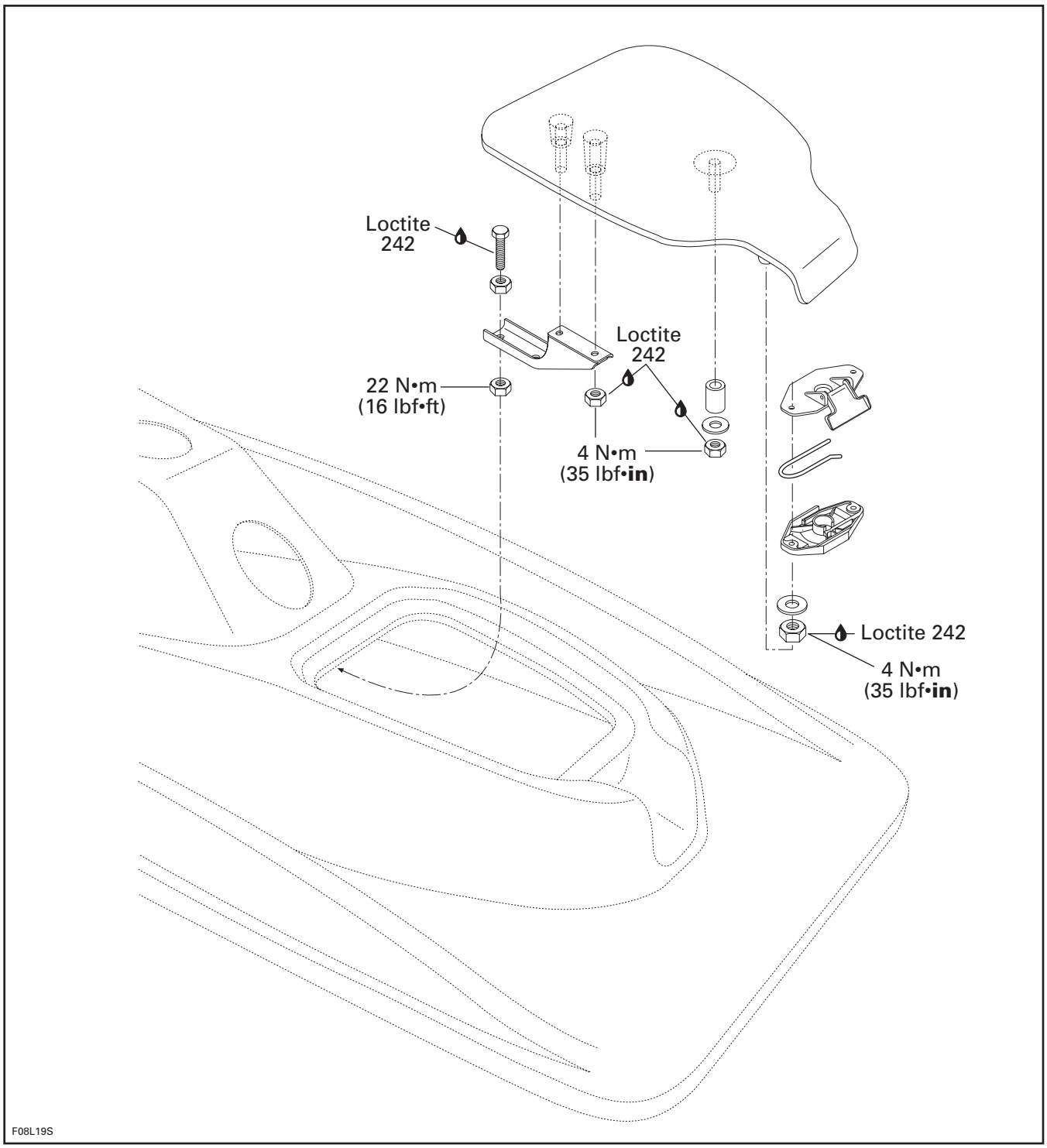

Loctite 242
732 sealant
9
10
8
7
5 N•m
(44 lbf•in)
6
Loctite
242
15 N•m
(11 lbf•ft)
732 sealant
Body
2
F08L14S


12
13
3
Loctite
271
Body
5 N•m
(44 lbf•in)
3
Loctite
271
Body
5 N•m
(44 lbf•in)
15 N•m
(11 lbf•ft)
Body
Loctite
271
732 sealant
1.5 N•m
(13 lbf•in)
732 sealant
15
4
5
14
12
12
4
5
12
F08L15S


Loctite 242
15 N•m
(11 lbf•ft)
4 N•m
(35 lbf•in)
Loctite 242
17
5 N•m
(44 lbf•in)
13 N•m
(10 lbf•ft)
24
Synthetic
grease
23
22
3 N•m
(27 lbf•in)
Loctite 271
21
20
19
3 N•m
(27 lbf•in)
18
F08L16S


4 N•m
(35 lbf•in)
Loctite 242
Loctite
242
8 N•m
(71 lbf•in)
4 N•m
(35 lbf•in)
Loctite
242
3 N•m
(27 lbf•in)
Loctite
242
Loctite 648
Loctite 242
8 N•m
(71 lbf•in)
4 N•m
(35 lbf•in)
F08L17S

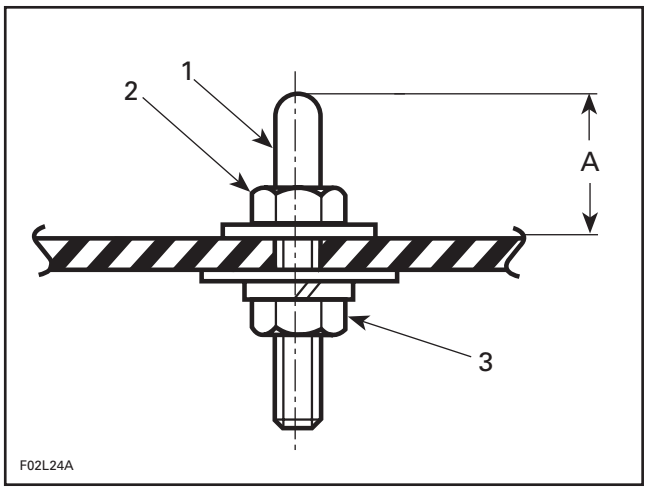

Loctite
271
3 N•m
(27 lbf•in)
Engine
cover
2 N•m
(18 lbf•in)
F08L18S


Loctite
242
Loctite
242
22 N•m
(16 lbf•ft)
4 N•m
(35 lbf•in)
Loctite 242
4 N•m
(35 lbf•in)
F08L19S

SEAT ADJUSTMENT

All Models Except the XP Limited

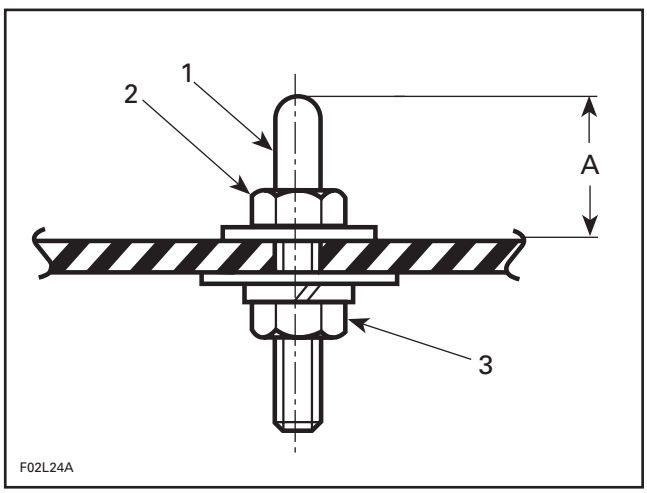
Adjust seat retainer no. 1 as per following specifications:



SPX, GTI AND GTX LIMITED

1. *Seat retainer*
2. *Adjustment nut (Loctite 271)*
3. *Nut (Loctite 242). Torque to 8 N•m (71 lbf•**in**)*

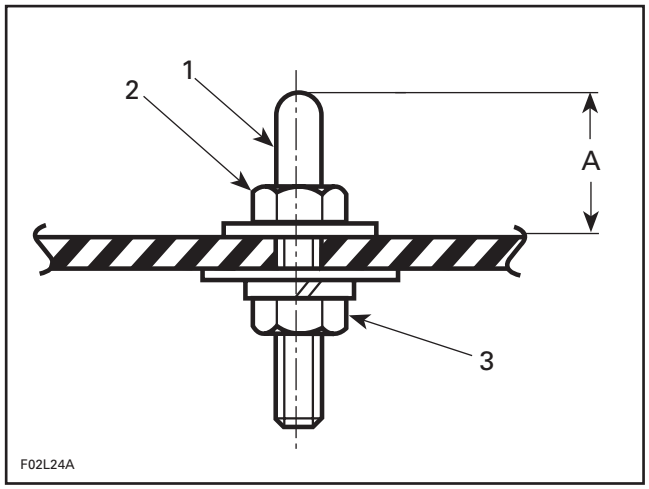
A. 25 ± 1 mm (63/64 ± 3/64 in)



GS AND GSX LIMITED

1. *Seat retainer*
2. *Adjustment nut (apply Loctite 271)*
3. *Nut (apply Loctite 242 and torque to 8 N•m (71 lbf•**in**)*

A. 21 ± 1 mm (53/64 ± 3/64 in)

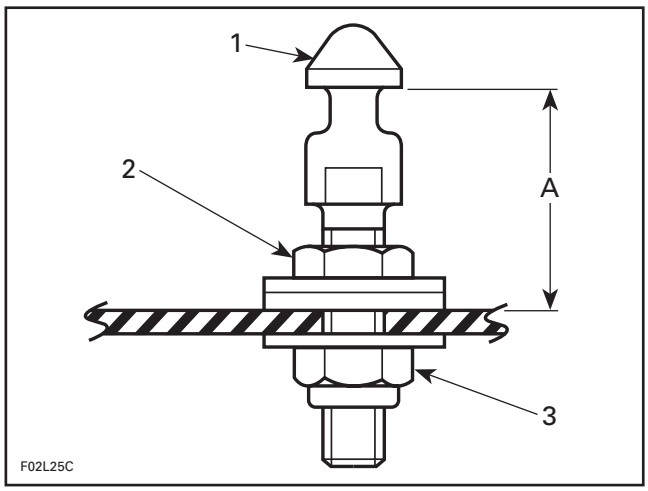


GTS MODEL

1. *Front hook*
2. *Adjustment nut (Loctite 271)*
3. *Nut (Loctite 242). Torque to 8 N•m (71 lbf•**in**)*

A. 22.5 (+ 1, - 0) mm (51/64 (+ 1/32, - 0) in)

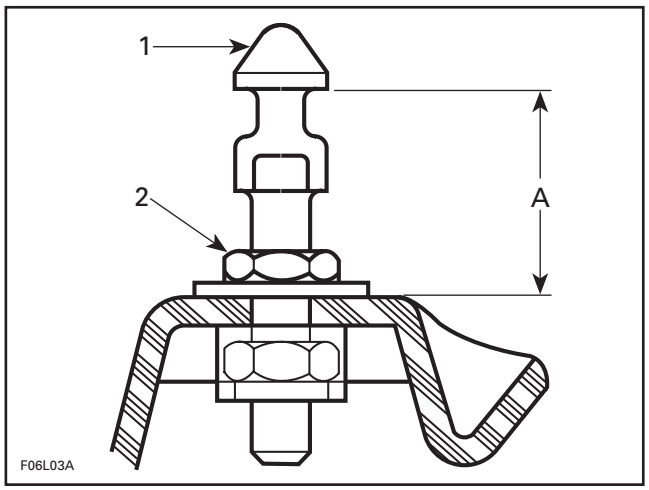
Adjust lock pin no. 2 as per following specifications:



SPX MODEL

1. *Lock pin*
2. *Adjustment nut (Loctite 271)*
3. *Lock nut. Torque to 5 N•m (44 lbf•**in**)*

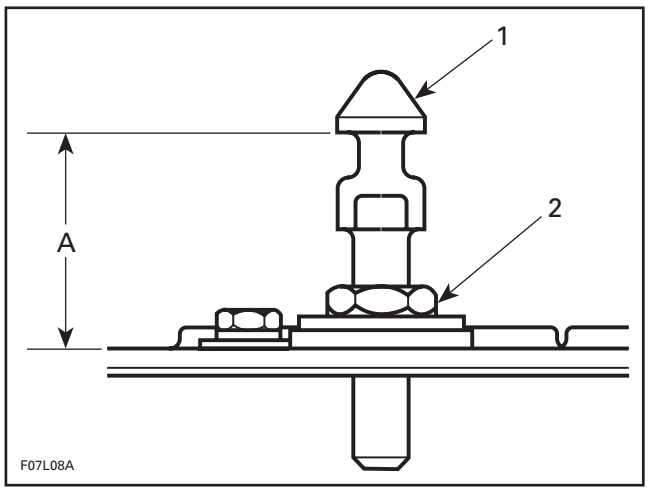
A. 37 ± 1 mm (1-29/64 ± 3/64 in)



GS AND GSX LIMITED

1. *Lock pin*
2. *Adjustment nut (apply Loctite 271)*

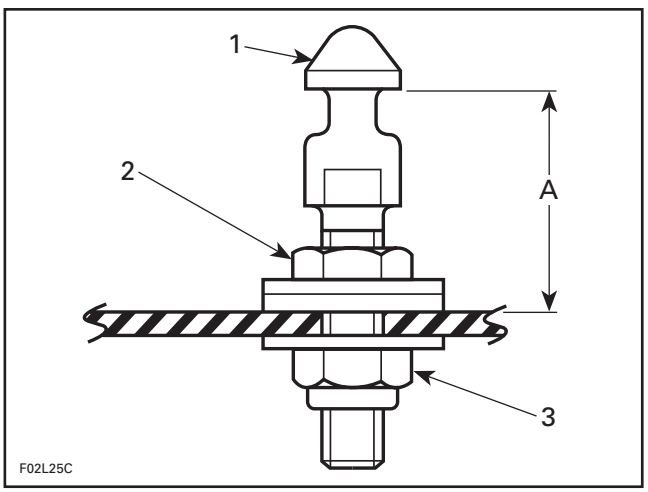
A. 33.5 ± 1 mm (1-5/16 ± 3/64 in)



GTI AND GTX LIMITED — FRONT SEAT

1. *Lock pin*
2. *Adjustment nut (Loctite 271)*

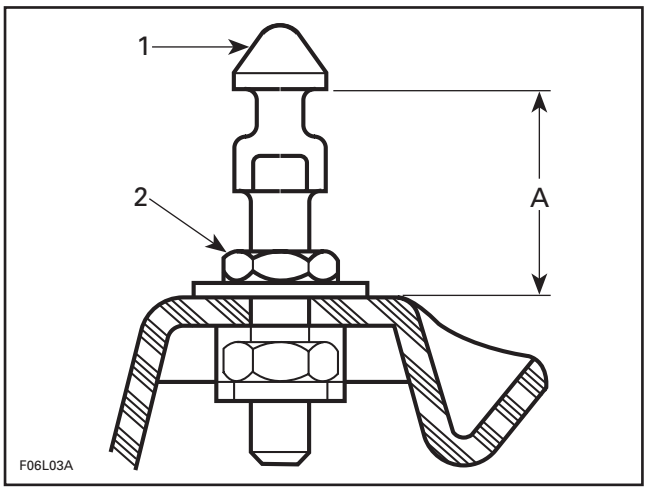
A. 39 ± 1 mm (1-35/64 ± 3/64 in)



GTS MODEL

1. *Lock pin*
2. *Adjustment nut (Loctite 271)*
3. *Lock nut. Torque to 5 N•m (44 lbf•**in**)*

A. 38 ± 1 mm (1-1/2 ± 3/64 in)



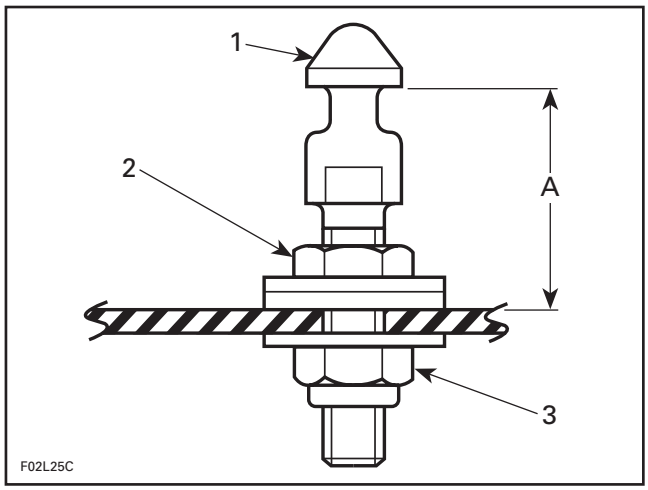
GTI AND GTX LIMITED — REAR SEAT

1. *Lock pin*
2. *Adjustment nut (apply Loctite 271)*

A. 33.5 ± 1 mm (1-5/16 ± 3/64 in)

STORAGE COMPARTMENT COVER ADJUSTMENT

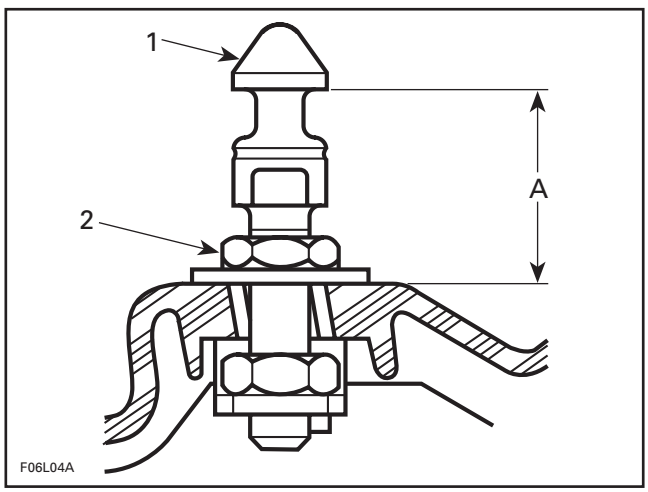
Adjust lock pin no. 3 as per following specifications:



SPX AND GTS MODELS

1. *Lock pin*
2. *Adjustment nut (Loctite 271)*
3. *Lock nut. Torque to 5 N•m (44 lbf•**in**)*

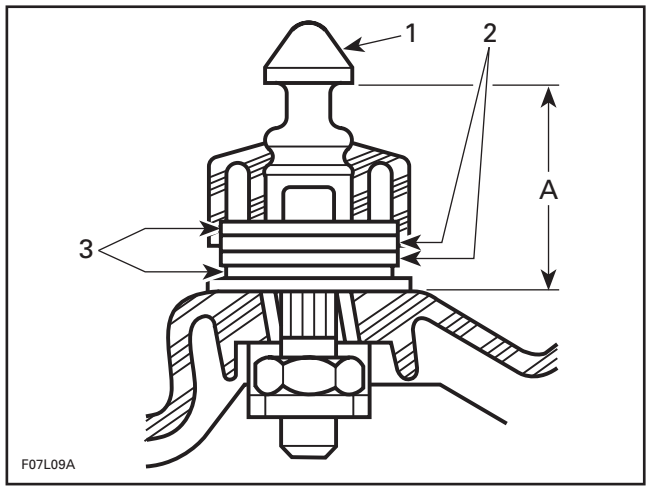
A. 37 ± 1 mm (1-29/64 ± 3/64 in)



GS AND GSX LIMITED

1. *Lock pin (apply Loctite 271)*
2. *Adjustment nut*

A. 34 ± 1 mm (1-11/32 ± 3/64 in)

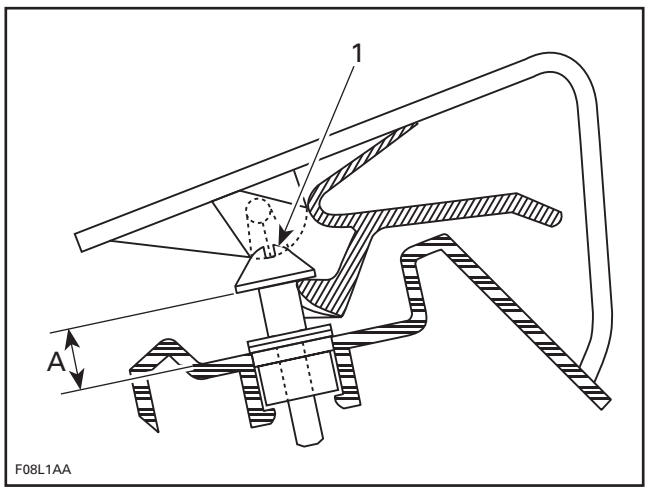


GTI AND GTX LIMITED

1. *Lock pin (apply Loctite 242)*
2. *Rubber washer*
3. *Flat washers*

A. 39.2 ± 1 mm (1-35/64 ± 3/64 in)

NOTE: The GTI and GTX Limited have a floating type lock pin. It is normal to have a front and aft play of the lock pin. To adjust, tighten lock pin until any vertical play is eliminated. Make sure a front and aft play remains when pressing by hands.



XP LIMITED

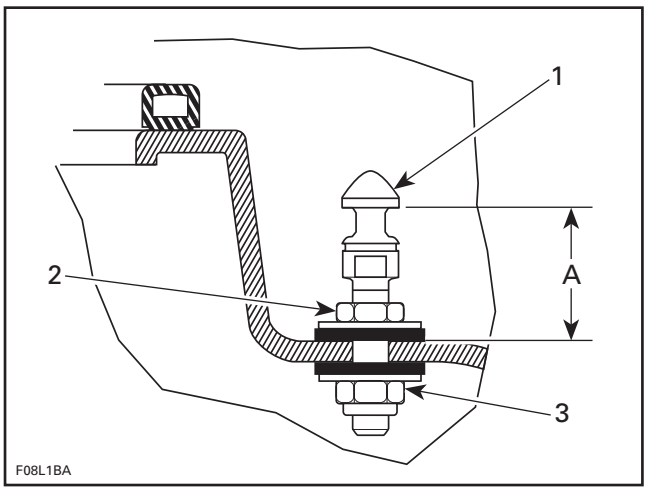
1. *Lock pin*

A. 13.4 mm (17/32 in)

ACCESS PANEL ADJUSTMENT

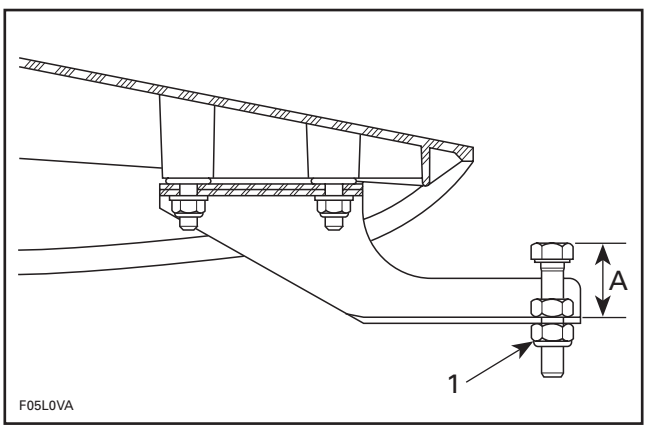
XP Limited

Adjust lock pin **no. 3** of access panel as per following specifications:



1. Lock pin
2. Adjustment nut (Loctite 271)
*3. Lock nut. Torque to 5 N•m (44 lbf•**in**)*
A. 39 ± 1 mm (1-17/32 ± 3/64 in)

Adjust bolts **no. 16** of access panel arms as per following specifications:



1. Lock nut. Torque to 22 N•m (16 lbf•ft)
A. 33 ± 1 mm (1-19/64 ± 3/64 in)

INLET GRATE REMOVAL

Loosen screws and remove inlet grate.

