

2022 Shop Manual

GTX[†] Series, RXT™ Series

WAKE™ Pro

Fish Pro Sport, Fish Pro Trophy

SEA·DOO®



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SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair GTX, RXT, Fish PRO and Wake PRO Sea-Doo® watercraft.

This edition was primarily published to be used by technicians who are already familiar with all service procedures relating to BRP products. Mechanical technicians should attend training courses given by BRPTI.

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

The contents of this manual depicts parts and procedures applicable to the particular product at the time of writing. Service and Warranty Bulletins may be published to update the content of this manual. Dealer modifications that were carried out after manufacturing of the product, whether or not authorized by BRP, are not included.


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


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

The engines and the corresponding components identified in this document should not be utilized on product(s) other than those mentioned in this document.

It is understood that certain modifications may render use of the watercraft illegal under existing federal, provincial and state regulations.

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

 WARNING
Indicates a potential hazard that, if not avoided, could result in serious injury or death.

 **CAUTION** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE Indicates an instruction which, if not followed, could result in severe damage to vehicle components or other property.

NOTE: Indicates supplementary information required 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 observe common shop safety practice.

Unless otherwise noted, the engine must be stopped and the tether cord must be removed prior to perform any services.

Before carrying out any inspection or maintenance procedure on the watercraft, wait until the engine and exhaust have cooled down to avoid potential burns.

Torque wrench tightening specifications must be strictly adhered to. Use the torque values and service products as in the exploded views or in the procedures when noted.

Locking devices when removed must be replaced (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.).

Hoses, cables and locking ties removed during a procedure must be reinstalled as per factory standards.

When ordering parts always refer to the specific model *PARTS CATALOG*.

We strongly recommend that any services be carried out and/or verified by a highly skilled professional mechanic.

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

BRP disclaims liability for all damages and/or injuries resulting from the improper use of the contents of this publication.

IMPORTANT SAFETY PRECAUTIONS

We do not provide warnings about many basic shop safety practices (e.g.: Use Grinding Wheel – wear safety glasses). If you have not received shop safety training or do not feel confident about your knowledge of safe servicing practices, we recommend that you do not attempt to perform the procedures described in BRP shop manuals.

You should have a clear understanding of all basic shop safety practices. You should be wearing the appropriate clothing, using appropriate safety

SAFETY NOTICE

equipment and taking all necessary safety precautions. Please be especially careful of the following:

- Read and understand all instructions before you begin a procedure or repair.
- Ensure you have the proper tools, any necessary replacement parts and the skills to perform the tasks safely and completely.
- Protect your eyes by using approved and properly fitted safety glasses.
- Use other protective wear when necessary, for example safety shoes and gloves.
- Unless the service procedure requires that the engine remain running, make sure the engine is off **before** beginning service.
- Be sure there is adequate ventilation whenever you run the engine, to avoid the risk of Carbon Monoxide poisoning.
- To avoid injury from moving parts, make sure your hands, fingers and clothing are out of the way when the engine is running.
- Gasoline vapors and hydrogen gases from batteries are explosive. Keep all cigarettes, sparks and flames away from the battery, fuel-related components and other enclosed compartments.
- Never use gasoline to clean parts, always use an approved nonflammable solvent.
- Never drain or store gasoline in an open container.

WARNING

The foregoing list represents general safety practices. For details on workplace health and safety requirements in your area, consult your local workplace health and safety agency or association.

We have provided you with some of the most important general service safety precautions, above. We cannot, however, warn you of every conceivable hazard that can arise in performing the service and repair procedures depicted in BRP manuals. Only you can decide whether or not you should perform a given task.

INTRODUCTION

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

Due to late changes, there may be some differences between the manufactured product and the description and/or specifications in this document.

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

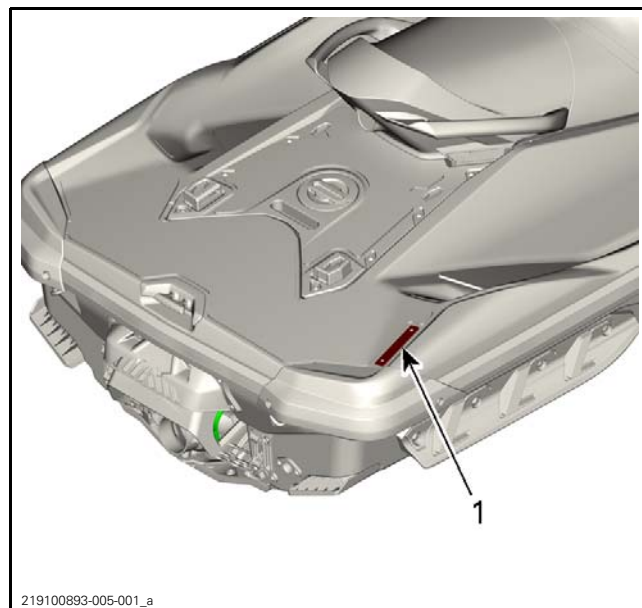
VEHICLE INFORMATION

HULL IDENTIFICATION NUMBER (HIN)

The hull identification number is composed of 12 digits:

YDV	12345	L	4	XX
				Model year
				Year of production
				Month of production
				Serial number (a letter may also be used as a digit)
				Manufacturer

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

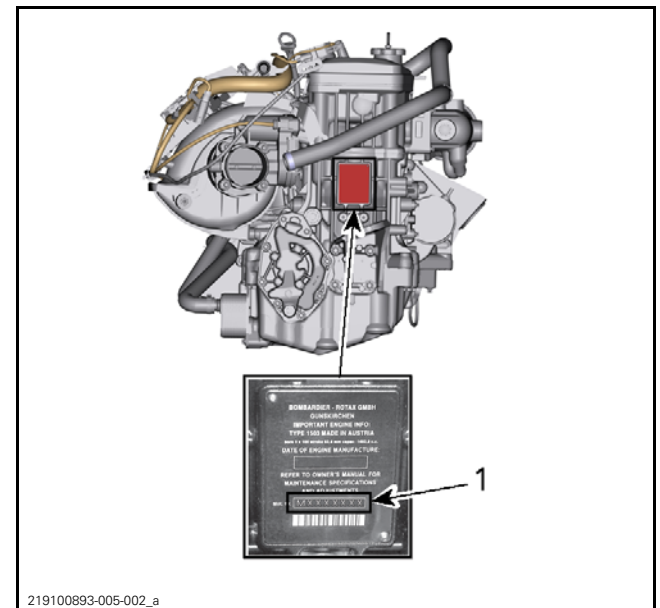


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1. Hull Identification Number (HIN)

ENGINE IDENTIFICATION NUMBER (EIN)

The Engine Identification Number is located on front end of the engine.



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1. Engine Identification Number (EIN)

HOISTING A WATERCRAFT

To work on a watercraft, you should mount it securely on a stand.

The lifting strap **MUST** be used to hoist and mount the watercraft on a stand.

REQUIRED TOOL	
LIFTING STRAP (P/N 295 100 758)	

NOTICE Using any other lifting strap kit than the one recommended may cause damage to the vehicle. Bumpers could be torn off.

INTRODUCTION



TYPICAL

ENGINE EMISSIONS INFORMATION

Manufacturer's Responsibility

Manufacturers of engines must determine the exhaust emission levels for each engine horsepower family and certify these engines with the United States of America Environmental Protection Agency (EPA). An emissions control information label, showing emission levels and engine specifications, must be placed on each vehicle at the time of manufacture.

Dealer Responsibility

When servicing any vehicle that carry an emissions control information label, adjustments must be kept within published factory specifications.

Replacement or repair of any emission related component must be executed in a manner that maintains emission levels within the prescribed certification standards.

Dealers are not to modify the engine in any manner that would alter the horsepower or allow emission levels to exceed their predetermined factory specifications.

Exceptions include manufacturers' prescribed changes, such as altitude adjustments.

Owner Responsibility

The owner/operator is required to have engine maintenance performed to maintain emission levels within prescribed certification standards.

The owner/operator is not to, and should not allow anyone else to modify the engine in any manner that would alter the horsepower or allow emissions levels to exceed their predetermined factory specifications.

Emission Regulations

The vehicle you are servicing may have been certified to applicable emission regulations in your country or state. Not as an exhaustive list; this may include standards for engine exhaust emissions, crankcase emissions, permeation emissions and evaporative emissions. Servicing procedures in this manual must be strictly followed in order to keep the vehicle within the factory specifications. Failure to follow servicing procedures in this manual may lead a vehicle to be out of compliance with applicable emission regulations.

When servicing any vehicle; adjustments must be kept within published factory specifications. Replacement or repair of any emission related component must be executed in a manner that maintains emission levels within the applicable certification standards. Nobody is allowed to modify the engine in any manner that would alter the horsepower or allow emission levels to exceed their predetermined factory specifications. Exceptions include manufacturer's prescribed changes.

The owner/operator is required to have engine maintenance performed to maintain emission levels within the prescribed certification standards. The owner/operator is allowed and should not allow anyone else to modify the engine in any manner that would alter the horsepower or allow emissions levels to exceed their predetermined factory specifications.

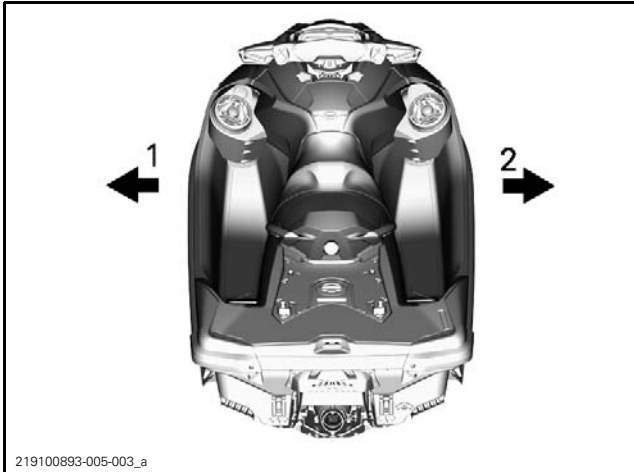
MANUAL INFORMATION

MANUAL PROCEDURES

Many of the procedures in this manual are inter-related. Before undertaking any task, you should 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 commencing any procedure, be sure that you have on hand all the tools required, or their approved equivalents.

The use of RIGHT (starboard) and LEFT (port) indications in the text are always referenced to the driving position (when sitting on the watercraft).



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

Other common terms used in the marine industry are the BOW (front of the watercraft), and the STERN (rear of the watercraft).

This manual uses technical terms which may be different from the ones in the *PARTS CATALOGS*.

MANUAL LAYOUT

This manual is divided into many major sections as can be seen in the main table of contents at the beginning of the manual.

Each section is divided into various subsections, and again, each subsection has one or more divisions.

Illustrations and photos show the typical construction of various assemblies and, in all cases, may not reproduce the full detail or exact shape of the parts used in a particular model vehicle. However, they represent parts which have the same or a similar function.

INTRODUCTION

TYPICAL PAGE

Section 06 ENGINE
Subsection 01 (MAGNETO)

Subsection title
→ **MAGNETO**

Indicates applicable models.
→ *Models*

Exploded view assists you in identifying parts and their related positions.

NEW indicates that the part must be replaced with a new one.

Illustration number for publishing process.
→ XXX0000

Document number for publishing process.
→ mmr2008-001

Drop represents a service product to be applied.

Dotted box contains parts applicable to a specific model.

Bold face number is used to identify a part referred to the text.

55

Specific torque applicable to this installation.

NOTICE Pay attention to torque specifications. Some of these are in lbf•in instead of lbf•ft. Use appropriate torque wrench.

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XII

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TYPICAL PAGE

Title in bold
indicates category
of information to be
carried out.

Reference to a
specific section
or subsection.

Indicates component
procedures apply to.

Indicates specific
procedure to be
carried out.

Section 03 ENGINE
Subsection 09 (MAGNETO SYSTEM)

GENERAL

NOTE: The following procedures can be done without removing the engine.

During assembly/installation, use the torque values and service products as in the exploded views.

Clean threads before applying a threadlocker. Refer to **SELF-LOCKING FASTENERS** and **LOC-TITE APPLICATION** sections at the beginning of this manual for complete procedure.

WARNING

Torque wrench tightening specifications must be strictly adhered to. Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be replaced with new ones.

PROCEDURES

MAGNETO FLYWHEEL

Magneto Flywheel Cleaning

Clean all metal components in a non-ferrous metal cleaner.

CAUTION: Clean magneto flywheel using only a clean cloth.

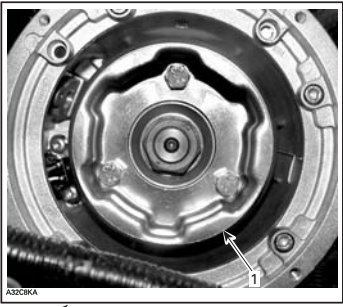
Magneto Flywheel Removal

Remove muffler, refer to the *EXHAUST SYSTEM* section.

Remove acoustic panel.


Remove rewind starter.

Remove starting pulley no. 2.



TYPICAL
1. Starting pulley

NOTE: To remove starting pulley bolts, hold magneto flywheel with a socket as shown.



TYPICAL

Models

Remove the connecting flange retaining the rewind starter to the engine housing.

“TYPICAL” indicates a general view which may not represent exact details.

Call-outs pertaining to above illustration.

Illustration always follows text to which it applies.

Italic bold face type-setting indicates a procedure applicable to a specific model(s).

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Bold face number following part name refers to exploded view at beginning of subsection.

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INTRODUCTION

TIGHTENING TORQUE

Tighten fasteners to the torque specified in the exploded view(s) and/or in the written procedure. When a torque is not specified, the torque normally recommended for a specific fastener should be used. Refer to the following table.

WARNING

Torque wrench tightening specifications must be strictly adhered to.
Locking devices must be replaced when removed (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.).

In order to avoid a poor assembly, tighten screws, bolts, or nuts in accordance with the following procedure:





1. Manually screw all screws, bolts and/or nuts.
2. Apply half the recommended torque value.

NOTICE Be sure to use the recommended tightening torque for the specified fastener used.

NOTE: Whenever possible, always apply torque on the nut.

3. Tighten fastener to the recommended torque value.

NOTE: Always torque screws, bolts and/or nuts using a crisscross pattern when multiple fasteners are used to secure a part (e.g. a cylinder head). Some parts must be torqued according to a specific sequence and torque pattern as detailed in the installation procedure.

Property class and head markings	<div>4.8</div> <div></div> <div></div>	<div>8.8</div> <div></div> <div><div>9.8</div></div>
----------------------------------	--	--

A00A8BS

FASTENER SIZE	FASTENER GRADE/TORQUE			
	5.8 Grade	8.8 Grade	10.9 Grade	12.9 Grade
M4	1.5 N•m - 2 N•m (13 lbf•in - 18 lbf•in)	2.5 N•m - 3 N•m (22 lbf•in - 27 lbf•in)	3.5 N•m - 4 N•m (31 lbf•in - 35 lbf•in)	4 N•m - 5 N•m (35 lbf•in - 44 lbf•in)
M5	3 N•m - 3.5 N•m (27 lbf•in - 31 lbf•in)	4.5 N•m - 5.5 N•m (40 lbf•in - 49 lbf•in)	7 N•m - 8.5 N•m (62 lbf•in - 75 lbf•in)	8 N•m - 10 N•m (71 lbf•in - 89 lbf•in)
M6	6.5 N•m - 8.5 N•m (58 lbf•in - 75 lbf•in)	8 N•m - 12 N•m (71 lbf•in - 106 lbf•in)	10.5 N•m - 15 N•m (93 lbf•in - 133 lbf•in)	16 N•m (142 lbf•in)
M8	15 N•m (133 lbf•in)	25 N•m (18 lbf•ft)	32 N•m (24 lbf•ft)	40 N•m (30 lbf•ft)
M10	29 N•m (21 lbf•ft)	48 N•m (35 lbf•ft)	61 N•m (45 lbf•ft)	73 N•m (54 lbf•ft)
M12	52 N•m (38 lbf•ft)	85 N•m (63 lbf•ft)	105 N•m (77 lbf•ft)	128 N•m (94 lbf•ft)
M14	85 N•m (63 lbf•ft)	135 N•m (100 lbf•ft)	170 N•m (125 lbf•ft)	200 N•m (148 lbf•ft)

FASTENER INFORMATION

NOTICE Most fasteners are metric. Mismatched or incorrect fasteners could cause damage to the vehicle.

SELF-LOCKING FASTENER PROCEDURE



TYPICAL — SELF-LOCKING FASTENER

The following describes common procedures used when working with self-locking fasteners.

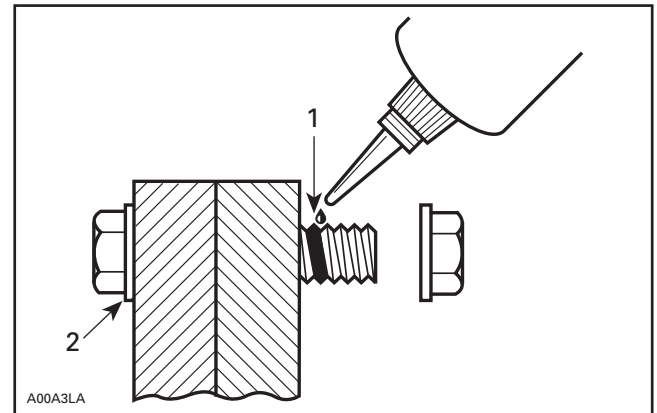
Use a metal brush or a tap to clean the hole properly, then use a solvent. Allow the solvent time to act, approximately 30 minutes, then wipe off. Solvent utilization is to ensure proper adhesion of the product used for locking the fastener.

LOCTITE® APPLICATION PROCEDURE

The following describes common procedures used when working with Loctite products.

NOTE: Always use proper strength Loctite product as recommended in this Shop Manual.

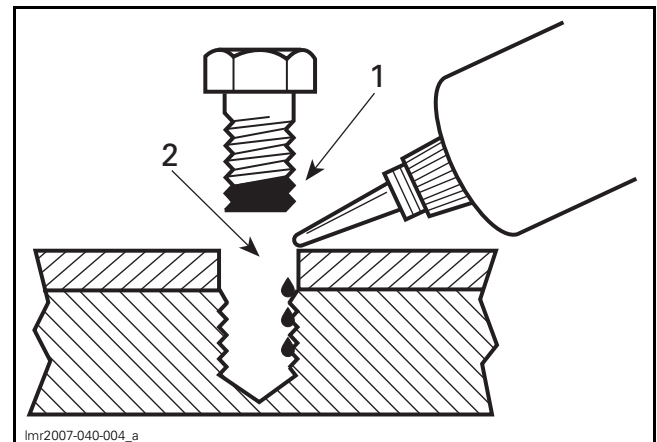
Threadlocker Application for Uncovered Holes (Bolts and Nuts)



1. Apply here
2. Do not apply

1. Clean threads (bolt and nut) with solvent.
2. Apply *LOCTITE 7649 (PRIMER)* on threads and allow to dry.
3. Choose proper strength Loctite threadlocker.
4. Fit bolt in the hole.
5. Apply a few drops of threadlocker at proposed tightened nut engagement area.
6. Position nut and tighten as required.

Threadlocker Application for Blind Holes



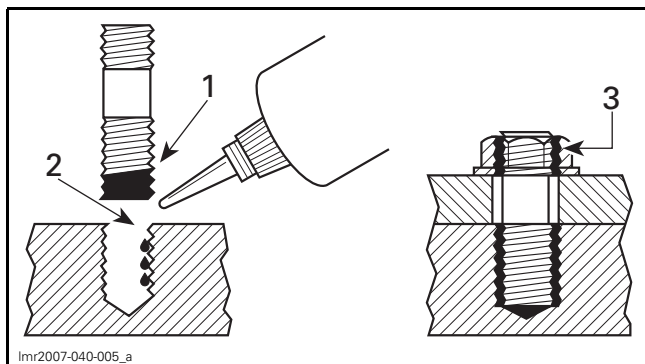
1. On fastener threads
2. On threads and at the bottom of hole

1. Clean threads (bolt and hole) with solvent.
2. Apply *LOCTITE 7649 (PRIMER)* on threads (bolt and nut) and allow to dry for 30 seconds.
3. Choose proper strength Loctite threadlocker.
4. Apply several drops along the threaded hole and at the bottom of the hole.

INTRODUCTION

5. Apply several drops on bolt threads.
6. Tighten as required.

Threadlocker Application for Stud Installation in Blind Holes



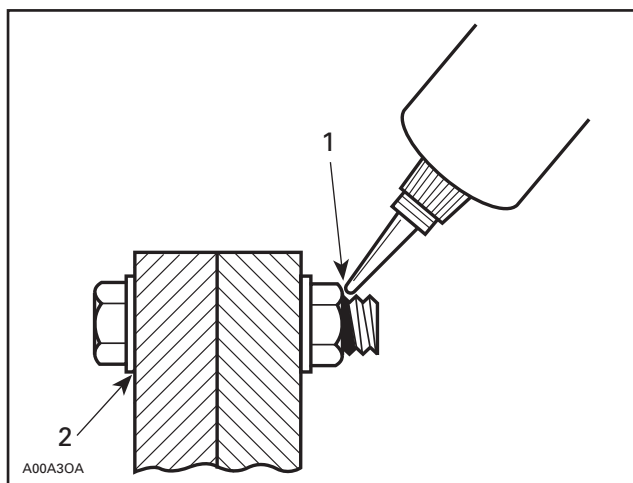
1. On stud threads
2. On threads and in the hole
3. On retaining nut threads

1. Clean threads (stud and hole) with solvent.
2. Apply *LOCTITE 7649 (PRIMER)* on threads and allow to dry.
3. Put 2 or 3 drops of proper strength Loctite threadlocker on female threads and in hole.

NOTE: To avoid a hydro lock situation, do not apply too much Loctite.

4. Apply several drops of proper strength Loctite on stud threads.
5. Install stud.
6. Install cover, part, etc.
7. Apply a few drops of proper strength Loctite on uncovered stud threads.
8. Install and tighten retaining nut(s) as required.

Threadlocker Application for Pre-Assembled Parts

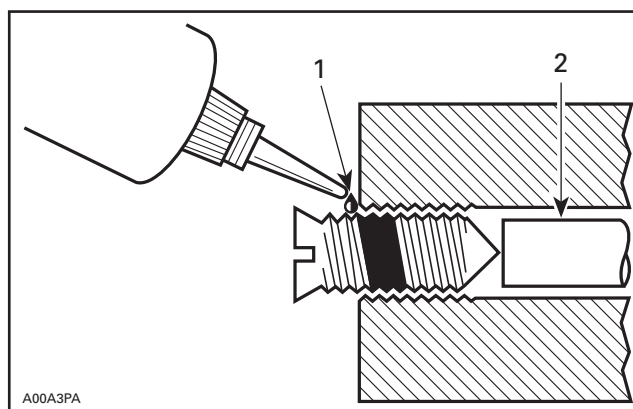


1. Apply here
2. Do not apply

1. Clean bolts and nuts with solvent.
2. Assemble components.
3. Tighten nuts.
4. Apply a few drops of proper strength Loctite on bolt/nut contact surfaces.
5. Avoid touching metal with tip of flask.

NOTE: For preventive maintenance on existing equipment, retighten nuts and apply proper strength Loctite on bolt/nut contact surfaces.

Threadlocker Application for an Adjustment Screw

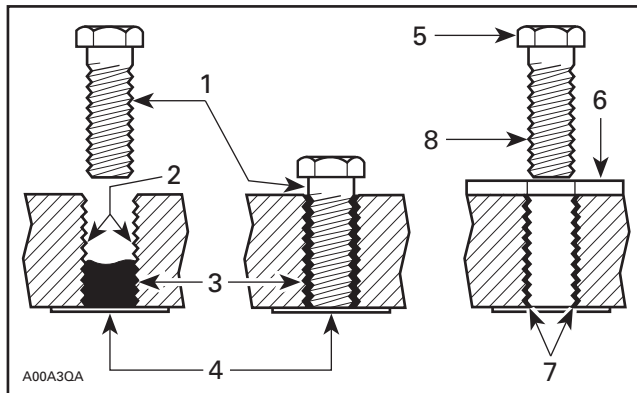


1. Apply here
2. Plunger

1. Adjust screw to proper setting.
2. Apply a few drops of proper strength Loctite threadlocker on screw/body contact surfaces.
3. Avoid touching metal with tip of flask.

NOTE: If it is difficult to readjust, heat screw with a soldering iron (232°C (450°F)).

Application for Stripped Thread Repair



1. Release agent
2. Stripped threads
3. Form-A-Thread
4. Tapes
5. Cleaned bolt
6. Plate
7. New threads
8. Threadlocker

Standard Thread Repair

Follow instructions on Loctite FORM-A-THREAD 81668 package.

If a plate is used to align bolt:

1. Apply release agent on mating surfaces.
2. Put waxed paper or similar film on the surfaces.
3. Twist bolt when inserting it to improve thread conformation.

NOTE: NOT intended for engine stud repairs.

Repair of Small Holes/Fine Threads

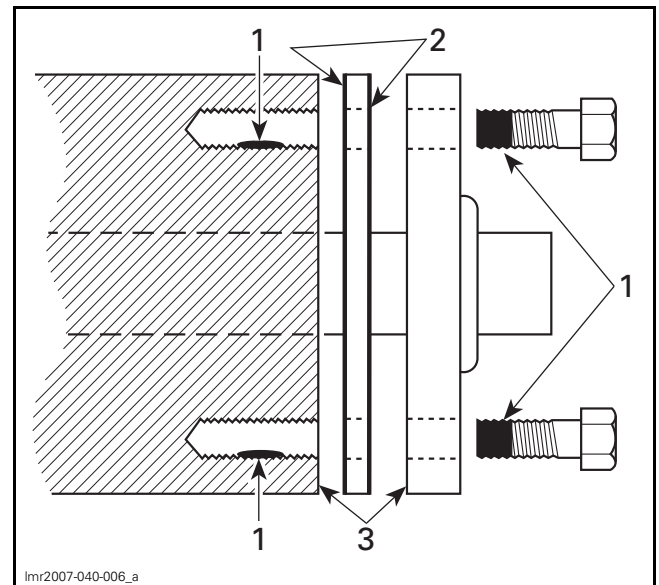
Option 1: Enlarge damaged hole, then follow *STANDARD THREAD REPAIR* procedure.

Option 2: Apply FORM-A-THREAD on the screw and insert in damaged hole.

Permanent Stud Installation (Light Duty)

1. Use a stud of the desired thread length.
2. DO NOT apply release agent on stud.
3. Follow Standard Thread Repair procedure.
4. Allow 30 minutes for Loctite FORM-A-THREAD to cure.
5. Complete part assembly.

Gasket Compound Application



1. Proper strength Loctite
2. Loctite Primer N and Gasket Eliminator 518 on both sides of gasket
3. Loctite Primer N only

1. Remove old gasket and other contaminants using *LOCTITE CHISEL (GASKET REMOVER)*. Use a mechanical means only if necessary.

NOTE: Avoid grinding.

2. Clean both mating surfaces with solvent.
3. Spray Loctite Primer N on both mating surfaces and on both sides of gasket and allow to dry 1 or 2 minutes.
4. Apply *LOCTITE 518* on both sides of gasket, using a clean applicator.
5. Place gasket on mating surfaces and assemble parts immediately.

NOTE: If the cover is bolted to blind holes, apply proper strength Loctite in the hole and on threads. Tighten fastener.

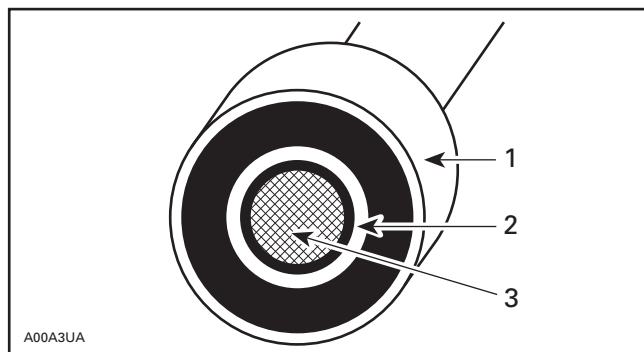
If holes are sunken, apply proper strength Loctite on bolt threads.

6. Tighten as usual.

Threadlocker Application for Mounting on a Shaft

Mounting with a Press

INTRODUCTION



- 1. Bearing
- 2. Proper strength Loctite
- 3. Shaft

1. Clean shaft external contact surface.
2. Clean internal contact surface of part to be installed on shaft.
3. Apply a strip of proper strength Loctite on circumference of shaft contact surface at insertion or engagement point.

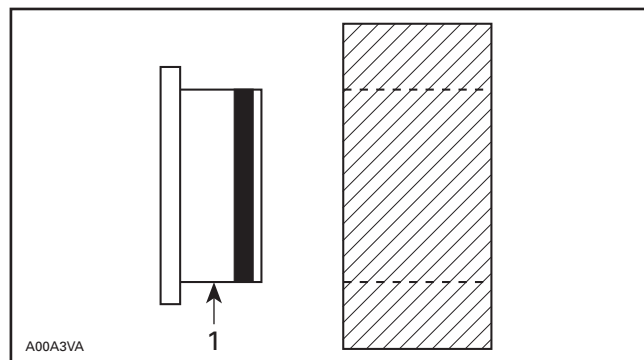
NOTE: Retaining compound is always forced out when applied on shaft.

4. DO NOT use antiseize Loctite or any similar product.
5. No curing period is required.

Mounting in Tandem

1. Apply retaining compound on internal contact surface (bore) of parts to be installed.
2. Continue parts assembly as per previous illustration.

Threadlocker Application for Case-In Components (Metallic Gaskets)



- 1. Proper strength Loctite

1. Clean inner housing diameter and outer gasket diameter.
2. Spray housing and gasket with *LOCTITE 7649 (PRIMER)*.

3. Apply a strip of proper strength Loctite on leading edge of outer metallic gasket diameter.

NOTE: Any Loctite product can be used here. A low strength liquid is recommended as normal strength and gap are required.

4. Install according to standard procedure.
5. Wipe off excess product.
6. Allow 30 minutes for product to cure.

NOTE: Normally used on worn-out housings to prevent leaking or sliding.

It is generally not necessary to remove gasket compound applied on outer gasket diameter.

ALIGNMENT SHAFT ADAPTER
(P/N 529 036 521)



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ALIGNMENT SHAFT SUPPORT
(P/N 529 035 506)



Page: 20

ALIGNMENT SHAFT
(P/N 295 000 141)



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DIAGNOSTIC CABLE
(P/N 710 000 851)



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DIAGNOSTIC HARNESS
(P/N 529 036 384)



Page: 85, 98, 117, 129, 181

DRIVE SHAFT C-CLIP REMOVER
(P/N 529 036 026)



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ECM ADAPTER TOOL
(P/N 529 036 166)



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ECM TERMINAL REMOVER 2.25
(P/N 529 036 175)



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ECM TERMINAL REMOVER 3.36
(P/N 529 036 174)



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FLOATING RING TOOL (TYPE II)
(P/N 529 036 116)



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FLUKE 115 MULTIMETER
(P/N 529 035 868)



Page: 86, 94, 98–99, 129, 139

FLUSHING CONNECTOR ADAPTER
(P/N 295 500 473)



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FUEL HOSE ADAPTER
(P/N 529 036 396)



Page: 92

FUEL PUMP MODULE SOCKET
(P/N 529 036 125)



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SERVICE TOOLS INDEX

FUEL TANK TEST CAP
(P/N 529 036 242)



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IBR NUT SOCKET
(P/N 529 036 379)




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IMPELLER REMOVER/INSTALLER
(P/N 529 035 956)




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IMPELLER SHAFT BEARING TOOL
(P/N 529 036 168)



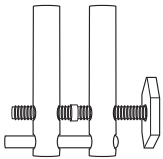
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IMPELLER SHAFT PUSHER
(P/N 529 035 955)




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LARGE HOSE PINCHER
(P/N 529 032 500)



Page: 14, 57

MPI-2 INTERFACE CARD
(P/N 529 036 018)



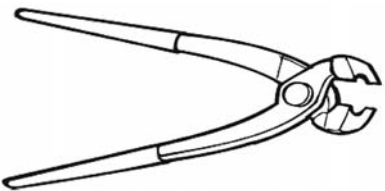
Page: 71

MPI-3 INTERFACE CARD
(P/N 529 036 353)



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OETIKER PLIER
(P/N 295 000 070)




Page: 54, 94

PRESSURE CAP
(P/N 529 036 283)



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PRESSURE GAUGE
(P/N 529 036 395)




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PTO SUPPORT TOOL
(P/N 529 035 842)




Page: 203, 206

PUMP PLATE
(P/N 529 036 224)



Page: 20, 189

SUCTION PUMP
(P/N 529 035 880)



Page: 14

TEST CAP

(P/N 529 035 991)



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VACUUM/PRESSURE PUMP

(P/N 529 021 800)



Page: 53, 57, 91, 186

MAINTENANCE SCHEDULE

Maintenance is very important for keeping your vehicle in safe operating condition.

Proper maintenance is the owner's responsibility. A warranty claim may be denied if, among other things, the owner or operator caused the problem through improper maintenance or use.

Perform periodic checks and follow the maintenance schedule. **The maintenance schedule does not exempt the pre-ride inspection.**

Verifying fault codes, as first maintenance step, is a good practice and is highly recommended.

WARNING

Failure to properly maintain the vehicle according to the maintenance schedule and procedures can make it unsafe to operate.

EPA Regulation - Canadian and USA Vehicles

A repair shop or person of the owner's choosing may maintain, replace, or repair emission control devices and systems. These instructions do not require components or service by BRP or authorized Sea-Doo dealers.

Although an authorized Sea-Doo dealer has an in-depth technical knowledge and tools to service your vehicle, the emission-related warranty is not conditioned on the use of an authorized Sea-Doo dealer or any other establishment with which BRP has a commercial relationship.

Proper maintenance is the owner's responsibility. A warranty claim may be denied if, among other things, the owner or operator caused the problem through improper maintenance or use.

You must follow the instructions for fuel requirements in the fueling section of the Operators Guide. Even if gasoline containing greater than ten volume percent ethanol is readily available, the US EPA issued a prohibition against the use of gasoline containing greater than 10 vol% ethanol that applies to this vehicle. The use of gasoline containing greater than 10 vol% ethanol with this engine may harm the emission control system.

The maintenance schedule does not exempt the pre-ride inspection. Refer to the *OPERATORS GUIDE*.

AFTER EACH RIDE IN SALT OR DIRTY WATER
Rinse engine compartment with fresh water and drain salt water.
Flush exhaust system
EVERY MONTH IN SALT OR DIRTY WATER
Spray anticorrosion lubricant to metallic components in engine compartment (every 10 hours in salt water use)
Inspect sacrificial anodes
AFTER FIRST 6 MONTHS OR 50 HOURS (WHICHEVER COMES FIRST)
Replace engine oil and filter (1630 ACE engines)
EVERY YEAR AT PRESEASON OR 100 HOURS OF OPERATION (WHICHEVER COMES FIRST)
Inspect sacrificial anodes
Check for fault codes
Perform all items indicated in the Pre-Ride Inspection and Post Operation Care
Replace engine oil and filter
Inspect engine rubber mounts
Inspect the cooling system (coolant level, hoses and fasteners for leaks)

Section 01 MAINTENANCE

Subsection 01 (MAINTENANCE SCHEDULE)

EVERY YEAR AT PRESEASON OR 100 HOURS OF OPERATION (WHICHEVER COMES FIRST)
Visually inspect connection between throttle body and intake manifold
Inspect the air intake for damage on hoses and clamps.
Inspect electrical connections and fastening (ignition system, starting system, fuel injectors, fuse box etc.)
Visually inspect area around carbon ring and drive shaft rubber bellow for the following signs of failure: black carbon dust and water sprays (more frequently when using PWC in dirty water)
Visually inspect impeller and bellow
Measure the clearance between the impeller and the wear ring
Remove impeller cover and inspect for signs of water intrusion
Visually inspect reverse gate bushing for excessive play
Inspect fuel system (cap, filler neck, fuel tank, straps, fuel lines and connections)
Visually inspect coolant level in transducer support, top-off if necessary (if equipped)
EVERY 200 HOURS OF OPERATION
Replace spark plugs
Validate condition of bearing by manually spinning impeller checking for radial shaft play or noise
Verify and lubricate splines of the drive shaft and impeller
MAINTENANCE FREE
230 and 300 engines: The supercharger is maintenance free *. *Inspect supercharger every 200 hours (irrespective of the number of years) when vehicle is used in intense conditions such as off-shore riding, continuous operation at wide open throttle, etc.
NOTICE Do not attempt to replace components of the supercharger assembly as the unit is factory- balanced to precise specifications. Failure to follow this recommendation may lead to supercharger and / or engine damage.
EVERY 5 YEARS OR 300 HOURS OF OPERATION (WHICHEVER COMES FIRST)
Replace the coolant

STORAGE PROCEDURE

SERVICE PRODUCTS

Description	Part Number	Page
ANTICORROSION SPRAY	219 700 304	9
FUEL STABILIZER (EUR)	779183	7
FUEL STABILIZER	779171	7
LUBRICANT AND ANTI-CORROSIVE (EUR)	779224	7, 9
LUBRICANT AND ANTI-CORROSIVE.....	779168	7, 9

PROCEDURES

PROPULSION SYSTEM

Cleaning and Protecting the Propulsion System

Clean jet pump by spraying water in its inlet and outlet and then apply a coating of anti-corrosive lubricant or equivalent.

SERVICE PRODUCT	
Scandinavia	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)

Inspecting the Jet Pump

Remove impeller cover and check if jet pump is water contaminated; if so, refer to *JET PUMP* subsection for the repair procedure.

FUEL SYSTEM

Inspecting the Fuel System

Verify fuel system. Check fuel hoses for leaks. Replace damaged hoses or clamps if necessary.

Protecting the Fuel System

Fuel stabilizer should be added in the fuel tank to prevent fuel deterioration and fuel system gumming. Follow manufacturer's instructions for proper use.

SERVICE PRODUCT	
Scandinavia	FUEL STABILIZER (EUR) (P/N 779183)
All other countries	FUEL STABILIZER (P/N 779171)

NOTICE Fuel stabilizer should be added prior to engine lubrication to ensure fuel system component protection against varnish deposits.

Fill up fuel tank completely. Ensure there is no water inside fuel tank.

NOTICE Should any water be trapped inside fuel tank, severe internal damage will occur to the fuel injection system.

ENGINE

Replacing the Engine Oil and the Filter

Change engine oil and filter. Refer to *LUBRICATION SYSTEM* subsection.

Flushing the Exhaust System

Flush the exhaust system. Refer to *EXHAUST SYSTEM* subsection.

Draining the Intercooler

It is important to expel any trapped water that may have accumulated from condensation in the external intercooler.

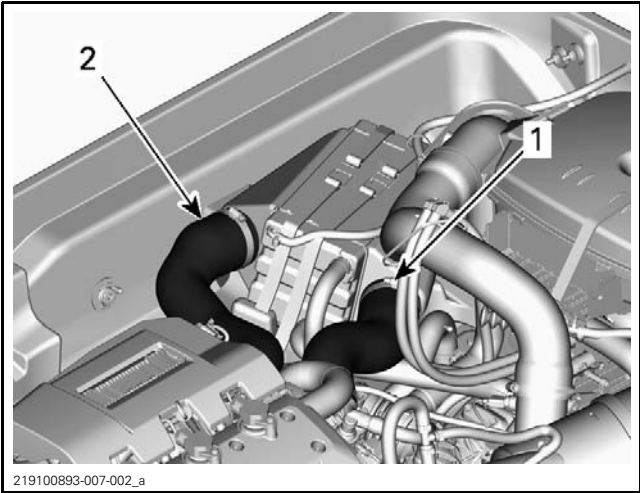
NOTICE Failure to drain the intercooler may cause severe damage to this component.

230 Engines and 300 Engines

1. Remove seats.
2. Remove engine service cover.
3. Ensure there is an alignment line drawn on the intercooler air inlet hose. This will ensure the hose is not twisted or kinked on reinstallation.

Section 01 MAINTENANCE

Subsection 02 (STORAGE PROCEDURE)



1. Air inlet hose
2. Air outlet hose

4. Loosen the clamp retaining the intercooler inlet hose.
5. Remove the intercooler inlet hose from the intercooler.

The air side of the intercooler is self-draining into the inlet manifold of the intercooler. By disconnecting the air inlet hose from the intercooler, the presence of condensate water can be visually assessed and properly drained off without running the engine.

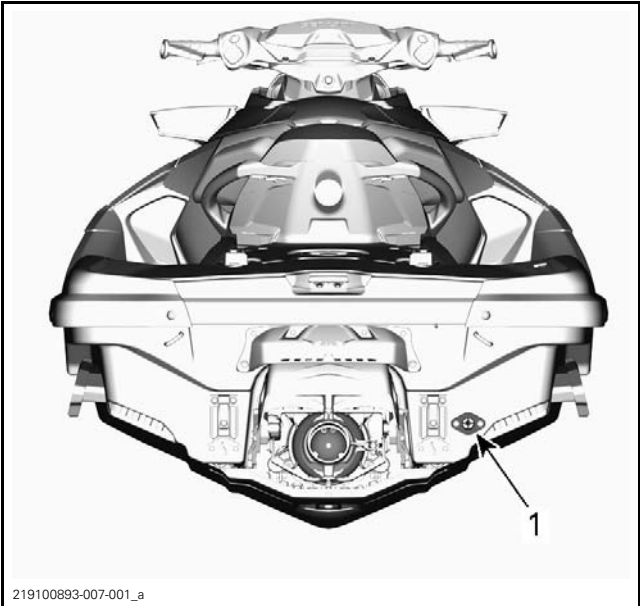
6. Reinstall the intercooler air inlet hose, ensure it is properly aligned as prior to removal to ensure proper engine operation.

TIGHTENING TORQUE	
Intercooler hose clamp	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)

Draining the Exhaust System

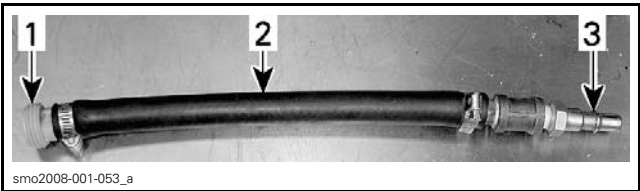
The exhaust system is self draining, but the exhaust manifold and intercooler need to be drained to avoid damages should the watercraft be stored in an area where the temperature attains the freezing point of water.

Using the flushing connector located at the rear of vehicle, inject pressurized air (at 380 kPa (55 PSI)) in the system until there is no more water flowing from jet pump.



1. Flushing connector

The following hose can be fabricated to ease draining procedure.



TYPICAL
1. Flushing adaptor (P/N 295 500 473)
2. Hose 13 mm (1/2 in)
3. Air hose male adapter

NOTICE Failure to drain the exhaust manifold may cause severe damage to components.

Replacing the Engine Coolant

Antifreeze should be replaced every 300 hours or every 5 years (whichever comes first) to prevent antifreeze deterioration.

NOTICE Failure to replace the antifreeze as recommended may allow its degradation that could result in poor engine cooling.

If coolant is not replaced, test the coolant density using an antifreeze hydrometer.

Replace coolant if necessary. For the coolant replacement procedure, refer to *COOLING SYSTEM* subsection.

NOTICE Improper antifreeze density may result in coolant freezing should the vehicle be stored in area where the freezing point is attained. This could seriously damage the engine.

Lubricating the Internal Parts of the Engine

Engine must be lubricated to prevent corrosion on internal parts.

Lubrication of the engine is recommended at the end of the season and before any extended storage period to provide additional corrosion protection. This will lubricate the engine intake valves, the cylinders and the exhaust valves.

To lubricate the engine, proceed as follows:

1. Remove seats.
2. Remove engine service cover.
3. Disconnect ignition coil connectors.
4. Remove spark plugs. Refer to *IGNITION SYSTEM* subsection.
5. Spray anti-corrosive lubricant into each spark plug hole.

SERVICE PRODUCT	
Scandinavia	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)

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

NOTE: To crank engine, use the drowned mode to avoid injecting fuel. Fully depress throttle lever and hold for cranking engine.

7. Reinstall spark plugs and ignition coils. Refer to *IGNITION SYSTEM* subsection.
8. Install all other removed parts.

ELECTRICAL SYSTEM

Removing the Battery

For battery removal, cleaning and storage, refer to *CHARGING SYSTEM* subsection.

ENGINE COMPARTMENT

Cleaning the Engine Compartment

1. Clean the bilge with hot water and a mild detergent, or using bilge cleaner.
2. Rinse thoroughly.
3. Lift front end of watercraft to completely drain bilge. Refer to appropriate *HULL* subsection for bilge drain plug removal.

Applying an Anticorrosion Treatment

Wipe off any residual water in the engine compartment.

Spray anti-corrosive lubricant or an equivalent product over all metallic components only in engine compartment while minimizing overspray.

SERVICE PRODUCT	
Scandinavia	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)
All countries	ANTICORROSION SPRAY (P/N 219 700 304)

NOTE: The seat should be left partially open during storage. This will prevent engine compartment condensation and possible corrosion.

BODY AND HULL

Cleaning and Repair

To clean and repair, refer to appropriate *CLEANING AND REPAIR* subsection.

Protecting the Body and the Hull

Apply a good quality marine wax on body and hull.

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.

NOTICE The watercraft should never be left in water for storage, stored in direct sunlight or stored in a plastic bag.

PRESEASON PREPARATION

Proper vehicle preparation is necessary after the winter months or when a watercraft has not been used during 4 months.

Any worn, broken or damaged parts found must be replaced.

Using the *MAINTENANCE SCHEDULE*, perform the items titled *EVERY 100 HOURS OR 1 YEAR*.

EVERY YEAR AT PRESEASON OR 100 HOURS OF OPERATION (WHICHEVER COMES FIRST)
Check for fault codes
Perform all items indicated in the Pre-Ride Inspection and Post Care Inspection
Replace engine oil and filter
Inspect engine rubber mounts
Inspect the cooling system (coolant level, hoses and fasteners for leaks)
Test the fuel system for leaks
Inspect and lubricate throttle body
Inspect the air intake for damage on hoses and clamps.
Inspect electrical connections and fastening ignition system, starting system, fuel injectors, fuse boxes etc.)

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- Furthermore, proceed with the following:
- Watercraft Prepared as per Storage Procedure**
- Ensure battery is fully charged.
 - Reinstall the battery.
 - Test ride watercraft to confirm proper operation.
- Watercraft Not Prepared as per Storage Procedure**
- Ensure battery is fully charged.
 - Replace engine oil and filter.
 - Drain fuel tank and fill with fresh fuel.
 - Reinstall the battery.
 - Test ride watercraft to confirm proper operation.

SPECIAL PROCEDURES

SERVICE TOOLS

Description	Part Number	Page
LARGE HOSE PINCHER.....	529 032 500	14
SUCTION PUMP	529 035 880	14

GENERAL

Refer to the following special procedures according to the specific event. Procedures described may not be applicable to every watercraft model.

PROCEDURES

TOWING THE WATERCRAFT IN WATER

Special precautions should be taken when towing a Sea-Doo watercraft in water.

The maximum recommended towing speed is 24 km/h (15 MPH).

This will prevent the exhaust system from filling with water, which may lead to water being injected into and filling the engine. Without the engine running, there isn't any exhaust pressure to push the water out the exhaust outlet.

NOTICE Failure to follow these instructions may result in damage to the engine. If you must tow a stranded watercraft in water, be sure not to exceed the maximum towing speed of 24 km/h (15 MPH).

SUBMERGED WATERCRAFT

NOTICE Never try to crank or start engine. Water trapped in the intake manifold would flow towards the engine and possibly cause severe engine damage.

1. Drain bilge.
2. If the watercraft was submerged in salt water, rinse the bilge and all components thoroughly with fresh water using a garden hose to stop the salt corroding effect.
3. Check for water in the intake system. If water is found in the intake system, refer to *WATER-FLOODED ENGINE* in this subsection.

Lubricating the Engine

Refer to *WATER-FLOODED ENGINE* in this subsection.

Inspecting the Fuel

Check fuel tank for water contamination. If necessary, siphon and refill with fresh fuel.

WATER-FLOODED ENGINE

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

NOTICE

- Never try to crank or start the engine. Water trapped in the intake manifold would enter the combustion chamber through the intake valves and may cause damage to the engine.
- An engine flooded with water must be properly drained, lubricant replaced (oil change), operated (boil out procedure), then lubricant replaced again, otherwise parts will be seriously damaged.

Servicing the Supercharger

Remove the supercharger and flush its bearings with fresh engine oil. Refer to appropriate subsection.

Afterwards, reinstall the supercharger and follow the next procedure.

NOTICE The supercharger must NOT be disassembled.

Draining the Exhaust System

If water is suspected to be in the exhaust system, remove the exhaust pipe and the muffler. Drain them or siphon the water out of them. Refer to *EXHAUST SYSTEM* subsection.

Draining the Intake System

1. If water is present in the air intake silencer, empty it. Refer to *AIR INTAKE SYSTEM* subsection.

Section 01 MAINTENANCE
Subsection 04 (SPECIAL PROCEDURES)


- 2. Remove the air intake silencer and check for water in the supercharger inlet hose. Remove hose to empty it.
- 3. Remove the water from blow-by valve hose.
- 4. If water is suspected in the intake manifold, remove the intake manifold and drain it. Then siphon the water out from the intake valve ports. Refer to INTAKE MANIFOLD subsection.

Replacing the Engine Oil and the Filter

If the engine oil is contaminated with water (oil will be milky), change the engine oil and filter as per following procedure.

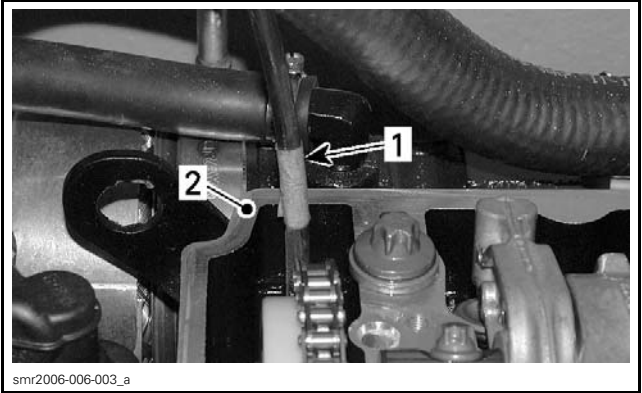
- 1. Using the suction pump, siphon the contaminated oil from the engine reservoir through the dipstick hole.

REQUIRED TOOL

SUCTION PUMP (P/N 529 035 880)	
-----------------------------------	---

NOTICE Never crank or start engine when siphon tube is in dipstick hole. Never start engine when there is no oil in engine.

- 2. Remove the suction pump tube from the dipstick hole.
- 3. Fully depress throttle lever and HOLD it for cranking.
- 4. Crank the engine for 5 seconds.
- 5. Remove the oil filter cap and the oil filter. Refer to appropriate LUBRICATION SYSTEM subsection.
- 6. Again, siphon the contaminated oil from the oil filter reservoir.
- 7. Remove valve cover. Refer to appropriate CYLINDER HEAD subsection.
- 8. Wrap a piece of tape around the suction pump tube 400 mm (16 in) from the end of the tube.
- 9. Insert the tube in the PTO area until the tape is even with the cylinder-block edge.
- 10. Siphon contaminated oil out.



TYPICAL
1. Suction pump tube with tape
2. Edge of cylinder-block

- 11. Remove the suction pump tube.
- 12. Reinstall valve cover.
- 13. Install a NEW oil filter and reinstall the oil filter cap.
- 14. Replenish the engine with appropriate amount of the recommended engine oil. Refer to appropriate LUBRICATION SYSTEM subsection.
- 15. Proceed with the BOIL OUT PROCEDURE that follows.

NOTE: The boil out procedure is intended to evaporate a small quantity of water contained in the oil system.


Boil Out Procedure in a Test Tank or Tied to a Trailer with Watercraft in Water

- 1. Connect the vehicle to the BRP diagnostic software (BUDS2) to monitor the coolant temperature. Coolant temperature must exceed 80°C (176°F) in order for the water to boil out. Once the boiling point is attained, the water will evaporate quickly.
- 2. Run the engine for 5 minutes at 3500 RPM.

WARNING
Be sure to safely secure the watercraft.

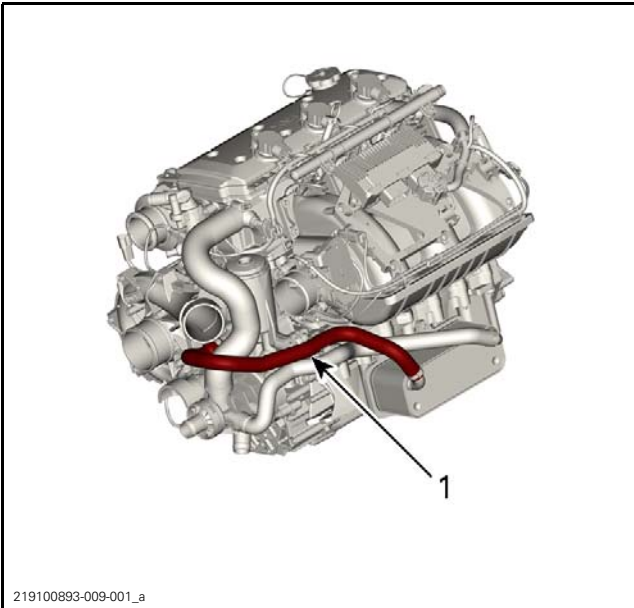
- 3. With the engine still running at 3500 RPM, install a large hose pincher on the coolant line going to the oil cooler.

REQUIRED TOOL

LARGE HOSE PINCHER (P/N 529 032 500)	
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⚠ WARNING

Certain components in the engine compartment may be very hot. Direct contact may result in skin burn. Do not touch any electrical parts or jet pump area when the engine is running.



TYPICAL

1. Oil cooler coolant inlet hose

4. Continue to run the engine at 3500 RPM for 15 more minutes (20 minute total run time).

NOTE: Oil temperature might get high enough to trigger the alarm. If so, remove the large hose pincher and run the engine for 2 to 3 minutes.

5. Shut the engine off.
6. Remove the hose pincher from coolant line going to the oil cooler.

NOTICE Hose pincher must be removed prior to operating the watercraft. Failure to do this will result in damage to the engine.

7. Change the oil and filter again.
8. Procedure is now complete.

DROWNED MODE

If the engine is flooded and does not start, this special mode can be activated to prevent fuel injection and ignition while cranking in order to ventilate the engine to dry the cylinder walls.

To activate DROWNED MODE, proceed as per following steps.

1. Install the tether cord cap on the engine cut out switch.
2. While the engine is stopped, fully pull and HOLD the throttle lever.
3. Press the START/STOP button. DROWNED MODE is now on.

Releasing the throttle lever will allow the ECM to revert back to normal mode.

If the engine does not start, it may be necessary to remove the spark plugs and crank the engine with rags over the spark plug holes. Refer to *IGNITION SYSTEM* subsection.

CAPSIZED WATERCRAFT

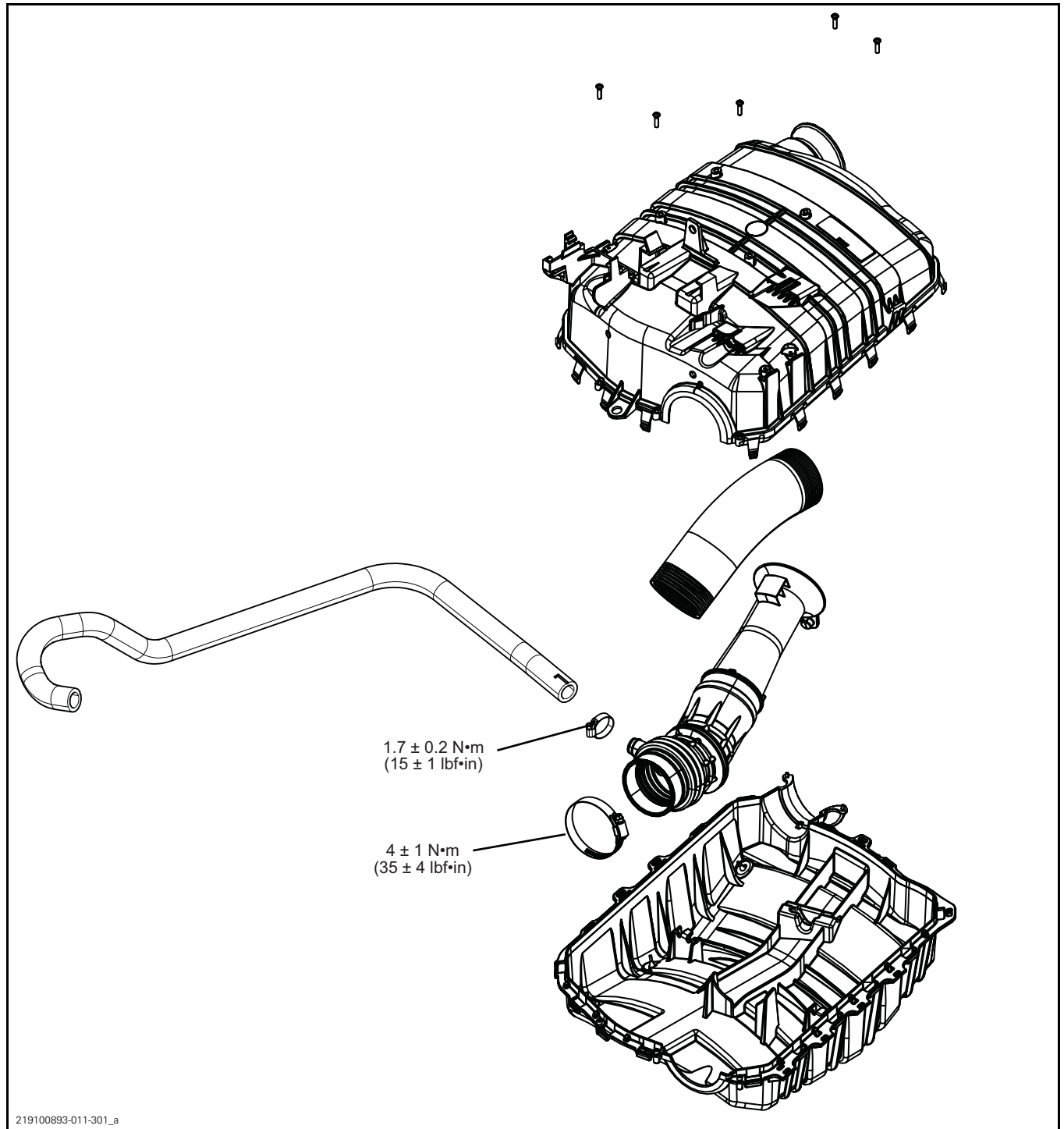
Capsized for More than 5 Minutes

Refer to *WATER-FLOODED ENGINE* in this subsection.

**REFER TO ENGINE REMOVAL
AND INSTALLATION**

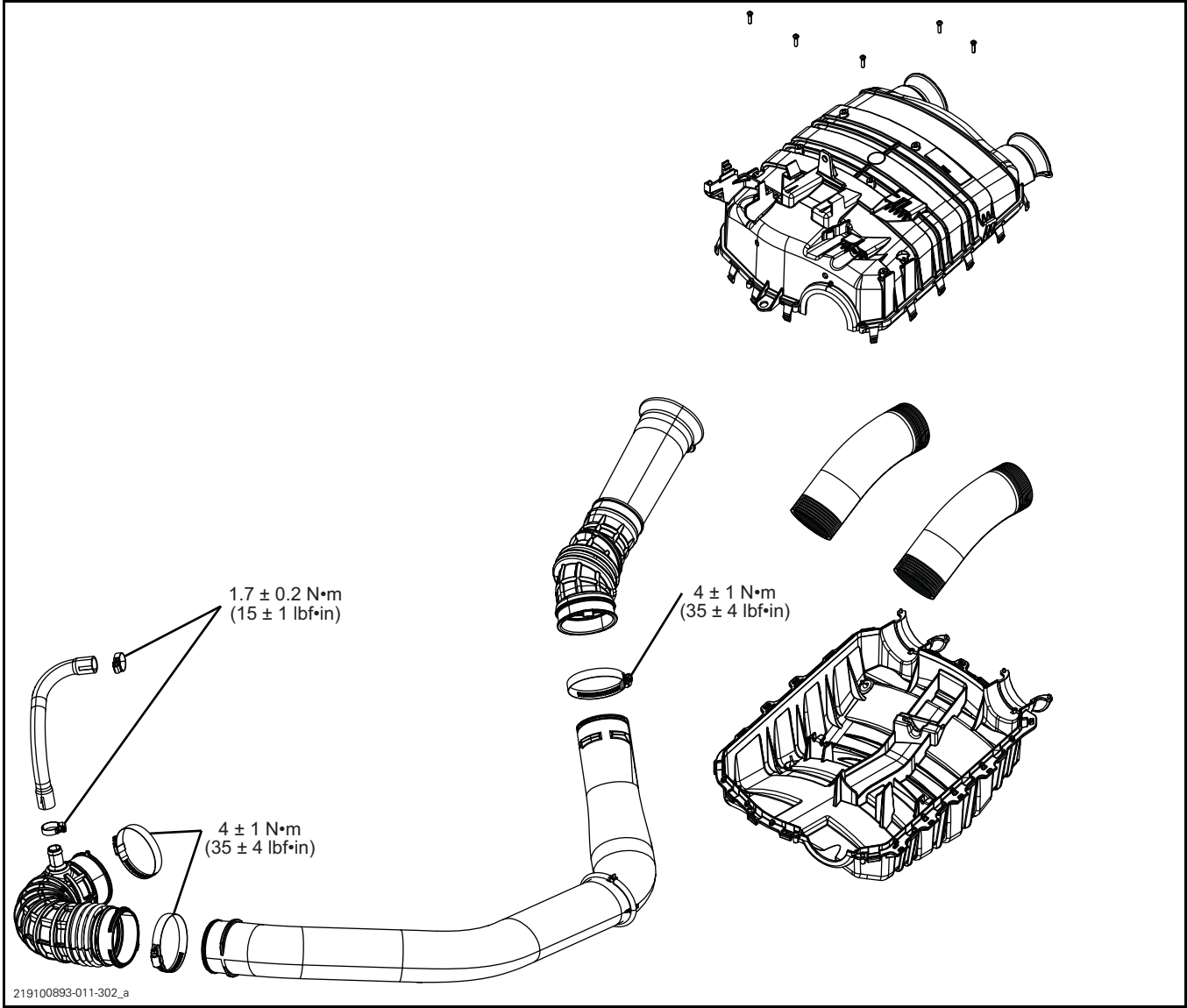
AIR INTAKE SYSTEM

155 Engines



Section 02 ENGINE
Subsection 02 (AIR INTAKE SYSTEM)

230 and 300 Engines



PROCEDURES

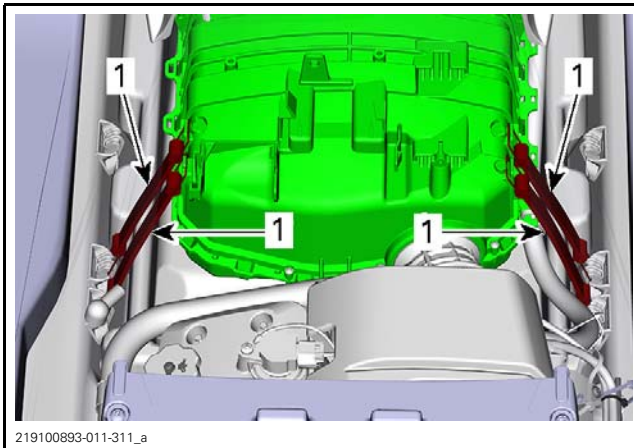
AIR INTAKE SILENCER

Air Intake Silencer Location

Air intake silencer is located above the fuel tank.

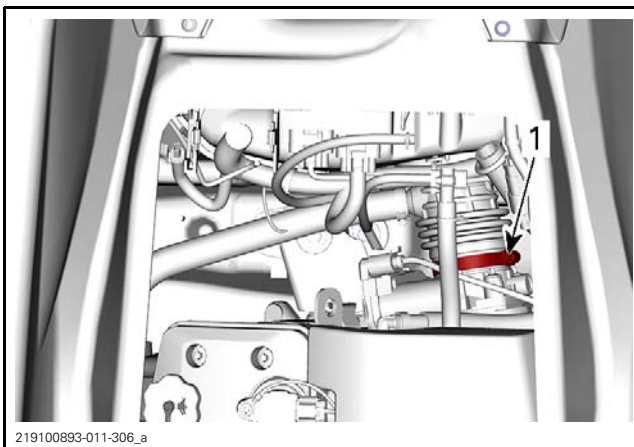
Removing the Air Intake Silencer

1. Remove the seats.
2. Detach rear retaining straps retaining air intake silencer.



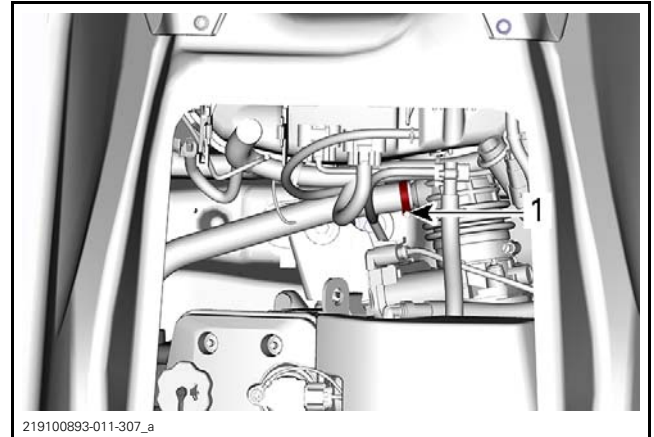
1. Rear retaining straps

3. Loosen clamp securing the air intake silencer outlet hose to air intake tube.



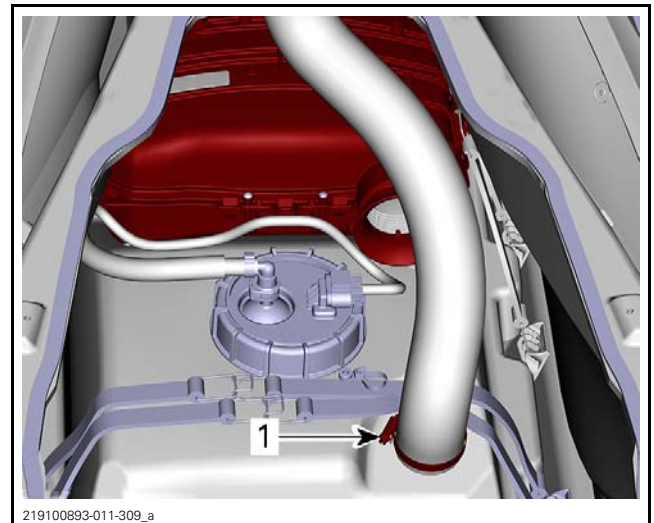
1. Loosen Clamp

4. Loosen clamp securing the air intake silencer breather tube to engine.



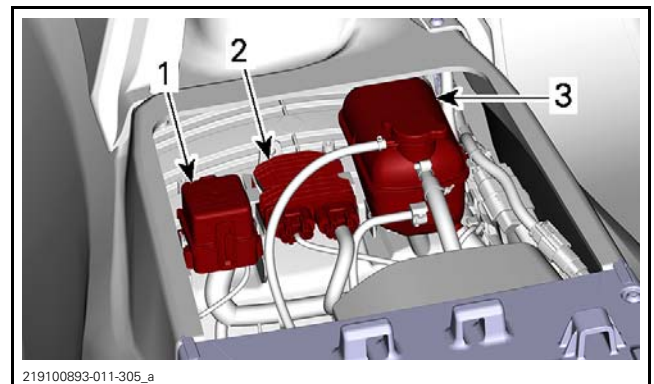
1. Loosen Clamp

5. Open the front storage compartment cover.
6. Remove the storage bin. Refer to *BODY* sub-section.
7. Loosen clamp from fuel filler tube to rotate the tube to increase access.



1. Loosen Clamp

8. Unclip the fuse box, the regulator and the coolant reservoir from the air intake silencer.

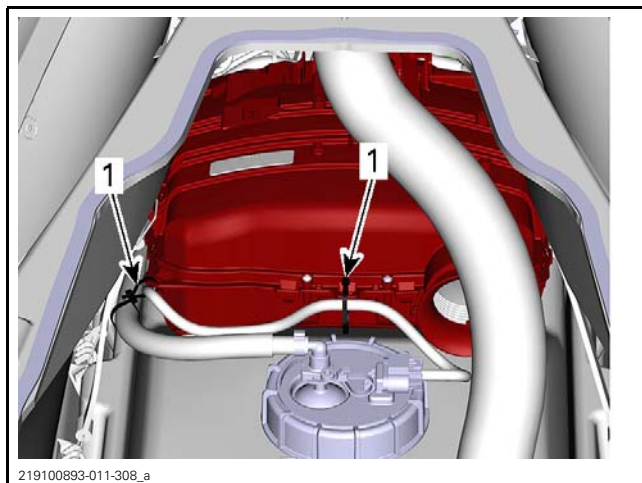


1. Fuse box
2. Regulator
3. Coolant reservoir

Section 02 ENGINE

Subsection 02 (AIR INTAKE SYSTEM)

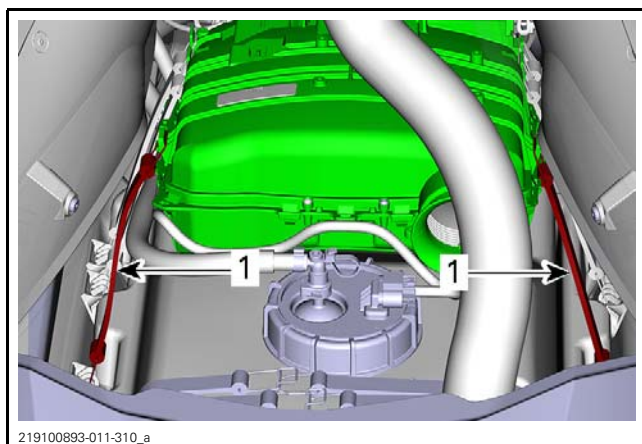
9. From the front storage compartment, cut locking ties securing the wiring harness and the fuel hose to air intake silencer.



TYPICAL

1. Cut these locking ties

10. Detach the front retaining straps.

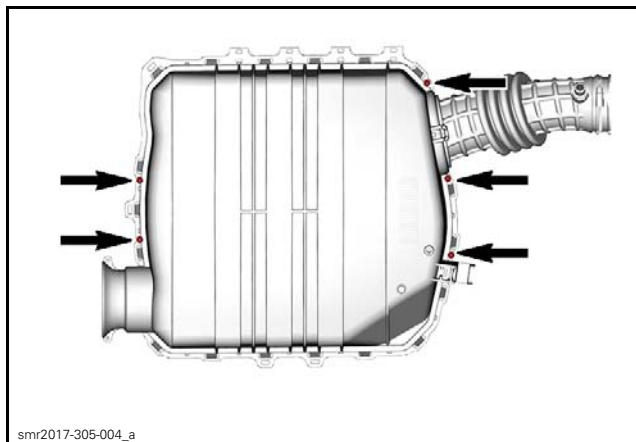


1. Front retaining straps

11. Carefully pull the air intake silencer forward to remove it from the vehicle.

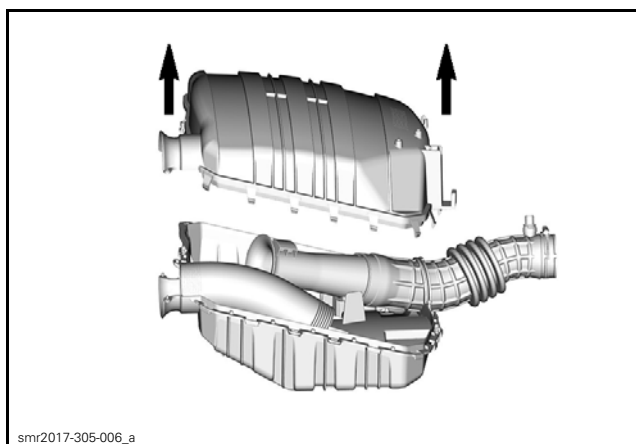
Disassembling the Air Intake Silencer

Remove screws securing upper section of air intake silencer to the lower section.



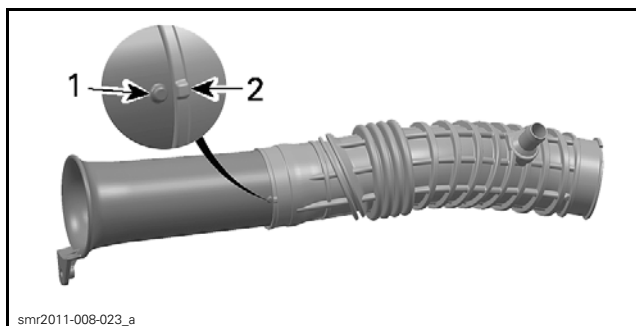
Release all retaining tabs.

Separate upper and lower sections.



Assembling the Air Intake Silencer

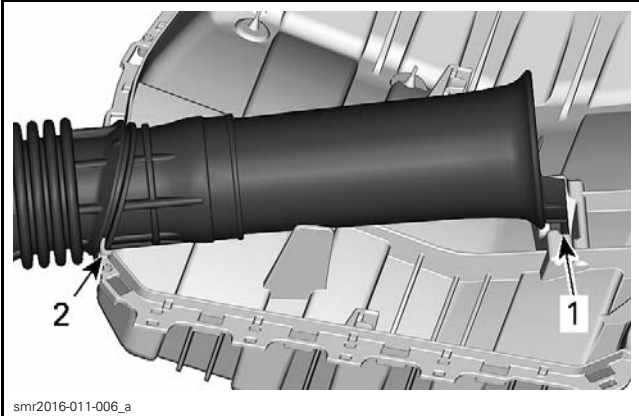
Install the baffle into the outlet hose. Ensure marks are aligned.



TYPICAL

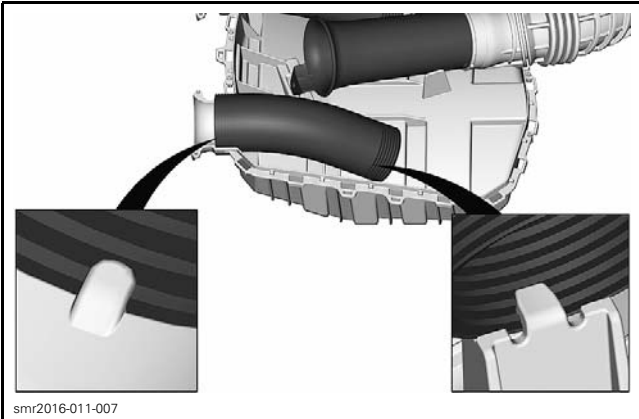
1. Baffle mark
2. Outlet hose mark

Install the assembly in the air intake silencer.



1. Baffle tab into air intake silencer slot
2. Air intake silencer rib into the outlet hose groove

Install the inlet tubes. Ensure each end is properly attached.



Press both halves of the air intake silencer together until all tabs are locked. Do not force, make sure all tubes are properly installed.

TIGHTENING TORQUE	
Air intake silencer screws	Hand tight

Installing the Air Intake Silencer

The installation is the reverse of the removal procedure. However, pay attention to the following. Ensure wiring harness and fuel hoses are properly routed.

Perform fuel tank leak test. Refer to *FUEL TANK AND FUEL PUMP* subsection.

Install new locking ties

Make sure hoses are perfectly inserted into air intake tube before tightening the clamps.

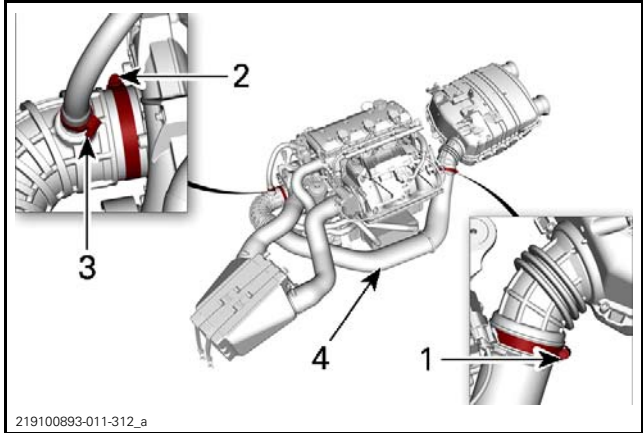
TIGHTENING TORQUE	
Retaining clamps	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)

AIR INTAKE TUBE

Removing the Air Intake Tube

Supercharged Engine

1. Remove seats.
2. Remove the engine access cover. Refer to *BODY*.
3. Loosen clamps retaining the air intake tube.



1. Retaining clamp
2. Retaining clamp
3. Retaining clamp
4. Air intake tube

4. Detach the air intake tube from both hoses.
5. Open the front compartment storage cover and remove the storage bin. Refer to *BODY* subsection.
6. Slide the air intake tube over the air intake silencer and through the front compartment opening.

Installing the Air Intake Tube

The installation is the reverse of the removal procedure. However pay attention to the following.

Make sure air intake tube is perfectly inserted into air intake hoses before tightening the clamps.

TIGHTENING TORQUE	
Retaining clamps	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)

EXHAUST SYSTEM

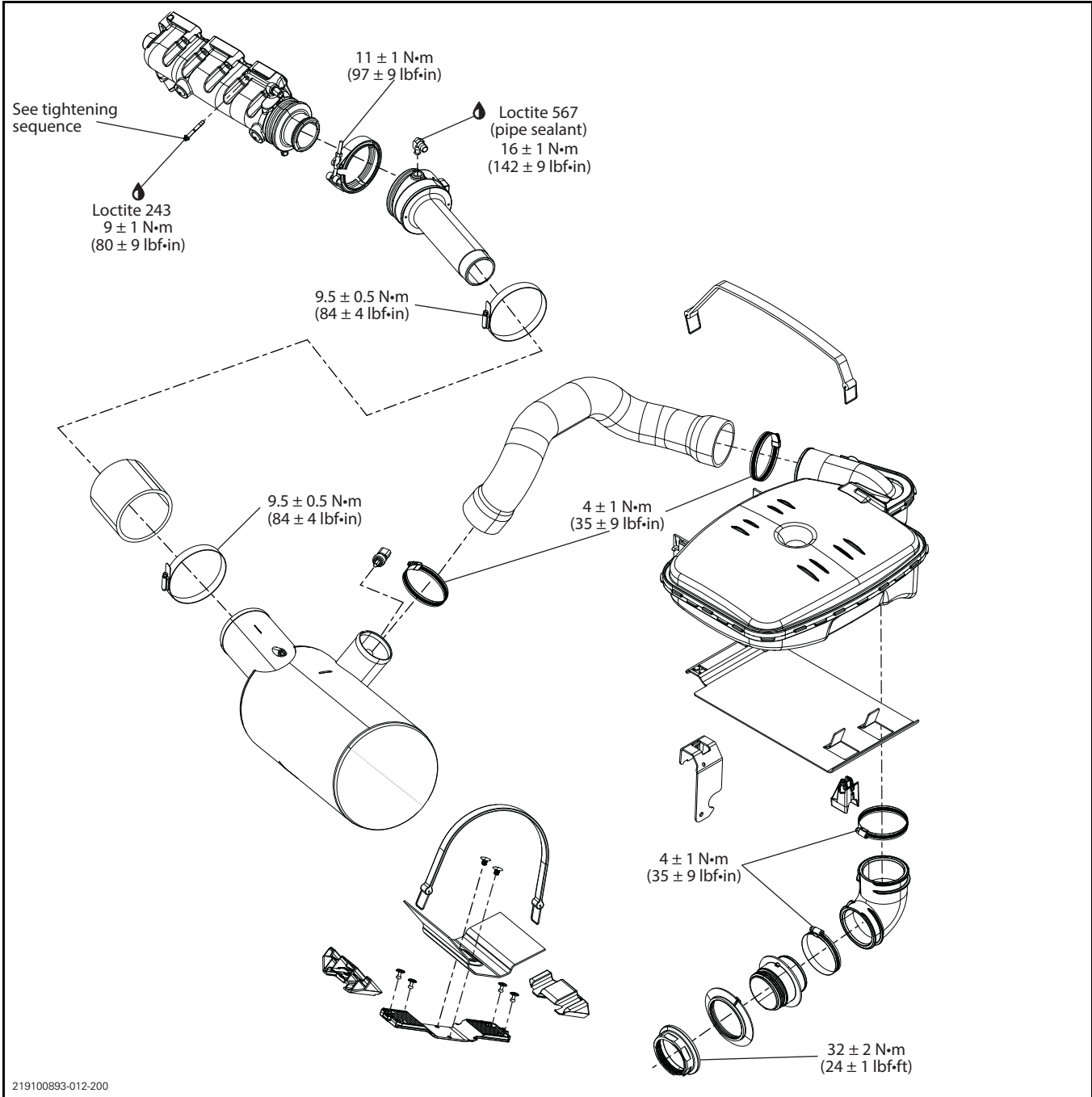
SERVICE TOOLS

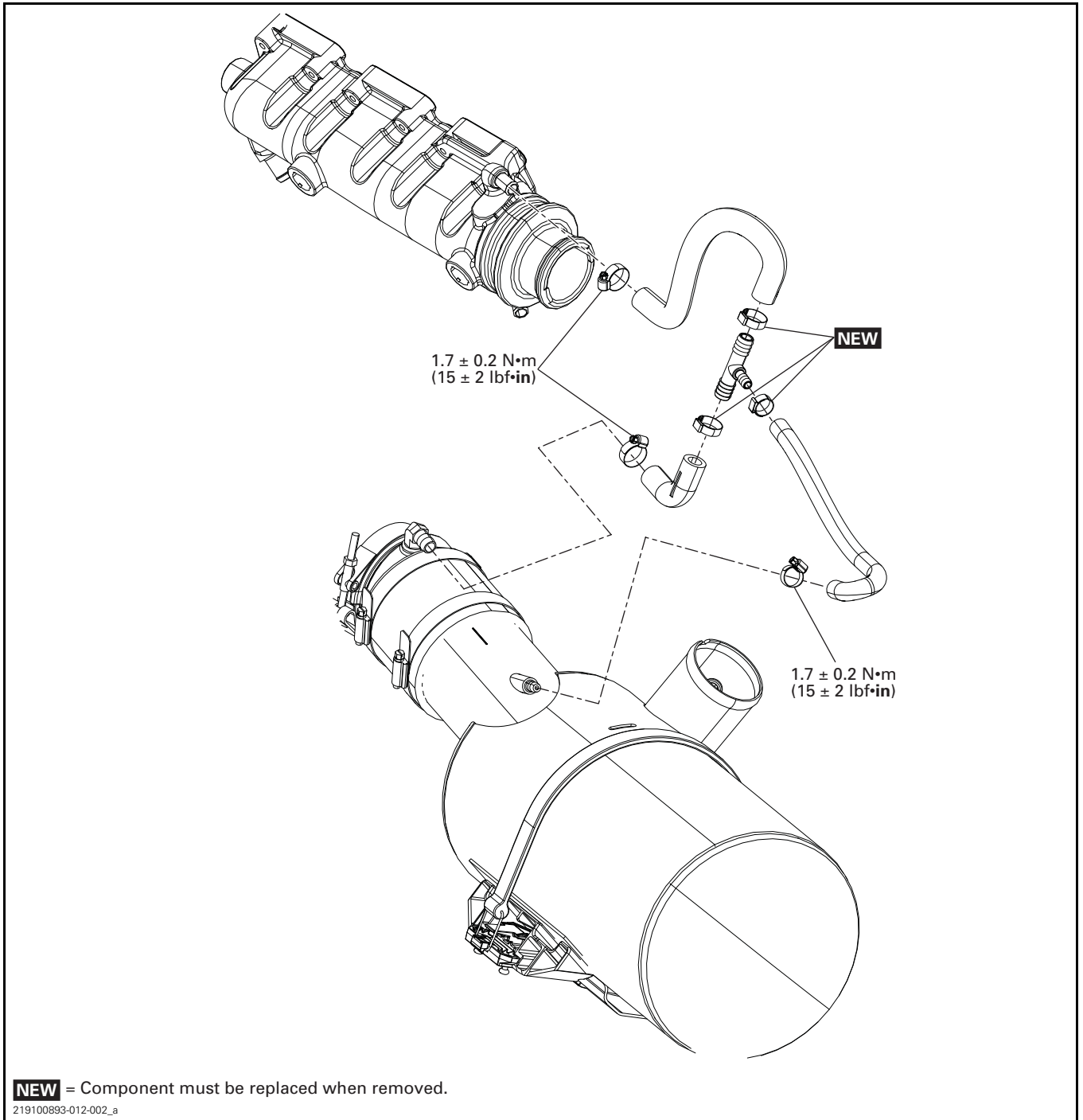
Description	Part Number	Page
FLUSHING CONNECTOR ADAPTER	295 500 473	36

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	37
LOCTITE 518	293 800 038	35

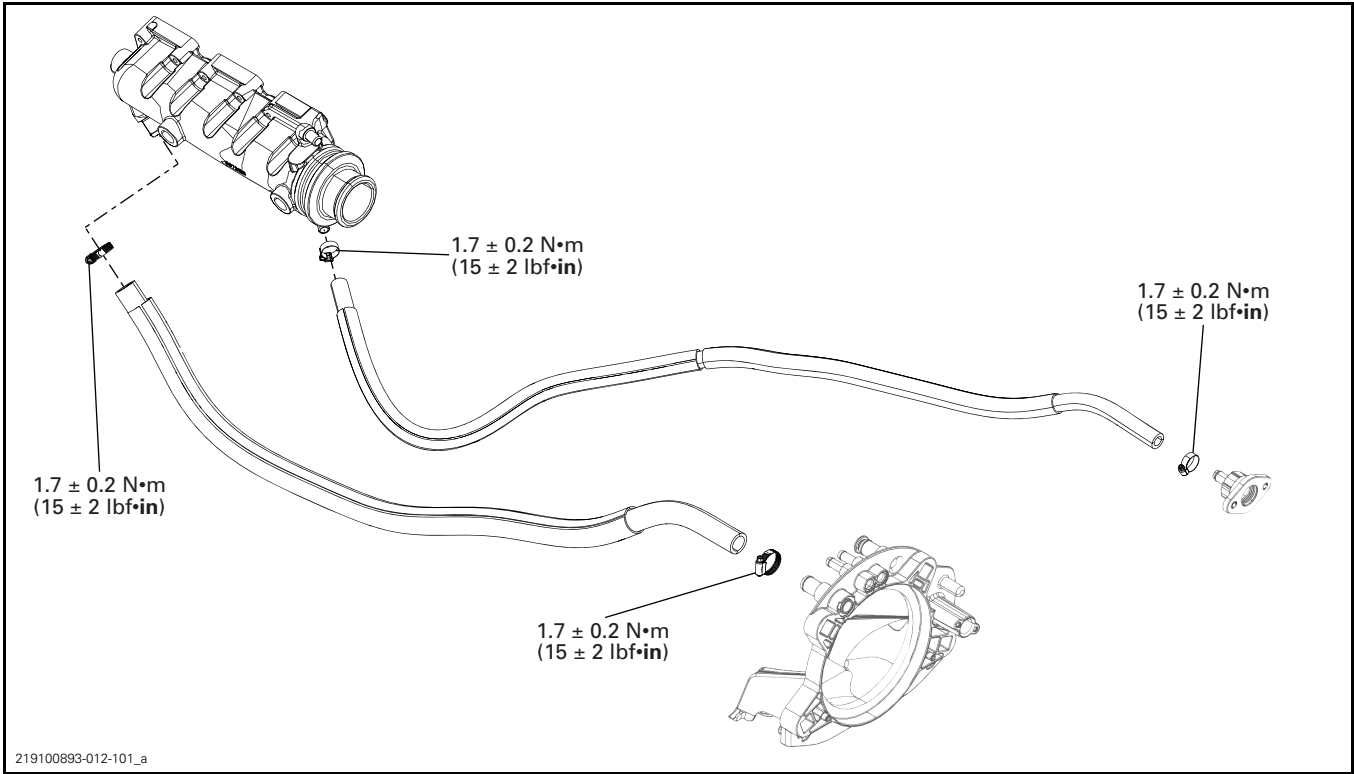
Section 02 ENGINE
Subsection 03 (EXHAUST SYSTEM)



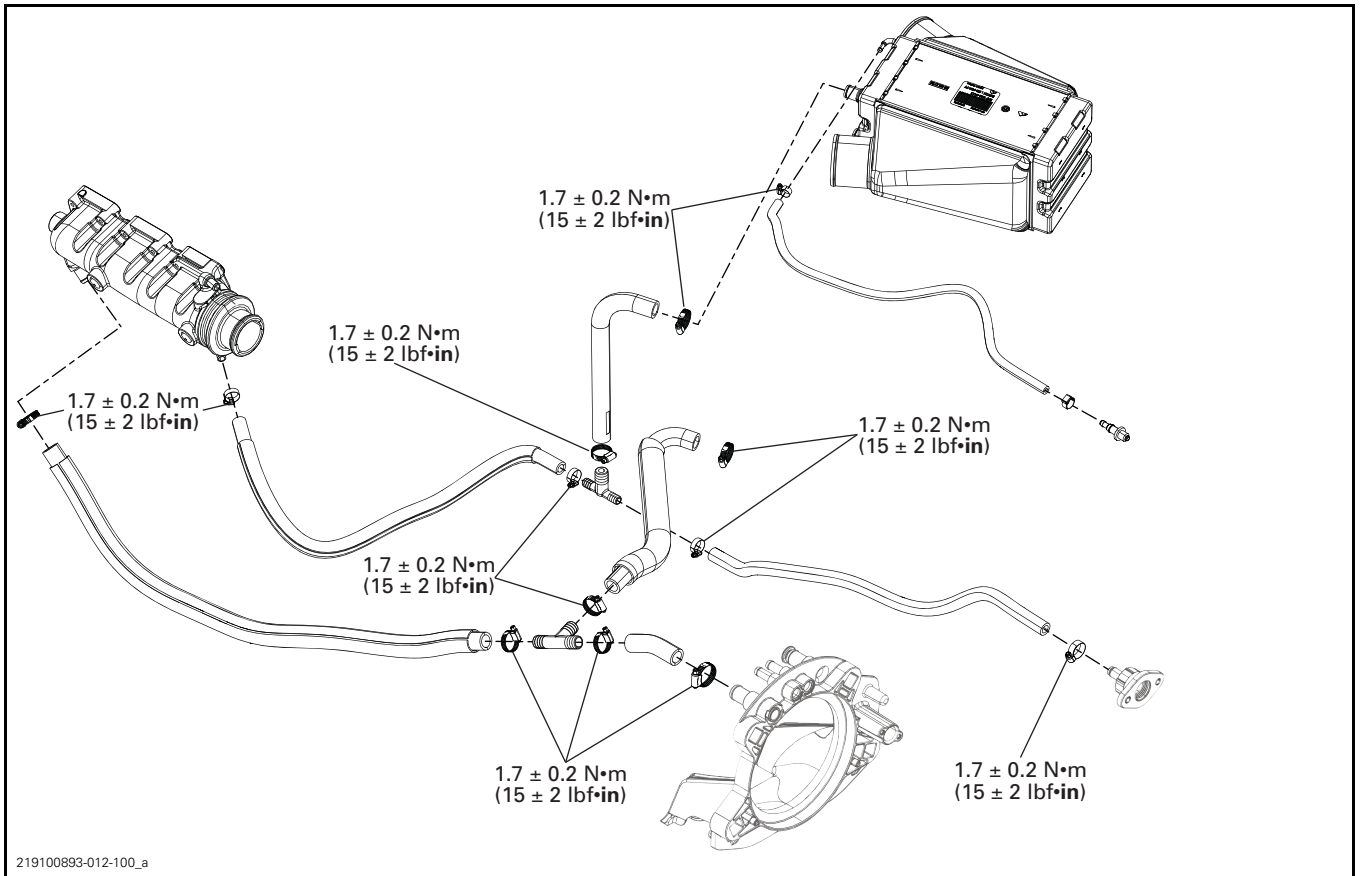


Section 02 ENGINE
Subsection 03 (EXHAUST SYSTEM)

Models without intercooler



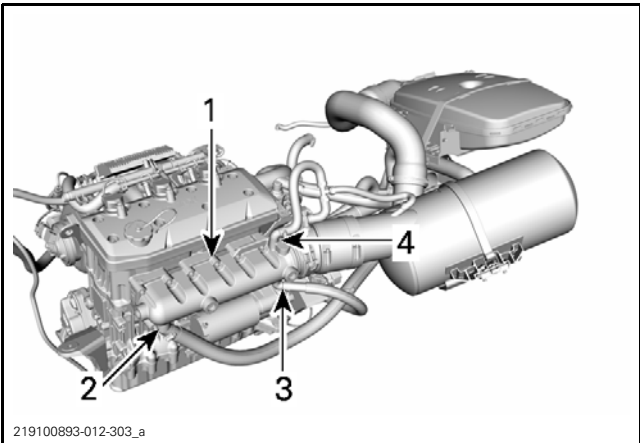
Models with intercooler



GENERAL

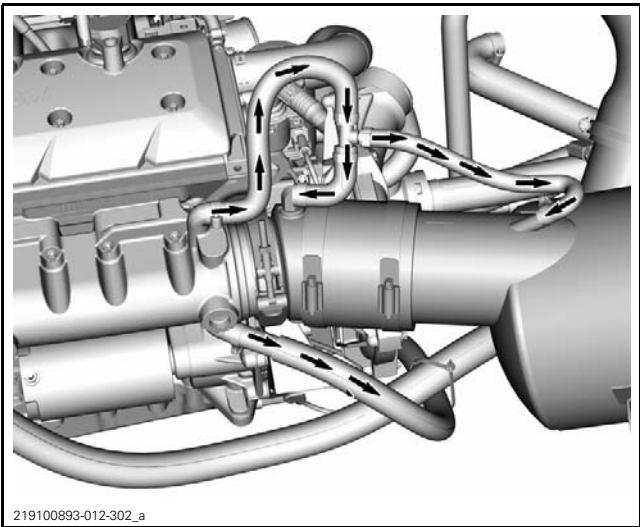
SYSTEM DESCRIPTION

The exhaust system is cooled by water provided by a pressurized area in the jet pump (open loop system).

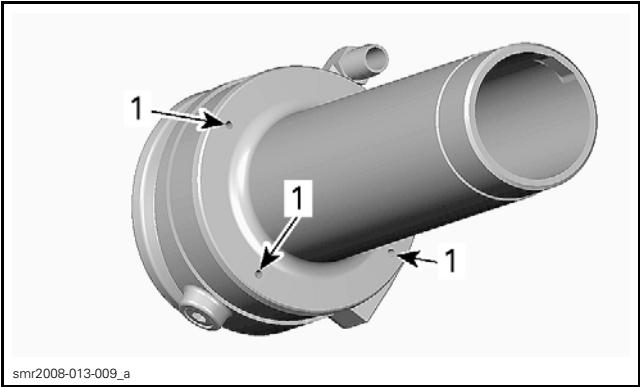


- 1. Exhaust manifold
- 2. Exhaust manifold water inlet
- 3. Exhaust manifold water outlet
- 4. Exhaust manifold water outlet (to exhaust pipe and muffler)

Water from the exhaust manifold jacket is directed to the exhaust pipe via 2 hoses.



Water exits exhaust pipe water jacket through holes to inject water in muffler and resonator.



- 1. Water packet holes

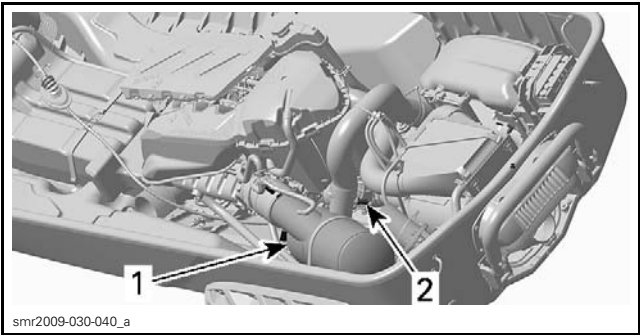
Water is evacuated through the exhaust outlet in transom area.

Exhaust System Technical Specifications

TYPE	Total Loss Cooling System (TLCS)
WATER FLOW	Flow from jet pump (no water pump)
TEMPERATURE CONTROL	Calibrated outlet fittings (no thermostat)
SYSTEM BLEEDING	Self-bleed type
SYSTEM DRAINING	Self-drain type

MAINTENANCE

EXHAUST GAS TEMPERATURE SENSOR (EGTS)



- 1. Muffler
- 2. Exhaust gas temperature sensor (EGTS)

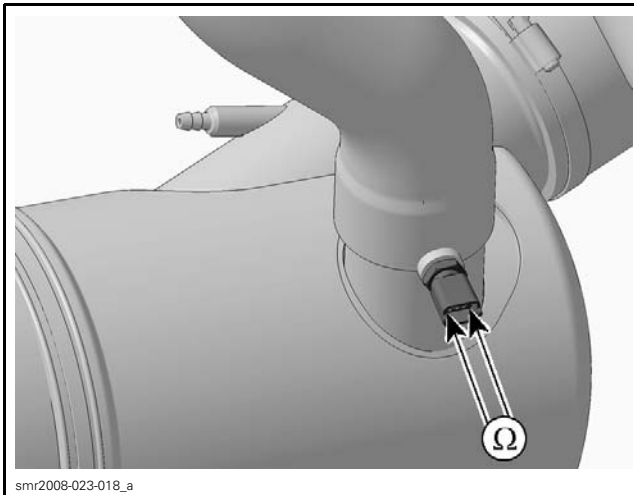
NOTE: An overheat signal will come on in the information center when the exhaust temperature reaches.

OVERHEAT TEMPERATURE
110°C (230°F)

Testing the EGTS Resistance

1. Remove the parts required to access the EGTS.
2. Disconnect the connector from the EGTS.
3. Measure the resistance of the sensor.

EGTS RESISTANCE TEST		
EGTS PIN		MEASUREMENT
1	2	Refer to <i>EGTS RESISTANCE CHART</i>

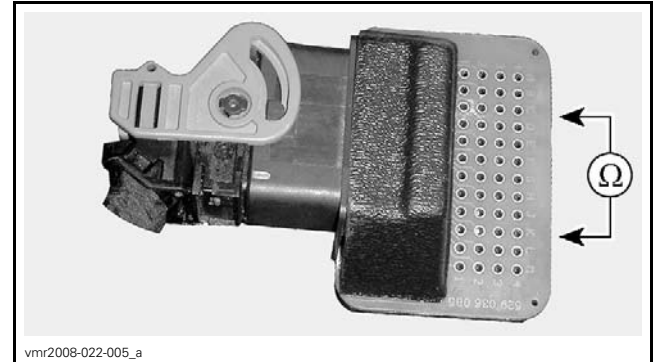


The resistance should be as per the *EGTS RESISTANCE CHART* that follows. Otherwise, replace the EGTS.

If the EGTS resistance is within specifications, proceed with the following steps.

4. Reconnect the EGTS.
5. Disconnect ECM-B connector from the ECM and install it on the ECM adapter tool.
6. Check the circuit resistance as per following table.

EGTS RESISTANCE TEST AT ECM		
ECM ADAPTOR PIN		MEASUREMENT
B-F3	B-G4	Refer to <i>EGTS RESISTANCE CHART</i>



EGTS RESISTANCE CHART				
TEMPERATURE		RESISTANCE (OHMS)		
°C	°F	NOMINAL	LOW	HIGH
- 30	- 22	12600	11800	13400
- 20	- 4	11400	11000	11800
- 10	14	9500	8000	11,000
0	32	5900	4900	6900
10	50	3800	3100	4500
20	68	2500	2200	2800
30	86	1700	1500	1900
40	104	1200	1080	1320
50	122	840	750	930
60	140	630	510	750
70	158	440	370	510
80	176	325	280	370
90	194	245	210	280
100	212	195	160	210
110	230	145	125	160
120	248	115	100	125

If resistance value is as specified, check ECM. Refer to *ENGINE CONTROL MODULE (ECM)* sub-section.

If resistance value is not within specifications, repair or replace wiring and connectors between the ECM and the EGTS.

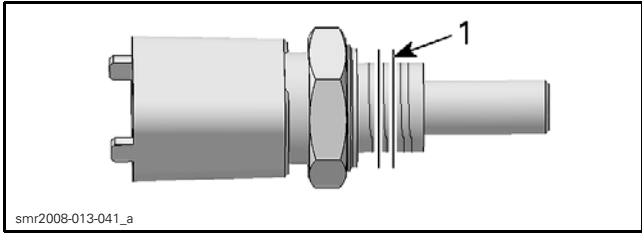
Replacing the EGTS

1. Disconnect the EGTS connector.
2. Unscrew EGTS from muffler.
3. Apply Loctite 518 on the middle threads of the new EGTS.

SERVICE PRODUCT
LOCTITE 518 (P/N 293 800 038)

Section 02 ENGINE

Subsection 03 (EXHAUST SYSTEM)



1. Apply Loctite 518 in this area

4. Install the EGTS.

TIGHTENING TORQUE	
EGTS	16 N•m ± 2 N•m (142 lbf•in ± 18 lbf•in)

5. Install the EGTS connector.

6. Install all other removed parts, refer to applicable subsections.

FLUSHING THE EXHAUST SYSTEM

Flushing the exhaust system with fresh water is essential to neutralize corroding effects of salt or other chemical products present in water. It will help to remove sand, salt, shells or other particles in water jackets and/or hoses.

NOTICE If watercraft is used in salt water, exhaust system must be flushed daily to avoid serious damage to mechanical components.

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

⚠ WARNING

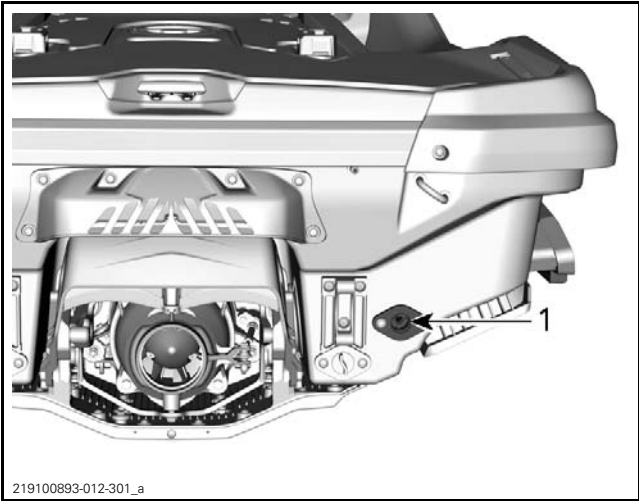
Perform this operation in a well ventilated area. Certain components in the engine compartment may be very hot. Direct contact may result in skin burn. Do not touch any electrical part or jet pump area when engine is running.

Proceed as follows:

Clean propulsion system by spraying water in its inlet and outlet and then apply a coating of XPS Lube or equivalent.

⚠ CAUTION When operating the engine while the watercraft is out of the water, the heat exchanger in the ride plate may become very hot. Avoid any contact with ride plate as burns may occur.

Connect a garden hose to the connector located at the rear of watercraft (on the port side of the stern). Do not open water tap at this time.




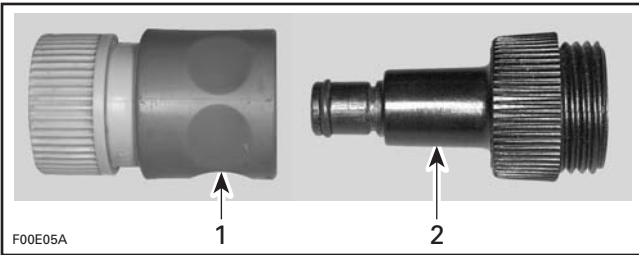
1. Water inlet connector

NOTE: The following tool is recommended when a quick connect adapter is used to ease garden hose installation.

RECOMMENDED TOOL

FLUSHING CONNECTOR ADAPTER (P/N 295 500 473)





1. Quick connect adapter
2. Flushing connector adapter

To flush, start engine then immediately open the water tap.

⚠ CAUTION Certain components in the engine compartment may be very hot. Direct contact may result in skin burn. Do not touch any electrical parts or propulsion system component when the engine is running.

NOTICE 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.

Let the water circulate through the exhaust system for approximately 1 minute.

NOTICE The engine must not run more than 30 seconds without water supply. Stopping engine might be necessary.

Ensure water flows out of jet pump while flushing.

NOTICE Never run engine longer than 2 minutes. Drive line seal has no cooling when watercraft is out of water.

Close the water tap.

Remove the garden hose from the vehicle.

Quickly rev the engine 3-5 times at approximately 5000 RPM.

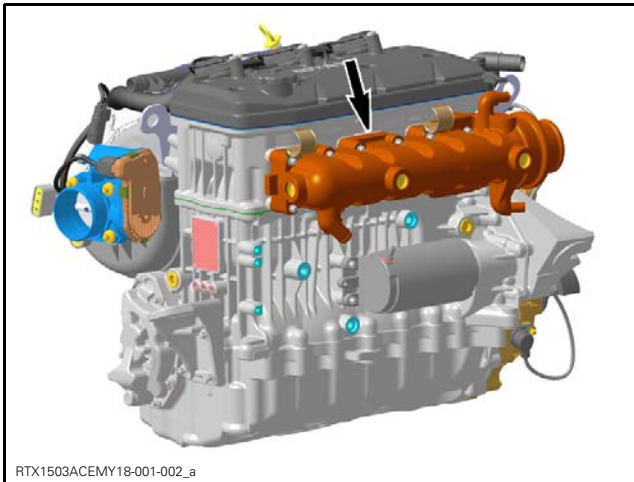
Stop engine.

NOTICE Always close the water tap before stopping the engine.

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

PROCEDURES

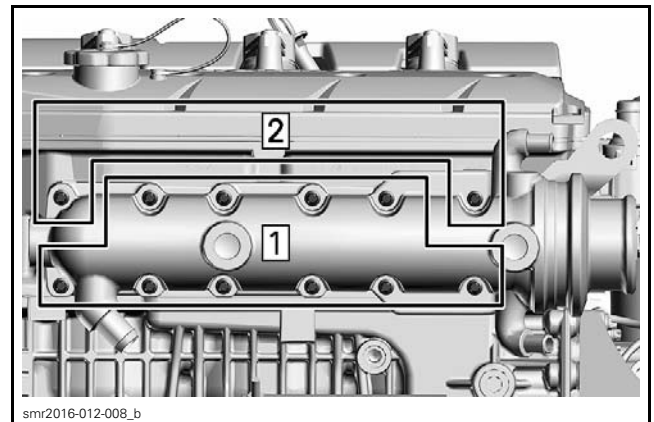
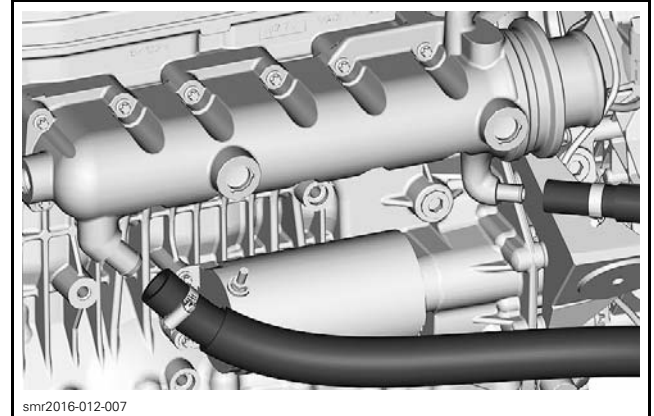
EXHAUST MANIFOLD



TYPICAL

Removing the Exhaust Manifold

1. Move muffler rearwards to make room. Refer to *REMOVING THE MUFFLER* in this subsection.



Step 1: Remove first
Step 2: Remove last

2. Remove the exhaust manifold from vehicle.

Inspecting the Exhaust Manifold

Inspect exhaust manifold condition paying attention for cracks or other damage. Check contact surfaces and hose. Replace any defective part.

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.

Clean all metal components in a solvent.

