

## 2021 Sea-Doo Spark Series

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This manual is made up of the base manual with all needed supplements organized into one easy to use manual.

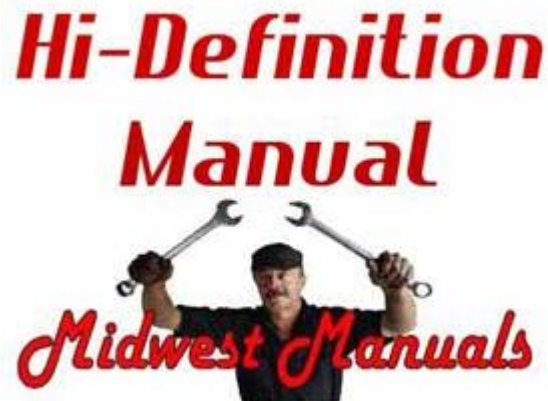
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# SAFETY NOTICE

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.



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# 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                                         |       |                     |   |    |

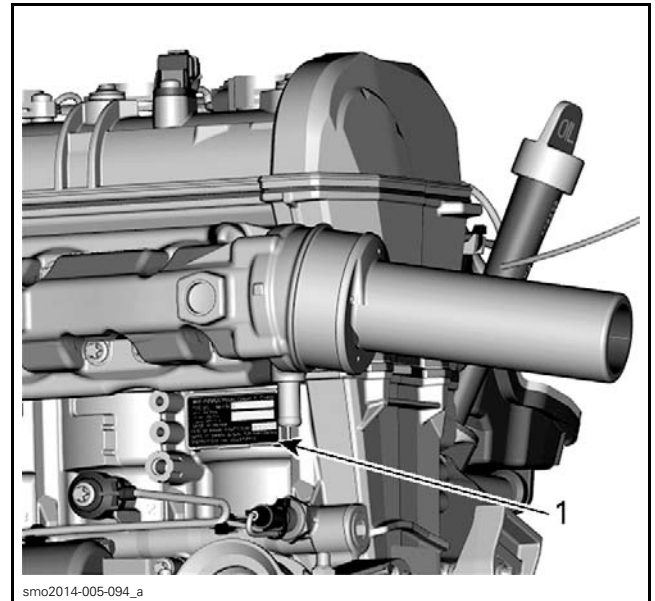
It is located on the deck at the rear of watercraft.



**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.

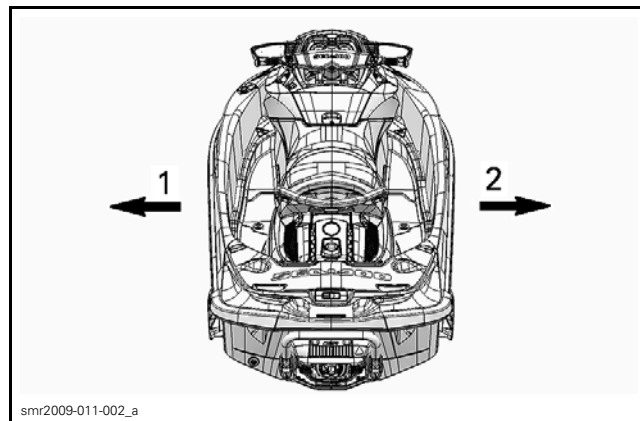
## MANUAL INFORMATION

### 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).

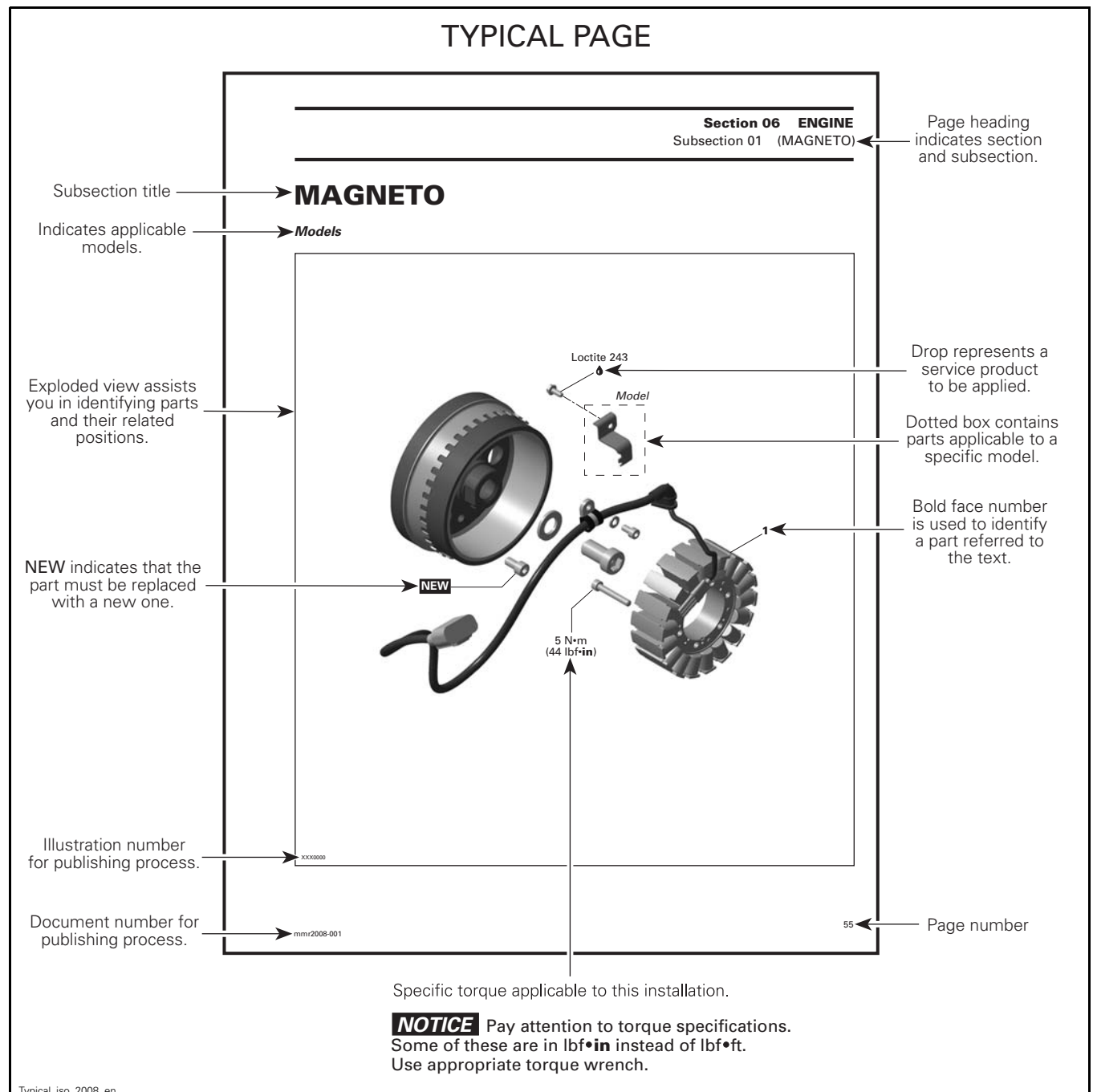
This manual uses technical terms which may be different from the ones in the *PARTS CATALOGS*.

## 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 **LOC-TITE APPLICATION** sections at the beginning of this manual for complete procedure.

**⚠ WARNING**

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

## PROCEDURES

## ► MAGNETO FLYWHEEL

**Magneto Flywheel Cleaning**  
Clean all metal components in a non-ferrous metal cleaner.

**CAUTION:** Clean magneto flywheel using only a clean cloth.

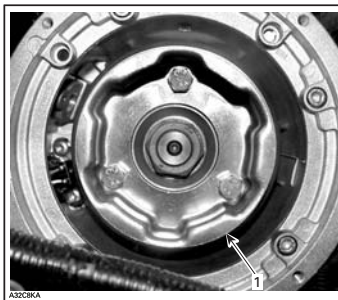
### ► Magneto Flywheel Removal

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

Remove acoustic panel

Remove rewind starter.

Remove starting pulley no. 2.



**TYPICAL** ←

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

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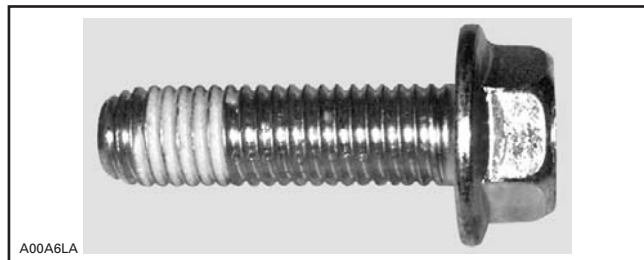
| FASTENER SIZE | FASTENER GRADE/TORQUE                        |                                              |                                               |                                           |
|---------------|----------------------------------------------|----------------------------------------------|-----------------------------------------------|-------------------------------------------|
|               | 5.8 Grade                                    | 8.8 Grade                                    | 10.9 Grade                                    | 12.9 Grade                                |
| M4            | 1.5 N•m - 2 N•m<br>(13 lbf•in - 18 lbf•in)   | 2.5 N•m - 3 N•m<br>(22 lbf•in - 27 lbf•in)   | 3.5 N•m - 4 N•m<br>(31 lbf•in - 35 lbf•in)    | 4 N•m - 5 N•m<br>(35 lbf•in - 44 lbf•in)  |
| M5            | 3 N•m - 3.5 N•m<br>(27 lbf•in - 31 lbf•in)   | 4.5 N•m - 5.5 N•m<br>(40 lbf•in - 49 lbf•in) | 7 N•m - 8.5 N•m<br>(62 lbf•in - 75 lbf•in)    | 8 N•m - 10 N•m<br>(71 lbf•in - 89 lbf•in) |
| M6            | 6.5 N•m - 8.5 N•m<br>(58 lbf•in - 75 lbf•in) | 8 N•m - 12 N•m<br>(71 lbf•in - 106 lbf•in)   | 10.5 N•m - 15 N•m<br>(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.

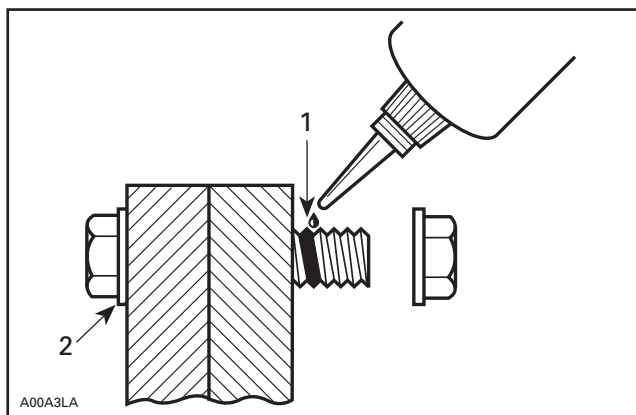
## LOCTITE® APPLICATION PROCEDURE

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).

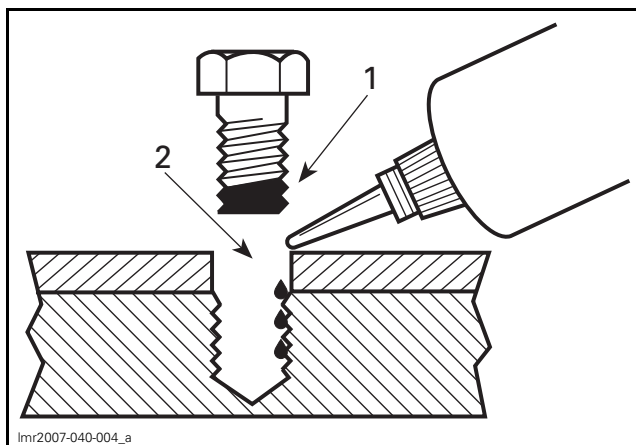
## Threadlocker Application for Uncovered Holes (Bolts and Nuts)



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

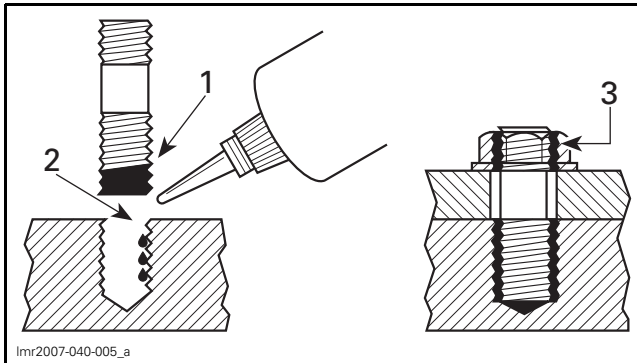


1. On fastener threads
2. On threads and at the bottom of hole

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.

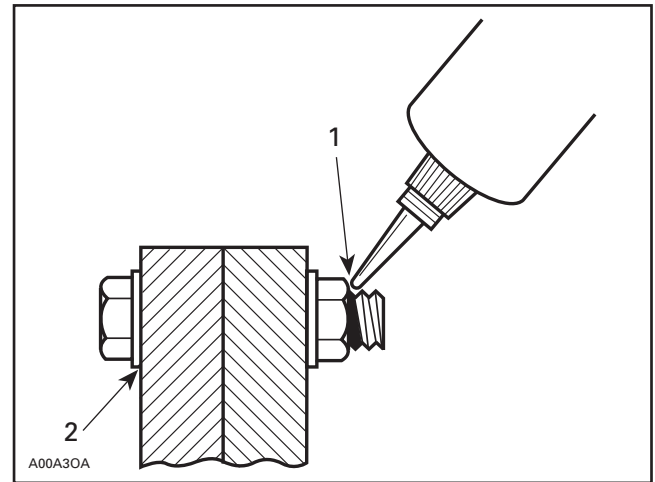
**NOTE:** To avoid a hydro lock situation, do not apply too much Loctite.

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.



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## Threadlocker Application for Pre-Assembled Parts

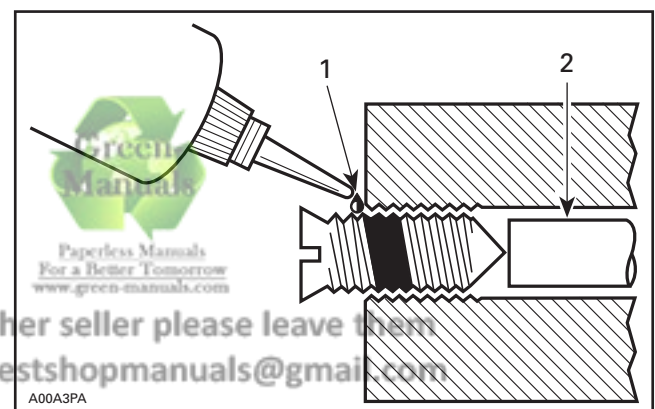


1. Apply here
2. Do not apply

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



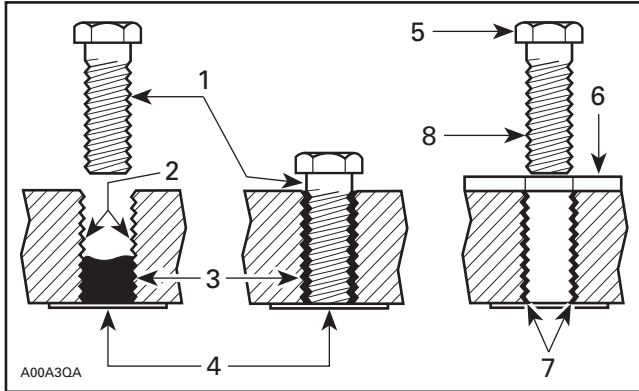
1. Apply here
2. Plunger

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

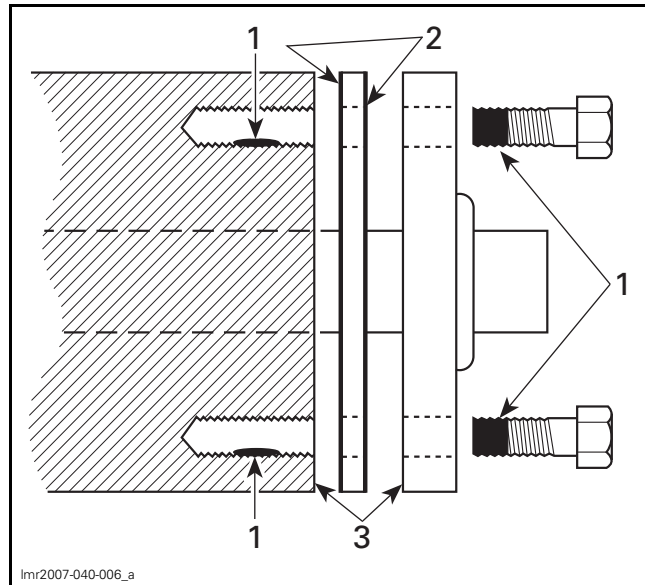
Option 1: Enlarge damaged hole, then follow *STANDARD THREAD REPAIR* procedure.

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.

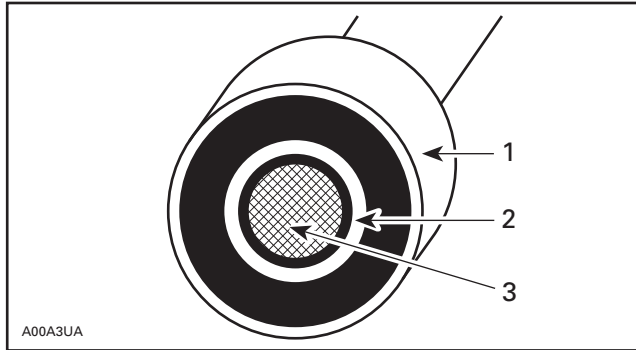
**NOTE:** If the cover is bolted to blind holes, apply proper strength Loctite in the hole and on threads. Tighten fastener.

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.

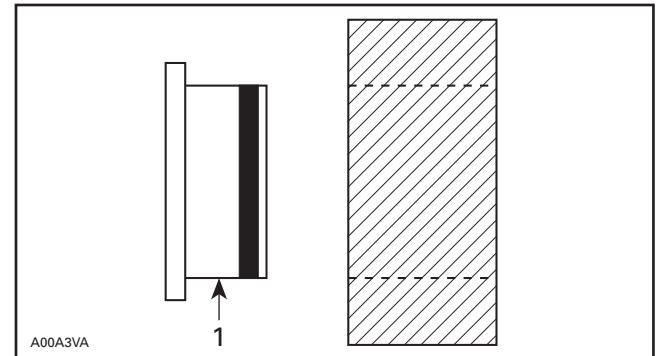
**NOTE:** Retaining compound is always forced out when applied on shaft.

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.

# 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<br>(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                 |

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## Subsection XX (PERIODIC MAINTENANCE SCHEDULE)

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| EVERY 2 YEARS OR 200 HOURS OF OPERATION<br>(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                                                                                                                                                                                                         |
| <b>The following must be performed every 200 hours (irrespective of the number of years):</b>                                                                                                                                                         |
| 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<br>(WHICHEVER COMES FIRST)                                                                                                                                                                                    |
| Replace the coolant                                                                                                                                                                                                                                   |



# PERIODIC MAINTENANCE PROCEDURES

## SERVICE TOOLS

| Description        | Part Number       | Page |
|--------------------|-------------------|------|
| SUCTION PUMP ..... | 529 035 880 ..... | 3    |

## SERVICE PRODUCTS

| Description                                   | Part Number       | Page |
|-----------------------------------------------|-------------------|------|
| 4T 5W40 SYNTHETIC BLEND OIL (EUR).....        | 779290 .....      | 1    |
| 4T 5W40 SYNTHETIC BLEND OIL .....             | 779133 .....      | 1    |
| CLUTCH AND PULLEY FLANGE CLEANER PRO S1 ..... | 779244 .....      | 7    |
| EXTENDED LIFE PRE-MIXED COOLANT (EUR) .....   | 779223 .....      | 4    |
| EXTENDED LIFE PRE-MIXED COOLANT .....         | 779150 .....      | 4    |
| FUEL STABILIZER (EUR) .....                   | 779183 .....      | 7    |
| FUEL STABILIZER .....                         | 779171 .....      | 7    |
| LOCTITE 243 (BLUE).....                       | 293 800 060 ..... | 4    |

## 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:<br>– API service classification SJ, SL, SM or SN<br>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.

## Subsection XX (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

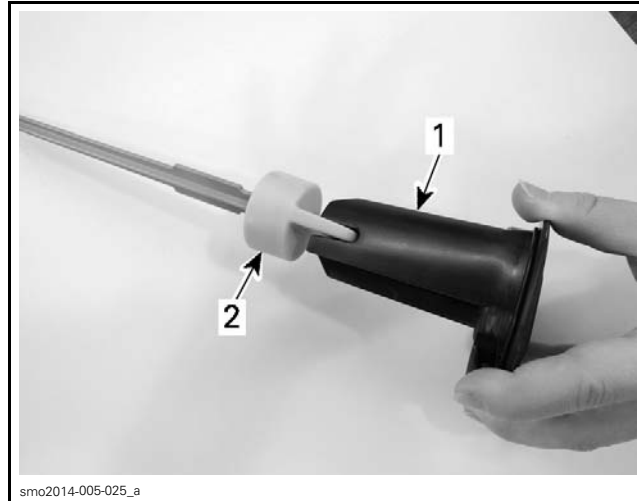
5. To check level, remove access cover located on rear of RH side of watercraft by turning counter-clockwise.



**TYPICAL**  
1. RH access cover

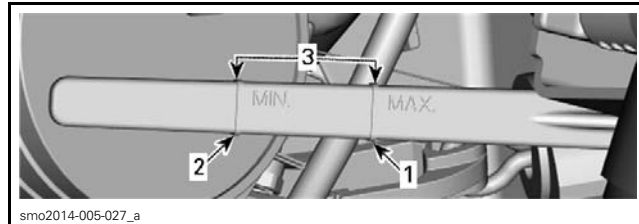
6. Unscrew dipstick, pull it out and wipe clean.

**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.



smo2014-005-024\_a

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.

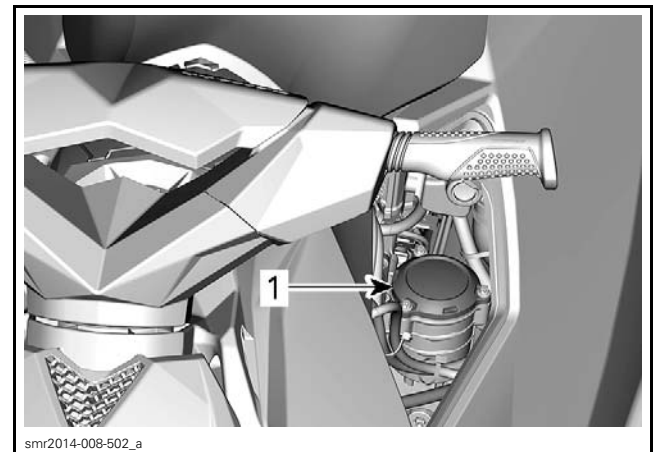
6. Pull suction pump hose out of dipstick tube.
7. Replace *OIL FILTER*, see procedure in this subsection.
8. Fully depress the throttle lever and HOLD it while cranking engine for 10 seconds. Siphon oil again. Repeat the crank-siphon cycle 2 - 3 times.
9. Refill oil tank at the proper level with the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



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PORT SIDE - ACCESS COVER REMOVED

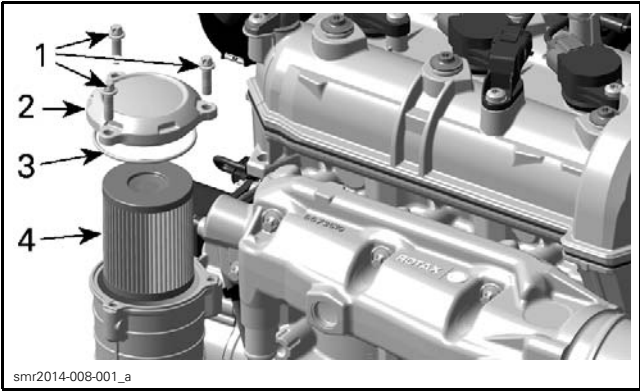
1. Oil filter cover

2. Clean oil filter area.

Subsection XX (PERIODIC MAINTENANCE PROCEDURES)

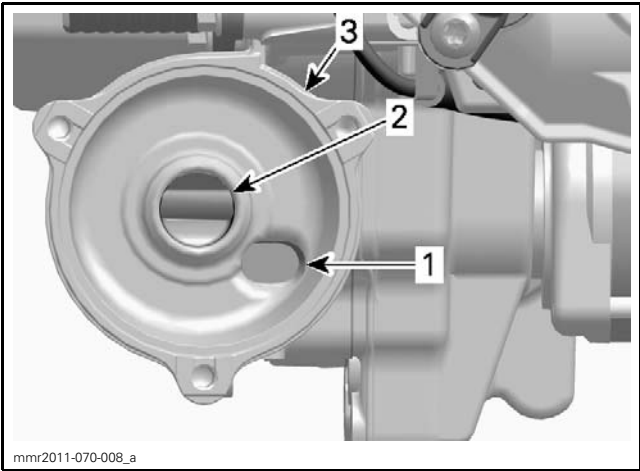
**NOTE:** Oil will spill when oil filter cover is removed. Place a rag around oil filter housing to prevent spillage.

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



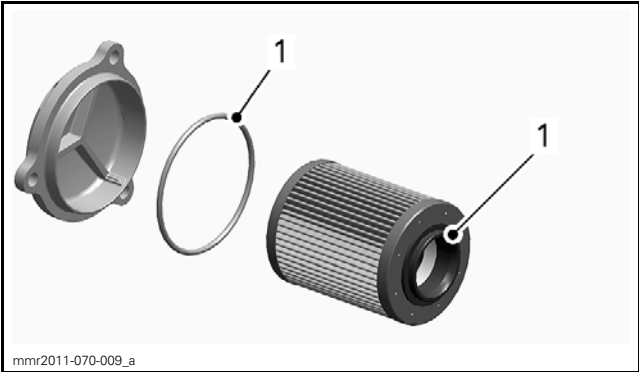
1. Oil filter cover screws  
2. Oil filter cover  
3. O-ring  
4. Oil filter

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<br>(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

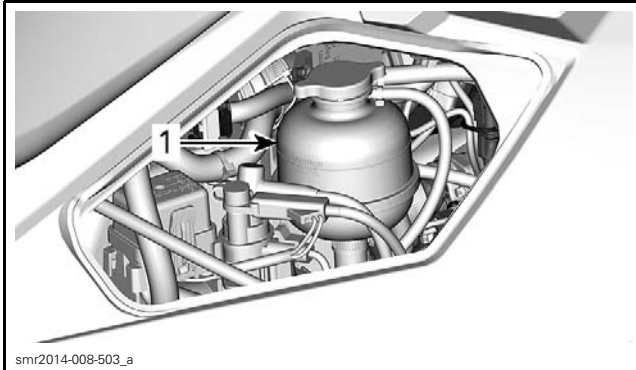
| COUNTRY                          | RECOMMENDED COOLANT                                                                                                                                                                         |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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

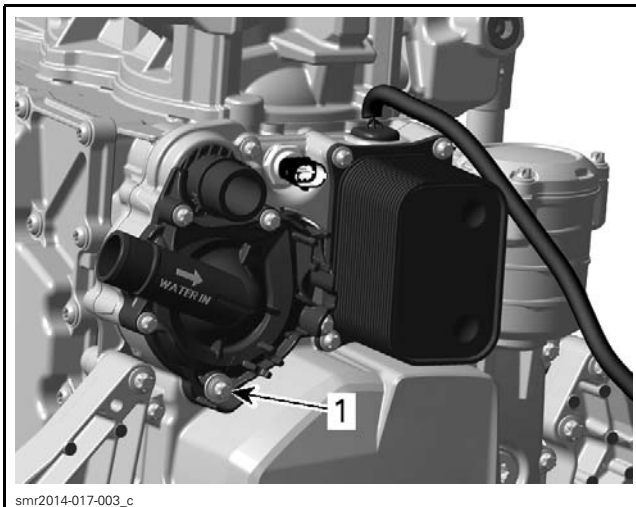
Replace coolant every 300 hours or 5 years.

## Draining the Cooling System

### **WARNING**

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

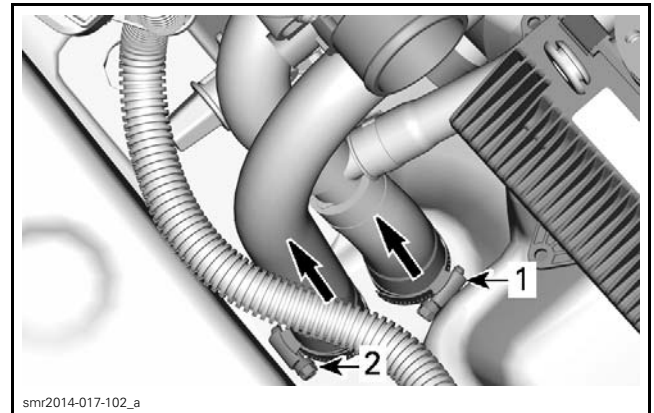
1. Remove central body. Refer to *BODY*.
2. Place a drain pan under the drain screw.
  - 2.1 Remove components as required.
3. Remove drain screw at water pump to drain coolant.



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.

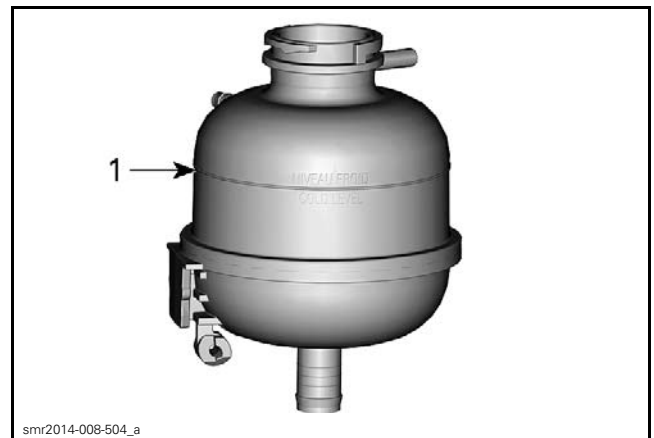
| TIGHTENING TORQUE |                                         |
|-------------------|-----------------------------------------|
| Screw clamp       | 4 N•m ± 1 N•m<br>(35 lbf•in ± 9 lbf•in) |

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

| TIGHTENING TORQUE |                                         |
|-------------------|-----------------------------------------|
| Drain screw       | 9 N•m ± 1 N•m<br>(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*.

**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.

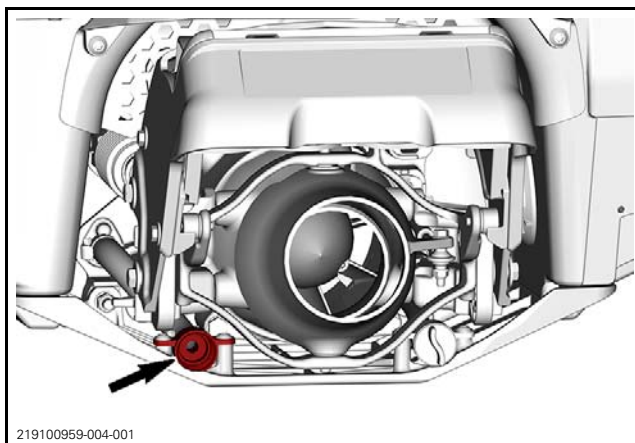
### WARNING

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)<br>(P/N 779183) |
| All other countries | FUEL STABILIZER<br>(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..

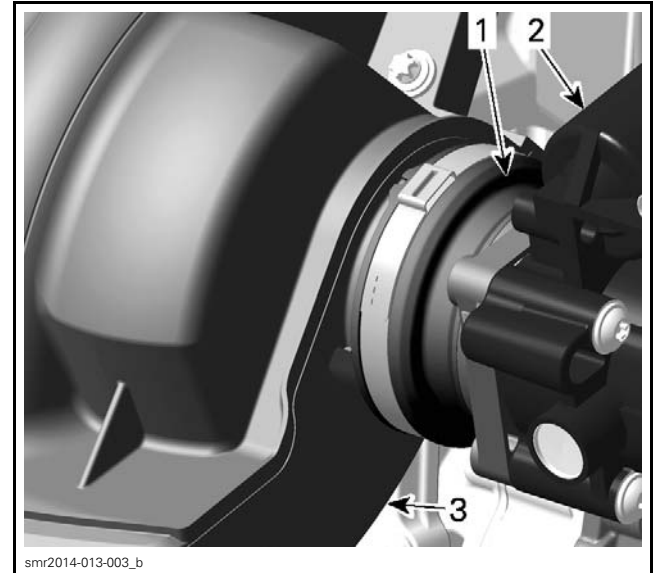
| SERVICE PRODUCT                                         |
|---------------------------------------------------------|
| CLUTCH AND PULLEY FLANGE CLEANER<br>PRO S1 (P/N 779244) |

## 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.



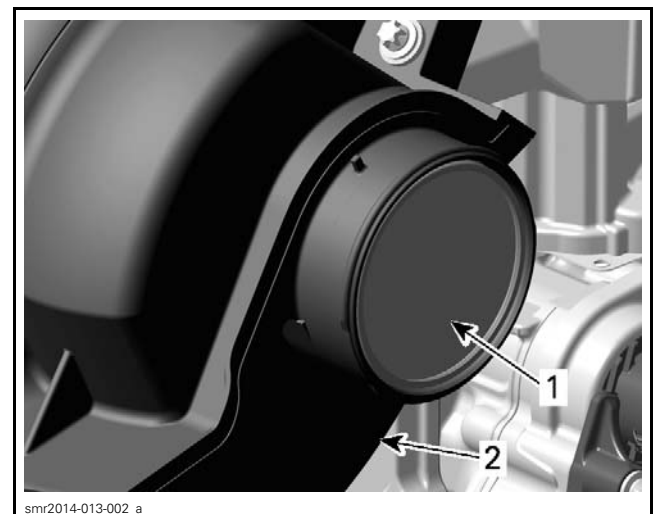
1. Connecting socket
2. Throttle body
3. Intake manifold

### 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.



1. Flame arrestor
2. Intake manifold

## ELECTRICAL SYSTEM

### Charging the Battery

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

### 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 ..... | 3    |
| FUEL STABILIZER (EUR) .....              | 779183 .....      | 1    |
| FUEL STABILIZER .....                    | 779171 .....      | 1    |
| LUB. & ANTI-CORROSIVE .....              | 779168 .....      | 1–2  |
| LUBRICANT AND ANTI-CORROSIVE (EUR) ..... | 779224 .....      | 1    |

## 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)<br>(P/N 779224) |
| All othe countries | LUB. & ANTI-CORROSIVE<br>(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)<br>(P/N 779183) |
| All other countries | FUEL STABILIZER<br>(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

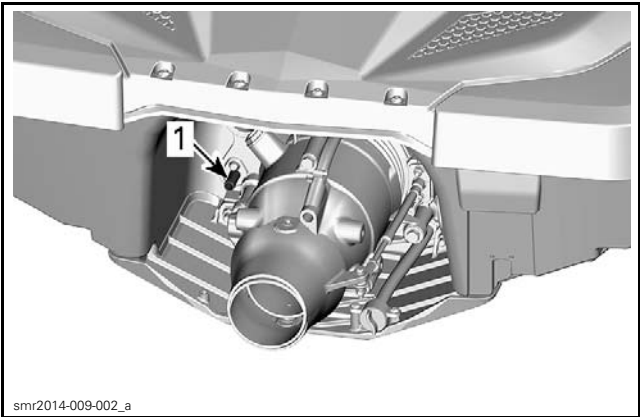
Flush the exhaust system. Refer to *EXHAUST SYSTEM* subsection.

### Draining the Exhaust System

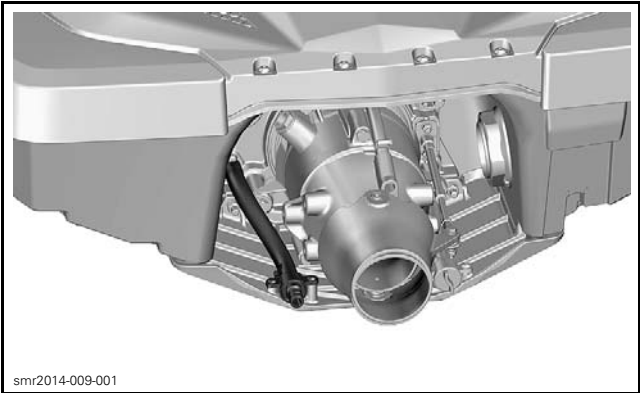
The exhaust system is self draining, but the exhaust manifold needs to be drained to avoid damages should the watercraft be stored in an area where the temperature attains the freezing point of water.

Subsection XX (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.

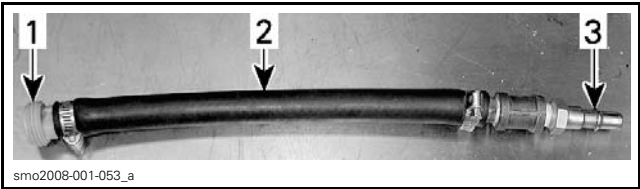


1. Jet pump support connector



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                    |
|------------------------------------|
| LUB. & 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 ..... | 2    |

## SERVICE PRODUCTS

| Description                 | Part Number       | Page |
|-----------------------------|-------------------|------|
| ANTICORROSION SPRAY .....   | 219 700 304 ..... | 3    |
| DIELECTRIC GREASE .....     | 293 550 004 ..... | 2    |
| LUB. & ANTI-CORROSIVE ..... | 779168 .....      | 2-3  |

## 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.

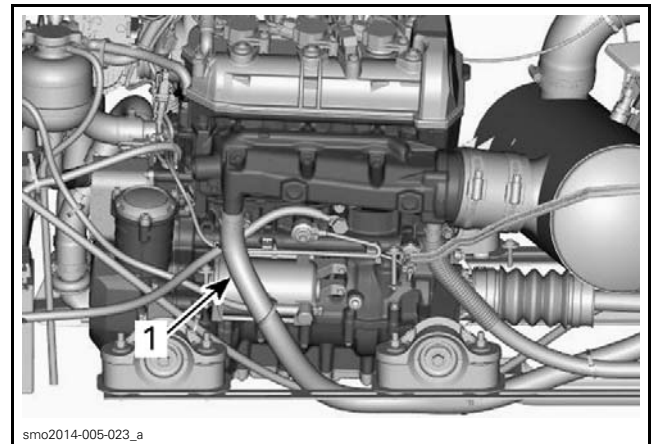
To access the water supply hose, pull out the LH access cover below the LH side of the seat and slide rearward to remove.

### 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.

Subsection XX (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.

| SERVICE PRODUCT                     |
|-------------------------------------|
| 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.

| SERVICE PRODUCT                    |
|------------------------------------|
| LUB. & 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.

| REQUIRED TOOL                     |
|-----------------------------------|
| SUCTION PUMP<br>(P/N 529 035 880) |



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                      |
|---------------------------------------|
| LUB. & 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.





## **WATERCRAFT** **SERVICE** Bulletin



Subject: **Storage Procedure**

| YEAR | MODEL | MODEL NUMBER | SERIAL NUMBER |
|------|-------|--------------|---------------|
| All  | All   | All          | All           |

NOTE: Carry out the following tasks in the same order as detailed in this bulletin.

## **PROCEDURES**

### **Propulsion System**

#### **Jet Pump Cleaning**

Clean jet pump by spraying water in its inlet and outlet and then apply a coating of XPS LUBE (P/N 293 600 016) or equivalent.

#### **⚠ WARNING**

Always remove safety lanyard cap from post to prevent unexpected engine starting before cleaning the jet pump area. Engine must not be running for this operation.

#### **Jet Pump Inspection**

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

#### **Drive Shaft Corrosion Protection**

No protection against corrosion is required since the drive shaft is rubber-coated.

### **Fuel System**

#### **Fuel System Inspection**

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

**NOTICE** Salt water use may cause clamps to prematurely corrode. Therefore, they would require a closer look and a more frequent preventive replacement.

#### **Fuel System Protection**

The BRP FUEL STABILIZER (P/N 413 408 600) or equivalent should be added in 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 components protection against varnish deposits.

### **Engine**

#### **Engine Oil and Filter Replacement**

Change engine oil and filter. Refer to *LUBRICATION SYSTEM* subsection in the appropriate *SHOP MANUAL*.

#### **Intercooler Draining**

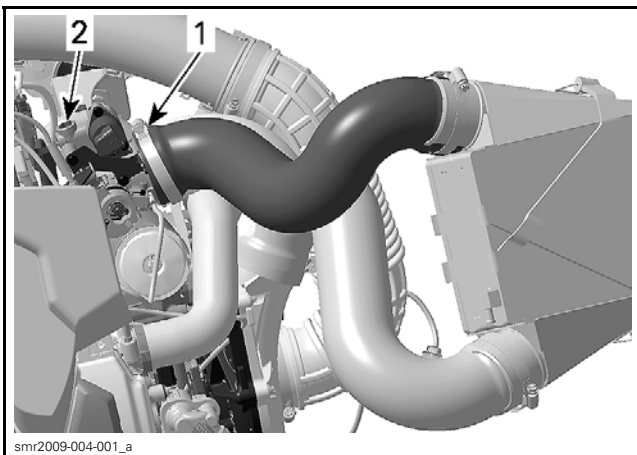
It is important to expel any trapped water that may have accumulated from condensation in the external intercooler.

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

#### ***All 255 Engine Models except iS Series***

1. Removed the intake hose from throttle body.





1. Intake hose
2. Throttle body

2. Start engine and rev up to 4000 RPMs several times. Water will be expelled from intercooler.



sbs2008-005-002

**WATER EXPELLED FROM INTERCOOLER**

3. Stop engine.
4. Liberally lubricate throttle body inside and out.
5. Clean off any lubrication on the throttle body intake hose flange.
6. Install air intake hose to the throttle body.

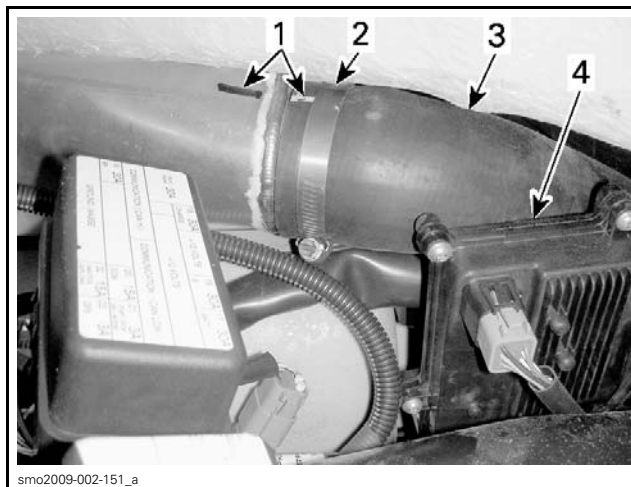
### ***iS Series***

Proceed as follows:

1. Loosen the clamp retaining the intercooler outlet hose.
2. Remove the intercooler outlet hose from the intercooler.

**NOTE:** This hose feeds the inlet of the throttle body.

3. Drape a couple of shop rags over the iS module to protect it from any expelled water from the intercooler.



1. Hose alignment lines
2. Hose clamp
3. Intercooler outlet hose
4. iS module

4. Start engine and rev up to 4000 RPMs several times. Water will be expelled from intercooler.

**NOTE:** Prevent air intake system from aspirating foreign objects which may cause severe engine or damage.

5. Stop engine.

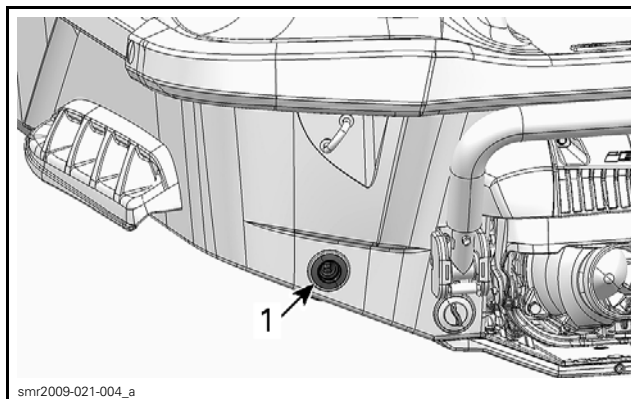
6. Install intercooler outlet hose.

### **Exhaust System Protection**

The exhaust system is self draining, but the exhaust manifold needs to be drained to avoid damages if watercraft is stored in area where freezing weather is present.

Using the flushing connector located at the rear of vehicle, inject pressurized air into system until there is no more water flowing from jet pump.

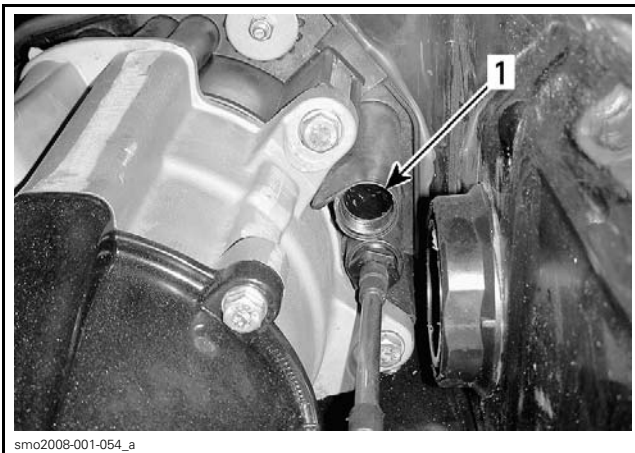
| MODEL            | AIR PRESSURE      |
|------------------|-------------------|
| iS Series        | 380 kPa (55 PSI)  |
| All other models | 689 kPa (100 PSI) |



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**TYPICAL – iS SERIES**

1. Flushing connector

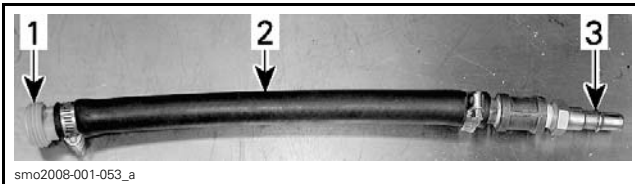


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**TYPICAL – ALL OTHER MODELS**

1. Flushing connector — location may differ

The following hose can be fabricated to ease draining procedure.



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**TYPICAL**

1. Flushing adaptor (P/N 295 500 473)

2. Hose 13 mm (1/2 in)

3. Air hose male adapter

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

## Engine Coolant Replacement

Antifreeze should be replaced every 200 hours or every two years to prevent antifreeze deterioration.

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

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

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

**NOTICE** Improper antifreeze density might lead coolant to freeze if vehicle is stored in area where freezing point is reached. This would seriously damage the engine.

## Engine Internal Lubrication

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:

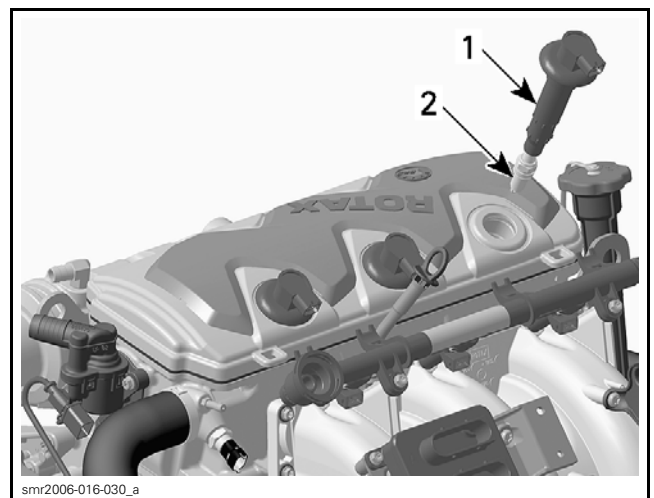
1. Open seat and remove the rear ventilation box.
2. On **iS series**, remove the rear ventilation box. For **all other models**, pull engine cover upward and remove it.
3. Disconnect ignition coil connectors.

### **WARNING**

When disconnecting coil from spark plug, always disconnect coil from main harness first. Never check for engine ignition spark from an open coil and/or spark plug in the engine compartment as spark may cause fuel vapor to ignite.

**NOTICE** Never cut the locking ties of ignition coil connectors. This would allow mixing the wires between cylinders.

4. Clean ignition coil areas to avoid falling dirt into cylinder.
5. Remove ignition coils.
6. Unscrew spark plugs.
7. Using an ignition coil as a puller, remove spark plugs.



smr2006-016-030\_a

1. Ignition coil

2. Spark plug

8. Spray XPS LUBE (P/N 293 600 016) into each spark plug hole.
9. Crank the engine a few turns to distribute the oil on cylinder wall.

---

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

10. Apply LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070) on spark plug threads then reinstall them.
11. Prior to inserting the ignition coil to its location, apply some DOW CORNING 111 (P/N 413 707 000) around the seal area that touches the spark plug hole.
12. Reinstall ignition coils.
13. Ensure the seal seats properly with the engine top surface.
14. Reconnect ignition coil connectors.
15. Install all other removed parts.

## Electrical System

### Battery Removal

For battery removal, cleaning and storage, refer to *CHARGING SYSTEM* subsection in the appropriate *SHOP MANUAL*.

## Vehicle

### Bilge Cleaning

Clean the bilge with hot water and mild detergent or with bilge cleaner.

Rinse thoroughly.

Lift front end of watercraft to completely drain bilge.

### Body and Hull Cleaning

Wash the body with soap and water solution (only use mild detergent). Rinse thoroughly with fresh water. Remove marine organisms from the hull.

**NOTICE** Never clean body parts or hull with strong detergent, degreasing agent, paint thinner, acetone, etc.

Replace damaged labels/decals.

### Body Repair

If any repair is needed, refer to *BODY* subsection in the appropriate *SHOP MANUAL*.

### Anticorrosion Treatment

Wipe off any residual water in the engine compartment.

Spray XPS LUBE (P/N 293 600 016) over all metallic components in engine compartment.

## Vehicle Protection

Apply a good quality marine wax on body and hull.

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

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

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

# ENGINE REMOVAL AND INSTALLATION

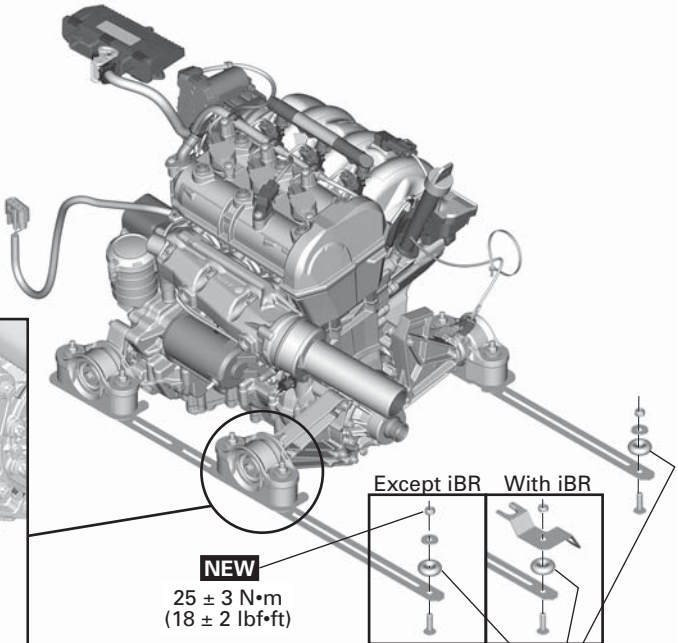
## SERVICE TOOLS

| Description                     | Part Number       | Page |
|---------------------------------|-------------------|------|
| ALIGNMENT GUIDE.....            | 529 036 454 ..... | 7-8  |
| ALIGNMENT SHAFT SUPPORT .....   | 529 035 506 ..... | 7    |
| ALIGNMENT SHAFT .....           | 295 000 141 ..... | 7    |
| ENGINE ALIGNMENT PLATE .....    | 529 036 278 ..... | 7    |
| ENGINE LIFTING TOOL .....       | 529 036 217 ..... | 3    |
| FUEL HOSE DISCONNECT TOOL ..... | 529 036 037 ..... | 3    |
| LARGE HOSE PINCHER.....         | 529 032 500 ..... | 3    |
| SUCTION PUMP .....              | 529 035 880 ..... | 3    |

## SERVICE PRODUCTS

| Description                        | Part Number       | Page |
|------------------------------------|-------------------|------|
| CLEANER AND DEGREASER PRO C1 ..... | 779262 .....      | 6    |
| PULLEY FLANGE CLEANER (F) .....    | 619 600 022 ..... | 6    |

Subsection XX (ENGINE REMOVAL AND INSTALLATION)



25 ± 3 N•m  
(18 ± 2 lbf•ft)

**NEW**

**NEW**

12 ± 2 N•m  
(106 ± 18 lbf•in)

25 ± 3 N•m  
(18 ± 2 lbf•ft)  
+  
Loctite 243

**NEW**

12 ± 2 N•m  
(106 ± 18 lbf•in)

**NEW**

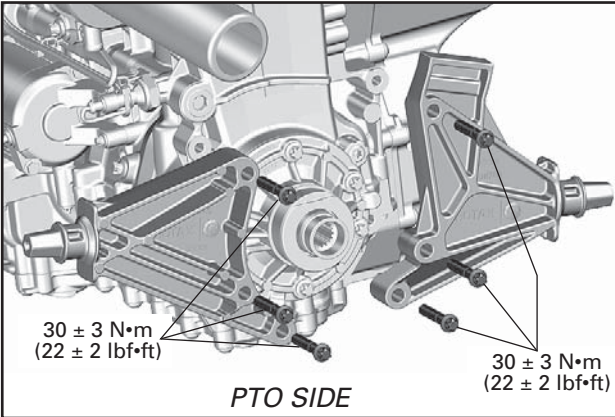
25 ± 3 N•m  
(18 ± 2 lbf•ft)

Except iBR With iBR

**NEW**

25 ± 3 N•m  
(18 ± 2 lbf•ft)

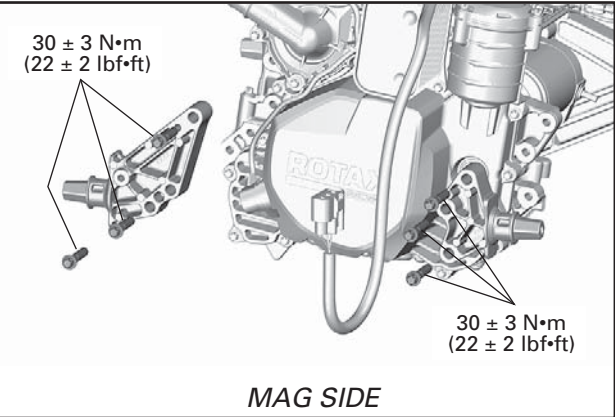
Loctite 5900



30 ± 3 N•m  
(22 ± 2 lbf•ft)

PTO SIDE

30 ± 3 N•m  
(22 ± 2 lbf•ft)



30 ± 3 N•m  
(22 ± 2 lbf•ft)

MAG SIDE

30 ± 3 N•m  
(22 ± 2 lbf•ft)

**NEW** = Component must be replaced when removed.

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## GENERAL

### ⚠ WARNING

When electrically disconnecting or removing the throttle body from the intake manifold, always remove the tether cord from the engine cut-off switch and disconnect the battery.

### ⚠ WARNING

Always disconnect battery prior to working on the fuel system. Always disconnect battery exactly in the specified order, **BLACK (-)** cable first. Electrical connections should be disconnected prior to disconnecting fuel lines.

### ⚠ WARNING

Fuel is flammable and explosive under certain conditions. Work in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity.

### ⚠ WARNING

Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on a pressurized fuel system. Wear safety glasses. Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Proceed with care when removing or installing high pressure test equipment, or disconnecting fuel line connections. Wipe off any fuel spillage in the bilge. Never use a hose pincher on high pressure hoses.

Cover the fuel line connection with an absorbent shop rag before disconnecting them. Slowly disconnect the fuel hose to minimize spilling.

When the repair is completed, ensure the hose from the fuel rail to the fuel pump is properly connected and secured in its support.

### ⚠ WARNING

After working on the fuel system, always pressurize the fuel system and check for fuel leaks. Refer to *FUEL SYSTEM PRESSURIZATION* in *FUEL TANK AND FUEL PUMP* subsection.

### ⚠ WARNING

If a gasoline leak and/or odor is present, do not start the engine. Repair the leak.

## PROCEDURES

### ENGINE

#### Removing the Engine

| REQUIRED TOOLS                                    |                                                                                     |
|---------------------------------------------------|-------------------------------------------------------------------------------------|
| SUCTION PUMP<br>(P/N 529 035 880)                 |  |
| FUEL HOSE<br>DISCONNECT TOOL<br>(P/N 529 036 037) |  |
| LARGE HOSE PINCHER<br>(P/N 529 032 500)           |  |
| ENGINE LIFTING TOOL<br>(P/N 529 036 217)          |  |

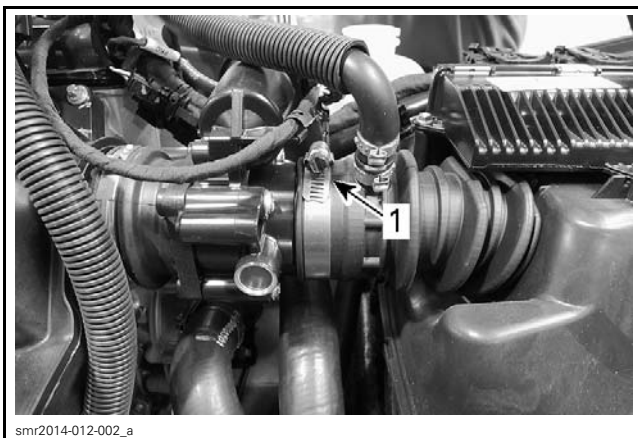
- Place vehicle on a workstation equipped with an engine-lifting hoist.
- Remove the following components:
  - Central body (refer to *BODY* subsection)
  - Jet pump housing (refer to *JET PUMP* subsection)
  - Drive shaft (refer to *DRIVE SHAFT* subsection)
  - Muffler (refer to *EXHAUST SYSTEM* subsection).
- Disconnect **BLACK (-)** lead from battery.
- Drain engine coolant using the suction pump.



- Coolant reservoir
- Suction pump hose

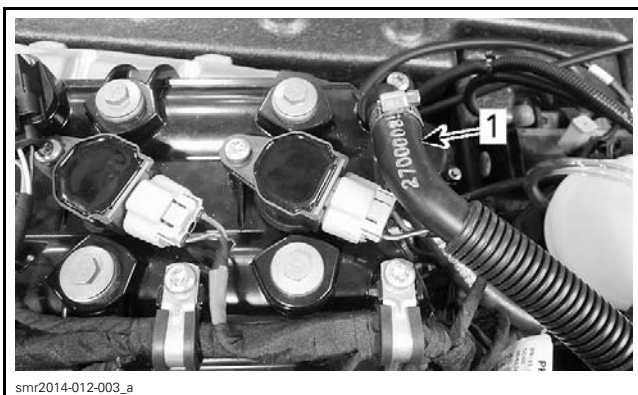
- Detach air intake silencer hose from throttle body.
  - Loosen air intake silencer hose clamp.

## Subsection XX (ENGINE REMOVAL AND INSTALLATION)



1. Loosen this clamp

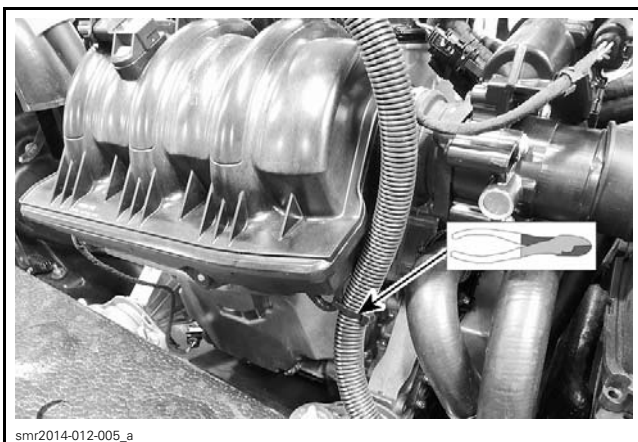
5.2 Detach blow-by hose from cylinder valve cover.



1. Blow-by hose

6. Disconnect fuel inlet hose from fuel rail. Refer to *FUEL RAIL HOSE DISCONNECTION* in *ELECTRONIC FUEL INJECTION*

7. Cut locking tie securing fuel hose to intake manifold.

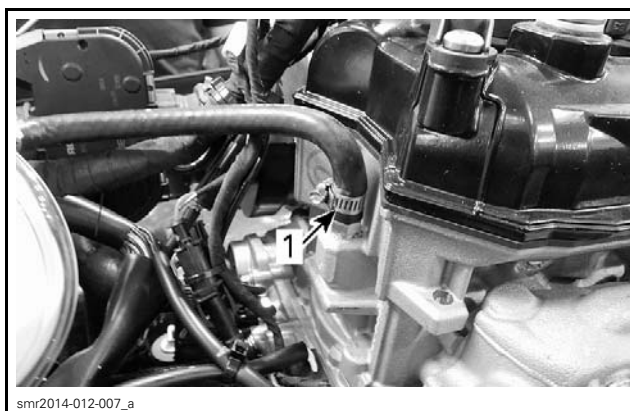


8. Disconnect coolant return hose.

8.1 Cut locking tie securing the hose to wiring harness.



8.2 Loosen clamp on cylinder head.

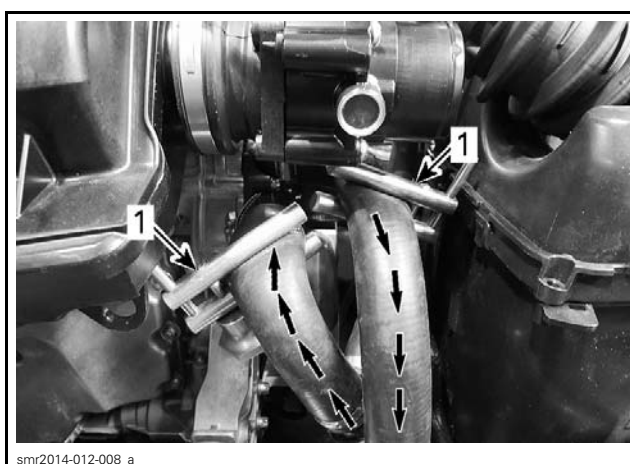


1. Coolant return hose clamp

9. Disconnect inlet and outlet radiator hoses.

9.1 Install a large hose pincher on each hose.

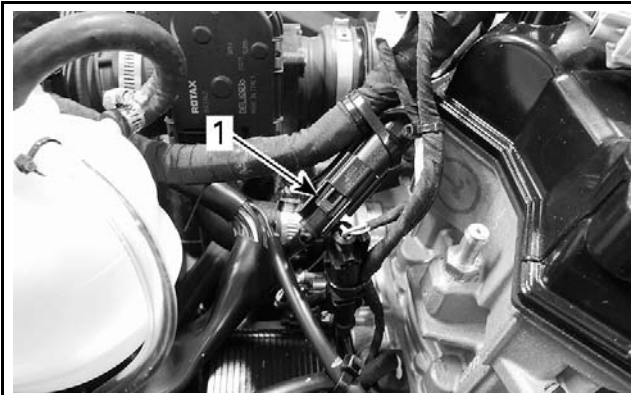
9.2 Loosen hoses clamps and disconnect hoses from thermostat housing.



1. Large hose pinchers

10. Unplug knock sensor connector.





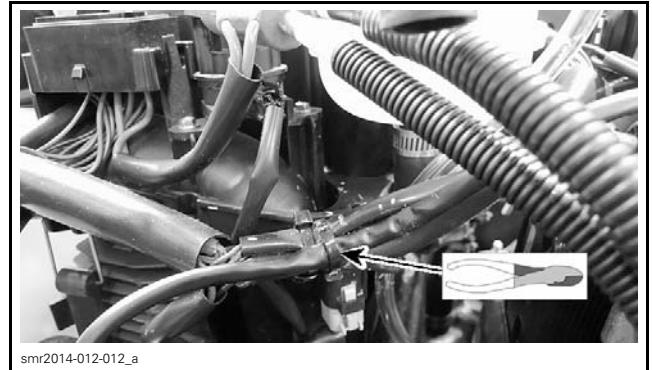
1. Knock sensor connector

11. Unplug the "A" connector from the ECM.

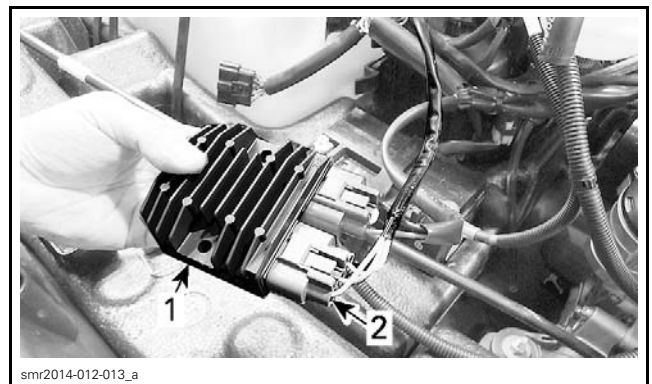


1. ECM "A" connector

12. Cut locking ties securing engine harness to vehicle harness.



13. Unplug magneto connector from voltage regulator/rectifier.



1. Voltage regulator/rectifier  
2. Magneto connector

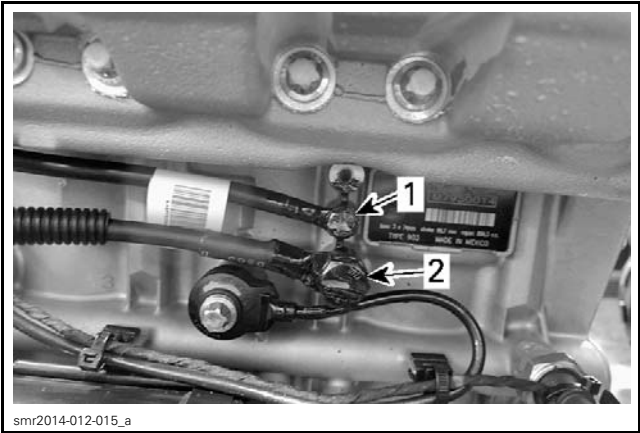
14. Disconnect inlet and outlet hoses from exhaust manifold.



1. Exhaust manifold inlet hose  
2. Exhaust manifold outlet hose

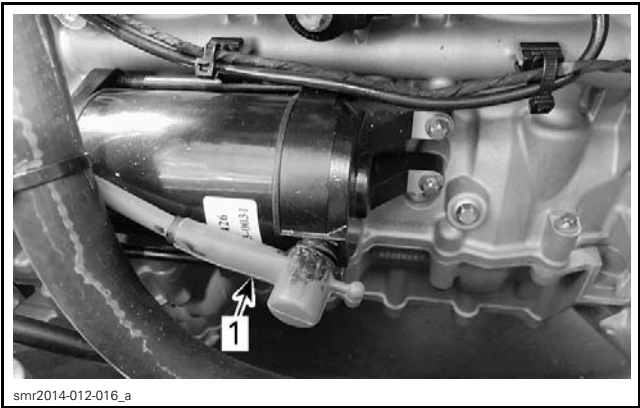
15. Unscrew both ground wires from engine.

Subsection XX (ENGINE REMOVAL AND INSTALLATION)



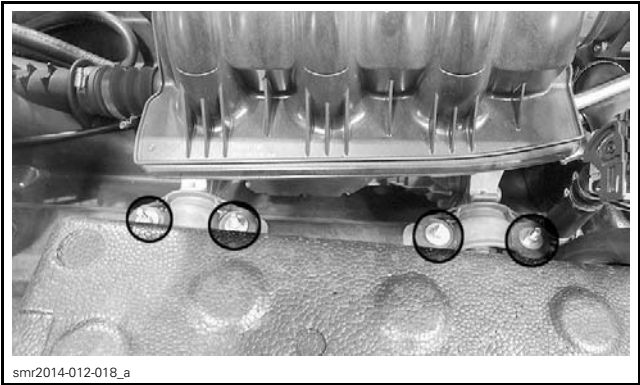
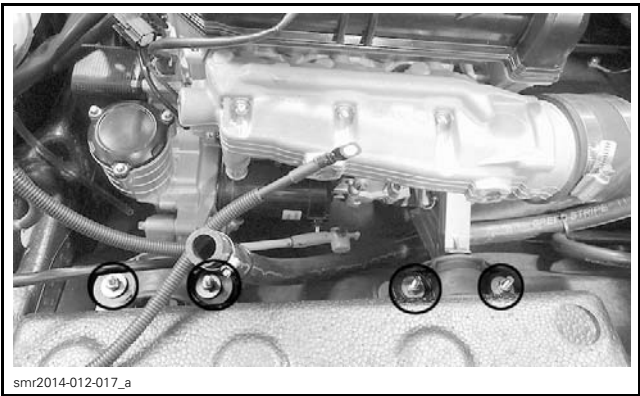
- 1. Engine/vehicle grounds
- 2. Battery ground

16. Detach starter cable from starter.

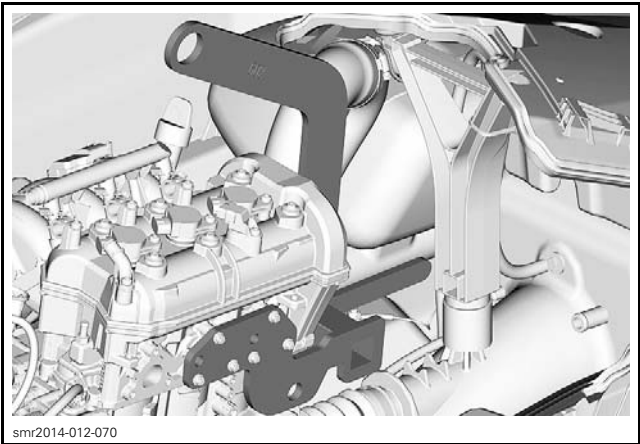


- 1. Starter cable

17. Remove and discard elastic nuts retaining engine mount clamps.



18. Remove exhaust manifold and install the engine lifting tool.



19. Slowly lift the engine out of hull.

Installing the Engine

The installation is the reverse of the removal procedures. However pay attention to the following. Wipe off any spillage in bilge.

| SERVICE PRODUCT     |                                             |
|---------------------|---------------------------------------------|
| Scandinavia         | PULLEY FLANGE CLEANER (F) (P/N 619 600 022) |
| All other countries | CLEANER AND DEGREASER PRO C1 (P/N 779262)   |

Place engine into vehicle.

Install all engine mount clamps and secure them loosely using new M8 elastic stop nuts.

Perform the engine alignment.

**NOTICE** The engine alignment must be completed before finalizing the engine installation.

Install and properly align muffler. Refer to *EXHAUST SYSTEM* subsection.

Reinstall all other removed parts.

Check fuel hose condition and pressure test the fuel system, refer to *FUEL SYSTEM* section.

### **⚠ WARNING**

Whenever doing any type of repair on watercraft or if any components of the fuel system are disconnected, a pressure test must be done before starting engine.

Verify all electrical connections (ground wires and battery).

Fill and bleed the engine cooling system. Refer to *COOLING SYSTEM* subsection

Run engine and ensure there is no leakage.

**NOTICE** If watercraft is out of water, exhaust system must be cooled using the flush kit. Never run engine more than 2 minutes.

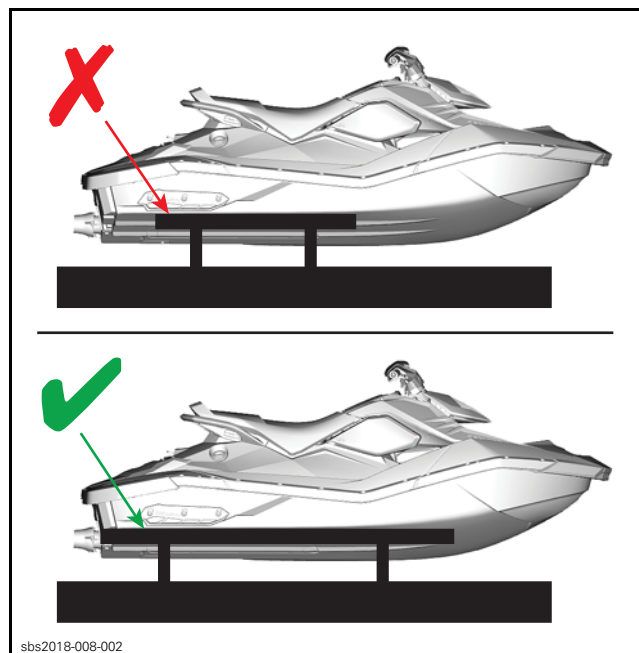
### Performing the Engine Alignment

Engine alignment is required only when one of the following parts is removed and/or replaced with new one.

- Engine supports (from cylinder block)
- Engine mount base (more than one)
- Jet pump support
- Hull.

### Vehicle and Tool Preparation

The vehicle must be supported practically on its complete length to avoid hull deformation. It is important to support from the edge of the rear end up to at least the front of the engine.

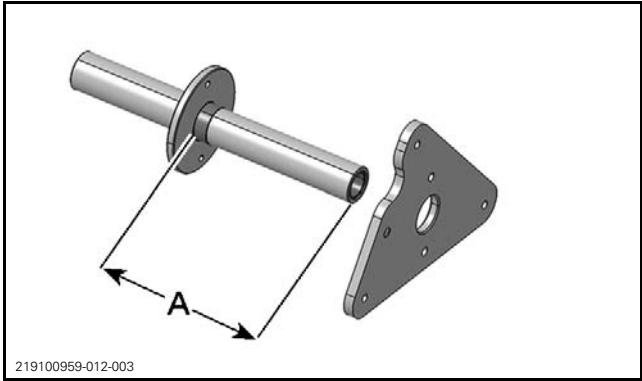


| REQUIRED TOOLS                               |                                                                                       |
|----------------------------------------------|---------------------------------------------------------------------------------------|
| ENGINE ALIGNMENT PLATE<br>(P/N 529 036 278)  |   |
| ALIGNMENT SHAFT SUPPORT<br>(P/N 529 035 506) |  |
| ALIGNMENT SHAFT (P/N 295 000 141)            |  |
| ALIGNMENT GUIDE (P/N 529 036 454)            |  |

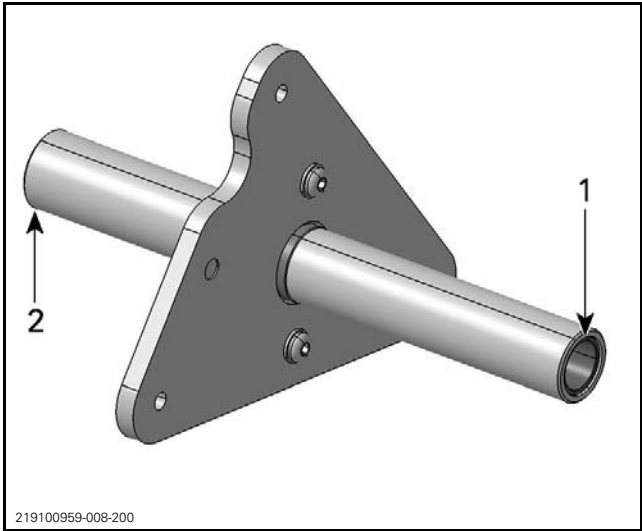
To verify alignment of engine proceed as follows:

1. Remove drive shaft. Refer to *DRIVE SHAFT* subsection.
2. Assemble alignment tool.
  - 2.1 Install the alignment shaft support on engine alignment plate.

Subsection XX (ENGINE REMOVAL AND INSTALLATION)



A. 166.5 mm (7 in)

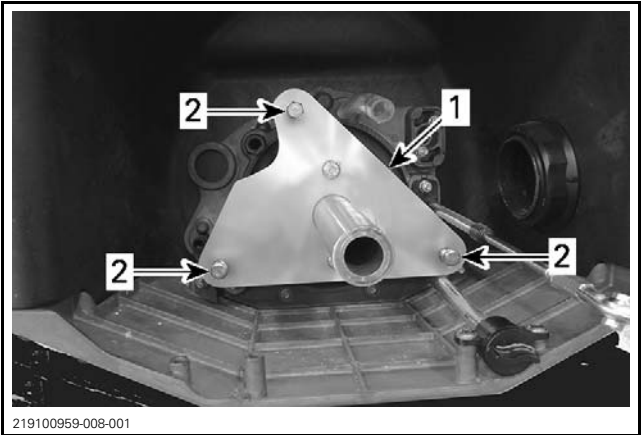


THE DIAMETER OF THE SHAFT IS AS FOLLOWS

- 1. 36 mm (1.42 in)
- 2. 37 mm (1.46 in)

**NOTICE** Proper tool assembly is critical to positioning the engine correctly. The shaft support needs to be behind the plate to have a correct reading.

- 2.2 Secure using M8 x 25 x 1.25 hexagonal screws.
- 3. Install the alignment tool.
  - 3.1 Put the alignment tool assembly against the pump support.
  - 3.2 Secure it using previously removed jet pump retaining screws.

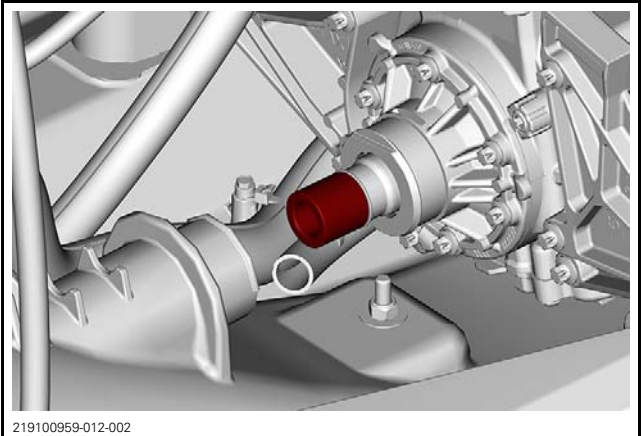


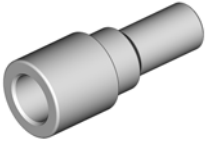
- 1. Alignment tool
- 2. Jet pump retaining screws

| TIGHTENING TORQUE         |                                          |
|---------------------------|------------------------------------------|
| Jet pump retaining screws | 22 N•m ± 2 N•m<br>(16 lbf•ft ± 1 lbf•ft) |

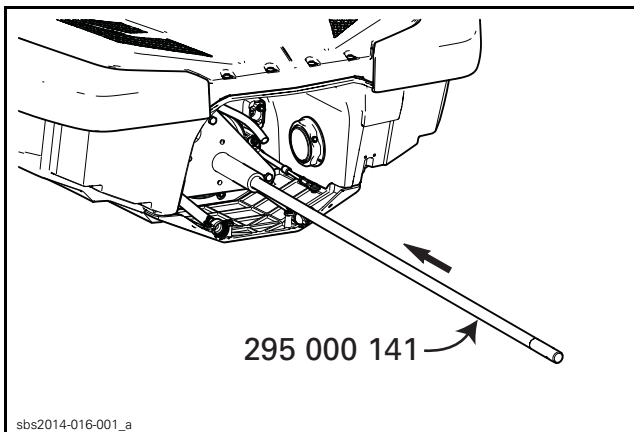
Validating the Engine Vertical and Transversal Positions

Install the engine alignment guide tool in crankshaft PTO sleeve.



| REQUIRED TOOL                        |                                                                                       |
|--------------------------------------|---------------------------------------------------------------------------------------|
| ALIGNMENT GUIDE<br>(P/N 529 036 454) |  |

Carefully slide the alignment shaft tool through the engine alignment tool until it bottoms out inside the bore of the alignment guide tool.



Insert alignment shaft end into crankshaft PTO sleeve.

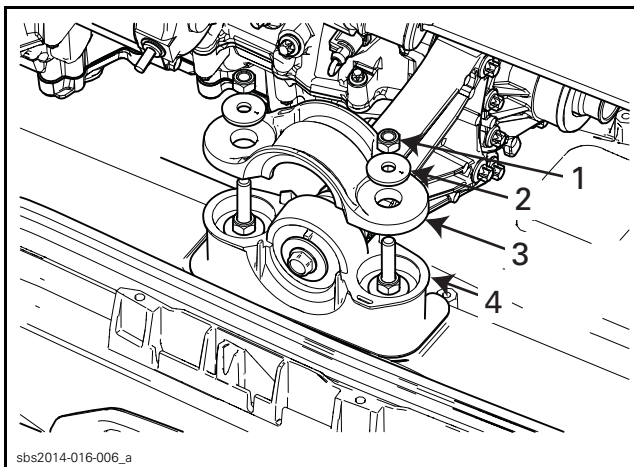
**NOTE:** A small resistance during shaft insertion is normal.

## If the Engine Alignment is Correct

Check the longitudinal position of engine.

## If the Engine Alignment is Incorrect

1. Remove all engine mount clamps.
2. Loosen nuts securing engine mount base.



1. Engine mount clamp nut
2. Flat washer
3. Engine mount clamp
4. Engine mount base

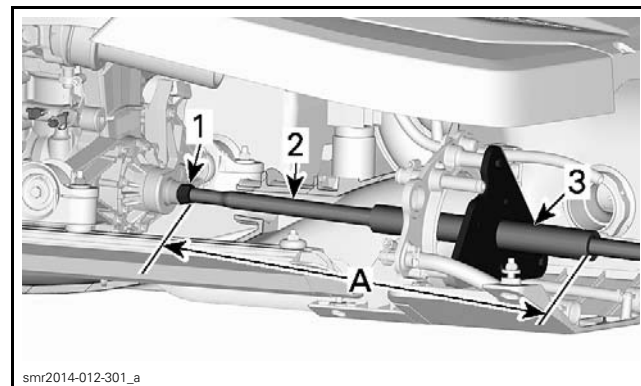
3. Add or remove shims as required.

**NOTE:** It is better to install **slightly** too thick shims than not thick enough.

4. Try to insert the alignment shaft into crankshaft PTO sleeve again.
5. Repeat all steps until alignment is done.
6. When engine alignment is correct, check the longitudinal position of engine.

## Verifying the Engine Longitudinal Position

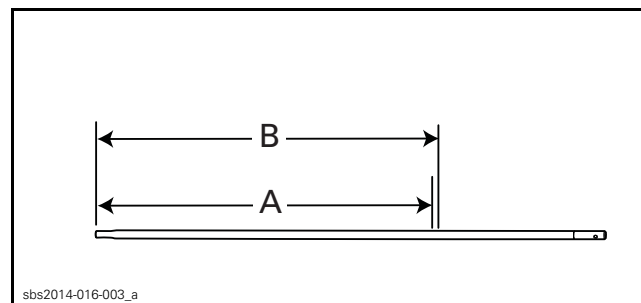
The longitudinal verification is taken between the PTO alignment guide and the end of the alignment tool.



1. PTO alignment guide
2. Alignment shaft
3. Alignment tool

A. Required longitudinal distance of engine

Trace two thin lines on alignment shaft as per the following table.

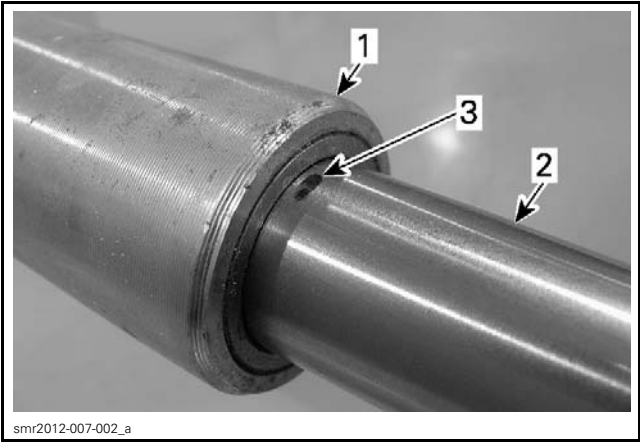


| LINES  | DISTANCE             |
|--------|----------------------|
| Line A | at 612 mm (24.1 in)  |
| Line B | at 615 mm (24.21 in) |

1. Slide the alignment shaft through the engine alignment tool until it bottoms out inside the bore of the alignment guide tool.
2. While holding the alignment shaft in this position, check the location of the marks (previously drawn at the beginning of this procedure).
3. Engine is properly positioned longitudinally when the engine alignment tool is between both shaft marks.
  - If **one** mark is visible, the engine is properly positioned.
  - If **both** marks are visible, the engine must be moved forward.
  - If **no** mark is visible, the engine must be moved rearward.

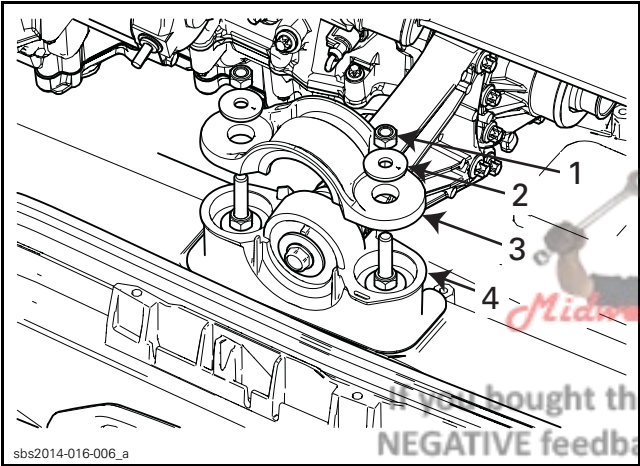


Subsection XX (ENGINE REMOVAL AND INSTALLATION)



- PROPER POSITION**
- 1. Engine alignment tool
  - 2. Alignment shaft
  - 3. Mark at 615 mm (24.21 in)

- If an adjustment is required:
- Remove all engine mount clamps.
  - Loosen nuts securing engine mount base.
  - Move the engine forwards or rearwards to reach the required position.



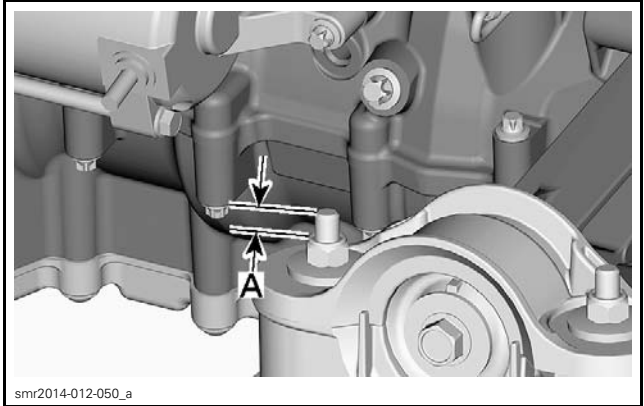
- 1. Engine mount clamp nut
- 2. Flat washer
- 3. Engine mount clamp
- 4. Engine mount base

- 4. Retighten engine mount base nuts.
- 5. Install and secure engine mount clamps.

| TIGHTENING TORQUE       |                                            |
|-------------------------|--------------------------------------------|
| Engine mount base nuts  | 12 N•m ± 2 N•m<br>(106 lbf•in ± 18 lbf•in) |
| Engine mount clamp nuts | 25 N•m ± 3 N•m<br>(18 lbf•ft ± 2 lbf•ft)   |

- 6. Repeat all steps until alignment is done.
- 7. When the engine alignment is completed, replace nuts retaining the engine mount clamps with **NEW** ones.

**NOTICE** When the tightening is completed, make sure to leave a minimum of 3 mm (1/8 in) of free threads over the engine mount clamp nuts.



A. 3 mm (1/8 in) minimum

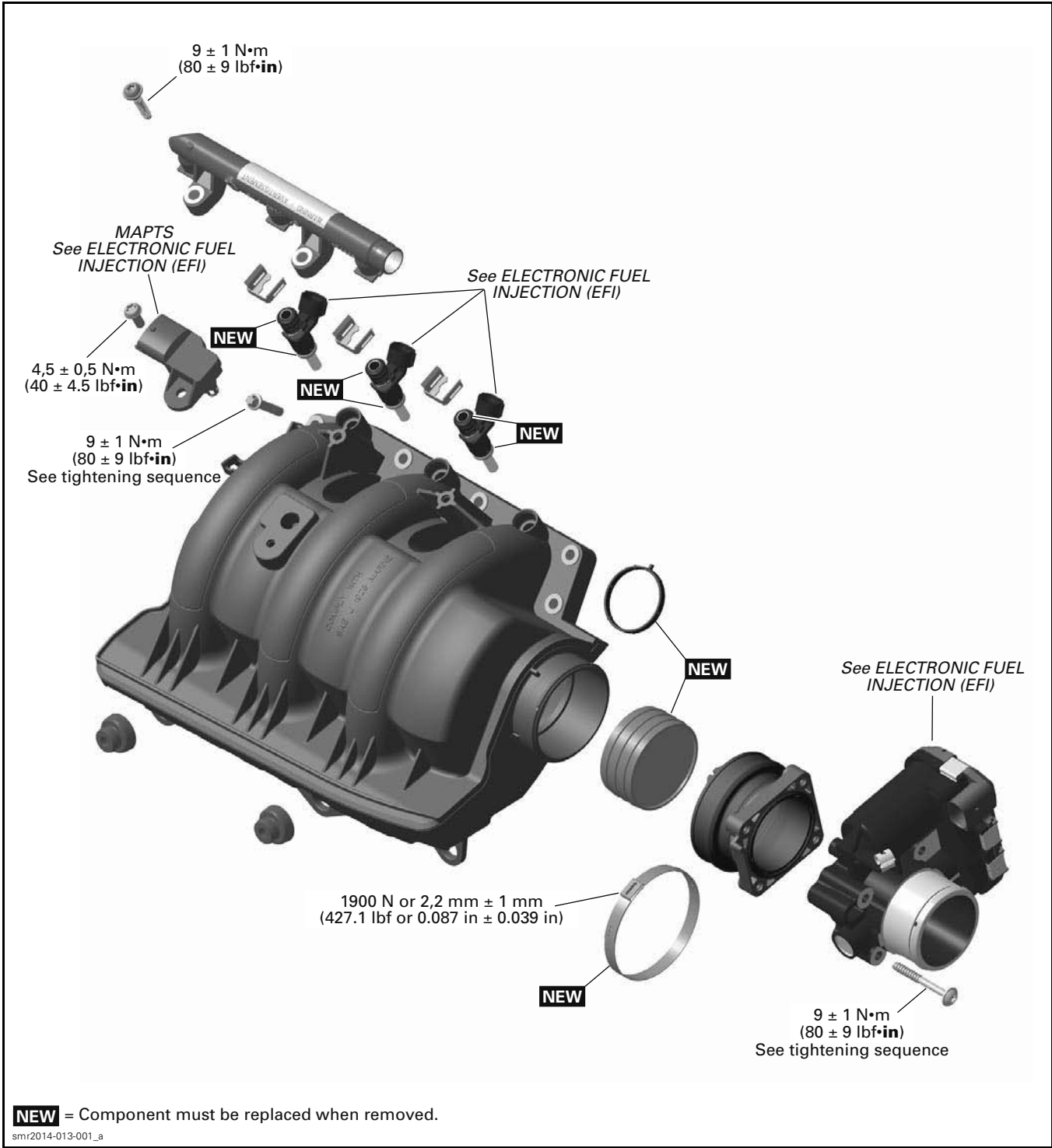
Recheck engine alignment.

# AIR INTAKE SYSTEM

## SERVICE TOOLS

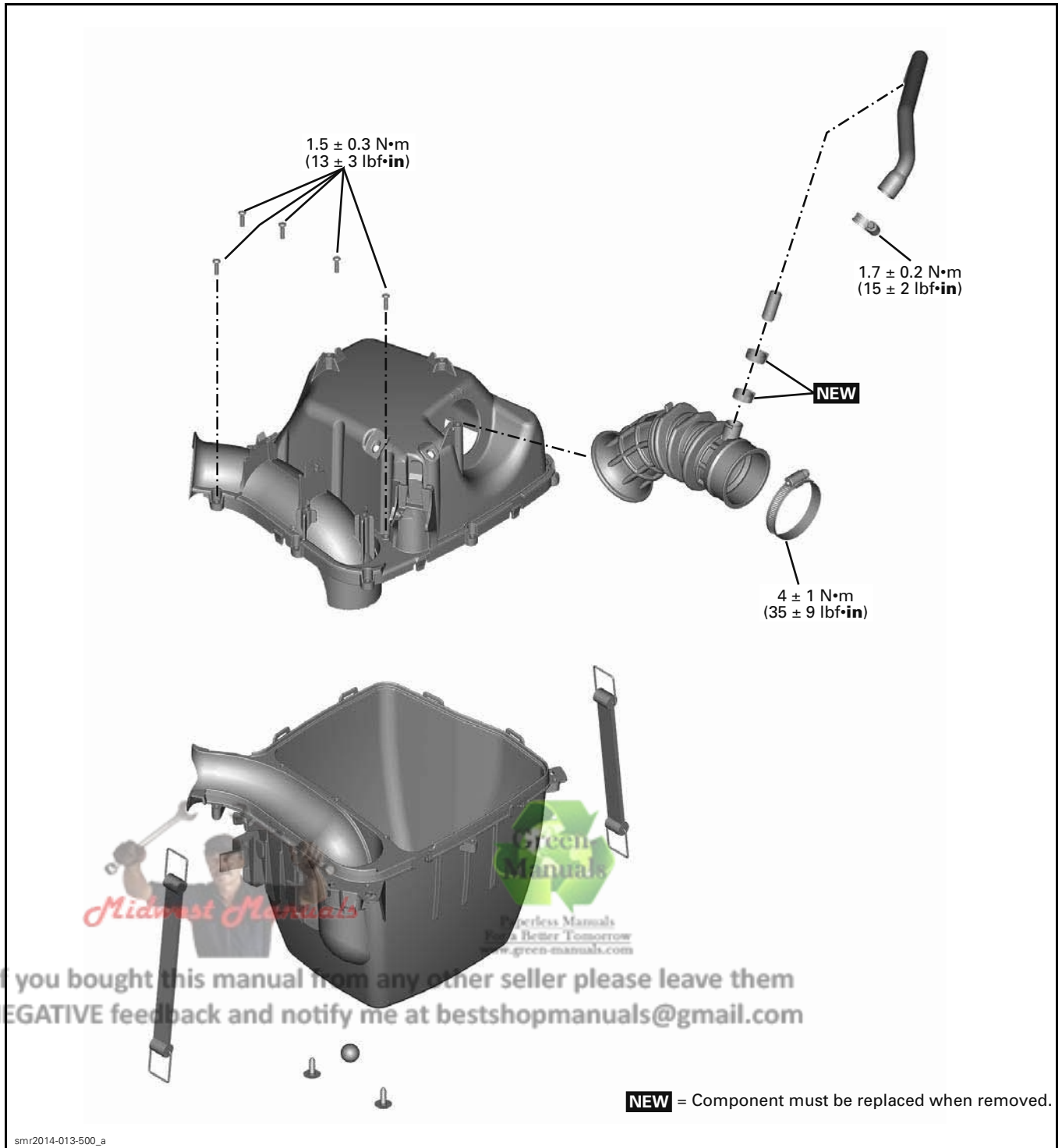
| Description         | Part Number       | Page  |
|---------------------|-------------------|-------|
| OETIKER PLIERS..... | 295 000 070 ..... | 36-37 |

INTAKE MANIFOLD





## AIR INTAKE SILENCER



**PROCEDURES**

**FLAME ARRESTOR**

**Flame Arrestor Location**

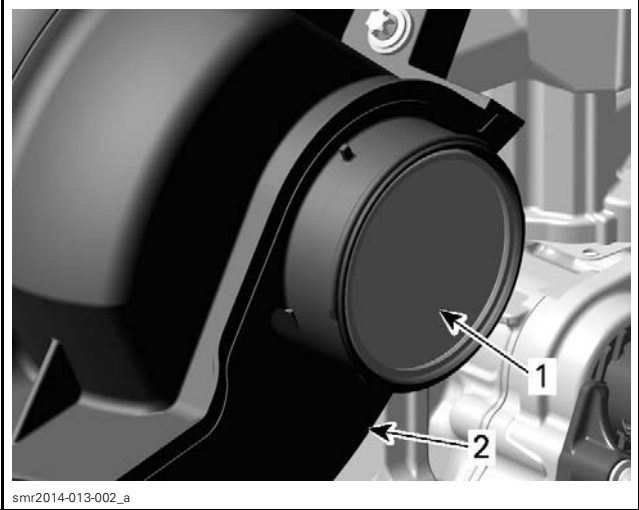
The flame arrestor is integrated in the intake manifold.

**Flame Arrestor Access**

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

Remove Oetiker clamp and discard it.

| REQUIRED TOOL                    |                                                                                   |
|----------------------------------|-----------------------------------------------------------------------------------|
| OETIKER PLIERS (P/N 295 000 070) |  |

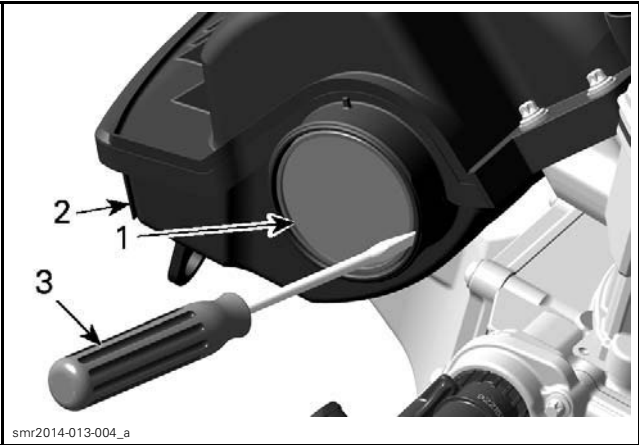


1. Flame arrestor  
2. Intake manifold

**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

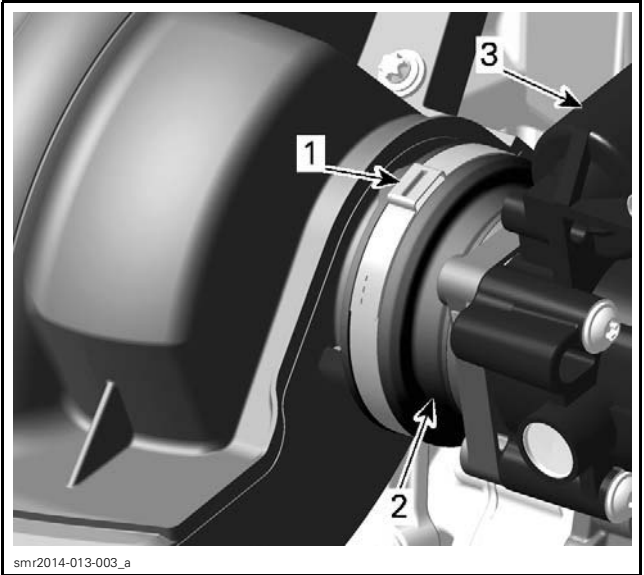
**Flame Arrestor Cleaning**

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.

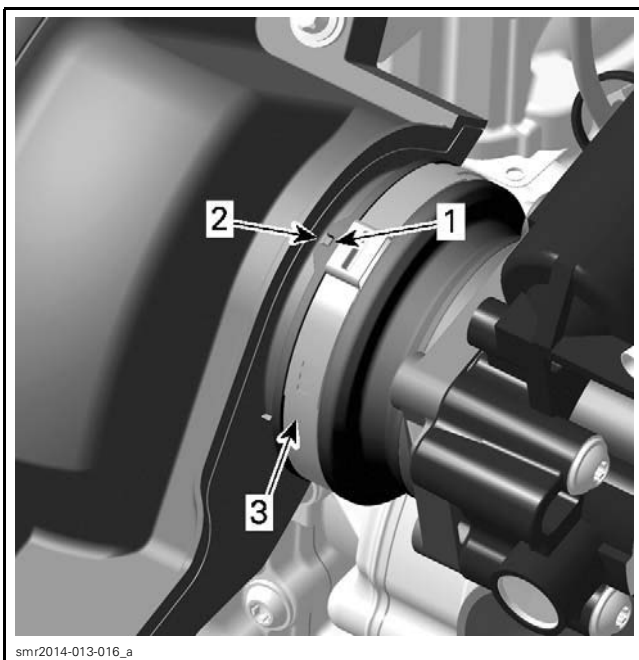
**NOTE:** A clogged flame arrestor may have a negative impact on engine performance.



smr2014-013-012  
**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.

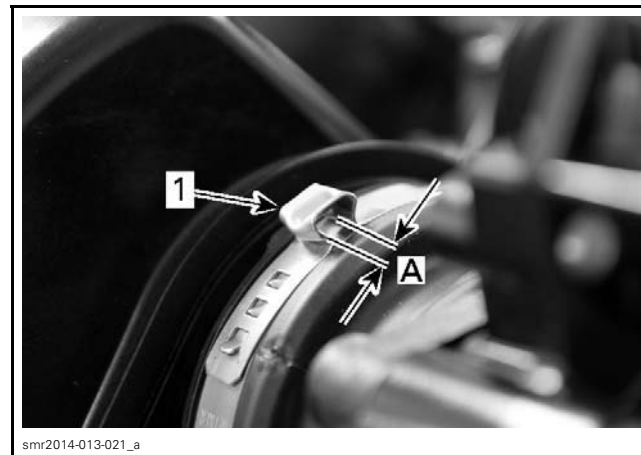


- smr2014-013-016\_a
1. Connecting socket notch
  2. Intake manifold tab
  3. Oetiker clamp

Crimp Oetiker clamp beside the intake manifold tab.

| REQUIRED TOOL                    |                                                                                     |
|----------------------------------|-------------------------------------------------------------------------------------|
| OETIKER PLIERS (P/N 295 000 070) |  |

| OETIKER CLAMP CRIMPING                                      |
|-------------------------------------------------------------|
| 2.2 mm ± 1 mm (.087 in ± .039 in) or<br>1 900 N (427.1 lbf) |



- smr2014-013-021\_a
1. Oetiker clamp
  - A. Crimp to 2.2 mm ± 1 mm (.087 in ± .039 in)

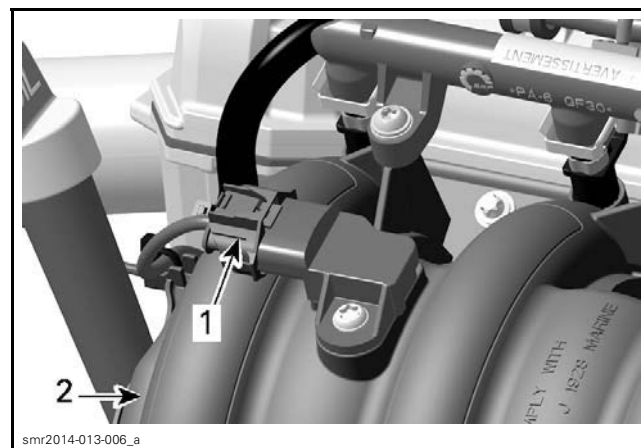
### INTAKE MANIFOLD

#### Intake Manifold Access

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

#### Intake Manifold Removal

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

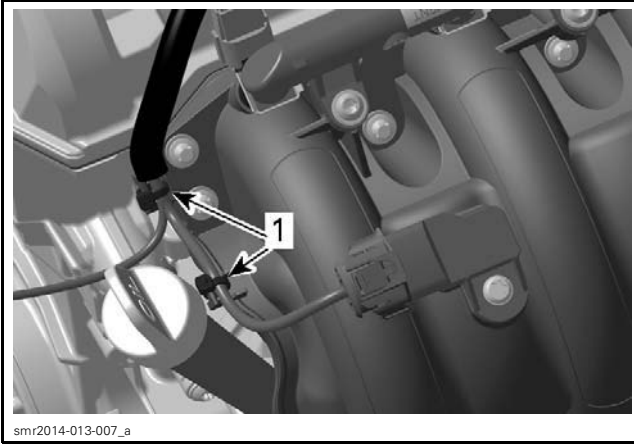


- smr2014-013-006\_a
1. MAPTS connector
  2. Intake manifold

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

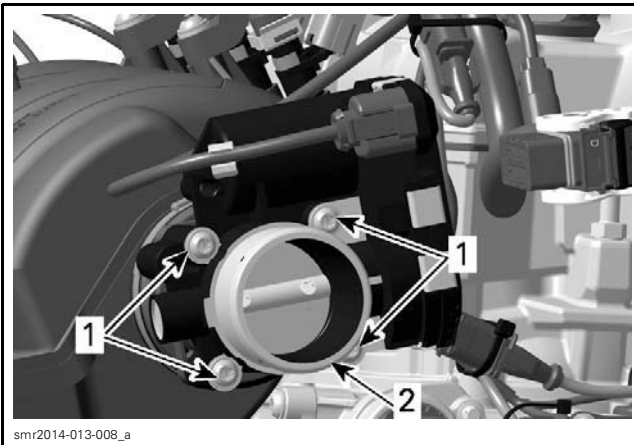
## Section 02 ENGINE

### Subsection 02 (AIR INTAKE SYSTEM)



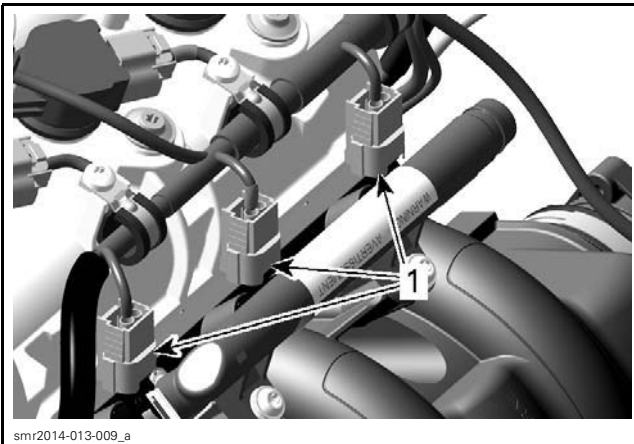
1. Locking ties

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



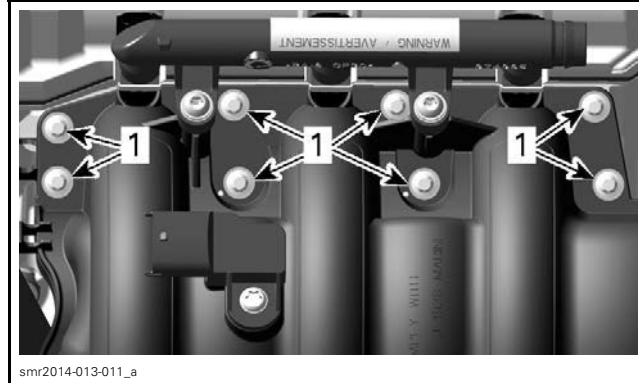
1. Retaining screws  
2. Throttle body

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.

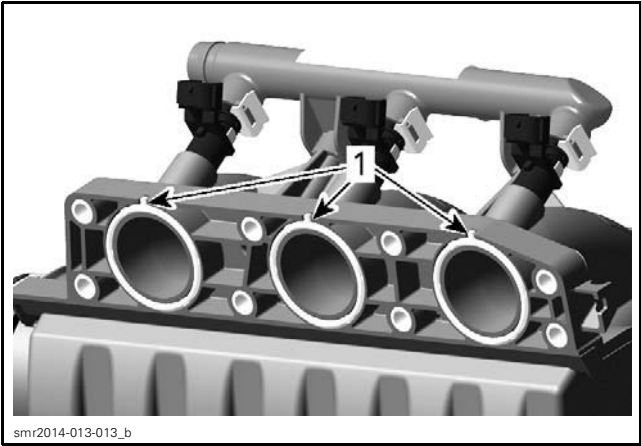
Drain intake manifold if any liquids accumulated.

Flush intake manifold with solvent and let it dry out.

### Intake Manifold Installation

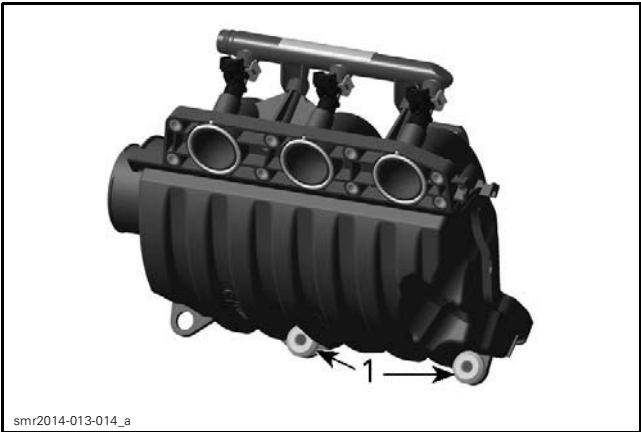
The installation is the reverse of the removal procedure. However, pay attention to the following.

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



1. Gaskets tab properly inserted

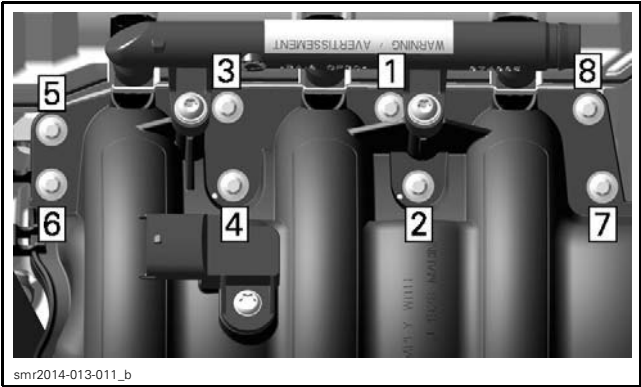
Ensure that rubber grommets are properly inserted.



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<br>(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.

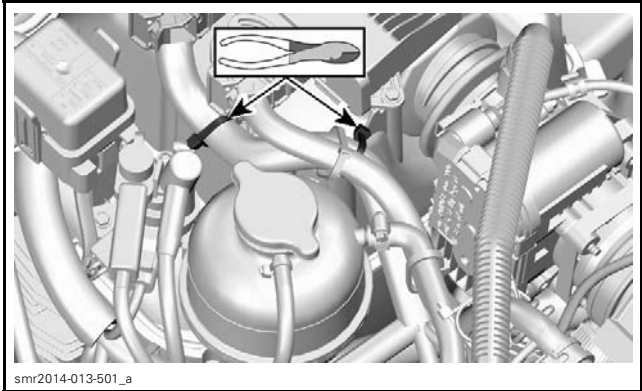
## AIR INTAKE SILENCER

### Air Intake Silencer Access

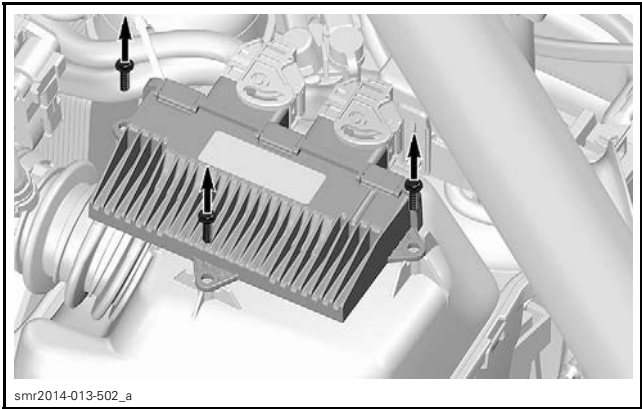
Remove the central body. Refer to *BODY* subsection.

### Air Intake Silencer Removal

Cut locking ties securing electrical harnesses to air intake silencer.



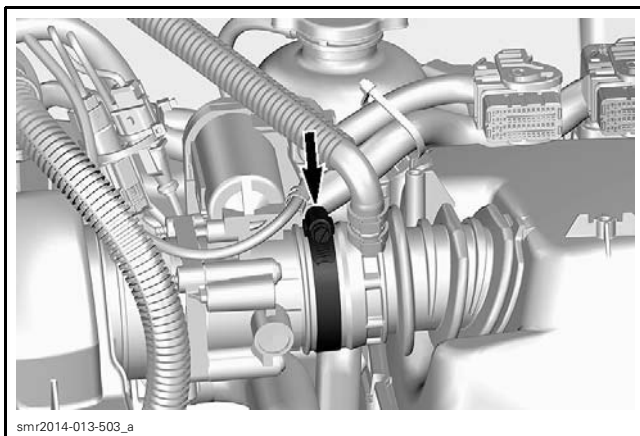
Remove the ECM.



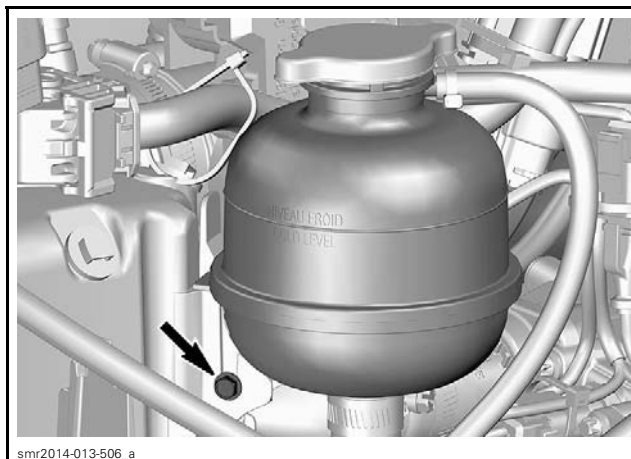
Loosen throttle body clamp.

## Section 02 ENGINE

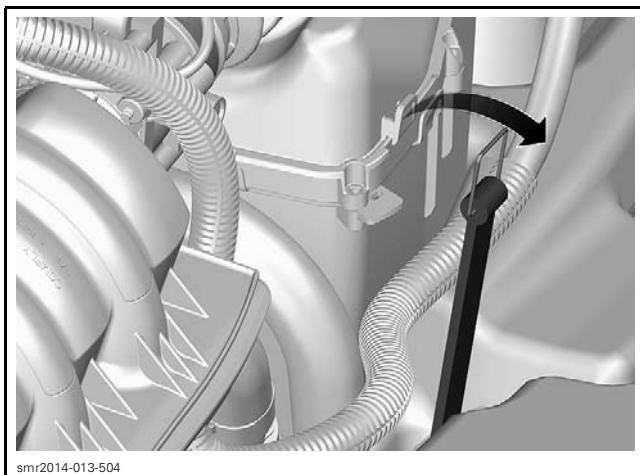
### Subsection 02 (AIR INTAKE SYSTEM)



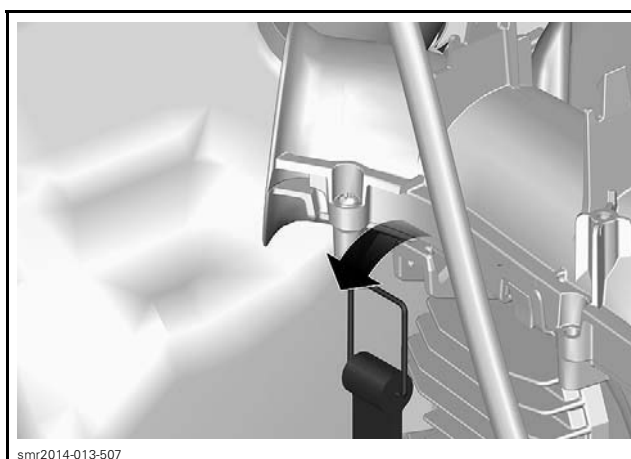
Detach the RH retaining strap.



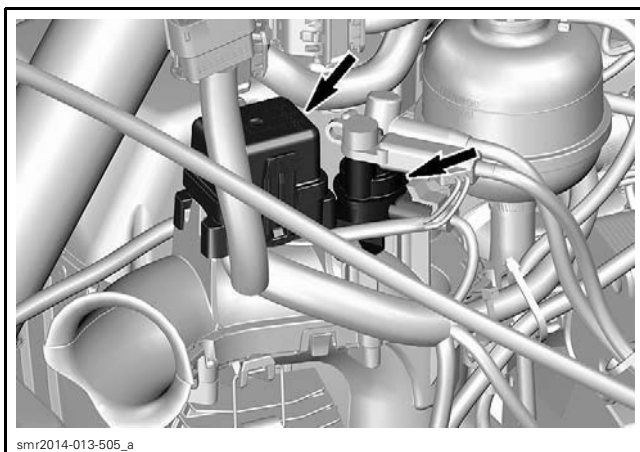
Remove the last retaining strap.



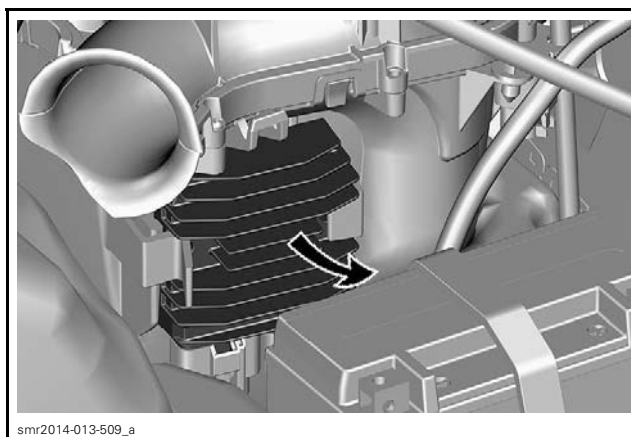
Remove fuse box and starter solenoid.



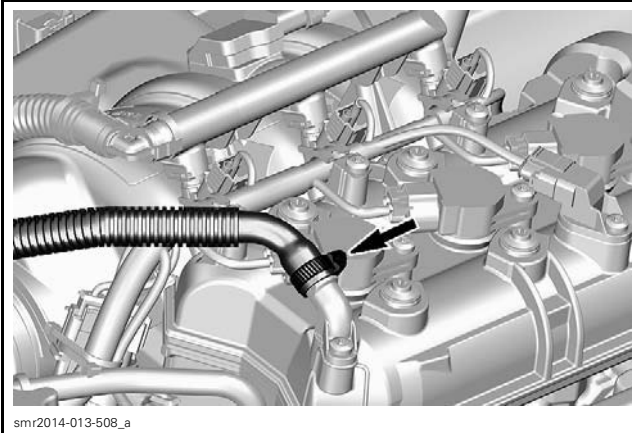
Remove the voltage regulator/rectifier.



Loosen coolant reservoir screw and move the reservoir aside.



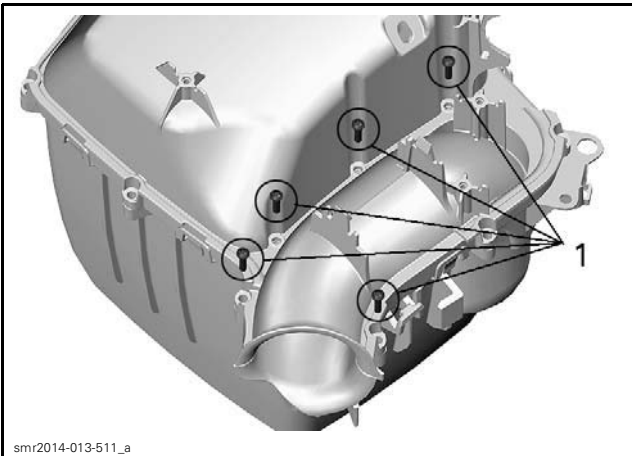
Loosen clamp and remove vent hose from the cylinder head cover.



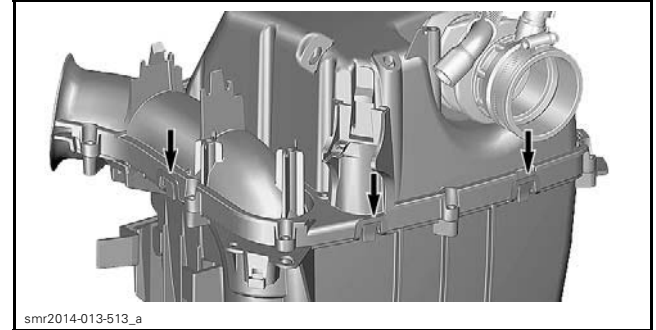
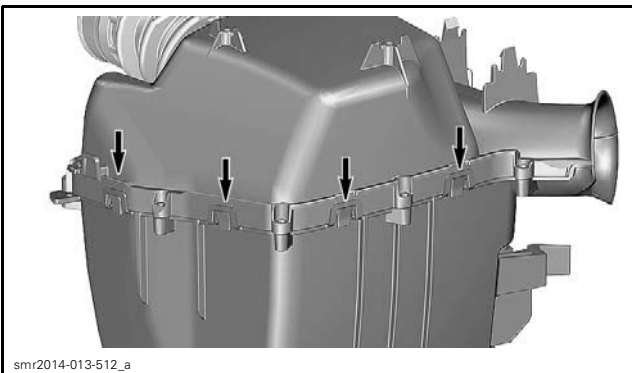
Detach the diagnostic connector and pull the air intake silencer out of the vehicle.

### Air Intake Silencer Disassembly

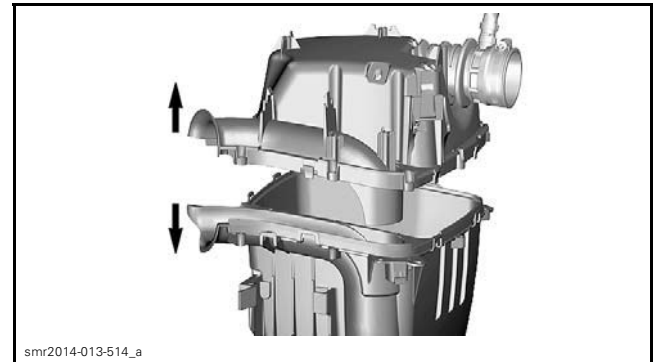
Remove screws securing upper section of air intake silencer to the lower section.



Release all retaining tabs.

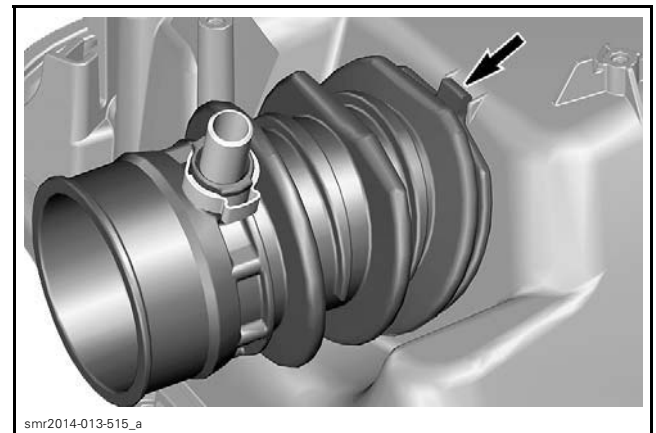


Separate upper and lower sections.



### Air Intake Silencer Assembly

Align the rubber tab in the notch.

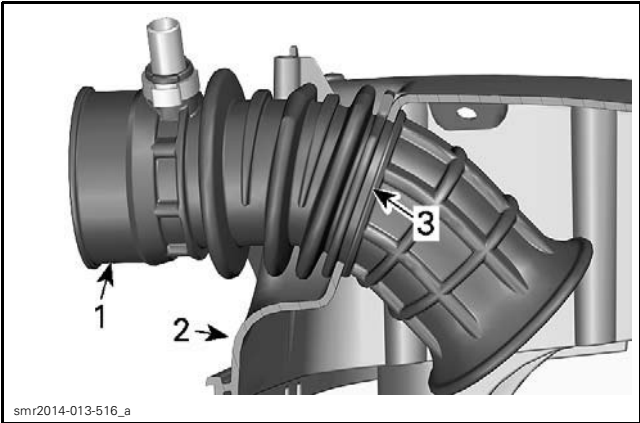


Make sure that air intake tube is well locked (groove) in the upper section of the air intake silencer.



Section 02 ENGINE

Subsection 02 (AIR INTAKE SYSTEM)

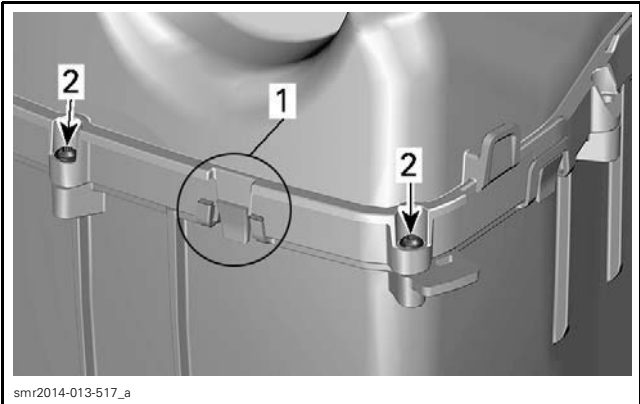


- 1. Air intake tube
- 2. Air intake silencer upper section
- 3. Retaining groove

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<br>(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<br>(13 lbf•in ± 3 lbf•in) |

Air Intake Silencer Installation

The installation is the reverse of the removal procedure.

# EXHAUST SYSTEM

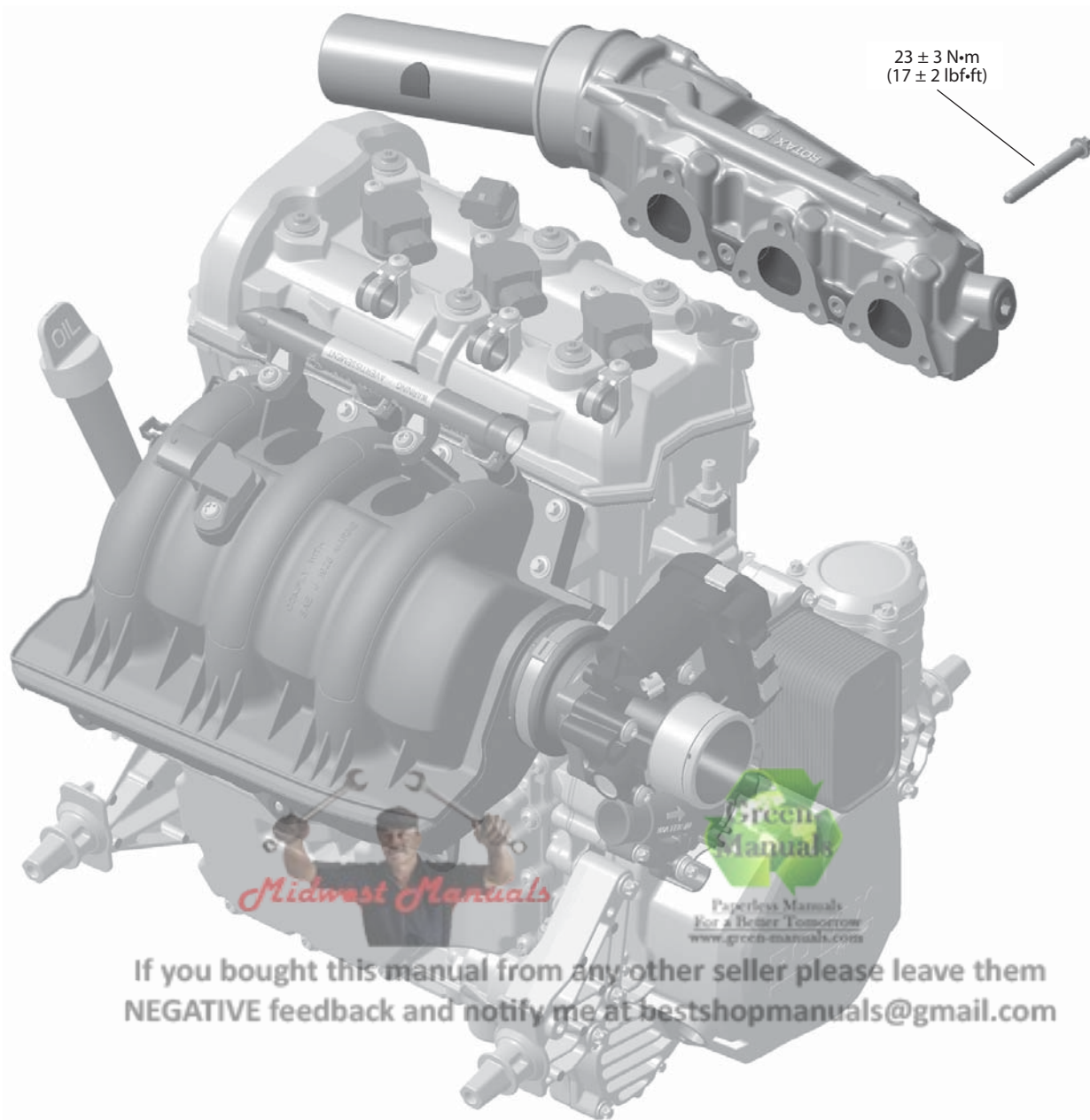
## SERVICE TOOLS

| Description                | Part Number       | Page |
|----------------------------|-------------------|------|
| EXHAUST OULET SOCKET ..... | 529 036 282 ..... | 7-8  |

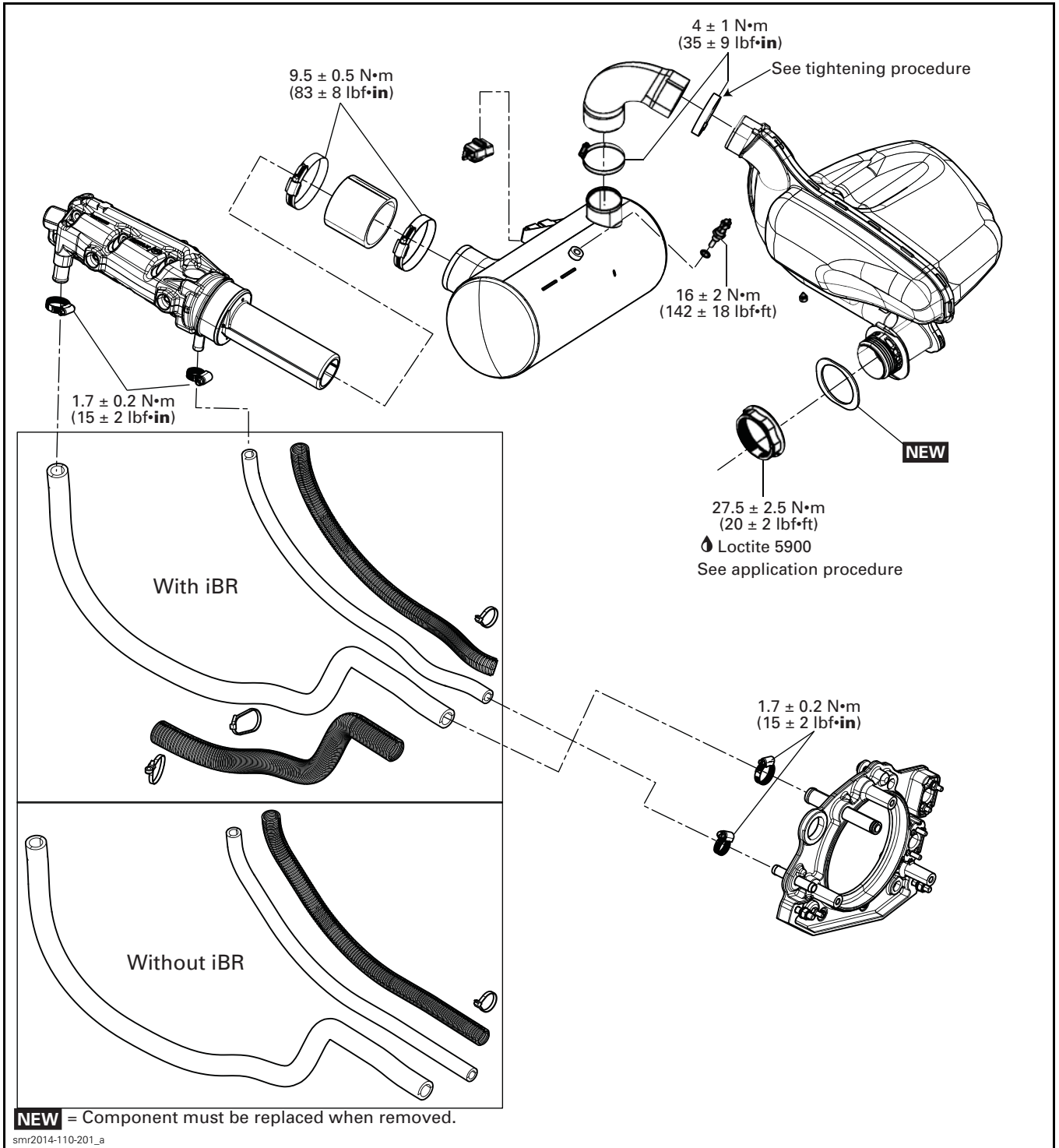
## SERVICE PRODUCTS

| Description        | Part Number       | Page |
|--------------------|-------------------|------|
| LOCTITE 5900 ..... | 293 800 066 ..... | 8    |

### Subsection 03 (EXHAUST SYSTEM)



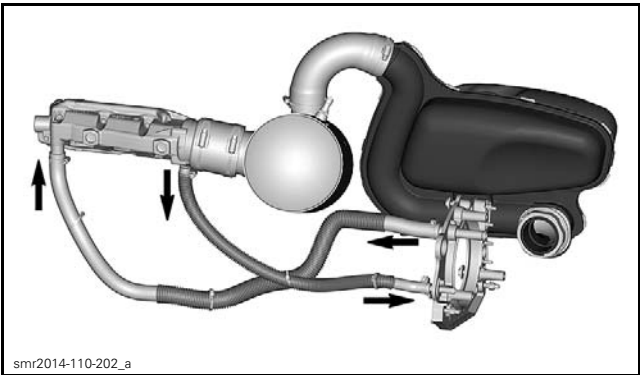
Smr2014-015-001\_a



GENERAL

SYSTEM DESCRIPTION

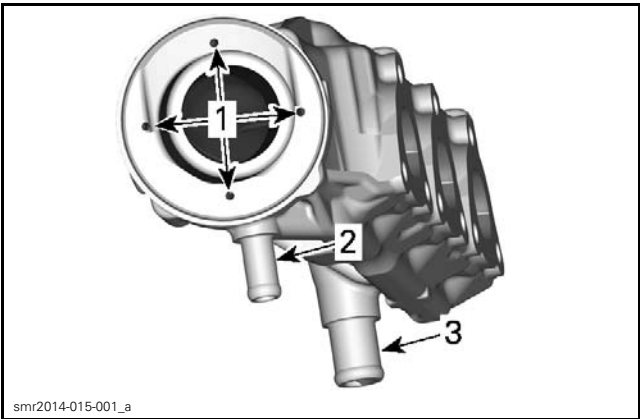
The exhaust system is cooled by water provided by a pressurized area in the jet pump (open loop system).



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                            |

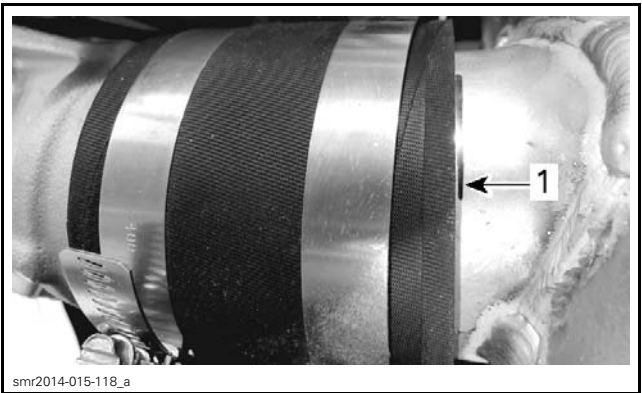
PROCEDURES

MUFFLER

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

Muffler Removal

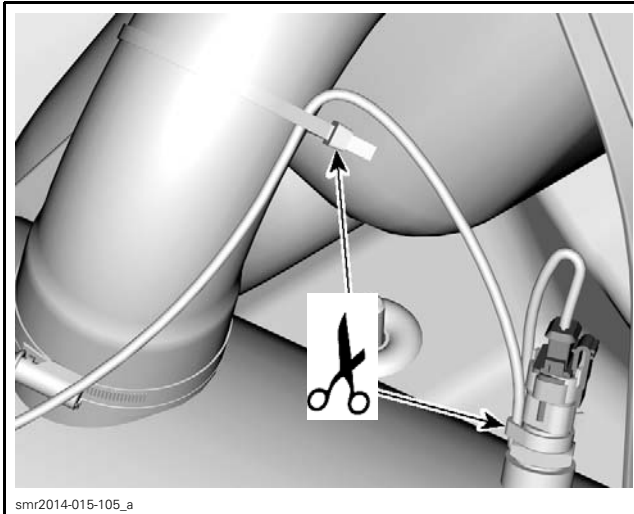
1. Remove central body. Refer to *BODY*.
2. Mark manifold to muffler hose location on muffler.



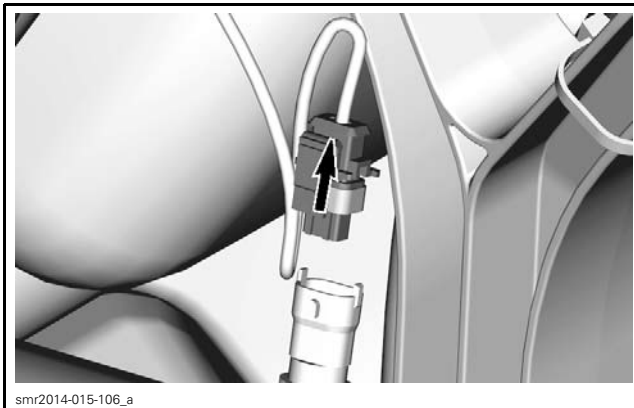
MANIFOLD TO MUFFLER EXHAUST HOSE - PORT SIDE VIEW

1. Mark

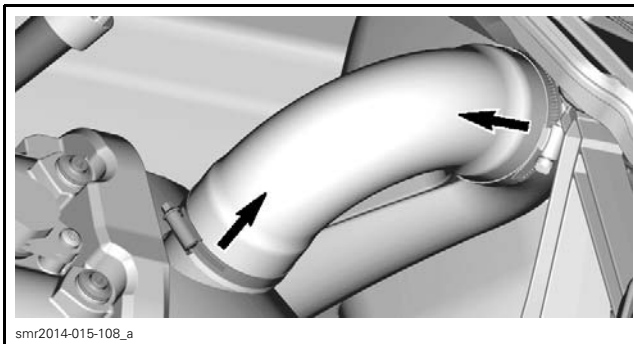
3. Follow image sequence.



MUFFLER TO RESONATOR EXHAUST HOSE

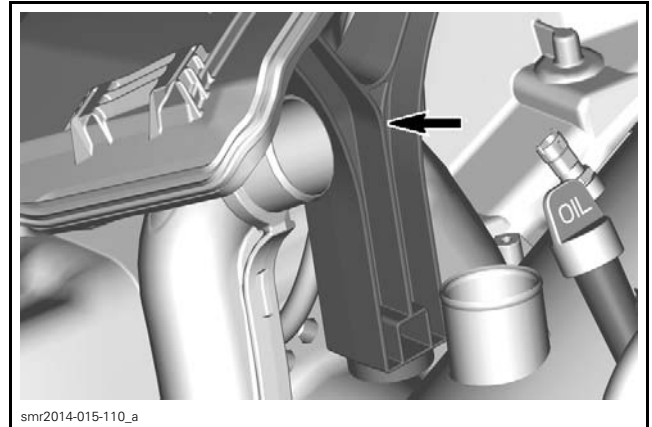


EGTS

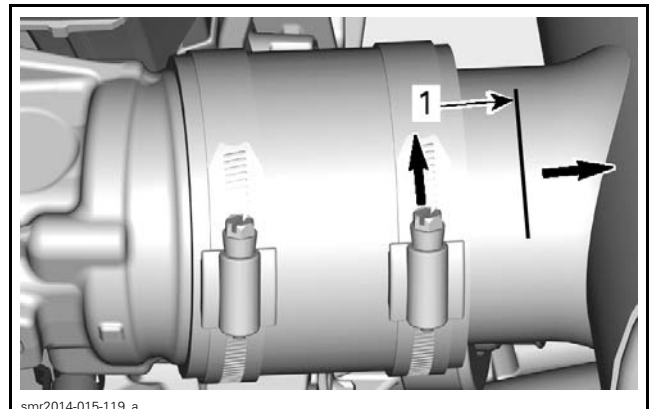


MUFFLER TO RESONATOR EXHAUST HOSE - FROM PORT SIDE VIEW

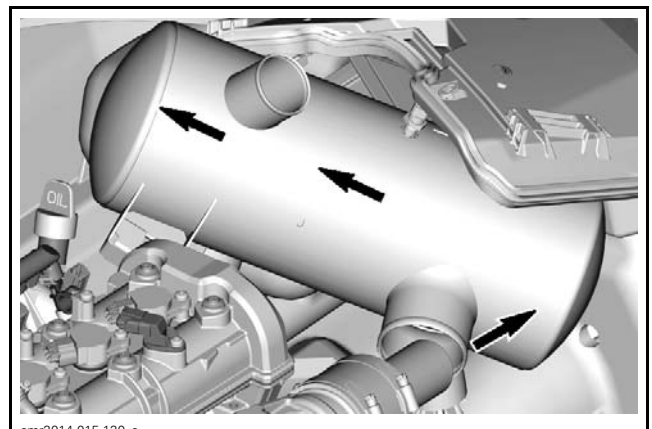
4. Move rear support backwards.



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

## Subsection 03 (EXHAUST SYSTEM)

- Cracked
- Otherwise damaged.

Replace any defective part.

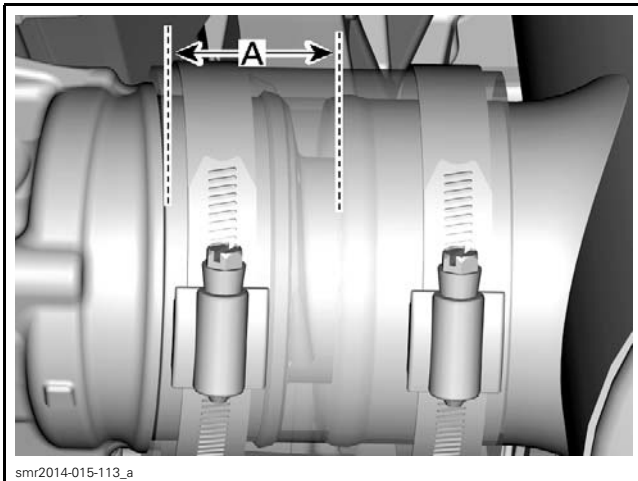
### Muffler Installation

With a new muffler, install the EGTS sensor. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

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

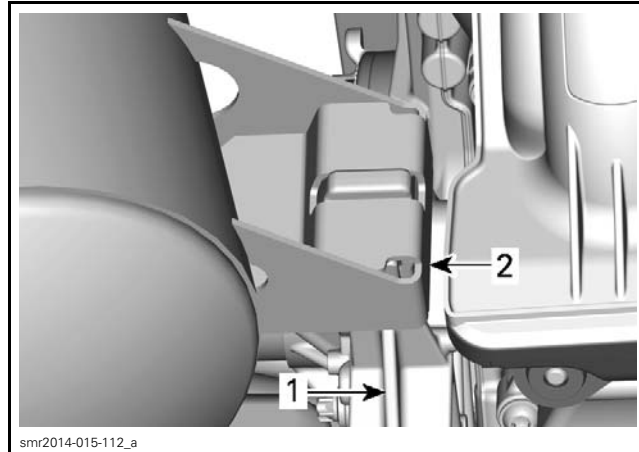
1. Ensure mark on muffler, inscribed during removal, provides correct engagement length into manifold to muffler exhaust hose.

**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  $\pm$  2 mm (1.57 in  $\pm$  .08 in)

2. Install muffler.
3. Position muffler support on rear starboard engine mount.



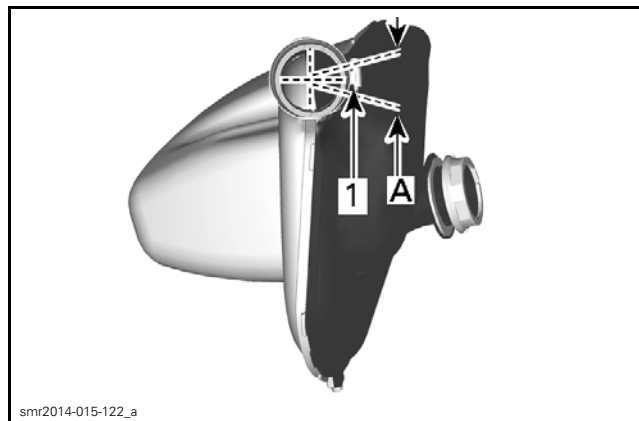
**MUFFLER SUPPORT - STARBOARD SIDE VIEW**

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 inscribed muffler.

4. Tighten fasteners as per exploded view.



**SCREW CLAMP POSITION ON RESONATOR**

1. Screw clamp
2.  $0^\circ \pm 10^\circ$  ( $\pm$ )

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

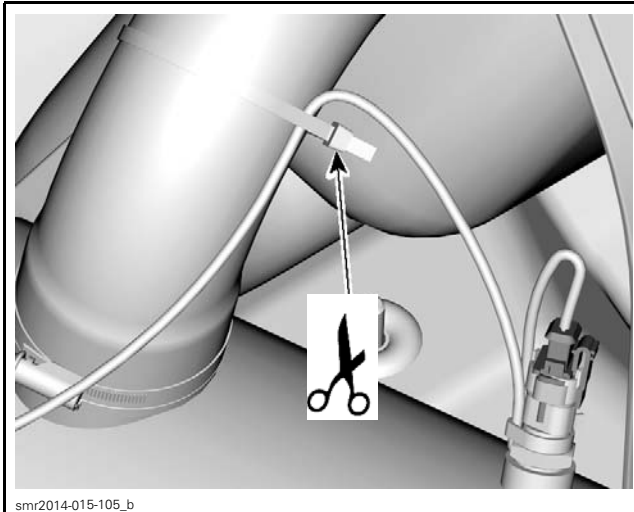
### Resonator Removal

*All models*

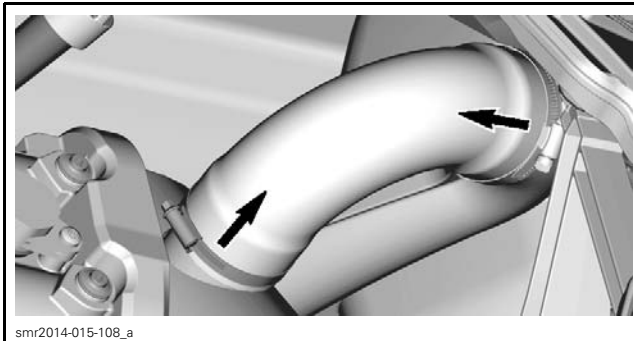
1. Remove central body. Refer to *BODY*.



**NOTE:** Rear body removed for clarity.  
2. Follow image sequence.

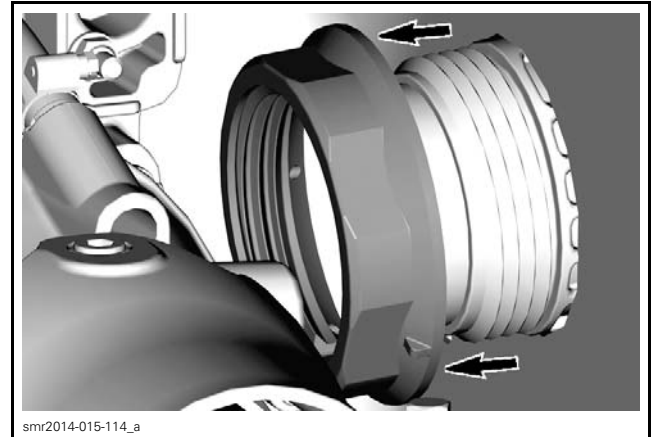
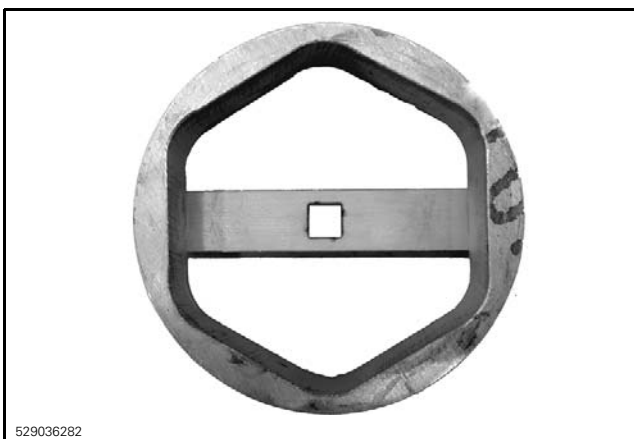


**MUFFLER TO RESONATOR EXHAUST HOSE**

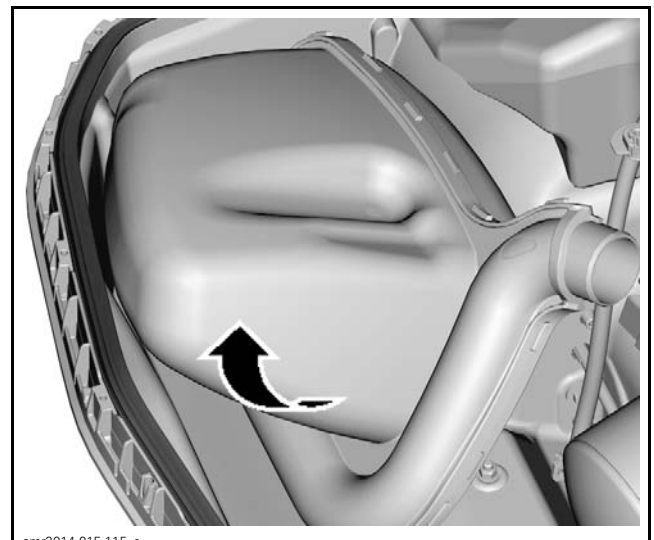


**MUFFLER TO RESONATOR EXHAUST HOSE - FROM PORT SIDE VIEW**

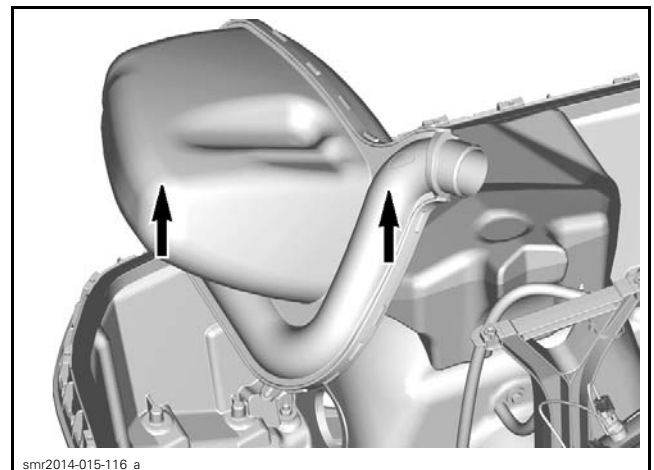
Use EXHAUST OULET SOCKET (P/N 529 036 282).



**RESONATOR OUTLET NUT - OUTSIDE HULL**

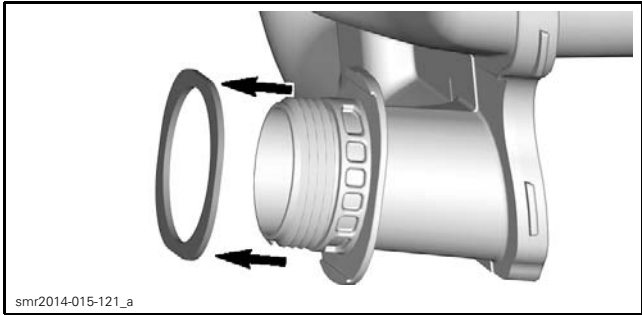


**RESONATOR**



**RESONATOR**

Subsection 03 (EXHAUST SYSTEM)



RESONATOR GASKET

Gently scrape off sealant residues from resonator outlet.

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

Resonator Inspection

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

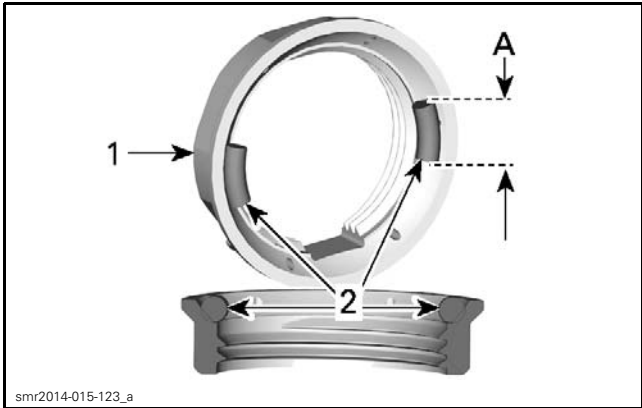
Resonator Installation

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

Install a new resonator gasket.

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.



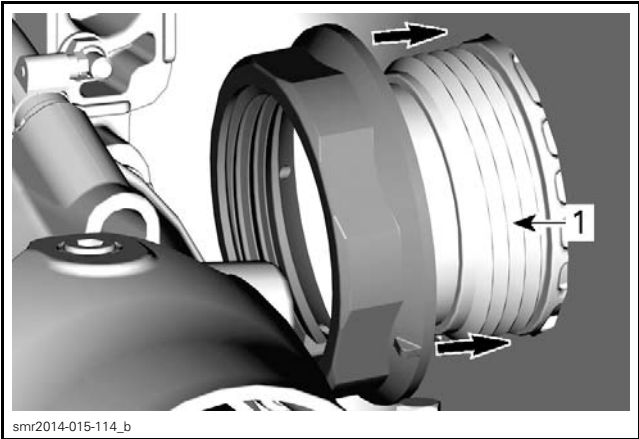
LOCTITE 5900 SEALANT APPLICATION

1. Resonator outlet nut

2. Loctite 5900

A. 20 mm (.8 in)

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



RESONATOR OUTLET

1. Resonator threads

| TIGHTENING TORQUE    |                                              |
|----------------------|----------------------------------------------|
| Resonator outlet nut | 27.5 N•m ± 2.5 N•m<br>(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.

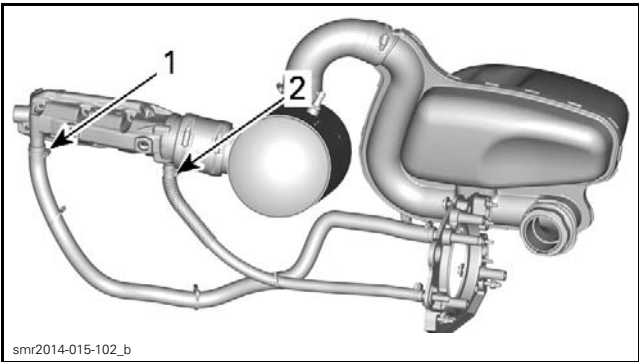
EXHAUST MANIFOLD

Exhaust Manifold Access

Remove central body. Refer to *BODY*.

From exhaust manifold disconnect:

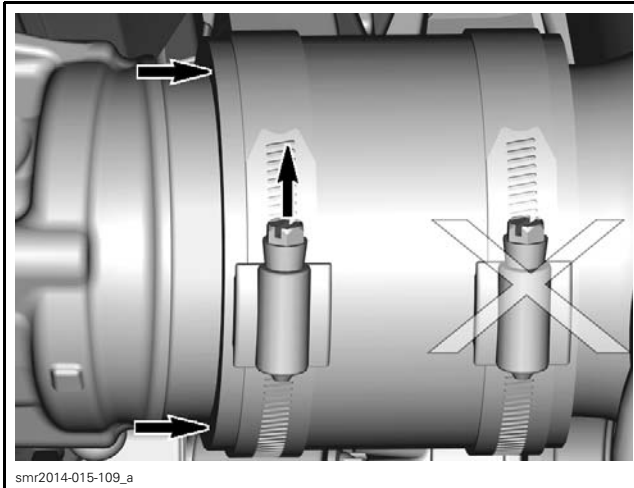
- Manifold inlet hose from jet pump support.
- Manifold outlet hose to jet pump support.



EXHAUST SYSTEM

1. Manifold inlet hose from jet pump support

2. Manifold outlet hose to jet pump support

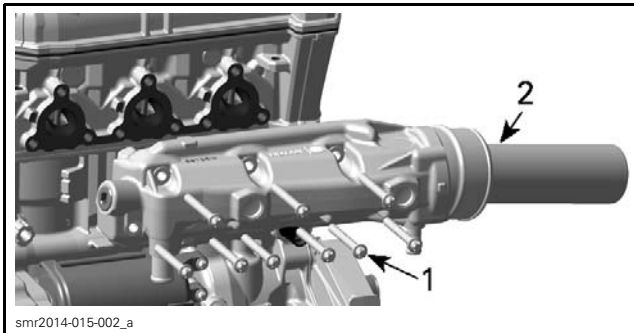


MANIFOLD TO MUFFLER EXHAUST HOSE - PORT SIDE VIEW

## Exhaust Manifold Removal

Unscrew the exhaust manifold screws.

Remove the exhaust manifold.


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

## Exhaust Manifold Installation

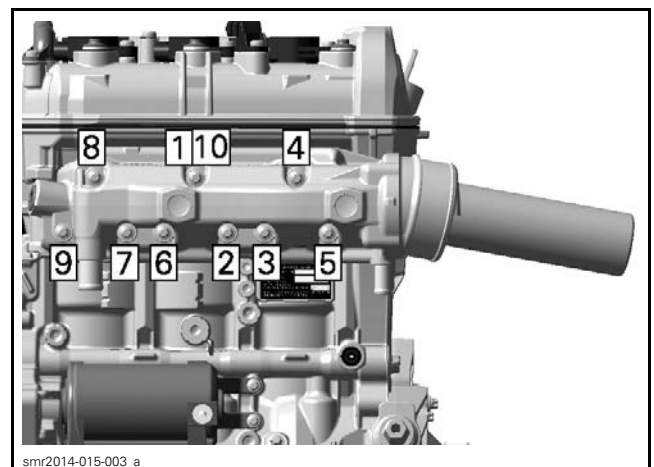
Installation is essentially the reverse of removal procedures. However, pay particular attention to the following.

**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<br>(17 lbf•ft ± 2 lbf•ft) |

Install all removed parts.

---

### Subsection 03 (EXHAUST SYSTEM)

---

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.

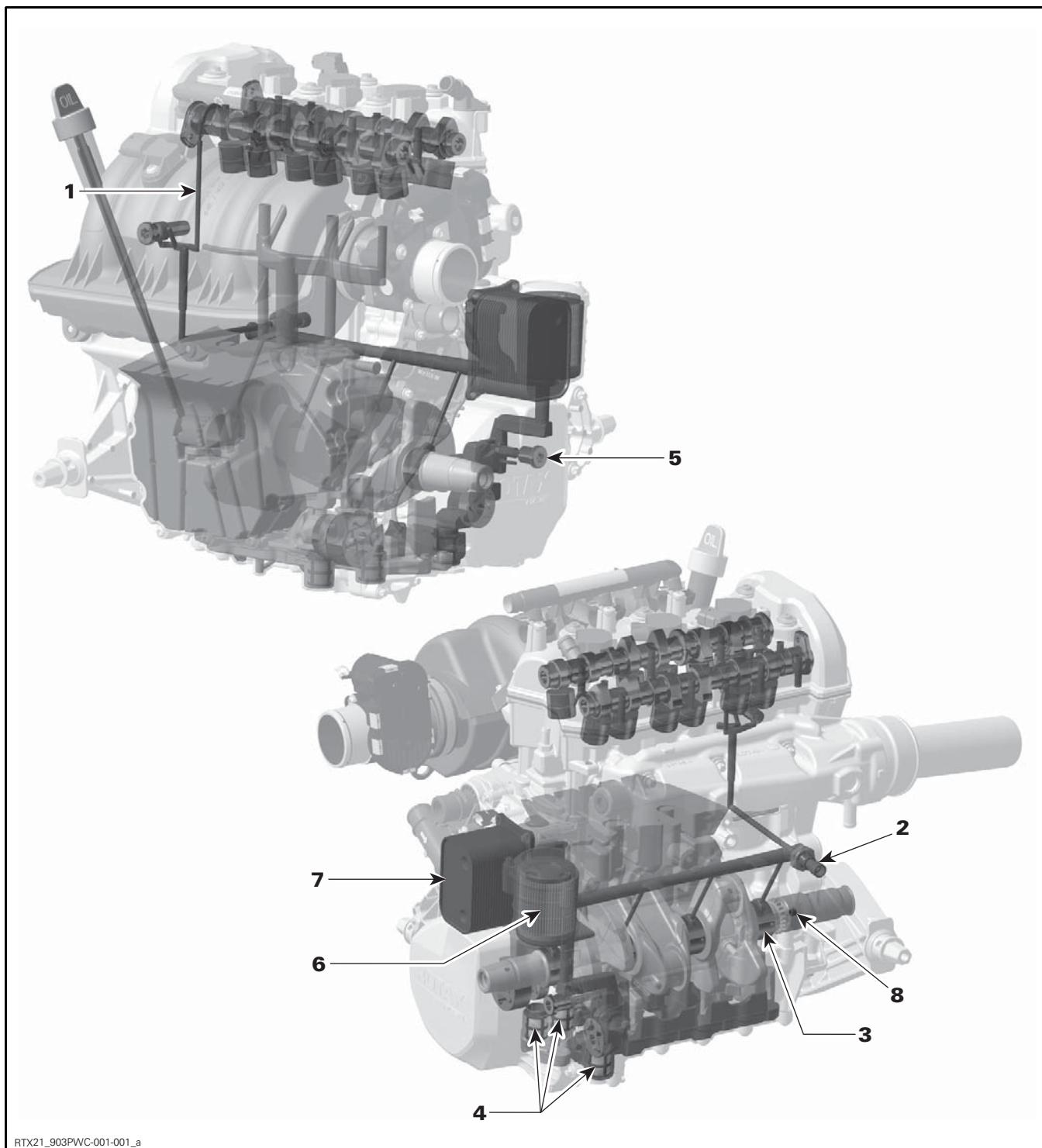
# LUBRICATION SYSTEM

## SERVICE TOOLS

| Description                | Part Number       | Page |
|----------------------------|-------------------|------|
| ECM ADAPTER TOOL.....      | 529 036 166 ..... | 6    |
| FLUKE 115 MULTIMETER ..... | 529 035 868 ..... | 6    |
| OIL PRESSURE HOSE .....    | 529 036 394 ..... | 4    |
| PRESSURE GAUGE.....        | 529 036 395 ..... | 4    |

## SERVICE PRODUCTS

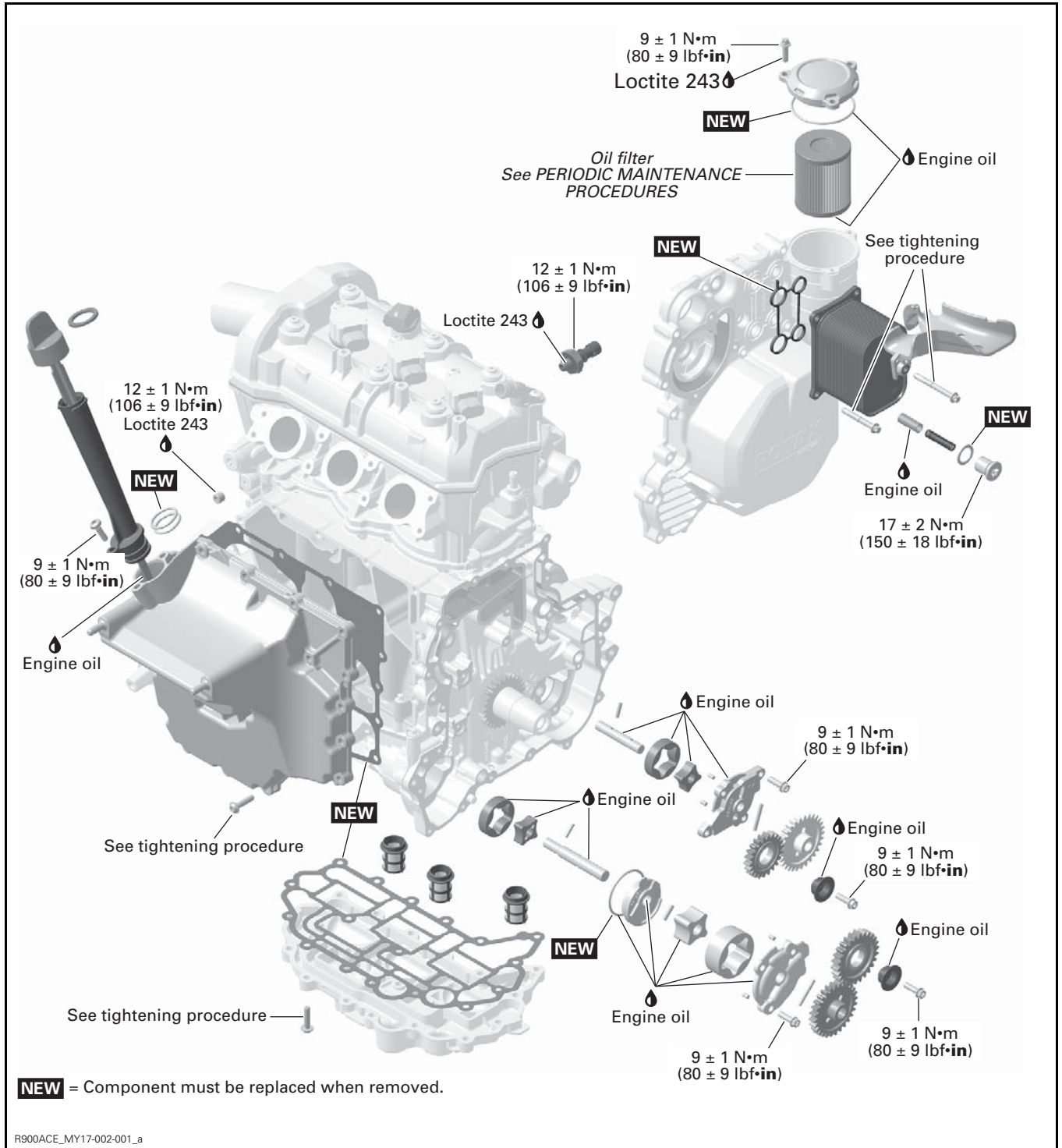
| Description             | Part Number       | Page |
|-------------------------|-------------------|------|
| LOCTITE 243 (BLUE)..... | 293 800 060 ..... | 4, 7 |



RTX21\_903PWC-001-001\_a

### ENGINE LUBRICATION CIRCUIT

1. Oil channel to camshaft bearing
2. Oil pressure switch
3. Crankshaft main bearing
4. Oil strainers
5. Oil pressure regulator
6. Oil filter
7. Oil cooler
8. Oil nozzle in crankshaft to lubricate PTO spline





GENERAL

SYSTEM DESCRIPTION

This engine uses dry sump lubrication. The oil from the cylinder block, timing chain chamber and magneto cover is pumped by two suction pumps. Both suction pumps are integrated into one module.

The large 20 mm (.79 in) oil suction pump returns the crankshaft and magneto chamber oil to the reservoir.

The small 11 mm (.43 in) oil suction pump returns the timing chain chamber oil to the oil reservoir.

An oil filter and three oil strainers are used to filter dirt and debris from the oil circuit.

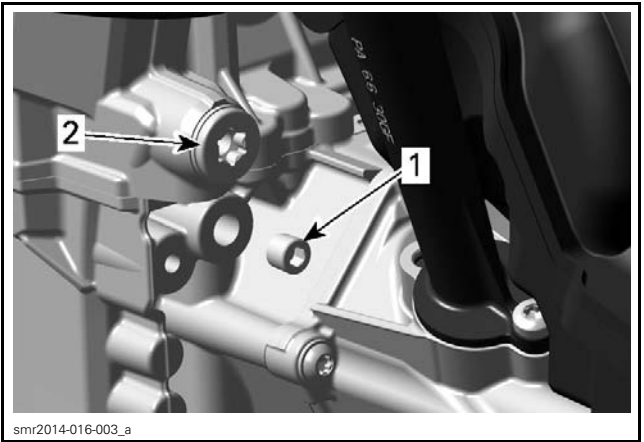
The oil strainers are located between oil sump cover and crankcase underneath the oil pressure pump.

The oil pressure is provided by a pump and regulated by a spring loaded pressure regulator.

INSPECTION

ENGINE OIL PRESSURE

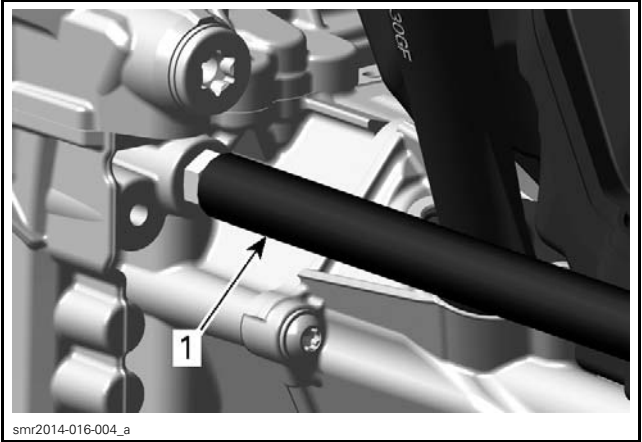
- 1. Remove central body. Refer to *BODY* subsection.
- 2. Remove oil pressure test plug screw from cylinder block.



1. Oil pressure test plug screw  
2. Timing chain tensioner

- 3. Install the adapter hose on cylinder block.

| REQUIRED TOOL                          |                                                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------|
| OIL PRESSURE HOSE<br>(P/N 529 036 394) |  |



1. Adapter hose

- 4. Connect the pressure gauge to adapter hose.

| REQUIRED TOOL                    |                                                                                     |
|----------------------------------|-------------------------------------------------------------------------------------|
| PRESSURE GAUGE (P/N 529 036 395) |  |

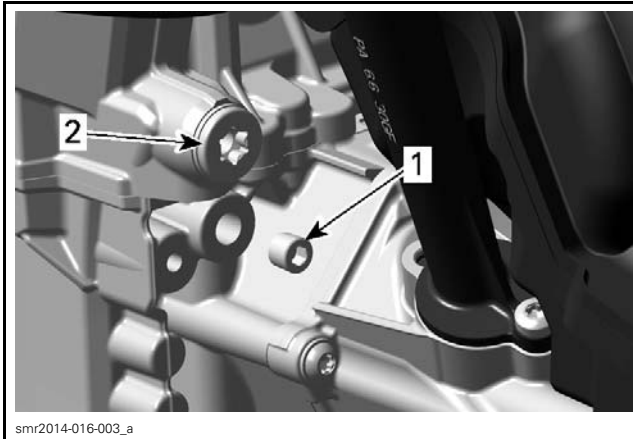
- 5. Start engine and check the oil pressure.

| ENGINE OIL PRESSURE @ 100°C (212°F) |                     |
|-------------------------------------|---------------------|
| ENGINE SPEED                        | MINIMUM PRESSURE    |
| Idle                                | 80 kPa (11.6 PSI)   |
| 4000 RPM                            | 270 kPa (39.16 PSI) |
| 6000 to 8000 RPM                    | 350 kPa (50.76 PSI) |

If the engine oil pressure is out of specification, refer to *TROUBLESHOOTING* in this subsection.

- 6. Remove engine oil pressure test tools.
- 7. Clean threads of oil pressure test plug screw before installing the plug screw.
- 8. Tighten oil pressure test plug screw to specification.

| TIGHTENING TORQUE            |                                                                                           |
|------------------------------|-------------------------------------------------------------------------------------------|
| Oil pressure test plug screw | 12 N•m ± 1 N•m<br>(106 lbf•in ± 9 lbf•in)<br>+<br>LOCTITE 243 (BLUE)<br>(P/N 293 800 060) |



1. Oil pressure test plug screw  
2. Timing chain tensioner

9. Reinstall all removed parts.

## TROUBLESHOOTING

Always check for fault codes. If a fault code is detected, service the fault code first.

### LOW OR NO ENGINE OIL PRESSURE

1. Oil level is too low.
  - Refill engine oil.
  - Check for high oil consumption. See below.
  - Check for oil leaks (oil leaking out of leak indicator hole, gaskets, oil seal or O-rings). Repair or replace.
2. Defective or clogged oil filter.
  - Replace engine oil and filter.
3. Use of a bad grade oil.
  - Replace engine oil with BRP recommended oil.
4. Oil pressure regulator valve sticks open, or spring load is insufficient.
  - Clean oil regulator piston and its bore. Replace if necessary.
  - Measure spring free length. Replace if out of specification.
5. Oil pump(s) worn or damaged.
  - Check if oil pump drive gears are damaged. Replace if necessary.
  - Check oil pump rotors and its bore for wear limits. Replace if out of specification.
6. Engine oil strainer is clogged.
  - Remove and clean engine oil strainer.
7. Heavy wear on plain bearings.
  - Check radial clearance of plain bearings. Replace if out of specification.

### HIGH OIL CONSUMPTION

1. Oil in breathing system.
  - Check if breather V-ring is brittle, hard or damaged. Replace V-ring.
  - Check if oil separator cover is damaged or missing.
2. Valve stem seals worn or damaged.
  - Replace valve stem seals.
3. Piston rings worn out (blue colored exhaust smoke).
  - Replace piston rings.

### OIL CONTAMINATION (WHITE APPEARANCE)

**NOTICE** Inspect and replace engine coolant if contaminated.

1. Oil seal and rotary seal on water pump shaft leaking.
  - Replace oil seal, rotary seal and water pump shaft. Change engine oil.
2. Cylinder head gasket leaking.
  - Replace cylinder head gasket. Change engine oil.
3. Cylinder head screws not properly tightened.
  - Retighten screws with recommended torque. Change engine oil.
4. Oil cooler gasket leaking.
  - Replace oil cooler gasket. Change engine oil.
5. PTO seal leaking.
  - Replace PTO seals. Change engine oil.

## PROCEDURES

### OIL PRESSURE SWITCH (OPS)

#### OPS Activation

The oil pressure switch activates when the engine oil pressure is lower than following specified pressure range.

**NOTE:** ECM does not trigger the OPS signal below 4500 rpm.

#### OIL PRESSURE SWITCH ACTIVATION RANGE

130 kPa to 170 kPa (18.85 PSI to 24.66 PSI)

#### OPS Access

Remove central body. Refer to *BODY* subsection.

Subsection XX (LUBRICATION SYSTEM)

OPS Inspection

First, ensure oil pressure is adequate. Refer to *ENGINE OIL PRESSURE*.

If the oil pressure is good, check the resistance of the oil pressure switch.

Inspecting the OPS Resistance

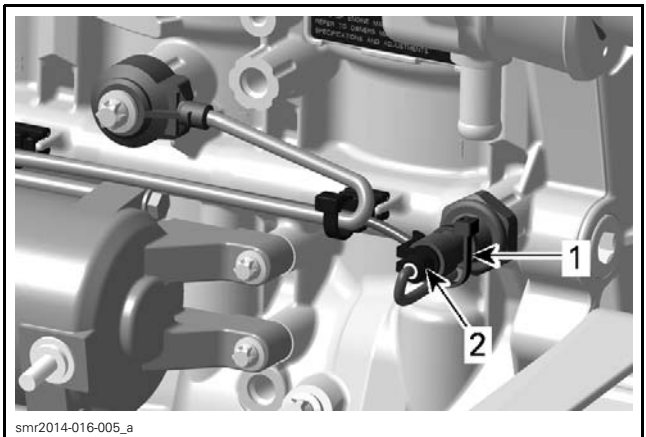
The engine must be warm to check the oil pressure switch properly.



**WARNING**

Be careful when working near hot part. To avoid potential burns, never touch exhaust system components immediately after the engine has been running as these components are very hot. Always use long sleeves and gloves.

1. Cut locking tie and disconnect the OPS connector.



UNDER EXHAUST MANIFOLD

1. Locking tie  
2. OPS connector

2. Check the oil pressure switch resistance.

| REQUIRED TOOL                             |                                                                                     |
|-------------------------------------------|-------------------------------------------------------------------------------------|
| FLUKE 115 MULTIMETER<br>(P/N 529 035 868) |  |

3. Read result and compare to table.

| RESISTANCE ( $\Omega$ ) |               |                                                 |
|-------------------------|---------------|-------------------------------------------------|
| ENGINE NOT RUNNING      |               |                                                 |
| OPS pin                 | Engine ground | Close to 0 $\Omega$<br>(normally closed switch) |

If resistance is out of specification, replace the oil pressure switch.

If the resistance is correct, continue procedure. It will be necessary to use jumper wires.

4. Start engine.  
5. Read result and compare to table.

| RESISTANCE ( $\Omega$ ) |               |                      |
|-------------------------|---------------|----------------------|
| ENGINE RUNNING          |               |                      |
| OPS pin                 | Engine ground | Infinitely high (OL) |

If resistance is out of specification, replace the oil pressure switch.

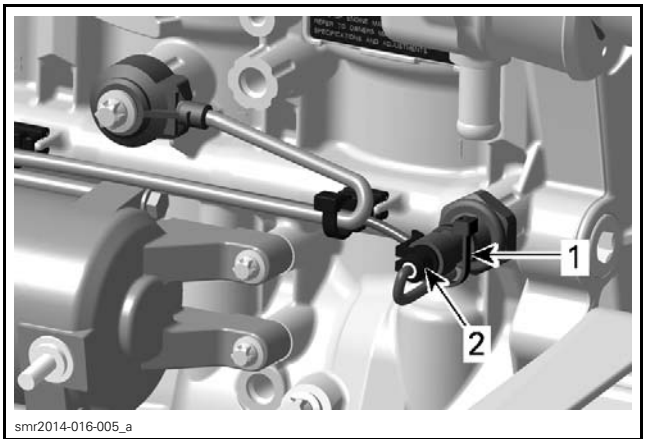
If the resistance is correct, check the oil pressure switch circuit continuity.

Testing the OPS Circuit Continuity

1. Disconnect ECM connector A. Refer to *ECM CONNECTOR ACCESS* in *ELECTRONIC FUEL INJECTION* subsection.  
2. Install connector A to the ECM adapter.

| REQUIRED TOOL                         |                                                                                      |
|---------------------------------------|--------------------------------------------------------------------------------------|
| ECM ADAPTER TOOL<br>(P/N 529 036 166) |  |

3. Cut locking tie and disconnect the OPS connector.



1. Locking tie  
2. OPS connector

4. Check continuity as follows.

| REQUIRED TOOL                             |                                                                                       |
|-------------------------------------------|---------------------------------------------------------------------------------------|
| FLUKE 115 MULTIMETER<br>(P/N 529 035 868) |  |

### CIRCUIT CONTINUITY

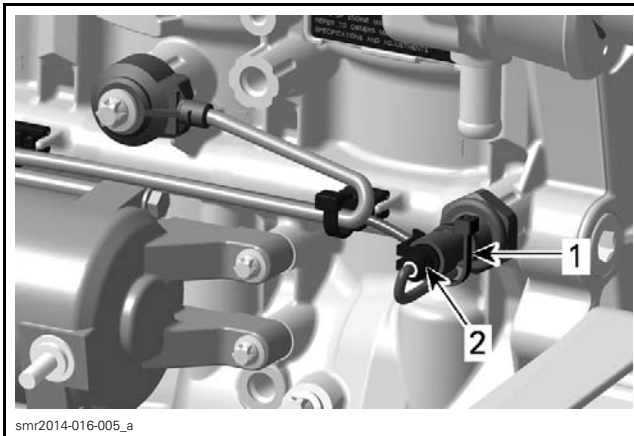
|               |              |                     |
|---------------|--------------|---------------------|
| OPS connector | ECM A pin E3 | Close to 0 $\Omega$ |
|---------------|--------------|---------------------|

If the continuity is good and all other tests, try a **NEW ECM**.

If the continuity is bad, repair or replace defective wire or connectors.

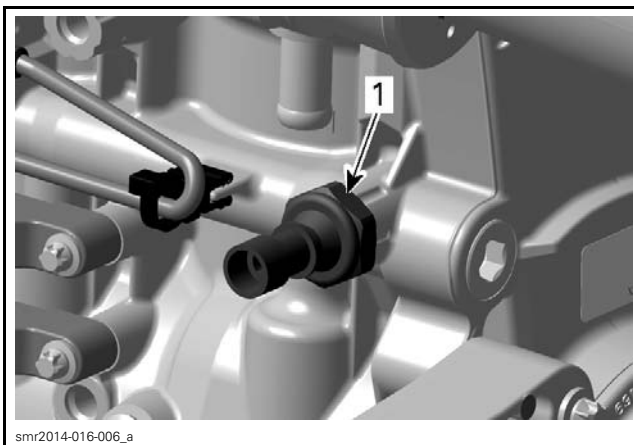
### Removing the OPS

1. Cut locking tie and unplug the OPS switch connector.



1. Locking tie
2. OPS connector

2. Unscrew and remove the OPS.



1. Oil pressure switch

### Installing the OPS

Install oil pressure switch as per the following informations.

### TIGHTENING TORQUE

|                     |                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------|
|                     | 12 N•m $\pm$ 1 N•m<br>(106 lbf•in $\pm$ 9 lbf•in)<br>+<br>LOCTITE 243 (BLUE)<br>(P/N 293 800 060) |
| Oil pressure switch |                                                                                                   |

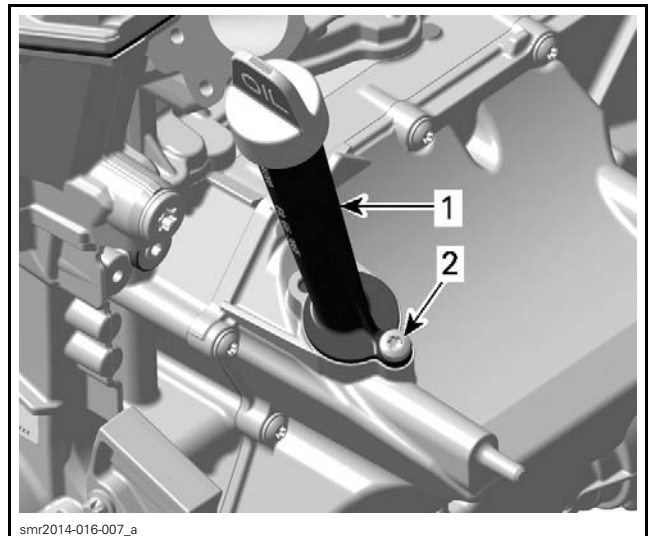
Install all other removed parts.

**NOTICE** When installing the locking tie on the OPS connector, take care that the wires do not make a sharp bend.

### OIL FILLER TUBE

#### Removing the Oil Filler Tube

1. Remove intake manifold, refer to *AIR INTAKE SYSTEM* subsection.
2. Remove the oil filler tube retaining screw.

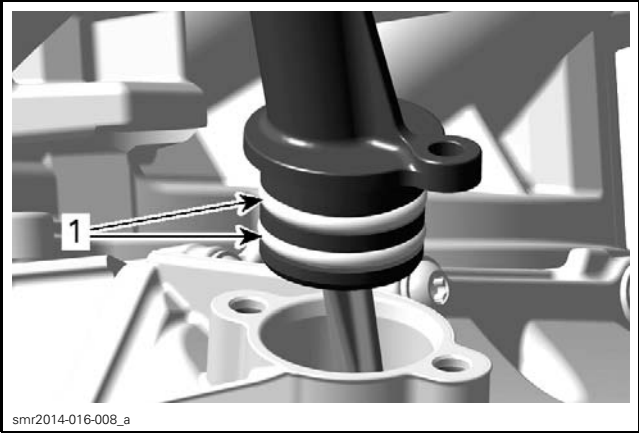


1. Oil filler tube
2. Retaining screw

3. Pull filler tube out of the oil tank cover.

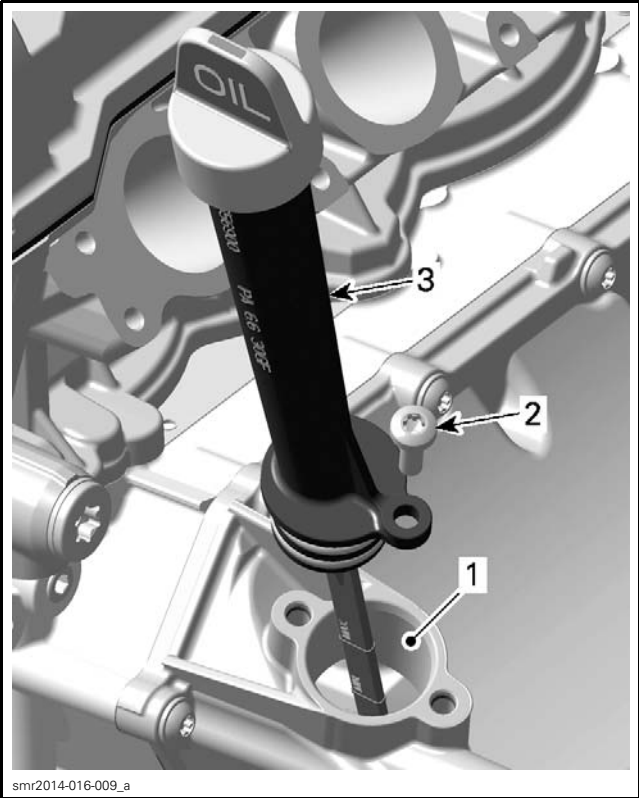
#### Installing the Oil Filler Tube

1. Install **NEW** O-rings on the oil filler tube.



1. Oil filler tube O-rings

2. Lubricate the oil tank cover bore with engine oil.



1. Lubricate the oil tank cover bore  
2. Retaining screw  
3. Oil filler tube

3. Install the oil filler tube.

4. Tighten retaining screw to the specified torque.

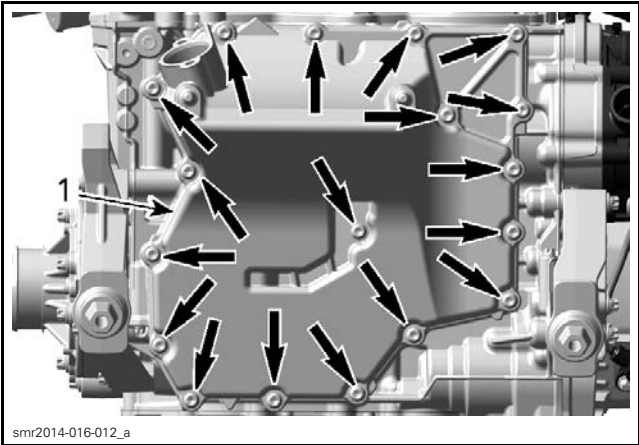
| TIGHTENING TORQUE     |                                         |
|-----------------------|-----------------------------------------|
| Oil filler tube screw | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |

5. Install all other removed parts.

## OIL TANK

### Removing the Oil Tank Cover

1. Drain engine oil. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove the engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
3. Remove intake manifold. Refer to *AIR INTAKE SYSTEM* subsection.
4. Place a drain pan underneath oil tank.
5. Unscrew oil tank cover retaining screws.



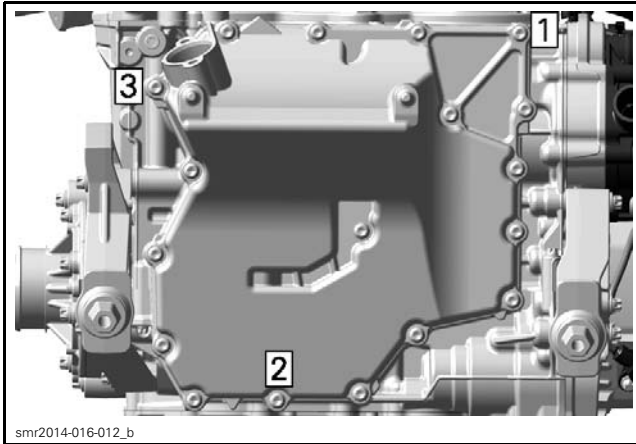
RETAINING SCREWS  
1. Oil tank

6. Remove oil tank from the engine.

### Installing the Oil Tank Cover

1. Install **NEW** gasket.
2. Install the oil tank on the engine, then tighten screws in two steps as follows:
  - 2.1 Tighten the following screws to the specified torque and sequence.

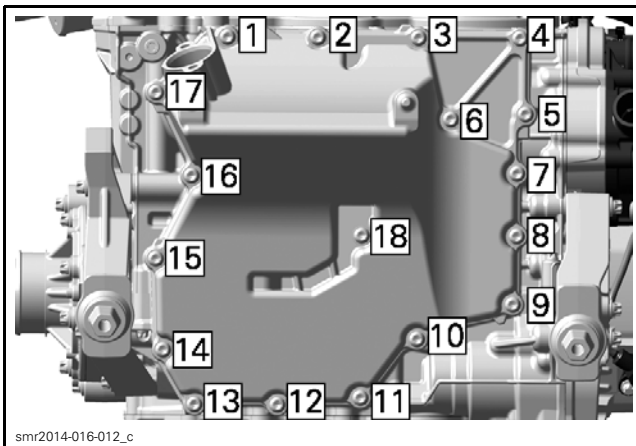
| TIGHTENING TORQUE |        |                                           |
|-------------------|--------|-------------------------------------------|
| Oil tank screws   | Step A | 5 N•m ± 0.6 N•m<br>(44 lbf•in ± 5 lbf•in) |



TIGHTENING SEQUENCE STEP A

- 2.2 Tighten the following screws to the specified torque and sequence.

| TIGHTENING TORQUE |        |                                         |
|-------------------|--------|-----------------------------------------|
| Oil tank screws   | Step B | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |



TIGHTENING SEQUENCE STEP B

- Wipe off any oil spillage.
- Install the engine in the vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
- Install intake manifold. Refer to *AIR INTAKE SYSTEM* subsection.
- Fill up oil tank and check oil level. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

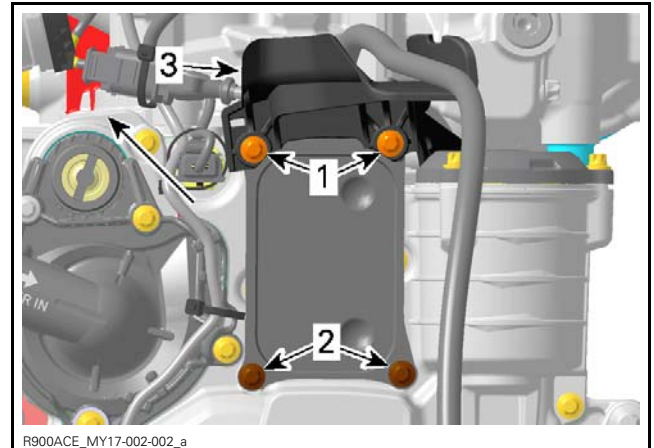
## OIL COOLER

### Oil Cooler Access

Remove central body. Refer to *BODY* subsection.

