

2022 Shop Manual

Spark™ Series

SEA-DOO®



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Printed in Canada

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SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair 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.

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	95
		Model year		
		Year of production		
		Month of production		
Serial number (a letter may also be used as a digit)				
Manufacturer				

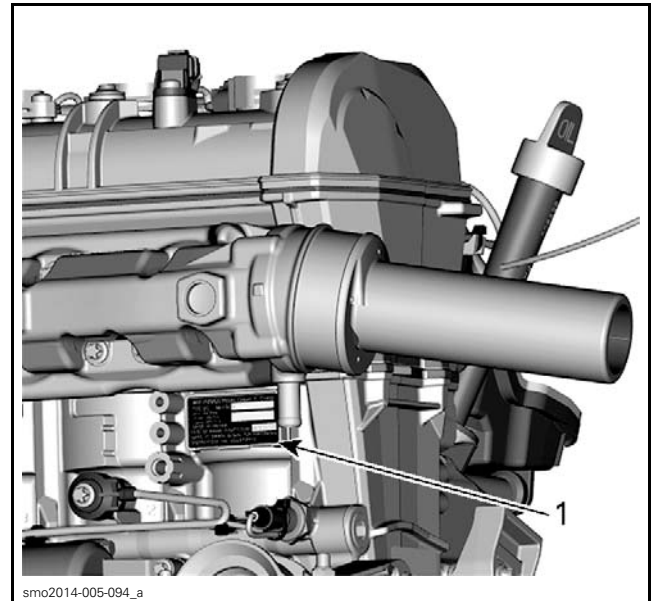
It is located on the deck at the rear of watercraft.



TYPICAL - SPARK
1. Hull Identification Number (HIN)

ENGINE IDENTIFICATION NUMBER (EIN)

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



TYPICAL - 900 ACE
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 529 036 189)

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



TYPICAL

INTRODUCTION

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.

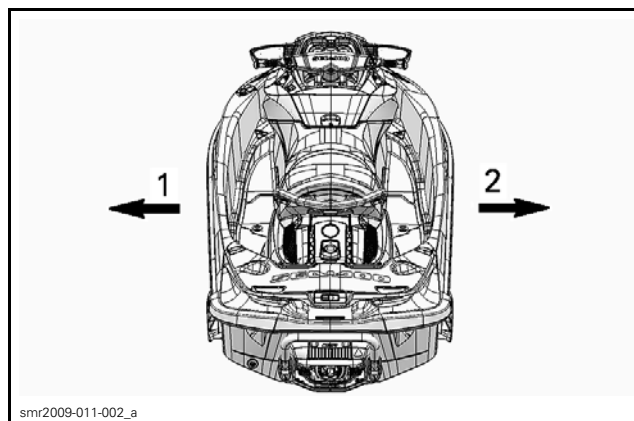
MANUAL INFORMATION

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).



TYPICAL
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).

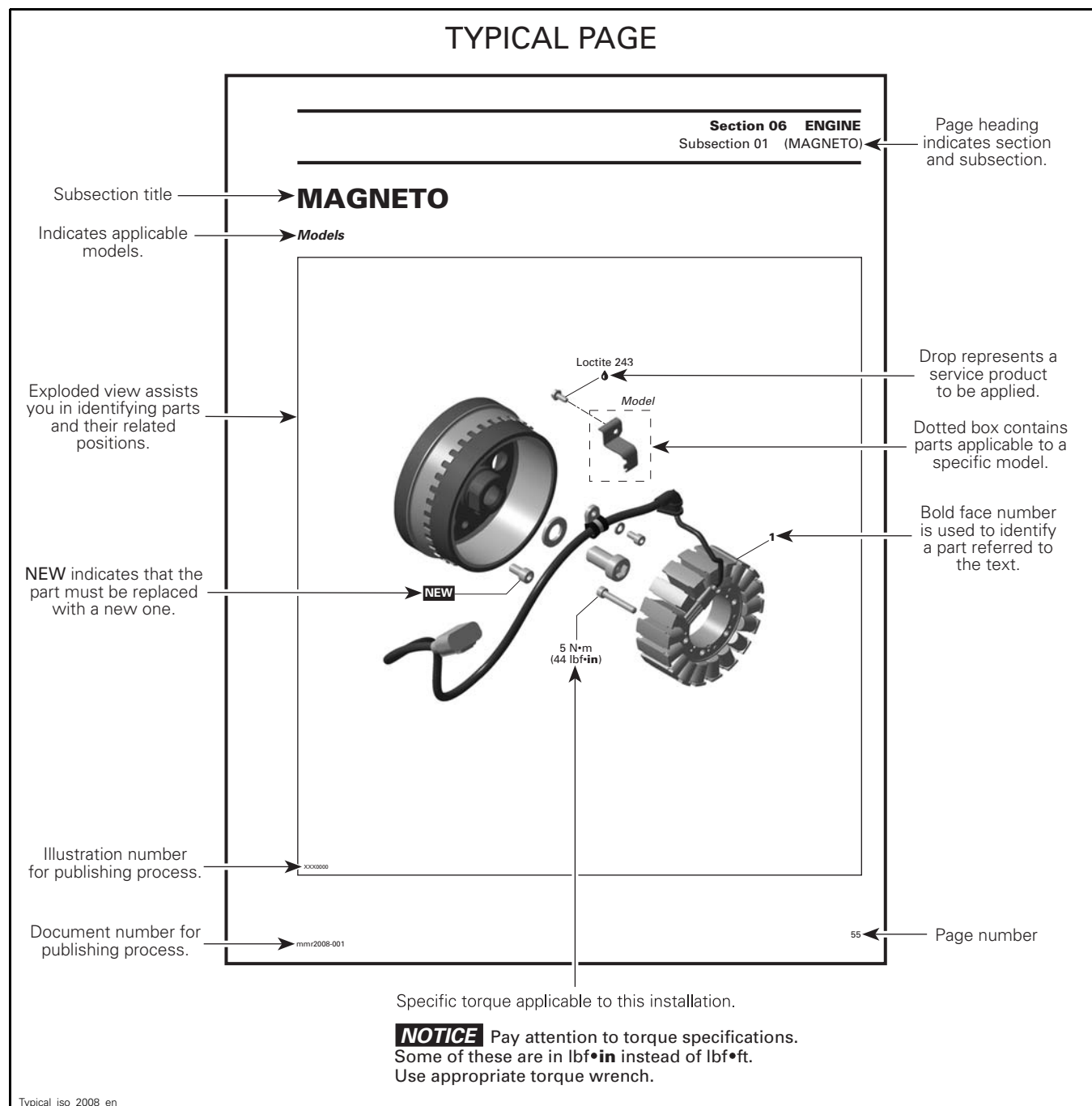
This manual uses technical terms which may be different from the ones in the *PARTS CATALOGS*.

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.



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.

► 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 **LOCTITE 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

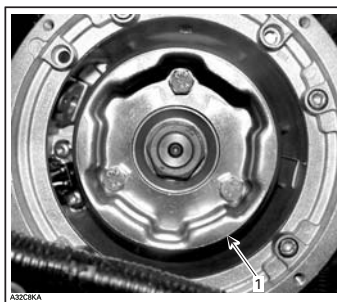
Remove muffler, refer to the *EXHAUST SYSTEM* section.

Remove acoustic panel.

Remove rewind starter.

Remove starting pulley **no. 2**.

mmr2008-001



TYPICAL ←

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).

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

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></div>	<div>8.8</div> <div></div> <div></div>	<div>9.8</div> <div></div> <div></div>	<div>10.9</div> <div></div> <div></div>	<div>12.9</div> <div></div> <div></div>
Property class and nut markings	<div>5</div> <div></div> <div></div> <div></div>	<div>8</div> <div></div> <div></div> <div></div>	<div>10</div> <div></div> <div></div> <div></div>	<div>12</div> <div></div> <div></div> <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)

INTRODUCTION

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.

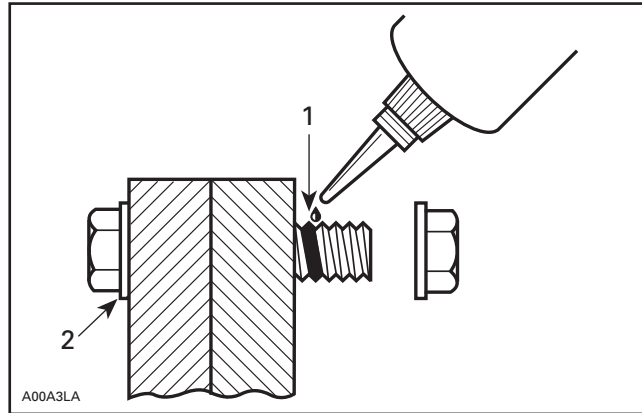
LOCTITE® APPLICATION PROCEDURE

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

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

NOTICE When applying threadlocker products (anaerobic products), pay attention to prevent the product from coming into contact with ABS plastic parts (painted parts).

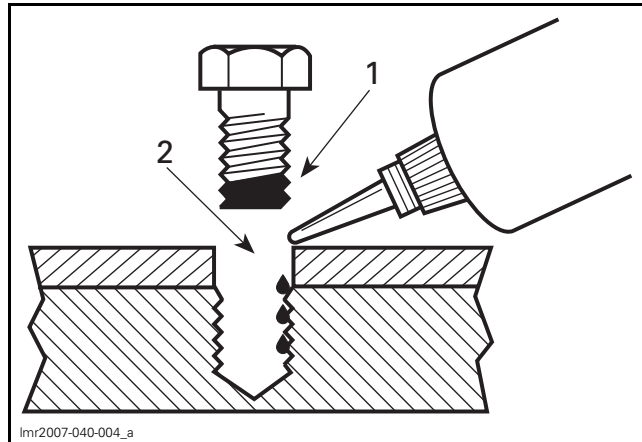
Threadlocker Application for Uncovered Holes (Bolts and Nuts)



1. Apply here
2. Do not apply

1. Clean threads (bolt and nut) with solvent.
2. Apply Loctite 7649 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

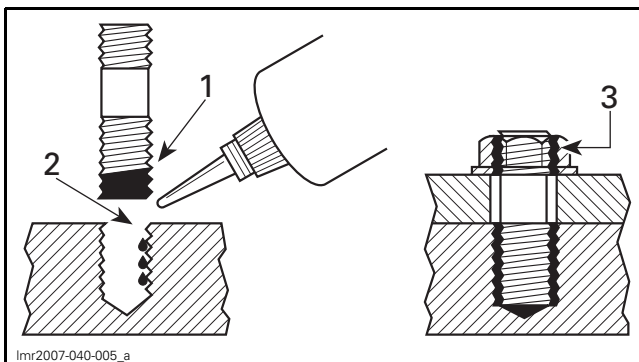


1. On fastener threads
2. On threads and at the bottom of hole

1. Clean threads (bolt and hole) with solvent.
2. Apply Loctite 7649 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.
5. Apply several drops on bolt threads.

6. Tighten as required.

Threadlocker Application for Stud Installation in Blind Holes



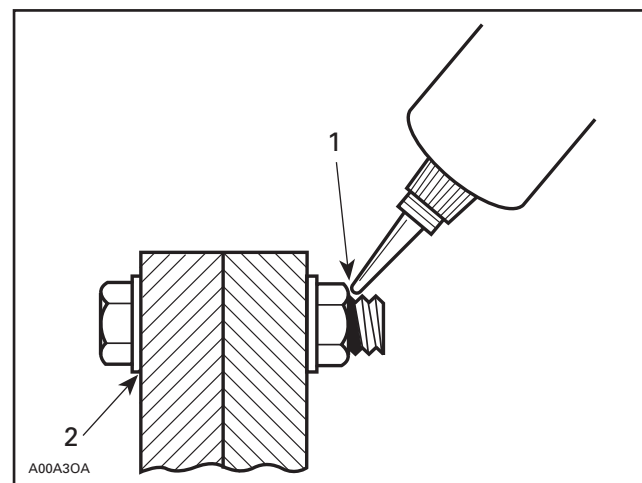
1. On stud threads
2. On threads and in the hole
3. On retaining nut threads

1. Clean threads (stud and hole) with solvent.
2. Apply Loctite 7649 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

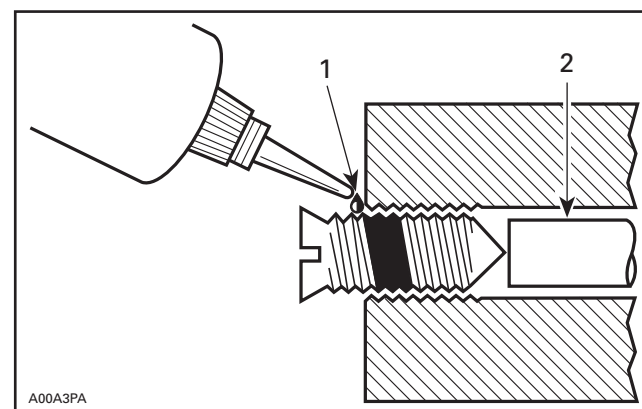


1. Apply here
2. Do not apply

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



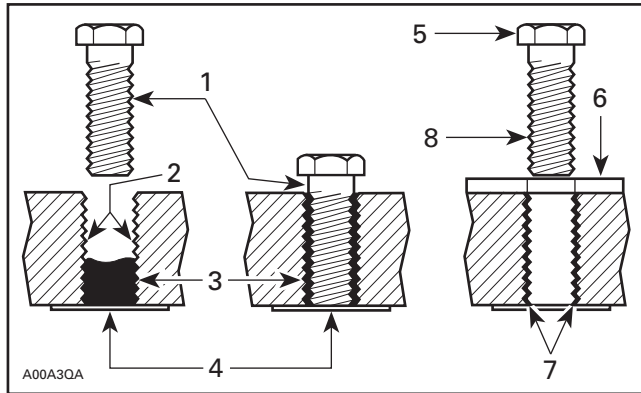
1. Apply here
2. Plunger

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.

INTRODUCTION

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. Tape
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

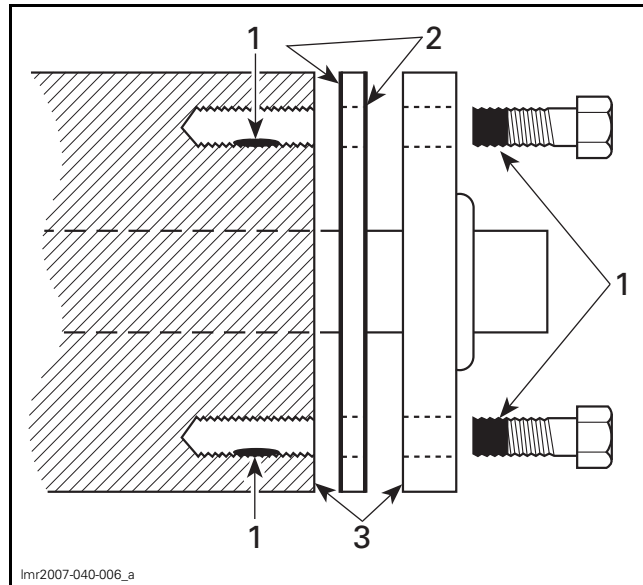
Option 1: Enlarge damaged hole, then follow *STANDARD THREAD REPAIR* procedure.

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.

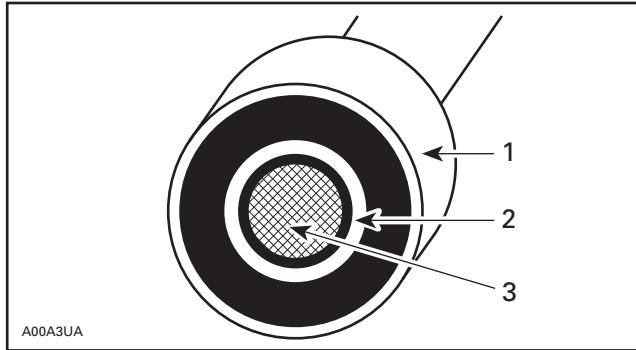
NOTE: If the cover is bolted to blind holes, apply proper strength Loctite in the hole and on threads. Tighten fastener.

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



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.

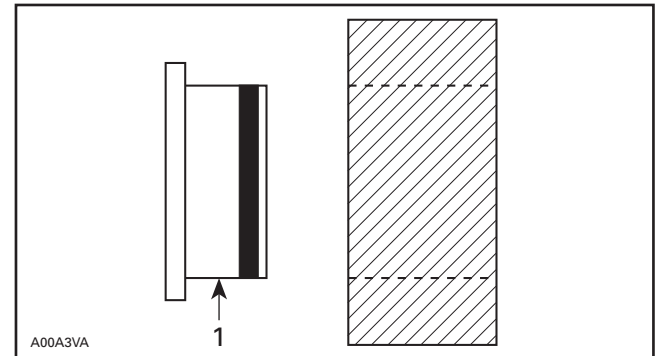
NOTE: Retaining compound is always forced out when applied on shaft.

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

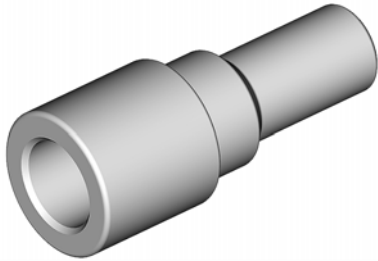
NOTE: Any Loctite product can be used here. A low strength liquid is recommended as normal strength and gap are required.

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 (900 ACE)
(P/N 529 036 454)



Page: 31–32

DIAGNOSTIC HARNESS
(P/N 529 036 384)



Page: 85, 111, 120–121, 132, 150, 166, 211

ENGINE ALIGNMENT PLATE
(P/N 529 036 278)



Page: 31, 187, 208

ALIGNMENT SHAFT SUPPORT
(P/N 529 035 506)



Page: 31

ECM ADAPTER TOOL
(P/N 529 036 166)



Page: 49, 88, 108, 118, 121, 132

ENGINE LIFTING TOOL
(P/N 529 036 217)



Page: 27

ALIGNMENT SHAFT
(P/N 295 000 141)



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



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EXHAUST OUTLET SOCKET
(P/N 529 036 282)



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D.E.S.S. POST REMOVER
(P/N 529 035 943)



Page: 121

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



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DIAGNOSTIC CABLE
(P/N 710 000 851)



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FLUKE 115 MULTIMETER
(P/N 529 035 868)



Page: 49, 118, 120–121, 124, 132, 166

SERVICE TOOLS INDEX

FUEL HOSE ADAPTER
(P/N 529 036 396)



Page: 86

FUEL HOSE DISCONNECT TOOL
(P/N 529 036 037)



Page: 27

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




Page: 90

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




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IBR NUT SOCKET
(P/N 529 036 305)



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IMPELLER SHAFT BEARING TOOL
(P/N 529 036 279)




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IMPELLER SHAFT PUSHER
(P/N 529 035 955)



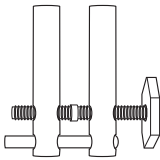
Page: 193, 195

IMPELLER SHAFT/BEARING TOOL
(P/N 529 036 416)




Page: 193, 195

LARGE HOSE PINCHER
(P/N 529 032 500)




Page: 27

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



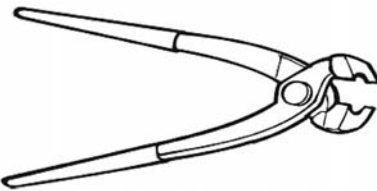
Page: 65

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



Page: 65

OETIKER PLIER
(P/N 295 000 070)




Page: 38–39, 87, 217

PRESSURE CAP
(P/N 529 036 283)



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PRESSURE GAUGE
(P/N 529 036 395)



Page: 86

PTO SHAFT ADAPTER
(P/N 529 036 401)



Page: 191–192, 194, 197, 216

SUCTION PUMP
(P/N 529 035 880)



Page: 9, 22, 27

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



Page: 83–84, 186

VENTED CAP TEST ADAPTER
(THREADED)
(P/N 529 036 243)



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PERIODIC MAINTENANCE SCHEDULE

Maintenance is very important for keeping the watercraft in a safe operating condition. The watercraft should be serviced as per the maintenance schedule.

Carry out all maintenance as listed in the schedule whenever the hours or time of each table is reached.

NOTE: As an example, at 200 hours or 2 years, complete all items in this table and ALSO in the EVERY 100 hours or 1 year table.

WARNING

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

The maintenance schedule does not exempt the pre-ride inspection.

AFTER EACH RIDE IN SALT OR DIRT WATER
Rinse engine compartment with fresh water and drain salt water
Flush the exhaust system
EVERY MONTH IN SALT OR DIRT WATER
Spray an anticorrosion lubricant to metallic components in engine compartment (every 10 hours in salt water use)
Inspect sacrificial anode
EVERY YEAR AT PRESEASON OR 100 HOURS OF OPERATION (WHICHEVER COMES FIRST)
Inspect sacrificial anode
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)
Visually inspect connection between throttle body and intake manifold
Inspect the air intake for damage on hoses and clamps.
Inspect spark plugs and ignition coils
Inspect electrical connections and fastening (ignition system, starting system, fuel injectors, fuse boxes etc.)
Inspect steering cable and connections
Verify O.T.A.S. operation (if equipped)
Visually inspect impeller and boot
Measure impeller and impeller wear ring clearance
Remove impeller cover and inspect for signs of water intrusion
Visually inspect condition of steering cable and connections
Visually inspect reverse gate bushing for excessive play (If equipped)
Inspect fuel cap, filler neck, fuel tank, fuel tank straps, fuel lines and connections for leaks

Section 01

MAINTENANCE

Subsection 01 (PERIODIC MAINTENANCE SCHEDULE)

EVERY 2 YEARS OR 200 HOURS OF OPERATION (WHICHEVER COMES FIRST)
Replace spark plugs
Inspect flame arrestor
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
Inspect and lubricate drive shaft/PTO splines
The following must be performed every 200 hours (irrespective of the number of years):
Inspect, lubricate PTO sleeve and replace oil seal and both water seals. (Inspect for possible leaks or damages on oil seal or on both water seals, and PTO sleeve surface. Lubricate grease chamber (between the two water seals.) (900 ACE engines)
EVERY 5 YEARS OR 300 HOURS OF OPERATION (WHICHEVER COMES FIRST)
Replace the coolant

PERIODIC MAINTENANCE PROCEDURES

SERVICE TOOLS

Description	Part Number	Page
SUCTION PUMP	529 035 880	9

SERVICE PRODUCTS

Description	Part Number	Page
4T 5W40 SYNTHETIC BLEND OIL (EUR).....	779290	7
4T 5W40 SYNTHETIC BLEND OIL	779133	7
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	13
EXTENDED LIFE PRE-MIXED COOLANT (EUR)	779223	10
EXTENDED LIFE PRE-MIXED COOLANT	779150	10
FUEL STABILIZER (EUR)	779183	13
FUEL STABILIZER	779171	13
LOCTITE 243 (BLUE).....	293 800 060	10

GENERAL

This subsection provides general maintenance instructions. Where detailed instructions for disassembly or reassembly is required, refer to the applicable subsection.

PROCEDURES

ENGINE

Lubrication System

Recommended Engine Oil

Rotax® engines were developed and validated using the XPS™ oil. BRP recommends the use of its XPS engine oil or an equivalent at all time. Do not add any additives to the recommended engine oil. Damages caused by the use of an oil not suitable for the engine or by adding of an additives may not be covered by the BRP Limited Warranty.

900 ACE

XPS™ RECOMMENDED ENGINE OIL	
Scandinavia	4T 5W40 SYNTHETIC BLEND OIL (EUR) (P/N 779290)
All Other Countries	4T 5W40 SYNTHETIC BLEND OIL (P/N 779133)
If THE RECOMMENDED XPS ENGINE OIL IS NOT AVAILABLE	
Use a 5W40 4-stroke SAE synthetic engine oil meeting or exceeding the following lubricant industry specifications: – API service classification SJ, SL, SM or SN Always check the API service label certification on the oil container, it must contain at least one of the indicated standards.	

Engine Oil Level Verification

NOTICE Check level frequently and refill if necessary. Do not overfill. Operating the engine with an improper level may severely damage engine.

CAUTION Certain components in the engine compartment may be very hot. Direct contact may result in skin burn.

Oil level can be checked with watercraft either in or out of water.

Section 01 MAINTENANCE

Subsection 02 (PERIODIC MAINTENANCE PROCEDURES)

Out of Water

NOTICE Watercraft must be level.

CAUTION When operating the engine out of water, the heat exchanger may become very hot. Avoid any contact with the heat exchanger as burns may occur.

1. Raise trailer tow pole, then block in position when bumper rail is level.
2. Install a garden hose on the exhaust system flushing connector. Refer to *EXHAUST SYSTEM* in this section and follow the procedure.

NOTICE

- Never run engine without supplying water to the exhaust system. Failure to cool exhaust system may severely damage it.
- Never run engine longer than 2 minutes. Drive line seal has no cooling when watercraft is out of water. Also, extreme heat will damage engine.

3. With the engine already at normal operating condition, let engine **idle for 30 seconds** then stop engine.
4. Wait at least 30 seconds for the oil to settle in the engine.

In or Out of Water

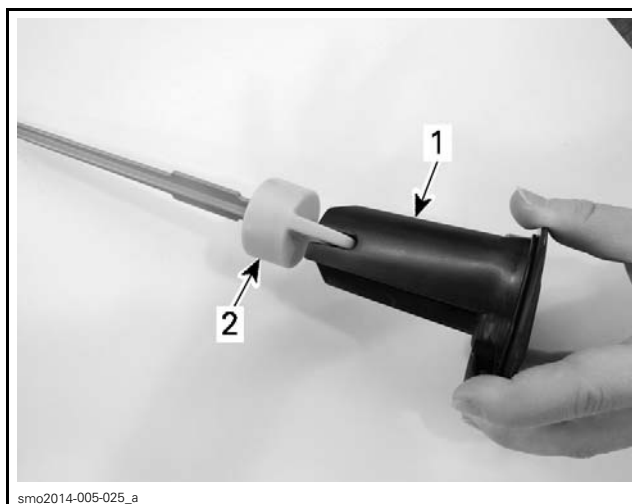
5. To check level, remove access cover located on rear of RH side of watercraft by turning counter-clockwise.



TYPICAL
1. RH access cover

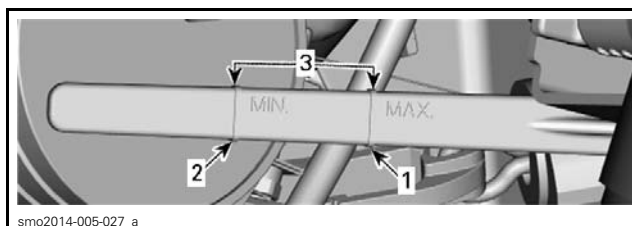
6. Unscrew dipstick, pull it out and wipe clean.

NOTE: Inner side of RH access cover is equipped with an extension to facilitate dipstick unscrewing.



1. RH access cover - extension side
2. Dipstick

7. Reinstall dipstick, push in completely.
8. Remove dipstick again and read oil level. It should be between the MAX and MIN marks.



1. Maximum
2. Minimum
3. Operating range

9. Add oil to ensure the level is between marks as required.

NOTE: Do not overfill.

To add oil:

- Place a funnel in the oil neck opening.
- Add the recommended oil to the proper level.

NOTE: Every time oil is added in the engine, the complete procedure explained in this section must be carried out again. Otherwise, you will obtain a false oil level reading.

10. Properly reinstall dipstick and RH access cover.

Replacing the Engine Oil

NOTICE Engine oil and oil filter must be replaced at the same time.

1. Bring engine to its normal operating temperature.

NORMAL OPERATING TEMPERATURE
90°C (194°F)

NOTICE When watercraft is out of water:

- Never run engine without supplying water to the exhaust system.
- Never run engine longer than 2 minutes. Drive line seal has no cooling when watercraft is out of water.

2. Place watercraft on a level surface.
3. Remove access cover located on rear of RH side of watercraft by turning counterclockwise.



TYPICAL
1. RH access cover

4. Remove dipstick.

CAUTION Engine oil may be hot. Certain components in the engine compartment may be very hot. Direct contact may result in skin burn.

5. Siphon oil through the dipstick tube.

REQUIRED TOOL
SUCTION PUMP (P/N 529 035 880)



NOTICE Never crank or start engine when suction pump hose is in the dipstick tube. Never start engine when there is no oil in engine.

NOTE: To properly position the suction pump hose is located at the proper height to siphon oil, it is suggested to put some electrical tape on hose at 400 mm (15 in) from its end. Then, insert the hose until you reach the tape.

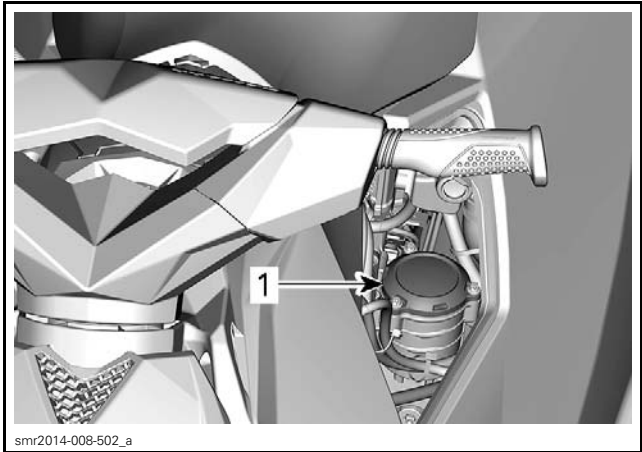
6. Pull suction pump hose out of dipstick tube.
7. Replace *OIL FILTER*, see procedure in this subsection.
8. Fully depress the throttle lever and HOLD it while cranking engine for 10 seconds. Siphon oil again. Repeat the crank-siphon cycle 2 - 3 times.
9. Refill oil tank at the proper level with the recommended oil.

ENGINE OIL CAPACITY
Capacity with oil filter replacement
1.8 L (1.9 qt (U.S. liq.))

10. Reinstall dipstick in oil tank and properly tighten it.
11. Start engine and let it idle for a few minutes.
12. Ensure there are no leaks.
13. Stop engine and check oil level as explained in this subsection. Refill if necessary.
14. Dispose oil and filter as per your local environmental regulations.

Replacing the Engine Oil Filter

1. Remove the port access cover.



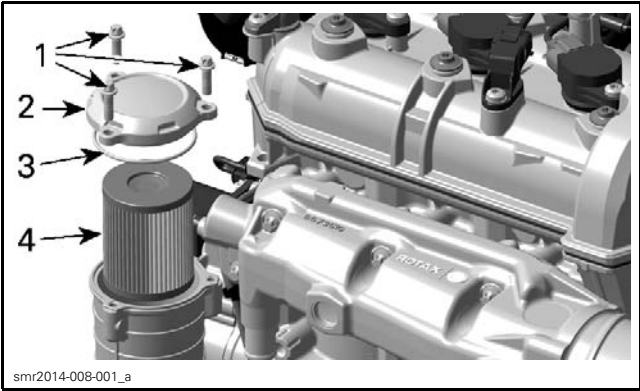
PORT SIDE - ACCESS COVER REMOVED
1. Oil filter cover

2. Clean oil filter area.

Section 01 MAINTENANCE
Subsection 02 (PERIODIC MAINTENANCE PROCEDURES)

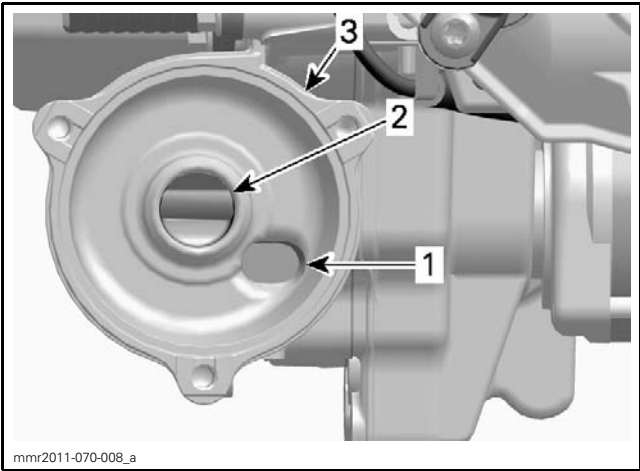
NOTE: Oil will spill when oil filter cover is removed. Place a rag around oil filter housing to prevent spillage.

3. Remove:
- Oil filter cover screws
 - Oil filter cover with O-ring
 - Oil filter.



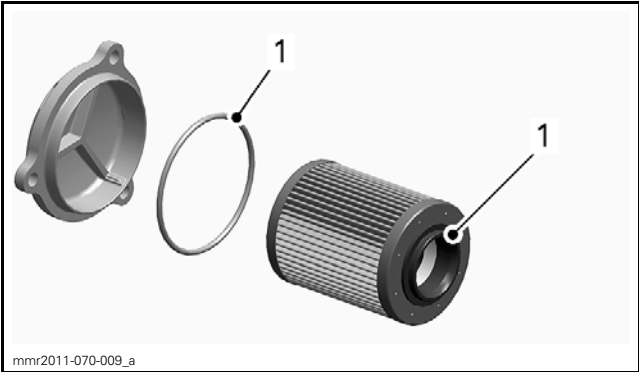
1. Oil filter cover screws
2. Oil filter cover
3. O-ring
4. Oil filter

4. Dispose filter as per your local environmental regulations.
5. Check the oil filter inlet and outlet orifices inside oil filter housing (integrated in magneto cover) for dirt and contaminations.



1. Oil inlet orifice from the oil pressure pump
2. Oil outlet orifice to the engine lubrication system
3. Oil filter housing

6. Install a **NEW** O-ring on oil filter cover.
7. Lubricate filter seal and cover O-ring with engine oil.



1. Lubricate with engine oil

8. Install the oil filter cover.
9. Apply treadlocker to the oil filter cover screws.

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

10. Tighten oil filter cover screws to the specified torque.

TIGHTENING TORQUE	
Oil filter cover	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

Cooling System

Inspecting the Cooling System

Inspect cooling system pressure cap, hoses and clamps for leaks.

Test pressure cap for proper operation.

Recommended Engine Coolant

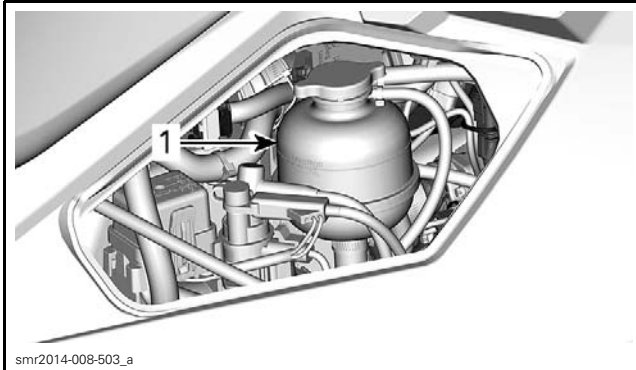
COUNTRY	RECOMMENDED COOLANT
Scandinavia	EXTENDED LIFE PRE-MIXED COOLANT (EUR) (P/N 779223)
All other countries	EXTENDED LIFE PRE-MIXED COOLANT (P/N 779150)
Alternative, or if not available	If the recommended coolant is not available, use a low silicate, extended life ethylene-glycol premixed coolant (50%-50%) specifically formulated for internal combustion aluminum engines.

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.

Engine Coolant Level Verification

Check coolant level at room temperature with the cap removed. Liquid should be at cold level line (engine cold) of coolant tank.

NOTE: When checking level at low temperature it may be slightly lower than the mark.



PORT ACCESS COVER REMOVED

1. Coolant tank

Replacing the Engine Coolant

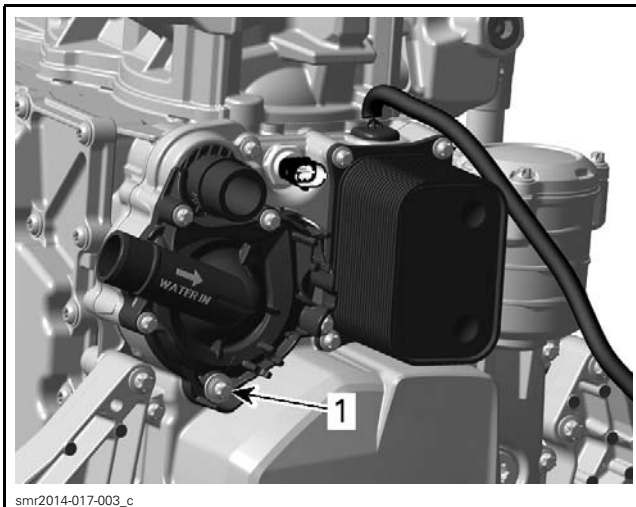
Replace coolant every 300 hours or 5 years.

Draining the Cooling System

⚠ WARNING

Never drain or refill the cooling system when engine is hot.

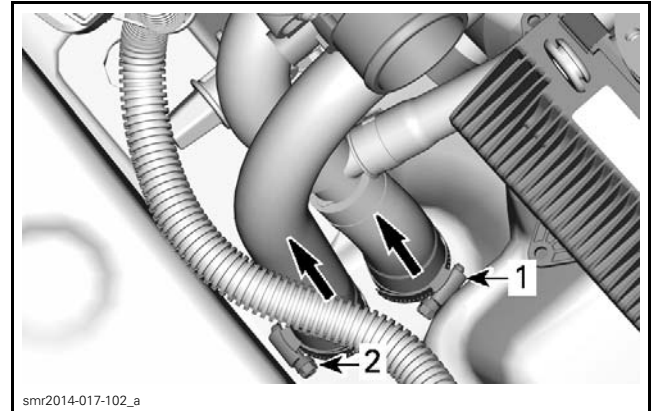
1. Remove central body. Refer to *BODY*.
2. Place a drain pan under the drain screw.
 - 2.1 Remove components as required.
3. Remove drain screw at water pump to drain coolant.



1. Drain screw

4. Remove coolant reservoir cap.

5. When coolant level is low enough, disconnect heat exchanger outlet hose.



HEAT EXCHANGER HOSES- VIEW INSIDE HULL

1. Heat exchanger outlet hose
 2. Heat exchanger inlet hose

6. Siphon remaining coolant from heat exchanger.
7. Install outlet hose on heat exchanger.

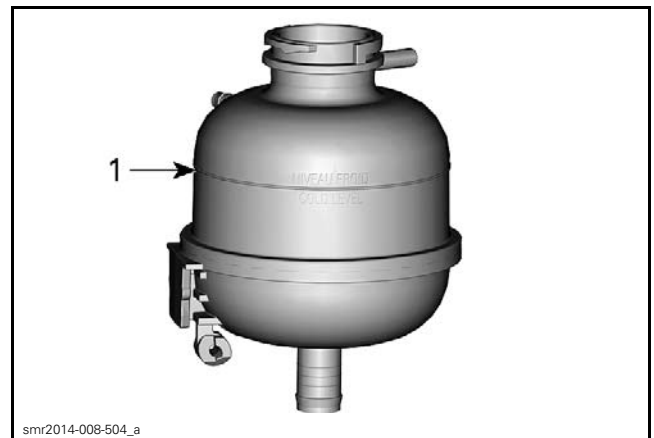
TIGHTENING TORQUE	
Screw clamp	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)

8. Install **new** sealing washer on drain screw.
9. Tighten drain screw to specification.

TIGHTENING TORQUE	
Drain screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

Refilling and Bleeding the Cooling System

1. Fill coolant reservoir with recommended coolant.



COOLANT RESERVOIR

1. Full mark

- Do not install pressure cap at this time.
2. Connect water hose to exhaust system. Refer to *FLUSHING THE EXHAUST SYSTEM*.

Section 01 MAINTENANCE

Subsection 02 (PERIODIC MAINTENANCE PROCEDURES)

NOTICE Always start the engine before opening the water tap. Open water tap immediately after engine is started to prevent overheating. Never run engine without supplying water to the exhaust system when watercraft is out of water.

3. Start engine.
4. Supply water to hose.

NOTICE Never run engine longer than 2 minutes when out of water.

5. Turn off water.
6. Stop engine.
7. Refill coolant reservoir as necessary.
8. Repeat this run-stop cycle 2-3 times until thermostat opens and stop engine.

Last, refill coolant tank and install pressure cap.

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

EXHAUST SYSTEM

Inspecting the Exhaust System

Check the following components for leaks, cracks, or other damage:

- Exhaust system mounts
- Muffler
- Manifold
- Resonator
- Hoses
- Clamps

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 clean up sand, salt, shells or other particles in water jackets and hoses.

Exhaust system 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.

NOTICE Failure to flush the system, when necessary, will severely damage exhaust system. Make sure engine operates during entire procedure.

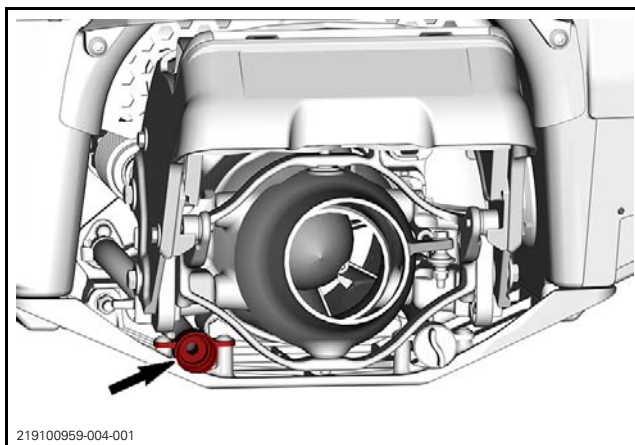
⚠ WARNING

Perform these operations 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.

⚠ WARNING

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

Connect a hose to the jet pump support connector or a garden hose to the flushing device kit (P/N 295 100 555) located at the rear of watercraft. Do not open water tap yet.



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

NOTICE Always start the engine before opening the water tap. Open water tap immediately after engine is started to prevent overheating. Never run engine without supplying water to the exhaust system when watercraft is out of water.

Run the engine 90 seconds at idle speed.

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

Ensure water flows out of jet pump while flushing. Close the water tap, run the engine at 5000 RPM for 5 seconds and stop the engine.

NOTICE Always close the water tap before stopping the engine.

Disconnect the garden hose.

NOTICE Remove flushing connector adapter after operation (if used).

FUEL SYSTEM

Protecting the Fuel System

With the new fuel additives used today, it is critical to add a fuel stabilizer to the fuel during storage to prevent fuel deterioration, gum formation and fuel system gumming. Follow manufacturers instructions for proper use.

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

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

1. Pour fuel stabilizer in fuel tank.
2. Fill up fuel tank completely.
3. Run engine sufficiently for fuel with stabilizer to be distributed to entire fuel system.
4. Ensure there is no water inside fuel tank.

NOTICE Do not drain fuel system.

Inspecting the Fuel Line and Connections

Visually inspect all fuel lines and connections for cracks or leaks.

Inspecting and Cleaning the Throttle Body

Clean throttle plates and throttle body bores..

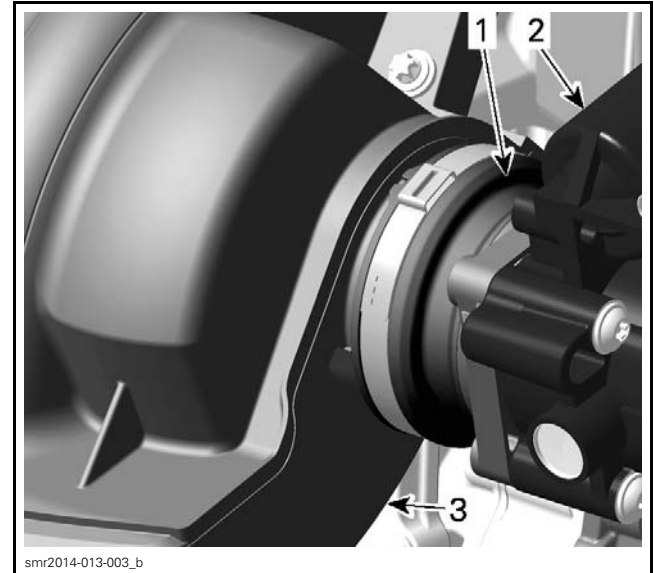
SERVICE PRODUCT
CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

AIR INTAKE SYSTEM

Throttle Body Connecting Socket

Visually inspect throttle body connecting socket for cracks or other damages.

Replace if necessary. Refer to *FLAME ARRESTOR* in the *AIR INTAKE SYSTEM* subsection.



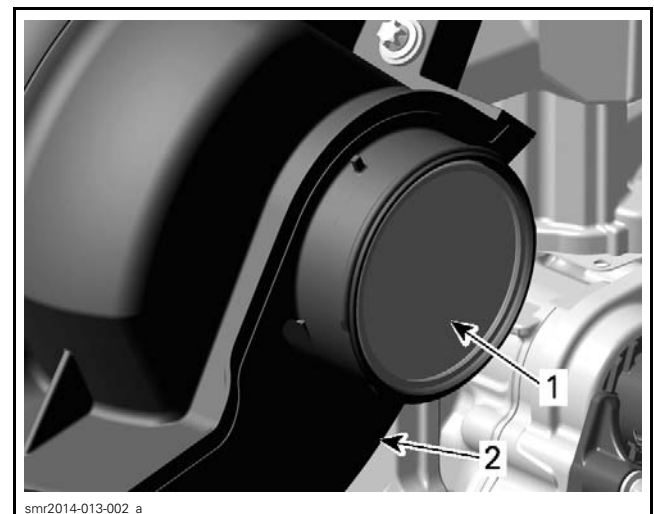
- smr2014-013-003_b
1. Connecting socket
 2. Throttle body
 3. Intake manifold

Flame Arrestor

Get access to the flame arrestor. Refer to *FLAME ARRESTOR* in the *AIR INTAKE SYSTEM* subsection.

Check for any debris clogging the flame arrestor. Clean flame arrestor. Refer to *FLAME ARRESTOR CLEANING* in the *AIR INTAKE SYSTEM* subsection.

Replace flame arrestor if necessary.



- smr2014-013-002_a
1. Flame arrestor
 2. Intake manifold

ELECTRICAL SYSTEM

Charging the Battery

To charge battery, refer to *CHARGING SYSTEM* subsection.

Section 01 MAINTENANCE

Subsection 02 (PERIODIC MAINTENANCE PROCEDURES)

Replacing the Spark Plug

For spark plug replacement procedure, refer to *IGNITION SYSTEM*.

STORAGE PROCEDURE

SERVICE PRODUCTS

Description	Part Number	Page
ANTICORROSION SPRAY	219 700 304	17
FUEL STABILIZER (EUR)	779183	15
FUEL STABILIZER	779171	15
LUBRICANT AND ANTI-CORROSIVE (EUR)	779224	15
LUBRICANT AND ANTI-CORROSIVE.....	779168	15–16

PROCEDURES

PROPULSION SYSTEM

WARNING

Always remove tether cord from the engine cut-off switch to prevent unexpected engine starting before cleaning or servicing the propulsion system components.

Cleaning and Protecting the Propulsion System

Clean jet pump by spraying water in its inlet and outlet and then apply a coating of anticorrosion spray or equivalent.

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

With the new fuel additives, it is critical to use a fuel stabilizer to prevent fuel deterioration and fuel system gumming. Follow the manufacturer's instructions for proper use.

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

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

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

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 Filter

Change engine oil and filter. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Flushing the Exhaust System

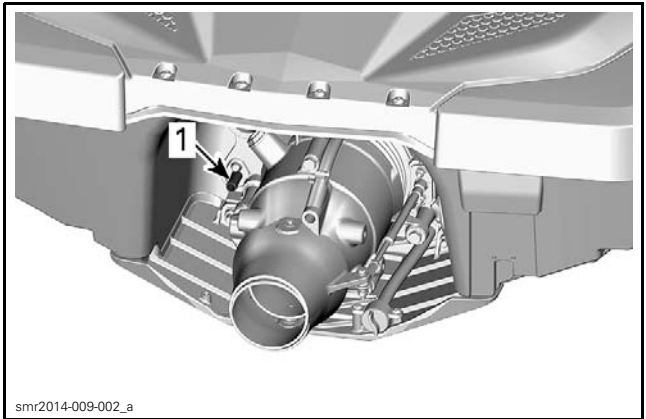
Flush the exhaust system. Refer to *EXHAUST SYSTEM* subsection.

Draining the Exhaust System

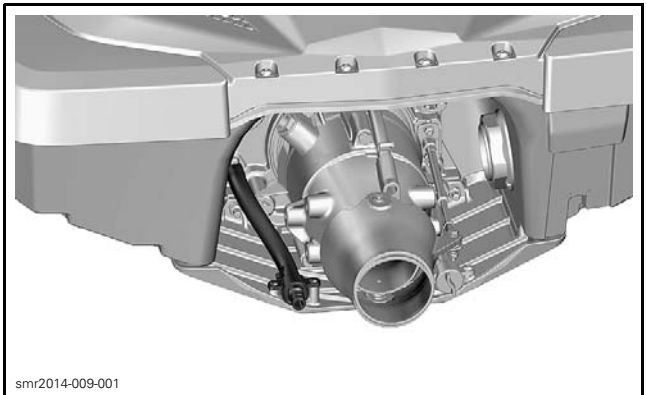
The exhaust system is self draining, but the exhaust manifold needs to be drained to avoid damages should the watercraft be stored in an area where the temperature attains the freezing point of water.

Section 01 MAINTENANCE
Subsection 03 (STORAGE PROCEDURE)

Using the jet pump support connector or the flushing kit (P/N 295 100 555) 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.

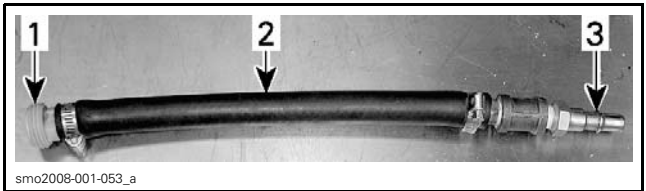


1. Jet pump support connector



WITH FLUSHING DEVICE KIT INSTALLED

The following hose can be fabricated to ease draining procedure.



TYPICAL

1. Flushing adaptor (P/N 295 500 473), to be used with flushing device kit
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 to prevent antifreeze deterioration.

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

Replace coolant if necessary. For the coolant replacement procedure, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Lubricating the Engine Internals

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 spark plugs. Refer to *IGNITION SYSTEM* subsection for details on removing the spark plugs and ignition coils.
2. Spray lub. & anti-corrosive into each spark plug hole.

SERVICE PRODUCT
LUBRICANT AND ANTI-CORROSIVE (P/N 779168)

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

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

4. Refer to *IGNITION SYSTEM* subsection for details on installing the spark plugs and ignition coils.
5. 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 *HULL* subsection for bilge drain plug removal.

Anticorrosion Treatment

Wipe off any residual water in the engine compartment.

Spray anticorrosion spray over all metallic components in engine compartment.

SERVICE PRODUCT
ANTICORROSION SPRAY (P/N 219 700 304)

BODY AND HULL

Cleaning the Body and Hull

Refer to *CLEANING AND REPAIR* subsection.

Replace damaged labels/decals.

Repairing the Body or Hull

If any repair are required, refer to *CLEANING AND REPAIR* subsection.

Protecting the 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.

The LH access cover should be removed during storage. This will prevent engine compartment condensation and possible corrosion.

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 or more.

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

Using the *MAINTENANCE SCHEDULE*, perform the items titled *EVERY YEAR AT PRESEASON OR 100 HOURS OF OPERATION*.

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
SUCTION PUMP	529 035 880	22

SERVICE PRODUCTS

Description	Part Number	Page
ANTICORROSION SPRAY	219 700 304	23
DIELECTRIC GREASE	293 550 004	22
LUBRICANT AND ANTI-CORROSIVE.....	779168	22–23

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 21 km/h (13 MPH).

If you have to tow the watercraft, clamp the water supply hose in the engine compartment.

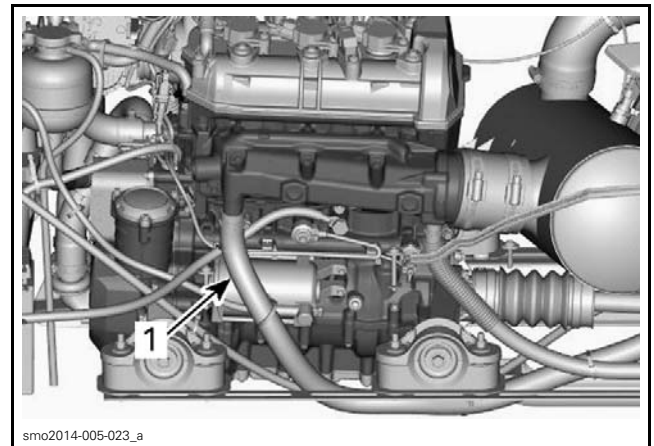
To access the water supply hose, pull out the LH access cover below the LH side of the seat and slide rearward to remove.

WARNING

Some components in the engine compartment may be hot. To avoid injury, wait for engine to cool down.

 CAUTION Make sure the hose is properly clamped before towing the watercraft. If hose is not properly clamped when engine is not running, water will accumulate in the exhaust system, will enter the engine and cause damages.

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 21 km/h (13 MPH).



1. Water supply hose

Reinstall the LH access cover.

SUBMERGED WATERCRAFT

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

1. Drain bilge.
2. Remove the central body. Refer to *BODY* subsection.
3. 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.
4. Check for water inside:
 - Air intake system
 - Exhaust system
 - Combustion chamber.

If water found, refer to *WATER-FLOODED ENGINE* in this subsection.

Section 01 MAINTENANCE
Subsection 05 (SPECIAL PROCEDURES)

- 5. Inspect all electrical connectors (harness and part side) for trace of corrosion.
- If any corrosion is found, repair terminals and connectors.
- Reapply dielectric grease if needed in all connectors except the ECM and starter relay.

Table with 1 column: SERVICE PRODUCT. Row 1: DIELECTRIC GREASE (P/N 293 550 004)

If terminals and connectors are not corroded, re-install the central body, as per procedure done in the BODY 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 or inside air intake silencer 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 (cranking of engine), then lubricant replaced again, otherwise parts will be seriously damaged.

Draining the Exhaust System

If water is suspected to be in the exhaust system, remove and drain the resonator, muffler and exhaust manifold. Refer to EXHAUST SYSTEM subsection.

Draining the Intake System

1. If water is present in the air intake silencer, empty it and check for water in the inlet hose. Refer to AIR INTAKE SYSTEM subsection.
2. Remove the water from blow-by hose.

3. 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 AIR INTAKE SYSTEM subsection.

Draining and Lubricating the Combustion Chamber

Remove spark plugs. Drain any water from combustion chambers and spray lub. & anti-corrosive in each spark plug hole. Do not crank engine yet.

Table with 1 column: SERVICE PRODUCT. Row 1: LUBRICANT AND ANTI-CORROSIVE (P/N 779168)

Replacing the Engine Oil and 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 tube.

Table with 1 column: REQUIRED TOOL. Row 1: SUCTION PUMP (P/N 529 035 880) [Image of a suction pump]

2. Remove the suction pump tube from the dipstick tube.
3. Remove the oil filter. Refer to PERIODIC MAINTENANCE PROCEDURES subsection.
4. Siphon the contaminated oil from the oil filter reservoir.
5. Fully depress throttle lever and HOLD it for cranking. Crank the engine for 10 seconds.
6. Again, siphon the contaminated oil from the oil filter reservoir and dipstick tube.
7. Continue cranking and siphoning oil until no more oil coming into the oil filter reservoir.
8. Install a NEW oil filter and reinstall the oil filter cap.
9. Fill the engine with appropriate amount of the recommended engine oil. Refer to LUBRICATION SYSTEM subsection.
10. Reinstall spark plugs and ignition coils. Refer to IGNITION SYSTEM subsection.

NOTE: The installation of new spark plugs should be necessary.

11. Proceed with the *BOIL OUT PROCEDURE* that follows.

Boil Out Procedure in Water

NOTICE This procedure may be performed in water only. Performing this procedure out of water, using a garden hose, may seriously damaged the PTO sealing system and the cooling system.

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

1. Run the engine for 20 minutes at 4500 RPM.
2. Shut the engine off.
3. Change the oil and filter again.

Anticorrosion Treatment

NOTICE It is important to apply an anticorrosion treatment, especially if the vehicle was submerged in salt waters.

Wipe off any residual water in the engine compartment.

Spray lub. & anti-corrosive or anticorrosion spray over all metallic components in engine compartment.

SERVICE PRODUCTS
LUBRICANT AND ANTI-CORROSIVE (P/N 779168)
ANTICORROSION SPRAY (P/N 219 700 304)

NOTICE Never spray lub. & anti-corrosive on any plastic parts or any electrical connector. For these parts always use ANTICORROSION SPRAY (P/N 219 700 304).

CAPSIZED WATERCRAFT

Capsized for More than 5 Minutes

Refer to *SUBMERGED WATERCRAFT* in this subsection.

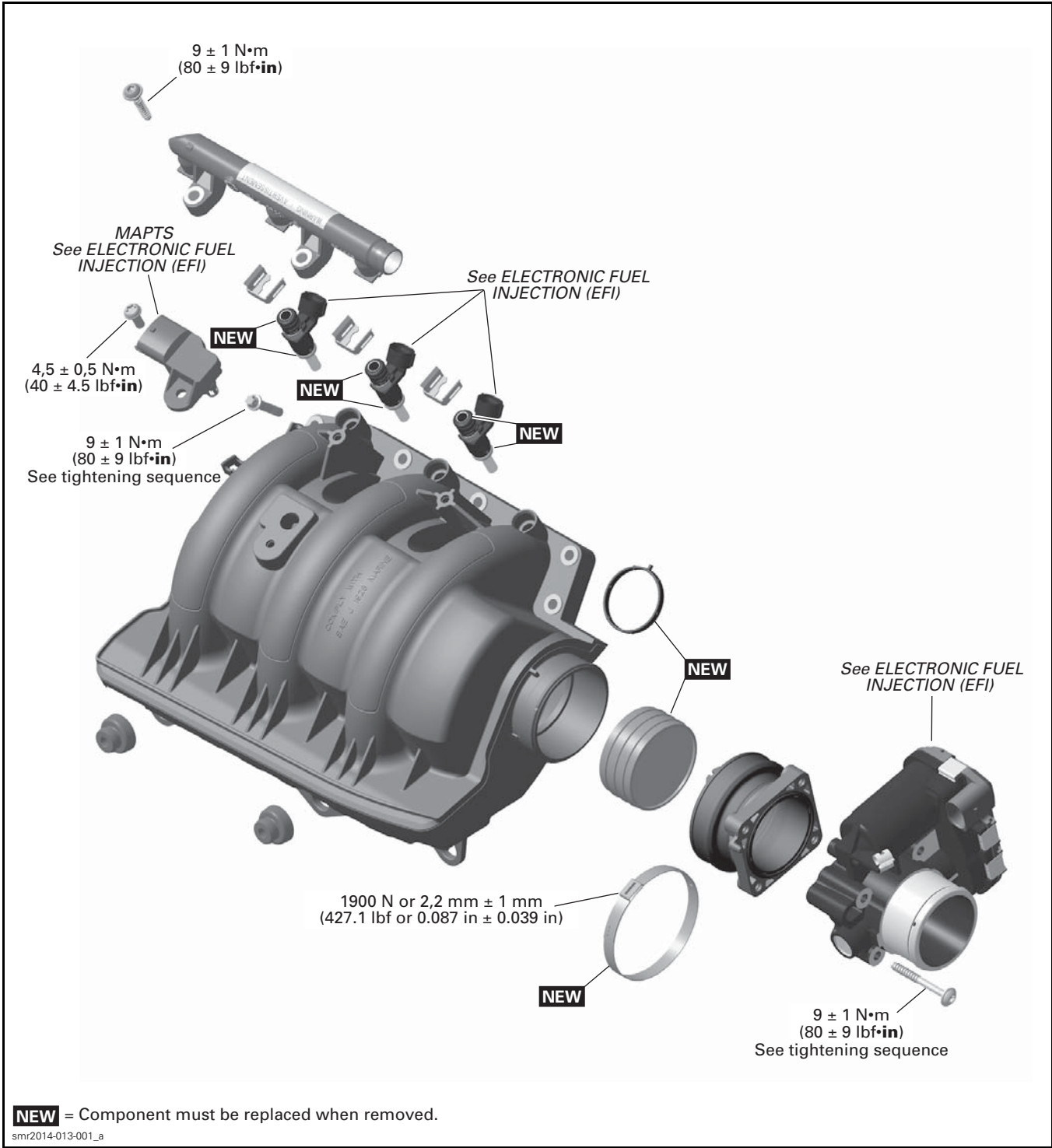
**REFER TO ENGINE REMOVAL
AND INSTALLATION**

AIR INTAKE SYSTEM

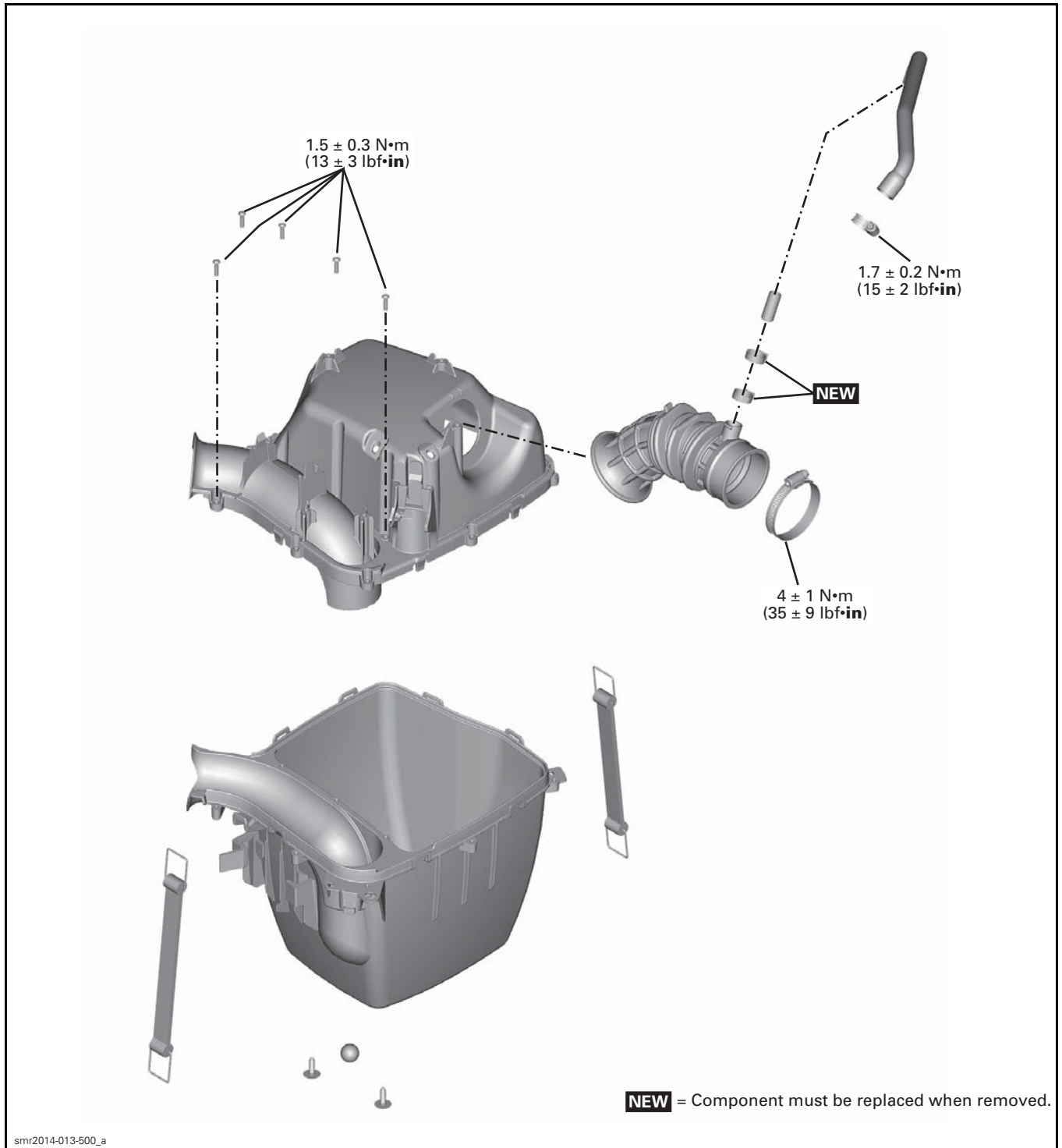
SERVICE TOOLS

Description	Part Number	Page
OETIKER PLIER.....	295 000 070	38–39

INTAKE MANIFOLD



AIR INTAKE SILENCER



PROCEDURES

FLAME ARRESTOR


Flame Arrestor Location

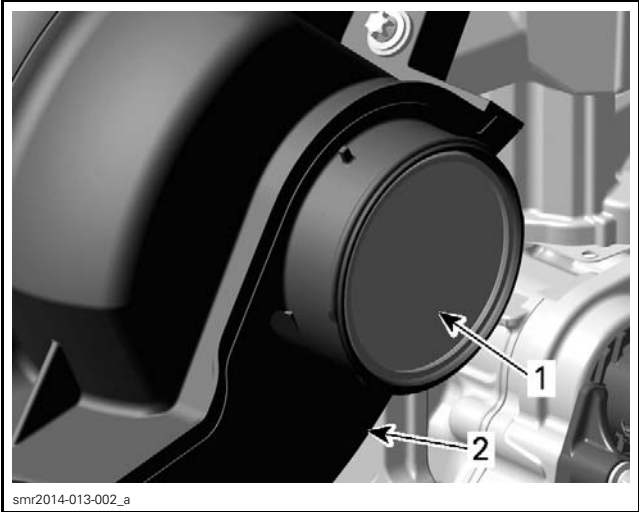
The flame arrestor is integrated in the intake manifold.

Flame Arrestor Access

Remove the central body. Refer to *BODY* subsection.

Remove Oetiker clamp and discard it.

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

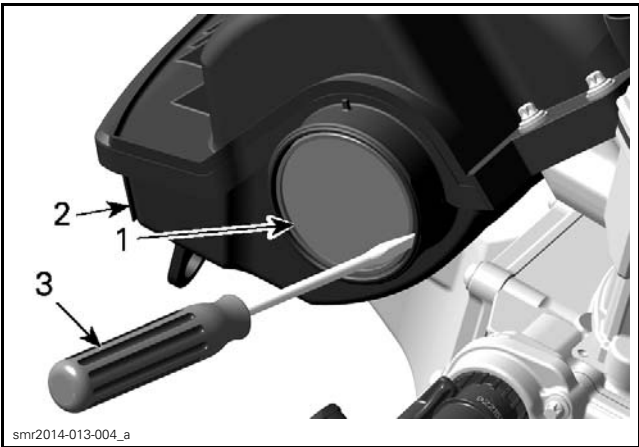


1. Flame arrestor
2. Intake manifold

Flame Arrestor Removal

Carefully insert a small flat screwdriver between flame arrestor gasket and intake manifold.

Pry out flame arrestor from intake manifold in alternate diagonally order.



1. Flame arrestor
2. Intake manifold
3. Flat screwdriver

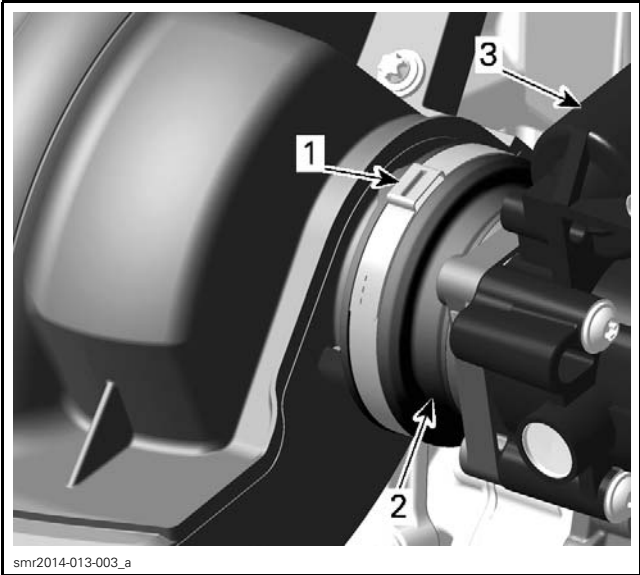
Flame Arrestor Cleaning

Clean flame arrestor with solvent and compressed air.

CAUTION Always wear safety goggles when working with compressed air system.

Connecting Socket Inspection.

Check if connecting socket is cracked, brittle or otherwise damaged. Replace if necessary.



1. Oetiker clamp
2. Connecting socket
3. Throttle body

Remove connecting socket from intake manifold.
Move connecting socket with throttle body aside.

Flame Arrestor Inspection

Check if flame arrestor is clogged.

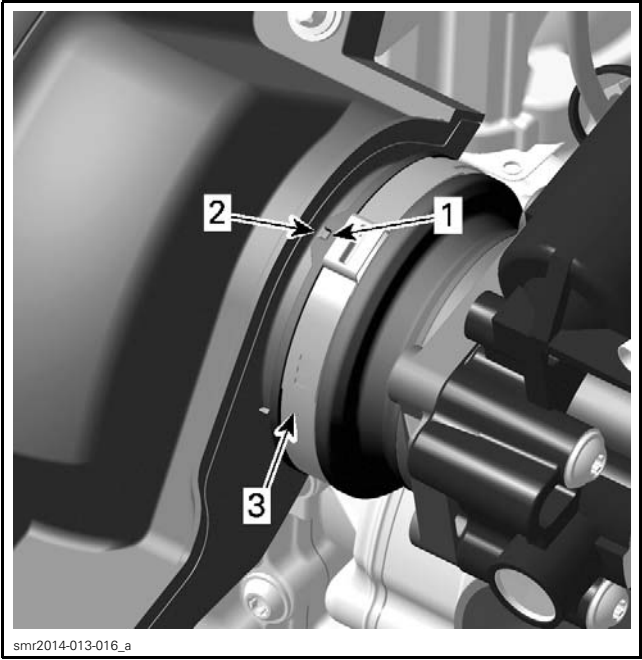
NOTE: A clogged flame arrestor may have a negative impact on engine performance.



CONNECTING SOCKET

Flame Arrestor Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Always install a **NEW** gasket on the flame arrestor. Make sure to index connecting socket notch with intake manifold tab.

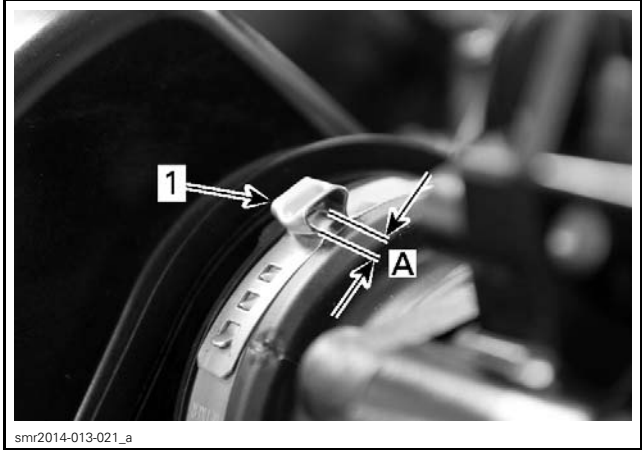


- 1. Connecting socket notch
- 2. Intake manifold tab
- 3. Oetiker clamp

Crimp Oetiker clamp beside the intake manifold tab.

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

OETIKER CLAMP CRIMPING
2.2 mm ± 1 mm (.087 in ± .039 in) or 1 900 N (427.1 lbf)



- 1. Oetiker clamp
- A. Crimp to 2.2 mm ± 1 mm (.087 in ± .039 in)

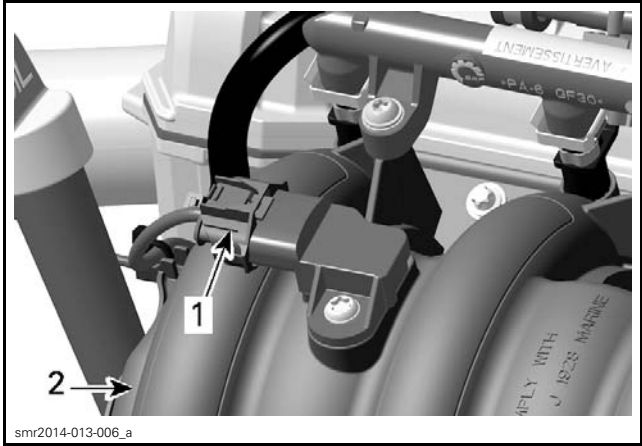
INTAKE MANIFOLD

Intake Manifold Access

Remove the central body. Refer to *BODY* subsection.

Intake Manifold Removal

- 1. Disconnect manifold absolute pressure and temperature sensor (MAPTS).

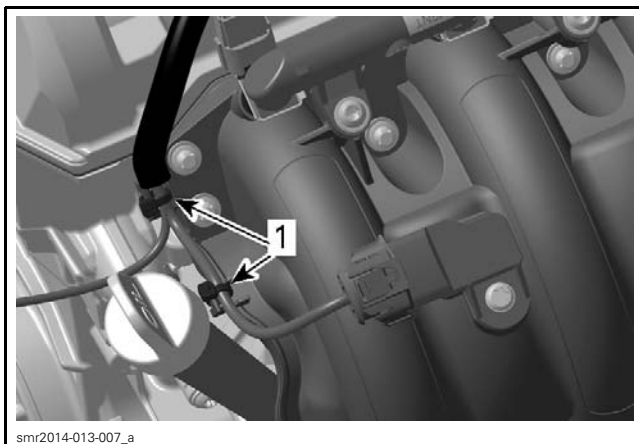


- 1. MAPTS connector
- 2. Intake manifold

- 2. Cut locking ties securing MAPTS harness to intake manifold.

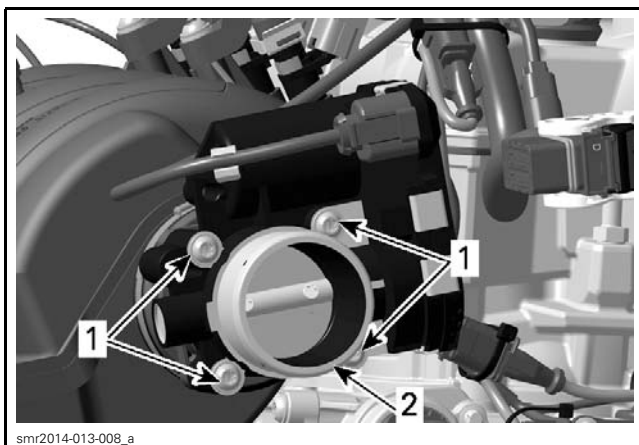
Section 02 ENGINE

Subsection 02 (AIR INTAKE SYSTEM)



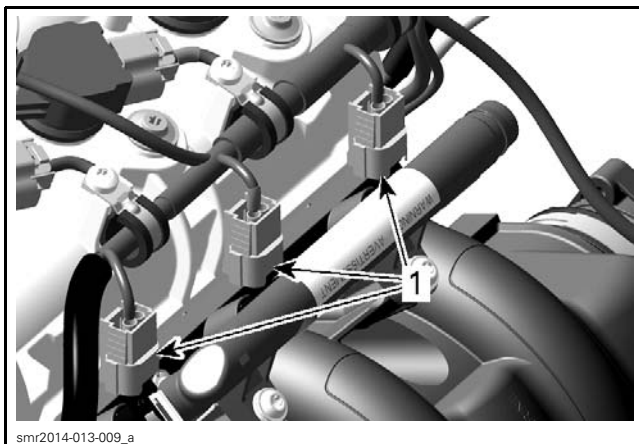
1. Locking ties

3. Remove screws retaining the throttle body to connecting socket.



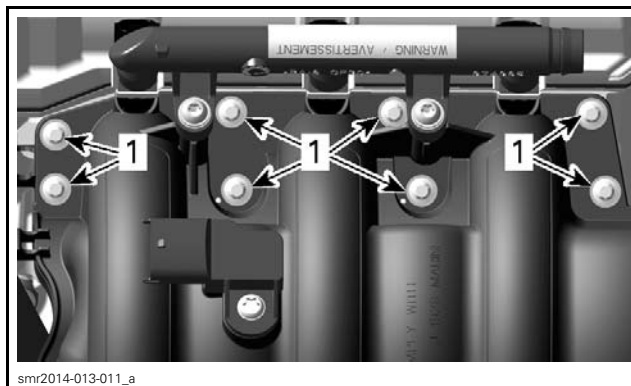
1. Retaining screws
2. Throttle body

4. Move throttle body aside.
5. Disconnect fuel injector connectors.



1. Fuel injector connectors

6. Remove screws securing intake manifold to cylinder head.



1. Intake manifold screws

7. Remove intake manifold from engine.
8. Remove and discard intake manifold gaskets.
9. If required, remove the following parts from intake manifold:
- Connecting socket. Refer to *FLAME ARRESTOR* in this subsection.
 - Flame arrestor. Refer to *FLAME ARRESTOR* in this subsection.
 - MAPTS. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
 - Fuel rail with injectors. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Intake Manifold Inspection

Check intake manifold for cracks, warping at flanges or any other visible damages. Replace if required.

Check if intake manifold gaskets are brittle, hard or otherwise damaged. Replace if necessary.

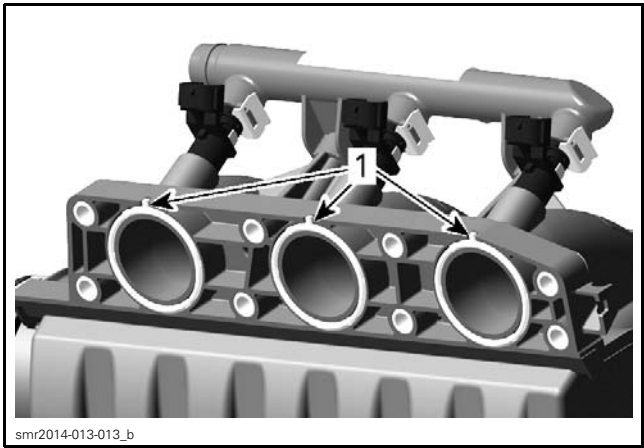
Drain intake manifold if any liquids accumulated.

Flush intake manifold with solvent and let it dry out.

Intake Manifold Installation

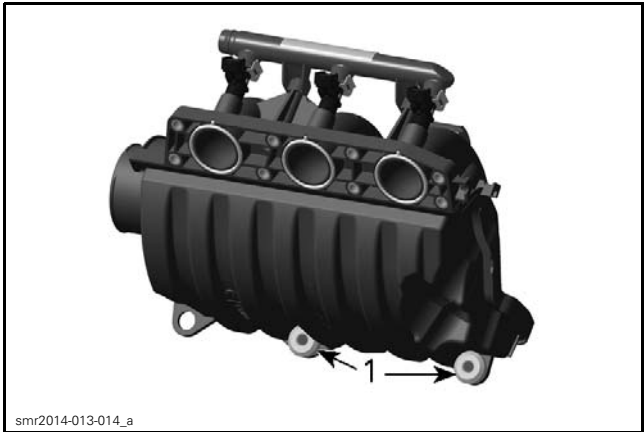
The installation is the reverse of the removal procedure. However, pay attention to the following.

Install **NEW** gaskets with tab properly inserted into notch.



1. Gaskets tab properly inserted

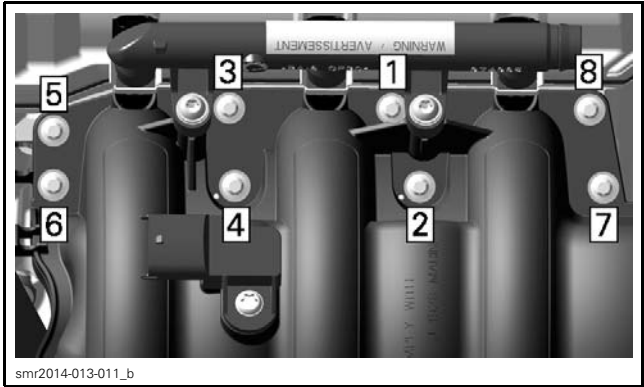
Ensure that rubber grommets are properly inserted.



1. Rubber grommets

Tighten intake manifold screws to specification as per the following sequence.

INTAKE MANIFOLD SCREWS	
Tightening Torque	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)



TIGHTENING SEQUENCE

Refer to *FLAME ARRESTOR* in this subsection to install:

- Flame arrestor
- Connecting socket.

Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection to install:

- MAPTS
- Throttle body
- Fuel rail with injectors.

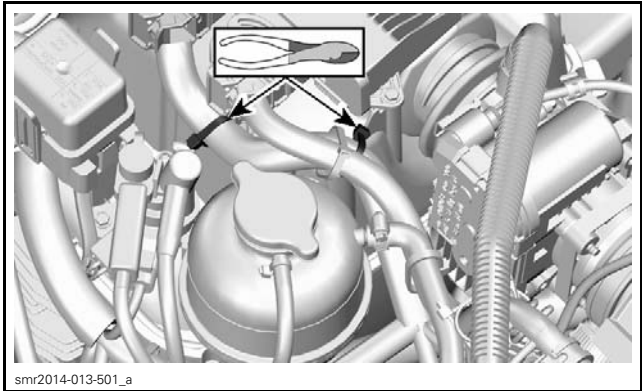
AIR INTAKE SILENCER

Air Intake Silencer Access

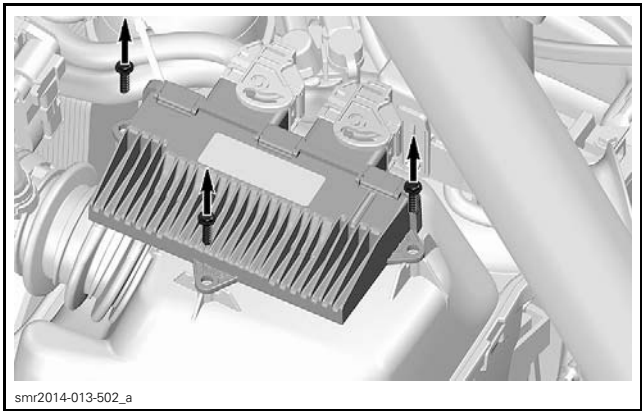
Remove the central body. Refer to *BODY* subsection.

Air Intake Silencer Removal

Cut locking ties securing electrical harnesses to air intake silencer.



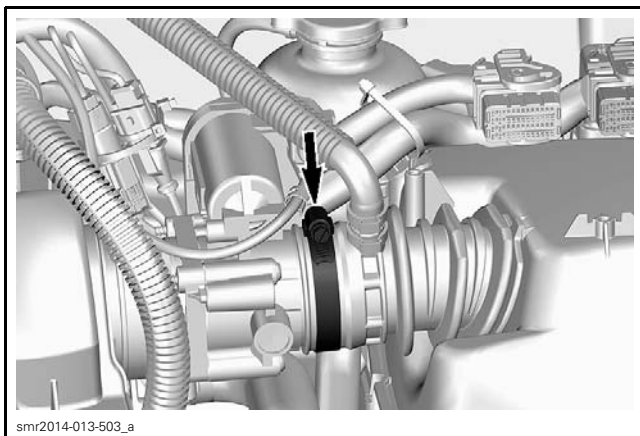
Remove the ECM.



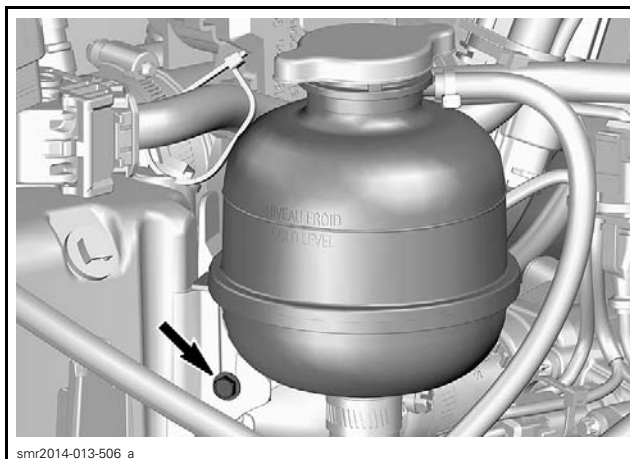
Loosen throttle body clamp.

Section 02 ENGINE

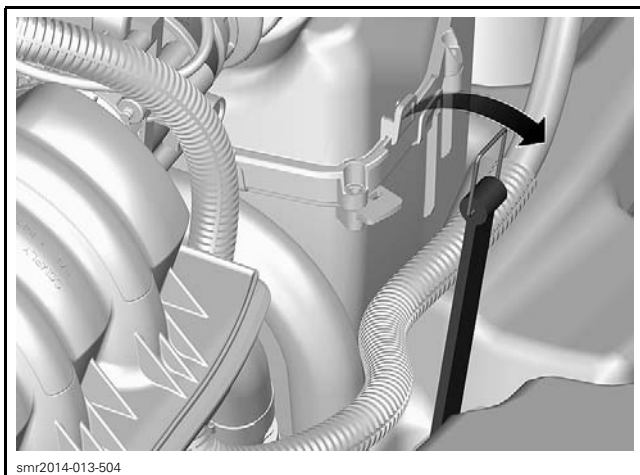
Subsection 02 (AIR INTAKE SYSTEM)



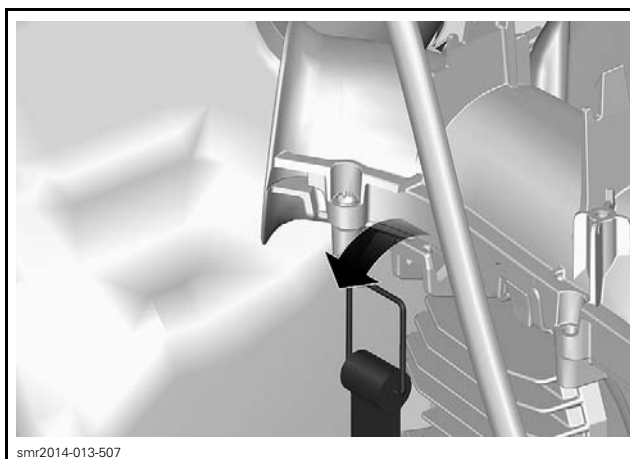
Detach the RH retaining strap.



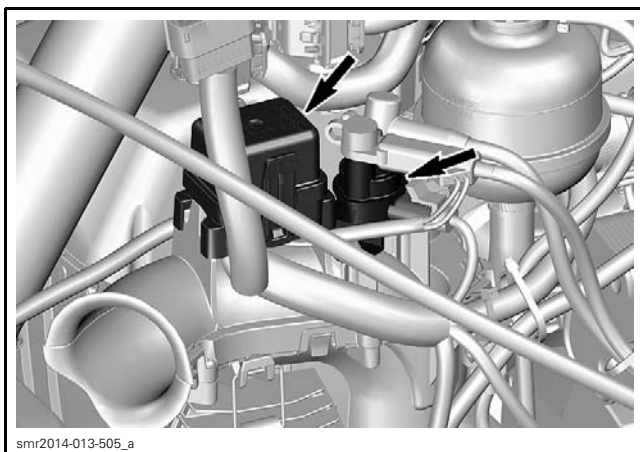
Remove the last retaining strap.



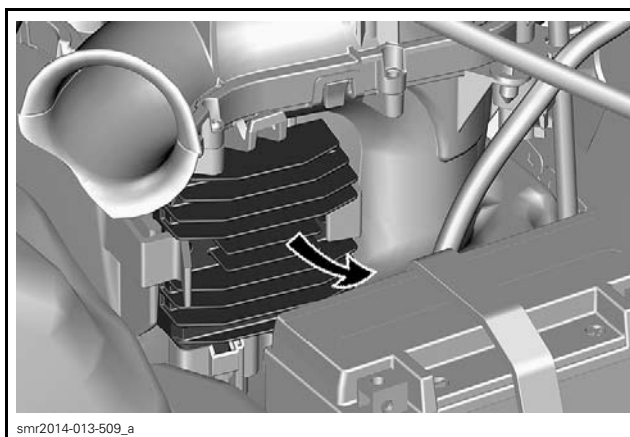
Remove fuse box and starter solenoid.



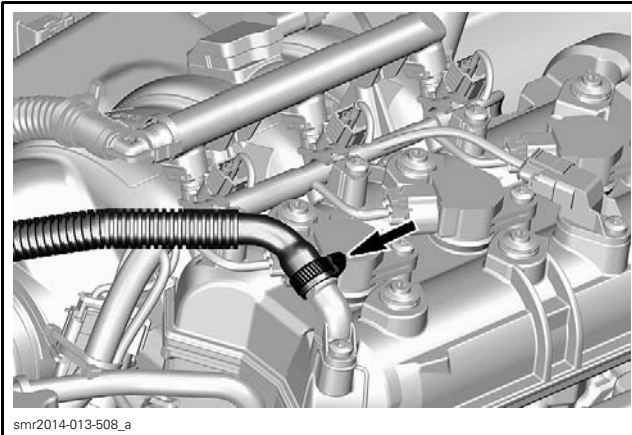
Remove the voltage regulator/rectifier.



Loosen coolant reservoir screw and move the reservoir aside.



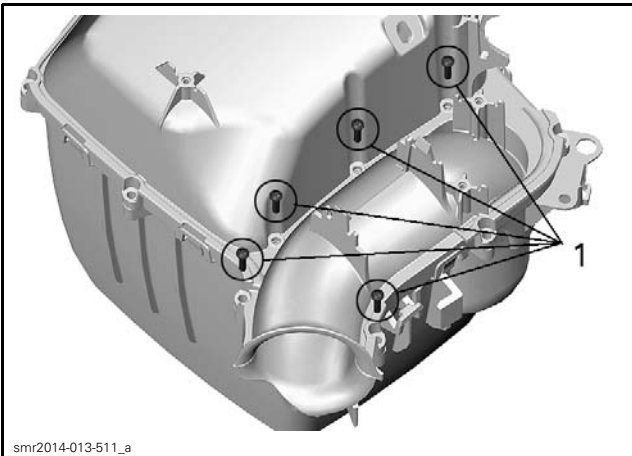
Loosen clamp and remove vent hose from the cylinder head cover.



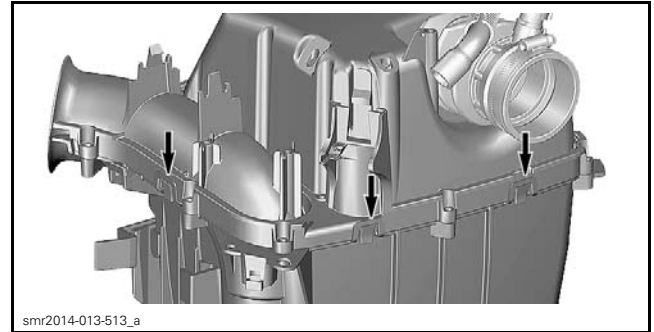
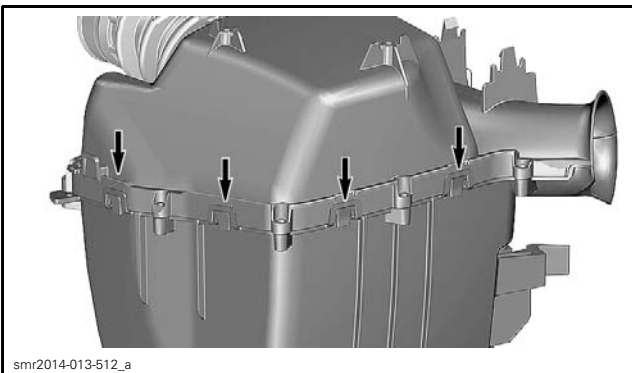
Detach the diagnostic connector and pull the air intake silencer out of the vehicle.

Air Intake Silencer Disassembly

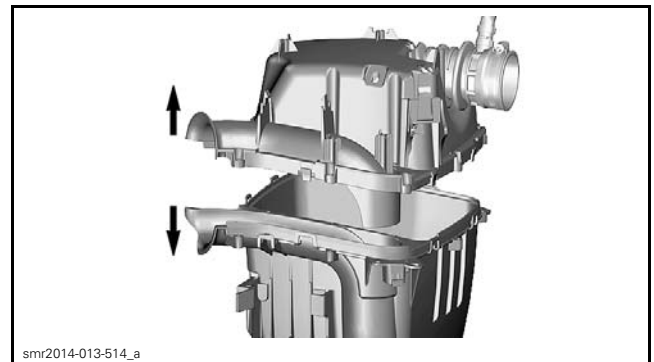
Remove screws securing upper section of air intake silencer to the lower section.



Release all retaining tabs.

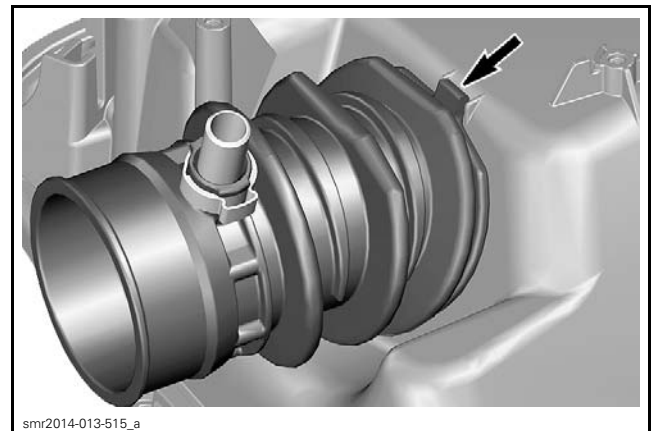


Separate upper and lower sections.