Installing the Exhaust Manifold

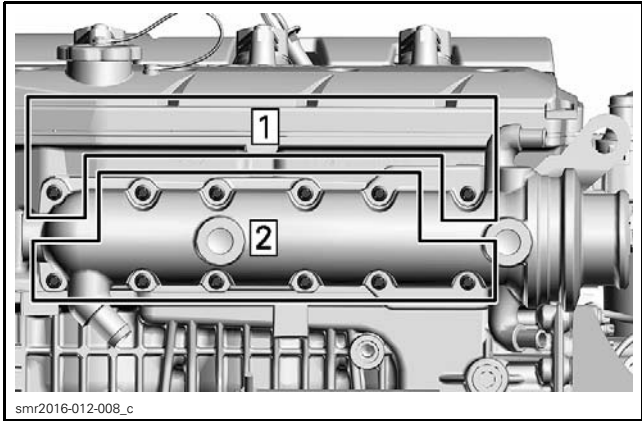
The installation is the reverse of the removal procedure. However, pay attention to the following.

NOTE: There is no gasket between cylinder block and exhaust manifold.

Apply threadlocker on threads of screws.

SERVICE PRODUCT	
Exhaust manifold screws	LOCTITE 243 (BLUE) (P/N 293 800 060)

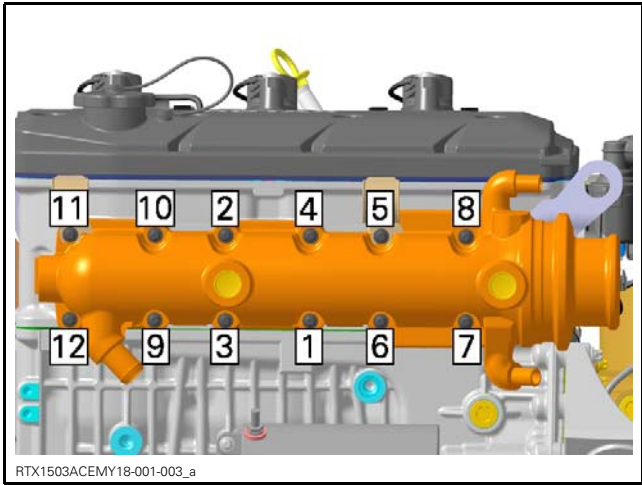
Section 02 ENGINE
Subsection 03 (EXHAUST SYSTEM)



Step 1: Install first
Step 2: Install last

Tighten screws to specification as per following illustrated sequence.

TIGHTENING TORQUE	
Repeat the procedure twice.	
Exhaust manifold screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)



After installation, ensure there is no water or exhaust gas leak when the engine is running. Test run the engine while supplying water to the flushing connector.

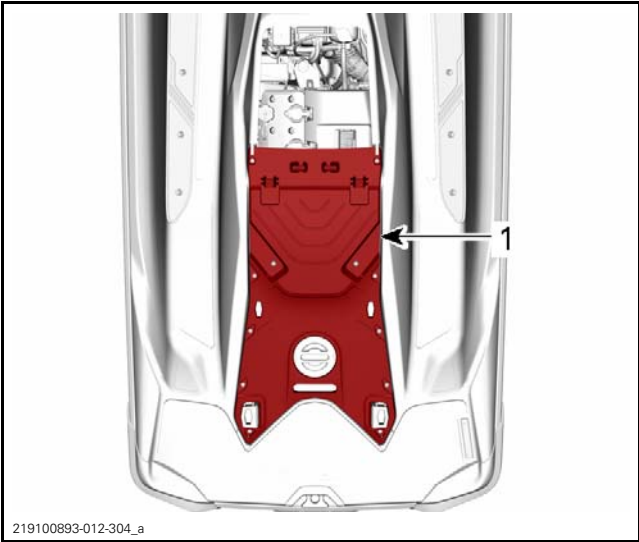
NOTICE Never run engine without supplying water to the exhaust system when watercraft is out of water.

MUFFLER

CAUTION Certain components in the engine compartment may be very hot. Let exhaust system cool down prior to removing parts.

Muffler Access

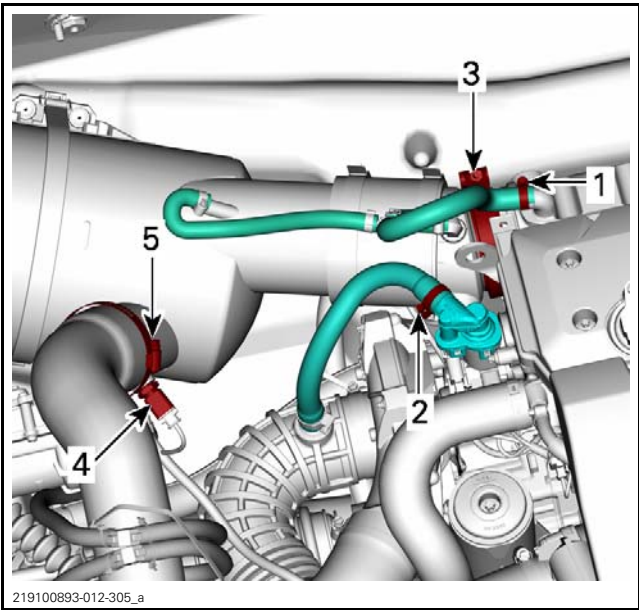
Remove or open seat.
Remove the engine service cover.



1. Engine service cover

Removing the Muffler

1. Remove seats.
2. Remove engine service cover.
3. Disconnect the water outlet hose from the exhaust manifold.

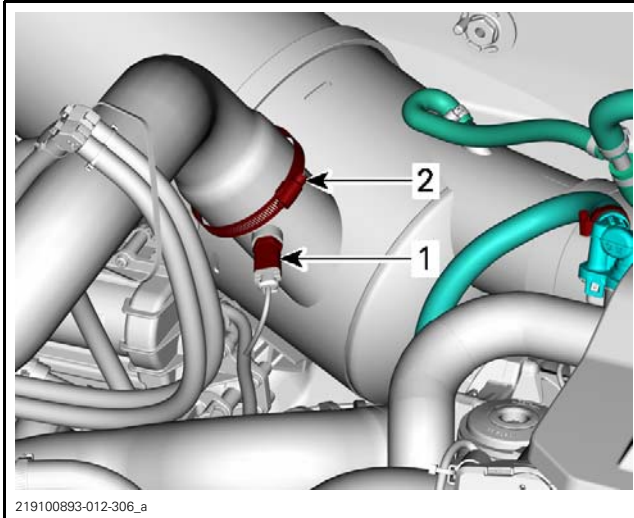


1. Water outlet hose (exhaust manifold)
2. Blow-by hose (blow-by valve)
3. Exhaust clamp
4. EGTS sensor
5. Exhaust hose

4. Gently disconnect the hose from blow-by valve.
5. Unscrew exhaust clamp.

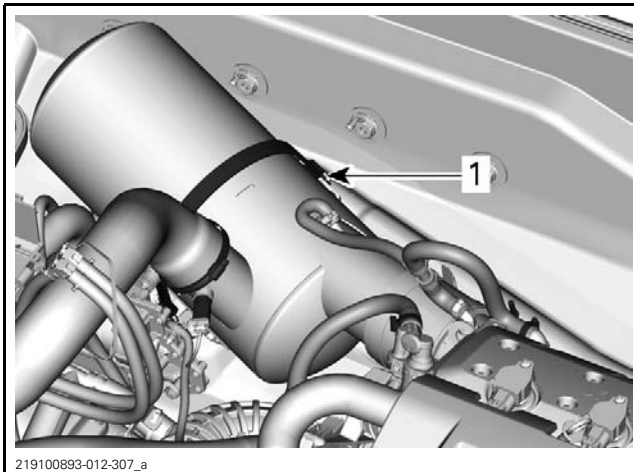
NOTICE Do not use pneumatic or electrical tools as seizure may occur.

6. Unplug the exhaust gas temperature sensor (EGTS).



1. EGTS sensor
2. Exhaust hose clamp

7. Disconnect the exhaust hose from muffler.
8. Detach retaining strap.



1. Muffler retaining strap

9. Move the muffler back then slide it forward through the deck opening.

Inspecting the Muffler

Check muffler for:

- Cracks
- Corrosion
- Other damages.

Check if exhaust hose is:

- Brittle
- Hard

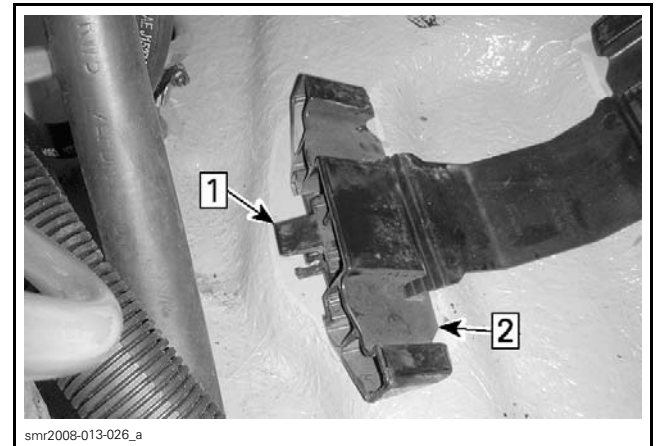
- Cracked
- Otherwise damaged.

Replace any defective part.

Installing the Muffler

With a new muffler, install the EGTS sensor. Refer to this subsection.

Open muffler adjusters by sliding adjuster blocks.



TYPICAL – RUBBER PAD REMOVED FOR CLARITY PURPOSE

Step 1: Lift adjuster tab

Step 2: Move adjuster outward

Insert the muffler in hull.

Align the exhaust pipe flange with the exhaust manifold. Rotate and move muffler so that the exhaust pipe flange makes perfect contact with exhaust manifold.

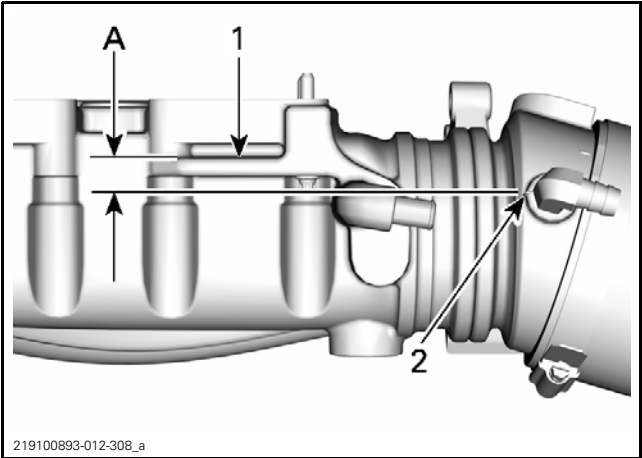
Slide both adjuster blocks against muffler to support it in position.

NOTE: Ensure muffler is in contact with both adjuster blocks. Readjust as required.

Install exhaust clamp with the nut upward.

Tighten clamp loosely.

Align the exhaust pipe mark with the mark on the exhaust manifold.



1. Exhaust manifold rib wall facing the engine
2. Exhaust pipe mark
- A. 15 mm (19/32 in)

Tighten exhaust clamp to specification.

TIGHTENING TORQUE	
Exhaust clamp	11 N•m ± 1 N•m (97 lbf•in ± 9 lbf•in)

NOTICE Do not use pneumatic or electric tools as seizure may occur.

Install the muffler strap.

NOTICE Ensure not to rotate muffler during strap installation. The use of a soapy water solution on inner side of muffler strap is recommended.

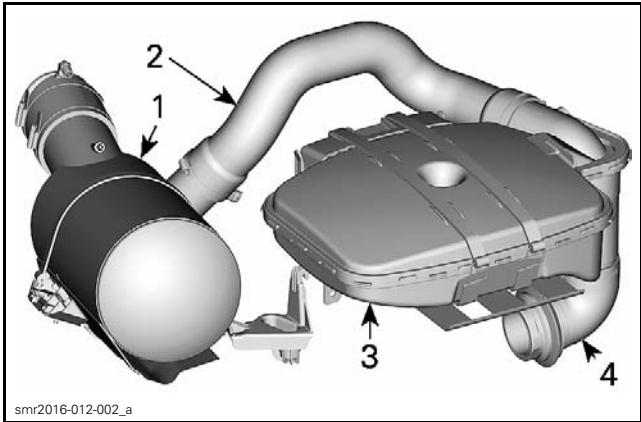
Install all other removed parts.

After installation, ensure there is no water or exhaust gas leak when engine is running.

Test run the engine while supplying water to the exhaust system.

NOTICE Never run engine without supplying water to the exhaust system when watercraft is out of water.

EXHAUST HOSES



1. Muffler
2. Front exhaust hose
3. Resonator
4. Rear exhaust hose

Replacing the Front Exhaust Hose

Remove seats.

Remove engine service cover.

Cut all locking ties from exhaust hose.

Remove exhaust hose from the muffler outlet and resonator.

Remove front exhaust hose from vehicle.

When reinstalling exhaust hose, make sure to attach elbow fittings at the highest position that you can on the exhaust hose.

Replace all locking ties previously cut.

Tighten retaining clamps to specification.

TIGHTENING TORQUE	
Front exhaust hose clamp	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)

Install all other removed parts.

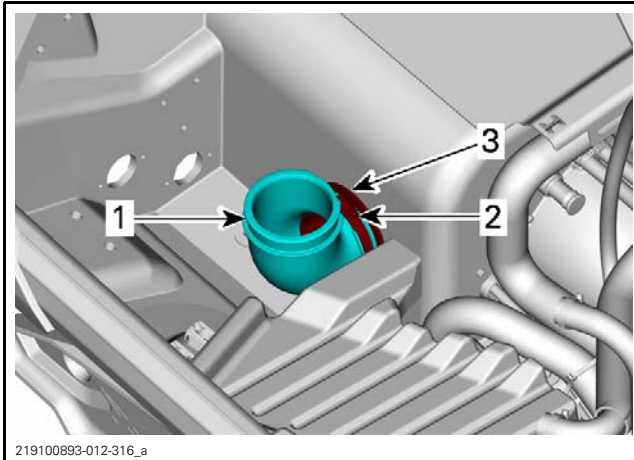
After installation, ensure there is no water or exhaust gas leak when the engine is running. Test run the engine while supplying water to the exhaust system.

NOTICE Never run engine without supplying water to the exhaust system when watercraft is out of water.

Replacing the Rear Exhaust Hose

Remove the resonator. See procedure in this subsection.

Loosen clamp securing the rear exhaust hose to RH fixing plate.



1. Rear exhaust hose
2. Hose clamp
3. RH fixing plate

When reinstalling rear exhaust hose, tighten clamps to specification.

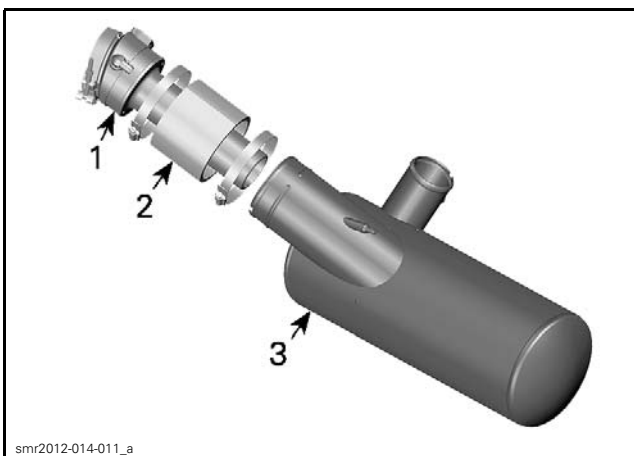
TIGHTENING TORQUE	
Rear exhaust hose clamp	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)

Reinstall all other removed parts.

After installation, ensure there is no water or exhaust gas leak when the engine is running. Test run the engine while supplying water to the exhaust system.

NOTICE Never run engine without supplying water to the exhaust system when watercraft is out of water.

EXHAUST PIPE

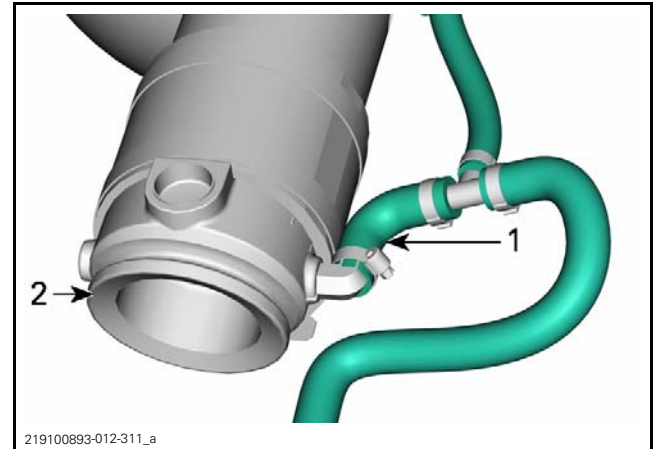


1. Exhaust pipe
2. Rubber adapter
3. Muffler

Removing the Exhaust Pipe

Remove *MUFFLER*, see procedure in this subsection.

Disconnect water inlet hose from exhaust pipe fitting.



1. Water inlet hose
2. Exhaust pipe

Loosen rubber adapter clamps.

Remove exhaust pipe and the rubber adapter.

Inspecting the Exhaust Pipe

Inspect exhaust pipe for:

- Cracks
- Flange damages
- Other damages.

Replace exhaust pipe as required.

Check if the rubber adapter is:

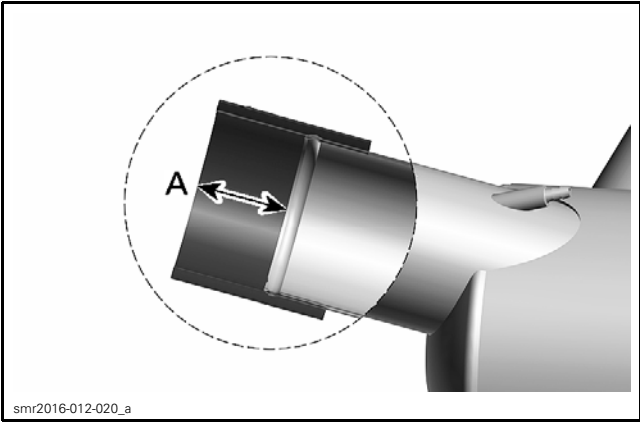
- Brittle
- Hard
- Otherwise damaged.

Replace rubber adapter if necessary.

Installing the Exhaust Pipe

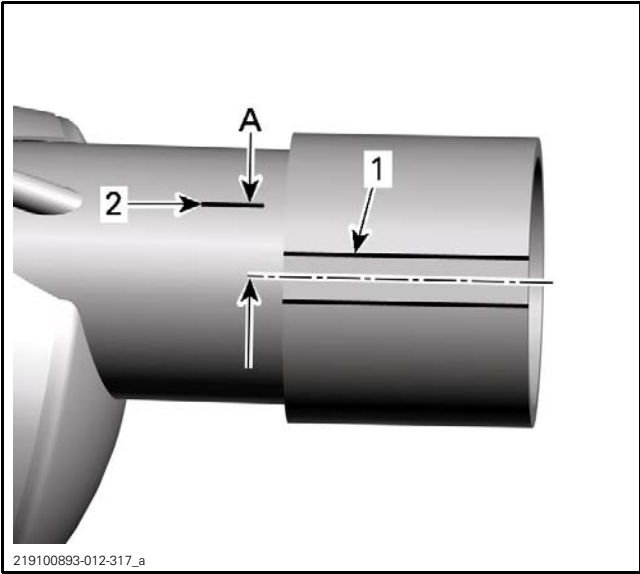
Install rubber adapter on muffler.

Section 02 ENGINE
Subsection 03 (EXHAUST SYSTEM)



SECTION VIEW
1. 57mm ± 2mm (2-1/4 in ± 5/64 in)

Center the muffler pre-mark with the BLUE strip on rubber adapter.

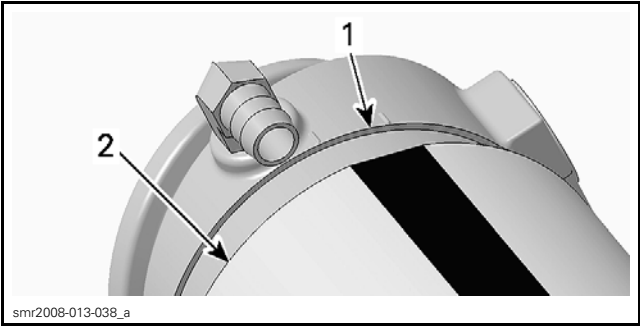


1. Blue strip on rubber adapter
2. Muffler pre mark
A. 30mm (1.181 in)

Secure the rubber adapter to the muffler using retaining clamp.

TIGHTENING TORQUE	
Rubber adapter retaining clamp	9.5 N•m ± 0.5 N•m (84 lbf•in ± 4 lbf•in)

Install the exhaust pipe in the rubber adapter. Ensure rubber adapter is properly seats against exhaust pipe shoulder.

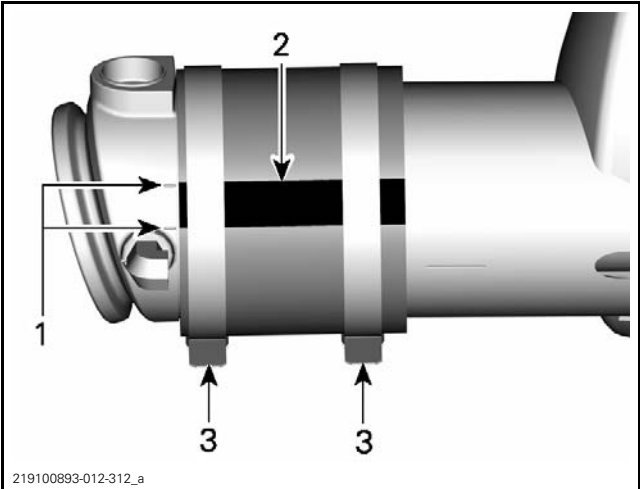


1. Exhaust pipe shoulder
2. Rubber adapter

Center the rubber adapter strip of the rubber adapter between both exhaust pipe marks.

Tighten retaining clamps.

TIGHTENING TORQUE	
Rubber adapter retaining clamp	9.5 N•m ± 0.5 N•m (84 lbf•in ± 4 lbf•in)



1. Exhaust pipe marks
2. Rubber adapter strip
3. Retaining clamps

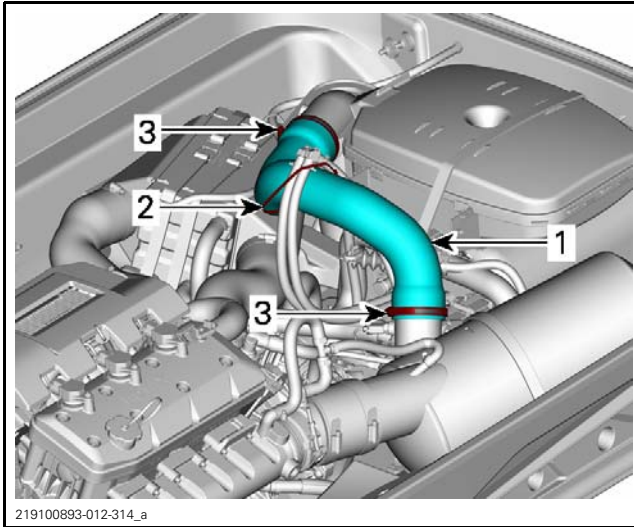
Install muffler in vehicle. Refer to *INSTALLING THE MUFFLER* in this subsection for complete procedure.

RESONATOR

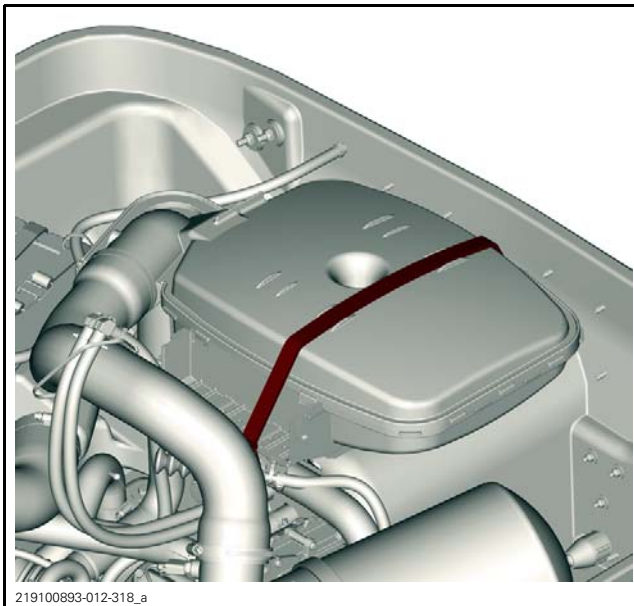
Removing the Resonator

Remove the intercooler if equipped. Refer to *INTERCOOLER* subsection.

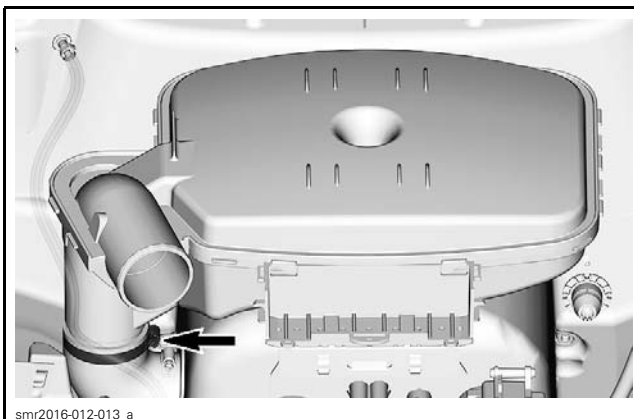
Remove front exhaust hose.



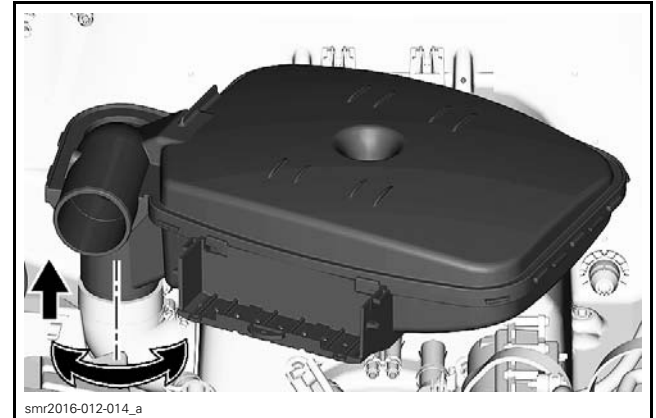
Remove strap holding resonator.



Loosen upper clamp from rear exhaust hose.



Rotate resonator to free it up from rear exhaust hose.



Inspecting the Resonator

Inspect parts condition paying attention for deformation, cracks or other damage. Check hoses. Replace any defective part.

Installing the Resonator

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

After installation, ensure there is no water or exhaust gas leak when the engine is running. Test run the engine while supplying water to the exhaust system.

TIGHTENING TORQUE	
Crossover pipe clamps	$4 \text{ N}\cdot\text{m} \pm 1 \text{ N}\cdot\text{m}$ $(35 \text{ lbf}\cdot\text{in} \pm 9 \text{ lbf}\cdot\text{in})$

NOTICE Never run engine without supplying water to the exhaust system when watercraft is out of water.

COOLING SYSTEM - VEHICLE

SERVICE TOOLS

Description	Part Number	Page
OETIKER PLIER.....	295 000 070	54
TEST CAP.....	529 035 991	53
VACUUM/PRESSURE PUMP	529 021 800	53

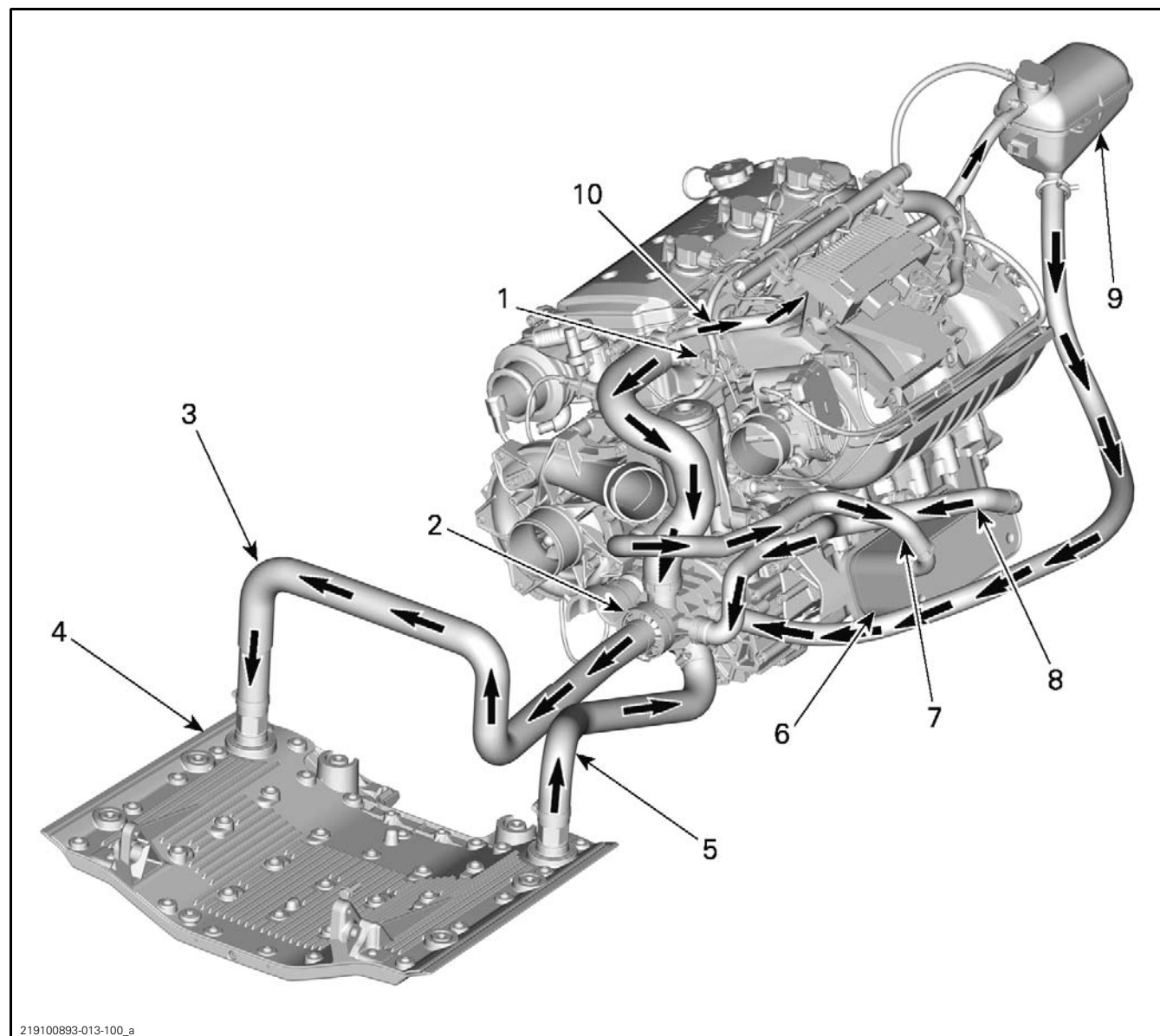
SERVICE PRODUCTS

Description	Part Number	Page
EXTENDED LIFE PRE-MIXED COOLANT (EUR)	779223	51
EXTENDED LIFE PRE-MIXED COOLANT	779150	51
LOCTITE 567 (PIPE SEALANT)	293 800 013	52

Section 02 ENGINE

Subsection 04 (COOLING SYSTEM - VEHICLE)

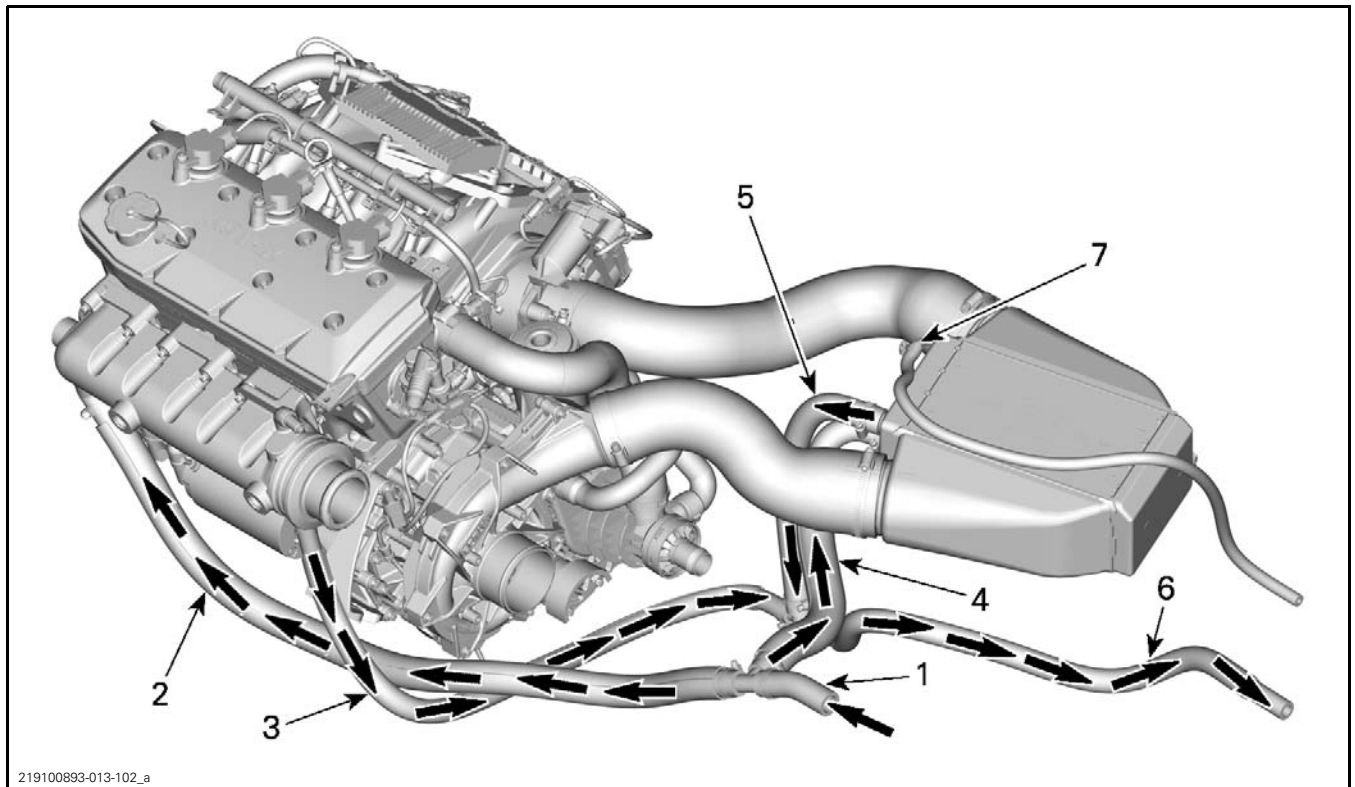
Cooling System (closed loop)



219100893-013-100_a

- | | |
|---|---|
| 1. Coolant temperature sensor (CTS) activates when monitoring beeper turns on at 110°C (230°F) | 6. Oil cooler |
| 2. Water pump cover / thermostat housing - Thermostat opens at 102°C (216°F) for 155 and 230 models and 97.5°C (208°F) for 300 models | 7. Coolant flows to oil cooler |
| 3. Coolant flows to ride plate | 8. Coolant returns from oil cooler |
| 4. Ride plate (operates as heat exchanger) | 9. Expansion coolant tank |
| 5. Coolant returns from ride plate | 10. Bleed hose from cylinder head to expansion coolant tank |

Cooling System (open loop)



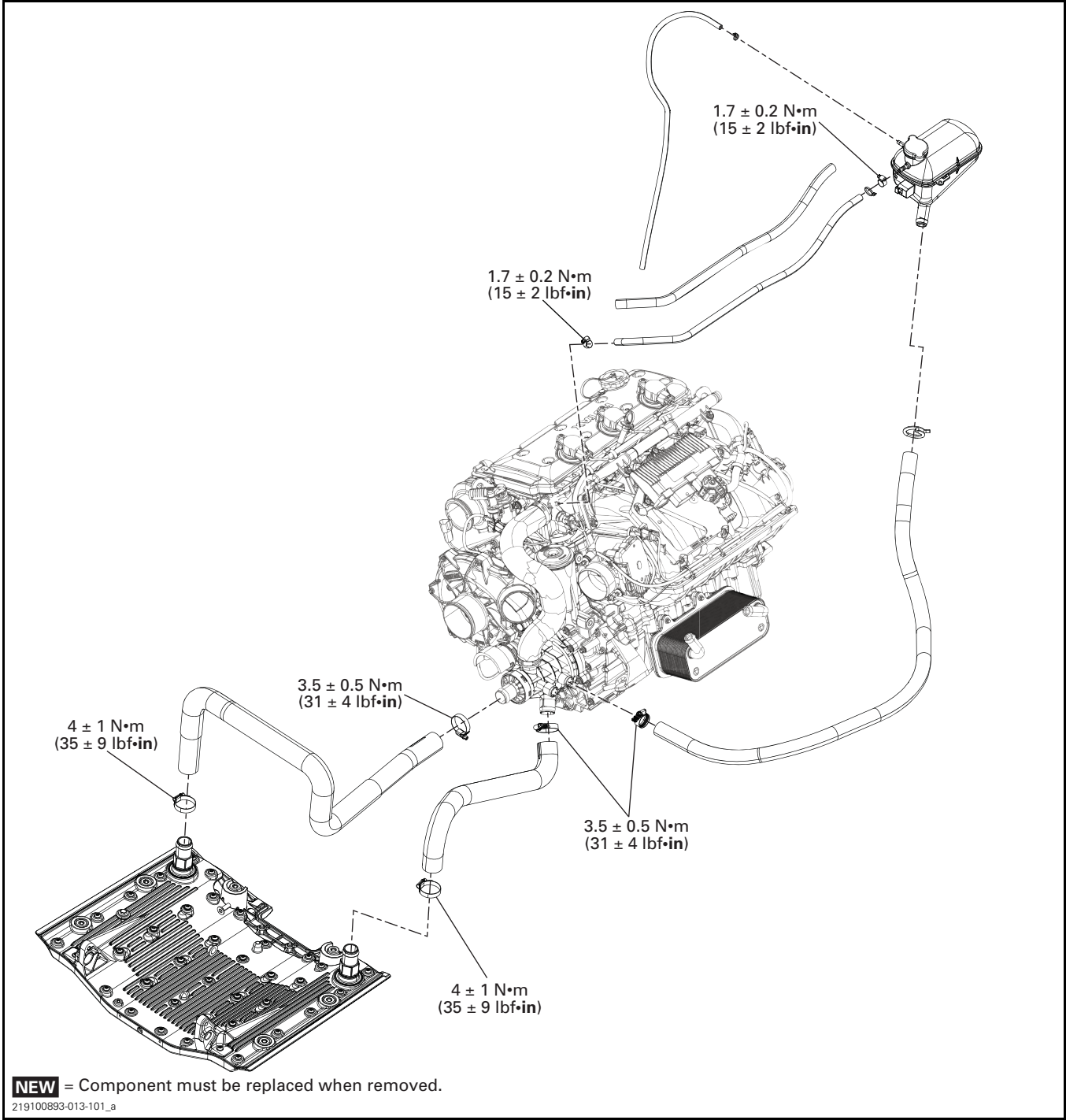
219100893-013-102_a

1. Water enters system
2. Water enters the exhaust manifold
3. Water exits the exhaust manifold
4. Water enters intercooler

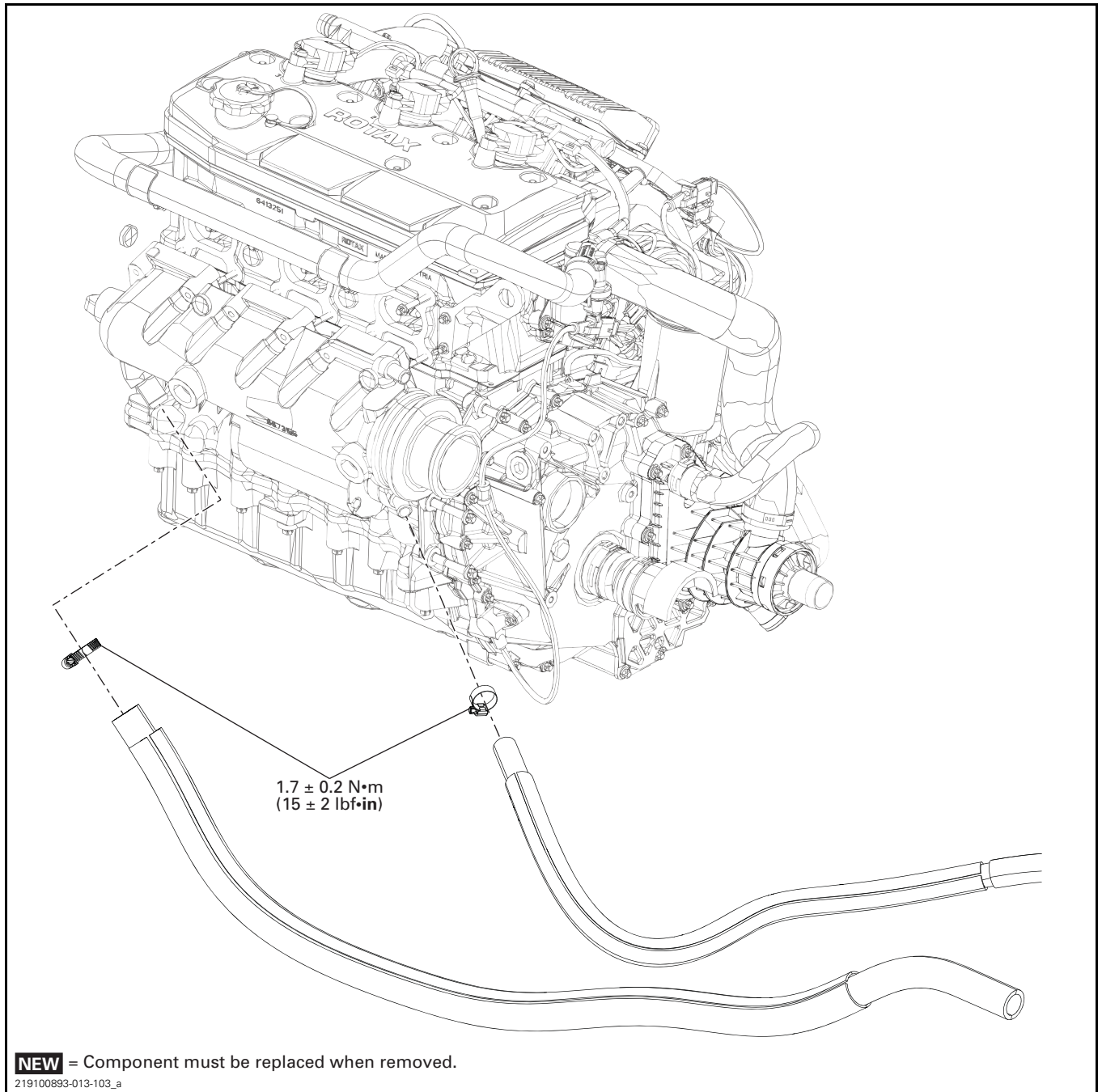
5. Water exits the intercooler
6. Water exits system
7. Bleed hose from intercooler

Section 02 ENGINE
Subsection 04 (COOLING SYSTEM - VEHICLE)

Cooling System Components (closed loop)

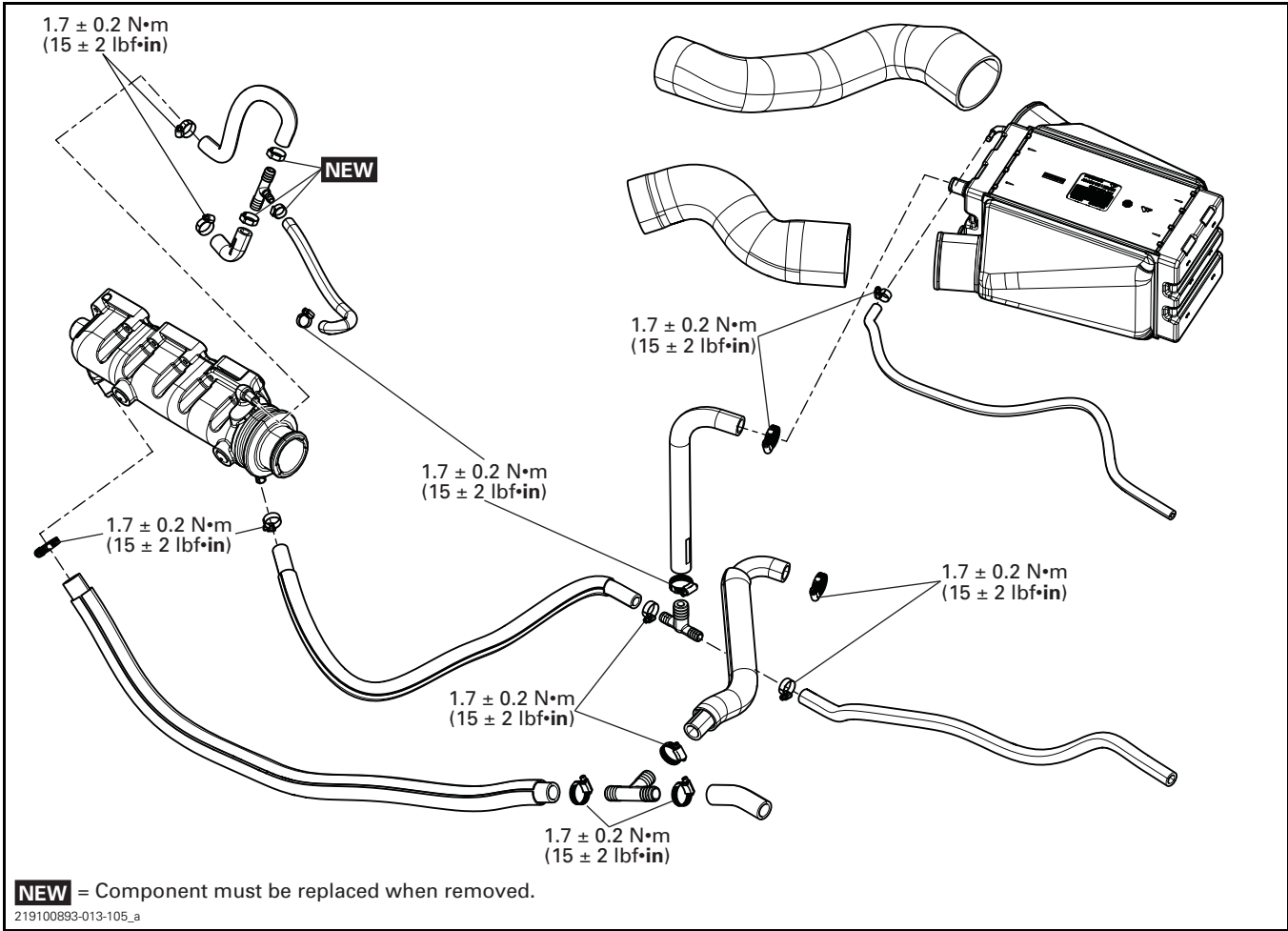


Cooling System Components (open loop, 155 models)



Section 02 ENGINE
Subsection 04 (COOLING SYSTEM - VEHICLE)

Cooling System Components (open loop, 230 and 300 models)



GENERAL

SYSTEM DESCRIPTION

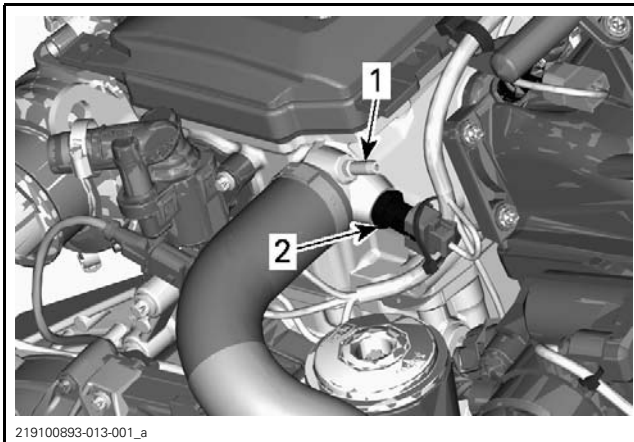
A closed loop cooling system is utilized on all BRP watercraft engines, which offers an efficient engine cooling while keeping dirt and salt water out of the cooling system. This system keeps the temperature constant and prevents internal engine corrosion.

A separate coolant tank ensures that enough engine coolant is in the circuit during any operating condition.

The coolant flow comes from the water pump impeller into the cylinder block. It goes around the cylinders and straight up to the cylinder head. A smaller quantity of engine coolant enters the cylinder block on the exhaust side for a better cooling. In the cylinder head the water channels flow around the exhaust and then the intake valves and leave the engine through a large hose. From there the coolant goes back to the water pump housing and depending on the engine temperature, it flows through the thermostat directly back to the water pump impeller, or it takes its way through the heat exchanger.

Engine coolant is also directed towards the oil cooler (coolant type).

Coolant temperature sensor and bleed hose fitting are located on the cylinder head.



219100893-013-001_a
1. Bleed hose fitting
2. Coolant temperature sensor (CTS)

NOTICE Never modify cooling system arrangement, otherwise serious engine damage could occur.

Technical Specifications

TYPE	Closed loop cooling system.
COOLANT FLOW	Flow from water pump.
TEMPERATURE CONTROL	Thermostat.
SYSTEM BLEEDING	Self-bleed type through coolant tank (hose at uppermost point of circuit).
MONITORING BEEPER	Turns on at 102°C (216°F) for 155 and 230 models and 97.5°C (208°F) for 300 models.

MAINTENANCE

ENGINE COOLANT

⚠ WARNING

To avoid potential burns, do not remove the coolant tank cap or loosen the ride plate drain plug if the engine is hot.

Recommended Coolant

SERVICE PRODUCTS	
Scandinavia	EXTENDED LIFE PRE-MIXED COOLANT (EUR) (P/N 779223)
All other countries	EXTENDED LIFE PRE-MIXED COOLANT (P/N 779150)
IF THE RECOMMENDED XPS COOLANT IS NOT AVAILABLE: Use a low silicate, extended life ethylene-glycol premixed coolant (50%-50%) specifically formulated for internal combustion aluminum engines.	

NOTICE Do not use tap water, straight antifreeze or straight water in the system. Tap water contains minerals and impurities which build up in the system. Straight water will cause the system to freeze while straight antifreeze will cause system temperature problems.

To prevent antifreeze deterioration, always use the same brand and grade. Never mix different brands or grades unless cooling system is completely flushed and refilled.

Section 02 ENGINE

Subsection 04 (COOLING SYSTEM - VEHICLE)

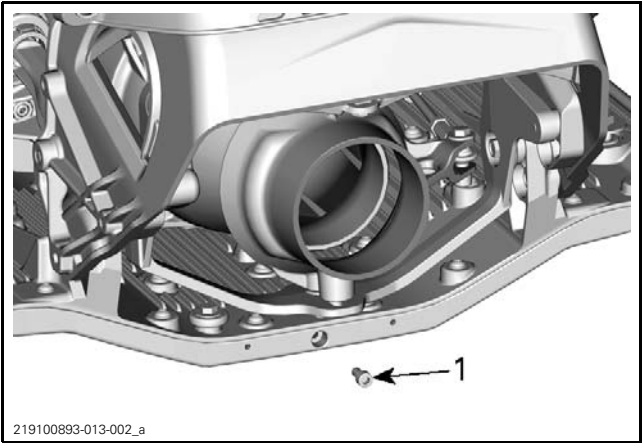
NOTICE To prevent rust formation or freezing condition in cold areas, always replenish the system with 50% antifreeze and 50% distilled water. Pure antifreeze will freeze at a higher temperature than the optimal water/antifreeze mix. Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

Draining the System

 **WARNING**

Never drain or refill cooling system when engine is hot.

- Remove seats.
 - Remove engine service cover.
 - Install a drain pan underneath the ride plate.
 - Unscrew the drain plug on ride plate.
- NOTE:** Raising the front of the watercraft will contribute to drain the cooling system.



1. Cooling drain plug

- Remove the coolant tank cap.
- Dispose coolant as per local regulations.
- Do not reinstall drain plug at this time.

Cleaning the System

NOTICE Cleaning the cooling system as per the following procedure is required when engine overheats (assuming everything else is operating normally) or each time coolant is replaced.

- Drain the cooling system.
- Add a cleaning product such as the Zerex® Super Cleaner by Valvoline (or an equivalent) in coolant tank then fill cooling system with demineralized water.

- Reinstall cap on coolant tank.
- Install watercraft in a test basin or ride on a water plane. Start engine and run for approximately 15 minutes.
- IMPORTANT:** Ensure thermostat opens so that the cleaning product flows in ride plate properly.
- Stop engine and let the cleaning product work for 12 to 16 hours.
- Thereafter, engine can be run one last time to soak off deposits.
- Drain and thoroughly rinse the cooling system with clean fresh water.
- Refill cooling system as described below.

Refilling the System

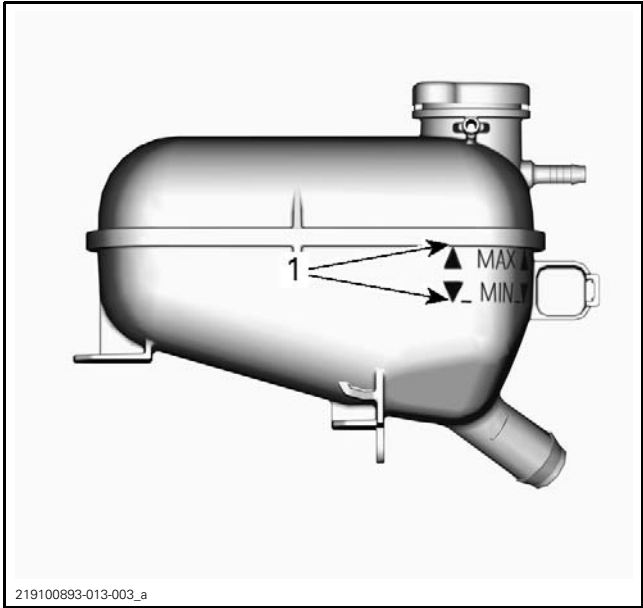
- Watercraft should be level, engine cold and drain plug removed for refilling.
- Place a container under drain plug to collect antifreeze.
- Apply pipe sealant on drain plug threads.

SERVICE PRODUCT
LOCTITE 567 (PIPE SEALANT) (P/N 293 800 013)

- Ask someone to pour recommended antifreeze in coolant tank.
- When antifreeze flows out from the ride plate drain hole, reinstall drain plug. Tighten drain plug to specification.

TIGHTENING TORQUE	
Drain plug	8.5 N•m ± 1 N•m (75 lbf•in ± 9 lbf•in)

- Continue to pour and fill coolant tank between marks.



1. Level between marks when engine is cold

Do not install pressure cap at this time.

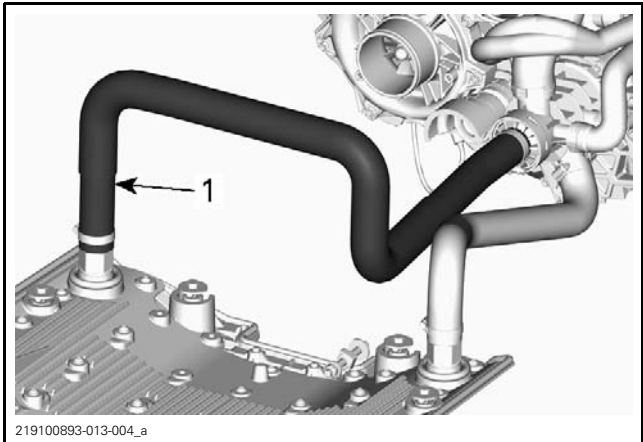
Link a garden hose to the hose adapter at the back of the watercraft. Refer to *FLUSHING THE EXHAUST SYSTEM* in the *EXHAUST SYSTEM* subsection.

NOTICE Never run engine without supplying water to the exhaust system.

Start engine and let run for a maximum of 2 minutes. Stop engine and wait 15 minutes to cool down. Refill tank as necessary.

NOTICE Never run engine longer than 2 minutes. Drive line seal has no cooling when watercraft is out of water.

Repeat this run-stop cycle 2-3 times until thermostat opens and stop engine.



1. This hose becomes hot when thermostat opens

Last, refill coolant tank and install pressure cap.

When engine has completely cooled down, recheck coolant level in the coolant tank and top up if necessary.

INSPECTION



COOLING SYSTEM LEAK TEST

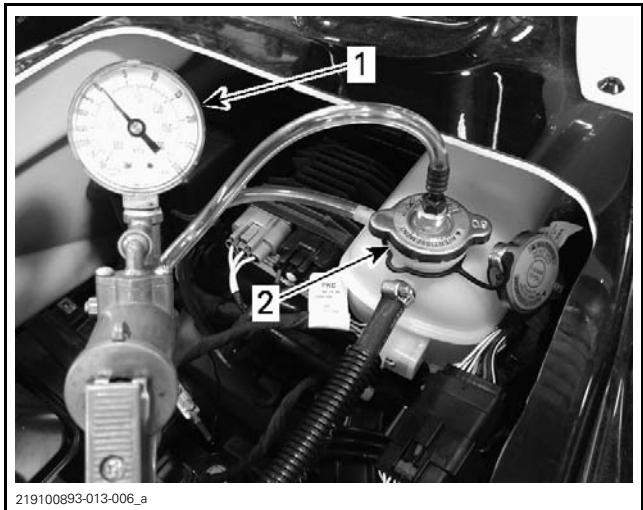
⚠ WARNING

To avoid potential burns, do not remove the coolant tank cap if the engine is hot.

NOTE: This test confirms if there is a leak in the cooling system, including the engine.

Pressurize cooling system through coolant reservoir.

REQUIRED TOOL	
TEST CAP (P/N 529 035 991)	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	
COOLING SYSTEM LEAK TEST	
110 kPa (16 PSI)	



TYPICAL

1. Vacuum/pressure pump
2. Test cap

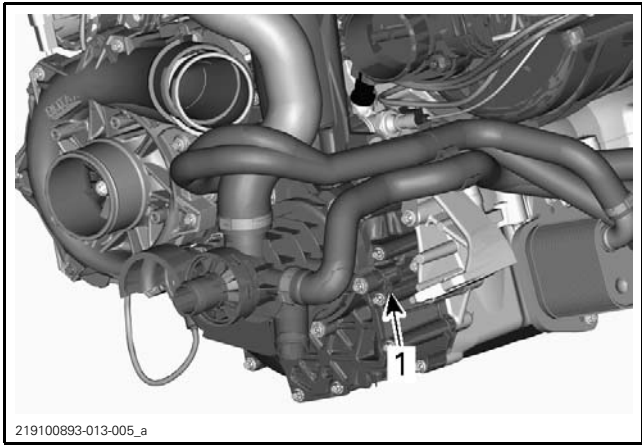
If pressure drops, check all hoses, heat exchanger and engine for coolant leaks. Spray a soap/water solution and look for air bubbles.

Check the leak indicator hole if there is oil or coolant leaking.

Section 02 ENGINE

Subsection 04 (COOLING SYSTEM - VEHICLE)

NOTE: In general leaking coolant indicates a damaged rotary seal. Leaking oil indicates a damaged oil seal. If either seal is leaking, both seals must be replaced at the same time. Refer to *WATER PUMP* in *COOLING SYSTEM - ENGINE* in the appropriate engine shop manual.



1. Leak indicator hole

TROUBLESHOOTING

The following is provided to help in diagnosing the probable source of troubles. It is a guideline and it should not be assumed to list all possible problems.

Always check for fault codes. If a fault code is detected, service the fault code first. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

ENGINE OVERHEATING

1. Low coolant level.
- Refill and check for leaks (coolant leaking out of engine leak indicator hole, hoses or clamps missing/defective, cylinder head gaskets leaks, ride plate leaking, etc.). Repair or replace.
2. Air in cooling system
- Refill and bleed cooling system.
3. Thermostat defective (does not open when engine gets hot)
- Replace thermostat housing.
4. Water pump failure
- Inspect and replace defective components.
5. Water temperature sensor defective
- Check or replace. Refer to *ELECTRONIC FUEL INJECTION (EFI)*.
6. Ride plate or hoses damaged
- Check or replace damaged components.

7. Exhaust system clogged
- Flush exhaust system.
8. Internal passage blocked in cooling system
- Inspect and clean.

PROCEDURES

PRESSURE CAP

Testing the Pressure Cap

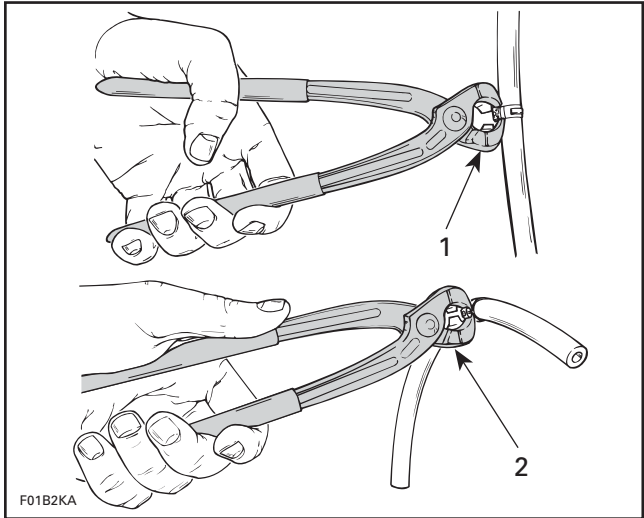
Using a pressure cap tester, check cap opening pressure. If opening pressure is out of range, install a new pressure cap.

CAP OPENING PRESSURE	
Opening range	90 kPa ± 10 kPa (13 PSI ± 1.5 PSI)

CLAMPS

Replacing the Oetiker Clamp

REQUIRED TOOL	
OETIKER PLIER (P/N 295 000 070)	



1. Cutting clamp
2. Securing clamp

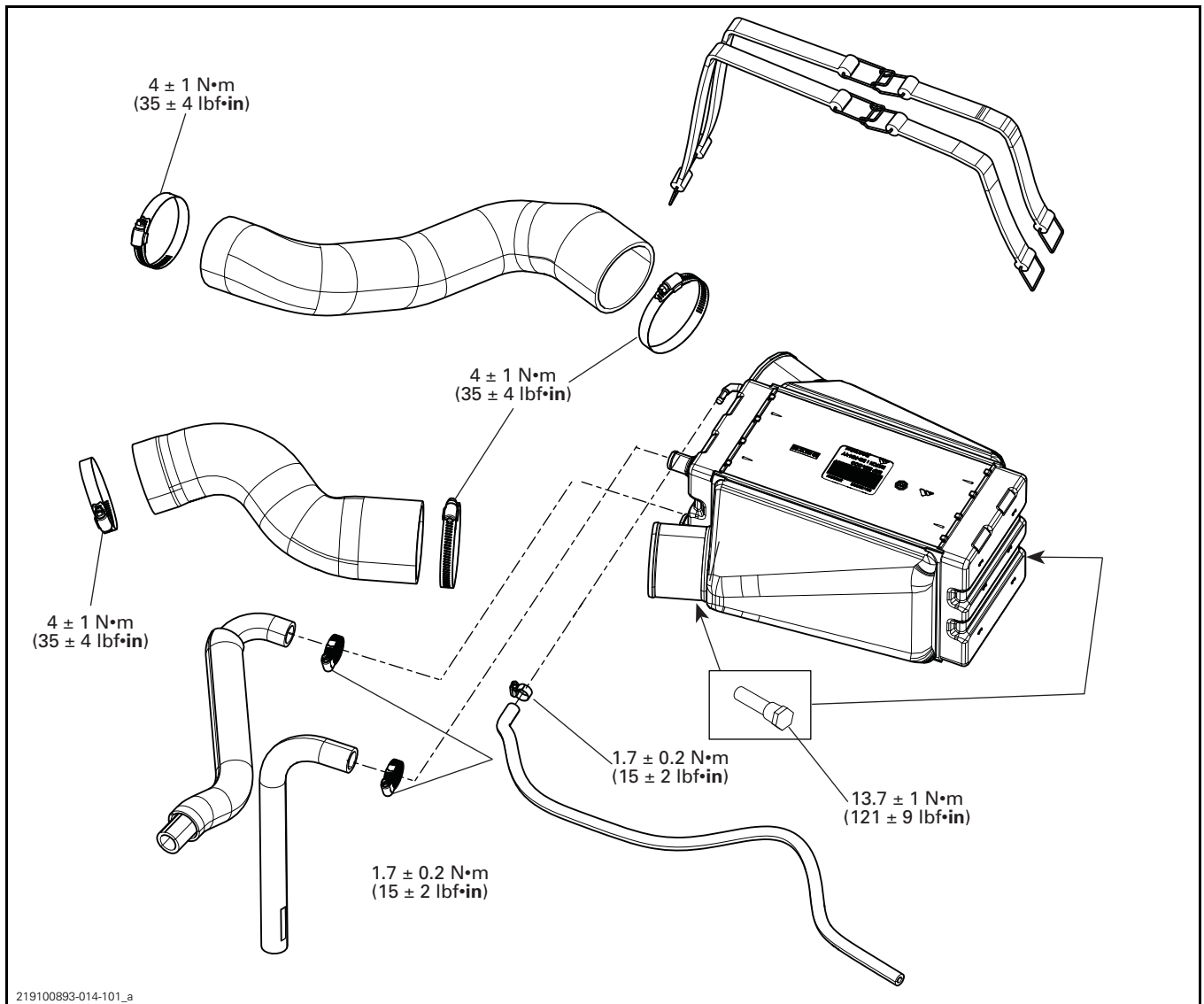
NOTE: Always check general condition of hoses and clamp tightness.

INTERCOOLER

SERVICE TOOLS

Description	Part Number	Page
LARGE HOSE PINCHER.....	529 032 500	57
VACUUM/PRESSURE PUMP	529 021 800	57

230 and 300 engines



MAINTENANCE

INTERCOOLER FLUSHING

Flushing the intercooler 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 intercooler.

NOTE: Intercooler is flushed with the exhaust system, as they are on the same circuit.

Exhaust system and intercooler should be flushed each time:

- Watercraft is used in salt water and is not expected to be used further the same day.
- Watercraft is used in foul water.
- Watercraft is stored for any extended time.

Refer to *EXHAUST SYSTEM* subsection for flushing procedure.

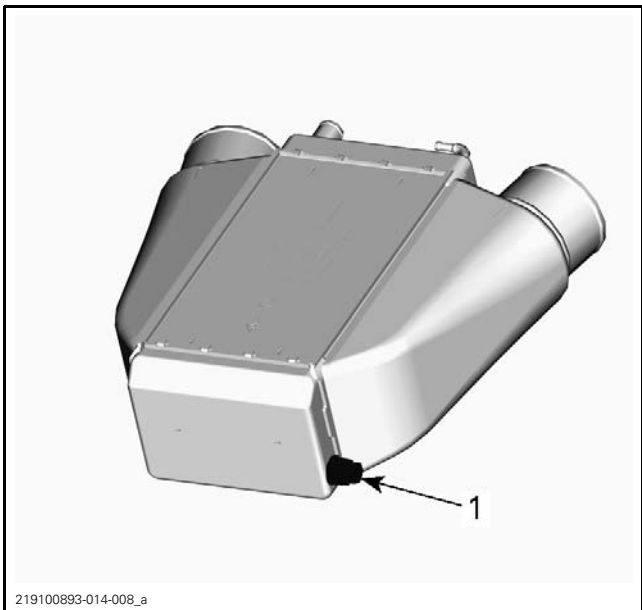
NOTICE Failure to flush the system, when necessary, will severely damage engine intercooler and/or exhaust system.

PROCEDURES

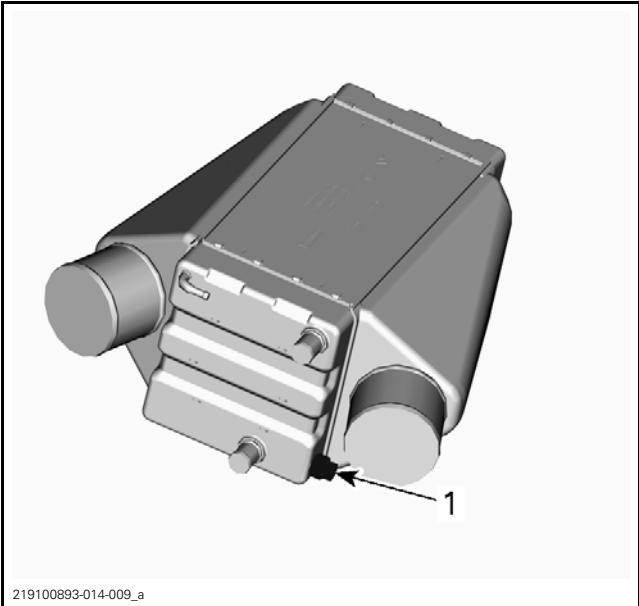
SACRIFICIAL ANODE

Sacrificial Anode location

Sacrificial Anode is located on the front of the intercooler for the 300 engine models and on the back of the intercooler for the 230 engine models.



1. Sacrificial anode for the 230 engine models



1. Sacrificial anode for the 300 engine models

Sacrificial Anode maintenance

Inspect and replace sacrificial anode according to *MAINTENANCE SCHEDULE*.

INTERCOOLER

 **WARNING**

Let engine cool down prior to work on or near intercooler.

Cleaning the Intercooler

If temperature in intake manifold is too high or if engine is down in performance, intercooler may require to be cleaned.

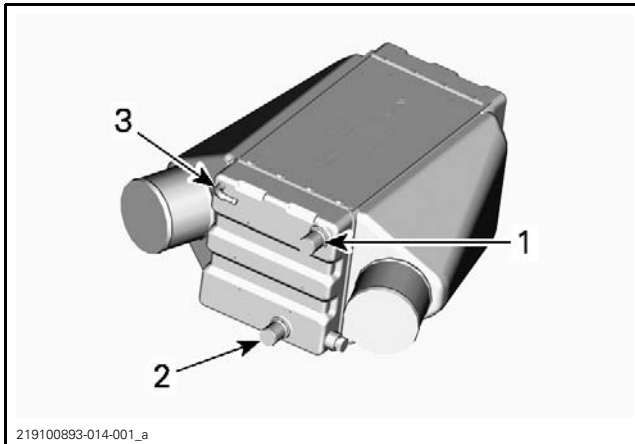
The exhaust system should be flushed first, as it may unclog the intercooler. If not, then proceed with the intercooler cleaning procedure as detailed here.

NOTE: The exhaust temperature will decrease when the intercooler is clogged because more water is rerouted through the exhaust system.

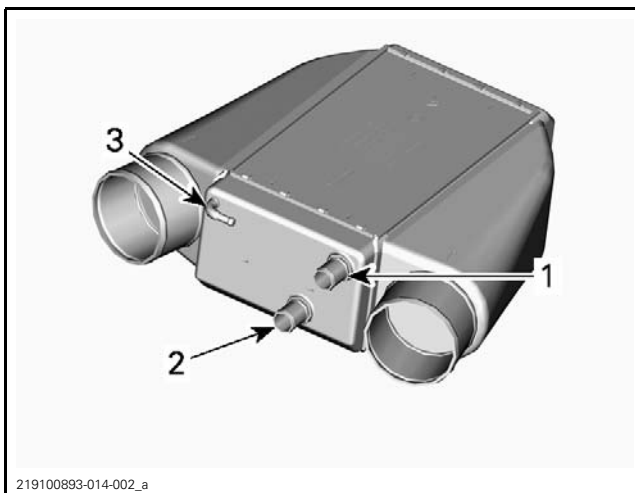
To clean the intercooler, do the following:

NOTICE Never try to clean the intercooler with chemical products. Only use fresh water. Chemical products will permanently damage the internal parts of intercooler.

1. Remove the intercooler from the watercraft. See procedure further in this subsection.
2. Pour fresh water into the water outlet fitting.



300 ENGINE INTERCOOLER
1. Intercooler water outlet fitting
2. Intercooler water inlet fitting
3. Intercooler bleeding hose fitting



230 ENGINE INTERCOOLER
1. Intercooler water outlet fitting
2. Intercooler water inlet fitting
3. Intercooler bleeding hose fitting

3. Let water soak in intercooler for a couple of hours. Occasionally, shake the intercooler to soak off deposits.
4. Rinse the intercooler using a garden hose installed on water outlet.
5. Let water flow out of intercooler a few minutes to evacuate internal deposits.
6. Check water flow.

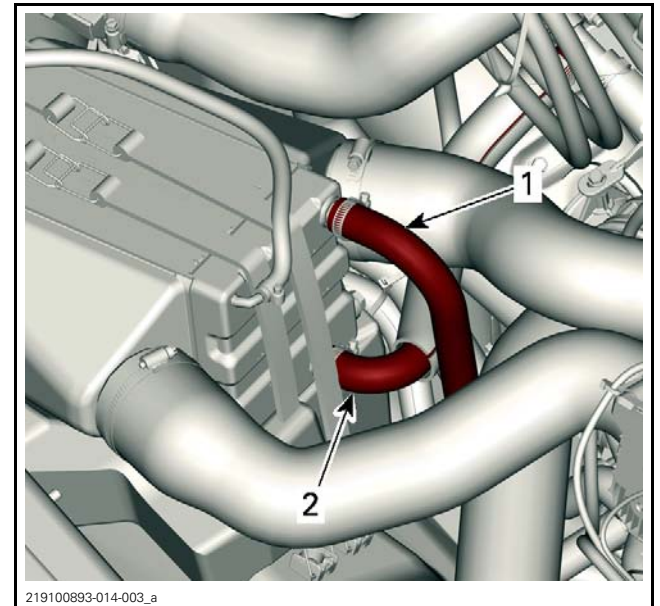
WATER FLOW	
LOW OR ERRATIC	1. Repeat cleaning procedure.
	2. Replace the intercooler.
HIGH AND REGULAR	Intercooler is not clogged.

7. Perform a leak test before installing the intercooler in the watercraft.

Intercooler Leak Test

Block intercooler water outlet hose.

REQUIRED TOOL	
LARGE HOSE PINCHER (P/N 529 032 500)	



MANY PARTS REMOVED FOR CLARITY PURPOSE
1. Intercooler water outlet hose
2. Intercooler water inlet hose

Block intercooler bleed fitting.

Unplug the intercooler water inlet hose from the intercooler.

Install the vacuum/pressure pump on intercooler water inlet fitting.

REQUIRED TOOL	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	

Pressurize the intercooler.

PRESSURE TEST
69 kPa (10 PSI) for 10 minutes minimum

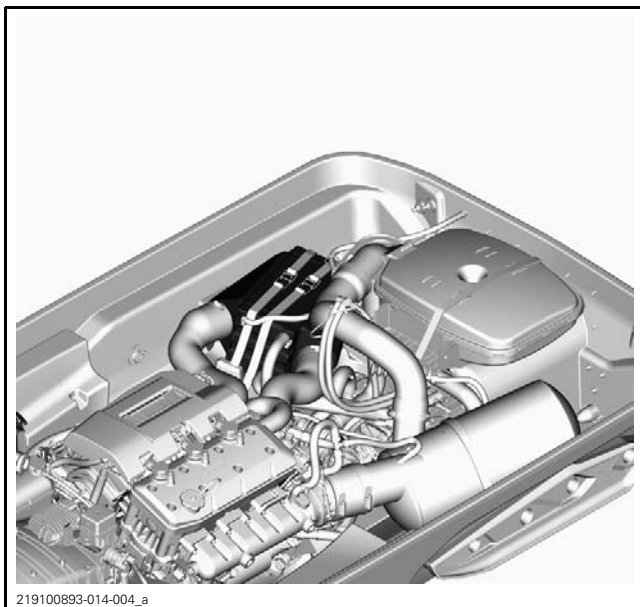
If there is a pressure drop, first spray tool, hoses and adapters with a soapy water solution to ensure they are not leaking. If they are not leaking, replace the intercooler.

Locating the Intercooler

Intercooler is located on the rear right side of the watercraft.

Section 02 ENGINE

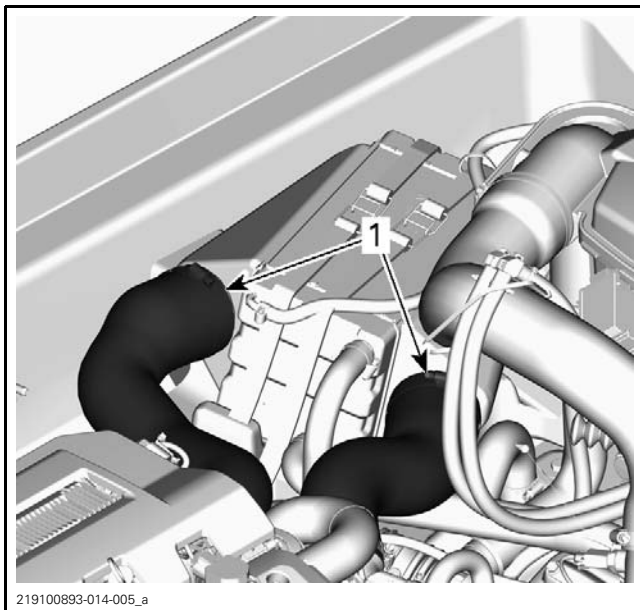
Subsection 05 (INTERCOOLER)



PARTS REMOVED FOR CLARITY

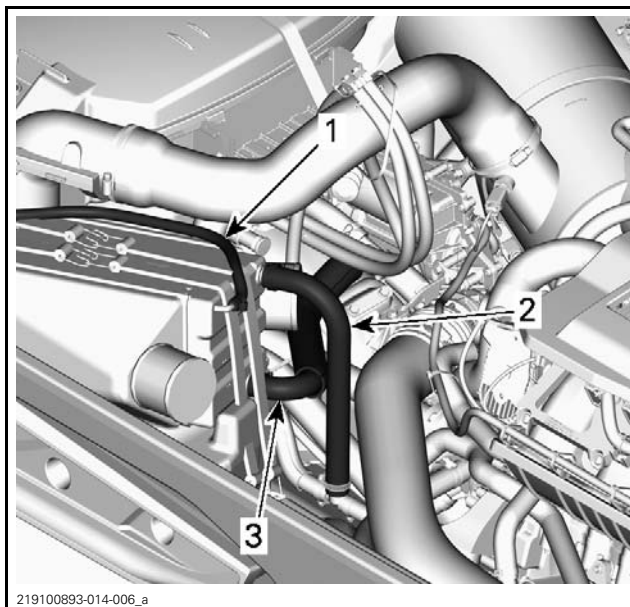
Removing the Intercooler

1. Remove seats. Refer to *BODY* subsection.
2. Remove engine service cover. Refer to *BODY* subsection.
3. Remove front exhaust hose. Refer to *EX-HAUST SYSTEM* subsection.
4. Disconnect and remove intercooler air hoses.



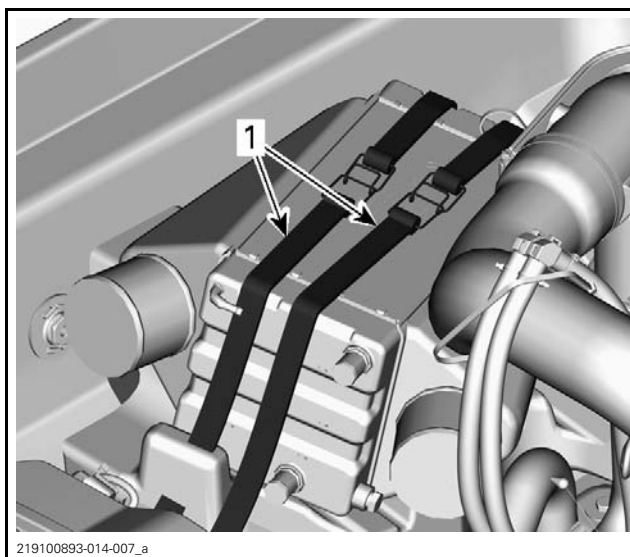
1. Intercooler air hoses

5. Disconnect intercooler water hoses and intercooler bleed hose.



1. Intercooler bleed hose
2. Intercooler outlet hose
3. Intercooler inlet hose

6. Untie intercooler straps.



1. Intercooler straps

Installing the Intercooler

The installation is the reverse of the removal procedure. However, pay attention to the following.

NOTE: Ensure hoses are routed correctly and locking ties are positioned at proper locations.

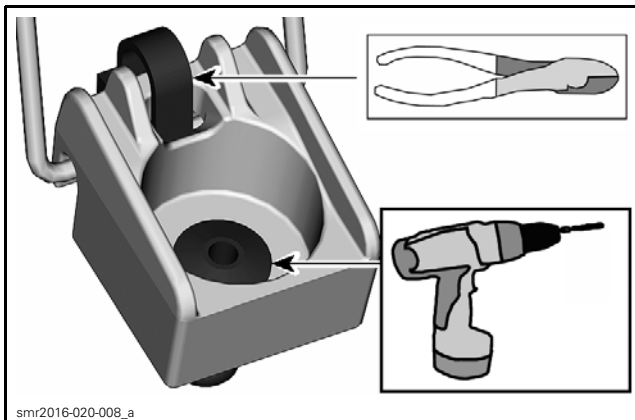
TIGHTENING TORQUE	
Intercooler air hoses clamp	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)
Intercooler water hoses clamp	1.7 N•m ± .2 N•m (15 lbf•in ± 2 lbf•in)
Intercooler bleed hose clamp	1.7 N•m ± .2 N•m (15 lbf•in ± 2 lbf•in)

REPLACING INTERCOOLER ATTACHMENTS

Remove the intercooler.

Drill the head of the rivets.

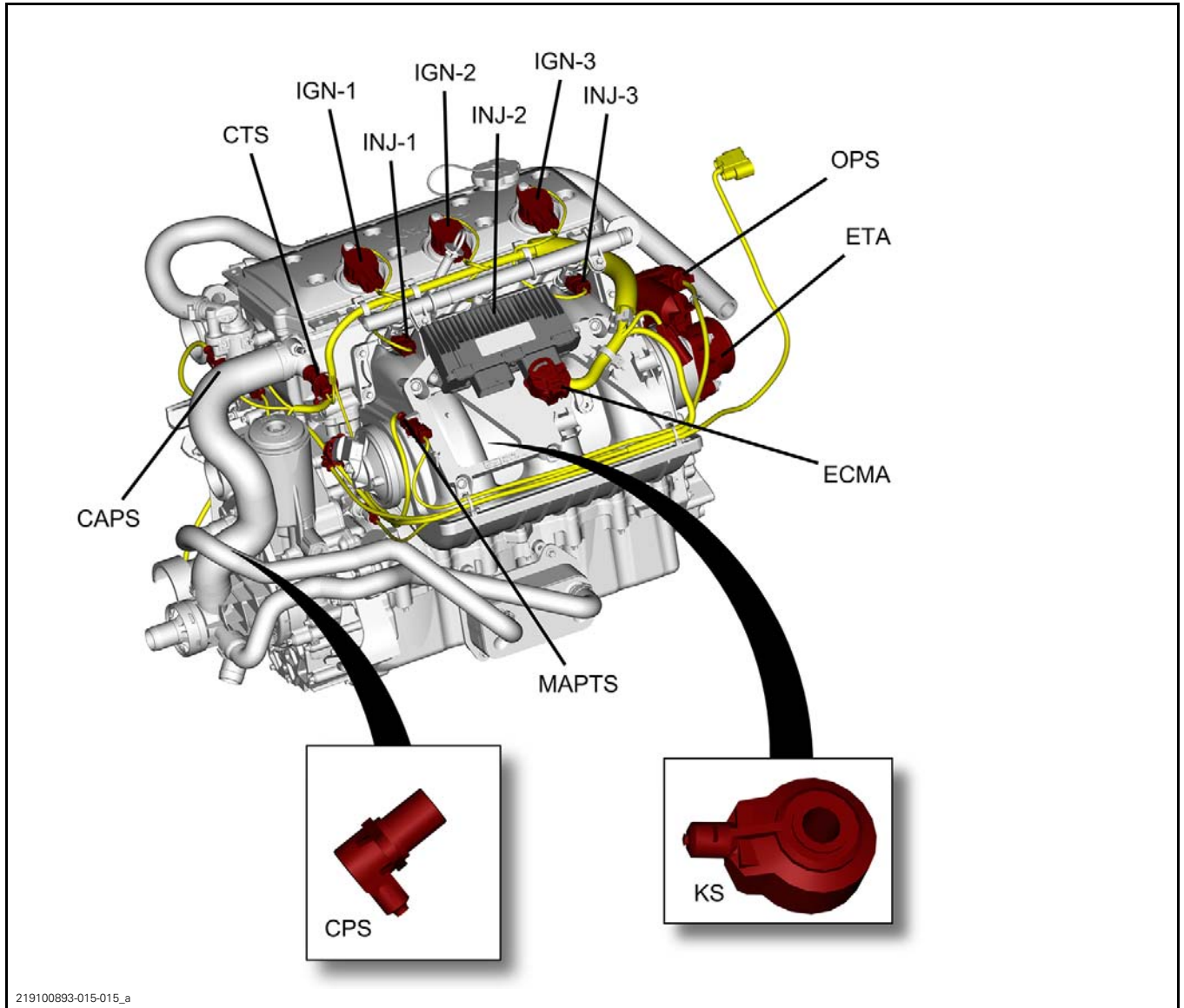
NOTICE Drilling rivets too deep may lead to hull damage.



Install the attachment with new rivets and new locking tie if required.

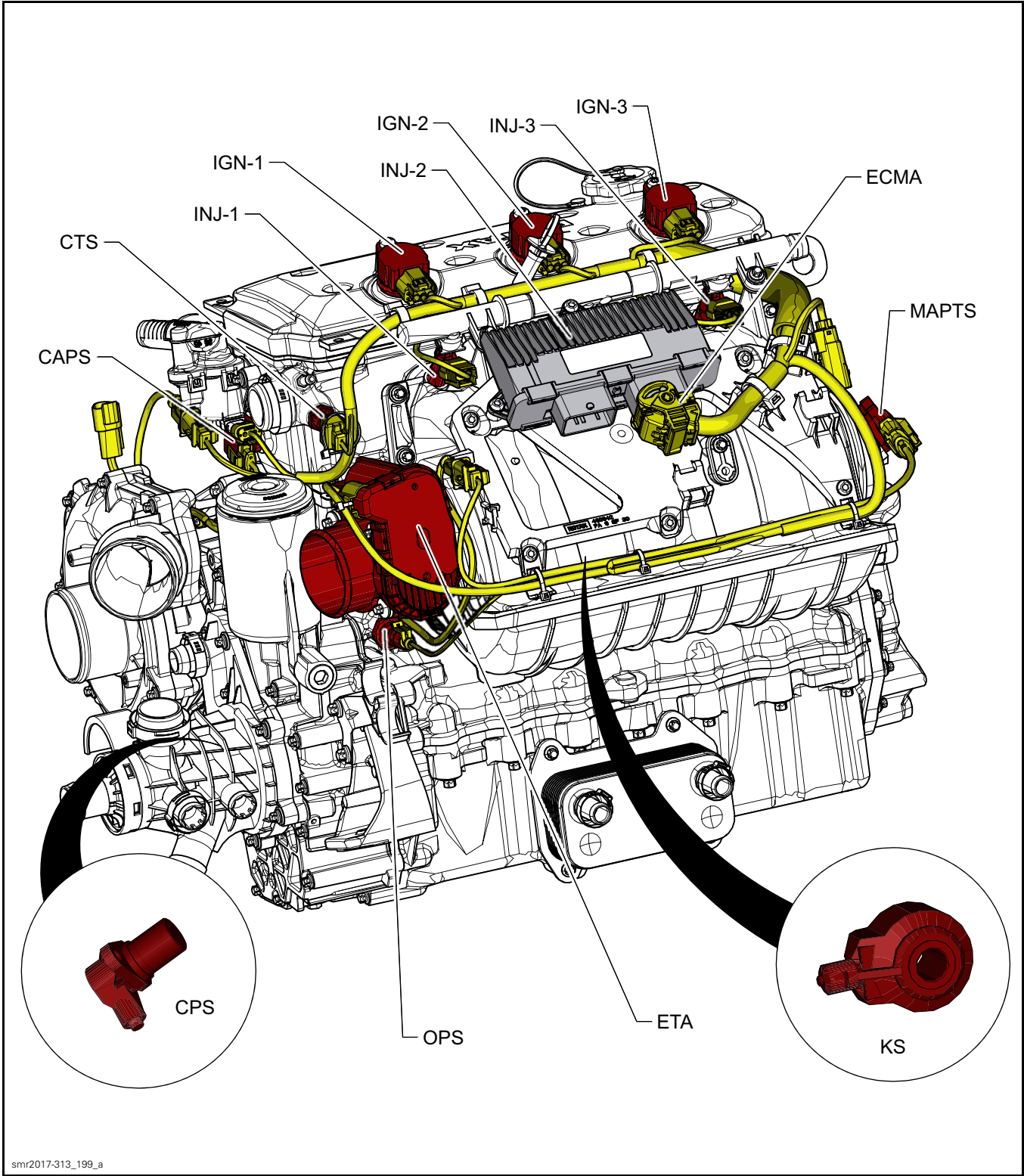
ENGINE MANAGEMENT SYSTEM

1503 NA (155)

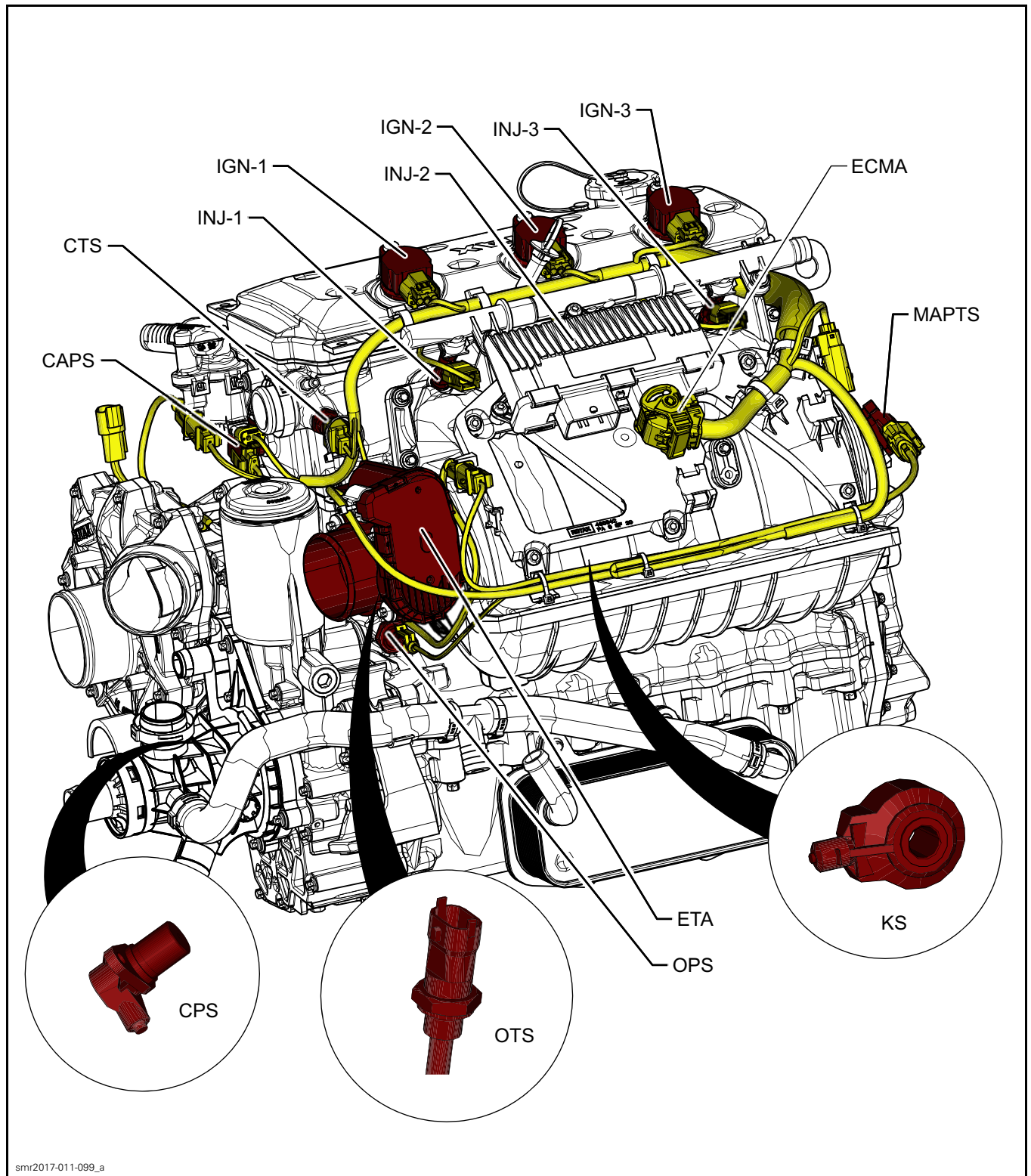


Section 03 ELECTRONIC MANAGEMENT SYSTEMS
Subsection 01 (ENGINE MANAGEMENT SYSTEM)

1503 HO ACE (230)



1630 ACE (300)



Section 03 ELECTRONIC MANAGEMENT SYSTEMS

Subsection 01 (ENGINE MANAGEMENT SYSTEM)

GENERAL

SYSTEM DESCRIPTION

An engine management system (EMS) is used to ensure a high power output with cleaner combustion.

There are 6 main systems that interact with the engine management system:

1. Electronic fuel injection
2. D.E.S.S. System
3. Ignition System
4. Starting System
5. T.O.P.S.
(Tip-Over Protection System)
6. iControl System

Air management

The quantity of air admitted into the engine is calculated by the throttle angle (TPS), the intake air temperature (IAT) and the manifold pressure/vacuum sensor (MAP) on the intake manifold.

NOTE: the MAPTS combines the pressure and temperature sensors into one sensor.

The operator's demands on the throttle lever are captured by the throttle accelerator sensor (TAS) and result in the movement of the electronic throttle actuator (ETA).

Fuel management

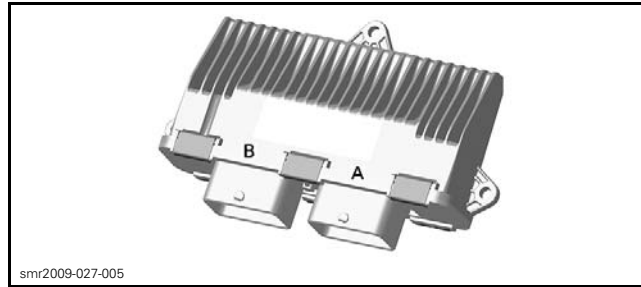
The coolant temperature sensor (CTS) is used to determine engine temperature. The ECM will slightly lean out the fuel mixture to bring a cold engine to operating temperature faster. Once the engine is at operating temperature, this stops.

NOTE: On some engines the oil temperature sensor is also used to calculate engine temperature.

In response to changes in air management, the ECM will adjust the quantity of fuel injected to optimize combustion.

The ECM will vary injection duration and timing to minimize emissions and maximize power.

Engine Control Module (ECM)



ECM

The ECM is the main component of the engine management system. It controls the electrical system and the engine management functions by processing the information obtained from various switches, controls and sensors that it compares to predetermined parameters stored in the ECM.

It also interacts with the other electronic systems through the CAN bus (information center and iControl System) for various functions that affect engine management.

It features a permanent memory that will store fault codes, customer information and other engine information, even when the battery is removed from the vehicle.

The ECM controls the following engine management functions:

Engine RPM Limiter

The ECM limits maximum engine speed. It monitors engine RPM through the CPS and varies fuel injection, ignition and throttle plate opening as necessary.

Engine Speed Control

The ECM controls the engine idle RPM. In addition, it can vary the engine speed by commanding the electronic throttle actuator (ETA) to open or close based on throttle position and various other inputs. The ETA also allows for other functions of the iControl system.

Monitoring System

The ECM monitors:

- The electrical and electronic components of the engine system
- The iControl system
- The information center (gauge)
- Some components of the electrical system
- Signals from other electronic modules

For more information, refer to *DIAGNOSTIC AND FAULT CODES*.

Limp Home Mode

The ECM may automatically set the engine in LIMP HOME MODE using default parameters when certain major faults are detected. For more information, refer to *DIAGNOSTIC AND FAULT CODES*.

Diagnostic Mode

The ECM features a self-diagnostic mode that is initiated on system power up for certain systems and components (when pressing the START button), and when the engine is running for others. Refer to *DIAGNOSTIC AND FAULT CODES* subsection for more information.

iCONTROL SYSTEM

GENERAL

The iControl (intelligent Control) system may consist of the following systems:

- Intelligent Throttle Control (iTC)
- Intelligent Brake and Reverse (iBR).

The information center (gauge) and handlebar switches are used to navigate through and select several functions, modes of operation and change certain settings and system parameters using the appropriate handlebar controls.

Each control is electronic and provides a command signal to an electronic module whose function is to assure proper operation of its system within set parameters.

For a comprehensive and complete description of the information center, refer to *INFORMATION CENTER* subsection.

iTC (INTELLIGENT THROTTLE CONTROL)

The iTC is an electronic throttle control system (ETC) that includes a cable-less throttle control (TAS) located on the RH side of handlebar and an electric throttle actuator (ETA) located on the throttle body.

The iTC allows functions such as touring mode, sport mode, eco mode, cruise control, slow speed mode and ski mode as well as a more precise control of the engine power.

For a comprehensive and complete description of this system, refer to *INTELLIGENT THROTTLE CONTROL (iTC)* subsection.

iBR (INTELLIGENT BRAKE AND REVERSE)

The iBR is a brake and reverse system used to avoid obstacles, gradually slow down or stop the watercraft, or drive backwards by lowering the iBR gate that redirects the water flow at the outlet of the jet pump nozzle.

For a comprehensive and complete description of this system, refer to *IBR, REVERSE AND VTS* subsection.

CONTROLLER AREA NETWORK (CAN)

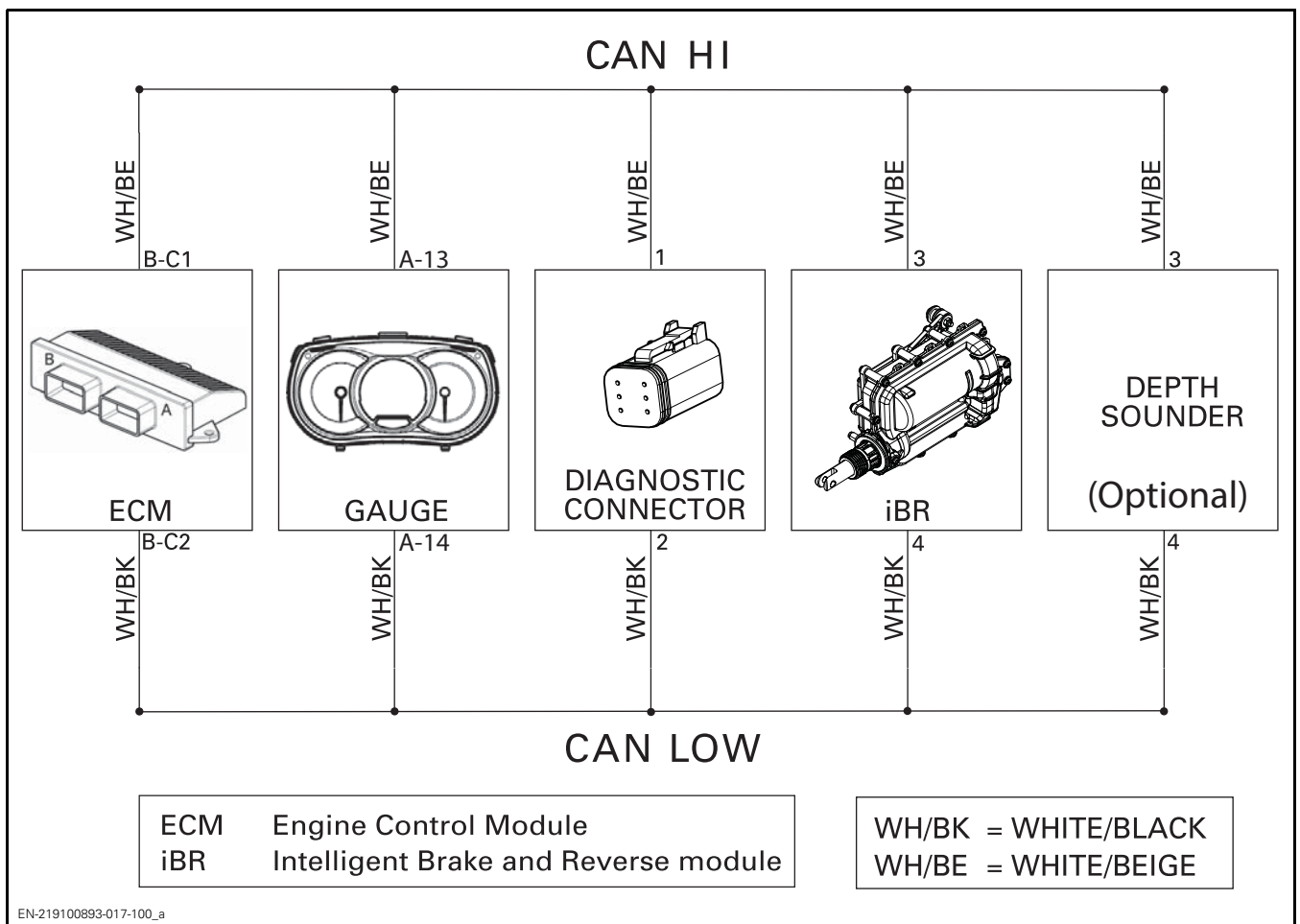
GENERAL

SYSTEM DESCRIPTION

The CAN (Controller Area Network) protocol is an ISO standard for serial data communication.

The CAN bus is the nervous system of the iControl system and the engine management system (EMS). It links the electronic modules (ECMs) together so that they communicate to interact as required.

Two wires connect each component and they are in constant communication with each other at a rate of about every 10 or 100 milliseconds depending on the component. CAN lines consist of a pair of twisted wires (WHITE/BLACK and WHITE/BEIGE).



CAN BUS DIAGRAM

Section 03 ELECTRONIC MANAGEMENT SYSTEMS

Subsection 03 (CONTROLLER AREA NETWORK (CAN))

TROUBLESHOOTING

DIAGNOSTIC TIPS

Check the fault codes using the BRP diagnostic software (BUDS2) as a first troubleshooting step.

Make sure the modules are powered before testing CAN.

CAN Communication Problems

The following chart gives some symptoms and behaviors relative to the CAN component in cause. The list is not exhaustive, only the most significant items are given to help in troubleshooting.

CAN FAULTY WIRES (no communication)	VEHICLE BEHAVIOR OR OBSERVATION IN INFORMATION CENTER	OBSERVATION IN BUDS2
Water in holder of diagnostic connector (particularly with salt water)	Communication problems and strange behavior of information center. Inoperative electronic systems in watercraft.	Nothing
Short circuit in CAN wires	Engine is set to limp home mode. iBR gate will return to VTS position. iBR light is ON. Check engine light is ON.	BUDS2 will not be able to communicate with any electronic module. "No vehicle detected" message will be displayed in BUDS2.
Information center (gauge)	Check engine light is ON. iBR light is ON. Some functions not displayed such as: Engine hours, VTS and RPM.	2 modules instead of 3 will be active. "Cluster" tab and its data will not be available in BUDS2 ECM and iBR will report a cluster CAN problem.
ECM (Engine Control Module)	Engine is set to limp home mode. Check engine light is ON. iBR light is ON. iBR gate will return to VTS position. Some functions not displayed such as: Engine hours and RPM.	2 modules instead of 3 will be active. ECM tab and its data will not be available in BUDS2 iBR will report an ECM CAN problem.
iBR (Intelligent Brake and Reverse)	Engine is set to limp home mode. iBR gate will return to VTS position. iBR light is ON. Check engine light is ON. Some functions not displayed such as: Lake water temperature, no VTS, no F, N and R indication.	2 modules instead of 3 will be active. iBR tab and its data will not be available in BUDS2 ECM will report an iBR CAN problem.
Depth sounder	The menu Depth Sounder Indicator will not be visible. The Depth menu will not be available.	Nothing will be observable.
Diagnostic connector	Nothing will be observable.	BUDS2 will not be able to communicate with any electronic module. "No vehicle detected" message will be displayed in BUDS2.

If the gauge cannot communicate with an optional accessory (e.g.: depth sounder) during the initial power up, the gauge will interpret this as if the vehicle is not equipped with it. No further test of the system occurs and no indication or fault message will be visible. If communication is interrupted after the gauge has already detected them, then the gauge will indicate that there is a communication fault.

COMMUNICATION TOOLS

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC CABLE	710 000 851	71
MPI-2 INTERFACE CARD	529 036 018	71
MPI-3 INTERFACE CARD	529 036 353	71

GENERAL





Refer to the **B.U.D.S. directory** on *KNOWLEDGE CENTER* for all BUDS2 related information, including:

- Download link
- User manual (programming keys, reading fault codes, writing data to modules etc.)
- Installation instructions

Download and install the software on a PC.

Connect the vehicle to the BRP diagnostic software (BUDS2).

REQUIRED TOOLS

MANDATORY TOOLS	
A personal computer (laptop or desktop)	
MPI-2 INTERFACE CARD (P/N 529 036 018)	
OR	
MPI-3 INTERFACE CARD (P/N 529 036 353)	
DIAGNOSTIC CABLE (P/N 710 000 851)	
OPTIONAL TOOL	
Extension cable available at electronic retail outlets. Do not exceed 7.5 m (25 ft)	

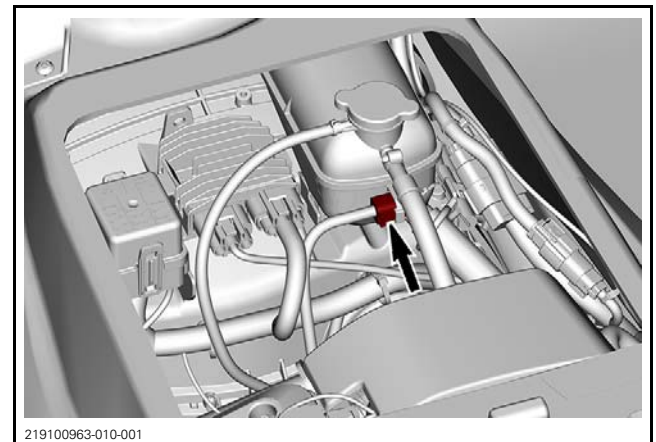
Multi-Purpose Interface Card (MPI-2 or MPI-3)

The Multi-Purpose Interface (MPI) in conjunction with the diagnostic cable is used with BUDS2 to communicate with the engine control module (ECM) and other modules.

The MPI card uses the power from the PC computer's USB port.

DIAGNOSTIC CONNECTOR LOCATION

The diagnostic connector is located inside the engine compartment, under the seat, stored in its protective cap.



TROUBLESHOOTING

Refer to the BRP BUDS chart to ensure you are using the appropriate hardware and tools.

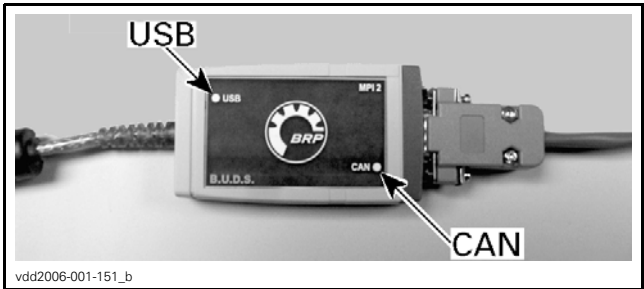
COMMUNICATION PROBLEMS

MPI Connection Troubleshooting

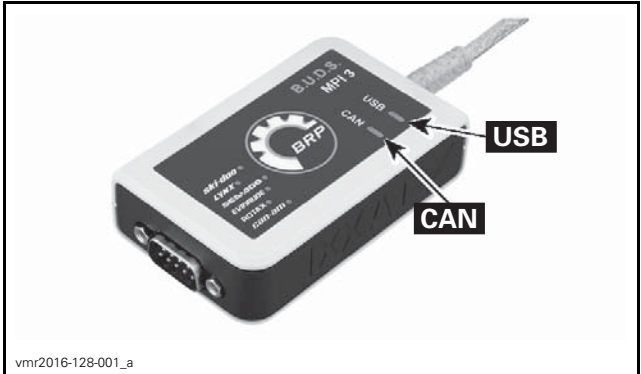
MPI Status Lights

The MPI includes 2 status lights to show the connection conditions: USB and CAN. **Both lights must be GREEN** for the MPI to function properly. Otherwise, refer to the following charts.