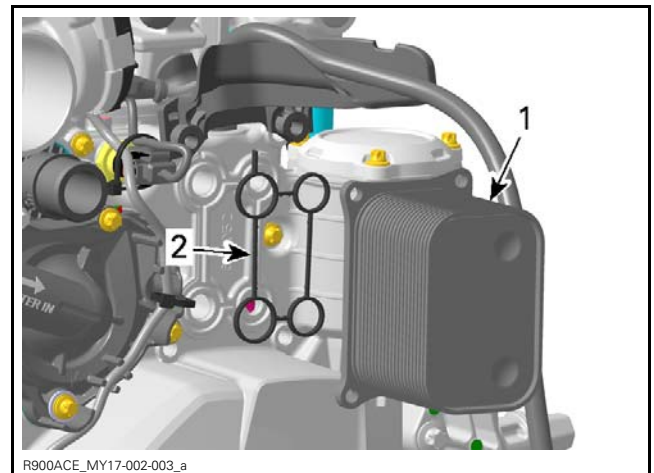
## Removing the Oil Cooler

- Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection to:
  - Drain engine oil
  - Drain cooling system.
- Place rags or towels under oil cooler to catch remaining oil and coolant.
- Remove oil cooler retaining screws.
- Lift harness bracket.



- Retaining screws M6x55
- Retaining screws M6x45
- Harness bracket

- Remove:
  - Oil cooler
  - Gasket (discard it)

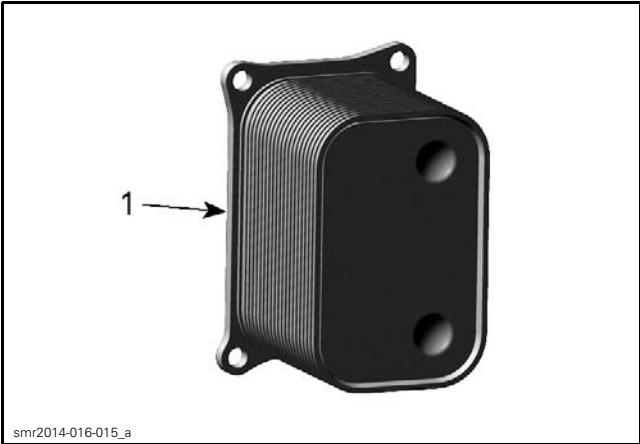


- Oil cooler
- Gasket

## Inspecting the Oil Cooler

Check oil cooler for cracks and other damage.





1. Check for cracks

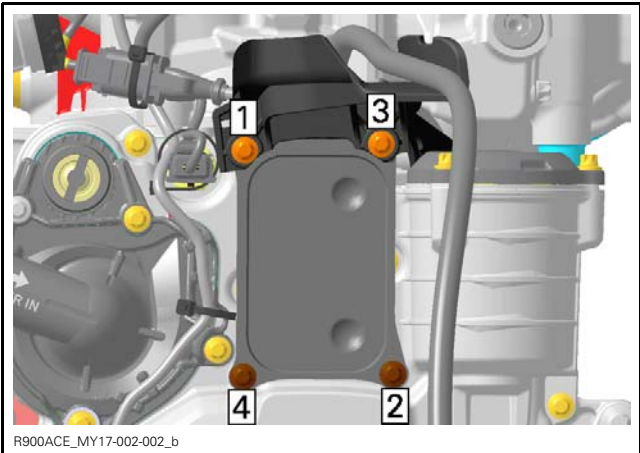
Replace parts as necessary.

Installing the Oil Cooler

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

Tighten oil cooler screws in two steps to the specified torque following the illustrated sequence.

| TIGHTENING TORQUE |        |                                           |
|-------------------|--------|-------------------------------------------|
| Oil tank screws   | Step A | 5 N•m ± 0.6 N•m<br>(44 lbf•in ± 5 lbf•in) |
|                   | Step B | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in)   |



TIGHTENING SEQUENCE OIL-COOLER

Wipe off any oil and coolant spillage.

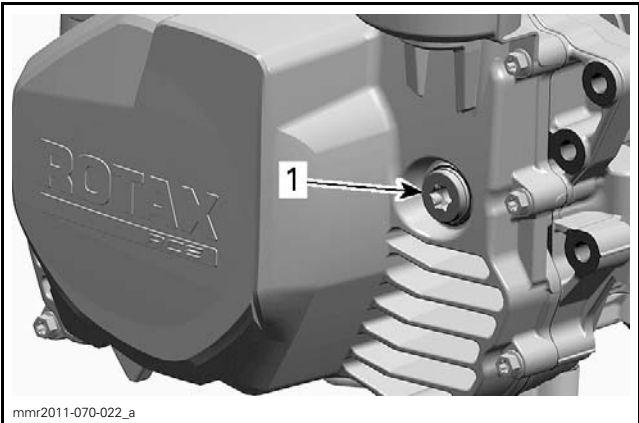
Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection for following procedures:

- Fill up oil tank and check oil level.
- Refill and bleed cooling system.

OIL PRESSURE REGULATOR

Oil Pressure Regulator Location

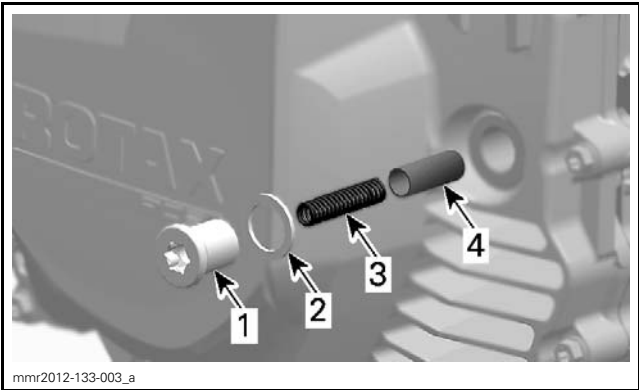
The engine oil pressure regulator is located inside the magneto cover.



1. Engine oil pressure regulator location

Removing the Oil Pressure Regulator

1. Drain engine oil. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove regulator plug and sealing washer. Discard sealing washer.
3. Pull oil pressure regulator parts out of the magneto cover.



1. Plug
2. Sealing washer
3. Regulator spring
4. Regulator piston

Inspecting the Oil Pressure Regulator

Clean bore and thread in the magneto cover from any contamination.

Inspect oil pressure regulator piston and its bore in cylinder block for scoring or other damages.

Check if piston moves easily in its bore.

Check compression spring for free length.



| SPRING FREE LENGTH |                  |
|--------------------|------------------|
| New nominal        | 46 mm (1.811 in) |
| Service limit      | 45 mm (1.772 in) |

Visually check compression spring for squareness.

Replace worn or damaged components.

### Installing the Oil Pressure Regulator

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

Install a **NEW** sealing washer on plug.

Tighten regulator plug to the specified torque.

| TIGHTENING TORQUE           |                                            |
|-----------------------------|--------------------------------------------|
| Oil pressure regulator plug | 17 N•m ± 2 N•m<br>(150 lbf•in ± 18 lbf•in) |

Wipe off any oil spillage.

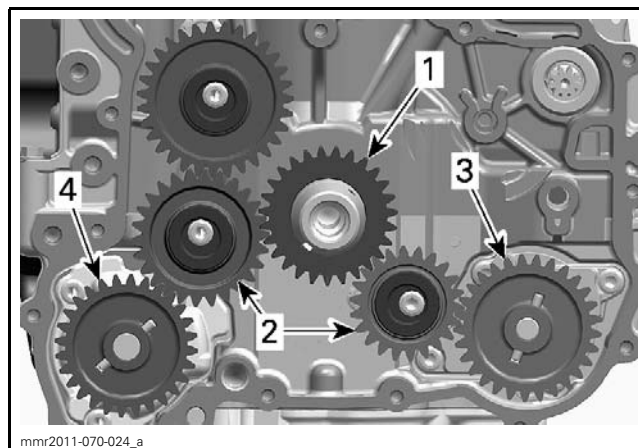
Fill up oil tank and check oil level. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Install all other removed parts.

## OIL PUMP DRIVE GEARS

### Oil Pump Drive Gear Location

The oil pump gears are located on the MAG side, behind the magneto cover.



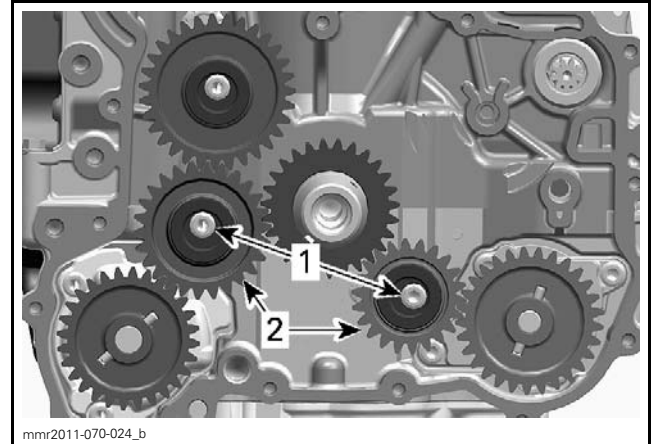
1. Oil pump drive gear
2. Intermediate gears
3. Oil pressure pump gear
4. Oil suction pump gear

### Oil Pump Drive Gear Removal

1. Refer to *MAGNETO AND STARTER* subsection to remove:
  - Magneto cover

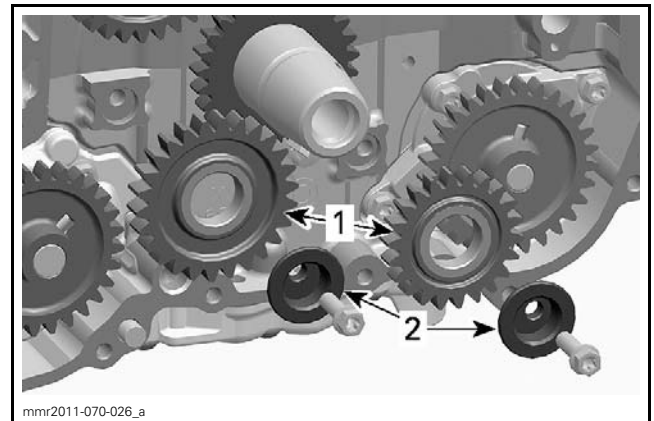
- Rotor
- Sprag clutch gear.

2. Unscrew oil pump intermediate gear screws.



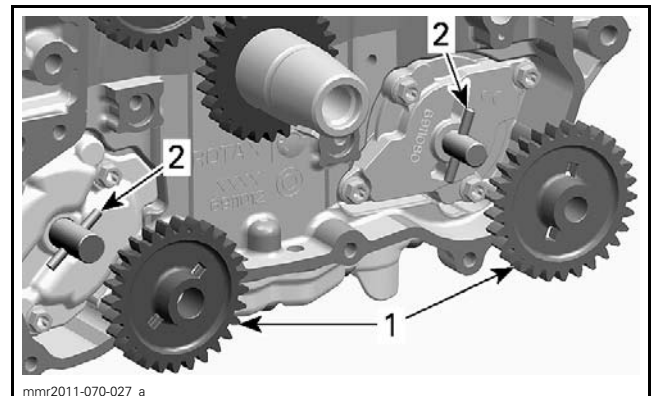
1. Retaining screws
2. Intermediate gears

3. Remove bearing sleeves and oil pump intermediate gears.



1. Intermediate gears
2. Bearing sleeves

4. Remove oil pump gears and needle pins.



1. Oil pump gears
2. Needle pins

## Subsection XX (LUBRICATION SYSTEM)

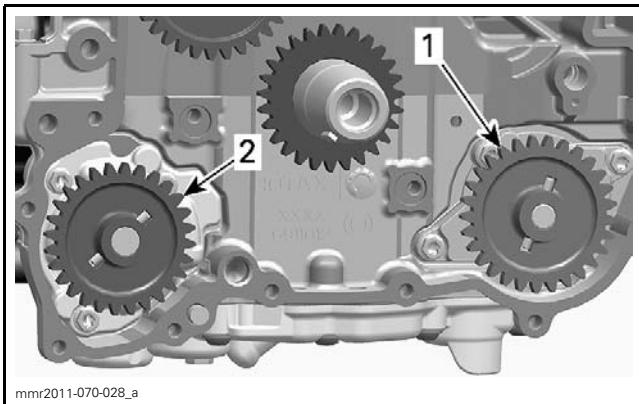
### Inspecting the Oil Pump Drive Gear

Inspect gears for wear, cracks or other damage.  
Replace if damaged.

### Installing the Oil Pump Drive Gear

For installation, reverse the removal procedure, however, pay attention to the following.

1. Ensure not to mix up the oil pump gears, see next illustration.
  - 1.1 Install the BROWN oil pump gear (29 teeth) on oil pressure pump.
  - 1.2 Install the BLACK oil pump gear (28 teeth) on oil suction pump.



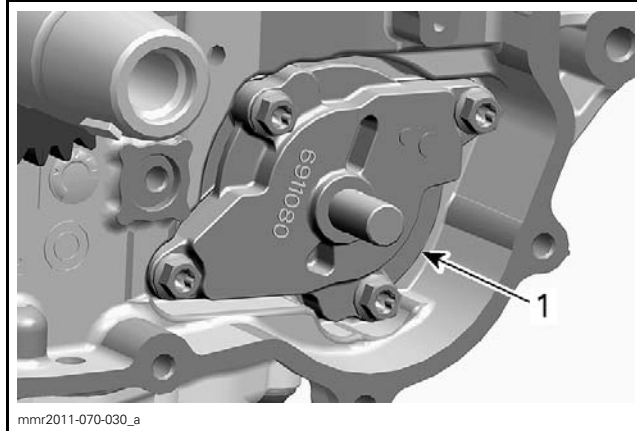
1. BROWN oil pump gear - 29 teeth
2. BLACK oil pump gear - 28 teeth

2. Lubricate intermediate gears bearing sleeves with engine oil, then install gears.
3. Install all other removed parts.
4. Fill up oil tank and check oil level. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

## OIL PRESSURE PUMP

### Oil Pressure Pump Location

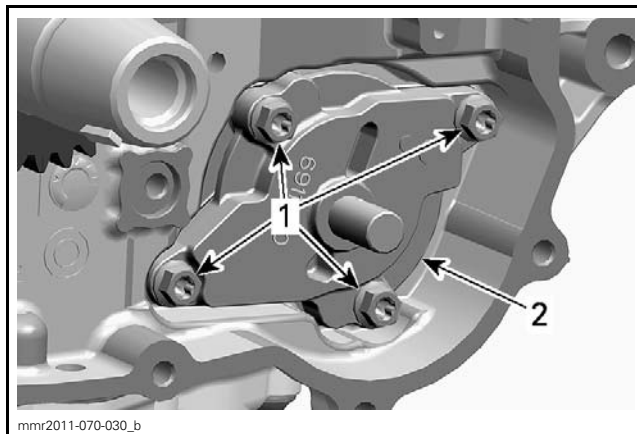
The oil pressure pump is located in the cylinder block, behind the magneto cover.



1. Oil pressure pump

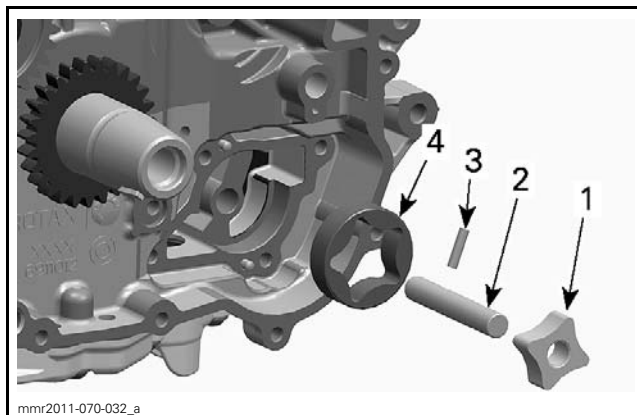
### Removing the Oil Pressure Pump

1. Remove *OIL PUMP DRIVE GEARS*, see procedure in this subsection.
2. Remove oil pump cover.



1. Retaining screws
2. Oil pump cover

3. Remove the following parts.



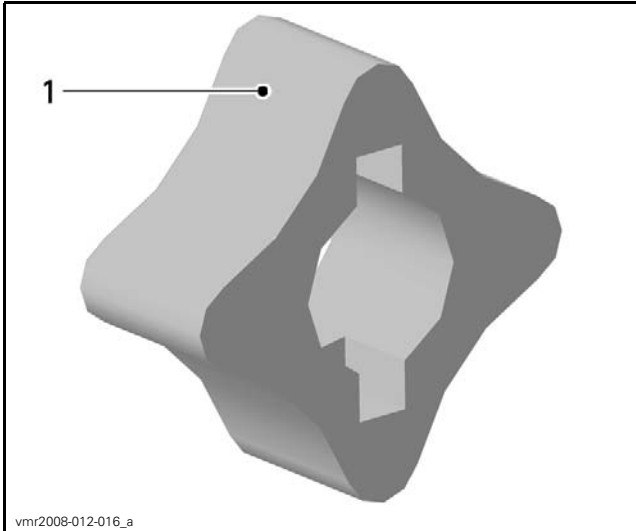
1. Inner rotor
2. Oil pump shaft
3. Needle pin
4. Outer rotor

## Inspecting the Oil Pressure Pump

Inspect oil pump and oil pump cover bore for marks, scratches or other damage. Replace any damaged parts.

Check oil pump cover for damages and for surface straightness with a straight edge.

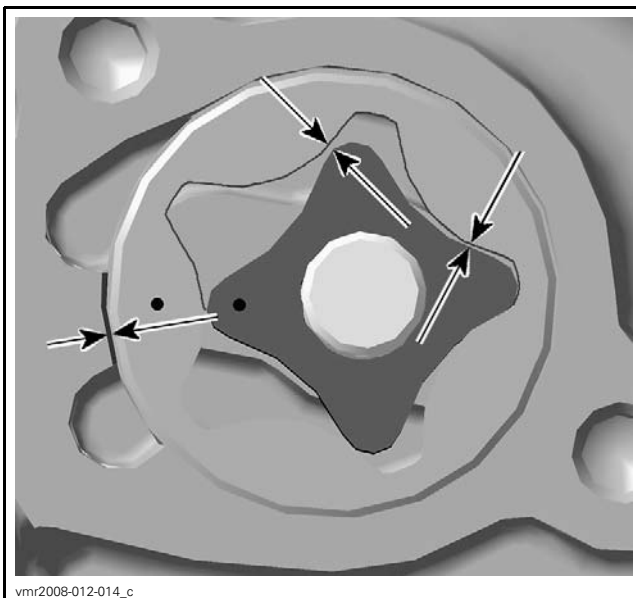
Check inner rotor for corrosion, worn pin slots or other damages. If so, replace inner and outer rotor at the same time.



1. Pitting on the teeth

## Radial Clearance

Using a feeler gauge, measure the clearance of outer rotor and inner rotor where shown with the arrows.



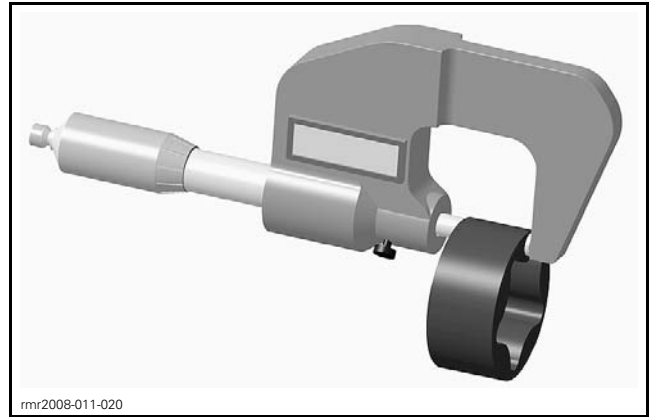
vmr2008-012-014\_c

| OIL PUMP RADIAL CLEARANCE |                    |
|---------------------------|--------------------|
| Service limit             | 0.25 mm (.0098 in) |

**NOTE:** If clearance of inner and outer rotors exceeds the tolerance, replace oil pump.

## Axial Clearance

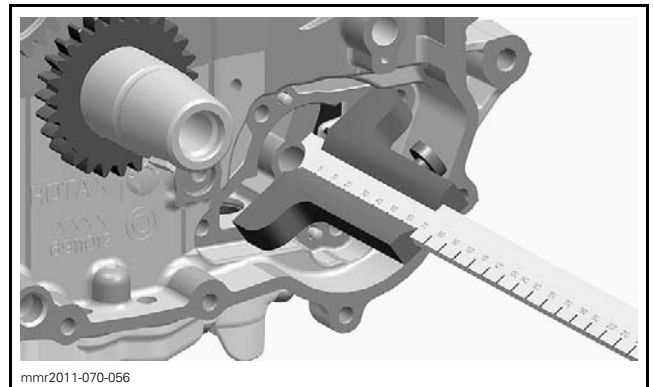
Measure outer rotor thickness with a micrometer.



mmr2008-011-020

## OUTER ROTOR THICKNESS

Using a depth gauge, measure the depth of oil pump bore in the lower crankcase.



mmr2011-070-056

## OIL PUMP BORE DEPTH (OIL PUMP COVER)

Subtract bore depth from rotor thickness to obtain axial clearance.

| OIL PUMP AXIAL CLEARANCE |                    |
|--------------------------|--------------------|
| Service limit            | 0.15 mm (.0059 in) |

**NOTE:** When the axial clearance of the oil pump assembly increases, the oil pressure decreases.

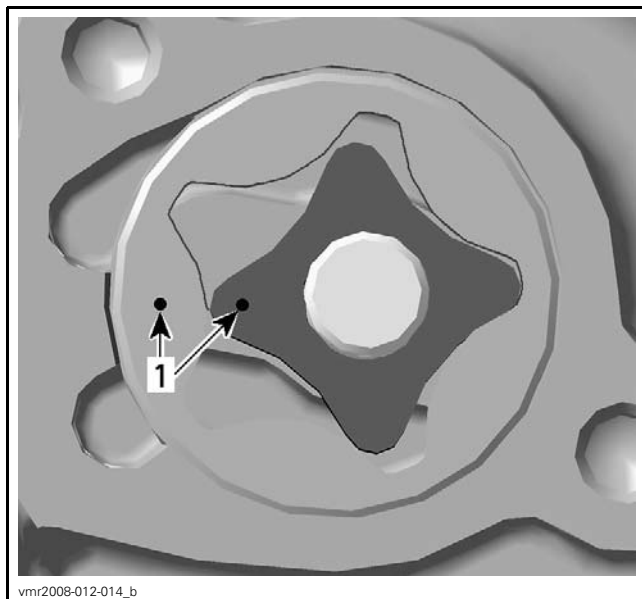
## Installing the Oil Pressure Pump

For installation, reverse the removal procedure, however, pay attention to the following.

1. Lubricate outer rotor with engine oil.

**NOTICE** Install rotors with the marks outwards.

2. Install outer rotor into crankcase oil pump bore.

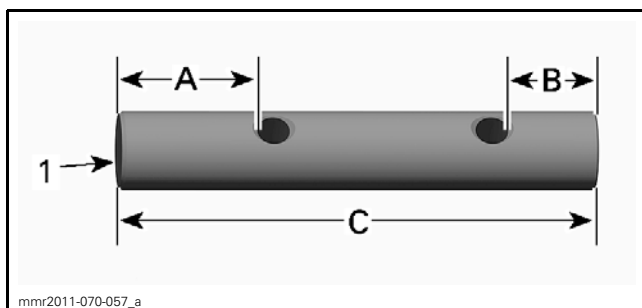


### TYPICAL

1. Marks on inner and outer rotor

3. Install needle pin in oil pump shaft.

**NOTICE** The oil pump shaft is not symmetrical, the longer side must be installed inward.



1. Towards engine

- A. 16.96 mm (.67 in)
- B. 11.43 mm (.45 in)
- C. 60.5 mm (2.38 in)

4. Place inner rotor onto the oil pump shaft. Lubricate oil pump shaft and inner rotor with engine oil.

5. Install oil pump shaft assembly into the crankcase.

After installation of the remaining parts, check for smooth operation of the oil pump assembly and axial play of the oil pump shaft.

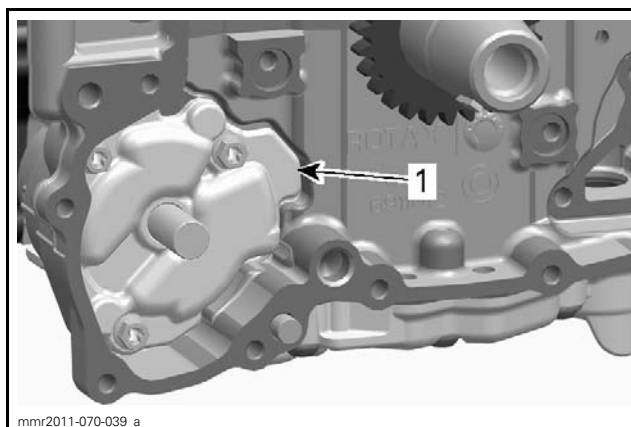
6. Fill up oil tank and check oil level. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Start engine and make sure oil pressure is within specifications (refer to *ENGINE OIL PRESSURE* in this subsection).

## OIL SUCTION PUMP MODULE

### Oil Suction Pump Module Location

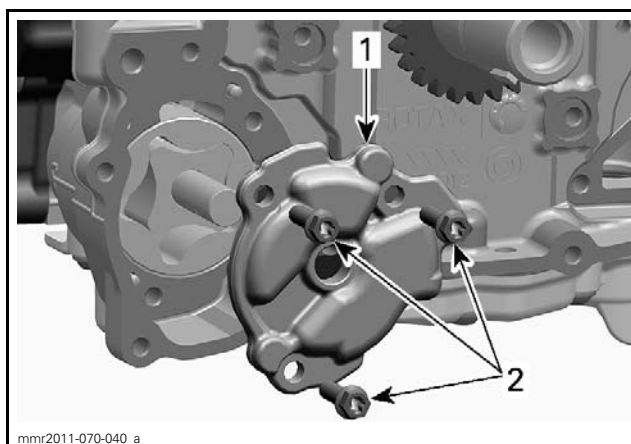
The oil suction pump module is located in the cylinder block, behind the magneto cover.



1. Oil suction pump module

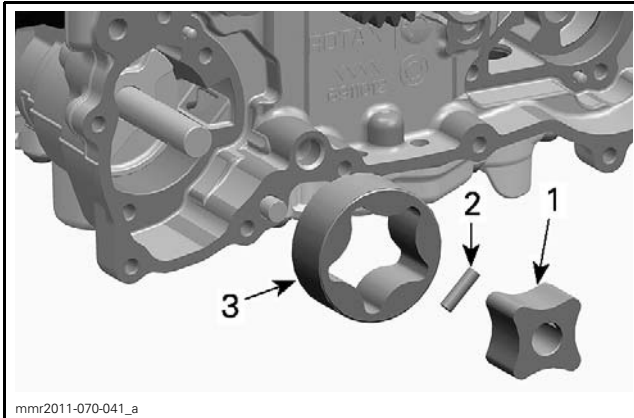
### Disassembling the Oil Suction Pump Module

1. Remove *OIL PUMP DRIVE GEARS*, see procedure in this subsection.
2. Remove oil pump module cover.



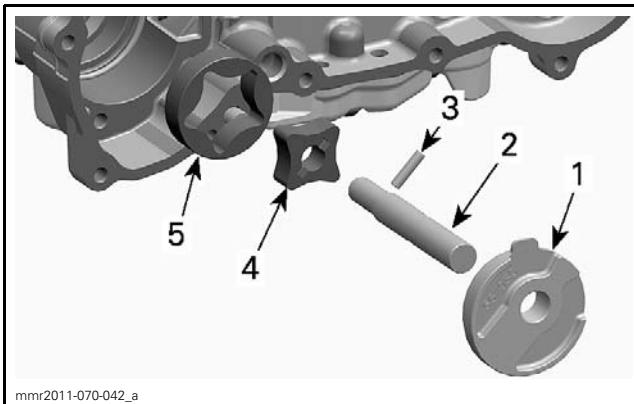
1. Oil pump module cover
2. Retaining screws

3. Disassemble the large oil suction pump as shown.



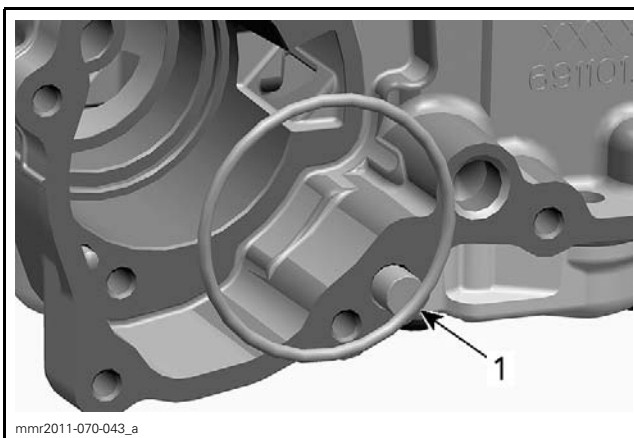
1. Inner rotor
2. Needle pin
3. Outer rotor

4. Disassemble the small oil suction pump as shown.



1. Oil pump cover
2. Oil pump shaft
3. Needle pin
4. Inner rotor
5. Outer rotor

5. Remove and discard the oil pump cover O-ring.



1. Oil pump cover O-ring

## Inspecting the Oil Suction Pumps

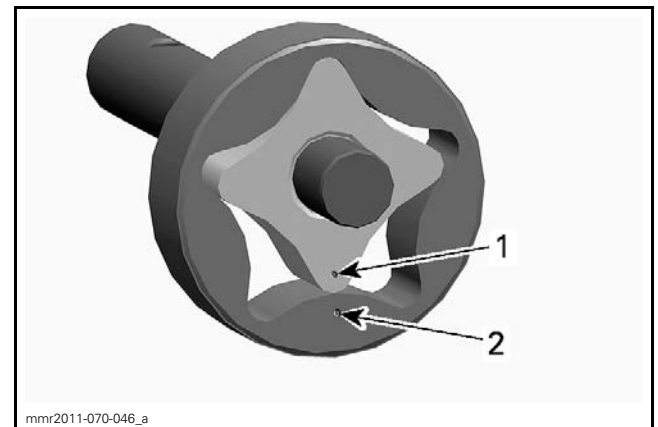
The inspection of both oil suction pumps is the same as for the oil pressure pump. Refer to *OIL PRESSURE PUMP* in this subsection.

## Assembling the Oil Suction Pump Module

For installation, reverse the removal procedure, however, pay attention to the following.

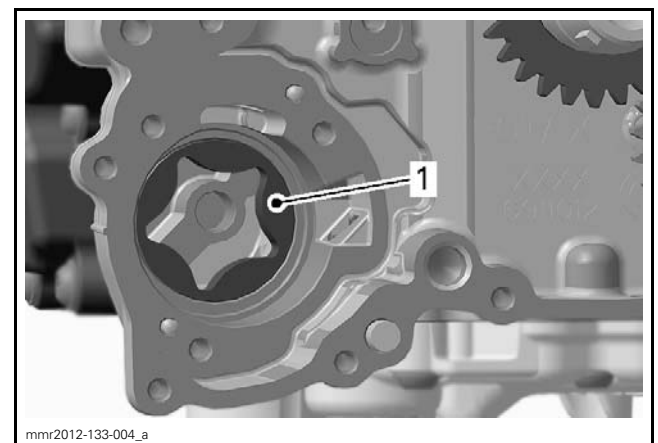
1. Lubricate small oil suction pump outer rotor with engine oil.

**NOTICE** When installing the oil pump rotors, make sure both marks are pointing toward the inside of the crankcase.



1. Mark on inner rotor
2. Mark on outer rotor

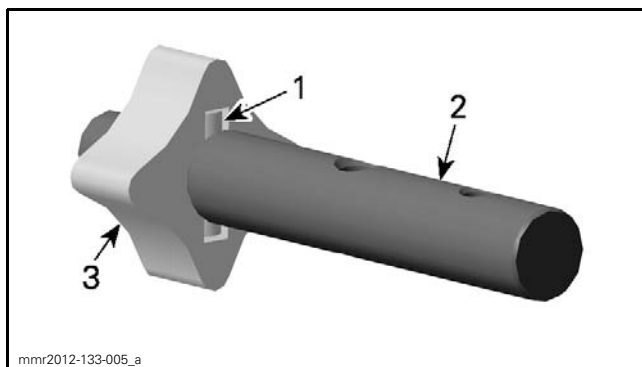
2. Install small oil suction pump outer rotor into crankcase oil pump bore.



1. Small oil suction pump outer rotor

3. Install needle pin in bore of the oil pump shaft and place the small inner rotor on the shaft.

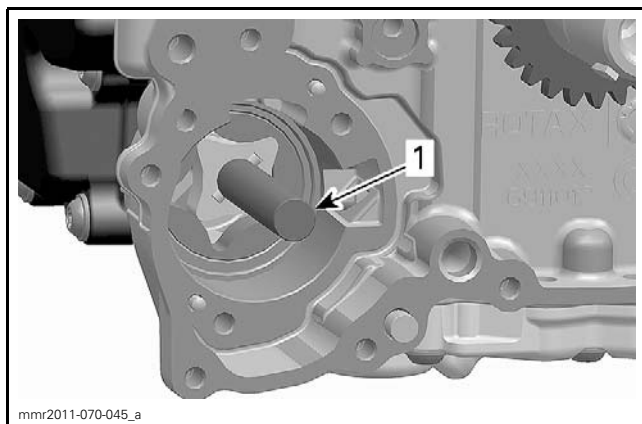
## Subsection XX (LUBRICATION SYSTEM)



1. Needle pin
2. Oil pump shaft
3. Small suction pump inner rotor

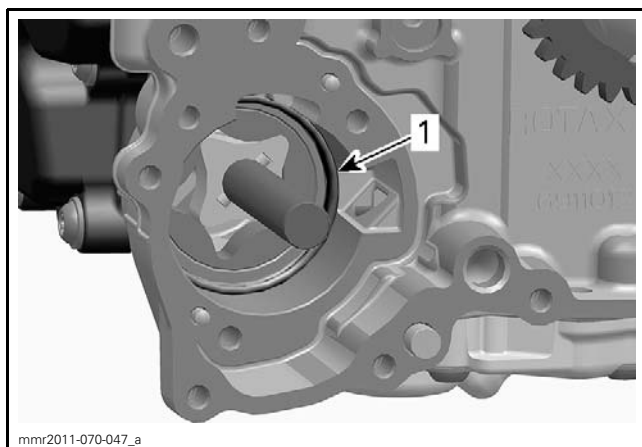
4. Lubricate oil pump shaft and inner rotor with engine oil.

5. Install oil pump shaft assembly into the crankcase.



1. Oil pump shaft with small oil suction pump

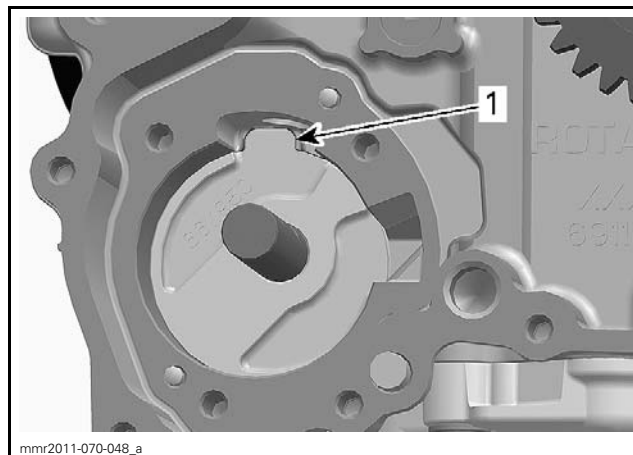
6. Install a **NEW** oil pump cover O-ring.



1. Oil pump cover O-ring

7. Lubricate both sides of the oil pump cover with engine oil.

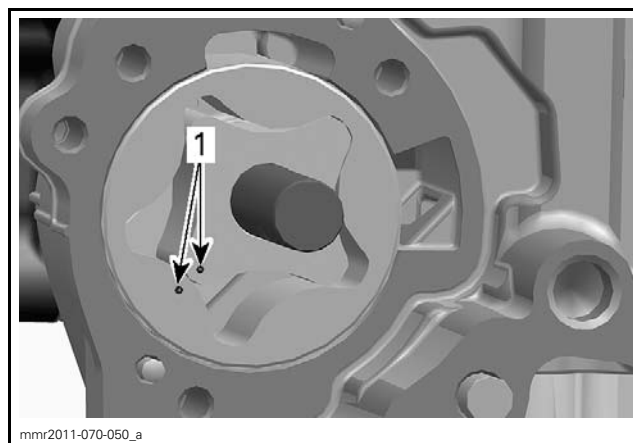
8. Align tab of the oil pump cover with the upper recess in the crankcase. Push cover in until a click is heard, indicating the cover is properly installed.



1. Oil pump cover tab properly positioned

9. Install large oil suction pump needle pin.

10. Install large oil suction pump inner rotor and outer rotor with the marks outwards.



1. Marks on inner and outer rotor

11. Lubricate large oil suction pump parts with engine oil.

12. Install other removed parts.

After installation is complete, check for smooth operation of the oil pump assembly and axial play of the oil pump shaft.

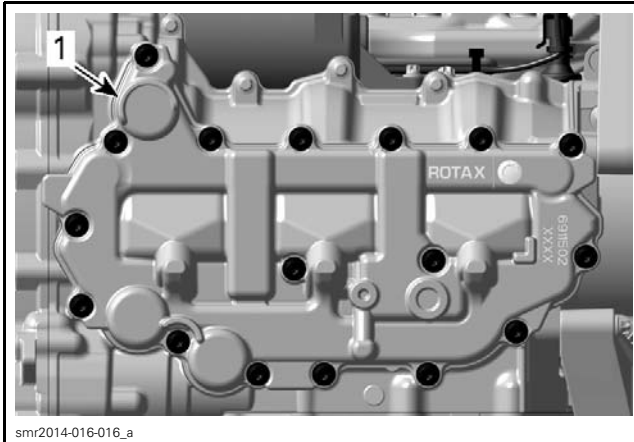
13. Fill up oil tank and check oil level. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Start engine and make sure oil pressure is within specifications (refer to *ENGINE OIL PRESSURE* in this subsection).

## OIL SUMP COVER

### Oil Sump Cover Location

The oil sump cover is located on the engine bottom.

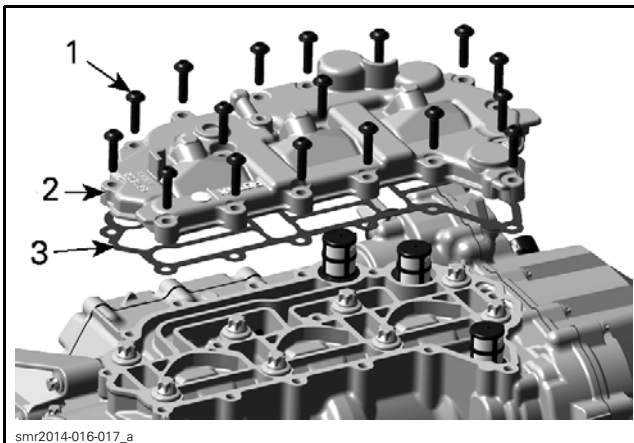


**BOTTOM OF ENGINE**

1. Oil sump cover

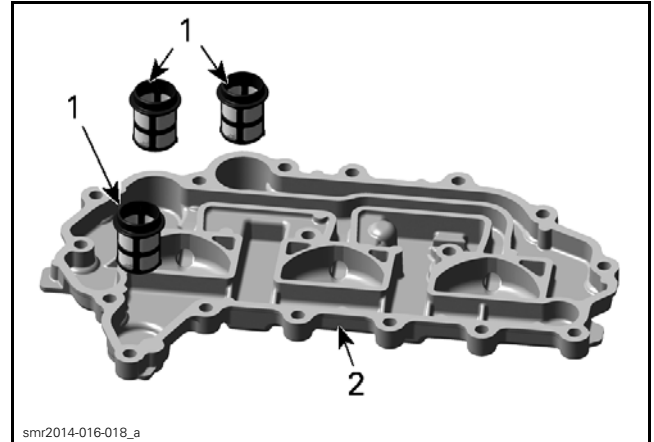
### Removing the Oil Sump Cover

1. Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
2. Drain engine oil, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
3. Unscrew oil sump cover retaining screws.
4. Remove oil sump cover. Discard gasket.



1. Retaining screws  
2. Oil sump cover  
3. Gasket

5. Remove and clean engine oil strainers.

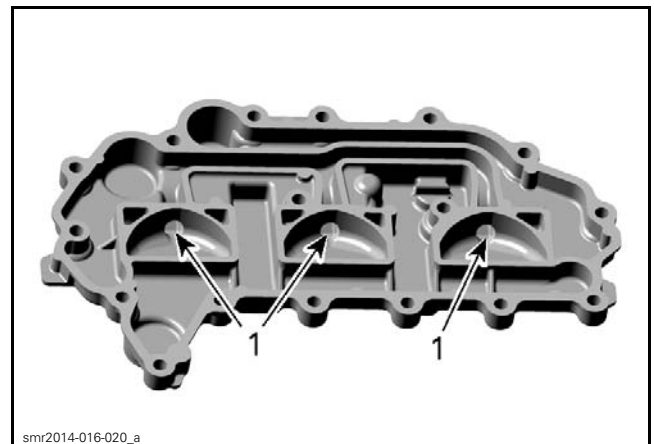


1. Engine oil strainers  
2. Oil sump cover

### Inspecting the Oil Sump Cover

Clean oil sump cover and engine oil strainers with a part cleaner, then use an air gun to dry it.

Blow out the oil orifices and check if they are not clogged.



1. Oil drain bores

Check oil sump cover for cracks or other damage. Check oil sump cover for flatness with straight edge.

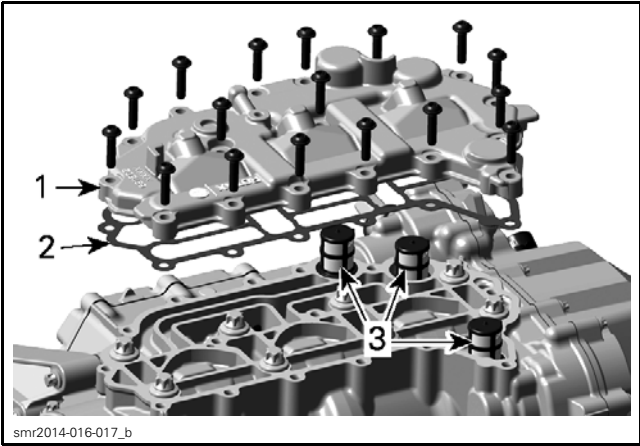
Replace oil sump cover if necessary.

Check engine oil strainers for damage and change if necessary.

### Installing the Oil Sump Cover

1. Install a **NEW** oil sump cover gasket.
2. Install the strainers as shown.

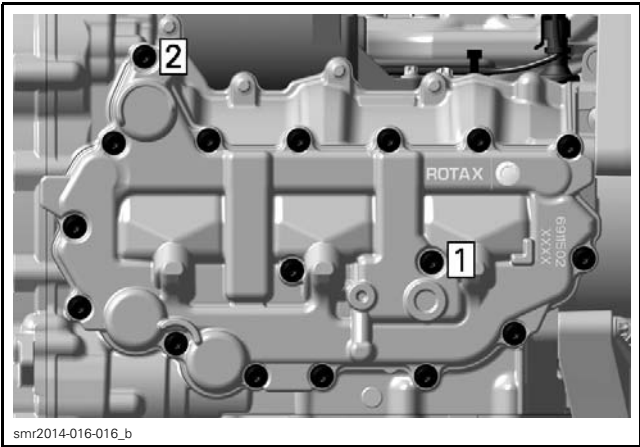




- 1. Oil sump cover
- 2. Gasket
- 3. Engine oil strainers

3. Install the oil sump cover on the engine, then tighten screws in two steps as follows:
- 3.1 Tighten the following screws to the specified torque and sequence.

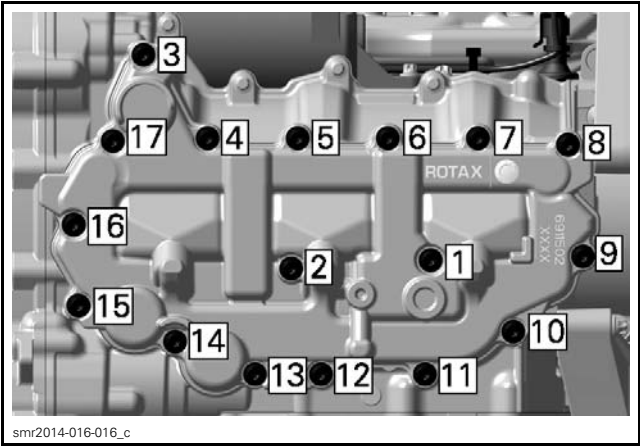
| TIGHTENING TORQUE     |        |                                           |
|-----------------------|--------|-------------------------------------------|
| Oil sump cover screws | Step A | 5 N•m ± 0.6 N•m<br>(44 lbf•in ± 5 lbf•in) |



TIGHTENING SEQUENCE STEP A

- 3.2 Tighten the following screws to the specified torque and sequence.

| TIGHTENING TORQUE     |        |                                         |
|-----------------------|--------|-----------------------------------------|
| Oil sump cover screws | Step B | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |



TIGHTENING SEQUENCE STEP B

4. Install engine in vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
5. Fill up oil tank and check oil level. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

# COOLING SYSTEM

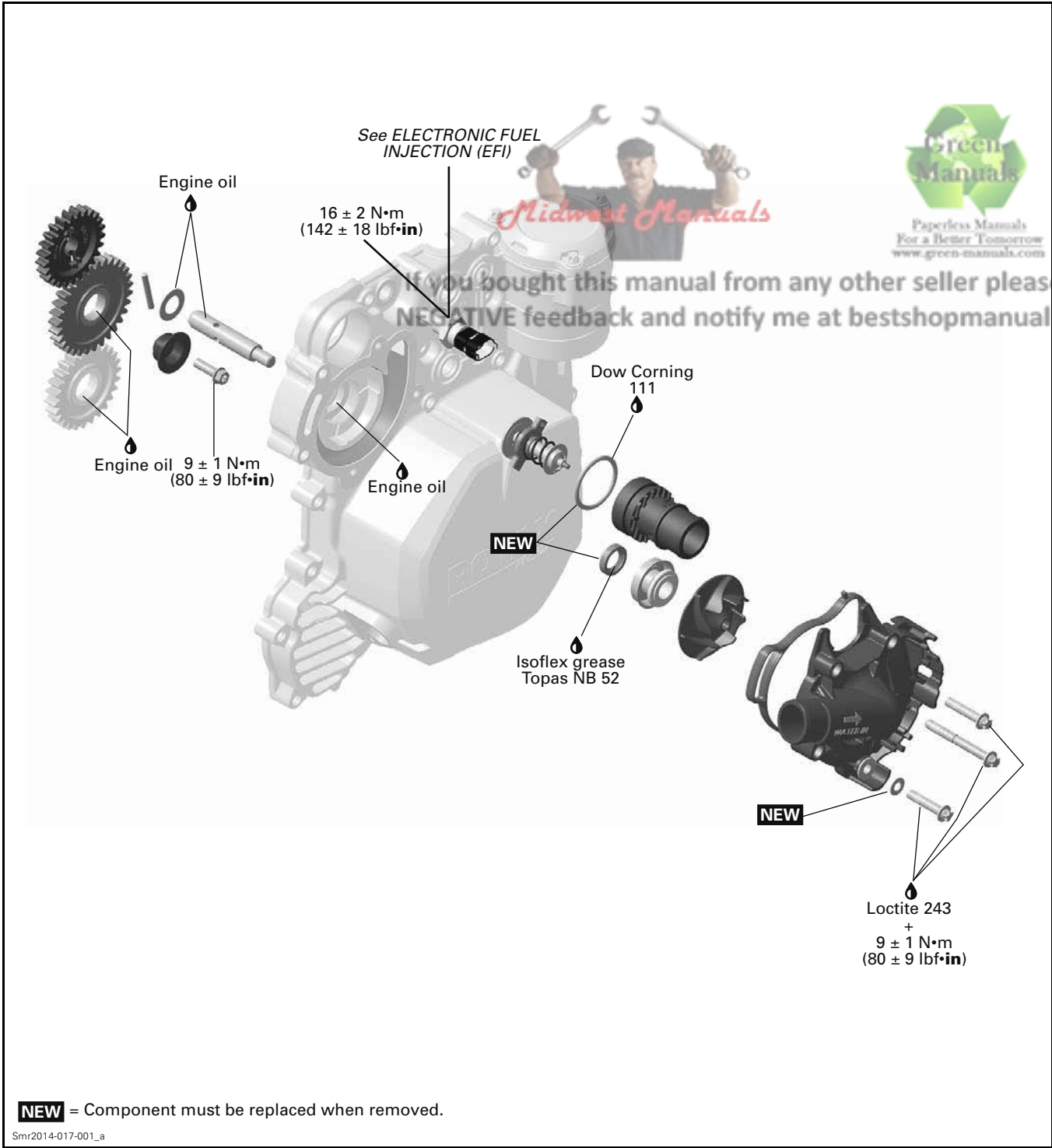
## SERVICE TOOLS

| Description                 | Part Number       | Page |
|-----------------------------|-------------------|------|
| HANDLE .....                | 420 877 650 ..... | 81   |
| OETIKER PLIERS.....         | 295 000 070 ..... | 76   |
| OIL SEAL PUSHER.....        | 529 036 210 ..... | 81   |
| ROTARY SEAL INSTALLER ..... | 529 036 211 ..... | 81   |
| TEST CAP .....              | 529 035 991 ..... | 75   |
| VACUUM/PRESSURE PUMP .....  | 529 021 800 ..... | 75   |

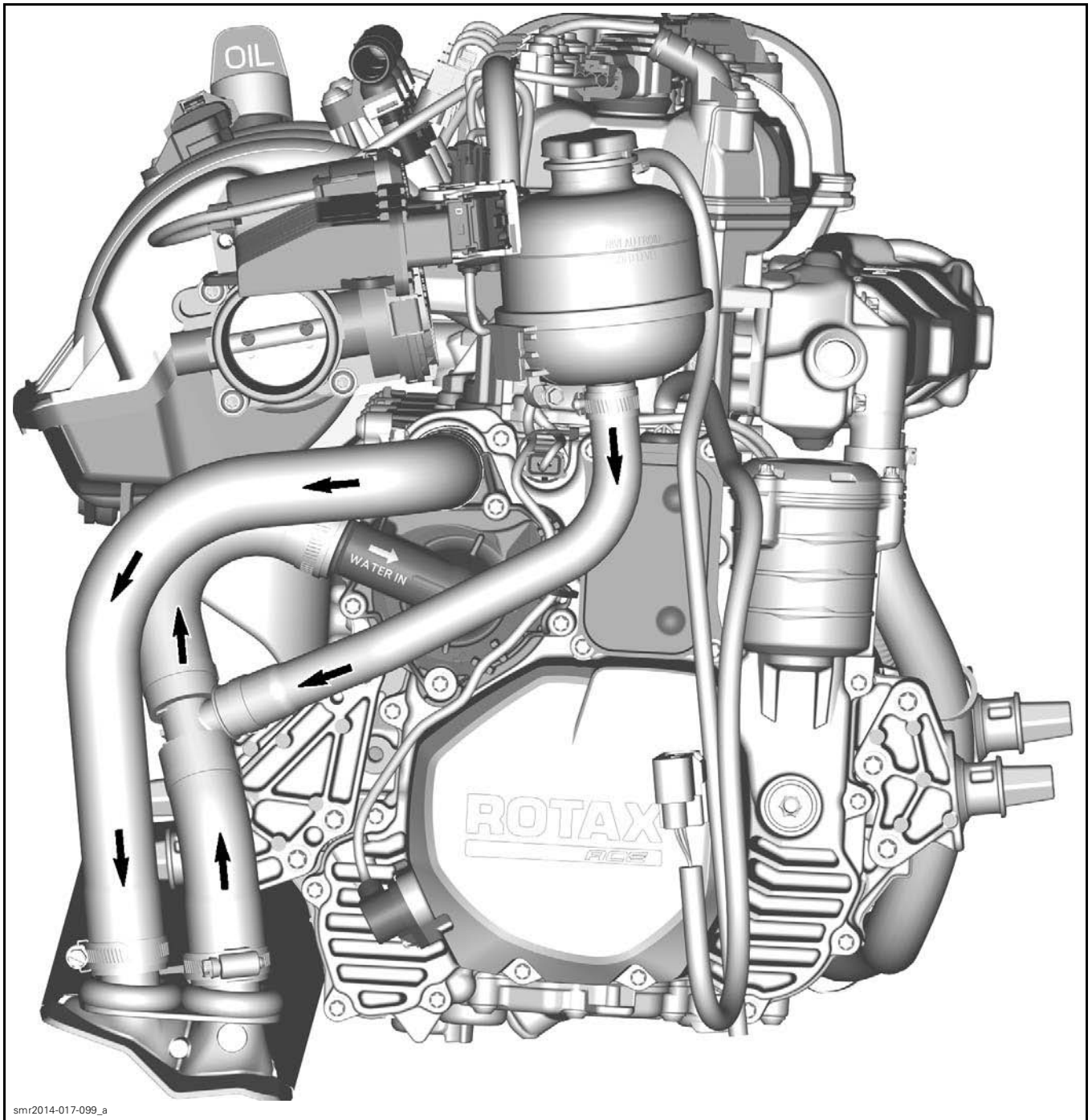
## SERVICE PRODUCTS

| Description                      | Part Number       | Page   |
|----------------------------------|-------------------|--------|
| DOW CORNING 111 .....            | 413 707 000 ..... | 78     |
| ISOFLEX GREASE TOPAS NB 52 ..... | 293 550 021 ..... | 81     |
| LOCTITE 243 (BLUE).....          | 293 800 060 ..... | 82     |
| LOCTITE 5900 .....               | 293 800 066 ..... | 85     |
| LONG LIFE ANTIFREEZE .....       | 219 702 685 ..... | 75, 83 |

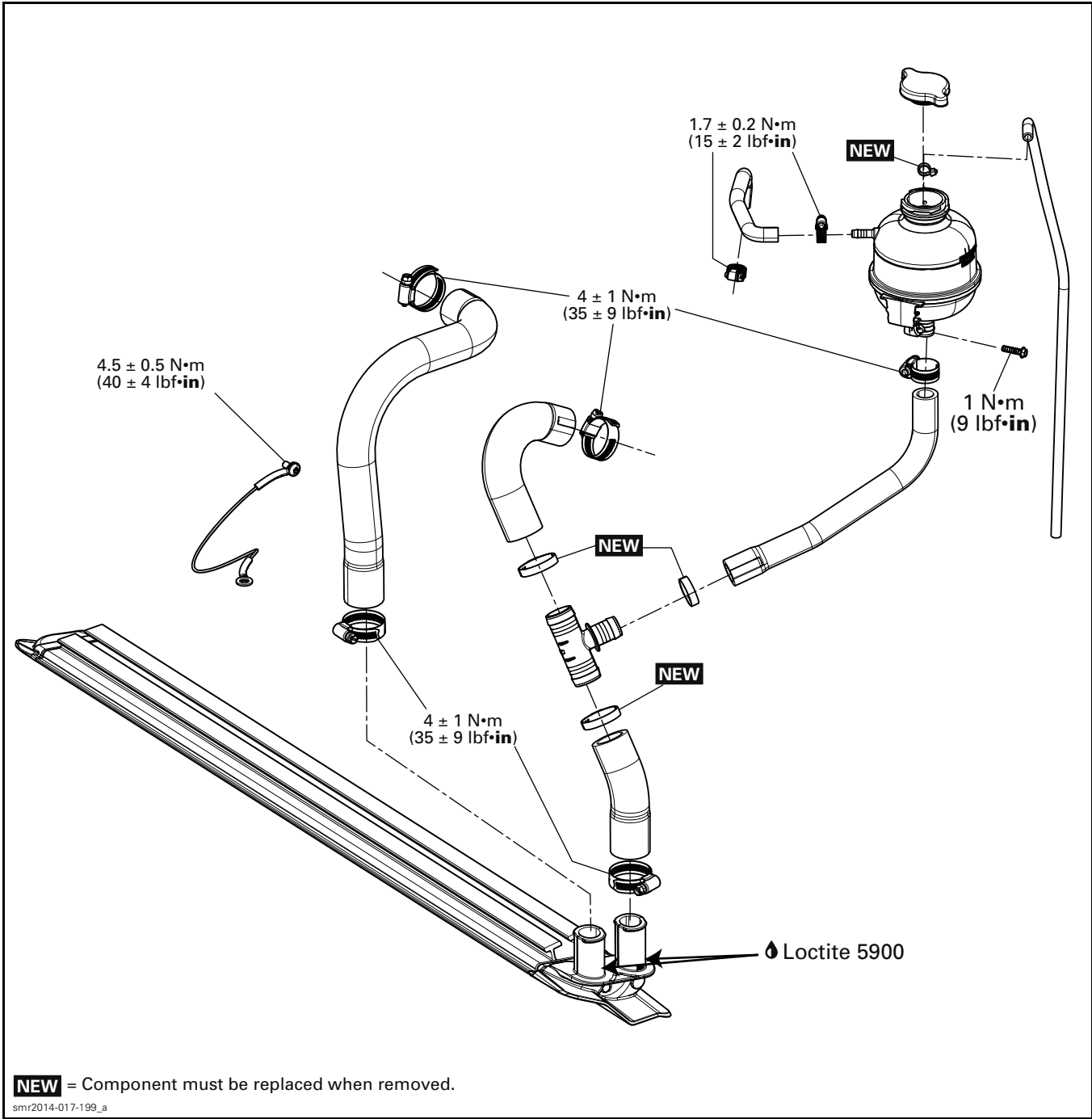
ENGINE COMPONENTS



## COOLANT FLOW

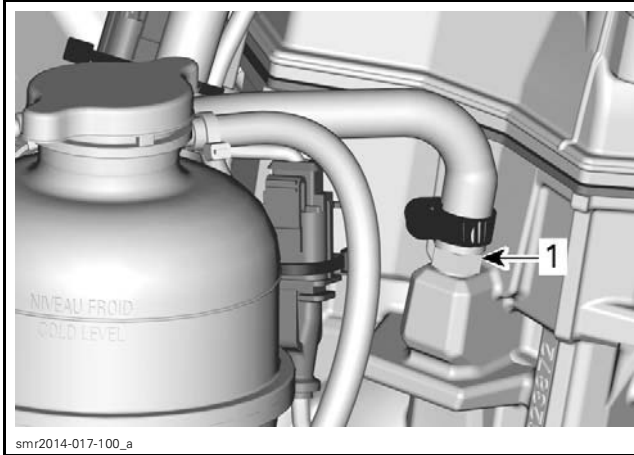


VEHICLE COMPONENTS



## GENERAL

Coolant bleed hose nipple is located on the cylinder head.



1. Bleed hose nipple

**NOTE:** It is a good practice to check for fault codes using B.U.D.S. software as a first troubleshooting step. Refer to the *DIAGNOSTIC AND FAULT CODES* subsection.

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

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

### **⚠ WARNING**

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

### **⚠ WARNING**

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

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

## TECHNICAL SPECIFICATIONS

|                     |                                                                            |
|---------------------|----------------------------------------------------------------------------|
| TYPE                | Closed loop cooling system.                                                |
| COOLANT FLOW        | Flow from water pump.                                                      |
| TEMPERATURE CONTROL | Thermostat.                                                                |
| SYSTEM BLEEDING     | Self-bleed type through coolant tank (hose at uppermost point of circuit). |
| MONITORING BEEPER   | Turns on at 100°C (212°F).                                                 |
| COOLANT TYPE        | LONG LIFE ANTIFREEZE (P/N 219 702 685)                                     |

## INSPECTION

### COOLING SYSTEM LEAK TEST

#### **⚠ WARNING**

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

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

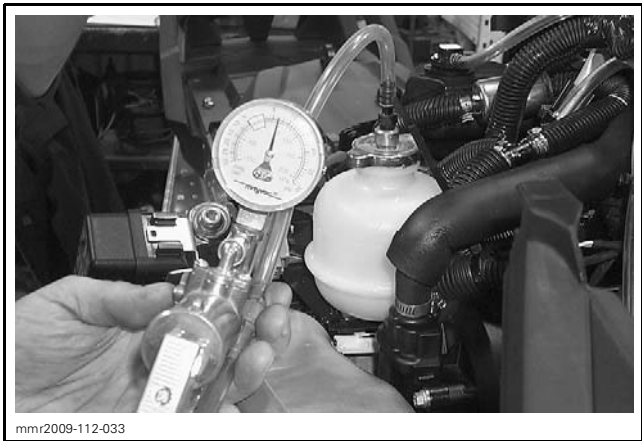
Pressurize cooling system through coolant reservoir.

#### REQUIRED TOOL

|                                        |                                                                                       |
|----------------------------------------|---------------------------------------------------------------------------------------|
| TEST CAP (P/N 529 035 991)             |  |
| VACUUM/PRESSURE PUMP (P/N 529 021 800) |  |

#### COOLING SYSTEM LEAK TEST

110 kPa (16 PSI)

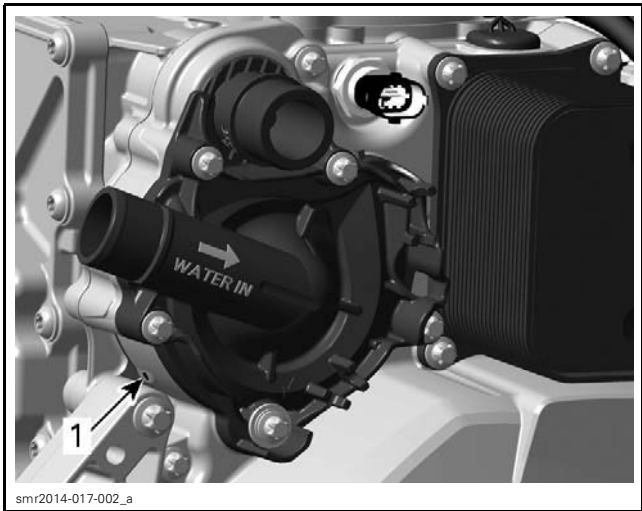


TYPICAL

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

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

**NOTE:** In general leaking coolant indicates a damaged rotary seal. Leaking oil indicates a damaged oil seal. If either seal is leaking, both seals must be replaced at the same time. Refer to *WATER PUMP* in this subsection.



1. Leak indicator hole

## TROUBLESHOOTING

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

Always check for fault codes. If a fault code is detected, service the fault code first.

## ENGINE OVERHEATING

1. Low coolant level.
  - Refill and check for leaks (coolant leaking out of leak indicator hole, hoses or clamps missing or defective, or cylinder head gaskets leaks). Repair or replace.
2. Dirty heat exchanger.
  - Flush heat exchanger. Replace heat exchanger as required.
3. Air in cooling system.
  - Refill. Perform *COOLING SYSTEM LEAK TEST*.
4. Defective thermostat (does not open when engine is warm up).
  - Replace thermostat.
5. Exhaust system clogged
  - Flush exhaust system.
6. Defective water pump.
  - Inspect and replace defective components.
7. Coolant temperature sensor defective.
  - Check and replace if necessary. Refer to *ELECTRONIC FUEL INJECTION (EFI)*.
8. Wrong coolant concentration.
  - Check and adjust coolant concentration according to BRP's recommendations or replace coolant.
9. Defective coolant reservoir cap.
  - Replace cap.
10. Internal passage blocked in cooling system
  - Inspect and clean.

## PROCEDURES

### COOLANT RESERVOIR CAP

#### Coolant Reservoir Cap Test

Using a pressure cap tester, check the efficiency of coolant reservoir cap. If the efficiency is weak, replace the cap.

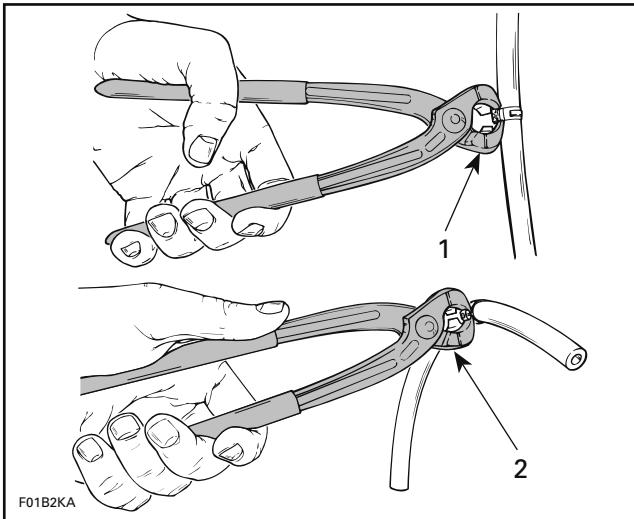
| CAP OPENING PRESSURE             |
|----------------------------------|
| 110 kPa ± 7 kPa (16 PSI ± 1 PSI) |

## CLAMPS

### Clamp Replacement

To cut or secure Oetiker clamps of cooling system hoses, use the OETIKER PLIERS (P/N 295 000 070).





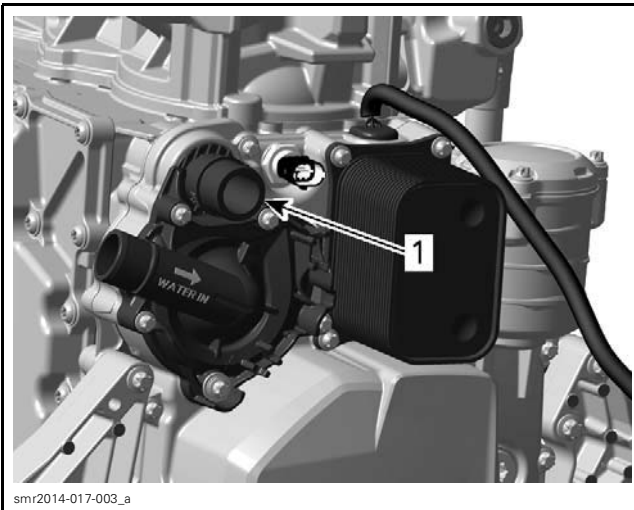
1. Cutting clamp
2. Securing clamp

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

## THERMOSTAT

### Thermostat Location

The thermostat is located on engine MAG side.



1. Thermostat housing



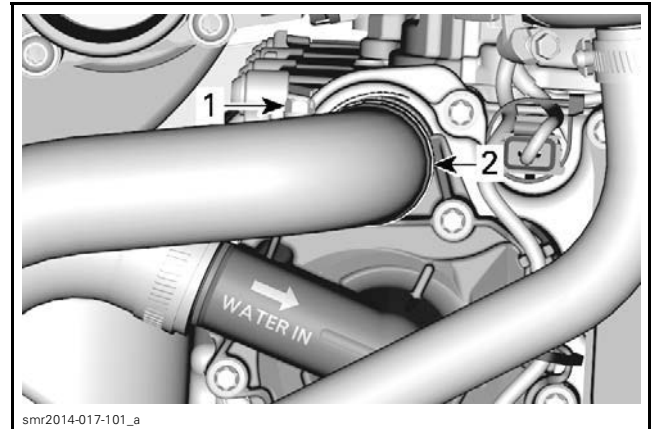
1. Thermostat
2. Thermostat housing

### Thermostat Access

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

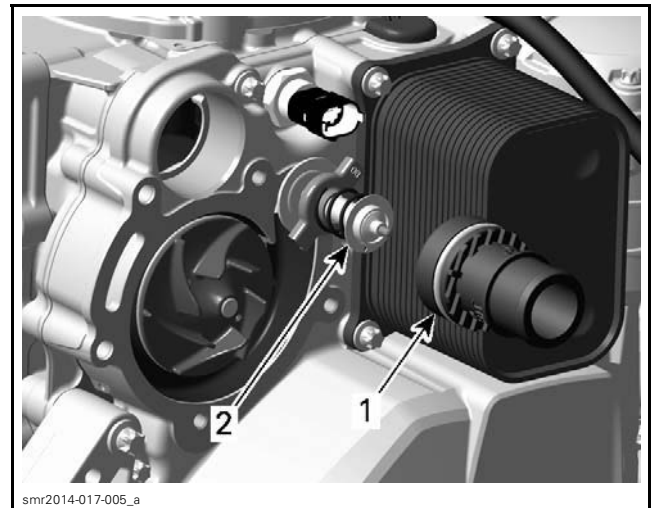
### Thermostat Removal

1. Drain engine coolant. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Disconnect outlet hose from thermostat housing.



1. Thermostat housing outlet hose clamp
2. Thermostat housing outlet hose

3. Proceed with *WATER PUMP HOUSING REMOVAL*. See procedure in this subsection.
4. Remove thermostat housing then thermostat.



1. Thermostat housing
2. Thermostat

**NOTE:** Use shop rags to catch any spilled engine coolant.

### Thermostat Test

To check thermostat, put it in water and heat water.

Section 02 ENGINE

Subsection 05 (COOLING SYSTEM)

| THERMOSTAT TEMPERATURE |              |
|------------------------|--------------|
| Starts to open         | 80°C (176°F) |
| Fully open             | 95°C (203°F) |

Replace thermostat if out of specification.

Thermostat Installation

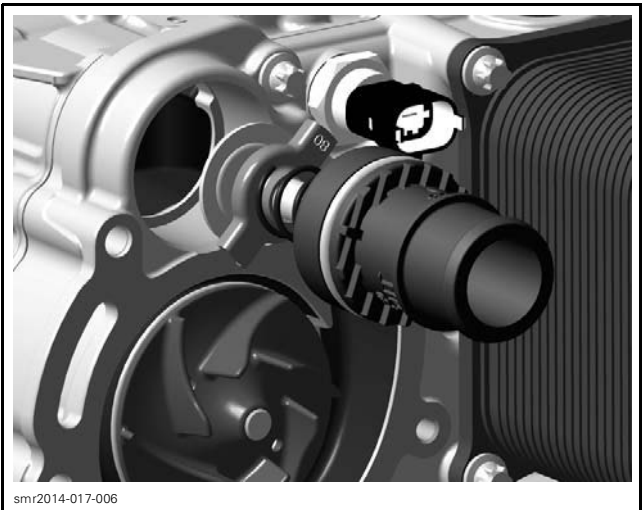
The installation is the reverse of removal procedure, however pay attention to the following.

Install **NEW** O-ring on thermostat housing.

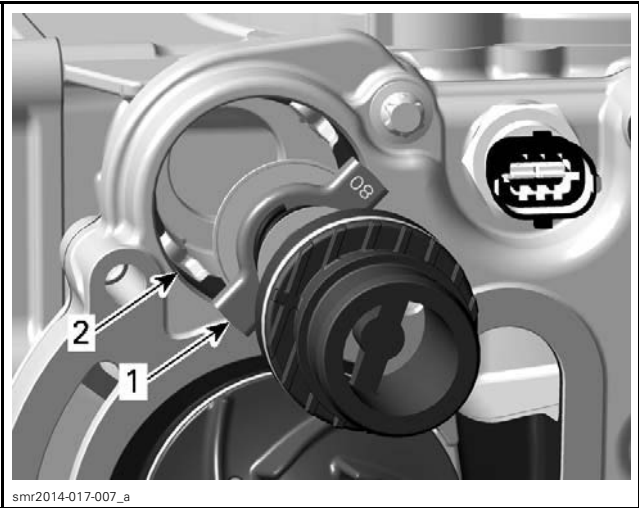
Lubricate O-ring.

| THERMOSTAT HOUSING O-RING |                                      |
|---------------------------|--------------------------------------|
| Service Product           | DOW CORNING 111<br>(P/N 413 707 000) |

Fit thermostat in thermostat housing.



Align both tabs of thermostat with the recess in the magneto cover.



- 1. Thermostat tabs
- 2. Magneto cover recess

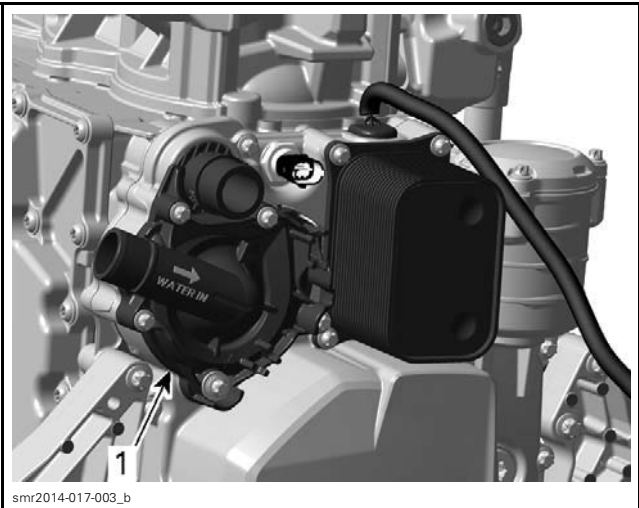
Install water pump housing, refer to *WATER PUMP HOUSING INSTALLATION* in this subsection.

Refill and bleed cooling system. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

WATER PUMP

Water Pump Location

The water pump is located on engine MAG side.



- 1. Water pump

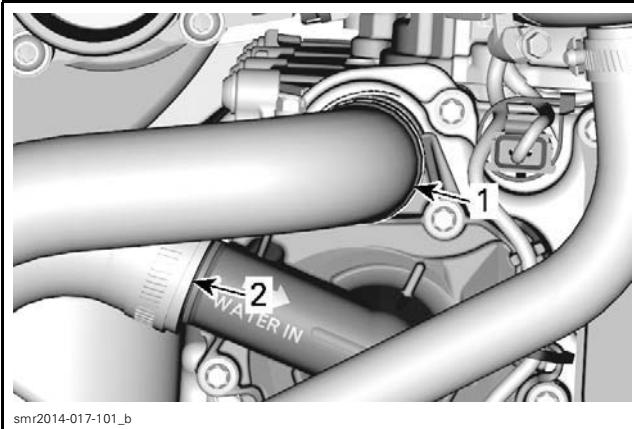
Water Pump Access

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

Water Pump Housing Removal

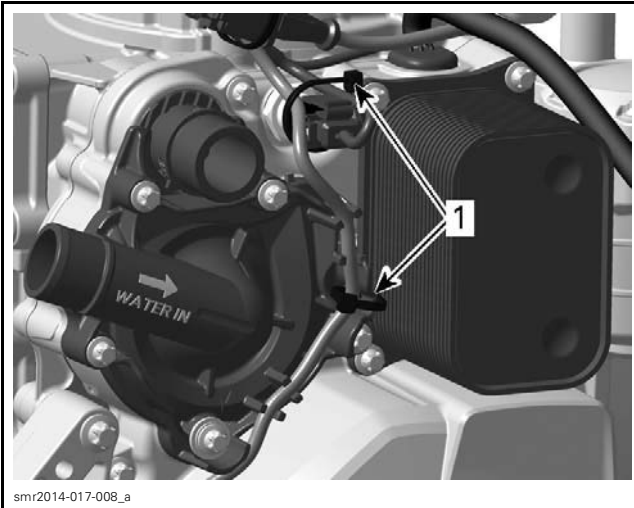
- 1. Drain engine coolant. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

2. Disconnect outlet hose from thermostat housing.
3. Disconnect inlet hose from water pump.



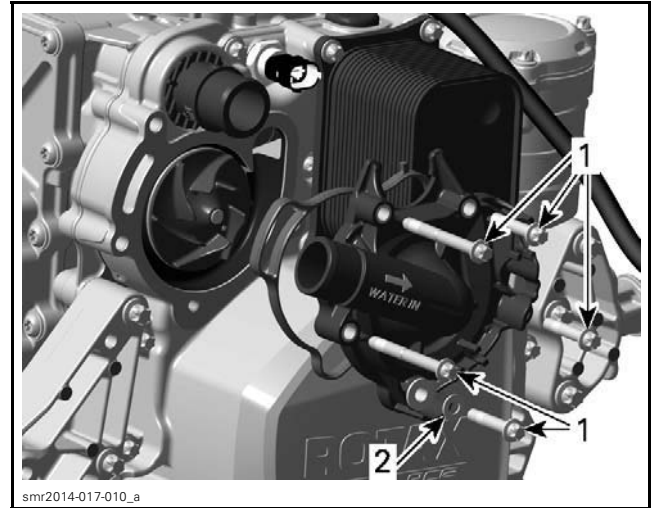
1. Water pump outlet hose
2. Water pump inlet hose

4. Remove both locking ties securing magneto wires.



1. Locking ties

5. Remove retaining screws of water pump housing.
6. Discard sealing washer.
7. Remove water pump housing from magneto cover.

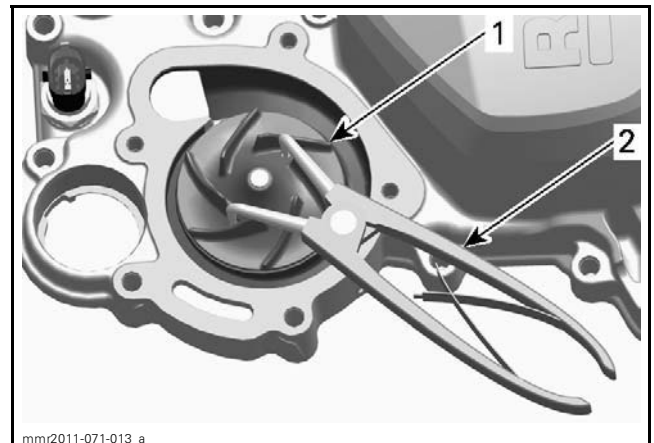


1. Retaining screws
2. Sealing washer

**NOTE:** Use shop rags to catch any spilled engine coolant.

### Water Pump Disassembly

1. Unscrew impeller counterclockwise using appropriate pliers.

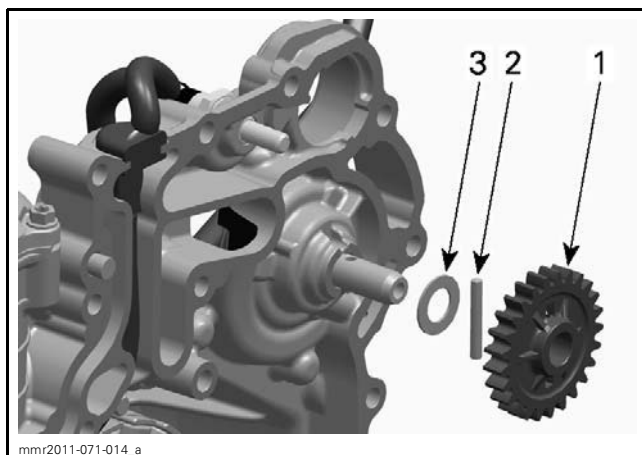


1. Impeller
2. Pliers

2. Remove magneto cover. Refer to *MAGNETO AND STARTER* subsection.
3. Remove the following components from magneto cover:
  - Water pump gear
  - Needle pin
  - Thrust washer.

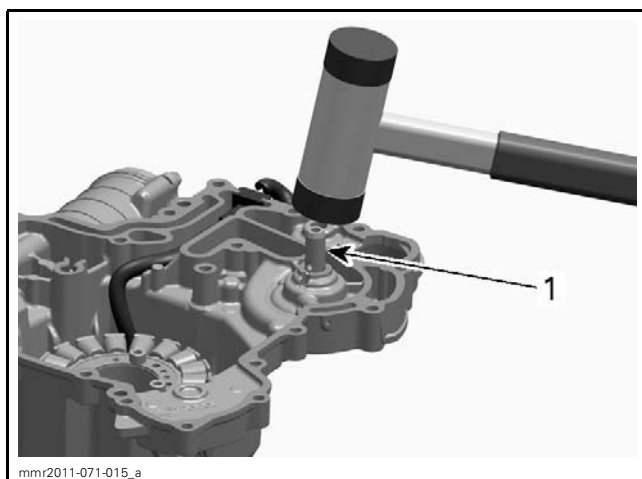
## Section 02 ENGINE

### Subsection 05 (COOLING SYSTEM)



1. Water pump gear
2. Needle pin
3. Thrust washer

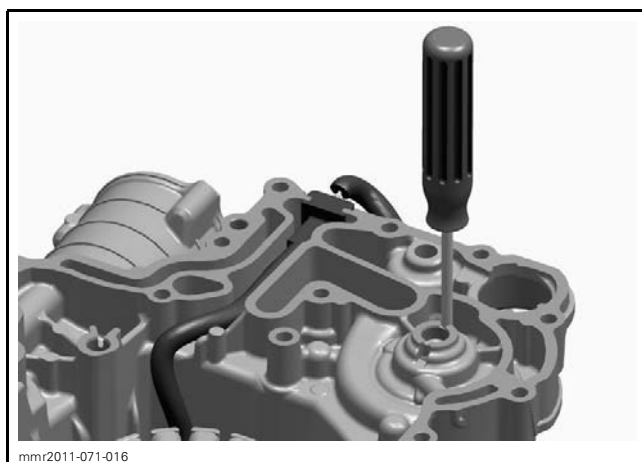
4. Remove water pump shaft using a plastic mallet.



1. Water pump shaft

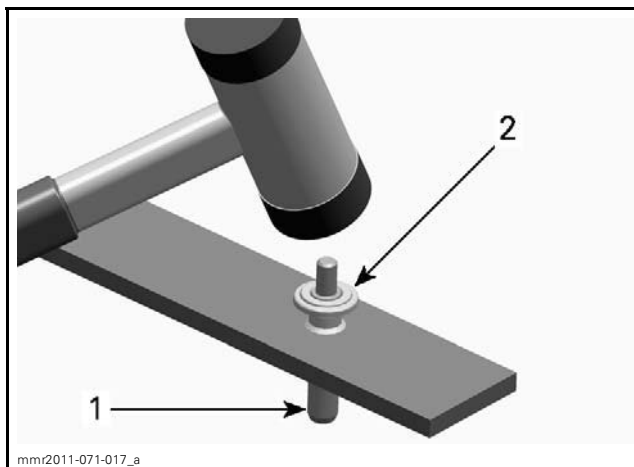
5. Remove the following components from magneto cover:

- Oil seal
- Remaining parts of rotary seal.



**NOTICE** Be careful not to damage the surface of the rotary seal bore in the magneto cover.

6. Separate rotary seal from water pump shaft.



1. Water pump shaft.
2. Rotary seal

### Water Pump Inspection

Check area of water pump housing for cracks or other visible damage.

Check water pump gear for wear or broken teeth.

Check if housing gasket is brittle, hard or damaged.

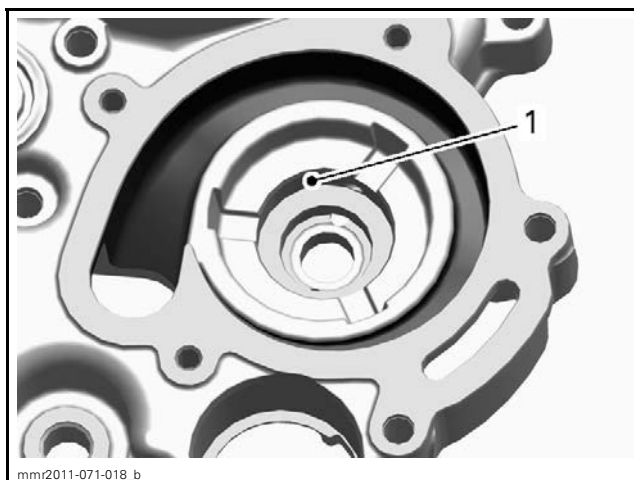
Check water pump shaft for visible damage.

Replace parts if necessary.

### Water Pump Assembly

**NOTE:** Always replace oil seal and rotary seal at the same time.

1. Clean rotary seal surface from old sealant.



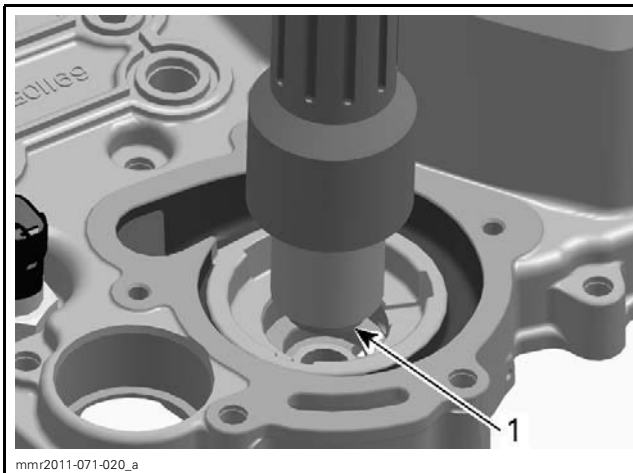
1. Clean surface

2. Apply engine oil on the press fit area of oil seal.

**NOTICE** Never use engine oil on the press fit area of the rotary seal.

3. Install **NEW** oil seal.

| REQUIRED TOOL                     |                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------|
| OIL SEAL PUSHER (P/N 529 036 210) |  |
| HANDLE (P/N 420 877 650)          |  |



1. Oil seal



1. Oil seal correctly installed

4. Lubricate sealing lip of the oil seal.

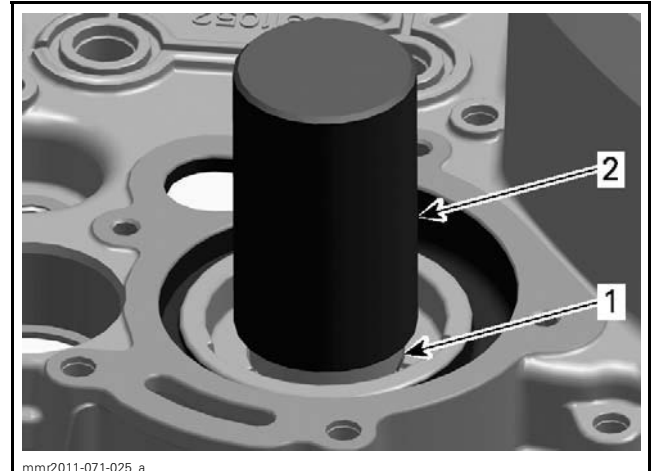
| OIL SEAL        |                                                 |
|-----------------|-------------------------------------------------|
| Service Product | ISOFLEX GREASE<br>TOPAS NB 52 (P/N 293 550 021) |

5. Install **NEW** rotary seal.

**NOTE:** Prior to installing, ensure that press fit sealing of rotary seal is not damaged.

| REQUIRED TOOL                           |                                                                                     |
|-----------------------------------------|-------------------------------------------------------------------------------------|
| Press                                   |                                                                                     |
| ROTARY SEAL INSTALLER (P/N 529 036 211) |  |

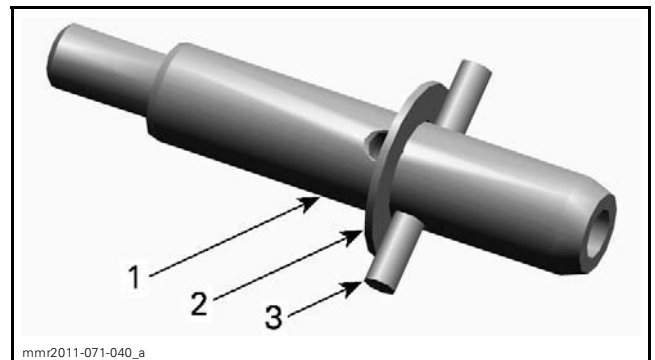
**NOTICE** Never use a hammer for rotary seal installation. Only use a press to avoid damaging the ceramic component.



1. Rotary seal  
2. Rotary seal installer

6. Assemble the following components onto water pump shaft.

- Needle pin
- Thrust washer.

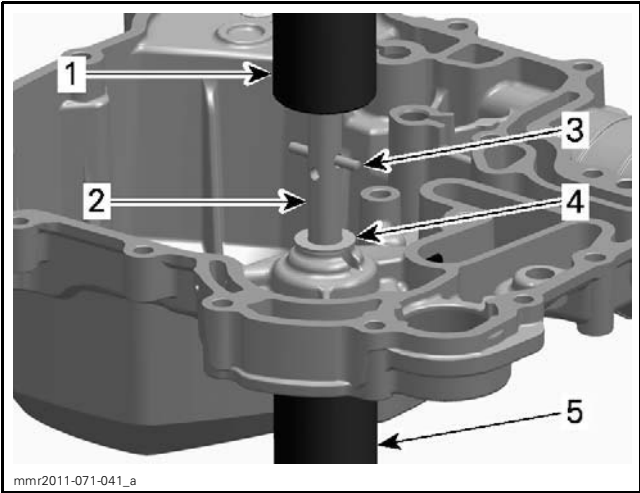


1. Water pump shaft  
2. Thrust washer  
3. Needle pin

7. Slide water pump shaft into rotary seal using a press.

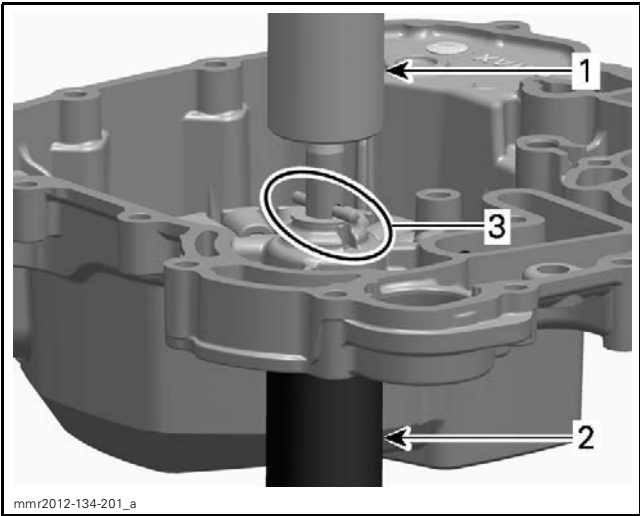
**NOTE:** To avoid damaging the rotary seal and to achieve the proper preload support the rotary seal with the ROTARY SEAL INSTALLER (P/N 529 036 211)

Section 02 ENGINE
Subsection 05 (COOLING SYSTEM)



- 1. Press
- 2. Water pump shaft
- 3. Needle pin
- 4. Thrust washer
- 5. Rotary seal installer

8. Carefully press water pump shaft until needle pin touches thrust washer.



- 1. Press
- 2. Rotary seal installer
- 3. Needle pin touches thrust washer

NOTICE Never use a hammer to install water pump shaft into rotary seal.

NOTE: After installation, water pump shaft must rotate freely.

9. Screw impeller clockwise using appropriate pliers.

NOTICE Be careful not to damage impeller wings during its installation.

10. Install magneto cover. Refer to MAGNETO AND STARTER subsection.

Water Pump Housing Installation

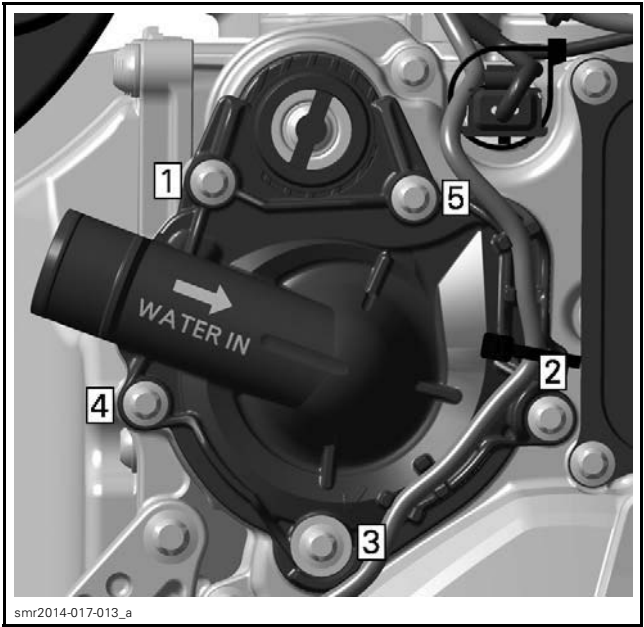
The installation is the reverse of the removal procedure. However, pay attention to the following.

NOTICE To prevent leaking, take care that the new gasket is exactly in groove when you reinstall the water pump housing.

Install a NEW sealing washer on drain screw.

Tighten water pump housing retaining screws to specification as per the following procedure.

Table with 2 columns: Tightening parameter and Specification. Row 1: Service product, LOCTITE 243 (BLUE) (P/N 293 800 060). Row 2: Tightening torque, 9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in).



TIGHTENING SEQUENCE

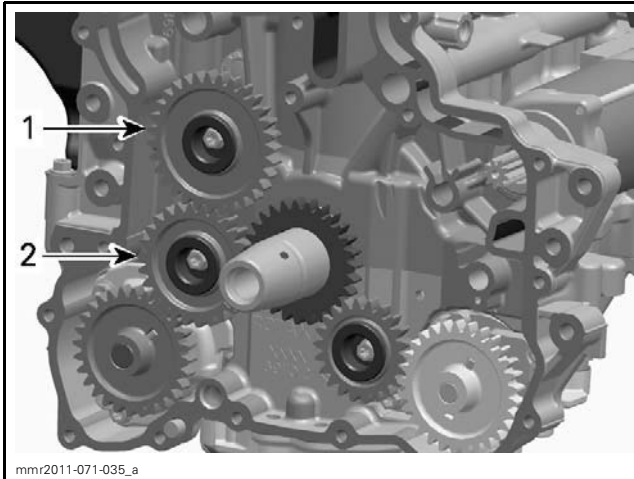
Tighten coolant hose clamps to specification.

Table with 2 columns: Tightening parameter and Specification. Row 1: Coolant hose clamps, 4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in).

WATER PUMP DRIVE GEAR

Water Pump Drive Gear Location

The water pump drive gear is located behind the magneto cover.



mmr2011-071-035\_a  
 1. Water pump drive gear 31 T  
 2. Intermediate gear, refer to LUBRICATION SYSTEM

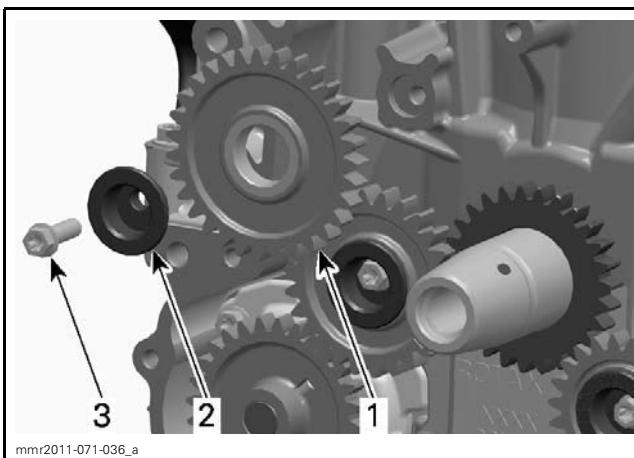
### Water Pump Drive Gear Access

Refer to *MAGNETO AND STARTER* subsection and remove:

- Magneto cover
- Magneto flywheel.

### Water Pump Drive Gear Removal

1. Remove screw securing water pump drive gear.
2. Remove bearing sleeve.
3. Slide off water pump drive gear.



mmr2011-071-036\_a  
 1. Water pump drive gear 31 T  
 2. Bearing sleeve  
 3. M6 x 20 screw

### Water Pump Drive Gear Inspection

Inspect gear for wear or other damage.  
 Replace gear if necessary.

### Water Pump Drive Gear Installation

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

Apply engine oil on bearing sleeve.

Tighten water pump drive gear retaining screw to specification.

| WATER PUMP DRIVE GEAR RETAINING SCREW |                                         |
|---------------------------------------|-----------------------------------------|
| Tightening torque                     | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |

## HEAT EXCHANGER

### Heat Exchanger Inspection

Inspect Heat exchanger for leaks, cracks or sediments. Replace if necessary.

### Heat Exchanger Cleaning

**NOTICE** Cleaning the cooling system as per the following procedure should be performed when cooling system is contaminated, or fouling is suspected. It is not necessary to clean the cooling system if the same LONG LIFE ANTIFREEZE (P/N 219 702 685) (orange color) is used for refilling or replacing.

1. Start with a cool engine.
2. Completely drain coolant. Refer to *PERIODIC MAINTENANCE PROCEDURES*.
3. Add coolant system flushing agent according to instructions.
4. Run the engine according to flushing agent instructions. Allow the engine to cool.
5. Drain flushing agent.
6. Add demineralized water to the cooling system and run the engine according to flushing agent instructions to clear out the system flushing agent. Allow engine to cool.
7. Drain demineralized water.
8. Refill the cooling system with the recommended type and quantity of coolant. Refer to *PERIODIC MAINTENANCE PROCEDURES*.
9. Start the engine and test for proper operation of cooling system.

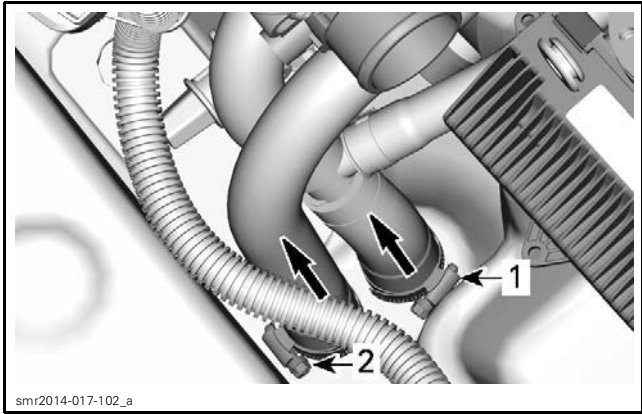
### Heat Exchanger Removal

Air intake system and other components removed for clarity.

1. Remove central body. Refer to *BODY*.
2. Follow image sequence



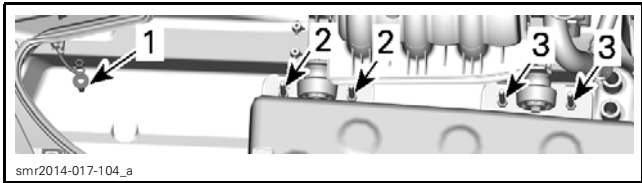
**Section 02 ENGINE**  
**Subsection 05 (COOLING SYSTEM)**



HEAT EXCHANGER REMOVAL- VIEW INSIDE HULL

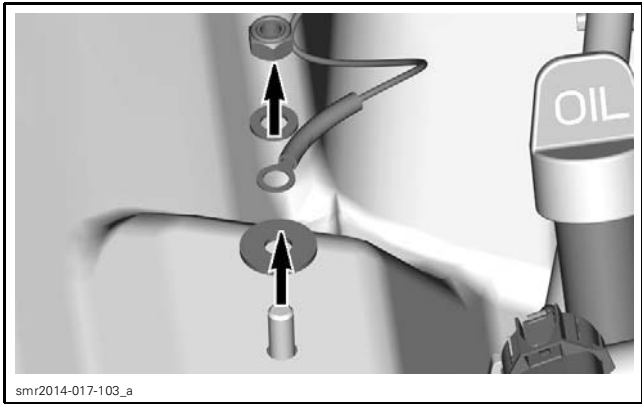
- 1. Heat exchanger outlet hose
- 2. Heat exchanger inlet hose

3. Remove starboard side engine mount clamps. Refer to *ENGINE REMOVAL AND INSTALLATION*.

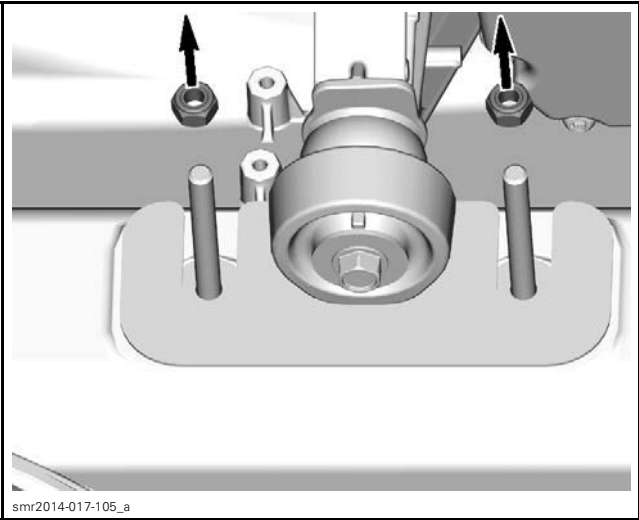


HEAT EXCHANGER CARRIAGE BOLTS

- 1. Rear heat exchanger carriage bolt
- 2. Heat exchanger retaining nuts under rear engine mount clamp
- 3. Heat exchanger retaining nuts under front engine mount clamp

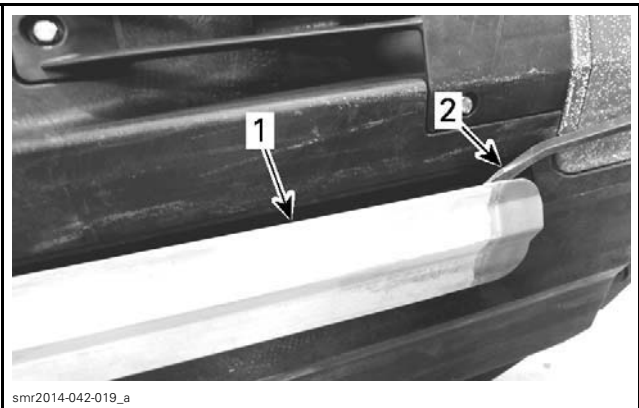


REAR HEAT EXCHANGER CARRIAGE BOLT



HEAT EXCHANGER RETAINING NUTS - UNDER ENGINE MOUNT CLAMP

**NOTE:** Shims must be re-installed in original location for proper engine alignment.

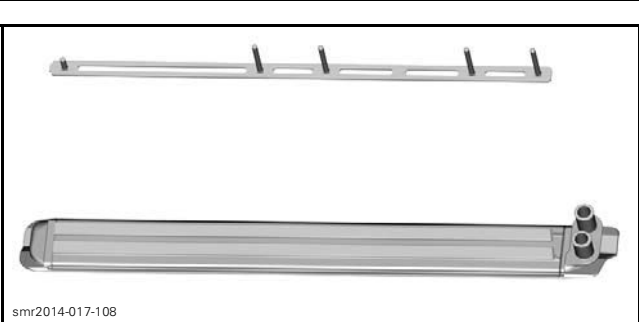
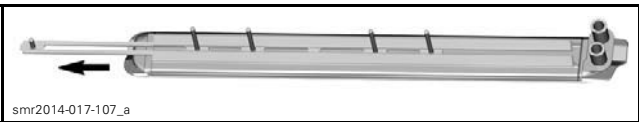


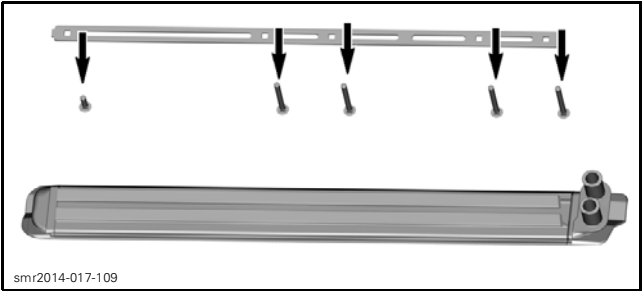
HEAT EXCHANGER- UNDER WATERCRAFT

- 1. Heat exchanger
- 2. Prybar

4. Clean off sealant residues from hull and heat exchanger.

**Heat Exchanger Disassembly**



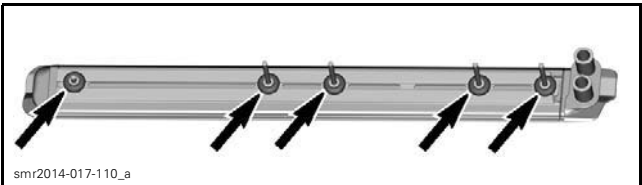


### Heat Exchanger Assembly

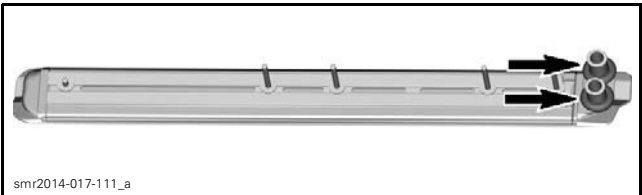
Heat exchanger assembly is the reverse of disassembly.

### Heat Exchanger Installation

1. Apply LOCTITE 5900 (P/N 293 800 066) beads as indicated.



LOCTITE 5900 12 MM (15/32 IN) DIAMETER BEAD APPLICATION



LOCTITE 5900 13.5 MM (17/32 IN) DIAMETER BEAD APPLICATION

Heat exchanger installation is the reverse of removal.

| TIGHTENING TORQUE                |                                          |
|----------------------------------|------------------------------------------|
| M8 heat exchanger retaining nuts | 25 N•m ± 3 N•m<br>(18 lbf•ft ± 2 lbf•ft) |

Refill and bleed cooling system. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Place watercraft in test tank and ensure no water enters the hull.

# MAGNETO AND STARTER

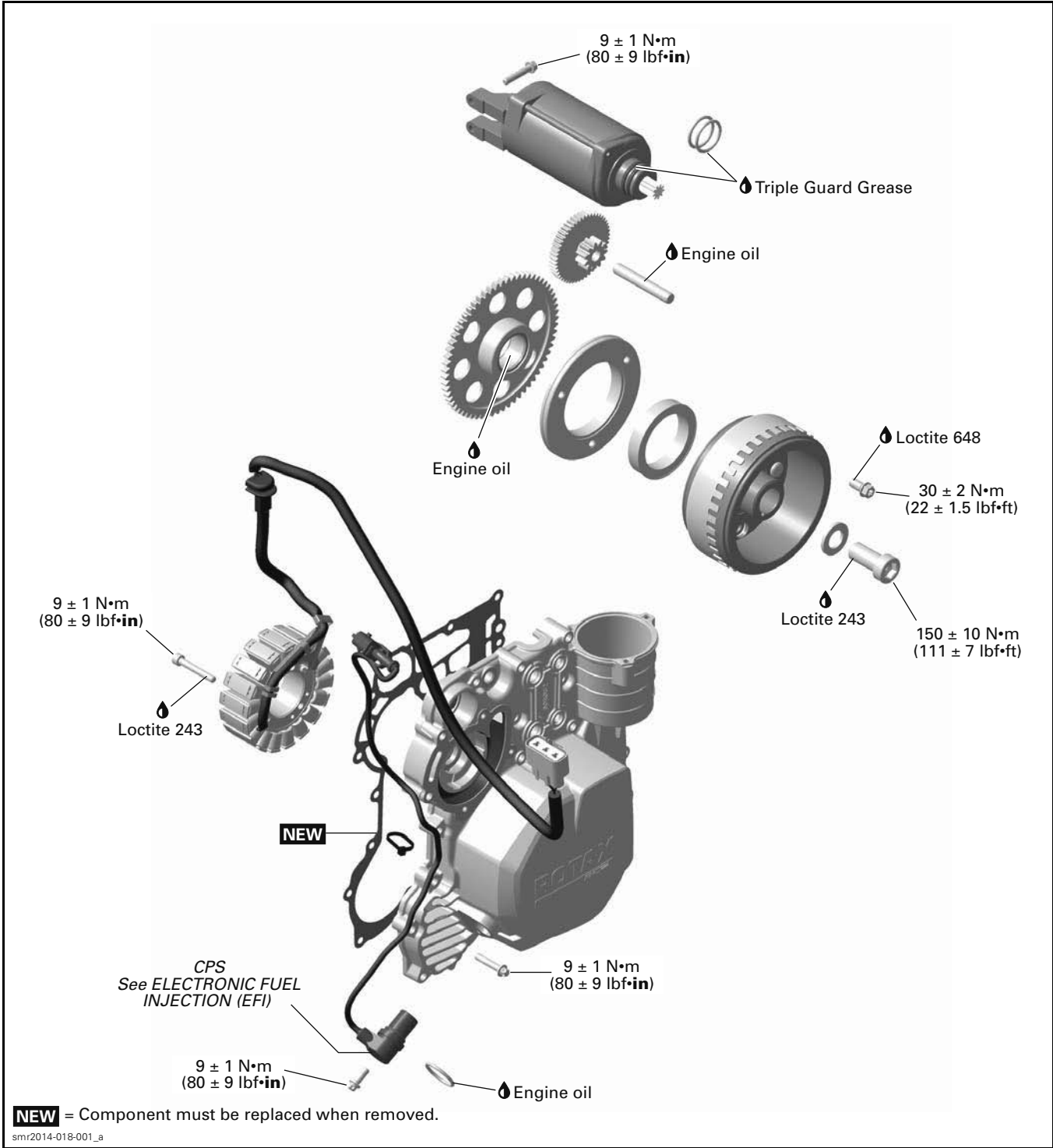
## SERVICE TOOLS

| Description                | Part Number       | Page   |
|----------------------------|-------------------|--------|
| CRANKSHAFT PROTECTOR ..... | 529 036 213 ..... | 93     |
| FLUKE 115 MULTIMETER ..... | 529 035 868 ..... | 91, 97 |
| FLYWHEEL PULLER.....       | 420 976 235 ..... | 93     |

## SERVICE PRODUCTS

| Description                           | Part Number       | Page  |
|---------------------------------------|-------------------|-------|
| LOCTITE 243 (BLUE) .....              | 293 800 060 ..... | 93–94 |
| LOCTITE 648 (GREEN) .....             | 413 711 400 ..... | 96    |
| LOCTITE CHISEL (GASKET REMOVER) ..... | 413 708 500 ..... | 89    |
| PULLEY FLANGE CLEANER .....           | 413 711 809 ..... | 94–95 |
| TRIPLE-GUARD GREASE .....             | 296 000 329 ..... | 98    |

**Section 02 ENGINE**  
**Subsection 06 (MAGNETO AND STARTER)**



## GENERAL

### WARNING

Always disconnect BLACK (-) battery cable first and reconnect last.

During assembly/installation, use the torque values and service products as 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 strictly be adhered to. Locking devices when removed (ex: locking tabs, cotter pin, etc.) must be replaced.

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

## PROCEDURES

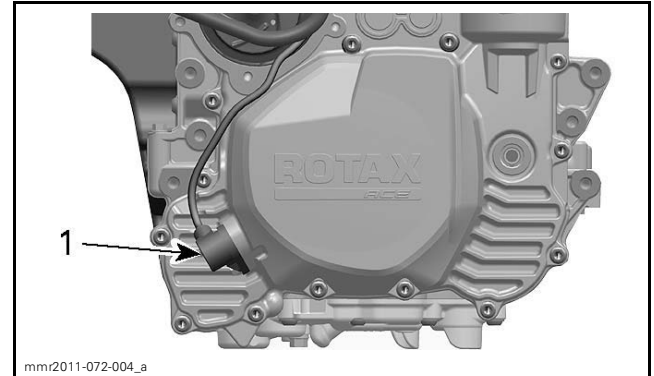
### MAGNETO COVER

#### Magneto Cover Access

1. Remove central body. Refer to *BODY*.
2. Remove battery. Refer to *CHARGING SYSTEM*.
3. Remove air intake silence. Refer to *AIR INTAKE SYSTEM*.
4. Remove fuel tank. Refer to *FUEL TANK AND FUEL PUMP*.
5. Remove central foam (under fuel tank).

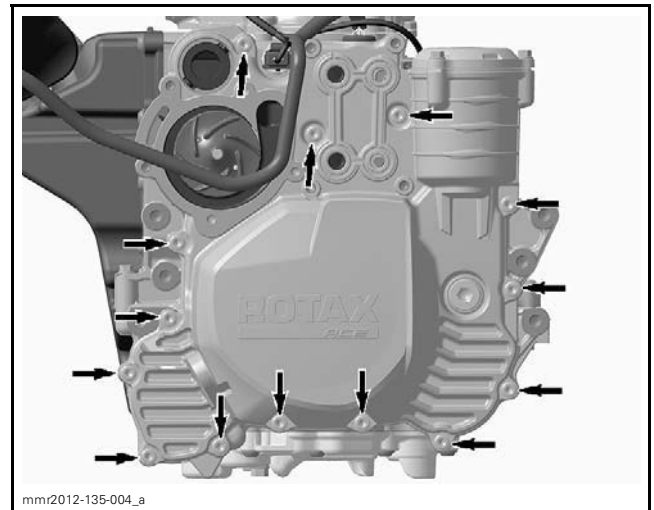
#### Magneto Cover Removal

1. Refer to *PERIODIC MAINTENANCE PROCEDURES* and:
  - Drain coolant
  - Drain engine oil.
2. Refer to *COOLING SYSTEM* and remove:
  - Water pump housing
  - Thermostat housing.
3. Refer to *LUBRICATION SYSTEM* subsection and remove:
  - Oil pressure regulator
  - Oil cooler.
4. Remove the CPS.



1. CPS

5. Remove magneto cover retaining screws.



MAGNETO COVER SCREWS

6. Place an oil pan under magneto area to catch remaining oil.
7. Pull magneto cover off.

#### Magneto Cover Inspection

Check magneto cover for cracks or other damage. Replace if necessary.

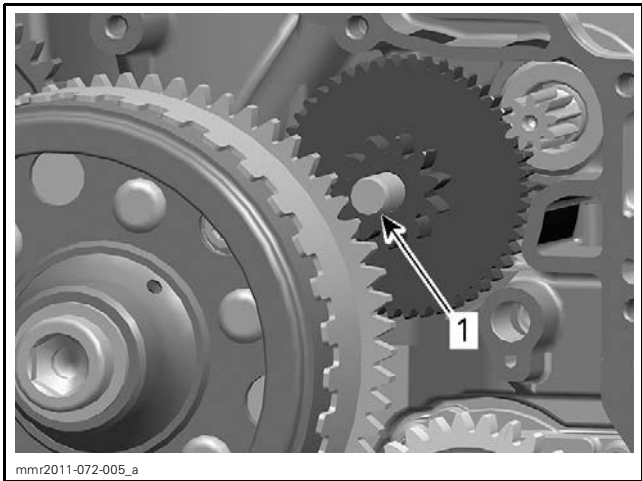
#### Magneto Cover Installation

1. Clean magneto cover.

| MAGNETO COVER CLEANING |                                                   |
|------------------------|---------------------------------------------------|
| Service product        | LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) |

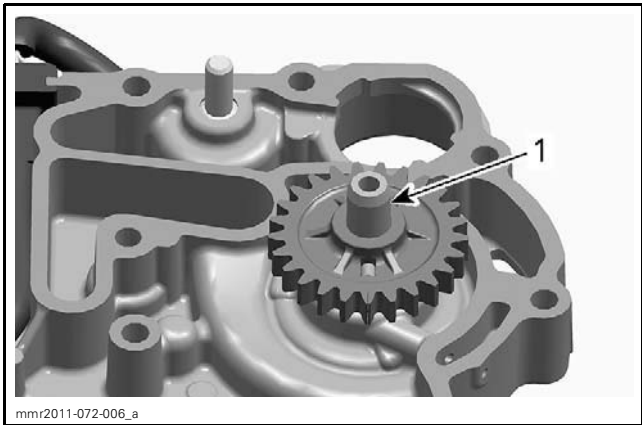
2. Install a **NEW** magneto cover gasket.
3. Ensure starter drive gear pin is in place.
4. Apply engine oil on starter drive gear pin.

Section 02 ENGINE  
Subsection 06 (MAGNETO AND STARTER)



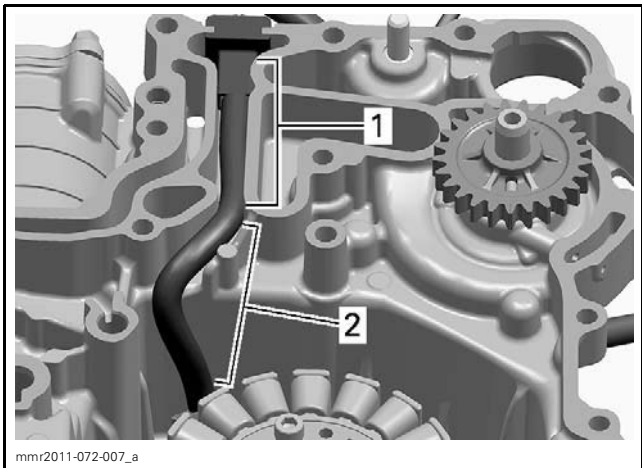
1. Starter drive gear pin

5. Apply engine oil on water pump shaft.



1. Water pump shaft - apply engine oil

**NOTICE** Make sure that the stator cable harness is embedded into the channel. The part of the harness that is out of the channel must be tight, otherwise it might chafe or jam.



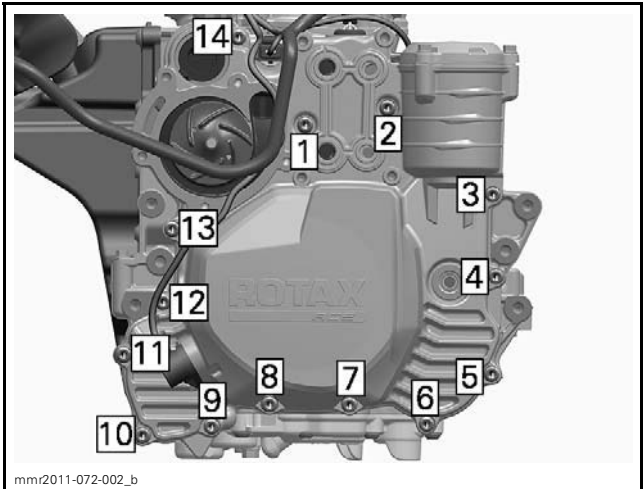
1. Embedded in that area  
2. Tight in this area

6. Carefully install magneto cover.

**CAUTION** Magnetic force between magneto flywheel and stator is very high. Avoid finger contusions.

7. Tighten magneto cover screws according to the following sequence.

| TIGHTENING TORQUE    |                                         |
|----------------------|-----------------------------------------|
| Magneto cover screws | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |



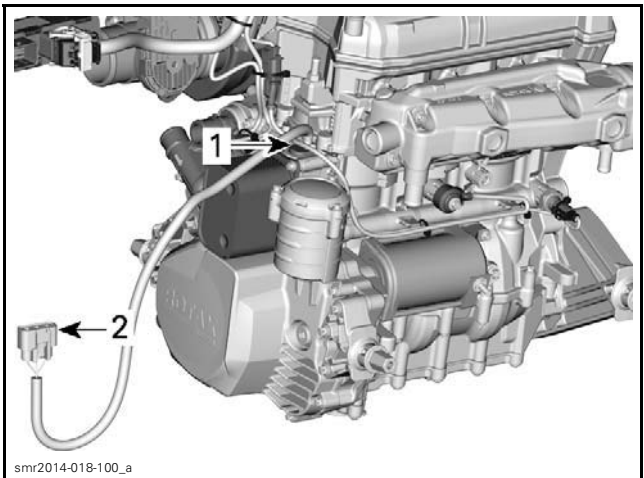
TIGHTENING SEQUENCE

8. Install all other removed parts.

## STATOR

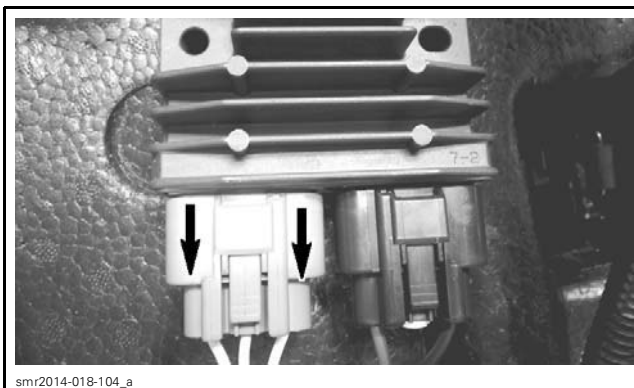
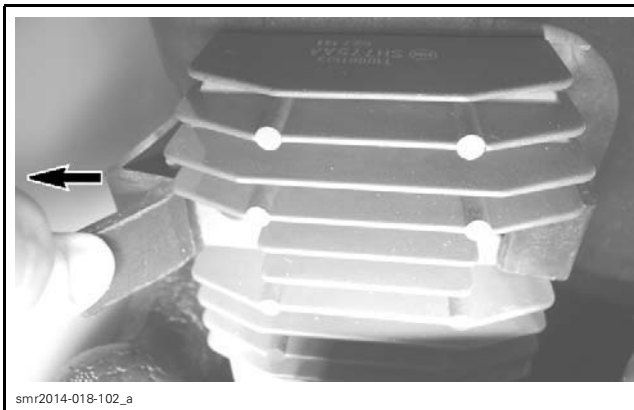
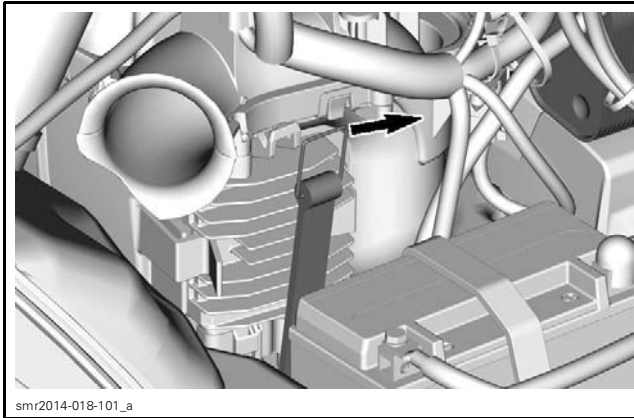
### Stator Connector Access

Remove central body. Refer to *BODY*.  
Follow image sequence.



STATOR CONNECTOR ACCESS

1. Stator harness at magneto cover  
2. Stator connector



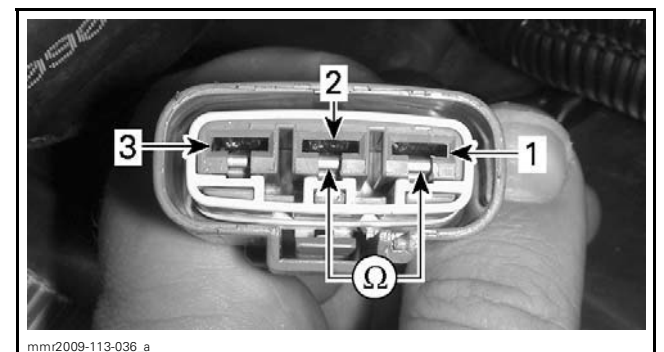
### Stator Continuity Test

1. Disconnect battery.
2. Disconnect the stator connector from voltage regulator, refer to *STATOR CONNECTOR ACCESS* in this subsection.
3. Set the multimeter to  $\Omega$ .

| REQUIRED TOOL                             |                                                                                     |
|-------------------------------------------|-------------------------------------------------------------------------------------|
| FLUKE 115 MULTIMETER<br>(P/N 529 035 868) |  |

4. Probe each pair of YELLOW wires by touching (NOT inserting) terminals lock tabs as shown.

**NOTICE** Never insert a multimeter probe into a terminal as it would ruin the terminal.



1. Pin #1
2. Pin #2
3. Pin #3

5. Read resistance as per following table.



**Section 02 ENGINE**  
**Subsection 06 (MAGNETO AND STARTER)**

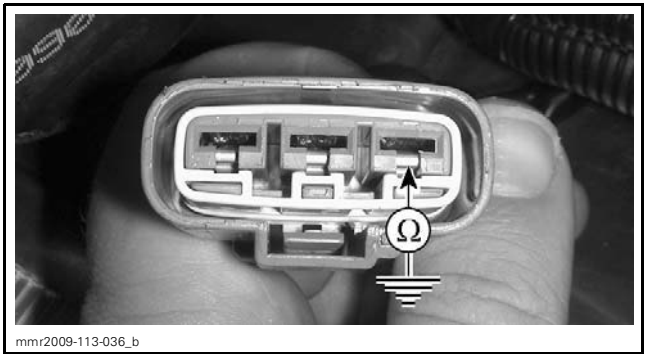
| STATOR CONTINUITY TEST   |                          |
|--------------------------|--------------------------|
| YELLOW WIRES (EACH PAIR) | RESISTANCE @ 20°C (68°F) |
| Pins 1 and 2             | 0.1 - 1 Ω                |
| Pins 1 and 3             |                          |
| Pins 2 and 3             |                          |

If any resistance reading is not as specified, the stator or the wiring (including connector) is open and needs to be repaired or replaced.

If resistance is good, perform the stator insulation test.

**Stator Insulation Test**

1. Connect multimeter between any YELLOW wire and chassis ground.



2. Read resistance.

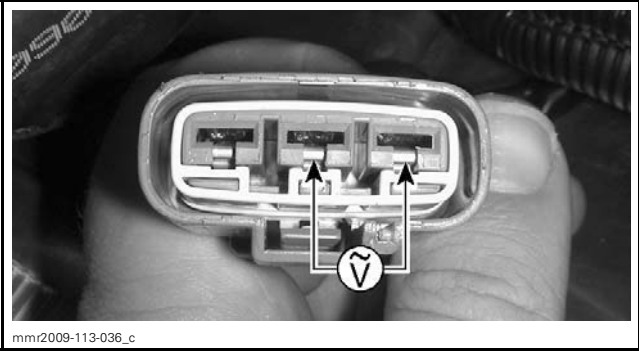
| STATOR INSULATION TEST             |                          |
|------------------------------------|--------------------------|
| PROBE POSITIONS                    | RESISTANCE @ 20°C (68°F) |
| Any YELLOW wire and chassis ground | Infinity (OL)            |

If any resistance reading is not as specified, the stator or the wiring is shorted to ground and needs to be repaired or replaced.

If the insulation test is good, perform the output voltage test.

**Stator Output Voltage Test**

1. With the stator connector unplugs from the voltage regulator/rectifier, start engine and let it reach its operating temperature.
2. Set multimeter to Vac scale.
3. With engine idling, connect multimeter between each pair of YELLOW wires.



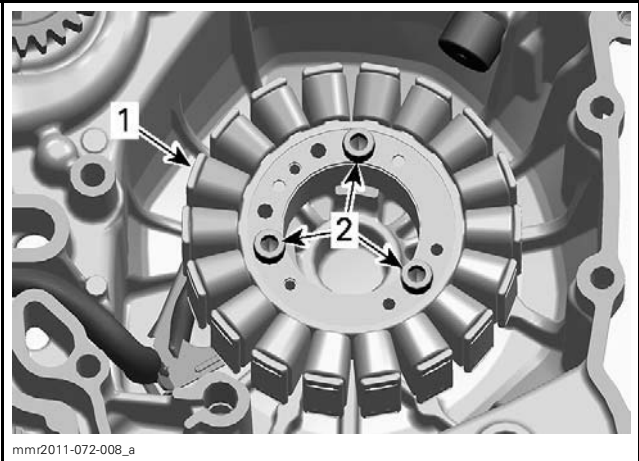
4. Read voltage.

| STATOR OUTPUT VOLTAGE TEST |          |          |
|----------------------------|----------|----------|
| TEST ENGINE SPEED          | TERMINAL | VOLTAGE  |
| Idle speed                 | 1 and 2  | ± 25 Vac |
|                            | 1 and 3  |          |
|                            | 2 and 3  |          |

If any voltage reading is significantly lower than specification, replace the stator.

**Stator Removal**

1. Remove the *MAGNETO COVER*, see procedure in this subsection.
2. Remove stator retaining screws.



1. Stator
2. Stator retaining screws

3. Remove stator.

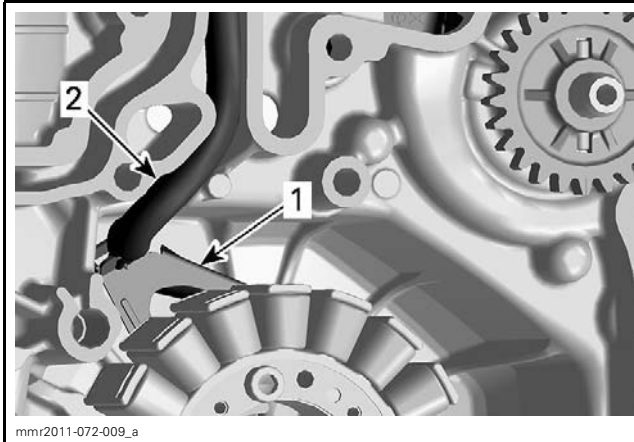
**Stator Inspection**

Check stator windings and insulation for cracks and other damages. If damaged replace it.

Check if stator wires are brittle, hard or otherwise damaged.

## Stator Installation

1. Ensure that the stator cable is underneath the cable holder during installation of the stator.



1. Cable holder
2. Stator cable

2. Install stator retaining screws and tighten to the specified torque.

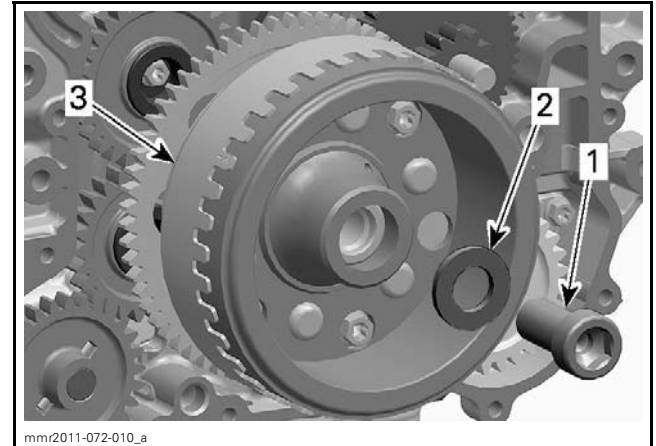
| TIGHTENING TORQUE       |                                         |
|-------------------------|-----------------------------------------|
| Service product         | LOCTITE 243 (BLUE)<br>(P/N 293 800 060) |
| Stator retaining screws | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |

3. Reinstall *MAGNETO COVER*, see procedure in this subsection.

## ROTOR

### Rotor Removal

1. Remove the *MAGNETO COVER*, see procedure in this subsection.
2. Lock crankshaft. Refer to *CYLINDER BLOCK* subsection.
3. Remove rotor retaining screw and lock washer.

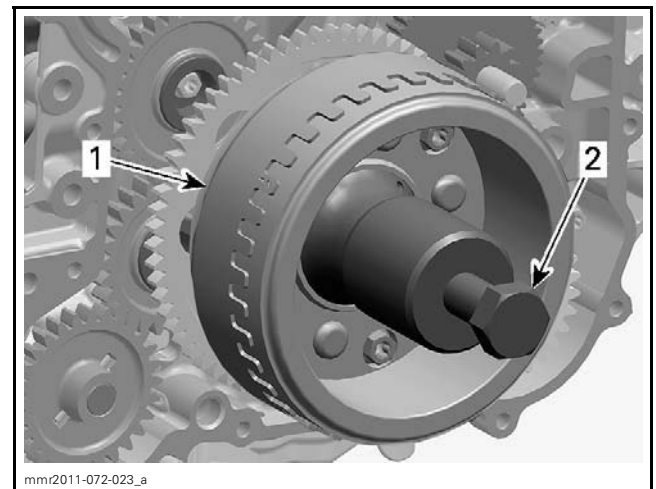


1. Retaining screw
2. Lock washer
3. Rotor

4. Remove rotor.

| REQUIRED TOOL                             |  |
|-------------------------------------------|--|
| CRANKSHAFT PROTECTOR<br>(P/N 529 036 213) |  |
| FLYWHEEL PULLER (P/N 420 976 235)         |  |

**NOTE:** Apply some grease on the crankshaft protector surface to ease puller operation.



1. Rotor
2. Flywheel puller screw

### Rotor Inspection

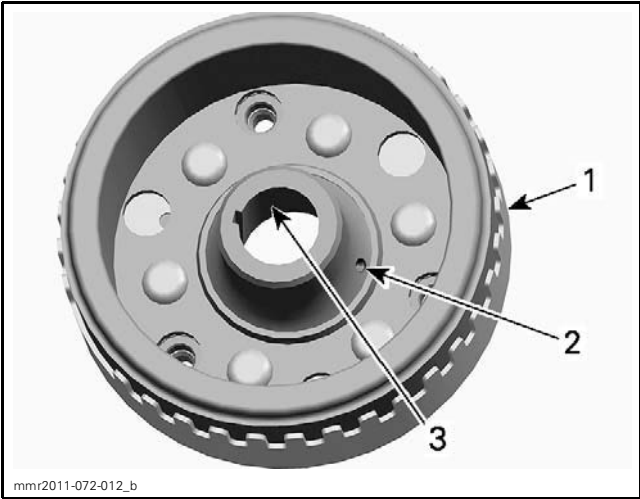
Check the inner side of the rotor for scratches or other damage.

Check keyway for wear or damages.

Check if trigger wheel teeth are bent or otherwise damaged.

Section 02 ENGINE

Subsection 06 (MAGNETO AND STARTER)



- 1. Rotor with trigger wheel
- 2. Oil passage in magneto hub
- 3. Rotor taper

Check woodruff key and keyway on the crankshaft for wear or damages.

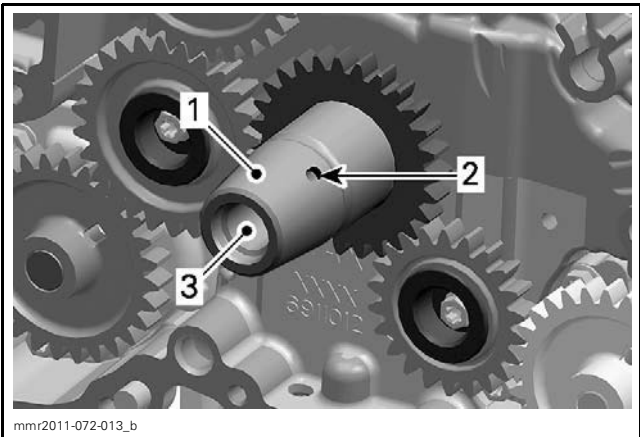
Replace parts as necessary.

Rotor Installation

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

- 1. Blow the oil passage in the magneto hub using compressed air. Check if it is clogged.
- 2. Using PULLEY FLANGE CLEANER (P/N 413 711 809), clean:
  - The oil passage
  - The crankshaft thread
  - The crankshaft taper
  - The rotor taper.

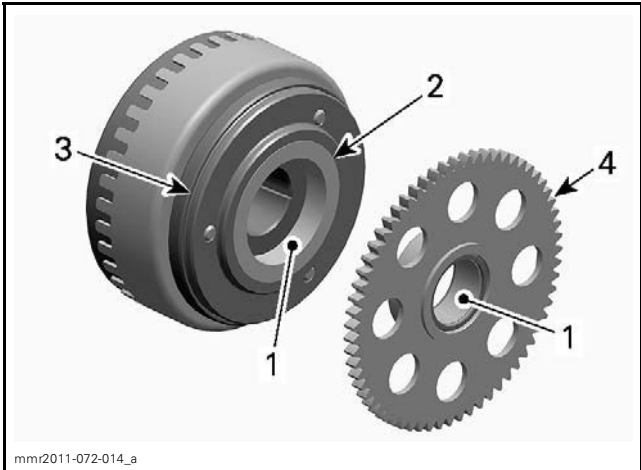
**NOTICE** Taper on crankshaft and rotor must be free of grease.



- 1. Crankshaft taper
- 2. Oil passage
- 3. Thread

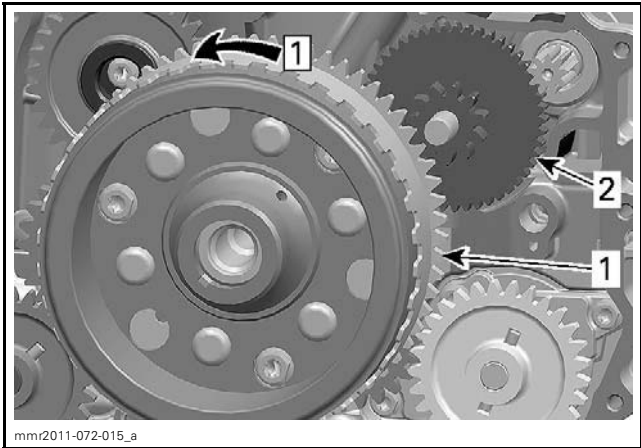
3. Apply oil on sprag clutch and needle bearing.

4. Install sprag clutch gear onto the rotor.



- 1. Apply engine oil here
- 2. Sprag clutch
- 3. Sprag clutch housing
- 4. Sprag clutch gear

- 5. Slide rotor along with the sprag clutch gear onto the crankshaft. The woodruff key and keyway must be aligned.
- 6. Rotate sprag clutch gear counterclockwise to align with starter double gear.



- Step 1: Rotate to align teeth
- 1. Sprag clutch gear
  - 2. Starter double gear

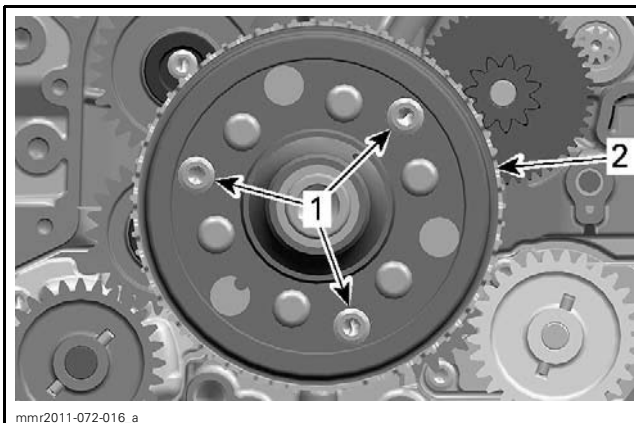
- 7. Install washer and retaining screw.
- 8. Tighten to the specified torque.

| ROTOR RETAINING SCREW |                                             |
|-----------------------|---------------------------------------------|
| Service product       | LOCTITE 243 (BLUE)<br>(P/N 293 800 060)     |
| Tightening torque     | 150 N•m ± 10 N•m<br>(111 lbf•ft ± 7 lbf•ft) |

## SPRAG CLUTCH

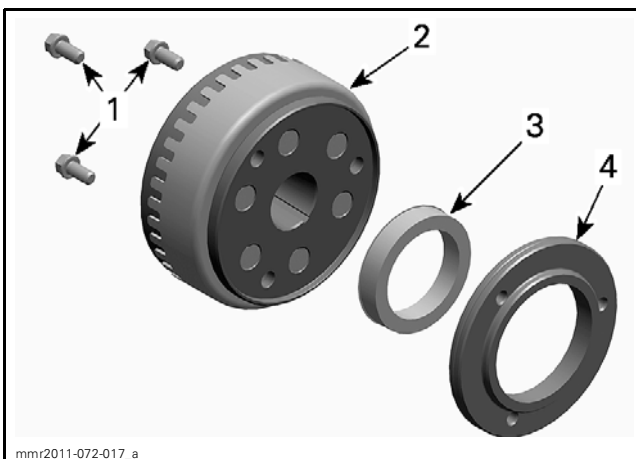
### Sprag Clutch Removal

1. Remove the *MAGNETO COVER*, see procedure in this subsection.
2. Lock crankshaft. Refer to *CYLINDER BLOCK* subsection.
3. Loosen and remove sprag clutch housing screws.



1. Sprag clutch housing screws
2. Rotor

4. Remove *ROTOR*, see procedure in this subsection.
5. Remove sprag clutch housing.
6. Remove sprag clutch from sprag clutch housing.



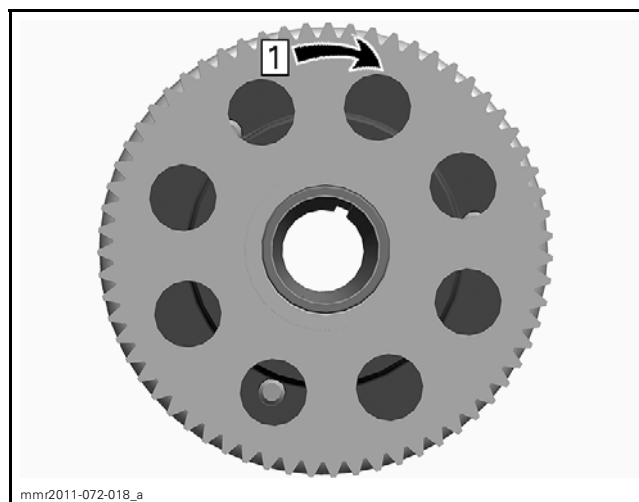
1. Sprag clutch housing screws
2. Rotor
3. Sprag clutch
4. Sprag clutch housing

### Sprag Clutch Inspection

Inspect sprag clutch and sprag clutch housing for wear and damage.

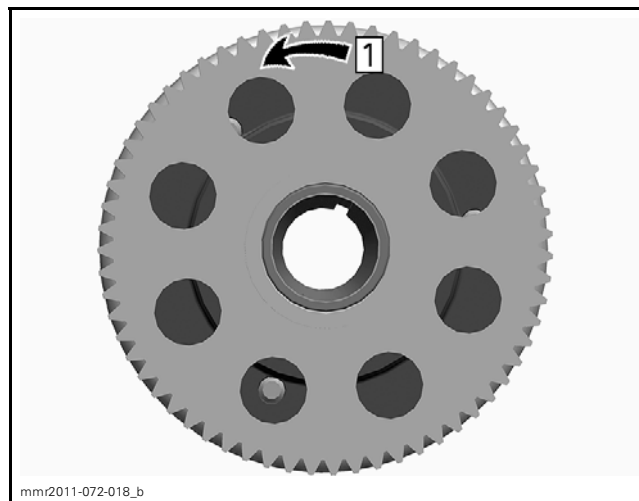
Check the collar of the sprag clutch gear, refer to *SPRAG CLUTCH GEAR*.

Rotate sprag clutch gear clockwise. Gear must rotate freely.



Step 1: Free

Rotate sprag clutch gear counterclockwise. Gear must lock.



Step 1: Lock

### Sprag Clutch Installation

1. Clean sprag clutch housing with a parts cleaner.

**NOTICE** Threads of sprag clutch housing must be free of any lubricants.

| SPRAG CLUTCH HOUSING |                                         |
|----------------------|-----------------------------------------|
| Service product      | PULLEY FLANGE CLEANER (P/N 413 711 809) |

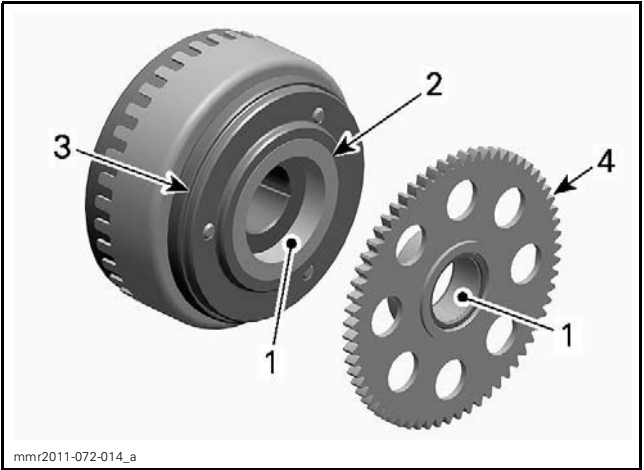
2. Apply thread locker on threads of sprag clutch housing screws.

Section 02 ENGINE

Subsection 06 (MAGNETO AND STARTER)

| SPRAG CLUTCH HOUSING SCREWS |                                          |
|-----------------------------|------------------------------------------|
| Service product             | LOCTITE 648 (GREEN)<br>(P/N 413 711 400) |

3. Loosely install screws.
4. Apply engine oil on sprag clutch and sprag clutch gear needle bearing.



1. Apply engine oil here
2. Sprag clutch
3. Sprag clutch housing
4. Sprag clutch gear

5. Install *ROTOR*, see procedure in this subsection.
6. Tighten sprag clutch housing screws to the specified torque.

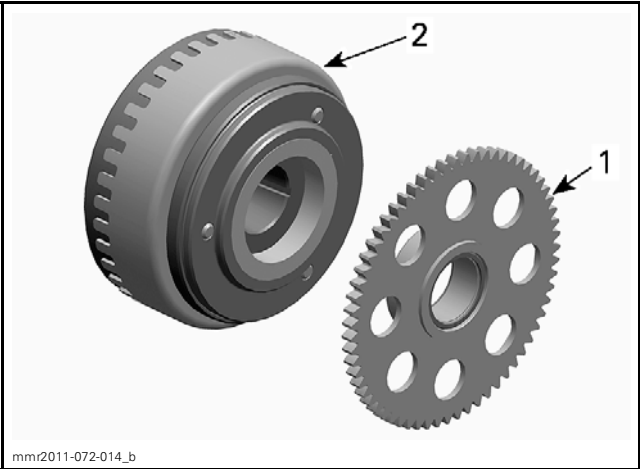
| TIGHTENING TORQUE           |                                          |
|-----------------------------|------------------------------------------|
| Sprag clutch housing screws | 30 N•m ± 2 N•m<br>(22 lbf•ft ± 1 lbf•ft) |

7. Install all other removed parts.

SPRAG CLUTCH GEAR

Sprag Clutch Gear Removal

1. Remove rotor and sprag clutch gear together. Refer to *ROTOR* in this subsection.
2. Pull sprag clutch gear out of the rotor.

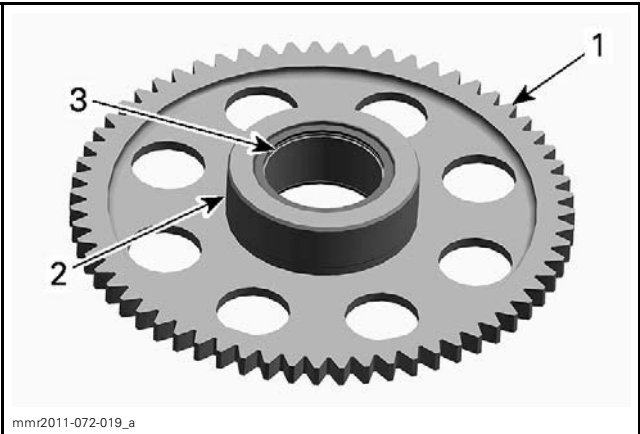


1. Sprag clutch gear
2. Rotor

Sprag Clutch Gear Inspection

Inspect gear, especially teeth and sprag clutch collar for wear and other damage.

Check needle bearing for wear and pittings.



1. Teeth
2. Collar
3. Needle bearing

Replace sprag clutch gear if necessary.

Sprag Clutch Gear Installation

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

**NOTE:** Apply engine oil on needle bearing and collar of sprag clutch gear.

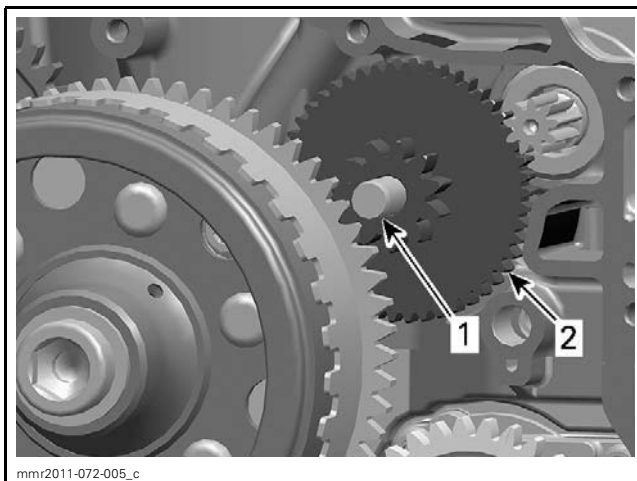
STARTER DRIVE GEARS

The starter drive gears are located on the engine MAG side behind the magneto cover.

Starter Drive Gear Removal

1. Remove *MAGNETO COVER*, see procedure in this subsection.

2. Remove location pin and starter double gear.



1. Location pin
2. Starter double gear

### Starter Drive Gear Inspection

Inspect starter drive gears and location pin for wear and damage.

Replace parts if necessary.

### Starter Drive Gear Installation

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

Apply engine oil on the location pin.

## STARTER

### Starter Operation Test

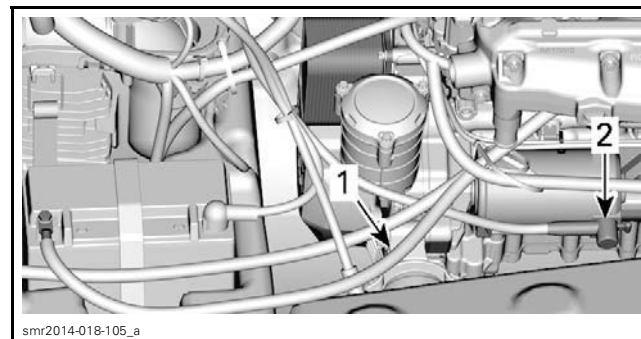
Before carrying out any starter test, make sure:

- Battery is fully charged and in good condition.
- Cable connections at battery, starter and solenoid are tight.
- Cables are in good condition.

1. Disconnect the negative battery cable.
2. Using booster cables and a fully charged battery or a power pack, carefully supply current directly to the starter.
  - 2.1 Connect the negative booster cable or power pack cable to a good ground such as an engine support.
  - 2.2 Temporarily touch the starter positive terminal.

### **WARNING**

Sparks can occur when connecting jumper cables. To avoid fire hazard, be sure that no flammable liquids or fuel vapors are in the test area.



1. Engine support
2. Starter positive terminal

If starter turns at normal speed, test the starting circuit. Refer to *STARTING SYSTEM* subsection.

If starter turns slowly, carry out the *STARTER VOLTAGE DROP TEST (AT BATTERY)*.

If starter does not turn, replace starter.

### Starter Voltage Drop Test (at Battery)

**NOTE:** This test will confirm if starter draws too much current. Battery must be fully charged and in good condition.

1. Set the multimeter to Vdc.

| REQUIRED TOOL                             |                                                                                       |
|-------------------------------------------|---------------------------------------------------------------------------------------|
| FLUKE 115 MULTIMETER<br>(P/N 529 035 868) |  |

2. Probe the battery posts.
3. Crank engine in drowned mode. Refer to *ENGINE MANAGEMENT SYSTEM*.
4. Read voltage while cranking.

**NOTE:** Battery voltage will drop approximately 2 Vdc and fluctuate with starter cranking load.

If the result is close to battery voltage, the starter is in good condition.

If the result is below battery voltage (- 2 Vdc and more), the starter may be defective.

### Starter Access

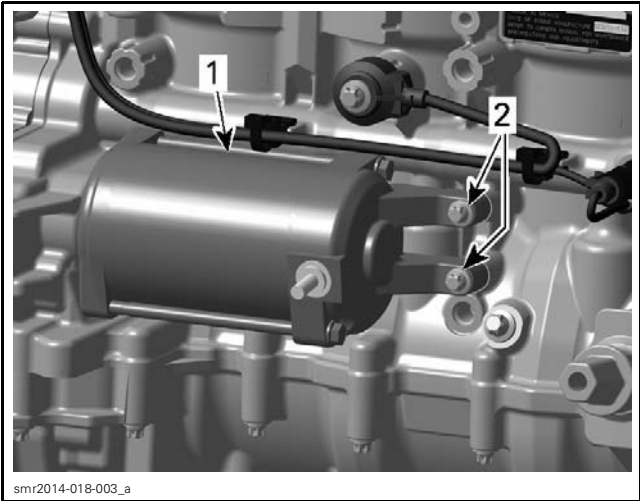
Remove central body. Refer to *BODY*.

### Starter Removal

1. Disconnect the BLACK (–) cable from the battery.
2. Remove the starter cable from starter.
3. Remove starter retaining screws.

Section 02 ENGINE

Subsection 06 (MAGNETO AND STARTER)



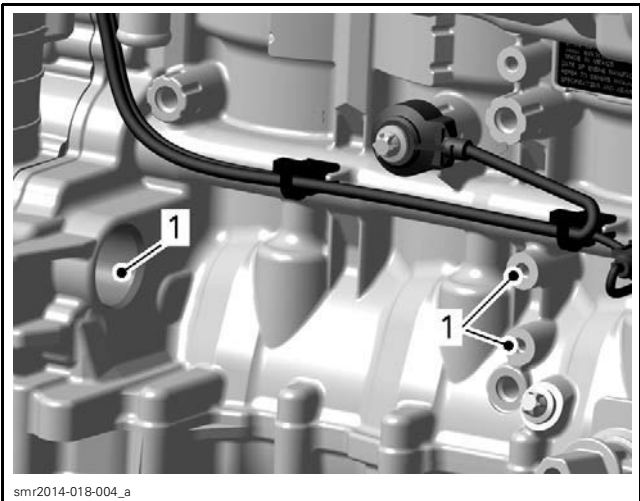
- 1. Starter
- 2. Starter retaining screws

4. Pull starter off the cylinder block.

Starter Installation

- 1. Ensure starter and engine mating surfaces are free of debris.

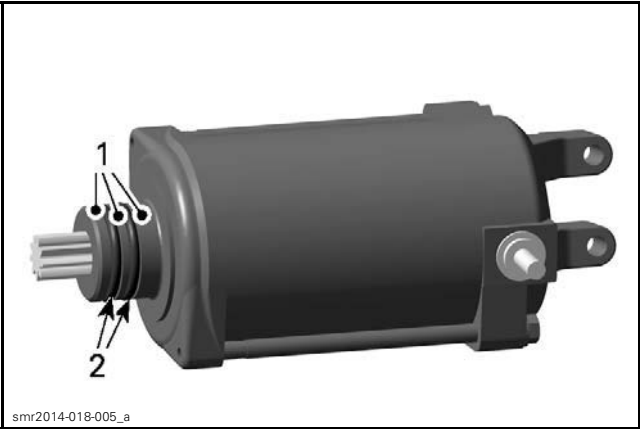
**NOTICE** Serious problems may arise if the starter is not properly aligned.



- 1. Clean mating surfaces

- 2. Lubricate on starter end and starter O-rings before installation.

| STARTER END +O-RINGS |                                       |
|----------------------|---------------------------------------|
| Service product      | TRIPLE-GUARD GREASE (P/N 296 000 329) |



- 1. Lubricate starter end
- 2. Lubricate starter O-rings

- 3. Insert starter gear into engine.
- 4. Install starter screws and tighten to the specified torque.

| TIGHTENING TORQUE |                                         |
|-------------------|-----------------------------------------|
| Starter screws    | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |

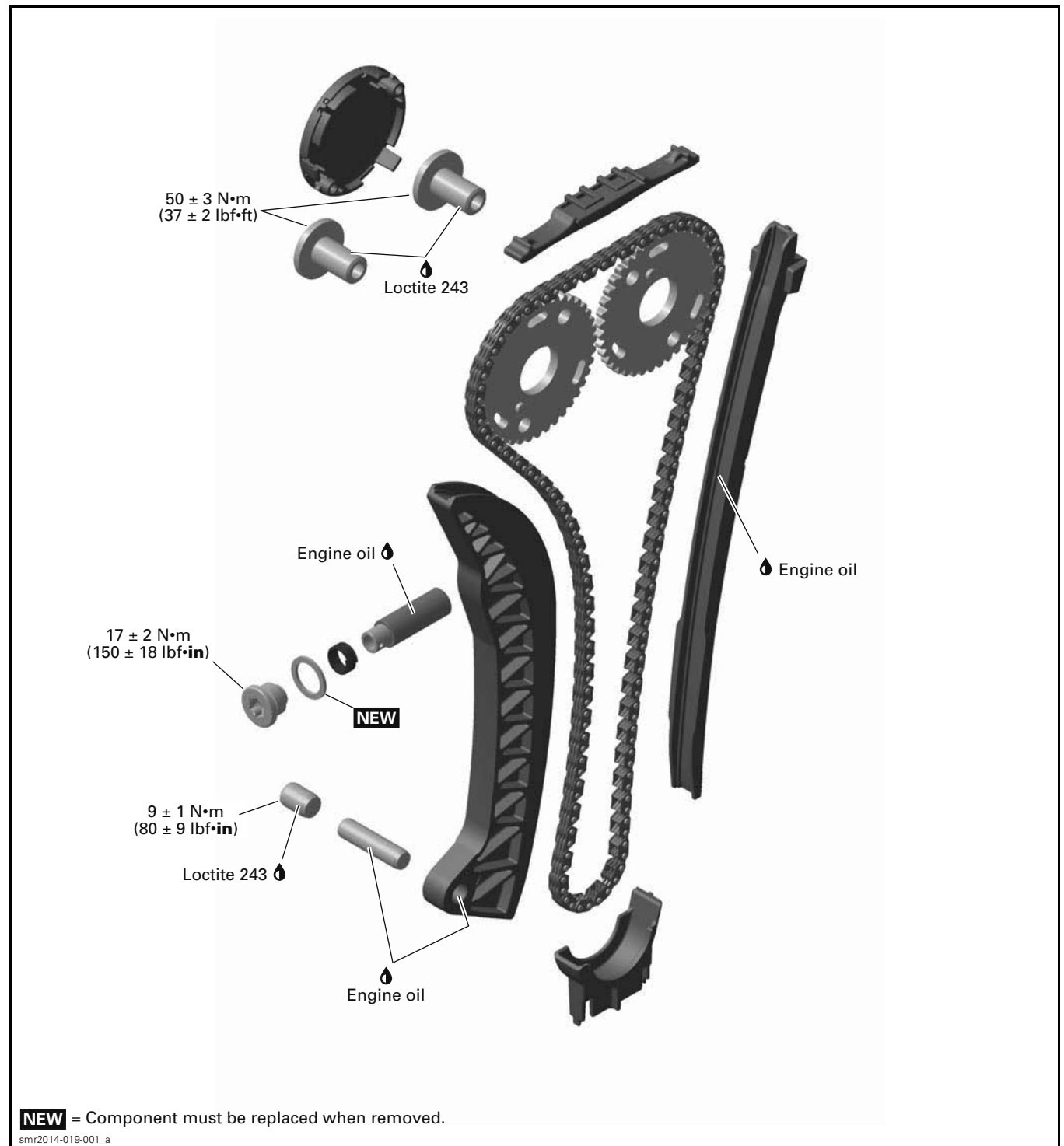
- 5. Connect the starter cable to the starter and tighten nut to the specified torque.

| TIGHTENING TORQUE |                                         |
|-------------------|-----------------------------------------|
| Starter cable nut | 7 N•m ± 1 N•m<br>(62 lbf•in ± 9 lbf•in) |

- 6. Install all other removed parts.
- 7. Reconnect BLACK (–) cable on battery post.
- 8. Test for proper starter operation.

## SERVICE PRODUCTS

| Description             | Part Number       | Page     |
|-------------------------|-------------------|----------|
| LOCTITE 243 (BLUE)..... | 293 800 060 ..... | 102, 106 |





## Section 02 ENGINE

### Subsection 07 (TIMING CHAIN)

## GENERAL

Engine removal is necessary to work on the following components:

- Timing chain
- Timing chain guide (tensioner side).

Always disconnect BLACK (-) cable from the battery, then RED (+) cable before working on the engine.

### WARNING

Always disconnect BLACK (-) cable first and reconnect last.

During assembly/installation, use torque values and service products as specified 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 when removed (e.g.: locking tabs, elastic stop nuts, cotter pin, etc.) must be replaced.

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

When disassembling parts that are duplicated in the engine, (e.g.: valves, springs, etc.), it is strongly recommended to note their position and to keep the parts of the same assembly as a "group". If you find a defective component, it will be much easier to find the cause of the failure. Since parts were broken-in together during engine operation, they will maintain their matched fit when reassembled together within their "group".

## TROUBLESHOOTING

The following is provided to help in diagnosing the probable source of troubles. It is a guideline and should not be assumed to provide solutions to every cause of all problems.

### UNUSUAL ENGINE NOISE OR VIBRATIONS

1. Faulty chain tensioner.  
– Replace chain tensioner.

2. Chain guide(s) worn out.  
– Replace chain guide(s).
3. Stretched timing chain or worn sprockets.  
– Replace timing chain and sprockets.
4. Camshaft timing gear screws loose.  
– Retighten screws to recommended torque.
5. Incorrect camshaft timing adjustment.  
– Replace damaged components and readjust camshaft timing.

### ENGINE LACKS ACCELERATION OR POWER

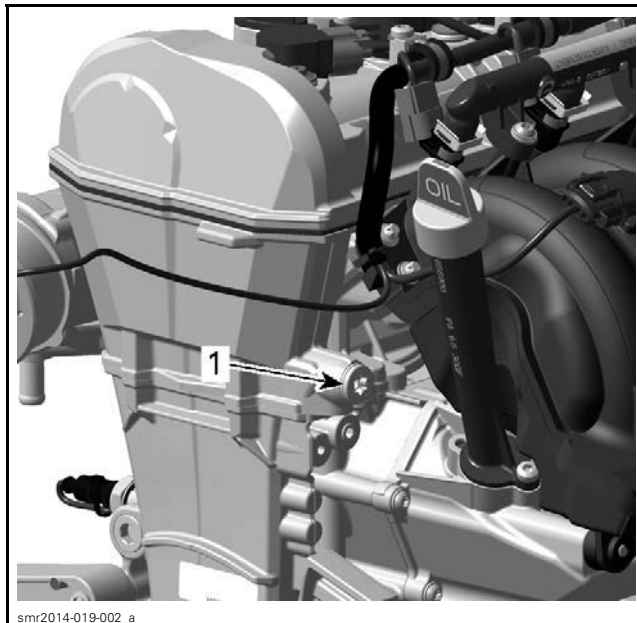
1. Incorrect camshaft timing adjustment.  
– Replace damaged components and readjust camshaft timing.

## PROCEDURES

### TIMING CHAIN TENSIONER

#### Timing Chain Tensioner Location

The timing chain tensioner is located in the cylinder head beside the intake port of the PTO cylinder.



1. Screw plug location, timing chain tensioner

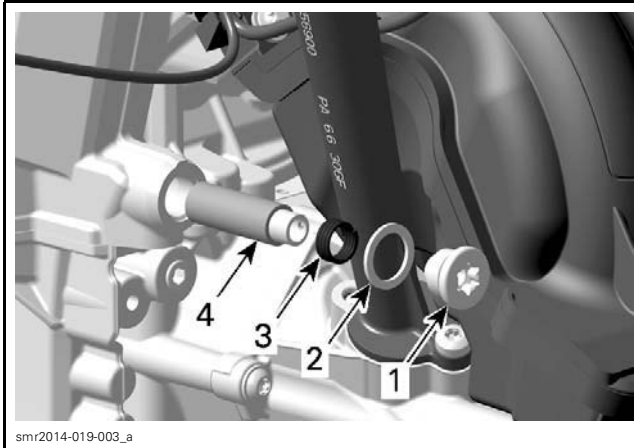
#### Timing Chain Tensioner Access

Remove central body. Refer to *BODY*.

#### Timing Chain Tensioner Removal

1. Lock crankshaft, refer to *CYLINDER BLOCK* subsection.

2. Remove screw plug and discard the sealing washer.
3. Pull out spring and chain tensioner.



1. Screw plug
2. Sealing washer
3. Spring
4. Chain tensioner

### Timing Chain Tensioner Inspection

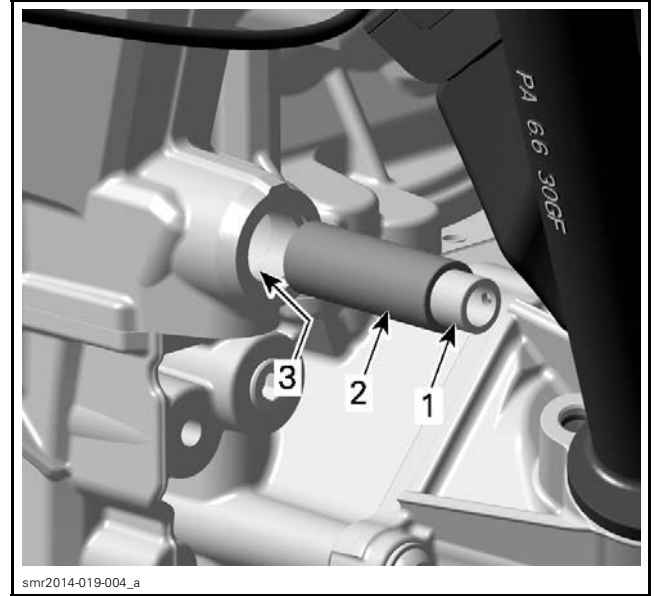
1. Check chain tensioner for scoring and freedom of movement in bore.
2. Compress chain tensioner and check for proper operation.

**NOTE:** The chain tensioner is difficult to compress when properly charged with oil, and easily compressed when it is not.

3. Check spring for straightness, corrosion and other visible damage.

### Timing Chain Tensioner Installation

1. Apply engine oil on chain tensioner.
2. Insert chain tensioner in its bore with the plunger pointing outwards.



### TIMING CHAIN TENSIONER INSTALLATION

1. Plunger
2. Chain tensioner
3. Tensioner bore in cylinder head

3. Install spring on chain tensioner.
4. Tighten screw plug to specified torque.

| SCREW PLUG TIMING CHAIN TENSIONER |                                            |
|-----------------------------------|--------------------------------------------|
| Sealing washer                    | NEW                                        |
| Tightening torque                 | 17 N•m ± 2 N•m<br>(150 lbf•in ± 18 lbf•in) |

5. Install all other removed parts.

## CAMSHAFT TIMING GEARS

### Camshaft Timing Gear Removal

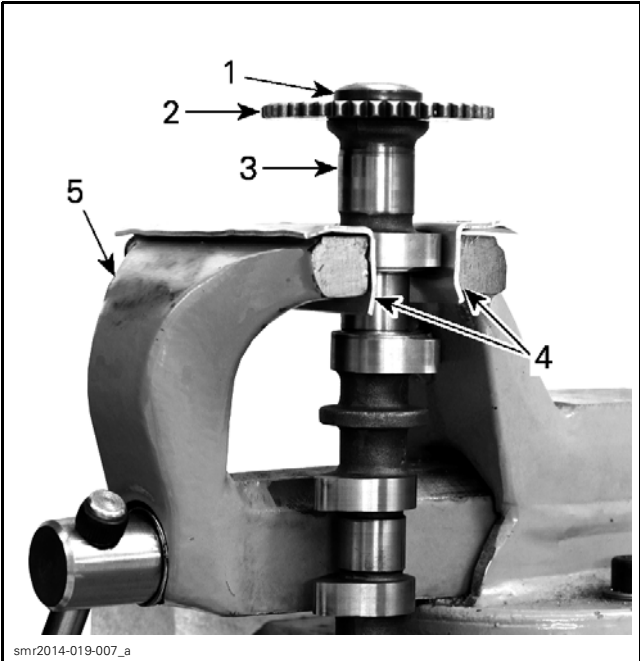
Remove camshaft assembly. Refer to *CYLINDER HEAD* subsection.

Clamp camshaft in a vice using aluminium protectors.

**NOTICE** Take care not damaging the cams.

Unscrew and remove camshaft timing gear screw.

Remove camshaft timing gear.



- 1. Camshaft timing gear screw
- 2. Camshaft timing chain gear
- 3. Camshaft
- 4. Aluminium protectors
- 5. Vice

Camshaft Timing Gear Inspection

Check camshaft timing gears for wear or deterioration. If a gear is worn or damaged, replace camshaft timing gears and timing chain as a set.

**NOTE:** For crankshaft timing gear inspection, refer to *CYLINDER BLOCK* subsection.

Camshaft Timing Gear Installation

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

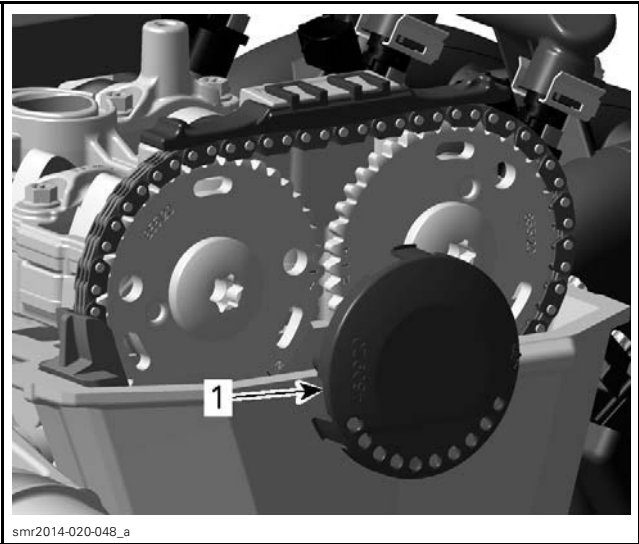
Tighten camshaft timing gear screw to specification.

**NOTICE** Do not torque timing gear screws when camshafts are installed in cylinder head to avoid overstressing timing chain.

| TIMING GEAR SCREWS |                                          |
|--------------------|------------------------------------------|
| Service product    | LOCTITE 243 (BLUE)<br>(P/N 293 800 060)  |
| Tightening torque  | 50 N•m ± 3 N•m<br>(37 lbf•ft ± 2 lbf•ft) |

**NOTICE** Improper camshaft timing will damage engine components. Make sure camshafts and crankshaft are still locked. If not, lock them before beginning this procedure. Refer to *CAMSHAFTS* in the *CYLINDER HEAD* subsection.

Install breather cover on exhaust camshaft.



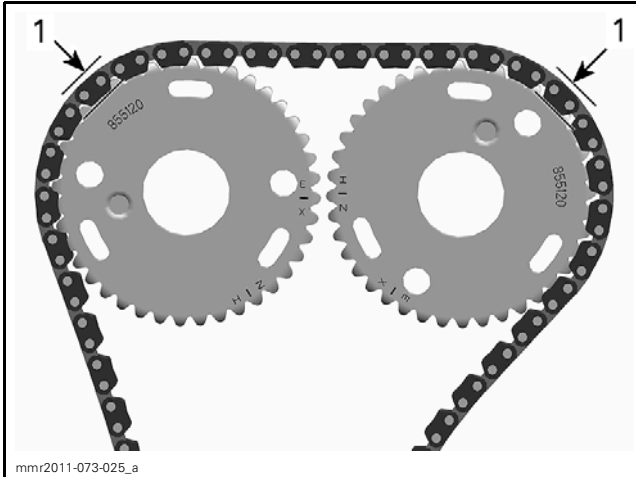
- 1. Breather cover

Install remaining parts.

TIMING CHAIN

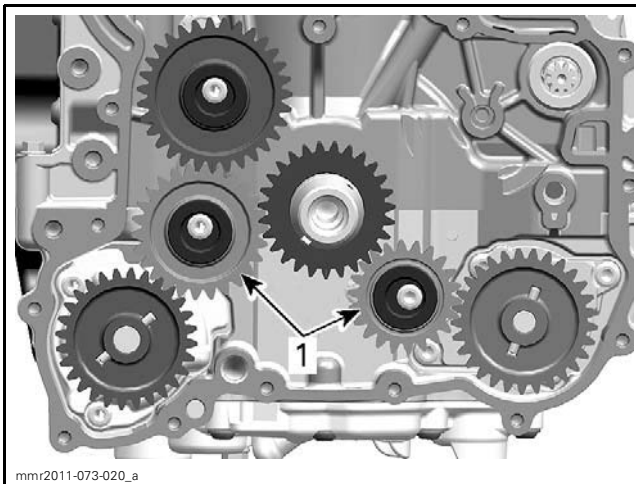
Timing Chain Removal

1. Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
2. Remove air intake manifold, refer to *AIR INTAKE SYSTEM* subsection.
3. Remove valve cover, refer to *CYLINDER HEAD* subsection.
4. Refer to *LUBRICATION SYSTEM* subsection and remove the following parts:
  - Oil tank
  - Oil pressure regulator valve
  - Oil cooler
  - Oil sump cover.
5. Refer to *COOLING SYSTEM* subsection and remove following parts:
  - Water pump housing
  - Thermostat.
6. Check timing chain for excessive radial play while still installed on timing gears.



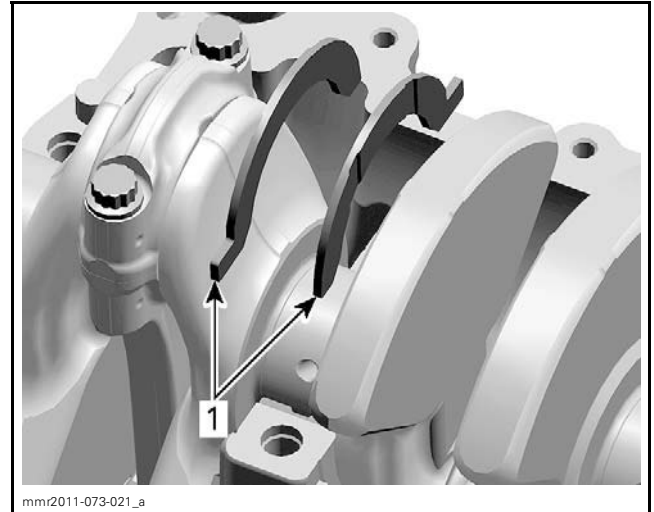
1. Radial play

7. Remove the *CAMSHAFTS*, refer to *CYLINDER HEAD* subsection.
8. Refer to *MAGNETO AND STARTER* subsection and remove the following parts:
  - Magneto cover
  - Rotor
  - Starter drive gears.
9. Remove oil pump intermediate gears, refer to *LUBRICATION SYSTEM* subsection.



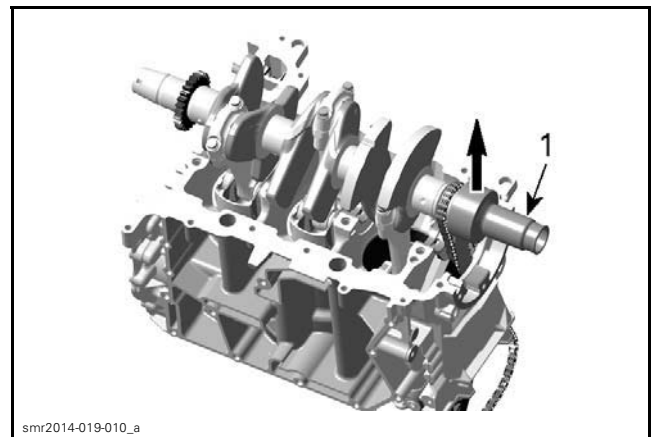
1. Oil pump intermediate gears

10. Remove crankshaft locking bolt.
11. Separate cylinder block, refer to *CYLINDER BLOCK* subsection.
12. Remove crankshaft thrust washers.



1. Crankshaft thrust washers

13. Slightly lift the crankshaft.



**LIFT CRANKSHAFT**

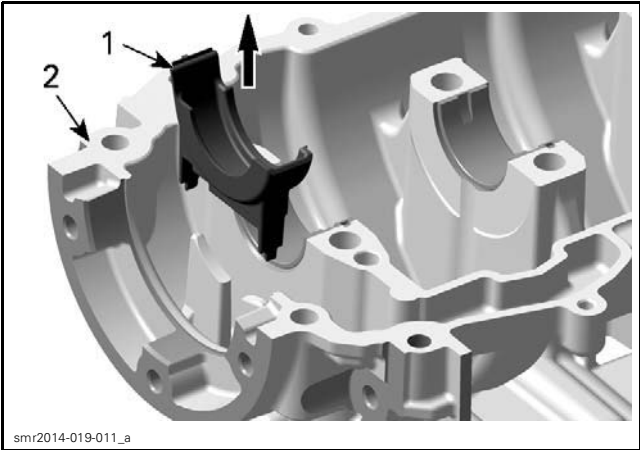
1. Crankshaft

14. Remove timing chain.

**NOTE:** Make a mark on the timing chain to indicate the operating direction of the chain before removal.

15. Remove lower timing chain guide from lower half of cylinder block.

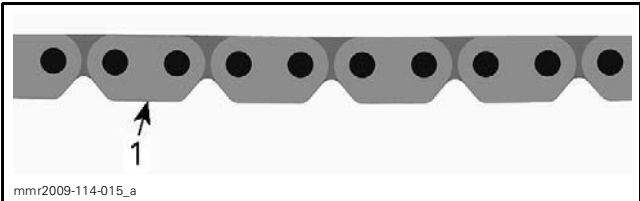
Section 02 ENGINE  
Subsection 07 (TIMING CHAIN)



1. Lower timing chain guide  
2. Lower half of cylinder block

Timing Chain Inspection

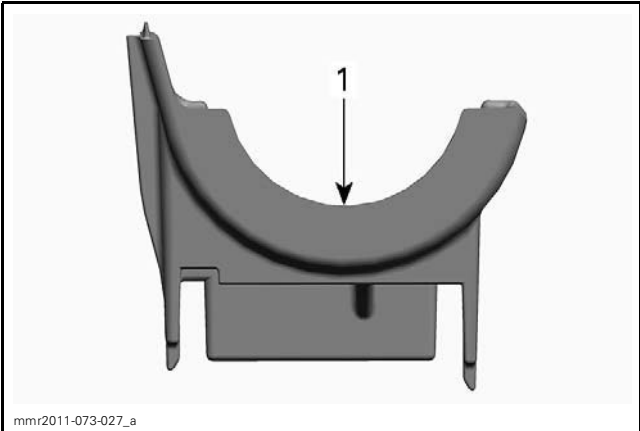
Check timing chain for wear and teeth condition.



1. Check teeth condition

**NOTICE** If timing chain is excessively worn or damaged, replace timing chain and camshaft timing gears as a set.

Check lower chain guide for wear, cracks or deformation. Replace as required.



1. Lower chain guide

Replace lower chain guide if timing chain wear grooves are visible.

| CHAIN GUIDE GROOVE DEPTH |                                     |
|--------------------------|-------------------------------------|
| SERVICE LIMIT            | No timing chain wear groove allowed |

**NOTE:** Also check the chain guide, tensioner side. Refer to *CHAIN GUIDE INSPECTION (TENSIONER SIDE)* in this subsection.

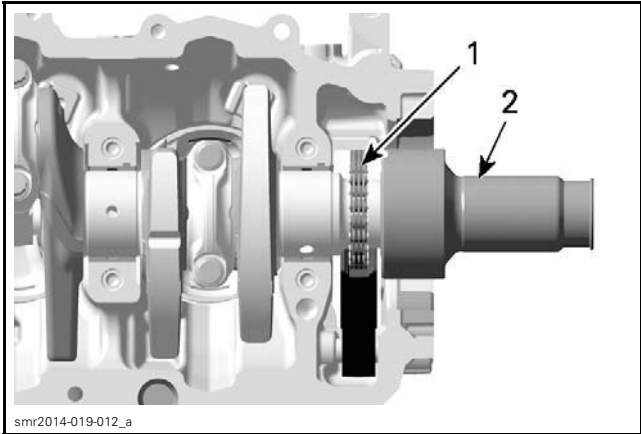
Timing Chain Installation

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

1. Install timing chain on crankshaft timing gear.

**NOTE:** If the same timing chain is reinstalled, be sure to reinstall it in the same operating direction as marked during removal procedure.

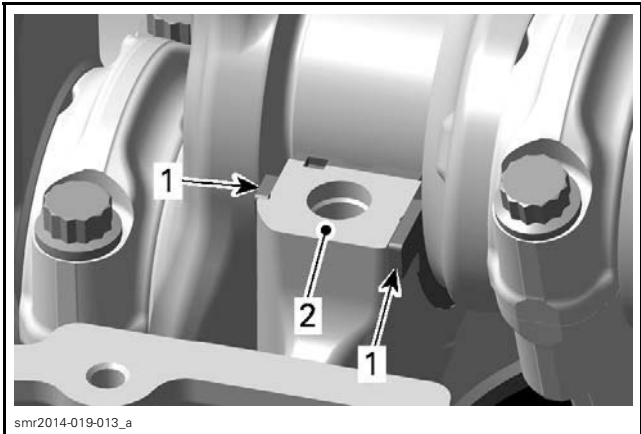
2. Install crankshaft.



1. Timing chain  
2. Crankshaft

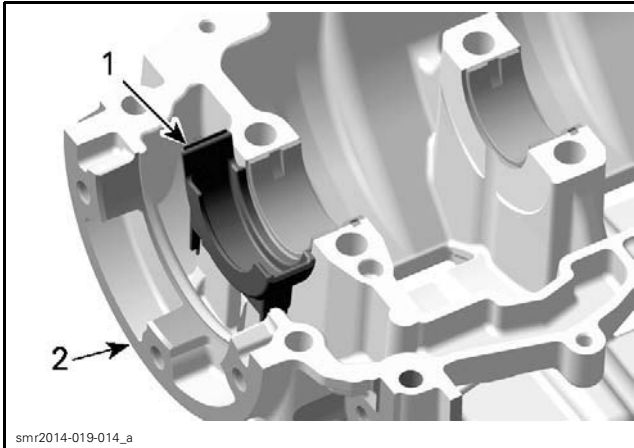
3. Properly install the crankshaft thrust washers with the slots facing against crankshaft counterweights.

**NOTE:** Crankshaft thrust washers must be flush with the cylinder block sealing surface.



1. Crankshaft thrust washers  
2. Sealing surface

4. Reinstall lower chain guide in lower half of cylinder block.



1. Lower chain guide
2. Lower half of cylinder block

5. Reassemble cylinder block, refer to *CYLINDER BLOCK* subsection.
6. Lock crankshaft, refer to *CRANKSHAFT LOCKING PROCEDURE* in the *CYLINDER BLOCK* subsection.
7. Reinstall timing chain properly on camshaft timing gears. Refer to *CAMSHAFT INSTALLATION* in the *CYLINDER HEAD* subsection.

**NOTICE** Improper camshaft timing will damage engine components.

8. Install all other removed parts.

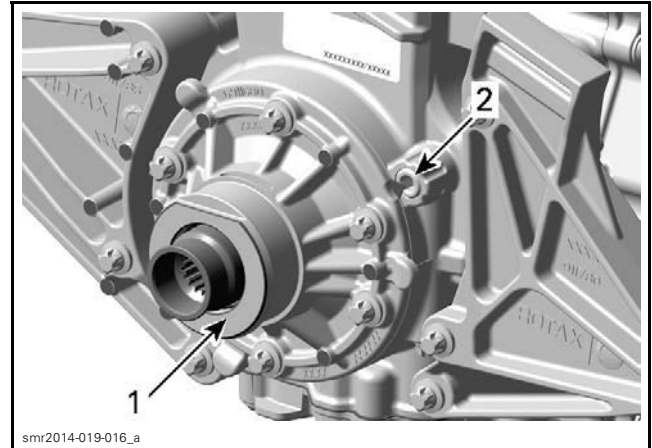
**NOTE:** Be sure to remove camshaft and crankshaft locking tools when timing chain is completely installed.

## CHAIN GUIDE (TENSIONER SIDE)

### Chain Guide Removal (Tensioner Side)

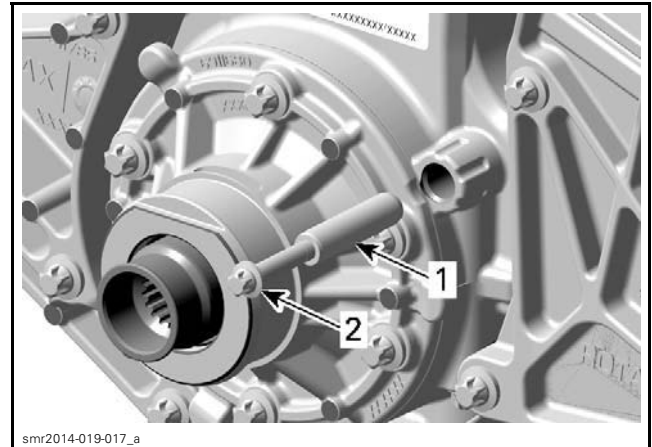
**NOTE:** Removal of chain guide is not recommended if there is no need for replacement.

1. Remove the *CAMSHAFTS*. Refer to *CYLINDER HEAD* subsection.
2. Remove screw plug that covers the chain guide bearing pin.



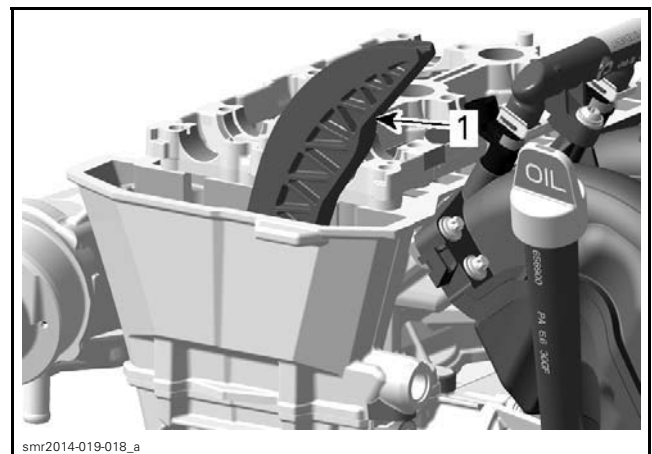
1. PTO cover
2. Screw plug location

3. Use an M6 bolt to pull chain guide bearing pin out of cylinder block.



1. Chain guide bearing pin
2. M6 bolt

4. Remove chain guide (tensioner side).



1. Chain guide (tensioner side)

Section 02 ENGINE

Subsection 07 (TIMING CHAIN)

Chain Guide Inspection  
(Tensioner Side)

Check chain guide for wear, cracks or deforming.  
Replace as required.