Air Intake Silencer Assembly

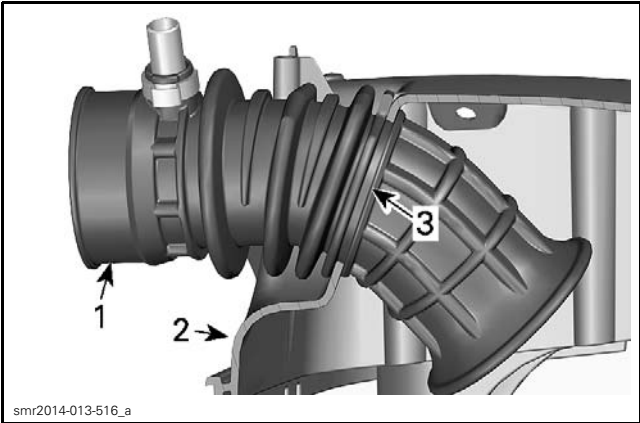
Align the rubber tab in the notch.



Make sure that air intake tube is well locked (groove) in the upper section of the air intake silencer.

Section 02 ENGINE

Subsection 02 (AIR INTAKE SYSTEM)

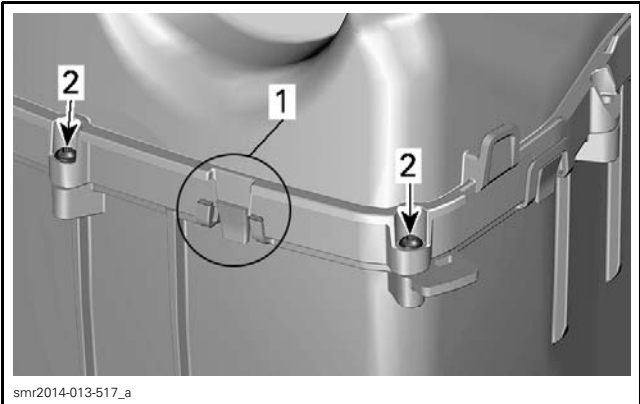


- 1. Air intake tube
- 2. Air intake silencer upper section
- 3. Retaining groove

Secure the upper section to lower section using previously removed K40 x 16 Torx screws.

TIGHTENING TORQUE	
K40 x 16 Torx screws	1.5 N•m ± 0.3 N•m (13 lbf•in ± 3 lbf•in)

In case of a broken clip, install a K40 x 16 Torx screw (P/N 250 000 287) on each side of the defective clip.



- 1. Broken clip
- 2. K40 x 16 Torx screws (P/N 250 000 287)

TIGHTENING TORQUE	
K40 x 16 Torx screws	1.5 N•m ± 0.3 N•m (13 lbf•in ± 3 lbf•in)

Air Intake Silencer Installation

The installation is the reverse of the removal procedure.

EXHAUST SYSTEM

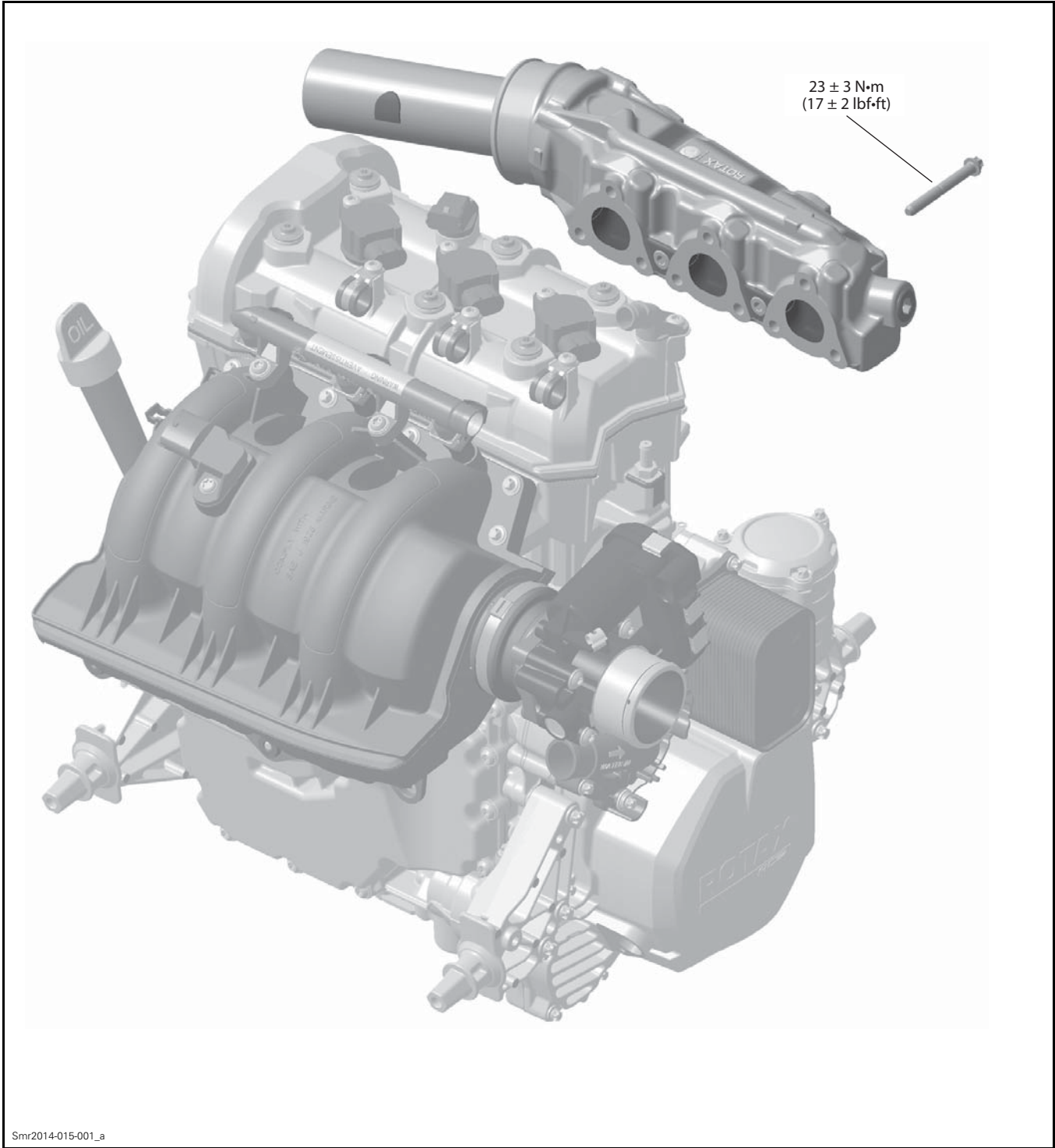
SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL.....	529 036 166	49
EXHAUST OUTLET SOCKET.....	529 036 282	52–53
FLUKE 115 MULTIMETER	529 035 868	49

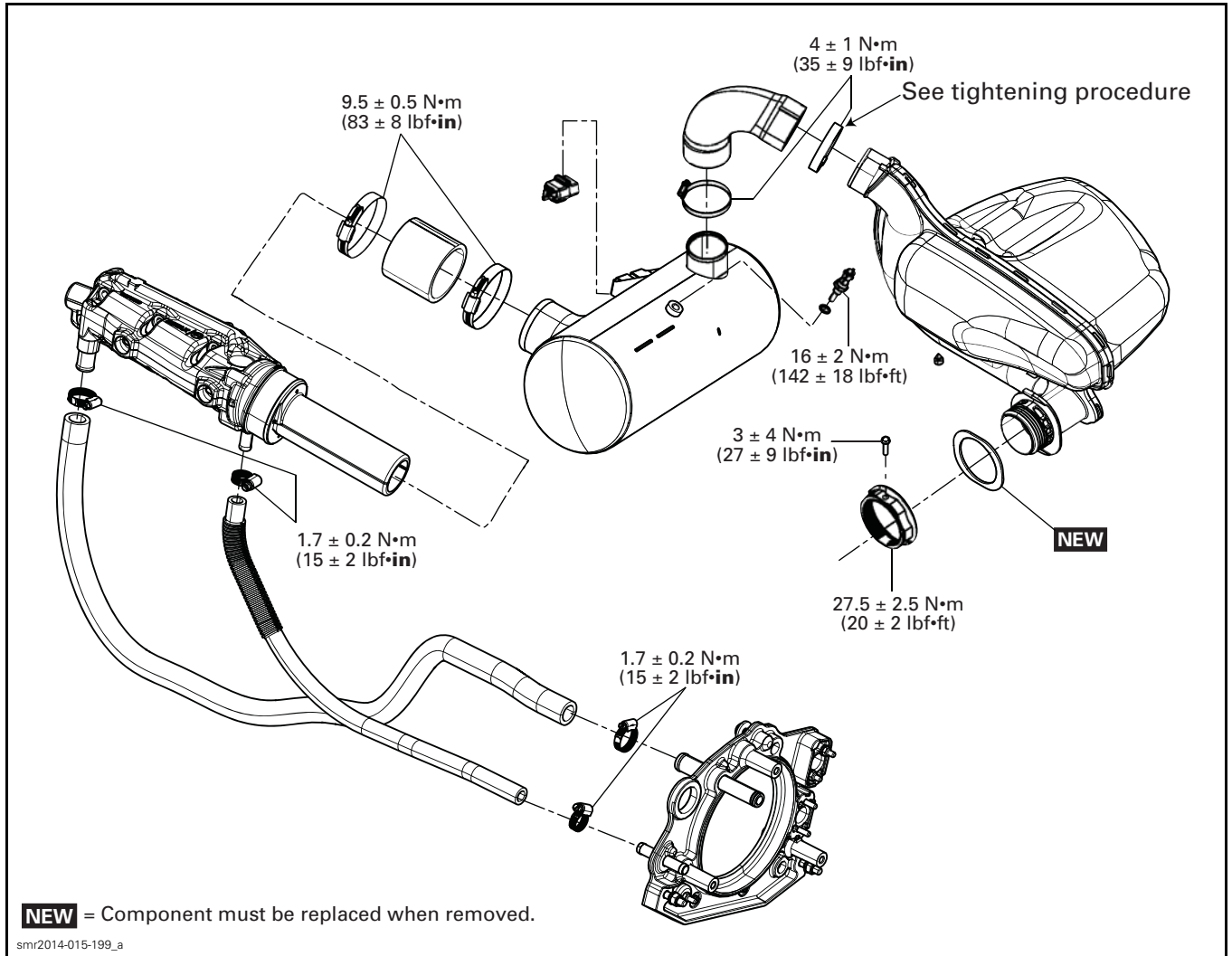
SERVICE PRODUCTS

Description	Part Number	Page
DIELECTRIC GREASE	293 550 004	50
LOCTITE 518	293 800 038	49
LOCTITE 5900	293 800 066	53

Section 02 ENGINE
Subsection 03 (EXHAUST SYSTEM)



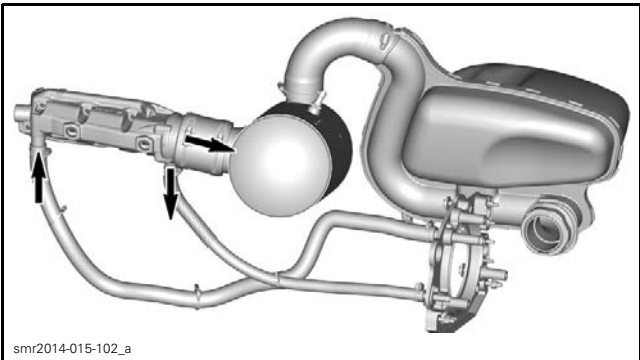
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GENERAL

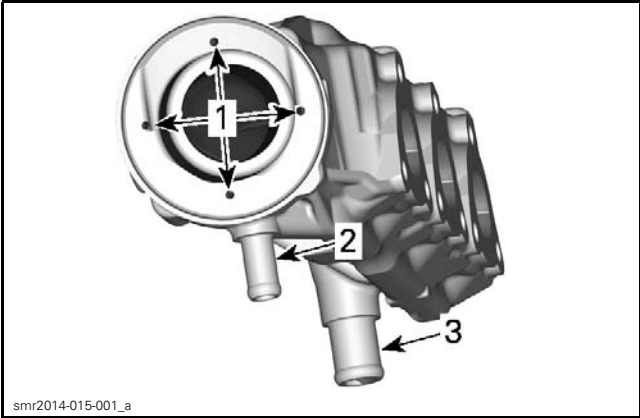
SYSTEM DESCRIPTION

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



EXHAUST SYSTEM

Water from the exhaust manifold jacket is directed to the exhaust internally. Water exits exhaust manifold through holes to inject water in muffler.



EXHAUST MANIFOLD

- 1. Injection holes
- 2. Manifold outlet to jet pump support
- 3. Manifold inlet from jet pump support

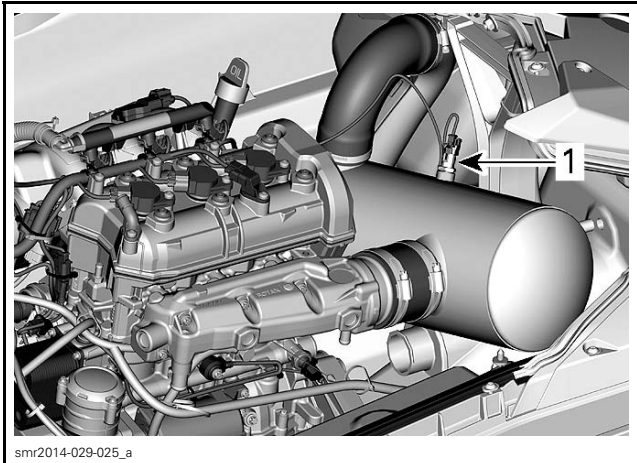
Water from the muffler is evacuated through the exhaust outlet in transom area.

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

PROCEDURES

EXHAUST GAS TEMPERATURE SENSOR (EGTS)



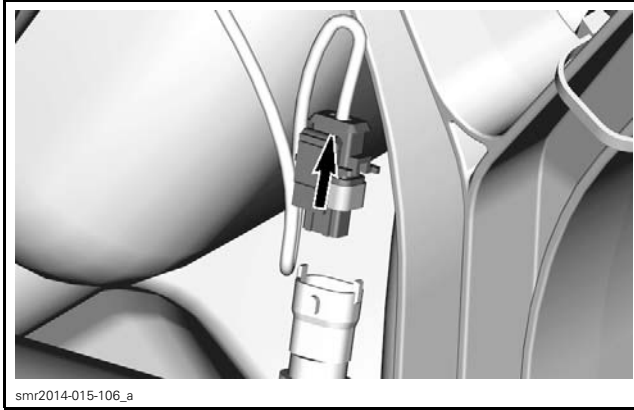
1. Exhaust gas temperature sensor (EGTS)

An overheat signal will come on in the multifunction gauge when the exhaust gases reach the following temperature.

OVERHEAT TEMPERATURE
95°C (203°F)

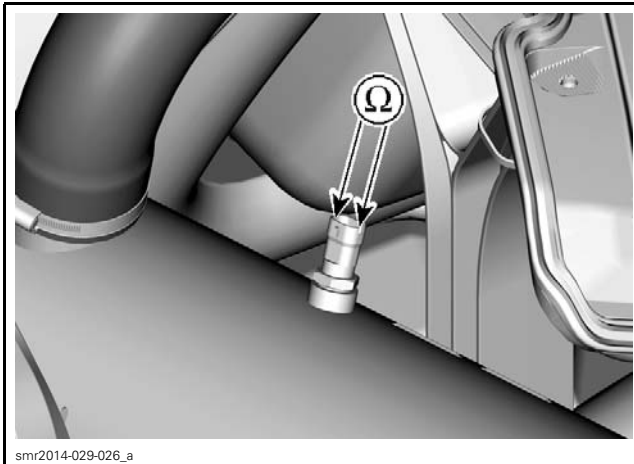
Testing the EGTS Resistance

- 1. Remove the parts required to access the EGTS.
- 2. Disconnect the EGTS connector.



EGTS

3. Set the FLUKE 115 MULTIMETER (P/N 529 035 868) to Ω selection and measure the resistance of the sensor.



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

EGTS TEMPERATURE SENSOR TABLE			
TEMPERATURE		RESISTANCE (OHMS)	
°C	°F	LOW	HIGH
- 40	- 40	38457	52630
- 10	14	8208	10,656
20	68	2233	2780
80	176	297	349
120	248	105	122

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

1. Reconnect the EGTS.
2. Disconnect ECM-A connector.
3. Using a multimeter and the ECM adapter tool, check the circuit resistance as per following table.

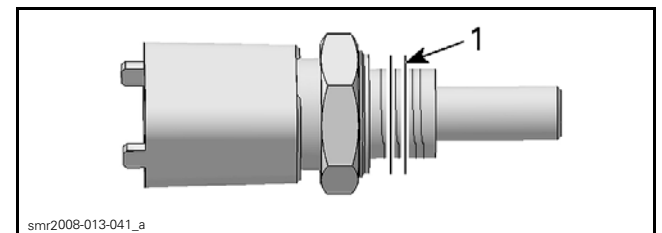
REQUIRED TOOL		
ECM ADAPTER TOOL (P/N 529 036 166)		
ECM ADAPTER		MEASUREMENT
J4	H4	See <i>EGTS RESISTANCE CHART</i>

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

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 (P/N 293 800 038) on treads of new EGTS.
4. Install new EGTS.



1. Apply Loctite 518 in this area

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

Section 02 ENGINE

Subsection 03 (EXHAUST SYSTEM)

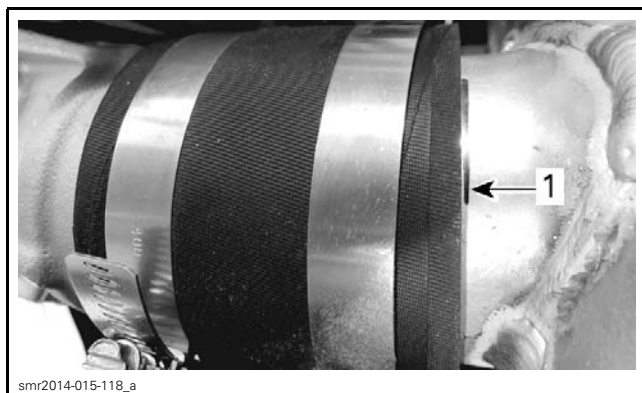
5. Apply DIELECTRIC GREASE (P/N 293 550 004) on EGTS connector before reinstall it.
6. Install all other removed parts, refer to applicable subsections.

MUFFLER

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

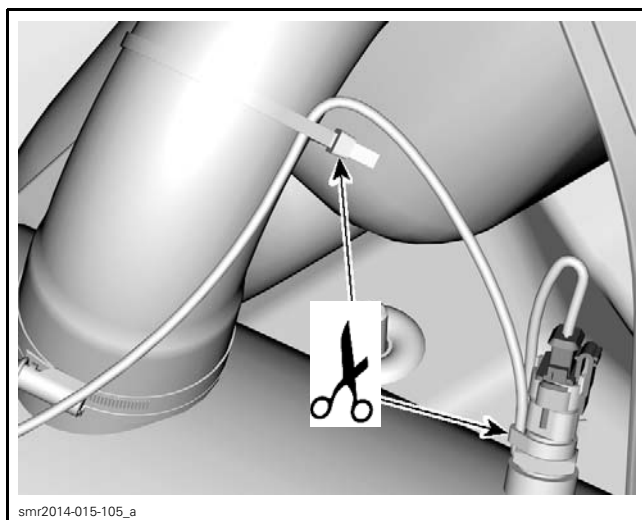
Muffler Removal

1. Remove central body. Refer to *BODY*.
2. Mark manifold to muffler hose location on muffler.

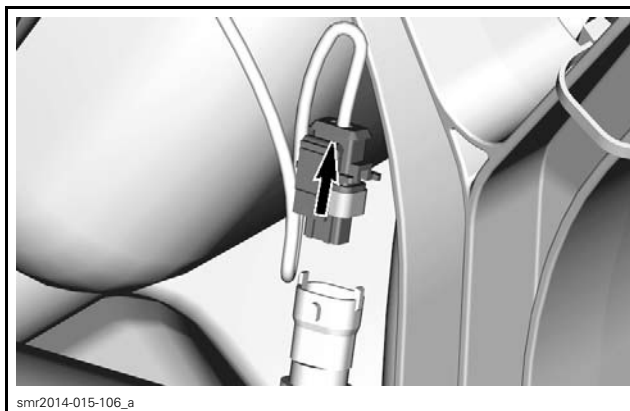


MANIFOLD TO MUFFLER EXHAUST HOSE - PORT SIDE VIEW
1. Mark

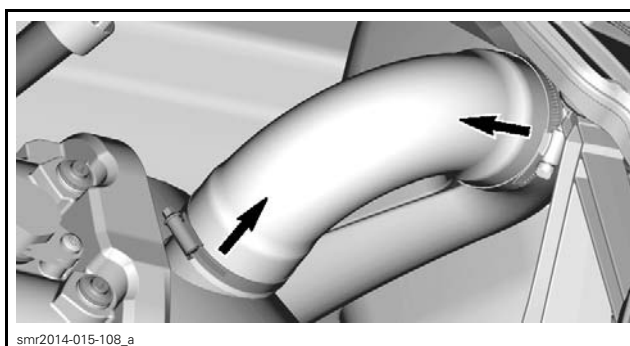
3. Follow image sequence.



MUFFLER TO RESONATOR EXHAUST HOSE

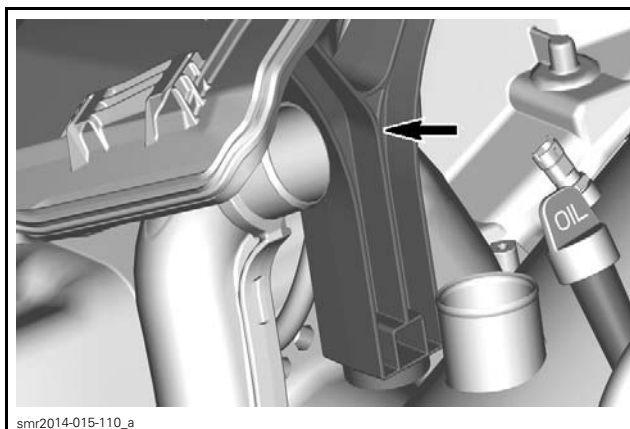


EGTS

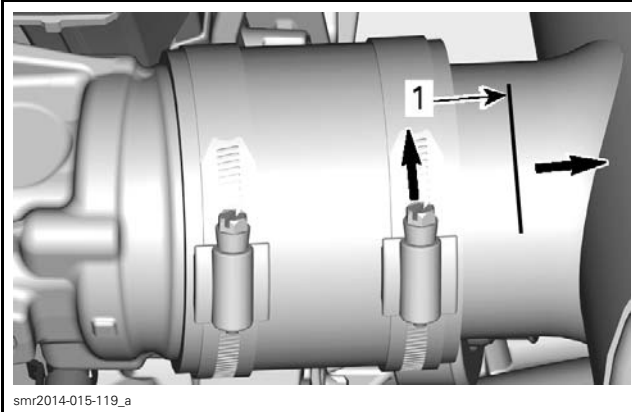


MUFFLER TO RESONATOR EXHAUST HOSE - FROM PORT SIDE VIEW

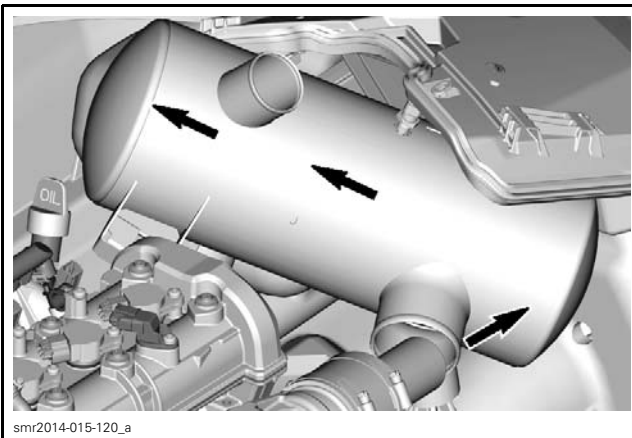
4. Move rear support backwards.



REAR SUPPORT MOVED TOWARDS REAR - STARBOARD SIDE VIEW



MANIFOLD TO MUFFLER EXHAUST HOSE - PORT SIDE VIEW
 1. Mark



MUFFLER REMOVAL - PORT SIDE VIEW

Muffler Inspection

Check muffler for:

- Cracks
- Corrosion
- Other damages.

Check if exhaust hose is:

- Brittle
- Hard
- Cracked
- Otherwise damaged.

Replace any defective part.

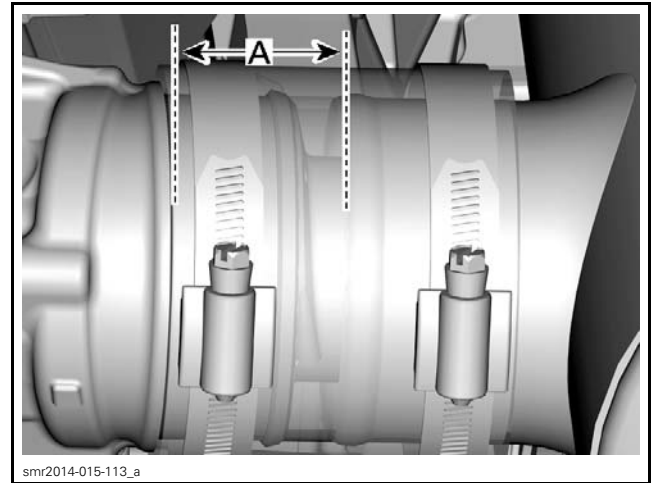
Muffler Installation

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

With a new muffler, mark muffler as per specification in step 1.

1. Ensure mark on muffler, inscribed during removal, provides correct engagement length into manifold to muffler exhaust hose.

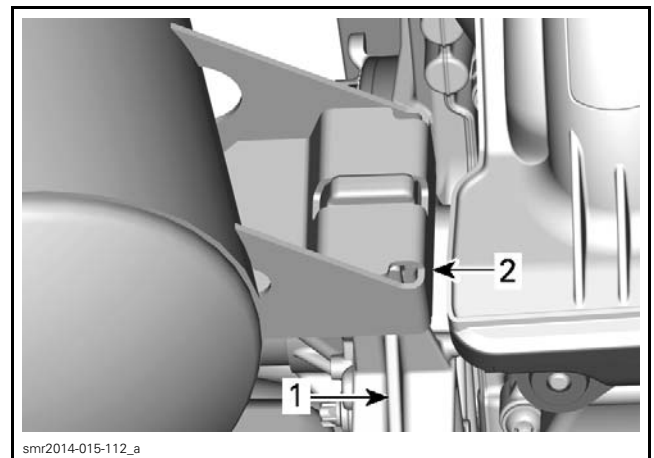
NOTE: Because of manufacturing tolerances, the measurement must be taken as illustrated. From the muffler to the end of the hose.



MANIFOLD TO MUFFLER EXHAUST HOSE - PORT SIDE VIEW
 A. Muffler engagement length 40 mm ± 2 mm (1.57 in ± .08 in)

2. Install muffler.

3. Position muffler support on rear starboard engine mount.



MUFFLER SUPPORT - STARBOARD SIDE VIEW

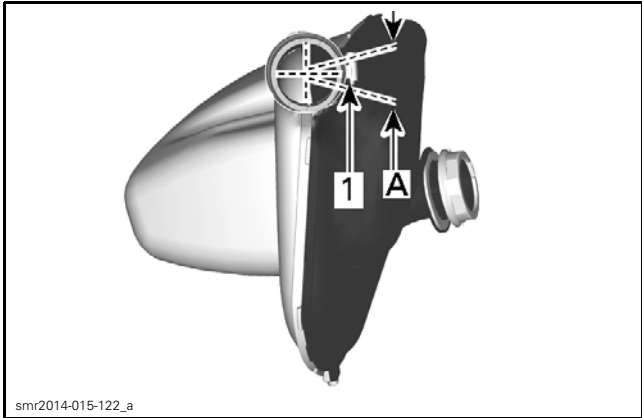
1. Rear starboard engine mount
2. Muffler support

NOTE: Ensure muffler support is properly seated on rear starboard engine mount.

Ensure manifold to muffler exhaust hose is aligned with mark on incised muffler.

4. Tighten fasteners as per exploded view.

Section 02 ENGINE
Subsection 03 (EXHAUST SYSTEM)



SCREW CLAMP POSITION ON RESONATOR

- 1. Screw clamp
- 2. $0^{\circ} \pm 10^{\circ}$ (±)

- 5. Reposition rear support.
- 6. Install all other removed parts.
- 7. Test run the engine while supplying water to the exhaust system.
- 8. After installation, ensure there is no water or exhaust gas leak when engine is running.

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

RESONATOR

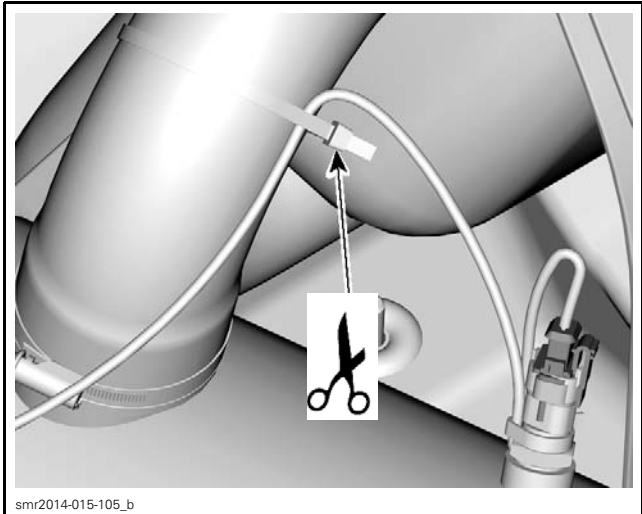
Resonator Removal

All models

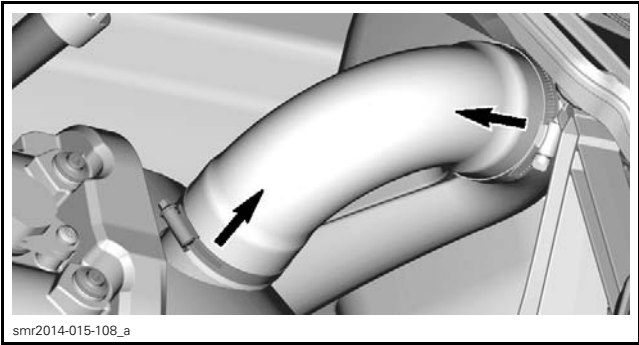
- 1. Remove central body. Refer to BODY.

NOTE: Rear body removed for clarity.

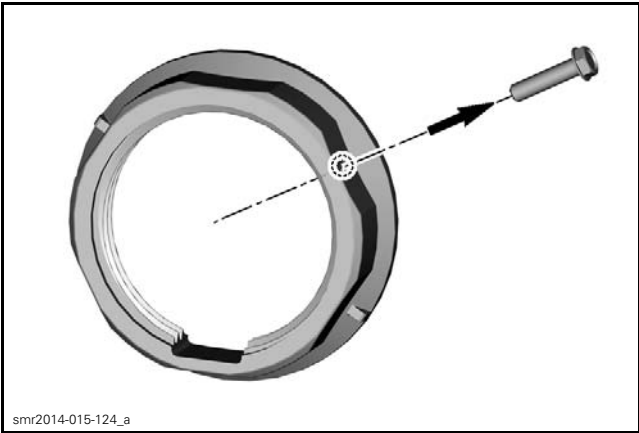
- 2. Follow image sequence.



MUFFLER TO RESONATOR EXHAUST HOSE

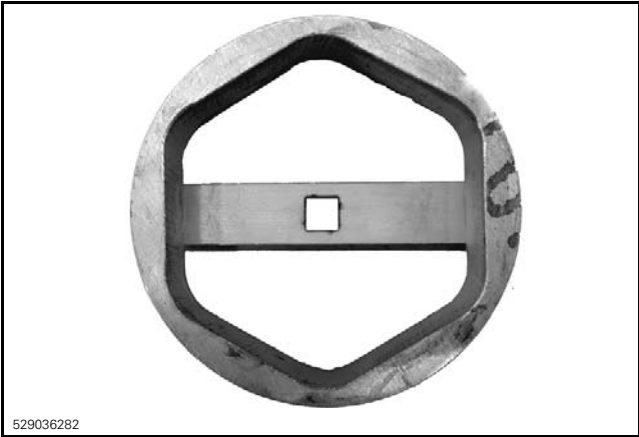


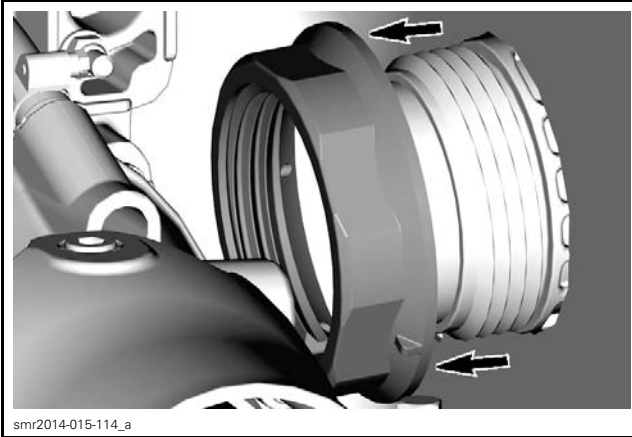
MUFFLER TO RESONATOR EXHAUST HOSE - FROM PORT SIDE VIEW



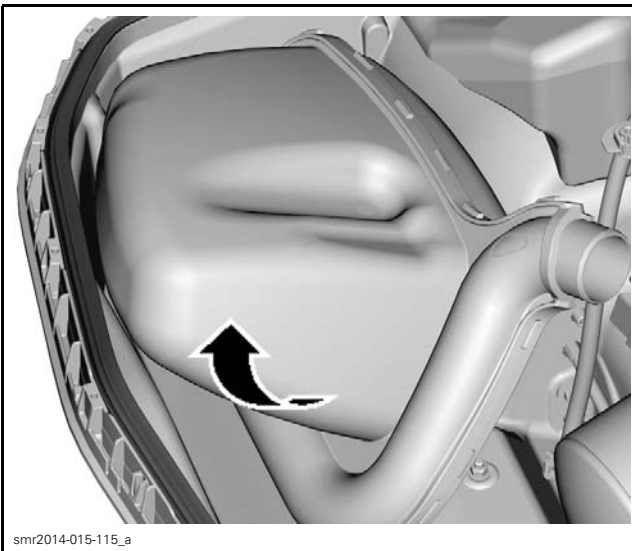
RESONATOR OUTLET NUT - OUTSIDE HULL

Use EXHAUST OUTLET SOCKET (P/N 529 036 282).

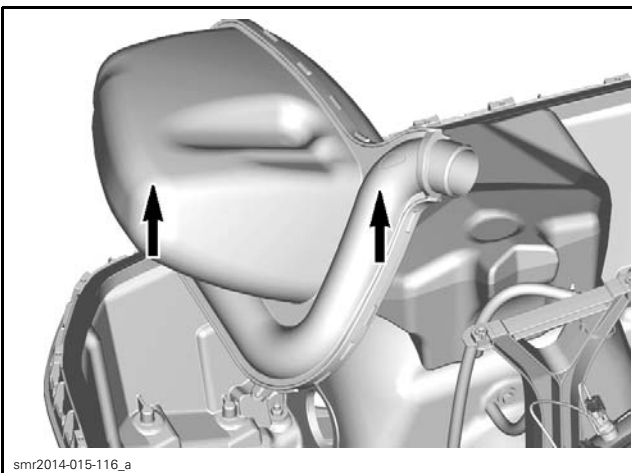




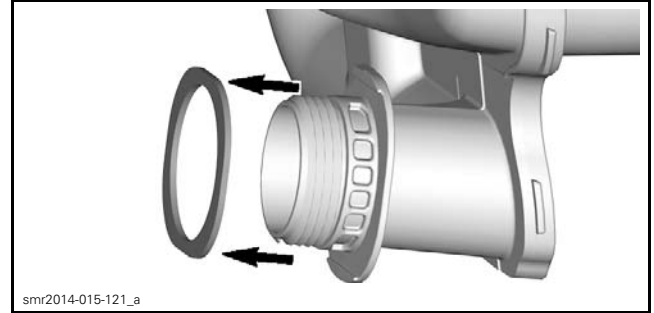
RESONATOR OUTLET NUT - OUTSIDE HULL



RESONATOR



RESONATOR



RESONATOR GASKET

Gently scrape off sealant residues from resonator outlet.

Clean surfaces with isopropyl alcohol to eliminate grease, dust or any sealant residue.

Resonator Inspection

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

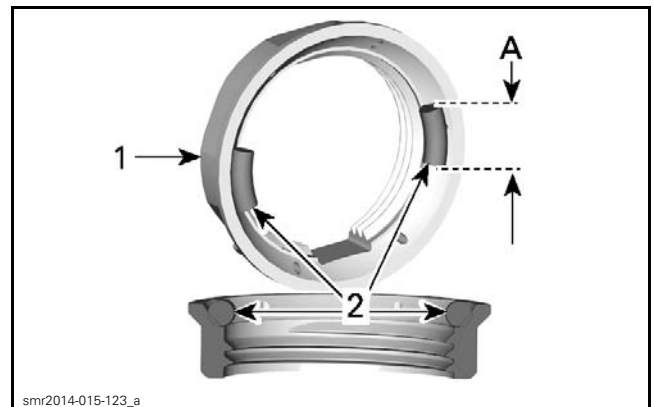
Resonator Installation

Install a new resonator gasket.

Installation is the reverse of the removal procedures. However, pay attention to the following if the screw does not line up with hole in the resonator outlet after properly torquing the resonator nut.

Apply two lines of LOCTITE 5900 (P/N 293 800 066) inside resonator outlet nut.

NOTE: Do not apply any sealant on resonator outlet nut threads.



LOCTITE 5900 SEALANT APPLICATION

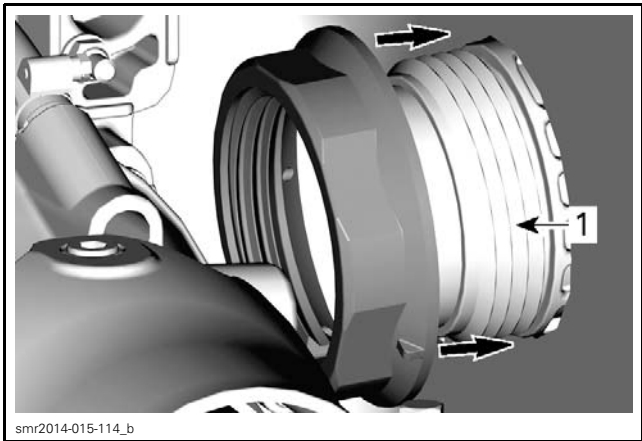
1. Resonator outlet nut
2. Loctite 5900

A. 20 mm (.8 in)

Use EXHAUST OUTLET SOCKET (P/N 529 036 282).

Section 02 ENGINE

Subsection 03 (EXHAUST SYSTEM)



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RESONATOR OUTLET

1. Resonator threads

TIGHTENING TORQUE	
Resonator outlet nut	27.5 N•m ± 2.5 N•m (20 lbf•ft ± 2 lbf•ft)

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

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

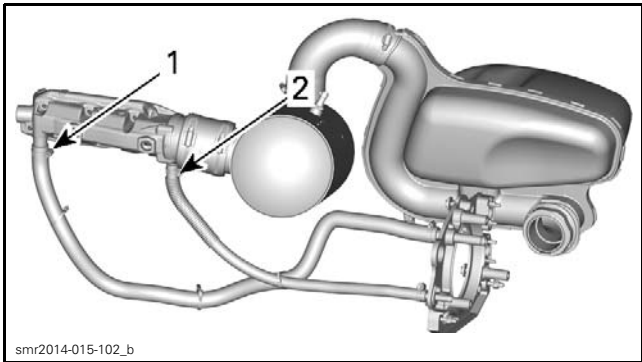
EXHAUST MANIFOLD

Exhaust Manifold Access

Remove central body. Refer to *BODY*.

From exhaust manifold disconnect:

- Manifold inlet hose from jet pump support.
- Manifold outlet hose to jet pump support.

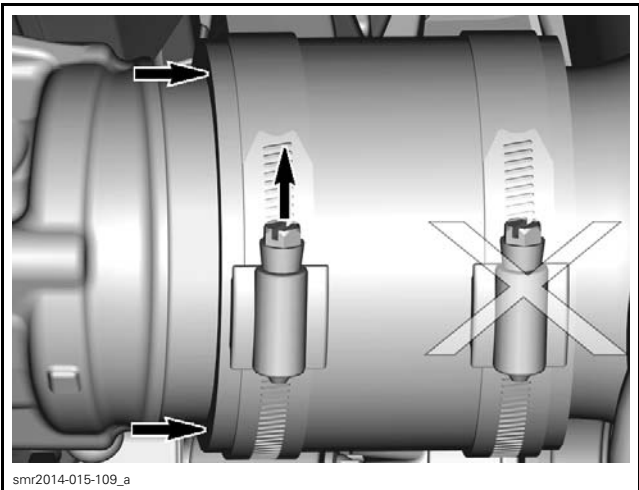


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EXHAUST SYSTEM

1. Manifold inlet hose from jet pump support

2. Manifold outlet hose to jet pump support



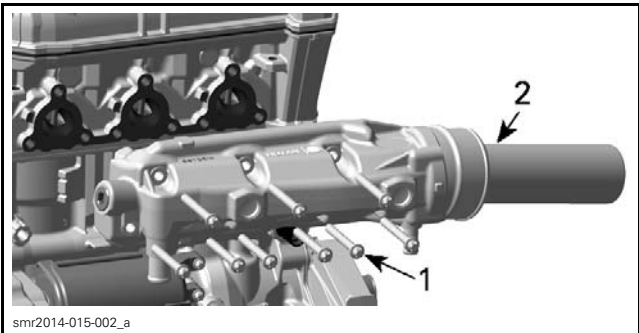
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MANIFOLD TO MUFFLER EXHAUST HOSE - PORT SIDE VIEW

Exhaust Manifold Removal

Unscrew the exhaust manifold screws.

Remove the exhaust manifold.



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1. Exhaust manifold screws

2. Exhaust manifold

Exhaust Manifold Inspection

Inspect exhaust manifold condition, pay attention for cracks or other damages.

Check contact surfaces and hose. Replace any defective part.

Inspect plane surfaces, ensure they are not warped.

NOTE: Small deformations can be corrected by grinding the surface with a fine sand paper. Lay the sand paper on a plane surface and rub part against oiled sand paper.

Clean all metal components in a solvent.

Check if the injection holes (4x) are not clogged.



1. Injection holes

After installation, test run the engine while supplying water to the flushing connector. Ensure there is no water or exhaust gas leakage when the engine is running.

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

Exhaust Manifold Installation

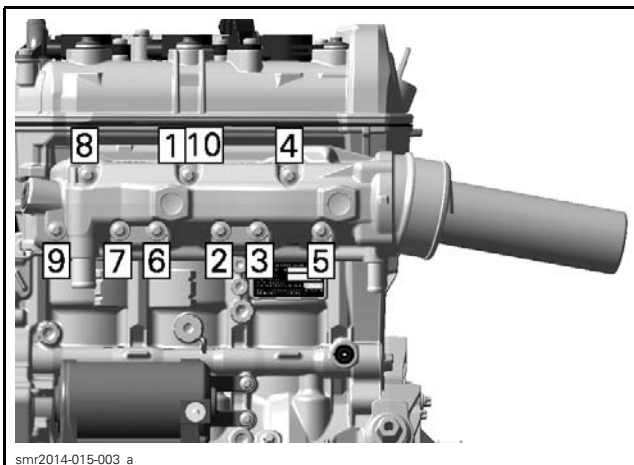
Installation is essentially the reverse of removal procedures. However, pay particular attention to the following.

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

Insert the exhaust manifold into the exhaust hose.

Install exhaust manifold screws as per sequence illustrated.

Tighten exhaust manifold screws to specification as per sequence illustrated.



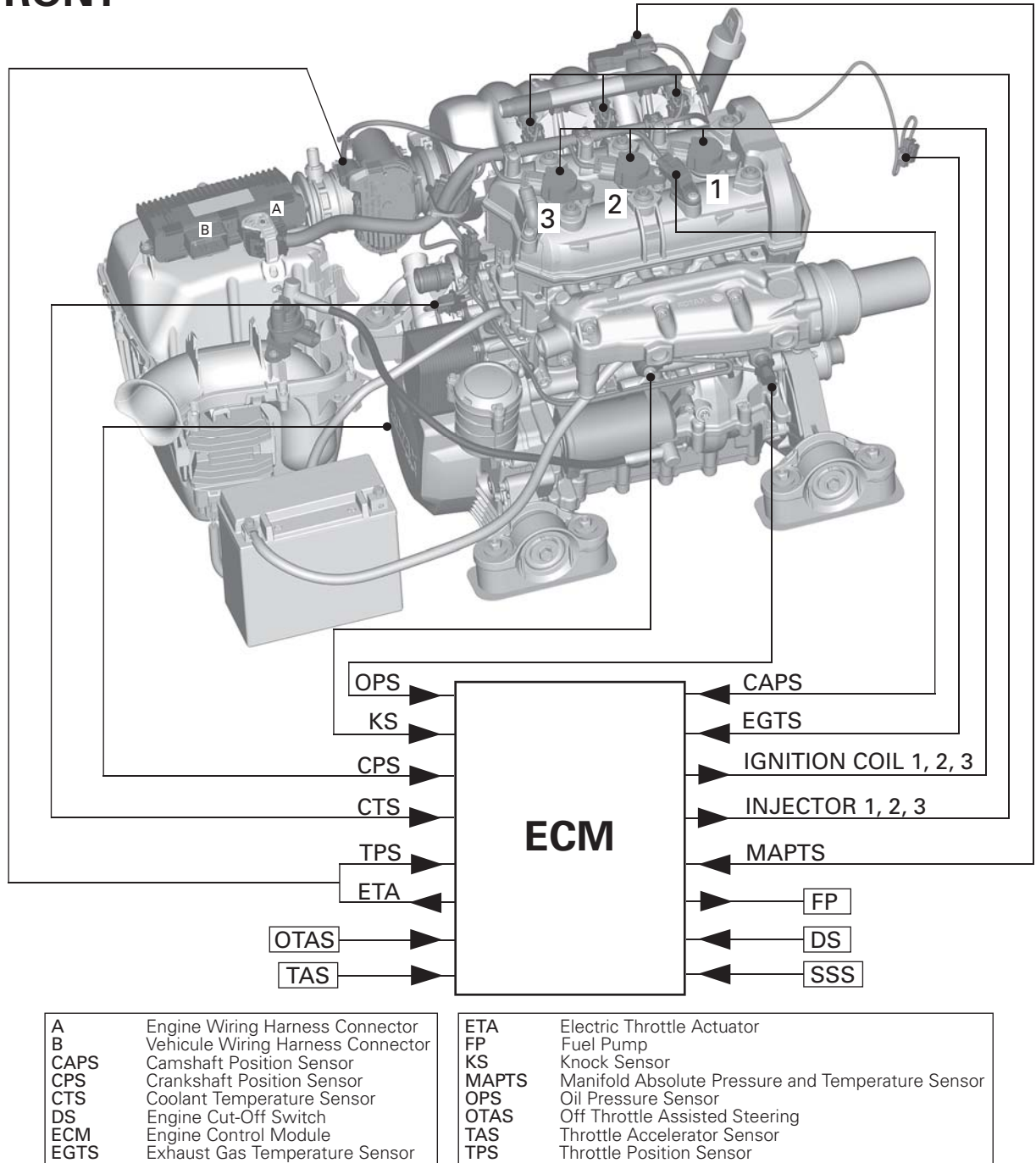
EXHAUST MANIFOLD TIGHTENING SEQUENCE

TIGHTENING TORQUE	
Exhaust manifold screws	23 N•m ± 3 N•m (17 lbf•ft ± 2 lbf•ft)

Install all removed parts.

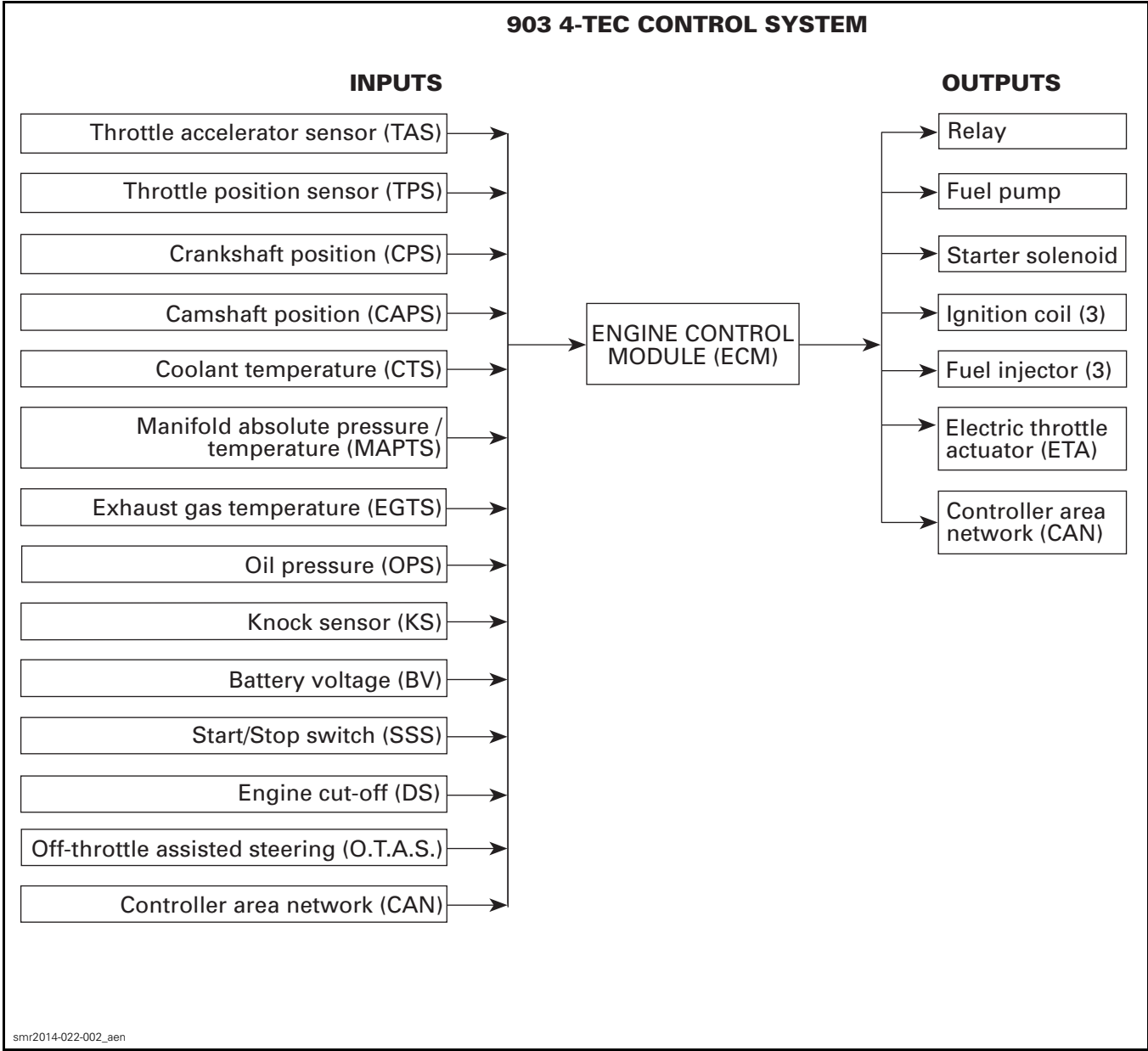
ENGINE MANAGEMENT SYSTEM

FRONT



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



GENERAL

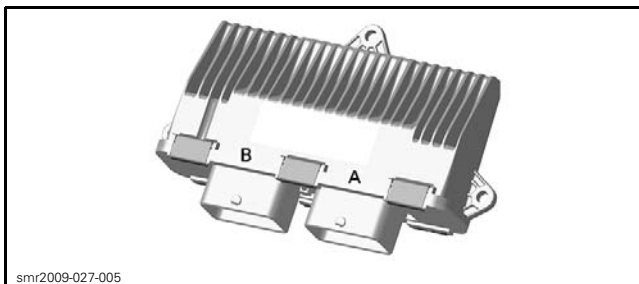
SYSTEM DESCRIPTION

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

There are 5 main systems that interact with the engine management system:

1. Electronic fuel injection
2. Ignition System
3. Starting System
4. O.T.A.S.
(Off-Throttle Assisted Steering)
5. iControl System

Engine Control Module (ECM)

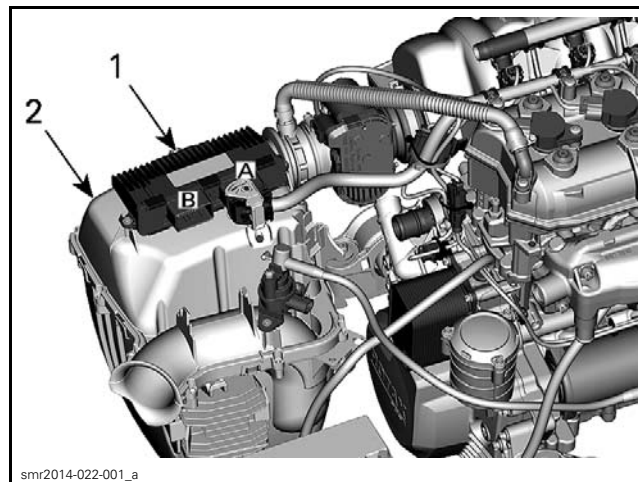


ECM

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 (multifunction gauge and iControl System) for various functions that affect engine management.

The ECM is mounted on the air intake silencer.



1. ECM

2. Air intake silencer

A. Connector "A" (Engine harness)

B. Connector "B" (Vehicle harness)

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

The ECM controls the following engine management functions:

Throttle Protection

If the throttle is not completely closed during engine startup, the engine will not start.

To revert to normal operation, completely release the throttle lever.

Engine RPM Limiter

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

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.

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.

NOTE: This mode can also be used if the engine is water-flooded.

Section 03 ELECTRONIC MANAGEMENT SYSTEMS

Subsection 01 (ENGINE MANAGEMENT SYSTEM)

To activate DROWNED MODE, proceed as per following steps.

1. Install the tether cord cap on the engine cut-off switch.
2. While the engine is stopped, fully pull in 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 disable the ignition system, remove the spark plugs and crank the engine with rags over the spark plug holes. Refer to *IGNITION SYSTEM* subsection.

Monitoring System

The ECM monitors:

- The electrical and electronic components of the engine system
- The iControl system
- The multifunction gauge
- Some components of the electrical system

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 consists of the Intelligent Throttle Control (iTc) system.

The information center (gauge) is used to select the mode of operation of the system.

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 (GAUGE)* 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 the handlebar, and an electric throttle actuator (ETA) located on the throttle body.

The iTc allows functions such as touring/sport mode, O.T.A.S.[™], 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.

CONTROLLER AREA NETWORK (CAN)

GENERAL

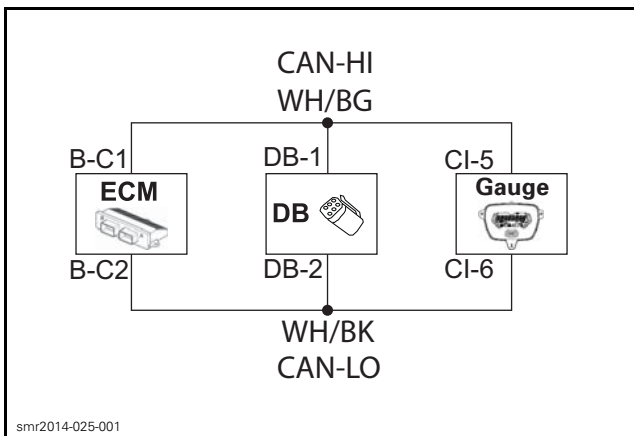
SYSTEM DESCRIPTION

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

The CAN bus, which is composed of a pair of twisted wires (WHITE/BEIGE and WHITE/BLACK), is the nervous system of the iControl system and the engine management system (EMS). It links the electronic modules (ECUs) together, allowing them to communicate and interact with each other as required.

Using B.U.D.S., technicians may also communicate through the diagnostic connector (DB) with the ECM (Engine Control Module) and the multi-function gauge for various reasons such as:

- extracting data
- reprogramming a module
- changing settings
- viewing fault codes
- and for various other functions.



CAN BUS DIAGRAM

Section 03 ELECTRONIC MANAGEMENT SYSTEMS

Subsection 03 (CONTROLLER AREA NETWORK (CAN))

TROUBLESHOOTING

DIAGNOSTIC TIPS

Check for fault codes using B.U.D.S. as a first troubleshooting step. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

Make sure the modules are powered before testing CAN.

CAN Communication Problems

The following chart provides 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 B.U.D.S.
Diagnostic connector not secured in its holder (may hang down in bilge water)	CAN intermittent problems. Strange behavior of multifunction gauge. Inoperative electronic systems in watercraft.	Nothing
Water in holder of diagnostic connector (particularly with salt water)	CAN intermittent problems. Strange behavior of multifunction gauge. Inoperative electronic systems in watercraft.	Nothing
Short circuit in CAN wires	Engine is set to limp home mode. Check engine light is ON.	B.U.D.S. will not be able to communicate with any electronic module. "No vehicle detected" message will be displayed in B.U.D.S.
Multifunction gauge	Check engine light is ON. Some functions not displayed such as: Engine hours and RPM.	1 module instead of 2 will be active. "Cluster" tab and its data will not be available in B.U.D.S. ECM report a cluster CAN problem.
ECM (Engine Control Module)	Engine is set to limp home mode. Check engine light is ON. Some functions not displayed such as: Engine hours and RPM.	1 module instead of 2 will be active. ECM tab and its data will not be available in B.U.D.S.
Depth sounder (If so equipped)	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.	B.U.D.S. will not be able to communicate with any electronic module. "No vehicle detected" message will be displayed in B.U.D.S.

NOTE: If the gauge cannot communicate with an optional module 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 AND B.U.D.S.

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC CABLE	710 000 851	65
MPI-2 INTERFACE CARD	529 036 018	65
MPI-3 INTERFACE CARD	529 036 353	65

GENERAL

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

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

Download and install the software on a PC.

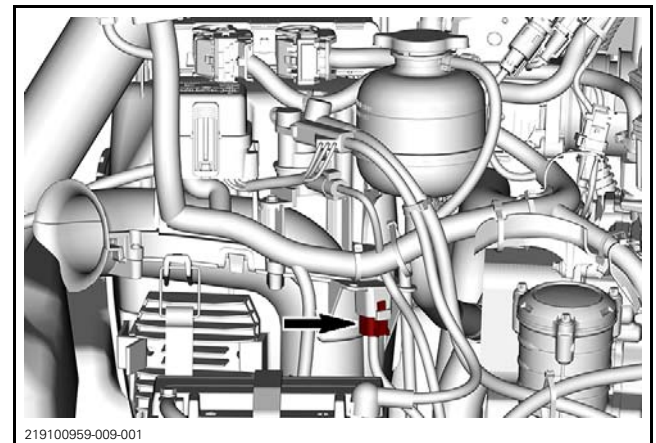
Connect the vehicle to the BRP diagnostic software (BUDS2).

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





In BUDS2, click Scan on the upper left corner of the screen.

DIAGNOSTIC CONNECTOR LOCATION

The diagnostic connector is located near the coolant tank, stored in it's protective cap. To access it, remove the LH access cover.



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.

TROUBLESHOOTING

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

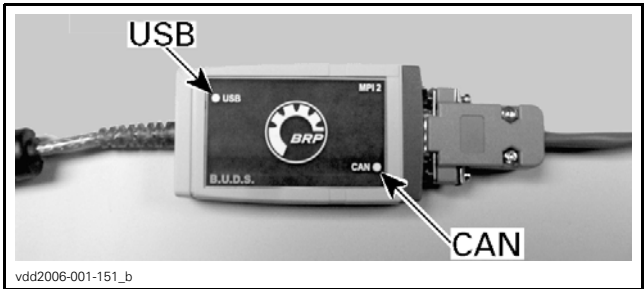
COMMUNICATION PROBLEMS

MPI Connection Troubleshooting

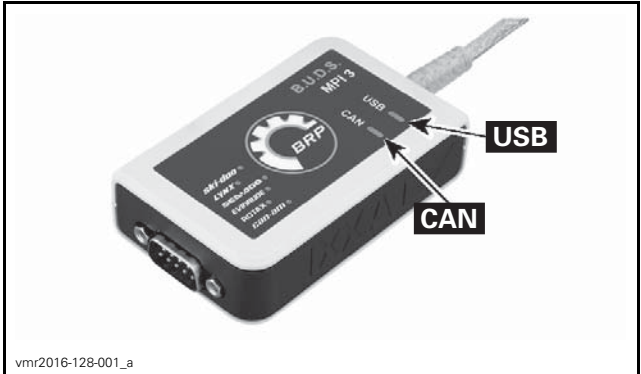
MPI Status Lights

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 AND B.U.D.S.)



MPI-2 CARD



MPI-3 CARD

Prerequisite for USB Communication:

- PC 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-2 and PC computer.– Check USB operation on PC computer (hardware or USB 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 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), the multifunction gauge, 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 require 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, MAPTS, CTS, OPS, EGTS, knock sensor). Throttle actuator, ignition coils and fuel injectors
ECM
Engine RPM
CAN
Engine starter solenoid (STS)
Fuel pump (FP)
O.T.A.S.
Multifunction gauge

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

MULTIFUNCTION GAUGE MONITORING
Multifunction gauge
Sport mode activation
MODE switch
CAN
Fuel level sensor
ECM

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 multifunction gauge which provides beeper codes, fault indicators and fault messages to inform the rider of a particular condition.

When a minor or transient fault occurs, the fault and beeper will cease automatically if the condition that caused the fault no longer exists.

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 RPM) 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 is not operating properly, limp home mode will be set. Engine speed (RPM) will be limited and therefore vehicle speed.

This mode allows the rider to return to shore which would otherwise not be possible without this advanced system.

Subsection 05 (DIAGNOSTIC AND FAULT CODES)

Major Fault and Vehicle Reaction






ENGINE PROBLEM	MAX ALLOWED RPM
High engine temperature (from 100°C (212°F))	3800
High exhaust temperature (from 95°C (203°F))	3800
Low oil pressure (below 150 kPa ± 20 kPa (21.76 PSI ± 2.9 PSI))	4500

Section 03 ELECTRONIC MANAGEMENT SYSTEMS

Subsection 05 (DIAGNOSTIC AND FAULT CODES)

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.

PILOT LAMPS (ON)	MESSAGE DISPLAY	DESCRIPTION
	HI ENGINE TEMPERATURE	Engine overheating
	HI EXHAUST TEMPERATURE	Exhaust system overheating
	CHECK ENGINE or LIMP HOME MODE	Check engine (minor fault req. maint.) or LIMP HOME MODE (major eng. fault)
	LO OIL	Low oil pressure
	LOW FUEL level indicator, NO message	Low fuel level warning, approx. 12 L (3.2 U.S. gal.) remaining, or fuel level sensor disconnected.
	MAINTENANCE REQUIRED	Engine or vehicle maintenance required.
SPORT	SPORT MODE	Sport mode is active.
TOURING	TOURING MODE	Touring mode is active

FAULT MESSAGES	
LO OIL	Engine low oil pressure detected
HI EXHAUST TEMPERATURE	High exhaust temperature detected
HI ENGINE TEMPERATURE	High engine temperature detected
CHECK ENGINE	Engine management system malfunction or maintenance required
HI BATTERY VOLTAGE	High battery voltage detected
LO BATTERY VOLTAGE	Low battery voltage detected
LIMP HOME	Major fault detected, engine power limited
FUEL SENSOR DEFECTIVE	Fuel level sensor fault
UNSYNC GPS	GPS signal synchronization with navigation satellites not acquired
CALIBRATION CHECKSUM ERROR	Information center programming corrupted
MAINTENANCE REQUIRED	Watercraft maintenance required
FUNCTION CANNOT BE ACTIVATED	Message when a function is not or cannot be properly activated
O.T.A.S. FAILURE	O.T.A.S. sensor failure (or not detected), or O.T.A.S. system failure
iBR MODULE ERROR	Error message if communication with the iBR module is lost while riding

Section 03 ELECTRONIC MANAGEMENT SYSTEMS

Subsection 05 (DIAGNOSTIC AND FAULT CODES)

Beeper Signals

When one of the following conditions occurs, the monitoring system emits the associated beep signal.

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.

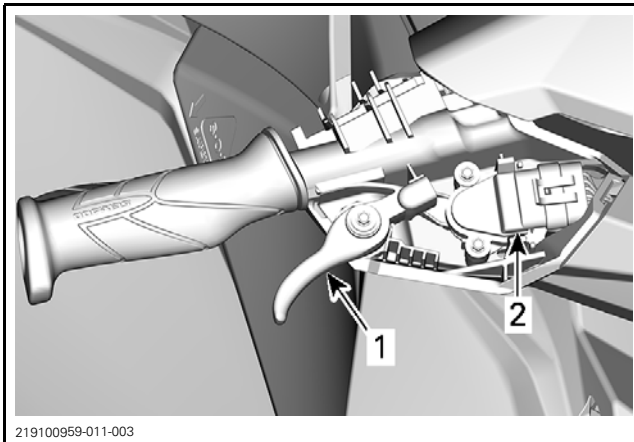
Browse lists of active/ occurred and inactive fault codes.

INTELLIGENT THROTTLE CONTROL (iTC)

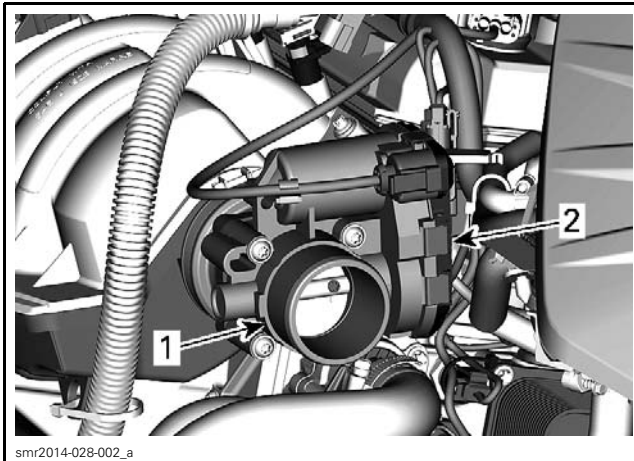
GENERAL

SYSTEM DESCRIPTION

The iTC is an electronic throttle control system that includes a cableless throttle control located on the RH side of the 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)



1. Throttle body
2. Electric throttle actuator (ETA)

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 position via a drive gear. The ETA must always dis-

place the throttle plate against a spring load that tends to return the throttle plate to its rest position. Pulse width modulation (PWM) is used to control the motor.

In the throttle body, there is also a double throttle position sensor (TPS). The redundancy is used for security purposes. The TPS is a potentiometer that supplies the ECM the actual angular 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 position, the ECM commands the throttle actuator to hold the throttle plate at that position.

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.

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

Touring Mode

Touring mode provides for a smooth and 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.

When throttle is applied, the engine will progressively accelerate through its 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 provides a crisper, more instantaneous throttle response.

Maximum engine power is available throughout the engine operational range.

NOTE: Touring/Sport mode selection is only available on the ACE 900 HO engine.

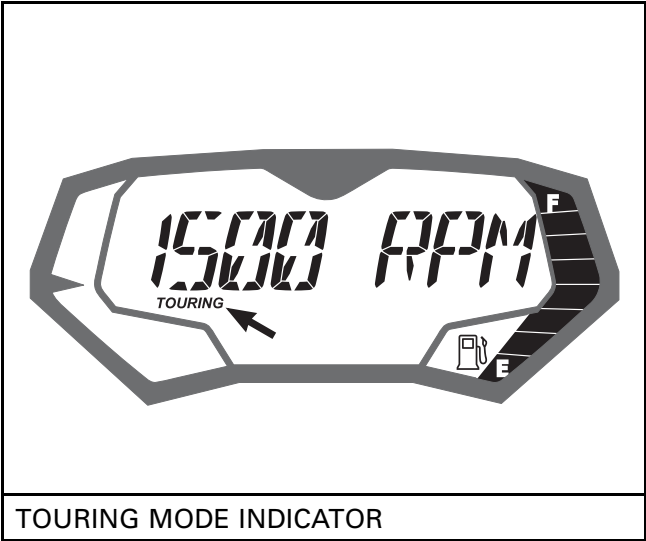
OPERATING MODES

NOTE: Touring/Sport mode selection is only available on the ACE 900 HO engine.

Section 04 FUEL SYSTEM
Subsection 01 (INTELLIGENT THROTTLE CONTROL (iTC))

Touring Mode

By default, the watercraft is set to TOURING mode of operation when started.
A TOURING mode indicator is ON in the multi-function gauge to confirm the active mode of operation.



Sport Mode

When selected, 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.

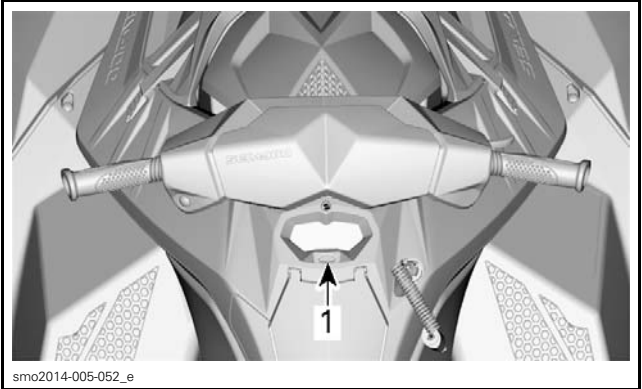
Activating Sport Mode

To activate sport mode, carry out the following:

WARNING

When activating sport mode, be sure to maintain situational awareness of other watercrafts, obstacles, or persons in the water.

1. Start engine.
2. Depress and hold the SET button for at least 1 second.



TYPICAL
1. SET button

Two beeps will be heard and the following message will be displayed in the multifunction gauge:

MESSAGE DISPLAYED

ENTERING SPORT MODE - INCREASED ACCELERATION - INSTRUCT PASSENGERS TO HOLD - PRESS_MODE_BUTTON

WARNING

Ensure passengers are advised that sport mode provides for increased accelerations and that they are to hold on tightly.

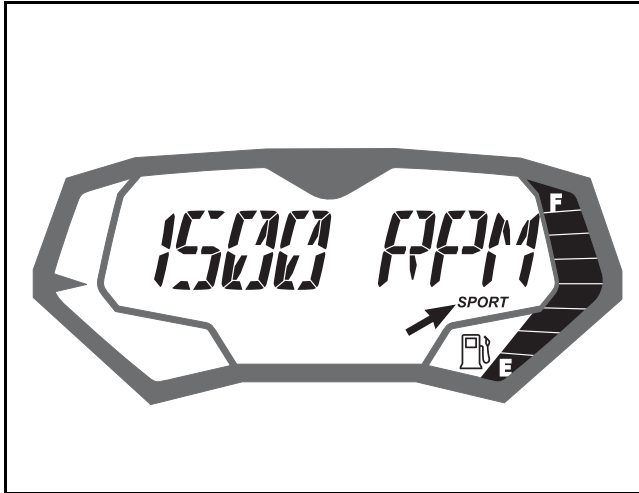
3. Press the SET button again to acknowledge the message and activate sport mode.
- One beep will be heard and a scrolling SPORT MODE ACTIVATED message will momentarily confirm that sport mode has been activated.

MESSAGE DISPLAYED

SPORT MODE ACTIVATED

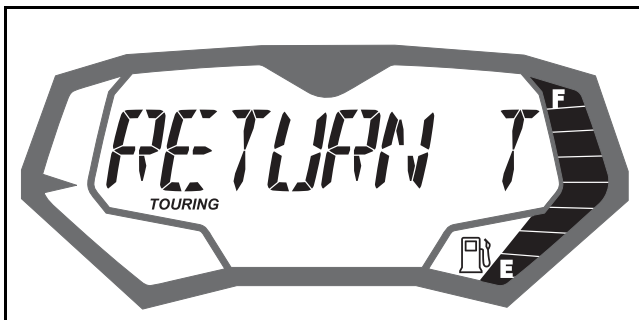
NOTE: After a few seconds, the gauge will revert to its normal display.

4. Ensure the SPORT mode indicator is turned on.



SPORT MODE INDICATOR

NOTE: The SPORT mode indicator will come on and stay on as long as sport mode is active. If the throttle is not fully released and the engine is not at idle, SPORT mode cannot be activated. The following message will then appear in the multifunction gauge.



MESSAGE DISPLAYED

SPORT MODE - RETURN TO IDLE TO ACTIVATE

Release the throttle. Once the engine has returned to idle, SPORT mode will be activated.

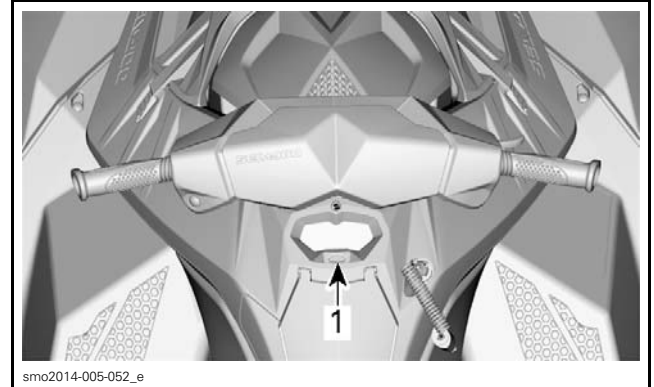
Deactivating Sport Mode

To deactivate sport mode, carry out the following:

⚠ WARNING

When deactivating sport mode, be sure to maintain situational awareness of other watercrafts, obstacles, or persons in the water.

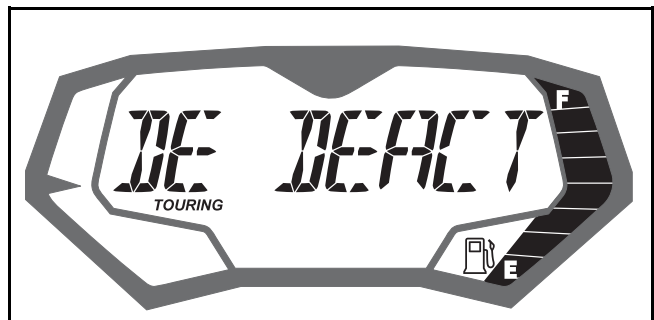
1. Depress and hold the MODE button for at least 1 second.



TYPICAL

1. MODE button

NOTE: The following message will scroll in the multifunction display: SPORT MODE DEACTIVATED.

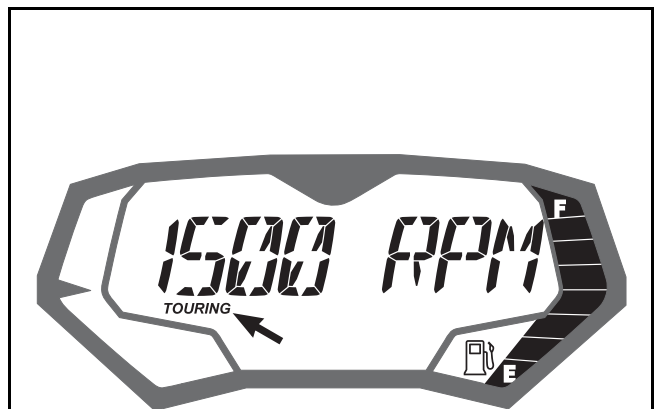


MESSAGE DISPLAYED

SPORT MODE DEACTIVATED

NOTE: After a few seconds, the gauge will revert to its normal display.

2. Ensure the TOURING mode indicator is on.



TOURING MODE INDICATOR

Section 04 FUEL SYSTEM

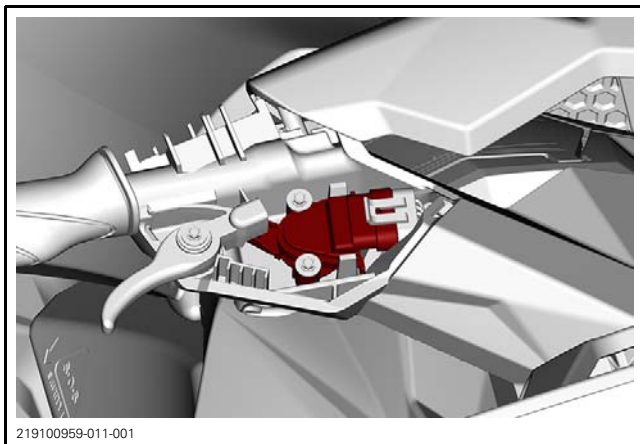
Subsection 01 (INTELLIGENT THROTTLE CONTROL (iTC))

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.



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 the TAS Using BUDS2

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Press START button.
3. Install tether cord on engine cut-off switch.
4. In BUDS2, select the following:
 - **Measurements** page tab
 - **ECM** button
 - Monitor **Throttle Opening** and **TAS (%)**
5. While slowly pulling in and letting out throttle lever, ensure the TAS % indication changes with throttle activation.

NOTE: The TAS % indication is not directly proportional to the percentage of the throttle lever travel.

If the TAS % indication changes the throttle activation, the TAS and the wiring harness are good.

If the TAS % indication does not change, look for a fault code in BUDS2 and carry out service actions. Refer to the wiring diagram to carry out the following continuity tests:

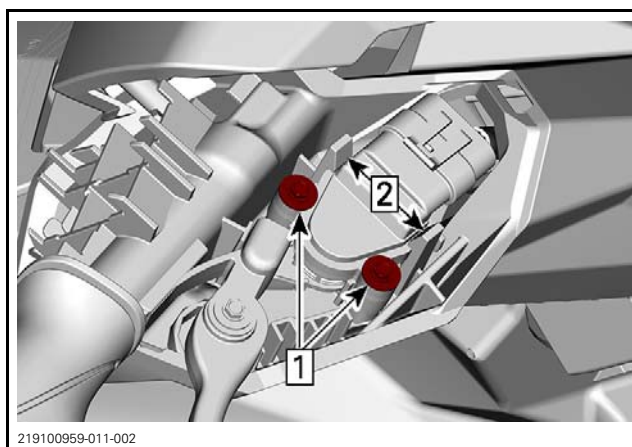
- Steering connector to TAS connector
- Steering connector to ECM-B connector.

If continuity is NOT good, repair or replace wiring and connectors.

If continuity is good, replace the TAS.

Replacing the TAS

1. Remove RH steering cover. Refer to *STEERING SYSTEM*.
2. Remove mounting screws and pry out sensor locking tabs to pull out sensor.



Step 1: Remove screws

Step 2: Pry out

3. Pull up on the connector end of the TAS and gently pull it out of the throttle handle.
4. Remove connector from TAS sensor.
5. The installation is the reverse of the removal procedure. However pay attention to the following.
6. Align sensor pins in their holes.



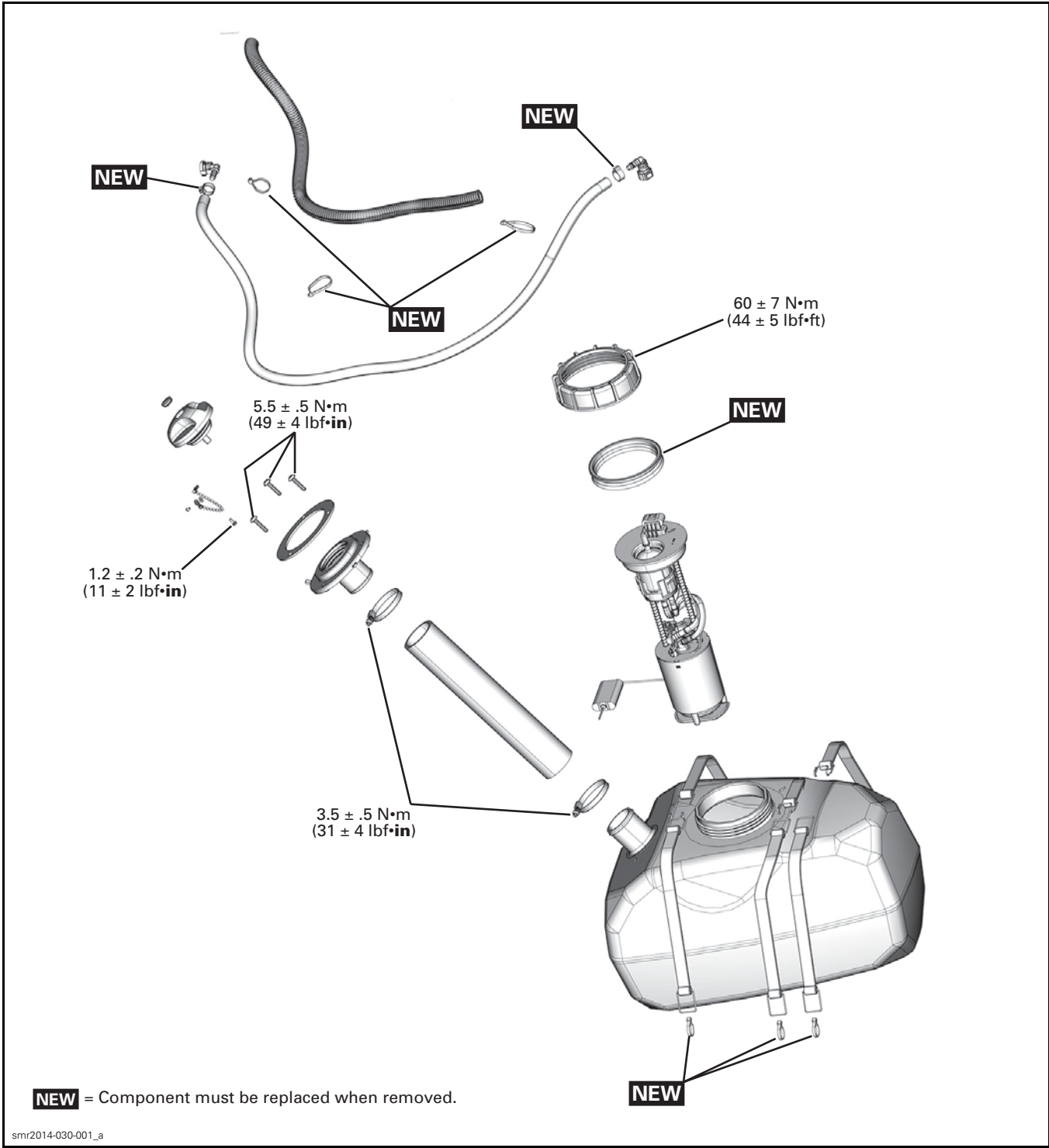
1. *Align pin into hole*
7. Press sensor into position until locking tabs engage. Ensure it is properly locked in place.
8. When installation is complete, ensure throttle lever functions properly.

FUEL TANK AND FUEL PUMP

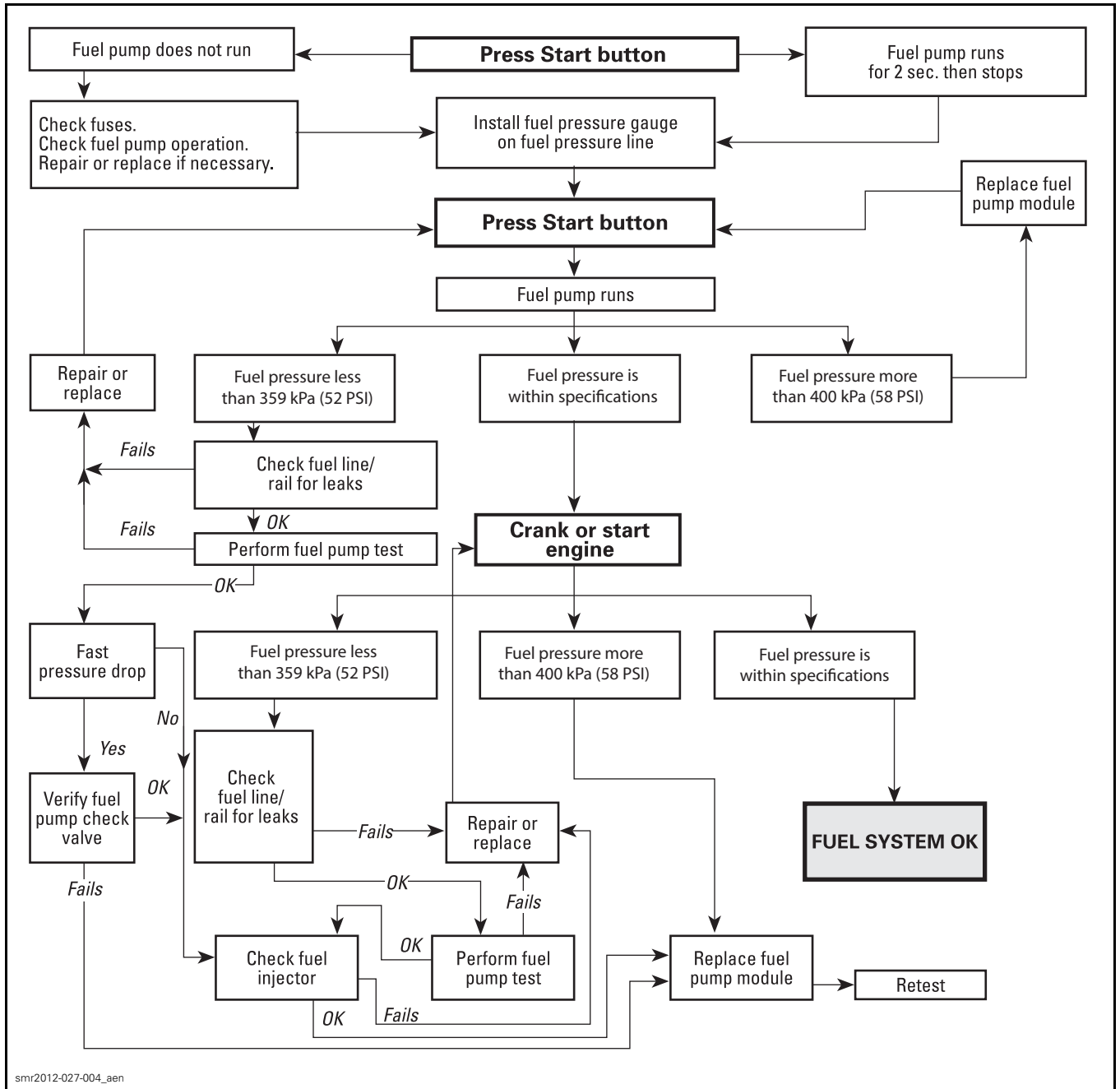
SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	85
ECM ADAPTER TOOL.....	529 036 166	88
FUEL HOSE ADAPTER.....	529 036 396	86
FUEL PUMP MODULE SOCKET.....	529 036 125	90
FUEL TANK TEST CAP	529 036 242	83
OETIKER PLIER.....	295 000 070	87
PRESSURE GAUGE.....	529 036 395	86
VACUUM/PRESSURE PUMP	529 021 800	83–84
VENTED CAP TEST ADAPTER (THREADED).....	529 036 243	84

FUEL TANK AND FUEL PUMP



FUEL SYSTEM DIAGNOSTIC FLOW CHART



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.

⚠ 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.

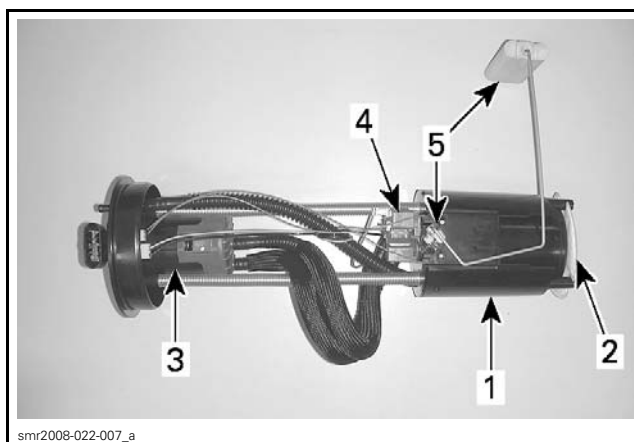
SYSTEM DESCRIPTION

The fuel system is comprised of:

- A fuel tank
- A vented fuel tank cap
- A fuel pump module mounted inside the fuel tank, and
- 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 or engine cut-off 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 multifunction gauge. This signal is representative of the fuel level.

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

The multifunction gauge 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.

NOTE: BRP is the only supplier of the vented fuel tank cap. There is no equivalent vented fuel tank cap available on the market today.

INSPECTION

FUEL TANK LEAK TEST

1. Remove central body. Refer to *BODY* subsection.

NOTE: To access all fuel system components for a thorough inspection, the central body must be removed.

2. Visually inspect condition of hoses and clamps.

3. Remove fuel tank cap.

4. Fill up fuel tank.

5. Install test cap on the fuel tank filler neck.

REQUIRED TOOL

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



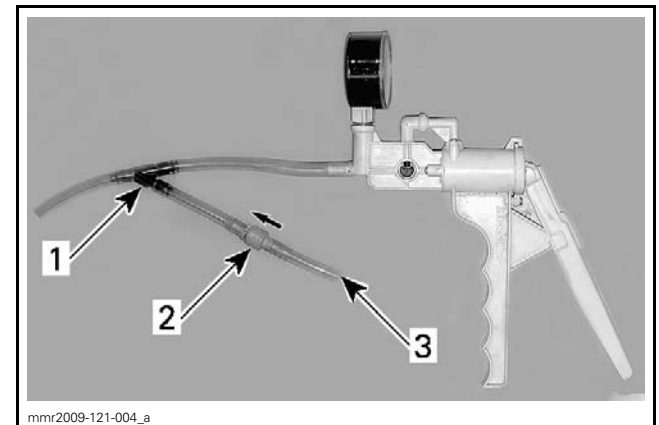
6. Use the following tool to pressurize fuel tank.

REQUIRED TOOL

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



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.



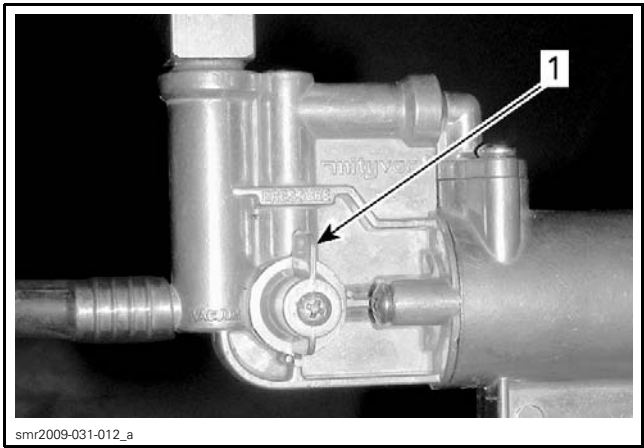
- 1. Y-fitting (P/N 293 710 059)
- 2. Check valve (P/N 275 500 505)
- 3. Apply compressed air here

7. Connect the vacuum/pressure pump to the nipple of fuel tank test cap.

8. Set vacuum/pressure pump to PRESSURE.

Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)



1. Pressure selected

9. Pressurize fuel tank to specification.

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

FUEL TANK LEAK TEST	
PRESSURE	TIME WITHOUT PRESSURE DROP
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 could possibly be a fuel pump check valve problem.

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.

FUEL TANK CAP LEAK TEST

To test the fuel tank cap, use the following tools.

REQUIRED TOOLS	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	
VENTED CAP TEST ADAPTER (THREADED) (P/N 529 036 243)	

Testing the Inlet Check Valve Function

Install the fuel tank cap onto the vented cap test adapter.

Set vacuum/pressure pump to the VACUUM function.

Connect vacuum/pressure pump to nipple of vented cap test adapter.

Squeeze the vacuum/pressure pump handle several times to draw air in through the check valve of fuel tank cap.

Air should be drawn in freely and vacuum indication on pump should remain at zero. If vacuum rises, replace the fuel tank cap.

Testing the Pressure Relief Valve Function

Set the vacuum/pressure pump to the PRESSURE function.

Squeeze the vacuum/pressure pump handle to apply pressure to the check valve of fuel tank cap and observe the pressure rise. It should be as per specification.

FUEL TANK CAP TEST	
PRESSURE	TEST RESULT
Up to 6.9 kPa (1 PSI)	Pressure must hold
Above 6.9 kPa (1 PSI) and below 13.8 kPa (2 PSI)	Pressure must release

If pressure holds above specification, replace the fuel tank cap.

Remove test adapter.

Reinstall/close fuel tank cap.

FUEL SYSTEM HIGH PRESSURE LEAK TEST

⚠ WARNING

A high pressure leak test must be carried out before starting the engine anytime a fuel system component has been disconnected for maintenance or replacement.