Section 03 ELECTRONIC MANAGEMENT SYSTEMS
Subsection 04 (COMMUNICATION TOOLS)



MPI-2 CARD



MPI-3 CARD

Prerequisite for USB Communication:

- Computer turned ON
- MPI connected to PC computer.

COMMUNICATION PROBLEM (USB)	
STATUS	WHAT TO DO
USB Light is OFF	<ul style="list-style-type: none">– Check USB connection between MPI card and PC computer.– Check USB operation on computer (hardware or Windows drivers).
USB Light is GREEN	<ul style="list-style-type: none">– Connections are GOOD. Communication can take place on USB side.

Prerequisite for CAN Communication:

1. MPI card connected to diagnostic connector.
2. The tether cord cap (D.E.S.S. key) is installed on the engine cut-off switch.
3. BUDS2 started and logged.
4. ECM is powered.

COMMUNICATION PROBLEM (CAN)	
STATUS	WHAT TO DO
CAN Light is OFF	<ul style="list-style-type: none">– BUDS2 does not communicate with the vehicle.– Check connections from computer to vehicle.– Check if BUDS2. is started.– Check if vehicle is powered: is cluster turned ON? If it is not ON, install the tether cord cap (D.E.S.S. key) on the engine cut-off switch.
CAN Light is RED	<p>This occurs when BUDS2 loses communication with vehicle.</p> <ul style="list-style-type: none">– Check connections from computer to vehicle.– Check if vehicle is powered: is cluster turned ON? If not, install the tether cord cap (D.E.S.S. key) on the engine cut-off switch.
CAN Light is GREEN	<ul style="list-style-type: none">– Connections are GOOD. BUDS2 communicates normally with the vehicle.

DIAGNOSTIC AND FAULT CODES

GENERAL

MONITORING SYSTEM

This system monitors the electronic components of the EMS (engine management system), iBR, information center and other components of the electrical system to detect if they are faulty or defective. The monitoring system becomes active when the START button is pressed.

NOTE: Some components need the engine to be running to be monitored (fuel injectors for example).

The following components or functions are monitored.

EMS MONITORING
Battery voltage
EMS sensors (TAS, TPS, CPS, CAPS, MAPS, MATS, CTS, OPS, EGTS, TOPS, knock sensor). Throttle actuator, ignition coils and fuel injectors
ECM
Engine RPM
CAN
D.E.S.S. system
START switch and starter solenoid
Fuel pump
Information center
iBR module

iBR MONITORING
iBR module and motor
BRLS
Engine RPM
Vehicle speed
iBR gate position
CAN
Lake temperature sensor
Information center
ECM

INFORMATION CENTER MONITORING
Information center
VTs, Sport and ECO switch

INFORMATION CENTER MONITORING
MODE and SET switch
Cruise switch
CAN
GPS
Fuel level sensor
Depth sounder
ECM
iBR module

When a malfunction is currently detected, the related electronic module:

- Sets an active fault code.
- Adapts the proper protection strategy according to the failure.
- Sends out warning signals to the information center/beeper codes to inform the rider of a particular condition.

When a minor or transient fault occurs, the fault message and beeper will cease automatically if the condition that caused the fault does not exist anymore.

If a minor fault is active, the engine will operate without a noticeable loss of performance.

Releasing the throttle and letting the engine return to idle speed may allow normal operation to resume. If this does not work, try the following:

- Remove tether cord from the engine cut-off switch.
- Wait 3 minutes to allow the ECM to shut down.
- Start engine.
- Check if the fault code is still active.

The electronic system will react differently depending on the fault type. If a severe failure occurs, the engine may not be allowed to be started. In other cases, the engine may operate in limp home mode (reduced speed) or not be affected at all.

These strategies are used to protect the engine system from damage and to maintain safe operation of the vehicle.

Limp Home Mode

When a major component of the EMS or the iBR is not operating properly, limp home mode will be set. Engine speed will be limited and therefore vehicle speed.

Section 03 ELECTRONIC MANAGEMENT SYSTEMS

Subsection 05 (DIAGNOSTIC AND FAULT CODES)




This mode allows the rider to return home which would otherwise not be possible.

When this mode is active, LIMP HOME MODE will be displayed in the information center.






Indicator Lights and Message Display Information

The fault indicators and messages displayed in the information center will inform you of a particular condition or if an anomaly occurs.

Standard Gauge

FAULT INDICATOR (ON)	MESSAGE DISPLAY	DESCRIPTION
	HIGH TEMPERATURE	Engine or exhaust system overheating
	CHECK ENGINE or LIMP HOME MODE	Check engine (minor fault req. maint.) or iBR system fault or LIMP HOME MODE (major eng. fault)
	LOW or HIGH BATTERY VOLTAGE	Low/high battery voltage
	LOW OIL PRESSURE	Low engine oil pressure detected
	iBR MODULE ERROR	iBR system fault

Gauge for X Models

FAULT INDICATOR (ON)	MESSAGE DISPLAY	DESCRIPTION
	LOW or HIGH BATTERY VOLTAGE	Low/high battery voltage
	HIGH TEMPERATURE	Engine or exhaust system overheating
	CHECK ENGINE or LIMP HOME MODE	Check engine (minor fault req. maint.) or LIMP HOME MODE (major eng. fault)
	LOW OIL PRESSURE	Low oil pressure
	—	iBR system fault

FAULT MESSAGES

RIGHT OR LEFT KEYPAD ERROR	Gauge control button malfunction
LOW OIL PRESSURE	Engine low oil pressure detected
HIGH EXHAUST TEMPERATURE	High exhaust temperature detected
HIGH TEMPERATURE	High engine temperature detected
CHECK ENGINE	Engine management system malfunction or maintenance required
HIGH BATTERY VOLTAGE	High battery voltage detected
LOW BATTERY VOLTAGE	Low battery voltage detected

Section 03 ELECTRONIC MANAGEMENT SYSTEMS
Subsection 05 (DIAGNOSTIC AND FAULT CODES)

FAULT MESSAGES	
LIMP HOME MODE	Major fault detected, engine power limited
FUEL SENSOR DEFECTIVE	Fuel level sensor fault
WATER TEMP SENSOR DEFECTIVE	Problem in iBR, not sending water temperature info
CALIBRATION CHECKSUM ERROR	Information center programming corrupted
MAINTENANCE REQUIRED	Watercraft maintenance required
DEPTH SOUNDER MODULE COMMUNICATION PROBLEM	Error message if depth sounder is disconnected while riding
iBR MODULE ERROR	Error message if communication with the iBR module is lost while riding
FUNCTION CANNOT BE ACTIVATED	Message when a function is not or cannot be properly activated
WRONG KEY	Key not programmed for this watercraft

Section 03 ELECTRONIC MANAGEMENT SYSTEMS

Subsection 05 (DIAGNOSTIC AND FAULT CODES)

Beeper Signals

When one of the below conditions occurs, the monitoring system emits the following beep signals.

BEEPER CODES	DESCRIPTION
A 1 second beep every 5 second interval (while installing D.E.S.S. key on engine cut-off switch if ECM is on)	Bad D.E.S.S. system connection. Reinstall tether cord correctly over engine cut-off switch.
	Wrong D.E.S.S. key. Use a tether cord with a D.E.S.S. key that has been programmed for the watercraft.
	Defective D.E.S.S. key. Use another programmed D.E.S.S. key.
	Defective engine cut-off switch. Check. Refer to <i>IGNITION SYSTEM</i> subsection.
	Improper operation of ECM or defective wiring harness. Check. Refer to <i>ELECTRONIC FUEL INJECTION (EFI)</i> subsection.
A 2 second beep every 5 minute interval	Low fuel level. Refill fuel tank. If problem persists, check sensor and circuit. Refer to <i>FUEL TANK AND FUEL PUMP</i> subsection.
	Fuel tank level sensor or circuit malfunction. Check sensor and circuit. Refer to <i>FUEL TANK AND FUEL PUMP</i> subsection.
Continuously beeps	High engine coolant temperature. Refer to <i>COOLING SYSTEM</i> subsection.
	High exhaust temperature. Refer to <i>ELECTRONIC FUEL INJECTION (EFI)</i> subsection.
	Low oil pressure. Turn off engine as soon as possible. Check oil level and refill. Refer to <i>LUBRICATION SYSTEM</i> subsection.

FAULT CODES

A fault code is an indication that a glitch or malfunction is detected by the monitoring system of the vehicle.

When there is a problem, the ECM can provide fault codes to ease troubleshooting.

The faults registered in the ECM are stored in memory.

IMPORTANT: After a problem has been solved, be sure to clear the fault(s) in the ECM using the BRP diagnostic software (BUDS2). This will properly reset their states.

How to Read Fault Codes

Refer to *COMMUNICATION TOOLS* subsection.

For more information pertaining to the faults code status and report, refer to BUDS2 online help.

How to Find Fault Code Descriptions

Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS* subsection.

In BUDS2, go to **FAULTS** page.

Browse lists of active/ occurred and inactive fault codes.

INTELLIGENT THROTTLE CONTROL (iTC)

SERVICE TOOLS

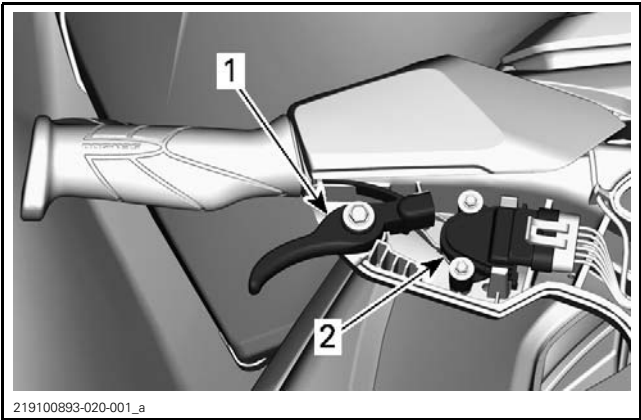
Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	85
FLUKE 115 MULTIMETER	529 035 868	86

GENERAL

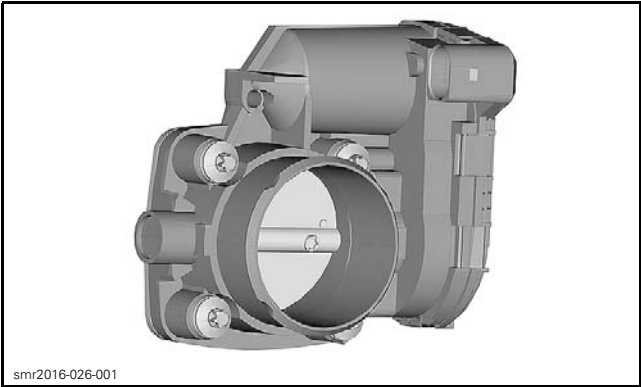
SYSTEM DESCRIPTION

Some functions or features described in this section may not apply to every PWC model, or may be available as an option.

The iTC is an electronic throttle control system that includes a cableless throttle control located on the RH side of handlebar, an electric throttle actuator (ETA) located on the throttle body and the engine control module (ECM). The iTC is often referred to as a "throttle by wire" system.



1. Throttle lever
2. Throttle accelerator sensor (TAS)



The throttle lever operates the throttle accelerator sensor (TAS). It is a double output hall effect sensor. The redundancy is used for security purposes.

The throttle actuator (ETA) is a DC motor on the throttle body that regulates the throttle plate via a drive gear. Pulse width modulation (PWM) is used to control the motor. In the throttle body, there is a double throttle position sensor (TPS). The redundancy is used for security purposes. The TPS is a potentiometer that supplies the ECM the actual angle position of the throttle plate.

According to the torque demand from the TAS, the ECM powers the ETA motor to rotate towards open or close the throttle plate. When the ECM detects through the TPS that the throttle plate has reached the targeted opening, the ECM stops the throttle actuator.

The iTC allows the throttle actuator to be moved irrespective of the accelerator sensor position since it is not directly linked by a throttle cable.

While the throttle lever might be fully pulled in and held, the ECM could close the throttle plate instead of opening it if the iBR lever were pulled in. Then, the ECM could open the throttle plate to accelerate the engine to increase the braking effect. These different throttle plate movements could be achieved while the throttle lever was still fully pulled in. This is one of the great flexibility of the iTC.

The use of the iTC allows the following additional engine modes of operation.

Touring Mode

Touring mode allows the operator to choose for progressive throttle response at certain engine speed.

Available engine power and acceleration is reduced when accelerating from a complete stop and when operating in the low engine power range under certain conditions.

Section 04 FUEL SYSTEM

Subsection 01 (INTELLIGENT THROTTLE CONTROL (iTC))

When throttle is applied, the engine will progressively accelerate to an operating range whereby full power eventually becomes available. If the engine is throttled down sufficiently and for a long enough period of time, engine power and acceleration will again be reduced.

Sport Mode

Sport mode allows the operator for instant throttle response.

Maximum engine power is available throughout the engine operational range.

ECO Mode

When ECO mode is selected (fuel economy mode), engine RPM is limited whereby an optimal cruising speed is maintained in order to reduce fuel consumption.

Cruise Control

Cruise mode is a function of iTC (intelligent Throttle Control) system that allows the operator to set the desired maximum watercraft speed.

This is useful when cruising for long distances, operating in limited speed zones, or towing a tuber, skier or wake boarder.

Cruise mode only limits forward speed, the operator must keep the throttle depressed to maintain forward speed.

Once the maximum cruise speed is set, the operator can vary the watercraft speed from idle speed up to the set cruise speed using the throttle lever. The set cruise speed will not be exceeded even if the throttle lever is fully depressed.

As you proceed under a constant cruising speed setting, keep your attention level up to maintain good situational awareness.

Slowing down is a matter of releasing the throttle lever further than the set point, or by pulling the iBR lever in or decrease speed with the DOWN button.

If the iBR lever is pulled in for braking, CRUISE mode is overridden but **not deactivated**.

Once the iBR lever is released and the throttle is pulled in to engage forward position, the cruise function will reengage to limit the watercraft speed as it was set before iBR lever activation.

Slow Speed Mode

The Intelligent Throttle Control also allows for a Slow Speed Mode where the driver can adjust and set idle speed. This is useful when operating in slow speed zones where the driver must be especially attentive to possible obstacle avoidance.

The throttle plate will open and close as necessary to maintain the set speed.

Ski Mode

Ski mode allows for repeated and precisely controlled launches and a set towing speed, designed specifically for towing a skier or wake boarder.

RAMP Function

The RAMP function available in ski mode is a pre-programmed function used for launching and accelerating the PWC when towing a skier or wake boarder.

TARGET SPEED Function

The TARGET SPEED function limits the maximum towing speed.

Learning and Rental Keys

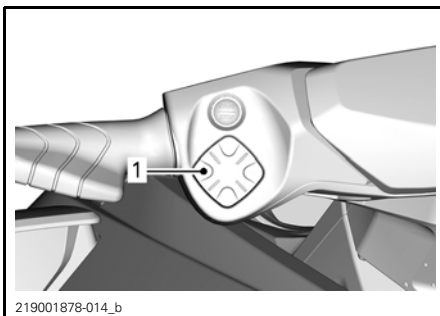
Learning and Rental keys limit the watercraft maximum speed. The full stroke of the throttle lever is used while only a partial stroke of the throttle plate is achieved. Therefore, greater throttle lever movement is used while a smaller engine speed and torque variation is applied through the throttle actuator. This permits a more accurate and easier throttle operation to control the engine within a specified torque curve and maximum speed setting for a learner.

OPERATING MODES

OPERATING MODE AVAILABLE	GTX 155, GTX 230	GTX LIMITED 230, GTX LIMITED 300	RXT	RXT-X	WAKE PRO	FISH PRO
Touring mode	X	X	X	X	X	X
Sport mode	X	X	X	X	X	X
ECO mode	X	X	X	X	X	X
Speed limiter mode	X	X	X	X	X	X
Slow speed mode	X	X	X	X	X	X
Ski mode	-	-	-	-	X	-
Learning key mode	X	X	X	X	X	X
X = Indicates a standard feature - = See a Sea-Doo dealer for availability. N.A. = Not Available						

To change the operating mode;

- Press MODE button,
- Acknowledge the safety message by pressing and holding MODE button will get the SPORT mode,
- Pressing MODE button again will activate the SKI mode,
- Pressing the MODE button again will activate the ECO mode.



1. Mode button

Touring Mode

By default, the watercraft is set to TOURING mode of operation when started.

Sport Mode

SPORT MODE provides for instant throttle response and more rapid accelerations than TOURING MODE.

Once activated, SPORT MODE will remain active until it is deactivated by the operator, or the engine is shut down whereby it defaults back to TOURING MODE.

Activating Sport Mode

To activate the Sport mode, press once on the mode button while in touring mode. The sport icon will start to flash and a safety message will scroll. For safety reason, follow the instruction in the safety message to activate the sport mode. Once activated, the SPORT icon will turn ON.

Deactivating Sport Mode

A single press on mode button will take you to the SKI mode (if available) or ECO mode.

ECO Mode (Fuel Economy Mode)

ECO mode provides a smoother throttle application and increased fuel economy.

Speed Limiter Mode

Speed limiter mode is a function of iTC (intelligent Throttle Control) system that allows the operator to set the desired maximum watercraft speed.

This is useful when cruising for long distances, operating in limited speed zones, or towing a tuber, skier or wake boarder.

The operator must keep the throttle depressed to maintain forward speed.

Section 04 FUEL SYSTEM

Subsection 01 (INTELLIGENT THROTTLE CONTROL (iTC))

Once the maximum speed is set, the operator can vary the watercraft speed from idle speed up to the set speed using the throttle lever. The set speed will not be exceeded even if the throttle lever is fully depressed.

As you proceed under a constant speed setting, keep your attention level up to maintain good situational awareness.

Slowing down is a matter of releasing the throttle lever further than the set point, or by pulling the iBR lever in.

If the iBR lever is pulled in for braking, Speed Limiter mode is overridden but **not deactivated**.

Once the iBR lever is released and the throttle is pulled in to engage forward thrust, the speed limiter function will reengage to limit the watercraft speed as it was set before.

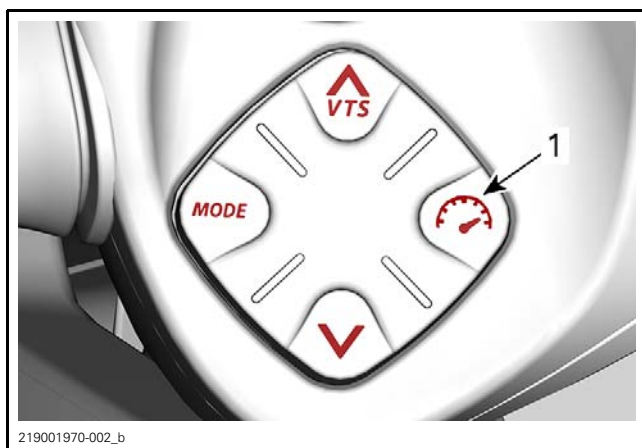
Prerequisite for Speed Limiter Mode Activation

NOTE: Speed limiter mode is not available if slow speed mode or ski mode (if equipped) is engaged.

Speed limiter MODE can be activated when the watercraft is going at more than 15m/h.

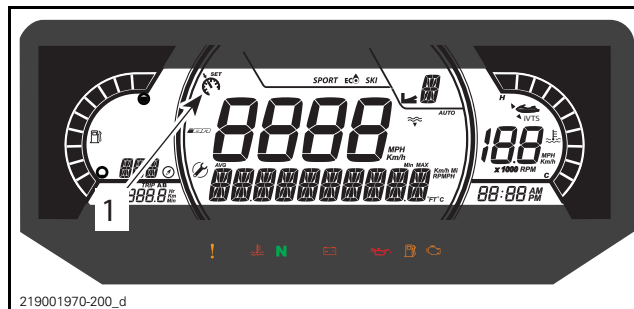
Activating Speed Limiter Mode

1. Maintain a constant speed.
2. Press the Speed Control button.



1. Speed Control button

You will hear a beep indicating that you are now in speed limiter mode, and a speed limiter MODE indicator will be lit.



TYPICAL

1. Speed limiter/Slow Speed MODE INDICATOR

NOTE: Activating speed limiter mode of operation only limits the maximum speed available when depressing the throttle lever. The throttle lever must be held in to maintain forward speed. Watercraft speed can be varied from idle up to the set cruise speed using the throttle lever once the speed limiter function is activated. Watercraft speed may vary depending on water conditions during use.

To change the set speed; keep throttle lever fully depressed and press the UP or DOWN arrow button.

Deactivating Speed Limiter Mode

To deactivate speed limiter mode:

1. Release the throttle lever.
2. Press the speed limiter button.

Deactivation of speed limiter mode is indicated by:

- The speed limiter indicator will go off.

NOTE: If the throttle lever is not fully released when the button is pressed to deactivate the speed limiter mode, the speed limiter MODE indicator will remain on. The speed limiting function will stay active until the throttle is fully released, then the speed limiter MODE indicator will go out.

Slow Speed Mode

The Intelligent Throttle Control also allows for a Slow Speed Mode where the driver can adjust and set idle speed. This is useful when operating in slow speed zones where the driver must be especially attentive to possible obstacle avoidance.

The operator can set idle speed between 1.6 km/h to 11 km/h (1 MPH to 7 MPH).

If you accelerate above approximately 14 km/h (9 MPH), Slow Speed Mode will be deactivated and the engine will return to idle RPM when the throttle is released.

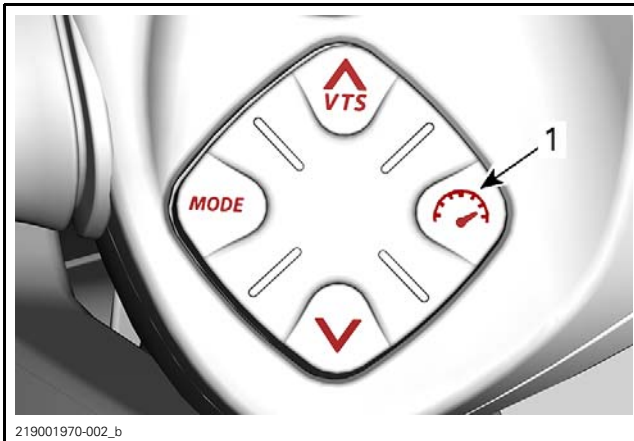
Should a situation arise where the operator must stop or accelerate quickly away from a hazardous situation, pulling in the iBR lever, or pulling in on

the throttle lever will deactivate slow speed mode and normal control of the watercraft will be returned to the operator.

Activating Slow Speed Mode

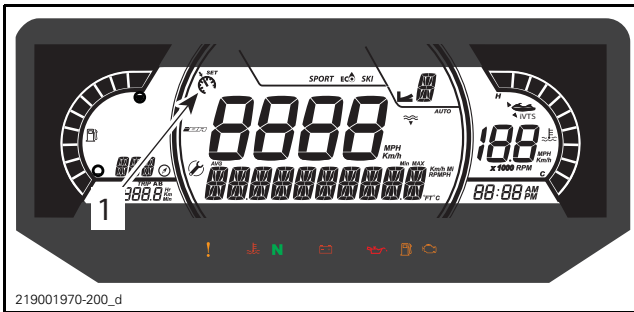
To activate slow speed mode of operation:

1. Release the throttle lever to idle RPM.
2. Press the Speed Control button.



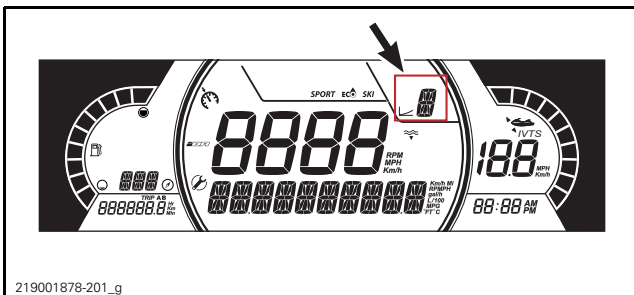
1. Speed Control button

The Speed limiter/Slow Speed indicator will come on in the multifunction display to indicate activation.



TYPICAL
 1. Speed limiter/Slow Speed INDICATOR

A message will scroll in the multifunction display to specify that you are now in slow speed mode. The default slow speed setting of 5 will show in the numerical display.



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Changing Set Slow Speed

To **increase** or **decrease** the set slow speed, press the UP/DOWN button on the RH handlebar once, or repeatedly.

NOTE: There are 9 slow speed settings available (1 through 9). Adjust slow speed mode to desired speed.

When pressing the up/down button, a message "SET LEVEL" will appear. You can select from one of the 9 slow speed setting (1 to 9).

Level 5 is the default and it correspond to the normal idle of the vehicle. By using level 1-4 you can slow down the vehicle and go as slow as 1.5 km/h (1 MPH). The slow speed mode can be used as a trolling mode and is useful for fishing. Level 6-9 gives you the ability to go up to 12 km/h (7 MPH) without touching the throttle lever.

NOTE: Speed will vary depending on load, wind and waves conditions

Deactivating Slow Speed Mode

The slow speed mode can be deactivated using any of the following methods:

- Pressing the Speed Control button.
- Depressing the iBR lever.
- Accelerating past the set slow speed.

When deactivating SLOW SPEED MODE by accelerating using the throttle lever, the iBR gate stays in the forward position.

When using the iBR lever, the iBR gate will move towards the reverse position, then neutral when the lever is released.

SLOW SPEED MODE deactivation will be indicated in the following manner:

- The Speed Limiter indicator will go out

Ski Mode (If equipped)

Ski mode allows for repeated and precisely controlled launches, and a set towing speed, specifically for towing a skier or wake boarder.

RAMP Function

The RAMP function offers a pre-programmed setting for launching and accelerating the PWC.

RAMP 1 provides:

- Slowest launch (smoothest)
- Slowest acceleration rate

RAMP 5 provides:

- Quickest launch
- Quickest acceleration rate

Section 04 FUEL SYSTEM

Subsection 01 (INTELLIGENT THROTTLE CONTROL (iTC))

TARGET SPEED Function

The TARGET SPEED function limits the maximum towing speed.

Once the RAMP has been selected, an average PWC target speed for that RAMP will be visible in the numerical display.

The operator may increase or decrease the target speed to any value within the selected RAMP speed range.

Using Ski Mode

Press MODE button to select the SKI mode.

1. Press OK button when SKI icon flashes.
2. Select ski ramp by using the UP or DOWN arrow button. Ramp 1 will give the slowest acceleration.

NOTE: Acceleration ramp will not behave the same depending on the vehicle type, vehicle load and water conditions. For safety reasons, always start using ramp # 1 to familiarize your skier with acceleration and then change the ramp as needed.

3. Press RIGHT arrow button to confirm acceleration ramp.
4. Select the maximum target speed by using the UP or DOWN arrow button.
5. Press RIGHT arrow button to confirm.

NOTE: At any moment you can use the left and right arrow to change the ramp and speed selection.

6. After your selection and when you are ready, press the OK button to activate the function.

The message **SKI READY** will display.

Keep throttle fully applied to ski.

Releasing the throttle or applying the brake will pause the SKI mode, simply press OK button to reactivate the SKI mode.

Deactivating Ski Mode

To end a ski run and completely deactivate ski mode, release the throttle to idle, then press the MODE button.

Learning Key Mode

The learning I key provides a mode of operation whereby engine power and speed is limited.

There are 5 speed settings available.

By default, the speed setting is no 1.

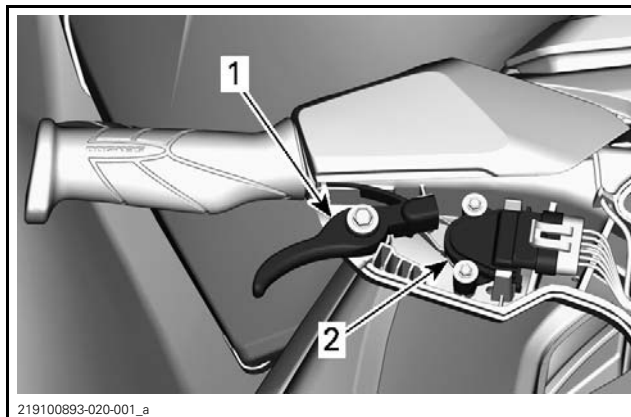
Contact an authorized Sea-Doo dealer for adjustment.

PROCEDURES

THROTTLE ACCELERATOR SENSOR (TAS)

General

The throttle accelerator sensor (TAS) is a double hall effect sensor that sends a signal to the ECM which is proportional to the throttle lever angle.

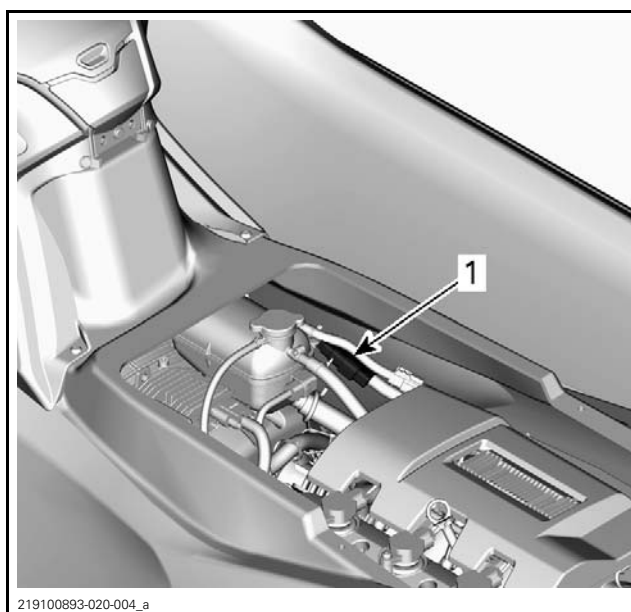


1. Throttle lever
2. Throttle accelerator sensor (TAS)

First ensure the throttle lever functions adequately. Pull the throttle lever fully in towards the handlebar, then release it. It must reach the wide open position and return to the idle position freely when released. Otherwise, refer to *STEERING SYSTEM* for an inspection.

Testing TAS Voltage

1. Disconnect the 20-pin steering connector.



1. 20-pin connector

2. Connect the diagnostic harness to make an in-line connection between the disconnected connectors.

REQUIRED TOOL	
DIAGNOSTIC HARNESS (P/N 529 036 384)	

3. Install the tether cord on the engine cut-off switch.
4. Briefly press the START button to wake up the ECM.
5. Measure the voltage readings on the installed diagnostic harness connector as follows. Refer to wiring diagram for details.

20-PIN CONNECTOR		IDLE POSITION	WIDE OPEN POSITION
PIN		VOLTAGE (VDC)	
13 (VI/BU)	14 (BK)	4.9 - 5.1	
14 (BK)	15 (YL/BU)	0.15 - 0.35	1.4 - 1.6
16 (VI/GN)	17 (BK)	4.9 - 5.1	
17 (BK)	18 (YL/GY)	0.4 - 0.6	2.9 - 3.1

If voltage is as per specification, the TAS sensor is functional.

If voltage is out of specification, check continuity of wires between the ECM and the sensor. If continuity is good, replace sensor.

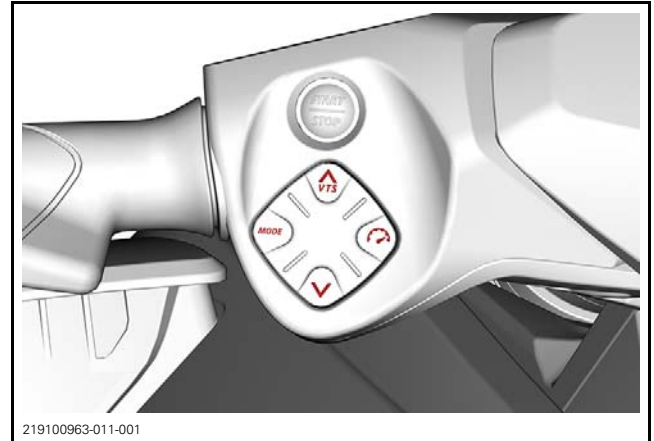
6. Reinstall removed components.

Replacing the TAS

Refer to BRLS in iBR subsection.

MODE/SPEED CONTROL SWITCH

Mode/Speed Control Switch Overview



The Mode/Speed Control switch contain a series of 4 diodes for the Mode and Speed Control switches.

The center wire to the switches (pin C), is common for Mode/Speed Control switch and VTS switch. The other two wires (pins A and B), act as signal wires for each set of switches to the gauge. They actually each form one branch of an electronic circuit within the gauge.

Each diode (in circuit) drops a nominal 0.6 Vdc when conducting electricity. If the circuit current passes through all four diodes (if the Mode/Speed Control switch is open), a drop of 2.4 Vdc would be measured across the 4 the diodes (pin A to pin C). This 2.4 Vdc at pin A tells the gauge the Mode/Speed Control switch is open.

If the Mode button is pressed, 2 diodes are bypassed. The remaining two diodes in the circuit drop 1.2 Vdc (at pin A).

If the Speed Control button is pressed, 1 diode is bypassed. The remaining three diodes in the circuit drop 1.8 Vdc (at pin A).

The gauge senses these voltages through pin 14 of its connector, and interprets them as signals that tell it which switch is activated.

When Mode or Speed Control button is pressed, a circuit within the gauge will translate it to CAN protocol and transmit it through the CAN bus. The ECM (engine control module) will react to the command and carry out the function.

Section 04 FUEL SYSTEM

Subsection 01 (INTELLIGENT THROTTLE CONTROL (iTC))

NOTE: The above stated voltages vary slightly depending on the actual voltage applied to the circuit and the current flow through the diodes. When using a Fluke 115 multimeter for testing in diode test mode, the voltage and current applied by the multimeter are lower than in circuit. The quality of probe contact, the actual probes and leads, and the precision of the meter calibration will all affect the results, which will most likely be slightly lower than nominal values stated.

Testing the Mode/Speed Control Switch

If Mode/Speed Control switches do not allow the selection, test the switches as follows:

- Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS* subsection.
- Check if there is any occurred or active fault code(s). If not, proceed with the following test.
- In BUDS2, go to:
 - **Measurements** page
 - **Cluster** button
 - **Cluster - Basic** tab
- Depress the Mode button on steering and check the **Mode** light status.
- Repeat with the Speed Control switch. **Speed Control** light status should change

If one switch does not function, replace Mode/Speed Control switch.

If both switches stay off, do the following to verify the circuit.

1. Remove the gauge support cover.
2. Disconnect the gauge connector.
3. Using the multimeter set to the diode test function, test the Sport or ECO switches as per following tables.

REQUIRED TOOL
FLUKE 115 MULTIMETER (P/N 529 035 868)

NOTE: In diode test mode, the multimeter will test the voltage drop through the diodes.



MULTIMETER LEAD/ GAUGE CONNECTOR	SWITCH POSITION	VOLTAGE
RED lead/Pin 14 BLACK lead/Pin 15	Both switches released	± 2.4 Vdc
	Speed Control switch depressed	± 1.8 Vdc
	Mode switch depressed	± 1.2 Vdc
RED lead/Pin 15 BLACK lead/Pin 14	Both switches released	OL
	Speed Control switch depressed	
	Mode switch depressed	

NOTE: Remember that each diode should drop approximately 0.6 Vdc when positively biased, and read as an OL (open circuit) when negatively biased (leads reversed).

If, when measuring between pins 14 and 15 an OL is obtained with both positive and negative diode biasing, test the wiring harness continuity between the gauge and switch assembly. If harness continuity is good, replace the switch assembly.

If any reading is significantly different than listed, carry out the same test at the switch connector, refer to the wiring diagram. If you obtain the same results, replace the switch assembly.

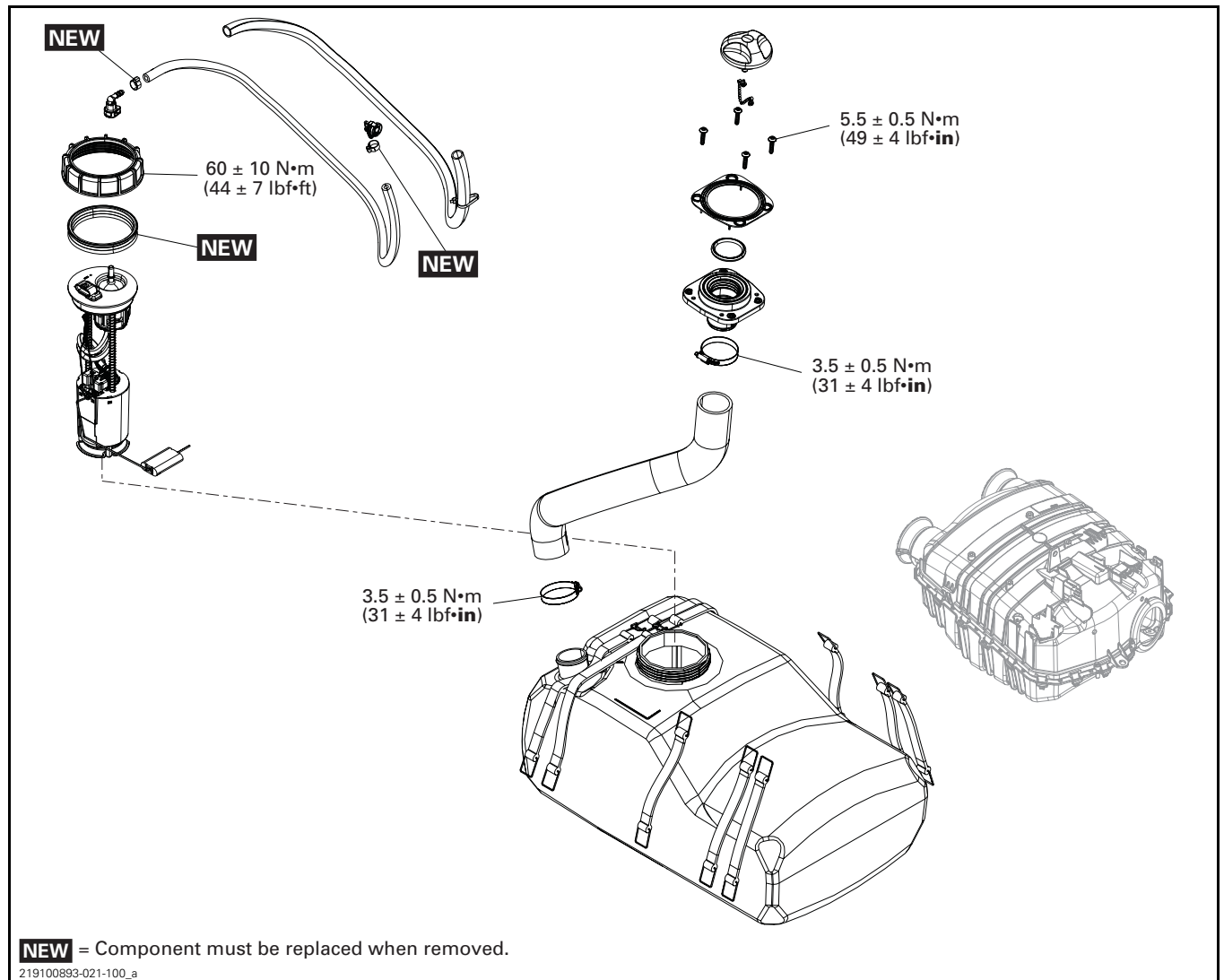
If voltages measured on every switch are as listed in the previous tables (or very close to it), the switches and the wiring harness are good. The fault may be within the gauge, or in the circuit or component the function applies to.

FUEL TANK AND FUEL PUMP

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	98
ECM ADAPTER TOOL.....	529 036 166	94
FLUKE 115 MULTIMETER	529 035 868	94, 98–99
FUEL HOSE ADAPTER.....	529 036 396	92
FUEL PUMP MODULE SOCKET.....	529 036 125	96
FUEL TANK TEST CAP	529 036 242	91
OETIKER PLIER.....	295 000 070	94
PRESSURE GAUGE.....	529 036 395	92
VACUUM/PRESSURE PUMP	529 021 800	91

FUEL TANK AND FUEL PUMP



Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)

GENERAL

⚠ WARNING

Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on a pressurized fuel system. Wear safety glasses.

⚠ WARNING

Always disconnect battery prior to working on the fuel system. Fuel vapors are flammable and explosive under certain conditions. Always work in a well ventilated area. Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Proceed with care when removing/installing high pressure test equipment or disconnecting fuel line connections. Cover the fuel line connection with an absorbent shop rag. Wipe off any fuel spillage in the bilge.

⚠ WARNING

When the repair is completed, ensure that hoses and connections from fuel rail to the fuel pump are properly secured. Then, pressurize the fuel system. After carrying out a fuel pump pressure test, use the valve on the fuel pressure gauge to release the pressure (if so equipped).

⚠ WARNING

The fuel pump is energized for a few seconds each time the START button is depressed. It builds fuel system pressure very quickly. Prior to pressing the START button, ensure there are no disconnected or damaged fuel lines that may leak fuel. A high pressure leak test must be carried out whenever a fuel system component has been disconnected.

⚠ WARNING

Ensure wires and hoses are routed and secured away from any vibrating, rotating, moving or hot components or sharp edges. Use appropriate shields and fastening devices as per factory standards.

NOTICE Whenever repairing the fuel system, always check for water infiltration in the fuel tank. Replace any damaged, leaking or deteriorated fuel line.

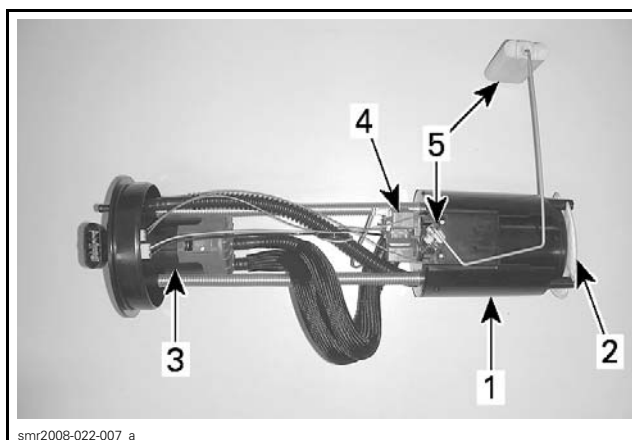
SYSTEM DESCRIPTION

The fuel system is comprised of:

- A fuel tank
- A vented fuel tank cap
- A fuel pump module mounted inside the fuel tank
- A variety of hoses.

The fuel pump module is basically comprised of:

- An electric fuel pump mounted inside a canister type pump reservoir
- A lower inlet filter
- An upper outlet filter
- A pressure regulator
- A float type fuel level sensor.



FUEL PUMP MODULE

1. Fuel pump reservoir
2. Lower inlet filter
3. Upper outlet filter
4. Fuel pressure regulator
5. Float type fuel level sensor

Fuel Pump Operation

When the pump is in operation, it draws fuel into the canister through a lower inlet filter and a disk type valve.

The pressurized fuel is pushed through an upper outlet filter to the fuel rail.

Excess fuel pressure generated by the pump is routed from the upper filter back to the pump canister reservoir by a pressure regulator mounted on the pump reservoir cover.

When the START button is pressed, the electrical system is powered. The fuel pump will come on for approximately 2 seconds to pressurize the fuel rail in preparation for the engine start.

The ECM supplies the ground signal to turn on the fuel pump motor.

The pressure regulator will ensure appropriate fuel pressure is supplied to the injectors.

When the ECM receives a signal to shut down the engine (START/STOP switch, engine cut-off switch, or T.O.P.S. switch) it removes the fuel pump ground signal.

Fuel Level Indication

An electric float type fuel level sensor is mounted on the side of the fuel pump reservoir. As the float moves with changing fuel levels, it varies a resistance that changes the voltage signal coming from the information center (multifunction gauge). This signal is representative of the fuel level.

The information center interprets the fuel level voltage signal that comes back from the fuel level sensor. It then displays the proper fuel level in the information center and a low fuel warning message when required.

The information center will also trigger the beeper which produces the appropriate beep signal to warn the driver of a low fuel condition.

The fuel level sensor resistance is at its lowest value when the fuel tank is full, and at its highest value when the tank is empty.

Refer to the *FUEL LEVEL SENSOR* in this subsection for fuel level sensor testing procedures.

Fuel Tank Venting

The entire vent system is incorporated within the fuel tank cap.

WARNING

If the cap requires replacement, it must be replaced with an approved vented cap of the same type supplied by BRP. Use of any other cap, or use of a non-vented cap will not allow proper venting of the fuel tank. The result may be engine fuel starvation, fuel tank overpressure, or fuel leaks which could lead to a fire or an explosion.

INSPECTION

TESTING FUEL TANK FOR LEAKS

1. Visually inspect condition of hoses and clamps.
2. Remove/open fuel tank cap.
3. Fill up fuel tank.
4. Install test cap on filler neck.
5. Use the following tool to pressurize fuel tank.

REQUIRED TOOL

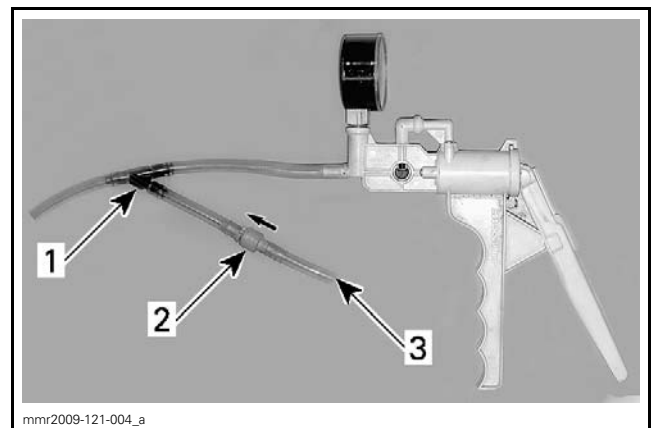
VACUUM/PRESSURE PUMP
(P/N 529 021 800)



FUEL TANK TEST CAP
(P/N 529 036 242)

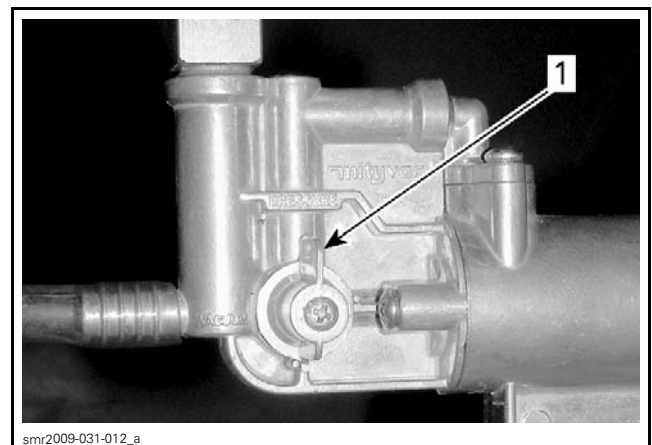


NOTE: A Y-fitting and a check valve can be installed to use compressed air for quick pressure build-up when the fuel tank is not full.



1. Y-fitting (P/N 293 710 059)
2. Check valve (P/N 275 500 505)
3. Apply compressed air here

6. Install the fuel tank test cap.
7. Connect the vacuum/pressure pump to the nipple of fuel tank test cap.
8. Set vacuum/pressure pump to PRESSURE.



1. Pressure selected

9. Pressurize fuel tank to specification.

NOTICE Do not exceed the specification when pressurizing the fuel tank.

Section 04 FUEL SYSTEM
Subsection 02 (FUEL TANK AND FUEL PUMP)

Table with 2 columns: PRESSURE, TIME WITHOUT PRESSURE DROP. Row 1: 21 kPa (3 PSI), 10 minutes.

If the pressure drops, locate fuel leak(s), repair/replace leaking component(s) and retest.

- Possible leak areas are:
- Filler neck, hose and connections
- Fuel tank
- Fuel tank neck
- Fuel pump gasket
- Fuel pump check valve (unlikely).

To locate a leak, check for a fuel smell or leaking fuel.

If a leak is not visible, spray a soapy water solution on components to ease locating the leak(s); bubbles will indicate the leak location(s).

NOTE: If the pressure drops and no leak has been found, it is possibly fuel pump check valve.

NOTICE When the fuel system leak test is completed, thoroughly rinse all components of the soapy water solution with clear water. A soapy water residue may cause premature deterioration and must be rinsed away.

WARNING
If a leak is found, do not start the engine. Wipe off any fuel that leaked and ventilate the hull thoroughly to remove any accumulated fuel vapors. Do not use electric powered tools on watercraft unless system has passed the leak test.

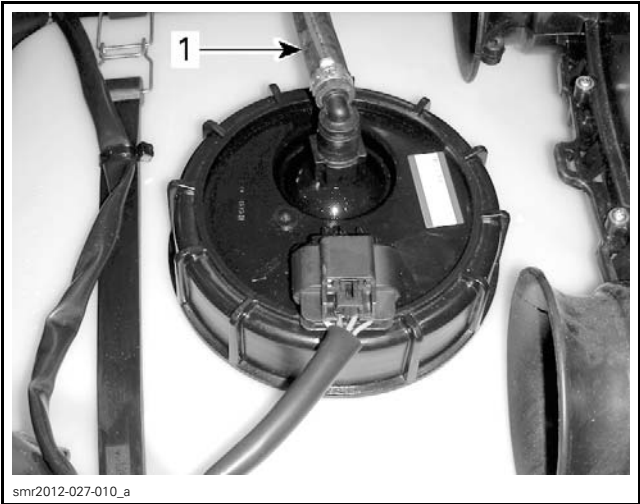
10. Remove test cap.

TESTING FUEL PUMP PRESSURE
Preparation

The pressure test will show the available pressure at the fuel pump outlet. It validates the pressure regulator, the fuel pump and check valve and it tests for leaks in the system.

- 1. Ensure the battery is fully charged, refer to CHARGING SYSTEM.
2. Ensure hoses and fittings are not leaking. Repair any leaks.
3. Ensure there is enough gas in the fuel tank.
4. Disconnect the pressure outlet hose from the fuel pump.

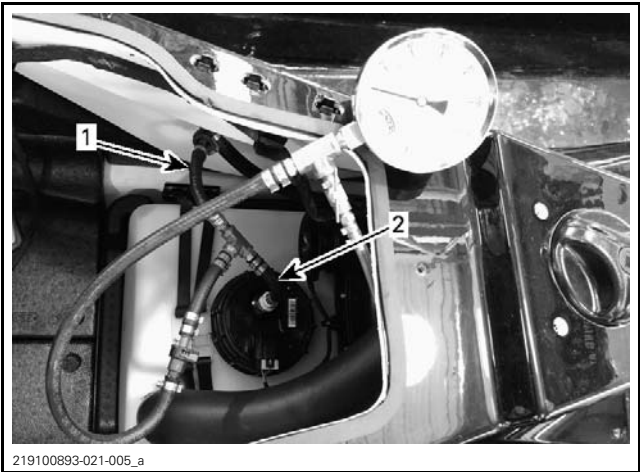
WARNING
Cover the fuel line connection with an absorbent shop rag. Wipe off any fuel spillage inside the bilge.



1. Outlet hose

5. Install pressure test tools between disconnected hose and fuel pump fitting (in line installation).

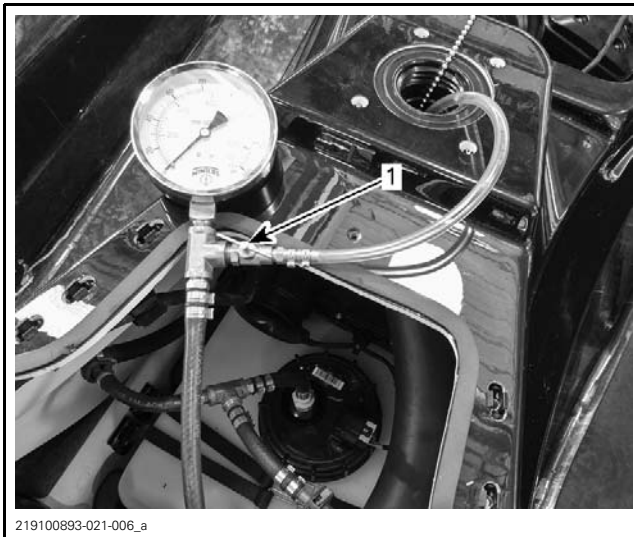
Table with 2 columns: REQUIRED TOOLS, Image. Row 1: PRESSURE GAUGE (P/N 529 036 395), Image of a pressure gauge. Row 2: FUEL HOSE ADAPTER (P/N 529 036 396), Image of a fuel hose adapter.



TYPICAL
1. Connect to outlet hose
2. Connect to fuel pump

Test when Engine Is Stopped

1. Remove tether cord from the engine cut-off switch to prevent engine starting.
2. Press the START button and observe fuel pressure.
3. Release pressure in system using the valve on the pressure gauge between each test so that the reading returns to zero (0).
4. Repeat test twice and compare readings to specifications in following table.



FUEL PUMP PRESSURE TEST
1. Valve on gauge

FUEL PRESSURE (WHEN PRESSING THE START BUTTON)
386 kPa - 414 kPa (56 PSI - 60 PSI)

Test when Cranking or Starting Engine

1. **Crank or start engine** and observe fuel pressure. The fuel pressure should be the same as in previous test.

If pressure is good, fuel pump and pressure regulator are functioning correctly.

2. Stop the engine.

A rapid pressure drop indicates leakage either from the fuel rail or from the fuel pump check valve. Check fuel rail for leaks.

If a pressure drop occurs when pressing the START button and the fuel rail is not leaking, then replace the fuel pump module.

A slow pressure drop indicates leakage either from a fuel injector or from the fuel pressure regulator in the fuel pump module. To check

fuel injectors for leaks, refer to the *ELECTRONIC FUEL INJECTION (EFI)* subsection. If injectors are not leaking, then replace fuel pump.

3. Release fuel pressure in system using the valve on the pressure gauge.
4. Remove pressure gauge and reinstall fuel hose on fuel pump module.

⚠ WARNING

Wipe off any fuel spillage in the bilge. Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area.

5. Reinstall all other removed parts, refer to applicable subsections.

PROCEDURES

FUEL HOSES AND OETIKER CLAMPS

Inspecting Fuel Hoses

1. Inspect all fuel hoses for wear, kinks, cracks or any other types of damages.
2. Inspect all clamps for tightness.


Replacing Fuel Hoses

When replacing fuel hoses, be sure to use hoses and clamps as available from BRP parts department. This will ensure continued proper and safe operation.

⚠ WARNING


Use of fuel lines other than those recommended by BRP may compromise fuel system integrity.


Section 04 FUEL SYSTEM
Subsection 02 (FUEL TANK AND FUEL PUMP)

 **WARNING**

- Never use a hose pincher on high pressure hoses.
- Never change the routing of a fuel hose.
- Always reinstall the corrugated protective tubing on fuel hoses.
- Secure fuel hoses using the appropriate locking tie or fastener to prevent contact with sharp edges or hot, rotating and moving parts.
- After connecting a hose or a quick connect fitting, pull on the hose near the fitting to make sure it is securely locked.
- Always validate fuel system tightness by testing fuel tank for leaks.

Replacing Oetiker Clamps

REQUIRED TOOL	
OETIKER PLIER (P/N 295 000 070)	

 **WARNING**

Whenever removing a hose in the fuel system, always use new Oetiker clamps at assembly.

FUEL PUMP

Testing the Fuel Pump

1. Remove tether cord from the engine cut-off switch to prevent engine starting.
2. Press START button.
3. The fuel pump should run for 2 seconds to build up fuel system pressure.
4. If fuel pump runs, test the *FUEL PUMP PRESSURE* as described in this subsection.
5. If the fuel pump does not run:
 - Ensure ECM is powered. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
 - Check fuse F2. If fuse is faulty, replace it and repeat test. If fuse is good, test the *FUEL PUMP INPUT VOLTAGE* in this subsection.

Testing Fuel Pump Pressure

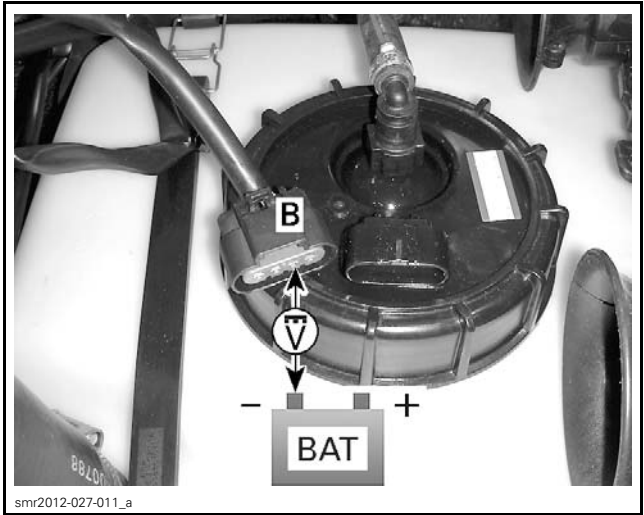
Refer to *INSPECTION* in this subsection.

Testing Fuel Pump Input Voltage

1. Ensure the fuel inj. fuse (F2) is in good condition.

2. Disconnect fuel pump harness connector. Refer to *REMOVING THE FUEL PUMP*.
3. Use the FLUKE 115 MULTIMETER (P/N 529 035 868).
4. Select Vdc.
5. Press the START button.
6. Read voltage at fuel pump harness connector as per following table.

INPUT VOLTAGE TEST		
TEST PROBES		VOLTAGE
Pin B (+ probe)	Battery ground (- probe)	Battery voltage



FUEL PUMP INPUT VOLTAGE TEST

If battery voltage is read, power circuit is good. Test the *FUEL PUMP CIRCUIT*.
If battery voltage is not read, power circuit is faulty. Test continuity of power circuit wiring between fuse box and fuel pump. Test the *FUEL PUMP CIRCUIT* in this subsection.

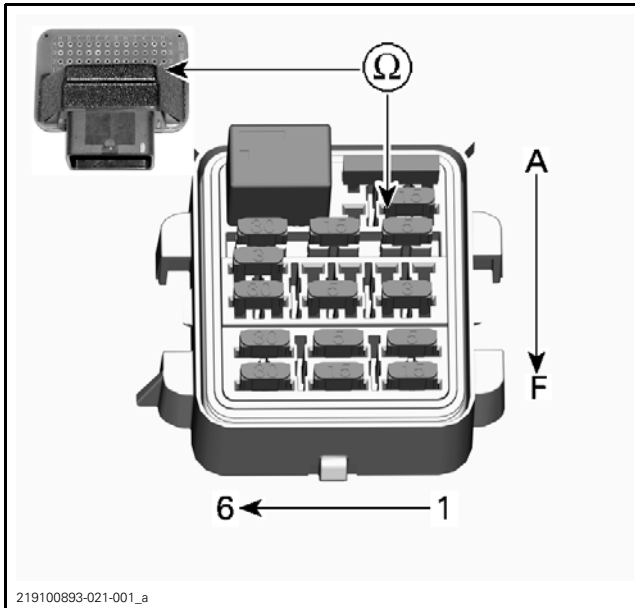
Testing Fuel Pump Circuit

1. Reconnect the fuel pump harness connector.
2. Remove cover of fuse box.
3. Remove ECM connector "B" and install it on the ECM ADAPTER TOOL (P/N 529 036 166).
4. Set multimeter to Ω and test pump circuit as per following table.

Section 04 FUEL SYSTEM

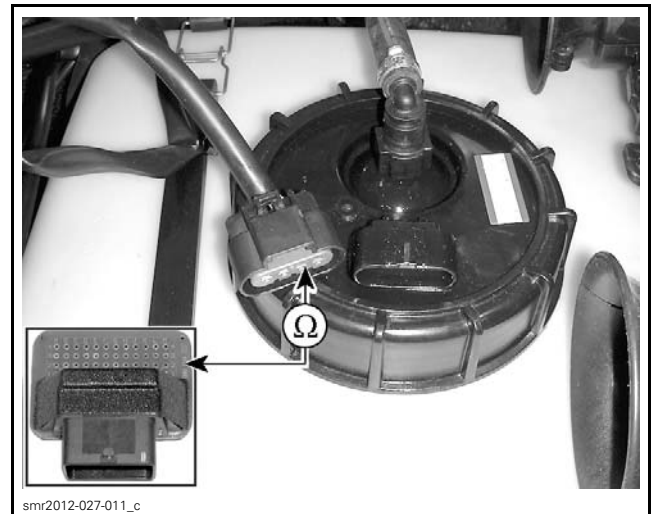
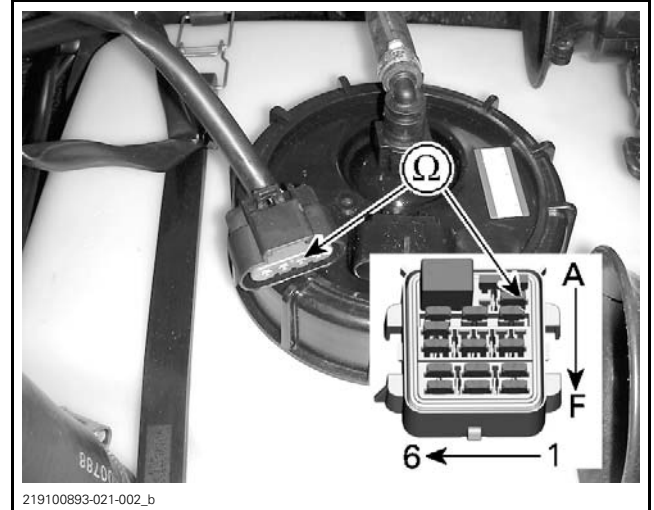
Subsection 02 (FUEL TANK AND FUEL PUMP)

PUMP CIRCUIT TEST THROUGH FUEL PUMP		
TEST PROBES		RESISTANCE @ 20°C (68°F)
Fuse box terminal B2	ECM connector B pin B-M1	Approx. 12 Ω



5. If test succeeded, the fuel pump, its fuse and its wiring harness are good.
6. If test failed, test wiring continuity as per table.

FUEL PUMP HARNESS CONTINUITY TEST (WIRING ONLY)		
TEST PROBES		RESISTANCE @ 20°C (68°F)
Pump harness connector pin B	Fuse box terminal B1	Close to 0 Ω (continuity)
Pump harness connector pin A	ECM connector B pin B-M1	



If there is an open circuit to FB-B1, repair wiring/connector between fuel pump and fuse box.

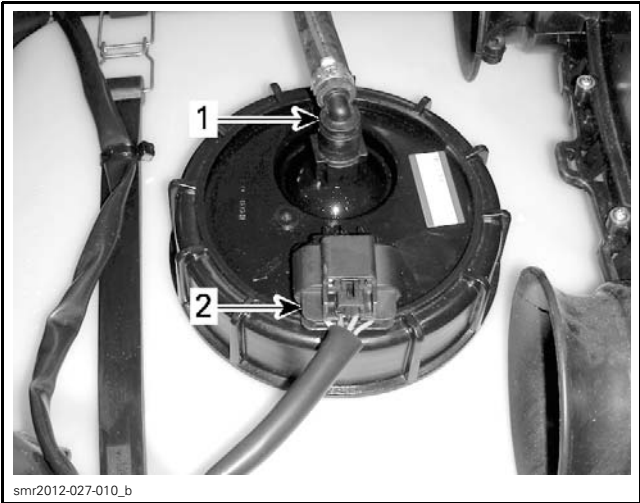
If every test succeeded and fuel pump fuse is good and fuel pump still does not work, try a new ECM. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Removing the Fuel Pump

1. Remove front storage bin. Refer to *BODY* subsection..
2. Disconnect the negative battery terminal, refer to *CHARGING SYSTEM* subsection.
3. Disconnect fuel pump electrical connector.
4. Wrap shop rags around the high pressure fuel hose fitting, then press on the release button of the quick connect fitting and disconnect the hose.

Section 04 FUEL SYSTEM

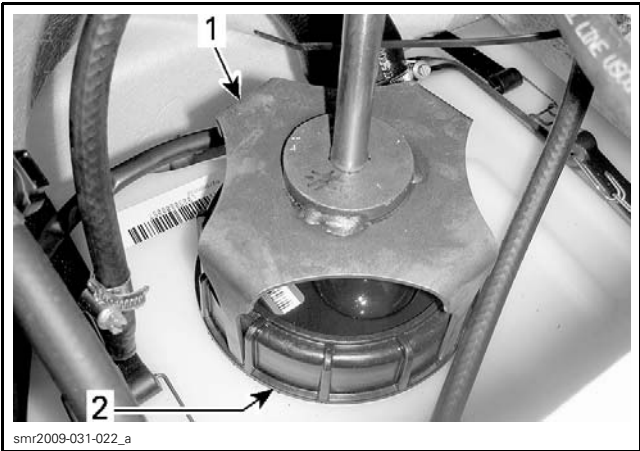
Subsection 02 (FUEL TANK AND FUEL PUMP)



1. Quick connect fitting (high pressure fuel hose)
2. Harness connector

5. Unscrew the fuel pump retaining nut.

REQUIRED TOOL	
FUEL PUMP MODULE SOCKET (P/N 529 036 125)	



1. Fuel pump module socket
2. Fuel pump retaining nut

NOTICE While pulling out the fuel pump module, pay attention to the corrugated tubes and fuel sensor float arm. Float arm can get caught up and bend which will reduce fuel sensor accuracy. If fuel pump module is dropped or damaged, it must be replaced.

6. Slowly pull fuel pump module up through opening until corrugated tubes contact sides of opening. Tilt the fuel pump module as you slowly pull the pump upwards.

⚠ WARNING

The upper filter and fuel pump reservoir on the fuel pump module contain fuel which will drain out when fuel pump module is not in an upright position.

7. Carefully pull fuel pump module out.

⚠ WARNING

Always wipe off any fuel spillage from the watercraft. When working with fuel or fuel system and its components, always work in a well ventilated area.

Installing the Fuel Pump

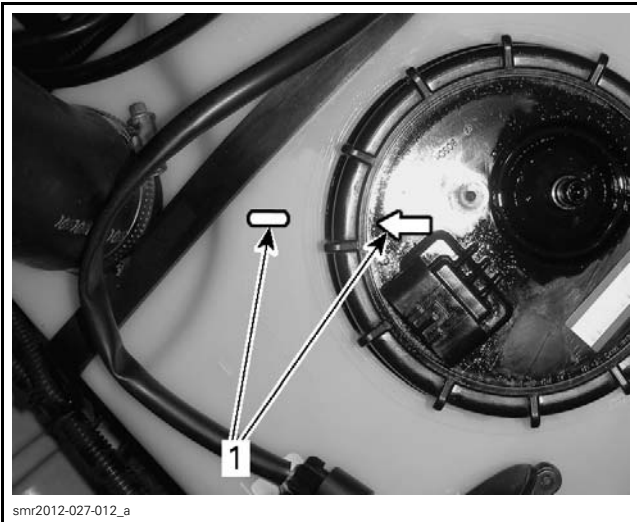
Reverse the removal procedure however, pay attention to the following.

1. Carefully insert fuel pump module in fuel tank so as not to bend float arm.
2. Install a NEW fuel pump module gasket each time the module is reinstalled.

NOTE: Wipe off parts to prevent fuel pump from turning while torquing fuel pump nut.

3. Align arrow on top of fuel pump module with index mark on top of fuel tank or fuel sensor accuracy will be affected.

NOTE: Index mark and arrow locations are highlighted for clarity in following illustration.



FUEL PUMP MODULE INDEXING

1. Align marks

4. Tighten fuel pump nut.

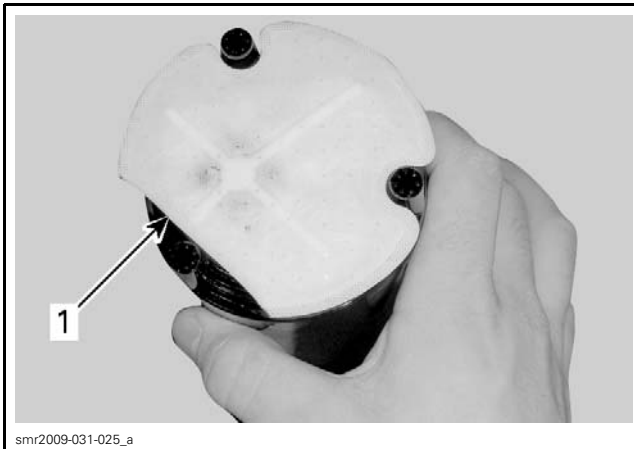
TIGHTENING TORQUE	
Fuel pump nut	60 N•m (44 lbf•ft)

5. Test the fuel tank for leaks. Refer to *TESTING FUEL TANK FOR LEAKS*.

FUEL FILTER

Inspecting the Fuel Filter

Inspect fuel filter. If dirty, partially clogged or damaged, replace it.



1. Fuel filter

Removing the Fuel Filter

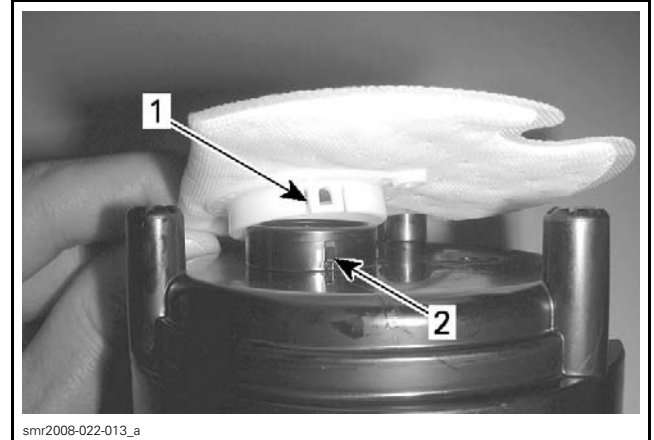
NOTE: The lower fuel filter on the fuel pump module does not require replacement under normal operating conditions. Replace only if permanently clogged or damaged.

1. Remove fuel pump. Refer to *FUEL PUMP* in this subsection.

WARNING

The upper filter and fuel pump reservoir on the fuel pump module contain fuel which will drain out when fuel pump module is not in an upright position.

2. Turn fuel pump upside down.
3. Using a small flat screwdriver, pry up the filter locking tabs.



1. Fuel filter locking tab (x2)
2. Filter locking pin (x2)

4. Pull filter off fuel pump reservoir housing.

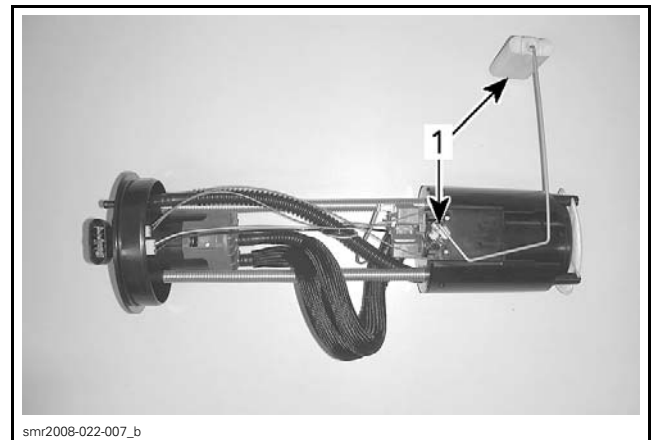
Installing the Fuel Filter

1. Align new filter with pump reservoir housing.
2. Press new filter on by hand. Ensure it is fully seated and locked onto the pump reservoir housing.
3. Reinstall fuel pump as per procedure in this subsection.
4. Test the fuel tank for leaks. Refer to *TESTING FUEL TANK FOR LEAKS*.
5. Install all other removed parts, refer to applicable subsection.

FUEL LEVEL SENSOR

Fuel Level System Overview

A float type fuel level sensor mounted on the fuel pump module sends a signal to the information center.



TYPICAL — FUEL PUMP MODULE
1. Fuel level sensor

Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)

The information center interprets this signal and turns on the appropriate number of segments of a bar type fuel level indication in the lower RH side of the digital screen in the information center.

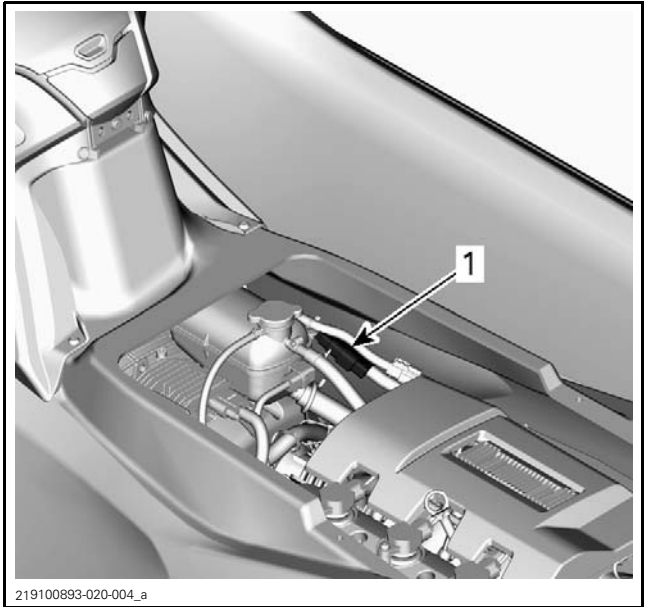
Troubleshooting the Fuel Level Sensor

FUEL LEVEL TROUBLESHOOTING	
SYMPTOM	POSSIBLE CAUSE
Fuel gauge always display EMPTY	<div><div>–</div>Wiring/connectors</div> <div><div>–</div>Fuel level sensor</div> <div><div>–</div>Float stuck in low position</div>
Fuel gauge always display FULL	<div><div>–</div>Water in fuel pump connector</div> <div><div>–</div>Float stuck in full position</div>
Fuel level sensor fault code	<div><div>–</div>Wiring/connectors</div> <div><div>–</div>Fuel level sensor</div>
Fuel gauge displays wrong level	<div><div>–</div>Low battery voltage</div> <div><div>–</div>Fuel level sensor fault</div>

Use the BRP diagnostic software (BUDS2) to check for a fault code. Refer to *DIAGNOSTIC AND FAULT CODES*.

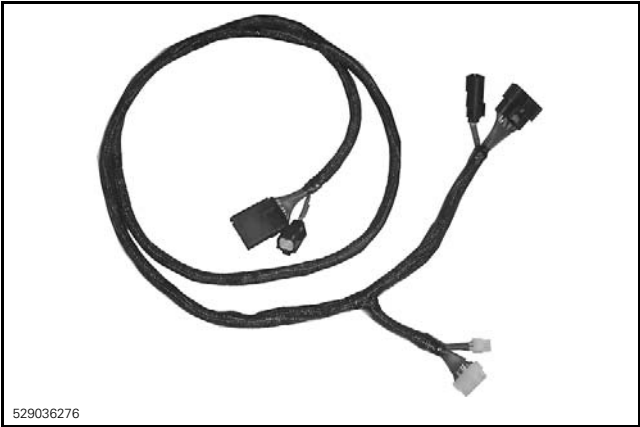
Testing Fuel Level Sensor Voltage

1. First ensure battery is fully charged.
2. From under the steering support area, disconnect the 20-pin connector.



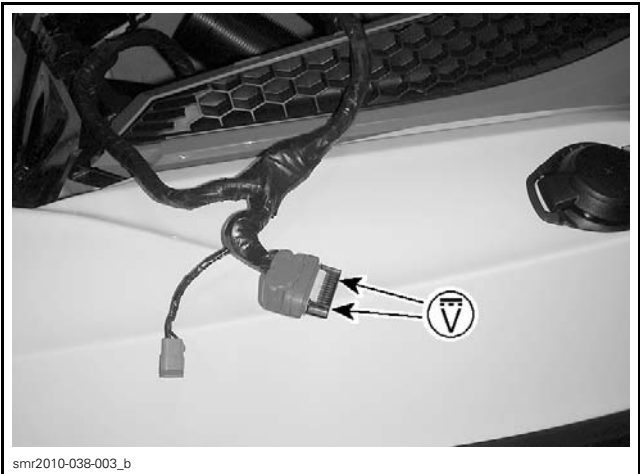
Step 1: Steering connector

3. Connect the DIAGNOSTIC HARNESS (P/N 529 036 384) to make an in-line connection between the disconnected connector.



4. Briefly press the START button to wake up the ECM.
5. Install the tether cord on the engine cut-off switch.
6. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) and select Vdc.
7. Measure the voltage at the test connector of the diagnostic harness as follows.

FUEL TANK LEVEL	TEST CONNECTOR OF DIAGNOSTIC HARNESS	VOLTAGE
Full	Pins 12 and 19	0.14 Vdc
Empty		2.7 Vdc



TEST CONNECTOR OF DIAGNOSTIC HARNESS

NOTE: Voltage could be slightly different depending on battery voltage but should remain relatively close to this range. If fuel tank is not full or empty, the voltage value will be proportional to the fuel level (somewhere in-between).

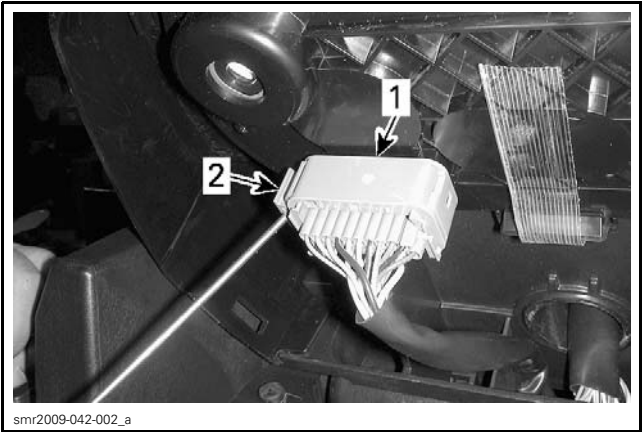
If voltage is as per specifications the fuel level circuit and sensor are good. If fuel level does not work in information center, try a new one.

If voltage is out of specifications, test the *FUEL LEVEL SENSOR RESISTANCE AT INFORMATION CENTER* as described in this subsection.

Remove diagnostic harness and reconnect connector.

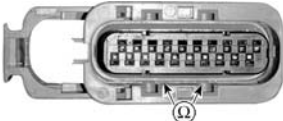
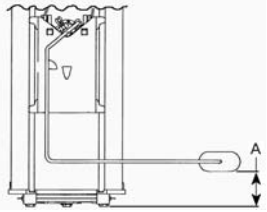
Testing Fuel Level Sensor Resistance at Information Center

1. Disconnect information center (multifunction gauge) connector. Refer to *INFORMATION CENTER* subsection.



1. Gauge connector
2. Pull out to unlock connector

2. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) and select Ω .
3. Alternately drain then fill fuel tank and measure the sensor resistance between pins 19 and 20 as follows.

RESISTANCE (Ω)	FLOAT HEIGHT
4.8 ± 2.2	Maximum (FULL)
47.8 ± 2.2	Middle (HALF)
89.8 ± 2.2	Minimum (EMPTY)
	 A. Float height

NOTE: If fuel tank is not full or empty, the resistance value will be proportional to the fuel level (somewhere in-between).

If readings are as per specifications, the fuel level circuit and sensor are good. If fuel level does not work in information center, try a new one.

If readings are out of specifications, test the *FUEL LEVEL SENSOR RESISTANCE AT FUEL PUMP*.

If an open circuit is measured, carry out a continuity test of the wiring from the information center to the 20-pin steering connector, and from the 20-pin steering connector to the fuel pump module connector. Refer to *WIRING DIAGRAM*.

If the wiring is good, test *FUEL LEVEL SENSOR RESISTANCE AT FUEL PUMP*.

4. Reconnect information center (multifunction gauge) connector.

Testing Fuel Level Sensor Resistance at Fuel Pump

1. Disconnect fuel pump module connector.



FUEL PUMP MODULE
1. Fuel pump module connector

2. Alternately drain then fill fuel tank and measure the sensor resistance between pins "C" and "D" of the fuel pump connector. See table in *TESTING FUEL LEVEL SENSOR RESISTANCE AT INFORMATION CENTER*.

Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)

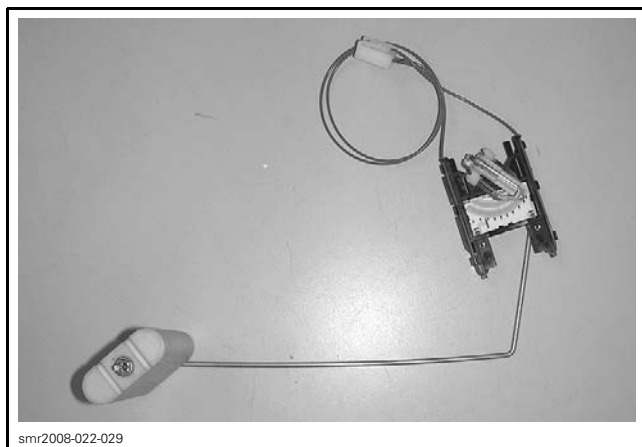


FUEL LEVEL SENSOR RESISTANCE TEST

If readings are out of specifications, replace sensor.

When everything else has been tested and fuel level is still not working, try a new information center.

Removing the Fuel Level Sensor



FUEL LEVEL SENSOR

1. Remove fuel pump module from fuel tank, see *FUEL PUMP REMOVAL* in this subsection.

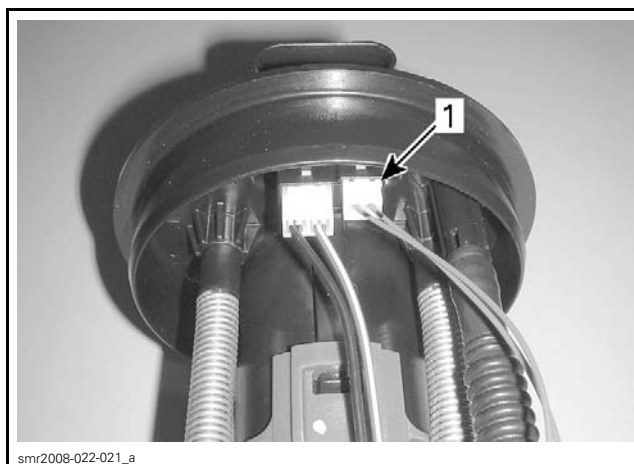
WARNING

The upper filter and fuel pump reservoir on the fuel pump module contain fuel which will drain out when fuel pump module is not in an upright position.

2. Drain all fuel from the upper fuel filter and fuel pump reservoir in an appropriate container.

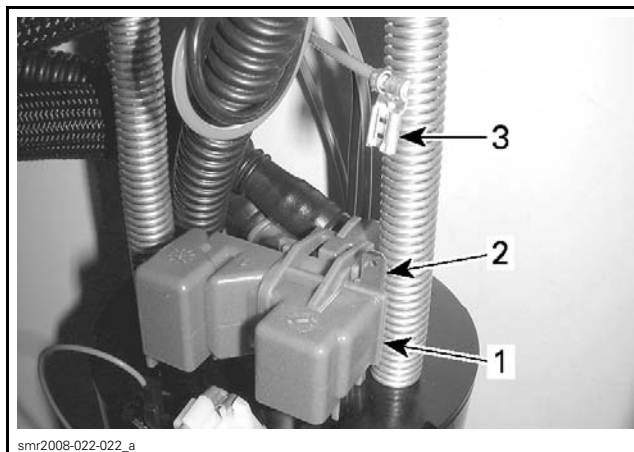
NOTE: Note routing of fuel level sensor wires prior to disconnecting the sensor from the fuel pump module flange.

3. Disconnect the fuel level sensor connector from the fuel pump module upper flange.



1. Fuel level sensor connector

4. Disconnect the ground wire from the pressure regulator. Be careful not to bend the ground contact on the pressure regulator.

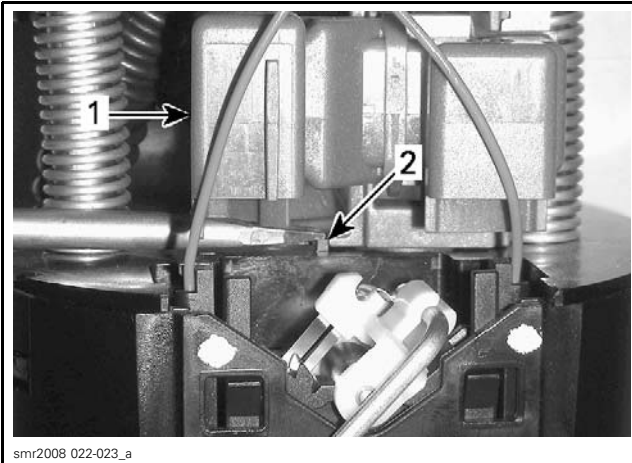


1. Pressure regulator
2. Ground wire contact on pressure regulator
3. Ground wire disconnected

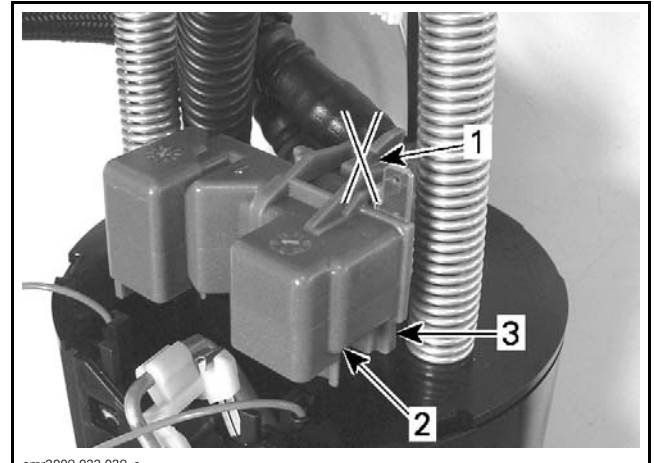
5. Using a flat screwdriver, press down on the locking tab just below the pressure regulator to release it from the pump reservoir cover, and rotate it clockwise simultaneously so that it slips over the locking tab.

Section 04 FUEL SYSTEM

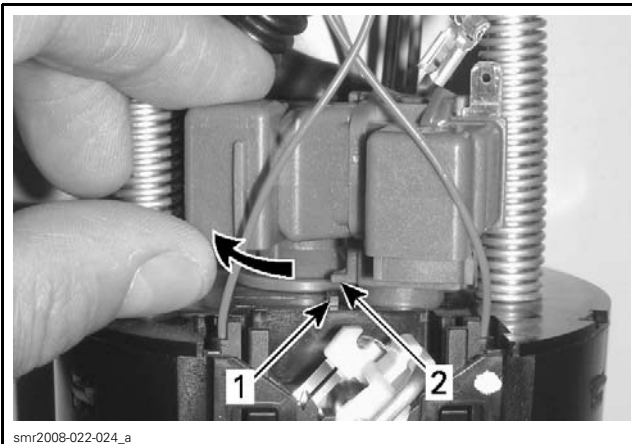
Subsection 02 (FUEL TANK AND FUEL PUMP)



1. Pressure regulator
2. Pressure regulator locking tab

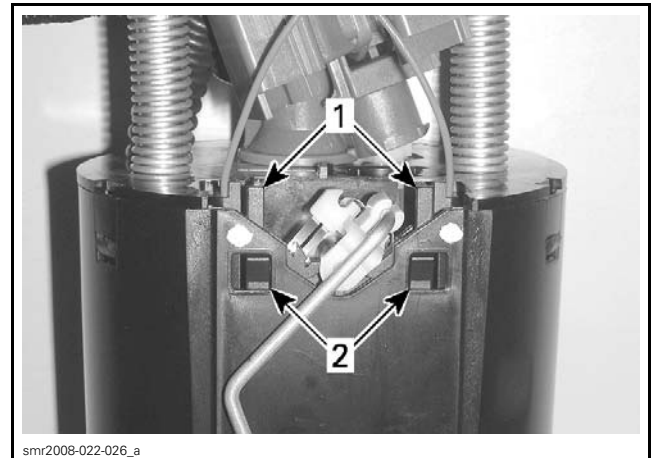


1. Do not remove pressure regulator cover at locking tabs
2. Pressure regulator cover
3. Pressure regulator housing

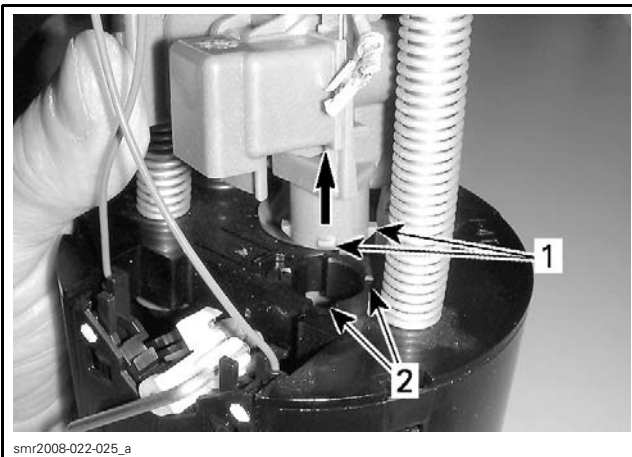


1. Pressure regulator locking tab
2. Pressure regulator rotated clockwise over locking tab

6. Once the pressure regulator is rotate over the locking tab, pull up on it to remove it from the pump reservoir cover.

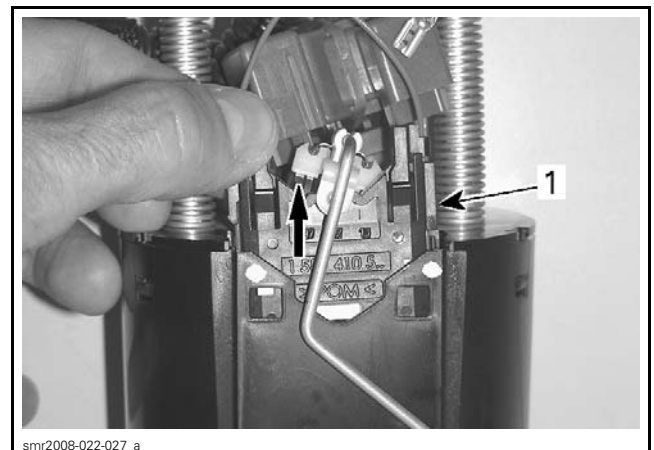


1. Fuel level sensor release tabs
2. Locking pins



1. Pressure regulator alignment tabs
2. Fuel pump reservoir alignment tabs

NOTE: The pressure regulator cover must not be removed from the pressure regulator housing assembly.



1. Pull up on fuel level sensor

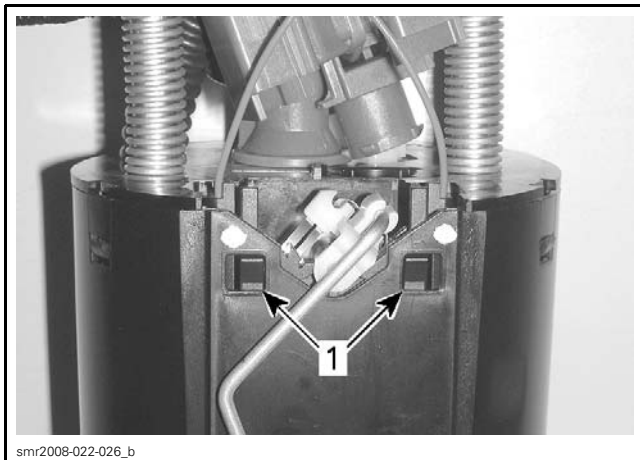
Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)

Installing the Fuel Level Sensor

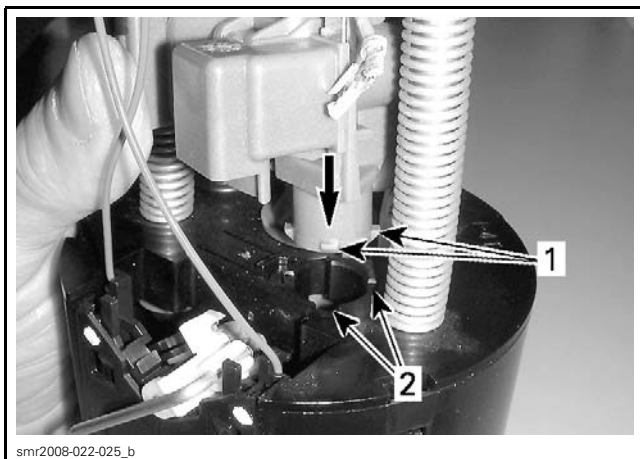
Installation is the reverse of the removal procedure however, pay attention to the following.

1. Ensure fuel level sensor locking pins are properly engaged into the fuel pump reservoir.



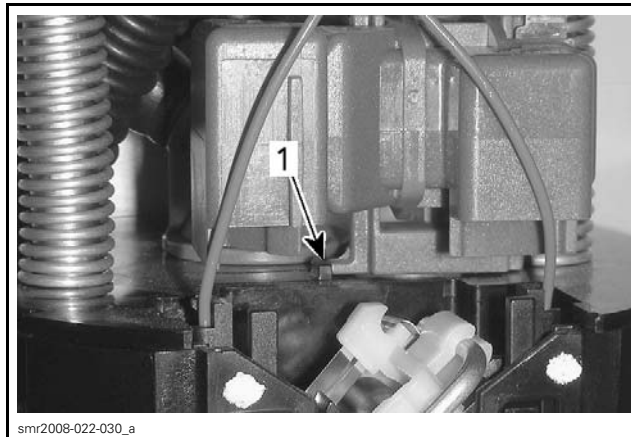
1. Ensure engagement of sensor locking pins

2. Align the fuel pressure regulator tabs into the pump reservoir cover and turn it counterclockwise until it locks properly.



PRESSURE REGULATOR INSERTION INTO PUMP RESERVOIR COVER

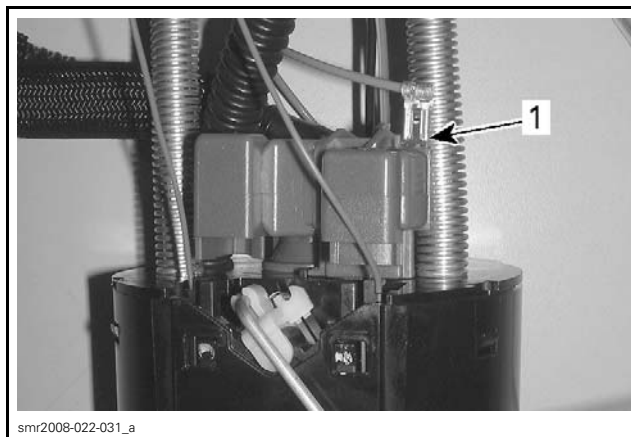
1. Pressure regulator alignment tabs
2. Fuel pump reservoir alignment tabs



TAB UP WHEN PRESSURE REGULATOR PROPERLY LOCKED

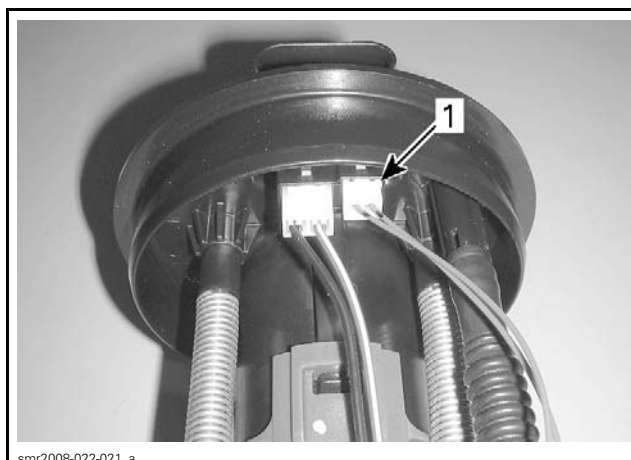
1. Pressure regulator locking tab

3. Reconnect the ground wire onto the pressure regulator.



1. Pressure regulator ground wire installed

4. Ensure fuel level sensor connector is locked into the module flange connector.



1. Fuel level sensor connector

5. Test fuel level sensor resistance as described in this subsection.

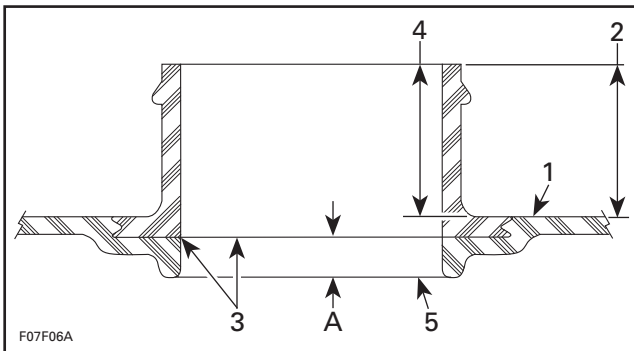
6. Reinstall the fuel pump module. Refer to *INSTALLING THE FUEL PUMP* in this subsection.

FUEL TANK

Inspecting the Fuel Tank

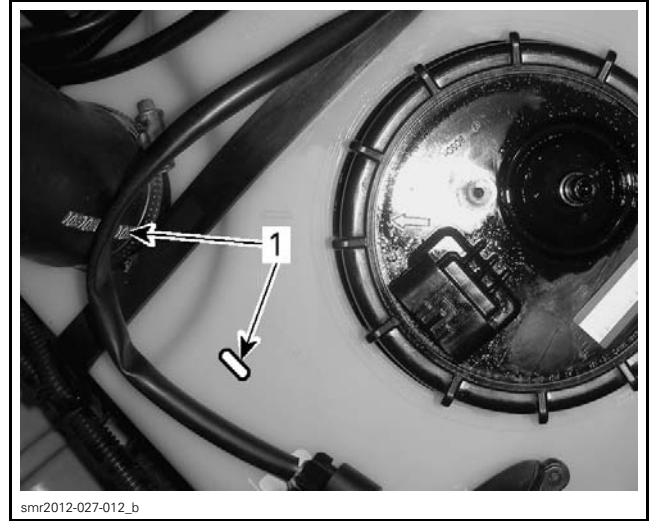
1. Remove storage bin. Refer to *BODY* subsection.
2. Remove seats and engine service cover for access to aft end of fuel tank.
3. Inspect fuel tank retaining straps for wear, cracks or any other damages. Inspect strap clip anchors.
4. Inspect fuel tank for wear caused by any abnormal contact or rubbing with other component(s).
5. Disconnect fuel filler hose from fuel tank.
6. Inspect fuel tank filler hose for wear, cracks or other damages.
7. Visually inspect the inside and outside of the fuel tank filler necks for crack(s). If crack(s) are found, replace fuel tank.
8. With your fingers, feel the inside and outside surfaces of fuel tank, especially near the filler neck.
9. Flex fuel tank neck to ensure there are no hidden cracks.

NOTE: A fuel tank is comprised of 2 components: the tank and the filler neck. The filler neck is injection molded and the tank is then blow molded over the neck. During the molding process, a small molding seam may appear on the inner side of the neck at approximately 4 mm (5/32 in) from the base of the neck. It is normal to have a molding seam and it should not be confused with a crack.



1. Tank upper surface area
2. Inspect outer upper surface at filler neck
3. Normal molding seam
4. Inspect upper surface area inside filler neck
5. Base of filler neck
- A. Approx. 4 mm (5/32 in)

10. Install filler hose and torque retaining clamps.



INDEXING WITH FUEL TANK

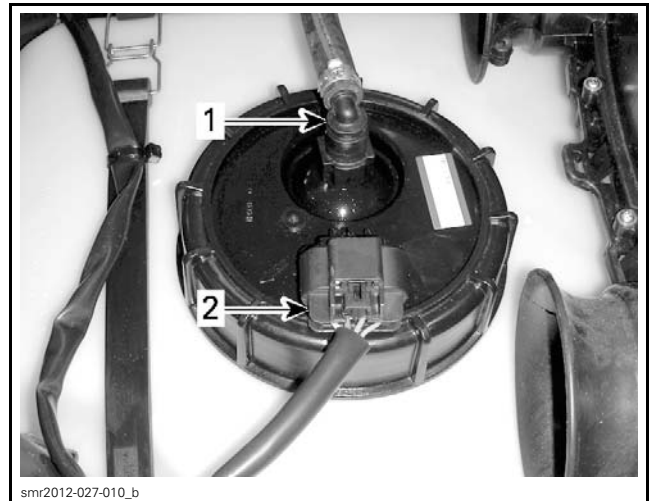
1. Align mark with the writing on hose

TIGHTENING TORQUE	
Filler hose retaining clamps	3.5 N•m (31 lbf•in)

11. Reinstall all other removed parts. Refer to appropriate subsection.

Removing the Fuel Tank

1. Remove front storage bin. Refer to *BODY* subsection.
2. Siphon fuel tank.
3. Disconnect fuel pump connections.

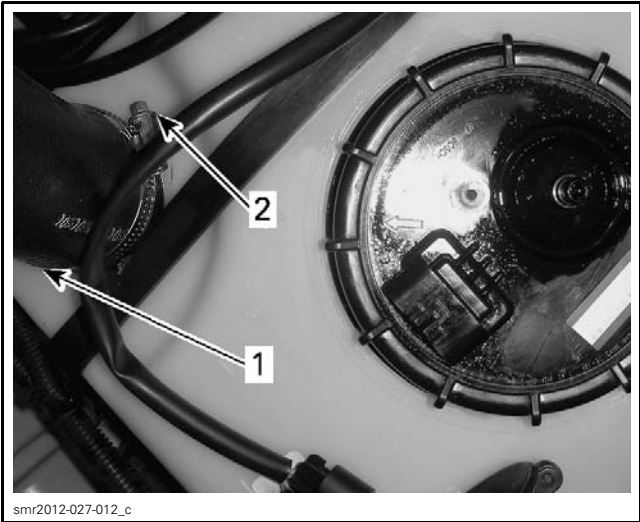


1. Quick connect fitting (high pressure fuel hose)
2. Harness connector

4. Disconnect filler hose from fuel tank.

NOTE: Removing retaining screws of the filler neck may help to disconnect hose from fuel tank.

Section 04 FUEL SYSTEM
Subsection 02 (FUEL TANK AND FUEL PUMP)



1. Filler hose
2. Retaining clamp

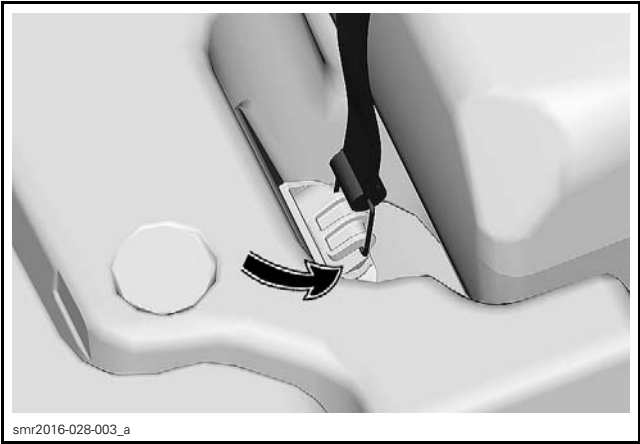
NOTE: Take note of wiring harness, hose and cable routing for proper reinstallation. Also note method used for securing with locking ties.

- 5. Remove air intake silencer. Refer to *AIR INTAKE* SUBSECTION for procedure.
- 6. Detach fuel tank retaining straps.
- 7. Remove fuel tank from the vehicle.
- 8. Remove fuel pump as necessary. Refer to *FUEL PUMP* in this subsection.
- 9. Inspect hull and flotation foams for wear.

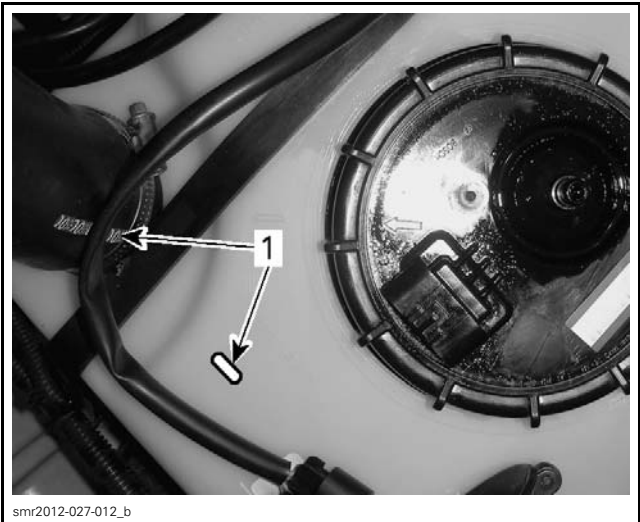
Installing the Fuel Tank

NOTE: Apply torque values as specified in the exploded view.

- 1. Reinstall fuel pump if it was removed. Refer to *FUEL PUMP* in this subsection.
- 2. Ensure flotation foams are properly positioned under fuel tank.
- 3. Insert fuel tank in hull.
- 4. Place fuel tank retaining strap ends in anchoring clips.



- 5. Secure retaining strap ends on top of fuel tank.
- 6. Properly secure wire harness, cables and hose as prior to removal using appropriate locking ties.
- 7. Install fuel tank filler hose as illustrated.



INDEXING WITH FUEL TANK
1. Align mark with the writing on hose

TIGHTENING TORQUE	
Filler hose retaining clamps	3.5 N•m (31 lbf•in)

- 8. Reinstall all other removed parts. Refer to their subsections.
- 9. When vehicle reassembly is complete, test fuel tank for leaks as described in this subsection.

POWER DISTRIBUTION AND GROUNDS

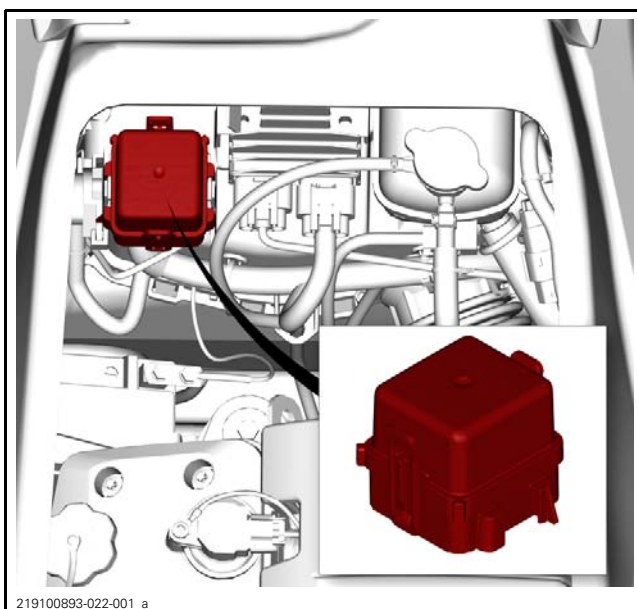
GENERAL

POWER DISTRIBUTION DIAGRAM

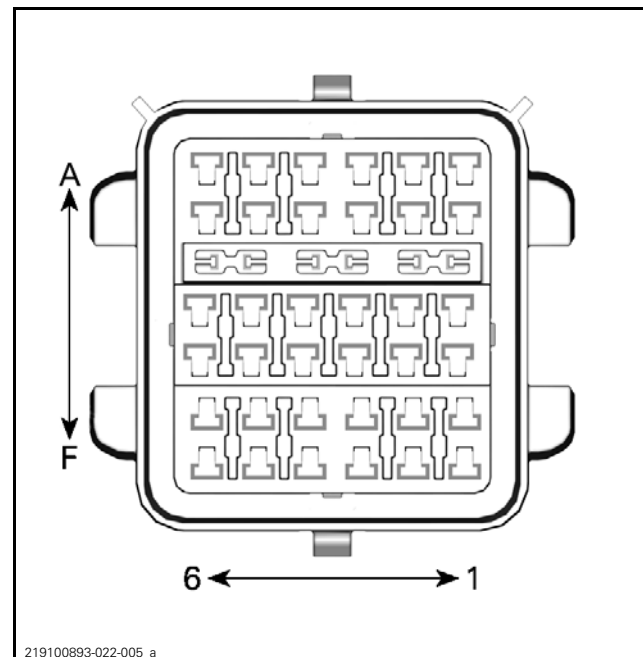
Refer to the appropriate *WIRING DIAGRAM*.

NOTE: Refer to *WIRING DIAGRAM INFORMATION* for how to properly interpret the *WIRING DIAGRAM*.