NOTE: An impact screwdriver should be used to loosen tight screws.

RIDING PLATE

Removal

Remove inlet grate.

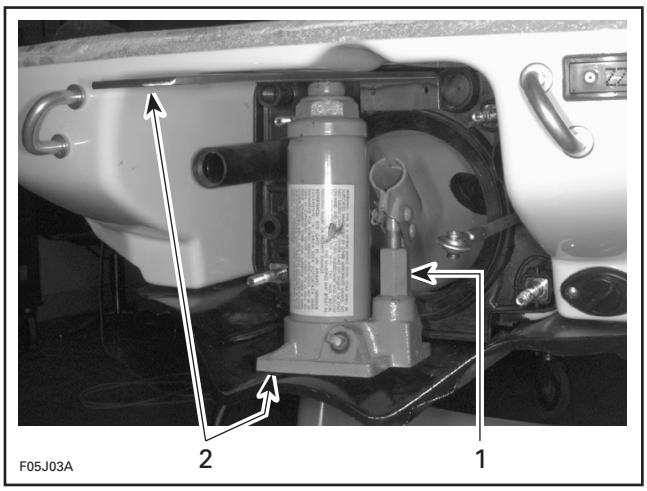
Remove jet pump. Refer to JET PUMP 09-02.

Remove the speed sensor from the riding plate (if applicable).

Loosen riding plate screws.

NOTE: An impact screwdriver should be used to loosen tight screws.

Using a low height hydraulic bottle jack and 2 steel plates, pry out riding plate.

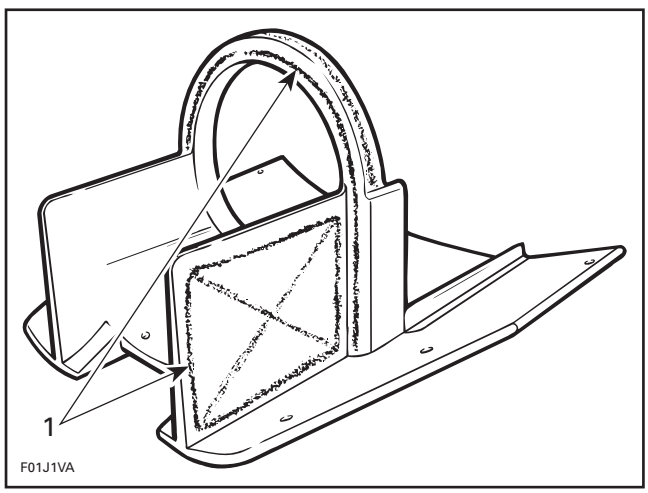


TYPICAL

1. Hydraulic bottle jack
2. Steel plates

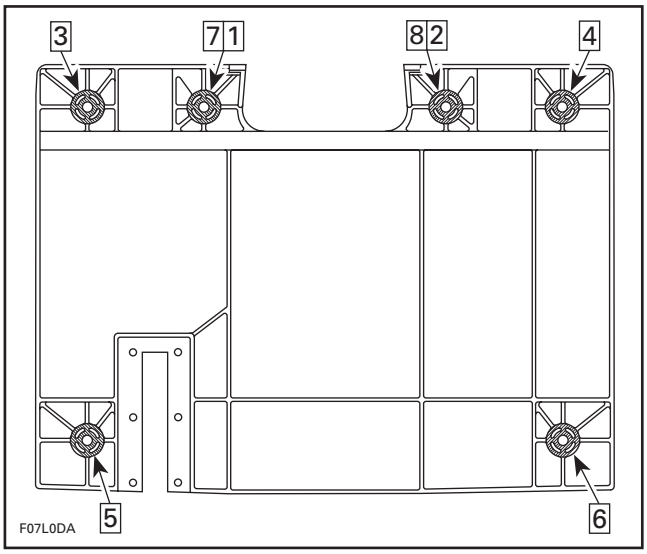
Installation

Apply Loctite "The Right Stuff Gasket" as indicated by the shaded areas in the next illustrations. Follow also the torquing sequence (if applicable) as shown in the same illustrations.

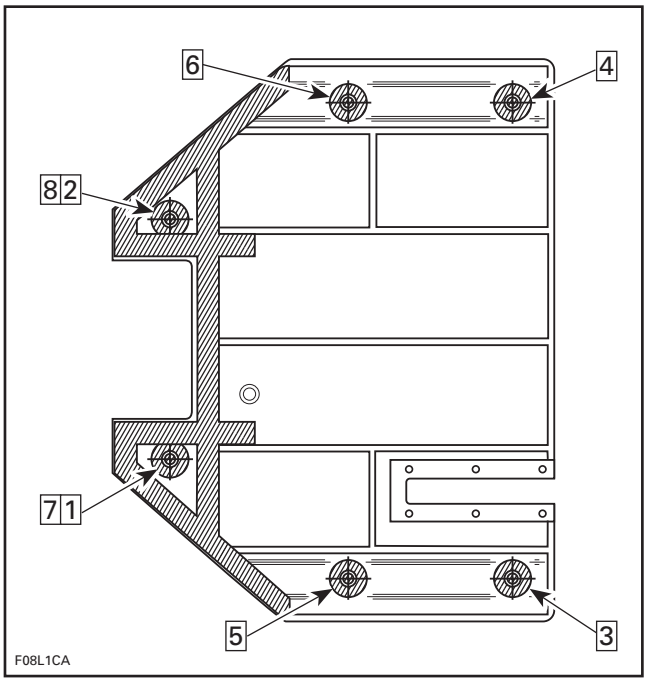


SPX AND GTS MODELS

1. Apply Loctite The Right Stuff Gasket as indicated by the shaded area



GS, GSX LIMITED, GTI AND GTX LIMITED



XP LIMITED

JET PUMP SUPPORT

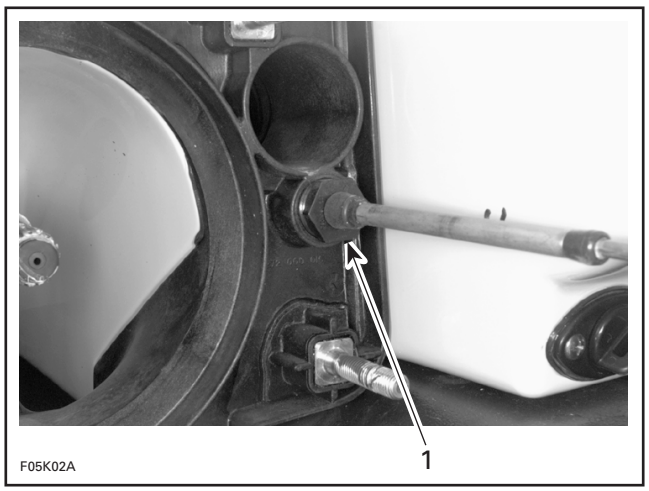
All Models Except SPX and GTS

Removal

Remove jet pump. Refer to JET PUMP 09-02.

Remove inlet grate and riding plate.

Remove ball joint, boot, nut, half rings and O-rings from steering cable.



TYPICAL

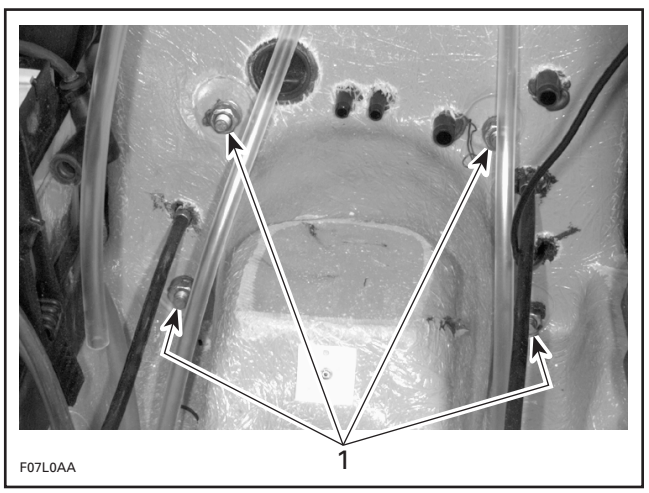
1. Unscrew nut

Remove ball joint, boot, nut, half rings and O-rings from reverse cable (GTI and GTX Limited).

Remove boot and nut from VTS sliding shaft (GSX Limited and XP Limited).

Disconnect water supply hose, water return hose and bailer hoses.

Remove nuts, lock washers and flat washers retaining jet pump support.



TYPICAL

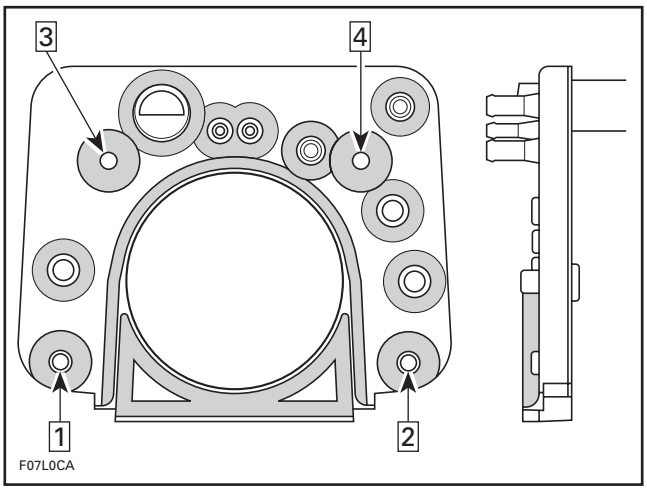
1. Remove nuts

Using a heat gun, heat jet pump support until it is possible to pull it.

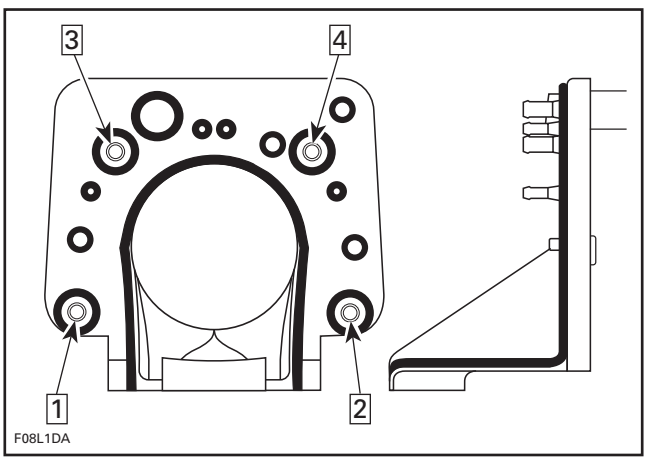
NOTE: Shims may have been installed between support and body. Do not remove these shims, otherwise jet pump alignment will be altered.

Installation

Apply Loctite The Right Stuff Gasket as indicated by the shaded areas in the next illustrations. Follow also the torquing sequence as shown in the same illustrations.



GS, GSX LIMITED, GTI AND GTX LIMITED



XP LIMITED

DEFLECTOR

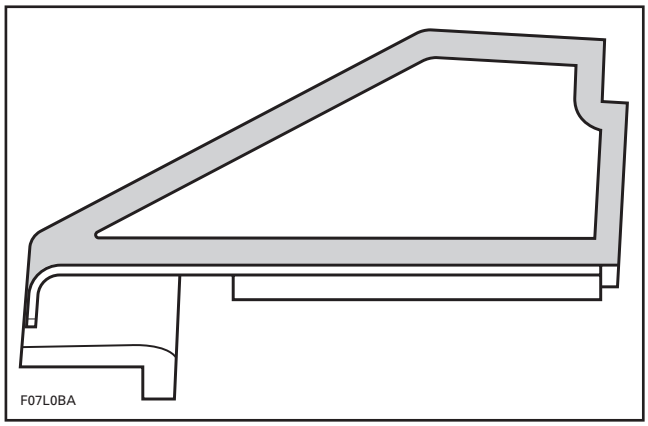
GS, GSX Limited, GTI and GTX Limited

Removal

Using a heat gun, heat deflector and pry it using a piece of wood.

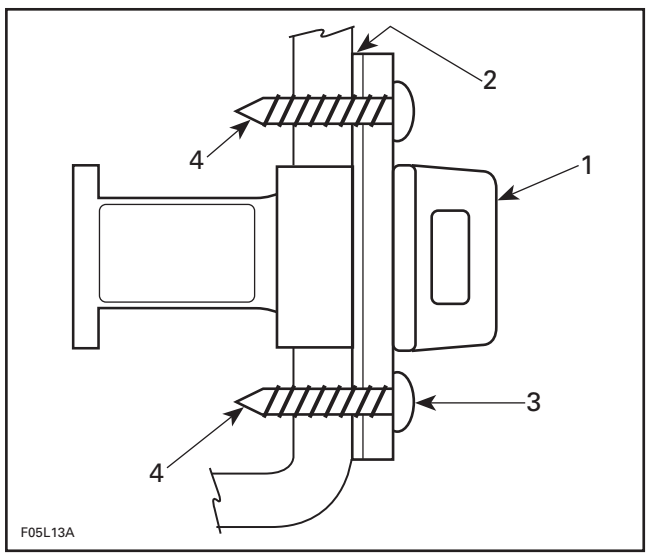
Installation

Apply Loctite 598 Ultra Black as indicated by the shaded area in the following illustration.



DRAIN PLUG INSTALLATION

Refer to the following illustration to install drain plug no. 15.

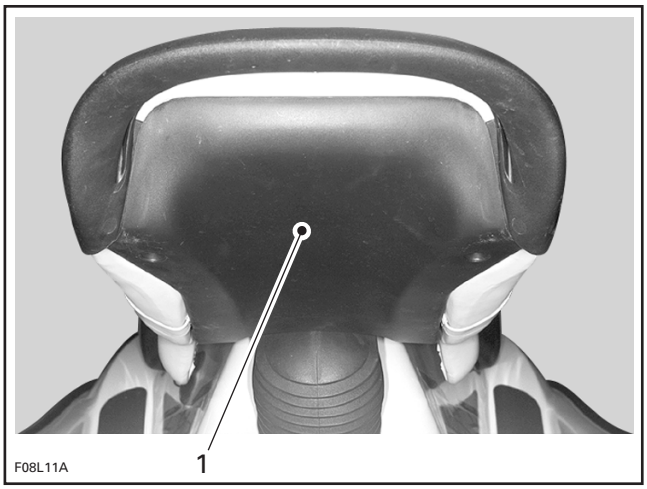


1. *Drain plug*
2. *Gasket and 732 sealant*
3. *Torque screws to 1.5 N•m (13 lbf•**in**)*
4. *From inside bilge, apply 732 sealant on screws*

SEAT REMOVAL

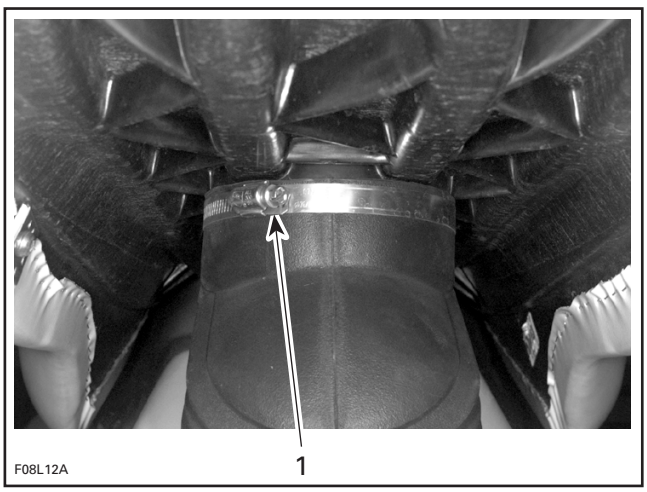
XP Limited

Loosen 4 screws and remove bottom cover no. 17 of seat.



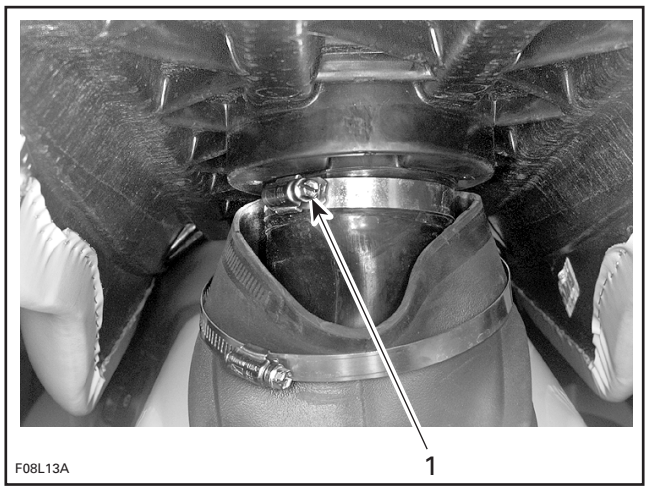
1. Remove cover

Loosen gear clamp of outer boot; then, pull outer boot downward.



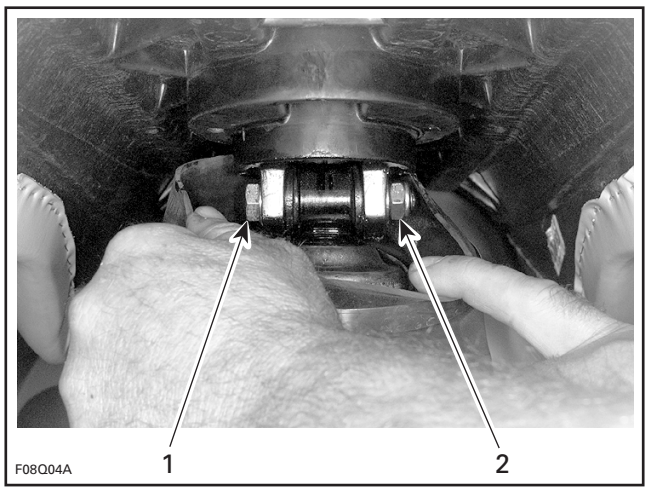
1. Loosen gear clamp

Loosen gear clamp of inner boot; then, pull boot downward.



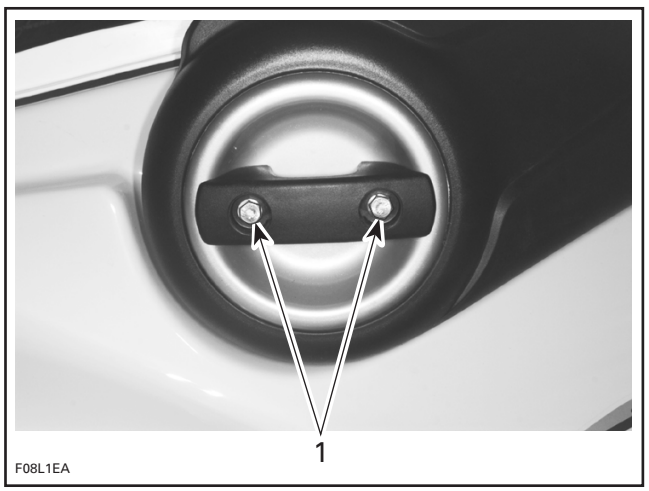
1. Gear clamp

Remove bolt and lock nut from shock absorber upper support.



1. Bolt
2. Lock nut

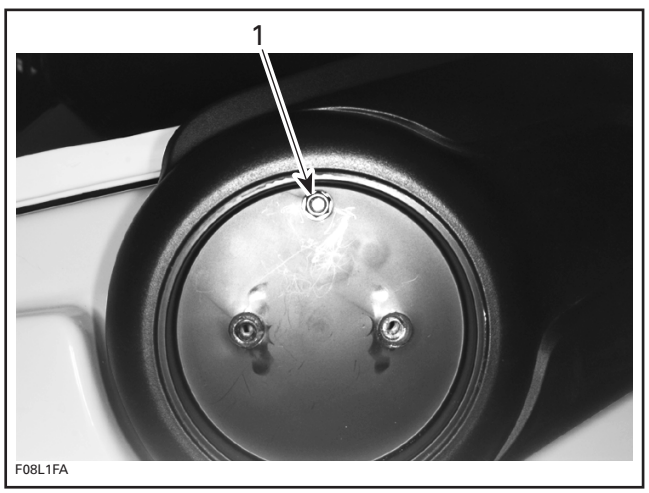
Remove protective caps **no. 18** and loosen screws **no. 19** to remove eyelet **no. 20** on each side of seat.



1. Loosen screws of eyelet

Remove cup **no. 21** on each side of seat.

Loosen nut **no. 23** on each side of seat.



1. Loosen nut

Tilt seat.

Loosen screws **no. 24** on each side of seat retaining the side covers.

Lower seat.

Remove side covers.

Pull seat frame out of pivots.

Remove seat.

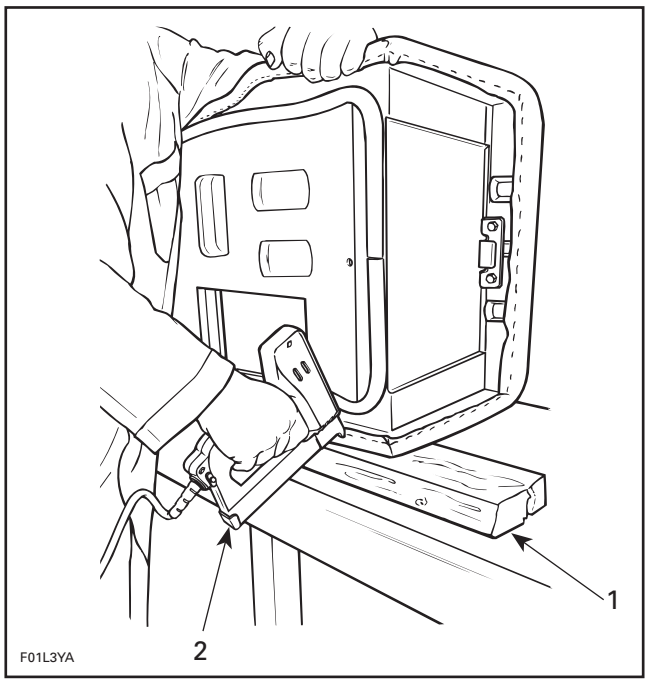
Seat installation is essentially the reverse of removal procedure. Refer to the main illustration of seat at the beginning of this subsection for proper torque specifications and service products to be used.

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.



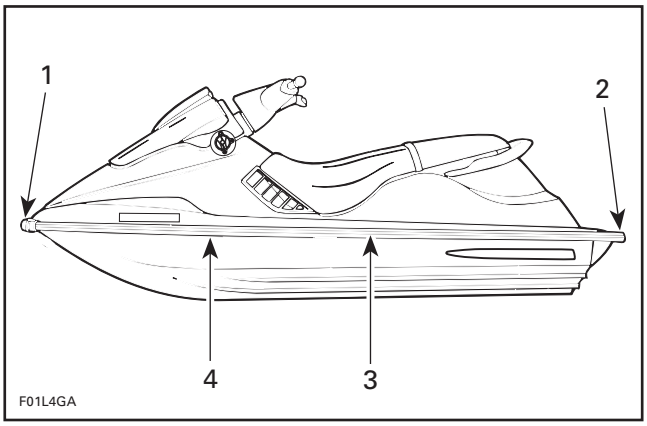
TYPICAL

1. Piece of wood
2. ETN-50 (electric) or T-50 (manual)

After cover installation cut all around the excess of material.

BUMPER REPLACEMENT

1. Remove trim **no. 5** from side bumper rail **no. 4**.
2. Drill pop rivets **no. 12** to remove side bumper rail **no. 4**.
3. Mark hole positions on body straight and bow sections.