Replace chain guide if groove depth caused by  
timing chain exceeds service limit.

| CHAIN GUIDE GROOVE DEPTH |                |
|--------------------------|----------------|
| SERVICE LIMIT            | 1 mm (.039 in) |



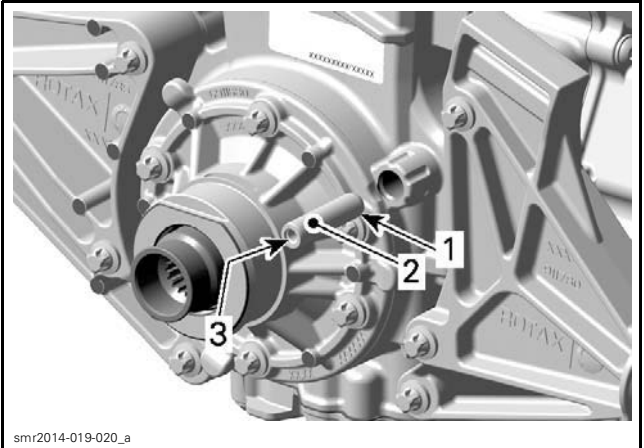
TYPICAL  
1. Chain guide

Chain Guide Installation  
(Tensioner Side)

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

1. Insert chain guide.
2. Apply engine oil on bearing pin and install it with M6 threads facing outwards.

**NOTICE** Ensure chain guide bearing pin is properly inserted in the chain guide.



1. Bearing pin  
2. Apply engine oil here  
3. M6 threads facing outwards

3. Tighten screw plug as specified.

**NOTE:** Install screw plug only in final assembled cylinder block to avoid warpage of sealing surface.

| SCREW PLUG        |                                         |
|-------------------|-----------------------------------------|
| Service product   | LOCTITE 243 (BLUE)<br>(P/N 293 800 060) |
| Tightening torque | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |

4. Properly reinstall camshafts. Refer to *CAMSHAFTS* in the *CYLINDER HEAD* sub-section.

**NOTICE** Improper camshaft timing will damage engine components.

# CYLINDER HEAD

## SERVICE TOOLS

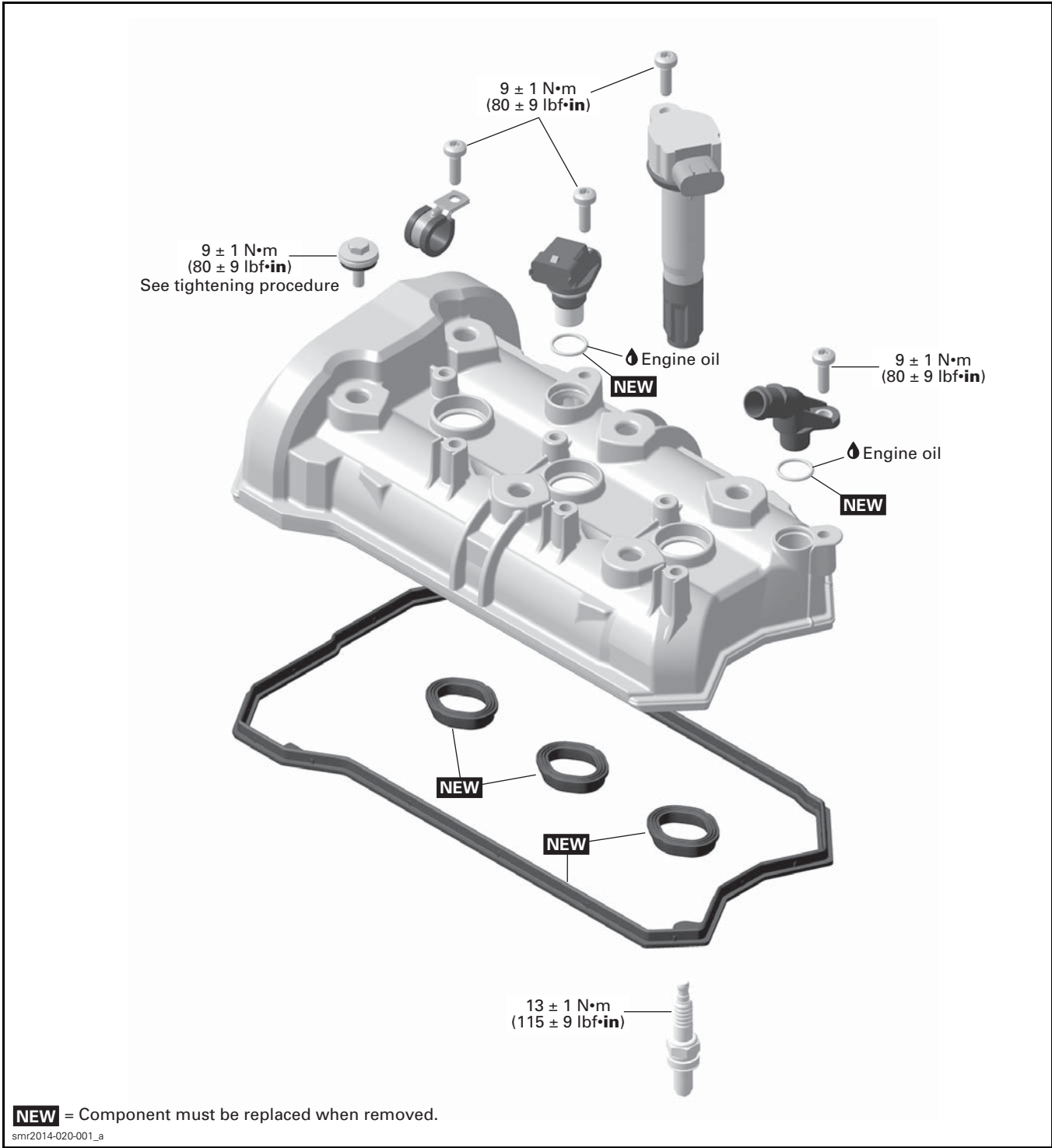
| Description                      | Part Number       | Page |
|----------------------------------|-------------------|------|
| CAMSHAFT LOCKING TOOL.....       | 529 036 206 ..... | 12   |
| ENGINE LEAK DOWN TEST KIT .....  | 529 035 661 ..... | 5    |
| PTO ADAPTER .....                | 529 036 273 ..... | 5    |
| VALVE SPRING COMPRESSOR CUP..... | 529 036 209 ..... | 18   |
| VALVE SPRING COMPRESSOR .....    | 529 035 724 ..... | 18   |

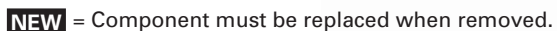
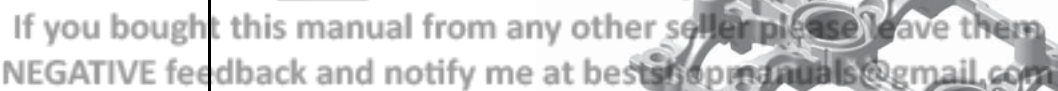
## SERVICE TOOLS – OTHER SUPPLIER

| Description                          | Part Number   | Page |
|--------------------------------------|---------------|------|
| SNAP-ON VALVE HOLDER.....            | VL2 .....     | 21   |
| SNAP-ON VALVE STEM SEAL PLIERS ..... | YA 8230 ..... | 19   |

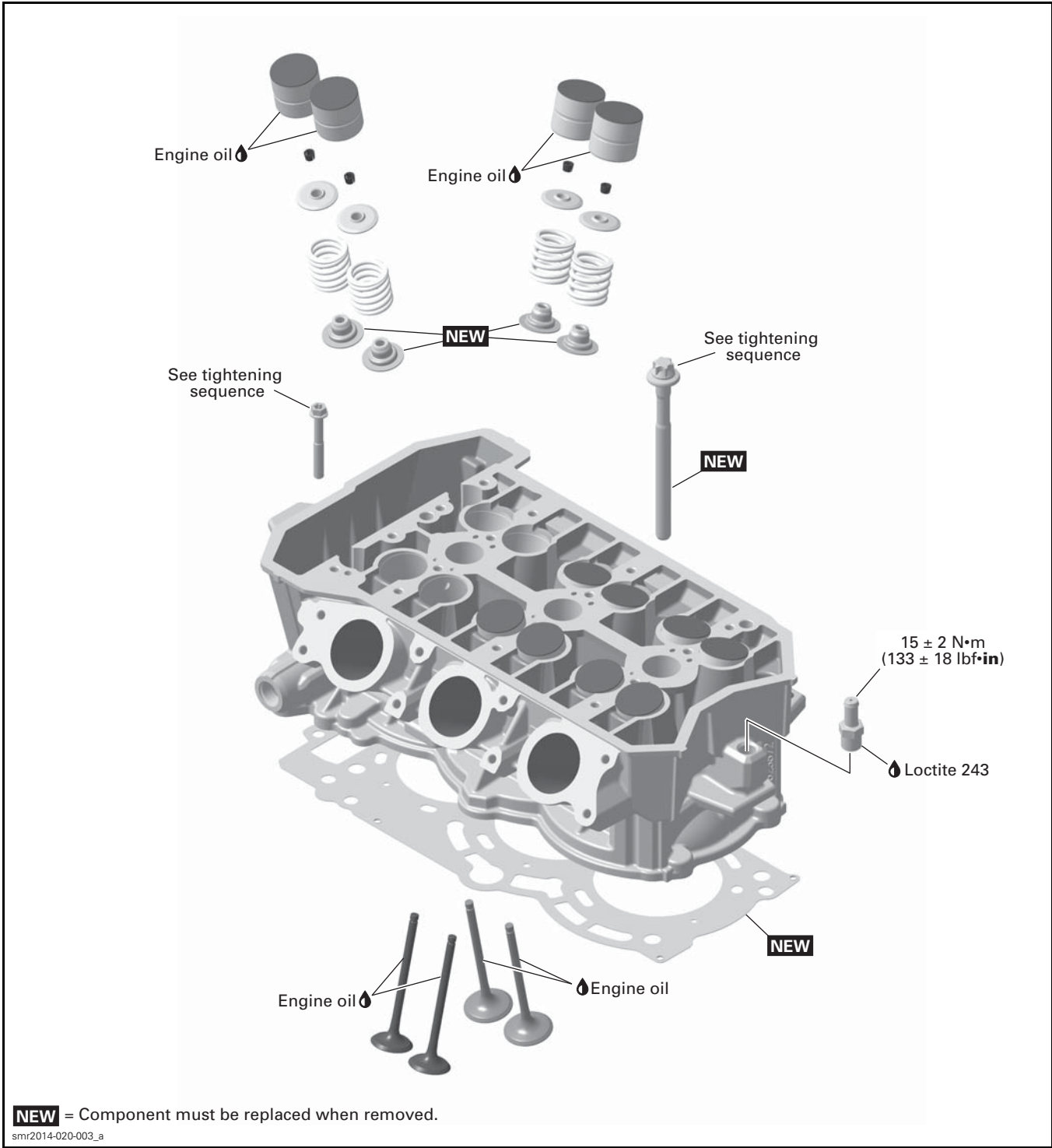


VALVE COVER





CYLINDER HEAD



## GENERAL

**NOTE:** For a better understanding, some illustrations are taken with engine out of the vehicle.

When disassembling parts that are duplicated in the engine, (e.g.: valves, springs, etc.), it is strongly recommended to note their position and to keep the parts of the same assembly as a "group". If you find a defective component, it will be much easier to find the cause of the failure. Since parts were broke-in together during engine operation, they will maintain their matched fit when reassembled together within their "group".

## INSPECTION

### CYLINDER LEAK TEST

#### General

Before performing the cylinder leak test, verify the following:

- Clamp tightness
- Hoses condition.

**NOTE:** For best accuracy, the leak test should be done with the engine at normal operating temperature.

**⚠ CAUTION** Engine parts could be hot.

**NOTE:** The following steps are the same for each cylinder.

#### Preparation

1. Remove the *VALVE COVER*, see procedure in this subsection.
2. Remove spark plug.
3. Turn the engine counterclockwise to bring piston to TDC of compression stroke. Use a dial gauge or a suitable tool to position the piston to TDC.

| REQUIRED TOOL                 |                                                                                     |
|-------------------------------|-------------------------------------------------------------------------------------|
| PTO ADAPTER (P/N 529 036 273) |  |

**NOTE:** The piston must be set precisely to TDC of compression stroke. If not, the engine will continue to rotate when pressure builds up.

#### Leak Test

1. Install a gauge adaptor into spark plug hole.

| REQUIRED TOOL                               |                                                                                     |
|---------------------------------------------|-------------------------------------------------------------------------------------|
| ENGINE LEAK DOWN TEST KIT (P/N 529 035 661) |  |

2. Connect the leak down tester to an adequate air supply.

3. Set gauge needle to zero.

**NOTE:** All testers have specific instructions on gauge operation and required pressure. Refer to manufacturer's instructions.

4. Supply combustion chamber with air pressure.
5. Note the amount or percentage of leakage (depending on tester).

| LEAKAGE PERCENTAGE | ENGINE CONDITION                           |
|--------------------|--------------------------------------------|
| 0% to 15%          | Excellent condition                        |
| 16% to 25%         | Good condition                             |
| 26% to 40%         | Fair condition; reduced engine performance |
| 41% and higher     | Poor condition, diagnose and repair engine |

### Diagnosis

Listen for air leaks.

- Air escaping on intake port or throttle body means leaking intake valve(s).
- Air escaping on exhaust port means leaking exhaust valve(s).
- Air bubbles out of coolant tank means leaking cylinder head gasket.
- Air or coolant escaping from cylinder head means damaged gasket or loosened screws.
- Air escaping into crankcase area means excessively worn cylinder or broken piston rings.
- Air or oil escaping from crankcase means damaged gasket or loosened screws.

### Repair Tips

Blue exhaust gas means damaged or worn piston rings or valve stem seals.

White exhaust gas means damaged cylinder head gasket.

Coolant tank cap opening without overheat means damaged cylinder head gasket.

Leaking valves can be caused by carbon deposits or burnt valve face.

## Subsection XX (CYLINDER HEAD)

### Assembly

Reverse the preparation procedure.

## TROUBLESHOOTING

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

**NOTE:** When diagnosing an engine problem, always perform the cylinder leak test. This will help pinpoint a problem. Refer to *CYLINDER LEAK TEST* in this subsection.

### UNUSUAL ENGINE NOISE OR VIBRATIONS

1. Discharged or defective valve lifters.
  - Check engine oil pressure, refer to *LUBRICATION SYSTEM* subsection.
  - Replace valve lifters.
2. Camshaft(s) or camshaft holder(s) worn out.
  - Check and replace damaged parts.
3. Faulty chain tensioner.
  - Replace chain tensioner. Refer to *TIMING CHAIN* subsection.
4. Chain guide(s) worn out.
  - Replace chain guide(s). Refer to *TIMING CHAIN* subsection.
5. Stretched timing chain or worn out sprockets.
  - Replace timing chain and sprockets. Refer to *TIMING CHAIN* subsection.
6. Loose timing chain gear screws.
  - Retighten screws with recommended torque.
7. Incorrect camshaft timing.
  - Replace damaged components and readjust camshaft timing.

### OIL LEAKAGE FROM CYLINDER HEAD

1. Leaking valve cover gasket.
  - Replace valve cover gaskets and retighten valve cover with recommended torque.
  - Check valve cover for cracks or other damage.
2. Leaking spark plug tube O-rings.
  - Replace spark plug tube O-rings.
  - Clean spark plug area from oil spillage.
3. Blow-by connector is leaking.
  - Replace blow by connector O-ring.

4. Leaking cylinder head gasket.
  - Check cylinder head for damage.
  - Replace cylinder head gasket and retighten screws with recommended torquing procedure.

### ENGINE SUDDENLY TURNS OFF OR LACKS ACCELERATION OR POWER

1. Incorrect camshaft timing.
  - Replace damaged components and readjust camshaft timing.
2. Leaking intake or exhaust valves.
  - Perform a *CYLINDER LEAK TEST*. Repair or replace damaged components.
3. Broken valve spring(s).
  - Replace defective parts.

## PROCEDURES

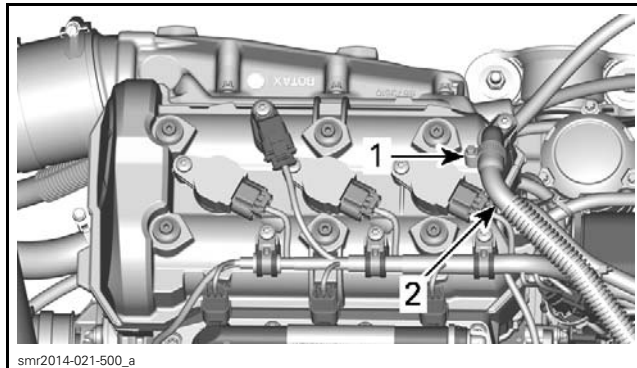
### VALVE COVER

#### Valve Cover Access

Remove central body. refer to *BODY*.

Remove the air intake silencer. Refer to *AIR INTAKE SYSTEM* subsection.

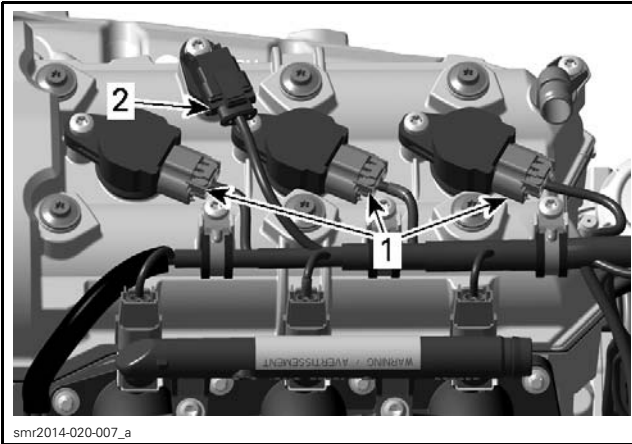
Disconnect vent tube from the blow-by-connector.



1. Clamp
2. Vent tube

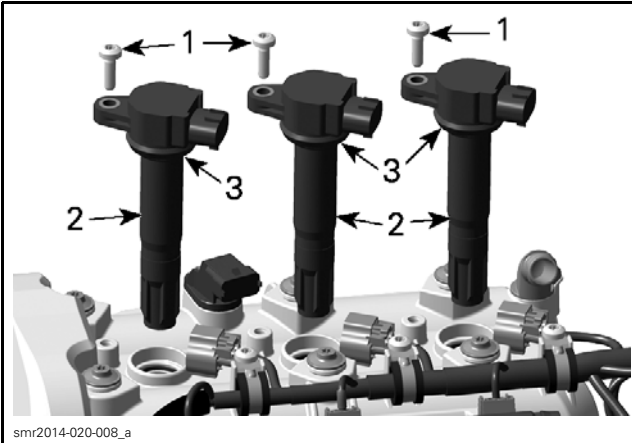
#### Valve Cover Removal

1. Unplug CAPS (camshaft position sensor).
2. Unplug ignition coils.



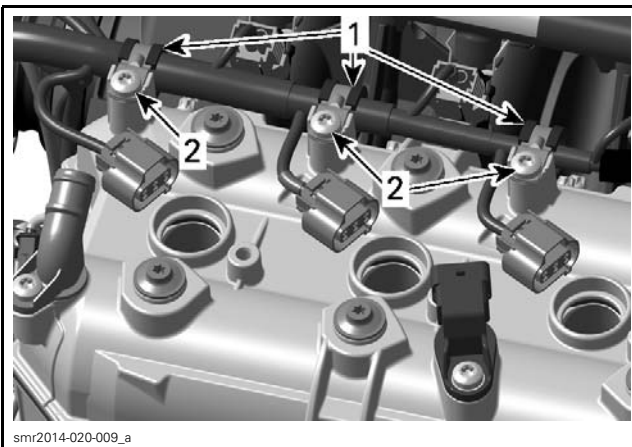
1. Ignition coil connectors
2. CAPS connector

3. Remove ignition coils with gaskets.



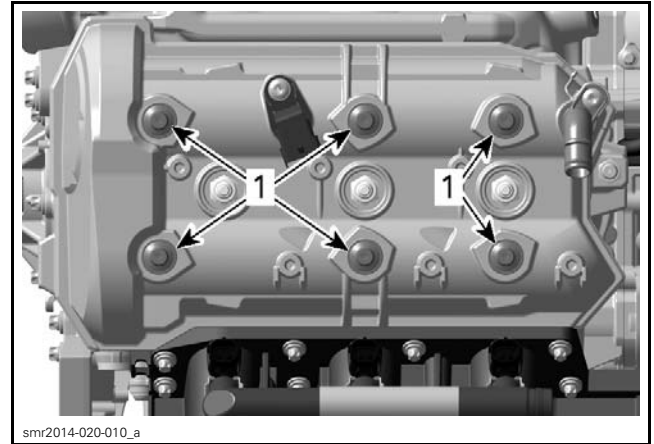
1. Retaining screws
2. Ignition coils
3. Gaskets

4. Remove screws securing the electrical harness to the valve cover.



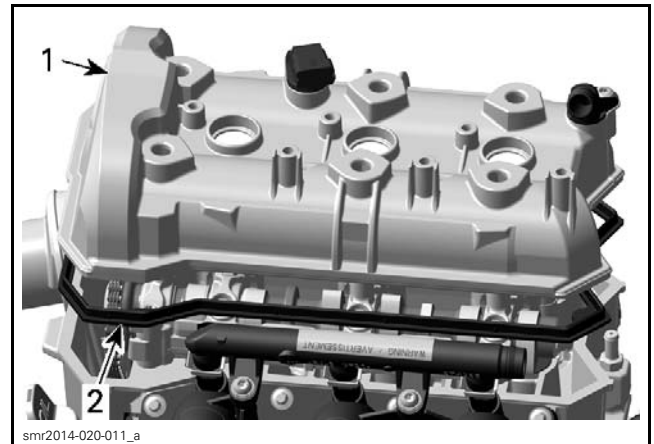
1. Cable clamps
2. Retaining screws

5. Remove valve cover retaining screws.



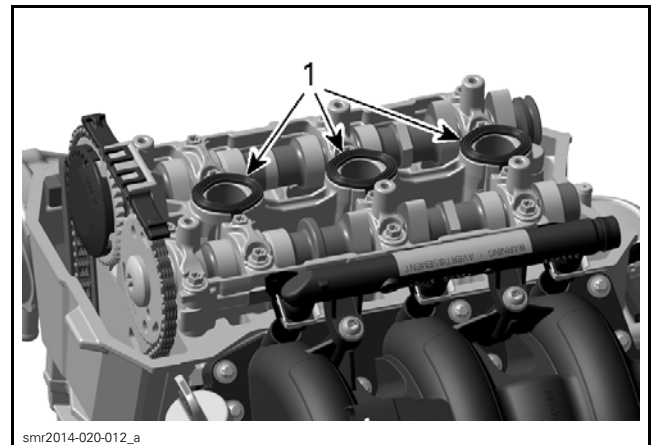
1. Valve cover screws

6. Remove the valve cover and its gasket.



1. Valve cover
2. Gasket

7. Remove valve cover small gaskets (spark plug tubes).



1. Small gaskets

## Valve Cover Inspection

Check the valve cover for cracks or other damage. Check if the valve cover gaskets are brittle, hard or otherwise damaged.

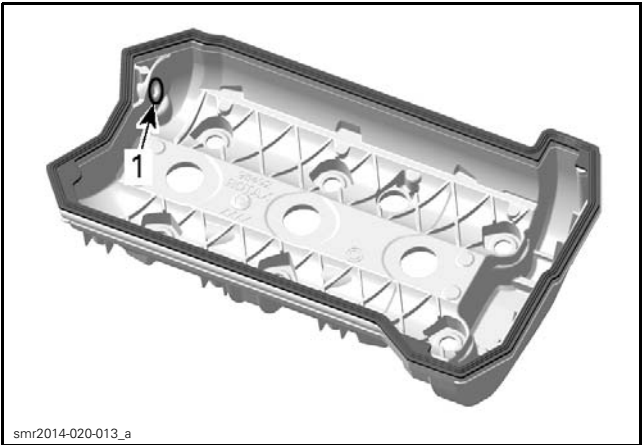
Subsection XX (CYLINDER HEAD)

Replace defective parts.

Valve Cover Installation

For installation reverse the removal procedure. However, pay attention to the following details.

- 1. Properly fit the small gaskets into the camshaft holder grooves.
- 2. Properly fit the large gasket into the valve cover groove.
- 3. Apply engine oil to the sealing surface of the V-ring.

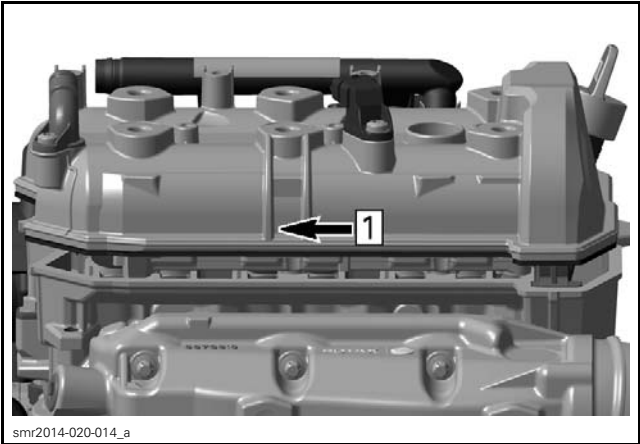


INSIDE VALVE COVER  
1. Apply engine oil here

- 4. If engine is in the vehicle, slide the valve cover inside engine compartment by the LH side of the vehicle.
- 5. Install valve cover.

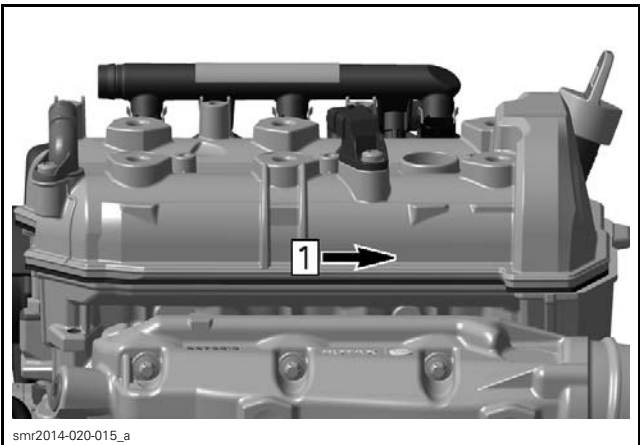
**NOTICE** Adhere to the following procedure, otherwise damage to the V-ring will occur causing crankcase venting malfunction.

- 5.1 Move the valve cover towards the MAG side.



Step 1: Move valve cover towards MAG side

- 5.2 Put valve cover onto cylinder head.
- 5.3 Push valve cover towards the PTO side to ensure that the V-ring properly seals on sealing surface inside the cover.

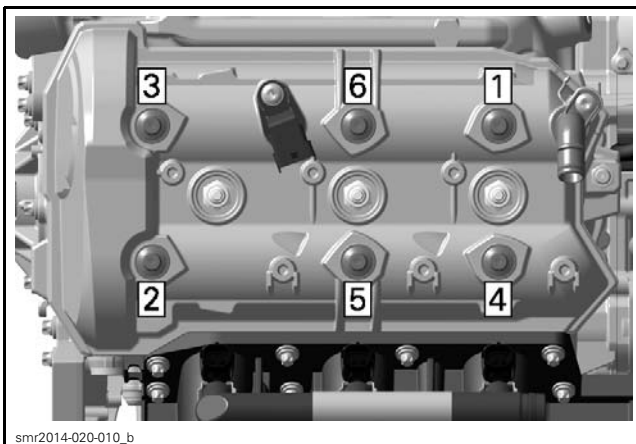


Step 1: Push valve cover towards PTO side

- 6. Install valve cover screws and tighten as per following sequence:

| VALVE COVER SCREWS TIGHTENING PROCEDURE |                                         |
|-----------------------------------------|-----------------------------------------|
| Step A                                  | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |
| Step B                                  | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |




smr2014-020-010\_b  
TIGHTENING SEQUENCE

## CAMSHAFTS

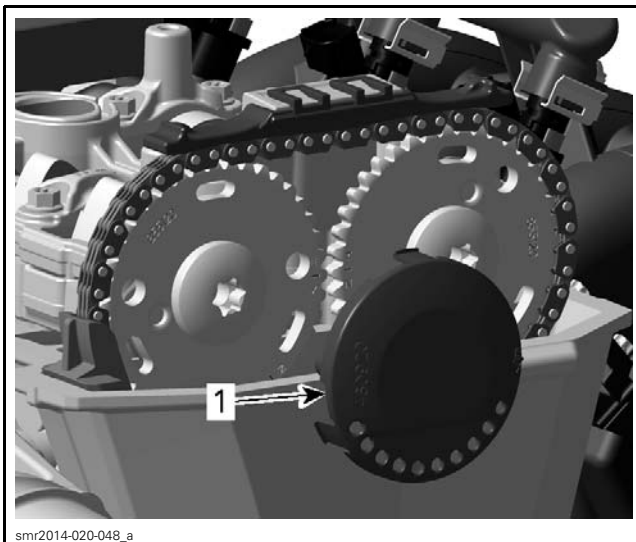
### Camshaft Removal

1. Remove *VALVE COVER*, see procedure in this subsection.
2. Lock crankshaft, refer to *CRANKSHAFT LOCKING PROCEDURE* in the *CYLINDER BLOCK* subsection.

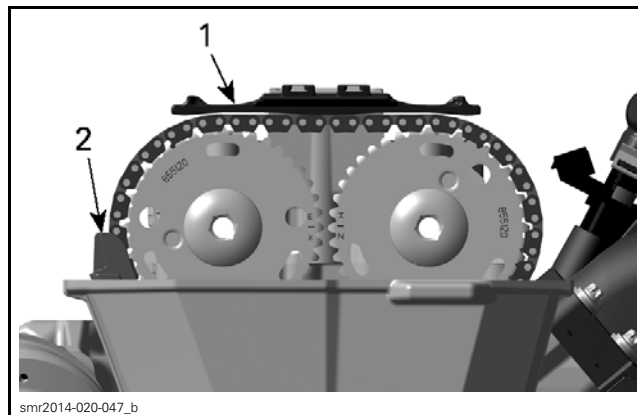
Remove timing chain tensioner. Refer to *TIMING CHAIN* subsection.

3. Remove:

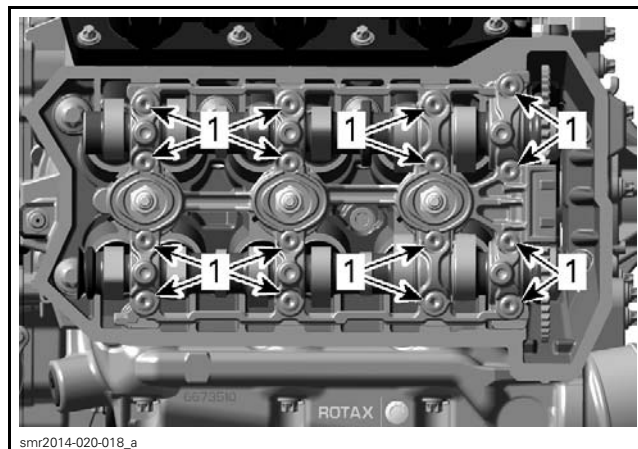
- 3.1 Breather cover


smr2014-020-048\_a  
1. Breather cover

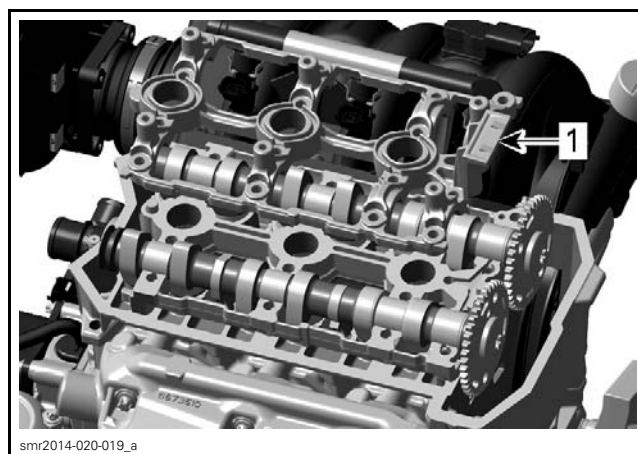
- 3.2 Upper timing chain guide
- 3.3 Timing chain guide.


smr2014-020-047\_b  
1. Upper timing chain guide  
2. Timing chain guide

4. Remove timing chain from camshaft timing gears.
5. Remove camshaft holder retaining screws (16).


smr2014-020-018\_a  
1. Camshaft holder retaining screws

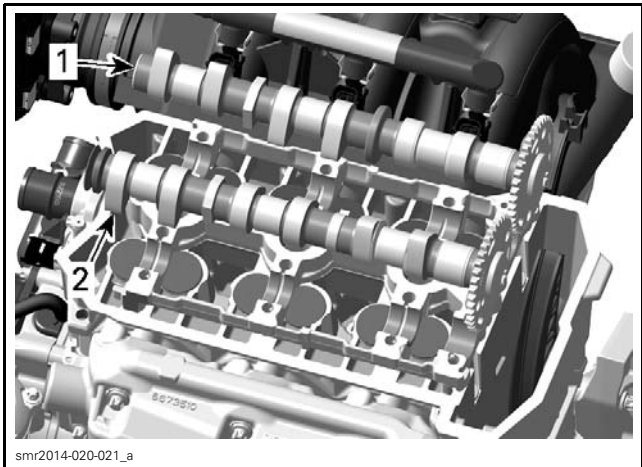
6. Remove the camshaft holder upper half.


smr2014-020-019\_a  
1. Upper half of camshaft holder

7. Put timing chain aside.
8. Remove camshafts with timing gears.



Subsection XX (CYLINDER HEAD)

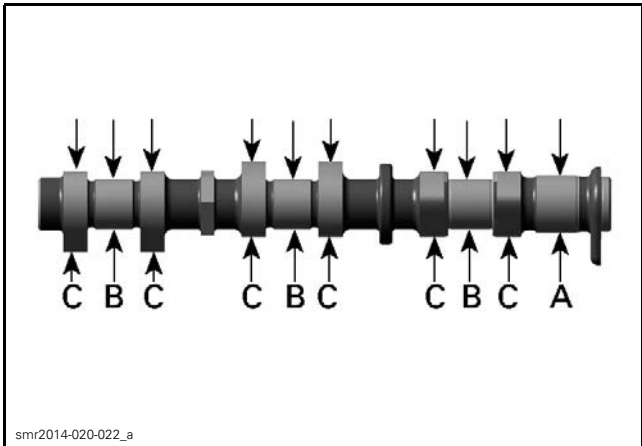


1. Intake camshaft  
2. Exhaust camshaft

9. Remove camshaft timing gears only if necessary. Refer to *TIMING CHAIN* subsection.

Camshaft Inspection

- 1. Check each lobe and bearing journal for scoring, scuffing, cracks, or other signs of wear.
- 2. Check V-ring if it is brittle, hard or otherwise damaged.
- 3. Measure camshaft bearing journal diameter and lobe height, using a micrometer.



A. Camshaft journal (PTO)  
B. Camshaft journal (center and MAG)  
C. Camshaft lobes

| CAMSHAFT JOURNAL DIAMETER  |                                                    |
|----------------------------|----------------------------------------------------|
| PTO JOURNAL (A)            |                                                    |
| NEW                        | 25.967 mm to 25.980 mm<br>(1.0223 in to 1.0228 in) |
| SERVICE LIMIT              | 25.940 mm (1.0213 in)                              |
| CENTER AND MAG JOURNAL (B) |                                                    |
| NEW                        | 22.957 mm to 22.970 mm<br>(.9038 in to .9043 in)   |
| SERVICE LIMIT              | 22.930 mm (.9028 in)                               |

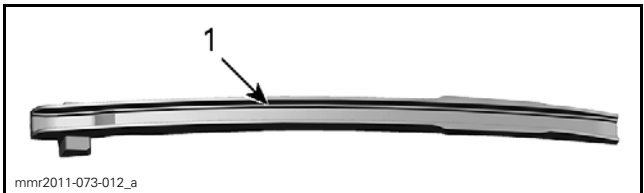
| CAMSHAFT LOBE HEIGHT            |                                               |
|---------------------------------|-----------------------------------------------|
| EXHAUST and INTAKE CAMSHAFT (C) |                                               |
| NEW                             | 38.35 mm to 38.55 mm<br>(1.51 in to 1.518 in) |
| SERVICE LIMIT                   | 38.33 mm (1.509 in)                           |

Replace parts if necessary.

For camshaft journal radial clearance and camshaft holder bearing diameter refer to *CAMSHAFT HOLDER* in this subsection.

- 4. Check timing chain guide for wear, cracks or deformation. Replace as required.
- 5. Replace timing chain guide if any groove caused by timing chain exceeds service limit.

| CHAIN GUIDE GROOVE DEPTH |                |
|--------------------------|----------------|
| SERVICE LIMIT            | 1 mm (.039 in) |

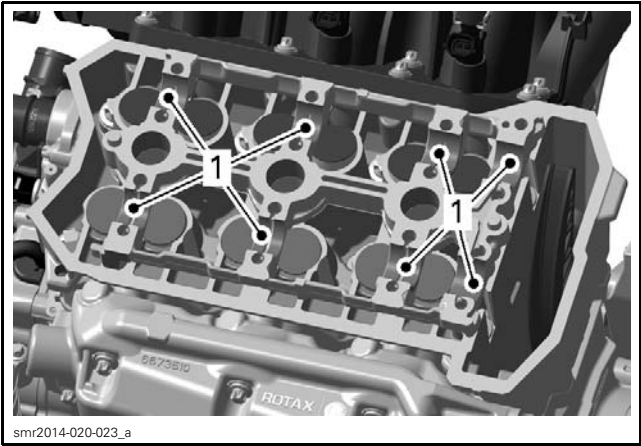


1. Timing chain guide

Camshaft Installation

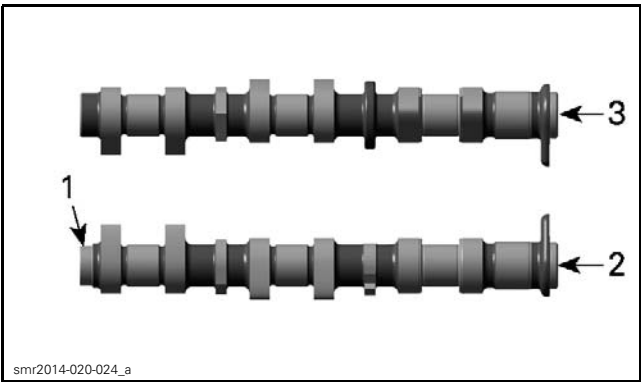
The assembly is the reverse of the removal procedure. However pay attention to the following details.

- 1. Ensure crankshaft is still locked.
- 2. Apply engine oil on camshaft bearings.



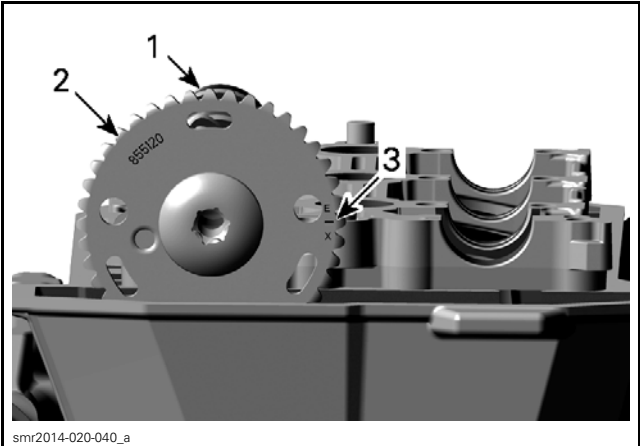
1. Areas where to apply engine oil

**NOTE:** The camshafts are not identical. Any mix-up of the components would lead to engine damage. The exhaust camshaft has a machined area on MAG side for the V-ring.



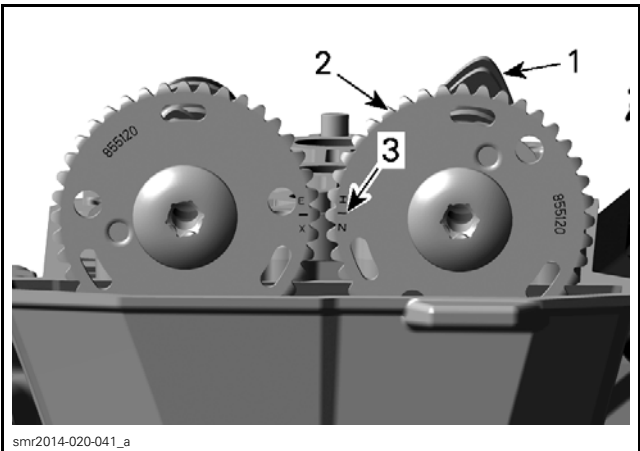
1. Machined area  
2. Exhaust camshaft  
3. Intake camshaft

3. If removed, reinstall camshaft timing gears on camshafts. Refer to *CAMSHAFT TIMING GEARS* in the *TIMING CHAIN* subsection.
4. Apply engine oil on camshaft journal diameter.
5. Install exhaust camshaft assembly with mark "EX" parallel to cylinder head gasket.



1. Exhaust camshaft  
2. Camshaft timing gear  
3. Mark "EX"

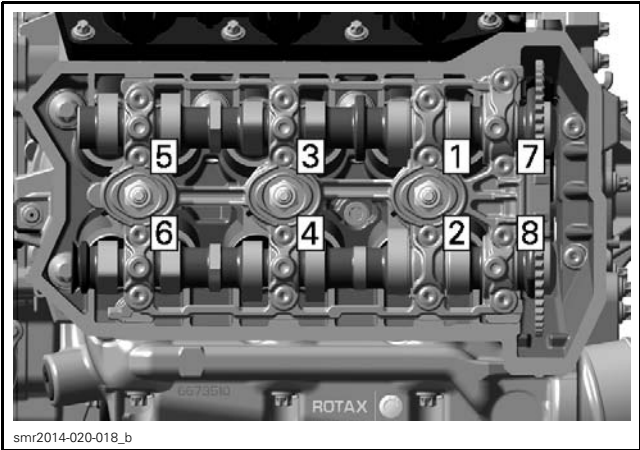
6. Install intake camshaft assembly with mark "IN" parallel to cylinder head gasket.



1. Intake camshaft  
2. Camshaft timing gear  
3. Mark "IN"

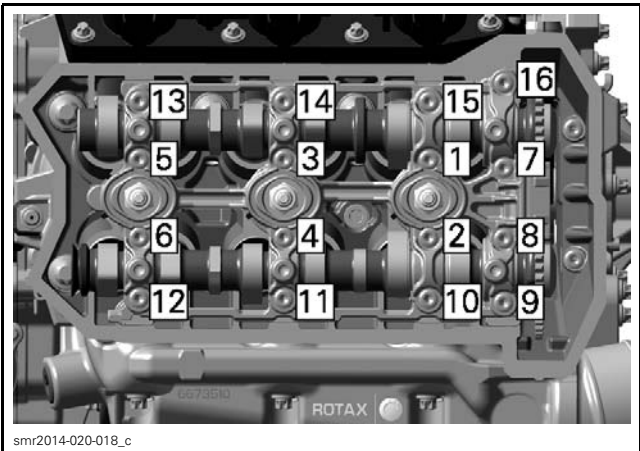
7. Install the camshaft holder upper half, then tighten screws as per following sequence:

| CAMSHAFT HOLDER TIGHTENING PROCEDURE |                                           |
|--------------------------------------|-------------------------------------------|
| STEP A                               | 5 N•m ± 0.5 N•m<br>(44 lbf•in ± 4 lbf•in) |



CAMSHAFT HOLDER TIGHTENING SEQUENCE - STEP A

| CAMSHAFT HOLDER TIGHTENING PROCEDURE |                                         |
|--------------------------------------|-----------------------------------------|
| STEP B                               | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |

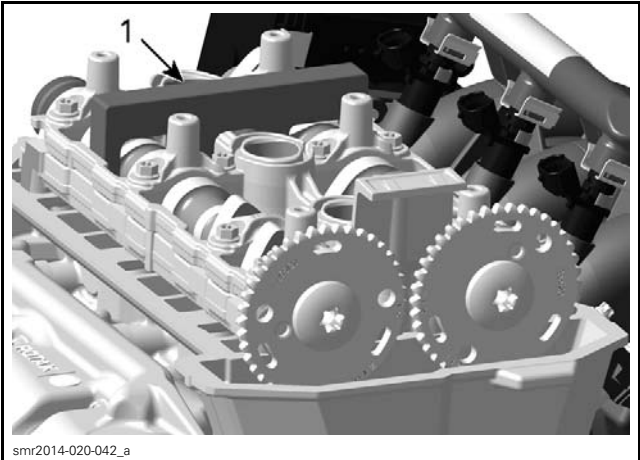


CAMSHAFT HOLDER TIGHTENING SEQUENCE - STEP B

**NOTE:** After the reassembly of the camshafts is completed, check if camshafts can be turned easily.

8. Lock camshafts.

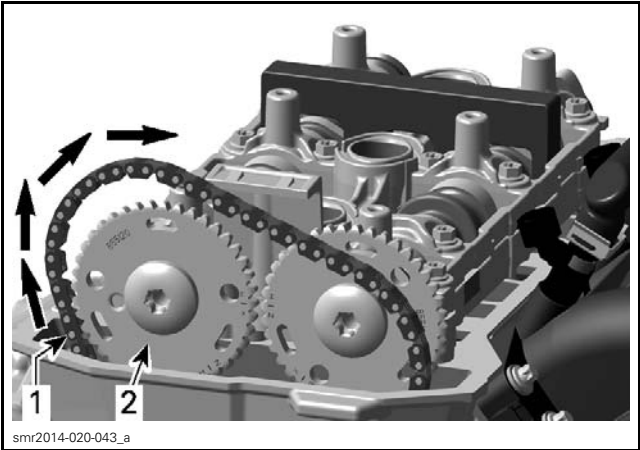
| REQUIRED TOOL                              |  |
|--------------------------------------------|--|
| CAMSHAFT LOCKING TOOL<br>(P/N 529 036 206) |  |



1. Camshaft locking tool

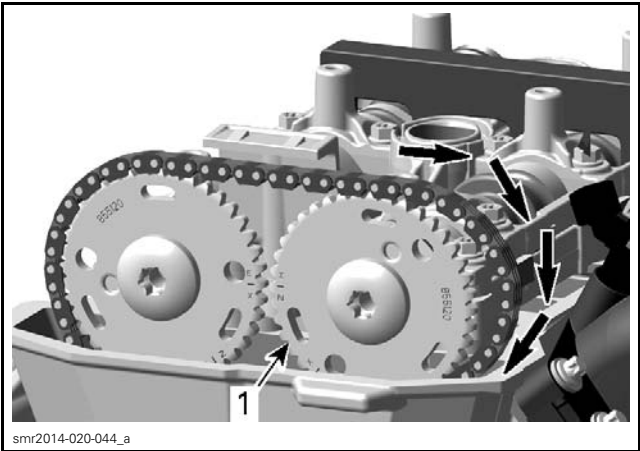
9. Lift timing chain out of timing chain compartment.

10. Pull timing chain up on exhaust side and install it on the exhaust camshaft timing gear.



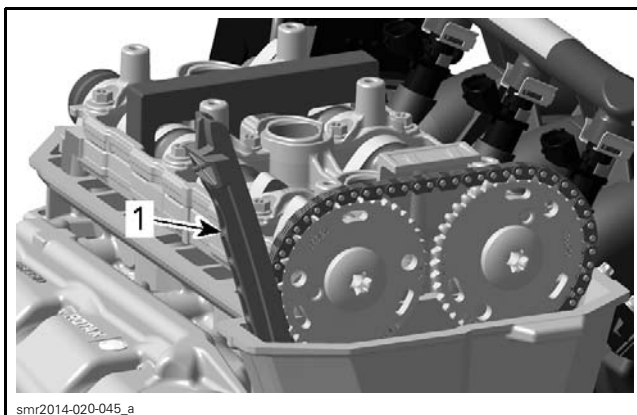
1. Timing chain  
2. Exhaust camshaft timing gear

11. Pull timing chain towards intake side and install it on the intake camshaft timing gear.



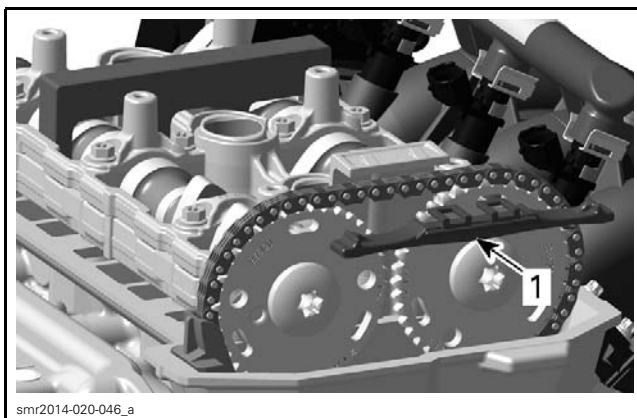
1. Intake camshaft timing gear

12. Install timing chain guide.



1. Timing chain guide

13. Install upper timing chain guide on camshaft holder.

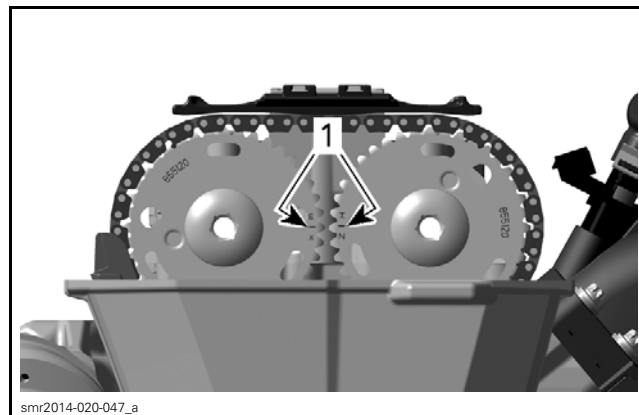


1. Upper timing chain guide

14. Install *TIMING CHAIN TENSIONER*, refer to *TIMING CHAIN* subsection.

15. Ensure marks on camshaft timing gears are still aligned. If not, repeat procedure.

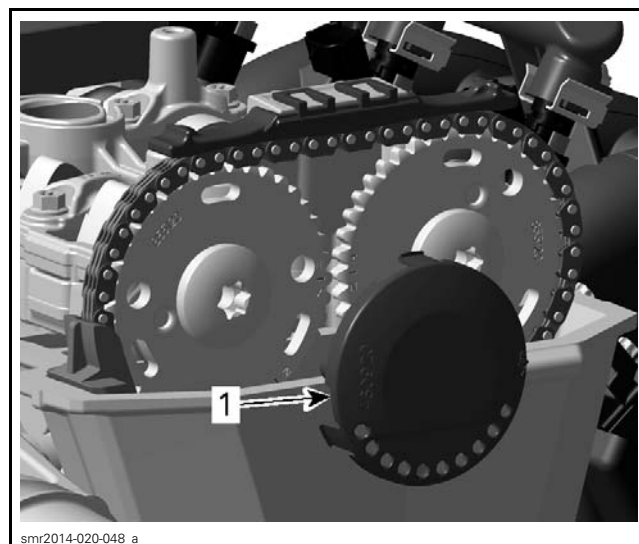
**NOTICE** After installation of timing chain tensioner, the marks "IN" on intake and "EX" on exhaust camshafts must be aligned.



**CAMSHAFT TIMING GEARS**

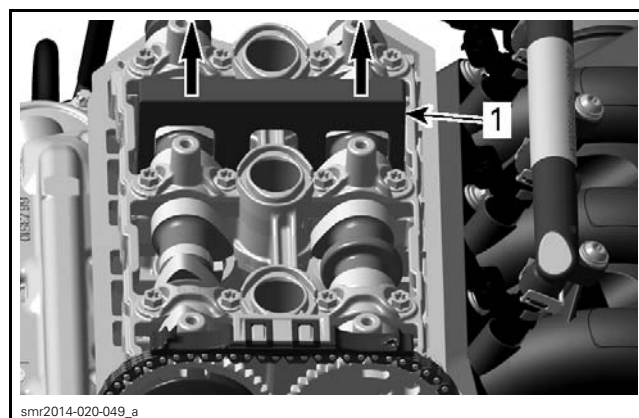
1. Marks must be aligned

16. Install breather cover.



1. Breather cover

17. Remove camshaft locking tool.



1. Camshaft locking tool removal

18. Remove crankshaft locking tool.

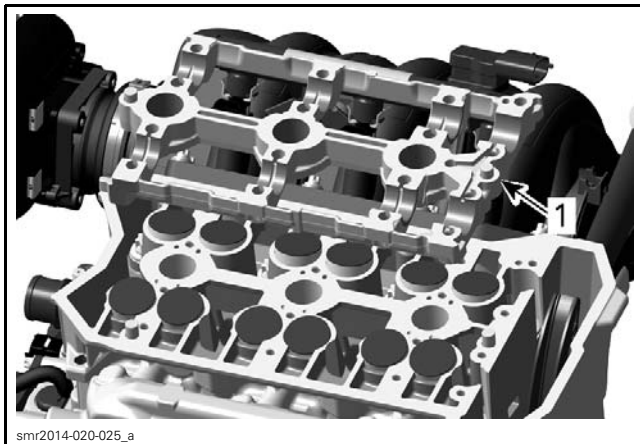
### CAMSHAFT HOLDER

#### Camshaft Holder Removal

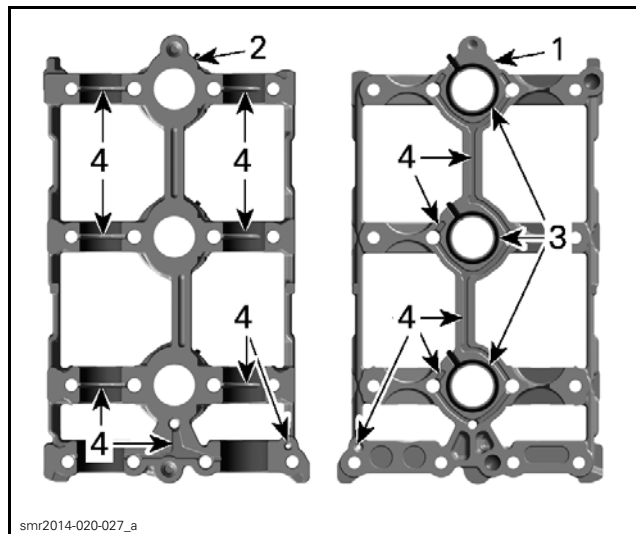
Remove camshafts, see procedure in this subsection.

Remove the camshaft holder lower half with gaskets from cylinder head.

Remove gaskets from camshaft holder halves and discard gaskets.



1. Camshaft holder lower half



1. Camshaft holder lower half - view from beneath
2. Camshaft holder lower half - view from above
3. Gaskets
4. Oil orifices

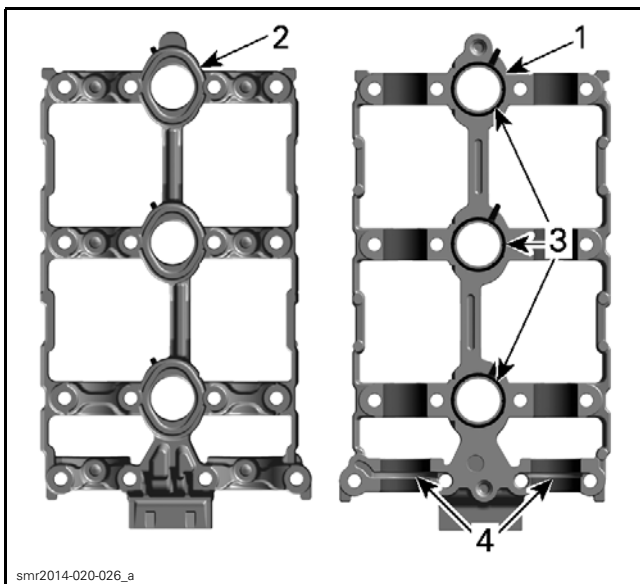
Install camshaft holder on cylinder head.

Tighten camshaft holder screws to specification, refer to *CAMSHAFT INSTALLATION* in this subsection.

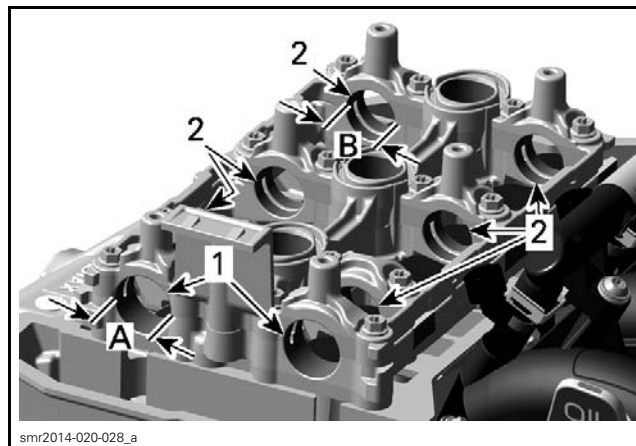
Measure camshaft holder bearing diameter.

#### Camshaft Holder Inspection

1. Check camshaft holder for scoring, scuffing, cracks, or other signs of wear.
2. Make sure oil orifices are not clogged. Blow them out with pressurized air.



1. Camshaft holder upper half - view from beneath
2. Camshaft holder upper half - view from above
3. Gaskets
4. Oil orifices



#### CAMSHAFT HOLDER BEARINGS

1. PTO bearings
2. Center and MAG bearings
- A. Diameter PTO bearing
- B. Diameter center and MAG bearing

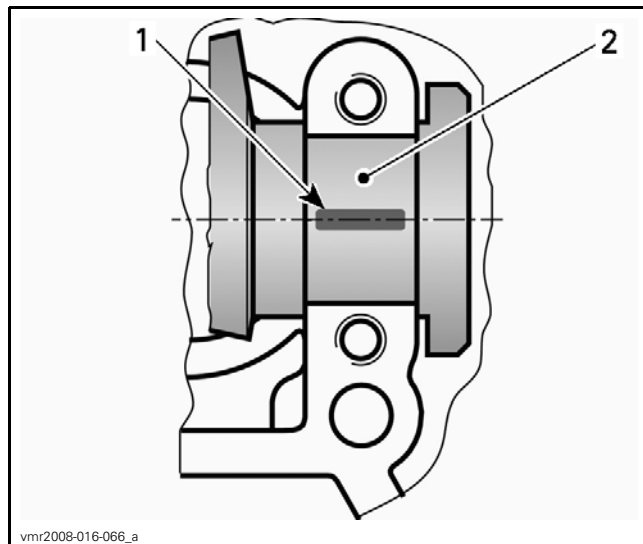
| CAMSHAFT HOLDER BEARING DIAMETER |                                                  |
|----------------------------------|--------------------------------------------------|
| PTO BEARING                      |                                                  |
| NEW                              | 26.000 mm to 26.021 mm<br>(1.024 in to 1.024 in) |
| SERVICE LIMIT                    | 26.050 mm (1.026 in)                             |
| CENTER AND MAG BEARING           |                                                  |
| NEW                              | 23.000 mm to 23.021 mm<br>(.906 in to .906 in)   |
| SERVICE LIMIT                    | 23.050 mm (.907 in)                              |

Measure clearance between camshaft journals and camshaft holder, using the plastic feeler gauge.

**NOTE:** The plastic feeler gauge is available at automotive parts retailer.

Install camshaft holder lower half on cylinder head.

Place the camshafts in the camshaft holder lower half and apply a plastic-gauge on the camshaft bearing journal.

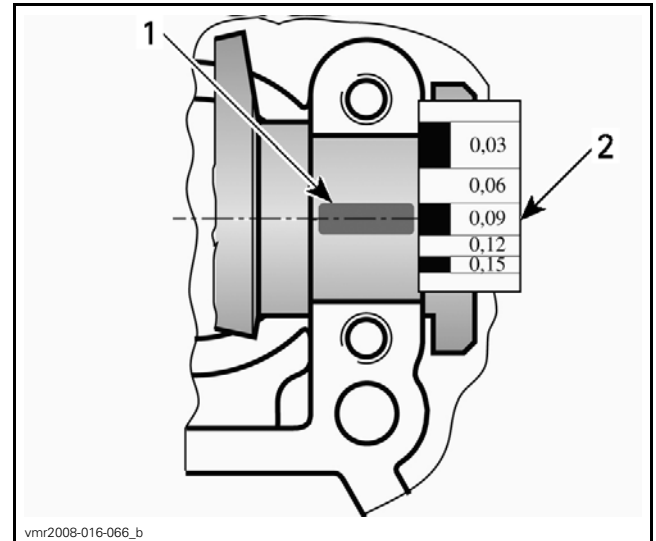


**TYPICAL**  
1. Plastic gauge  
2. Camshaft bearing journal

Install camshaft holder upper half in the proper position and tighten screws to specification, refer to *CAMSHAFT INSTALLATION* in this subsection.

Unfasten camshaft holder.

Measure the maximum width of the pressed plastic gauge with the corresponding graduated scale.



**TYPICAL**  
1. Pressed plastic gauge  
2. Graduated scale

| CAMSHAFT JOURNAL RADIAL CLEARANCE |                                              |
|-----------------------------------|----------------------------------------------|
| PTO, CENTER AND MAG BEARING       |                                              |
| NEW                               | 0.020 mm to 0.054 mm<br>(.001 in to .002 in) |
| SERVICE LIMIT                     | 0.080 mm (.003 in)                           |

Replace parts if necessary.

## Camshaft Holder Installation

Install camshaft holder lower half.

Continue procedure as explained in *CAMSHAFT INSTALLATION* in this subsection.

## HYDRAULIC VALVE LIFTERS

### Hydraulic Valve Lifter Removal

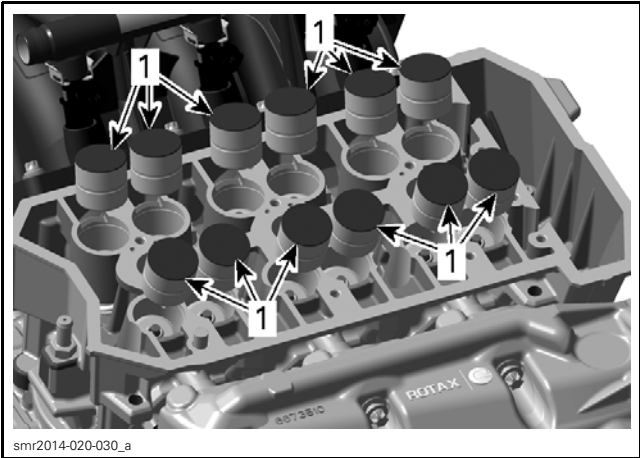
**NOTE:** Hydraulic valve lifter are maintenance free.

See procedures in this subsection to remove:

- Valve cover
- Camshafts
- Camshaft holder.

Pull hydraulic valve lifter off the cylinder head.

**NOTE:** When disassembling the hydraulic valve lifter, it is strongly recommended to note their original position.



1. Hydraulic valve lifter

Hydraulic Valve Lifter Inspection

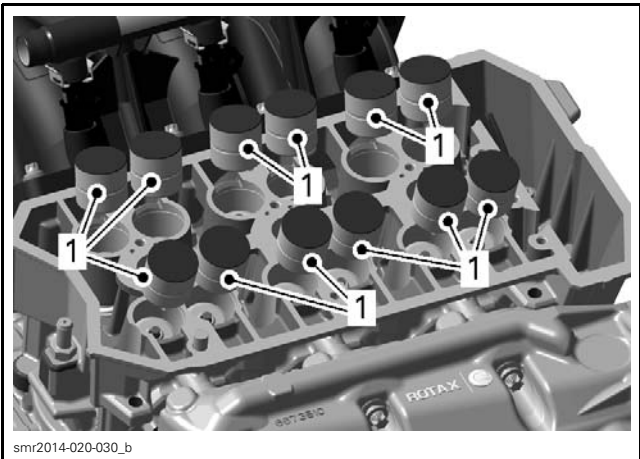
- 1. Check surface of hydraulic valve lifter for scoring or other damage.
- 2. Measure valve lifter diameter. Replace if out of specification.

| HYDRAULIC VALVE LIFTER                  |                                                    |
|-----------------------------------------|----------------------------------------------------|
| NEW                                     | 28.354 mm to 28.370 mm<br>(1.1163 in to 1.1169 in) |
| SERVICE LIMIT                           | 28.34 mm (1.1157 in)                               |
| HYDRAULIC VALVE LIFTER RADIAL CLEARANCE |                                                    |
| SERVICE LIMIT                           | 0.100 mm (.0039 in)                                |

Hydraulic Valve Lifter Installation

For installation reverse the removal procedure. However pay attention to the following details.

- 1. Apply engine oil on the outside diameter of the hydraulic valve lifter.



1. Apply engine oil on outer diameter

CYLINDER HEAD

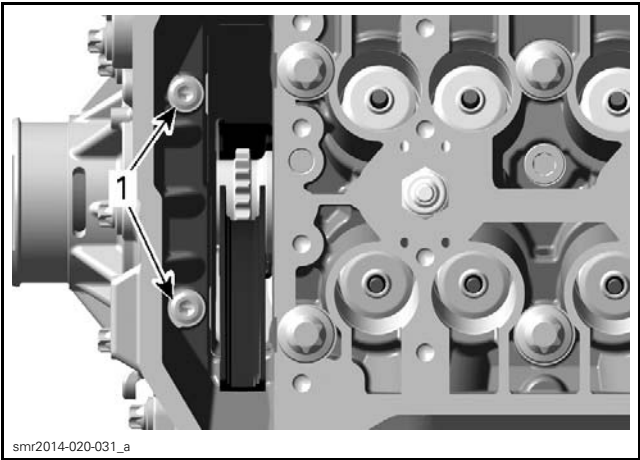
Cylinder Head Access

Remove central body. Refer to *BODY*.  
Remove exhaust manifold. Refer to *EXHAUST*.  
Remove intake manifold. Refer to *AIR INTAKE SYSTEM*.

Cylinder Head Removal

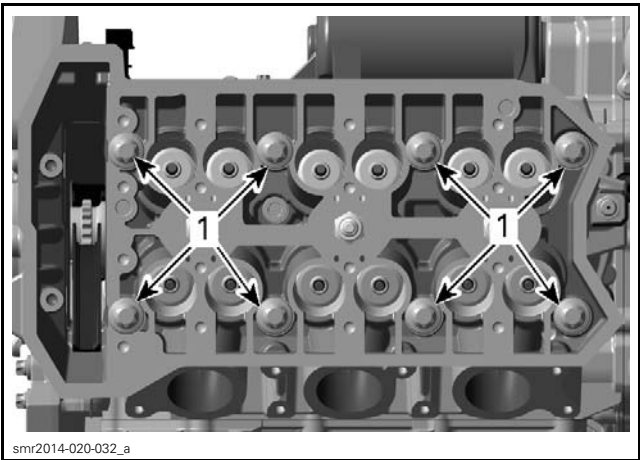
- See procedures in this subsection to remove:
- Valve cover
  - Camshafts
  - Camshaft holder
  - Hydraulic valve lifters.

Remove M6 cylinder head screws.



1. Remove M6 cylinder head screws

Remove and discard M9 cylinder head screws.



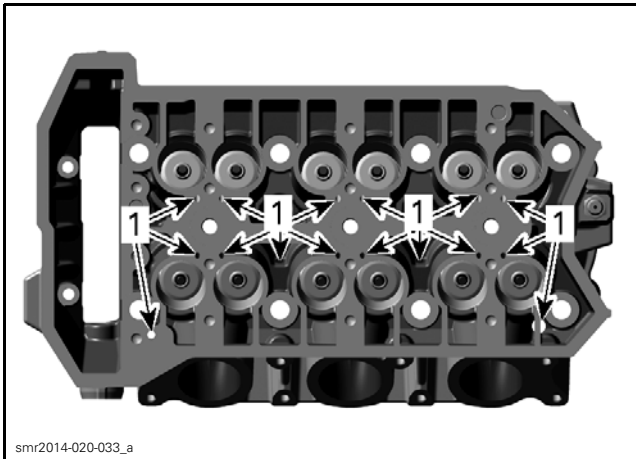
1. Remove M9 cylinder head screws

Pull cylinder head off the cylinder block.  
Remove and discard cylinder head gasket.



## Cylinder Head Cleaning

1. Remove carbon deposits from combustion chambers, exhaust ports and piston tops.
2. Clean cylinder head, especially cylinder head screw surface from oil spillage.
3. Blow out the oil orifices with pressurized air and make sure they are not clogged.



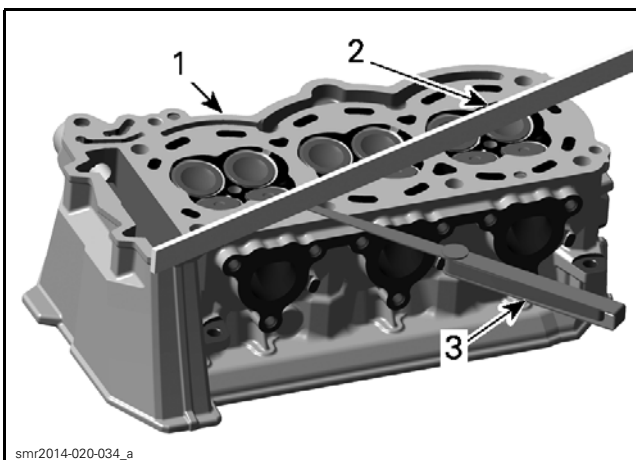
1. Oil orifices

## Cylinder Head Inspection

Check for cracks between valve seats or other damage, if so, replace cylinder head.

Check cylinder head mating surface for flatness using a straight edge.

Check hydraulic valve lifter bores for scoring or other damage, if so, replace cylinder head.



1. Cylinder head  
2. Straight edge  
3. Feeler gauge

Check cylinder head warpage.

| CYLINDER HEAD WARPAGE |                    |
|-----------------------|--------------------|
| SERVICE LIMIT         | 0.15 mm (.0059 in) |

If warpage exceeds specification, resurface the cylinder head as follows.

Use a 400 - 600 grit wet sandpaper on a surface plate and gently grind off the mating surface.

**NOTE:** To ensure an even surface, rotate cylinder head several times during resurfacing.

Replace cylinder head, if resurfacing fails.

## Cylinder Head Installation

For installation, reverse the removal procedure. However, pay attention to the following details.

1. Install a **NEW** cylinder head gasket.

**NOTICE** Each installation of the cylinder head requires a **NEW** cylinder head gasket. Using a gasket twice would cause engine damage.

2. Install cylinder head on the cylinder block.

3. Install **NEW** M9 cylinder head screws.

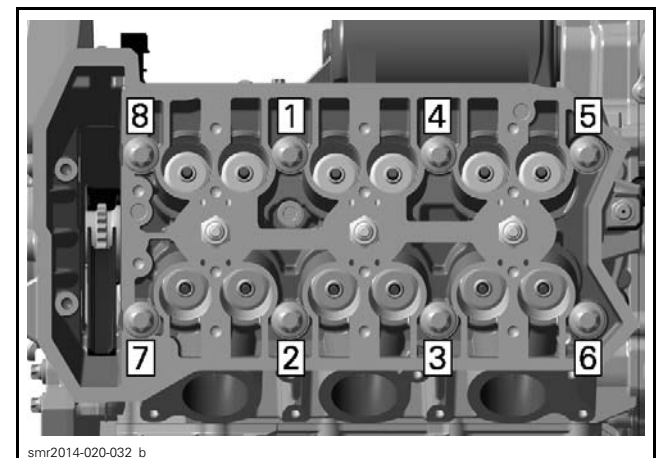
**NOTICE** This assembly uses stretch screws. Always use **NEW** screws and strictly adhere to the tightening procedure.

4. Tighten cylinder head screws as follows:

**NOTE:** Always perform step 1 on all M9 cylinder head screws before going to the next step.

### CYLINDER HEAD M9 SCREWS TIGHTENING PROCEDURE

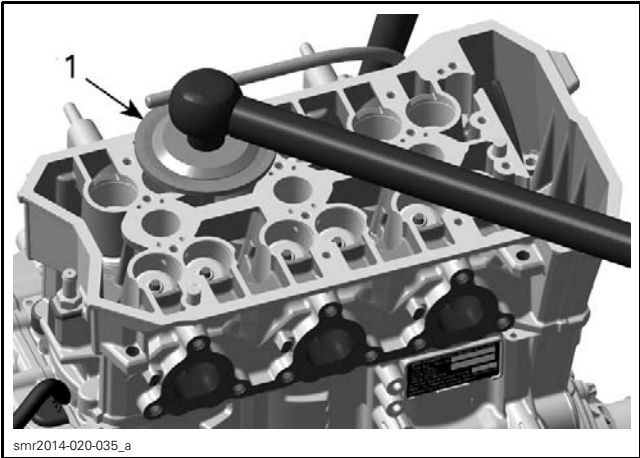
|        |                                          |
|--------|------------------------------------------|
| STEP A | 20 N•m ± 2 N•m<br>(15 lbf•ft ± 1 lbf•ft) |
| STEP B | <u>Additional 150° ± 5°</u>              |



M9 SCREWS TIGHTENING SEQUENCE

**NOTE:** Use a torque angle gauge to carry out the second step.

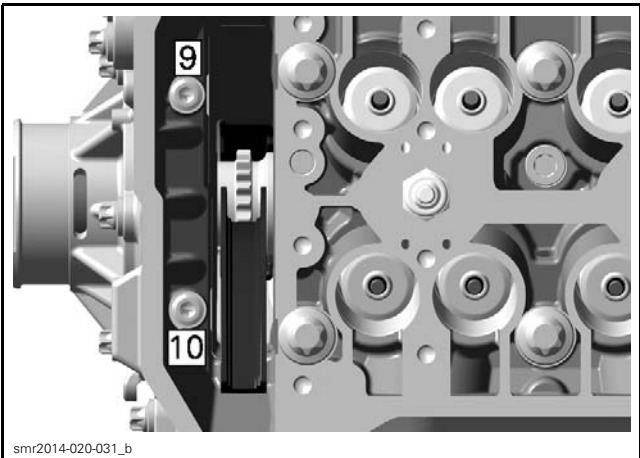




1. Torque angle gauge

5. Install M6 screws. Tighten as follows.

| M6 CYLINDER HEAD SCREWS |                                         |
|-------------------------|-----------------------------------------|
| Tightening torque       | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |



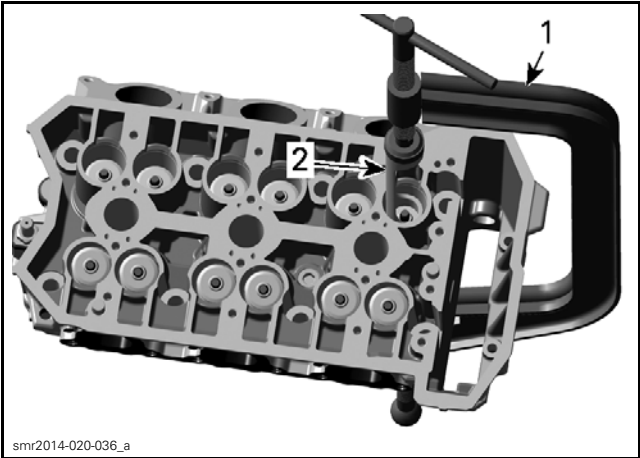
M6 SCREWS TIGHTENING SEQUENCE

## VALVE SPRINGS

### Valve Spring Removal

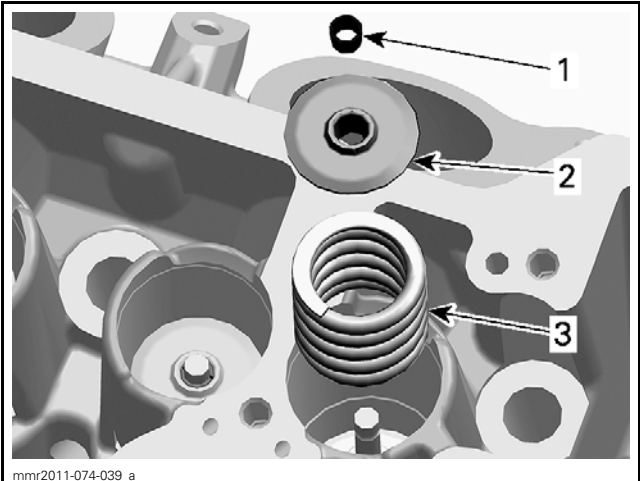
1. Remove *CYLINDER HEAD*, see procedure in this subsection.
2. Compress valve spring.

| REQUIRED TOOLS                                   |                                                                                     |
|--------------------------------------------------|-------------------------------------------------------------------------------------|
| VALVE SPRING COMPRESSOR<br>(P/N 529 035 724)     |  |
| VALVE SPRING COMPRESSOR<br>CUP (P/N 529 036 209) |  |



1. Valve spring compressor clamp  
2. Valve spring compressor cup

3. Remove valve cotters.
4. Withdraw valve spring compressor tools.
5. Remove valve spring retainer and valve spring.

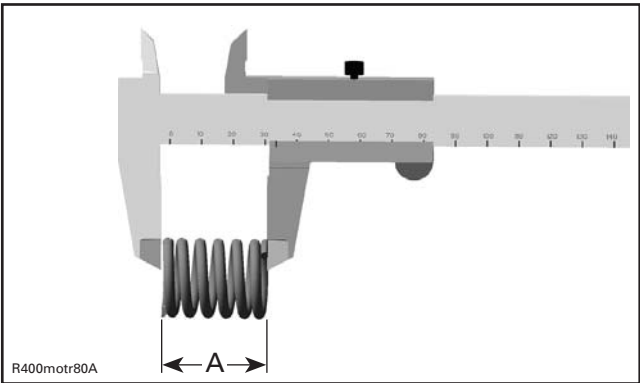


1. Valve cotters  
2. Valve spring retainer  
3. Valve spring

**NOTE:** Identify the position of each part very carefully, so it can be reinstalled in its original place.

### Valve Spring Inspection

1. Check valve spring for rust, corrosion or other visible damage.
2. Check valve spring free length and straightness.



A. Spring free length

| VALVE SPRING FREE LENGTH |                      |
|--------------------------|----------------------|
| NEW                      | 31.35 mm (1.2343 in) |
| SERVICE LIMIT            | 29.5 mm (1.1614 in)  |

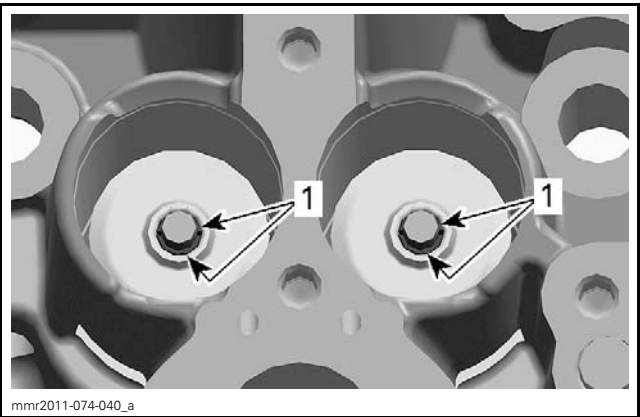
Replace valve spring, if out of specification.

### Valve Spring Installation

For installation, reverse the removal procedure. Pay attention to the following details.

**NOTE:** Ensure to reinstall all parts in their original position as marked during removal.

1. Apply some grease on valve cotters, so that they remain in place while releasing the valve spring.
2. Make sure valve cotters are properly engaged into valve stem groove.



1. Valve cotters

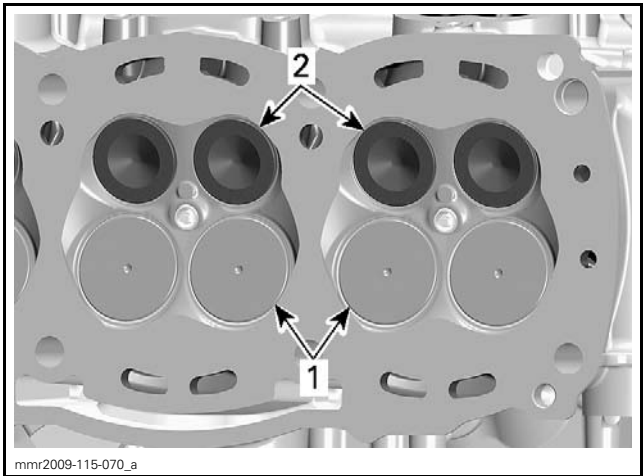
3. After spring is installed, ensure it is properly locked by lightly tapping on valve stem end with a soft punch and a hammer so that valve opens and closes a few times.

**NOTICE** Improperly locked valve spring will cause severe engine damage and hitting the valve stem end with excessive force could damage the valve.

## VALVES

### Valve Removal

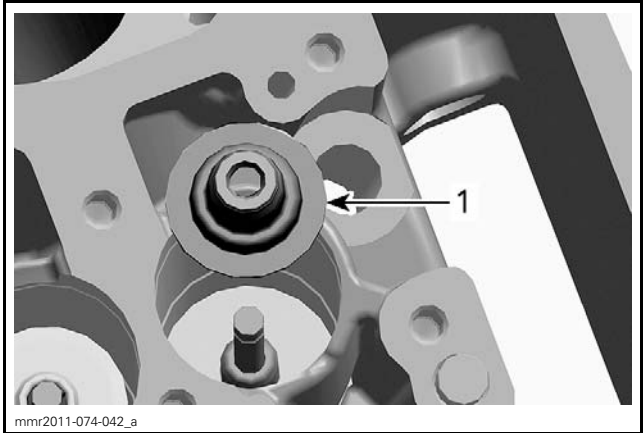
1. Remove *VALVE SPRING*, see procedure in this subsection.
2. Push on the valve stem, then pull valves out of cylinder head.



1. Intake valves 29 mm
2. Exhaust valves 25 mm

3. Remove and discard valve stem seal with special pliers.

| REQUIRED TOOL                                |  |
|----------------------------------------------|--|
| SNAP-ON VALVE STEM SEAL PLIERS (P/N YA 8230) |  |



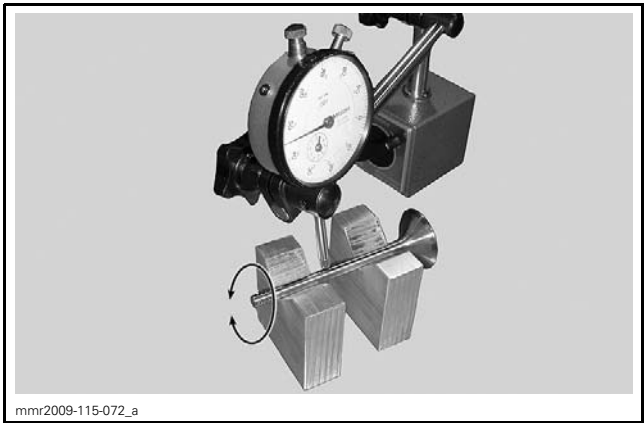
1. Valve stem seal

**NOTE:** Identify the position of each part very carefully, so it can be reinstalled in its original place.

### Valve Inspection

Inspect valve surface, check for abnormal stem wear and bending.

Subsection XX (CYLINDER HEAD)

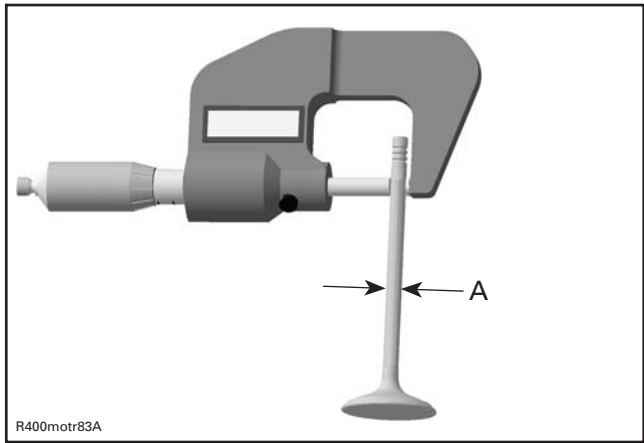


| VALVE OUT OF ROUND<br>INTAKE AND EXHAUST VALVE |                     |
|------------------------------------------------|---------------------|
| NEW                                            | 0.005 mm (.0002 in) |
| SERVICE LIMIT                                  | 0.06 mm (.0024 in)  |

Replace valve if out of specification.

Valve Stem and Valve Guide Clearance

1. Measure valve stem at three places, using a micrometer.



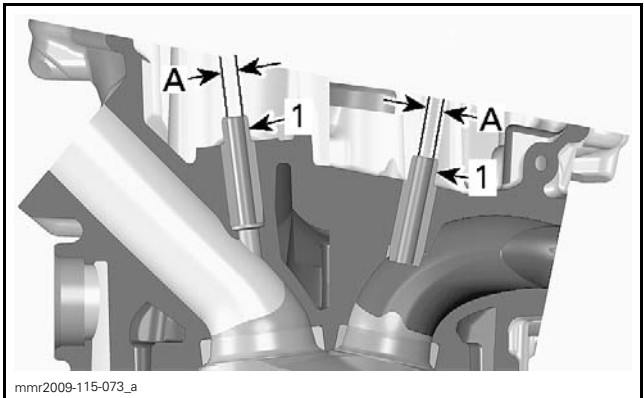
A. Valves stem diameter

| VALVE STEM DIAMETER |                                                |
|---------------------|------------------------------------------------|
| INTAKE VALVE        |                                                |
| NEW                 | 4.958 mm to 4.972 mm<br>(.1952 in to .1957 in) |
| SERVICE LIMIT       | 4.94 mm (.1945 in)                             |
| EXHAUST VALVE       |                                                |
| NEW                 | 4.956 mm to 4.970 mm<br>(.1951 in to .1957 in) |
| SERVICE LIMIT       | 4.94 mm (.1945 in)                             |

Replace valve if stem is out of specification or if its surface is damaged or worn.

2. Measure valve guide inner diameter, using a small bore gauge.

**NOTE:** Clean valve guide from carbon deposits before measuring.



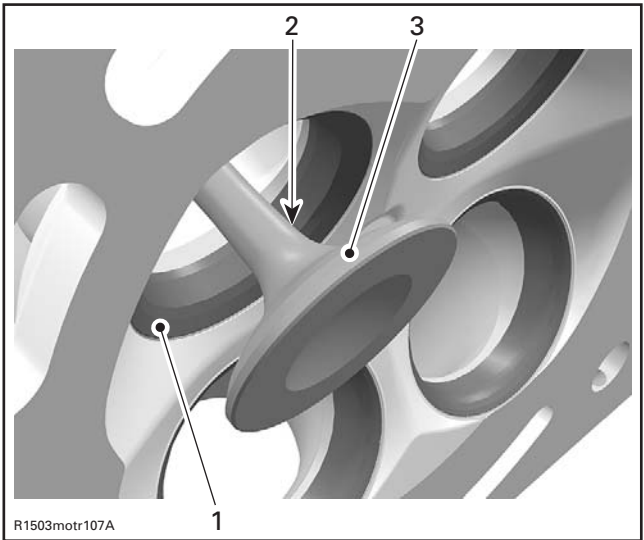
1. Valve guides

A. Valve guide inner diameter

| VALVE GUIDE INNER DIAMETER |                                                |
|----------------------------|------------------------------------------------|
| NEW                        | 5.000 mm to 5.012 mm<br>(.1969 in to .1973 in) |
| SERVICE LIMIT              | 5.05 mm (.1988 in)                             |

Replace cylinder head, if valve guide is out of specification.

Valve Face and Seat



TYPICAL

1. Valve seat  
2. Exhaust valve contaminated area  
3. Valve face (contact surface to valve seat)

1. Check valve face and seat for burning, pitting and other signs of damage.

2. Check if valve seats properly in cylinder head. Proceed as follows.

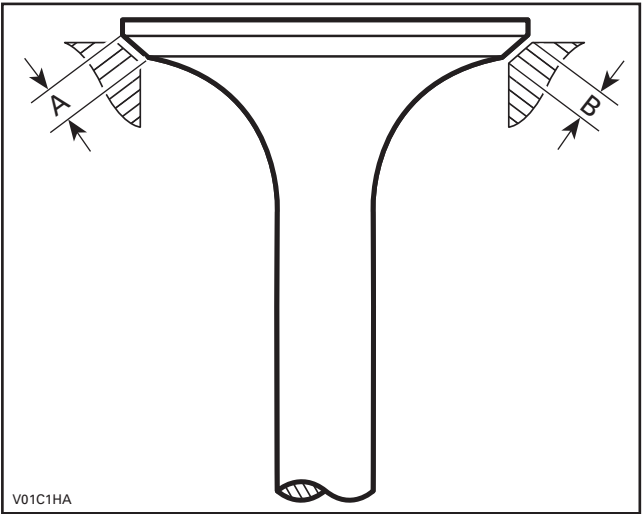
2.1 Apply some lapping compound on valve face and work valve on its seat with a lapping tool.

| REQUIRED TOOL                  |
|--------------------------------|
| SNAP-ON VALVE HOLDER (P/N VL2) |

**NOTE:** The location of contact area should be in center of valve face.

2.2 Repeat procedure until valve seat and valve face fit together.

3. Measure valve seat contact width, using a caliper.



A. Valve face contact width  
B. Valve seat contact width

| VALVE SEAT CONTACT WIDTH (B) |                                            |
|------------------------------|--------------------------------------------|
| INTAKE VALVE                 |                                            |
| NEW                          | 1.05 mm to 1.35 mm<br>(.041 in to .053 in) |
| SERVICE LIMIT                | 1.7 mm (.067 in)                           |
| EXHAUST VALVE                |                                            |
| NEW                          | 1.25 mm to 1.45 mm<br>(.049 in to .057 in) |
| SERVICE LIMIT                | 1.8 mm (.0709 in)                          |

Replace parts if out of specification.

### Valve Installation

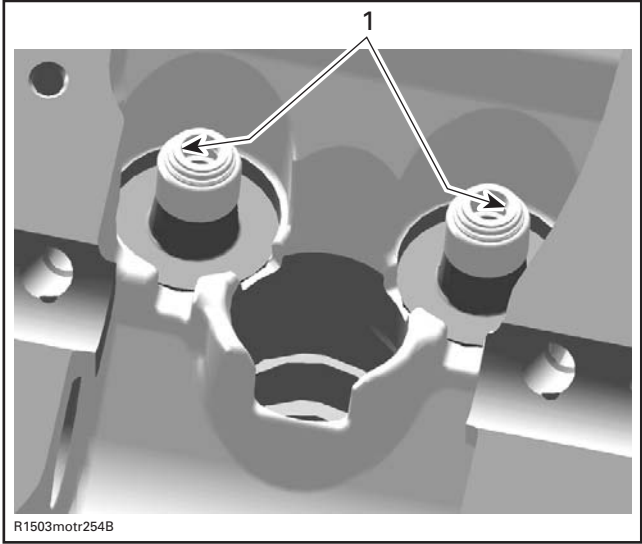
For installation reverse the removal procedure. Pay attention to the following details.

**NOTE:** Ensure to reinstall all parts in their original position as marked during removal.

1. Install a **NEW** valve stem seal whenever valve is removed.

2. Apply engine oil on valve stem and carefully slide through cylinder head and valve stem seal.

**NOTICE** Be careful when passing the valve stem through the sealing lip of the seal.



#### TYPICAL

1. Sealing lips of valve stem seal

3. Install **VALVE SPRING**. See procedure in this subsection.

4. Install all other removed parts.

# CYLINDER BLOCK

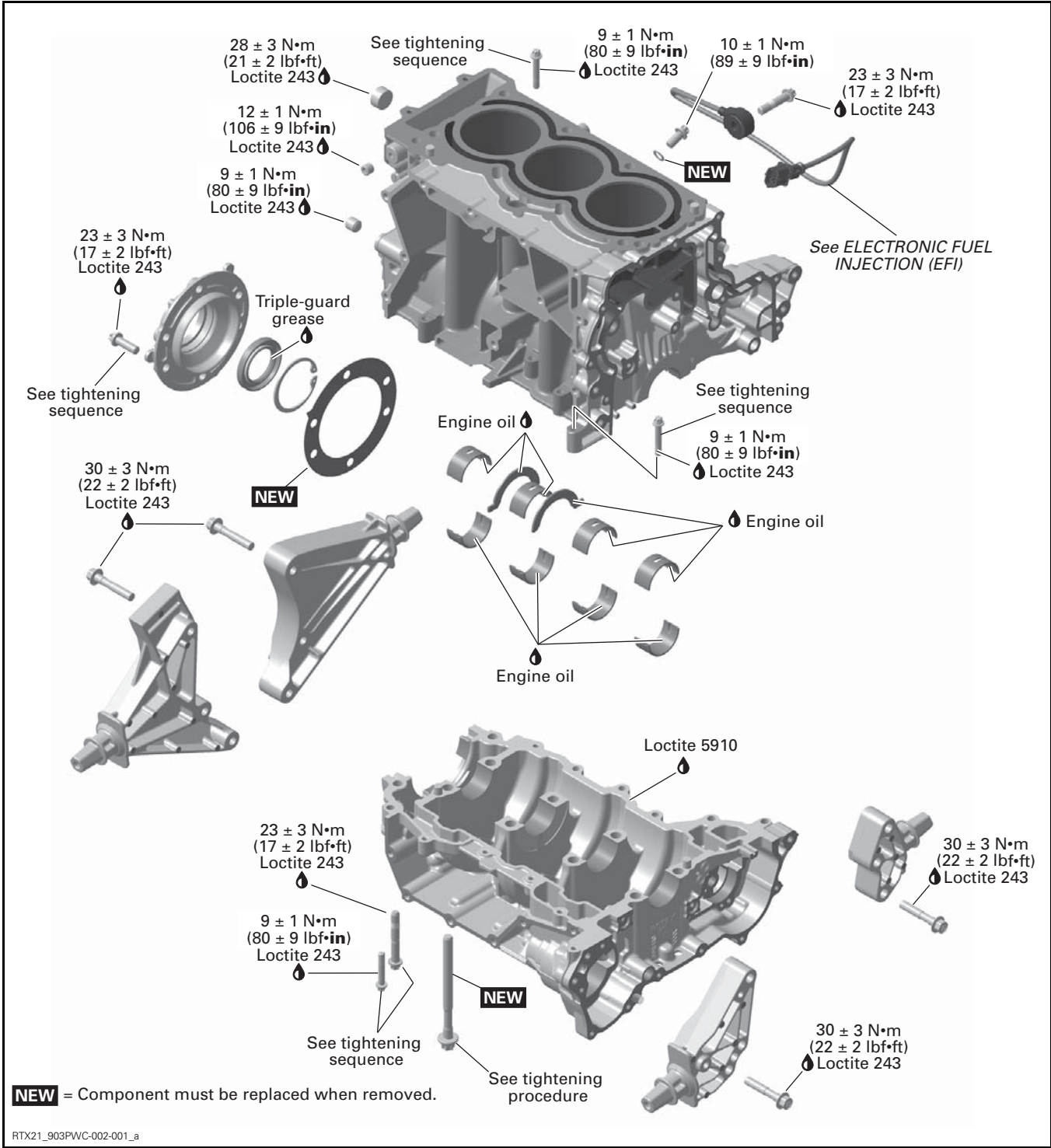
## SERVICE TOOLS

| Description                   | Part Number       | Page  |
|-------------------------------|-------------------|-------|
| CRANKSHAFT LOCKING TOOL ..... | 529 036 407 ..... | 14    |
| OIL SEAL INSTALLER .....      | 529 036 277 ..... | 5     |
| PISTON CIRCLP INSTALLER.....  | 529 036 207 ..... | 20    |
| PISTON RING COMPRESSOR .....  | 529 036 208 ..... | 21    |
| PTO SHAFT ADAPTER .....       | 529 036 401 ..... | 6, 14 |

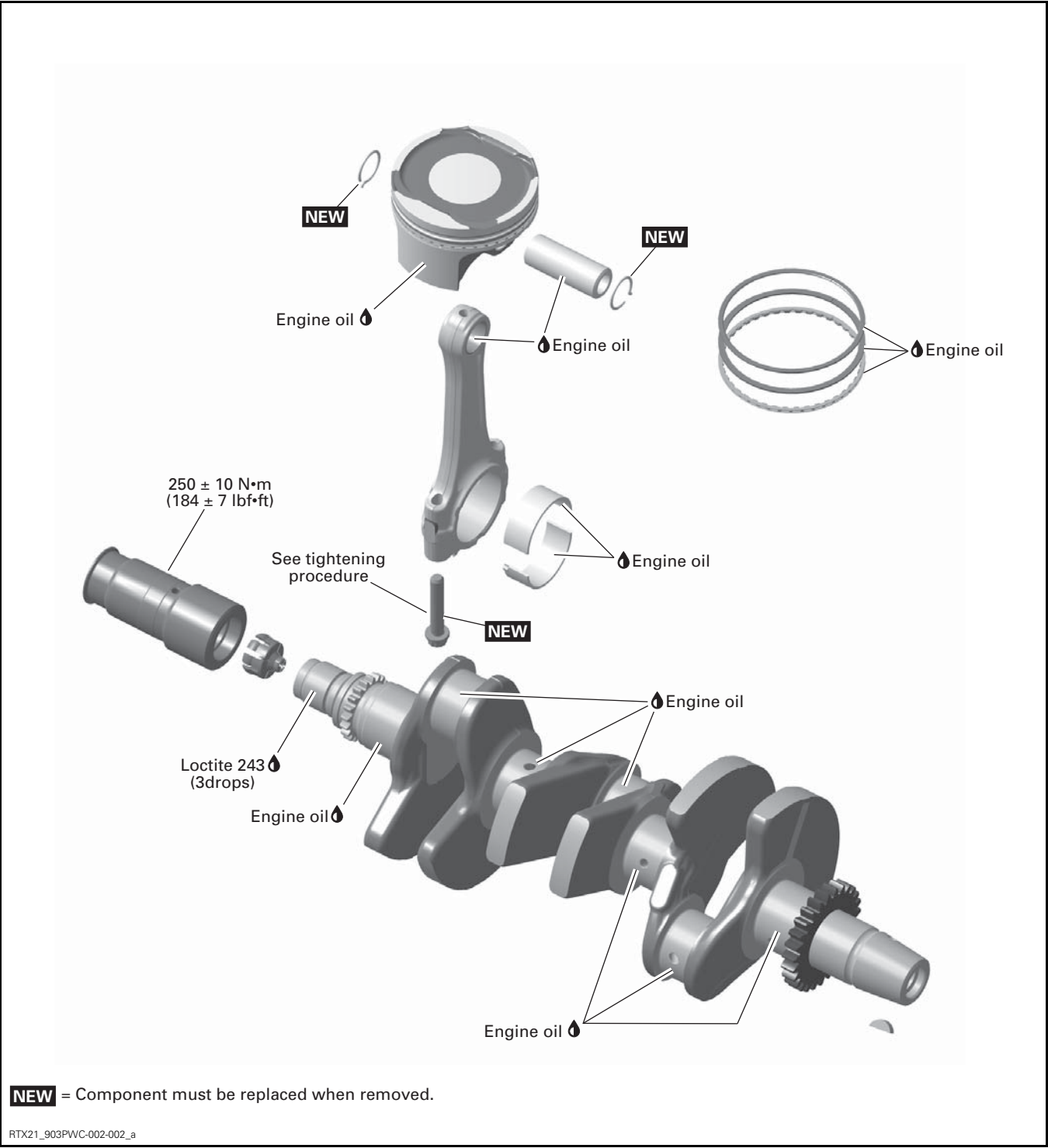
## SERVICE PRODUCTS

| Description                                   | Part Number       | Page |
|-----------------------------------------------|-------------------|------|
| CLUTCH AND PULLEY FLANGE CLEANER PRO S1 ..... | 779244 .....      | 6    |
| LOCTITE 243 (BLUE).....                       | 293 800 060 ..... | 5, 7 |
| LOCTITE 5910 .....                            | 293 800 081 ..... | 11   |
| LOCTITE CHISEL (GASKET REMOVER) .....         | 413 708 500 ..... | 10   |
| TRIPLE-GUARD GREASE .....                     | 508298 .....      | 5    |

Subsection XX (CYLINDER BLOCK)







### GENERAL

When disassembling parts that are duplicated in the engine, (e.g.: pistons, connecting rods etc.), it is strongly recommended to note their position and to keep the parts of the same assembly as a "group". If you find a defective component, it would be much easier to find the cause of the failure. Since parts were broken-in during engine operation, they will maintain their matched fit when reassembled together within their "group".

### TROUBLESHOOTING

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

#### UNUSUAL ENGINE NOISE OR VIBRATIONS

1. Heavy wear on plain bearings.
  - Check radial play of plain bearings. Replace if out of specification.
2. Crankshaft axial play out of specification.
  - Measure crankshaft axial play. If crankshaft axial play is out of specification, replace thrust washers.
3. Connecting rod axial play out of specification.
  - Measure connecting rod axial play on crankshaft. Replace connecting rod or crankshaft if out of specification.
4. Connecting rod screws got loose.
  - Replace damaged components and retighten screws with the recommended torque.

#### BLUE SMOKE IN THE EXHAUST

1. Oil scraper rings worn out.
  - Replace piston rings.

#### ENGINE SUDDENLY TURNS OFF (POOR IDLING)

1. Piston rings worn out.
  - Replace piston rings.
2. Piston/cylinder clearance out of specification.
  - Check piston/cylinder clearance. Replace if out of specification.
3. Melted or broken piston.
  - Replace piston and cylinder block if necessary.

### PROCEDURES

#### PTO COVER AND PTO OIL SEAL

##### PTO Cover Access

**NOTE:** To replace the PTO oil seal, it is not necessary to remove engine from the vehicle.

Remove central body. Refer to *BODY*.

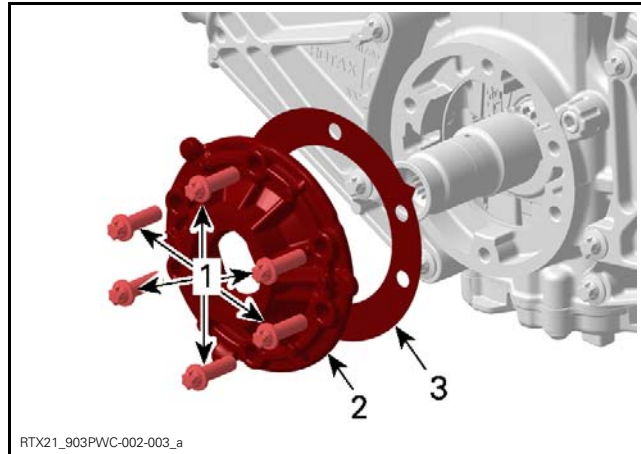
Remove drive shaft. Refer to *DRIVE SHAFT*.

##### Removing the PTO Cover

Place rags under PTO cover to catch up spilled engine oil.

Remove screws retaining the PTO cover.

Remove PTO cover and discard gasket.

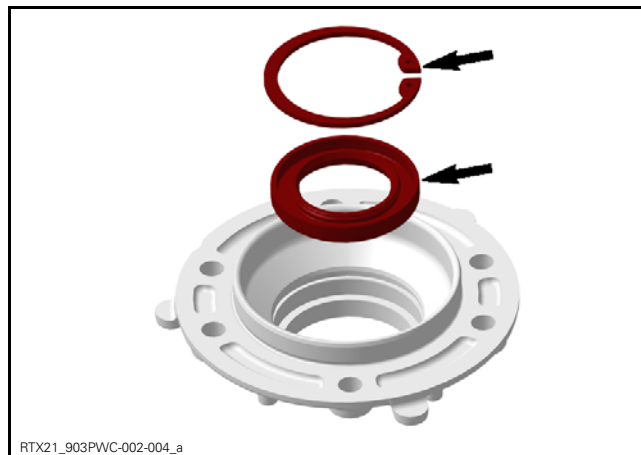


1. PTO cover screws
2. PTO cover
3. Gasket

##### PTO Oil Seal Replacement

##### PTO Oil Seal Removal

1. Use pliers to remove retaining ring.
2. Pry out oil seal and discard it.





Installing the PTO Oil Seal

**NOTE:** Check the oil seal running surface of crankshaft for grooves and deposits, before installation of NEW oil seal.

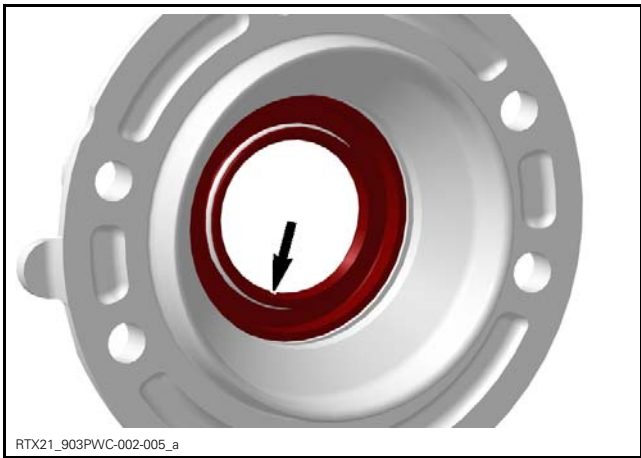
- 1. Clean crankshaft PTO side from deposits.
- 2. Clean oil seal area in PTO cover.
- 3. Apply engine oil on oil seal seat in PTO cover.
- 4. Press **NEW** oil seal in PTO cover.

| REQUIRED TOOL                        |                                                                                   |
|--------------------------------------|-----------------------------------------------------------------------------------|
| OIL SEAL INSTALLER (P/N 529 036 277) |  |

**NOTICE** Oil seal must be installed with sealing lip towards the engine.

- 5. Lubricate sealing lip of oil seal.

| SERVICE PRODUCT                  |
|----------------------------------|
| TRIPLE-GUARD GREASE (P/N 508298) |

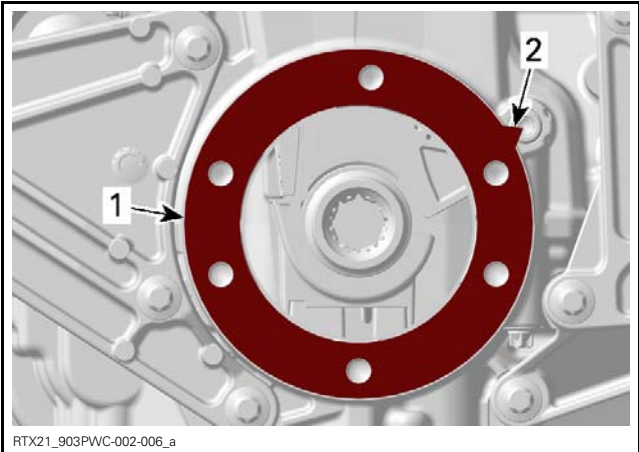


- 6. Install retaining ring.

Installing the PTO Cover

For installation, reverse the removal procedure. Pay attention to following details.

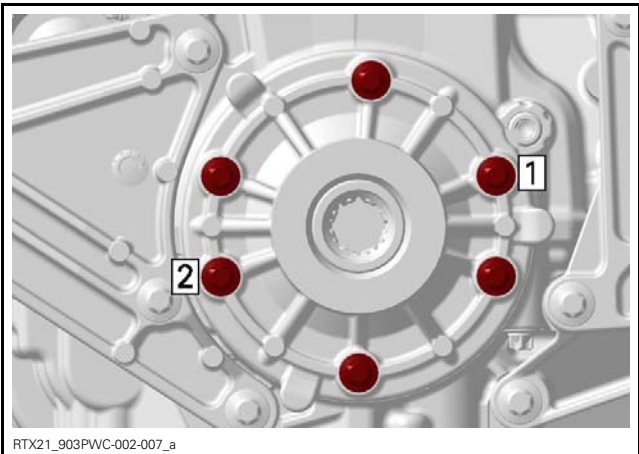
Install a **NEW** PTO cover gasket in proper position.



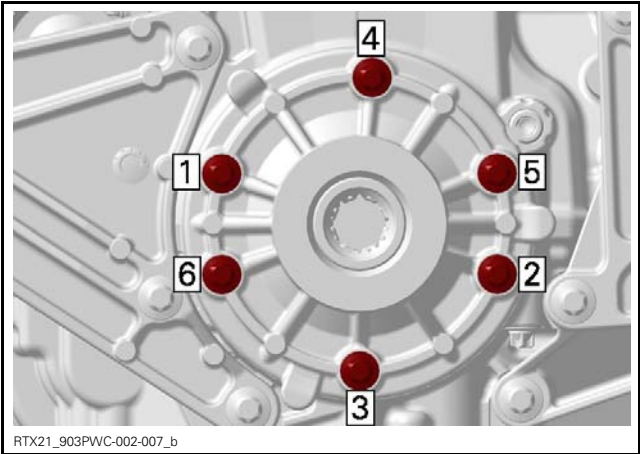
- 1. Gasket
- 2. Tab

Tighten PTO cover screws as per following sequence.

| TIGHTENING TORQUE |        |                                                                                           |
|-------------------|--------|-------------------------------------------------------------------------------------------|
| PTO cover screws  | STEP A | 5 N•m ± 0.6 N•m<br>(44 lbf•in ± 5 lbf•in)<br>+<br>LOCTITE 243 (BLUE)<br>(P/N 293 800 060) |
|                   | STEP B | 23 N•m ± 3 N•m<br>(17 lbf•ft ± 2 lbf•ft)                                                  |



STEP A



STEP B

PTO SLEEVE

Replacing the PTO Sleeve

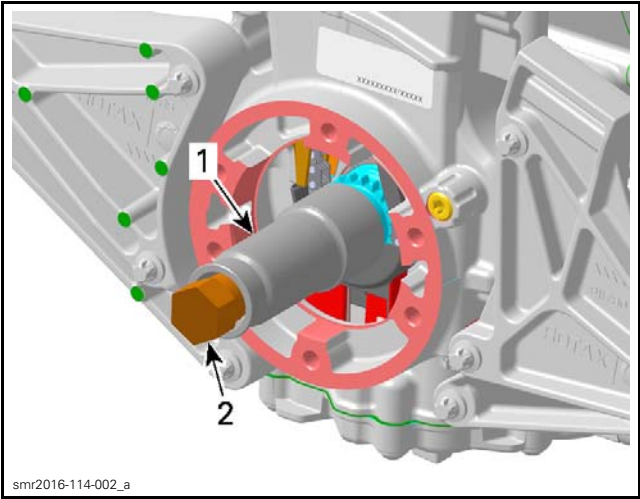
- 1. Remove:
  - Jet pump housing, refer to *JET PUMP* subsection
  - Drive shaft, refer to *DRIVE SHAFT* subsection
  - Muffler, refer to *EXHAUST SYSTEM* subsection.
- 2. Lock crankshaft, refer to *CRANKSHAFT* in this subsection.
- 3. Remove PTO cover, refer to *PTO COVER AND PTO OIL SEAL* in this subsection.
- 4. Unscrew PTO sleeve.

**NOTE:** If splines are damaged, strike the adapter to insert it in the PTO sleeve.

**CAUTION** PTO sleeve can loosen abruptly.

| REQUIRED TOOL                          |                                                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------|
| PTO SHAFT ADAPTER<br>(P/N 529 036 401) |  |

**NOTICE** This service tool is specially designed for this application. Other tools can break during the removal or the installation of the PTO sleeve.



- 1. PTO sleeve
- 2. PTO adapter

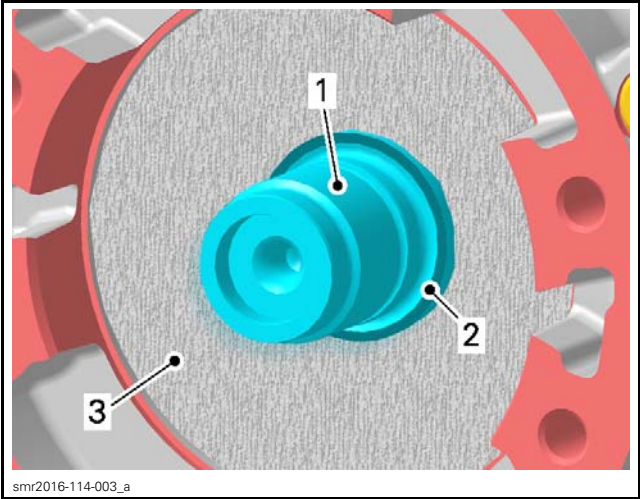
- 5. Clean crankshaft PTO thread and sleeve mating surface.

**NOTE:** Place clean rags inside crankcase to avoid debris in engine.

If necessary use a small screw driver or small brush to remove thread locker residues.

Clean crankshaft using a part cleaner and compressed air.

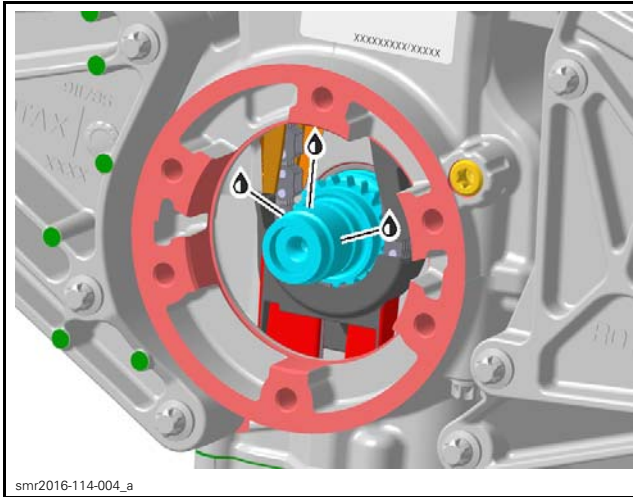
| SERVICE PRODUCT                                         |
|---------------------------------------------------------|
| CLUTCH AND PULLEY FLANGE CLEANER<br>PRO S1 (P/N 779244) |



- CLEAN**
- 1. Thread
  - 2. Sleeve mating surface
  - 3. Rags

- 6. Remove rags.
- 7. Apply threadlocker on crankshaft PTO thread as specified.

| CRANKSHAFT PTO THREAD |                                         |
|-----------------------|-----------------------------------------|
| Service product       | LOCTITE 243 (BLUE)<br>(P/N 293 800 060) |
| Quantity              | 3 drops                                 |



APPLY 3 DROPS OF THREAD LOCKER

8. Tighten new PTO sleeve to specification.

| TIGHTENING TORQUE |                                             |
|-------------------|---------------------------------------------|
| PTO sleeve        | 250 N•m ± 10 N•m<br>(184 lbf•ft ± 7 lbf•ft) |

9. Remove crankshaft locking bolt.
10. Replace PTO oil seal, refer to *PTO COVER AND PTO OIL SEAL* in this subsection.
11. Install PTO cover, refer to *PTO COVER AND PTO OIL SEAL* in this subsection.
12. Check engine oil level, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

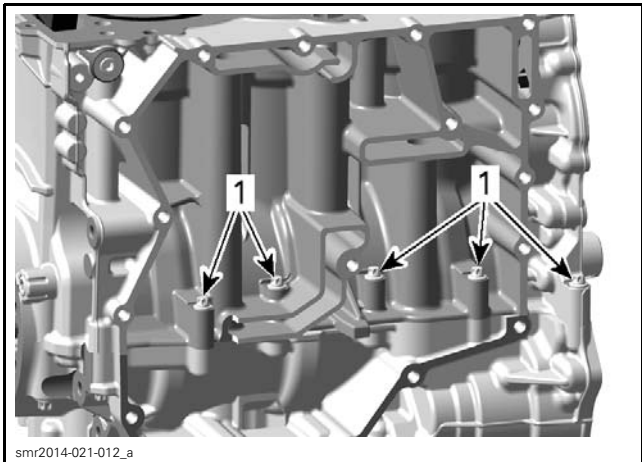
## CYLINDER BLOCK

### Disassembling the Cylinder Block

1. Remove engine from the vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
2. Refer to *PERIODIC MAINTENANCE PROCEDURES* and drain engine oil.
3. Refer to *CYLINDER HEAD* subsection and remove:
  - Ignition coils
  - Valve cover
  - Spark plugs.
4. Lock crankshaft, refer to *CRANKSHAFT LOCKING PROCEDURE* in this subsection.

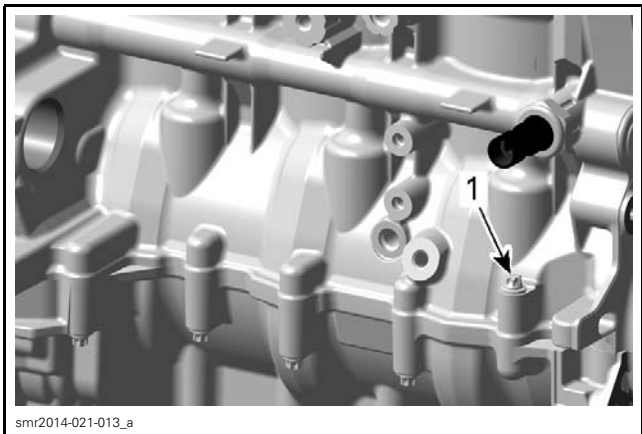
5. Remove air intake manifold. Refer to *AIR INTAKE SYSTEM* subsection.
  6. Refer to *COOLING SYSTEM* subsection and remove:
    - Water pump housing
    - Thermostat
    - Water pump drive gear.
  7. Refer to *LUBRICATION SYSTEM* subsection and remove:
    - Oil tank
    - Oil cooler
    - Oil pressure regulator
    - Oil pump drive gears and oil pumps
    - Oil sump cover
    - Oil strainers.
  8. Refer to *MAGNETO AND STARTER* subsection and remove:
    - Magneto cover
    - Rotor
    - Starter drive gears
    - Electric starter.
  9. Remove engine mount brackets.
  10. Refer to *TIMING CHAIN* subsection and remove:
    - Timing chain tensioner
    - Timing chain guides.
  11. Refer to *CYLINDER HEAD* subsection and remove:
    - Camshaft holders
    - Cylinder head.
  12. Remove PTO cover. Refer to *PTO COVER AND PTO OIL SEAL* in this subsection.
- NOTE:** Before splitting the cylinder block, measure crankshaft axial play. Refer to *CRANKSHAFT* in this subsection.
13. Remove crankshaft locking tool.
  14. Remove cylinder block screws.
    - 14.1 Start removing the M6 screws.
    - 14.2 Then remove the M8 screws.
    - 14.3 Finally remove and discard the M9 screws.

Subsection XX (CYLINDER BLOCK)



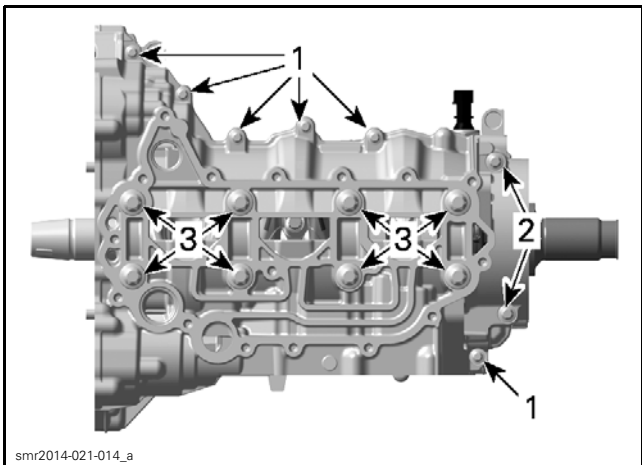
INTAKE SIDE

1. Cylinder block screws (M6) screwed from top to bottom



EXHAUST SIDE

1. Cylinder block screw (M6) screwed from top to bottom

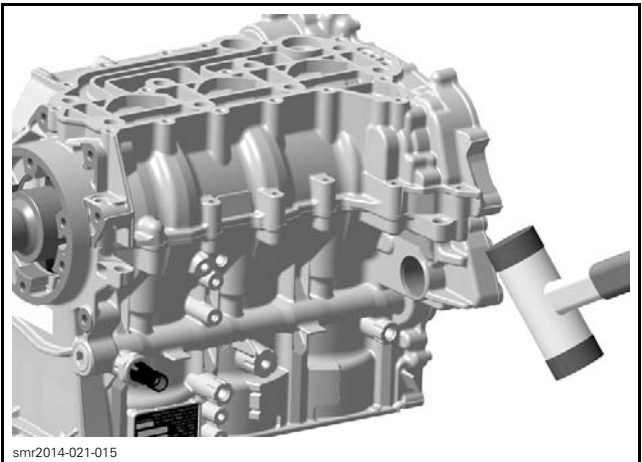


BOTTOM SIDE

- 1. M6 screws
- 2. M8 screws
- 3. M9 screws (discard)

15. Carefully remove cylinder block lower half by using a soft hammer.

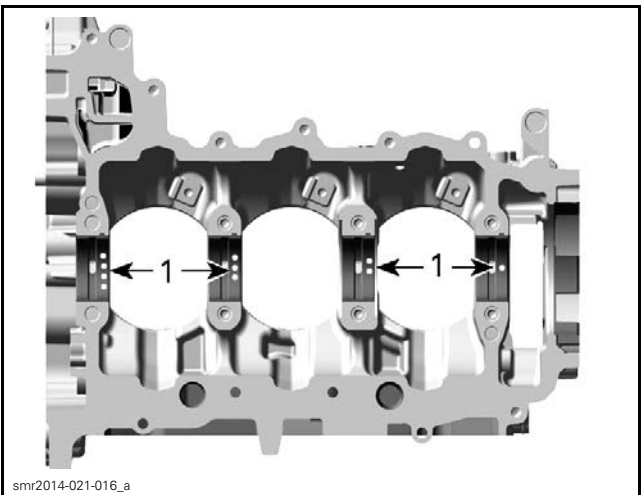
**NOTE:** Take care not to damage the sealing surfaces of the cylinder block halves.



- 16. Remove connecting rod caps. Refer to *PISTONS AND CONNECTING RODS* in this subsection.
- 17. Refer to *CRANKSHAFT* in this subsection and remove:
  - Crankshaft thrust washers
  - Crankshaft.
- 18. Remove pistons and connecting rods. See procedure in this subsection.

Removing the Plain Bearing

When the plain bearings need to be removed from the cylinder block, mark them to identify the correct position at installation. See the illustration as an example.

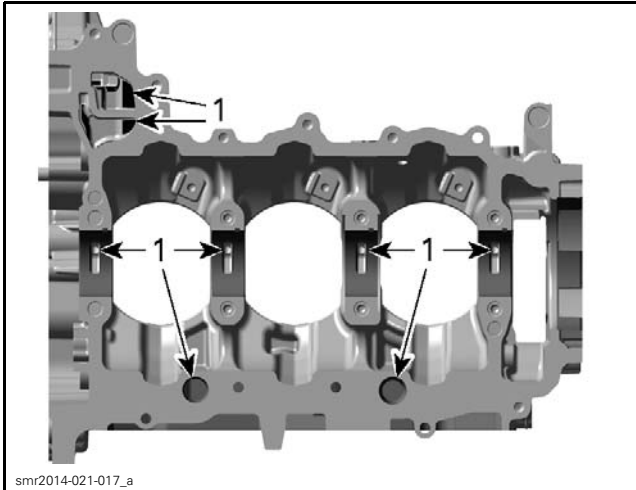


1. Mark on crankshaft plain bearings

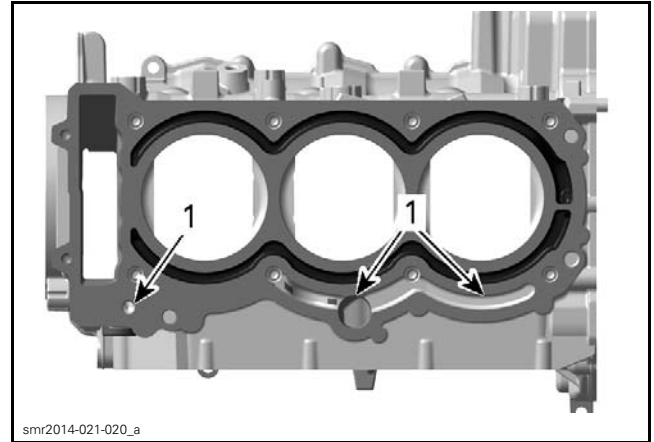
Cleaning the Cylinder Block

Clean cylinder block using a part cleaner, then use compressed air to dry it.

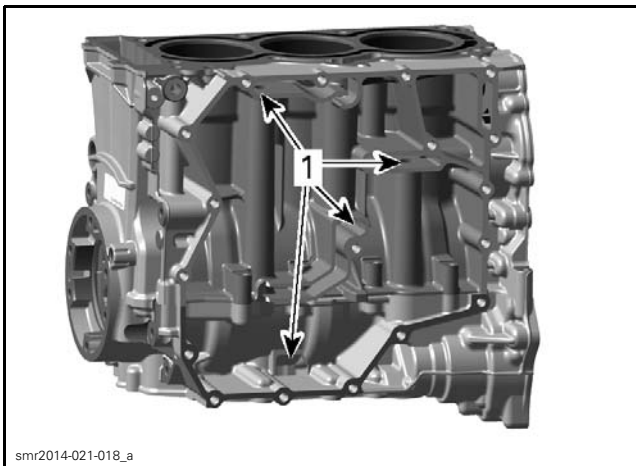
Blow out the oil orifices using compressed air and make sure they are not clogged.



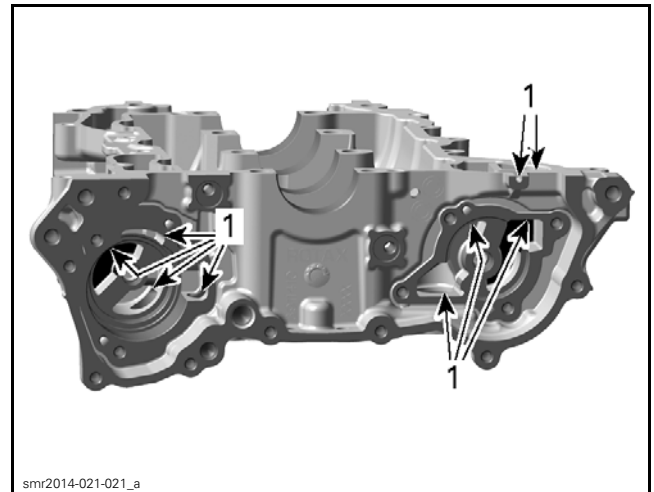
**CYLINDER BLOCK UPPER HALF**  
1. Oil orifices



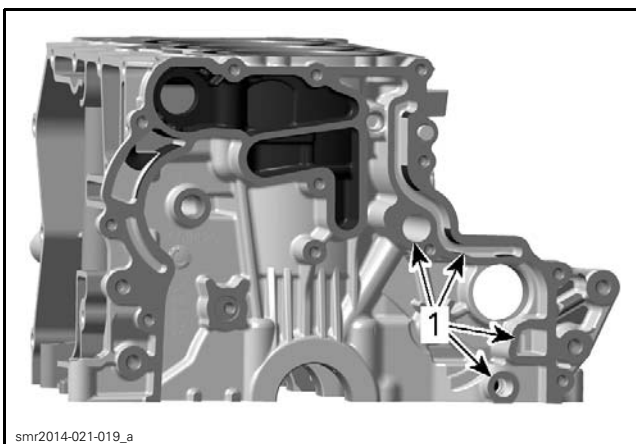
**CYLINDER BLOCK - TOP**  
1. Oil orifices



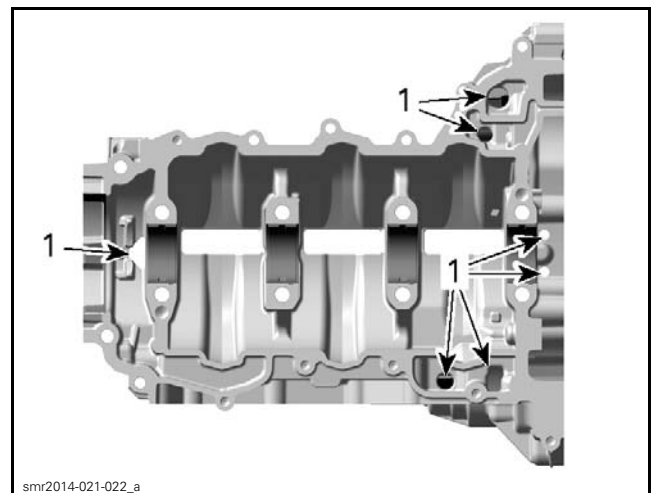
**CYLINDER BLOCK - REAR**  
1. Oil orifices



**CYLINDER BLOCK LOWER HALF**  
1. Oil orifices



**CYLINDER BLOCK - MAG SIDE**  
1. Oil orifices



**CYLINDER BLOCK LOWER HALF**  
1. Oil orifices

Clean all metal components in a solvent.

Clean cylinder block mating surfaces using gasket remover and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass (cross hatch).



Subsection XX (CYLINDER BLOCK)

|                                                      |
|------------------------------------------------------|
| SERVICE PRODUCT                                      |
| LOCTITE CHISEL (GASKET REMOVER)<br>(P/N 413 708 500) |

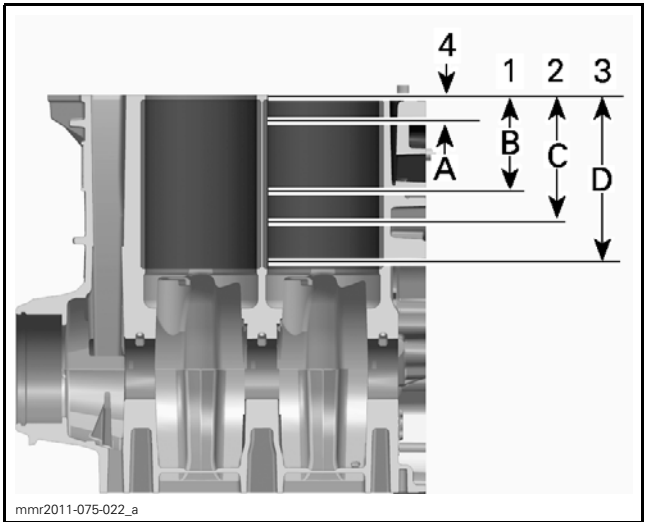
**NOTE:** Do not wipe with rags. Use a new clean hand towel only.

Inspecting the Cylinder Block

Check cylinder block for cracks or other damage.  
Check cylinder block mating surfaces for flatness using a straight edge.  
Replace cylinder block if necessary.  
Check cylinder bores for cracks, scoring and wear ridges on top and bottom of the cylinders.

Cylinder Taper

Measure cylinder bore diameter at 4 recommended positions. See illustration.



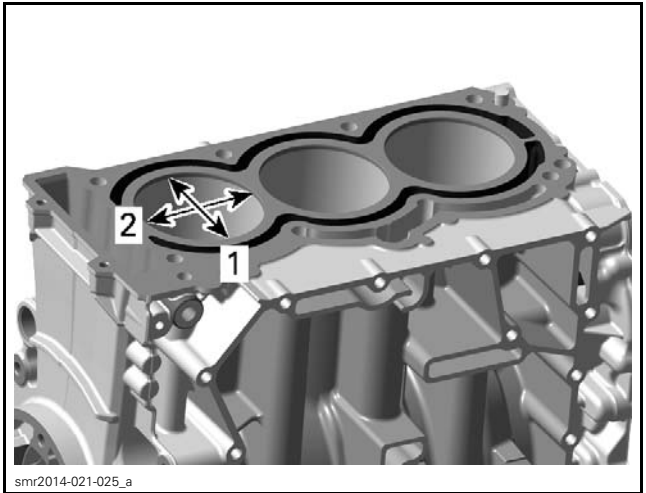
- TYPICAL**
- 1. First measure
  - 2. Second measure
  - 3. Third measure
  - 4. Fourth measure
- A. 5 mm to 10 mm (.197 in to .394 in)
  - B. 30 mm to 35 mm (1.181 in to 1.378 in)
  - C. 57 mm to 62 mm (2.244 in to 2.441 in)
  - D. 111 mm to 113 mm (4.37 in to 4.449 in)

The difference between measurements should not exceed the service limit mentioned in next table.

| CYLINDER TAPER |                     |
|----------------|---------------------|
| NEW MAXIMUM    | 0.030 mm (.0012 in) |
| SERVICE LIMIT  | 0.050 mm (.002 in)  |

Cylinder Out of Round

Measure cylinder bore diameter as shown and at the same measuring points as for *CYLINDER TAPER*.



- 1. Perpendicular to piston pin axis
- 2. Parallel to piston pin axis

To obtain the cylinder out of round, calculate the difference between the perpendicular measures.

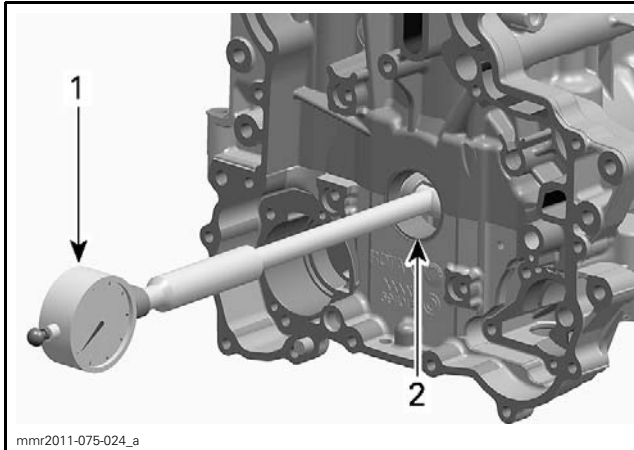
| CYLINDER OUT OF ROUND |                     |
|-----------------------|---------------------|
| NEW MAXIMUM           | 0.008 mm (.0003 in) |
| SERVICE LIMIT         | 0.030 mm (.0012 in) |

Crankshaft Plain Bearings Inside Diameter

Check the plain bearings for scoring or other damages.

Measure plain bearing inside diameter and compare with crankshaft bearing journal diameter (refer to *CRANKSHAFT* in this subsection). Proceed as follows.

- Use the OLD plain bearings and put both cylinder block halves together.
- Tighten screws as described in *CYLINDER BLOCK ASSEMBLY*.
- Measure the inside diameter of the crankshaft plain bearings using a bore gauge.



mmr2011-075-024\_a

1. Bore gauge
2. Crankshaft plain bearing

### CRANKSHAFT PLAIN BEARING INSIDE DIAMETER

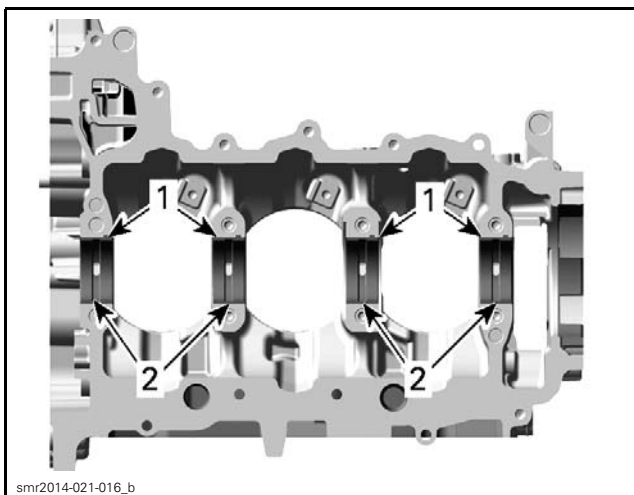
|               |                       |
|---------------|-----------------------|
| SERVICE LIMIT | 36.080 mm (1.4205 in) |
|---------------|-----------------------|

Replace bearings if they are out of specifications.

### Assembling the Cylinder Block

For assembly, reverse the disassembly procedure. Pay attention to the following details.

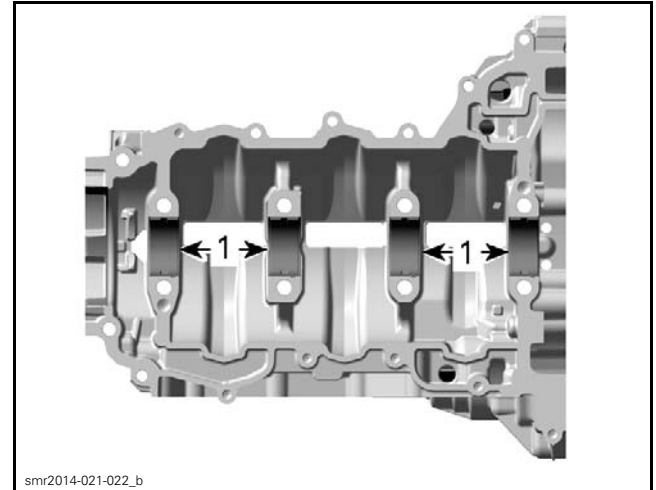
1. Correctly reinstall plain bearings as follows.
  - 1.1 Use NEW bearings if diameters are out of specification. Refer to *PLAIN BEARING INSPECTION* in this subsection.
  - 1.2 Install bearings with lubrication grooves in the cylinder block upper half.



smr2014-021-016\_b

1. Plain bearings
2. Lubrication grooves

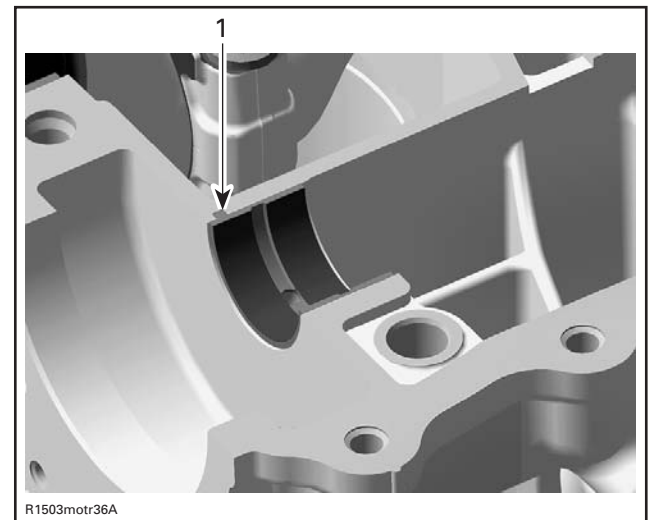
- 1.3 Install flat bearings in the cylinder block lower half.



smr2014-021-022\_b

1. Flat bearings

- 1.4 Bearings must be flush with the cylinder block split surface and their protrusions have to fit in the notched areas in the cylinder block seat.



R1503motr36A

### TYPICAL

1. Bearing protrusion in cylinder block notch

2. Install pistons, refer to *PISTONS AND CONNECTING RODS* in this subsection.
3. Apply engine oil on all plain bearings.
4. Install the following components:
  - Crankshaft and thrust washers (refer to *CRANKSHAFT*)
  - Connecting rod caps (refer to *PISTONS AND CONNECTING RODS*).

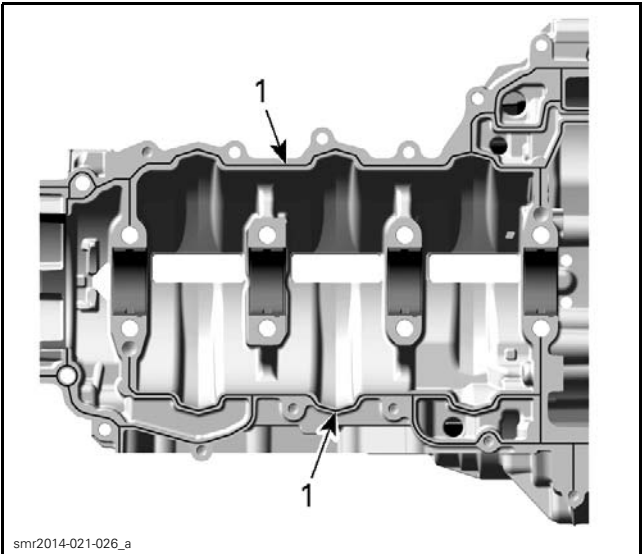
5. Apply sealant on mating surface of cylinder block lower half as shown on next illustration.

### SERVICE PRODUCT

LOCTITE 5910 (P/N 293 800 081)

Subsection XX (CYLINDER BLOCK)

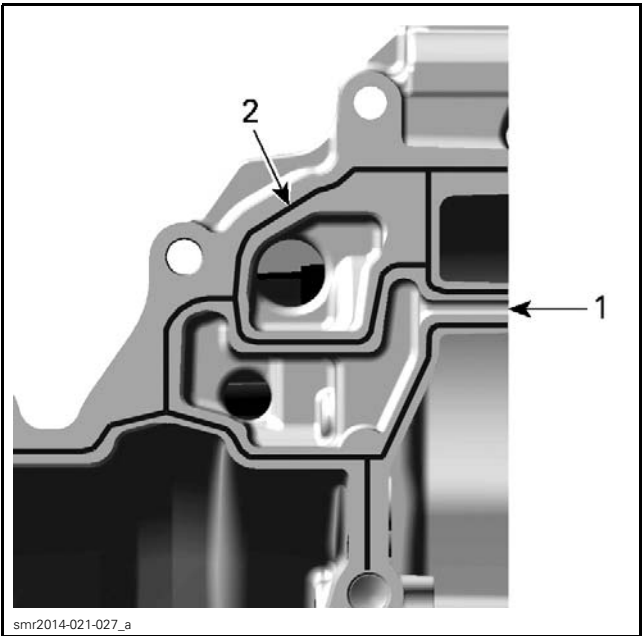
**IMPORTANT:** When beginning the application of the cylinder block sealant, the assembly and first tightening have to be done within 12 minutes. It is suggested to have all you need on hand to save time.



1. Apply Loctite 5910 following this pattern

**NOTICE** Ensure not to apply too much sealant, as it will spread out inside the cylinder block.

**NOTICE** Take care that the bypass passage of the engine oil pressure regulator is not clogged with sealant.

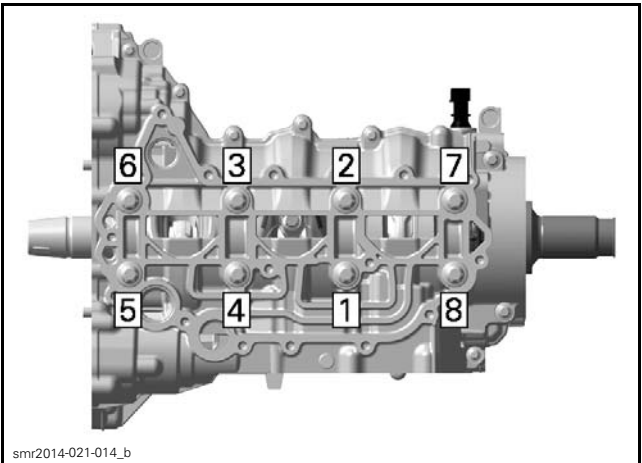


1. Bypass passage of engine oil pressure regulator  
2. Loctite 5910 applied

6. Install **NEW** M9 cylinder block screws and tighten as follows.

**NOTICE** This assembly uses stretch screws. Always use **NEW** screws and strictly adhere to the tightening procedure.

- 6.1 Torque the M9 screws according the sequence.
- 6.2 Use a torque angle gauge to carry out the second step, following the same sequence.

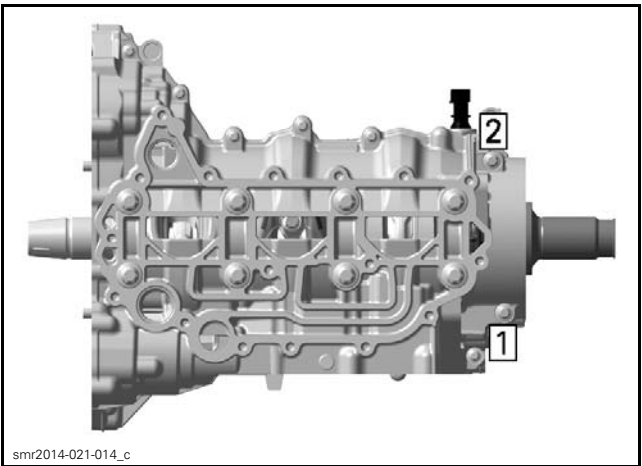


M9 SCREWS TIGHTENING SEQUENCE - FIRST AND SECOND STEPS

| TIGHTENING TORQUE        |        |                                          |
|--------------------------|--------|------------------------------------------|
| M9 cylinder block screws | STEP A | 20 N•m ± 2 N•m<br>(15 lbf•ft ± 1 lbf•ft) |
|                          | STEP B | Additional 150° ± 5°                     |

7. Install the M8 screws and tighten as follows.

| TIGHTENING TORQUE        |                                          |
|--------------------------|------------------------------------------|
| M8 Cylinder block screws | 23 N•m ± 2 N•m<br>(17 lbf•ft ± 1 lbf•ft) |

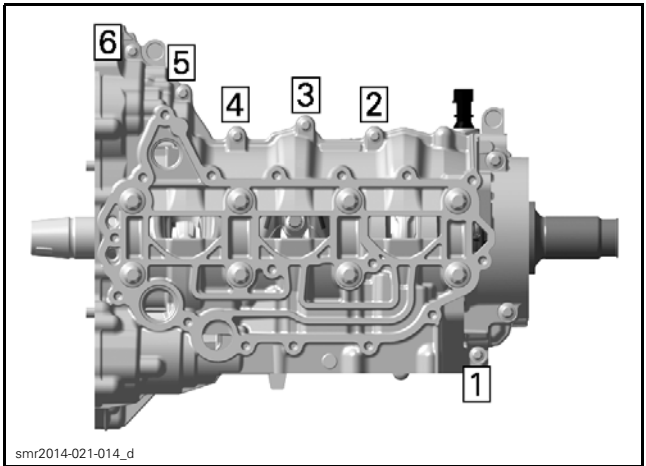


M8 SCREWS TIGHTENING SEQUENCE

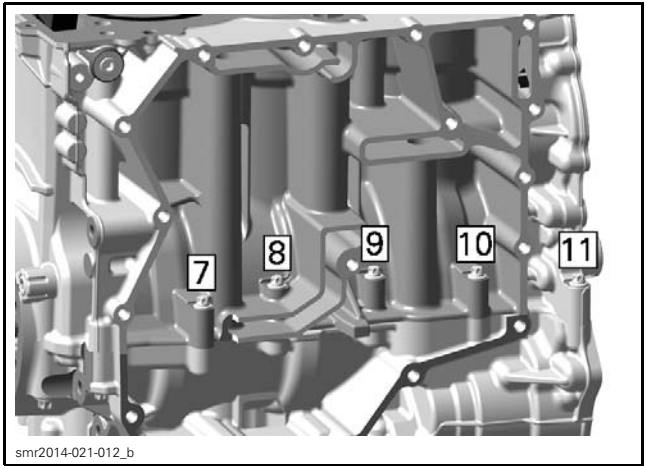


8. Install the M6 screws and tighten as follows.

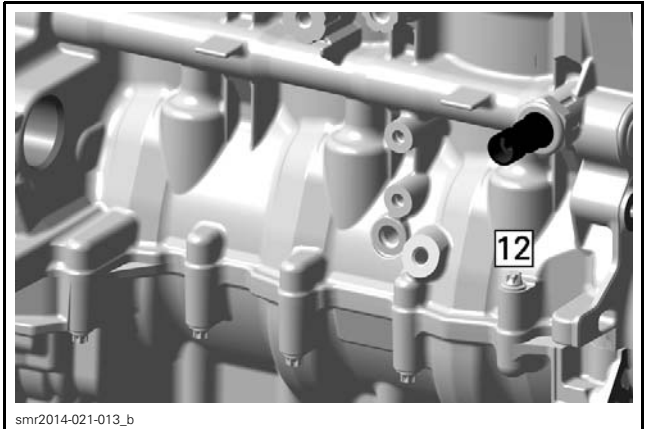
| TIGHTENING TORQUE        |                                         |
|--------------------------|-----------------------------------------|
| M6 cylinder block screws | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |



M6 SCREWS TIGHTENING SEQUENCE (BOTTOM OF CRANKCASE)



M6 SCREWS TIGHTENING SEQUENCE (INTAKE SIDE OF CRANKCASE)



M6 SCREW TIGHTENING SEQUENCE (EXHAUST SIDE OF CRANKCASE)

**NOTE:** Check the crankshaft axial play before continuing the assembly. Refer to *CRANKSHAFT* in this subsection for the procedure.

9. Lubricate PTO oil seal properly before reinstalling the PTO cover. Refer to *PTO COVER AND PTO OIL SEAL* in this subsection.

10. Reassemble engine in accordance with the proper assembly procedures.

## CRANKSHAFT

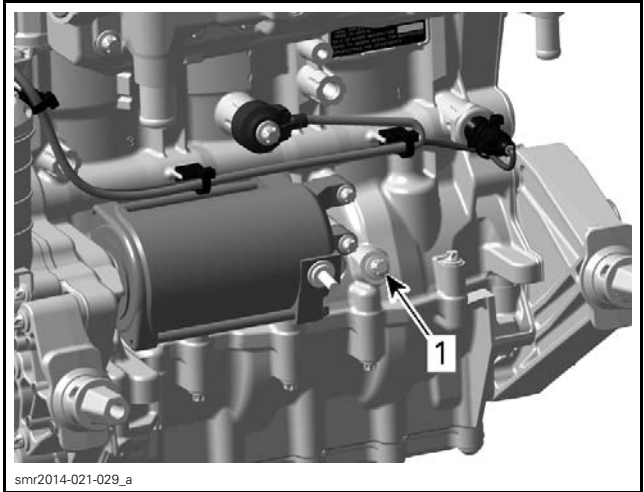
### Crankshaft Locking Procedure

**NOTICE** When crankshaft is locked, the second cylinder is set to TDC.

Crankshaft must be locked whenever the magneto rotor retaining screw has to be removed or whenever working on the valve train.

**NOTICE** When working on the valve train or timing chain, crankshaft must be locked with the marks "IN" and "EX" on the camshaft timing gears facing each other.

1. If working on the valve train or timing chain, remove the valve cover. Refer to *CYLINDER HEAD* subsection.
2. Remove spark plugs.
3. Remove crankshaft access plug and discard gasket ring.

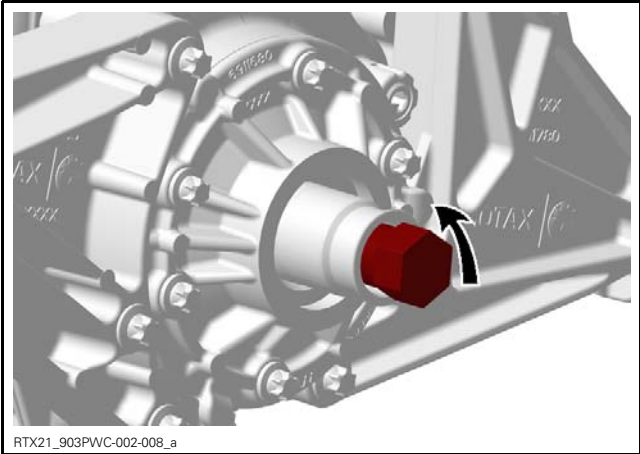


1. Crankshaft access plug

4. Turn engine on PTO side counterclockwise to bring crankshaft to locking position.

Subsection XX (CYLINDER BLOCK)

| REQUIRED TOOL                          |                                                                                   |
|----------------------------------------|-----------------------------------------------------------------------------------|
| PTO SHAFT ADAPTER<br>(P/N 529 036 401) |  |



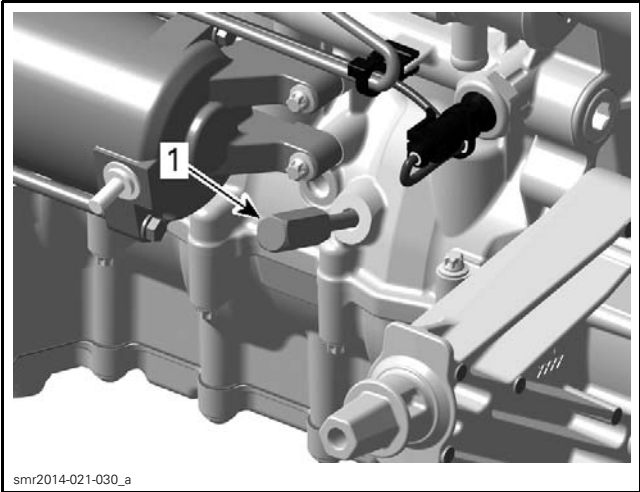
**NOTICE** Crankshaft locking position is reached when marks "IN" and "EX" on the camshaft timing gears face each other.

- 5. Use a flashlight to check if the groove in the crankshaft is aligned with the hole.
- 6. Lock crankshaft.

| REQUIRED TOOL                                |                                                                                     |
|----------------------------------------------|-------------------------------------------------------------------------------------|
| CRANKSHAFT LOCKING<br>TOOL (P/N 529 036 407) |  |

Tighten service tool to specification.

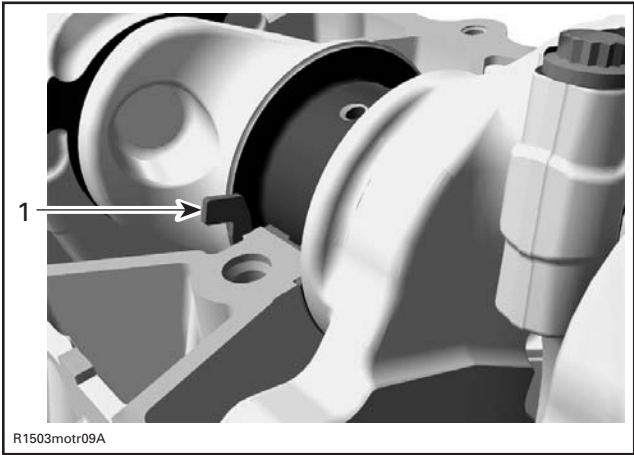
| TIGHTENING TORQUE       |                                          |
|-------------------------|------------------------------------------|
| Crankshaft locking bolt | 23 N•m ± 2 N•m<br>(17 lbf•ft ± 1 lbf•ft) |



1. Crankshaft locking tool

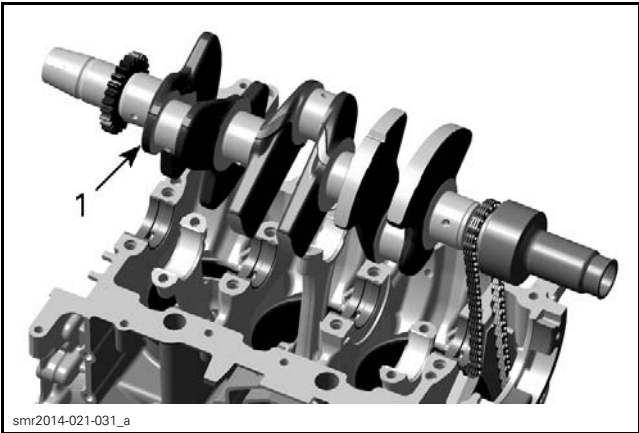
Removing the Crankshaft

- 1. Disassemble *CYLINDER BLOCK*, see procedure in this subsection.
- 2. Remove connecting rod caps. Refer to *PISTONS AND CONNECTING RODS* in this subsection.
- 3. Remove crankshaft thrust washers.



TYPICAL  
1. Thrust washer

- 4. Remove crankshaft from cylinder block.

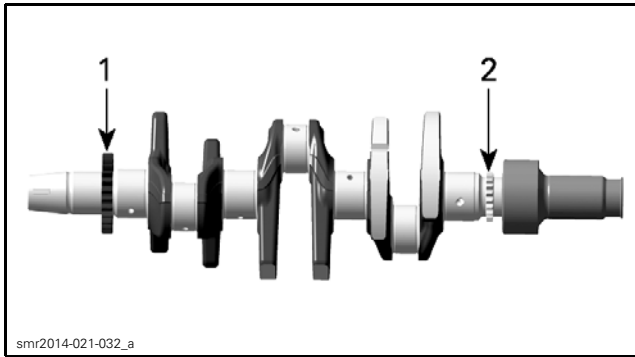


1. Crankshaft

Inspecting the Crankshaft

Check each bearing journal of crankshaft for scoring, scuffing, cracks or other signs of wear.

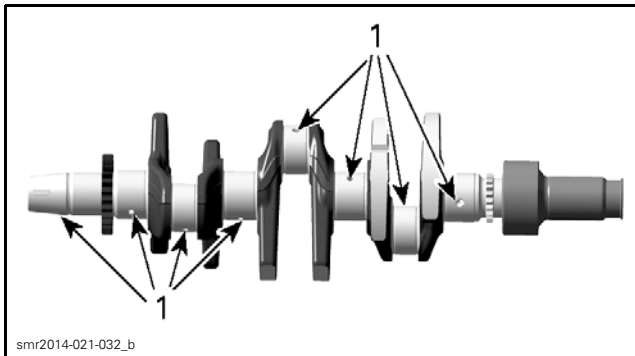
Check if crankshaft gears are worn or otherwise damaged.



1. Oil pump drive gear
2. Crankshaft timing gear

Replace crankshaft if damaged.

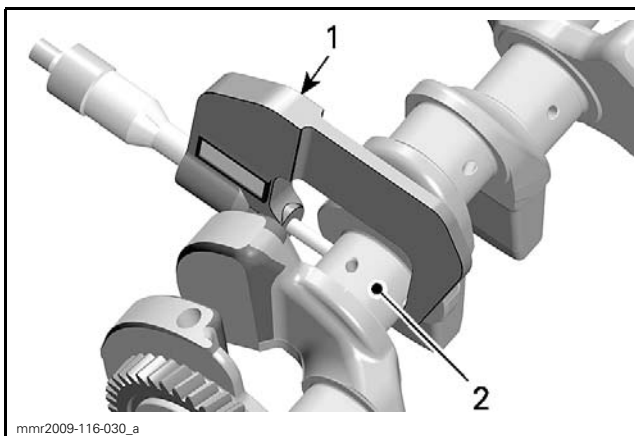
Blow the oil orifices using compressed air and make sure they are not clogged.



1. Check oil orifices

### Crankshaft Radial Play

Measure crankshaft bearing journal diameter, using a micrometer.



- TYPICAL**
1. Micrometer
  2. Crankshaft area for plain bearing

To obtain the radial play, calculate the difference between the bearing journal diameter and the crankshaft plain bearings inner diameter (see *CYLINDER BLOCK*).

### CRANKSHAFT BEARING JOURNAL DIAMETER

|               |                                                    |
|---------------|----------------------------------------------------|
| NEW           | 35.990 mm to 36.006 mm<br>(1.4169 in to 1.4176 in) |
| SERVICE LIMIT | 35.960 mm (1.4157 in)                              |

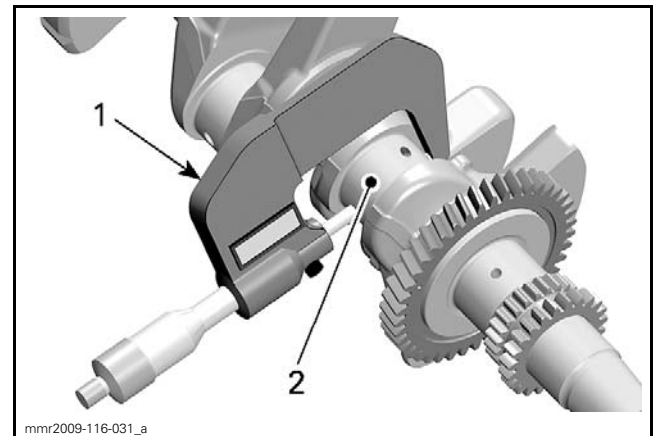
### CRANKSHAFT RADIAL PLAY

|               |                    |
|---------------|--------------------|
| SERVICE LIMIT | 0.08 mm (.0031 in) |
|---------------|--------------------|

### Crankshaft Pin Diameter

Measure crankshaft pin diameter, using a micrometer.

To obtain the radial play, calculate the difference between the crankshaft pin diameter and the connecting rod plain bearings inner diameter (see *CONNECTING ROD INSPECTION*).



- TYPICAL**
1. Micrometer
  2. Crankshaft pin area for plain bearing

### CRANKSHAFT PIN DIAMETER

|               |                                                  |
|---------------|--------------------------------------------------|
| NEW           | 35.979 mm to 35.995 mm<br>(1.416 in to 1.417 in) |
| SERVICE LIMIT | 35.969 mm (1.416 in)                             |

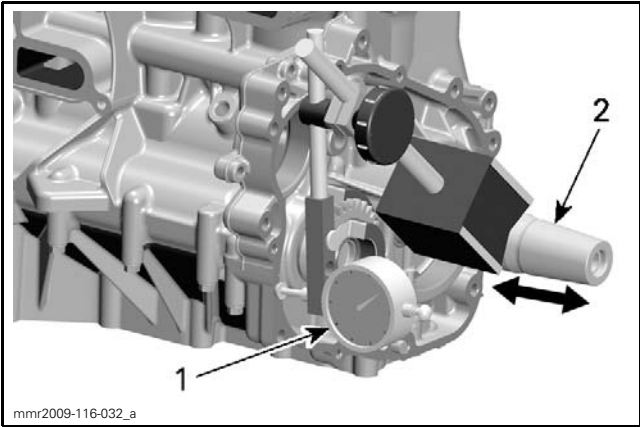
### CONNECTING ROD BIG END RADIAL PLAY

|               |                    |
|---------------|--------------------|
| SERVICE LIMIT | 0.08 mm (.0031 in) |
|---------------|--------------------|

### Crankshaft Axial Play

With the crankshaft in the cylinder block, measure the crankshaft axial play, using a dial indicator.

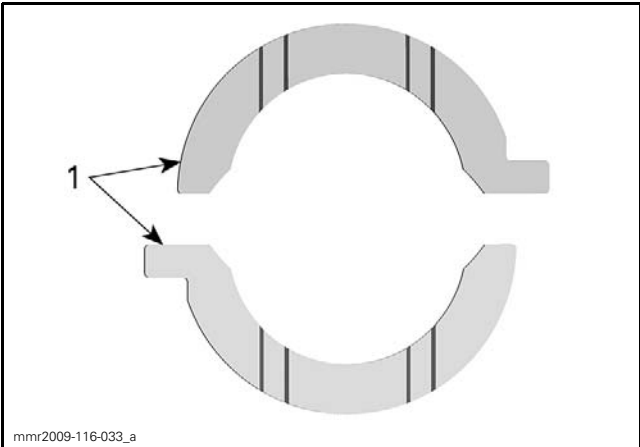
Subsection XX (CYLINDER BLOCK)



TYPICAL  
1. Dial indicator  
2. Crankshaft

| CRANKSHAFT AXIAL PLAY |                                              |
|-----------------------|----------------------------------------------|
| NEW                   | 0.120 mm to 0.352 mm<br>(.005 in to .014 in) |
| SERVICE LIMIT         | 0.450 mm (.018 in)                           |

If play is out of specification, replace the crankshaft thrust washers and repeat measurement.



TYPICAL  
1. Crankshaft thrust washers

Installing the Crankshaft

For installation, reverse the removal procedure. Pay attention to following details.

Turn cylinder block upside down.

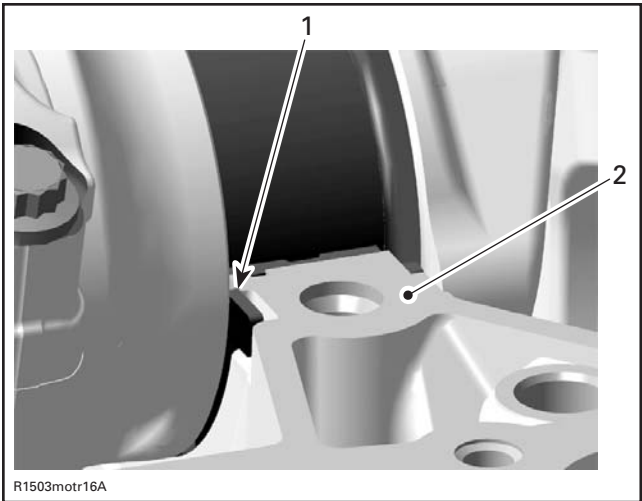
**NOTICE** Be careful that connecting rods do not hit the cylinder block.

Apply engine oil on all plain bearings before installing them.

Install crankshaft along with the timing chain.

Lubricate (both sides) and reinstall crankshaft thrust washers with the slots facing against crankshaft counterweights.

**NOTE:** Thrust washers have to be flush with the cylinder block sealing surface.



TYPICAL  
1. Thrust washer  
2. Sealing surface

Install connecting rod caps. Refer to *PISTONS AND CONNECTING RODS* in this subsection.

**NOTICE** It is absolutely necessary to follow this procedure. Otherwise severe engine damage can occur.

Install cylinder block lower half. Refer to *CYLINDER BLOCK* in this subsection.

Lock crankshaft before further assembly of the engine. See *CRANKSHAFT LOCKING PROCEDURE* in this subsection.

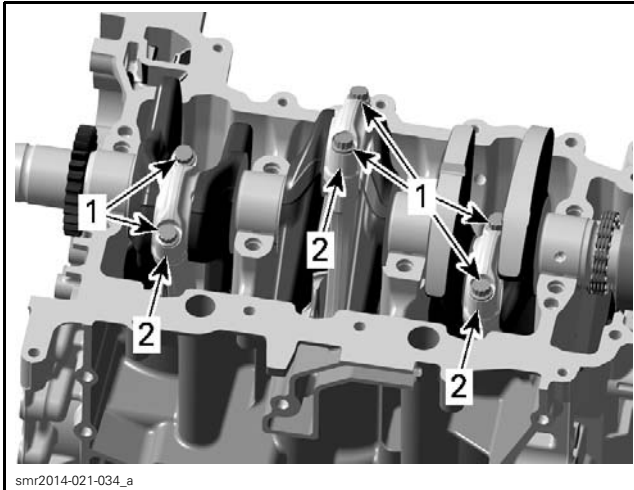
PISTONS AND CONNECTING RODS

Removing the Piston and Connecting Rod

**NOTE:** It is recommended to measure connecting rod big end axial play prior to remove connecting rod. Refer to *INSPECTING THE CONNECTING ROD*.

1. Disassemble *CYLINDER BLOCK* as per procedure in this subsection.
2. Remove connecting rod cap.

**NOTICE** Mark cylinder position of connecting rod before disassembly.

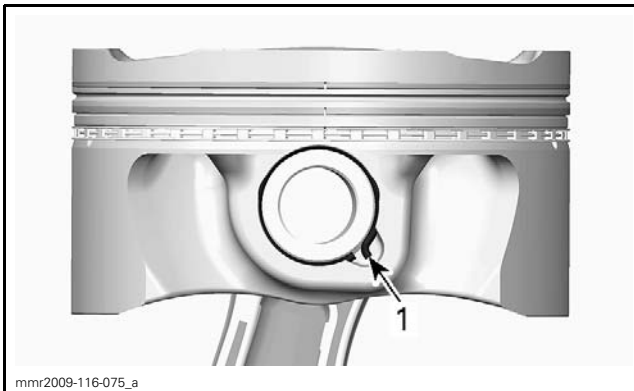


1. Connecting rod screws
2. Connecting rod cap

3. Remove **CRANKSHAFT** as per procedure in this subsection.
4. Turn cylinder block and push piston with connecting rod out of the cylinder.

### Disassembling the Piston and Connecting Rod

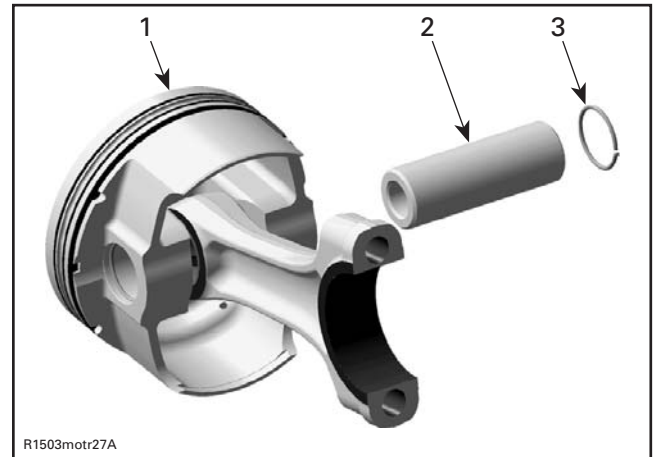
1. Remove one piston pin circlip and discard it.



- TYPICAL**
1. Piston pin circlip

**NOTE:** The removal of both piston pin circlips is not necessary to remove the piston pin.

2. Push piston pin out of the piston.



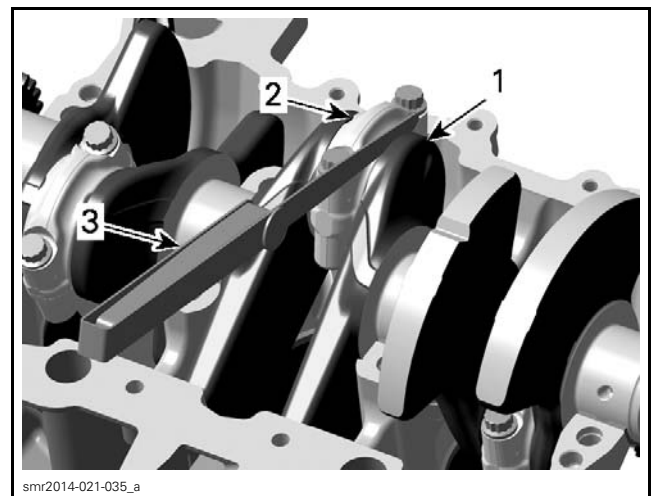
- TYPICAL**
1. Piston
  2. Piston pin
  3. Circlip

3. Detach piston from connecting rod.

### Inspecting the Connecting Rod

#### Connecting Rod Big End Axial Play

Using a feeler gauge, measure distance between butting face of connecting rod and crankshaft counterweight. If the distance exceeds specified tolerance, replace the worn part.



1. Crankshaft
2. Connecting rod
3. Feeler gauge

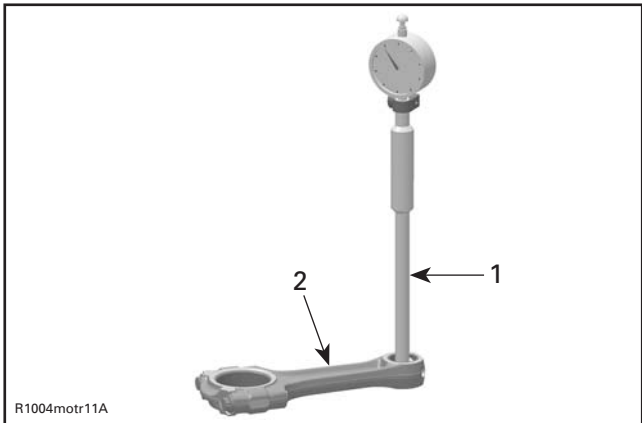
| CONNECTING ROD BIG END AXIAL PLAY |                                              |
|-----------------------------------|----------------------------------------------|
| NEW                               | 0.100 mm to 0.352 mm<br>(.004 in to .014 in) |
| SERVICE LIMIT                     | 0.450 mm (.018 in)                           |

#### Connecting Rod Small End Radial Play

Measure connecting rod small end, using a bore gauge.



Subsection XX (CYLINDER BLOCK)



TYPICAL  
1. Bore gauge  
2. Connecting rod

| CONNECTING ROD SMALL END DIAMETER |                                                  |
|-----------------------------------|--------------------------------------------------|
| NEW                               | 17.010 mm to 17.020 mm<br>(.6697 in to .6701 in) |
| SERVICE LIMIT                     | 17.060 mm (.6717 in)                             |

If the connecting rod small end diameter is out of specification, replace the connecting rod.

To obtain the radial play, calculate the difference between the piston pin diameter (*INSPECTING THE PISTON PIN*) and the connecting rod small end inner diameter.

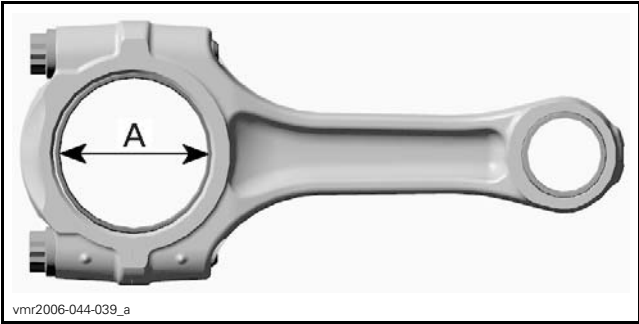
| CONNECTING ROD SMALL END RADIAL PLAY |                     |
|--------------------------------------|---------------------|
| SERVICE LIMIT                        | 0.040 mm (.0016 in) |

Connecting Rod Big End Radial Play

1. Measure inside diameter of connecting rod big end.
  - 1.1 Install the OLD plain bearings as they were mounted initially.
  - 1.2 Perform the tightening procedure as described in *INSTALLING THE PISTON AND CONNECTING ROD* in this subsection.

**NOTE:** To measure the connecting rod big end diameter, ALWAYS use the OLD connecting rod screws.

- 1.3 Measure inside diameter in longitudinal direction of the connecting rod.



TYPICAL  
A. Connecting rod big end bearing

| CONNECTING ROD BIG END DIAMETER |                      |
|---------------------------------|----------------------|
| SERVICE LIMIT                   | 36.06 mm (1.4197 in) |

To obtain the connecting rod big end radial play, calculate the difference between the big end diameter and the crankshaft pin diameter (see *INSPECTING THE CRANKSHAFT*).

| CONNECTING ROD BIG END RADIAL PLAY |                     |
|------------------------------------|---------------------|
| SERVICE LIMIT                      | 0.080 mm (.0031 in) |

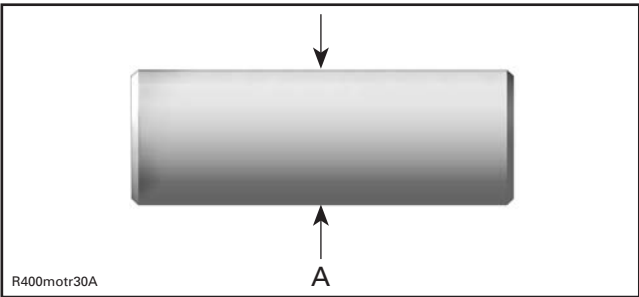
If connecting rod big end diameter is out of specification, install **NEW** plain bearings.

Inspecting the Piston Pin

Using synthetic abrasive woven, clean piston pin from deposits.

Inspect piston pin for scoring, cracks or other damage.

Measure piston pin diameter, using a micrometer. See the following illustration for the proper measurement position.



TYPICAL  
A. Measure piston pin diameter here

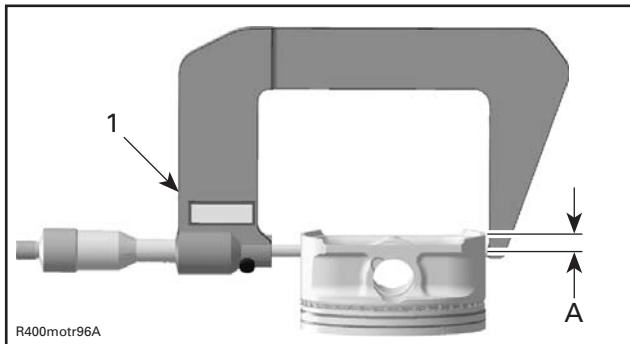
| PISTON PIN DIAMETER |                                                 |
|---------------------|-------------------------------------------------|
| NEW                 | 16.996 mm to 17.00 mm<br>(.6691 in to .6693 in) |
| SERVICE LIMIT       | 16.986 mm (.6687 in)                            |

Replace the piston pin if it is out of specification.

## Inspecting the Piston

Inspect piston for scoring, scuffing, cracks or other damage. Replace piston and piston rings if necessary.

Using a micrometer, measure piston perpendicularly (90°) to piston pin axis at 8.5 mm (11/32 in) from the skirt edge.



### TYPICAL

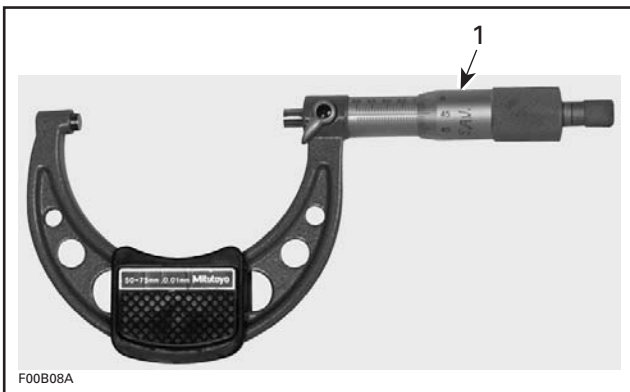
1. Measuring perpendicularly (90°) to piston pin axis
- A. 8.5 mm (11/32 in)

| PISTON MEASUREMENT |                                                  |
|--------------------|--------------------------------------------------|
| NEW                | 73.950 mm to 73.966 mm<br>(2.911 in to 2.912 in) |
| SERVICE LIMIT      | 73.92 mm (2.9102 in)                             |

Replace piston if it is out of specification.

## Piston/Cylinder Clearance

1. Adjust and lock a micrometer to the piston dimension.

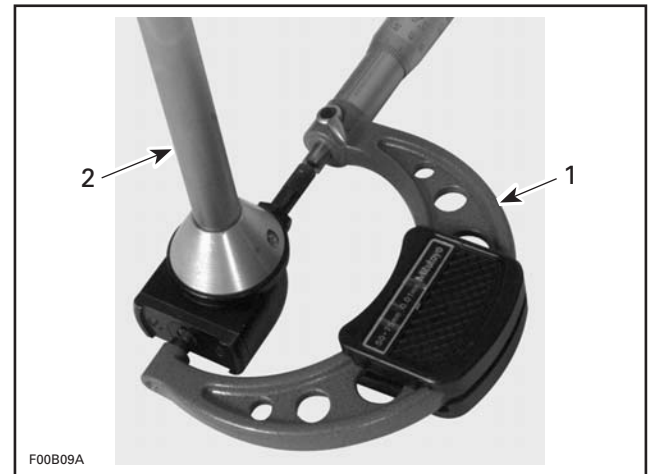


### TYPICAL

1. Micrometer set to the piston dimension

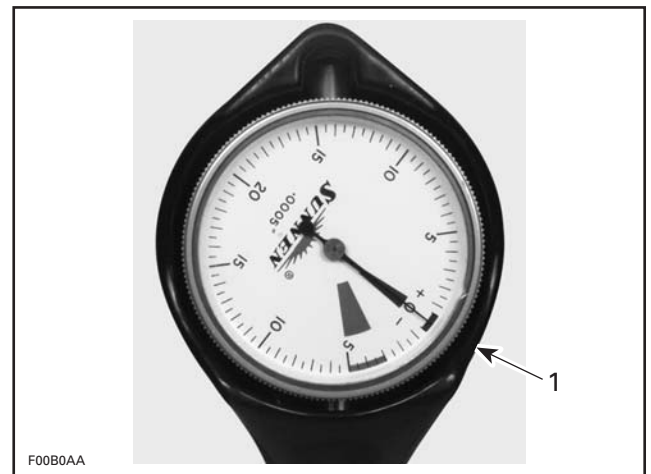
**NOTE:** Make sure used piston is not worn.

2. With the micrometer locked at step 1, adjust a cylinder bore gauge to the micrometer dimension and set the indicator to 0 (zero).



### TYPICAL

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



### TYPICAL

1. Indicator set to 0 (zero)

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

3. Position the cylinder bore gauge 35 mm (1-3/8 in) below the cylinder head mating surface, measuring perpendicularly (90°) to piston pin axis.
4. Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder clearance.

| PISTON/CYLINDER CLEARANCE |                                                |
|---------------------------|------------------------------------------------|
| NEW                       | 0.037 mm to 0.067 mm<br>(.0015 in to .0026 in) |
| SERVICE LIMIT             | 0.080 mm (.0031 in)                            |

If clearance exceeds the specified tolerance, replace the piston and repeat the measurement procedure.



Assembling the Piston and Connecting Rod

For assembly, reverse the disassembly procedure. Pay attention to the following details.

- 1. Apply engine oil on the piston pin.
- 2. Insert piston pin into piston and connecting rod.

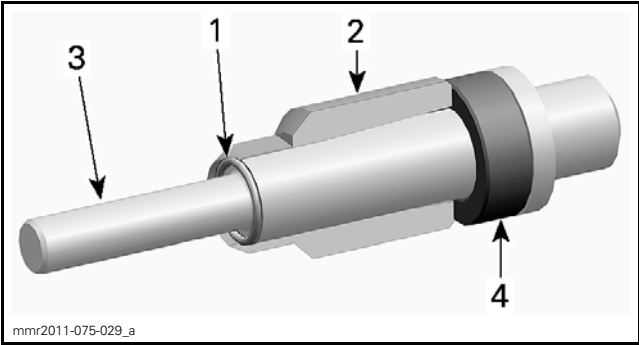
**NOTE:** Ensure to reinstall all parts in their original position as marked during removal.

- 3. Install **NEW** piston pin circlip(s).

| REQUIRED TOOL                                   |                                                                                   |
|-------------------------------------------------|-----------------------------------------------------------------------------------|
| PISTON CIRCLP<br>INSTALLER (P/N 529<br>036 207) |  |

**NOTICE** Always replace removed piston pin circlips by **NEW** ones.

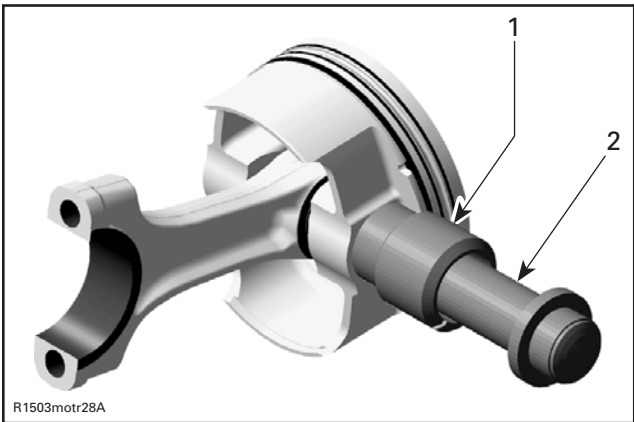
- 3.1 Place the circlip in the sleeve and push piston circlip installer handle until circlip reaches the mid position in the sleeve.



- 1. Circlip
- 2. Sleeve
- 3. Installer handle
- 4. Distance sleeve

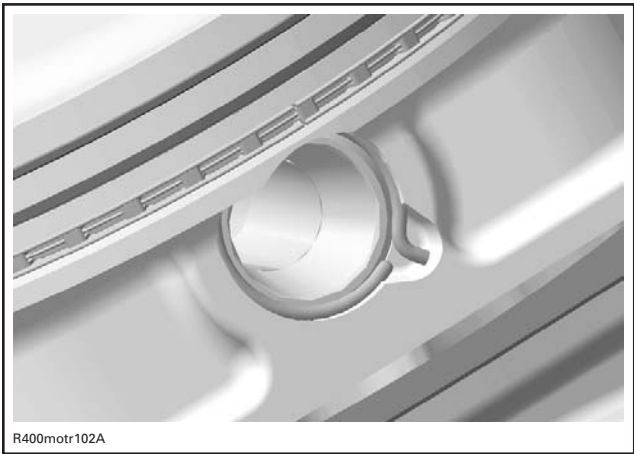
- 3.4 Remove distance sleeve and insert installer handle into the sleeve.

- 3.5 Insert the end of the handle into the piston pin, then push to engage the circlip into the piston groove.



- TYPICAL**
- 1. Sleeve with piston circlip inside
  - 2. Piston clip installer handle

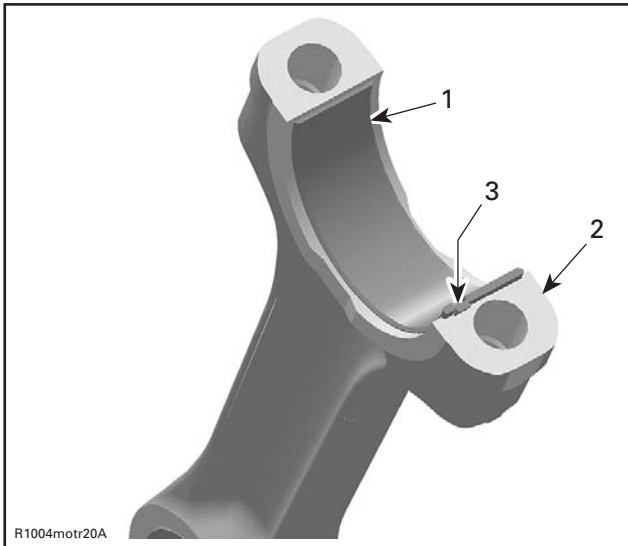
**NOTE:** Take care that the hook of the piston pin circlip is positioned properly.



CORRECT POSITION OF THE PISTON PIN CIRCLIP

**NOTICE** If piston pin circlip installation fails, repeat step 3 by using a NEW circlip.

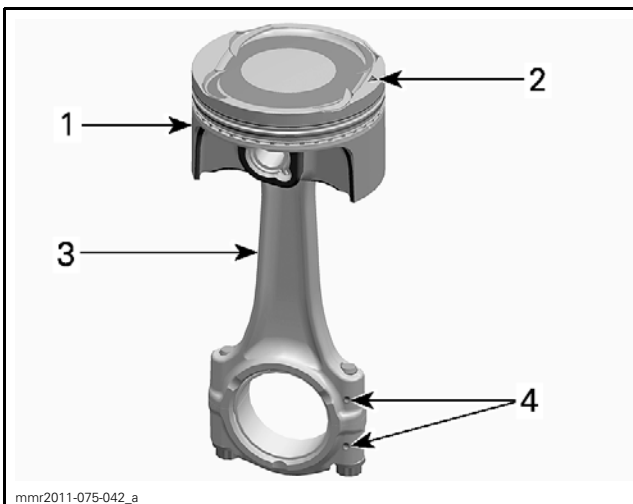
4. Correctly install plain bearings and carefully clean split surface on both sides (cracked area) with compressed air.



**TYPICAL**

1. Half bearing of connecting rod big end
2. Split surface of the connecting rod
3. Protrusion of bearing in line with connecting rod groove

**NOTICE** The arrow on top of the piston and the punched marks on the connecting rods must always point towards exhaust.



1. Piston
2. Arrow on top
3. Connecting rod
4. Punched marks

## Installing the Piston and Connecting Rod

1. Use engine oil and lubricate:
  - Piston

- Piston rings
- Cylinder bore
- Connecting rod bearings.

2. Slide piston into cylinder bore. Pay attention to the following.

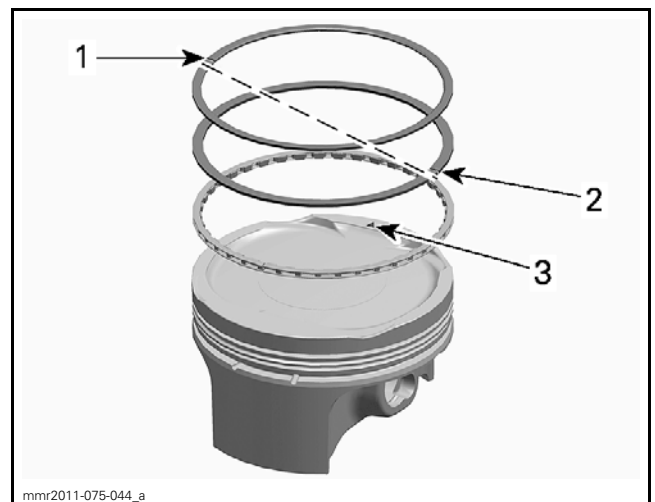
| REQUIRED TOOL                            |  |
|------------------------------------------|--|
| PISTON RING COMPRESSOR (P/N 529 036 208) |  |



**TYPICAL**

- 2.1 If reused, install piston in its original bore.
- 2.2 Make sure piston rings are properly spaced.

**NOTICE** The ring gaps of both compression rings should always be 180° from each other and 90° from the arrow on top of the piston.



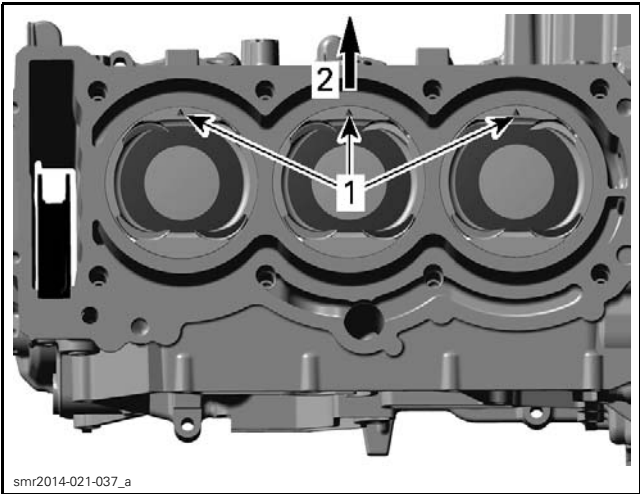
**RING GAPS AT 180° FROM EACH OTHER AND 90° FROM ARROW**

1. Rectangular ring - ring gap
2. Taper-face ring - ring gap
3. Arrow

Subsection XX (CYLINDER BLOCK)

2.3 The arrow on top of the piston must point towards exhaust.

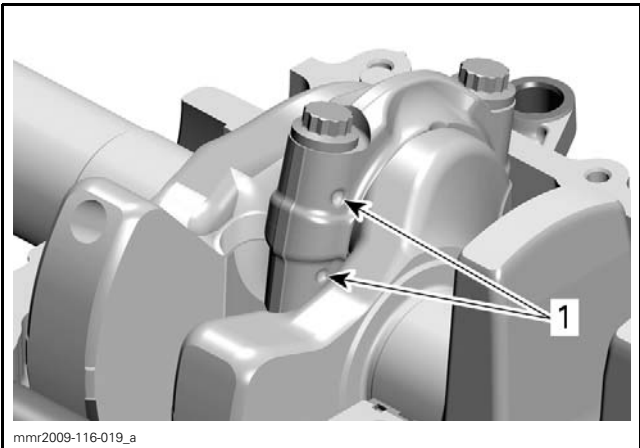
**NOTICE** Piston installed with the arrow in the wrong direction would cause serious engine damage.



1. Arrows  
2. Exhaust

- 3. Turn cylinder block upside down.
- 4. Install *CRANKSHAFT* as per procedure in this subsection.
- 5. Oil the crankshaft pin.
- 6. Install connecting rod caps.

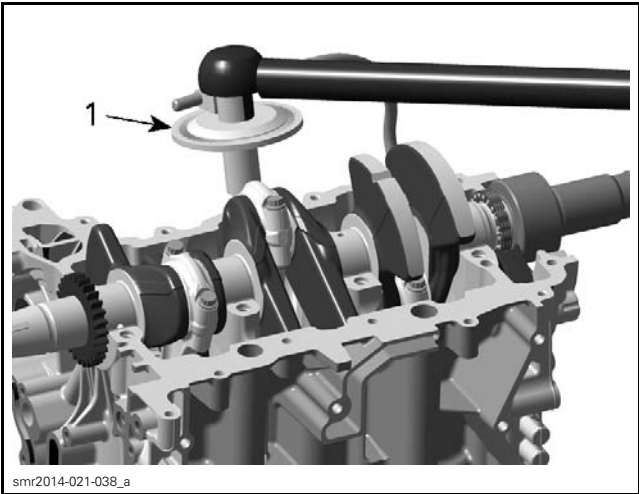
**NOTE:** Printed marks on connecting rod and cap must point together.



TYPICAL  
1. Printed marks

**NOTICE** This assembly uses stretch screws. Always use NEW screws and strictly adhere to the tightening procedure.

- 7. Tighten connecting rod screws as follows:
  - 7.1 Torque both connecting rod screws of a connecting rod.
  - 7.2 Use a torque angle gauge to carry out the second step.



1. Torque angle gauge

| TIGHTENING TORQUE     |        |                                             |
|-----------------------|--------|---------------------------------------------|
| Connecting rod screws | STEP A | 12 N•m ± 0.2 N•m<br>(106 lbf•in ± 2 lbf•in) |
|                       | STEP B | Additional 70° ± 5°                         |

**NOTICE** Failure to strictly follow this procedure may cause screws to loosen and lead to severe engine damage.

- 8. Install all other removed parts.

PISTON RINGS

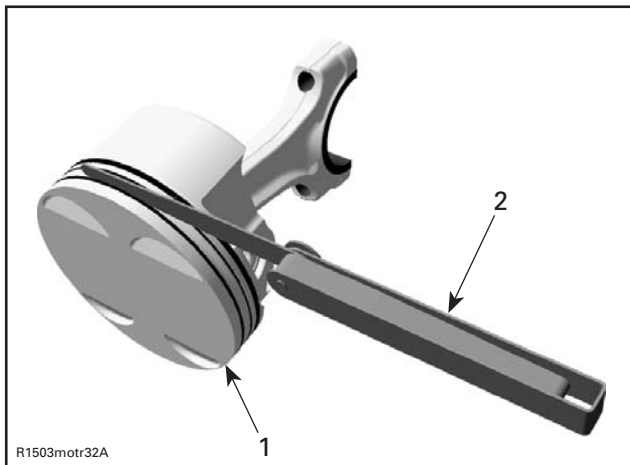
Removing the Piston Ring

- 1. Remove piston, see procedure in this subsection.
- 2. Remove rings from piston.

Inspecting the Piston Ring

Ring/Piston Groove Clearance

Using a feeler gauge measure each ring/piston groove clearance.



**TYPICAL**  
1. Piston  
2. Feeler gauge

| RING/PISTON GROOVE CLEARANCE |                                                |
|------------------------------|------------------------------------------------|
| UPPER COMPRESSION RING       |                                                |
| NEW                          | 0.030 mm to 0.066 mm<br>(.0012 in to .0026 in) |
| SERVICE LIMIT                | 0.12 mm (.0047 in)                             |
| LOWER COMPRESSION RING       |                                                |
| NEW                          | 0.020 mm to 0.056 mm<br>(.0008 in to .0022 in) |
| SERVICE LIMIT                | 0.12 mm (.0047 in)                             |
| OIL SCRAPER RING             |                                                |
| NEW                          | 0.010 mm to 0.040 mm<br>(.0004 in to .0016 in) |
| SERVICE LIMIT                | 0.15 mm (.0059 in)                             |

If clearance is out of specification, the piston and rings should be replaced.

### Ring End Gap

- Place piston ring in the cylinder bore between 8 mm to 16 mm (5/16 in to 5/8 in) from the top of cylinder.

**NOTE:** In order to correctly position the ring in the cylinder bore, use a piston as a pusher.

- Using a feeler gauge, check ring end gap.

| RING END GAP           |                                              |
|------------------------|----------------------------------------------|
| UPPER COMPRESSION RING |                                              |
| NEW                    | 0.20 mm to 0.35 mm<br>(.008 in to .014 in)   |
| SERVICE LIMIT          | 1.2 mm (.047 in)                             |
| LOWER COMPRESSION RING |                                              |
| NEW                    | 0.30 mm to 0.50 mm<br>(.012 in to .02 in)    |
| SERVICE LIMIT          | 1.2 mm (.047 in)                             |
| OIL SCRAPER RING       |                                              |
| NEW                    | 0.20 mm to 0.70 mm<br>(.0079 in to .0276 in) |
| SERVICE LIMIT          | 1.2 mm (.047 in)                             |

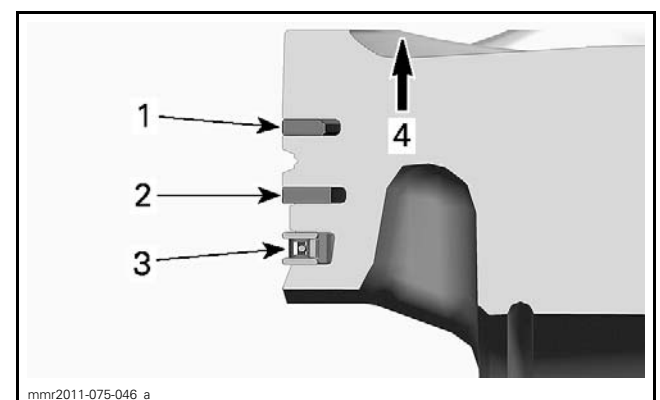
If ring end gap is out of specification, replace piston rings.