1. Visually inspect fuel system to ensure all fuel system connections are properly made.
2. Lightly pull on hoses at each connection to ensure they are properly locked at the quick connect fittings.
3. Install the diagnostic harness on the disconnected steering connector. This will permit activation of the electrical system for testing using the vehicle controls.

REQUIRED TOOL

DIAGNOSTIC HARNESS
(P/N 529 036 384)



4. Remove tether cord from the engine cut-off switch to prevent engine starting.
5. Press the START button to turn on the fuel pump for a few seconds and pressurize the fuel system.

NOTE: As you press the START button, take a firm hold of the fuel pump outlet hose. You should feel the fuel pump operation.

6. Check for fuel odor and visually inspect hoses, fittings and components for leaking fuel.
 - If a leak is detected, repair or replace the leaking component and repeat leak test after the repair.
 - If no leak is found, engine can be started.

TESTING THE FUEL PUMP PRESSURE

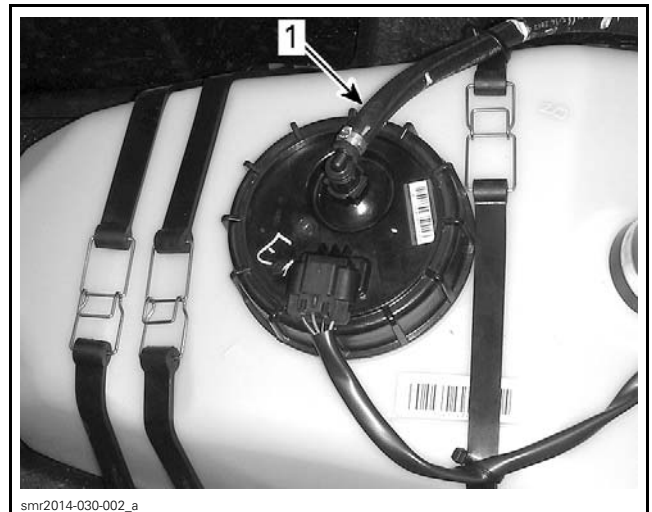
Preparation

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. Install the diagnostic harness on the disconnected steering connector. This will permit activation of the electrical system for testing using the vehicle controls.
3. Ensure hoses and fittings are not leaking. Repair any leak.
4. Ensure there is enough gas in the fuel tank.
5. 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.





TYPICAL

1. Outlet hose

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

Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)

REQUIRED TOOLS	
PRESSURE GAUGE (P/N 529 036 395)	
FUEL HOSE ADAPTER (P/N 529 036 396)	



TYPICAL

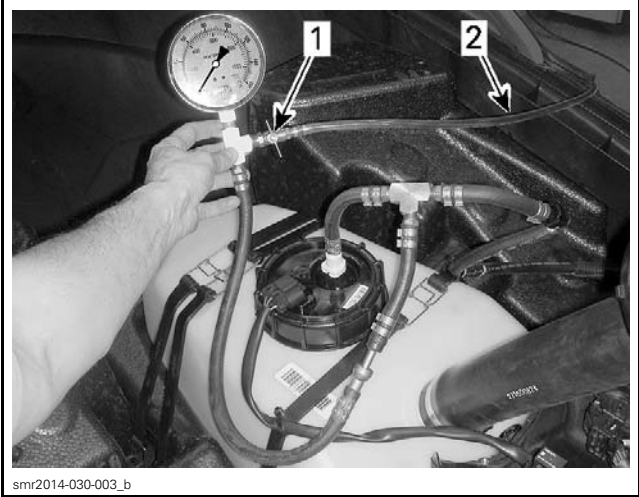
1. Connect to fuel pump
2. Connect to outlet hose

Testing 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).

NOTE: Be sure to drain the fuel pressure into an approved fuel container.

4. Repeat test twice and compare readings to specifications in following table.



TYPICAL - FUEL PUMP PRESSURE TEST

1. Pressure relief valve on gauge
2. Hose to a fuel drain bottle

FUEL PRESSURE (WHEN PRESSING THE START BUTTON)
356 kPa - 400 kPa (52 PSI - 58 PSI)

Testing when Cranking or Starting Engine

NOTICE The engine must not be run out of water without providing proper cooling to the exhaust system. Maximum engine run time out of water is 2 minutes. Failure to do so may result in damage to the exhaust system and engine. Refer to *EXHAUST SYSTEM* subsection.

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.

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

PROCEDURES

FUEL HOSES AND OETIKER CLAMPS

NOTE: To access all fuel system components for a thorough inspection, the central body must be removed. Refer to *BODY* subsection.

Inspecting the Fuel Hose

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

Replacing the Fuel Hose

When replacing fuel hoses, be sure to use OEM hoses and clamps. This will ensure continued proper and safe operation.

⚠ WARNING

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

⚠ 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 performing a *FUEL PUMP PRESSURE TEST*.

Replacing the 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 Operation

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.

NOTE: As you press the START button, take a firm hold of the fuel pump outlet hose. You should feel the fuel pump operation.

4. If fuel pump runs, carry out the *TESTING THE FUEL PUMP PRESSURE* as described in *INSPECTION* of this subsection.
5. If the fuel pump does not run:
 - Check if multifunction gauge comes on when start button is pressed.
 - If the gauge does not come on, check fuses F1, F2 and F3. If a fuse is faulty, replace it and repeat the test.
 - If the gauge came on, connect the vehicle to BRP diagnostic software (BUDS2) and check for fault codes. Carry out service actions.

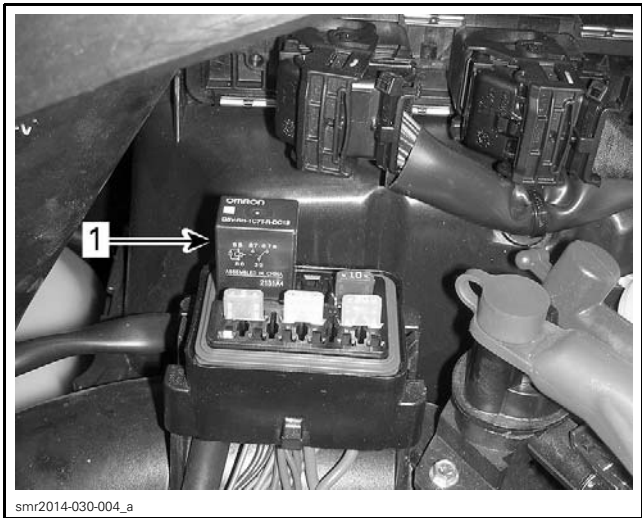
Testing the Fuel Pump Pressure

Refer to *INSPECTION* in this subsection.

Testing the Fuel Pump Circuit

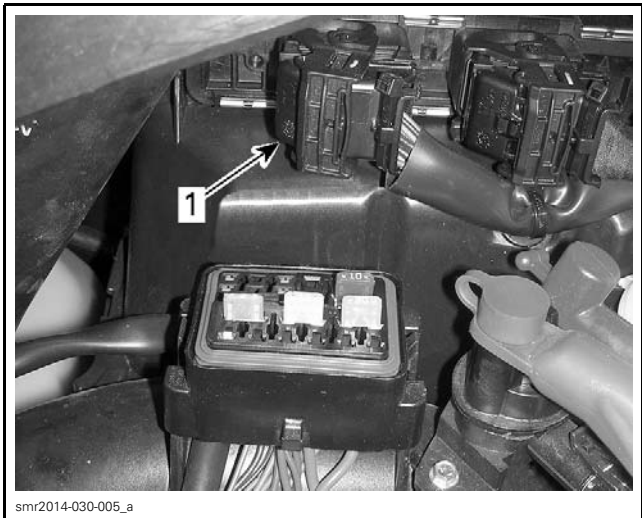
1. Remove fuse box cover.
2. Remove relay from fuse box.

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



1. Relay to remove

3. Remove ECM-B connector and install it on the ECM adapter tool.



TYPICAL
1. ECM-B connector to remove

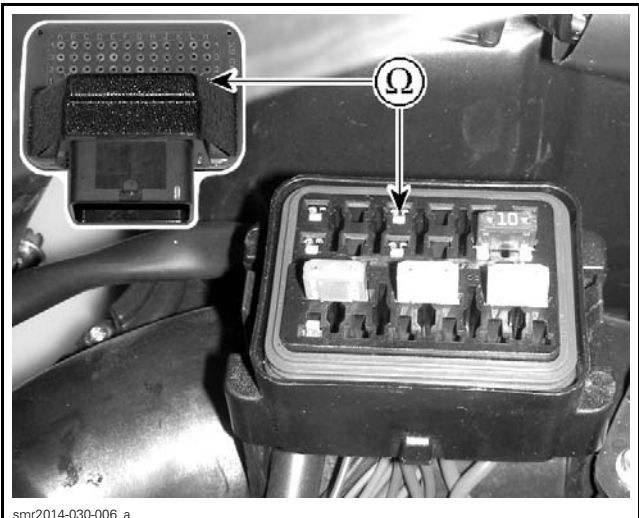
REQUIRED TOOL

ECM ADAPTER TOOL (P/N 529 036 166)

4. Set multimeter to Ω and test pump circuit as per following table.

PUMP CIRCUIT TEST THROUGH FUEL PUMP

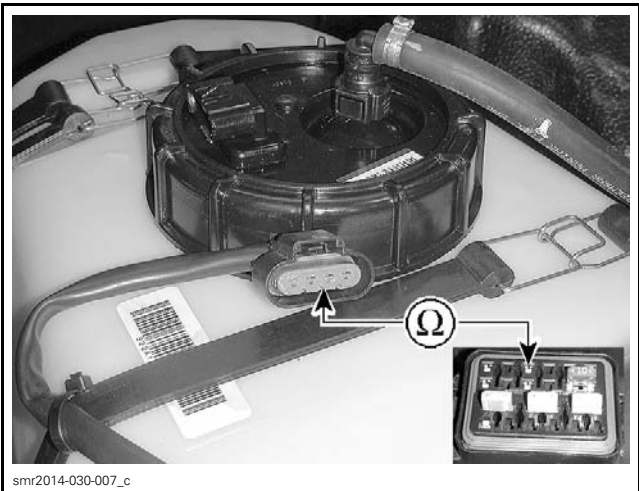
TEST PROBES		RESISTANCE @ 20°C (68°F)
Fuse box terminal A4	ECM connector B pin B-M1	Approx. 12 Ω



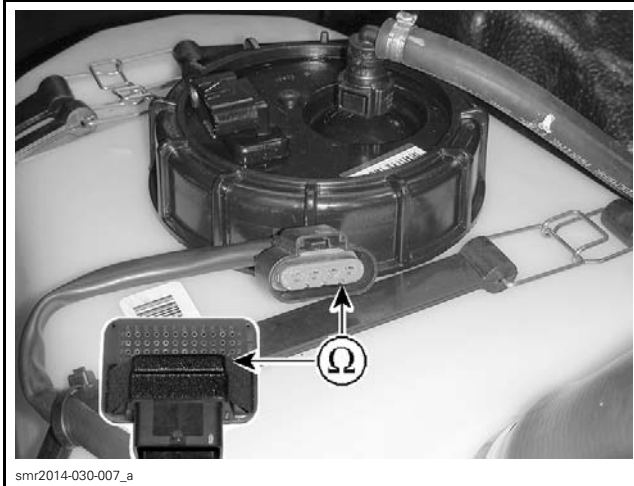
5. If test succeeded, the fuel pump and its wiring are electrically good. The problem may be a mechanical problem internal to the fuel pump, or an internal ECM problem that does not provide the control ground for the pump.
6. If test failed:
- Disconnect fuel pump connector.
 - Test wiring continuity as per following table.

FUEL PUMP HARNESS CONTINUITY TEST (WIRING ONLY)

TEST PROBES		RESISTANCE @ 20°C (68°F)
Pump harness connector pin B	Fuse box terminal A4	Close to 0 Ω (continuity)
Pump harness connector pin A	ECM connector B pin B-M1	



TYPICAL



TYPICAL

If there is an open circuit to FB-A4, repair wiring/connector or JT VT between fuel pump and fuse box. Refer to wiring diagram.

If there is good there is an open circuit to the ECM, repair or replace wiring and connectors as required.

If the test succeeded, carry out the *TESTING THE FUEL PUMP INPUT VOLTAGE*.

Testing the Fuel Pump Input Voltage

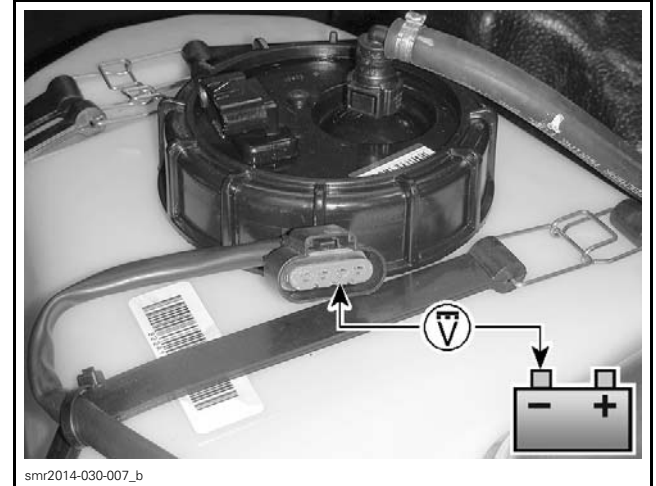
1. Ensure the relay is installed in the fuse box and that fuses F1, F2 and F3 are in good condition.

NOTE: The fuel pump does not have a dedicated fuse. However, if any one of the listed fuses is open circuit, electrical power will not come on, or stay on.

2. Install the diagnostic harness on the disconnected steering connector. This will permit activation of the electrical system for testing using the vehicle controls.
3. Use the multimeter.
4. Select Vdc.
5. Press the START button.
6. Read voltage at fuel pump harness connector as per following table.

NOTICE Do not force a probe in the connector sockets. If so, the sockets may be permanently damaged causing poor pin contact with socket resulting in the requirement to replace the socket(s), or the connector.

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 control circuit from ECM. Refer to *TESTING THE FUEL PUMP CIRCUIT*.

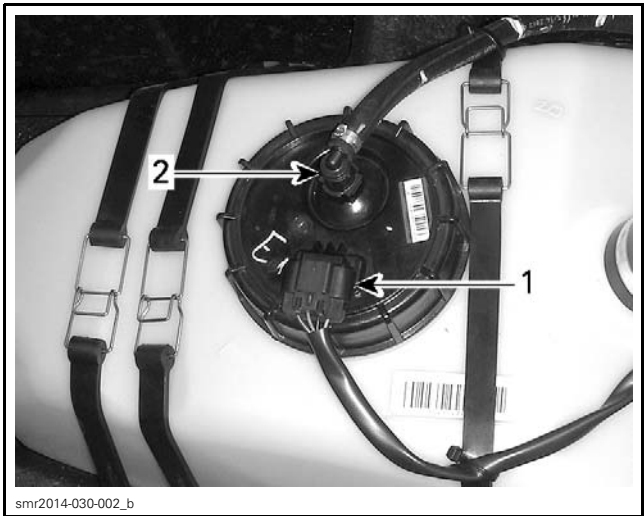
If battery voltage is not read, power circuit is faulty. Test continuity of power circuit wiring between fuse box and fuel pump. Refer to *TESTING THE FUEL PUMP CIRCUIT* in this subsection.

If every test succeeded and fuel pump still does not work, the problem may be a mechanical fuel pump problem, or the ECM that does not provide the ground control signal to the fuel pump. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Removing the Fuel Pump


1. Disconnect the negative battery terminal, refer to *CHARGING SYSTEM* subsection.
2. Disconnect fuel pump electrical connector.
3. 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.

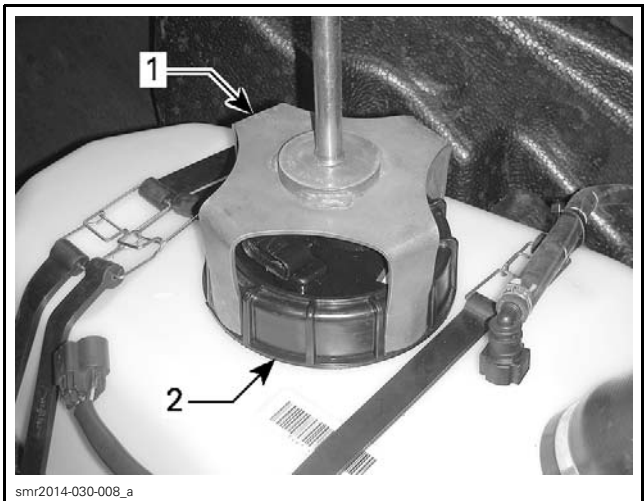
Section 04 FUEL SYSTEM
Subsection 02 (FUEL TANK AND FUEL PUMP)



TYPICAL
1. Fuel pump harness connector
2. Quick connect fitting (high pressure fuel hose)

4. Unscrew the fuel pump retaining nut.


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



TYPICAL
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.

5. 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.

6. 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

The installation is the 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.



TYPICAL - FUEL PUMP MODULE INDEXING
1. Align marks

4. Tighten fuel pump nut to specification.

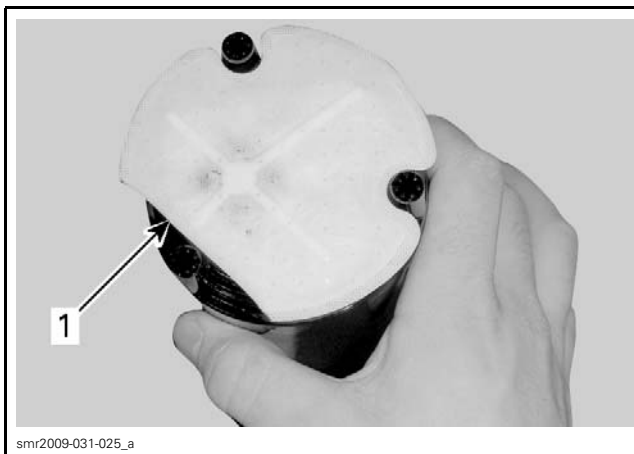
TIGHTENING TORQUE	
Fuel pump nut	60 N•m ± 7 N•m (44 lbf•ft ± 5 lbf•ft)

5. Carry out a *FUEL TANK LEAK TEST* and a *FUEL SYSTEM HIGH PRESSURE LEAK TEST*. See procedures in this subsection.

FUEL FILTER

Inspecting the Fuel Filter

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



1. Fuel filter

Removing the Fuel Filter

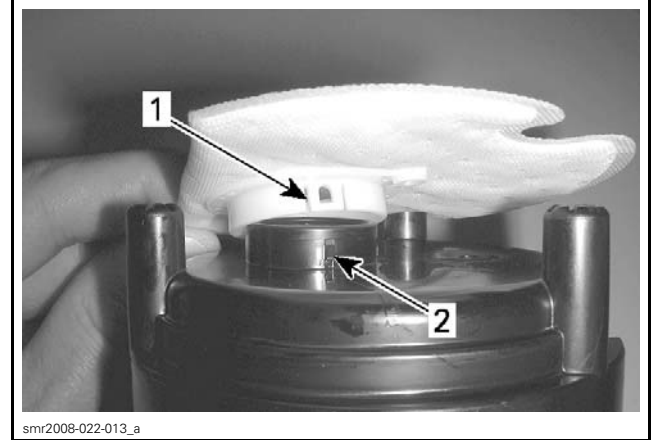
The lower fuel filter on the fuel pump module does not require replacement under normal operating conditions. Replace only if permanently clogged or damaged.

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.

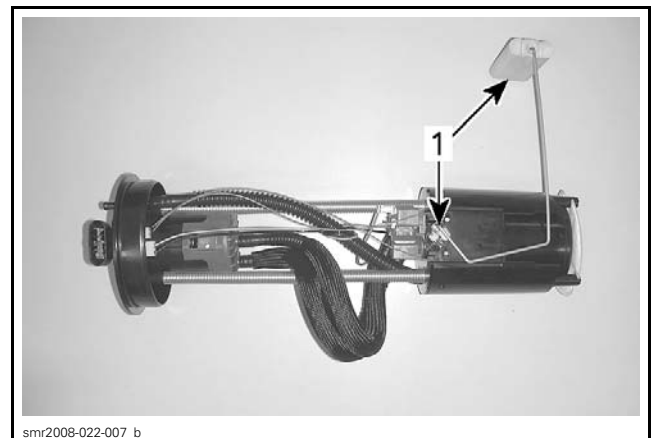
Installing the Fuel Filter

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. Carry out a *FUEL SYSTEM HIGH PRESSURE LEAK TEST* as described in this subsection.
5. Install or 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 multifunction gauge.



TYPICAL — FUEL PUMP MODULE
 1. Fuel level sensor

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

The multifunction gauge 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 multifunction gauge.

Fuel Level Troubleshooting

Table with 2 columns: SYMPTOM, POSSIBLE CAUSE. Rows include: Fuel gauge always display EMPTY (Wiring/connectors, Fuel level sensor, Float stuck in low position); Fuel gauge always display FULL (Water in fuel pump connector, Float stuck in full position); Fuel level sensor fault code (Wiring/connectors, Fuel level sensor); Fuel gauge displays wrong level (Low battery voltage, Fuel level sensor fault).

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

Testing the Fuel Level Sensor
Resistance at Steering Connector

- 1. Disconnect steering connector. Refer to WIRING HARNESS AND CONNECTORS subsection for location.
- 2. Connect the diagnostic harness to make an in-line connection between the disconnected connectors.
- 3. Briefly press the START button to wake up the ECM.
- 4. Install the tether cord on the engine cut-off switch.
- 5. Use the multimeter and select Ω.
- 6. Alternately drain then fill fuel tank and measure the sensor resistance between pin 19 and battery ground.

Table with 2 columns: RESISTANCE (Ω), FLOAT HEIGHT (MM). Rows show resistance values (4.8 to 57.8 Ω) and corresponding float heights (260.2 to 117.6 MM) for FULL, HALF, and EMPTY states.

Table with 2 columns: RESISTANCE (Ω), FLOAT HEIGHT (MM). Rows show resistance values (67.8 to 89.8 Ω) and corresponding float heights (84.6 to 27.3 MM) for FULL, HALF, and EMPTY states. Includes diagrams of the fuel tank and float assembly.

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, check continuity of wire from steering connector to multifunction gauge connector. Refer to WIRING DIAGRAM.

If continuity is good, the fuel level circuit and sensor are good. If fuel level does not work in multifunction gauge, try a new one.

If readings are out of specifications at the steering connector, perform the TESTING THE FUEL LEVEL SENSOR RESISTANCE AT INFORMATION CENTER.

Repair or replace wiring and connectors as required.

- 7. Use the multimeter and select Vdc.
- 8. Measure the voltage at the test connector of the diagnostic harness as follows.

Table with 3 columns: FUEL TANK LEVEL, TEST CONNECTOR OF DIAGNOSTIC HARNESS, VOLTAGE. Rows show voltage values (0.14 Vdc, 2.7 Vdc) for Full and Empty fuel tank levels.

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.

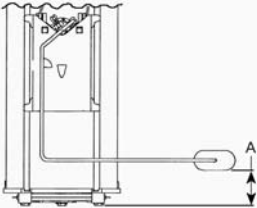
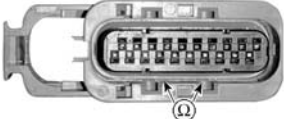
If voltage is out of specifications, proceed with *TESTING THE FUEL LEVEL SENSOR RESISTANCE AT INFORMATION CENTER* as described in this subsection.

Remove diagnostic harness and reconnect connector.

Testing the Fuel Level Sensor Resistance at Information Center

1. Disconnect information center (multifunction gauge) connector. Refer to *INFORMATION CONNECTOR* subsection.
2. Use the multimeter and select Ω .
3. Alternately drain then fill fuel tank and measure the sensor resistance between the pins 3 and 4.

RESISTANCE (Ω)	FLOAT HEIGHT (MM)
4.8 ± 2.2	268.9 ± 3.0 (FULL)
17.8 ± 2.2	240.6 ± 3.0
27.8 ± 2.2	219.1 ± 3.0
37.8 ± 2.2	193.8 ± 3.0
47.8 ± 2.2	161.9 ± 3.0 (HALF)
57.8 ± 2.2	128.3 ± 3.0
67.8 ± 2.2	94.1 ± 3.0
77.8 ± 2.2	60.6 ± 3.0
89.8 ± 2.2	28.8 ± 3.0 (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, perform the *TESTING 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, carry out a *TESTING THE FUEL LEVEL SENSOR RESISTANCE AT FUEL PUMP*.

4. Reconnect information center (multifunction gauge) connector.

Testing the Fuel Level Sensor Resistance at Fuel Pump

1. Remove central body, refer to *BODY* subsection.
2. Disconnect fuel pump module connector.



TYPICAL
1. Fuel pump module connector

3. 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 THE FUEL LEVEL SENSOR RESISTANCE AT MULTIFUNCTION GAUGE*.

Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)

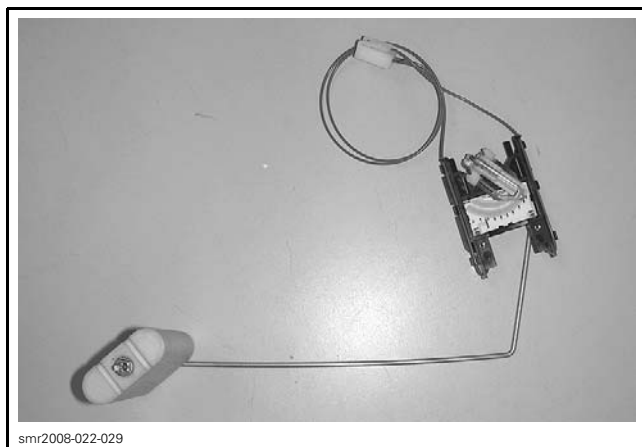


TYPICAL - FUEL LEVEL SENSOR RESISTANCE TEST

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 *REMOVING THE FUEL PUMP* in this subsection.

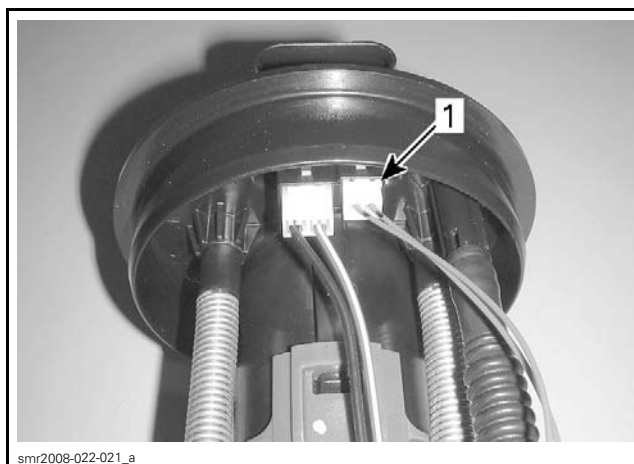
WARNING

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

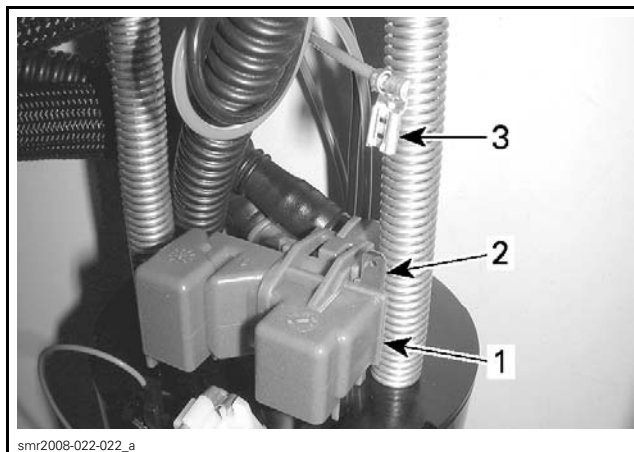
NOTE: Note routing of fuel level sensor wires prior to disconnecting the sensor from the fuel pump module flange.

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.

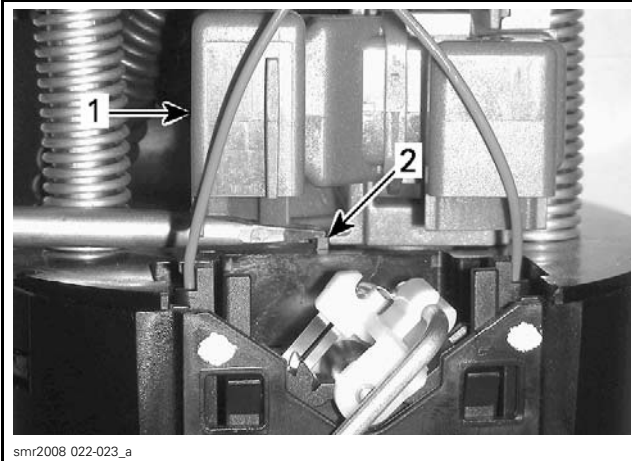


1. Pressure regulator
2. Ground wire contact on pressure regulator
3. Ground wire disconnected

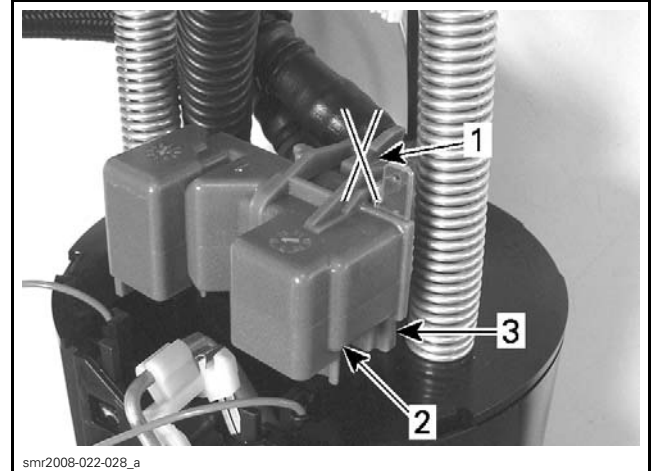
5. Using a flat screwdriver, press down on the locking tab just below the pressure regulator to release it from the pump reservoir cover, and rotate it clockwise simultaneously so that it slips over the locking tab.

Section 04 FUEL SYSTEM

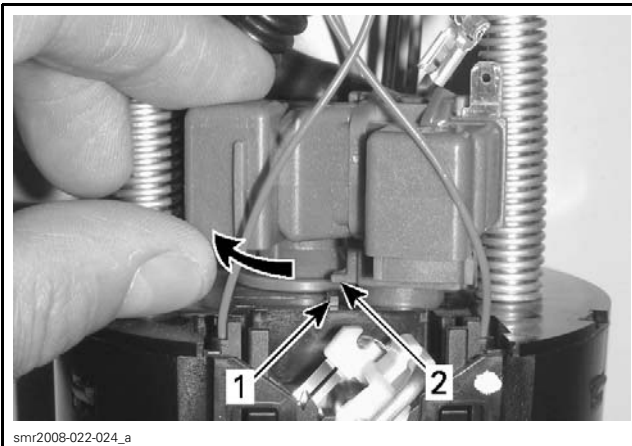
Subsection 02 (FUEL TANK AND FUEL PUMP)



1. Pressure regulator
2. Pressure regulator locking tab

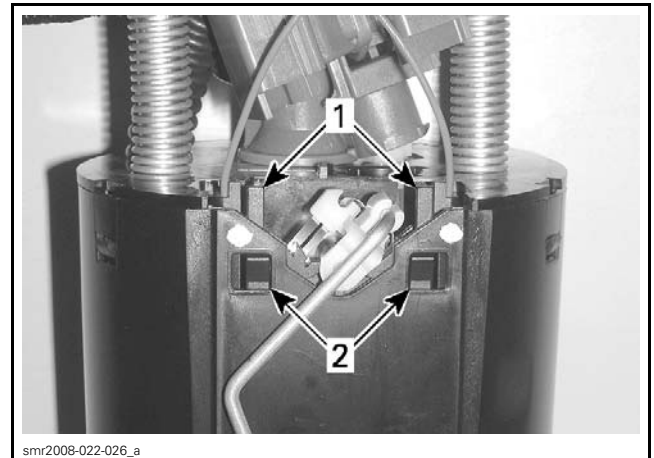


1. Do not remove pressure regulator cover at locking tabs
2. Pressure regulator cover
3. Pressure regulator housing

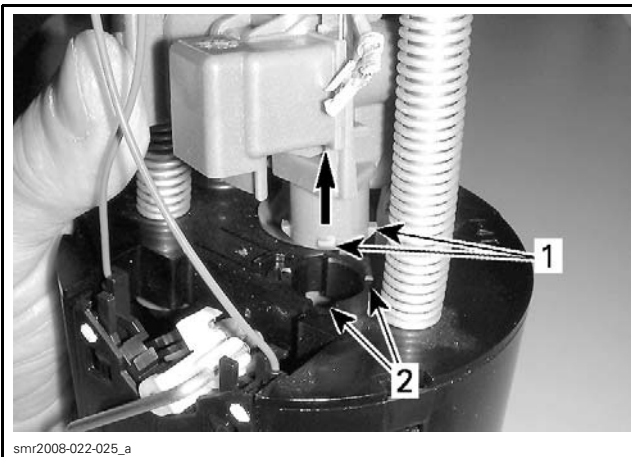


1. Pressure regulator locking tab
2. Pressure regulator rotated clockwise over locking tab

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

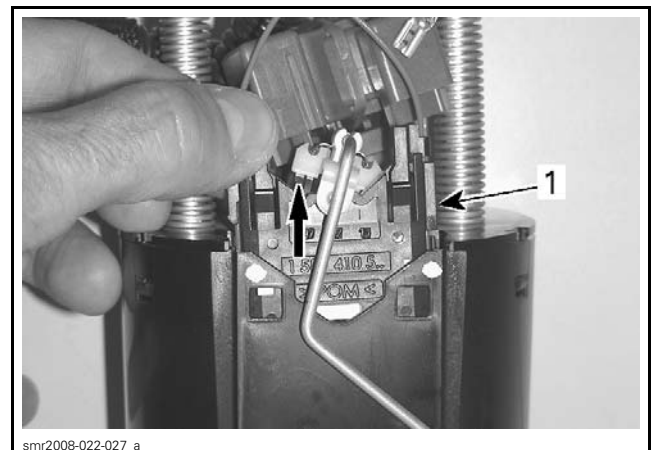


1. Fuel level sensor release tabs
2. Locking pins



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

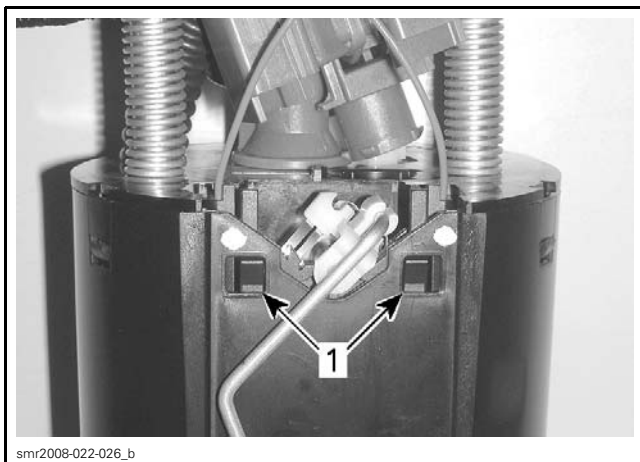
Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)

Installing the Fuel Level Sensor

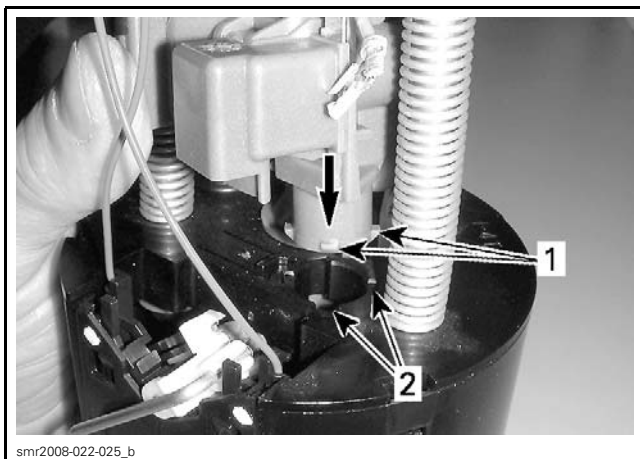
Installation is the reverse of the removal procedure however, pay attention to the following.

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



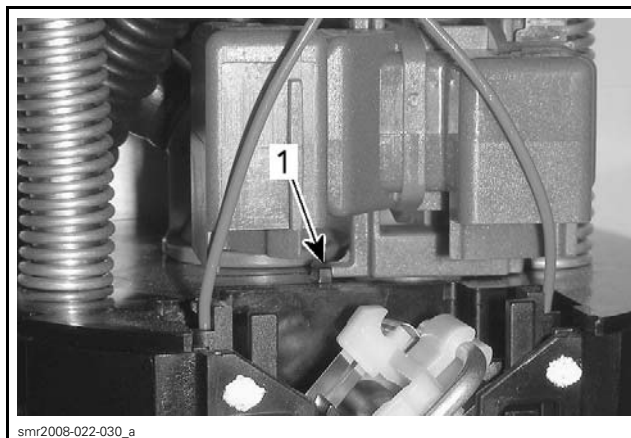
1. Ensure engagement of sensor locking pins

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

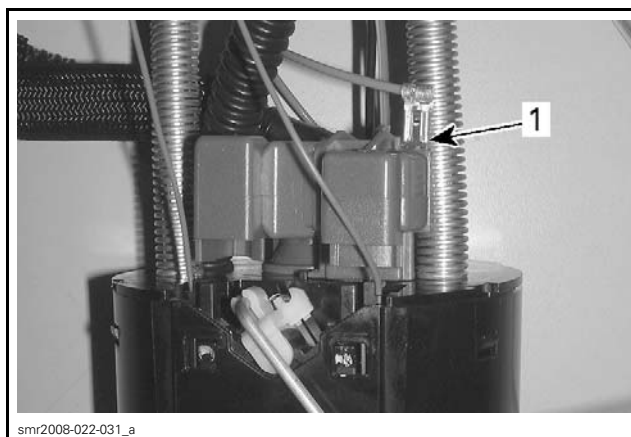
1. Pressure regulator alignment tabs
2. Fuel pump reservoir alignment tabs



TAB UP WHEN PRESSURE REGULATOR PROPERLY LOCKED

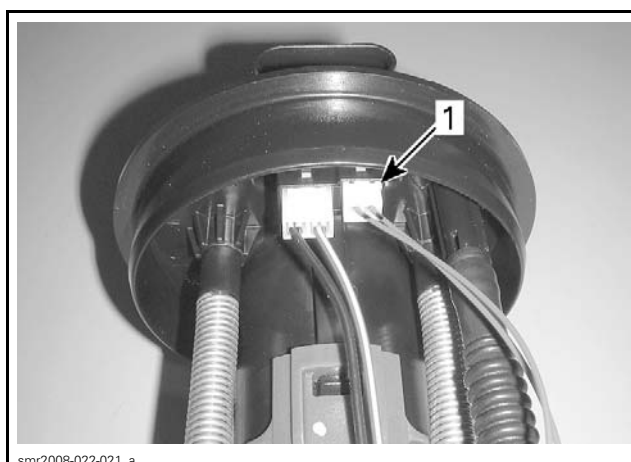
1. Pressure regulator locking tab

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. Carry out *TESTING THE FUEL LEVEL SENSOR RESISTANCE* as described in this subsection.

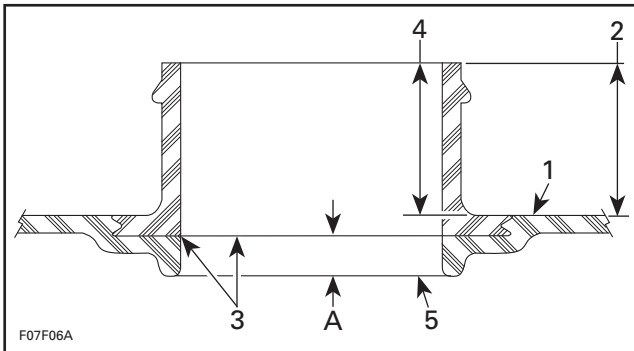
6. Reinstall the fuel pump module. Refer to *INSTALLING THE FUEL PUMP* in this subsection.

FUEL TANK

Inspecting the Fuel Tank

1. Inspect fuel tank retaining straps for wear, cracks or any other damages. Inspect strap clip anchors and bolts.
2. Inspect fuel tank for wear caused by any abnormal contact or rubbing with other component(s).
3. Disconnect fuel filler hose from fuel tank.
4. Inspect fuel tank filler hose for wear, cracks or other damages.
5. Visually inspect the inside and outside of the fuel tank filler necks for crack(s). If crack(s) are found, replace fuel tank.
6. With your fingers, feel the inside and outside surfaces of fuel tank, especially near the filler neck.
7. 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)

8. Install filler hose and tighten retaining clamps to specification.



TYPICAL - INDEXING WITH FUEL TANK

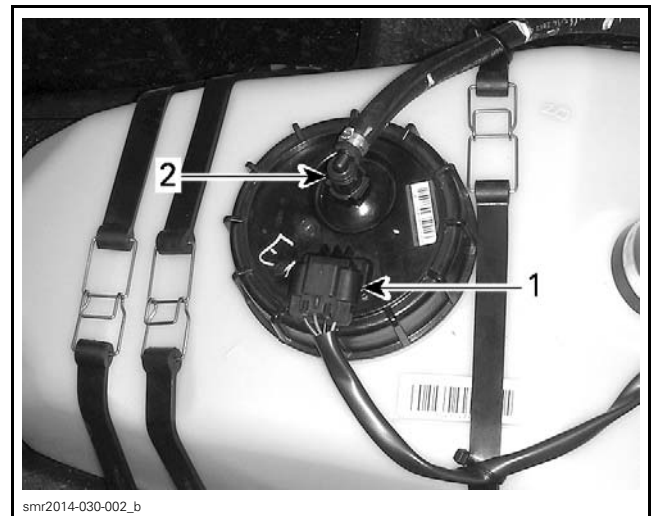
1. Index mark on fuel tank
2. Index mark drawn on hose before removal

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

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

Removing the Fuel Tank

1. Siphon fuel tank.
2. Disconnect fuel pump connections. Do not cut any locking ties. It is not necessary for fuel tank removal.



TYPICAL

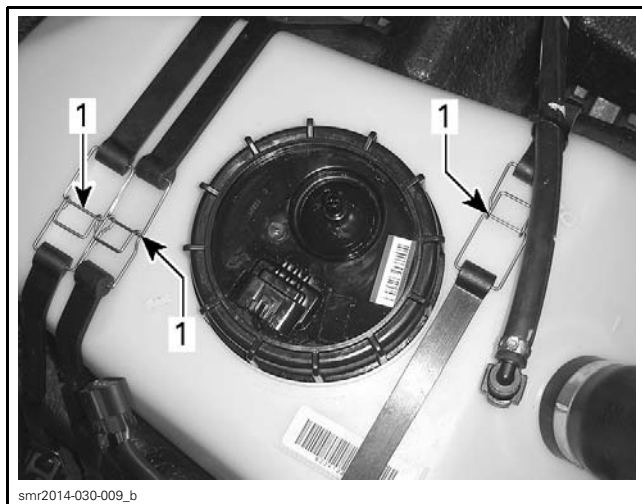
1. Fuel pump harness connector
2. Quick connect fitting (high pressure fuel hose)

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

3. Detach fuel tank retaining straps.

Section 04 FUEL SYSTEM

Subsection 02 (FUEL TANK AND FUEL PUMP)



TYPICAL

1. Detach fuel tank retaining straps here

4. Remove fuel tank from the vehicle.

5. Remove fuel pump as necessary. Refer to *FUEL PUMP* in this subsection.

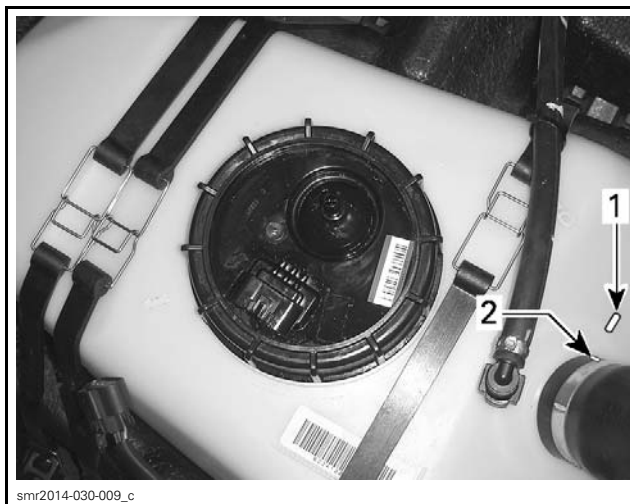
6. Inspect hull and flotation foams for wear.

NOTE: If replacing fuel tank with a new one, be sure to mark the fuel filler hose position with the hose index mark on the fuel tank before removing the hose from the old tank. This will ease alignment of the retaining screws of the filler neck adapter to the central body.

Installing the Fuel Tank

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

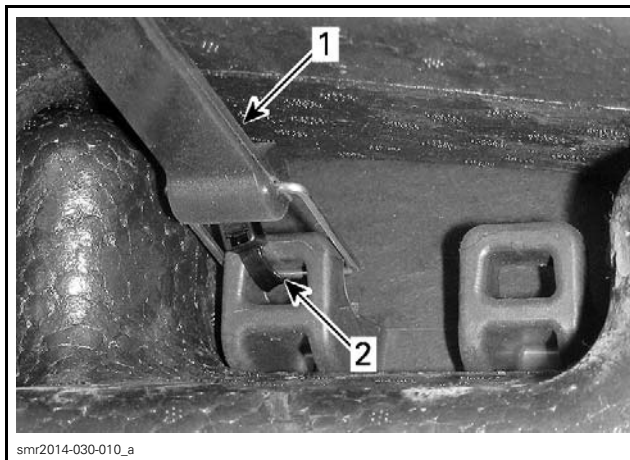
1. Reinstall fuel pump if it was removed. Refer to *FUEL PUMP* in this subsection.
2. If replacing fuel tank with a new one, be sure to align mark on filler hose with index mark on fuel tank.



1. Index mark on fuel tank
2. Index mark drawn on hose before removal

3. Ensure flotation foam is properly positioned under fuel tank.

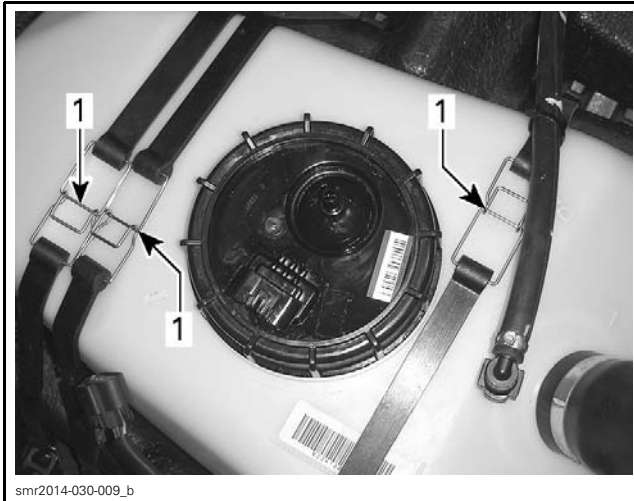
4. Ensure fuel tank retaining straps are properly secured to anchor points in hull using locking ties.



1. Fuel tank retaining strap
2. Strap clip secured with locking tie to anchor point in hull

5. Insert fuel tank in hull.

6. Secure retaining strap ends on top of fuel tank.



TYPICAL

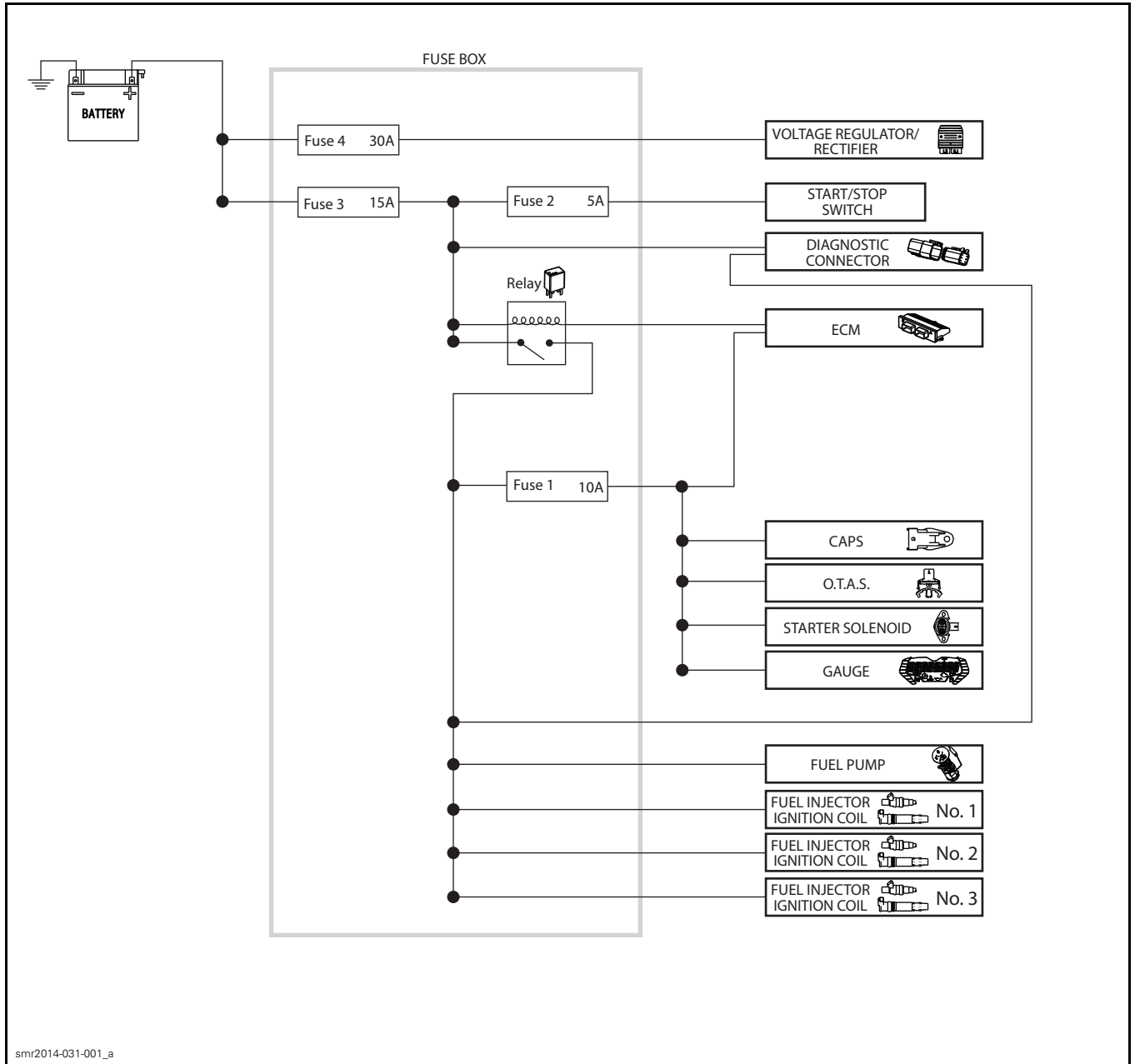
1. Fuel tank retaining strap

7. Properly secure wire harness, cables and hose as prior to removal using appropriate locking ties.
8. Reinstall all other removed parts Refer to applicable subsections.
9. When vehicle reassembly is complete, carry out a *FUEL TANK LEAK TEST* and a *FUEL SYSTEM HIGH PRESSURE LEAK TEST* as described in this subsection.
10. Reinstall the central body. Refer to *BODY* subsection.

NOTE: If the retaining screws for the filler neck adapter do not align with the holes in the central body, loosen the filler hose clamp and slightly rotate the hose. Be sure to retighten hose clamp to specification.

POWER DISTRIBUTION AND GROUNDS

POWER DISTRIBUTION DIAGRAM



Section 05 ELECTRICAL SYSTEM

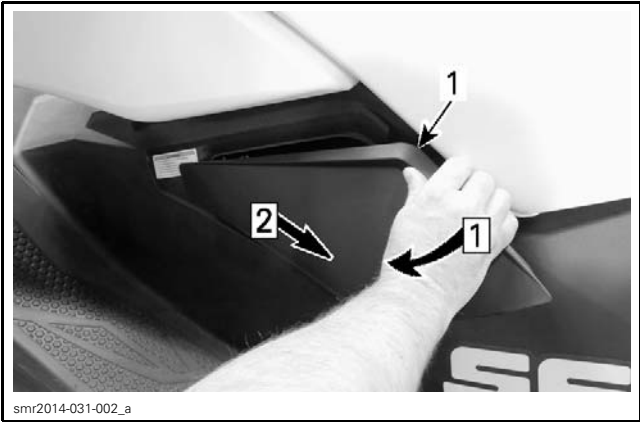
Subsection 01 (POWER DISTRIBUTION AND GROUNDS)

GENERAL

FUSE BOX

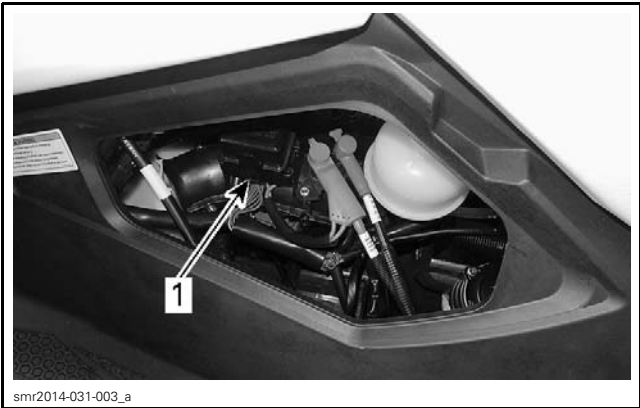
Fuse Box Location

It may be reached through the LH access cover.



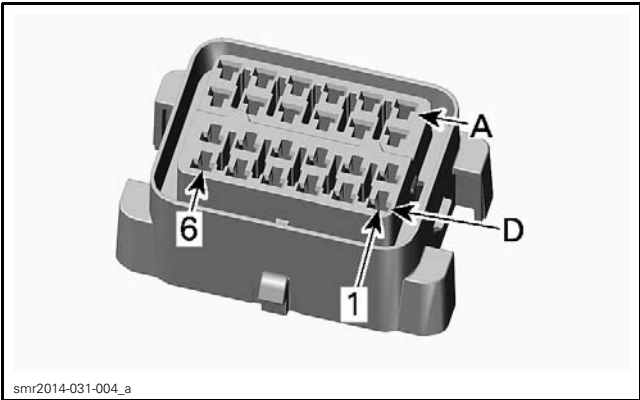
1. LH access cover
Step 1: Pull the RH upper corner outwards
Step 2: Slide the cover rearwards

The fuse box is located on the inlet baffle of the air intake silencer.



1. Fuse box

Fuse Identification



FUSE BOX PIN IDENTIFICATION

NO.	DESCRIPTION	
F1	Through relay: <ul style="list-style-type: none">– ECM– CAPS– OTAS– Starter Solenoid– Gauge	10 A
F2	Direct power (through F3): <ul style="list-style-type: none">– Start/Stop Switch	5 A
F3	Direct power <ul style="list-style-type: none">– F2– Relay– Diagnostic Connector	15 A
F4	Direct power <ul style="list-style-type: none">– Voltage regulator/rectifier	30 A

RELAY

Relay Pin Identification

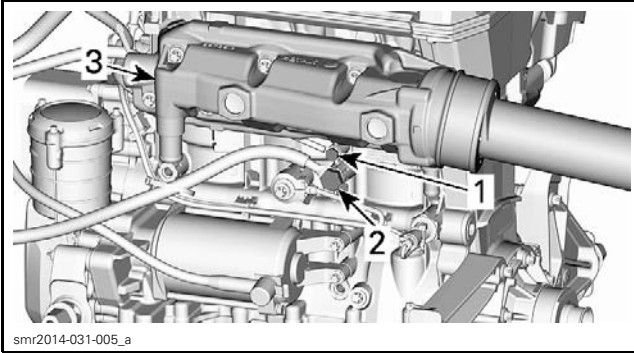
The relay is in the fuse box. Refer to *FUSE BOX LOCATION*.

RELAY PIN IDENTIFICATION		
FUNCTION	FUSE BOX PIN	CONDITION
12-volt input at winding	A6	Direct battery power from fuse F3
Control	B4	Grounded by ECM B pin H2 once START/STOP is depressed
12-volt input at contacts	B6	Direct battery power from fuse F3
12-volt output	A4	-

GROUND

Ground Location

All the ground terminals are located on the LH side of engine, just under the exhaust manifold.



LH SIDE OF ENGINE

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

WIRING HARNESS AND CONNECTORS

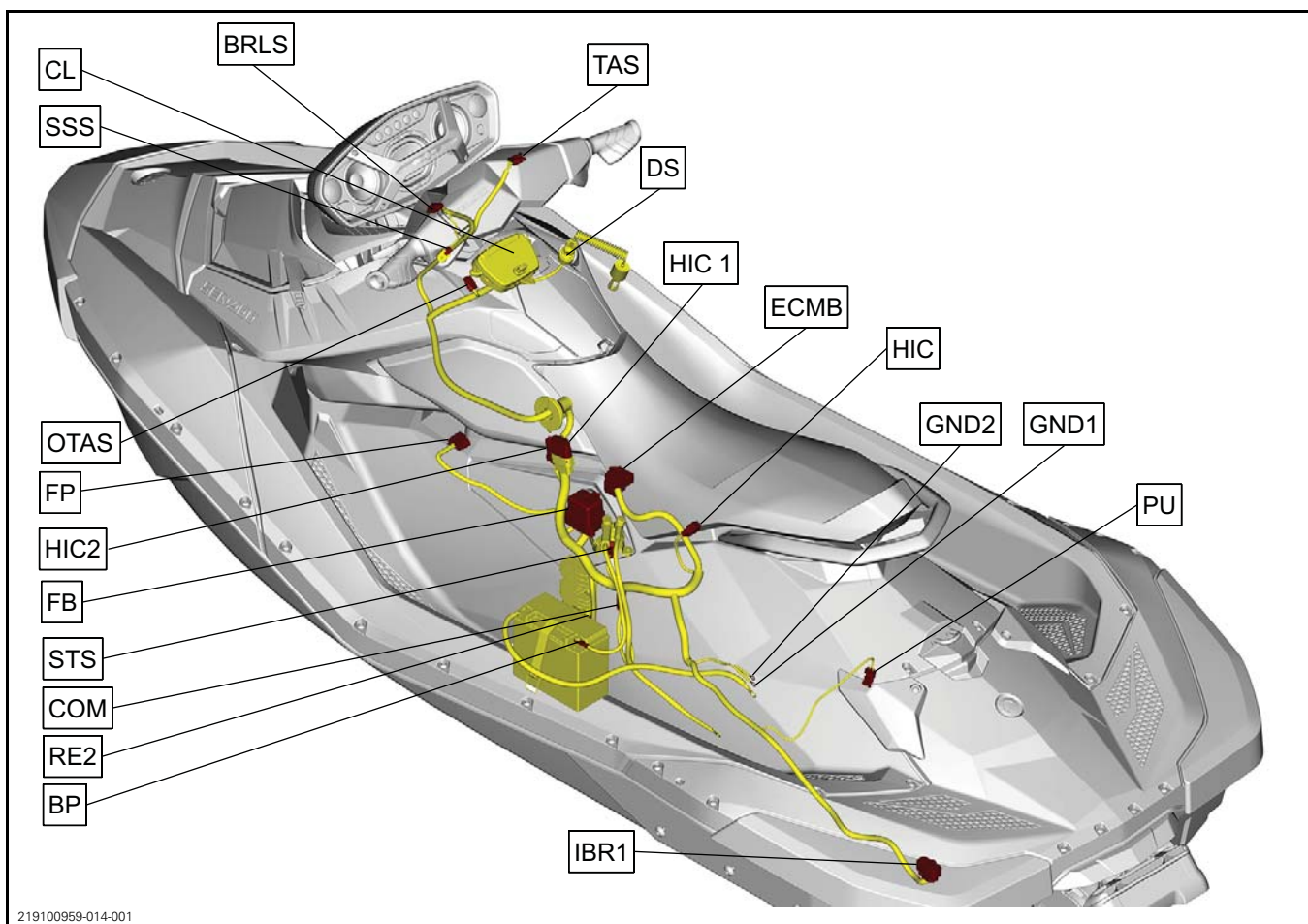
SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	111
ECM ADAPTER TOOL.....	529 036 166	108
ECM TERMINAL REMOVER 2.25.....	529 036 175	108
ECM TERMINAL REMOVER 3.36.....	529 036 174	108

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
DELPHI TERMINAL EXTRACTOR	12094429	109–110
FCI TERMINAL EXTRACTOR TOOL	54241678	111
GM TERMINAL EXTRACTOR.....	12094430	113
MOLEX 150 TERMINAL EXTRACTOR TOOL	63813 - 1500	111

WIRING HARNESS AND CONNECTORS



GENERAL

ACRONYM	DEFINITION
BP	Battery Post
BRLS	Brake and Reverse Lever Sensor
CL	Cluster
COM	Communication/Diagnostic connector
DS	DESS Post
ECMB	ECM connector B
FB	Fuse box
FP	Fuel Pump
GND1	Ground iBR
GND2	Ground Fuse Box
HIC	Harness Inter Connector to Engine
HIC1	Harness Inter Connector to Steering
iBR	Intelligent Brake and Reverse
OTAS	Off Throttle Assisted Steering
PU	Bilge Pump
RE2	Reg/Rect connector 2
SSS	Start Stop Switch
STS	Starter Solenoid
TAS	Throttle Accelerator Sensor

PROCEDURES

WARNING

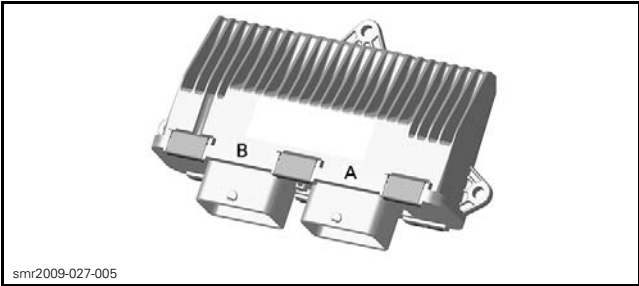
When disassembling any connector for repair or replacement on the vehicle, always disconnect the battery to ensure all electrical power is removed and prevent any possibility of a short circuit. Refer to *CHARGING SYSTEM* subsection.

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".

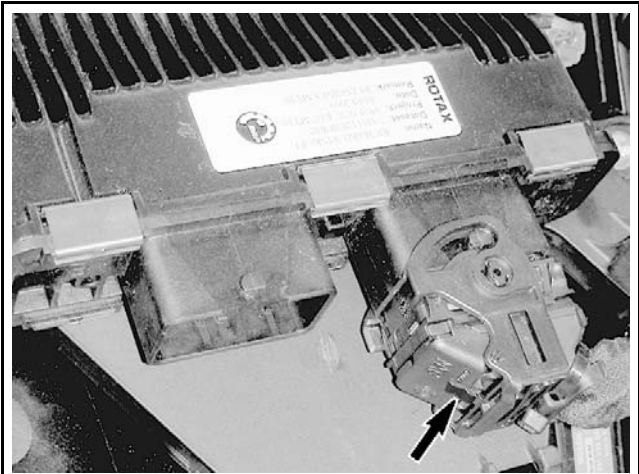
Each ECM connector has 48 pins however, connectors "A" and "B" are not interchangeable due to their specific keyways.



ECM CONNECTORS

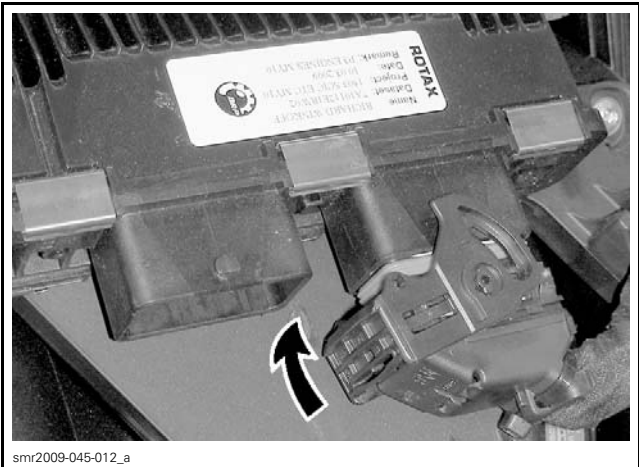
Removing the Connectors

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.

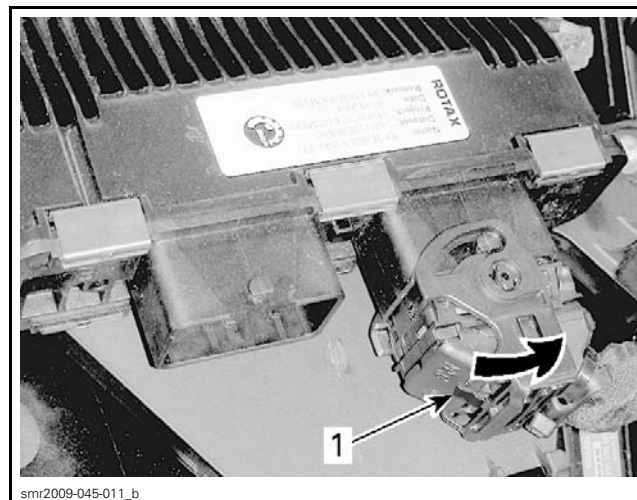
Section 05 ELECTRICAL SYSTEM

Subsection 02 (WIRING HARNESS AND CONNECTORS)



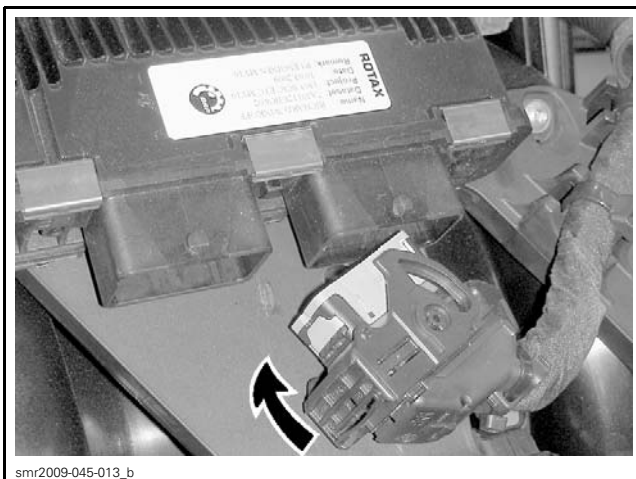
Installing the Connectors

1. Fully open connector locking cam.



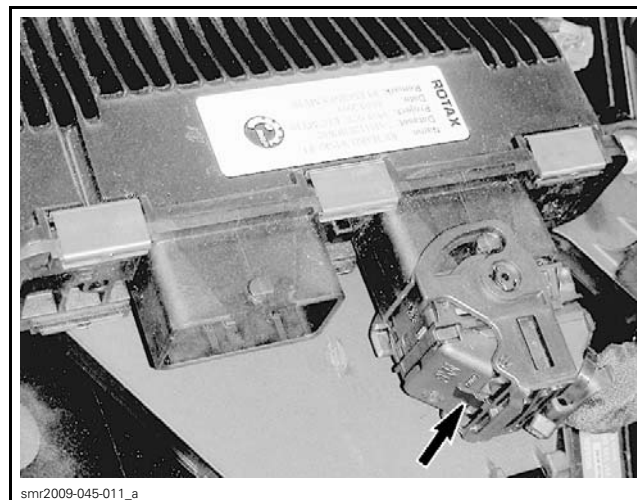
1. Locked here

4. Ensure the locking tab is fully out.



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.



LOCKING TAB FULLY OUT

Inspecting the Connectors

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.


Section05 ELECTRICAL SYSTEM

Subsection 02 (WIRING HARNESS AND CONNECTORS)

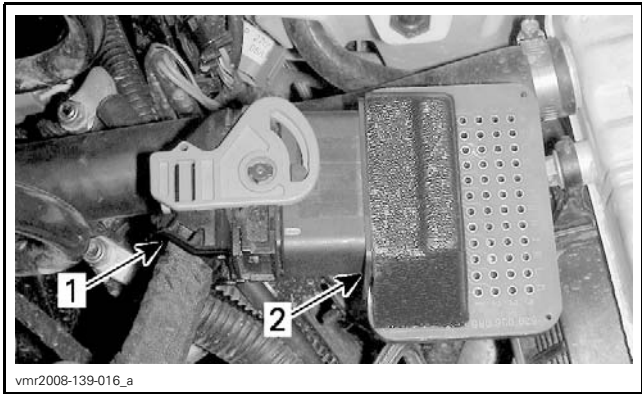
NOTICE Do not apply any lubricant product to the pins of the ECM connector.

Probing the Connectors

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.

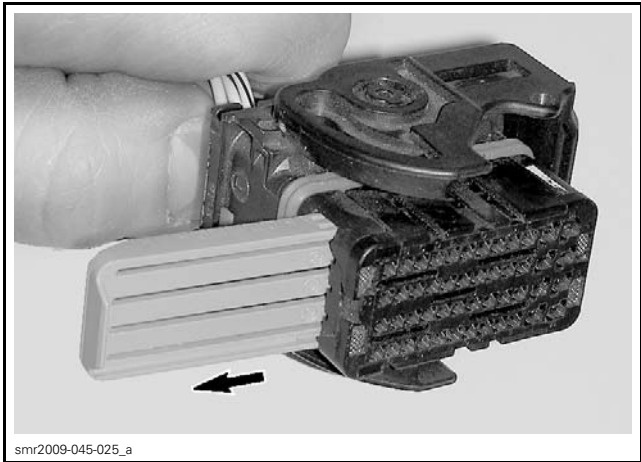
Removing the Connector Terminal (Harness Connector)

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

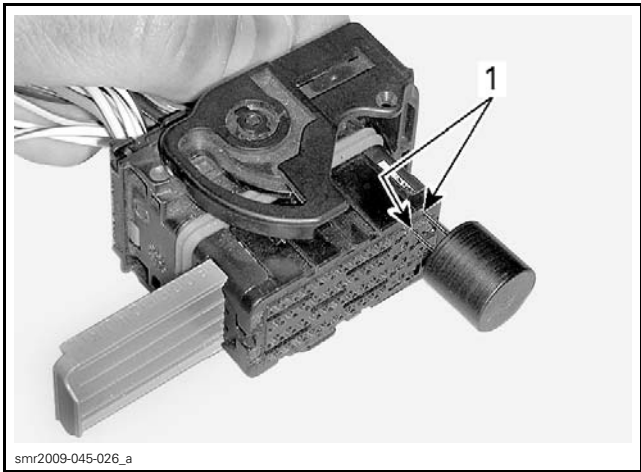
To remove a power terminal, use the ECM terminal remover 3.36.

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

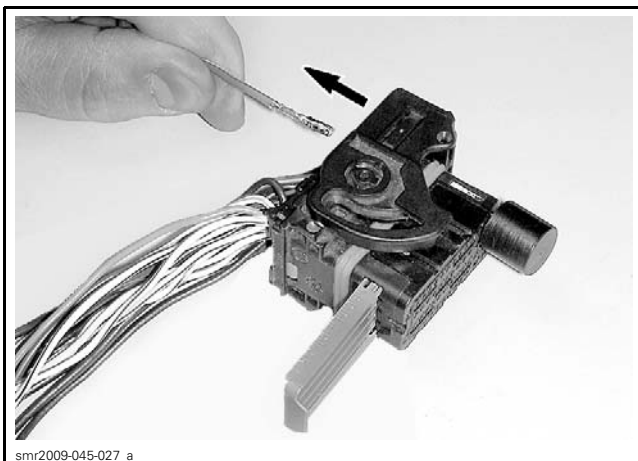
1. Remove rear protector from connector.
2. Pull out the connector lock.



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.




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.

TAS, STS, FP, BILGE PUMP, AND OTAS CONNECTORS (DELPHI/PACKARD)

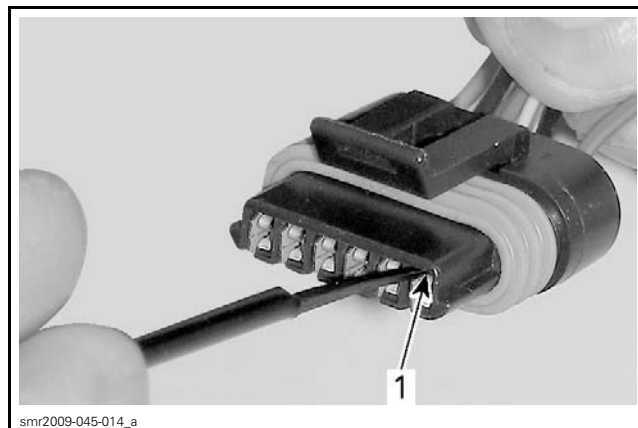
Connector Terminal Removal

To remove a terminal (pin) from the connector, use a special tool such as the Delphi terminal extractor.

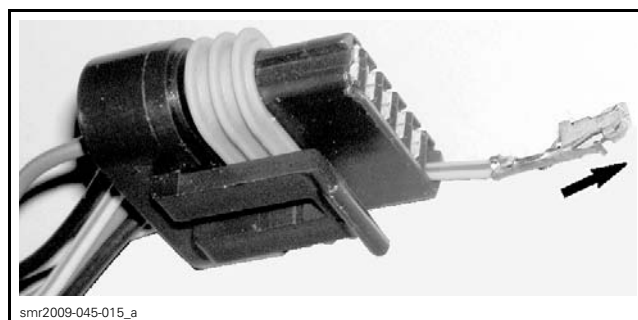
REQUIRED TOOL	
DELPHI TERMINAL EXTRACTOR (P/N 12094429)	

NOTE: Grinding the tool end to a taper is required.

1. Carefully insert the tool in the space provided to release the pin lock.
2. Push the pin out the front of the connector by pushing on the wire.



1. Unlock terminal here

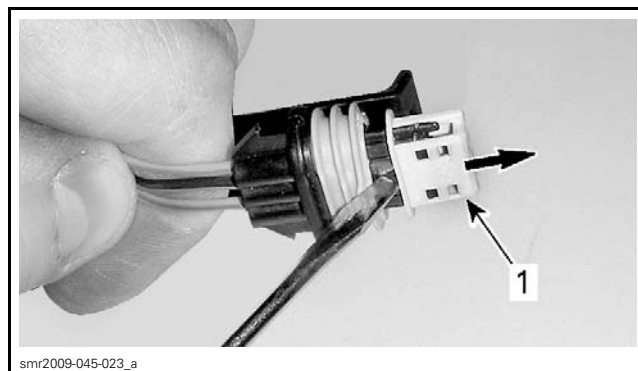


NOTICE Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

CONNECTORS (DELPHI)

Removing the Terminal


1. To remove a terminal from connector, first remove the locking cap.

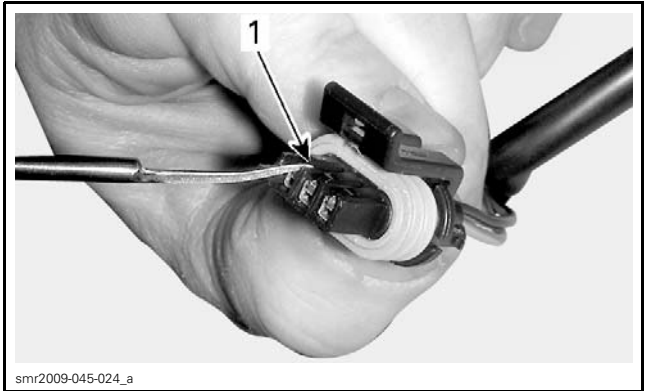


1. Pry out locking cap

2. Carefully insert the Delphi terminal extractor in the space provided to release the pin lock.

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

REQUIRED TOOL	
DELPHI TERMINAL EXTRACTOR (P/N 12094429)	

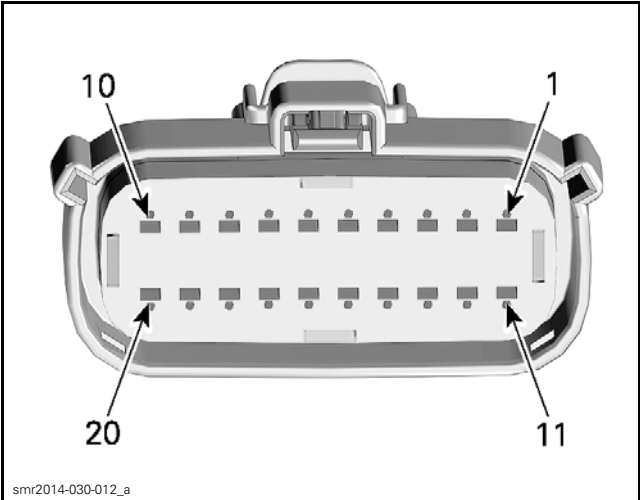


1. Unlock here
3. Gently pull on the wire to extract the pin out the back of the connector.



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.

STEERING CONNECTOR (20 PIN MOLEX 150)



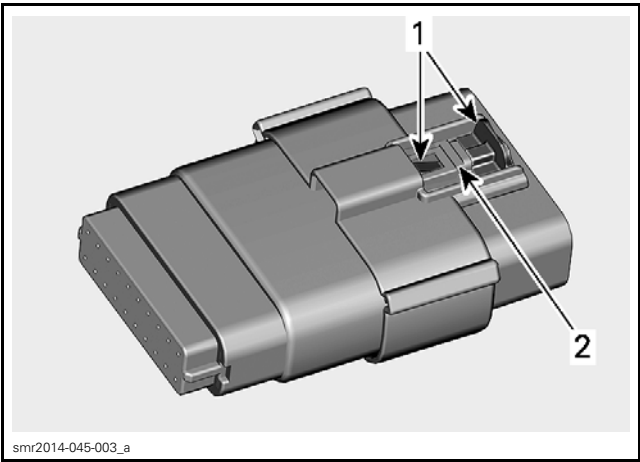
1. Female connector pin-out (sockets)

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.

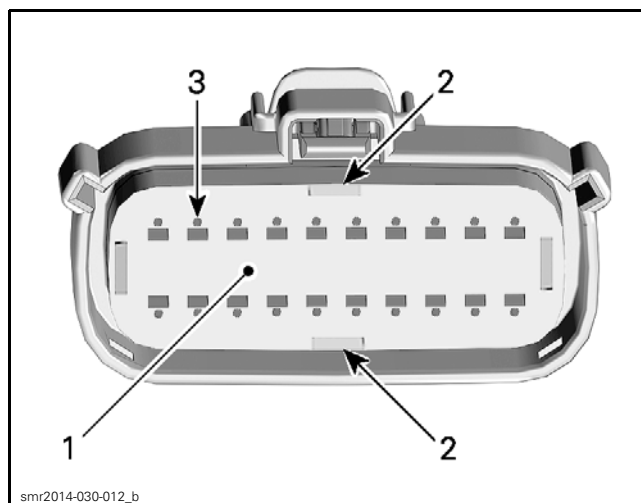
REQUIRED TOOL	
DIAGNOSTIC HARNESS (P/N 529 036 384)	

- 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)

- Insert a small flat screwdriver in the pry holes of the socket locator, on the socket side of the connector.





- Socket locator
- Pry holes
- Holes for inserting terminal extractor tool

- 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.

- Insert the terminal 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.

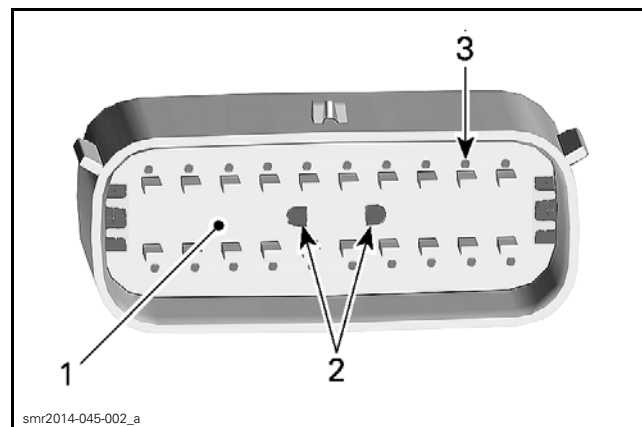
REQUIRED TOOLS	
FCI TERMINAL EXTRACTOR TOOL (P/N 54241678)	
MOLEX 150 TERMINAL EXTRACTOR TOOL (P/N 63813 - 1500)	

- Gently pull on the wire to extract the socket out the back of the connector.

Extracting the Pin (Male Connector)

- 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.



- Pin locator
- Insert long nose pliers here
- Holes for inserting terminal extractor tool

- 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.

REQUIRED TOOLS	
FCI TERMINAL EXTRACTOR TOOL (P/N 54241678) or,	
MOLEX 150 TERMINAL EXTRACTOR TOOL (P/N 63813 - 1500)	

- Gently pull on the wire to extract the pin out the back of the connector.

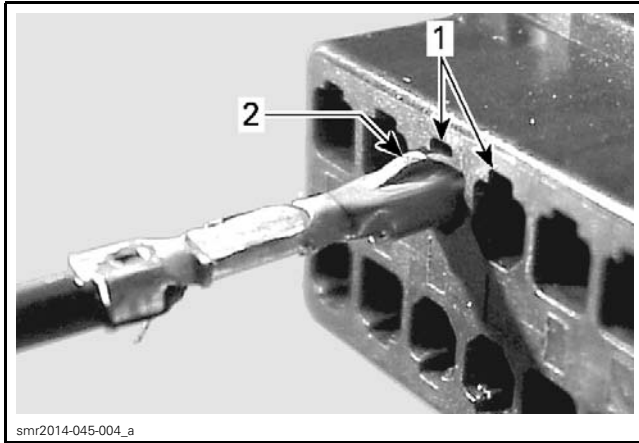
Section 05 ELECTRICAL SYSTEM

Subsection 02 (WIRING HARNESS AND CONNECTORS)

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.



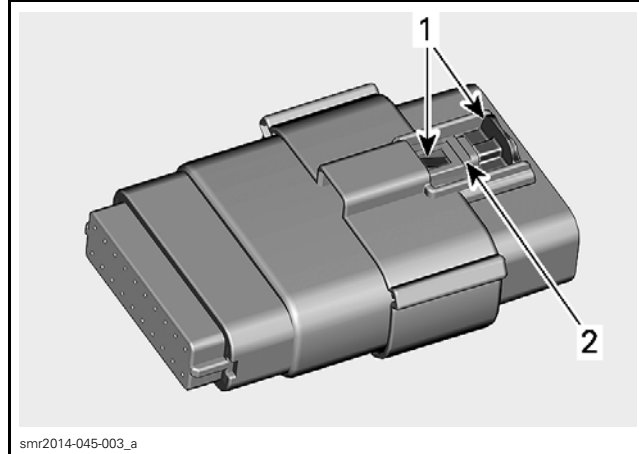
TYPICAL - PIN INSERTION

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 20 pin 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.



1. Red secondary lock (shown out)
2. Latch lever

ENGINE CONNECTOR (4 PIN MOLEX 150)

Refer to *STEERING CONNECTOR (20 PIN MOLEX 150)* for applicable procedures.

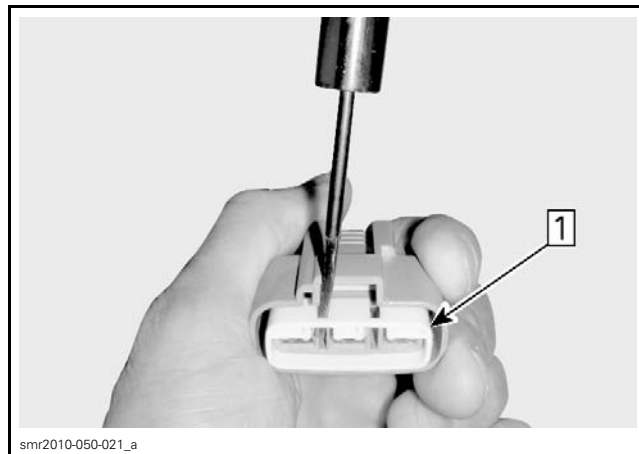
MULTIFUNCTION GAUGE CONNECTOR (6 PIN MOLEX 150)

Refer to *STEERING CONNECTOR (20 PIN MOLEX 150)* for applicable procedures.

VOLTAGE REGULATOR/RECTIFIER CONNECTOR (FURUKAWA)


Removing the Terminal

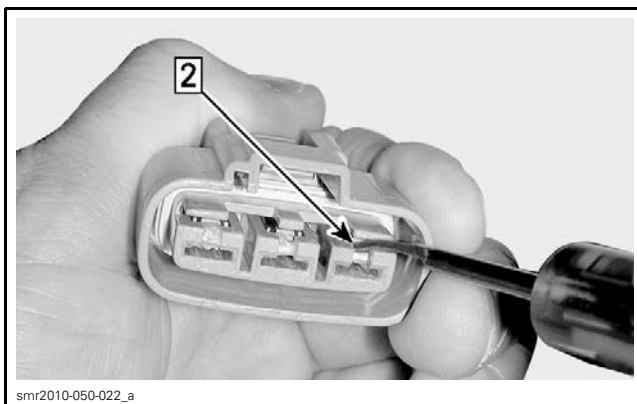
1. Remove the secondary lock (plastic insert).



Step 1: Remove the secondary lock

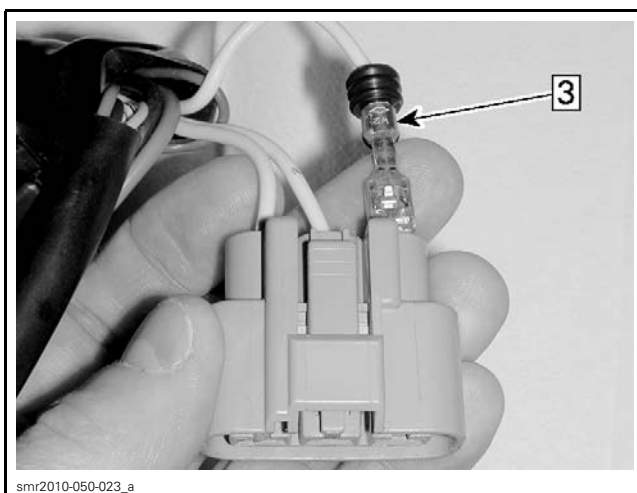
2. Carefully insert the GM terminal extractor between the lock and the pin to release the pin.

REQUIRED TOOL	
GM TERMINAL EXTRACTOR (P/N 12094430)	



Step 2: Insert GM extractor tool

3. Gently pull on the wire to extract the pin out the back of the connector.



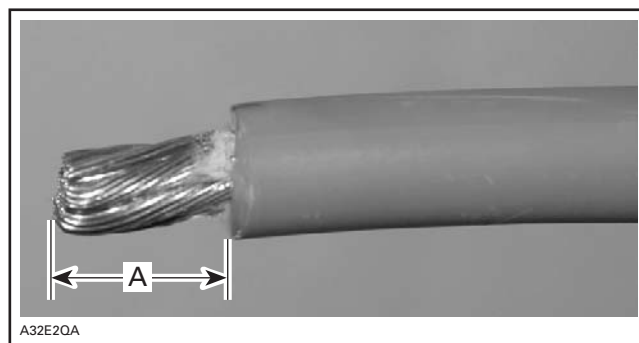
Step 3: Pull wire to extract pin

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

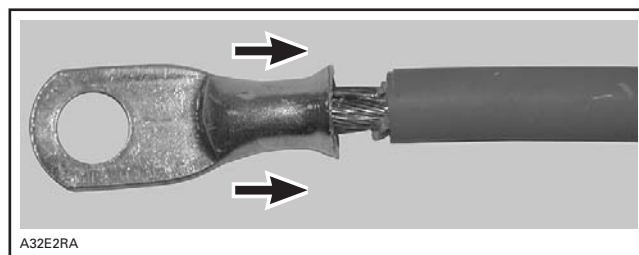
Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.



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.

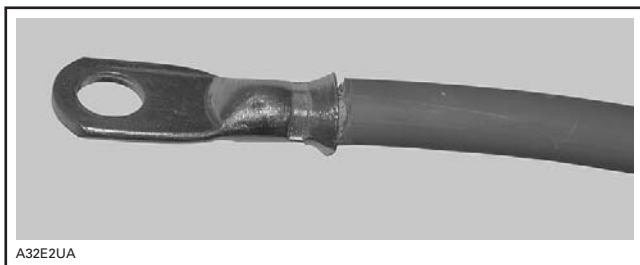
After positioning the crimping pliers, crimp the terminal already installed on wire.



CRIMPING OF WIRE

Section 05 ELECTRICAL SYSTEM

Subsection 02 (WIRING HARNESS AND CONNECTORS)



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.

IGNITION SYSTEM

SERVICE TOOLS

Description	Part Number	Page
D.E.S.S. POST REMOVER	529 035 943	121
DIAGNOSTIC HARNESS	529 036 384	120–121
ECM ADAPTER TOOL.....	529 036 166	118, 121
FLUKE 115 MULTIMETER	529 035 868	118, 120–121

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 767 (ANTI-SEIZE LUBRICANT)	293 800 070	120

GENERAL

⚠ WARNING

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

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

⚠ WARNING

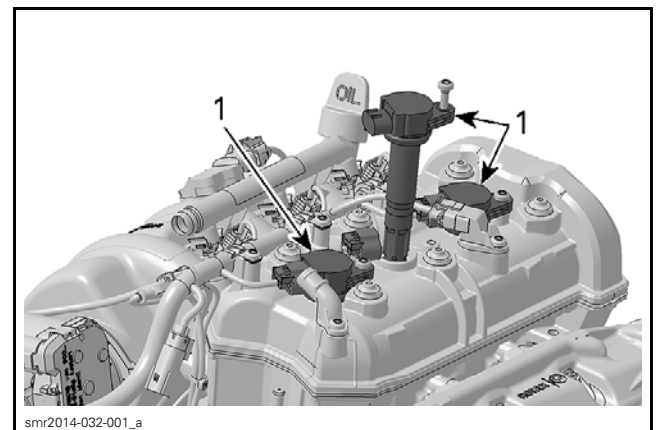
Never check for engine ignition spark from an open coil and/or spark plug as spark may cause potential fuel vapors to ignite. Always use an approved spark tester.

SYSTEM DESCRIPTION

The ignition system is a digital inductive type (IDI) system.

Ignition system parameters such as ignition timing, spark duration, and firing order, as well as many other engine related functions are controlled by the engine management system (EMS) in order to meet engine operational requirements. The EMS can detect many abnormalities including a short circuit in the primary winding of the ignition coils as well as its associated circuits.

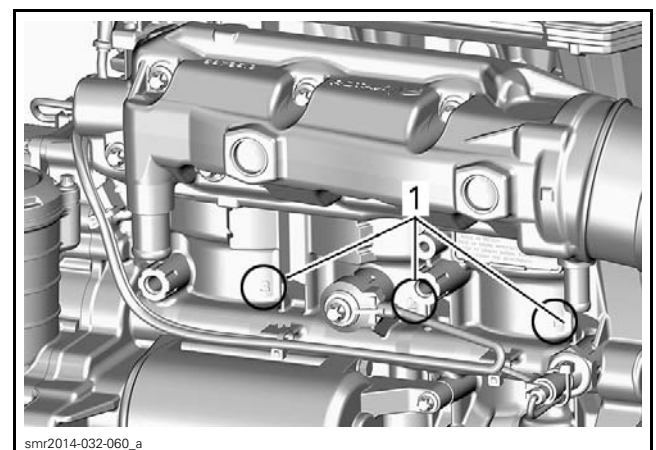
Three direct ignition coils receive power from the fuse F3 through the relay.



1. Ignition coils

When a ground signal is provided by the ECM to an ignition coil primary winding, a high voltage is induced in the coil secondary winding that is used to produce a spark at the spark plug electrode.

Cylinder 1 is located on the PTO side of the engine. Each cylinder is identified by a number on cylinder block housing.



1. Cylinder identification numbers

Ignition Timing

Ignition timing is not adjustable.

The ECM is programmed with data (ignition mappings) that it uses to establish optimum ignition timing under all engine operating conditions.

It receives signals from a variety of sensors that it compares with the ignition mappings and uses it to control the ignition spark timing, duration and firing order.

The firing of each spark plug is independent of the others.

Engine RPM Limiter

The ECM will limit the maximum engine speed by cutting off ignition spark and fuel at a predetermined engine RPM.

ENGINE SPEED LIMITER SETTING	8300 RPM
---------------------------------	----------

Knock Sensor

A knock sensor is mounted on the cylinder block below the exhaust manifold. It detects specific vibrations that would typically be generated by engine detonation.

If detonation occurs, the knock sensor detects it and the ECM goes into a specific operating mode whereby it temporarily retards the ignition advance until detonation stops.

The ECM is able to identify in which cylinder the knocking occurs and modifies the ignition advance on that cylinder only.

Refer to the *ELECTRONIC FUEL INJECTION (EFI)* subsection for testing and replacement procedures.

TROUBLESHOOTING

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.

Always refer to the *WIRING DIAGRAM* when troubleshooting an electrical circuit.