TYPICAL

1. *Front bumper*
2. *Corner bumper*
3. *Straight section*
4. *Bow section*

4. Slide bumper rail **no. 4** under front bumper **no. 13**.
5. Using a 4.80 mm (3/16 in) drill bit, drill first hole through bumper rail **no. 4** at front of bow section. Use locating mark as a guide. Then install a rivet **no. 12**.

▼ CAUTION

When drilling, be careful not to damage bumper rail and/or hull.

6. Position bumper rail **no. 4** properly onto body and cut excess length if necessary.
7. Slide bumper rail **no. 4** in corner bumper **no. 14**.
8. Using hole positions previously marked on body, drill holes in bumper rail **no. 4** and install rivets **no. 12**.
9. Install trim **no. 5** using soapy water.
10. Repeat procedure for the other side.

SPONSON REPLACEMENT

Remove seat (access cover for the XP Limited).

Remove air vent tube support (SPX, GS and GSX Limited).

Remove seat support (GTI and GTX Limited).

Remove muffler.

Remove battery.

From bilge, unscrew sponsons **no. 6** using a 10 mm deep socket with an extension.

Remove sponsons **no. 6**. Clean any residues of sealant adhesive on hull.

Install gaskets **no. 7** on new sponsons **no. 6**.

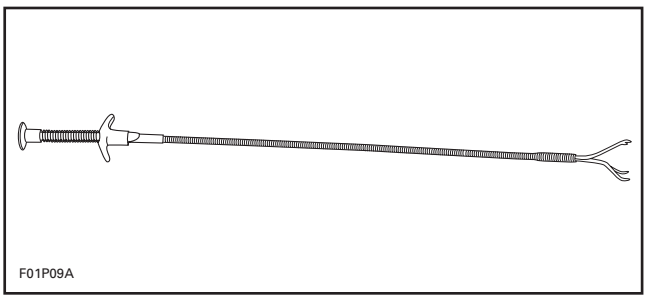
Apply 732 sealant (P/N 293 800 006) or sealant adhesive (P/N 293 800 033) around sponson studs.

Apply Loctite 242 (blue) on sponson studs.

Install sponsons **no. 6** on hull.

From bilge, first insert flat washers **no. 8** over sponson studs, then lock washers **no. 9**. Secure with lock nuts **no. 10**. 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 removed parts.

Clean hull and sponsons of any sealant adhesive surplus.

◆ WARNING

Recommended torques and use of Loctite must be strictly followed.

BAFFLE SEALING

GTS Model

Apply Sikaflex primer 449 (P/N 293 530 012) on rear baffle **no. 11** 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.

ENGINE COVER REMOVAL

XP Limited

Disconnect throttle and choke cables at carburetor linkage.

Disconnect wiring harnesses of start/stop button, monitoring beeper, safety lanyard switch and gauges.

Loosen bolts and nuts of hinge from watercraft body.

Disconnect the gas assist cylinder.

Remove engine cover.

Engine cover installation is essentially the reverse of removal procedure. Refer to the main illustration of engine cover at the beginning of this subsection for proper torque specifications and service products to be used.

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 ACRYLI-CLEAN DX 330 from PPG or equivalent (refer to manufacturer instructions).

For best result apply an activator (P/N 293 530 036) to prepare the surface using a clean cloth. After a few seconds, when the activator evaporates, the surface is ready.

Using a pencil and the decal as a template mark the area where decal will be located.

For better adhesion a dry application is recommended, however, to ease decal installation a mild solution of soapy water can be sprayed over surface where decal will be installed.

Remove back protective film from decal and align decal with marks. When well aligned squeegee decal beginning at center and working outward using firm, short, overlapping strokes.

Remove front protective film once decal has adhered to hull.

INSTALLATION ON PLASTIC (STORAGE COVER)

Clean surface with isopropyl alcohol.

Using a pencil and the decal as a template, mark the area where decal will be located.

Apply an activator (P/N 293 530 036) to prepare the surface using a clean cloth. After a few seconds, when the activator evaporates, the surface is ready.

▼ CAUTION

Do not use soapy water to locate decal on plastic parts.

Remove back protective film from decal and carefully align decal with marks. When well aligned squeegee decal beginning at center and working outward using firm, short, overlapping strokes.

Remove front protective film once decal has adhered.

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.

NOTE: Fiberglass repair kit is available through automotive or marine suppliers. Gelcoat repair kits are available through regular channel.

◆ 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.

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.

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.

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.

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. Finish off using a fine compound. While buffing, pay close attention to avoid overheating the surface.

Blisters

Possible causes:

– Insert 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, follow the same repair procedure as for air bubbles. If they are numerous and in close concentration, spray liquid gelcoat to achieve proper repair. This procedure is covered in **Minor Gelcoat Fractures**.

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 Compound Fractures.

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.

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.

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.

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. Finish off using a fine 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**.

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

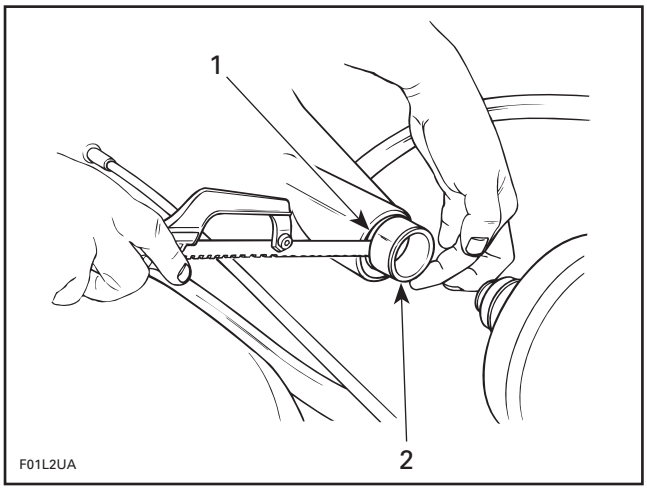
Materials

- fiberglass mat
- fiberglass cloth
- polyester resin
- cardboard
- masking tape
- sandpaper (100-grit, 220-grit, 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

HULL INSERT REPAIR

For hull insert repair proceed as follows:

Cut plastic hull insert flush with hull using a saw.



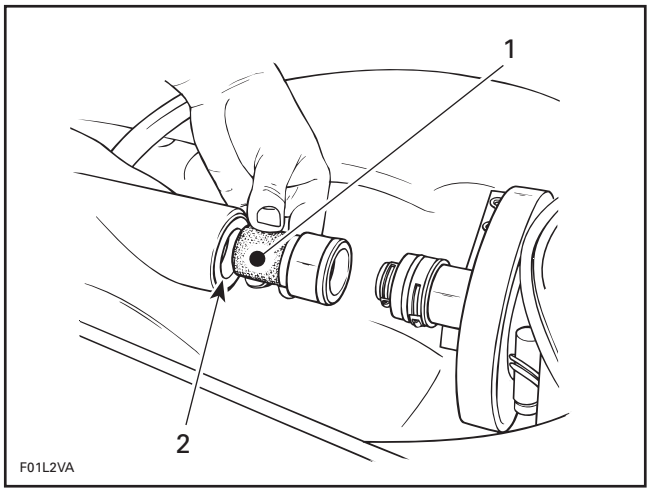
1. Hull
2. Plastic hull insert

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

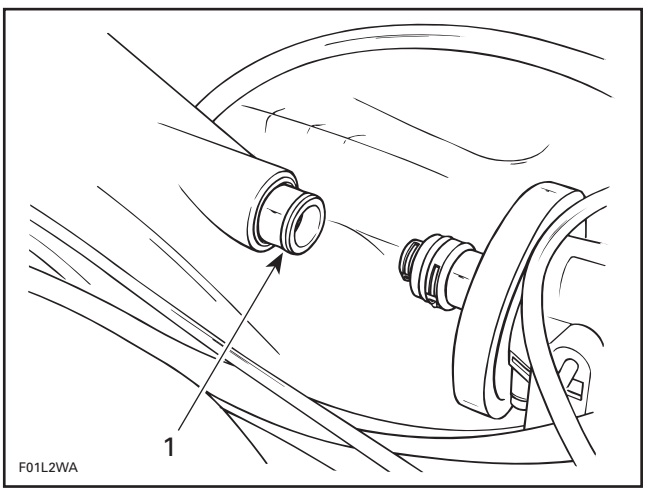
If you notice any clearance between plastic insert and aluminum insert, fill gap with epoxy glue to obtain good adhesion of aluminum insert.



1. Knurled surface
2. Inner bore

Install aluminum insert into plastic hull insert.

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



1. Aluminum insert

NOTE: The epoxy glue curing time is 30 minutes.

SPX MODEL

ENGINE		SPX (5838/5839)
Engine type		BOMBARDIER-ROTAX 787
Induction type		Rotary valve
Exhaust system	Type	Water cooled, water injected with regulator
	Water injection fitting (head)	3.5 mm (.139 in)
	Water injection fitting (cone)	Not applicable
	Water injection fitting (muffler)	3.5 mm (.139 in)
Exhaust valve		Rotax Adjustable Variable Exhaust (RAVE)
Starting system		Electric start
Lubrication	Fuel/oil mixture	VROI (Variable Rate Oil Injection)
	Oil injection pump	Direct driven
	Oil injection type	BOMBARDIER-ROTAX
Number of cylinders		2
Bore	Standard	82 mm (3.228 in)
	First oversize	82.25 mm (3.238 in)
	Second oversize	Not applicable
Stroke		74 mm (2.91 in)
Displacement		781.6 cm^3 (47.7 in^3)
Corrected compression ratio		6.0:1
Combustion chamber volume		36.3 ± 1.6 cc
Cylinder head warpage (maximum)		0.05 mm (.002 in)
Piston ring type and quantity		1 Semi-trapez – 1 Rectangular
Ring end gap	New	0.40 - 0.55 mm (.016 - .022 in)
	Wear limit	1.00 mm (.039 in)
Ring piston groove	New	0.025 - 0.070 mm (.001 - .003 in)
	Wear limit	0.2 mm (.008 in)
Piston/cylinder wall clearance	New (minimum)	0.11 mm (.0043 in)
	Wear limit	0.20 mm (.008 in)
Cylinder taper (maximum)		0.10 mm (.004 in)
Cylinder out of round (maximum)		0.08 mm (.003 in)
Connecting rod big end axial play	New	0.230 - 0.617 mm (.009 - .024 in)
	Wear limit	1.2 mm (.047 in)
Crankshaft deflection		MAG side: 0.050 mm (.002 in); PTO side: 0.030 mm (.001 in)
Rotary valve timing	Opening	147° ± 5 BTDC
	Closing	63.5° ± 5 ATDC
Rotary valve duration		159°
Rotary valve/cover clearance		0.25 - 0.35 mm (.010 - .014 in)
Connecting rod/crankshaft pin radial clearance	New	0.023 - 0.034 mm (.0009 - .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:		

ELECTRICAL		SPX (5838/5839)
Magneto generator output		180 W @ 6000 RPM or 5.0 A @ 6000 RPM
Ignition system type		Digital DC-CDI
Spark plug	Make and type	NGK BR8ES
	Gap	0.5 - 0.6 mm (.020 - .024 in)
Ignition timing (BTDC)	mm (in)	3.38 (.133)
	Degrees	22° ± 1 @ 3500 RPM
Battery charging coil		0.1 - 1 Ω
Trigger coil		190 - 300 Ω
Ignition coil	Primary	0.33 - 0.62 Ω
	Secondary	8.4 - 15.6 k Ω
Engine rev limiter setting		7200 (± 50) RPM
Battery		12 V, 19 A•h (Yuasa/Exide)
Fuse	Starting system	5 A
	Charging system	2 x 15 A
	VTS system	7.5 A
ADDITIONAL INFORMATION:		

CARBURETION		SPX (5838/5839)
Carburetor	Type	Mikuni BN-40I (diaphragm) Fuel accelerator pump
	Quantity	2
Main jet		140 (MAG) 142.5 (PTO)
Pilot jet		67.5
Spring		95 g
Valve seat		1.5 mm
Adjustment	Low-speed screw	1.5 turn ± 1/4
	High-speed screw	0
	Idle speed (in water)	1500 RPM
	Idle speed (out of water)	3000 RPM
Fuel	Type	Regular unleaded gasoline
	Minimum octane no.	87
Fuel return line orifice		MAG and PTO: 0.8 mm (.031 in)
ADDITIONAL INFORMATION:		

COOLING	SPX (5838/5839)
Type	Open circuit – Direct flow from jet propulsion unit
Thermostat	None
Monitoring beeper setting	86-94°C (187-201°F)
ADDITIONAL INFORMATION:	

PROPULSION		SPX (5838/5839)
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 POLYOL ESTER OIL 75W90 GL5
Steering nozzle pivoting angle		26°
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	0.0 - 0.4 mm (.000 - .016 in)
	Wear limit	1.00 mm (.040 in)
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)
Impeller shaft radial play		0.05 mm (.002 in)
Impeller pitch/material		Progressive pitch 16° - 23°/stainless steel
ADDITIONAL INFORMATION: Do not mix different brands or oil types.		

DIMENSIONS	SPX (5838/5839)
Number of passenger (driver incl.)	2
Overall length	254 cm (100 in)
Overall width	105 cm (41.3 in)
Overall height	92 cm (36.2 in)
Dry weight	194 kg (428 lb)
Load limit (passenger and 10 kg (22 lb) luggage)	159 kg (351 lb)
ADDITIONAL INFORMATION:	

CAPACITIES		SPX (5838/5839)
Fuel tank (including reserve)		34 L (9 U.S. gal)
Fuel tank reserve		5 L (1.3 U.S. gal)
Oil injection reservoir		4.5 L (1.2 U.S. gal)
Jet pump impeller shaft reservoir	Capacity	80 mL (2.7 U.S. oz)
	Oil level height	Up to plug
ADDITIONAL INFORMATION:		

MATERIALS	SPX (5838/5839)
Hull	Composite
Inlet grate	Plastic
Impeller housing/stator/venturi/nozzle	Plastic/brass/plastic/aluminum
Air intake silencer	Thermoplastic
Flame arrester	Multi-layer wire screen
Exhaust muffler	Aluminum
Steering padding	Thermoplastic with polyethylene foam
Fuel tank	Polyethylene
Oil injection reservoir	Polyethylene
Seat	Polyurethane foam
ADDITIONAL INFORMATION:	

STANDARD EQUIPMENT	SPX (5838/5839)
Safety lanyard	Standard
Digitally Encoded Security System	Standard
Fuel tank reserve	Standard
Monitoring beeper	Standard
Speedometer	Optional
Fuel/oil gauge (analog)	Standard
Tachometer	Optional
Variable trim system (VTS)	Standard
Reverse	Not applicable
Storage compartment	Standard
Rear grab handle	Standard
Extinguisher holder	Standard
Tool kit	Standard
ADDITIONAL INFORMATION:	

PERFORMANCE		SPX (5838/5839)
Estimated pump output		34 kW (46 hp)
Maximum fuel consumption at wide open throttle		44.5 L/h (11.7 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	39 minutes
	Fuel tank reserve	7 minutes
ADDITIONAL INFORMATION:		

TIGHTENING TORQUES			SPX (5838/5839)		
ENGINE	Exhaust manifold screw		40 N•m	(30 lbf•ft)	(3) (4)
	Magneto flywheel nut		105 N•m	(77 lbf•ft)	(1)
	Flywheel (PTO side)		110 N•m	(81 lbf•ft)	(5)
	Crankcase screws	M8	24 N•m	(17 lbf•ft)	(3) (4)
		M10	40 N•m	(30 lbf•ft)	(3) (4)
	Crankcase/engine support nuts		35 N•m	(26 lbf•ft)	(1)
	Engine mount/hull		25 N•m	(18 lbf•ft)	(1)
	Cylinder head screws		24 N•m	(17 lbf•ft)	(1) (4)
	Crankcase/cylinder screws		40 N•m	(30 lbf•ft)	(3) (4)
	Tuned pipe flange screws/nut		40 N•m	(30 lbf•ft)	(1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft)	(1)
	Flame arrester screws		10 N•m	(89 lbf•**in**)	(1)
	Magneto housing cover screws		9 N•m	(80 lbf•**in**)	(5)
	Starter mounting screws		22 N•m	(16 lbf•ft)	(1)
	Spark plugs		24 N•m	(17 lbf•ft)	(5)
JET PUMP	Impeller		70 N•m	(52 lbf•ft)	(2)
	Pump/hull nuts		33 N•m	(24 lbf•ft)	(1)
	Venturi/pump housing screws		21 N•m	(16 lbf•ft)	(1)
	VTS ring screws		13 N•m	(10 lbf•ft)	(1)
	Pump housing cover screws		4 N•m	(35 lbf•**in**)	(1)
	Inlet grate screws		8 N•m	(71 lbf•**in**)	(1)
	Riding plate screws		10 N•m	(89 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		6 N•m	(53 lbf•**in**)	
	Handlebar clamp bolts		26 N•m	(19 lbf•ft)	
	Steering cable ball joint bolt (nozzle)		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)	
	Handlebar grip screw		13 N•m	(10 lbf•ft)	

ADDITIONAL INFORMATION: apply where indicated; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 518
(4) Synthetic grease
(5) Anti-seize lubricant

◆ WARNING

Correct torques and use of Loctite must be strictly followed.

GS AND GSX LIMITED

ENGINE		GS (5626/5844)	GSX Limited (5629/5845)
Engine type		BOMBARDIER-ROTAX 717	BOMBARDIER-ROTAX 947
Induction type		Rotary valve	Reed valve
Exhaust system	Type	Water cooled, water injected	Water cooled, water injected with regulator
	Water injection fitting (head)	3.5 mm (.139 in)	
	Water injection fitting (cone)	3.5 mm (.139 in)	Not applicable
	Water injection fitting (muffler)	Not applicable	3.5 mm (.139 in)
Exhaust valve		Not applicable	RAVE
Starting system		Electric start	
Lubrication	Fuel/oil mixture	VROI (Variable Rate Oil Injection)	
	Oil injection pump	Gear driven	Direct driven
	Oil injection type	BOMBARDIER-ROTAX	FORMULA XP-S (synthetic)
Number of cylinders		2	
Bore	Standard	82 mm (3.228 in)	88 mm (3.465 in)
	First oversize	82.25 mm (3.238 in)	88.25 mm (3.474 in)
	Second oversize	82.50 mm (3.248 in)	Not applicable
Stroke		68 mm (2.677 in)	78.20 mm (3.079 in)
Displacement		718.2 cm^3 (43.81 in^3)	951.2 cm^3 (58 in^3)
Corrected compression ratio		6.2:1	6.0:1
Combustion chamber volume		32.6 ± 1.4 cc	45.3 ± 2.0 cc
Cylinder head warpage (maximum)		0.05 mm (.002 in)	Not applicable
Piston ring type and quantity		1 Semi-trapez 1 Rectangular	2 Semi-trapez
Ring end gap	New	0.40 - 0.55 mm (.016 - .022 in)	
	Wear limit	1.00 mm (.039 in)	
Ring/piston groove clearance	New	0.025 - 0.070 mm (.001 - .003 in)	
	Wear limit	0.2 mm (.008 in)	
Piston/cylinder wall clearance	New (minimum)	0.10 mm (.0039 in)	0.09 mm (.0035 in)
	Wear limit	0.20 mm (.008 in)	
Cylinder taper (maximum)		0.10 mm (.004 in)	
Cylinder out of round (maximum)		0.08 mm (.003 in)	
Connecting rod big end axial play	New	0.311 - 0.678 mm (.012 - .027 in)	0.390 - 0.737 (.015 - .029 in)
	Wear limit	1.2 mm (.047 in)	
Crankshaft deflection		MAG side: 0.050 mm (.002 in); PTO side: 0.030 mm (.001 in)	
Rotary valve timing	Opening	147° ± 5 BTDC	Not applicable
	Closing	65.5° ± 5 ATDC	Not applicable
Rotary valve duration		159°	Not applicable
Rotary valve/cover clearance		0.25 - 0.35 mm (.010 - .014 in)	Not applicable
Connecting rod/ crankshaft pin radial clearance	New	0.020 - 0.033 mm (.0008 - .0013 in)	0.023 - 0.034 mm (.0009 - .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:			

ELECTRICAL		GS (5626/5844)	GSX Limited (5629/5845)
Magneto generator output		160 W @ 6000 RPM or 4.0 A @ 2000 RPM	180 W @ 6000 RPM or 5.0 A @ 6000 RPM
Ignition system type		Digital CDI	Digital DC-CDI
Spark plug	Make and type	NGK BR8ES	
	Gap	0.5 - 0.6 mm (.020 - .024 in)	
Ignition timing (BTDC)	mm (in)	2.59 (.102)	3.60 (.142)
	Degrees	20° ± 1 ①	22° ± 1 @ 3500 RPM
Generating coil		40 - 76 Ω	Not applicable
Battery charging coil		0.05 - 0.6 Ω	0.1 - 1 Ω
Trigger coil		Not applicable	190 - 300 Ω
Ignition coil	Primary	0.33 - 0.62 Ω	
	Secondary	8.4 - 15.6 kΩ	
Engine rev limiter setting		7000 (± 50) RPM	7200 (± 50) RPM
Battery		12 V, 19 A•h (Yuasa/Exide)	
Fuse	Starting system	5 A	
	Charging system	2 x 15 A	
	VTS system	Not applicable	7.5 A
ADDITIONAL INFORMATION: ① Engine cold @ 6000 RPM.			

CARBURETION		GS (5626/5844)	GSX Limited (5629/5845)
Carburetor	Type	Mikuni BN-40I diaphragm Fuel accelerator pump	Mikuni BN-46I diaphragm Fuel accelerator pump
	Quantity	1	2
Main jet		167.5	165
Pilot jet		70	82.5
Spring		95 g	
Valve seat		1.5 mm	2.0 mm
Adjustment	Low-speed screw	1-1/4 turn ± 1/4	2 turn ± 1/4
	High-speed screw	0	
	Idle speed (in water)	1500 RPM	
	Idle speed (out of water)	3000 RPM	
Fuel	Type	Regular unleaded gasoline	
	Minimum octane no.	87	
Fuel return line orifice		0.8 mm (.031 in)	MAG and PTO: 0.8 mm (.031 in)
ADDITIONAL INFORMATION:			

COOLING	GS (5626/5844)	GSX Limited (5629/5845)
Type	Open circuit – Direct flow from jet propulsion unit	
Thermostat	None	
Monitoring beeper setting	86-94°C (187-201°F)	
ADDITIONAL INFORMATION:		

PROPULSION		GS (5626/5844)	GSX Limited (5629/5845)
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 POLYOL ESTER OIL 75W90 GL5	
Steering nozzle pivoting angle		23°	
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)	155.6 mm (6.126 in)
Impeller/wear ring clearance	New	0.0 - 0.4 mm (.000 - .016 in)	
	Wear limit	1.0 mm (.040 in)	
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)	
Impeller shaft radial play		0.05 mm (.002 in)	
Impeller pitch/material		Progressive pitch 11° - 22°/stainless steel	Progressive pitch 16° - 25°/stainless steel
ADDITIONAL INFORMATION: Do not mix different brands or oil types.			