### Installing the Piston Ring

- Install piston rings in the following order.

**NOTE:** Use a ring expander to prevent breakage during installation. The oil ring must be installed by hand.

- 1.1 Install oil scraper ring.
- 1.2 Install the lower compression ring with the letter "N" facing up.
- 1.3 Install upper compression ring with the letter "N" facing up.



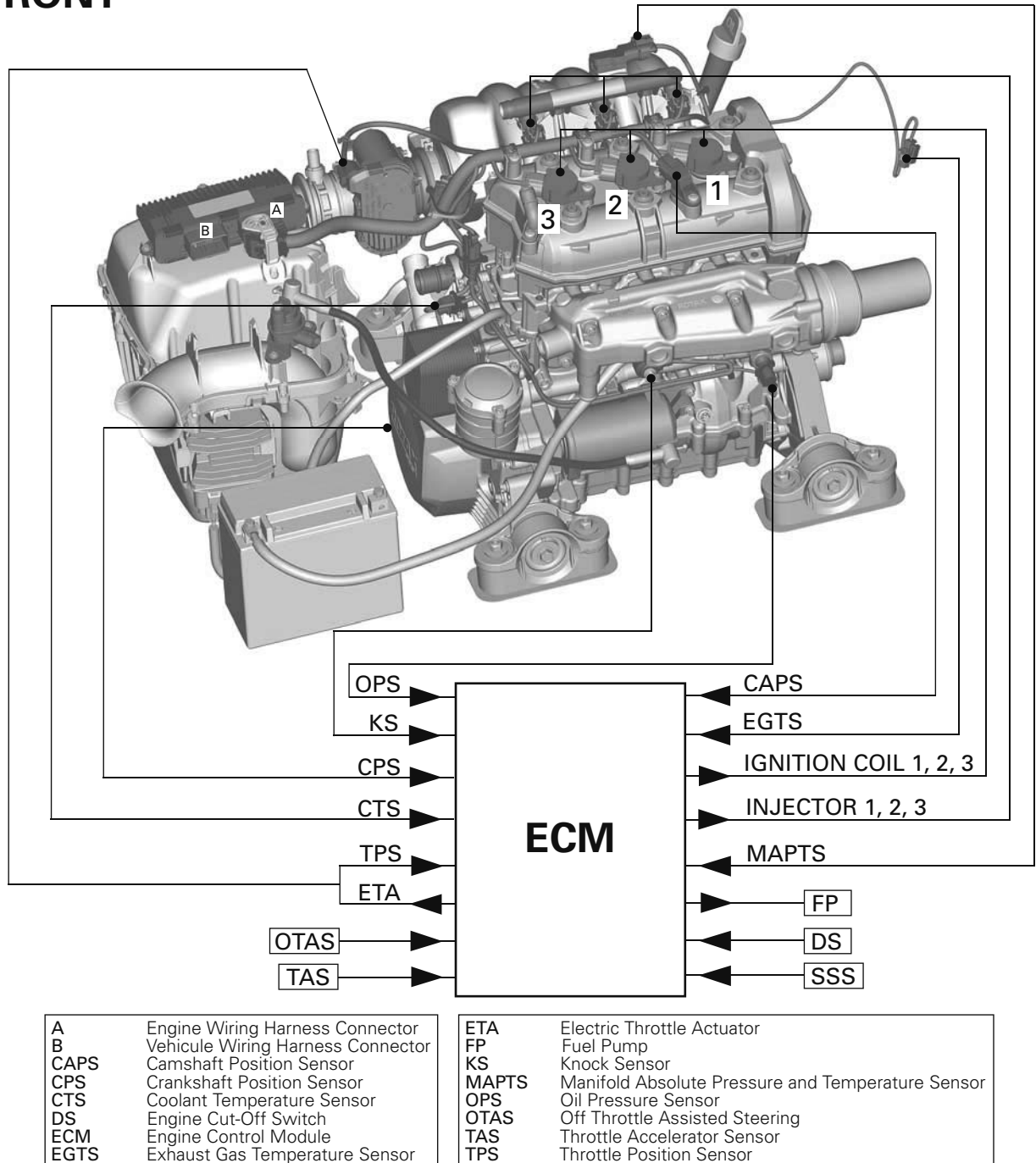
1. Rectangular ring
2. Taper-face ring
3. Oil scraper ring
4. Letter "N" facing up

**NOTICE** Ensure that upper and lower compression rings are not interchanged.

2. Check that rings rotate smoothly after installation.

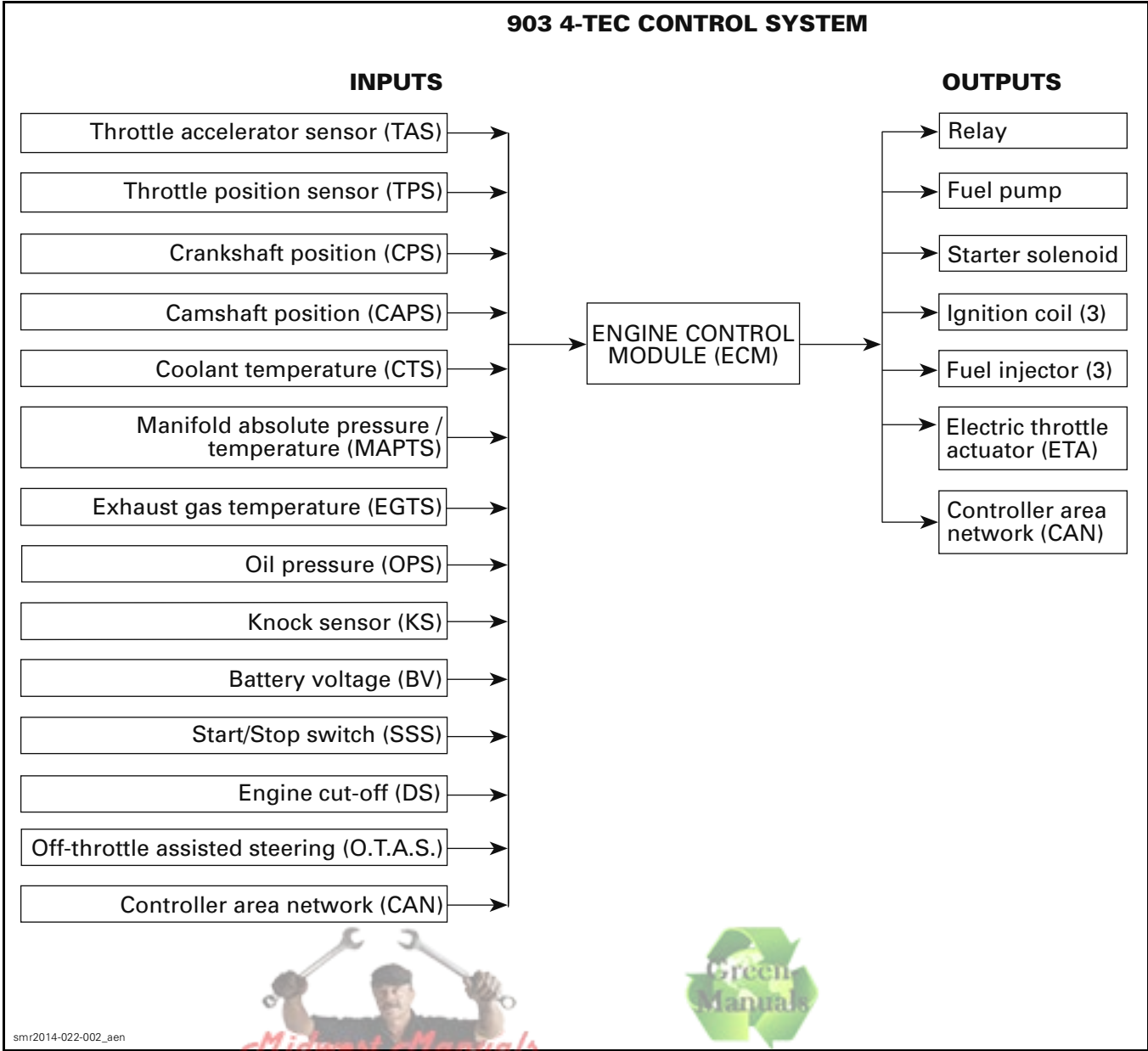
# ENGINE MANAGEMENT SYSTEM

**FRONT**



smr2014-022-003\_aen

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



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## GENERAL

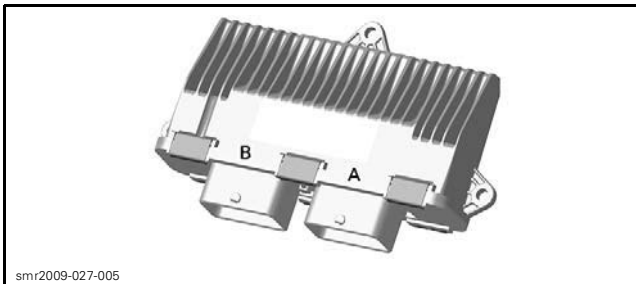
### SYSTEM DESCRIPTION

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)

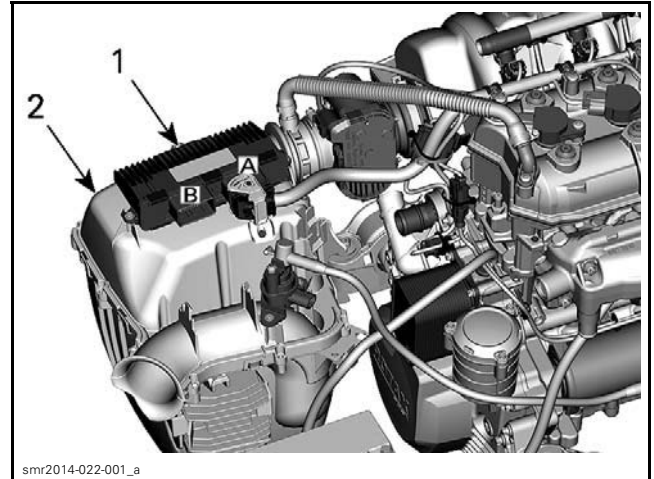


*ECM*

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.



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## Section 03 ELECTRONIC MANAGEMENT SYSTEMS

### Subsection 01 (ENGINE MANAGEMENT SYSTEM)

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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 and Intelligent Brake and Reverse (iBR) system.

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

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

For a comprehensive and complete description of the information center, refer to *INFORMATION CENTER (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.<sup>™</sup>, as well as a more precise control of the engine power.

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

## iBR (INTELLIGENT BRAKE AND REVERSE)

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

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

# CONTROLLER AREA NETWORK (CAN)

## GENERAL

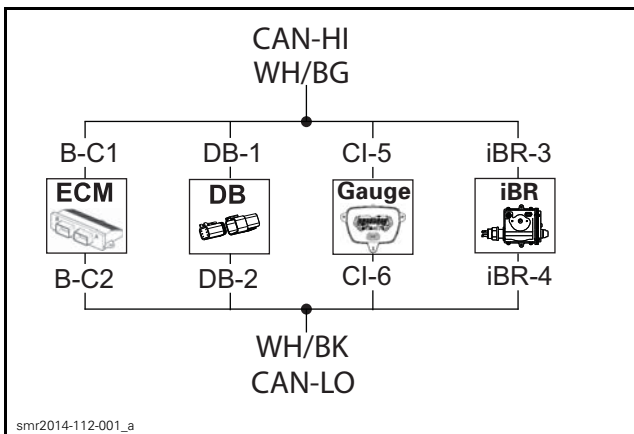
### SYSTEM DESCRIPTION

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), iBR and the multifunction gauge for various reasons such as:

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



CAN BUS DIAGRAM

# 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<br>(no communication)                                        | VEHICLE BEHAVIOR OR OBSERVATION<br>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.<br>Strange behavior of multifunction gauge.<br>Inoperative electronic systems in watercraft.           | Nothing                                                                                                                                                  |
| Water in holder of diagnostic connector (particularly with salt water)        | CAN intermittent problems.<br>Strange behavior of multifunction gauge.<br>Inoperative electronic systems in watercraft.           | Nothing                                                                                                                                                  |
| Short circuit in CAN wires                                                    | Engine is set to limp home mode.<br>iBR gate will not move. "Locked" in neutral.<br>iBR light is ON.<br>Check engine light is ON. | B.U.D.S. will not be able to communicate with any electronic module.<br>"No vehicle detected" message will be displayed in B.U.D.S.                      |
| Multifunction gauge                                                           | Check engine light is ON.<br>iBR light is ON.<br>Some functions not displayed such as: Engine hours and RPM.                      | 2 modules instead of 3 will be active.<br>"Cluster" tab and its data will not be available in B.U.D.S.<br>ECM and iBR will report a cluster CAN problem. |
| ECM (Engine Control Module)                                                   | Engine is set to limp home mode.<br>Check engine light is ON.<br>Some functions not displayed such as: Engine hours and RPM.      | 2 modules instead of 3 will be active.<br>ECM tab and its data will not be available in B.U.D.S.                                                         |
| iBR (intelligent Brake and Reverse)                                           | Engine is set to limp home mode.<br>iBR gate will not move. "Locked" in neutral.<br>iBR light is ON.<br>Check engine light is ON. | 2 modules instead of 3 will be active.<br>iBR tab and its data will not be available in B.U.D.S.<br>ECM and iS will report an iBR CAN problem.           |
| Depth sounder (If so equipped)                                                | The menu Depth Sounder Indicator will not be visible.<br>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.<br>"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 ..... | 1    |
| MPI-2 INTERFACE CARD ..... | 529 036 018 ..... | 1    |
| MPI-3 INTERFACE CARD ..... | 529 036 353 ..... | 1    |

## 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.

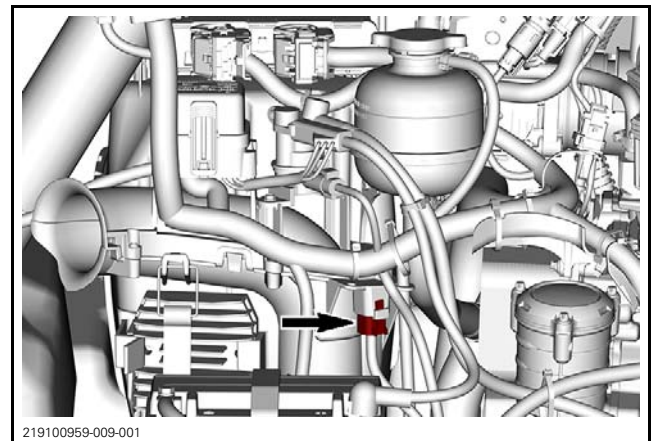
Connect the vehicle to the BRP diagnostic software (BUDS2).

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<br>(P/N 529 036 018)                                                 |  |
| <b>OR</b>                                                                                 |                                                                                     |
| MPI-3 INTERFACE CARD (P/N 529 036 353)                                                    |  |
| DIAGNOSTIC CABLE<br>(P/N 710 000 851)                                                     |  |
| OPTIONAL TOOL                                                                             |                                                                                     |
| Extension cable<br>available at electronic retail outlets.<br>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.

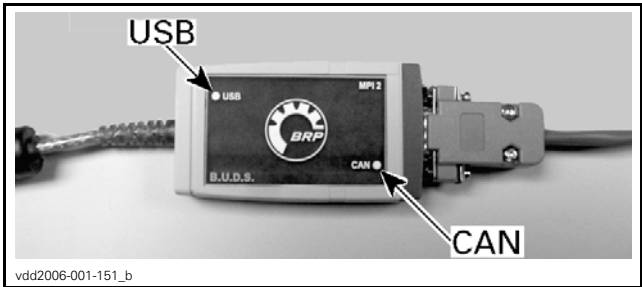
## COMMUNICATION PROBLEMS

### MPI Connection Troubleshooting

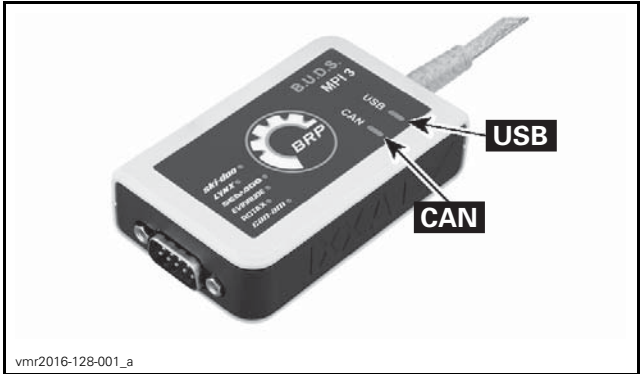
#### MPI Status Lights

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.

Subsection XX (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"><li>– Check USB connection between MPI-2 and PC computer.</li><li>– Check USB operation on PC computer (hardware or USB drivers).</li></ul> |
| USB Light is GREEN          | <ul style="list-style-type: none"><li>– Connections are GOOD.</li><li>– Communication can take place on USB side.</li></ul>                                                   |

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"><li>– BUDS2 does not communicate with the vehicle.</li><li>– Check connections from computer to vehicle.</li><li>– Check if BUDS2. is started.</li><li>– 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.</li></ul> |
| CAN Light is RED            | <p>This occurs when BUDS2 loses communication with vehicle.</p> <ul style="list-style-type: none"><li>– Check connections from computer to vehicle.</li><li>– 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.</li></ul>                                       |
| CAN Light is GREEN          | <ul style="list-style-type: none"><li>– Connections are GOOD. BUDS2 communicates normally with the vehicle.</li></ul>                                                                                                                                                                                                                             |

# 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.



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## Subsection XX (DIAGNOSTIC AND FAULT CODES)

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When this mode is active, the CHECK ENGINE indicator will come on and a LIMP HOME message will be displayed in the multifunction gauge.

### Major Fault and Vehicle Reaction

The following EMS conditions will trigger a limp home mode.

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

## 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.                                                            |
| <b>SPORT</b>                                                                      | SPORT MODE                           | Sport mode is active.                                                                              |
| <b>TOURING</b>                                                                    | 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 |

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## Subsection XX (DIAGNOSTIC AND FAULT CODES)

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

# DIAGNOSTIC AND FAULT CODES

## GENERAL

### FAULT CODE TABLE

| PCODE | MODULE    | DESCRIPTION                             | CAUSE                                                                                                                    | ACTION                                                                                                 |
|-------|-----------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| C0051 | DPS GLOBE | ROTOR ENCODER SPI COM FAIL              | internal comm fail error or damaged DPS                                                                                  | change dps if condition still active after key-on cycle                                                |
| C0052 | DPS GLOBE | ROTOR INCODER VARIANCE                  | internal INCODER fail or damaged DPS                                                                                     | change dps if condition still active after key-on cycle                                                |
| C1203 | DPS GLOBE | TORQUE SENSOR OUT OF RANGE              | internal error or damaged DPS                                                                                            | change dps if condition still active after key-on cycle                                                |
| C1304 | DPS GLOBE | TORQUE SENSOR LINEARITY CHECK FAIL      | internal error or damaged DPS                                                                                            | change dps if condition still active after key-on cycle                                                |
| C1309 | DPS GLOBE | TEMPERATURE HIGH                        | DPS temp upper range due to excessive use of DPS                                                                         | verify with customer condition when dps ovr show-up                                                    |
| C1310 | DPS GLOBE | TEMPERATURE OVER                        | DPS temp exceed due to excessive use of DPS                                                                              | verify with customer condition when dps ovr show-up                                                    |
| C1318 | DPS GLOBE | SEPIC LOW                               | internal error or damaged DPS                                                                                            | change DPS                                                                                             |
| C1319 | DPS GLOBE | SEPIC HIGH                              | internal error or damaged DPS                                                                                            | change DPS                                                                                             |
| C2109 | SCM       | Release Valve Activation delay Exceed   | If pressure threshold not reach after calibrated time delay (When release valve activated)                               | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |
| C210A | SCM       | Suspension Valve Activation time Exceed | If the suspension valve maximum allowed activation time in a specific time window is exceeded for (counter > CntExceed). | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |
| C210B | SCM       | Outlet Valve Activation time Exceed     | If the suspension valve maximum allowed activation time in a specific time window is exceeded for (counter > CntExceed). | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |
| C2111 | SCM       | Pressure sensor signal Invalid          | Sensor input voltage < 0.5V for hardcoded debounce time                                                                  | Open SCM Activation page in BUDS, performe a pressure sensor test in System self test sequence section |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                              | CAUSE                                                                                                                                                             | ACTION                                                                                                 |
|-------|--------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| C21D0 | SCM    | Pressure threshold not Reach outlet adjustment           | If pressure threshold not reach after calibrated time delay (threshold change in function of compressor temperature) (When outlet pressure adjustment activated)  | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |
| C21D2 | SCM    | Compressor over temperature condition                    | If over temp threshold reach for time delay                                                                                                                       | Open SCM Activation page in BUDS, performe a pressure test in System self test sequence section        |
| C21D3 | SCM    | Over pressure detected                                   | If pressure > 350PSI                                                                                                                                              | Open SCM Activation page in BUDS, performe a pressure sensor test in System self test sequence section |
| C21E0 | SCM    | Pressure threshold not reach Rear suspension adjustment  | If pressure threshold not reach after calibrated time delay (threshold change in function of compressor temperature) (When Rear suspension adjustment activated)  | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |
| C21E1 | SCM    | Air Leak Plausibility check Rear suspension              | If maximum number of readjustment for rear suspension is reach                                                                                                    | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |
| C21F0 | SCM    | Pressure threshold not reach Front suspension adjustment | If pressure threshold not reach after calibrated time delay (threshold change in function of compressor temperature) (When front suspension adjustment activated) | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |
| C21F3 | SCM    | Air Leak Plausibility check Front Right suspension       | If maximum number of readjustment for front right suspension is reach                                                                                             | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |
| C21F4 | SCM    | Air Leak Plausibility check Front left suspension        | If maximum number of readjustment for front left suspension is reach                                                                                              | Open SCM Activation page in BUDS, performe a combined test in System self test sequence section        |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                                     | CAUSE                                                                                   | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------|--------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0030 | ECM    | Internal fault path number for Signal error : power stage of heater of Sensor upstream catalyst | Damaged O2 sensor, damaged circuit wires, damaged connector or damaged ECM output pins. | <p>Check related fuse(s)</p> <p>Disconnect the 1st oxygen sensor (FRONT cylinder) and measure his resistance (Expected value: 7 to 12 Ohms)</p> <p>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)</p> <p>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)</p> <p>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value &lt; 2 Ohms)</p> |
| P0031 | ECM    | Internal fault path number for Min error : power stage of heater of Sensor upstream catalyst    | Damaged O2 sensor, damaged circuit wires,damaged connector or damaged ECM output pins.  | <p>Check related fuse(s)</p> <p>Disconnect the 1st oxygen sensor (FRONT cylinder) and measure his resistance (Expected value: 7 to 12 Ohms)</p> <p>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)</p> <p>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)</p> <p>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value &lt; 2 Ohms)</p> |



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## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                                         | CAUSE                                                                                                          | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------|--------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0032 | ECM    | Internal fault path number for Max error: power stage of heater of Sensor upstream catalyst         | Damaged O2 sensor, damaged circuit wires,damaged connector or damaged ECM output pins.                         | Check related fuse(s)<br>Disconnect the 1st oxygen sensor (FRONT cylinder) and measure his resistance (Expected value: 7 to 12 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P0037 | ECM    | Internal fault path number for Min error : power stage of heater of Sensor upstream catalyst, LSU 2 | Blown fuse, damaged or disconnected O2 sensor, damaged or disconnected circuit wires, damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 2nd oxygen sensor (REAR cylinder) and measure his resistance (Expected value: 7 to 12 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)  |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                                        | CAUSE                                                                                                          | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------|--------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0038 | ECM    | Internal fault path number for Max error: power stage of heater of Sensor upstream catalyst, LSU 2 | Blown fuse, damaged or disconnected O2 sensor, damaged or disconnected circuit wires, damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 2nd oxygen sensor (REAR cylinder) and measure his resistance (Expected value: 7 to 12 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P0106 | ECM    | Manifold Absolute Pressure circuit range/performance                                               | Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins, ECM voltage supply               | Make sure sensor connector is well inserted<br>Disconnect the sensor, measure the voltage of the harness power wires (Expected value: 4.8 to 5.1 Volts)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                                                                                                                             |
| P0107 | ECM    | Manifold Air Pressure Sensor voltage too Low                                                       | Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins, ECM voltage supply Low           | Make sure sensor connector is well inserted<br>Disconnect the sensor, measure the voltage of the harness power wires (Expected value: 4.8 to 5.1 Volts)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                                                                                                                             |

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## Subsection XX (DIAGNOSTIC AND FAULT CODES)

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| PCODE | MODULE | DESCRIPTION                                   | CAUSE                                                                                                | ACTION                                                                                                                                                                                                                                                                  |
|-------|--------|-----------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0108 | ECM    | Manifold Air Pressure Sensor voltage too High | Damaged sensor, wires shorted to battery +, ECM voltage supply too High.                             | Make sure sensor connector is well inserted<br>Disconnect the sensor, measure the voltage of the harness power wires (Expected value: 4.8 to 5.1 Volts)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P0112 | ECM    | Intake Air Temperature Sensor 1 circuit Low   | Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins, ECM voltage supply Low | Make sure sensor connector is well inserted<br>Disconnect the sensor, measure the voltage of the harness power wires (Expected value: 4.8 to 5.1 Volts)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P0113 | ECM    | Intake Air Temperature Sensor 1 circuit High  | Damaged sensor, wires shorted to battery +, ECM voltage supply too High.                             | Make sure sensor connector is well inserted<br>Disconnect the sensor, measure the voltage of the harness power wires (Expected value: 4.8 to 5.1 Volts)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                   | CAUSE                                                           | ACTION                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------|--------|---------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0116 | ECM    | Engine Coolant Temperature Sensor 1 circuit range/performance | Damaged sensor, wires shorted to battery +, ECM voltage supply. | Disconnect the sensor and check for a change in the fault code. If the fault code stays the same, look for a short circuit on the harness. If the fault code is different, replace the sensor<br>Measure the sensor resistance (Expected value: 2280 to 2736 Ohms at 19 to 21°C (66 to 70°F))<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P0117 | ECM    | Engine Coolant Temperature Sensor 1 circuit Low               | Engine temperature sensor or circuit wires shorted to ground.   | Disconnect the sensor and check for a change in the fault code. If the fault code stays the same, look for a short circuit on the harness. If the fault code is different, replace the sensor<br>Measure the sensor resistance (Expected value: 2280 to 2736 Ohms at 19 to 21°C (66 to 70°F))<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P0118 | ECM    | Engine Coolant Temperature Sensor 1 circuit High              | Disconnected sensor, or sensor resistance too High.             | Make sure sensor connector is well inserted<br>Measure the sensor resistance (Expected value: 2280 to 2736 Ohms at 19 to 21°C (66 to 70°F))<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                                                                   |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                                  | CAUSE                                                                                   | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------|--------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0122 | ECM    | First Throttle Accelerator Sensor (TAS) Short circuit to GND                                 | Damaged circuit wires, damaged sensor or damaged ECM pins.                              | Make sure sensor connector is well inserted<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                                                                                                                                                                                                                                          |
| P0123 | ECM    | First Throttle Accelerator Sensor (TAS) shorted to battery +                                 | Damaged circuit wires, damaged sensor or damaged ECM pins.                              | Make sure sensor connector is well inserted<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                                                                                                                                                                                                                                          |
| P0127 | ECM    | Intake Air Temperature too High                                                              | Air Temperature in intake High                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| P0130 | ECM    | ECU int. fault path no.: electrical diagnosis for lambda sensor upstream catalyst. npl-error | Damaged O2 sensor, damaged circuit wires, damaged connector or damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 1st oxygen sensor (FRONT cylinder) and measure his resistance (Expected value: 7 to 12 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                                      | CAUSE                                                                                            | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------|--------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0131 | ECM    | ECU int. fault path no.:<br>electrical diagnosis for<br>lambda sensor upstream<br>cat. min-error | Damaged O2 sensor,<br>damaged circuit wires,<br>damaged connector or<br>damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 1st<br>oxygen sensor (FRONT<br>cylinder) and measure<br>his resistance (Expected<br>value: 7 to 12 Ohms)<br>Measure the voltage<br>of the harness power<br>wire relative to ground<br>(Expected value:<br>Battery voltage)<br>Disconnect the<br>associated ECM<br>connector and<br>measure resistance<br>between harness<br>wires and ground<br>(Expected value: open)<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms) |
| P0132 | ECM    | ECU int. fault path no.:<br>electrical diagnosis for<br>lambda sensor upstream<br>cat. max-error | Damaged O2 sensor,<br>damaged circuit wires,<br>damaged connector or<br>damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 1st<br>oxygen sensor (FRONT<br>cylinder) and measure<br>his resistance (Expected<br>value: 7 to 12 Ohms)<br>Measure the voltage<br>of the harness power<br>wire relative to ground<br>(Expected value:<br>Battery voltage)<br>Disconnect the<br>associated ECM<br>connector and<br>measure resistance<br>between harness<br>wires and ground<br>(Expected value: open)<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms) |

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## Subsection XX (DIAGNOSTIC AND FAULT CODES)

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| PCODE | MODULE | DESCRIPTION                                                              | CAUSE                                                                                            | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------|--------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0133 | ECM    | ECU int. fault path no.:<br>diagnosis lambda sensor<br>upstream catalyst | Damaged O2 sensor,<br>damaged circuit wires,<br>damaged connector or<br>damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 1st<br>oxygen sensor (FRONT<br>cylinder) and measure<br>his resistance (Expected<br>value: 7 to 12 Ohms)<br>Measure the voltage<br>of the harness power<br>wire relative to ground<br>(Expected value:<br>Battery voltage)<br>Disconnect the<br>associated ECM<br>connector and<br>measure resistance<br>between harness<br>wires and ground<br>(Expected value: open)<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms) |
| P0135 | ECM    | ECU int. fault path no.:<br>lambda sensor heating<br>upstream cat.       | Damaged O2 sensor,<br>damaged circuit wires,<br>damaged connector or<br>damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 1st<br>oxygen sensor (FRONT<br>cylinder) and measure<br>his resistance (Expected<br>value: 7 to 12 Ohms)<br>Measure the voltage<br>of the harness power<br>wire relative to ground<br>(Expected value:<br>Battery voltage)<br>Disconnect the<br>associated ECM<br>connector and<br>measure resistance<br>between harness<br>wires and ground<br>(Expected value: open)<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms) |

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| PCODE | MODULE | DESCRIPTION                                                                                             | CAUSE                                                                                            | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------|--------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0136 | ECM    | ECU int. fault path no.:<br>electrical diagnosis for<br>second lambda sensor<br>upstream cat. npl-error | Damaged O2 sensor,<br>damaged circuit wires,<br>damaged connector or<br>damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 2nd<br>oxygen sensor (REAR<br>cylinder) and measure<br>his resistance (Expected<br>value: 7 to 12 Ohms)<br>Measure the voltage<br>of the harness power<br>wire relative to ground<br>(Expected value:<br>Battery voltage)<br>Disconnect the<br>associated ECM<br>connector and<br>measure resistance<br>between harness<br>wires and ground<br>(Expected value: open)<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms) |
| P0137 | ECM    | ECU int. fault path no.:<br>electrical diagnosis for<br>second lambda sensor<br>upstream cat. min-error | Damaged O2 sensor,<br>damaged circuit wires,<br>damaged connector or<br>damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 2nd<br>oxygen sensor (REAR<br>cylinder) and measure<br>his resistance (Expected<br>value: 7 to 12 Ohms)<br>Measure the voltage<br>of the harness power<br>wire relative to ground<br>(Expected value:<br>Battery voltage)<br>Disconnect the<br>associated ECM<br>connector and<br>measure resistance<br>between harness<br>wires and ground<br>(Expected value: open)<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms) |



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| PCODE | MODULE | DESCRIPTION                                                                                    | CAUSE                                                                                   | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------|--------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0138 | ECM    | ECU int. fault path no.: electrical diagnosis for second lambda sensor upstream cat. max-error | Damaged O2 sensor, damaged circuit wires, damaged connector or damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 2nd oxygen sensor (REAR cylinder) and measure his resistance (Expected value: 7 to 12 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P0139 | ECM    | ECU int. fault path no.: diagnosis lambda sensor upstream catalyst (exhaust bank2)             | Damaged O2 sensor, damaged circuit wires, damaged connector or damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 2nd oxygen sensor (REAR cylinder) and measure his resistance (Expected value: 7 to 12 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |

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| PCODE | MODULE | DESCRIPTION                                                        | CAUSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------|--------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0141 | ECM    | ECU int. fault path no.:<br>lambda sensor heating<br>upstream cat. |   <p>If you bought this manual from any other seller please leave them<br/>NEGATIVE feedback and notify me at <a href="mailto:bestshopmanuals@gmail.com">bestshopmanuals@gmail.com</a></p> <p>Damaged O2 sensor,<br/>damaged circuit wires,<br/>damaged connector or<br/>damaged ECM output pins.</p> | <p>Check related fuse(s)<br/>Disconnect the 2nd<br/>oxygen sensor (REAR<br/>cylinder) and measure<br/>his resistance (Expected<br/>value: 7 to 12 Ohms)<br/>Measure the voltage<br/>of the harness power<br/>wire relative to ground<br/>(Expected value:<br/>Battery voltage)<br/>Disconnect the<br/>associated ECM<br/>connector and<br/>measure resistance<br/>between harness<br/>wires and ground<br/>(Expected value: open)<br/>Measure the resistance<br/>of the harness wires,<br/>between the ECM<br/>and sensor connectors<br/>(Expected value &lt; 2<br/>Ohms)</p> |
| P0201 | ECM    | Power stage sig error<br>injector 2                                | ECM injector power stage<br>error                                                                                                                                                                                                                                                                                                                                                                                                                                        | Open ECM ACTIVATION<br>page in BUDS.<br>Activate injector and<br>check if injector is<br>reacting as expected                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| P0202 | ECM    | Power stage sig error<br>injector 1                                | ECM injector power stage<br>error                                                                                                                                                                                                                                                                                                                                                                                                                                        | Open ECM ACTIVATION<br>page in BUDS.<br>Activate injector and<br>check if injector is<br>reacting as expected                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| P0217 | ECM    | Engine Coolant over<br>temperature condition                       | Coolant fluid temperature too<br>high                                                                                                                                                                                                                                                                                                                                                                                                                                    | Check for coolant<br>fluid leak and<br>coolant fluid level<br>Check radiator condition<br>Check for other fault,<br>Check thermostat                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| P0222 | ECM    | 2nd Throttle Accelerator<br>Sensor (TAS) shorted to<br>GND         | Damaged circuit wires,<br>damaged sensor, or damaged<br>ECM pins.                                                                                                                                                                                                                                                                                                                                                                                                        | Make sure sensor<br>connector is<br>well inserted<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms)                                                                                                                                                                                                                                                                                                                                                                                              |

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| PCODE | MODULE | DESCRIPTION                                                | CAUSE                                                                                                                | ACTION                                                                                                                                                                                                                                                                                                                                                                            |
|-------|--------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0223 | ECM    | 2nd Throttle Accelerator Sensor (TAS) shorted to battery + | Damaged circuit wires, damaged sensor, or damaged ECM pins.                                                          | Make sure sensor connector is well inserted<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                                                                                                                                       |
| P0231 | ECM    | Fuel Pump circuit shorted to ground, or open circuit       | Blown fuse, damaged or disconnected fuel pump, damaged circuit wires, damaged connectors or damaged ECM output pins. | Check related fuse(s)<br>Disconnect the fuel pump and measure his winding resistance (Expected value < 2 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wire, between the ECM and fuel pump connectors (Expected value < 2 Ohms) |
| P0232 | ECM    | Fuel Pump circuit shorted to battery +                     | Damaged fuel pump, damaged circuit wires, damaged connectors or damaged ECM output pins.                             | Check related fuse(s)<br>Disconnect the fuel pump and measure his winding resistance (Expected value < 2 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wire, between the ECM and fuel pump connectors (Expected value < 2 Ohms) |

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| PCODE | MODULE | DESCRIPTION                                           | CAUSE                                                                                                         | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------|--------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0261 | ECM    | Cylinder 1 injector open circuit or shorted to ground | Blown fuse, damaged or disconnected injector, damaged or disconnected circuit wires, damaged ECM output pins. | <p>Check related fuse(s)</p> <p>Disconnect injector 1 and measure his resistance (Expected value: 14 to 15 Ohms)</p> <p>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)</p> <p>Disconnect the associated ECM connector</p> <p>Measure the resistance of the harness wire, between the ECM and injector 1 connectors (Expected value &lt; 2 Ohms)</p> <p>Check if HIC connector is connecting the engine harness to the vehicle harness</p>                                                                                      |
| P0262 | ECM    | Cylinder 1 injector shorted to battery +              | Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.                        | <p>Check related fuse(s)</p> <p>Disconnect injector 1 and measure his resistance (Expected value: 14 to 15 Ohms)</p> <p>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)</p> <p>Disconnect the associated ECM connector</p> <p>Verify the isolation between harness injectors signals (Expected value: open)</p> <p>Measure the resistance of the harness wire, between the ECM and injector 1 connectors (Expected value &lt; 2 Ohms)</p> <p>Check if HIC connector is connecting the engine harness to the vehicle harness</p> |

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| PCODE | MODULE | DESCRIPTION                                           | CAUSE                                                                                                         | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------|--------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0264 | ECM    | Cylinder 2 injector open circuit or shorted to ground | Blown fuse, damaged or disconnected injector, damaged or disconnected circuit wires, damaged ECM output pins. | Check related fuse(s)<br>Disconnect injector 2 and measure his resistance (Expected value: 14 to 15 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wire, between the ECM and injector 2 connectors (Expected value < 2 Ohms)<br>Check if HIC connector is connecting the engine harness to the vehicle harness                                                                                  |
| P0265 | ECM    | Cylinder 2 injector shorted to battery +              | Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.                        | Check related fuse(s)<br>Disconnect injector 2 and measure his resistance (Expected value: 14 to 15 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Verify the isolation between harness injectors signals (Expected value: open)<br>Measure the resistance of the harness wire, between the ECM and injector 2 connectors (Expected value < 2 Ohms)<br>Check if HIC connector is connecting the engine harness to the vehicle harness |
| P0324 | ECM    | Diagnostic Fault Code for min error of knock sensor   | Damaged knock sensor, damaged circuit wires, damaged connector or damaged ECM output pins.                    | Make sure sensor connector is fully inserted and check knock system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

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| PCODE | MODULE | DESCRIPTION                                         | CAUSE                                                                                       | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------|--------|-----------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P032A | ECM    | Diagnostic Fault Code for min error of knock sensor | Damaged knock sensor, damaged circuit wires, damaged connector or damaged ECM output pins.  | Make sure sensor connector is fully inserted and check knock system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| P0335 | ECM    | Crankshaft Position Sensor                          | Damaged CPS, damaged circuit wires, damaged connector or damaged ECM output pins.           | Make sure sensor connector is well inserted<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                                                                                                                                                                                                                                                                                                        |
| P0359 | ECM    | Ignition coil                                       | Damaged ignition coil, damaged circuit wires, damaged connector or damaged ECM output pins. | Open the ECM Activation page in BUDS<br>Perform an ignition coil activation and check if ignition coil is reacting as expected<br>Check related fuse(s)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value < 2 Ohms)<br>Check if HIC connector is connecting the engine harness to the vehicle harness<br>Refer to the service manual for detailed ignition coil testing procedure |

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| PCODE | MODULE | DESCRIPTION                     | CAUSE                                                                                       | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------|--------|---------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0360 | ECM    | Ignition coil                   | Damaged ignition coil, damaged circuit wires, damaged connector or damaged ECM output pins. | Open the ECM Activation page in BUDS<br>Perform an ignition coil activation and check if ignition coil is reacting as expected<br>Check related fuse(s)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value < 2 Ohms)<br>Check if HIC connector is connecting the engine harness to the vehicle harness<br>Refer to the service manual for detailed ignition coil testing procedure |
| P0361 | ECM    | Ignition coil range/performance | Damaged ignition coil, damaged circuit wires, damaged connector or damaged ECM output pins. | Open the ECM Activation page in BUDS<br>Perform an ignition coil activation and check if ignition coil is reacting as expected<br>Check related fuse(s)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value < 2 Ohms)<br>Check if HIC connector is connecting the engine harness to the vehicle harness<br>Refer to the service manual for detailed ignition coil testing procedure |

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| PCODE | MODULE | DESCRIPTION                     | CAUSE                                                                                                                   | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------|--------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0362 | ECM    | Ignition coil range/performance | Damaged ignition coil, damaged circuit wires, damaged connector or damaged ECM output pins.                             | <p>Open the ECM Activation page in BUDS</p> <p>Perform an ignition coil activation and check if ignition coil is reacting as expected</p> <p>Check related fuse(s)</p> <p>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)</p> <p>Disconnect the associated ECM connector</p> <p>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value &lt; 2 Ohms)</p> <p>Check if HIC connector is connecting the engine harness to the vehicle harness</p> <p>Refer to the service manual for detailed ignition coil testing procedure</p> |
| P0480 | ECM    | Radiator cooling fan relay      | Blown fuse, damaged or disconnected relay, damaged circuit wires or connectors, damaged ECM output pins, damaged Relay. | <p>Check related fuse(s)</p> <p>Disconnect relay and measure his coil resistance (Expected value: 70 to 90 Ohms)</p> <p>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)</p> <p>Measure the resistance of the harness wire, between the ECM and tested device connectors (Expected value &lt; 2 Ohms)</p>                                                                                                                                                                                                                                                     |



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| PCODE | MODULE | DESCRIPTION                      | CAUSE                                                                                                                                                                                 | ACTION                                                                                                                                                                                                                                                                                                                               |
|-------|--------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0500 | DPS    | Invalid or missing vehicle speed | No vehicle speed available & Vehicle is in (H or L Gear) with Engine RPM over 4000RPM. Damaged Vehicle Speed sensor circuit, Damaged sensor, Wrong mounting position of speed sensor. | Check if vehicle speed is available in BUDS Monitoring page<br>Check related fuse(s)<br>Disconnect the sensor, measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 5 Ohms)    |
| P0501 | ECM    | Vehicle speed not plausible      | Vehicle speed correlation check failed                                                                                                                                                | Check if vehicle speed is available in Monitoring page in BUDS<br>Check related fuse(s)<br>Disconnect the sensor, measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 5 Ohms) |
| P0504 | ECM    | Brake signal not plausible       | Brake signal correlation check failed                                                                                                                                                 | Open the ECM Monitoring page in BUDS.<br>Check fuse<br>Press on brake pedal.<br>Ensure that brake switch light comes on ECM Monitoring page                                                                                                                                                                                          |
| P0512 | ECM    | Starter control circuit          | Damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins.                                                                                  | Measure voltage between harness connector SS1 and ground (Expected value: 11 to 13 volts)<br>Measure resistance from connector: ECMB-L4 to SS2 (Expected value: < 2 ohms)                                                                                                                                                            |
| P0513 | ECM    | Invalid Access Key Detected      | A non stored access key was detected when key switch was turned to ON.                                                                                                                | Use a stored access key to turn key switch.<br>If no stored access keys are available program one and try again                                                                                                                                                                                                                      |

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| PCODE | MODULE | DESCRIPTION                                    | CAUSE                                                                       | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------|--------|------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0520 | ECM    | Engine oil pressure sensor circuit malfunction | Damaged switch, damaged circuit wires, damaged connector, damaged ECM pins. | <p>Measure resistance between harness connector EOP and ground When engine stopped. (Expected value &lt; 2 Ohms)</p> <p>Measure resistance between harness connector EOP and ground When engine running. (Expected value = open)</p> <p>Measure resistance from harness connector: EOP to ECMA-E3 (Expected value: &lt; 2 Ohms)</p> <p>Check if HIC connector is properly connected (engine harness to the vehicle harness).</p> |
| P0523 | ECM    | Engine oil pressure sensor sticking            | Damaged switch, damaged circuit wires, damaged connector, damaged ECM pins. | <p>Measure resistance between harness connector EOP and ground When engine stopped. (Expected value &lt; 2 Ohms)</p> <p>Measure resistance between harness connector EOP and ground When engine running. (Expected value = open)</p> <p>Measure resistance from harness connector: EOP to ECMA-E3 (Expected value: &lt; 2 Ohms)</p> <p>Check if HIC connector is properly connected (engine harness to the vehicle harness).</p> |

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| PCODE | MODULE | DESCRIPTION                              | CAUSE                                                                                                                                                          | ACTION                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------|--------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0524 | ECM    | Engine oil pressure too Low              | Damaged switch, damaged circuit wires, damaged connector, damaged ECM pins.                                                                                    | Measure resistance between harness connector EOP and ground When engine stopped. (Expected value < 2 Ohms)<br>Measure resistance between harness connector EOP and ground When engine running. (Expected value = open)<br>Measure resistance from harness connector: EOP to ECMA-E3 (Expected value: < 2 Ohms)<br>Check if HIC connector is properly connected (engine harness to the vehicle harness) |
| P0551 | DPS    | TORQUE_SENSOR_OPEN                       | Damaged DPS                                                                                                                                                    | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                                                                                                                                                                                                                   |
| P0552 | DPS    | TORQUE_SENSOR_SHORT_GND                  | Damaged DPS                                                                                                                                                    | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                                                                                                                                                                                                                   |
| P0553 | DPS    | TORQUE_SENSOR_SHORT_5V                   | Damaged DPS                                                                                                                                                    | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                                                                                                                                                                                                                   |
| P0560 | ECM    | Non-plausibility error on system voltage | Battery failure, voltage regulator failure, damaged circuit wires or connection, damaged magneto generator.<br>An external battery charger may have been used. | Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts)<br>Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts)<br>Check connections on voltage regulator.<br>Check ground and positive connections on battery.<br>Check ground on vehicle frame                                                                                                      |

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| PCODE | MODULE    | DESCRIPTION        | CAUSE                                                                                                                                                                                             | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------|-----------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0562 | DPS       | System voltage low | Blown fuse, battery low (damaged magneto/regulator), damaged circuit wires or connection, Intense usage of WINCH                                                                                  | Check related fuse(s)<br>Measure battery voltage with engine stopped (Expected value: 11 to 13 Volts)<br>Check ground and positive connections on battery<br>Validate that all the DPS connectors are secured<br>On the DPS power connector, measure the voltage between the two harness wires (Expected value: Battery voltage)                                                                                                       |
| P0562 | DPS GLOBE | BATTERY LOW        | Battery low (damaged magneto/regulator), damaged circuit wires or connection. Intense usage of WINCH                                                                                              | Measure battery voltage with engine stopped (Expected value: 11 to 13 Volts)<br>Check ground and positive connections on battery<br>Validate that all the DPS connectors are secured<br>On the DPS power connector pins, measure the voltage between the two harness power wires (Expected value: Battery voltage)<br>Measure the resistance of the harness wire, between the DPS power connector and ground (Expected value < 2 Ohms) |
| P0562 | ECM       | System voltage low | Blown fuse FC, battery failure, voltage regulator failure, damaged circuit wires or connection, damaged magneto generator. An external battery charger may have been used. Intense usage of WINCH | Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts)<br>Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts)<br>Check connections on voltage regulator.<br>Check ground and positive connections on battery.<br>Check ground on vehicle frame                                                                                                                                      |

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| PCODE | MODULE    | DESCRIPTION                         | CAUSE                                                                                                       | ACTION                                                                                                                                                                                                                                                                                            |
|-------|-----------|-------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0563 | DPS       | system voltage high                 | Rectifier failure, damaged circuit wires or connection.                                                     | Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts)<br>Measure battery voltage with engine Running at 3500RPM. (Expected value: 13 to 14.7 volts)<br>Check connections on voltage regulator.<br>Check ground and positive connections on battery.                       |
| P0563 | DPS GLOBE | BATTERY HIGH                        | Rectifier failure, damaged circuit wires or connection./<br>Improper battery charger could raise that fault | Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts)<br>Measure battery voltage with engine Running at 3500RPM. (Expected value: 13 to 14.7 volts)<br>Check connections on voltage regulator.<br>Check ground and positive connections on battery.                       |
| P0563 | ECM       | System voltage high                 | Damaged regulator.<br>An external battery charger may have been used.                                       | Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts)<br>Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts)<br>Check connections on voltage regulator.<br>Check ground and positive connections on battery.<br>Check ground on vehicle frame |
| P0601 | DPS       | CALIBRATION FAULT                   | DPS not calibrated or damage DPS                                                                            | Try updating the DPS                                                                                                                                                                                                                                                                              |
| P0601 | SCM       | SCM calibration fault               | Calibration Checksum err                                                                                    | Update SCM                                                                                                                                                                                                                                                                                        |
| P0602 | DPS GLOBE | Manufacturing CRC Programming Error | Internal error or damaged DPS                                                                               | change dps if condition always active                                                                                                                                                                                                                                                             |
| P0605 | SCM       | EEPROM COMMUNICATION FAULT          | Last minute memory or last modes memory check                                                               | External troubleshooting is not possible<br>Check for communication fault using BUDS                                                                                                                                                                                                              |
| P0606 | DPS GLOBE | Application CRC(boot)               | Application CRC(boot)                                                                                       | reflash DPS                                                                                                                                                                                                                                                                                       |

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| PCODE | MODULE    | DESCRIPTION                                                                  | CAUSE                                                                                                   | ACTION                                                                                                                                                                                                                                                                                                        |
|-------|-----------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0606 | ECM       | Control Module Processor                                                     | Faulty calibration<br>Faulty programming<br>Damaged ECM                                                 | Try updating the ECM calibration<br>If the problem persists, reflash ECM<br>If the problem persists, replace the ECM.                                                                                                                                                                                         |
| P0607 | DPS GLOBE | Boot Count(boot)                                                             | Battery low (damaged magneto/regulator), damaged circuit wires or connection.<br>Intense usage of WINCH | Measure battery voltage with engine stopped (Expected value: 11 to 13 Volts)<br>Check ground and positive connections on battery<br>Validate that all the DPS connectors are secured<br>On the DPS power connector, measure the voltage between the two harness power wires (Expected value: Battery voltage) |
| P060D | ECM       | Throttle Accelerator Sensor (TAS) synchronistic error between sensor 1 and 2 | Throttle Accelerator Sensors (TAS) plausibility check error                                             | Make sure sensor connector is well inserted<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                        |
| P060E | ECM       | Throttle position performance                                                | TPS plausibility check error                                                                            | Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                                                                                                                       |
| P0610 | ECM       | Variant Coding error                                                         | Faulty variant coding<br>Faulty programming<br>Wrong ECM after replacement                              | Try updating the ECM variant or calibration<br>If the problem persists, reflash ECM<br>If the problem persists, replace ECM.                                                                                                                                                                                  |
| P062F | DPS GLOBE | EEPROM SPI                                                                   | internal error or damaged DPS, EEPROM SPI                                                               | change dps if condition still active after key-on cycle external troubleshooting not possible                                                                                                                                                                                                                 |

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| PCODE | MODULE    | DESCRIPTION                          | CAUSE                                                                                                           | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------|-----------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P062F | ECM       | Internal control module EEPROM error | Faulty calibration or variant<br>Faulty programming<br>Damaged ECM                                              | Try updating the ECM variant or calibration<br>If the problem persists, reflash ECM<br>If the problem persists, replace ECM.                                                                                                                                                                                                                                                                                                                          |
| P0635 | DPS GLOBE | EXCESSIVE ERROR CURRENT              | internal error or damaged DPS                                                                                   | change DPS                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| P0636 | DPS       | MOTOR LOW CURRENT FAULT              | Internal error or damaged DPS                                                                                   | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                                                                                                                                                                                                                                                                  |
| P0637 | DPS       | MOTOR HIGH CURRENT FAULT             | Internal error or damaged DPS                                                                                   | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                                                                                                                                                                                                                                                                  |
| P0637 | DPS GLOBE | OVER CURRENT                         | short-circuit in motor/ internal error                                                                          | change DPS                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| P0658 | DPS       | PHASE A_LOW                          | DPS motor supply<br>Damaged DPS                                                                                 | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                                                                                                                                                                                                                                                                  |
| P0659 | DPS       | PHASE A_HIGH                         | DPS motor supply<br>Damaged DPS                                                                                 | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                                                                                                                                                                                                                                                                  |
| P0666 | DPS       | HIGH TEMPERATURE                     | High temperature of the DPS.<br>Extreme usage of the unit.                                                      | Let the unit cool down.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| P0685 | ECM       | Accessory relay circuit              | Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins | Check related fuse(s)<br>Disconnect Accessories and Lights relays, turn key switch (on w/lights)<br>Measure coil resistance of both relays (Expected value: 70 to 90 Ohms)<br>Measure the voltage of the harness power wires of both relays relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and both relays (Expected value < 2 Ohms) |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                               | CAUSE                                                                                                                | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------|--------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0686 | ECM    | Accessory relay circuit shorted to ground or open circuit | Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins      | Check related fuse(s)<br>Disconnect Accessories and Lights relays, turn key switch (on w/lights)<br>Measure coil resistance of both relays (Expected value: 70 to 90 Ohms)<br>Measure the voltage of the harness power wires of both relays relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and both relays (Expected value < 2 Ohms) |
| P0687 | ECM    | Accessory relay circuit shorted to battery +              | Damaged relay, damaged circuit wires, damaged connector or damaged ECM output pins.                                  | Check related fuse(s)<br>Disconnect Accessories and Lights relays, turn key switch (on w/lights)<br>Measure coil resistance of both relays (Expected value: 70 to 90 Ohms)<br>Measure the voltage of the harness power wires of both relays relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and both relays (Expected value < 2 Ohms) |
| P0691 | ECM    | Radiator fan circuit shorted to ground or open circuit    | Blown fuse, damaged or disconnected fan relay, damaged circuit wires, damaged connectors or damaged ECM output pins. | Check related fuse(s)<br>Disconnect radiator fan relay and measure his coil resistance (Expected value: 70 to 90 Ohms)<br>Measure the voltage of the harness power wire of relay relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wire, between the ECM and relay (Expected value < 2 Ohms)                                                                   |



## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                                            | CAUSE                                                                                                          | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------|--------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P0692 | ECM    | Radiator fan circuit shorted to battery +                                                              | Damaged fan relay, damaged circuit wires, damaged connector or damaged ECM output pins.                        | Check related fuse(s)<br>Disconnect radiator fan relay and measure his coil resistance (Expected value: 70 to 90 Ohms)<br>Measure the voltage of the harness power wire of relay relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector<br>Measure the resistance of the harness wire, between the ECM and relay (Expected value < 2 Ohms)                                                                                 |
| P0790 | ECM    | Check of Override Button                                                                               | Damaged switch, damaged circuit wires, damaged connector, damaged ECM pins.                                    | Open the ECM Monitoring page in BUDS.<br>Press on Override button.<br>Ensure that the 2 switch light change of state.                                                                                                                                                                                                                                                                                                                                               |
| P0811 | ECM    | Clutch slippage detected                                                                               | Excessive clutch slippage                                                                                      | Check clutch for proper clutch behavior                                                                                                                                                                                                                                                                                                                                                                                                                             |
| P1036 | ECM    | Internal fault path number for Signal error : power stage of heater of Sensor upstream catalyst, LSU 2 | Blown fuse, damaged or disconnected O2 sensor, damaged or disconnected circuit wires, damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 2nd oxygen sensor and measure his resistance (Expected value: 7 to 12 Ohms)<br>Measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Disconnect the associated ECM connector and measure resistance between harness wires and ground (Expected value: open)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P1120 | ECM    | Wrong Throttle Accelerator Sensor (TPS) position                                                       | Wrong TPS sensor position. Both TPS position failed test.                                                      | Check TAS adjustment.                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                                             | CAUSE                                                                                            | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------|--------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P1130 | ECM    | ECU int. fault path no.:<br>electrical diagnosis for<br>lambda sensor upstream<br>cat. Sig-error        | Damaged O2 sensor,<br>damaged circuit wires,<br>damaged connector or<br>damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 1st<br>oxygen sensor (FRONT<br>cylinder) and measure<br>his resistance (Expected<br>value: 7 to 12 Ohms)<br>Measure the voltage<br>of the harness power<br>wire relative to ground<br>(Expected value:<br>Battery voltage)<br>Disconnect the<br>associated ECM<br>connector and<br>measure resistance<br>between harness<br>wires and ground<br>(Expected value: open)<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms) |
| P1136 | ECM    | ECU int. fault path no.:<br>electrical diagnosis for<br>second lambda sensor<br>upstream cat. Sig-error | Damaged O2 sensor,<br>damaged circuit wires,<br>damaged connector or<br>damaged ECM output pins. | Check related fuse(s)<br>Disconnect the 2nd<br>oxygen sensor (REAR<br>cylinder) and measure<br>his resistance (Expected<br>value: 7 to 12 Ohms)<br>Measure the voltage<br>of the harness power<br>wire relative to ground<br>(Expected value:<br>Battery voltage)<br>Disconnect the<br>associated ECM<br>connector and<br>measure resistance<br>between harness<br>wires and ground<br>(Expected value: open)<br>Measure the resistance<br>of the harness wires,<br>between the ECM<br>and sensor connectors<br>(Expected value < 2<br>Ohms)  |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                | CAUSE                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION                                 |
|-------|--------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| P1171 | ECM    | Diagnostic Fault code for Fuel Supply System (ORA Max Fault) Exhaust Bank1 | Injection and fuel supply system.<br>Adaptation of the air charge reaching the limits (min and max) based on the lambda sensors feedback.<br>Too much variation in the engine itself in reference to a nominal engine. It can be cause by an engine that has been modified or out of spec (airbox, air filter, injectors, exhaust system, valve clearance, etc.) or any other components that can influence the engine performance. | Check injector and fuel supply system. |
| P1172 | ECM    | Diagnostic Fault code for Fuel Supply System (ORA Min Fault) Exhaust Bank1 | Injection and fuel supply system.<br>Adaptation of the air charge reaching the limits (min and max) based on the lambda sensors feedback.<br>Too much variation in the engine itself in reference to a nominal engine. It can be cause by an engine that has been modified or out of spec (airbox, air filter, injectors, exhaust system, valve clearance, etc.) or any other components that can influence the engine performance. | Check injector and fuel supply system. |
| P1174 | ECM    | Diagnostic Fault code for Fuel Supply System (ORA Max Fault) Exhaust Bank2 | Injection and fuel supply system.<br>Adaptation of the air charge reaching the limits (min and max) based on the lambda sensors feedback.<br>Too much variation in the engine itself in reference to a nominal engine. It can be cause by an engine that has been modified or out of spec (airbox, air filter, injectors, exhaust system, valve clearance, etc.) or any other components that can influence the engine performance. | Check injector and fuel supply system. |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                                | CAUSE                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION                                                                                                                                |
|-------|--------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| P1175 | ECM    | Diagnostic Fault code for Fuel Supply System (ORA Min Fault) Exhaust Bank2 | Injection and fuel supply system.<br>Adaptation of the air charge reaching the limits (min and max) based on the lambda sensors feedback.<br>Too much variation in the engine itself in reference to a nominal engine. It can be cause by an engine that has been modified or out of spec (airbox, air filter, injectors, exhaust system, valve clearance, etc.) or any other components that can influence the engine performance. | Check injector and fuel supply system.                                                                                                |
| P1339 | ECM    | Signal fault at phase determination                                        | backup phase detection strategies not able to find the correct phase                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                       |
| P1606 | ECM    | Control Module Processor                                                   | Internal ECM problem                                                                                                                                                                                                                                                                                                                                                                                                                | Check for ECM fault<br>External troubleshooting not possible                                                                          |
| P160E | ECM    | Electrical Throttle Actuator (ETA) control fault                           | Damaged ETC, damaged circuit wires, damaged connector or damaged ECM output pins.                                                                                                                                                                                                                                                                                                                                                   | Disconnect ETC<br>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value < 2 Ohms) |
| P1610 | ECM    | Electrical Throttle Actuator (ETA) shorted to V +                          | Damaged ETC, damaged circuit wires, damaged connector or damaged ECM output pins.                                                                                                                                                                                                                                                                                                                                                   | Disconnect ETC<br>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value < 2 Ohms) |
| P1611 | ECM    | Electrical Throttle Actuator (ETA) shorted to ground                       | Damaged ETC, damaged circuit wires, damaged connector or damaged ECM output pins.                                                                                                                                                                                                                                                                                                                                                   | Disconnect ETC<br>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value < 2 Ohms) |
| P1612 | ECM    | Electrical Throttle Actuator (ETA) signal not plausible                    | Damaged ETC, damaged circuit wires, damaged connector or damaged ECM output pins.                                                                                                                                                                                                                                                                                                                                                   | Disconnect ETC<br>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value < 2 Ohms) |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                        | CAUSE                                                                                    | ACTION                                                                                                                                                                                                                                                                                           |
|-------|--------|----------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P1613 | ECM    | Electrical Throttle Actuator (ETA)                 | Damaged ETC, damaged circuit wires, damaged connector or damaged ECM output pins.        | Disconnect ETC<br>Measure the resistance of the harness wires, between the ECM and tested device connectors (Expected value < 2 Ohms)                                                                                                                                                            |
| P1614 | ECM    | Throttle idle position failure on throttle release | Throttle mechanical adjustment<br>No initialization after throttle body/ ECM replacement | Check throttle mechanical adjustment.<br>Check idle stop for wear.<br>Ensure throttle plate is against throttle stop.<br>Check throttle angle at idle.<br>Perform THROTTLE POSITION SENSOR RESET in BUDS with throttle completely OFF.<br>Refer to the service manual for more details.          |
| P1615 | ECM    | TPS position deviation fault                       | Throttle mechanical adjustment<br>No initialization after throttle body/ ECM replacement | Check throttle mechanical adjustment.<br>Check idle stop for wear.<br>Ensure throttle plate is against throttle stop.<br>Check throttle angle at idle.<br>Perform THROTTLE POSITION SENSOR INITIALIZATION in BUDS with throttle completely OFF.<br>Refer to the service manual for more details. |
| P1616 | ECM    | Throttle limp-home-position failed                 | Throttle mechanical stop<br>No initialization after throttle body/ ECM replacement       | Check throttle mechanical adjustment.<br>Check idle stop for wear.<br>Ensure throttle plate is against throttle stop.<br>Check throttle angle at idle.<br>Perform THROTTLE POSITION SENSOR INITIALIZATION in BUDS with throttle completely OFF.<br>Refer to the service manual for more details. |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                               | CAUSE                                                                                                          | ACTION                                                                                                                                                                                                                                                                              |
|-------|--------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P1619 | ECM    | TPS adaptation failure                                    | Wrong throttle body mechanical position during reset of closed TPS or no initialization after ECM replacement. | Check THROTTLE cable adjustment.<br>Check idle stop for wear.<br>Ensure throttle plate is against throttle stop.<br>Perform THROTTLE POSITION SENSOR INITIALIZATION in BUDS with throttle completely OFF.FF.                                                                        |
| P1620 | ECM    | TPS adaptation failure                                    | Wrong throttle body mechanical position during reset of closed TPS or no initialization after ECM replacement. | Check cable adjustment.<br>Check idle stop for wear.<br>Make sure throttle plate is against throttle stop.<br>Perform THROTTLE POSITION SENSOR INITIALIZATION in BUDS with throttle completely OFF.                                                                                 |
| P1621 | ECM    | TPS adaptation cancelled lower mechanical stop failed     | Throttle mechanical stop<br>No initialization after throttle body/ ECM replacement                             | Check cable adjustment.<br>Check idle stop for wear.<br>Ensure throttle plate is against throttle stop.<br>Check throttle angle at idle.<br>Perform THROTTLE POSITION SENSOR INITIALIZATION in BUDS with throttle completely OFF.<br>Refer to the service manual for more details.  |
| P1622 | ECM    | TPS adaptation failed                                     | Throttle mechanical stop<br>No initialization after throttle body/ ECM replacement                             | Check cable adjustment.<br>Check idle stop for wear.<br>Ensure throttle plate is against throttle stop..<br>Check throttle angle at idle.<br>Perform THROTTLE POSITION SENSOR INITIALIZATION in BUDS with throttle completely OFF.<br>Refer to the service manual for more details. |
| P16C0 | ECM    | ECU ADC plausibility check                                | Monitoring plausibility check failed                                                                           | Check for ECM fault                                                                                                                                                                                                                                                                 |
| P16C1 | ECM    | ECU ADC test failed                                       | Monitoring plausibility check failed                                                                           | Check for ECM fault                                                                                                                                                                                                                                                                 |
| P16C2 | ECM    | ECU monitoring error                                      | Monitoring plausibility check failed                                                                           | Check for ECM fault                                                                                                                                                                                                                                                                 |
| P16C3 | ECM    | Throttle Accelerator Sensors (TAS) monitoring check fault | Monitoring plausibility check failed                                                                           | Check for ECM fault                                                                                                                                                                                                                                                                 |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                                 | CAUSE                                                                                  | ACTION                                                                                                                                                                                                      |
|-------|--------|-------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P16C4 | ECM    | Engine speed monitoring check fault                         | Monitoring plausibility check failed                                                   | Check for ECM fault                                                                                                                                                                                         |
| P16C5 | ECM    | Safety fuel cut-off activated monitoring check level 1      | Monitoring plausibility check failed                                                   | Check for ECM fault                                                                                                                                                                                         |
| P16C6 | ECM    | Safety fuel cut-off activated monitoring check level 2      | Monitoring plausibility check failed                                                   | Check for ECM fault                                                                                                                                                                                         |
| P16C7 | ECM    | Throttle valve plausibility check failed                    | Monitoring plausibility check failed                                                   | Check for ECM fault                                                                                                                                                                                         |
| P16C8 | ECM    | Permitted throttle valve position monitoring check exceeded | Monitoring plausibility check failed                                                   | Check for ECM fault                                                                                                                                                                                         |
| P1F01 | DPS    | Power output overload                                       | Motor short circuit or power output failed                                             | Reset fault, If fault re-occur, replace DPS unit                                                                                                                                                            |
| P1F02 | DPS    | Power output overload (18V).                                | High voltage at the unit input.                                                        | Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts)<br>Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts)<br>test charging system as per shop manual |
| P1F03 | DPS    | Electronic Circuit Overheat                                 | Hi temperature detected by on board temperature sensor.                                | Fault may become Active in extreme use situations.<br>Reset fault and let DPS cool down.<br>If fault re-occur in normal riding conditions, replace DPS unit                                                 |
| P1F05 | DPS    | Motor current sensor range/performance                      | Motor input vs output Current correlation check failed                                 | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                        |
| P20EB | ECM    | Main relay de-energized too late or sticking                | Damaged circuit wires, damaged connectors or damaged ECM output pins.<br>Damaged relay | Disconnect main relay and measure his coil resistance (Expected value: 70 to 90 Ohms)                                                                                                                       |

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| PCODE | MODULE | DESCRIPTION                                 | CAUSE                                                                                                | ACTION                                                                                                                                                                                                                                                                  |
|-------|--------|---------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P212C | ECM    | 2nd Throttle Accelerator Sensors (TPS) low  | Damaged TPS, damaged circuit wires, damaged connector or damaged ECM output pins.                    | Make sure sensor connector is well inserted<br>Disconnect the sensor and associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                       |
| P212D | ECM    | 2nd Throttle Accelerator Sensors (TPS) high | Damaged TPS, damaged circuit wires, damaged connector or damaged ECM output pins.                    | Make sure sensor connector is well inserted<br>Disconnect the sensor and associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms)                                                       |
| P2228 | ECM    | Ambient pressure sensor shorted to ground   | Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins, ECM voltage supply low | Make sure sensor connector is well inserted<br>Disconnect the sensor, measure the voltage of the harness power wires (Expected value: 4.8 to 5.1 Volts)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P2229 | ECM    | Ambient pressure sensor short to V +        | Damaged sensor, wires shorted to battery +, ECM voltage supply too high.                             | Make sure sensor connector is well inserted<br>Disconnect the sensor, measure the voltage of the harness power wires (Expected value: 4.8 to 5.1 Volts)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P2279 | ECM    | Intake Air System leak                      | Check for cracked plenum                                                                             | Intake or throttle body air leak                                                                                                                                                                                                                                        |



## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE | DESCRIPTION                                        | CAUSE                                                                                                                                      | ACTION                                                                                                                                                                                                            |
|-------|--------|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P2299 | ECM    | Throttle and brake pedal are used at the same time | If the accelerator pedal and the brake are activated simultaneously for a delay time and the vehicle is moving faster than Speed-threshold |                                                                                                                                                                                                                   |
| P2416 | ECM    | exchanged lambda sensors upstream catalyst         | Wrong O2 sensor position after O2 replacement or wire replacement.                                                                         | Swap O2 sensor wires.                                                                                                                                                                                             |
| P2530 | ECM    | Ignition switch state not plausible                | Ignition key switch connection or internal switch fault                                                                                    | Check ignition key contacts and wire connections                                                                                                                                                                  |
| P2620 | ECM    | Throttle Accelerator Sensors (TPS) position        | Wrong TPS sensor position.                                                                                                                 | Check TAS adjustment.                                                                                                                                                                                             |
| P2621 | ECM    | First Throttle Accelerator Sensor (TPS) low        | Damaged TPS, damaged circuit wires, damaged connector or damaged ECM output pins.                                                          | Make sure sensor connector is well inserted<br>Disconnect the sensor and associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P2622 | ECM    | First Throttle Accelerator Sensors (TPS) high      | Damaged TPS, damaged circuit wires, damaged connector or damaged ECM output pins.                                                          | Make sure sensor connector is well inserted<br>Disconnect the sensor and associated ECM connector<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 2 Ohms) |
| P2670 | DPS    | PHASE B_LOW                                        | DPS motor supply<br>Damaged DPS                                                                                                            | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                              |
| P2671 | DPS    | PHASE B_HIGH                                       | DPS motor supply<br>Damaged DPS                                                                                                            | External troubleshooting is not possible<br>Clear the Fault. If Fault becomes Active Replace the DPS                                                                                                              |

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| PCODE | MODULE | DESCRIPTION                                                       | CAUSE                                                                                          | ACTION                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------|--------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P2801 | ECM    | Gear position sensor invalid range                                | Damaged circuit wires, damaged gear position sensor, damaged ECM pins or damaged transmission. | Open ECM Monitoring page in BUDS, Verify that gear position information changes with gear selection changes on vehicle. Disconnect GBPS Measure voltage between harness connector 5-GBPS-1 and 5-GBPS-3. (Expected value: 4.8 to 5.1 Volts) Measure resistance from connector: 5-ECM-B13 to 5-GBPS-2 (Expected value: < 2 Ohms) Measure resistance from connector: 5-ECM-B22 to 5-GBPS-3 (Expected value: < 2 Ohms) |
| P2806 | ECM    | Gear position sensor angle defined area vs position not plausible | Damaged circuit wires, damaged gear position sensor, damaged ECM pins or damaged transmission. | Open ECM Monitoring page in BUDS, Verify that gear position information changes with gear selection changes on vehicle. Disconnect GBPS Measure voltage between harness connector 5-GBPS-1 and 5-GBPS-3. (Expected value: 4.8 to 5.1 Volts) Measure resistance from connector: 5-ECM-B13 to 5-GBPS-2 (Expected value: < 2 Ohms) Measure resistance from connector: 5-ECM-B22 to 5-GBPS-3 (Expected value: < 2 Ohms) |
| U0073 | DPS    | CAN bus off, no messages                                          | Damaged circuit wires or damaged DPS pins.                                                     | On the Diagnostic connector, measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms) Measure the resistance of each CAN wire in the harness, between the Diagnostic and DPS connectors (Expected value < 5 Ohms)                                                                                                                                                                           |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE    | DESCRIPTION                                    | CAUSE                                                                                             | ACTION                                                                                                                                                                                                                                    |
|-------|-----------|------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U0073 | DPS GLOBE | CAN LOSS/CANBUS FAILURE/CANBUSS OFF            | Damaged CAN Bus wires to Network, damaged DPS pins or wires.                                      | On the Diagnostic connector, measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms) Measure the resistance of each CAN wire in the harness, between the Diagnostic and DPS connectors (Expected value < 5 Ohms) |
| U0073 | SCM       | CAN-Bus failure, CAN-Bus OFF                   | Damaged circuit wires or damaged SCM pins.                                                        | On the Diagnostic connector, measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms) Measure the resistance of each CAN wire in the harness, between the Diagnostic and SCM connectors (Expected value < 2 Ohms) |
| U0100 | DPS       | Lost communication with ECM (lost of CAN ID's) | Damaged CAN Bus wires to ECM, damaged DPS/ECM pins.                                               | On the Diagnostic connector, measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms) Measure the resistance of each CAN wire in the harness, between the Diagnostic and ECM connectors (Expected value < 5 Ohms) |
| U0100 | DPS GLOBE | ECM CAN COMMUNICATION OFF                      | Damaged CAN Bus wires to Network, damaged DPS pins or wires.                                      | On the Diagnostic connector, measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms) Measure the resistance of each CAN wire in the harness, between the Diagnostic and DPS connectors (Expected value < 5 Ohms) |
| U0100 | SCM       | Lost Communication With ECM (lost of CAN ID's) | Missing CAN ID from ECM<br>Internal module error<br>Damaged circuit wires or damaged module pins. | On the Diagnostic connector, measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms) Measure the resistance of each CAN wire in the harness, between the Diagnostic and ECM connectors (Expected value < 2 Ohms) |

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| PCODE | MODULE | DESCRIPTION                                        | CAUSE                                                                                    | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------|--------|----------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U0155 | DPS    | Lost communication with CLUSTER                    | Damage CAN Bus wires to cluster<br>Damaged circuit wires or damaged Cluster module pins. | On the Cluster power connector, measure the voltage between the two harness power wires (Expected value: Battery voltage)<br>On the Diagnostic connector, measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms)<br>Measure the resistance of each CAN wire in the harness, between the Diagnostic and Cluster connectors (Expected value < 2 Ohms)                                                                                                                                                                                                                                                                        |
| U0155 | ECM    | Lost communication with CLUSTER (lost of CAN ID's) | Missing CAN ID<br>Module internal error<br>Damaged circuit wires or damaged module pins. | With vehicle connected to BUDS with MPI2, check for CLUSTER fault or ECM fault<br>Disconnect the cluster connector<br>Measure the voltage of the harness power wires relative to ground (Expected value: Battery voltage)<br>Disconnect MPI2 from DB connector<br>Measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms)<br>Disconnect the ECM connector<br>Measure the resistance of each CAN wire in the harness, between the Diagnostic and ECM connectors (Expected value < 2 Ohms)<br>Measure the resistance of each CAN wire in the harness, between the Diagnostic and Cluster connectors (Expected value < 2 Ohms) |

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## Subsection XX (DIAGNOSTIC AND FAULT CODES)

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| PCODE | MODULE | DESCRIPTION                                        | CAUSE                                                                                    | ACTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------|--------|----------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U0155 | ECM    | Lost communication with CLUSTER (lost of CAN ID's) | Missing CAN ID<br>Module internal error<br>Damaged circuit wires or damaged module pins. | With vehicle connected to BUDS with MPI2, check for CLUSTER fault or ECM fault<br>Disconnect the cluster connector<br>Measure the voltage of the harness power wires relative to ground (Expected value: Battery voltage)<br>Disconnect MPI2 from DB connector<br>Measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms)<br>Disconnect the ECM connector<br>Measure the resistance of each CAN wire in the harness, between the Diagnostic and ECM connectors (Expected value < 2 Ohms)<br>Measure the resistance of each CAN wire in the harness, between the Diagnostic and Cluster connectors (Expected value < 2 Ohms) |
| U0155 | SCM    | Lost Communication With Cluster (lost of CAN ID's) | Missing CAN ID<br>Module internal error<br>Damaged circuit wires or damaged module pins. | Check for Cluster fault<br>Measure the voltage of the cluster harness power wires relative to ground (Expected value: Battery voltage)<br>On the Diagnostic connector, measure the resistance between the two CAN lines (Expected value: 50 to 70 Ohms)<br>Measure the resistance of each CAN wire in the harness, between the Diagnostic and SCM connectors (Expected value < 2 Ohms)<br>Measure the resistance of each CAN wire in the harness, between the Diagnostic and Cluster connectors (Expected value < 2 Ohms)                                                                                                                            |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

| PCODE | MODULE    | DESCRIPTION                                                | CAUSE                                                                               | ACTION                                                                                                                                                                                                                                                                                                 |
|-------|-----------|------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U0167 | ECM       | Lost communication with Vehicle Immobilizer Control Module | The Vehicle Immobilizer is reporting an electrical fault on the communication line. | Check for dirty or oxidized Key contact. Clean key contact if needed.<br>Check for broke key contact<br>Ensure sensor connector is fully inserted.<br>Measure resistance between ECMB-A1 and CC-C (Expected value < 2 Ohms).<br>Measure resistance between ECMB-C2 and CC-E (Expected value < 2 Ohms). |
| U0300 | ECM       | Invalid Security Exchange received                         | Incorrect ECM or CLUSTER, Incorrect software version.                               | Install the proper ECM or CLUSTER on vehicle.<br>Update security coding using BUDS                                                                                                                                                                                                                     |
| U0301 | ECM       | Variant Coding, software incompatibility (DFC_MoFVar)      | Faulty calibration or variant<br>Faulty programming<br>Damaged ECM                  | Try updating the ECM variant or calibration<br>If the problem persists, reflash ECM<br>If the problem persists, replace ECM.                                                                                                                                                                           |
| U0302 | ECM       | Variant Coding, software incompatibility (DFC_MTVARNPL)    | Faulty calibration or variant<br>Faulty programming<br>Damaged ECM                  | Try updating the ECM variant or calibration<br>If the problem persists, reflash ECM<br>If the problem persists, replace ECM.                                                                                                                                                                           |
| U0400 | DPS       | Variant Coding failure<br>Software incompatibility         | Faulty variant coding<br>Faulty programming                                         | Check in the BUDS Tab "vehicle configuration" if the DPS option is checked.<br>Reflash the DPS with the latest software                                                                                                                                                                                |
| U0400 | DPS GLOBE | VARIANT IMCOMPATIBILITY                                    | vehicle configuration error or<br>DPS software mismatch or error                    | look at BUDS vehicle config. check DPS for reflash write config and cycle on/off vehicle                                                                                                                                                                                                               |
| U0400 | SCM       | Variant Coding failure<br>Software incompatibility         | SCM not install on expected vehicle<br>Faulty programming                           | Check if SCM is install on a valid vehicle<br>Update SCM<br>Open Vehicle Configuration in Setting page in BUDS & if check vehicle configuration is set as expected for the vehicle.                                                                                                                    |

## Subsection XX (DIAGNOSTIC AND FAULT CODES)

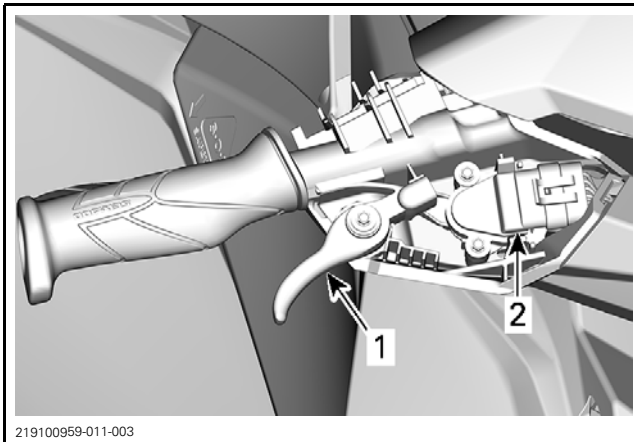
| PCODE | MODULE    | DESCRIPTION                                                   | CAUSE                                                                                 | ACTION                                                                                                                                                                                                                                                                                                                                     |
|-------|-----------|---------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U0416 | DPS GLOBE | VEHICLE SPEED ERROR VALUE                                     | vehicle speed error value received from ECM                                           | Check if vehicle speed is available in Monitoring page in BUDS<br>Check related fuse(s)<br>Remove the sensor connector, measure the voltage of the harness power wire relative to ground (Expected value: Battery voltage)<br>Measure the resistance of the harness wires, between the ECM and sensor connectors (Expected value < 5 Ohms) |
| U0426 | ECM       | Invalid Data Received From Vehicle Immobilizer Control Module | The Vehicle Immobilizer could not read the number of the access key.                  | Check for dirty or oxidized Key contact. Clean key contact if needed.<br>Check for broke key contact<br>Ensure sensor connector is fully inserted.<br>Measure resistance between ECMB-A1 and CC-C (Expected value < 2 Ohms).<br>Measure resistance between ECMB-C2 and CC-E (Expected value < 2 Ohms).                                     |
| U220E | ECM       | Invalid Check Sum from CLUSTER message                        | Check Sum error                                                                       | External troubleshooting is not possible<br>Check for communication fault                                                                                                                                                                                                                                                                  |
| U3001 | DPS       | Module improper shutdown                                      | Lost of power on DPS that can be caused by damaged circuit wires or damaged DPS pins. | Check the two DPS fuses<br>Ensure DPS connector is fully inserted.<br>Check for Damaged tail light, DPS, Cluster circuit wires<br>Check for damaged DPS pins.                                                                                                                                                                              |
| U3001 | SCM       | Module improper shutdown                                      | Lost of power on SCM<br>Damaged circuit wires or damaged SCM pins.                    | Check fuse<br>Ensure SCM connector is fully inserted.<br>Check for Damaged circuit wires or damaged SCM pins.                                                                                                                                                                                                                              |

# INTELLIGENT THROTTLE CONTROL (iTC)

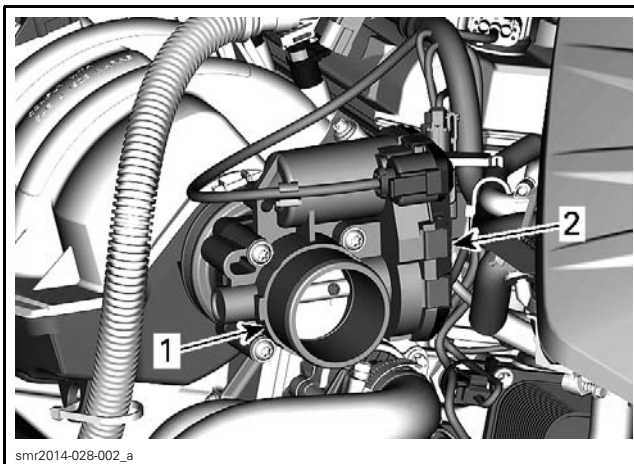
## GENERAL

### 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

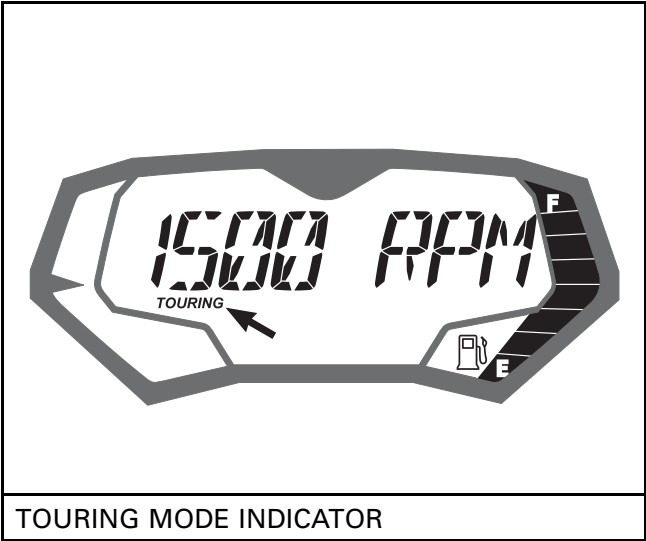
**NOTE:** Touring/Sport mode selection is only available on the ACE 900 HO engine.



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.

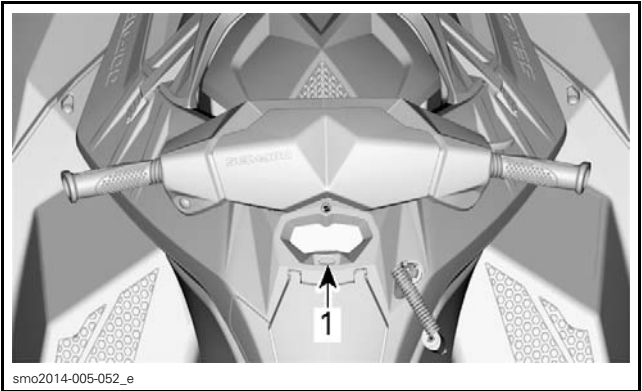
Activating Sport Mode

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:



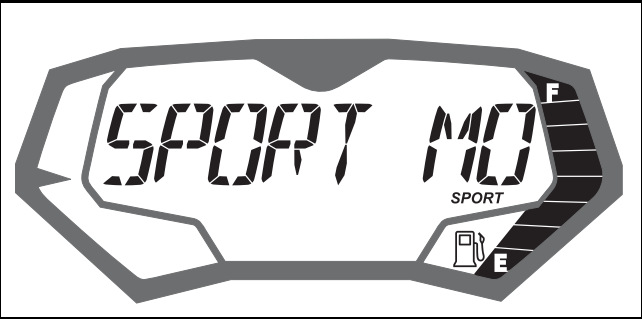
MESSAGE DISPLAYED

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.

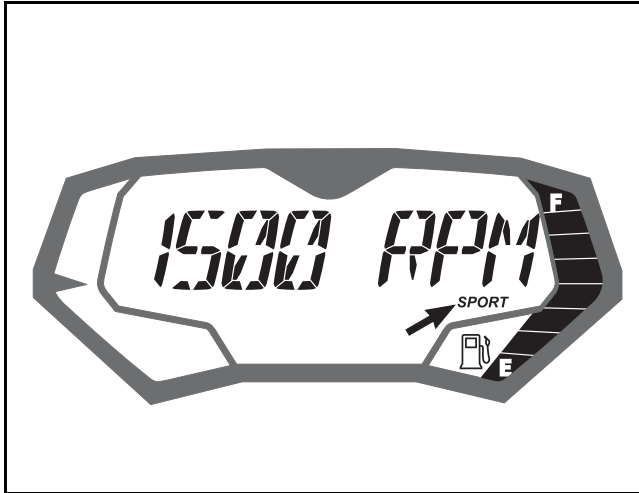


MESSAGE DISPLAYED

SPORT MODE ACTIVATED

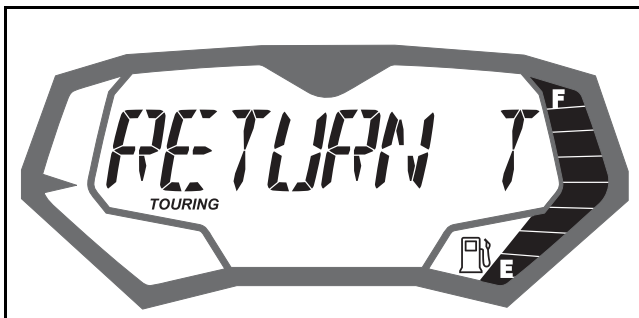
**NOTE:** After a few seconds, the gauge will revert to its normal display.

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.

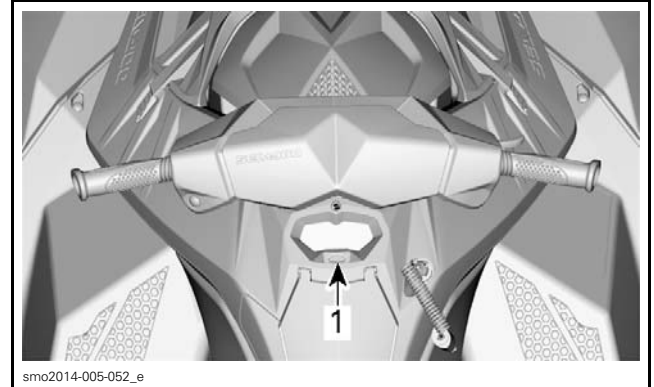
### Deactivating Sport Mode

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.

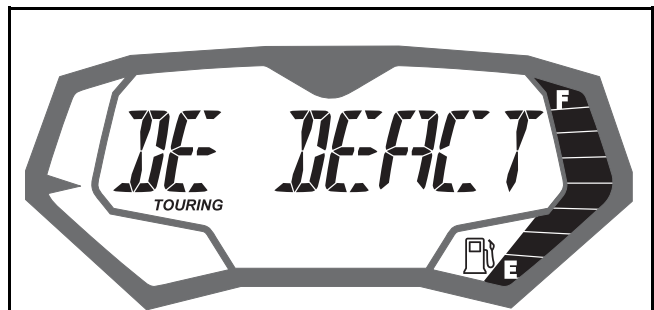
1. Depress and hold the MODE button for at least 1 second.



TYPICAL

1. MODE button

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

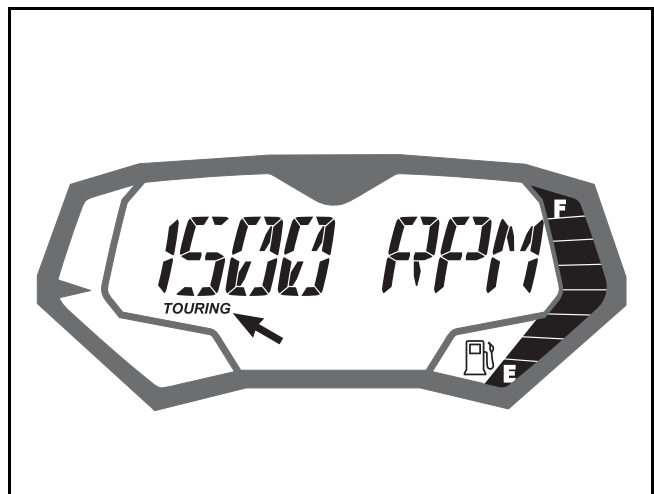


MESSAGE DISPLAYED

SPORT MODE DEACTIVATED

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

2. Ensure the TOURING mode indicator is on.



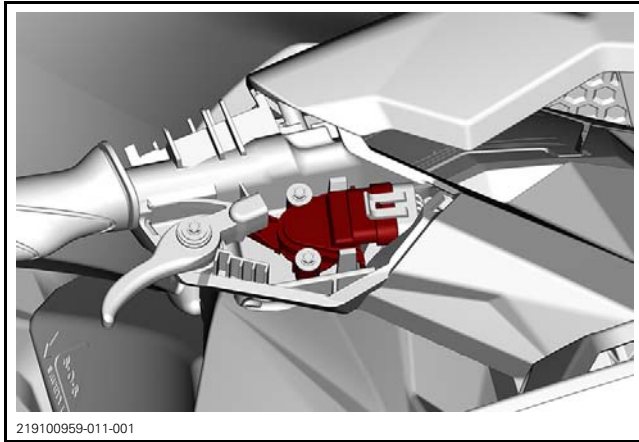
TOURING MODE INDICATOR

## 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:

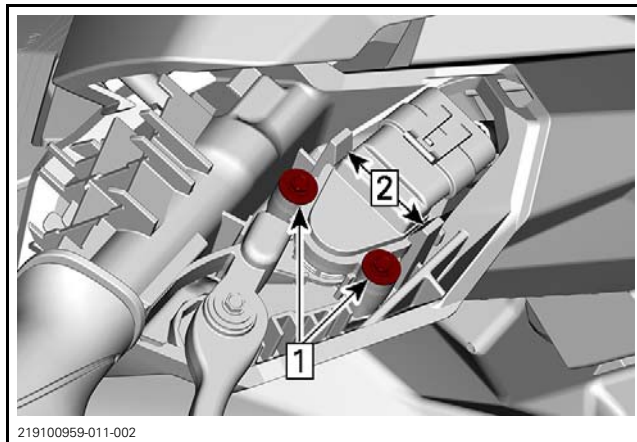
- Steering connector to TAS connector
- Steering connector to ECM-B connector.

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.



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# ELECTRONIC FUEL INJECTION (EFI)

## SERVICE TOOLS

| Description                     | Part Number       | Page |
|---------------------------------|-------------------|------|
| ECM ADAPTER TOOL.....           | 529 036 166 ..... | 2    |
| FLUKE 115 MULTIMETER .....      | 529 035 868 ..... | 2    |
| FUEL HOSE DISCONNECT TOOL ..... | 529 036 037 ..... | 11   |

## SERVICE TOOLS – OTHER SUPPLIER

| Description                              | Part Number | Page |
|------------------------------------------|-------------|------|
| FLUKE AUTOMOTIVE BACK PROBE PIN.....     | TP40 .....  | 27   |
| FLUKE SUREGRIP INSULATED TEST LEADS..... | TL224 ..... | 27   |

## SERVICE PRODUCTS

| Description             | Part Number       | Page               |
|-------------------------|-------------------|--------------------|
| DIELECTRIC GREASE ..... | 293 550 004 ..... | 26, 29, 32, 34, 36 |
| LOCTITE 243 (BLUE)..... | 293 800 060 ..... | 26, 36             |
| LOCTITE 518.....        | 293 800 038 ..... | 34                 |

## GENERAL

### WARNING

When electrically disconnecting or removing the throttle body from the intake manifold, always remove the tether cord from the engine cut-off switch and disconnect the battery.

### WARNING

Always disconnect battery prior to working on the fuel system. Always disconnect battery exactly in the specified order, BLACK (-) cable first. Electrical connections should be disconnected prior to disconnecting fuel lines.

### WARNING

Fuel is flammable and explosive under certain conditions. Work in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity.

### WARNING

Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on a pressurized fuel system. Wear safety glasses. Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Proceed with care when removing or installing high pressure test equipment, or disconnecting fuel line connections. Wipe off any fuel spillage in the bilge. Never use a hose pincher on high pressure hoses.

Cover the fuel line connection with an absorbent shop rag before disconnecting them. Slowly disconnect the fuel hose to minimize spilling.

When the repair is completed, ensure the hose from the fuel rail to the fuel pump is properly connected and secured in its support. Perform the *FUEL SYSTEM HIGH PRESSURE LEAK TEST* as described in *FUEL TANK AND FUEL PUMP* subsection.

### WARNING

Replace any damaged, leaking or deteriorated fuel lines or connections. After working on the fuel system, always pressurize the fuel system and check for fuel leaks. Refer to *FUEL SYSTEM PRESSURIZATION* in *FUEL TANK AND FUEL PUMP* subsection.

 **WARNING**

Always perform the fuel system high pressure leak test if any fuel line has been removed or disconnected from a component.

 **WARNING**

If a gasoline leak and/or odor is present, do not start the engine. Repair the leak.

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

To test and probe the ECM connector terminals, the following tools are required. The electrical harness and/or ECM replacement may be required if connectors or terminals are damaged.

| REQUIRED TOOLS                            |                                                                                    |
|-------------------------------------------|------------------------------------------------------------------------------------|
| FLUKE 115 MULTIMETER<br>(P/N 529 035 868) |   |
| ECM ADAPTER TOOL<br>(P/N 529 036 166)     |  |

SYSTEM DESCRIPTION

The electronic fuel injection system (EFI) is comprised of various sensors used for detecting on-going operating conditions of the engine, and includes all the components that perform the required adjustments to the engine.

Electrical System

ECM (Engine Control Module)

The ECM reads input signals that it receives from the throttle lever as well as various sensors. Through calculation of several variables, which it compares to stored parameters (fuel maps), the ECM controls the iTC (intelligent Throttle Control), the injection system and the ignition system to meet driver demands and to ensure safe engine operation.

Through its management of the engine systems, the ECM ensures the engine is delivering optimum performance, fuel economy and meets emission regulations. The ECM also controls idle RPM by modulating the electric throttle actuator (ETA) and limits maximum engine speed through ETA, the ignition system, and fuel injection system.

EFI Sensors

To control the injection system, the engine management uses input signals from the following sensors:

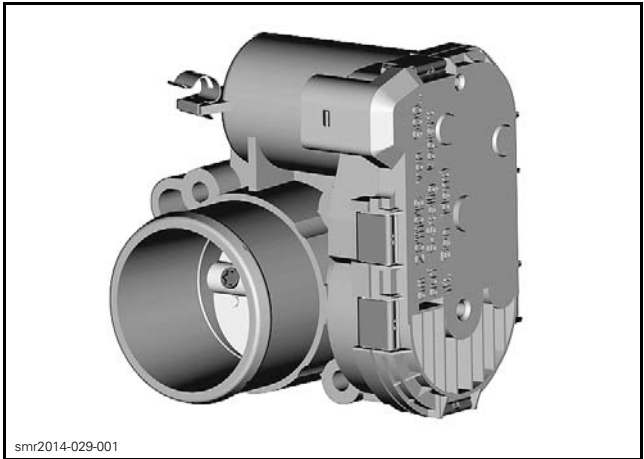
- Camshaft position sensor (CAPS)
- Crankshaft position sensor (CPS)
- Manifold absolute pressure and temperature sensor (MAPTS)
- Throttle position sensor (TPS)
- Throttle accelerator sensor (TAS).

The ECM reads the inputs from the sensors which it compares to predetermined parameters stored in the ECM (fuel and ignition maps), makes computations, and activates the outputs accordingly (injectors, ignition coils etc.).

Air Intake System

Throttle Body (ETC (Electronic Throttle Control))

A 46 mm (1.81 in) single draft throttle body (ETC) is mounted directly on the air intake manifold. The throttle position sensor (TPS) and the electric throttle actuator (ETA) are part of the throttle body assembly.



The ETA is used to control air delivery by opening or closing the throttle plate. It allows the ECM to electrically control the position of the throttle plate throughout the full range of engine operation. There is no idle air control valve (IACV).

The TPS provides the ECM with a signal of the actual angular position of the throttle plate. When the ETA changes the position of the throttle plate, the ECM uses the TPS signal to monitor the throttle plate position, and modulate the ETA through pulse width modulation to move the throttle plate until the targeted position is achieved.

The use of an ETA controlled by the ECM also allows for an electronic cruise control function.

If there is a system malfunction and the ETA is not powered by the ECM, return springs move the throttle plate back to the LIMP HOME position against a mechanical stop, not the idle position. The throttle plate is electrically driven to the idle position by the ETA when commanded by the ECM.

### TAS Description

This vehicle is designed with an electronic throttle accelerator sensor (TAS) that is used to determine the driver requested torque. There are no mechanical cables between the throttle lever and the throttle body. This is often referred to as a "throttle by wire" system.

The TAS sensor is composed of two magnets and a double output hall effect sensor that are incorporated within the throttle lever assembly.

The double hall effect sensor TAS is used for redundancy. If one sensor is inoperative, throttle control will be maintained, but a check engine light and a check engine message will appear in the gauge cluster, and a relevant fault code will be recorded in the ECM.

### TAS Operation

The ECM provides a supply voltage and a ground to each hall effect sensor. The hall effect sensors in the TAS each produce a command signal voltage that is proportional to the throttle position.

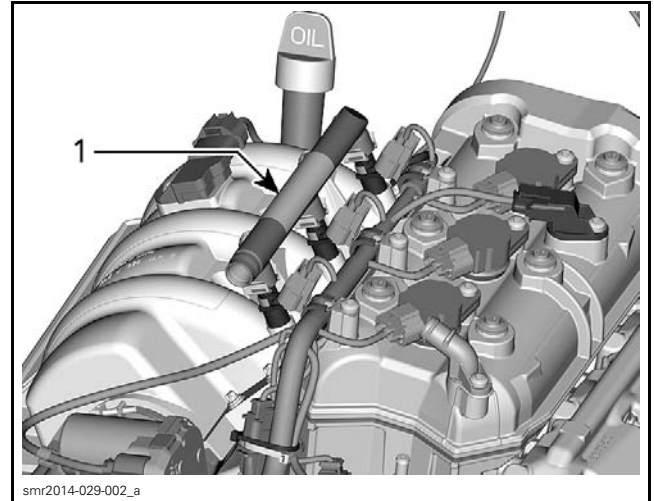
Pulling the throttle lever varies the two command signal voltages produced by the TAS accordingly. The ECM will then power the ETA to open or close the throttle plates in the throttle body according to the torque commanded by the operator.

## Fuel System

### Fuel Rail

A fuel rail is mounted on the intake manifold. The fuel rail, which is used to secure the injectors to the manifold, also provides to the injectors the fuel pressure that it receives from the fuel pump.

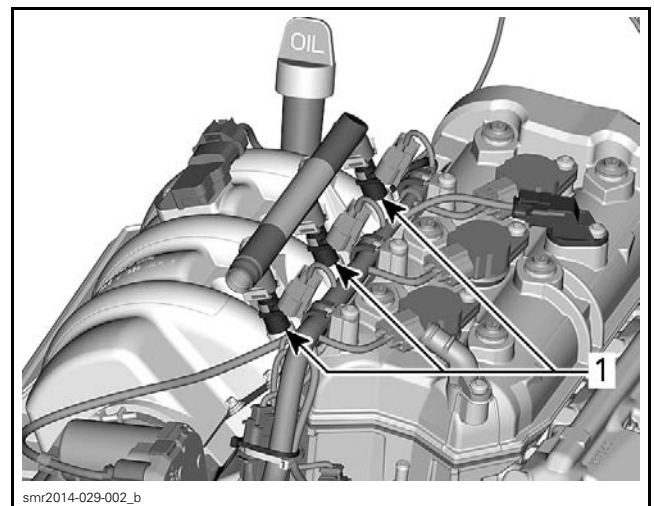
The fuel pressure applied to the fuel rail is regulated by the fuel pressure regulator located in the fuel pump module.



1. Fuel rail

### Fuel Injectors

Three fuel injectors are used to inject fuel into the intake ports of the cylinder head. One injector is used per cylinder.



1. Fuel injectors

Fuel is injected in accordance with injection signals received from the ECM.

### Fuel Pump

An electric fuel pump with an integrated pressure regulator and fuel system filters is used. For more details on the fuel pump unit, refer to *FUEL TANK AND FUEL PUMP* subsection.

## ADJUSTMENT

### IDLE SPEED

Idle speed is not adjustable. The ECM controls the idle speed of the engine through the iTC system by controlling throttle plate opening using the ETA (electric throttle actuator).



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## Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

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The engine RPM may be verified using the BRP diagnostic software (BUDS2).

**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. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, select:
  - **Measurements** page
  - **ECM** button.

**NOTE:** The multifunction gauge and the BRP diagnostic software (BUDS2) use the same signal to provide the engine RPM indication.

### THROTTLE POSITION SENSOR

#### BUDS2 Throttle Position Sensor Reset Function

This operation performs a reset of the values stored in the ECM for the TPS when it is at the closed position and at the limp home position. The TPS position is used to determine the basic parameters for all fuel mapping and several ECM calculations.

A reset must be carried out each time any of the following situations has occurred:

- Throttle body has been replaced.
- ECM has been replaced.

**NOTE:** The TPS is not adjustable. The ECM must learn the TPS values when carrying out the **Throttle position sensor initialization** reset procedure in BUDS2. An improperly set TPS may lead to poor engine performance. Emission compliance could possibly be affected.

#### Updating the TPS Values in the ECM

1. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, select:
  - **Settings** page
  - **ECM** button
  - **Reset TPS**.
3. Ensure the throttle lever is fully released and at the idle position.
4. In the **Reset TPS** box, click on the **Reset** button.

A message will be displayed if the operation is successful.

If an error occurred or the TPS is not within the allowed range while resetting, the ECM will generate a fault code and will not accept the setting.

5. If a fault message is displayed, follow the instructions in the message(s).
6. Check for fault codes.
7. If a fault code is generated,
  - Carry out the service actions.
  - Reset the fault.
  - Repeat the reset procedure.
8. Start engine and make sure it operates normally throughout its full engine RPM range.

## TROUBLESHOOTING

### DIAGNOSTIC TIPS

The first step in troubleshooting the EFI system is to check for fault codes using BUDS2; refer to *DIAGNOSTIC AND FAULT CODES* subsection. Also check for fuel trim changes as indicated in BUDS2. Fuel trim levels can be used for diagnosis of fuel system problems. However, engine problems are not necessarily related to the electronic fuel injection system.

It is important to ensure that the engine, fuel delivery system and electrical system are operating normally.

#### WARNING

Electrical actuators and electronic modules may be powered up as soon as the START/STOP button is depressed. Always disconnect the battery prior to disconnecting any electrical or electronic components.

Never use a battery charger to temporarily substitute the battery as it may cause the ECM to function erratically, or not at all.

Check related-circuit fuse solidity and condition with an ohmmeter. A visual inspection could lead to a false diagnosis.

### Poor Idling

If poor idling is experienced, check the following:

- Poor quality fuel or water in the fuel
- Fault codes using BUDS2
- Throttle body and flame arrestor cleanliness
- Engine leaks or other mechanical problem.



## Engine Related Problems

The following items should not be overlooked:

- Inappropriate engine valve timing or valve lifter damage
- Poor or unequal engine compression.

## Fuel Delivery System Related Problems

The following items may affect the fuel injection system:

- Faulty fuel pump
- Faulty fuel pressure regulator
- Dirty or clogged fuel filter
- Faulty purge valve
- Leaking, kinked, or obstructed fuel line
- An air leak that is not metered
- A faulty heated oxygen sensor (HO<sub>2</sub>S, on equipped models).

## Electrical Related Problems

It is important to check the following in the electrical system:

- Battery voltage
- Fuses
- Ignition (misfiring spark plug or faulty ignition coil)
- Ground connections
- Wiring and connectors.

Ensure that all electronic components are original BRP recommended components. Any modification to the wiring harness may lead to poor system operation or generate fault codes.

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

When probing terminals, pay attention to the condition of terminal pins and sockets. Be sure not to bend the terminal pins. Multimeter probes should never be inserted in terminal sockets as this could deform the socket and create a loose connection that would be difficult to troubleshoot. Always use special tools (such as an ECM adapter tool) when carrying out electrical tests. Refer to *WIRING HARNESS AND CONNECTORS* subsection for more details on electrical connectors.

## ⚠ WARNING

Some EMS components are continuously powered when the electrical system is turned on. The ECM switches the circuit to the ground to complete the electrical circuits it controls. Take this into account when troubleshooting. Always disconnect the battery prior to disconnecting any electric or electronic component.

Ensure that all electronic components are genuine OEM parts (original equipment manufacturer) recommended by BRP. Any modification to a circuit may generate fault codes or result in bad system operation.

**NOTE:** For diagnostics purposes, use the BRP diagnostic software (BUDS2). Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

After a problem has been solved, always clear the fault(s) in the ECM (and other ECUs as applicable) using BUDS2.

## Temperature Sensors

When measuring the resistance with an ohmmeter, all values are given for a temperature of 20°C (68°F). The resistance value of a resistance varies with the temperature. The resistance value for commonly used resistors or windings (such as injectors) **increases** as the temperature increases. However, temperature sensors normally used in this vehicle are NTC types (Negative Temperature Coefficient), which means that the resistance value **decreases** as their temperature increases. This must be taken into account when measuring them at temperatures other than 20°C (68°F).

The resistance value of a temperature sensor may test good at a certain temperature but may not be within acceptable limits at other temperatures. If in doubt, try a new sensor.

Also remember that this validates the operation of the sensor at room temperature. It does not validate the functionality of the sensor at higher (or normal) operating temperatures. To test it, the sensor could be removed from the engine and heated with a heat gun while it is still connected to the harness to see if the ECM will detect the high temperature condition and generate a fault code.

## Fuel Injection Related Problems

Also check for the following items:

- Leaking, faulty or dirty fuel injectors.
- Fuel injector connector problem.

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- Faulty fuel pump (inadequate pressure).
- Clogged fuel filter.
- MAPTS sensor port obstruction, leakage, damage or proper electrical connection. Refer to *MAPTS SENSOR* in this subsection.
- Throttle body TPS or ETA faults.
- Intake flange leakage.

**NOTE:** Do not apply dielectric grease or other lubricants on the ECM connectors and on the starter relay connector.

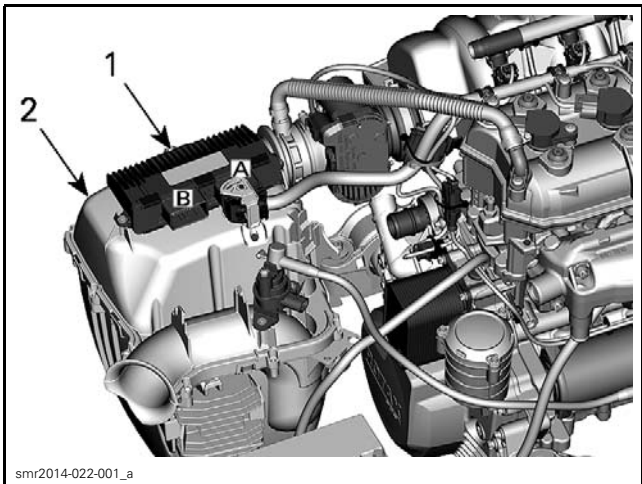
PROCEDURES

ENGINE CONTROL MODULE (ECM)

**NOTE:** As a first troubleshooting step, always check for applicable fault codes using the BRP diagnostic software (BUDS2) software.

ECM Location

The ECM is located on top of the air intake silencer.

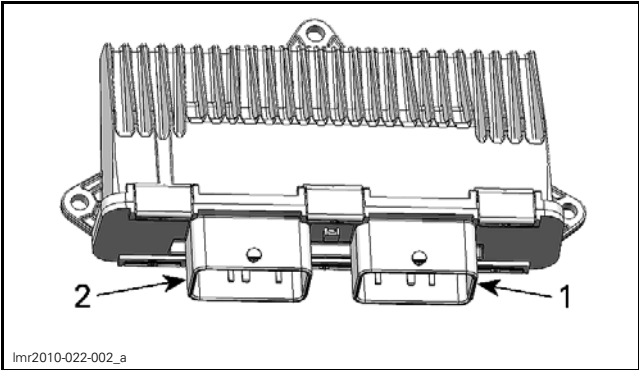


1. ECM  
2. Air intake silencer  
A. Connector "A"  
B. Connector "B"

ECM Connector Identification

There are 2 connectors connected to the ECM:

- Engine harness connected to ECM-A
- Vehicle system control harness connected to ECM-B.



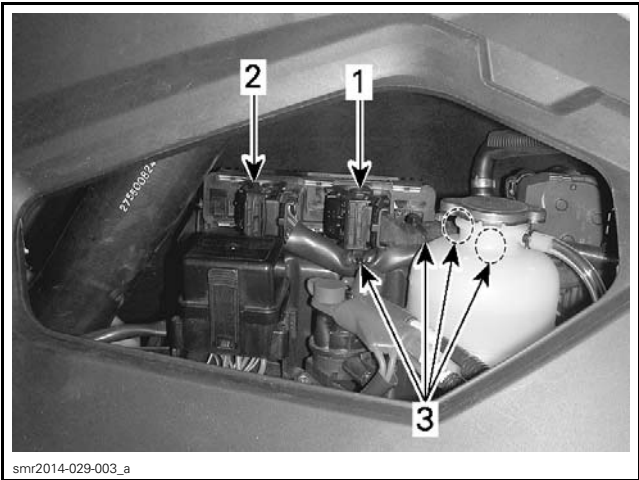
ECM CONNECTOR IDENTIFICATION - COOLING FINS FACING OUT  
1. Connector A  
2. Connector B

The ECM connectors have 48 pins.

**NOTE:** For connector information, cleaning and probing, refer to *CONNECTOR INFORMATION* subsection.

ECM Connector Access

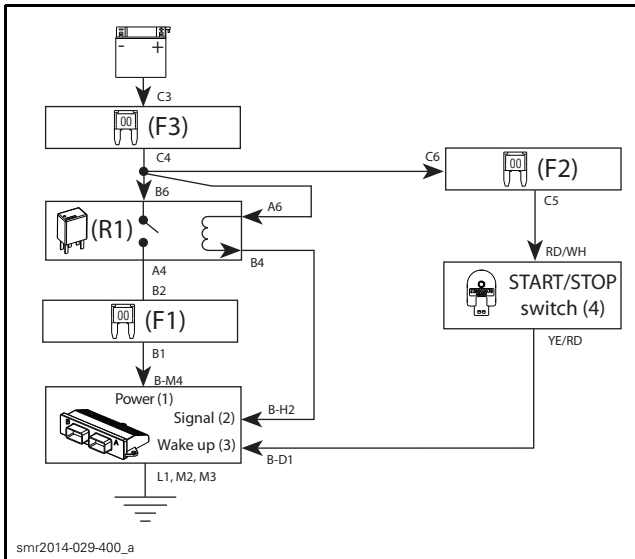
Limited access to the ECM connectors is obtained by removing the LH access cover. The ECM harnesses are firmly secured with multiple locking ties which make the connectors (especially ECM-A) and the locking ties extremely difficult to work with.



1. ECM-A  
2. ECM-B  
3. Locking ties

For ease of access, remove the central body. Refer to *BODY* subsection.

## ECM Power Circuit Diagram



1. Power
2. Signal
3. Wake up
4. START/STOP switch

## ECM Power Circuit Validation

Briefly press START/STOP button.

This should wake up the ECM. The ECM will then activate relay 1 which will turn ON all power. After approximately 12 seconds, the multifunction gauge indications will go out if the tether cord is not installed, and all electrical power will be turned off after approximately 3 minutes.

If the tether cord is installed when the START/STOP button is pressed, the multifunction gauge and electrical power will stay on for approximately 3 minutes if the START/STOP button is not pressed again, or if the engine is not started.

**QUICK INDICATION THAT ECM IS POWERED  
(ASSUMING THE OBSERVED COMPONENT  
IS WORKING)**

Multifunction gauge comes ON.

Fuel pump turns on for approx. 2 seconds (if tether cord installed).

If ECM does not turn on, check the following:

- Fuse F1, F2 and F3.
- Battery voltage. Refer to *CHARGING SYSTEM* subsection.
- Relay R1.
- START/STOP switch. Refer to *STARTING SYSTEM* subsection.
- ECM power circuit wires and ground wires.

For testing of fuses and relay R1, refer to *POWER DISTRIBUTION AND GROUNDS* subsection.

**NOTE:** When relay R1 is not working, the EMS (engine management system) and the complete vehicle electrical system will not be powered.

## ECM Wake Up Logic

### With Tether Cord Installed

When the START/STOP button is pressed to start engine:

- ECM pin B-D1 receives current from battery via the START/STOP switch. ECM is woken up.
- ECM pin B-H2 provides a ground to the relay coil in fuse box.
- The relay contacts close and provide main 12 Vdc power to the ECM at pin B-M4.
- The relay also powers the other components in the electrical system.
- ECM pin B-E4 monitors for a tether cord installed on the engine cut-off switch.
- When the tether cord is installed on the engine cut-off switch, it completes a circuit that provides a ground to the ECM, pin B-F2. This tells the ECM the tether cord is installed and the engine can be started. If the engine is not started, the power will be turned off after approximately 3 minutes.

### Without a Tether Cord Installed

When the START/STOP button is pressed:

- The multifunction gauge turns on, goes through the self-test function, displays applicable messages and turns off a few seconds later.
- The engine cannot be cranked.
- The ECM stays powered up until it removes the ground to the relay coil after 3 minutes (pin B-H2).
- Relay contacts open and power to the ECM is removed.
- Power is also removed on all other electrical systems.

## Testing Electrical System Power After Multifunction Gauge Shutdown

1. Remove LH access cover.
2. Remove fuse box cover.
3. Using a multimeter set to Vdc, check for power at the contacts on top of the ACC 10A fuse (F1).

## Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

| MULTIMETER PROBES |                | READING         | CONDITION    |
|-------------------|----------------|-----------------|--------------|
| Fuse F1 contacts  | Battery ground | Battery voltage | Power is ON  |
|                   |                | No voltage      | Power is OFF |

### ECM Shut Down Logic

When the engine is stopped by using the START/STOP button or by removing the tether cord from the engine cut-off switch, the following occurs:

- ECM stops the engine.
- After a few seconds, the multifunction gauge turns off.
- After 60 seconds, ECM (pin B-H2) removes the ground to the relay coil.
- Relay contacts open and power to the ECM is removed.
- Power is also removed on all other electrical systems.

### Testing the ECM Wake Up Circuit

1. Disconnect ECM-B connector, refer to *ECM CONNECTOR ACCESS* in this subsection.
2. Install ECM-B connector on the ECM adapter tool.
3. Use a multimeter and select Vdc.
4. While pressing START/STOP button, read voltage as follows.

| ECM ADAPTER | BATTERY        | MEASUREMENT     |
|-------------|----------------|-----------------|
| D1          | Battery ground | Battery voltage |

If voltage is as per specification, refer to *TESTING THE ECM POWER CIRCUIT*.

If voltage is out of specification:

- Test the START/STOP switch, refer to *STARTING SYSTEM* subsection.
- If START/STOP switch tests good, test wiring and connectors from battery to ECM. Refer to *WIRING DIAGRAM*.

### Testing ECM Power Circuit

1. Connect ECM connector "B" on the ECM adapter tool.
2. Install an appropriate fused jumper wire between the following terminals on the ECM adapter tool.

| JUMPER WIRE COORDINATES ON ECM ADAPTER |              |
|----------------------------------------|--------------|
| H2                                     | M2, M3 or L1 |

**NOTE:** When the jumper is installed, the multifunction gauge should come on.

If the multifunction gauge did not come on, check the following:

- Fuses F1, F2 and F3
- Relay 1
- Wiring between ECM-B contact 2H and fuse F3, refer to the *WIRING DIAGRAM* subsection
- ECM ground circuit, refer to *TESTING CONTINUITY OF ECM GROUND CIRCUITS* in this subsection.

For testing of fuses and relay R1, refer to *POWER DISTRIBUTION AND GROUNDS* subsection.

If gauge came on, carry on with the following step.

3. Use the multimeter and select Vdc.

4. Check for voltage as follows.

| ECM ADAPTER | BATTERY       | VOLTAGE         |
|-------------|---------------|-----------------|
| B-4M        | Negative post | Battery voltage |

If voltage is not measured, check the wiring and connections between ECM and junction JT-1 VT/GY, refer to the *WIRING DIAGRAM* subsection.

If all items mentioned in this test and in *TESTING ECM WAKE UP CIRCUIT* tested good, try a new ECM.

### Testing the Continuity of ECM Ground Circuits

1. Connect ECM-B connector on the ECM adapter tool.
2. Using the multimeter set to  $\Omega$ , probe adapter terminals as per following table.

| ECM ADAPTER        | BATTERY POST | RESISTANCE                       |
|--------------------|--------------|----------------------------------|
| Pins L1, M2 and M3 | Ground       | Close to 0 $\Omega$ (continuity) |



If any measurement is out of specification refer to *POWER DISTRIBUTION AND GROUNDS* subsection and check the following:

- Wiring and connections
- Engine grounds
- Battery ground.

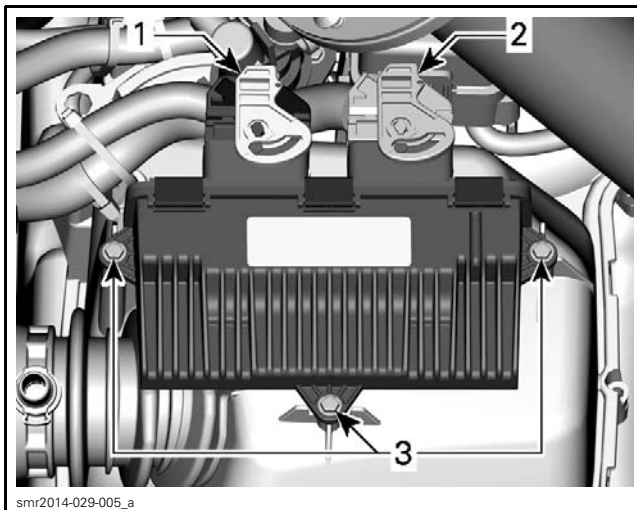
### Removing the ECM

**NOTE:** If a new ECM is to be installed, first read the procedures in *REPLACING THE ECM* in this subsection.

1. Disconnect battery cables.

**NOTICE** Always disconnect the **BLACK** negative (–) battery cable first, then disconnect **RED** positive (+) cable.

2. Refer to *BODY* subsection and remove the central body.
3. Disconnect both ECM connectors from ECM.
4. Remove ECM retaining screws and remove the ECM from the air intake silencer.



**TYPICAL - ECM REMOVAL**  
1. ECM-A connector  
2. ECM-B connector  
3. ECM retaining screws

### Installing the ECM

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

| TIGHTENING TORQUE   |                                           |
|---------------------|-------------------------------------------|
| ECM retaining screw | 2 N•m ± 0.5 N•m<br>(18 lbf•in ± 4 lbf•in) |

2. Reconnect ECM connectors.
3. Reconnect battery cables.

### ⚠ WARNING

Always reconnect the **RED** positive (+) battery cable first, then reconnect **BLACK** negative (–) cable.

4. If a new ECM is installed, refer to *REPLACING THE ECM* in this subsection.

**NOTICE** Always replace ECM by the same part number or by a BRP approved equivalent.

### Replacing the ECM

Prior to replacing an ECM, ensure that all the recommendations in the general introduction of this subsection have been followed and all applicable testing procedures have been carried out.

**NOTE:** Proceed with an *ECM FIRST INITIALIZATION* as it may resolve the problem.

When installing a new ECM, data must be entered and a reset is required.

### ECM Data Entry for ECM Replacement

Use one of the following 2 methods to collect the required information. The 1st being the easiest:

1. Use BUDS2 to obtain the data from a saved "\*.buds2" file on your PC computer.
2. Collect the information from the vehicle and on the Knowledge Center.

Once the required information has been collected, refer to *ENTERING THE COLLECTED INFORMATION INTO THE ECM*.

#### 1st Collecting Method: Obtaining the Data from a Saved .buds2 File

1. Start BUDS2.

**NOTE:** It is not necessary to perform any connection. The PC computer can be used alone.

2. In BUDS2, click on the **Open a BUDS2 file** button.

Make sure you are at: C:\Program Files(x86)\BRP\BUDS2\Files.

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**IMPORTANT:** Be sure to use the file that specifically matches the vehicle you are servicing.

NOTE: The file name structure is as follows:

VIN\_date read (yyyymmdd)\_hour read (hhmmss).mpem

Example:

2BPSBK8C68V000168\_20090206\_111640.buds2

Therefore:

VIN: 2BPSBK8C68V000168

Date: 2009 02 06

Hour: 11h 16m 40s

3. Select the **Summary** page then the **Vehicle** tab and record (write down) the following information.
1. Vehicle serial number

2. Engine serial number

3. Vehicle model number

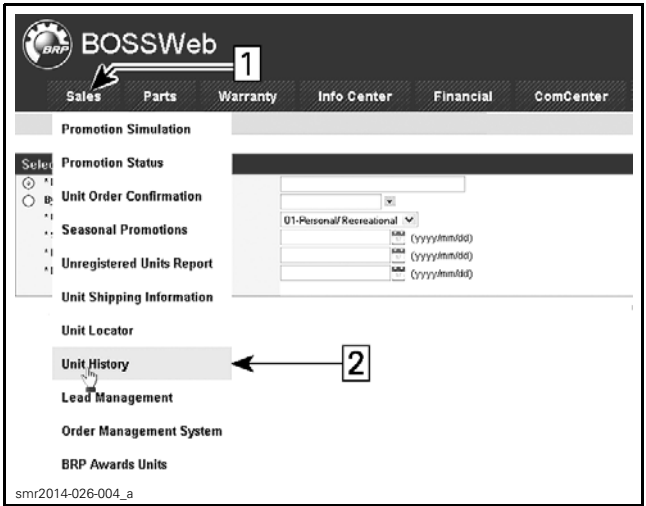
4. Customer name.

**2nd Collecting Method: Collect the Information from the Vehicle and BOSSWeb**

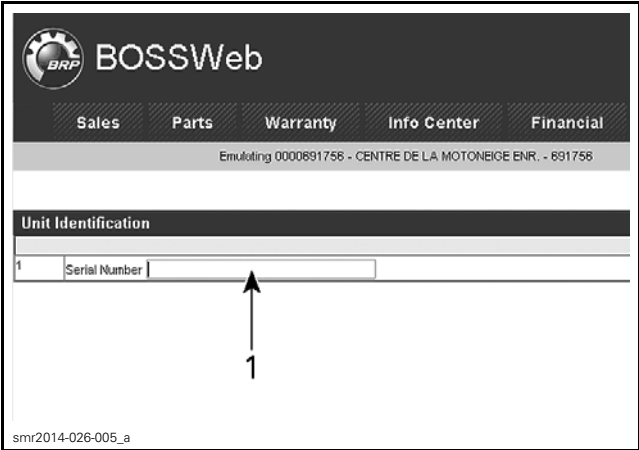
1. Record engine serial number.
2. Record the following numbers from BOSSWeb.  
Look in **Sales** menu and choose **Unit history**.
1. Vehicle serial number

2. Vehicle model number

3. Customer name.



**SERVICE, UNIT HISTORY**  
1. Click on **SALES** menu  
2. Select **Unit History**



1. *Vehicle Serial Number here*
3. Enter the recorded data in the new ECM as detailed in *ENTERING THE COLLECTED INFORMATION INTO THE ECM*.

**Entering the Collected Information Into the ECM**

1. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, select:
  - **Summary** page
  - **Vehicle** button.
3. Write all of the following information you recorded previously.
  - 1. Vehicle serial number (VIN)
  - 2. Engine serial number
  - 3. Vehicle model number
  - 4. Customer name.

**NOTICE** Enter only the appropriate product model number as obtained when gathering the information.

**NOTICE** Pay particular attention when typing the V.I.N. and model numbers. Once **Write Data** button is pressed, the data cannot be modified.

4. Perform the *THROTTLE POSITION SENSOR INITIALIZATION* procedure, refer to *THROTTLE POSITION SENSOR (TPS)* in this subsection.
5. Start the engine and ensure proper operation.
6. Reinstall any remaining removed parts.

**ECM First Initialization**

This procedure performs a reset of the following values in the ECM:

- TAS (Throttle Accelerator Sensor)
- TPS (Throttle Position sensor)

This reset **must** be carried out whenever the ECM has been replaced.

This reset **may** be carried out whenever the throttle body (for TPS) has been replaced instead of its respective reset procedures.

1. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, select:
  - **Settings** page
  - **ECM** button
  - **ECM First Initialization**
  - **Reset** button.
3. Follow the instructions in the message boxes that appear.

If the operation is successful, a message will be displayed stating that the reset was successful.

If an error occurred or a component is out of range, a message may be displayed. Follow the instructions in the message and repeat the procedure.

4. Check for fault codes.

If a fault code is generated, carry out the service actions, reset the fault and repeat the reset procedure.

5. Start engine and make sure it operates normally throughout its full engine RPM range.

## FUEL RAIL

### Removing the Fuel Rail

Disconnect battery, refer to *POWER DISTRIBUTION AND GROUNDS*.

Remove central body. Refer to *BODY* subsection.

#### Fuel Rail Hose Disconnection

1. Place an absorbent shop rag around the fuel supply hose fitting at the fuel rail to catch any fuel leakage.
2. Disconnect fuel hose from fuel rail with the fuel hose disconnect tool.

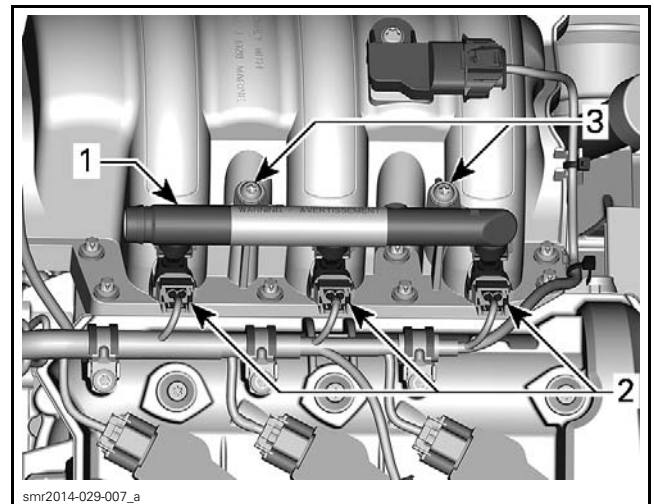
| REQUIRED TOOL                                     |                                                                                     |
|---------------------------------------------------|-------------------------------------------------------------------------------------|
| FUEL HOSE<br>DISCONNECT TOOL<br>(P/N 529 036 037) |  |



**NOTE:** It may be necessary to rotate fuel hose fitting to align the tool ends with the openings of the locking mechanism.

### Removing the Fuel Rail

1. Disconnect all injector connectors.
2. Remove screws retaining the fuel rail.



1. Fuel rail
2. Fuel injector connectors
3. Retaining screws

3. Gently wiggle fuel rail side to side as you pull the fuel rail out with fuel injectors.

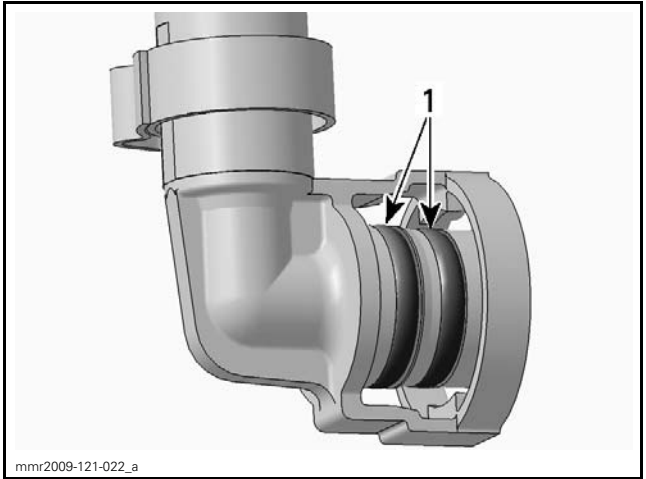
### Installing the Fuel Rail

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

| FUEL RAIL INSTALLATION |                                         |
|------------------------|-----------------------------------------|
| INJECTOR O-RINGS       | SERVICE PRODUCT                         |
|                        | APPLY ENGINE OIL ON O-RING              |
| RETAINING SCREWS       | TIGHTENING TORQUE                       |
|                        | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |

Fuel Rail Hose Connection

| FUEL RAIL HOSE CONNECTION |                 |
|---------------------------|-----------------|
| FUEL HOSE O-RINGS         | SERVICE PRODUCT |
|                           | ENGINE OIL      |



1. Apply oil on O-rings

1. Connect fuel hose to fuel rail.

IMPORTANT: Push fuel hose fitting on fuel rail until you hear a "click". Try pulling fuel hose off fuel rail to ensure fitting is properly locked.

2. Pressurize the fuel system and check for a fuel leak. Refer to *FUEL SYSTEM HIGH PRESSURE LEAK TEST* in *FUEL TANK AND FUEL PUMP* subsection.

**WARNING**

Failure to pressure test the fuel system may result in severe injury or a life threatening situation should a leak occur.

3. Reinstall all remaining removed parts.

FUEL INJECTOR

Fuel Injector Access

Remove central body, refer to *BODY* subsection.

Testing the Fuel Injectors

Testing the Fuel Injector Operation Using BUDS2 (Dynamic)

NOTE: As a first troubleshooting step, always check for applicable fault codes using the BRP diagnostic software (BUDS2).

1. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Start engine.
3. In BUDS2, select:
  - **Functions** page
  - **ECM** button.
4. Select an injector and press the **ACTIVE** button.
5. Repeat for all injectors.

If the engine RPM drops momentarily when clicking on a cylinder, the injector on this cylinder is functioning normally.

If the engine RPM does not drop momentarily when clicking on a cylinder, this cylinder is not functioning properly. Check the following:

- Fuel injector operation. Refer to *TESTING THE FUEL INJECTOR BALANCE USING BUDS2*
- Spark plug and ignition coil. Refer to *IGNITION SYSTEM* subsection.
- Engine condition.

Testing the Fuel Injector Operation Using BUDS2 (Static)

1. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Press the START/STOP button to wake up the ECM.
3. In BUDS2, select:
  - **Functions** page
  - **ECM** button
  - The fuel injector to be tested to activate it.

You should hear the injector working.

This will validate the injector mechanical and electrical operation.

If the injector does not function, carry out a *TESTING THE FUEL INJECTOR TRIGGER SIGNAL*.

Testing the Fuel Injector Trigger Signal

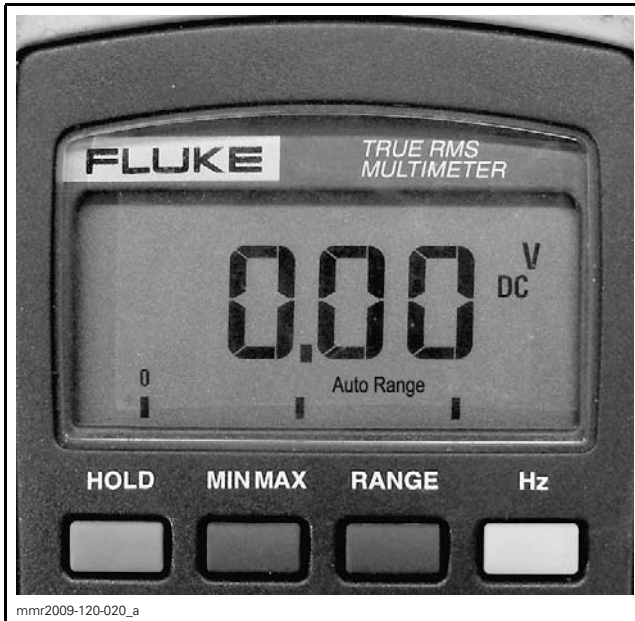
1. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Press the START/STOP button to wake up the ECM.



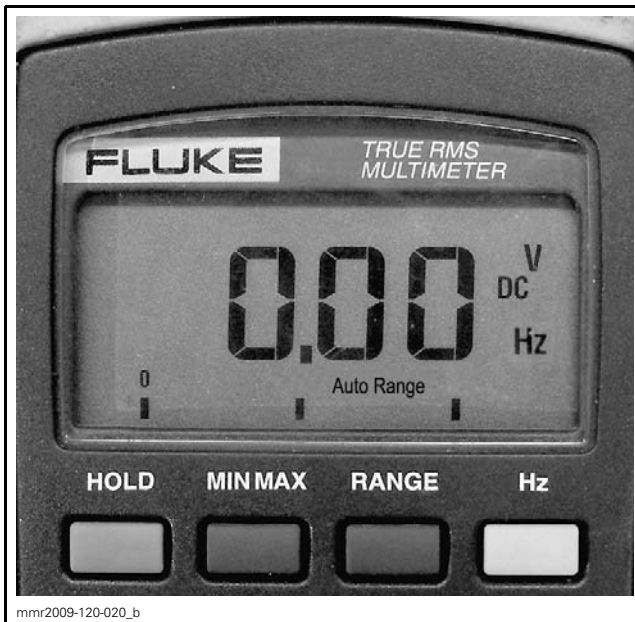
3. In BUDS2, select the **Functions** page.

4. Use a multimeter and set it to Vdc.

**NOTE:** Make sure the multimeter is in the **Auto Range** mode.



5. Press the **Hz** button so that the display shows Hz.



6. Connect the multimeter probes as indicated in the following table and using BUDS2, activate each injector and read the frequency on the multimeter.

**NOTE:** The multimeter counts the pulses per seconds (Hertz) of current the ECM sends to the injector.

| INJECTOR | INJECTOR CONNECTOR CONTACT | BATTERY        | MEASUREMENT         |
|----------|----------------------------|----------------|---------------------|
| No. 1    | Pin 2                      | Battery ground | Approximately 40 Hz |
| No. 2    | Pin 2                      |                |                     |
| No. 3    | Pin 2                      |                |                     |

If there is a frequency reading, the control circuit is functional. Refer to *TESTING FOR THE FUEL INJECTOR INPUT VOLTAGE* in this subsection.

If there is no reading, check continuity of the control circuit (ECM to injectors). Refer to *TESTING THE FUEL INJECTOR RESISTANCE (ECM TO FUSE BOX)* in this subsection.

### Testing for Fuel Injector Balance

**NOTICE** After fuel injector activation using BUDS2, always crank engine in drowned mode to ventilate engine and prevent a potential backfire due to fuel accumulation in engine.

1. Install a fuel pressure gauge as described in the *TESTING THE FUEL PRESSURE*. Refer to *FUEL TANK AND FUEL PUMP* subsection.
2. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
3. Press the START/STOP button to wake up the ECM.
4. In BUDS2, select:
  - **Functions** page
  - **ECM** button.
5. In BUDS2, click the Fuel Pump button to activate fuel pump. Record fuel system pressure once the fuel pump has stopped, and just before you carry out the following step.
6. In BUDS2, energize fuel injector **no. 1**.
7. Record the fuel pressure drop for injector **no. 1** immediately after the injector cycle has stopped.
8. Repeat previous 3 steps for fuel injectors **no. 2** and **no. 3** and record the pressure drop for each injector.
9. The maximum difference in fuel pressure drop between injectors should not exceed the following specification:

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|                                                                            |
|----------------------------------------------------------------------------|
| MAXIMUM DIFFERENCE IN FUEL PRESSURE<br>DROP ALLOWED BETWEEN FUEL INJECTORS |
| 13.8 kPa (2 PSI)                                                           |

| FUEL INJECTOR BALANCE TEST                                           |                                                  |                                                                                                      |
|----------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------|
| RESULT                                                               | POSSIBLE CAUSE                                   | ACTION                                                                                               |
| Fuel pressure drop of an injector is lower than other 2 injectors.   | Fuel injector may be dirty or clogged.           | Clean the injectors and repeat the test.                                                             |
| Fuel pressure drop of an injector is greater than other 2 injectors. | Injector may be sticking open.                   | Clean the injectors and repeat the test.                                                             |
| Cleaning injectors does not reestablish fuel injector balance.       | Faulty wiring and connectors<br>Faulty injector. | Carry out all injector electrical tests in this subsection.<br>Replace injector.<br>Repeat the test. |

10. Using the valve on the fuel pressure gauge, release the pressure in the system (if so equipped).
11. Remove fuel pressure gauge and reinstall removed parts.

Testing for Fuel Injector Leaks

1. Ensure there is enough fuel in fuel tank.
2. Ensure fuel pressure from fuel pump is within specification. Refer to *FUEL TANK AND FUEL PUMP* subsection.

**NOTE:** Keep the pressure gauge installed for the leak test.

3. Remove the tether cord of the engine cut-off switch.
4. Disconnect BUDS2 diagnostic cable from the vehicle.



5. Wait for vehicle electrical power to shut off; the multifunction gauge will turn off.
6. Remove fuel rail with injectors from engine however, **do not** disconnect fuel pump pressure hose from fuel rail. Refer to *REMOVING THE FUEL RAIL* in this subsection.
7. Position fuel rail so that an appropriate container may be placed under the injectors to collect any fuel leakage.



TYPICAL - INJECTOR LEAKAGE TEST SETUP

8. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
9. In BUDS2, select:
- **Functions** page
  - **ECM** button.
10. Click on the **Fuel Pump** button to activate fuel pump for a few seconds.
11. Check for fuel leakage from the injector nozzles.
12. Monitor fuel pressure at fuel pressure gauge. If pressure drops below 372 kPa (54 PSI) during the test, re-activate fuel pump as necessary.

| FUEL INJECTOR LEAKAGE |                           |
|-----------------------|---------------------------|
| TEST DURATION         | SPECIFICATION             |
| 2 minutes             | 1 drop per minute maximum |

If test is not within specification, replace the faulty fuel injector.

13. Properly reinstall fuel rail. Refer to *FUEL RAIL* in this subsection.
14. Reinstall remaining removed components.

# **⚠ WARNING**

Wipe up any spilled fuel.

## **Testing Fuel Injector Resistance (ECM to Fuse Box)**

1. Disconnect ECM-A connector and install it on the ECM adapter tool; refer to *ECM CONNECTOR ACCESS* in *ENGINE CONTROL MODULE (ECM)* in this subsection.
2. Check injector resistance as follows.

| INJECTOR | ECM ADAPTER | FUSE BOX CONTACT | RESISTANCE @ 20°C (68°F) |
|----------|-------------|------------------|--------------------------|
| No. 1    | B3          | A4               | 11.4 - 12.6 Ω            |
| No. 2    | K1          |                  |                          |
| No. 3    | J1          |                  |                          |

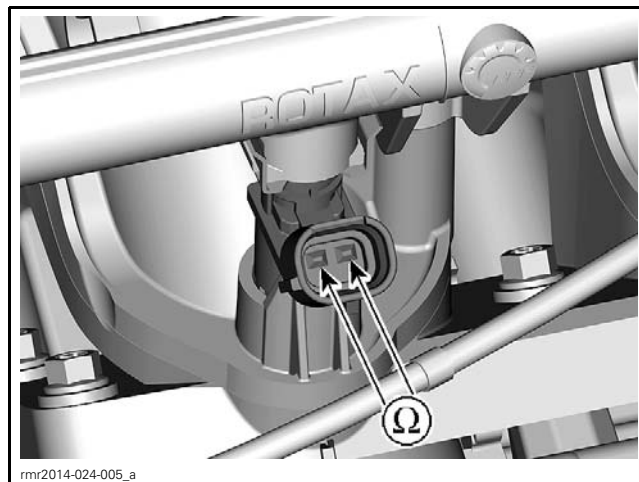
If resistance value is as specified, the injector and its circuits from the fuse contact are good. Refer to *TESTING FOR FUEL INJECTOR INPUT VOLTAGE* in this subsection.

If resistance value is NOT as specified, refer to *TESTING THE FUEL INJECTOR RESISTANCE (AT INJECTOR)* in this subsection.

## **Testing the Fuel Injector Resistance (at Injector)**

1. Disconnect injector electrical connector.
2. Check resistance value between injector pins as follows.

| INJECTOR PIN |   | RESISTANCE @ 20°C (68°F) |
|--------------|---|--------------------------|
| 1            | 2 | 11.4 - 12.6 Ω            |



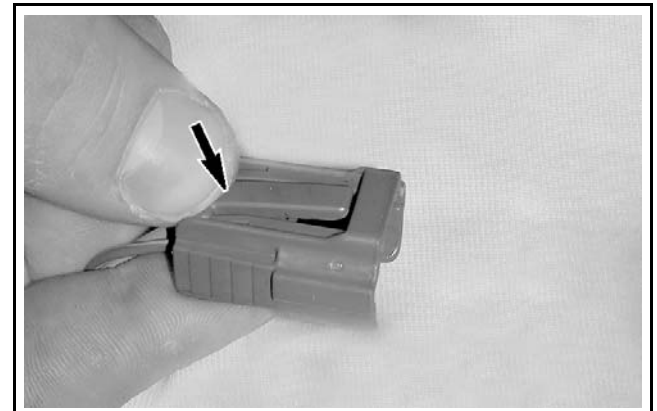
If reading is not as specified, replace injector.

If reading is as specified, carry out a:

- *TESTING FOR CONTINUITY OF THE FUEL INJECTOR POWER CIRCUIT*
- *TESTING FOR CONTINUITY OF THE FUEL INJECTOR CONTROL CIRCUIT* in this subsection.

## **Testing for Fuel Injector Input Voltage**

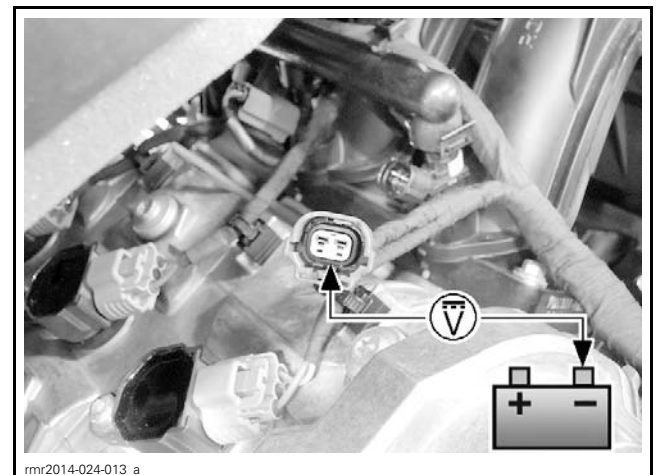
1. Ensure ECM is properly connected.
2. Disconnect the electrical connector from the injector(s).



PRESS HERE TO UNLOCK

3. Press the START/STOP button to wake up the ECM.
4. Using a multimeter set to Vdc, measure the injector input voltage as per following table.

| INJECTOR CONNECTOR |       |                |                 |
|--------------------|-------|----------------|-----------------|
| CYLINDER           | WIRE  |                | MEASUREMENT     |
| No. 1              | Pin 2 | Battery ground | Battery voltage |
| No. 2              | Pin 2 |                |                 |
| No. 3              | Pin 2 |                |                 |



TYPICAL

Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

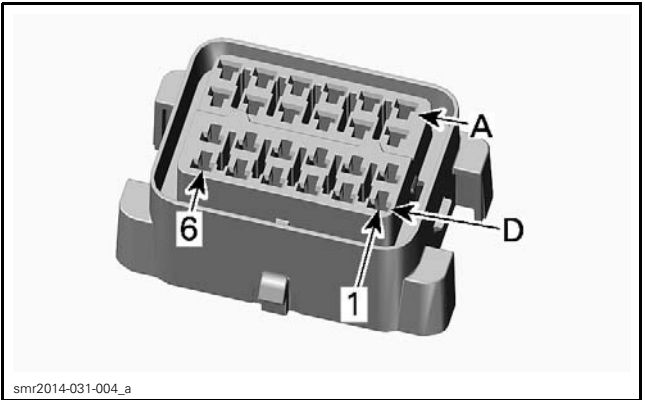
If the injector input voltage is good, the injector problem may be mechanical.

If the injector input voltage is not good, check relay R1 and fuse F3 in the fuse box. If the fuse is good, the problem may be in the power distribution system before the fuse, or in the ECM (does not provide a ground signal).

Testing for Continuity of the Fuel Injector Power Circuit

- 1. Refer to *POWER DISTRIBUTION AND GROUNDS* subsection and remove from the LH fuse box:
  - Main power relay (R1)
  - Fuse F3
- 2. Using a multimeter set to "Ω", test for continuity of the injector power circuit as per following table.

| CYLINDER | INJECTOR CIRCUIT   |              | MEASUREMENT               |
|----------|--------------------|--------------|---------------------------|
|          | INJECTOR CONNECTOR | FUSE BOX PIN |                           |
| No. 1    | Pin 2              | B3           | Close to 0 Ω (continuity) |
| No. 2    | Pin 2              |              |                           |
| No. 3    | Pin 2              |              |                           |



FUSE BOX PIN-OUT

If continuity is good, carry out the *TESTING FOR CONTINUITY OF THE FUEL INJECTOR CONTROL CIRCUIT* in this subsection.

If continuity is faulty, repair wiring or connector between fuse box and injector.

Testing for Continuity of the Fuel Injector Control Circuit

- 1. Remove main power relay (R1) in fuse box. Refer to *POWER DISTRIBUTION AND GROUNDS* subsection.

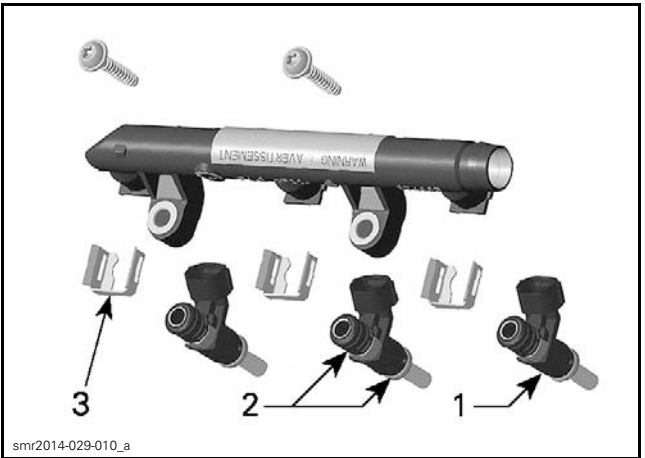
- 2. Disconnect ECM-A connector and install it on the ECM adapter tool. Refer to *ECM CONNECTOR ACCESS* in *ENGINE CONTROL MODULE (ECM)* in this subsection.
- 3. Test the injector ground circuit continuity between the injector and ECM adapter as per following table.

| CYLINDER | INJECTOR CONNECTOR | ECM "A" CONNECTOR | MEASUREMENT               |
|----------|--------------------|-------------------|---------------------------|
|          | WIRE               | PIN               |                           |
| No. 1    | Pin 1              | B3                | Close to 0 Ω (continuity) |
| No. 2    | Pin 1              | K-1               |                           |
| No. 3    | Pin 1              | J-1               |                           |

If control circuit is faulty, repair wiring or connector.

Removing a Fuel Injector

- 1. Remove fuel rail and injectors as an assembly. Refer to *FUEL RAIL* in this subsection.
- 2. Remove the injector retaining clip.



FUEL RAIL ASSEMBLY

- 1. Fuel injector
- 2. O-rings
- 3. Injector retaining clip

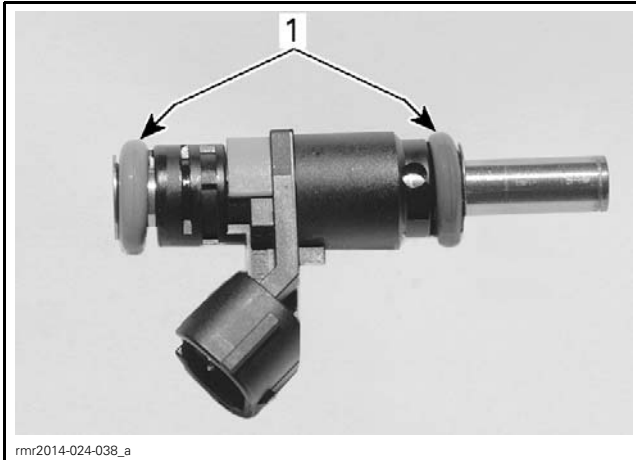
- 3. Pull the fuel injector out of the fuel rail and discard the O-rings.

Installing a Fuel Injector

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

**NOTICE** If installing the removed injector(s), always install NEW O-rings.

- 1. Apply a thin film of engine oil to O-rings to prevent possible damage and to ease insertion in rail.



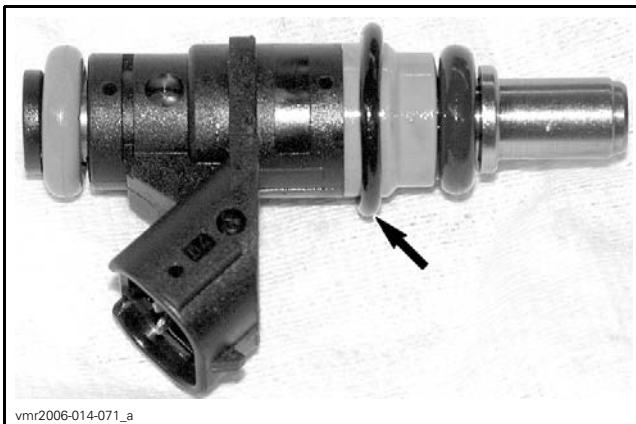
1. Oil on O-rings here

2. Install fuel injector with your hand. Do not use any tool.

#### FUEL INJECTOR INSTALLATION

| O-RINGS | New | Lubricate with engine oil |
|---------|-----|---------------------------|
|---------|-----|---------------------------|

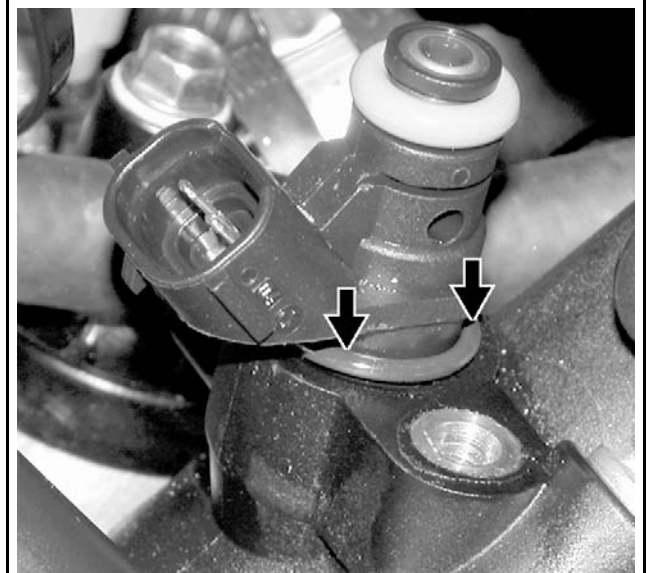
3. Ensure proper positioning of the intake manifold O-ring on injector as in following illustration.



TYPICAL - INTAKE MANIFOLD O-RING POSITION

4. Carefully insert injector in air intake manifold paying attention to the manifold O-ring.

**NOTICE** Gently push O-ring in evenly all around while inserting injector. O-ring must be completely inserted and not visible, before completing the insertion of the injector.



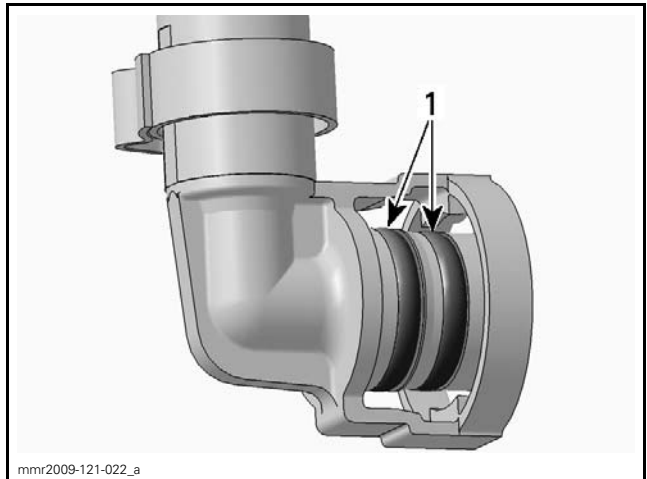
vmr2006-014-072\_a

TYPICAL

5. Firmly push injector in until it bottoms out.

6. Install fuel rail on injectors. Refer to *INSTALLING THE FUEL RAIL* in this subsection.

7. Apply engine oil on O-rings of fuel pressure hose fitting.



FUEL PRESSURE HOSE FITTING

1. Apply oil on O-rings

8. Connect fuel pressure hose to fuel rail.

**IMPORTANT:** Push fuel hose fitting on fuel rail until you hear a "click". Try pulling on fuel hose fitting to ensure it is properly locked.

Pressurize the fuel system and check for fuel leaks. Refer to *FUEL SYSTEM PRESSURIZATION* in *FUEL TANK AND FUEL PUMP* subsection.



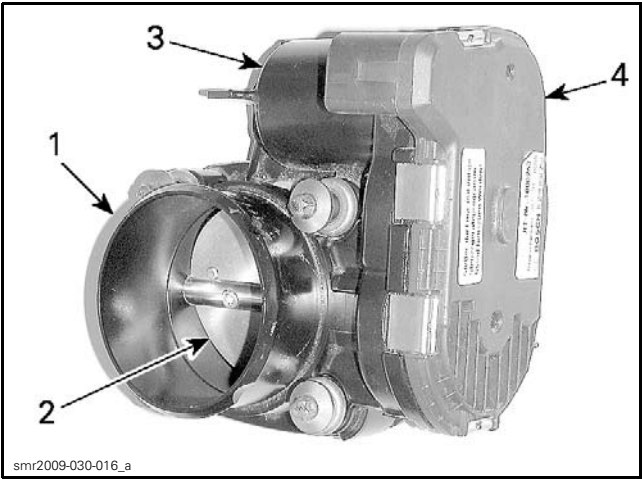
**WARNING**

Failure to pressurize the fuel system and checking for fuel leaks may result in severe injury or a life threatening situation should a leak occur.

9. Reinstall all remaining removed parts.

THROTTLE BODY (ELECTRONIC THROTTLE CONTROL)

Throttle Body (ETC) Description



- 1. Throttle body
- 2. Throttle plate
- 3. Throttle actuator (electric motor inside)
- 4. Throttle position sensor (TPS) (inside)

Electric Throttle Actuator (ETA)

The electric throttle actuator (ETA) is a DC motor on the throttle body that regulates the throttle plate via a drive gear. It receives its control signal from the ECM. Pulse width modulation (PWM) is used to control the motor.

Throttle Plate Operating Positions

Two torsional springs are connected to the throttle plate. A main spring and another one in a plunger mechanism.

When there is no power to the throttle actuator (ETA), the plunger mechanism maintains the throttle plate at a rest position. This also serves as the limp home position.

When the throttle plate is opened by the ETA as commanded by the ECM, it acts against the main spring. If the ETA failed, the return spring would bring the throttle plate back to the limp home position.

| ECM                                                         | ENGINE                                   | THROTTLE BODY                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OFF                                                         | Stopped                                  | Throttle actuator: Off.<br>Throttle plate: Rest position, maintained opened at approximately 8° (1). This is also the limp home position.                                                                                                                                                                                                                         |
| ON                                                          | Not started                              | Throttle actuator: On.<br>Throttle plate: Moves from the rest position to approximately 15°. It then moves back to the rest position. This is the diagnostic mode where the rest position, actuator opening force to overcome the return springs and the motor return rate are monitored. If any of these parameters are out of range, a fault code is initiated. |
| ON                                                          | Started. Normal operation at idle        | Throttle actuator: On.<br>Throttle plate: Moves from the rest position to idle position (approximately 1-3°) according to ECM injection and ignition maps. Throttle plate is opened and closed as necessary to control the idle speed.                                                                                                                            |
| ON                                                          | Started. Normal operation at various RPM | Throttle actuator: On.<br>Throttle plate: Opens and closes according to ECM torque management priorities.                                                                                                                                                                                                                                                         |
| (1) Degree values are given from the fully closed position. |                                          |                                                                                                                                                                                                                                                                                                                                                                   |

Throttle-Body Faults and Effects

**NOTE:** Among other things, a weak or broken spring and a sticky throttle plate are validated by the throttle body diagnostic mode.

| FAULT                                                                                                                                                                          | EFFECT                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Partial failure of TAS sensor (one internal sensor only)                                                                                                                       | Limp home mode. Engine speed limited to idle. ECM will use the remaining TAS sensor. Fault code set and beeper activated to emit warning signals. Check engine light is turned ON. Driveability could be reset by releasing and reapplying the throttle. |
| Complete failure of TAS sensor (both internal sensors)                                                                                                                         | Limp home mode. Engine speed limited to 2500 RPM. Fault code set and beeper activated to emit warning signals. Check engine light is turned ON.                                                                                                          |
| Any throttle body failure                                                                                                                                                      | Limp home mode. Engine speed limited to 2500 RPM. Engine speed can still be increased up to 3200 RPM using the throttle lever. Fault code set and beeper activated to emit warning signals. Check engine light is turned ON.                             |
| NOTE: When one of these faults is active, O.T.A.S. will continue to monitor its input signals. However, since the engine speed is limited, the O.T.A.S. will not be activated. |                                                                                                                                                                                                                                                          |

## Throttle Body Access

Remove central body, refer to *BODY* subsection.

## Throttle Body Lubrication

No lubrication is required.

## Testing the Electric Throttle Actuator (ETA)

### Testing the ETA Using BUDS2

1. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, select the **Settings** page.

**NOTE:** Use the **Settings** page to confirm ETA movement. The BUDS2 indication may lag the actual ETA movement.

3. Slowly apply the throttle from idle to WOT. The ETA should move from approximately 7% to 60% if ECO mode is selected, and 100% if ECO mode is not selected.

If result is out of specification, refer to *UPDATING THE TPS VALUES IN THE ECM*. See *ADJUSTMENT* in this subsection.

**NOTE:** The ETA is reset at the same time as the TPS.

After the reset, test ETA again.

If the result is still out of specification, check wire continuity between ECM and throttle body before assuming the ETA is at fault.

### Testing the ETA Resistance

1. Remove main power relay (R1) in fuse box. Refer to *POWER DISTRIBUTION AND GROUNDS* subsection.
2. Disconnect ECM-A connector and connect it to the ECM adapter tool. Refer to *ECM CONNECTOR ACCESS* in *ENGINE CONTROL MODULE (ECM)* in this subsection.
3. Set multimeter to "Ω" selection and measure the ETA motor coil resistance as per following table.

| ETA RESISTANCE TEST |    |            |
|---------------------|----|------------|
| ECM ADAPTER PINS    |    | RESISTANCE |
| L1                  | L2 | 1.6 Ω      |

If resistance measured is not close to specification, repeat test at the ETA connector. If resistance is still not to specification, replace the throttle body.

If resistance is as specified at ETA, carry out a continuity test of the wiring from ECM connector to ETA connector. Refer to applicable *WIRING DIAGRAM* for details. Repair or replace wiring and connectors as required.

If the wiring and ETA test good, refer to *TESTING THE THROTTLE BODY (ETC)* and *CLEANING THE THROTTLE BODY (ETC)*.

If the throttle body checks good, refer to *ENGINE CONTROL MODULE (ECM)* in this subsection. The problem may be related to the ECM.

**NOTE:** ECM requires proper signals from the TAS (throttle accelerator sensor) and the TPS (throttle position sensor) for proper control of the ETA.

## Inspecting the Throttle Body

Always check for corroded terminals or damaged wiring when diagnosing throttle body problems.

### Testing the Throttle Body (ETC) Operation (Dynamic Tests)

1. Remove the parts required to access the throttle body, refer to *REMOVING THE THROTTLE BODY*.
2. Observe the throttle plate with the engine stopped.

**NOTE:** The throttle plate should be in the rest position (slightly opened).

## Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

**⚠ CAUTION** Keep your fingers out of the throttle plate area while the ECM turns on. The throttle actuator will cycle. This could cause serious finger injuries as throttle plate quickly moves.

3. As you observe the throttle plate, have someone press the START/STOP button to wake up the ECM.

**NOTE:** The throttle plate should cycle quickly from the rest position to a partially open position (approximately 15°), then back to the rest position.

4. Install the tether cord on the engine cut-off switch.

**NOTE:** The throttle plate should cycle again.

5. As you observe the throttle plate, have someone gradually and evenly pull in the throttle lever, then release it in the same way.

**NOTE:** The throttle plate should open then close according to throttle lever position however, the movement of the throttle plate may not be linear with the displacement of the throttle lever.

If any test failed, proceed with *TESTING FOR THROTTLE BODY (ETC) FREEDOM OF MOVEMENT (STATIC TESTS)*.

### Testing for Throttle Body (ETC) Freedom of Movement (Static Tests)

#### **⚠ WARNING**

First ensure the ECM is off. Do not move the throttle plate using your fingers. Otherwise, should the START/STOP button be pressed, the ECM would turn on and quickly cycle the throttle plate which could cause serious finger injury.

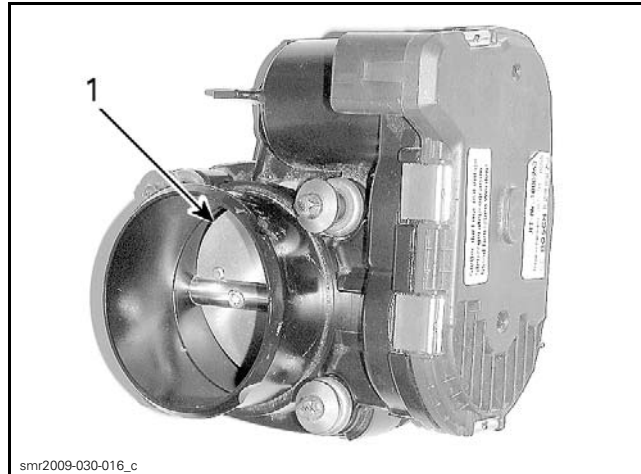
1. Using a blunt tool, push in on the throttle plate and ensure it opens smoothly.



1. Push here to open

**NOTE:** The throttle plate must open fully and return freely to the rest position (slightly opened) when released.

2. Push throttle plate closed as indicated in following illustration. It must close completely and return freely to the rest position (slightly opened) when released.



1. Push here to close

If the throttle plate does not move smoothly or does not return freely to the rest position, the problem is mechanical. Check for salt accumulation on throttle plate shaft. It may also be an actuator or gear problem. Replace throttle body as necessary.

If throttle plate operates normally, the problem is electrical. Check electric throttle actuator (ETA) wiring continuity, throttle position sensor (TPS) and throttle accelerator sensor (TAS).

#### **⚠ WARNING**

If the throttle plate does not return to its rest position properly after a proper cleaning, replace the throttle body.



## Cleaning the Throttle Body

Remove the parts required to access the throttle body, refer to *REMOVING THE THROTTLE BODY*.

Check throttle body cleanliness using a flashlight. Fully open throttle plate and verify:

- Throttle body bore
- Throttle plate edge.

Look for:

- Dirt
- Oily surfaces
- Carbon and salt deposits on throttle plate and the surrounding bore.

Clean as necessary.

**NOTICE** Only use an appropriate throttle body cleaner that will not damage O-rings and EFI sensors.

### WARNING

Use the product in well ventilated area. Refer to product manufacturer's warnings. Wipe off any product leakage in bilge.

To avoid getting dirt into engine, spray cleaner on a clean rag (outside the bilge) then rub rag against throttle plate and bore. A toothbrush works well too.

### WARNING

First ensure ECM is off. Otherwise, if ECM should suddenly turn off, it would quickly close the throttle plate which could cause serious finger injury.

Manually open throttle and hold fully open to reach all surfaces.

### WARNING

Ensure nobody presses the START/STOP button. The ECM would turn on and the throttle actuator (ETA) would cycle. This could cause serious finger injury as the throttle plate moves quickly.

To remove residual dirt, spray cleaner on throttle plate and on bore.

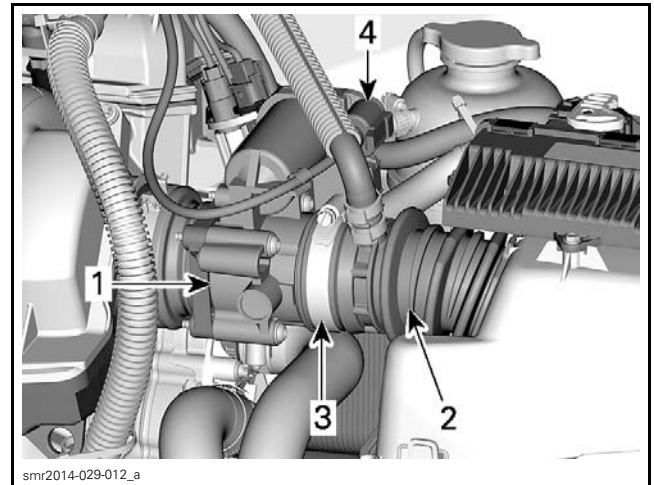
Reinstall removed parts.

## Replacing the Throttle Body

### Removing the Throttle Body

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

2. Disconnect inlet hose from throttle body.
3. Disconnect throttle body connector.



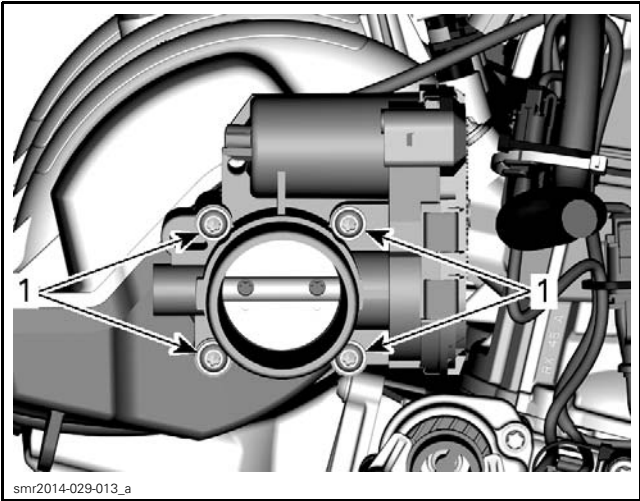
#### TYPICAL

1. Throttle body
2. Inlet hose
3. Inlet hose clamp
4. Throttle body connector



PRESS HERE TO UNLOCK

4. Remove retaining screws from throttle body.



1. Throttle body screws

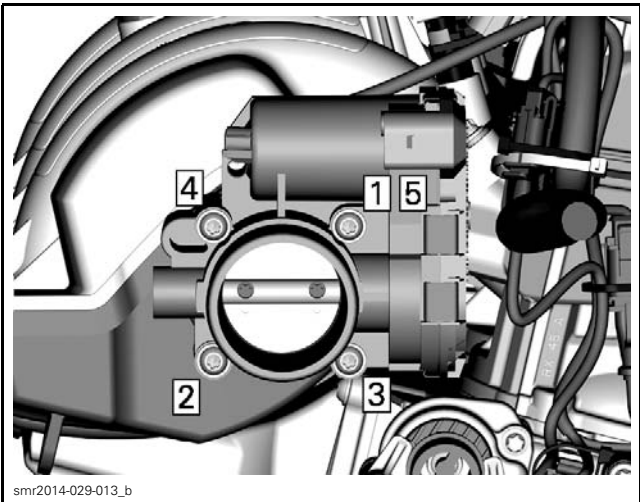
5. Pull throttle body off intake manifold.

Installing the Throttle Body

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

1. Tighten retaining screws to specification as per following sequence.

| RETAINING SCREW TIGHTENING SEQUENCE |                                           |
|-------------------------------------|-------------------------------------------|
| Step 1                              | 5 N•m ± 0.6 N•m<br>(44 lbf•in ± 5 lbf•in) |
| Step 2 through 5                    | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in)   |



2. Perform the *CLOSED THROTTLE RESET*. See procedure in *ADJUSTMENTS*.

THROTTLE POSITION SENSOR (TPS)

General

The throttle position sensor (TPS) is a double potentiometer that sends signals to the ECM that are proportional to the throttle plate angle.

**IMPORTANT:** Prior to testing the TPS, ensure throttle body components are properly installed and connected.

Use BUDS2 to check for related fault codes the EMS may have generated. Refer to *DIAGNOSTIC AND FAULT CODES* subsection for more information.

TPS Location

The TPS is an integral part of the throttle body.

Testing the TPS Wear

1. With the engine turned off, slowly pull in throttle lever and pay attention for smooth operation without physical stops.
2. Press the START/STOP button to wake up the ECM.
3. Install the tether cord on the engine cut-off switch.
4. Connect watercraft to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
5. In BUDS2, click the following:
  - **Monitoring** tab
  - **ECM** tab.
6. Slowly and regularly pull in the throttle lever.
7. Observe the Throttle Opening needle movement.

**NOTE:** The needle should move gradually and regularly as you move the throttle lever. If the needle “sticks”, bounces or suddenly drops, it may indicate a worn TPS that needs to be replaced. An initial slight delay after the throttle lever is pulled and before the needle starts to move is normal.

If the needle behavior is not as expected, proceed with the following steps.

8. Manually move the throttle plate in throttle body using a blunt tool (without sharp tip).

# **⚠ WARNING**

Do not move throttle plate with your fingers. Otherwise, if ECM should turn off, it would quickly close the throttle plate which could cause serious finger injury.



1. Push here

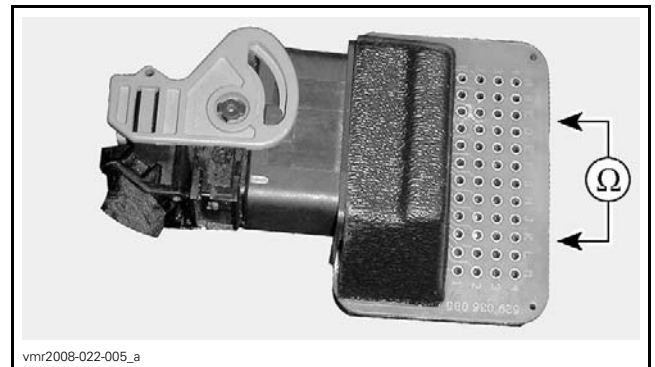
9. Check needle movement again.
  - If needle moves as expected, check the throttle accelerator sensor (TAS). Refer to *THROTTLE ACCELERATOR SENSOR (TAS)* in the *INTELLIGENT THROTTLE CONTROL (ITC)* subsection.
  - If needle does not move as expected, perform the *TESTING THE TPS RESISTANCE* in this subsection.

## **Testing the TPS Resistance**

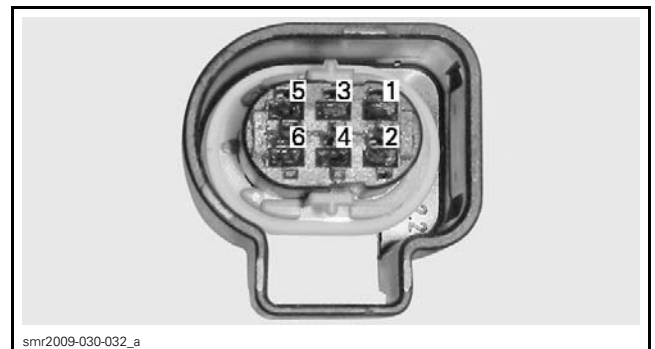
1. Remove the parts required to access the throttle body, refer to *THROTTLE BODY REMOVAL* in this subsection.
2. Ensure the throttle body connector is properly connected.
3. Disconnect ECM-A connector from the ECM, refer to *ECM CONNECTOR ACCESS* in this subsection.
4. Use the multimeter and select  $\Omega$ .
5. Probe circuit as per following table while using a finger to manually move throttle plate.

| ECM ADAPTER |      | FULLY CLOSED THROTTLE PLATE (1) |      | FULLY OPEN THROTTLE PLATE |      |
|-------------|------|---------------------------------|------|---------------------------|------|
|             |      | RESISTANCE (Ω)                  |      |                           |      |
| PIN         |      | MIN.                            | MAX. | MIN.                      | MAX. |
| A-A2        | A-K4 | 625                             | 3000 | 625                       | 3000 |
| A-A2        | A-K3 | 678                             | 3768 | 163                       | 1260 |
| A-A2        | A-F3 | 178                             | 1368 | 700                       | 3840 |
| A-K3        | A-K4 | 163                             | 1260 | 678                       | 3768 |
| A-K3        | A-F3 | 925                             | 4800 | 925                       | 4800 |
| A-K4        | A-F3 | 700                             | 3840 | 178                       | 1368 |

(1) To obtain the fully closed position, it is necessary to push against the throttle plate in the throttle body with a finger and hold it in this position for the measurement.



If any resistance value is incorrect, check wire continuity between ECM and throttle body before assuming the TPS is at fault. Refer to *WIRING DIAGRAM* subsection.



TPS CONNECTOR PIN-OUT

If the TPS resistance values are correct, try a new ECM. Refer to *ENGINE CONTROL MODULE (ECM)* in this subsection.

## **Testing for TPS Input Voltage**

1. Ensure main power relay (R1) is installed in fuse box.

Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

- 2. Disconnect throttle body connector .
- 3. Wake up electrical system.
- 4. Measure for voltage at TPS harness connector as follows.

| CONNECTION                | VOLTAGE |
|---------------------------|---------|
| Pin 3 with battery ground | 3.3 V   |

If voltage test is not good, test and repair the wiring from ECM to the throttle body as required. Refer to applicable *WIRING DIAGRAM*.

If wiring is good, refer to *REPLACING THE ECM* in this subsection.

If voltage test is good, test for continuity of the signal wires and the neutral wire between the throttle body and ECM. Refer to applicable *WIRING DIAGRAM*.

Replacing the TPS

Replace throttle body. Refer to *REPLACING THE THROTTLE BODY*.

Adjusting the TPS

**NOTE:** There is no adjustment that can be carried out on the TPS, however the *BUDS2 THROTTLE POSITION SENSOR RESET FUNCTION* must be carried out when the throttle body has been replaced. Refer to *ADJUSTMENTS* in the beginning of this subsection. If the ECM was replaced, then a *ECM FIRST INITIALIZATION* must be carried out.

While using BUDS2, check for and reset fault codes. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

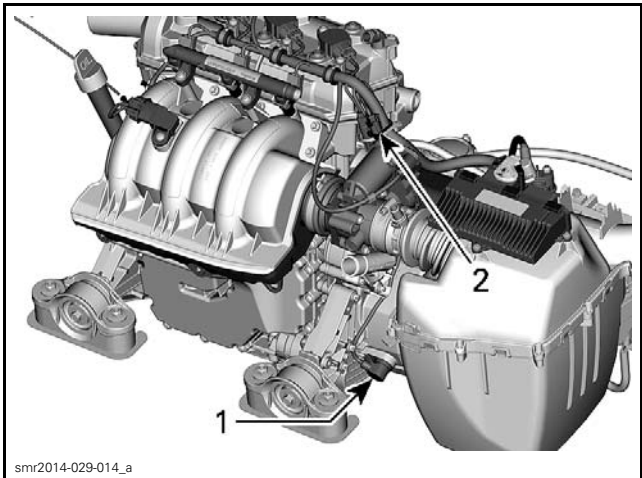
CRANKSHAFT POSITION SENSOR (CPS)

CPS TROUBLESHOOTING

When troubleshooting a CPS fault, take into account that a CPS fault can be triggered by bent or missing encoder wheel teeth.

Push START/STOP button and crank engine. If engine does not start within 15 seconds check for fault codes using BUDS2.

CPS and CPS Connector Location



TYPICAL - RH SIDE OF ENGINE  
1. CPS location  
2. CPS connector location

CPS Connector Access

- 1. Remove central body, refer to *BODY* subsection.

Testing the CPS Resistance at ECM Connector

- 1. Remove parts required to access ECM-A connector, refer to *ECM CONNECTOR ACCESS* in this subsection.
- 2. Disconnect ECM-A connector from the ECM and connect it to the ECM adapter.
- 3. Set the multimeter to  $\Omega$ .
- 4. Measure the resistance of the sensor as per following table.

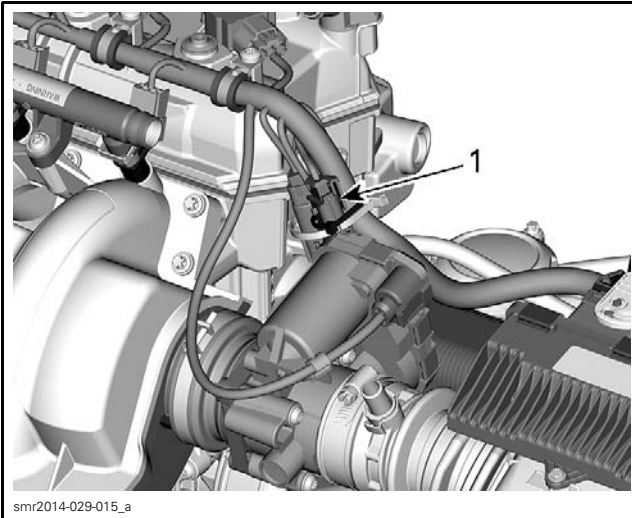
| ECM A CONNECTOR |        | RESISTANCE @ 20°C (68°F) |
|-----------------|--------|--------------------------|
| Pin H1          | Pin K2 | 775 - 950 $\Omega$       |

If resistance is as specified, test continuity of wiring between ECM-A and CPS connectors. Refer to *WIRING DIAGRAM* subsection.

If resistance value is not as specified, reconnect ECM-A connector to the ECM and refer to *TESTING THE CPS RESISTANCE AT CPS CONNECTOR*.

Testing the CPS Resistance at CPS Connector

- 1. Disconnect CPS wiring harness connector.

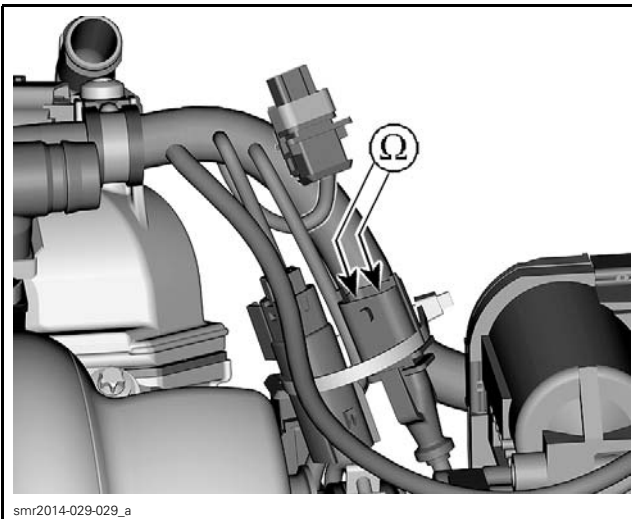


**FRONT OF ENGINE**

1. CPS connector location

2. Probe CPS connector terminals as per following table.

| CPS CONNECTOR |   | MEASUREMENT                          |
|---------------|---|--------------------------------------|
| PIN           |   | RESISTANCE $\Omega$<br>@ 20°C (68°F) |
| 1             | 2 | 775 - 950 $\Omega$                   |



If resistance is not within specifications, replace the CPS.

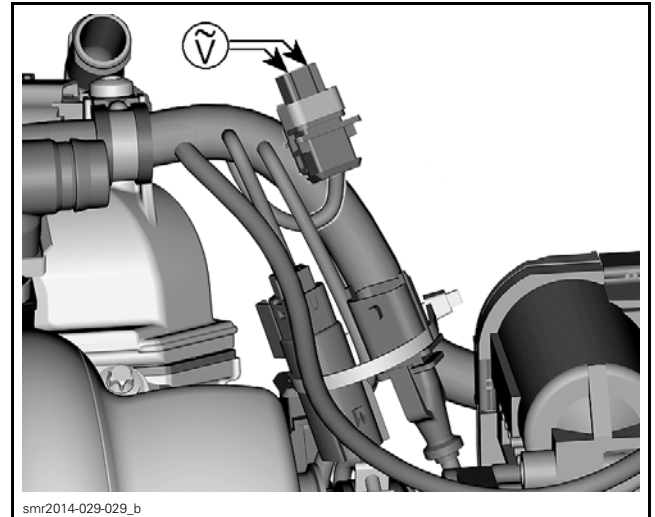
If resistance tests good, carry out a *TESTING THE CPS OUTPUT VOLTAGE*.

## Testing the CPS Voltage

1. Press the START/STOP button to wake up the ECM.
2. Install the tether cord on the engine cut-off switch.

3. Pull the throttle lever completely in to the handlebar and hold (drowned mode).
4. While cranking the engine, probe CPS terminals.

| CPS CONNECTOR |   | MEASUREMENT           |
|---------------|---|-----------------------|
| PIN           |   | VOLTAGE               |
| 1             | 2 | Approximately 3.7 Vac |

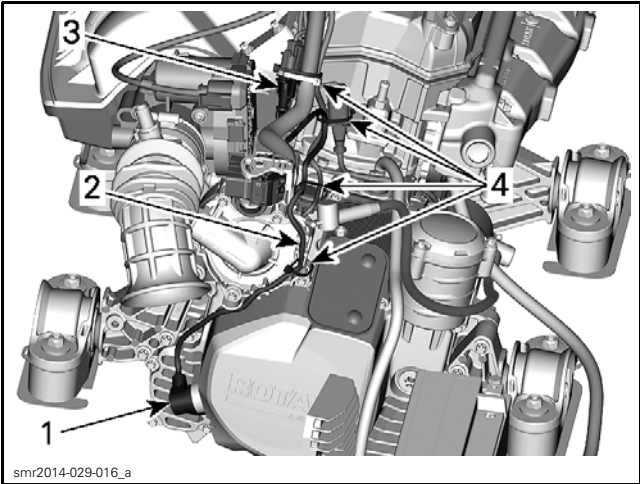


If voltage is not as specified, carry out a *TESTING THE CPS RESISTANCE*.

If voltage is as specified, check continuity of wiring between CPS connector and ECM connector. Refer to *WIRING DIAGRAM*.

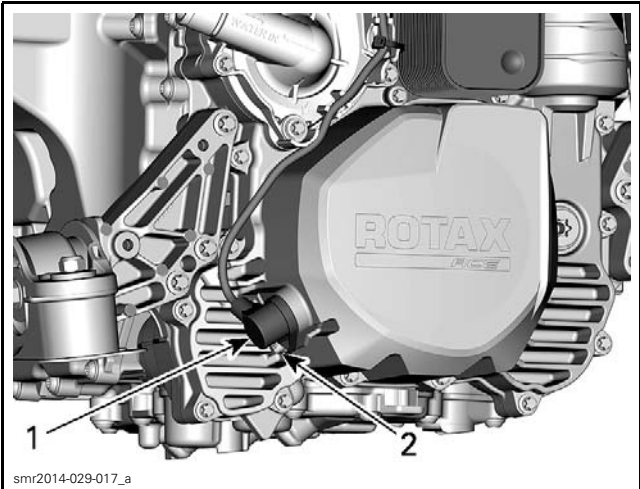
## Replacing the CPS

1. Remove air intake silencer to access the CPS, refer to *AIR INTAKE SYSTEM* subsection.
2. Take note of factory CPS wire harness routing for reinstallation.
3. Disconnect CPS connector and cut harness locking ties.



- 1. CPS
- 2. CPS wiring harness
- 3. CPS connector
- 4. Locking ties

4. Remove CPS retaining screw and pull on CPS to remove it from engine.



- 1. CPS
- 2. Retaining screw

5. Install new CPS.

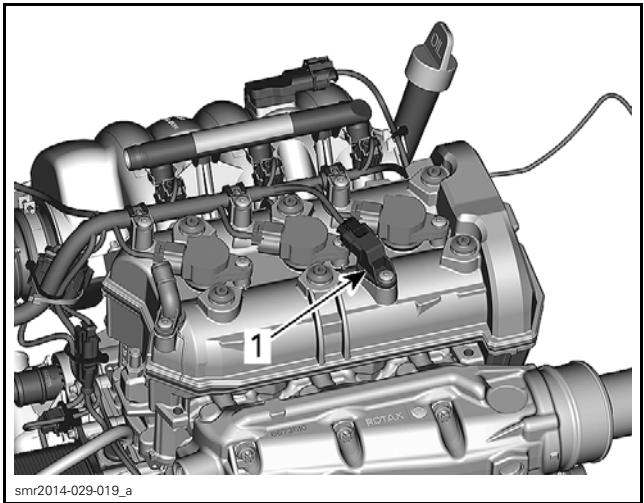
| CPS INSTALLATION |                                      |
|------------------|--------------------------------------|
| O-RING           | SERVICE PRODUCT                      |
|                  | APPLY ENGINE OIL ON O-RING           |
| CONNECTOR        | SERVICE PRODUCT                      |
|                  | DIELECTRIC GREASE (P/N 293 550 004)  |
| RETAINING SCREW  | SERVICE PRODUCT                      |
|                  | LOCTITE 243 (BLUE) (P/N 293 800 060) |
|                  | TIGHTENING TORQUE                    |
|                  | 9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) |

- 6. Route and secure CPS harness using locking ties as noted prior to removal.
- 7. Reconnect CPS connector.
- 8. Install air intake silencer, refer to *AIR INTAKE SYSTEM* subsection.

**NOTE:** Ensure tab on air hose is aligned between the two marks on the intake silencer.

9. Install all remaining removed parts, refer to applicable subsection.

CAMSHAFT POSITION SENSOR (CAPS)



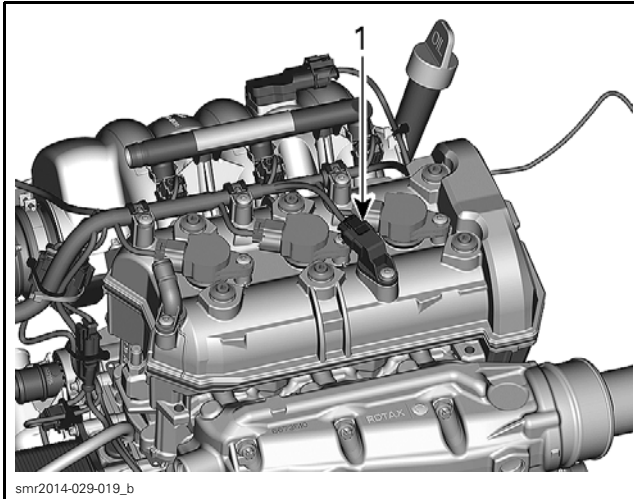
- 1. CAPS

CAPS Access

Remove central body, refer to *BODY* subsection.

Testing the CAPS Input Voltage (Harness Side)

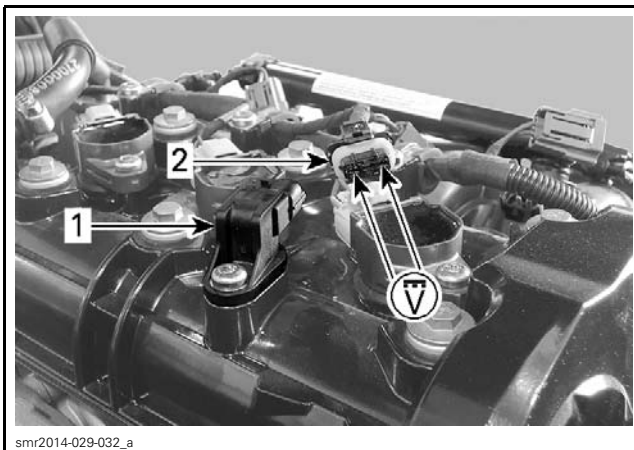
- 1. Remove the parts required to access the CAPS, refer to *CAPS ACCESS*.
- 2. Disconnect CAPS connector.



1. CAPS connector

3. Press the START/STOP button to wake up the ECM.
4. Install tether cord on engine cut-off switch.
5. Probe harness connector terminals as per following table.

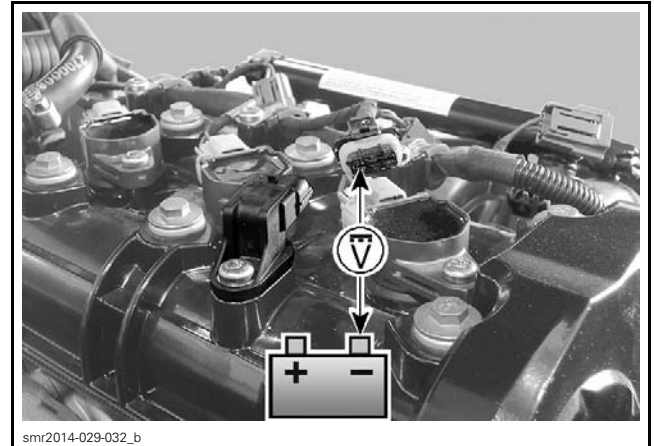
| CAPS CONNECTOR |   | MEASUREMENT     |
|----------------|---|-----------------|
| PIN            |   | VOLTAGE         |
| 3              | 1 | Battery voltage |


1. CAPS  
2. CAPS connector

If battery voltage is read, proceed with *CAPS DYNAMIC TEST* further in this subsection.