IGNITION SYSTEM TESTING

The ECM controls the ignition system.

If a fault is detected by the ECM, the check engine light will turn on.

The ECM can detect a problem on the primary winding or circuit of the ignition coils.

The secondary winding of the ignition coils is not monitored by the ECM.


Other sensors in relation with the ignition system are also monitored by the ECM.

Ignition System Testing Sequence

Check for fault codes using BUDS2 as a first troubleshooting step. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

Ensure fuse F3 and relay are powered and in good condition.

If a fuse is burnt, test for a short circuit or faulty component on that fuse circuit before replacing the fuse.

 **WARNING**

Due to the possibility of flammable vapors accumulating in the bilge, you should always test for a short circuit which may produce a spark and ignite the vapors before replacing a burnt fuse.

Check ignition spark, refer to *TESTING THE IGNITION COIL USING BUDS2* in this subsection.

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.

ENGINE WILL NOT STOP WHEN REMOVING KEY FROM ENGINE CUT-OFF SWITCH

- 1. Defective engine cut-off switch
 - Check engine cut-off switch. Replace if necessary.

ENGINE WILL NOT START (ENGINE TURNS OVER)

- 1. Fouled or defective spark plug
 - Check spark plug condition. Replace if necessary.
- 2. Defective CPS
 - Test CPS, refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
- 3. Defective trigger wheel
 - Check. Refer to *MAGNETO AND STARTER* subsection.
- 4. Defective ignition circuit
 - Check fuses, ignition coils, wiring and connectors.

ENGINE HARD TO START

1. Faulty, fouled or worn out spark plug
 - Check spark plug condition. Replace if necessary.
2. Drowned engine
 - Check engine temperature value using BUDS2 monitoring page. If the temperature read is lower than the ambient temperature, CTS sensor may be defective or have a bad connection. Therefore, the ECM would erroneously set the engine in cold start mode and it could flood the spark plugs.

ENGINE MISFIRES, RUNS IRREGULARLY

1. Fouled, defective, worn spark plugs
 - Check spark plug condition. Replace if necessary.
2. Damaged trigger wheel/loose CPS
 - Check. Refer to STARTING SYSTEM subsection.
3. Defective ignition circuit
 - Check fuses, ignition coils, wiring and connectors.
4. Poor engine grounds
 - Check ground condition, refer to WIRING HARNESS AND CONNECTORS subsection.

ENGINE CONTINUALLY BACKFIRES

1. Fouled, defective spark plugs
 - Check spark plug condition. Replace if necessary.
2. Damaged trigger wheel/defective or loose CPS
 - Check, refer to STARTING SYSTEM and ELECTRONIC FUEL INJECTION (EFI) subsections.

ENGINE DETONATION OR PINGING

1. Faulty or disconnected knock sensor
 - Check, refer to ELECTRONIC FUEL INJECTION (EFI) subsection.

ENGINE LACKS ACCELERATION OR POWER

1. Weak spark
 - Check spark plugs, coils, wiring and connections.

PROCEDURES

IGNITION COILS

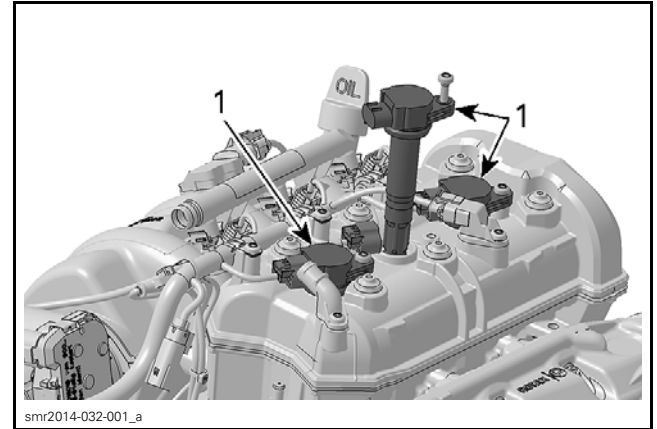
WARNING

Never check for engine ignition spark from an open coil and/or spark plug in the engine compartment as a spark may cause fuel vapors which may have accumulated in the bilge to ignite.

Ignition Coil Access

Remove the central body. Refer to *BODY* subsection.

Ignition coils are located on top of the valve cover.



1. Ignition coils

Testing the Ignition Coil Using BUDS2

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. In BUDS2, go to:
 - Functions page
 - ECM button
 - Activators tab
3. Select the ignition coils to be tested and click on it.

You should hear the spark occurring. If in doubt, use a sealed **vapor proof** spark tester or an inductive spark tester as available from tool suppliers, to prevent a spark from occurring in the bilge.

If there is no ignition at one or more coils, carry out a *TESTING THE IGNITION COIL INPUT VOLTAGE*.

If spark is weak, try a new spark plug. If spark is still weak, try a new ignition coil.

NOTE: The voltage required to produce a spark in the combustion chamber is higher when the engine is running.

Testing the Ignition Coil Input Voltage

Make sure fuse F3 and the relay are good before testing.

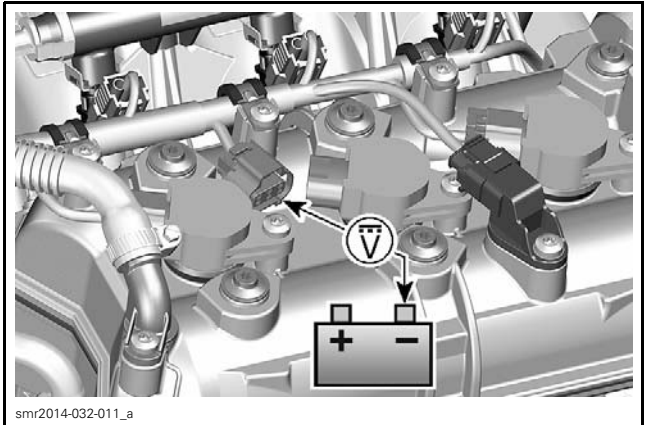
1. Disconnect the applicable ignition coil connector.
2. Remove tether cord from the engine cut-off switch.
3. Set the multimeter to Vdc.

Section 05 ELECTRICAL SYSTEM
Subsection 03 (IGNITION SYSTEM)

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

- 4. Press the START button to activate the ECM.
- 5. Measure voltage.

TEST PROBES		VOLTAGE
Ignition coil pin 1	Battery ground	Battery voltage



IGNITION COIL INPUT VOLTAGE TEST

If test succeeds, carry out *TESTING THE IGNITION COIL RESISTANCE*.
If test fails, carry out *TESTING THE IGNITION COIL POWER CIRCUIT CONTINUITY*.

Testing the Ignition Coil Power Circuit Continuity

- 1. Use the multimeter and select Ω .
- 2. Press the START button to activate the ECM.
- 3. Read resistance of the desired ignition coil circuit.

IGNITION COIL	IGNITION COIL WIRE	FUSE BOX	MEASUREMENT
1 (rear)	Pin 1	Terminal A4	Close to 0 Ω
2	Pin 1		
3	Pin 1		

If test fails at any ignition coil, test the following items separately and repair/replace wiring or terminals from fuse box to the applicable ignition coil. Refer to *WIRING DIAGRAM* for details.

- Wiring from fuse box to engine connector
- Wiring from engine connector to ignition coil.

Testing the Ignition Coil Control Circuit Continuity

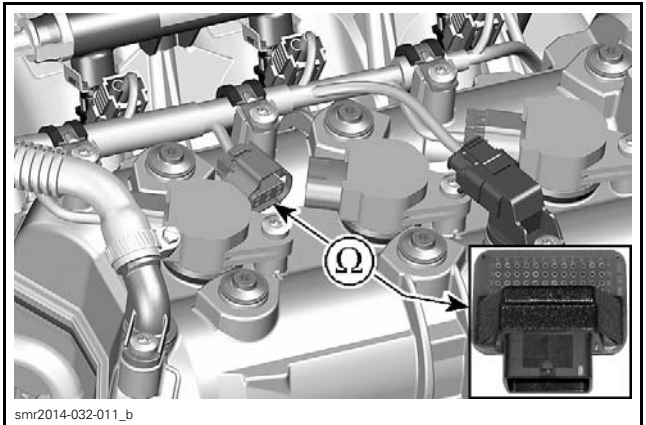
- 1. Disconnect ECM connector "A". For connector identification, refer to *WIRING HARNESS AND CONNECTOR* subsection.
- 2. Connect ECM connector to the ECM adapter tool.

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



- 3. Disconnect ignition coil connector.
- 4. Test for continuity of circuit as per following table.

COIL	IGNITION COIL WIRE	ECM ADAPTER	RESISTANCE
Cylinder 1 (rear)	Pin 2	A-M4	Close to 0 Ω (continuity)
Cylinder 2	Pin 2	A-M2	
Cylinder 3	Pin 2	A-M1	



IGNITION COIL CONTROL CIRCUIT TEST

If test fails, repair the connector or replace the engine wiring harness.

Testing the Ignition Coil Resistance

An ignition coil with a good resistance measurement can still be faulty. Current leakage can occur at high voltage levels which is not detectable with an ohmmeter. Replacing the ignition coil may be necessary as a test.

- 1. Remove ignition coil. Refer to *REMOVING THE IGNITION COIL* in this subsection.

2. Perform a visual inspection of the ignition coils. Check for corrosion, bent pins, loose or burnt contacts and cracked or torn insulator.
3. Using a multimeter, test the resistance in both primary and secondary windings.



PRIMARY WINDING

CIRCUIT	TERMINAL	RESISTANCE @ 20°C (68°F)
Primary winding	1 and 2	0.85 - 1.15 Ω



SECONDARY WINDING

CIRCUIT	TERMINAL	RESISTANCE @ 20°C (68°F)
Secondary winding	1 and spark plug terminal	9.5 - 13.5 kΩ

If any test fails, replace ignition coil.

If test succeeds, carry out *TESTING THE IGNITION COIL CONTROL CIRCUIT CONTINUITY*.

Removing the Ignition Coil

1. Disconnect ignition coil connector.
2. Remove ignition coil retaining screw.

NOTICE Do not pry on ignition coil with a tool.

3. Remove ignition coil from spark plug by rotating coil side to side as you pull up.

Installing the Ignition Coil

Install the ignition coil on the spark plug.

Align the retaining screw hole of the ignition coil with the threaded hole on the valve cover.

Push the ignition coil all the way down until it rests on the valve cover.

Install and tighten retaining screw.

TIGHTENING TORQUE	
Ignition coil retaining screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

Connect ignition coil connector.

SPARK PLUGS

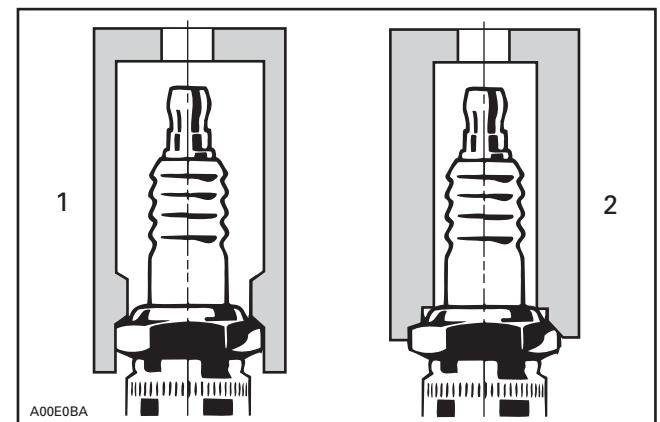
Removing the Spark Plug

1. Remove ignition coil. Refer to *REMOVING THE IGNITION COIL* in this subsection.

⚠ WARNING

Never remove an ignition coil from a spark plug without disconnecting it from the wiring harness. Flammable vapors may be present in the bilge. Should the tether cord be installed on the engine cut-off switch, a spark could be generated at the spark plug end of the coil possibly resulting in an explosion.

2. Using a spark plug socket, release the torque applied to the spark plug.

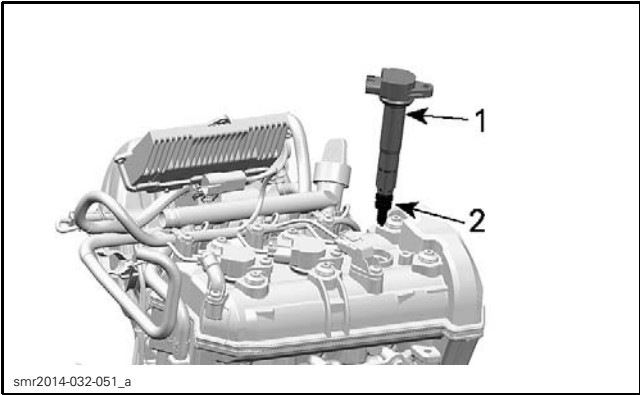


1. Approved socket
2. Improper socket

3. Clean the spark plug and cylinder head with pressurized air.

4. Unscrew spark plug then use the ignition coil to take spark plug out of spark plug hole.

Section 05 ELECTRICAL SYSTEM
Subsection 03 (IGNITION SYSTEM)



1. Ignition coil
2. Spark plug

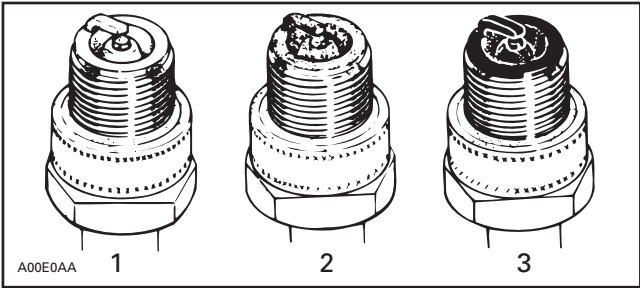
Troubleshooting a Fouled Spark Plug

Fouling of the spark plug is indicated by irregular running or misfiring of the engine, decreased engine speed due to misfiring, reduced performance, and increased fuel consumption.

Other possible causes are: use of incorrect or bad fuel, defective ignition system, incorrect spark plug gap, loss of compression, or lubricating oil entering the combustion chamber.

The plug face of a fouled spark plug has either a wet or dry black carbon deposit. Such coatings form a conductive connection between the center electrode and the ground electrode.

Spark Plug Analysis



TYPICAL

- 1. Overheated (light gray, white)
- 2. Normal (light brown, brown)
- 3. Fouled (black, wet or dry, dark deposits, gray, melted coating)

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

Installing the Spark Plug

Prior to installation, ensure the contact surfaces of the cylinder head and spark plug are free of grime.

- 1. Using a wire feeler gauge, check electrode gap as specified in *TECHNICAL SPECIFICATIONS*.
- 2. Apply Loctite 767 (antiseize lubricant) over the spark plug threads to prevent possible seizure.

SERVICE PRODUCT
LOCTITE 767 (ANTI-SEIZE LUBRICANT) (P/N 293 800 070)



- 3. Hand screw spark plug into cylinder head. Then, tighten the spark plug to specification with an approved spark plug socket.

TIGHTENING TORQUE	
Spark plug	13 N•m ± 1 N•m (115 lbf•in ± 9 lbf•in)

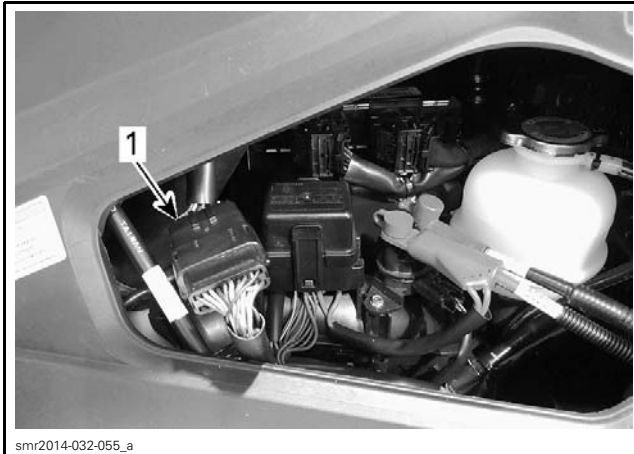
- 4. Install ignition coil. Refer to *INSTALLING THE IGNITION COIL* in this subsection.
- 5. The installation is the reverse of the removal procedure.

ENGINE CUT-OFF SWITCH

Testing the Continuity of Engine Cut-Off Switch

REQUIRED TOOLS	
DIAGNOSTIC HARNESS (P/N 529 036 384)	
FLUKE 115 MULTIMETER (P/N 529 035 868)	

- 1. Disconnect the steering connector from the vehicle harness.



1. Steering connector

2. **IMPORTANT:** Connect the diagnostic harness to the steering connector only, **NOT** to the vehicle harness connector.

NOTICE Do not attempt to probe the steering connector on the watercraft. Use the test connector on the diagnostic harness.

3. Set multimeter to Ω .
4. Probe test connector on diagnostic harness to check continuity as follows.

TETHER CORD	DIAGNOSTIC HARNESS	READING
Removed	Pin 6 and Pin 9	Open circuit
Installed		Close to 0 Ω

If continuity test fails:

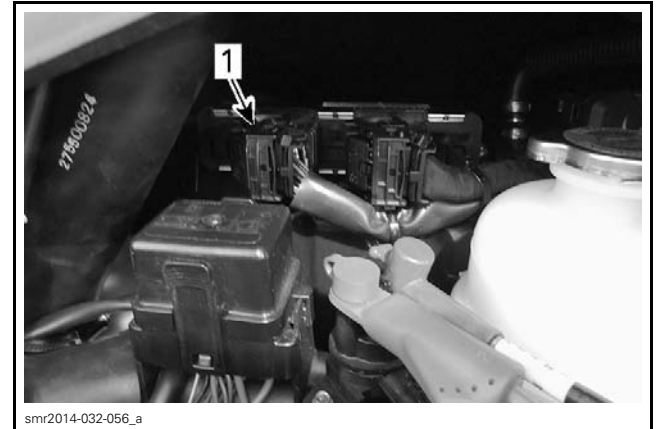
- Check steering harness between steering connector and engine cut-off switch. Repair or replace.
- If harness is good, replace the engine cut-off switch.

If all readings were as specified, carry out *TESTING THE CONTINUITY OF VEHICLE HARNESS TO ENGINE CUT-OFF SWITCH*.

Testing the Continuity of Vehicle Harness to Engine Cut-Off Switch

REQUIRED TOOLS
DIAGNOSTIC HARNESS (P/N 529 036 384)
FLUKE 115 MULTIMETER (P/N 529 035 868)
ECM ADAPTER TOOL (P/N 529 036 166)

1. Disconnect the diagnostic harness from the steering connector and reconnect it to vehicle connector.
2. Disconnect connector "B" from ECM.



3. Install the ECM adapter tool on ECM connector "B".

4. Probe test connector as follows.

DIAGNOSTIC HARNESS CONNECTOR	ECM ADAPTER TOOL	READING
Pin 9	B-E4	Close to 0 Ω
Pin 6	B-F2	

If any continuity test failed, check wiring harness between steering connector and ECM connector.


If problem persists and all tests have been performed, try a new ECM. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

5. Reconnect ECM "B" connector and steering harness connector.

6. Reinstall removed components.

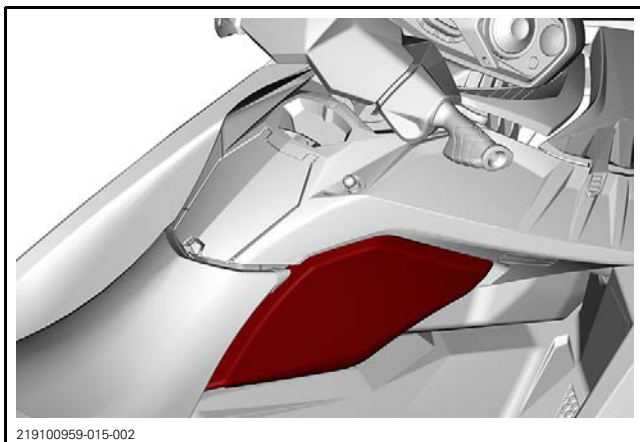
Replacing the Engine Cut-Off Switch

REQUIRED TOOL
D.E.S.S. POST REMOVER (P/N 529 035 943)

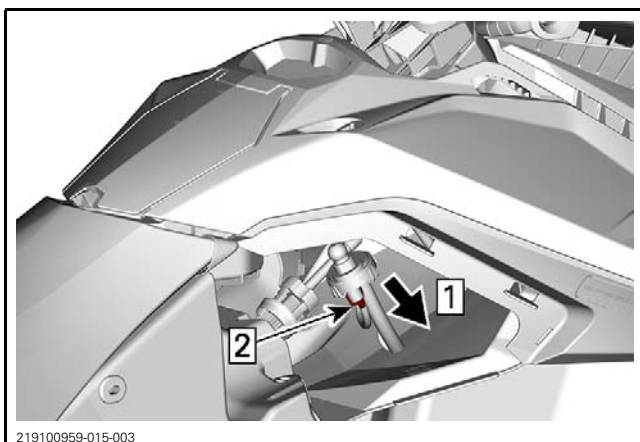



Section 05 ELECTRICAL SYSTEM

Subsection 03 (IGNITION SYSTEM)



Lower cut-off switch and disconnect electrical connector.



Step 1: Lower cut-off switch
Step 2: Disconnect electrical connector

CHARGING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	124

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
EXTECH INDUCTIVE AMMETER	380941	124

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 delta wound stator.



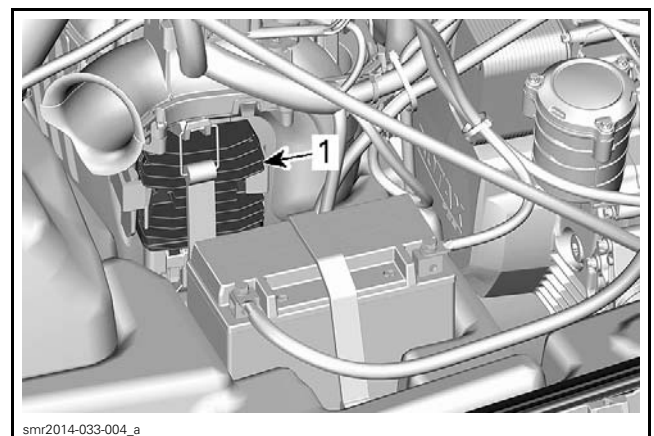
TYPICAL

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.

The voltage regulator is located on the LH side of the air intake silencer, behind the battery.



1. Voltage regulator/rectifier

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 SYSTEM AND FAULT CODES* subsection.

When performing charging system tests, if the watercraft is out of water, link a garden hose to the exhaust system. Refer to *FLUSHING THE EXHAUST SYSTEM* subsection.

Section 05 ELECTRICAL SYSTEM

Subsection 04 (CHARGING SYSTEM)

- NOTICE** When watercraft is out of water:
- Never run engine without supplying water to the exhaust system.
 - Never run engine longer than 2 minutes.

Testing the Output Voltage Using BUDS2

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. In BUDS2, Go to:
 - **Measurements** page
 - **ECM** button
 - **Battery voltage (V)**

NOTE: Connect a garden hose to cool exhaust system. Refer to *EXHAUST SYSTEM* subsection.


3. Start engine.
4. Increase engine RPM as specified in the following table and read voltage in BUDS2

OUTPUT VOLTAGE TEST	
ENGINE SPEED	VOLTAGE (DC)
5500 RPM	14.5 ± .5 Vdc

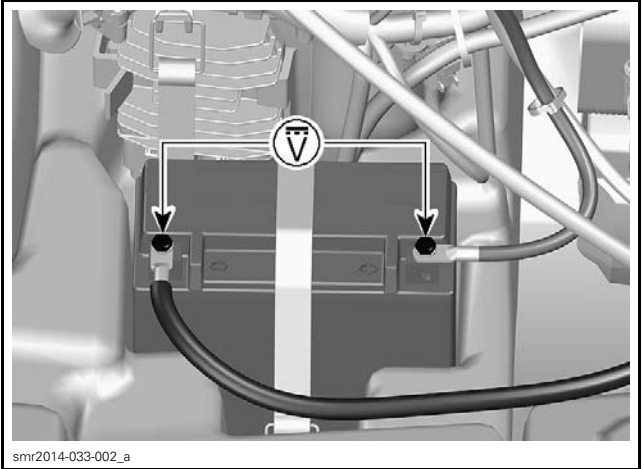
If voltage is above specification, replace voltage regulator/rectifier.

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 Voltage Using a Multimeter

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

- For battery access, refer to *BATTERY ACCESS* in this subsection.
1. Set multimeter to Vdc.
 2. Connect multimeter to battery posts.



TYPICAL - CHARGING SYSTEM VOLTAGE TEST AT BATTERY POSTS


3. Start engine.
4. Increase engine RPM as specified in the following table and read voltage with the multimeter.

OUTPUT VOLTAGE TEST	
ENGINE SPEED	VOLTAGE (DC)
5500 RPM	14.5 ± .5 Vdc

If voltage is above specification, replace voltage regulator/rectifier.

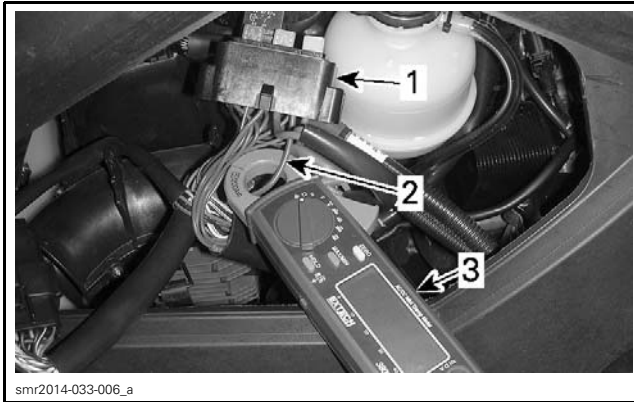
If voltage is below specification, check stator output and wiring harness prior to concluding that voltage regulator/rectifier is defective. Refer to *STARTING SYSTEM* subsection.

Testing the Output Current with an Inductive Ammeter

REQUIRED TOOL	
EXTECH INDUCTIVE AMMETER (P/N 380941)	

1. Through the LH access opening, detach fuse box from its support.
2. Turn on the ammeter and select 40 Adc.
3. From underneath the fuse box, clamp the ammeter around the DC output wire.

DC OUTPUT WIRE IN FUSE BOX
Terminal C2 (RED/BLACK wire)



1. Fuse box
2. DC output wire
3. Ammeter clamp

NOTE: Zero set the ammeter before use or reading may be erroneous.

4. Start engine.
5. Increase engine RPM as specified in the following table and read current with the ammeter.

TEST ENGINE SPEED	CURRENT
5500 RPM	Approx. 7-8 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.

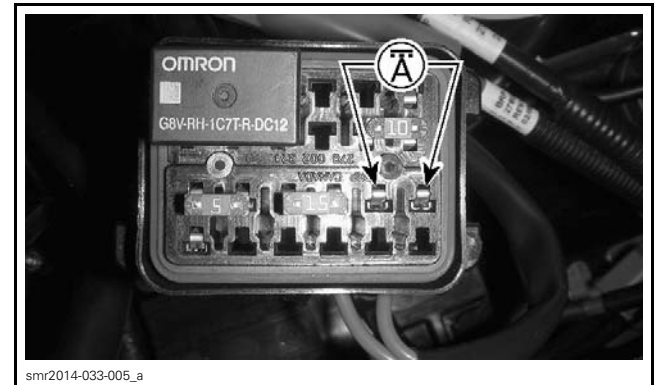
6. Secure fuse box to its support.

Testing the Output Current with a Multimeter

NOTICE Charging current may rise over multimeter current reading capacity (usually 10 A) possibly causing test equipment damage. It is preferable to use an inductive ammeter to test the charging system current.

1. Through the LH access opening, remove fuse box cover.
2. Remove charging system fuse F4.
3. Set multimeter to Adc.
4. Connect probes to fuse holder terminals.

NOTICE Probe terminals by touching (NOT inserting) terminals lock tabs.



CHARGING SYSTEM FUSE REMOVED

5. Start engine.
6. Increase engine RPM as specified in the following table and read current with the multimeter.

OUTPUT CURRENT TEST	
ENGINE SPEED	CURRENT (DC)
5500 RPM	Approx. 10 A

NOTE: Initial current reading will be higher than specified due to the battery drain from the engine start. This proves the charging system works. Current load will come down as the battery recovers its charge.

If current is below specification, carry out *TESTING THE STATOR OUTPUT VOLTAGE* prior to concluding the voltage regulator/rectifier is faulty.

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).
 - Carry out *TESTING THE BATTERY VOLTAGE (LOAD APPLIED)*.
 - Replace battery.
4. Burnt fuse) or faulty rectifier.
 - First check fuse. If in good condition, check voltage regulator/rectifier.

Section 05 ELECTRICAL SYSTEM

Subsection 04 (CHARGING SYSTEM)

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 F4 fuse.
 - Check F4 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 F4 FUSE

1. Battery not connected.
 - Connect battery.
2. Voltage regulator/rectifier internal circuit shorted to ground.
 - Refer to *TESTING THE VOLTAGE REGULATOR/RECTIFIER FOR BLOWN F4 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 Access

Remove the LH access cover.

Disconnect the steering connector.

Detach fuse box from its support.

Testing the Voltage Regulator/Rectifier for Blown F4 Fuse

1. Detach the voltage regulator/rectifier from the electrical component 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.

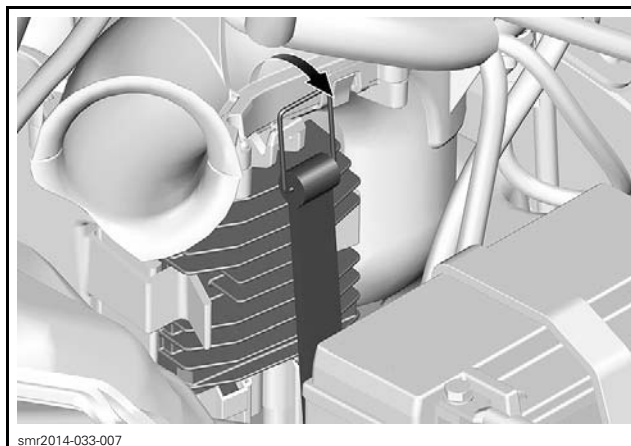
If the fuse still burns, check for a shorted wire or connector pin.

If fuse does not burn, replace regulator/rectifier.

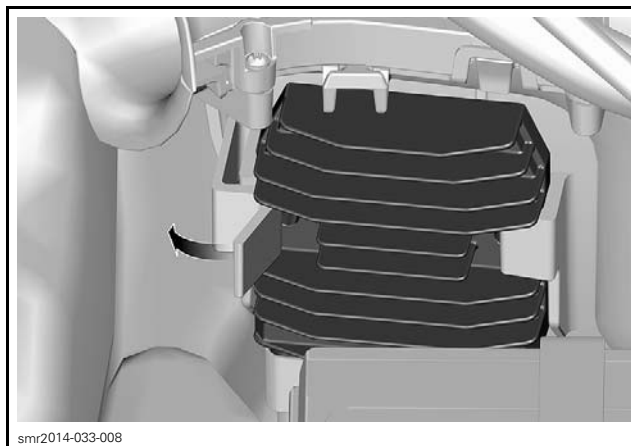
Replacing the Voltage Regulator/Rectifier

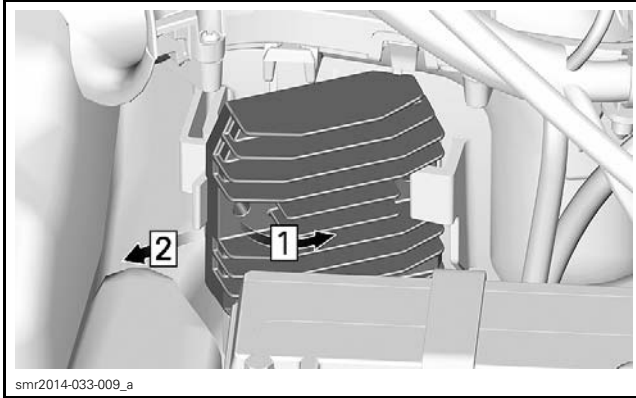
Removing the Voltage Regulator/Rectifier

Detach the retaining strap.



Push the support locking tab and remove voltage regulator/rectifier from its support.





Installing the Voltage Regulator/Rectifier

Installation is the reverse of the removal procedure.

BATTERY

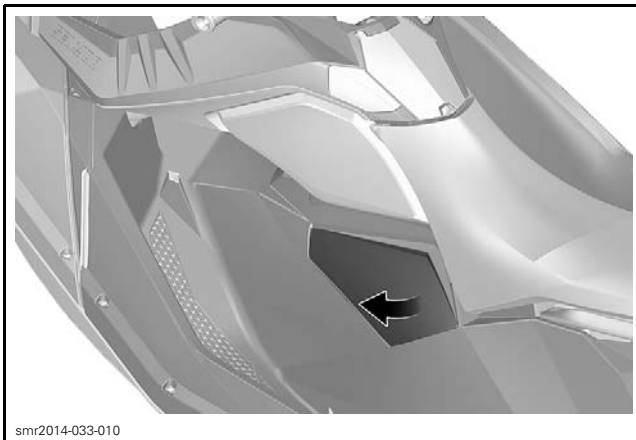
Battery Information

The battery is a VRLA (Valve Regulated Lead Acid) maintenance free and non-spillable. It never need electrolyte level check, readjustment and refilling, however, they still need periodic charging.

- This battery is factory filled and activated.
- It requires an initial charging to ensure proper operation and maximum life span.

Battery Access

Remove the LH access cover.



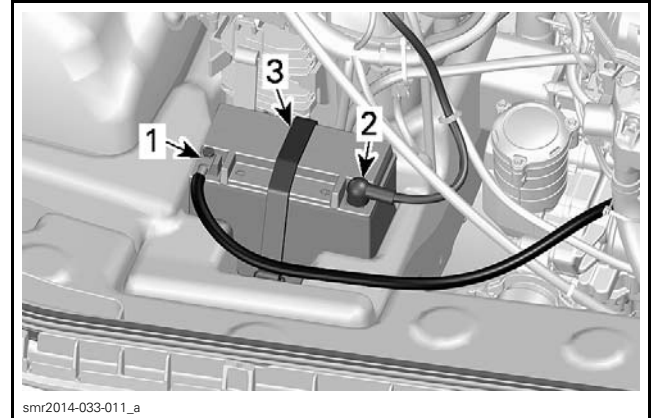
Removing the Battery

⚠ WARNING

The BLACK (-) battery cable must always be disconnected first and reconnected last. Never charge or boost battery while installed in watercraft.

1. Disconnect the BLACK (-) battery cable.

2. Slide the RED rubber protector off the RED (+) cable terminal and disconnect it from the battery post.
3. Reinstall bolts to secure retaining nuts during removal.
4. Detach retaining strap.

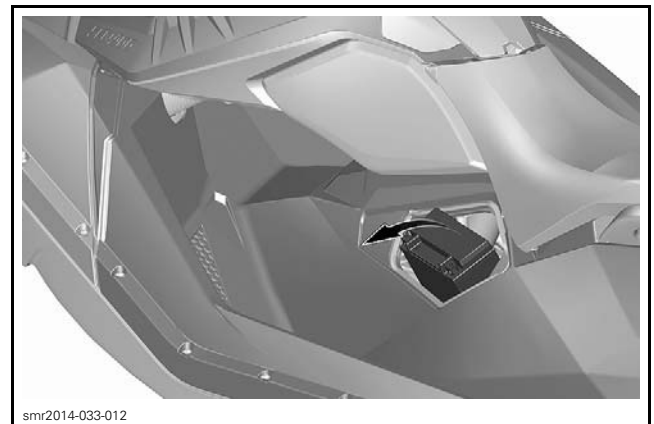


CENTRAL BODY REMOVED FOR CLARITY PURPOSE

1. BLACK (-) cable
2. RED (+) cable
3. Retaining strap

5. Remove battery from vehicle.

NOTICE Should any electrolyte spillage occur, immediately wash off area with a solution of baking soda and water, then rinse thoroughly.



Cleaning the Battery

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

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

Battery top should be cleaned with a soft brush and any grease-cutting soap or baking soda solution.

Rinse with clear water then dry well.

Inspecting the Battery

Visually inspect battery casing for cracks, leaks or other possible damages.

Discoloration, warping or raised top, indicates that the battery has overheated or been overcharged.

If the casing is damaged, replace battery and thoroughly clean battery tray and surrounding area with a water and baking soda solution.

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

Inspect the battery posts for security of mounting.

Testing the Battery

There are 3 types of battery tests.

TEST METHOD	COMMENT
Voltage test (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.
Voltage test (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.
Battery electrolyte reading	Gives an accurate indication of the charge condition of each cell.

Load Testing the Battery

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

NOTICE Battery storage is critical for battery life. Regularly charging the battery during storage will prevent cell sulfation. Keeping the battery in vehicle for storage may lead to contacts degradation/corrosion and case damage if freezing occurs. A discharged battery will freeze and crack in areas where freezing conditions are experienced. Electrolyte leakage will damage surrounding parts. Always remove battery from vehicle for storage and regularly recharge it to keep an optimal condition.

Clean battery terminals and cable connections using a wire brush.

Apply a light coat of dielectric grease on terminals.

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

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.

Check battery voltage every 3 months, recharge if voltage is below 12.4 volts.

The use of an automatic type battery charger, approved by the battery manufacturer, is recommended.

NOTE: The battery must always be stored in fully a charged state.

Activation of a New Battery

Battery Initial Charging

NOTE: Since the batteries are factory activated, they never need to be activated using electrolyte container (acid packs). The electrolytes are already in the batteries.

1. Carefully read the *SAFETY WARNINGS* section before starting.
2. Remove battery from vehicle.
3. Place battery on a level surface.

4. Charge battery to bring it to a full state of charge.
 - **When using a constant current charger:** Refer to the standard (STD) charging method indicated on the battery. Keep an eye on the voltmeter and battery to avoid overcharging.
 - **When using an automatic type taper charger:** Check to make sure that the charger current (amps) is equal to or greater than the standard (STD) charging method indicated on the battery.



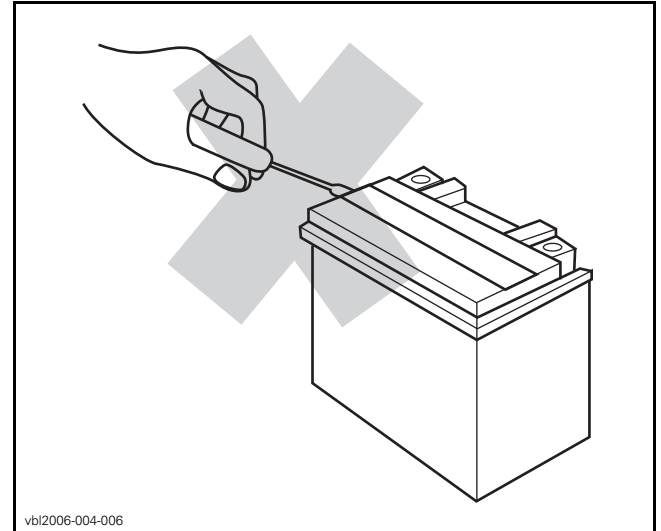
TYPICAL CHARGING METHOD LABEL
Some batteries may differ

5. Let stand for at least 2 hours.
6. Check battery voltage using a voltmeter.
7. Ensure that the battery voltage is 12.8 V or higher.

NOTE: Reading for a newly-charged battery should be 12.8 V or higher. If less, it needs additional charge.

8. Install battery on vehicle.

NOTICE Never remove the battery strip from caps or add electrolyte for the life of the battery.



Charging a Used Battery

! WARNING

Always wear safety glasses and charge the battery in a ventilated area. Never charge or boost a battery while installed on a vehicle. Do not open the sealed caps during charging. Do not place battery near an open flame.

NOTICE If the battery becomes hot to the touch, stop charging and allow it to cool before continuing.

NOTE: Sealed VRLA batteries have an internal safety valve. If battery pressure increases due to overcharging, the valve opens to release excess pressure, preventing battery damage.

An automatic charger is the fastest and most convenient way for error-proof charging.

When using a constant current charger, charge battery according to the chart below.

Battery Voltage Below 12.8 V and Above 11.5 V

YTX20L-BS	TIME	CHARGE
STANDARD CHARGING (RECOMMENDED)	4 - 9 hours	2 A
QUICK CHARGING	50 minutes	10 A

Battery Voltage Below 11.5 V

A battery with a voltage below 11.5 V requires a special procedure to recharge. In charging an over discharged battery, its internal resistance may be too high to charge at a normal charging rate.

Section 05 ELECTRICAL SYSTEM

Subsection 04 (CHARGING SYSTEM)

Set charger to the 10 A charging rate and monitor charging current for approximately 30 minutes. If there is no change in charging current or battery becomes abnormally hot, the battery is most likely at the end of its service life and should be replaced.

Installing the Battery

1. Install the battery in the watercraft and secure it using retaining strap.

WARNING

Always connect battery cables in the specified order, RED (+) cable first, BLACK (-) cable last.

2. Connect RED (+) cable.
3. Connect BLACK (-) cable last.
4. Apply dielectric grease on battery posts.
5. Verify cable routing and attachments.
6. Install remaining removed components.

Battery maintenance

These batteries require little maintenance to perform perfectly. Follow this simple check list for optimum battery performance:

- Check voltage every 3 months using a voltmeter.
- Keep a battery fully charged to 100% (12.8 V or higher after standing 2 hours).
- Check and charge battery if the voltage drops below 12.5 V.
- Keep the battery top free of grime.
- Clean terminals and connectors if necessary.
- For storage, pull battery or disconnect battery cables.

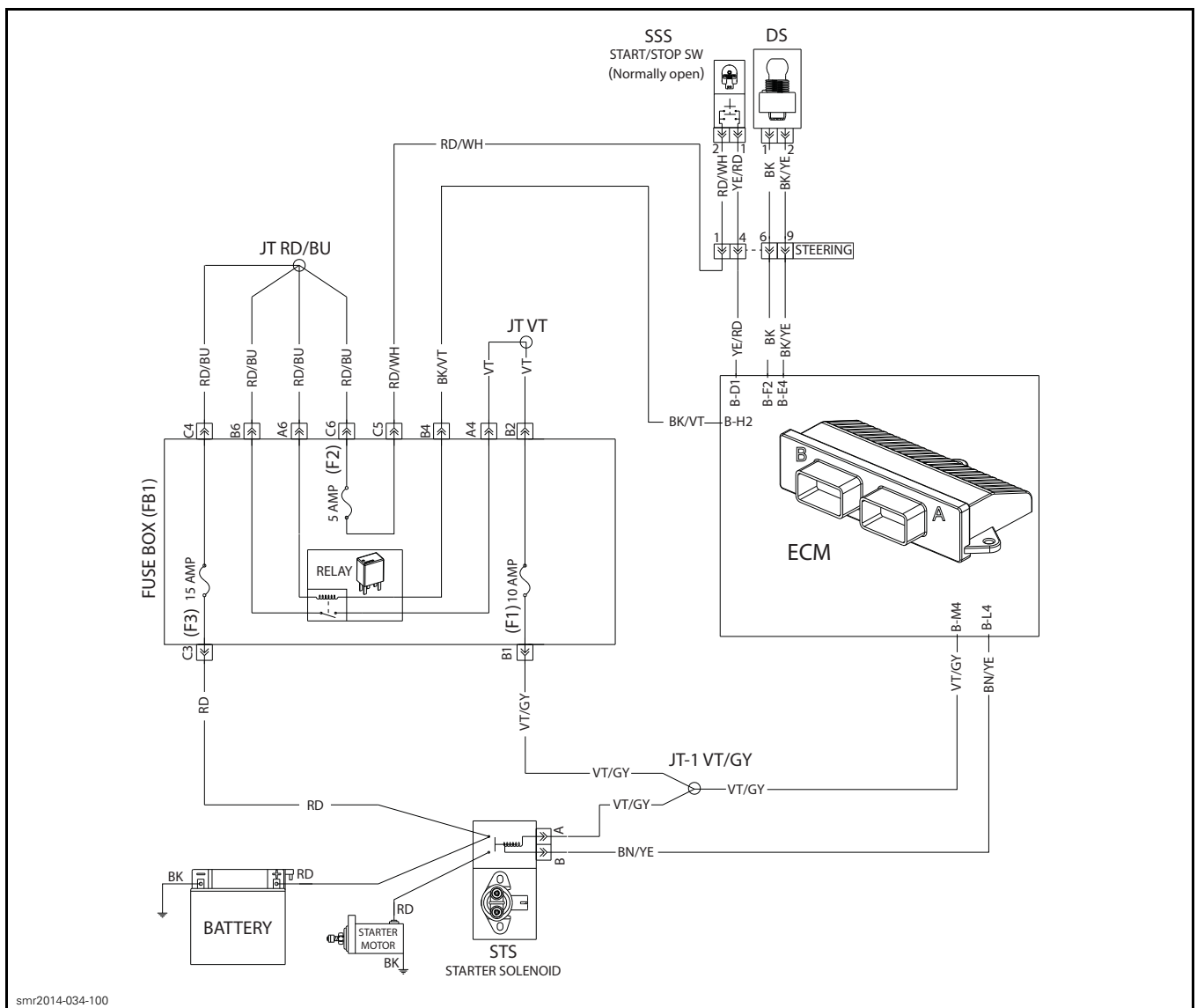
STARTING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	132
ECM ADAPTER TOOL.....	529 036 166	132
FLUKE 115 MULTIMETER	529 035 868	132

SERVICE PRODUCTS

Description	Part Number	Page
DIELECTRIC GREASE	293 550 004	137



GENERAL

BASIC STARTING SYSTEM
OPERATION

Engine Cranking Conditions

The following conditions must be met to allow engine cranking:

- 1. The tether cord securely installed on the engine cut-off switch and it's recognized by the ECM as valid (2 short beeps)
- 2. START/STOP button pressed and held.

Starting System Logic

When the ECM detects a tether cord, 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 SYSTEM 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 (F1)
- Battery, refer to *CHARGING SYSTEM*
- START/STOP button
- 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.

DIAGNOSTIC GUIDELINES

NOTHING HAPPENS WHEN START/STOP
BUTTON PRESSED

- 1. Battery not connected
 - Connect battery.
- 2. Burnt fuse
 - F2 fuse: (START/STOP switch circuit).
 - F3 fuse: (main DC power fuses).
- 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. Burnt fuse
 - F1 fuse: (starter solenoid power) Carry out a TESTING THE SOLENOID INPUT VOLTAGE (Solenoid Coil).
- 2. Discharged battery
 - Recharge and test. Refer to *CHARGING SYSTEM* subsection.

3. **Battery connections**
- Check/clean/tighten.
4. **Poor/bad or corroded ground contacts (engine, battery ground cable, starter etc.)**
- Check/clean/repair, refer to *POWER DISTRIBUTION AND GROUNDS* subsection.
5. **Starter solenoid**
- Test solenoid, wiring and connections.
6. **Damaged starter or ground cables**
- Carry out *DYNAMIC TESTING THE SOLENOID*.
7. **Obstructed starter drive gear assembly**
- Check/repair, refer to *MAGNETO AND STARTER*.
8. **No ground provided by ECM to starter solenoid**
- Refer to *TESTING THE CONTINUITY OF START/STOP SWITCH CONTROL CIRCUIT* in this subsection.
9. **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 *STARTING SYSTEM* 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 *MAGNETO AND STARTER* subsection.
2. **Defective drive**
- Replace starter drive. Refer to *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 *MAGNETO AND STARTER*.

PROCEDURES

⚠ WARNING

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.

START/STOP SWITCH

Testing the START/STOP Switch Circuit Continuity

1. Remove START/STOP switch fuse (F2).

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.

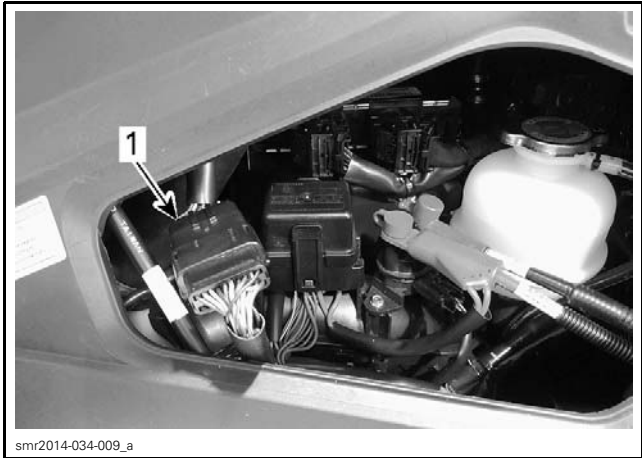
CONTINUITY TEST OF START/STOP SWITCH CIRCUIT (BUTTON PRESSED AND HELD)		
FUSE BOX	ECM CONNECTOR B	RESISTANCE
Pin C5	B-D1	Close to 0 Ω (continuity)

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 (F2).
2. Disconnect the steering connector.

Section 05 ELECTRICAL SYSTEM
Subsection 05 (STARTING SYSTEM)



1. Steering connector

3. Connect the diagnostic harness to make an in-line connection between the disconnected connector.
4. Use the multimeter and select Ω .
5. 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 START/STOP switch.

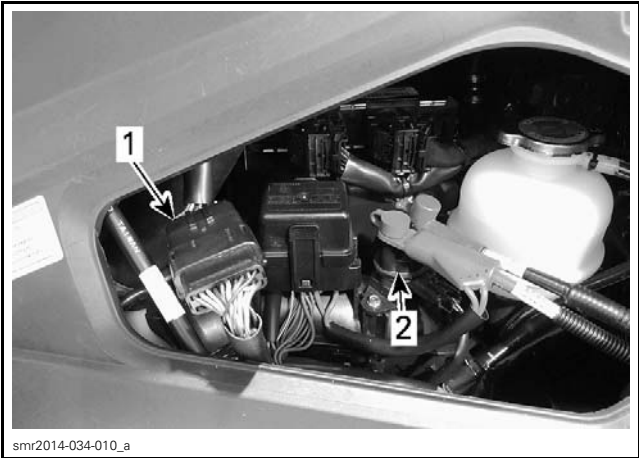
If the switch tests as specified, check for an open circuit between connections as per table:

OPEN CIRCUIT TEST		
CIRCUIT CONNECTIONS		RESISTANCE
Fuse box pin C5	Steering connector pin 1	Must be close to 0 Ω
Steering connector pin 4	ECM connector B, pin D1	

STARTER SOLENOID

Starter Solenoid Access

The starter solenoid is located beside the fuse box and it is accessible through the LH access opening.



1. Steering connector
2. Starter solenoid

Testing the Solenoid Input Voltage (Solenoid Coil)

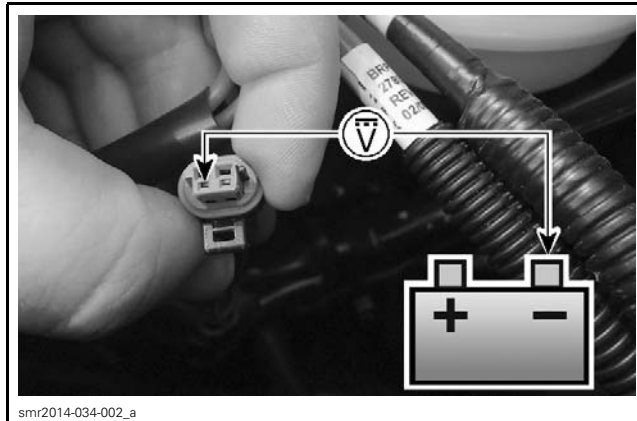
1. Make sure F1 fuse is powered and in good condition before testing.
2. Disconnect solenoid connector.



1. 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 3 minutes after START/STOP switch has been depressed.

SOLENOID INPUT VOLTAGE TEST (SOLENOID COIL)		
TEST PROBES		VOLTAGE READING
Pin A	Battery ground	Battery voltage



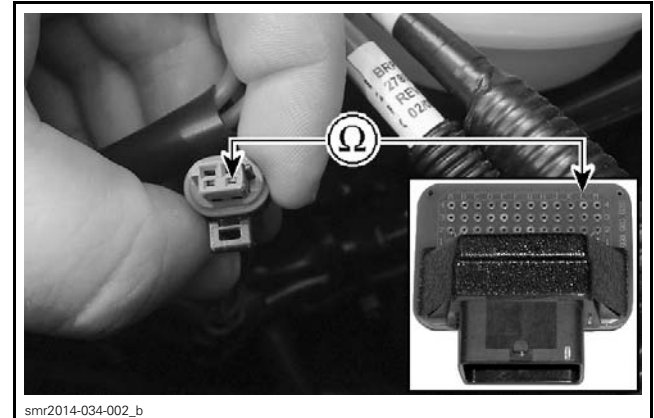
If test succeeded, carry out *TESTING THE SOLENOID CONTROL CIRCUIT*.

If test failed, carry out *TESTING THE START/STOP SWITCH CIRCUIT CONTINUITY*.

Testing the Solenoid Control Circuit Continuity

1. Set the multimeter to Ω .
2. Disconnect connector "B" from ECM, refer to *WIRING HARNESS AND CONNECTOR* subsection.
3. Install the ECM adaptor 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 THE SOLENOID COIL RESISTANCE*.

Testing the 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.

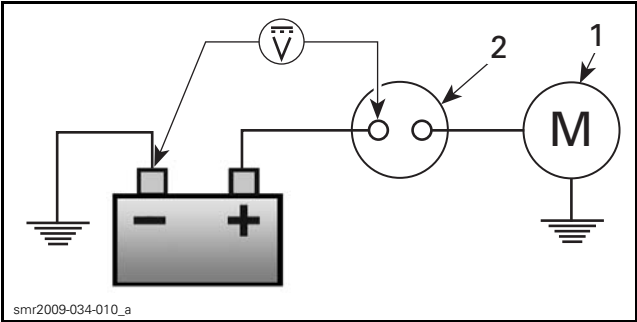
Testing the Solenoid (Dynamic)

1. Ensure fuse F1, 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. Depress the throttle lever to place the ECM in engine drowned mode. Hold throttle lever in place using a rubber band
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

Section 05 ELECTRICAL SYSTEM

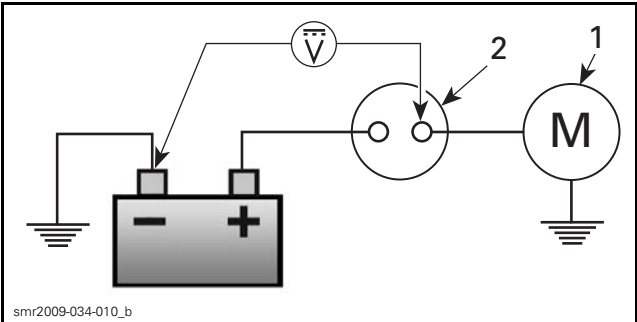
Subsection 05 (STARTING SYSTEM)



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.

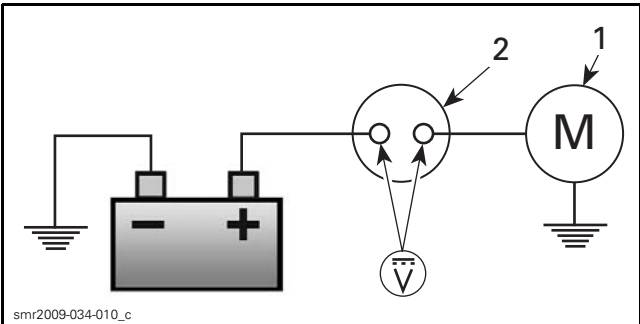
SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		VOLTAGE (DC)
Solenoid starter post	Battery ground	Battery voltage



1. Starter motor
2. Starter solenoid

9. If test failed, carry out a *TESTING THE SOLENOID INPUT VOLTAGE (SOLENOID COIL)*.
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.



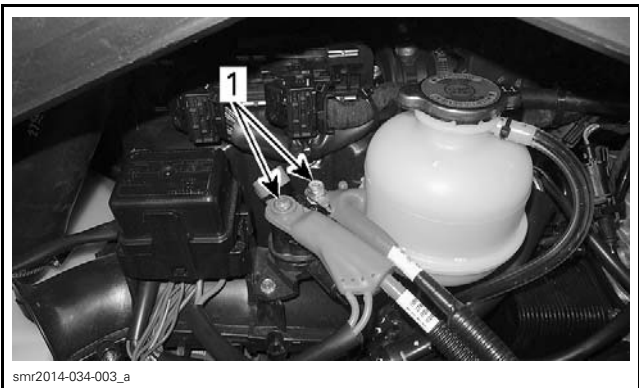
1. Starter motor
2. Starter solenoid

- If test failed, replace solenoid.
If all solenoid dynamic tests are as specified, replace starter.
11. Remove rubber band from throttle lever.
12. Reinstall all removed parts.

Removing the Solenoid

1. Disconnect battery.

- CAUTION** Always disconnect the BLACK (-) battery cable first and reconnect last.
2. Disconnect solenoid cables.



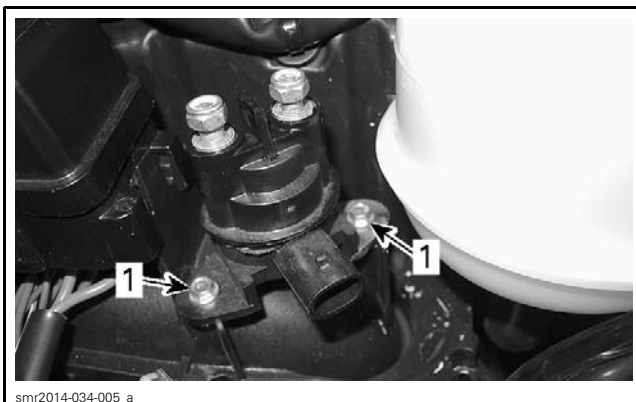
1. Solenoid cable nuts

3. Disconnect starter solenoid connector.



1. Starter solenoid connector

4. Remove both screws retaining the solenoid.



1. Solenoid retaining screws

5. Reconnect battery and test starter solenoid operation.

STARTER

For starter information refer to *MAGNETO AND STARTER* subsection.

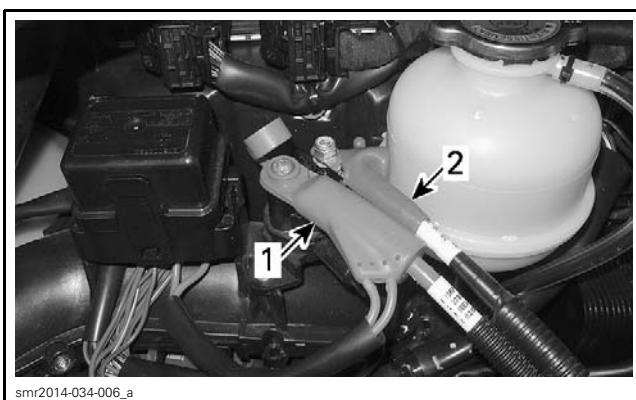
Installing the Solenoid

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

1. Secure solenoid on its supports using previously removed screws.

TIGHTENING TORQUE	
Solenoid retaining screws	2 N•m ± 0.5 N•m (18 lbf•in ± 4 lbf•in)

2. Connect solenoid connector.
3. Reinstall cables to solenoid as shown.



1. Cable from battery
2. Cable to starter motor

NOTE: Apply dielectric grease under and over each connections and make sure each nut are well covered.

SERVICE PRODUCT	
DIELECTRIC GREASE (P/N 293 550 004)	

TIGHTENING TORQUE	
Solenoid cable retaining nuts	4 N•m ± 0.5 N•m (35 lbf•in ± 4 lbf•in)

4. Close or slide protective caps.

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 B.U.D.S. 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.

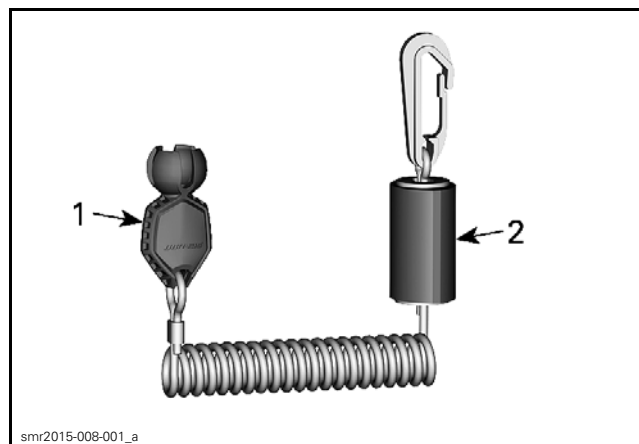
D.E.S.S. Key Types

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 06 (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)*.

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:

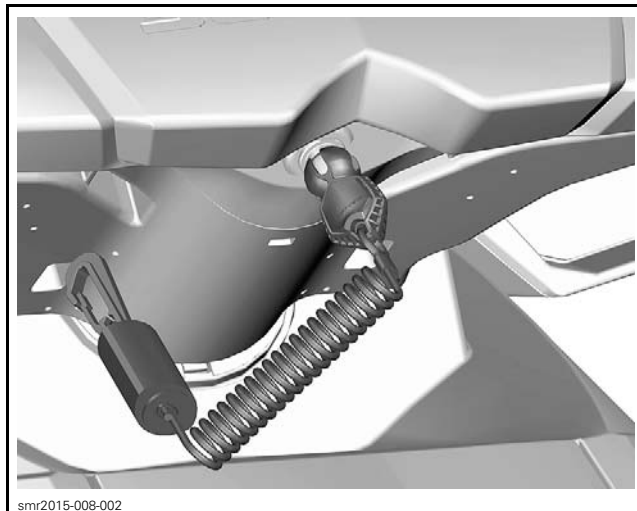
1. Briefly press the START/STOP button to wake up the ECM.
2. Securely install the tether cord on watercraft engine cut-off switch.
3. Press and hold the START/STOP button to start engine.

Programming D.E.S.S. Keys

1. Connect the watercraft to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

IMPORTANT: Ensure all connections have been made **before starting B.U.D.S.** to allow proper operation.

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. Read ECM.

5. Click on **Keys** tab.

Refer to *IGNITION SYSTEM* subsection for testing procedures.

Adding a Key

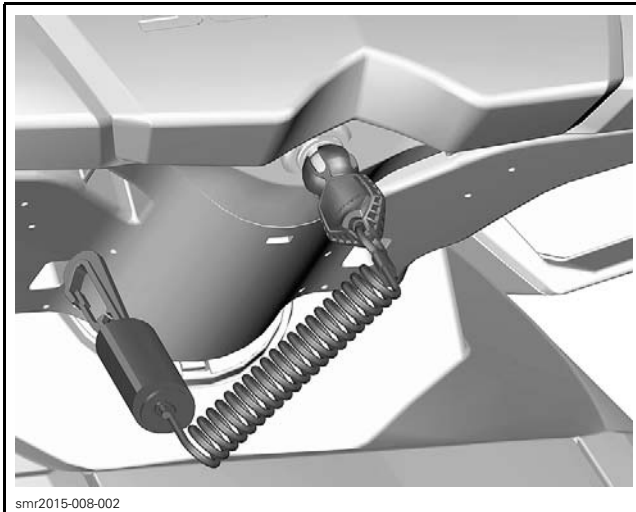
1. Click on the **Add Key** button.
2. Follow instructions on BUDS2 screen.

Adding Another Key

1. Remove the tether cord from the engine cut-off switch.
2. Install the next tether cord on the engine cut-off switch.
3. Click on the **Add Key** button.

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.

MULTIFUNCTION GAUGE

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	150

SERVICE PRODUCTS

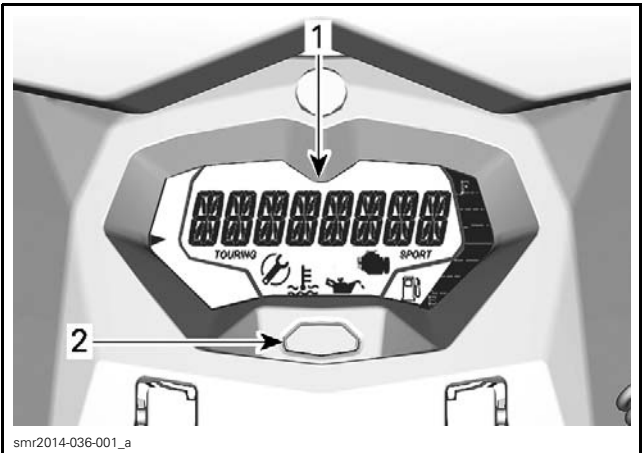
Description	Part Number	Page
DEOXIT LUBRICANT.....	293 550 034	147
DIELECTRIC GREASE	293 550 004	147, 154

GENERAL

MULTIFUNCTION GAUGE

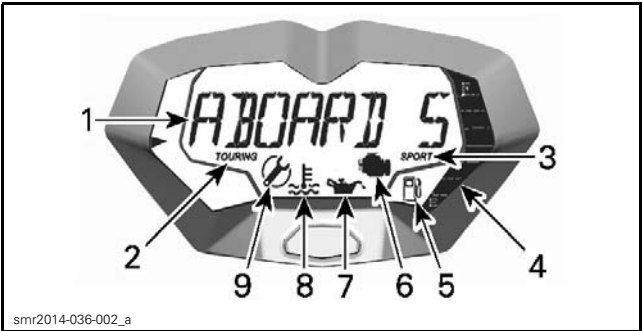
 **WARNING**

Do not adjust the display while riding, you could lose control.



1. Multifunction gauge
2. Mode button

Multifunction Gauge Description



1) Multifunction Display

The multifunction display is used to:

- Display the WELCOME message on power up.
- Activating and setting modes of operation.
- Display scrolling messages of function activation or system faults.
- Display the accumulated engine hours.
- Provide various indications as selected by the operator.

NOTE: If a fault occurs, the multifunction display will periodically scroll the applicable fault message and revert to the RPM indication, depending on the severity of the fault detected.

2) Touring Mode Indicator

When the TOURING mode indicator is ON, the default TOURING mode is active.

Refer to *INTELLIGENT THROTTLE CONTROL (ITC)* subsection for details.

NOTE: Touring mode is only applicable to the ACE 900 HO models.

3) Sport Mode Indicator

The SPORT mode indicator is normally off.

When sport mode of operation is selected, the SPORT mode indicator will come on and stay on until sport mode is deactivated, or the watercraft is shut down.

NOTE: Sport mode is only available on the ACE 900 HO models. It is not the default riding mode. To be active, it must be selected on after starting the engine.

Refer to *INTELLIGENT THROTTLE CONTROL (ITC)* subsection for detailed instructions.

4) Fuel Level Indication

A bar gauge located in the RH side of the multifunction display continuously indicates the amount of fuel in the fuel tank while riding.

When the fuel tank is full, 8 segments (bars) of the indicator are turned on.

When there is only 2 segments of fuel indicated (approximately 12 L (3.2 U.S. gal.)), the following indications will come ON to advise you that a low fuel condition exists.

LOW FUEL LEVEL INDICATIONS	
Last 2 fuel gauge segments	Flashing
Fuel tank symbol	
Audible advisory (a 2 second beep)	Periodically (every 5 minutes)

5) Low Fuel Level Indicator

When the low fuel indicator starts flashing, it indicates that there is approximately 12 L (3.2 U.S. gal.) of fuel left in fuel tank.

6) Check Engine Light

The check engine light comes ON when a fault is detected by the engine management system.

The check engine light may be accompanied by the applicable scrolling fault message in the multifunction display.

7) Low Oil Pressure Indicator

When this indicator is ON, it indicates a low oil pressure condition which may be due to a low oil level. Look for a message in the multifunction display.

8) High Temperature Indicator

The high temperature indicator comes ON when a high engine temperature or a high exhaust system temperature is detected.

9) Maintenance Reminder Indicator

The maintenance reminder indicator comes ON when required maintenance is due.

MULTIFUNCTION DISPLAY MESSAGES

ADVISORY MESSAGES	
WELCOME ABOARD SEA-DOO	Power up display
RPM	RPM indication
ENTERING SPORT MODE - INCREASED ACCELERATION - INSTRUCT PASSENGERS TO HOLD - PRESS SET BUTTON	Message when SPORT mode is selected
SPORT MODE ACTIVATED	Message when SPORT mode is activated
SPORT MODE - RETURN TO IDLE TO ACTIVATE	Message when SPORT mode cannot be activated, engine not at idle
SPORT MODE ACTIVE - RETURN TO IDLE TO CANCEL	Message when SPORT mode is in use
SPORT MODE DEACTIVATED	Message when user first returns to TOURING mode

FAULT MESSAGES	
LO OIL	Engine low oil pressure detected
HI EXHAUST TEMP	High exhaust temperature detected
HI ENGINE TEMP	High engine temperature detected
CHECK ENGINE	Engine system malfunction or maintenance required
HI BATTERY VOLTAGE	High battery voltage detected
LO BATTERY VOLTAGE	Low battery voltage detected
LIMP HOME	Major fault detected, engine power limited
FUEL SENSOR DEFECTIVE	Fuel level sensor fault
CALIBRATION CHECKSUM ERROR	Cluster programming corrupted, need to be re-flashed using BUDS2
MAINTENANCE REQUIRED	Watercraft maintenance required
OTAS FAILURE	OTAS is not correctly adjusted

TROUBLESHOOTING

DIAGNOSTIC TIPS

NOTE: It is a good practice to check for fault codes using BUDS2 software as a first troubleshooting step. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

IMPORTANT: When troubleshooting an electrical system fault, check battery condition, cables and connections first.

Electrical System Activation

1. Press the START/STOP button.

NOTE: Pressing the START/STOP button without the tether cord installed on the engine cut-off switch will turn on electrical power without starting the engine; the multifunction gauge will cycle through a self-test function and shut off its display after a few seconds. However, the electrical system will stay powered up for approximately three minutes after the START button was pressed.

2. After pressing the START/STOP button, install the tether cord on the engine cut-off switch to maintain the multifunction gauge active when testing procedures require it to stay active.

IMPORTANT: When BUDS2 is being used, the ECM will eventually stop communicating with BUDS2. Therefore, operations with BUDS2 will be interrupted. To reestablish communication, briefly press the START button. **Do not hold** the START button to avoid engine starting.

Testing the Circuits

Check the related-circuit fuse condition with a fuse tester or ohmmeter (a visual inspection could lead to a wrong conclusion).

Inspecting the Electrical Connections

When replacing an electric or electronic component, always check electrical connections. Make sure they are tight, make good contact, and are corrosion-free. Dirty, loose or corroded contacts are poor conductors and are often the source of a system or component malfunction.

Pay particular attention to ensure that pins are not bent or pushed out of their connectors.

Ensure all wire terminals are properly crimped on wires, and connector housings are properly fastened.

Pay attention to ground wires.

Check for signs of moisture, corrosion or dullness. Clean pins properly using Deoxit lubricant and coat them with dielectric grease or other appropriate lubricant when reassembling them, except if otherwise specified such as for the ECM connectors.

SERVICE PRODUCT
DEOXIT LUBRICANT (P/N 293 550 034)
DIELECTRIC GREASE (P/N 293 550 004)

TROUBLESHOOTING GUIDELINES

Press the START/STOP button and install the tether cord on the engine cut-off switch.

NOTE: The multifunction gauge should come on, cycle through its self test function, and stay on for approximately 3 minutes after which all electrical power will turn off.

Briefly press the START/STOP button every 3 minutes to reenergize the electrical system. Do not hold the START/STOP button to avoid engine starting.

NOTE: When troubleshooting using the following guidelines, it is important to remember that some indications, functions and features described may not apply to every PWC model, or may be available as an option.

Multifunction Gauge “Does Not Turn ON”

If the multifunction gauge does not turn ON when the START/STOP button is pressed, the power circuit or ground circuit to the multifunction gauge is probably open.

Check the following in the listed order:

- 15A battery fuse (F3)
- 10A ACC fuse (F1)
- 5A START/STOP fuse (F2)
- Test for battery voltage at contacts on top of the ACC fuse (F1)
- If voltage is good on both contacts of F1, carry out *TESTING THE MULTIFUNCTION GAUGE INPUT VOLTAGE*
- Continuity of gauge ground circuit (gauge connector pin 4 (without iBR) or pin 8 (with iBR) (BLACK wire) to engine or battery ground)
- If no voltage at F1, test relay in fuse box
- Refer to *TESTING THE ECM WAKE-UP CIRCUIT* in *ELECTRONIC FUEL INJECTION (EFI)* subsection.

NOTE: When testing for power, be sure to test within 3 minutes after pressing the START button.

Multifunction Gauge Turns ON with Some Indications Missing

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Read the fault codes, refer to *DIAGNOSTIC AND FAULT CODES* subsection.

If a fault code is related to a communication problem, carry out a continuity test of the CAN bus wires. Refer to *WIRING DIAGRAM* and *CONTROLLER AREA NETWORK (CAN)* subsections.

NOTE: The multifunction gauge, ECM, and the diagnostic connector are linked together through CAN bus. If one wire of the two wire CAN bus system is open, communication will be slower than normal. Multiple fault codes may be generated and the ECM may put the watercraft in LIMP HOME mode.

If one module cannot be seen in BUDS2, the fault may be the wires that link the module to the CAN bus, or a problem internal to that module. Test the CAN bus wires of the faulty module for continuity before assuming the problem is the module.

Multifunction Gauge Goes Blank Except for:

- Fuel level ON

Section 05 ELECTRICAL SYSTEM

Subsection 07 (MULTIFUNCTION GAUGE)

There is no communication between the multifunction gauge and the ECM.

Carry out a continuity check of the CAN bus wires from the multifunction gauge (pins 5 and 6) to the ECM and diagnostic connector. Refer to the *WIRING DIAGRAM* and *CONTROLLER AREA NETWORK (CAN)* subsections for details.

If an open circuit is detected, carry out the same test from the 20 pin steering connector (pins 2 and 3).

NO RPM Indication and NO Engine Hour Display

If there is NO RPM indication, and NO engine hour display (on power-up), and the watercraft is in LIMP HOME mode, the CAN bus to the ECM is open.

Carry out a continuity check of the CAN bus wires from the ECM module, connector "B" pins C1 and C2 (B-C1 and B-C2) to the gauge and diagnostic connector. Refer to the *WIRING DIAGRAM* and *CONTROLLER AREA NETWORK (CAN)* subsections for details.

NO Fuel Level Indication

If there is no fuel level indication, test the fuel level sensor and its wiring circuit to the multifunction gauge. Refer to *FUEL TANK AND FUEL PUMP* subsection.

Beeper Does Not Function

The beeper is incorporated within the multifunction gauge.

If no beep code is heard when pressing the START button and installing the tether cord, first ensure ECM is powered. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

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

In BUDS2, go to:

- **Functions** page
- **Cluster** button
- **Execute Cluster Buzzer Test**

If the **Cluster Buzzer Test** failed, the ECM is powered, and the ECM and multifunction gauge are communicating properly through the CAN bus, replace the multifunction gauge.

PROCEDURES

MULTIFUNCTION GAUGE

Multifunction Gauge Self Test Function

When the START/STOP button is pressed momentarily and the vehicle powers up, all LCD segments and indicator lights in the multifunction gauge will turn **ON for approximately 3 seconds** (self test function). This self test function allows the driver time to ensure that all indications are functioning properly.

It also validates the multifunction gauge internal circuits, however, this does not validate proper operation of the individual external circuits and sensors that provide inputs to the multifunction gauge.

If a system fault is detected by the ECM, the applicable message and/or indicator light will be displayed, and a beep code may be heard.

If the tether cord is not installed, the indications in the multifunction gauge will shut off a few seconds after the self test function, but the electrical system power stays on for approximately 3 minutes. Installing the tether cord on the engine cut-off switch will turn the indications back on.

If the tether cord is installed, the multifunction gauge will stay on for approximately 3 minutes.

NOTE: If the START/STOP button is pressed and held without the tether cord installed, the multifunction gauge will stay on as long as the START button is held.

Multifunction Gauge Setup

Units of Measurement and Language Setting

1. Connect vehicle to the BRP diagnostic software (BUDS2), refer to the *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Press the START/STOP button to energize the electrical system.

NOTE: You will need to press the START button every three minutes or the electrical system will shut off.

3. In BUDS2, go to:
 - **SETTINGS** page
 - **CLUSTER** button
 - **Change Cluster Language and Units.**

Clearing the Maintenance Reminder Indicators

When the watercraft or engine are due for maintenance, the maintenance reminder indicator will come on, and a scrolling **MAINTENANCE REQUIRED** message will scroll in the digital screen. These maintenance reminders must be cleared using BUDS2.

1. Connect the vehicle to the BRP diagnostic software (BUDS2),
2. Press the START/STOP button to energize the electrical system.
3. Install the tether cord on engine cut-off switch.
4. In BUDS2, select the following:
 - **SUMMARY** tab
 - **VEHICLE** button
5. At the bottom RH side of the **LAST SERVICE** table, press the **RESET SERVICE** button.

Multifunction Gauge Pin-Out

NOTE: Depending on watercraft model and installed accessories, some multifunction gauge connector pins may not be used.

Models without iBR

MULTIFUNCTION GAUGE PIN-OUT	
PIN NO.	FUNCTION
1	Accessory 12 Vdc input power
2	Not used
3	Fuel level sensor VDC signal
4	GND
5	CAN HI
6	CAN LOW

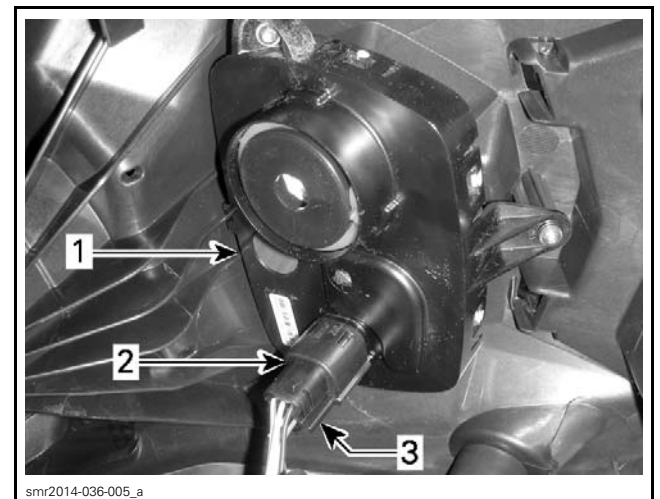
Models with iBR

MULTIFUNCTION GAUGE PIN-OUT	
PIN NO.	FUNCTION
1	VTs button GND (if equipped)
2	Accessory 12 Vdc input power
3	Permanent 12 Vdc input power
4	Fuel level sensor VDC signal
5	VTs button input signal (if equipped)
6	Not used
7	Not used

MULTIFUNCTION GAUGE PIN-OUT	
PIN NO.	FUNCTION
8	GND
9	CAN HI
10	CAN LOW

Testing the Multifunction Gauge Input Voltage (at Gauge Connector)

1. Remove the LH knee pad, refer to *BODY* subsection.
2. Disconnect the gauge connector.



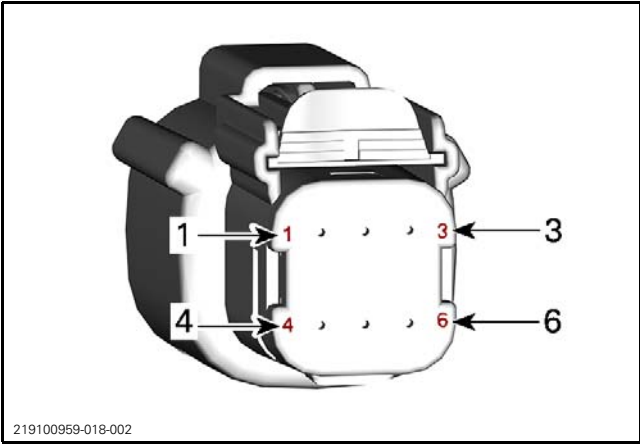
1. Gauge
2. Gauge connector
3. Press tab to unlock connector

3. Set the multimeter to Vdc.
4. Press the START button.
5. Install the tether cord on the engine cut-off switch.
6. Measure the multifunction gauge input voltage as per following table.

Models without iBR

INPUT VOLTAGE TEST AT GAUGE CONNECTOR		
PROBE		VOLTAGE
Pin 1	Pin 4	Battery voltage
Pin 1	Battery ground	

Section 05 ELECTRICAL SYSTEM
Subsection 07 (MULTIFUNCTION GAUGE)

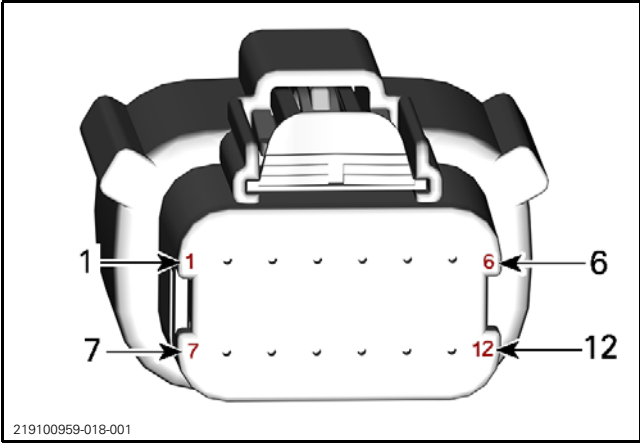


GAUGE CONNECTOR PIN-OUT

Models with iBR

PROBE		VOLTAGE
Pin 2	Pin 8	Battery voltage
Pin 2	Battery ground	
Pin 3*	Battery ground	

NOTE: * pin 3 is unswitched 12V.

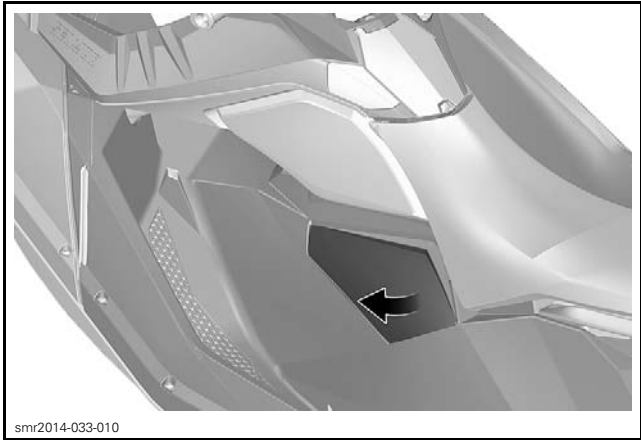


GAUGE CONNECTOR PIN-OUT

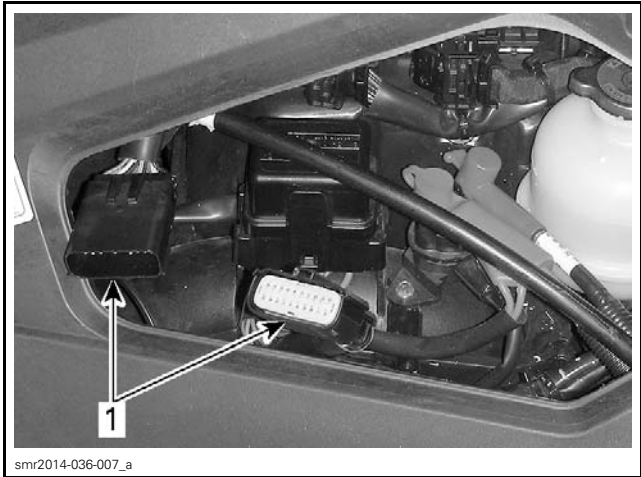
If battery voltage is measured as specified, replace the multifunction gauge.
If battery voltage is measured to battery ground but not to pin 4 (for models without iBR) or pin 8 (for models with iBR), carry out TESTING THE CONTINUITY OF GAUGE GROUND WIRE circuit from the gauge connector to the engine ground.
If battery voltage is not measured at the gauge connector, carry out TESTING THE MULTIFUNCTION GAUGE INPUT VOLTAGE (AT STEERING CONNECTOR).

Testing the Multifunction Gauge Input Voltage (at Steering Connector)

- 1. Remove LH access cover, refer to BODY sub-section.



- 2. Disconnect the 20-pin steering connector.



1. Disconnected 20-pin steering connector

- 3. Connect the diagnostic harness between the disconnected steering connectors.

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

- 4. Press the START/STOP button.
- 5. Install tether cord on the engine cut-off switch.
- 6. Test as per following table.

Section 05 ELECTRICAL SYSTEM

Subsection 07 (MULTIFUNCTION GAUGE)

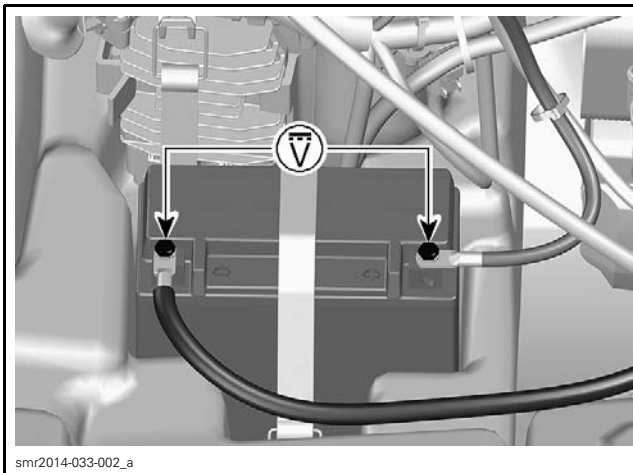
MULTIFUNCTION GAUGE INPUT VOLTAGE TEST (STEERING CONNECTOR)		
TEST CONNECTOR ON DIAGNOSTIC HARNESS		VOLTAGE
Pin 20	Pin 11	Battery voltage
Pin 20	Battery ground	

If battery voltage is read at steering connector (vehicle harness side) as specified in preceding table, but was not measured to pin 4 (without iBR) or pin 8 (with iBR) at the gauge connector (gauge ground wire), repair or replace the BLACK ground wire between the gauge connector and the steering connector.

If battery voltage is measured to battery ground but not to pin 11, carry out a *TESTING THE CONTINUITY OF GAUGE GROUND WIRE* described further in this subsection.

If no voltage is measured, carry out the following steps.

- Set multimeter to Vdc and measure voltage at battery terminals.



TYPICAL - BATTERY VOLTAGE TEST

- Remove fuse box cover.

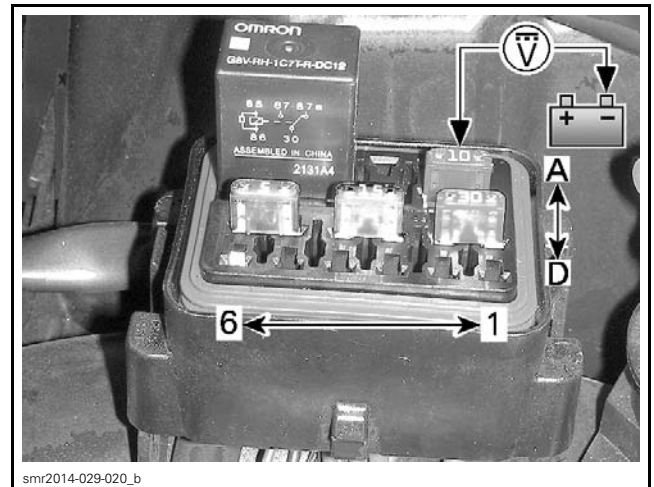


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- Fuse box cover to remove

- Press the START/STOP button.
- Install the tether cord on engine cut-off switch.
- Test for battery voltage between each of the terminals atop the ACC fuse (F1) and battery ground as per following table.

VOLTAGE TEST AT FB		
TEST PROBES		READING
B1	Battery (-) post	Battery Vdc
B2		



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VOLTAGE TEST AT FUSE CONTACTS

If battery voltage is measured at B2 but not at B1 (with fuse installed), replace the fuse.

If battery voltage is measured at fuse contact B1, refer to *TESTING THE CONTINUITY OF GAUGE POWER WIRE* in this subsection.

Testing the Continuity of Gauge Power Wire

- Remove tether cord from engine cut-off switch.

Section 05 ELECTRICAL SYSTEM
Subsection 07 (MULTIFUNCTION GAUGE)

- 2. Disconnect gauge connector.
- 3. Disconnect 20-pin steering connector.
- 4. Connect diagnostic harness between the disconnected steering connectors.
- 5. Remove the ACC fuse (F1).



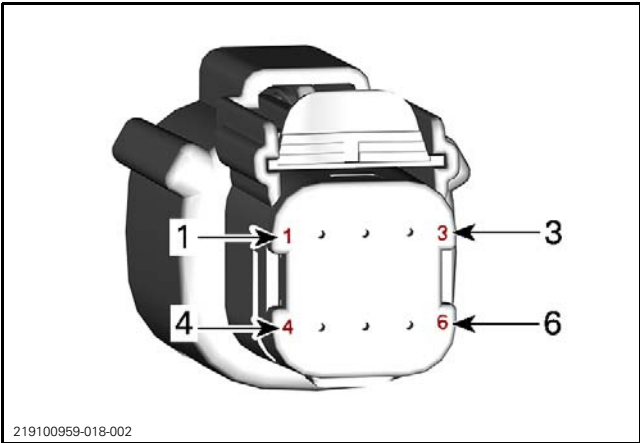
1. Remove ACC fuse (F1)

- 6. Set multimeter to Ω setting.
- 7. Test for continuity of the multifunction gauge power circuit as per following table.

Models without iBR

CONTINUITY TEST OF GAUGE POWER CIRCUIT

GAUGE CONNECTOR	TEST CONNECTOR ON DIAGNOSTIC HARNESS	FUSE BOX	READING
Pin 1	Pin 20	—	Close to 0 Ω
Pin 1	—	B1	
—	Pin 20	B1	



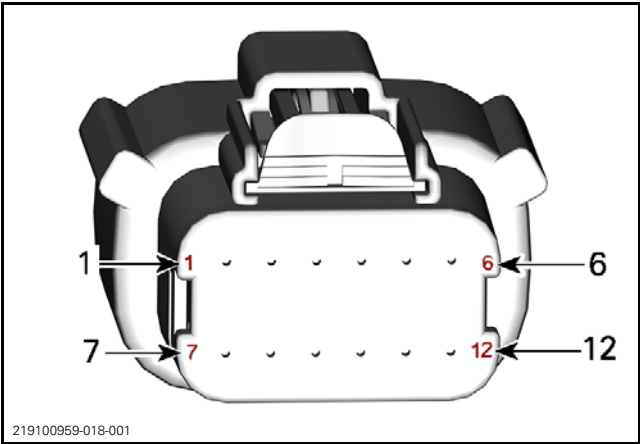
GAUGE CONNECTOR PIN-OUT

Models with iBR

CONTINUITY TEST OF GAUGE POWER CIRCUIT

GAUGE CONNECTOR	TEST CONNECTOR ON DIAGNOSTIC HARNESS	FUSE BOX	READING
Pin 2	Pin 20	—	Close to 0 Ω
Pin 2	—	B1	
—	Pin 20	B1	
Pin 3*	—	C5	

NOTE: * pin 3 is unswitched 12V.



GAUGE CONNECTOR PIN-OUT



FUSE BOX CONTACT COORDINATES

- 8. If an open circuit is measured, pay attention to the following:
 - Pin and socket condition in connectors
 - Proper contact and crimping of pins and sockets in connectors
 - Wire junctions JT-2 (VT/GY) and JT-1 (VT/GY). Refer to WIRING DIAGRAM for details.

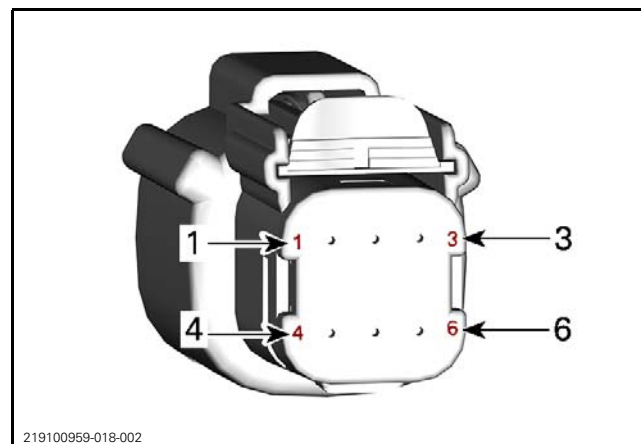
9. Repair or replace wiring/connectors as required.

Testing the Continuity of Gauge Ground Wire

1. Disconnect the 20-pin steering connector.
2. Connect the diagnostic harness between the disconnected steering connectors.
3. Set multimeter to Ω selection and carry out a continuity test as per following table. Refer to the *WIRING DIAGRAM* for circuit details.