DIMENSIONS	GS (5626/5844)	GSX Limited (5629/5845)
Number of passenger (driver incl.)	2	
Overall length	267 cm (105 in)	
Overall width	116 cm (45.7 in)	
Overall height	94 cm (37 in)	
Dry weight	215 kg (474 lb)	237 kg (523 lb)
Load limit (passenger and 10 kg (22 lb) luggage)	159 kg (351 lb)	
ADDITIONAL INFORMATION:		

CAPACITIES		GS (5626/5844)	GSX Limited (5629/5845)
Fuel tank (including reserve)		56.5 L (15 U.S. gal)	
Fuel tank reserve		11.4 L (3 U.S. gal)	
Oil injection reservoir		6 L (1.6 U.S. gal)	
Jet pump impeller shaft reservoir	Capacity	80 mL (2.7 U.S. oz)	120 mL (4.0 U.S. oz)
	Oil level height	Up to plug	
ADDITIONAL INFORMATION:			

MATERIALS	GS (5626/5844)	GSX Limited (5629/5845)
Hull	Composite	
Inlet grate	Aluminum	
Impeller housing/stator/venturi/nozzle	Plastic/plastic/ plastic/plastic	Plastic/brass/aluminum/ aluminum
Air intake silencer	Thermoplastic	
Flame arrester	Multi-layer wire screen	Tubular wire screen
Exhaust muffler	Aluminum	
Resonator	Not applicable	Plastic
Steering padding	Thermoplastic with polyethylene foam	
Fuel tank	Polyethylene	
Oil injection reservoir	Polyethylene	
Seat	Polyurethane foam	
ADDITIONAL INFORMATION:		

STANDARD EQUIPMENT	GS (5626/5844)	GSX Limited (5629/5845)
Safety lanyard	Standard	
Digitally Encoded Security System	Standard	
Fuel tank reserve	Standard	
Monitoring beeper	Standard	
Speedometer	Optional	Standard
Fuel/oil gauge (analog)	Standard	Not applicable
Info Center	Not applicable	Standard
Variable trim system (VTS)	Optional	Standard
Reverse	Not applicable	
Storage compartment	Standard	
Rear grab handle	Standard	
Extinguisher holder	Standard	
Tool kit	Standard	
ADDITIONAL INFORMATION: Info Center standard functions: Fuel level/low fuel level/low oil level/low voltage/high temperature/tachometer/speedometer/average speed/ peak speed/trip meter/hour meter/clock/lake temperature/chronometer/VTS indicator/maintenance information.		

PERFORMANCE		GS (5626/5844)	GSX Limited (5629/5845)
Estimated pump power		26.3 kW (35.3 hp)	55.8 kW (74.9 hp)
Maximum fuel consumption at wide open throttle		33.5 L/h (8.8 U.S. gal/h)	55 L/h (14.5 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour 21 minutes	49 minutes
	Fuel tank reserve	21 minutes	13 minutes
ADDITIONAL INFORMATION:			

TIGHTENING TORQUES			GS (5626/5844)	GSX Limited (5629/5845)	
ENGINE	Exhaust manifold screw		24 N•m (17 lbf•ft) (4)	40 N•m (30lbf•ft)	(4)
	Magneto flywheel nut		145 N•m (107 lbf•ft) (1)	115 N•m (85 lbf•ft)	(1)
	Flywheel (PTO side)		110 N•m (81 lbf•ft) (5)	115 N•m (85 lbf•ft)	(1)
	Crankcase screws	M8	24 N•m (17 lbf•ft) (3) (4)	27 N•m (20 lbf•ft)	(3) (4)
		M10	40 N•m	(30 lbf•ft)	(3) (4)
	Crankcase/engine support nuts		35 N•m (26 lbf•ft) (1)	25 N•m (18 lbf•ft)	(1)
	Engine mount/hull		25 N•m	(18 lbf•ft)	(1)
	Cylinder head screws		24 N•m (17 lbf•ft) (1) (4)	34 N•m (25 lbf•ft)	(1) (4)
	Cylinder head nuts		Not applicable	34 N•m (25 lbf•ft)	(1)
	Crankcase/cylinder screws		24 N•m (17 lbf•ft) (1) (4)	Not applicable	
	Tuned pipe flange screws/nut		25 N•m (18 lbf•ft) (1)	40 N•m (30 lbf•ft)	(1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft)	(1)
	Flame arrester screws		10 N•m (89 lbf•**in**) (1)	Not applicable	
	Magneto housing cover screws		9 N•m	(80 lbf•**in**)	(5)
	Starter mounting screws		22 N•m (16 lbf•ft) (1)	10 N•m (89 lbf•**in**)	(1)
	Spark plugs		24 N•m	(17 lbf•ft)	(5)
JET PUMP	Impeller		70 N•m	(52 lbf•ft)	(2)
	Pump/hull nuts		31 N•m	(23 lbf•ft)	(1)
	Venturi/pump housing screws		21 N•m	(16 lbf•ft)	(1)
	VTS ring screws		Not applicable	13 N•m (10 lbf•ft)	(1)
	Pump housing cover screws		4 N•m	(35 lbf•**in**)	(1)
	Inlet grate screws		8 N•m	(71 lbf•**in**)	(1)
	Riding plate screws		22 N•m	(16 lbf•ft)	(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		6 N•m	(53 lbf•**in**)	
	Handlebar clamp bolts		26 N•m	(19 lbf•ft)	
	Steering cable ball joint (nozzle)		2 N•m (18 lbf•**in**)	7 N•m (62 lbf•**in**)	
	Steering support bolts		15 N•m	(11 lbf•ft)	(1)
	Handlebar grip screw		13 N•m	(10 lbf•ft)	

ADDITIONAL INFORMATION: apply where indicated; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 518
(4) Synthetic grease
(5) Anti-seize lubricant

◆ WARNING

Correct torques and use of Loctite must be strictly followed.

XP LIMITED

ENGINE		XP Limited (5665/5667)
Engine type		BOMBARDIER-ROTAX 947
Induction type		Reed valve
Exhaust system	Type	Water cooled, water injected with regulator
	Water injection fitting (head)	3.5 mm (.139 in)
	Water injection fitting (cone)	Not applicable
	Water injection fitting (muffler)	3.5 mm (.139 in)
Exhaust valve		Rotax Adjustable Variable Exhaust (RAVE)
Starting system		Electric start
Lubrication	Fuel/oil mixture	VROI (Variable Rate Oil Injection)
	Oil injection pump	Direct driven
	Oil injection type	FORMULA XP-S (synthetic)
Number of cylinders		2
Bore	Standard	88 mm (3.465 in)
	First oversize	88.25 mm (3.474 in)
	Second oversize	Not applicable
Stroke		78.20 mm (3.079 in)
Displacement		951.2 cm^3 (58 in^3)
Corrected compression ratio		6.0:1
Combustion chamber volume		45.3 ± 2.0 cc
Cylinder head warpage (maximum)		Not applicable
Piston ring type and quantity		2 Semi-trapez
Ring end gap	New	0.40 - 0.55 mm (.016 - .022 in)
	Wear limit	1.00 mm (.039 in)
Ring piston groove	New	0.025 - 0.070 mm (.001 - .003 in)
	Wear limit	0.2 mm (.008 in)
Piston/cylinder wall clearance	New (minimum)	0.09 mm (.0035 in)
	Wear limit	0.20 mm (.008 in)
Cylinder taper (maximum)		0.10 mm (.004 in)
Cylinder out of round (maximum)		0.08 mm (.003 in)
Connecting rod big end axial play	New	0.390 - 0.737 mm (.015 - .029 in)
	Wear limit	1.2 mm (.047 in)
Crankshaft deflection		MAG side: 0.050 mm (.002 in); PTO side: 0.030 mm (.001 in)
Rotary valve timing	Opening	Not applicable
	Closing	Not applicable
Rotary valve duration		Not applicable
Rotary valve/cover clearance		Not applicable
Connecting rod/crankshaft pin radial clearance	New	0.023 - 0.034 mm (.0009 - .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:		

ELECTRICAL		XP Limited (5665/5667)
Magneto generator output		180 W @ 6000 RPM or 5.0 A @ 6000 RPM
Ignition system type		Digital DC-CDI
Spark plug	Make and type	NGK BR8ES
	Gap	0.5 - 0.6 mm (.020 - .024 in)
Ignition timing (BTDC)	mm (in)	3.60 (.142)
	Degrees	22° ± 1 @ 3500 RPM
Battery charging coil		0.1 - 1 Ω
Trigger coil		190 - 300 Ω
Ignition coil	Primary	0.33 - 0.62 Ω
	Secondary	8.4 - 15.6 k Ω
Engine rev limiter setting		7200 (± 50) RPM
Battery		12 V, 19 A•h (Yuasa/Exide)
Fuse	Starting system	5 A
	Charging system	2 x 15 A
	VTS system	7.5 A
ADDITIONAL INFORMATION:		

CARBURETION		XP Limited (5665/5667)
Carburetor	Type	Mikuni BN-46I (diaphragm) Fuel accelerator pump
	Quantity	2
Main jet		165
Pilot jet		82.5
Spring		95 g
Valve seat		2.0 mm
Adjustment	Low-speed screw	2.0 turn ± 1/4
	High-speed screw	0
	Idle speed (in water)	1500 RPM
	Idle speed (out of water)	3000 RPM
Fuel	Type	Regular unleaded gasoline
	Minimum octane no.	87
Fuel return line orifice		MAG and PTO: 0.8 mm (.031 in)
ADDITIONAL INFORMATION:		

COOLING	XP Limited (5665/5667)
Type	Open circuit – Direct flow from jet propulsion unit
Thermostat	None
Monitoring beeper setting	86-94°C (187-201°F)
ADDITIONAL INFORMATION:	

PROPULSION		XP Limited (5665/5667)
Propulsion system		Bombardier Formula Pump
Jet pump type		Axial flow single stage
Impeller rotation (seen from rear)		Counterclockwise
Transmission		Direct drive
Coupling type		Split FR and RR
Oil type		SEA-DOO JET PUMP SYNTHETIC POLYOL ESTER OIL 75W90 GL5
Steering nozzle pivoting angle		20°
Minimum required water level		90 cm (35 in)
Drive shaft deflection (maximum)		0.5 mm (.020 in)
Impeller outside diameter		155.6 mm (6.126 in)
Impeller/wear ring clearance	New	0.0 - 0.4 mm (.000 - .016 in)
	Wear limit	1.00 mm (.040 in)
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)
Impeller shaft radial play		0.05 mm (.002 in)
Impeller pitch/material		Progressive pitch 16° - 25°/stainless steel
ADDITIONAL INFORMATION: Do not mix different brands or oil types.		

DIMENSIONS	XP Limited (5665/5667)
Number of passenger (driver incl.)	2
Overall length	272 cm (107 in)
Overall width	111 cm (43.7 in)
Overall height	103 cm (40.6 in)
Dry weight	250 kg (551 lb)
Load limit (passenger and 10 kg (22 lb) luggage)	159 kg (351 lb)
ADDITIONAL INFORMATION:	

CAPACITIES		XP Limited (5665/5667)
Fuel tank (including reserve)		54 L (14 U.S. gal)
Fuel tank reserve		10 L (2.6 U.S. gal)
Oil injection reservoir		4 L (1.1 U.S. gal)
Jet pump impeller shaft reservoir	Capacity	120 mL (4.0 U.S. oz)
	Oil level height	Up to plug
ADDITIONAL INFORMATION:		

MATERIALS	XP Limited (5665/5667)
Hull	Composite
Inlet grate	Aluminum
Impeller housing/stator/venturi/nozzle	Plastic/brass/aluminum/aluminum
Air intake silencer	Thermoplastic
Flame arrester	Tubular wire screen
Exhaust muffler	Aluminum
Resonator	Plastic
Steering padding	Thermoplastic with polyethylene foam
Fuel tank	Polyethylene
Oil injection reservoir	Polyethylene
Seat	Polyurethane foam
ADDITIONAL INFORMATION:	

STANDARD EQUIPMENT	XP Limited (5665/5667)
Safety lanyard	Standard
Digitally Encoded Security System	Standard
Fuel tank reserve	Standard
Monitoring beeper	Standard
Speedometer	Standard
Fuel/oil gauge (analog)	Standard
Tachometer	Standard
Variable trim system (VTS)	Standard
Reverse	Not applicable
Storage compartment	Standard
Rear grab handle	Standard
Extinguisher holder	Standard
Tool kit	Standard
ADDITIONAL INFORMATION:	

PERFORMANCE		XP Limited (5665/5667)
Estimated pump output		52.5 kW (70.4 hp)
Maximum fuel consumption at wide open throttle		55 L/h (14.5 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	48 minutes
	Fuel tank reserve	11 minutes
ADDITIONAL INFORMATION:		

TIGHTENING TORQUES			XP Limited (5665/5667)		
ENGINE	Exhaust manifold screw		40 N•m	(30 lbf•ft)	(4)
	Magneto flywheel nut		115 N•m	(85 lbf•ft)	(1)
	Flywheel (PTO side)		115 N•m	(85 lbf•ft)	(1)
	Crankcase screws	M8	27 N•m	(20 lbf•ft)	(3) (4)
		M10	40 N•m	(30 lbf•ft)	(3) (4)
	Crankcase/engine support nuts		25 N•m	(18 lbf•ft)	(1)
	Engine mount/hull		25 N•m	(18 lbf•ft)	(1)
	Cylinder head screws		34 N•m	(25 lbf•ft)	(1) (4)
	Cylinder head nuts		34 N•m	(25 lbf•ft)	(1)
	Tuned pipe flange screws/nut		40 N•m	(30 lbf•ft)	(1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft)	(1)
	Magneto cover screws		9 N•m	(80 lbf•**in**)	(5)
	Starter mounting screws		10 N•m	(89 lbf•**in**)	(1)
	Spark plugs		24 N•m	(17 lbf•ft)	(5)
JET PUMP	Impeller		70 N•m	(52 lbf•ft)	(2)
	Pump/hull nuts		31 N•m	(23 lbf•ft)	(1)
	Venturi/pump housing screws		21 N•m	(16 lbf•ft)	(1)
	VTS ring screws		13 N•m	(10 lbf•ft)	(1)
	Pump housing cover screws		4 N•m	(35 lbf•**in**)	(1)
	Inlet grate screws		8 N•m	(71 lbf•**in**)	(1)
	Riding plate screws		10 N•m	(89 lbf•**in**)	(1)
STEERING	Cable retaining block bolts		6 N•m	(53 lbf•**in**)	
	Steering cable/lever		3 N•m	(26 lbf•**in**)	
	Steering stem arm bolts		6 N•m	(53 lbf•**in**)	
	Handlebar clamp bolts		26 N•m	(19 lbf•ft)	
	Steering cable ball joint bolt (nozzle)		7 N•m	(62 lbf•**in**)	
	Steering support bolts		15 N•m	(11 lbf•ft)	
	Lever pivot bolt		6 N•m	(53 lbf•**in**)	
	Handlebar grip screw		13 N•m	(10 lbf•ft)	

ADDITIONAL INFORMATION: apply where indicated; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 518
(4) Synthetic grease
(5) Anti-seize lubricant

◆ WARNING

Correct torques and use of Loctite must be strictly followed.

GTS MODEL

ENGINE		GTS (5819)
Engine type		BOMBARDIER-ROTAX 717
Induction type		Rotary valve
Exhaust system	Type	Water cooled, water injected
	Water injection fitting (head)	3.5 mm (.139 in)
	Water injection fitting (cone)	3.5 mm (.139 in)
Starting system		Electric start
Lubrication	Fuel/oil mixture	VROI (Variable Rate Oil Injection)
	Oil injection pump	Gear driven
	Oil injection type	BOMBARDIER-ROTAX
Number of cylinders		2
Bore	Standard	82 mm (3.228 in)
	First oversize	82.25 mm (3.238 in)
	Second oversize	82.50 mm (3.248 in)
Stroke		68 mm (2.677 in)
Displacement		718.2 cm^3 (43.81 in^3)
Corrected compression ratio		6.2:1
Combustion chamber volume		32.6 ± 1.4 cc
Cylinder head warpage (maximum)		0.05 mm (.002 in)
Piston ring type and quantity		1 Semi-Trapez – 1 Rectangular
Ring end gap	New	0.40 - 0.55 mm (.016 - .022 in)
	Wear limit	1.00 mm (.039 in)
Ring/piston groove clearance	New	0.025 - 0.070 mm (.001 - .003 in)
	Wear limit	0.2 mm (.008 in)
Piston/cylinder wall clearance	New (minimum)	0.10 mm (.0039 in)
	Wear limit	0.20 mm (.008 in)
Cylinder taper (maximum)		0.10 mm (.004 in)
Cylinder out of round (maximum)		0.080 mm (.003 in)
Connecting rod big end axial play	New	0.311 - 0.678 mm (.012 - .027 in)
	Wear limit	1.2 mm (.047 in)
Crankshaft deflection		MAG side: 0.050 mm (.002 in) PTO side: 0.030 mm (.001 in)
Rotary valve timing	Opening	147° ± 5 BTDC
	Closing	65.5° ± 5 ATDC
Rotary valve duration		159°
Rotary valve/cover clearance		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:		

ELECTRICAL		GTS (5819)
Magneto generator output		160 W @ 6000 RPM or 4.0 A @ 2000 RPM
Ignition system type		Digital CDI
Spark plug	Make and type	NGK BR8ES
	Gap	0.5 - 0.6 mm (.020 - .024 in)
Ignition timing (BTDC)	mm (in)	2.59 (.102)
	Degrees	20° ± 1 ①
Generating coil		40 - 76 Ω
Battery charging coil		0.05 - 0.6 Ω
Ignition coil	Primary	Not applicable
	Secondary	9 - 15 kΩ
Engine rev limiter setting		7000 ± 50 RPM
Battery		12 V, 19 A•h (Yuasa/Exide)
Fuse	Starting system	5 A
	Charging system	15 A
ADDITIONAL INFORMATION: Engine cold @ 6000 RPM.		

CARBURETION		GTS (5819)
Carburetor	Type	Mikuni BN-40I diaphragm Fuel accelerator pump
	Quantity	1
Main jet		167.5
Pilot jet		70
Spring		95 g
Valve seat		1.5 mm
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)	3000 RPM
Fuel	Type	Regular unleaded gasoline
	Minimum octane no.	87
Fuel return line orifice		0.8 mm (.031 in)
ADDITIONAL INFORMATION:		

COOLING	GTS (5819)
Type	Open circuit – Direct flow from jet propulsion unit
Thermostat	None
Monitoring beeper setting	86-94°C (187-201°F)
ADDITIONAL INFORMATION:	

PROPULSION		GTS (5819)
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 POLYOL ESTER OIL 75W90 GL5
Steering nozzle pivoting angle		26°
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	0.0 - 0.4 mm (.000 - .016 in)
	Wear limit	1.00 mm(.040 in)
Impeller shaft end play (new)		0.12 - 0.54 mm (.005 - .021 in)
Impeller shaft radial play		0.05 mm (.002 in)
Impeller pitch/material		Progressive pitch, 11° - 22°/stainless steel
ADDITIONAL INFORMATION: Do not mix different brands or oil types.		

DIMENSIONS	GTS (5819)
Number of passenger (driver incl.)	3
Overall length	302 cm (119.0 in)
Overall width	119 cm (46.9 in)
Overall height	95 cm (37.4 in)
Dry weight	219 kg (483 lb)
Load limit (passenger and 10 kg (22 lb) luggage)	224 kg (494 lb)
ADDITIONAL INFORMATION:	

CAPACITIES		GTS (5819)
Fuel tank (including reserve)		47 L (12 U.S. gal)
Fuel tank reserve		11.4 L (3 U.S. gal)
Oil injection reservoir		4.5 L (1.2 U.S. gal)
Jet pump impeller shaft reservoir	Capacity	80 mL (2.7 U.S. oz)
	Oil level height	Up to plug
ADDITIONAL INFORMATION:		

MATERIALS	GTS (5819)
Hull	Composite
Inlet grate	Plastic
Impeller housing/stator/venturi/nozzle	Plastic/plastic/plastic/plastic
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 (5819)
Safety lanyard	Standard
Digitally Encoded Security System	Standard
Fuel tank reserve	Standard
Monitoring beeper	Standard
Fuel gauge/low oil warning light	Standard
Tachometer	Optional
Speedometer	Optional
Variable trim system (VTS)	Not applicable
Reverse	Standard
Storage compartment	Standard
Rear grab handle	Standard
Extinguisher holder	Standard
Tool kit	Standard
ADDITIONAL INFORMATION:	

PERFORMANCE		GTS (5819)
Estimated pump power		35.9 kW (48 hp)
Maximum fuel consumption at wide open throttle		33.5 L/h (8.8 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour
	Fuel tank reserve	20 minutes
ADDITIONAL INFORMATION:		

TIGHTENING TORQUES			GTS (5819)		
ENGINE	Exhaust manifold screws		24 N•m	(17 lbf•ft)	(4)
	Magneto flywheel nut		145 N•m	(107 lbf•ft)	(1)
	Flywheel (PTO side)		110 N•m	(81 lbf•ft)	(5)
	Crankcase screws	M8	24 N•m	(17 lbf•ft)	(3) (4)
		M10	40 N•m	(30 lbf•ft)	(3) (4)
	Crankcase/engine support nuts		35 N•m	(26 lbf•ft)	(1)
	Engine mount/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 flange screws/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	(89 lbf•**in**)	(1)
	Magneto housing cover screws		9 N•m	(80 lbf•**in**)	(5)
	Starter mounting screws		22 N•m	(16 lbf•ft)	(1)
	Spark plugs		24 N•m	(17 lbf•ft)	(5)
JET PUMP	Impeller		70 N•m	(52 lbf•ft)	(2)
	Pump/hull nuts		31 N•m	(23 lbf•ft)	(1)
	Venturi/pump housing screws		21 N•m	(16 lbf•ft)	(1)
	Nozzle/venturi screws		20 N•m	(15 lbf•ft)	(1)
	Pump housing cover screws		4 N•m	(35 lbf•**in**)	(1)
	Inlet grate screws		8 N•m	(71 lbf•**in**)	(1)
	Riding plate screws		10 N•m	(89 lbf•**in**)	(1)
STEERING	Steering cable jam nuts		10 N•m	(89 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)	(1)
	Steering cable ball joint (nozzle)		2 N•m	(18 lbf•**in**)	
	Reverse cable ball joint nut		7 N•m	(62 lbf•**in**)	
	Handlebar grip screw		13 N•m	(10 lbf •ft)	

ADDITIONAL INFORMATION: apply where indicated; (1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 518
(4) Synthetic grease
(5) Anti-seize lubricant

◆ WARNING

Correct torques and use of Loctite must be strictly followed.