FUSE BOX



Fuse Identification



FUSE BOX PIN IDENTIFICATION

NUMBER OF CAVITIES BY ROW	
ROW	NUMBER OF CAVITIES
A-F	6

30A RELAY		GROUND	
		FUEL INJ.	
		2.	15A
BILGE PUMP			
3. 3A	4.	5.	
CHARGE	CLUSTER	DEPTH SOUNDER	
6. 30A	7. 5A	8.	3A
IBR	START/STOP	ECM	
9. 30A	10. 5A	11.	5A
BATT	DIAG TOOL 2	DIAG TOOL 1	
12. 30A	13. 15A	14.	15A

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FUSE IDENTIFICATION

Section 05 ELECTRICAL SYSTEM

Subsection 01 (POWER DISTRIBUTION AND GROUNDS)

NO.	DESCRIPTION	
F2	Through relay: – Fuel pump – Fuel injectors – Ignition coils	15 A
F3	Through relay and F13: – Blige Pump	3 A
F6	Direct power: – Regulator/rectifier	30 A
F7	Through relay: – Cluster – Accessory connection	5 A
F8	Through relay and F13: – Depth Sounder	3 A
F9	Direct power: – iBR™ control	30A
F10	Direct power (through F12): – START/STOP	5A
F11	Through relay: – ECM	5 A
F12	Direct power: – Relay – F10 – F14	30 A
F13	Through relay: – F3 – F8 – Diag Tool 2	15 A
F14	Direct power (through F12): – Diag Tool 1	15 A

Note 3: If equipped.

RELAY

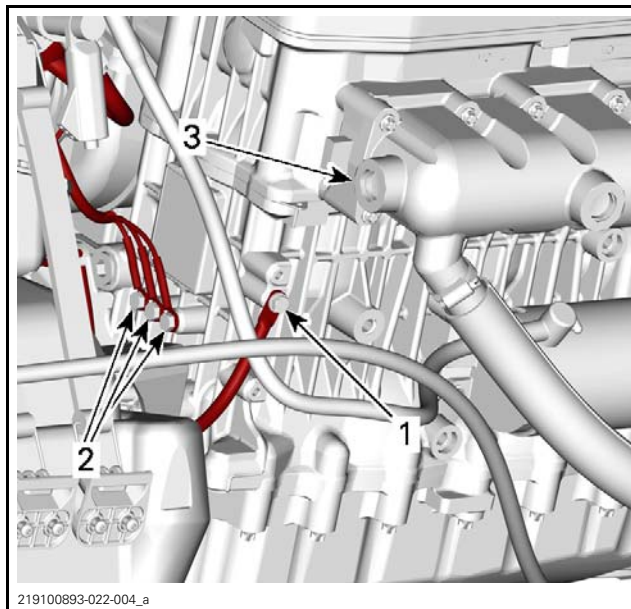
Relay Pin Identification

The relay is in the fuse box. Refer to *FUSE BOX*.

RELAY PIN IDENTIFICATION		
FUNCTION	FUSE BOX PIN	CONDITION
12-volt input at winding	B6	Direct battery power from fuse F12
Control	B4	Grounded by ECM B pin H2 once START/STOP is depressed
12-volt input at contacts	A6	Direct battery power from fuse F12
12-volt output	A4	-

GROUNDS

All the ground terminals are located on the front of engine.



FRONT OF ENGINE

1. Battery ground
2. Electrical components grounds
3. Exhaust manifold

WIRING HARNESS AND CONNECTORS

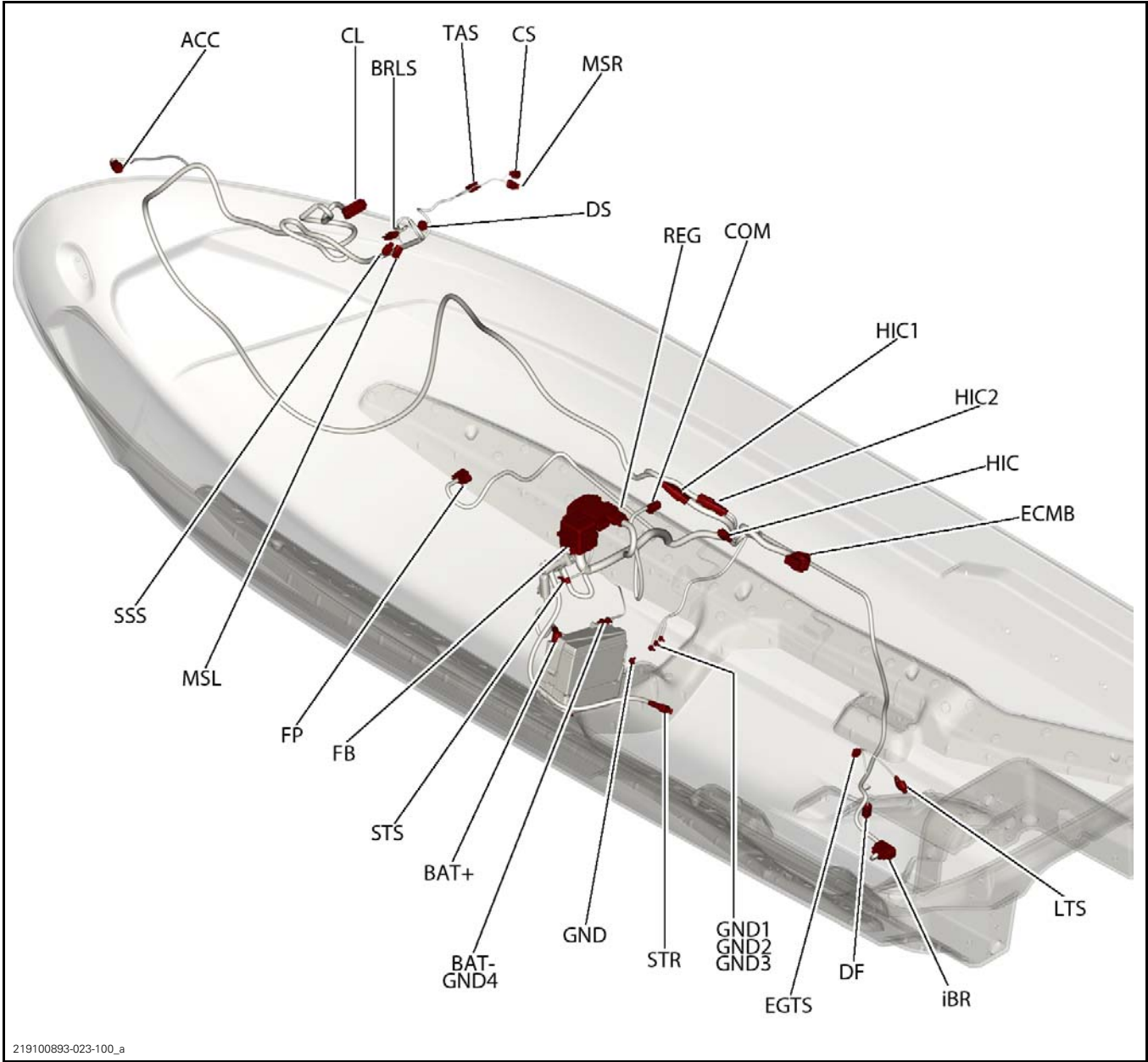
SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	117
ECM ADAPTER TOOL.....	529 036 166	114
ECM TERMINAL REMOVER 2.25.....	529 036 175	115
ECM TERMINAL REMOVER 3.36.....	529 036 174	115

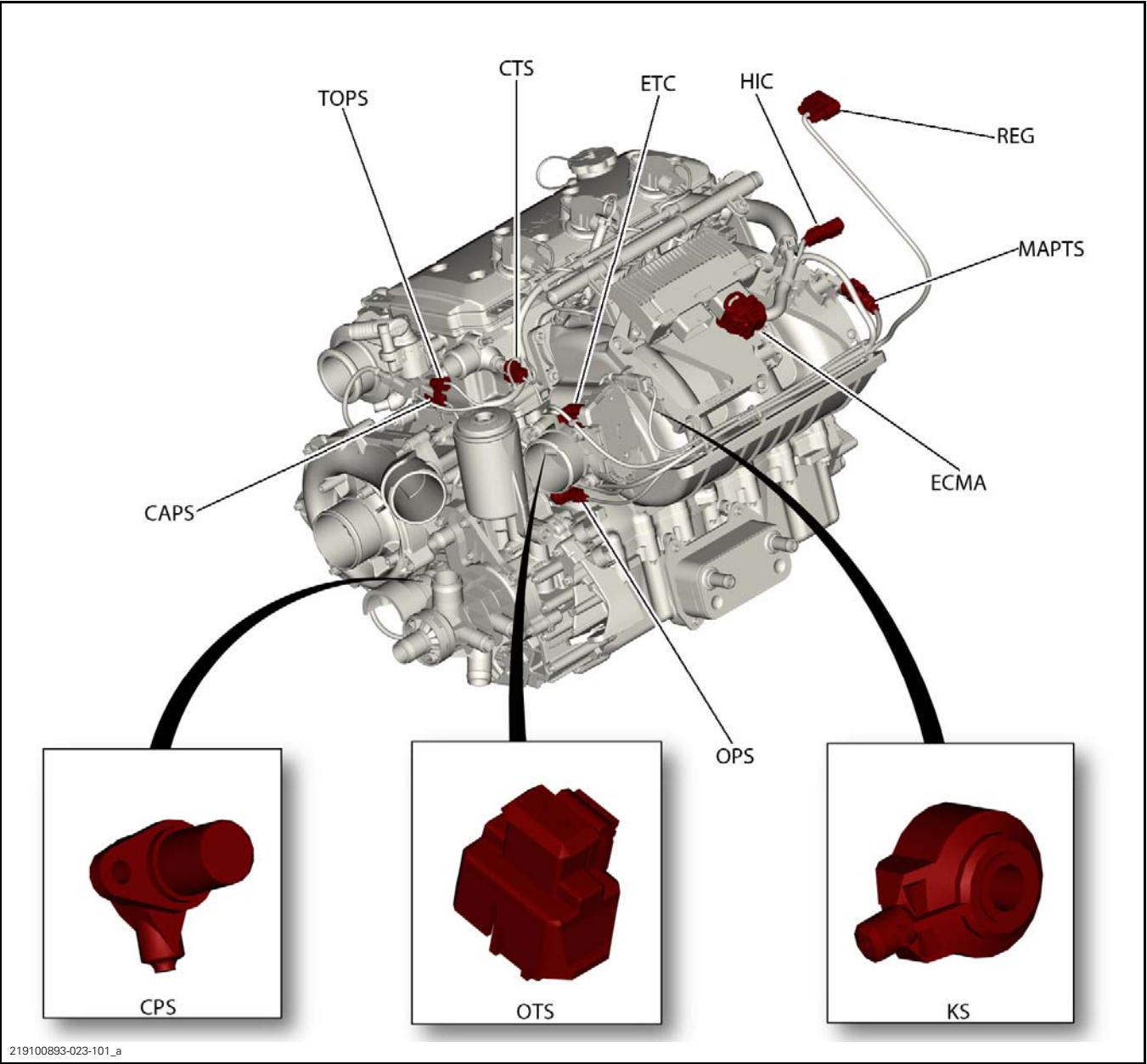
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
DELPHI TERMINAL EXTRACTOR	12094429	116
FCI TERMINAL EXTRACTOR TOOL	54241678	118
GM TERMINAL EXTRACTOR.....	12094430	119
MOLEX 150 TERMINAL EXTRACTOR TOOL	63813 - 1500	118

Section 05 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)

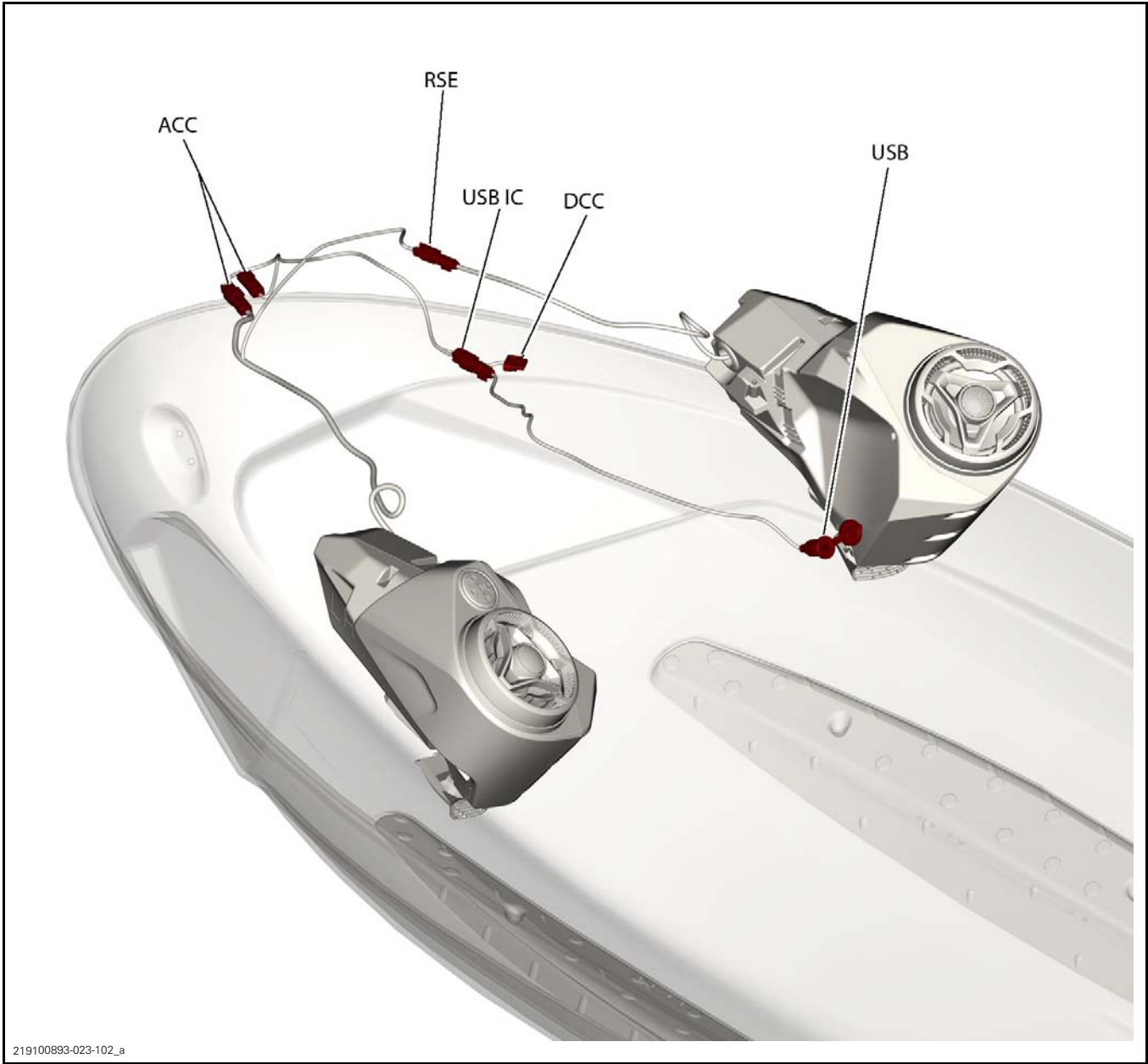


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Section 05 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)

Sound System and USB Option



GENERAL

ACRONYM	DESCRIPTION	ACRONYM	DESCRIPTION
ACC	Accessory	GND3	Engine Ground
BAT+	Battery +	GND4	Battery Ground
BAT-	Battery -	HIC	Harness Inter Connector to Engine
BRLS	Brake and Reverse Lever Sensor	HIC1	Harness Inter Connector to Steering 1
CAPS	Camshaft Position Sensor	HIC2	Harness Inter Connector to Steering 2
CL	Cluster	iBR	Intelligent Braking and Reverse
COM	Communication	KS	Knock Sensor
CPS	Crankshaft Position Sensor	LTS	Lake temperature sensor
CS	Cruise Switch	MAPTS	Manifold Air Pressure Sensor
CTS	Coolant Temperature sensor	MSL	Multi Switch Left
DCC	DC Connection	MSR	Multi Switch Right
DF	Depth finder	OPS	Oil Pressure Sensor
DS	DESS post	OTS	Oil temperature sensor
ECMA	ECM connector A	REG	Voltage Regulator/Rectifier connector
ECMB	ECM connector B	RSE	Right Speaker Enclosure
EGTS	Exhaust Gas Temperature	SSS	Start/Stop Switch
ETC	Electronic Throttle Control	STS	Starter Solenoid
FB	Fusebox	STR	Starter
FP	Fuel Pump	TAS	Throttle Accelerator Sensor
GND	Battery Ground	TOPS	Tip Over Position Sensor
GND1	Engine Ground	USB	USB Port
GND2	Engine Ground	USB IC	USB Inter Connector

PROCEDURES

WARNING

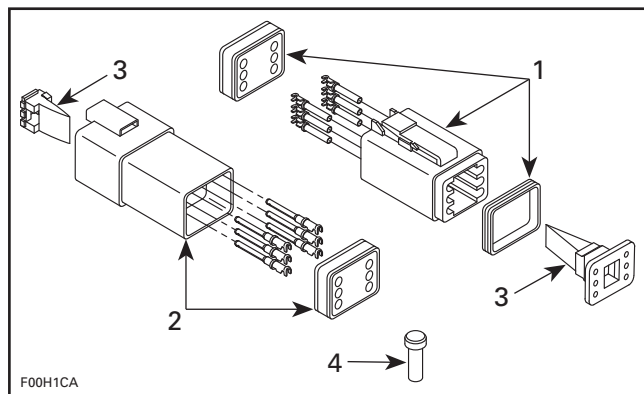
When disassembling any connector for repair or replacement on the vehicle, always disconnect the battery to ensure all electrical power is removed and prevent any possibility of a short circuit. Refer to *CHARGING SYSTEM* subsection.

Section 05 ELECTRICAL SYSTEM

Subsection 02 (WIRING HARNESS AND CONNECTORS)

DIAGNOSTIC CONNECTOR, LTS (DEUTSCH)

Disassembling and reassembling the Connector



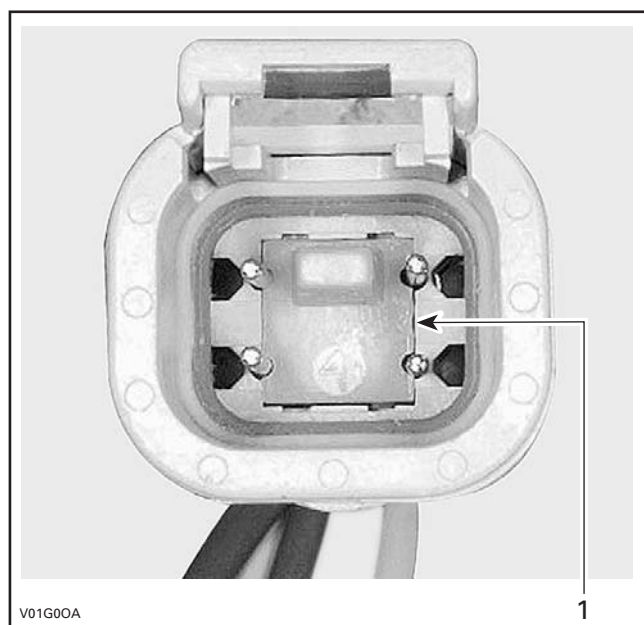
TYPICAL - DEUTSCH CONNECTOR

1. Male connector
2. Female connector
3. Secondary lock
4. Sealing cap

NOTICE Do not apply dielectric grease on terminal inside connector.

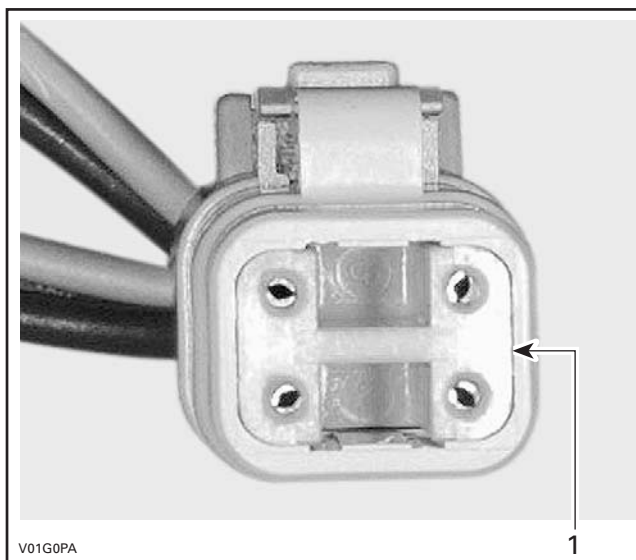
To remove terminals from connector, proceed as follows:

1. Using long nose pliers, pull out the plastic lock from between the terminals.



TYPICAL - FEMALE CONNECTOR

1. Female lock

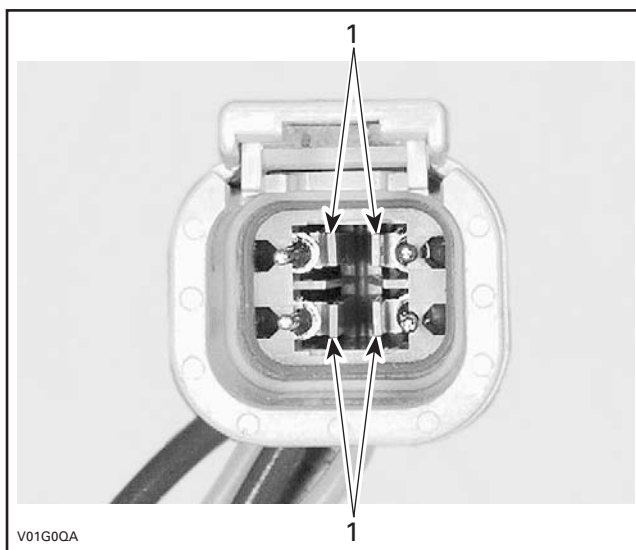


TYPICAL - MALE CONNECTOR

1. Male lock

NOTE: Before pin extraction, push wire forward to relieve pressure on retaining tab.

2. Insert a 4.8 mm (.189 in) wide screwdriver blade inside the front of the terminal cavity.
3. Pry the retaining tab away from the terminal while gently pulling the wire and terminal out of the back of the connector.



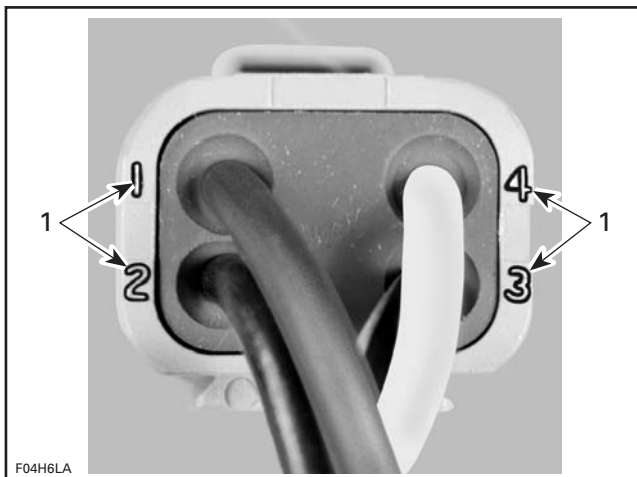
TYPICAL - FEMALE CONNECTOR

1. Retaining tabs

To install:

1. For insertion of a terminal, ensure the plastic lock is removed.
2. Insert terminal through the back of the connector in the appropriate position, and push it in as far as it will go. You should feel or hear the terminal lock engage.

3. Pull back on the terminal wire to ensure the retention fingers are holding the terminal.
4. After all required terminals have been inserted, the lock must be installed.



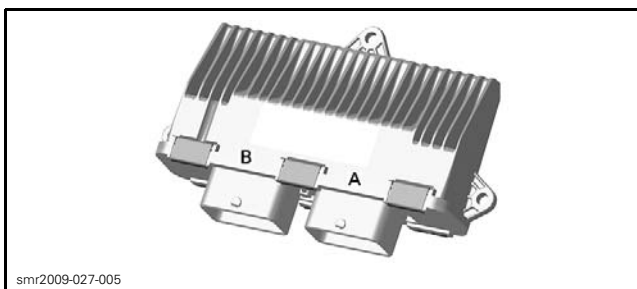
TYPICAL - CONNECTOR PIN-OUT
 1. Terminal position identification numbers

ECM CONNECTOR (MOLEX)

There are 2 connectors on the ECM.

The engine wiring harness connector is connected to ECM connector "A". The vehicle wiring harness connector is connected to ECM connector "B".

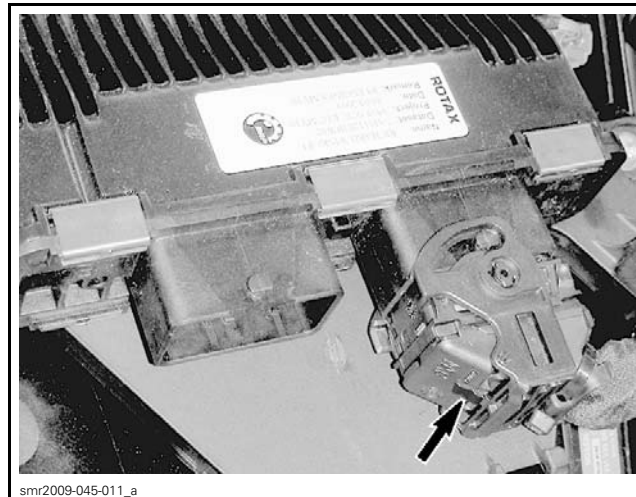
Each ECM connector has 48 pins however, connectors "A" and "B" are not interchangeable due to their specific keyways.



ECM CONNECTORS

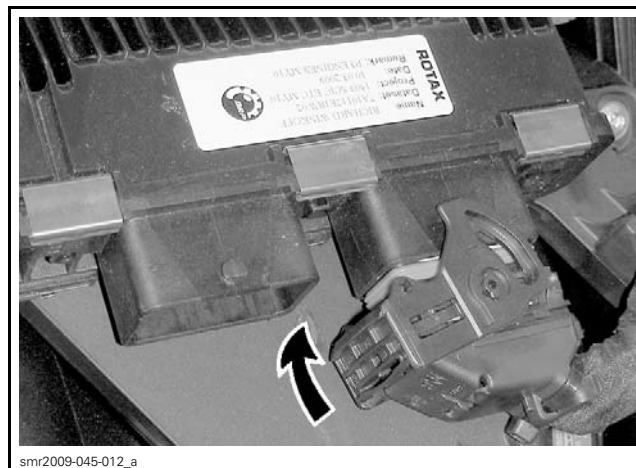
Removing the Connector

1. To access the ECM, refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
2. Press and hold the locking tab on the connector to be disconnected.



LOCKING TAB TO PRESS AND HOLD

3. As you hold the locking tab, rotate the connector locking cam until it stops.



CONNECTOR LOCKING CAM ROTATION TO RELEASE

4. Pull connector off ECM.



Installing the Connector

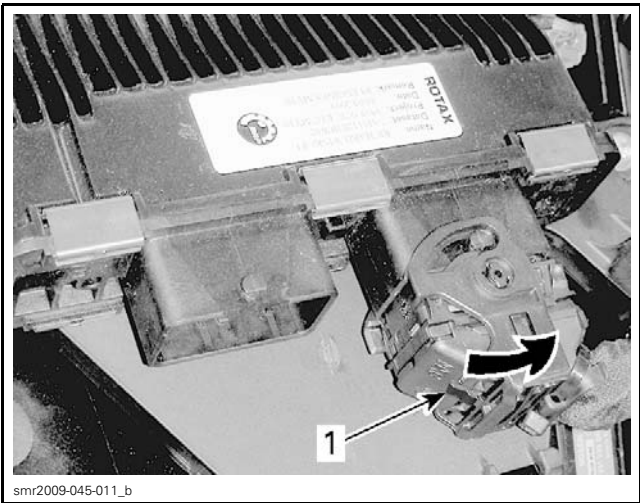
1. Fully open connector locking cam.

Section 05 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)



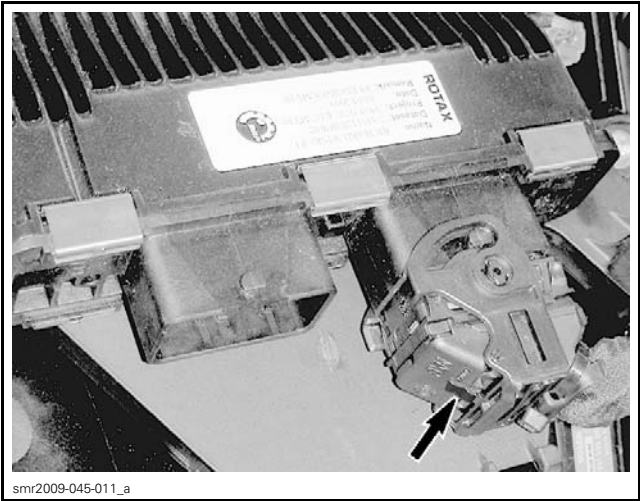
CONNECTOR LOCKING CAM IN RELEASE POSITION

2. Insert connector on ECM.
3. As you push the connector onto the ECM, rotate the connector locking cam until it snaps locked.



1. Locked here

4. Ensure the locking tab is fully out.



LOCKING TAB FULLY OUT

Inspecting the Connector

Before replacing an ECM, always check electrical connections.


1. Ensure connector locking mechanism is functioning properly.
2. Ensure all wire terminals (pins) are properly locked in the connector.
3. Ensure they are very tight, make good contact with the pins in the ECM.
4. Ensure the pins in the harness connector and the ECM connector are clean, shiny and corrosion-free.
5. Check wiring harness for signs of scoring.

NOTE: A “defective ECM module” could possibly be repaired simply by disconnecting and reconnecting it.

NOTICE Do not apply any lubricant product to the pins of the ECM connector.

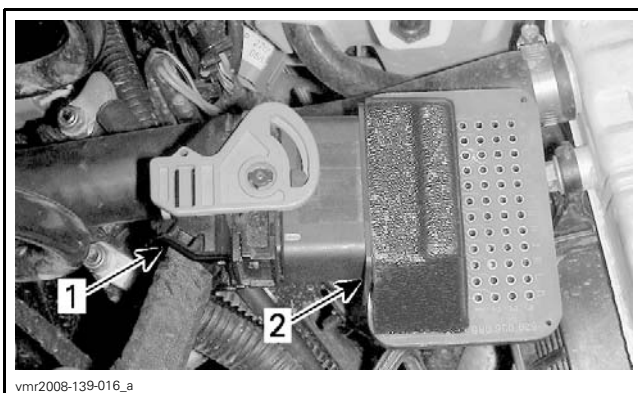
Probing the Connector

The most recommended and safest method to probe the MOLEX (ECM) connector terminals is to use the ECM adapter tool. This tool will prevent deforming or enlarging of the terminals, which would lead to bad ECM terminal contact creating intermittent or permanent problems.

REQUIRED TOOL	
ECM ADAPTER TOOL (P/N 529 036 166)	

1. Disconnect the ECM connector to be probed, and reconnect it on the ECM adapter.

2. Probe wire terminals of the circuit to be tested directly in the adapter holes.





TYPICAL
 1. ECM connector
 2. ECM adapter

NOTICE Never probe directly on the ECM harness connector. This could change the shape or enlarge the terminals and create intermittent or permanent contact problems.

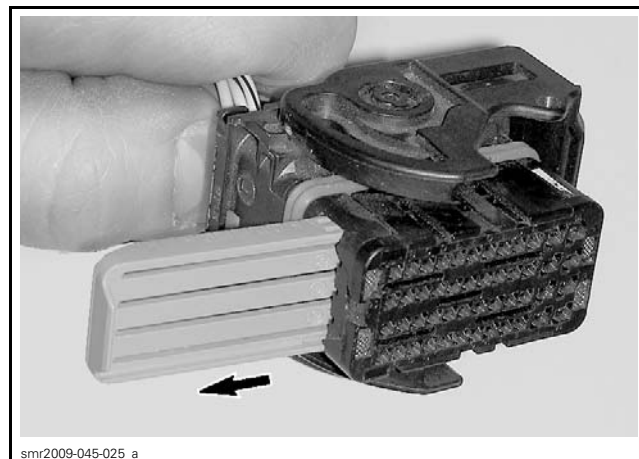
Removing Connector Terminal (Harness Connector)

To remove a signal terminal from the ECM harness connector, use the ECM terminal remover 2.25.

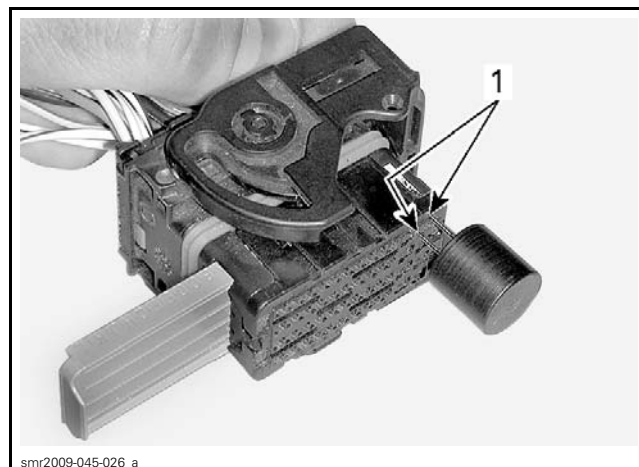
To remove a power terminal, use the ECM terminal remover 3.36.

REQUIRED TOOL	
ECM TERMINAL REMOVER 2.25 (P/N 529 036 175)	
ECM TERMINAL REMOVER 3.36 (P/N 529 036 174)	

1. Remove rear protector from connector.
2. Pull out the connector lock.

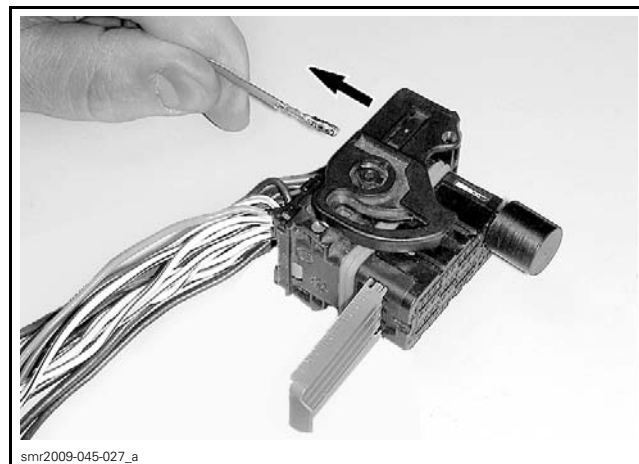


3. Insert tool to unlock terminal.



1. Unlock here

4. Gently pull on the wire to extract the terminal out the back of the connector.



Section 05 ELECTRICAL SYSTEM


Subsection 02 (WIRING HARNESS AND CONNECTORS)

NOTICE Before installing wire terminals in the connector, ensure all terminals are properly crimped on wires. After installation of wire terminals in the connectors, ensure they are properly locked by gently pulling on them as if to extract them.

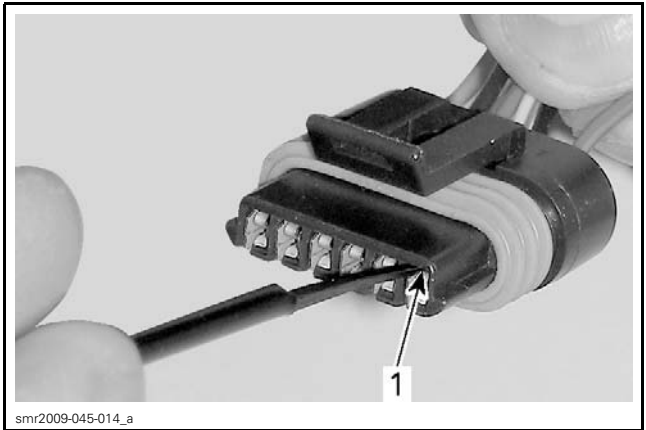
DS, STS, FP, TAS, BRLS, FB,
DCC, MSL, MSR,CONNECTORS
(DELPHI/PACKARD)

Removing the Connector Terminal

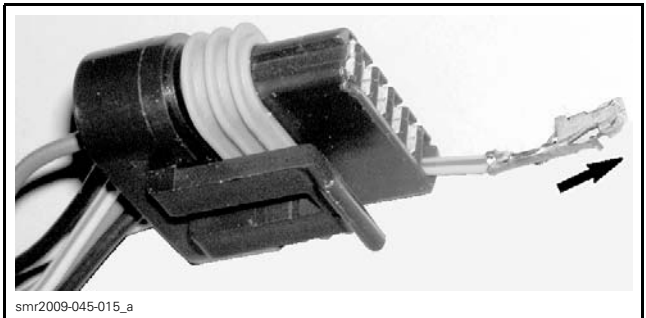
To remove a terminal (pin) from the connector, use a special tool such as the Delphi terminal extractor.

REQUIRED TOOL	
DELPHI TERMINAL EXTRACTOR (P/N 12094429)	

- NOTE:** Grinding the tool end to a taper is required.
- Carefully insert the tool in the space provided to release the pin lock.
 - Push the pin out the front of the connector by pushing on the wire.



1. Unlock terminal here

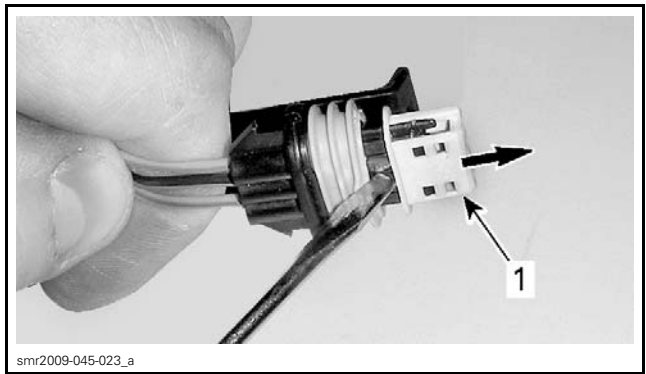


NOTICE Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

MSL, MSR CONNECTORS
(DELPHI)

Removing the Terminal

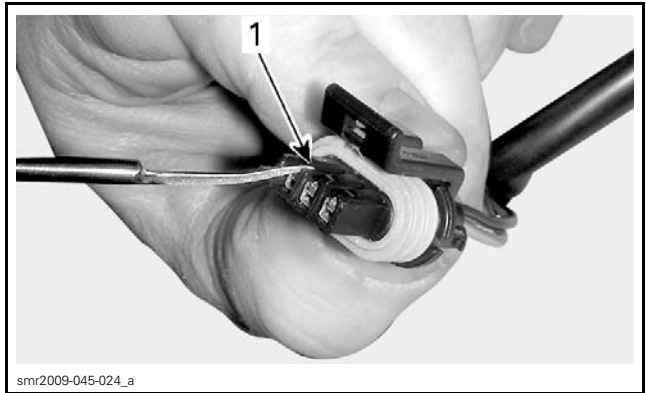
- To remove a terminal from connector, first remove the locking cap.



1. Pry out locking cap

- Carefully insert the Delphi terminal extractor in the space provided to release the pin lock.

REQUIRED TOOL	
DELPHI TERMINAL EXTRACTOR (P/N 12094429)	



1. Unlock here

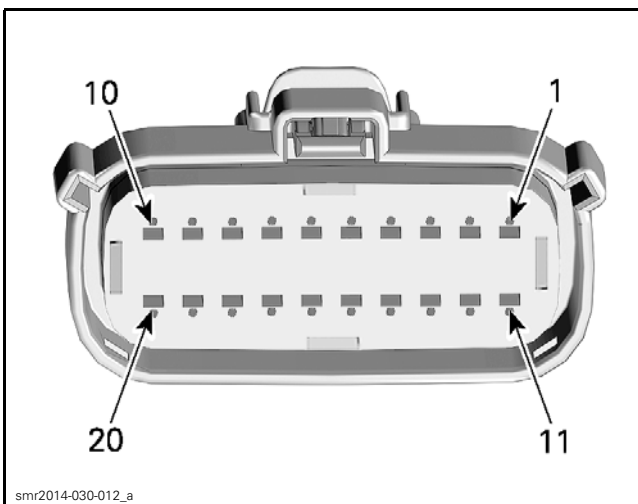
- Gently pull on the wire to extract the pin out the back of the connector.



NOTICE Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

ACC, HIC, HIC1, HIC2, USB IC, (MOLEX)

NOTE: 20 pin Molex is shown



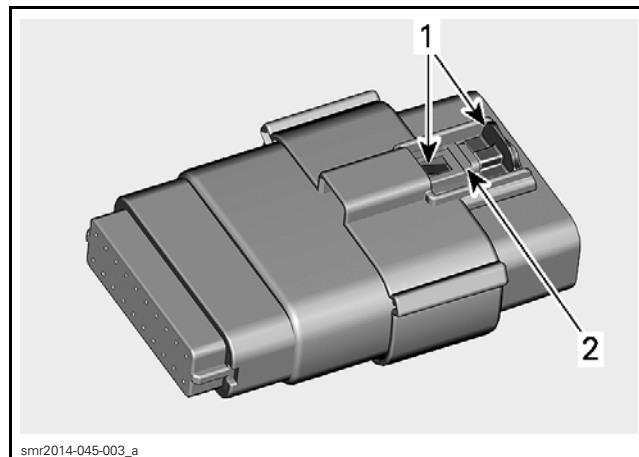
1. Female connector pin-out (sockets)

Disconnecting the Connector

Pull back the red secondary lock from the connector latch lever. Do not remove it from the latch.

Push the two connector assemblies together to unload the latch.


Depress the latch lever and pull the two connector assemblies apart.



1. Red secondary lock (shown out)
2. Latch lever

Probing the Connector

1. Disconnect the steering connector in the vehicle and connect it to the diagnostic harness.

REQUIRED TOOL	
DIAGNOSTIC HARNESS (P/N 529 036 384)	

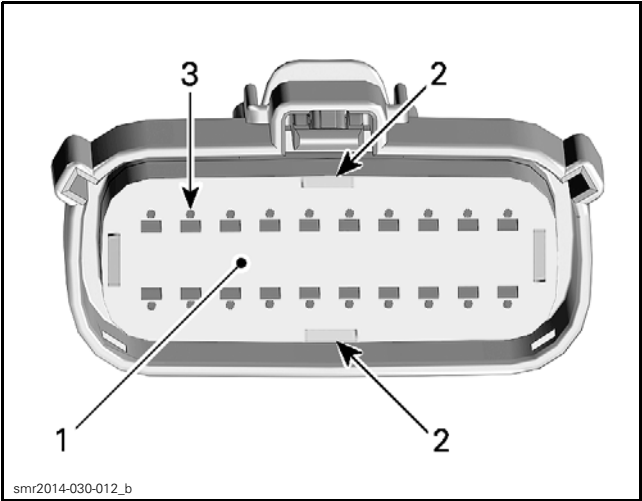
2. Probe the applicable circuit using the test connector on the diagnostic harness.

NOTICE Attempting to probe the connector without using the diagnostic connector may damage the connector pins, or even cause a short circuit if testing an energized circuit.

Extracting the Socket (Female Connector)

1. Insert a small flat screwdriver in the pry holes of the socket locator, on the socket side of the connector.

Section 05 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)



- 1. Socket locator
- 2. Pry holes
- 3. Holes for inserting terminal extractor tool

2. Carefully pull out the socket locator out to the detent position (approximately 5 mm).

NOTE: Do not remove the socket locator from the connector housing.

3. Insert the extractor tool in the small hole adjacent to the socket.

NOTE: Push the extractor tool in only as far as required to release the lock from the socket. The tool should slide along the socket and be inserted between the socket and the lock.

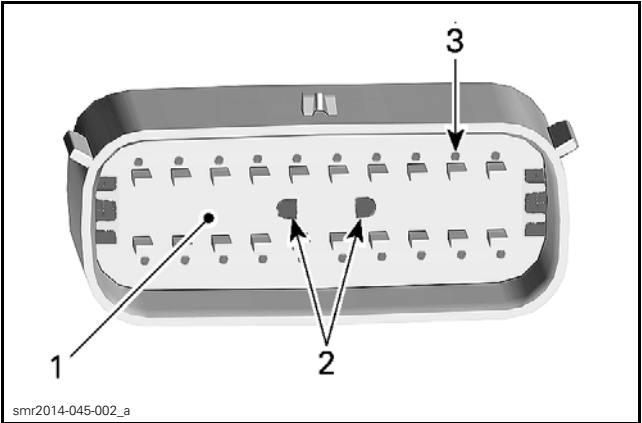
Table with 2 columns: Tool Name, Part Number, and Image. Row 1: FCI TERMINAL EXTRACTOR TOOL (P/N 54241678) or, with image of FCI 54241678. Row 2: MOLEX 150 TERMINAL EXTRACTOR TOOL (P/N 63813 - 1500) with image of MOLEX 63813-1500.

4. Gently pull on the wire to extract the socket out the back of the connector.

Extracting the Pin (Male Connector)

1. Using a pair of thin long nose pliers, pull the pin locator out to the detent position (approximately 5 mm). This will allow unlocking of the pins.

NOTICE Do not attempt to remove the pin locator or damage will occur. Be careful not to bend the pins when using the pliers.



- 1. Pin locator
- 2. Insert long nose pliers here
- 3. Holes for inserting terminal extractor tool

2. Insert the extractor tool in the small hole adjacent to the pin.

NOTE: Push the extractor tool in only as far as required to release the lock from the pin. The tool should slide along the pin and be inserted between the pin and the lock.

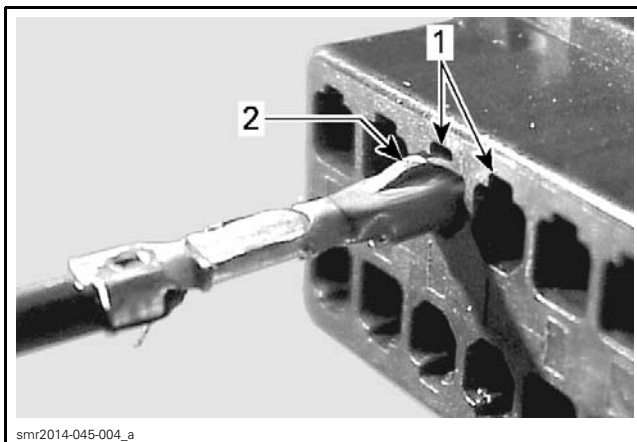
Table with 2 columns: Tool Name, Part Number, and Image. Row 1: FCI TERMINAL EXTRACTOR TOOL (P/N 54241678) or, with image of FCI 54241678. Row 2: MOLEX 150 TERMINAL EXTRACTOR TOOL (P/N 63813 - 1500) with image of MOLEX 63813-1500.

3. Gently pull on the wire to extract the pin out the back of the connector.

Inserting the Pin

- 1. Ensure the terminal (pin) is properly crimped onto the wire.
- 2. Ensure the pin locator (the white plastic insert in the connector) is out in the detent position.
- 3. Insert the pin in through the back of the connector.

NOTE: When inserting the pin, insert the stepped portion facing the notch in the connector pin hole.



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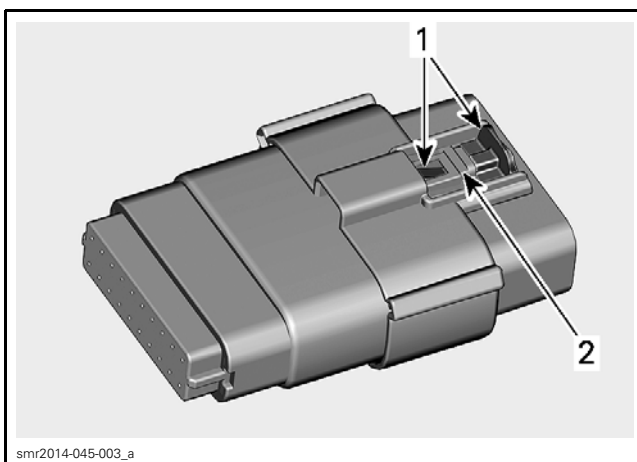
TYPICAL - PIN INSERTION

1. Notch
2. Stepped portion towards notch

4. Push the pin in until the pin lock engages the pin.
5. Gently pull on the pin to ensure it is properly locked.
6. Repeat previous steps for each pin to be inserted.
7. Push the pin locator into the connector to the locked position.

Reconnecting the MOLEX Connector

1. Insert the male connector into the female connector and push it in until the latch lever fully engages.
2. Push in the secondary lock (red tab) until it fully engages into the latch lever.

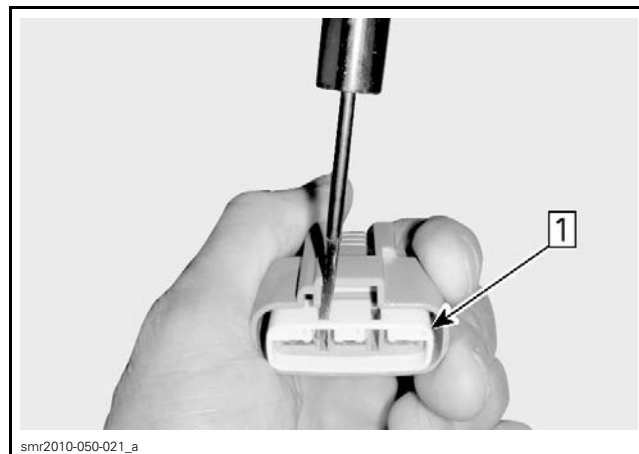


- smr2014-045-003_a
1. Red secondary lock (shown out)
 2. Latch lever

VOLTAGE REGULATOR/RECTIFIER CONNECTOR (FURUKAWA)

Removing the Terminal


1. Remove the secondary lock (plastic insert).

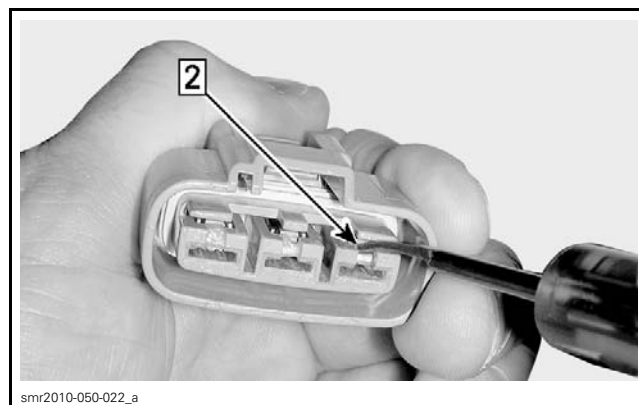


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Step 1: Remove the secondary lock

2. Carefully insert the GM terminal extractor between the lock and the pin to release the pin.

REQUIRED TOOL	
GM TERMINAL EXTRACTOR (P/N 12094430)	

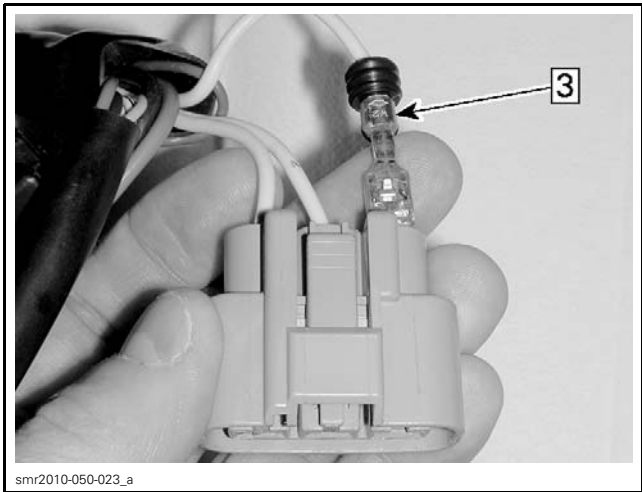


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Step 2: Insert GM extractor tool (P/N 12094430)

3. Gently pull on the wire to extract the pin out the back of the connector.

Section 05 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)



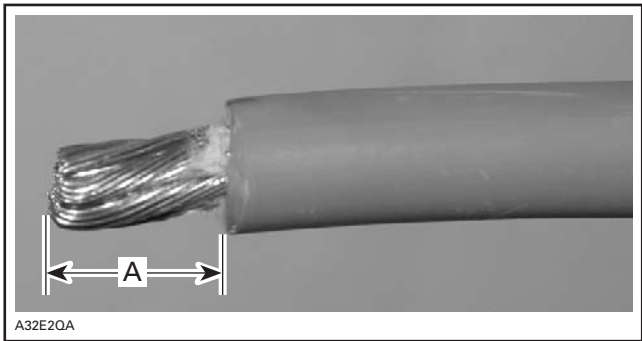
Step 3: Pull wire to extract pin

NOTICE Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

BATTERY CABLES

Crimping the Battery Cable

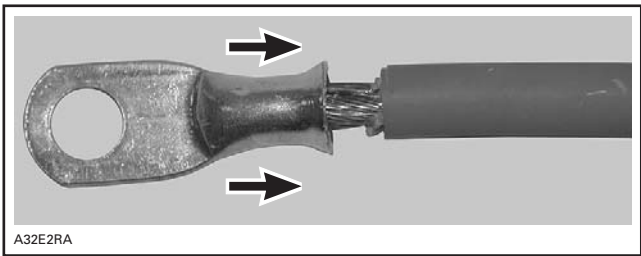
Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.



A. 10 mm (3/8 in)

NOTE: Make sure not to cut wire strands while stripping the wire.

Install the appropriate terminal on the wire according to the requirement. Refer to appropriate *PARTS CATALOG*.



INSTALLATION OF TERMINAL

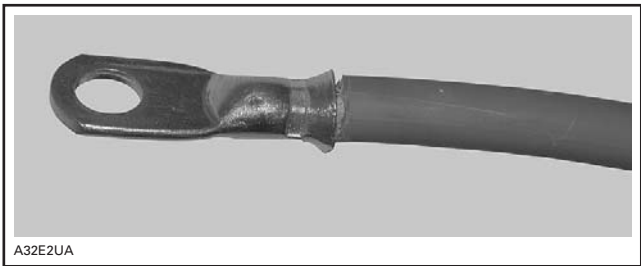
Follow the instructions provided with the crimping tool to select the proper position of the tool.

NOTE: Different wires require different crimping pliers settings, so make sure to follow the instruction supplied with the tool.

After positioning the crimping pliers, crimp the terminal already installed on wire.



CRIMPING OF WIRE



PROPERLY CRIMPED WIRE

To verify, if the wire is properly crimped, apply some pulling force on wire and the terminal at the same time from both directions.

NOTICE Never weld the wire to the terminal. Welding can change the property of the wire and it can become brittle and break.

Install the protective heat shrink rubber tube on the terminal. Heat the heat shrink rubber tube using the heat gun so that it grasps the wire and the terminal.

NOTICE Make sure that the protective heat shrink rubber tube has been properly installed and no part of wire is exposed.

CHARGING SYSTEM

GENERAL

SYSTEM DESCRIPTION

The purpose of the charging system is to maintain the battery at a full state of charge and to provide the electrical system with the required electrical power for normal vehicle operation.

Magneto

The magneto is the primary source of electrical energy. It transforms a magnetic field into an electric current (AC).

The magneto has a 3 phase stator.

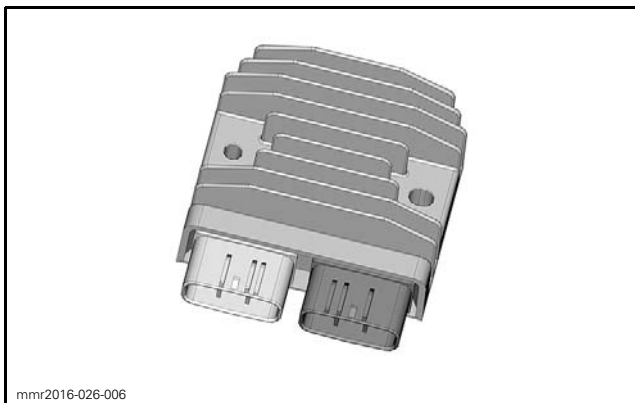


TYPICAL

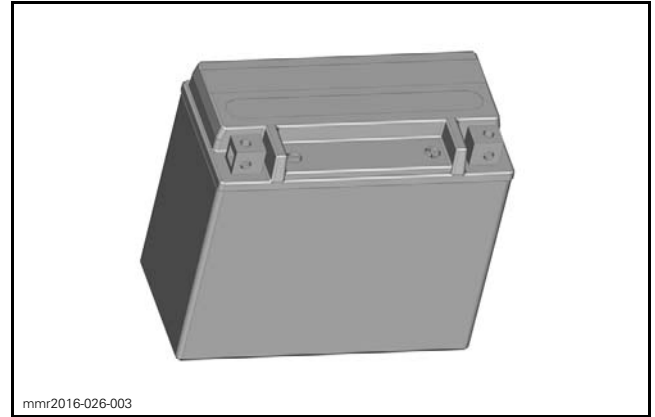
Voltage Regulator/Rectifier

The rectifier receives AC current from the magneto and transforms it into direct current (DC).

The voltage regulator, included in the same unit, limits voltage to a maximum level to prevent any damage to electrical components.



Battery



The battery supplies DC power to the electric starter for cranking the engine. During engine starting, it also supplies DC power to every electrical and electronic system in the vehicle as well as all accessories.

At low engine RPM operation and high current load conditions, it supplements the magneto output and helps to maintain a steady system voltage.

INSPECTION

CHARGING SYSTEM OUTPUT

First ensure that battery is in good condition prior to performing the following tests.

NOTE: It is good practice to check for fault codes using the BRP diagnostic software (BUDS2) as a first troubleshooting step. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

Testing the Output Voltage Using BUDS2

Connect the vehicle to the BRP diagnostic software (BUDS2).

In BUDS2, go to:

- **Measurements** page
- **ECM** button
- **Battery voltage (V)**

1. Start engine.

NOTE: Connect a garden hose to cool exhaust system. Refer to *EXHAUST SYSTEM* subsection.

2. Increase engine RPM as specified in the following table and read voltage.

Section 05 ELECTRICAL SYSTEM
Subsection 03 (CHARGING SYSTEM)

OUTPUT VOLTAGE TEST USING A MULTIMETER	
TEST ENGINE SPEED	VOLTAGE (DC)
5500 RPM	14.5 ± .5 Vdc

If voltage is above specification, replace voltage regulator/rectifier.

If voltage is below specification, check stator output and wiring harness prior to concluding that voltage regulator/rectifier is defective. Refer to *STARTING SYSTEM* subsection.

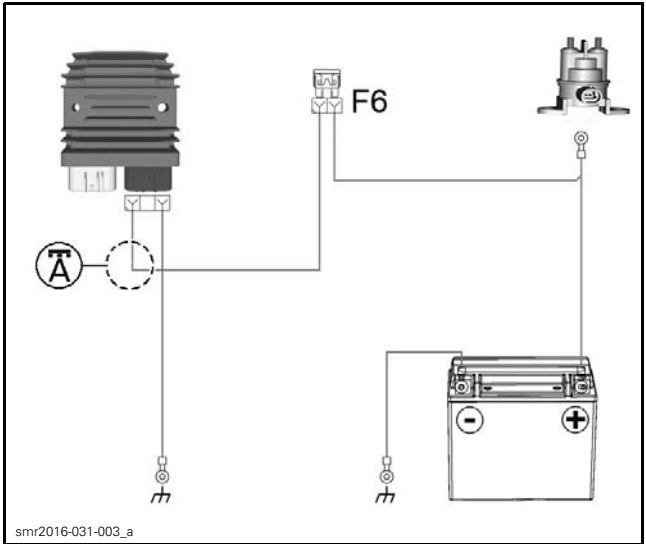
Testing the Output Current with an Inductive Ammeter

Use an inductive ammeter that can read at least 200 Aac and 40 Adc current.

1. Turn on the ammeter and select 40 Adc.

NOTE: Zero set the ammeter before use or reading may be erroneous.

VOLTAGE REGULATOR
RE1-1



2. Start engine.

NOTE: Connect a garden hose to cool exhaust system. Refer to *EXHAUST SYSTEM* subsection.

3. Increase engine RPM as specified in the following table and read current with the ammeter.

TEST ENGINE SPEED	CURRENT
5500 RPM	Approx. 10 A

NOTE: Initial current reading will be higher than specified due to the battery drain from the engine start. This is an indication that the charging system is operating normally. Current load will come down as the battery recovers its charge.

If current reading is far below specification, test stator output and wiring harness prior to concluding the voltage regulator/rectifier is faulty.

NOTE: If the battery is in poor condition or is not at a full state of charge, current reading will be above specification. Refer to *BATTERY* in this subsection for battery testing.

TROUBLESHOOTING

DISCHARGED OR WEAK BATTERY

1. **Battery posts and/or cable terminal oxidized.**
 - Clean battery terminals, posts, and coat with dielectric grease.
2. **Loose or bad connections.**
 - Check for wiring and connector tightness, frayed or broken wires. Repair or replace cables or connectors.
3. **Worn or faulty battery (sulfated, fretting, shorted plates or cell, damaged casing, loose post).**
 - Test *BATTERY VOLTAGE (LOAD APPLIED)*.
 - Replace battery.
4. **Burnt fuse(s) or faulty rectifier.**
 - First check fuse(s). If in good condition, check voltage regulator/rectifier.
5. **Faulty stator.**
 - Test stator and replace as required.
6. **Parasitic or "Key Off" current loads.**
 - Isolate, reduce or eliminate such loads.
 - Recharge battery as recommended if vehicle is not used for extended periods of time.

NOTE: "Key Off" or parasitic loads may be loads due to installed accessories. Parasitic loads may also be due to water infiltration in connectors, or partial short circuits that slowly drain a battery without causing a fuse to burn.

LOW OR NO CHARGING SYSTEM VOLTAGE

1. **Blown F6 fuse.**
 - Check F6 fuse.
2. **Defective stator.**
 - Test stator. Refer to *STARTING SYSTEM* subsection.

3. Defective charging system wiring or connections.
 - Check for damaged wiring.
 - Check for damaged or loose connections.

REPETITIVE BLOWN F6 FUSE

1. Voltage regulator/rectifier internal circuit shorted to ground.
 - Refer to *TESTING VOLTAGE REGULATOR/RECTIFIER FOR BLOWN F6 FUSE* in this subsection.

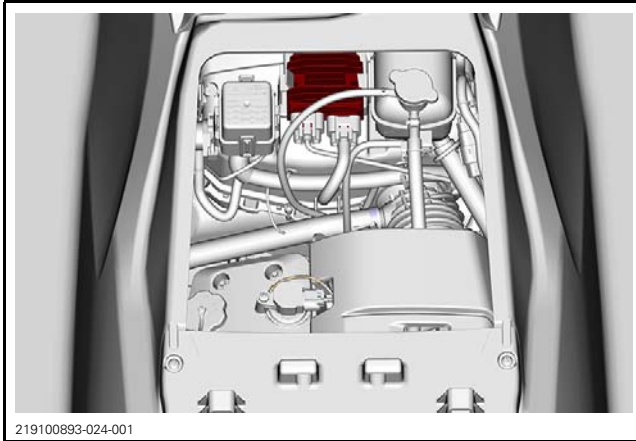
PROCEDURES

VOLTAGE REGULATOR/RECTIFIER

Testing the Voltage Regulator Continuity

Due to internal circuitry, there is no static test available to check continuity.

Voltage Regulator/Rectifier Location



Testing Voltage Regulator/Rectifier for Blown F6 Fuse

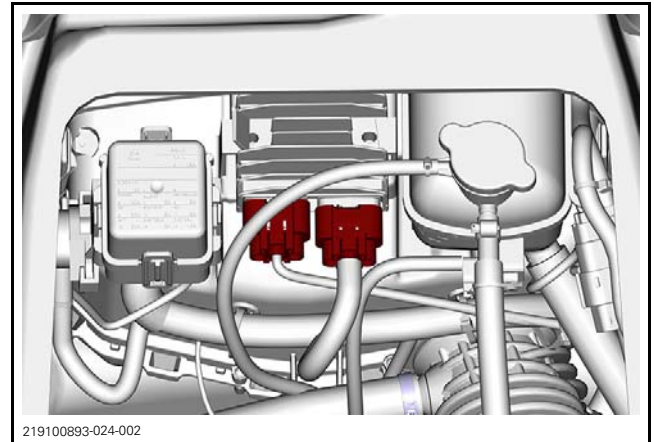
1. Detach the voltage regulator/rectifier from support. Refer to *REMOVING THE VOLTAGE REGULATOR/RECTIFIER* in this subsection.
2. Disconnect the voltage regulator/rectifier 2-wire connector.
3. Install a new fuse.

If the fuse still burns, check for a shorted wire or connector pin.

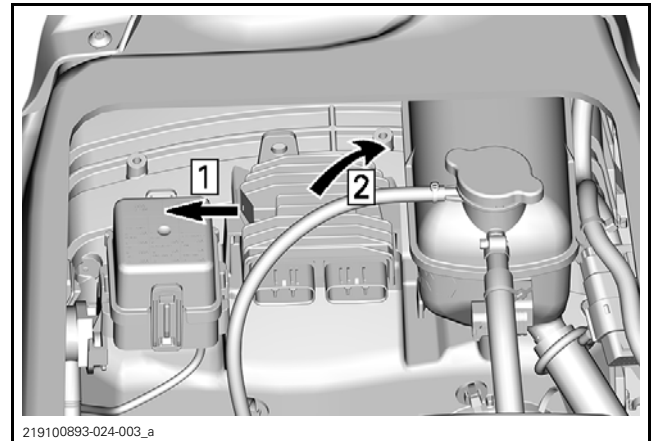
If fuse does not burn, replace regulator/rectifier.

Removing the Voltage Regulator/Rectifier

1. Disconnect both connectors from the voltage regulator/rectifier.



2. Push the support locking tab and remove voltage regulator/rectifier from its support.

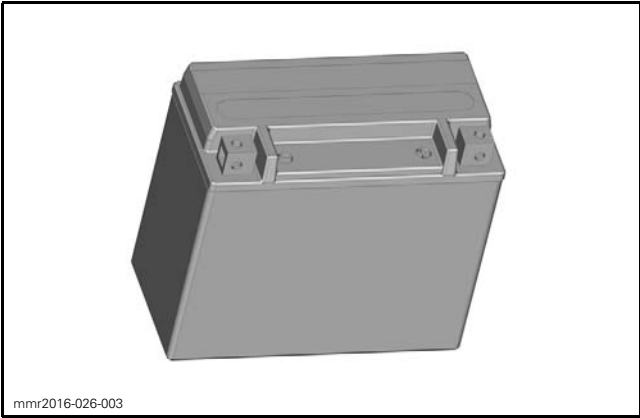


Step 1: Push locking tab
Step 2: Tilt voltage regulator to remove

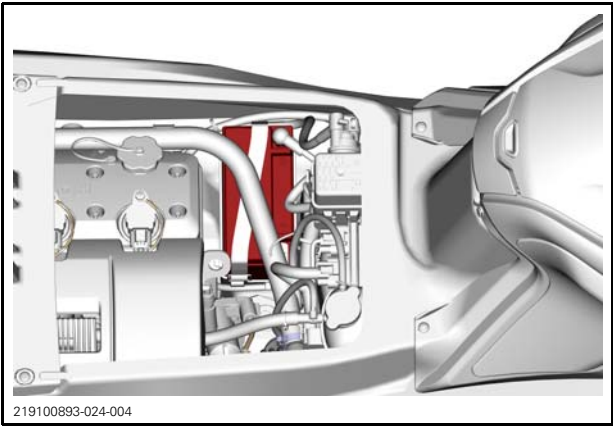
Installing the Voltage Regulator/Rectifier

Installation is the reverse of the removal procedure.

BATTERY



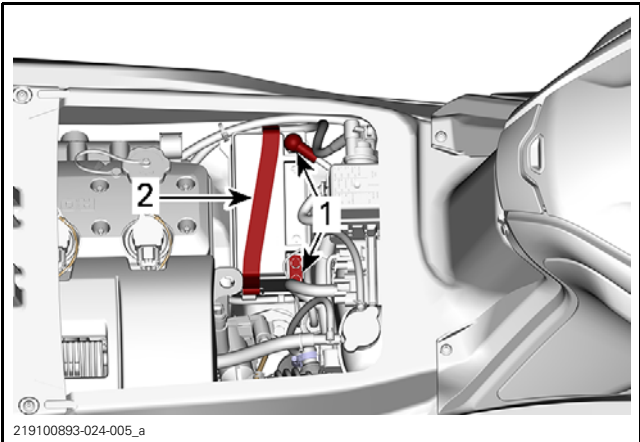
Battery Location



Removing the Battery

Disconnect battery posts and remove strap.

NOTICE Always respect this order for removal; disconnect BLACK cable first.



- 1. Battery post
- 2. Strap

Cleaning the Battery

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

NOTICE 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 then dry well.

Inspecting the Battery

- Keep the top free of grime
- Check casing, cables, clamps, and case for obvious damage or loose connections.
- Clean terminals and connectors as necessary

Refer to battery manufacturer guidelines.

Testing the Battery

There are 2 types of battery tests.

TEST METHOD	COMMENT
Testing voltage (load applied)	A dynamic voltage test with a load applied gives an accurate indication of the condition of the battery. This is the most recommended method.
Testing voltage (no load)	A static voltage test is carried out without discharging current. It is the simplest and most commonly used but the most likely to give false results.

Testing Battery Voltage (Load Applied)

1. Connect a battery load tester to battery.
2. Ensure proper test conditions:
 - Initial battery voltage above 12.5 Vdc
 - Engine OFF
 - Ambient temperature of 20°C (68°F)
3. Refer to load tester manufacturer for testing procedure.

If battery voltage has dropped below specification, the battery storage capacity has decreased appreciably and the battery should be replaced.

Testing the Battery Voltage (No Load)

NOTE: Be aware that the voltage test can indicate that the battery is in good condition even though the battery does not have enough stored energy to crank the engine. A load test gives a more accurate indication of the condition of the battery.

If the battery has just received a charge, wait 1-2 hours before taking a voltage reading.

Set multimeter to Vdc and measure voltage at battery terminals.

FULLY CHARGED BATTERY VOLTAGE (NO LOAD)
12.6 Vdc minimum

Storing the Battery

Disconnect and remove battery from watercraft as explained in *REMOVING THE BATTERY*.

NOTICE Battery storage is critical for battery life. Always refer to the battery manufacturer's instruction.

The battery must always be stored fully charged.

NOTICE Battery electrolyte temperature must not exceed 50°C (122°F) during charging. The battery casing should not feel hot to the touch.


Clean battery posts and cable terminals using a wire brush.

Clean battery casing and caps using a solution of baking soda and water. Apply a light coat of dielectric grease on battery posts and cable terminals.

Rinse battery with clear water and dry well using a clean cloth.

Store battery 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.

AMBIENT TEMPERATURE	CHARGING FREQUENCY
Below 16°C (60°F)	Every month
Above 16°C (60°F)	Every 2 weeks

 WARNING
Batteries must always be stored out of reach of children.

Activating a New Battery

Refer to instruction provided with the battery.

Charging a Used Battery

To find the recommended charger current output in amps for a specific battery, divide the battery amp hour rating by 10. For example a 14 AH battery should be charged at 1.4 amps (14 AH ÷ 10 = 1.4 amp current).

 WARNING
Never charge battery while installed in watercraft.

For best results, battery should be charged when it is at room temperature. A battery that is cold may not accept current for several hours after charging has begun.

Do not charge a frozen battery. If the battery charge is very low, the battery may freeze. If you suspect the battery to be frozen, move it to a heated area for about 2 hours (or more if required) to let it thaw out before charging.

 WARNING
Always charge a battery in a well ventilated area.

The time required to charge a battery will vary depending on several factors, such as:

- Battery temperature: The charging time is increased for a cold battery as charging current accepted by a cold battery will be lower than for a warm battery. As the battery warms up, it will accept a higher rate of charge.
- State of charge: As a battery discharges, it gives up its stored energy. The greater the discharge, the longer it will take to fully recharge it.
- Type of charger: Battery chargers vary in the amount of voltage and current that they can supply.

Charging a Very Flat or Completely Discharged Battery

The battery charger used should have an adjustable charging rate. 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.

1. 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. 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 not seem to accept the charge.
2. Exceptionally for this particular case, set the charger to a high rate.

Section 05 ELECTRICAL SYSTEM

Subsection 03 (CHARGING SYSTEM)

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.

3. Since battery chargers vary in the amount of voltage and current they provide, the time required for the battery to accept a measurable charger current may be up to 10 hours or more.
4. If the charging current is not up to a measurable amount after 10 hours, the battery should be replaced.
5. If the charging current is measurable before the end of the 10 hour period, the battery is good and charging should be completed at a lower rate.
6. It is recommended that any battery recharged using this procedure be tested under load prior to returning it to service.

Installing the Battery

Installation is the reverse of removal procedure.

NOTICE Always connect battery cables in the specified order, RED positive cable first, BLACK negative cable last.

1. Connect RED (+) cable.
2. Connect BLACK (-) cable last.
3. Apply dielectric grease on battery posts.
4. Verify cable routing and attachments.

STARTING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	129
ECM ADAPTER TOOL.....	529 036 166	129
FLUKE 115 MULTIMETER	529 035 868	129

GENERAL

BASIC STARTING SYSTEM OPERATION

Engine Cranking Conditions

The following conditions must be met to allow engine cranking:

1. START/STOP button pressed and released to activate the ECM.
2. The tether cord securely installed on the engine cut-off switch and the D.E.S.S. key recognized by the ECM as valid (2 short beeps)
3. START/STOP button pressed and held.

Starting System Logic

If the ECM recognizes a valid D.E.S.S. key, it allows engine cranking by providing the ground to the starter solenoid when the START/STOP button is pressed and held.




If the START/STOP button is activated while the throttle lever is depressed more than 60%, the engine will crank but will not start (engine drowned mode).

If the START/STOP button is held after engine has started, the ECM automatically stops the starter if engine speed reaches at least 1400 RPM.

If the START/STOP button is pressed when the engine is running, the engine will shut down.

Required Tools

To perform the tests in this subsection, the following tools are required.

REQUIRED TOOLS	
ECM ADAPTER TOOL (P/N 529 036 166)	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
DIAGNOSTIC HARNESS (P/N 529 036 384)	

TROUBLESHOOTING

DIAGNOSTIC TIPS

NOTE: It is a good practice to check for fault codes using the BRP diagnostic software (BUDS2) as a first troubleshooting step. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

Starting system failures are not necessarily related to the starter but may be due to one the following:

- Starter solenoid fuse F11
- Battery, refer to *CHARGING SYSTEM*
- START/STOP switch
- Starter solenoid
- Engine cut-off switch
- ECM
- Wiring/connections.

Check these components before removing the starter.

NOTE: This subsection assumes the problem is related to an electrical component of the starting system. If the starting system tests good, ensure engine and jet pump integrity. Refer to applicable subsection.

Section 05 ELECTRICAL SYSTEM

Subsection 04 (STARTING SYSTEM)

DIAGNOSTIC GUIDELINES

NOTHING HAPPENS WHEN START/STOP BUTTON PRESSED

1. Battery not connected
 - Connect battery.
2. Burnt fuse
 - F10 fuse: (START/STOP switch circuit).
 - F12 fuse: (main DC power fuses).
 - F11 fuse (ECM power fuse).
3. Defective relay or related circuits
 - Test relay and circuits.
4. Defective START/STOP switch
 - Test START/STOP switch, wiring and connections.

ENGINE DOES NOT CRANK

1. D.E.S.S. not functional or wrong D.E.S.S. key
 - If 2 short beeps are not heard when pressing the START/STOP button, refer to RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM subsection.
2. Burnt fuse
 - F11 fuse: (starter solenoid power) Carry out TESTING THE SOLENOID INPUT VOLTAGE.
3. Discharged battery
 - Recharge and test. Refer to CHARGING SYSTEM subsection.
4. Battery connections
 - Check/clean/tighten.
5. Poor/bad or corroded ground contacts (engine, battery ground cable, starter etc.)
 - Check/clean/repair, refer to POWER DISTRIBUTION AND GROUNDS subsection.
6. Starter solenoid
 - Test solenoid, wiring and connections.
7. Damaged starter or ground cables
 - Carry out TESTING THE SOLENOID (DYNAMIC).
8. Obstructed starter drive gear assembly
 - Check/repair, refer to PTO HOUSING, MAGNETO AND STARTER.
9. No ground provided by ECM to starter solenoid
 - Refer to TESTING THE CONTINUITY OF START/STOP SWITCH CONTROL CIRCUIT in this subsection.
10. Engine cannot be rotated (possibly seized or jet pump blocked)
 - Refer to ENGINE subsection.

ENGINE CRANKS SLOWLY

1. Loose, corroded or dirty battery cable connections
 - Check/clean/tighten.
2. Discharged/weak battery
 - Recharge and test. Refer to CHARGING SYSTEM subsection.
3. Low voltage from starter solenoid
 - Carry out a TESTING THE SOLENOID (DYNAMIC).
4. Damaged starter or ground cables
 - Carry out TESTING THE SOLENOID (DYNAMIC).
5. Worn starter
 - Check starter motor, refer to PTO HOUSING, MAGNETO AND STARTER subsection.

STARTER TURNS, BUT STARTER DRIVE DOES NOT MESH WITH RING GEAR

1. Worn starter drive gear/starter gear/ring gear
 - Replace worn parts. Refer to STARTER GEAR in this subsection and PTO HOUSING, MAGNETO AND STARTER subsection.
2. Defective drive
 - Replace starter drive. Refer to PTO HOUSING, MAGNETO AND STARTER subsection.

STARTER KEEPS RUNNING

1. Shorted solenoid winding
 - Replace solenoid.
2. Melted solenoid contacts
 - Replace solenoid.
3. Sticking or defective starter drive
 - Lubricate or replace. Refer to PTO HOUSING, MAGNETO AND STARTER.

PROCEDURES

NOTICE When carrying out any kind of maintenance on the starting system, always disconnect the battery ground cable. This will eliminate the possibility of shorting out a power cable, and generating a spark which could result in a fire or and explosion. Do not place any tool on the battery.

ENGINE START/STOP SWITCH

Testing the START/STOP Switch Circuit Continuity

1. Remove START/STOP switch fuse (F10).

Disconnect connector "B" from the ECM, refer to *WIRING HARNESS AND CONNECTOR* subsection.

Install ECM adapter tool on ECM harness connector "B".

Set the multimeter to Ω .

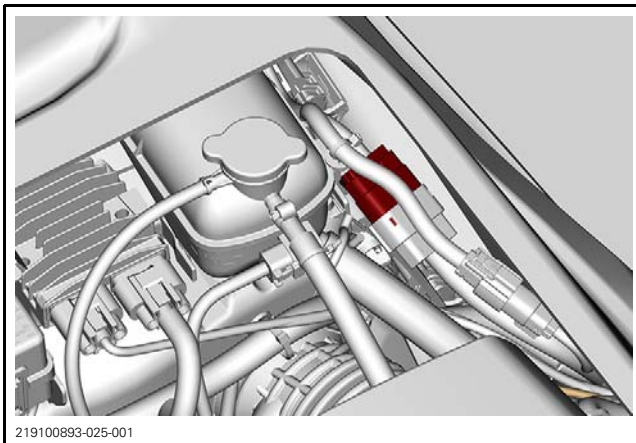
Press and hold the START/STOP switch and test for continuity of the switch circuit as per following table.

CONTINUITY TEST OF START/STOP SWITCH CIRCUIT (BUTTON PRESSED AND HELD)		
FUSE BOX	ECM CONNECTOR B	RESISTANCE
Pin E3	B-H2	Close to 0 Ω (continuity)

2. If the reading is as specified, the START/STOP switch and its wiring are good.
3. If a high resistance or an open circuit is measured, carry out *TESTING THE START/STOP SWITCH CONTINUITY*.

Testing the START/STOP Switch Continuity

1. Remove START/STOP switch fuse (F10).
2. Disconnect the 20-pin steering harness connector:



1. 20-pin steering connector

3. Use the multimeter and select Ω .
4. Measure resistance through switch as per following table.

CONTINUITY TEST OF START/STOP SWITCH CIRCUIT		
SWITCH POSITION	DIAGNOSTIC HARNESS CONNECTOR	RESISTANCE
Released	Pins 1 and 4	Infinite (OL)
Pressed and held		Close to 0 Ω

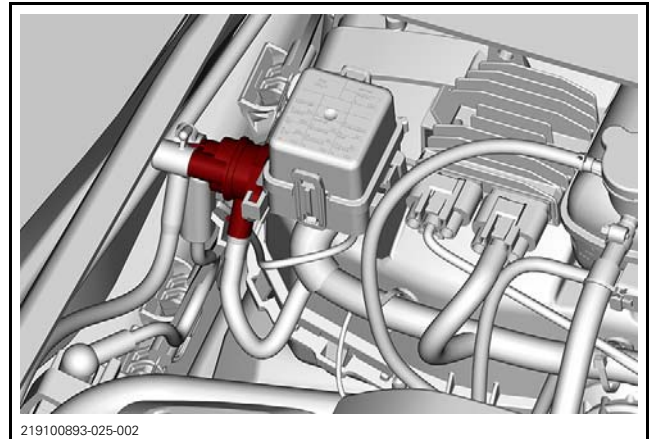
If the switch does not test as specified, replace the engine START/STOP switch.

If the switch tests as specified, check for an open circuit between connections as per table:

OPEN CIRCUIT TEST		
CIRCUIT CONNECTIONS		RESISTANCE
Fuse box pin E3	Steering harness connector pin 1	Must be close to 0 Ω
Steering connector pin 4	ECM connector B, pin H2	

STARTER SOLENOID

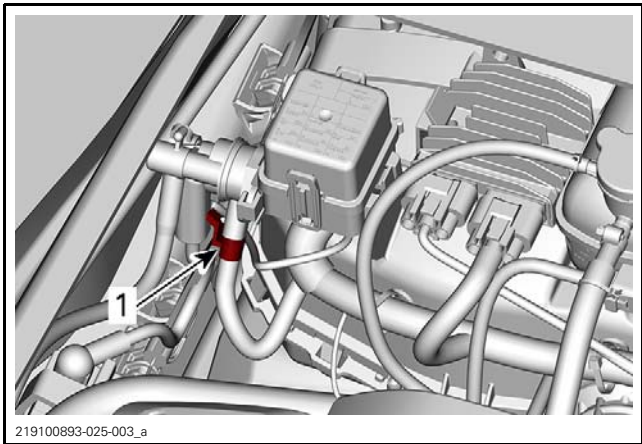
Starter Solenoid Location



Testing Solenoid Input Voltage

1. Make sure F11 fuse is powered and in good condition before testing.
2. Disconnect solenoid connector.

Section 05 ELECTRICAL SYSTEM
Subsection 04 (STARTING SYSTEM)



1. Starter solenoid connector

3. Set the multimeter to Vdc.
4. Install tether cord on the engine cut-off switch.
5. Press the START/STOP button to activate ECM.
6. Measure voltage within 75 seconds after START/STOP switch has been depressed.

SOLENOID INPUT VOLTAGE TEST (SOLENOID COIL)		
TEST PROBES		VOLTAGE READING
Pin A	Battery ground	Battery voltage

If test succeeded, carry out *TESTING SOLENOID CONTROL CIRCUIT*.

If test failed, carry out *TESTING THE START/STOP SWITCH CIRCUIT CONTINUITY*.

Testing Solenoid Control Circuit Continuity

1. Set the multimeter to Ω .
2. Disconnect connector "B" from ECM.
3. Install ECM adapter tool on ECM harness connector.
4. Test continuity of wiring from solenoid to ECM as per following table.

SOLENOID CONTROL CIRCUIT TEST		
SOLENOID CONNECTOR	ECM CONNECTOR B	RESISTANCE
Pin B	B-L4	Close to 0 Ω (continuity)

If test failed, repair or replace wiring/connectors.

If test succeeded, carry out *TESTING SOLENOID COIL RESISTANCE*.

Testing Solenoid Coil Resistance

1. Set multimeter to Ω .
2. Disconnect solenoid connector.
3. Measure solenoid coil resistance as per following table.

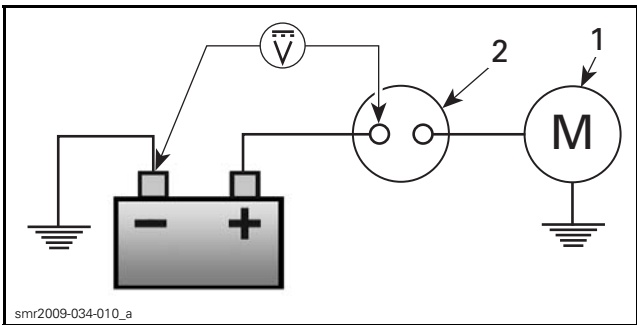
SOLENOID COIL RESISTANCE TEST		
SOLENOID CONNECTOR		RESISTANCE
Pin A	Pin B	4.5 to 5.5 Ω

If test fails, replace solenoid.

Testing Solenoid (Dynamic)

1. Ensure fuse F11, battery, and starter solenoid are properly connected.
2. Make sure the battery ground cable is securely connected to the engine. Refer to *POWER DISTRIBUTION AND GROUNDS*.
3. Set ECM in engine drowned mode:
 - 3.1 Depress throttle lever.
 - 3.2 Install a rubber band to hold lever in full throttle position.
4. Set multimeter to Vdc.
5. Crank engine.
6. **As engine is cranking**, measure the voltage as per following tables.

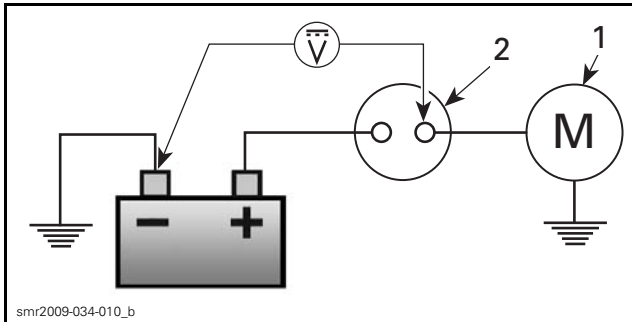
SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		VOLTAGE (DC)
Solenoid battery post	Battery ground	Battery voltage



1. Starter motor
2. Starter solenoid

7. If test failed, check battery positive cable (from battery to solenoid).
8. If test succeeded, continue with next step.

SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		VOLTAGE (DC)
Solenoid starter post	Battery ground	Battery voltage

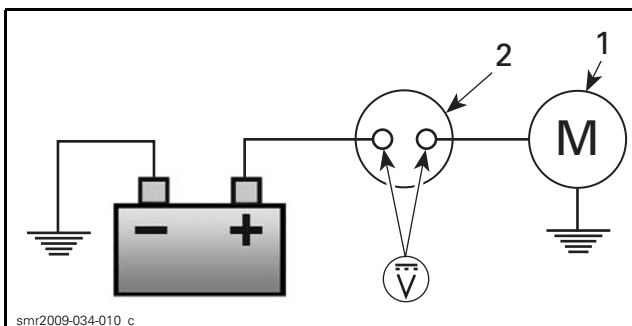


1. Starter motor
2. Starter solenoid

9. If test failed, carry out a *TESTING SOLENOID INPUT VOLTAGE*.

10. If test succeeded, continue with next step.

SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		VOLTAGE (DC)
Solenoid battery post	Solenoid starter post	0.2 Vdc max.



1. Starter motor
2. Starter solenoid

If test failed, replace solenoid.

If all solenoid dynamic tests are as specified, replace starter.

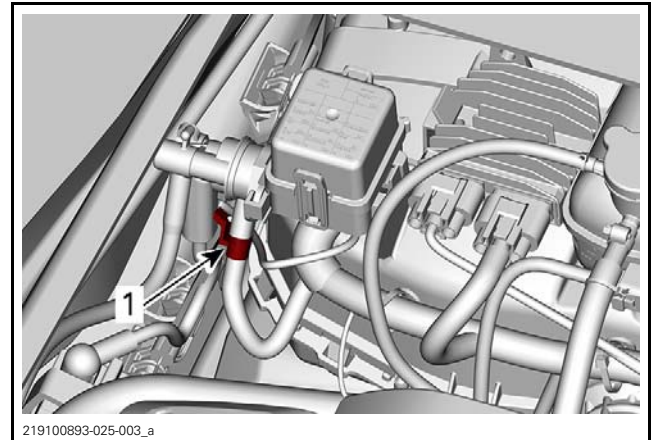
11. Remove rubber band from throttle lever.
12. Attach the electrical component support to the battery holder. Refer to *ELECTRICAL COMPONENT SUPPORT* in *CHARGING SYSTEM* subsection.
13. Reinstall removed parts.

Removing the Solenoid

1. Disconnect battery. Refer to *CHARGING SYSTEM* subsection.

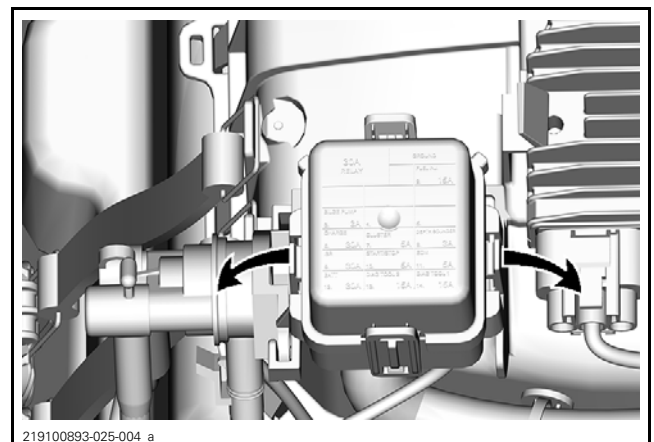
NOTICE Always disconnect the BLACK (-) battery cable first and reconnect last.

Disconnect solenoid connector.

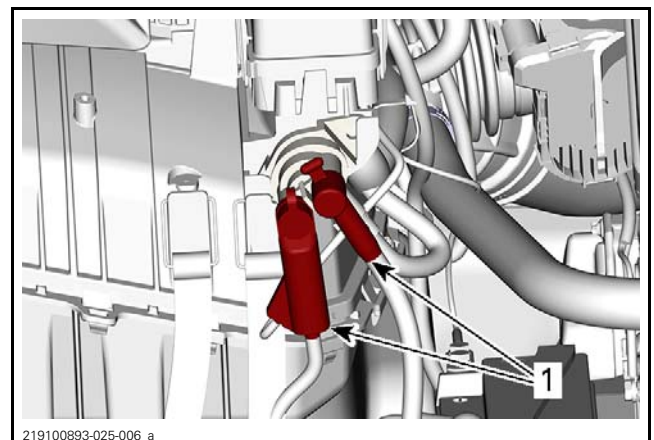


1. Starter solenoid connector

2. Set aside fuse box by opening the tabs and lifting it.



3. Disconnect solenoid cables.

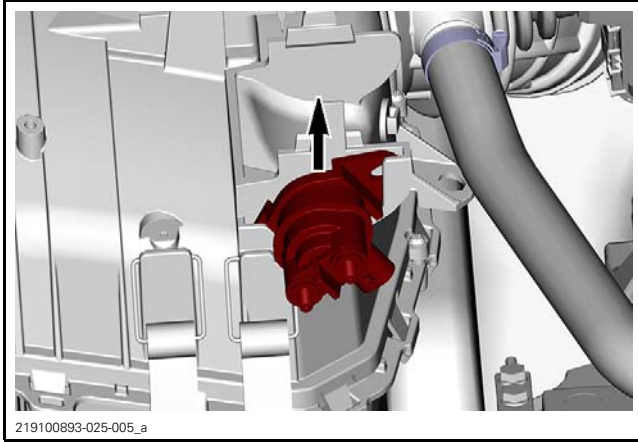


1. Cables

Lift starter solenoid.

Section 05 ELECTRICAL SYSTEM

Subsection 04 (STARTING SYSTEM)



Installing the Solenoid

The installation is the reverse of the removal procedure.

STARTER

For starter information refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.

RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM (RF D.E.S.S.)

GENERAL

SYSTEM DESCRIPTION

The following components are specially designed for this system: ECM, D.E.S.S. key (inside tether cord cap) and engine cut-off switch.

The D.E.S.S. key contains a magnet and a RFID chip.

- The magnet closes the hall effect switch inside the engine cut-off switch.
- The RFID chip contains a unique digital code. It is the equivalent of the tooth-pattern cut on a conventional ignition key.

The D.E.S.S. system allows the engine to start only if a tether cord cap is installed on the engine cut-off switch and the D.E.S.S. key is recognized as valid by the ECM.

The D.E.S.S. key is quite flexible:

- Up to 8 D.E.S.S. keys may be programmed in the ECM memory using the BRP diagnostic system (BUDS2) The keys can also be erased individually.
- The same D.E.S.S. key can be used on another vehicle equipped with the D.E.S.S. system. It only needs to be programmed for that vehicle.

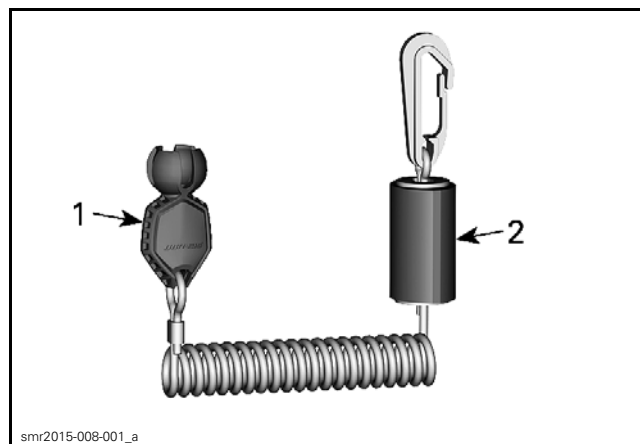
D.E.S.S. Key Types

Three types of keys can be used:

- Normal key
- Learning key

To ease key type recognition, the tether cord float comes in different colors.

KEY TYPE	FLOAT COLOR
Normal	Yellow or Black
Learning	Green



1. D.E.S.S. Key
 2. Tether cord float

Upon tether cord installation, the key type used is momentarily displayed by the multifunction gauge.

Learning keys provide a mode of operation whereby engine power and speed is limited.

There are 5 speed settings available for the learning key mode. By default, the key modes are preset to the speed setting (3). Refer to *INTELLIGENT THROTTLE CONTROL (iTC)* subsection.

NOTE: Changing key settings is only available when the engine is not running.

D.E.S.S. Key Beeper Codes

BEEPER	SIGNIFICATION
A 0.5 second beep every 5 seconds	Indicates the D.E.S.S. is reading the key.
2 short beeps	Indicates the D.E.S.S. recognizes the key.
A 1 second beep every 5 seconds	Indicates the D.E.S.S. does not recognize the key.

NOTE: Other beeps not related to D.E.S.S. can be heard. Refer to *DIAGNOSTIC AND FAULT CODES*.

Section 05 ELECTRICAL SYSTEM

Subsection 05 (RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM (RF D.E.S.S.))

TROUBLESHOOTING

DIAGNOSTIC GUIDELINES

The following is provided to help in diagnosing the probable cause of a problem. It is a guideline and should not be assumed to list all possible causes.

NO BEEP CODE WHEN KEY IS INSTALLED ON ENGINE CUT-OFF SWITCH — ENGINE CAN NOT BE STARTED

1. Gauge shuts-down after its WOW test: Defective engine cut-off switch
 - Check engine cut-off switch. Refer to *IGNITION SYSTEM* subsection.

NO BEEP CODE WHEN KEY IS INSTALLED ON ENGINE CUT-OFF SWITCH — ENGINE CAN BE STARTED

1. Defective gauge beeper
 - Check gauge beeper. Refer to *INFORMATION CENTER*.

GAUGE DISPLAYS "READING KEY" AND THERE IS NO KEY INSTALLED ON ENGINE CUT-OFF SWITCH

1. Gauge shuts-down after 3 minutes: Defective engine cut-off switch
 - Check engine cut-off switch.

KEY NOT READ (CONDITION CAN BE DUPLICATED WITH A MAGNET ON THE D.E.S.S. POST)

1. Damaged RFID chip
2. No voltage at RFID-D connector
3. No voltage at RFID-C connector
 - Try a new key
 - Refer to *WIRING DIAGRAM* and / or *IGNITION SYSTEM* and troubleshoot D.E.S.S. / Engine Cut-Off Switch

KEY NOT PRESENT (CONDITION CAN BE DUPLICATED BY UNPLUGGING THE RFID CONNECTOR)

1. No key installed
2. No **ground** at RFID-A connector
3. No voltage at RFID-B connector
4. No voltage at RFID-C connector

5. No voltage at RFID-D connector
 - Refer to *WIRING DIAGRAM* and / or *IGNITION SYSTEM* and troubleshoot D.E.S.S. / Engine Cut-Off Switch

INVALID KEY

1. Key not programmed to ECM
 - Program key

PROCEDURES

D.E.S.S. KEY

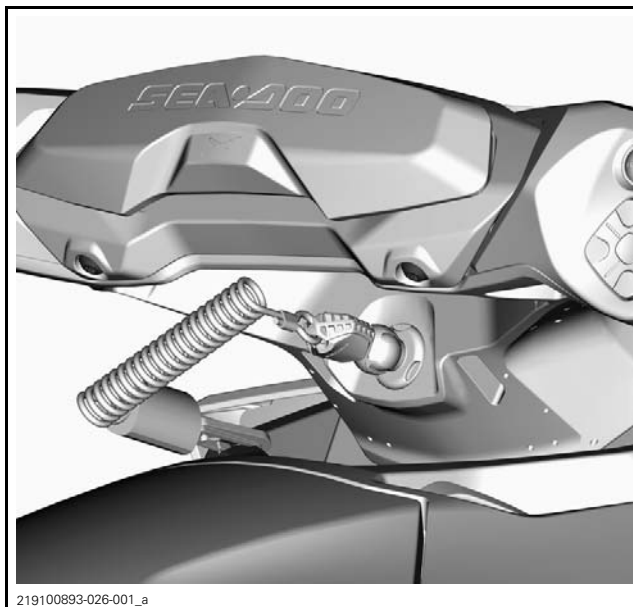
D.E.S.S. Key Recognition

To allow key recognition, carry out the following steps:

1. Briefly press the START/STOP button to wake up the ECM.
2. Securely install the tether cord on watercraft engine cut-off switch.
3. Press and hold the START/STOP button to start engine.

Programming D.E.S.S. Keys

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS* subsection.
2. Briefly press START/STOP button to power the ECM.
3. Install a tether cord on the engine cut-off switch to program a D.E.S.S. key.



4. Go to the key page.

Section 05 ELECTRICAL SYSTEM

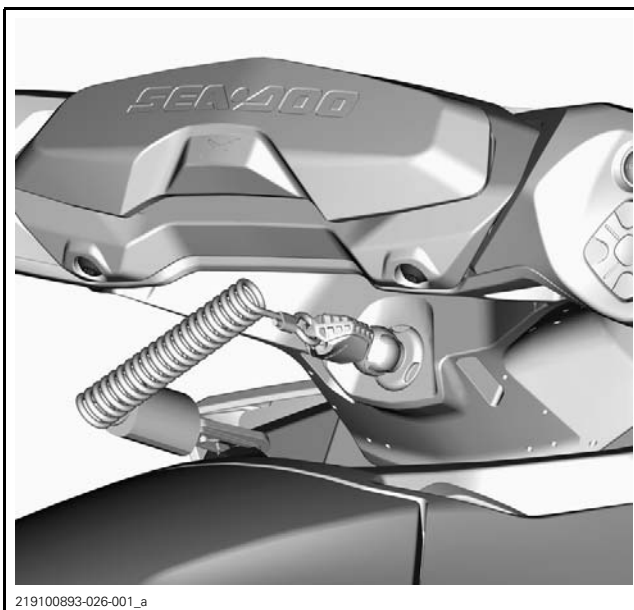
Subsection 05 (RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM (RF D.E.S.S.))

5. Ensure that anti-theft system is activated. If not, activate it before trying to add a key.
6. Install new key on the D.E.S.S. post.
7. Press the READ button (top right of the table).
8. Select key type
9. Press ADD button to register the key. The new key should be displayed in the table. Repeat steps 6 to 9 to add other keys.

Refer to *IGNITION SYSTEM* subsection for testing procedures.

Erasing Keys

1. Install the tether cord on the engine cut-off switch.



2. Click on **Erase Key**.

After approximately 10 seconds the following message will appear.

The key is now erased.

Erasing All Keys

1. Click on **Erase All Keys**.
2. When done, program at least one new key to the vehicle. Refer to *ADDING A KEY* in this subsection.

D.E.S.S. / Engine Cut-Off Operation

Normal Operation

The electrical system provides power to RFID-D. The ECM provides 5Vdc to the DESS module DS-C. The ECM provides a ground to the DESS module DS-A. When a key (tether cord) is installed on the DESS post, a hall effect switch closes and sends a 12-15Vdc signal to the ECM.

INFORMATION CENTER

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	139

GENERAL

Most of the electrical tests require the following tools.






REQUIRED TOOLS	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
Test light	

Refer to *WIRING DIAGRAM INFORMATION* subsection for diagnostic tips on troubleshooting electrical problems.

NOTICE It is recommended to always disconnect the battery when replacing any electrical component. Always disconnect battery as specified, BLACK (-) cable first. Do not place tools on battery.

INDICATOR LIGHTS AND MESSAGE DISPLAY INFORMATION

Important information about vehicle condition is displayed on the multifunction gauge. When starting the engine, always look at the gauge for any indicator lamps or special messages.

INDICATOR LIGHT / ICON (ON)	MESSAGE DISPLAY	DESCRIPTION
	LOW or HIGH BATTERY VOLTAGE	Low/high battery voltage
	HIGH TEMPERATURE	Engine or exhaust system overheating
	CHECK ENGINE or LIMP HOME MODE	Check engine (minor fault req. maint.) or LIMP HOME MODE (major eng. fault)
	LOW OIL PRESSURE	Low oil pressure
	IBR MODULE ERROR	Light is steady with a buzzer and a check engine light: iBR system fault (refer to an authorized Sea-Doo dealer)
	—	Light is flashing: iBR system fault (refer to an authorized Sea-Doo dealer)
	—	Light is steady with no buzzer: iBR system still functional but needs to be inspected by an authorized Sea-Doo dealer

MESSAGE DISPLAY INFORMATION	
HIGH EXHAUST TEMPERATURE	High exhaust temperature detected
HIGH ENGINE TEMPERATURE	High engine temperature detected
CHECK ENGINE	Engine system malfunction or maintenance required
LIMP HOME MODE	Major fault detected, engine power limited
FUEL SENSOR FAULT	Fuel level sensor fault

MESSAGE DISPLAY INFORMATION	
WATER TEMP SENSOR DEFECTIVE	Problem with water temperature sensor, not sending water temperature info.
IBR MODULE ERROR	iBR system malfunction
MAINTENANCE REQUIRED	Watercraft maintenance required

When a digital warning appears, it will show the warning for 6 seconds and then the warning will disappear for 15 minutes. During the 15 minutes, only the indicator lamps will be activated.

TROUBLESHOOTING

DIAGNOSTIC TIPS

IMPORTANT: When solving an electrical problem, the first thing to do is to check the battery condition as well as its cables and connections.

Make sure the battery is fully charged or install a power pack for any tests that involves a prolonged "key ON" period. If battery voltage gets too low, not only test results can be altered, but the vehicle electrical system may not operate normally.

Pay attention to ground wires. They could become loose or corroded which causes them to act as an additional load in a circuit, dropping voltage and reducing current to components. Some components may be grounded through their outer casing and mounted hardware. This should also be considered.

Electrical Connectors

Pay particular attention to ensure that pins are not out of their connectors, loose, or damaged. The troubleshooting procedures may not cover problems resulting from one of these causes.

NOTICE Ensure all terminals are properly crimped on wires and connector housings are properly fastened. When replacing any electric or electronic part(s), always check electrical connections. Make sure that they are clean, corrosion-free, tight and make good contact. The voltage and current might be too weak to go through dirty or corroded connector pins or terminals.

**MULTIFUNCTION GAUGE
TROUBLESHOOTING**

**GAUGE FUNCTIONS INOPERATIVE OR
WORKING INTERMITTENTLY**

- 1. Power supply or ground problem
 - Check power supply and ground circuits.

PROCEDURES

**TESTING THE MULTIFUNCTION
GAUGE**

Before beginning any troubleshooting, test or repair, always check for fault codes.

- 1. Check for fault codes using BUDS2.
- 2. Record all fault codes, then erase them.
- 3. Perform a complete shutdown of the electrical system and reactivate it.
- 4. Check fault codes. If a previous fault codes reappears, perform the required service actions.

**Testing the Multifunction Gauge Using
BRP Diagnostic Software (BUDS2)**

Connect vehicle to the latest applicable BRP Diagnostic Software version. Refer to *COMMUNICATION TOOLS* subsection.

Select the **Functions** tab.

Click on the **Execute WOW Test** button.

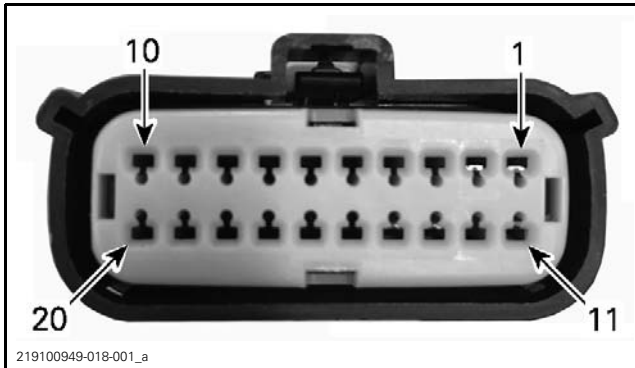
All indications will come and stay ON so that you can verify each indication.

NOTE: The **WOW Test** only tests the gauge LEDs and LCD. It does not test the actual circuit functions related to each indication.

**Testing the Multifunction Gauge Power
Input**

If the multifunction gauge is inoperative, first check for fault codes with BRP Diagnostic Software, record all faults then erase them. Reactivate the electrical system and recheck for faults. If any fault code appears, perform service actions required. Refer to *COMMUNICATION TOOLS* subsection.

- 1. Remove multifunction gauge. Refer to procedure in this subsection.
- 2. Perform testing at multifunction gauge connector as per following illustration and tables.



MULTIFUNCTION GAUGE CONNECTOR (PIN-OUT)

MULTIFUNCTION GAUGE POWER TEST			
CL_A CONNECTOR	BATTERY	IGNITION POSITION	SPECIFICATION
pin 1	Negative (-) post	Any	Close to battery voltage
pin 11		ON	Close to battery voltage

If there is no power at pin 1, check fuse F10 and the related circuit.

If there is no power at pin 11, in check fuse F7, MAIN relay RY1, and the related circuit.

If the power test is within specification, continue with *TESTING THE MULTIFUNCTION GAUGE GROUND CIRCUIT*.

Testing the Multifunction Gauge Ground Circuit

Test as per the following table.

MULTIFUNCTION GAUGE GROUND TEST		
CL_A CONNECTOR	BATTERY	SPECIFICATION
Pin 2	Negative (-) post	Close to 1 Ω

If the ground at pin 2 is not within specification, check the related circuit.

If the ground tested to specification, continue with *TESTING THE MULTIFUNCTION GAUGE CAN CIRCUIT*.

Testing the Multifunction Gauge CAN Circuit

1. Remove the seats for access to the DLC (Diagnostic Link Connector). Refer to *BODY* subsection.

2. Test as per the following table.

MULTIFUNCTION GAUGE CAN WIRE TEST		
CL_A CONNECTOR	DLC	SPECIFICATION
Pin 13 (CAN HI)	Pin 1	Close to 0.4 Ω
Pin 14 (CAN LO)	Pin 2	Close to 0.4 Ω

If the CAN wire verification test fails, check the related circuit.

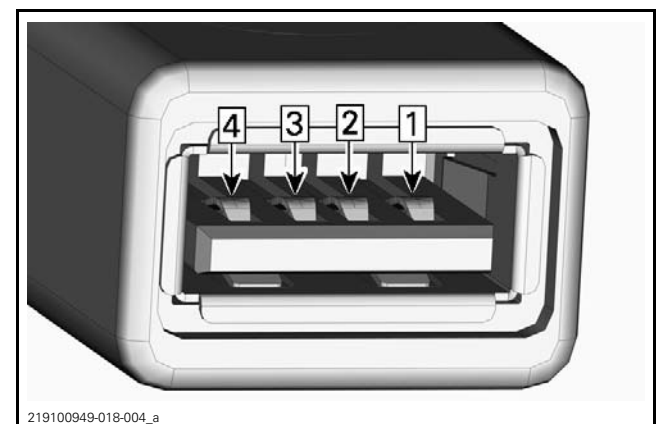
If the multifunction gauge functions, however there is a suspected communication problem with another component, perform this test between the multifunction gauge and that component.