If battery voltage is not read, probe circuit as per following table.

| CAPS CONNECTOR |                | MEASUREMENT     |
|----------------|----------------|-----------------|
| PIN            |                | VOLTAGE         |
| 3              | Battery ground | Battery voltage |



If voltage is read to battery ground, check continuity of ground circuit between CAPS pin 1 and ECM connector "A" pin E2. Repair or replace wiring and connectors.

If voltage is not read to battery ground, carry out *TESTING THE CONTINUITY OF CAPS POWER CIRCUIT*.

### Testing the CAPS Output Voltage

1. Remove the parts required to access the CAPS, refer to *CAPS ACCESS*.
2. Remove CAPS sensor from engine.
3. Back-probe connector and read voltage as follows.

**NOTE:** To safely probe wire terminals through the back of the connector, use the following tool or an equivalent.

| REQUIRED TOOL                              |
|--------------------------------------------|
| FLUKE AUTOMOTIVE BACK PROBE PIN (P/N TP40) |



FLUKE AUTOMOTIVE BACK PROBE PIN P/N TP40

**NOTICE** Do not use sharp end probes. They could damage the connector seal.

Probes can be inserted at the end of the FLUKE SUREGRIP INSULATED TEST LEADS (P/N TL224).



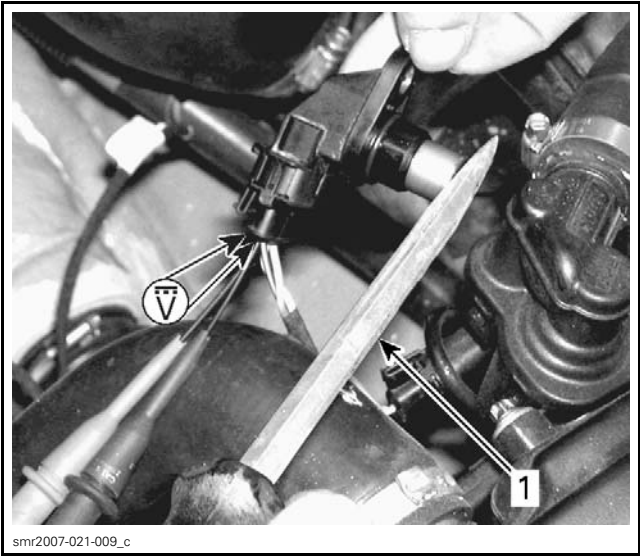
- 4. Briefly press the START/STOP button to wake up the ECM.
- 5. Install the tether cord cap on the engine cut-off switch.
- 6. Read voltage as per following tables.

| CAPS<br>CONDITION | CAPS<br>CONNECTOR |   | VOLTAGE        |
|-------------------|-------------------|---|----------------|
| Free              | 3                 | 2 | Close to 0 Vdc |



TYPICAL

| CAPS<br>CONDITION               | CAPS<br>CONNECTOR |   | VOLTAGE         |
|---------------------------------|-------------------|---|-----------------|
| Metallic<br>object on<br>sensor | 3                 | 2 | Battery voltage |



TYPICAL

- 1. Metallic object

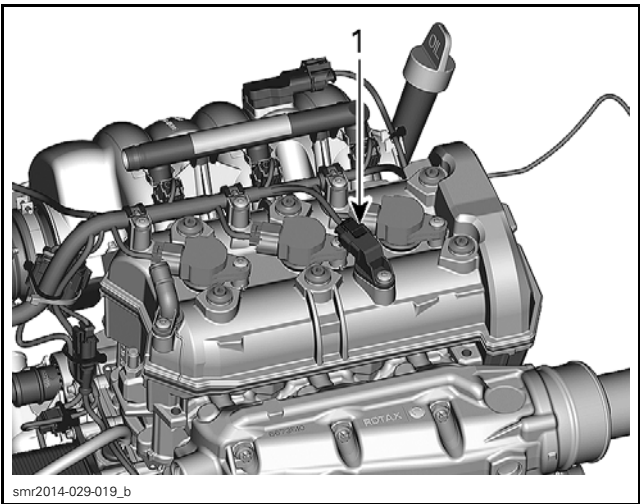
If voltage is as specified, repair or replace wiring and connectors between sensor and ECM.

If wiring is good, check ECM. Refer to *ENGINE CONTROL MODULE (ECM)*.

If battery voltage is not measured as specified, try a new CAPS.

Replacing the CAPS

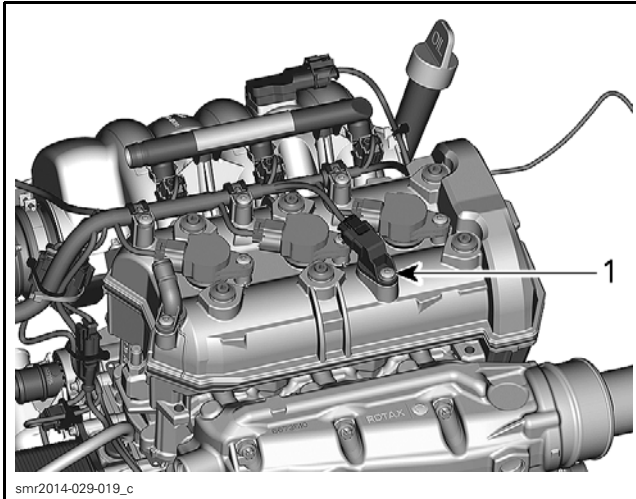
- 1. Disconnect CAPS connector.



- 1. CAPS connector

- 2. Unscrew the CAPS retaining screw.





1. CAPS retaining screw

3. Pull CAPS from engine.
4. Install the new CAPS.

**NOTICE** Be sure to install new O-ring on the new CAPS.

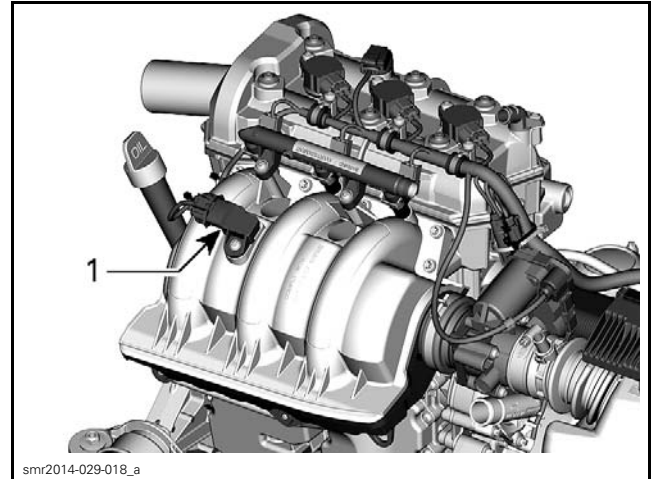
| CAPS INSTALLATION  |                                         |
|--------------------|-----------------------------------------|
| O-RING             | SERVICE PRODUCT                         |
|                    | APPLY ENGINE OIL ON O-RING              |
| CONNECTOR          | SERVICE PRODUCT                         |
|                    | DIELECTRIC GREASE<br>(P/N 293 550 004)  |
| RETAINING<br>SCREW | TIGHTENING TORQUE                       |
|                    | 9 N•m ± 1 N•m<br>(80 lbf•in ± 9 lbf•in) |

## MANIFOLD ABSOLUTE PRESSURE AND TEMPERATURE SENSOR (MAPTS)

**NOTE:** This sensor is a multifunction device. It measures manifold absolute pressure and intake air temperature for air flow calculations.

### MAPTS Access

To access the MAPTS, remove the central body. Refer to *BODY* subsection.



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### MAPTS LOCATION

1. Manifold air pressure and temperature sensor (MAPTS)

### MAPTS Pressure Function

Before the engine is started, when power is applied to the system, the sensor measures the ambient atmospheric air pressure. The ambient air pressure is at that moment stored in the ECM. Thereafter, once the engine is started, it measures the air pressure in the intake manifold at operating RPMs.

The sensor must be correctly installed on the intake manifold. Otherwise, the MAPTS could generate a fault code for an unexpected sensor range at idle when it reads an erroneous intake manifold pressure. If this is the case, remove sensor and check for oil or dirt on its end and if problem persists, check throttle plate condition/position and the wiring harness. Perform the following tests.

### MAPTS Quick Test (Pressure Function)

1. Connect the vehicle to BUDS2. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, select:
  - **Measurements** page
  - **ECM** button.
3. Look for and take note of the MAPTS pressure reading while the engine is stopped.

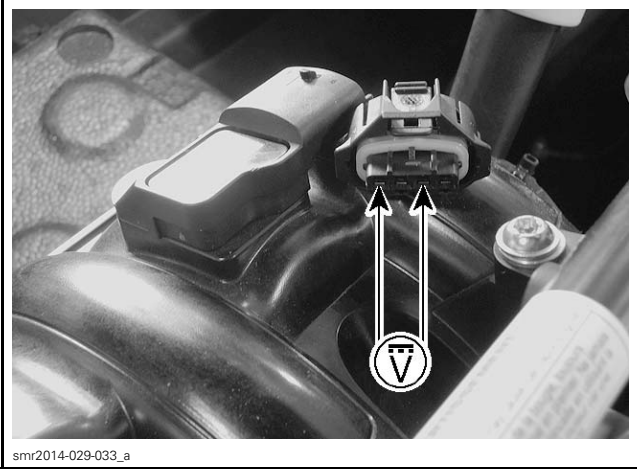
**NOTE:** The indicated intake air pressure in BUDS2 must be within 3.4 kPa (.5 PSI) of local atmospheric pressure when the engine is stopped.

| MAPTS PRESSURE FUNCTION QUICK TEST |                                                    |                          |                          |
|------------------------------------|----------------------------------------------------|--------------------------|--------------------------|
| RESULT                             | SERVICE ACTION                                     |                          |                          |
| NO READING                         | Circuit Continuity Test of MAPTS Pressure Function | MAPTS Input Voltage Test | Repair or replace wiring |
| VALUE IS OUT OF RANGE              | Replace MAPTS                                      |                          |                          |

4. Perform the same test with a new MAPTS and compare both readings.

Testing for MAPTS Input Voltage

1. Remove parts required to access the MAPTS, refer to *MAPTS ACCESS*.  
2. Remove electrical connector from MAPTS.



If voltage test is good, replace the MAPTS.

If voltage test is not good, carry out the *TESTING THE MAPTS CIRCUIT CONTINUITY (PRESSURE FUNCTION)*.

Testing the MAPTS Circuit Continuity (Pressure Function)

1. Remove parts required to access ECM connectors, refer to *ECM CONNECTOR ACCESS* in this subsection.  
2. Disconnect the ECM-A connector from the ECM and connect it to the ECM adapter tool.  
3. Using the multimeter set to  $\Omega$  and check continuity of the following circuits.

| MAPTS CIRCUIT CONTINUITY TEST (PRESSURE FUNCTION) |                 |                     |
|---------------------------------------------------|-----------------|---------------------|
| ECM-A                                             | MAPTS CONNECTOR | RESISTANCE VALUE    |
| Pin B4                                            | Pin 3           | Close to 0 $\Omega$ |
| Pin G4                                            | Pin 4           |                     |
| Pin H2                                            | Pin 1           |                     |

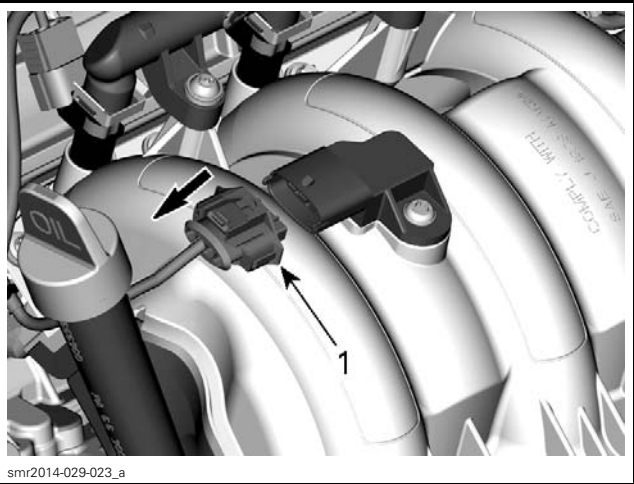
If resistance is not within specification, repair or replace the wiring harness between ECM connector and the MAPTS. Refer to *WIRING DIAGRAM*.

MAPTS Temperature Function

The MAPTS also monitors the temperature of the air in the intake manifold.

Testing the MAPTS Resistance (Temperature Function)

1. Disconnect the MAPTS connector.  
2. Using the multimeter set to  $\Omega$ , test MAPTS resistance at the sensor as per following tables.

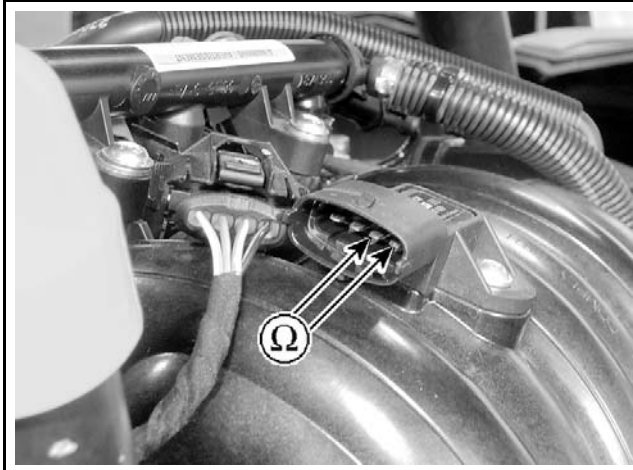


1. MAPTS connector

3. Briefly press START/STOP button.  
4. Install tether cord cap on engine shut-off switch.  
5. Using a multimeter set to Vdc, measure for MAPTS input voltage as per following table.

| MAPTS CONNECTOR |   | MEASUREMENT |
|-----------------|---|-------------|
| PIN             |   | VOLTAGE     |
| 1               | 3 | 5 Vdc       |

| MAPTS |   | MEASUREMENT                             |
|-------|---|-----------------------------------------|
| PIN   |   | Refer to MAPTS TEMPERATURE SENSOR TABLE |
| 1     | 2 |                                         |



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| MAPTS TEMPERATURE SENSOR TABLE |      |                                  |
|--------------------------------|------|----------------------------------|
| TEMPERATURE                    |      | RESISTANCE<br>(ohms $\pm 10\%$ ) |
| °C                             | °F   | AAPTS                            |
| - 30                           | - 22 | 26860                            |
| - 20                           | - 4  | 15614                            |
| - 10                           | 14   | 9425                             |
| 0                              | 32   | 6350                             |
| 20                             | 68   | 2510                             |
| 30                             | 86   | 1715                             |
| 40                             | 104  | 1200                             |
| 50                             | 122  | 850                              |
| 60                             | 140  | 610                              |
| 70                             | 158  | 445                              |
| 80                             | 176  | 330                              |
| 90                             | 194  | 245                              |
| 100                            | 212  | 185                              |
| 110                            | 230  | 140                              |
| 120                            | 248  | 110                              |
| 130                            | 266  | 85                               |

If resistance is not within specification, replace the MAPTS.

If resistance tests good, **reconnect** the MAPTS and proceed with the following steps.

3. Disconnect the ECM-A connector.

4. Install ECM-A connector on the ECM adapter tool.

5. Using a multimeter, recheck resistance value as per following table.

| ECM ADAPTER |    | MEASUREMENT                             |
|-------------|----|-----------------------------------------|
| PIN         |    | Refer to MAPTS TEMPERATURE SENSOR TABLE |
| H2          | H3 |                                         |

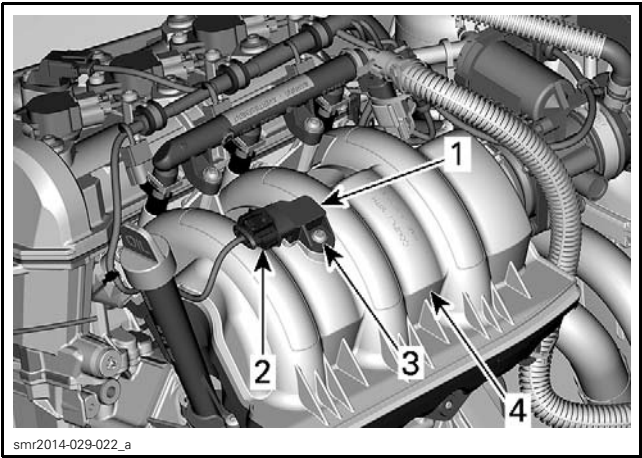
| MAPTS TEMPERATURE SENSOR TEST RESULTS |                                                       |                          |                          |
|---------------------------------------|-------------------------------------------------------|--------------------------|--------------------------|
| RESULT                                | SERVICE ACTION                                        |                          |                          |
| NO READING                            | Circuit Continuity Test of MAPTS Temperature Function | MAPTS Input Voltage Test | Repair or replace wiring |
| INCORRECT RESISTANCE VALUE            | Check condition of connector pins, replace MAPTS      |                          |                          |
| CORRECT RESISTANCE VALUE              | Try a new ECM                                         |                          |                          |

Testing the MAPTS Circuit Continuity (Temperature Function)

| MAPTS CIRCUIT CONTINUITY TEST (TEMPERATURE FUNCTION) |                 |                     |
|------------------------------------------------------|-----------------|---------------------|
| ECM ADAPTER                                          | MAPTS CONNECTOR | RESISTANCE VALUE    |
| Pin H2                                               | Pin 1           | Close to 0 $\Omega$ |
| Pin H3                                               | Pin 2           |                     |

Repair or replace wiring as required.

Replacing the MAPTS



- 1. MAPTS
- 2. MAPTS connector
- 3. Retaining screw
- 4. Intake manifold

- 1. Disconnect MAPTS connector and remove the MAPTS from the intake manifold.
- 2. Install new MAPTS as per following table.

| MAPTS INSTALLATION |                                             |
|--------------------|---------------------------------------------|
| Retaining screw    | <b>TIGHTENING TORQUE</b>                    |
|                    | 4.5 N•m ± 0.5 N•m<br>(40 lbf•in ± 4 lbf•in) |
| Connector          | <b>SERVICE PRODUCT</b>                      |
|                    | DIELECTRIC GREASE<br>(P/N 293 550 004)      |

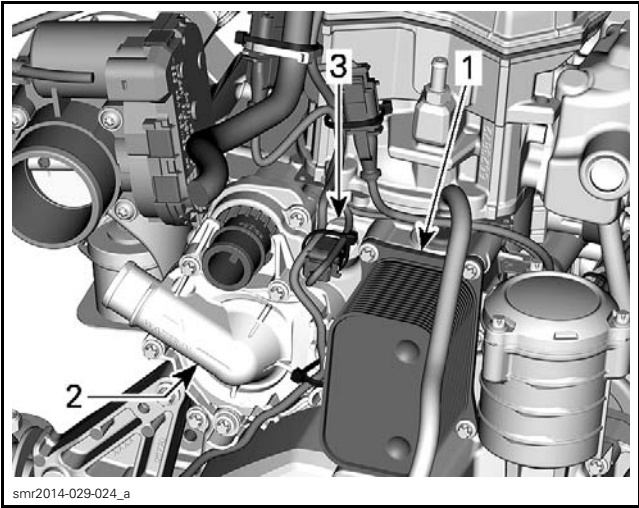
COOLANT TEMPERATURE SENSOR (CTS)

Overheat Warning

The CTS will cause the engine overheat warning to come on when the coolant temperature is above 100°C (212°F).

CTS Access

The CTS is located on the forward end of the engine, between the water pump and oil cooler. To access the CTS, remove the central body. Refer to *BODY* subsection.



TYPICAL - FORWARD END OF ENGINE

- 1. Oil cooler
- 2. Water pump
- 3. Coolant temperature sensor (CTS)

Testing the CTS Using BUDS2

- 1. Connect the vehicle BUDS2 Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
- 2. In B.U.D.S., select the following:
  - **Measurements** page tab
  - **ECM** page.

If engine temperature indicated in BUDS2 is correct for actual engine temperature, the CTS and it's circuit is functioning normally.

If there is no temperature reading, or if reading does not reflect actual engine temperature, proceed with *TESTING THE CTS RESISTANCE AT THE COMPONENT*.

Testing the CTS Resistance at the Component

- 1. Remove parts required to access ECM connectors, refer to *ECM CONNECTOR ACCESS* in this subsection.
- 2. Disconnect the ECM-A connector.
- 3. Install ECM-A connector on the ECM adapter tool.
- 4. Using a multimeter, check resistance from the ECM connector as per following table.

| ECM ADAPTER |    | MEASUREMENT                           |
|-------------|----|---------------------------------------|
| PIN         |    | Refer to CTS TEMPERATURE SENSOR TABLE |
| A1          | J2 |                                       |

If resistance test is good, refer to *ECM REPLACEMENT*.

If resistance is out of specification, proceed with the following steps.

5. Disconnect the CTS connector.
6. Check continuity of wiring between ECM and CTS connector, refer to *WIRING DIAGRAM*. If there is an open circuit, repair or replace wiring and connectors.
7. If continuity of wiring is good, test the resistance of the sensor as per following tables.

| CTS SENSOR |   | MEASUREMENT                           |
|------------|---|---------------------------------------|
| PIN        |   | Refer to CTS TEMPERATURE SENSOR TABLE |
| 1          | 2 |                                       |

| CTS 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    |

**NOTE:** To test sensor at various temperatures, remove sensor and use a heat gun, ice and a thermometer. Refer to *CTS REPLACEMENT*.

If resistance value is correct, repair the connectors or replace the wiring harness between ECM connector and CTS connector.

If resistance value is incorrect, replace the CTS.

## Replacing the CTS

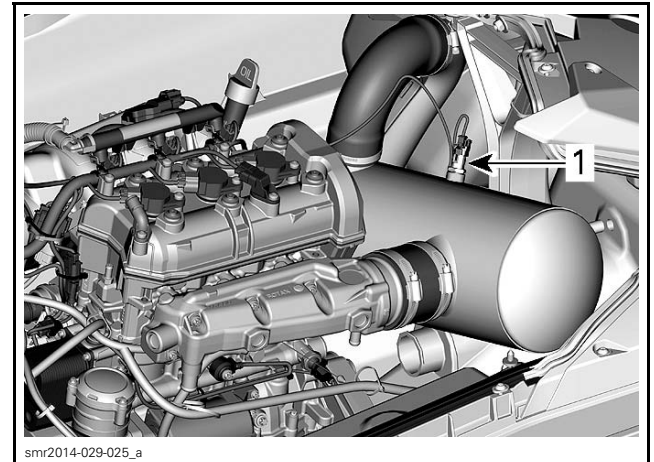
1. Drain engine coolant to below CTS level, refer to *COOLING SYSTEM* subsection.
2. Cut locking ties on wiring harnesses and move wiring aside for access. Be sure to take note of their position.
3. Disconnect CTS connector.
4. Remove CTS from engine.
5. Install new CTS and tighten to specification.

| TIGHTENING TORQUE |                                            |
|-------------------|--------------------------------------------|
| CTS               | 16 N•m ± 2 N•m<br>(142 lbf•in ± 18 lbf•in) |

6. Reinstall remaining removed parts. Be sure to secure wiring harnesses as noted prior to removal.

7. Refill and bleed the cooling system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

## EXHAUST GAS TEMPERATURE SENSOR (EGTS)



1. Exhaust gas temperature sensor (EGTS)

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

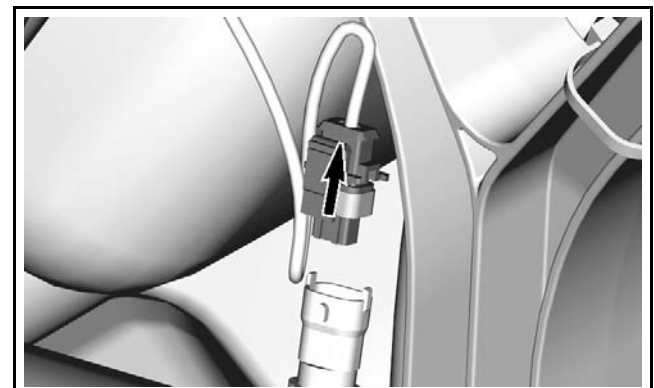
| OVERHEAT TEMPERATURE |
|----------------------|
| 95°C (203°F)         |

## EGTS Access

Remove the central body, refer to *BODY* subsection.

## Testing the EGTS Resistance

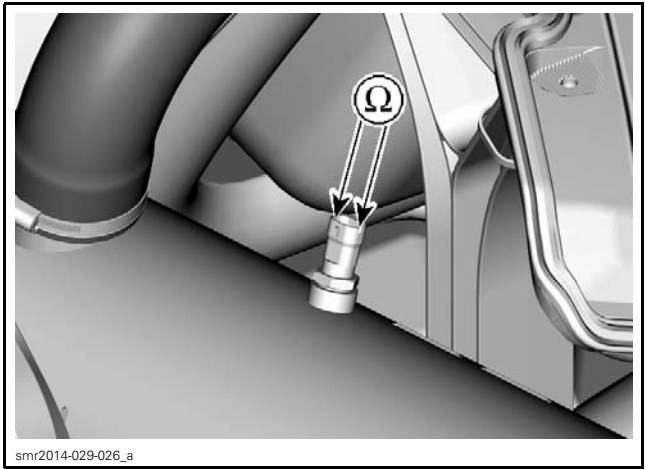
1. Remove the parts required to access the EGTS, refer to *EGTS ACCESS* in this subsection.
2. Disconnect the EGTS connector.



EGTS

Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

3. Set the multimeter to  $\Omega$  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 RESISTANCE CHART |      |                   |        |
|-----------------------|------|-------------------|--------|
| 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.

4. Reconnect the EGTS.  
5. Disconnect ECM-A connector.  
6. Using a multimeter and the ECM adapter tool, check the circuit resistance as per following table.

| 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)* in this subsection.

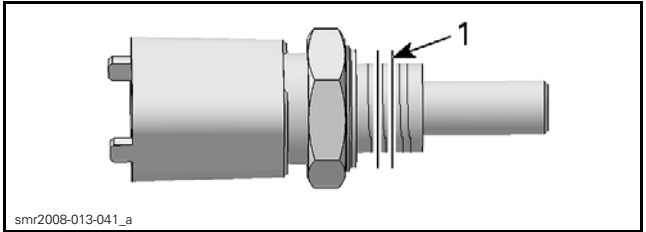
If resistance value is not within specifications, repair or replace wiring and connectors between the ECM and the EGTS.

Replacing the EGTS

1. Disconnect the EGTS connector.  
2. Unscrew EGTS from muffler.

3. Install new EGTS.

| EGTS INSTALLATION                   |                                            |
|-------------------------------------|--------------------------------------------|
| Sensor                              | SERVICE PRODUCT                            |
|                                     | LOCTITE 518 (P/N 293 800 038)              |
|                                     | TIGHTENING TORQUE                          |
| Connector                           | 16 N•m ± 2 N•m<br>(142 lbf•in ± 18 lbf•in) |
|                                     | SERVICE PRODUCT                            |
| DIELECTRIC GREASE (P/N 293 550 004) |                                            |



1. Apply Loctite 518 in this area

4. Install the EGTS connector.  
5. Install all other removed parts, refer to applicable subsections.

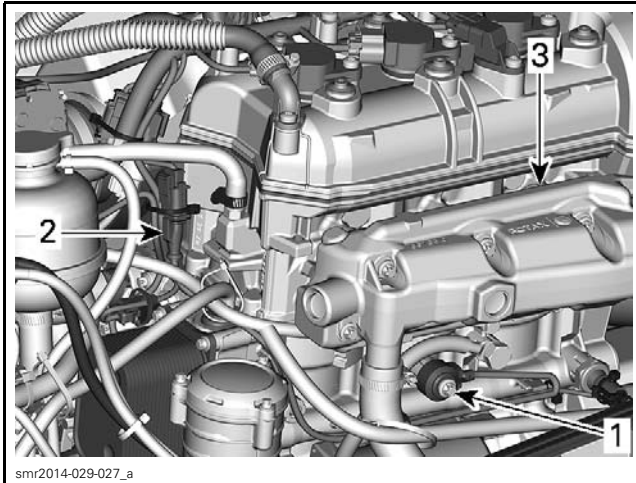
KNOCK SENSOR (KS)

This engine is equipped with one knock sensor (KS1) that measures the amount of noise generated by the engine.

If an abnormally high amount of noise is measured, the ECM perceives this as a KNOCK condition and adjusts ignition timing by retarding it to correct the situation.

If, with the engine running under load above 4000 RPM, the ECM receives no knock sensor signal, or receives a knock sensor signal representing an engine noise level below a calibrated threshold, it perceives this as a knock sensor fault and sets a knock sensor fault code.

## Knock Sensor Location



**KNOCK SENSOR LOCATION - LH SIDE OF ENGINE**

1. Knock sensor (KS)
2. Knock sensor connector
3. Exhaust manifold

## Knock Sensor Troubleshooting

Always use BUDS2 to check for a knock sensor related fault code and carry out service actions.

Knock sensor problems may be related to, but not limited to any of the following items:

- Loose or improperly tightened knock sensor
- Dirty or corroded mounting surface
- Cracked knock sensor from over tightening
- Bad wiring and connections
- An induced knock (or vibration) due to a loose part external to the engine.
- Knock sensor and CPS sensor harness connectors swapped (mixed up).

## Testing KS Operation (Dynamic Test)

1. Using the latest applicable BUDS2 version, check for a knock sensor fault. If an occurred knock sensor fault is present, reset the fault.
2. Disconnect vehicle from BUDS2 and make vehicle ready for a test ride.
3. During test ride, perform several accelerations under load and ensure engine RPM exceeds 4000 RPM.
4. After test ride, reconnect vehicle to BUDS2 and look for a knock sensor fault code in BUDS2

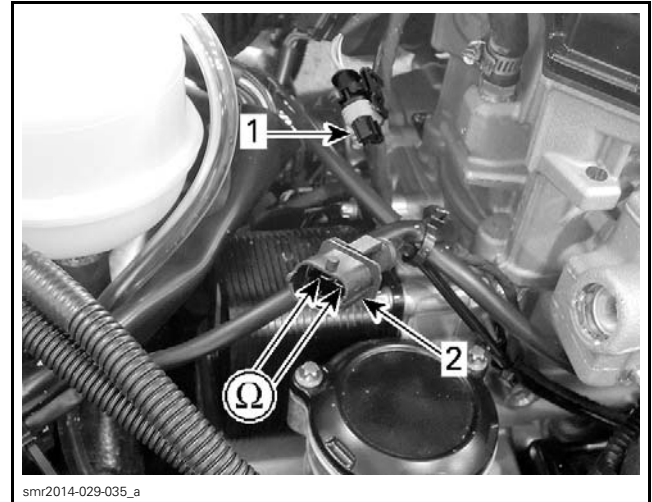
If no fault code occurs, the knock sensor is good.

If a fault occurs, do the following:

- Refer to *KNOCK SENSOR TROUBLESHOOTING* and check for any of the problems listed. Repair as required.
- Carry out *TESTING THE KS RESISTANCE*.

## Testing the KS Resistance

1. Remove parts required to access knock sensor, refer to *REPLACING THE KS*.
2. Disconnect knock sensor connector.
3. Using a multimeter, measure the resistance between the knock sensor terminals.



### KNOCK SENSOR RESISTANCE @ 20°C (68°F)

Approximately 5 MΩ

If resistance is not as specified, replace knock sensor.

If resistance is as specified, carry on with the following steps.

4. Reconnect knock sensor connector.
5. Disconnect ECM-A connector.
6. Using a multimeter and ECM adapter tool, check circuit resistance through the knock sensor as per following table.

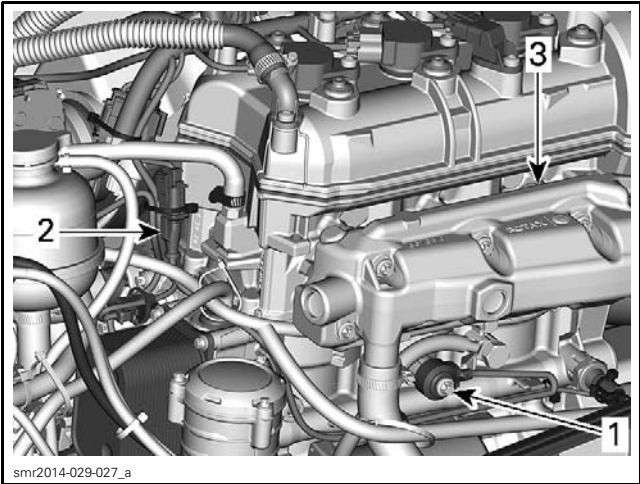
| ECM ADAPTER |      | MEASUREMENT              |
|-------------|------|--------------------------|
| PIN         |      | RESISTANCE @ 20°C (68°F) |
| A-C3        | A-G2 | Approximately 5 MΩ       |

If wiring harness is good, check ECM. Refer to *ENGINE CONTROL MODULE (ECM)* in this section.

If an open circuit is measured, repair or replace wiring and connectors between ECM and knock sensor.

## Replacing the KS

1. Disconnect KS sensor connector.
2. Unscrew and remove knock sensor from engine.



- 1. Knock sensor (KS)
- 2. Knock sensor connector
- 3. Exhaust manifold

- 3. Clean contact surfaces.
- 4. Apply service product in threaded hole then install the new knock sensor.
- 5. Tighten sensor retaining screw as specified.

| KNOCK SENSOR INSTALLATION |                                          |
|---------------------------|------------------------------------------|
| Mounting screw            | SERVICE PRODUCT                          |
|                           | LOCTITE 243 (BLUE)<br>(P/N 293 800 060)  |
|                           | TIGHTENING TORQUE                        |
|                           | 23 N•m ± 3 N•m<br>(17 lbf•ft ± 2 lbf•ft) |
| Harness Connector         | SERVICE PRODUCT                          |
|                           | DIELECTRIC GREASE<br>(P/N 293 550 004)   |

**NOTICE** Improper tightening torque may interfere with knock sensor operation and lead to severe internal engine damage.

- 6. Reconnect knock sensor connector.
- 7. Reinstall remaining removed parts, refer to applicable subsections.

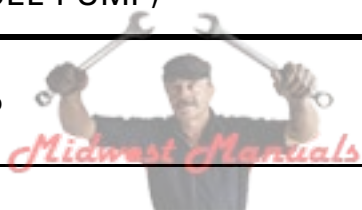


# FUEL TANK AND FUEL PUMP

## SERVICE TOOLS

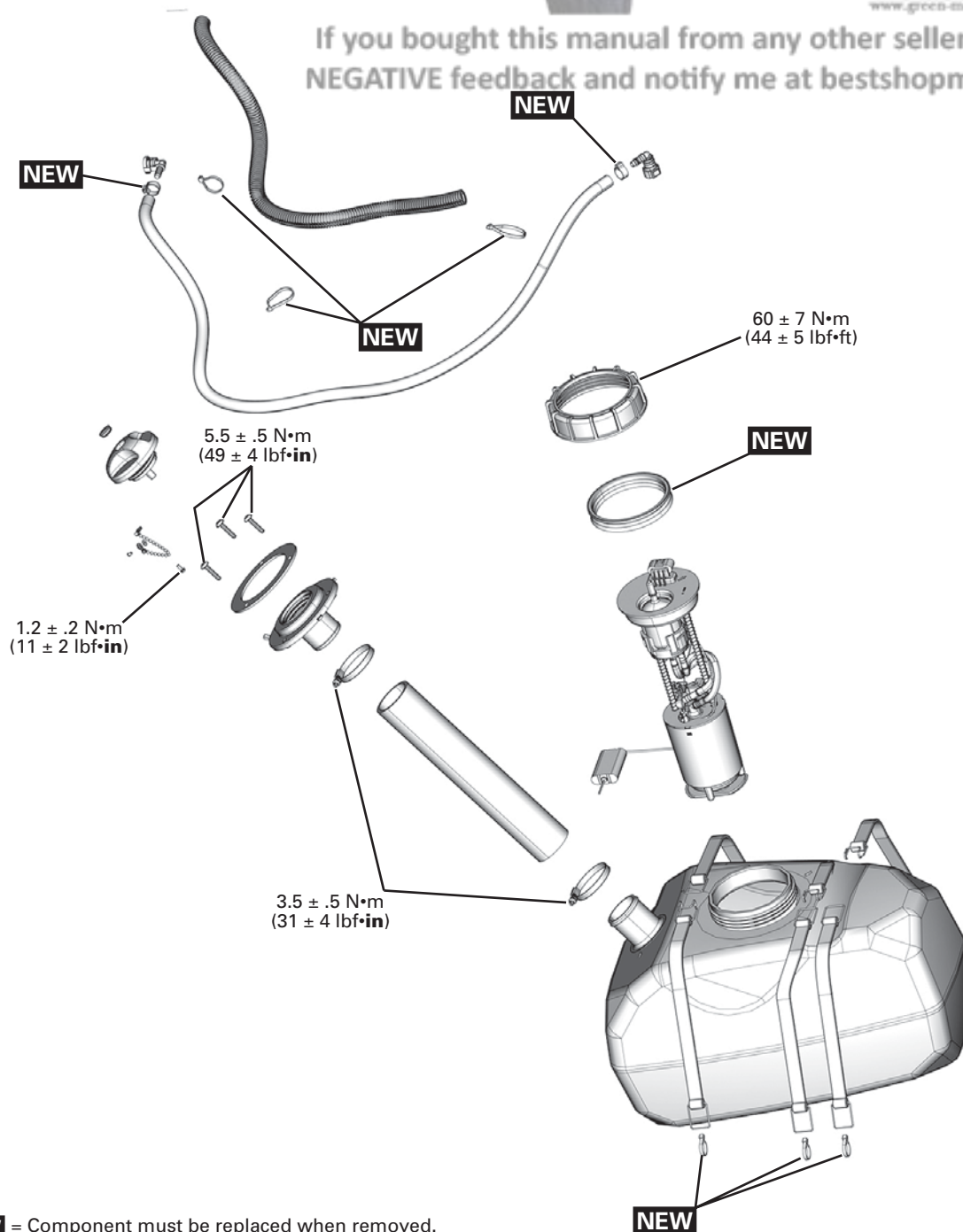
| Description                             | Part Number       | Page |
|-----------------------------------------|-------------------|------|
| DIAGNOSTIC HARNESS .....                | 529 036 384 ..... | 7    |
| ECM ADAPTER TOOL.....                   | 529 036 166 ..... | 10   |
| FUEL HOSE ADAPTER.....                  | 529 036 396 ..... | 8    |
| FUEL PUMP MODULE SOCKET.....            | 529 036 125 ..... | 12   |
| FUEL TANK TEST CAP .....                | 529 036 242 ..... | 5    |
| OETIKER PLIER.....                      | 295 000 070 ..... | 9    |
| PRESSURE GAUGE.....                     | 529 036 395 ..... | 8    |
| VACUUM/PRESSURE PUMP .....              | 529 021 800 ..... | 5-6  |
| VENTED CAP TEST ADAPTER (THREADED)..... | 529 036 243 ..... | 6    |

## FUEL TANK AND FUEL PUMP



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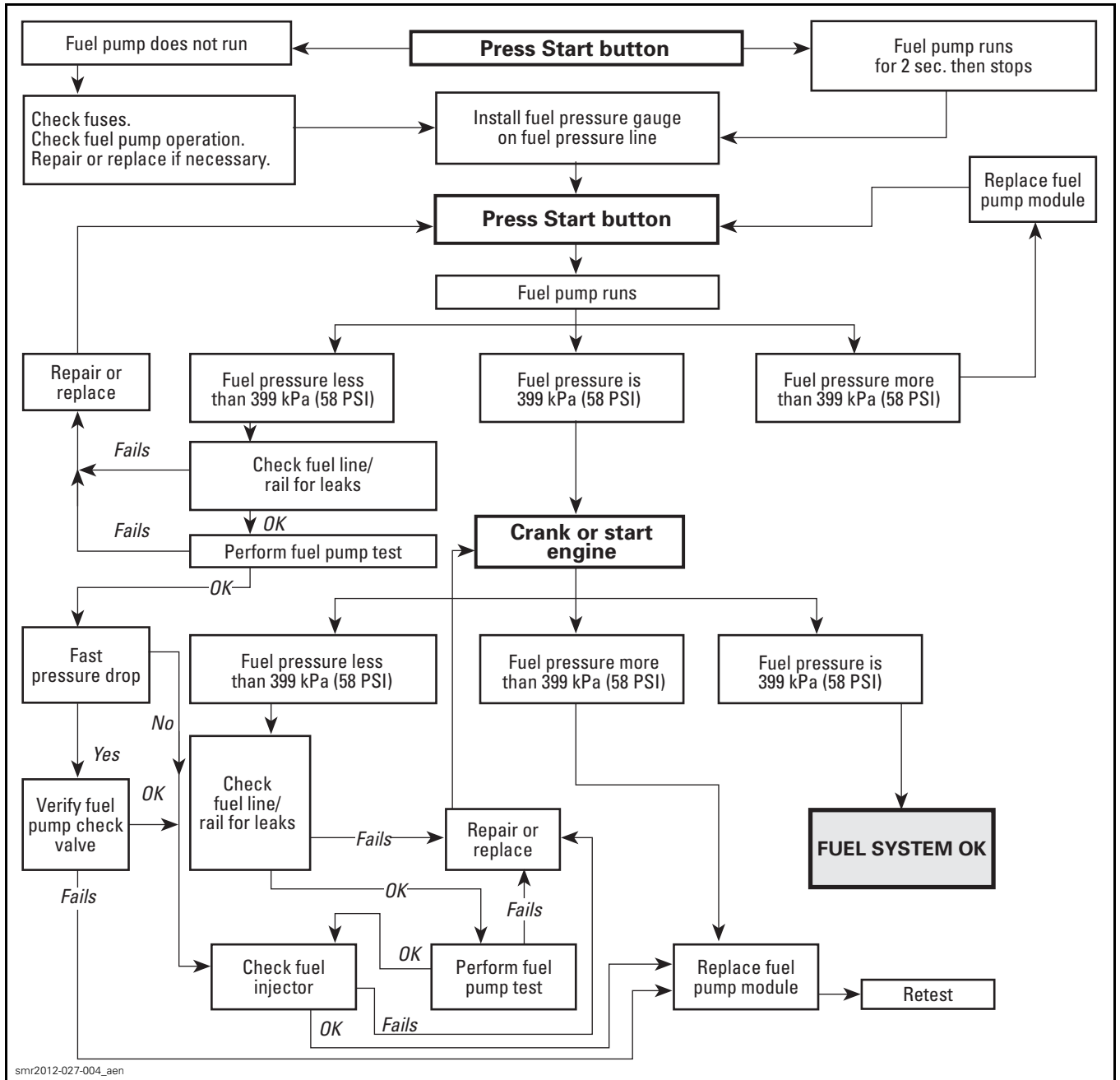
If you bought this manual from any other seller please leave them  
NEGATIVE feedback and notify me at [bestshopmanuals@gmail.com](mailto:bestshopmanuals@gmail.com)



**NEW** = Component must be replaced when removed.

smr2014-030-001\_a

# FUEL SYSTEM DIAGNOSTIC FLOW CHART



### 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.

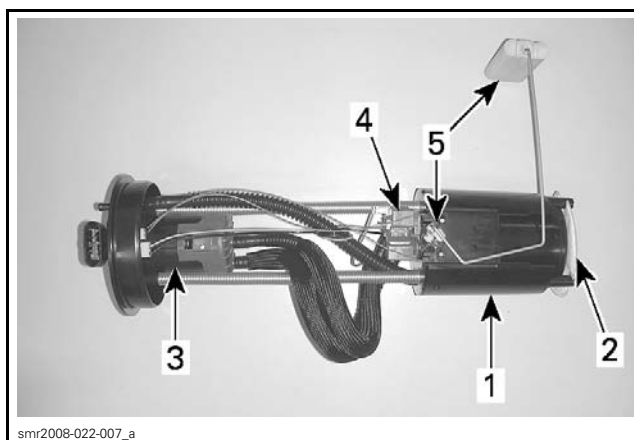
### SYSTEM DESCRIPTION

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)



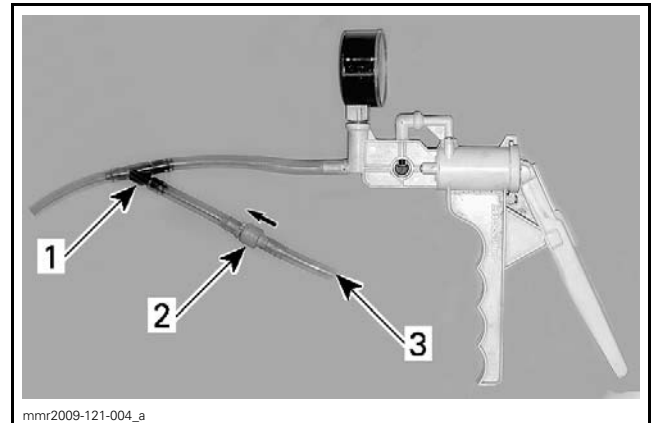
6. Use the following tool to pressurize fuel tank.

#### REQUIRED TOOL

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



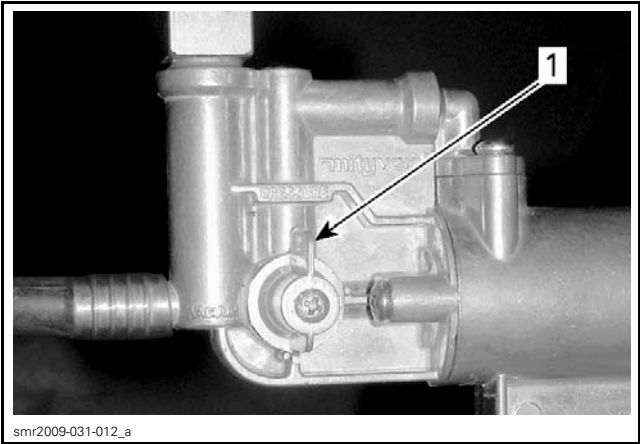
**NOTE:** A Y-fitting and a check valve can be installed to use compressed air for quick pressure build-up when the fuel tank is not full.



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.



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

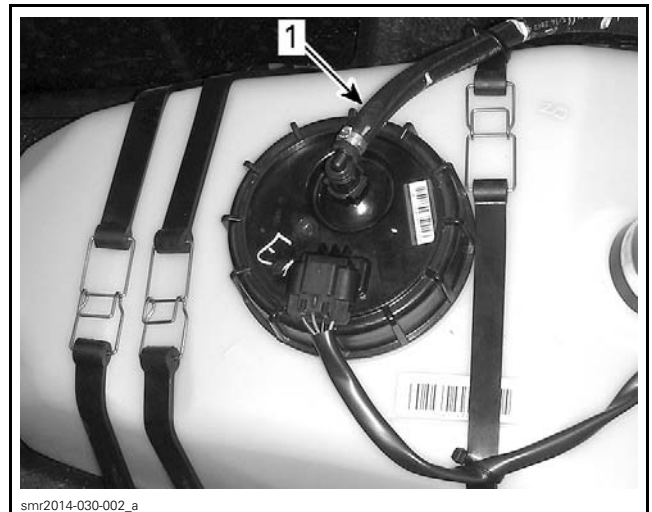
### Preparation

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.



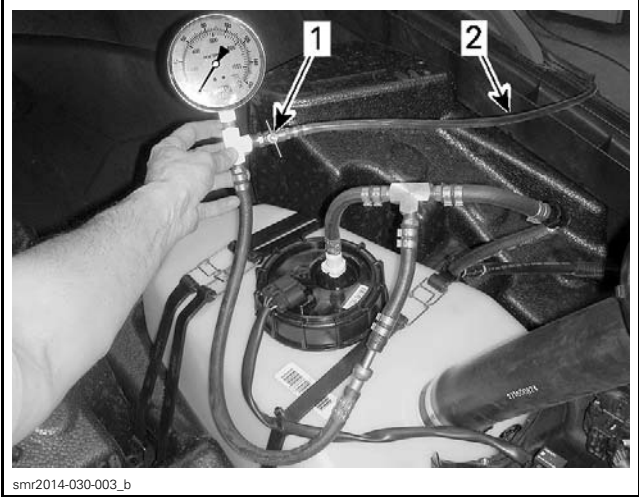
TYPICAL

1. Outlet hose

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

Subsection XX (FUEL TANK AND FUEL PUMP)

| REQUIRED TOOLS                         |                                                                                   |
|----------------------------------------|-----------------------------------------------------------------------------------|
| PRESSURE GAUGE<br>(P/N 529 036 395)    |  |
| FUEL HOSE ADAPTER<br>(P/N 529 036 396) |  |



TYPICAL - FUEL PUMP PRESSURE TEST  
1. Pressure relief valve on gauge  
2. Hose to a fuel drain bottle

| FUEL PRESSURE<br>(WHEN PRESSING THE START BUTTON) |
|---------------------------------------------------|
| 386 kPa - 414 kPa (56 PSI - 60 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.

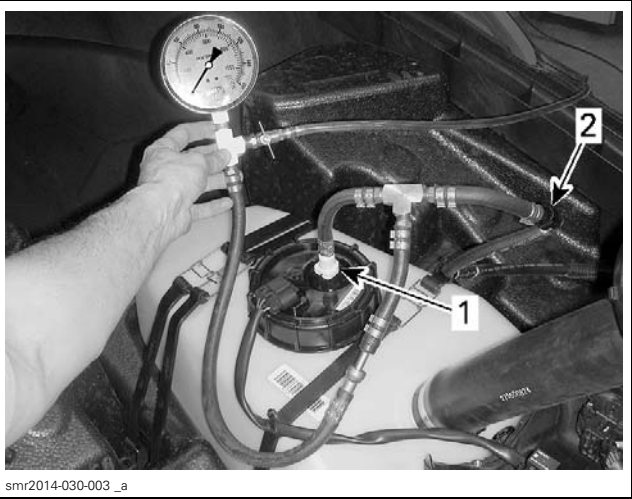
2. Stop the engine.

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.



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.



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.

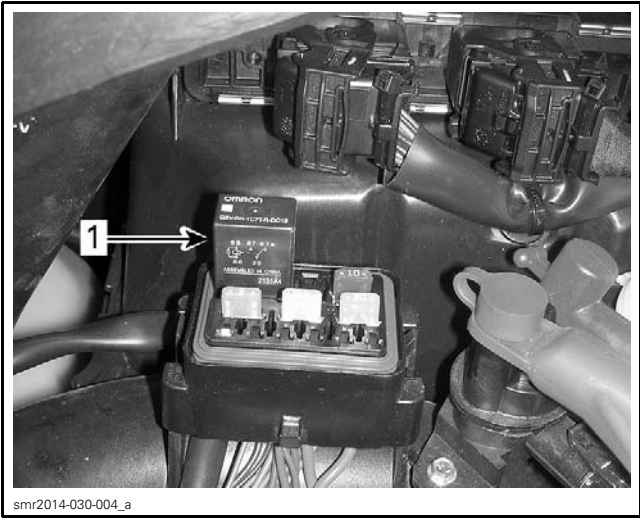
#### Testing the Fuel Pump Pressure

Refer to *INSPECTION* in this subsection.

#### Testing the Fuel Pump Circuit

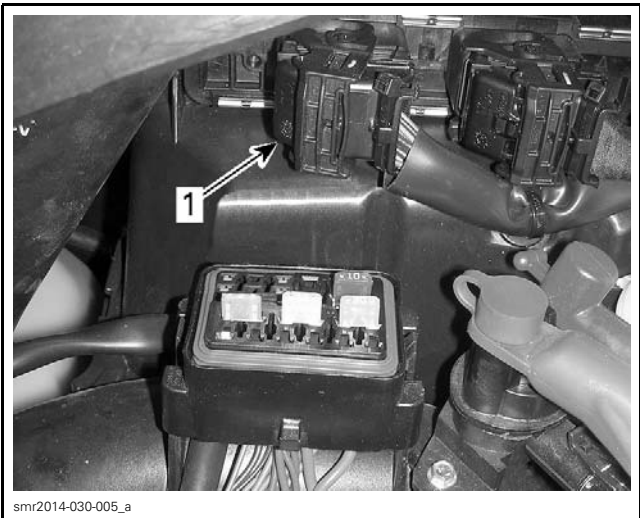
1. Remove fuse box cover.
2. Remove relay from fuse box.

Subsection XX (FUEL TANK AND FUEL PUMP)



1. Relay to remove

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

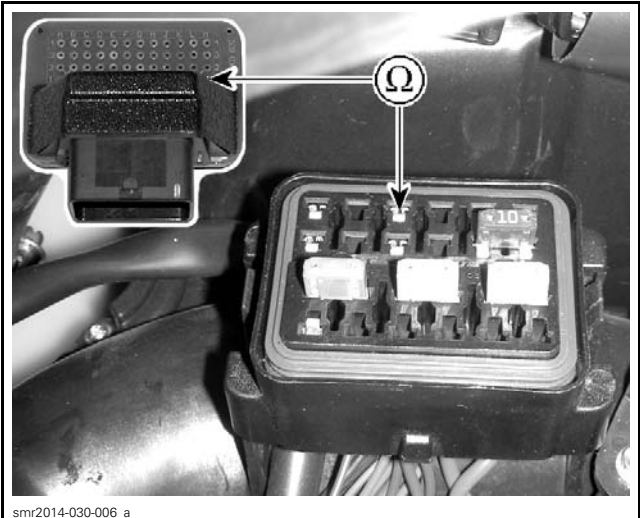


TYPICAL  
1. ECM-B connector to remove

| REQUIRED TOOL                         |                                                                                     |
|---------------------------------------|-------------------------------------------------------------------------------------|
| ECM ADAPTER TOOL<br>(P/N 529 036 166) |  |

4. Set multimeter to  $\Omega$  and test pump circuit as per following table.

| PUMP CIRCUIT TEST THROUGH FUEL PUMP |                             |                             |
|-------------------------------------|-----------------------------|-----------------------------|
| TEST PROBES                         |                             | RESISTANCE @<br>20°C (68°F) |
| Fuse box<br>terminal A4             | ECM connector B<br>pin B-M1 | Approx. 12 $\Omega$         |

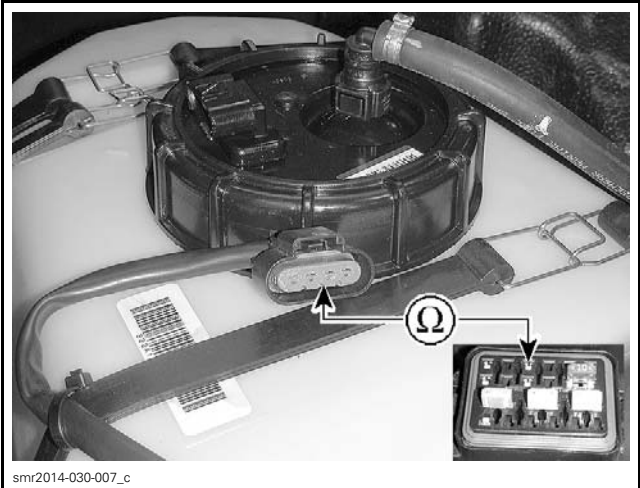


5. If test succeeded, the fuel pump and its wiring are electrically good. The problem may be a mechanical problem internal to the fuel pump, or an internal ECM problem that does not provide the control ground for the pump.

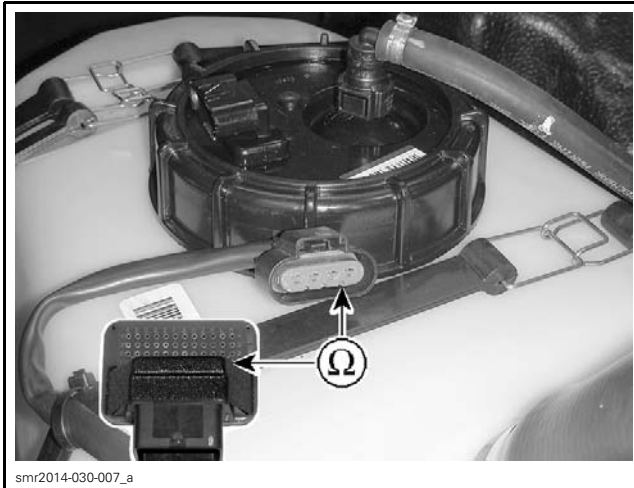
6. If test failed:

- Disconnect fuel pump connector.
- Test wiring continuity as per following table.

| FUEL PUMP HARNESS CONTINUITY<br>TEST (WIRING ONLY) |                                |                                     |
|----------------------------------------------------|--------------------------------|-------------------------------------|
| TEST PROBES                                        |                                | RESISTANCE @<br>20°C (68°F)         |
| Pump harness<br>connector pin B                    | Fuse<br>box terminal A4        | Close to 0 $\Omega$<br>(continuity) |
| Pump harness<br>connector pin A                    | ECM<br>connector B<br>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

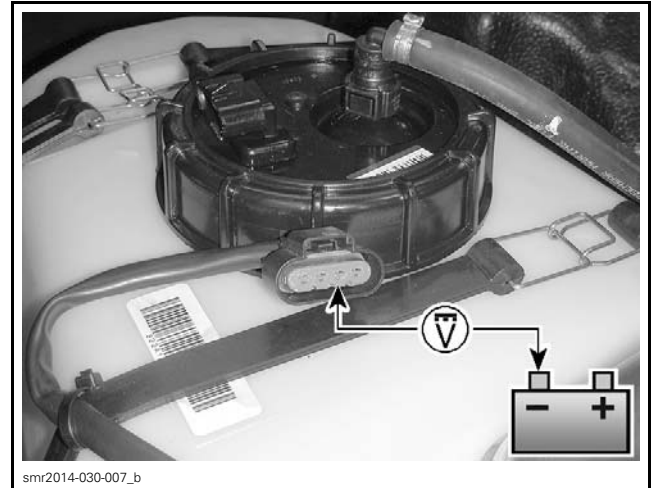
1. Ensure the relay is installed in the fuse box and that fuses F1, F2 and F3 are in good condition.

**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<br>(+ probe) | Battery ground<br>(- 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*.

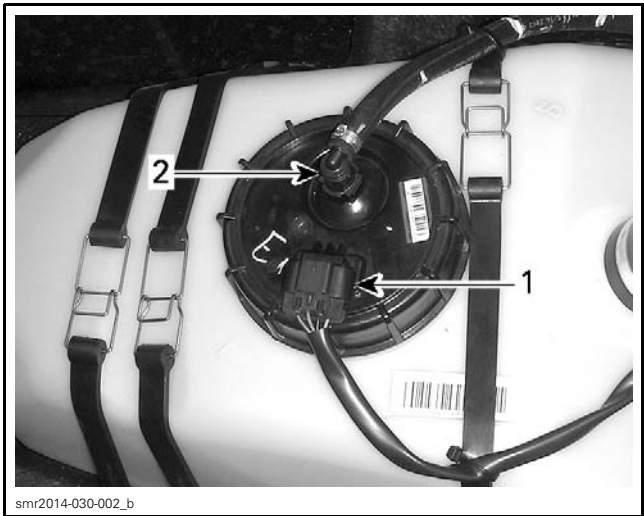
If battery voltage is not read, power circuit is faulty. Test continuity of power circuit wiring between fuse box and fuel pump. Refer to *TESTING THE FUEL PUMP CIRCUIT* in this subsection.

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.

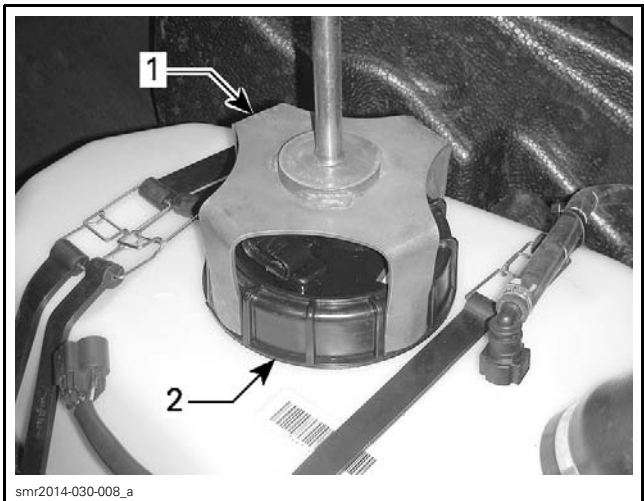
Subsection XX (FUEL TANK AND FUEL PUMP)



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<br>(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.

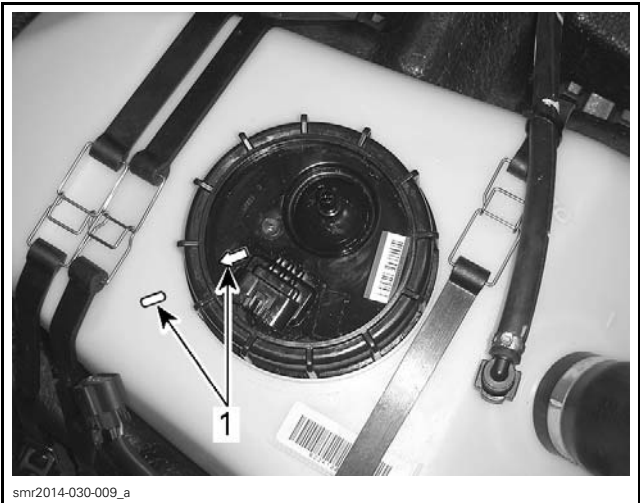
1. Carefully insert fuel pump module in fuel tank so as not to bend float arm.

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.

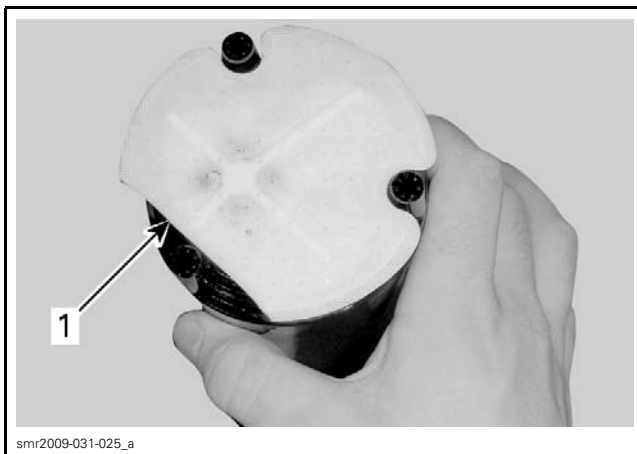
| TIGHTENING TORQUE |                                          |
|-------------------|------------------------------------------|
| Fuel pump nut     | 60 N•m ± 7 N•m<br>(44 lbf•ft ± 5 lbf•ft) |

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

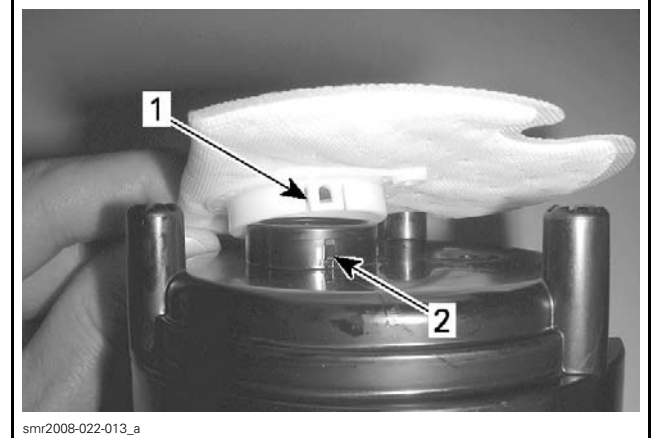
The lower fuel filter on the fuel pump module does not require replacement under normal operating conditions. Replace only if permanently clogged or damaged.

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.

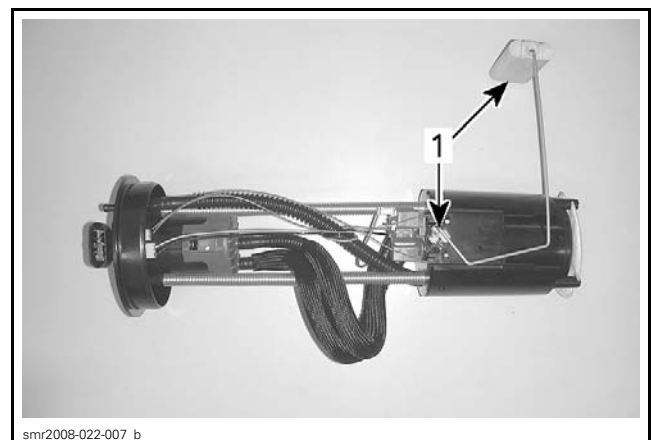
### Installing the Fuel Filter

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

Subsection XX (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

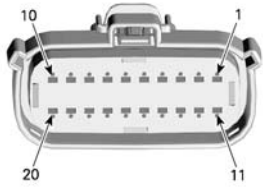
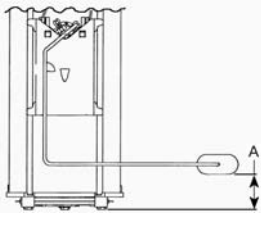
| FUEL LEVEL TROUBLESHOOTING      |                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------|
| SYMPTOM         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

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

Testing 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  $\Omega$ .
6. Alternately drain then fill fuel tank and measure the sensor resistance between pin 19 and battery ground.

| RESISTANCE ( $\Omega$ ) | FLOAT HEIGHT (MM)      |
|-------------------------|------------------------|
| 4.8 $\pm$ 2.2           | 260.2 $\pm$ 3.0 (FULL) |
| 17.8 $\pm$ 2.2          | 220.9 $\pm$ 3.0        |
| 27.8 $\pm$ 2.2          | 198.1 $\pm$ 3.0        |
| 37.8 $\pm$ 2.2          | 173.2 $\pm$ 3.0        |
| 47.8 $\pm$ 2.2          | 147.6 $\pm$ 3.0 (HALF) |
| 57.8 $\pm$ 2.2          | 117.6 $\pm$ 3.0        |

| RESISTANCE ( $\Omega$ )                                                            | FLOAT HEIGHT (MM)                                                                                      |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 67.8 $\pm$ 2.2                                                                     | 84.6 $\pm$ 3.0                                                                                         |
| 77.8 $\pm$ 2.2                                                                     | 59.3 $\pm$ 3.0                                                                                         |
| 89.8 $\pm$ 2.2                                                                     | 27.3 $\pm$ 3.0 (EMPTY)                                                                                 |
|  | <br>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, 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.

| FUEL TANK LEVEL | TEST CONNECTOR OF DIAGNOSTIC HARNESS | VOLTAGE  |
|-----------------|--------------------------------------|----------|
| Full            | Pins 11 and 19                       | 0.14 Vdc |
| Empty           |                                      | 2.7 Vdc  |

**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.

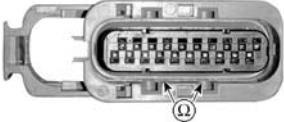
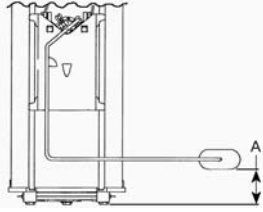
If voltage is out of specifications, proceed with *TESTING THE FUEL LEVEL SENSOR RESISTANCE AT INFORMATION CENTER* as described in this subsection.

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  $\Omega$ .
3. Alternately drain then fill fuel tank and measure the sensor resistance between the pins 3 and 4.

| RESISTANCE ( $\Omega$ ) | FLOAT HEIGHT (MM)      |
|-------------------------|------------------------|
| $4.8 \pm 2.2$           | $268.9 \pm 3.0$ (FULL) |
| $17.8 \pm 2.2$          | $240.6 \pm 3.0$        |
| $27.8 \pm 2.2$          | $219.1 \pm 3.0$        |
| $37.8 \pm 2.2$          | $193.8 \pm 3.0$        |
| $47.8 \pm 2.2$          | $161.9 \pm 3.0$ (HALF) |
| $57.8 \pm 2.2$          | $128.3 \pm 3.0$        |
| $67.8 \pm 2.2$          | $94.1 \pm 3.0$         |
| $77.8 \pm 2.2$          | $60.6 \pm 3.0$         |
| $89.8 \pm 2.2$          | $28.8 \pm 3.0$ (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*.

## Subsection XX (FUEL TANK AND FUEL PUMP)

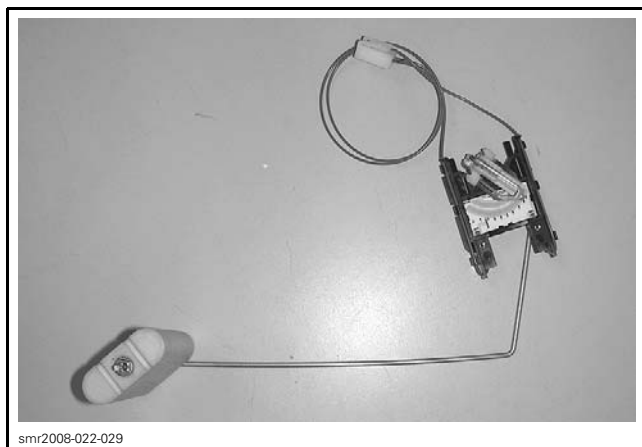


TYPICAL - FUEL LEVEL SENSOR RESISTANCE TEST

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.

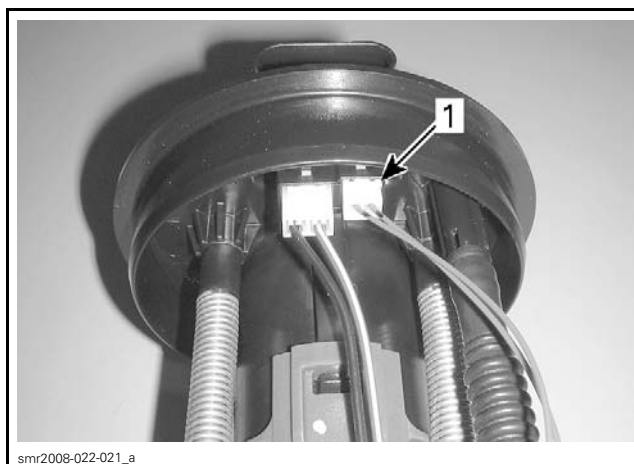
### WARNING

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.

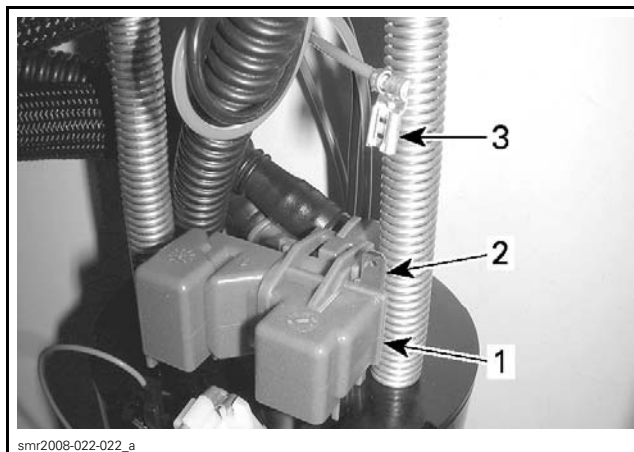
**NOTE:** Note routing of fuel level sensor wires prior to disconnecting the sensor from the fuel pump module flange.

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



1. Fuel level sensor connector

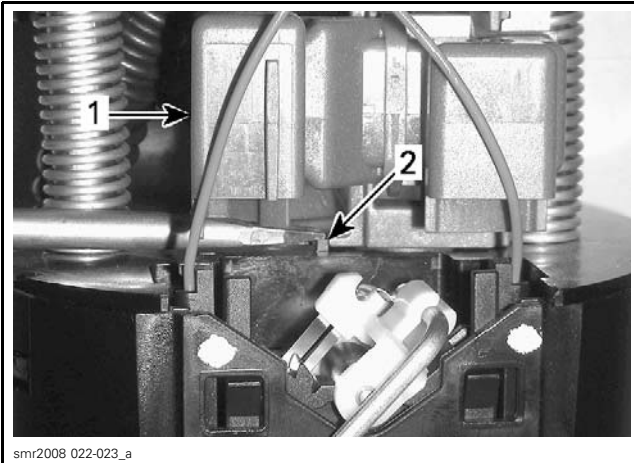
4. Disconnect the ground wire from the pressure regulator. Be careful not to bend the ground contact on the pressure regulator.



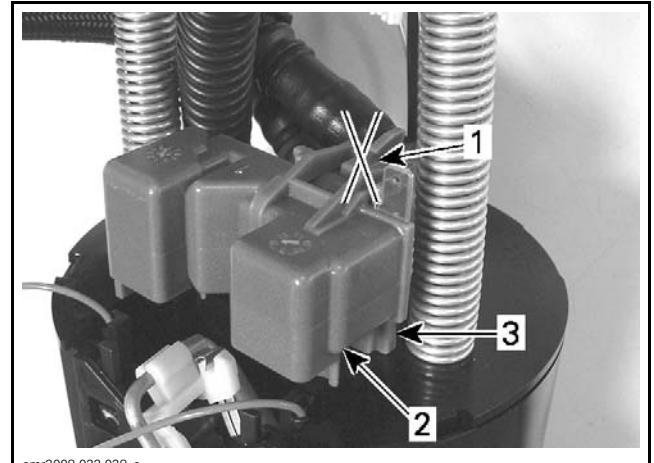
1. Pressure regulator  
2. Ground wire contact on pressure regulator  
3. Ground wire disconnected

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.

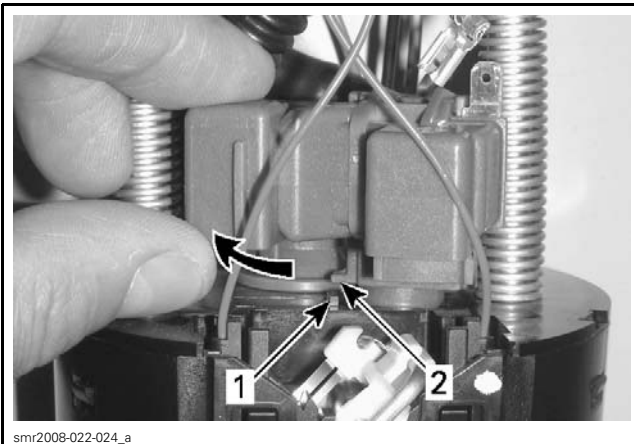




1. Pressure regulator
2. Pressure regulator locking tab

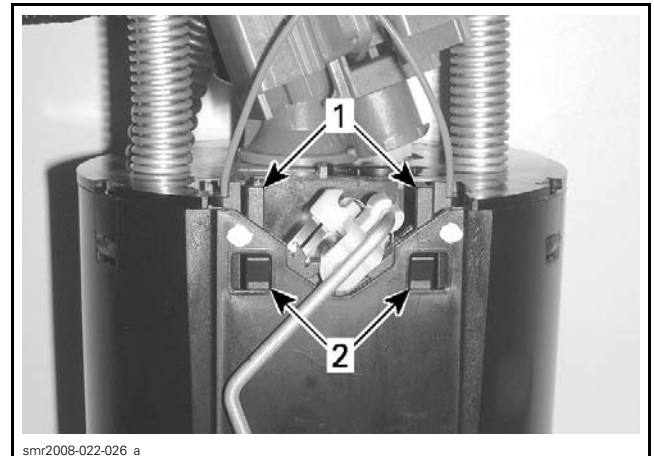


1. Do not remove pressure regulator cover at locking tabs
2. Pressure regulator cover
3. Pressure regulator housing

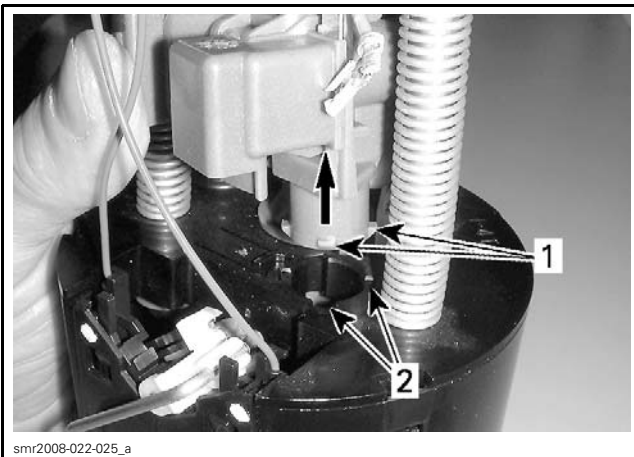


1. Pressure regulator locking tab
2. Pressure regulator rotated clockwise over locking tab

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

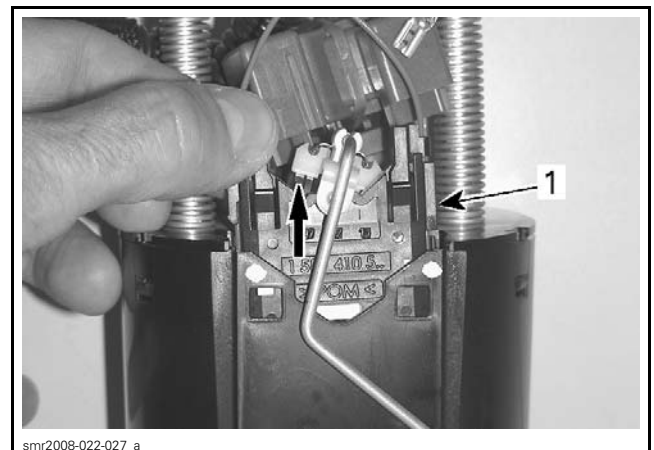


1. Fuel level sensor release tabs
2. Locking pins



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.



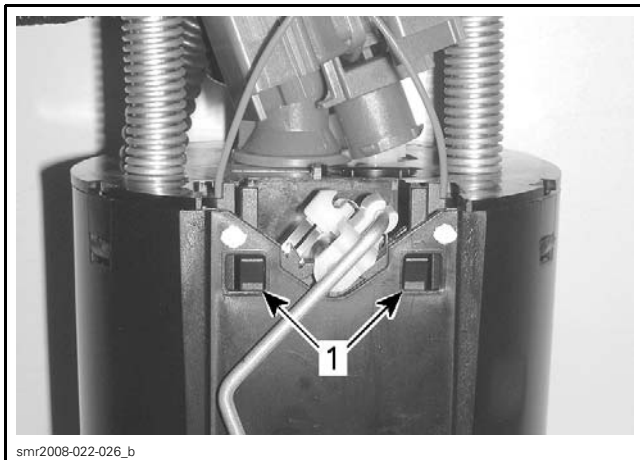
1. Pull up on fuel level sensor

## Subsection XX (FUEL TANK AND FUEL PUMP)

### Installing the Fuel Level Sensor

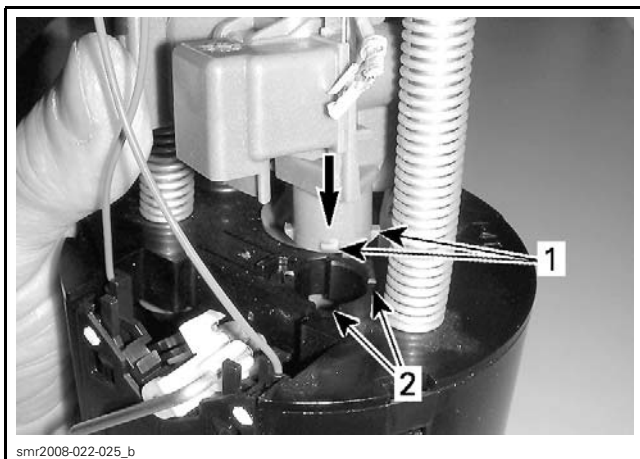
Installation is the reverse of the removal procedure however, pay attention to the following.

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



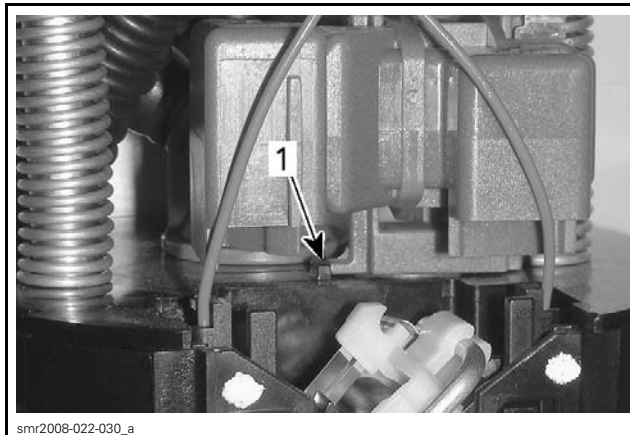
1. Ensure engagement of sensor locking pins

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

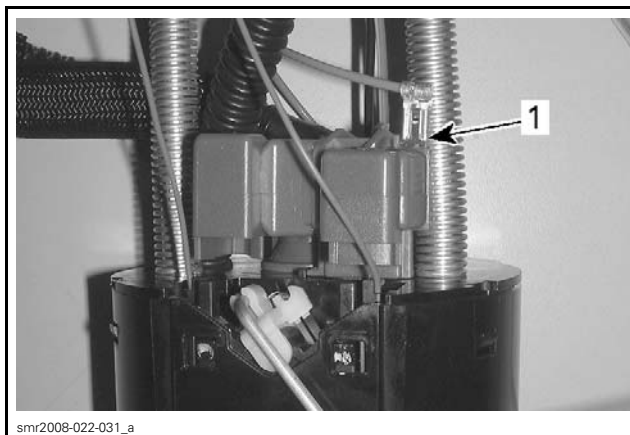
1. Pressure regulator alignment tabs
2. Fuel pump reservoir alignment tabs



#### TAB UP WHEN PRESSURE REGULATOR PROPERLY LOCKED

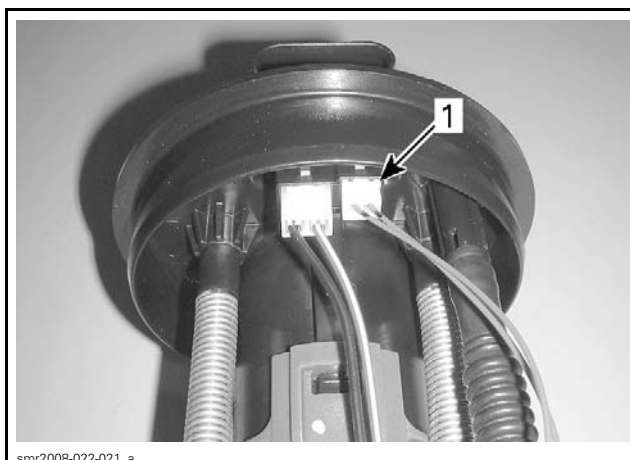
1. Pressure regulator locking tab

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.

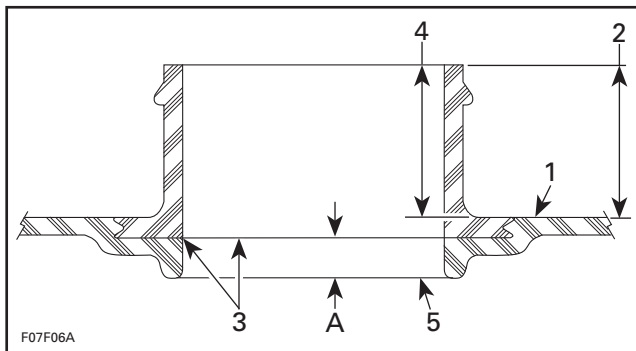
- Reinstall the fuel pump module. Refer to *INSTALLING THE FUEL PUMP* in this subsection.

## FUEL TANK

### Inspecting the Fuel Tank

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



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

- Install filler hose and tighten retaining clamps to specification.



**TYPICAL - INDEXING WITH FUEL TANK**

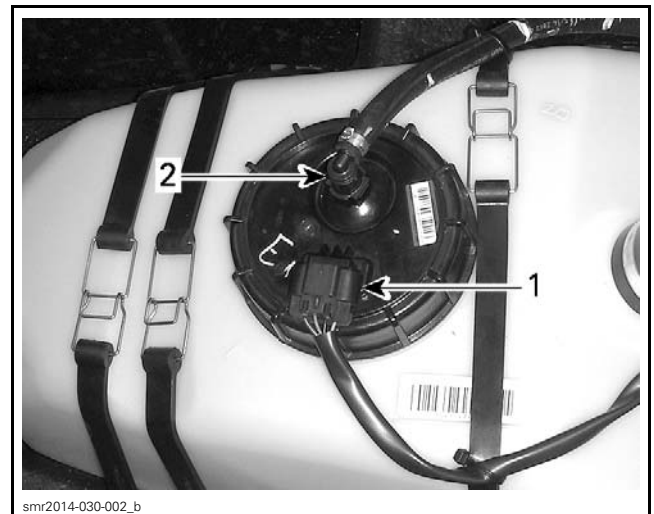
- Index mark on fuel tank
- Index mark drawn on hose before removal

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

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

### Removing the Fuel Tank

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



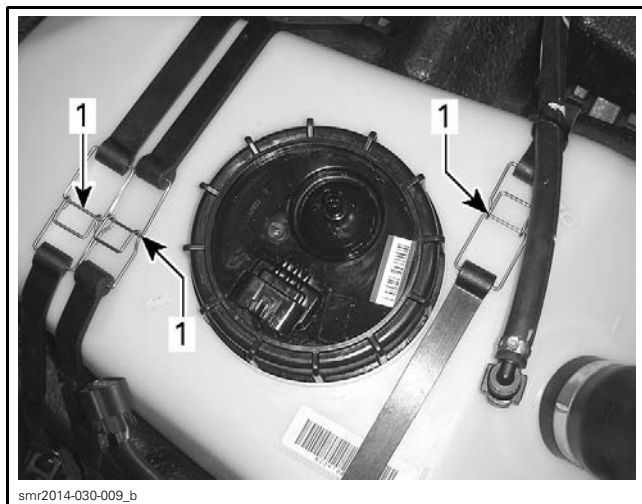
**TYPICAL**

- Fuel pump harness connector
- 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.

- Detach fuel tank retaining straps.

## Subsection XX (FUEL TANK AND FUEL PUMP)



### TYPICAL

1. Detach fuel tank retaining straps here

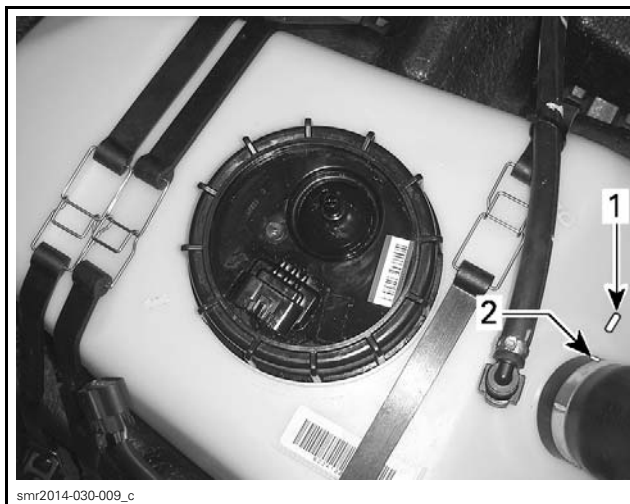
4. Remove fuel tank from the vehicle.
5. Remove fuel pump as necessary. Refer to *FUEL PUMP* in this subsection.
6. Inspect hull and flotation foams for wear.

**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

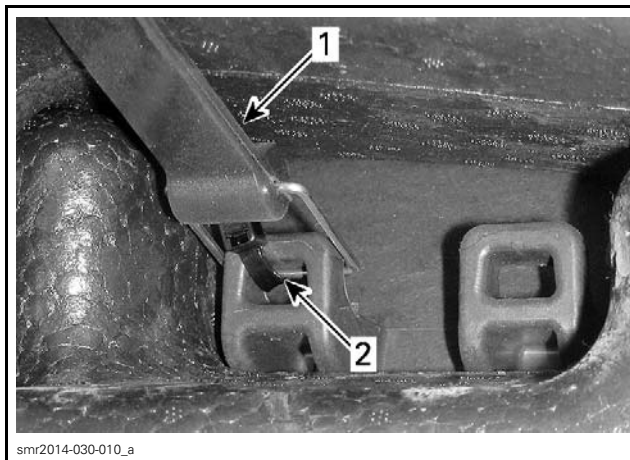
**NOTE:** Apply torque values as specified in the exploded view.

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.



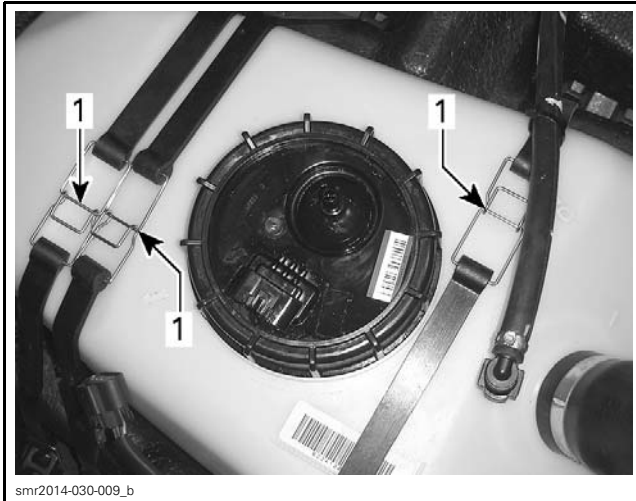
1. Index mark on fuel tank
2. Index mark drawn on hose before removal

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**

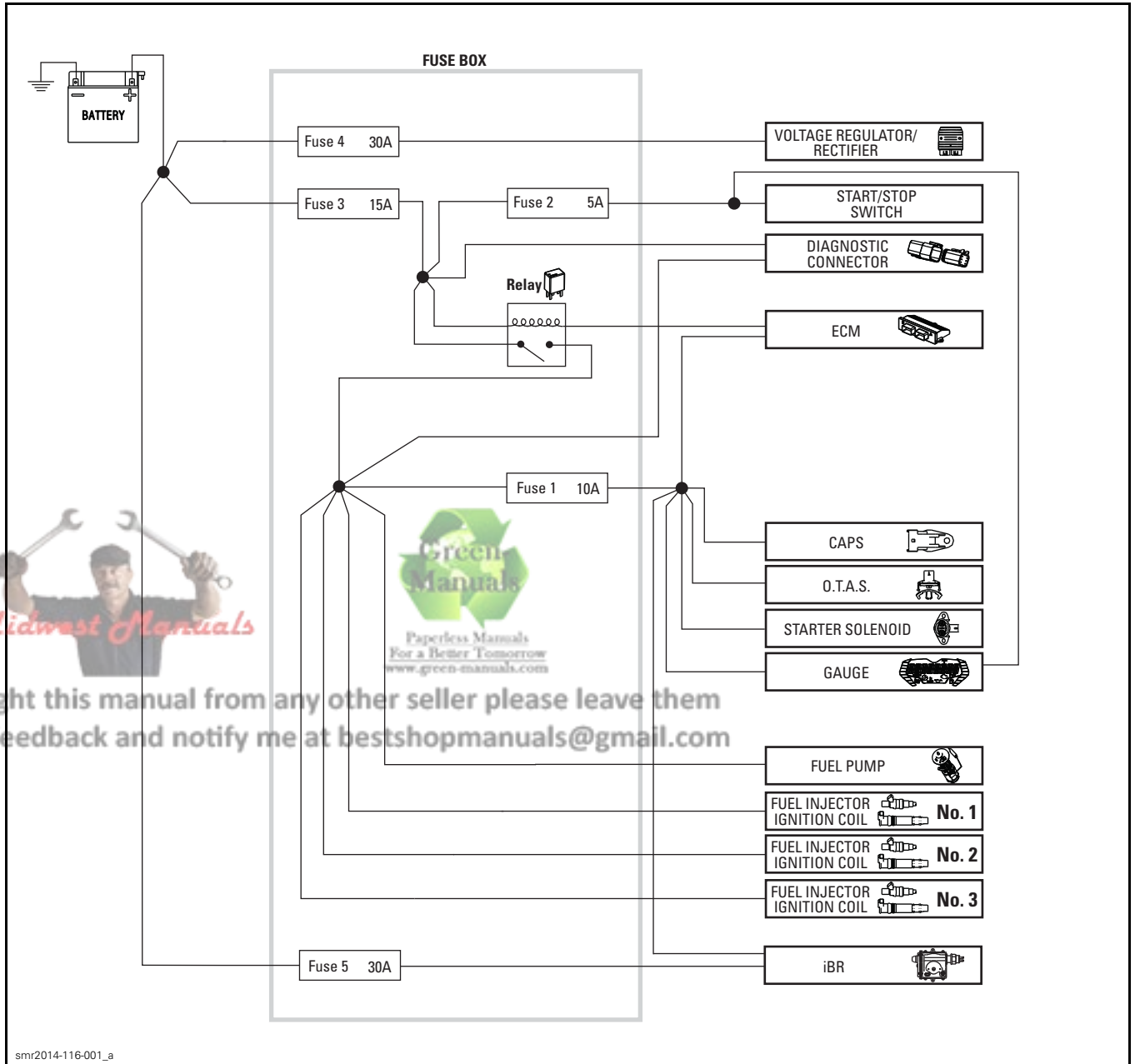
1. Fuel tank retaining strap

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

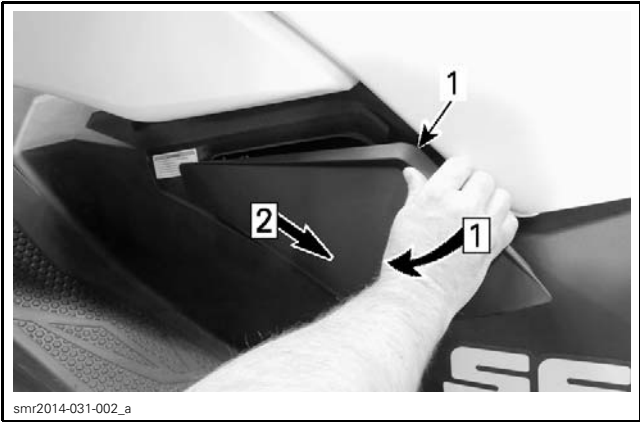


GENERAL

FUSE BOX

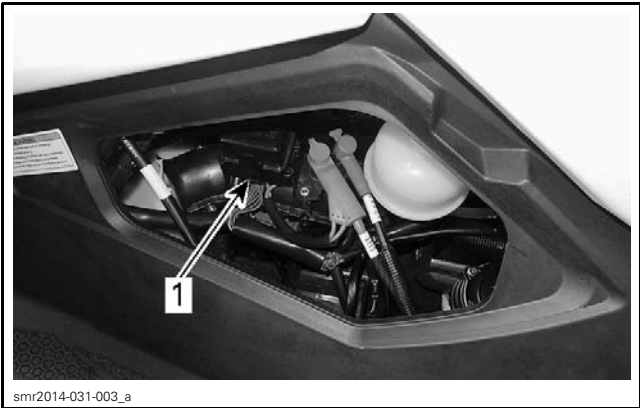
Fuse Box Location

It may be reached through the LH access cover.



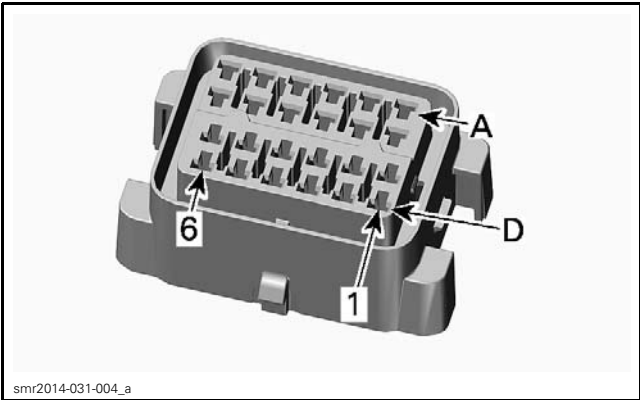
1. LH access cover  
Step 1: Pull the RH upper corner outwards  
Step 2: Slide the cover rearwards

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"><li>– ECM</li><li>– CAPS</li><li>– OTAS</li><li>– Starter Solenoid</li><li>– Gauge</li><li>– iBR Control</li></ul> | 10 A |
| F2  | Direct power (through F3): <ul style="list-style-type: none"><li>– Start/Stop Switch</li><li>– Gauge (GPS)</li></ul>                                                | 5 A  |
| F3  | Direct power <ul style="list-style-type: none"><li>– F2</li><li>– Relay</li><li>– Diagnostic Connector</li></ul>                                                    | 15 A |
| F4  | Direct power <ul style="list-style-type: none"><li>– Voltage regulator/rectifier</li></ul>                                                                          | 30 A |
| F5  | Direct power <ul style="list-style-type: none"><li>– iBR actuator</li></ul>                                                                                         | 30 A |

RELAY

Relay Pin Identification

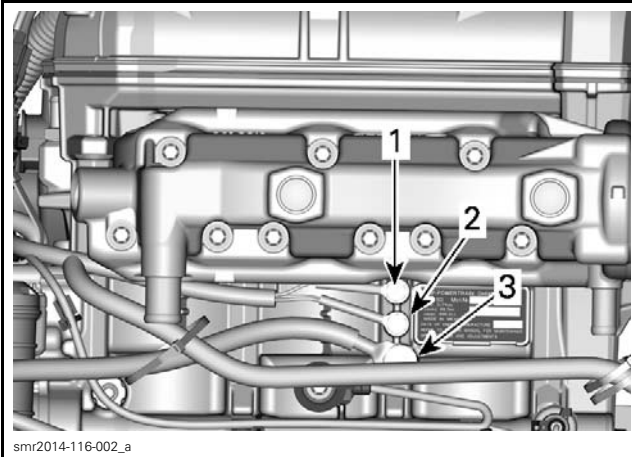
The relay is in the fuse box. Refer to *FUSE BOX LOCATION*.

| 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 <b>once START/STOP is depressed</b> |
| 12-volt input at contacts | B6           | Direct battery power from fuse F3                            |
| 12-volt output            | A4           | -                                                            |

## GROUNDS

### Ground Location

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



- smr2014-116-002\_a
1. *iBR ground*
  2. *Electrical components grounds*
  3. *Battery ground*



# WIRING HARNESS AND CONNECTORS

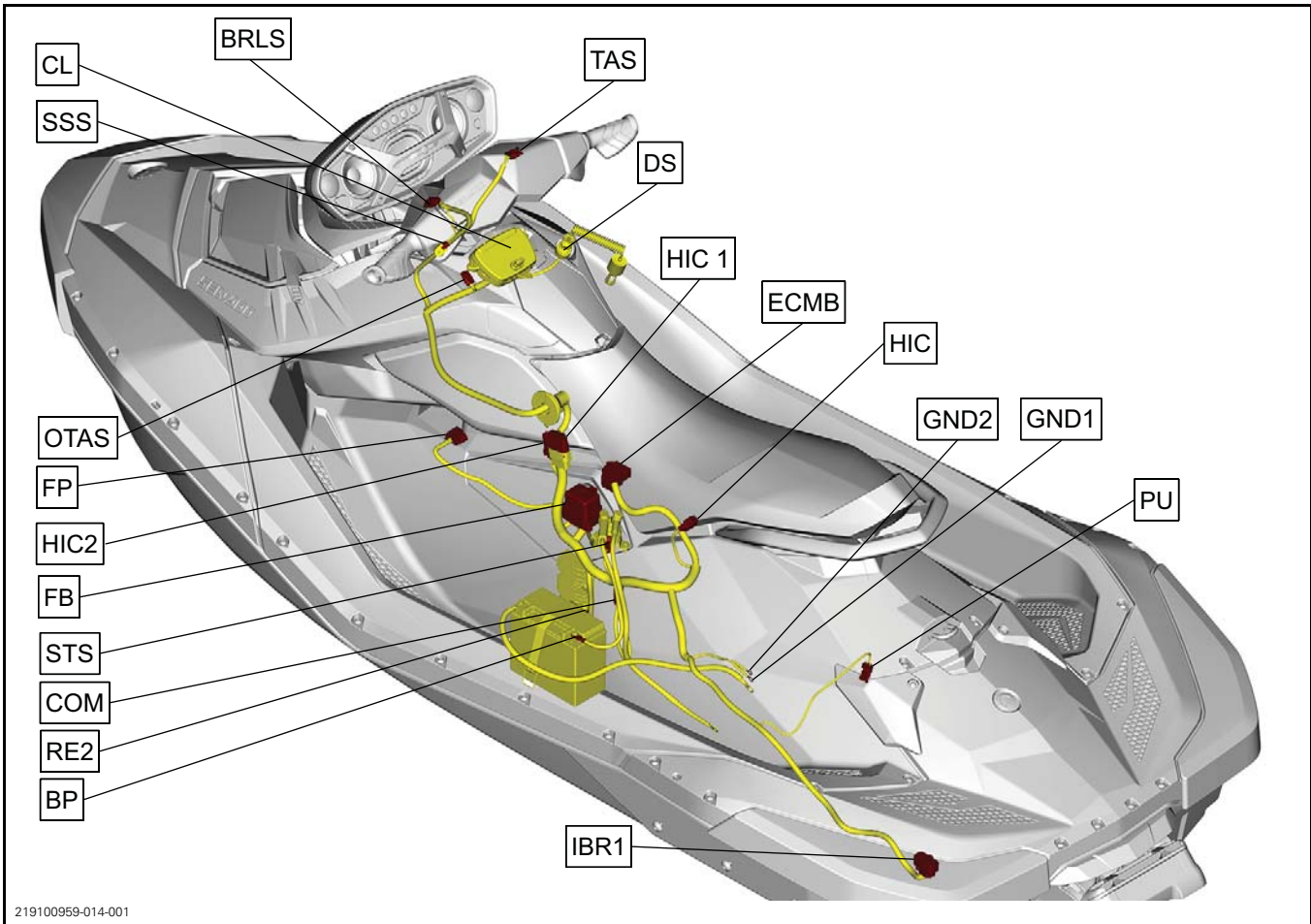
## SERVICE TOOLS

| Description                    | Part Number       | Page |
|--------------------------------|-------------------|------|
| DIAGNOSTIC HARNESS .....       | 529 036 384 ..... | 7    |
| ECM ADAPTER TOOL.....          | 529 036 166 ..... | 4    |
| ECM TERMINAL REMOVER 2.25..... | 529 036 175 ..... | 4    |
| ECM TERMINAL REMOVER 3.36..... | 529 036 174 ..... | 4    |

## SERVICE TOOLS – OTHER SUPPLIER

| Description                             | Part Number        | Page |
|-----------------------------------------|--------------------|------|
| DELPHI TERMINAL EXTRACTOR.....          | 12094429 .....     | 5–6  |
| FCI TERMINAL EXTRACTOR TOOL .....       | 54241678 .....     | 7    |
| GM TERMINAL EXTRACTOR.....              | 12094430 .....     | 9    |
| MOLEX 150 TERMINAL EXTRACTOR TOOL ..... | 63813 - 1500 ..... | 7    |

## 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**

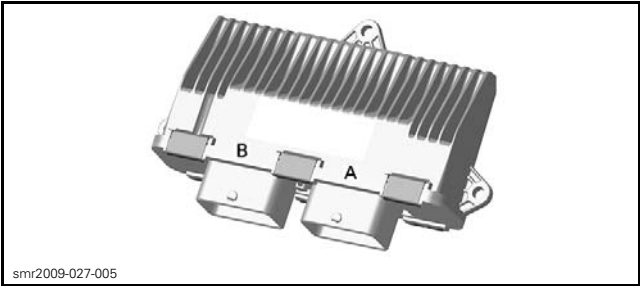
When disassembling any connector for repair or replacement on the vehicle, always disconnect the battery to ensure all electrical power is removed and prevent any possibility of a short circuit. Refer to *CHARGING SYSTEM* subsection.

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".

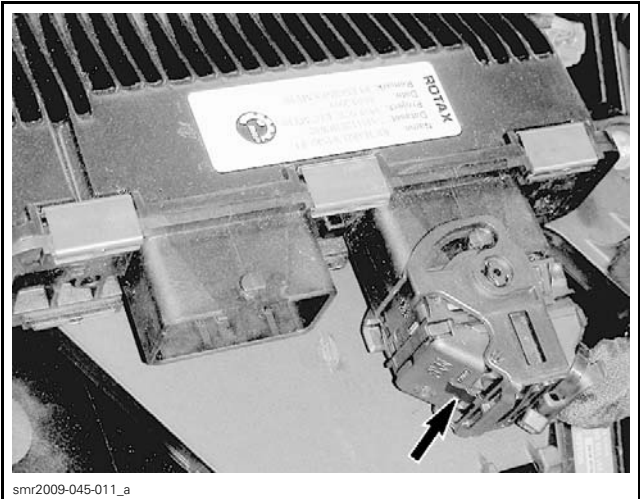
Each ECM connector has 48 pins however, connectors "A" and "B" are not interchangeable due to their specific keyways.



ECM CONNECTORS

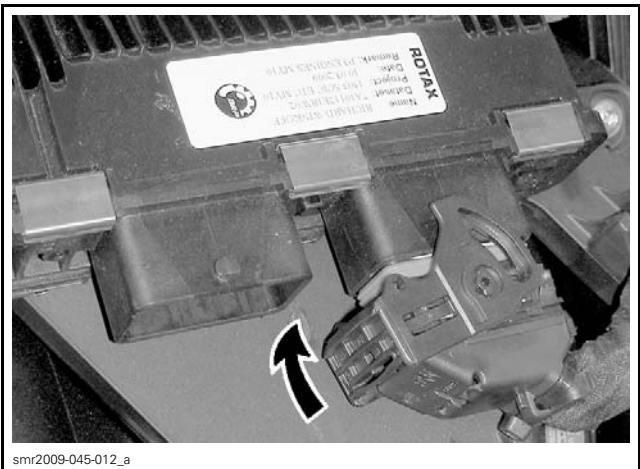
Removing the Connectors

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.



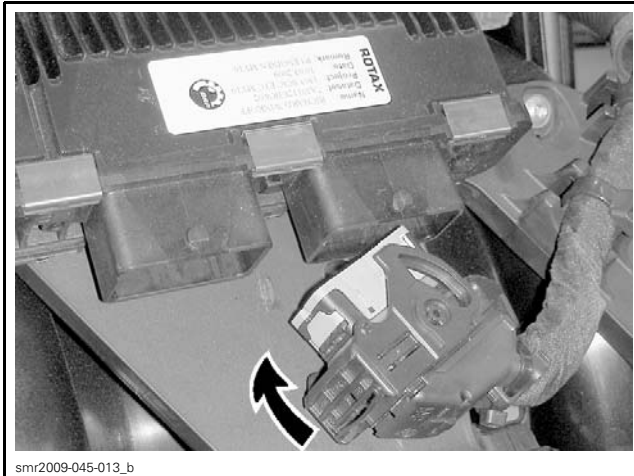
CONNECTOR LOCKING CAM ROTATION TO RELEASE

4. Pull connector off ECM.



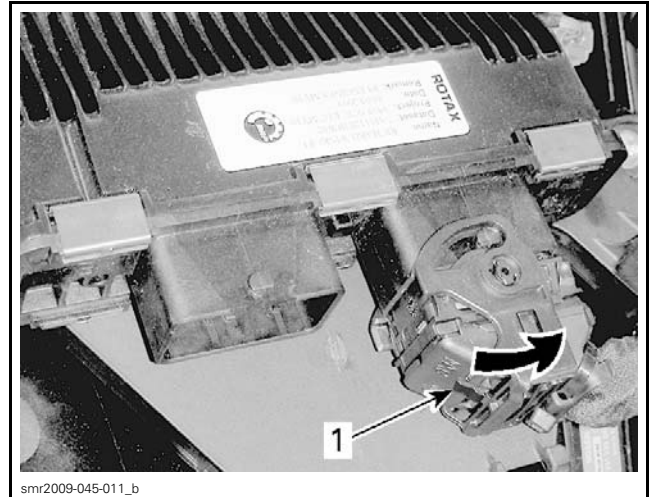
## Installing the Connectors

1. Fully open connector locking cam.



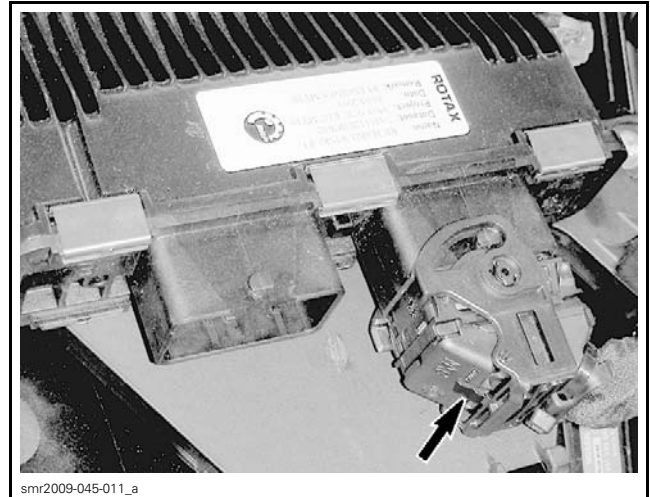
CONNECTOR LOCKING CAM IN RELEASE POSITION

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



1. Locked here

4. Ensure the locking tab is fully out.



LOCKING TAB FULLY OUT

## Inspecting the 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.

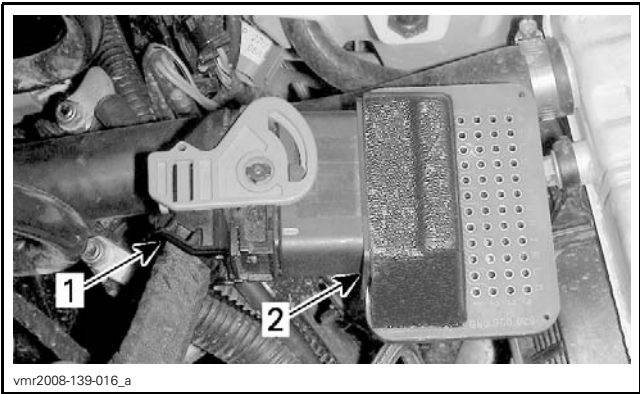
**NOTICE** Do not apply any lubricant product to the pins of the ECM connector.

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<br>(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.

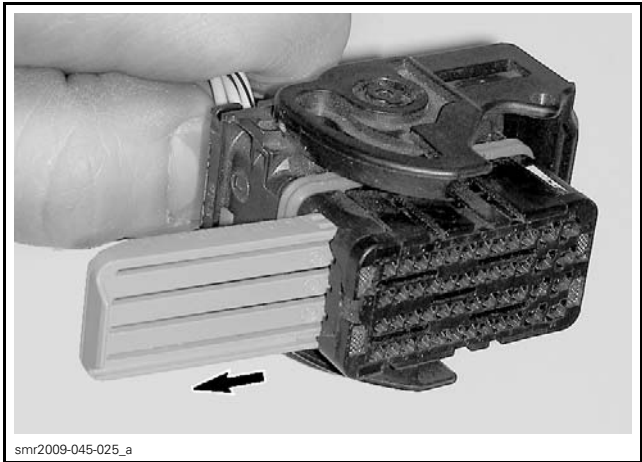
Removing the Connector Terminal (Harness Connector)

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

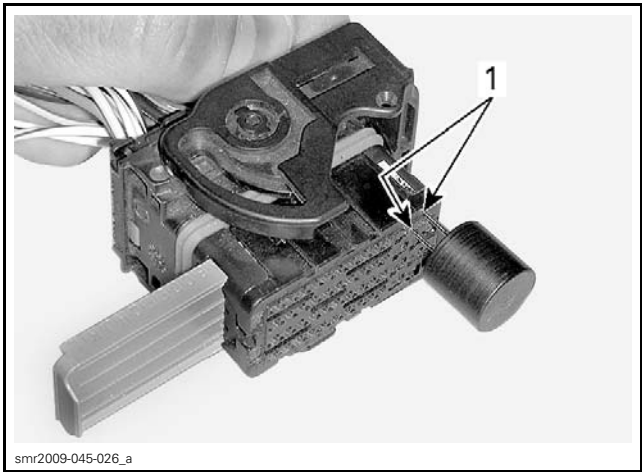
To remove a power terminal, use the ECM terminal remover 3.36.

| REQUIRED TOOLS                                    |                                                                                     |
|---------------------------------------------------|-------------------------------------------------------------------------------------|
| ECM TERMINAL<br>REMOVER 2.25 (P/N 529<br>036 175) |  |
| ECM TERMINAL<br>REMOVER 3.36 (P/N 529<br>036 174) |  |

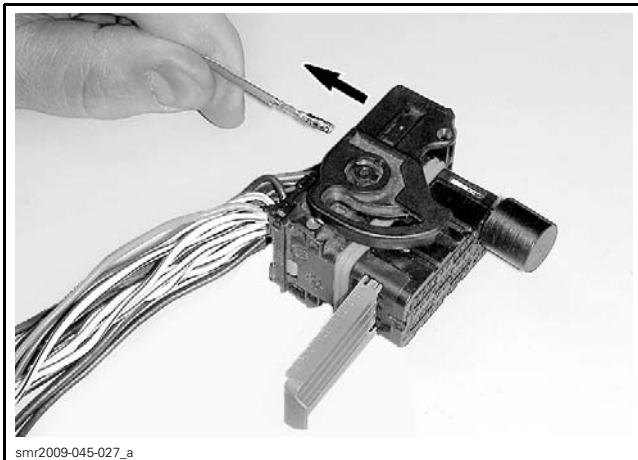
- 1. Remove rear protector from connector.
- 2. Pull out the connector lock.



- 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)

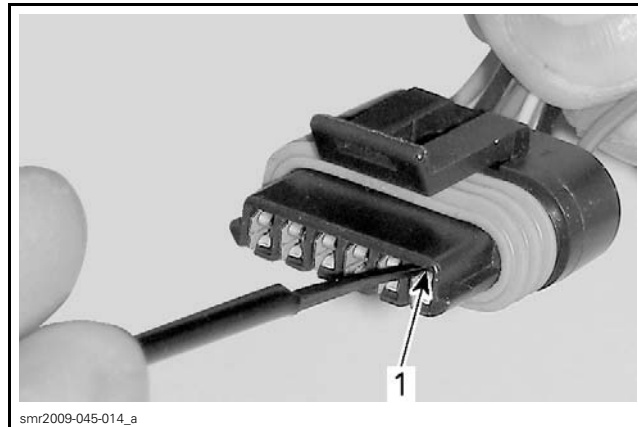
### Connector Terminal Removal

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

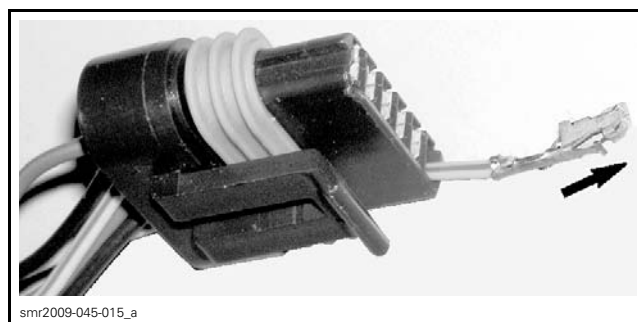
| REQUIRED TOOL                            |                                                                                     |
|------------------------------------------|-------------------------------------------------------------------------------------|
| DELPHI TERMINAL EXTRACTOR (P/N 12094429) |  |

**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

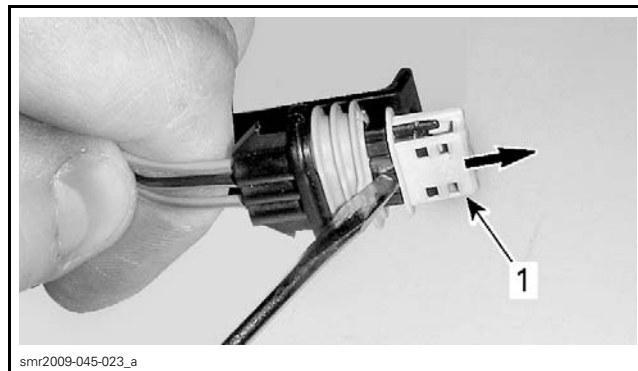


**NOTICE** Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

## CONNECTORS (DELPHI)

### Removing the Terminal

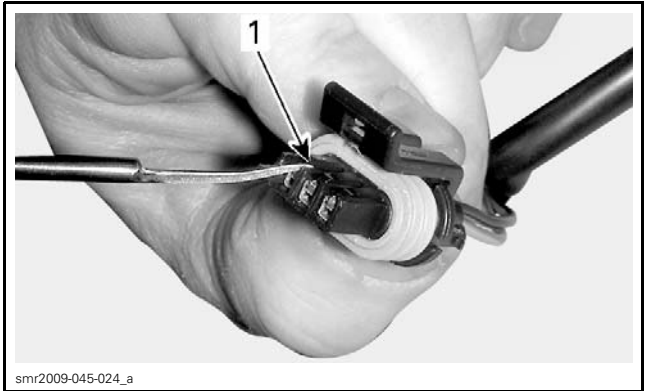
1. To remove a terminal from connector, first remove the locking cap.



1. Pry out locking cap

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

| REQUIRED TOOL                            |                                                                                   |
|------------------------------------------|-----------------------------------------------------------------------------------|
| DELPHI TERMINAL EXTRACTOR (P/N 12094429) |  |



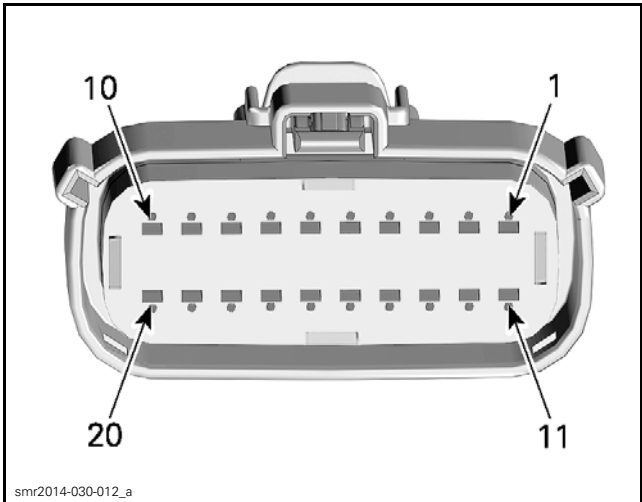
1. Unlock here

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.

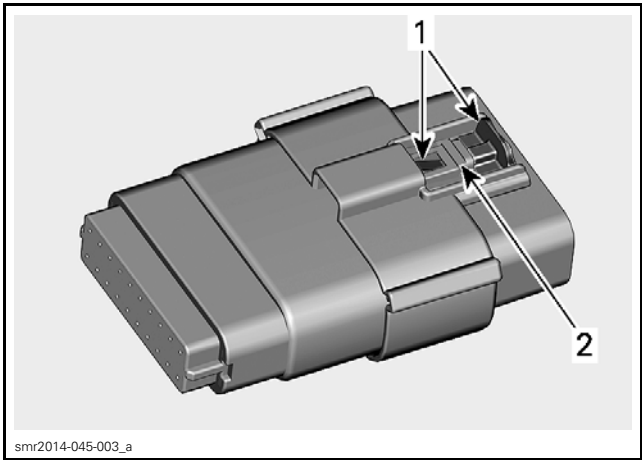
STEERING CONNECTOR (20 PIN MOLEX 150)



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.

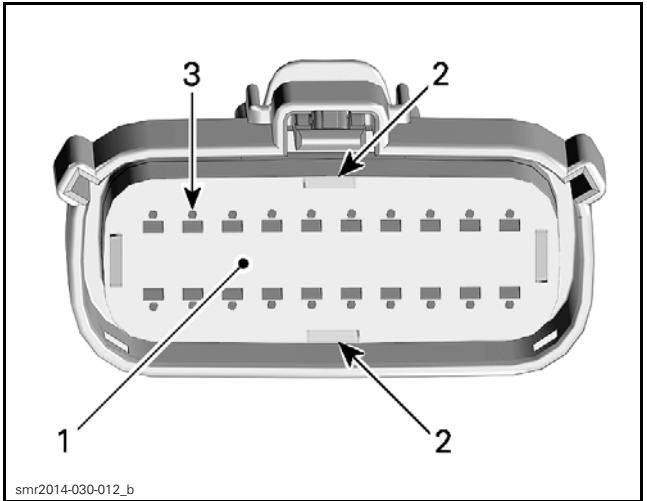
| REQUIRED TOOL                           |                                                                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------|
| DIAGNOSTIC HARNESS<br>(P/N 529 036 384) |  |

2. Probe the applicable circuit using the test connector on the diagnostic harness.

**NOTICE** Attempting to probe the connector without using the diagnostic connector may damage the connector pins, or even cause a short circuit if testing an energized circuit.

Extracting the Socket (Female Connector)

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



- 1. Socket locator
- 2. Pry holes
- 3. Holes for inserting terminal extractor tool

2. Carefully pull out the socket locator out to the detent position (approximately 5 mm).

**NOTE:** Do not remove the socket locator from the connector housing.

3. Insert the 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.

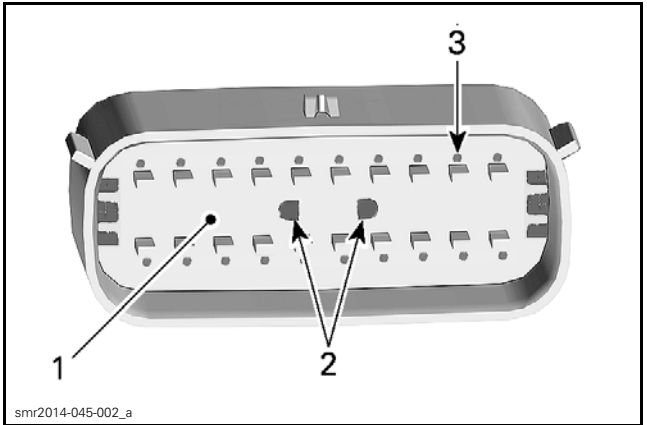
| REQUIRED TOOL                                           |                                                                                     |
|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| FCI TERMINAL EXTRACTOR TOOL<br>(P/N 54241678)           |  |
| MOLEX 150 TERMINAL EXTRACTOR TOOL<br>(P/N 63813 - 1500) |  |

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

Extracting the Pin (Male Connector)

1. Using a pair of thin long nose pliers, pull the pin locator out to the detent position (approximately 5 mm). This will allow unlocking of the pins.

**NOTICE** Do not attempt to remove the pin locator or damage will occur. Be careful not to bend the pins when using the pliers.



- 1. Pin locator
- 2. Insert long nose pliers here
- 3. Holes for inserting terminal extractor tool

2. Insert the extractor tool in the small hole adjacent to the pin.

**NOTE:** Push the extractor tool in only as far as required to release the lock from the pin. The tool should slide along the pin and be inserted between the pin and the lock.

| REQUIRED TOOL                                           |                                                                                       |
|---------------------------------------------------------|---------------------------------------------------------------------------------------|
| FCI TERMINAL EXTRACTOR TOOL<br>(P/N 54241678) or,       |  |
| MOLEX 150 TERMINAL EXTRACTOR TOOL<br>(P/N 63813 - 1500) |  |

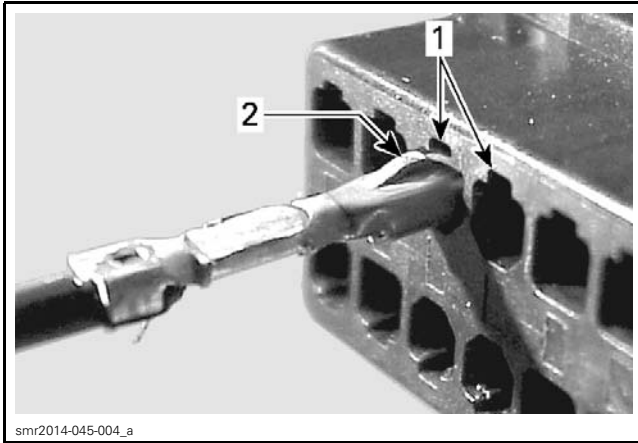
3. Gently pull on the wire to extract the pin out the back of the connector.



### Inserting the Pin

1. Ensure the terminal (pin) is properly crimped onto the wire.
2. Ensure the pin locator (the white plastic insert in the connector) is out in the detent position.
3. Insert the pin in through the back of the connector.

**NOTE:** When inserting the pin, insert the stepped portion facing the notch in the connector pin hole.



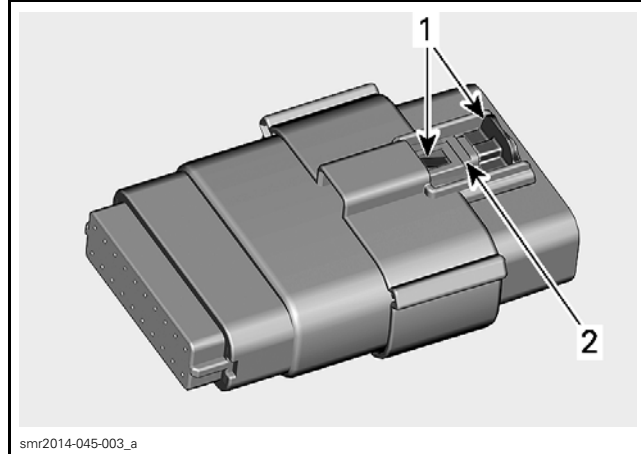
**TYPICAL - PIN INSERTION**

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.

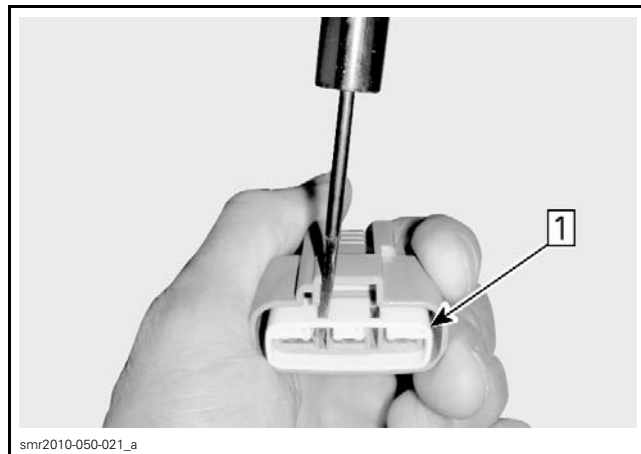
### MULTIFUNCTION GAUGE CONNECTOR (6 PIN MOLEX 150)

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).

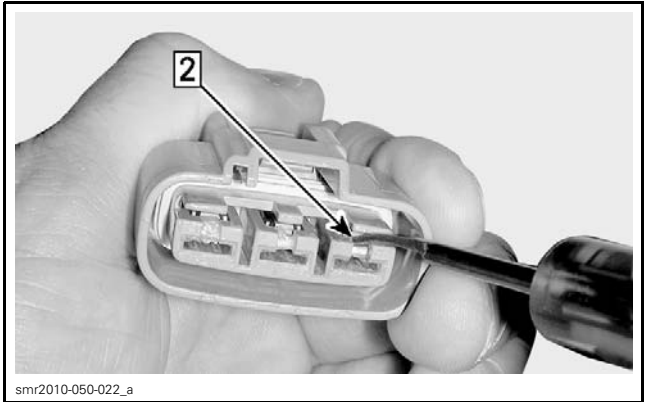


**Step 1: Remove the secondary lock**

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

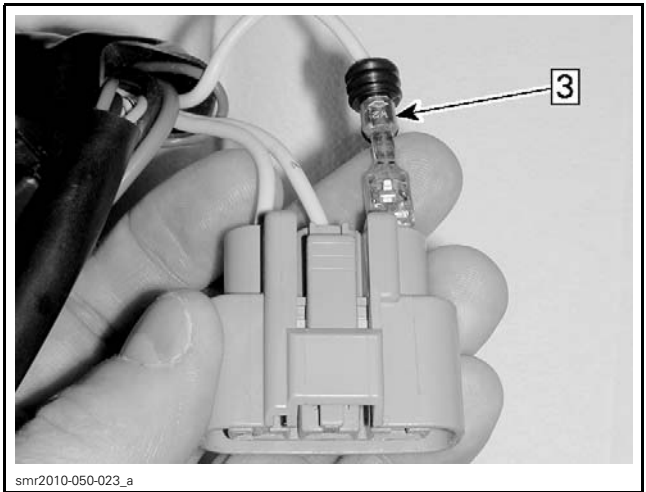


| REQUIRED TOOL                              |                                                                                   |
|--------------------------------------------|-----------------------------------------------------------------------------------|
| GM TERMINAL<br>EXTRACTOR<br>(P/N 12094430) |  |



Step 2: Insert GM extractor tool

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



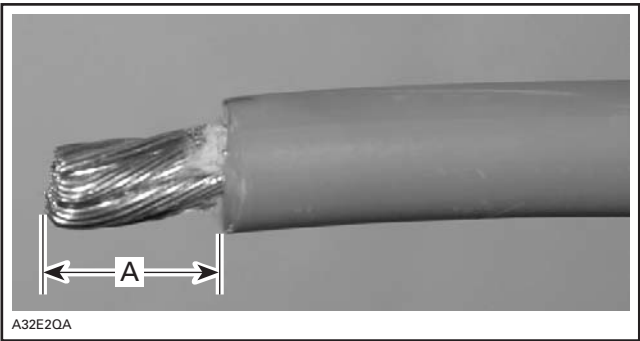
Step 3: Pull wire to extract pin

**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

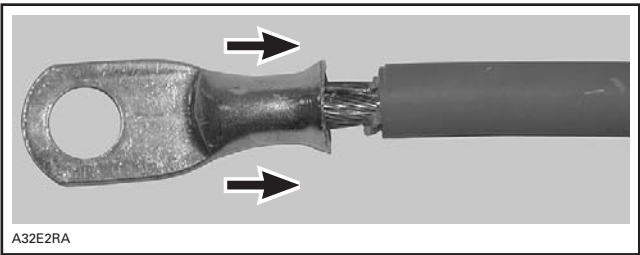
Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.



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.

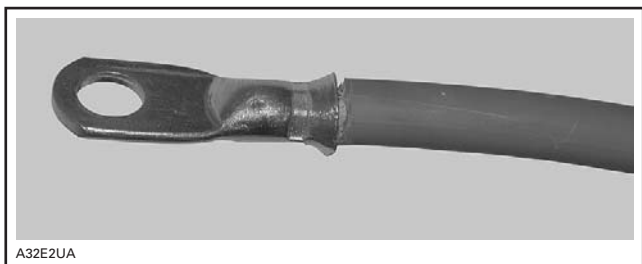


### CRIMPING OF WIRE

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## Subsection XX (WIRING HARNESS AND CONNECTORS)

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*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 ..... | 7      |
| DIAGNOSTIC HARNESS .....    | 529 036 384 ..... | 6–7    |
| ECM ADAPTER TOOL.....       | 529 036 166 ..... | 4, 7   |
| FLUKE 115 MULTIMETER .....  | 529 035 868 ..... | 4, 6–7 |

## SERVICE PRODUCTS

| Description                             | Part Number       | Page |
|-----------------------------------------|-------------------|------|
| LOCTITE 767 (ANTISEIZE LUBRICANT) ..... | 293 800 070 ..... | 6    |

## 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**

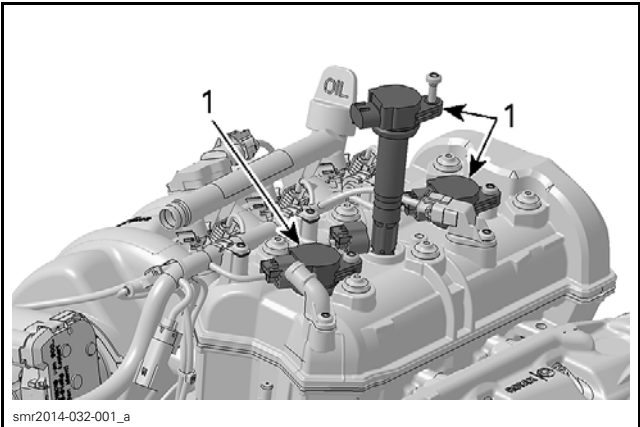
Never check for engine ignition spark from an open coil and/or spark plug as spark may cause potential fuel vapors to ignite. Always use an approved spark tester.

## 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.

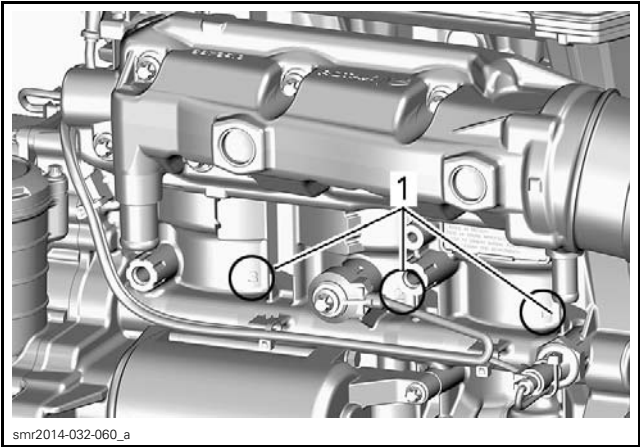
Three direct ignition coils receive power from the fuse F3 through the relay.



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

Subsection XX (IGNITION SYSTEM)

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<br>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

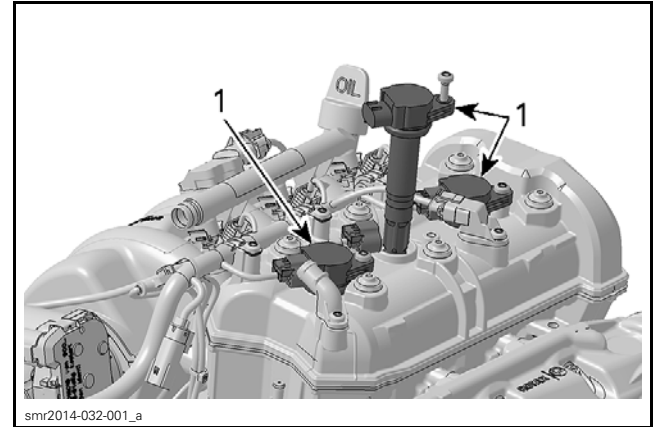
#### ⚠ WARNING

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.

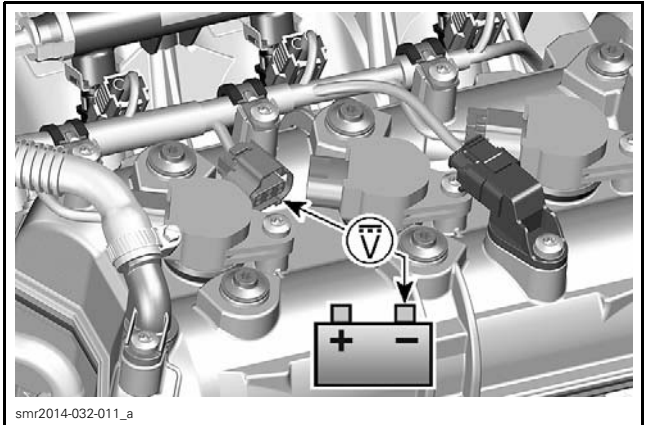
1. Disconnect the applicable ignition coil connector.
2. Remove tether cord from the engine cut-off switch.
3. Set the multimeter to Vdc.

Subsection XX (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  $\Omega$ .
- 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 $\Omega$ |
| 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

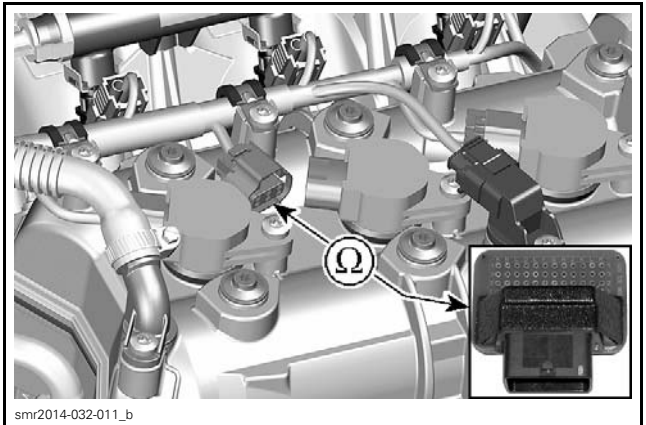
- 1. Disconnect ECM connector "A". For connector identification, refer to *WIRING HARNESS AND CONNECTOR* subsection.
- 2. Connect ECM connector to the ECM adapter tool.

| 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 $\Omega$ (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.

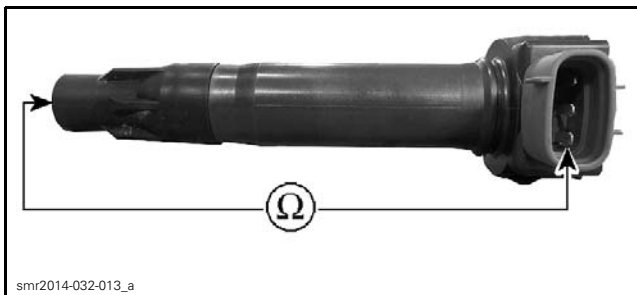
- 1. Remove ignition coil. Refer to *REMOVING THE IGNITION COIL* in this subsection.

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<br>(80 lbf•in ± 9 lbf•in) |

Connect ignition coil connector.

## SPARK PLUGS

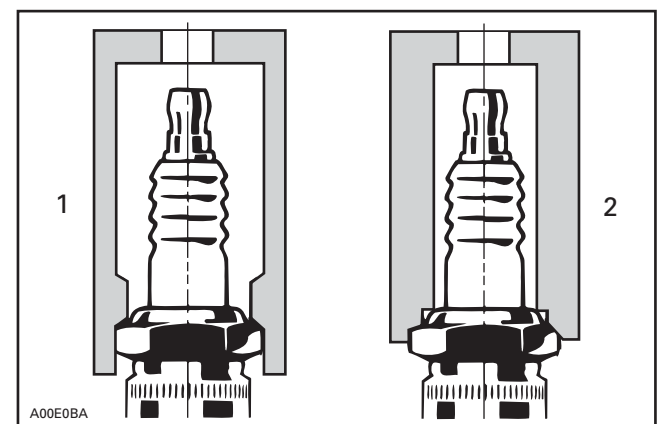
### Removing the Spark Plug

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.



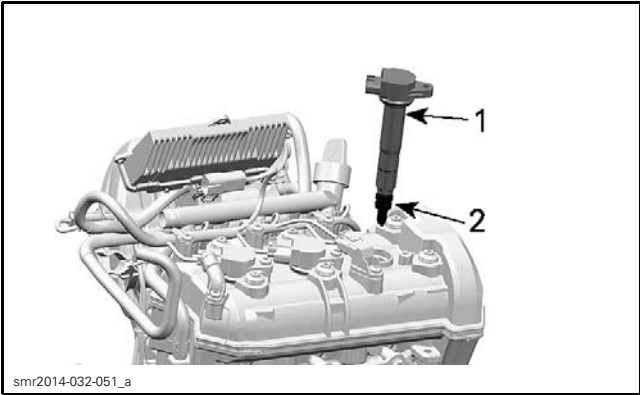
1. Approved socket
2. Improper socket

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.



Subsection XX (IGNITION SYSTEM)



1. Ignition coil  
2. Spark plug

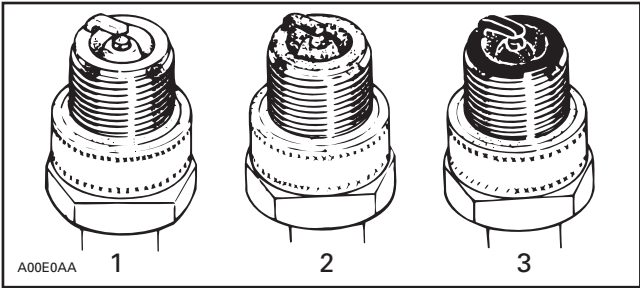
Troubleshooting a Fouled Spark Plug

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 (ANTISEIZE LUBRICANT)<br>(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<br>(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.

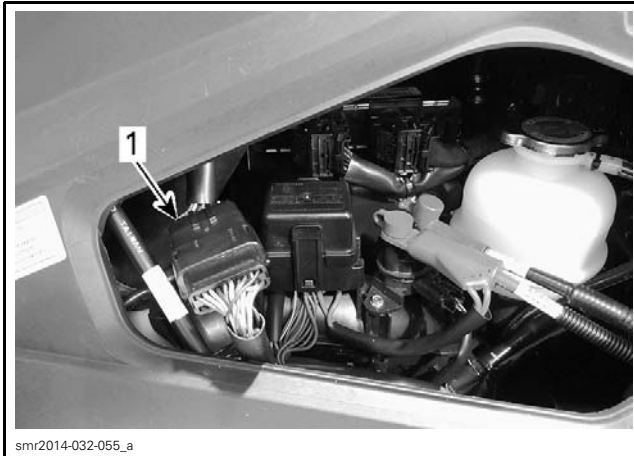
ENGINE CUT-OFF SWITCH

Testing the Continuity of Engine Cut-Off Switch

| REQUIRED TOOLS                               |                                                                                       |
|----------------------------------------------|---------------------------------------------------------------------------------------|
| DIAGNOSTIC HARNESS<br>(P/N 529 036 384)      |  |
| FLUKE 115<br>MULTIMETER (P/N 529<br>035 868) |  |

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





1. Steering connector

- 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.

- Set multimeter to  $\Omega$ .
- 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 $\Omega$ |

If continuity test fails:

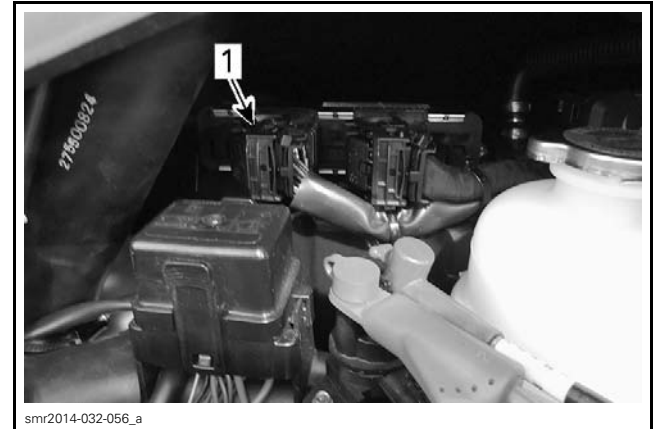
- Check steering harness between steering connector and engine cut-off switch. Repair or replace.
- If harness is good, replace the engine cut-off switch.

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)     |

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



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

- Probe test connector as follows.

| DIAGNOSTIC HARNESS CONNECTOR | ECM ADAPTER TOOL | READING             |
|------------------------------|------------------|---------------------|
| Pin 9                        | B-E4             | Close to 0 $\Omega$ |
| 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.

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

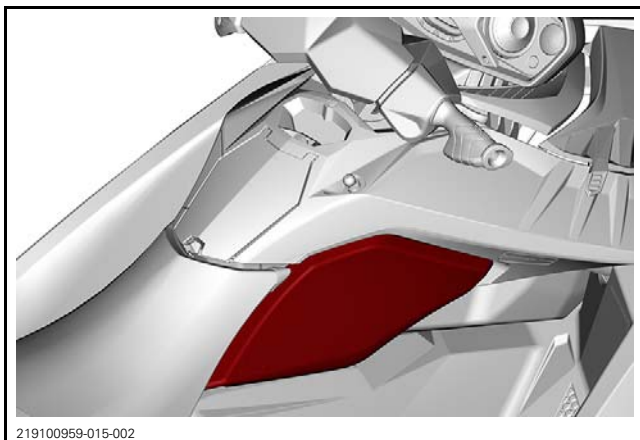
- Reinstall removed components.

### Replacing the Engine Cut-Off Switch

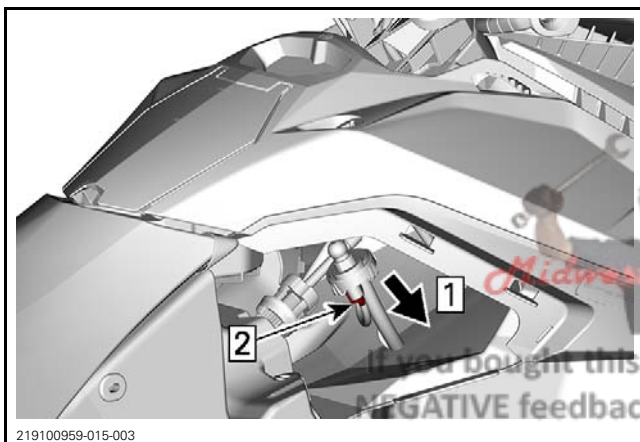
| REQUIRED TOOL                           |
|-----------------------------------------|
| D.E.S.S. POST REMOVER (P/N 529 035 943) |



## Subsection XX (IGNITION SYSTEM)



Lower cut-off switch and disconnect electrical connector.



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



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# CHARGING SYSTEM

## SERVICE TOOLS

| Description                | Part Number       | Page |
|----------------------------|-------------------|------|
| FLUKE 115 MULTIMETER ..... | 529 035 868 ..... | 2    |

## SERVICE TOOLS – OTHER SUPPLIER

| Description                    | Part Number  | Page |
|--------------------------------|--------------|------|
| EXTECH INDUCTIVE AMMETER ..... | 380941 ..... | 2    |

## 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.



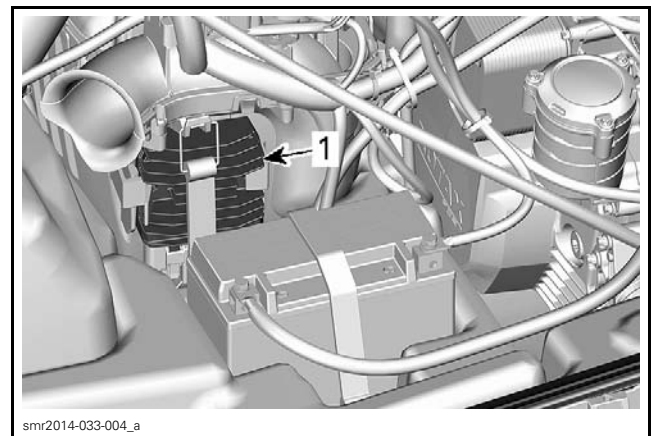
TYPICAL

#### 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.

Subsection XX (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 |

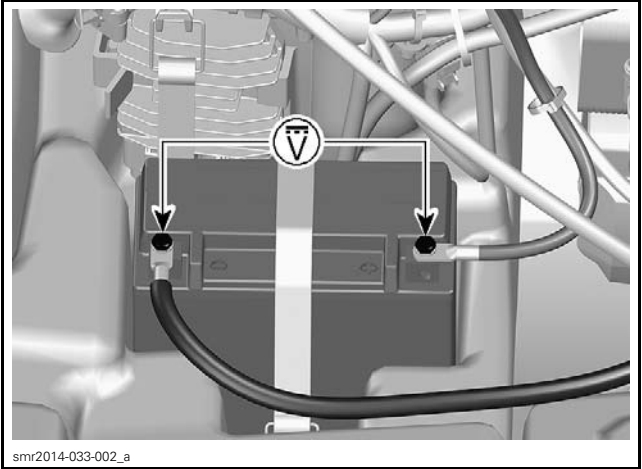
If voltage is above specification, replace voltage regulator/rectifier.

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<br>(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.

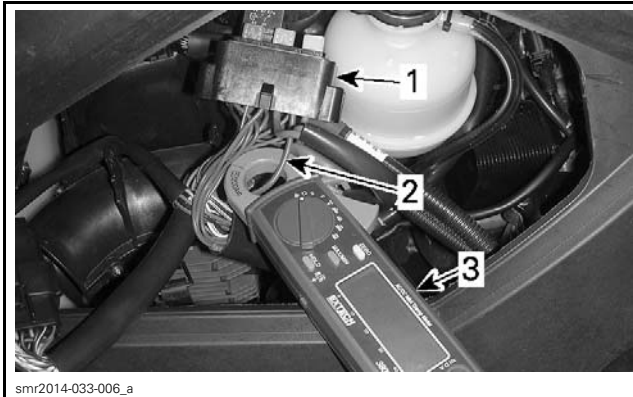
If voltage is below specification, check stator output and wiring harness prior to concluding that voltage regulator/rectifier is defective. Refer to *STARTING SYSTEM* subsection.

Testing the Output Current with an Inductive Ammeter

| REQUIRED TOOL                            |                                                                                       |
|------------------------------------------|---------------------------------------------------------------------------------------|
| EXTECH INDUCTIVE AMMETER<br>(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<br>(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.

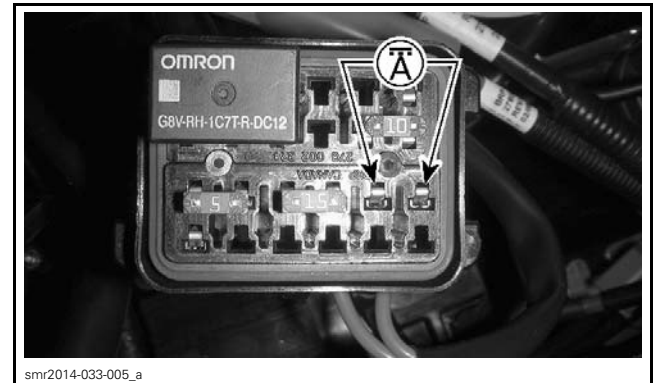
6. Secure fuse box to its support.

### 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.

## Subsection XX (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.

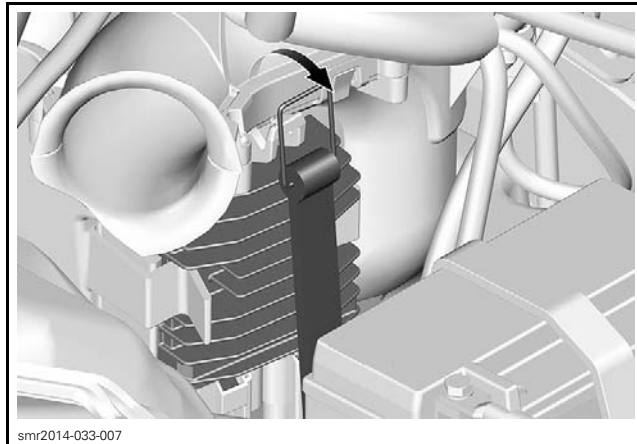
If the fuse still burns, check for a shorted wire or connector pin.

If fuse does not burn, replace regulator/rectifier.

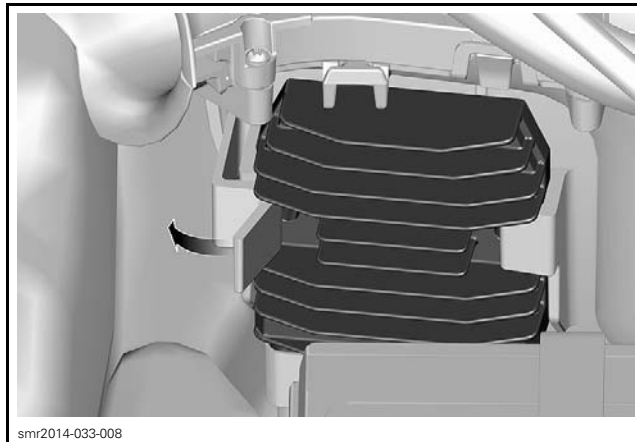
#### Replacing the Voltage Regulator/Rectifier

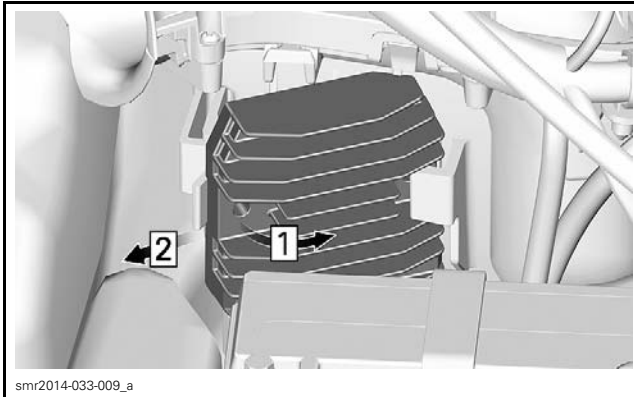
#### Removing the Voltage Regulator/Rectifier

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

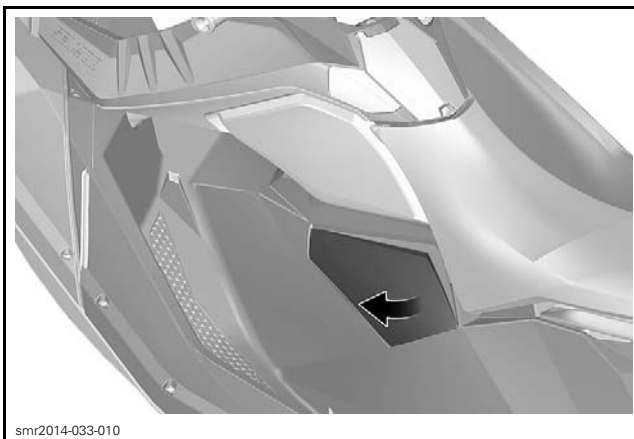
### Battery Information

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.



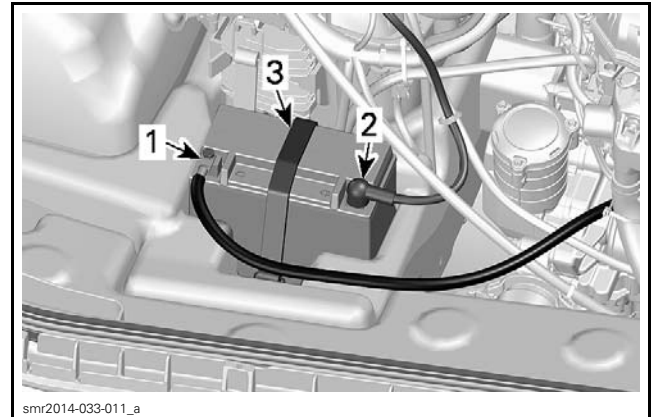
### Removing the Battery

#### **⚠ 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.

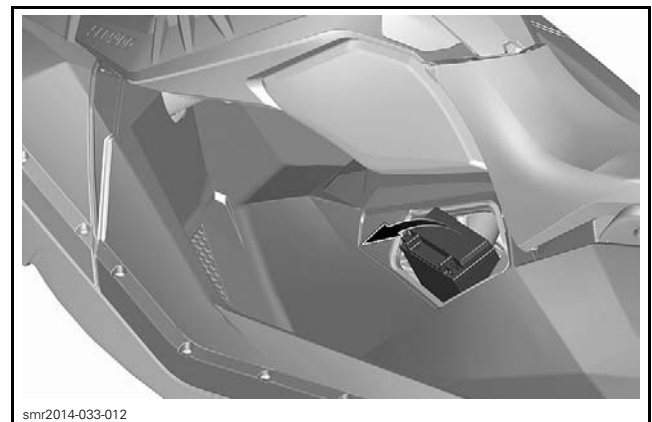


*CENTRAL BODY REMOVED FOR CLARITY PURPOSE*

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. <b>This is the most recommended method.</b>   |
| 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.



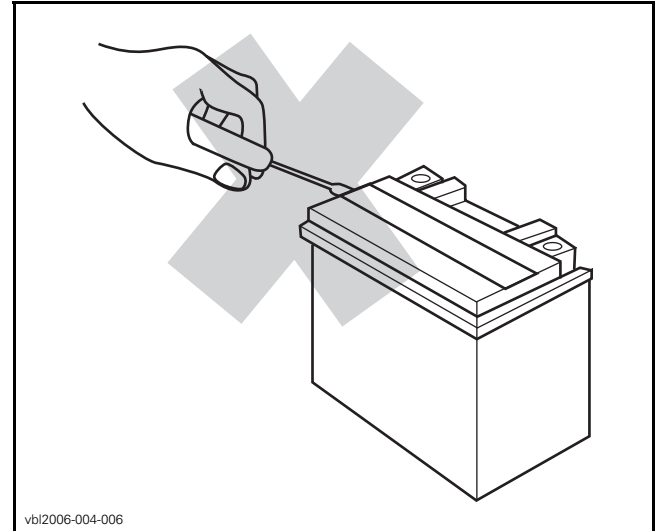
4. Charge battery to bring it to a full state of charge.
  - **When using a constant current charger:** Refer to the standard (STD) charging method indicated on the battery. Keep an eye on the voltmeter and battery to avoid overcharging.
  - **When using an automatic type taper charger:** Check to make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



**NEVER REMOVE BATTERY STRIP**

## 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.

---

## Subsection XX (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.



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  $\Omega$ .

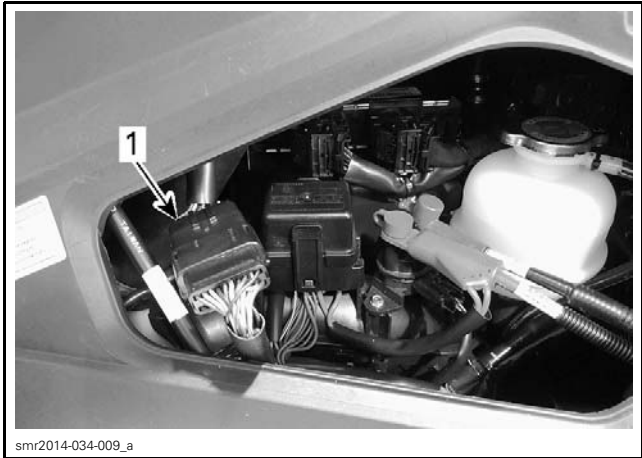
Press and hold the START/STOP switch and test for continuity of the switch circuit as per following table.

| CONTINUITY TEST OF START/STOP SWITCH CIRCUIT (BUTTON PRESSED AND HELD) |                 |                                  |
|------------------------------------------------------------------------|-----------------|----------------------------------|
| FUSE BOX                                                               | ECM CONNECTOR B | RESISTANCE                       |
| Pin C5                                                                 | B-D1            | Close to 0 $\Omega$ (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.



1. Steering connector

- 3. Connect the diagnostic harness to make an in-line connection between the disconnected connector.
- 4. Use the multimeter and select  $\Omega$ .
- 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 $\Omega$ |

If the switch does not test as specified, replace the START/STOP switch.

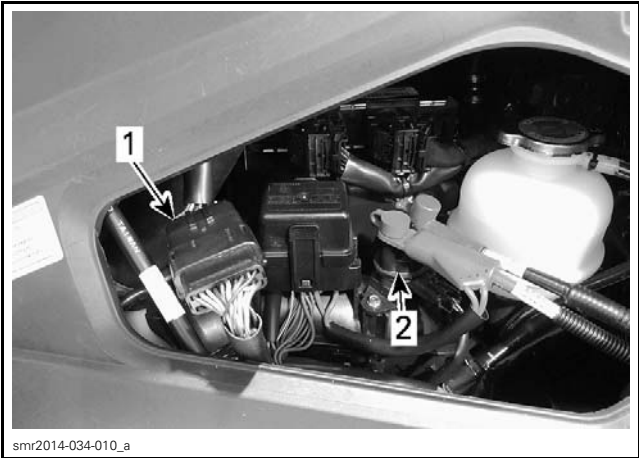
If the switch tests as specified, check for an open circuit between connections as per table:

| OPEN CIRCUIT TEST        |                          |                             |
|--------------------------|--------------------------|-----------------------------|
| CIRCUIT CONNECTIONS      |                          | RESISTANCE                  |
| Fuse box pin C5          | Steering connector pin 1 | Must be close to 0 $\Omega$ |
| 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)

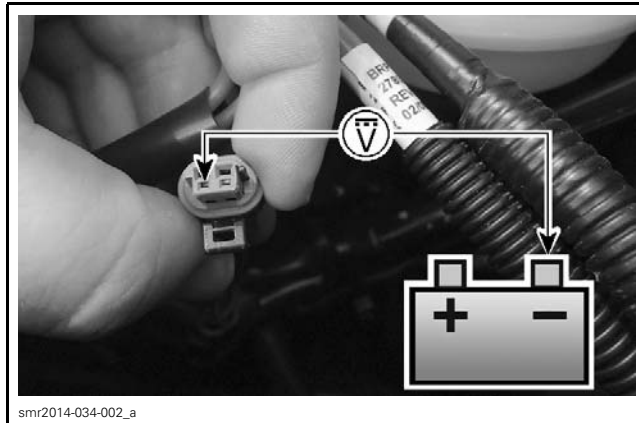
- 1. Make sure F1 fuse is powered and in good condition before testing.
- 2. Disconnect solenoid connector.



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<br>(SOLENOID COIL) |                |                 |
|------------------------------------------------|----------------|-----------------|
| TEST PROBES                                    |                | VOLTAGE READING |
| Pin A                                          | Battery ground | Battery voltage |



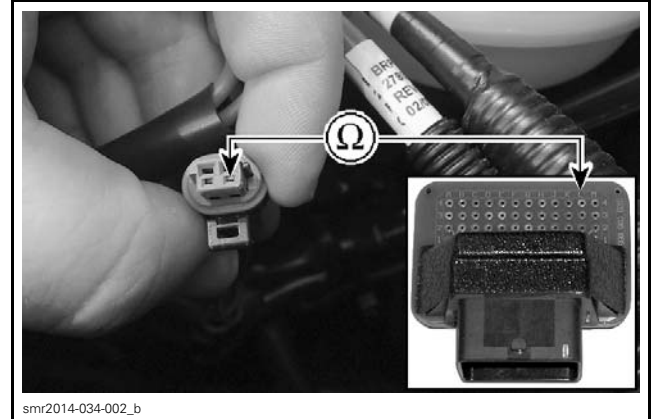
If test succeeded, carry out *TESTING THE SOLENOID CONTROL CIRCUIT*.

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

### Testing the Solenoid Control Circuit Continuity

1. Set the multimeter to  $\Omega$ .
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 $\Omega$ (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  $\Omega$ .
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 $\Omega$ |

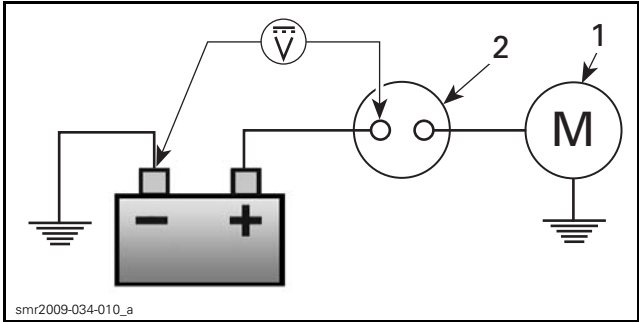
If test fails, replace solenoid.

### 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 |

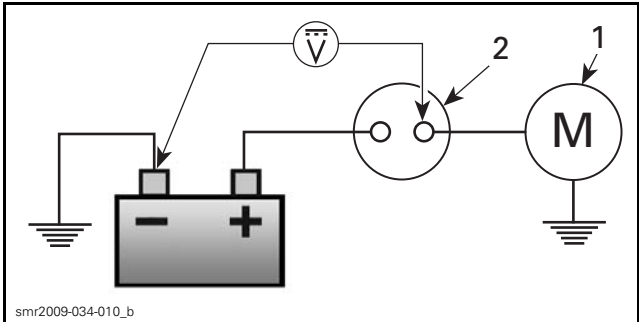
Subsection XX (STARTING SYSTEM)



- 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.

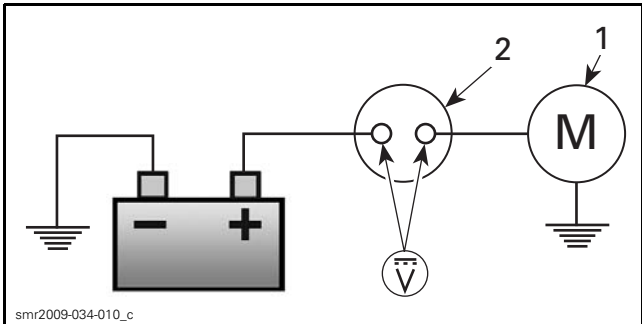
| SOLENOID DYNAMIC TEST (ENGINE CRANKING) |                |                 |
|-----------------------------------------|----------------|-----------------|
| TEST PROBES                             |                | VOLTAGE (DC)    |
| Solenoid starter post                   | Battery ground | Battery 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. |



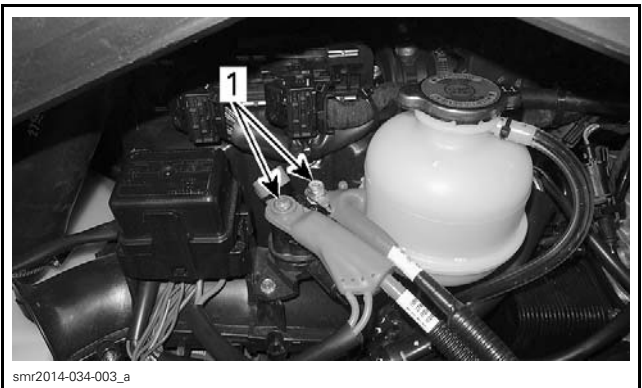
- 1. Starter motor
- 2. Starter solenoid

- 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

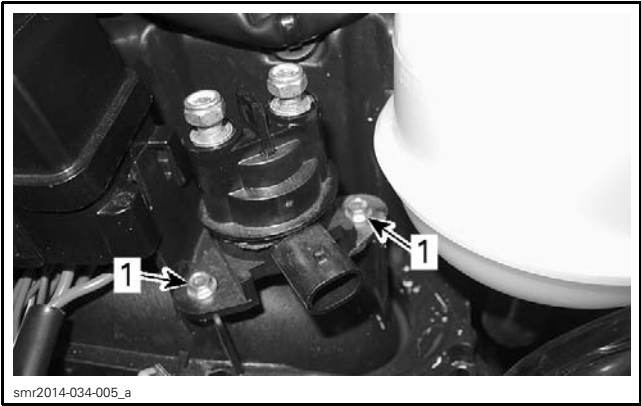
- 3. Disconnect starter solenoid connector.



- 1. Starter solenoid connector

- 4. Remove both screws retaining the solenoid.





1. Solenoid retaining screws

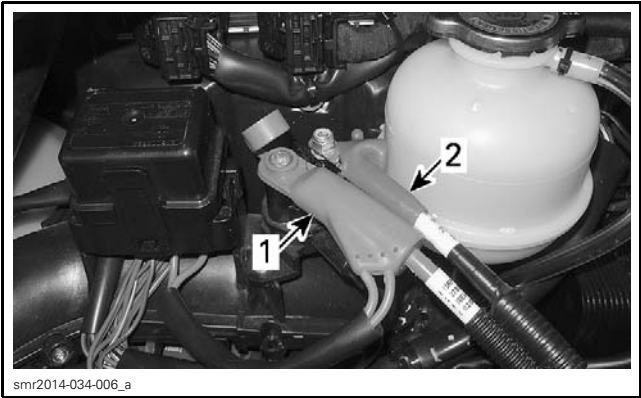
Installing the Solenoid

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<br>(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<br>(35 lbf•in ± 4 lbf•in) |

- 4. Close or slide protective caps.

- 5. Reconnect battery and test starter solenoid operation.

STARTER

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

# RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM (RF D.E.S.S.)

## GENERAL

### SYSTEM DESCRIPTION

The following components are specially designed for this system: ECM, D.E.S.S. key (inside tether cord cap) and engine cut-off switch.

The D.E.S.S. key contains a magnet and a RFID chip.

- The magnet closes the hall effect switch inside the engine cut-off switch.
- The RFID chip contains a unique digital code. It is the equivalent of the tooth-pattern cut on a conventional ignition key.

The D.E.S.S. system allows the engine to start only if a tether cord cap is installed on the engine cut-off switch and the D.E.S.S. key is recognized as valid by the ECM.

The D.E.S.S. key is quite flexible:

- Up to 8 D.E.S.S. keys may be programmed in the ECM memory using the 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.

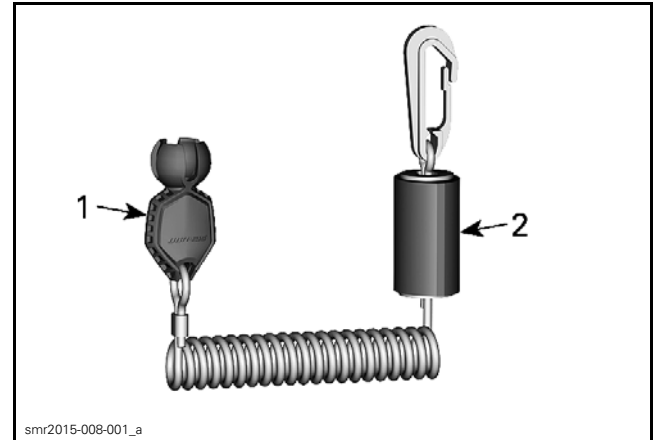
### D.E.S.S. Key Types

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*.

## 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:

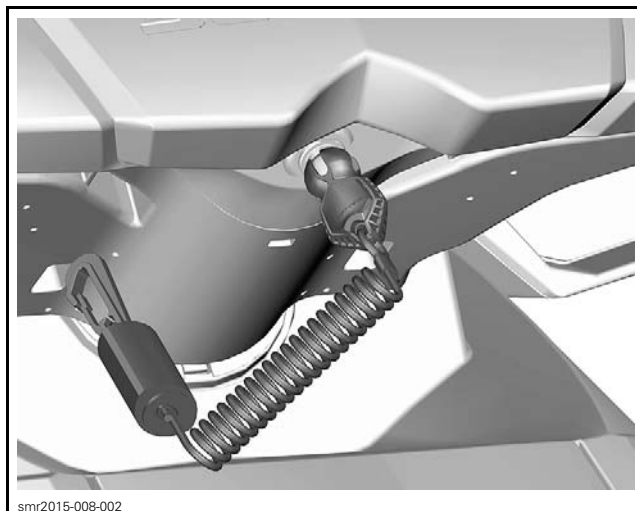
1. Briefly press the START/STOP button to wake up the ECM.
2. Securely install the tether cord on watercraft engine cut-off switch.
3. Press and hold the START/STOP button to start engine.

#### 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 BUDS2** 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.

### Adding a Key

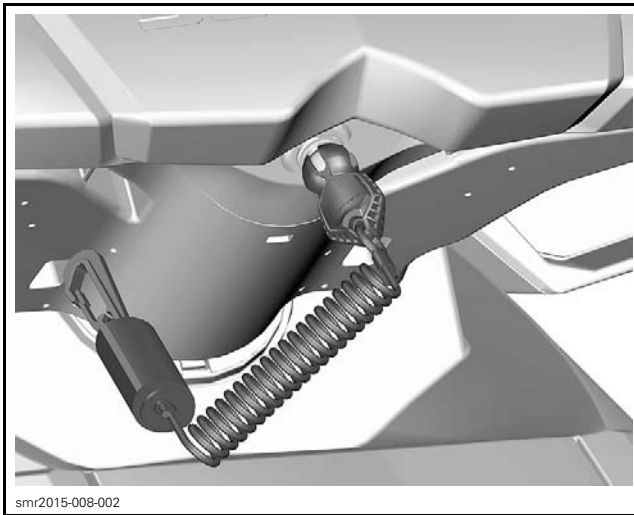
1. Click on the **Add Key** button.
2. Follow instructions on BUDS2 screen.

### 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.

Refer to *IGNITION SYSTEM* subsection for testing procedures.

# MULTIFUNCTION GAUGE

## SERVICE TOOLS

| Description              | Part Number       | Page |
|--------------------------|-------------------|------|
| DIAGNOSTIC HARNESS ..... | 529 036 384 ..... | 8    |

## SERVICE PRODUCTS

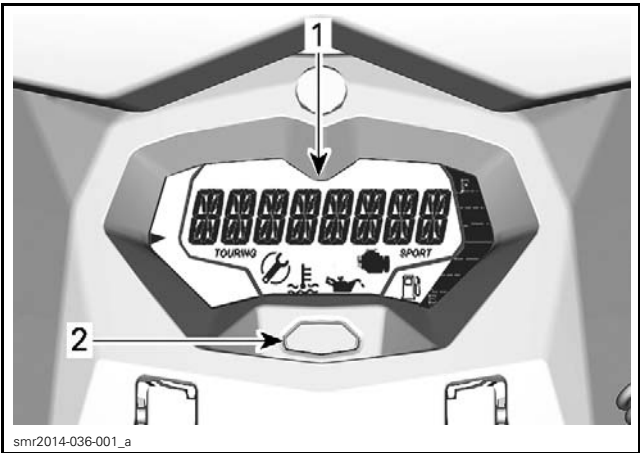
| Description             | Part Number       | Page  |
|-------------------------|-------------------|-------|
| DEOXIT LUBRICANT .....  | 293 550 034 ..... | 5     |
| DIELECTRIC GREASE ..... | 293 550 004 ..... | 5, 12 |

GENERAL

MULTIFUNCTION GAUGE

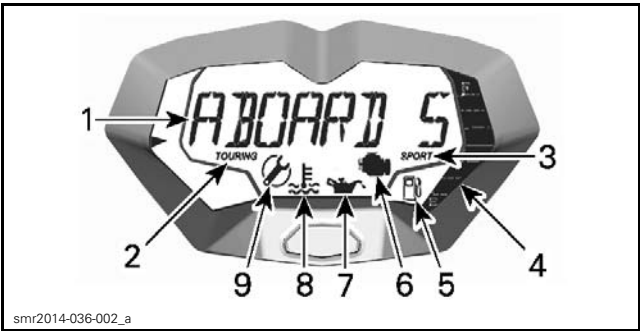
 **WARNING**

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 -<br>INCREASED ACCELERATION -<br>INSTRUCT PASSENGERS TO HOLD -<br>PRESS SET BUTTON | Message when SPORT mode is selected                              |
| SPORT MODE ACTIVATED                                                                                   | Message when SPORT mode is activated                             |
| SPORT MODE - RETURN TO IDLE TO<br>ACTIVATE                                                             | Message when SPORT mode cannot be activated, engine not at idle  |
| SPORT MODE ACTIVE - RETURN TO<br>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

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## Subsection XX (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                      |

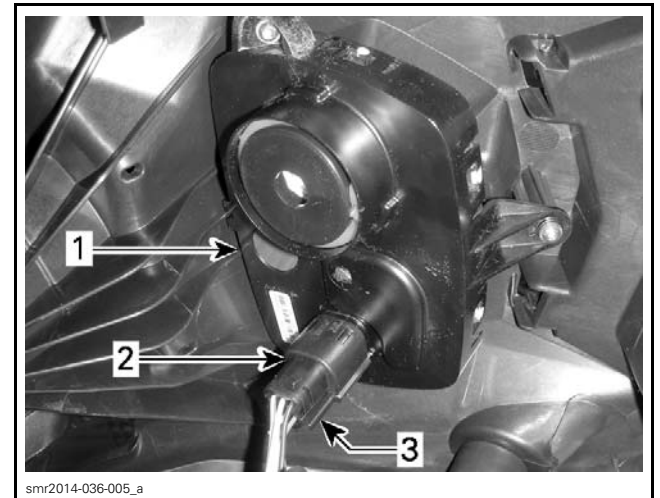
### Models with iBR

| 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 |                 |

### Models with $iBR$

**NOTE:** \* pin 3 is unswitched 12V.



If battery voltage is not measured at the gauge connector, carry out *TESTING THE MULTIFUNCTION GAUGE INPUT VOLTAGE (AT STEERING CONNECTOR)*.

2. Disconnect the 20-pin steering connector.

1. *Disconnected 20-pin steering connector*

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

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

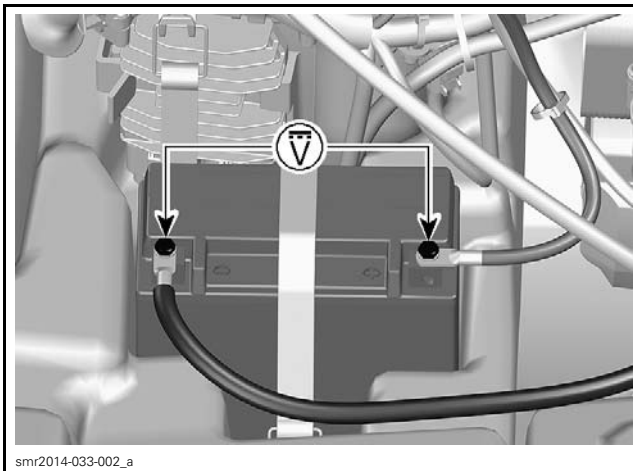
| MULTIFUNCTION GAUGE INPUT VOLTAGE TEST (STEERING CONNECTOR) |                |                 |
|-------------------------------------------------------------|----------------|-----------------|
| TEST CONNECTOR ON DIAGNOSTIC HARNESS                        |                | VOLTAGE         |
| Pin 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.

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



TYPICAL - BATTERY VOLTAGE TEST

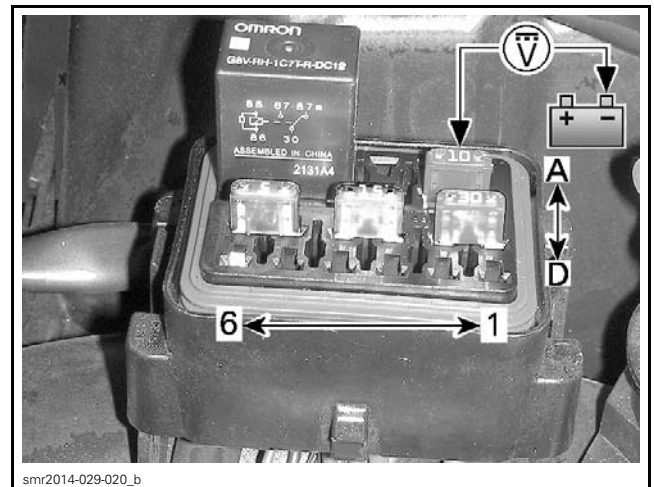
8. Remove fuse box cover.



1. Fuse box cover to remove

9. Press the START/STOP button.
10. Install the tether cord on engine cut-off switch.
11. 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                 |                  |             |



VOLTAGE TEST AT FUSE CONTACTS

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

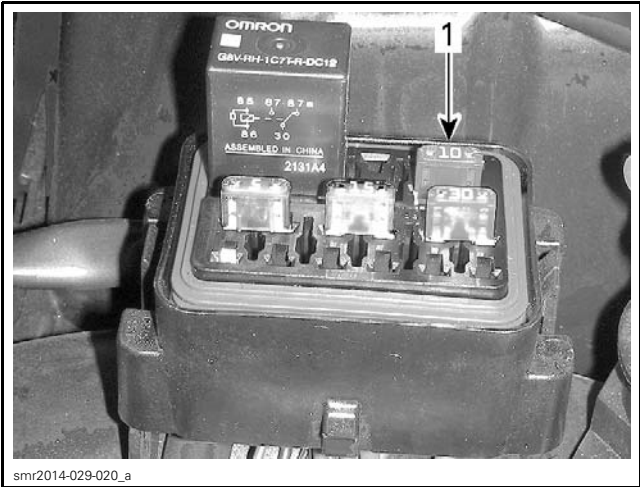
If battery voltage is measured at fuse contact B1, refer to *TESTING THE CONTINUITY OF GAUGE POWER WIRE* in this subsection.

### Testing the Continuity of Gauge Power Wire

1. Remove tether cord from engine cut-off switch.

Subsection XX (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).

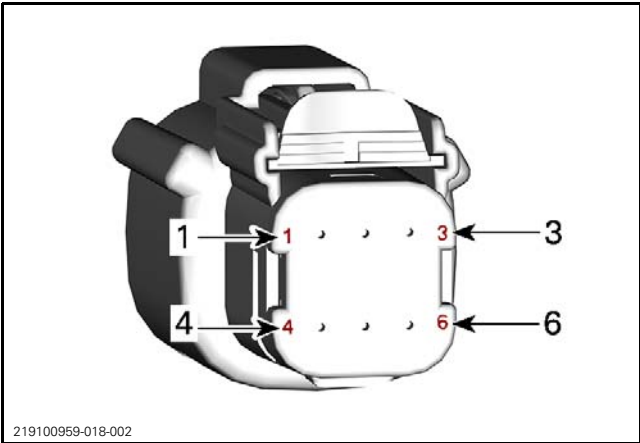


1. Remove ACC fuse (F1)

- 6. Set multimeter to  $\Omega$  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 $\Omega$ |
| Pin 1                                  | –                                    | B1       |                     |
| –                                      | Pin 20                               | B1       |                     |

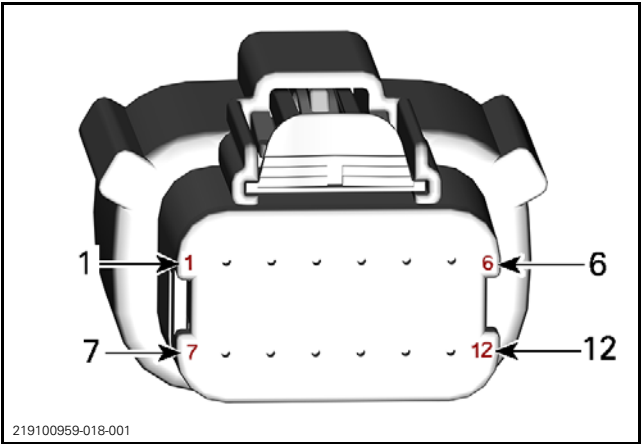


GAUGE CONNECTOR PIN-OUT

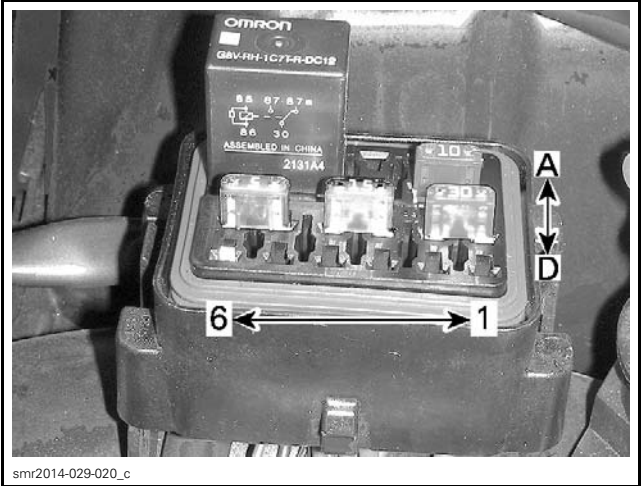
Models with iBR

| CONTINUITY TEST OF GAUGE POWER CIRCUIT |                                      |          |                     |
|----------------------------------------|--------------------------------------|----------|---------------------|
| GAUGE CONNECTOR                        | TEST CONNECTOR ON DIAGNOSTIC HARNESS | FUSE BOX | READING             |
| Pin 2                                  | Pin 20                               | –        | Close to 0 $\Omega$ |
| 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.



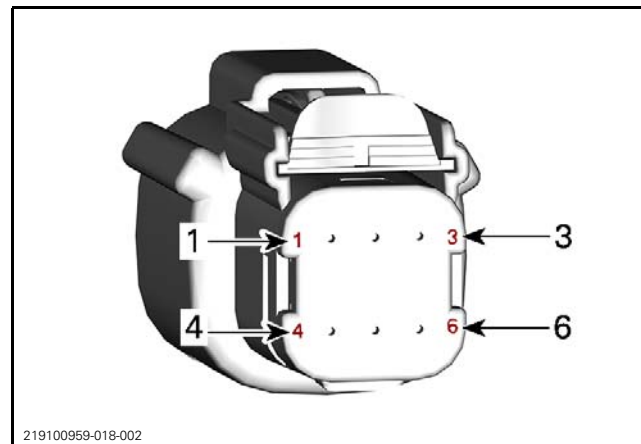
- Repair or replace wiring/connectors as required.

### Testing the Continuity of Gauge Ground Wire

- Disconnect the 20-pin steering connector.
- Connect the diagnostic harness between the disconnected steering connectors.
- Set multimeter to  $\Omega$  selection and carry out a continuity test as per following table. Refer to the *WIRING DIAGRAM* for circuit details.

#### Models without iBR

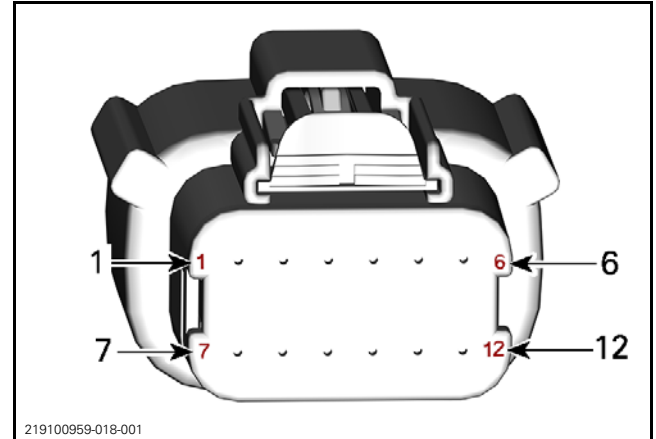
| CONTINUITY TEST OF GAUGE GROUND WIRE |                                      |               |                     |
|--------------------------------------|--------------------------------------|---------------|---------------------|
| MULTIMETER PROBES                    |                                      |               | READING             |
| GAUGE CONNECTOR                      | TEST CONNECTOR ON DIAGNOSTIC HARNESS | ENGINE GROUND |                     |
| Pin 4                                | —                                    | ✓             | Close to 0 $\Omega$ |
| 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 $\Omega$ |
| Pin 8                                | Pin 11                               | —             |                     |
| —                                    | Pin 11                               | ✓             |                     |

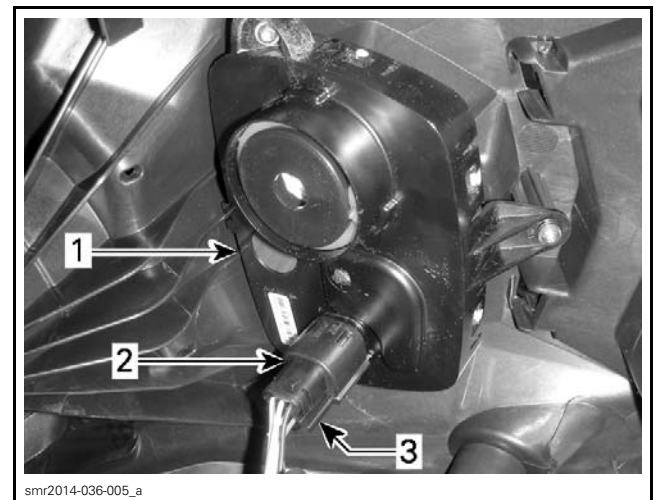


GAUGE CONNECTOR PIN-OUT

- Repair wiring and connectors as required.

### Removing the Multifunction Gauge

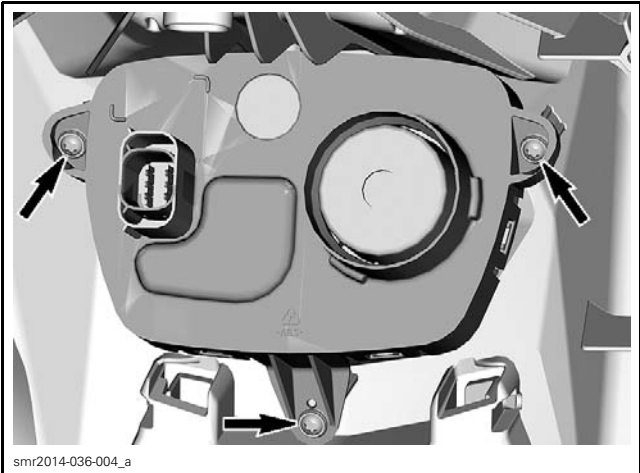
- Remove LH or RH knee pad.
- Reach in under console and disconnect multifunction gauge connector.



- Multifunction gauge (viewed from under console)
- Multifunction gauge connector
- Connector release tab to press

- Remove the 3 multifunction gauge mounting screws.

Subsection XX (MULTIFUNCTION GAUGE)



smr2014-036-004\_a  
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.

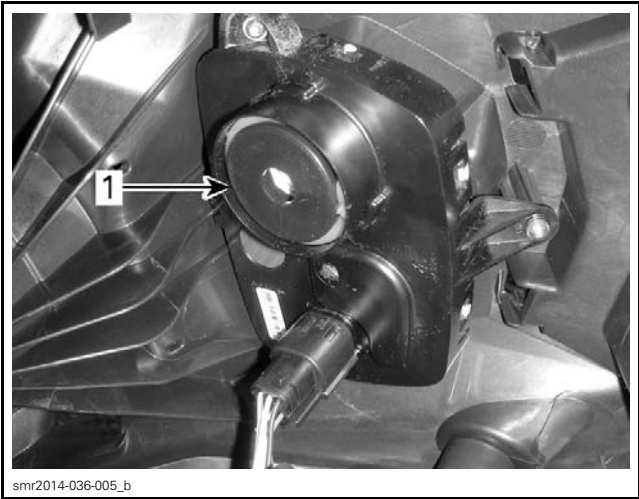
After the multifunction gauge has been replaced, connect the watercraft to BUDS2 and carry out any updates (if required). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Once the multifunction gauge has been updated (if required), refer to *SETTING THE UNITS OF MEASUREMENT AND LANGUAGE* in this subsection.

BEEPER

Beeper Information

The beeper is part of the multifunction gauge.



smr2014-036-005\_b  
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*.

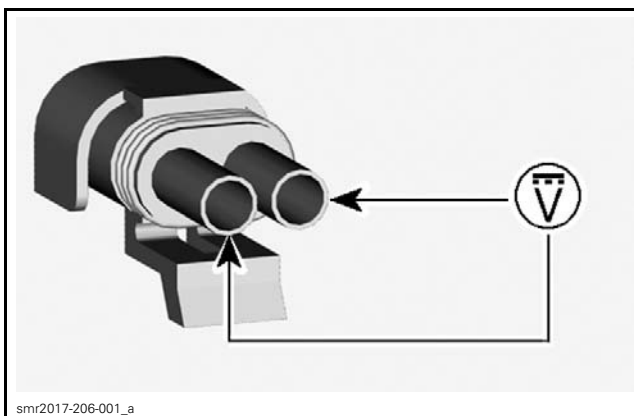
If fuse is good, test the *BILGE PUMP INPUT VOLTAGE*.