GTI AND GTX LIMITED

ENGINE		GTI (5836/5841)	GTX Limited (5837/5842)
Engine type		BOMBARDIER-ROTAX 717	BOMBARDIER-ROTAX 947
Induction type		Rotary valve	Reed valve
Exhaust system	Type	Water cooled, water injected	Water cooled, water injected with regulator
	Water injection fitting (head)	3.5 mm (.139 in)	
	Water injection fitting (cone)	3.5 mm (.139 in)	Not applicable
	Water injection fitting (muffler)	Not applicable	3.5 mm (.139 in)
Exhaust valve		Not applicable	RAVE
Starting system		Electric start	
Lubrication	Fuel/oil mixture	VROI (Variable Rate Oil Injection)	
	Oil injection pump	Gear driven	Direct driven
	Oil injection type	BOMBARDIER-ROTAX	FORMULA XP-S (synthetic)
Number of cylinders		2	
Bore	Standard	82 mm (3.228 in)	88 mm (3.465 in)
	First oversize	82.25 mm (3.238 in)	88.25 mm (3.474 in)
	Second oversize	82.50 mm (3.248 in)	Not applicable
Stroke		68 mm (2.677 in)	78.20 mm (3.079 in)
Displacement		718.2 cm^3 (43.81 in^3)	951.2 cm^3 (58 in^3)
Corrected compression ratio		6.2:1	6.0:1
Combustion chamber volume		32.6 ± 1.4 cc	45.3 ± 2.0 cc
Cylinder head warpage (maximum)		0.05 mm (.002 in)	Not applicable
Piston ring type and quantity		1 Semi-trapez 1 Rectangular	2 Semi-trapez
Ring end gap	New	0.40 - 0.55 mm (.016 - .022 in)	
	Wear limit	1.00 mm (.039 in)	
Ring/piston groove clearance	New	0.025 - 0.070 mm (.001 - .003 in)	
	Wear limit	0.2 mm (.008 in)	
Piston/cylinder wall clearance	New (minimum)	0.10 mm (.0039 in)	0.09 mm (.0035 in)
	Wear limit	0.20 mm (.008 in)	
Cylinder taper (maximum)		0.10 mm (.004 in)	
Cylinder out of round (maximum)		0.08 mm (.003 in)	
Connecting rod big end axial play	New	0.311 - 0.678 mm (.012 - .027 in)	0.390 - 0.737 mm (.015 - .029 in)
	Wear limit	1.2 mm (.047 in)	
Crankshaft deflection		MAG side: 0.050 mm (.002 in); PTO side: 0.030 mm (.001 in)	
Rotary valve timing	Opening	147° ± 5 BTDC	Not applicable
	Closing	65.5° ± 5 ATDC	Not applicable
Rotary valve duration		159°	Not applicable
Rotary valve/cover clearance		0.25 - 0.35 mm (.010 - .014 in)	Not applicable
Connecting rod/crankshaft pin radial clearance	New	0.020 - 0.033 mm (.0008 - .0013 in)	0.023 - 0.034 mm (.0009 - .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:			

ELECTRICAL		GTI (5836/5841)	GTX Limited (5837/5842)
Magneto generator output		160 W @ 6000 RPM or 4.0 A @ 2000 RPM	180 W @ 6000 RPM or 5.0 A @ 6000 RPM
Ignition system type		Digital CDI	Digital DC-CDI
Spark plug	Make and type	NGK BR8ES	
	Gap	0.5 - 0.6 mm (.020 - .024 in)	
Ignition timing (BTDC)	mm (in)	2.59 (.102)	3.60 (.142)
	Degrees	20° ± 1 ①	22° ± 1 @ 3500 RPM
Generating coil		40 - 76 Ω	Not applicable
Battery charging coil		0.05 - 0.6 Ω	0.1 - 1 Ω
Trigger coil		Not applicable	190 - 300 Ω
Ignition coil	Primary	0.33 - 0.62 Ω	
	Secondary	8.4 - 15.6 kΩ	
Engine rev limiter setting		7000 (± 50) RPM	7200 (± 50) RPM
Battery		12 V, 19 A•h (Yuasa/Exide)	
Fuse	Starting system	5 A	
	Charging system	2 x 15 A	
	VTS system	Not applicable	
ADDITIONAL INFORMATION: ① Engine cold @ 6000 RPM.			

CARBURETION		GTI (5836/5841)	GTX Limited (5837/5842)
Carburetor	Type	Mikuni BN-40I diaphragm Fuel accelerator pump	Mikuni BN-46I diaphragm Fuel accelerator pump
	Quantity	1	2
Main jet		167.5	165
Pilot jet		70	82.5
Spring		95 g	
Valve seat		1.5 mm	2.0 mm
Adjustment	Low-speed screw	1-1/4 turn ± 1/4	2 turn ± 1/4
	High-speed screw	0	
	Idle speed (in water)	1500 RPM	
	Idle speed (out of water)	3000 RPM	
Fuel	Type	Regular unleaded gasoline	
	Minimum octane no.	87	
Fuel return line orifice		0.8 mm (.031 in)	MAG and PTO: 0.8 mm (.031 in)
ADDITIONAL INFORMATION:			

COOLING	GTI (5836/5841)	GTX Limited (5837/5842)
Type	Open circuit – Direct flow from jet propulsion unit	
Thermostat	None	
Monitoring beeper setting	86-94°C (187-201°F)	
ADDITIONAL INFORMATION:		

PROPULSION		GTI (5836/5841)	GTX Limited (5837/5842)
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 POLYOL ESTER OIL 75W90 GL5	
Steering nozzle pivoting angle		23°	
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)	155.6 mm (6.126 in)
Impeller/wear ring clearance	New	0.0 - 0.4 mm (.000 - .016 in)	
	Wear limit	1.0 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 11° - 22°/stainless steel	Progressive pitch 14° - 21°/stainless steel
ADDITIONAL INFORMATION: Do not mix different brands or oil types.			

DIMENSIONS	GTI (5836/5841)	GTX Limited (5837/5842)
Number of passenger (driver incl.)	3	
Overall length	312 cm (122.8 in)	
Overall width	119 cm (47 in)	
Overall height	94 cm (37 in)	
Dry weight	269 kg (593 lb)	288 kg (635 lb)
Load limit (passenger and 10 kg (22 lb) luggage)	242 kg (534 lb)	
ADDITIONAL INFORMATION:		

CAPACITIES		GTI (5836/5841)	GTX Limited (5837/5842)
Fuel tank (including reserve)		56.5 L (15 U.S. gal)	
Fuel tank reserve		11.4 L (3.0 U.S. gal)	
Oil injection reservoir		6 L (1.6 U.S. gal)	
Jet pump impeller shaft reservoir	Capacity	80 mL (2.7 U.S. oz)	120 mL (4.0 U.S. oz)
	Oil level height	Up to plug	
ADDITIONAL INFORMATION:			

MATERIALS	GTI (5836/5841)	GTX Limited (5837/5842)
Hull	Composite	
Inlet grate	Aluminum	
Impeller housing/stator/venturi/nozzle	Plastic/brass/plastic/ plastic	Plastic/brass/aluminum/ aluminum
Air intake silencer	Thermoplastic	
Flame arrester	Multi-layer wire screen	Tubular wire screen
Exhaust muffler	Aluminum	
Resonator	Not applicable	Plastic
Steering padding	Thermoplastic with polyethylene foam	
Fuel tank	Polyethylene	
Oil injection reservoir	Polyethylene	
Seat	Polyurethane foam	
ADDITIONAL INFORMATION:		

STANDARD EQUIPMENT	GTI (5836/5841)	GTX Limited (5837/5842)
Safety lanyard	Standard	
Digitally Encoded Security System	Standard	
Fuel tank reserve	Standard	
Monitoring beeper	Standard	
Speedometer	Standard	
Fuel/oil gauge (analog)	Standard	Not applicable
Tachometer	Not applicable	Standard
Info Center	Not applicable	Standard
Reverse	Standard	
Storage compartment	Standard	
Glove box	Standard	
Rear grab handle	Standard	
Extinguisher holder	Standard	
Tool kit	Standard	
ADDITIONAL INFORMATION: Info Center standard functions: Fuel level/low fuel level/low oil level/low voltage/high temperature/tachometer/speedometer/average speed/peak speed/ trip meter/hour meter/clock/compass/exterior temperature/lake temperature/chronometer/maintenance information.		

PERFORMANCE		GTI (5836/5841)	GTX Limited (5837/5842)
Estimated pump power		26 kW (34.9 hp)	51 kW (68.4 hp)
Maximum fuel consumption at wide open throttle		33.5 L/h (8.8 U.S. gal/h)	55 L/h (14.5 U.S. gal/h)
Cruising time at full throttle	Fuel tank without reserve	1 hour 21 minutes	49 minute
	Fuel tank reserve	21 minutes	13 minutes
ADDITIONAL INFORMATION:			

TIGHTENING TORQUES			GTI (5836/5841)	GTX Limited (5837/5842)	
ENGINE	Exhaust manifold screw		24 N•m (17 lbf•ft) (4)	40 N•m (30 lbf•ft)	(4)
	Magneto flywheel nut		145 N•m (107 lbf•ft) (1)	115 N•m (85 lbf•ft)	(1)
	Flywheel (PTO side)		110 N•m (81 lbf•ft) (5)	115 N•m (85 lbf•ft)	(1)
	Crankcase screws	M8	24 N•m (17 lbf•ft) (3) (4)	27 N•m (20 lbf•ft)	(3) (4)
		M10	40 N•m	(30 lbf•ft)	(3) (4)
	Crankcase/engine support nuts		35 N•m (26 lbf•ft) (1)	25 N•m (18 lbf•ft)	(1)
	Engine mount/hull		25 N•m	(18 lbf•ft)	(1)
	Cylinder head screws		24 N•m (17 lbf•ft) (1) (4)	34 N•m (25 lbf•ft)	(1) (4)
	Cylinder head nuts		Not applicable	34 N•m (25 lbf•ft)	(1)
	Crankcase/cylinder screws		24 N•m (17 lbf•ft) (1) (4)	Not applicable	
	Tuned pipe flange screws/nut		25 N•m (18 lbf•ft) (1)	40 N•m (30 lbf•ft)	(1)
	Tuned pipe fixation screws		25 N•m	(18 lbf•ft)	(1)
	Flame arrester screws		10 N•m (89 lbf•**in**) (1)	Not applicable	
	Magneto housing cover screws		9 N•m	(80 lbf•**in**)	(5)
	Starter mounting screws		22 N•m (16 lbf•ft) (1)	10 N•m (89 lbf•**in**)	(1)
	Spark plugs		24 N•m	(17 lbf•ft)	(5)
JET PUMP	Impeller		70 N•m	(52 lbf•ft)	(2)
	Pump/hull nuts		31 N•m	(23 lbf•ft)	(1)
	Venturi/pump housing screws		21 N•m	(16 lbf•ft)	(1)
	Pump housing cover screws		4 N•m	(35 lbf•**in**)	(1)
	Inlet grate screws		8 N•m	(71 lbf•**in**)	(1)
	Riding plate screws		22 N•m	(16 lbf•ft)	(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		6 N•m	(53 lbf•**in**)	
	Handlebar clamp bolts		26 N•m	(19 lbf•ft)	
	Steering cable ball joint (nozzle)		2 N•m (18 lbf•**in**)	7 N•m (62 lbf•**in**)	
	Steering support bolts		15 N•m	(11 lbf•ft)	(1)
	Handlebar grip screw		13 N•m	(10 lbf•ft)	

ADDITIONAL INFORMATION: apply where indicated;

(1) Loctite 242 (blue)
(2) Loctite 271 (red)
(3) Loctite 518
(4) Synthetic grease
(5) Anti-seize lubricant

◆ WARNING

Correct torques and use of Loctite must be strictly followed.

WIRING DIAGRAMS

WIRE COLOR CODES

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

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

WIRE DIGIT CODES

All Models Except SPX and GTS

First number indicates in which connector the wire is plugged in.

Second number indicates the position of the wire in the connector.

The letter at the end of the number (if applicable) indicates a common circuit in the MPEM printed circuit with another wire bearing the same letter.

Example: 2-18 (g)

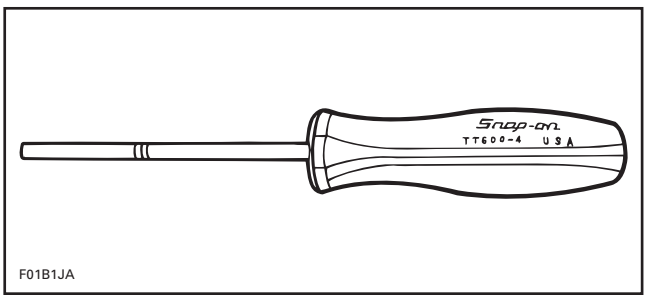
The first number indicates that the wire is positioned in the connector no. 2 of the MPEM.

The second number indicates that the wire is positioned in the terminal no. 18.

The letter (g) indicates a common circuit with another wire(s) bearing the same letter (g) in the circuit.

PACKARD CONNECTOR

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



◆ WARNING

Ensure all terminals are properly crimped on wires and connector housings are properly fastened.

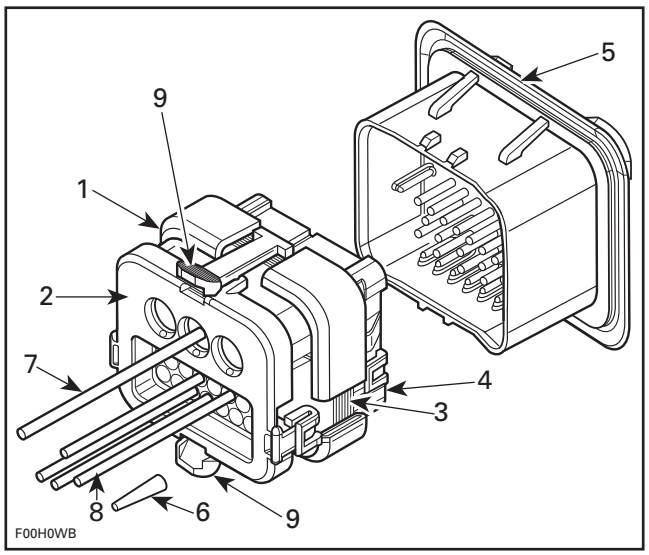
AMP PLUG CONNECTOR

All Models Except SPX and GTS

These connectors are found on the MPEM.

When servicing electrical system, special care must be taken when working with AMP Plug Connectors in order to prevent any malfunction of the system.

Description

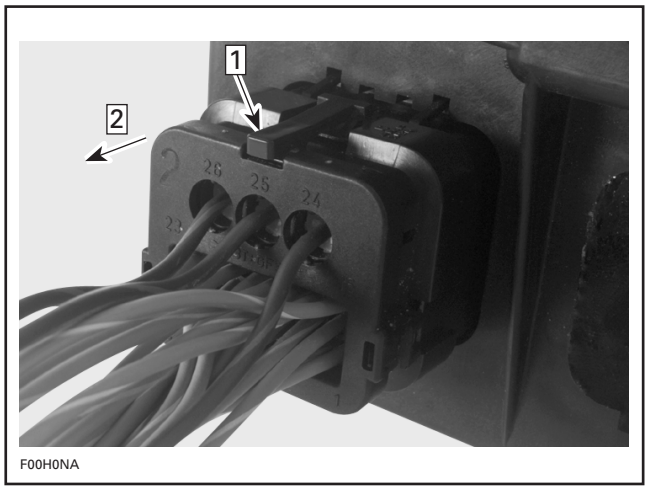


AMP PLUG CONNECTOR

1. *Plug assembly*
2. *Cover assembly*
3. *Mating seal*
4. *Wedge lock*
5. *Header assembly*
6. *Seal plug*
7. *Power wire*
8. *Signal wire*
9. *Locking tab*

Removal

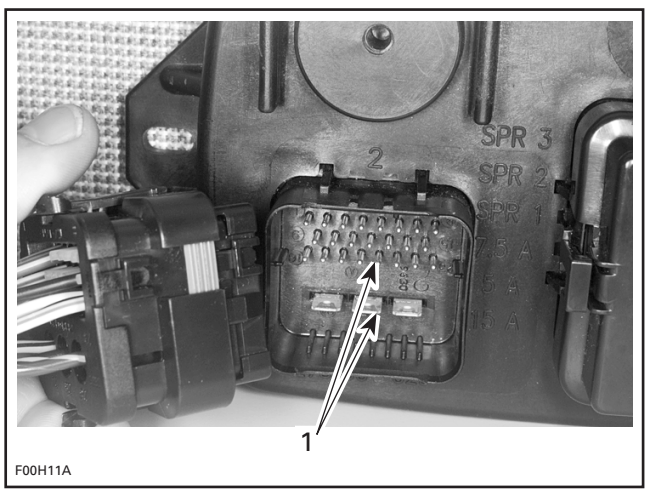
To remove the plug connector from the header assembly, press both tabs and pull plug.



Step 1 : Press tabs (both sides)
Step 2 : Pull plug

Installation

Apply a thin coat of DEOXIT contact lubricant (P/N 293 550 015) to the pins of the header on the MPEM only.

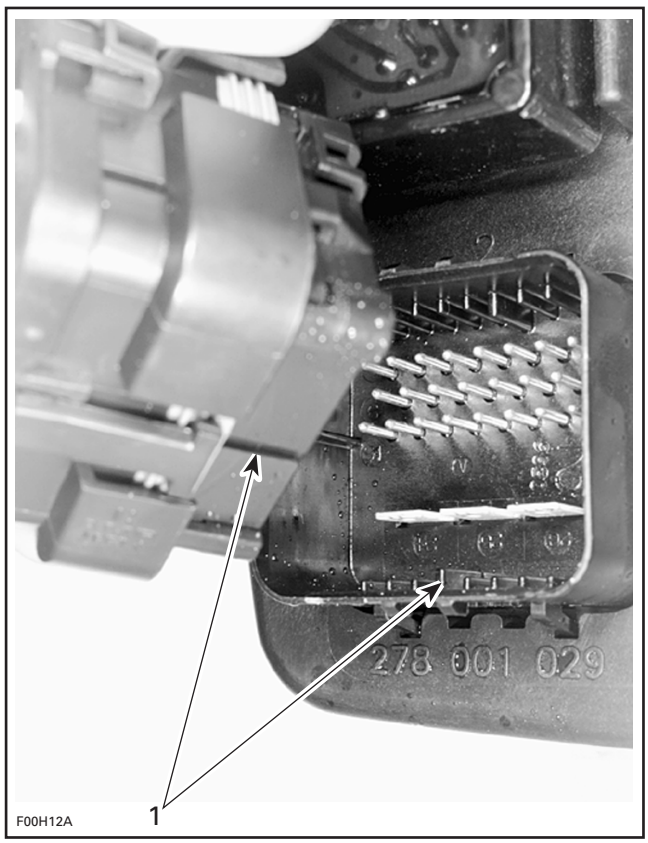


1. Apply a thin coat of DEOXIT contact lubricant

▼ CAUTION

Do not apply lubricant excessively. Care must be taken so that the lubricant will not come in contact with the mating seal; the seal may loose its sealing capacities. Do not apply lubricant on contacts inside plug connector.

Each plug assembly is mechanically keyed to mate only with identical mechanical keyed header on the MPEM.



1. Mechanically keyed

Contact Removal

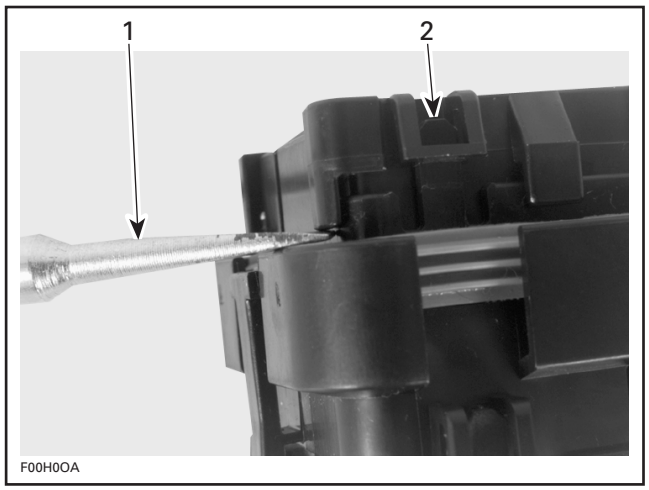
SIGNAL WIRE

Insert a screwdriver blade between the connector and the wedge lock tab.

Release the locking tab and at the same time, pry open the wedge lock to open position.

▼ CAUTION

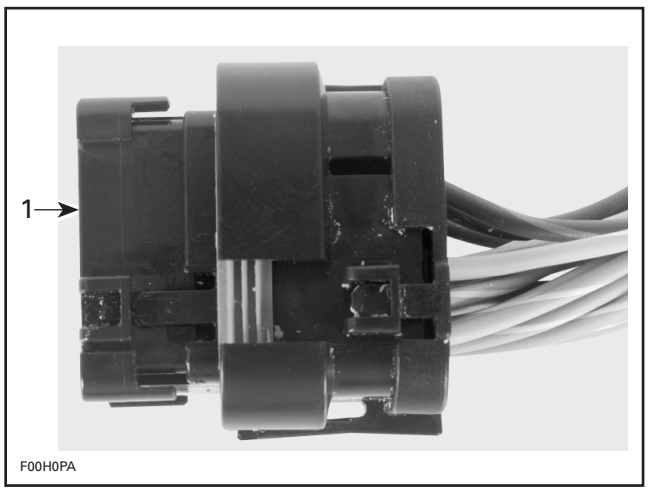
The wedge lock should never be removed from the connector for insertion or removal of the signal wire contacts



1. Screwdriver between wedge lock and connector
2. Locking tab

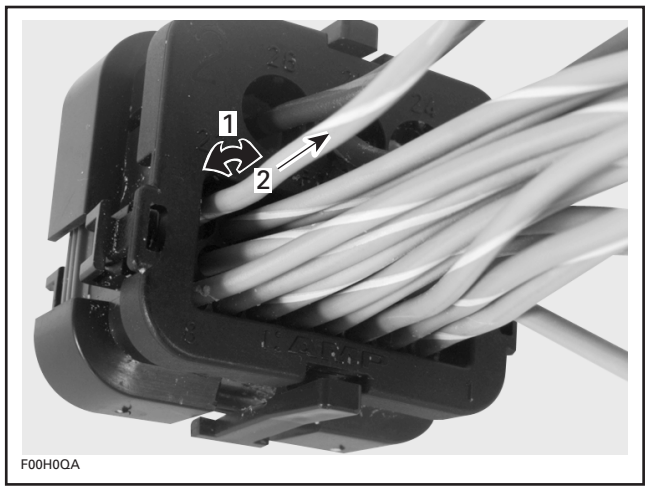
Repeat the same steps for the other locking tab retaining the wedge lock.

The wedge lock is now in the open position.



1. Wedge lock opened

While rotating the wire back and forth over a half turn (1/4 turn in each direction), gently pull the wire until the contact is removed.



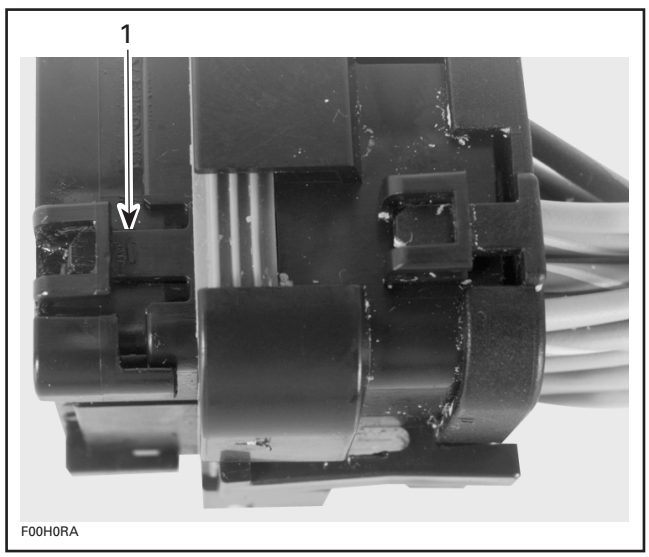
1. Rotate wire back and forth
2. Pull wire

POWER WIRE CONTACT

NOTE: The wedge lock must be removed to extract power contact.

Open the wedge lock.