Models without iBR

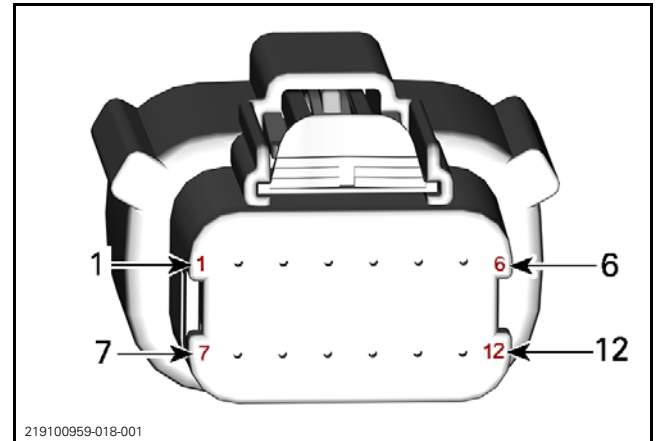
CONTINUITY TEST OF GAUGE GROUND WIRE			
MULTIMETER PROBES			READING
GAUGE CONNECTOR	TEST CONNECTOR ON DIAGNOSTIC HARNESS	ENGINE GROUND	
Pin 4	—	✓	Close to 0 Ω
Pin 4	Pin 11	—	
—	Pin 11	✓	



GAUGE CONNECTOR PIN-OUT

Models with iBR

CONTINUITY TEST OF GAUGE GROUND WIRE			
MULTIMETER PROBES			READING
GAUGE CONNECTOR	TEST CONNECTOR ON DIAGNOSTIC HARNESS	ENGINE GROUND	
Pin 8	—	✓	Close to 0 Ω
Pin 8	Pin 11	—	
—	Pin 11	✓	

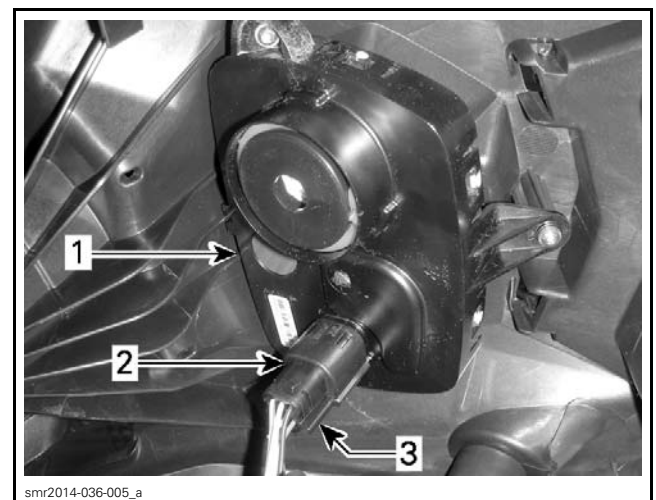


GAUGE CONNECTOR PIN-OUT

4. Repair wiring and connectors as required.

Removing the Multifunction Gauge

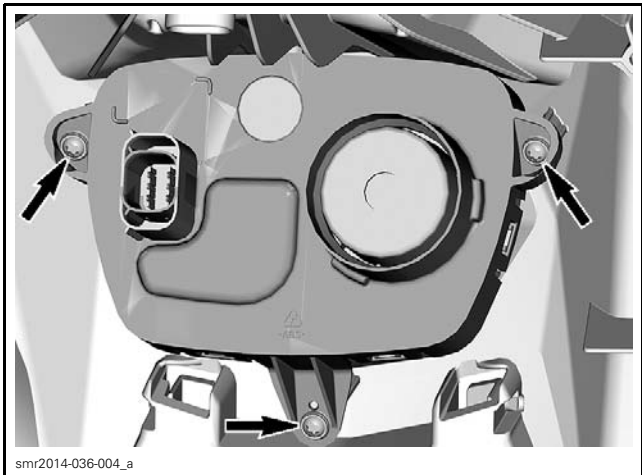
1. Remove LH or RH knee pad.
2. Reach in under console and disconnect multifunction gauge connector.



1. Multifunction gauge (viewed from under console)
2. Multifunction gauge connector
3. Connector release tab to press

3. Remove the 3 multifunction gauge mounting screws.

Section 05 ELECTRICAL SYSTEM
Subsection 07 (MULTIFUNCTION GAUGE)



MULTIFUNCTION GAUGE MOUNTING SCREWS (3)

Installing the Multifunction Gauge

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

1. Apply a small amount of dielectric grease to the gauge connector pins (harness side).

SERVICE PRODUCT
DIELECTRIC GREASE (P/N 293 550 004)

2. Reconnect gauge connector and ensure proper operation of gauge.

NOTE: If you are installing a replacement multifunction gauge, refer to *REPLACING THE MULTIFUNCTION GAUGE* in this subsection.

Replacing the Multifunction Gauge

NOTE: Replacement multifunction gauges are delivered already programmed.

After the multifunction gauge has been replaced, connect the watercraft to BUDS2 and carry out any updates (if required). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

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.

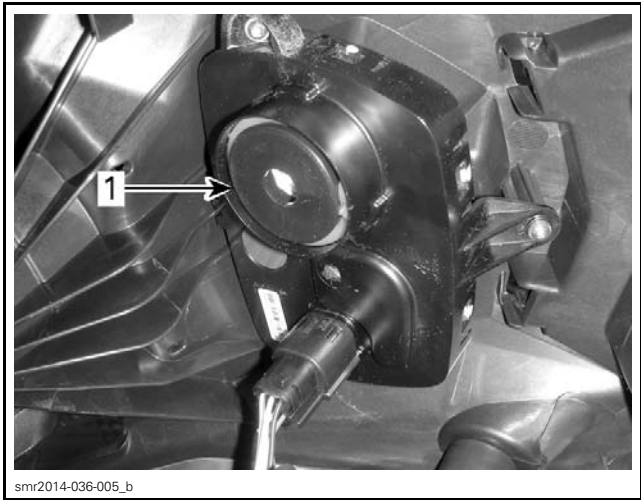
Setting Language and Units of Measurement

1. In BUDS2, go to:
 - **SETTINGS** page
 - **CLUSTER** button
 - **SETTINGS** tab
 - **CONFIGURE LANGUAGE AND UNITS**.

BEEPER

Beeper Information

The beeper is part of the multifunction gauge.



1. Beeper

For a the definition of the beeper codes, refer to the *BEEPER SIGNALS* table in the *DIAGNOSTIC AND FAULT CODES* subsection.

ACCESSORIES

PROCEDURES

ELECTRIC BILGE PUMP

Bilge Pump Operation

The bilge pump has 12 volt input from the main relay.

The pump activate when the ECM is activated.
It is protected by a 3 Amp fuse.

Bilge Pump Location

The bilge pump is located on the right side, under the muffler.

Testing the Bilge Pump Operation

Pump should automatically run. Otherwise, make sure circuit fuse is good. Refer to the *WIRING DIAGRAM*.

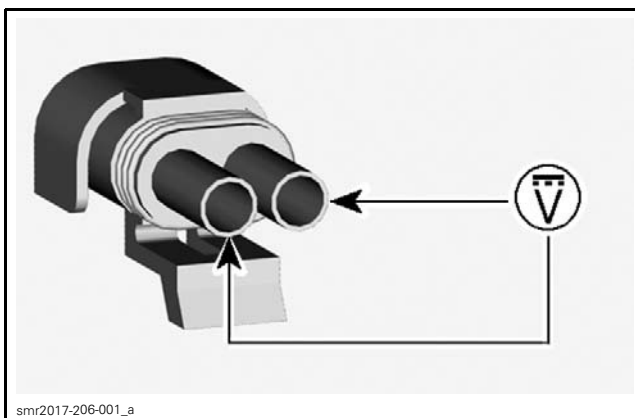
If fuse is good, test the *BILGE PUMP INPUT VOLTAGE*.

Testing the Bilge Pump Input Voltage.

Disconnect bilge pump connector.

Activate ECM.

Set multimeter to Vdc and read voltage as shown.



If voltage is not the same as battery, test positive and ground circuits separately. Refer to the *WIRING DIAGRAM*.

AUDIO SYSTEM

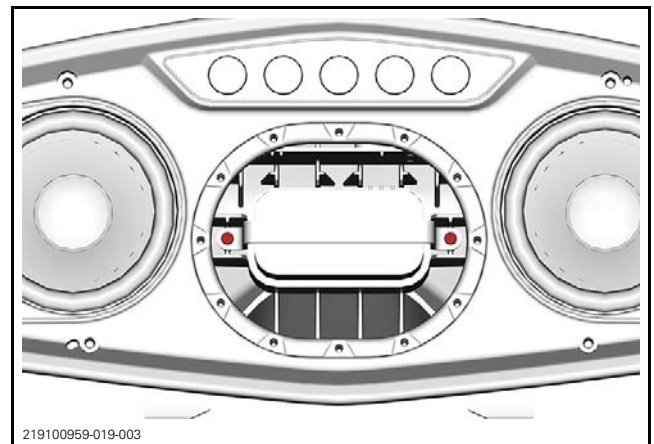
This system is completely self contained and has no electrical connection to the PWC. It needs to be connected to a household electrical outlet to be charged.

Removing and Installing the Sound System

Refer to *BODY* subsection.

Replacing the Battery

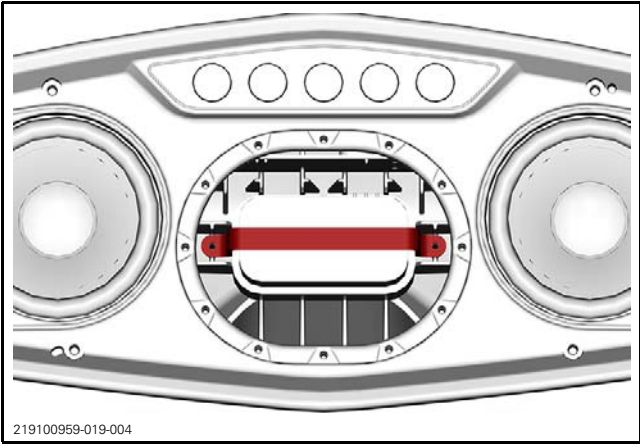
Remove the following fasteners.



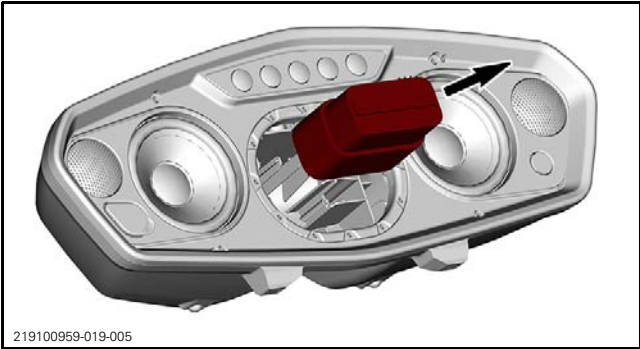
Remove battery support.

Section 05 ELECTRICAL SYSTEM

Subsection 08 (ACCESSORIES)



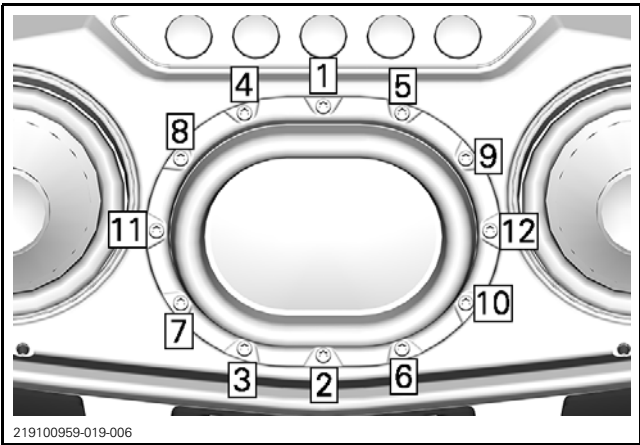
Disconnect electrical connector and remove battery.



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

TIGHTENING TORQUE	
Handle retaining screw	0.7 N•m (6 lbf•in)
Center Trim retaining screw See tightening sequence	0.3 N•m (3 lbf•in)
Battery support retaining screw	0.5 N•m (4 lbf•in)

The center trim tightening sequence is as follow.



STEERING AND OTAS SYSTEMS

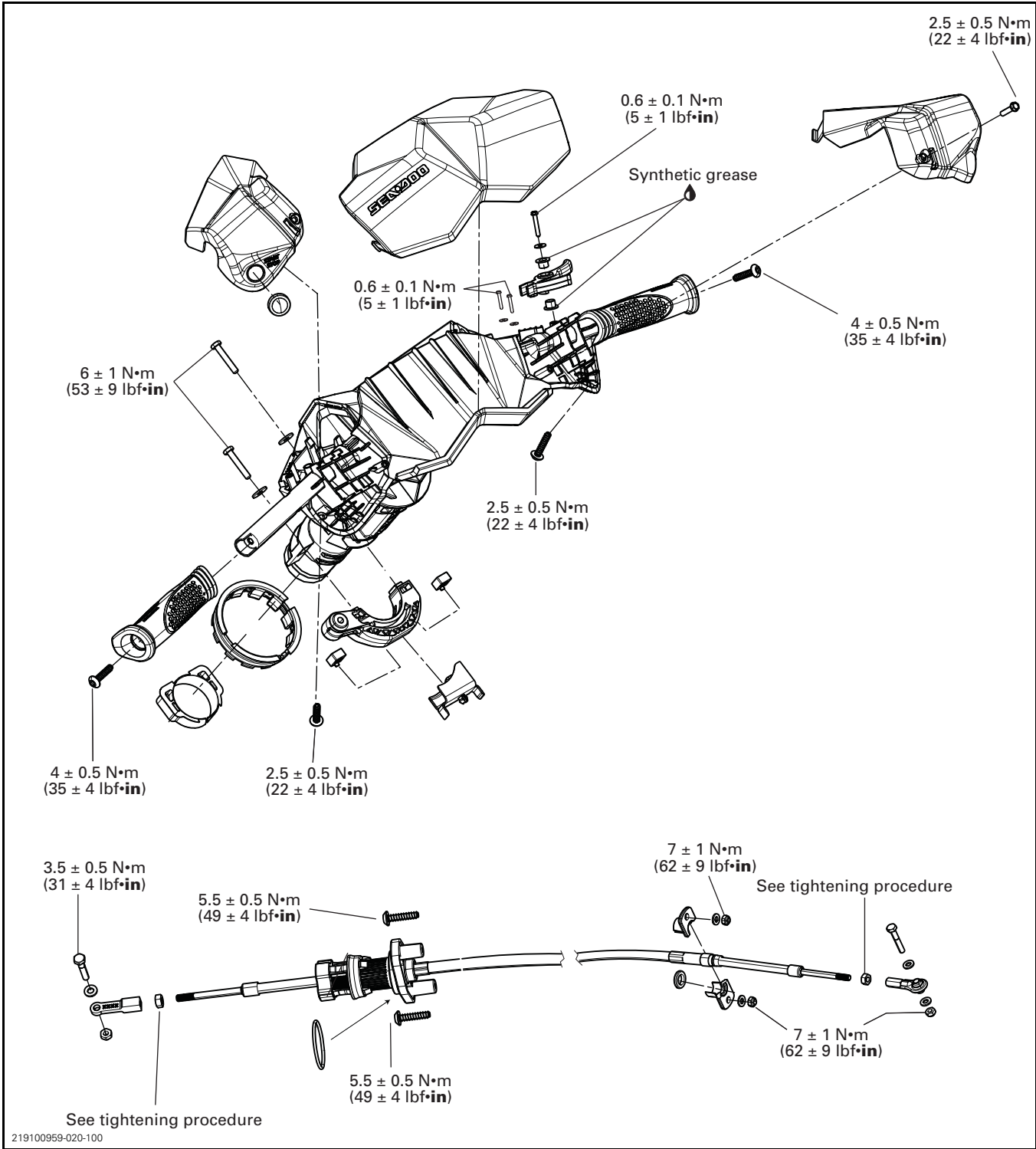
SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	166
FLUKE 115 MULTIMETER	529 035 868	166

SERVICE PRODUCTS

Description	Part Number	Page
SYNTHETIC GREASE (EUR)	779231	161
SYNTHETIC GREASE	779162	161

STEERING COLUMN AND CABLE

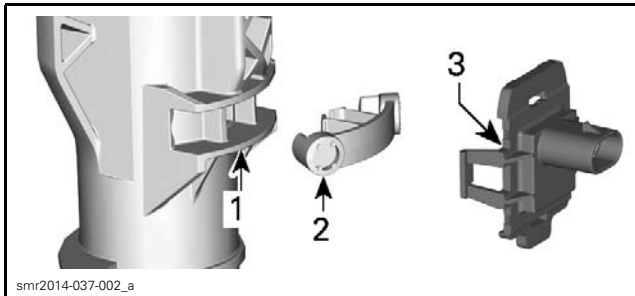


GENERAL

O.T.A.S. SYSTEM DESCRIPTION

The O.T.A.S. (Off-Throttle Assisted Steering) provides additional maneuverability in off-throttle situations.

The system uses a pair of magnets attached to the steering column and a Hall effect switch attached to the steering console.



OTAS COMPONENTS

1. Steering column
2. Magnet
3. Hall effect switch

When activated by a magnet, the O.T.A.S. switch sends a signal to the ECM.

The ECM activates a pre-programmed RPM setting when the driver initiates a full turn after releasing throttle lever. The engine RPM is controlled by the Intelligent Throttle Control (iTC).

The O.T.A.S. system is activated in the following conditions:

- The engine speed must be above 4000 RPM for at least 1.5 second (approximately).
- The throttle lever must be released completely.
- The steering must be fully turned within approximately 4 seconds after throttle release.

The O.T.A.S. will stay activated for a calculated period of time as long as the O.T.A.S. switch is closed.

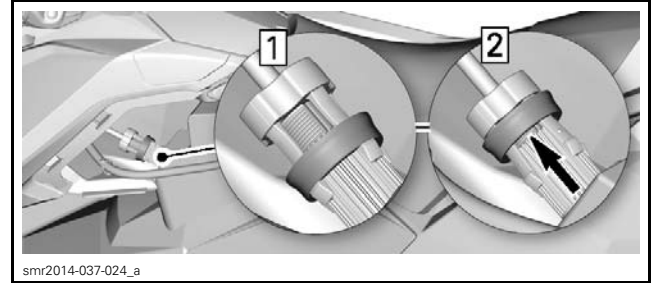
O.T.A.S. will be deactivated if:

- The throttle is reapplied, or
- The steering is turned sufficiently to open the O.T.A.S. switch for more than one second.

ADJUSTMENT

ADJUSTING THE ALIGNMENT OF THE STEERING

1. Remove port side knee pad. Refer to *BODY*.
2. Unlock steering cable adjustment.



STEERING CABLE ADJUSTMENT

STEERING ALIGNMENT	
WATERCRAFT BEHAVIOR	WHAT TO DO
Pulls on left side	Turn steering cable adjustment clockwise
Pulls on right side	Turn steering cable adjustment counter clockwise

3. Lock steering cable adjustment.
4. Test watercraft.
5. Readjust as necessary.

INSPECTION

O.T.A.S. OPERATION

NOTICE Perform inspection procedure within 30 seconds.

Start engine.

Raise engine speed higher than 4000 RPM for more than 1.5 seconds.

Release throttle while steering is in the straight ahead position.

Within 3 seconds, turn handlebar all the way to one side.

The O.T.A.S. should come on by keeping or increasing engine speed to approximately 3000 RPM.

Then, engine speed will gradually decrease to idle speed within approximately 5 seconds.

Repeat test for the other side.

If the engine does not behave as described, carry out the *TESTING THE O.T.A.S. SWITCH WITH BUDS2*

TROUBLESHOOTING

DIAGNOSTIC TIPS

Check fault codes as a first troubleshooting step.

Section 06 STEERING AND PROPULSION
Subsection 01 (STEERING AND OTAS SYSTEMS)

If O.T.A.S. works when handlebar is turned on one side only, check:

- Magnets condition
- If magnets and switch are securely installed.

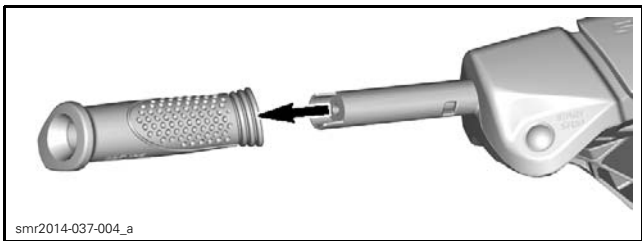
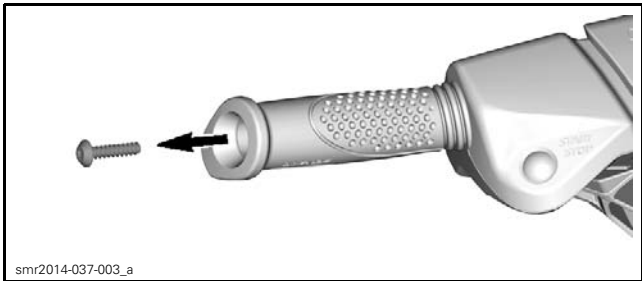
To confirm if O.T.A.S. is functional, carry out *O.T.A.S. OPERATION* in this subsection.

PROCEDURES

HANDLEBAR GRIP

Removing the Handlebar Grip

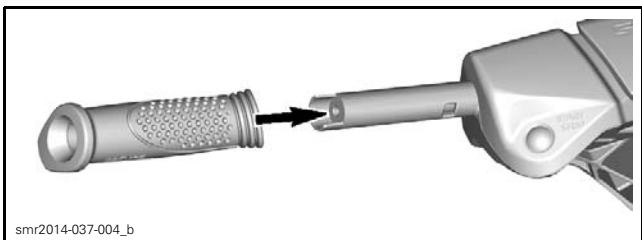
Follow image sequence.



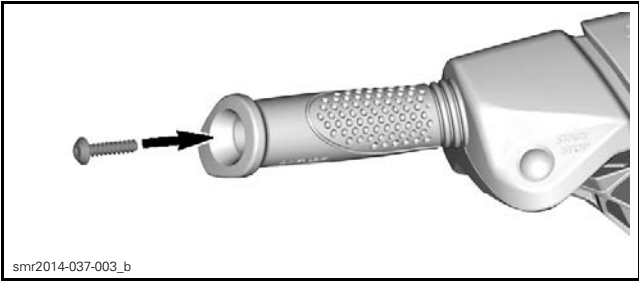
NOTE: Verify grip insert for damage.

Installing the Handlebar Grip

When installing the grip insert in the handlebar, ensure that it is properly inserted in the slot at the end of the handlebar tubing.



Install handlebar grip on handlebar matching it to the notch in the handlebar.



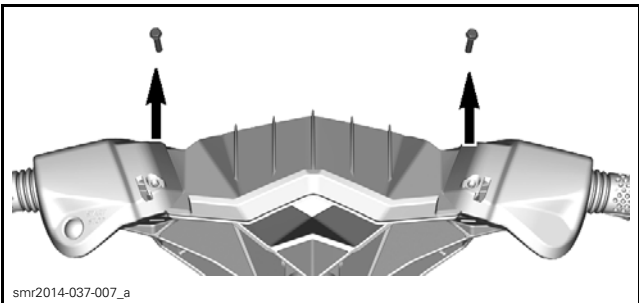
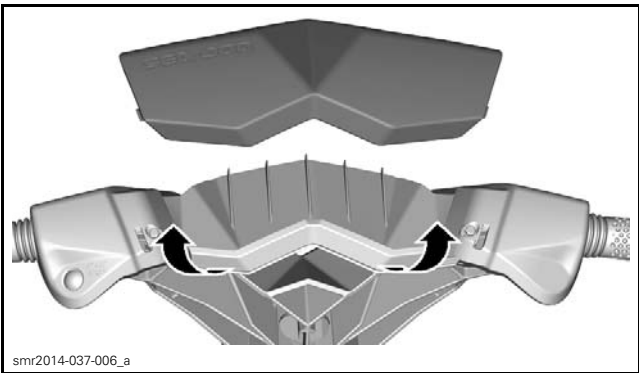
Refer to the exploded view for tightening torque specification.

HANDLEBAR SWITCH COVER (LH OR RH)

Removing the Handlebar Switch Cover (LH and RH)

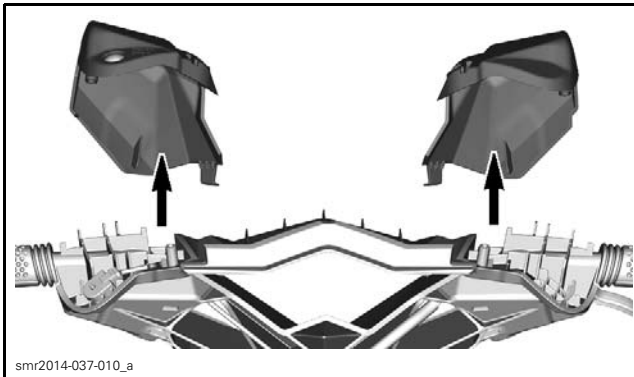
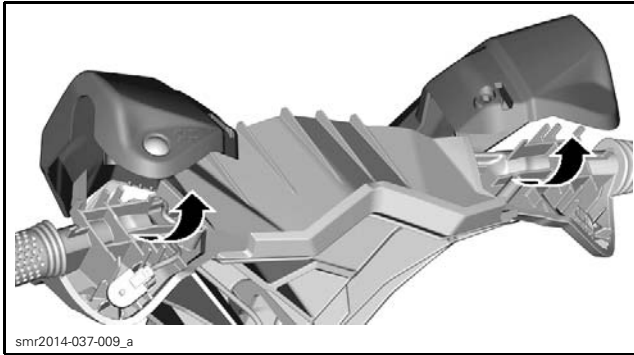
Spark models excluding Trixx

Follow image sequence.



All models





Installing the Handlebar Switch Cover (LH or RH)

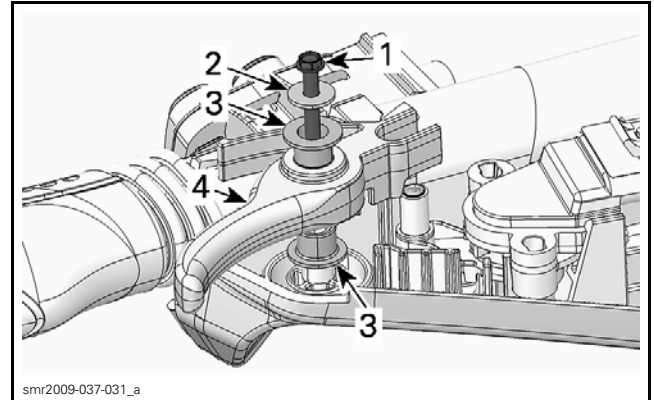
The installation is the reverse of the removal procedure. However, pay attention to the following. Install cover on switch.

Refer to the exploded view for tightening torque specification.

THROTTLE LEVER

Replacing the throttle Lever

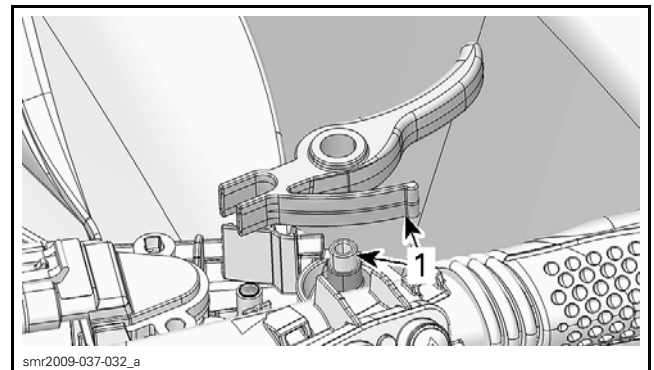
1. Remove *HANDLEBAR SWITCH COVER*, see procedure in this subsection.
2. Remove the screw and washer securing throttle lever.
3. Remove throttle lever and its bushings.



1. Retaining screw
2. Washer
3. Bushings
4. Throttle lever

4. Clean throttle lever area from dust or any deposits.
5. Apply synthetic grease on bushings and on 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

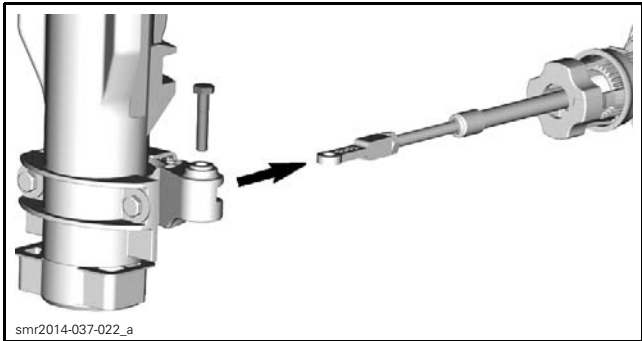
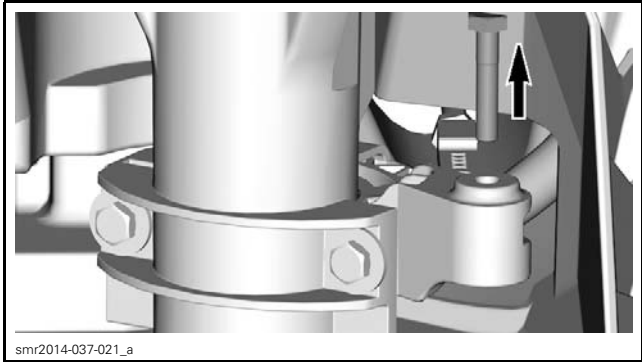
6. Install the lever.
 - 6.1 Install both bushings in lever hole.
 - 6.2 Insert sensor lever end into throttle lever fork.
 - 6.3 Position the return tab against the handlebar.
 - 6.4 Secure the lever with washer and screw.
- Refer to the exploded view for tightening torque specification.

Section 06 STEERING AND PROPULSION
Subsection 01 (STEERING AND OTAS SYSTEMS)

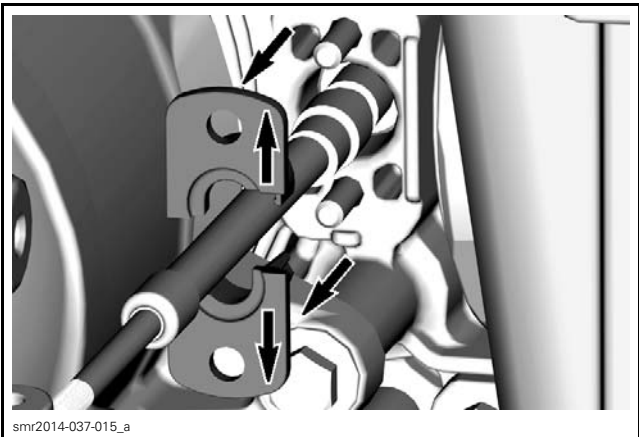
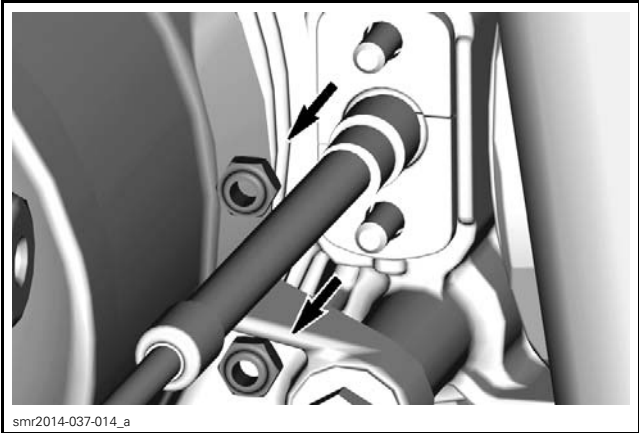
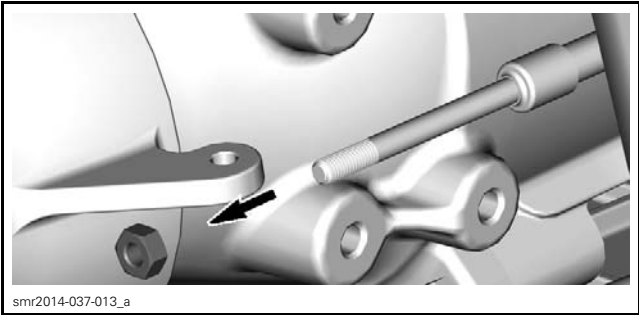
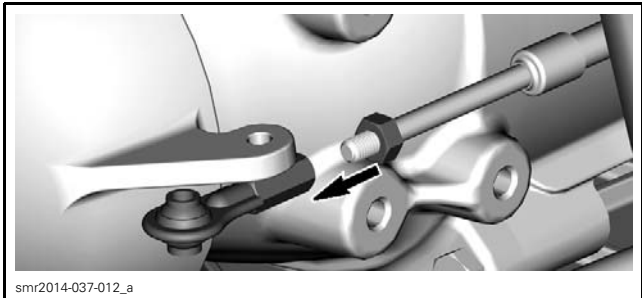
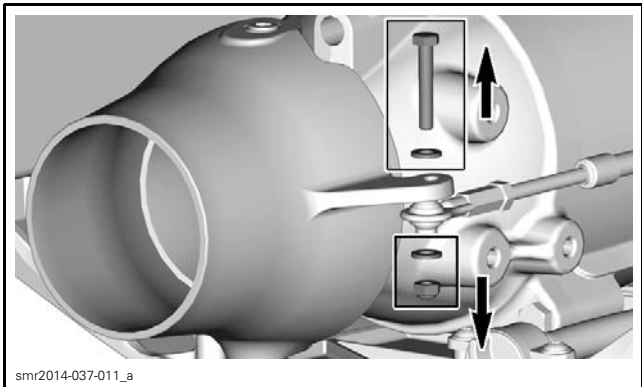
STEERING CABLE

Removing the Steering Cable

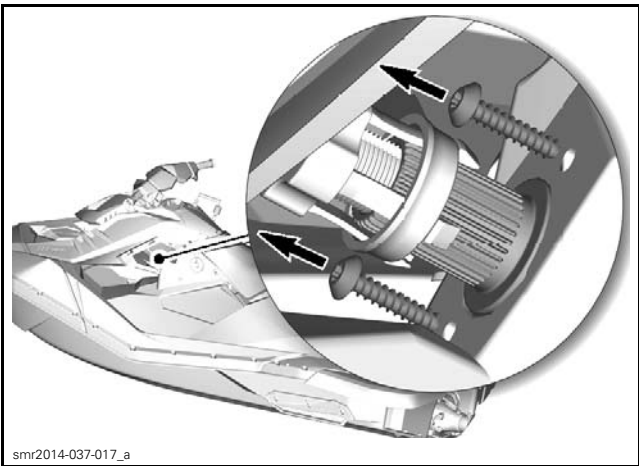
Remove front trim. Refer to *BODY*.



Follow image sequence.



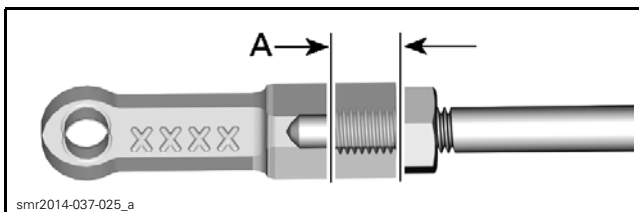
Remove port side knee pad. Refer to *BODY*.



Remove central body. Refer to *BODY*.
 Remove steering cable.

Steering Cable End Fitting

Verify steering cable end fitting engagement.

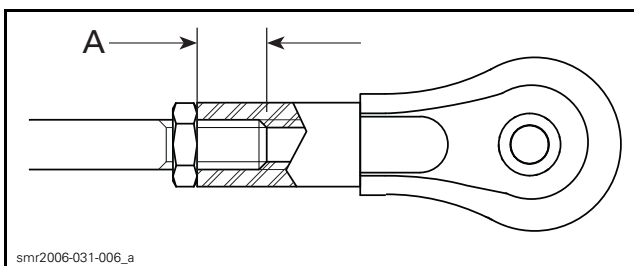


STEERING CABLE END FITTING - AT STEERING COLUMN
 A. Steering cable end fitting engagement
 9 mm ± 1 mm (.354 in ± .039 in)

TIGHTENING TORQUE	
Steering cable end fitting jam nut	3.5 N•m ± 0.5 N•m (31 lbf•in ± 4 lbf•in)

Steering Cable Ball Joint

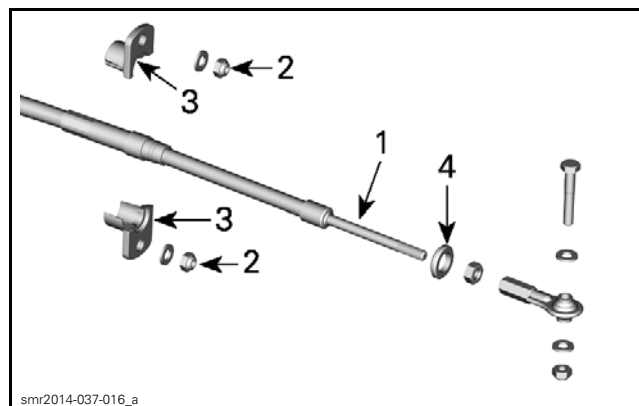
Verify steering cable ball joint engagement.



STEERING CABLE BALL JOINT - AT NOZZLE
 A. Steering cable ball joint engagement
 9 mm ± 1 mm (.354 in ± .039 in)

TIGHTENING TORQUE	
Steering cable ball joint jam nut	2.5 N•m ± 0.3 N•m (22 lbf•in ± 3 lbf•in)

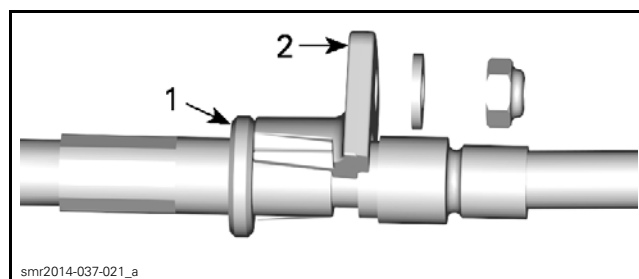
Installing the Steering Cable



STEERING CABLE - AT JET PUMP

1. Steering cable
2. Half moon retaining nuts
3. Half moons
4. O-ring

1. Secure the steering cable to the jet pump support.
 - 1.1 Install O-ring and half rings.
 - 1.2 Secure steering cable half rings on jet pump support.

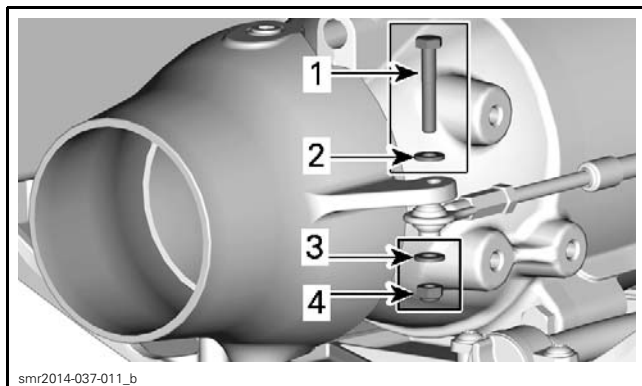


STEERING CABLE ASSEMBLY

1. O-ring
 2. Half rings
2. Install the ball joint on the end of the steering cable.
 - 2.1 Refer to *STEERING CABLE BALL JOINT*.
 - 2.2 Position the steering cable ball joint to the nozzle.

Section 06 STEERING AND PROPULSION

Subsection 01 (STEERING AND OTAS SYSTEMS)



smr2014-037-011_b

STEERING CABLE BALL JOINT

1. Ball joint bolt
2. Washer
3. Washer
4. Ball joint nut

Refer to the exploded view for tightening torque specification.

1. Carry out *ADJUSTING THE STEERING CABLE*. See procedure in this subsection.

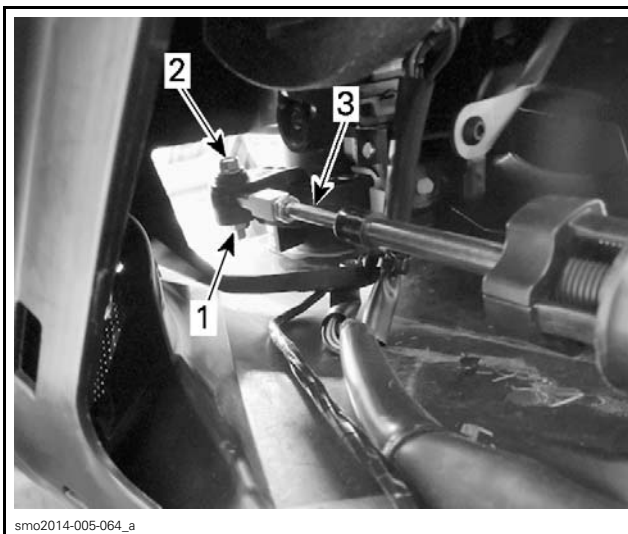
The installation is the reverse of the removal procedure. However, pay attention to the following.

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.

1. Remove left knee pad. Refer to *BODY*.
2. Remove nut, bolt, and washer to disconnect rod from steering column.



smo2014-005-064_a

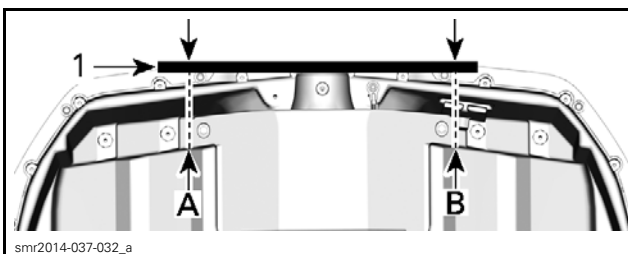
1. Nut and washer
2. Bolt
3. Rod

1. Position jet pump nozzle as follows:

- 1.1 Place a straight edge on the nozzle end.

NOTE: A spacer is necessary on the 3UP models.

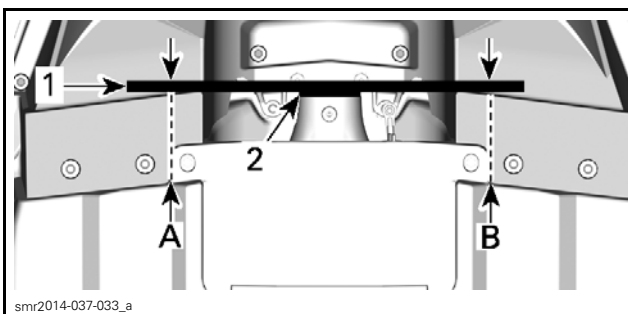
- 1.2 Measure the distance from the transom each side of the straight edge.



smr2014-037-032_a

VIEW FROM UNDERNEATH THE HULL - 2UP MODELS

1. Straight edge
- A. LH side measure
- B. RH side measure



smr2014-037-033_a

VIEW FROM UNDERNEATH THE HULL - 3UP MODELS

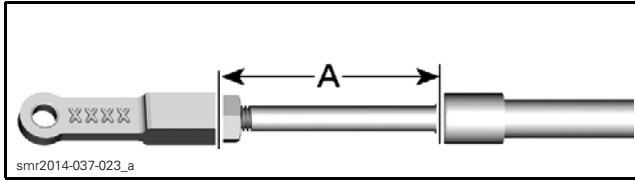
1. Straight edge
2. Spacer
- A. LH side measure
- B. RH side measure

- 1.3 Turn nozzle so that measures A and B are equal.

2. Adjust steering cable as follows:

Section 06 STEERING AND PROPULSION

Subsection 01 (STEERING AND OTAS SYSTEMS)



STEERING CABLE END FITTING AT STEERING COLUMN

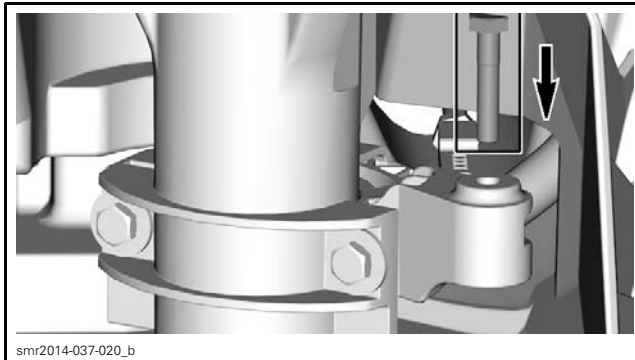
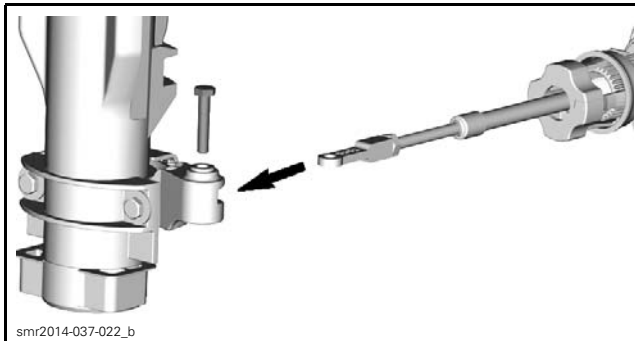
A. Steering adjustment specification

STEERING ADJUSTMENT SPECIFICATION

55 mm \pm 6 mm (2.17 in \pm .24 in)

NOTE: This specification gives the proper nozzle adjustment to offset the jet pump thrust.

3. Attach steering cable end fitting to steering column.



NOTE: When handlebar is in straight position and steering cable is installed, steering nozzle may not be parallel to transom. This is to offset jet pump thrust.

4. Test ride watercraft.

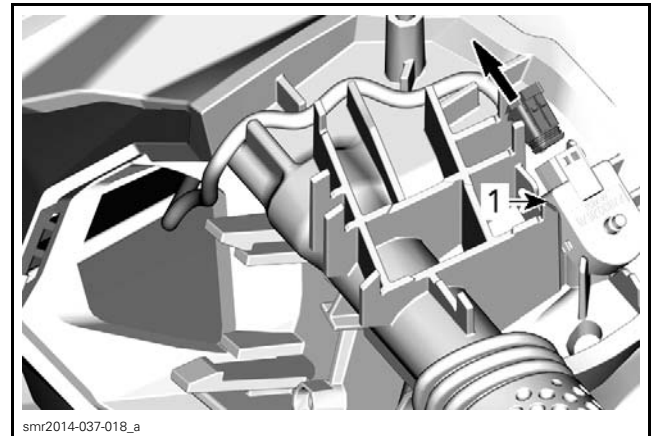
- 4.1 If watercraft pull on one side, carry out *ADJUSTING THE ALIGNMENT OF THE STEERING* in this subsection.

STEERING COLUMN

Removing the Steering Column

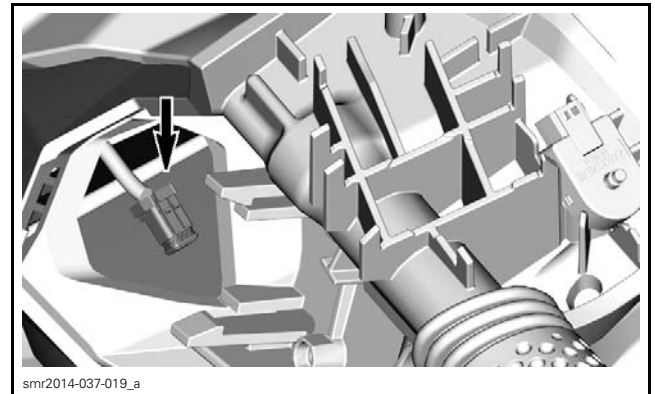
1. Remove front trim. Refer to *BODY* subsection.
2. Remove LH and RH handlebar switch covers.

3. Disconnect Start/Stop switch and drop connector into steering column.



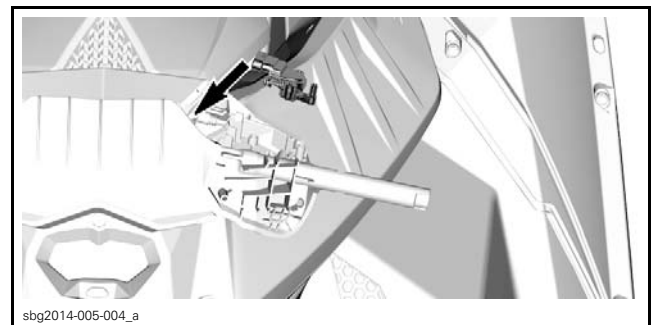
LH HANDLEBAR

1. Start/Stop switch



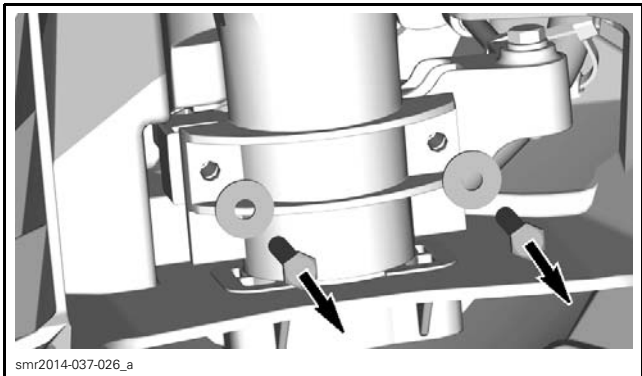
LH HANDLEBAR

4. Disconnect TAS connector and drop connector into steering column.



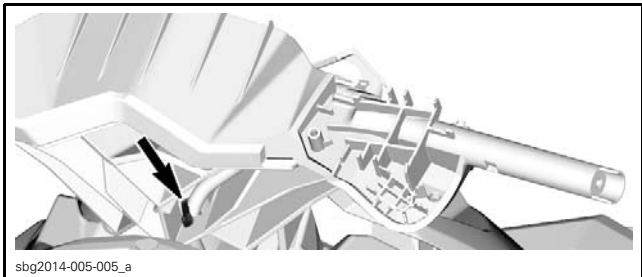
5. Remove both screws securing the steering column.

Section 06 STEERING AND PROPULSION
Subsection 01 (STEERING AND OTAS SYSTEMS)



STEERING COLUMN

6. Cut locking tie securing the wiring harness to the steering column.



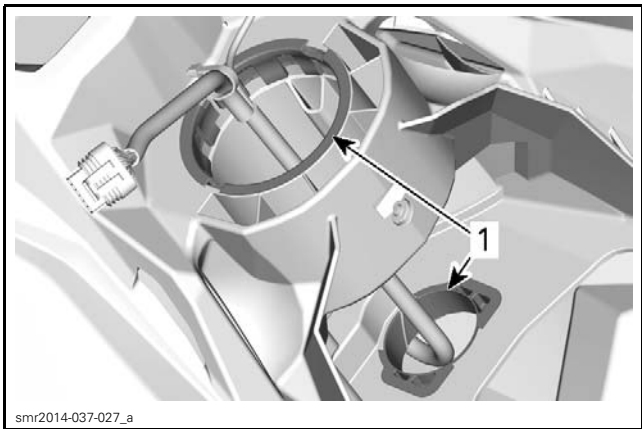
7. Pull steering column out of its support. Ensure to not damage wiring harness connectors and O.T.A.S. magnets.

Inspecting the Steering Column

Check steering column for:

- Cracks
- Stress marks
- Signs of wear.

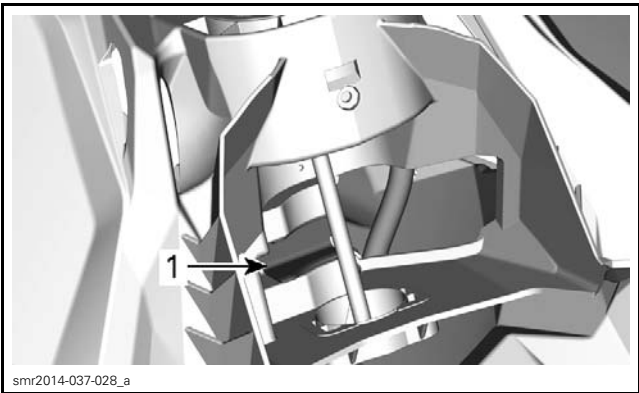
Check steering column support bushings.



CONSOLE

1. Steering column support bushings

Check wear sleeve behind the steering column arm.



1. Wear sleeve

Replace any damaged or worn parts.

Installing the Steering Column

NOTICE Ensure not to hit the O.T.A.S. magnet during steering column installation.



The installation is the reverse of the removal procedure.

Refer to the exploded view for tightening torque specification.

O.T.A.S. SWITCH

Required Tools

To perform O.T.A.S. system tests, the following tools are required.

REQUIRED TOOLS	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
DIAGNOSTIC HARNESS (P/N 529 036 384)	

Testing the O.T.A.S. Switch Using BUDS2

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

In BUDS2, go to:

- **Measurement** page
- **iBR** button.

Briefly press the START/STOP button to wake up the ECM.

Install the tether cord on the engine cut-off switch.

Completely turn steering in one direction and keep it in this position.

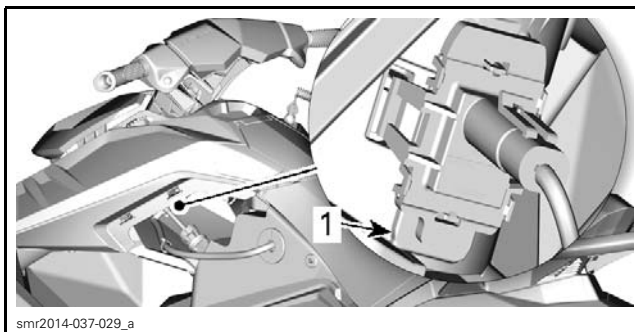
The O.T.A.S. indicator should turn on when handlebar reaches the stopper.

Repeat test for the other side.

If O.T.A.S. indicator does not turn on, carry out the *TESTING THE O.T.A.S. SWITCH INPUT VOLTAGE*.

Testing the O.T.A.S. Switch Input Voltage

Remove port side knee pad. refer to *BODY*.



OTAS SWITCH LOCATION

1. OTAS switch

Disconnect the O.T.A.S. connector.

Connect the diagnostic harness in-line between the disconnected O.T.A.S. connectors.

Press the START/STOP button to activate the electrical system.

Using the multimeter, measure voltage as follows.

TEST PROBES		VOLTAGE (VDC)
PIN A (3-pin connector)	Battery negative post	Battery voltage

If voltage is not as specified, check wiring and connectors.

If voltage is as specified, carry out *TESTING THE O.T.A.S. SWITCH GROUND*.

Testing the O.T.A.S. Switch Ground

Install the diagnostic harness as described in the *TESTING THE O.T.A.S. SWITCH INPUT VOLTAGE*.

Press the START/STOP button to activate the electrical system.

Using the multimeter, check ground circuit as follows.

TEST PROBES		VOLTAGE (VDC)
PIN A (3-pin connector)	PIN B (3-pin connector)	Battery voltage

If voltage is not as specified, check wiring and connectors.

If voltage is as specified, carry out the *TESTING THE O.T.A.S. SWITCH SIGNAL*.

Testing the O.T.A.S. Switch Signal

Install the diagnostic harness as described in the *TESTING THE O.T.A.S. SWITCH INPUT VOLTAGE*.

Press the START/STOP button to activate the electrical system.

Using the multimeter, check switch signal as follows.

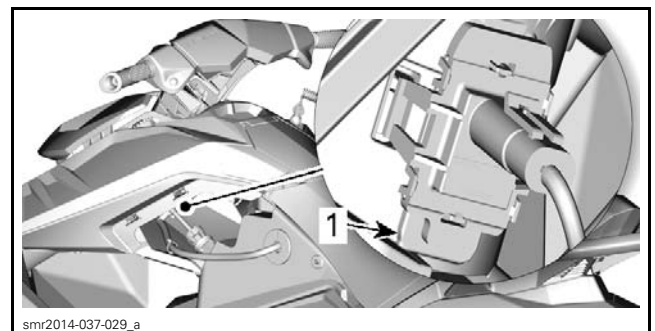
TEST PROBES		HANDLEBAR POSITION	VOLTAGE
PIN C (3-pin connector)	PIN B (3-pin connector)	Straight ahead	0.6 to 0.8 Vdc
		Turned completely to the right	2.0 to 2.5 Vdc
		Turned completely to the left	

If voltage is not as specified, replace the switch.

NOTE: To avoid useless switch replacement, make sure magnets are in good condition. Also, make sure magnets and switch are securely clipped.

Replacing the O.T.A.S. Switch

Remove port side knee pad. refer to *BODY*.

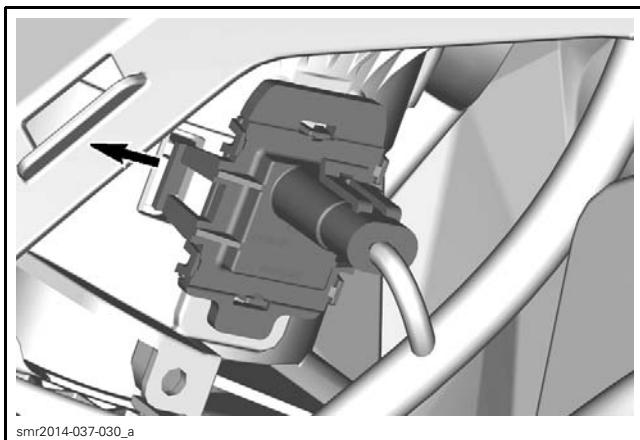


OTAS SWITCH LOCATION

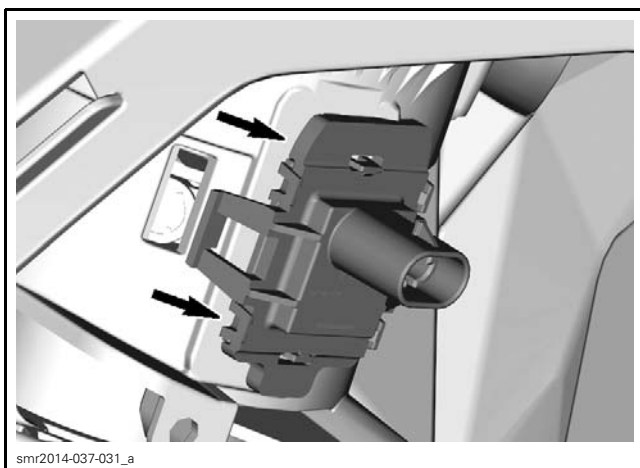
1. OTAS switch

Section 06 STEERING AND PROPULSION

Subsection 01 (STEERING AND OTAS SYSTEMS)



OTAS SWITCH

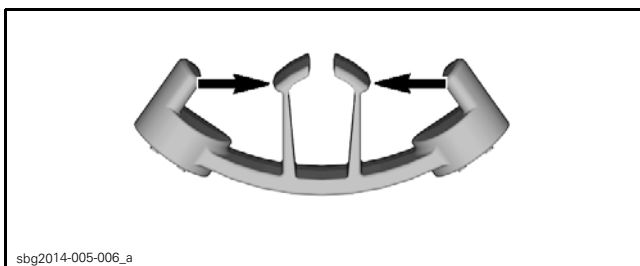


The installation is the reverse of the removal procedure.

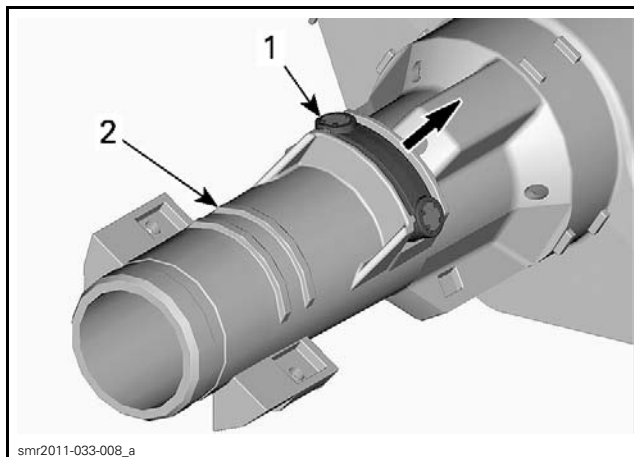
O.T.A.S. MAGNETS

Replacing the Magnets

1. Remove *STEERING COLUMN*, see procedure in this subsection.
2. Using long pliers, unclip the magnets from inside the steering column.



3. Pull magnets off the steering column.



TYPICAL

1. Magnets
2. Steering column

Reverse removal procedure to reinstall the magnets.

Verify that both clips lock in place.

TELESCOPIC STEERING AND OTAS SYSTEM

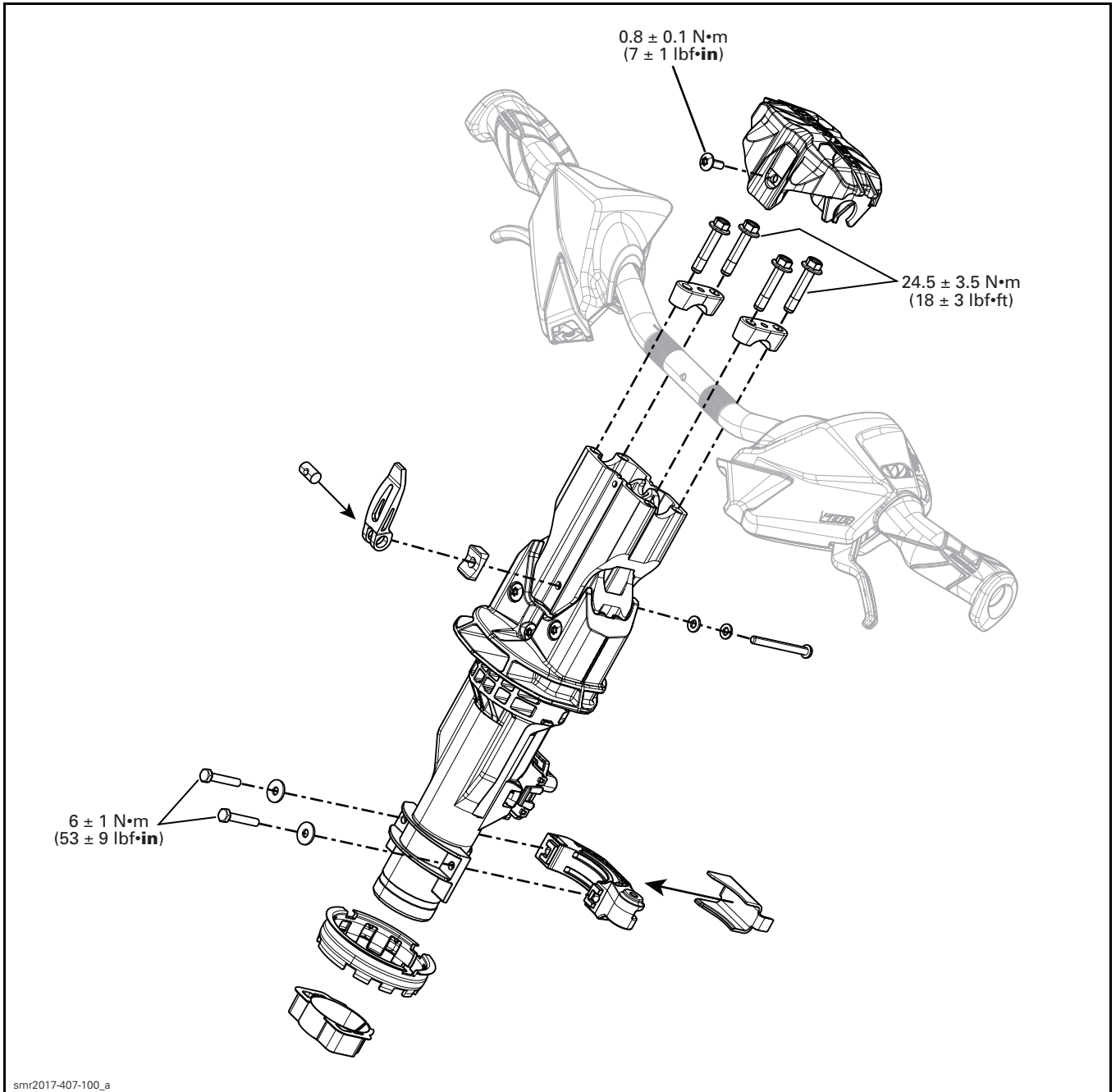
SERVICE PRODUCTS

Description

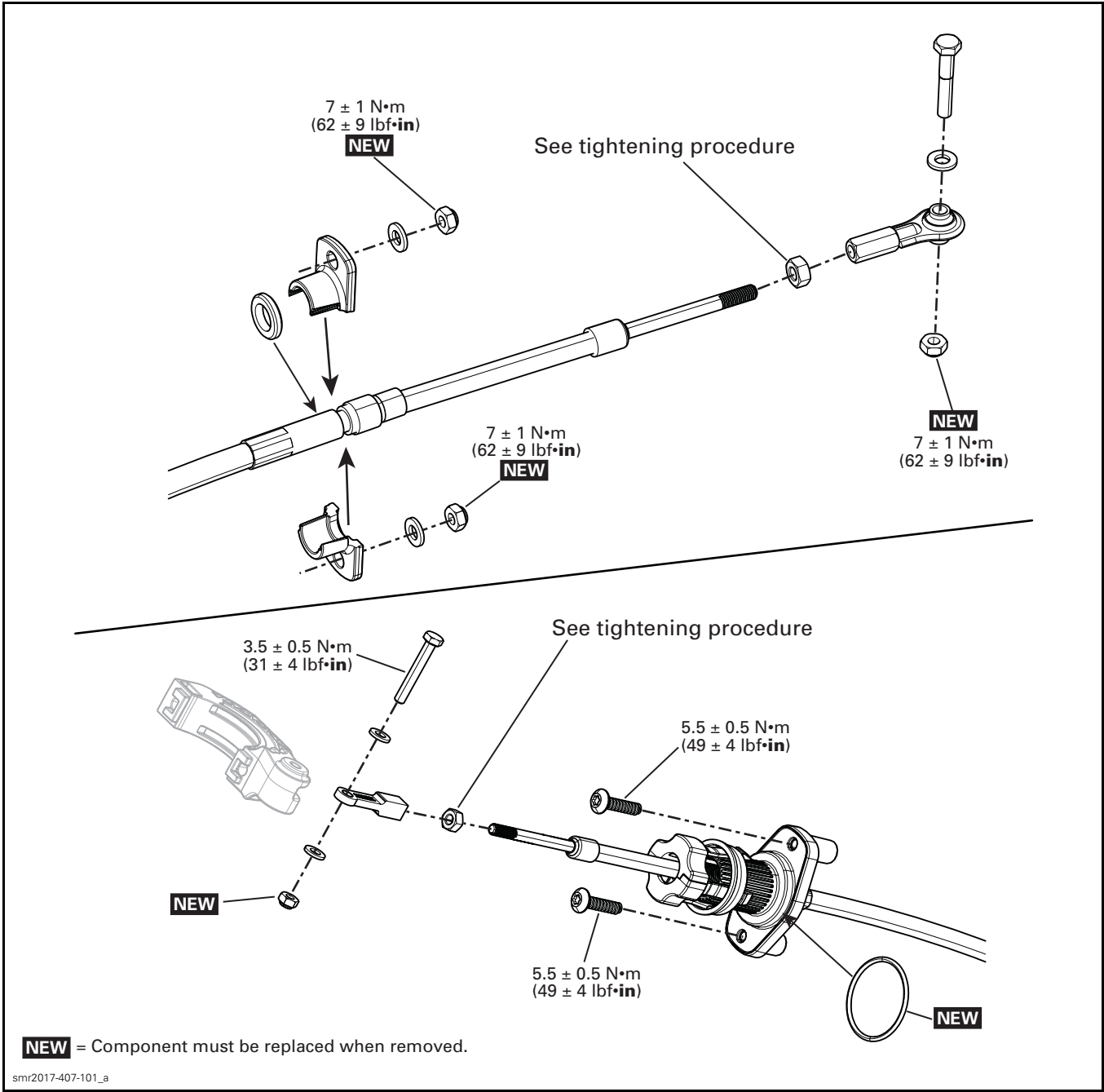
Part Number

Page

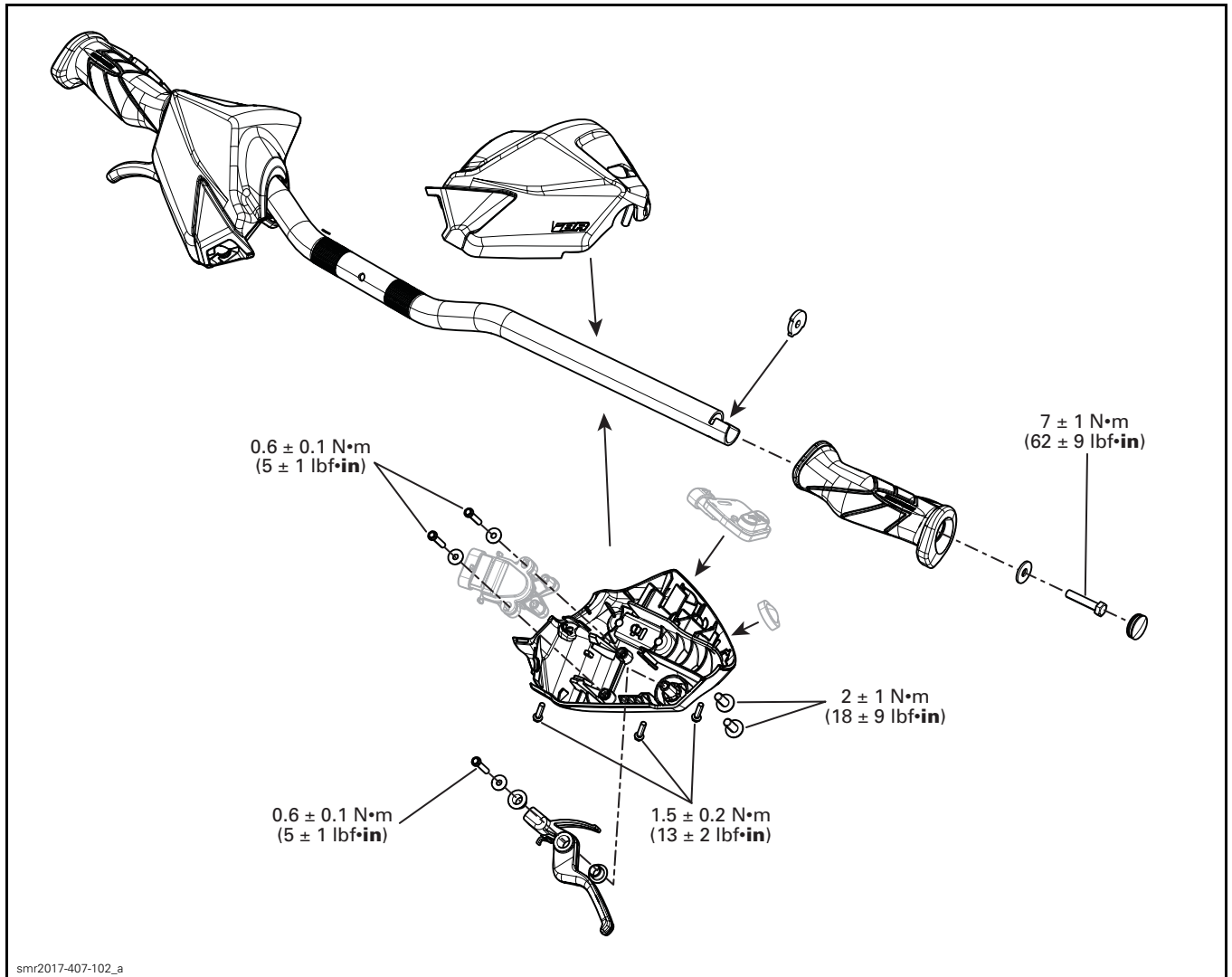
STEERING COLUMN



STEERING CABLE



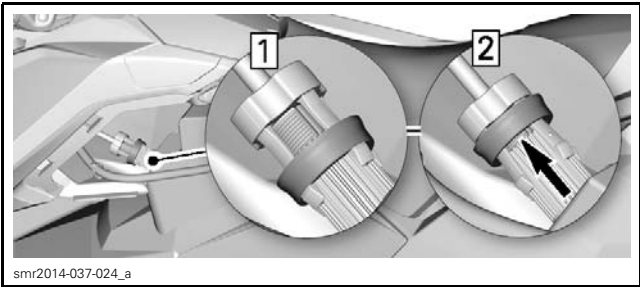
HANDLEBAR



ADJUSTMENT

STEERING ALIGNMENT

1. Remove port side knee pad. Refer to *BODY*.
2. Unlock steering cable adjustment.



STEERING CABLE ADJUSTMENT

STEERING ALIGNMENT	
WATERCRAFT BEHAVIOR	WHAT TO DO
Pulls on left side	Turn steering cable adjustment clockwise
Pulls on right side	Turn steering cable adjustment counter clockwise

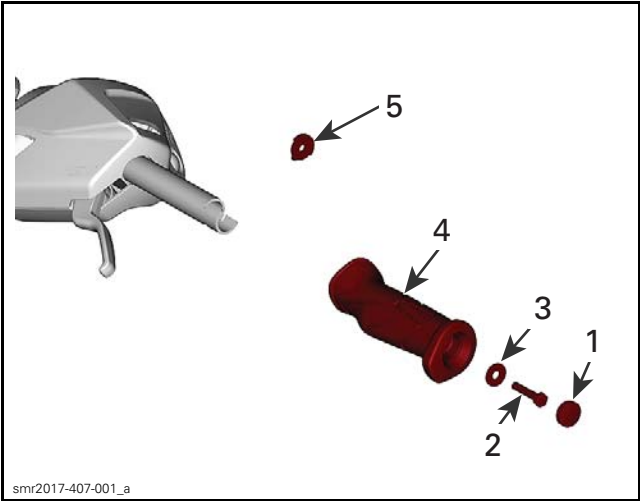
3. Lock steering cable adjustment.
4. Test watercraft.
5. Readjust as necessary.

PROCEDURES

HANDLEBAR GRIP

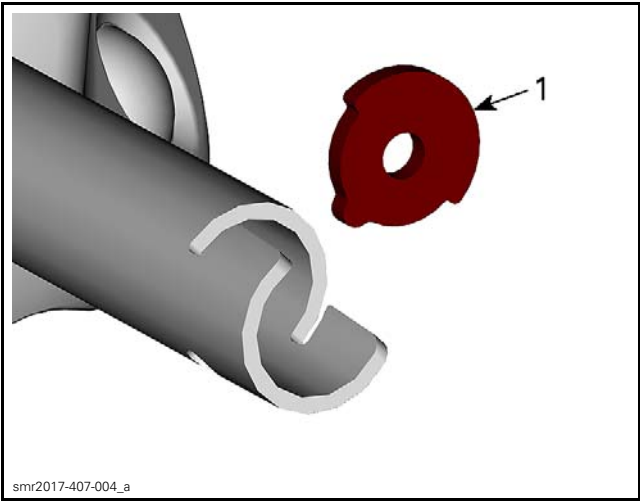
Removing the Handlebar Grip

Remove cap, screw, washer, handlebar grip and grip insert.



1. Cap
2. M6 x 30 hexagonal screw
3. Washer
4. Handlebar grip
5. Grip insert

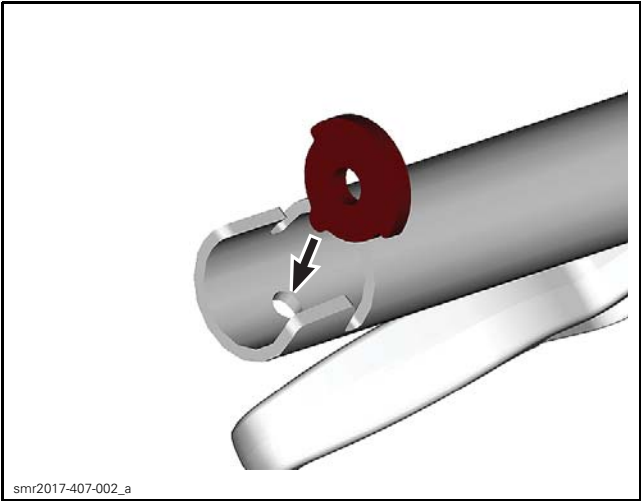
Verify grip insert for damage.



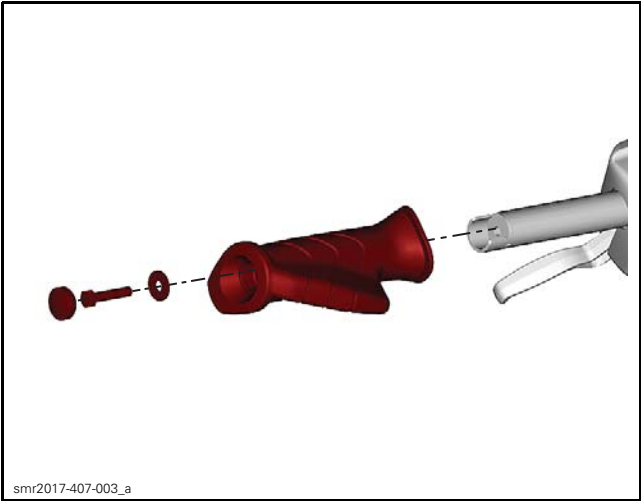
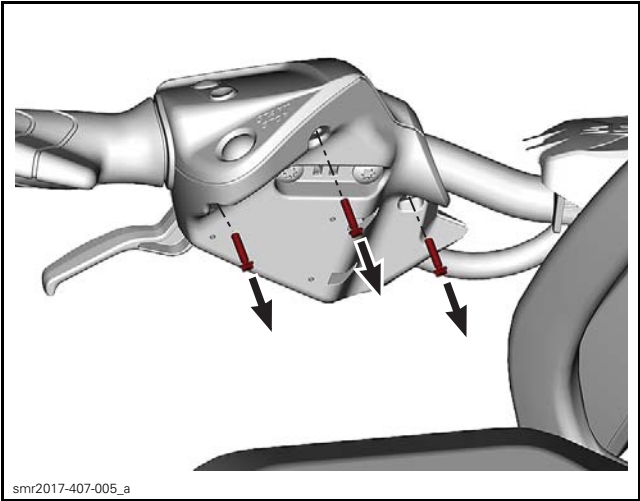
1. Grip insert

Installing the Handlebar Grip

When installing the grip insert in the handlebar, ensure that it is properly inserted in the slot at the end of the handlebar tubing.



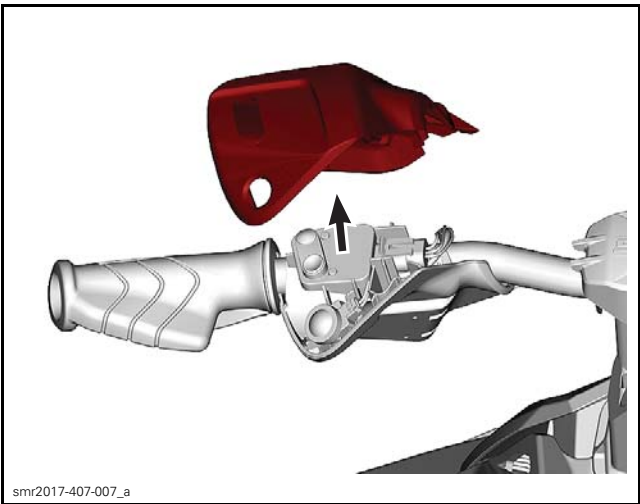
Install handlebar grip on handlebar matching it to the notch in the handlebar.



TIGHTENING TORQUE	
Handlebar grip screws (M6 x 30)	7 N•m ± 1 N•m (62 lbf•in ± 9 lbf•in)

HANDLEBAR SWITCH COVER (LH OR RH)

Removing the Handlebar Switch Cover
Follow image sequence.



Installing the Handlebar Switch Cover
Reverse removal procedure.

TIGHTENING TORQUE	
K40 x 16 hexagonal screws	1.5 N•m ± 0.2 N•m (13 lbf•in ± 2 lbf•in)
M6 x 16 Torx screws	2 N•m ± 1 N•m (18 lbf•in ± 9 lbf•in)

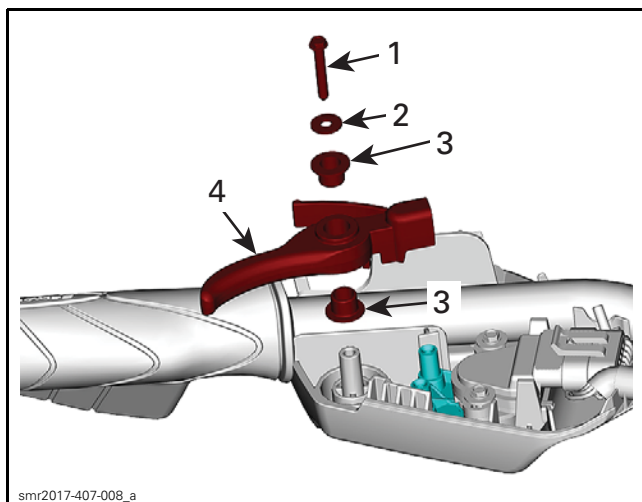
THROTTLE LEVER

Replacing the Lever

1. Remove *HANDLEBAR SWITCH COVER*, see procedure in this subsection.
2. Remove the screw and washer securing throttle lever.
3. Remove throttle lever and its bushings.

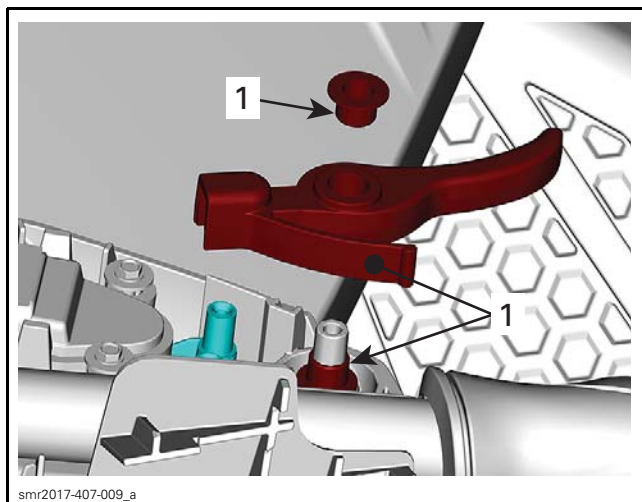
Section 06 STEERING AND PROPULSION

Subsection 02 (TELESCOPIC STEERING AND OTAS SYSTEM)



1. Retaining screw
2. Washer
3. Bushings
4. Throttle lever

4. Clean throttle lever area from dust or any deposits.
5. Apply (P/N 293 550 010) on bushings and on the outer surface of the return tab.



1. Apply grease here

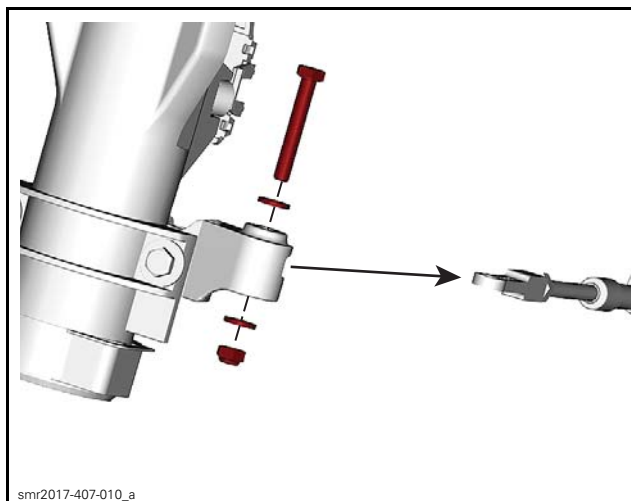
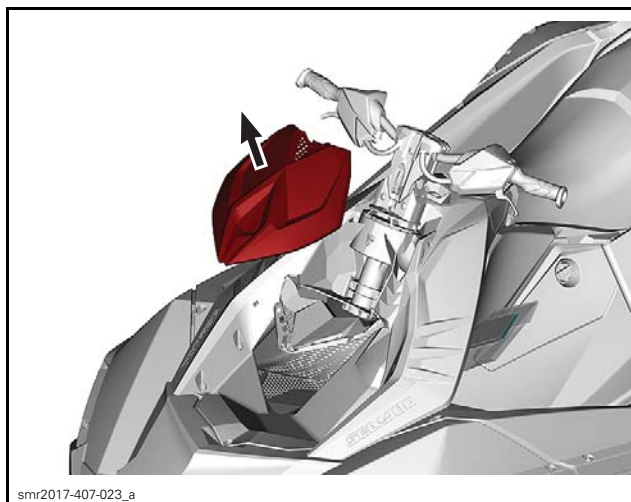
6. Install the lever.
 - 6.1 Install both bushings in lever hole.
 - 6.2 Insert sensor lever end into throttle lever fork.
 - 6.3 Position the return tab against the handlebar.
 - 6.4 Secure the lever with washer and screw.

STEERING CABLE

Removing the Steering Cable

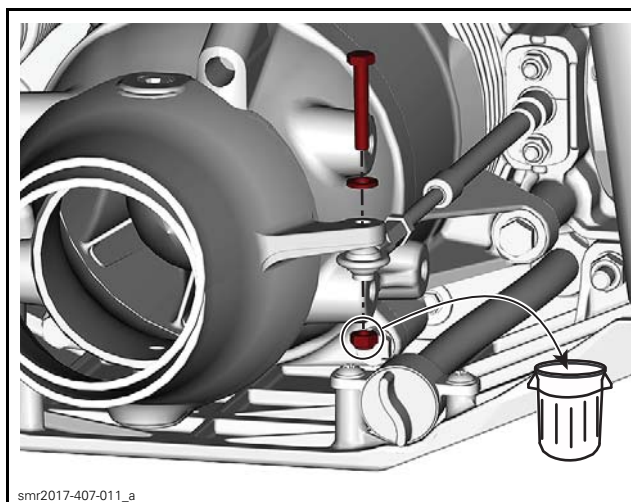
Follow image sequence.

At Steering Column



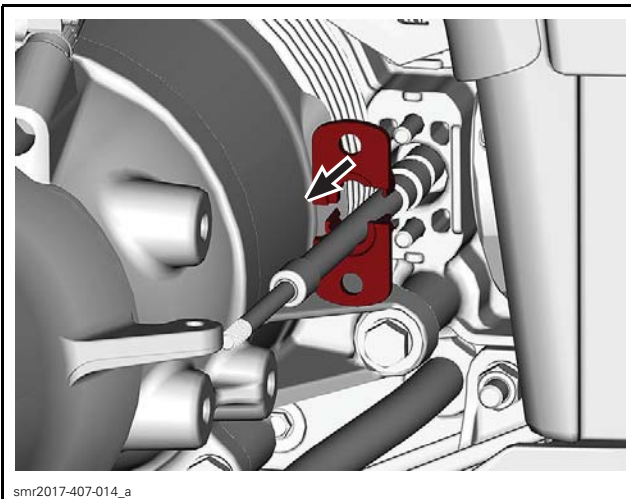
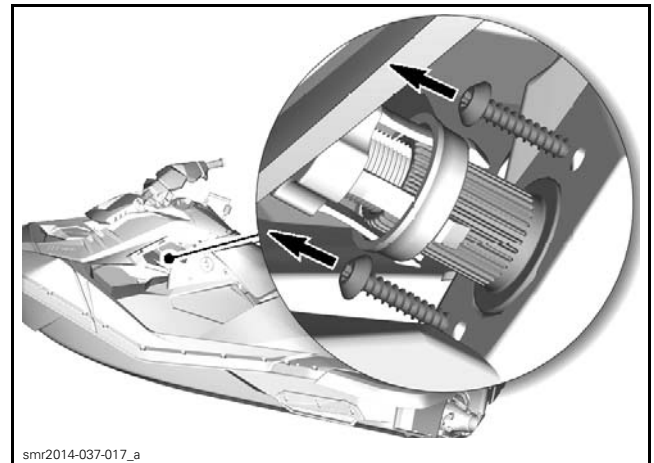
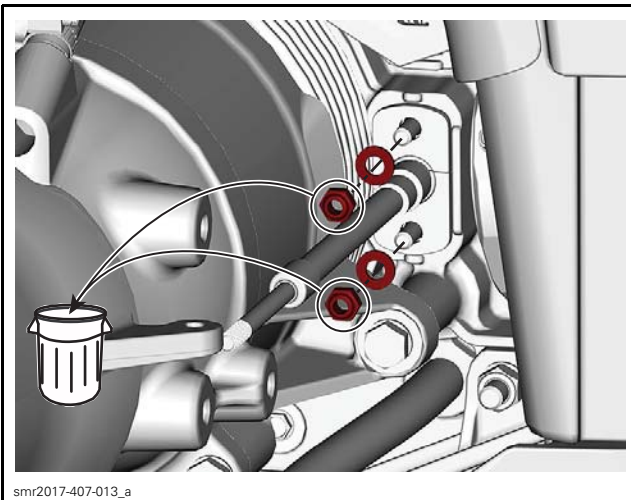
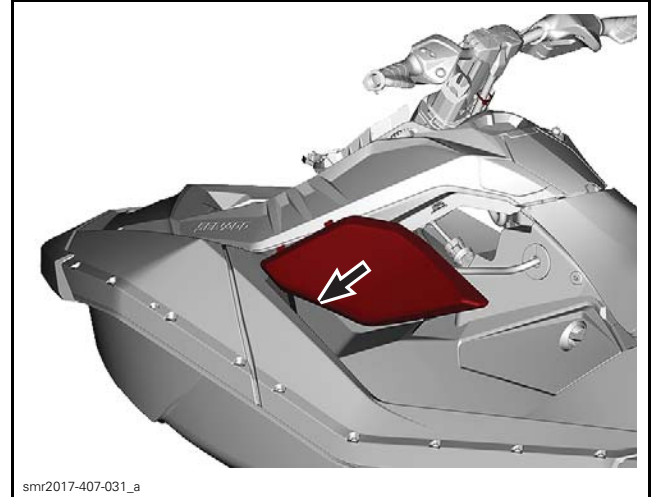
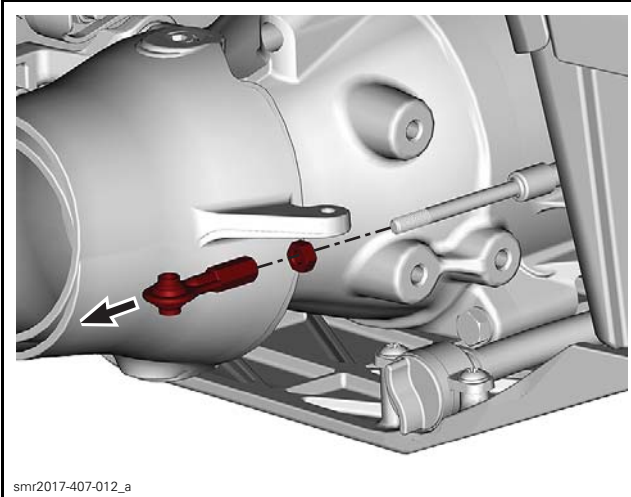
At Nozzle

NOTE: Many iBR parts were removed to clarify purpose



Section 06 STEERING AND PROPULSION

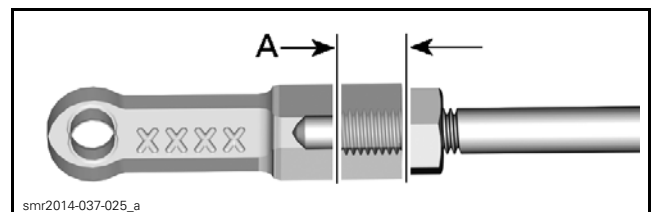
Subsection 02 (TELESCOPIC STEERING AND OTAS SYSTEM)



Remove central body. Refer to *BODY*.
Remove steering cable.

Inspecting the Steering Cable End Fitting

Verify steering cable end fitting engagement.



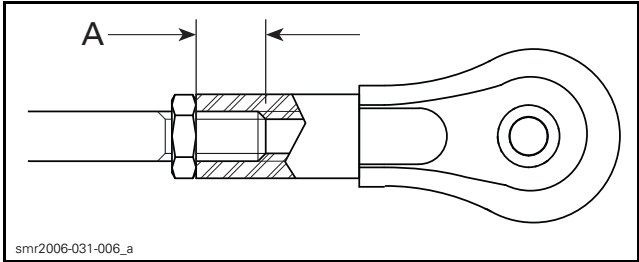
STEERING CABLE END FITTING - AT STEERING COLUMN
A. Steering cable end fitting engagement
9 mm ± 1 mm (.354 in ± .039 in)

TIGHTENING TORQUE	
Steering cable end fitting jam nut	2.5 N•m ± 0.3 N•m (22 lbf•in ± 3 lbf•in)

Inspecting the Steering Cable Ball Joint

Verify steering cable ball joint engagement.