#### 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

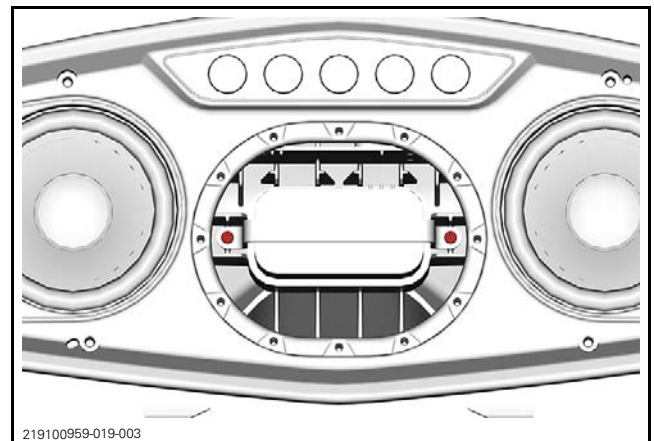
This system is completely self contained and has no electrical connection to the PWC. It needs to be connected to a household electrical outlet to be charged.

#### Removing and Installing the Sound System

Refer to *BODY* subsection.

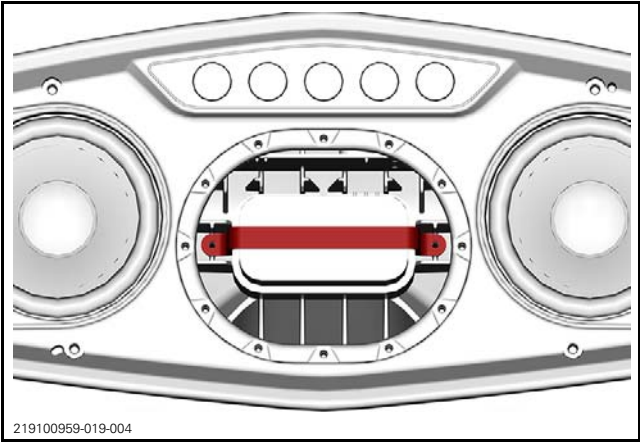
#### Replacing the Battery

Remove the following fasteners.

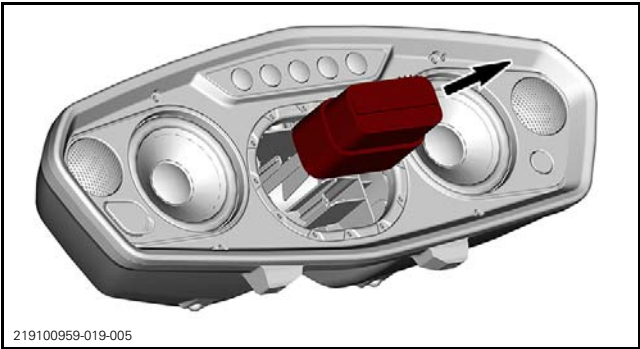


Remove battery support.

Subsection XX (ACCESSORIES)



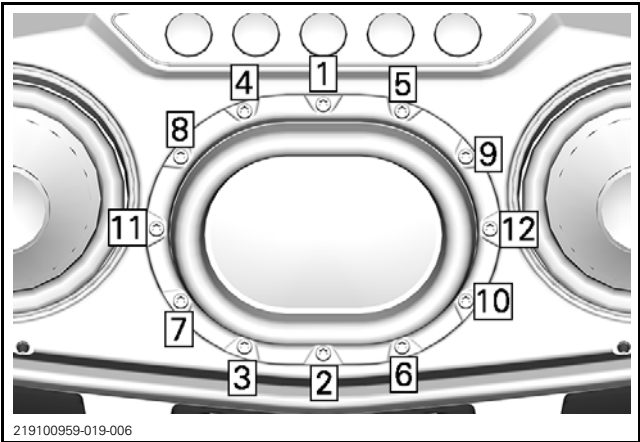
Disconnect electrical connector and remove battery.



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<br>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

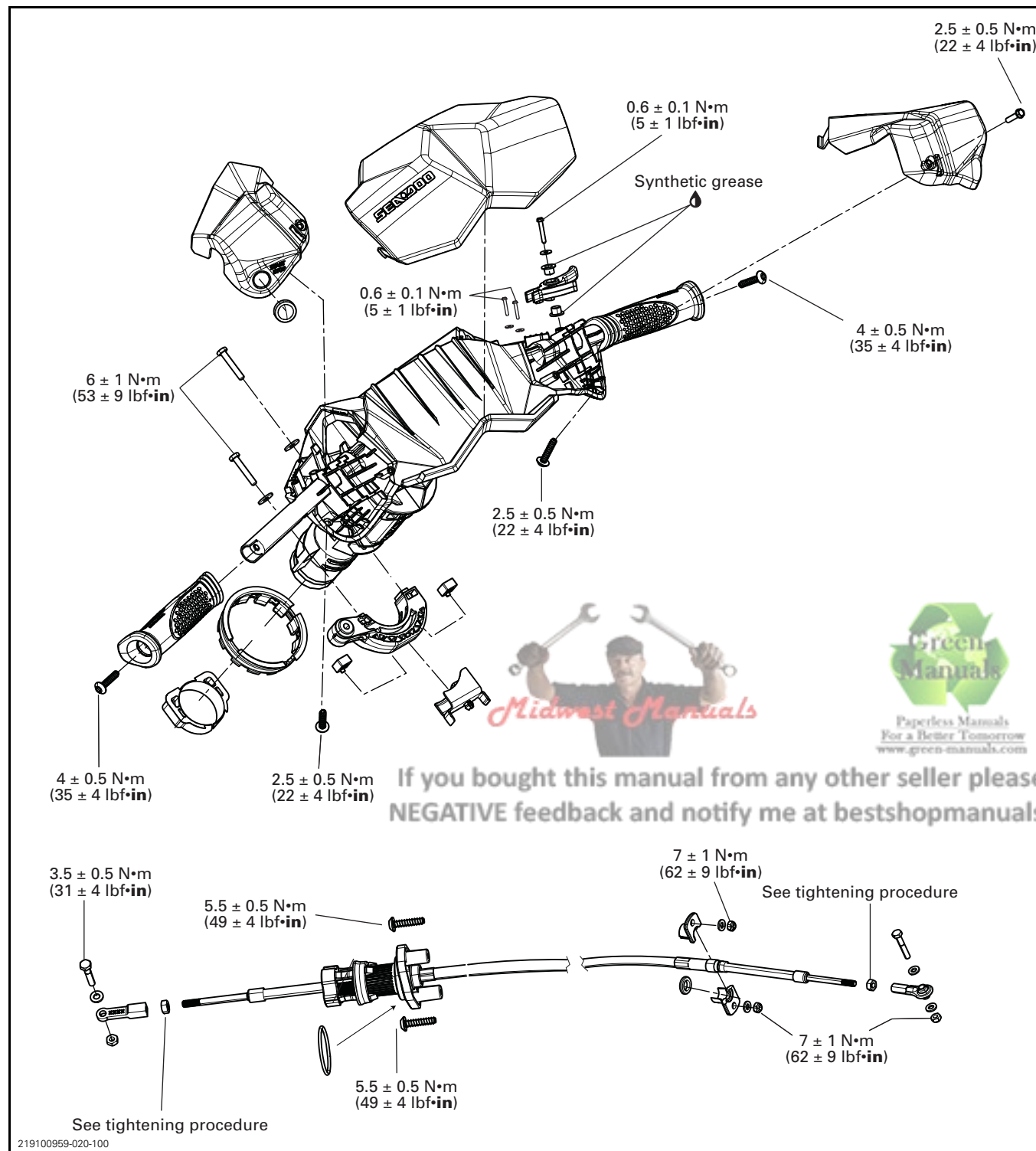
## SERVICE TOOLS

| Description                | Part Number       | Page |
|----------------------------|-------------------|------|
| DIAGNOSTIC HARNESS .....   | 529 036 384 ..... | 10   |
| FLUKE 115 MULTIMETER ..... | 529 035 868 ..... | 10   |

## SERVICE PRODUCTS

| Description                  | Part Number  | Page |
|------------------------------|--------------|------|
| SYNTHETIC GREASE (EUR) ..... | 779231 ..... | 5    |
| SYNTHETIC GREASE .....       | 779162 ..... | 5    |

## STEERING COLUMN AND CABLE

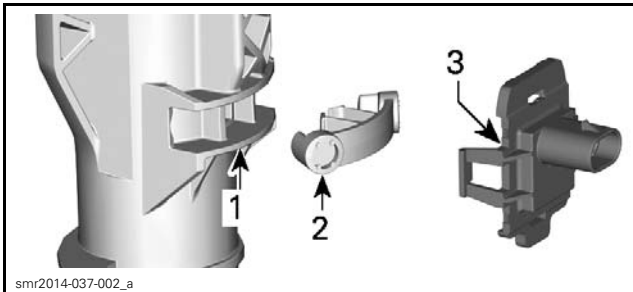


## GENERAL

### 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.

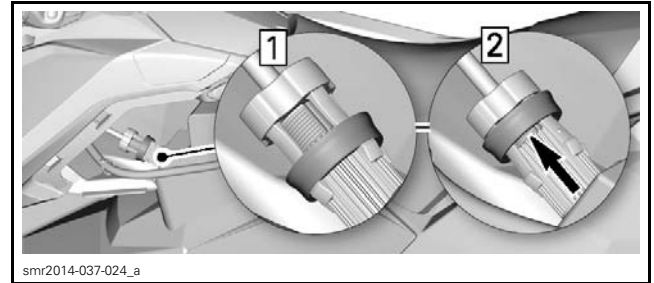
O.T.A.S. will be deactivated if:

- 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.

Subsection XX (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.

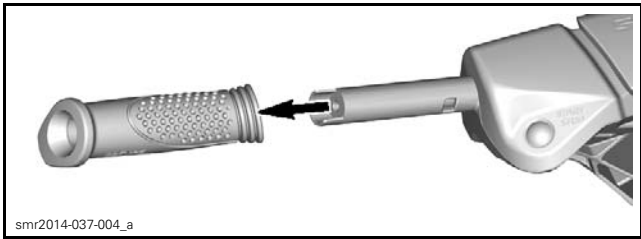
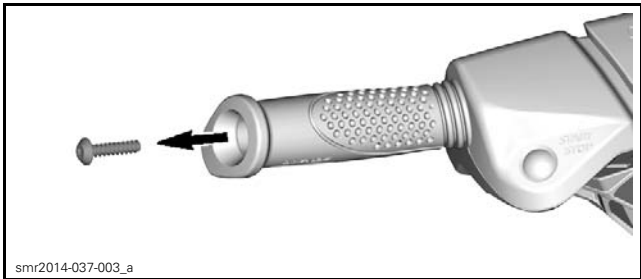
To confirm if O.T.A.S. is functional, carry out *O.T.A.S. OPERATION* in this subsection.

PROCEDURES

HANDLEBAR GRIP

Removing the Handlebar Grip

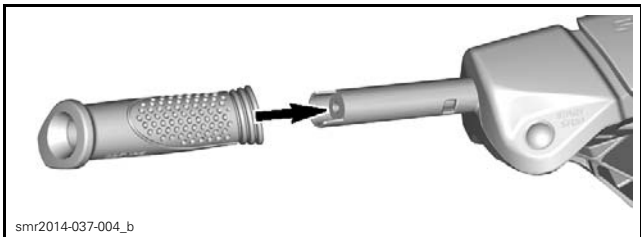
Follow image sequence.



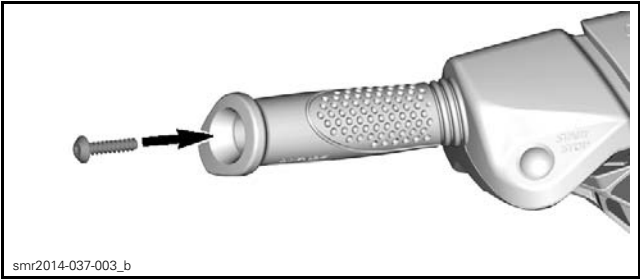
NOTE: Verify grip insert for damage.

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.



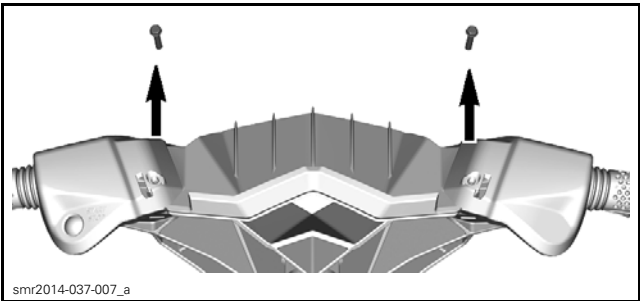
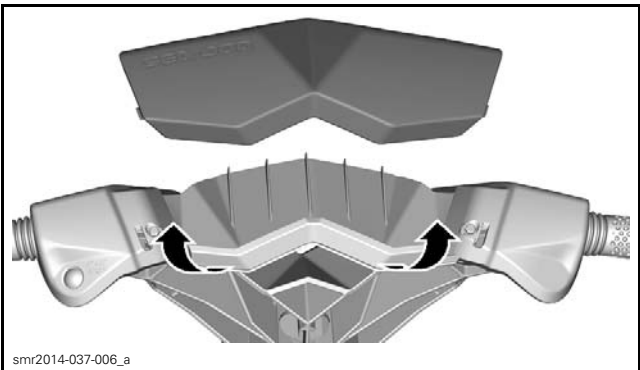
Refer to the exploded view for tightening torque specification.

HANDLEBAR SWITCH COVER (LH OR RH)

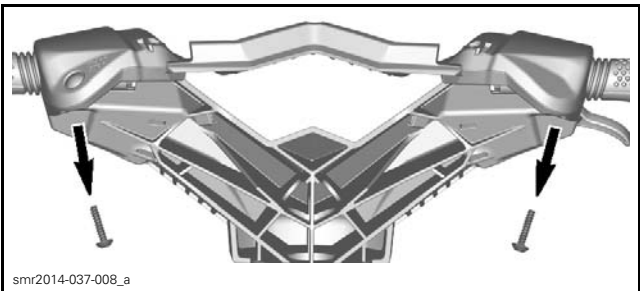
Removing the Handlebar Switch Cover (LH and RH)

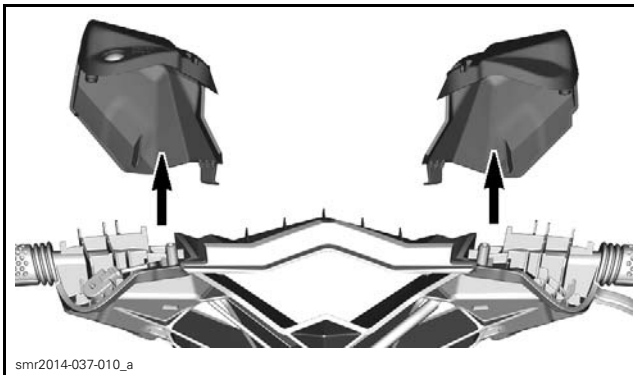
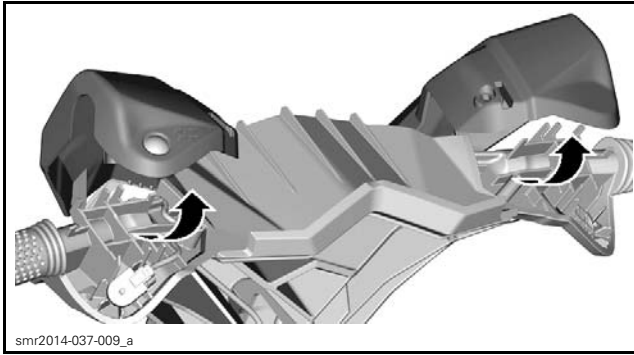
*Spark models excluding Trixx*

Follow image sequence.



*All models*





### Installing the Handlebar Switch Cover (LH or RH)

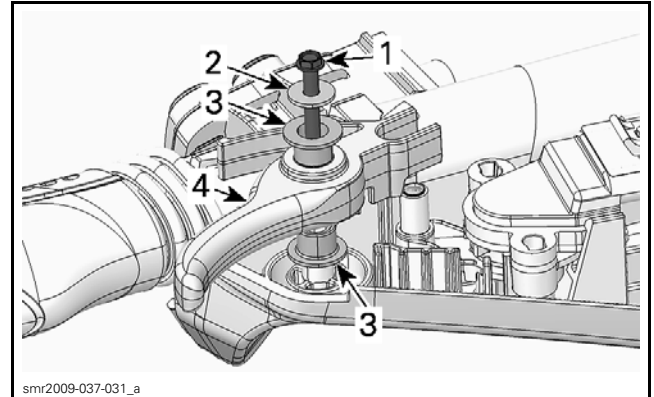
The installation is the reverse of the removal procedure. However, pay attention to the following. Install cover on switch.

Refer to the exploded view for tightening torque specification.

## THROTTLE LEVER

### Replacing the throttle Lever

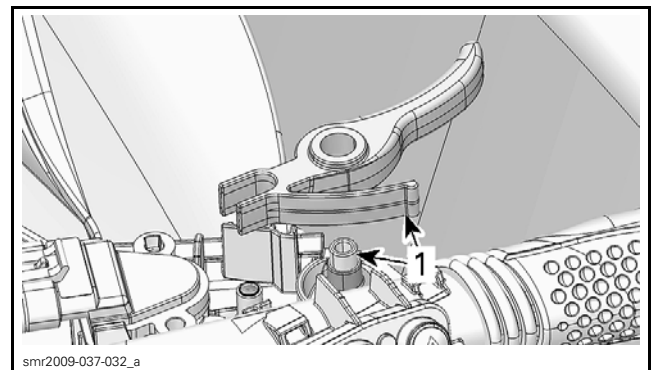
1. Remove *HANDLEBAR SWITCH COVER*, see procedure in this subsection.
2. Remove the screw and washer securing throttle lever.
3. Remove throttle lever and its bushings.



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)       |



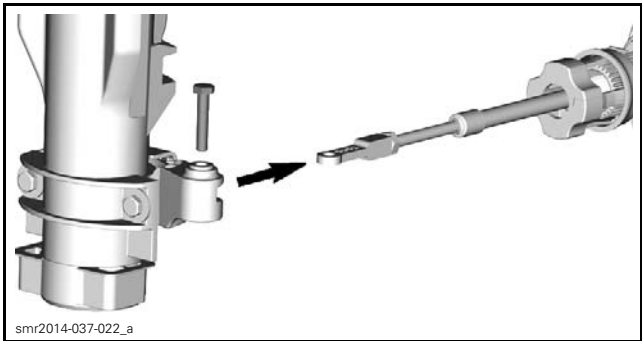
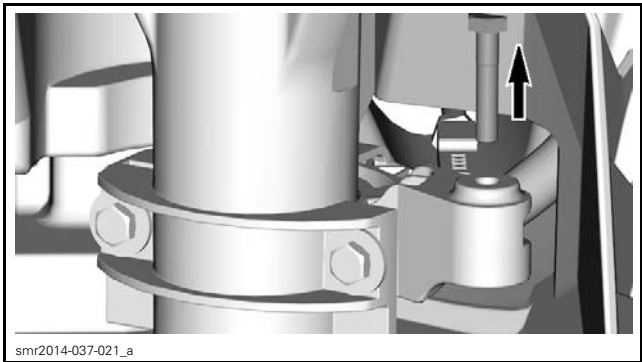
1. Apply grease here

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.

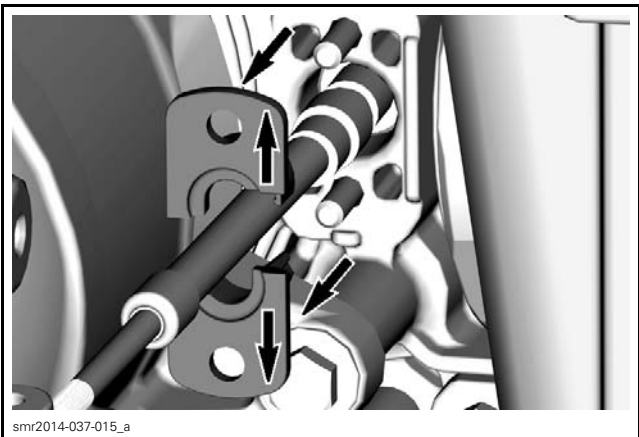
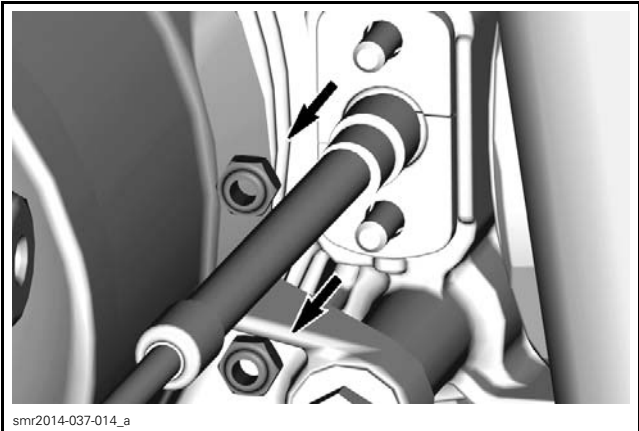
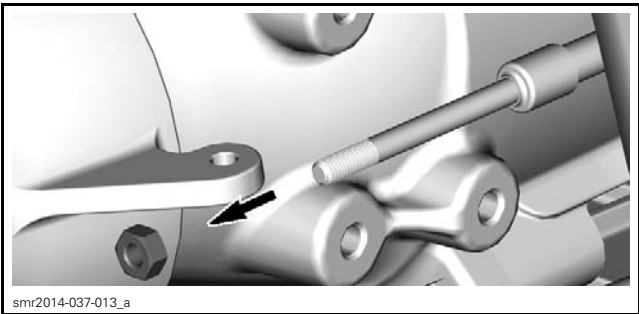
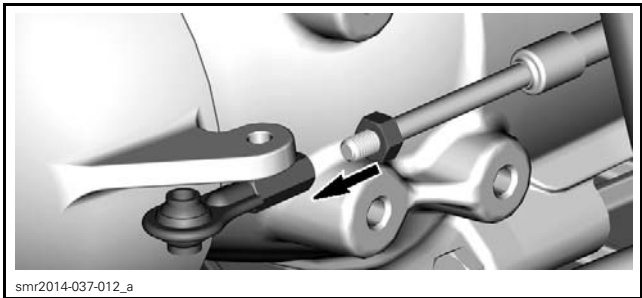
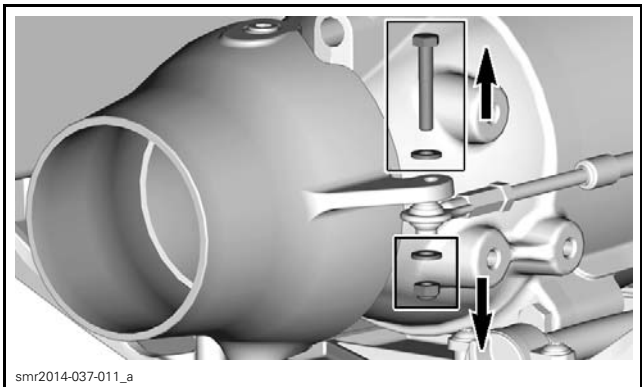
## STEERING CABLE

### Removing the Steering Cable

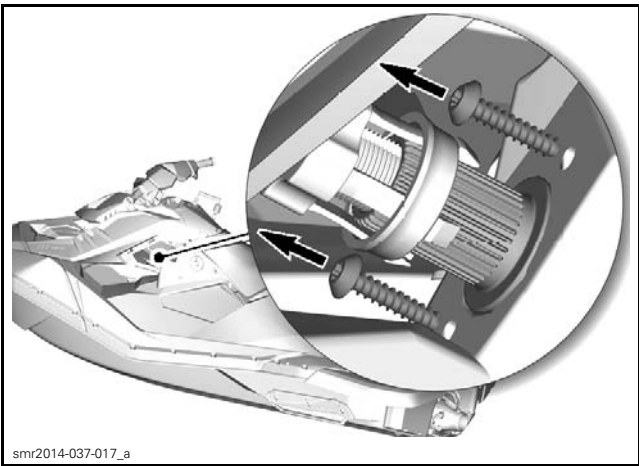
Remove front trim. Refer to *BODY*.



Follow image sequence.



Remove port side knee pad. Refer to *BODY*.



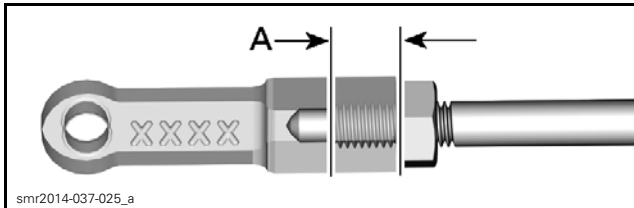


Remove central body. Refer to *BODY*.

Remove steering cable.

### Steering Cable End Fitting

Verify steering cable end fitting engagement.

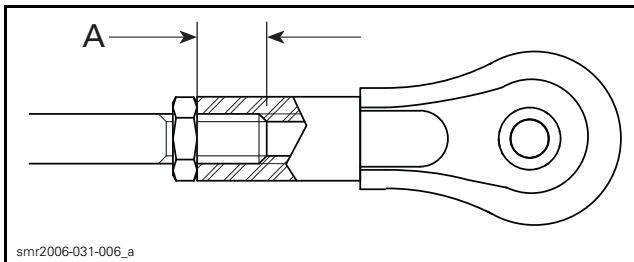


**STEERING CABLE END FITTING - AT STEERING COLUMN**  
A. Steering cable end fitting engagement  
9 mm ± 1 mm (.354 in ± .039 in)

| TIGHTENING TORQUE                  |                                             |
|------------------------------------|---------------------------------------------|
| Steering cable end fitting jam nut | 3.5 N•m ± 0.5 N•m<br>(31 lbf•in ± 4 lbf•in) |

### Steering Cable Ball Joint

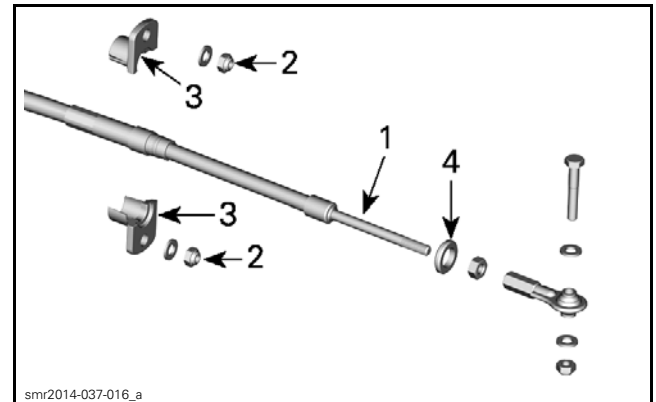
Verify steering cable ball joint engagement.



**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<br>(22 lbf•in ± 3 lbf•in) |

### Installing the Steering Cable



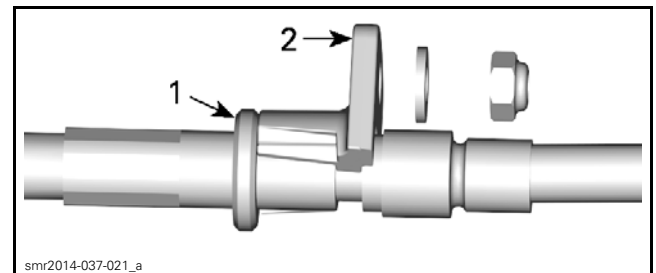
**STEERING CABLE - AT JET PUMP**

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**

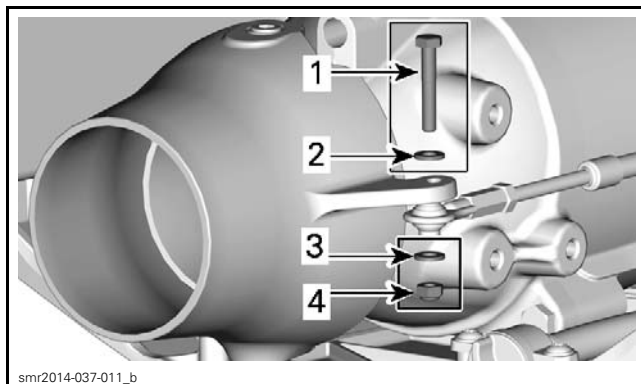
1. O-ring
2. Half rings

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.

## Subsection XX (STEERING AND OTAS SYSTEMS)



### 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.

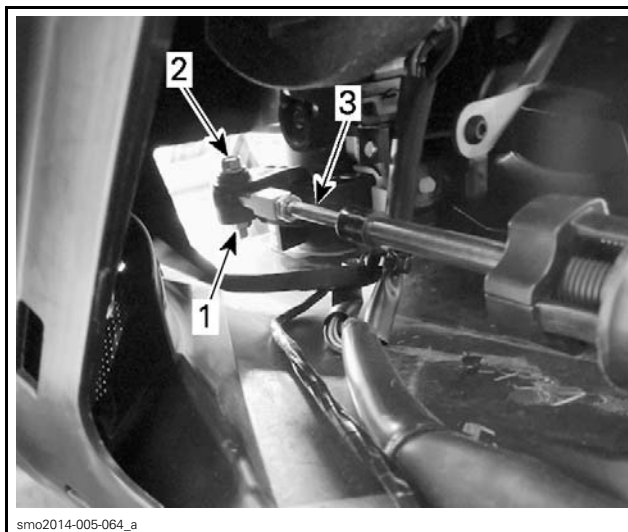
The installation is the reverse of the removal procedure. However, pay attention to the following.

### Adjusting the Steering Cable

Steering cable adjustment is required only if:

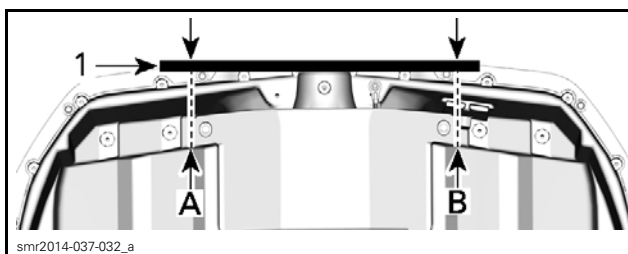
- A steering cable end ball joint has been replaced or loosened/tightened.
- Steering cable adjustment nut has been loosened/tightened.
- Steering cable has been replaced.
- Steering column or support has been replaced.

1. Remove left knee pad. Refer to *BODY*.
2. Remove nut, bolt, and washer to disconnect rod from steering column.



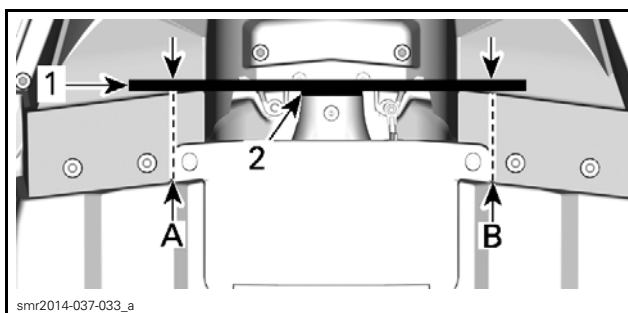
1. Nut and washer
2. Bolt
3. Rod

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.



### VIEW FROM UNDERNEATH THE HULL - 2UP MODELS

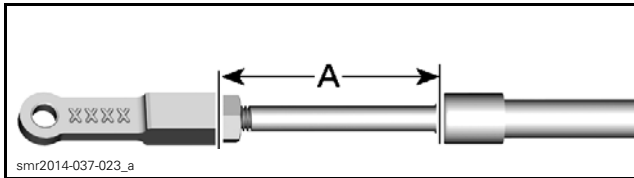
1. Straight edge
- A. LH side measure
- B. RH side measure



### 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:



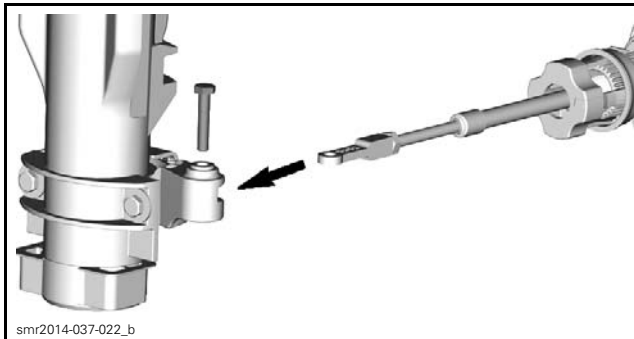
smr2014-037-023\_a  
**STEERING CABLE END FITTING AT STEERING COLUMN**  
A. Steering adjustment specification

#### STEERING ADJUSTMENT SPECIFICATION

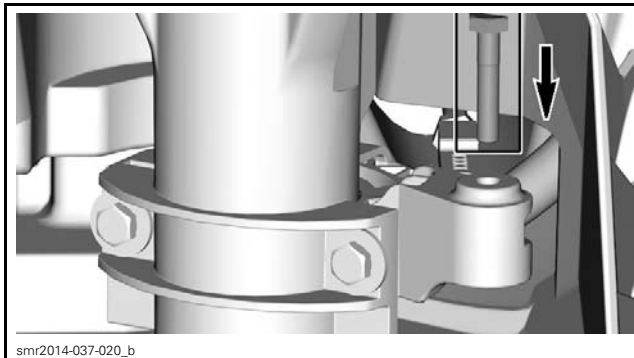
55 mm  $\pm$  6 mm (2.17 in  $\pm$  .24 in)

**NOTE:** This specification gives the proper nozzle adjustment to offset the jet pump thrust.

3. Attach steering cable end fitting to steering column.



smr2014-037-022\_b



smr2014-037-020\_b

**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.

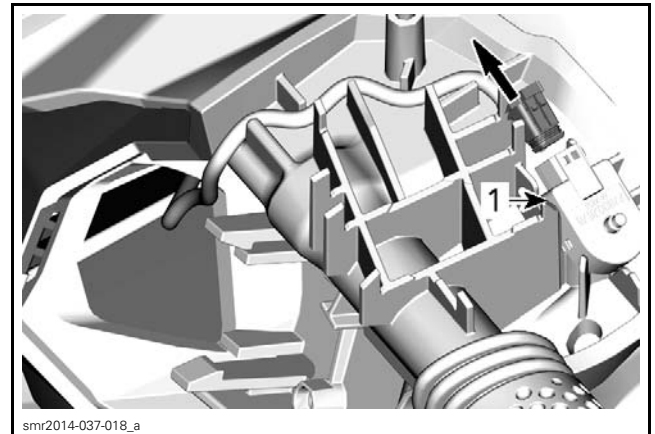
- 4.1 If watercraft pull on one side, carry out *ADJUSTING THE ALIGNMENT OF THE STEERING* in this subsection.

## STEERING COLUMN

### Removing the Steering Column

1. Remove front trim. Refer to *BODY* subsection.
2. Remove LH and RH handlebar switch covers.

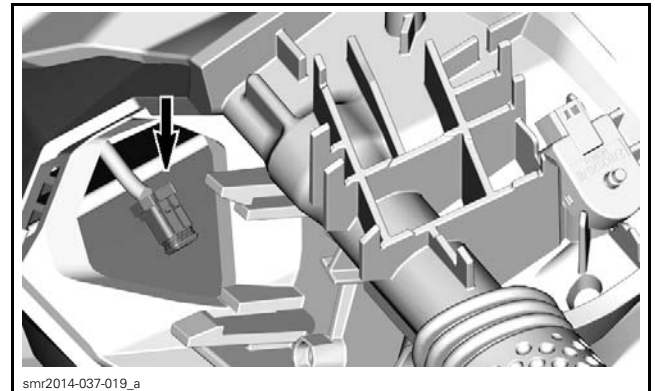
3. Disconnect Start/Stop switch and drop connector into steering column.



smr2014-037-018\_a

#### LH HANDLEBAR

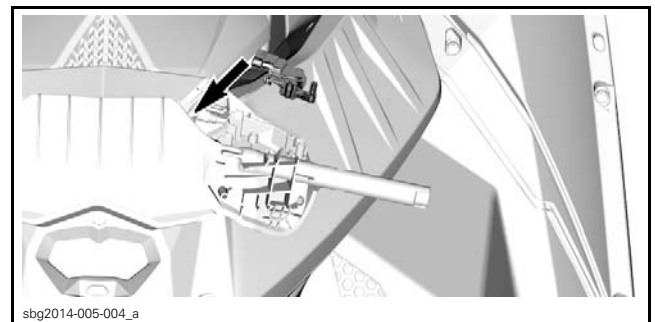
1. Start/Stop switch



smr2014-037-019\_a

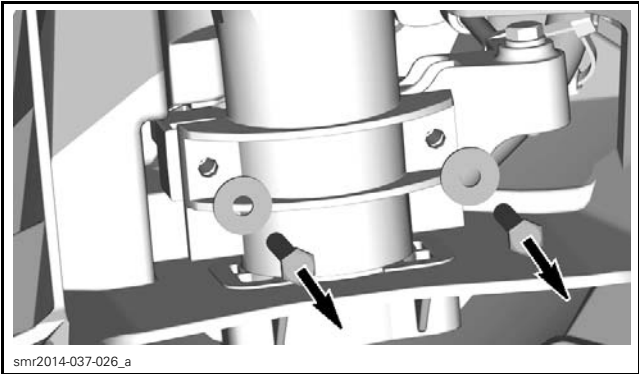
#### LH HANDLEBAR

4. Disconnect TAS connector and drop connector into steering column.



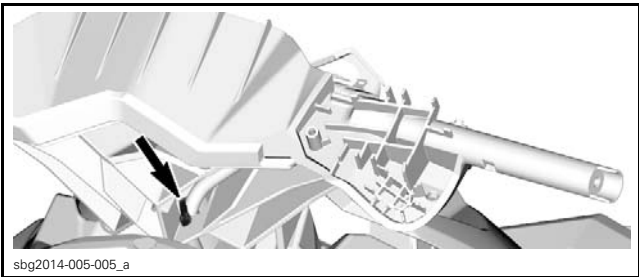
sbg2014-005-004\_a

5. Remove both screws securing the steering column.



STEERING COLUMN

6. Cut locking tie securing the wiring harness to the steering column.



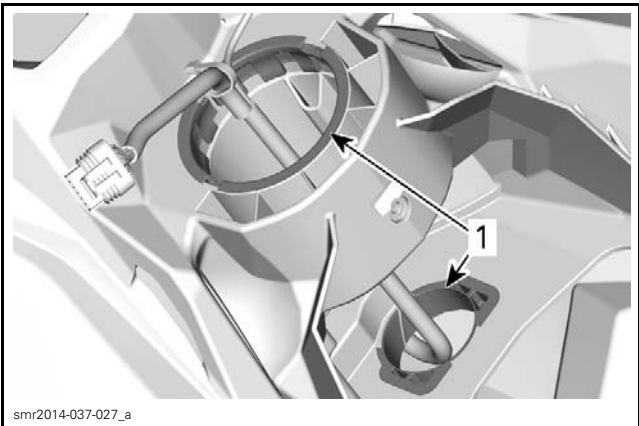
7. Pull steering column out of its support. Ensure to not damage wiring harness connectors and O.T.A.S. magnets.

Inspecting the Steering Column

Check steering column for:

- Cracks
- Stress marks
- Sings of wear.

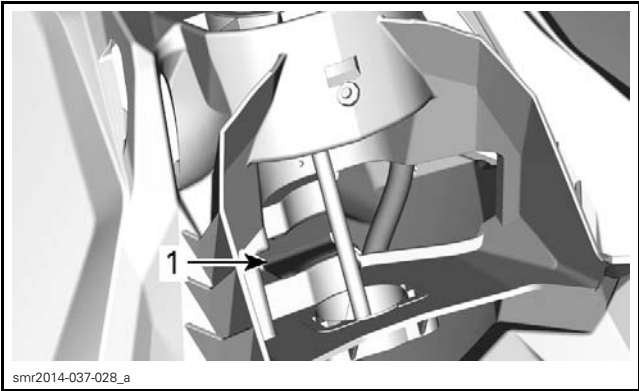
Check steering column support bushings.



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 TOOL                                |                                                                                       |
|----------------------------------------------|---------------------------------------------------------------------------------------|
| FLUKE 115<br>MULTIMETER (P/N 529<br>035 868) |  |
| DIAGNOSTIC HARNESS<br>(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.

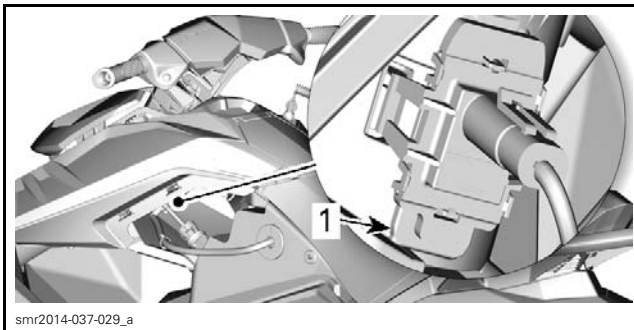
The O.T.A.S. indicator should turn on when handlebar reaches the stopper.

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.

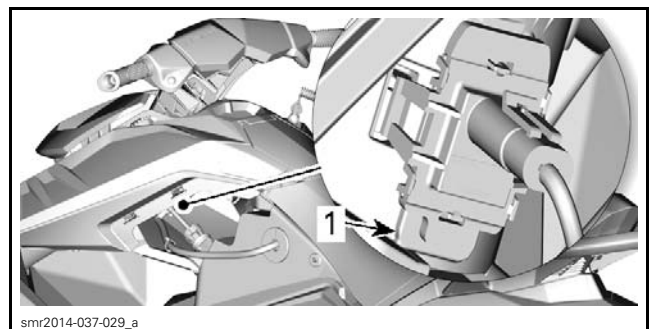
| TEST PROBES             |                         | HANDLEBAR POSITION             | VOLTAGE        |
|-------------------------|-------------------------|--------------------------------|----------------|
| PIN C (3-pin connector) | PIN B (3-pin connector) | Straight ahead                 | 0.6 to 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

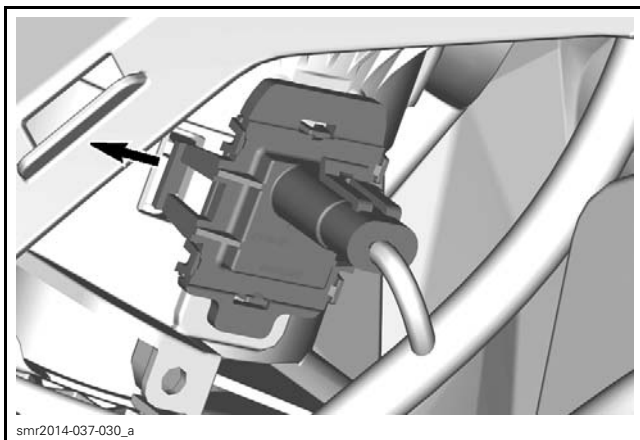
Remove port side knee pad. refer to *BODY*.



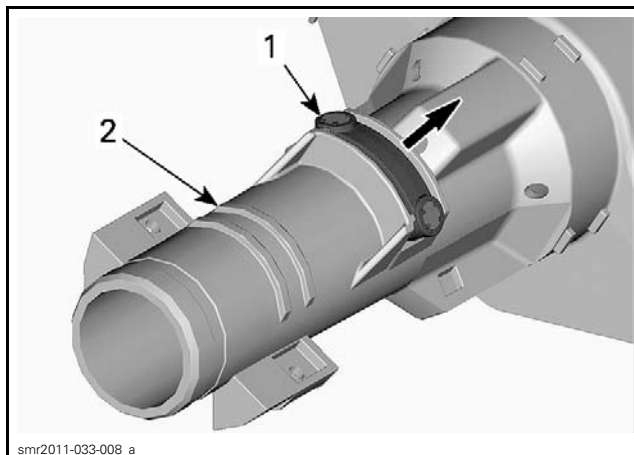
OTAS SWITCH LOCATION

1. OTAS switch

## Subsection XX (STEERING AND OTAS SYSTEMS)



OTAS SWITCH

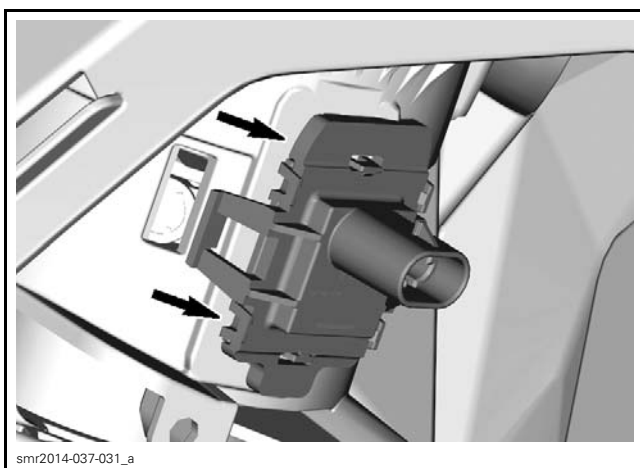


### TYPICAL

1. Magnets
2. Steering column

Reverse removal procedure to reinstall the magnets.

Verify that both clips lock in place.

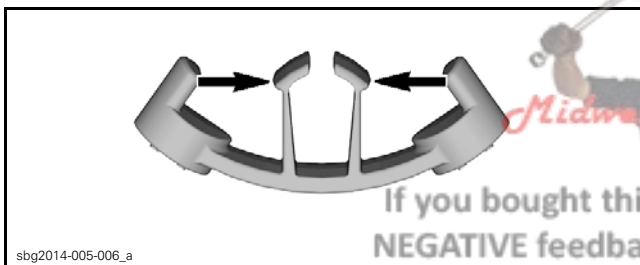


The installation is the reverse of the removal procedure.

## 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.

# TELESCOPIC STEERING AND O.T.A.S. SYSTEMS

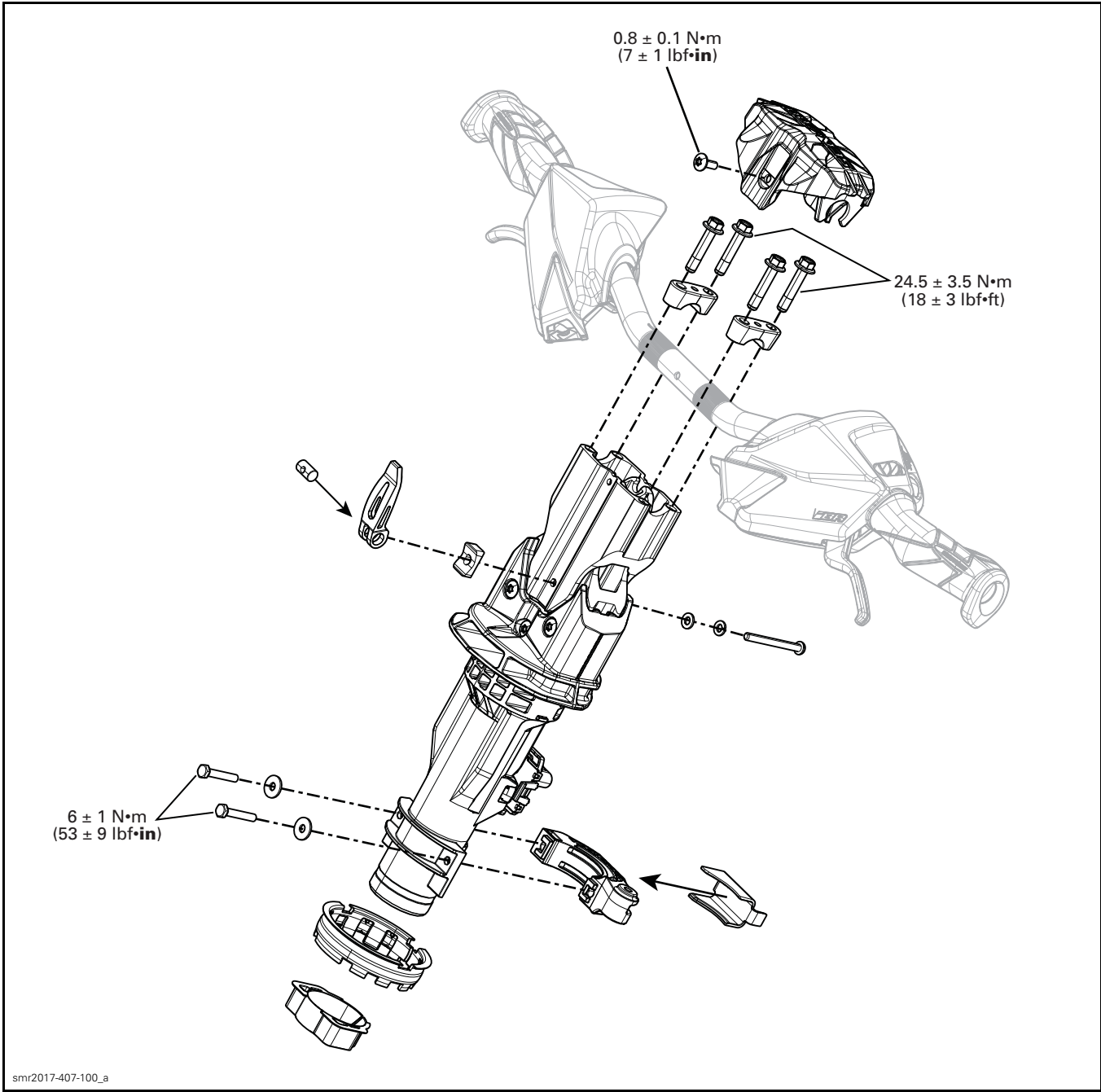
## SERVICE TOOLS

| Description                      | Part Number       | Page |
|----------------------------------|-------------------|------|
| DIAGNOSTIC HARNESS ADAPTER ..... | 529 036 423 ..... | 15   |
| DIAGNOSTIC HARNESS .....         | 529 036 276 ..... | 15   |
| FLUKE 115 MULTIMETER .....       | 529 035 868 ..... | 15   |
| OTAS HARNESS.....                | 278 002 399 ..... | 15   |

## SERVICE PRODUCTS

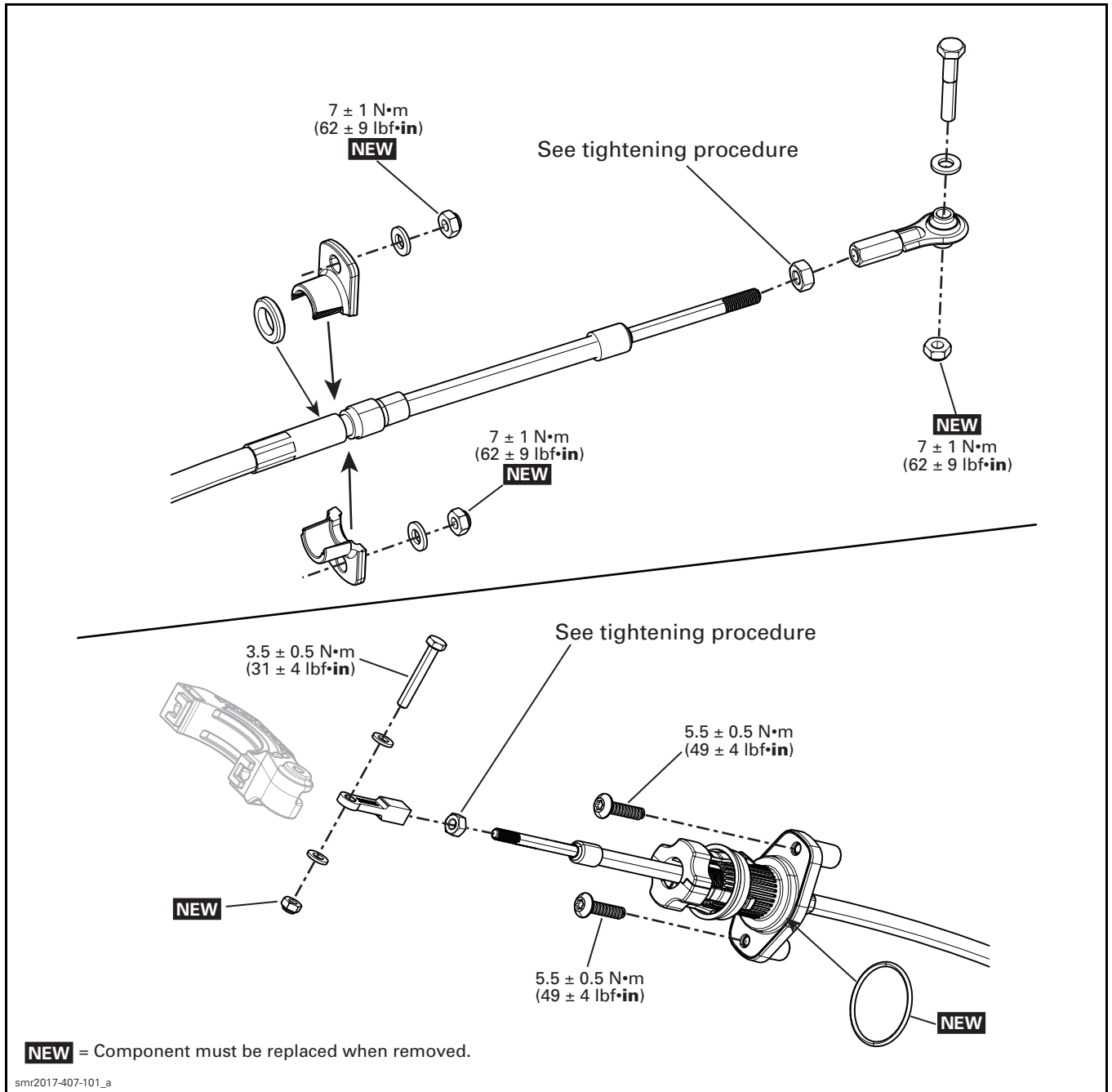
| Description               | Part Number       | Page |
|---------------------------|-------------------|------|
| XPS SYNTHETIC GREASE..... | 293 550 010 ..... | 7    |

STEERING COLUMN

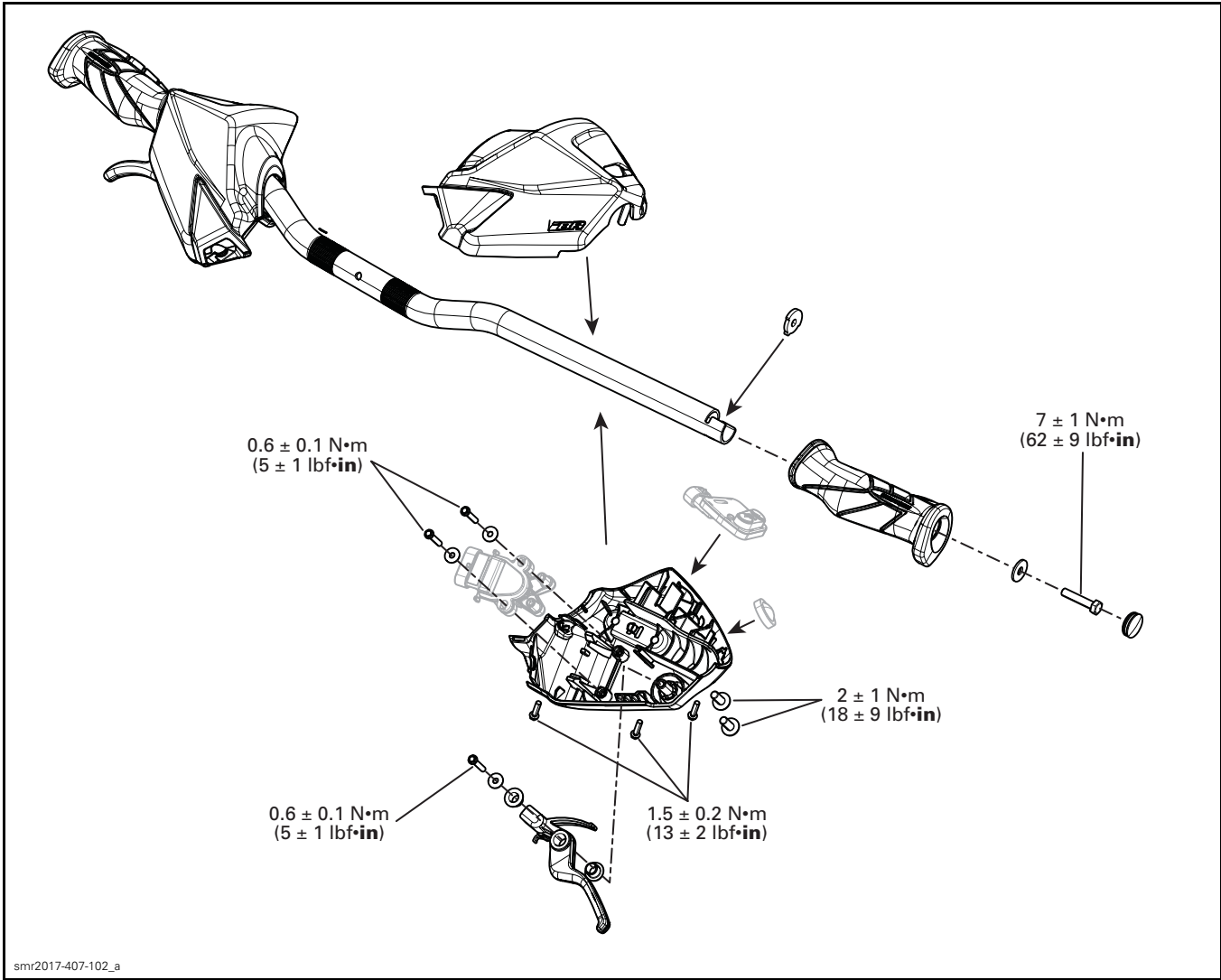




## STEERING CABLE



HANDLEBAR

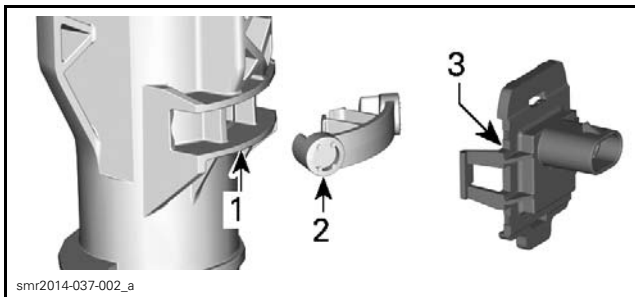


## GENERAL

### OFF-THROTTLE ASSISTED STEERING SYSTEM DESCRIPTION

The Off-Throttle Assisted Steering (O.T.A.S.) 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.



#### O.T.A.S. 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.

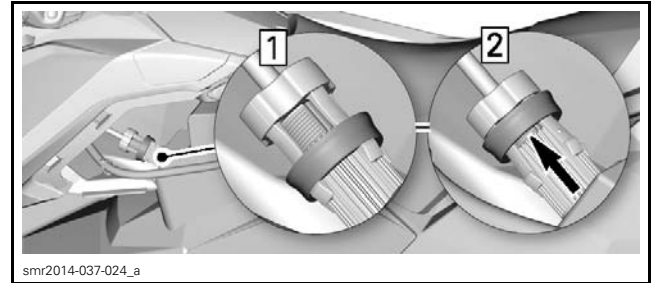
O.T.A.S. will be deactivated if:

- The throttle is reapplied, or
- The steering is turned sufficiently to open the O.T.A.S. switch for more than one second.

## ADJUSTMENT

### 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.

## 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, test the O.T.A.S. switch.

## TROUBLESHOOTING

### DIAGNOSTIC TIPS

Check fault codes as a first troubleshooting step.

If O.T.A.S. works when handlebar is turned on one side only, check:

- Magnets condition
- If magnets and switch are securely installed.

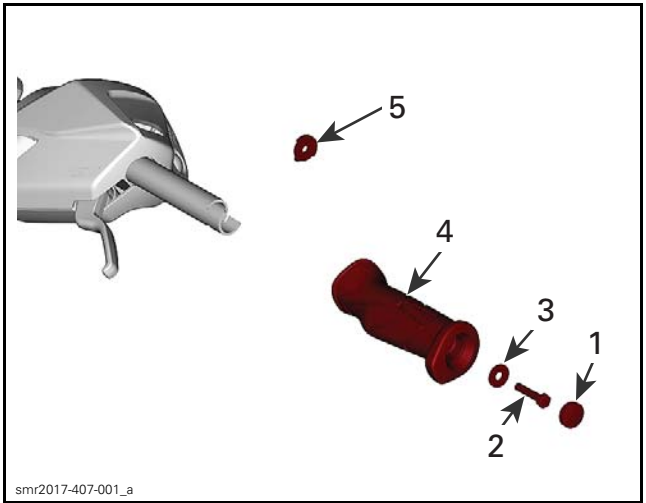
To confirm if O.T.A.S. is functional, carry out *O.T.A.S. OPERATION* in this subsection.

PROCEDURES

HANDLEBAR GRIP

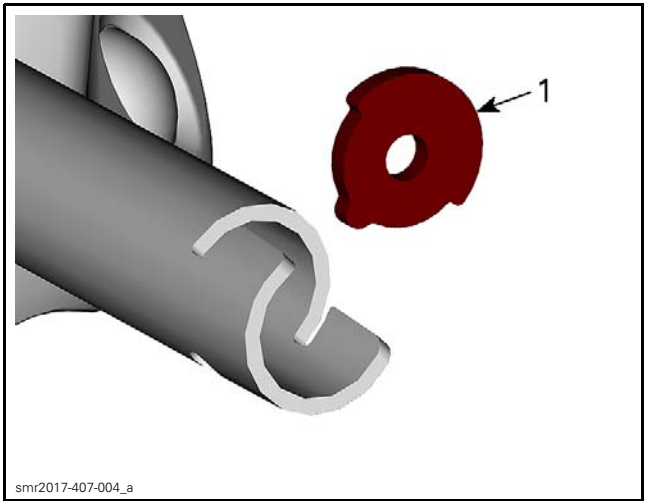
Removing the Handlebar Grip

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

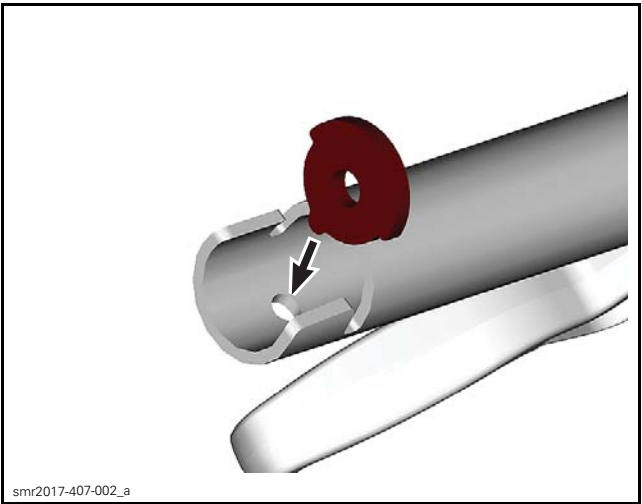
Verify grip insert for damage.



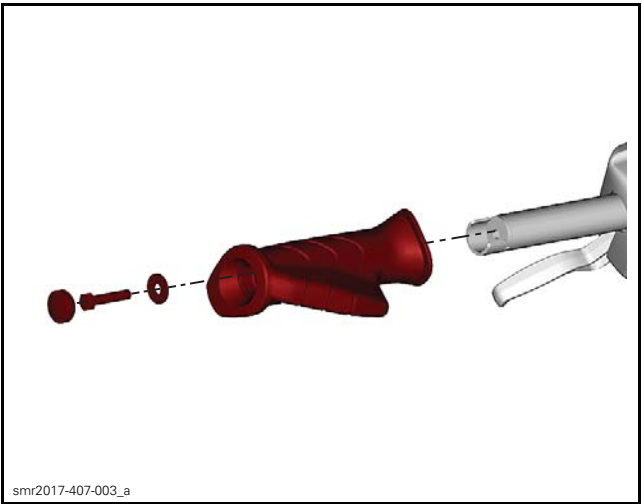
- 1. Grip insert

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.

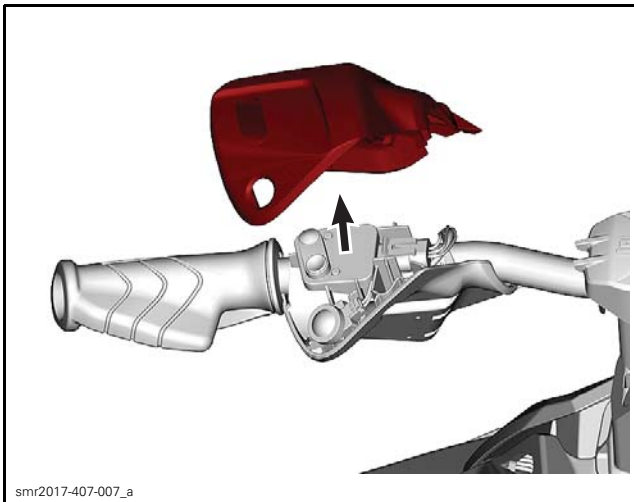
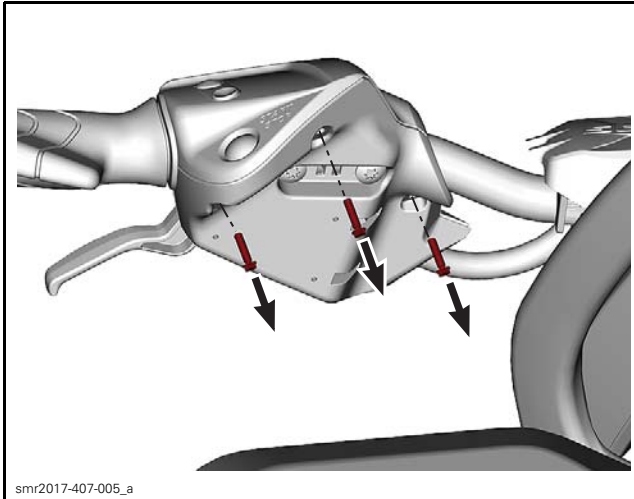


| TIGHTENING TORQUE                  |                                         |
|------------------------------------|-----------------------------------------|
| Handlebar grip screws<br>(M6 x 30) | 7 N•m ± 1 N•m<br>(62 lbf•in ± 9 lbf•in) |

HANDLEBAR SWITCH COVER  
(LH OR RH)

Removing the Handlebar Switch Cover

Follow image sequence.



## Installing the Handlebar Switch Cover

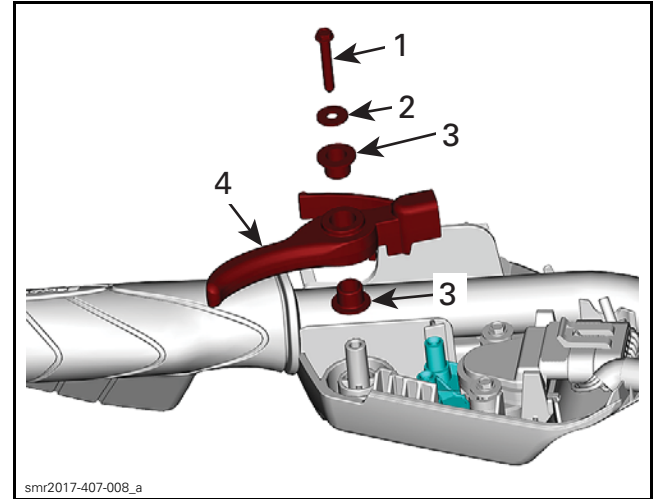
Reverse removal procedure.

| TIGHTENING TORQUE         |                                             |
|---------------------------|---------------------------------------------|
| K40 x 16 hexagonal screws | 1.5 N•m ± 0.2 N•m<br>(13 lbf•in ± 2 lbf•in) |
| M6 x 16 Torx screws       | 2 N•m ± 1 N•m<br>(18 lbf•in ± 9 lbf•in)     |

## THROTTLE LEVER

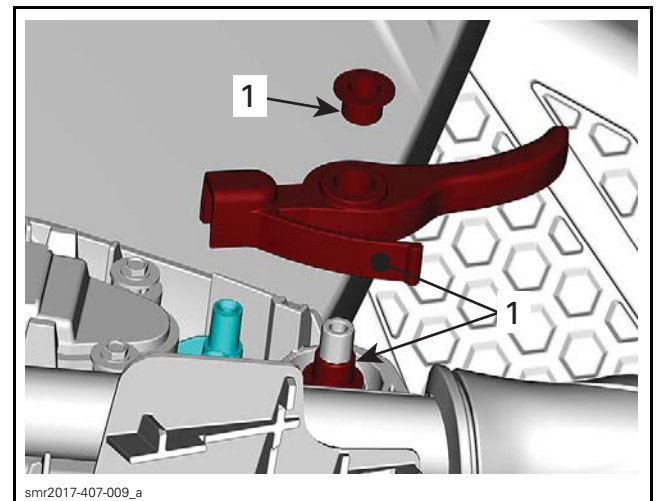
### Replacing the Lever

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.



1. Retaining screw
2. Washer
3. Bushings
4. Throttle lever

4. Clean throttle lever area from dust or any deposits.
5. Apply XPS SYNTHETIC GREASE (P/N 293 550 010) on bushings and on the outer surface of the return tab.



1. Apply grease here

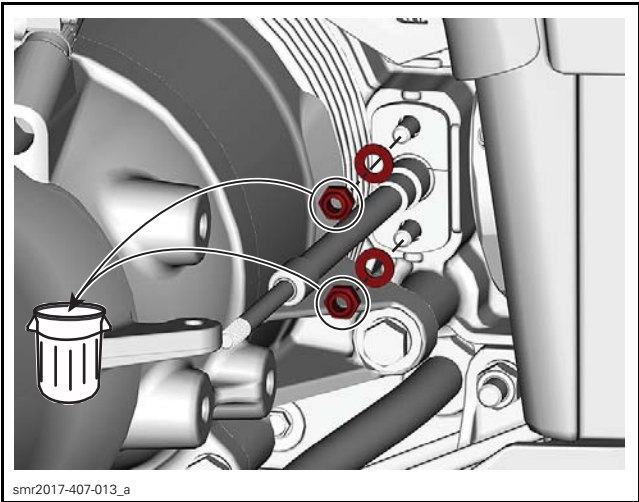
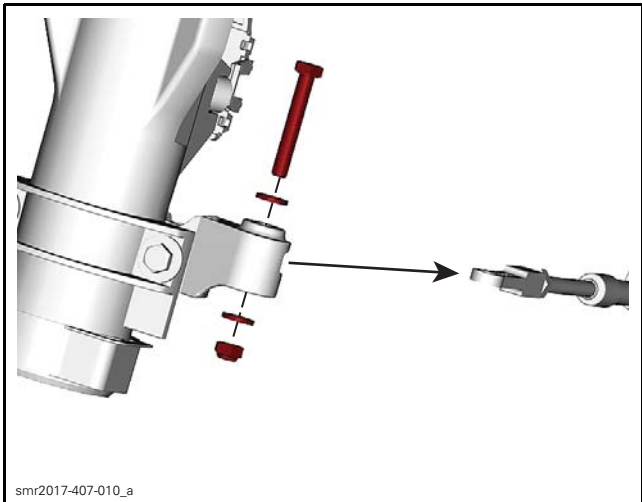
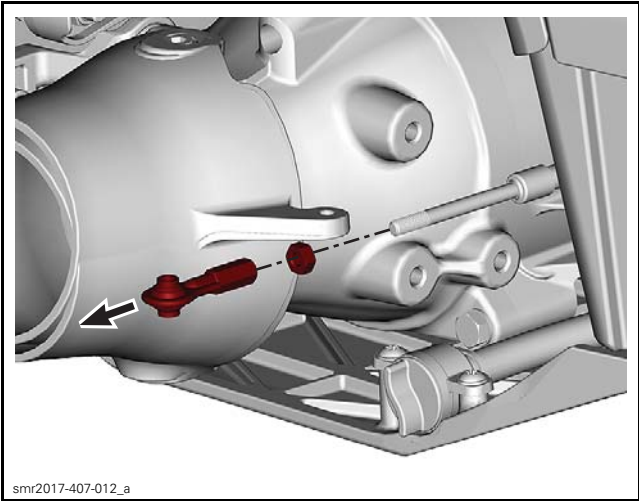
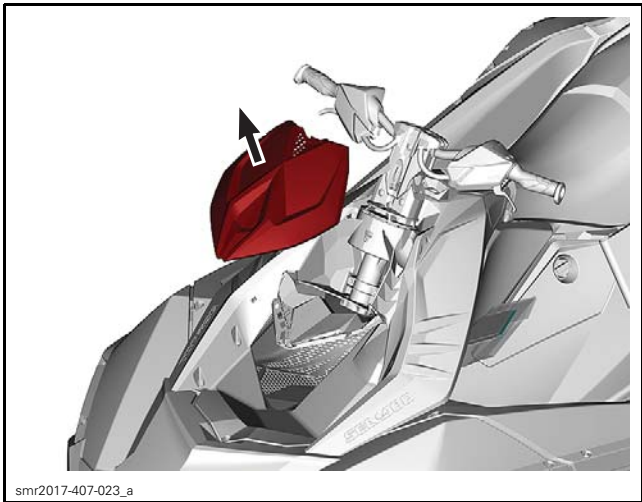
6. Install the lever.
  - 6.1 Install both bushings in lever hole.
  - 6.2 Insert sensor lever end into throttle lever fork.
  - 6.3 Position the return tab against the handlebar.
  - 6.4 Secure the lever with washer and screw.

## STEERING CABLE

### Removing the Steering Cable

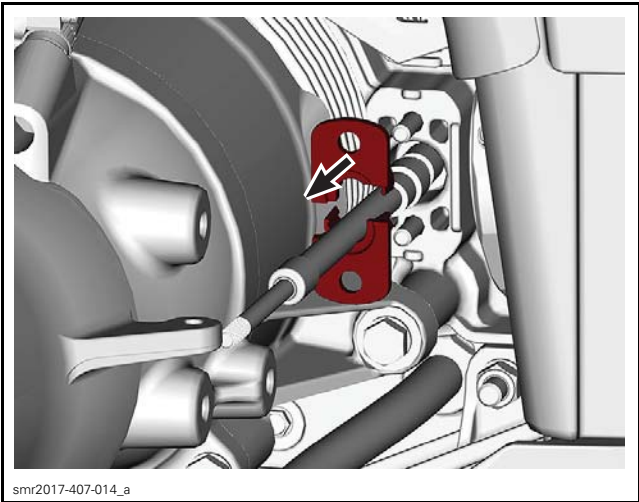
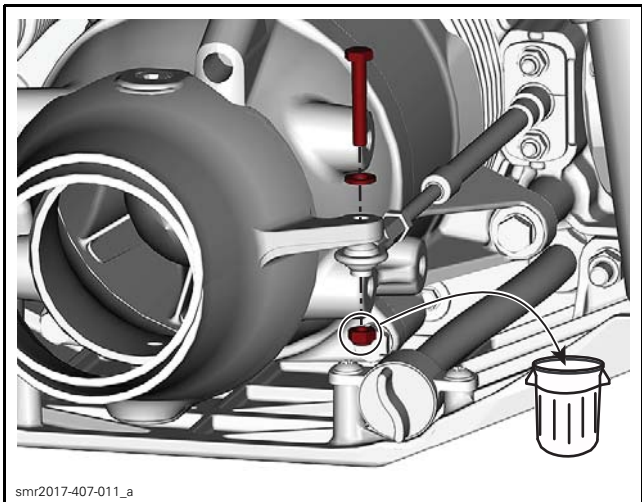
Follow image sequence.

At Steering Column

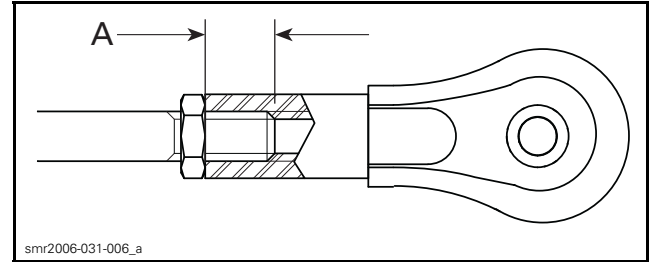


At Nozzle

NOTE: Many iBR parts were removed to clarity purpose





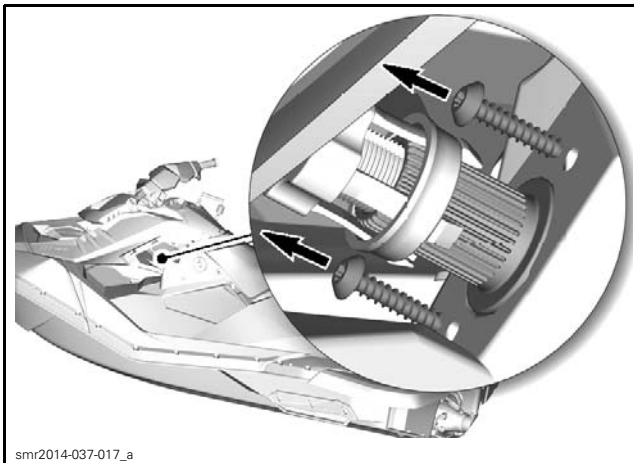


**STEERING CABLE BALL JOINT - AT NOZZLE**

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<br>(22 lbf•in ± 3 lbf•in) |

## Installing the Steering Cable

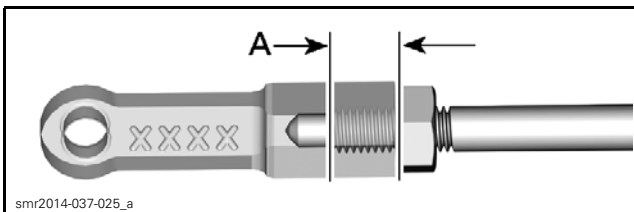


Remove central body. Refer to *BODY*.

Remove steering cable.

## Inspecting the Steering Cable End Fitting

Verify steering cable end fitting engagement.



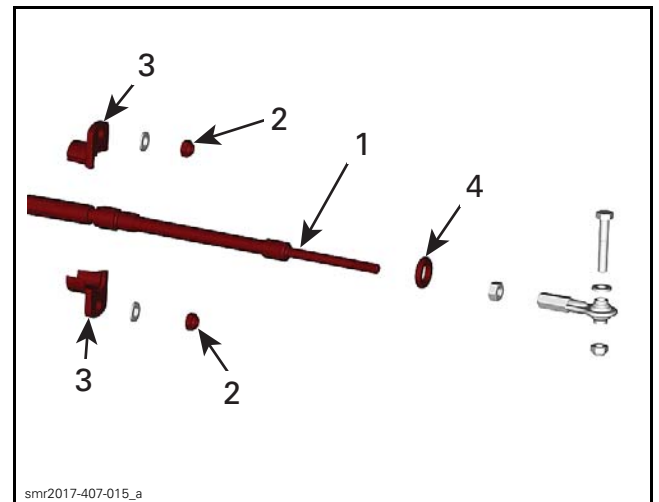
**STEERING CABLE END FITTING - AT STEERING COLUMN**

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<br>(22 lbf•in ± 3 lbf•in) |

## Inspecting the Steering Cable Ball Joint

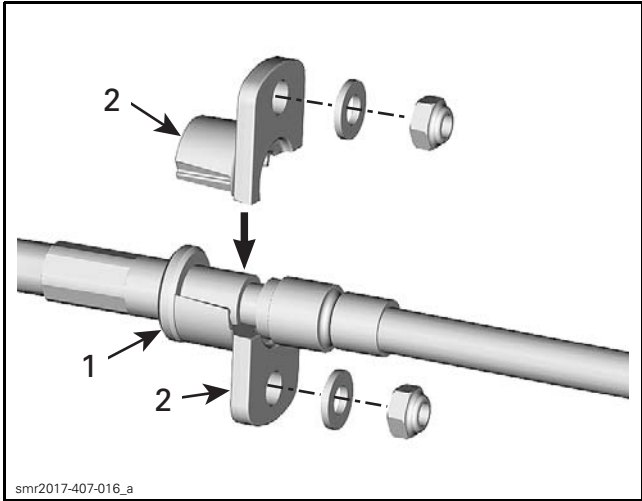
Verify steering cable ball joint engagement.



**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.

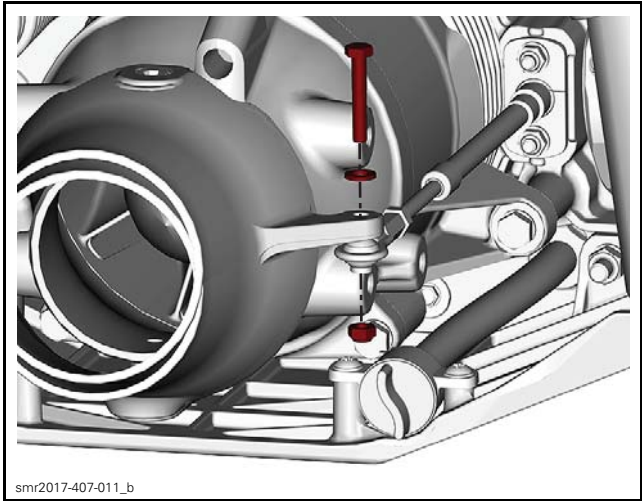


STEERING CABLE ASSEMBLY

- 1. O-ring
- 2. Half rings

| TIGHTENING TORQUE               |                                         |
|---------------------------------|-----------------------------------------|
| Steering cable half ring screws | 7 N•m ± 1 N•m<br>(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.



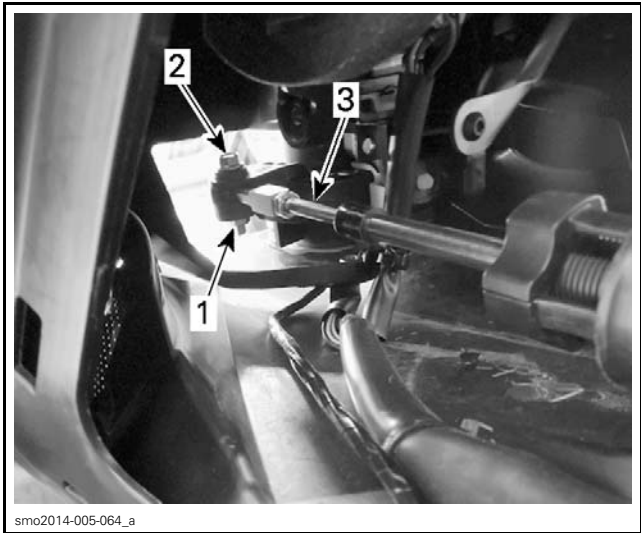
| TIGHTENING TORQUE |                                         |
|-------------------|-----------------------------------------|
| Ball joint nut    | 7 N•m ± 1 N•m<br>(62 lbf•in ± 9 lbf•in) |

- 1. Carry out the steering cable adjustment. See procedure in this subsection.
- Reverse removal procedure.

Adjusting the Steering Cable

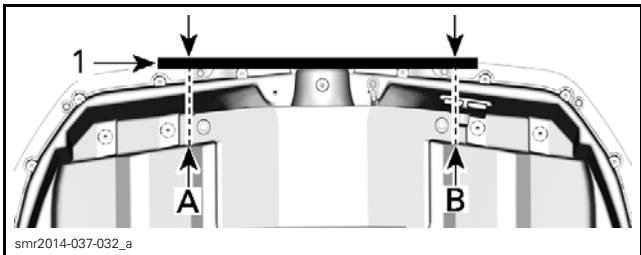
- Steering cable adjustment is required only if:
- A steering cable end ball joint has been replaced or loosened/tightened.
  - Steering cable adjustment nut has been loosened/tightened.
  - Steering cable has been replaced.
  - Steering column or support has been replaced.

- 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

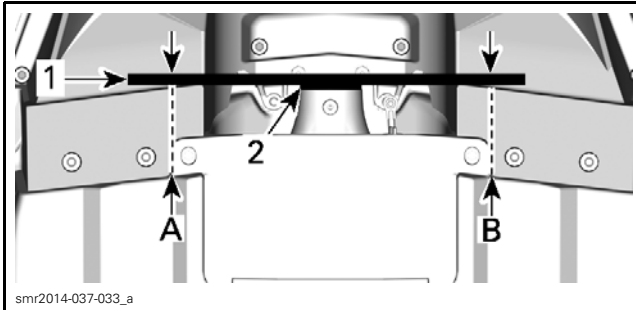
- 1. Position jet pump nozzle as follows:
  - 1.1 Place a straight edge on the nozzle end.  
**NOTE:** A spacer is necessary on the 3UP models.
  - 1.2 Measure the distance from the transom each side of the straight edge.



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

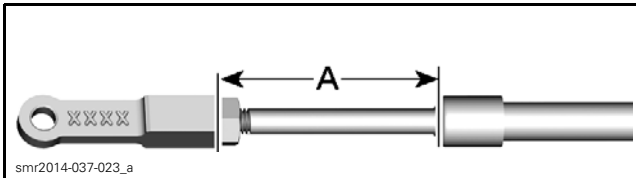
2. Spacer

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

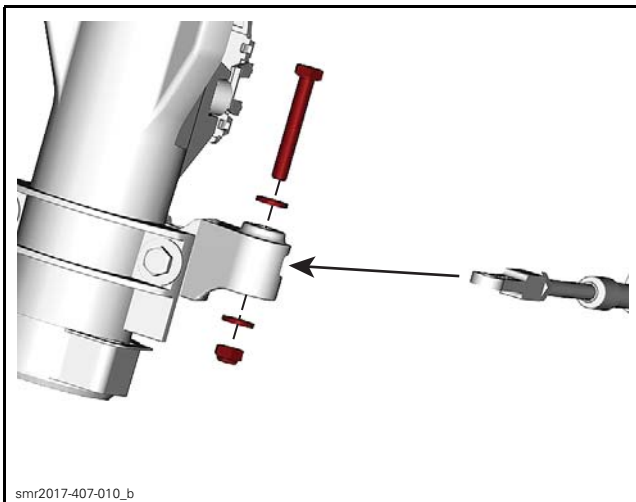
A. Steering adjustment specification

#### STEERING ADJUSTMENT SPECIFICATION

55 mm  $\pm$  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.

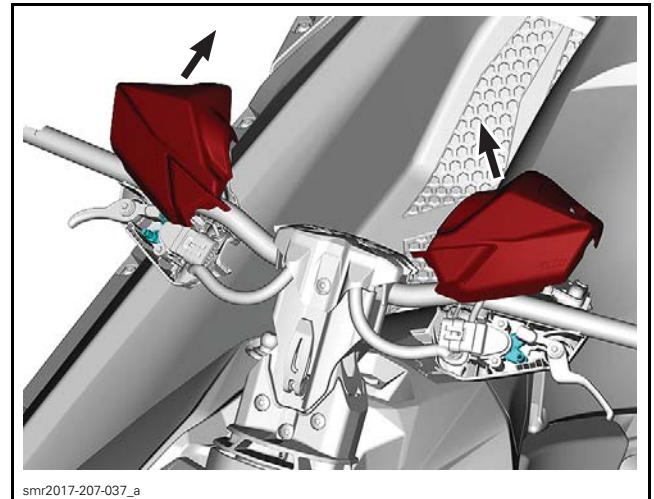
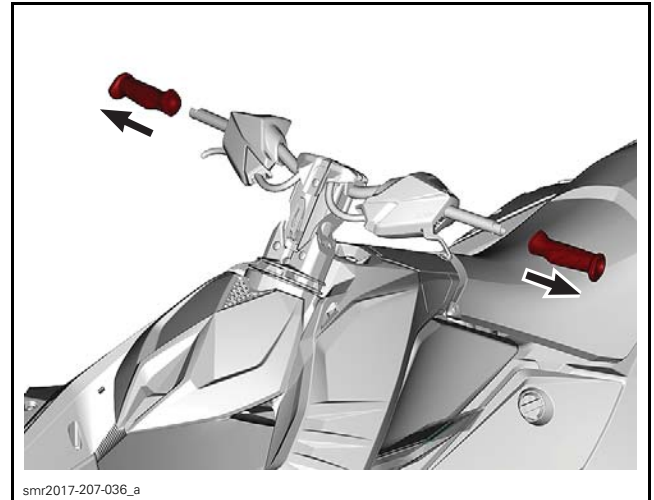
4. Test ride watercraft.

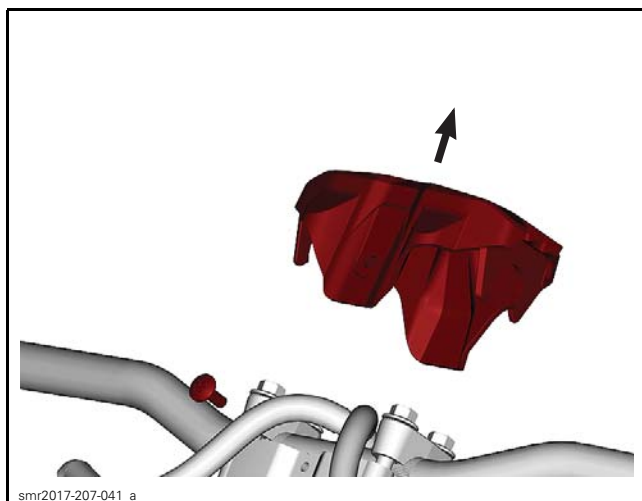
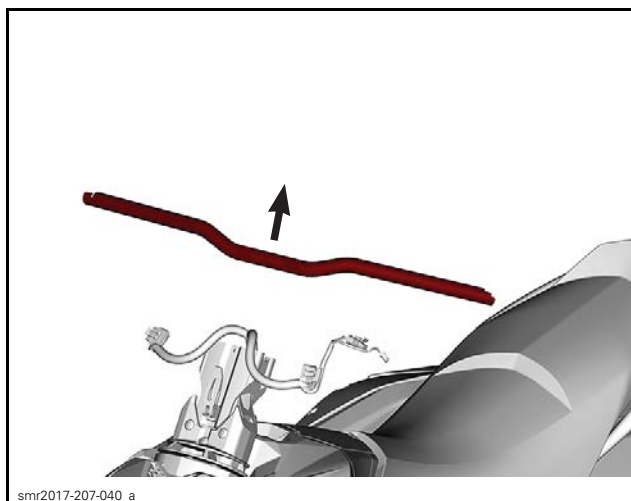
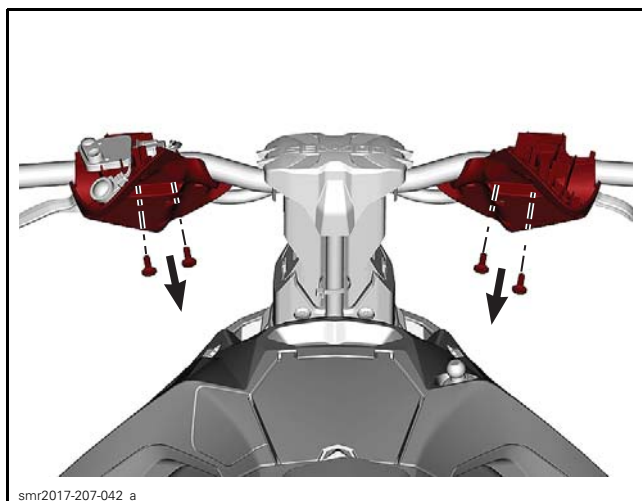
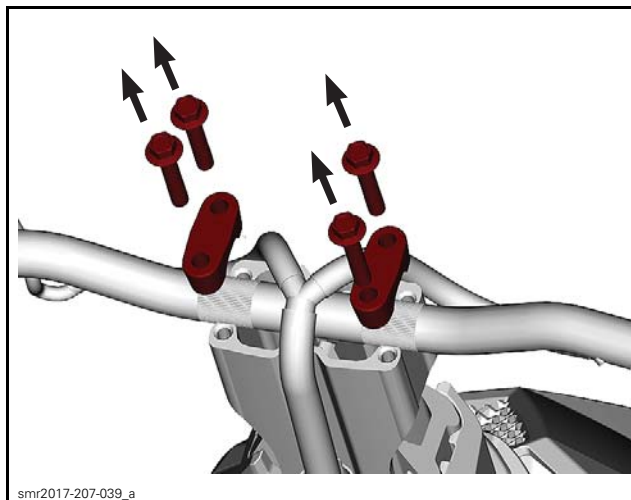
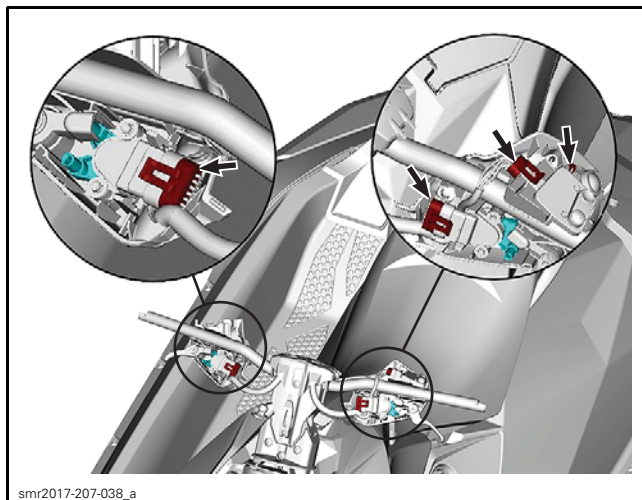
4.1 If watercraft pull on one side, carry out *STEERING ALIGNMENT* in this subsection.

## HANDLEBAR

### Removing the Handlebar

Follow image sequence.

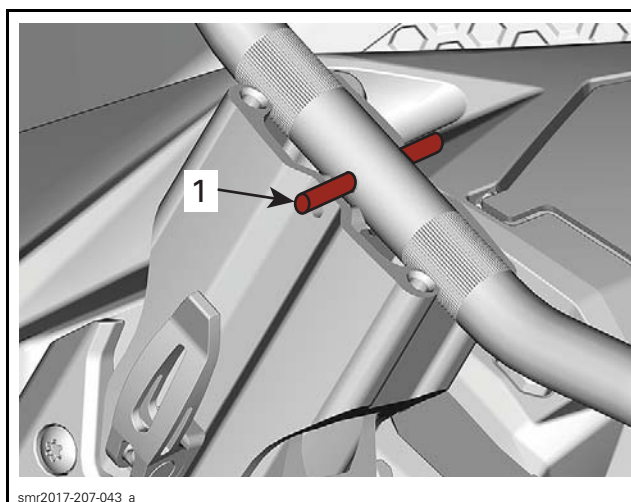




## Installing the Handlebar

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

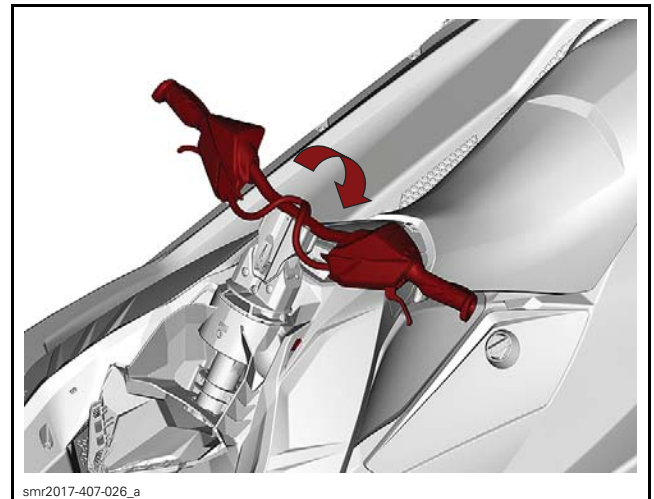
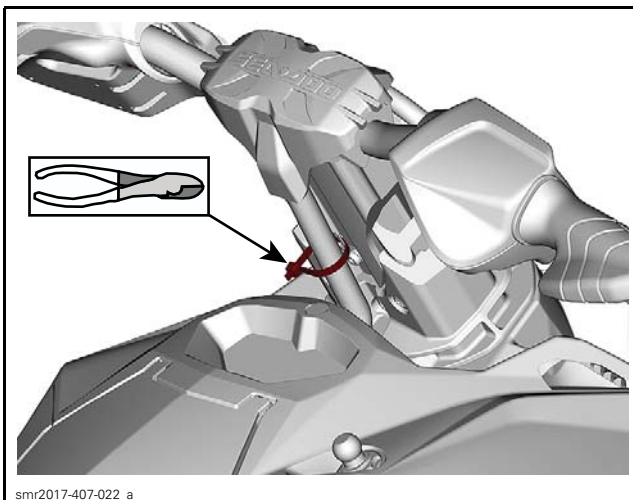
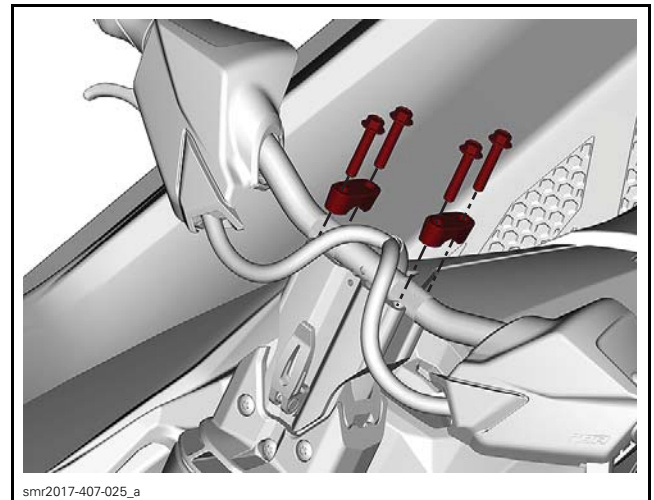
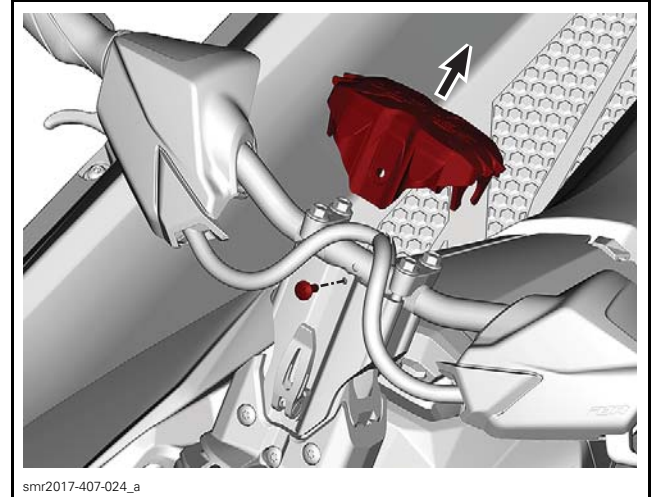
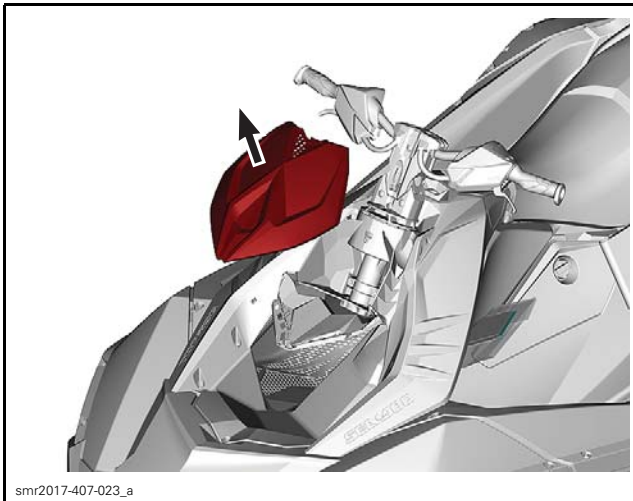
Remove the 6 mm (15/64 in) centering tool before tightening handlebar clamp screws.

| TIGHTENING TORQUE |                                              |
|-------------------|----------------------------------------------|
| Handlebar screws  | 24.5 N•m ± 3.5 N•m<br>(18 lbf•ft ± 3 lbf•ft) |
| Handlebar cover   | 0.8 N•m ± 0.1 N•m<br>(7 lbf•in ± 1 lbf•in)   |

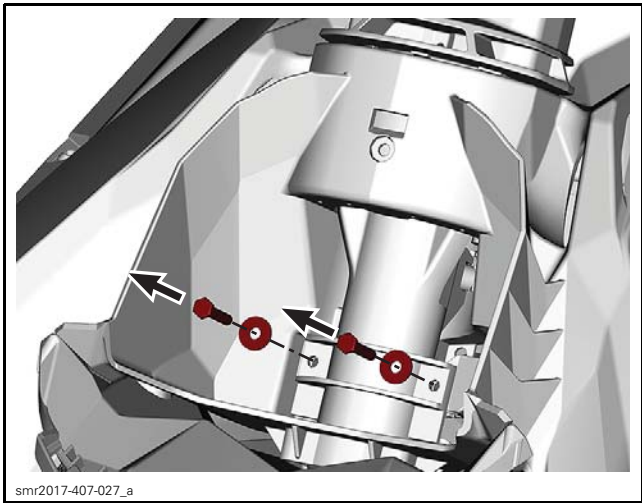
## STEERING COLUMN

### Removing the Steering Column

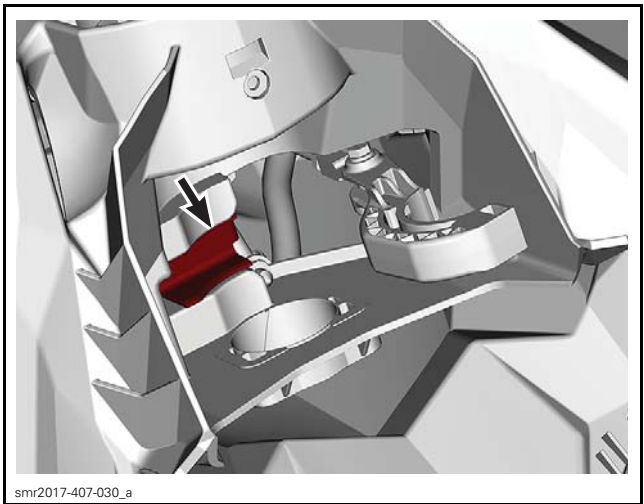
Follow image sequence.







Check wear sleeve behind the steering column arm.



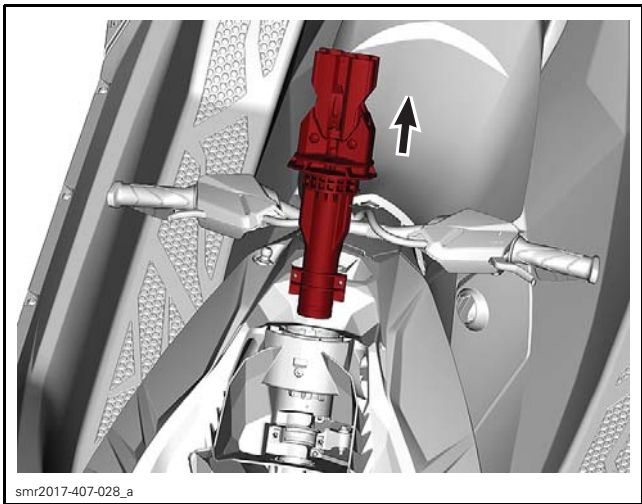
Replace any damaged or worn parts.

### 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.

| TIGHTENING TORQUE            |                                          |
|------------------------------|------------------------------------------|
| Steering column clamp screws | 6 N•m ± 1 N•m<br>(53 lbf•in ± 9 lbf•in)  |
| Handlebar screws             | Refer to <i>INSTALLING THE HANDLEBAR</i> |



### Inspecting the Steering Column

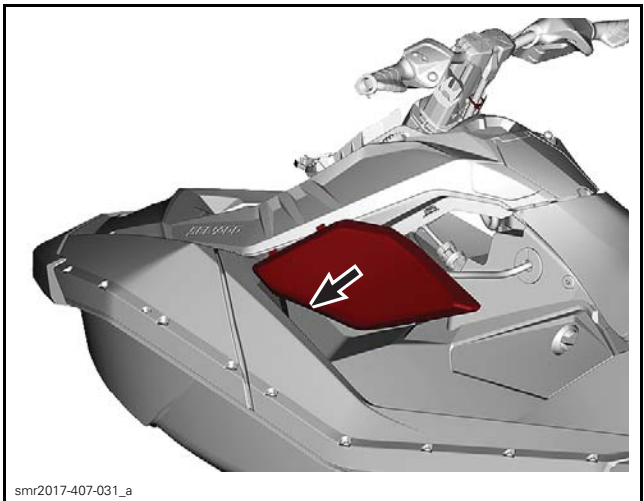
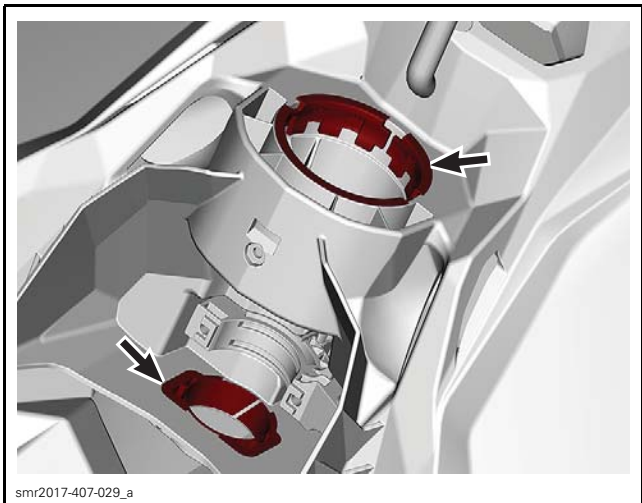
Check steering column for:

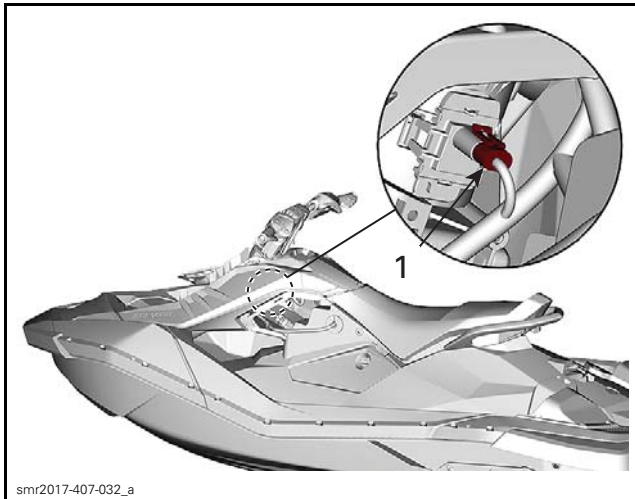
- Cracks
- Stress marks
- Signs of wear.

Check steering column support bushings.

### O.T.A.S. SWITCH

#### O.T.A.S. Switch Access





1. O.T.A.S. connector

### Testing the O.T.A.S. Switch Input Voltage

| REQUIRED TOOLS                                  |                                                                                   |
|-------------------------------------------------|-----------------------------------------------------------------------------------|
| DIAGNOSTIC HARNESS<br>(P/N 529 036 276)         |  |
| DIAGNOSTIC HARNESS ADAPTER<br>(P/N 529 036 423) |                                                                                   |
| OTAS HARNESS (P/N 278 002 399)                  |                                                                                   |

Disconnect the O.T.A.S. connector.

Connect the diagnostic harness and the proper adapter in-line between the disconnected O.T.A.S. connectors.

Press the START/STOP button to activate the electrical system.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), measure voltage as follows.

| TEST PROBES                |                       | VOLTAGE (VDC)   |
|----------------------------|-----------------------|-----------------|
| PIN A<br>(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 the *O.T.A.S. SWITCH GROUND* test.

### Testing the O.T.A.S. Switch Ground

Install the diagnostic harness and the proper adapter as described in the *O.T.A.S. SWITCH INPUT VOLTAGE* test.

Press the START/STOP button to activate the electrical system.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), check ground circuit as follows.

| TEST PROBES                |                            | VOLTAGE (VDC)   |
|----------------------------|----------------------------|-----------------|
| PIN A<br>(3-pin connector) | PIN B<br>(3-pin connector) | Battery voltage |

If voltage is not as specified, check wiring and connectors.

If voltage is as specified, carry out the *O.T.A.S. SWITCH SIGNAL* test.

### Testing the O.T.A.S. Switch Signal

Install the diagnostic harness and the proper adapter as described in the *O.T.A.S. SWITCH INPUT VOLTAGE* test.

Press the START/STOP button to activate the electrical system.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), check switch signal as follows.

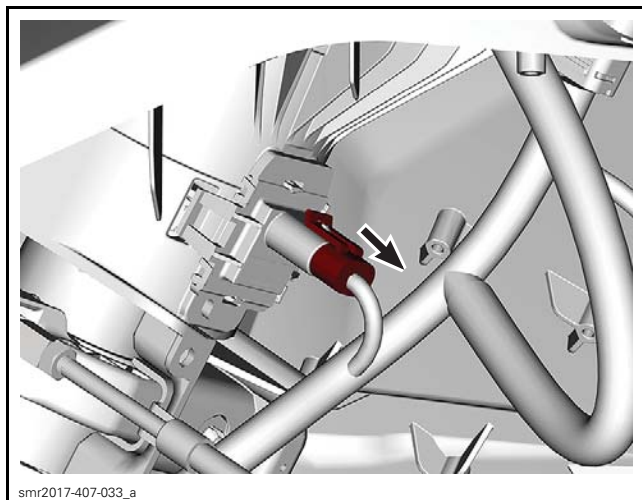
| TEST PROBES                |                            | HANDLEBAR POSITION             | VOLTAGE        |
|----------------------------|----------------------------|--------------------------------|----------------|
| PIN C<br>(3-pin connector) | PIN B<br>(3-pin connector) | Straight ahead                 | 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

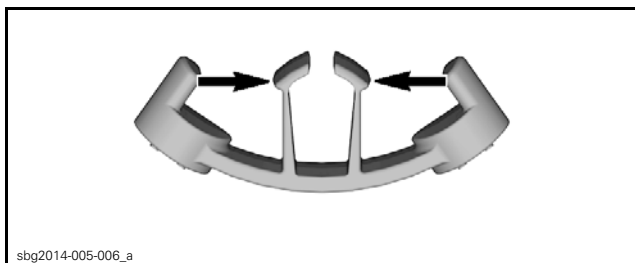
Follow image sequence.



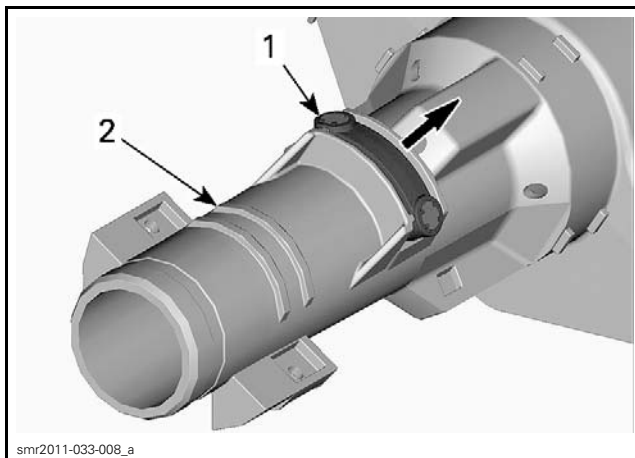
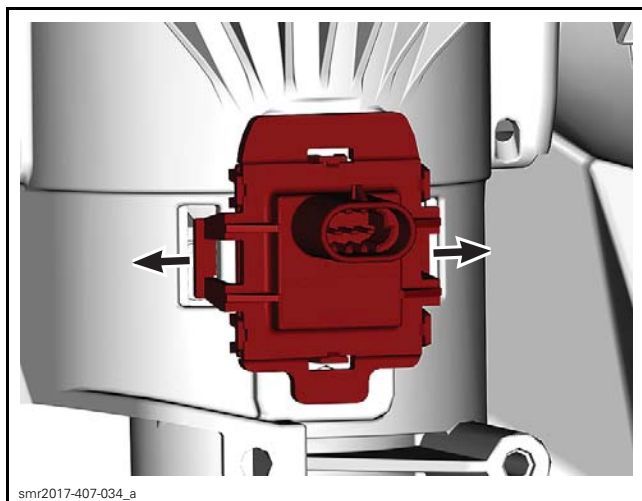
## O.T.A.S. MAGNETS

### 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.

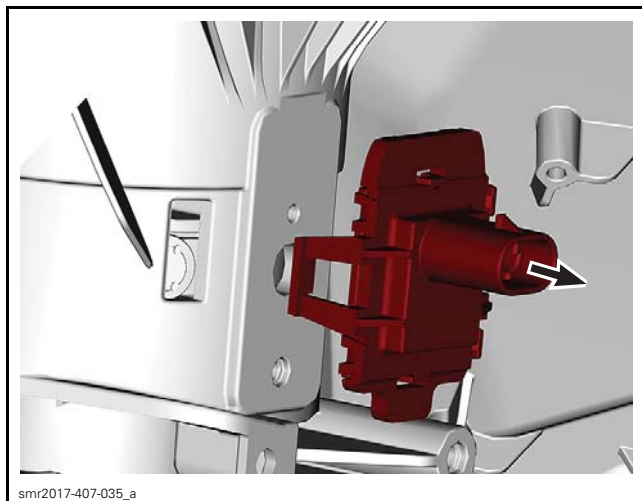


#### TYPICAL

1. Magnets
2. Steering column

Reverse removal procedure to reinstall the magnets.

Verify that both clips lock in place.



The installation is the reverse of the removal procedure

# JET PUMP

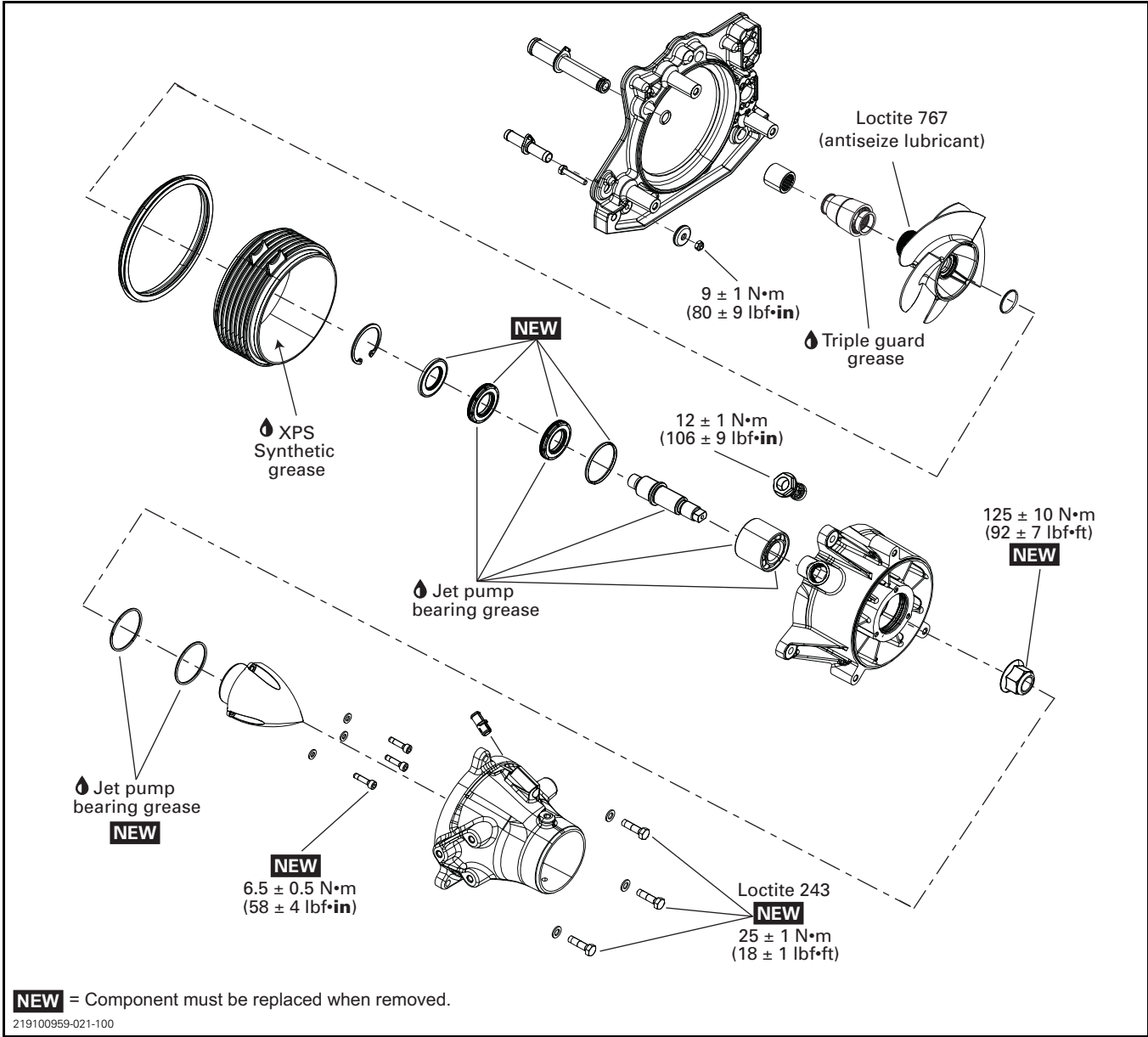
## SERVICE TOOLS

| Description                       | Part Number       | Page         |
|-----------------------------------|-------------------|--------------|
| ENGINE ALIGNMENT PLATE .....      | 529 036 278 ..... | 5            |
| IMPELLER SHAFT BEARING TOOL ..... | 529 036 168 ..... | 11, 13       |
| IMPELLER SHAFT BEARING TOOL ..... | 529 036 279 ..... | 13–14        |
| IMPELLER SHAFT PUSHER.....        | 529 035 955 ..... | 11, 13       |
| PRESSURE CAP .....                | 529 036 283 ..... | 4            |
| PTO SHAFT ADAPTER .....           | 529 036 401 ..... | 9–10, 12, 15 |
| VACUUM/PRESSURE PUMP .....        | 529 021 800 ..... | 4            |

## SERVICE PRODUCTS

| Description                             | Part Number       | Page      |
|-----------------------------------------|-------------------|-----------|
| BRAKE AND PARTS CLEANER PRO S2 .....    | 779245 .....      | 6         |
| JET PUMP BEARING GREASE .....           | 293 550 032 ..... | 8, 13, 15 |
| LOCTITE 243 (BLUE).....                 | 293 800 060 ..... | 7         |
| LOCTITE 577 (THREAD SEALANT) .....      | 293 800 050 ..... | 9         |
| LOCTITE 767 (ANTISEIZE LUBRICANT) ..... | 293 800 070 ..... | 9         |
| SYNTHETIC GREASE (EUR) .....            | 779231 .....      | 6, 10     |
| SYNTHETIC GREASE .....                  | 779162 .....      | 6, 10     |
| TRIPLE-GUARD GREASE .....               | 508298 .....      | 6, 9      |

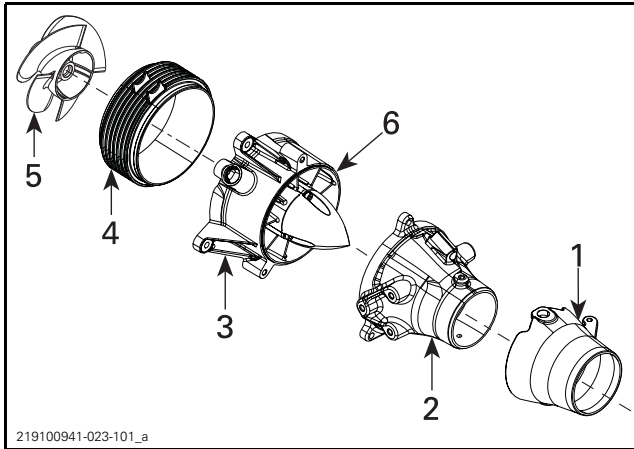
Subsection XX (JET PUMP)





## GENERAL

### JET PUMP MAIN COMPONENTS



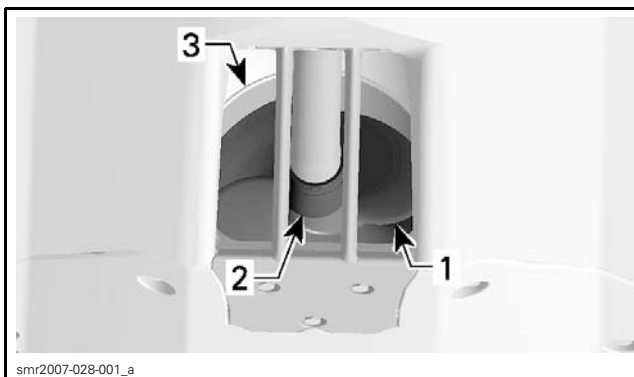
#### TYPICAL

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.



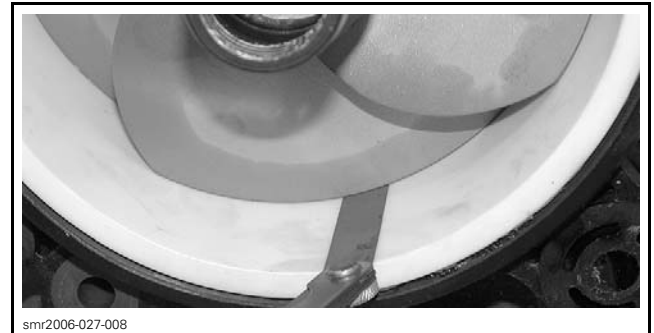
#### TYPICAL — UNDERNEATH HULL

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)      |

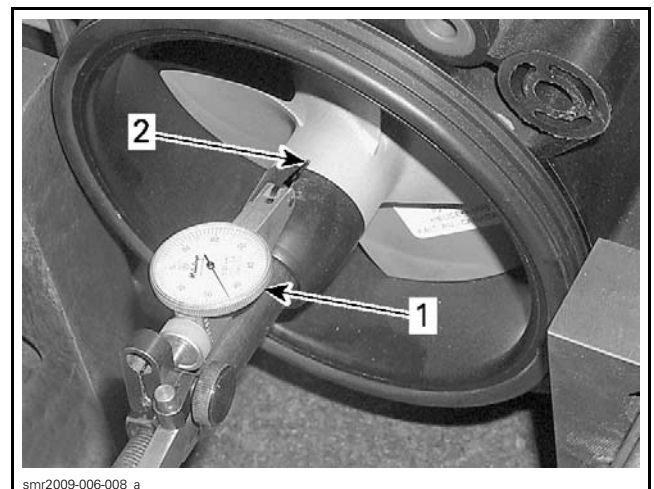
### IMPELLER SHAFT RADIAL PLAY

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

Subsection XX (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<br>(P/N 529 036 283)         |   |
| VACUUM/PRESSURE<br>PUMP (P/N 529 021 800) |  |

- 4. Connect the vacuum/pressure pump to the pressure cap fitting.



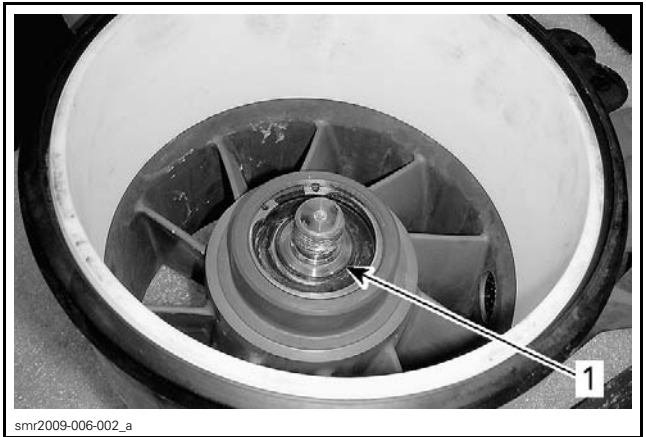
TYPICAL

- 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.

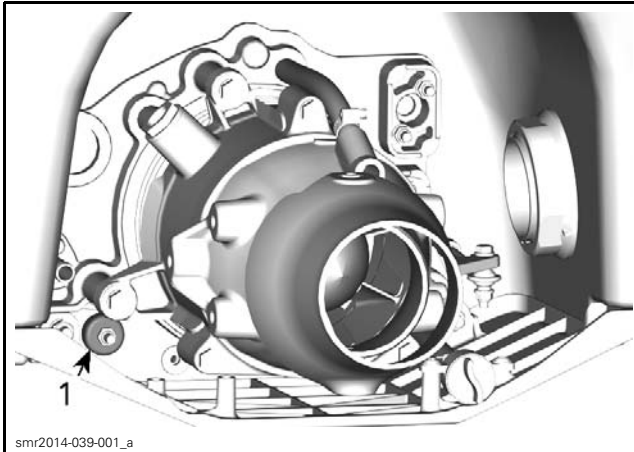
PROCEDURES

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<br>(80 lbf•in ± 9 lbf•in) |

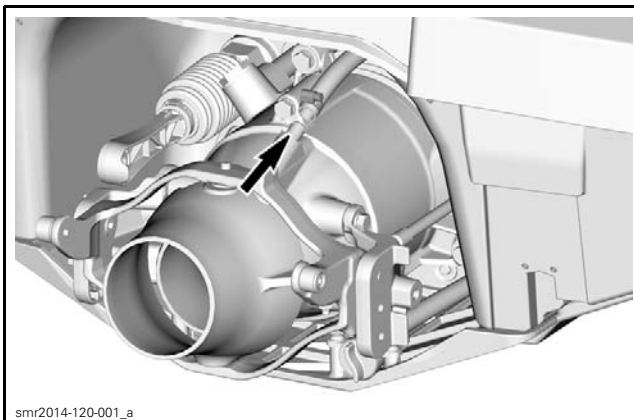
## JET PUMP HOUSING

**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.

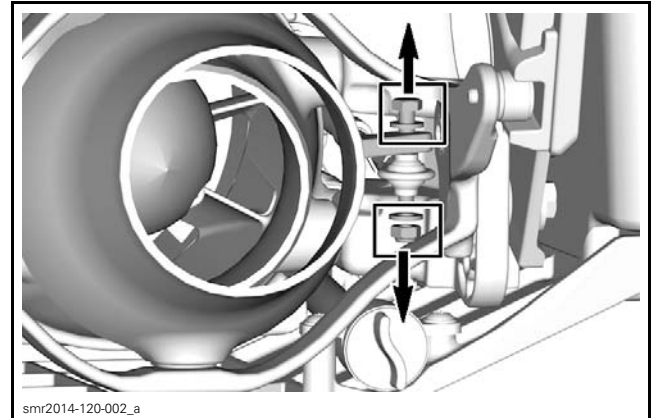
### Removing the Jet Pump Housing

Remove iBR gate. Refer to *iBR, REVERSE AND VTS SYSTEM* subsection.

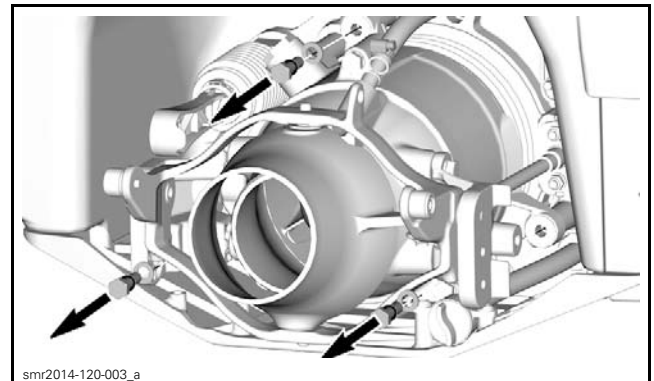
Remove the following fasteners.



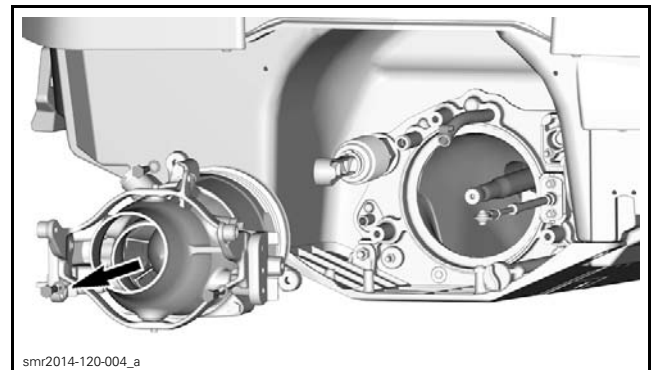
smr2014-120-001\_a



smr2014-120-002\_a



smr2014-120-003\_a



smr2014-120-004\_a

Temporarily fasten the engine alignment plate to pump support to support drive shaft and avoid PTO oil seal damage.

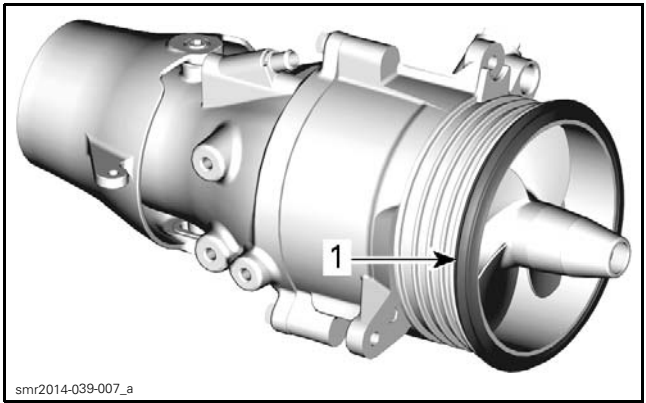
| REQUIRED TOOLS                           |  |
|------------------------------------------|--|
| ENGINE ALIGNMENT PLATE (P/N 529 036 278) |  |

### 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.

Subsection XX (JET PUMP)

- 2. Ensure the elastomer seal is in good condition. Replace as required.



1. Elastomer seal

Installing the Jet Pump Housing

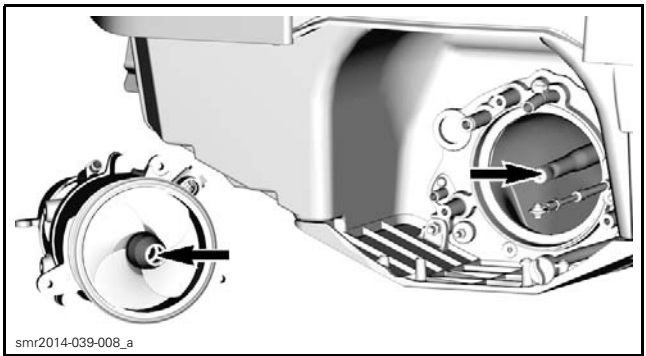
The installation is the reverse of the removal procedure. However, pay attention to the following.

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.

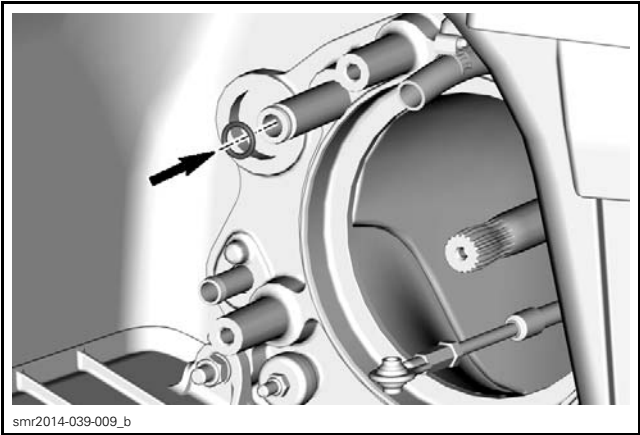
| SERVICE PRODUCTS                            |
|---------------------------------------------|
| BRAKE AND PARTS CLEANER PRO S2 (P/N 779245) |
| TRIPLE-GUARD GREASE (P/N 508298)            |

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.

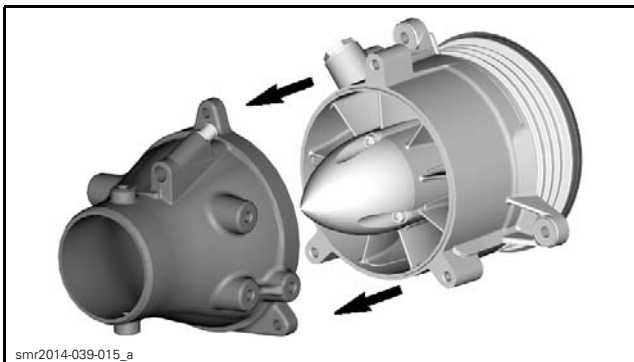
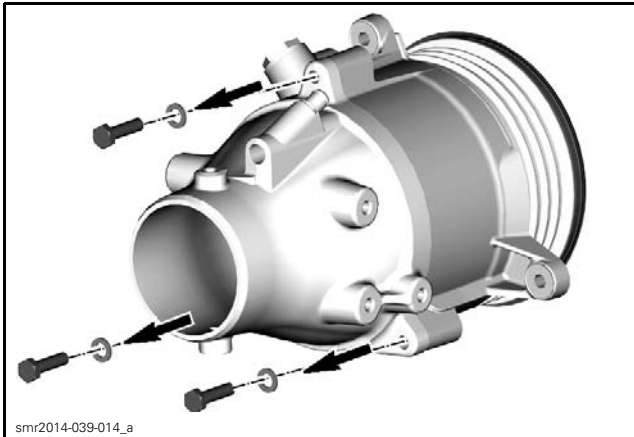
Installing the Nozzle

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 PRODUCTS |
|------------------|

|                                      |
|--------------------------------------|
| 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).

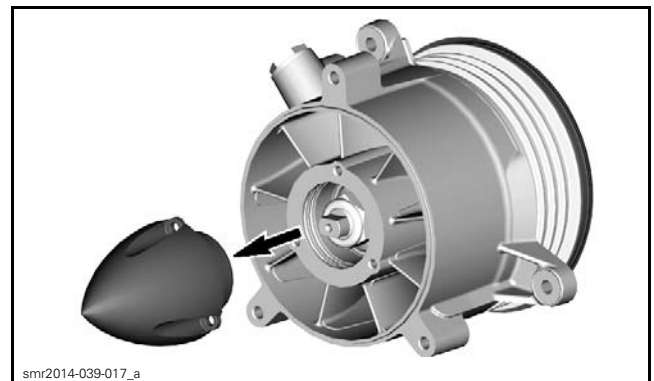
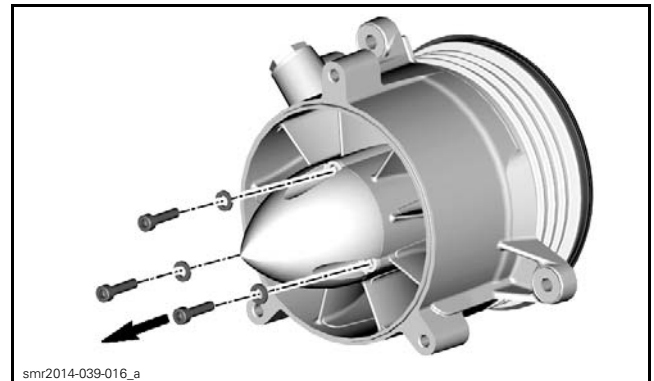
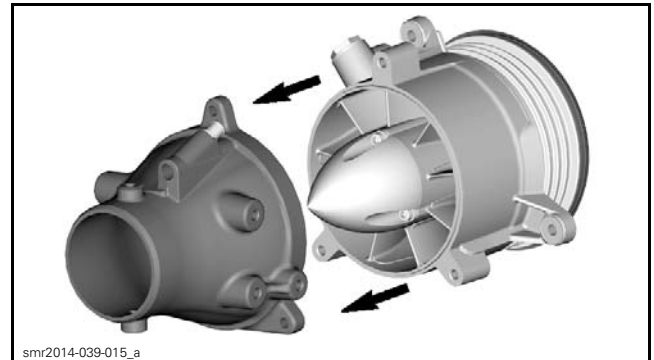
|                  |
|------------------|
| SERVICE PRODUCTS |
|------------------|

|                                      |
|--------------------------------------|
| 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<br>(18 lbf•ft ± 1 lbf•ft) |
|--------------------------|------------------------------------------|

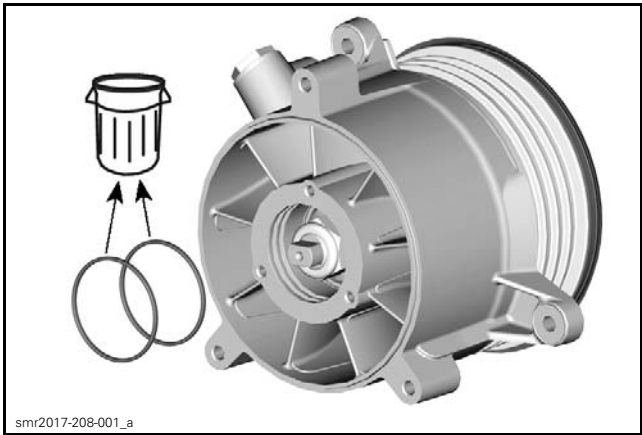
**IMPELLER COVER****Removing the Impeller Cover****Inspecting the Impeller Cover**

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.

Subsection XX (JET PUMP)



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 PRODUCTS                          |
|-------------------------------------------|
| JET PUMP BEARING GREASE (P/N 293 550 032) |

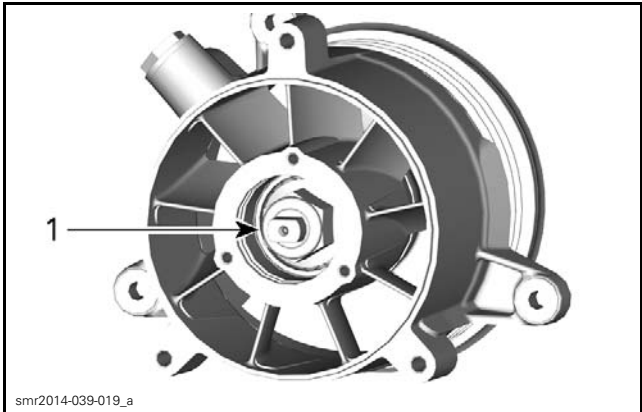
Push cover against pump housing while alternately tightening screws. Make sure O-rings are positioned correctly and they are not damaged when pushing the cover.

| TIGHTENING TORQUE                      |                                             |
|----------------------------------------|---------------------------------------------|
| NEW M6 impeller cover retaining screws | 6.5 N•m ± 0.5 N•m<br>(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

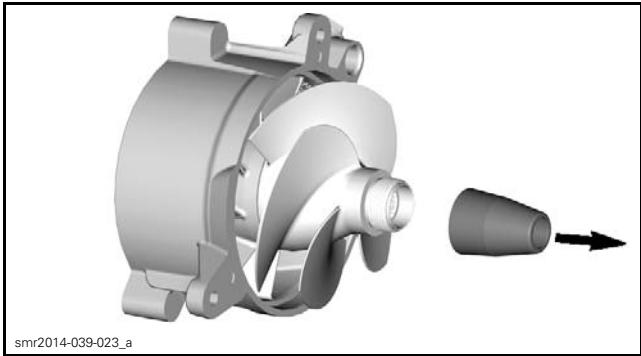
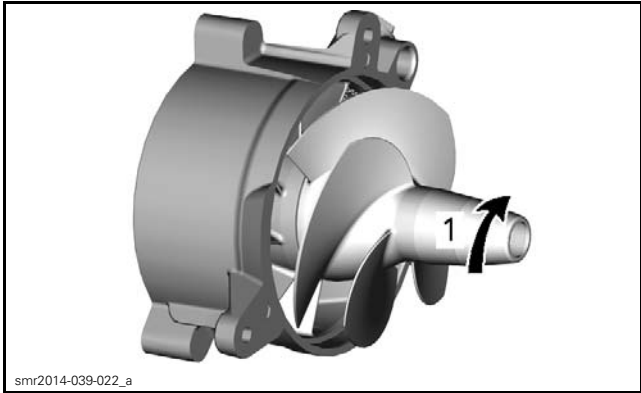
1. Remove jet pump from the watercraft. Refer to *JET PUMP HOUSING*.

2. Remove impeller cover. Refer to *IMPELLER COVER*.

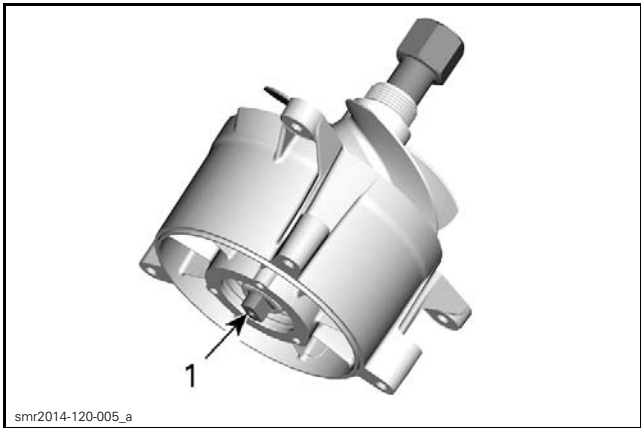
3. Remove wear ring. Refer to *WEAR RING*.

**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.

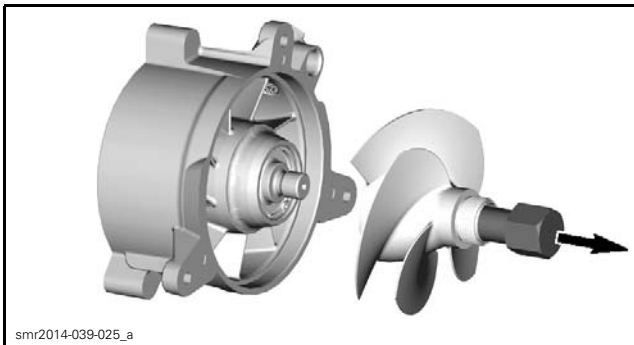
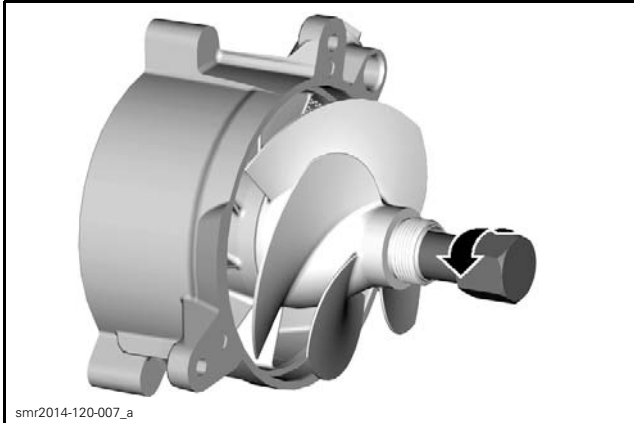
# REQUIRED TOOL

PTO SHAFT ADAPTER  
(P/N 529 036 401)

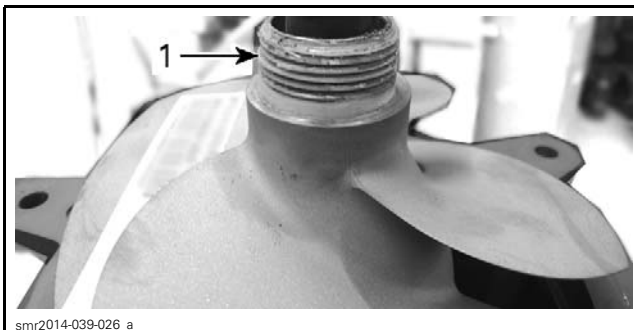


**NOTE:** It may be necessary to heat the impeller to ease removal.

**NOTICE** Never use an impact wrench to loosen impeller.



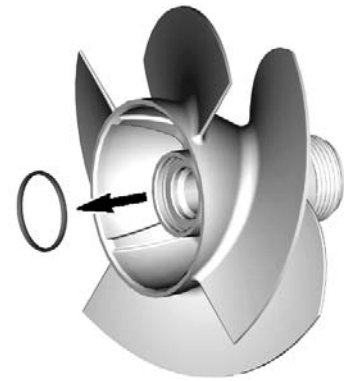
6. Clean impeller to boot threads.



## IMPELLER

1. Impeller to boot threads

7. Discard impeller O-ring.



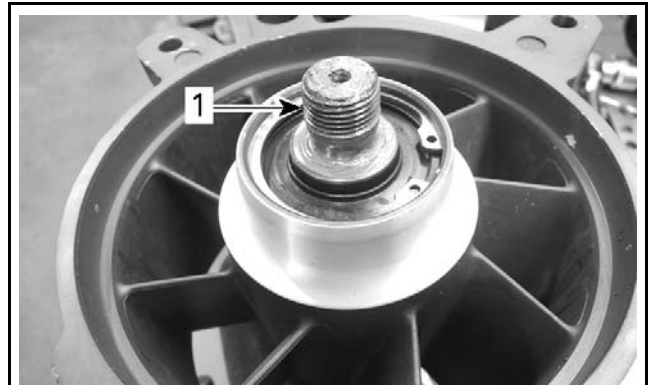
## Installing the Impeller

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 PRODUCTS

LOCTITE 767 (ANTISEIZE LUBRICANT)  
(P/N 293 800 070)



1. Antiseize lubricant

## 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

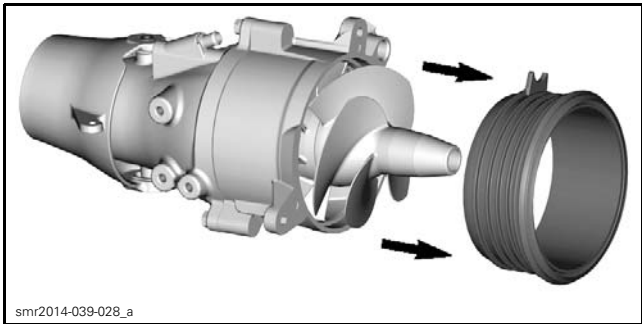
Check wear ring for:

- Deep scratches
- Irregular surface
- Any apparent damage.

Check *IMPELLER/WEAR RING CLEARANCE*, see procedure at the beginning of this subsection.

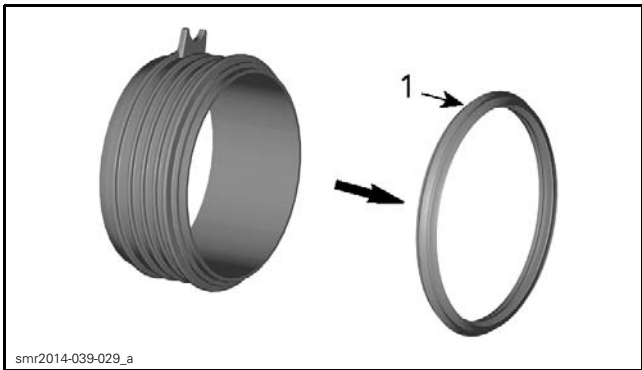
Removing the Wear Ring

Remove jet pump from watercraft. Refer to *JET PUMP HOUSING*.

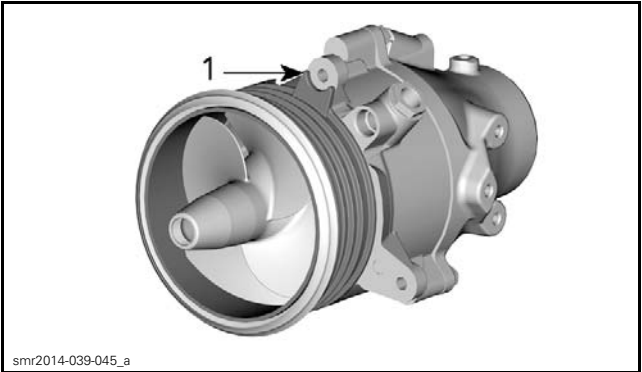


Installing the Wear Ring

Check wear ring elastomer seal condition. Replace if necessary.



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

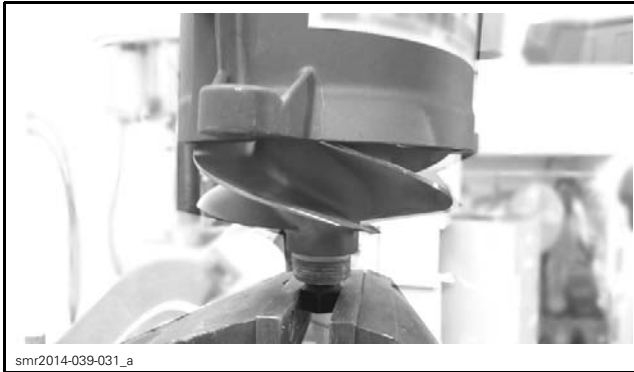
1. Remove impeller cover. Refer to *IMPELLER COVER* in this subsection.
2. Install the PTO adapter in a vise.

| REQUIRED TOOL                       |                                                                                       |
|-------------------------------------|---------------------------------------------------------------------------------------|
| PTO SHAFT ADAPTER (P/N 529 036 401) |  |



3. Install jet pump housing over PTO adapter.





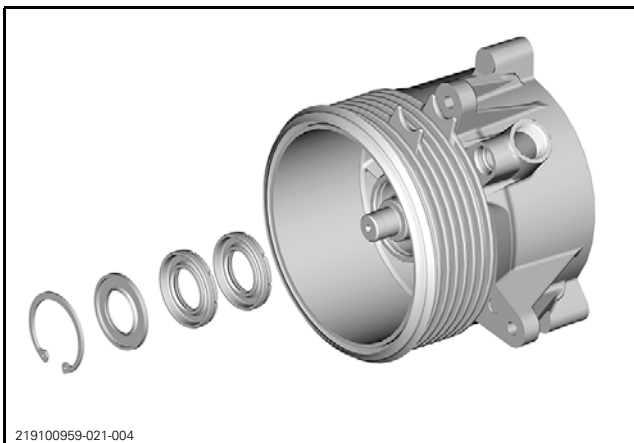
4. Using a 30 mm socket, unscrew the impeller shaft nut.
5. Remove impeller shaft nut.



**TYPICAL**

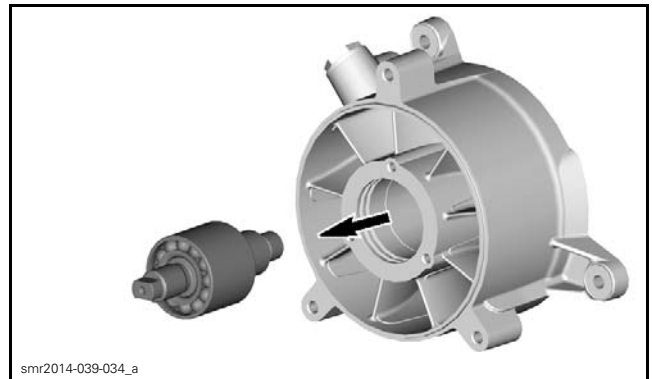
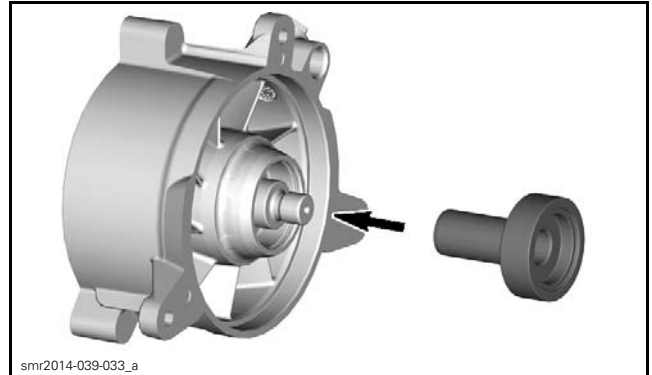
**NOTE:** If impeller loosens instead of shaft nut, refer to *REMOVING THE IMPELLER SHAFT NUT IF IMPELLER HAS LOOSENED* further in this procedure.

6. Remove impeller. Refer to *IMPELLER*.
7. From the impeller side, remove circlip, seals and O-ring from jet pump housing.



#### REQUIRED TOOL

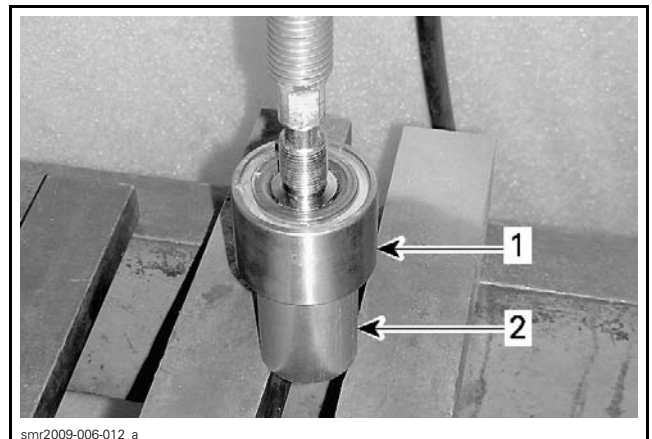
IMPELLER SHAFT  
PUSHER (P/N 529  
035 955)



8. Use the required tool to press bearing off impeller shaft.

#### REQUIRED TOOL

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



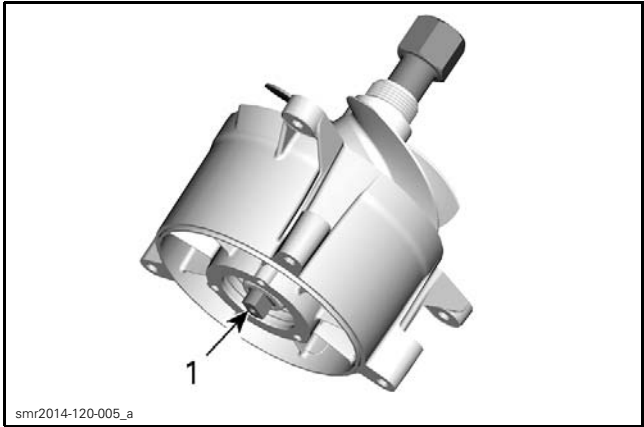
**TYPICAL**

1. Impeller shaft and bearing
2. Impeller shaft bearing tool on INNER race

Subsection XX (JET PUMP)

Removing the Impeller Shaft Nut if Impeller Has Loosened

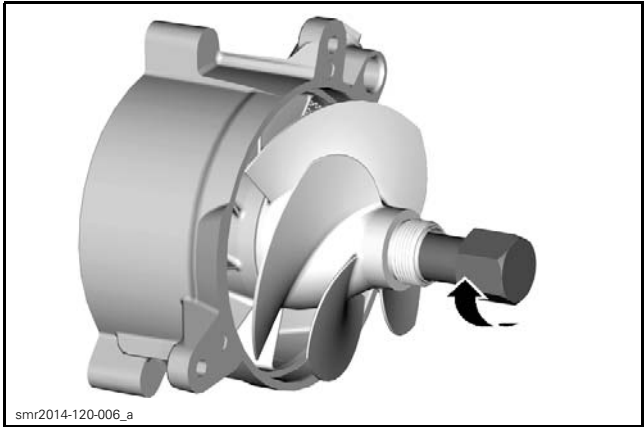
- 1. Turn pump upside down and mount the flat sides of impeller shaft in a vise.



TYPICAL  
1. Flat side

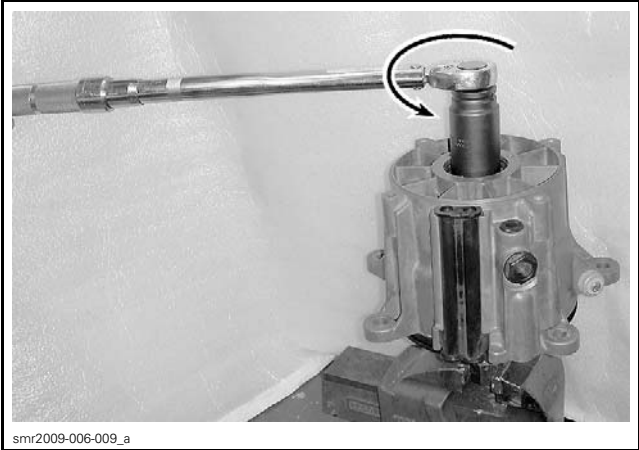
| REQUIRED TOOL                          |                                                                                   |
|----------------------------------------|-----------------------------------------------------------------------------------|
| PTO SHAFT ADAPTER<br>(P/N 529 036 401) |  |

- 2. Tighten impeller more than impeller shaft nut.



TYPICAL

- 3. Turn pump upside down and retry unscrewing impeller shaft nut.



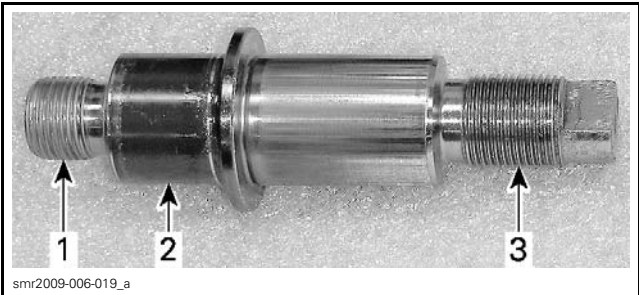
TYPICAL

- 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.

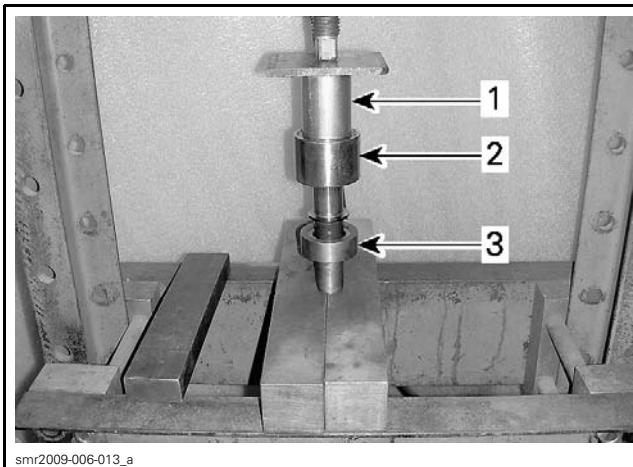
- 1. Using the Impeller shaft bearing tool on the bearing inner race, press the bearing on the impeller shaft.

| REQUIRED TOOL                                       |                                                                                   |
|-----------------------------------------------------|-----------------------------------------------------------------------------------|
| IMPELLER SHAFT<br>BEARING TOOL<br>(P/N 529 036 168) |  |

2. Use the impeller shaft pusher to protect the impeller shaft threads.

| REQUIRED TOOL                                 |                                                                                   |
|-----------------------------------------------|-----------------------------------------------------------------------------------|
| IMPELLER SHAFT<br>PUSHER (P/N 529<br>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

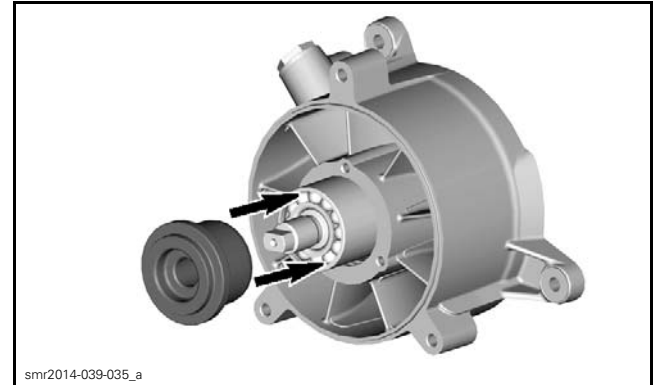
3. Press bearing until it bottoms.

**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<br>BEARING TOOL<br>(P/N 529 036 279) |  |



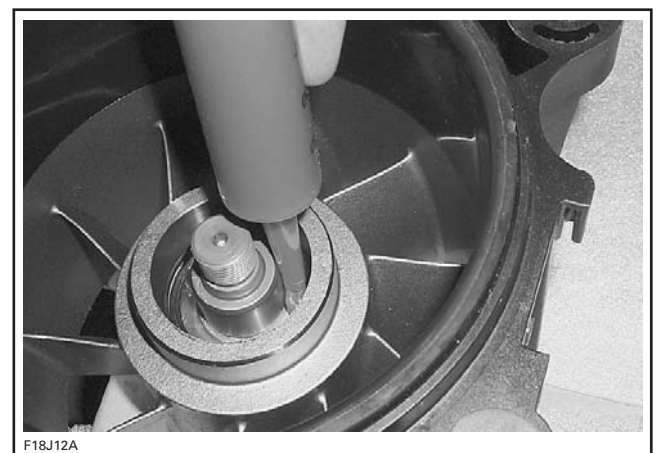
**NOTE:** Ensure impeller shaft turns freely and smoothly.

2. Turn pump upside down.
3. Coat shaft surface with grease.

| SERVICE PRODUCTS                          |
|-------------------------------------------|
| JET PUMP BEARING GREASE (P/N 293 550 032) |

4. Apply 5 g (.2 oz) of grease on bearing.

| SERVICE PRODUCTS                          |
|-------------------------------------------|
| JET PUMP BEARING GREASE (P/N 293 550 032) |



**TYPICAL**

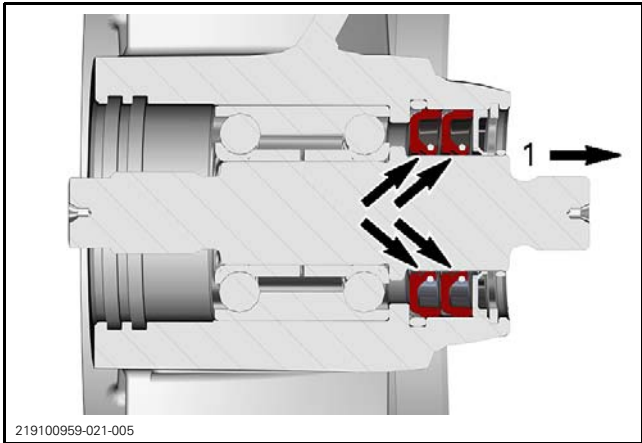
5. Apply 11 g (.4 oz) of grease inside NEW double lip seal and in the seal lips.

Subsection XX (JET PUMP)

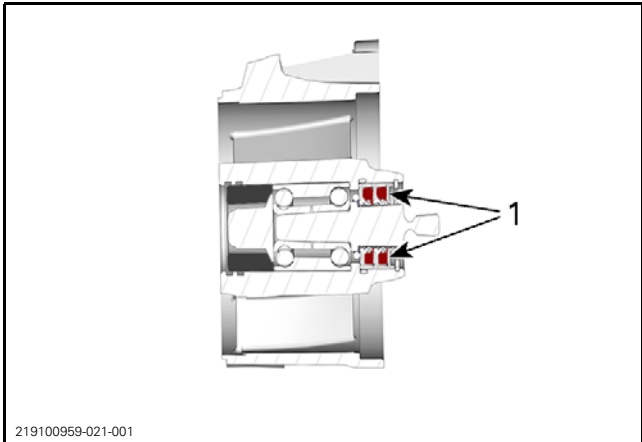


PUT GREASE IN ALL SEAL CAVITIES.

6. Install double lip seals making sure seal lips are facing upwards (toward impeller side).

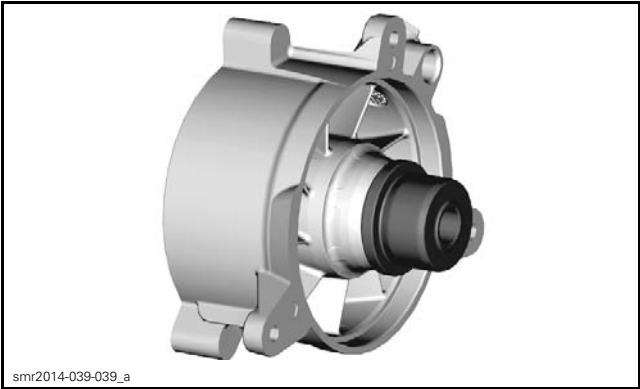
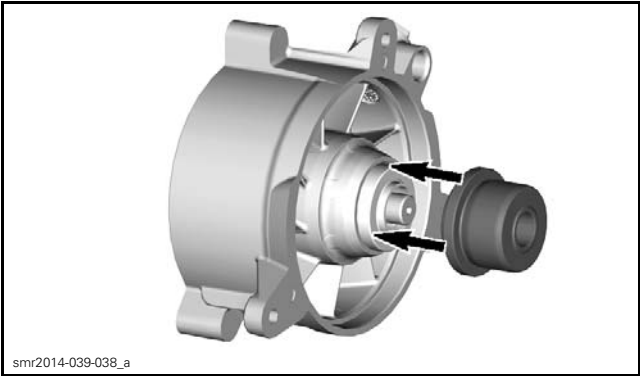


1. Toward impeller

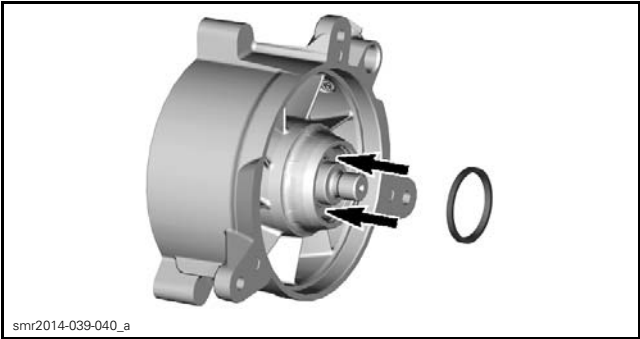


1. Grease in seals cavities

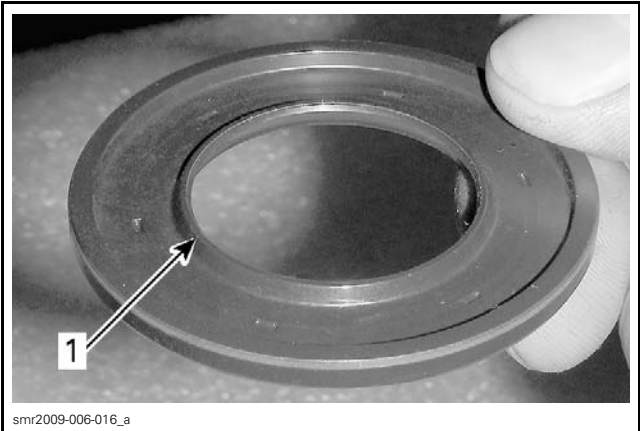
| REQUIRED TOOL                                       |  |
|-----------------------------------------------------|--|
| IMPELLER SHAFT<br>BEARING TOOL<br>(P/N 529 036 279) |  |



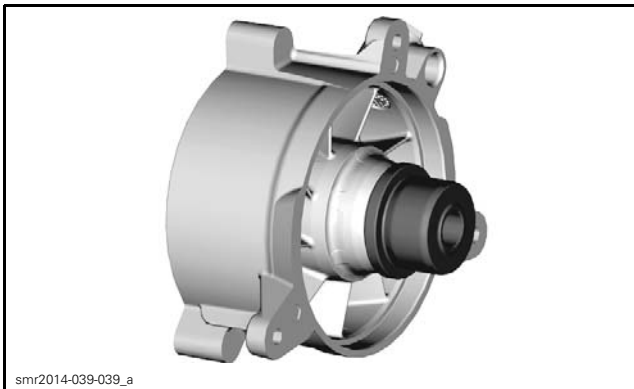
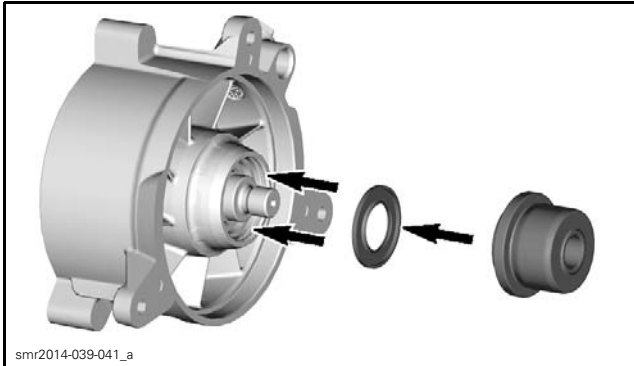
7. Install spacer.



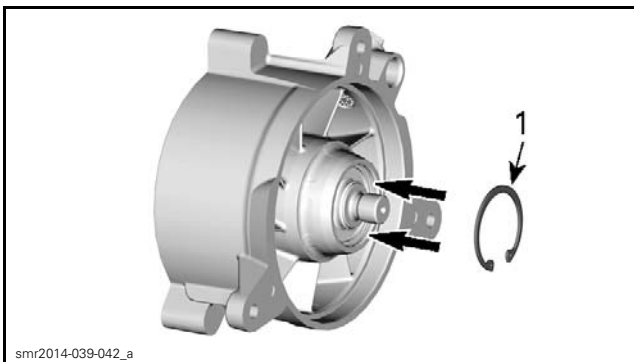
8. Install **NEW** outer impeller shaft seal.



1. Seal lip facing up



9. Install circlip.

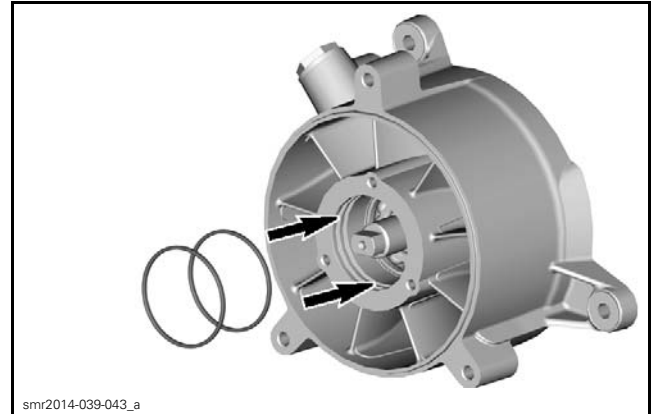


**TYPICAL**

1. Circlip

10. Turn pump upside down.

11. Install the two impeller cover O-rings in pump housing.



12. Before installing any other parts, pressurize jet pump to insure proper seal installation. Refer to *LEAK TEST* in this subsection.

13. Install impeller. Refer to *IMPELLER*.

14. Mount PTO shaft adapter tool in a vise.

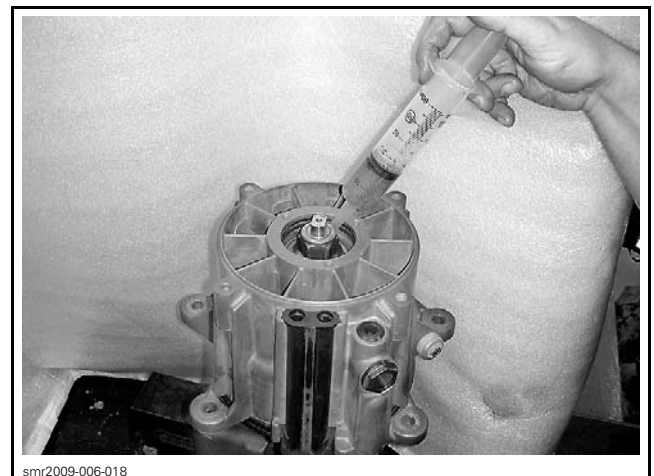
| REQUIRED TOOL                          |                                                                                     |
|----------------------------------------|-------------------------------------------------------------------------------------|
| PTO SHAFT ADAPTER<br>(P/N 529 036 401) |  |

15. Using a 30 mm socket, screw the impeller shaft nut on clockwise.

| TIGHTENING TORQUE      |                                            |
|------------------------|--------------------------------------------|
| M20 impeller shaft nut | 125 N•m ± 10 N•m<br>(92 lbf•ft ± 7 lbf•ft) |

16. Apply 30 g (1.1 oz) of grease around nut.

| SERVICE PRODUCTS                          |  |
|-------------------------------------------|--|
| JET PUMP BEARING GREASE (P/N 293 550 032) |  |

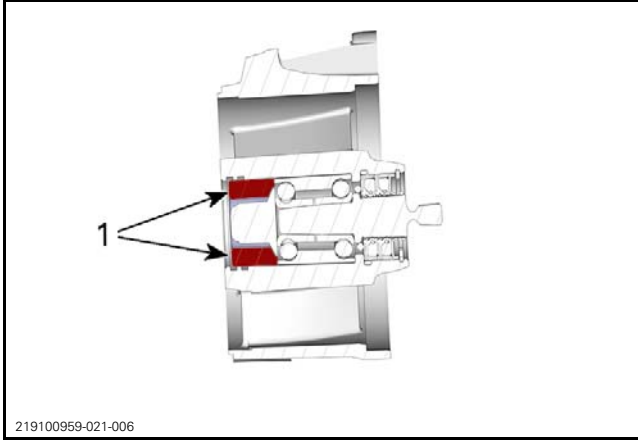


**TYPICAL**

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## Subsection XX (JET PUMP)

---



1. Grease around nut

17. Install the impeller cover. Refer to *IMPELLER COVER*.

# iBR, REVERSE AND VTS (SPARK SERIES)

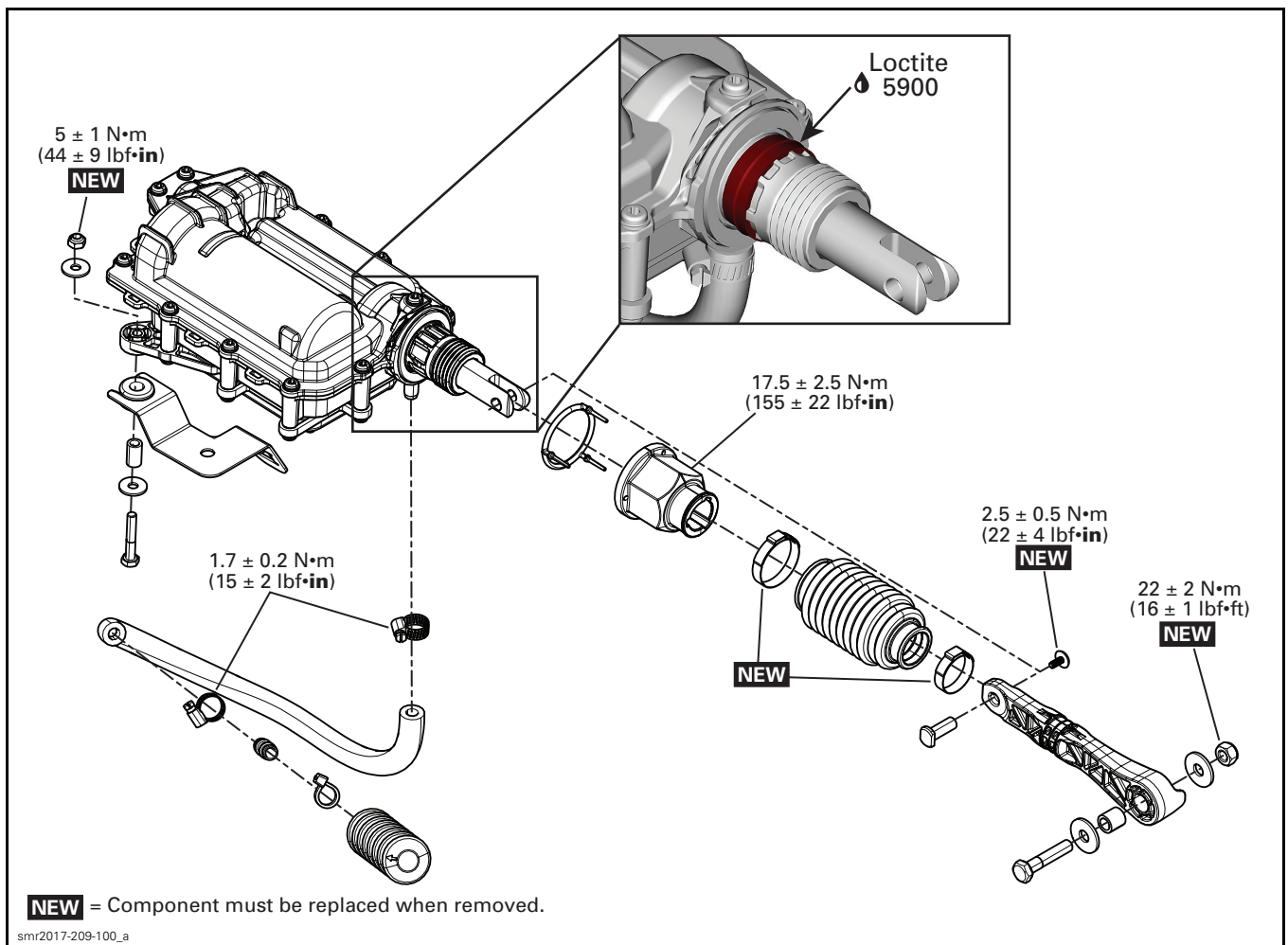
## SERVICE TOOLS

| Description                  | Part Number       | Page |
|------------------------------|-------------------|------|
| DIAGNOSTIC HARNESS .....     | 529 036 276 ..... | 13   |
| ENGINE ALIGNMENT PLATE ..... | 529 036 278 ..... | 10   |
| IBR NUT SOCKET.....          | 529 036 305 ..... | 11   |

## SERVICE PRODUCTS

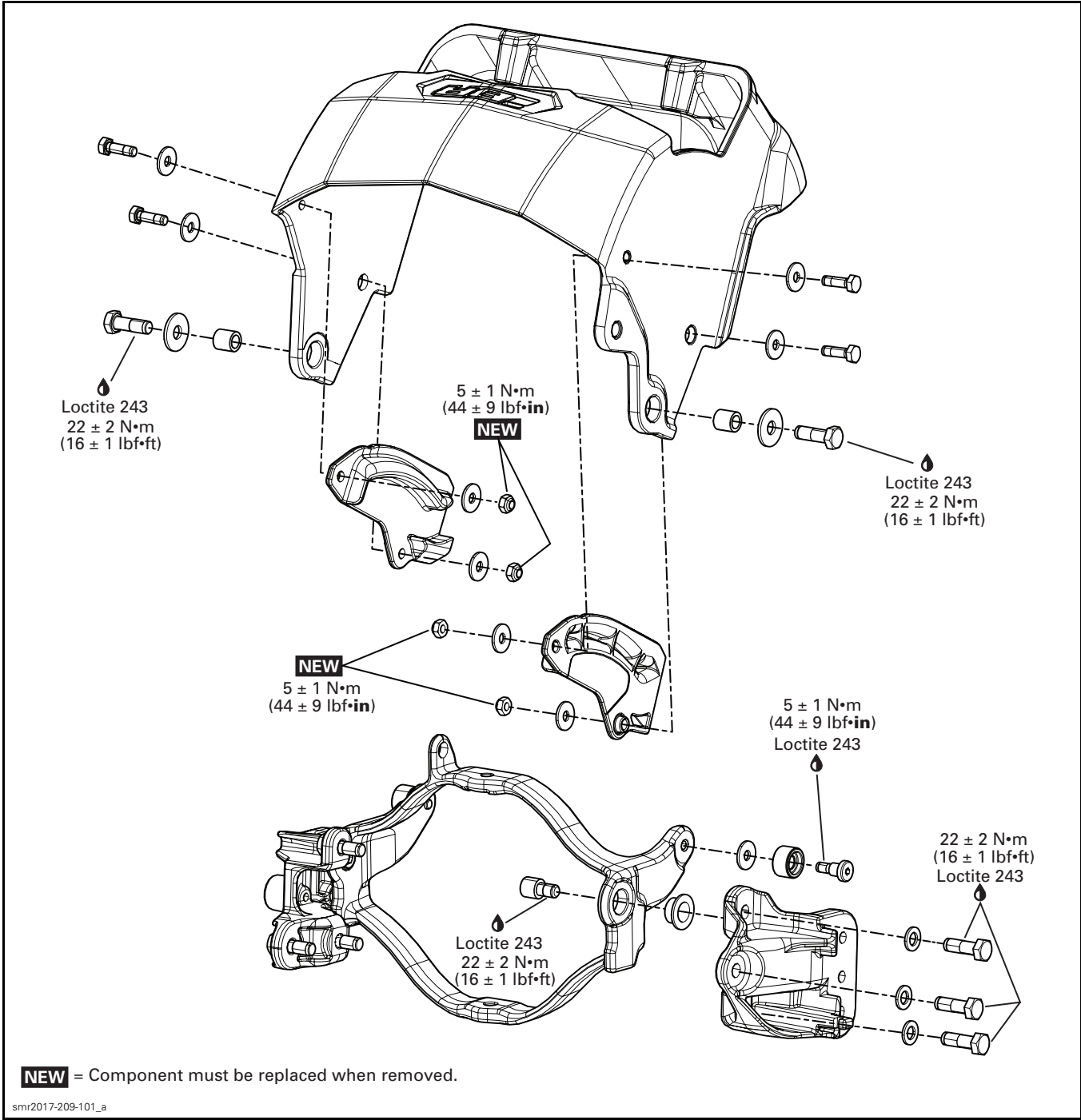
| Description        | Part Number       | Page |
|--------------------|-------------------|------|
| LOCTITE 5900 ..... | 293 800 066 ..... | 11   |

## IBR ACTUATOR

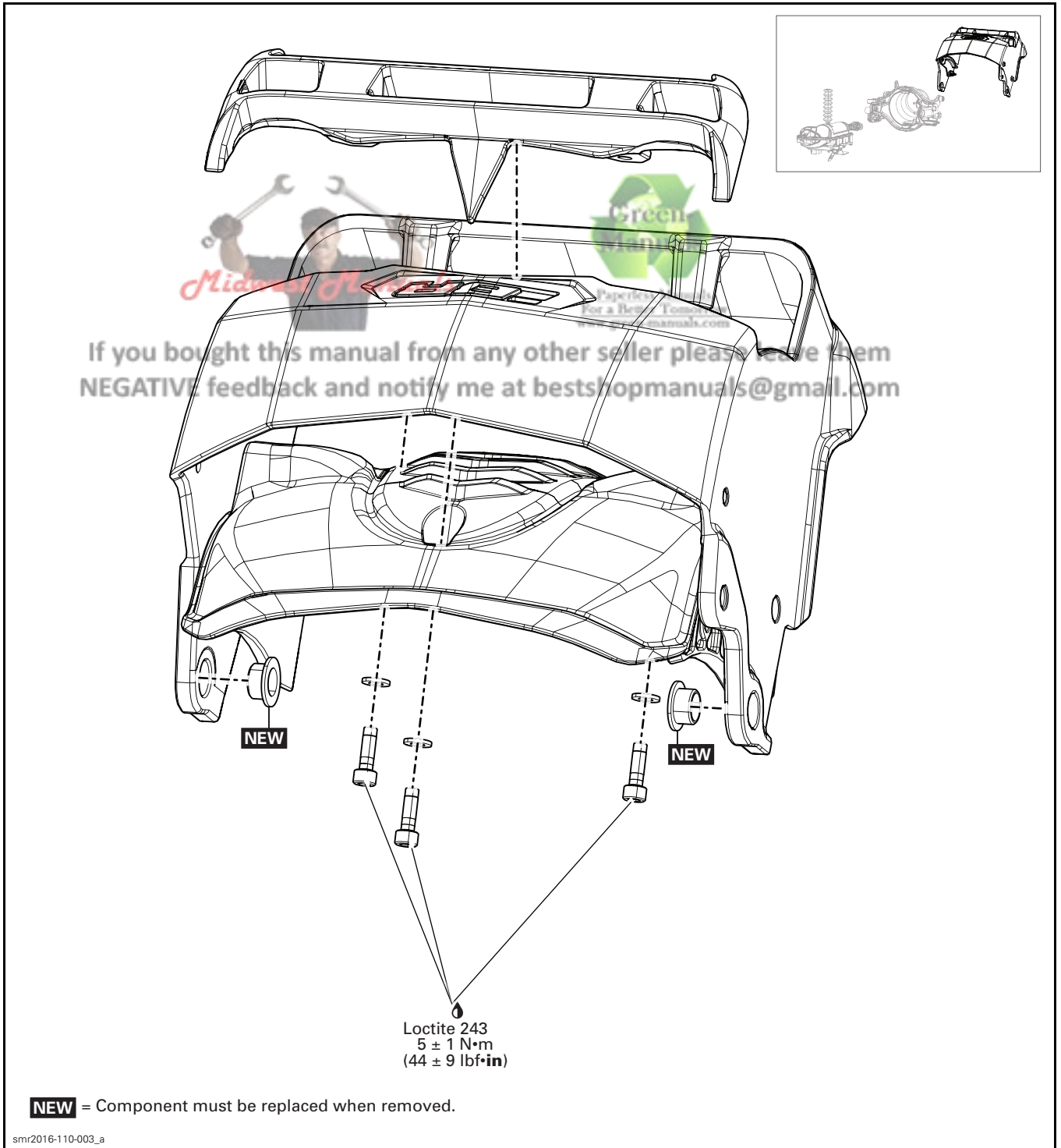




Subsection XX (iBR, REVERSE AND VTS (SPARK SERIES))







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.



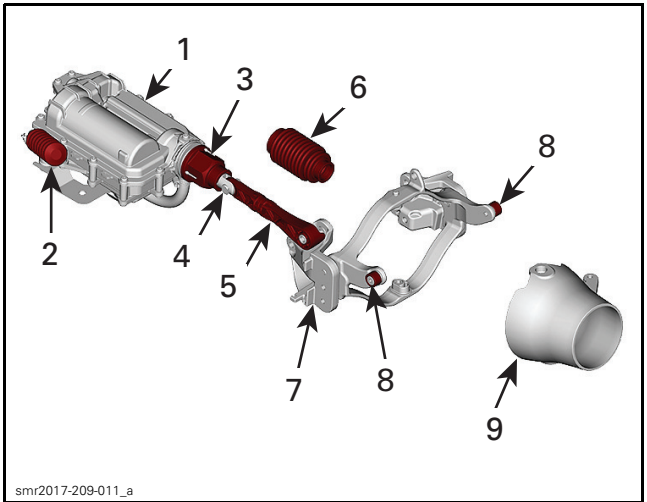
**WARNING**

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.

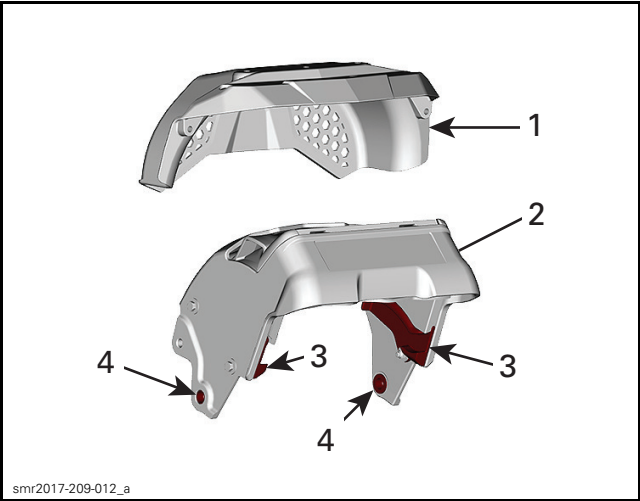
Hoses, cables or locking ties removed during a procedure must be reinstalled as per factory standards.

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



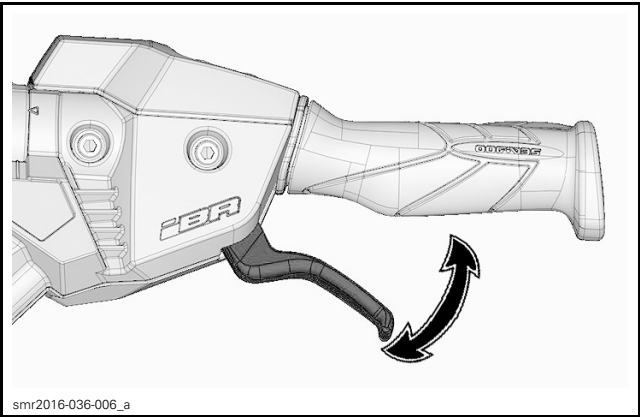
- 1. Protective guard (models without boarding platform)
- 2. Gate
- 3. Support plates
- 4. Gate bushings

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.

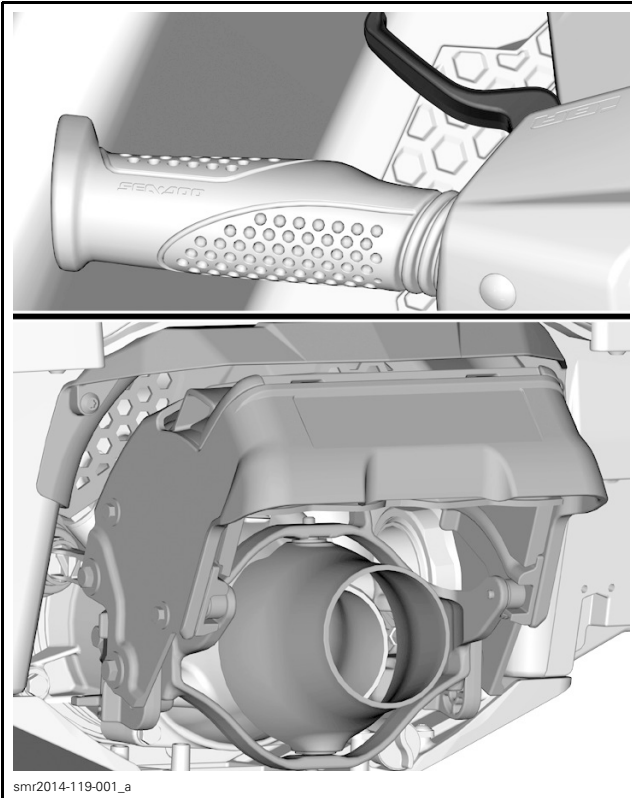
The iBR lever is located on the LH side of the handlebar.



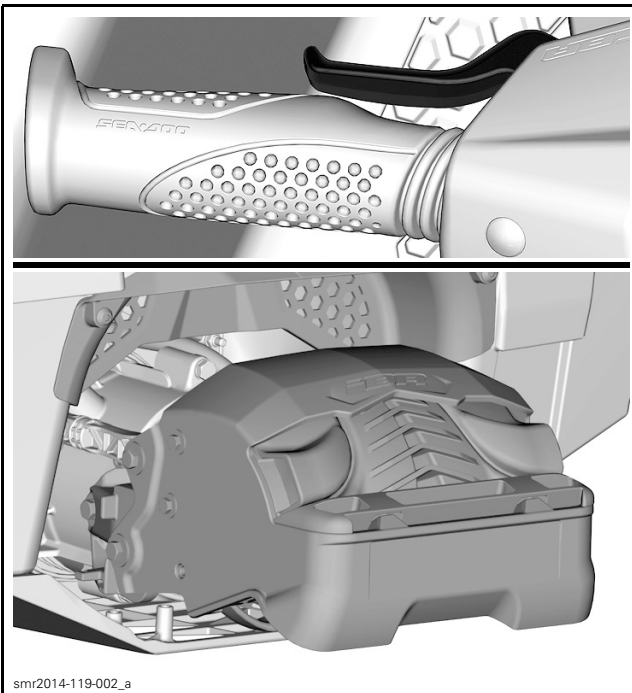
TYPICAL

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.