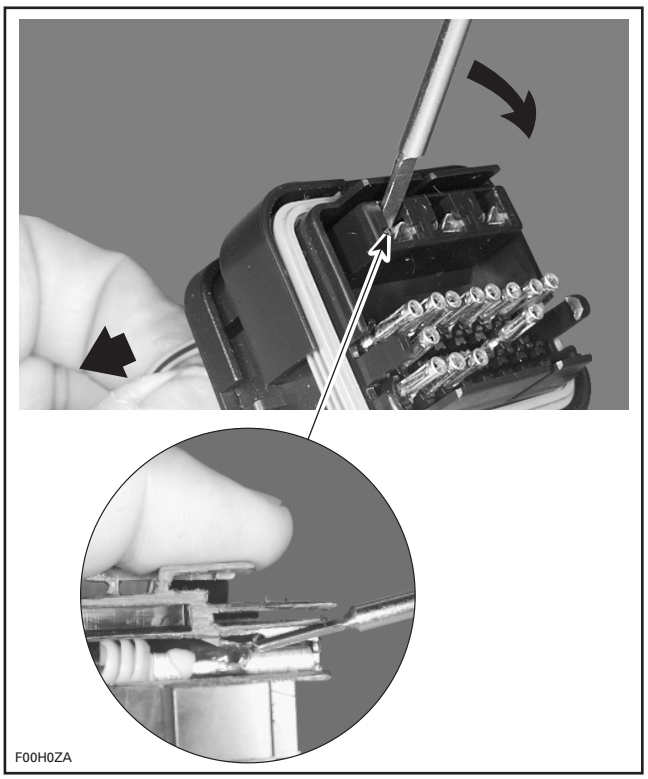
Pull both locking tabs and remove wedge lock from plug assembly.



1. Pull locking tab (both sides)

Before extraction, push wire forward to relieve pressure on retaining tab.

Insert a 4.8 mm (.189 in) wide screwdriver blade inside the front of the contact cavity.



Pry back the retaining tab while gently pulling wire back until contact is removed.

Contact Crimping

The size of the wires must be 20 to 16 AWG with a wire insulation diameter having a minimum dimension of 1.7 mm (.067 in) and a maximum dimension of 2.78 mm (.106 in).

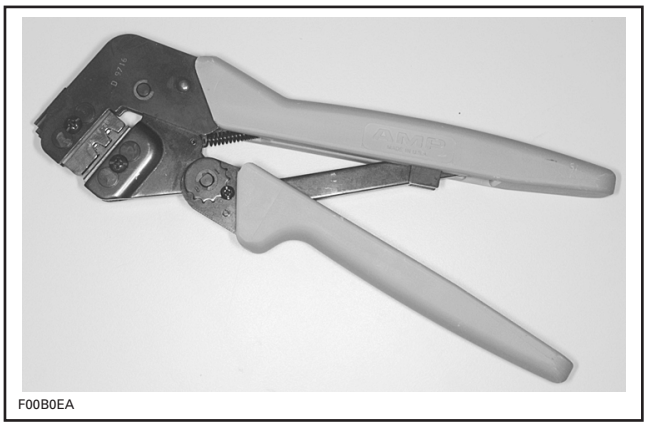
The wire strip length shall be 5.1 mm (13/64 in).

NOTE: When stripping wires, ensure conductor is not nicked, scrapped or cut. Wire stripping tool jaws may leave marks on the surface of the wire insulation. If these marks occur at the location of the wire seal, leakage may result. Insulation surface within 25 mm (1 in) from the tip of the contact must be smooth.

All contacts in AMP plug connectors must be crimped using the crimping tool (P/N 295 100 164).

▼ CAUTION

If contacts are not crimped using the proper crimping tool, the wire seal may be damaged.

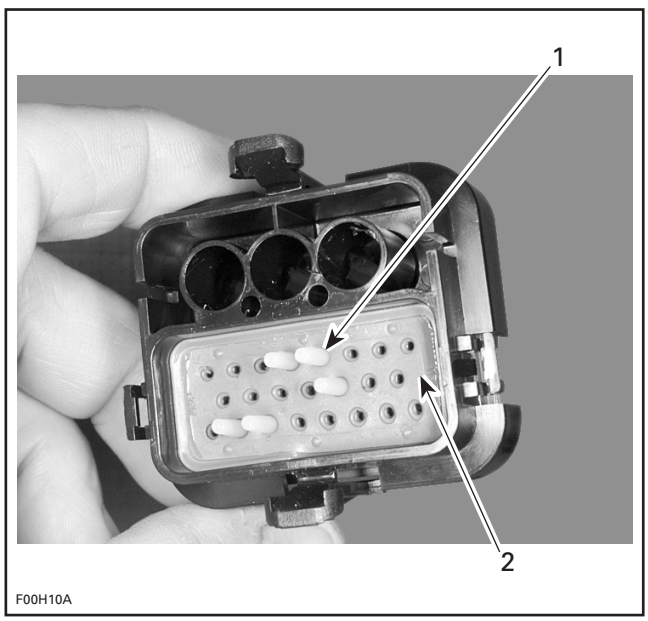


CRIMPING TOOL (P/N 295 100 164)

All circuits are sealed by a diaphragm in the rubber wire seal. When installing wire contacts in plug connector, the diaphragm is pierced as the contact passes through it.

If the diaphragm is pierced and the cavity is not used, install a seal plug, **large end first,** into circuit cavity as far as it will go.

NOTE: It is suggested that all unused circuit cavities be sealed with a seal plug, even if they are not pierced.



1. Seal plug
2. Wire seal

▼ CAUTION

Do not pierce the diaphragm with a sharp point for electrical troubleshooting. The resulting pinholes in the insulation will allow moisture to penetrate the system and possibly result in system failure.

Contact Installation

For insertion of signal contact, make sure the wedge lock is in the open position.

NOTE: For insertion of power contact, the wedge lock may or may not be on the open position.

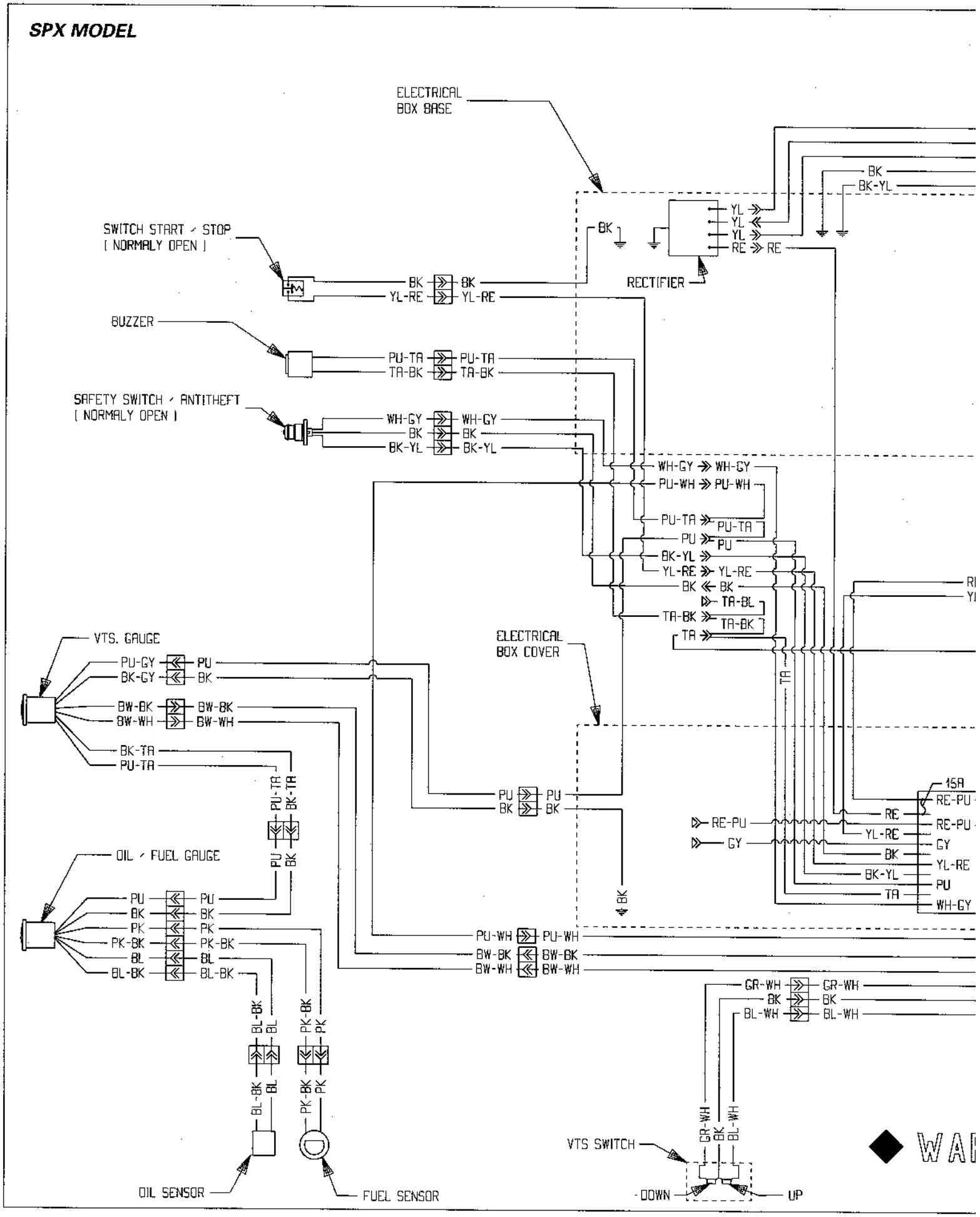
Insert contact into appropriate circuit cavity and push as far as it will go.

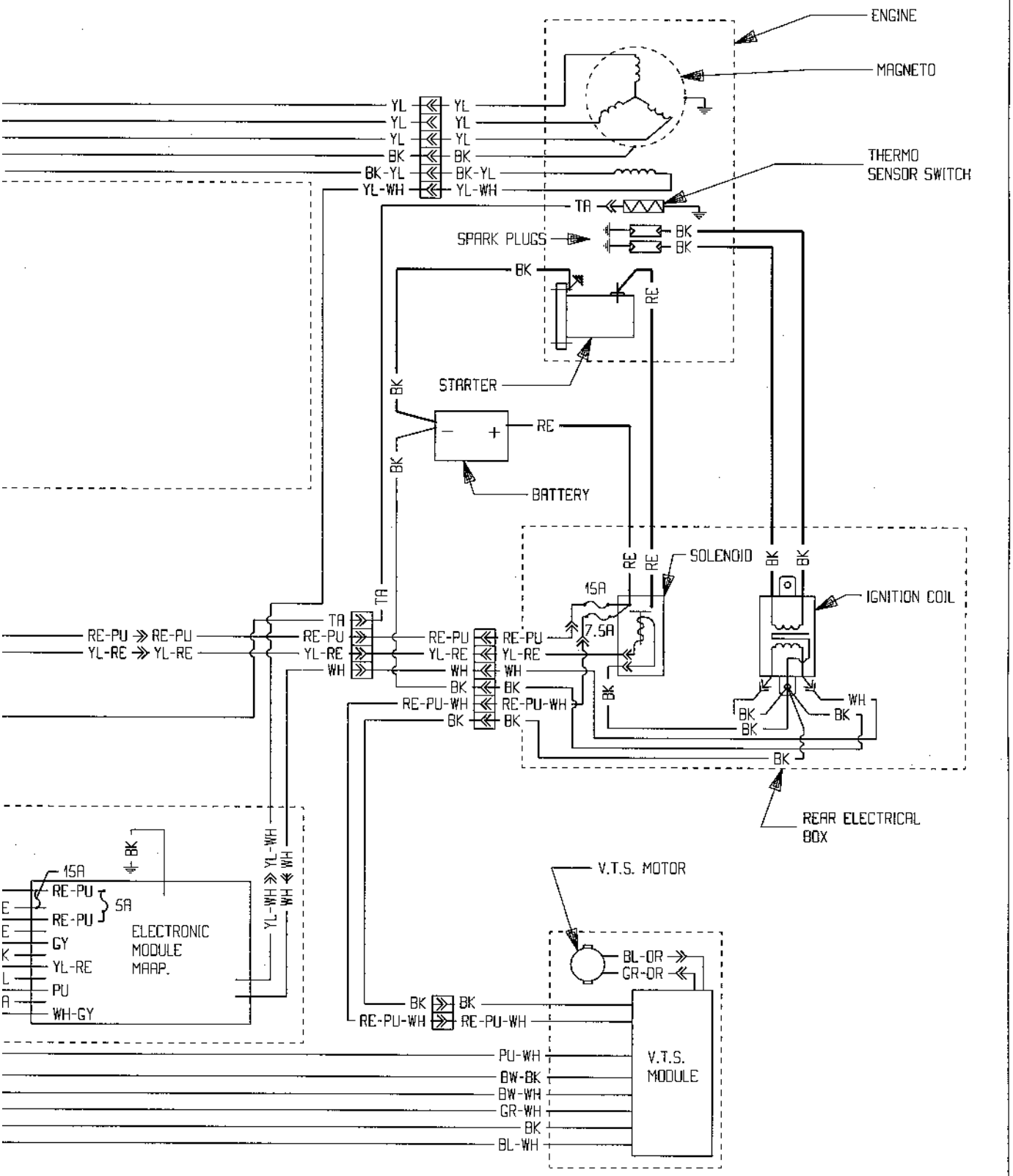
Pull back on the contact wire to be sure the retention fingers in the housing are holding the contact properly.

After all required contacts have been inserted, the wedge lock must be closed to its **locked** position.

SPX MODEL 5838/5839

SPX MODEL


ELECTRICAL BOX BASE
SWITCH START - STOP [NORMALY OPEN]
BUZZER
SAFETY SWITCH - ANTITHEFT [NORMALY OPEN]
RECTIFIER
VTS. GAUGE
ELECTRICAL BOX COVER
OIL - FUEL GAUGE
OIL SENSOR
FUEL SENSOR
VTS SWITCH
DOWN
UP
15A
BK
BK-YL
YL
RE
WH-GY
PU-WH
PU-TA
PU
YL-RE
TA-BL
TA-BK
TA
PU-GY
BK-GY
BW-BK
BW-WH
BK-TA
PK
PK-BK
BL
BL-BK
GR-WH
BL-WH
RE-PU
GY



COLOR CODE

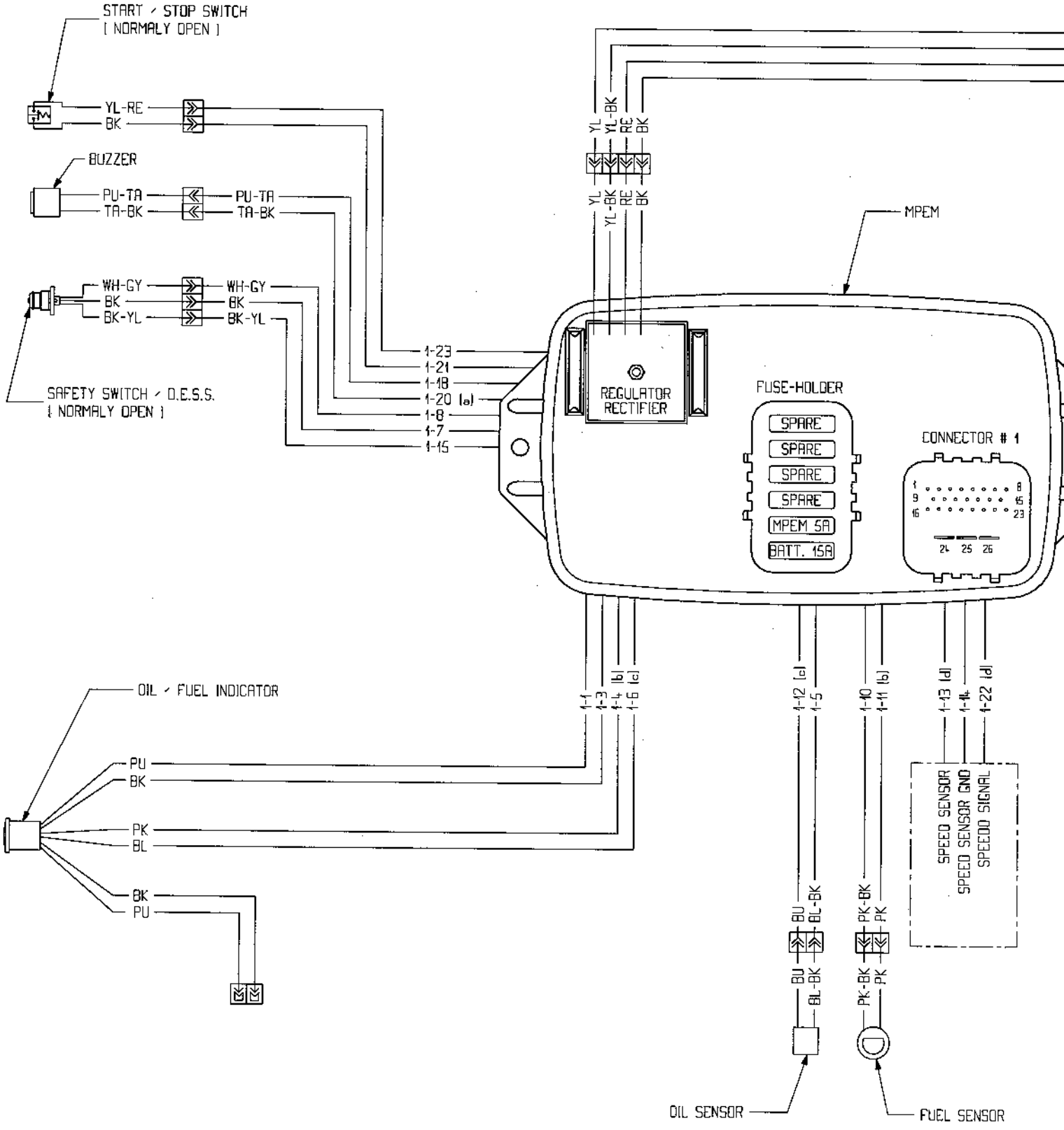
WH = WHITE	BK = BLACK
RE = RED	YL = YELLOW
PU = PURPLE	TA = TAN
GR = GREEN	BW = BROWN
GY = GREY	BL = BLUE
PK = PINK	OR = ORANGE

WARNING

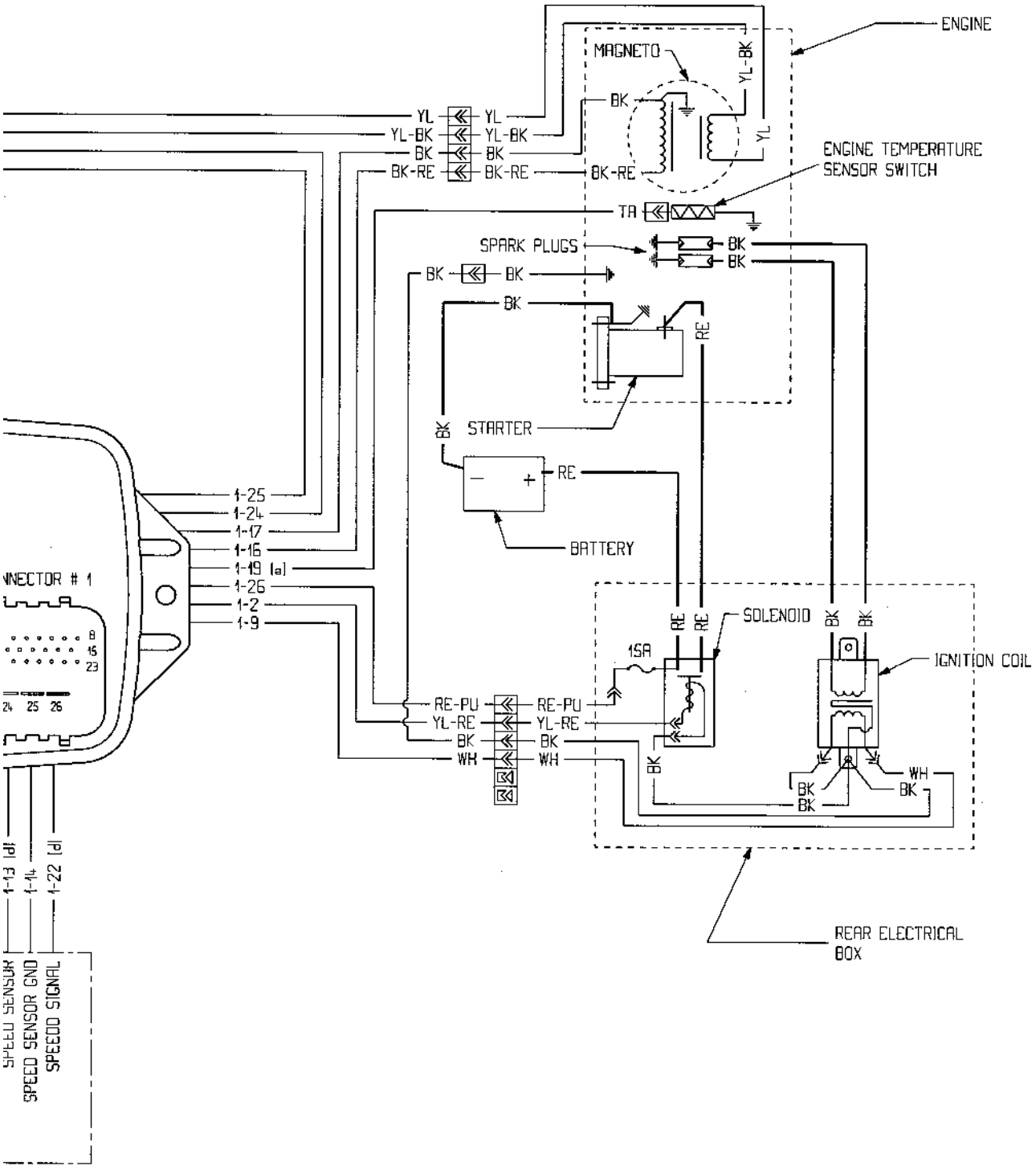
- ENSURE ALL TERMINALS ARE PROPERLY CRIMPED ON THE WIRES AND ALL CONNECTOR HOUSING ARE PROPERLY FASTENED.