If the multifunction gauge power, ground and CAN verification tests are all to specifications and the multifunction gauge is inoperative, replace the multifunction gauge.

Testing the Multifunction Gauge USB Power Voltage

1. Test as per the following table.

MULTIFUNCTION GAUGE USB POWER VOLTAGE TEST AT USB CONNECTOR		
USB CONNECTOR	BATTERY	SPECIFICATION
Pin 1	Negative (-) post	Close to 5 V



USB CONNECTOR PINOUT

- Pin 1 (5V)
- Pin 2 (Data -)
- Pin 3 (Data +)
- Pin 4 (Ground)

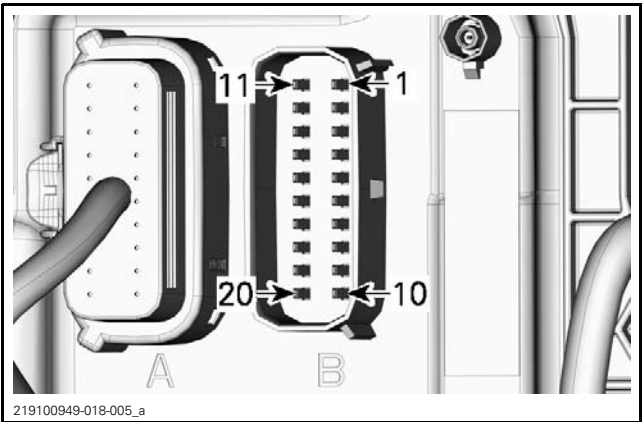
If result is not as per specification, continue with the following steps.

- Disconnect connector CL_B from the gauge.
- Test as per the following table.

Section 05 ELECTRICAL SYSTEM

Subsection 06 (INFORMATION CENTER)

MULTIFUNCTION GAUGE USB POWER VOLTAGE TEST AT GAUGE		
GAUGE PINOUT B	BATTERY	SPECIFICATION
Pin 20	Negative (-) post	Close to 5 V



GAUGE PINOUT B

If result is not as per specification, test with a new gauge.

If result is good, carry out a *TESTING THE MULTIFUNCTION GAUGE USB CIRCUIT*.

Testing the Multifunction Gauge USB Ground Circuit

1. Test as per the following table.

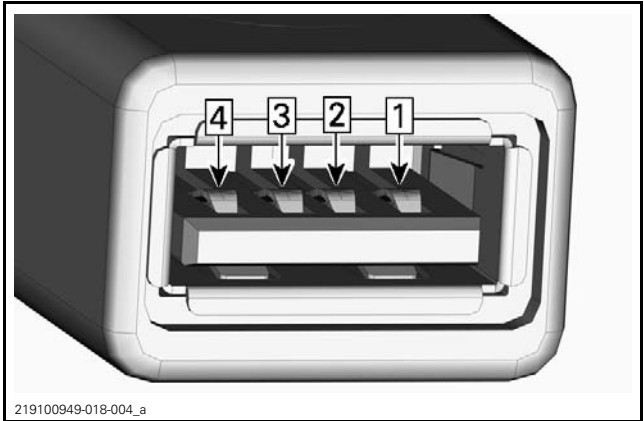
MULTIFUNCTION GAUGE USB GROUND CIRCUIT TEST AT USB CONNECTOR		
USB CONNECTOR	BATTERY	SPECIFICATION
Pin 4	Negative (-) post	Close to 1.5 Ω

If the result is not within specification, check the related circuit.

Testing the Multifunction Gauge USB Circuit

1. Disconnect Connector CL_B from the gauge.
2. Test as per the following table.

MULTIFUNCTION GAUGE USB CIRCUIT TEST		
CL_B CONNECTOR	USB CONNECTOR	SPECIFICATION
Pin 20	Pin 1 (5V)	Close to 0.4 Ω
Pin 9	Pin 2 (Data -)	
Pin 8	Pin 3 (Data +)	
Pin 10	Pin 4 (Ground)	



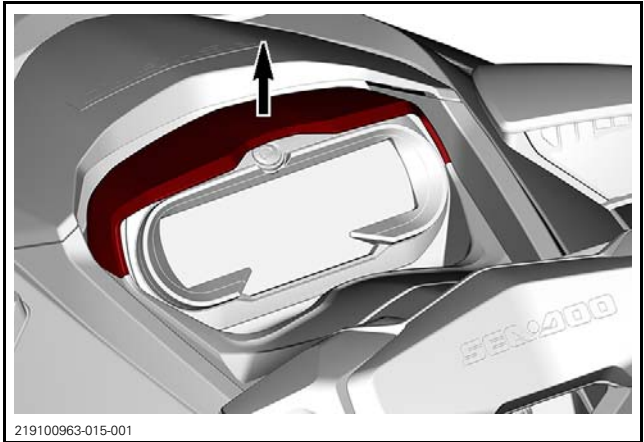
USB CONNECTOR PINOUT

1. Pin 1 (5V)
2. Pin 2 (Data -)
3. Pin 3 (Data +)
4. Pin 4 (Ground)

If results are out of specifications, repair the defective circuit.

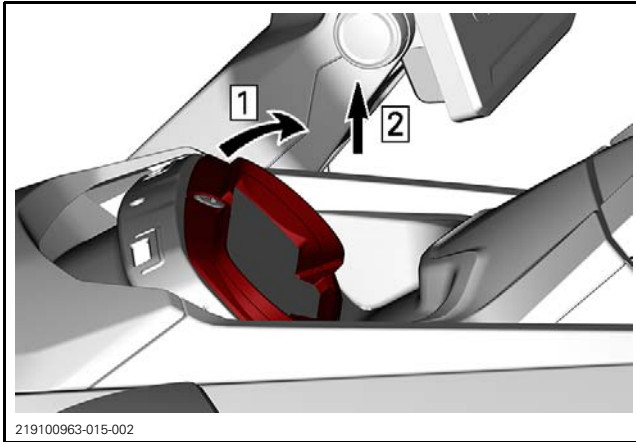
Removing the Multifunction Gauge

Remove gauge support cover.



TYPICAL

Pull top of gauge and lift.



TYPICAL

Disconnect electrical connector.

Installing the Multifunction Gauge

The installation is the reverse of the removal procedure.

If the multifunction gauge was replaced, connect the vehicle to the BRP diagnostic software (BUDS2) and apply any available updates.

When updates are completed, perform the following:

- Transfer the vehicle mileage as described in *VEHICLE MILEAGE TRANSFER*.
- Change settings as per customer preferences (language and units) as described in *SETTING LANGUAGE AND UNITS OF MEASUREMENT*

Vehicle Mileage Transfer

1. In BUDS2, go to:
 - **SETTINGS** page
 - **CLUSTER** button
 - **SETTINGS** tab.
2. Select **Increase Odometer Mileage**.
3. Click on the upper right arrow in the green circle.
4. Read carefully the on-screen instructions before clicking in the value box.
5. Enter the new mileage if it is different from the indicated one.
6. Press SET button.
7. Press the WRITE TOTAL button.
8. Select OK to confirm the mileage.
9. Close the window.

Setting Language and Units of Measurement

1. Connect the vehicle to the BRP diagnostic software (BUDS2), refer to the *COMMUNICATION TOOLS* subsection.
2. Press the START/STOP button to energize the electrical system.
3. In BUDS2, go to:
 - **SETTINGS** page
 - **CLUSTER** button
 - **SETTINGS** tab
 - **CONFIGURE LANGUAGE AND UNITS**.

ACCESSORIES

GENERAL

Refer to *WIRING DIAGRAM* subsection for diagnostic tips on troubleshooting electrical problems.

NOTE: The accessory circuit stays ON for a period of up to 60 minutes after the engine is turned OFF if the key remains on the D.E.S.S. post. If battery voltage drops below 12.3V, the ECM will not allow the accessory circuit back ON until the engine has been started.

⚠ WARNING

It is recommended to always disconnect the battery when replacing any electrical component. Always disconnect battery as specified, BLACK (-) cable first. Do not place tools on battery.

TROUBLESHOOTING

DIAGNOSTIC TIPS

IMPORTANT: When solving an electrical problem, the first thing to do is to check the battery condition as well as its cables and connections.

Install a battery charger on battery terminals for any tests that involves a prolonged "key ON" period. If battery voltage gets too low, not only test results can be altered, but the vehicle electrical system may not operate normally.

Pay attention to ground wires. They could become loose or corroded which causes them to act as an additional load in a circuit, dropping voltage and reducing current to components. Some components may be grounded through their outer casing and mounted hardware. This should also be considered.

Electrical Connectors

Pay particular attention to ensure that pins are not out of their connectors, loose, or damaged. The troubleshooting procedures may not cover problems resulting from one of these causes.

NOTICE Ensure all terminals are properly crimped on wires and connector housings are properly fastened. When replacing any electric or electronic part(s), always check electrical connections. Make sure that they are clean, corrosion-free, tight and make good contact. The voltage and current might be too weak to go through dirty or corroded connector pins or terminals.

PROCEDURES

REMOVING AND INSTALLING THE SOUND SYSTEM

Refer to *BODY* subsection.

PREREQUISITES OF SOUND SYSTEM TESTS

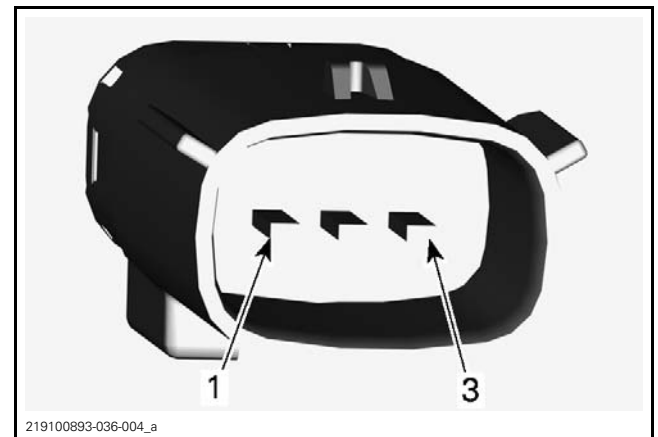
Make sure diagnostic tool 1 fuse (F14) and cluster fuse (F7) is in good condition and powered.

Make sure the battery is fully charged.

TESTING SOUND SYSTEM GROUND WIRE CONTINUITY

1. Remove the cover. Refer to *BODY* subsection.
2. Disconnect the sound system connector.

GROUND TEST AT SOUND SYSTEM CONNECTOR		
PROBE		RESISTANCE
Pin 3	Battery -	Close to 0 Ohms



SOUND SYSTEM CONNECTOR PIN-OUT

If ground test is good, test the INPUT VOLTAGE.

TESTING SOUND SYSTEM INPUT VOLTAGE

Press the START button and install the tether cord on the engine cut-off switch.

Section 05 ELECTRICAL SYSTEM

Subsection 07 (ACCESSORIES)

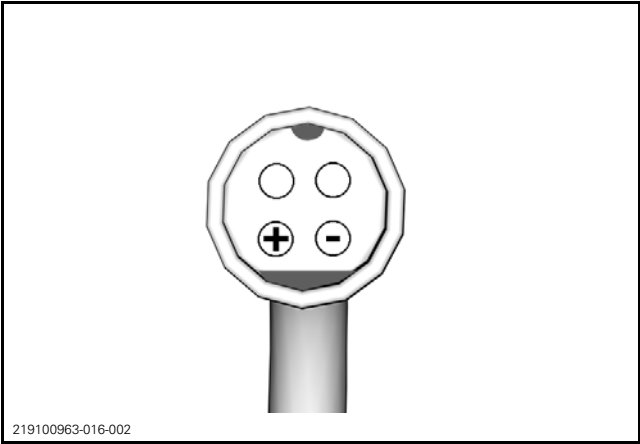
INPUT VOLTAGE TEST AT SOUND SYSTEM CONNECTOR		
PROBE		VOLTAGE
Pin 1 (Hot at all times)	Pin 3 (Permanent ground)	Battery voltage
Pin 2 (Hot with main relay on)		

Repair wiring and connectors as required.

FISH FINDER SONAR

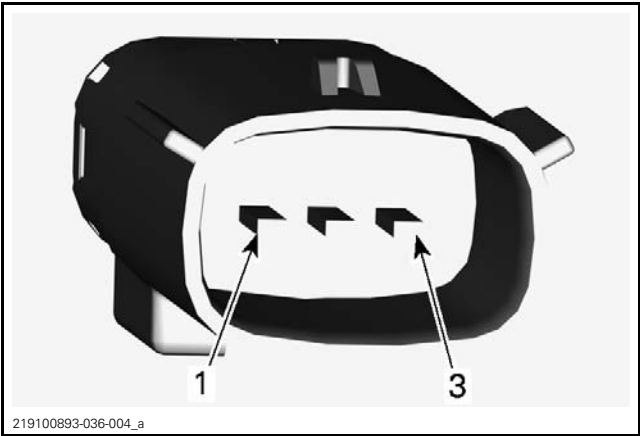
The sonar is connected on the accessory circuit and is hot only when the electrical circuit is ON. There is a 3A fuse in-line protecting the circuit.

Ensure all connectors are properly secured and there is no trace of corrosion or other defects. Clean or replace as necessary.



SONAR CONNECTOR PIN-OUT

GROUND TEST AT VEHICLE CONNECTOR		
PROBE		RESISTANCE
Pin 3	Battery -	Close to 0 Ohms



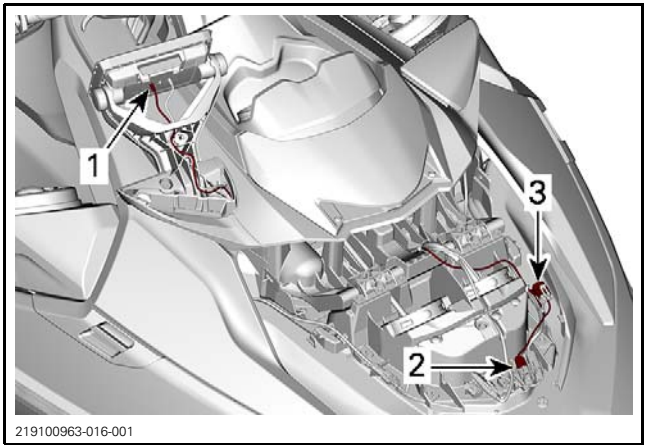
VEHICLE CONNECTOR PIN-OUT

If ground test is good, test the INPUT VOLTAGE.

Testing Fish Finder sonar Input Voltage

Press the START button and install the tether cord on the engine cut-off switch.

INPUT VOLTAGE TEST AT SONAR CONNECTOR		
PROBE		RESISTANCE
Positive pin	Battery -	Battery voltage



- 1. Sonar connector
- 2. Vehicle connector
- 3. 3A Fuse

Make sure the 3A fuse is in good condition and powered.

Make sure the battery is fully charged.

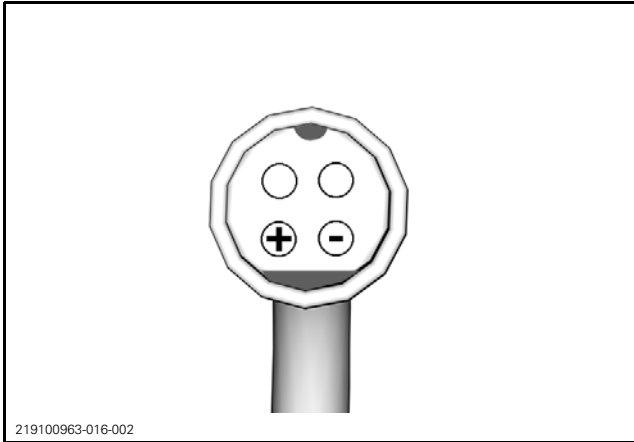
Removing and Installing the Fish Finder Sonar

Refer to BODY subsection.

Testing Fish Finder sonar Ground Wire Continuity

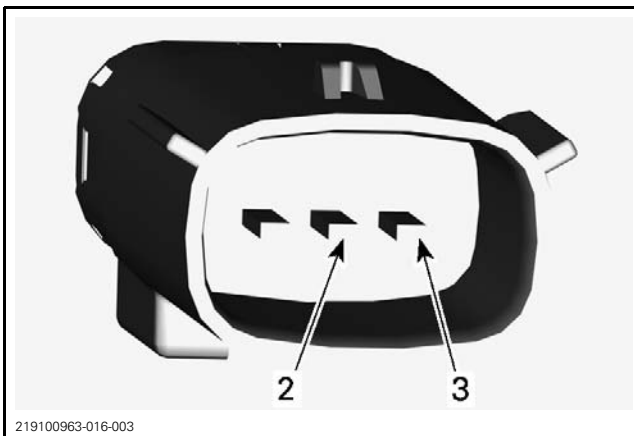
- 1. Remove the sonar and Hood. Refer to BODY subsection.

GROUND TEST AT SONAR CONNECTOR		
PROBE		RESISTANCE
Negative pin	Battery -	Close to 0 Ohms



SONAR CONNECTOR PIN-OUT

INPUT VOLTAGE TEST AT VEHICLE CONNECTOR		
PROBE		VOLTAGE
Pin 2 (Hot with main relay on)	Pin 3 (Permanent ground)	Battery voltage



VEHICLE CONNECTOR PIN-OUT

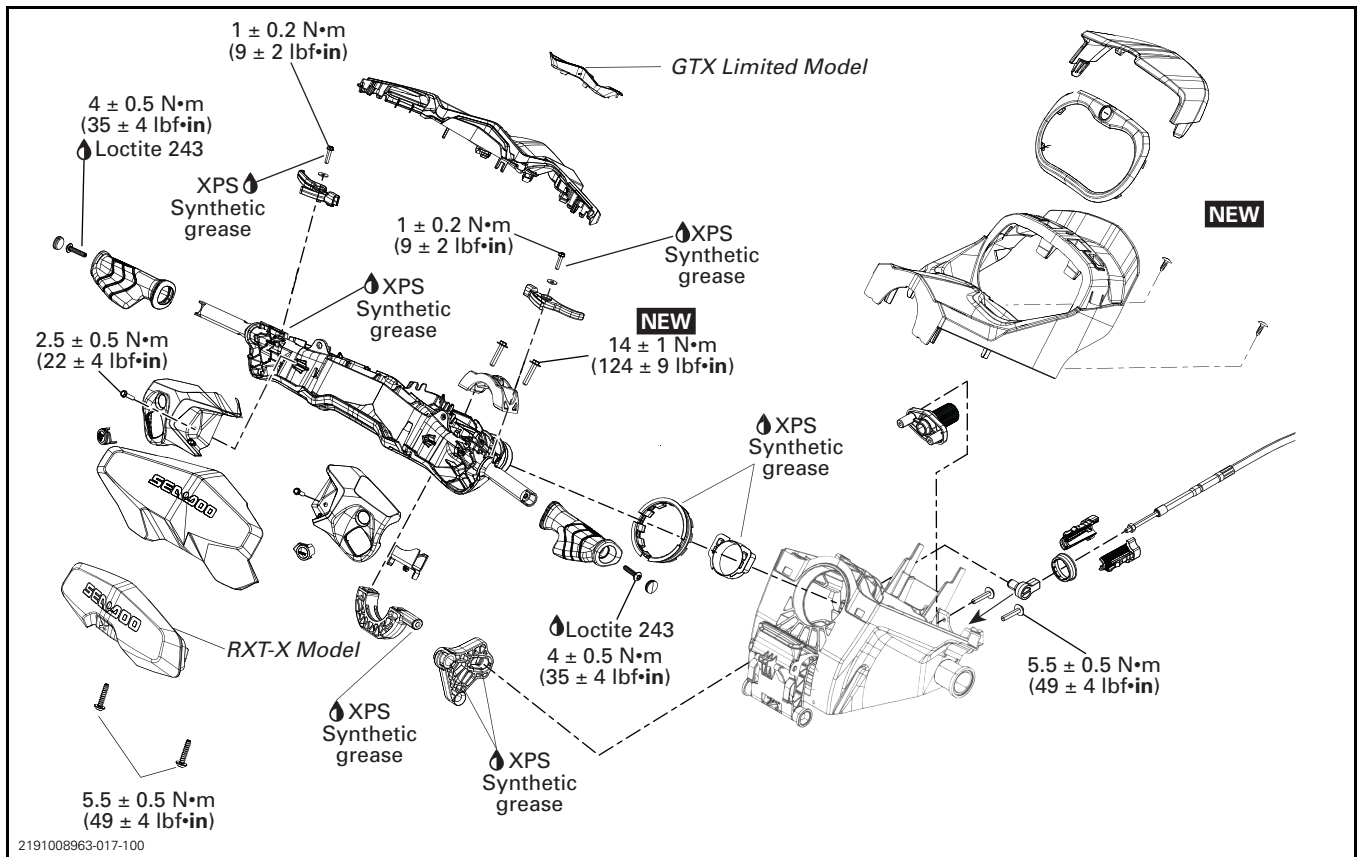
Repair wiring and/or connectors as required.
For further information, troubleshooting and diagnostic, refer to the sonar manufacturer.

STEERING

SERVICE PRODUCTS

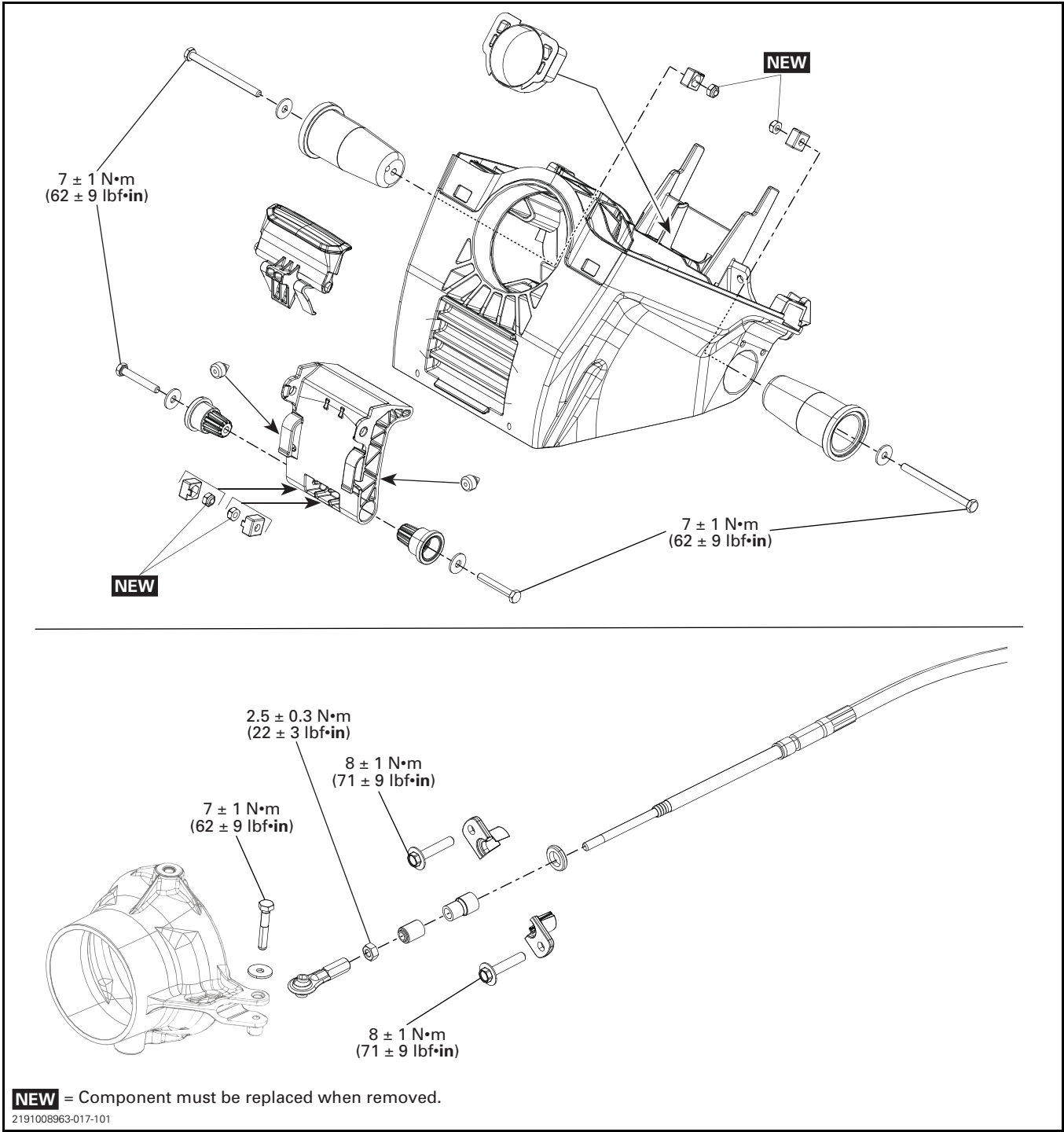
Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	153
SYNTHETIC GREASE (EUR)	779231	157
SYNTHETIC GREASE	779162	157

STEERING COLUMN



Section 06 STEERING AND PROPULSION
Subsection 01 (STEERING)

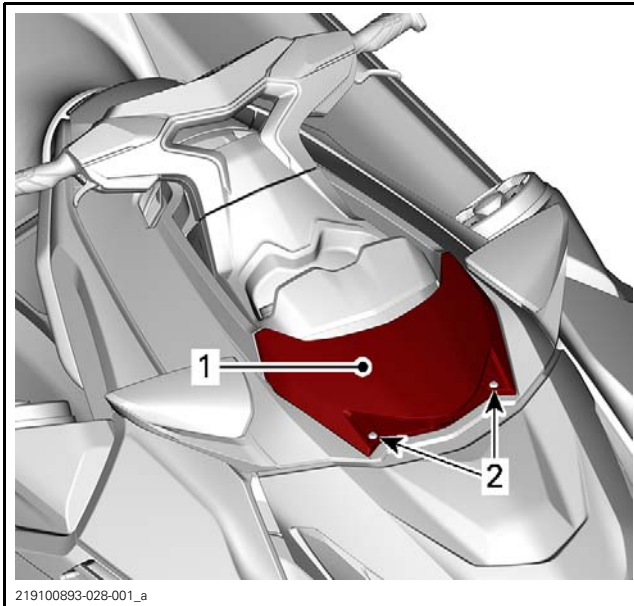
STEERING COLUMN SUPPORT AND CABLE



ADJUSTMENT

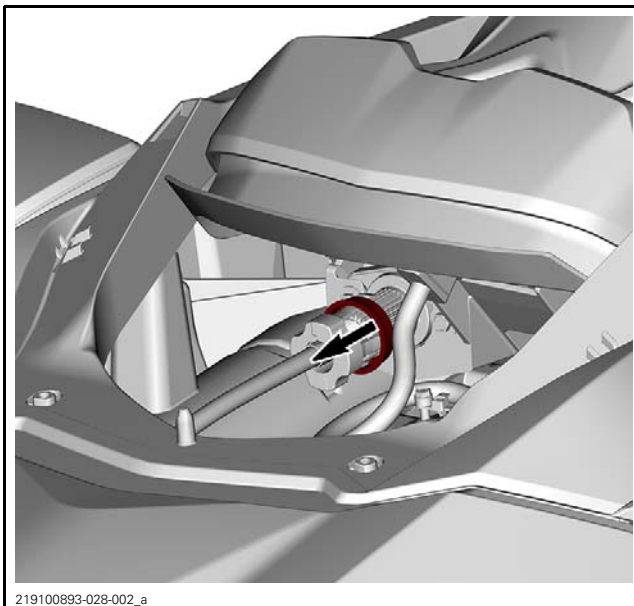
ADJUSTING THE ALIGNMENT OF THE STEERING

Remove the top cover.



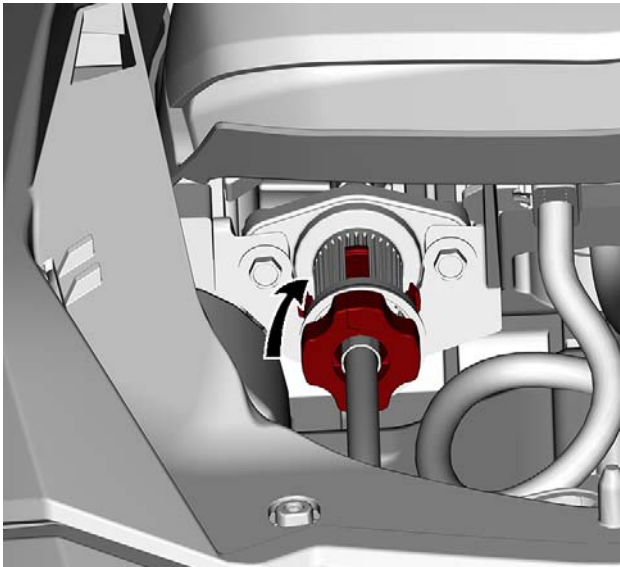
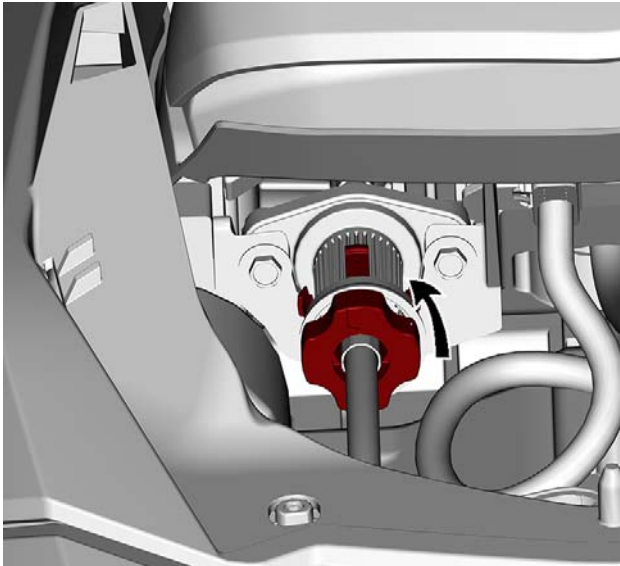
1. Top cover
2. Top cover retaining crews

1. Slide the cable lock toward the front of watercraft.

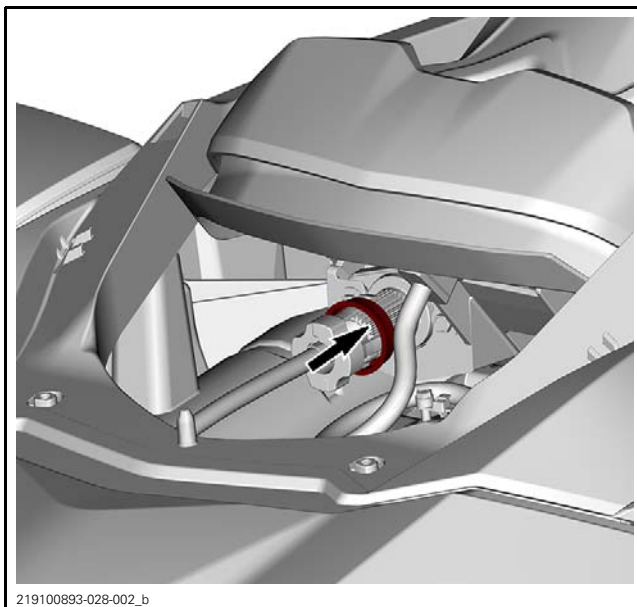


2. Turn adjustment 1 turn at a time in the direction shown in following table.

Section 06 STEERING AND PROPULSION
Subsection 01 (STEERING)

WATERCRAFT BEHAVIOR	WHAT TO DO
Pulls on left side	<p data-bbox="662 279 1222 310">Turn steering cable adjustment nut as shown</p> 
Pulls on right side	<p data-bbox="662 915 1222 947">Turn steering cable adjustment nut as shown</p> 

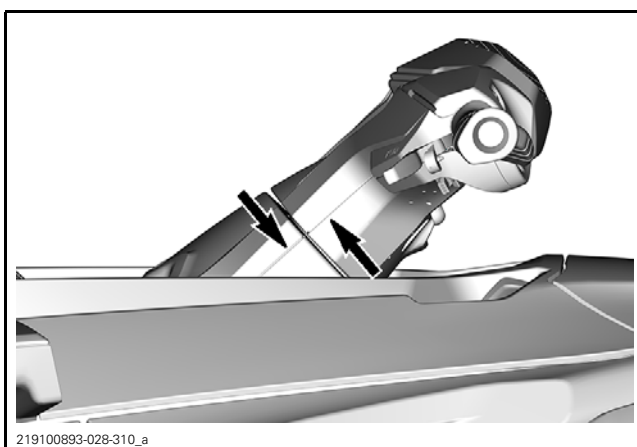
3. Slide back the cable lock in place.



4. Test watercraft.
5. Readjust as necessary.
6. Reinstall the top cover.

TIGHTENING TORQUE	
Top cover screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

NOTE: It is a good starting point to align body lines when replacing the steering cable.



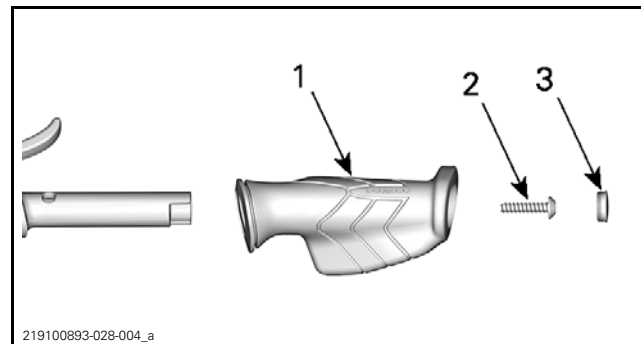
PROCEDURES

HANDLEBAR GRIP

Removing the Handlebar Grip

To remove handlebar grip, remove the cap, then the retaining screw.

Pull out handlebar from handlebar.



1. Handlebar grip
2. Handlebar grip screw
3. Handlebar grip cap

Installing the Handlebar Grip

Install handlebar grip on handlebar matching it to the notch in the handlebar.

Apply blue Loctite on screw threads (or use new self-locking screws).

SERVICE PRODUCT
LOCTITE 243 (BLUE) (P/N 293 800 060)

Install handlebar grip screw.

Torque handlebar grip screw to specification.

TIGHTENING TORQUE	
Handlebar grip screw	4 N•m ± 0.5 N•m (35 lbf•in ± 4 lbf•in)

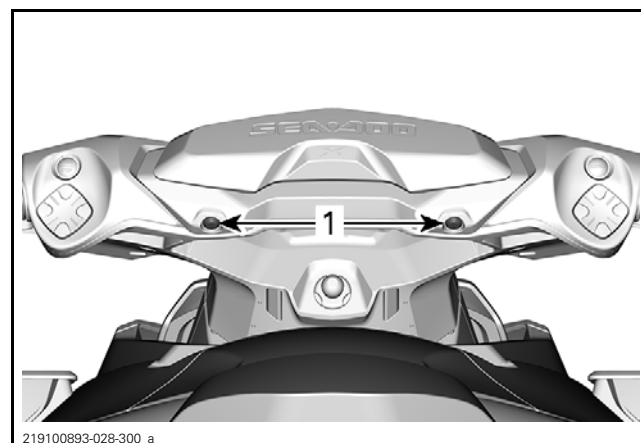
Install cap.

HANDLEBAR SWITCH COVER (LH OR RH)

Removing the Handlebar Switch Cover (LH or RH)

On RXT-X models

1. Remove retaining screws.

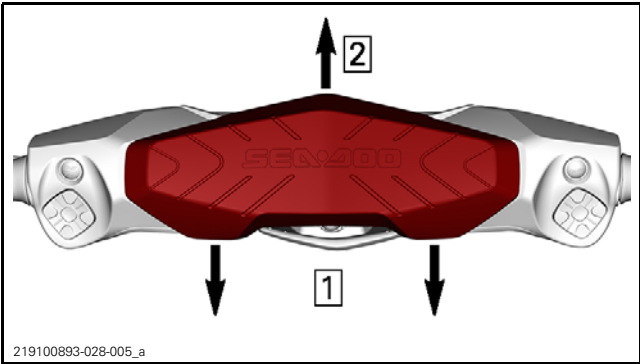


Section 06 STEERING AND PROPULSION

Subsection 01 (STEERING)

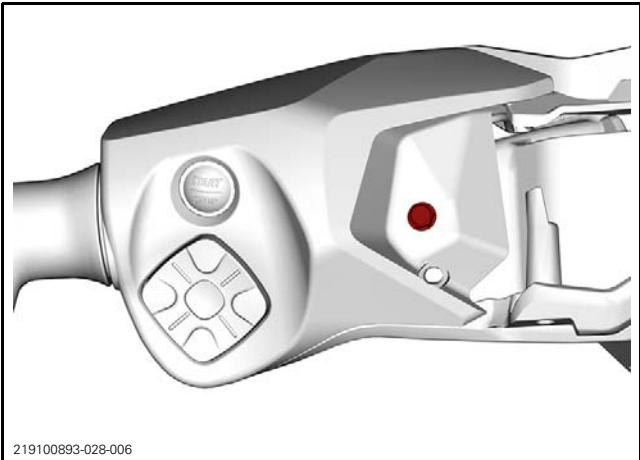
On all models

2. Remove steering pad by pulling the bottom first and then the top.



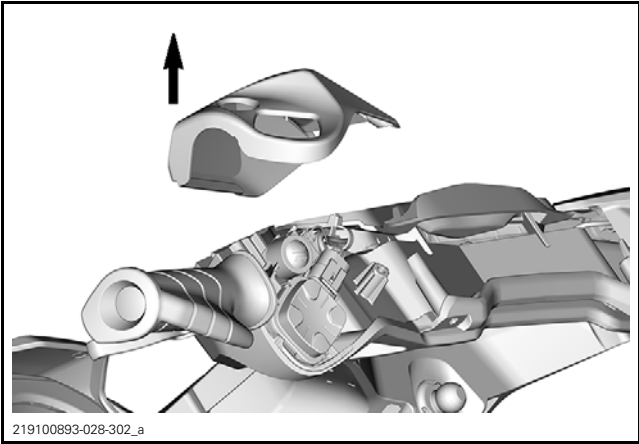
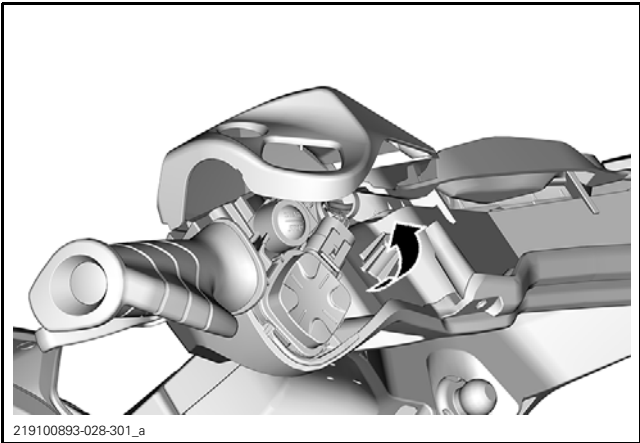
TYPICAL

3. Remove the switch cover retaining screw.



LH SIDE SHOWN

4. Remove the switch cover.



Installing the Handlebar Switch Cover (LH or RH)

Installation is the reverse of the removal procedure. However, pay attention to the following.

1. Route wires to avoid pinching them.
2. Position the switch cover onto the steering cover.
3. Ensure positioning of steering electrical harness.
4. Ensure proper engagement of the upper housing and cover tabs.
5. Ensure proper engagement of upper and lower switch covers.
6. Tighten housing cover screw to specification.

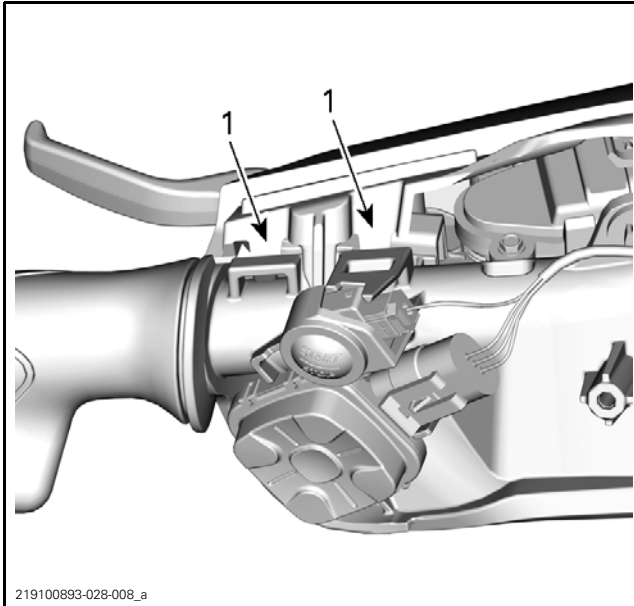
TIGHTENING TORQUE	
Housing cover screw	2.5 N•m ± 0.5 N•m (22 lbf•in ± 4 lbf•in)
Steering pad retaining screw (RXT-X)	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

STEERING COVER

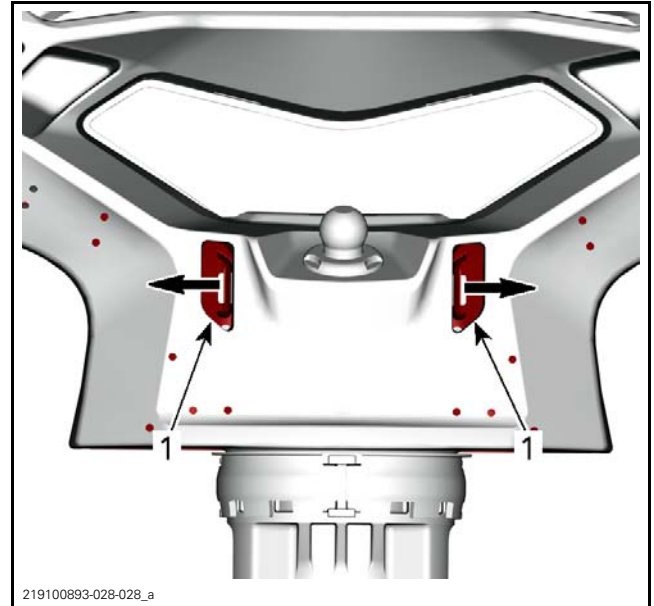
Removing the Steering Cover

1. Remove steering pad and both handlebar switch covers. See procedure in this subsection.
2. Unlock steering cover from steering.
 - 2.1 Insert a small tool, such as a small flat screwdriver, into a steering cover hole. Press the tool against the retaining tab to unlock it. Repeat for the other side.

NOTICE The tool must be inserted perfectly straight to avoid breaking the tab holder.

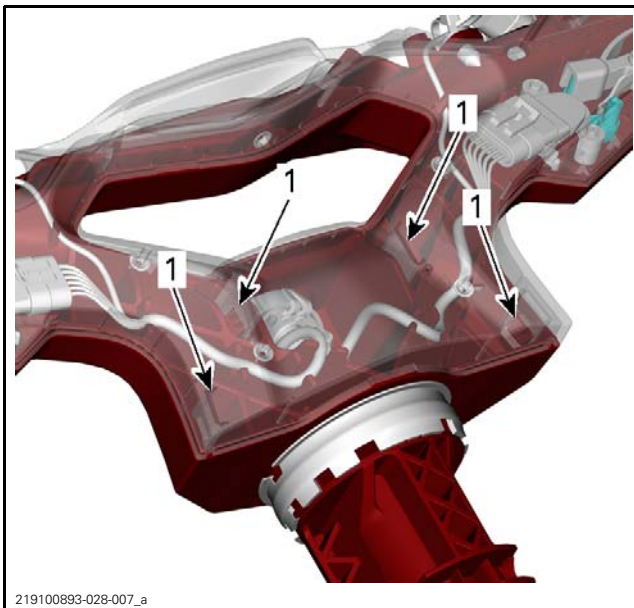


1. Retaining tab

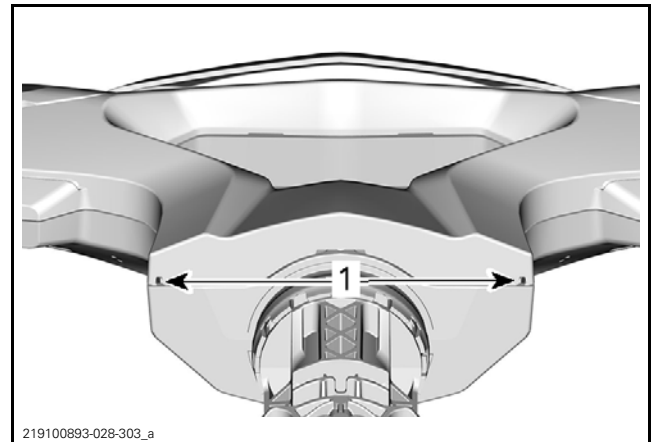


VIEWED FROM UNDERNEATH

1. Rear cavity



1. Retaining tab



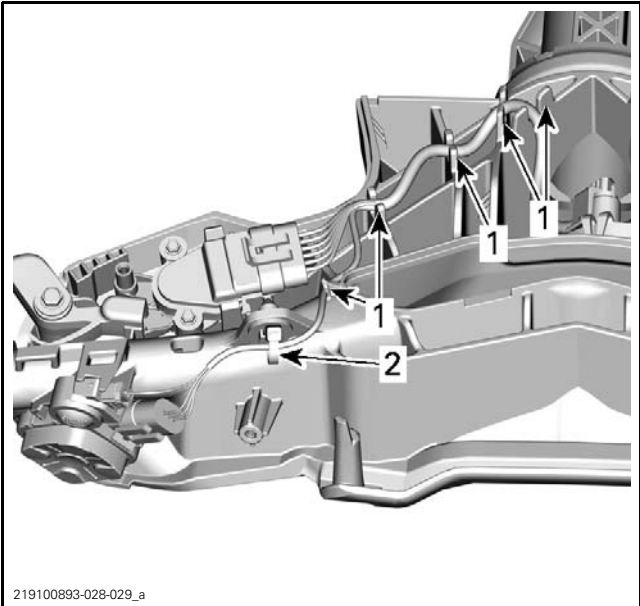
Installing the Steering Cover

1. Make sure all harnesses are routed properly into their positioning slots and are away from the outer edges. This will ensure the wires will not get pinched.

- 2.2 In both cavities under the steering cover, release both inner retaining tabs using a long screwdriver.

Section 06 STEERING AND PROPULSION

Subsection 01 (STEERING)

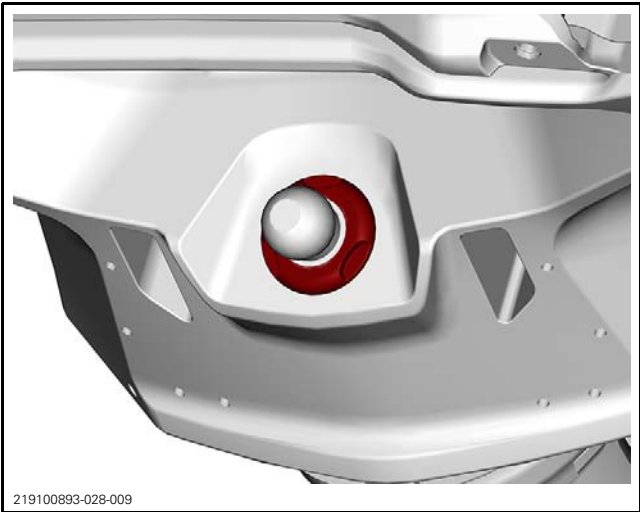


- 1. Harness slots
 - 2. Locking tie
2. Clip the top of the cover.
3. Push both side of the cover to lock it with the steering column.
4. Install switch covers.

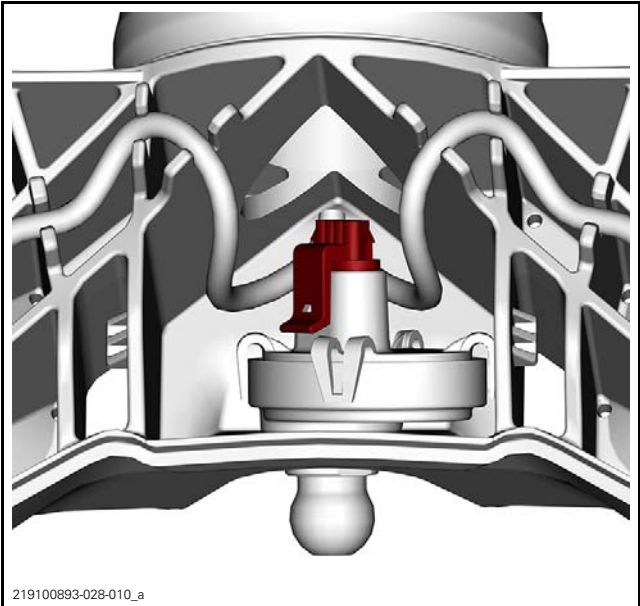
REPLACING THE ENGINE CUT-OFF SWITCH

Remove steering pad, see procedure in this subsection.

Remove cut-off switch nut.

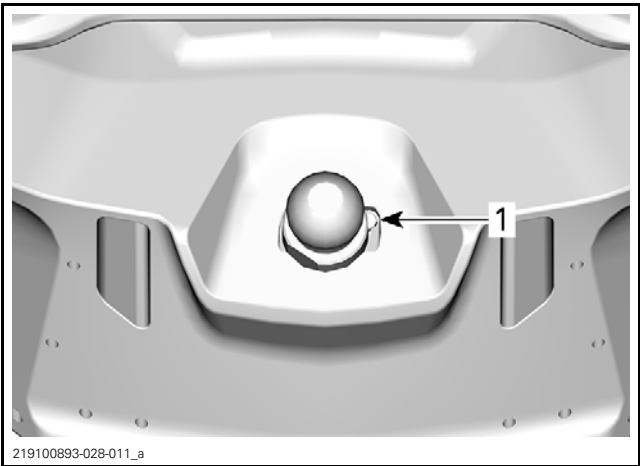


Disconnect cut-off switch connector.



Push cut-off switch out of the steering column.

Install the engine cut-off switch by aligning the alignment pin into the notch of steering column.



- 1. Alignment pin

Connect and install all removed parts using appropriate procedures.

TIGHTENING TORQUE	
Engine cut-off switch nut	2 N•m (18 lbf•in)

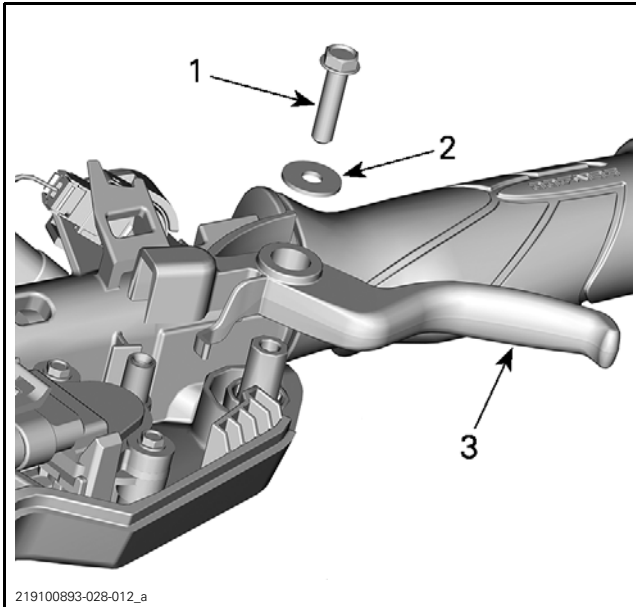
THROTTLE AND iBR LEVERS

NOTE: The following procedure demonstrates the replacement of the throttle lever but the same procedure will be used for the iBR lever.

Replacing the Lever

- 1. Remove *STEERING COVER*, see procedure in this subsection.

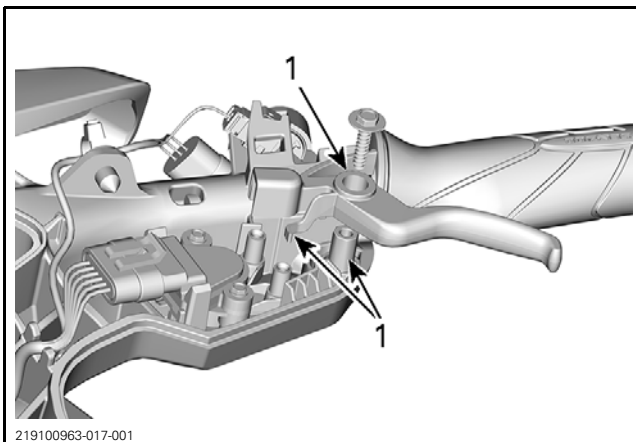
2. Remove the screw and washer securing throttle lever.
3. Remove throttle lever.



1. Retaining screw
2. Washer
3. Throttle lever

4. Clean throttle lever area from dust or any deposits.
5. Apply grease on pivot and the outer surface of the return tab.

SERVICE PRODUCT	
Scandinavia	SYNTHETIC GREASE (EUR) (P/N 779231)
All other countries	SYNTHETIC GREASE (P/N 779162)



1. Apply grease here

6. Install the lever.
 - 6.1 Install lever on pivot.

- 6.2 Insert sensor lever end into throttle lever fork.
- 6.3 Position the return tab against the handlebar.
- 6.4 Secure the lever with washer and screw.

TIGHTENING TORQUE	
Lever screw	1 N•m ± 0.2 N•m (9 lbf•in ± 2 lbf•in)

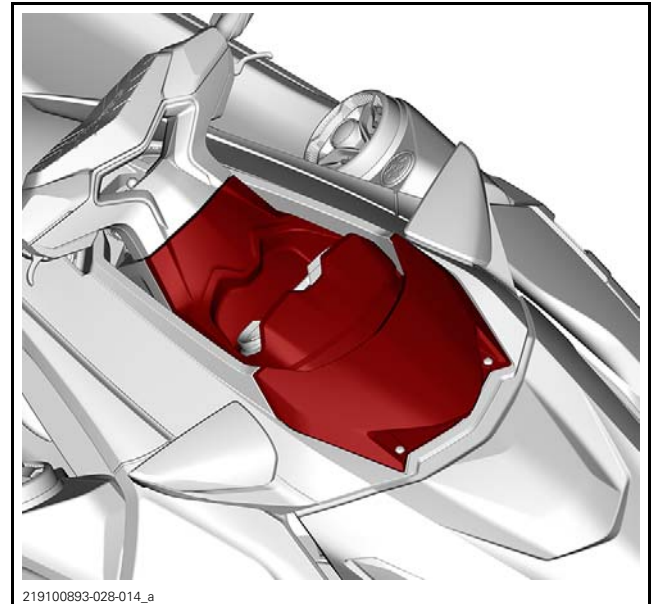
7. Reinstall all removed parts using appropriate procedures.

STEERING CABLE

Replacing the Steering Cable

Remove the seat and top cover.

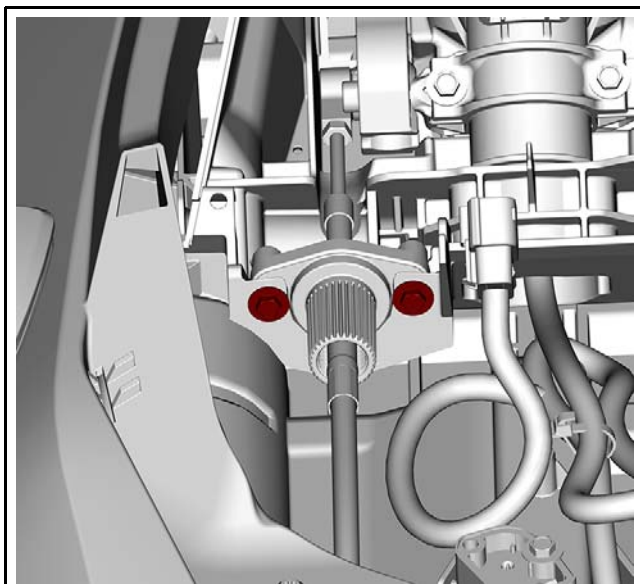
Remove the gauge support. Refer to *INFORMATION CENTER* subsection.



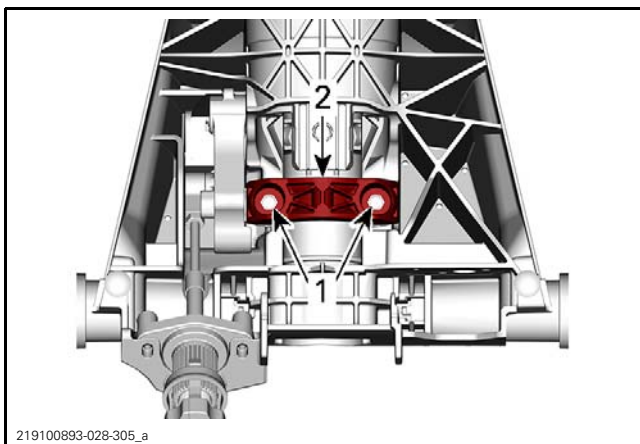
1. Detach steering cable from steering column.
 - 1.1 Remove the steering cable support screws.

Section 06 STEERING AND PROPULSION

Subsection 01 (STEERING)

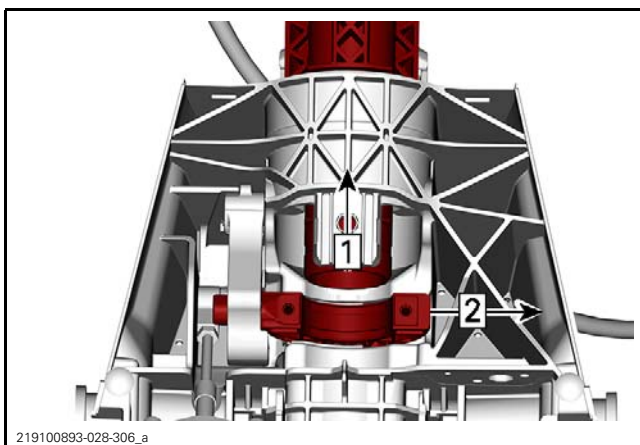


- 1.2 Remove the steering column upper steering arm by removing the screws.



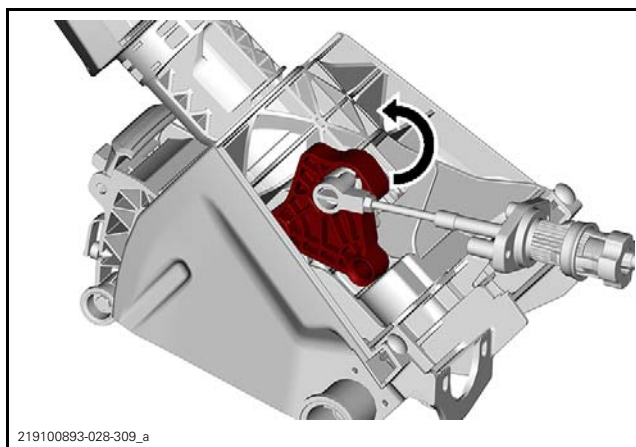
1. C-clamp retaining screws

- 1.3 Pull on steering column upward enough to remove the lower steering arm.

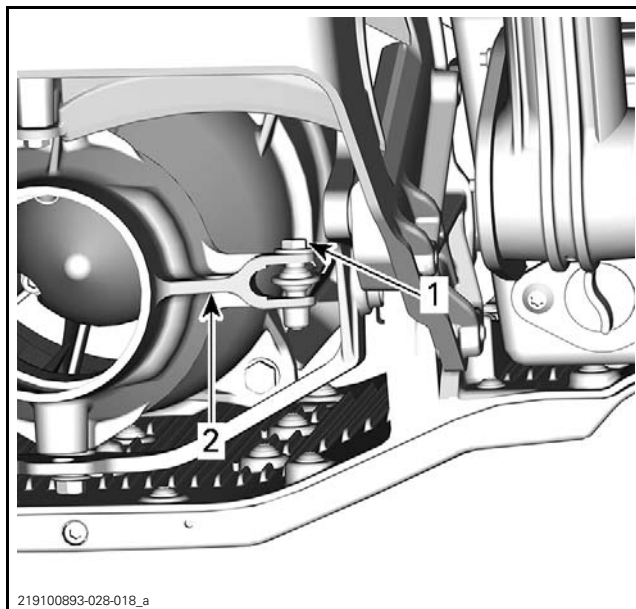


1. Lift steering column
2. Slide lower

- 1.4 Slide out the cable from the steering arm. Access can be improved by lifting the steering lever.

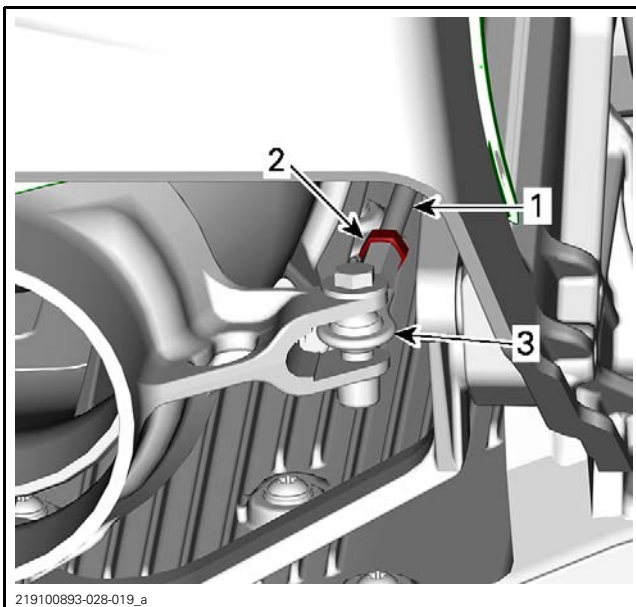


2. At rear of the watercraft, disconnect ball joint from jet pump nozzle arm.



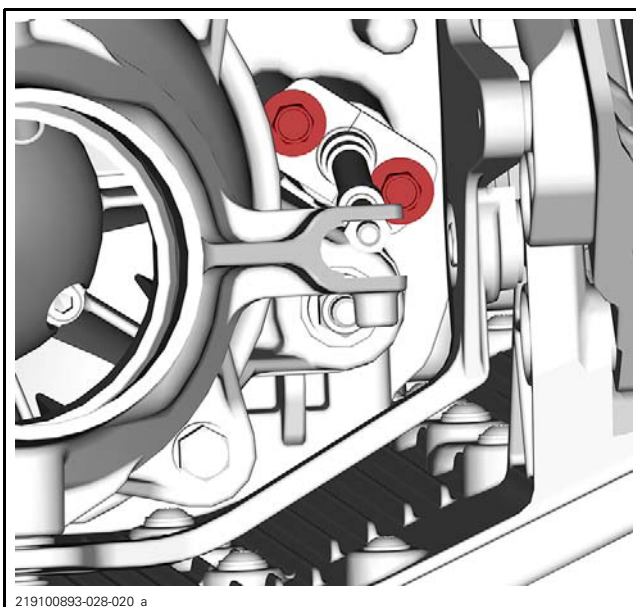
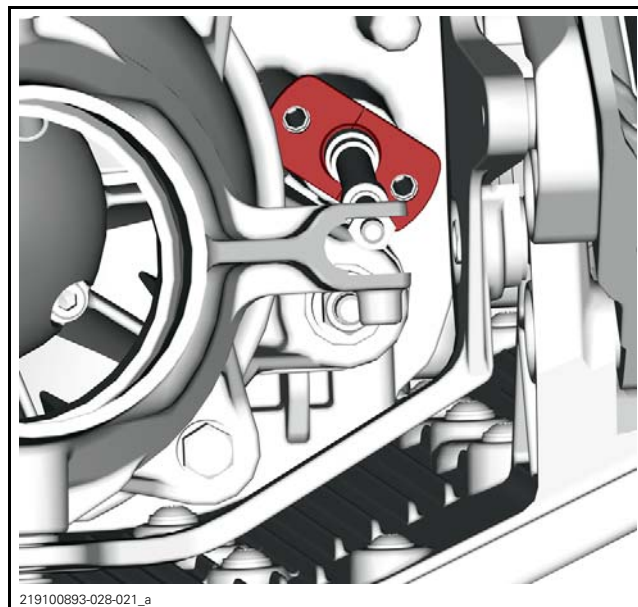
1. Steering cable bolt
2. Nozzle arm

3. Remove ball joint and jam nut from cable.

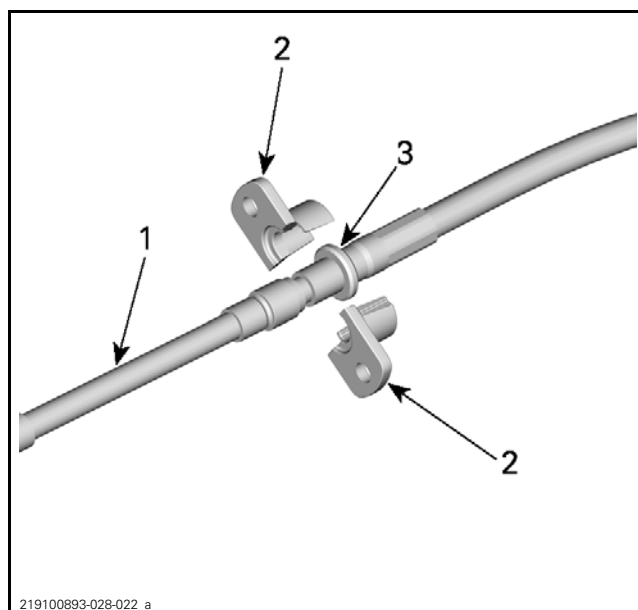


- 1. Steering cable
- 2. Jam nut
- 3. Ball joint

4. Remove half-rings retaining screws.



5. Pull the cable assembly to remove the half-rings and O-ring.



- 1. Steering cable
- 2. Half ring
- 3. O ring

- 6. Remove the adjusting nut from the new steering cable.
- 7. From inside the hull, pull the aft end of the cable through the hull fitting.
- 8. Using a piece of hose, attach one end of the new cable to the opposite end of the old cable together.
- 9. Route the new cable in the hull by slowly pulling the old one, then separate cable ends.
- 10. From inside of the hull, pass the aft end of the cable through the hull fitting.
- 11. Secure the steering cable to the hull fitting.
 - 11.1 Install O-ring and half rings.

Section 06 STEERING AND PROPULSION

Subsection 01 (STEERING)

11.2 Tighten the half-rings retaining screws to specification.

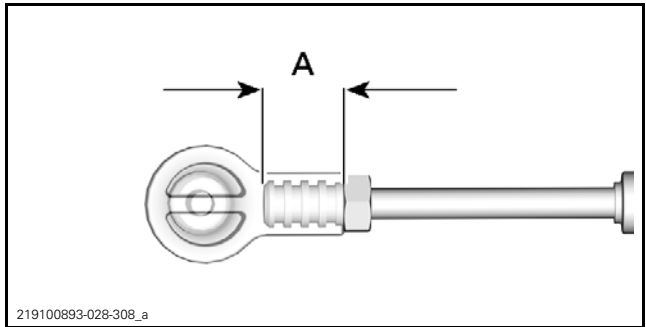
TIGHTENING TORQUE	
Half-rings retaining screws	8 N•m ± 1 N•m (71 lbf•in ± 9 lbf•in)

The installation of the steering cable to the steering column is the reverse of the removal procedure. However, pay attention to the following.

TIGHTENING TORQUE	
Cable support retaining screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

Carry out *ADJUSTING THE ALIGNMENT OF THE STEERING*. See procedure in this subsection.

The threaded portion of steering cable inserted into the end fitting should be 9 mm ± 1 mm (.354 in ± .039 in).



A. 9 mm ± 1 mm (.354 in ± .039 in)

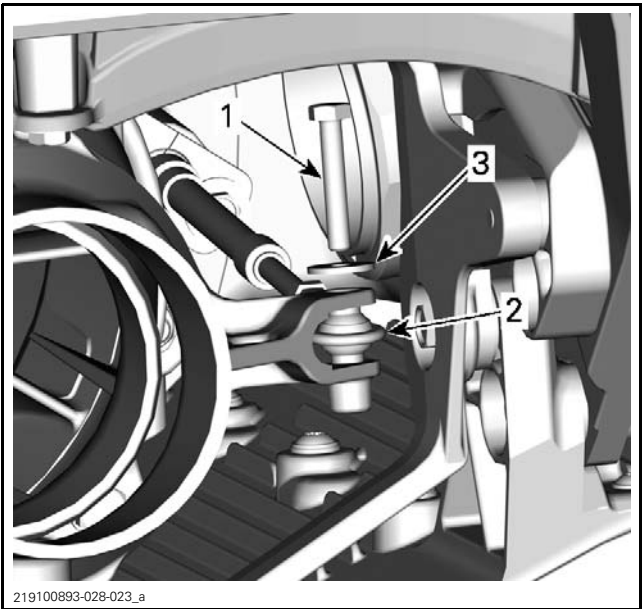
- 12.2 Tighten jam nut to specification.
- 12.3 Position the steering cable ball joint to the nozzle as per following illustration.

Install all removed parts using appropriate procedure.

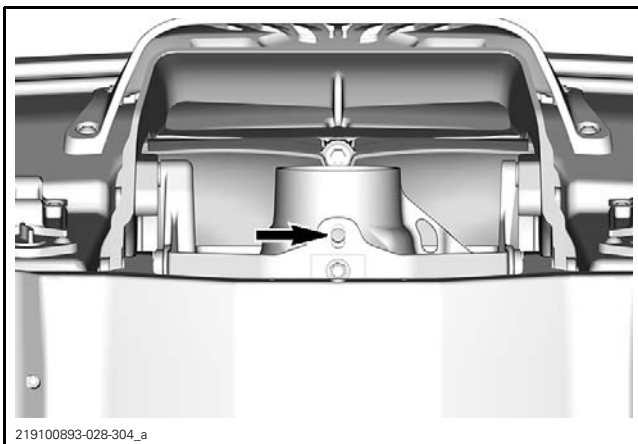
Adjusting the Steering Cable

- Steering cable adjustment is required only if:
 - A steering cable end ball joint has been replaced or loosened/tightened.
 - Steering cable adjustment nut has been loosened/tightened.
 - Steering cable has been replaced.
 - Steering column or support has been replaced.
- Lock the jet pump nozzle position by installing a 10 mm (3/8 in) rod through the trimming ring as the following illustration.

- Ball joint bolt
- Ball joint
- Washer



TIGHTENING TORQUE	
Ball joint jam nut	2.5 N•m ± 0.3 N•m (22 lbf•in ± 3 lbf•in)
Ball joint bolt	7 N•m ± 1 N•m (62 lbf•in ± 9 lbf•in)



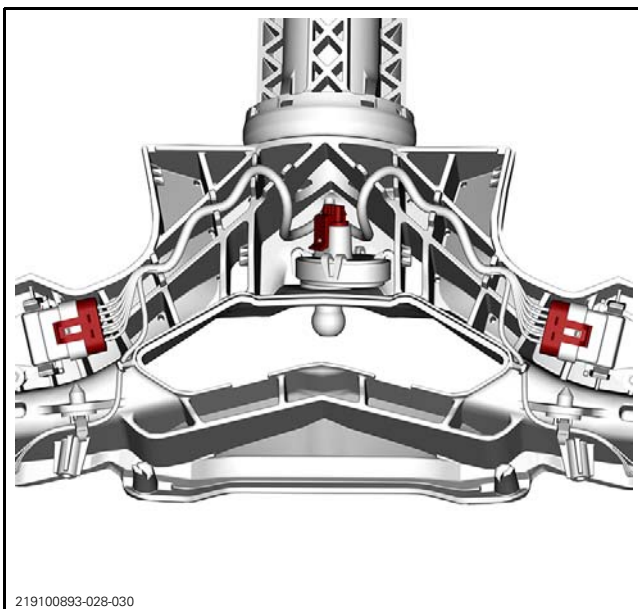
VIEWD FROM UNDERSIDE

3. Adjust steering cable as described in *STEERING ALIGNMENT* in this subsection.

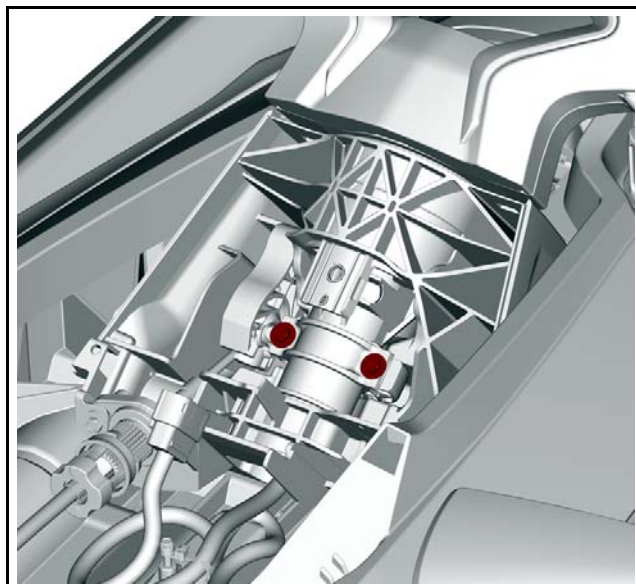
STEERING COLUMN

Removing the Steering Column

1. Remove the top cover and the gauge support, Refer to *BODY* subsection.
2. Remove the steering cover.
3. Disconnect both iBR and throttle connectors and engine cut off switch connector.



4. Remove both screws securing the steering column arm and clamp.



1. Steering column screws

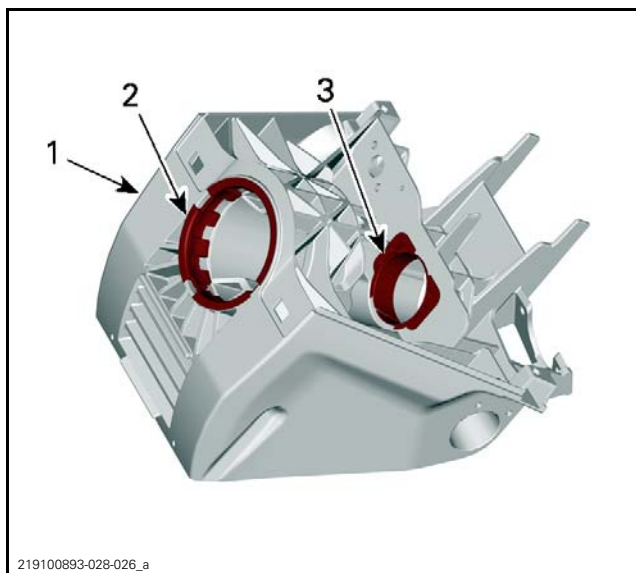
5. Pull steering column out of its support.

Inspecting the Steering Column

Check steering column for:

- Cracks
- Stress marks
- Signs of wear.

Check steering column support bushings.

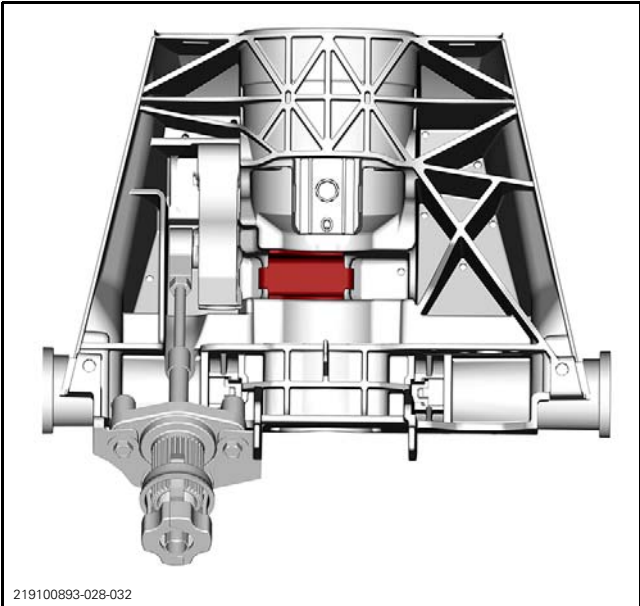


1. Steering column support
2. Upper bushing
3. Lower bushing

Check wear sleeve behind the steering column arm.

Section 06 STEERING AND PROPULSION

Subsection 01 (STEERING)



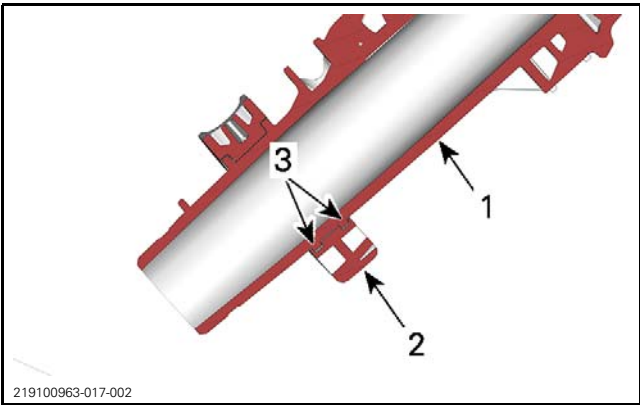
Replace any damaged or worn parts.

Installing the Steering Column

The installation is the reverse of the removal procedure. However, pay attention to the following.

Carefully, drive steering column through steering column support.

Make sure the locating grooves of the steering column arm are properly engaged in the steering column as shown.



- 1. Steering column
- 2. Steering arm
- 3. Locating grooves

Tighten steering column arm screws to specifications.

TIGHTENING TORQUE	
Steering column arm screws	14 N•m ± 1 N•m (124 lbf•in ± 9 lbf•in)

NOTICE Ensure the head of the screws touches the upper steering arm.

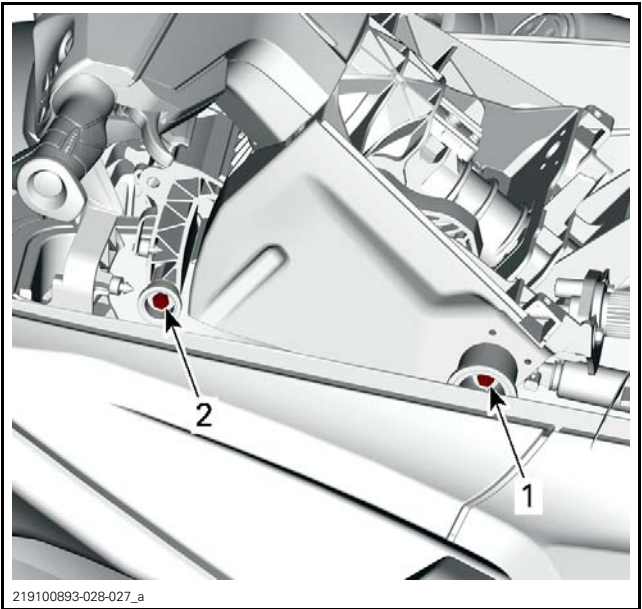
Ensure the steering system is working properly by turning side to side.

Reinstall all removed parts using appropriate procedure.

STEERING COLUMN SUPPORT

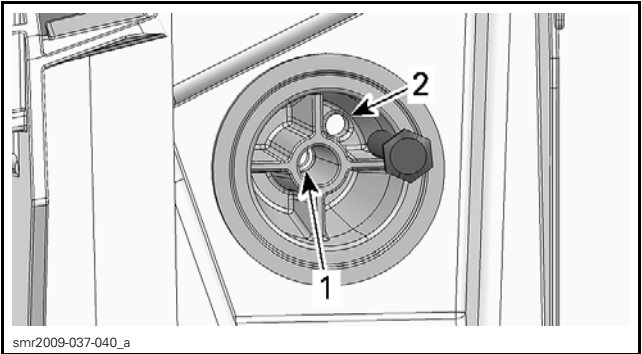
Removing the Steering Column Support

- 1. Remove steering column, refer to *REMOVING THE STEERING COLUMN* in this subsection.
- 2. On each sides, remove both pivot bushings.



- PARTS REMOVED FOR CLARITY**
- 1. Pivot bushing of steering column support
 - 2. Pivot bushing of steering adjustment handle

If pivot bushings retaining steering column are hard to remove, remove the retaining screw from the center hole and tighten it into the offset hole. Tighten screw until the pivot bushing comes out of steering column support.



- 1. Center hole
- 2. Offset hole

3. Remove steering column support and steering adjustment handle from vehicle.

Installing the Steering Column Support

The installation is the reverse of the removal procedure.

STEERING TILT RELEASE HANDLE

Replacing the Steering Tilt Release Handle

Use the same procedure as for *STEERING COLUMN SUPPORT*.

iBR, REVERSE AND VTS

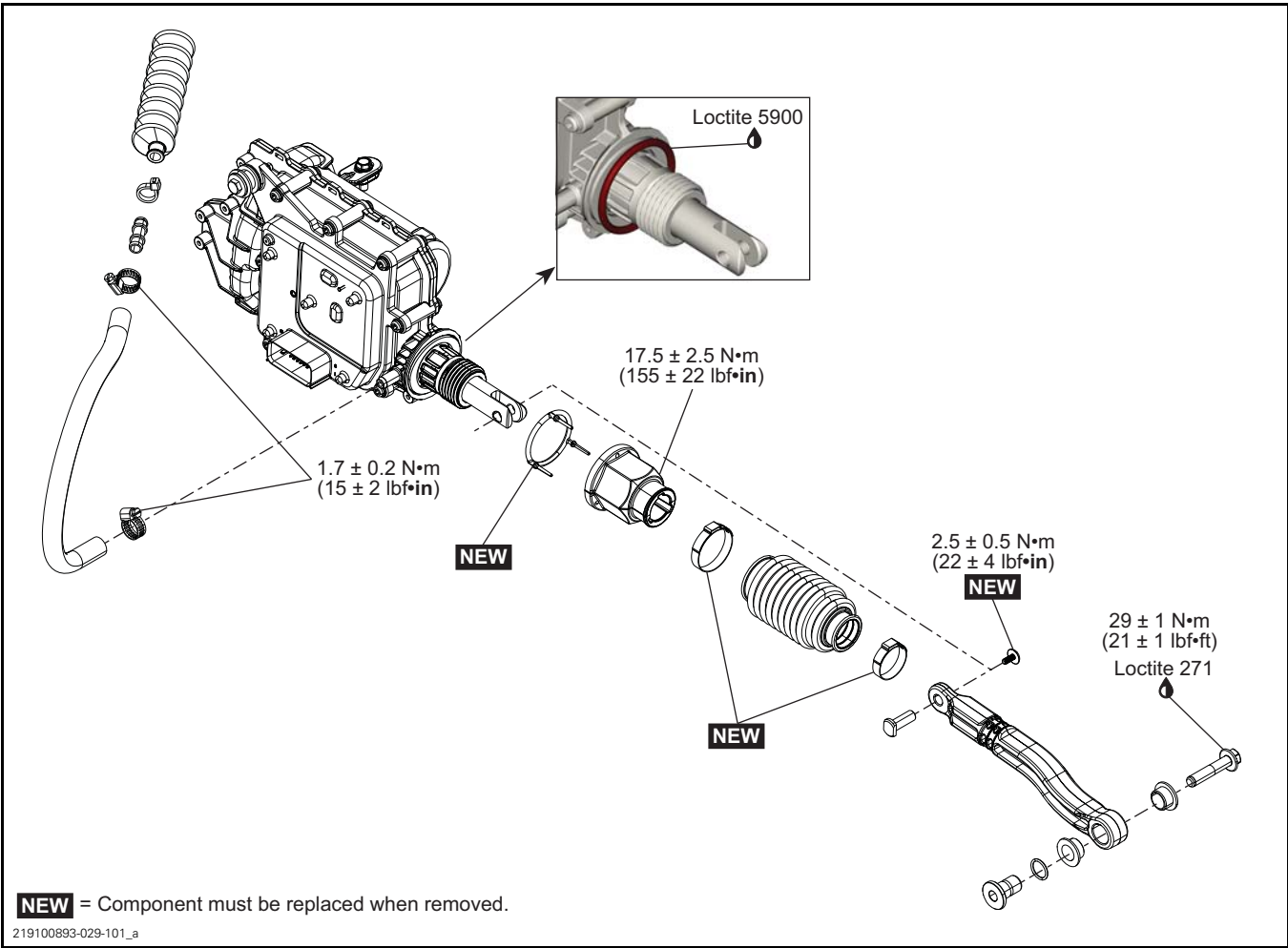
SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	181
iBR NUT SOCKET.....	529 036 379	176

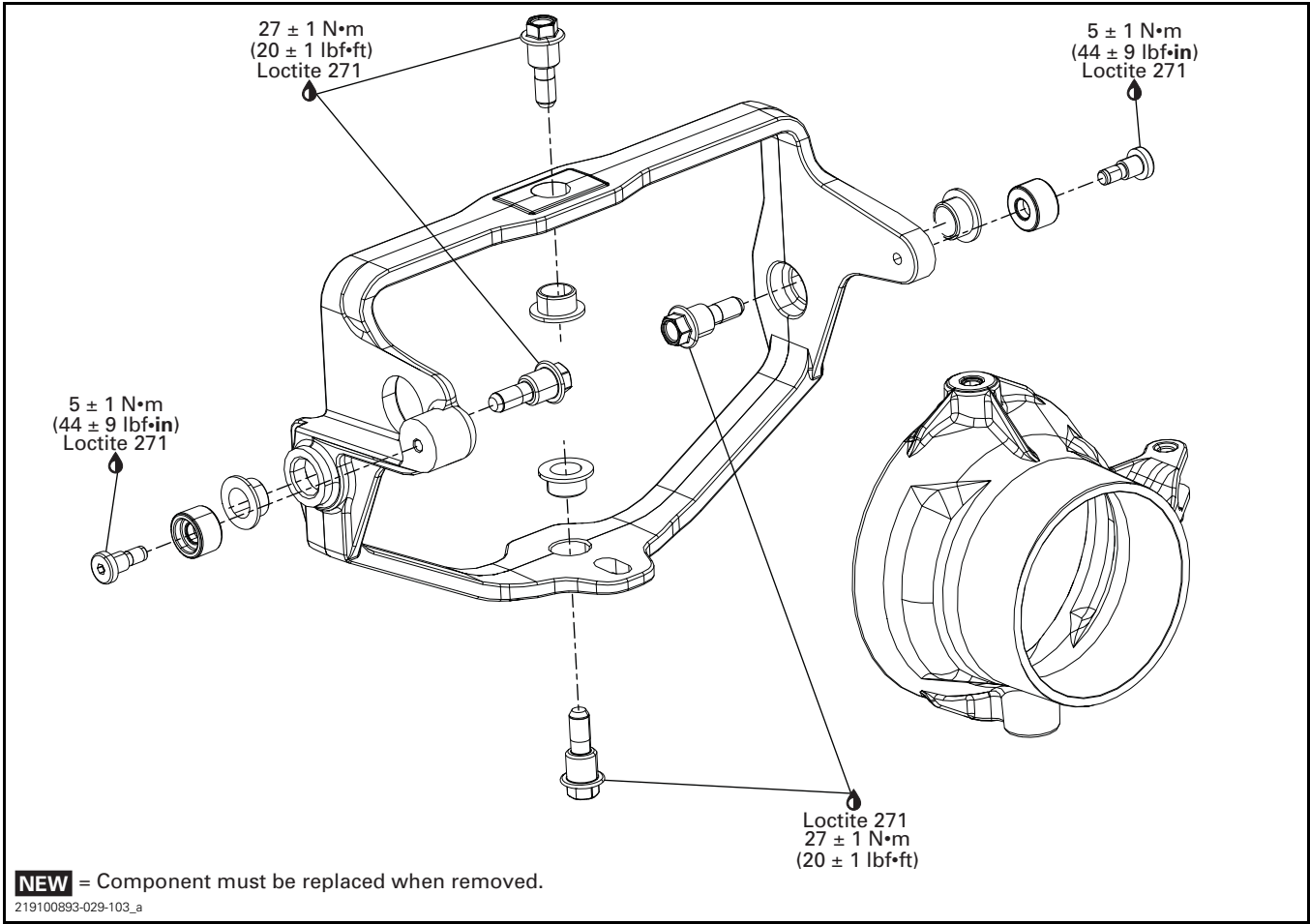
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 271 (RED).....	293 800 005	178, 180
LOCTITE 5900	293 800 066	177

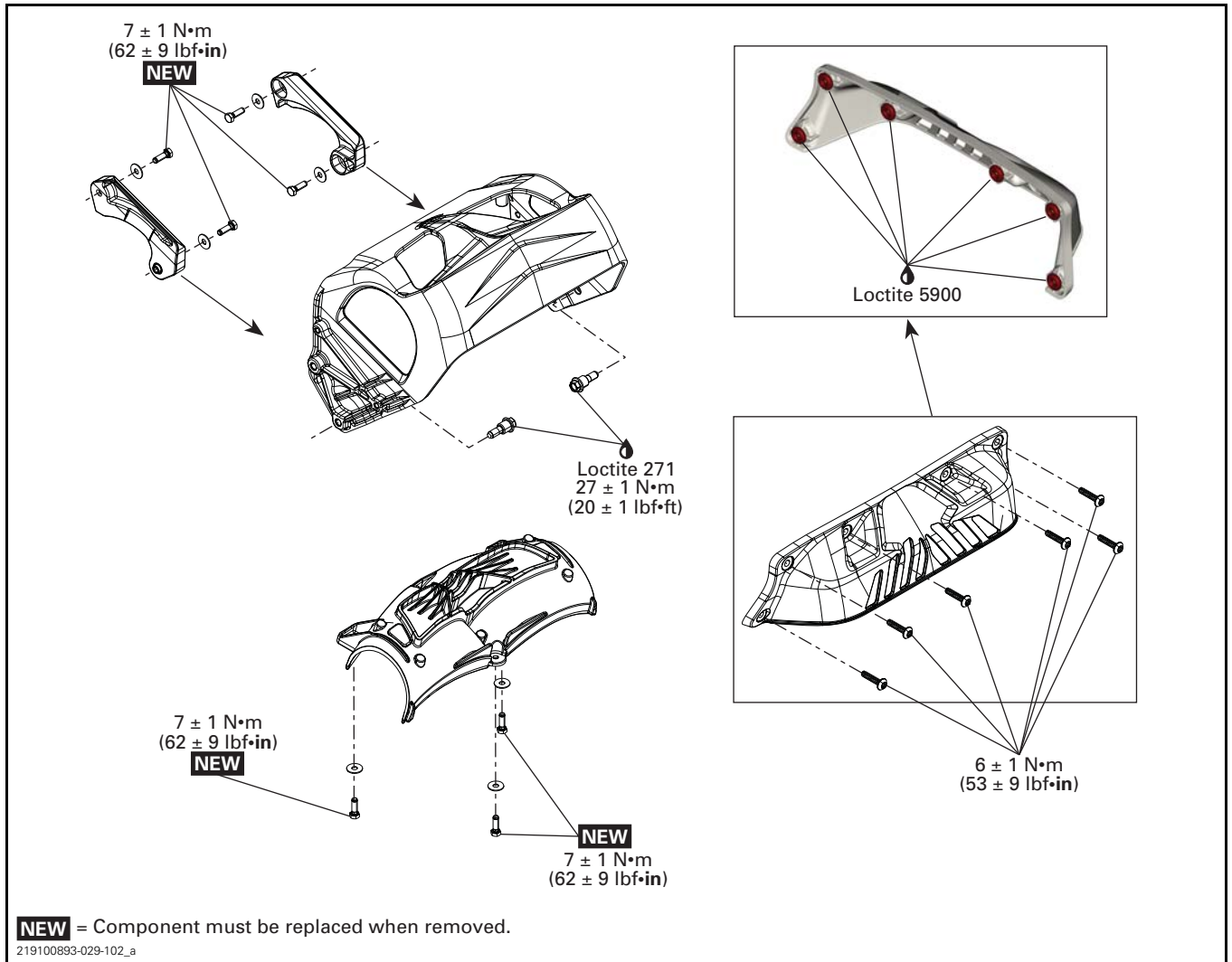
iBR ACTUATOR



VTS TRIM RING AND NOZZLE



iBR GATE



GENERAL

During assembly/installation, use torque values and service products as indicated in the exploded view.

Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE APPLICATION* at the beginning of this manual for complete procedure.

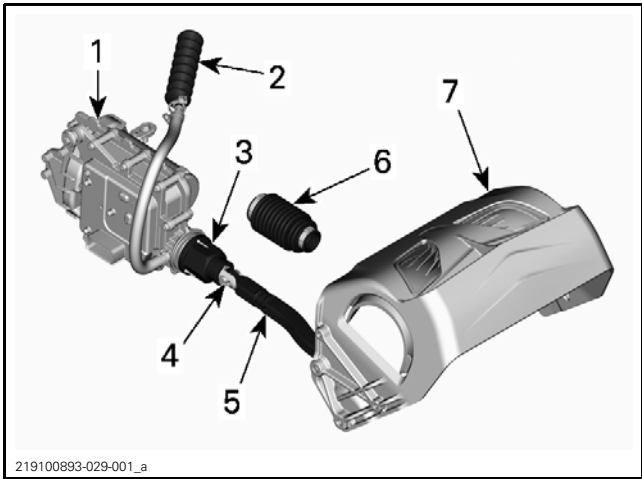
WARNING

Torque wrench tightening specifications must be strictly adhered to. Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be replaced with new ones.

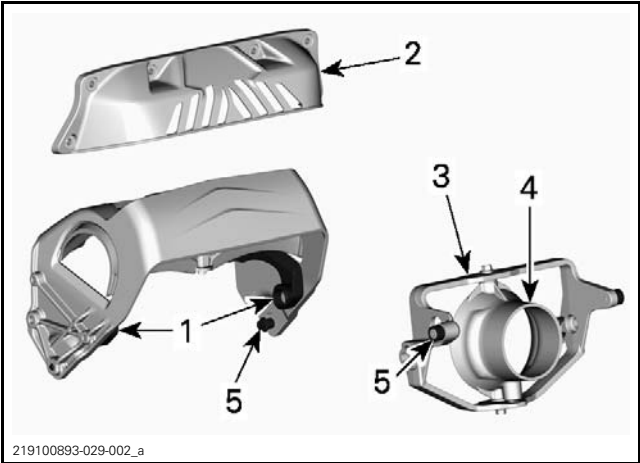
Hoses, cables or locking ties removed during a procedure must be reinstalled as per factory standards.

SYSTEM DESCRIPTION (iBR)

iBR System Components



- TYPICAL
- 1. Actuator
 - 2. Air chamber
 - 3. iBR nut
 - 4. Actuator shaft
 - 5. Connecting arm
 - 6. Connecting arm bellows
 - 7. iBR Reverse Gate



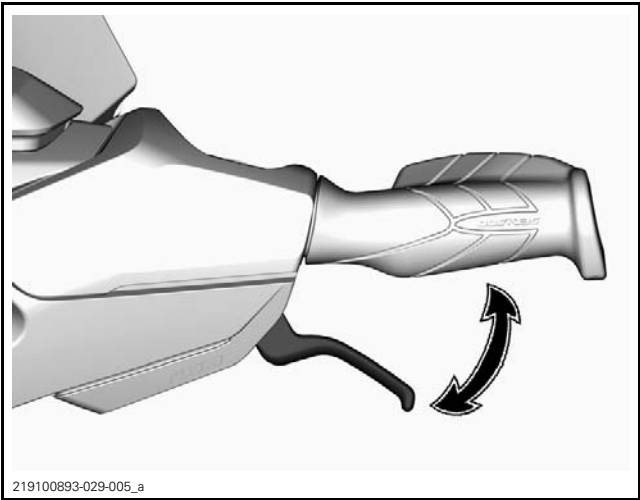
- 1. Support plates
- 2. Protective guard
- 3. VTS trim
- 4. Nozzle
- 5. Friction sleeves

The iBR (intelligent Brake and Reverse) is an electronically controlled braking and reverse system.

The iBR module controls the position of the iBR gate to provide forward thrust, reverse thrust, braking thrust, and neutral.

The operator commands the position of the iBR gate using either the throttle lever for forward thrust, or the iBR lever for neutral, reverse, and for the braking function.

The iBR lever is located on the LH side of the handlebar.

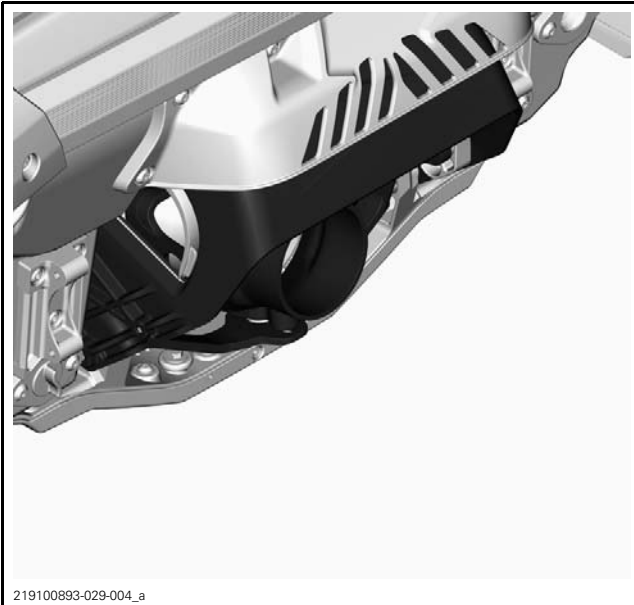
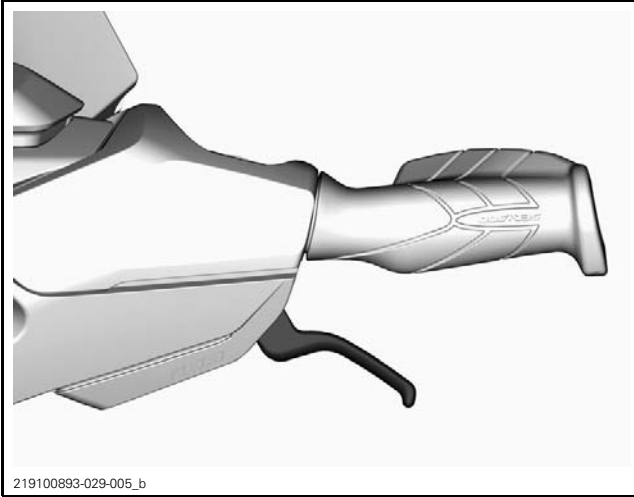


When the iBR lever is pulled in, it operates the brake and reverse lever sensor (BRLS). It is a double output hall effect sensor. The redundancy is used for security purposes.

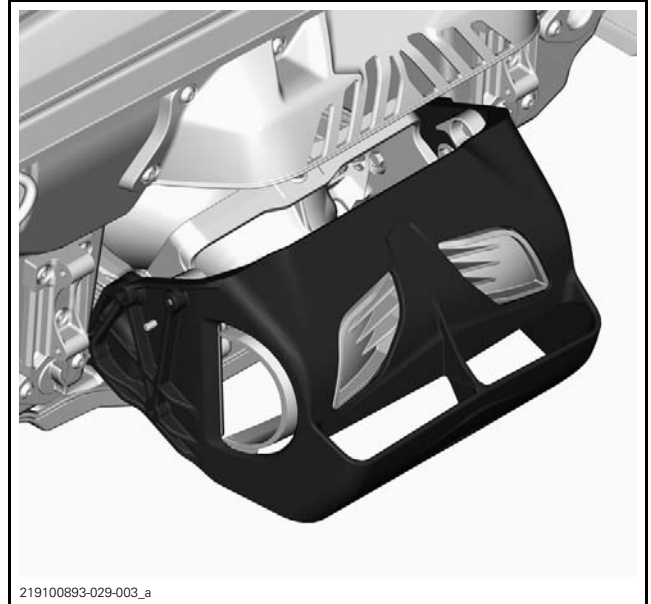
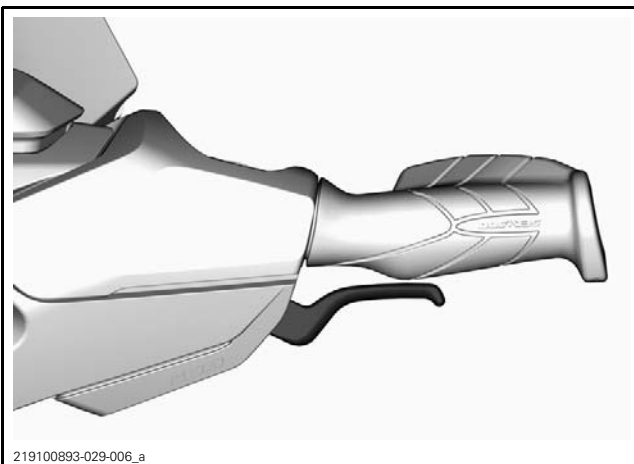
The BRLS sends the signals to the iBR module. The iBR module controls an electric motor that in turn raises or lowers the iBR gate through a mechanical drive unit.

Section 06 STEERING AND PROPULSION

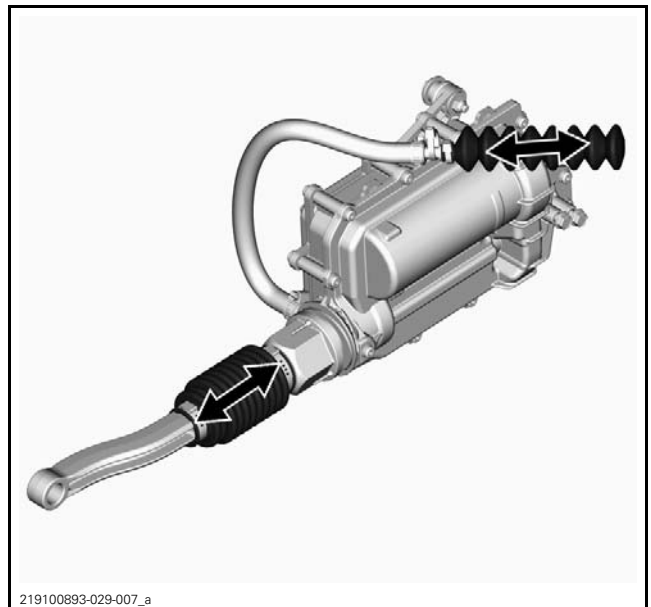
Subsection 02 (iBR, REVERSE AND VTS)



FORWARD



REVERSE



iBR ACTUATOR AIR CHAMBER MOVEMENT

NOTE: The iBR gate will move when commanded by the iBR lever only if the engine is running. For maintenance purposes, the iBR OVERRIDE function available through the gauge can be used to electrically move the gate to the desired position.

Depending on vehicle speed and how far the iBR lever is pulled in, the iBR module will automatically adjust the iBR gate movement speed and stroke.

NOTE: The iBR lever must be pulled in at least 25% of its travel (approximately) before the iBR gate starts to move. The first 25% of iBR lever travel has no effect on the iBR gate.

Section 06 STEERING AND PROPULSION

Subsection 02 (iBR, REVERSE AND VTS)

Every time the iBR gate moves when commanded by the iBR lever, engine RPM is momentarily reduced to idle speed as the gate moves.

WARNING

If it is necessary to remove any foreign object catch in the iBR gate, nozzle or linkages, strictly observe the following before proceeding:

- Remove tether cord from engine cut-off switch.
- Wait at least 5 minutes or remove iBR fuses.
- Do not press on START/STOP button. If START/STOP button is pressed, wait another 5 minutes.

iBR Override Function

iBR override moves the iBR actuator through its full range of motion.

NOTICE Remove any foreign object that may obstruct iBR actuator movement.

Activating iBR Override Function

1. Press the START/STOP button.
2. Install the tether cord.

NOTE: Do not start the engine. The tether cord must be installed to ensure the information center will not shut off all indications after its self test function. Briefly press the START/STOP button to reactivate the electrical system when required.

3. Pull in the iBR lever;
 - 3.1 There will be a beep.
 - 3.2 Press the SET or OK button on the information center (gauge).
4. Press the VTS UP or DOWN button to move the iBR gate.

Forward Mode

To engage forward:

- Start engine
- Pull in the throttle lever.

The iBR gate will automatically move to the forward position (full up).

NOTE: The full up position of the iBR gate is dependent on the selected VTS trim position.

Reverse Mode

If the watercraft speed is below 14 km/h (9 MPH) when the iBR lever is pulled in, reverse mode is engaged.

When the iBR lever is pulled in to engage the reverse, the following occurs:

- Engine RPM is reduced to idle.
- The iBR gate moves to the reverse position.
- Engine RPM ramps up to the engine power commanded by the throttle lever.

When operating in reverse mode, the iBR lever controls the iBR gate position and the engine RPM is controlled by the throttle lever.

Maximum engine RPM in reverse is 5000 RPM.

Braking Mode

If the watercraft speed is 14 km/h (9 MPH) per hour and above when the iBR lever is pulled in, braking mode is engaged.

When the iBR lever is pulled in to engage braking, the following occurs:

- Engine RPM is reduced to idle.
- The iBR gate moves to the maximum down position.
- Engine RPM ramps up to the engine power commanded by the iBR lever.

When operating in braking mode, the iBR gate always moves to the maximum down position. The throttle lever signal is overridden and engine RPM is now dependent on watercraft speed and how far the iBR lever is pulled in.

If watercraft speed is high when braking is applied, engine power will be initially low and then ramp up to the power commanded by the iBR lever position. The engine RPM may be increased, as necessary, to apply a stronger braking effect with the jet pump thrust when the conditions dictate.

As the watercraft slows to less than 8 km/h (5 MPH), the following occurs:

- Braking mode ceases.
- Reverse mode takes over if the iBR lever is not released.
- Throttle control reverts back to the throttle lever.

Neutral Mode

Every time the iBR lever is pulled in and released, the iBR gate will default to the **neutral** position, except if the throttle lever is still pulled in when the iBR lever is released. If the throttle lever is still pulled, the iBR gate will move to the forward position when the iBR lever is released and the watercraft will accelerate forward.

SYSTEM DESCRIPTION (VTS)

The VTS system is actually part of the iBR system. It provides watercraft pitch trim adjustments by adjusting the vertical position of the jet nozzle.

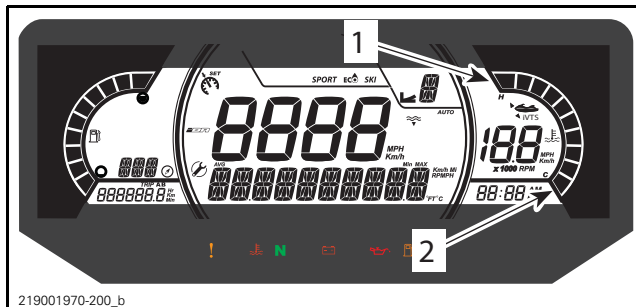
The VTS can be electrically trimmed to the desired attitude within the VTS range, or to one of 2 preset trim positions (on applicable models).

The VTS switch (or Up/Down switch) sends command signals to the gauge. The gauge converts them to CAN protocol and sends them through the CAN bus to the iBR module on the iBR actuator. The actuator then moves the iBR gate which moves the nozzle to the desired trim position.

NOTE: The nozzle and iBR gate move together in the VTS trim range up to the maximum nozzle down position. If NEUTRAL, BRAKING or REVERSE is engaged, the iBR gate moves past the VTS full down position. When FORWARD thrust is reengaged, the nozzle and iBR gate move up to the last selected VTS trim position.

The nozzle trim position can be seen on the VTS position indicator in the information center.

NOTE: Changing the VTS trim position only changes the indication. The nozzle will move to the selected VTS trim position when forward thrust is engaged.



219001970-200_b
INFORMATION CENTER — VTS POSITION INDICATOR

1. Bow up
2. Bow down

NOTE: Only the segment indicating the relative position of the VTS will be on. The illustration shows all segments on as can be seen during the self test function.

The VTS system provides the following features according to models

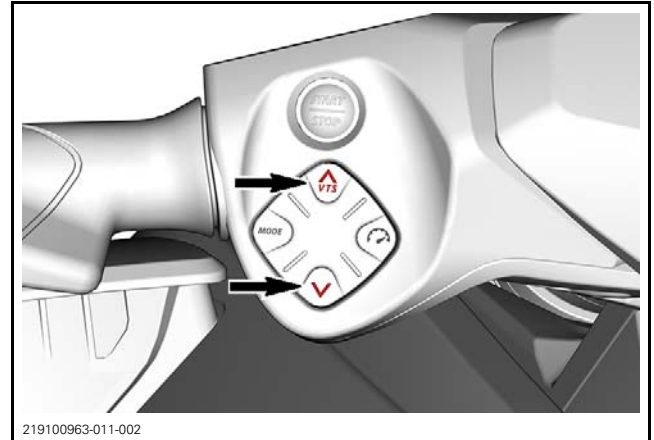
- Nozzle trimming
- Selection of 3 preset trim positions

Nozzle Trimming

Watercraft must be operating in forward position. 9 trim positions are available.