Section 06 STEERING AND PROPULSION
Subsection 02 (TELESCOPIC STEERING AND OTAS SYSTEM)

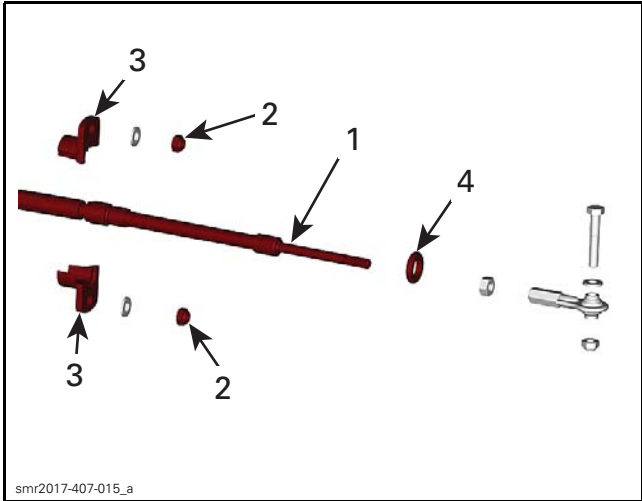


STEERING CABLE BALL JOINT - AT NOZZLE

A. Steering cable ball joint engagement
9 mm ± 1 mm (.354 in ± .039 in)

TIGHTENING TORQUE	
Steering cable ball joint jam nut	2.5 N•m ± 0.3 N•m (22 lbf•in ± 3 lbf•in)

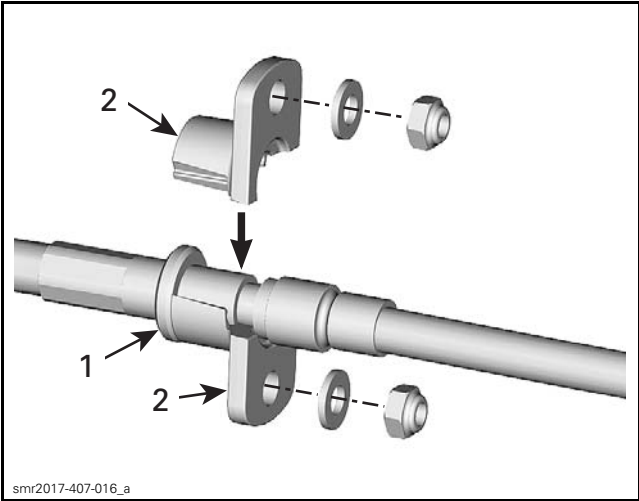
Installing the Steering Cable



STEERING CABLE - AT JET PUMP

- 1. Steering cable
- 2. Half moon retaining nuts
- 3. Half moons
- 4. O-ring

- 1. Secure the steering cable to the jet pump support.
 - 1.1 Install O-ring and half rings.
 - 1.2 Secure steering cable half rings on jet pump support.

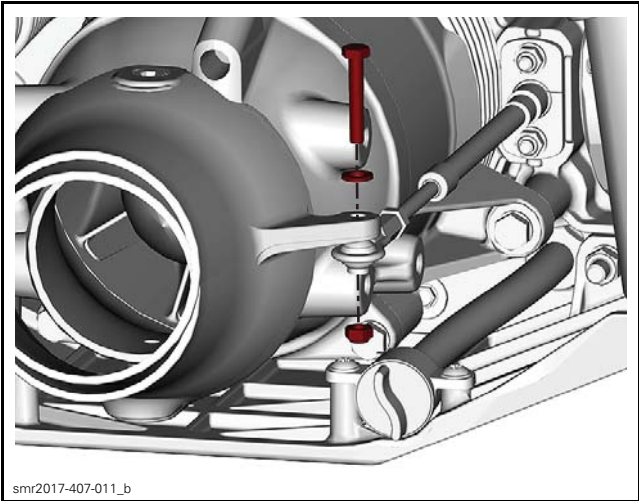


STEERING CABLE ASSEMBLY

- 1. O-ring
- 2. Half rings

TIGHTENING TORQUE	
Steering cable half ring screws	7 N•m ± 1 N•m (62 lbf•in ± 9 lbf•in)

- 2. Install the ball joint on the end of the steering cable.
 - 2.1 Refer to *INSPECTING THE STEERING CABLE BALL JOINT*.
 - 2.2 Position the steering cable ball joint to the nozzle.



TIGHTENING TORQUE	
Ball joint nut	7 N•m ± 1 N•m (62 lbf•in ± 9 lbf•in)

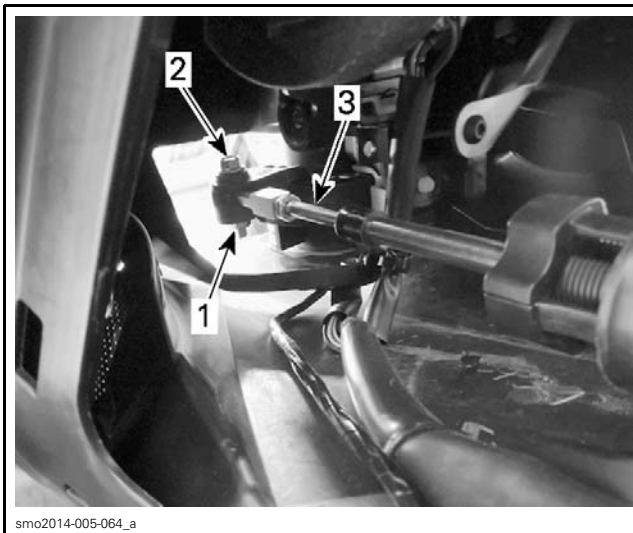
- 3. Carry out the steering cable adjustment. See procedure in this subsection.

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.

1. Remove left knee pad. Refer to *BODY*.
2. Remove nut, bolt, and washer to disconnect steering cable from steering column.

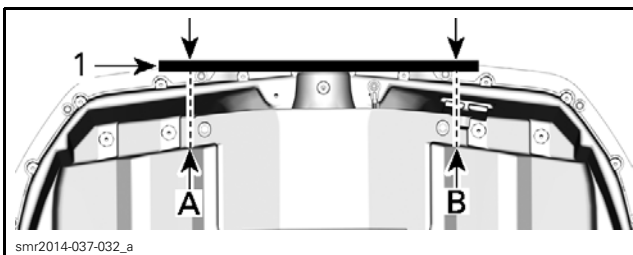


1. Nut and washer
2. Bolt
3. Steering cable

1. Position jet pump nozzle as follows:
 - 1.1 Place a straight edge on the nozzle end.

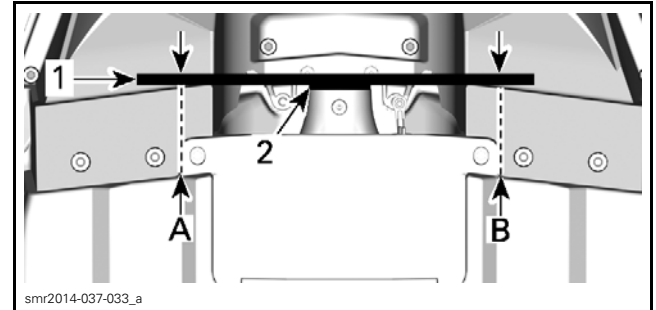
NOTE: A spacer is necessary on the 3UP models.

 - 1.2 Measure the distance from the transom each side of the straight edge.



VIEW FROM UNDERNEATH THE HULL - 2UP MODELS

1. Straight edge
- A. LH side measure
- B. RH side measure

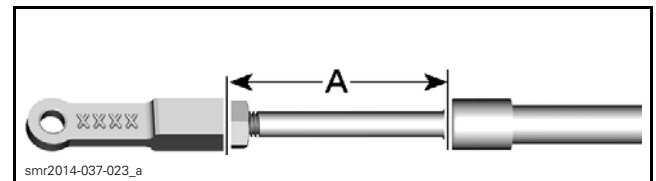


VIEW FROM UNDERNEATH THE HULL - 3UP MODELS

1. Straight edge
2. Spacer
- A. LH side measure
- B. RH side measure

- 1.3 Turn nozzle so that measures A and B are equal.

2. Adjust steering cable as follows:



STEERING CABLE END FITTING AT STEERING COLUMN

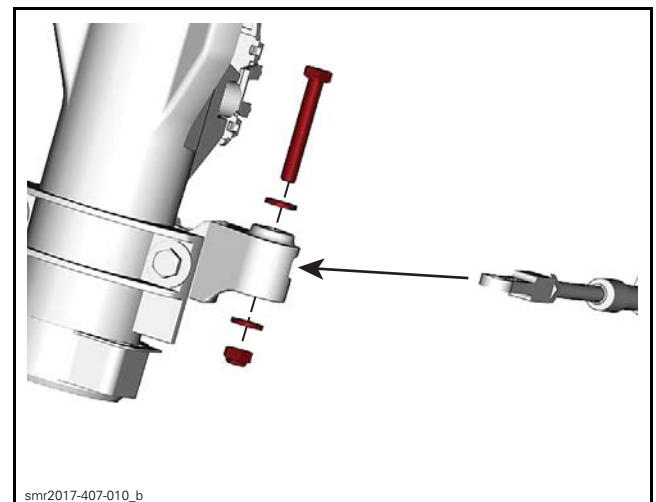
- A. Steering adjustment specification

STEERING ADJUSTMENT SPECIFICATION

55 mm ± 6 mm (2.17 in ± .24 in)

NOTE: This specification gives the proper nozzle adjustment to offset the jet pump thrust.

3. Attach steering cable end fitting to steering column.

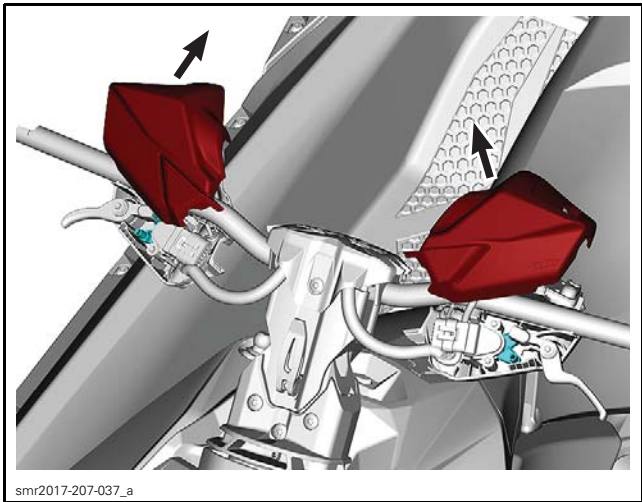
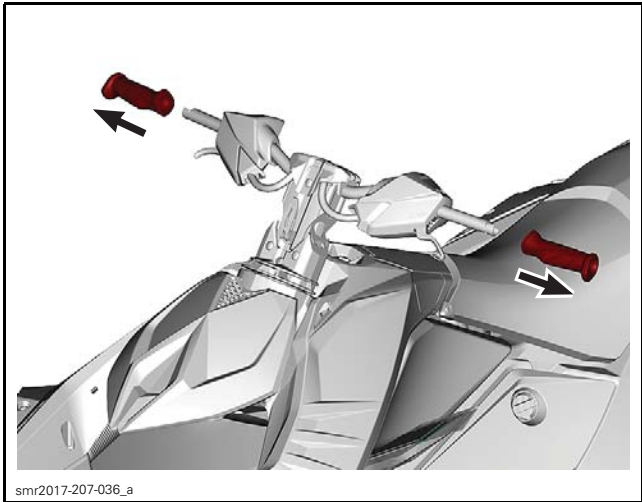
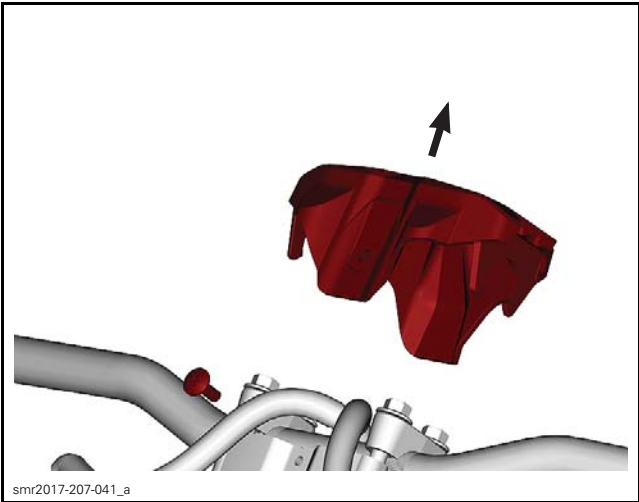
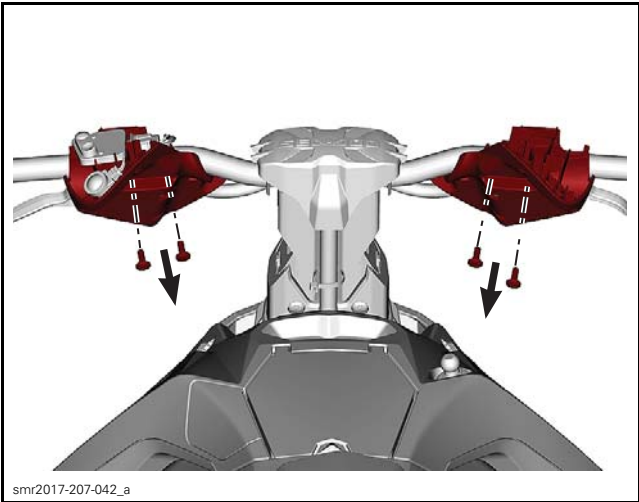
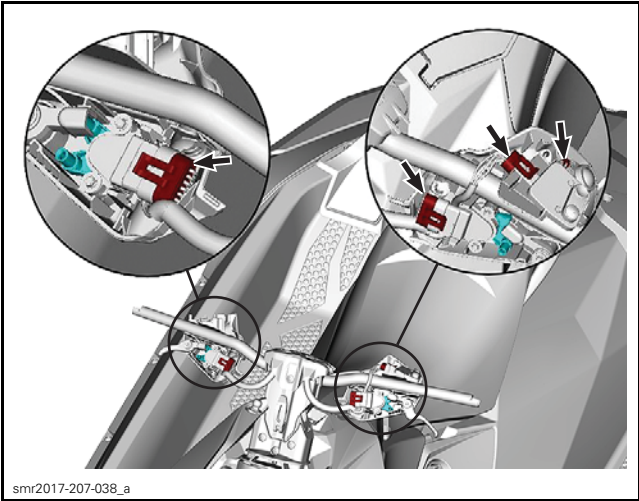


NOTE: When handlebar is in straight position and steering cable is installed, steering nozzle may not be parallel to transom. This is to offset jet pump thrust.

Section 06 STEERING AND PROPULSION
Subsection 02 (TELESCOPIC STEERING AND OTAS SYSTEM)

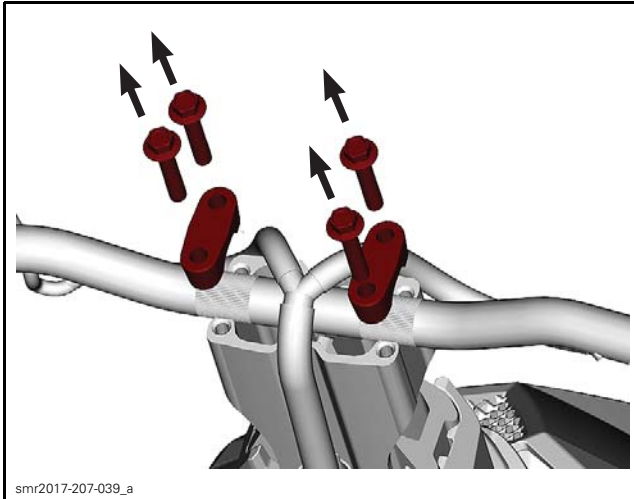
- 4. Test ride watercraft.
 - 4.1 If watercraft pull on one side, carry out *STEERING ALIGNMENT* in this subsection.

HANDLEBAR
Removing the Handlebar
Follow image sequence.



Section 06 STEERING AND PROPULSION

Subsection 02 (TELESCOPIC STEERING AND OTAS SYSTEM)



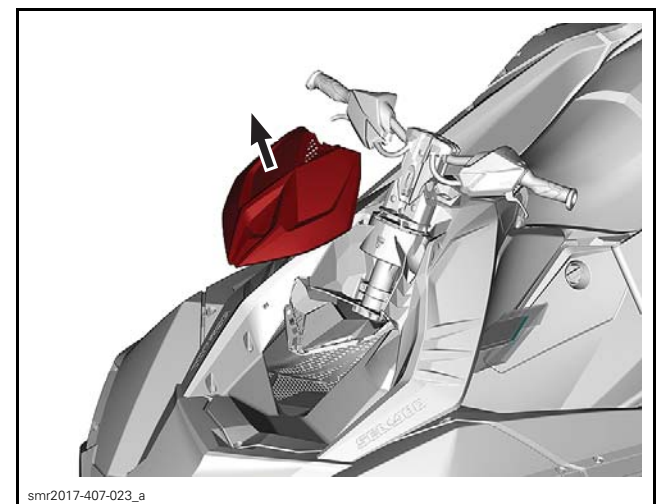
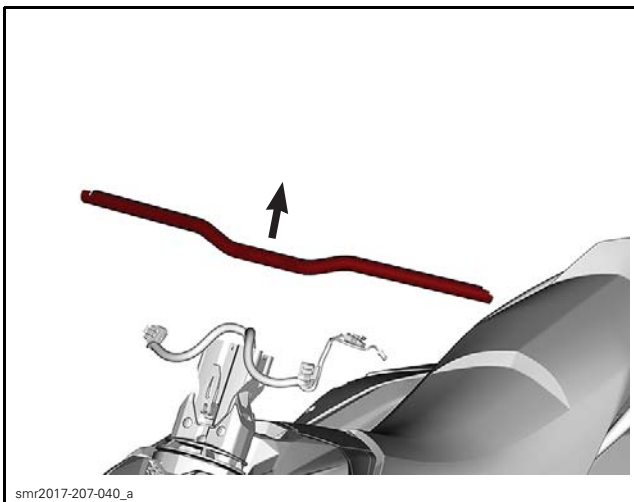
Remove the 6 mm (15/64 in) centering tool before tightening handlebar clamp screws.

TIGHTENING TORQUE	
Handlebar screws	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)
Handlebar cover	0.8 N•m ± 0.1 N•m (7 lbf•in ± 1 lbf•in)

STEERING COLUMN

Removing the Steering Column

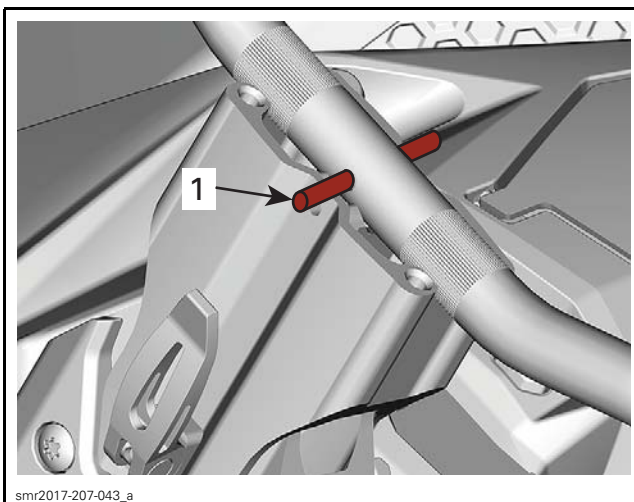
Follow image sequence.



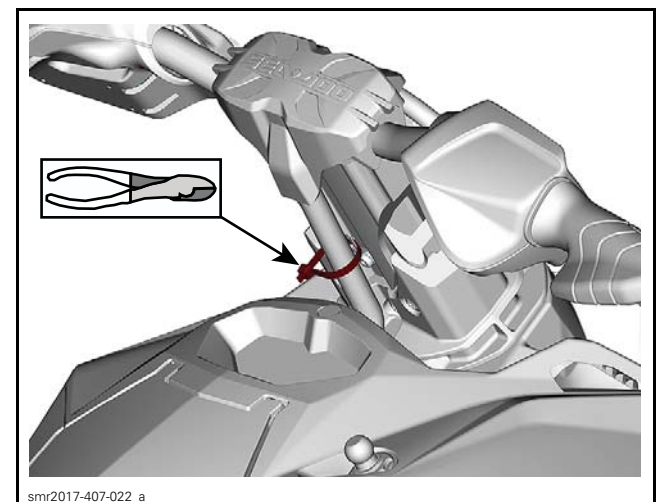
Installing the Handlebar

The installation is the reverse of the removal procedure.

To center the handlebar, insert a 6 mm (15/64 in) drill bit or any other suitable object.

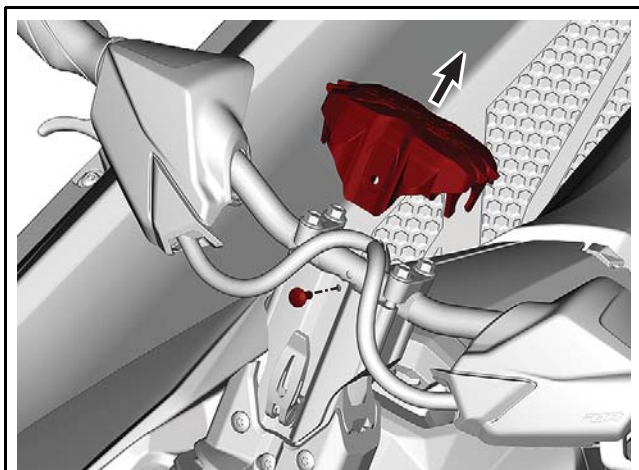


1. Centering tool

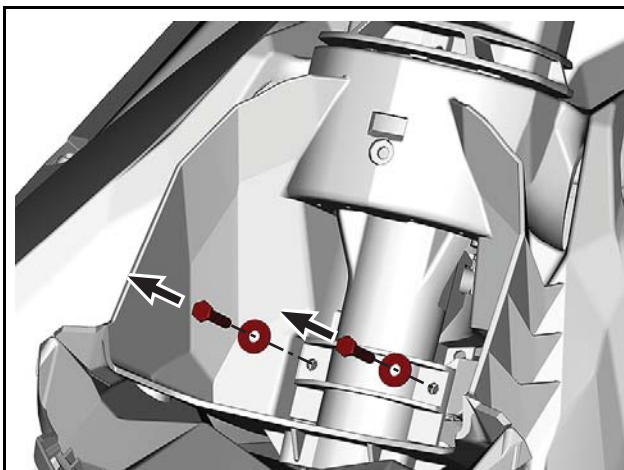


Section 06 STEERING AND PROPULSION

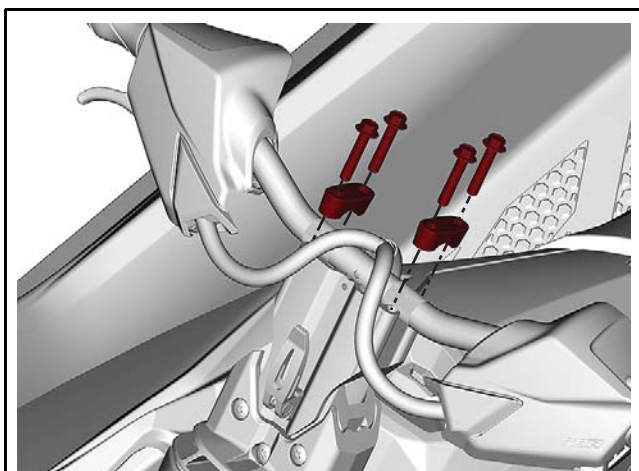
Subsection 02 (TELESCOPIC STEERING AND OTAS SYSTEM)



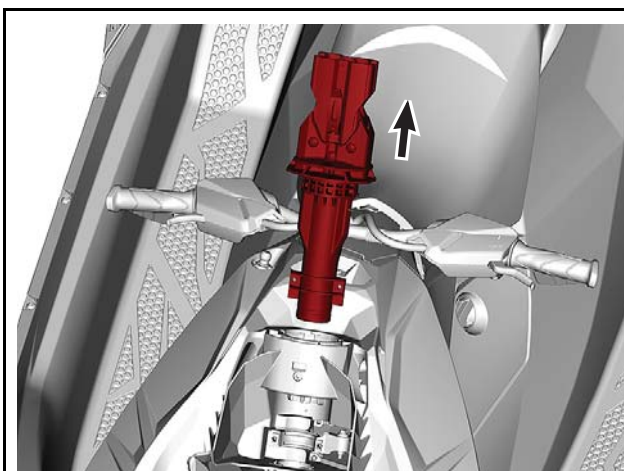
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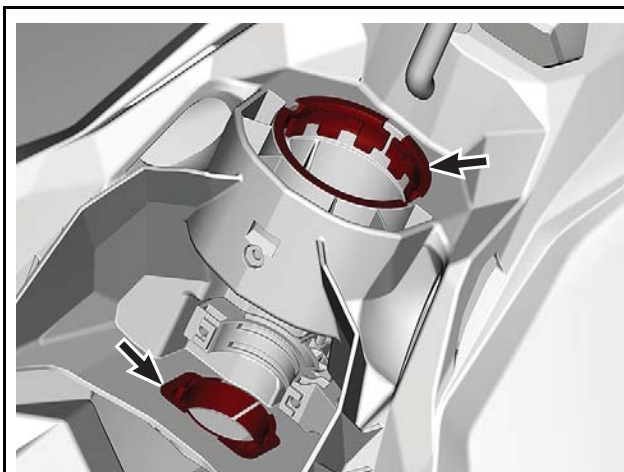
smr2017-407-026_a

Inspecting the Steering Column

Check steering column for:

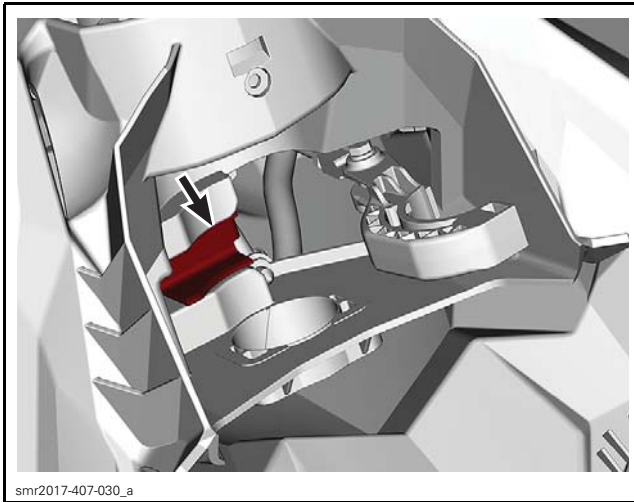
- Cracks
- Stress marks
- Signs of wear.

Check steering column support bushings.



smr2017-407-029_a

Check wear sleeve behind the steering column arm.



Replace any damaged or worn parts.

Installing the Steering Column

The installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Steering column clamp screws	6 N•m ± 1 N•m (53 lbf•in ± 9 lbf•in)
Handlebar screws	Refer to <i>INSTALLING THE HANDLEBAR</i>

JET PUMP

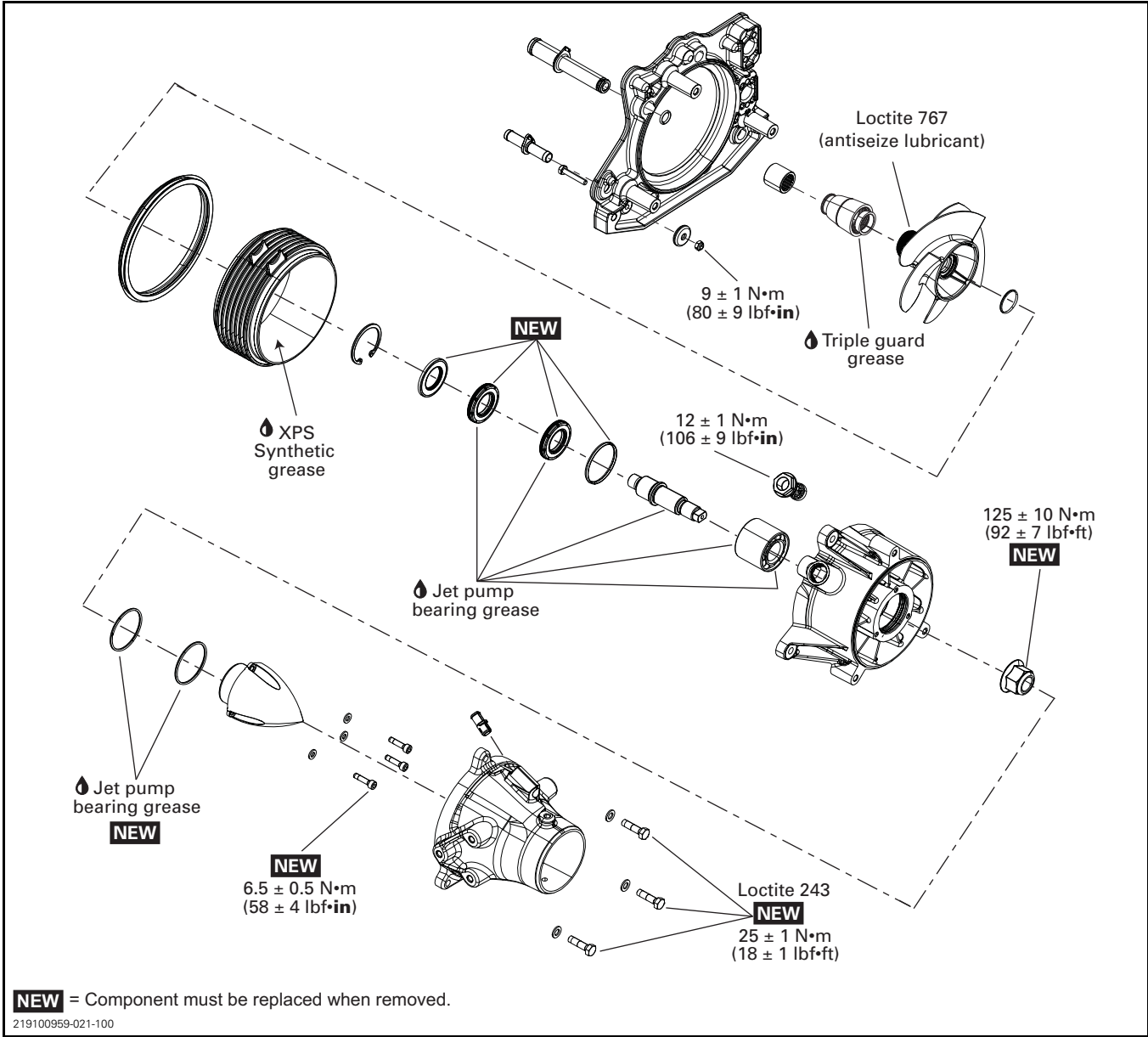
SERVICE TOOLS

Description	Part Number	Page
ENGINE ALIGNMENT PLATE	529 036 278	187
IMPELLER SHAFT BEARING TOOL	529 036 279	195–196
IMPELLER SHAFT PUSHER.....	529 035 955	193, 195
IMPELLER SHAFT/BEARING TOOL.....	529 036 416	193, 195
PRESSURE CAP	529 036 283	186
PTO SHAFT ADAPTER	529 036 401	191–192, 194, 197
VACUUM/PRESSURE PUMP	529 021 800	186

SERVICE PRODUCTS

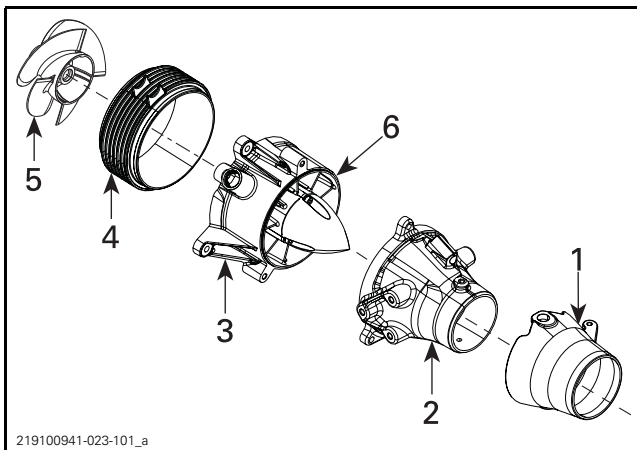
Description	Part Number	Page
BRAKE AND PARTS CLEANER PRO S2	779245	188
JET PUMP BEARING GREASE	293 550 032	190, 196, 198
LOCTITE 243 (BLUE).....	293 800 060	189
LOCTITE 577 (THREAD SEALANT)	293 800 050	192
LOCTITE 767 (ANTI-SEIZE LUBRICANT)	293 800 070	191
SYNTHETIC GREASE (EUR)	779231	188, 192
SYNTHETIC GREASE	779162	188, 192
TRIPLE-GUARD GREASE	508298	188, 192

Section 06 STEERING AND PROPULSION
Subsection 03 (JET PUMP)



GENERAL

JET PUMP MAIN COMPONENTS



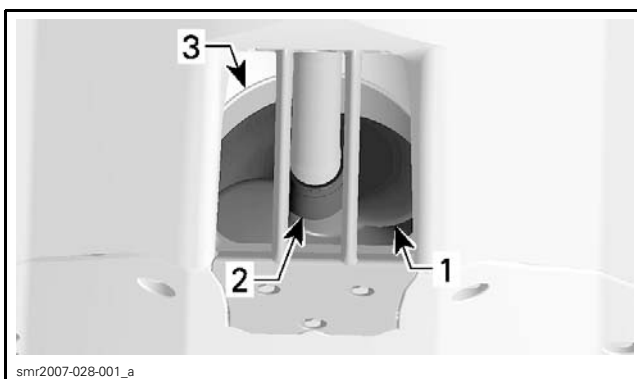
TYPICAL

1. Nozzle
2. Venturi
3. Jet pump housing
4. Wear ring
5. Impeller
6. Stator

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.



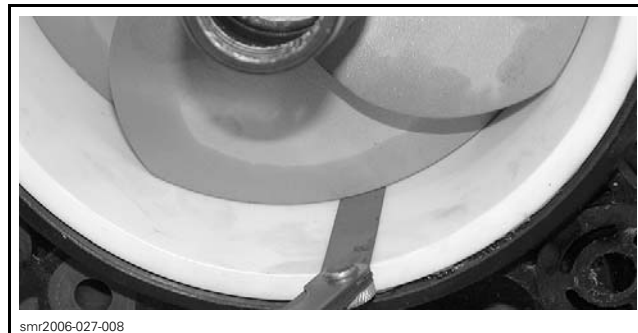
TYPICAL — UNDERNEATH HULL

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.



TYPICAL

MAXIMUM WEAR CLEARANCE
0.35 mm (.014 in)

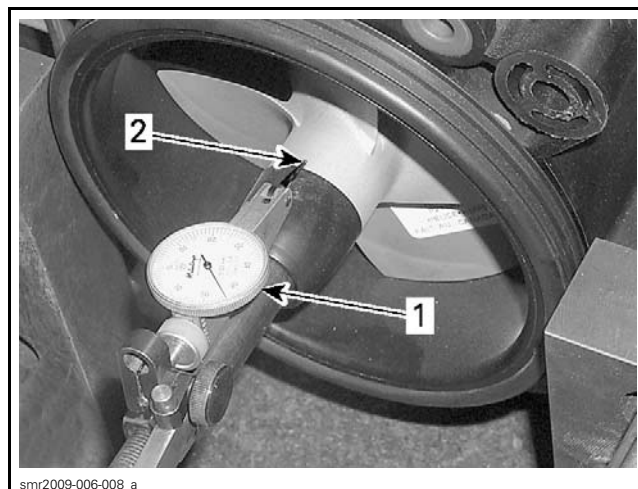
IMPELLER SHAFT RADIAL PLAY

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

Section 06 STEERING AND PROPULSION

Subsection 03 (JET PUMP)

RADIAL PLAY
0 mm (0 in)

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 carried out.

Proceed as follows:

- 1. Remove impeller cover. Refer to *IMPELLER COVER* in this subsection.
- 2. Remove impeller. Refer to *IMPELLER*.
- 3. Install the pressure cap on pump housing.

REQUIRED TOOLS	
PRESSURE CAP (P/N 529 036 283)	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	

- 4. Connect the vacuum/pressure pump to the pressure cap fitting.



TYPICAL

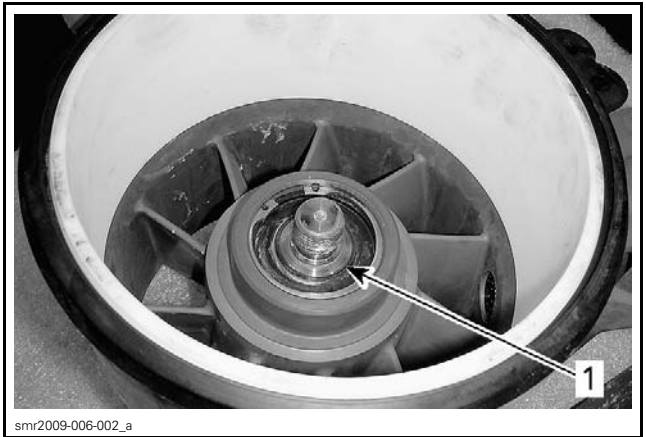
- 5. Pressurize pump.

LEAK TEST PRESSURE
Maximum 70 kPa (10 PSI)

- 6. Pump must maintain this pressure for at least 5 minutes.

– If there is a pressure drop, spray soapy water around cover. If there are no bubbles, impeller shaft and impeller shaft seal must be replaced. Jet pump unit has to be disassembled.

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.

- 7. Disconnect pump and remove pressure cap.
- 8. Reinstall impeller cover. Refer to *IMPELLER COVER* in this subsection.

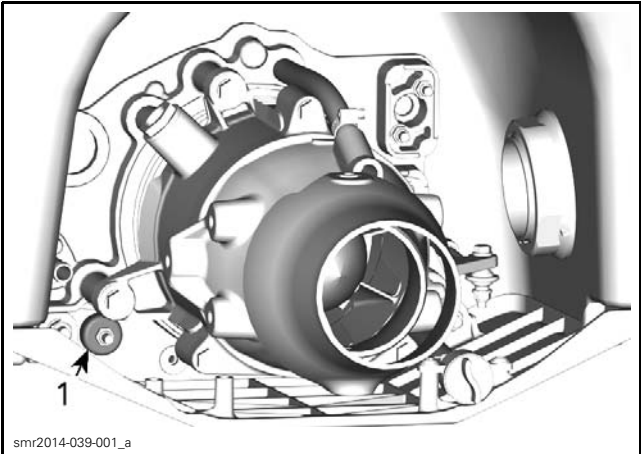
PROCEDURES

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 ANODE

Inspecting the Sacrificial Anode

Check for wear. If worn more than half, replace anode.



1. Sacrificial anode location

Removing the Sacrificial Anode

Unscrew sacrificial anode retaining nut and remove anode.

Installing the Sacrificial Anode

The installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Sacrificial anode retaining nut	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

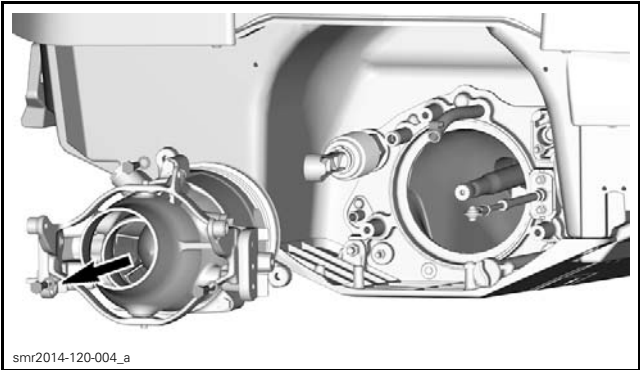
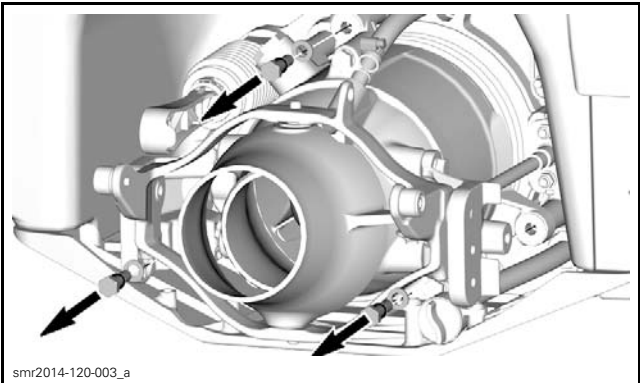
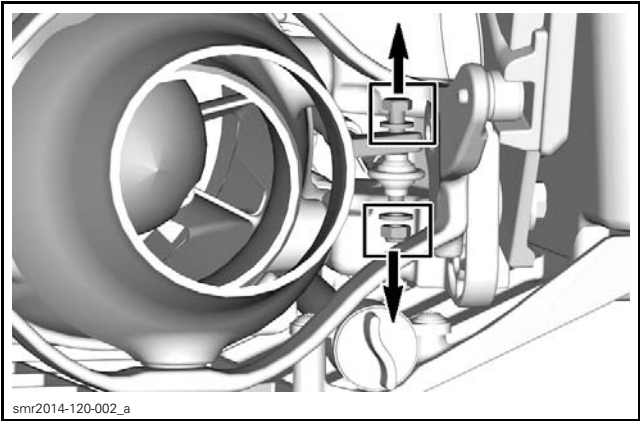
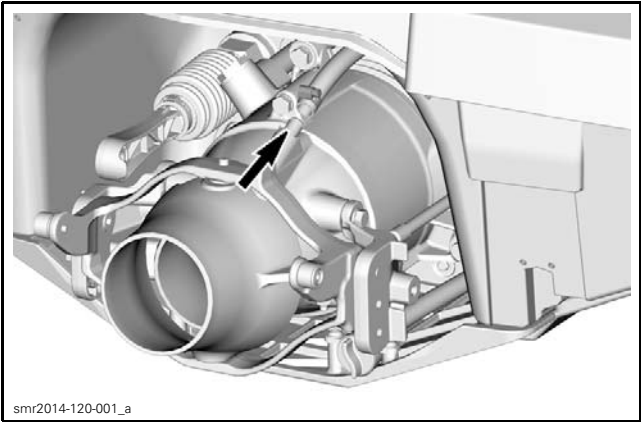
JET PUMP HOUSING

NOTE: The jet pump housing can be removed as an assembly with the venturi and nozzle. This is the preferred procedure when either the drive shaft or engine removal is required.

Removing the Jet Pump Housing

Remove iBR gate. Refer to *iBR, REVERSE AND VTS SYSTEM* subsection.

Remove the following fasteners.



Temporarily fasten the engine alignment plate to pump support to support drive shaft and avoid PTO oil seal damage.

REQUIRED TOOL	
ENGINE ALIGNMENT PLATE (P/N 529 036 278)	

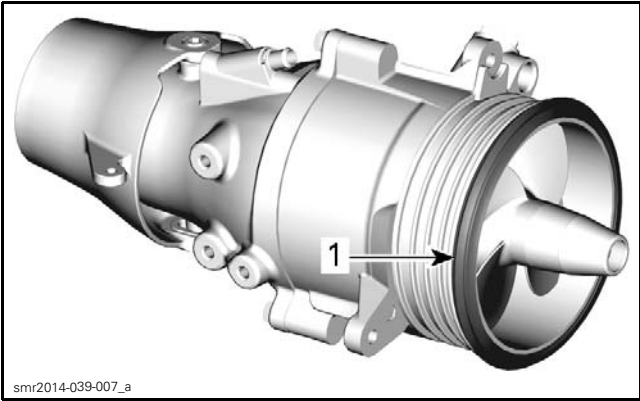
Inspecting and Cleaning the Jet Pump Housing

1. Visually inspect jet pump housing. Pay attention to the stator. Ensure the assembly is clean and free of any debris and defects.

Section 06 STEERING AND PROPULSION

Subsection 03 (JET PUMP)

2. Ensure the elastomer seal is in good condition.
Replace as required.



1. Elastomer seal

Installing the Jet Pump Housing

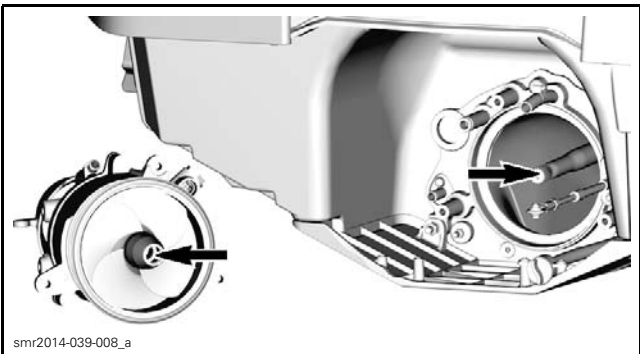
The installation is the reverse of the removal procedure. However, pay attention to the following.

Brush and clean impeller splines and drive shaft splines with brake and parts cleaner or equivalent. Splines must be free of any residue.

Lubricate drive shaft splines, impeller splines and the inside of the impeller boot with grease.

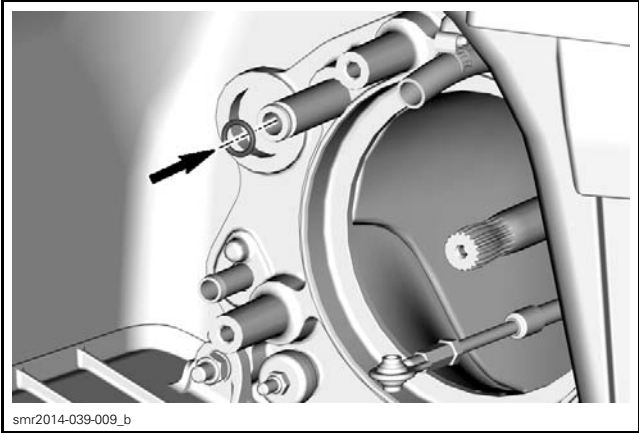
SERVICE PRODUCTS
BRAKE AND PARTS CLEANER PRO S2 (P/N 779245)
TRIPLE-GUARD GREASE (P/N 508298)

Ensure the elastomer seal is properly installed on the wear ring.



CLEANING AND LUBRICATION POINTS

Install a new O-ring



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

Generously apply grease on drive shaft splines.

NOTE: Slightly lubricate wear ring with grease to minimize friction during initial impeller start.

SERVICE PRODUCT	
Scandinavia	SYNTHETIC GREASE (EUR) (P/N 779231)
All other countries	SYNTHETIC GREASE (P/N 779162)

Install jet pump.

NOTE: If necessary, wiggle jet pump to engage drive shaft splines in impeller.

TIGHTENING TORQUE	
NEW M8 jet pump housing retaining screws	26 N•m ± 2 N•m (19 lbf•ft ± 1 lbf•ft)

NOZZLE

Removing the Nozzle

Remove iBR gate support. Refer to *iBR SYSTEM* subsection.

Inspecting the Steering Nozzle

Inspect steering nozzle for cracks, wear, deformation, and other damages.

Inspect bushings for wear or other damage.

Replace parts as required.

Installing the Nozzle

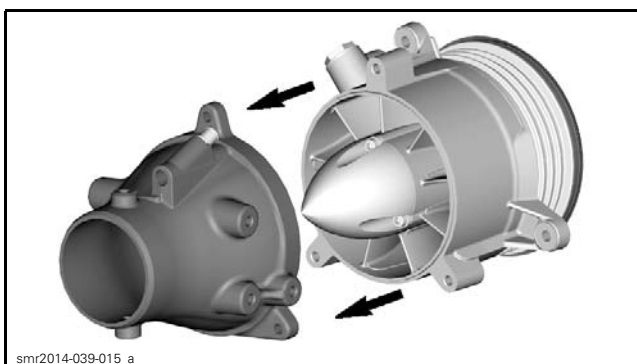
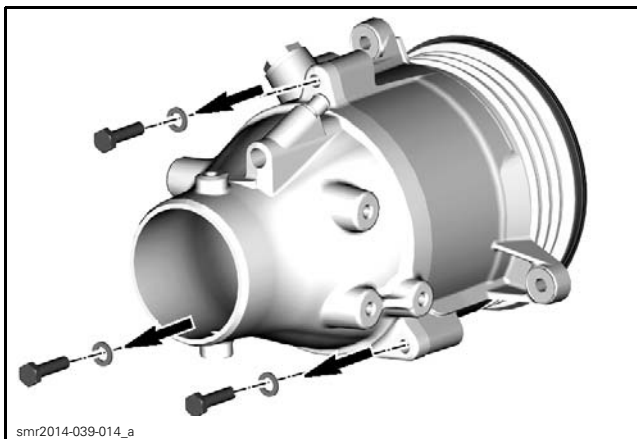
The installation is the reverse of the removal procedure. However, pay attention to the following.

Apply Loctite 243 (blue) on screw threads (or use new self-locking screws).

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

VENTURI

Removing the Venturi



Installing the Venturi

The installation is the reverse of the removal procedure. However, pay attention to the following. Apply Loctite 243 (blue) on threads of venturi retaining screws (or install new self-locking screws).

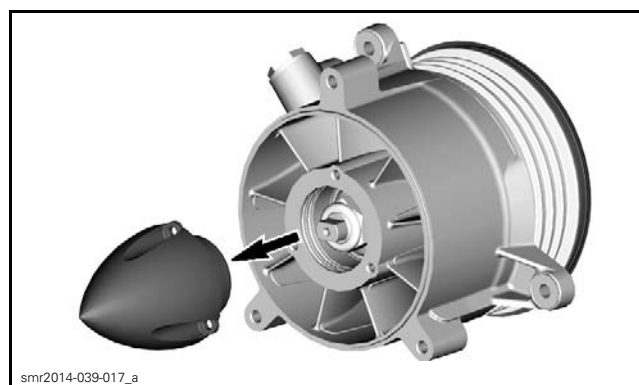
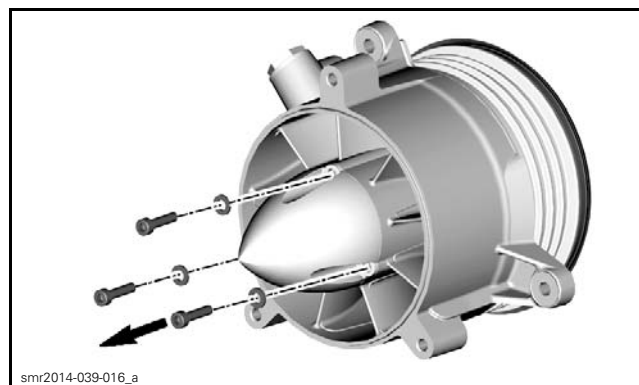
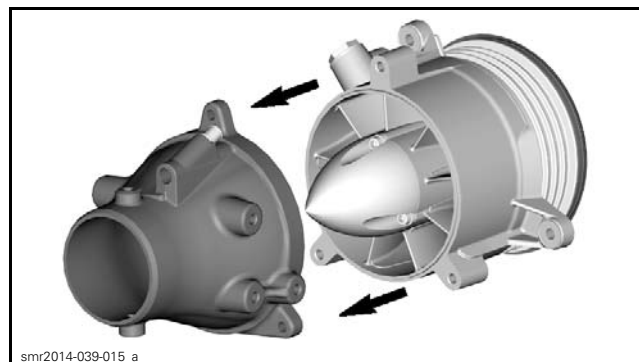
SERVICE PRODUCT
LOCTITE 243 (BLUE) (P/N 293 800 060)

Install venturi screws and flat washers.

TIGHTENING TORQUE	
Venturi retaining screws	25 N•m ± 1 N•m (18 lbf•ft ± 1 lbf•ft)

IMPELLER COVER

Removing the Impeller Cover

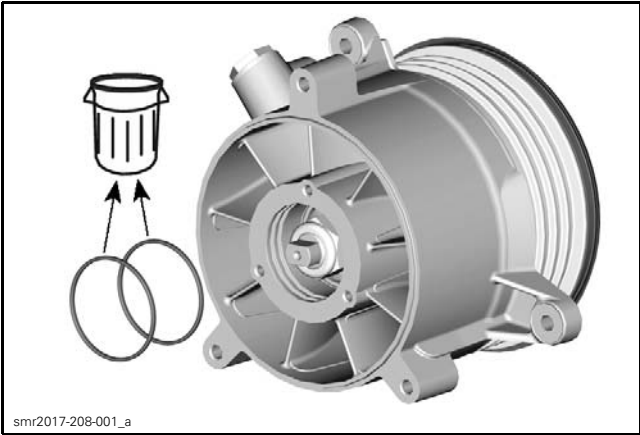


Inspecting the Impeller Cover

Check for presence of water in cover and bearing area.

If water is found, perform a leak test. Refer to *LEAK TEST* in this subsection.

Inspect cover for cracks, replace if necessary. After leak test, remove and discard O-rings.



Installing the Impeller Cover

The installation is the reverse of the removal procedure. However, pay attention to the following. Install and grease new O-rings in their respective grooves.

SERVICE PRODUCT
JET PUMP BEARING GREASE (P/N 293 550 032)

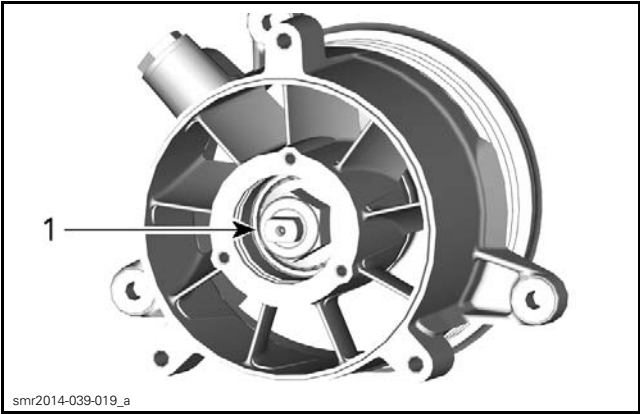
Push cover against pump housing while alternately tightening screws. Make sure O-rings are positioned correctly and they are not damaged when pushing the cover.

TIGHTENING TORQUE	
NEW M6 impeller cover retaining screws	6.5 N•m ± 0.5 N•m (58 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.

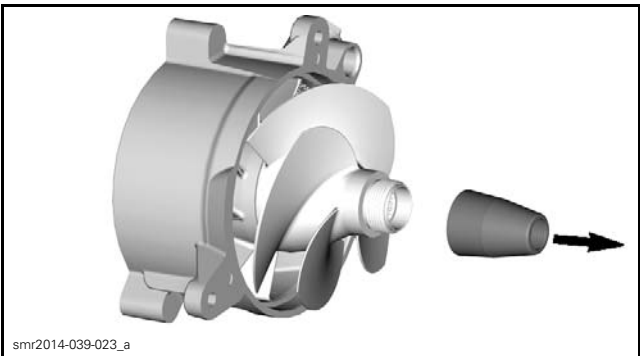
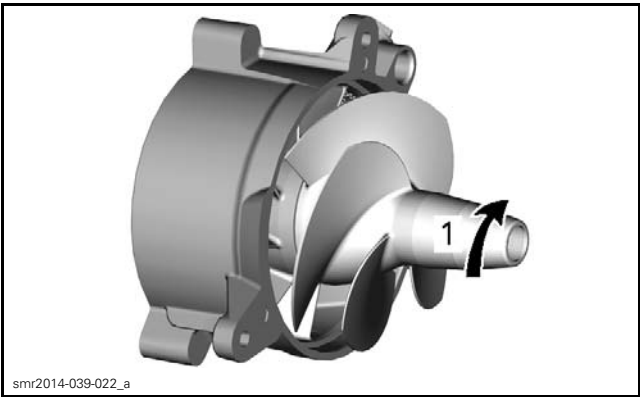


1. Impeller shaft nut

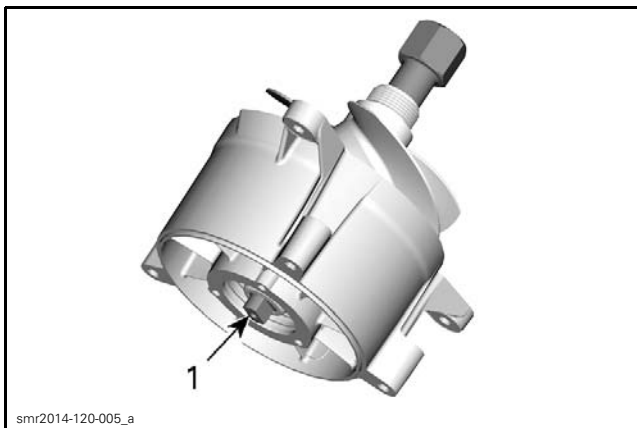
1. Remove jet pump from the watercraft. Refer to *JET PUMP HOUSING*.
2. Remove impeller cover. Refer to *IMPELLER COVER*.
3. Remove wear ring. Refer to *WEAR RING*.

NOTICE Remove impeller boot by turning it clockwise (LH threads).

NOTE: The impeller boot is the only component with LH threads.




4. Mount the flat sides of impeller shaft in a vise.



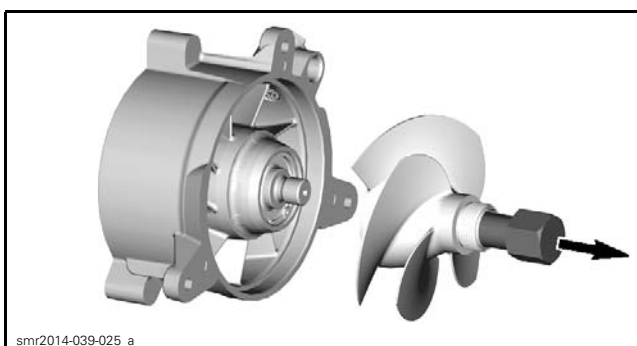
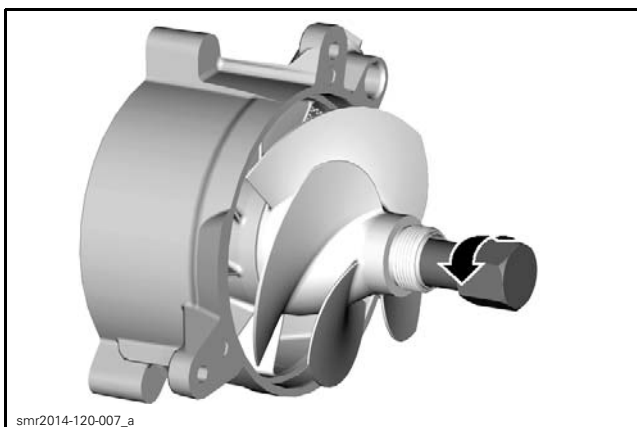
TYPICAL
1. Flat side

5. Unscrew the impeller using the PTO shaft adapter.

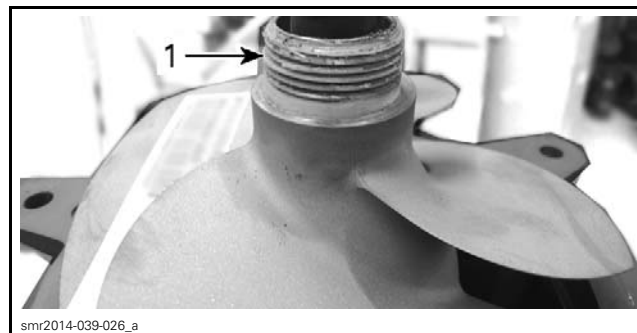
REQUIRED TOOL	
PTO SHAFT ADAPTER (P/N 529 036 401)	

NOTE: It may be necessary to heat the impeller to ease removal.

NOTICE Never use an impact wrench to loosen impeller.



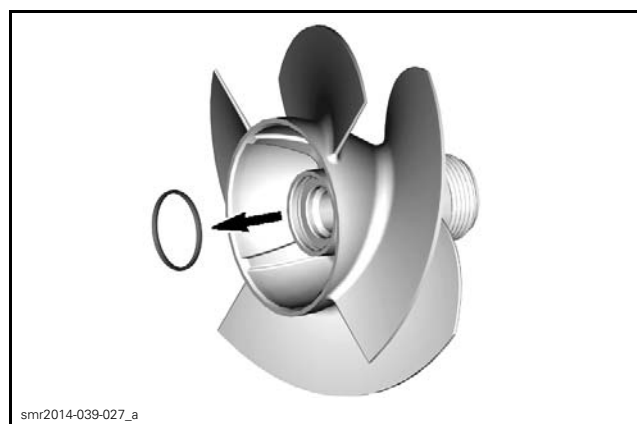
6. Clean impeller to boot threads.



IMPELLER

1. Impeller to boot threads

7. Discard impeller O-ring.

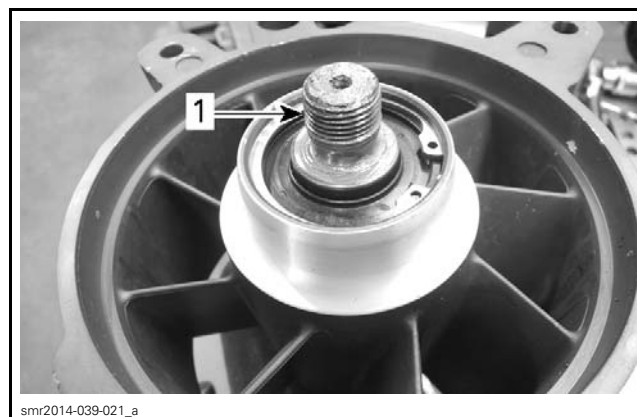


Installing the Impeller

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

1. Install a new impeller O-ring.
2. Apply Loctite 767 on threads of impeller shaft.

SERVICE PRODUCT
LOCTITE 767 (ANTI-SEIZE LUBRICANT) (P/N 293 800 070)



1. Antiseize lubricant

Section 06 STEERING AND PROPULSION

Subsection 03 (JET PUMP)

TIGHTENING TORQUE	
Impeller	125 N•m ± 10 N•m (92 lbf•ft ± 7 lbf•ft)

NOTICE Never use an impact wrench to tighten impeller shaft.

- 3. Apply Loctite 577 on impeller to boot threads.
- 4. Apply grease inside impeller boot.
- 5. Install impeller boot on impeller and tighten counterclockwise.

SERVICE PRODUCTS
LOCTITE 577 (THREAD SEALANT) (P/N 293 800 050)
TRIPLE-GUARD GREASE (P/N 508298)

WEAR RING

Inspecting the Wear Ring

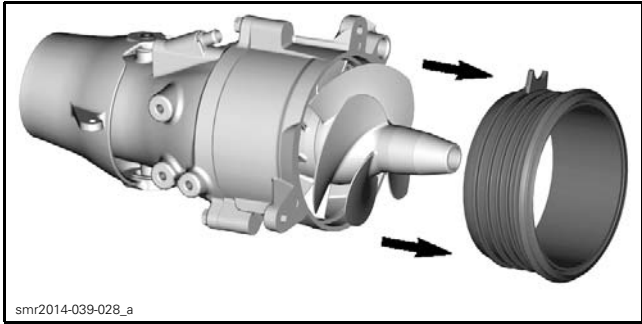
Check wear ring for:

- Deep scratches
- Irregular surface
- Any apparent damage.

Check *IMPELLER/WEAR RING CLEARANCE*, see procedure at the beginning of this subsection.

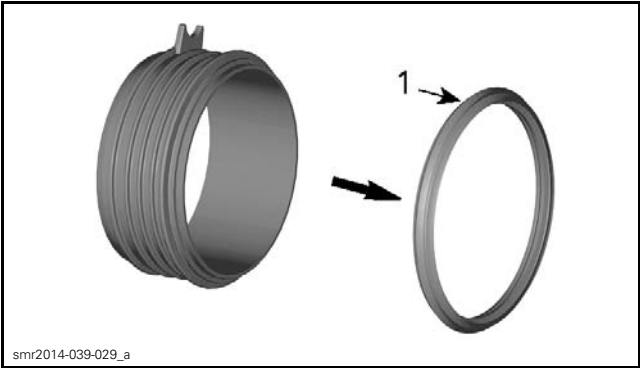
Removing the Wear Ring

Remove jet pump from watercraft. Refer to *JET PUMP HOUSING*.



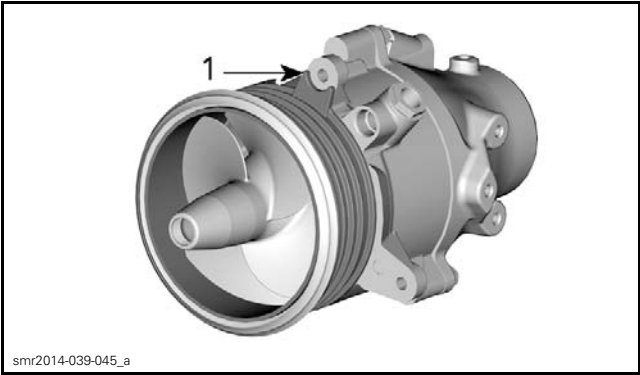
Installing the Wear Ring

Check wear ring elastomer seal condition. Replace if necessary.



1. Wear ring elastomer seal

Align anti rotation tab on wear ring with jet pump housing.



WEAR RING POSITION

- 1. Anti rotation tab


Apply grease on the wear ring surface.

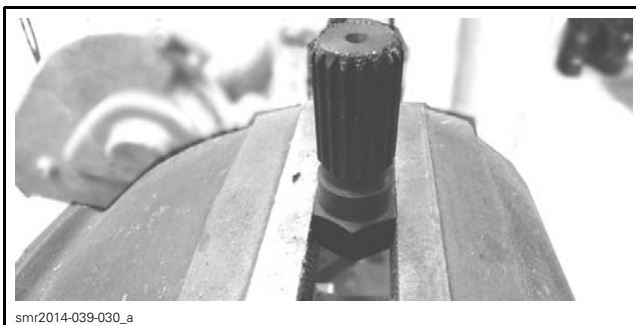
SERVICE PRODUCTS	
Scandinavia	SYNTHETIC GREASE (EUR) (P/N 779231)
All other countries	SYNTHETIC GREASE (P/N 779162)

IMPELLER SHAFT AND BEARING

Removing the Impeller Shaft and Bearing

- 1. Remove impeller cover. Refer to *IMPELLER COVER* in this subsection.
- 2. Install the PTO adapter in a vise.

REQUIRED TOOL	
PTO SHAFT ADAPTER (P/N 529 036 401)	

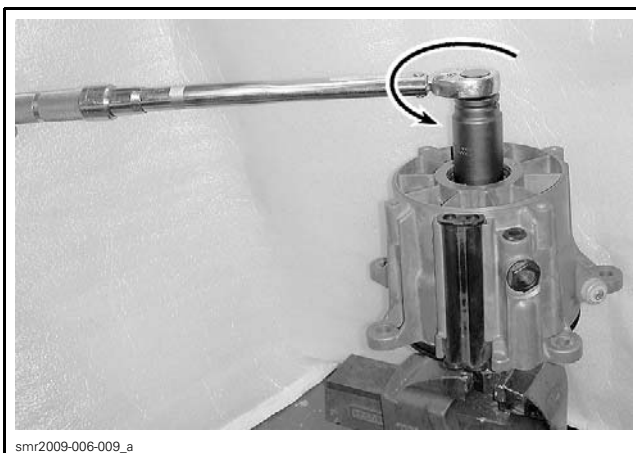


3. Install jet pump housing over PTO adapter.



4. Using a 30 mm socket, unscrew the impeller shaft nut.

5. Remove impeller shaft nut.

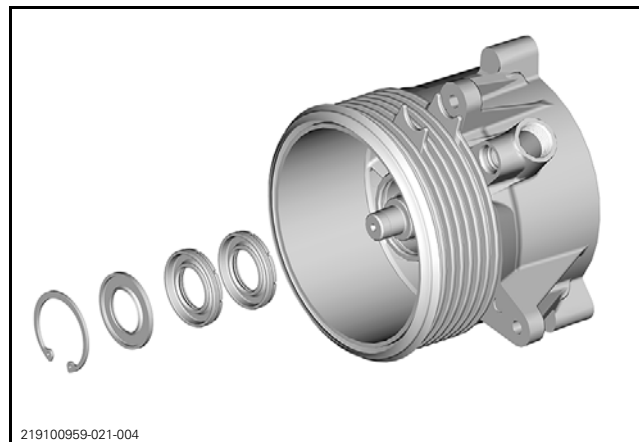


TYPICAL

NOTE: If impeller loosens instead of shaft nut, refer to *REMOVING THE IMPELLER SHAFT NUT IF IMPELLER HAS LOOSENED* further in this procedure.

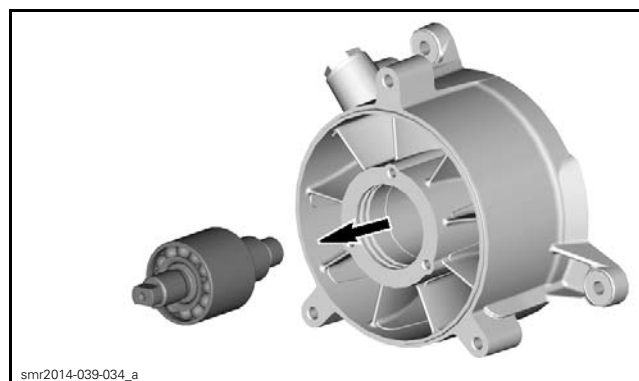
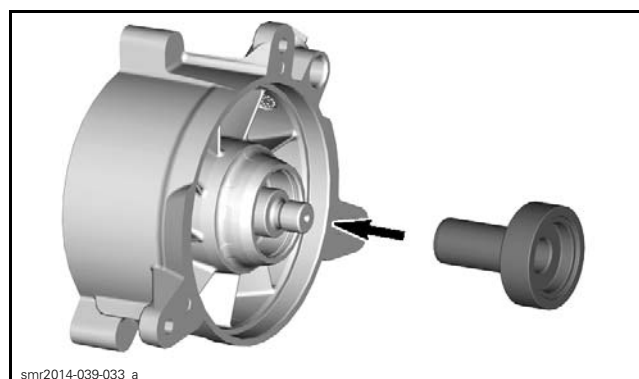
6. Remove impeller. Refer to *IMPELLER*.

7. From the impeller side, remove circlip, seals and O-ring from jet pump housing.



REQUIRED TOOL

IMPELLER SHAFT
PUSHER (P/N 529
035 955)



8. Use the required tool to press bearing off impeller shaft.

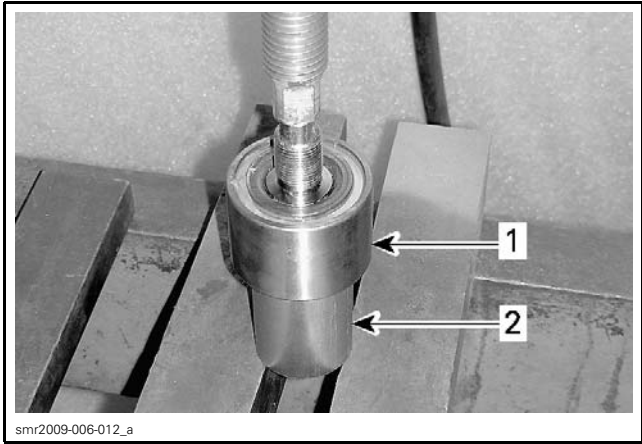
REQUIRED TOOL

IMPELLER
SHAFT/BEARING TOOL
(P/N 529 036 416)



Section 06 STEERING AND PROPULSION

Subsection 03 (JET PUMP)



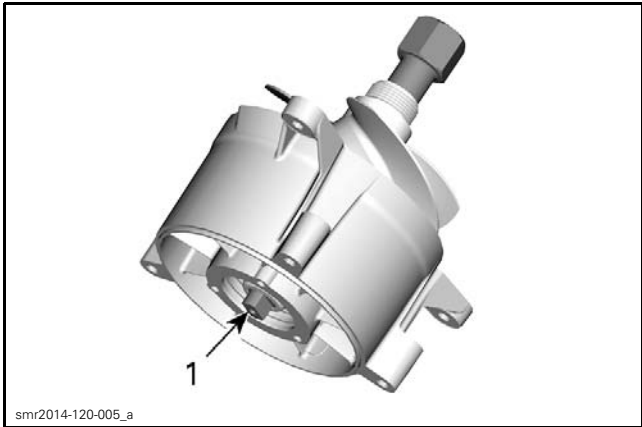
TYPICAL

1. Impeller shaft and bearing

2. Impeller shaft bearing tool on INNER race

Removing the Impeller Shaft Nut if Impeller Has Loosened

1. Turn pump upside down and mount the flat sides of impeller shaft in a vise.

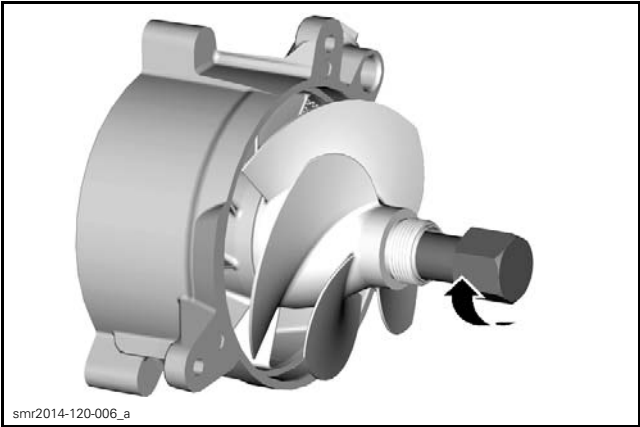


TYPICAL

1. Flat side

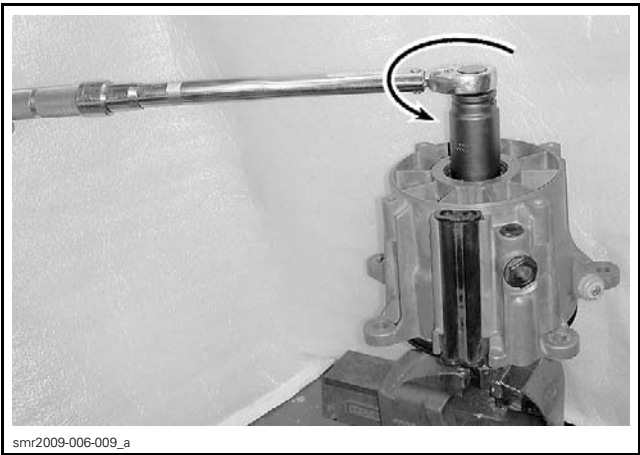
REQUIRED TOOL	
PTO SHAFT ADAPTER (P/N 529 036 401)	

2. Tighten impeller more than impeller shaft nut.



TYPICAL

3. Turn pump upside down and retry unscrewing impeller shaft nut.



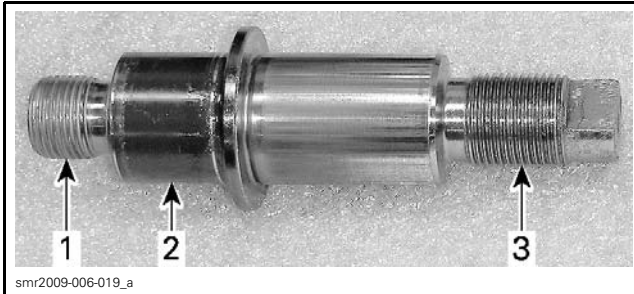
TYPICAL

4. If impeller still loosens instead of nut, retighten impeller more and retry. Repeat until nut loosens.
5. Remove impeller as described in this subsection.
6. Return to *REMOVING THE IMPELLER SHAFT AND BEARING* main procedure.

Inspecting the Impeller Shaft and 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. Replace if necessary.

Installing the Impeller Shaft and Bearing


Bearing Installation

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

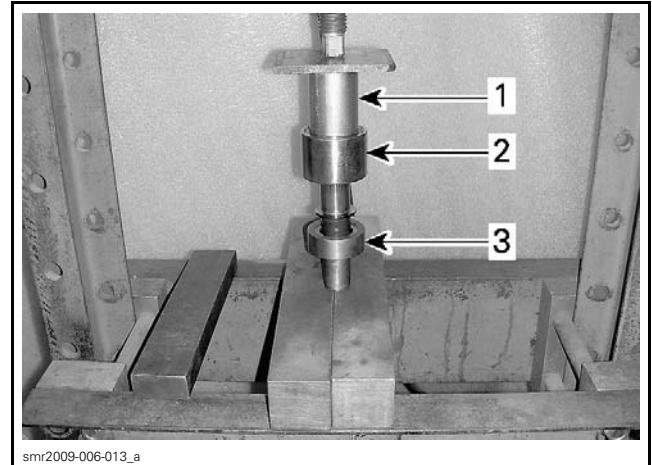
1. Using the Impeller shaft bearing tool on the bearing inner race, press the bearing on the impeller shaft.

REQUIRED TOOL	
IMPELLER SHAFT/BEARING TOOL (P/N 529 036 416)	

2. Use the impeller shaft pusher 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

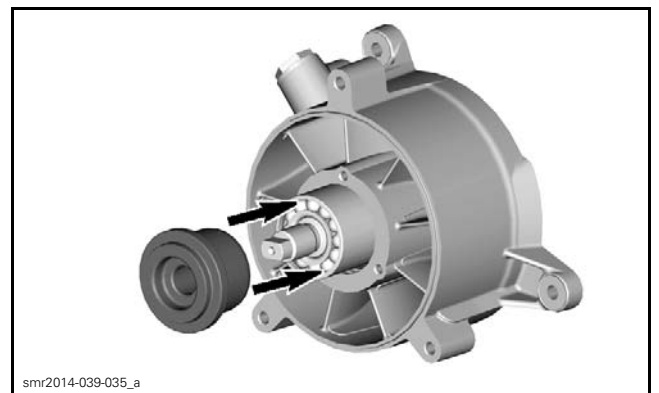
3. Press bearing until it bottoms.

Impeller Shaft Installation

NOTE: Ensure there is no O-ring in pump housing on the impeller cover side.

1. From the impeller cover side of pump, press impeller shaft assembly into housing.

REQUIRED TOOL	
IMPELLER SHAFT BEARING TOOL (P/N 529 036 279)	



NOTE: Ensure impeller shaft turns freely and smoothly.

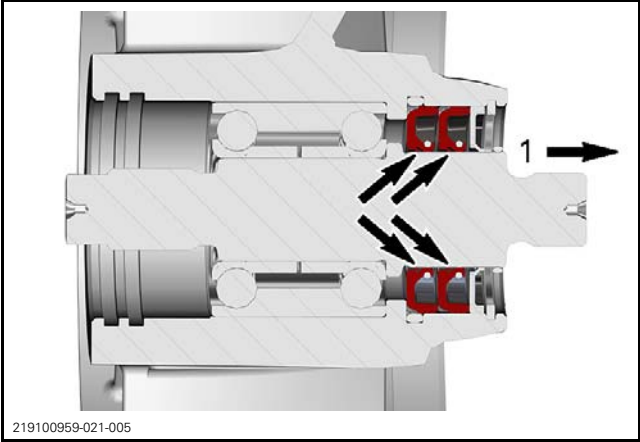
Section 06 STEERING AND PROPULSION
Subsection 03 (JET PUMP)

- 2. Turn pump upside down.
- 3. Coat shaft surface with grease.

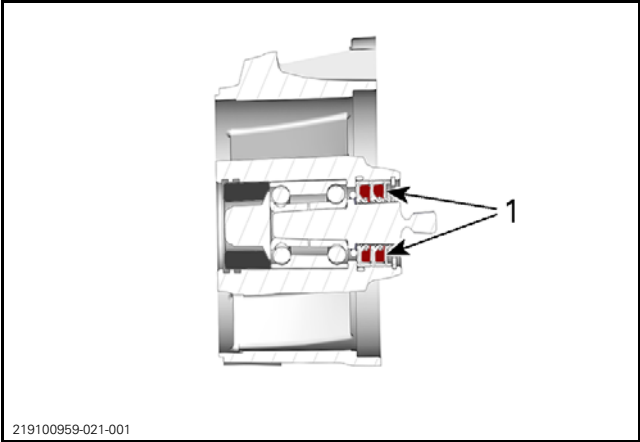
SERVICE PRODUCT
JET PUMP BEARING GREASE (P/N 293 550 032)

- 4. Apply 5 g (.2 oz) of grease on bearing.

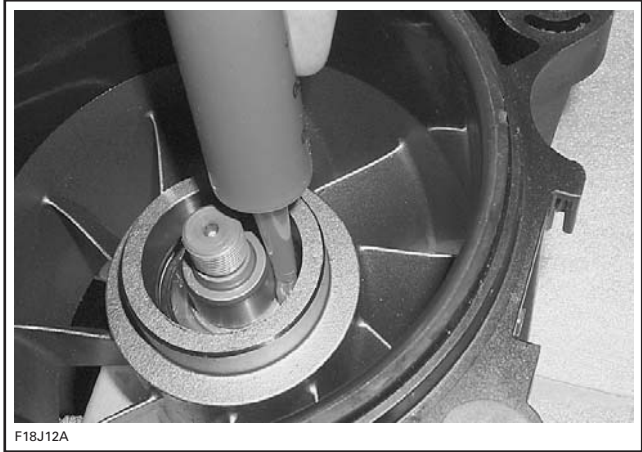
SERVICE PRODUCT
JET PUMP BEARING GREASE (P/N 293 550 032)



1. Toward impeller



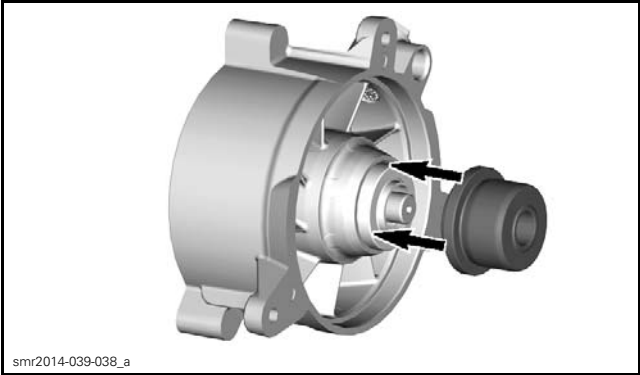
1. Grease in seals cavities



TYPICAL

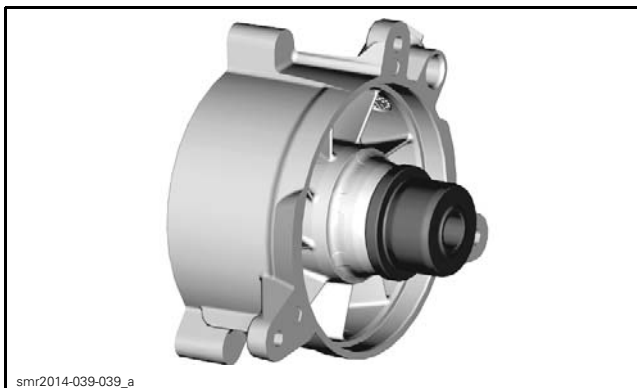
- 5. Apply 11 g (.4 oz) of grease inside **NEW** double lip seal and in the seal lips.

REQUIRED TOOL
IMPELLER SHAFT BEARING TOOL (P/N 529 036 279)

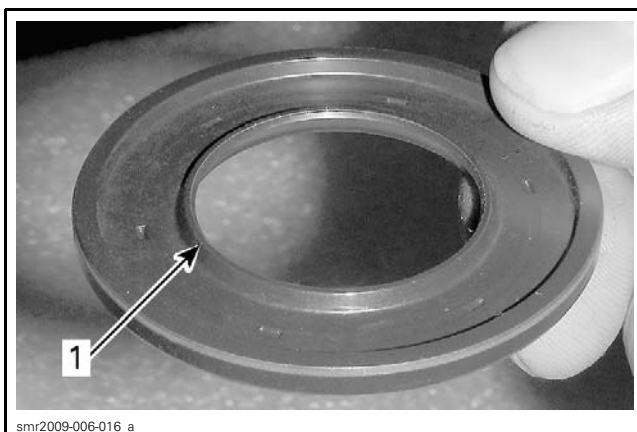


PUT GREASE IN ALL SEAL CAVITIES.

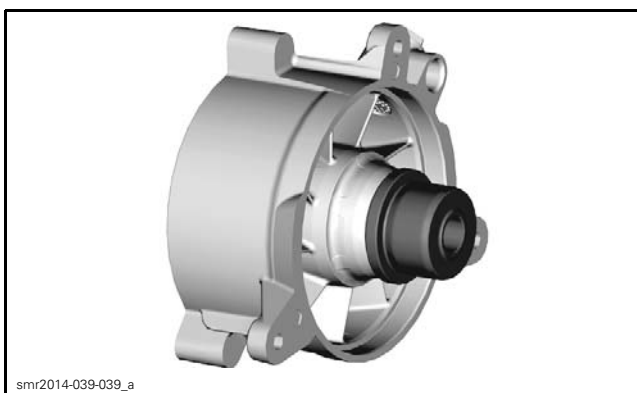
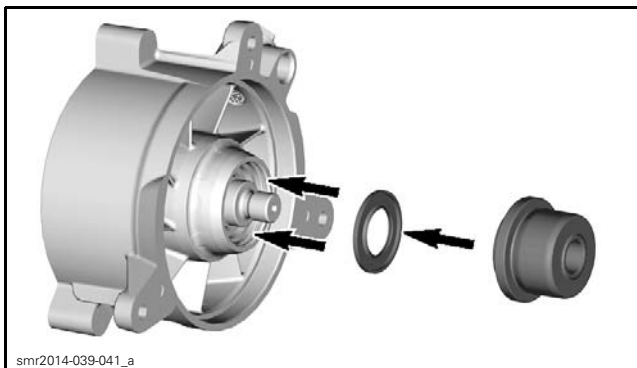
- 6. Install double lip seals making sure seal lips are facing upwards (toward impeller side).



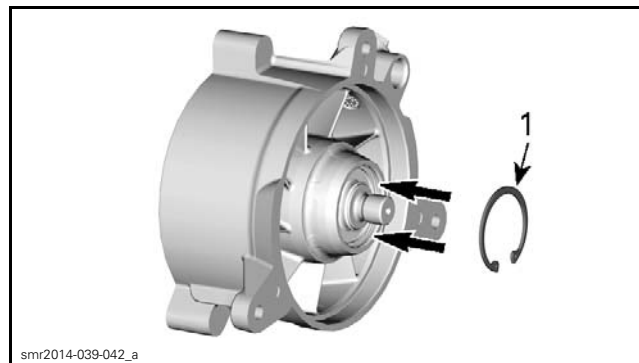
7. Install **NEW** outer impeller shaft seal.



1. Seal lip facing up



8. Install circlip.

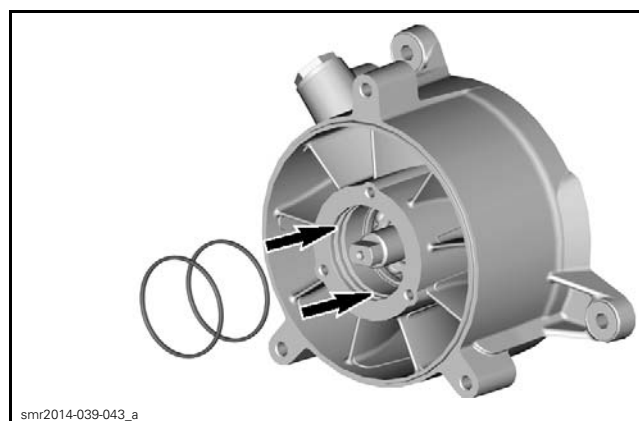


TYPICAL

1. Circlip

9. Turn pump upside down.

10. Install the two impeller cover O-rings in pump housing.



11. Before installing any other parts, pressurize jet pump to insure proper seal installation. Refer to **LEAK TEST** in this subsection.

12. Install impeller. Refer to **IMPELLER**.

13. Mount PTO shaft adapter tool in a vise.

REQUIRED TOOL

PTO SHAFT ADAPTER
(P/N 529 036 401)



14. Using a 30 mm socket, screw the impeller shaft nut on clockwise.

TIGHTENING TORQUE

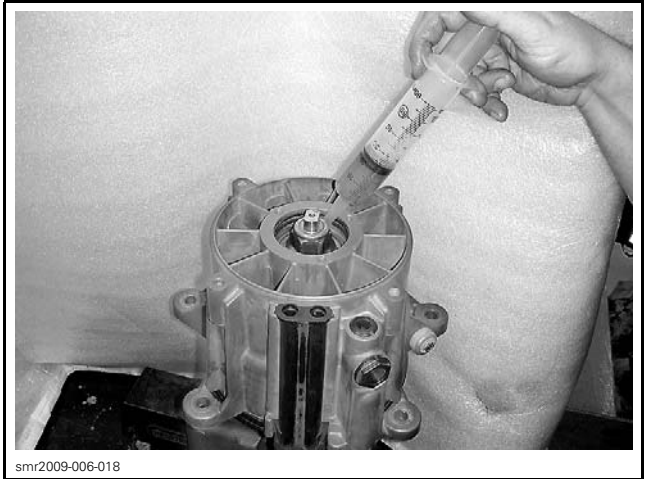
M20 impeller shaft nut

125 N•m ± 10 N•m
(92 lbf•ft ± 7 lbf•ft)

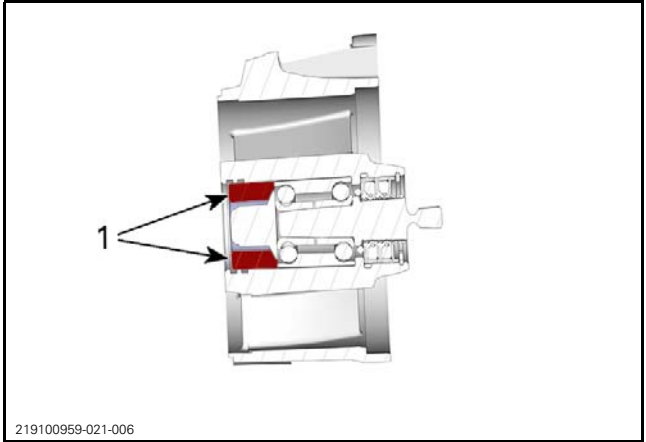
15. Apply 30 g (1.1 oz) of grease around nut.