GS MODEL 5626/5844

GS MODEL



WARN



EL SENSOR

WARNING

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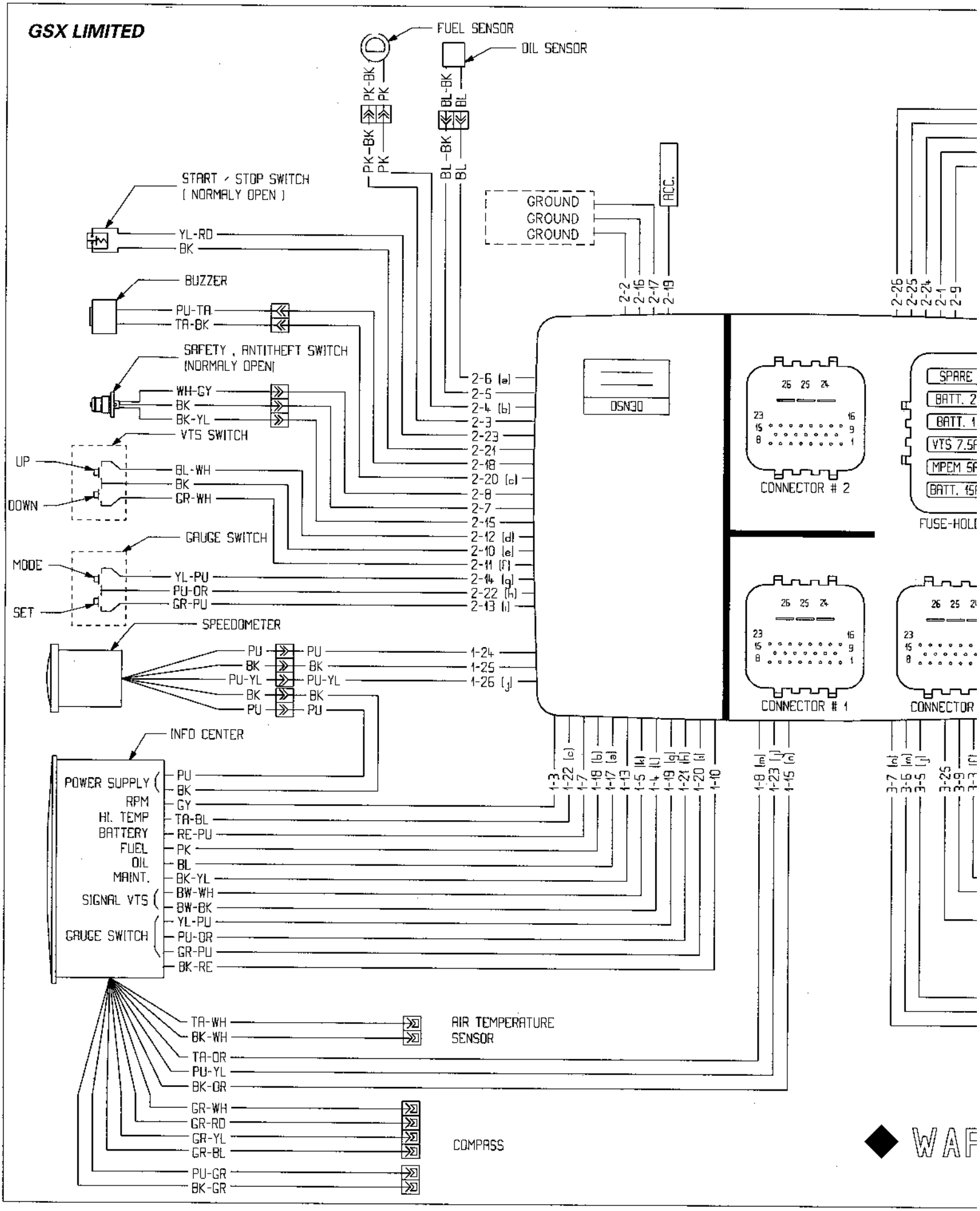
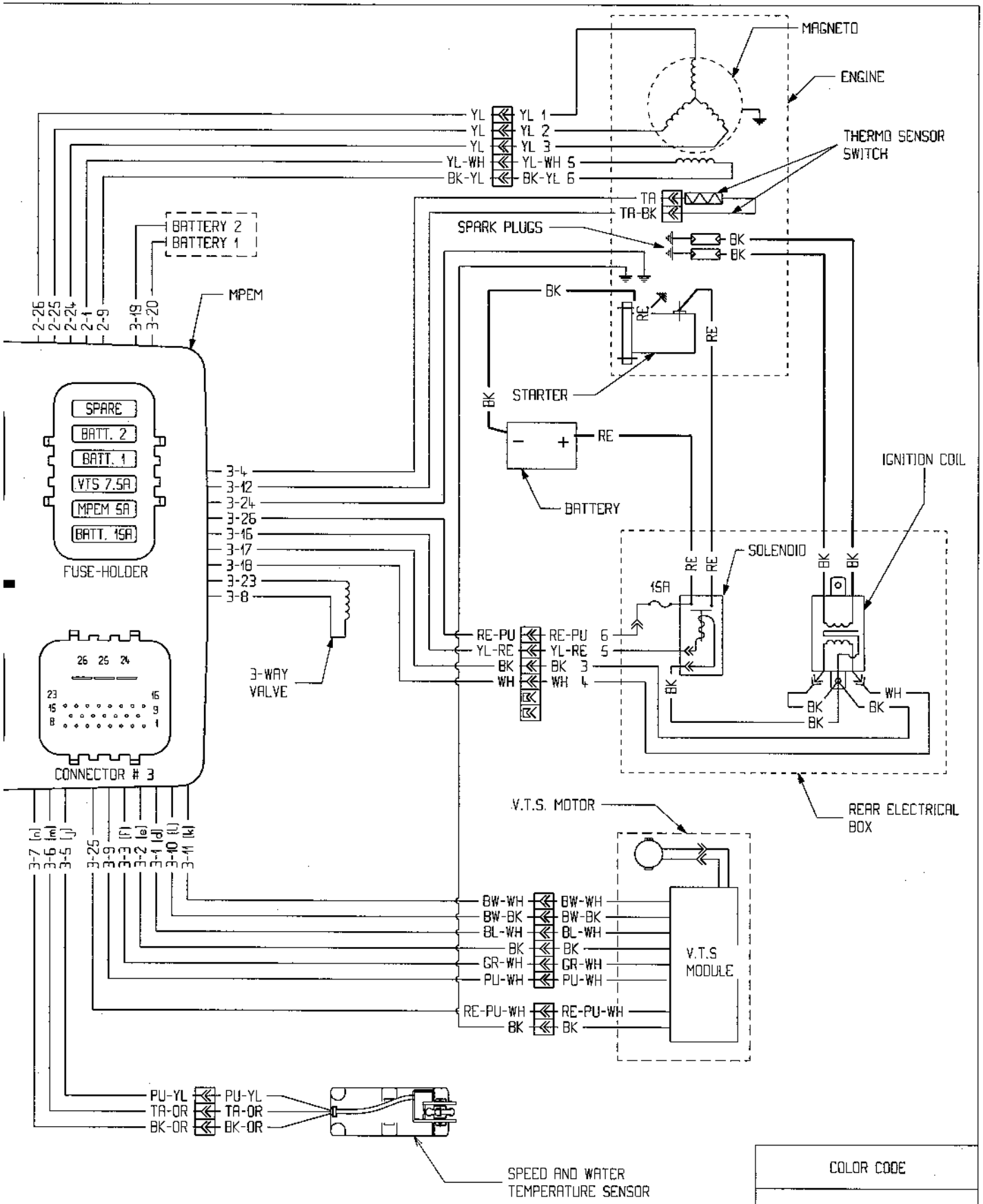
GSX LIMITED

5629/5845


GSX LIMITED
FUEL SENSOR
OIL SENSOR
PK-BK
PK
BL-BK
BL
START / STOP SWITCH
(NORMALY OPEN)
YL-RD
BK
BUZZER
PU-TA
TA-BK
SAFETY , ANTITHEFT SWITCH
(NORMALY OPEN)
WH-GY
BK
BK-YL
VTS SWITCH
UP
DOWN
BL-WH
BK
GR-WH
GAUGE SWITCH
MODE
SET
YL-PU
PU-OR
GR-PU
SPEEDOMETER
PU
BK
PU-YL
BK
PU
INFO CENTER
POWER SUPPLY
RPM
HI. TEMP
BATTERY
FUEL
OIL
MAINT.
SIGNAL VTS
GAUGE SWITCH
PU
BK
GY
TA-BL
RE-PU
PK
BL
BK-YL
BW-WH
BW-BK
YL-PU
PU-OR
GR-PU
BK-RE
GROUND
GROUND
GROUND
ACC.
2-2
2-16
2-17
2-19
2-6 (a)
2-5
2-4 (b)
2-3
2-23
2-21
2-18
2-20 (c)
2-8
2-7
2-15
2-12 (d)
2-10 (e)
2-11 (f)
2-14 (g)
2-22 (h)
2-13 (i)
1-24
1-25
1-26 (j)
DENSO
CONNECTOR # 2
CONNECTOR # 1
CONNECTOR
FUSE-HOLE
SPARE
BATT. 2
BATT. 1
VTS 7.5A
MPEM 5A
BATT. 15A
2-26
2-25
2-24
2-1
2-9
1-3 (c)
1-22 (c)
1-7
1-18 (b)
1-17 (a)
1-13
1-5 (k)
1-4 (L)
1-19 (g)
1-21 (h)
1-20 (i)
1-10
1-8 (m)
1-23 (j)
1-15 (n)
3-7 (n)
3-6 (m)
3-5 (j)
3-25
3-9
TA-WH
BK-WH
AIR TEMPERATURE SENSOR
TA-OR
PU-YL
BK-OR
GR-WH
GR-RD
GR-YL
GR-BL
COMPASS
PU-GR
BK-GR



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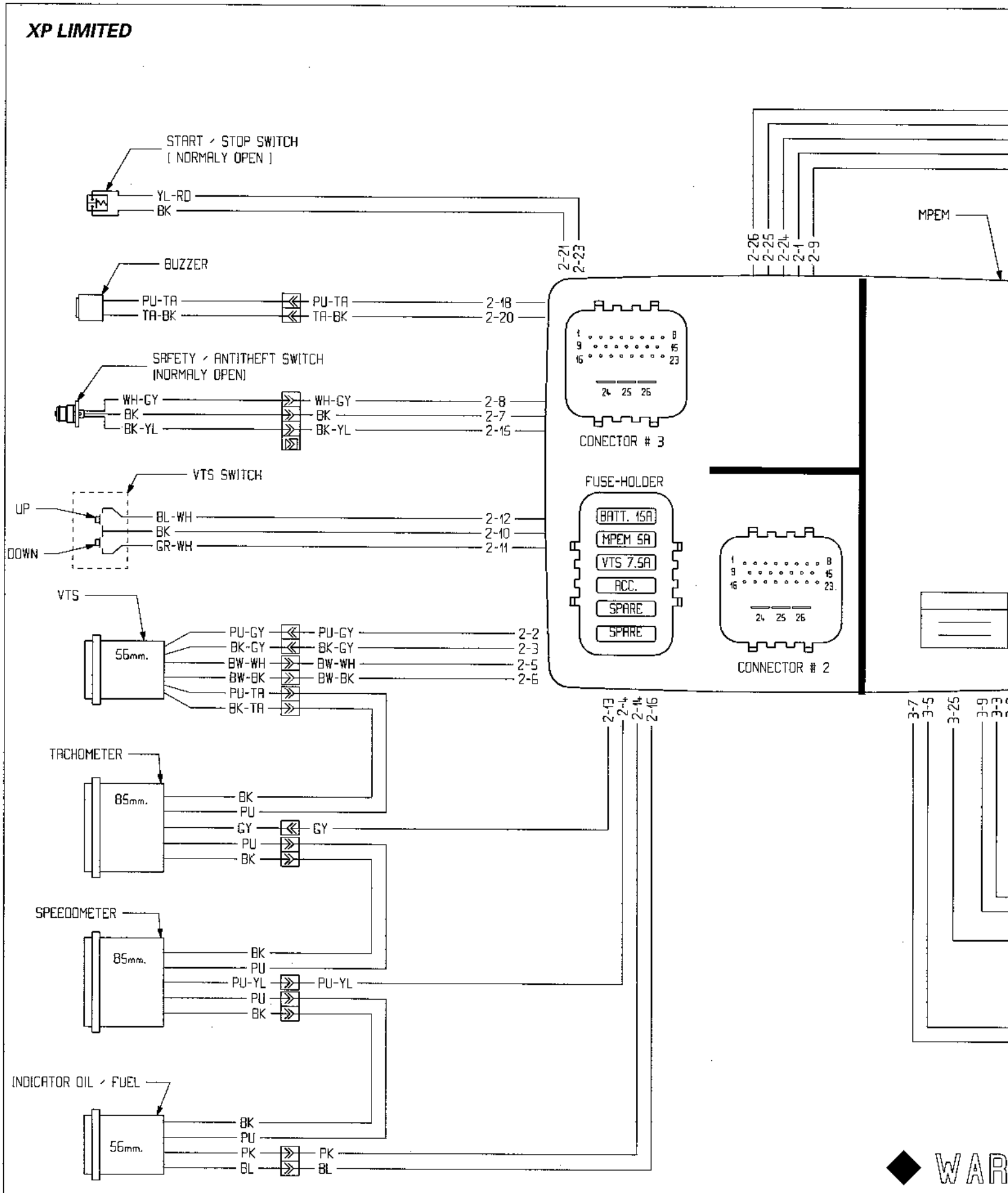
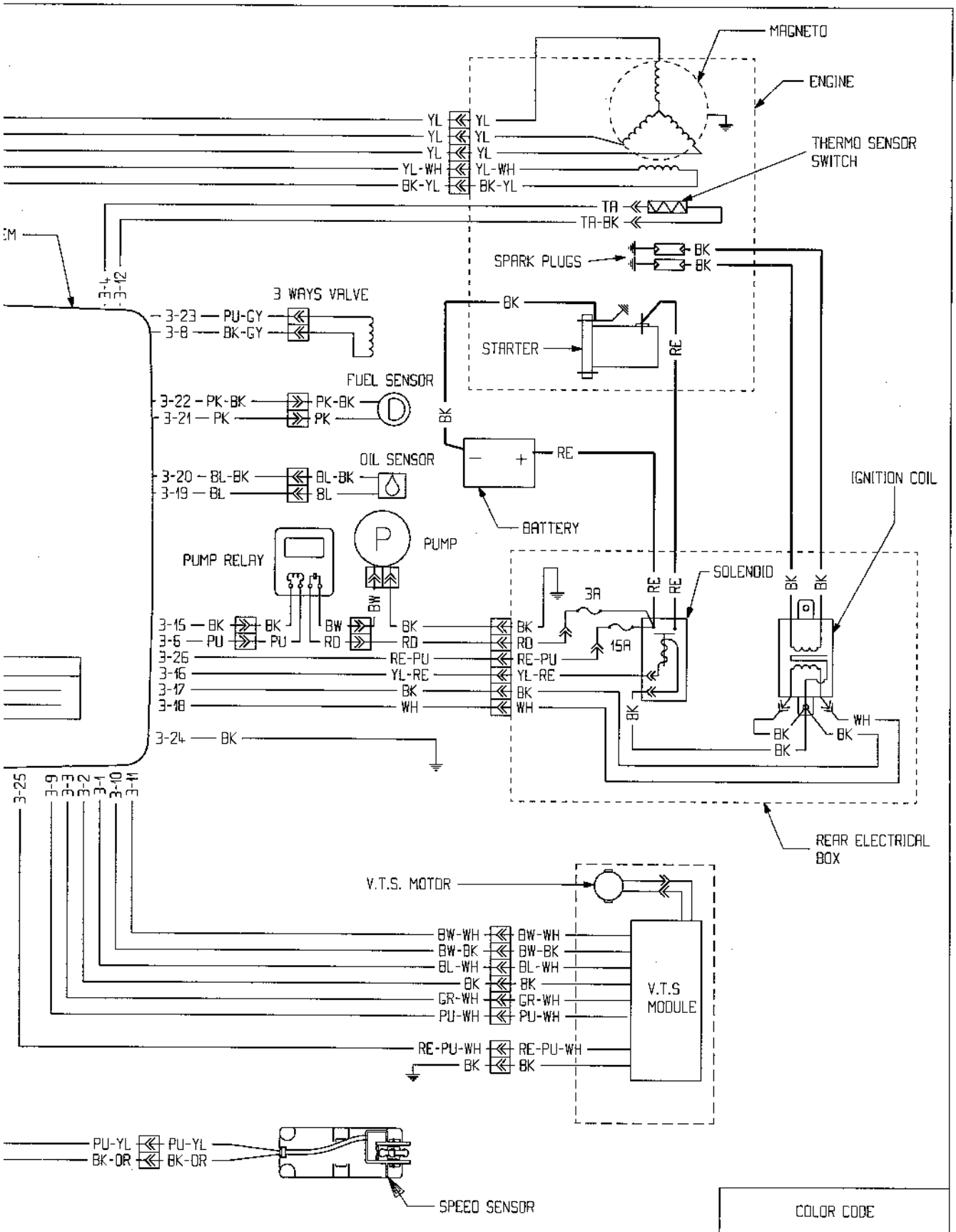
XP LIMITED

5665/5667

XP LIMITED


START / STOP SWITCH
[NORMALY OPEN]
YL-RD
BK
2-21
2-23
BUZZER
PU-TA
TA-BK
PU-TA
TA-BK
2-18
2-20
SAFETY / ANTITHEFT SWITCH
(NORMALY OPEN)
WH-GY
BK
BK-YL
WH-GY
BK
BK-YL
2-8
2-7
2-15
VTS SWITCH
UP
DOWN
BL-WH
BK
GR-WH
2-12
2-10
2-11
VTS
56mm.
PU-GY
BK-GY
BW-WH
BW-BK
PU-TA
BK-TA
PU-GY
BK-GY
BW-WH
BW-BK
2-2
2-3
2-5
2-6
TACHOMETER
85mm.
BK
PU
GY
PU
BK
GY
SPEEDOMETER
85mm.
BK
PU
PU-YL
PU
BK
PU-YL
INDICATOR OIL / FUEL
56mm.
BK
PU
PK
BL
PK
BL
2-13
2-4
2-14
2-16
2-26
2-25
2-24
2-1
2-9
MPEM
CONECTOR # 3
FUSE-HOLDER
BATT. 15A
MPEM 5A
VTS 7.5A
ACC.
SPARE
SPARE
CONNECTOR # 2
3-7
3-5
3-25
3-9
3-3



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WARNING

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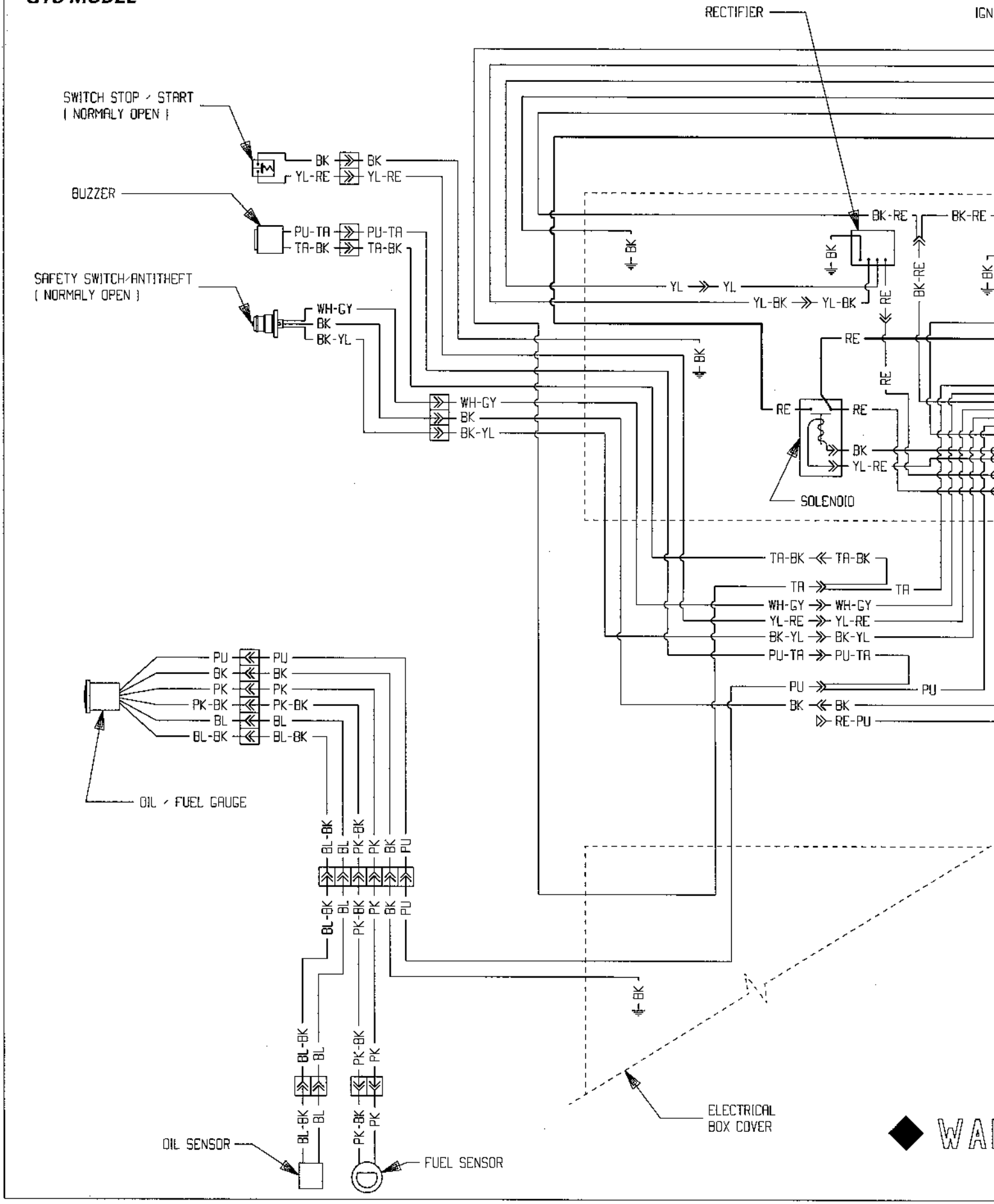
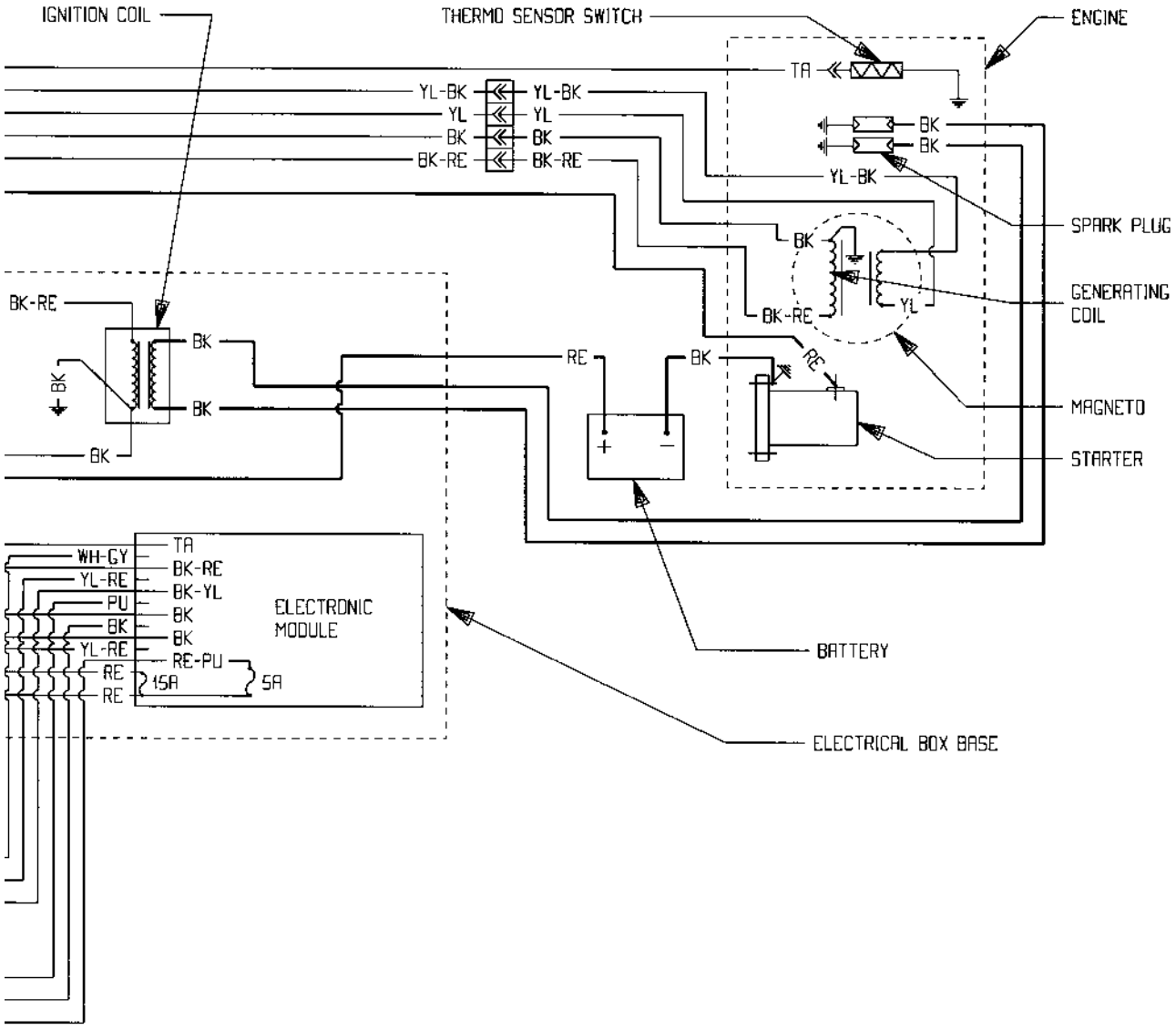
GTS MODEL 5819