Using the VTS Button (LH Side of Handlebar)

Press the UP or DOWN arrow button to change the VTS setting.



Using Preset Trim Positions

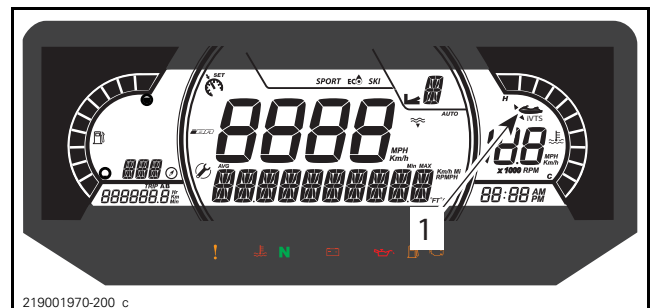
Three preset trim positions can be selected.

To select the **highest** trim position, double-click on the VTS UP arrow button (bow up).

To select the **lowest** trim position, double-click on the VTS DOWN arrow button (bow down).

Launch Control (If equipped)

The Launch Control is an automatic adjustment of the VTS to achieve optimum acceleration. When the speed is below 20 km/h (12 MPH), the VTS lowers to it's lowest position and the iVTS indicator flashes to indicate the system is ready. When the speed exceed 30 km/h (19 MPH) the VTS return to the user selected position.

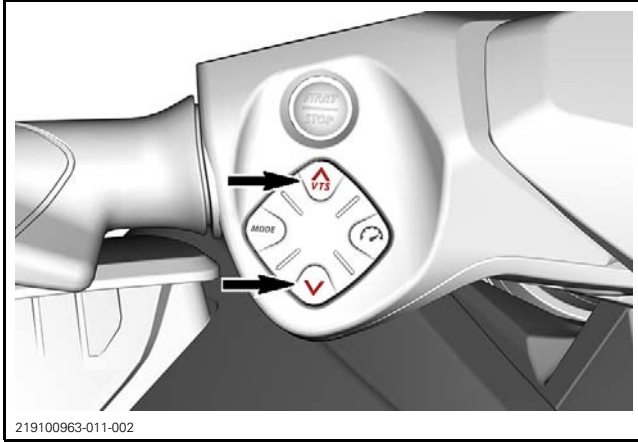


219001970-200_c
1. Launch Control indicator

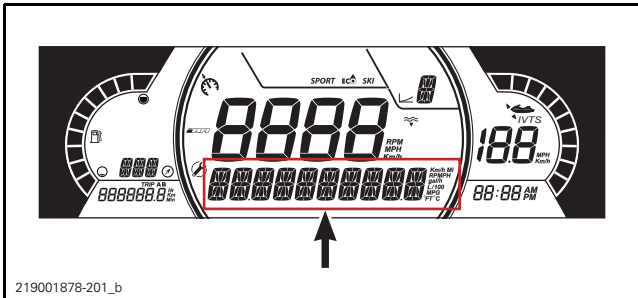
To activate the Launch Control, press simultaneously both the VTS UP and DOWN buttons.

Section 06 STEERING AND PROPULSION

Subsection 02 (iBR, REVERSE AND VTS)



The message **LAUNCH ON** will be displayed.



To deactivate the **Launch Control**, press simultaneously both UP/DOWN buttons again.

The message **LAUNCH OFF** will be displayed.

Lock/Unlock iBR Actuator

Locking/Unlocking the iBR Actuator

When working on the iBR, lock the iBR to avoid accidental movement.

In BUDS2, go to:

- Settings page
- iBR button
- Configuration - Lock/Unlock iBR

ADJUSTMENT

iBR FLASHING

NOTICE Make sure the unit's battery is fully charged before undertaking this operation.

NOTICE Continuous power to the computer is mandatory while performing this operation.

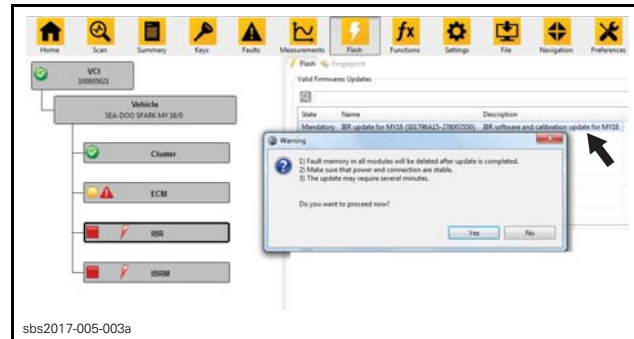
Perform after replacing the iBR actuator.

Connect the vehicle to the BRP diagnostic software (BUDS2).

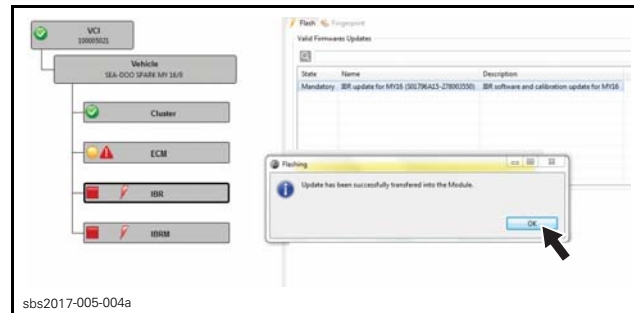
In BUDS2, go to:

- Flash page
- iBR button

Select the update file in the *VALID FIRMWARE UPDATES* window and click *YES* when prompted.



The following message will confirm that the update has been done successfully.



Click *OK* and proceed to the *iBRM* update.

iBRM FLASHING

NOTICE Make sure the unit's battery is fully charged before undertaking this operation.

NOTICE Continuous power to the computer is mandatory while performing this operation.

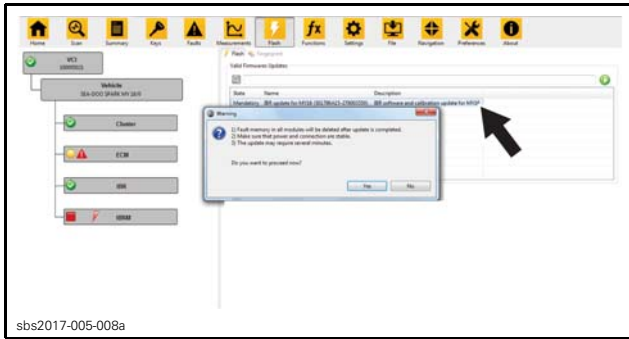
Perform after flashing the iBR.

Connect the vehicle to the BRP diagnostic software (BUDS2).

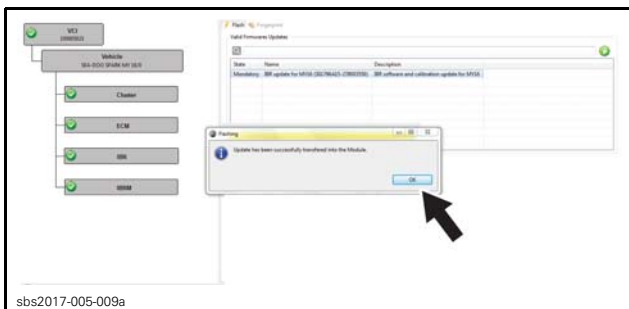
In BUDS2, go to:

- Flash page
- iBRM button

Select the update file in the *VALID FIRMWARE UPDATES* window and click *YES* when prompted.



The following message will confirm that the update has been done successfully.



iBR AUTO CALIBRATION

NOTICE iBR auto-calibration must be performed with the complete reverse gate assembly properly installed. Performing the auto-calibration procedure without the reverse gate assembly in place will damage the actuator.

Perform after repairing or removing the jet pump and/or iBR system components.

Connect the vehicle to the BRP diagnostic software (BUDS2).

In BUDS2, go to:

- Functions page
- iBR button
- Functions tab
- Routines - Auto Calibrate iBR

NOTICE Make sure the iBR actuator is unlocked before pressing the Auto Calibration button.

MAINTENANCE

Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection of this shop manual.

INSPECTION

The iBR system is self monitoring. If a fault occurs in the iBR system, it will raise a fault code and communicate it to the information center through the CAN bus. The information center will turn on the iBR indicator light to advise the operator of the iBR system fault. If the fault remains active, it may be displayed in the gauge. If it is no longer active, the BRP diagnostics software (BUDS2) must be used to read the fault.

TESTING SEQUENCE

To troubleshoot the iBR system, carry out the following in this order:

- Ensure the iBR gate movement is not obstructed in any way.
- Ensure the iBR gate mechanism is in good condition and does not show signs of excessive wear or friction.
- Check system fuses.
- Check battery condition and state of charge.
- Make sure battery connections are clean and tight.
- Connect the vehicle to the BRP diagnostic software (BUDS2) to check for iBR system or CAN bus related fault codes. Carry out service actions as indicated in BUDS2.
- If a CAN bus communication fault with the iBR actuator is indicated, or the iBR actuator is not visible in BUDS2, carry out a continuity test of the CAN bus wires. Refer to *TESTING CAN COMMUNICATION* in this subsection.
- Try moving the iBR using the iBR UP and iBR DOWN buttons on the iBR activation page in BUDS2.
- Check for proper gate and actuator movement. Refer to *TESTING THE iBR SYSTEM FUNCTION*.
- Visually inspect system connectors for moisture ingress, corrosion, and proper contact.
- Remove the screw retaining the gate to the connecting arm. Move the gate up and down by hand to check for freedom of movement.

TESTING THE iBR SYSTEM FUNCTION

This test requires two persons. One person to start engine and operate controls, and one person to observe iBR gate movement.

Provide adequate ventilation of exhaust gases or move watercraft outside.

Section 06 STEERING AND PROPULSION

Subsection 02 (iBR, REVERSE AND VTS)

NOTICE Do not install an exhaust ventilation hose in the iBR gate area or damage may occur when the iBR gate moves downward during operation.

NOTICE

- Ensure there are no tools or other object that may interfere with the iBR gate movement.
- Do not run engine for more than 2 minutes out of water or damage may occur.

⚠ WARNING

The person observing the iBR gate movement must stand to the side of the stern well clear of the iBR gate and pump nozzle in full view of the operator.

Test out of Water

NOTICE This procedure must be completed within one minute of the engine starting.

1. Connect a water hose to the watercraft to provide exhaust system cooling when operating engine. DO NOT open water tap yet.
2. Start engine, open water tap and let idle.

NOTE: If iBR gate was not in the neutral position, it will move to the neutral position on engine start up.

3. Depress the throttle lever slightly and visually confirm the iBR gate moves to the forward position (up to the VTS trim position), then release throttle. The iBR gate must remain in the forward position.
4. Depress the iBR lever fully and confirm the iBR gate moves to the full down position.
5. Release the iBR lever completely and confirm the iBR gate moves to the neutral position.
6. Close water tap and shut engine off.
7. Remove water hose from vehicle.

Test with Watercraft on a Waterway

1. Start engine.

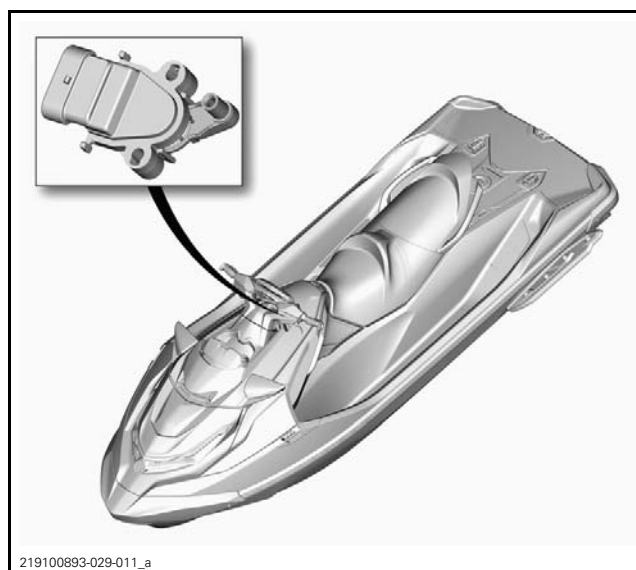
NOTE: If iBR gate is not in the neutral position before the engine start, it will move to the neutral position on engine start up.

2. Depress the throttle lever slightly, then release it. Forward movement of the watercraft confirms the iBR gate has moved to the forward position.
3. Depress the iBR lever fully. Rearward movement of the watercraft confirms the iBR gate has moved to the reverse position.

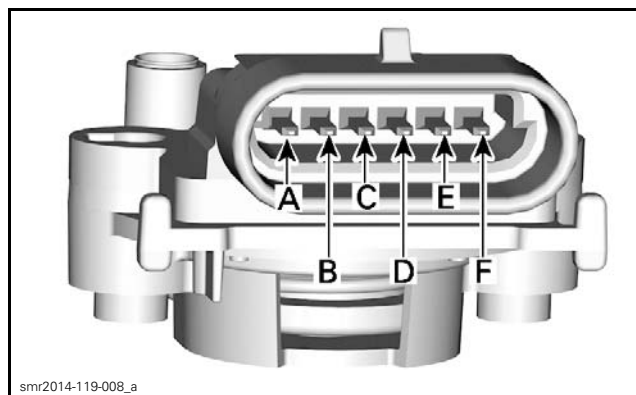
4. Release the iBR lever completely. Reverse thrust should cease and the watercraft should continue to drift rearward on momentum.
5. Apply a small amount of forward thrust to stop rearward velocity, then tap the iBR lever to return the iBR gate to neutral.
6. Shut engine off.

PROCEDURES

SWITCHES LOCATION AND PIN-OUT



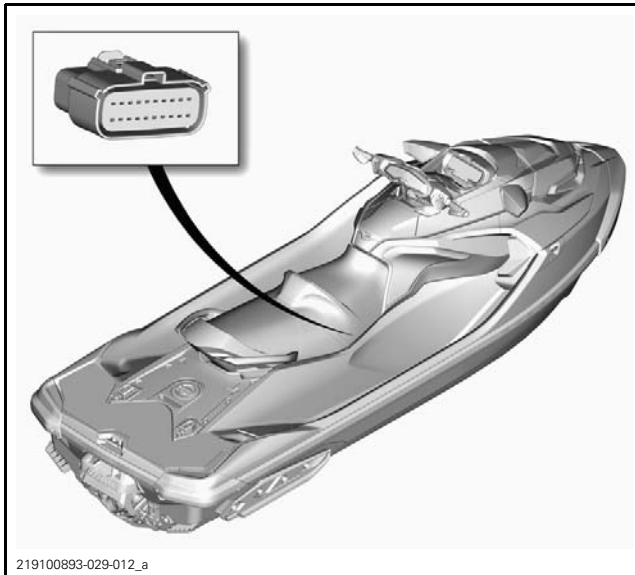
BRLS LOCATION



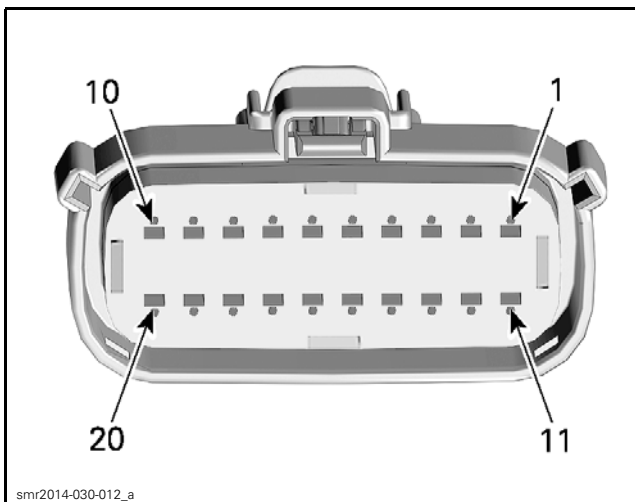
BRLS PINOUT

Section 06 STEERING AND PROPULSION

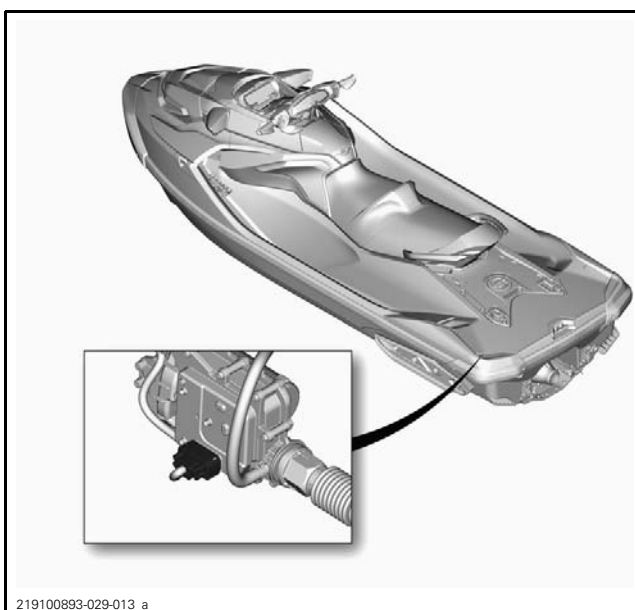
Subsection 02 (iBR, REVERSE AND VTS)



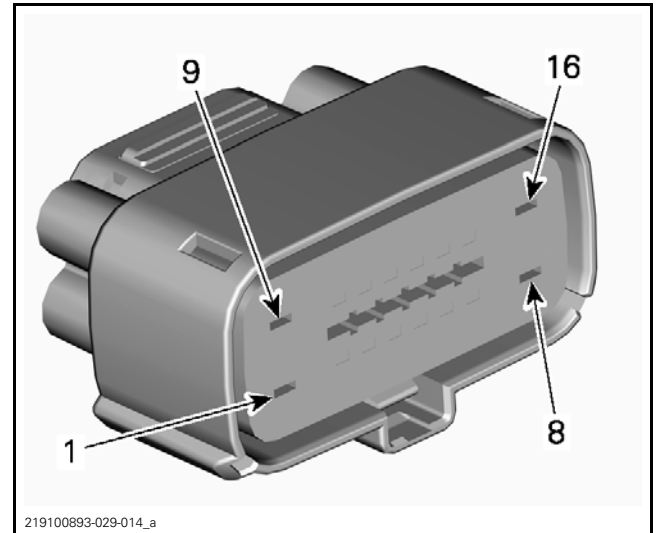
STEERING CONNECTOR LOCATION



STEERING CONNECTOR



iBR ACTUATOR CONNECTOR LOCATION



iBR ACTUATOR CONNECTOR

iBR ACTUATOR

Specifications

iBR ACTUATOR CONNECTOR	
PIN	SIGNAL
iBR-1	Battery voltage (Hot at all times)
iBR-2	Battery voltage (Hot with main relay on)
iBR-8	Ground

iBR ACTUATOR CURRENT DRAW	
DOWN SELECTION	-5 to -15 A
UP SELECTION	+10 to +20 A

Testing iBR Actuator Operation

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. In BUDS2, go to:
 - Functions page
 - iBR button
 - Functions tab
 - Move iBR Up/Down
3. Click **iBR UP** and **iBR DOWN** buttons alternately and look for a change in **iBR Position (Deg)**.

If the iBR moves using these buttons but does not move using the iBR lever, test *BRLS VOLTAGE* in this subsection.

If the iBR does not move, check the iBR fuse(s) in fuse box. If fuse(s) are good, check power and ground circuits.

Section 06 STEERING AND PROPULSION
Subsection 02 (iBR, REVERSE AND VTS)

Testing iBR Actuator Motor Current

- 1. Connect the vehicle to the BRP diagnostic software (BUDS2).
- 2. In BUDS2, go to:
 - **Measurements** page
 - **iBR** button
- 3. Note the **Gate Position (°)** indication.
- 4. Activate the iBR override function.
- 5. Move the iBR to the full up position and look for the **Motor Current (A)** indication. Also look for a change of **Gate Position (°)** indication.

NOTE: Current draw indication will not be stable. High and low peaks will be observed. Look for the maximum average current draw.

- 6. Move the iBR to the full down position and look for the **Motor Current (A)** draw indication. Also look for a change of **iBR Position (°)** indication.

If current draw is abnormally high (between 20 and 30 A), check the following:

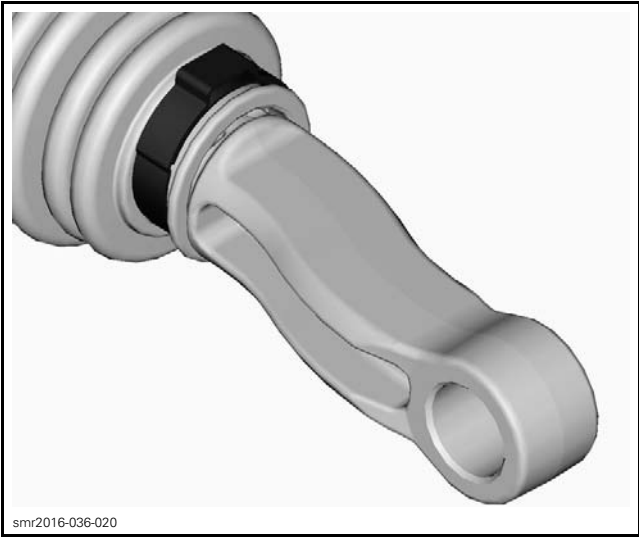
- Ensure iBR gate is free of debris.
- Check for excessive friction in gate movement.
- Check roller bushings, plastic bushings and iBR ramps.
- Check for proper voltage to the iBR actuator.
- Check for fault codes using .

Remove debris, replace iBR gate components, or replace the iBR actuator as applicable.

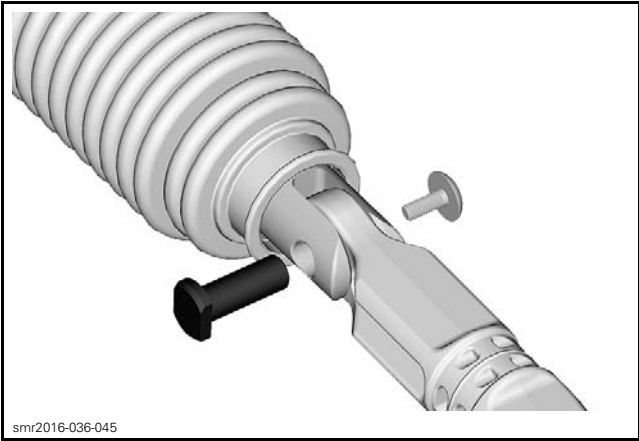
Removing the iBR Actuator

NOTICE Do not try to manually force the iBR gate when all components are installed.

- 1. Remove iBR reverse gate. Refer to *iBR REVERSE GATE* in this subsection.
- 2. Remove VTS trim ring. Refer to *VTS TRIM RING* in this subsection.
- 3. Remove the small Oetiker clamp retaining the connecting arm bellows.



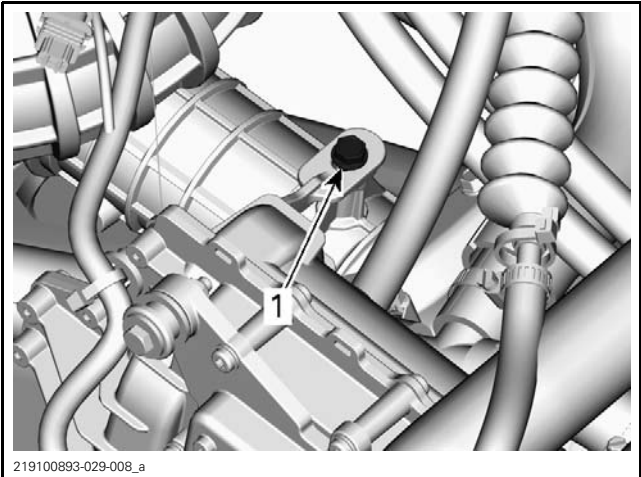
- 4. Remove connecting arm pin and screw.



- 5. Remove iBR nut and bellows using the iBR nut socket.

REQUIRED TOOL	
IBR NUT SOCKET (P/N 529 036 379)	

- 6. Move muffler. Refer to *EXHAUST SYSTEM*.
- 7. Unplug electrical connector.
- 8. Remove actuator retaining screw.



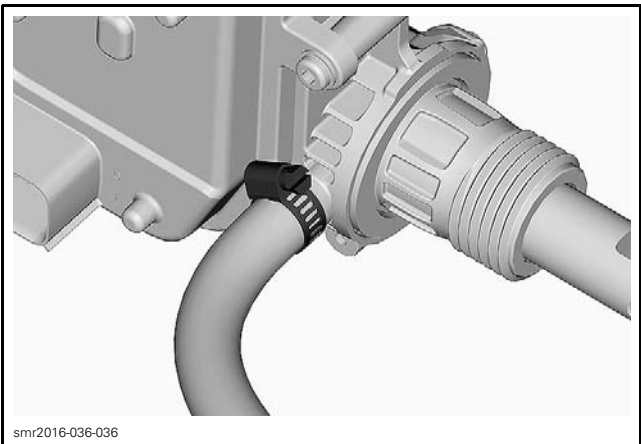
1. Actuator retaining screw

9. Remove iBR actuator and air chamber.

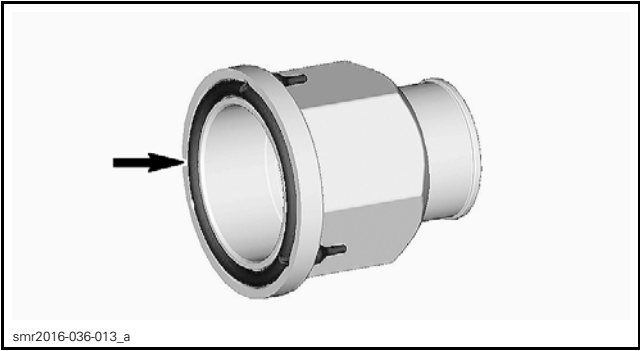
Installing the iBR Actuator

NOTICE Failure to adhere to the sequence in the following steps will cause the iBR air chamber to rupture or burst and cause premature failure of the iBR actuator.

1. Install the air chamber on the iBR actuator.
 - 1.1 Tighten the clamp.



2. Connect iBR actuator connector.
3. Install iBR actuator shaft through hull opening.
4. Slide the O-ring into position on iBR nut.



5. If the same actuator is reinstalled, clean all residues of sealing compound near the threaded area.
6. Apply Loctite 5900 on actuator, between actuator housing and threads, as shown in the exploded view.

SERVICE PRODUCT
LOCTITE 5900 (P/N 293 800 066)

NOTICE Ensure no sealing agents contact the iBR shaft.

7. Torque iBR nut.

TIGHTENING TORQUE	
iBR nut	17.5 N•m ± 2.5 N•m (155 lbf•in ± 22 lbf•in)

8. Install actuator retaining screw.

TIGHTENING TORQUE	
Actuator retaining screw	8 N•m ± 1 N•m (71 lbf•in ± 9 lbf•in)Text

9. Install connecting arm.
10. Reinstall other removed parts. Refer to appropriate subsections for procedures.

NOTICE Allow 24 hours for thread locker on retaining screws to cure.

Perform *iBR FLASHING* procedure.

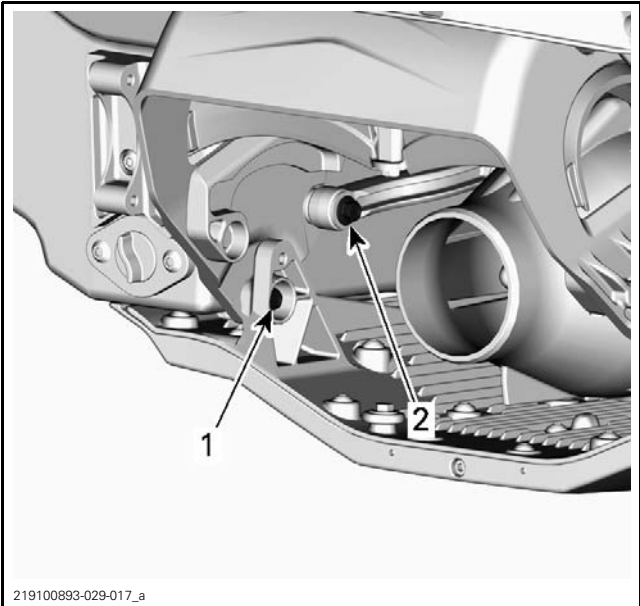
Perform *iBR AUTO-CALIBRATION* procedure.

iBR REVERSE GATE



Removing the iBR Reverse Gate

- 1. Remove the iDF connecting arm retaining screw.
- 2. Remove the iBR reverse gate retaining screws.



- 1. iBR reverse gate screw
- 2. Connecting arm screw

Installing the iBR Reverse Gate

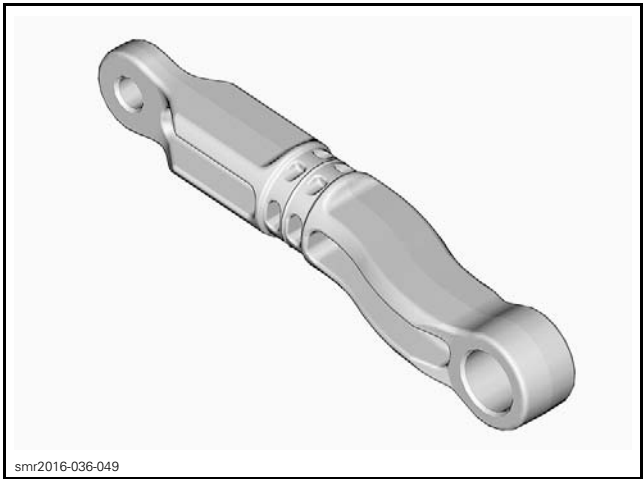
The installation is the reverse of the removal procedure. However, pay attention to the following.

TIGHTENING TORQUE	
iBR reverse gate screw	7 N•m ± 1 N•m (62 lbf•in ± 9 lbf•in)
iDF connecting arm screw	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft) + LOCTITE 271 (RED) (P/N 293 800 005)

NOTICE Allow 24 hours for threadlocker on retaining screws to cure

Perform *iBR AUTO-CALIBRATION* procedure.

CONNECTING ARM

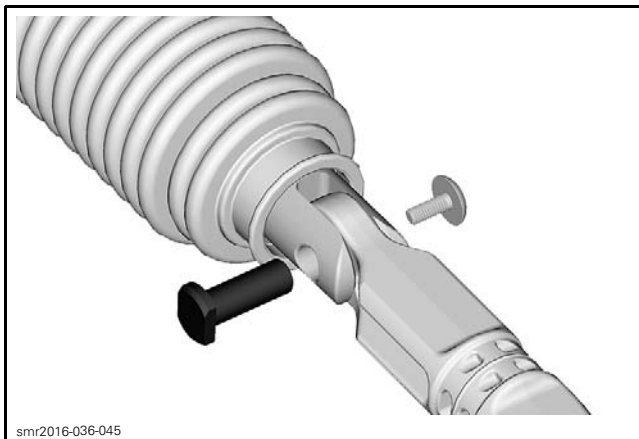


Removing the Connecting Arm

- 1. Remove iBR reverse gate. Refer to *iBR REVERSE GATE* subsection.
- 2. Remove the small Oetiker clamp retaining the connecting arm bellows.



3. Remove connecting arm pin and screw.

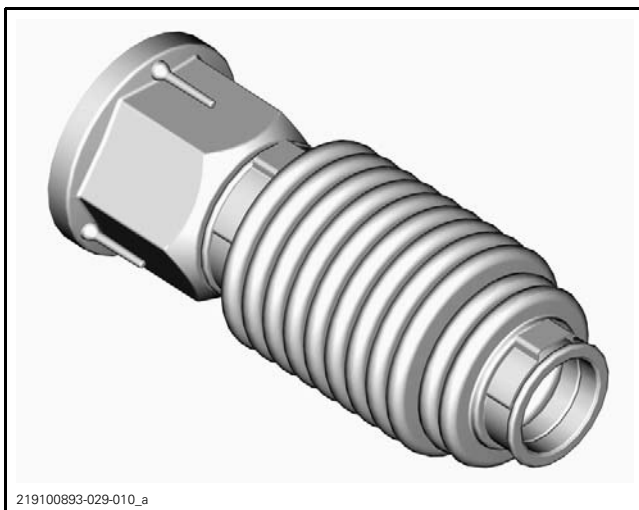


4. Remove connecting arm.

Installing the Connecting Arm

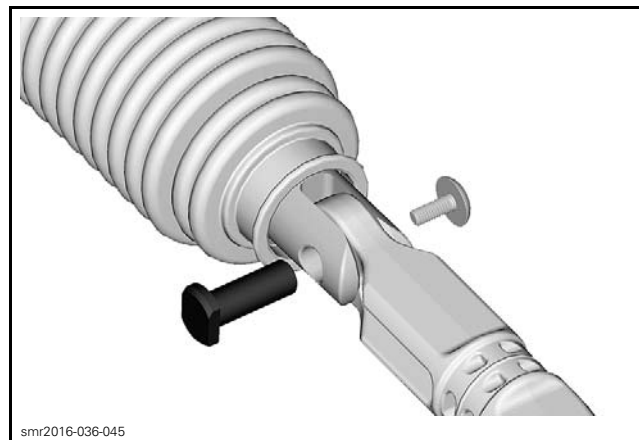
Use iBR override function to move iBR actuator to the full down setting.

NOTE: The bellows should already be installed and clamped on the iBR nut.

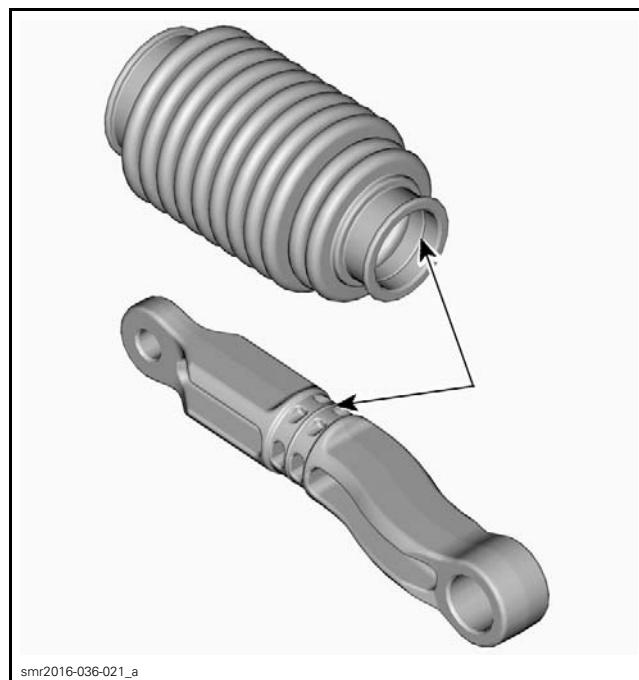


NOTICE Failure to adhere to the sequence in the following steps will cause the iBR air chamber to rupture or burst and cause premature failure of the iBR actuator.

1. Push the bellows back towards iBR actuator.
2. Install connecting arm pin and screw.
 - 2.1 Tighten screw.

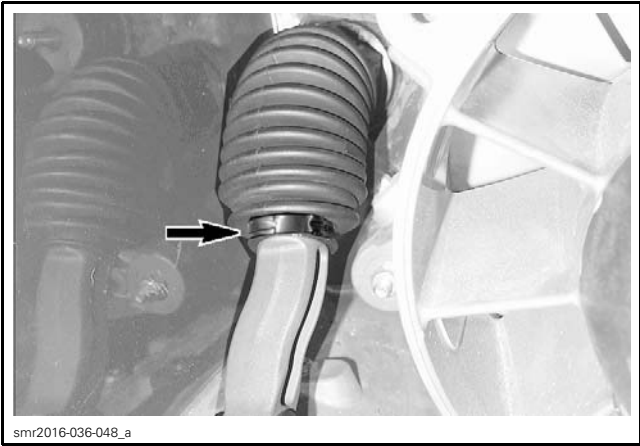


3. Position the bellows over the connecting arm.



4. Compress the air chamber (attached to iBR actuator).

- 4.1 Clamp the Oetiker clamp on the connecting arm bellows.



5. Reinstall other removed parts. Refer to appropriate subsections for procedures.

NOTICE Allow 24 hours for thread locker on retaining screws to cure.

Perform *IBR AUTO-CALIBRATION* procedure. Refer to *IBR AUTO-CALIBRATION* in this subsection.

ACTUATOR OUTPUT SHAFT

Removing the Actuator Output Shaft

- 1. Remove the connecting arm.
- 2. Unscrew the output shaft (1/4 of a turn) from the iBR actuator.

Installing the Actuator Output Shaft

The Installation is the reverse of the removal procedure. However, pay attention to the following.

TIGHTENING TORQUE	
Actuator output shaft	4.3 N•m (38 lbf•in)

Make sure the output shaft is aligned with the connecting arm.

Perform *iBR AUTO-CALIBRATION* procedure. Refer to *IBR AUTO-CALIBRATION* in this subsection.

VTS TRIM RING



Removing the VTS Trim Ring

- 1. Remove the iBR reverse gate.
- 2. Disconnect the steering cable from nozzle. Refer to *STEERING* subsection.
- 3. Remove VTS trim ring screws.
- 4. Remove nozzle pivot screws (if required).

iDF Models

- 5. Move the VTS trim ring with nozzle upwards.
- 6. Using a screwdriver or any suitable tool, carefully pry out the iDF arm from the VTS trim ring attachment.

Installing the VTS Trim Ring

The installation is the reverse of the removal procedure. However, pay attention to the following:

TIGHTENING TORQUE	
VTS trim ring screws	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft) + LOCTITE 271 (RED) (P/N 293 800 005)

Reinstall other removed parts. Refer to appropriate subsections for procedures.

NOTICE Allow 24 hours for thread locker on screws to cure.

Perform *IBR AUTO-CALIBRATION* procedure. refer to *IBR AUTO-CALIBRATION* in this subsection.

BRAKE AND REVERSE LEVER SWITCH (BRLS)

Testing and Specifications

BRLS PINOUT	
PIN	SIGNAL
BRLS-A	5 VDC
BRLS-B	GND
BRLS-C	View signal % in BUDS2
BRLS-D	5VDC
BRLS-E	GND
BRLS-F	View signal % in BUDS2


NOTE: When moving BRLS lever, the BRLS percentage should increase or decrease in a steady linear fashion.

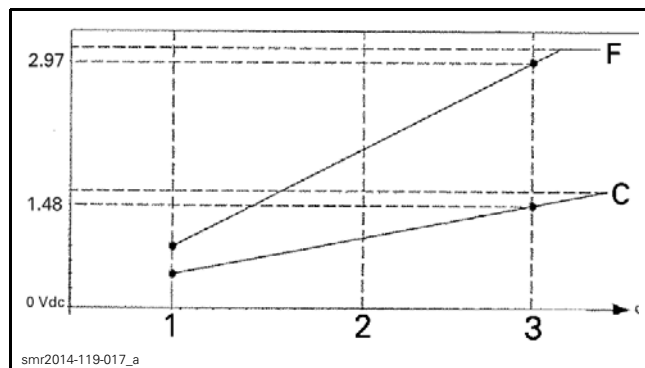
If BUDS2 does not show BRLS percentage moving or if reading is erratic:

- Check for BRLS reference voltage.
- Check for BRLS ground.
- Carry out a continuity test of the wiring between the iBR actuator and the BRLS.

NOTE: When installed on vehicle the BRLS-C Vdc signal should always be half of the BRLS-F Vdc signal when testing with a multimeter.

To test, install Diagnostic harness between steering harness connectors.

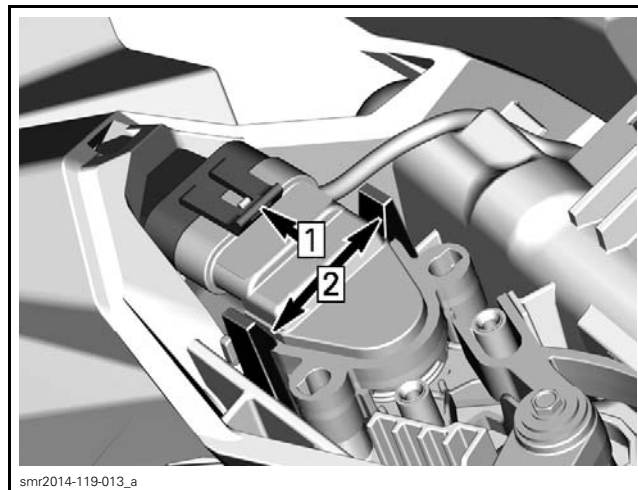
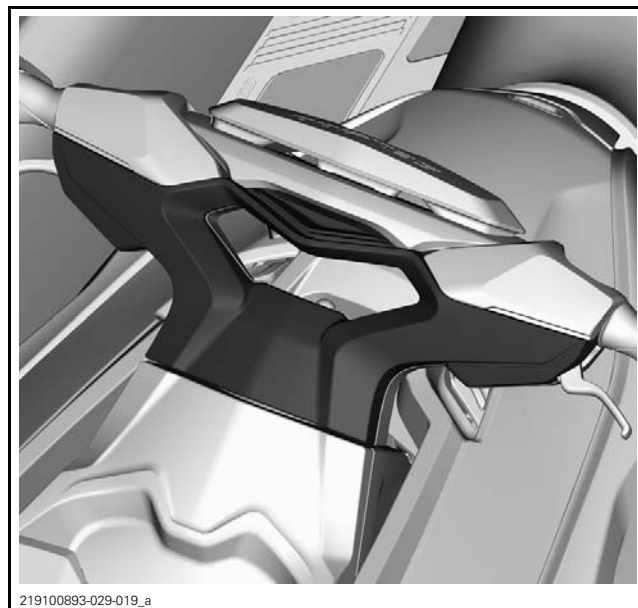
REQUIRED TOOL
<p>DIAGNOSTIC HARNESS (P/N 529 036 384)</p> 



APPROXIMATE BRLS SIGNAL VOLTAGE CURVE PINS F AND C

1. BRLS released
2. BRLS at 50% pulled
3. BRLS fully pulled

Removing the BRLS



Installing the BRLS

The installation is the reverse of the removal procedure.

Section 06

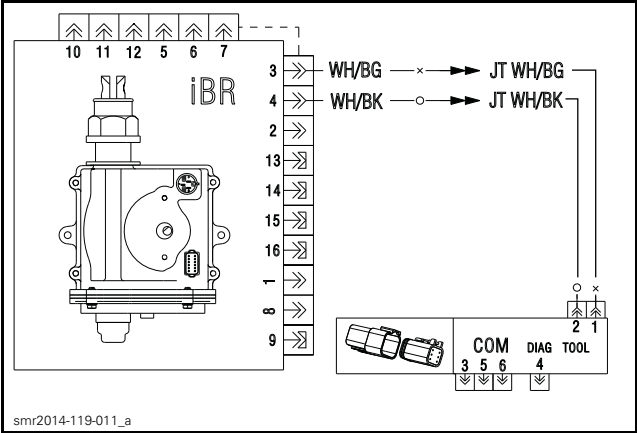
STEERING AND PROPULSION

Subsection 02

(iBR, REVERSE AND VTS)

TESTING CAN COMMUNICATION

CAN WIRE RESISTANCE TEST		
IBR ACTUATOR CONNECTOR PIN	COM CONNECTOR PIN	SPECIFIED RESISTANCE
iBR-3	COM-1	0 Ω
iBR-4	COM-2	0 Ω



Refer to *PROCEDURES* in this subsection for wiring diagram and pinouts.

Refer to *CONTROLLER AREA NETWORK (CAN)* subsection for additional information.

JET PUMP

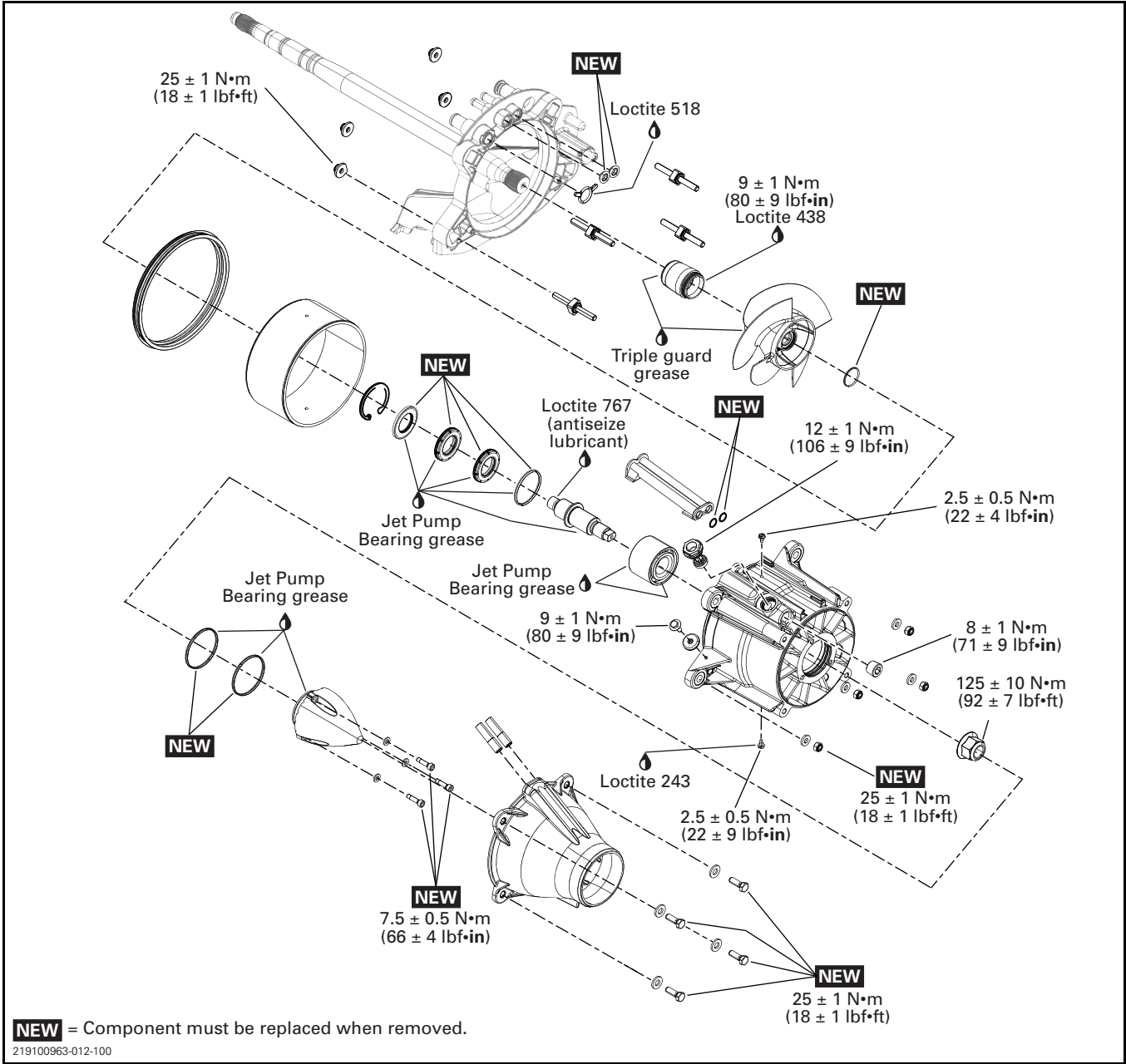
SERVICE TOOLS

Description	Part Number	Page
IMPELLER REMOVER/INSTALLER.....	529 035 956	193–194, 199
IMPELLER SHAFT BEARING TOOL	529 036 168	196–197
IMPELLER SHAFT PUSHER.....	529 035 955	195, 197
PRESSURE CAP	529 036 283	186
PUMP PLATE.....	529 036 224	189
VACUUM/PRESSURE PUMP	529 021 800	186

SERVICE PRODUCTS

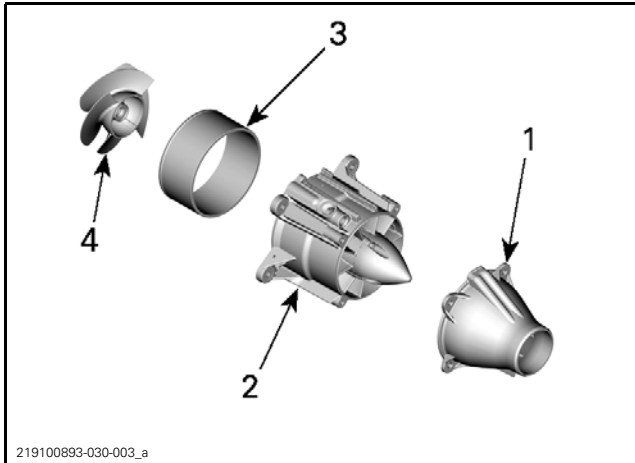
Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1.....	779244	189
JET PUMP BEARING GREASE	293 550 032	192, 197, 200
LOCTITE 243 (BLUE).....	293 800 060	195
LOCTITE 438	296 000 424	194
LOCTITE 518	293 800 038	190
LOCTITE 767 (ANTI-SEIZE LUBRICANT)	293 800 070	193
LUBRICANT AND ANTI-CORROSIVE (EUR)	779224	190, 193
LUBRICANT AND ANTI-CORROSIVE.....	779168	190, 193
TRIPLE-GUARD GREASE	508298	189–190, 194

Section 06 STEERING AND PROPULSION
Subsection 03 (JET PUMP)



GENERAL

JET PUMP MAIN COMPONENTS

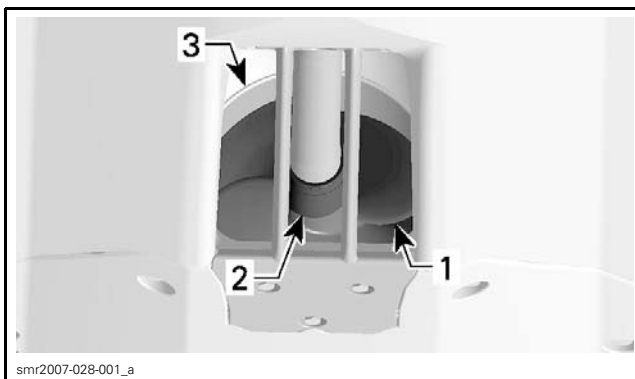


1. Venturi
2. Jet pump housing
3. Wear ring
4. Impeller

INSPECTION

IMPELLER CONDITION

Condition of impeller, impeller boot and wear ring can be quickly checked from underneath the watercraft. With the vehicle on the trailer, use a flashlight to visually inspect them through the inlet grate.



TYPICAL — UNDERNEATH HULL

1. Impeller
2. Impeller boot
3. Wear ring

IMPELLER/WEAR RING CLEARANCE

This clearance is critical for jet pump performance. To check clearance, remove jet pump.

Using a feeler gauge, measure clearance between impeller blade tip and wear ring. Measure each blade at its center.



MODEL	MAXIMUM WEAR CLEARANCE
All models	0.35 mm (.014 in)

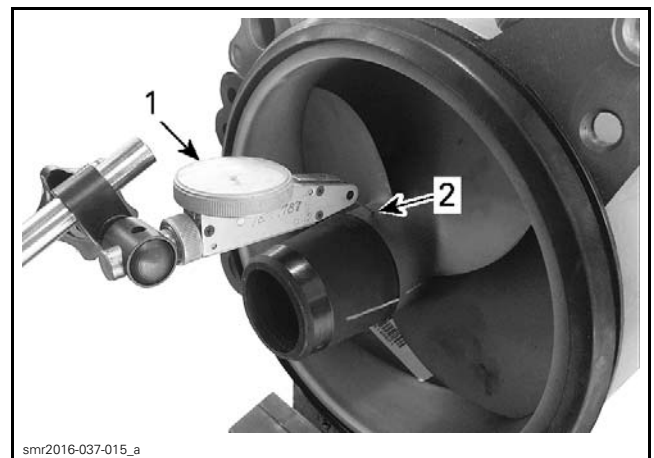
IMPELLER SHAFT RADIAL PLAY

Radial play is critical for jet pump life span.

To check radial play, remove jet pump.

Make sure impeller shaft turns freely and smoothly.

1. Retain housing in a soft jaw vise making sure not to damage housing lug.
2. Set a dial gauge and position its tip onto metal end, close to the end of the impeller hub.
3. Move shaft end up and down. Difference between highest and lowest dial gauge reading is radial play.



TYPICAL — MEASURING IMPELLER SHAFT RADIAL PLAY

1. Dial gauge
2. Measure close to impeller hub end

RADIAL PLAY
0.5 mm (.02 in)

Section 06 STEERING AND PROPULSION

Subsection 03 (JET PUMP)

Excessive play can come either from worn bearing or damaged jet pump housing bearing surface.

LEAK TEST

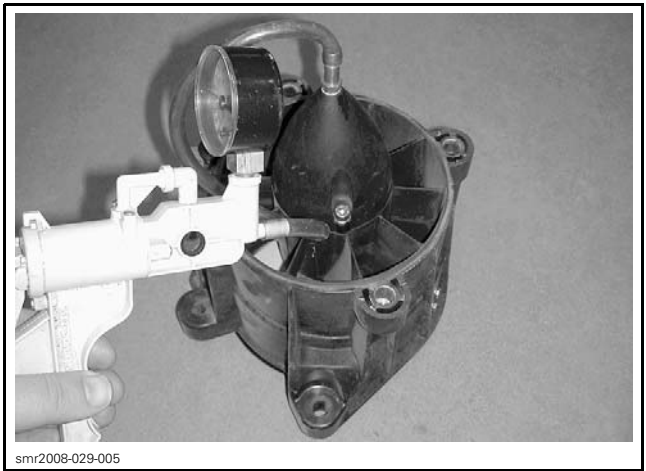
Whenever performing any type of repair on the jet pump, a leak test should be carry out.

Proceed as follows:

- 1. Remove impeller cover. Refer to *IMPELLER COVER* in this subsection.
- 2. Install the pressure cap on pump housing.

REQUIRED TOOLS	
PRESSURE CAP (P/N 529 036 283)	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	

- 3. Connect the vacuum/pressure pump to the pressure cap fitting.



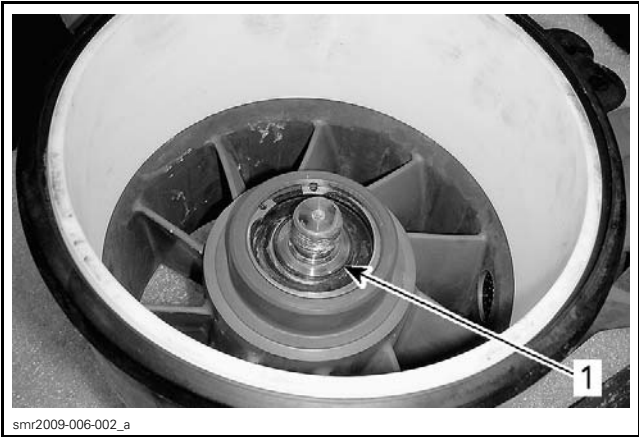
TYPICAL

- 4. Pressurize pump.

LEAK TEST PRESSURE
Maximum 70 kPa (10 PSI)

- 5. Pump must maintain this pressure for at least 5 minutes.

NOTE: Only 2 or 3 bubbles coming out from the seal on the impeller side is acceptable. Leaks from other areas must be repaired.



TYPICAL

- 1. Small leak here is acceptable

NOTICE Repair any leak. Failure to correct a leak will lead to premature wear of pump components.

- 6. Disconnect pump and remove pressure cap.
- 7. Reinstall impeller cover. Refer to *IMPELLER COVER* in this subsection.

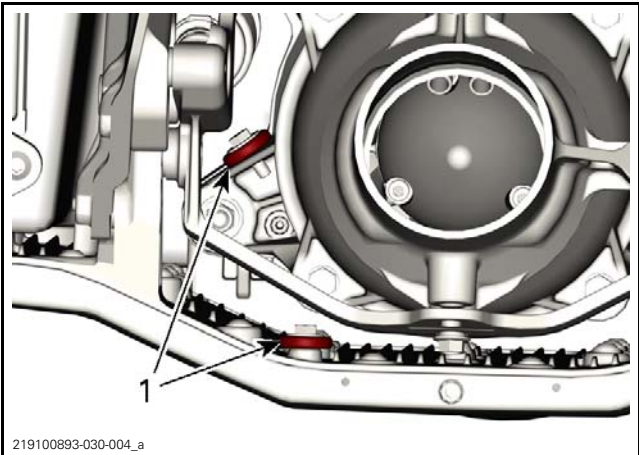
PROCEDURES

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

SACRIFICIAL ANODES

Inspecting the Sacrificial Anodes

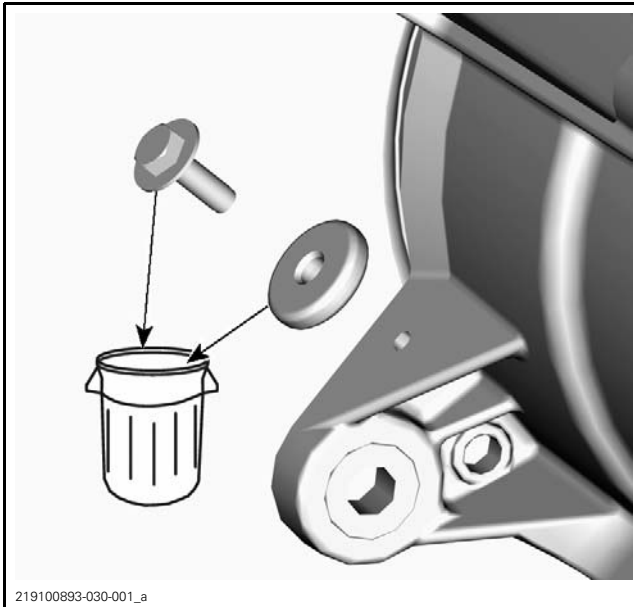
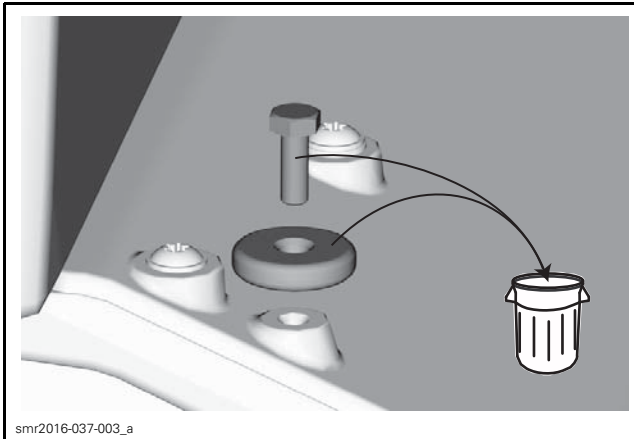
Check for wear. If worn more than half, replace anode.



- 1. Sacrificial anode location

Removing the Sacrificial Anode

Remove and discard screw and anode.



Installing the Sacrificial Anode

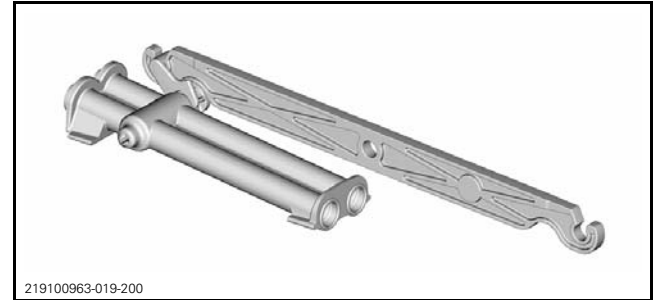
Installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Sacrificial anode screw	8 N•m ± 1 N•m (71 lbf•in ± 9 lbf•in)

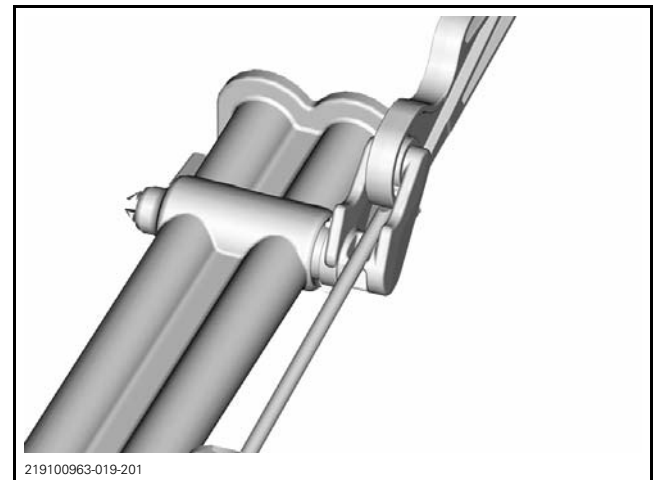
IDF ARM

Removing the iDF Arm

1. Remove the venturi from the pump housing.
2. Remove the water outlet tubes and the iDF arm from the top of the jet pump housing.



3. Rotate the iDF arm then using a screwdriver or any suitable tool, carefully pry out the iDF arm from the rotary valve.



Installing the iDF Arm

The installation is the reverse of the removal procedure.

VENTURI

Removing the Venturi

1. Remove the iBR gate, VTS trim ring and nozzle. Refer to *iBR, REVERSE AND VTS* subsection.
2. Remove the venturi from the jet pump housing.

Installing the Venturi

The installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Venturi retaining screw	25 N•m ± 1 N•m (18 lbf•ft ± 1 lbf•ft)

JET PUMP HOUSING

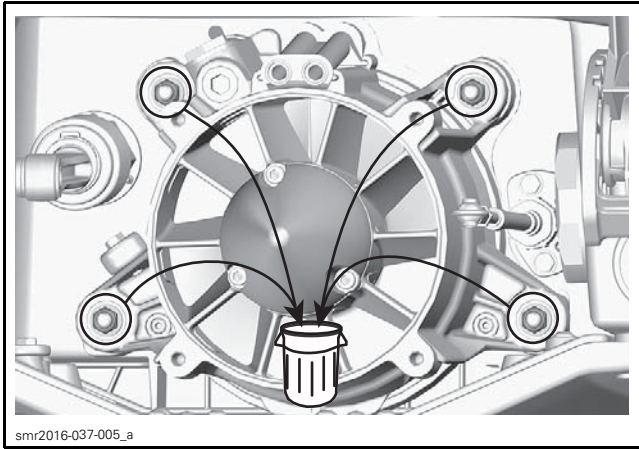
Removing the Jet Pump Housing

1. Remove the iBR gate, VTS trim ring and nozzle. Refer to *iBR, REVERSE AND VTS* subsection.
2. Remove the venturi.

Section 06 STEERING AND PROPULSION


Subsection 03 (JET PUMP)

3. Remove and discard the nuts that retain the jet pump to the pump support.



4. Pull back jet pump housing to remove it from the pump support. It may be necessary to wiggle it slightly as you pull back on the pump.

Temporarily fasten the engine alignment plate to pump support to support drive shaft and avoid PTO oil seal damage.

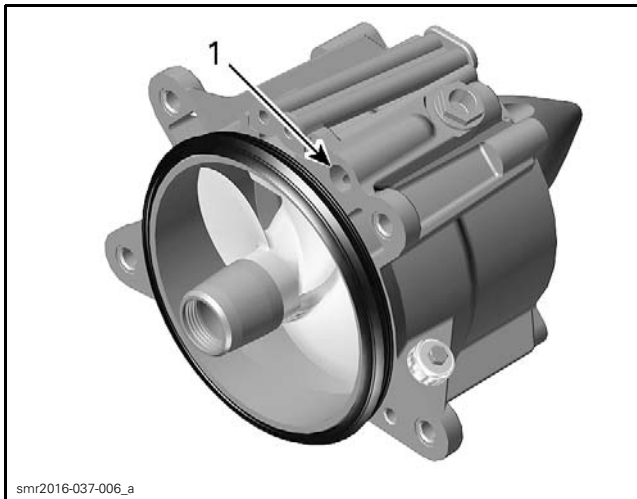
REQUIRED TOOL	
PUMP PLATE (P/N 529 036 224)	

Inspecting and Cleaning the Jet Pump Housing

1. Visually inspect jet pump housing. Pay attention to the stator. Ensure the assembly is clean and free of any debris and defects.

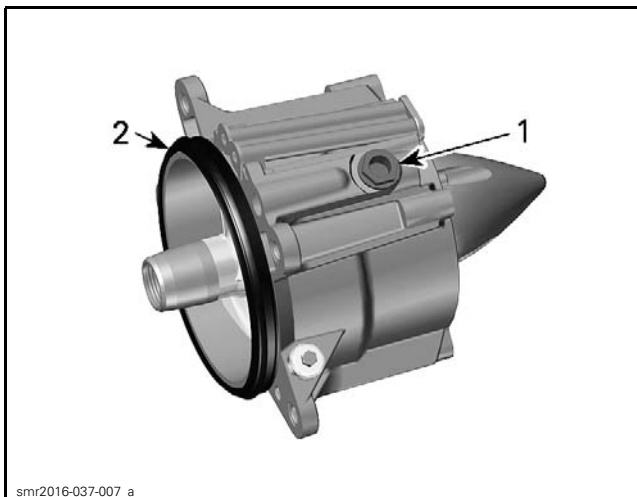
Do the following as applicable.

2. Blow low pressure compressed air through the pressure outlet fitting and make sure it is clear.



1. Pressure outlet

3. Ensure cap screw is tight.
4. Ensure the neoprene seal is in good condition. Replace as required.



1. Cap screw
 2. Neoprene seal

Installing the Jet Pump Housing

The installation is the reverse of the removal procedure. However, pay attention to the following.

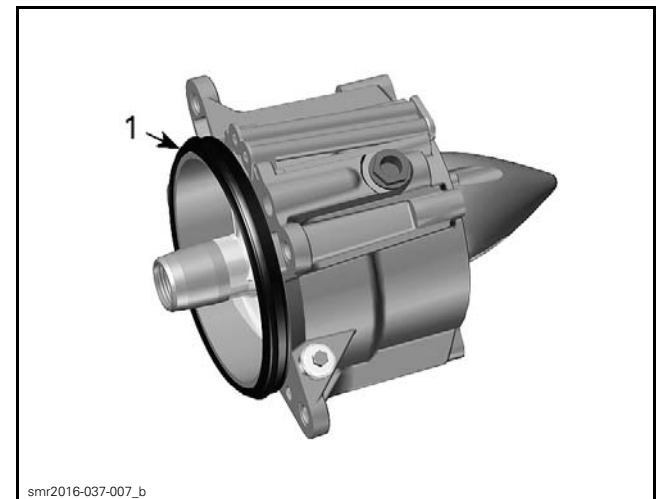
Clean impeller splines and drive shaft splines with Clutch and pulley flange cleaner or equivalent. Splines must be free of any residue.

NOTICE To avoid damaging the drive shaft finish, never use a metallic brush.

Lubricate drive shaft splines, impeller splines and the inside of the impeller boot with grease.

SERVICE PRODUCTS
CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)
TRIPLE-GUARD GREASE (P/N 508298)

Ensure the neoprene seal is properly installed on the jet pump.

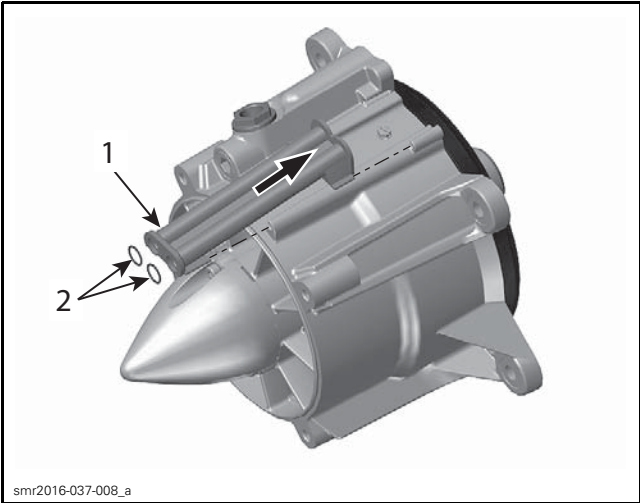


1. Neoprene seal

Install new O-rings then slide water outlet adapter onto pump.

Section06 STEERING AND PROPULSION

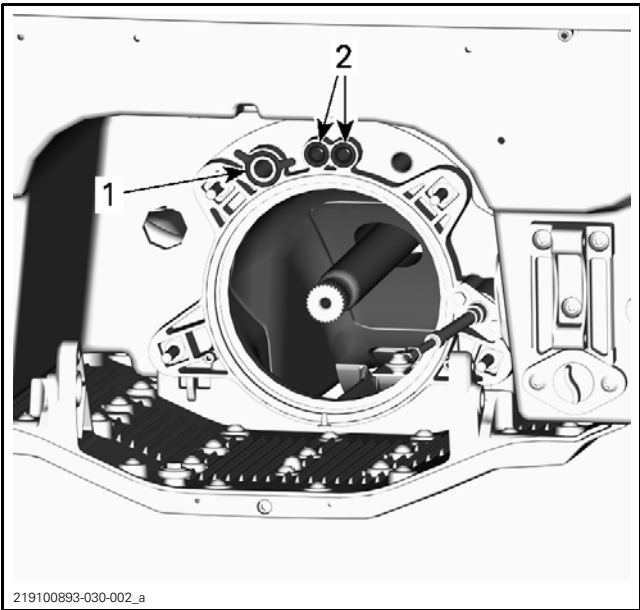
Subsection 03 (JET PUMP)



1. Slide adapter onto pump
2. New O-rings here

Install new O-rings on pump support.
Apply a thin layer of Loctite on the rounded portion of the O-rings to hold it against the support.

SERVICE PRODUCT
LOCTITE 518 (P/N 293 800 038)



1. Install new O-rings
2. O-rings (with tabs)

Generously apply grease on drive shaft splines.

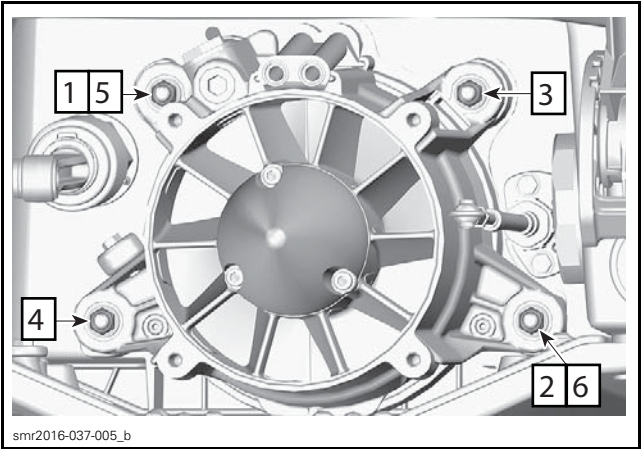
SERVICE PRODUCT
TRIPLE-GUARD GREASE (P/N 508298)

Install jet pump.

NOTE: If necessary, wiggle jet pump to engage drive shaft splines in impeller.

Install new nuts and tighten as per table and the illustrated sequence.

TIGHTENING TORQUE	
Jet pump nuts	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)



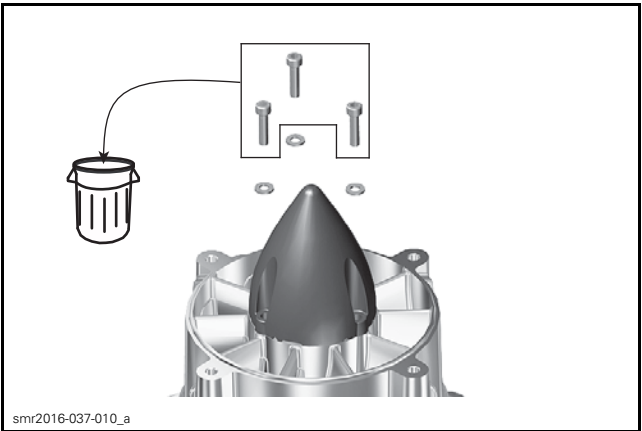
Slightly lubricate wear ring with Lubricant and anti-corrosive to minimize friction during initial impeller start.

SERVICE PRODUCTS	
Scandinavia	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)

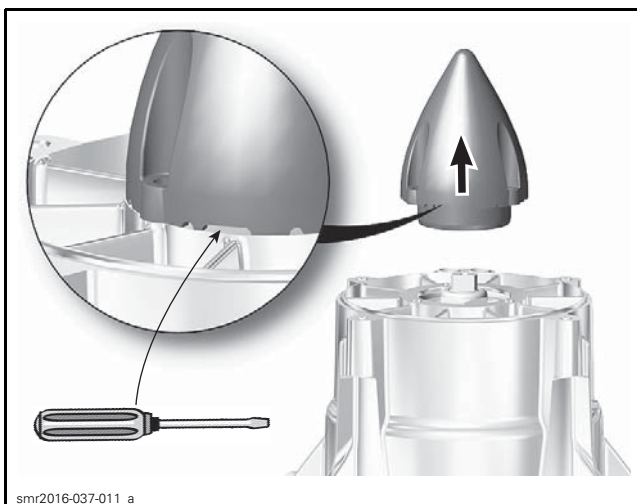
IMPELLER COVER

Removing the Impeller Cover

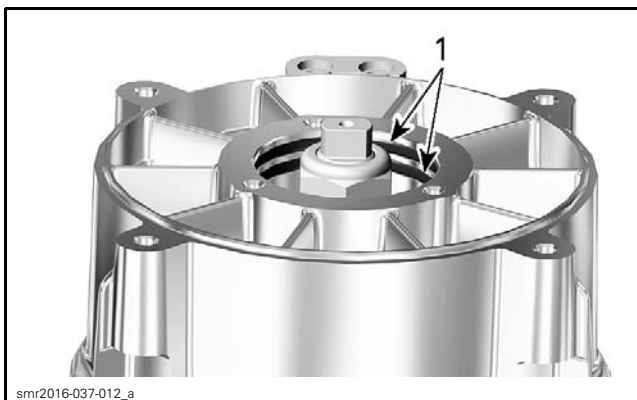
1. Remove the jet pump housing.
2. With pump housing in vertical position, remove and discard the 3 retaining screws.



3. Using a fiber hammer, gently tap impeller cover to help release it from the jet pump housing.
4. Use a flat screwdriver in the slots provided as pry points to remove it from the jet pump housing.



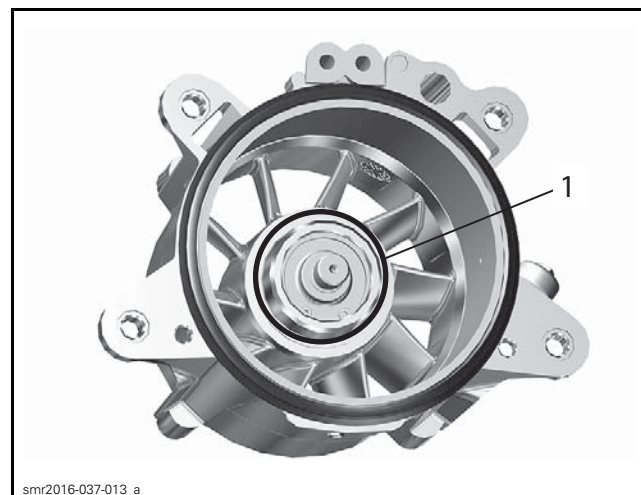
5. Remove both cover O-rings.



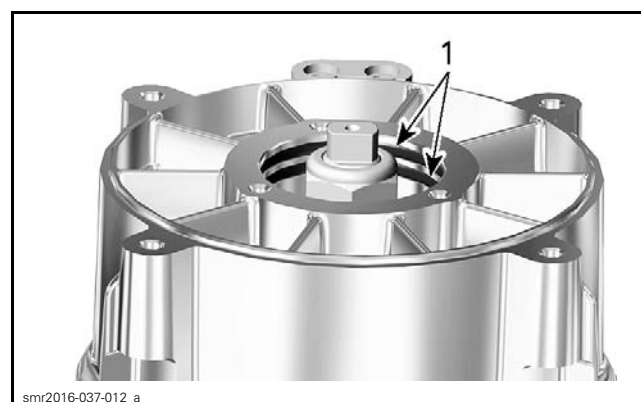
1. Cover O-rings

Inspecting the Impeller Cover

Check for presence of water in cover and bearing area. If water is found, replace seals on impeller side. Also replace O-rings and/or impeller cover.

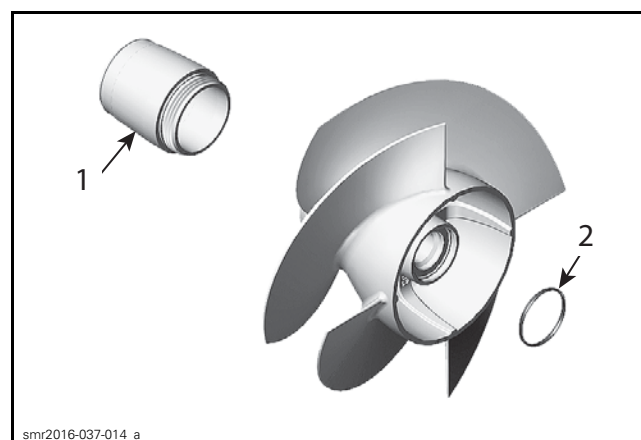


1. Seal on impeller side



1. Cover O-rings

Check impeller boot and O-rings condition on impeller. Replace as required.



1. Impeller boot
2. Impeller O-ring

Perform a leak test. Refer to *LEAK TEST* in this subsection.

Installing the Impeller Cover

1. Apply a thin layer of grease in O-ring grooves.

Section 06 STEERING AND PROPULSION

Subsection 03 (JET PUMP)

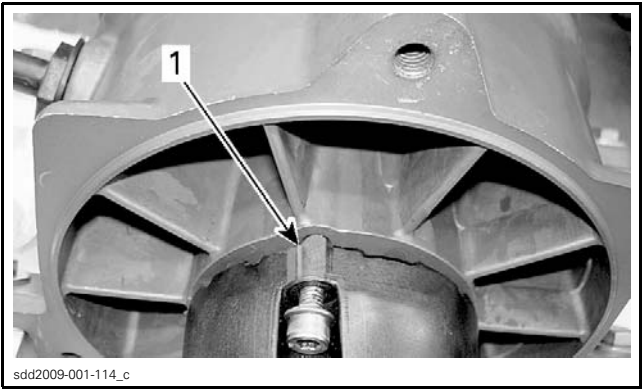
SERVICE PRODUCT	
JET PUMP BEARING GREASE (P/N 293 550 032)	

2. Install O-rings in their respective groove and make sure they are properly lubricated.



TYPICAL

3. Install impeller cover by aligning the cover index mark with the pump top fin as shown.



1. Align mark with top fin

NOTE: Cover can only be installed in one position as screw holes are not located symmetrically.

4. Secure cover with **NEW** self-locking screws.

NOTE: Push cover against pump housing while alternately tightening screws. Make sure O-rings are positioned correctly and they are not damaged when pushing the cover.

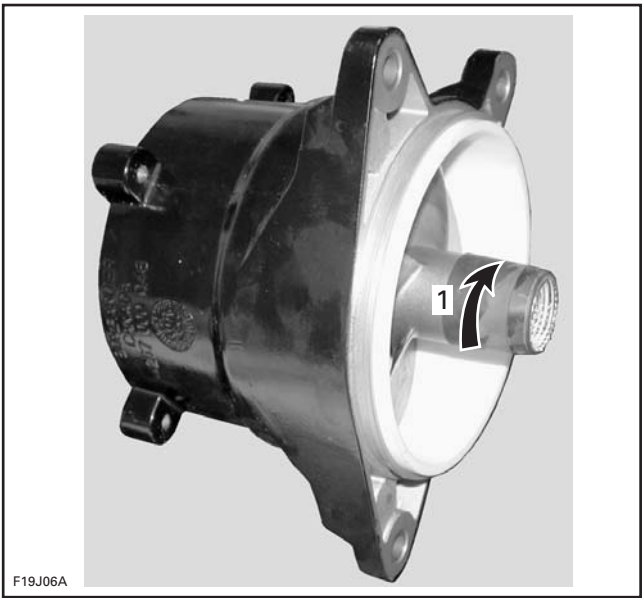
TIGHTENING TORQUE	
Cover screw	7.5 N•m ± 0.5 N•m (66 lbf•in ± 4 lbf•in)

IMPELLER

Removing the Impeller

NOTE: If impeller shaft is to be disassembled, loosen the impeller shaft nut prior to removing the impeller.

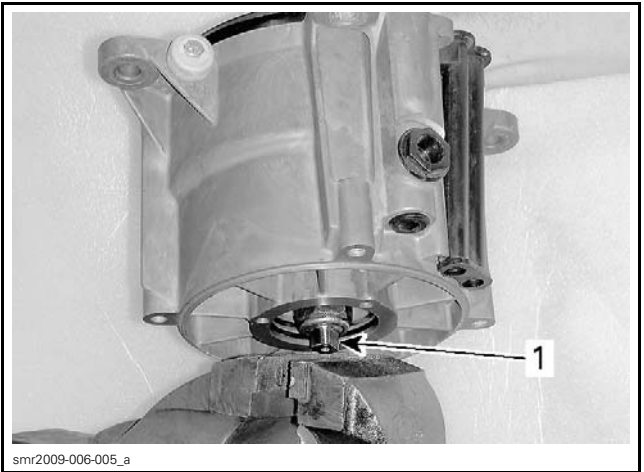
1. Remove jet pump housing. Refer to *JET PUMP HOUSING* in this subsection.
2. Remove impeller cover. Refer to *IMPELLER COVER* in this subsection.
3. Remove impeller boot by turning it **clockwise** (LH threads).



TYPICAL

1. Unscrew clockwise


4. Mount the flat sides of impeller shaft in a vise.



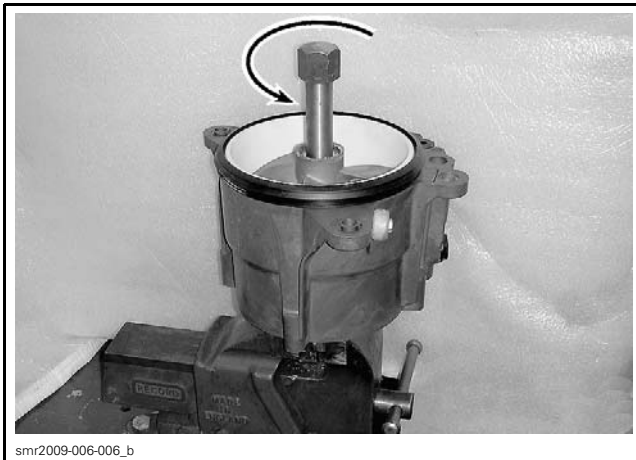
TYPICAL

1. Flat side

5. Unscrew the impeller counterclockwise using the required tool.

REQUIRED TOOL	
IMPELLER REMOVER/INSTALLER (P/N 529 035 956)	

NOTICE Never use an impact wrench to loosen impeller.

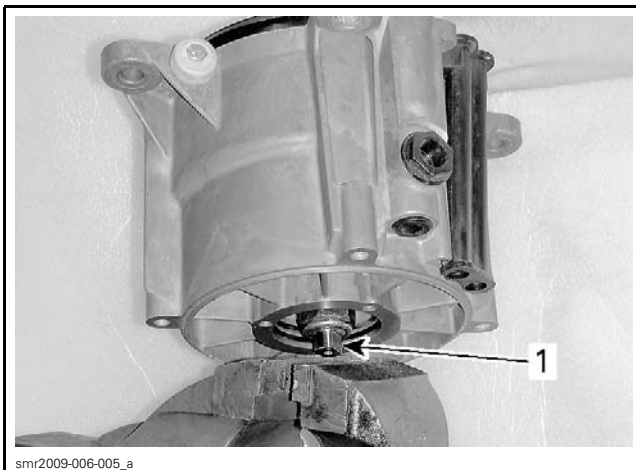


TYPICAL

- To pull impeller out of the pump, apply a rotating movement as you pull on the impeller.

Installing the Impeller

- Mount the flat sides of the impeller shaft in a vise.

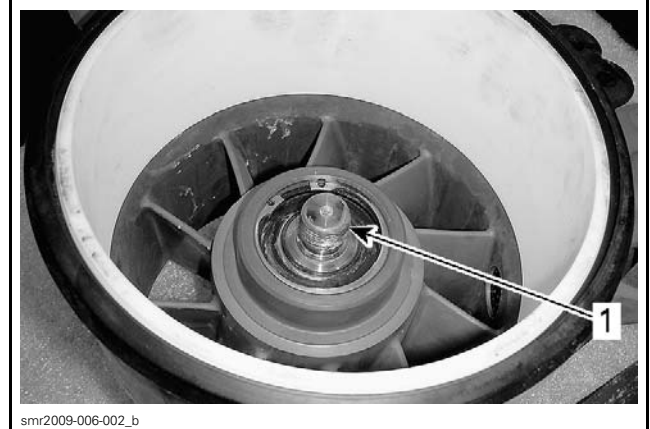


TYPICAL

- Flat side

- Apply antiseize lubricant on threads of impeller shaft.

SERVICE PRODUCT
LOCTITE 767 (ANTI-SEIZE LUBRICANT) (P/N 293 800 070)



TYPICAL

- Antiseize lubricant

- Apply Lubricant and anti-corrosive on the wear ring surface.

SERVICE PRODUCTS	
Scandinavia	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)



TYPICAL

- Spray XPS lube on this surface

- Start screwing the impeller on its shaft.


Section 06 STEERING AND PROPULSION

Subsection 03 (JET PUMP)



TYPICAL

5. Mount the required tool in impeller splines.

REQUIRED TOOL	
IMPELLER REMOVER/INSTALLER (P/N 529 035 956)	

6. Tighten impeller to specification.

NOTICE Never use an impact wrench to tighten impeller shaft.

TIGHTENING TORQUE	
Impeller	125 N•m ± 10 N•m (92 lbf•ft ± 7 lbf•ft)

Remove tool.

7. Apply Loctite on impeller boot threads.

8. Apply grease inside impeller boot.

SERVICE PRODUCTS	
LOCTITE 438 (P/N 296 000 424)	
TRIPLE-GUARD GREASE (P/N 508298)	

9. Install impeller boot on impeller and tighten counterclockwise.

WEAR RING

Inspecting the Wear Ring

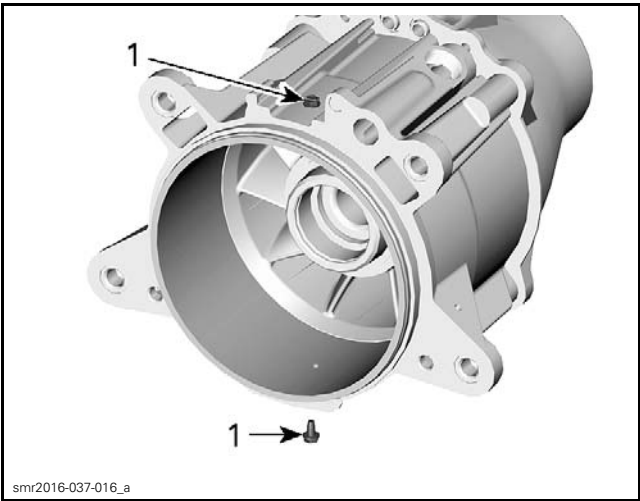
Check wear ring for:

- Deep scratches
- Irregular surface
- Any apparent damage.

Check *IMPELLER/WEAR RING CLEARANCE*, see procedure at the beginning of this subsection.

Removing the Wear Ring

1. Remove jet pump housing. Refer to *JET PUMP HOUSING* in this subsection.
2. Remove impeller, refer to *IMPELLER* in this subsection.
3. On models equipped with the 300 engine, remove screws securing the wear ring.



1. Wear ring screws

Two methods can be used to remove the wear ring, use the most appropriate as your situation.

Method Using a Freezer

1. Place the jet pump housing and the new wear ring in a freezer for approximately 1-1/2 hour at -10°C (14°F).
2. Remove the housing from the freezer and pull the wear ring out.

NOTE: The freezer method will help but the 300 wear ring will not come completely loose using this method.

Method by Cutting the Wear Ring

1. Place jet pump housing in a vise with soft jaws. It is best to clamp housing using a lower ear.
2. Cut wear ring at two places.

NOTICE When cutting ring, be careful not to damage jet pump housing.

NOTE: Wear ring can be cut using a jigsaw, a small grinder or a low clearance hacksaw.

3. After cutting ring, insert a screwdriver blade between jet pump housing and ring outside diameter.
4. Push ring so that it can collapse internally.
5. Pull ring out.

Installing the Wear Ring

Like the removing procedure, two methods can be used to install the wear ring, use the most appropriate as your situation.

Method Using a Freezer

While the housing is still cold, insert the new wear ring (previously placed in the freezer) in the housing.

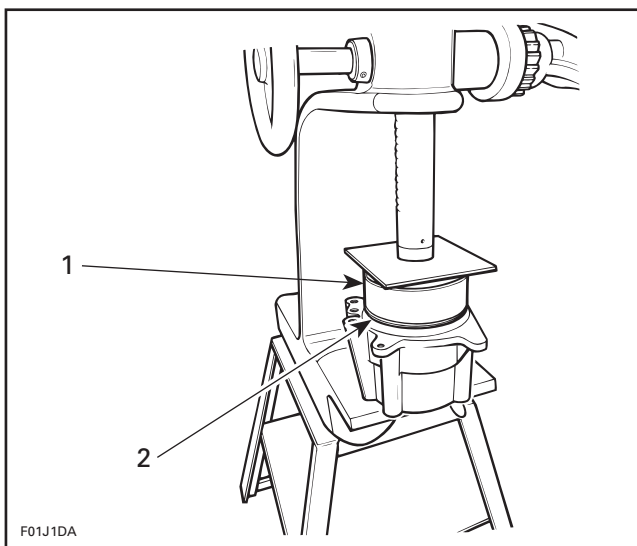
On models equipped with the 300 engine, the wear ring must be secured by screws. Drill pilot holes in the wear ring using a #24 drill bit (5/32 in) and apply blue Loctite on screw threads.

SERVICE PRODUCT	
LOCTITE 243 (BLUE) (P/N 293 800 060)	
TIGHTENING TORQUE	
Wear ring screws	2.5 N•m ± 0.5 N•m (22 lbf•in ± 4 lbf•in)

Method Using a Press

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

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



1. Rounded edge
2. Press wear ring

On models equipped with the 300 engine, the wear ring must be secured by screws. Drill pilot holes in the wear ring using a #24 drill bit (5/32 in) and apply blue Loctite on screw threads.

SERVICE PRODUCTS	
LOCTITE 243 (BLUE) (P/N 293 800 060)	
TIGHTENING TORQUE	
Wear ring screws	2.5 N•m ± 0.5 N•m (22 lbf•in ± 4 lbf•in)

IMPELLER SHAFT, BEARING AND SEALS

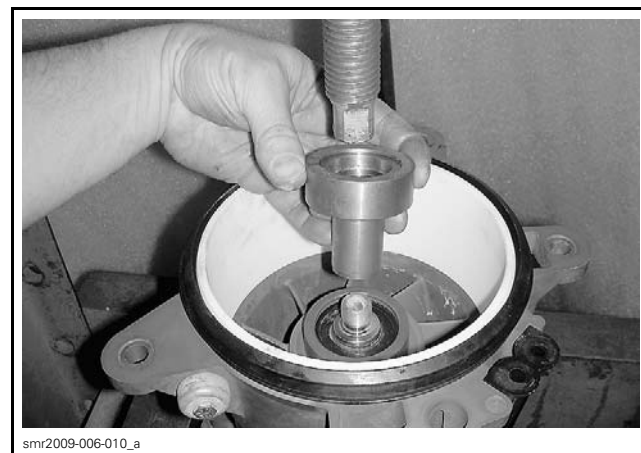
Removing the Impeller Shaft, Bearing and Seals

Removing the Shaft

1. Remove impeller. Refer to *IMPELLER* in this subsection.
2. Use the impeller shaft pusher tool to press impeller shaft out of pump housing.

REQUIRED TOOL	
IMPELLER SHAFT PUSHER (P/N 529 035 955)	

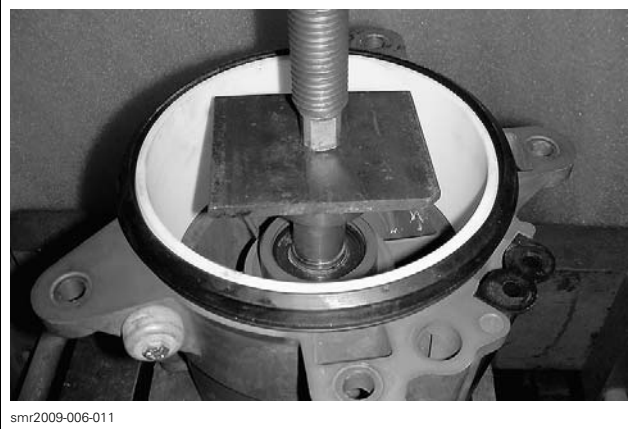
NOTE: Bearing will come out with the impeller shaft.



TYPICAL

Section 06 STEERING AND PROPULSION


Subsection 03 (JET PUMP)

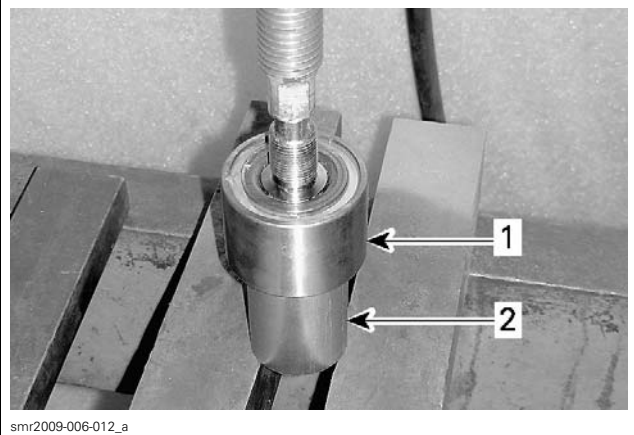


TYPICAL

Removing the Bearing

1. Remove the bearing retaining nut.
2. Use the Impeller shaft bearing tool to press bearing off impeller shaft.

REQUIRED TOOL	
IMPELLER SHAFT BEARING TOOL (P/N 529 036 168)	

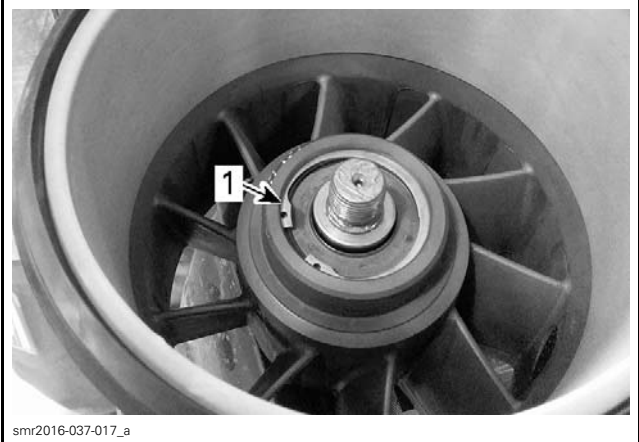


TYPICAL

1. Impeller shaft and bearing
2. Bearing tool on INNER race

Removing The Seals

1. Remove and discard the circlip securing the seals.



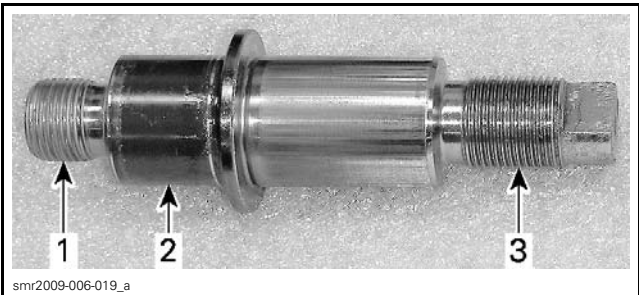
1. Circlip

2. Using an appropriate tool, press seals out of the housing.

Inspecting the Impeller Shaft and its Bearing

With your finger nail, feel seal lip contact surface on shaft. If any irregular surface is found, replace shaft and seals.

Check condition of shaft threads.



TYPICAL

1. Threads
2. Seal lip contact surface
3. Threads


Inspect ball bearing for corrosion.

Installing the Impeller Shaft, Bearing and Seals


Installing the Bearing

The installation is essentially the reverse of the removal procedure. However, pay attention to the following.

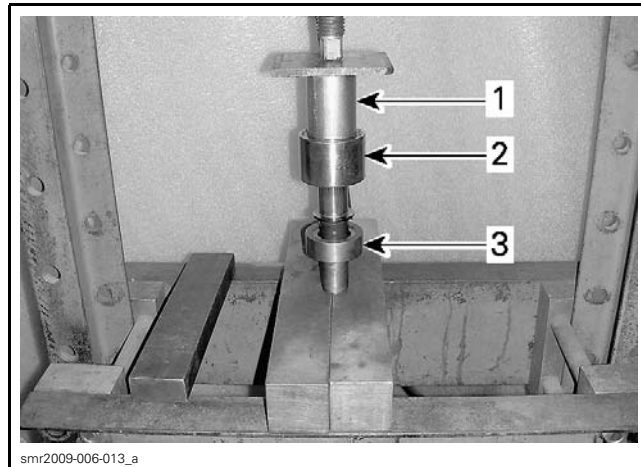
1. Using the Impeller shaft bearing tool on the bearing inner race, press the bearing on the impeller shaft.

REQUIRED TOOL	
IMPELLER SHAFT BEARING TOOL (P/N 529 036 168)	

2. Use the Impeller shaft pusher tool to protect the impeller shaft threads.

REQUIRED TOOL	
IMPELLER SHAFT PUSHER (P/N 529 035 955)	

NOTE: The bearing can be installed in either direction.



TYPICAL


1. Impeller shaft bearing tool on INNER race
2. Impeller shaft and bearing
3. Impeller shaft installer/pusher tool

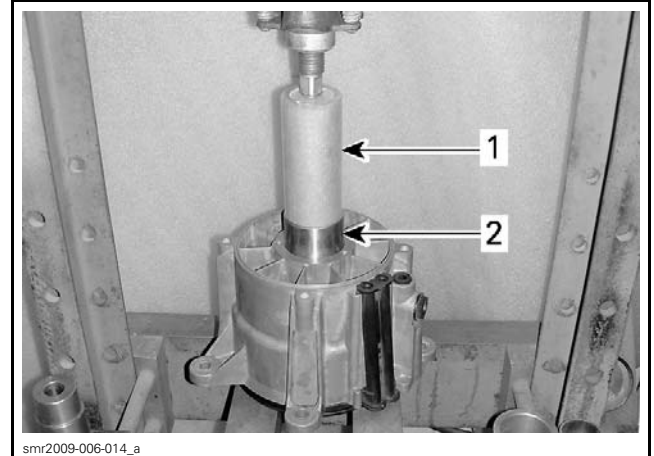
3. Press bearing until it bottoms.

Installing the Impeller Shaft and Seals

NOTE: Ensure there is no O-ring in pump housing on the cover side.

1. From the outlet side of pump, press impeller shaft assembly into housing using the Impeller shaft bearing tool.

REQUIRED TOOL	
IMPELLER SHAFT BEARING TOOL (P/N 529 036 168)	



TYPICAL

1. Bearing tool
2. Impeller shaft and bearing

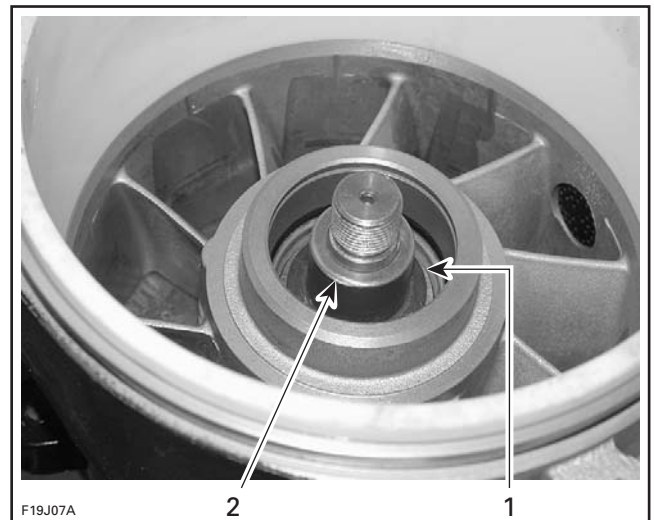
2. Press bearing until it bottoms.

NOTE: Ensure impeller shaft turns freely and smoothly.

3. Turn pump upside down.
4. Coat shaft surface and O-ring with grease.

SERVICE PRODUCT
JET PUMP BEARING GREASE (P/N 293 550 032)

5. Install greased O-ring at bottom.



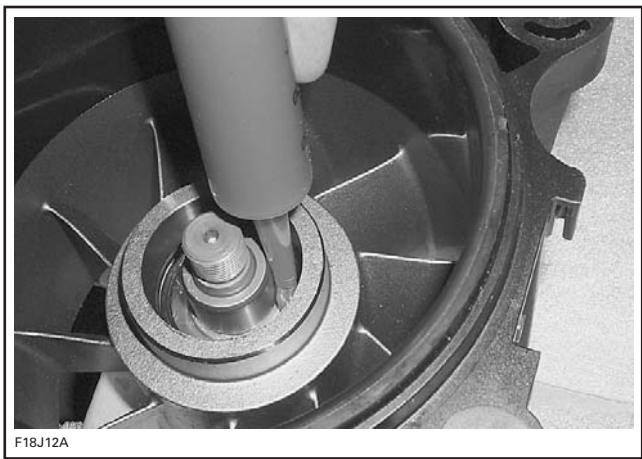
TYPICAL

1. O-ring at bottom
2. Coat surface

6. Apply 5 g (.2 oz) of grease on bearing.

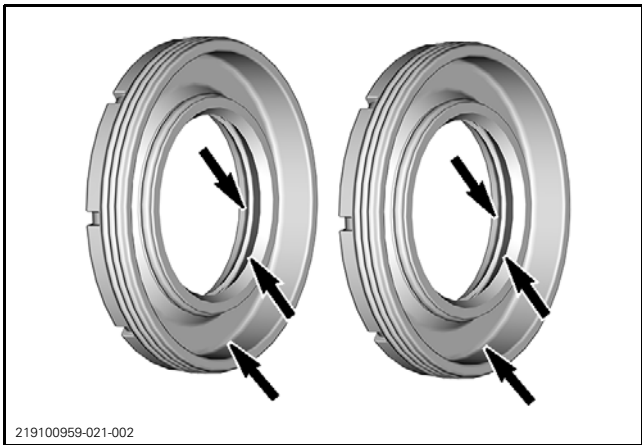
SERVICE PRODUCT
JET PUMP BEARING GREASE (P/N 293 550 032)

Section 06 STEERING AND PROPULSION
Subsection 03 (JET PUMP)



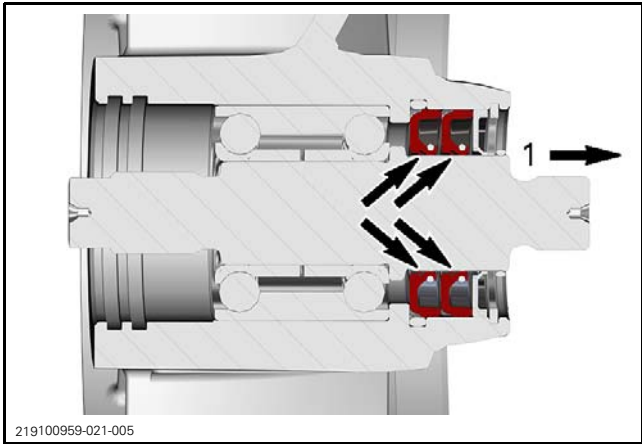
TYPICAL

7. Apply 11 g (.4 oz) of grease inside **NEW** double lip seal and in the seal lips.

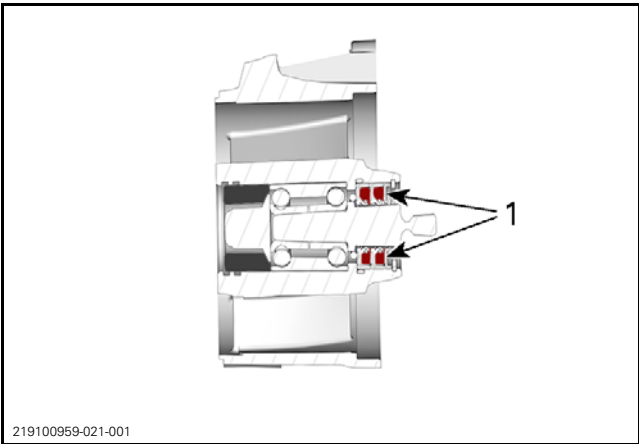


PUT GREASE IN ALL SEAL CAVITIES.

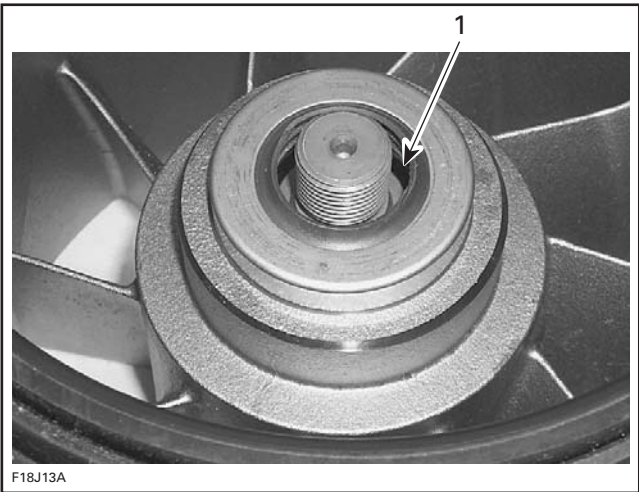
8. Install double lip seals making sure seal lip are facing upwards (toward impeller side).



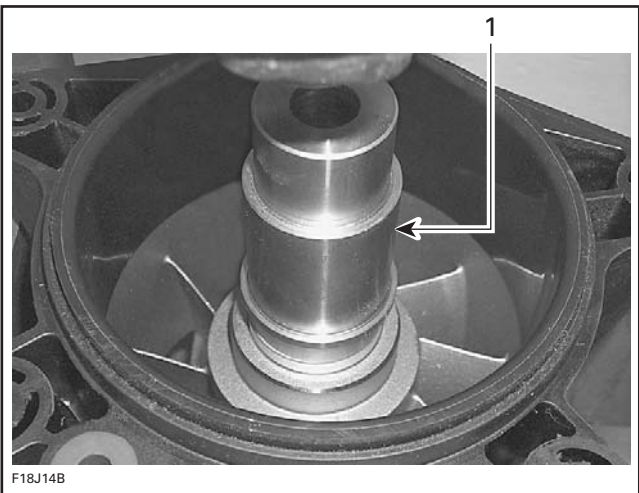
1. Toward impeller



1. Grease in seals cavities



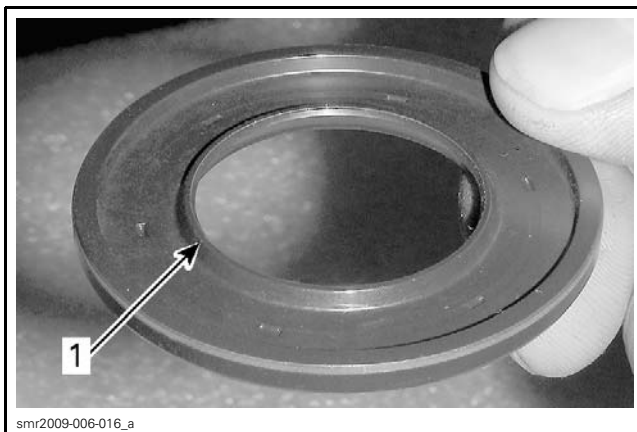
1. Seal lip facing up



TYPICAL

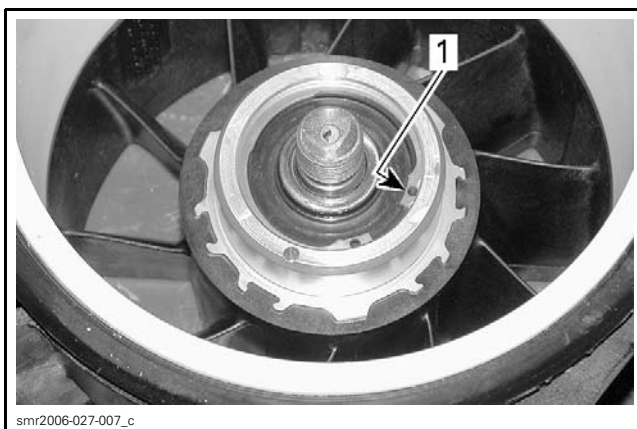
1. Seal/bearing pusher

9. Install the other seal (thin). Ensure seal lip is facing up.



1. Seal lip facing up

10. Install circlip.



TYPICAL


1. Circlip

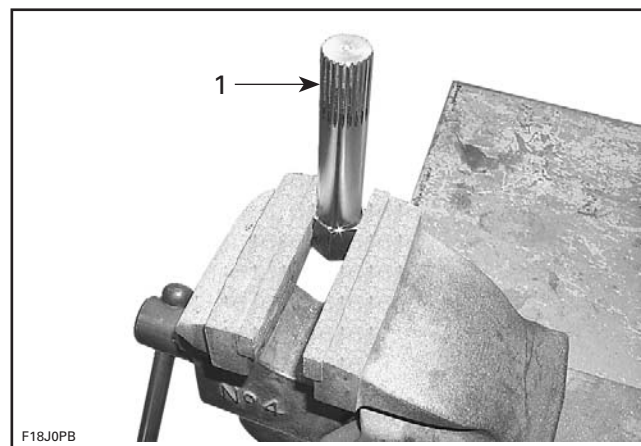
11. Turn pump upside down.