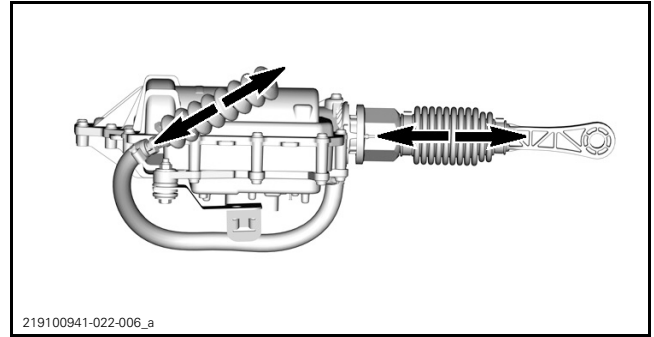
The BRLS sends the signals to the iBR module. The iBR module controls an electric motor that in turn raises or lowers the iBR gate through a mechanical drive unit.



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.

### 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.

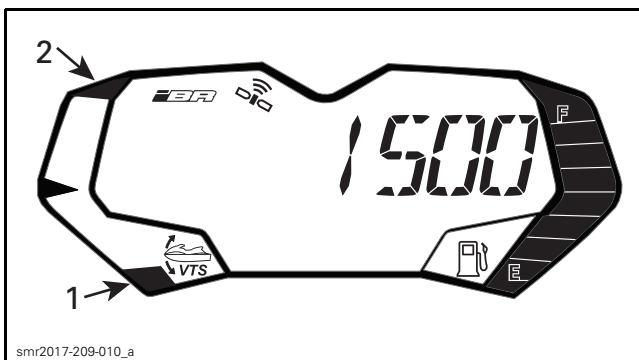
The VTS switch sends command signals to the gauge. The gauge converts them to CAN protocol and sends them through the CAN bus to the

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:

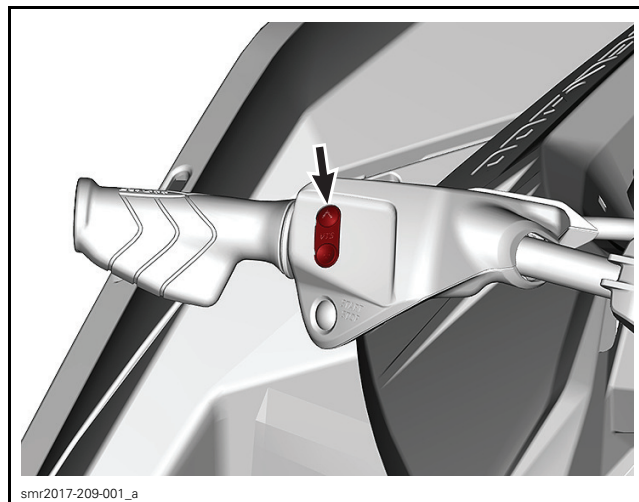
- Nozzle trimming
- Selection of 2 preset trim positions

### 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.

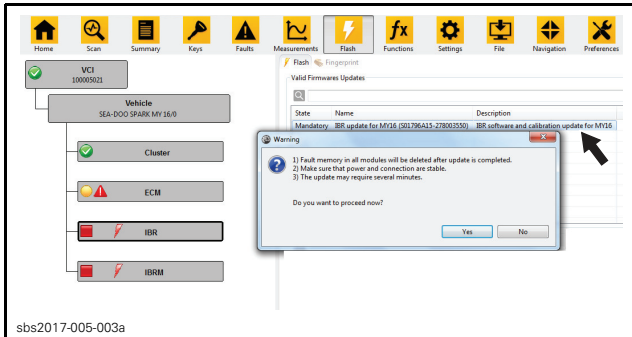
## Subsection XX (iBR, REVERSE AND VTS (SPARK SERIES))

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

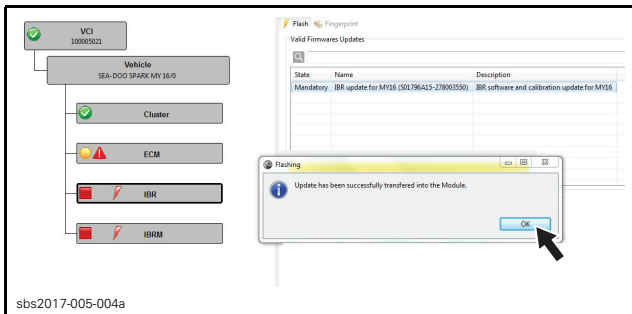
In BUDS2, go to:

- 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.

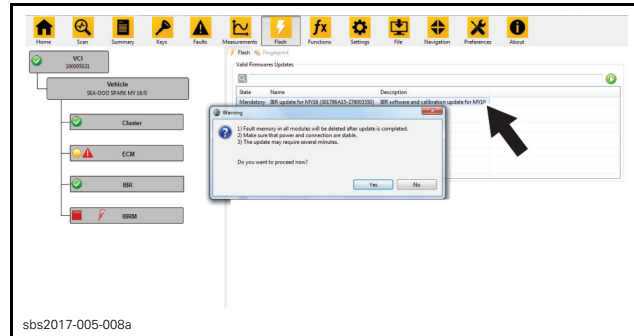
Perform after flashing the iBR.

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

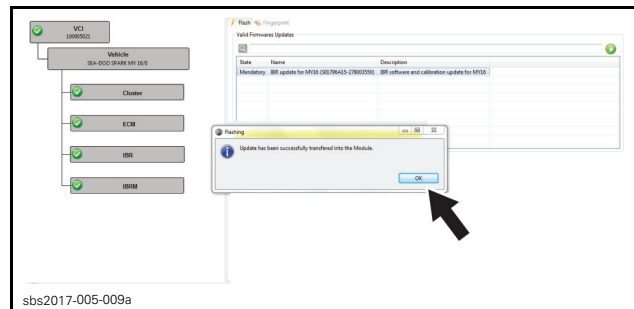
In BUDS2, go to:

- 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.

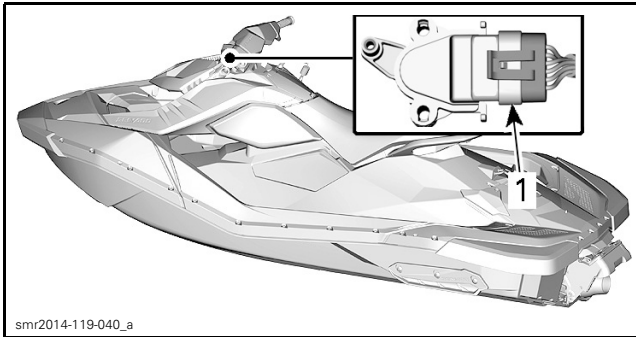
### MAINTENANCE

Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection of the appropriate shop manual.

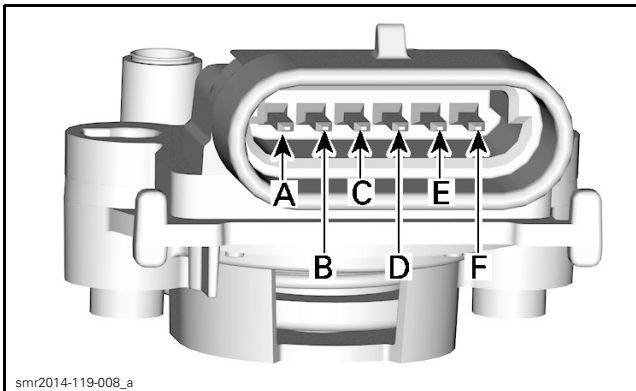


## PROCEDURES

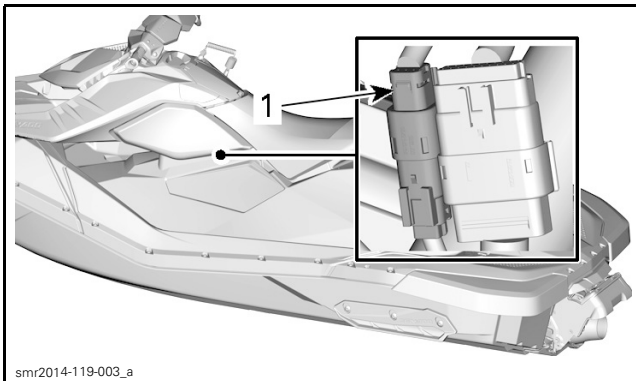
### SWITCHES LOCATION AND PIN-OUT



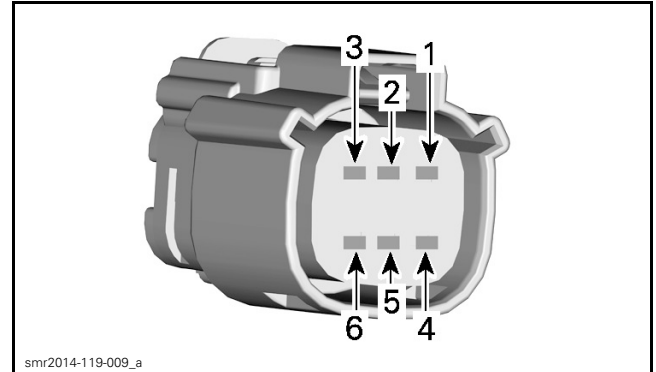
1. BRLS



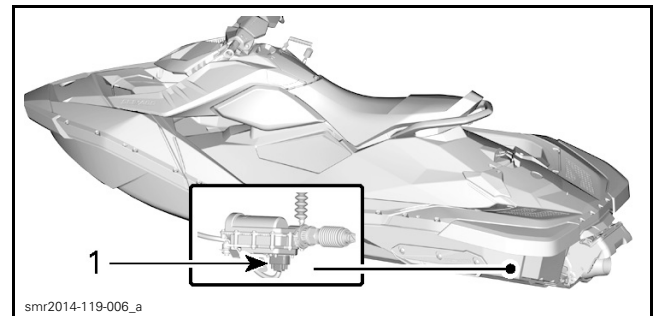
BRLS PINOUT



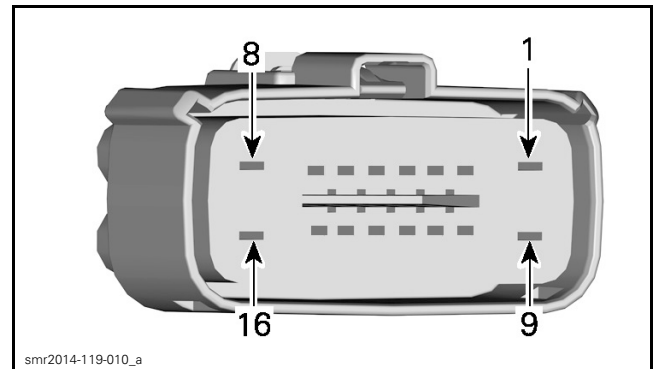
1. Steering 6 pos. connector



STEERING 6 POS. CONNECTOR



1. iBR actuator connector



iBR ACTUATOR CONNECTOR

### iBR ACTUATOR

#### Specifications

| iBR REFERENCE TABLE |                                             |
|---------------------|---------------------------------------------|
| PIN                 | SIGNAL                                      |
| iBR-1               | Battery voltage<br>(Hot at all times)       |
| iBR2                | Battery voltage<br>(Hot with main relay on) |
| iBR-8               | Ground                                      |

| iBR ACTUATOR CURRENT DRAW |              |
|---------------------------|--------------|
| DOWN SELECTION            | -5 to -15 A  |
| UP SELECTION              | +10 to +20 A |

### Testing iBR Actuator Operation

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. In BUDS2, go to:
  - **Functions** page
  - **iBR** button
  - **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.

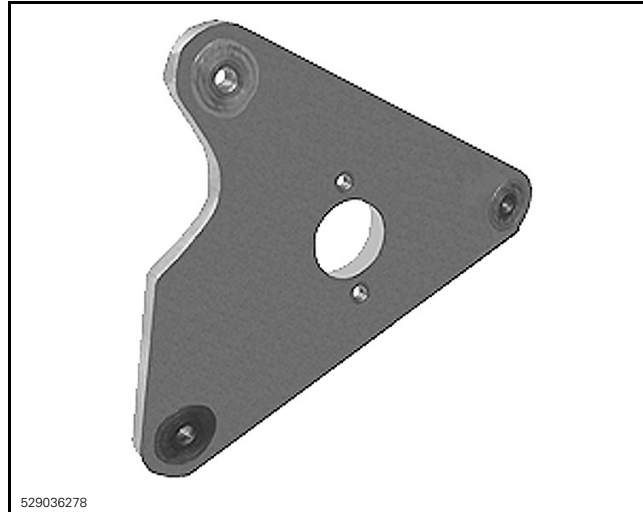
Remove debris, replace iBR gate components, or replace the iBR actuator as applicable.

### Removing the iBR Actuator

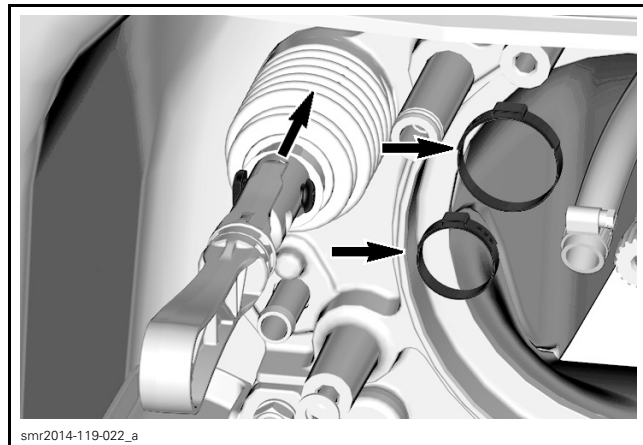
1. Remove iBR gate. Refer to *iBR GATE* in this subsection.

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.

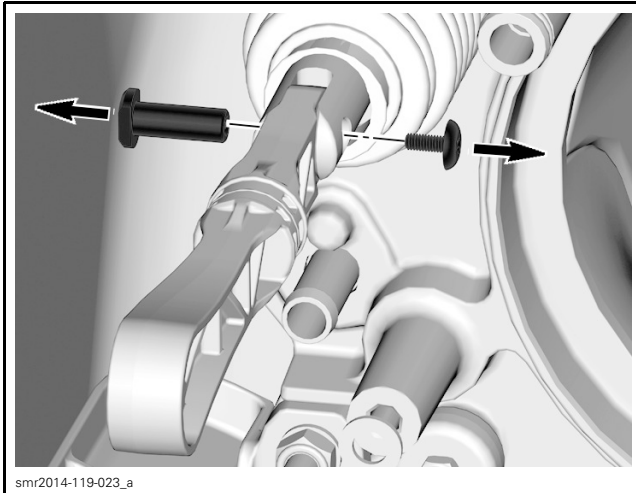


3. Remove Oetiker clamps.

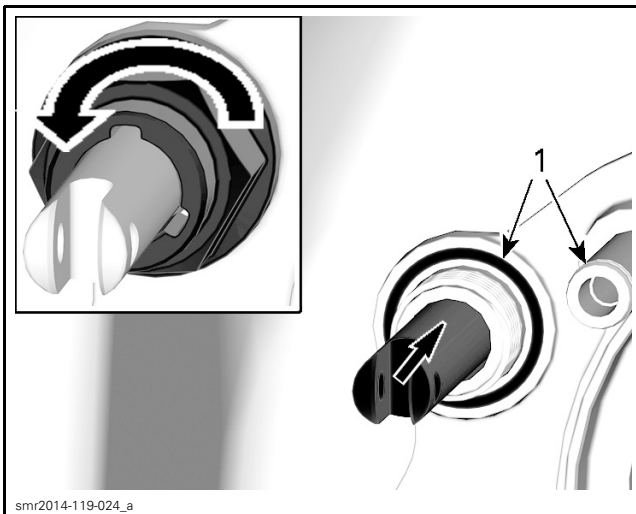


4. Remove connecting arm, sleeve and screw.





5. Remove iBR nut. Use IBR NUT SOCKET (P/N 529 036 305).
6. Push iBR actuator into hull and remove.

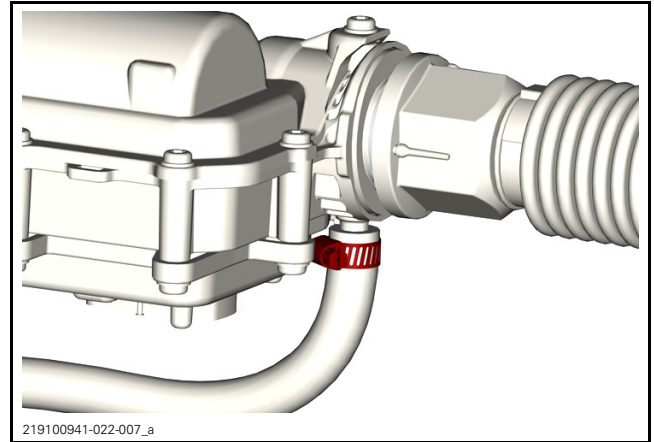


1. Inspect O-rings

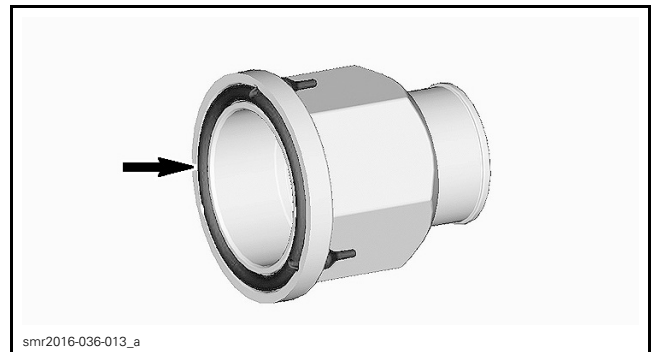
## Installing the Actuator

**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<br>(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.

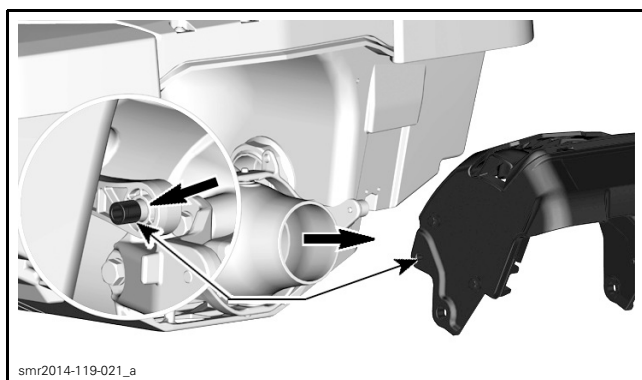
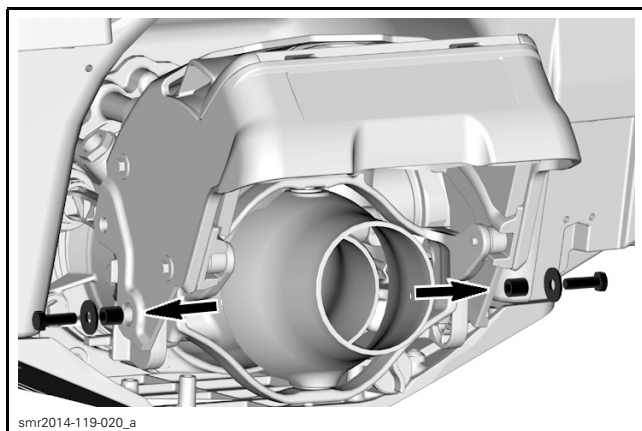
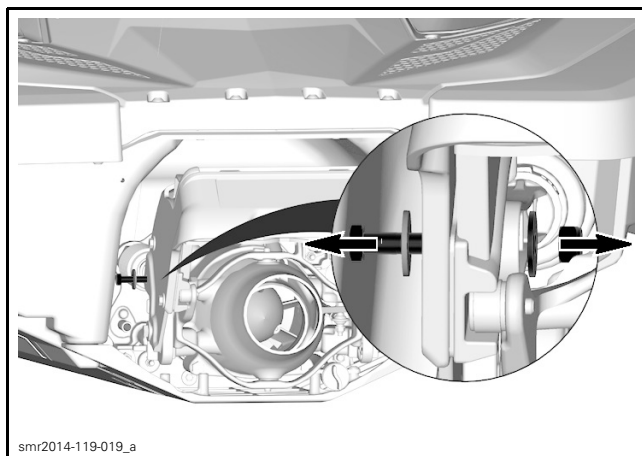
Perform *iBR FLASHING* and *iBR AUTO-CALIBRATION* procedures.

## 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

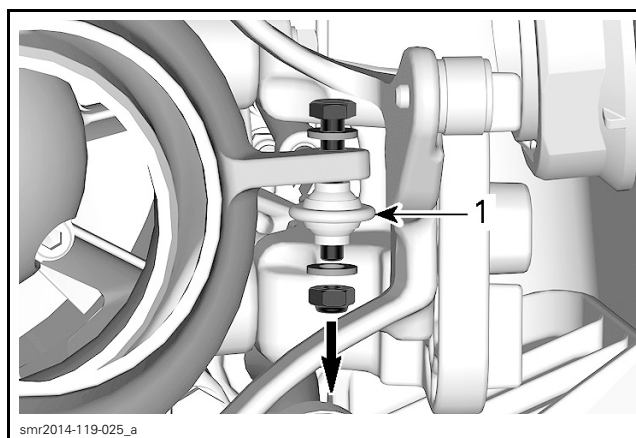
The installation procedure is the reverse of the removal procedure. However, pay attention to the following. Apply proper torque and service products as applicable in exploded view(s) at the beginning of this subsection.

## iBR GATE SUPPORT

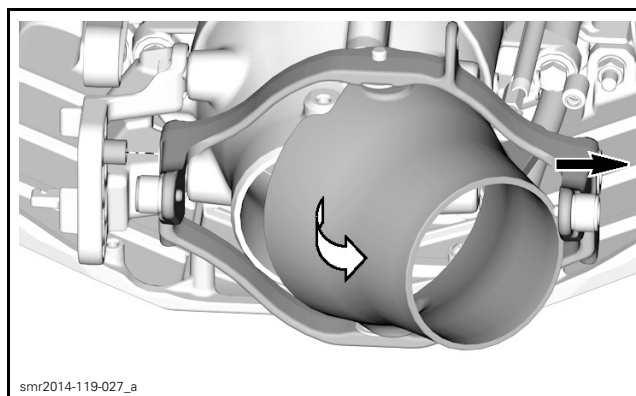
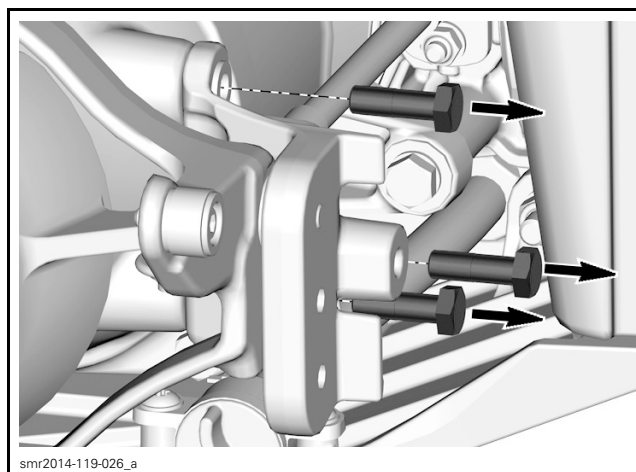
### Removing the Gate Support

Jet pump nozzle is removed with iBR gate support.

**NOTE:** iBR gate raised for illustration purposes. Gate should be at neutral position.



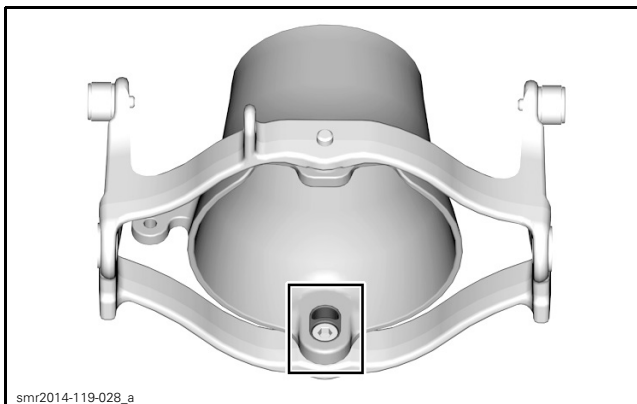
1. Steering cable



## 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<br>(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.

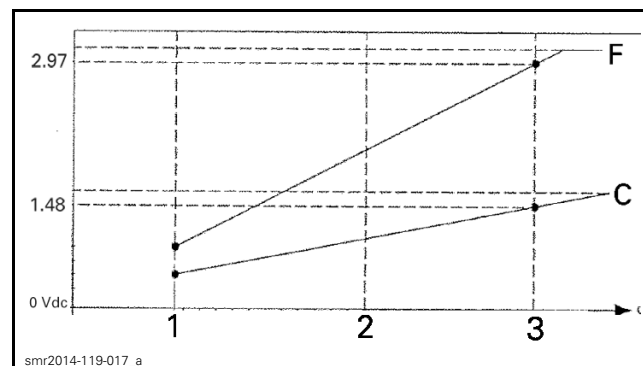
If BUDS2 does not show BRLS percentage moving or if reading is erratic:

- 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 529 036 276)

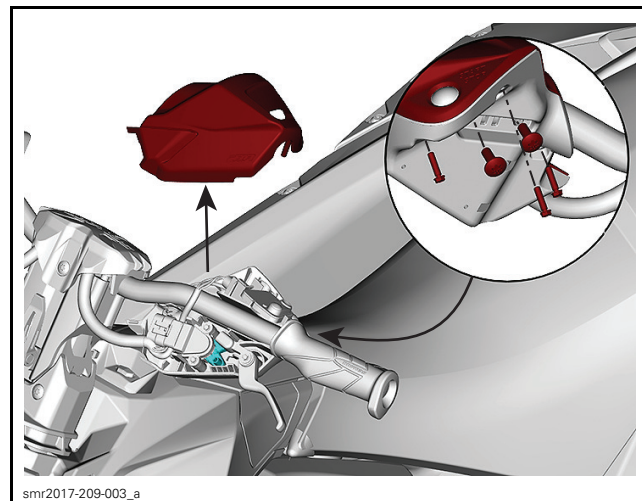


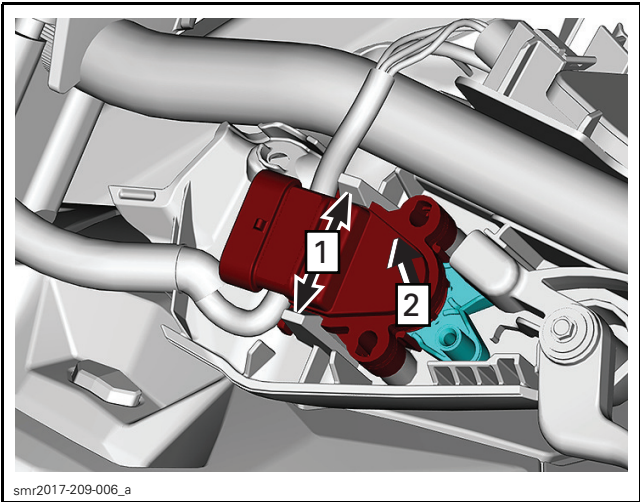
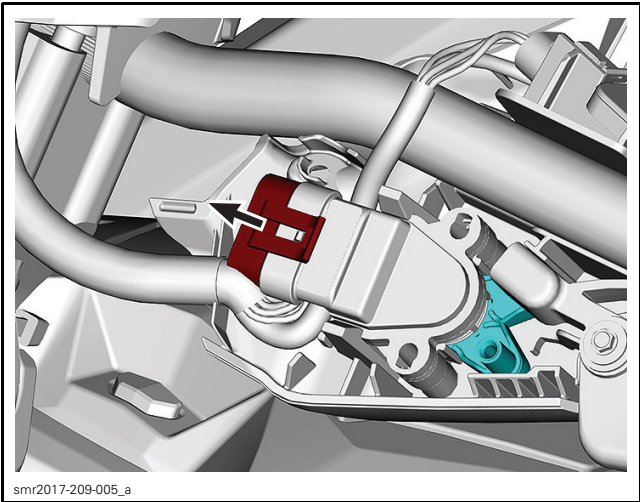
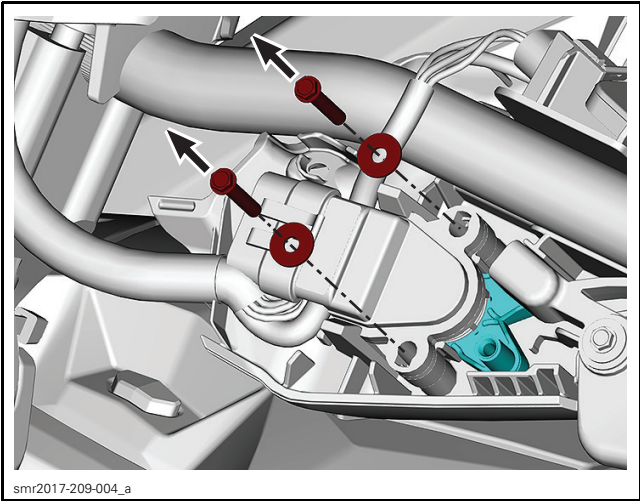
APPROXIMATE BRLS SIGNAL VOLTAGE CURVE PINS F AND C

1. BRLS released
2. BRLS at 50% pulled
3. BRLS fully pulled

## Removing the BRLS

Follow image sequence.

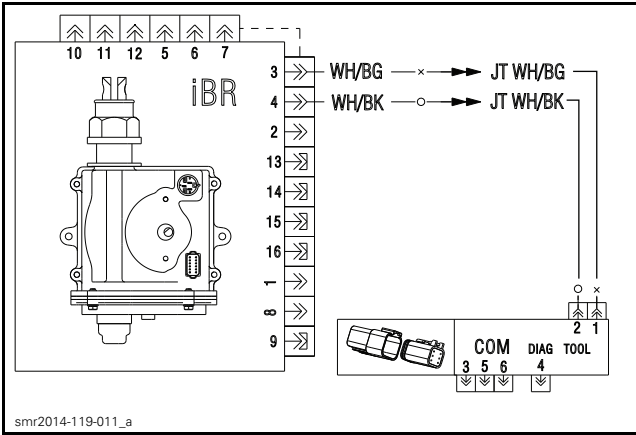




| TIGHTENING TORQUE              |                                             |
|--------------------------------|---------------------------------------------|
| K40 x 16 hexagonal screws (3x) | 1.5 N•m ± 0.2 N•m<br>(13 lbf•in ± 2 lbf•in) |
| M6 x 16 Torx screws (2x)       | 2 N•m ± 1 N•m<br>(18 lbf•in ± 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.



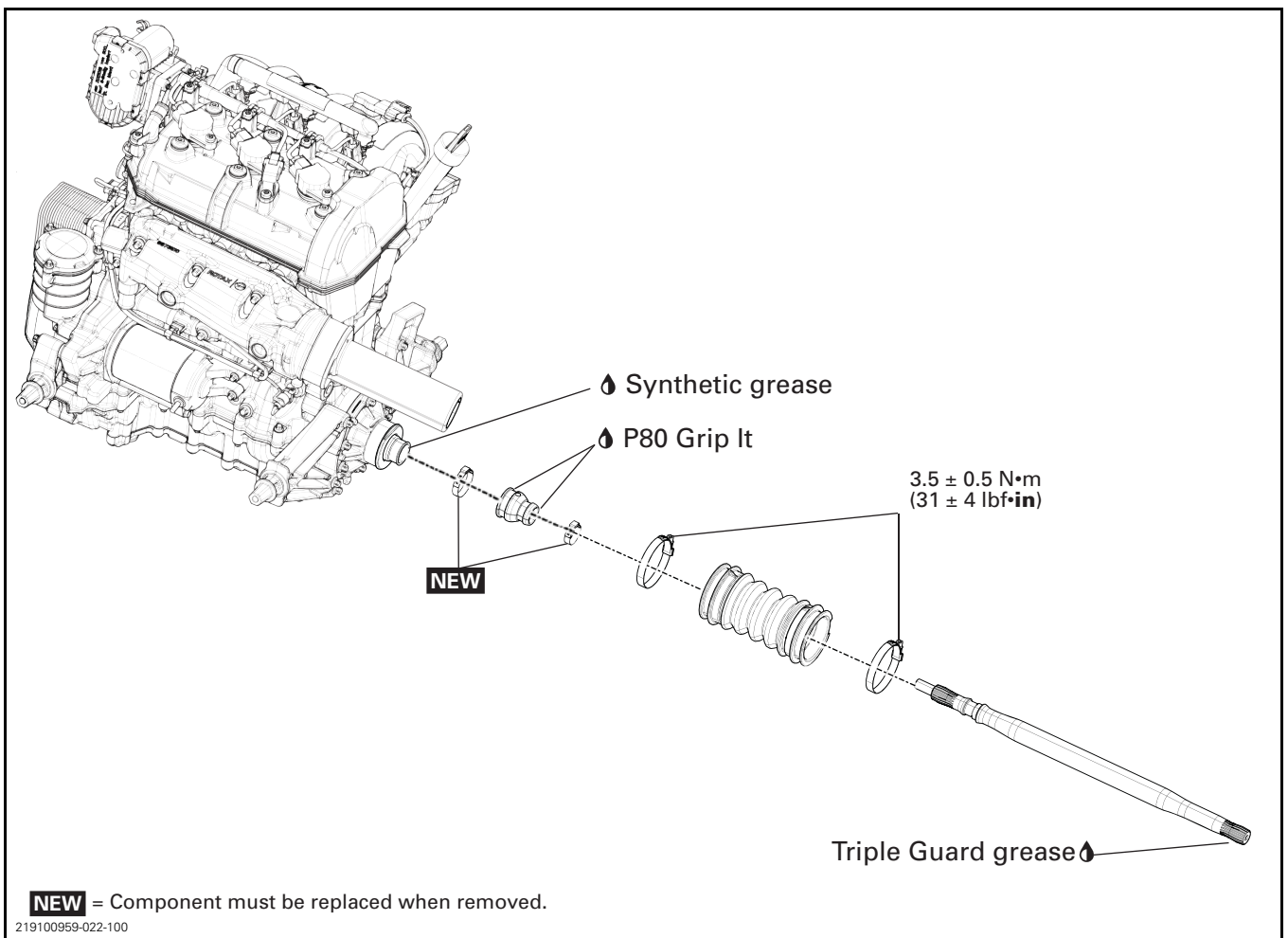
# DRIVE SHAFT

## SERVICE TOOLS

| Description             | Part Number       | Page |
|-------------------------|-------------------|------|
| OETIKER PLIER .....     | 295 000 070 ..... | 5    |
| PTO SHAFT ADAPTER ..... | 529 036 401 ..... | 4    |

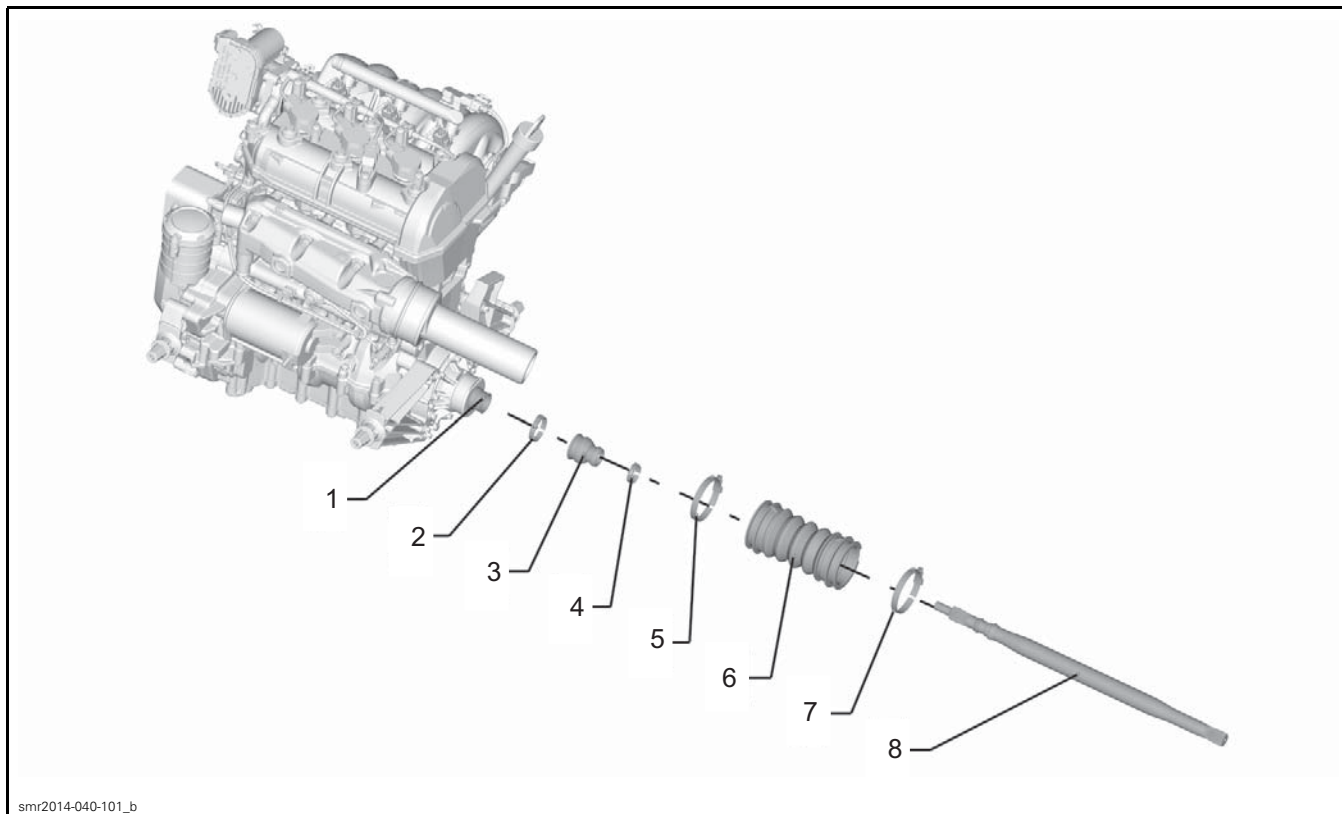
## SERVICE PRODUCTS

| Description                                   | Part Number       | Page |
|-----------------------------------------------|-------------------|------|
| CLUTCH AND PULLEY FLANGE CLEANER PRO S1 ..... | 779244 .....      | 4    |
| P80 GRIP-IT .....                             | 296 000 406 ..... | 4    |
| PULLEY FLANGE CLEANER (F) .....               | 619 600 022 ..... | 4    |
| SYNTHETIC GREASE (EUR) .....                  | 779231 .....      | 4    |
| SYNTHETIC GREASE .....                        | 779162 .....      | 4    |



## GENERAL

### NOMENCLATURE



1. PTO sleeve
2. Large Oeticker clamp
3. Drive shaft inner bellows
4. Small Oeticker clamp
5. Clamp
6. Drive shaft outer bellows
7. Gear clamp
8. Drive shaft

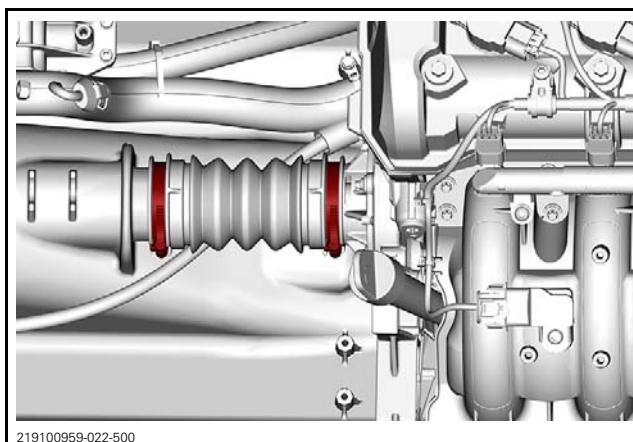
## PROCEDURES

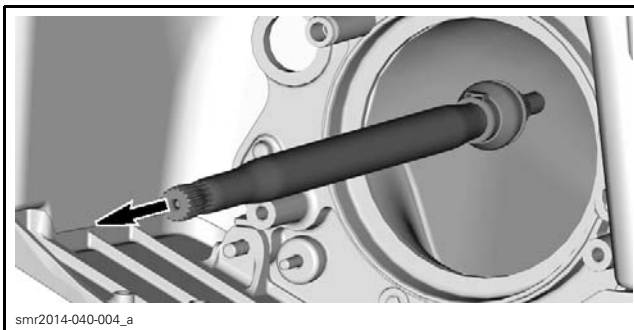
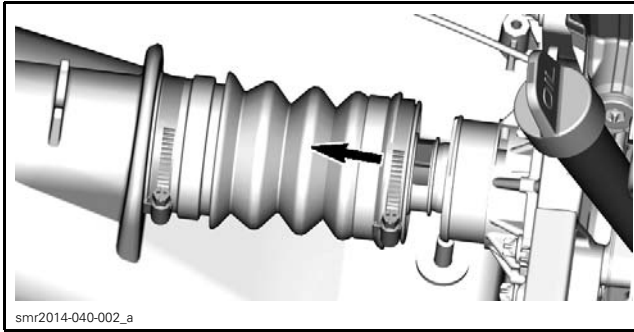
### DRIVE SHAFT

#### Drive Shaft Access

1. Remove central body. Refer to *BODY*.
2. Remove jet pump. Refer to *JET PUMP*.
3. Remove muffler. Refer to *EXHAUST SYSTEM*.

#### Removing the Drive Shaft

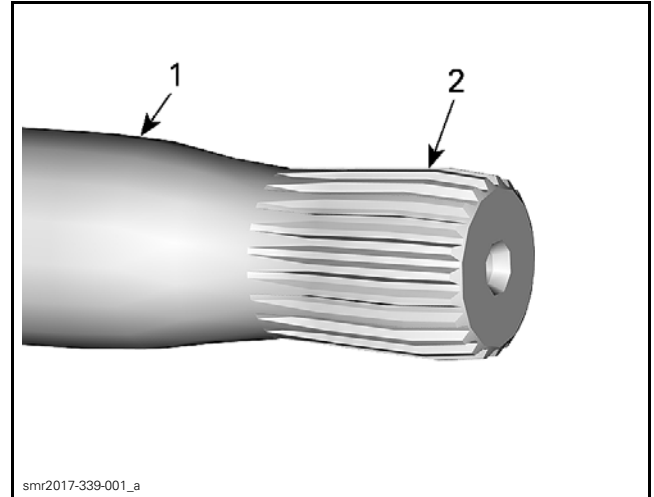




## Inspecting the Drive Shaft

Inspect condition of drive shaft splines. If splines are damaged, replace drive shaft.

With your finger nail, feel machined surface of drive shaft. If any irregular surface is found, replace drive shaft.

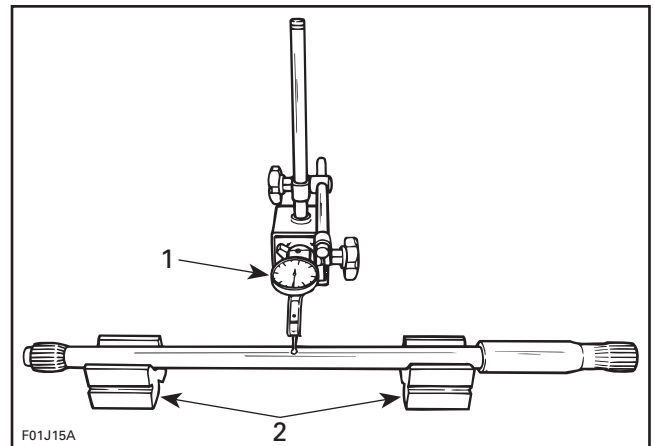


### TYPICAL

1. Surface condition
2. Splines condition

Excessive deflection could cause vibration and damage to drive shaft splines, impeller or floating ring.

Place drive shaft on V-blocks and set-up a dial gauge in center of shaft. Slowly rotate shaft; difference between highest and lowest dial gauge reading is deflection. Refer to the following illustration.



### MEASURING DRIVE SHAFT DEFLECTION

1. Dial gauge
2. V-blocks

| MAXIMUM DEFLECTION |
|--------------------|
| 0.5 mm (.02 in)    |

## Installing the Drive Shaft

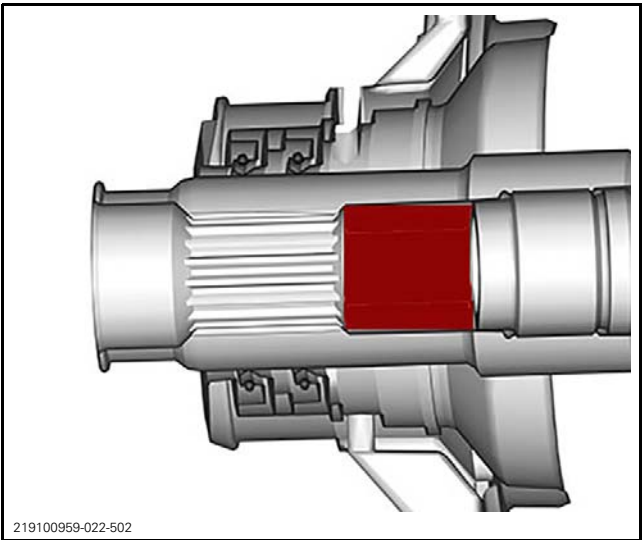
**NOTICE** The PTO sleeve and the drive shaft must be free of grease or other contaminants.

Subsection XX (DRIVE SHAFT)

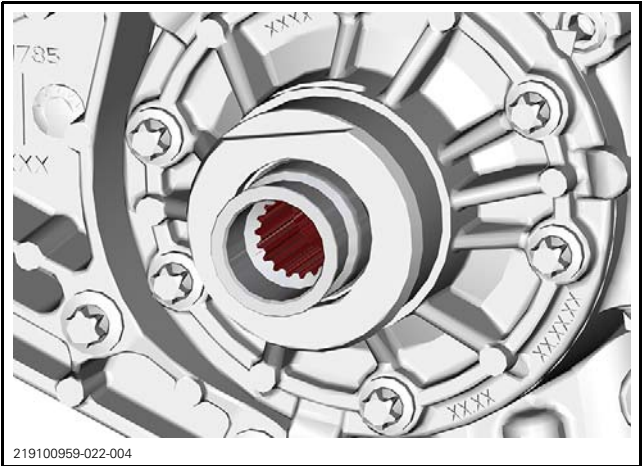
| SERVICE PRODUCT                                         |
|---------------------------------------------------------|
| CLUTCH AND PULLEY FLANGE CLEANER<br>PRO S1 (P/N 779244) |

1. Apply 6 g (.2 oz) of grease behind the PTO sleeve splines.

| SERVICE PRODUCT     |                                        |
|---------------------|----------------------------------------|
| Scandinavia         | SYNTHETIC GREASE<br>(EUR) (P/N 779231) |
| All other countries | SYNTHETIC GREASE<br>(P/N 779162)       |



2. Fill splines cavities of the PTO sleeve with the same grease.



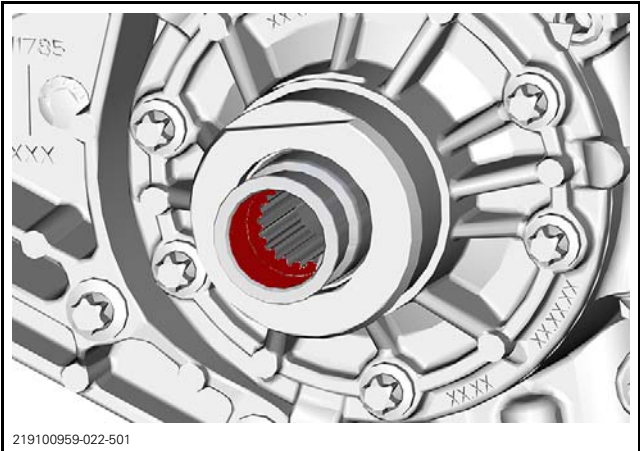
3. Fill splines cavities of the PTO shaft adapter with the same grease.

| REQUIRED TOOL                          |
|----------------------------------------|
| PTO SHAFT ADAPTER<br>(P/N 529 036 401) |



4. Insert the greased PTO shaft adaptor into the PTO sleeve splines and wipe off excess grease before removing it.

**NOTE:** If no grease has come out, repeat with slightly more grease in PTO sleeve splines until a small amount comes out. Wipe off excess grease.



5. Clean the outer flange of the PTO sleeve and the drive shaft inner bellows.

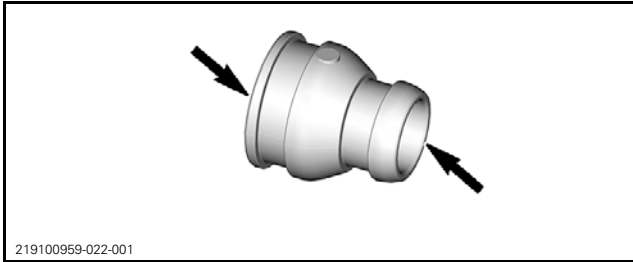
| SERVICE PRODUCT     |                                                            |
|---------------------|------------------------------------------------------------|
| Scandinavia         | PULLEY FLANGE<br>CLEANER (F) (P/N 619<br>600 022)          |
| All other countries | CLUTCH AND PULLEY<br>FLANGE CLEANER PRO<br>S1 (P/N 779244) |

6. If the drive shaft outer bellows was completely removed, reinstall it on hull.

7. Lubricate the inside of the drive shaft inner bellows.

| SERVICE PRODUCT               |
|-------------------------------|
| P80 GRIP-IT (P/N 296 000 406) |



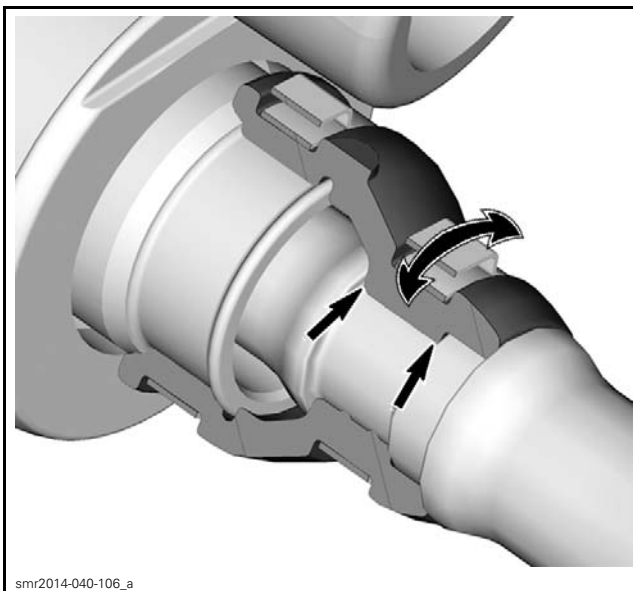


**NOTICE** Do not use any other type of lubricant.

8. Install the drive shaft inner bellows on the drive shaft.

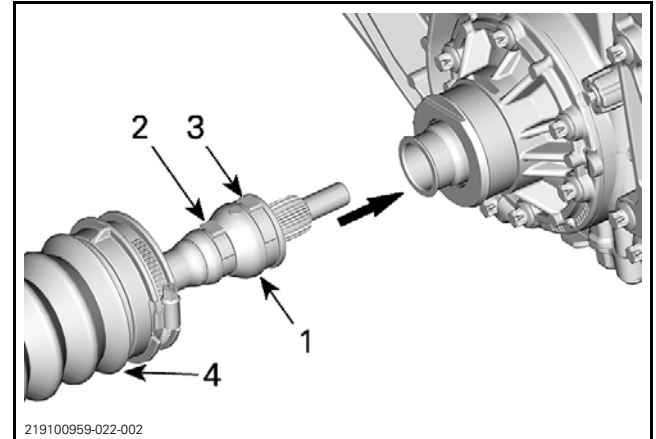
9. Install the small Oetiker clamp on the drive shaft inner bellows.

**NOTICE** The clamp turns only if the bellows is correctly positioned in the drive shaft groove.



10. Crimp the small Oetiker clamp.

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



1. Drive shaft inner bellows
2. Small Oetiker clamp
3. Big Oetiker clamp
4. Drive shaft outer bellows

11. Install the drive shaft into the PTO sleeve.

12. Pull back the drive shaft outer bellows and crimp the big Oetiker clamp on PTO sleeve.

13. Position the drive shaft outer bellows and tighten the clamps.

| TIGHTENING TORQUE                |                                             |
|----------------------------------|---------------------------------------------|
| Drive shaft outer bellows clamps | 3.5 N•m ± 0.5 N•m<br>(31 lbf•in ± 4 lbf•in) |

Test watercraft then ensure there is:

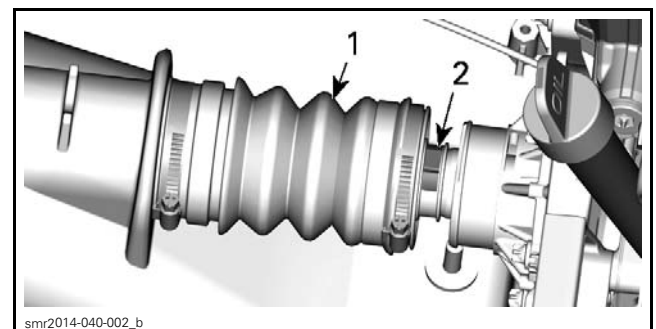
- No water intrusion by the thru-hull fitting area (drive shaft outer bellows).

## DRIVE SHAFT BELLOWS

### Inspecting the Drive Shaft Outer Bellows

Remove central body. Refer to *BODY*.

Inspect the condition of drive shaft outer bellows. If there is any damage or evidence of wear, replace it.



- DRIVE SHAFT BELLOWS**
1. Drive shaft outer bellows
  2. Drive shaft inner bellows

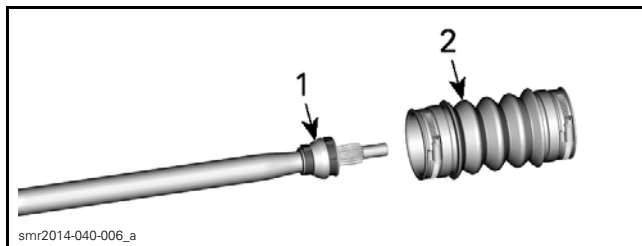
---

## Subsection XX (DRIVE SHAFT)

---

### Removing the Drive Shaft Bellows

Remove drive shaft. Refer to *DRIVE SHAFT*.



#### **DRIVE SHAFT BELLOWS - DISASSEMBLED**

1. *IDrive shaft inner bellows*
2. *Drive shaft outer bellows*

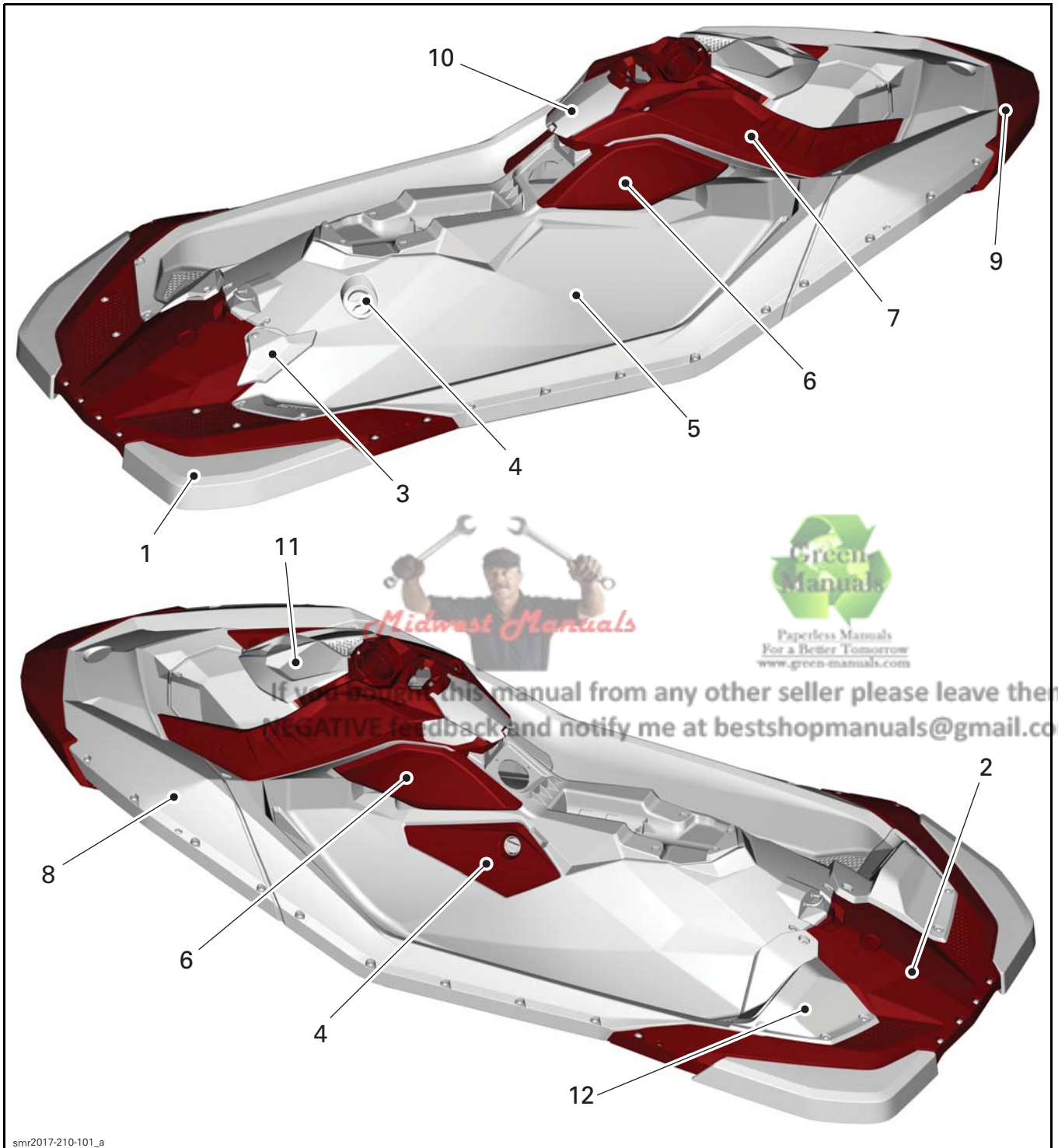
Inspect the condition of inner bellows. If there is any damage or evidence of wear, replace it.

### Installing the Drive Shaft Bellows

Refer to *INSTALLING THE DRIVE SHAFT*.

# BODY

*Body (Parts Nomenclature)*



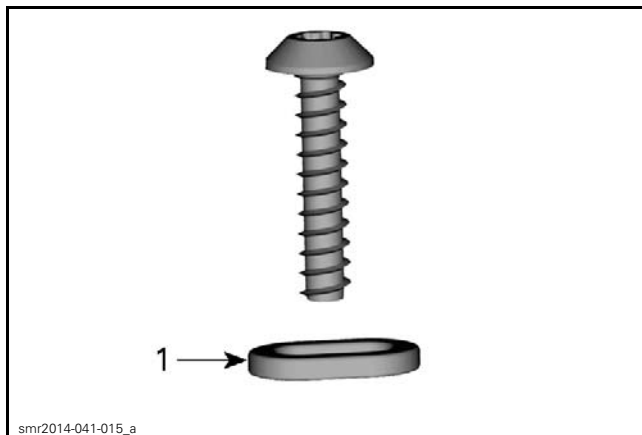
smr2017-210-101\_a

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

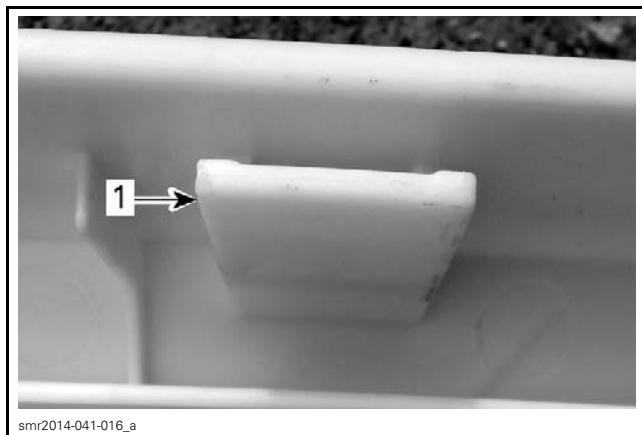
Inspect all oblong washers when removing body panels and assemblies. Any damage to an oblong washer requires it to be replaced.



**TYPICAL SELF TAPPING BODY SCREW**

1. Oblong washer

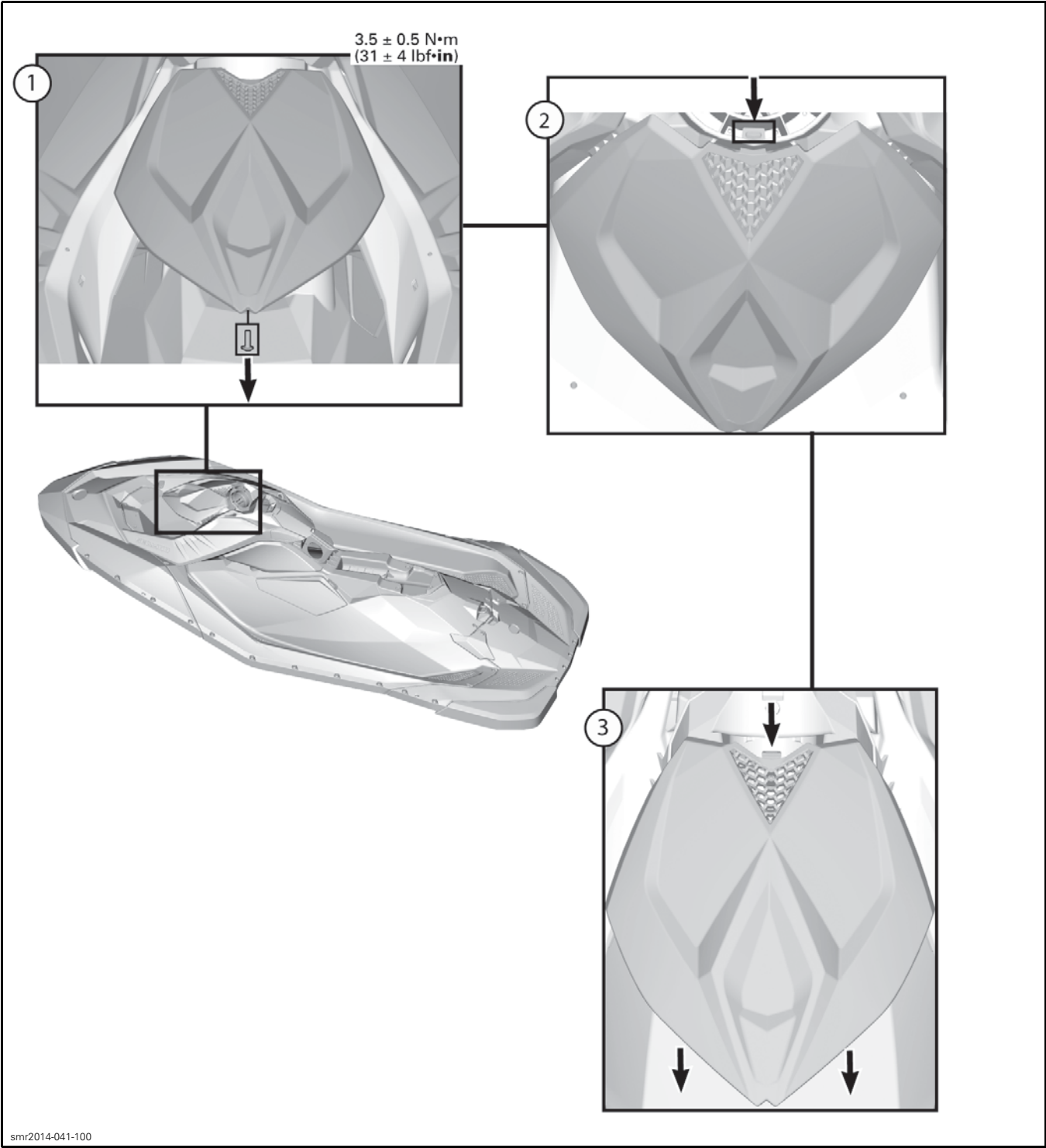
Body panels are held in place on the hull by alignment tabs on the body panels. Always ensure that alignment tabs are properly inserted into grooves in hull.



**TYPICAL**

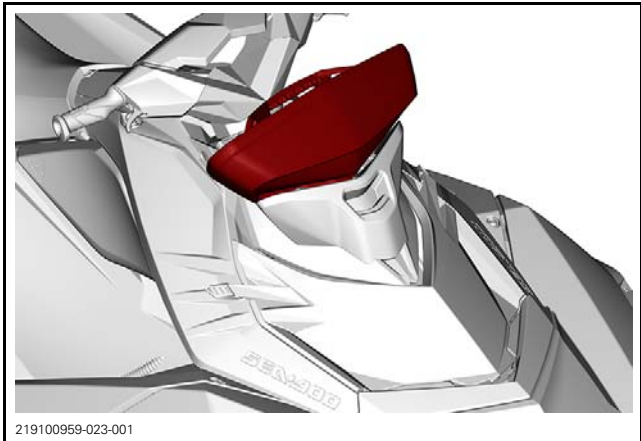
1. Alignment tab

FRONT TRIM (WITHOUT AUDIO SYSTEM)

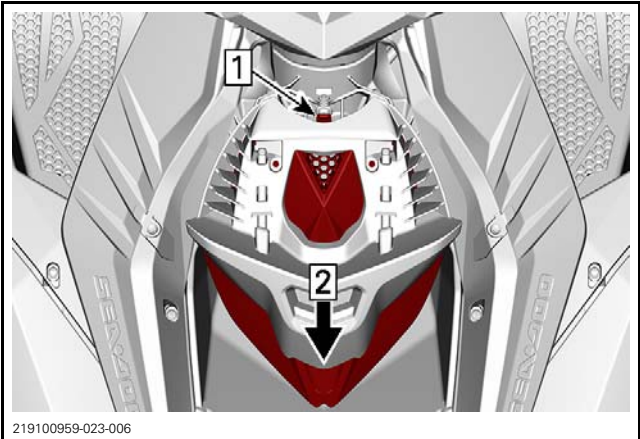
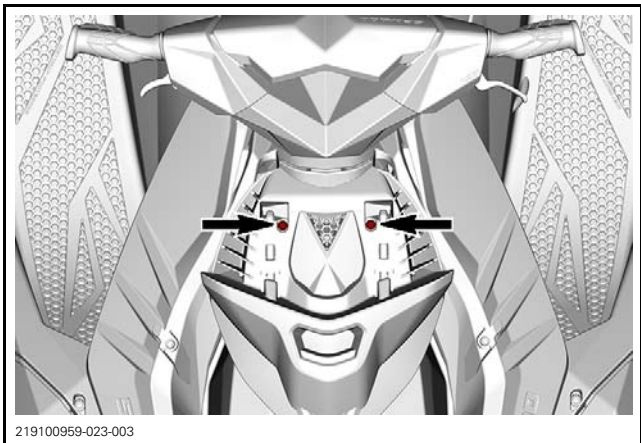
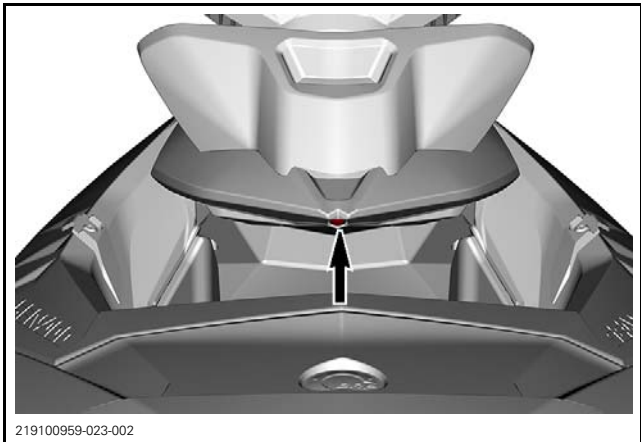


FRONT TRIM (WITH AUDIO SYSTEM)

Remove audio system.



Remove the following fasteners.

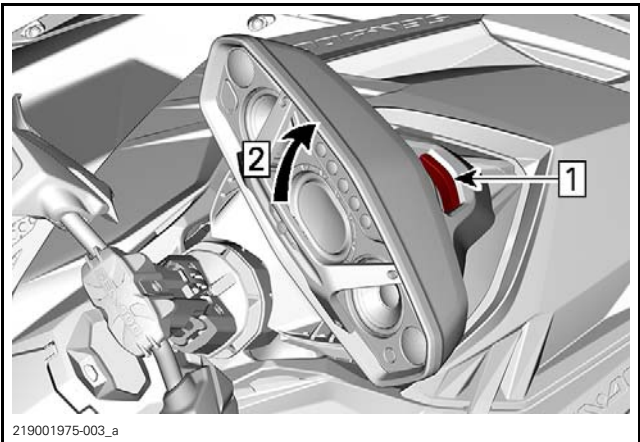


Step 1: Push tab  
Step 2: Slide support toward the front

AUDIO SYSTEM

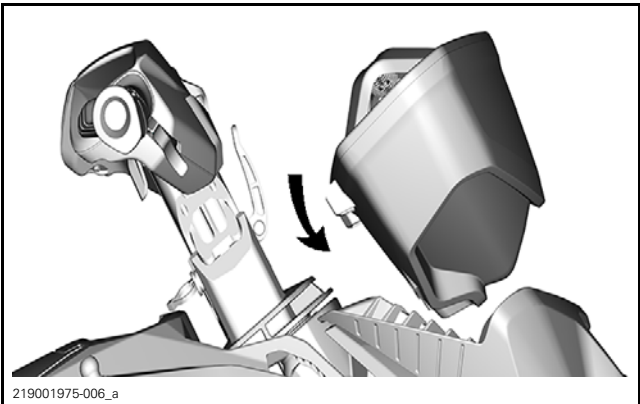
To remove the audio system;

1. Push button
2. Lift handle



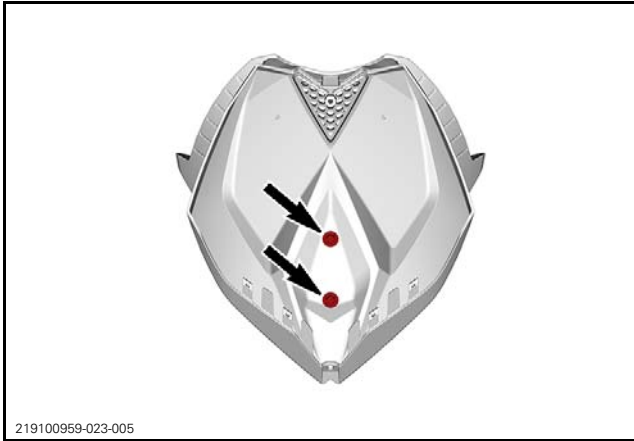
Step 1: Push button  
Step 2: Lift handle

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*.

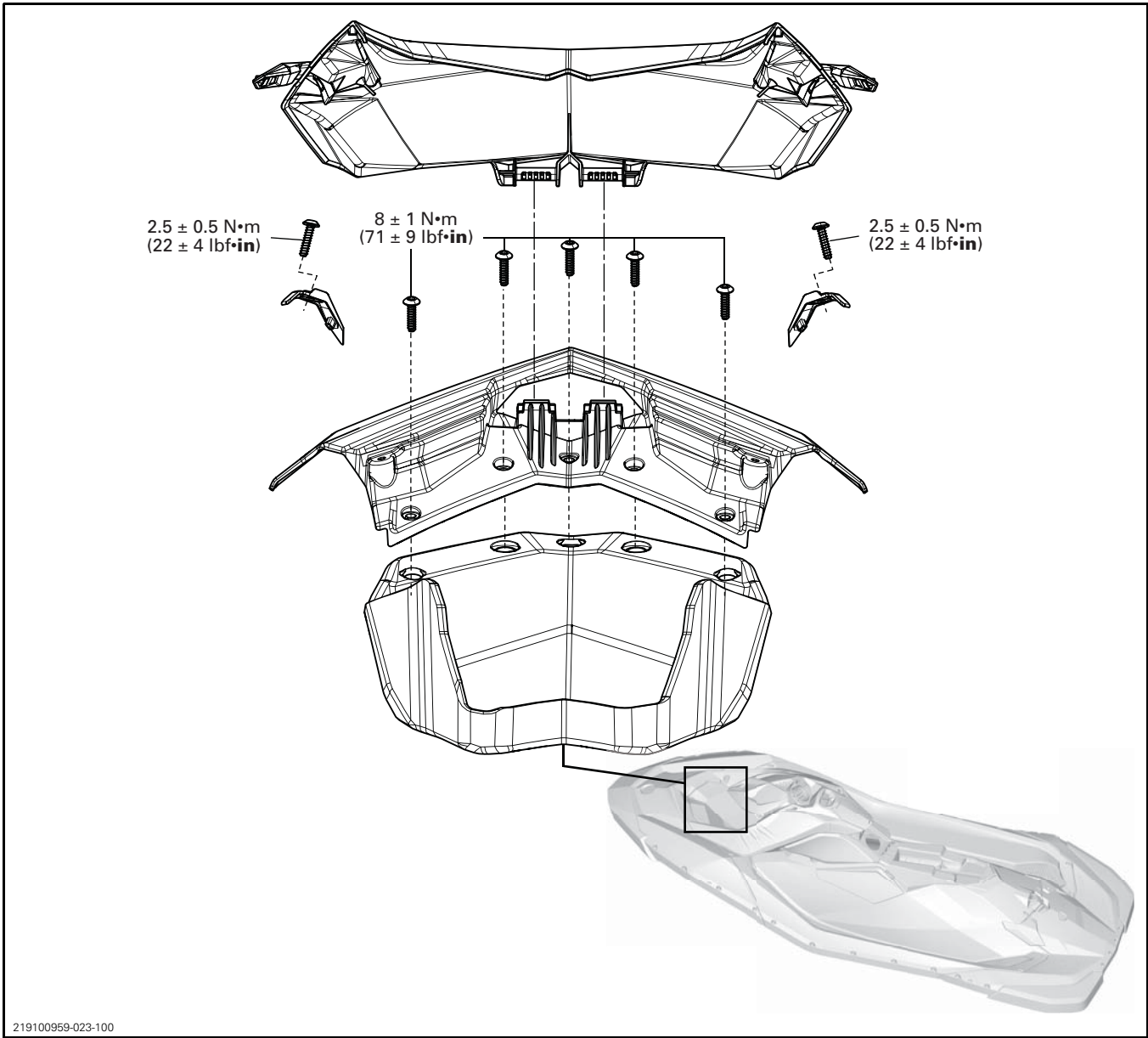
Remove the following fasteners.





STORAGE BIN

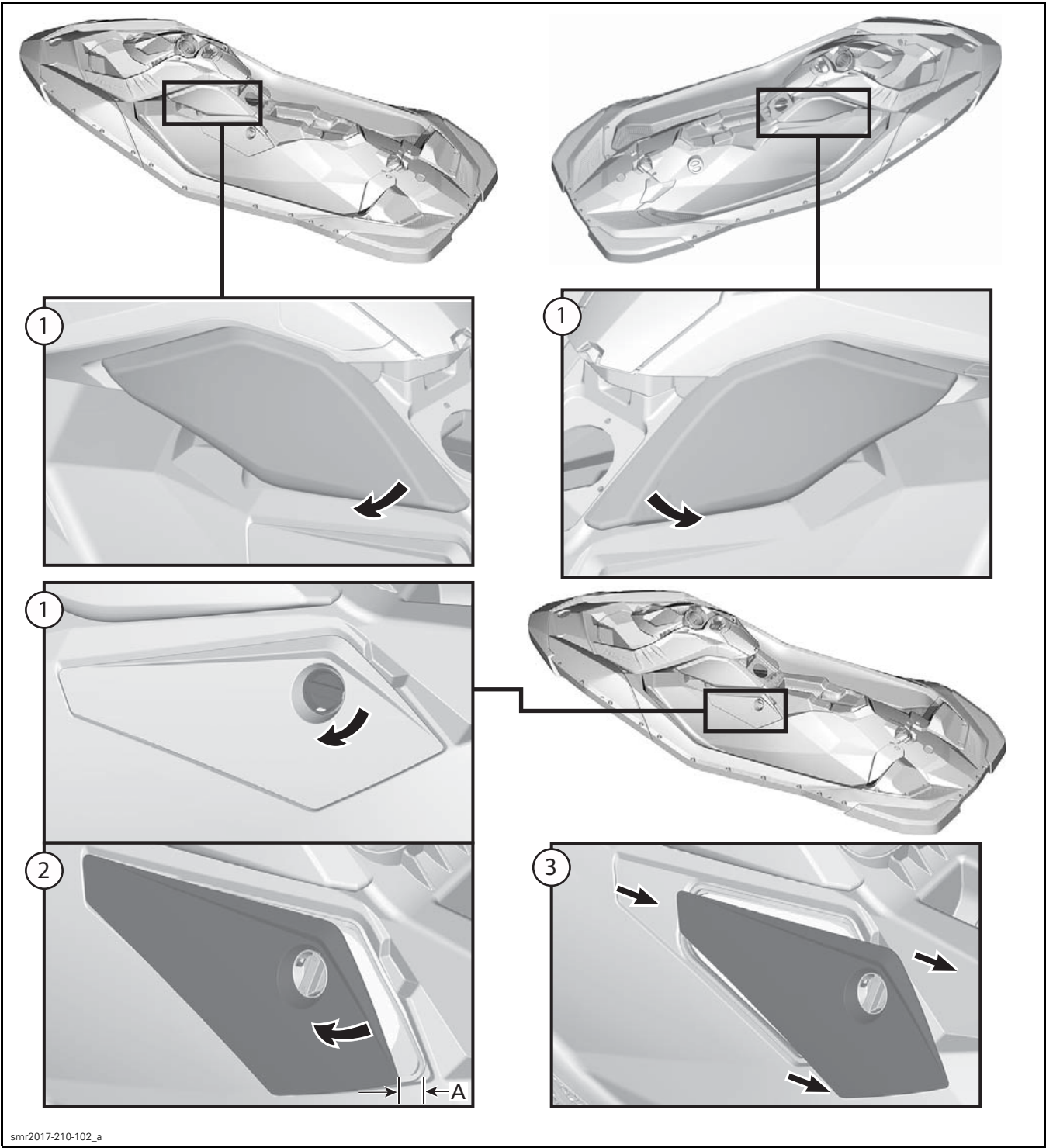
Convenience models



219100959-023-100

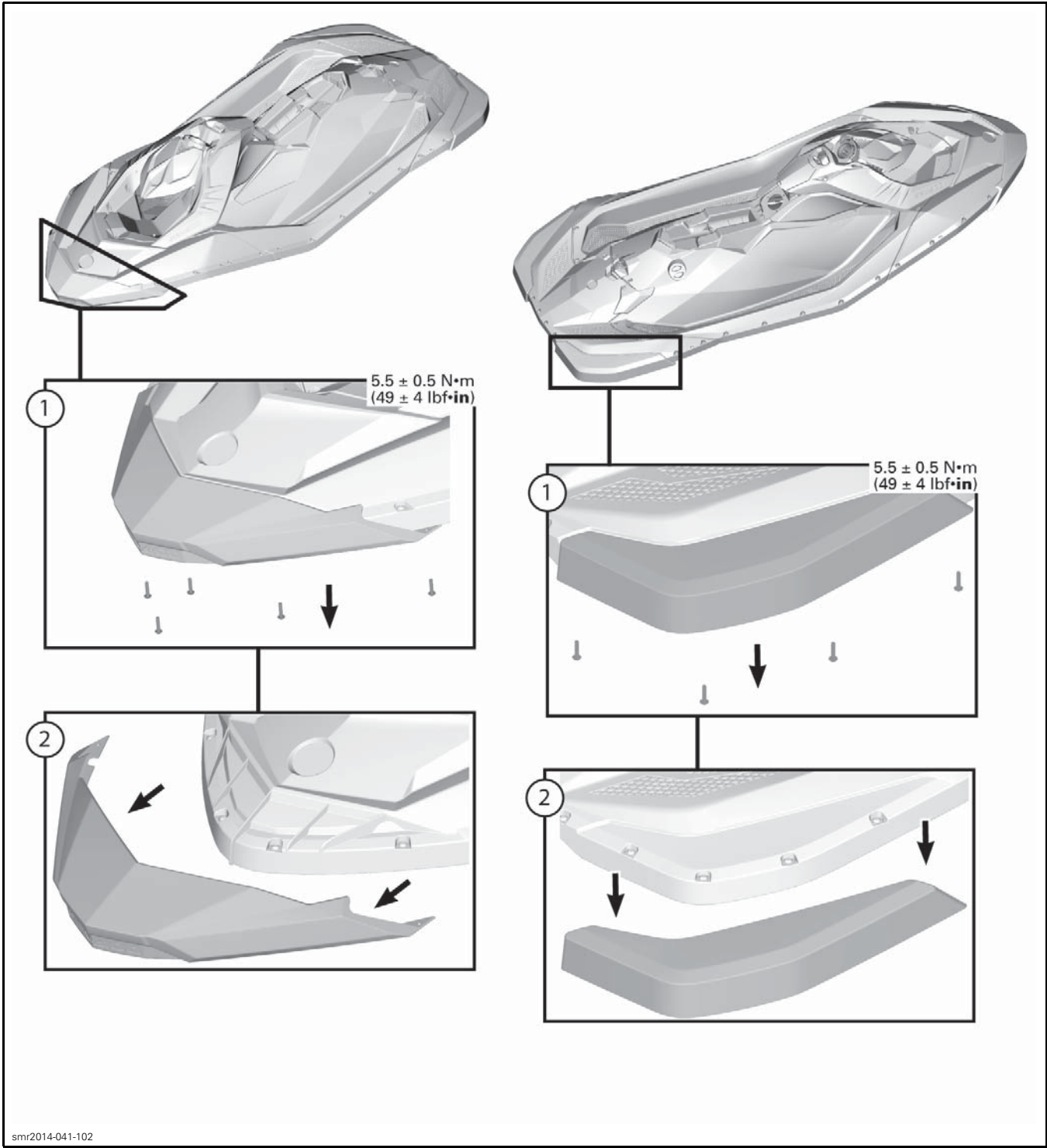


KNEE PADS AND LH SIDE ACCESS COVER

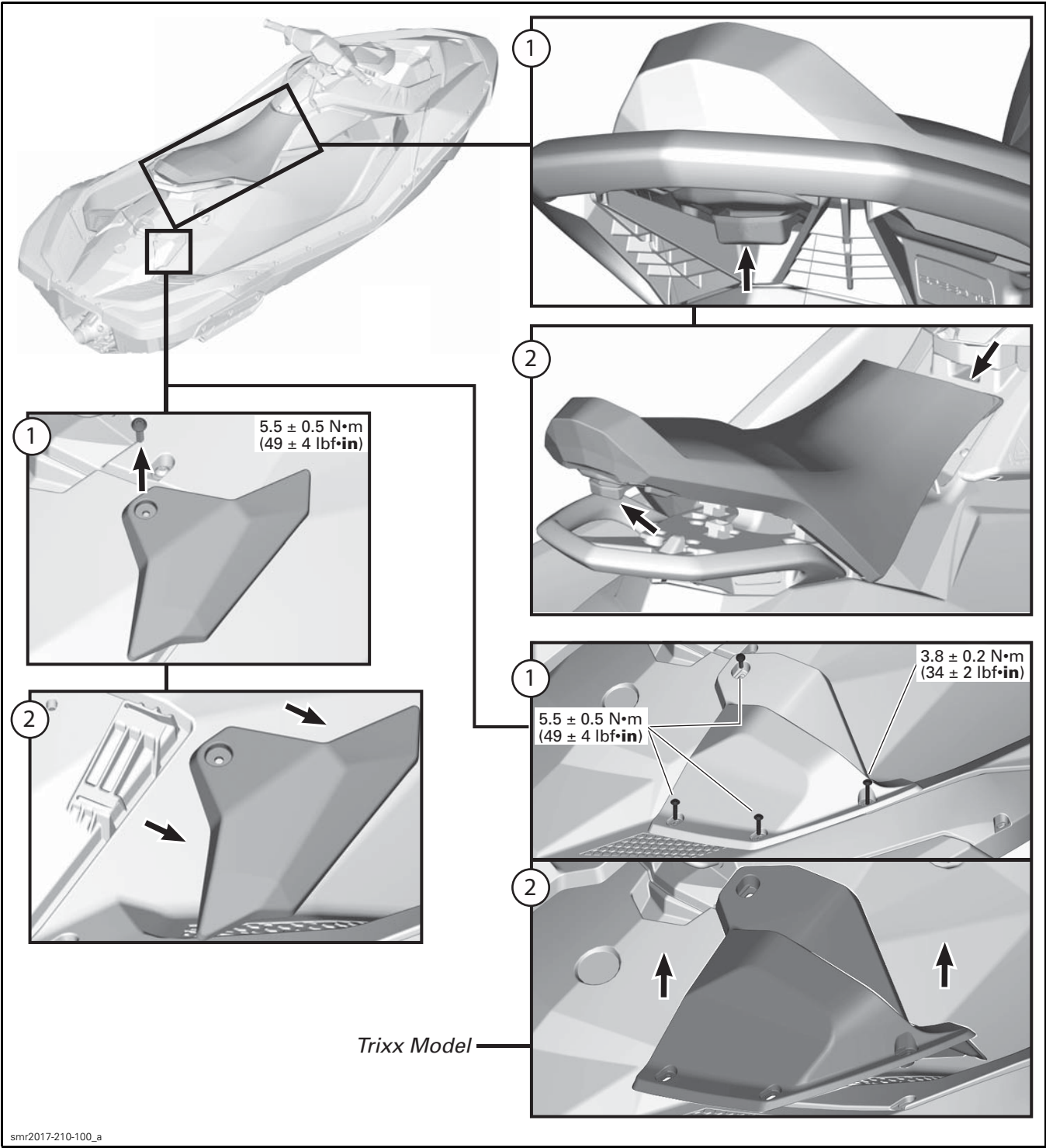


A. Maximum opening 10 mm (.4 in)

FRONT AND REAR BUMPERS



REAR PANEL TRIM AND SEAT

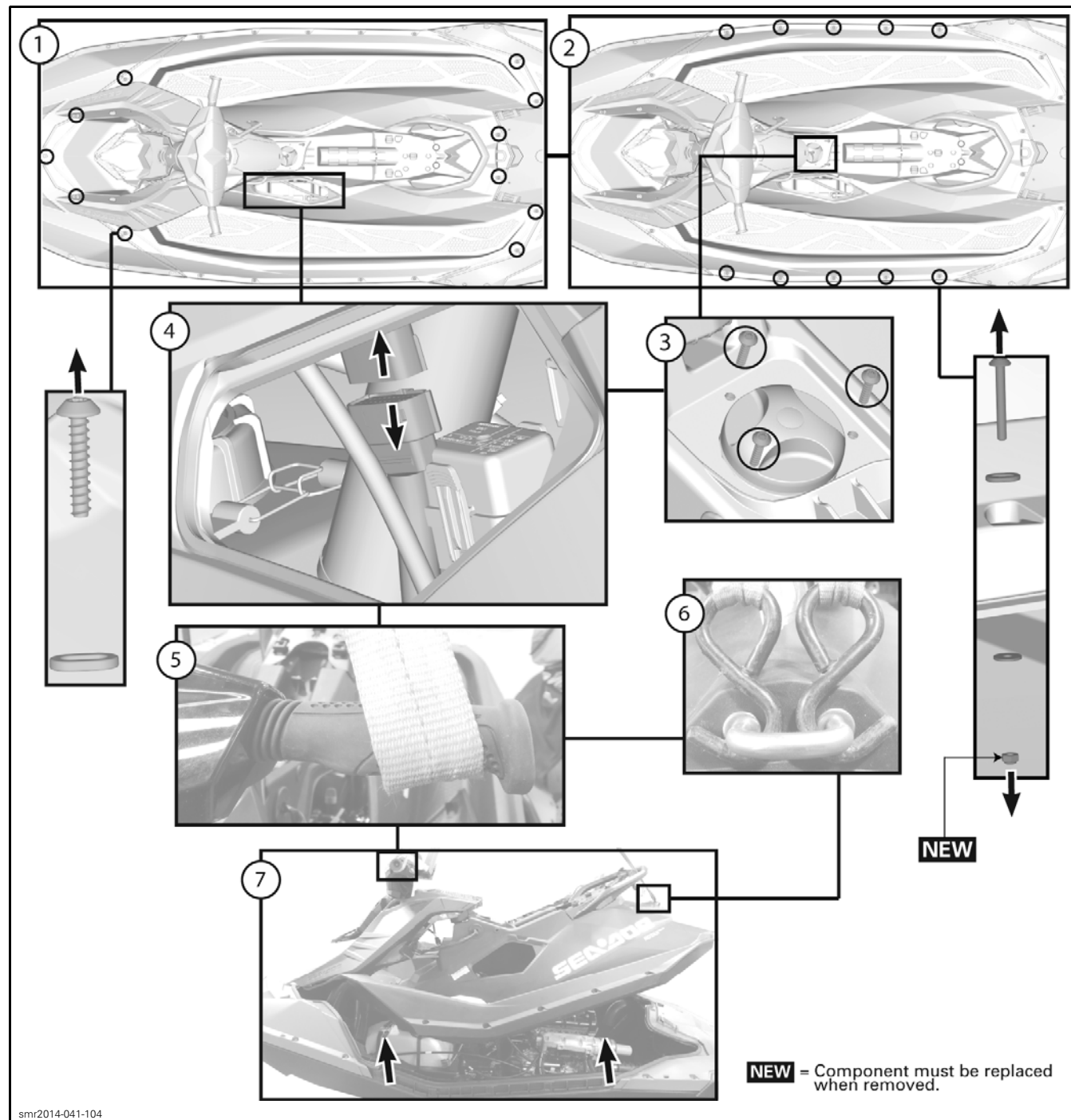


## CENTRAL BODY

### 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.

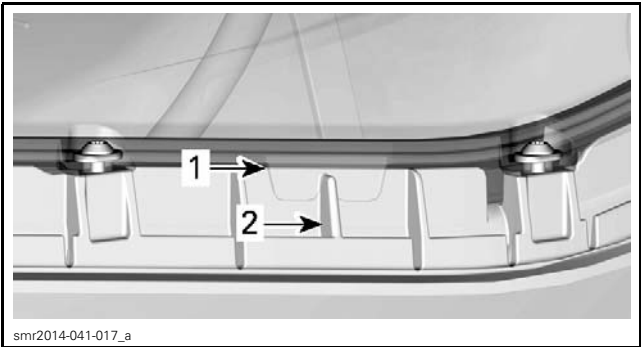


smr2014-041-104

New = Component must be replaced when removed

Installing the Central Body

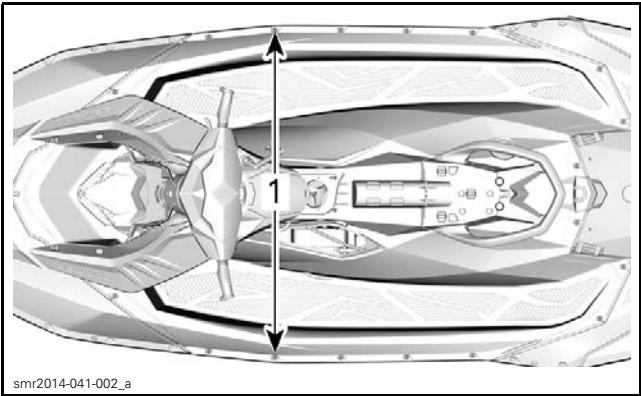
1. Properly place central body alignment tabs on hull.



CENTRAL BODY - STARBOARD SIDE VIEW

1. Alignment tab on central body  
2. Groove in hull

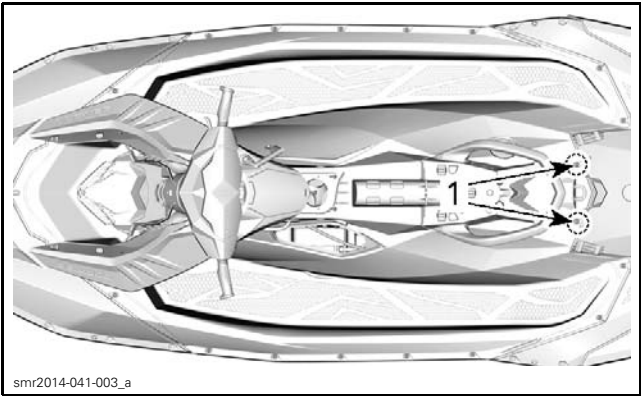
2. Install screws adjacent to alignment tabs first to ensure alignment tabs remain properly engaged.



CENTRAL BODY INSTALLATION

1. Screws adjacent to alignment tabs

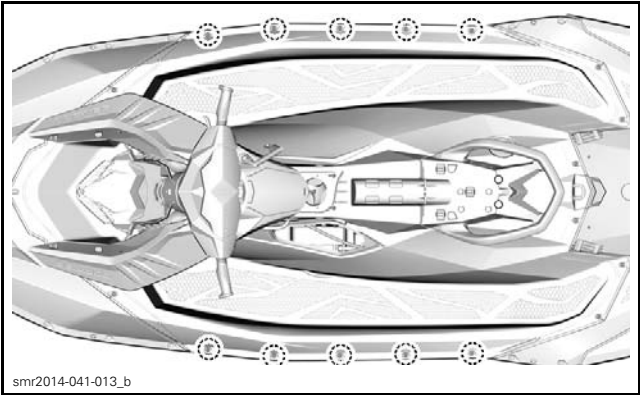
3. Install screws on rear support.



CENTRAL BODY INSTALLATION

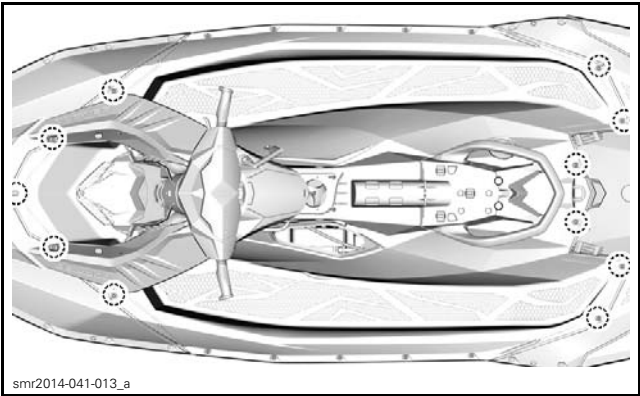
1. Screws on rear support

4. Tighten screws as per following illustrations.



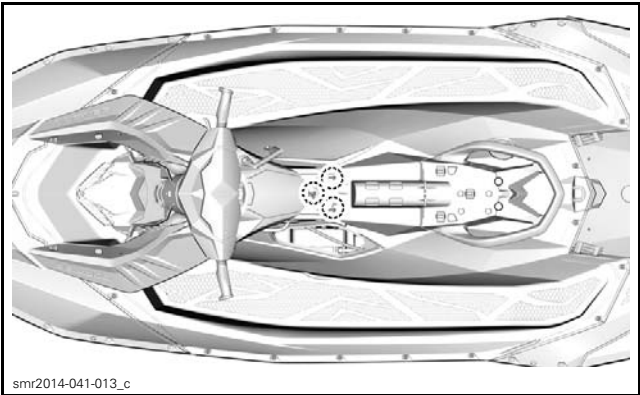
TIGHTENING TORQUE

|                    |                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------|
| M6 shoulder screws | $3.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$<br>(31 lbf•in $\pm$ 4 lbf•in) |
|--------------------|-------------------------------------------------------------------------------------------|



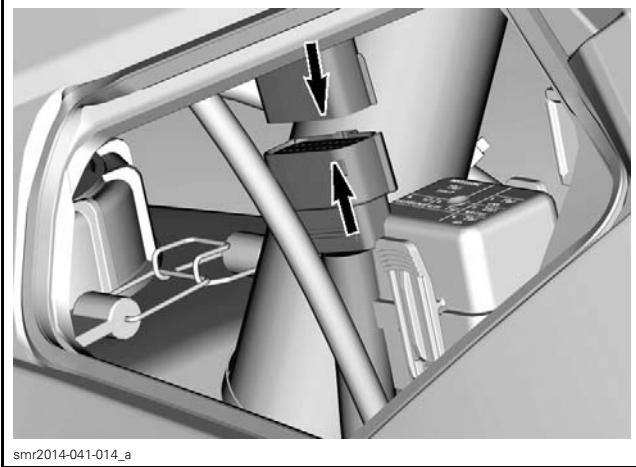
TIGHTENING TORQUE

|                          |                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------|
| M6.81 self tapping screw | $5.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$<br>(49 lbf•in $\pm$ 4 lbf•in) |
|--------------------------|-------------------------------------------------------------------------------------------|



TIGHTENING TORQUE

|                          |                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------|
| M6.81 self tapping screw | $5.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$<br>(49 lbf•in $\pm$ 4 lbf•in) |
|--------------------------|-------------------------------------------------------------------------------------------|

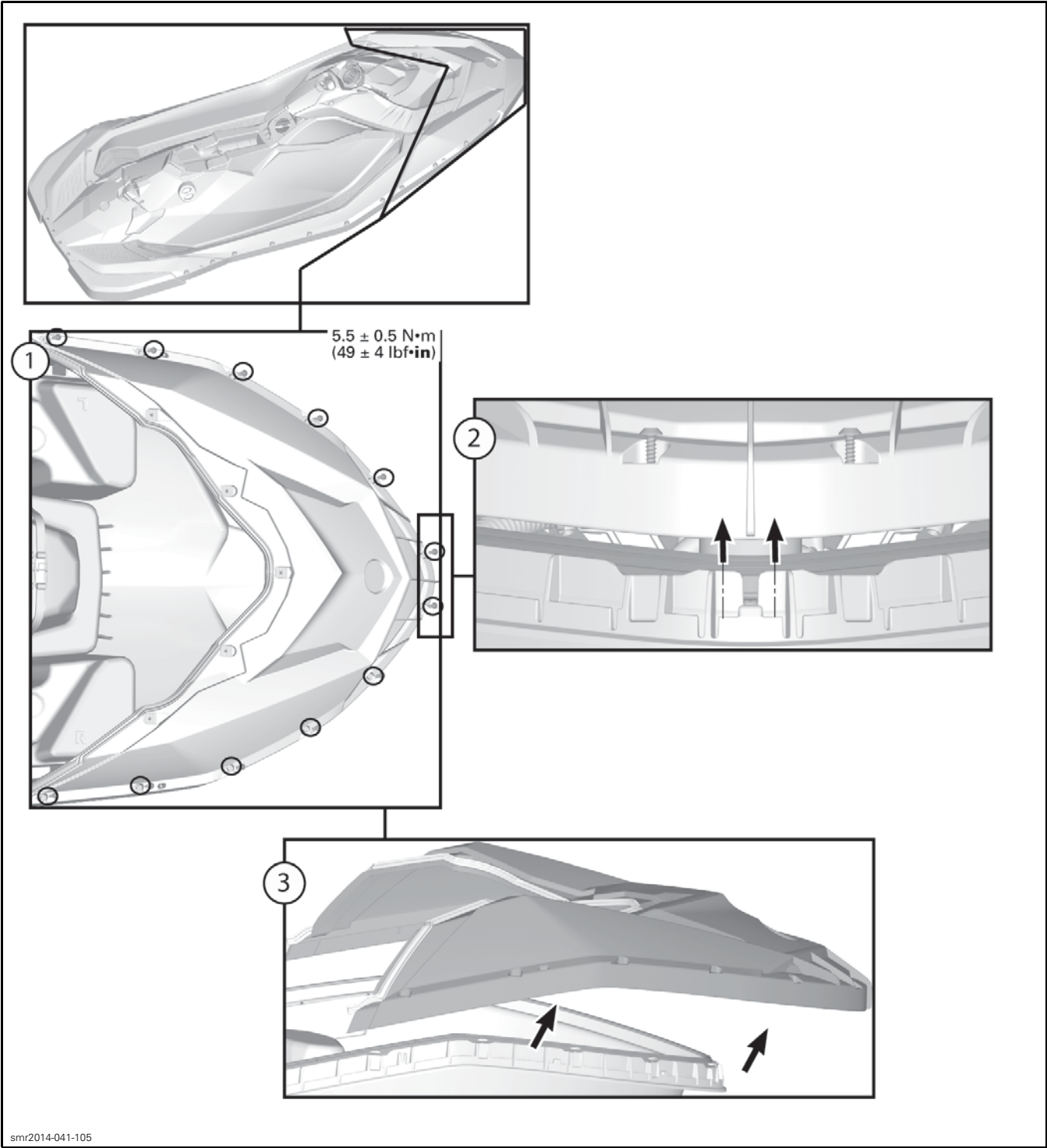


5. Connect steering cable to central body. Refer to *STEERING AND OTAS SYSTEMS*.
6. Install rear panel trims.



FRONT BODY

Remove central body.



## REAR BODY

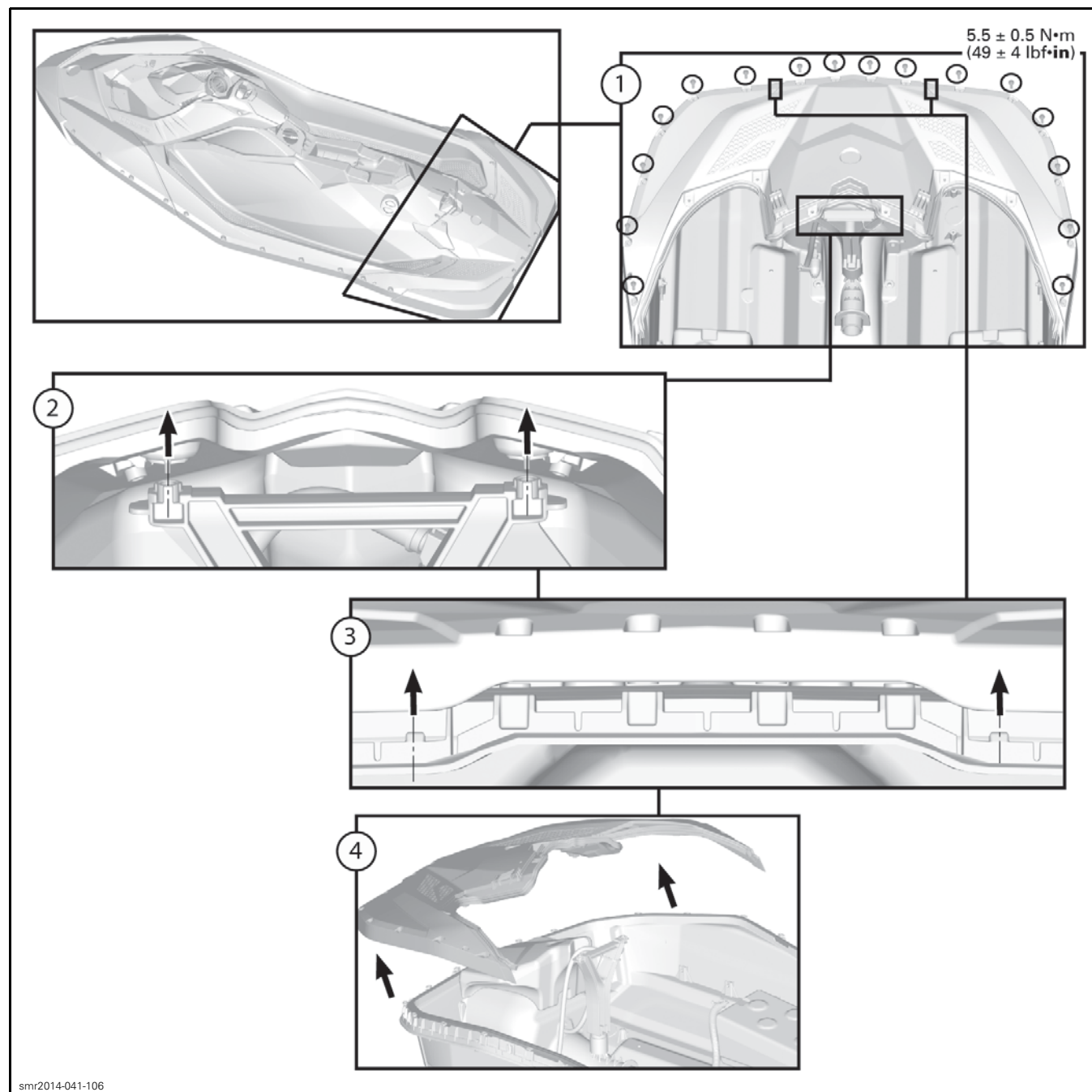
Remove central body.

### *2UP Models*

Remove rear bumpers.

### *3UP Models*

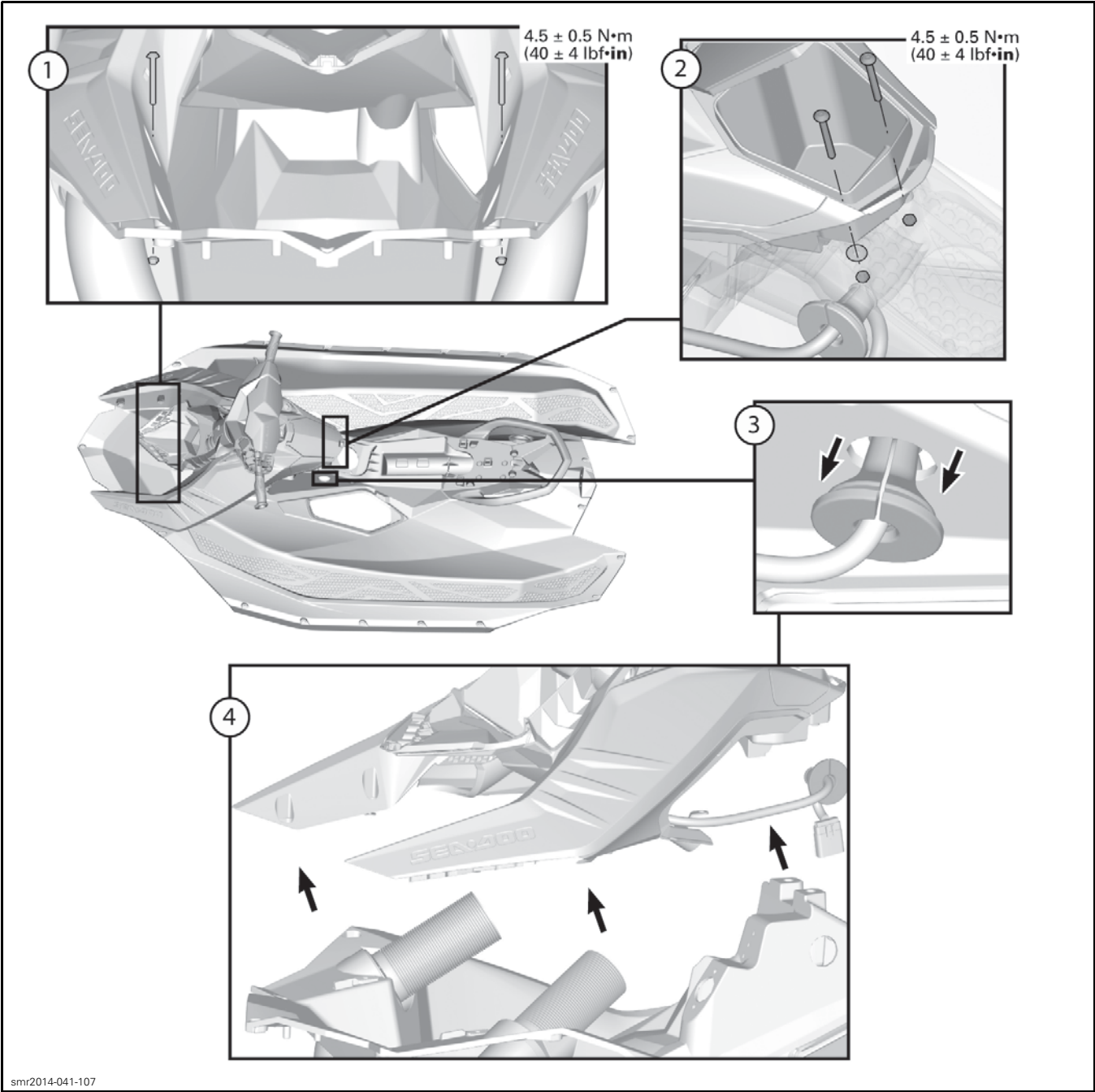
Remove boarding platform. Refer to *HULL*.



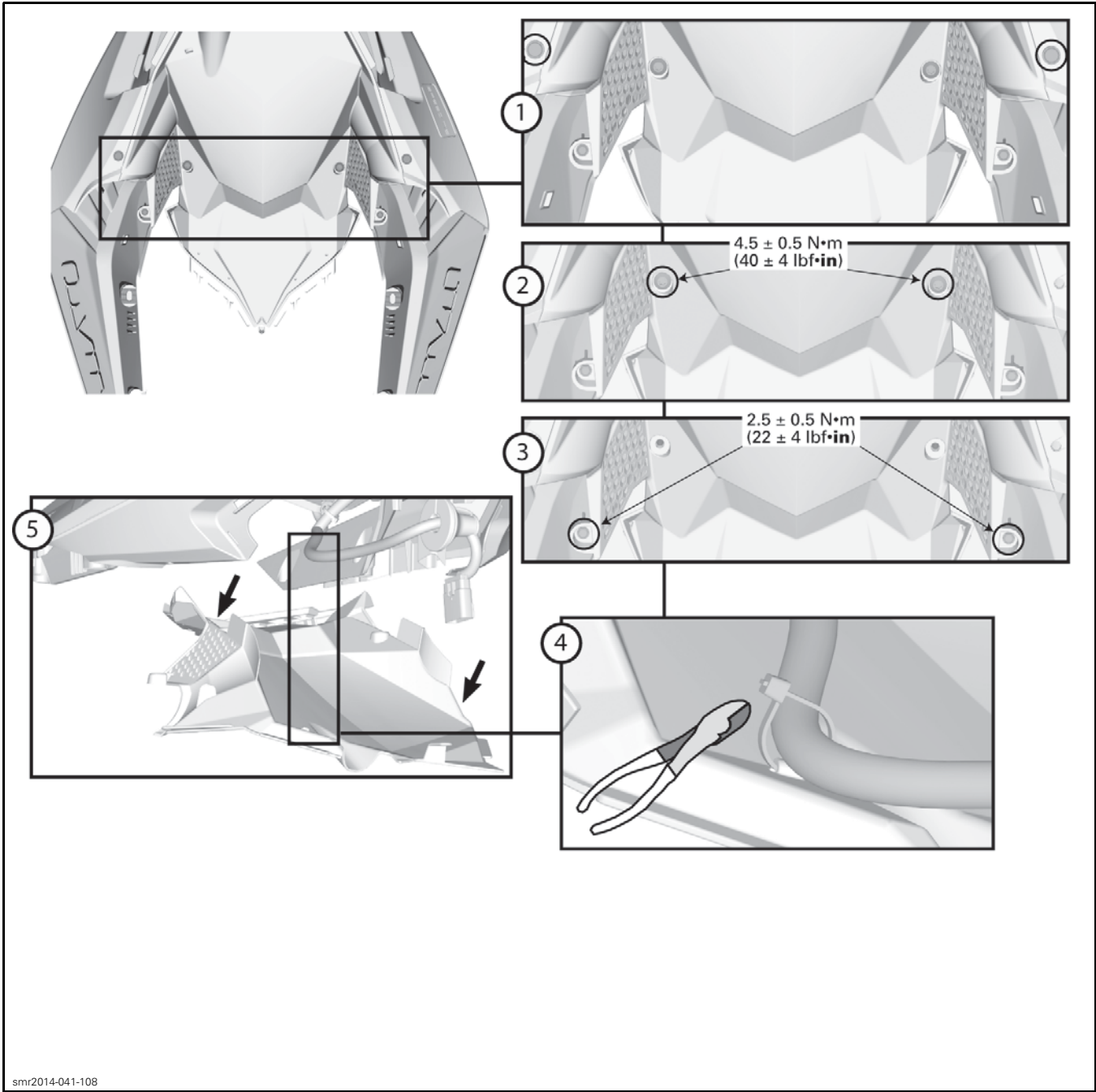


CONSOLE

Remove central body.



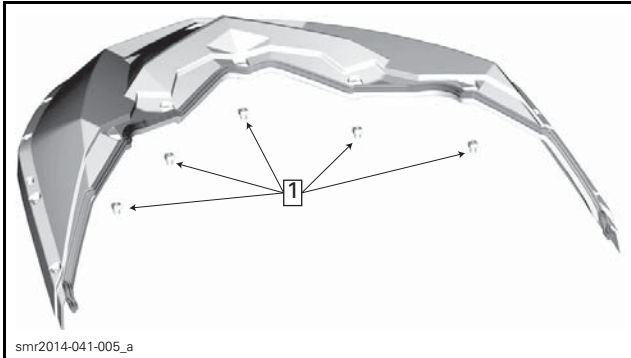
Disassembling the Console



CONSOLE - BOTTOM VIEW

## THREADED INSERTS

The front body has threaded inserts to accept central body screws.

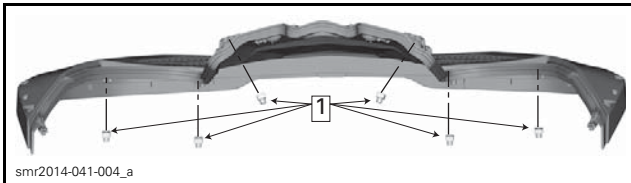


smr2014-041-005\_a

**FRONT BODY**

1. Threaded inserts

The rear body has threaded inserts to accept central body and rear panel trim screws.



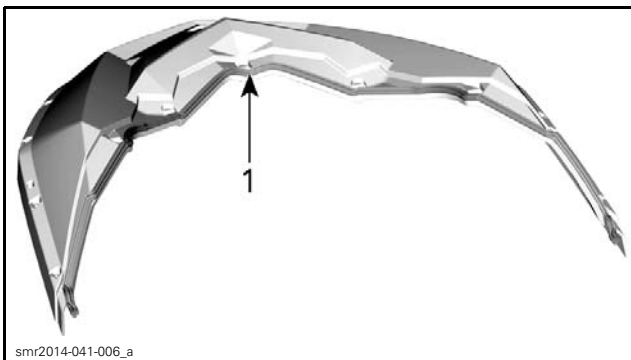
smr2014-041-004\_a

**REAR BODY**

1. Threaded inserts

**NOTE:** Similar replaceable threaded inserts may be found elsewhere on this watercraft.

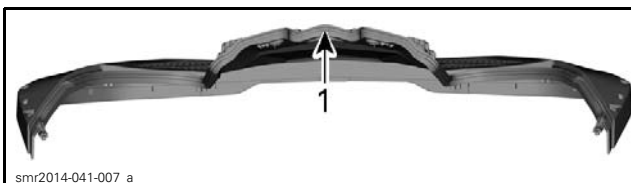
## FRONT AND REAR BODY SEALS



smr2014-041-006\_a

**FRONT BODY**

1. Front body seal



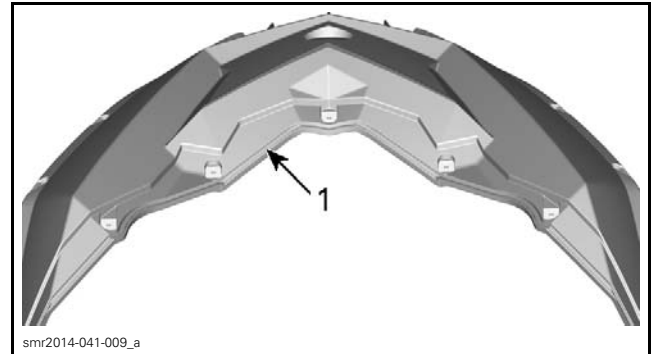
smr2014-041-007\_a

**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.

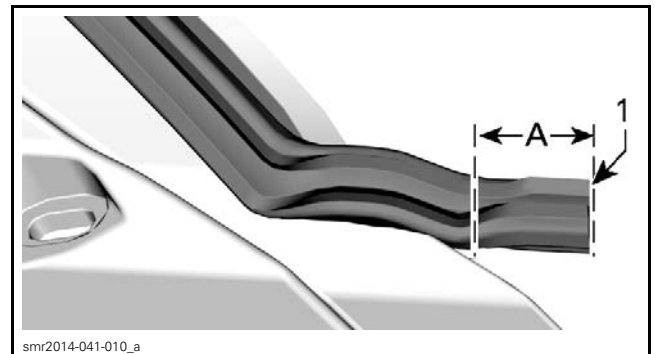


smr2014-041-009\_a

**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  $20\text{ mm} \pm 10\text{ mm}$  ( $.79\text{ in} \pm .39\text{ in}$ ) from end of front body seal groove.



smr2014-041-010\_a

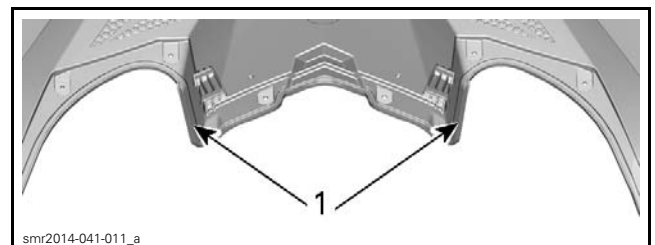
**FRONT BODY SEAL - PORT SIDE**

1. Cut seal

A.  $20\text{ mm} \pm 10\text{ mm}$  ( $.79\text{ in} \pm .39\text{ in}$ )

## 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.



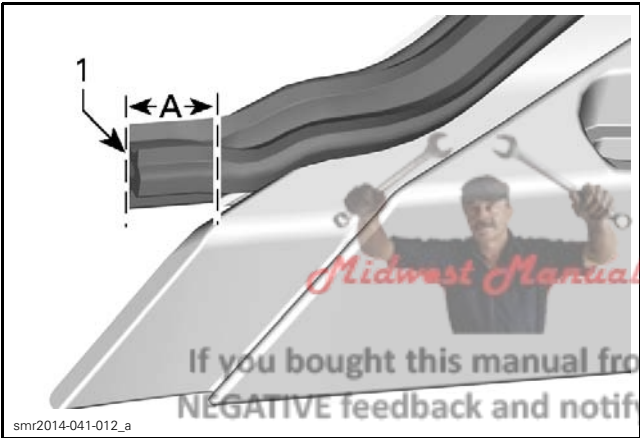
smr2014-041-011\_a

**REAR BODY SEAL**

1. Seal groove in body

Subsection XX (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)



If you bought this manual from any other seller please leave them  
NEGATIVE feedback and notify me at bestshopmanuals@gmail.com

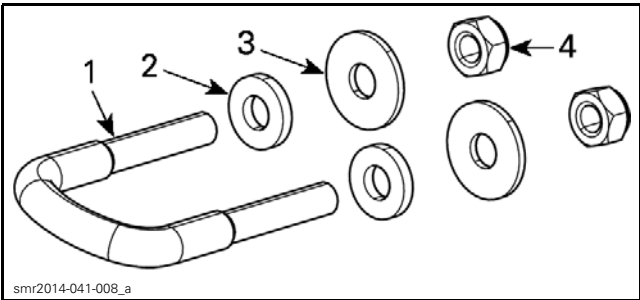
STERN EYELET

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

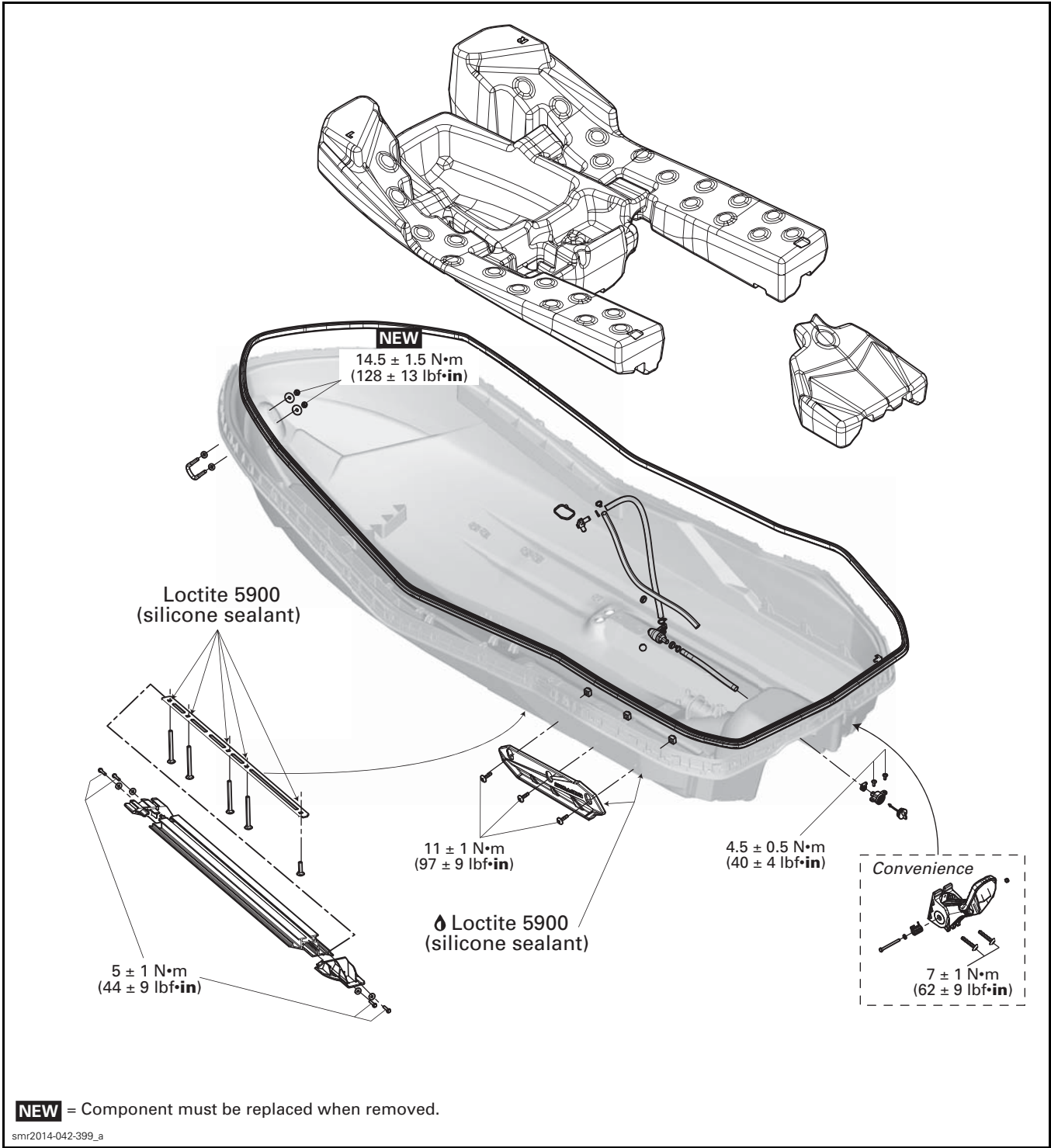
| TIGHTENING TORQUE |                                                |
|-------------------|------------------------------------------------|
| M8 hexagonal nut  | 14.5 N•m ± 1.5 N•m<br>(128 lbf•in ± 13 lbf•in) |

# HULL

## SERVICE PRODUCTS

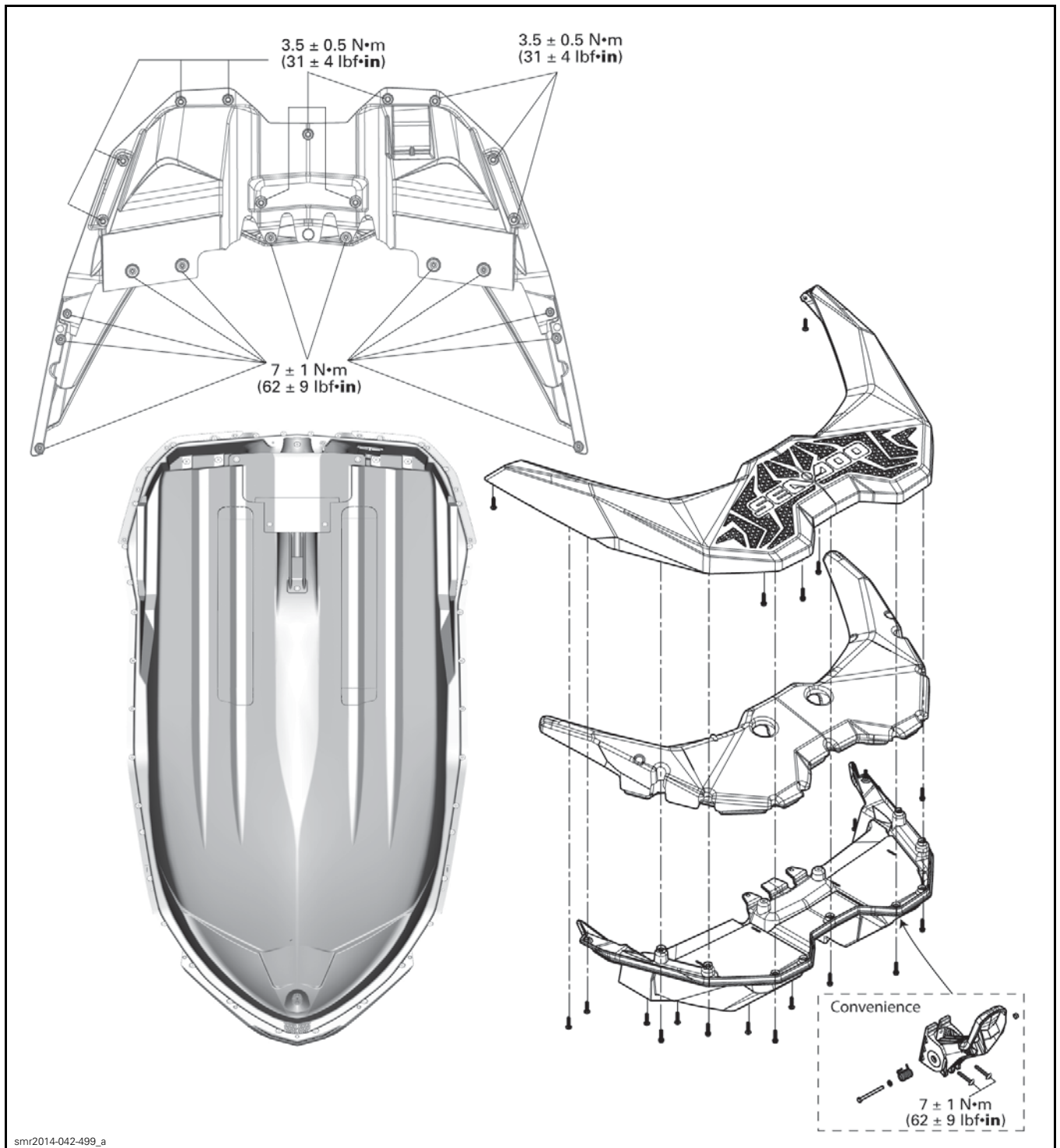
| Description                  | Part Number       | Page        |
|------------------------------|-------------------|-------------|
| BRP HEAVY DUTY CLEANER ..... | 293 110 001 ..... | 11-12       |
| LOCTITE 5900 .....           | 293 800 066 ..... | 8-9, 11, 13 |

Spark Series

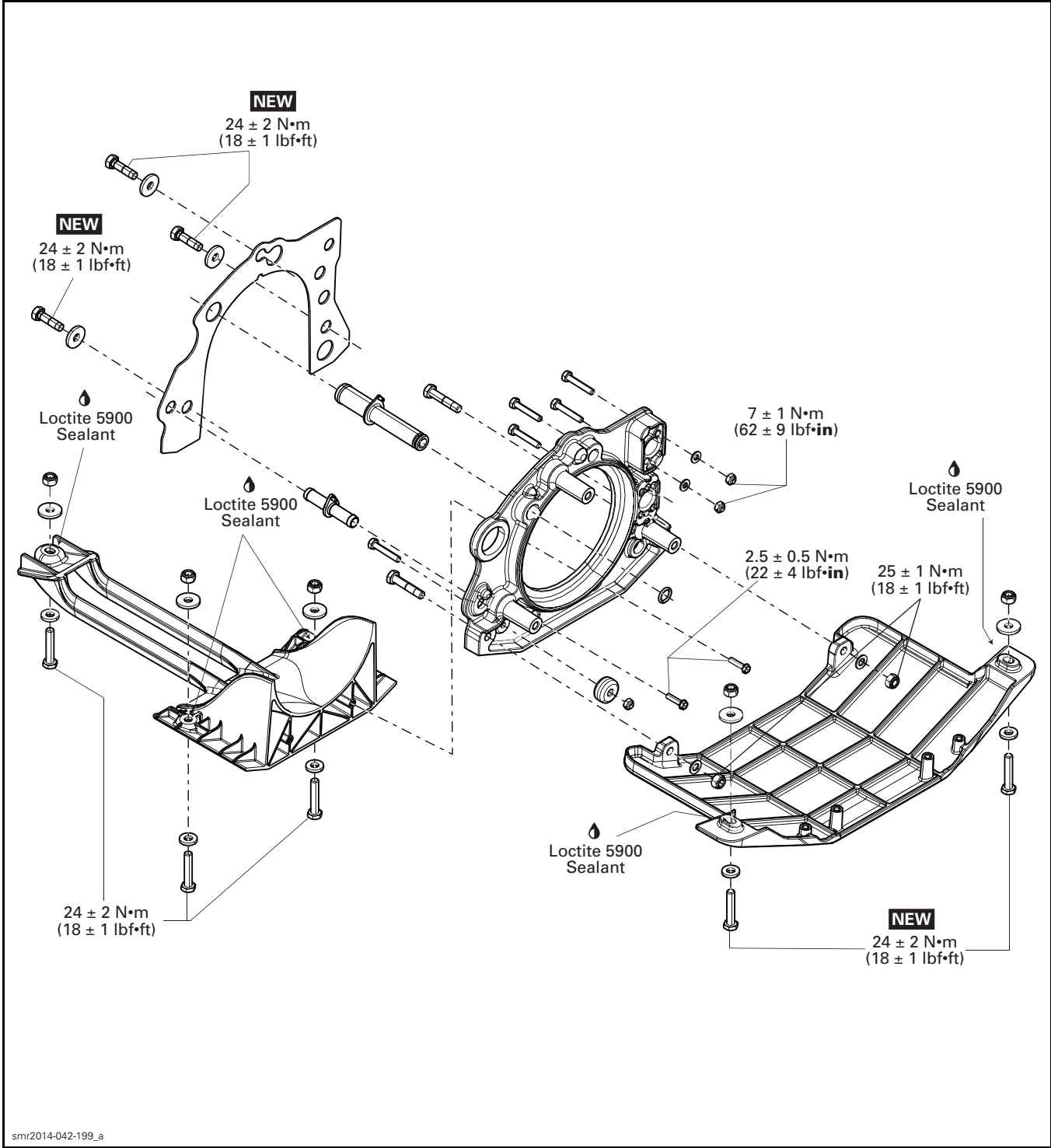




3UP



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.

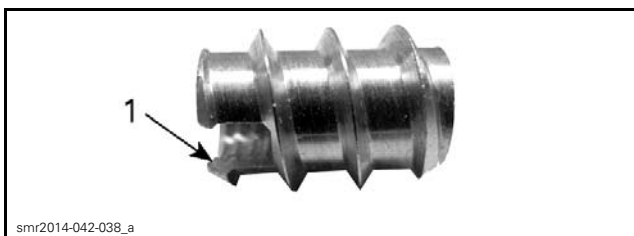
Remove the following components:

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.



smr2014-042-038\_a

**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.

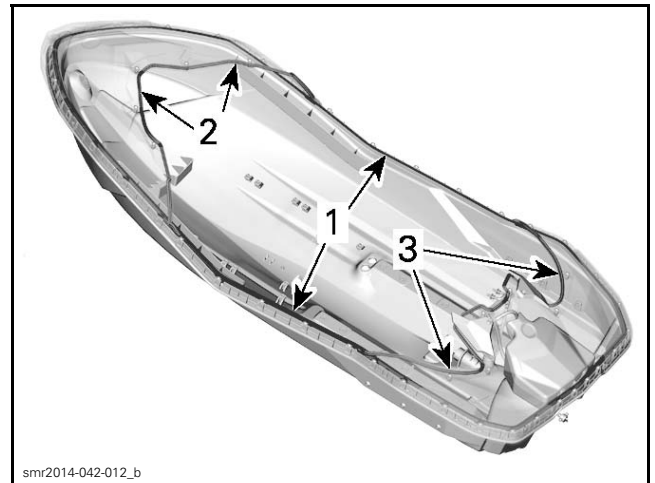
**NOTICE** Do not drill deeper than 20 mm (.8 in).

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<br>(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.

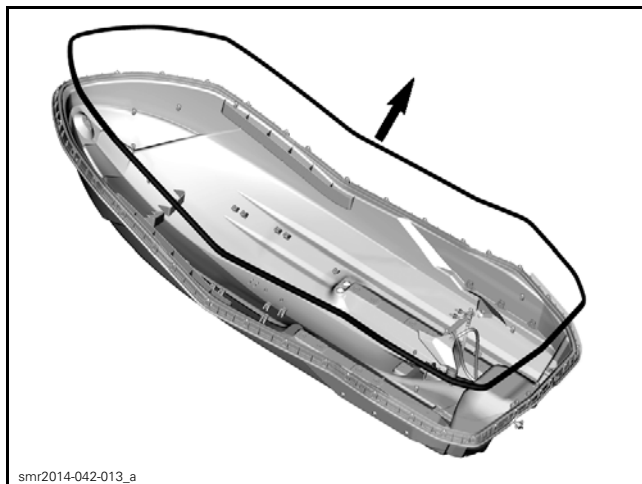
#### 3UP models.

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.

## Subsection XX (HULL)



**HULL SEAL**

### Installing the Hull Seal

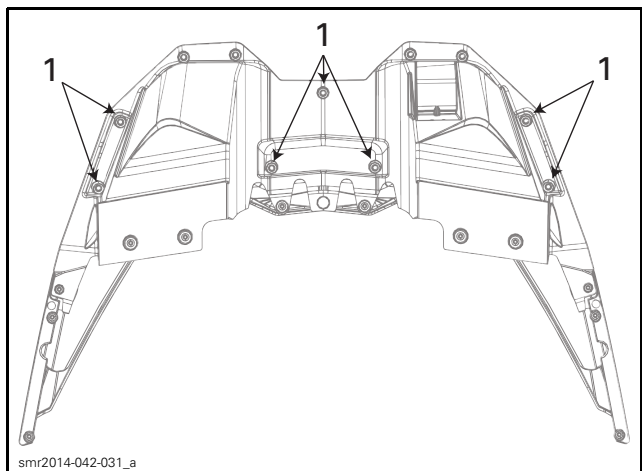
The installation is the reverse of the removal procedure. However, pay attention to the following. The hull seal is held in place by a perimeter groove in the hull.

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

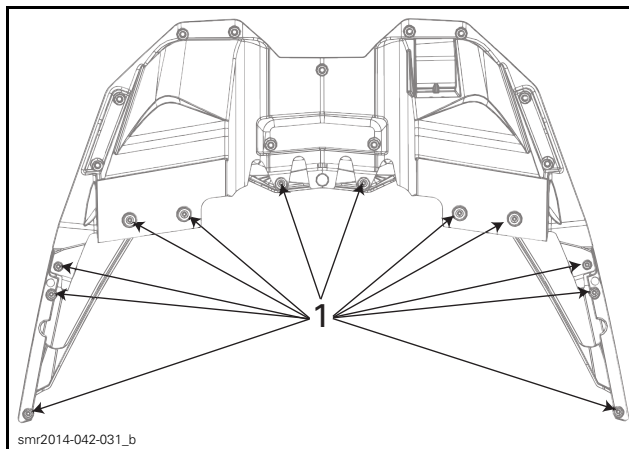
1. Loosen the following screws.



**3UP BOARDING PLATFORM - VIEW FROM UNDERNEATH**

1. M6 X 30 hexagonal shoulder screws

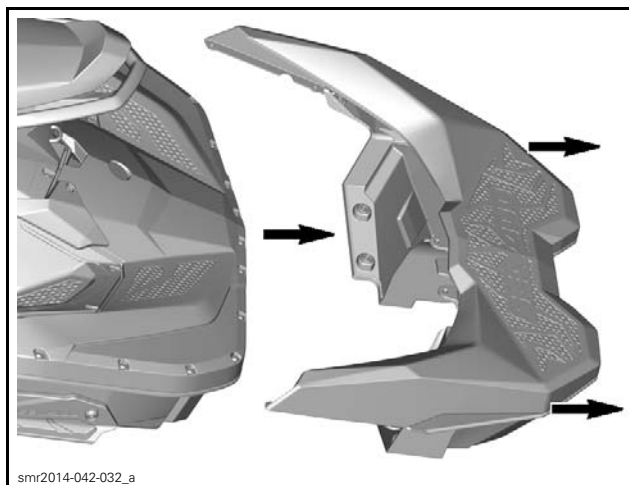
2. Remove the following screws.



**3UP BOARDING PLATFORM - VIEW FROM UNDERNEATH**

1. M6 X 30 torx shoulder screws

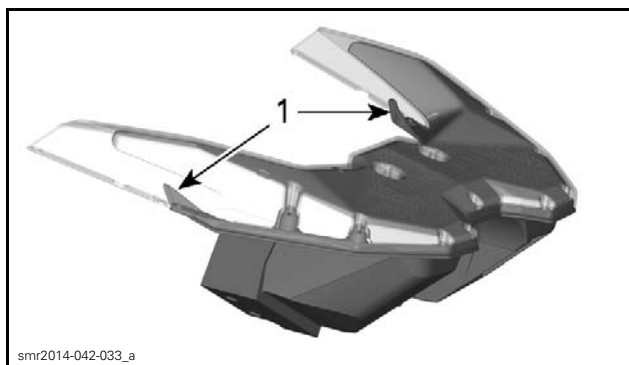
3. Wiggle the 3UP boarding platform off the stern of the watercraft.



### Installing the 3Up Boarding Platform

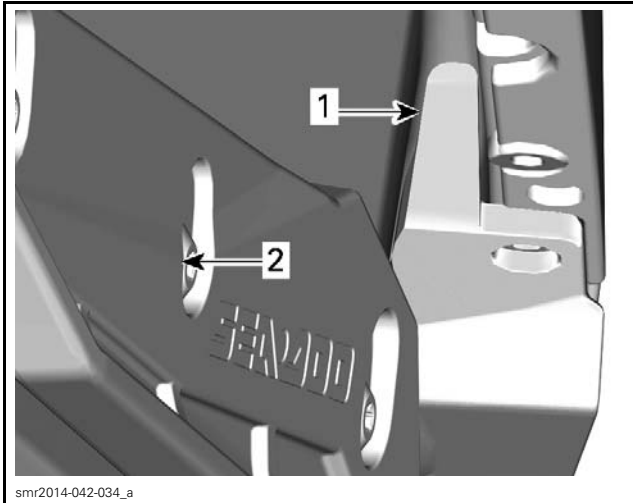
The installation is the reverse of the removal procedure. However, pay attention to the following.

When installing 3UP boarding platform, ensure splash tabs are properly positioned on hull.



**3UP BOARDING PLATFORM**

1. Splash tabs

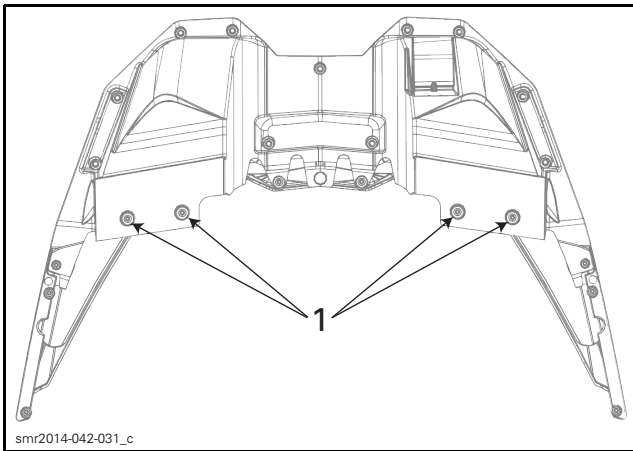


smr2014-042-034\_a

#### PORT SIDE - VIEW TOWARDS REAR

1. Position of splash tab under hull
2. Port side sponson

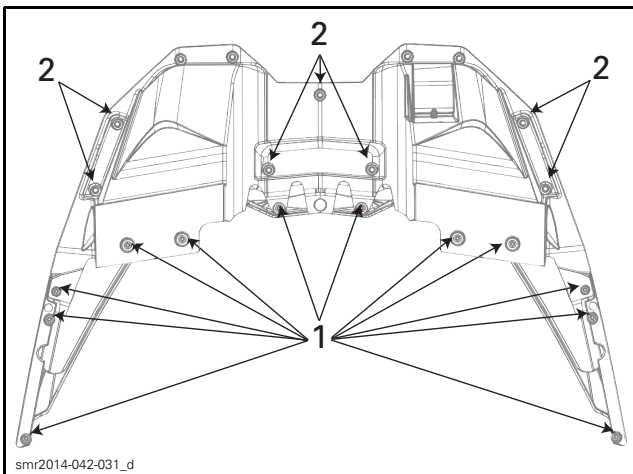
Install 3UP boarding platform onto hull



smr2014-042-031\_c

#### 3UP BOARDING PLATFORM - VIEW FROM UNDERNEATH

1. Ensure these points snap into place



smr2014-042-031\_d

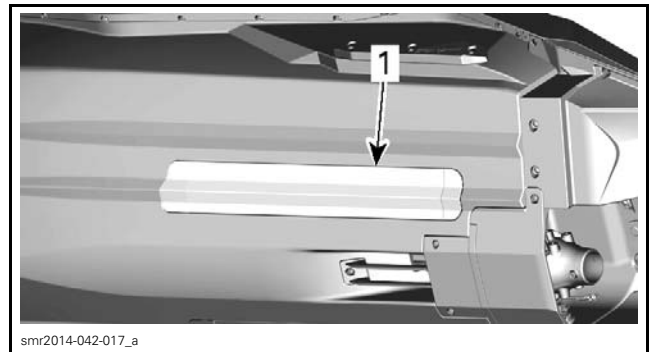
#### 3UP BOARDING PLATFORM - VIEW FROM UNDERNEATH

- 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<br>(31 lbf•in ± 4 lbf•in) |
| M6 X 30 torx shoulder screw      | 5.5 N•m ± 0.5 N•m<br>(49 lbf•in ± 4 lbf•in) |

## HULL REINFORCEMENT

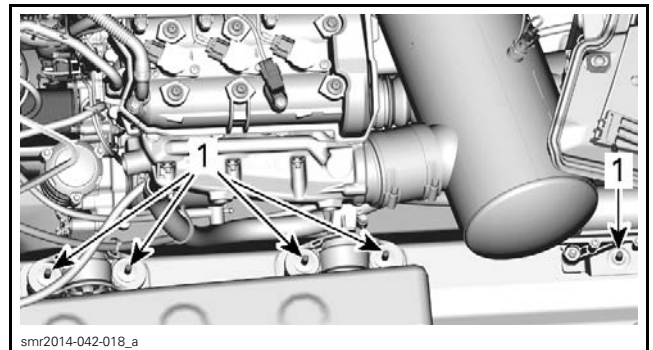
There are no inserts glued to the hull of the watercraft. Instead, the watercraft makes use of hull reinforcements and carriage bolts. The starboard side hull reinforcement is also the heat exchanger and will be covered under *COOLING SYSTEM* subsection.



smr2014-042-017\_a

#### PORT SIDE HULL REINFORCEMENT - UNDER WATERCRAFT

1. Hull reinforcement



smr2014-042-018\_a

#### PORT SIDE HULL REINFORCEMENT - INSIDE HULL

1. Hull reinforcement carriage bolt

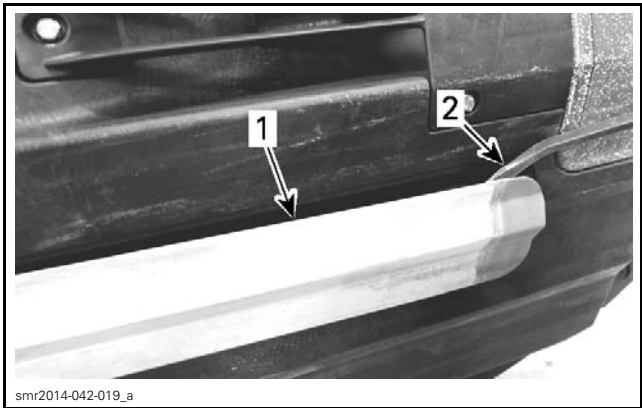
## Removing the Hull Reinforcement

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.

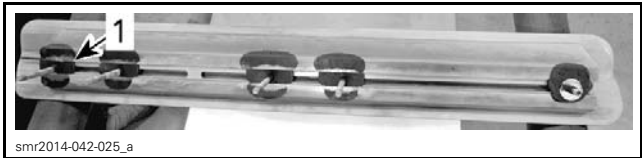
Subsection XX (HULL)



HULL REINFORCEMENT - UNDER WATERCRAFT

- 1. Hull reinforcement
- 2. Prybar

4. Clean off sealant residues from hull and hull reinforcement.

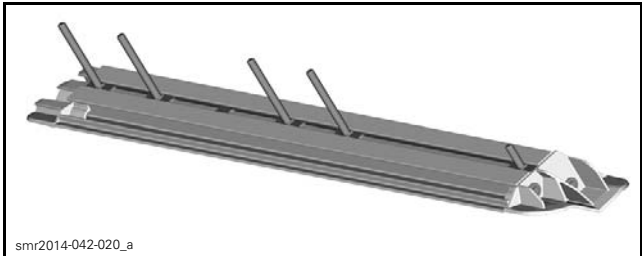


PORT SIDE HULL REINFORCEMENT

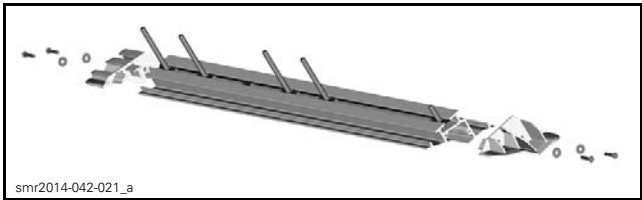
- 1. Sealant residue

Disassembling the Hull Reinforcement

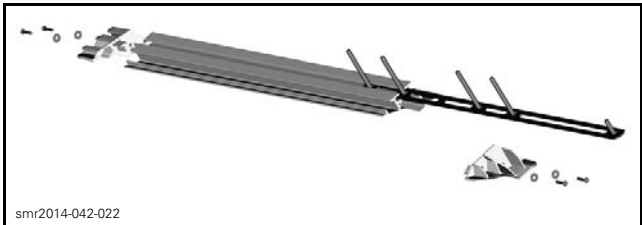
1. The following images represent disassembly.



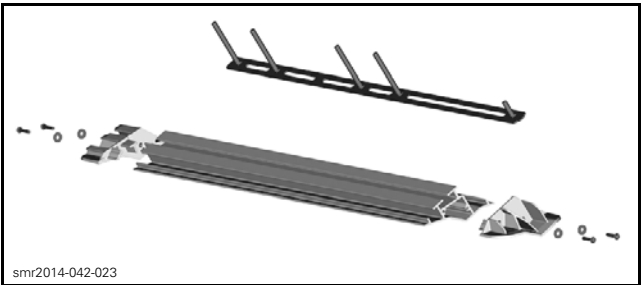
PORT SIDE HULL REINFORCEMENT



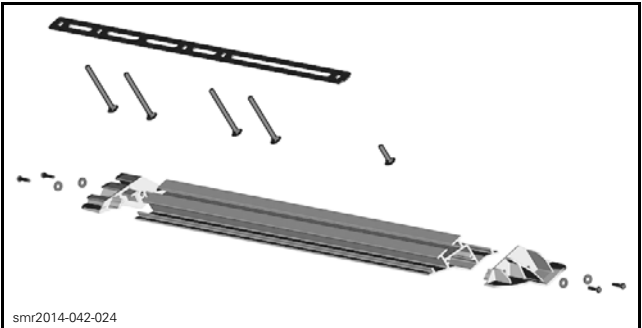
PORT SIDE HULL REINFORCEMENT



PORT SIDE HULL REINFORCEMENT



PORT SIDE HULL REINFORCEMENT



PORT SIDE HULL REINFORCEMENT

Assembling the Hull Reinforcement

The assembly is the reverse of disassembly procedure.

| TIGHTENING TORQUE       |                                         |
|-------------------------|-----------------------------------------|
| M5 X 25 Shoulder screws | 5 N•m ± 1 N•m<br>(44 lbf•in ± 9 lbf•in) |

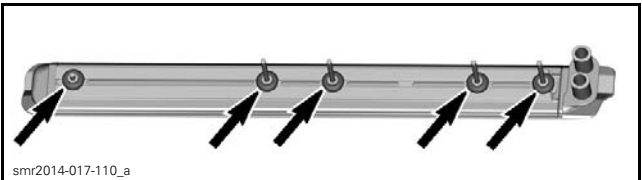
Installing the Hull Reinforcement

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

1. Apply Loctite 5900 beads as indicated.

| SERVICE PRODUCT                |
|--------------------------------|
| LOCTITE 5900 (P/N 293 800 066) |

NOTE: Heat exchanger shown.

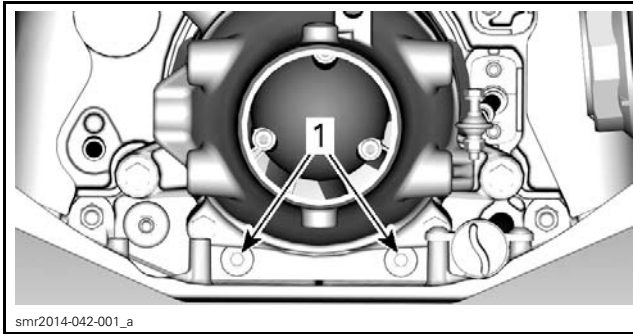


LOCTITE 5900 12 MM (15/32 IN) DIAMETER BEAD APPLICATION

INLET GRATE

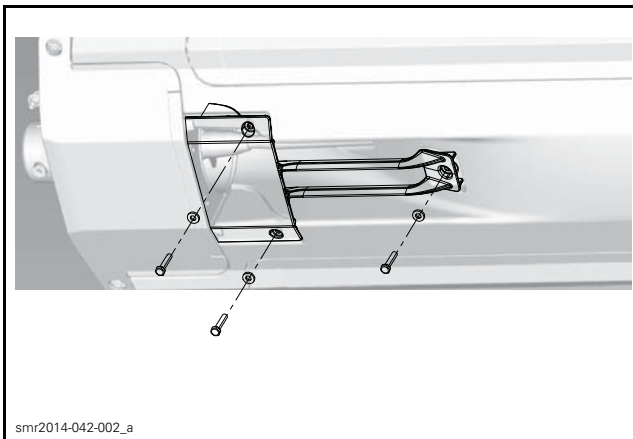
Removing the Inlet Grate

- 1. Remove central body. Refer to *BODY* subsection.
- 2. Remove rear inlet grate screws.

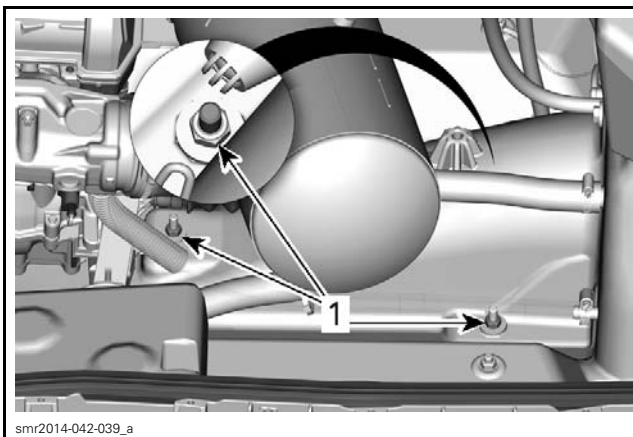


**REAR VIEW - UNDER JET PUMP**  
1. Rear inlet grate screws

3. Remove front inlet grate screws and retaining nuts.



**FRONT INLET GRATE SCREWS**



**FRONT INLET GRATE RETAINING NUTS**  
1. Inlet grate retaining nuts

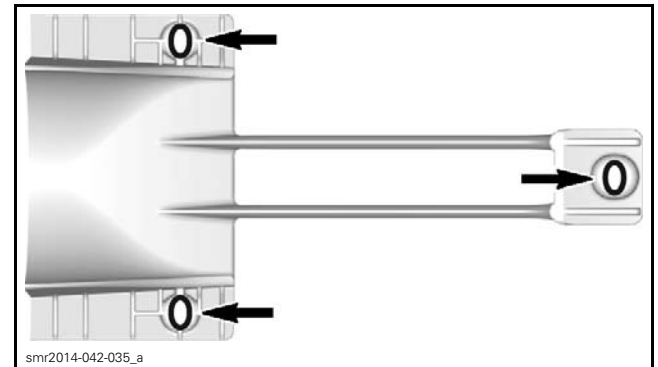
4. Remove inlet grate.

### Installing the Inlet Grate

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

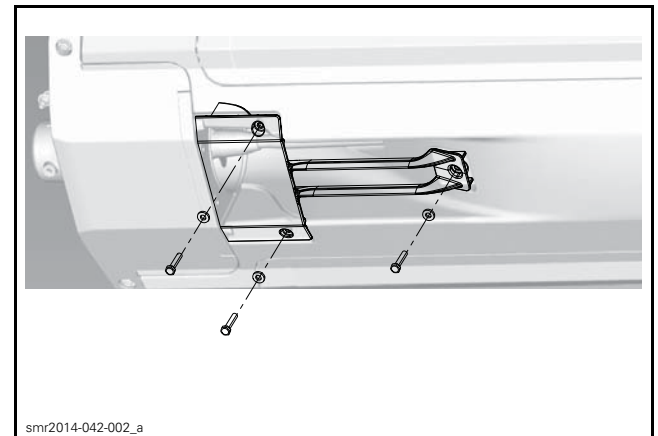
1. Apply Loctite 5900 sealant on inlet grate as indicated.

| SERVICE PRODUCT                |
|--------------------------------|
| LOCTITE 5900 (P/N 293 800 066) |



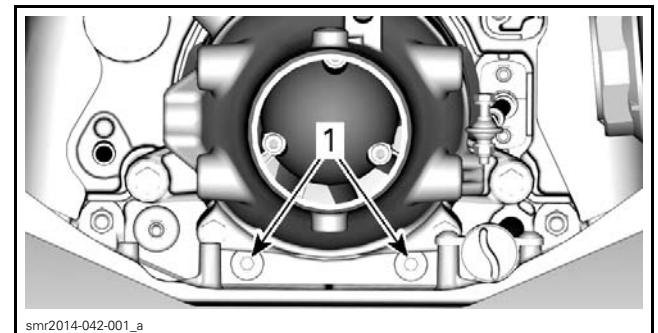
**INLET GRATE SEALANT APPLICATION**

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.



| TIGHTENING TORQUE AND SEQUENCE |                                       |                                             |
|--------------------------------|---------------------------------------|---------------------------------------------|
| STEP                           | FASTENER                              | TORQUE                                      |
| 1                              | Rear inlet grate screws               | 2.5 N•m ± 0.5 N•m<br>(22 lbf•in ± 4 lbf•in) |
| 2                              | Front M8 inlet grate retaining screws | 24 N•m ± 2 N•m<br>(18 lbf•ft ± 1 lbf•ft)    |

RIDE PLATE

Removing the Ride Plate

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

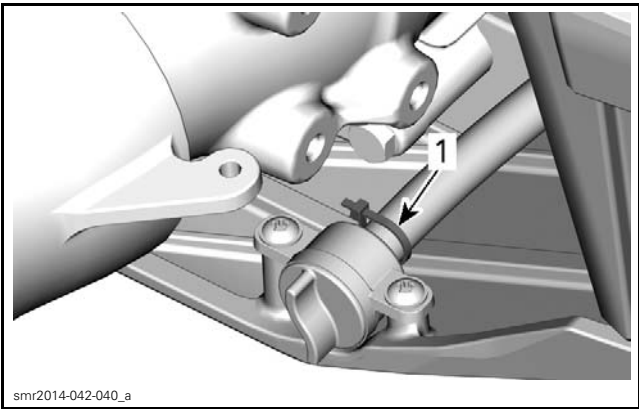
*3UP models*

2. Remove 3UP boarding platform. See procedure in this subsection.

*All models*

3. Remove resonator. Refer to *EXHAUST* subsection.

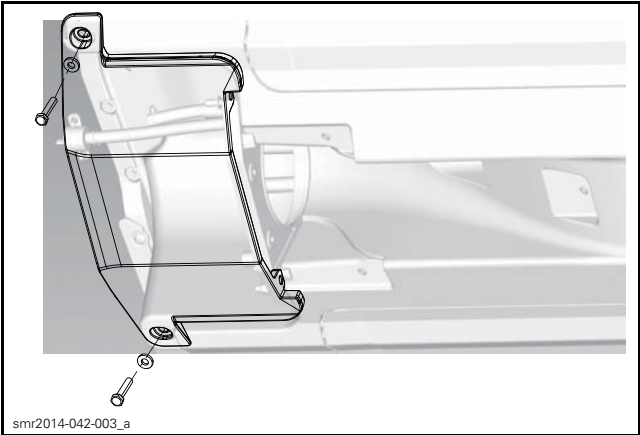
4. Cut locking tie and remove hose from drain on ride plate.



**DRAIN**

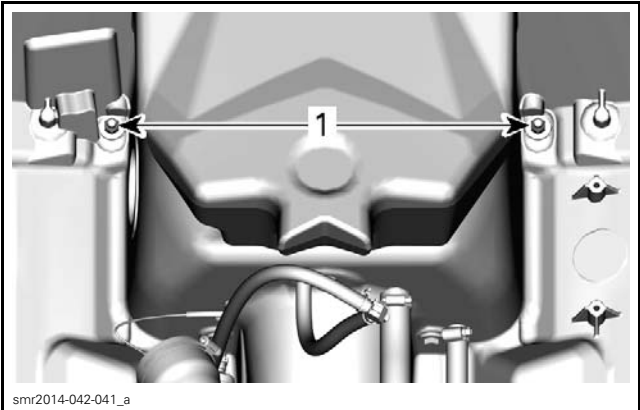
1. Locking tie

5. Remove and discard ride plate retaining screws.



**RIDE PLATE RETAINING SCREWS**

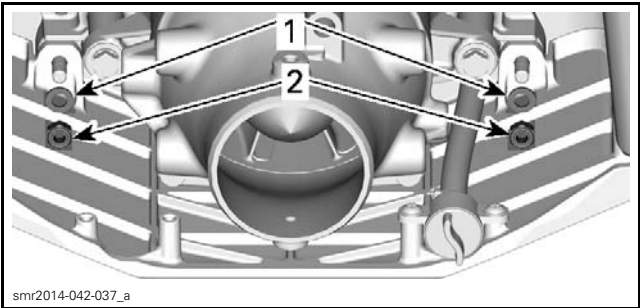
6. Remove ride plate retaining nuts.



**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)

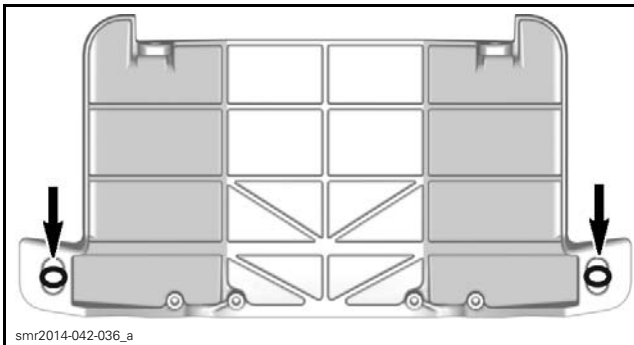
**Installing the Ride Plate**

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.

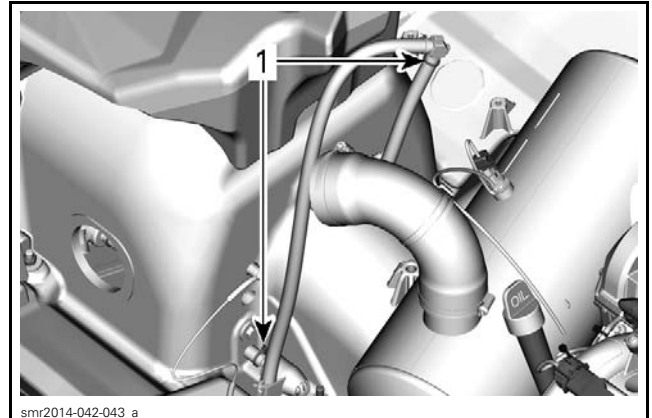
**TIGHTENING TORQUE AND SEQUENCE**

| STEP | FASTENER                                             | TORQUE                                   |
|------|------------------------------------------------------|------------------------------------------|
| 1    | M8 Ride plate retaining screws (on jet pump support) | 25 N•m ± 1 N•m<br>(18 lbf•ft ± 1 lbf•ft) |
| 2    | M8 Ride plate retaining screws                       | 24 N•m ± 2 N•m<br>(18 lbf•ft ± 1 lbf•ft) |

4. Reinstall other removed parts. Refer to appropriate subsections for procedures.

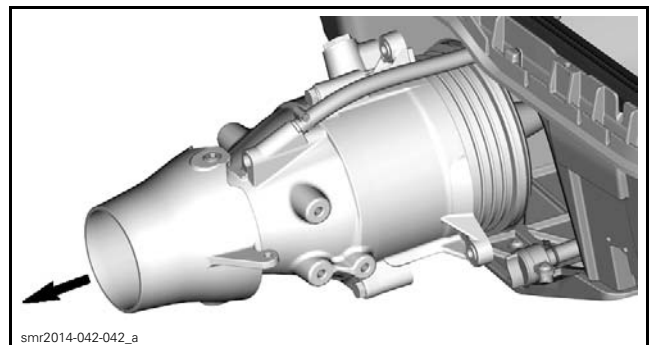
**JET PUMP SUPPORT****Removing the Jet Pump Support**

1. Remove central body. Refer to *BODY* subsection.
2. Cut locking ties on bailer elbow and pick up.

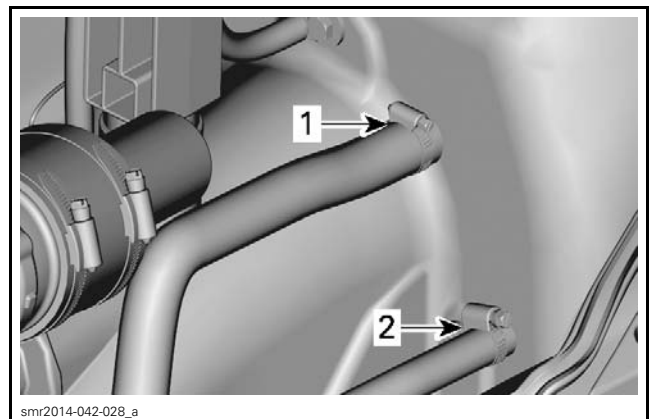


1. Locking ties to cut

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**

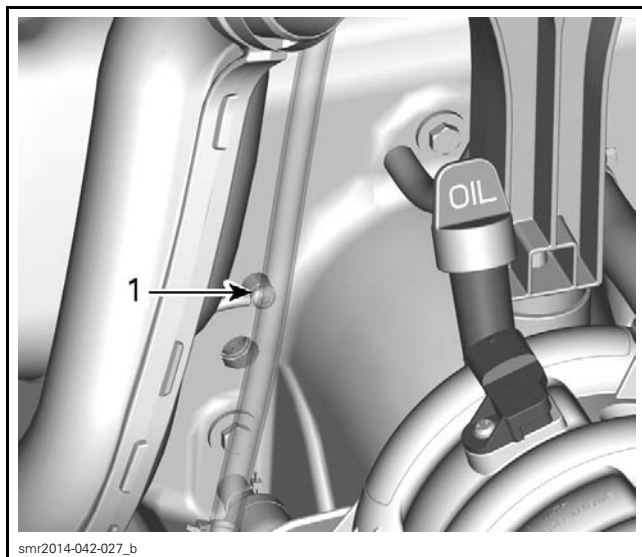
5. Remove inlet grate.
6. Remove ride plate with drain and drain hose.
7. Disconnect water supply and return hoses from jet pump support.

**PORT SIDE - INSIDE THE HULL**

1. Exhaust water supply hose
2. Exhaust water return hose

8. Disconnect ground strap.

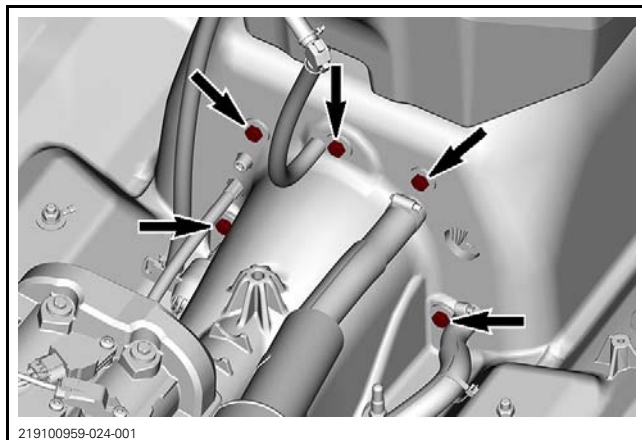
## Subsection XX (HULL)



**STARBOARD SIDE - INSIDE THE HULL**

1. Ground strap

9. Remove jet pump support retaining screws and washers.

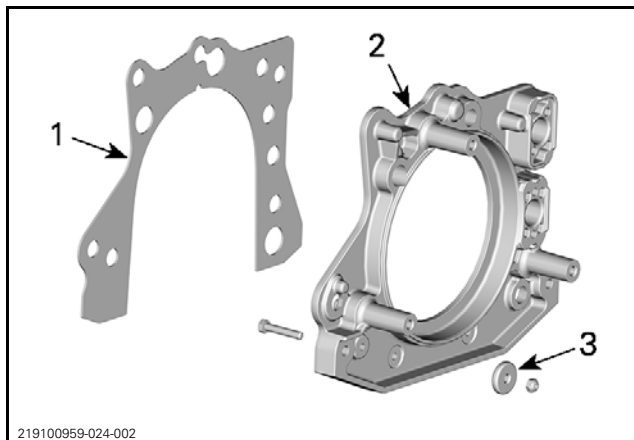


**JET PUMP SUPPORT - VIEW FROM INSIDE HULL**

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.

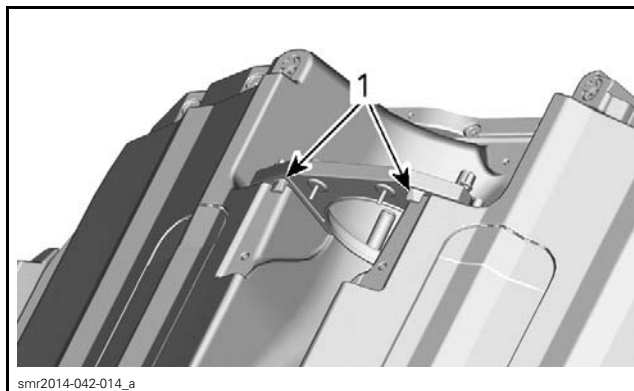
#### SERVICE PRODUCT

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.

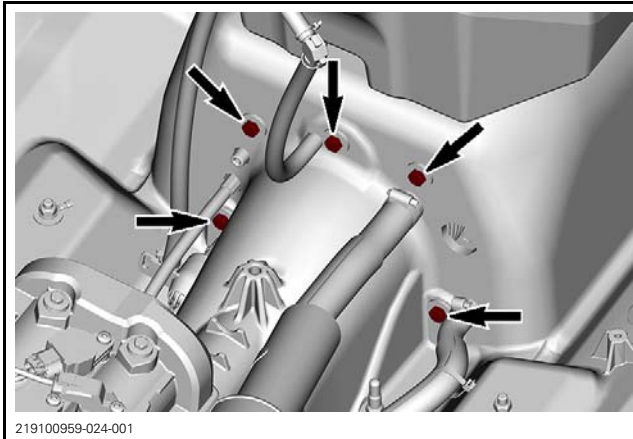


**JET PUMP SUPPORT**

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<br>(18 lbf•ft ± 1 lbf•ft) |

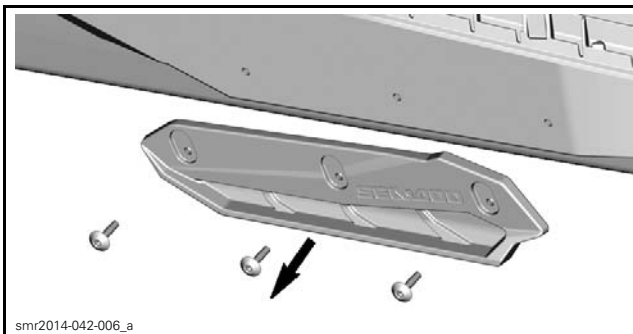
5. Reinstall other removed parts. Refer to appropriate subsections for procedures.

## 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

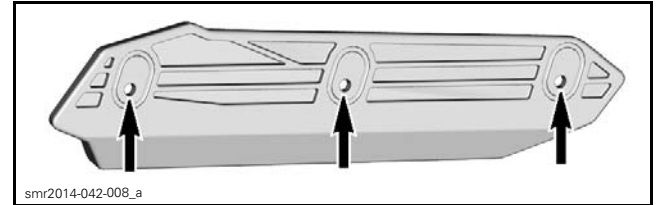

**PORT SPONSON**

### Installing the Fixed Rear Sponson

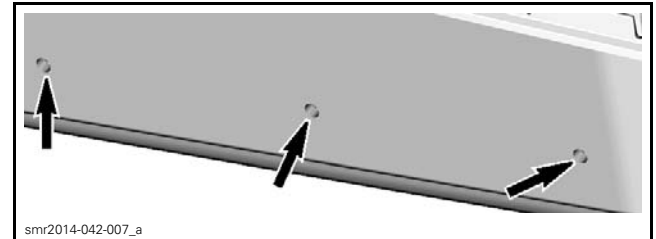
The installation is the reverse of the removal procedure. However, pay attention to the following.

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**

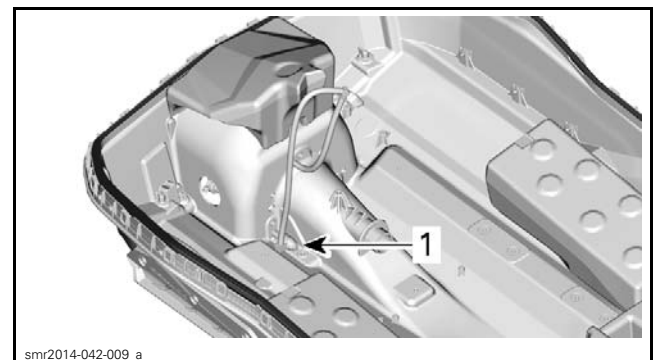
| TIGHTENING TORQUE |                                          |
|-------------------|------------------------------------------|
| Sponson screws    | 11 N•m ± 1 N•m<br>(97 lbf•in ± 9 lbf•in) |

## 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.

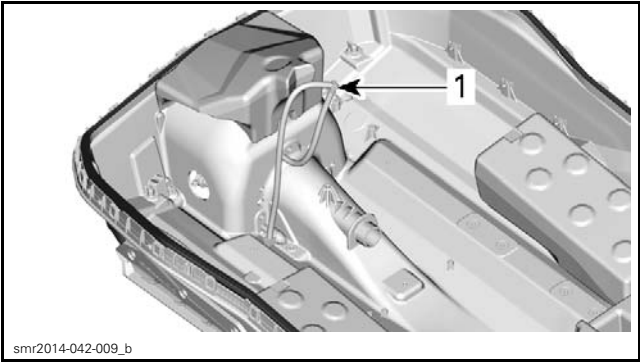
### Bailer Pick-Up Location



1. Bailer pick-up

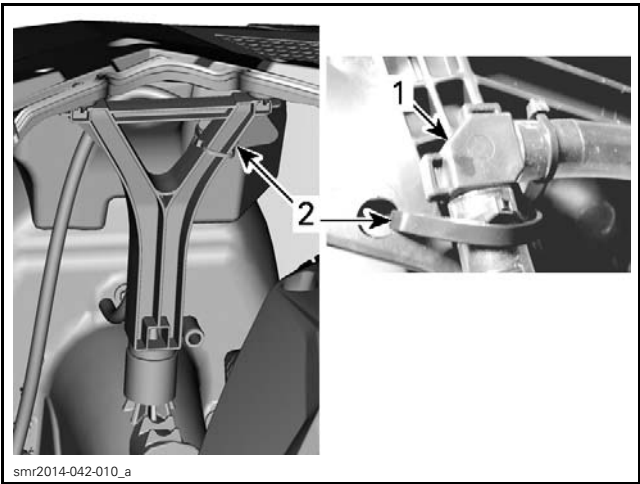
### Bailer Pick-Up Inspection

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.



1. bailer hose elbow fitting

**NOTE:** When repositioning the bailer hose elbow fitting, position it at the highest available point on the rear support.

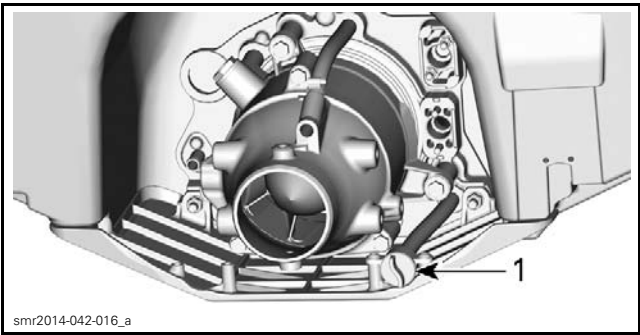


FRONT (LEFT) AND REAR (RIGHT) VIEW OF REAR SUPPORT  
1. Bailer hose elbow  
2. Locking tie on rear support

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

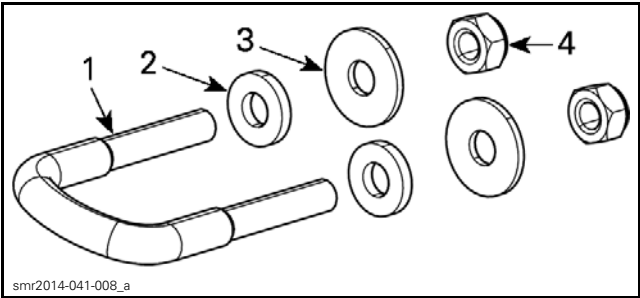
BOW EYELET

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<br>(128 lbf•in ± 13 lbf•in) |

FIXING SCRATCHES

Refer to *CLEANING AND REPAIR* subsection.

REPAIRING THE HULL

Refer to *CLEANING AND REPAIR* subsection.

# CLEANING AND REPAIR

## SERVICE TOOLS – OTHER SUPPLIER

| Description                                  | Part Number | Page |
|----------------------------------------------|-------------|------|
| 3M™ DURAMIX™ SEMI-RIGID PLASTIC REPAIR ..... | 04240 ..... | 7    |
| CHEM-PAK® PER-FIX BLACK™ POLYPROPYLENE ..... | 7500A ..... | 7    |

## SERVICE PRODUCTS

| Description                        | Part Number       | Page |
|------------------------------------|-------------------|------|
| BRP HEAVY DUTY CLEANER .....       | 293 110 001 ..... | 2    |
| CLEANER AND DEGREASER PRO C1 ..... | 779262 .....      | 1    |
| LOCTITE 5900 .....                 | 293 800 066 ..... | 7–8  |

## MAINTENANCE

### CLEANING

#### Seat

For general purpose cleaning, use cleaner and degreaser PRO C1, Vinyl Finish Cleaner, Fantastik or warm water with a mild dish soap such as Dawn or Ivory. Gently scrub with a small soft bristle brush.

| SERVICE PRODUCT                           |
|-------------------------------------------|
| CLEANER AND DEGREASER PRO C1 (P/N 779262) |

#### WARNING

Never apply plastic or vinyl protector on the carpets or seat as the surface will become slippery and the occupants may slip off the watercraft.

For dirt build-up, use cleaner and degreaser PRO C1, Vinyl Finish Vinyl Cleaner or an equivalent. Let soak for approximately 10 minutes, then gently scrub with a soft bristle brush. For specific stain removal, refer to your cleaning and care card.

Do not use any silicone-based protectants. They will extract the plasticizers, leaving the vinyl hard and brittle, and eventually cracking will occur.

#### RECOMMENDED PRODUCTS

- CLEANER AND DEGREASER PRO C1 (P/N 779262)
- Dish Soap (Dawn or Ivory)
- Fantastik
- 3M Citrus Cleaner
- 303 Protectant

#### Vinyl Cleaning Recommendations for Special Stains

| TYPE OF STAIN          | STEP 1 | STEP 2 | STEP 3 | ACTION                                                                                                                   |
|------------------------|--------|--------|--------|--------------------------------------------------------------------------------------------------------------------------|
| Ballpoint ink*         | E      | B      | A      | A. Medium-soft brush, warm soapy water, rinse/dry.                                                                       |
| Chewing gum            | D      | A      | —      |                                                                                                                          |
| Coffee, tea, chocolate | B      | —      | —      |                                                                                                                          |
| Pen                    | D      | B      | —      | B. Vinyl Finish Cleaner, rinse/dry.                                                                                      |
| Grease                 | D      | B      | —      |                                                                                                                          |
| Household soil         | A      | B      | —      |                                                                                                                          |
| Ketchup                | A      | B      | —      | C. One (1) tablespoon of ammonia, one-fourth (1/4) cup of hydrogen peroxide, three-fourth (3/4) cup of water, rinse/dry. |
| Latex paint            | A      | B      | —      |                                                                                                                          |
| Lipstick               | A      | B      | —      |                                                                                                                          |
| Mildew or wet leaves*  | C      | B      | A      | D. Wipe or scrape off excess (chill gum with ice beforehand).                                                            |
| Motor oil              | B      | —      | —      |                                                                                                                          |
| Oil-based paint        | D      | B      | —      |                                                                                                                          |
| Permanent marker*      | E      | B      | C      |                                                                                                                          |
| Spray paint            | B      | B      | —      |                                                                                                                          |

## Subsection 01 (CLEANING AND REPAIR)

|                                                                                                             |   |   |   |                                     |
|-------------------------------------------------------------------------------------------------------------|---|---|---|-------------------------------------|
| Suntan lotion                                                                                               | A | B | — | E. Denatured alcohol,<br>rinse/dry. |
| Tar/asphalt                                                                                                 | D | B | — |                                     |
| Yellow mustard                                                                                              | A | B | C |                                     |
| *Suntan lotion, tree pollen, wet leaves and some other products<br>can contain dyes that stain permanently. |   |   |   |                                     |

All cleaning methods must be followed by a thorough rinse with warm water.

Certain household cleaners, powdered abrasives, steel wool and industrial cleaners can cause damage and discoloration and are not recommended. Dry cleaning fluids and lacquer solvents should not be used as they will remove printed pattern and gloss. Waxes should be used with caution as many contain dyes or solvents that can permanently damage the protective coating.

### Thermofilm

#### Special Care

Do NOT use cleaners or products containing:

- BRP HEAVY DUTY CLEANER (P/N 293 110 001)
- Acetone or other ketones
- Alcohol
- Ammonia
- Chlorinated solvents
- Mineral spirits
- Paint thinners
- Petroleum based products
- Toluene or other aromatic solvents.

**NOTICE** Make sure to thoroughly clean fuel spillage by simply wiping out the excess. Failure to clean fuel spillage may weaken the surface causing small surface damage called “crazing”.

#### Washing

Wash the vehicle with a solution of mild soap or detergent and lukewarm water.

Use a clean soft cloth, applying only light pressure.

Rinse with clear water and dry with a damp cloth or chamois.

#### Polishing

Protect and maintain the surface gloss by occasionally polishing with a good acrylic-safe cleaner and polish.

Apply a thin, even coat with a soft clean cloth and polish lightly with cotton flannel.

**NOTICE** When using new products, it is good practice to test the product on a hidden surface area.

### Polytec and Gelcoat

Wash the hull and various body components with water and soap (use only mild detergent). Remove any marine organisms from engine and/or hull.

**NOTICE** Never clean hull and body parts with strong detergent, degreasing agent, paint thinner, acetone, or other strong chemical or petroleum type cleaner.

### WARNING

Never apply plastic or vinyl protector on the carpets or seat as the surface will become slippery and the occupants may slip off the watercraft.

## PROCEDURES

### THERMOFILM - SURFACE FINISH

The thermofilm hulls and decks are made of an acrylic and ABS thermoformed outer skin.

#### Painting - General Information

To properly paint the vehicle after a repair, refer to paint information in the *REPAIRING SURFACE FINISH IMPERFECTIONS* table.

#### Repair - General Information

For minor scratches, refer to *REMOVING MINOR SCRATCHES* further in this section.

For major structural repair, refer to the *MAJOR REPAIRS* in *CLOSED MOLD TECHNOLOGY (CM-TEC) - STRUCTURAL REPAIR* further in this section.

The thermofilm finish can be treated like an automotive painted finish when it comes to surface preparation, sanding grit and polishing procedure.

Also, the standard automotive paint repair procedure should be performed on thermofilm finish.

**For optimum results, the service of an automotive body shop is necessary.**

Follow recommendations to obtain a good result on the acrylic finish of the thermofilm.

**NOTE:** BRP strongly recommends providing a copy of this procedure to your local body shop before performing a repair.

Failing to follow the recommendations described in this document may result in a poor quality of repair or even damage to the thermofilm.

For additional information on the current repair procedures or additional alternative repairs, refer to *TST ARTICLE # 134706*.

#### IMPORTANT

Always adhere to the manufacturer's instructions for the products used unless otherwise specified

#### Avoiding Acrylic Crazing

Blending and cleaning procedures require additional precaution while performing the repair.

Most frequent damage observed when performing paint repairs is a chemical reaction causing crazing of the acrylic finish.

Thinners, reducers and blending agents will usually cause this crazing if they come in contact before being mixed or in a strong mixing ratio.

**NOTICE** Do not exceed the blending agent mix ratio described in this document.

**NOTICE** Do not use spray can products. They may cause crazing of the acrylic finish.

#### Required Products

Products are available at any automotive parts and accessories shop.

- Body filler
- Isopropyl alcohol (maximum concentration of 50%)
- Primer
- Base coat
- Pearl coat (when applicable)
- Clear coat
- Blending agent (optional)

**NOTE:** Always try products on a hidden area first.

#### Removing Minor Scratches

**NOTICE** Unsuccessful operation will involve performing the task *REPAIRING SURFACE FINISH IMPERFECTIONS*.

Some light scratches can often be removed by wet sanding and polishing the acrylic surface as described below.

Results may vary depending on the affected area.

| ACTIONS            | RECOMMENDATIONS                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wet sand 1500 grit | Wet sand over the affected area by hand using a circular motion until the scratch is barely visible.                                                                                            |
| Wet sand 2500 grit | Wet sand over the affected area by hand using a circular motion until the scratch is no longer visible.                                                                                         |
| Polishing          | Use standard automotive procedure.                                                                                                                                                              |
| Inspecting         | If no discoloration is visible: No more action is required.<br>If discoloration is visible or if results are not satisfactory, perform the task <i>REPAIRING SURFACE FINISH IMPERFECTIONS</i> . |

#### Repairing Surface Finish Imperfections

| ACTIONS                    | RECOMMENDATIONS                                                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Preparation                | Prepare the affected surface by sanding the area to eliminate the damage or imperfection. Making sure not to sand through the thermofilm. |
| Cleaning                   | Use isopropyl alcohol mixed with distilled water for a maximum concentration of 50%.                                                      |
| Body filler (if necessary) | Use standard polyester based or vinylester based body filler. Apply body filler on composite or thermofilm to obtain a uniform surface.   |
| Primer                     | Use standard automotive paint products.                                                                                                   |
| Base coat                  | Use automotive solvent or water based paints. Refer to Sea-Doo paint code bulletin for color codes reference.                             |
| Pearl coat                 | Only applicable with pearl colors. Use standard automotive paint products.                                                                |

## Subsection 01 (CLEANING AND REPAIR)

| ACTIONS                              | RECOMMENDATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clear coat                           | Use standard automotive paint products.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Use of blending agent (if necessary) | <b>Using a highly concentrated mixing ratio of the blending agent will cause crazing of the thermofilm finish.</b><br>Maximum concentration ratio should not exceed of 1:3 (1-part blender, 3-part clear coat). The blender from different paint manufacturers may vary in composition and concentration. Not all products can be tested by BRP. Testing your blender ratio on the area to be repaired is recommended to ensure this mixing ratio works with the products you are using. Result may vary depending of affected area. |
| Polishing                            | Use standard automotive procedure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## GELCOAT - SURFACE FINISH

This hull is constructed of chopped fiberglass, saturated with resin. It is sprayed on the layer of gelcoat along with pieces of fiberglass mat. The cloth and the woven roving are added when required in some areas. The inside finish is rough and grey.

### Gelcoat Repair Information

BRP does not distribute liquid gelcoat and resin kits. These products can be purchased directly from Spectrum Color or through automotive or marine suppliers.

Orders should be placed directly from [www.Spectrumcolor.com](http://www.Spectrumcolor.com)

| RECOMMENDED TOOLS          |                |
|----------------------------|----------------|
| Air mask                   | Power sander   |
| Polishing pad              | Putty knife    |
| Cover sheets               | Safety glasses |
| Heavy-duty polisher        | Sanding block  |
| Paint brush                | Scissors       |
| Plastic container (mixing) | Spray gun      |
| Plastic film               | Stirring stick |
| Plastic squeegee           | White cloths   |

| RECOMMENDED MATERIALS |                |
|-----------------------|----------------|
| Acetone               | Epoxy filler   |
| Cabosil               | Masking tape   |
| Cardboard             | Liquid gelcoat |

|                                                                         |                         |
|-------------------------------------------------------------------------|-------------------------|
| Fine compound (white)                                                   | Medium compound (white) |
| Fiberglass cloth                                                        | Polyester resin         |
| Fiberglass mat                                                          | 24-grit sanding disks   |
| Gelcoat putty                                                           | Wax                     |
| Sandpaper (100-grit, 220-grit, 320-grit, 400-grit, 600-grit, 1000-grit) |                         |

### Air Bubbles Repair

Possible cause:

- Air pocket trapped between layers of laminate and gelcoat.

### Preparation of Surface

Remove all of the damaged gelcoat surrounding the air bubble with a putty knife or preferably a carbide grinding tip. Make sure all loose and weak areas are completely removed.

Sand a small area of the gelcoat surface with 220-grit sandpaper. If needed, sand the cavity itself.

These areas must have a rough surface to allow the gelcoat putty to bond properly.

### Filling the Cavity

The prepared surface must be cleaned with acetone on a cloth.

Use a gelcoat repair kit. Follow the mixing instructions in the kit when preparing the gelcoat putty.

Carefully mix the required amount while making sure there are no air bubbles in the mixture.

With a putty knife, fill the repair area and cover with plastic film.

Curing time may depend on temperature, amount of putty and percentage of catalyst.

After 2 hours, press lightly on the surface with fingers to test the hardness.

When the area becomes hard, remove the plastic film.

### Sanding

Begin by sanding the patch with 320-grit sandpaper until you come close to the original surface.

Remove dust with a water soaked cloth and continue sanding with a 400-grit wet paper.

Finish wet sanding with a 600-grit to remove deeper scratches.

If needed you can wet sand with finer grit paper such as 1000-grit.

### Buffing and Waxing

Polish the surface using a heavy duty polisher with a polishing pad. Make sure the pad is free of dirt or you may damage the gelcoat.

Carefully begin polishing with a white medium compound.

Finish off using a fine compound.

While polishing, pay close attention to avoid overheating the surface.

### Blisters Repair

Possible causes:

- Insert catalyst
- Improper catalyst/gelcoat ratio.

A blister is a visible bump on the watercraft surface that may not necessarily come right through the gelcoat layer.

In the case of only a few blisters, follow the same repair procedure as for air bubbles.

If they are numerous and in close concentration, spray liquid gelcoat to achieve proper repair. This procedure is covered in *MINOR REPAIRS*.

### Minor Repairs

Possible causes:

- Flexing of fiberglass laminate
- Gelcoat thickness
- Direct result of impact.

In case of fractures which have not penetrated past the gelcoat layer, the repair concerns the gelcoat only.

### Preparing the Surface

**Small Fractures:** Open the cracks up with a sharp triangular can opener or preferably a carbide tipped die grinder. The V groove will provide a good bonding area for the gelcoat. With 220-grit sandpaper, sand the sides of the notched out areas.

**Numerous Fractures:** Using a grinder with a 24-grit disk, remove the gelcoat. Sand the area edge with 220-grit sandpaper.

### Filling the Repair Area

**Small Fractures:** Refer to the same procedure as in the *AIR BUBBLES*.

**Numerous Fractures Over Large Surface:** Prepare the area for spray application of liquid gelcoat. Wipe down the surface with acetone. Mask the area off to protect the watercraft from overspray.

Mix the needed quantity of gelcoat and catalyst according to suppliers recommendations. The gelcoat can be thinned with acetone up to 10%. If it needs more consistency you can add cabosil.

Make sure that the air supply is free of oil, dirt and water.

Test spray the gelcoat mixture on paper to verify its consistency and pattern. You may have to apply 5 or 6 coats to cover the area properly. Overlap each coat further than the last, leaving at least 30 seconds between passes. Avoid trying to coat the surface with only a few heavy coats, this will not allow the gelcoat to dry properly.

Apply a coat of polyvinyl alcohol (PVA) to seal off the air and protect the gelcoat surface from dust. PVA speeds up the curing process because gelcoat will not cure properly when exposed to air.

### Sanding

Wash the polyvinyl alcohol off with water.

Depending on the size of the area repaired, you can either sand by hand as per previous procedure or you may use an air sander.

Sand the surface down with progressively finer grits of sandpaper until the desired finish is achieved.

### Polishing and Waxing

Polish the surface using a heavy duty polisher with a polishing pad. Make sure the pad is free of dirt or you may damage the gelcoat.

Carefully begin polishing with a white medium compound. Finish off using a fine compound.

While polishing, pay close attention to avoid overheating the surface.

## POLYTEC - SURFACE FINISH

### Fixing scratches

Perform a flame treatment on any body or hull surface.