Section 06 STEERING AND PROPULSION
Subsection 03 (JET PUMP)

SERVICE PRODUCTS
JET PUMP BEARING GREASE (P/N 293 550 032)



TYPICAL



1. Grease around nut

16. Install the impeller cover. Refer to *IMPELLER COVER*.

iBR, REVERSE AND VTS

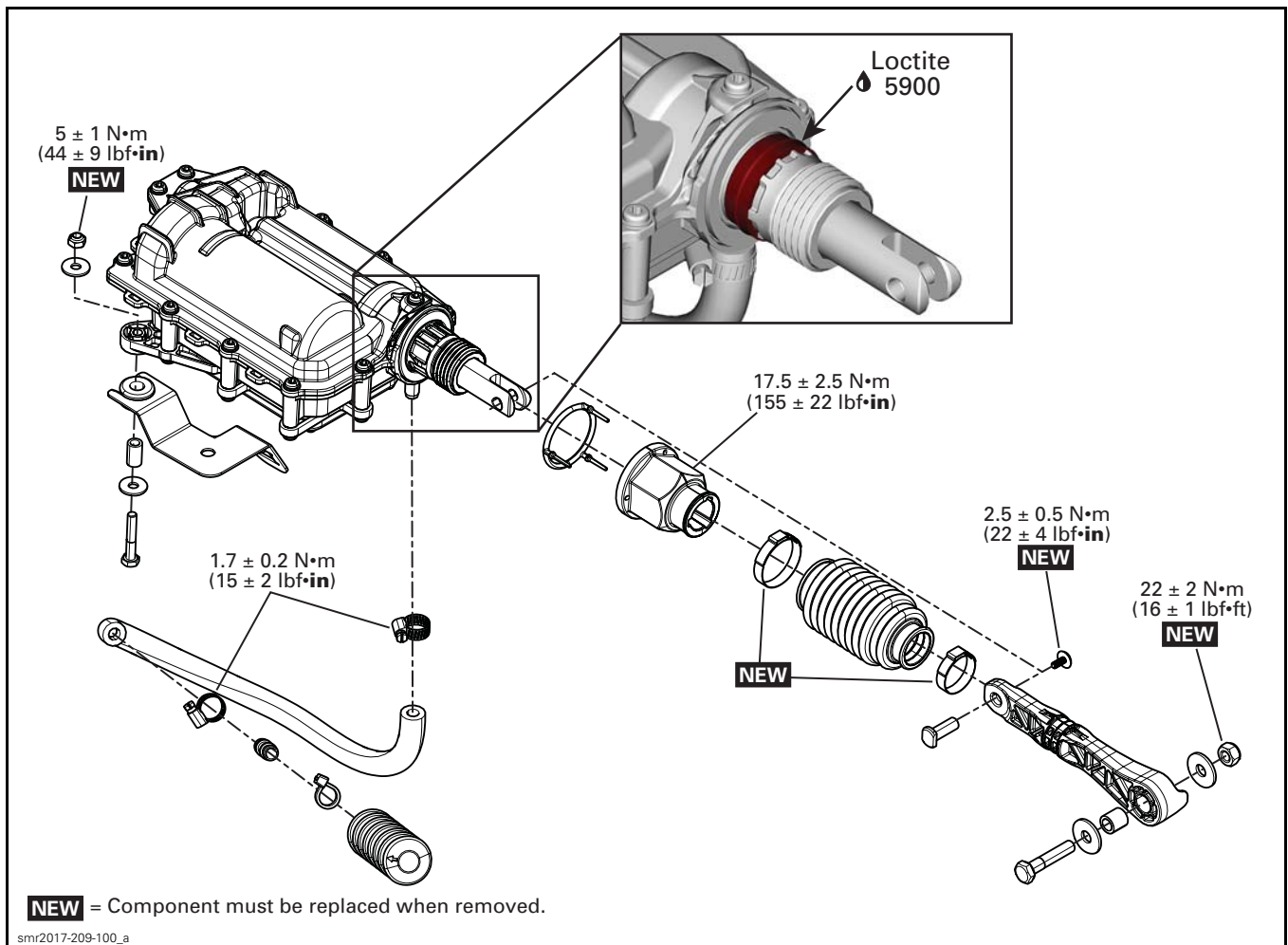
SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	211
ENGINE ALIGNMENT PLATE	529 036 278	208
IBR NUT SOCKET	529 036 305	209

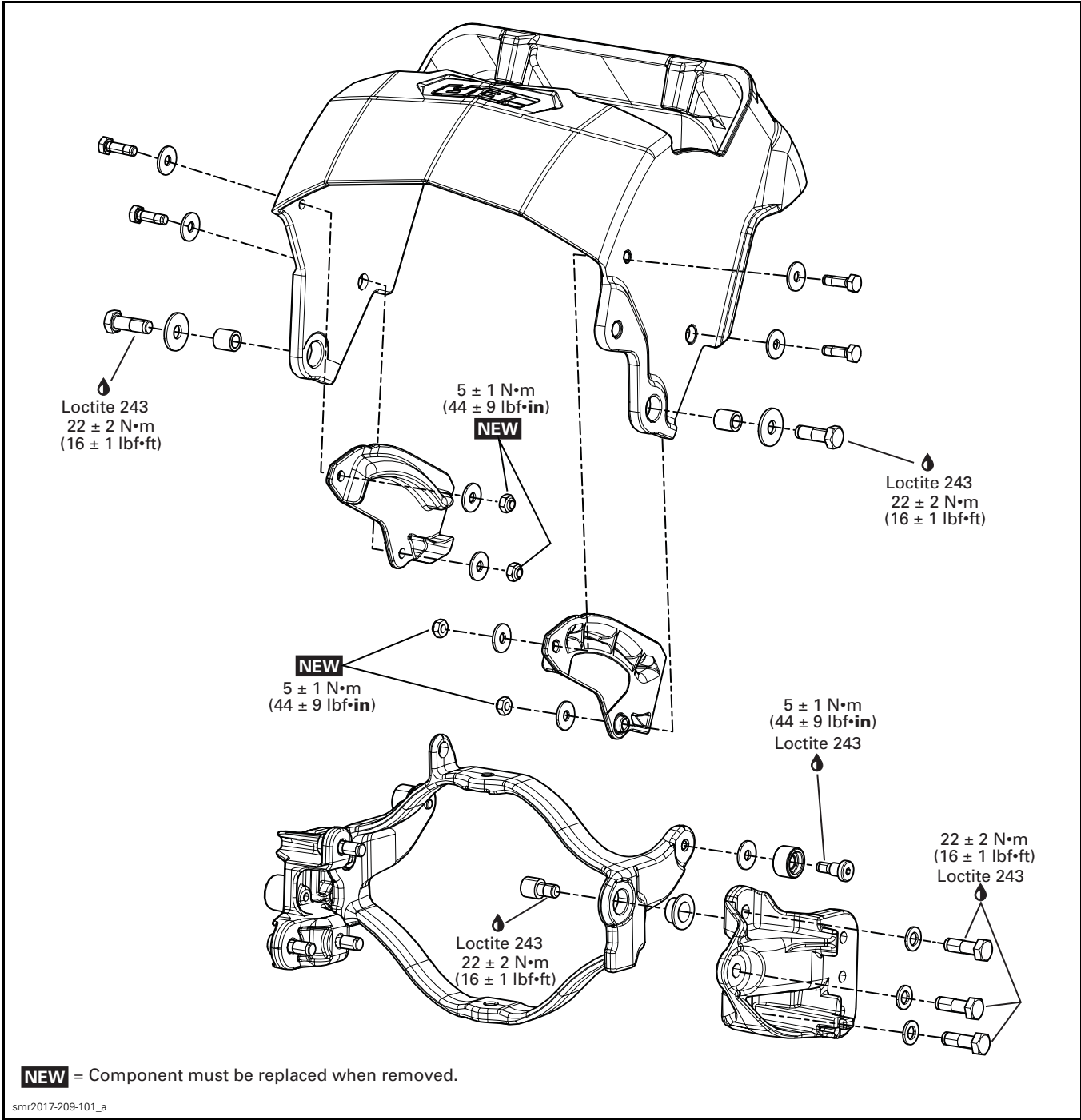
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 5900	293 800 066	209

IBR ACTUATOR

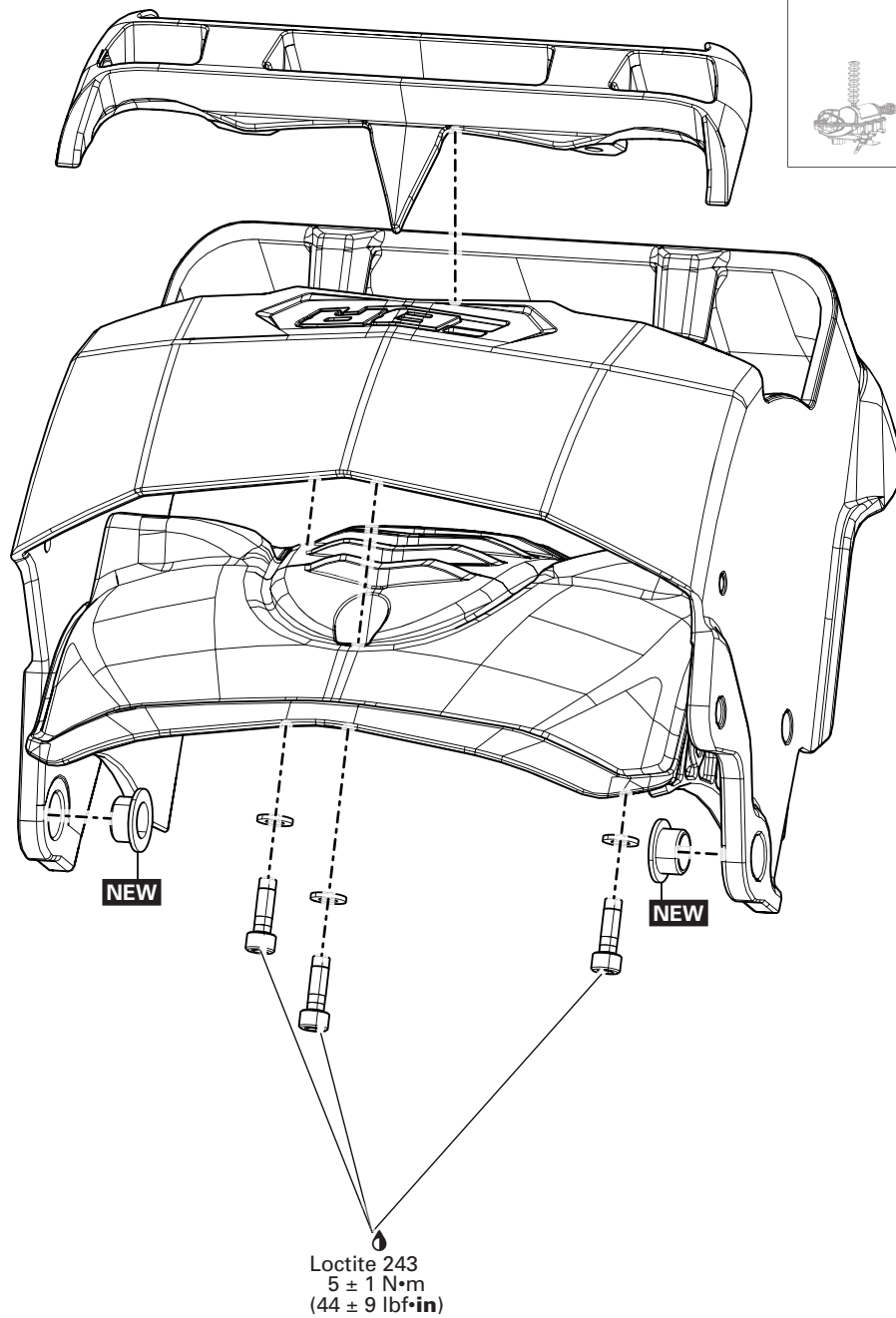


Section 06 STEERING AND PROPULSION
Subsection 04 (iBR, REVERSE AND VTS)



Section 06 STEERING AND PROPULSION

Subsection 04 (iBR, REVERSE AND VTS)




NEW = Component must be replaced when removed.

smr2016-110-003_a

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.



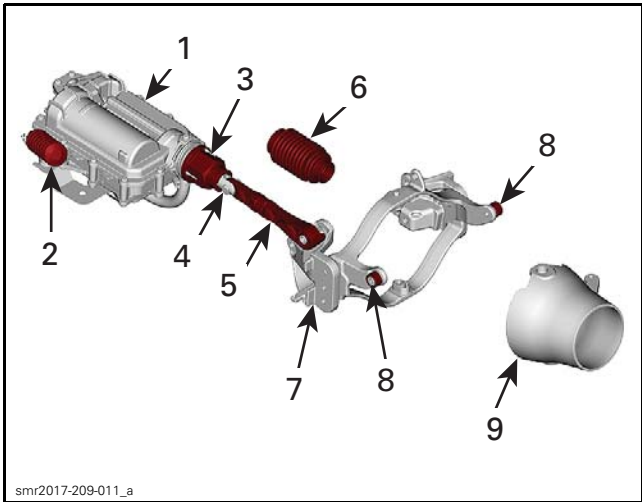
WARNING

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.

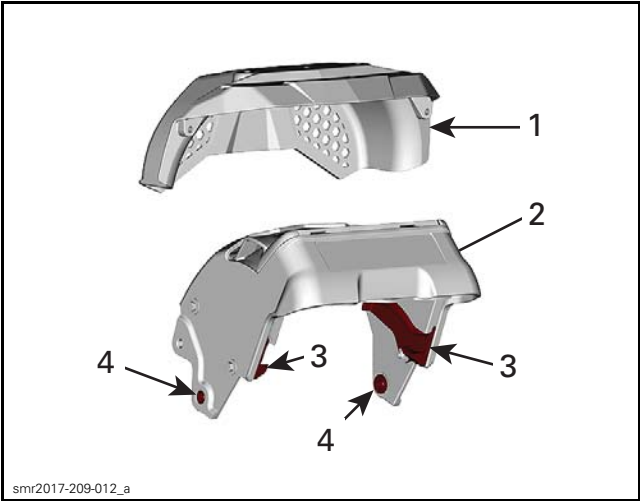
Hoses, cables or locking ties removed during a procedure must be reinstalled as per factory standards.

SYSTEM DESCRIPTION (iBR)

iBR System Components



- 1. Actuator
- 2. Air chamber
- 3. iBR nut
- 4. Actuator shaft
- 5. Connecting arm
- 6. Connecting arm bellows
- 7. Gate support bracket (LH)
- 8. Friction sleeves
- 9. Nozzle



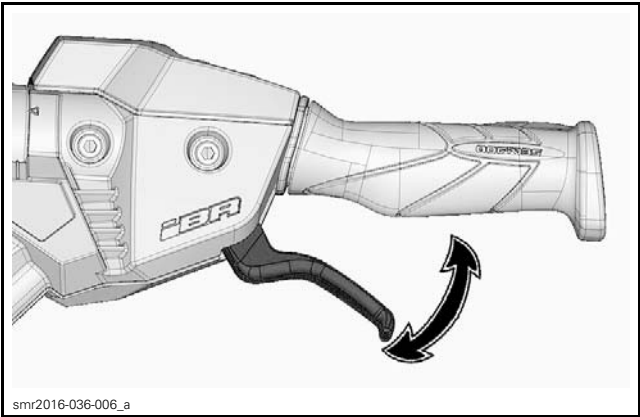
- 1. Protective guard (models without boarding platform)
- 2. Gate
- 3. Support plates
- 4. Gate bushings

The iBR (intelligent Brake and Reverse) is an electronically controlled braking and reverse system.

The iBR actuator 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.



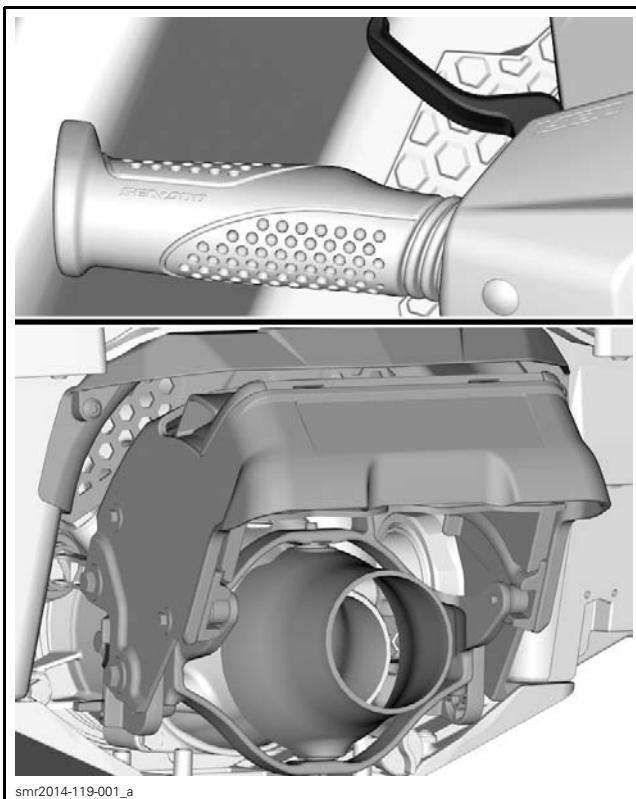
TYPICAL

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.

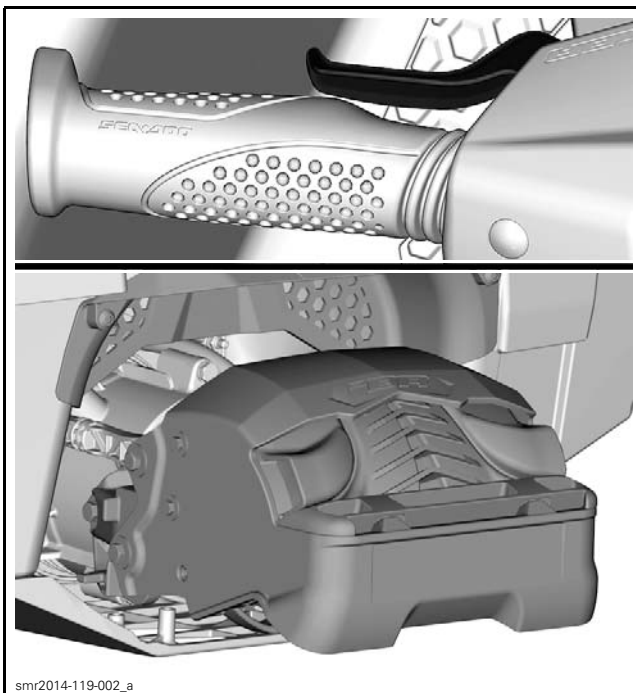
The BRLS sends the signals to the iBR module. The iBR module controls an electric motor that in turn raises or lowers the iBR gate through a mechanical drive unit.

Section 06 STEERING AND PROPULSION

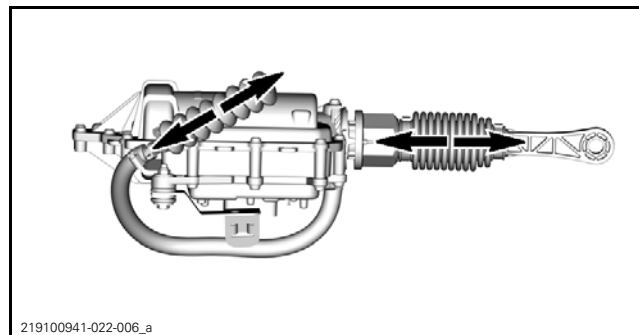
Subsection 04 (iBR, REVERSE AND VTS)



FORWARD



REVERSE



iBR ACTUATOR AIR CHAMBER MOVEMENT

The BRLS sends the signals to the iBR actuator. The iBR actuator controls an electric motor that in turn raises or lowers the iBR gate.

NOTE: The iBR gate will move when commanded by the iBR lever only if the engine is running. For maintenance purposes, use B.U.D.S. to move the gate to the desired position.

Depending on vehicle speed and how far the iBR lever is pulled in, the iBR actuator will automatically adjust the iBR gate movement speed and stroke. Engine RPM may also be modified.

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.

Every time the iBR gate moves when commanded by the iBR lever, engine RPM may be momentarily reduced as the gate moves.

⚠ WARNING

If it is necessary to remove any foreign object caught 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.

Section 06 STEERING AND PROPULSION

Subsection 04 (iBR, REVERSE AND VTS)

Activating iBR Override Function

All Models

The iBR gate can be moved using the BUDS2 software.

Models Without a VTS Switch

1. Install the tether cord.
2. Press the START/STOP button.

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 button on the information center (gauge).

Models with a VTS Switch

1. Install the tether cord.
2. Press the START/STOP button.

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. 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).

Reverse Mode

If the watercraft speed is below 8 km/h (5 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.
- 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 8 km/h (5 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 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 the 2 preset trim positions.

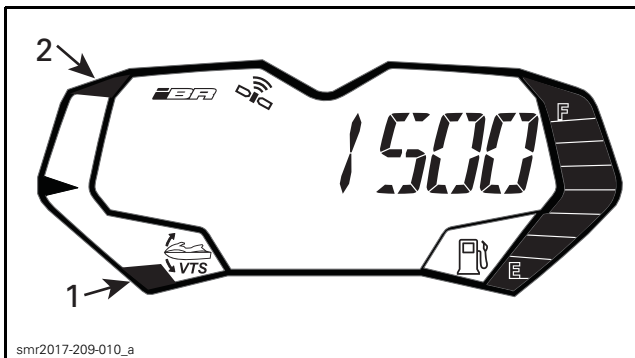
The VTS switch sends command signals to the gauge. The gauge converts them to CAN protocol and sends them through the CAN bus to the

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.



INFORMATION CENTER — VTS POSITION INDICATOR

1. Bow down
2. Bow up

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:

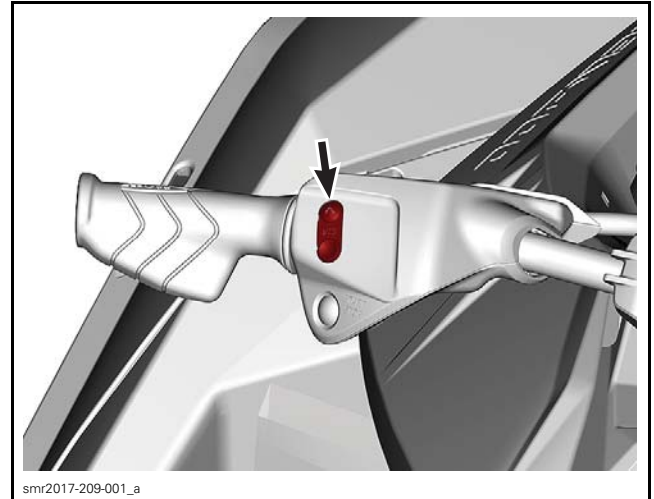
- Nozzle trimming
- Selection of 2 preset trim positions

Nozzle Trimming

Watercraft must be operating in forward position.

9 trim positions are available.

Press the UP or DOWN arrow button to change the VTS setting.



VTS CONTROL BUTTON

Using Preset Trim Positions

Two preset trim positions can be selected.

To select the **highest** preset trim position, double-click on the VTS UP arrow button (bow up).

To select the **lowest** preset trim position, double-click on the VTS DOWN arrow button (bow in the middle).

Lock/Unlock iBR Actuator

Locking the iBR Actuator

When working on or near the iBR, it may be required to lock the iBR to avoid accidental movement.

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

In BUDS2, go to:

- Functions page
- iBR button
- IO Controls tab
- Move iBR Up/Down

Follow the instructions displayed on the screen.

To unlock the iBR, do the same procedure.

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.

Section 06 STEERING AND PROPULSION

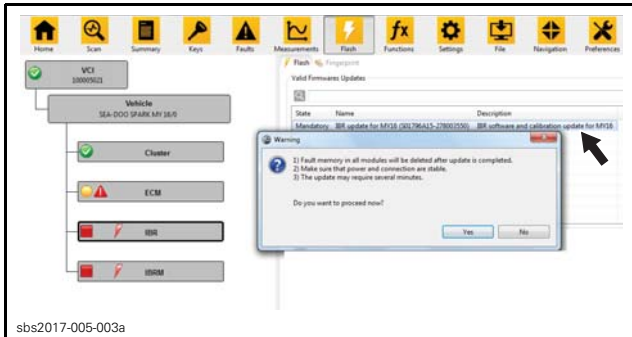
Subsection 04 (iBR, REVERSE AND VTS)

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

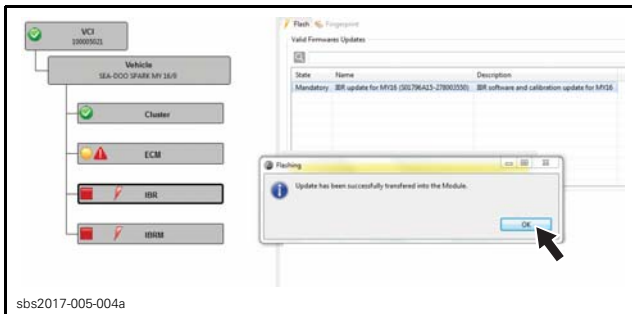
In BUDS2, go to:

- 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.

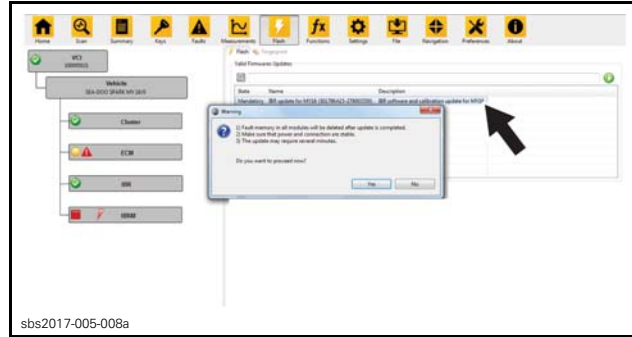
Perform after flashing the iBR.

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

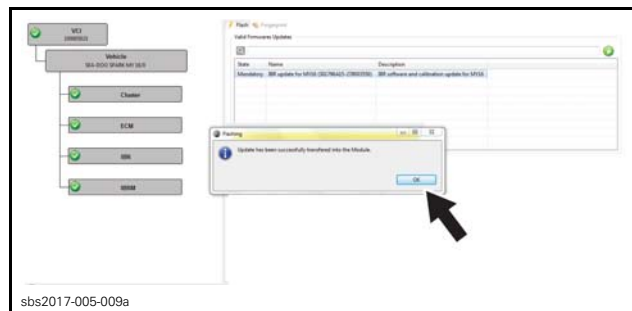
In BUDS2, go to:

- 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
- IO Controls tab
- Move iBR Up/Down

NOTICE Make sure the iBR actuator is unlocked before pressing the Auto Calibration button.

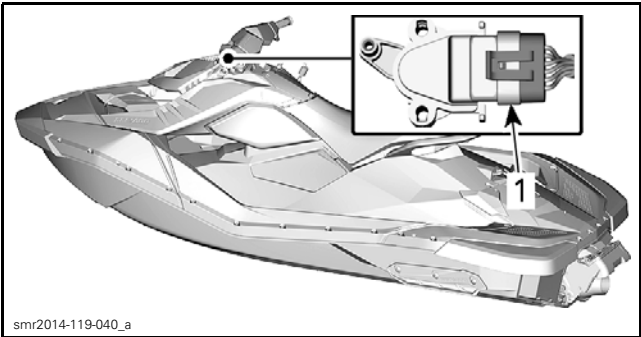
Follow the informations displayed on the screen so start the *AUTO-CALIBRATION* sequence.

MAINTENANCE

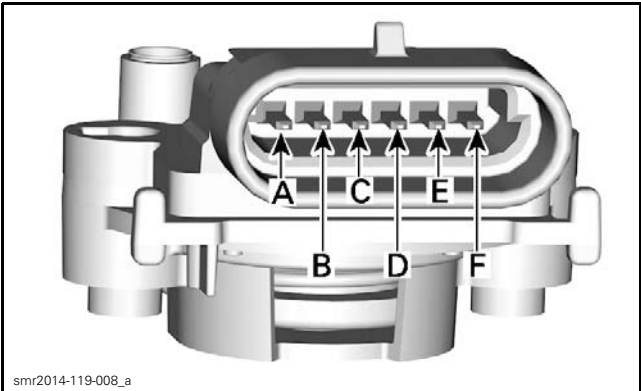
Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection of the appropriate shop manual.

PROCEDURES

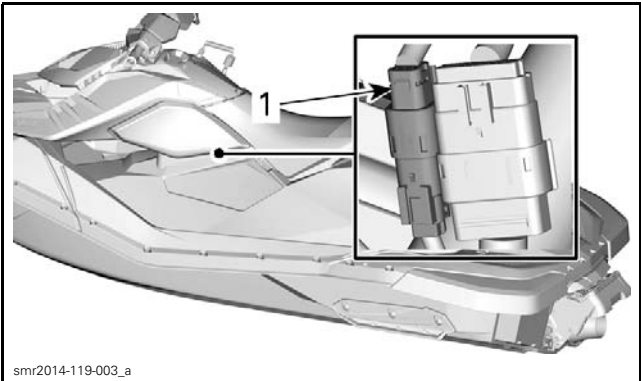
**SWITCHES LOCATION AND
PIN-OUT**



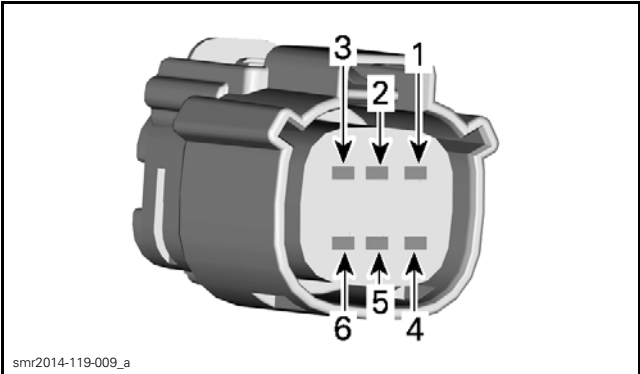
1. BRLS



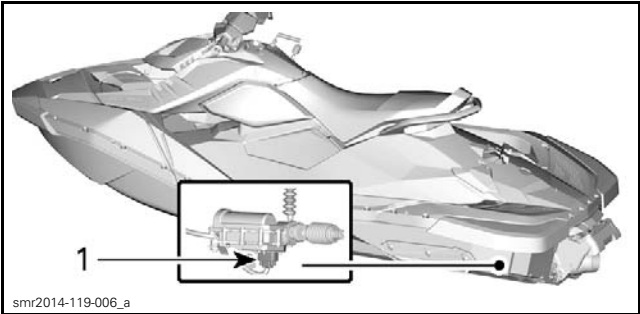
BRLS PINOUT



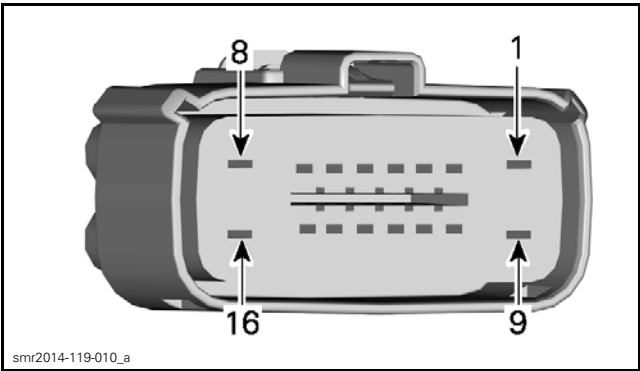
1. Steering 6 pos. connector



STEERING 6 POS. CONNECTOR



1. iBR actuator connector



iBR ACTUATOR CONNECTOR

iBR ACTUATOR
Specifications

iBR REFERENCE TABLE	
PIN	SIGNAL
iBR-1	Battery voltage (Hot at all times)
iBR2	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

Section 06 STEERING AND PROPULSION

Subsection 04 (iBR, REVERSE AND VTS)

Testing iBR Actuator Operation

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. In BUDS2, go to:
 - **Functions** page
 - **iBR** button
 - **IO Controls** 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 in fuse box. If fuse(s) are good, check power and ground circuits.

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 BUDS2.

Remove debris, replace iBR gate components, or replace the iBR actuator as applicable.

Removing the iBR Actuator

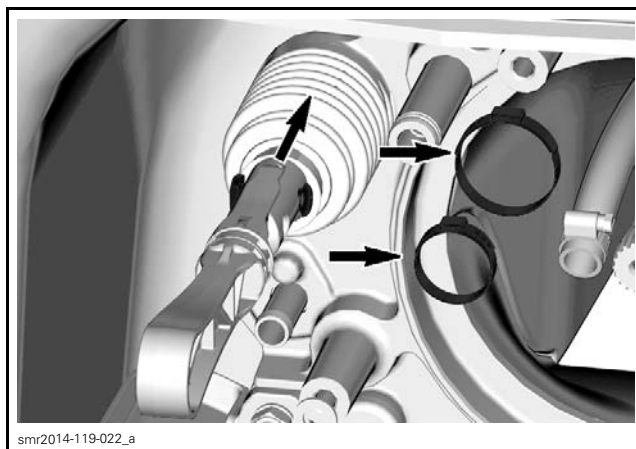
1. Remove iBR gate. Refer to *iBR GATE* in this subsection.

2. Remove jet pump assembly. Refer to *JET PUMP* subsection.

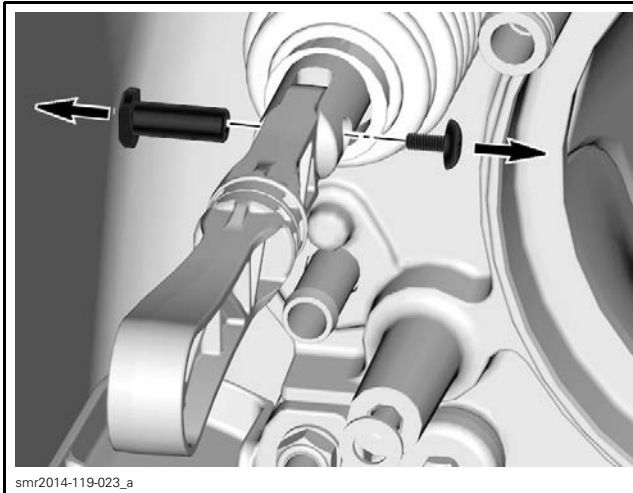
Temporarily fasten the ENGINE ALIGNMENT PLATE (P/N 529 036 278) to pump support to support drive shaft and avoid PTO oil seal damage.



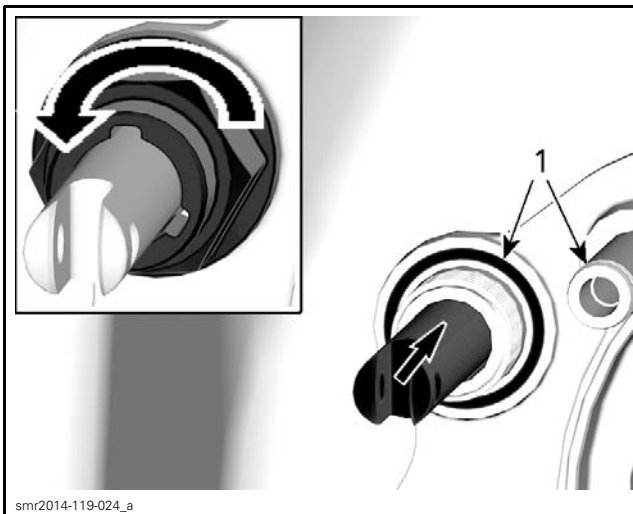
3. Remove Oetiker clamps.



4. Remove connecting arm, sleeve and screw.



5. Remove iBR nut. Use IBR NUT SOCKET (P/N 529 036 305).
6. Push iBR actuator into hull and remove.

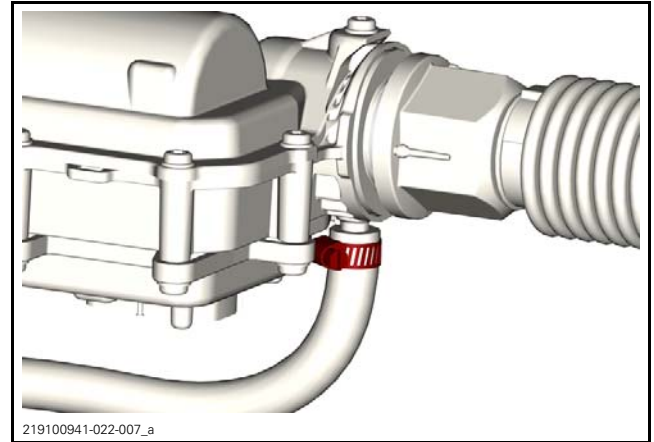


1. Inspect O-rings

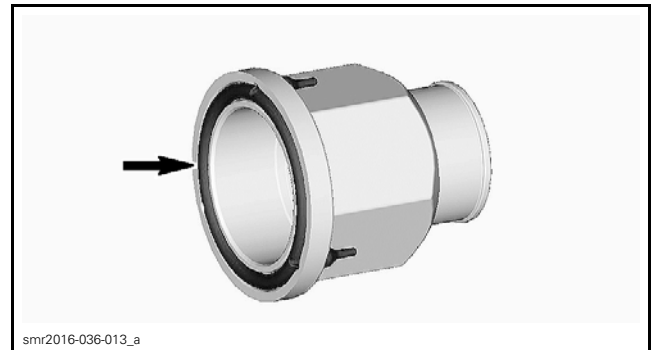
Installing the Actuator

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 (P/N 293 800 066) on actuator, between actuator housing and threads, as shown in the exploded view.

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 strap.
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.

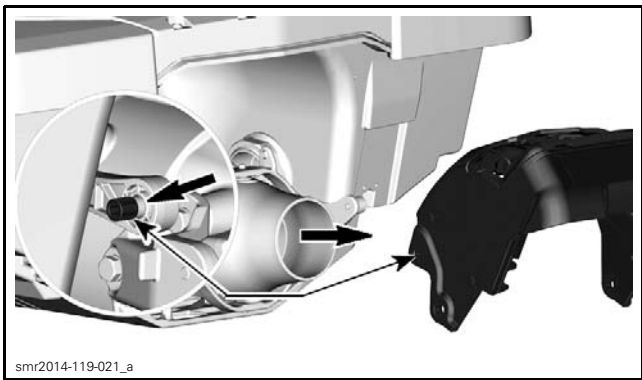
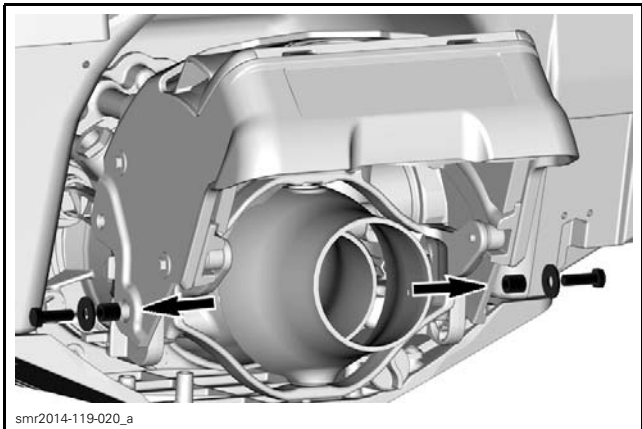
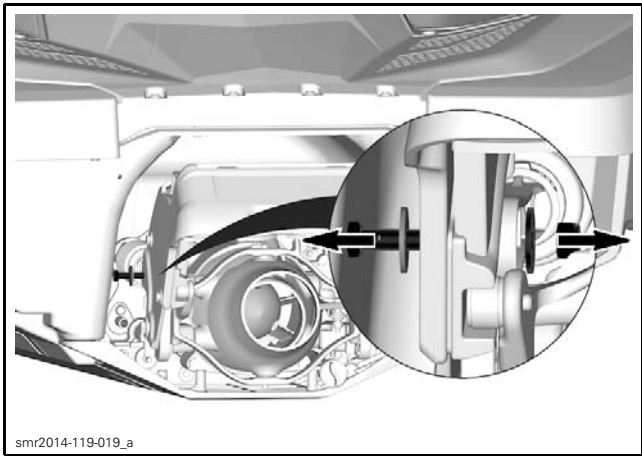
Perform *iBR FLASHING* and *iBR AUTO-CALIBRATION* procedures.

iBR GATE

Removing the Gate

Remove iBR protective guard.

NOTE: iBR gate raised for illustration purposes. Gate should be at neutral position.



Installing the Gate

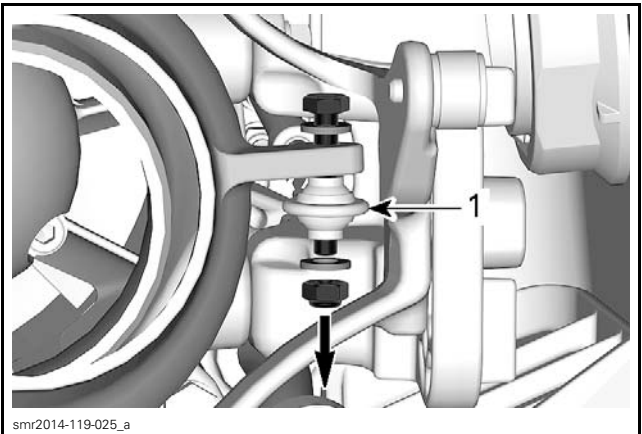
The installation procedure is the reverse of the removal procedure. However, pay attention to the following. Apply proper torque and service products as applicable in exploded view(s) at the beginning of this subsection.

iBR GATE SUPPORT

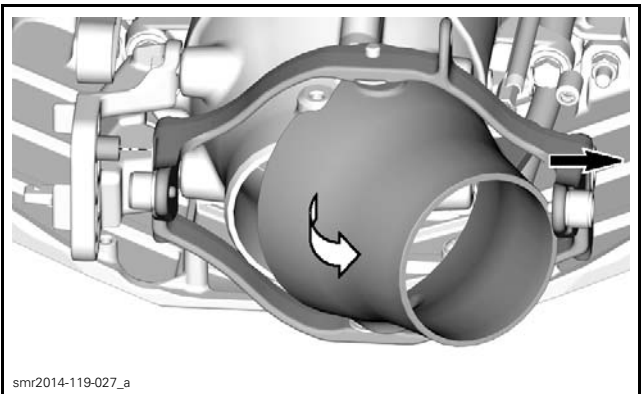
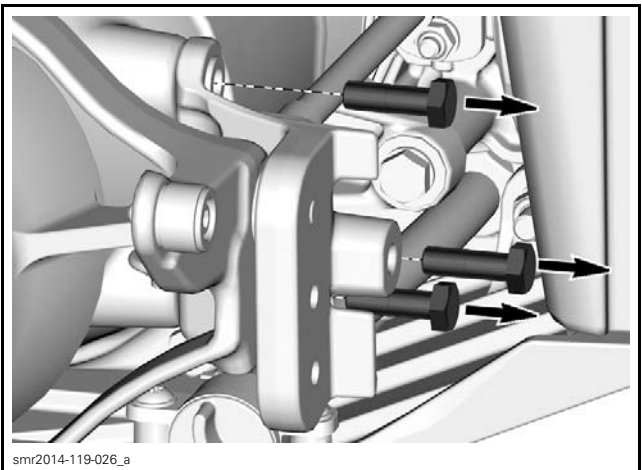
Removing the Gate Support

Jet pump nozzle is removed with iBR gate support.

NOTE: iBR gate raised for illustration purposes. Gate should be at neutral position.



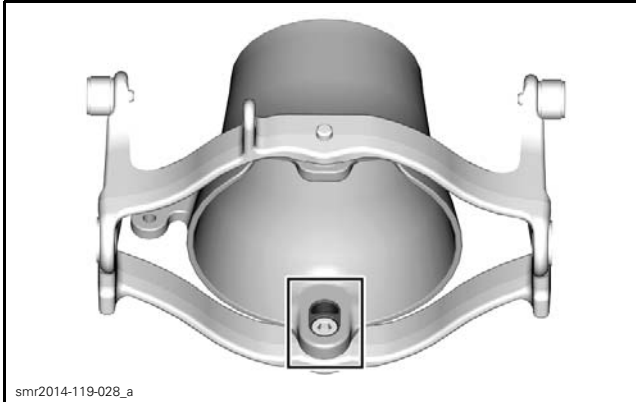
1. Steering cable



Installing the Gate Support

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

The nozzle on the models with iBR is mounted with the lower bushing, as illustrated.



TIGHTENING TORQUE	
M8 nozzle retaining screws	22 N•m ± 2 N•m (16 lbf•ft ± 1 lbf•ft)

BRAKE AND REVERSE LEVER SWITCH (BRLS)

Testing and Specifications

BRLS REFERENCE TABLE	
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

Connect the vehicle to the BRP diagnostic software (BUDS2). In BUDS2, go to: - Measurements page - iBR button - iBR - Basic tab

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

In BUDS2, go to:

- **Measurements** page
- **iBR** button
- **iBR - Basic** tab

When moving BRLS lever, the BRLS percentage in BUDS2 should increase or decrease in a steady linear fashion.

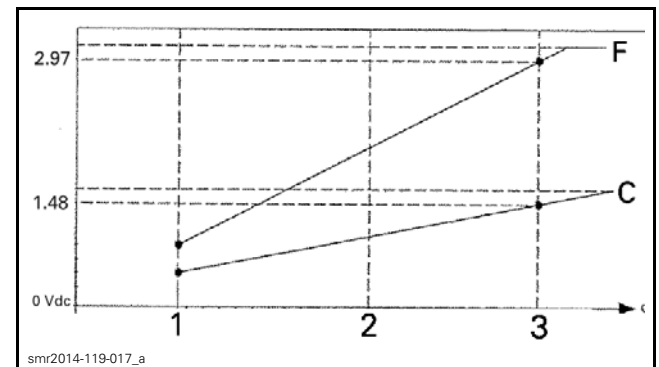
If BUDS2 does not show BRLS percentage moving or if reading is erratic:

- Check for BRLS reference voltage.
- Check for BRLS ground.
- Carry out a continuity test of the wiring between the iBR actuator and the BRLS.

Refer to *WIRING DIAGRAM*.

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.

Test with DIAGNOSTIC HARNESS (P/N 529 036 384)

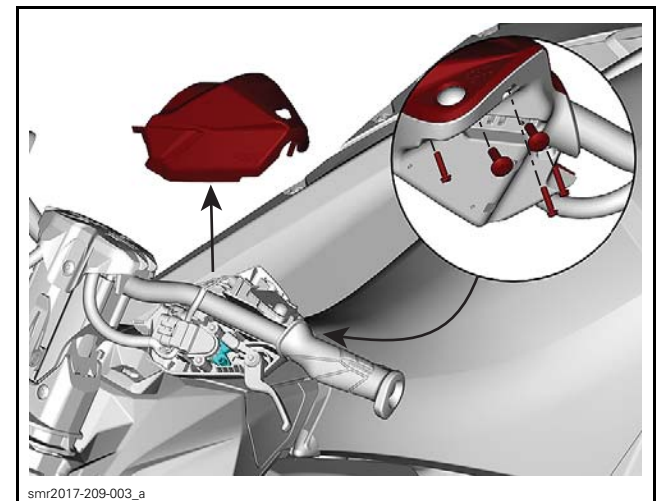


APPROXIMATE BRLS SIGNAL VOLTAGE CURVE PINS F AND C

1. BRLS released
2. BRLS at 50% pulled
3. BRLS fully pulled

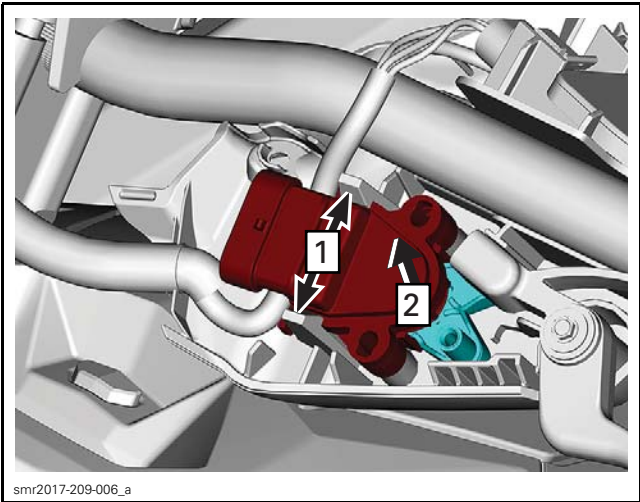
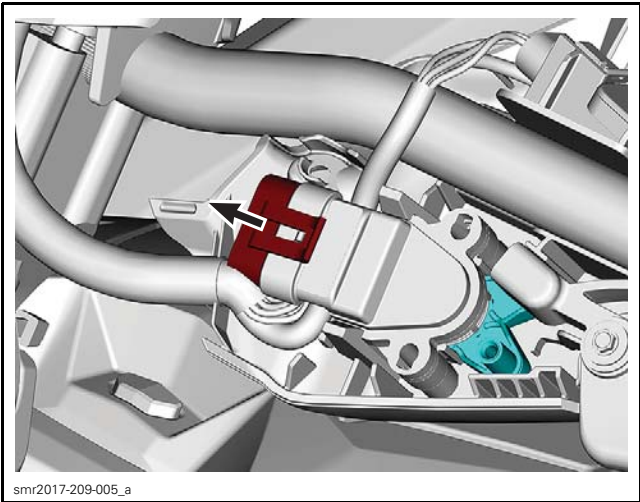
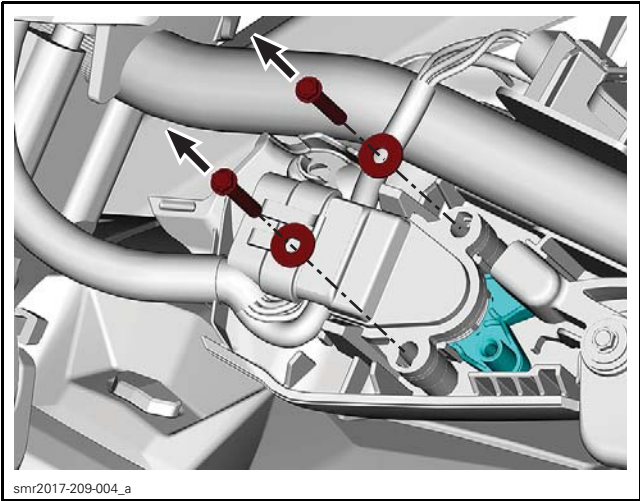
Removing the BRLS

Follow image sequence.



Section 06 STEERING AND PROPULSION

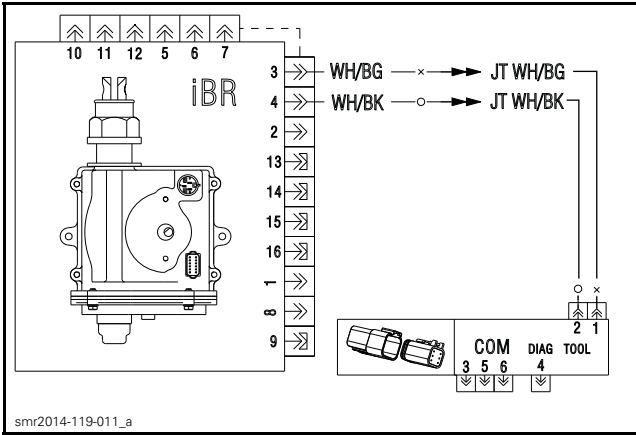
Subsection 04 (iBR, REVERSE AND VTS)



TIGHTENING TORQUE	
K40 x 16 hexagonal screws (3x)	1.5 N•m ± 0.2 N•m (13 lbf•in ± 2 lbf•in)
M6 x 16 Torx screws (2x)	2 N•m ± 1 N•m (18 lbf•in ± 9 lbf•in)

CAN COMMUNICATION TEST

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.

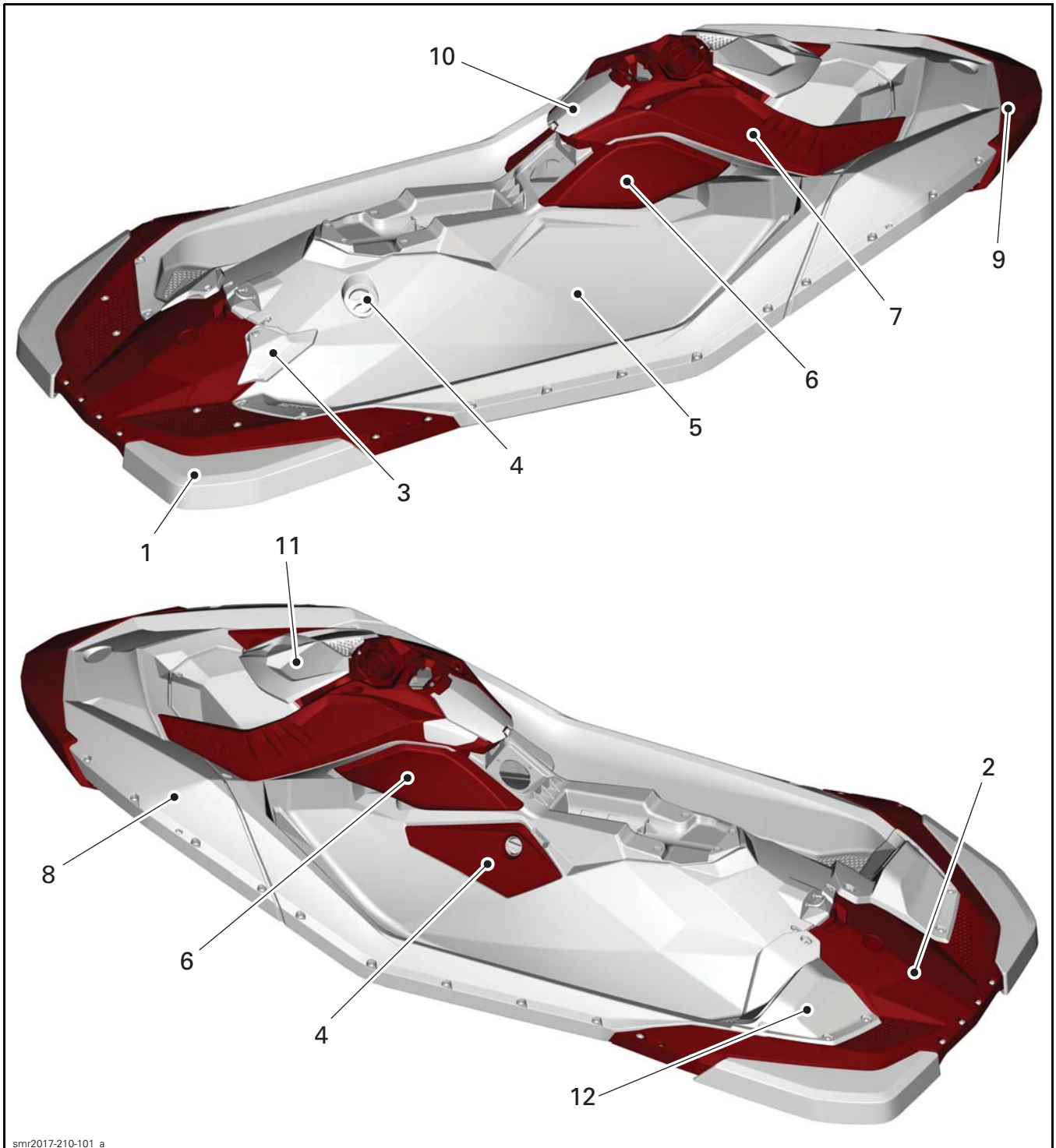
Installing the BRLS

The installation is the reverse of the removal procedure.

**REFER TO
DRIVE SHAFT - 900 ACE**

BODY

Body (Parts Nomenclature)



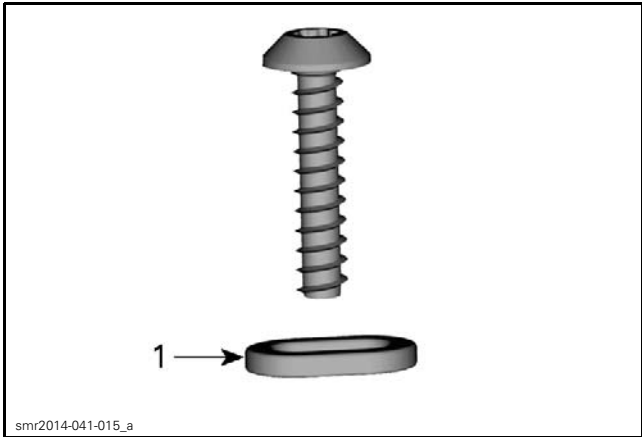
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- 1. Rear bumper
- 2. Rear body
- 3. Rear panel trim
- 4. Access cover
- 5. Central body
- 6. Knee pad

- 7. Console
- 8. Front body
- 9. Front bumper
- 10. Glove box cover
- 11. Front trim
- 12. Footrest (Trixx Model)

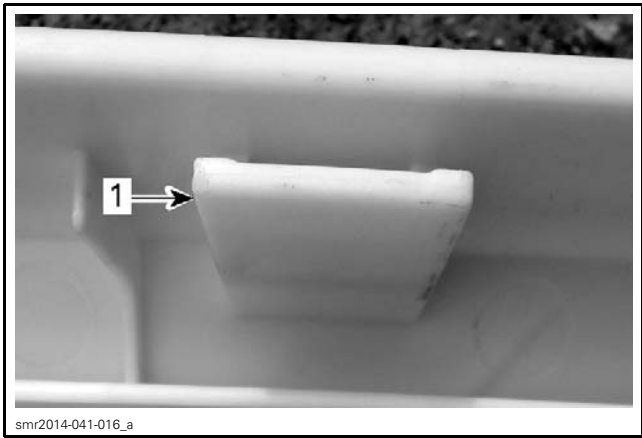
PROCEDURES

Inspect all oblong washers when removing body panels and assemblies. Any damage to an oblong washer requires it to be replaced.



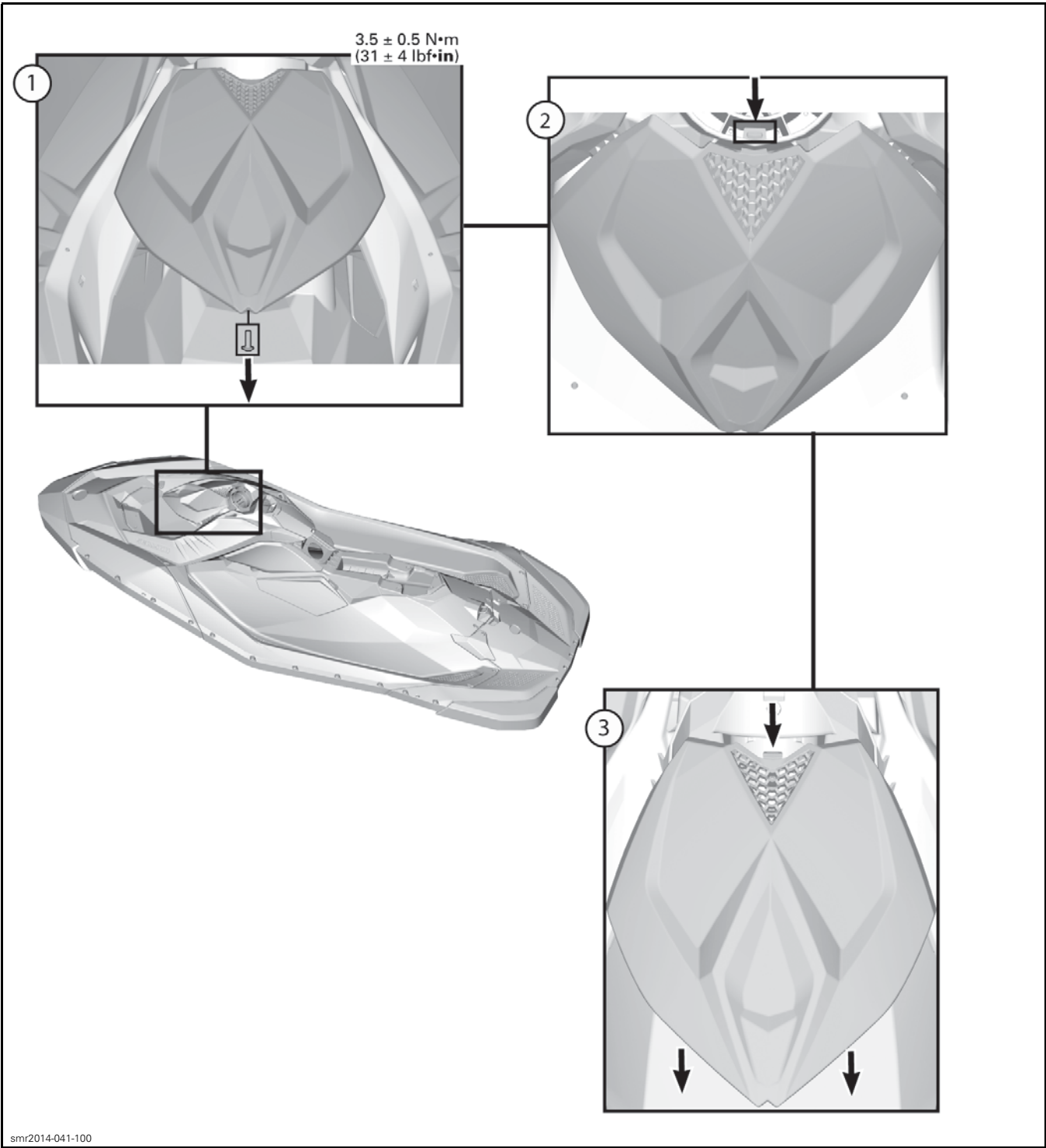
TYPICAL SELF TAPPING BODY SCREW
1. Oblong washer

Body panels are held in place on the hull by alignment tabs on the body panels. Always ensure that alignment tabs are properly inserted into grooves in hull.



TYPICAL
1. Alignment tab

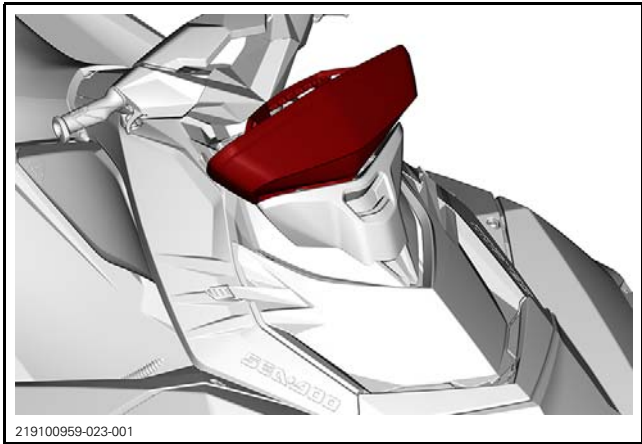
FRONT TRIM (WITHOUT AUDIO SYSTEM)



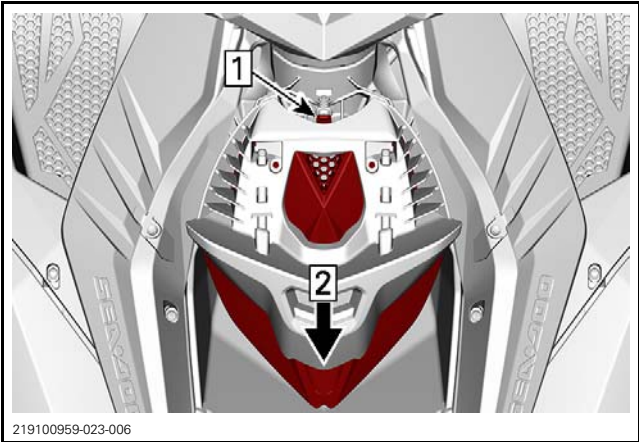
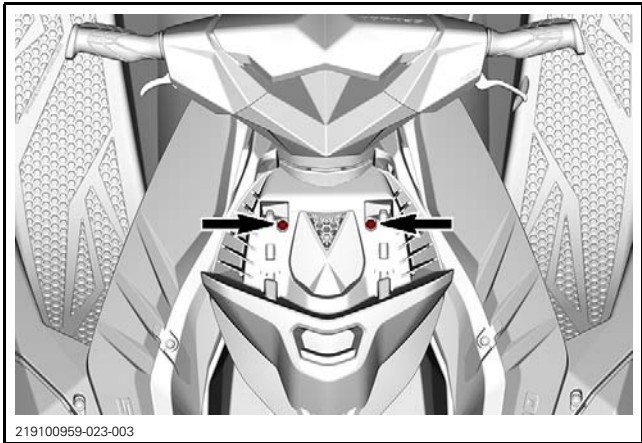
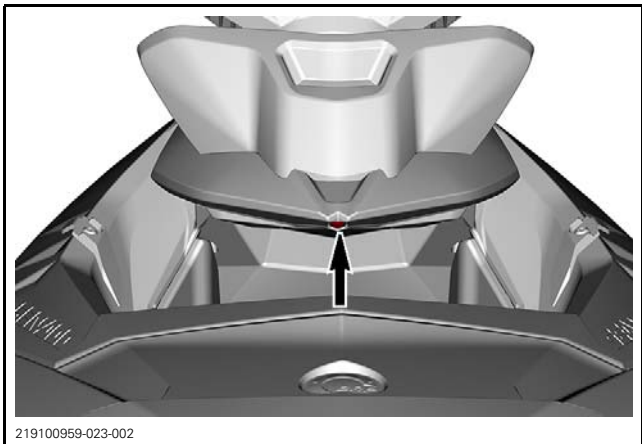
Section 07 BODY AND HULL
Subsection 01 (BODY)

FRONT TRIM (WITH AUDIO SYSTEM)

Remove audio system.



Remove the following fasteners.

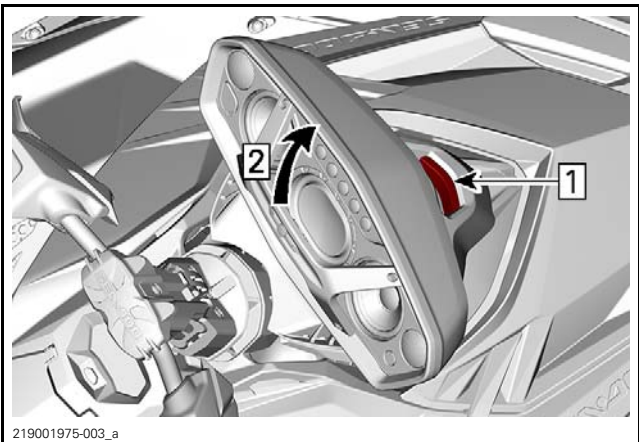


Step 1: Push tab
Step 2: Slide support toward the front

AUDIO SYSTEM

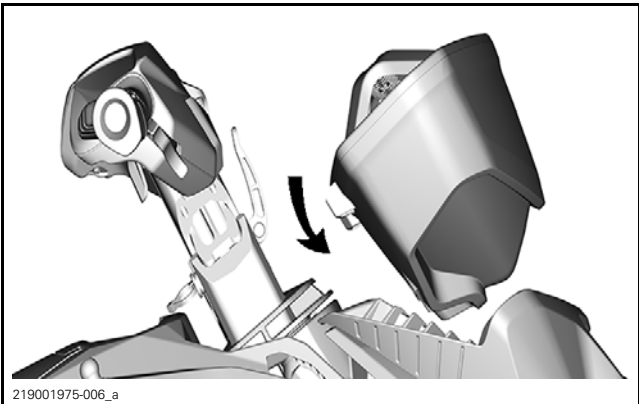
To remove the audio system;

1. Push button
2. Lift handle



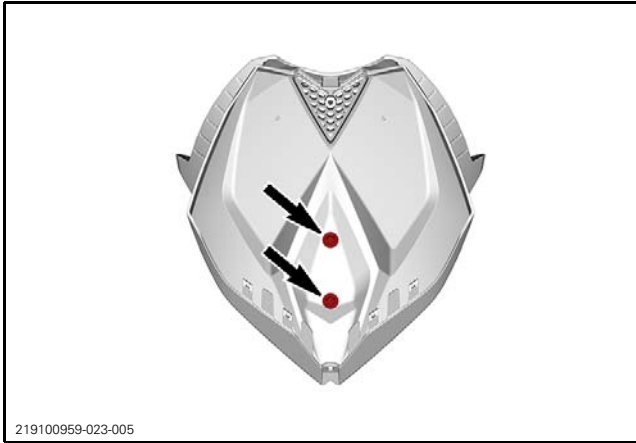
Step 1: Push button
Step 2: Lift handle

To install, make sure the front locking tabs are properly engaged before lowering.



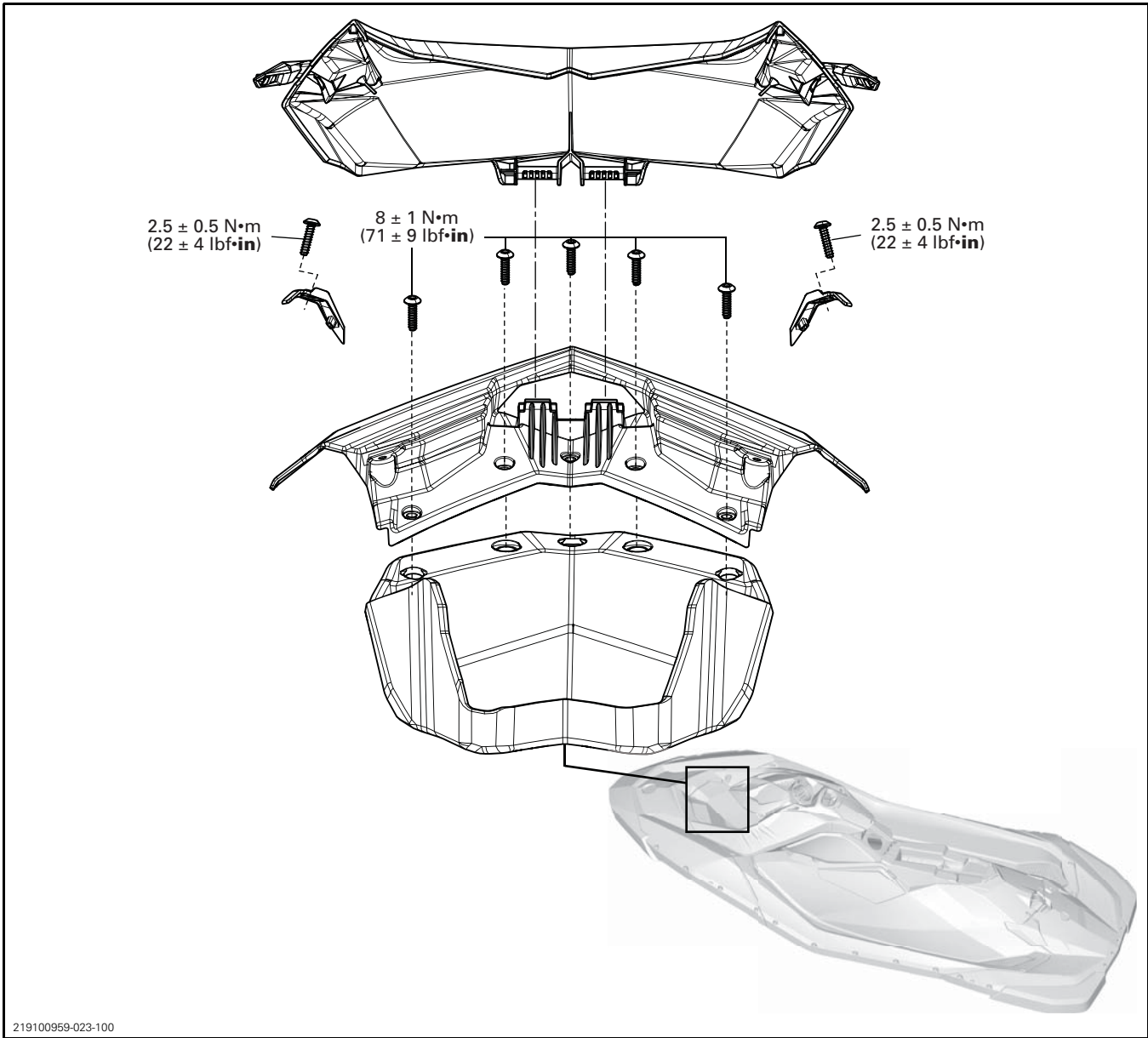
To remove the audio system support, remove the front trim. Refer to *FRONT TRIM*.

Remove the following fasteners.



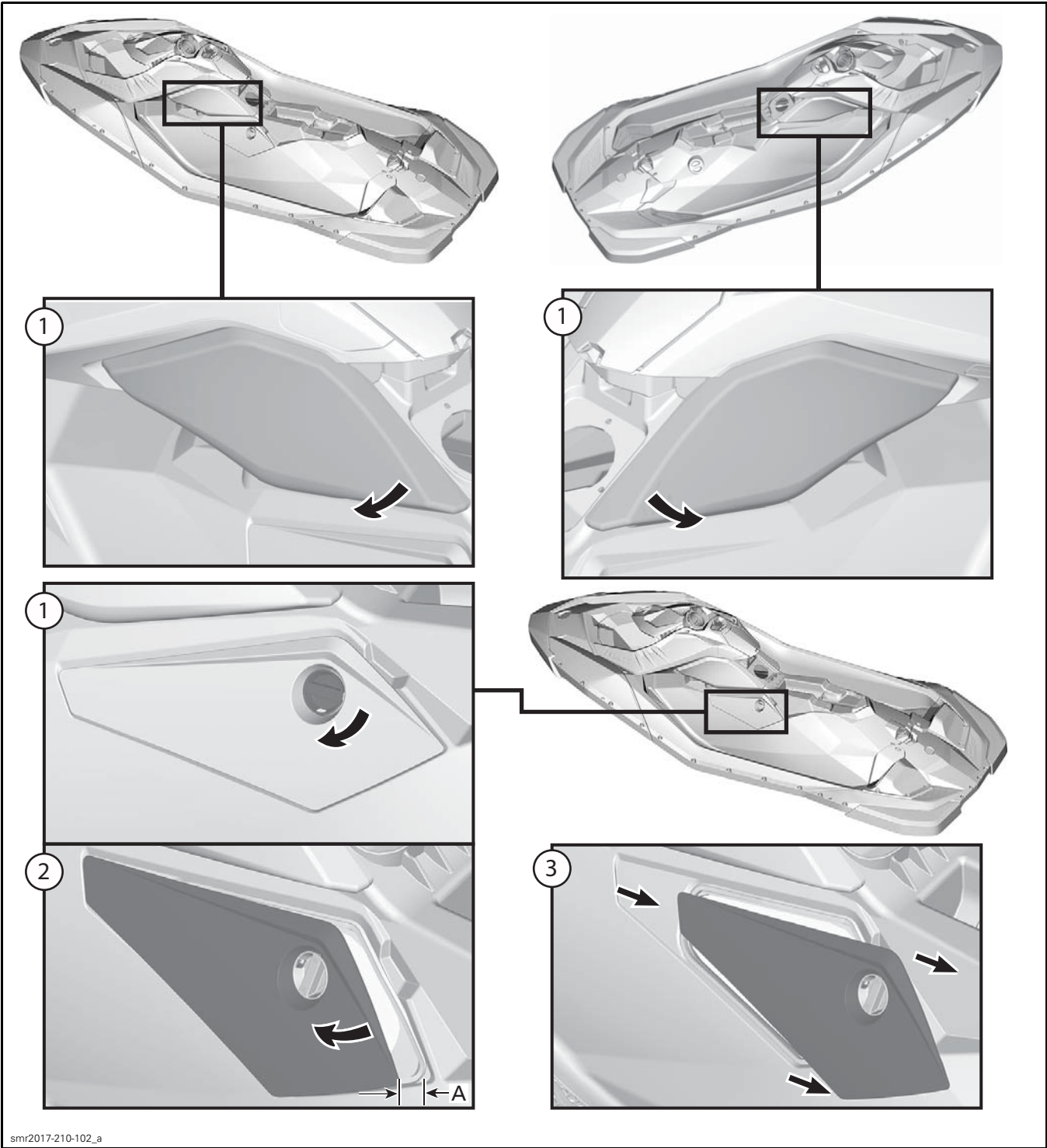
STORAGE BIN

Convenience models



219100959-023-100

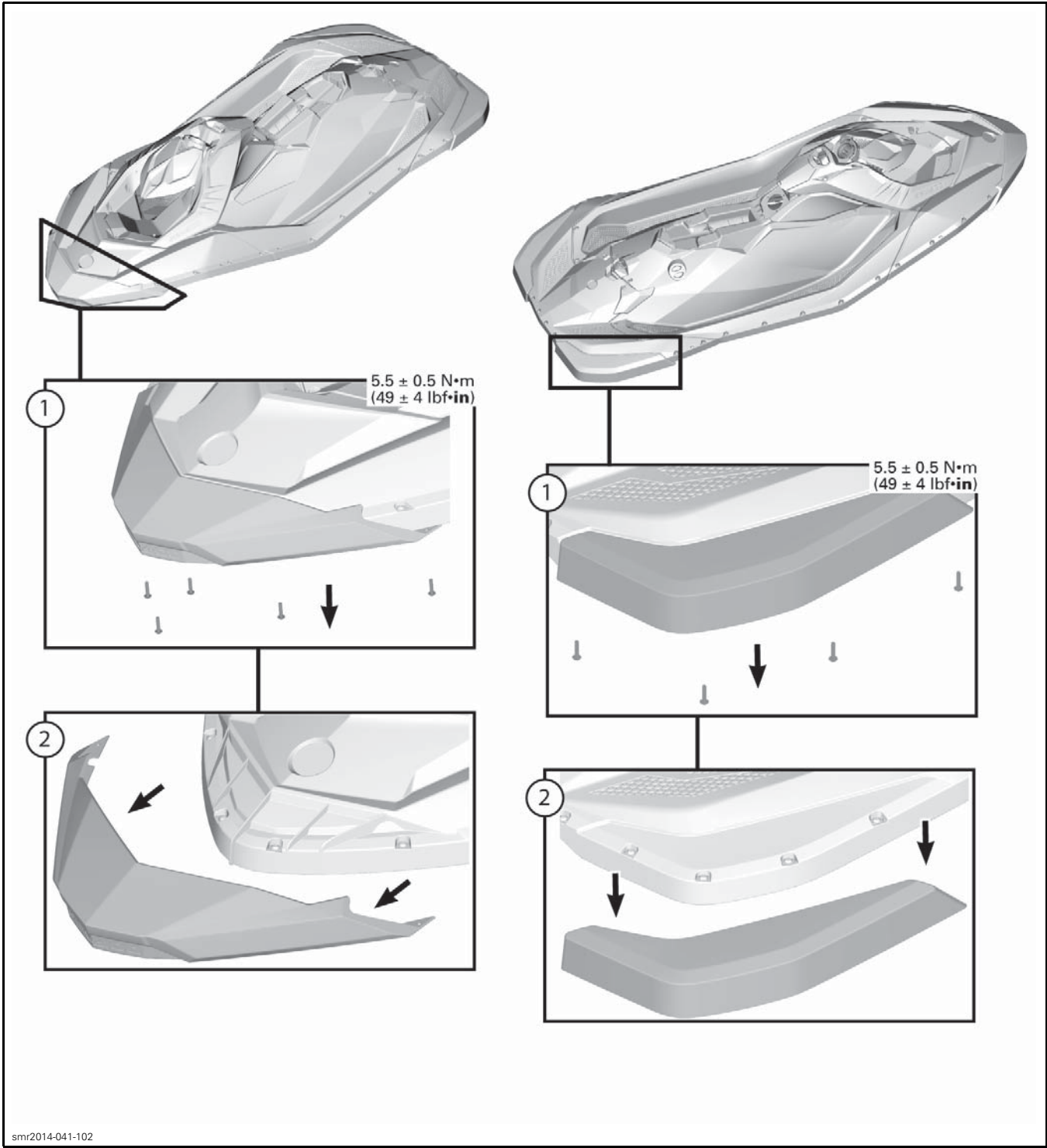
KNEE PADS AND LH SIDE ACCESS COVER



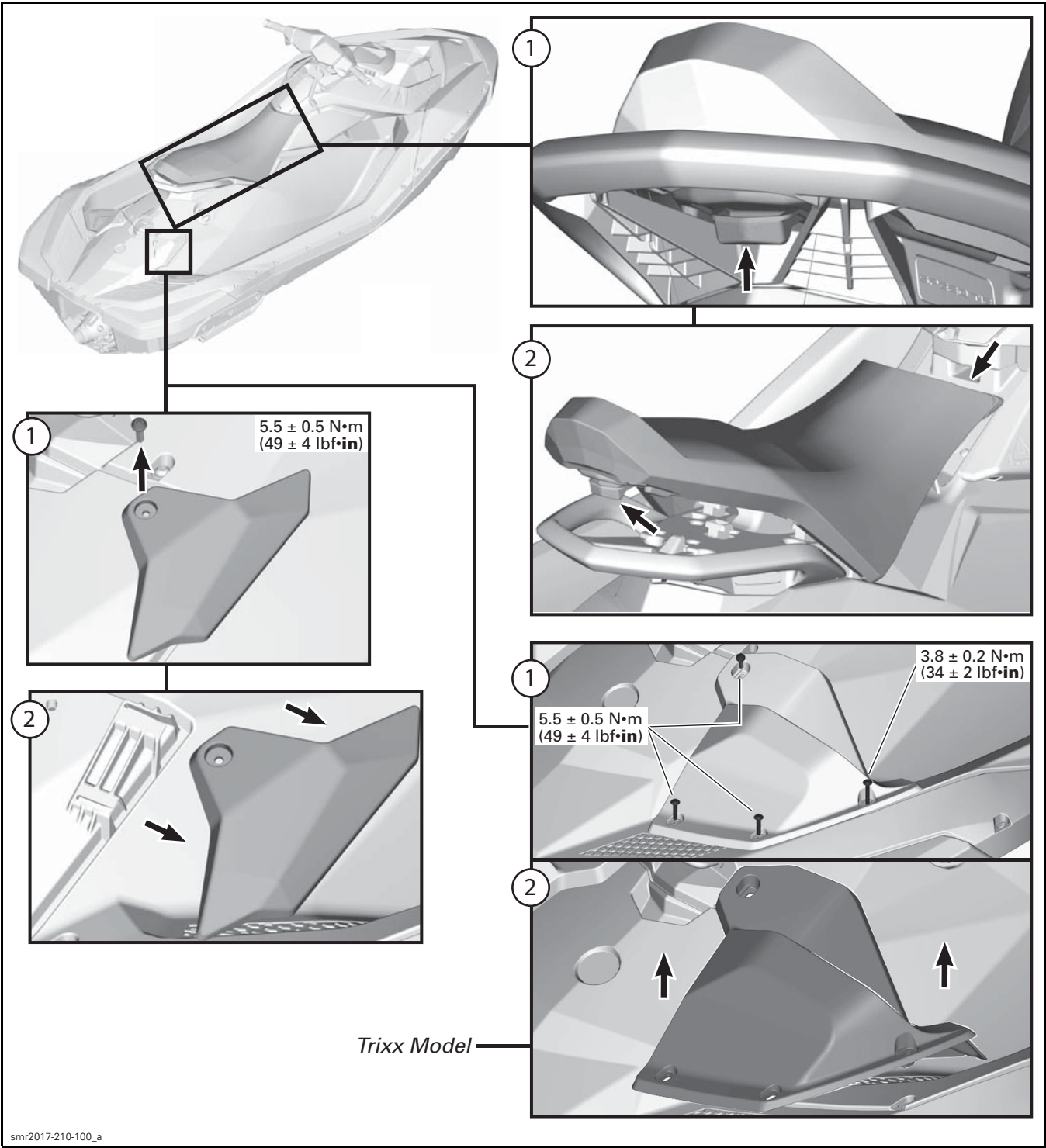
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A. Maximum opening 10 mm (.4 in)

FRONT AND REAR BUMPERS



REAR PANEL TRIM AND SEAT



Section 07 BODY AND HULL

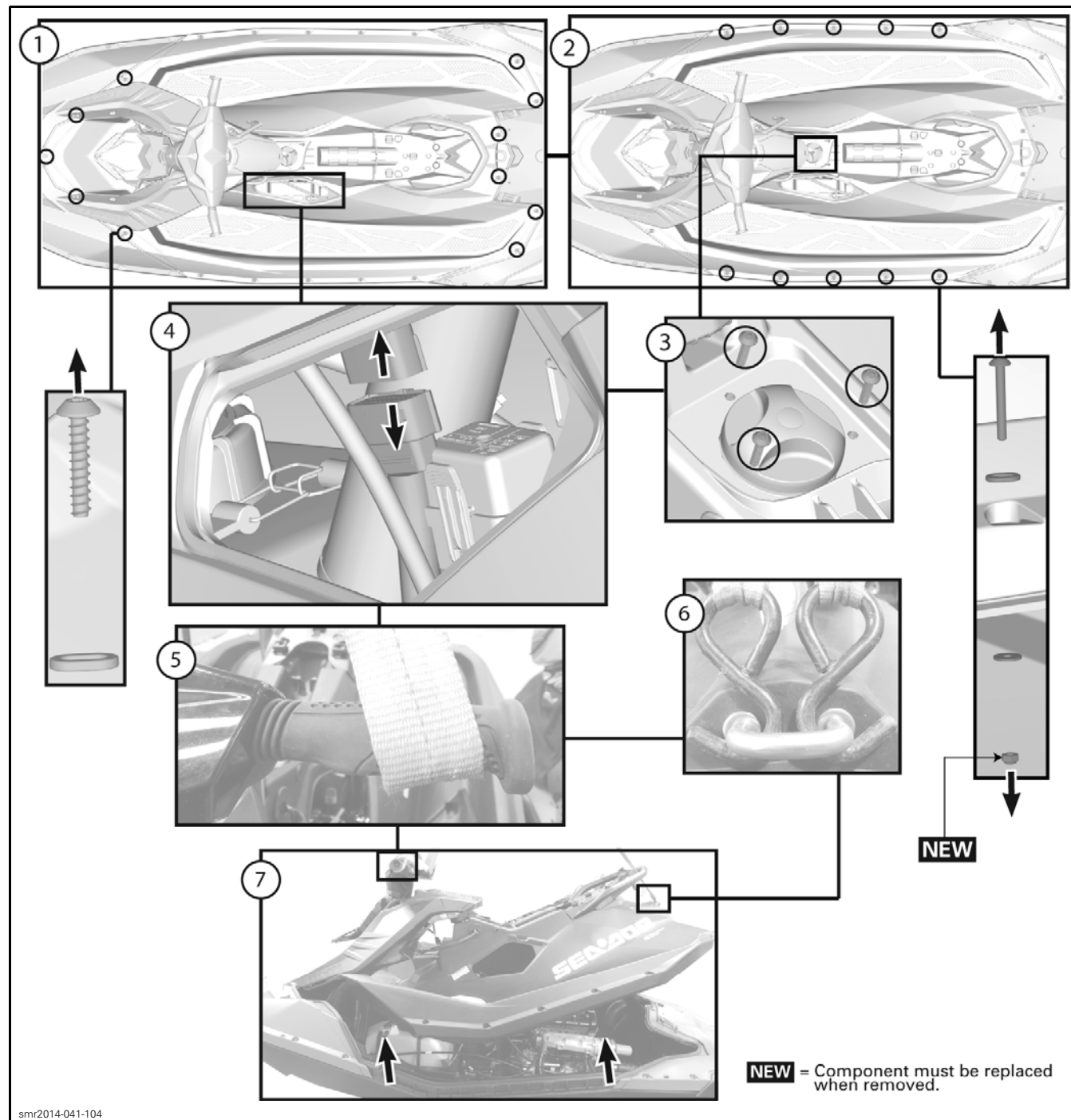
Subsection 01 (BODY)

CENTRAL BODY

Removing the Central Body

Follow the image sequence:

1. Disconnect steering cable from central body. Refer to *STEERING AND OTAS SYSTEMS*.
2. Remove rear panel trims.

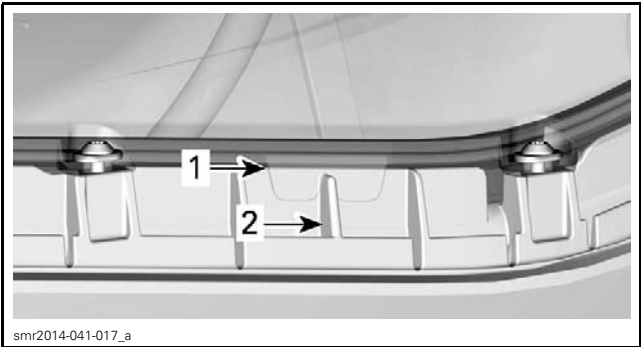


smr2014-041-104

New = Component must be replaced when removed

Installing the Central Body

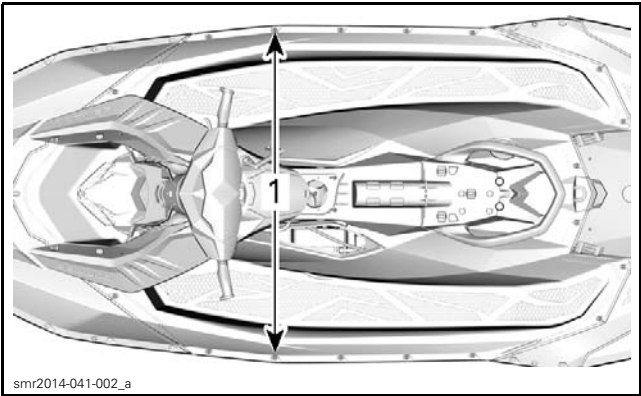
1. Properly place central body alignment tabs on hull.



CENTRAL BODY - STARBOARD SIDE VIEW

1. Alignment tab on central body
2. Groove in hull

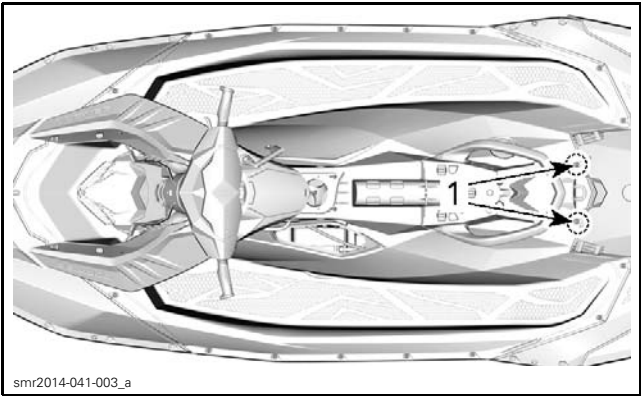
2. Install screws adjacent to alignment tabs first to ensure alignment tabs remain properly engaged.



CENTRAL BODY INSTALLATION

1. Screws adjacent to alignment tabs

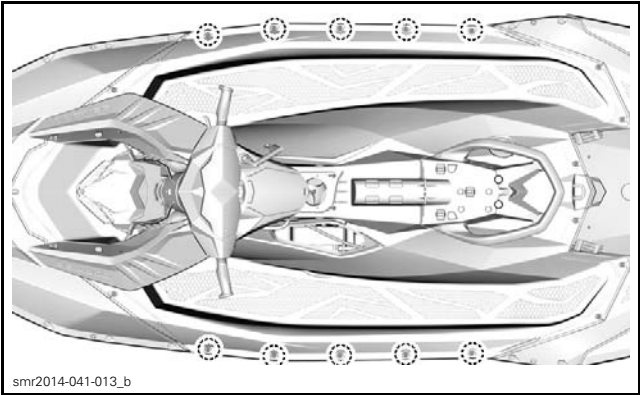
3. Install screws on rear support.



CENTRAL BODY INSTALLATION

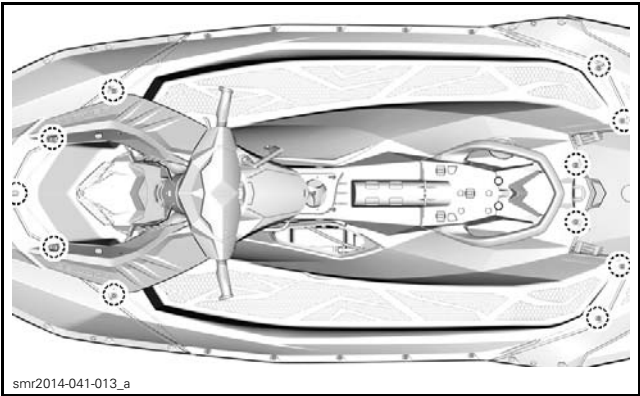
1. Screws on rear support

4. Tighten screws as per following illustrations.



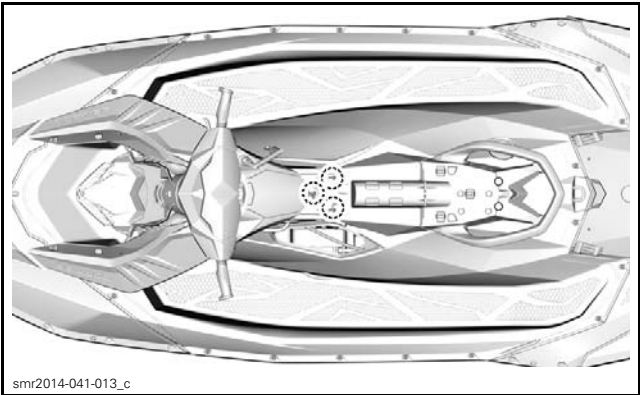
TIGHTENING TORQUE

M6 shoulder screws	$3.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$ (31 lbf•in \pm 4 lbf•in)
--------------------	---



TIGHTENING TORQUE

M6.81 self tapping screw	$5.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$ (49 lbf•in \pm 4 lbf•in)
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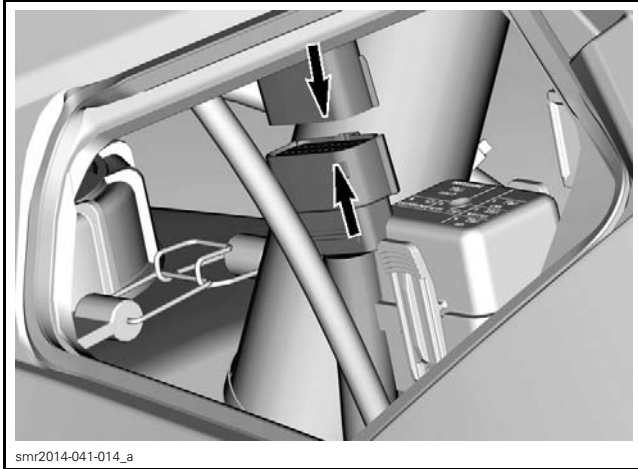


TIGHTENING TORQUE

M6.81 self tapping screw	$5.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$ (49 lbf•in \pm 4 lbf•in)
--------------------------	---

Section 07 BODY AND HULL

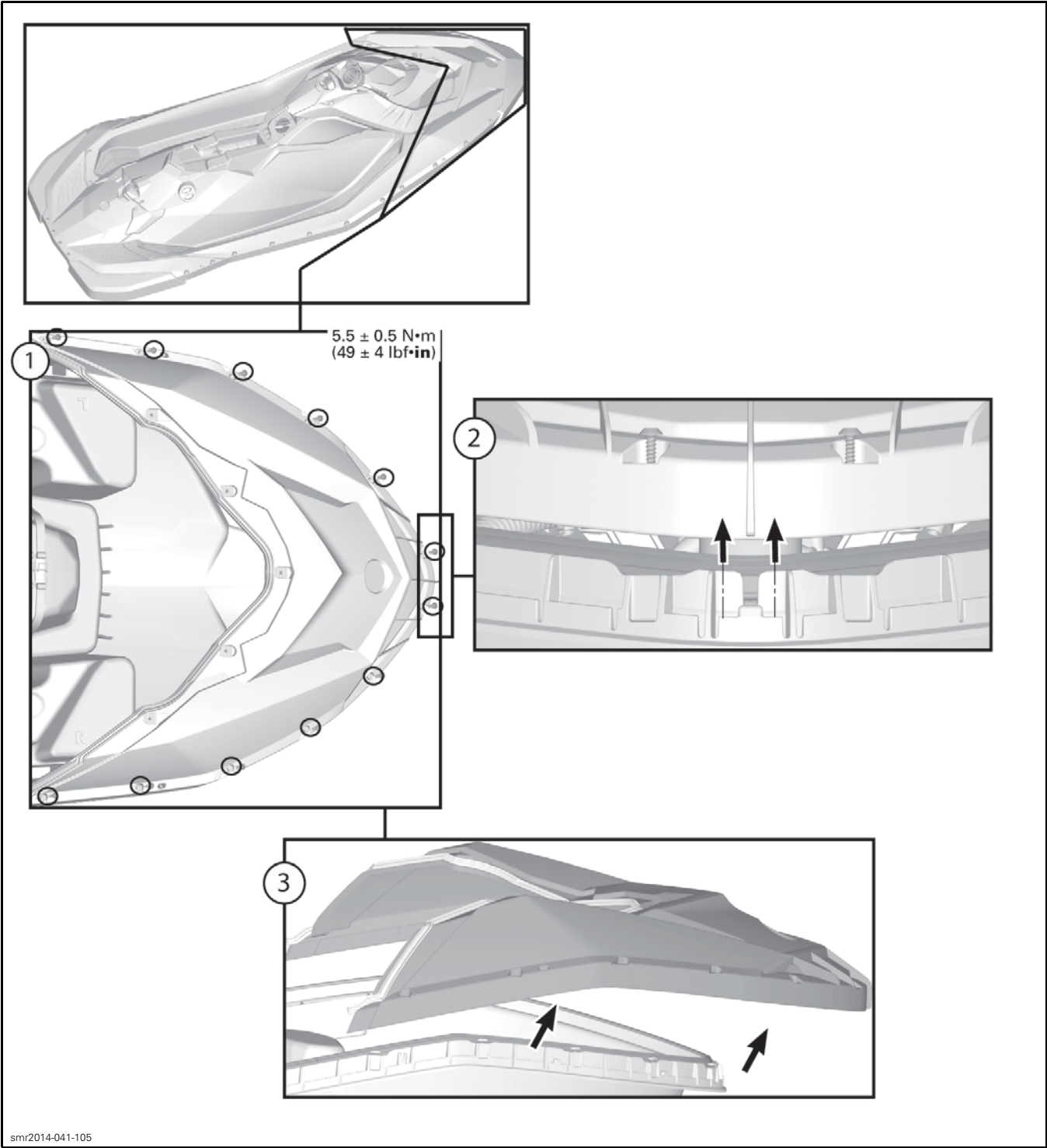
Subsection 01 (BODY)



5. Connect steering cable to central body. Refer to *STEERING AND OTAS SYSTEMS*.
6. Install rear panel trims.

FRONT BODY

Remove central body.