12. Before installing any other parts, pressurize jet pump to insure proper seal installation. Refer to *LEAK TEST* in this subsection.

13. Install impeller. Refer to *IMPELLER* in this subsection.

14. Mount in a vise the impeller remover/installer.

REQUIRED TOOL	
IMPELLER REMOVER/INSTALLER (P/N 529 035 956)	



1. Impeller remover/installer tool

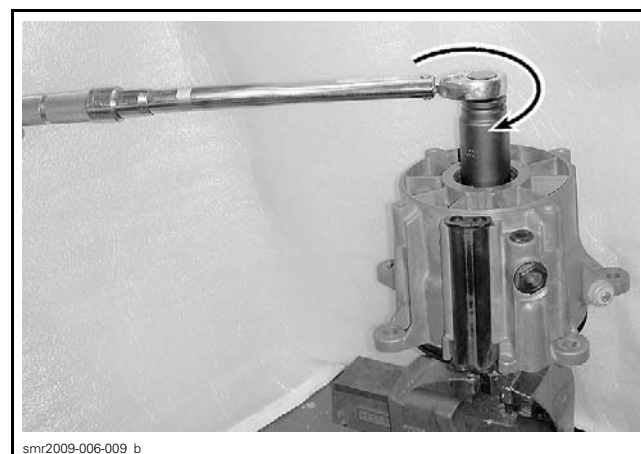
15. Install jet pump housing over tool.



TYPICAL

16. Using a 30 mm socket, screw the impeller shaft nut on clockwise.

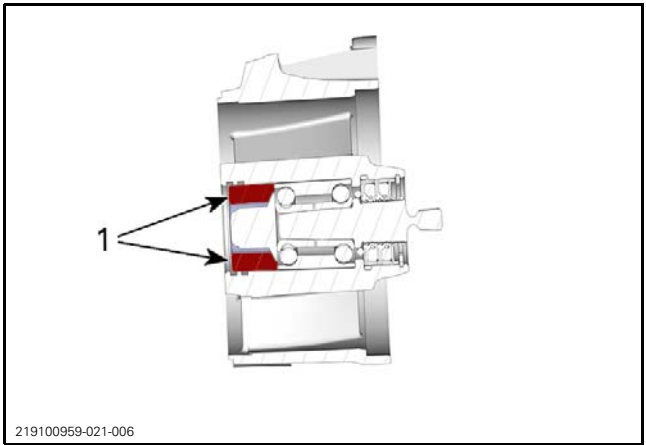
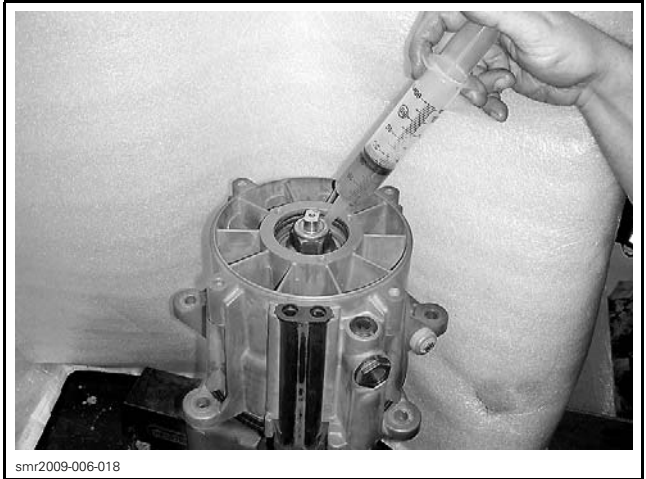
17. Tighten nut as specified in exploded view.



18. Apply 30 g (1.1 oz) of grease around nut.

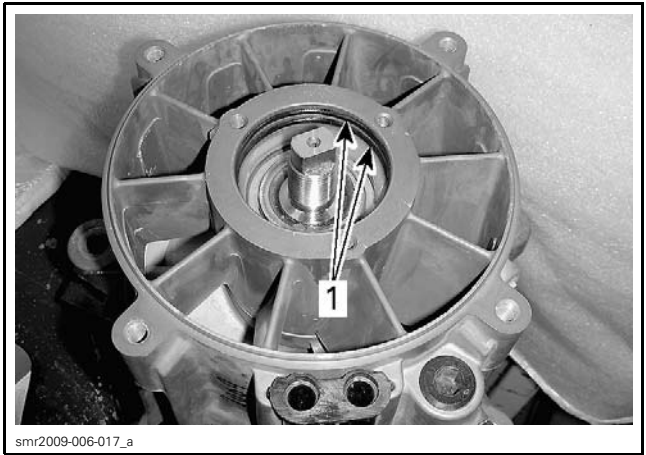
Section 06 STEERING AND PROPULSION
Subsection 03 (JET PUMP)

SERVICE PRODUCT
JET PUMP BEARING GREASE (P/N 293 550 032)



1. Grease around nut

19. Install the two O-rings in pump housing and make sure they are properly lubricated.



TYPICAL
1. O-rings

20. Install the impeller cover. Refer to *IMPELLER COVER* in this subsection.

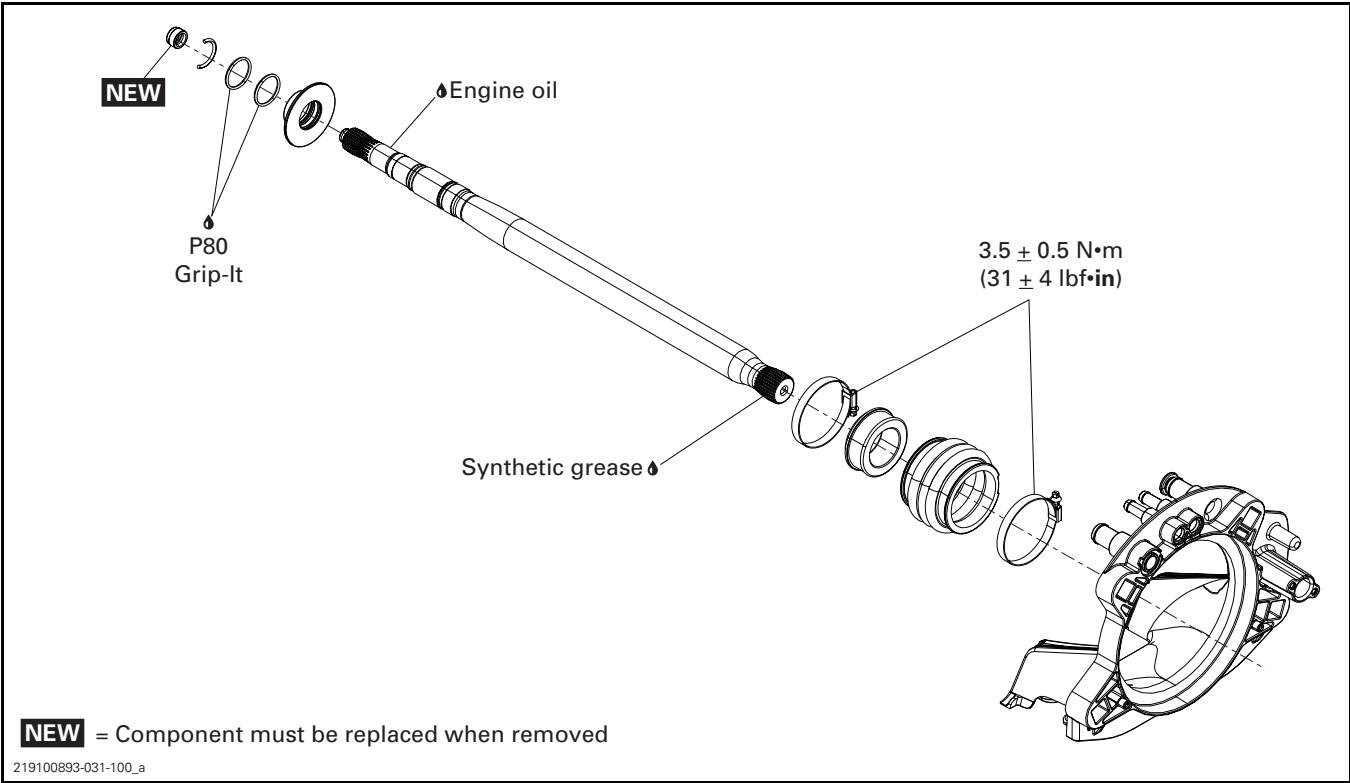
DRIVE SHAFT

SERVICE TOOLS

Description	Part Number	Page
DRIVE SHAFT C-CLIP REMOVER	529 036 026	202
FLOATING RING TOOL (TYPE II)	529 036 116	202
PTO SUPPORT TOOL	529 035 842	203, 206

SERVICE PRODUCTS

Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	204
LUBRICANT AND ANTI-CORROSIVE (EUR)	779224	203
LUBRICANT AND ANTI-CORROSIVE.....	779168	203
P80 GRIP-IT	296 000 406	206



PROCEDURES

DRIVE SHAFT

Drive Shaft Access

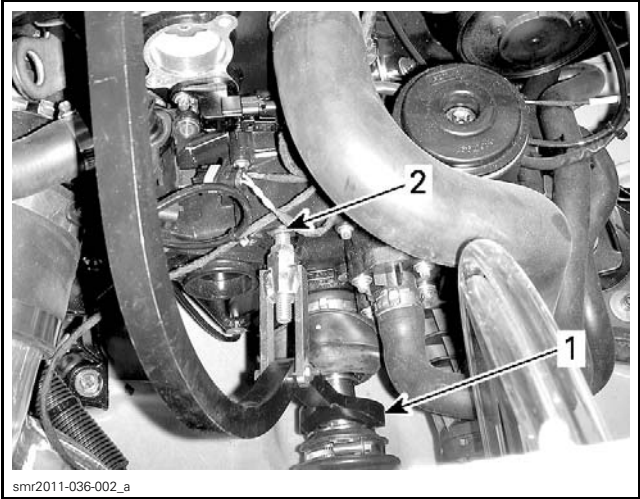
Remove the seat and engine service cover. Refer to *BODY* subsection.

Removing the Drive Shaft

Procedures

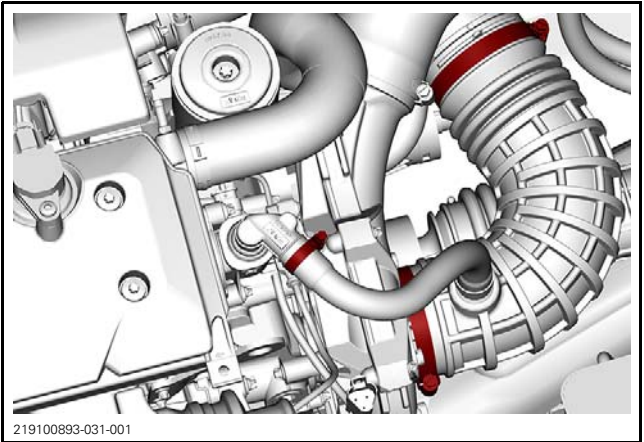
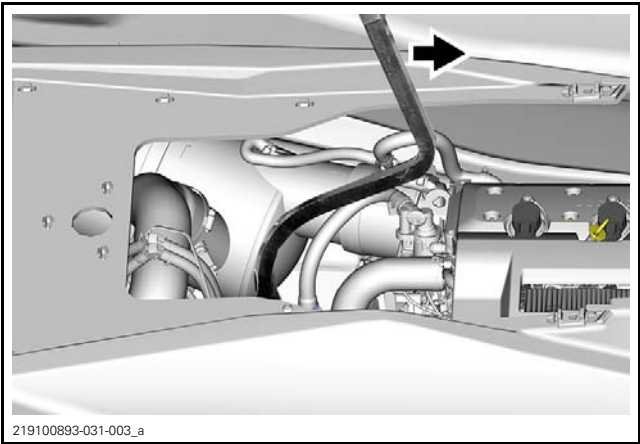
NOTE: Ensure jet pump is installed before beginning this procedure.

- 1. On supercharged engines, remove air intake hose.




TYPICAL
1. Fork against floating ring
2. Adjustable arm

- 3.3 Move the tool handle toward the front of vehicle to push floating ring rearward.



- 2. Lift rubber protector to expose PTO seal assembly.
- 3. Confirm the floating ring is not stuck on drive shaft as follows:


REQUIRED TOOL	
DRIVE SHAFT C-CLIP REMOVER (P/N 529 036 026)	

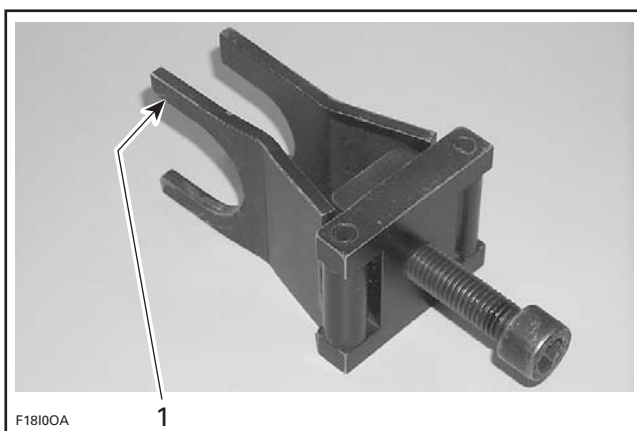
- 3.1 Place the fork of drive shaft C-clip remover against floating ring.
- 3.2 Place the adjustable arm against the engine block or the supercharger.

The next steps (4 to 12) should be performed only if the floating ring seems stuck or hard to move. Otherwise, go to the step 13.

NOTE: Do not remove circlip at this time.

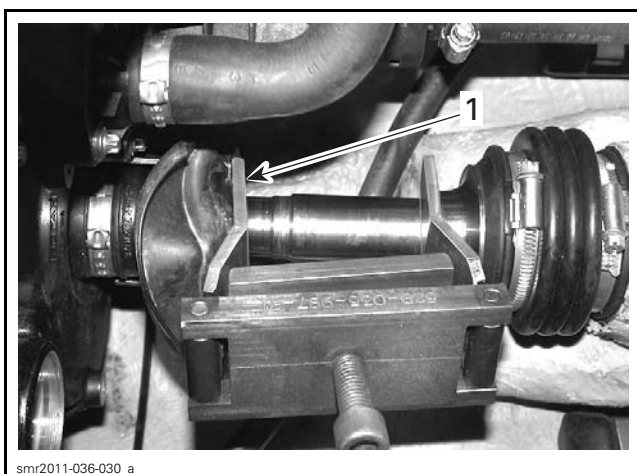
- 4. Remove the drive shaft C-clip remover.
- 5. If equipped, remove the supercharger. Refer to *SUPERCHARGER* subsection.
- 6. Install the following tool on drive shaft with its largest opening on PTO side.

REQUIRED TOOL	
FLOATING RING TOOL (TYPE II) (P/N 529 036 116)	



TYPICAL

1. Largest opening on PTO seal side



TYPICAL

1. Largest opening here

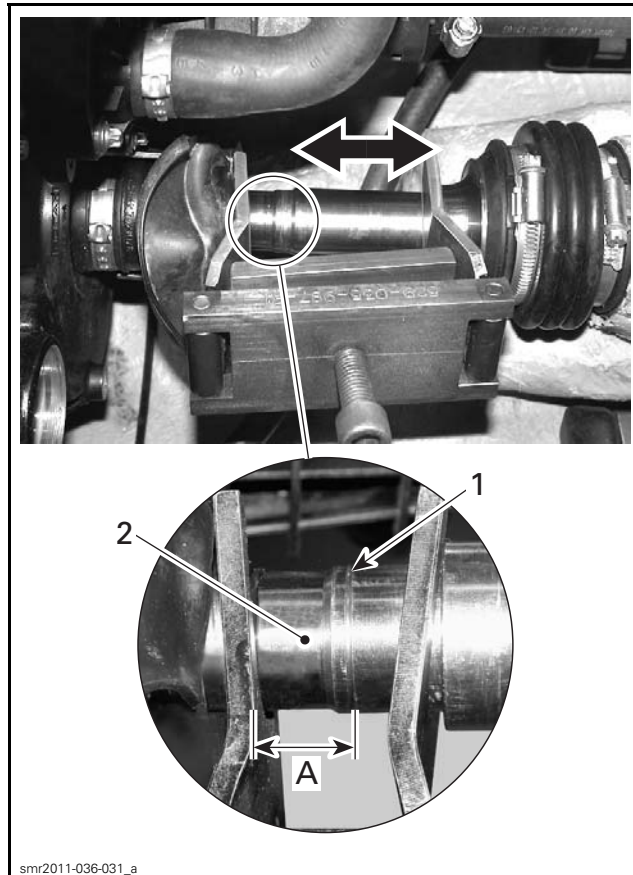
7. To expose the O-ring contact area, tighten tool screw until the following gap is obtained.

GAP BETWEEN TELLTALE GROOVE AND TOOL EDGE	
18 mm (11/16 in)	

8. Lubricate O-ring contact area with anti-corrosive lubricant.

SERVICE PRODUCT	
Lubricant and anti-corrosive	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)

NOTE: This is necessary to ease drive shaft removal later in this procedure.



TYPICAL

1. Telltale groove

2. Lubricate this area

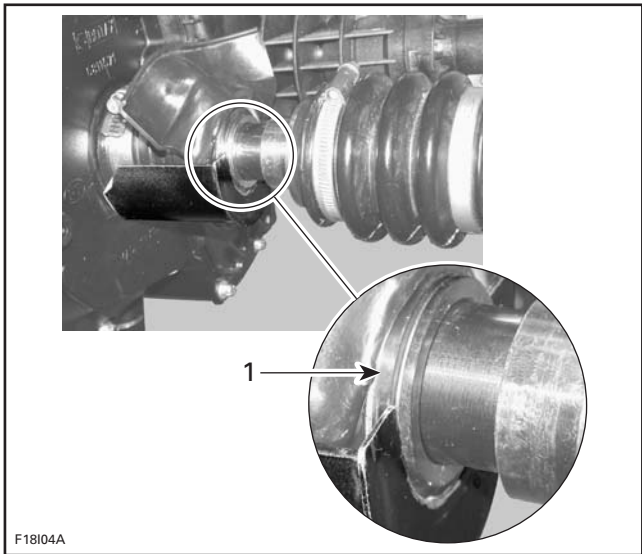
A. 18 mm (11/16 in)

9. Remove the floating ring tool.

10. Install the following tool to PTO seal assembly.

REQUIRED TOOL	
PTO SUPPORT TOOL (P/N 529 035 842)	

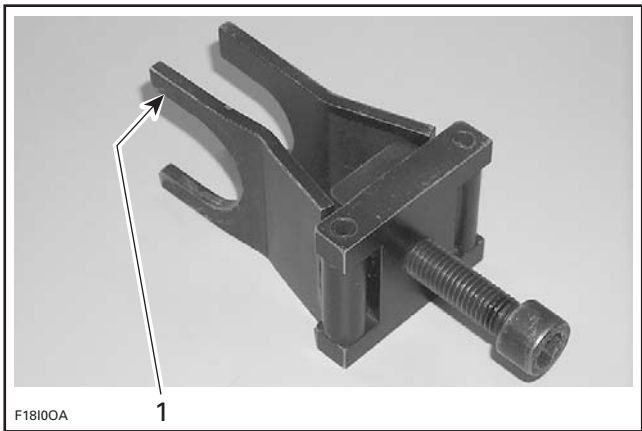
Section 06 STEERING AND PROPULSION
Subsection 04 (DRIVE SHAFT)



1. Insert in groove of PTO seal assembly

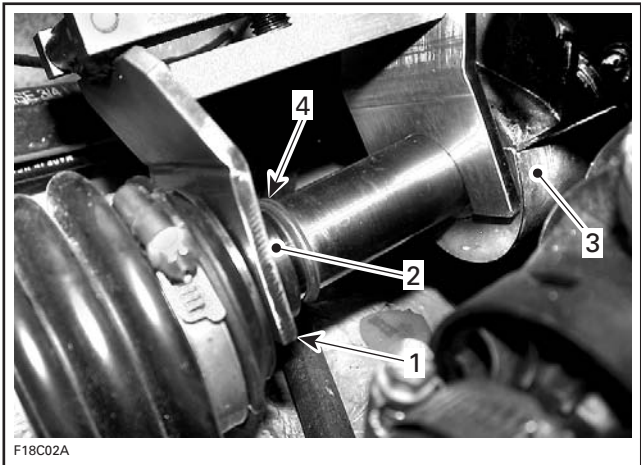
NOTICE Strictly follow this procedure otherwise damage to component might occur.

11. Reinstall the floating ring tool as shown.



TYPICAL
1. Largest opening on PTO seal side

12. Tighten tool screw to push floating ring rearward and expose circlip.
13. Remove and discard circlip.



TYPICAL
1. Largest opening here
2. Floating ring
3. PTO seal support tool
4. Remove circlip

14. Remove the floating ring tool.
15. Place rags under PTO housing to prevent spillage. If spillage occurs, clean immediately with pulley flange cleaner to prevent oil stains.

SERVICE PRODUCT
CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

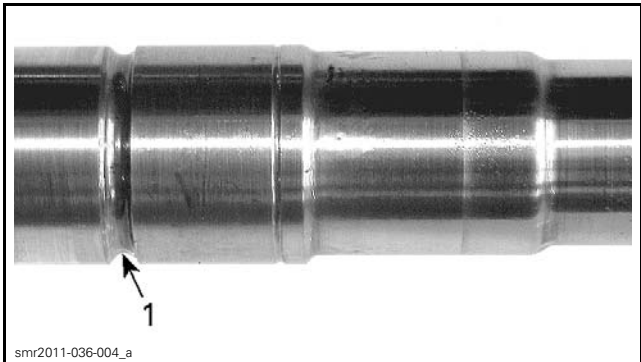
16. Remove jet pump. Refer to *JET PUMP* sub-section.
17. Remove drive shaft.

NOTE: A slight jerk to the rear may be required to remove the drive shaft from the PTO seal assembly.

Inspecting the Drive Shaft

Drive Shaft

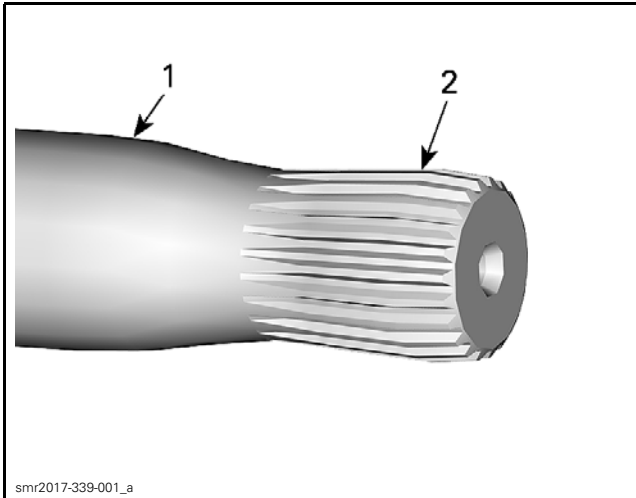
Inspect condition of circlip groove. If there is any damage or severe wear, replace drive shaft.



1. Circlip groove

Inspect condition of drive shaft splines. If splines are damaged, replace drive shaft and check splines of impeller and PTO housing.

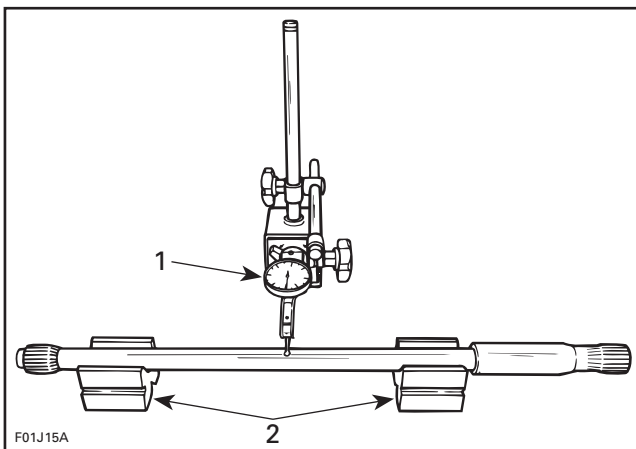
With your finger nail, feel machined surface of drive shaft. If any irregular surface is found, replace drive shaft.



TYPICAL
 1. Surface condition
 2. Splines condition

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.

NOTE: Excessive deflection could cause vibration and damage to drive shaft splines, impeller or floating ring.



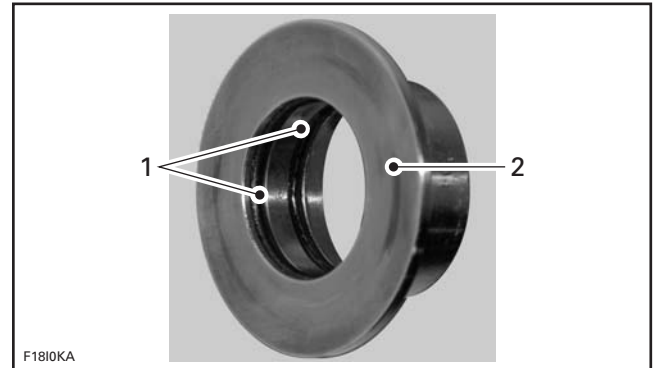
MEASURING DRIVE SHAFT DEFLECTION
 1. Dial gauge
 2. V-blocks

MAXIMUM DEFLECTION
0.5 mm (.02 in)

Floating Ring

Inspect condition of O-rings and contact surface of floating ring.

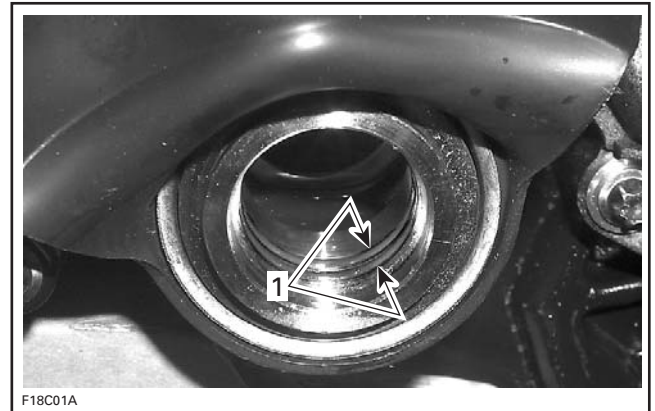
Replace as required.



1. O-rings
 2. Contact surface

Installing the Drive Shaft

Before installing drive shaft, discard both O-rings inside PTO seal and install **NEW** ones.

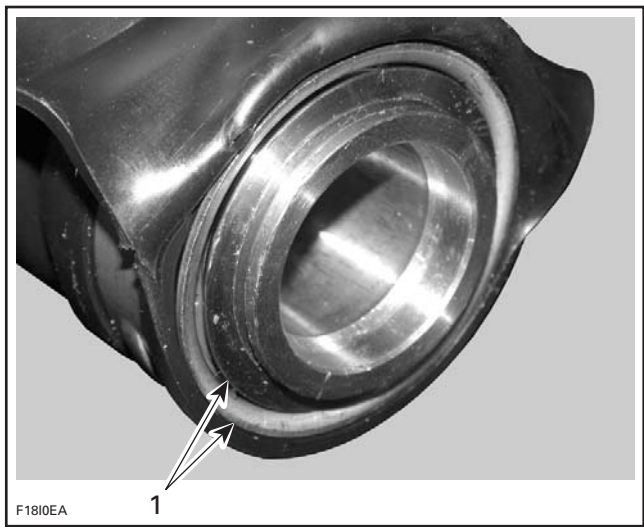


1. O-rings

Inspect PTO seal assembly. The inner sleeve must be flush with outer circumference of the assembly. Otherwise, gently push or tap on inner sleeve until flush.

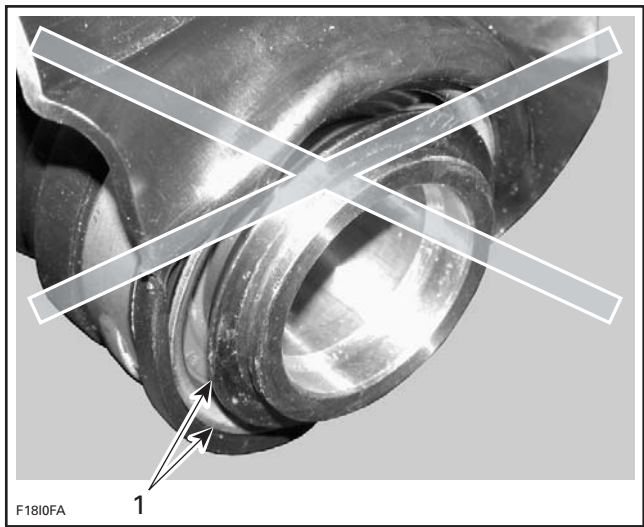
Section 06 STEERING AND PROPULSION

Subsection 04 (DRIVE SHAFT)



CORRECT POSITION

1. Inner sleeve flush with outer circumference



INCORRECT POSITION

1. Inner sleeve not flush with outer circumference

Remove the damper at the end of drive shaft and replace it with a **NEW** one.



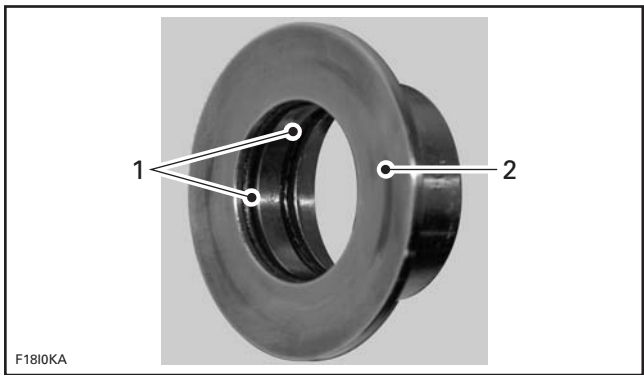
1. Damper

Install the PTO support tool on PTO seal assembly.

REQUIRED TOOL	
PTO SUPPORT TOOL (P/N 529 035 842)	

Apply a thin coat of lubricant on the floating ring O-rings. Do not get lubricant on floating ring contact surface.

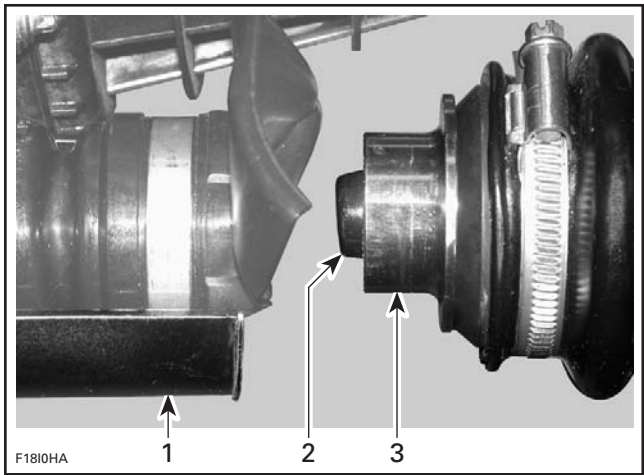
SERVICE PRODUCT
P80 GRIP-IT (P/N 296 000 406)



1. P80 Grip-it on O-rings

2. No lubrication on contact surface

Slide drive shaft far enough to install floating ring.



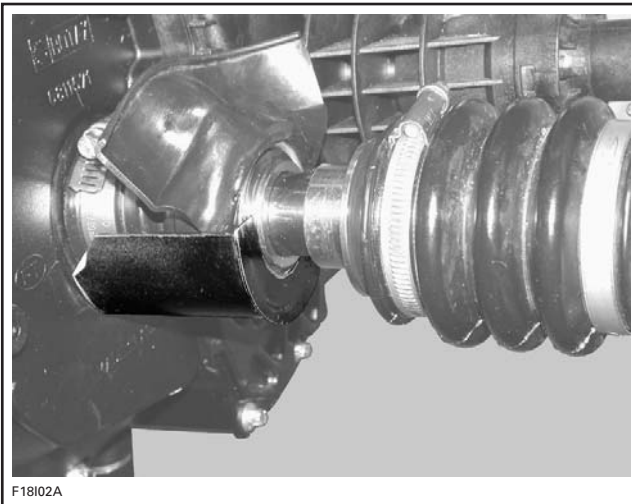
1. PTO seal support

2. Drive shaft end

3. Insert floating ring on shaft end

Continue pushing drive shaft towards engine carefully guiding it in the PTO seal then in crankshaft splines. It may be necessary to move PTO seal assembly up and down to position it in the same axis as the drive shaft.

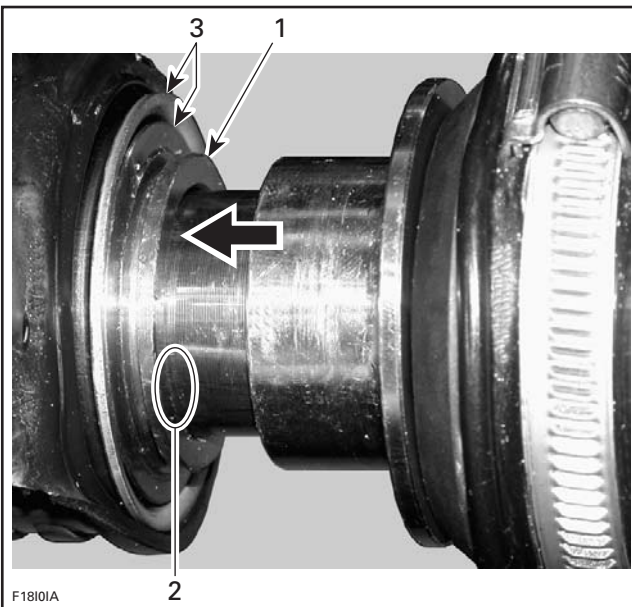
NOTE: If drive shaft does not enter into the PTO seal, check engine alignment.



TYPICAL

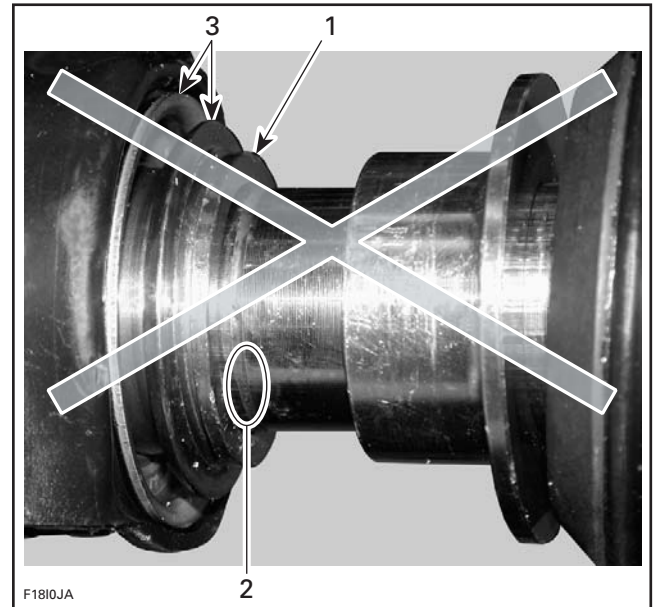
Maintain PTO seal assembly in the proper position and tap shaft end until it bottoms against engine. At this time, the telltale groove **MUST NOT** be visible. This validates the correct position.

NOTICE If the telltale groove is exposed, the installation is wrong and PTO seal assembly will be pressed into crankshaft splines which could rub a hole in seal thus creating an oil leak.



CORRECT INSTALLATION

1. PTO seal assembly
2. Shaft pushed in, hiding telltale groove
3. Inner sleeve flush with outer circumference



IMPROPER INSTALLATION

1. PTO seal assembly
2. Telltale groove visible
3. Inner sleeve NOT flush with outer circumference

Temporarily install the jet pump housing. Push floating ring rearwards and install a **NEW** circlip.

Ensure everything is properly positioned:

- Telltale groove is not visible
- Inner sleeve is flush with outer circumference of PTO seal assembly
- Circlip is not exposed.

If telltale groove is visible, pull PTO seal assembly rearwards to fully extend it.

If inner sleeve is not flush, gently tap it until it is flush.

Reposition rubber protector.

Permanently install jet pump. Refer to *JET PUMP* subsection.

Test watercraft then ensure there is:

- No oil leak in PTO seal area
- No water intrusion by the thru-hull fitting area.

DRIVE SHAFT BELLOWS

Inspecting the Drive Shaft Bellows

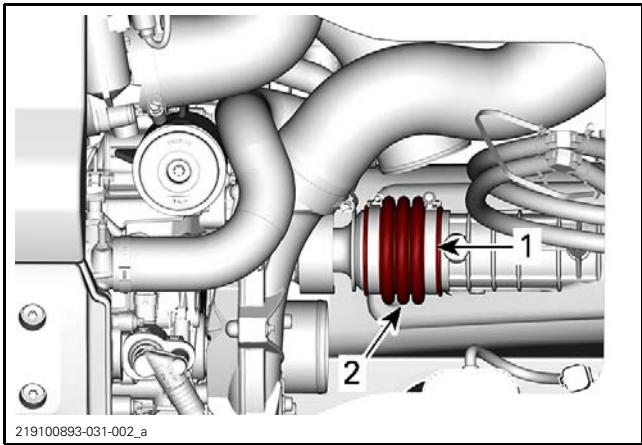
Inspect the condition of bellows. If there is any damage or evidence of wear, replace it.

Removing the Drive Shaft Bellows

Remove drive shaft. Refer to *DRIVE SHAFT* in this subsection.

Section 06 STEERING AND PROPULSION
Subsection 04 (DRIVE SHAFT)

Loosen gear clamp holding bellows, then carefully pull bellows and carbon ring from hull insert.



TYPICAL
1. Loosen this clamp
2. Drive shaft bellows

Installing the Drive Shaft Bellows

The installation is the reverse of the removal procedure.

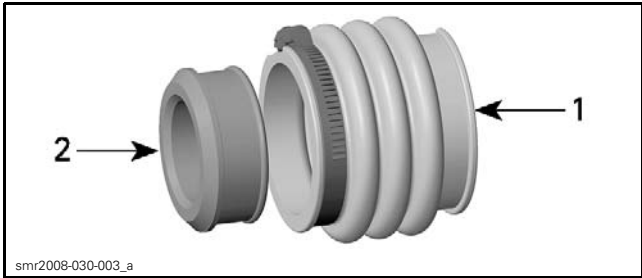
CARBON RING

Removing the Carbon Ring

NOTE: Always replace the floating ring when replacing the carbon ring.

Remove *DRIVE SHAFT BELLOWS*. See procedure in this subsection.

Loosen gear clamp then pull carbon ring from drive shaft bellows.



1. Drive shaft bellows
2. Carbon ring

Installing the Carbon Ring

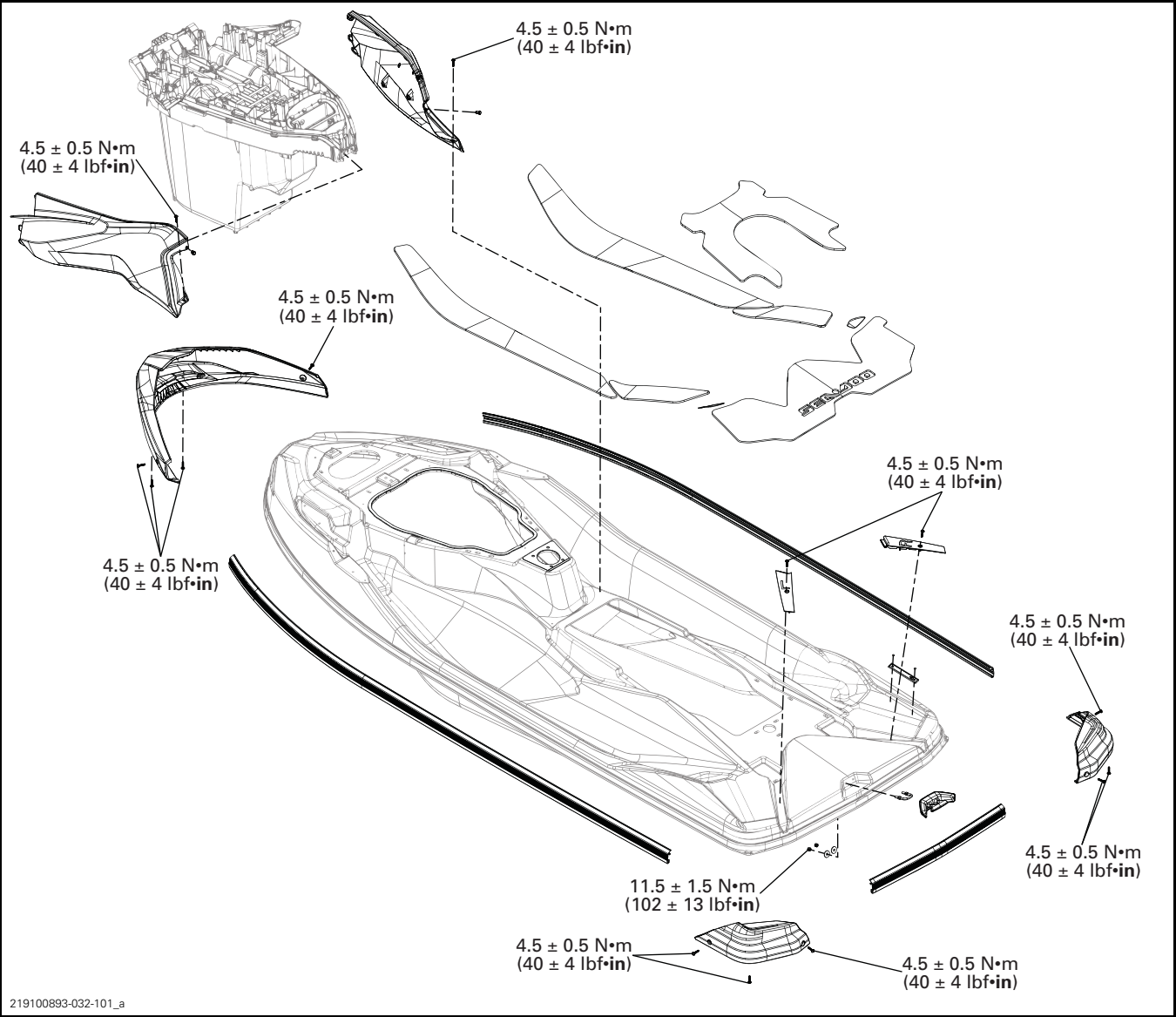
The installation is the reverse of the removal procedure.

BODY

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 414	413 705 800	219
LOCTITE 5900	293 800 066	236
SYNTHETIC GREASE (EUR)	779231	233–234
SYNTHETIC GREASE	779162	233–234

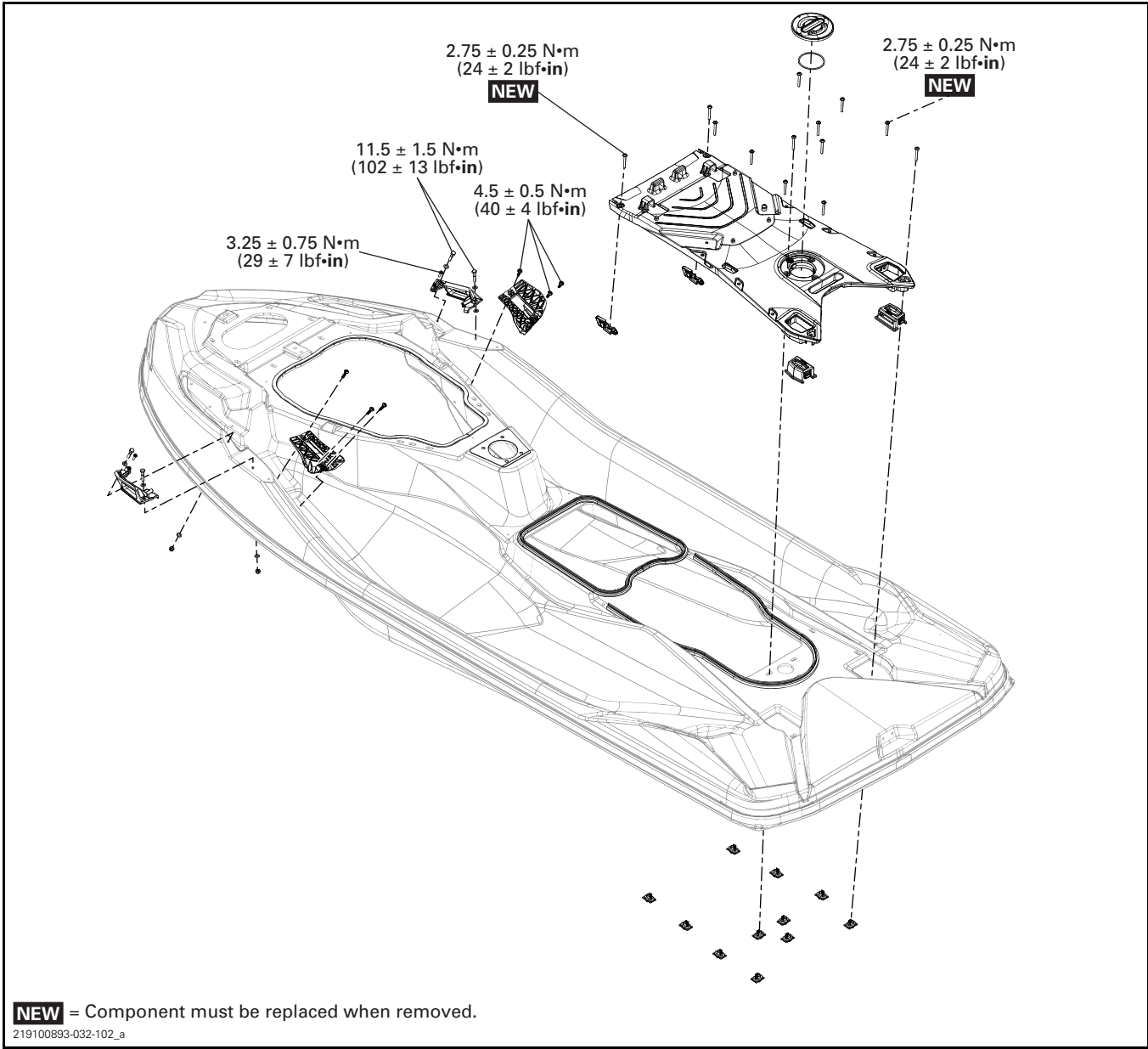
BODY



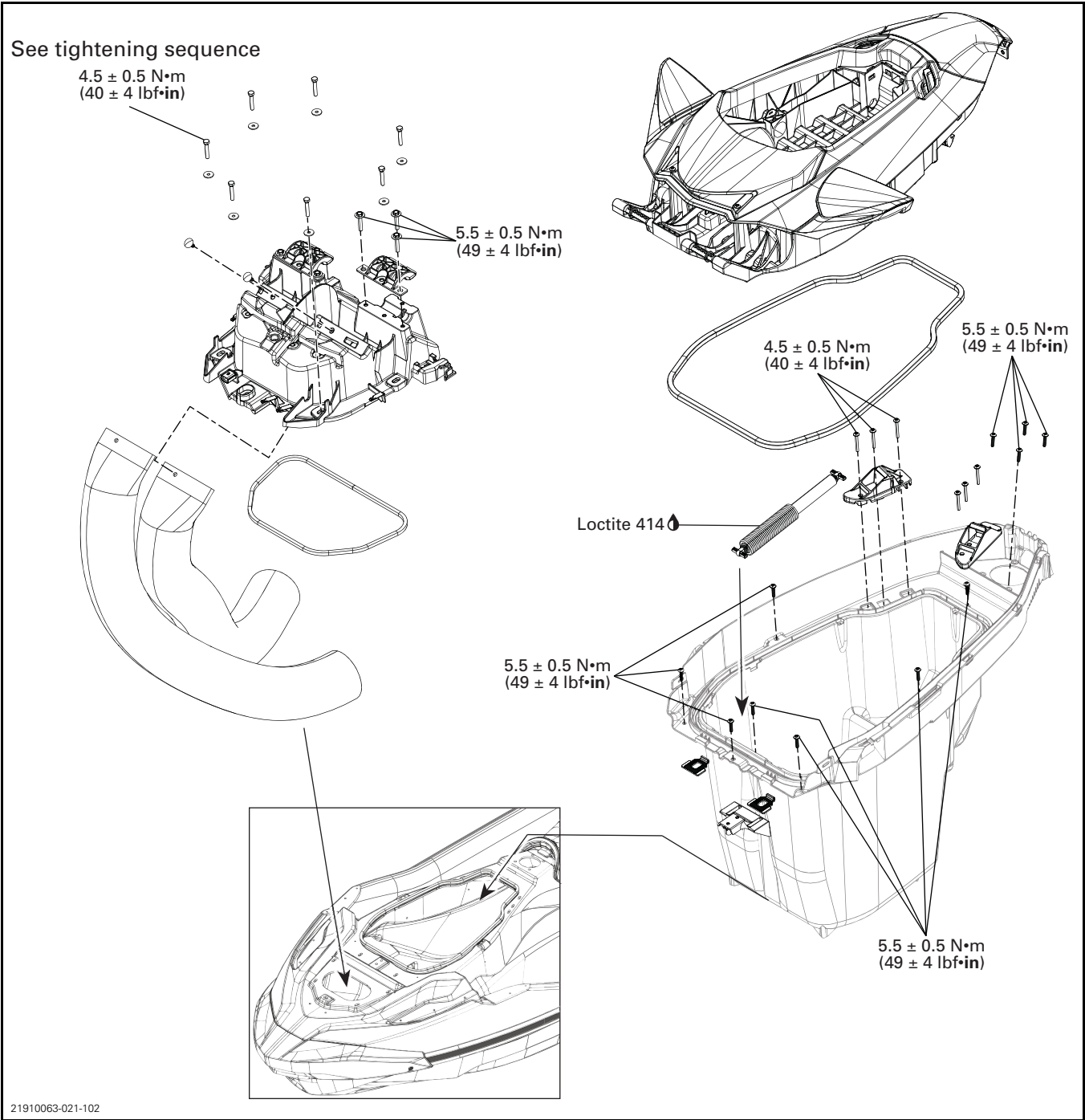
Section 07 BODY AND HULL

Subsection 01 (BODY)

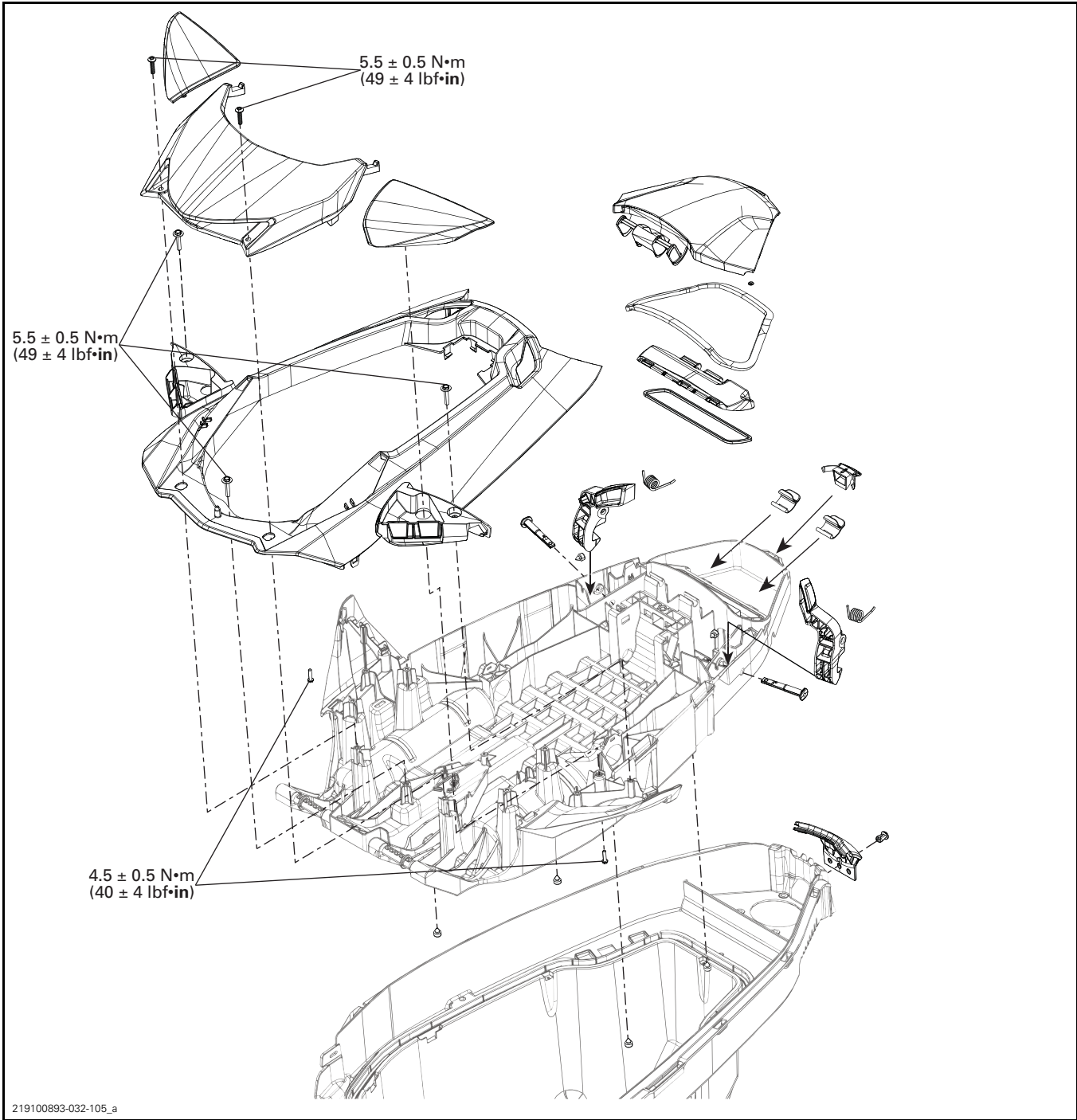
BODY



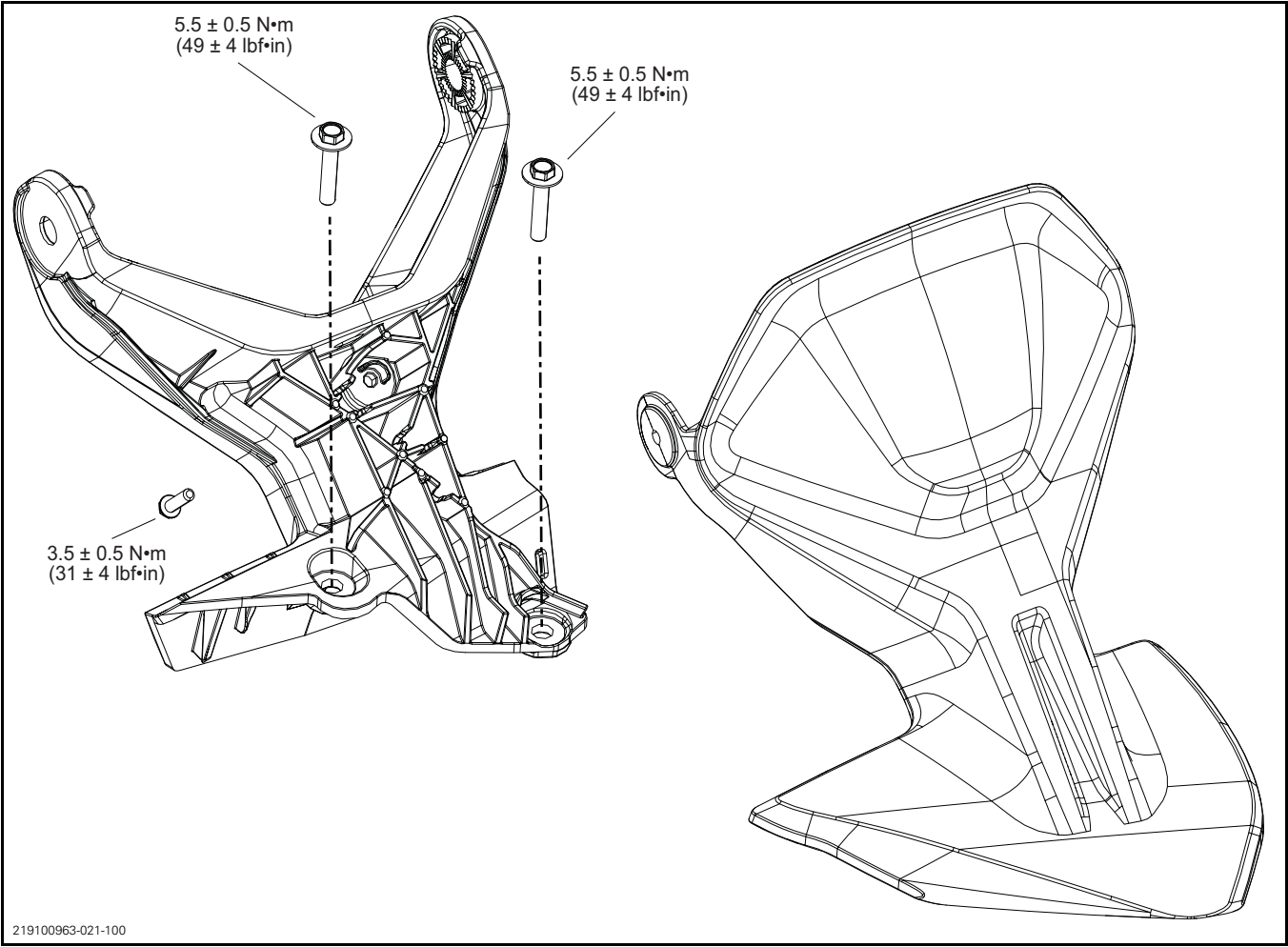
STORAGE COMPARTMENT AND VENTILATION



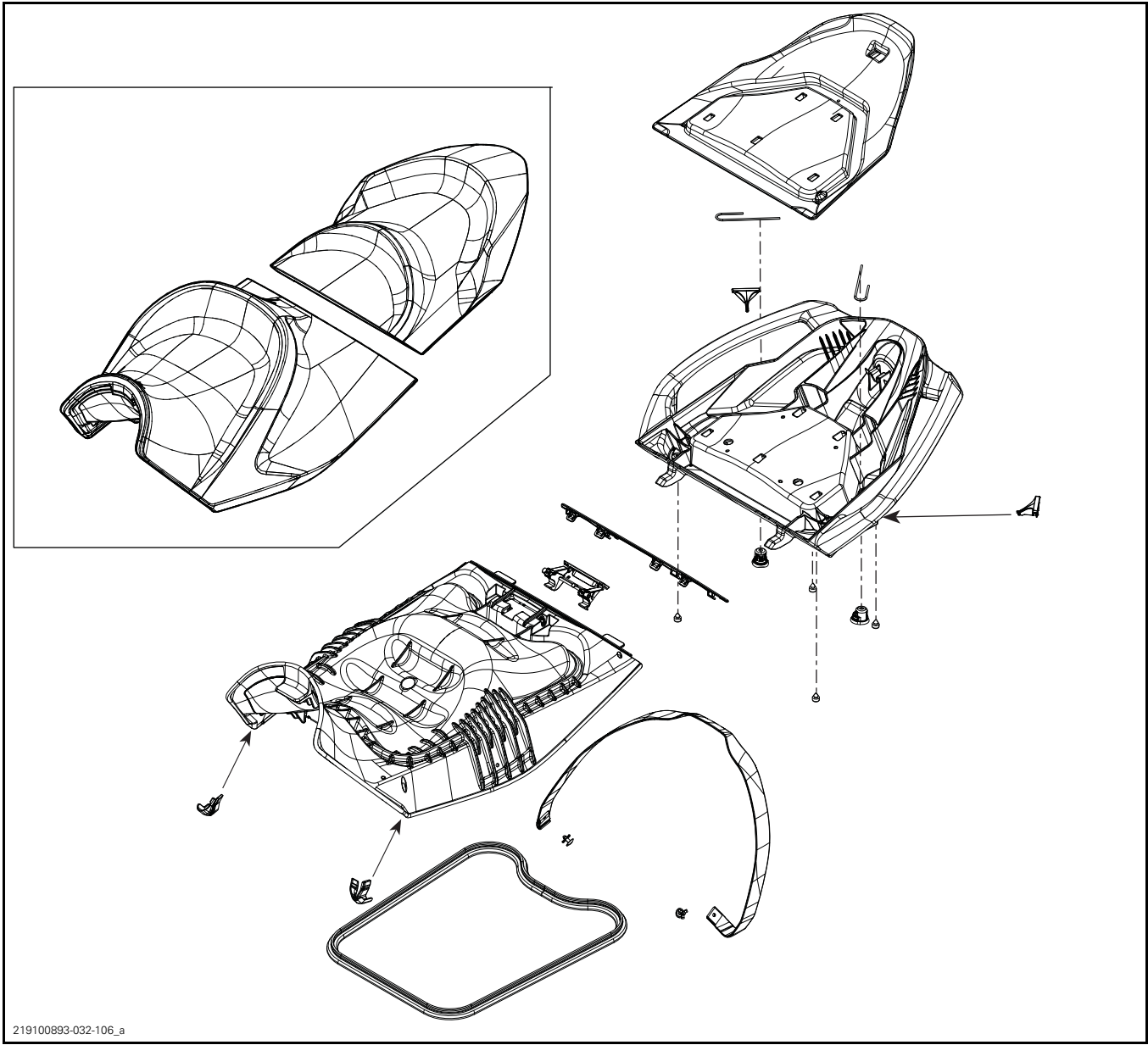
FRONT COVER



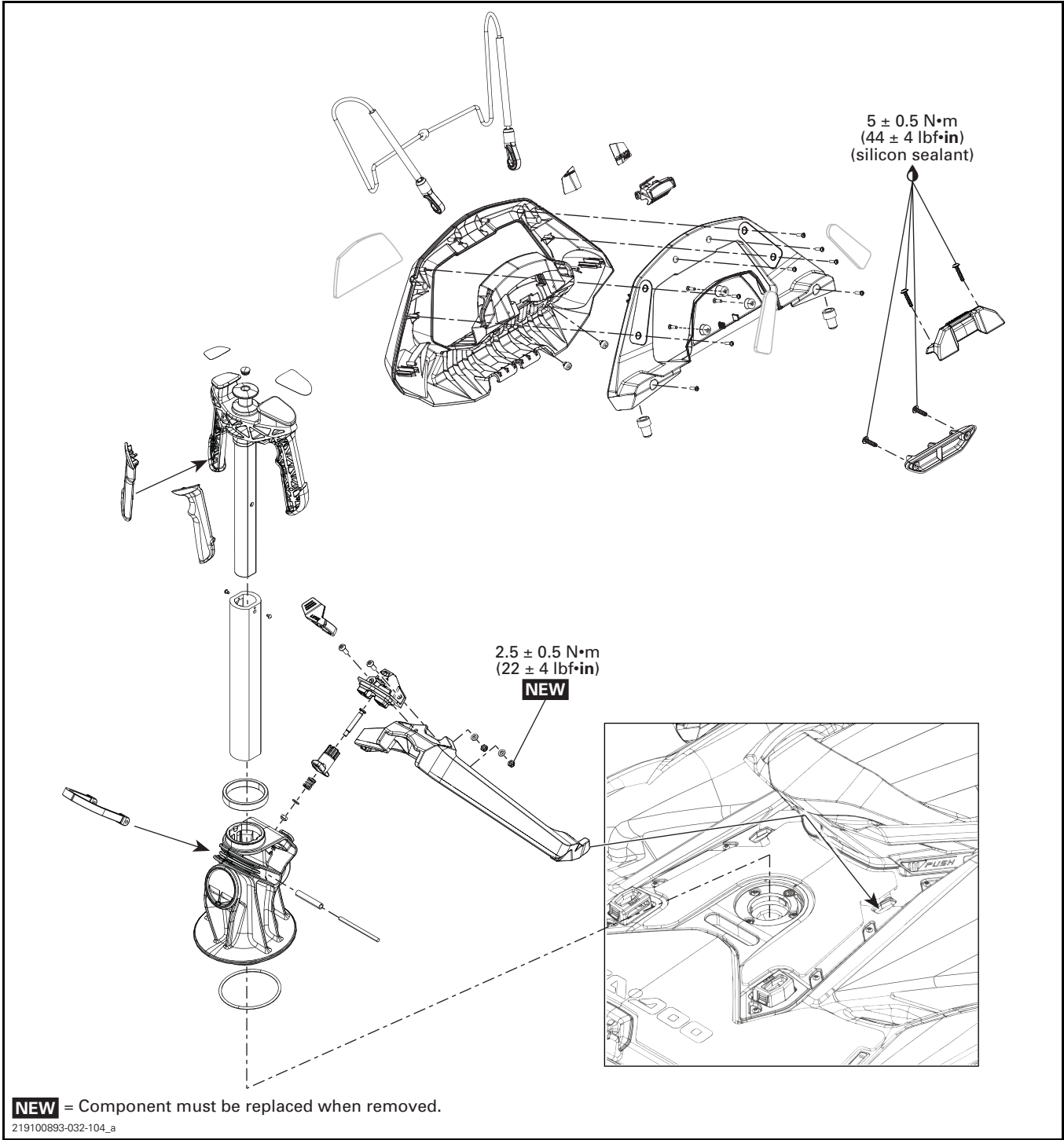
FISH FINDER SONAR (FISH PRO MODEL)



SEAT

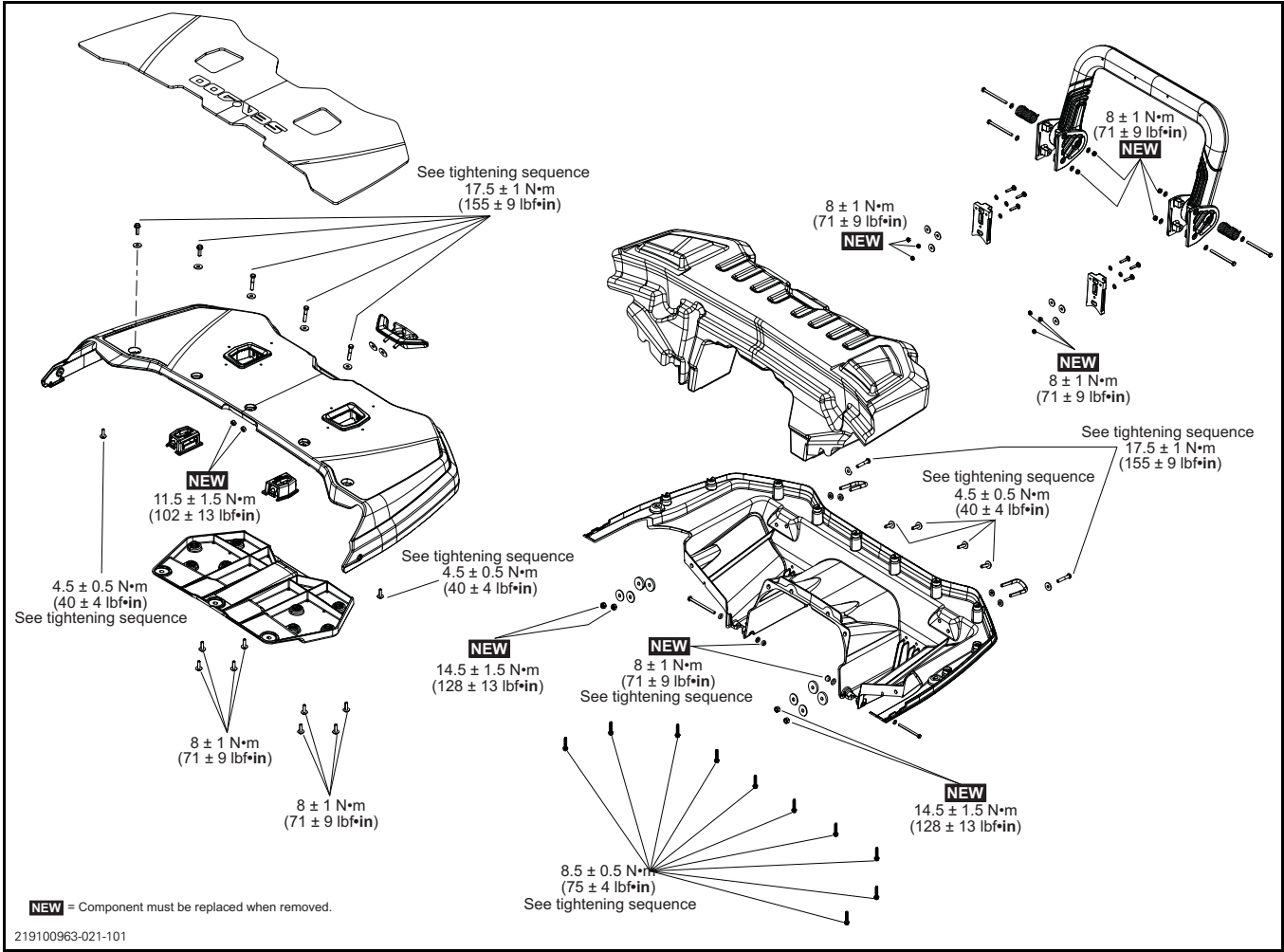


WAKEBOARD RACK AND WAKE PYLON (WAKE PRO MODEL)



Section 07 BODY AND HULL
Subsection 01 (BODY)

REAR EXTENSION (FISH PRO MODEL)

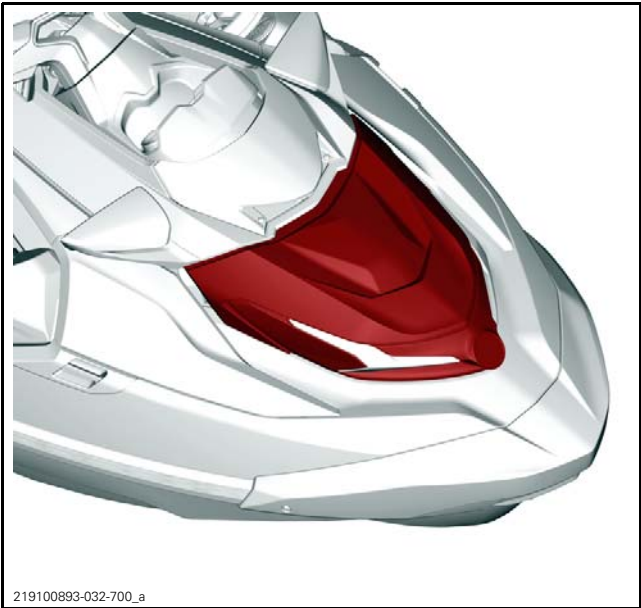


PROCEDURES

GELCOAT, DECALS AND CARPETS

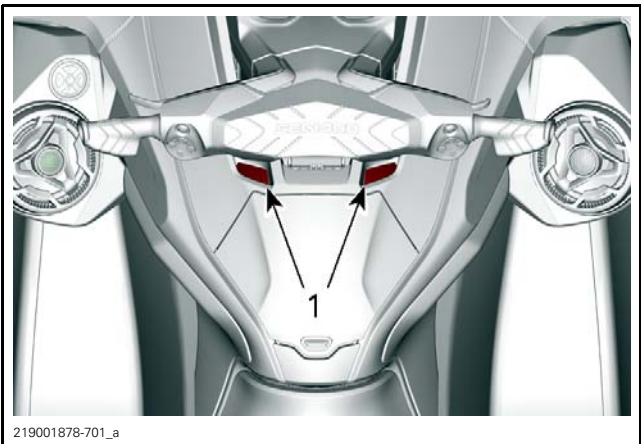
For information and repair, refer to *CLEANING AND REPAIR* subsection.

HOOD



Removing Hood

1. Open storage cover.



1. Storage cover release buttons

2. Remove side retaining screws on both sides.

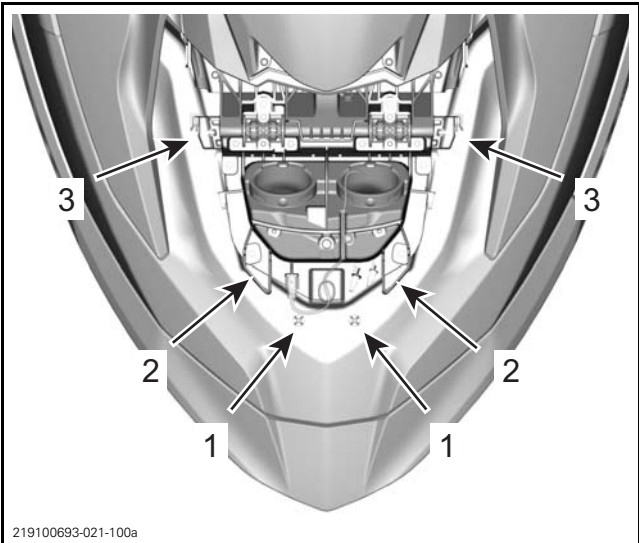


3. Remove hood by pulling it up and with a forward motion.

Installing Hood

The installation is the reverse of the removal procedure, however pay attention to the following.

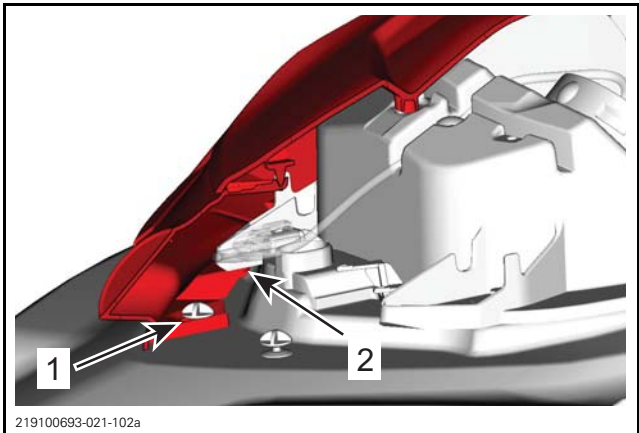
1. Ensure the hood is in appropriate position before installing the side retaining screws.



1. Retainer
2. Front attaching point
3. Rear attaching point

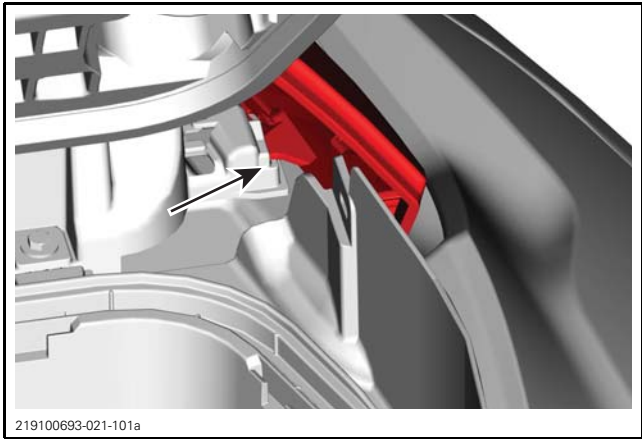
2. The hood's front tabs must be properly inserted under both attachment points.

Section 07 BODY AND HULL
Subsection 01 (BODY)

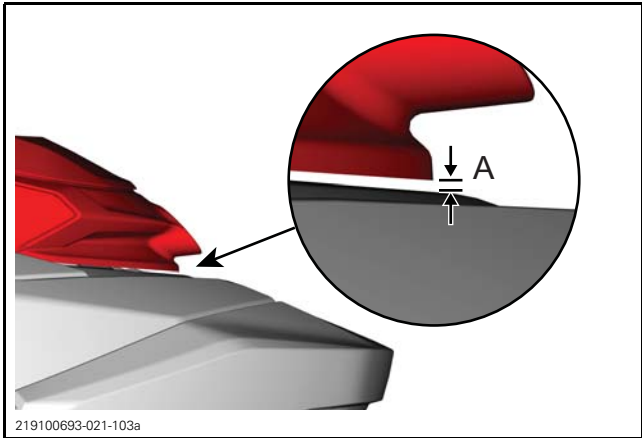


- 1. Retainer
- 2. Front attaching point

3. The hood's rear tabs must be properly inserted under the attachment points.



4. The gap between the hood and the deck must not exceed 2 mm (.08 in).

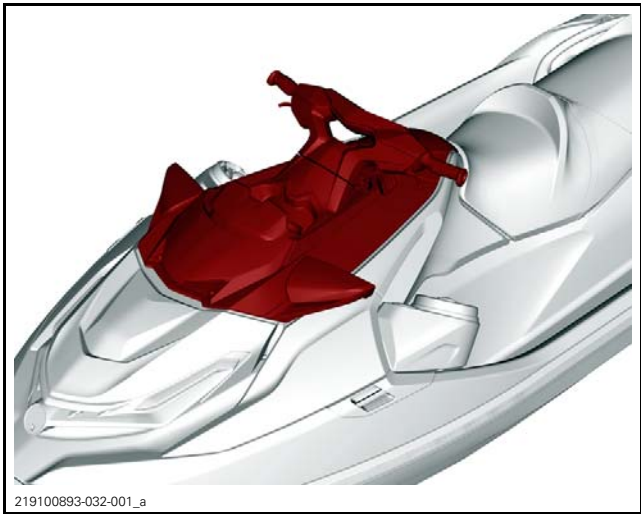


A. 2 mm (.08 in)

5. Tighten the side retaining screws to specification.

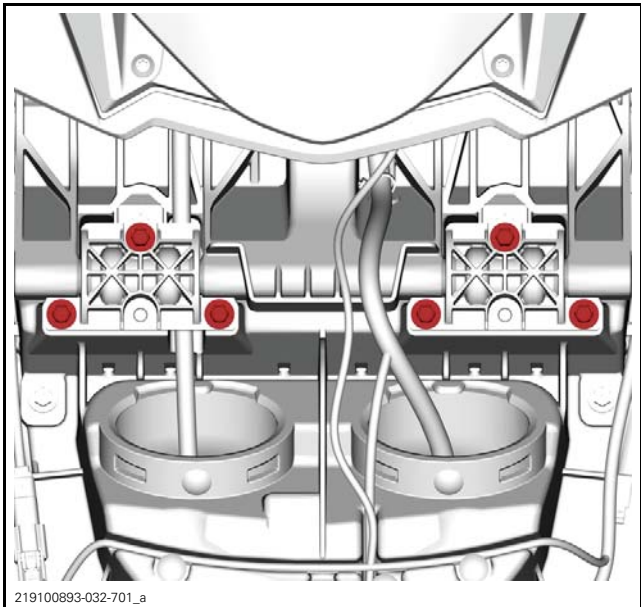
TIGHTENING TORQUE	
Screw	3.25 N•m ± 0.75 N•m (29 lbf•in ± 7 lbf•in)

STORAGE COMPARTMENT COVER

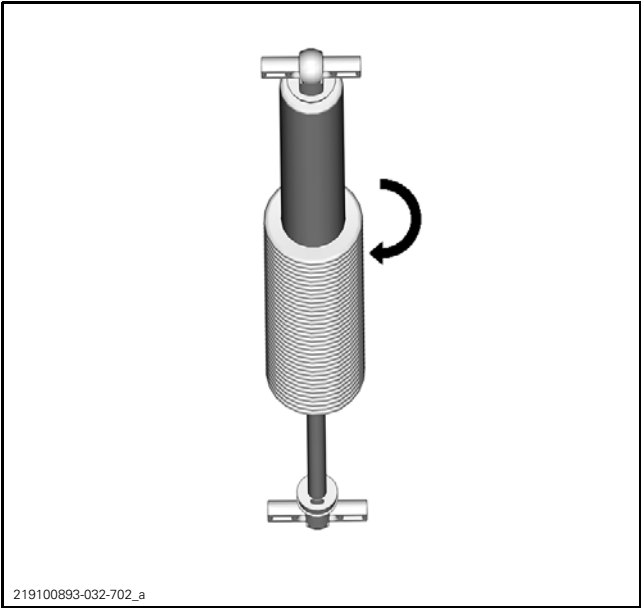


Removing the Storage Compartment Cover

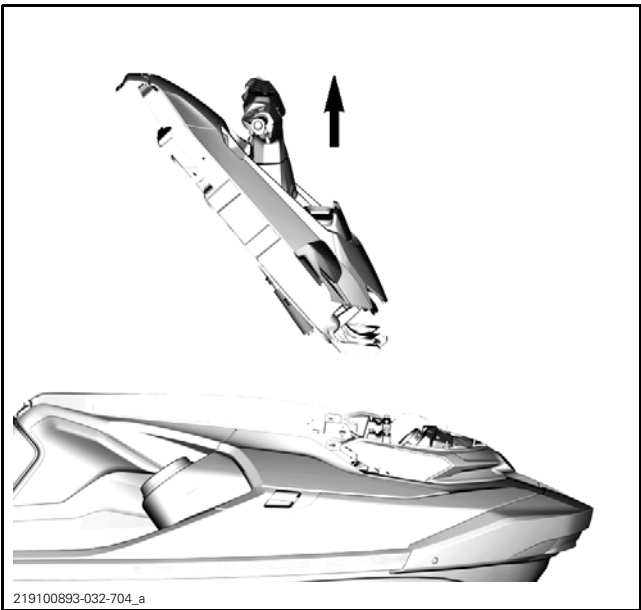
- 1. Remove hood.
- 2. Remove hinge retaining screws.



3. Unscrew gas shock from its upper attachment.



- 4. Remove top cover.
- 5. Unplug the electrical connector and steering cable, refer to *STEERING* section..
- 6. Pull up cover to remove it.



Installing Storage Compartment Cover

The installation is the reverse of the removal procedure. However, pay attention to the following. Apply Loctite on threads of shock absorber body.

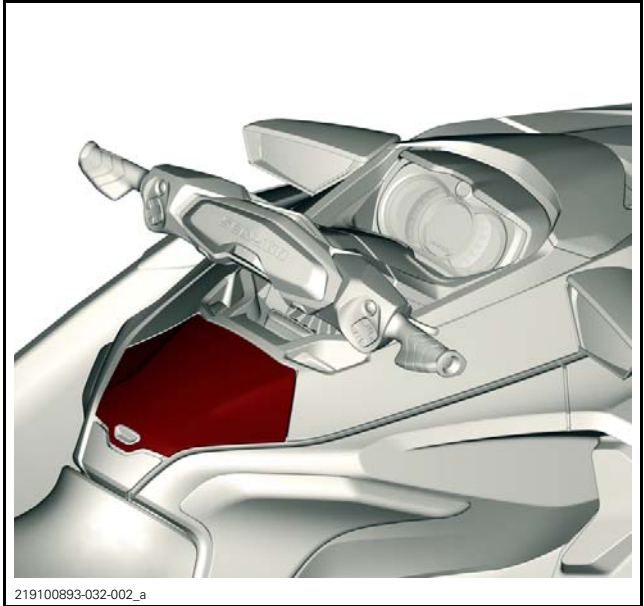
SERVICE PRODUCT
LOCTITE 414 (P/N 413 705 800)

Tighten manually the attachment on gas shock. Install cover on vehicle.

TIGHTENING TORQUE	
Hinge screws	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

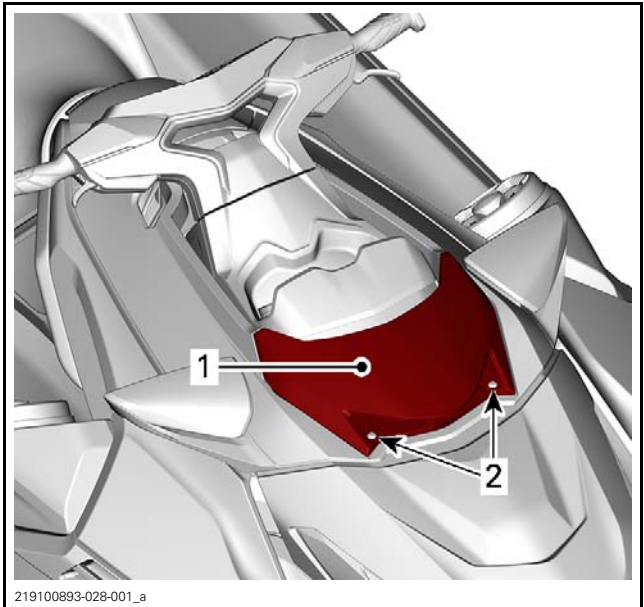
Adjust the alignment of the steering, refer to *STEERING* section.

GLOVE BOX COVER



Removing the Glove Box Cover

- 1. Move steering in its upper position.
- 2. Remove top cover.

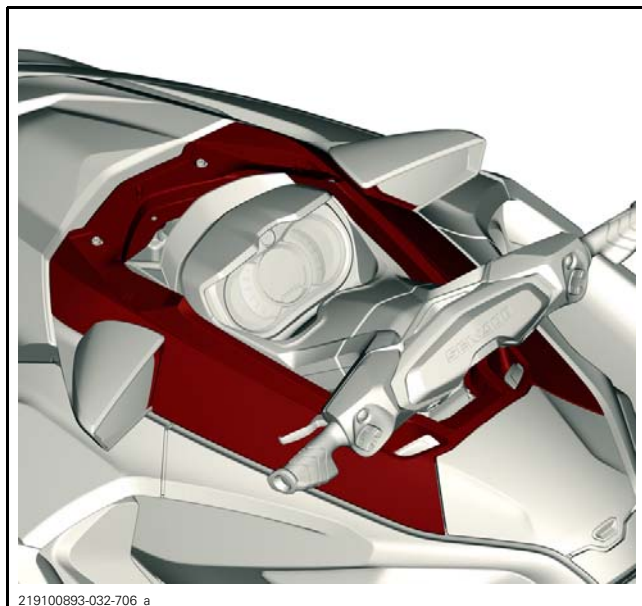


- 1. Top cover
- 2. Top cover retaining crews

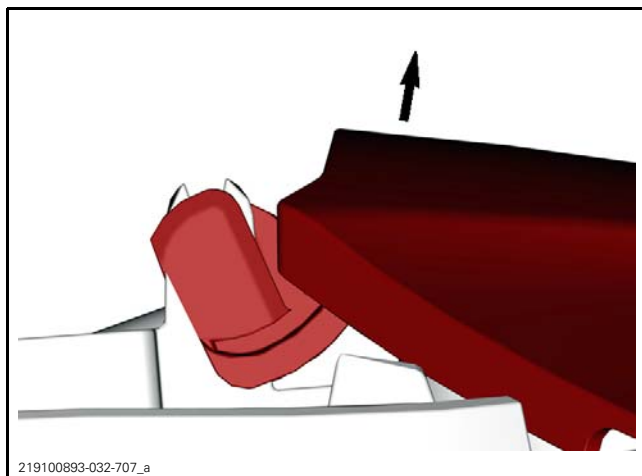
Section 07 BODY AND HULL

Subsection 01 (BODY)

3. Remove mirror covers and fish finder sonar support (if equipped), see procedure in this subsection.
4. Remove outer skin.



5. Lift cover.



Installing the Glove Box Cover

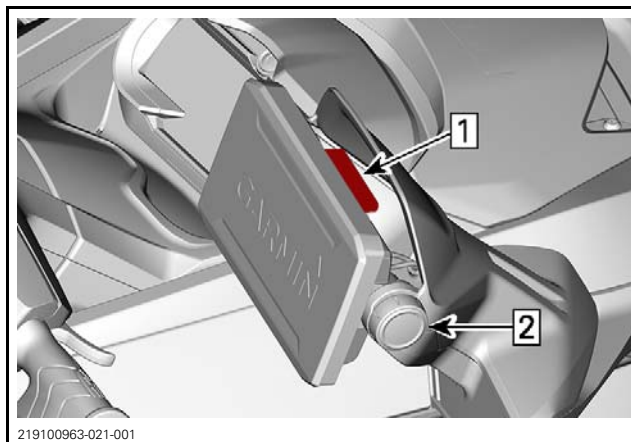
Reverse the removal procedure.

FISH FINDER SONAR SUPPORT

Removing the Support

To remove the sonar, lift the tab.

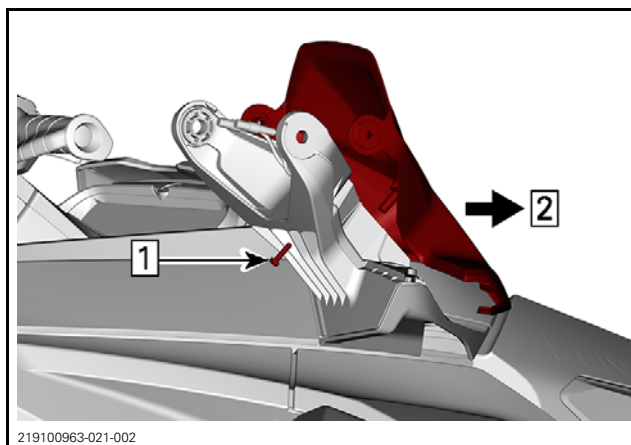
Remove the adjustment knobs and sonar support plate. Disconnect the electrical connectors.



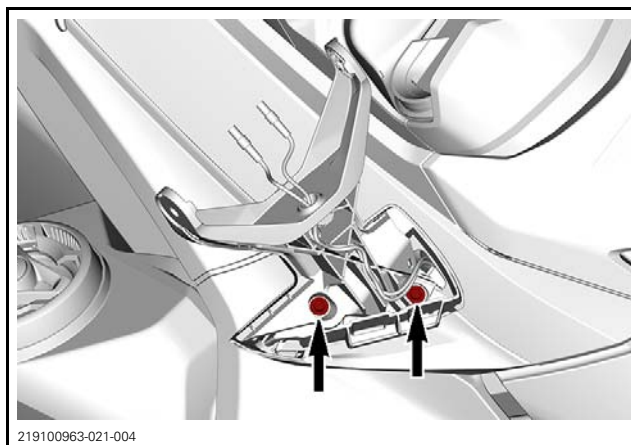
Step 1: Lift tab to remove sonar

Step 2: Unscrew knob to remove support plate

Remove the mounting screw and pull mirror cover toward the front.



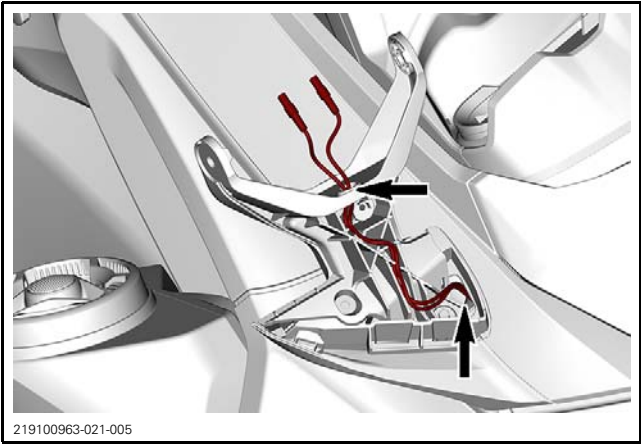
Remove the mounting screws.



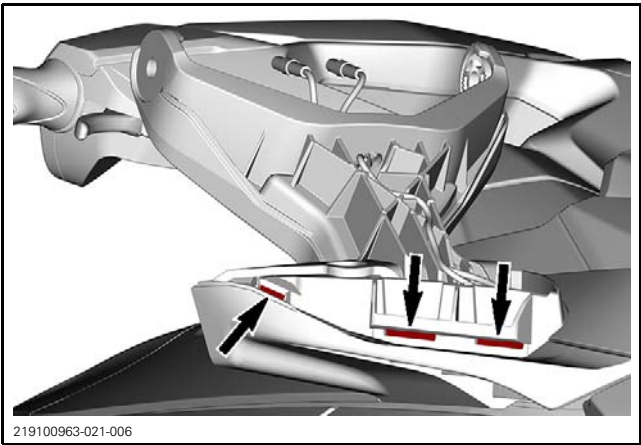
Installing the Support

The installation is the reverse of the removal procedure. However, pay attention to the following.

Ensure the wires are properly routed before installing the mirror cover.



Ensure the mounting tabs are properly located.



TIGHTENING TORQUE	
Support retaining screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)
Mirror cover retaining screw	3.5 N•m ± 0.5 N•m (31 lbf•in ± 4 lbf•in)

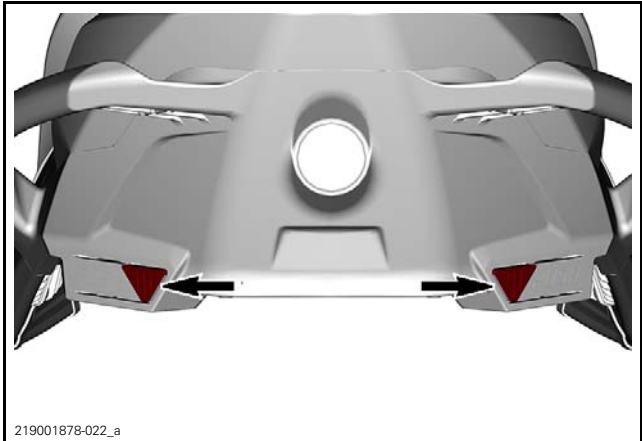
SEAT

Cleaning the Seat

For information, refer to *CLEANING AND REPAIR* subsection.

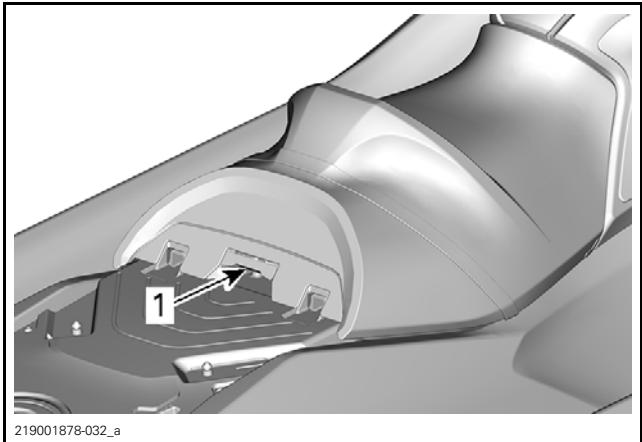
Removing the Seat

To remove the seat, push on the two release buttons and lift the back end of the seat.



RELEASE BUTTONS

Then pull the latch handle up and remove the seat from the watercraft.



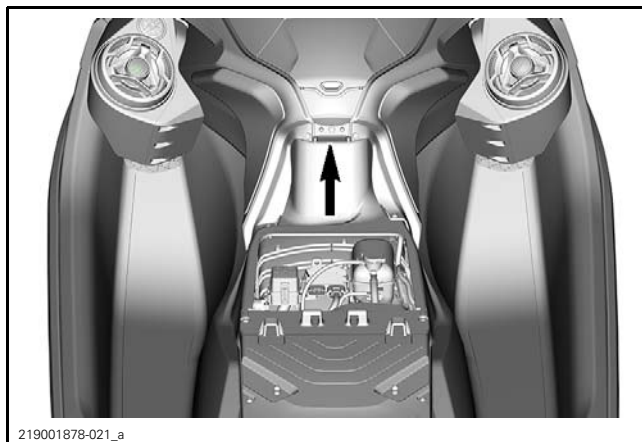
1. Latch handle

Installing the Seat

To install the seat, insert the forward end of the seat in its retainer.

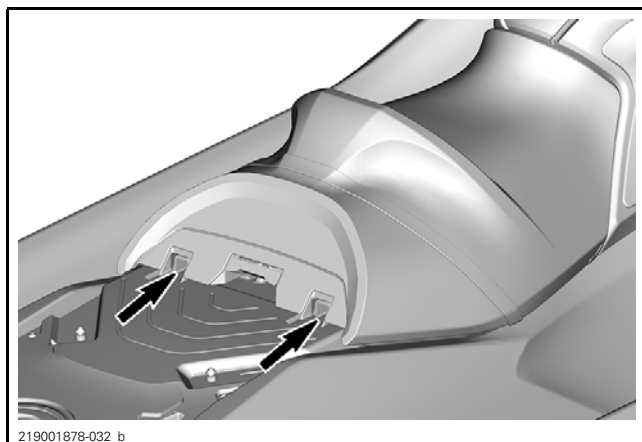
Section 07 BODY AND HULL

Subsection 01 (BODY)



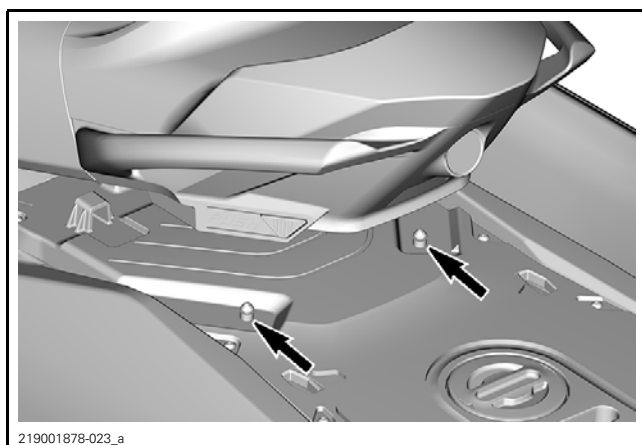
1. Seat retainer

Insert the forward part of the rear seat into the retainers.



1. Seat retainers

Align the seat latch with the latch pin and firmly press down on the rear portion of the seat to lock it in place.



LATCH PINS

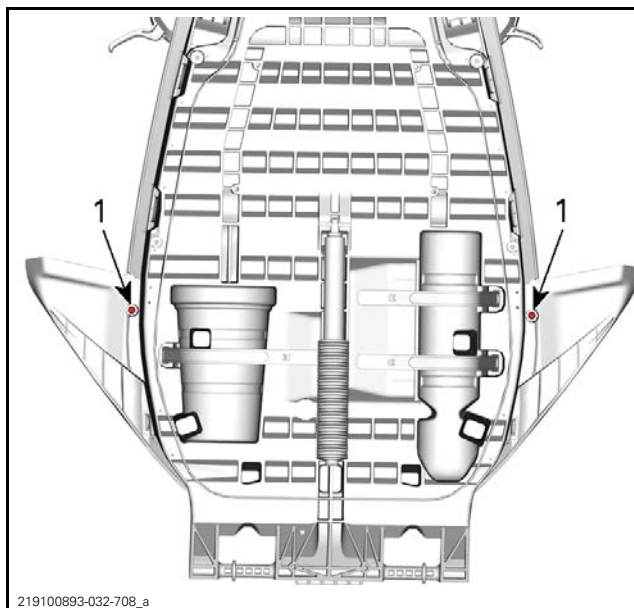
Pull up on the rear portion of the seat to ensure it is properly latched.

CAUTION Ensure the latch is properly locked onto the pin.

MIRRORS

Replacing the Mirror

1. Lift handlebar.
2. Open storage compartment.
3. Remove mirror cover



1. Mirror cover retaining screw

4. Slightly heat mirror with heat gun and not open flame.
5. Push at the back of mirror to remove it.



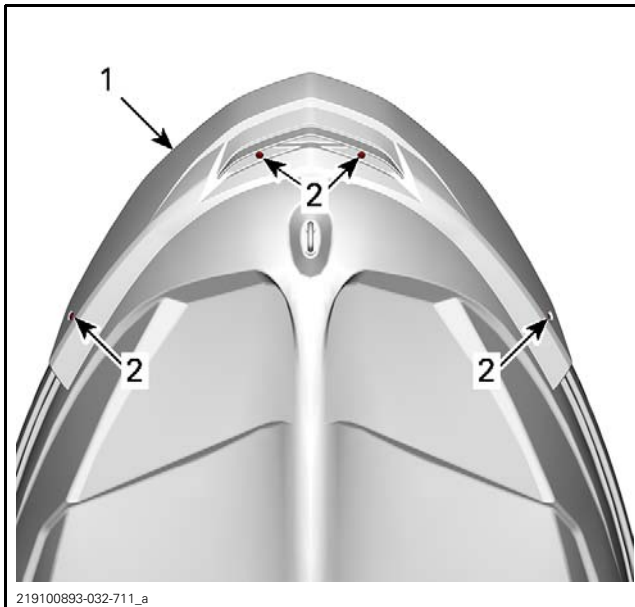
6. Properly clean outer skin surface of any glue residue.

7. Install mirror using adhesive tape at the back of mirror.
8. Install mirror trim by reversing the removal procedure.

BUMPERS

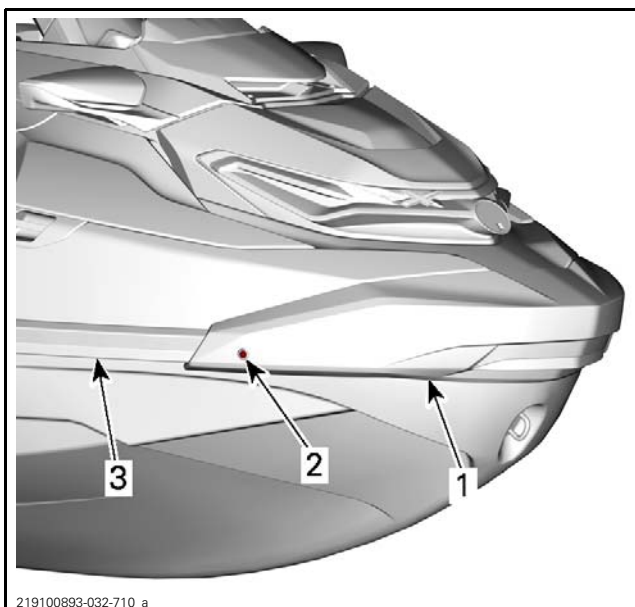
Removing the Bumper

Front Bumper



1. Front bumper
2. retaining screw

1. Remove screws securing front bumper to body.



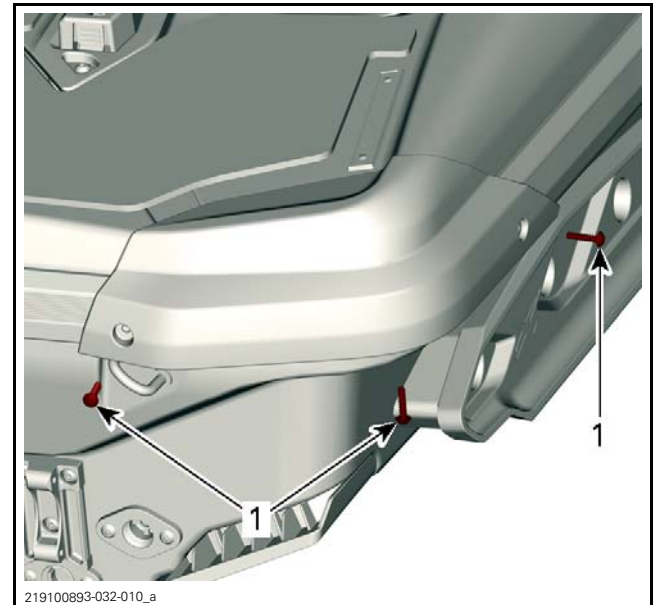
1. Front bumper
2. Retaining screw
3. Side bumper

2. Remove front bumper from vehicle.

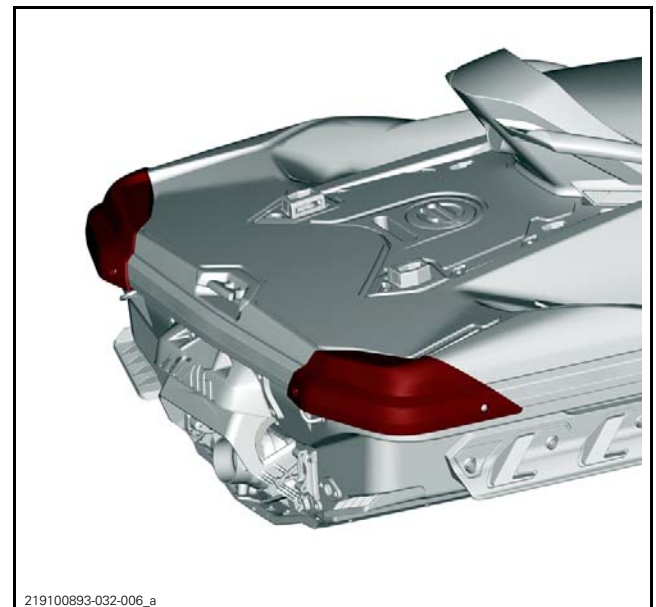
Rear Bumper

All models excluding Fish PRO.

1. Remove protective caps retaining screws.



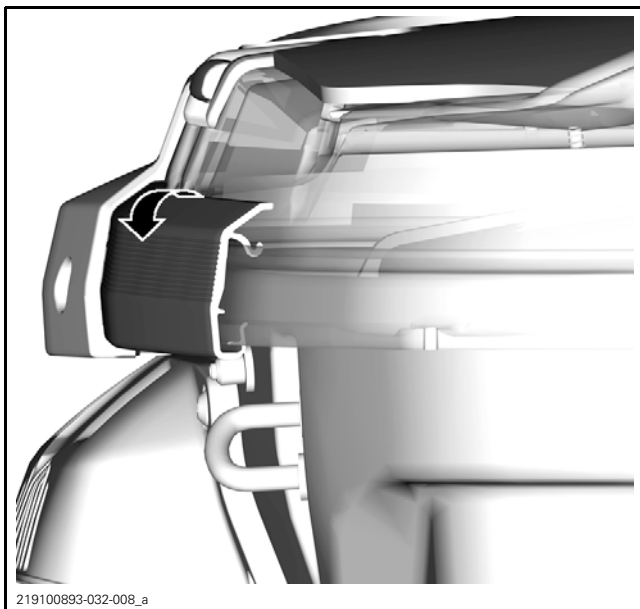
2. Remove both protective caps (one on each side).



3. Pull the top of bumper to unclip it from body.

Section 07 BODY AND HULL

Subsection 01 (BODY)

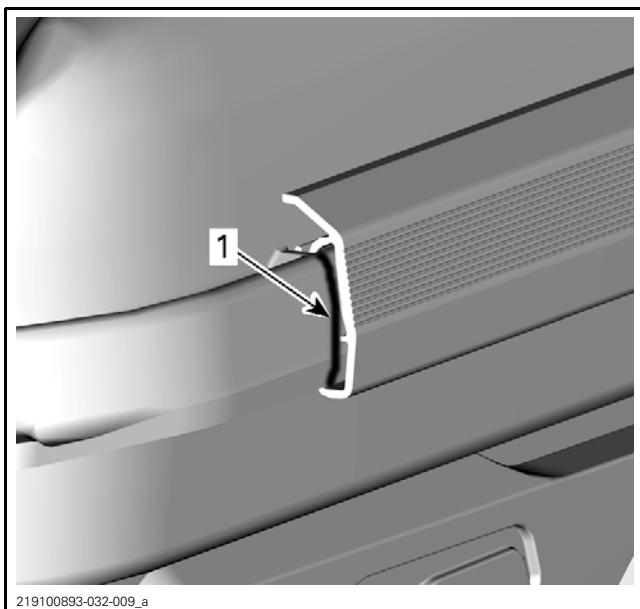


4. Remove rear bumper from vehicle.

Side Bumpers

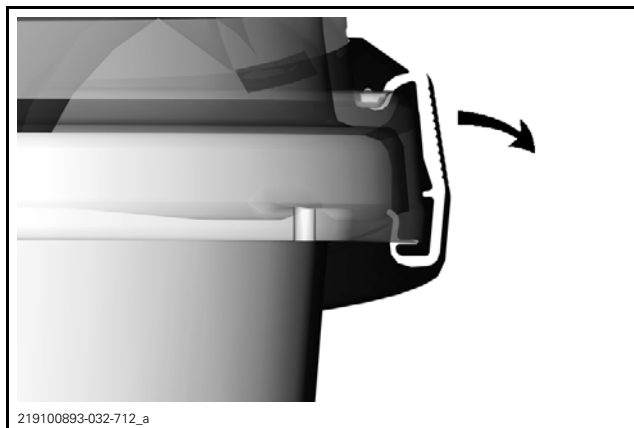
1. Remove front and rear bumpers.
2. Using a marker, trace a line at bumper end.