GTS MODEL


RECTIFIER
IGN
SWITCH STOP - START
(NORMALY OPEN)
BUZZER
SAFETY SWITCH/ANTITHEFT
(NORMALY OPEN)
BK
YL-RE
PU-TA
TA-BK
WH-GY
BK-YL
YL
YL-BK
BK-RE
RE
SOLENOID
TA
WH-GY
PU
PK
PK-BK
BL
BL-BK
RE-PU
OIL - FUEL GAUGE
OIL SENSOR
FUEL SENSOR
ELECTRICAL
BOX COVER



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WARNING

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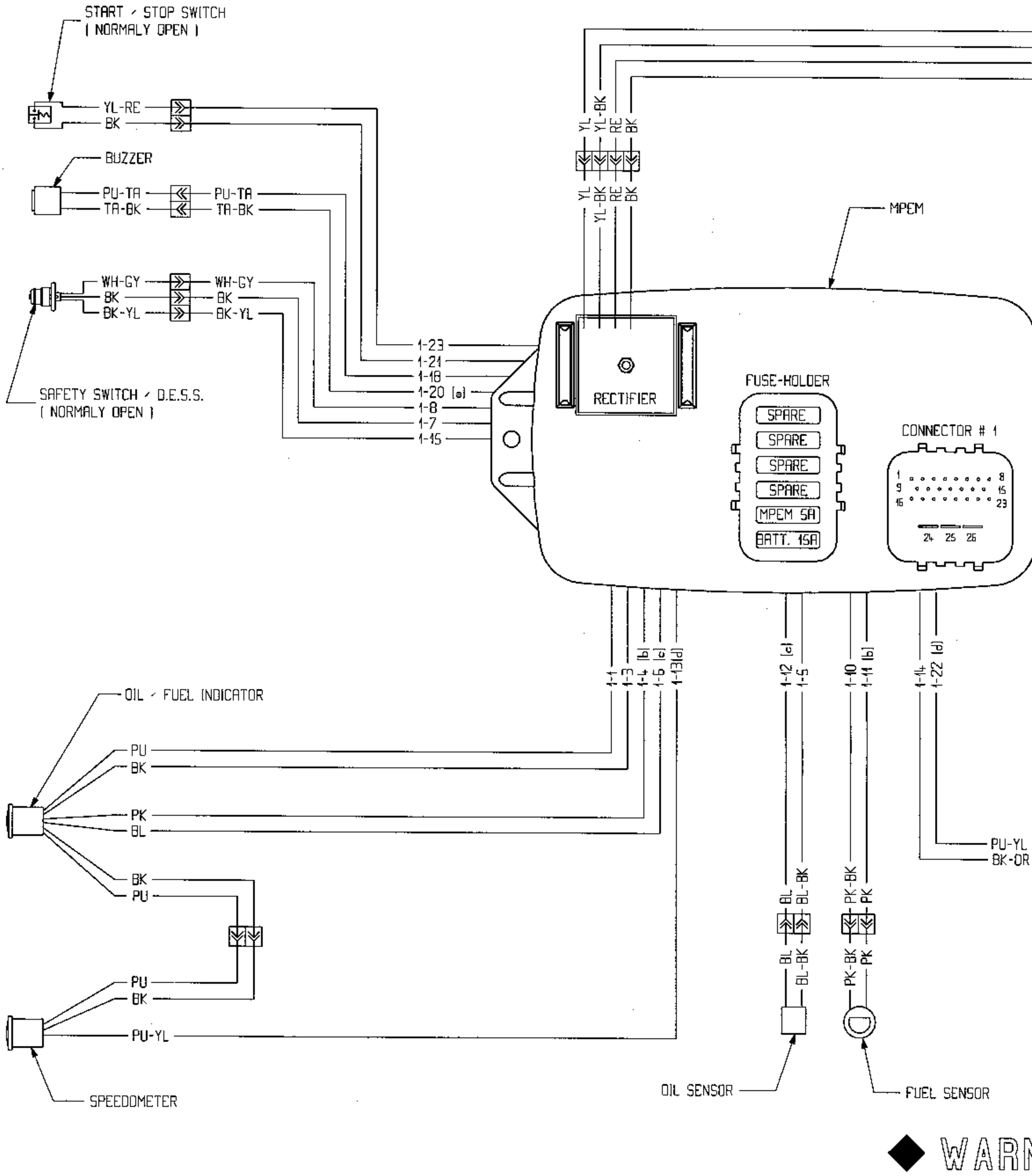
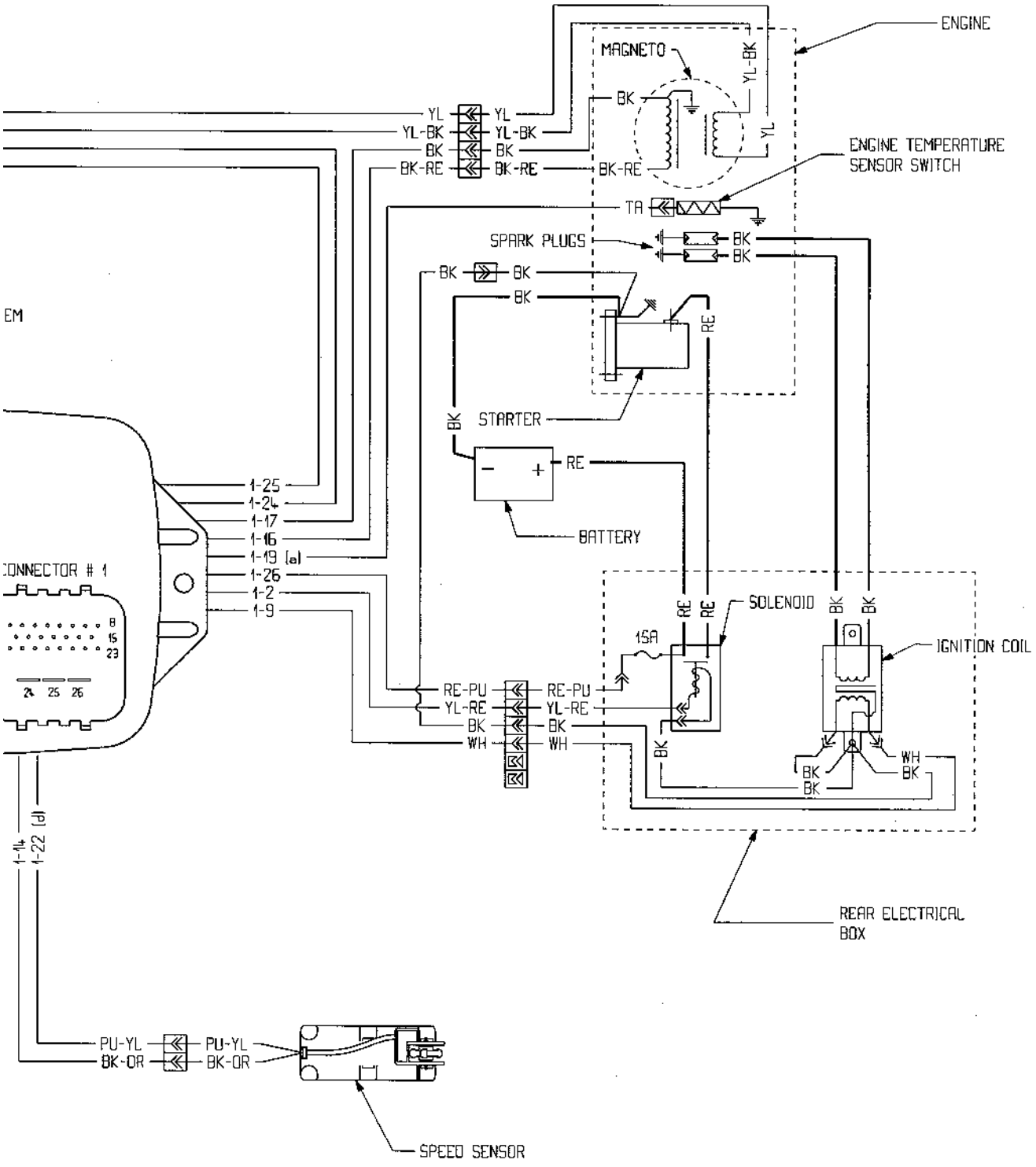
GTI MODEL 5836/5841

GTI MODEL



START / STOP SWITCH
(NORMALY OPEN)
YL-RE
BK
BUZZER
PU-TA
TA-BK
PU-TA
TA-BK
WH-GY
BK
BK-YL
WH-GY
BK
BK-YL
SAFETY SWITCH / D.E.S.S.
(NORMALY OPEN)
1-23
1-21
1-18
1-20 (a)
1-8
1-7
1-15
YL
YL-BK
RE
BK
YL
YL-BK
RE
BK
MPEM
RECTIFIER
FUSE-HOLDER
SPARE
SPARE
SPARE
SPARE
MPEM 5A
BATT. 15A
CONNECTOR # 1
1
8
9
15
16
23
24
25
26
1-1
1-3
1-4 (b)
1-6 (c)
1-13(d)
1-12 (c)
1-5
1-10
1-11 (b)
1-14
1-22 (d)
OIL / FUEL INDICATOR
PU
BK
PK
BL
BK
PU
PU
BK
PU-YL
SPEEDOMETER
BL
BL-BK
BL
BL-BK
PK-BK
PK
PK-BK
PK
PU-YL
BK-OR
OIL SENSOR
FUEL SENSOR
WARN



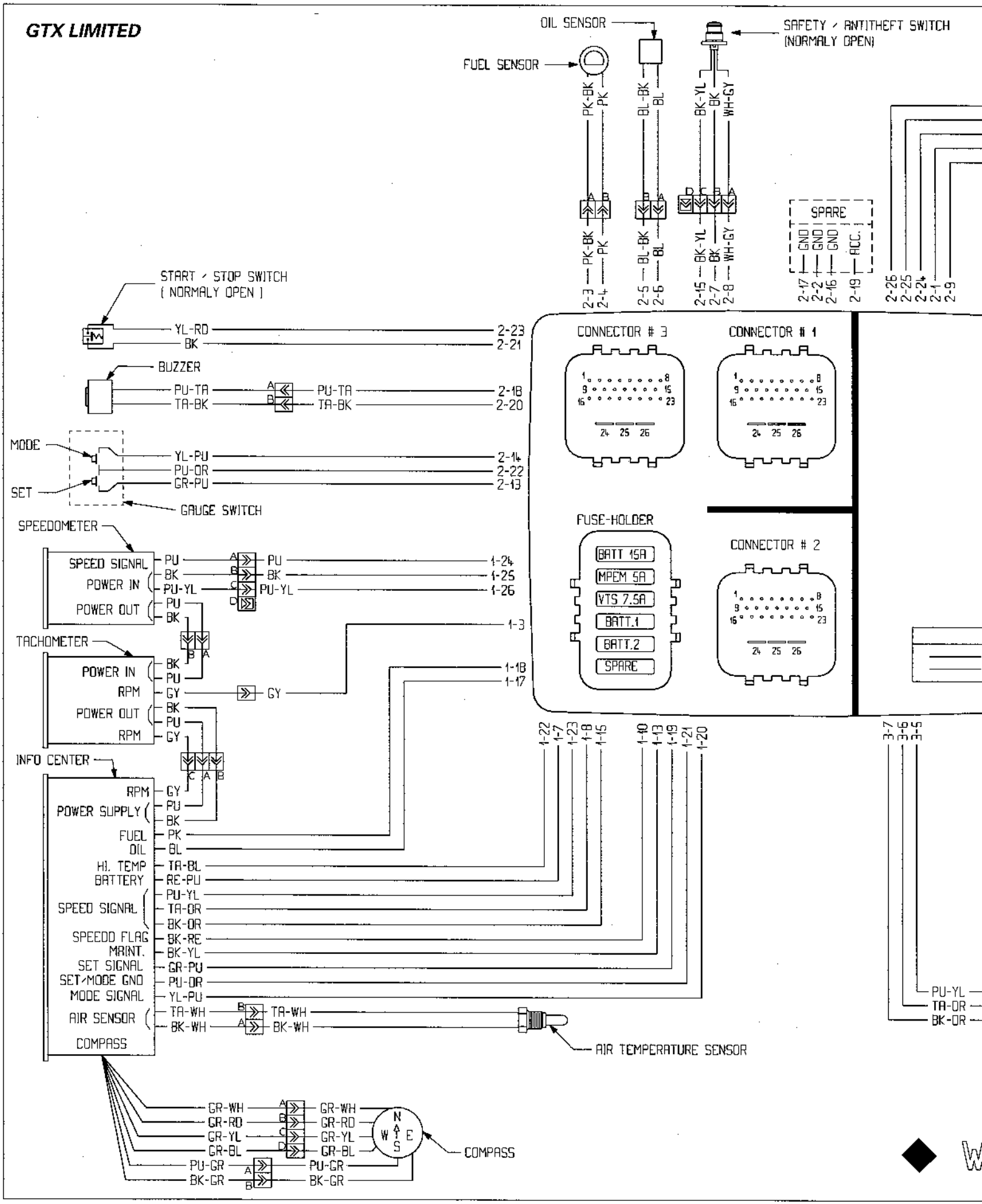
FUEL SENSOR

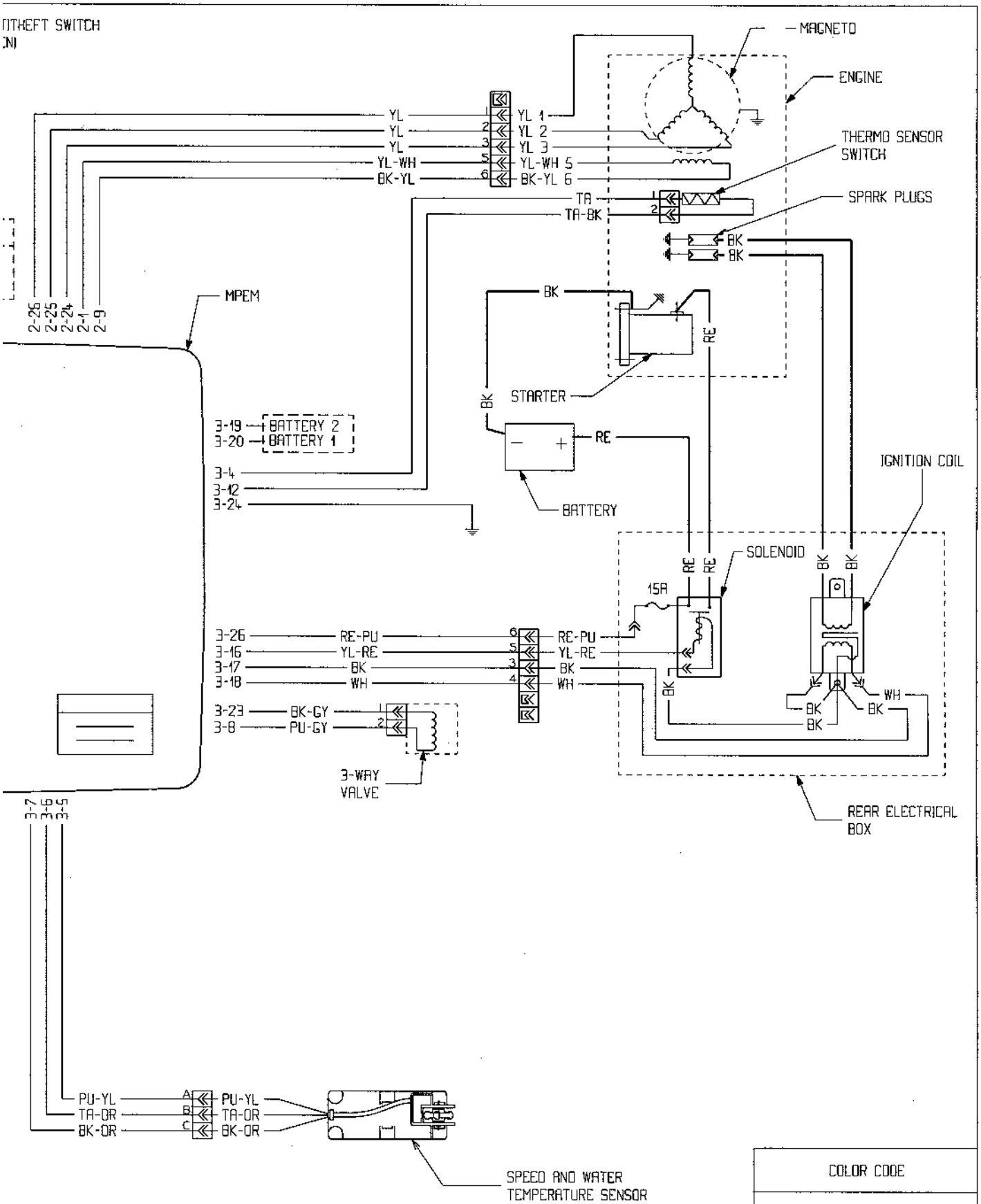
WARNING

- ENSURE ALL TERMINALS ARE PROPERLY CRIMPED ON THE WIRES AND ALL CONNECTOR HOUSING ARE PROPERLY FASTENED.

COLOR CODE	
WH = WHITE	BK = BLACK
RE = RED	YL = YELLOW
PU = PURPLE	TA = TAN
GR = GREEN	BW = BROWN
GY = GREY	BL = BLUE
PK = PINK	OR = ORANGE

GTX LIMITED 5837/5842


GTX LIMITED
OIL SENSOR
FUEL SENSOR
SAFETY / ANTITHEFT SWITCH
(NORMALY OPEN)
PK-BK
PK
BL-BK
BL
BK-YL
BK
WH-GY
2-3
2-4
2-5
2-6
2-15
2-7
2-8
SPARE
GND
GND
GND
ACC.
2-17
2-2
2-16
2-19
2-26
2-25
2-24
2-1
2-9
START / STOP SWITCH
(NORMALY OPEN)
YL-RD
BK
2-23
2-21
BUZZER
PU-TA
TA-BK
2-18
2-20
MODE
SET
YL-PU
PU-OR
GR-PU
2-14
2-22
2-13
GAUGE SWITCH
CONNECTOR # 3
CONNECTOR # 1
CONNECTOR # 2
FUSE-HOLDER
BATT 15A
MPEM 5A
VTS 7.5A
BATT.1
BATT.2
SPARE
SPEEDOMETER
SPEED SIGNAL
POWER IN
POWER OUT
PU
BK
PU-YL
1-24
1-25
1-26
TACHOMETER
RPM
GY
1-3
1-18
1-17
INFO CENTER
POWER SUPPLY
FUEL
OIL
HI. TEMP
BATTERY
SPEEDO FLAG
MAINT.
SET SIGNAL
SET/MODE GND
MODE SIGNAL
AIR SENSOR
COMPASS
PK
BL
TA-BL
RE-PU
PU-YL
TA-OR
BK-OR
BK-RE
BK-YL
GR-PU
PU-OR
YL-PU
TA-WH
BK-WH
1-22
1-7
1-23
1-8
1-15
1-10
1-13
1-19
1-21
1-20
3-7
3-6
3-5
AIR TEMPERATURE SENSOR
GR-WH
GR-RD
GR-YL
GR-BL
PU-GR
BK-GR
N
W
E
S
COMPASS



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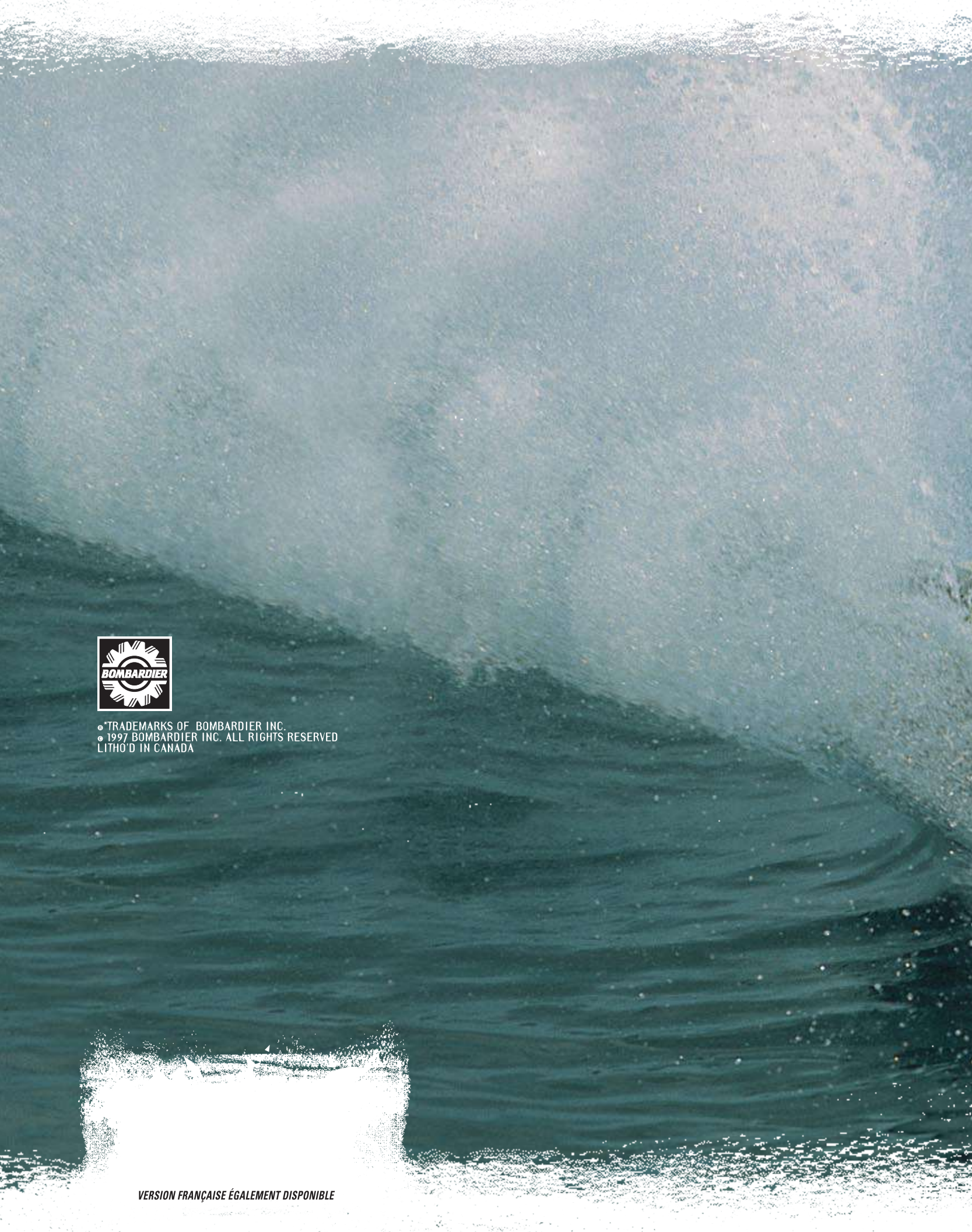
WARNING ENSURE ALL TERMINALS ARE PROPERLY CRIMPED ON THE WIRES AND ALL CONNECTOR HOUSING ARE PROPERLY FASTENED.



VERSION FRANÇAISE ÉGALEMENT DISPONIBLE