Section 07 BODY AND HULL

Subsection 01 (BODY)

REAR BODY

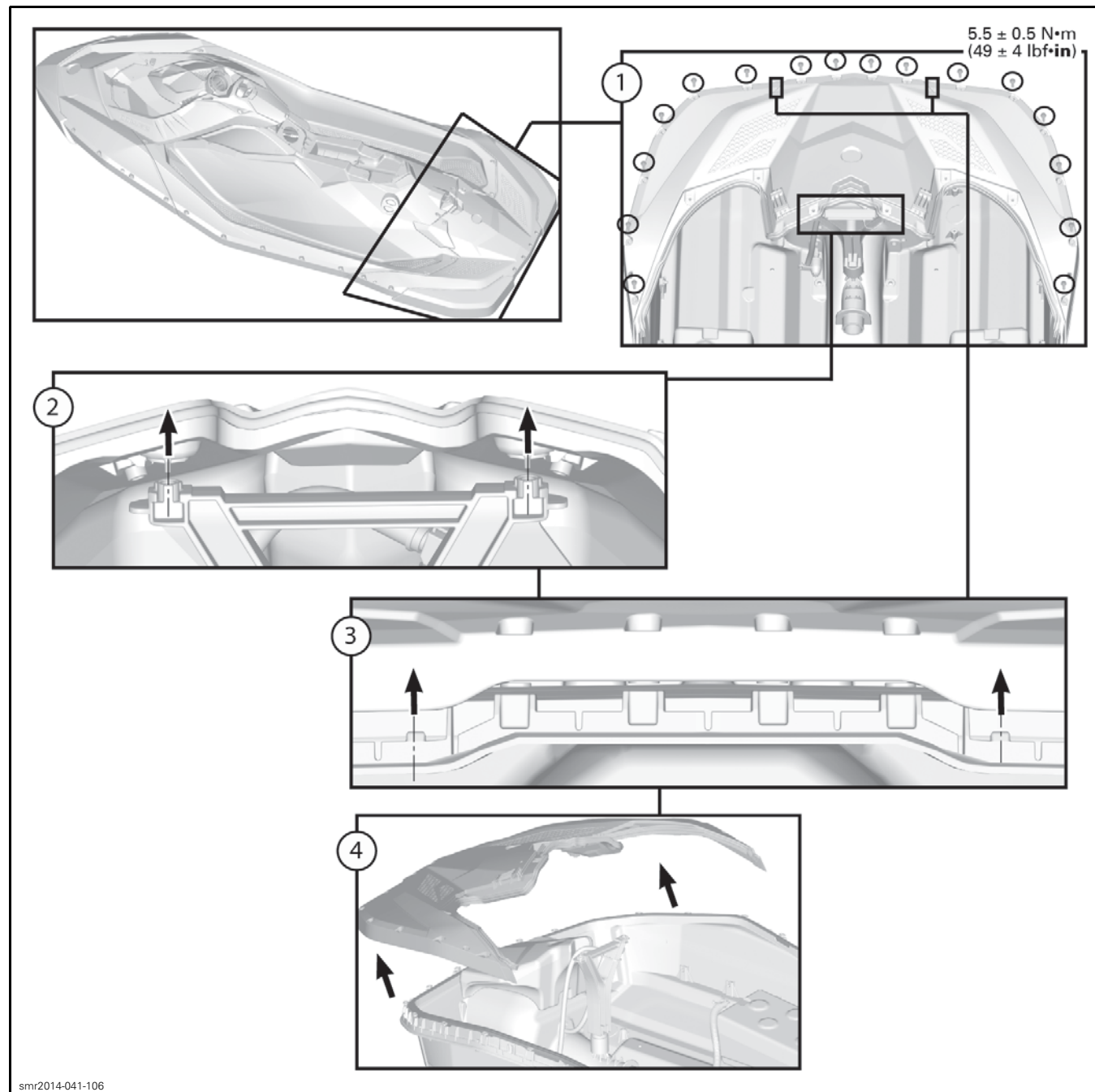
Remove central body.

2UP Models

Remove rear bumpers.

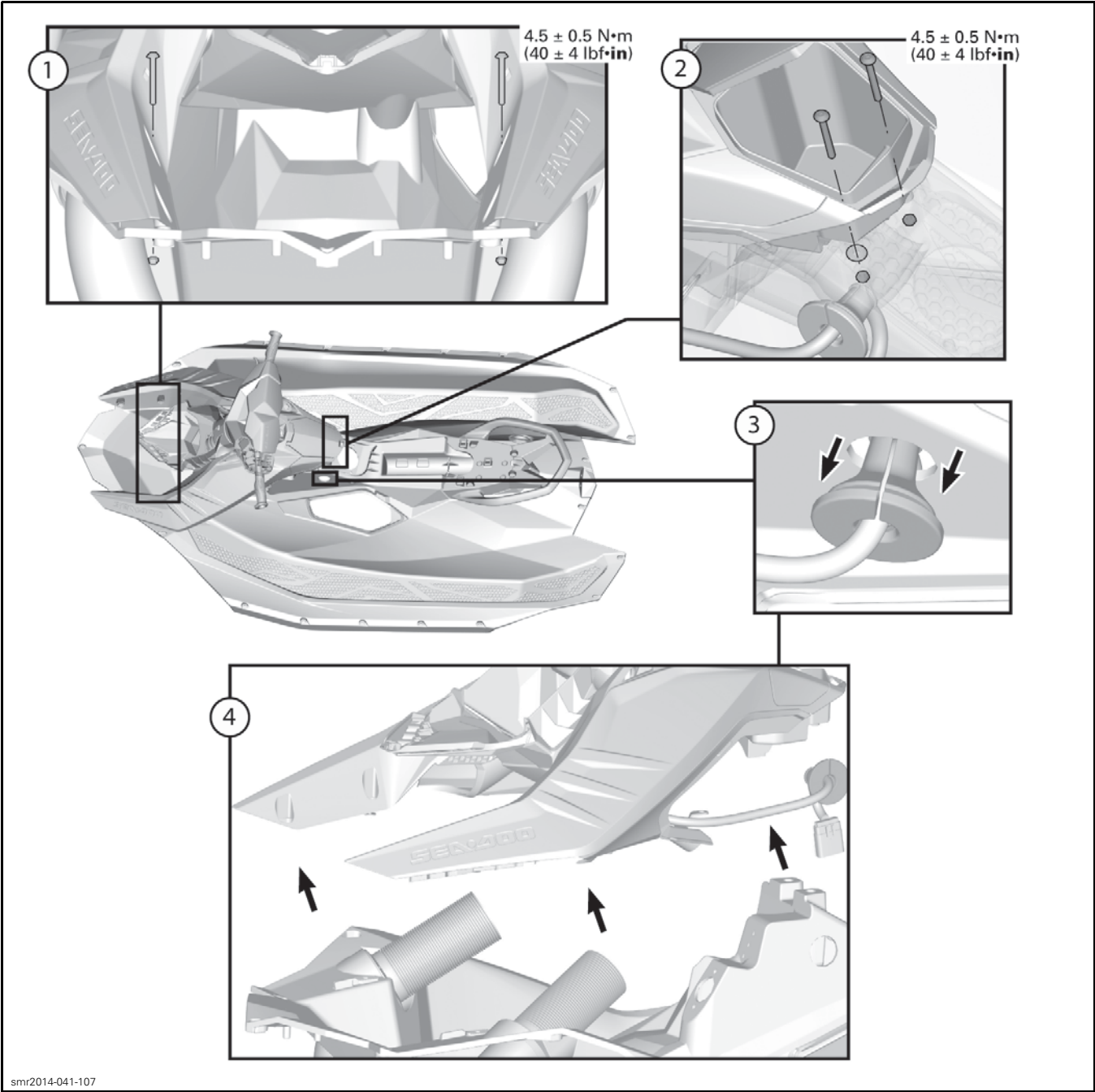
3UP Models

Remove boarding platform. Refer to *HULL*.

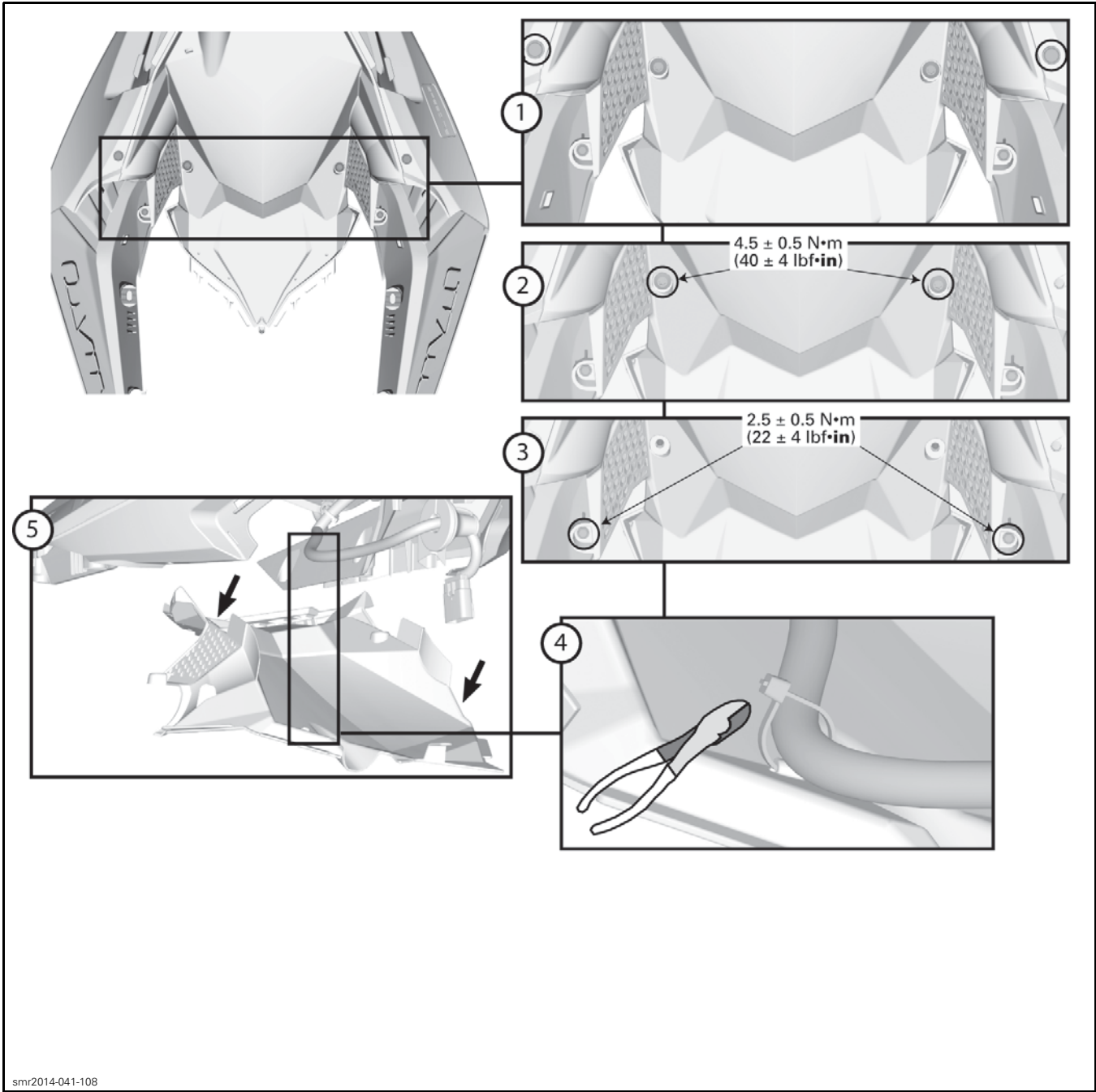


CONSOLE

Remove central body.



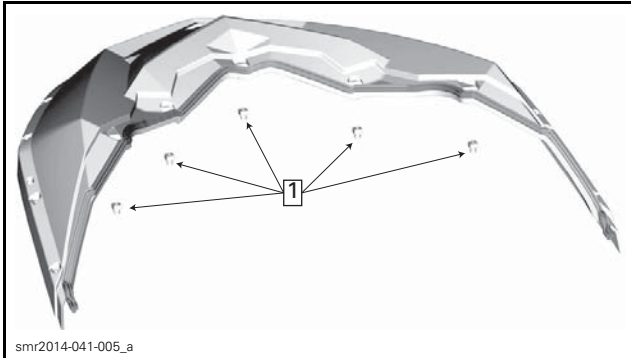
Disassembling the Console



CONSOLE - BOTTOM VIEW

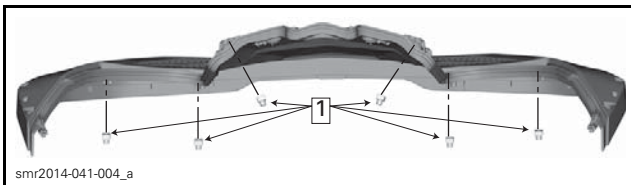
THREADED INSERTS

The front body has threaded inserts to accept central body screws.



FRONT BODY
1. Threaded inserts

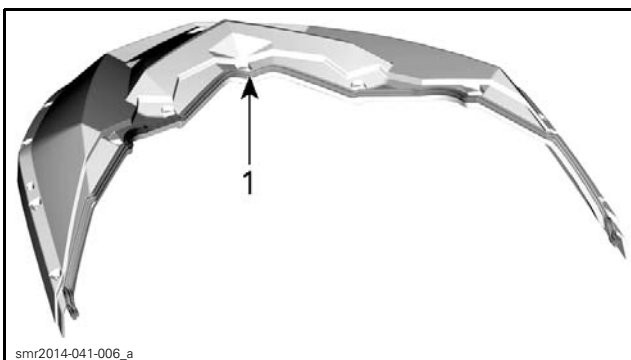
The rear body has threaded inserts to accept central body and rear panel trim screws.



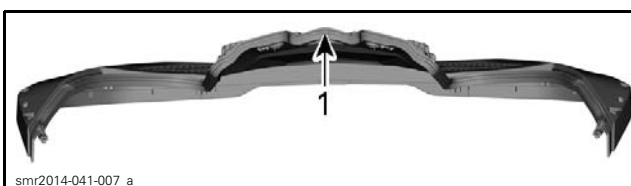
REAR BODY
1. Threaded inserts

NOTE: Similar replaceable threaded inserts may be found elsewhere on this watercraft.

FRONT AND REAR BODY SEALS



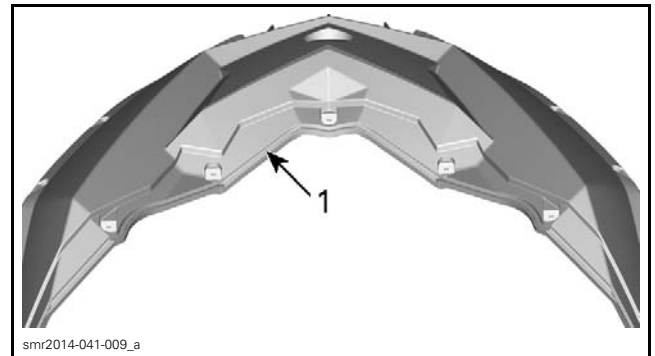
FRONT BODY
1. Front body seal



REAR BODY
1. Rear body seal

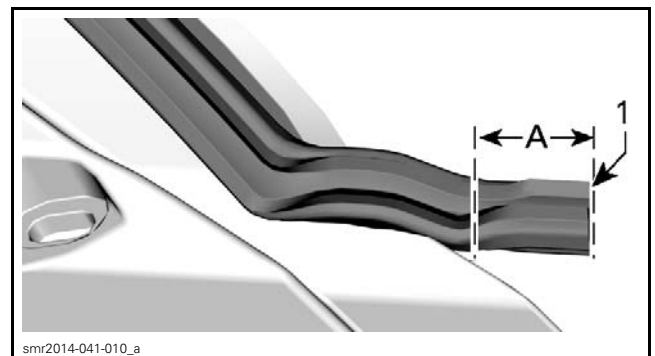
Replacing the Front Body Seal

1. Pull on old seal to remove it.
2. Clean off glue residue with isopropyl alcohol.
3. Flame treat the front body seal groove.



FRONT BODY
1. Front body seal groove

4. Center seal over front body seal groove.
5. Affix new seal into front body seal groove.
6. On each side, cut front body seal 20 mm \pm 10 mm (.79 in \pm .39 in) from end of front body seal groove.

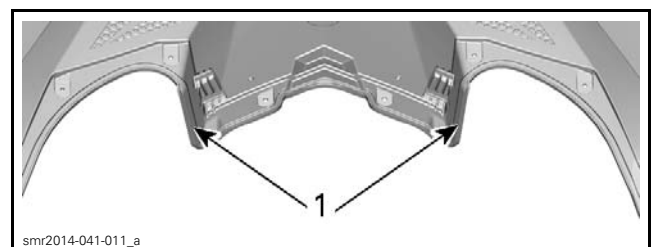


FRONT BODY SEAL - PORT SIDE

1. Cut seal
- A. 20 mm \pm 10 mm (.79 in \pm .39 in)

Replacing the Rear Body Seal

1. Pull on old seal to remove it.
2. Clean off glue residue with isopropyl alcohol.
3. Flame treat rear body seal groove.

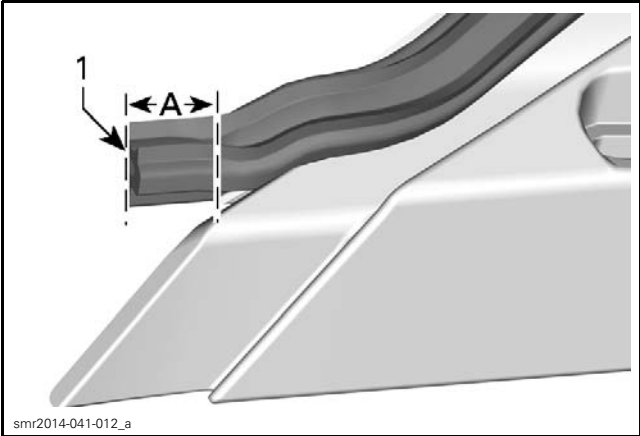


REAR BODY SEAL
1. Seal groove in body

Section07 BODY AND HULL

Subsection 01 (BODY)

- 4. Center seal over rear body seal groove.
- 5. Affix new seal into groove into rear body seal groove.
- 6. On each side, cut rear body seal 20 mm ± 10 mm (.79 in ± .39 in) from end of rear body seal groove.



REAR BODY SEAL- PORT SIDE

1. Cut seal

A. 20 mm ± 10 mm (.79 in ± .39 in)

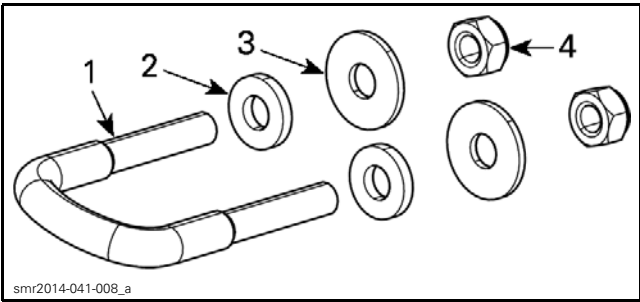
STERN EYELET

Eyelet Access

Remove central body

Removing the Eyelet

- 1. Unscrew and discard both eyelet retaining nuts.
- NOTE: Keep all washers for installation.



EYELET AND HARDWARE

1. Eyelet

2. Small stainless steel washer

3. Large stainless steel washer (inside body)

4. Eyelet retaining nut

- 2. Remove eyelet.

Installing the Eyelet

TIGHTENING TORQUE	
M8 hexagonal nut	14.5 N•m ± 1.5 N•m (128 lbf•in ± 13 lbf•in)

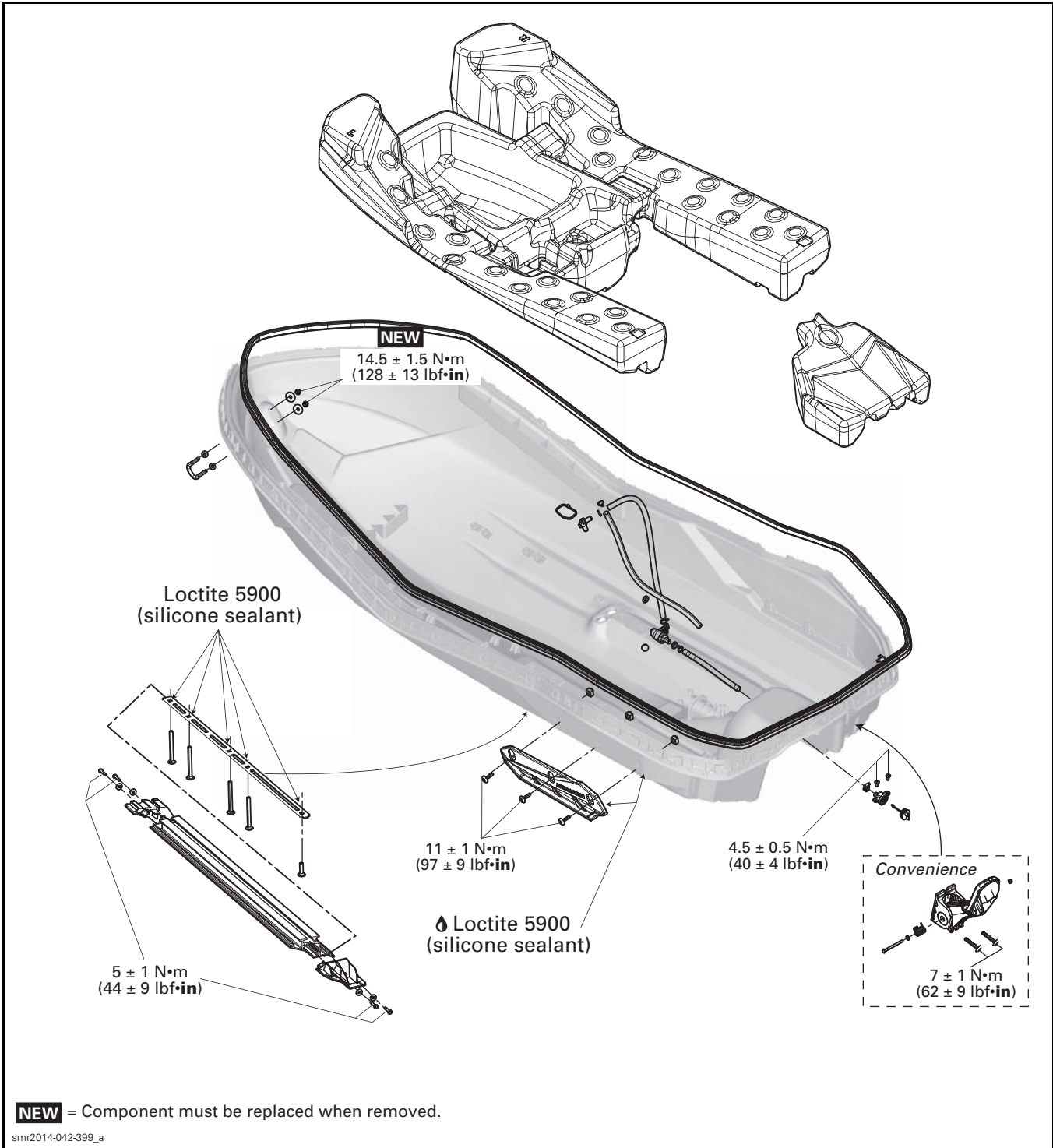
HULL

SERVICE PRODUCTS

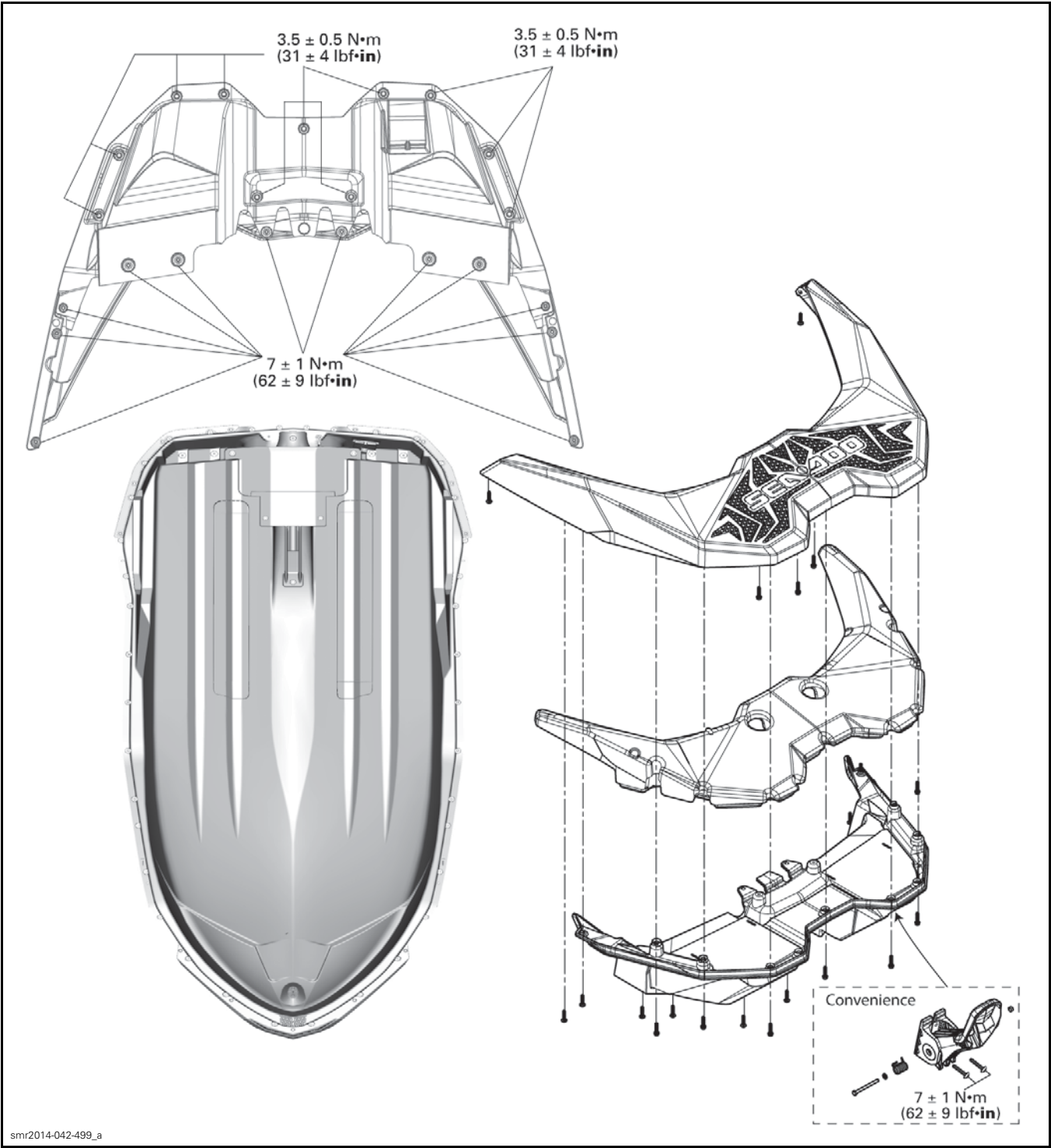
Description	Part Number	Page
BRP HEAVY DUTY CLEANER	293 110 001	247–248
LOCTITE 5900	293 800 066	244–245, 247, 249

Section 07 BODY AND HULL
Subsection 02 (HULL)

Spark Series

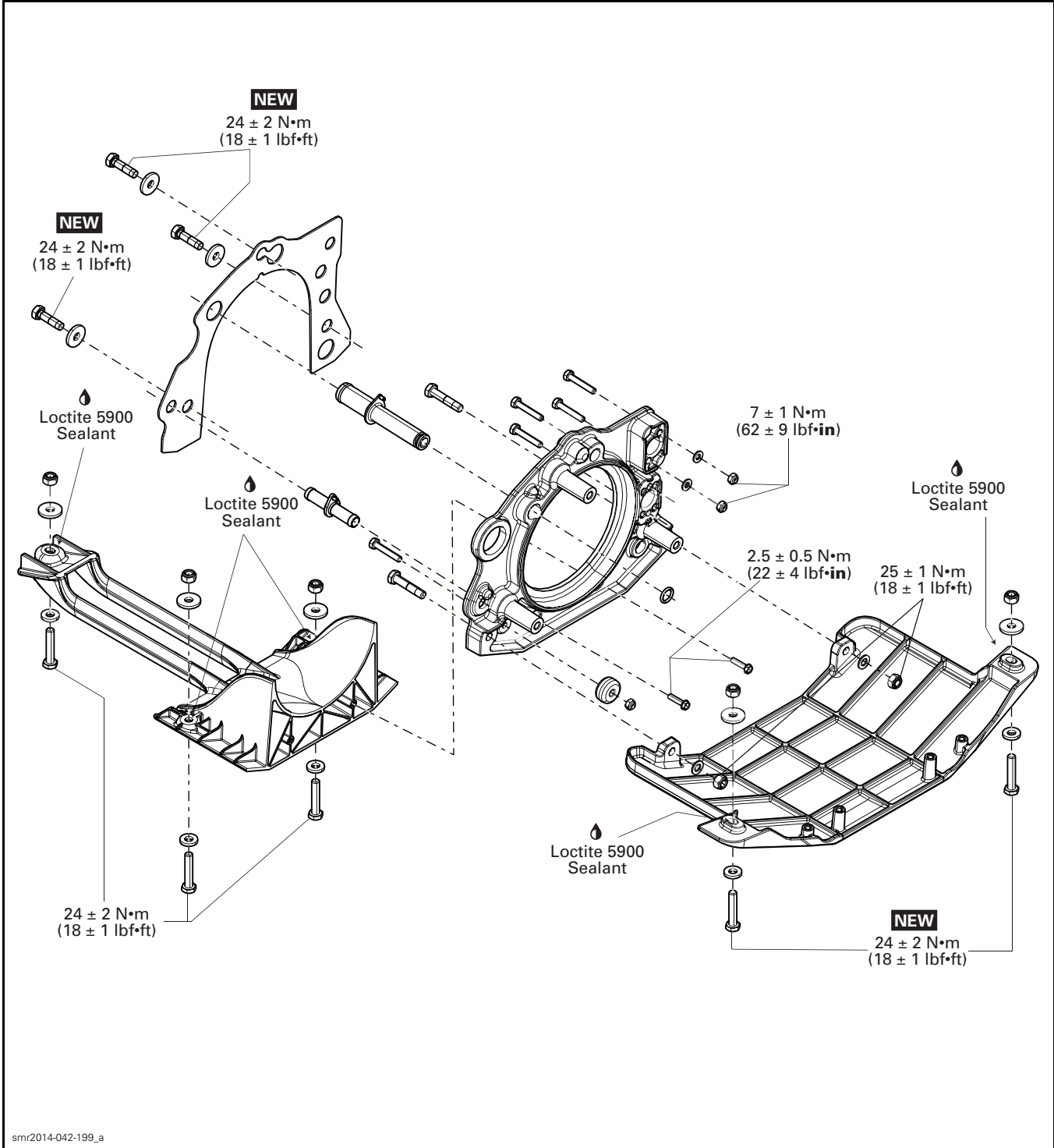


3UP



Section 07 BODY AND HULL
Subsection 02 (HULL)

Spark Series



PROCEDURES

HULL

Replacing the Hull

The hull is sold separately and may be replaced if damage is deemed too severe.

NOTICE The following list is not exhaustive and represents the general order in which to proceed with hull replacement.

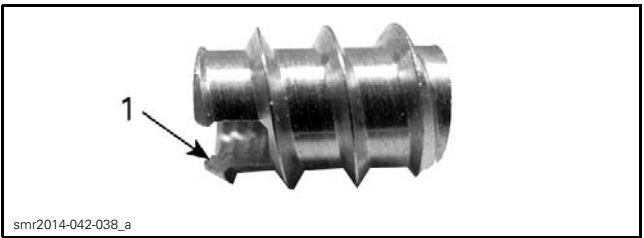
Remove the following components:

1. All body parts. Refer to *BODY* subsection.
2. Battery.
3. Jet pump. Refer to *JET PUMP* subsection.
4. Drive shaft. Refer to *DRIVE SHAFT* subsection.
5. Air intake silencer. *AIR INTAKE SYSTEM* subsection.
6. Engine. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
7. Remaining cooling system components. Refer to *COOLING SYSTEM* subsection.
8. Remaining exhaust system components. Refer to *EXHAUST SYSTEM* subsection.
9. Remaining fuel system components. Refer to *FUEL SYSTEM* subsection.
10. Electrical harness.
11. Steering cable. Refer to *STEERING AND OTAS SYSTEMS* subsection.
12. Remaining hull components.

Repairing the Hull Threads

In the event that proper torque on screws threaded into the hull cannot be applied, a brass insert can be installed.

Refer to the *PARTS CATALOG* for replacement inserts.



BRASS INSERT
1. Cut end

Installation Instructions

Use the supplied drill bit only.

NOTICE Do not use 8mm drill bit.

1. Drill a minimum of 15 mm (.6 in) deep.

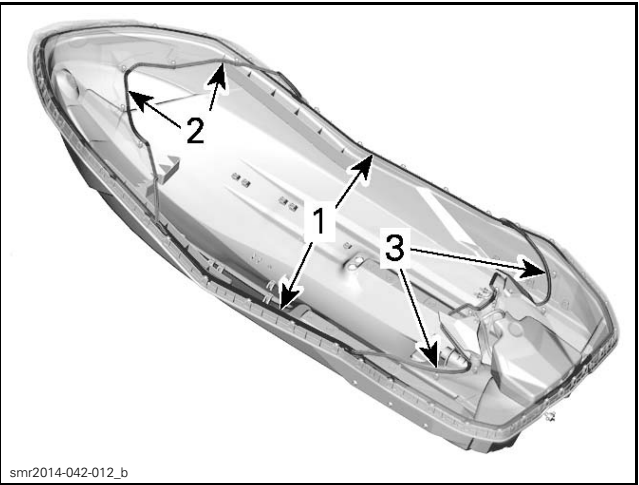
NOTICE Do not drill deeper than 20 mm (.8 in).

2. Install brass insert, cut end first, into hull using M6 X 20 screw and a spacer tube or nut.
3. Remove screw and spacer tube or nut.

TIGHTENING TORQUE	
M6 X 20 screw	3.5 N•m ± 0.5 N•m (31 lbf•in ± 4 lbf•in)

HULL SEAL

Do not reuse the hull seal if removed.



SEALS
1. Hull seal
2. Front body seal
3. Rear body seal

Removing the Hull Seal

For all body removal procedures, refer to *BODY* subsection.

1. Remove central body.
2. Remove front bumper.
3. Remove front body.

2UP models.

4. Remove rear bumpers.

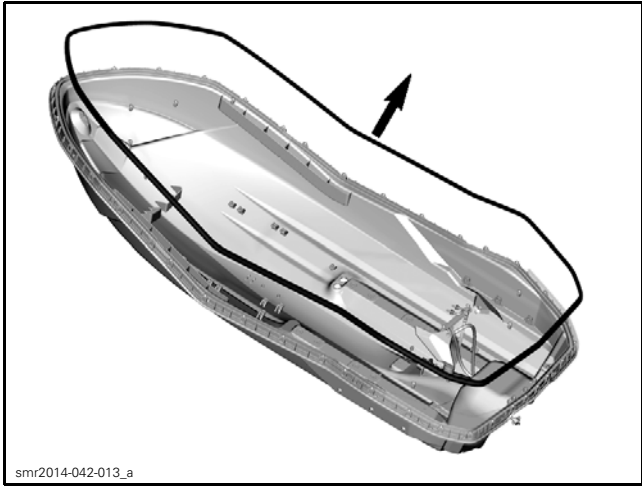
3UP models.

Remove 3UP boarding platform. Refer to *3UP BOARDING PLATFORM* in this subsection.

All models.

5. Remove rear body.
6. Pull on hull seal to remove it.

Section 07 BODY AND HULL
Subsection 02 (HULL)



HULL SEAL

Installing the Hull Seal

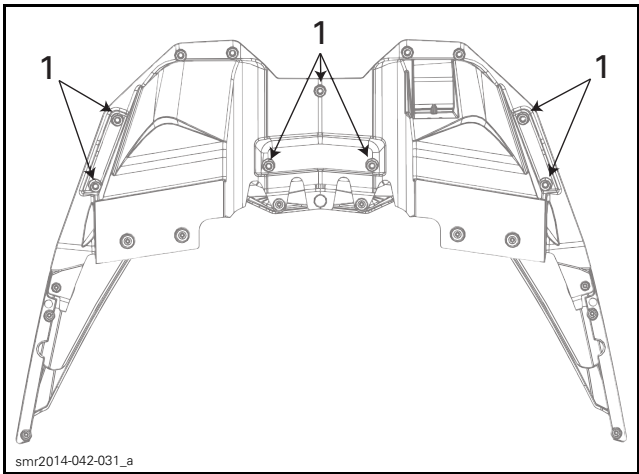
The installation is the reverse of the removal procedure. However, pay attention to the following. The hull seal is held in place by a perimeter groove in the hull.

- 1. Properly position the hull seal above the hull.
- 2. Firmly press the hull seal into perimeter groove in hull.
- 3. Install all removed parts.

3UP BOARDING PLATFORM

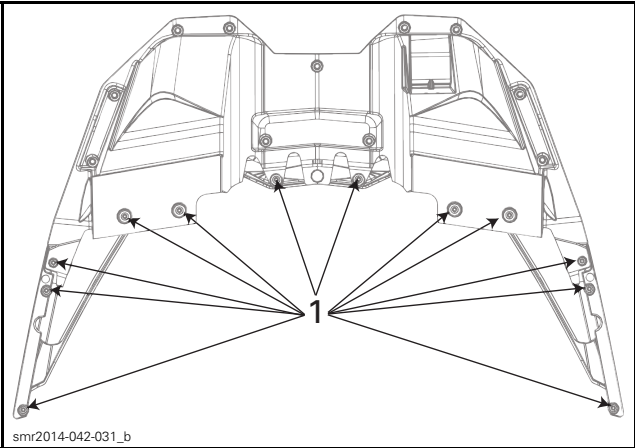
Removing the 3UP Boarding Platform

- 1. Loosen the following screws.



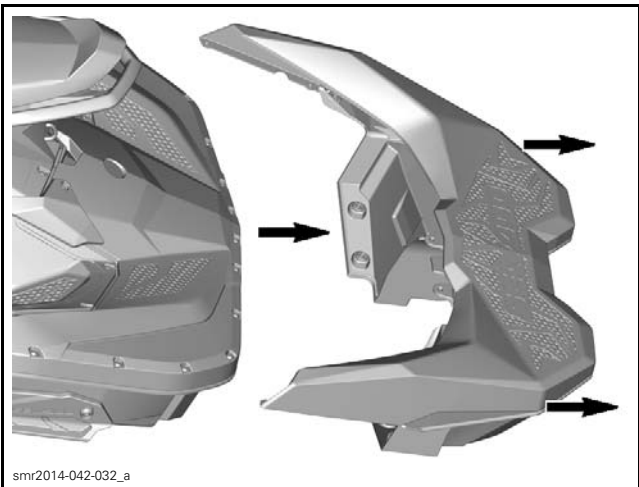
3UP BOARDING PLATFORM - VIEW FROM UNDERNEATH
1. M6 X 30 hexagonal shoulder screws

- 2. Remove the following screws.



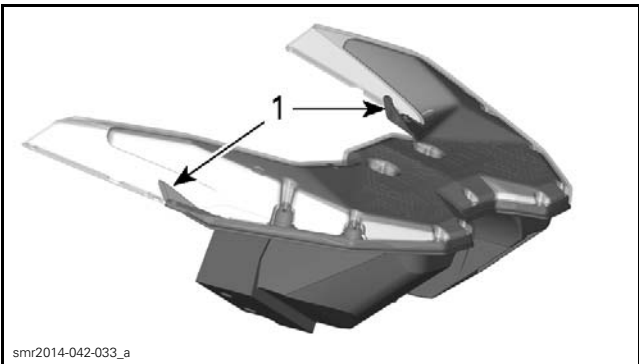
3UP BOARDING PLATFORM - VIEW FROM UNDERNEATH
1. M6 X 30 torx shoulder screws

- 3. Wiggle the 3UP boarding platform off the stern of the watercraft.

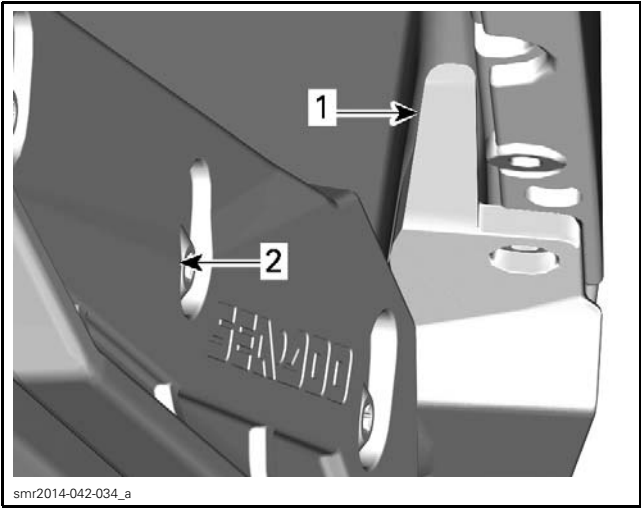


Installing the 3Up Boarding Platform

The installation is the reverse of the removal procedure. However, pay attention to the following. When installing 3UP boarding platform, ensure splash tabs are properly positioned on hull.

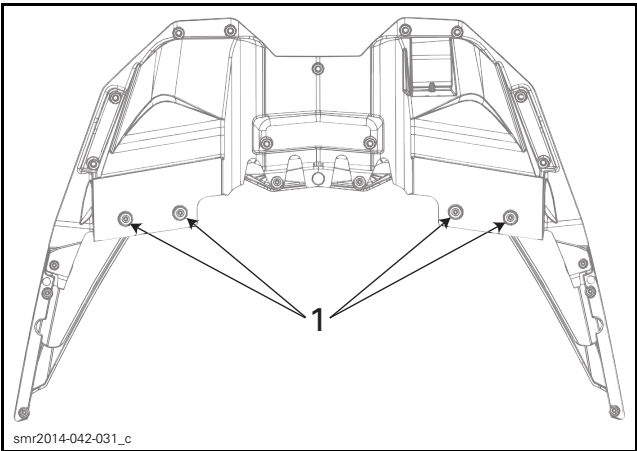


3UP BOARDING PLATFORM
1. Splash tabs

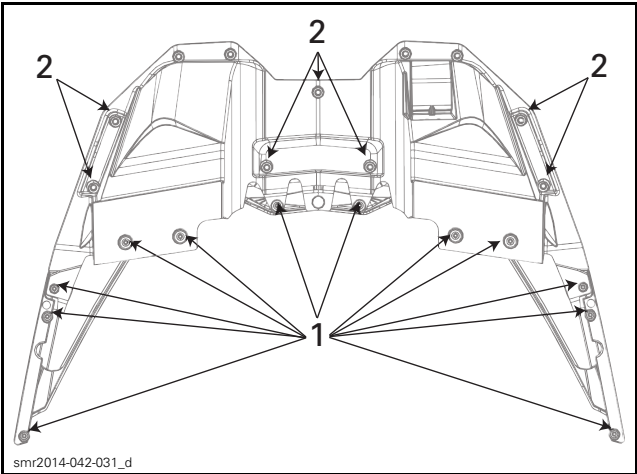


PORT SIDE - VIEW TOWARDS REAR
1. Position of splash tab under hull
2. Port side sponson

Install 3UP boarding platform onto hull



3UP BOARDING PLATFORM - VIEW FROM UNDERNEATH
1. Ensure these points snap into place

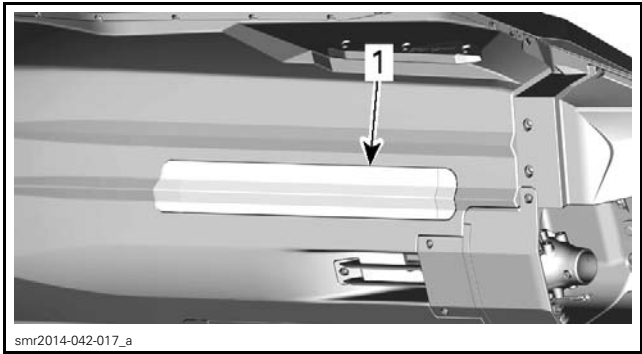


3UP BOARDING PLATFORM - VIEW FROM UNDERNEATH
Step 1: M6 X 30 torx shoulder screw - install first
Step 2: M6 X 30 hexagonal shoulder screw - tighten second

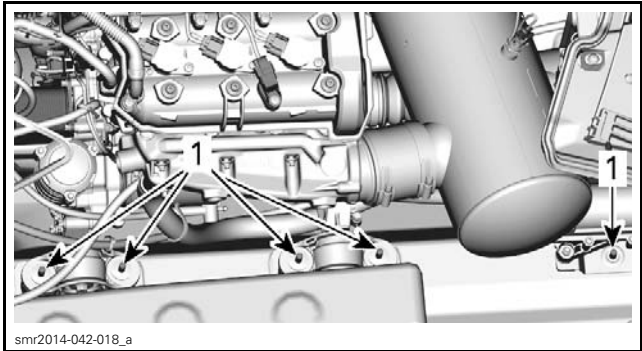
TIGHTENING TORQUE	
M6 X 30 hexagonal shoulder screw	3.5 N•m ± 0.5 N•m (31 lbf•in ± 4 lbf•in)
M6 X 30 torx shoulder screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

HULL REINFORCEMENT

There are no inserts glued to the hull of the watercraft. Instead, the watercraft makes use of hull reinforcements and carriage bolts. The starboard side hull reinforcement is also the heat exchanger and will be covered under *COOLING SYSTEM* subsection.



PORT SIDE HULL REINFORCEMENT - UNDER WATERCRAFT
1. Hull reinforcement



PORT SIDE HULL REINFORCEMENT - INSIDE HULL
1. Hull reinforcement carriage bolt

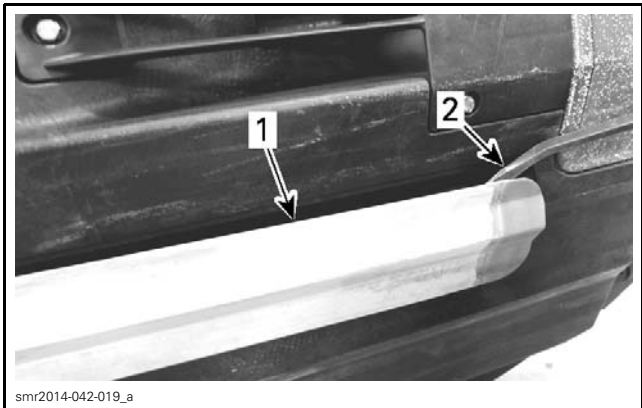
Removing the Hull Reinforcement

1. Remove central body. Refer to *BODY* subsection.
2. Remove port side engine mount clamps. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.

NOTE: The number and position of shims under engine mount clamps are important to maintain for proper engine alignment.

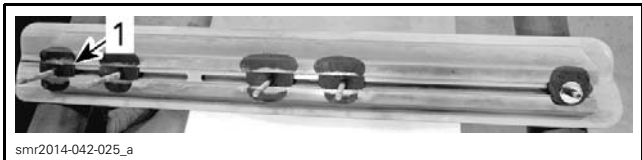
3. From under watercraft, pry out hull reinforcement.

Section07 BODY AND HULL
Subsection 02 (HULL)



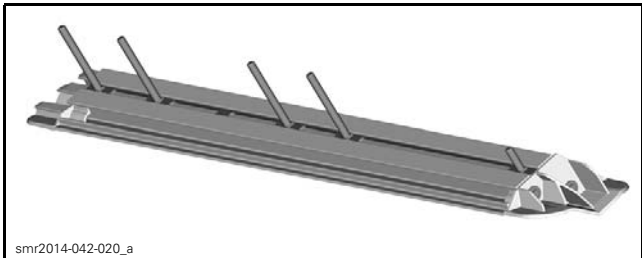
HULL REINFORCEMENT - UNDER WATERCRAFT
1. Hull reinforcement
2. Prybar

4. Clean off sealant residues from hull and hull reinforcement.

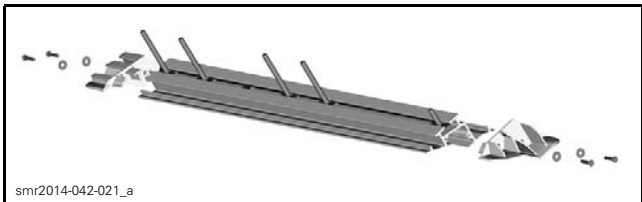


PORT SIDE HULL REINFORCEMENT
1. Sealant residue

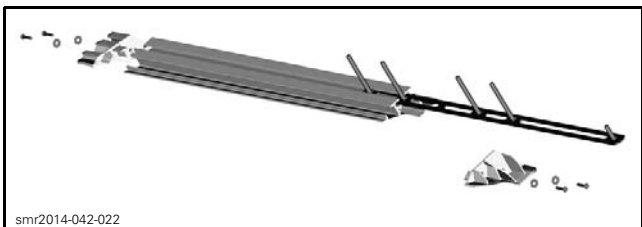
Disassembling the Hull Reinforcement
1. The following images represent disassembly.



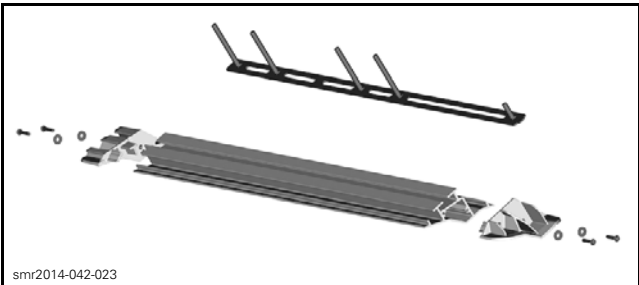
PORT SIDE HULL REINFORCEMENT



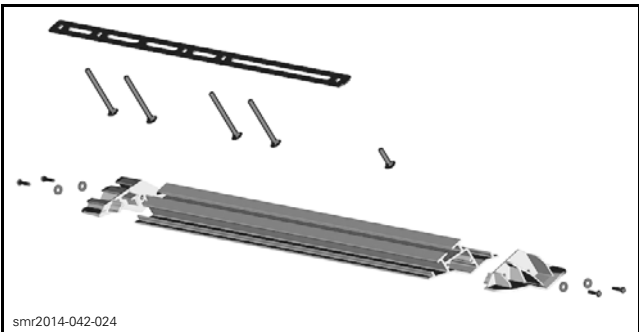
PORT SIDE HULL REINFORCEMENT



PORT SIDE HULL REINFORCEMENT



PORT SIDE HULL REINFORCEMENT



PORT SIDE HULL REINFORCEMENT

Assembling the Hull Reinforcement

The assembly is the reverse of disassembly procedure.

Table with 2 columns: Tightening Torque for M5 X 25 Shoulder screws, specifying 5 N•m ± 1 N•m (44 lbf•in ± 9 lbf•in).

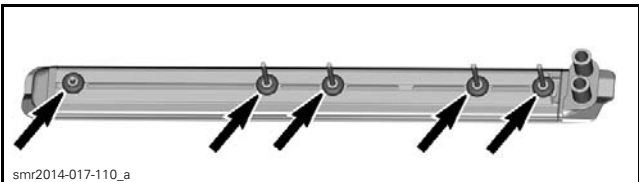
Installing the Hull Reinforcement

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

- 1. Apply Loctite 5900 beads as indicated.

Table with 2 columns: Service Product, specifying LOCTITE 5900 (P/N 293 800 066).

NOTE: Heat exchanger shown.

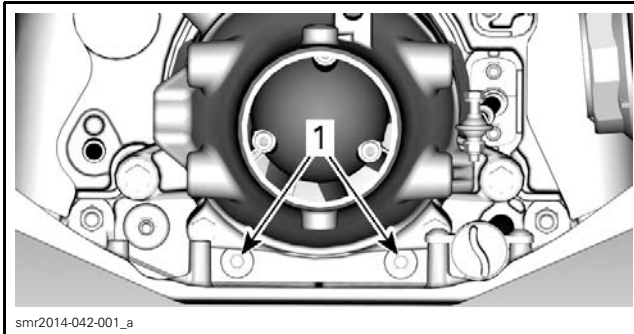


LOCTITE 5900 12 MM (15/32 IN) DIAMETER BEAD APPLICATION

INLET GRATE

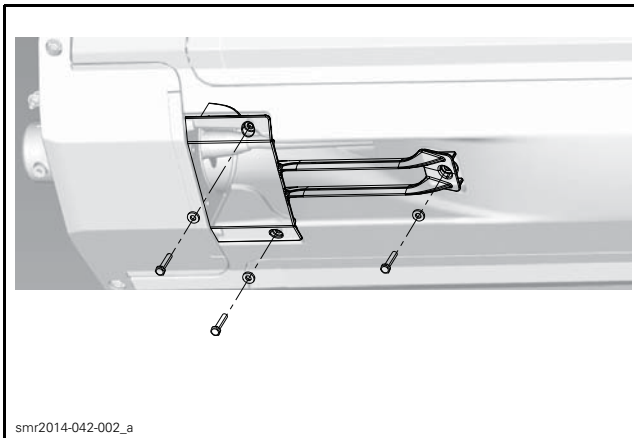
Removing the Inlet Grate

- 1. Remove central body. Refer to BODY subsection.
- 2. Remove rear inlet grate screws.

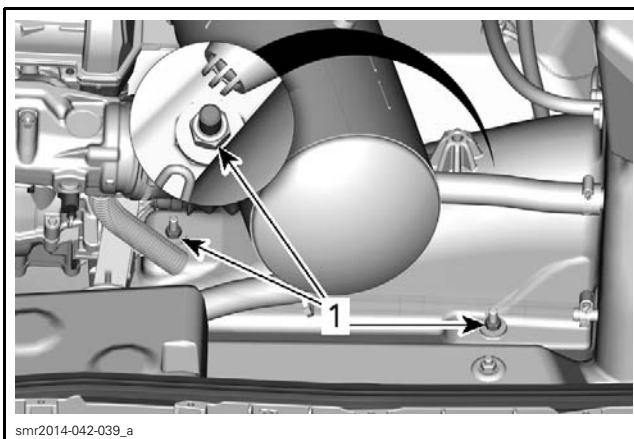


REAR VIEW - UNDER JET PUMP
1. Rear inlet grate screws

3. Remove front inlet grate screws and retaining nuts.



FRONT INLET GRATE SCREWS



FRONT INLET GRATE RETAINING NUTS
1. Inlet grate retaining nuts

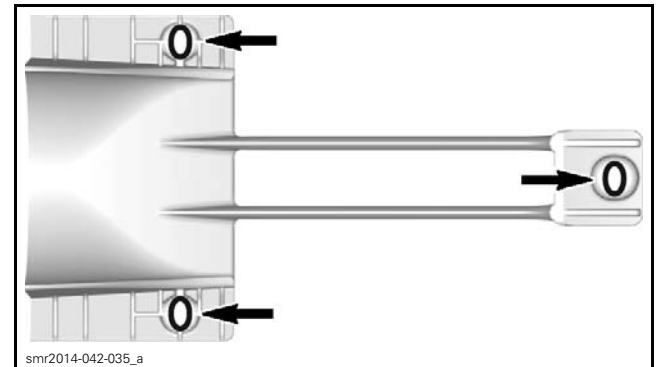
4. Remove inlet grate.

Installing the Inlet Grate

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

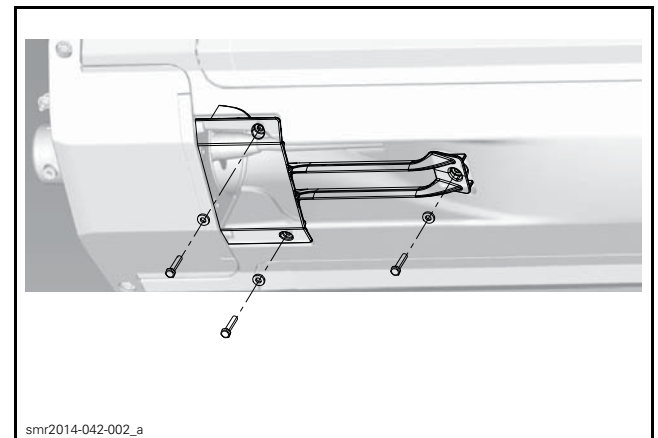
1. Apply Loctite 5900 sealant on inlet grate as indicated.

SERVICE PRODUCT
LOCTITE 5900 (P/N 293 800 066)



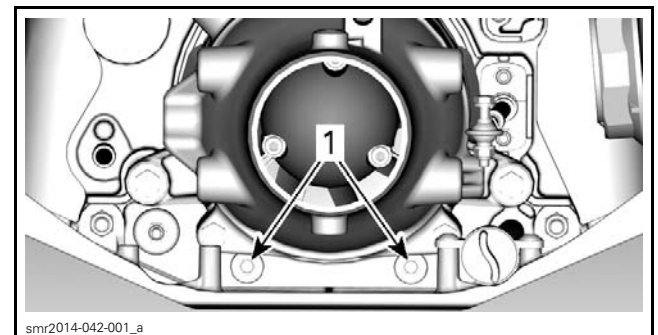
INLET GRATE SEALANT APPLICATION

2. Install inlet grate in position under watercraft.
3. Loosely install front inlet grate retaining screws and retaining nuts.



FRONT INLET GRATE SCREWS

4. Hand tighten rear inlet grate screws.



REAR VIEW - UNDER JET PUMP
1. Rear inlet grate screws

5. Tighten screws to the specified torque and sequence.

Section07 BODY AND HULL

Subsection 02 (HULL)

TIGHTENING TORQUE AND SEQUENCE		
STEP	FASTENER	TORQUE
1	Rear inlet grate screws	2.5 N•m ± 0.5 N•m (22 lbf•in ± 4 lbf•in)
2	Front M8 inlet grate retaining screws	24 N•m ± 2 N•m (18 lbf•ft ± 1 lbf•ft)

RIDE PLATE

Removing the Ride Plate

1. Remove central and rear body. Refer to *BODY* subsection.

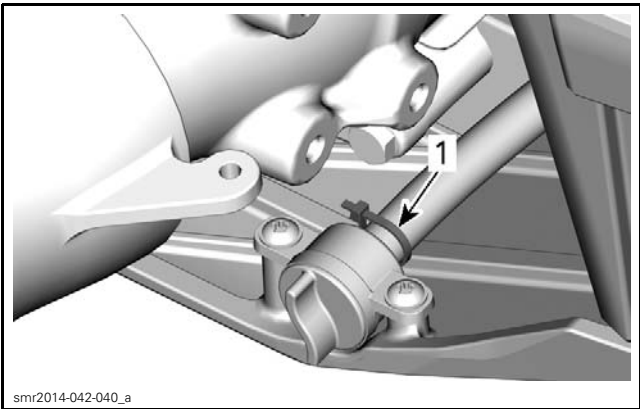
3UP models

2. Remove 3UP boarding platform. See procedure in this subsection.

All models

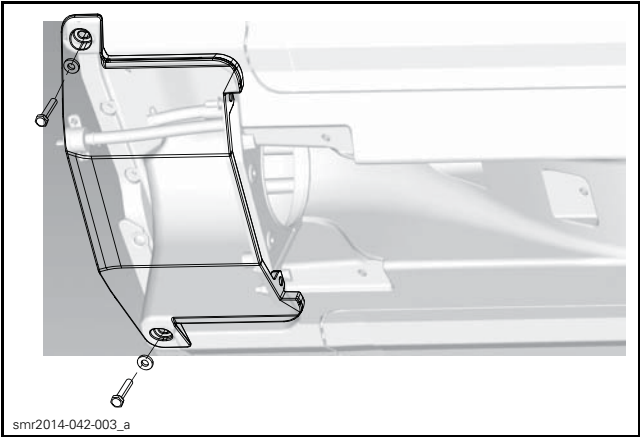
3. Remove resonator. Refer to *EXHAUST* subsection.

4. Cut locking tie and remove hose from drain on ride plate.



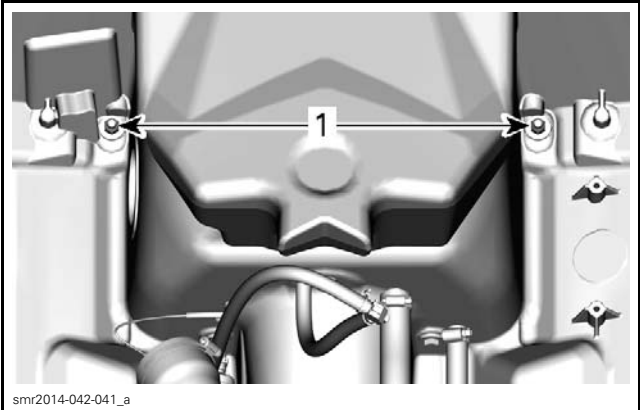
DRAIN
1. Locking tie

5. Remove and discard ride plate retaining screws.



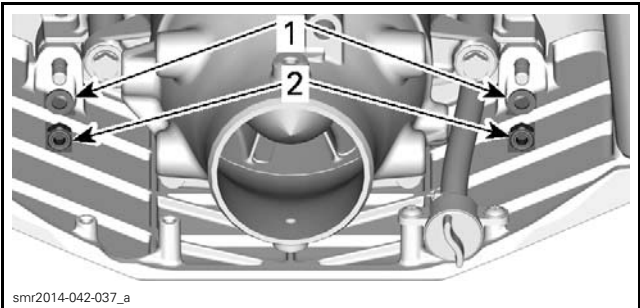
RIDE PLATE RETAINING SCREWS

6. Remove ride plate retaining nuts.



RIDE PLATE RETAINING NUTS - INSIDE HULL
1. Ride plate retaining nuts

7. Remove ride plate retaining nuts and washers.



RIDE PLATE RETAINING NUTS AND WASHERS- ON JET PUMP SUPPORT
1. M8 stainless steel washers
2. Brass M8 elastic nuts

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 to eliminate grease, dust and sealant residue. Clean fitting threads.

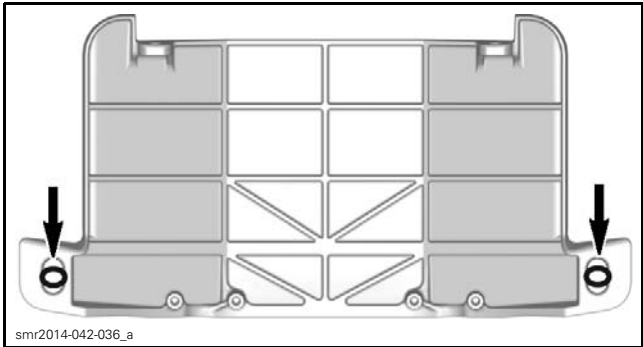
SERVICE PRODUCT
BRP HEAVY DUTY CLEANER (P/N 293 110 001)

Installing the Ride Plate

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

- 1. Apply Loctite 5900 sealant as illustrated.

SERVICE PRODUCT
LOCTITE 5900 (P/N 293 800 066)



RIDE PLATE SEALANT APPLICATION

- 2. Position ride plate on hull.
- 3. Tighten ride plate with new retaining nuts and screws to the specified torque and sequence.

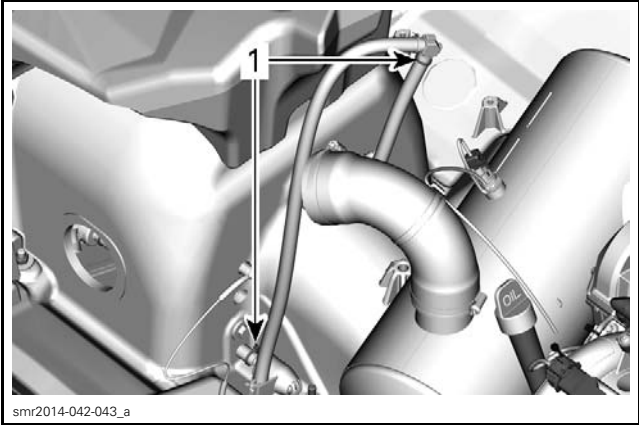
TIGHTENING TORQUE AND SEQUENCE		
STEP	FASTENER	TORQUE
1	M8 Ride plate retaining screws (on jet pump support)	25 N•m ± 1 N•m (18 lbf•ft ± 1 lbf•ft)
2	M8 Ride plate retaining screws	24 N•m ± 2 N•m (18 lbf•ft ± 1 lbf•ft)

- 4. Reinstall other removed parts. Refer to appropriate subsections for procedures.

JET PUMP SUPPORT

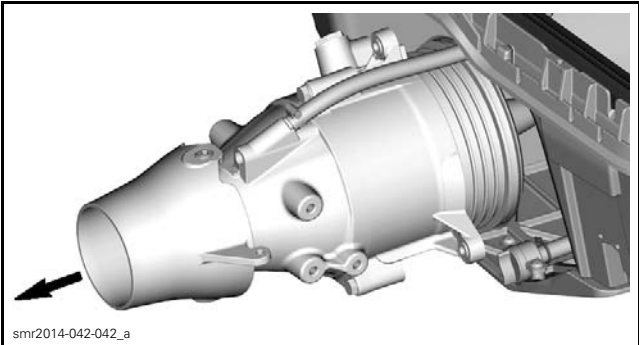
Removing the Jet Pump Support

- 1. Remove central body. Refer to *BODY* subsection.
- 2. Cut locking ties on bailer elbow and pick up.



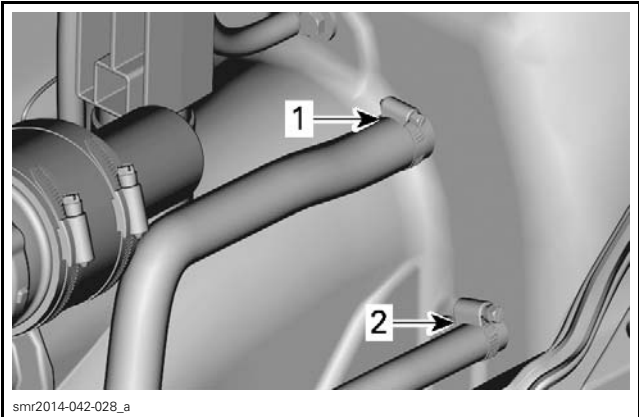
1. Locking ties to cut

- 3. Remove steering cable. Refer to *STEERING* subsection.
- 4. Remove jet pump assembly and hose to bailer elbow. Refer to *JET PUMP* subsection.



JET PUMP ASSEMBLY

- 5. Remove inlet grate.
- 6. Remove ride plate with drain and drain hose.
- 7. Disconnect water supply and return hoses from jet pump support.



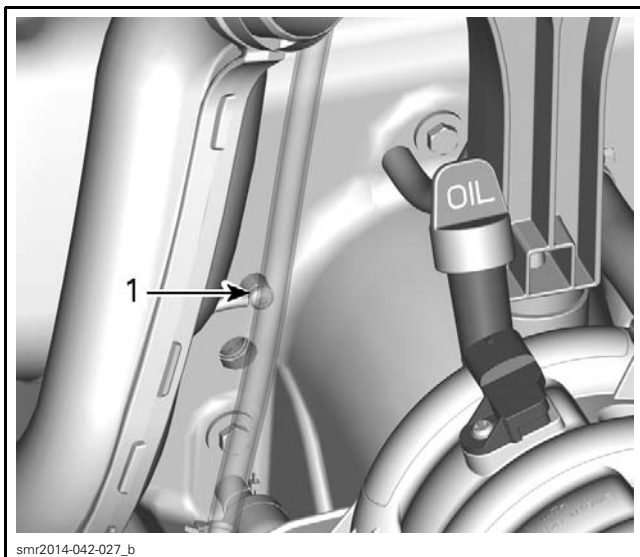
PORT SIDE - INSIDE THE HULL

- 1. Exhaust water supply hose
- 2. Exhaust water return hose

- 8. Disconnect ground strap.

Section 07 BODY AND HULL

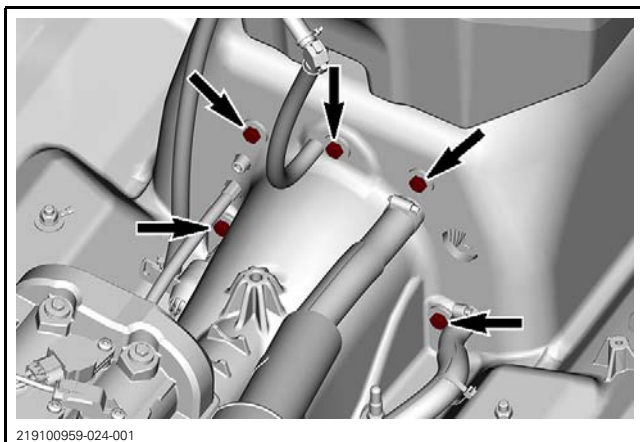
Subsection 02 (HULL)



STARBOARD SIDE - INSIDE THE HULL

1. Ground strap

9. Remove jet pump support retaining screws and washers.

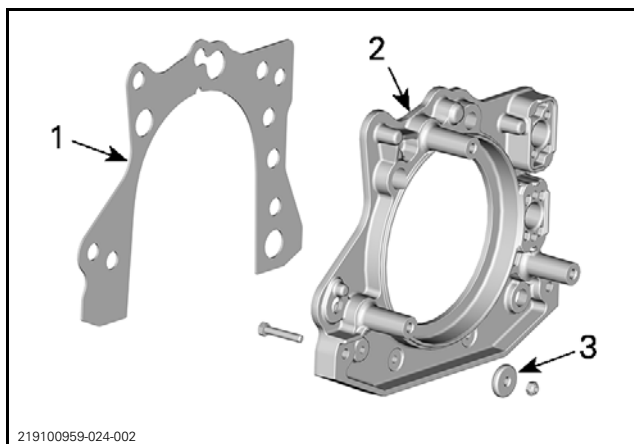


JET PUMP SUPPORT - VIEW FROM INSIDE HULL

1. Jet pump support retaining screws

10. Pull jet pump support off the hull.

11. Remove jet pump gasket.



JET PUMP SUPPORT

1. Jet pump support gasket
2. Jet pump support
3. Zinc anode

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 to eliminate grease, dust, and sealant residue.

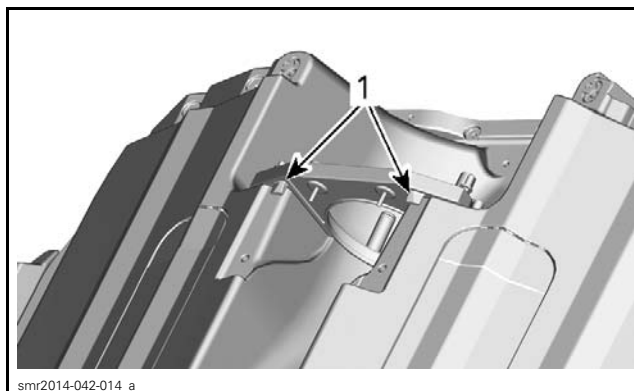
SERVICE PRODUCT

BRP HEAVY DUTY CLEANER (P/N 293 110 001)

Installing the Jet Pump Support

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

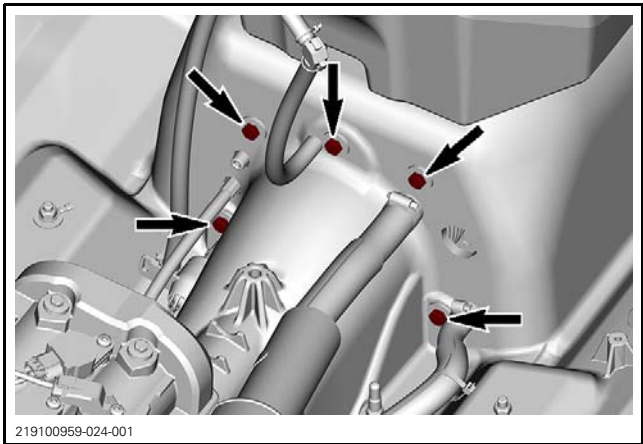
1. Install new jet pump support gasket.
2. Position the jet pump support against the hull.



JET PUMP SUPPORT

1. Jet pump support to hull contact

3. Inside the hull, thread all 3 jet pump support screws.
4. Tighten jet pump support screws.



JET PUMP SUPPORT - VIEW FROM INSIDE HULL
1. Jet pump support screws

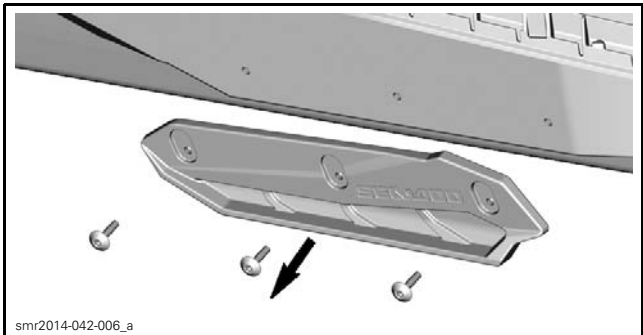
TIGHTENING TORQUE	
M8 Jet pump support screws	24 N•m ± 2 N•m (18 lbf•ft ± 1 lbf•ft)

5. Reinstall other removed parts. Refer to appropriate subsections for procedures.

FIXED REAR SPONSONS

NOTE: Removal and installation procedure for port and starboard sponsons is similar. Refer to exploded view at the beginning of this section.

Removing the Fixed Rear Sponson



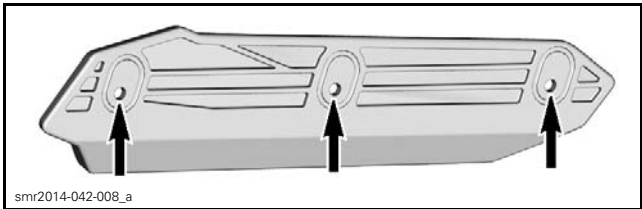
PORT SPONSON

Installing the Fixed Rear Sponson

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

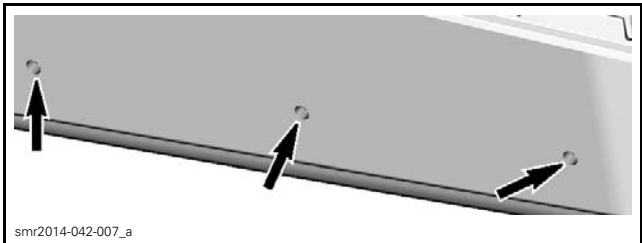
1. Clean off any silicone sealant residues from hull and sponson.
2. Apply Loctite 5900 on back side of sponsons.

SERVICE PRODUCT
LOCTITE 5900 (P/N 293 800 066)



BACK OF PORT SPONSON

3. Apply a small amount of Loctite 5900 into each hull hole.



REAR PORT HULL

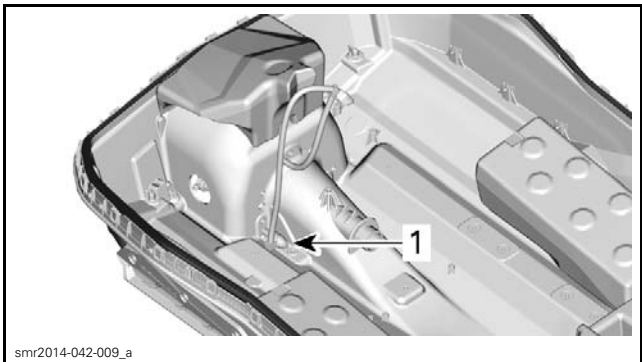
TIGHTENING TORQUE	
Sponson screws	11 N•m ± 1 N•m (97 lbf•in ± 9 lbf•in)

BAILER

The bailer pick up draws water from the bilge when watercraft is in operation.

The bailer pick up is connected to a syphon tube mounted in the jet pump venturi that use the jet pump thrust to create a vacuum. The bailer is also connected to the bilge drain plug on the ride plate.

Bailer Pick-Up Location

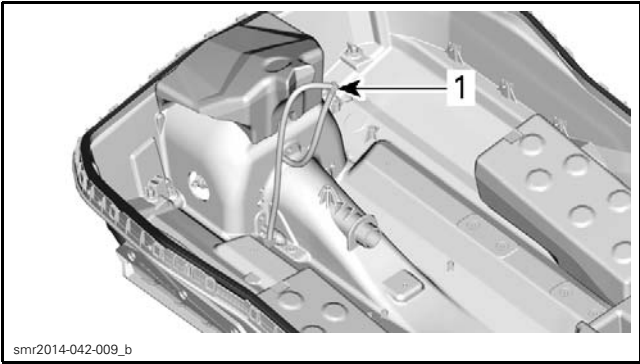


1. Bailer pick-up

Bailer Pick-Up Inspection

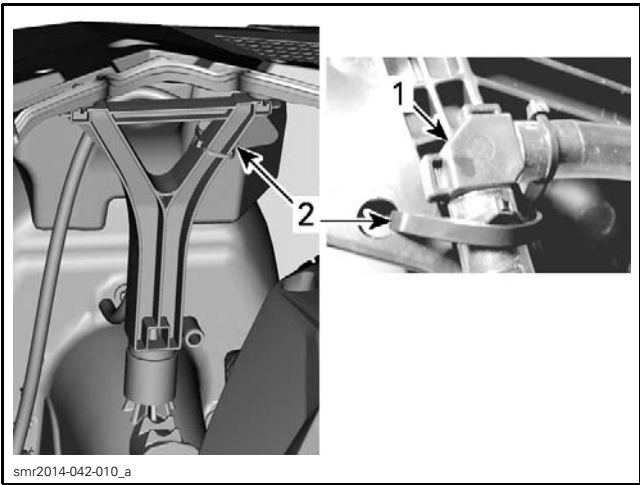
1. Check holes in the bailer pick-up to see if obstructed. Clean if necessary.
2. Check if the hole on bailer hose elbow fitting is obstructed. Clean if necessary.

Section07 BODY AND HULL
Subsection 02 (HULL)



1. bailer hose elbow fitting

NOTE: When repositioning the bailer hose elbow fitting, position it at the highest available point on the rear support.

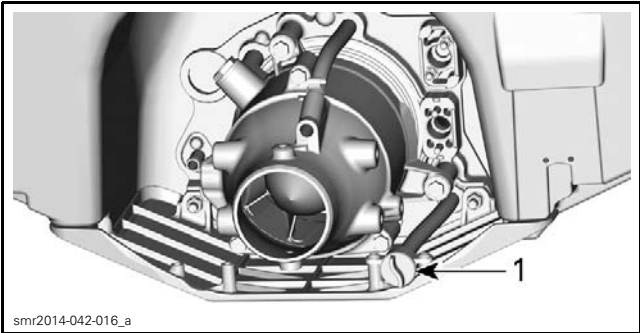


FRONT (LEFT) AND REAR (RIGHT) VIEW OF REAR SUPPORT
1. Bailer hose elbow
2. Locking tie on rear support

DRAIN PLUG

NOTE: The drain plug on the ride plate is connected to a bailer. When watercraft is off the water, the drain plug can be unscrewed to manually drain the bilge.

Drain Plug Neck Location



DRAIN PLUG LOCATION
1. Drain plug

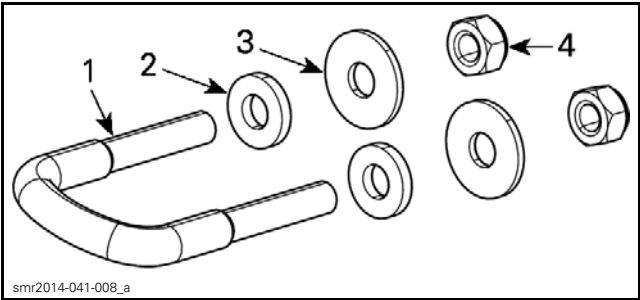
BOW EYELET

Eyelet Access

Remove central body. Refer to BODY subsection.

Removing the Eyelet

- 1. Unscrew and discard both M8 hexagonal nuts.
- NOTE: Keep all washers for installation.



EYELET AND HARDWARE

- 1. Eyelet
- 2. Small stainless steel washer - outside hull
- 3. Large stainless steel washer - inside
- 4. M8 hexagonal nuts

- 2. Remove eyelet.

Installing the Eyelet

TIGHTENING TORQUE	
M8 hexagonal nuts	14.5 N•m ± 1.5 N•m (128 lbf•in ± 13 lbf•in)

FIXING SCRATCHES

Refer to CLEANING AND REPAIR subsection.

REPAIRING THE HULL

Refer to CLEANING AND REPAIR subsection.

VEHICLE

COOLING SYSTEM		
Type		Closed loop cooling system (CLCS)
Coolant		BRP long life antifreeze Low silicate, extended life ethylene-glycol premixed coolant (50%-50%) specifically formulated for internal combustion aluminum engines
Cooling system capacity		3.0 L (3.2 qt (U.S. liq.))
Radiator cap opening pressure		110 kPa (16 PSI)
EXHAUST SYSTEM		
Type		D-Sea-Bel sound reduction system. Water cooled/water injected (open loop). Direct flow from jet pump
Water injection		4 x 3.5 mm (.138 in) on exhaust pipe
FUEL SYSTEM		
Fuel injection type		Multipoint fuel injection with iTC (intelligent Throttle Control). Single throttle body (46 mm) with actuator
Fuel pressure		386 kPa to 414 kPa (56 PSI to 60 PSI)
Fuel injector	Quantity	3
Fuel type	Inside North America ((RON + MON)/2)	87 Pump Posted AKI (RON+MON)/2
	Outside North America (RON)	(91 RON)
Fuel tank (including reserve)		30 L (7.9 U.S. gal.)
Fuel tank reserve (from low level signal)		approx. 12 L (3.2 U.S. gal.)
Idle speed		1450 ± 100 RPM (not adjustable)
ELECTRICAL SYSTEM		
Ignition system type		IDI (Inductive Discharge Ignition)
Battery		Battery, 12 V, 18 A•h YTX20HL
Spark plug	Make and type	NGK CR8EB or equivalent
	Gap	0.7 mm to 0.8 mm (.028 in to .031 in)
Magneto generator output		420 W @ 6000 RPM
Stator		0.1 to 1.0 Ω
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)
Ignition timing		Variable (electronically controlled)

Section 08 TECHNICAL SPECIFICATIONS

Subsection 01 (VEHICLE)

ELECTRICAL SYSTEM		
Ignition coil	Primary	0.80 to 0.97 Ω
	Secondary	N.A.
Engine speed limiter setting		8000 RPM
Fuse box	#1: ECM, Cluster, Starter Solenoid, O.T.A.S. (if equipped) and CAPS	10 A
	#2: Engine START/STOP button	5 A
	#3: Battery	15 A
	#4: Charge	30 A
	#5: iBR	30 A
	* Bilge pump (If equipped)	3 A

* The bilge pump fuse is located above the #1 ACC (10A) fuse.

STEERING SYSTEM		
Steering	TRIXX Models	Adjustable Handlebar Rise
	All Other Models	Fixed column
O.T.A.S. (Off-Throttle Assisted Steering) (If equipped)		Electronically-controlled

PROPULSION SYSTEM		
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	13°/20°
	Outside diameter	140 mm (5-1/2 in)
Impeller/wear ring clearance	New	0.00 mm to 0.24 mm (0 in to .009 in)
	Wear limit	0.35 mm (.014 in)
Impeller shaft	End play (new)	0.0 mm (0 in)
	Side play	0.0 mm (0 in)
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

Section 08 TECHNICAL SPECIFICATIONS

Subsection 01 (VEHICLE)

WEIGHT AND LOADING CAPACITY			
Dry weight	Models with iBR and Convenience Package	2UP	193 kg (426 lb)
		3UP	200 kg (442 lb)
	Models without iBR	2UP	184 kg (405 lb)
		3UP	191 kg (421 lb)
	Trixx Models	2UP	192 kg (423 lb)
		3UP	199 kg (439 lb)
Number of passenger (driver incl.)		2UP	2 (refer to load limit)
		3UP	3 (refer to load limit)
Load limit (passenger and 10 kg (22 lb))		2UP	160 kg (352 lb)
		3UP	205 kg (450 lb)
Storage capacity	Glove box		1.6 L (.42 U.S. gal.)
	Storage bin	Convenience Package	2.5 kg (5 lb)
	Rear under-seat storage compartment	3UP	0.5 L (.13 U.S. gal.)
DIMENSIONS			
Overall length		2UP	279 cm (110 in)
		3UP	305 cm (120 in)
Overall width			118 cm (46 in)
Overall height		TRIXX Models	107 cm (42 in) (Handlebar in its lower position)
		All Other Models	104 cm (41 in)
MATERIALS			
Hull			Fiberglass reinforced polypropylene
Deck (front, central and rear)			Fiberglass reinforced polypropylene
Inlet grate			Nylon
Steering cover			Thermoplastic
Impeller			Stainless steel
Impeller housing/stator			Acetal/aluminum
Venturi			Aluminum
Nozzle			Aluminum
Fuel tank			High-Density Polyethylene (HDPE)
Seat			Polyurethane/foam
Ride plate			Aluminum
Pump support			Aluminum

WIRING DIAGRAM INFORMATION

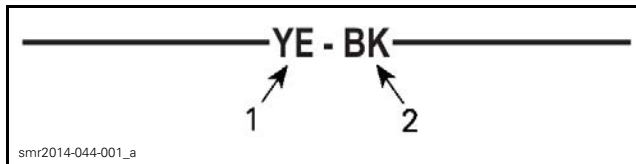
GENERAL

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, no fuse)
RED/BLACK	Main 12 Vdc from Voltage Regulator/ Rectifier Unit
RED/BLUE	Fused power from battery/ main 12 Vdc system
RED/WHITE	Fused power from battery/ main 12 Vdc system
VIOLET or VIOLET + tracer	Fused/ switched 12 Vdc power from main power relay in fuse box
YELLOW	Alternating current (AC) from magneto
BLACK or BLACK + tracer	Ground circuit
WHITE/BEIGE WHITE/BLACK	CAN HI wires, CAN LO wires

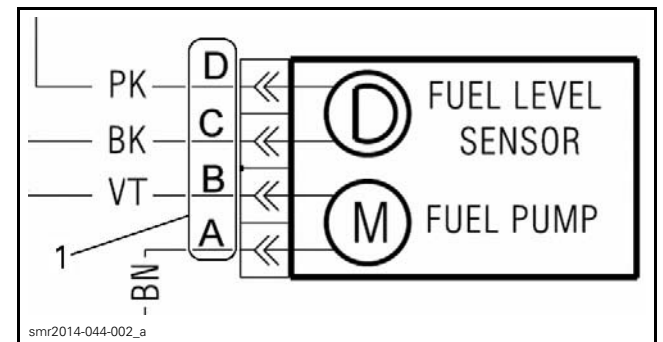
Color Codes

COLOR CODES			
CODE	COLOR	CODE	COLOR
BG	BEIGE (TAN)	OG	ORANGE
BN	BROWN	PK	PINK
BU	BLUE	RD	RED

COLOR CODES			
CODE	COLOR	CODE	COLOR
BK	BLACK	VT	VIOLET
GN	GREEN	WH	WHITE
GY	GRAY	YE	YELLOW

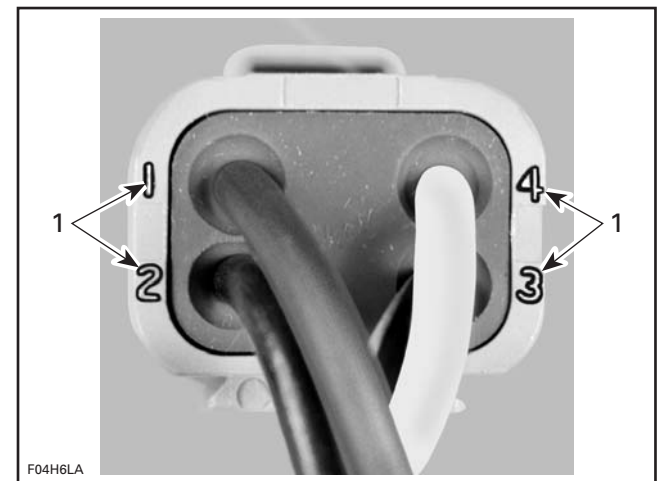
Terminal Identification on Connector

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

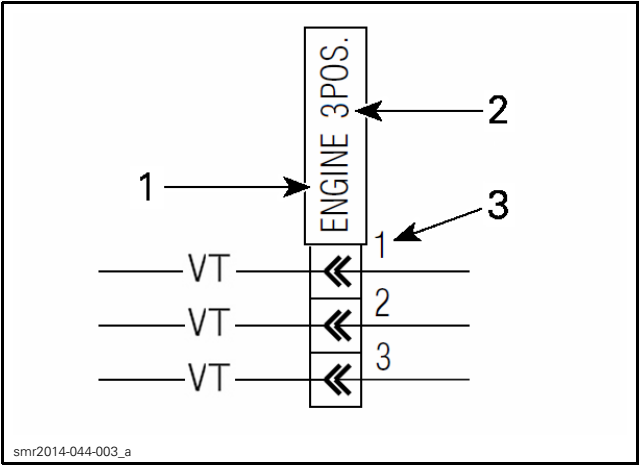
1. Wire identification numbers

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

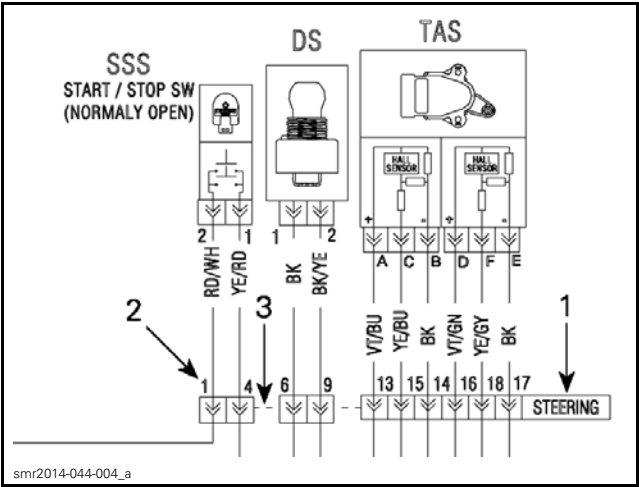
1. Connector location

2. Number of pins (terminals)

3. 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.



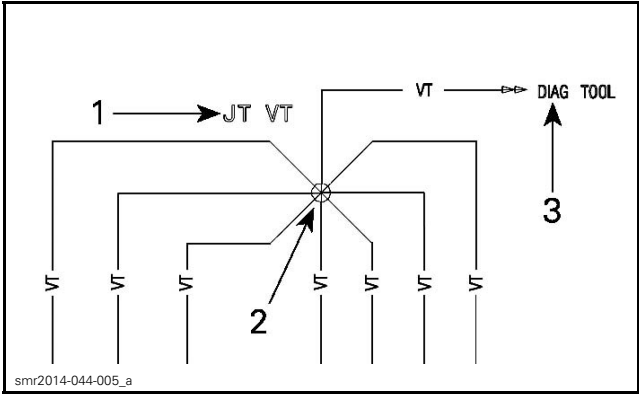
TYPICAL

1. Connector identification and location

2. Connector pin number

3. Dashed line links connector segments as one

Wire Junction Identification



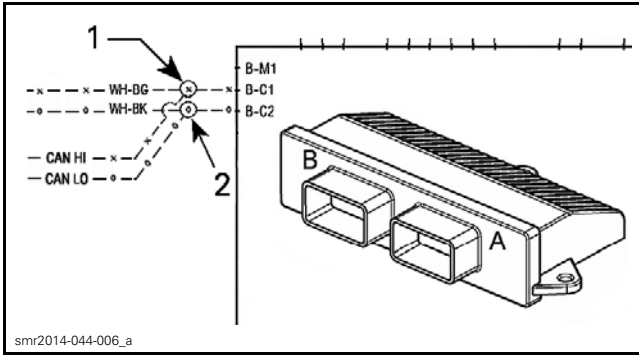
1. Wire junction name

2. Wire junction symbol (circle)

3. Wire destination

CAN Wire Circuit References

On the wiring diagram, CAN linked components use the following coding.



TYPICAL

1. Splice on CAN HI wire (x)

2. Splice on CAN LOW wire (o)

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.