NOTE: These marks will be used during installation.



1. Trace a line at end of bumper

3. Pull the top of bumper to unclip it from body.



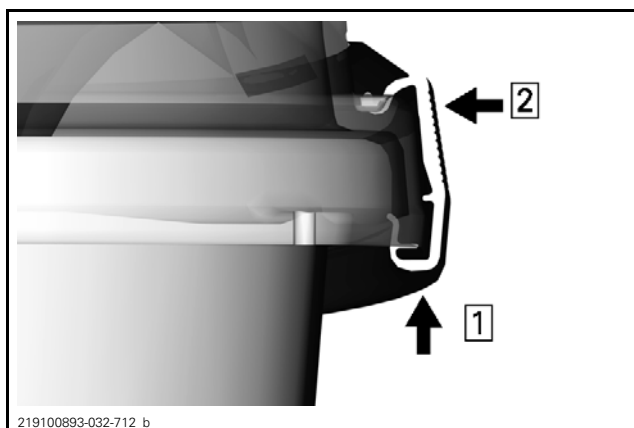
Installing the Bumper

Front and Rear Bumper

The installation is the reverse of the removal procedure.

Side Bumpers

1. Insert bumper over body lip.
 - 1.1 Insert lower section first.
 - 1.2 Insert upper section last.



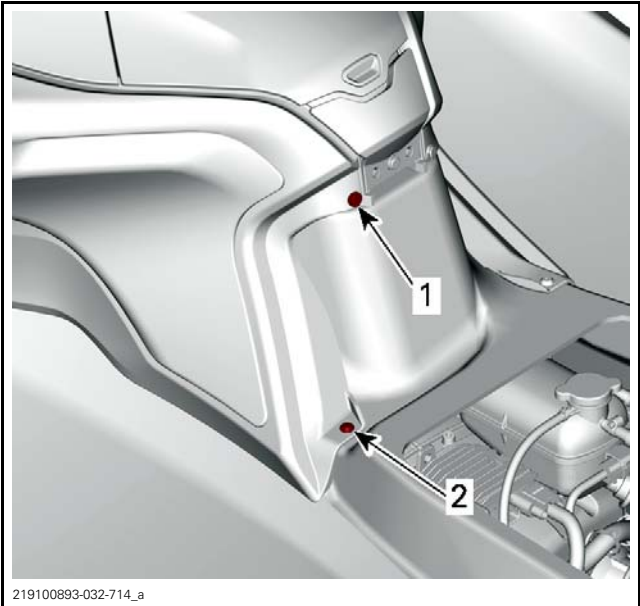
1. Insert lower edge
2. Push towards watercraft

NOTE: Use soapy water to ease bumper installation.

LATERAL COSMETICS



- 1. Front Cosmetic
- 2. Center Cosmetic

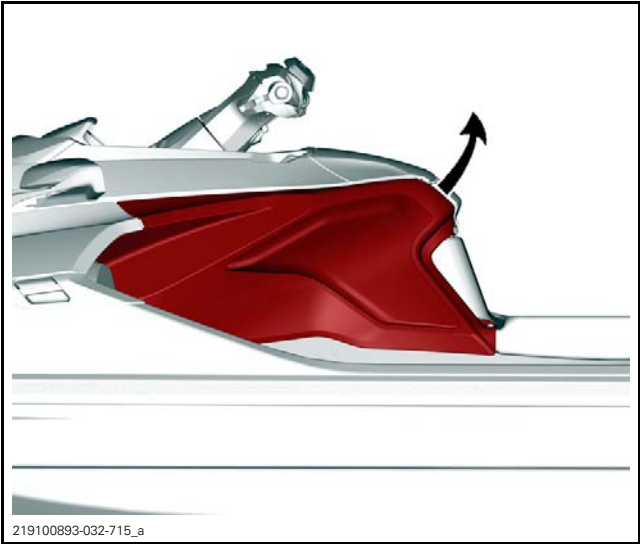


- 1. Plastic rivet
- 2. Screw

Removing the Center Cosmetic



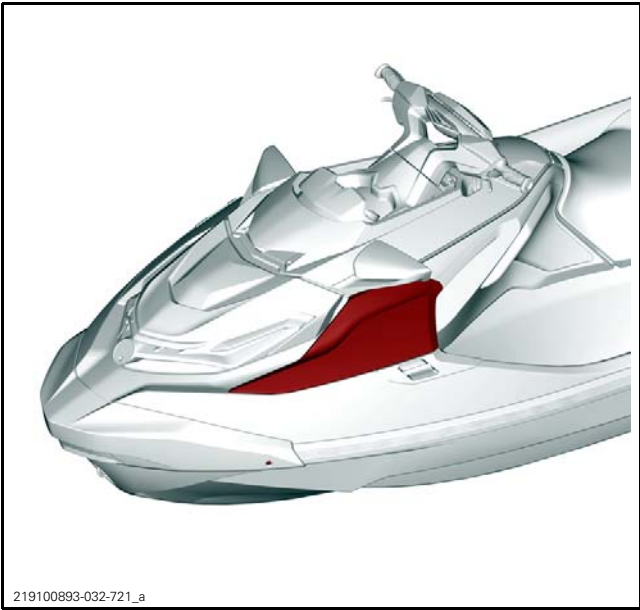
Remove seats.



Installing the Center Cosmetic

The installation is the reverse of the removal procedure.

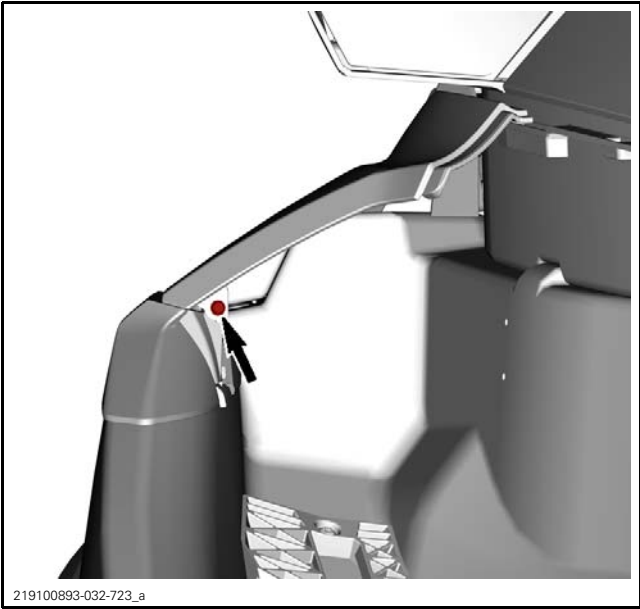
Removing the Front Cosmetic



Remove center cosmetic.

Remove lateral grille, see procedure in this subsection.

Remove screw.

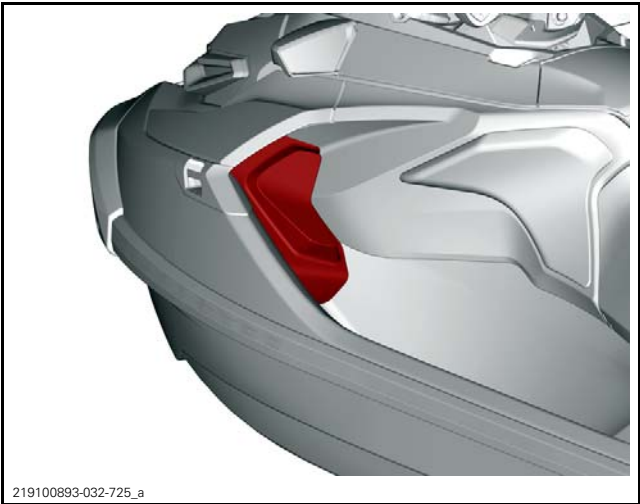


Pull Front cover toward the rear.

Installing the Front Cosmetic

The installation is the reverse of the removal procedure.

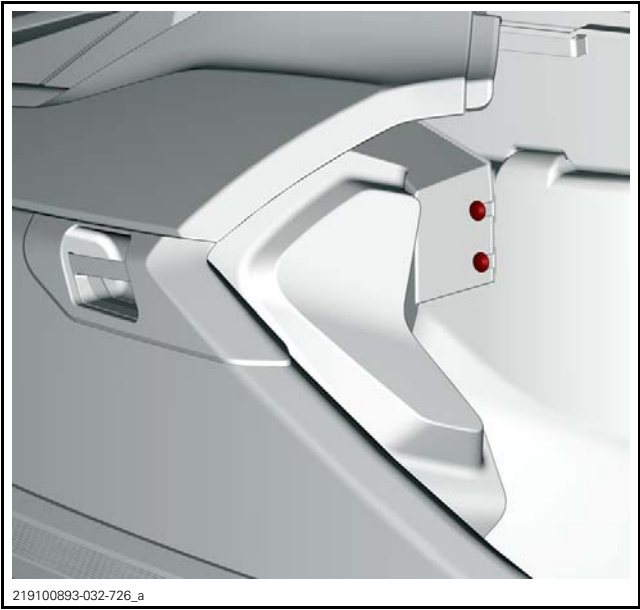
LATERAL GRILLE ASSEMBLY



Removing the Lateral Grille

Remove center cosmetic, see procedure in this subsection.

Remove screws.



Pull grille toward the rear.

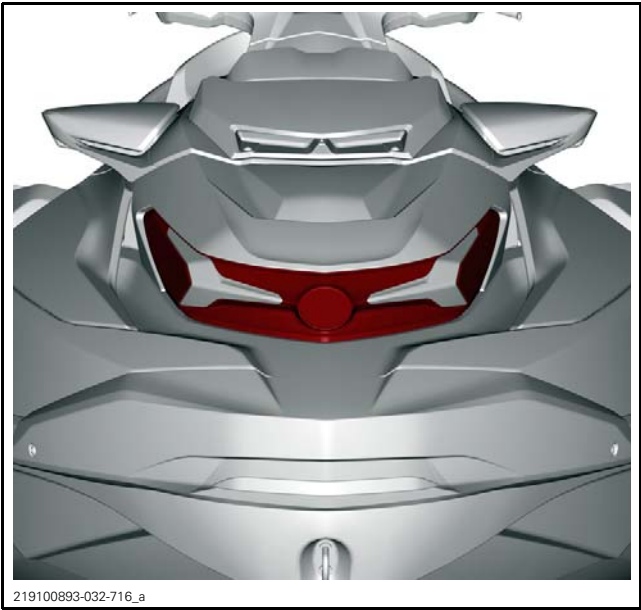
Installing the Lateral Grille

The installation is the reverse of the removal procedure. However, pay attention to the following.

Ensure lower clip is hooked in the support

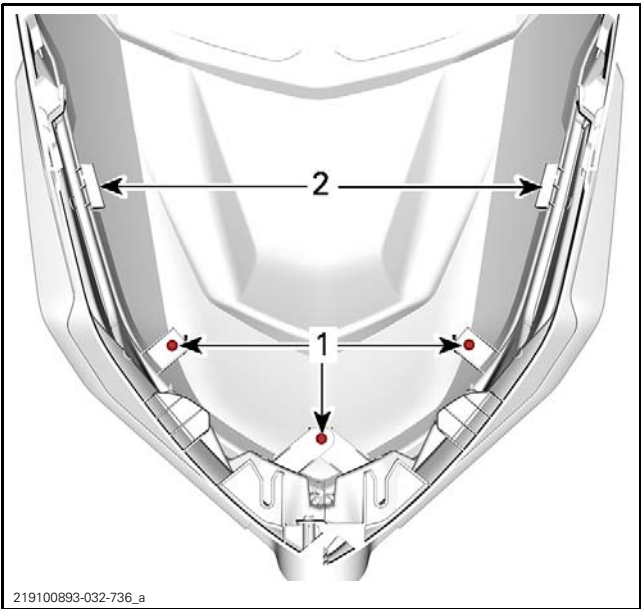
TIGHTENING TORQUE	
Lateral grille screw	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

FRONT GRILLE ASSEMBLY



Removing the Front Grille Assembly

1. Remove hood.
2. Remove screws and retaining tabs.



1. Screws
2. Tabs

3. Remove the grille assembly.

Installing the Front Grille Assembly

The installation is the reverse of the removal procedure. However pay attention to the following.

TIGHTENING TORQUE	
Grille retaining screw	3.25 N•m ± 0.75 N•m (29 lbf•in ± 7 lbf•in)

CLEAT



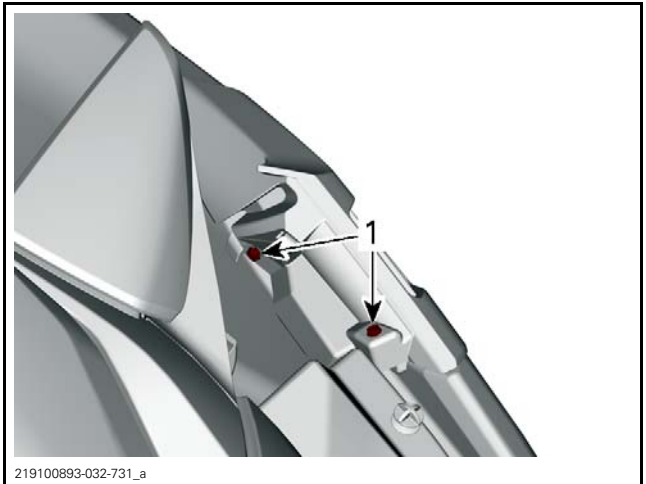
Removing the Cleat

LH side shown, the procedure is the same for both sides.

Remove:

- Seat
- Center cover
- Front cover
- Side grille.

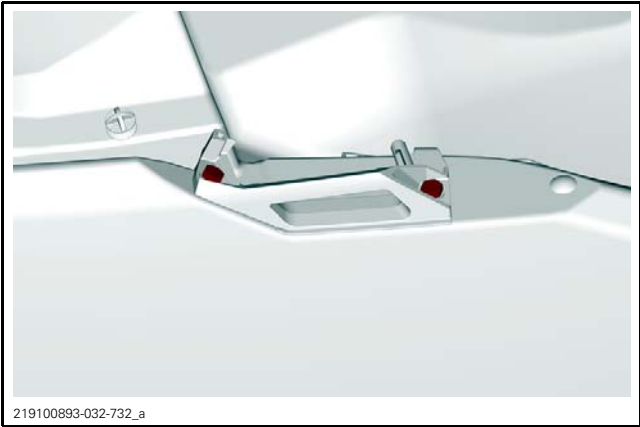
Remove cover retaining screws and cover.



1. Screw

Remove screws.

Section07 BODY AND HULL
Subsection 01 (BODY)



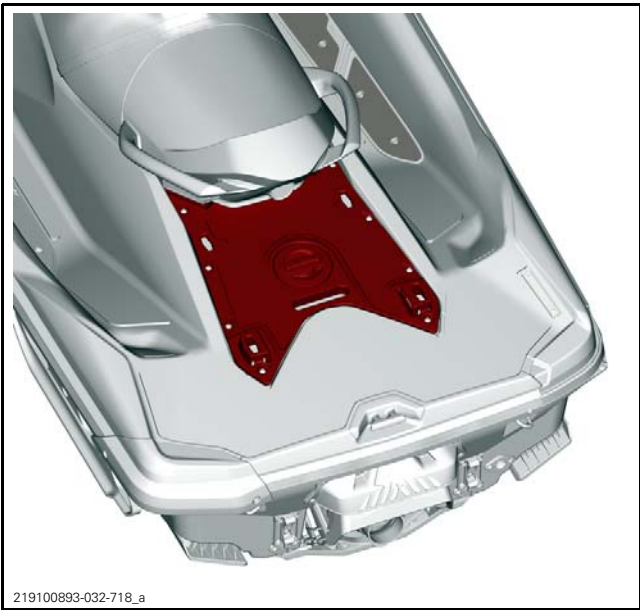
Remove cleat.
NOTE: There are nuts and washers inside the hull. Be careful not to lose them in the hull. Storage compartment can be removed for easy access.

Installing the Cleat

The installation is the reverse of the removal procedure. However pay attention to the following.

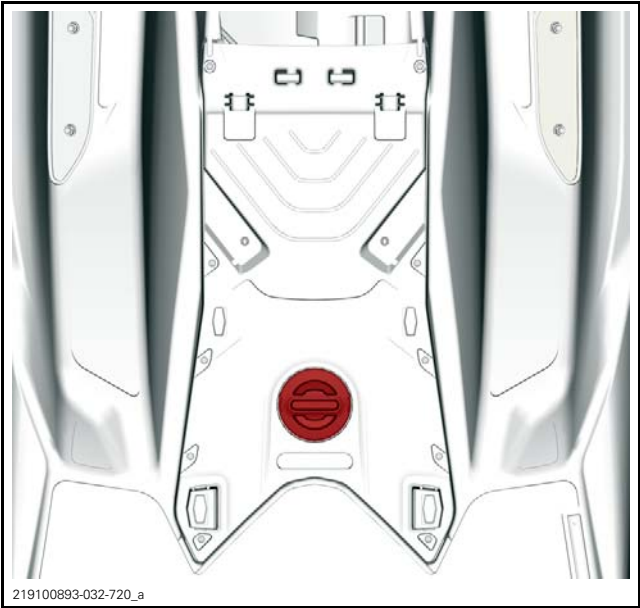
Table with 2 columns: Component, Tightening Torque. Row 1: Cleat screw, 2.75 N•m ± 0.25 N•m (24 lbf•in ± 2 lbf•in)

ENGINE SERVICE COVER

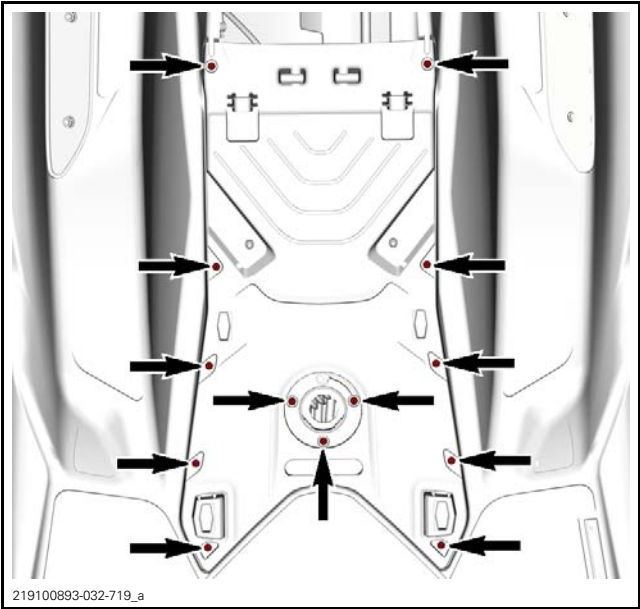


Removing the Engine Service Cover

- 1. Remove seats.
- 2. Remove wake pole cover.



3. Remove screws.



Installing the Engine Service Cover

The installation is the reverse of the removal procedure. However, pay attention to the following. Install all screws. Tighten screws to specification.

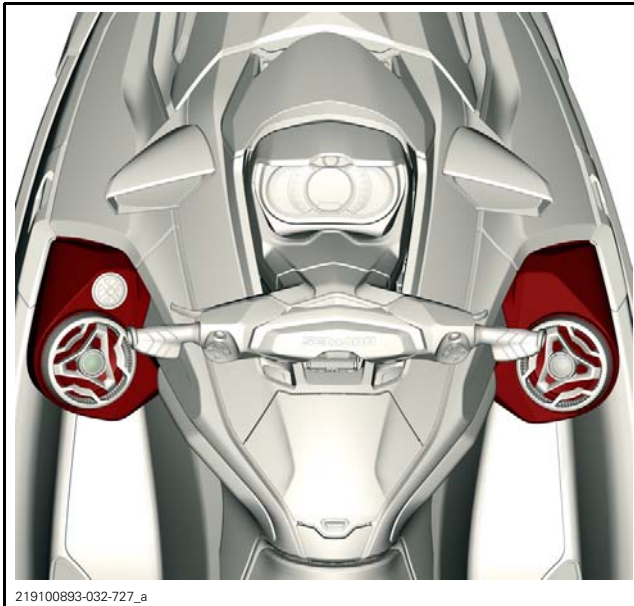
Table with 2 columns: Component, Tightening Torque. Row 1: Engine service cover screw, 2.75 N•m ± 0.25 N•m (24 lbf•in ± 2 lbf•in)

GAUGE

Removing and Installing the Gauge

Refer to INFORMATION CENTER subsection.

SOUND SYSTEM



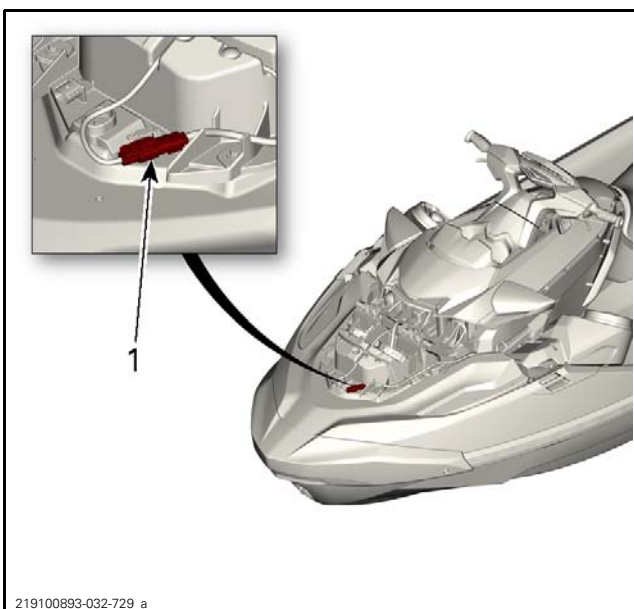
Removing the Sound System

LH side shown, the procedure is the same for both sides.

Remove:

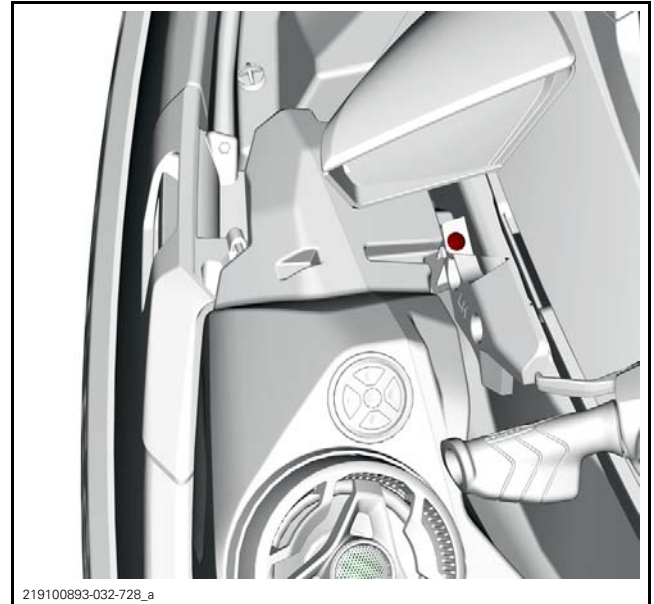
- Seats
- Center cover
- Front cover
- Hood

Disconnect electrical connector.

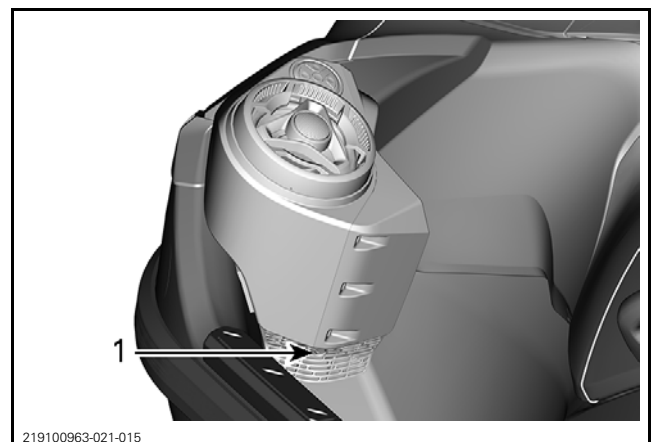


1. LH connector

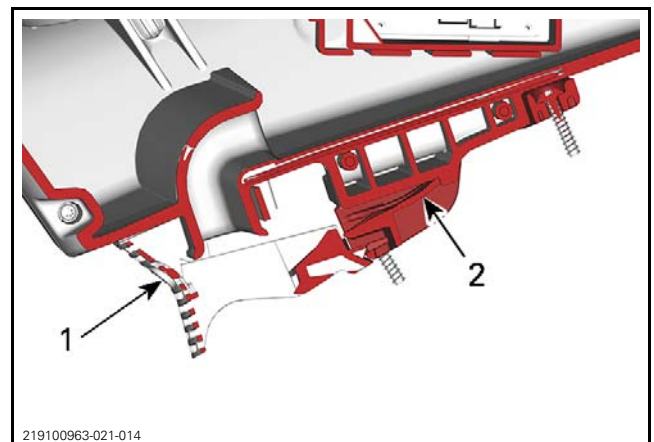
Remove retaining screw.



Insert a long screwdriver or 1/4 in. extension in hole to release tab.



1. Insert screwdriver in hole

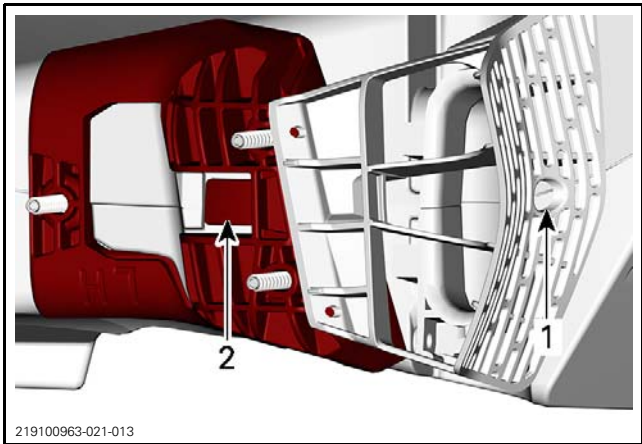


CUT SECTION FROM SIDE

1. Hole
2. Tab to be released.

Section 07 BODY AND HULL

Subsection 01 (BODY)



VIEWS FROM UNDERNEATH

1. Hole

2. Tab to be released.

Slide speaker unit out toward the rear.

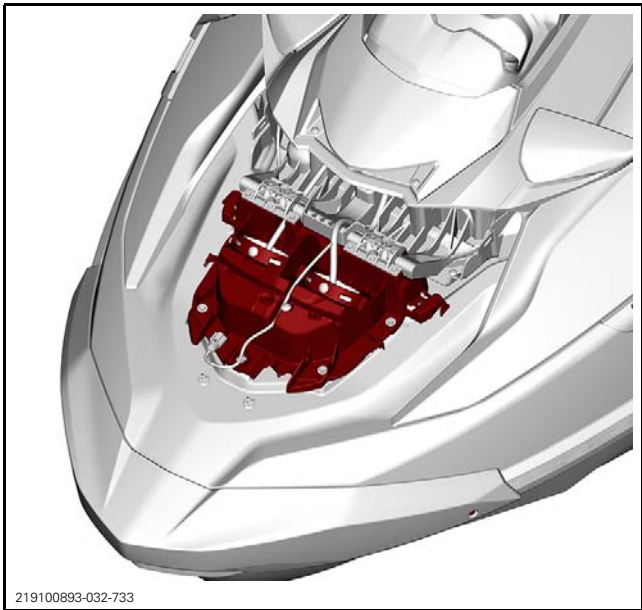
Installing the Sound System

The installation is the reverse of the removal procedure. However, pay attention to the following.

Tighten screws to specification.

TIGHTENING TORQUE	
Speaker retaining screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

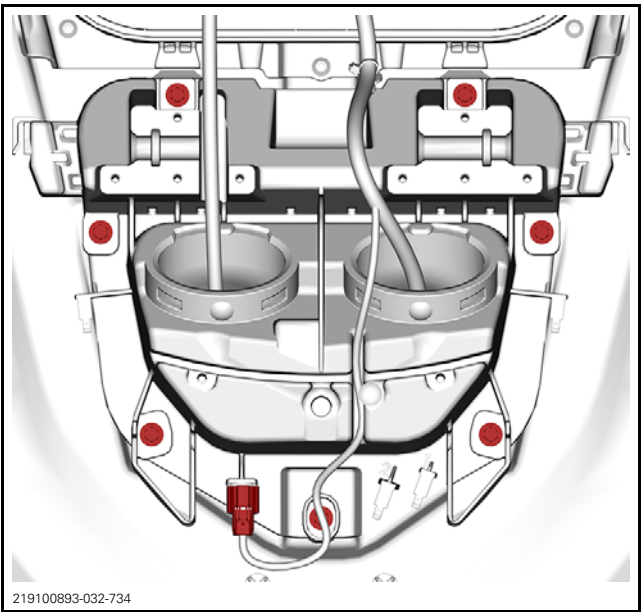
VENTILATION



Removing the Ventilation Adaptor

- Remove:
- Hood
 - Storage cover.

Remove retaining screws and disconnect electrical connector.



Pull ventilation adaptor out.

Installing the Ventilation Adaptor

The installation is the reverse of the removal procedure. However, pay attention to the following.

NOTICE Make sure both ventilation tubes are positioned underneath the storage compartment and not on each side.

Perform the *STORAGE COVER ALIGNMENT* before tightening the ventilation adaptor.

STORAGE COMPARTMENT

Removing the Storage Compartment

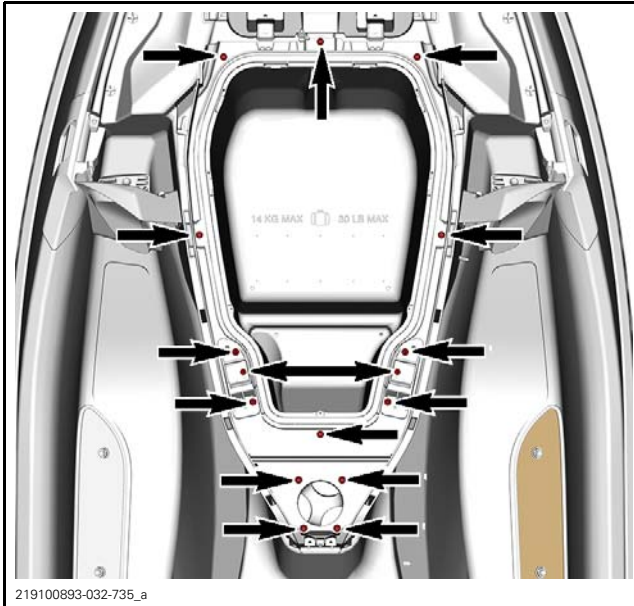
Remove:

- Hood
- Both center covers
- Both front covers.

Disconnect lower gas shock attachment.

Open front storage cover and secure it to maintain it open.

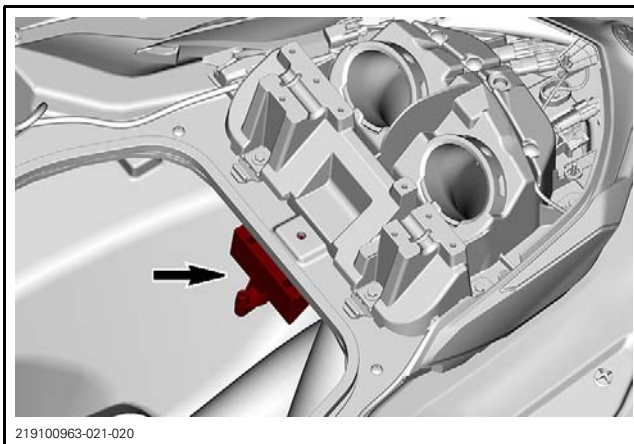
Remove the following fasteners.



Slightly pull storage compartment out.
Cut locking ties retaining the ventilation hoses to the bin.

Finish pulling the storage compartment out.

NOTE: Do not remove the lower shock reinforcement while pulling the storage compartment out.



Installing the Storage Compartment

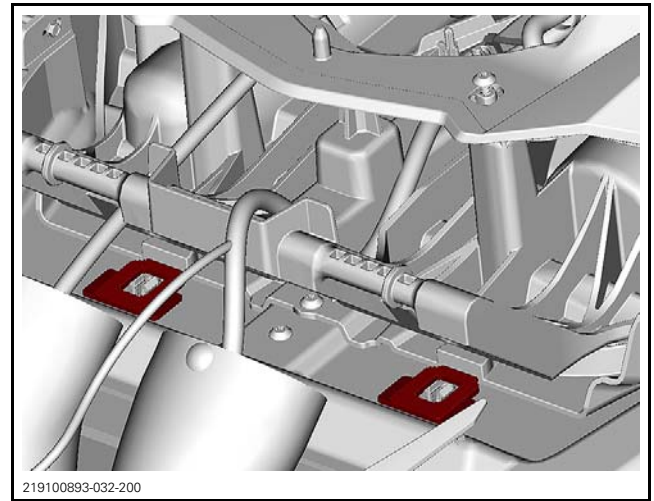
The installation is the reverse of the removal procedure. However, pay attention to the following.
Ensure the lower shock reinforcement is in place before installing the storage compartment.

Storage Cover Alignment

Before aligning the cover, ensure the storage compartment, latch bases, anchorages hooks, ventilation adapter and storage cover are installed and secured.

1. Detach one side of the shock absorber.

NOTICE Make sure anchorage hooks are properly installed.

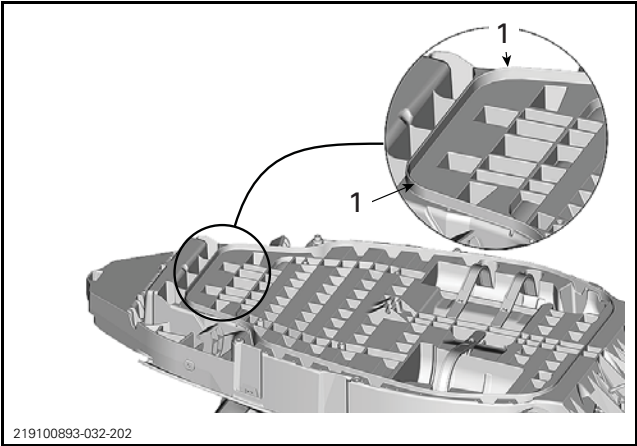


2. Position the inner rib of the compartment cover evenly front and back on the seal.
 - 2.1 Move the storage compartment front to rear to position the rib.
 - 2.2 Carefully, close and latch the cover.
 - 2.3 Check gap between cover and body.
 - 2.4 Open the cover and check if the rib mark is evenly located front and back on the seal.
 - 2.5 If the mark is not center on the seal or gap is not equal, move the compartment at the proper position.



STORAGE COMPARTMENT SEAL

Section07 BODY AND HULL
Subsection 01 (BODY)

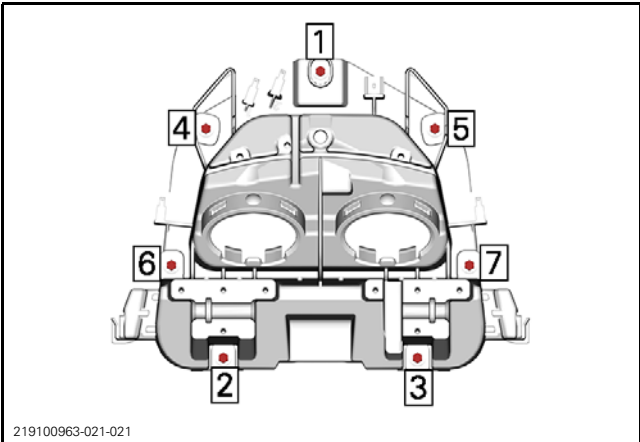


STORAGE COMPARTMENT COVER RIB

- 3. Make sure ventilation adaptor is properly installed on anchorage hooks.
- 4. Tighten anchorage hooks, ventilation adaptor and storage compartment.

NOTICE Make sure both ventilation tubes are positioned underneath the storage compartment and not on each side.

TIGHTENING TORQUE	
Latch base screws	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)
Ventilation adaptor screws	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)
Storage compartment screws	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)



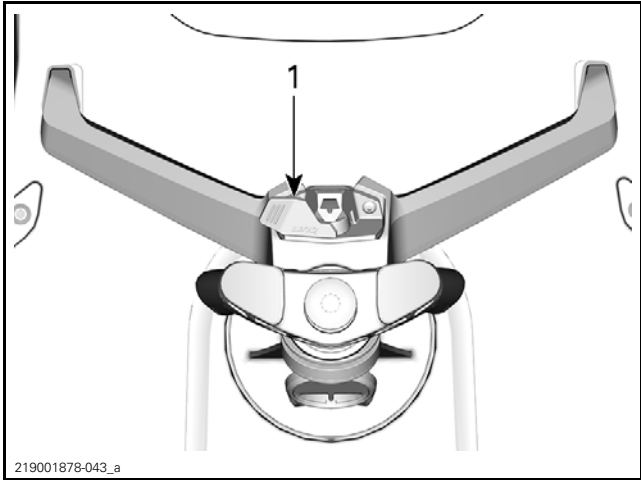
VENTILATION ADAPTOR SCREWS TIGHTENING SEQUENCE

- 5. Recheck position of the inner rib on seal. Reposition if necessary.
- 6. Ensure cover latch properly.
- 7. Install the shock.
- 8. Reinstall all other removed parts.

WAKE PYLON (WAKE PRO)

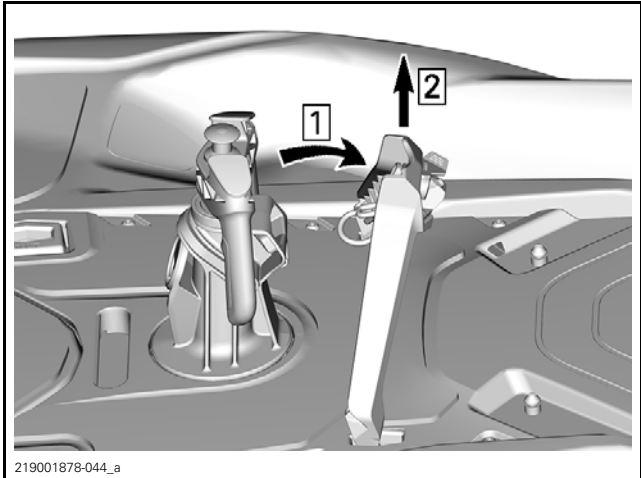
Removing the Wake Pylon

Remove the seat.
Unlock the LinQ attachment.



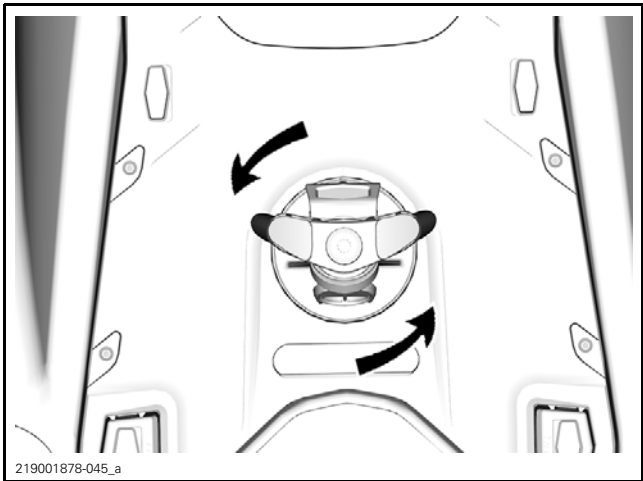
1. LinQ lever

Tilt the support toward the front and lift.



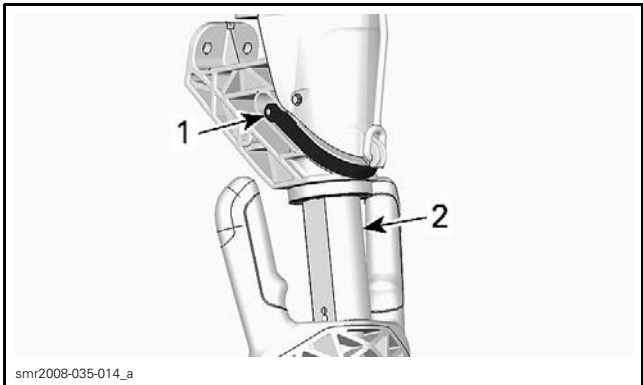
1. Tilt support
2. Lift support

Unscrew the pole by turning it one quarter of a turn and lifting it.



Disassembling the Wake Pylon

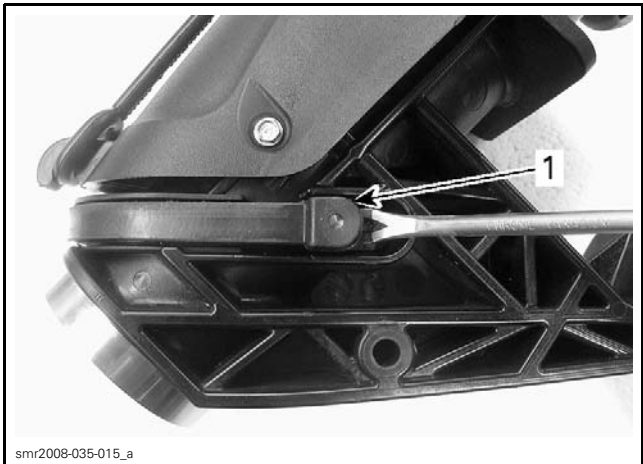
Extend the handle completely.
Turn the wake pylon upside down.
Move both ends of locking strap to disengage the inner lock and free the handle.



1. Locking strap end
2. Handle stem

Locking Strap

Using a screwdriver or any other suitable tool, detach a side of the locking strap from retaining pin.

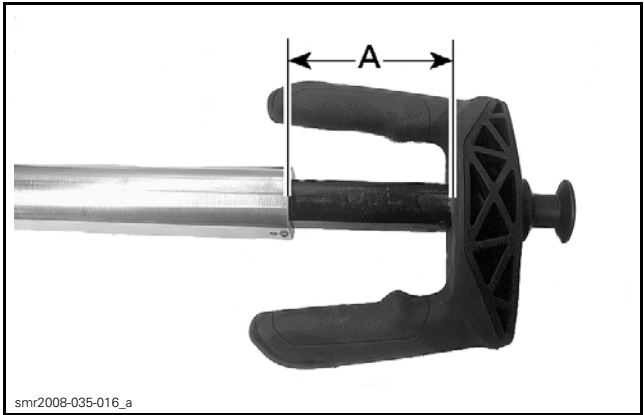


1. Locking strap

Remove locking strap and the inner lock.

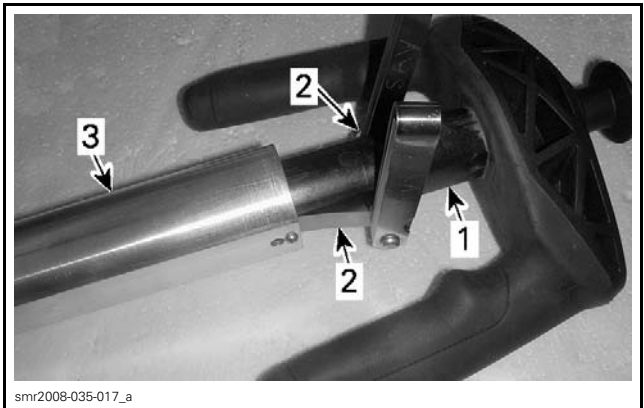
Handle

Extend handle approximately 75 mm to 90 mm (3 in to 3-1/2 in).



A. 75 mm to 90 mm (3 in to 3-1/2 in)

Insert two thin feeler gauges between handle stem and extension tube.



1. Handle stem
2. Feeler gauges
3. Extension tube

Place a rag around the joint to catch balls and spring.

Hold feeler gauges and pull the handle.

Assembling the Wake Pylon

Handle

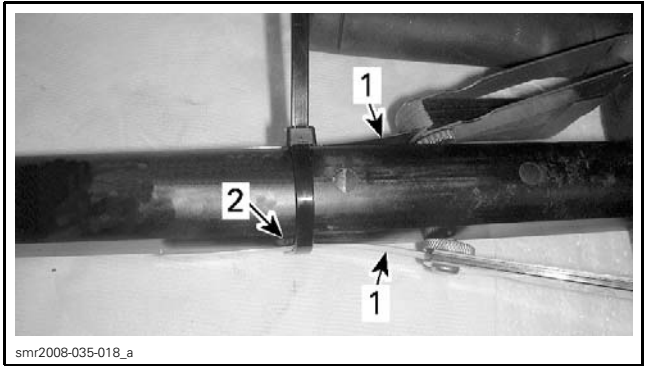
Install a loose locking tie on handle stem.
Apply grease on each ends of spring.

SERVICE PRODUCT	
Scandinavia	SYNTHETIC GREASE (EUR) (P/N 779231)
All other countries	SYNTHETIC GREASE (P/N 779162)

Insert the spring in the handle stem hole.

Section 07 BODY AND HULL
Subsection 01 (BODY)

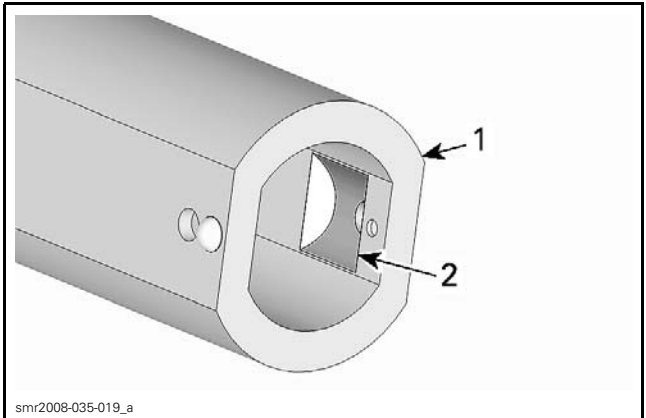
Position a ball on each ends of spring.
Install a feeler gauge over each balls.
Tighten the locking tie in order to retain feeler gauges and balls.



1. Feeler gauges
2. Ball

Apply grease in both recesses of the extension tube.

Table with 2 columns: SERVICE PRODUCT, and two rows of grease specifications for Scandinavia and other countries.

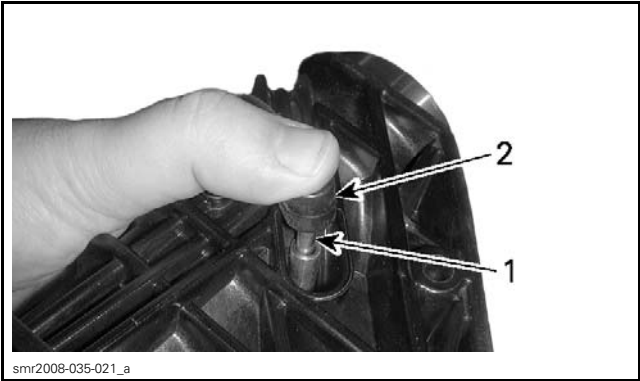


1. Extension tube
2. Recesses

Slide the handle stem into the extension tube.
Remove feeler gauges and locking tie.

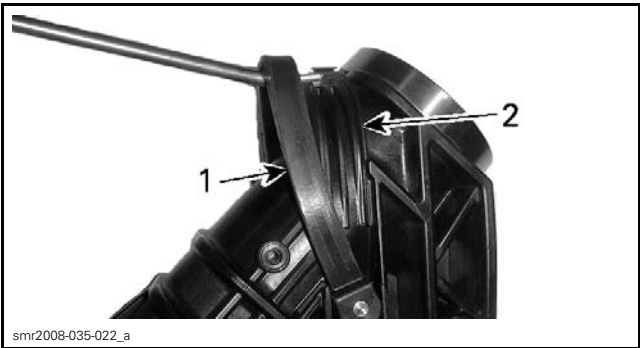
Locking Strap

Install lock and insert the end of the locking strap over the retaining pin.



1. Retaining pin
2. Locking strap

Using a suitable tool, position the locking strap in its groove.



1. Locking strap
2. Locking strap groove

Reinstall the wake pylon trim.
Do not install the handle into wake pylon yet.

Installing the Wake Pylon

The installation is the reverse of the removal procedure.

REAR EXTENSION (FISH PRO)

The following procedures are intended to replace an existing extension and not to install an extension on a regular GTX.

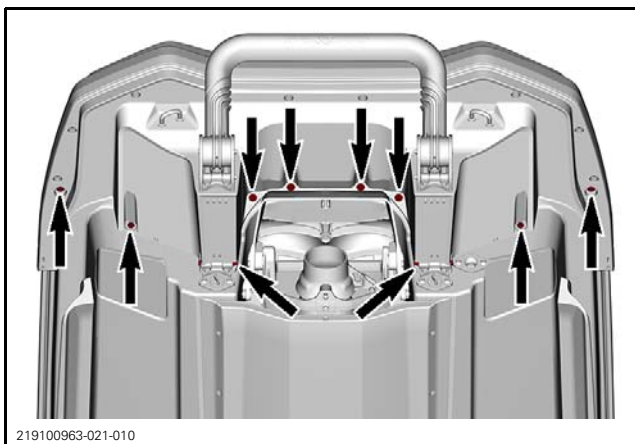
Warning box with a triangle icon and text: Do not install an extension on any other PWC than a Fish PRO model.

Removing the rear Extension

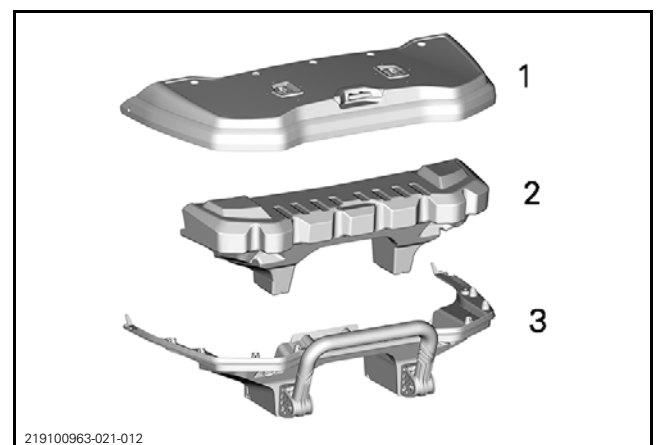
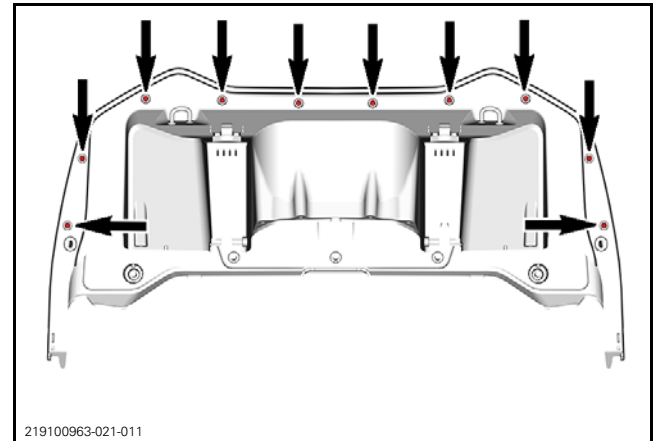
Remove carpet, refer to CLEANING AND REPAIR subsection.



Remove the following fasteners.



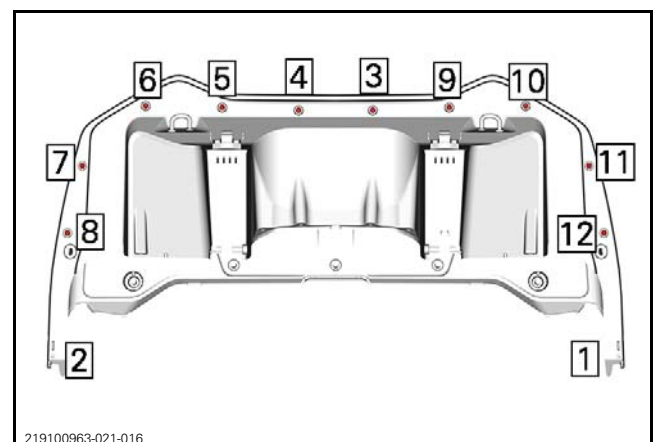
Remove extension.
To open the extension, remove the following fasteners.



1. Extension body
2. Extension float
3. Extension hull

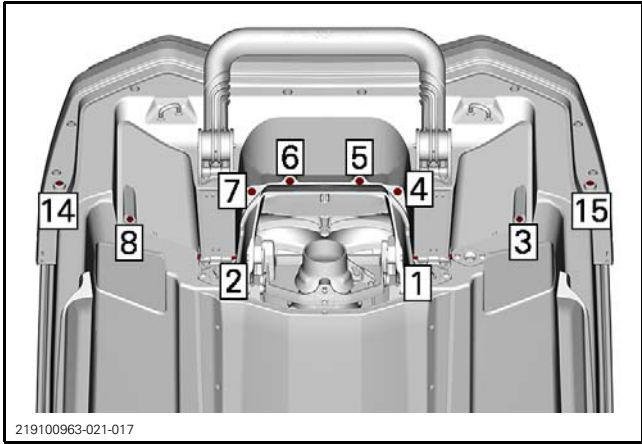
Installing the Fish PRO Extension

The installation is the reverse of the removal procedure. However, pay attention to the following. Refer to the exploded view for tightening torques. Assemble the body and hull by following the tightening sequence.



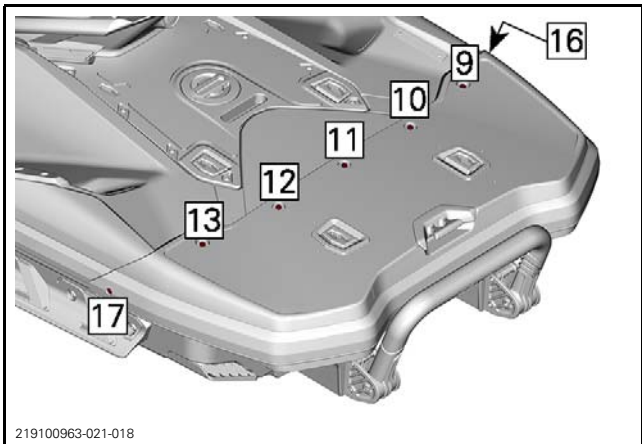
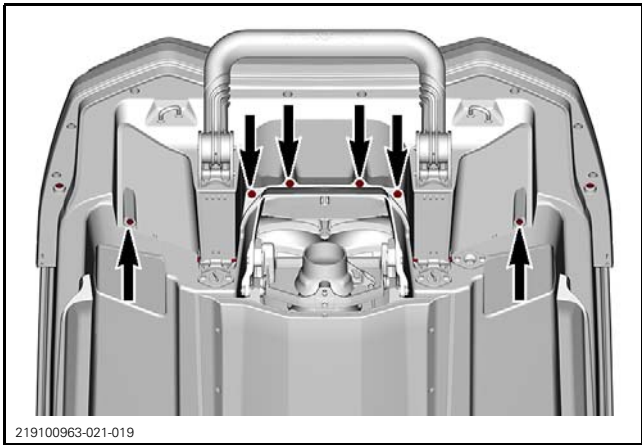
Install the extension to the body by following the tightening sequence.

Section 07 BODY AND HULL
Subsection 01 (BODY)



Apply loctite on the following screws.

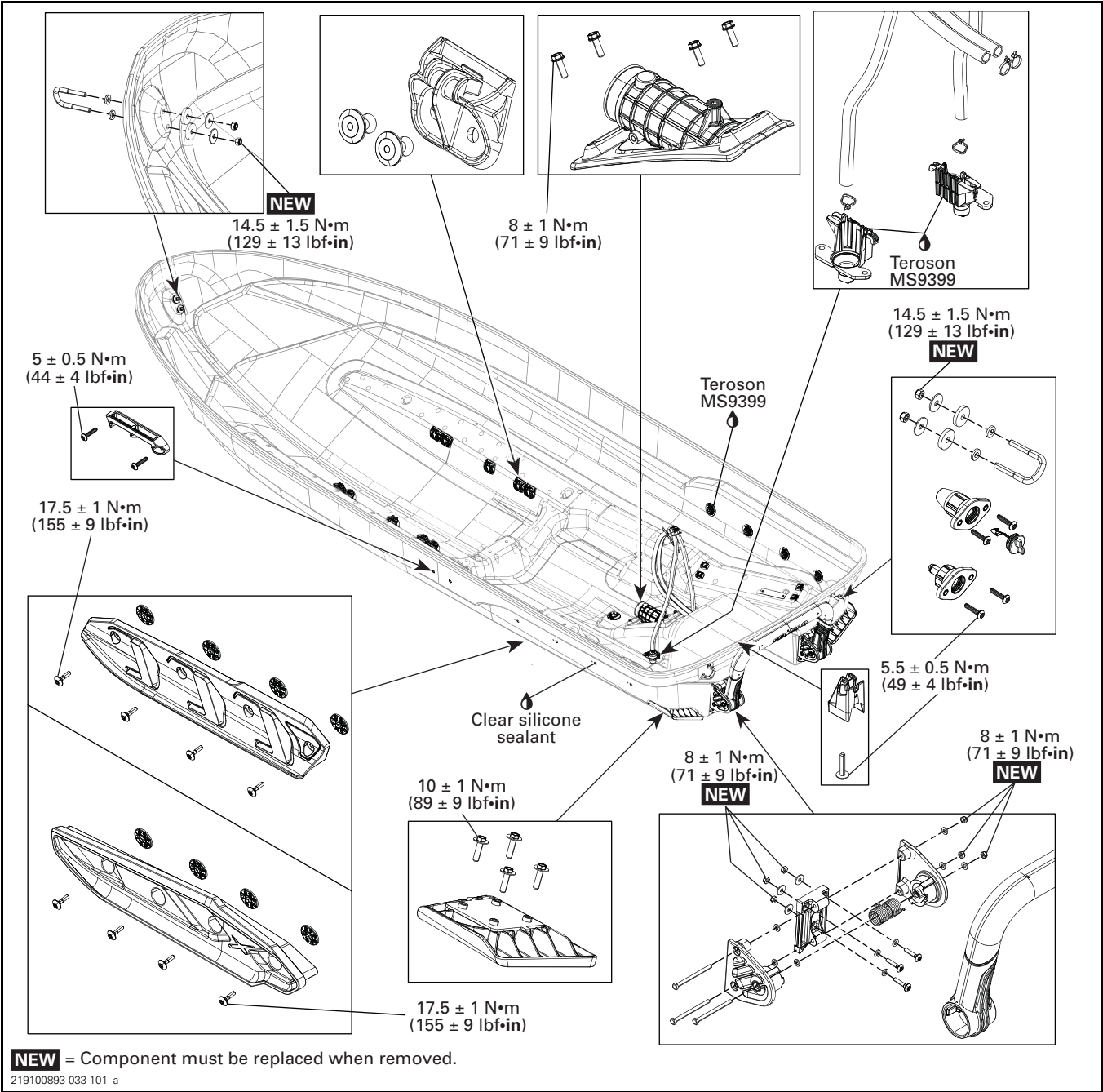
SERVICE PRODUCT
LOCTITE 5900 (P/N 293 800 066)



HULL

SERVICE PRODUCTS

Description	Part Number	Page
BRP HEAVY DUTY CLEANER	293 110 001	241–243
CLEAR SILICONE SEALANT	296 000 309	244, 246
LOCTITE 271 (RED)	293 800 005	239–240
LOCTITE 5900	293 800 066	239, 241–243



Subsection 02 (HULL)



PROCEDURES

HULL

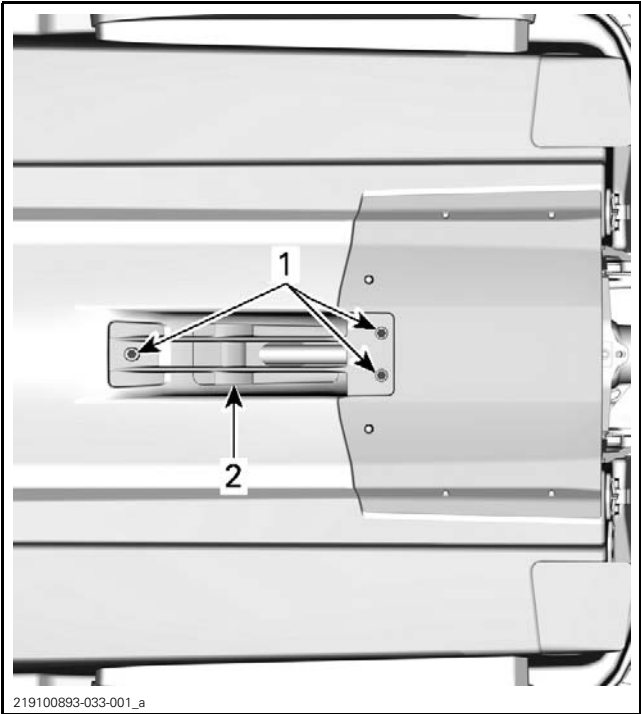
For hull repair, refer to *CLEANING AND REPAIR* subsection.

INLET GRATE

Removing the Inlet Grate

Remove counter nut on front screw on the inside of the hull.

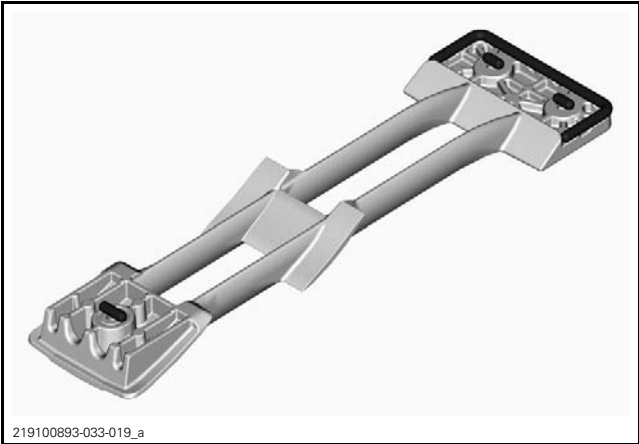
Remove inlet grate retaining screws using an impact tool.



TYPICAL
1. Inlet grate screws
2. Inlet grate

Installing the Inlet Grate

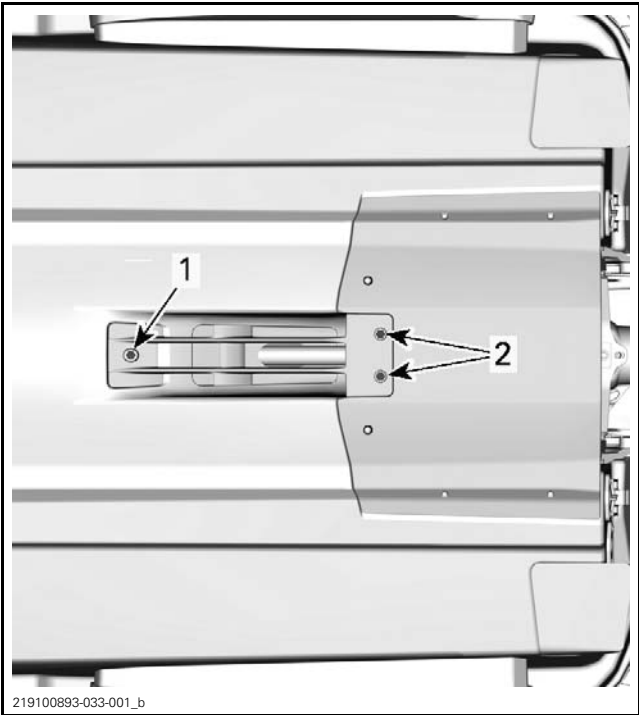
1. Apply LOCTITE 5900 (P/N 293 800 066) sealant as illustrated.



SEALANT APPLICATION

2. Install inlet grate retaining screws with LOCTITE 271 (RED) (P/N 293 800 005) at the proper location.

INLET GRATE SCREWS	
LOCATION	SCREW SIZE
Front	M8 x 45
Rear	M8 x 25



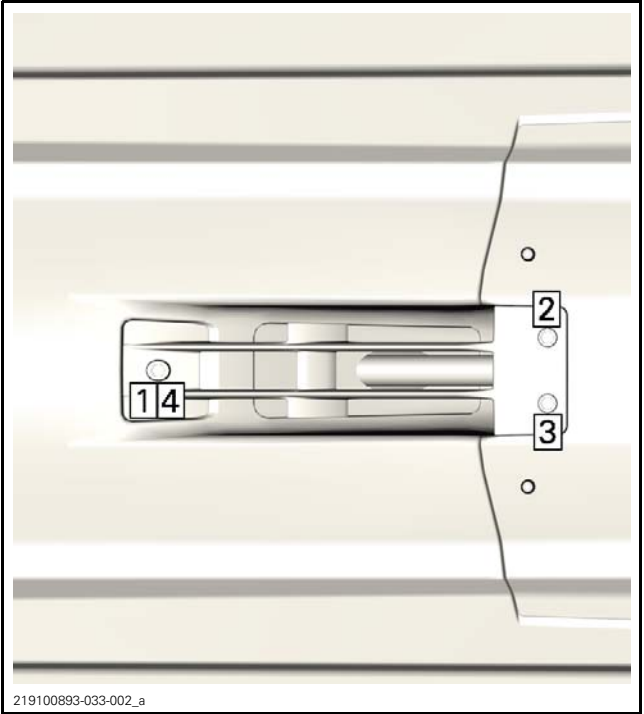
SCREW LOCATION
1. Front
2. Rear

3. Tighten screws to the specified torque and sequence.

Section07 BODY AND HULL

Subsection 02 (HULL)

TIGHTENING TORQUE		
INLET GRATE SCREWS	First step	Hand tighten
	Second step	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)



TIGHTENING TORQUE SEQUENCE

4. Reinstall counter nut on front screw inside the hull.
5. Torque to specification

TIGHTENING TORQUE	
Counter Nut	11 N•m ± 1 N•m (97 lbf•in ± 9 lbf•in)Text

RIDE PLATE

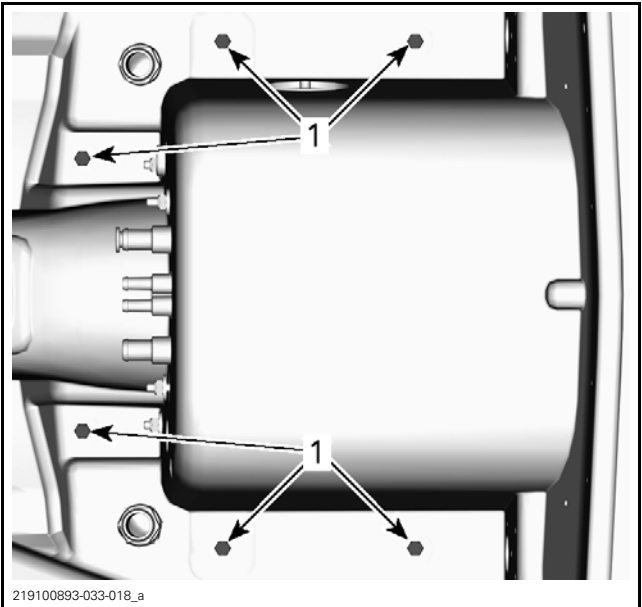
Removing the Ride Plate

1. Remove seats.
2. Remove engine service cover.
3. Remove intercooler, refer to *INTERCOOLER* subsection.
4. Remove muffler, refer to *MUFFLER* subsection.
5. Remove inlet grate, see procedure in this subsection.
6. Remove jet pump. Refer to *JET PUMP* subsection.
7. Drain cooling system. Refer to *COOLING SYSTEM* subsection.

8. Disconnect coolant hoses from the ride plate.
9. Remove coolant hose fittings from the ride plate.

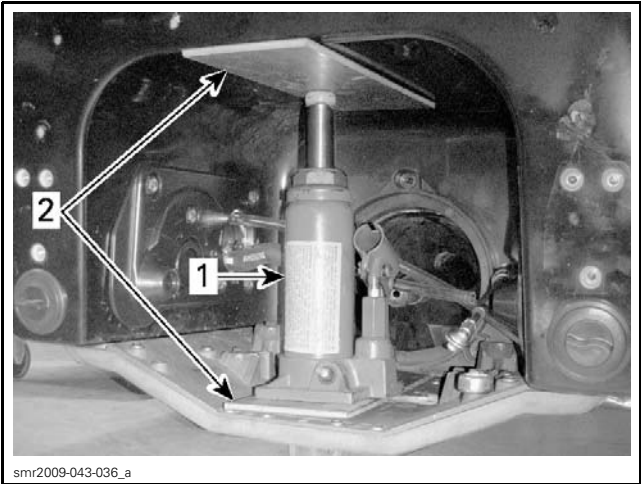
NOTICE If possible, remove the hose fittings from the ride plate before removing the ride plate. If fittings cannot be removed, proceed with care when removing the ride plate.

10. Heat ride plate retaining screws using a heat gun.
11. Using an impact tool, remove and discard retaining screws or reuse with LOCTITE 271 (RED) (P/N 293 800 005).



PARTS REMOVED FOR CLARITY
1. Ride plate retaining screws

12. Install a low height hydraulic bottle jack and 2 steel plates between ride plate and hull as per following illustration.



TYPICAL
1. Hydraulic bottle jack
2. Steel plates

13. Heat the edge of the ride plate with a heat gun to soften the sealant.
14. Start pumping the hydraulic jack slowly.
15. Using a sharp knife, carefully cut the sealant around the ride plate edges.
16. Pump the hydraulic jack slowly to pry the ride plate from the hull.

Cleaning the Ride Plate

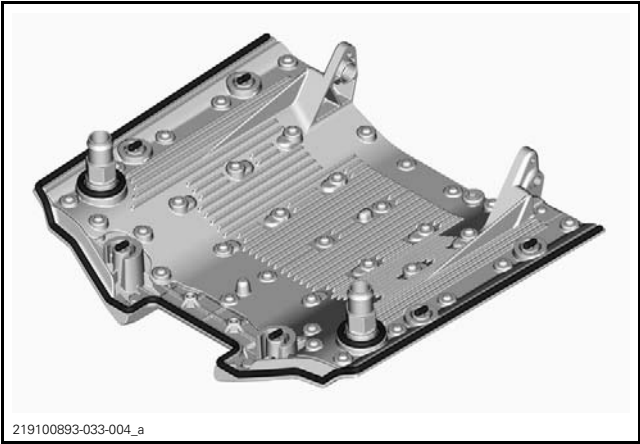
1. Carefully scrape off all excess sealant from ride plate and hull.
2. Clean hull surface with BRP HEAVY DUTY CLEANER (P/N 293 110 001) to eliminate grease, dust and sealant residue. Clean fitting threads.

Installing the Ride Plate

1. Reinstall both hose fittings on the ride plate with new O-rings.
2. Tighten to the specified torque.

TIGHTENING TORQUE	
Hose fittings	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

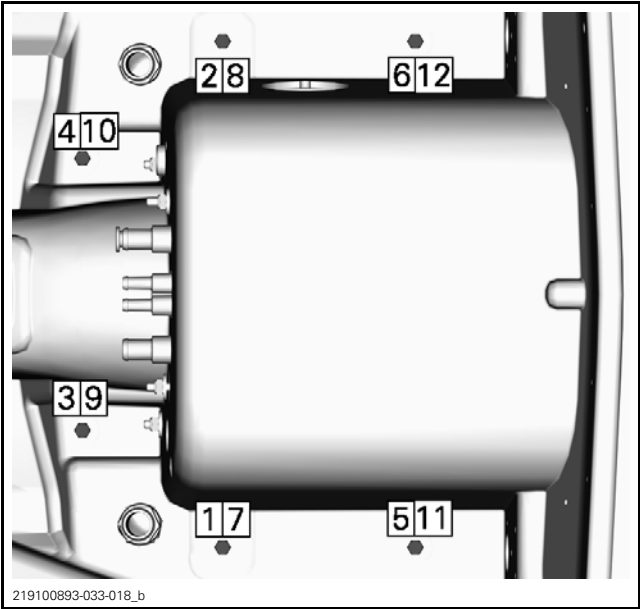
3. Apply LOCTITE 5900 (P/N 293 800 066) sealant as illustrated.



SEALANT APPLICATION

4. Secure ride plate with retaining screws.
- NOTE:** Measure distance between pivot arms on ride plate and jet pump support to ensure ride plate is centered.
5. Tighten screws to the specified torque and sequence.

TIGHTENING TORQUE		
RIDE PLATE RETAINING SCREWS	Steps 1 to 6	Hand tighten
	Steps 7 to 12	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)



6. Reinstall other removed parts. Refer to appropriate subsections for procedures.

JET PUMP SUPPORT

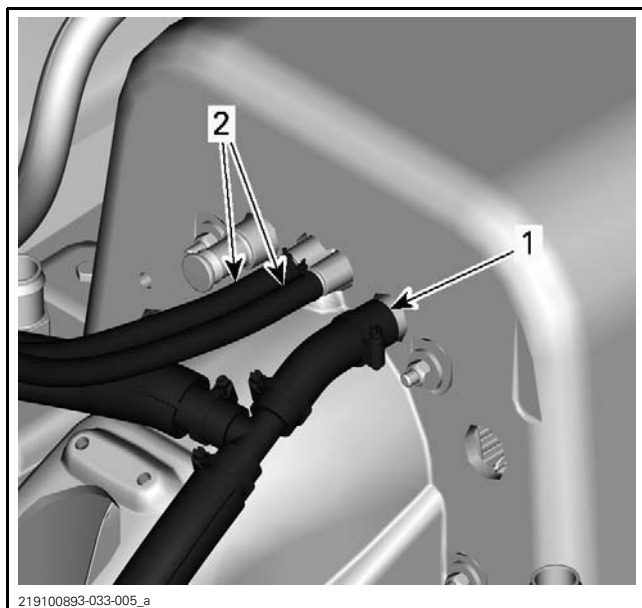
Removing the Jet Pump Support

1. Remove the ride plate. Refer to procedure in this subsection.

Section 07 BODY AND HULL

Subsection 02 (HULL)

2. Disconnect hoses from jet pump support.



INSIDE THE HULL

1. Exhaust water supply hose
2. Bailer hoses

3. Remove jet pump support retaining nuts and washers.



FROM INSIDE THE HULL

4. Heat the jet pump support using a heat gun in order to soften the sealant.
5. Pull jet pump support off the hull.
6. If applicable, note the alignment shims location.

NOTICE Alignment shims have to be reinstalled at the same location.

Cleaning the Jet Pump Support

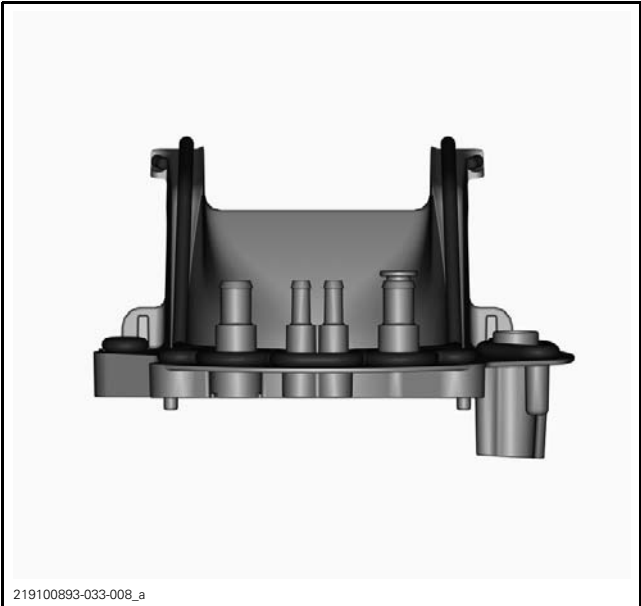
1. Scrape off all excess sealant from jet pump support, ride plate, and hull.
2. Inspect pump support for cracks or other damage.
3. Clean jet pump support and hull surface with BRP HEAVY DUTY CLEANER (P/N 293 110 001) to eliminate grease, dust, and sealant residue.

Installing the Jet Pump Support

1. Make sure sealant contact areas are clean and dry.
2. Apply LOCTITE 5900 (P/N 293 800 066) on the jet pump support as shown (thick black line).



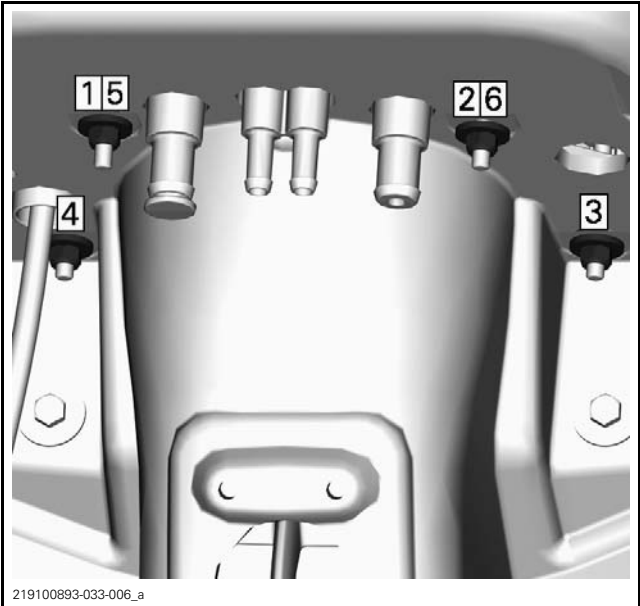
SEALANT APPLICATION



SEALANT APPLICATION

3. Insert the studs in the jet pump support square holes.
4. Slide the alignment shims on the studs.
5. Position the jet pump support against the hull.
6. Inside the hull, thread all 4 retaining nuts.
7. Push jet pump support towards the top of the vehicle to ensure that the stoppers on the jet pump support are in contact with the hull.
8. Tighten retaining nuts to the specified torque and sequence.

TIGHTENING TORQUE	
Jet pump support retaining nuts	25 N•m ± 1 N•m (18 lbf•ft ± 1 lbf•ft)



JET PUMP SUPPORT TIGHTENING SEQUENCE

9. Remove excess sealant.
10. Reinstall other removed parts. Refer to appropriate subsections for procedures.

THRU-HULL FITTING

Removing the Thru-Hull Fitting

1. Remove drive shaft, refer to *DRIVE SHAFT* subsection.
2. Remove thru-hull fitting retaining screws.
3. Remove iBR actuator retaining screw.
4. From both sides of the vehicle, heat the thru-hull fitting with a heat gun to soften the sealer. Be careful not to overheat the thermofilm.
5. Pull thru-hull fitting off the hull.

Cleaning the Thru-Hull Fitting Area

1. Scrape off all excess sealant from the hull.
2. Clean hull surface with BRP HEAVY DUTY CLEANER (P/N 293 110 001) to eliminate grease, dust, and sealant residue.

NOTE: Use only a clean, dry, oil free filtered air supply for dusting and drying parts or hull.

Installing the Thru-Hull Fitting

1. Make sure thru-hull fitting sealing surface is free of sealant residue, clean and dry before installation.
2. Apply LOCTITE 5900 (P/N 293 800 066) sealant as shown.

Section07 BODY AND HULL

Subsection 02 (HULL)



SEALANT APPLICATION

3. Tighten thru-hull fitting screws to the specified torque.

TIGHTENING TORQUE	
Thru-hull fitting screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

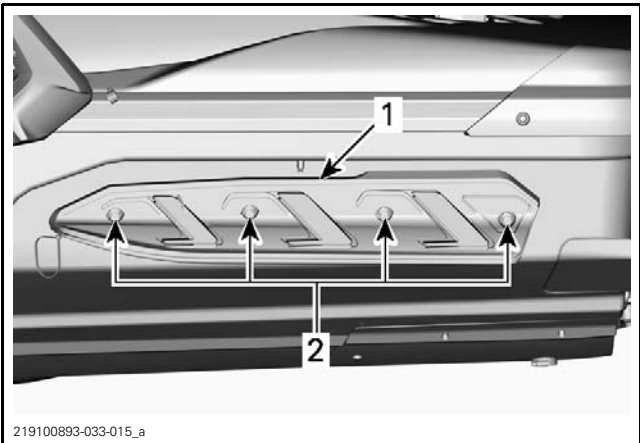
4. Install other removed parts, refer to the appropriate subsections.

REAR SPONSONS

NOTE: Removal and installation procedure for RH and LH sponson is similar.

Removing the Rear Sponson

Remove sponson retaining bolts.



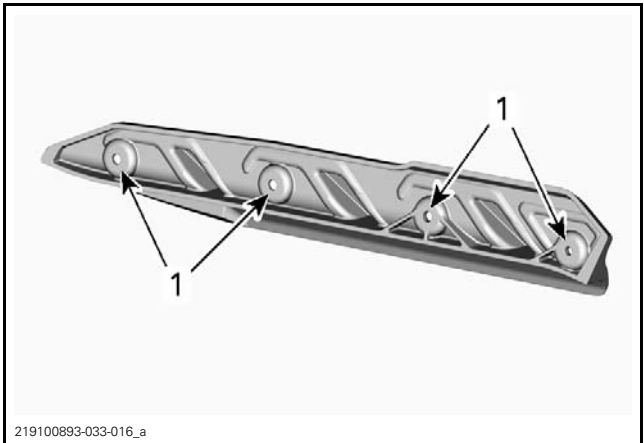
TYPICAL – LH SPONSON SHOWN

1. Sponson
2. Retaining bolts

Installing the Fixed Rear Sponson

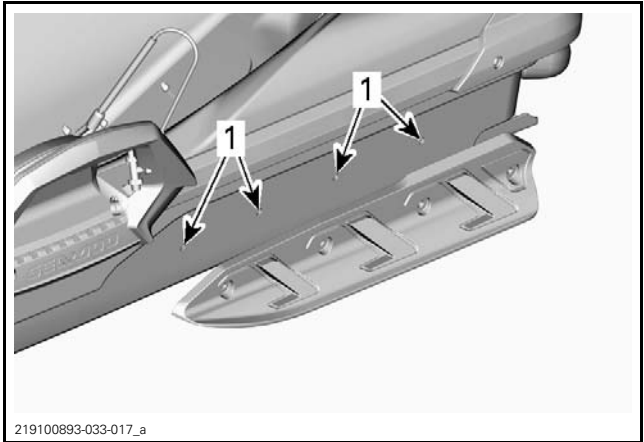
1. Clean any residues of silicone sealant on hull and sponsons.

2. Apply CLEAR SILICONE SEALANT (P/N 296 000 309) on back side of sponson spacers.



1. Apply silicone sealant here

3. Apply a small amount of CLEAR SILICONE SEALANT (P/N 296 000 309) into each hull hole.



1. Apply silicone sealant in these holes

4. Install sponson against the hull using the sponson retaining screws.

5. Tighten screws as specified.

TIGHTENING TORQUE	
Sponson retaining screws	17.5 N•m ± 1 N•m (155 lbf•in ± 9 lbf•in)

NOTE: If the retaining nut holders are damaged and need replacement, follow the following steps.

6. Remove the muffler (on left side) or the intercooler (on the right side). Refer to *INTER-COOLER* or *EXHAUST SYSTEM* subsection.

7. Clean any residues on hull.

8. Apply teroson 9399 on retaining nut holders.

9. Secure retaining nut holders on hull.

10. Reinstall removed parts. Refer to appropriate subsection.

BAILERS

Two bailers (one each side), serve to drain the bilge of the watercraft when it is in operation.

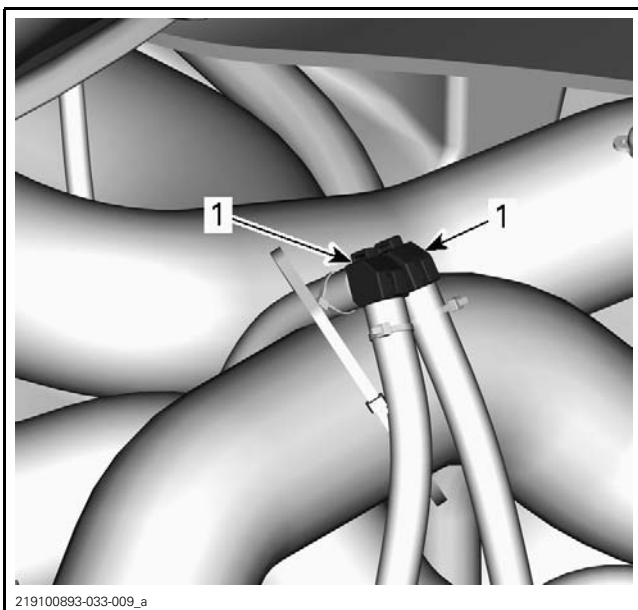
The bailers are connected to syphon tubes mounted in the jet pump venturi that use the jet pump thrust to create a vacuum.

Bailer Access

Remove engine service cover.

Inspecting the Bailer

1. Inside hull, check holes in the bailer pick-ups to see if they are obstructed. Clean if necessary.
2. Check if the hole on each bailer hose elbow fitting is obstructed. Clean both elbow fittings if necessary.



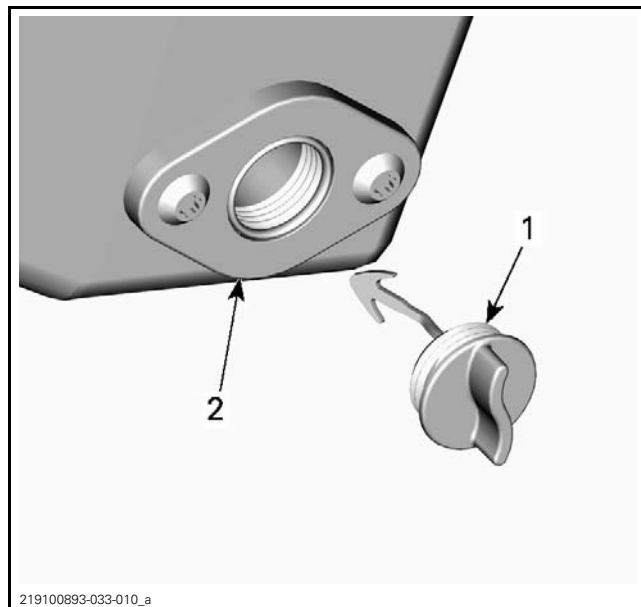
1. Elbow fitting holes

NOTE: When repositioning the bailer hose elbows, attach them at the highest position that you can on the exhaust hose.

DRAIN PLUGS

Removing the Drain Plug Neck

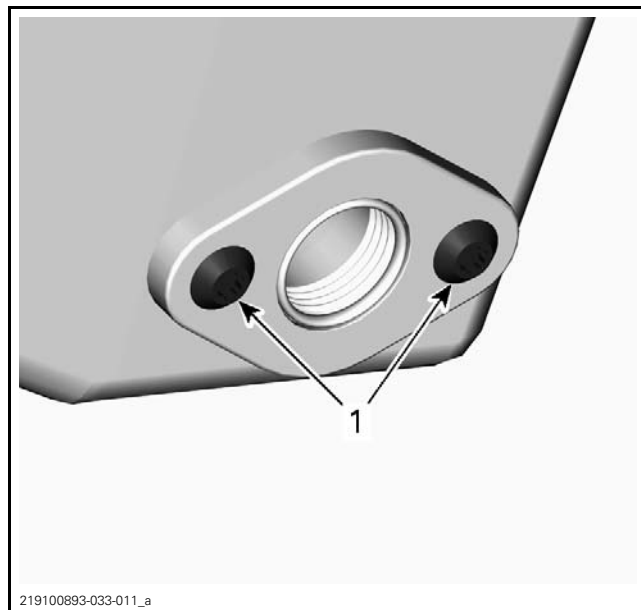
1. Unscrew the drain plug from the drain neck and use a small flat screw driver to compress and release the arrow head from the neck.



DRAIN PLUG REMOVAL

1. Drain plug
2. Drain neck

2. Remove the retaining screws securing the drain neck..



DRAIN NECK REMOVAL

1. Drain neck removal screws

Installing the Drain Plug Neck

1. Install drain neck and torque retaining screws to specification.

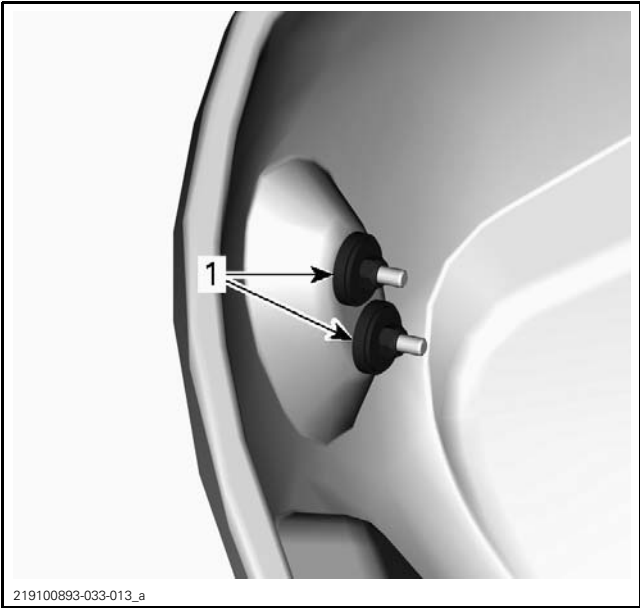
TIGHTENING TORQUE	
Drain plug retaining screws	5.5 N•m ± .5 N•m (49 lbf•in ± 4 lbf•in)

2. Replace O-ring if necessary.

BOW EYELET

Removing the Bow Eyelet

- 1. Remove the storage bin, refer to *BODY* subsection.
- 2. Remove nuts and washers securing the bow eyelet. Discard nuts.

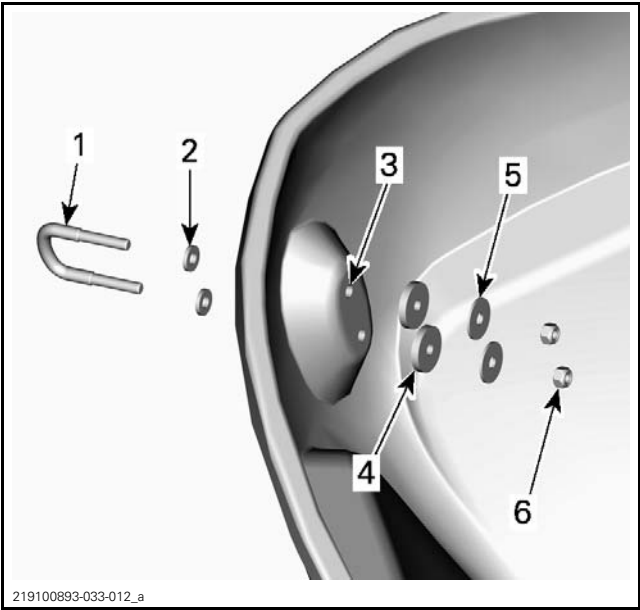


TYPICAL – INSIDE HULL

1. Eyelet retaining nuts

- 3. Remove the bow eyelet from the vehicle.
- 4. Clean any residue of silicone sealant from the hull.

Installing the Bow Eyelet



TYPICAL – BOW EYELET

1. Bow eyelet
2. Small washer
3. Loctite 5150 (silicone sealant) here
4. Rubber washer
5. Large washer
6. Elastic stop nut

REQUIRED PRODUCT	LOCATION
CLEAR SILICONE SEALANT (P/N 296 000 309)	Inside hull, around holes

TIGHTENING TORQUE	
Retaining nuts	14.5 N•m ± 1.5 N•m (128 lbf•in ± 13 lbf•in)

STERN EYELETS

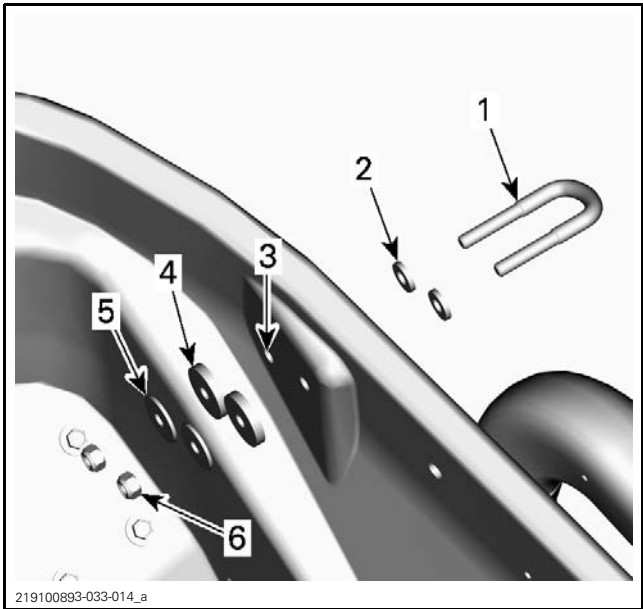
Removing the Stern Eyelet

- 1. Remove seats.
- 2. Remove engine service cover.
- 3. Inside hull, unscrew and discard elastic stop nuts securing the stern eyelet to hull.
- 4. Pull stern eyelet to remove it from watercraft.
- 5. Clean any residue of silicone sealant from the hull.

Installing the Stern Eyelet

- 1. Install small washers and nylon washers to stern eyelet and insert it through the hull.
- 2. Inside hull, apply CLEAR SILICONE SEALANT (P/N 296 000 309) all around holes.

3. Install eyelet and other parts using new elastic stop nuts as per following illustration.



- 1. Stern eyelet
- 2. Small washer
- 3. Loctite 5150 (silicone sealant) here
- 4. Rubber washer
- 5. Large washer
- 6. Elastic stop nut

4. Tighten nuts to the specified torque.

TIGHTENING TORQUE	
Eyelet retaining nuts	14.5 N•m ± 1.5 N•m (128 lbf•in ± 13 lbf•in)

VEHICLES

COOLING SYSTEM			
Type		Closed loop cooling system	
Coolant		Ethylene-glycol / distilled water mix (50%/50%) Use BRP extended life pre-mixed coolant or a low silicate coolant specially formulated for internal combustion aluminum engines	
Cooling system capacity		5.8 L (6.13 qt (U.S. liq.)) total	
Radiator cap opening pressure		90 kPa (13 PSI)	
EXHAUST SYSTEM			
Type		D-Sea-Bel sound reduction system. Water cooled/water injected (open loop). Direct flow from jet pump	
Water injection in muffler		3 x 3.5 mm (.138 in) on exhaust pipe and 1 x 3.5 mm (.138 in) on muffler	
FUEL SYSTEM			
Fuel type	Inside North America ((RON + MON)/2)	GTX LTD 300 RXT-X 300	91 or higher
		All other models	87 or higher
	Outside North America (RON)	GTX LTD 300 RXT-X 300	95 or higher
		All other models	91 or higher
Fuel tank (including reserve)		FISH PRO 155	70 L (18 U.S. gal.)
		All other models	60 L (16 U.S. gal.)
Fuel tank reserve (from low level signal)			approx. 14 L (3.7 U.S. gal.)
ELECTRICAL SYSTEM			
Battery		Sealed, 12 V, 18 A•h Yuasa - YTX20L (M420BS)	
Anti-start system		RFDI D.E.S.S. (Radio Frequency Identification Digitally Encoded Security System) with selectable maximum vehicle speed settings for LK (learning key)	

Section 08 TECHNICAL SPECIFICATIONS

Subsection 01 (VEHICLES)

ELECTRICAL SYSTEM			
Fuse box	#1: Not Used		---
	#2: Fuel inj., Ing. Coils and Fuel Pump		15 A
	#3: Bilge pump (if equipped)		3 A
	#4: NOT USED		---
	#5: NOT USED		---
	#6: Charge		30 A
	#7: Cluster		5 A
	#8: Depth sounder (if equipped)		3 A
	#9:iBR		30 A
	#10: Start/Stop		5 A
	#11: ECM		5 A
	#12 BATTERY (Fuses 10, 14 and relay)		30 A
	#13: Diagnostic tool 2		15 A
	#14: Diagnostic tool 1, Accessory connector		15 A
Transducer liquid (FISH PRO 155 models)			Ethylene-glycol / distilled water mix (50%/50%) Use BRP extended life pre-mixed coolant or a low silicate coolant specially formulated for internal combustion aluminum engines

STEERING			
Steering			Tilt at 4 positions
Steering nozzle pivoting angle			22°

PROPULSION			
Jet pump		Type	Axial flow single stage
		Grease type	Jet pump bearing grease (P/N 293 550 032)
Impeller	Rotation (seen from rear)		Counterclockwise
	Pitch	GTX LTD 300 RXT-X 300	13.5°/24°
		All other models	10°/21°
	Outside diameter	GTX LTD 300 RXT-X 300	161 mm ± 0.06 mm (6.34 in ± .002 in)
		All other models	159 mm ± 0.06 mm (6.26 in ± .002 in)
Impeller/wear ring clearance		New	0 mm to 0.23 mm (0 in to .009 in)
		Service limit	0.35 mm (.0138 in)
Impeller shaft		End play (new)	0
		Side play	0

Section 08 TECHNICAL SPECIFICATIONS

Subsection 01 (VEHICLES)

PROPULSION		
Drive shaft	Coupling type	Crowned splines, direct drive
	Deflection (max.)	0.5 mm (.02 in)
Minimum required water level for propulsion system		90 cm (3 ft) underneath the lowest rear portion of hull
IBR AND VTS		
Description		Intelligent Brake and Reverse activated by a LH lever. Electronically-controlled iBR gate to provide brake, reverse, neutral and forward position
Gate angle (from horizontal line of watercraft)	Forward	Approx. from +6° to -3°
	Neutral	Approx. -55°
	Braking	Approx. -70°
	Reverse	Approx. -70°
VTS system		Electronically-controlled through the VTS control button with 3 preset positions
VTS range angle		8° up, -3° down
Actuator		12 V, 75 A max. capacity. Reversible PWM (pulse-width modulation) motor
WEIGHT AND LOADING CAPACITY		
Dry weight	GTX 155	348 kg (768 lb)
	GTX 230	365 kg (805 lb)
	GTX LTD 230	380 kg (838 lb)
	GTX LTD 300	385 kg (849 lb)
	RXT 230	365 kg (805 lb)
	Wake Pro	370 kg (815 lb)
	RXT-X 300	376 kg (828 lb)
	FISH PRO 155	391 kg (860 lb)
Number of passenger (driver incl.)		3
Load limit (passenger(s) and luggages)		272 kg (600 lb)
Storage capacity	All models except FISH PRO 155	102.5 L (27 U.S. gal.)
	FISH PRO 155	102.5 L (27 U.S. gal.) + 51 L (13.5 U.S. gal.) Cooler
DIMENSIONS		
Overall length	All models except FISH PRO 155	345.1 cm (135.9 in)
	FISH PRO 155	373.4 cm (147 in)

Section 08

TECHNICAL SPECIFICATIONS

Subsection 01 (VEHICLES)

DIMENSIONS		
Overall width		125.5 cm (49.4 in)
Overall height	RXT-X 300	115 cm (45.3 in)
	All other models	114 cm (44.9 in)

MATERIALS	
Impeller material	Stainless steel
Impeller housing/stator	Aluminum/aluminum
Hull	CM-TEC process, composite
Inlet grate	Aluminum
Steering cover	Thermoplastic
Venturi	Aluminum
Nozzle	Aluminum
Fuel tank	Polyethylene
Seat	Polyurethane/foam

WIRING DIAGRAM INFORMATION

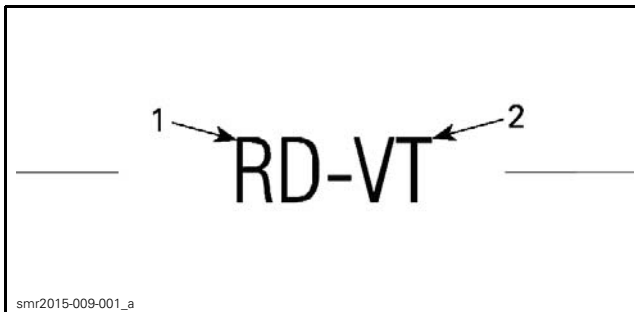
GENERAL

WIRING DIAGRAM LOCATION

The wiring diagrams are in the back cover pocket.

WIRING DIAGRAM CODES

Wire Color Codes



1. Wire main color
2. Tracer (thin colored line)

General Wire Color Use

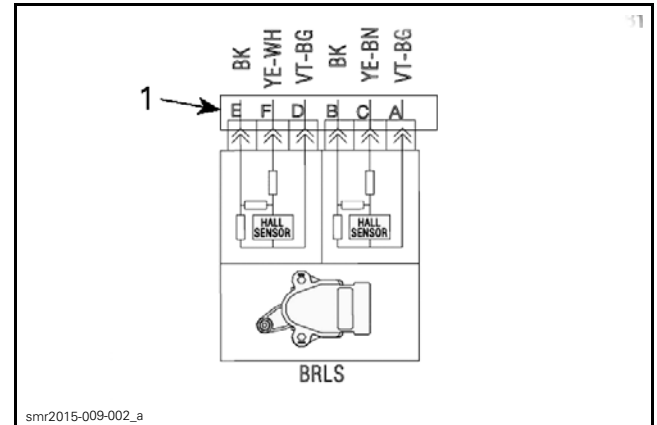
COLOR	USE
RED	Battery power (12 Vdc directly connected to battery)
RED + tracer	Fused 12 Vdc power or switched power from relay
VIOLET or VIOLET + tracer	Fused 12 Vdc accessory power from fuse box
YELLOW	Alternating current (AC) from magneto
BLACK	Ground
WHITE/BEIGE WHITE/BLACK	CAN HI wires, CAN LO wires

Color Codes

COLOR CODES			
CODE	COLOR	CODE	COLOR
BG	BEIGE (TAN)	OR / OG	ORANGE
BK	BLACK	PK	PINK
BN	BROWN	RD	RED
BU	BLUE	VT	VIOLET
GN	GREEN	WH	WHITE
GY	GRAY	YE	YELLOW

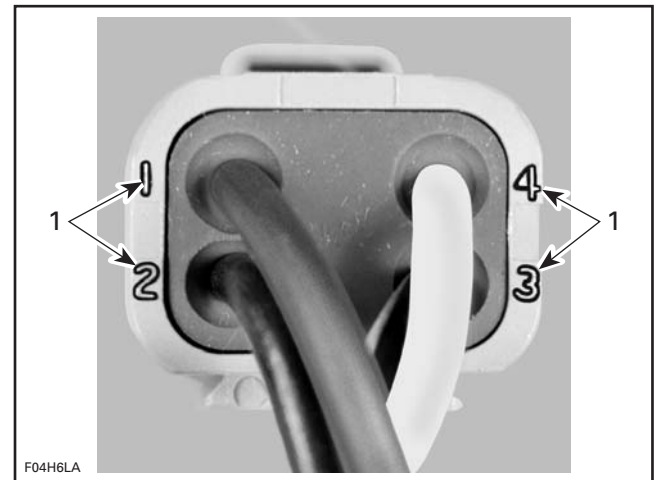
Terminal Identification on Connector

On the wiring diagram, a letter or a digit is used to identify the terminal position in a connector.



1. Terminal position

On a connector, a letter or a digit is usually molded on the connector to identify the terminal position.



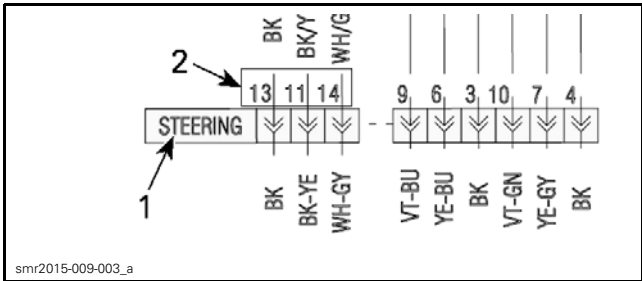
TYPICAL

1. Wire identification numbers

Terminal Identification on a Wiring Diagram

In-line connectors of wiring harnesses are identified on the wiring diagram with their approximate location and the following information.

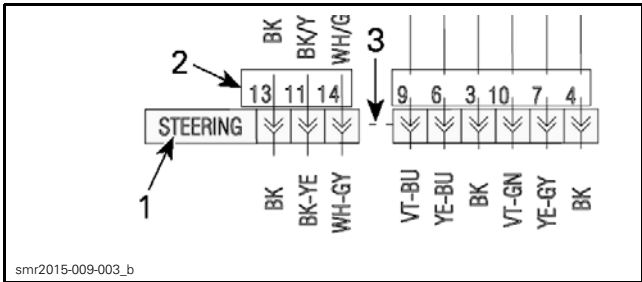
Section 09 WIRING DIAGRAM
Subsection 01 (WIRING DIAGRAM INFORMATION)



TYPICAL
1. Connector location
2. Wire pin location in connector

Connectors Linked by a Dashed Line

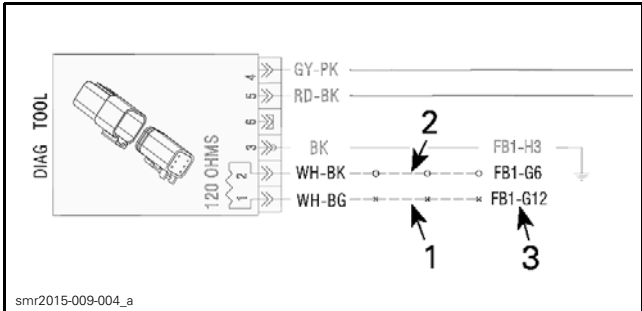
Connectors may be divided into segments linked by dashed lines, however, some segments of the same connector may be found elsewhere on the wiring diagram.



TYPICAL
1. Connector identification and location
2. Connector pin number
3. Dashed line links connector segments as one

CAN Wire Circuit References

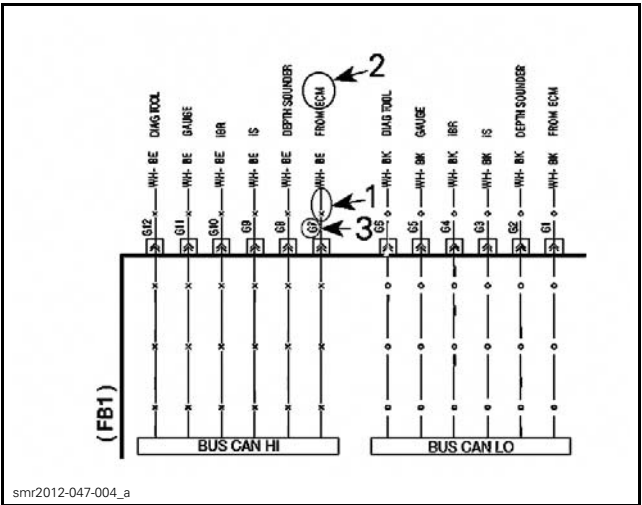
On the wiring diagram, CAN linked components use the following coding.



TYPICAL
1. CAN HI wire (x)
2. CAN LOW wire (o)
3. Wire destination

FB1 - G12 = : Terminal G12 in the fuse box no. 1

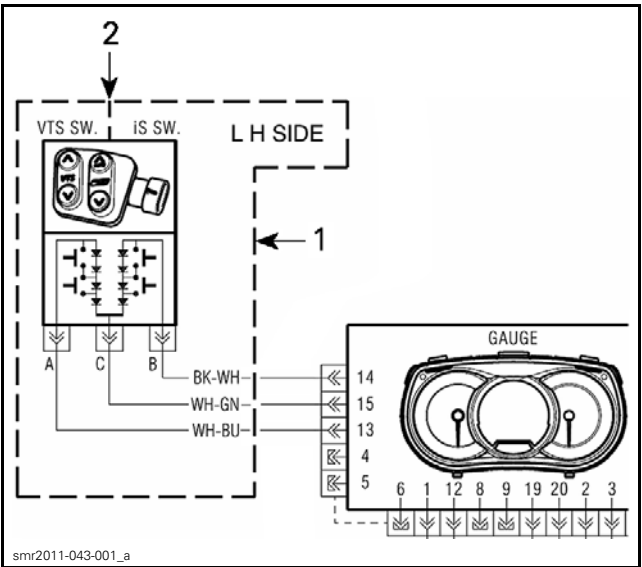
Corresponding CAN links are identified at fuse box using the following coding.



TYPICAL
1. CAN wire
2. Wire origin
3. Destination terminal (as referenced at ECM)

Component Application

If a component in the wiring diagram is not applicable to every vehicle model, or can be installed as an option or accessory on certain models, the component shall be enclosed in a dash line.



1. Component(s) optional or applicable to certain models
2. Indicates each switch is a separate component