A flame treatment:

- Is a quick movement over an area or part with a blow torch
- Should never be too intense. The part should never melt to the point that it looks polished
- Will burn any excess plastic around the scratch
- Will burn the oxygen on the surface of the part.

The flame treatment will also restore the original color of the plastic, painting is not necessary.

### CLOSED MOLD TECHNOLOGY (CM-TEC) - STRUCTURAL REPAIR

The CM-tec hulls and decks are made of fiberglass and polyester resin, both compressed in a closed mold (CM-tec)

#### Major Repairs

Possible causes:

- Thickness of fiberglass laminate
- Direct result of impact.

Major repairs are those that have gone past the surface finish and in through the composite structure.

Two types of repairs have to be performed.

The first is to restore the structural integrity of the damaged area. Fracture types can vary from a simple crack to a large hole. Usually, fiberglass reinforcement becomes necessary, especially if the fracture can be attributed to weakness.

The final part of the repair is the surface finish repair, which cannot be done until the interior and exterior laminate surfaces were repaired.

**Outside:** Remove the damaged surface finish with a 24-grit disk using a power sander. Grind outward at least 2 inches from the fracture to allow the patch to bond to strong material. Cut enough pieces of fiberglass mat necessary to build up the area. The pieces should be cut so they overlap each other by at least a half inch. For a smoother finish, the last layer should be fiberglass cloth. If the fracture is small enough all you may have to do is fill the area with an epoxy filler.

**Inside:** For the interior repair, you can grind more. This will allow for more fiberglass material which will strengthen the area. If the fracture opening is too large after surface preparation, you may need a backing support to cover the opening. Cut alternating pieces of fiberglass mat and cloth in overlapping sizes.

#### Patching the Repair Area

**Outside:** The outside should be done first. Wipe clean the area with isopropyl alcohol mixed with distilled water for a maximum concentration of 50% on a cloth, then mask off area. For a small crack use standard polyester based or vinyl ester based body filler. When laying up a larger area you will use mat, cloth and fiberglass resin and catalyst. Use a clean container to mix the resin, mix only what you will need. Follow the recommended catalyst ratio.

Using a clean paintbrush, brush the mixed resin on the surface. Place the smallest piece of mat over the fracture and then wet out the mat. Follow with the remaining pieces of mat and final layer of cloth. While wetting the pieces make sure you work the air bubbles out and saturate all the pieces evenly.

Wait until the repair has hardened before moving on to the interior repair. If the size of the opening is too large for the pieces to maintain the proper shape, you will have to use a backing support. It is a shaped piece of cardboard that fits flush to the interior surface and has a plastic layer on the repair side. It is held in place by tape or a support.

**Inside:** Wipe down the area with isopropyl alcohol mixed with distilled water for a maximum concentration of 50% on a cloth. Apply the same procedure as for outside repair when laminating the alternating pieces of fiberglass material. If a backing support was used, remove it before starting the repair. After the area has hardened, remove sharp edges of material from surface. If required paint the surface.

#### Sanding

**Outside:** This surface will have to be prepared for application of the body filler. The size of the area will determine the surface finish procedure to be used. Refer to the *MINOR REPAIRS*.

### POLYTEC - STRUCTURAL REPAIR

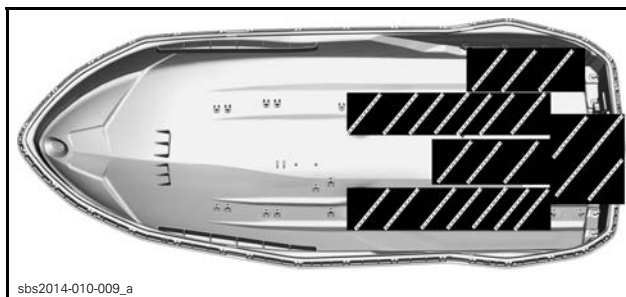
The deck and hull are made of a single thick skin of injected polypropylene reinforced with fiberglass.

#### Hull Repair

The shaded areas are:

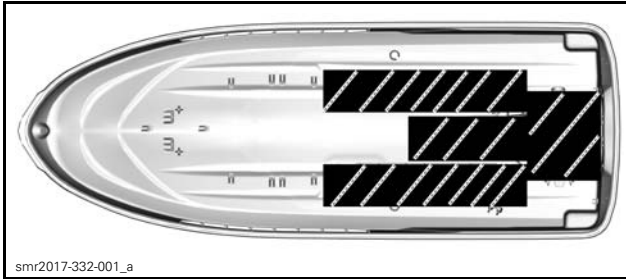
- Important structural sections of the hull
- Areas where clearance is tight.

The hull is not repairable in these areas.



SPARK SERIES





GTI SERIES

### Required Tools

| REQUIRED TOOLS                |                                                                                   |
|-------------------------------|-----------------------------------------------------------------------------------|
| Drill bit 5 mm (13/64 in)     |  |
| Counter bore 12.5 mm (1/2 in) |  |
| Grinding burr 3 mm (1/8 in)   |  |

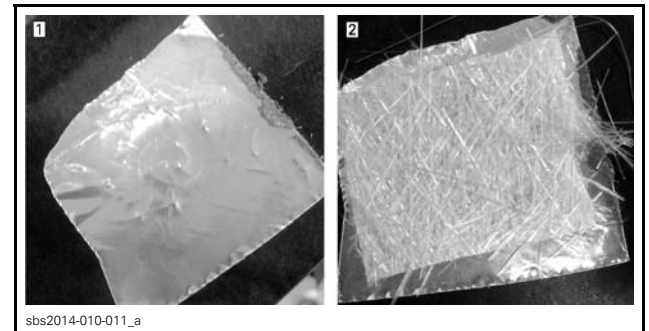
### Required Parts

| DESCRIPTION                                                                                       | PART NUMBER                    | QUANTITY  |
|---------------------------------------------------------------------------------------------------|--------------------------------|-----------|
| Aluminum foil tape                                                                                | Available locally              | As needed |
| ±150 grit sand paper                                                                              | Available locally              | As needed |
| M5 X 20 screw                                                                                     | Available locally              | 2         |
| M5 retaining nut                                                                                  | Available locally              | 2         |
| Stainless steel rivet                                                                             | 293150043                      | As needed |
| Stainless steel rivet washer                                                                      | 234052600                      | As needed |
| Fiber reinforced laminate with (polyester or epoxy) resin                                         | Available locally              | As needed |
| Sealant                                                                                           | LOCTITE 5900 (P/N 293 800 066) | As needed |
| Black epoxy <sup>1</sup>                                                                          | Available locally              | As needed |
| Multipurpose black paint (metal-wood-plastic) <sup>2</sup>                                        | Available locally              | As needed |
| <sup>1</sup> BRP has tested 3M™ DURAMIX™ SEMI-RIGID PLASTIC REPAIR (P/N 04240) with good results. |                                |           |
| <sup>2</sup> BRP has tested CHEM-PAK® PER-FIX BLACK™ POLYPROPYLENE (P/N 7500A) with good results. |                                |           |

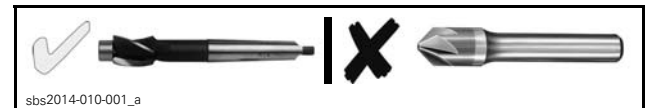
### Inside Hull Crack Repair

**NOTICE** Cracks longer than 400 mm (15-1/4 in) should not be repaired.

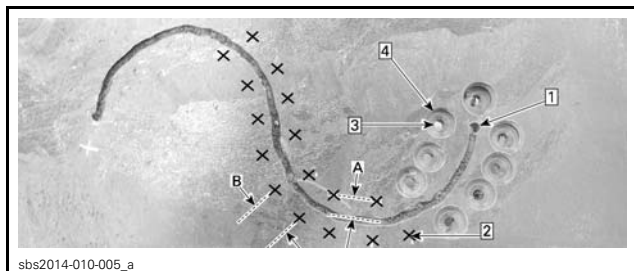
1. Lay down an aluminum foil tape over the area to be repaired. Extend the aluminum foil tape 150 mm (6 in) beyond the crack.
2. Prepare the fiber reinforced backing skin using 3 skins of laminate.
  - 2.1 Apply the mat, the resin and the catalyst over the aluminum foil tape.
  - 2.2 Allow to dry.
3. Remove the newly molded backing skin and trim to 50 mm (2 in) beyond the crack.
4. Remove the aluminum foil tape.



5. With the drill bit, drill a hole at each end of the crack to prevent it from growing longer.
6. Measure and mark drilling locations on the exterior of hull around crack.
7. Drill the hull at marked locations.
8. Install the backing skin over the area to be repaired from the interior.
9. Drill one hole in the backing skin using the hull as a template.
10. Install screw and retaining nut to prevent the backing skin from moving.
11. Repeat steps 5 and 6.
12. Drill all remaining holes.
13. Remove backing skin.
14. Counter bore all the drilled holes 3.5 mm (9/64 in) into the hull from the exterior.

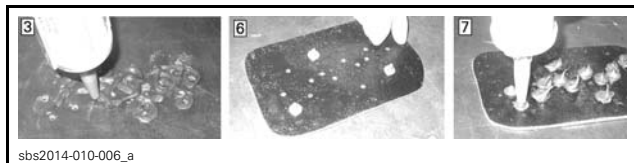


## Subsection 01 (CLEANING AND REPAIR)



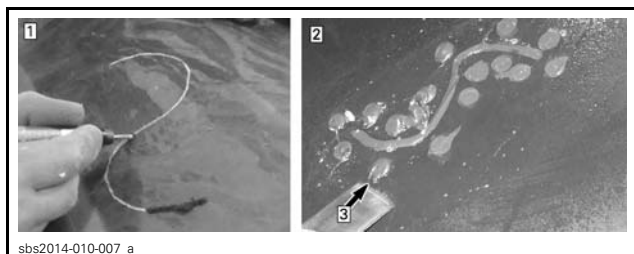
1. Hole at end of crack
2. Mark drilling locations
3. Drill hull
4. Counter bore
- A. 15 mm (19/32 in) from centerline of crack
- B. 30 mm (1-13/64 in) from next hole

15. Sand hull (inside only) to roughen surface.
16. Clean the area to be repaired with isopropyl alcohol.
17. Apply LOCTITE 5900 (P/N 293 800 066) on the inside hull around the drilled holes and the crack.
18. Align the backing skin over holes from interior. Push it against the sealant.
19. Use the screws and retaining nuts to hold the backing skin in place.
20. Install rivets from the exterior and washers from the interior.
21. Remove retaining nuts and screws.
22. Install remaining rivets with washers.
23. Apply LOCTITE 5900 (P/N 293 800 066) from the interior over the washers.

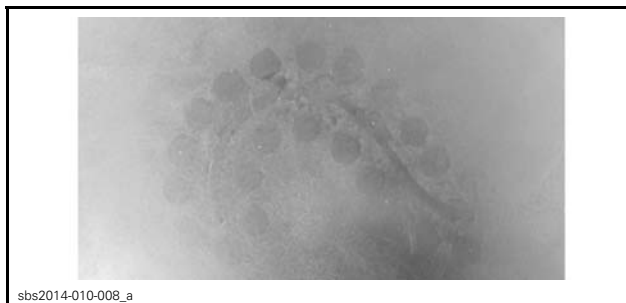


### Exterior Aesthetics Cracks Repair

1. Grind a 5 mm (5/32 in) wide by 3.5 mm (9/64 in) deep groove in the crack from the exterior.
2. Fill the groove and the counter bored holes with epoxy.
3. Remove the excess epoxy before it cures.



4. Apply a thin layer of paint or perform a flame treatment.



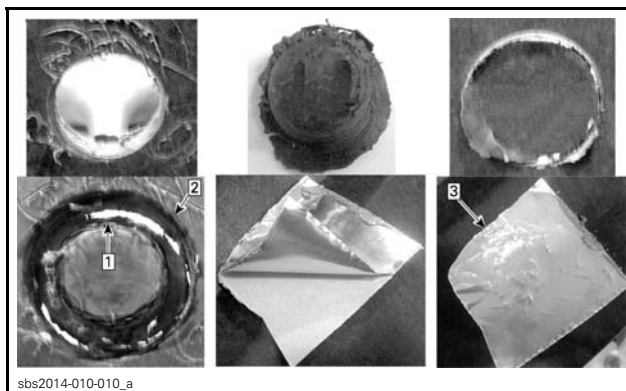
### Repairing a Hole

**NOTICE** Holes larger than 150 mm (6 in) in diameter should not be repaired.

If the broken piece is in your possession, ensure a good fit in its original location. If needed, rework some portions of the piece to make it fit perfectly.

**NOTE:** If the broken piece is not in your possession, it is recommended to replace the hull.

1. Grind a chamfer of 3 mm (1/8 in) wide by 3 mm (1/8 in) deep around the exterior perimeter of the broken piece.
2. Repeat step 1 to the hole in the hull.
3. Tape the broken piece to the exterior of the hull so that it fits flush with the inside.
4. Continue with *INSIDE HULL CRACK REPAIR* in this subsection.



# ENGINE

| ENGINE                   |         |               |                                                                     |
|--------------------------|---------|---------------|---------------------------------------------------------------------|
| Engine type              |         |               | ROTAX® 900 ACE and 900 ACE HO                                       |
|                          |         |               | 4-stroke, Double Over Head Camshaft (DOHC), dry sump, liquid cooled |
| Number of cylinders      |         |               | 3                                                                   |
| Number of valves         |         |               | 12 valves (self adjusting hydraulic valve lifters)                  |
| Bore                     |         |               | 74 mm (2.91 in)                                                     |
| Stroke                   |         |               | 69.7 mm (2.74 in)                                                   |
| Displacement             |         |               | 899.31 cm³ (54.88 in³)                                              |
| Compression ratio        |         |               | 11.0 : 1                                                            |
| Maximum HP RPM           |         |               | 8000 (± 100) RPM                                                    |
| Intake valve opening     |         |               | 5° ATDC                                                             |
| Intake valve closing     |         |               | 40° ABDC                                                            |
| Exhaust valve opening    |         |               | 40° BBDC                                                            |
| Exhaust valve closing    |         |               | 5° BTDC                                                             |
| Valve stem diameter      | Intake  | New           | 4.958 mm to 4.972 mm (.1952 in to .1957 in)                         |
|                          |         | Service limit | 4.940 mm (.1945 in)                                                 |
|                          | Exhaust | New           | 4.956 mm to 4.970 mm (.1951 in to .1957 in)                         |
|                          |         | Service limit | 4.940 mm (.1945 in)                                                 |
| Valve guide diameter     |         | New           | 5.0 mm to 5.012 mm (.1969 in to .1973 in)                           |
|                          |         | Service limit | 5.050 mm (.1988 in)                                                 |
| Valve out of round       |         | New           | 0.005 mm (.0002 in)                                                 |
|                          |         | Service limit | 0.060 mm (.0024 in)                                                 |
| Valve spring free length |         | New           | 31.35 mm (1.2343 in)                                                |
|                          |         | Service limit | 29.50 mm (1.1614 in)                                                |
| Valve seat contact width | Intake  | New           | 1.05 mm to 1.35 mm (.0413 in to .0531 in)                           |
|                          |         | Service limit | 1.70 mm (.0669 in)                                                  |
|                          | Exhaust | New           | 1.25 mm to 1.45 mm (.0492 in to .0571 in)                           |
|                          |         | Service limit | 1.80 mm (.0709 in)                                                  |
| Cylinder head warpage    |         | Service limit | 0.15 mm (.0059 in)                                                  |
| Piston measurement       |         | New           | 73.95 mm to 73.966 mm (2.9114 in to 2.912 in)                       |
|                          |         | Service limit | 73.920 mm (2.9102 in)                                               |

## Subsection XX (ENGINE)

| ENGINE                            |                  |                 |                                                    |
|-----------------------------------|------------------|-----------------|----------------------------------------------------|
| Piston/cylinder wall clearance    |                  | New             | 0.037 mm to 0.067 mm<br>(.0015 in to .0026 in)     |
|                                   |                  | Service limit   | 0.080 mm (.0031 in)                                |
| Piston ring type                  |                  | 1 <sup>st</sup> | Upper compression ring, rectangular                |
|                                   |                  | 2 <sup>nd</sup> | Lower compression ring, tapered face               |
|                                   |                  | 3 <sup>rd</sup> | Oil scraper ring                                   |
| Ring end gap                      | Rectangular      | New             | 0.20 mm to 0.35 mm<br>(.0079 in to .0138 in)       |
|                                   |                  | Service limit   | 1.20 mm (.0472 in)                                 |
|                                   | Taper-face       | New             | 0.30 mm to 0.50 mm<br>(.0118 in to .0197 in)       |
|                                   |                  | Service limit   | 1.20 mm (.0472 in)                                 |
|                                   | Oil scraper ring | New             | 0.20 mm to 0.70 mm<br>(.0079 in to .0276 in)       |
|                                   |                  | Service limit   | 1.20 mm (.0472 in)                                 |
| Ring/piston groove clearance      | Rectangular      | New             | 0.030 mm to 0.066 mm<br>(.0012 in to .0026 in)     |
|                                   |                  | Service limit   | 0.120 mm (.0047 in)                                |
|                                   | Taper-face       | New             | 0.020 mm to 0.056 mm<br>(.0008 in to .0022 in)     |
|                                   |                  | Service limit   | 0.120 mm (.0047 in)                                |
|                                   | Oil scraper ring | New             | 0.010 mm to 0.040 mm<br>(.0004 in to .0016 in)     |
|                                   |                  | Service limit   | 0.150 mm (.0059 in)                                |
| Cylinder bore                     |                  | New             | 74.003 mm to 74.017 mm<br>(2.9135 in to 2.9141 in) |
| Cylinder taper                    |                  | Maximum New     | 0.030 mm (.0012 in)                                |
|                                   |                  | Service limit   | 0.050 mm (.002 in)                                 |
| Cylinder out of round             |                  | Maximum New     | 0.008 mm (.0003 in)                                |
|                                   |                  | Service limit   | 0.03 mm (.0012 in)                                 |
| Camshaft bearing journal diameter | PTO              | New             | 25.967 mm to 25.980 mm<br>(1.0223 in to 1.0228 in) |
|                                   |                  | Service limit   | 25.940 mm (1.0213 in)                              |
|                                   | MAG/Center       | New             | 22.957 mm to 22.970 mm<br>(.9038 in to .9043 in)   |
|                                   |                  | Service limit   | 22.930 mm (.9028 in)                               |
| Camshaft holder bore diameter     | PTO              | New             | 26.00 mm to 26.021 mm<br>(1.0236 in to 1.0244 in)  |
|                                   |                  | Service limit   | 26.05 mm (1.0256 in)                               |
|                                   | MAG/Center       | New             | 23.00 mm to 23.021 mm<br>(.9055 in to .9063 in)    |
|                                   |                  | Service limit   | 23.05 mm (.9075 in)                                |

| ENGINE                                   |         |               |                                                    |
|------------------------------------------|---------|---------------|----------------------------------------------------|
| Camshaft journal radial play             | All     | New           | 0.020 mm to 0.054 mm<br>(.0008 in to .0021 in)     |
|                                          |         | Service limit | 0.080 mm (.0031 in)                                |
| Camshaft lobe height                     | Intake  | New           | 38.35 mm to 38.55 mm<br>(1.51 in to 1.518 in)      |
|                                          |         | Service limit | 38.33 mm (1.509 in)                                |
|                                          | Exhaust | New           | 38.35 mm to 38.55 mm<br>(1.51 in to 1.518 in)      |
|                                          |         | Service limit | 38.33 mm (1.509 in)                                |
| Crankshaft bearing journal diameter      |         | New           | 35.990 mm to 36.006 mm<br>(1.4169 in to 1.4176 in) |
|                                          |         | Service limit | 35.960 mm (1.4157 in)                              |
| Crankshaft radial play                   |         | Service limit | 0.08 mm (.003 in)                                  |
| Crankshaft pin diameter                  |         | New           | 35.979 mm to 35.995 mm<br>(1.416 in to 1.417 in)   |
|                                          |         | Service limit | 35.969 mm (1.416 in)                               |
| Crankshaft axial play                    |         | New           | 0.120 mm to 0.353 mm<br>(.0047 in to .0139 in)     |
|                                          |         | Service limit | 0.450 mm (.0177 in)                                |
| Crankshaft deflection (maximum)          |         | MAG           | 0.050 mm (.002 in)                                 |
|                                          |         | CENTER        | 0.050 mm (.002 in)                                 |
|                                          |         | PTO           | 0.080 mm (.003 in)                                 |
| Crankshaft plain bearing inside diameter |         | Service limit | 36.08 mm (1.4205 in)                               |
| Connecting rod big end diameter          |         | Service limit | 36.06 mm (1.4197 in)                               |
| Connecting rod big end radial play       |         | Service limit | 0.08 mm (.0031 in)                                 |
| Connecting rod big end axial play        |         | New           | 0.100 mm to 0.352 mm<br>(.0039 in to .0139 in)     |
|                                          |         | Service limit | 0.450 mm (.0177 in)                                |
| Connecting rod small end diameter        |         | New           | 17.010 mm to 17.020 mm<br>(.6697 in to .6701 in)   |
|                                          |         | Service limit | 17.060 mm (.6717 in)                               |
| Piston pin diameter                      |         | New           | 16.996 mm to 17.000 mm<br>(.6691 in to .6693 in)   |
|                                          |         | Service limit | 16.986 mm (.6687 in)                               |
| Connecting rod small end radial play     |         | Service limit | 0.04 mm (.0016 in)                                 |
| Chain guide groove depth                 |         | Service limit | 1 mm (.039 in)                                     |
| AIR INTAKE SYSTEM                        |         |               |                                                    |
| Intake spark arrestor                    |         |               | Tubular, wire screen                               |

## Subsection XX (ENGINE)

| LUBRICATION SYSTEM                                           |                                   |                                                                                                                                                                                            |
|--------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                                                         |                                   | Dry sump. Replaceable oil filter                                                                                                                                                           |
| Oil filter                                                   |                                   | BRP Rotax paper type, replaceable                                                                                                                                                          |
| Engine oil                                                   | Capacity (oil change with filter) | 1.8 L (1.9 qt (U.S. liq.))                                                                                                                                                                 |
|                                                              | Capacity (dry fill)               | 3.5 L (3.7 qt (U.S. liq.))                                                                                                                                                                 |
|                                                              | Recommended                       | XPS 4-Stroke synthetic blend oil (Summer) (P/N 293 600 121) (if not available, use a SAE 5W 40 or 10W 40 API service SN synthetic oil)                                                     |
| Engine oil pressure at 100°C (212°F)                         | Minimum                           | 80 kPa (11.6 PSI) @ idle speed                                                                                                                                                             |
|                                                              |                                   | 350 kPa (51 PSI) @ 6000 to 8000 RPM                                                                                                                                                        |
| Oil pressure regulator spring free length                    | New                               | 46 mm (1.811 in)                                                                                                                                                                           |
|                                                              | Service limit                     | 45 mm (1.772 in)                                                                                                                                                                           |
| Oil pump radial clearance                                    | Service limit                     | 0.25 mm (.0098 in)                                                                                                                                                                         |
| Oil pump axial clearance                                     | Service limit                     | 0.15 mm (.0059 in)                                                                                                                                                                         |
| COOLING SYSTEM                                               |                                   |                                                                                                                                                                                            |
| Type                                                         |                                   | Closed loop cooling system                                                                                                                                                                 |
| Coolant                                                      |                                   | Ethyl glycol and distilled water (50%/50%) or coolant specifically formulated for aluminum engines<br>For best performance use BRP LONG LIFE ANTIFREEZE (P/N 219702685) or (P/N 619590204) |
| Thermostat opening temperature                               |                                   | 80°C (176°F)                                                                                                                                                                               |
| Monitoring beeper setting                                    |                                   | 100°C (212°F)                                                                                                                                                                              |
| FUEL SYSTEM                                                  |                                   |                                                                                                                                                                                            |
| Fuel injection type                                          |                                   | Multipoint fuel injection                                                                                                                                                                  |
| Throttle body type                                           |                                   | 46 mm heated Dell'Orto throttle body with iTC (intelligent Throttle Control)                                                                                                               |
| Fuel injector                                                | Quantity                          | 3                                                                                                                                                                                          |
| Idle speed                                                   | Normal idle                       | 1400 ± 100 RPM                                                                                                                                                                             |
| ELECTRICAL SYSTEM                                            |                                   |                                                                                                                                                                                            |
| Magneto generator output                                     |                                   | 420 W @ 6000 RPM @ 14 V                                                                                                                                                                    |
| Magneto stator resistance (between any pair of yellow wires) |                                   | 0.1 to 1 Ω @ 20°C (68°F)                                                                                                                                                                   |

| ELECTRICAL SYSTEM            |               |                                           |
|------------------------------|---------------|-------------------------------------------|
| Ignition type                |               | IDI (Inductive Digital Ignition)          |
| Ignition timing              |               | Variable (electronically control)         |
| Spark plug                   | Make and type | NGK CR8EB                                 |
|                              | Gap           | .70 mm to 0.80 mm<br>(.028 in to .031 in) |
| Ignition coil                | Primary       | 0.80 to 0.97 $\Omega$                     |
|                              | Secondary     | 9.5 to 13.5 $\Omega$                      |
| Engine speed limiter setting |               | 8300 RPM                                  |

# VEHICLE

| COOLING SYSTEM                            |                                         |                                                                                                                                                                                 |
|-------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                                      |                                         | Closed loop cooling system (CLCS)                                                                                                                                               |
| Coolant                                   |                                         | BRP long life antifreeze<br>Low silicate, extended life<br>ethylene-glycol premixed coolant<br>(50%-50%) specifically formulated for<br>internal combustion aluminum<br>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.<br>Water cooled/water injected (open<br>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<br>(intelligent Throttle Control). Single<br>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<br>((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<br>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<br>Identification Digitally Encoded<br>Security System) with selectable<br>maximum vehicle speed settings<br>for LK (learning key)               |



## Subsection XX (VEHICLE)

| ELECTRICAL SYSTEM            |                                                                     |                                      |
|------------------------------|---------------------------------------------------------------------|--------------------------------------|
| Ignition timing              |                                                                     | Variable (electronically controlled) |
| Ignition coil                | Primary                                                             | 0.80 to 0.97 $\Omega$                |
|                              | 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 |

| 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)<br>(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

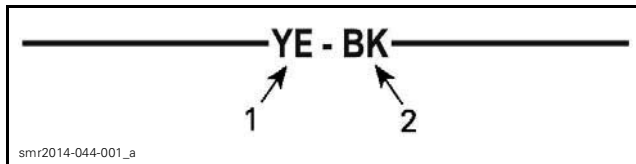
## GENERAL

### 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<br>WHITE/BLACK | CAN HI wires,<br>CAN LO wires                                  |

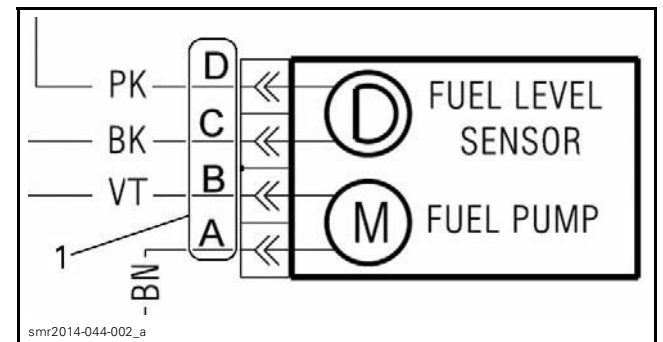
#### Color Codes

| 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 |

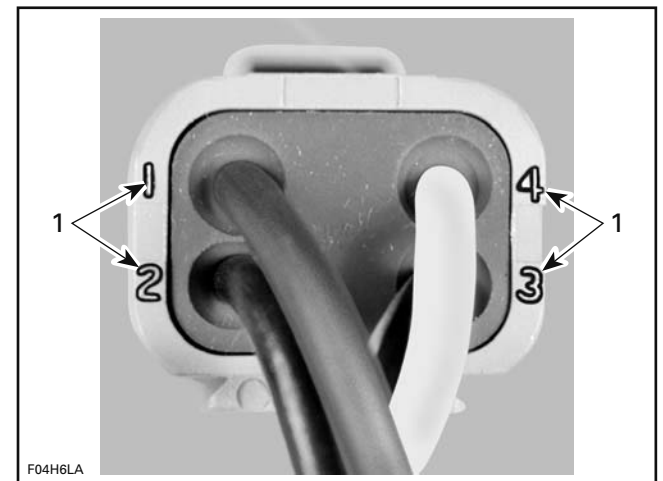
#### Terminal Identification on Connector

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

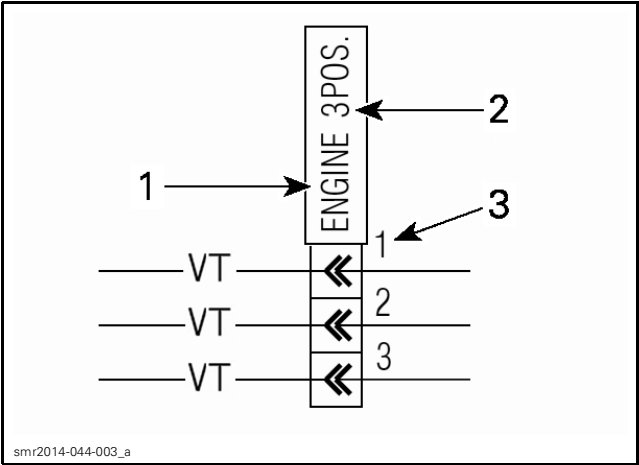
1. Wire identification numbers

#### 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)

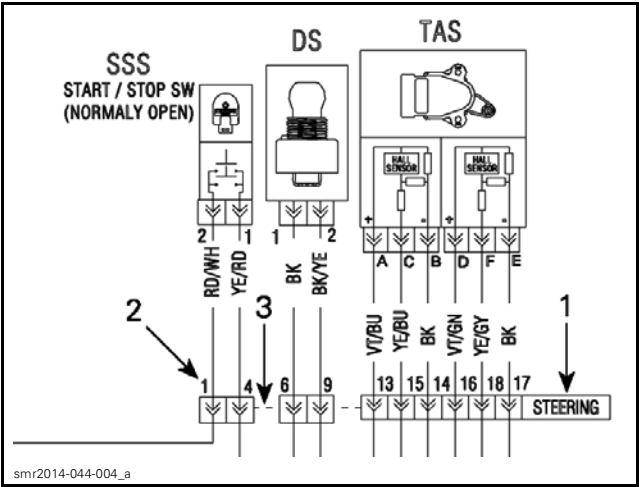


TYPICAL

- Connector location
- Number of pins (terminals)
- Wire pin location in connector

Connectors Linked by a Dashed Line

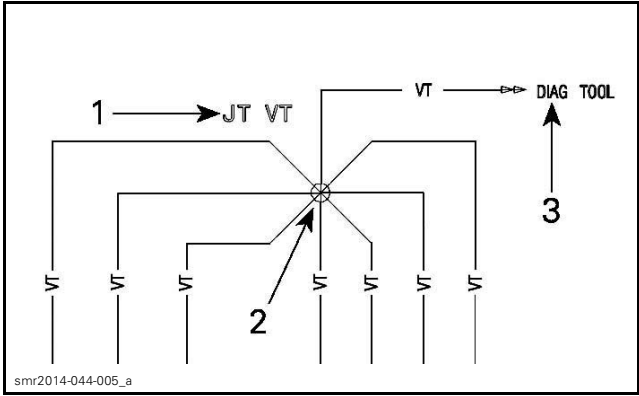
Connectors may be divided into segments linked by dashed lines, however, some segments of the same connector may be found elsewhere on the wiring diagram.



TYPICAL

- Connector identification and location
- Connector pin number
- Dashed line links connector segments as one

Wire Junction Identification



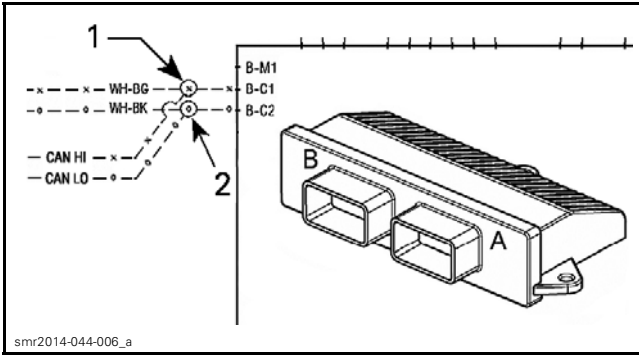
1. Wire junction name

2. Wire junction symbol (circle)

3. Wire destination

CAN Wire Circuit References

On the wiring diagram, CAN linked components use the following coding.



TYPICAL

- Splice on CAN HI wire (x)
- 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.

# 2021

## SPARK Series

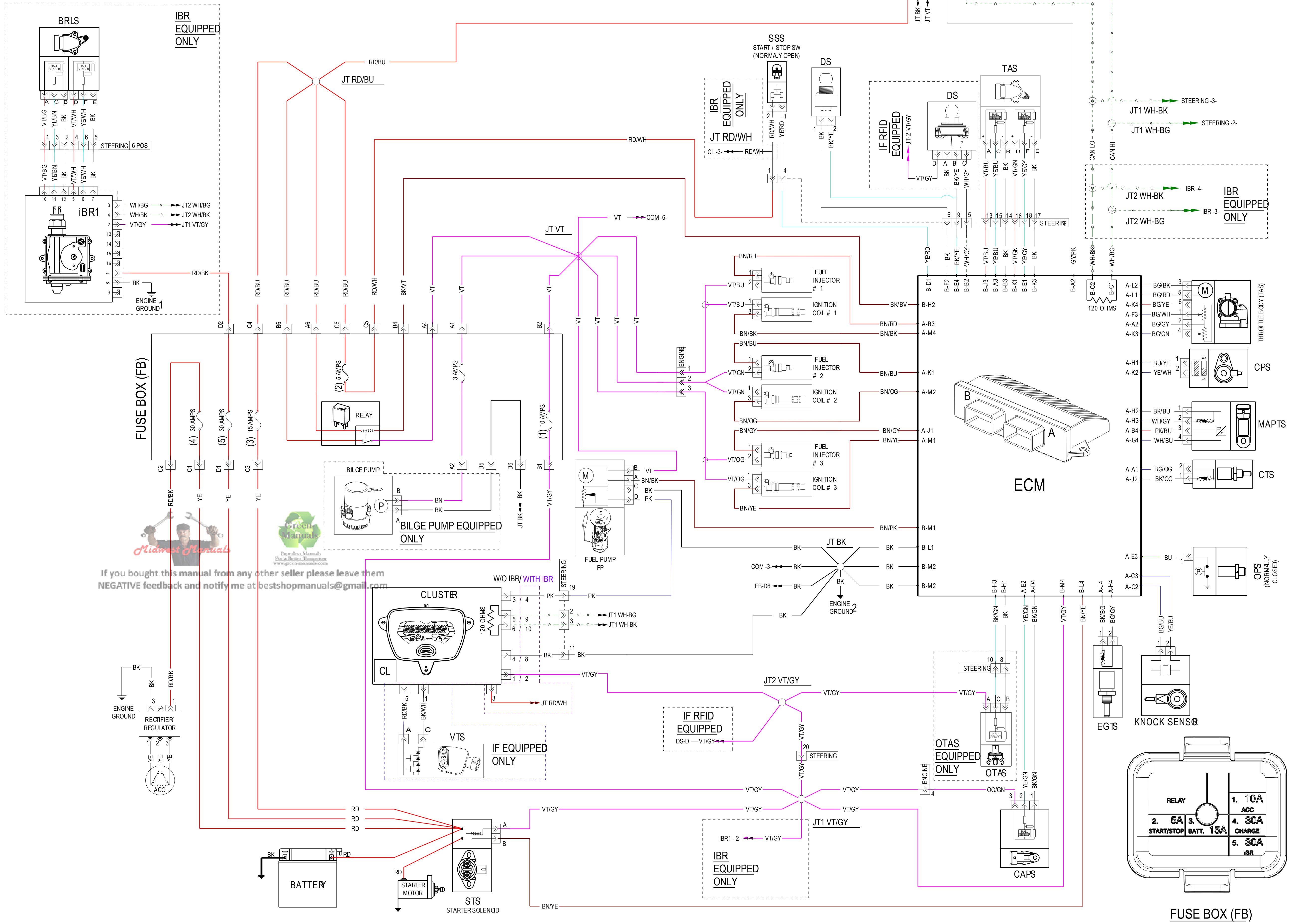
### LEGEND

WH = WHITE BK = BLACK  
RD = RED YE = YELLOW  
VT = VIOLET BG = BEIGE (TAN)  
GN = GREEN BN = BROWN  
GY = GREY BU = BLUE  
PK = PINK OG = ORANGE

⊗ : JUNCTION POSITION  
\* - \* : CAN HI WIRE  
○ - ○ : CAN LO WIRE

### LINE TYPE

|                     |  |
|---------------------|--|
| 55 / 60 VOLTS       |  |
| 12 VOLTS SWITCHED   |  |
| 12 VOLTS UNSWITCHED |  |
| 5 OR 3.3 VOLTS      |  |
| DIGITAL SIGNAL      |  |
| AC VOLTAGE          |  |
| POWER CONTROL       |  |
| ANALOG SIGNAL       |  |
| COMMUNICATION       |  |
| A-D GROUND          |  |
| POWER GROUND        |  |





**Flat rate times are what the manufacturer pays the authorized dealer for warranty work, the times listed are usually unrealistic for even the most experienced mechanic and will take longer to actually complete.**

**Because of this dealers will usually charge more than the times posted.**

**I cannot be held responsible for any errors BRP has made in these service flat rate or parts manuals.**

**If you bought this manual from any other seller, they could be reselling my work.**

**Please leave them negative feedback & email me at [bestshopmanuals@gmail.com](mailto:bestshopmanuals@gmail.com).**

**Our goal is to be one of the BEST sellers on the internet by providing you with the BEST customer service and the BEST manuals on the market.**

**Thank you for choosing us.**



# INTRODUCTION

This publication governs all warranty labor allowances for 2021 BRP Sea-Doo.

## 1. HOW DOES IT WORK

We follow the procedures detailed in the BRP *Sea-Doo Shop Manual*. The flat rate time is the maximum time allowed for a repair involving any given part. **FLAT RATE TIME IS NOT CUMULATIVE.** You must use the flat rate time given for the longest lasting operation.

**NOTE:** The *Flat Rate Time Schedule* was prepared by skilled mechanics using the hand tool usually found in workshops and all the special tools mentioned in the *Shop Manual*.

## 2. COMPILATION

The *Flat Rate Time Schedule* is compiled as follows:

The actual required time to perform the repair plus (+) 30% correction factor up to 3.0 hours or (+) 15% over 3.0 hours time to take into account, among others:

- Vehicle handling
- Obtaining the parts
- Diagnosis
- Cleaning
- Special compensation (rusted bolts).

## 3. HOW TO USE IT

Refer to the system you need, locate part of series of parts replaced. List JOB CODE in the appropriate column on claim.

| SYSTEM |                                      | PAGE |
|--------|--------------------------------------|------|
| 01     | ENGINE                               | 04   |
| 02     | CARBURETOR AND FUEL SYSTEM           | 16   |
| 03     | IGNITION SYSTEM                      | 19   |
| 04     | STARTER                              | 21   |
| 05     | TRANSMISSION SYSTEM                  | 23   |
| 07     | STEERING SYSTEM AND FRONT SUSPENSION | 28   |
| 09     | BODY                                 | 30   |
| 10     | ELECTRICAL SYSTEM                    | 35   |
| 12     | HULL AND DECK                        | 39   |

**NOTE:** Unless otherwise specified, dismantling order is: top to bottom, exterior to interior, front to rear.

All fractions of hours are in tenths:

- 0.1 = 6 minutes
- 0.2 = 12 minutes, and so on

### LEGEND:

- \* REQUIRES PRIOR AUTHORIZATION BY DISTRIBUTOR.
- \*\* INDICATE LABOUR TIME ON LINE "LABOUR ONLY" OF CLAIM.
- \*\*\* INDICATE \$\$\$ AMOUNT ON "SUB-CONTRACTED LABOUR" OF CLAIM.

**IMPORTANT:** Always use the longest flat rate time applicable to the repair performed.

## 4. JOB REQUIREMENTS

All the flat rate times mentioned in the following pages include the required operations such as: engine timing (rotary valve and ignition), connecting rod(s) alignment, cylinder head(s) torque or use of parallel bar, use of ignition tester, piston clearance/ring end gap measurement, crankshaft to crankcase measurement, cylinder honing, engine leak test.

## 5. ILLUSTRATIONS

The illustrations contained in this manual do not necessarily show every components of a given system as *Parts Catalog* do. Their purpose is to facilitate recognition of parts related to a flat rate time. **Item numbers on illustrations correspond to the four digit Job Code.**

## 6. FLAT RATE TIME SUGGESTION

### SEND A WARRANTY CASE ON BOSSWeb INFO CENTER

In the case, you must provide the following information:

Section *Subject*:

- Flat rate time suggestion

Section *Your Question*:

- Model year;
- Model description;
- Description job code;
- Job code;
- Present flat rate;
- Suggested flat rate;
- Detailed repair procedure;

To ensure that your case will be promptly and efficiently processed please indicate the step by step repair procedure you performed.

# INTRODUCTION

Cette publication détermine le temps de main-d'oeuvre couvert par la garantie pour les motoneiges BRP 2021.

## 1. UTILISATION DU MANUEL

En procédant de la façon indiquée dans le *Manuel de réparation motoneiges* BRP, chaque temps donné représente le maximum permis pour une réparation portant sur cette pièce. **LES TEMPS NE SONT PAS CUMULATIFS.** On doit inscrire le temps donné pour l'opération qui prend le plus de temps.

**REMARQUE:** Le *Barème de temps à taux fixe* a été préparé par des mécaniciens compétents utilisant les outils que l'on retrouve normalement dans les ateliers de réparation, en plus de tous les outils spéciaux mentionnés dans le *Manuel de réparation*.

## 2. COMPILATION

Le *Barème de temps à taux fixe* a été établi en compilant le temps nécessaire pour faire la réparation plus (+) un facteur de correction de 30% lorsqu'un travail dure 3.0 heures et moins, ou (+) 15% lorsqu'un travail dure plus de 3.0 heures. Cette compilation comprend, entre autres, les étapes suivantes:

- Manutention du véhicule
- Nettoyage
- Aller chercher les pièces, essais physiques
- Compensation spéciale (boulons rouillés)
- Diagnostic.

## 3. UTILISATION DU BARÈME

Se reporter à la section désirée, repérer la pièce ou l'ensemble de pièces remplacées et inscrire le CODE DE TRAVAIL dans la colonne appropriée sur la formule de réclamation.

| SYSTÈME |                                                 | PAGE |
|---------|-------------------------------------------------|------|
| 01      | MOTEUR                                          | 4    |
| 02      | CARBURATEUR ET SYSTÈME D'ALIMENTATION D'ESSENCE | 16   |
| 03      | SYSTÈME D'ALLUMAGE                              | 19   |
| 04      | DÉMARREUR                                       | 21   |
| 05      | SYSTÈME DE TRANSMISSION                         | 23   |
| 07      | SYSTÈME DE DIRECTION ET SUSPENSION AVANT        | 28   |
| 09      | CARROSSERIE                                     | 30   |
| 10      | SYSTÈME ÉLECTRIQUE                              | 35   |
| 12      | COQUE ET PLATE-FORME                            | 39   |

**REMARQUE:** Sauf indication contraire, le démontage doit s'effectuer de haut en bas, de l'extérieur vers l'intérieur, de l'avant vers l'arrière.

Toutes les fractions d'heures sont exprimées en dixièmes:

0.1 = 6 minutes

0.2 = 12 minutes, et ainsi de suite

## LÉGENDE:

- \* AUTORISATION REQUISE AVANT LE REMPLACEMENT.

- \*\* INSCRIRE LE TEMPS À LA LIGNE «MAIN-D'OEUVRE SEULEMENT».
- \*\*\* INSCRIRE LE MONTANT \$\$\$ À LA LIGNE «OUVRAGE SOUS-CONTRACTÉ».

**IMPORTANT:** Toujours utiliser le temps donné à l'opération qui nécessite le plus de temps.

## 4. TRAVAUX REQUIS

Tous les temps mentionnés dans les pages suivantes incluent les opérations telles que: réglage du moteur (valve rotative et allumage), alignement de la ou des bielles, couple de serrage de la ou des culasses ou l'utilisation de barres parallèles, utilisation du vérificateur d'allumage, mesure du jet des pistons/jeu en bout des segments, mesure de l'écart entre le vilebrequin et le carter, rectification du cylindre, vérification de fuite du moteur.

## 5. ILLUSTRATIONS

Contrairement aux *Catalogues de pièces*, les illustrations de ce manuel ne montrent pas nécessairement chacune des pièces qu'elles représentent, leur raison d'être étant plutôt de faciliter la reconnaissance des pièces reliées à un barème de temps à taux fixe. **Les numéros d'items sur les illustrations correspondent aux quatre derniers chiffres du code de travail.**

## 6. SUGGESTION DE BARÈME DE TEMPS À TAUX FIXE

**ENVOYEZ UNE REQUÊTE GARANTIE BOSSWeb DEPUIS LA SECTION INFO CENTRE**

Dans cette requête, vous devez fournir les informations suivantes:

Section *Objet*:

- Suggestion de barème de temps à taux fixe

Section *Votre Question*:

- L'année modèle;
- Description du modèle;
- Description du code de travail;
- Code de travail;
- Temps actuel;
- Temps suggéré;
- Détails de la marche à suivre;

Pour s'assurer que votre demande sera traitée dans les plus brefs délais et efficacement, s.v.p. nous fournir toutes les étapes de réparation dans les détails de la marche à suivre



# 2021

## *Liquid Cooled Engines / Moteurs refroidis par liquide*

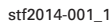
| TABLE | DESCRIPTION     | MODEL<br>MODÈLE                                  | ENGINE<br>MOTEUR | IBR |
|-------|-----------------|--------------------------------------------------|------------------|-----|
| 1     | SPARK 2up       | 61MA/61MB                                        | 900 ACE          | N/A |
| 2     | SPARK 3up       | 62MA/62MB<br>62ME/62MF                           | 900 HO<br>ACE    | N/A |
|       | SPARK 2up       | 64MA/64MB<br>64ME/64MF                           |                  |     |
|       | SPARK 3up       | 63MA/63MB<br>63ME/63MF<br>63MG/63MJ              |                  | STD |
| 3     | SPARK 2up TRIXX | 65MA/65MB<br>65MC/65MD<br>65ME/65MF<br>65MG/65MH | 900 HO ACE       | STD |
|       | SPARK 3up TRIXX | 66MA/66MB<br>66MC/66MD<br>66ME/66MF<br>66MG/66MH |                  |     |

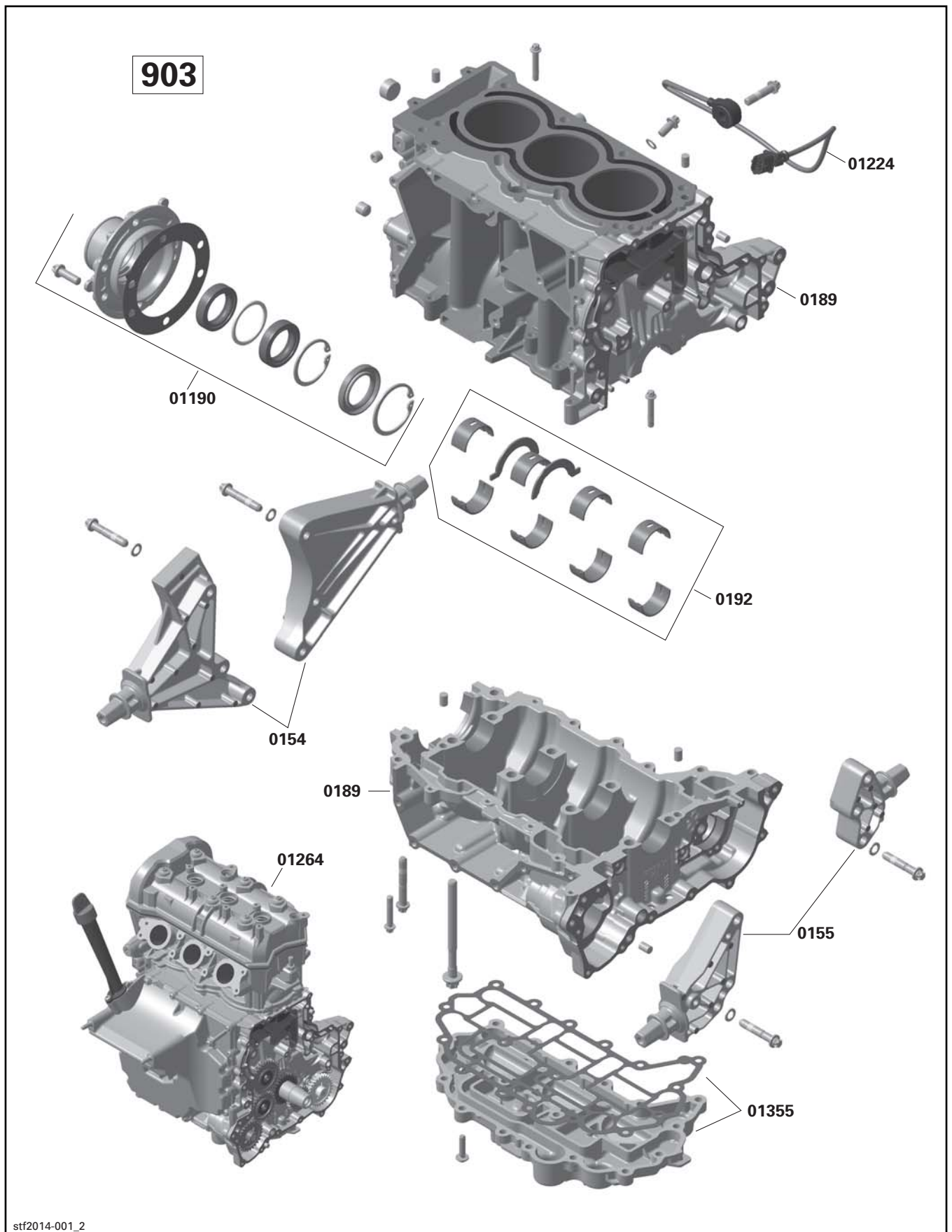
| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                                            | SPARK    | SPARK<br>TRIXX |
|-------------------|------|--------------------------------------------------------------------------------------------------------|----------|----------------|
|                   |      |                                                                                                        | 1/2      | 3              |
| 01                | 00   | <b>NO LABOR INVOLVED<br/>AUCUNE MAIN-D'OEUVRE</b>                                                      | <b>0</b> | <b>0</b>       |
| 01                | 01   | MUFFLER, HOSE, STRAP, RUBBER STRIP<br>SILENCIEUX, BOYAU, SANGLE, BANDE CAOUTCHOUC                      | 1.0      | 1.0            |
| 01                | 05   | EXHAUST MANIFOLD AND/OR BOLT(S)<br>COLLECTEUR D'ÉCHAPPEMENT ET/OU BOULON(S)                            | 1.1      | 1.1            |
| 01                | 08   | ENGINE (ASS'Y) REMOVAL AND INSTALLATION<br>DÉPOSE ET INSTALLATION DU MOTEUR (COMPLET)                  | 3.5      | 3.5            |
| 01                | 12   | TEMPERATURE SENSOR<br>CAPTEUR DE TEMPÉRATURE                                                           | 0.5      | 0.5            |
| 01                | 14   | CYLINDER HEAD<br>CULASSE                                                                               | 4.0      | 4.0            |
| 01                | 36   | EXHAUST OUTLET<br>SORTIE D'ÉCHAPPEMENT                                                                 | 0.6      | 0.6            |
| 01                | 52   | RESONATOR (RIGHT)<br>RÉSONATEUR (DROIT)                                                                | 1.2      | 1.2            |
| 01                | 54   | REAR ENGINE SUPPORT (EACH)<br>SUPPORT MOTEUR ARRIÈRE (CHAQUE)                                          | 1.4      | 1.4            |
| 01                | 55   | FRONT ENGINE SUPPORT (EACH)<br>SUPPORT MOTEUR AVANT (CHAQUE)                                           | 1.4      | 1.4            |
| 01                | 56   | ENGINE RUBBER MOUNTS (REAR OR FRONT) (EACH)<br>TAMPON D'ANCRAGE MOTEUR (AVANT OU ARRIÈRE) (CHACUN)     | 1.0      | 1.0            |
| 01                | 61   | HOSE (FROM PUMP SUPPORT TO HEAD PIPE ASS'Y)<br>BOYAU DU SUPPORT DE POMPE AU TUYAU COLLECTEUR (COMPLET) | 0.8      | 0.8            |
| 01                | 63   | SENSOR TEMPERATURE (MUFFLER)<br>CAPTEUR DE TEMPERATURE (SILENCIEUX)                                    | 0.8      | 0.8            |
| 01                | 65   | NOISE SENSOR<br>CAPTEUR DE CLIQUETIS                                                                   | 0.9      | 0.9            |
| 01                | 83   | PISTON, RINGS, CIRCLIP, PIN (1)<br>PISTON, SEGMENTS, ANNEAU DE RETENUE, GOUPILLE (1)                   | 6.0      | 6.0            |
| 01                | 84   | PISTON, RINGS, CIRCLIP, PIN (2)<br>PISTON, SEGMENTS, ANNEAU DE RETENUE, GOUPILLE (2)                   | 6.1      | 6.1            |
| 01                | 85   | PISTON, RINGS, CIRCLIP, PIN (3)<br>PISTON, SEGMENTS, ANNEAU DE RETENUE, GOUPILLE (3)                   | 6.2      | 6.2            |
| 01                | 86   | INLET HOSE (RADIATOR TO PUMP)<br>BOYAU ENTRÉE D'EAU (RADIATEUR À POMPE)                                | 1.3      | 1.3            |
| 01                | 87   | WATER OUTLET (ENGINE TO RADIATOR)<br>SORTIE D'EAU (MOTEUR AU RADIATEUR)                                | 1.3      | 1.3            |
| 01                | 88   | HOSE FROM MUFFLER LEFT TO MUFFLER RIGHT<br>BOYAU DU SILENCIEUX GAUCHE AU SILENCIEUX DROIT              | 0.8      | 0.8            |
| 01                | 89   | ENGINE BLOCK (CRANKCASE)<br>ENSEMBLE MOTEUR (CARTER)                                                   | 6.3      | 6.3            |

| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                                                          | SPARK | SPARK<br>TRIXX |
|-------------------|------|----------------------------------------------------------------------------------------------------------------------|-------|----------------|
|                   |      |                                                                                                                      | 1/2   | 3              |
| <b>01</b>         | 90   | ENGINE BLOCK RESEAL OR SEALANT<br>RESCELLEMENT DU MOTEUR OU SCELLANT                                                 | 5.0   | 5.0            |
| <b>01</b>         | 92   | CRANKSHAFT AND/OR PLAIN BEARING AND/OR RING HALF<br>VILEBREQUIN ET/OU ROULEMENT PLAT ET/OU DEMI-BAGUE                | 7.0   | 7.0            |
| <b>01</b>         | 93   | WATER PUMP HOUSING (ASS'Y) AND/OR GASKET<br>BOÎTIER POMPE À EAU (COMPLET) ET/OU JOINT D'ÉTANCHÉITÉ                   | 1.1   | 1.1            |
| <b>01</b>         | 94   | COOLING RESERVE<br>RÉSERVOIR ANTIGEL                                                                                 | 0.3   | 0.3            |
| <b>01</b>         | 95   | RADIATOR<br>RADIATEUR                                                                                                | 2.3   | 2.3            |
| <b>01</b>         | 96   | CAMSHAFT POSITION SENSOR<br>CAPTEUR DE POSITION DE L'ARBRE À CAMES                                                   | 0.5   | 0.5            |
| <b>01</b>         | 97   | VALVE COVER AND/OR GASKET<br>COUVERCLE DE SOUPAPE ET/OU JOINT D'ÉTANCHÉITÉ                                           | 1.2   | 1.2            |
| <b>01</b>         | 111  | TIMING GEARS<br>ENGRENAGES DE LA DISTRIBUTION                                                                        | 1.4   | 1.4            |
| <b>01</b>         | 121  | IGNITION COVER A/O GASKET<br>COUVERCLE ALLUMAGE E/O JOINT ÉTANCHE                                                    | 3.0   | 3.0            |
| <b>01</b>         | 132  | OIL JUMP GEAR<br>ENGRENAGE POMPE À L'HUILE                                                                           | 3.3   | 3.3            |
| <b>01</b>         | 146  | OIL PUMP GEAR (2)<br>ENGRANAGE POMPE À L'HUILE (2)                                                                   | 3.3   | 3.3            |
| <b>01</b>         | 174  | CAMSHAFT CHAIN<br>CHAÎNE DE L'ARBRE À CAMES                                                                          | 5.8   | 5.8            |
| <b>01</b>         | 177  | EXHAUST VALVE, SPRINGS, SEAL, GUIDE (1)<br>SOUPAPE D'ÉCHAPPEMENT, RESSORTS, JOINT, GUIDE (1)                         | 2.0   | 2.0            |
| <b>01</b>         | 178  | INTAKE VALVE, SRINGS, SEAL, GUIDE (1)<br>SOUPAPE D'ADMISSION, RESSORTS, JOINT, GUIDE (1)                             | 2.0   | 2.0            |
| <b>01</b>         | 179  | CHAIN GUIDE<br>GUIDE DE CHAÎNE                                                                                       | 2.0   | 2.0            |
| <b>01</b>         | 180  | OUTPUT SLEEVE<br>MANCHON DEBIT                                                                                       | 2.0   | 2.0            |
| <b>01</b>         | 182  | OIL RADIATOR AND/OR O-RING<br>RADIATEUR D'HUILE ET/OU JOINT TORIQUE                                                  | 1.0   | 1.0            |
| <b>01</b>         | 183  | OIL PUMP COVER AND/OR SHAFT AND/OR ROTOR (REAR)<br>COUVERCLE DE LA POMPE À L'HUILE ET/OU ARBRE ET/OU ROTOR (ARRIÈRE) | 3.2   | 3.2            |
| <b>01</b>         | 184  | OIL PUMP HOUSING AND/OR ALL PARTS (FRONT)<br>BOÎTIER DE LA POMPE À L'HUILE ET/OU TOUTES LES PIÈCES (AVANT)           | 3.2   | 3.2            |
| <b>01</b>         | 189  | OIL PRESSURE SWITCH<br>INTERRUPTEUR DE PRESSION D'HUILE                                                              | 0.5   | 0.5            |
| <b>01</b>         | 190  | PTO HOUSING AND/OR GASKET<br>BOÎTIER PDM ET/OU JOINT D'ÉTANCHÉITÉ                                                    | 1.8   | 1.8            |

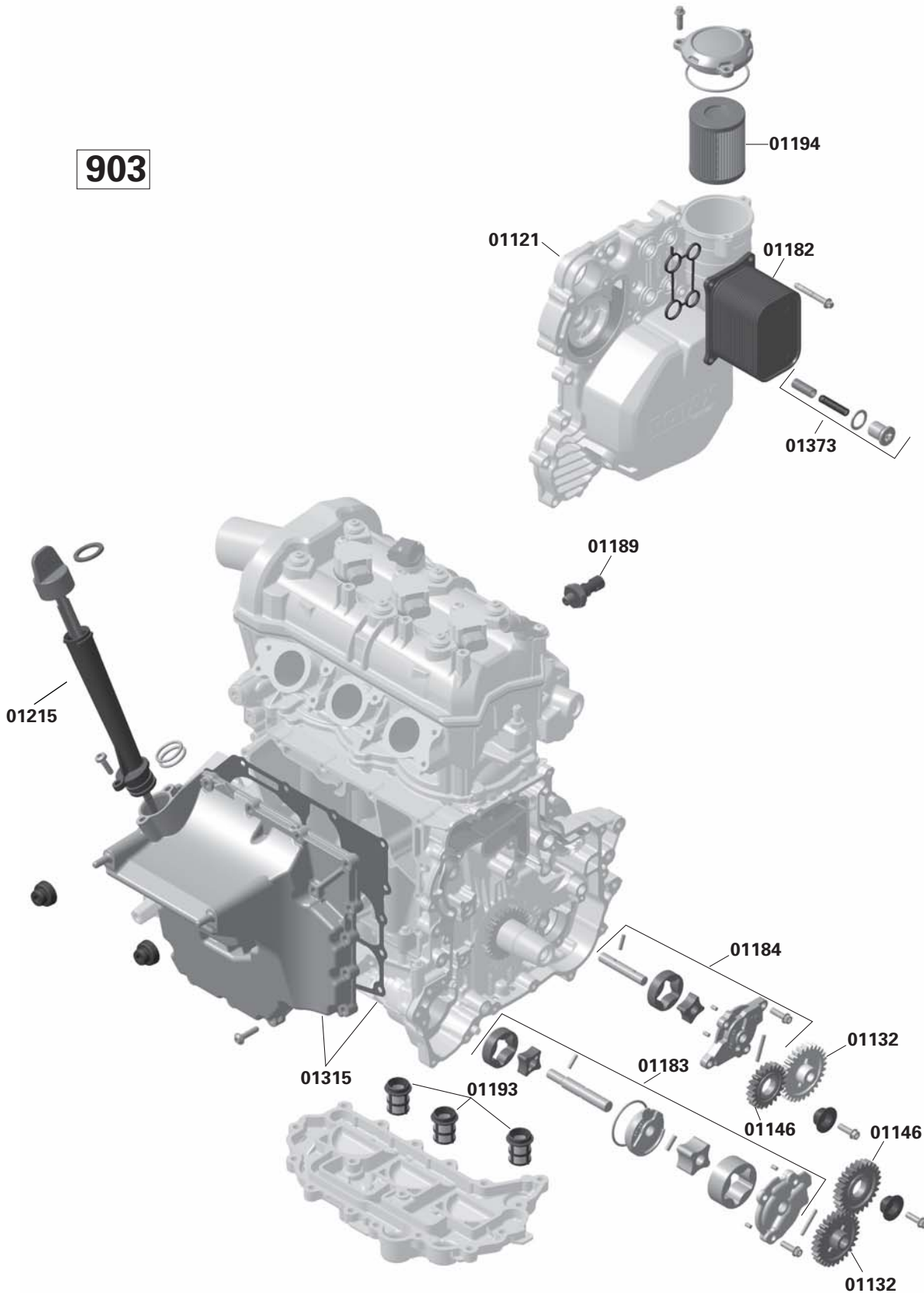
| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                                                                 | SPARK | SPARK<br>TRIXX |
|-------------------|------|-----------------------------------------------------------------------------------------------------------------------------|-------|----------------|
|                   |      |                                                                                                                             | 1/2   | 3              |
| 01                | 191  | CHAIN TENSION GUIDE<br>GUIDE DE TENSION DE CHAÎNE                                                                           | 5.0   | 5.0            |
| 01                | 192  | CHAIN TENSIONER (ASS'Y)<br>TENDEUR DE CHAÎNE (COMPLET)                                                                      | 0.9   | 0.9            |
| 01                | 193  | OIL SIEVE (PTO)<br>TAMIS D'HUILE (PDM)                                                                                      | 4.2   | 4.2            |
| 01                | 194  | OIL FILTER AND/OR O-RING<br>FILTRE À HUILE ET/OU JOINT TORIQUE                                                              | 0.3   | 0.3            |
| 01                | 200  | WATER PUMP GEAR<br>ENGRENAGE POMPE A EAU                                                                                    | 3.3   | 3.3            |
| 01                | 215  | OIL DIPSTICK<br>JAUGE À L'HUILE                                                                                             | 0.5   | 0.5            |
| 01                | 216  | PRESSURE CAP<br>BOUCHON DE RADIATEUR                                                                                        | 0.3   | 0.3            |
| 01                | 224  | KNOCK SENSOR<br>CAPTEUR DE CLIQUETIS                                                                                        | 0.8   | 0.8            |
| 01                | 246  | WATER PUMP GEAR AND/OR SEAL<br>ARBRE POMPE A EAU ET/OU JOINT ETANCHEITE                                                     | 3.3   | 3.3            |
| 01                | 248  | BREATHER GEAR AND/OR V-RING<br>RENIFLARD ET/OU ANNEAU ETANCHEITE EN V                                                       | 1.0   | 1.0            |
| 01                | 250  | CRANKSHAFT POSITION SENSOR (CPS)<br>CAPTEUR POSITION DU VILEBREQUIN (CPV)                                                   | 0.6   | 0.6            |
| 01                | 251  | PRESSURE VALVE (ASS'Y)<br>SOUPAPE DE PRESSURISATION (COMPLET)                                                               | 0.5   | 0.5            |
| 01                | 255  | EXHAUST/INLET VALVES AND/OR SPRINGS AND/OR SEALS (4)<br>VALVES D'ÉCHAPPEMENT/D'ADMISSION ET/OU RESSORTS ET/OU ANNEAUX (4)   | 2.5   | 2.5            |
| 01                | 256  | EXHAUST/INLET VALVES AND/OR SPRINGS AND/OR SEALS (8)<br>VALVES D'ÉCHAPPEMENT/D'ADMISSION ET/OU RESSORTS ET/OU ANNEAUX (8)   | 2.9   | 2.9            |
| 01                | 257  | EXHAUST/INLET VALVES AND/OR SPRINGS AND/OR SEALS (12)<br>VALVES D'ÉCHAPPEMENT/D'ADMISSION ET/OU RESSORTS ET/OU ANNEAUX (12) | 3.3   | 3.3            |
| 01                | 264  | LONG BLOCK<br>ENSEMBLE CARTER-CYLINDRE-CULASSE                                                                              | 5.0   | 5.0            |
| 01                | 301  | WATER PUMP DYNAMIC SEAL AND/OR OIL SEAL<br>ANNEAU D'ÉTANCHÉITÉ DYNAMIQUE POMPE À EAU ET/OU ANNEAU D'ÉTANCHÉITÉ D'HUILE      | 3.5   | 3.5            |
| 01                | 305  | CHAINS GUIDE (ALL)<br>GUIDE DE CHAINES (TOUS)                                                                               | 2.8   | 2.8            |
| 01                | 308  | CYLINDER HEAD GASKET<br>JOINT D'ÉTANCHÉITÉ DE LA CULASSE                                                                    | 4.3   | 4.3            |
| 01                | 311  | CAMSHAFT INTAKE/EXHAUST AND/OR CAMSHAFT BRACKETS<br>ARBRE A CAME ADMISSION/ECHAPPEMENT ET/OU SUPPORT D'ARBREA CAME          | 3.8   | 3.8            |
| 01                | 315  | OIL SUMP COVER AND GASKET<br>COUVERCLE DU CARTER D'HUILE ET JOINT D'ÉTANCHÉITÉ                                              | 1.4   | 1.4            |

| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                | SPARK | SPARK |
|-------------------|------|----------------------------------------------------------------------------|-------|-------|
|                   |      |                                                                            | 1/2   | 3     |
| 01                | 341  | BOIL OUT PROCEDURE<br>PROCÉDURE MOTEUR INONDÉ                              | 3.0   | 3.0   |
|                   | 354  | THERMOSTAT<br>THERMOSTAT                                                   | 1.2   | 1.2   |
|                   | 355  | OIL SUMP AND GASKET<br>CARTER D'HUILE ET JOINT D'ÉTANCHÉITÉ                | 5.0   | 5.0   |
|                   | 373  | OIL PRESSURE REGULATOR (ASS'Y)<br>REGULATEUR DE PRESSION D'HUILE (COMPLET) | 0.9   | 0.9   |



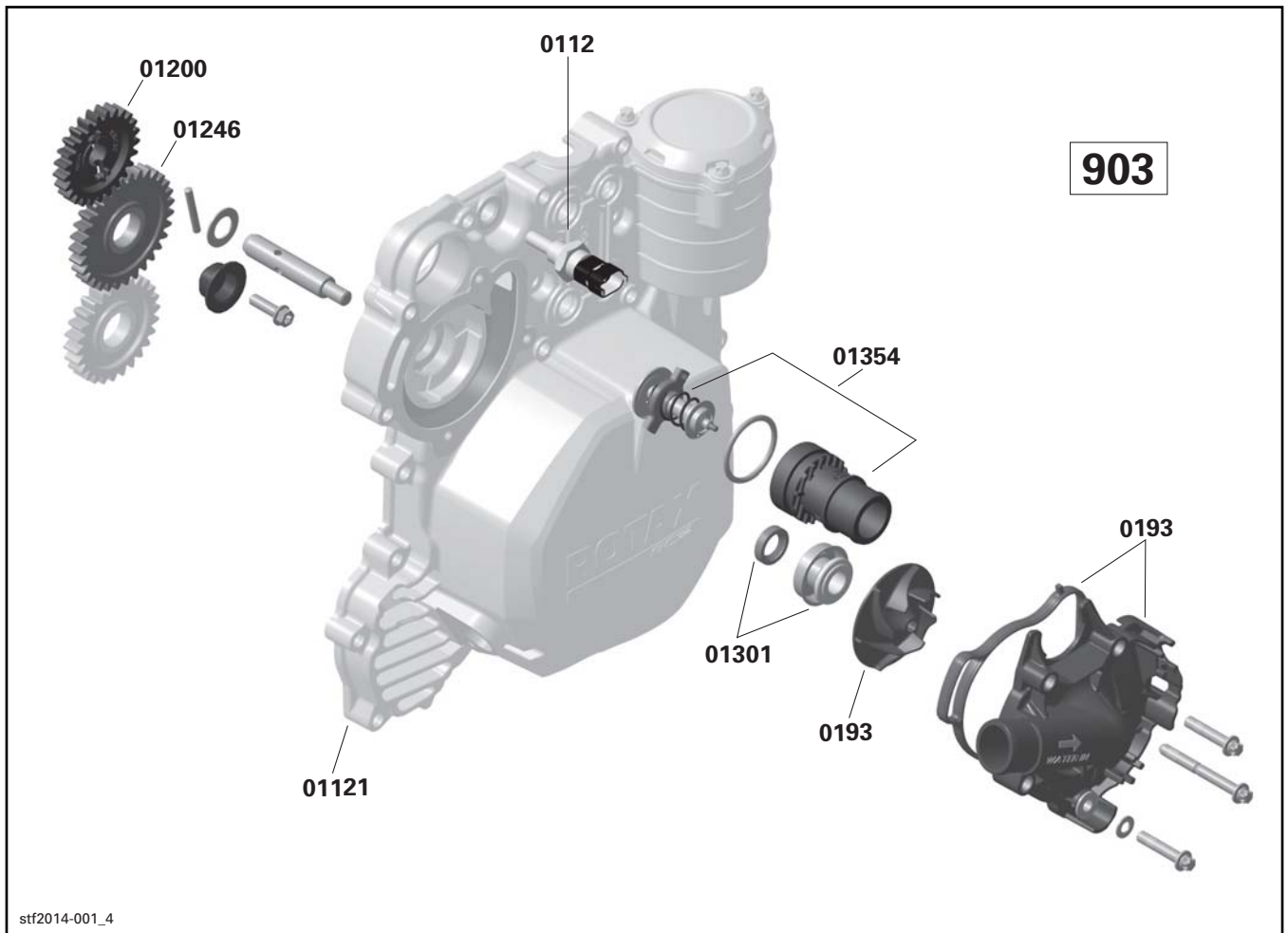


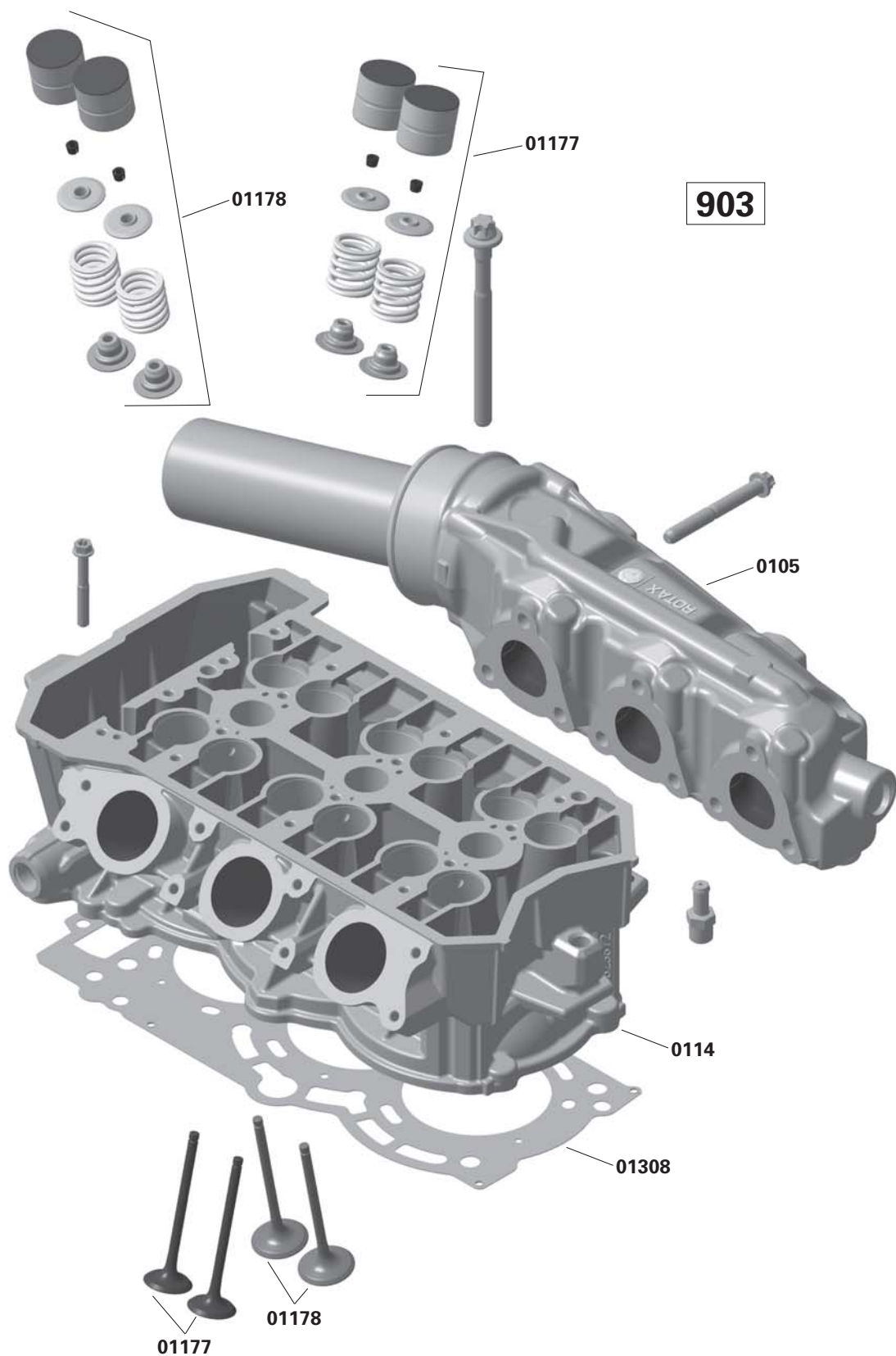
903



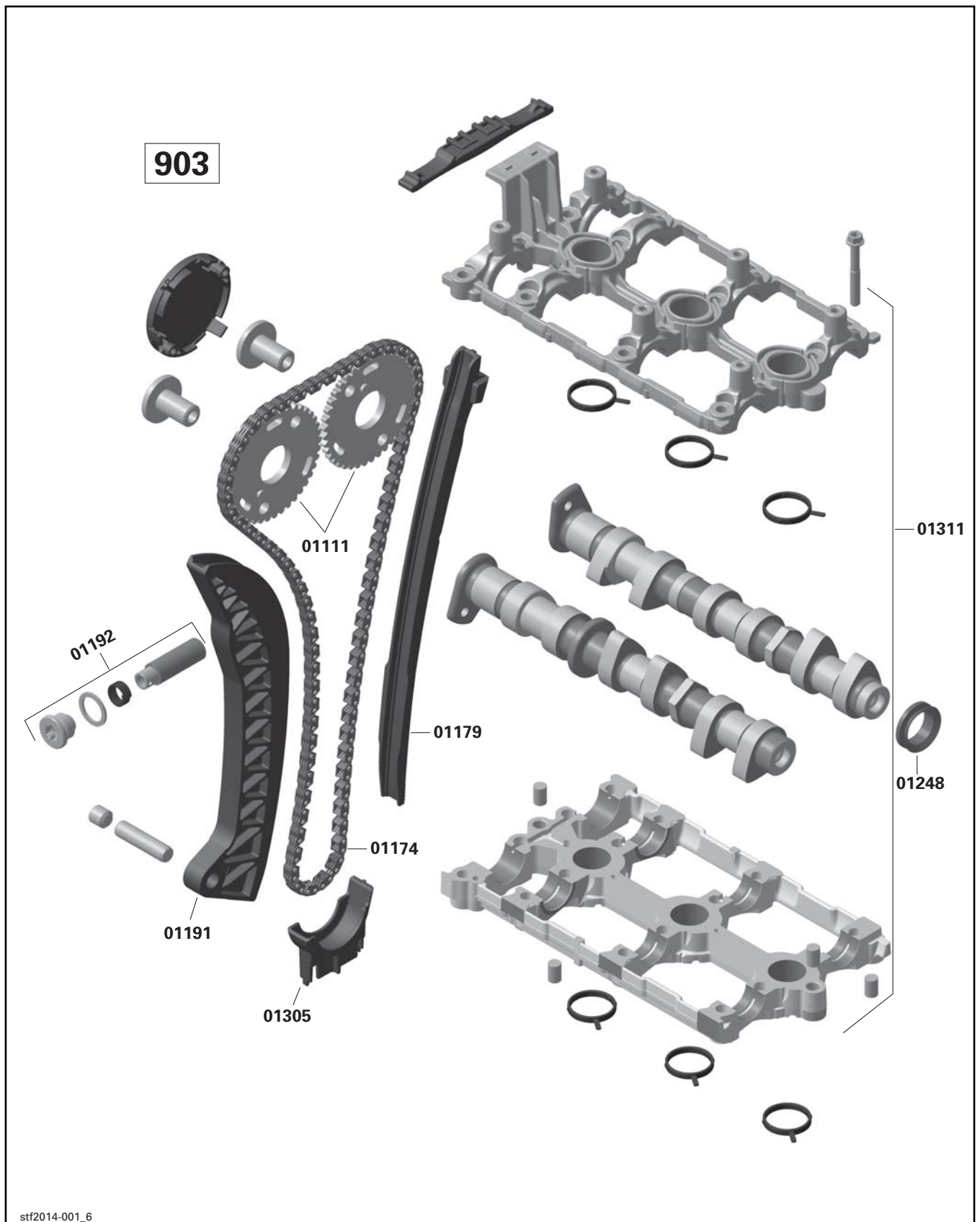
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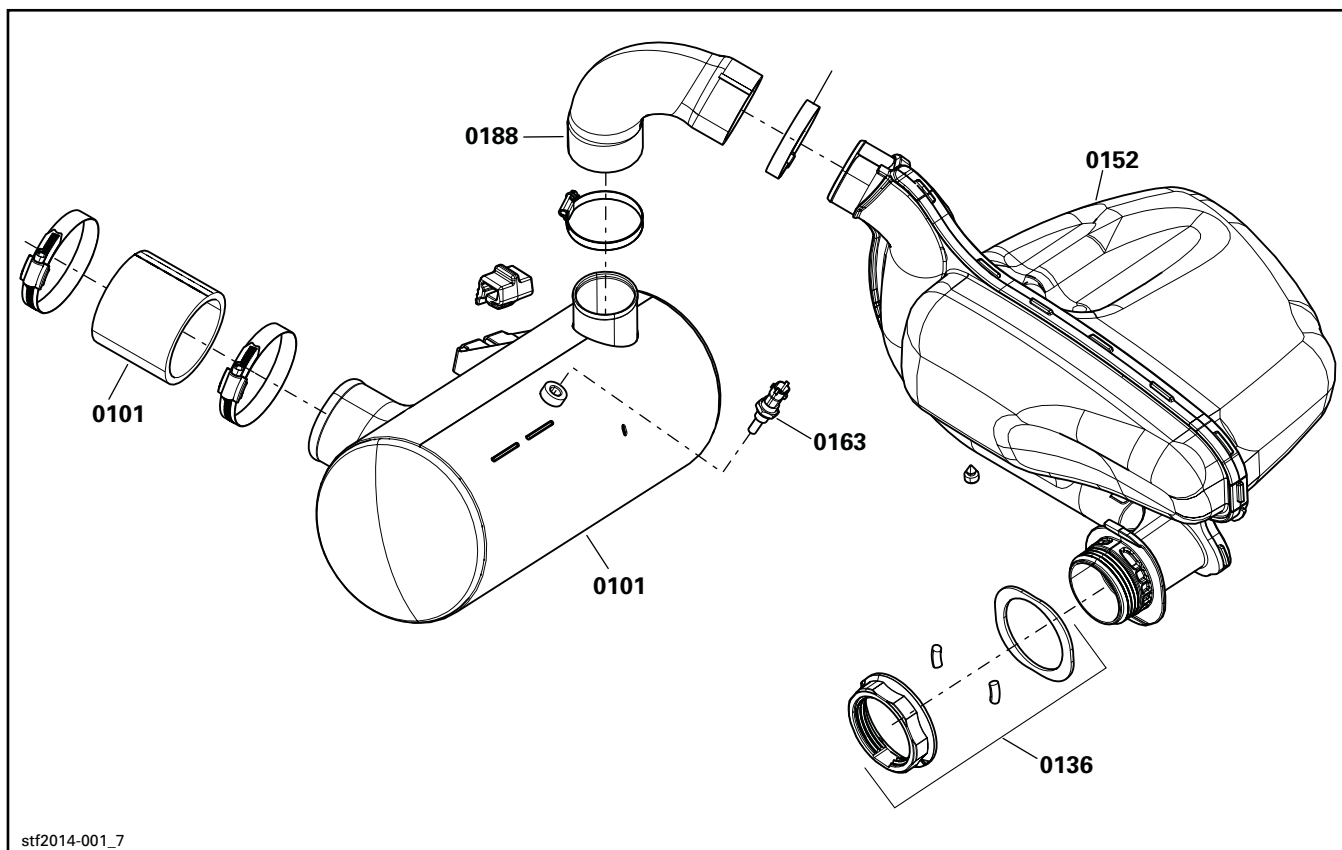




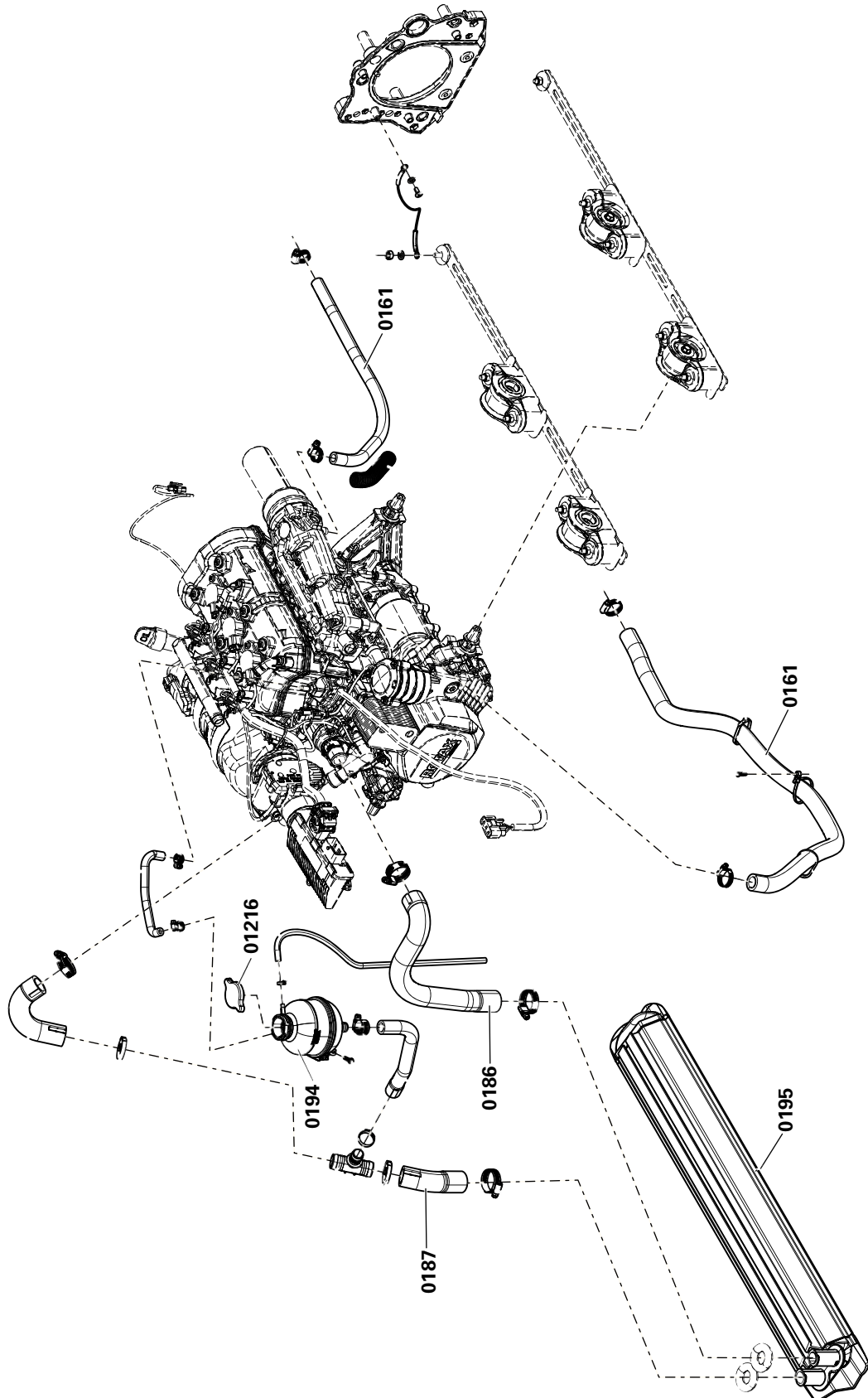


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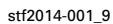


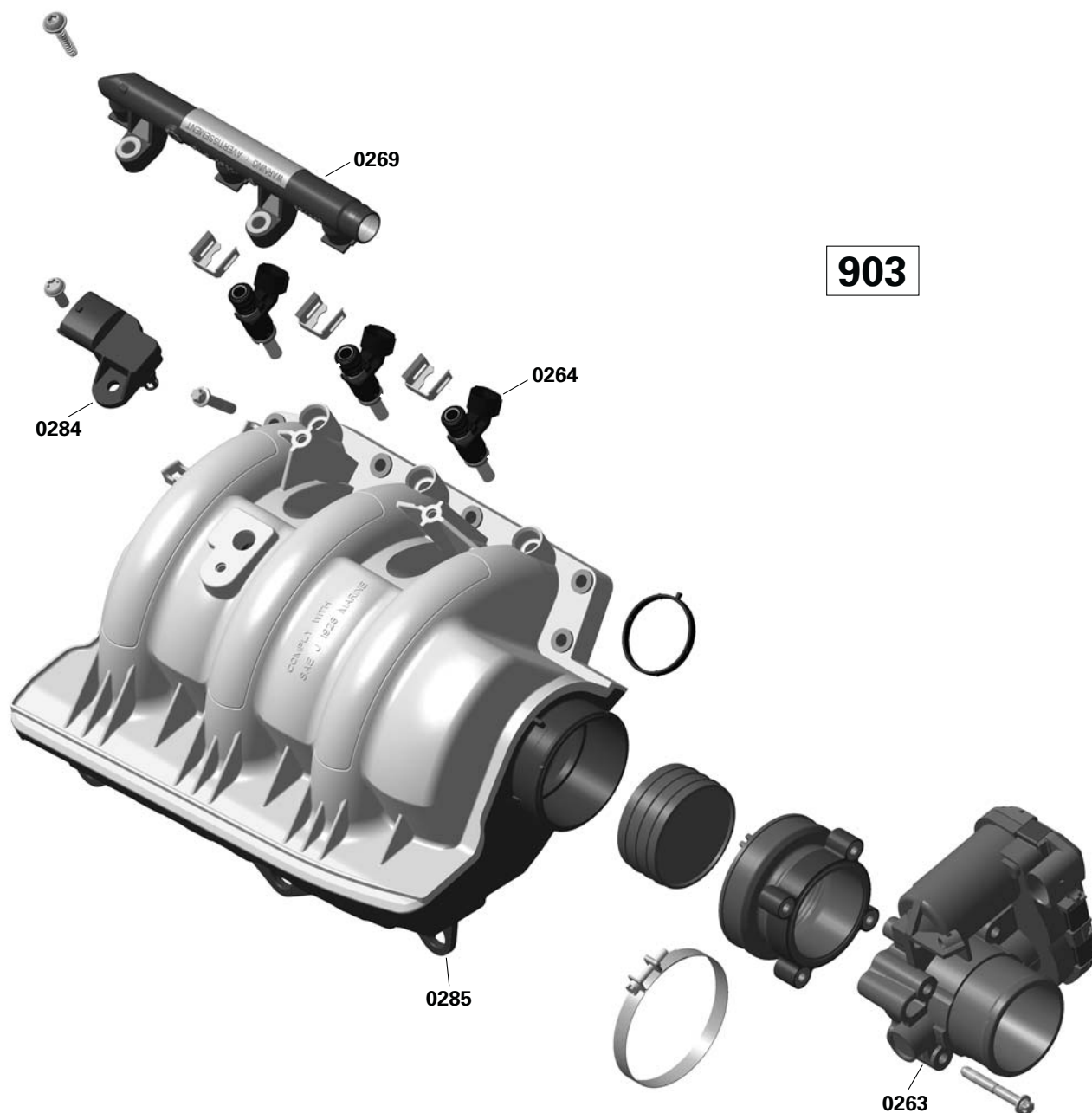
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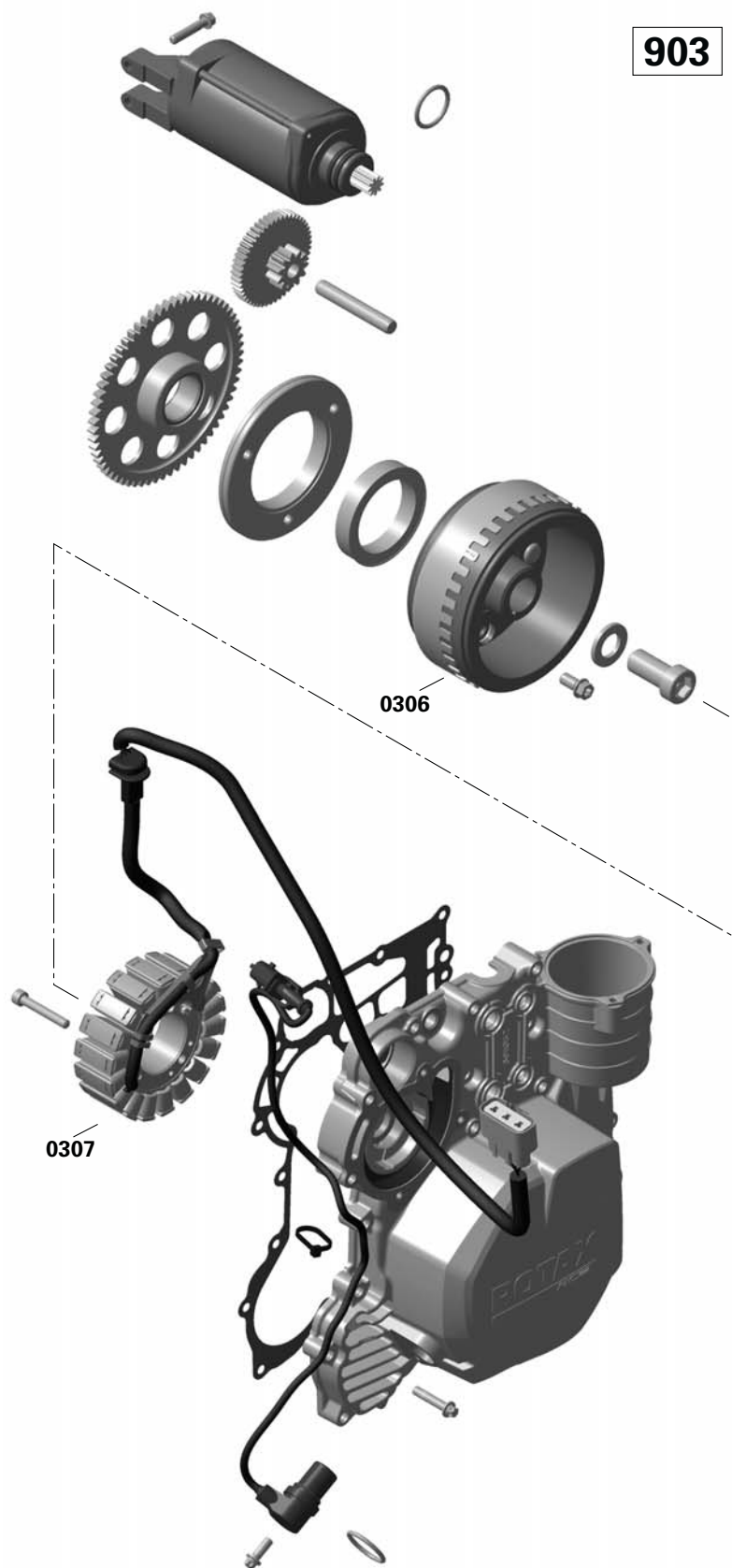
| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                                         | SPARK    | SPARK    |
|-------------------|------|-----------------------------------------------------------------------------------------------------|----------|----------|
|                   |      |                                                                                                     | 1/2      | 3        |
| 02                | 00   | <b>NO LABOR INVOLVED<br/>AUCUNE MAIN-D'OEUVRE</b>                                                   | <b>0</b> | <b>0</b> |
| 02                | 01   | REMOVAL AND/OR INSTALLATION OF AIR SILENCER<br>DÉPOSE ET/OU INSTALLATION SILENCIEUX ADMISSION D'AIR | 1.7      | 1.7      |
| 02                | 26   | FUEL TANK CAP AND/OR SEAL<br>BOUCHON DU RÉSERVOIR À ESSENCE ET/OU ANNEAU                            | 0.3      | 0.3      |
| 02                | 27   | FUEL TANK FILLER NECK AND/OR GASKET<br>GOULOT DE REMPLISSAGE ET/OU JOINT D'ÉTANCHÉITÉ               | 0.9      | 0.9      |
| 02                | 29   | FUEL TANK STRAPS (2 OR 5)<br>SANGLES DU RÉSERVOIR À ESSENCE (2 OU 5)                                | 0.9      | 0.9      |
| 02                | 31   | FUEL TANK<br>RÉSERVOIR À ESSENCE                                                                    | 1.4      | 1.4      |
| 02                | 36   | FUEL TANK HOSE (FROM FILLER NECK TO FUEL TANK)<br>BOYAU À ESSENCE (GOULOT AU RÉSERVOIR)             | 0.9      | 0.9      |
| 02                | 63   | THROTTLE BODY (ASS'Y)<br>CARTER D'ACCÉLÉRATEUR (COMPLET)                                            | 1.0      | 1.0      |
| 02                | 64   | INJECTOR<br>INJECTEUR                                                                               | 1.0      | 1.0      |
| 02                | 66   | FUEL PUMP MODULE<br>MODULE POMPE À ESSENCE                                                          | 1.2      | 1.2      |
| 02                | 67   | FUEL PUMP INLET FILTER<br>FILTRE DU CONDUIT D'ENTRÉE DE POMPE À ESSENCE                             | 1.2      | 1.2      |
| 02                | 69   | FUEL RAIL<br>RAIL D'ESSENCE                                                                         | 1.0      | 1.0      |
| 02                | 78   | FUEL FEEDING HOSE (ASS'Y)<br>BOYAU D'ALIMENTATION D'ESSENCE (COMPLET)                               | 0.9      | 0.9      |
| 02                | 84   | AIR PRESSURE SENSOR<br>CAPTEUR PRESSION D'AIR                                                       | 0.8      | 0.8      |
| 02                | 85   | AIR INTAKE (ASS'Y)<br>ADMISSION D'AIR (COMPLET)                                                     | 1.6      | 1.6      |
| 02                | 93   | FUEL PUMP NUT AND/OR GASKET<br>ÉCROU DE LA POMPE À ESSENCE ET/OU JOINT D'ÉTANCHÉITÉ                 | 1.2      | 1.2      |
| 02                | 98   | FUEL LEVEL SENSOR<br>CAPTEUR NIVEAU D'ESSENCE                                                       | 1.2      | 1.2      |





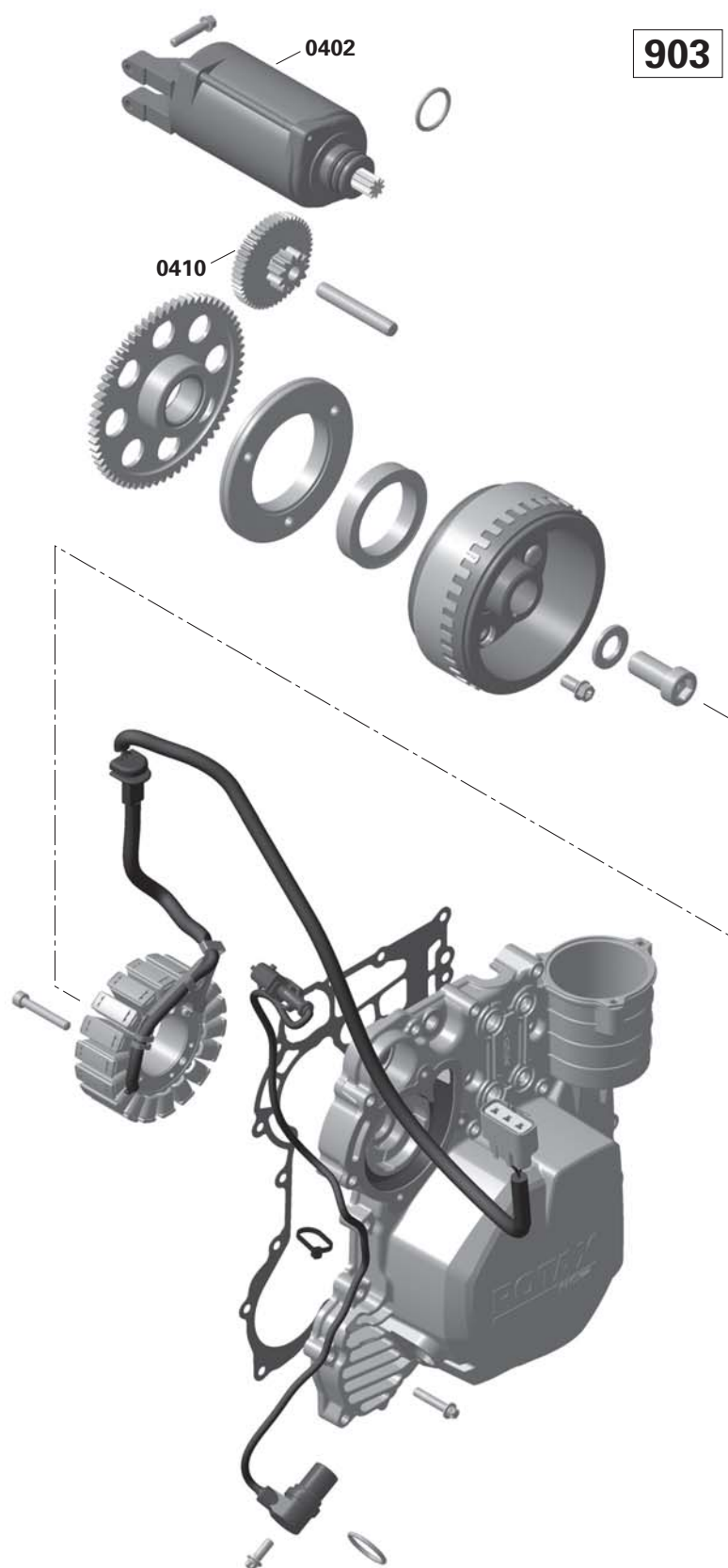


| SYSTEM<br>SYSTÈME | CODE      | DESCRIPTION                                       | SPARK    | SPARK    |
|-------------------|-----------|---------------------------------------------------|----------|----------|
|                   |           |                                                   | 1/2      | 3        |
|                   |           |                                                   |          |          |
| <b>03</b>         | <b>00</b> | <b>NO LABOR INVOLVED<br/>AUCUNE MAIN-D'OEUVRE</b> | <b>0</b> | <b>0</b> |
| <b>03</b>         | <b>04</b> | IGNITION COIL<br>BOBINE D'ALLUMAGE                | 0.5      | 0.5      |
| <b>03</b>         | <b>06</b> | MAGNETO FLYWHEEL<br>VOLANT MAGNÉTIQUE             | 3.2      | 3.2      |
| <b>03</b>         | <b>07</b> | STATOR PLATE (ASS'Y)<br>PLAQUE ARMATURE (COMPLET) | 3.1      | 3.1      |



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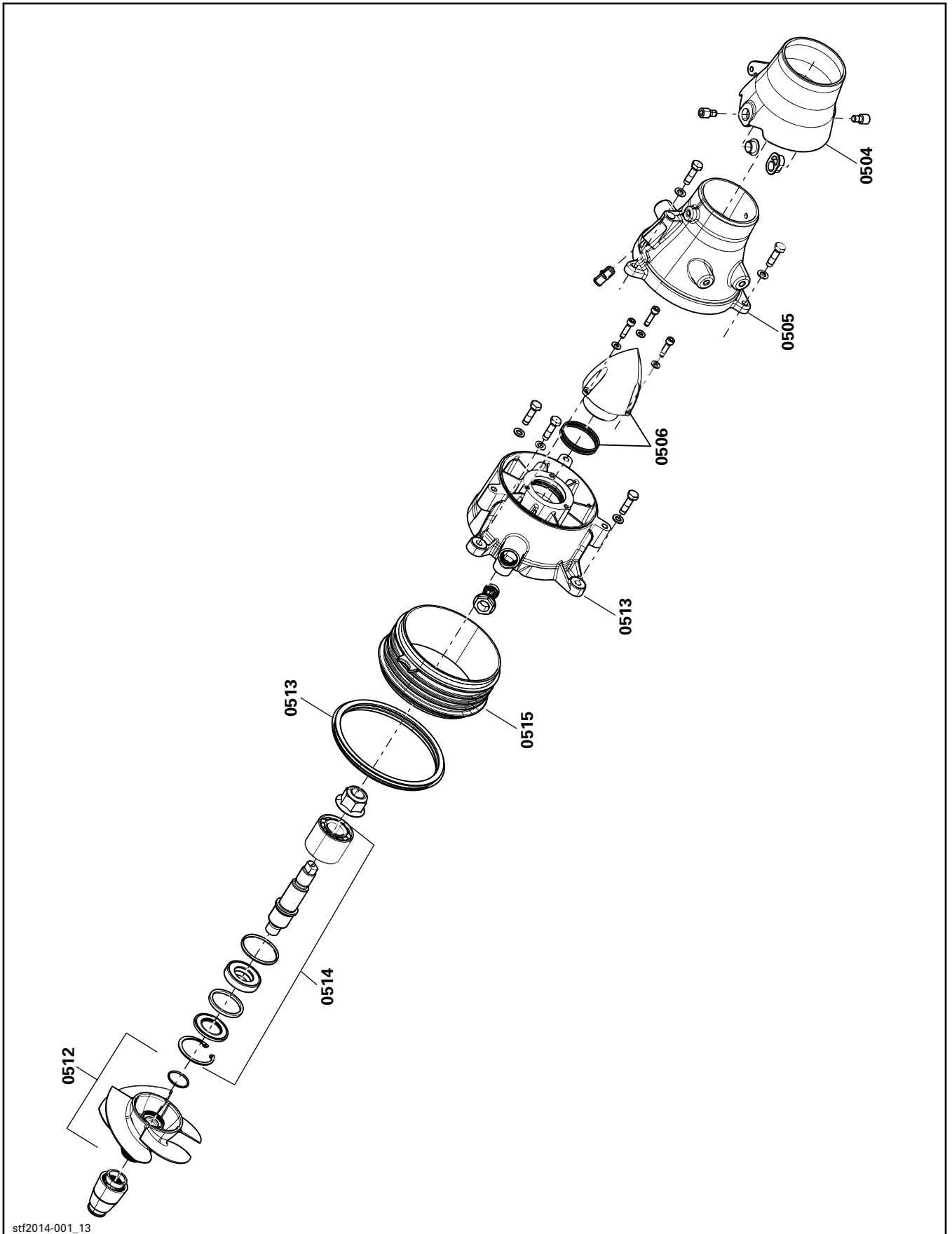
| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                      | SPARK | SPARK |
|-------------------|------|----------------------------------------------------------------------------------|-------|-------|
|                   |      |                                                                                  | 1/2   | 3     |
| 04                | 00   | NO LABOR INVOLVED<br>AUCUNE MAIN-D'OEUVRE                                        | 0     | 0     |
| 04                | 02   | ELECTRIC STARTER (ASS'Y)<br>DÉMARREUR ÉLECTRIQUE (COMPLET)                       | 0.9   | 0.9   |
| 04                | 03   | ONE OR ALL STARTER COMPONENTS<br>UNE OU TOUTES LES PIÈCES DU DÉMARREUR           | 1.1   | 1.1   |
| 04                | 05   | STARTER RELAY<br>SOLÉNOÏDE DÉMARREUR                                             | 0.3   | 0.3   |
| 04                | 10   | ELECTRIC STARTER DRIVE (ASS'Y)<br>ENTRAÎNEMENT DU DÉMARREUR ÉLECTRIQUE (COMPLET) | 3.1   | 3.1   |



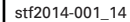
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| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                                                            | SPARK | SPARK      |
|-------------------|------|------------------------------------------------------------------------------------------------------------------------|-------|------------|
|                   |      |                                                                                                                        | 1/2   | TRIXX<br>3 |
| 05                | 00   | <b>NO LABOR INVOLVED<br/>AUCUNE MAIN-D'OEUVRE</b>                                                                      | 0     | 0          |
| 05                | 02   | HOSE (FROM SCREEN BAILERS TO IMPELLER HOUSING)<br>BOYAU (TAMIS DÉCLENCHÉMENT AU CARTER D'HELICE)                       | 0.4   |            |
| 05                | 04   | STEERING NOZZLE AND/OR BUSHING AND/OR SLEEVE<br>BUSE DE DIRECTION ET/OU DOUILLE ET/OU MANCHON                          | 0.3   | 0.3        |
| 05                | 05   | VENTURI AND/OR O-RING<br>VENTURI ET/OU JOINT TORIQUE                                                                   | 0.4   | 0.4        |
| 05                | 06   | IMPELLER SHAFT HOUSING COVER AND/OR O-RINGS AND/OR GREASE<br>COUVERCLE ARBRE TURBINE ET/OU JOINT TORIQUE ET/OU GRAISSE | 0.5   | 0.5        |
| 05                | 07   | PTO FLYWHEEL RUBBER BOOT CLAMP (EACH)<br>COLLIER DE SERRAGE DU SOUFFLET VOLANT PDM (CHACUN)                            | 0.3   | 0.3        |
| 05                | 08   | RUBBER BOOT<br>SOUFFLET CAOUTCHOUC                                                                                     | 1.2   | 1.2        |
| 05                | 10   | IMPELLER HOUSING FITTING<br>RACCORD DU CARTER D'HELICE                                                                 | 0.4   | 0.4        |
| 05                | 11   | DRIVE SHAFT AND/OR BUMPER PLUG<br>ARBRE DE TRANSMISSION ET/OU BOUCHON CONTRE CHOC                                      | 1.2   | 1.2        |
| 05                | 12   | IMPELLER AND/OR SHAFT AND/OR WASHER AND/OR THRUST BEARING<br>TURBINE ET/OU ARBRE ET/OU RONDELLE ET/OU PALIER BUTÉE     | 1.1   | 1.1        |
| 05                | 13   | IMPELLER HOUSING (ASS'Y)<br>CARTER D'HELICE (COMPLET)                                                                  | 1.1   | 1.1        |
| 05                | 14   | IMPELLER SHAFT DOUBLE LIP SEAL AND/OR BEARING<br>ANNEAU ETANCHEITE D'ARBRE TURBINE ET/OU ROULEMENT A BILLES            | 1.1   | 1.1        |
| 05                | 15   | WEAR RING<br>BAGUE D'USURE                                                                                             | 0.4   | 0.4        |
| 05                | 18   | WATER INLET GRATE<br>GRILLE DE POMPE (ADMISSION D'EAU)                                                                 | 1.2   | 1.2        |
| 05                | 21   | IMPELLER HOUSING REMOVAL AND INSTALLATION<br>DEPOSE ET INSTALLATION DU CARTER D'HELICE                                 | 0.3   | 0.3        |
| 05                | 27   | REVERSE SUPPORT PLATE<br>PLAQUE DE SUPPORT DE MARCHE ARRIERE                                                           | 0.4   | 0.4        |
| 05                | 30   | REVERSE GATE (ASS'Y)<br>DEFLECTEUR DE MARCHE ARRIERE (COMPLET)                                                         | 0.4   | 0.4        |
| 05                | 36   | RIDING PLATE<br>PLAQUE PROMENADE                                                                                       | 0.9   | 0.9        |
| 05                | 38   | PUMP SUPPORT<br>SUPPORT DE POMPE                                                                                       | 3.0   | 3.0        |
| 05                | 64   | ARM BLACK<br>BRAS NOIR                                                                                                 | 0.4   | 0.4        |
| 05                | 66   | ROD PIVOT<br>PIVOT DE RACCORD                                                                                          | 0.4   | 0.4        |

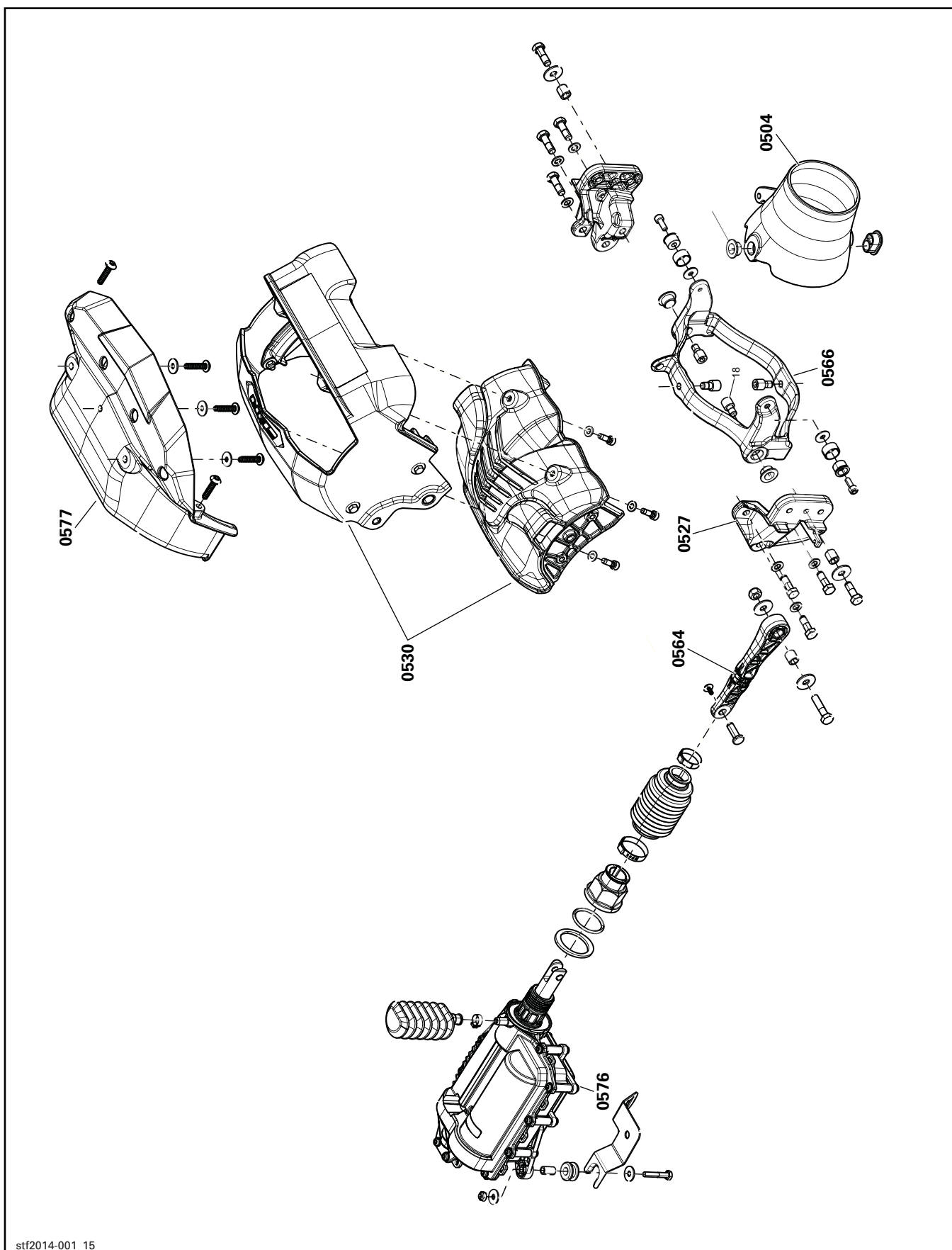
| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                   | SPARK | SPARK<br>TRIXX |
|-------------------|------|-------------------------------|-------|----------------|
|                   |      |                               | 1/2   | 3              |
| 05                | 76   | iBR ACTUATOR<br>ACTUATEUR iBR | 1.2   | 1.2            |
| 05                | 77   | GUARD<br>PROTECTEUR           | 0.3   | 0.3            |
| 05                | 148  | BELLOW<br>SOUFFLET            | 1.2   | 1.2            |



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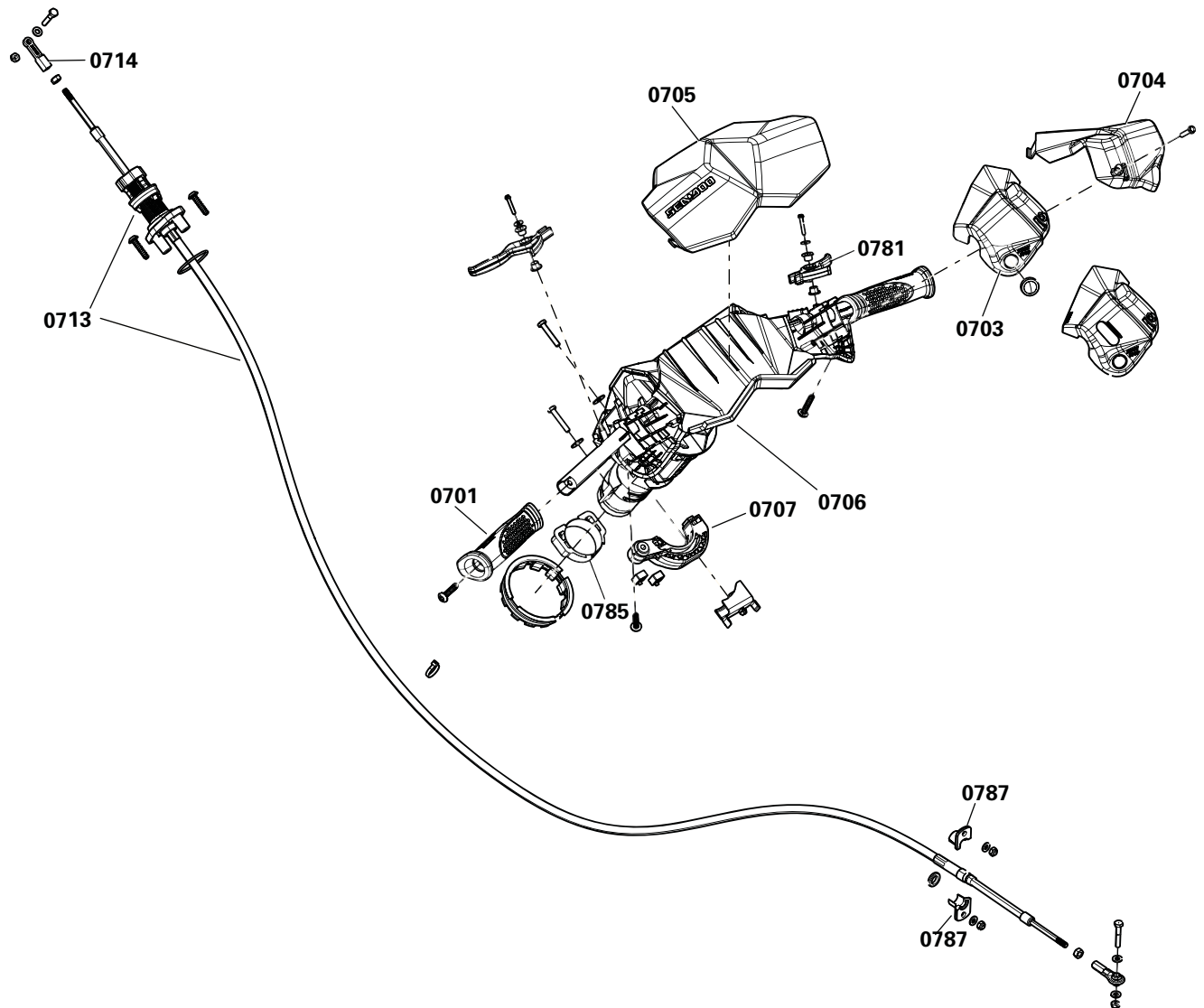






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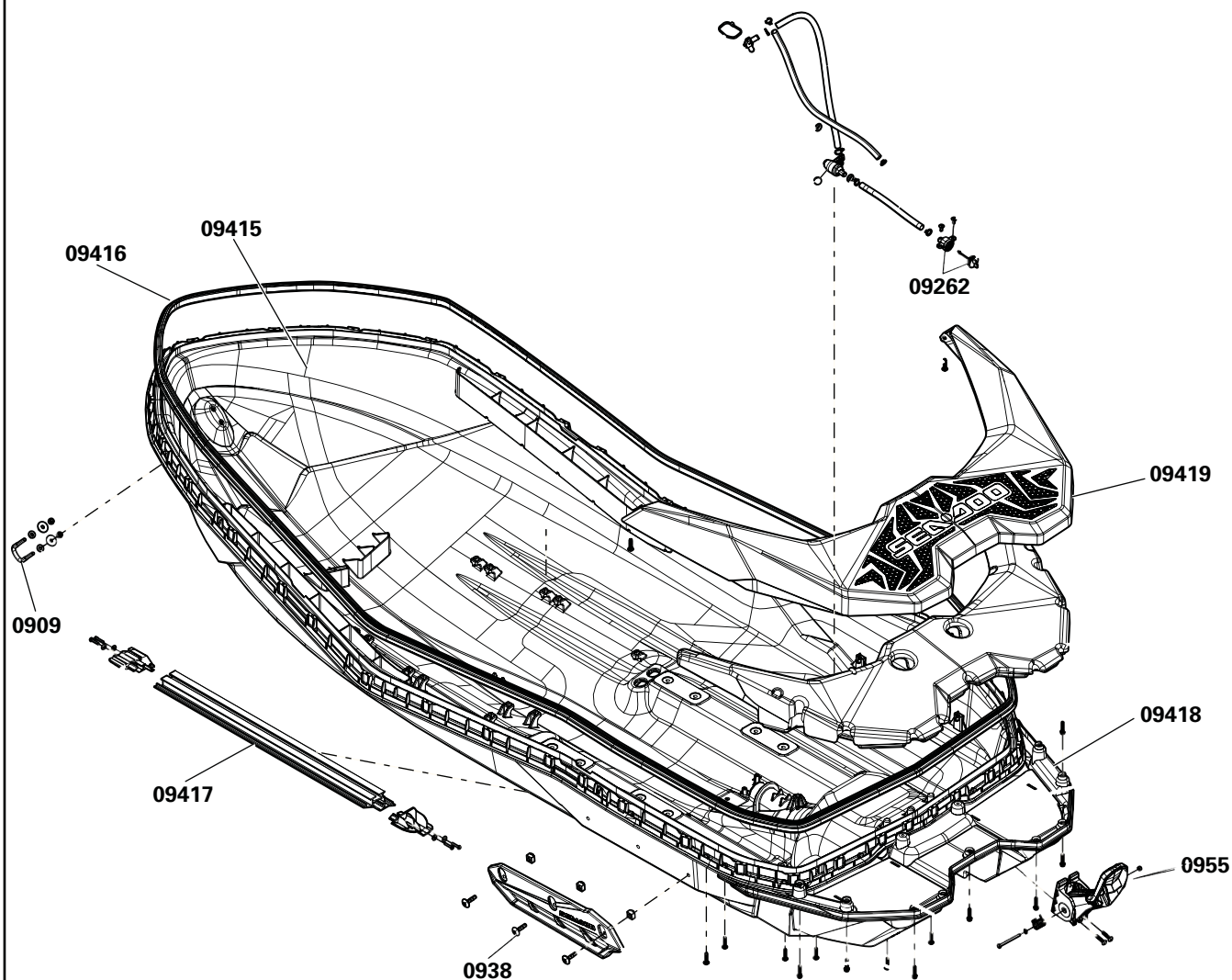
| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                                     | SPARK | SPARK |
|-------------------|------|-------------------------------------------------------------------------------------------------|-------|-------|
|                   |      |                                                                                                 | 1/2   | 3     |
| 07                | 00   | <b>NO LABOR INVOLVED<br/>AUCUNE MAIN-D'OEUVRE</b>                                               | 0     | 0     |
| 07                | 01   | HANDLE GRIP (1 OR 2)<br>GAINE DE GUIDON (1 OU 2)                                                | 0.3   | 0.3   |
| 07                | 03   | HANDLE HOUSING (LEFT)<br>LOGEMENT DE GUIDON (GAUCHE)                                            | 0.3   | 0.3   |
| 07                | 04   | THROTTLE HANDLE HOUSING (RIGHT)<br>LOGEMENT DE MANETTE D'ACCÉLÉRATEUR (DROIT)                   | 0.3   | 0.3   |
| 07                | 05   | STEERING COVER AND/OR FOAM<br>COUVRE-GUIDON ET/OU MOUSSE                                        | 0.4   | 0.4   |
| 07                | 06   | HANDLEBAR<br>GUIDON                                                                             | 0.6   | 0.4   |
| 07                | 07   | STEERING STEM ARM<br>BRAS DE TIGE DE DIRECTION                                                  | 0.4   | 0.4   |
| 07                | 13   | STEERING CABLE (FROM NOZZLE TO STEM ARM)<br>CÂBLE DE DIRECTION (DE LA BUSE AU BRAS DE TIGE)     | 1.5   | 1.5   |
| 07                | 14   | FRONT BALL JOINT STEERING CABLE<br>JOINT À ROTULE AVANT (CÂBLE DE DIRECTION)                    | 0.3   | 0.3   |
| 07                | 15   | REAR BALL JOINT STEERING CABLE (1 OR 2)<br>JOINT À ROTULE ARRIÈRE (CÂBLE DE DIRECTION) (1 OU 2) | 0.3   | 0.3   |
| 07                | 81   | THROTTLE HANDLE AND/OR BUSHINGS<br>MANETTE ACCÉLÉRATEUR ET/OU COUSSINETS                        | 0.4   | 0.4   |
| 07                | 82   | REVERSE HANDLE AND/OR BUSHINGS<br>MANETTE DE RENVERSE ET/OU COUSSINETS                          | 0.4   | 0.4   |
| 07                | 85   | WEAR RING<br>BAGUE D'USURE                                                                      | 0.5   | 0.5   |
| 07                | 87   | ADAPTER CABLE<br>ADAPTATEUR DE CÂBLE                                                            | 0.4   | 0.4   |
| 07                | 109  | UPPER STEERING COLUMN<br>COLONNE DE DIRECTION SUPERIEUR                                         |       | 0.6   |
| 07                | 133  | STEERING COLUMN<br>COLONNE DE DIRECTION                                                         |       | 0.6   |



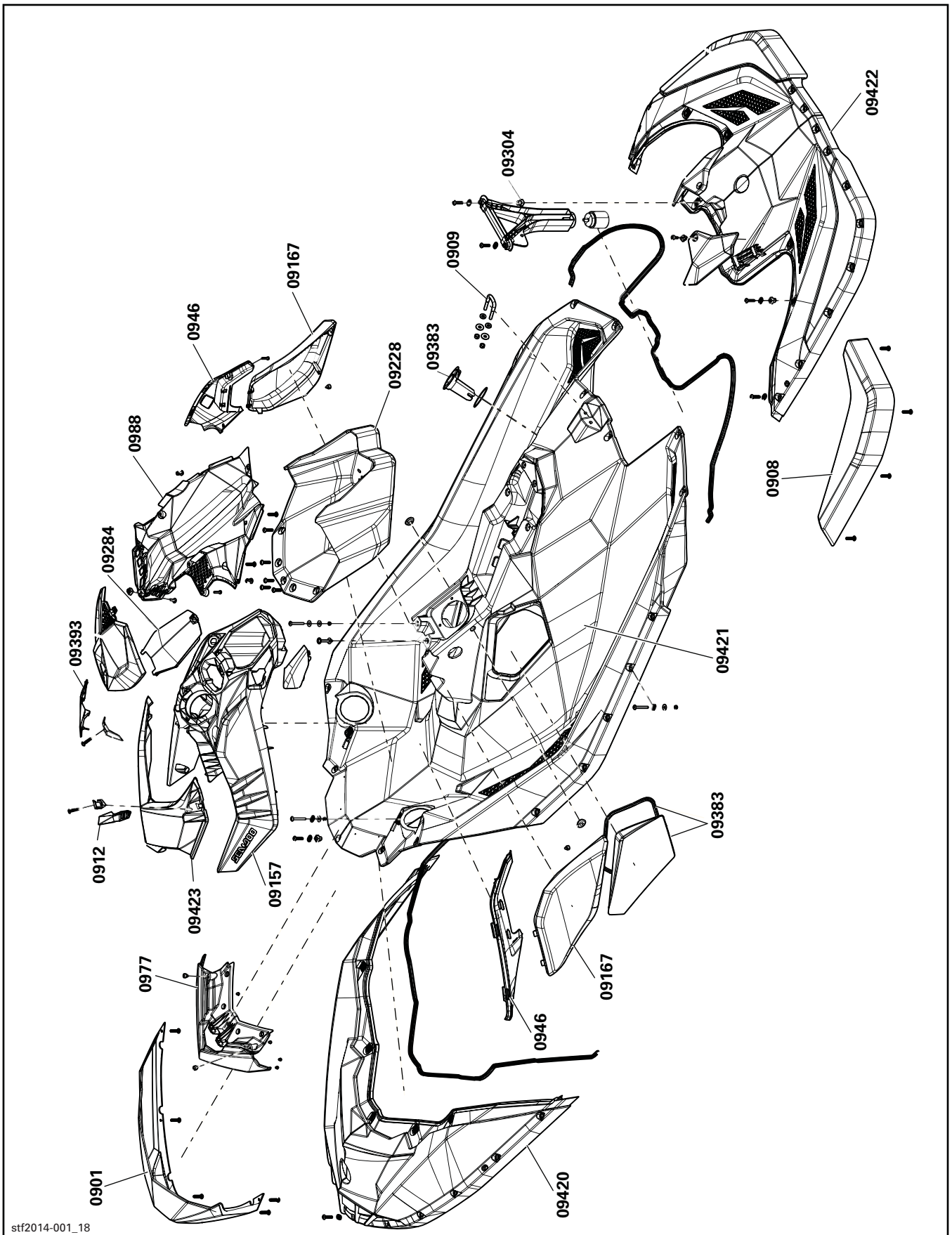
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| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                                                              | SPARK | SPARK<br>TRIXX |
|-------------------|------|--------------------------------------------------------------------------------------------------------------------------|-------|----------------|
|                   |      |                                                                                                                          | 1/2   | 3              |
| 09                | 00   | <b>NO LABOR INVOLVED<br/>AUCUNE MAIN-D'OEUVRE</b>                                                                        | 0     | 0              |
| 09                | 01   | FRONT BUMPER<br>PARE-CHOCS AVANT                                                                                         | 0.3   | 0.3            |
| 09                | 08   | CORNER BUMPER (LEFT OR RIGHT)1<br>PARE-CHOCS EN COIN (GAUCHE OU DROIT)                                                   | 0.3   | 0.3            |
| 09                | 09   | "U" CLAMP AND/OR SKI HOOK AND/OR FINITION/RETAINER PLATE<br>BRIDE EN «U» ET/OU CROCHET SKI ET/OU PLAQUE RETENUE          | 0.3   | 0.3            |
| 09                | 12   | STORAGE COVER LATCH<br>LOQUET DU COUVERCLE À BAGAGES                                                                     | 0.3   | 0.3            |
| 09                | 14   | STORAGE COVER DECAL<br>AUTOCOLLANT DU COUVERCLE À BAGAGES                                                                | 0.3   | 0.3            |
| 09                | 15   | SIDE BODY DECAL (RIGHT) (1 OR 2)<br>AUTOCOLLANT LATÉRAL DE LA CARROSSERIE (DROIT) (1 OU 2)                               | 0.4   | 0.4            |
| 09                | 16   | SIDE BODY DECAL (LEFT) (1 OR 2)<br>AUTOCOLLANT LATÉRAL DE LA CARROSSERIE (GAUCHE) (1 OU 2)                               | 0.4   | 0.4            |
| 09                | 17   | ALL BODY DECALS<br>TOUS LES AUTOCOLLANTS DE LA CARROSSERIE                                                               | 0.8   | 0.8            |
| 09                | 22   | SEAT (ASS'Y)<br>SIÈGE (COMPLET)                                                                                          | 0.3   | 0.3            |
| 09                | 31   | FRONT TUBE VENT<br>BOYAU DE VENTILATION AVANT                                                                            | 0.8   | 0.8            |
| 09                | 37   | GRAB HANDLE<br>POIGNÉE DE MAINTIEN                                                                                       | 0.3   | 0.3            |
| 09                | 38   | SPONSON (RIGHT OR LEFT) (EACH)<br>STABILISATEUR (DROIT OU GAUCHE) (CHACUN)                                               | 0.3   | 0.3            |
| 09                | 46   | SIDE MOULDING (RIGHT OR LEFT)<br>ENJOLIVEUR LATÉRAL (DROIT OU GAUCHE)                                                    | 0.3   | 0.3            |
| 09                | 50   | REAR SIDE BODY DECAL<br>AUTOCOLLANT ARRIÈRE DE LA CARROSSERIE                                                            | 0.3   | 0.3            |
| 09                | 51   | BRP DECAL(S)<br>AUTOCOLLANT(S) BRP                                                                                       | 0.3   | 0.3            |
| 09                | 55   | REBORDING LADDER ANT/OR SUPPORT (ASS'Y)<br>ÉCHELLE D'EMBARQUEMENT ET/OU SUPPORT (COMPLET)                                | 0.4   |                |
| 09                | 77   | DEFLECTOR<br>DÉFLECTEUR                                                                                                  | 0.3   | 0.3            |
| 09                | 88   | LOWER STORAGE COVER (ANY OR ALL PARTS)<br>COUVERCLE DU COMPARTIMENT DE RANGEMENT INFÉRIEUR<br>(UNE OU TOUTES LES PIÈCES) | 0.5   |                |
| 09                | 157  | UPPER CONSOLE<br>CONSOLE SUPÉRIEUR                                                                                       | 2.0   | 2.0            |
| 09                | 167  | KNEE PAD (RH OR LH)<br>TAMPON GENOU (DR OU GA)                                                                           | 0.3   | 0.3            |

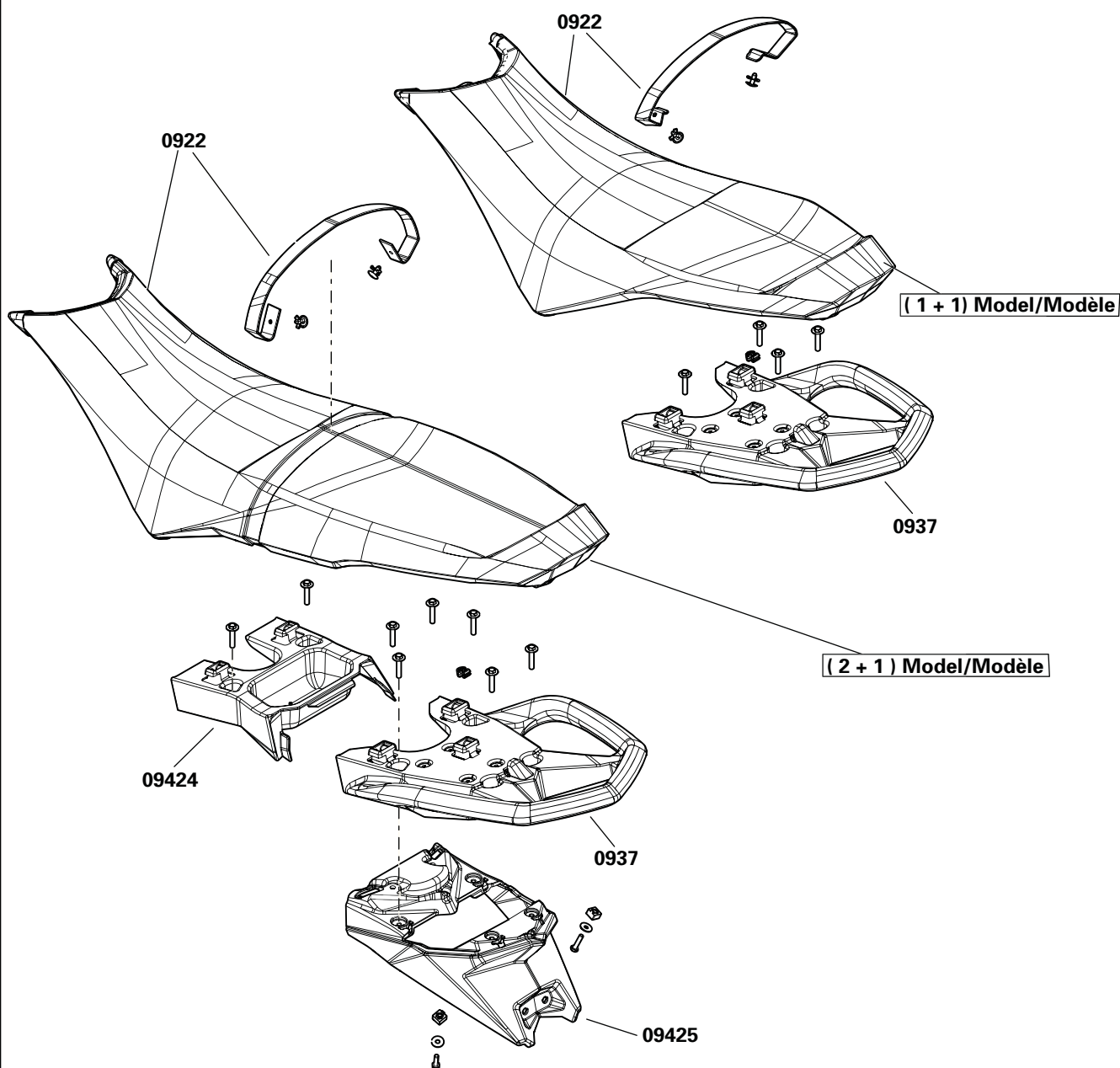
| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                       | SPARK | SPARK |
|-------------------|------|-----------------------------------------------------------------------------------|-------|-------|
|                   |      |                                                                                   | 1/2   | 3     |
| 09                | 228  | FRONT STORAGE COMPARTMENT<br>COMPARTIMENT DE RANGEMENT AVANT                      | 0.8   |       |
| 09                | 262  | BLEED PLUG<br>BOUCHON DE PURGE                                                    | 0.3   | 0.3   |
| 09                | 284  | BOX DOOR<br>PORTE DE COFFRE                                                       | 0.3   | 0.3   |
| 09                | 291  | DASHBOARD BEZEL<br>ENJOLIVEUR DE TABLEAU DE BORD                                  | 0.3   | 0.3   |
| 09                | 304  | REAR SUPPORT<br>SUPPORT ARRIÈRE                                                   | 0.9   | 0.9   |
| 09                | 383  | ACCESS COVER ASS'Y (LEFT OR RIGHT)<br>COUVERCLE D'ACCES COMPLET (DROIT OU GAUCHE) | 0.3   | 0.3   |
| 09                | 393  | COSMETIC DEFLECTOR<br>DÉFLECTEUR ENLOLIVEUR                                       | 0.3   | 0.3   |
| 09                | 416  | SEAL JOINT<br>JOINT D'ÉTANCHÉITÉ                                                  | 1.1   | 1.1   |
| 09                | 417  | HULL REINFORCEMENT<br>RENFORT DE COQUE                                            | 2.0   | 2.0   |
| 09                | 418  | HULL EXTENSION<br>EXTENSION DE COQUE                                              | 0.5   |       |
| 09                | 419  | DECK BODY<br>PONT DE CARROSSERIE                                                  | 0.4   |       |
| 09                | 420  | FRONT BODY<br>CARROSSERIE AVANT                                                   | 0.9   | 0.9   |
| 09                | 422  | REAR BODY<br>CARROSSERIE ARRIÈRE                                                  | 0.9   | 0.9   |
| 09                | 423  | FRONT COVER<br>COUVERCLE AVANT                                                    | 0.3   |       |
| 09                | 424  | SEAT SUPPORT<br>SUPPORT DE SIÈGE                                                  | 0.3   | 0.3   |
| 09                | 425  | HANDLE SUPPORT<br>SUPPORT DE POIGNÉE                                              | 1.0   | 1.0   |



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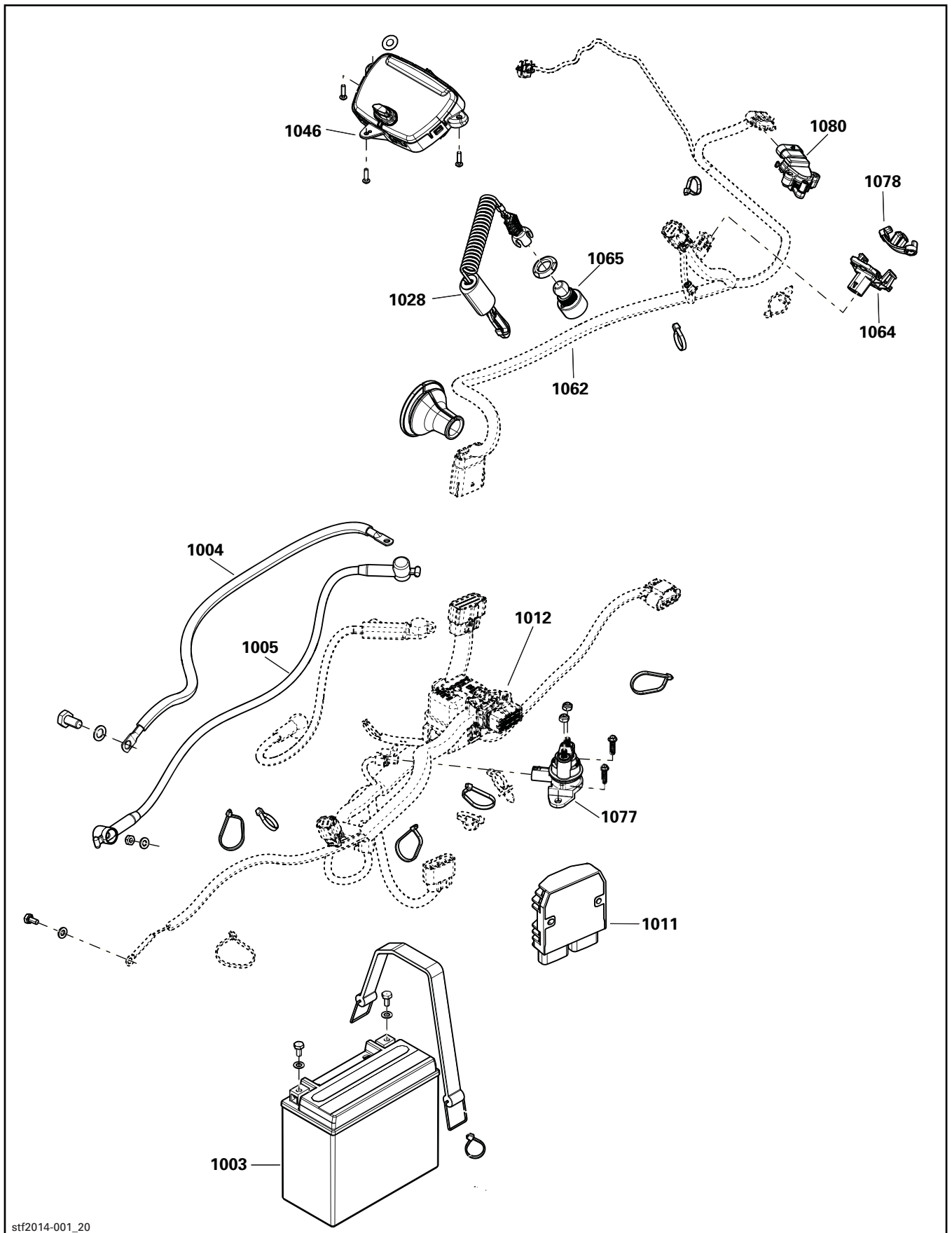
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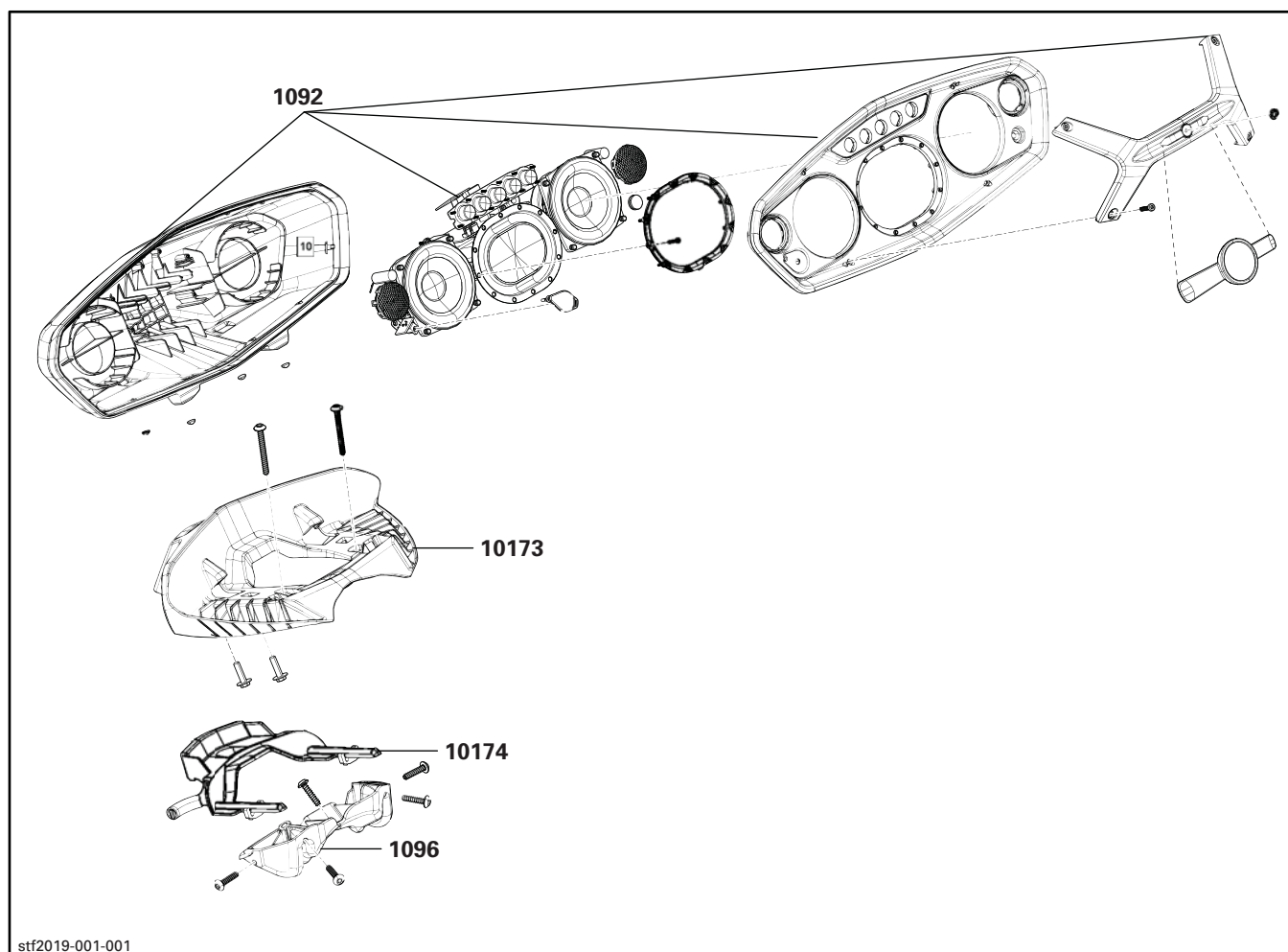


| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                                                                      | SPARK | SPARK      |
|-------------------|------|--------------------------------------------------------------------------------------------------|-------|------------|
|                   |      |                                                                                                  | 1/2   | TRIXX<br>3 |
| 10                | 00   | <b>NO LABOR INVOLVED<br/>AUCUNE MAIN-D'OEUVRE</b>                                                | 0     | 0          |
| 10                | 03   | BATTERY<br>BATTERIE                                                                              | 0.3   | 0.3        |
| 10                | 04   | GROUND CABLE<br>CÂBLE DE MASSE                                                                   | 1.0   | 1.0        |
| 10                | 05   | BATTERY RED CABLE (BATTERY TO STARTER RELAY)<br>CÂBLE ROUGE DE BATTERIE (BATTERIE AU SOLÉNOÏDE)  | 1.0   | 1.0        |
| 10                | 06   | BATTERY RED CABLE (STARTER TO STARTER RELAY)<br>CÂBLE ROUGE DE BATTERIE (DÉMARREUR AU SOLÉNOÏDE) | 1.0   | 1.0        |
| 10                | 09   | IGNITION SWITCH (START/STOP)<br>INTERRUPTEUR D'IGNITION (MARCHE/ARRÊT)                           | 0.3   | 0.3        |
| 10                | 11   | REGULATOR (ASS'Y)/RECTIFIER (ASS'Y)<br>RÉGULATEUR (COMPLET)/REDRESSEUR (COMPLET)                 | 0.3   | 0.3        |
| 10                | 12   | MAIN HARNESS (ASS'Y)<br>CÂBLAGE PRINCIPAL (COMPLET)                                              | 1.5   | 1.5        |
| 10                | 28   | D.E.S.S. KEY<br>CLÉ D.E.S.S.                                                                     | 0.3   | 0.3        |
| 10                | 46   | L.C.D INFO GAUGE (MULTIFUNCTION GAUGE)<br>CADRAN INFO MULTIFONCTION                              | 0.3   | 0.3        |
| 10                | 51   | BILGE PUMP<br>POMPE DE CALE                                                                      |       | 0.4        |
| 10                | 56   | ELECTRONIC CONTROL UNIT<br>UNITÉ CONTRÔLE ÉLECTRONIQUE                                           | 0.8   | 0.8        |
| 10                | 61   | ENGINE HARNESS (ASS'Y)<br>CÂBLAGE MOTEUR (COMPLET)                                               | 1.2   | 1.2        |
| 10                | 62   | STEERING HARNESS (ASS'Y)<br>CÂBLAGE GUIDON (COMPLET)                                             | 0.8   | 0.8        |
| 10                | 64   | OTAS SWITCH<br>INTERRUPTEUR DE L'OTAS                                                            | 0.4   | 0.4        |
| 10                | 65   | D.E.S.S. POST<br>BORNE D.E.S.S.                                                                  | 0.4   | 0.4        |
| 10                | 77   | STARTING RELAY<br>RELAIS DE DÉMARRAGE                                                            | 0.3   | 0.3        |
| 10                | 78   | OTAS ACTUATOR<br>ACTIONNEUR DE L'OTAS                                                            | 0.4   | 0.4        |
| 10                | 79   | BRAKE SENSOR<br>CAPTEUR DE FREINAGE                                                              | 0.3   | 0.3        |
| 10                | 80   | THROTTLE SENSOR<br>CAPTEUR D'ACCÉLÉRATEUR                                                        | 0.3   | 0.3        |
| 10                | 92   | AUDIO SYSTEM<br>SYSTÈME AUDIO                                                                    | 0.3   | 0.3        |

| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                      | SPARK | SPARK<br>TRIXX |
|-------------------|------|----------------------------------|-------|----------------|
|                   |      |                                  | 1/2   | 3              |
| 10                | 96   | AUDIO SUPPORT<br>SUPPORT AUDIO   | 0.3   | 0.3            |
| 10                | 173  | AUDIO ANCHORAGE<br>ANCRAGE AUDIO | 0.3   | 0.3            |
| 10                | 174  | LATCH PLATE<br>PLAQUE DE BLOCAGE | 0.3   | 0.3            |



stf2014-001\_20



stf2019-001-001

| SYSTEM<br>SYSTÈME | CODE | DESCRIPTION                                 | SPARK | SPARK<br>TRIXX |
|-------------------|------|---------------------------------------------|-------|----------------|
|                   |      |                                             | 1/2   | 3              |
| 12                | 00   | NO LABOR INVOLVED<br>AUCUNE MAIN-D'OEUVRE   | 0     | 0              |
| 12                | 02   | HULL REPLACEMENT<br>REPLACEMENT DE LA COQUE | 8.3   | 8.3            |
| 12                | 03   | CENTER BODY<br>CARROSSERIE CENTRALE         | 2.5   | 2.5            |



SEA-DOO®

# Living The Sea-Doo Life

WHAT'S NEW 2021

September 10, 2020

# WHAT'S NEW 2021

LIVE THE **SEA•DOO**.LIFE

# Sea-Doo sets the bar with ultimate performance and relentless innovation.

1

## Delivering a new wave of high-performance innovation with a completely redesigned RXP-X.

- INDUSTRY-LEADING **HANDLING AND PERFORMANCE**
- UNMATCHED **ERGONOMICS**
- REVOLUTIONARY **ON-BOARD EXPERIENCE**



2

## Introducing the industry-first Intelligent Debris Free Pump System (iDF).

- PREVIOUSLY UNCHARTED **PEACE OF MIND**
- **INCREDIBLY SIMPLE OPERATION**
- **SAVE TIME AND STAY DRY**



3

## Taking the revolutionary on-board experience to the next level with a new full color LCD display.

- **HIGH-RESOLUTION COLOR**
- **INTUITIVE & ORGANIZED**
- EASY ACCESS TO **VEHICLE-OPTIMIZED APPS**





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## REDESIGNED T3-R HULL

### DEEP V DESIGN



PRECISE TRACKING

### SHARK GILL FEATURE AT MID-HULL



ULTIMATE CONTROL AT HIGH SPEED

### AGGRESSIVE X-SPONSONS



PREDICTABLE AND TIGHT TURNING



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## REDESIGNED T3-R HULL

**UPGRADED RIDE PLATE & INTAKE GRATE**



**REFINED DYNAMICS AND IMPROVED ACCELERATION**

**POLISHED IMPELLER**



**IMPROVED ACCELERATION**

**WEIGHT REDUCTION**



**-67lbs / -30kg**

**IMPROVED POWER-TO-WEIGHT RATIO**

**OPTIMIZED CENTER OF GRAVITY**



**ENGINE AND FUEL TANK  
50 mm (2 in.)**

**ENHANCED BEHAVIOR IN CHOP + BETTER STEERING RESPONSE**



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UNMATCHED ERGONOMICS

REVOLUTIONARY ON-BOARD EXPERIENCE

## ENHANCED CONTROL

### PREVIOUS HULL DESIGN

Harder to predict while cornering at high speeds



Slow Down

Accelerate

Initiate Turn

### NEW HULL DESIGN

Very predictable while cornering at high speeds



Wide Open Throttle



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ENHANCED CONTROL



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REVOLUTIONARY ON-BOARD EXPERIENCE

IMPROVED ACCELERATION

0-50 mph (80 kmh) in under 3 seconds\* : The quickest factory built PWC!

## NEW RXP-X IMPROVEMENTS

Upgraded



+

Polished



+

PTW Ratio

10% improvement

2020 RXP-X 300



0-60 MPH

3.9 sec

NEW 2021 RXP-X 300



0-60 MPH

3.6 sec

7% Improvement

\*Based on comparison testing performed in July 2020 with available models done in optimal conditions with 5 Gal. tank of fuel.





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UNMATCHED ERGONOMICS

REVOLUTIONARY ON-BOARD EXPERIENCE

## ERGOLOCK-R

### ROUND GRIP with LOW PROFILE HANDLEBAR

- Provides intuitive racing position
- Adds greater leverage
- Allows the rider to initiate turn quicker
- Delivers comfort in any riding position



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- Delivers comfort in any riding position

### DEEP KNEE POCKET

- Increases rider stability during high speed turning
- Reduces upper body fatigue
- Tacky Surface



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- Reduces upper body fatigue
- Tacky Surface

**ADJUSTABLE REAR SADDLE**

- Cradles the rider during acceleration
- Locks the rider into position while turning
- 5 inches of adjustment to fit all riders



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**ADJUSTABLE REAR SADDLE**

- Cradles the rider during acceleration
- Locks the rider into position while turning
- 5 inches of adjustment to fit all riders

**DOUBLE-STEPPED ANGLED FOOTREST**

- Ensures maximum grip with lower body



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UNMATCHED ERGONOMICS

REVOLUTIONARY ON-BOARD EXPERIENCE

IMMERSE YOURSELF IN MUSIC

## BRP AUDIO PREMIUM

- Proven reliability and popularity
- 100 watts
- Watertight
- Fully integrated
- Bluetooth

PERFORMANCE SEGMENT TAKE RATE

80% +





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Delivering a new wave of high-performance innovation with a completely redesigned RXP-X.

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UNMATCHED ERGONOMICS

REVOLUTIONARY ON-BOARD EXPERIENCE

INGENIOUS STORAGE

LARGER FRONT STORAGE & FUEL TANK

- +40L (10.5 Gal) of storage versus previous platform
- +10L (2.6 Gal) of fuel capacity versus previous platform

WATERTIGHT PHONE COMPARTMENT

- Padded phone protection
- Watertight

NEW LARGER SWIM PLATFORM WITH LINQ ATTACHMENT SYSTEM

- LinQ 4 Gallon Fuel Caddy
- LinQ Watertight Bag
- LinQ Cooler
- And more



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Delivering a new wave of high-performance innovation with a completely redesigned RXP-X.

INDUSTRY LEADING HANDLING & PERFORMANCE

UNMATCHED ERGONOMICS

REVOLUTIONARY ON-BOARD EXPERIENCE

## ACCESSORIES

### 2up Passenger Seat

#### PASSENGER SEAT

**\$399 USD**

- Replaces the adjustable saddle to make room for a passenger.
- Two grab options for more comfort and improved passenger ergonomics.
- Tool-less installation.



OPTIONAL ACCESSORY

NEW MIDDLE  
PASSENGER  
GRIP



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

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REVOLUTIONARY ON-BOARD EXPERIENCE

## ACCESSORIES

### 2up Passenger Seat

#### PASSENGER SEAT

**\$489 CAD**

- Replaces the adjustable saddle to make room for a passenger.
- Two grab options for more comfort and improved passenger ergonomics.
- Tool-less installation.



OPTIONAL ACCESSORY

NEW MIDDLE  
PASSENGER  
GRIP





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## INDUSTRY LEADING HANDLING & PERFORMANCE



### ADJUSTABLE RISER

- Improved position for stand-up riding.
- Provides 3" of vertical adjustment.
  - +5/8" to 3 5/8" from stock

## UNMATCHED ERGONOMICS



### LID ORGANIZER

- Practically positioned within arm's reach.
- Optimized previously-unused space.
- Splash-proof inner pocket.
- 1.6 US Gal (6 L) volume

## REVOLUTIONARY ON-BOARD EXPERIENCE

### ACCESSORIES



### RXP-X COVER

- Perfect fit for the new RXP-X.
- Improved internal liners to better protect finish over time
- Sea-Doo quality is the reference in the market.



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1

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- REVOLUTIONARY **ON-BOARD EXPERIENCE**



2

Introducing the industry-first Intelligent Debris Free Pump System (iDF).

- PREVIOUSLY UNCHARTED **PEACE OF MIND**
- **INCREDIBLY SIMPLE OPERATION**
- **SAVE TIME AND STAY DRY**



3

Taking the revolutionary on-board experience to the next level with a new full color LCD display.

- **HIGH-RESOLUTION COLOR**
- **INTUITIVE & ORGANIZED**
- EASY ACCESS TO **VEHICLE-OPTIMIZED APPS**



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## Introducing the industry-first Intelligent Debris Free Pump system (iDF).

PREVIOUSLY UNCHARTED PEACE OF MIND

INCREDIBLY SIMPLE OPERATION

SAVE TIME AND STAY DRY

#1

CUSTOMER IRRITANT

“Sucking up debris or getting weeds and other objects stuck in my pump.”



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

## Introducing the industry-first Intelligent Debris Free Pump system (iDF).

PREVIOUSLY UNCHARTED PEACE OF MIND

INCREDIBLY SIMPLE OPERATION

SAVE TIME AND STAY DRY

PREVIOUSLY UNCHARTED PEACE OF MIND

Your on-water trouble-free insurance.





# Sea-Doo sets the bar with ultimate performance and relentless innovation.

## Introducing the industry-first Intelligent Debris Free Pump system (iDF).

PREVIOUSLY UNCHARTED PEACE OF MIND

INCREDIBLY SIMPLE OPERATION

SAVE TIME AND STAY DRY

### INCREDIBLY SIMPLE OPERATION

Easy and effortless handlebar-activated control.



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

## Introducing the industry-first Intelligent Debris Free Pump system (iDF).

PREVIOUSLY UNCHARTED PEACE OF MIND

INCREDIBLY SIMPLE OPERATION

SAVE TIME AND STAY DRY

SAVE TIME AND STAY DRY

iDF is quicker and more efficient than manual extraction of debris and avoids entering the water.



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Introducing the industry-first Intelligent Debris Free Pump system (iDF).

PREVIOUSLY UNCHARTED PEACE OF MIND

INCREDIBLY SIMPLE OPERATION

SAVE TIME AND STAY DRY

## STANDARD

GTX LTD 300



FISH PRO 170



## OPTIONAL

GTX 170/230





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1

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# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Taking the revolutionary on-board experience to the next level with a new full color LCD display.

Taking the revolutionary on-board experience to the next level.

2018



- Bluetooth Audio System
- Watertight Phone Compartment

**NEXT LEVEL OF ON-BOARD  
EXPERIENCE**

2021



- 7.8" Wide LCD Color Display
  - Bluetooth capabilities
  - Easy access to apps
  - High-resolution

# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Taking the revolutionary on-board experience to the next level with a new full color LCD display.

HIGH-RESOLUTION COLOR

INTUITIVE AND ORGANIZED

EASY ACCESS TO VEHICLE-OPTIMIZED APPS



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Taking the revolutionary on-board experience to the next level with a new full color LCD display.

HIGH-RESOLUTION COLOR

INTUITIVE AND ORGANIZED

EASY ACCESS TO VEHICLE-OPTIMIZED APPS

## Bright / Dark mode

Two modes according to your preference and for a clearer view in any light condition.



## LCD Color display

Large color display for quick and easy view of key information.

**7.8" wide screen**



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Taking the revolutionary on-board experience to the next level with a new full color LCD display.

HIGH-RESOLUTION COLOR

INTUITIVE AND ORGANIZED

EASY ACCESS TO VEHICLE-OPTIMIZED APPS

## BRP Connect Button

Dedicated home button to help you navigate through the gauge with ease.



## Handlebar-Activated

Keep your hands on the handlebars while scrolling through navigation, your favorite song list or weather apps.



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Taking the revolutionary on-board experience to the next level with a new full color LCD display.

HIGH-RESOLUTION COLOR

INTUITIVE AND ORGANIZED

EASY ACCESS TO VEHICLE-OPTIMIZED APPS



● Maps & Navigation



● Music

● Weather Forecast



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Taking the revolutionary on-board experience to the next level with a new full color LCD display.

## HIGH-RESOLUTION COLOR



- COLOR OPTION (Black/White)
- ECO MODE / SLOW MODE / SPORT MODE
- HANDLEBAR ACTIVATED (Access while riding)
- BLUETOOTH CONNECTIVITY
- AUDIO SYSTEM – Play louder
- MUSIC – Playlist access
- MUSIC – Speed-sensitive volume control
- NAVIGATION MAPS – Via Apps

## INTUITIVE AND ORGANIZED

## EASY ACCESS TO VEHICLE-OPTIMIZED APPS



- COLOR OPTION
- SPEED & MODE CONTROL
- TOUCHSCREEN & HELM CONTROL PAD



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Taking the revolutionary on-board experience to the next level with a new full color LCD display.

HIGH-RESOLUTION COLOR

INTUITIVE AND ORGANIZED

EASY ACCESS TO VEHICLE-OPTIMIZED APPS





# LINE-UP NOVELTIES

LIVE THE **SEA•DOO**.LIFE

# Sea-Doo sets the bar with ultimate performance and relentless innovation.

## REC LITE

### SPARK

**DISCONTINUED** – 1 color option

Dazzling Blue / Manta Green



Orange Crush / Deep Black

### SPARK TRIXX

**NEW** Color x 1

**NEW** Lava Red / Deep Black



Manta Green / Quetzal Green



Sea-Doo sets the bar with ultimate performance and relentless innovation.

RECREATION

GTI 90 / 130

White / Reef Blue



GTI SE 130 / 170

NEW Color x 1

NEW Neon Yellow (130 & 170)

Long Beach Blue (130)



Orange Crush (170)



Sea-Doo sets the bar with ultimate performance and relentless innovation.

## TOW SPORTS

### WAKE 170

Malibu Blue / Neon Yellow



### WAKE PRO 230

**DISCONTINUED** – model without Sound System

Malibu Blue / Neon Yellow



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

## TOURING

### GTX 170 / 230 / NEW 300

**NEW** 300 engine on standard GTX.

**NEW** 1x color (GTX 230 & 300)

**NEW** iDF System (GTX 170 & 230) (Optional)

**NEW** Eclipse Black (230 & 300)



Beach Blue Metallic / Lava Grey

### GTX LTD 300

**NEW** 7.8" Wide Color Display (Standard)

**NEW** iDF System (Standard)

**230hp engine option removed.**

Liquid Grey Metallic / Beach Blue



Sea-Doo sets the bar with ultimate performance and relentless innovation.

RENTAL

NEW GTX PRO 130

Enhanced value for dealer, operator and customer with the new GTX PRO 130



PROVEN RELIABILITY

IMPROVED CONVENIENCE

ENHANCED VALUE

NOW ST3-based

White / Reef Blue



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

## SPORT FISHING

### FISH PRO 170

**NEW** LinQ Front Support. Rod holder (total of 5) + 1 cup holder

**NEW** 1x color

**NEW** iDF System (Standard)

**NEW** White / Gulfstream Blue



White / Night Green



LinQ Front Support  
Cup Holder

Rod Holder

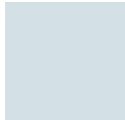
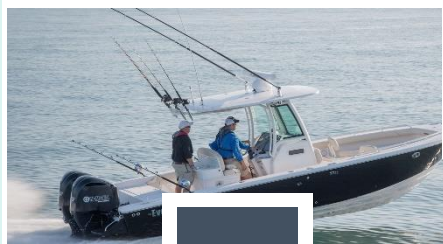


Sea-Doo sets the bar with ultimate performance and relentless innovation.

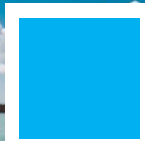
SPORT FISHING

FISH PRO 170

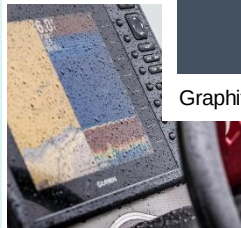
NEW White / Gulfstream Blue



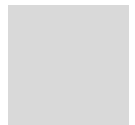
Ice Metal



G-S-Blue



Graphite



Flint Grey



Dusty Navy

**PURE, CLEAN & RELIABLE** - Inspired by the world of offshore boating, the new aquatic colors create the perfect connection with the bright light of the environment and the depths of the ocean waters.





Sea-Doo sets the bar with ultimate performance and relentless innovation.

PERFORMANCE

GTR 230

Eclipse Black / Neon Yellow



RXP-X 300

NEW Platform  
NEW 2x color

NEW PREMIUM  
Midnight Purple



NEW Millenium Yellow

RXT-X 300

NEW 2x color

NEW PREMIUM  
Midnight Purple



NEW Millenium Yellow



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

## PERFORMANCE

### RXP-X 300



**PROUD & LOUD** – In a nod to the world’s first performance runabout watercraft, the 1991 Sea-Doo XP, a passionate Midnight Purple color scheme reinforces the performance customer’s visceral need to show others how cool their new rigs look. Aimed at our extroverted fan base, this choice is influenced by mainstream exotic car trends resulting in an inspiring offering.



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

The 2021 Sea-Doo Accessory line-up is innovative and seamlessly well integrated

| What's new for 2021 | LinQ Accessories                                                                  | Docking                                                                           | Controls and Grips                                                                | Covers                                                                             | Bags and Storage                                                                    | Riding Accessories                                                                  | Electronics and Electricals                                                         |
|---------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                     |  |  |  |  |  |  |  |
|                     |  |  |  |  |                                                                                     |  |                                                                                     |
|                     |  |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |
|                     |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |
|                     | LinQ Cupholder<br>.....                                                           | Speed Ties                                                                        | Adjustable<br>Riser for RXP-X                                                     | Fish Pro cover<br>(with opening for<br>speed tie)                                  | Lid Organizer                                                                       | RXP-X 300<br>Removable 2-UP<br>Passenger Seat                                       | Learning keys<br>(complementary<br>sale opportunity)                                |
|                     | LinQ Front Support                                                                | Snap-in Fenders<br>installation kit                                               | Handlebars<br>(new colorations)                                                   | RXP-X cover                                                                        |                                                                                     | Floorboard wedges                                                                   |                                                                                     |
|                     | LinQ 51 L Cooler<br>Extension                                                     |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Redesigned for 2021, the Speed Tie is the ultimate mooring system for watercraft.

## Convenient

- Redesigned, simplified and optimized system.
- Retractable design removes the risk of lines being sucked into the intake and eliminates storing wet, smelly dock lines in storage compartments.
- Convenient bow and stern mounting locations.

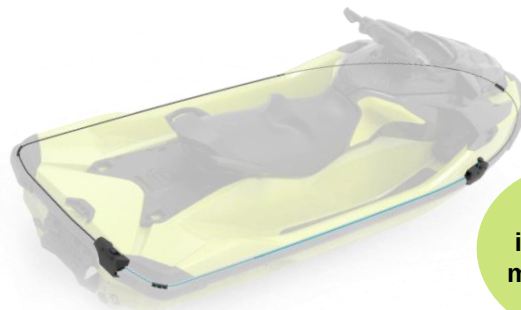
## Easy to use

- Innovative mechanism providing reliable performance and ease of use.

## Worry-Free

- Positive locking for worry-free docking.
- ¼ inch (6 mm) double braided rope, 5 feet (1.6 m) at front and 9 feet (2.8 m) at rear.

Incredible  
opportunity for  
incremental  
sales



New  
innovative  
mechanism

**Fits on:** GTX, RXT, RXT-X, WAKE PRO (2018 and up). Also available as a single unit for the Fish PRO (Side bumper only).



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Expanding awareness of LinQ accessories on all the Sea-Doo line-up

## New LinQ Accessories



LinQ CUP HOLDER



LinQ FRONT SUPPORT



LinQ 51L COOLER EXTENSION





# Sea-Doo sets the bar with ultimate performance and relentless innovation.

Expanding awareness of LinQ accessories on all the Sea-Doo line-up

## New LinQ Accessories



**LinQ 51L COOLER  
EXTENSION**



**MUST HAVE!**

- Add 5.3 US Gal (20 L) of extra storage to your existing 13.5 US Gal (51 L) cooler.
- Versatile usage
  - Separates hot from cold items
  - Separates refreshments from the catch of the day
  - Can be use as lunch box
  - Can be use as tackle box
- Fully insulated and easy to install.
- Tool-less installation.
- Competitive to what market offers.

ADDS  
**40%**  
MORE STORAGE



# Sea-Doo sets the bar with ultimate performance and relentless innovation.

## 1 Delivering a new wave of high-performance innovation with a completely redesigned RXP-X.

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- UNMATCHED **ERGONOMICS**
- REVOLUTIONARY **ON-BOARD EXPERIENCE**



## 2 Introducing the industry-first Intelligent Debris Free Pump System (iDF).

- PREVIOUSLY UNCHARTED **PEACE OF MIND**
- INCREDIBLY **SIMPLE OPERATION**
- **SAVE TIME AND STAY DRY**



## 3 Taking the revolutionary on-board experience to the next level with a new full color LCD display.

- **HIGH-RESOLUTION COLOR**
- **INTUITIVE & ORGANIZED**
- EASY ACCESS TO **VEHICLE-OPTIMIZED APPS**



## + Sea-Doo designs accessories with seamless integration enhancing consumer experience and growing BRP & Dealers' bottom line.





# Live the Sea-Doo Life

SEA-DOO





**SEA-DOO®**

**SPARK® Series**

# Operator's Guide

**Includes**

Safety, Vehicle and  
Maintenance Information

**2021**



## **⚠ WARNING**

Read this guide thoroughly.  
It contains important safety information.  
Minimum recommended operator's age: 16 years old.  
Keep this Operator's Guide in the watercraft.

---

**2 1 9 0 0 2 1 3 5**

**Original Instructions**

## **WARNING**

Disregarding any of the safety precautions and instructions contained in this Operator's Guide, *SAFETY VIDEO* and on-product safety labels could cause injury including the possibility of death!

### CALIFORNIA PROPOSITION 65 WARNING

 **WARNING:** Operating, servicing and maintaining a recreational marine vessel can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. For more information go to [www.p65warnings.ca.gov/products/passenger-vehicle](http://www.p65warnings.ca.gov/products/passenger-vehicle).



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iBR™

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Rotax®

SPARK™

D.E.S.S.™

iControl™

O.T.A.S.™

Sea-Doo®

XPS™

# FOREWORD

## OPERATOR'S GUIDE 2021

Spark 900 ACE - 60  
Spark 900 ACE - 90  
Spark Trixx 900 ACE - 90

|            |                                                                                                                                                                                                             |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Deutsch    | Dieses Handbuch ist möglicherweise in Ihrer Landessprache verfügbar. Bitte wenden Sie sich an Ihren Händler oder besuchen Sie: <a href="http://www.operatorsguides.brp.com">www.operatorsguides.brp.com</a> |
| English    | This guide may be available in your language. Check with your dealer or go to: <a href="http://www.operatorsguides.brp.com">www.operatorsguides.brp.com</a>                                                 |
| Español    | Es posible que este manual esté disponible en su idioma. Consulte a su distribuidor o visite: <a href="http://www.operatorsguides.brp.com">www.operatorsguides.brp.com</a>                                  |
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| Nederlands | Deze handleiding kan beschikbaar zijn in uw taal. Vraag het aan uw dealer of ga naar: <a href="http://www.operatorsguides.brp.com">www.operatorsguides.brp.com</a>                                          |
| Norsk      | Denne boken kan finnes tilgjengelig på ditt eget språk. Kontakt din forhandler eller gå til: <a href="http://www.operatorsguides.brp.com">www.operatorsguides.brp.com</a>                                   |
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| Русский    | Воспользуйтесь руководством на вашем языке. Узнайте о его наличии у дилера или на странице по адресу <a href="http://www.operatorsguides.brp.com">www.operatorsguides.brp.com</a>                           |
| Suomi      | Käyttöohjekirja voi olla saatavissa omalla kielelläsi. Tarkista jälleenmyyjältä tai käy osoitteessa: <a href="http://www.operatorsguides.brp.com">www.operatorsguides.brp.com</a>                           |
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Congratulations on your purchase of a new Sea-Doo® personal watercraft (PWC). It is backed by the BRP warranty and a network of authorized Sea-Doo personal watercraft dealers ready to provide the parts, service or accessories you may require.

Your dealer is committed to your satisfaction. He has taken training to perform the initial setup and inspection of your watercraft as well as completed the final adjustments before you took possession. If you need more complete servicing information, please ask your dealer.

At delivery, you were also informed of the warranty coverage and signed the *PREDELIVERY CHECK LIST* to ensure your new watercraft was prepared to your entire satisfaction.

## Know Before you Go

To learn how to reduce the risk for you or other persons being injured or killed, read the following sections before you operate the watercraft:

- *SAFETY INFORMATION*
- *WATERCRAFT INFORMATION*.

Read and understand all safety labels on your watercraft and watch attentively your *SAFETY VIDEO* located at <https://www.sea-doo.com/safety>.



Failure to follow the warnings contained in this Operator's Guide can result in serious injury or death.

BRP highly recommends that you take a safe boating course. Please check with your dealer or local authorities for availability in your area.

In certain areas, an operator competency card is mandatory to operate a pleasure craft.

## WARNING

Get familiar with this PWC; it may exceed the performance of other PWCs you have ridden.

## Safety Messages

This Operator's Guide utilizes the following symbols and words to emphasize particular information:

The safety alert symbol  indicates a potential injury hazard.

## WARNING

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

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

**NOTICE** Indicates an instruction which, if not followed, could severely damage watercraft components or other property.

## About this Operator's Guide

This Operator's Guide has been prepared to acquaint the owner/operator or passenger with this personal watercraft and its various controls, maintenance and safe riding instructions.

Keep this Operator's Guide in the watercraft as you can refer to it for operation, instructing others, maintenance and troubleshooting.

Note that this guide is available in several languages. In the event of any discrepancy, the English version shall prevail.

If you want to view and/or print an extra copy of your Operator's Guide, simply visit the following website [www.operatorsguides.brp.com](http://www.operatorsguides.brp.com).

The information contained in this document is correct at the time of publication. However, BRP 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, some differences between the manufactured product and the descriptions and/or specifications in this guide may occur. BRP reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring any obligation upon itself.

This Operator's Guide should remain with the watercraft when it's sold.

---

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# ***SAFETY INFORMATION***

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# GENERAL PRECAUTIONS

## Avoid Carbon Monoxide Poisoning

All engine exhaust contains carbon monoxide, a deadly gas. Breathing carbon monoxide can cause headaches, dizziness, drowsiness, nausea, confusion and eventually death.

Carbon monoxide is a colorless, odorless, tasteless gas that may be present even if you do not see or smell any engine exhaust. Deadly levels of carbon monoxide can collect rapidly, and you can quickly be overcome and unable to save yourself. Also, deadly levels of carbon monoxide can linger for hours or days in enclosed or poorly ventilated areas. If you experience any symptoms of carbon monoxide poisoning, leave the area immediately, get fresh air and seek medical treatment.

To prevent serious injury or death from carbon monoxide:

- Never run the watercraft in poorly ventilated or partially enclosed areas such as watercraft houses, seawalls or other boats in close proximity. Even if you try to ventilate engine exhaust, carbon monoxide can rapidly reach dangerous levels.
- Never run the watercraft outdoors where engine exhaust can be drawn into a building through openings such as windows and doors.
- Never stand behind the watercraft while the engine is running. A person standing behind a running engine may inhale high concentrations of exhaust fumes. Inhalation of concentrated exhaust fumes that contain carbon monoxide can result in CO poisoning, serious health problems and death.

## Avoid Gasoline Fires and Other Hazards

Gasoline is extremely flammable and highly explosive. Fuel vapors can spread and be ignited by a spark or

flame many feet away from the engine. To reduce the risk of fire or explosion, follow these instructions:

- Use only an approved red gasoline container to store fuel.
- Strictly adhere to the instructions in *FUELING* section.
- Never start watercraft if gasoline or gasoline vapor odors is present in the engine compartment.
- Never start or operate the engine if the fuel cap is not properly secured.
- Do not carry gasoline containers in the storage bin (if equipped).
- Use only a BRP approved LinQ fuel caddy, which should be properly installed and secured. Never tow a skier or wakeboarder while having a fuel caddy installed. Always follow the instructions for LinQ accessories. Never refill the fuel caddy on the PWC. Refill on shore.

Gasoline is poisonous and can cause injury or death.

- Never siphon gasoline with your mouth.
- If you swallow gasoline, get any in your eyes, or inhale gasoline vapors, see a doctor immediately.

If gasoline is spilled on you, wash thoroughly with soap and water and change your clothes.

## Avoid Burns from Hot Parts

Certain components may become hot during operation. Avoid contact during and shortly after operation to avoid burns.

## Accessories and Modifications

Do not make unauthorized modifications, or use accessories that are not approved by BRP. Since these changes have not been tested by BRP, they may increase the risk of accidents or injuries, and they can make the watercraft illegal for use on water.

See your authorized Sea-Doo dealer for available accessories for your watercraft.

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## SPECIAL SAFETY MESSAGES

### Reminders Regarding Safe Operation

The performance of this watercraft may significantly exceed that of other watercraft you may have operated. Make sure you read and understand the content of this Operator's Guide to become completely familiar with the controls and operation of the watercraft before embarking on your first trip, or taking on a passenger(s). If you have not had the opportunity to do so, practice driving solo in a suitable traffic free area to become accustomed to the feel and response of each control. Be fully familiar with all controls before accelerating above idle speed. Do not assume that all PWCs handle identically. Each model differs, often substantially.

Always keep in mind that as the throttle lever is returned to the idle position, less directional control is available. To turn the watercraft, both steering and throttle are necessary. Do not release throttle when trying to steer away from objects. Your need throttle to steer. If the engine is shut off, directional control is lost.

Although most watercraft have no means of braking, advancement in technologies now permit us to offer some models that are equipped with a braking system called the iBR™ system. Practice braking maneuvers in a safe traffic-free area to become familiar with handling under braking and with stopping distances under various operating conditions.

Stopping distance will vary depending on initial speed, load, wind, number of riders and water conditions. The amount of braking power commanded by the operator using the iBR lever (Intelligent Brake and Reverse) will also affect stopping distance.

When braking, riders must brace themselves against the deceleration force to prevent from moving forward on the watercraft and losing balance.

When operating an iBR equipped watercraft, be aware that other boats following or operating in close proximity may not be able to stop as quickly.

When at speed and the brake is first applied, a plume of water will shoot up in the air behind the watercraft which may cause the operator of a following watercraft to momentarily lose sight of your PWC. It is important to inform the operator of a watercraft who intends to follow in a convoy formation, of the braking and maneuvering capability of your PWC, what the plume of water indicates, and that a greater distance should be maintained between watercraft.

When actuating the iBR control lever while the watercraft has some forward speed, the braking mode will engage and generate a deceleration proportional to the iBR lever position. The more you pull in the iBR lever, the greater the braking force becomes. Be careful to gradually actuate the iBR lever to adjust the intensity of the braking force, and to simultaneously release the throttle lever.

The brake feature of the iBR system cannot prevent your PWC from drifting due to current or wind. It has no braking effect on the rearward motion. Also note that your engine must be running to be able to use the brake.

The personal watercraft jet thrust can cause injury. The jet pump may pick up debris and throw it rearward causing a risk of injuring people, damaging the jet pump, or other property.

Observe the instructions on all safety labels. They are there to help assure that you have a safe and enjoyable outing.

Do not store any objects in areas that are not designed specifically for storage.

Riding with passenger(s), pulling tubes, a skier, or a wake boarder makes the PWC handle differently and requires greater skill.

All PWC models come equipped with tow eyelets that can be used for mooring and as tie-down points when trailering, can be used to attach a tow rope for a skier, tube or wake boarder. Do not use these attachment points or any other portion of the watercraft to tow a para-sail or any other craft. Personal injury or severe damage may occur.

Combustion engines need air to operate; consequently this PWC cannot be totally watertight. Any maneuvers such as turning constantly in tight circles, plunging the bow through waves, or capsizing the watercraft, that cause the air inlet openings to be under water may cause severe engine problems due to water ingestion. Refer to *OPERATING INSTRUCTIONS* and the *WARRANTY* section contained in this Operator's Guide.

Engine exhaust contains carbon monoxide (CO), which can cause serious health problems or death if inhaled in sufficient quantities. Do not operate the PWC in a confined area or allow CO to accumulate around the PWC, or in enclosed or sheltered areas such as when docked, or when rafting. Be aware of the risk of CO emanations from exhaust of other PWCs.

Know the waters in which the watercraft is to be operated. Current, tides, rapids, hidden obstacles, wakes and waves etc. can affect safe operation. It is not advisable to operate the watercraft in rough waters or inclement weather.

In shallow water, proceed with caution and at very low speeds. Grounding or abrupt stops may result in injury and watercraft damage. Debris may also be picked up and thrown rearward by the jet pump onto people or property.

Keep the tether cord attached to the operator's PFD or wrist (wrist strap required) at all times and keep it free from snagging on the handlebars to help ensure the engine stops should the operator fall off. After riding, remove the tether cord from the engine cut-off switch to avoid unauthorized use by children or others. If the operator falls off the watercraft and the tether cord is not attached as recommended, the watercraft engine will not stop.

Ride within your limits and level of riding ability.

Always ride responsibly and safely. Use common sense and courtesy.

Respect the environment and the rights of other users of the waterways. As the operator and owner of a PWC, you are responsible for damage by the wake of your PWC. Do not let anyone throw refuse overboard.

While your watercraft has the capacity of operating at high speeds, it is strongly recommended that high speed operation only be applied when ideal conditions exist and are permitted. Higher speed operation requires a higher degree of skill and increases the risk of severe injuries.

The forces generated on the body of riders while turning, negotiating waves or wakes, operating in choppy waters, or falling off the watercraft, especially at higher speeds, may cause injury including the possibility of broken bones or more serious bodily injuries. Remain flexible and avoid sharp turns.

PWCs are not designed for night-time operation.

Avoid riding in very rough waters or practicing extreme maneuvers like jumping wakes or waves.

## Before Getting Underway

For safety reasons and proper care, always perform the pre-ride inspection as specified in your Operator's Guide before operating your watercraft.

Do not exceed the payload or passenger capacities for your watercraft. Overloading can affect maneuverability, stability and performance. Also, heavy seas reduce capacity. A payload or person capacity plate is not an excuse for failure to use common sense or good judgment.

Regularly inspect the PWC, hull, engine, safety equipment, and all other boating gear and keep them in safe operating condition.

Be sure you have the minimum required safety equipment, PFDs and any additional gear needed for your cruise.

Ensure that all lifesaving equipment, including fire extinguisher (not supplied with vehicle), are in safe operating condition and easily accessible. Show all passengers where this equipment is stored on the PWC, and make sure they know how to use it.

There are several classes of fire extinguishers, for marine application we recommend the use of a properly sized class 5 B:C.

Additionally, your fire extinguisher should be certified by ULC, UL or USCG. Taking proper care of your fire extinguisher is mandatory.

Often check if the fire extinguisher is loaded to its proper operating pressure and make sure that you and your guests know how to use it. Maintenance, repair and refilling must be carried out by qualified personnel in accordance with the manufacturer's instructions. For monthly fire extinguisher maintenance, turn the fire extinguisher back and shake it vigorously to prevent the chemical in the fire extinguisher from hardening.

Always be cautious when manipulating the fire extinguisher. Pay attention not to damage the mechanism (nozzle, dial, handle, etc) when storing it on the PWC.

Keep an eye on the weather. Check local weather broadcasts before departure. Be alert to changing conditions.

Keep accurate and up-to-date charts of the boating area on board. Before getting underway, check water conditions in the planned boating area.

Ensure there is enough fuel on board for the planned trip. Always verify fuel level before use and during the ride. Apply the principle of 1/3 of the fuel to reach your destination, 1/3 to return, and keep 1/3 in reserve. Allow for changes due to adverse weather or other delays.

## Operator and Passenger Awareness

Read and understand all safety labels on the Sea-Doo PWC, the Operator's Guide, all other safety documents, and watch the *SAFETY VIDEO* before operating the PWC.

Respect applicable laws. Check local and federal boating laws applicable to the waterways where you intend to use your watercraft. Learn the local navigation rules. Know and understand the applicable navigation system (such as buoys and signs).

Remember that sun, wind, fatigue or illness may impair your judgement and reaction time.

Operation of this PWC by a person under 16 years of age, or a person with a disability that impairs vision, reaction time, judgment, or operation of the controls is NOT recommended.

Always properly use the tether cord when operating the watercraft and ensure that all passengers are familiar with its use.

Ensure that any operator and all passengers know how to swim and how to reboard the PWC from the water.



Boarding in deep water can be strenuous. Practice in chest-deep water before operating or embarking your watercraft in deep water. Ensure that any operator and all passengers wear a PFD at all times and take extra precautions when boating.

Never turn handlebar while someone is near the rear of watercraft. Keep away from steering moving parts (nozzle, iBR gate, linkages, etc.).

Do not start the engine or operate the watercraft if anyone is in the water nearby, or near the rear of the watercraft.

Be aware of the iBR gate movement when starting the engine, shutting down the engine or using the iBR lever. Automatic movement of the gate may squeeze fingers or toes of people taking a hold on the back or your PWC.

The operator and passenger(s) should be properly seated and have a firm grip on a handhold before starting the watercraft, and at all times when the watercraft is in motion. All passenger(s) should be instructed to use the handholds provided, or to hold on to the waist of the person in front of them. Each passenger must be able to simultaneously place both feet firmly flat against each footwell when properly seated. When going over waves, or in rough water, passenger(s) may raise their body slightly off the seat to absorb the shocks with their legs.

When braking or decelerating, riders must brace themselves against the deceleration force to prevent from moving forward on the watercraft and losing balance.

When accelerating on a PWC with passenger(s), whether from a complete stop or while underway, always do so progressively. Fast acceleration may cause your passenger(s) to lose their balance and fall rearward off the watercraft. Make sure that your passenger(s) are aware of or can anticipate any rapid acceleration.

Severe internal injuries can occur if water is forced into body cavities as a result of falling into water or being near a jet thrust nozzle. Consequently, the wearing of a wet suit bottom is highly recommended.

Keep away from the intake grate while the engine is running. Items such as long hair, loose clothing, or PFD straps can become entangled in moving parts.

If the throttle lever is depressed while braking, the iBR system will disable the throttle command by the user. When releasing the iBR lever while the throttle lever is still depressed, the throttle command will regain control and generate an acceleration after a short delay. Release throttle lever if acceleration is not needed.

Before reboarding, make sure engine is off and the tether cord is removed from the engine cut-off switch.

To prevent accidental starting, always remove the tether cord from the engine cut-off switch when swimmers are boarding, nearby, or during removal of any weeds or debris from the intake grate.

On a PWC, never place your feet and legs in the water to aid turning.

### Operation by Minors

Minors should always be supervised by an adult whenever operating a watercraft. Laws regarding the minimum age and licensing requirements of minors may vary from one jurisdiction to another. Be sure to contact the local boating authorities for information regarding the legal operation of a PWC in the intended jurisdiction of use. BRP recommends a minimum operator age of 16 years old.

### Drugs and Alcohol

Never use with drugs or alcohol. Like driving a car, driving a watercraft requires the operator to be sober, attentive and alert. Operating a watercraft

while intoxicated or under the influence of drugs is not only dangerous, but it is also a Federal offense carrying a significant penalty. These laws are vigorously enforced. The use of drugs and alcohol, singly or in combination, decreases reaction time, impedes judgment, impairs vision, and inhibits your ability to safely operate a watercraft.

### **WARNING**

**Alcohol consumption and boating do not mix! Operating with the use of drugs or alcohol endangers the lives of your passengers, other boaters, and yourself. Federal laws prohibit operating a watercraft with the use of drugs or alcohol.**

## **Water Sports (Towing with the Watercraft) (3UP Models Only)**

### **WARNING**

**Avoid personal injury!** Your PWC is not designed for and should not be used for pulling another craft, parasails, kites, gliders, or any device which can become airborne. Use your watercraft only for water sports it was designed for.

Water skiing, wakeboarding, or riding a towed inflatable apparatus are some of the more popular water sports. Taking part in any water sport requires increased safety awareness by the participant and the watercraft operator. If you have never towed someone behind your PWC before, it is a good idea to spend some hours as an observer, working with and learning from an experienced operator. It is also important to be aware of the skill and experience of the person being towed.

Everyone participating in a water sport should observe these guidelines:

- Riding with passenger(s) or pulling a tube, skier or wakeboarder makes the watercraft handle differently and requires greater skill.
- Always respect the safety and comfort of your passenger(s) and person being towed on skis, wakeboard or other water products.
- Always carry an observer when pulling a tube, skier or wakeboarder to observe the person being towed and inform the operator about the participants' hand signals. The operator must focus his attention on operating the watercraft and the waters ahead.
- Proceed with only as much speed as required and follow the observers' instructions.
- When pulling a tube, skier, or a wakeboarder, do not make tight sharp turns or use the braking system unless absolutely necessary. Remember that although this PWC is manoeuvrable and has stopping capabilities (models with iBR), the person in tow may not be able to avoid an obstacle, or the PWC with which it is being towed.
- Allow only capable swimmers to take part in any water sport.
- Always wear an approved personal flotation device (PFD). Wearing a properly designed PFD helps a stunned or unconscious person stay afloat.
- Be considerate to others you share the water with.
- Both the operator and observer should monitor the location of the tow rope when participating in watersports. A slack tow rope can become entangled with a person(s) or objects on the PWC or in the water, particularly when making a tight turn or circling, and cause serious personal injury.

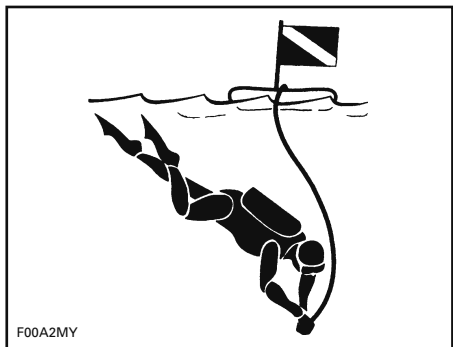
- Do not tow a person in any water sport on a short tow rope such that the person inhales exhaust fumes in concentration. Inhalation of concentrated exhaust fumes, which contain carbon monoxide, can result in CO poisoning, personal injury and death.
- Use a tow rope of sufficient length and size, and make sure it is adequately secured to your watercraft. Always store tow rope when not in use, see *STORING THE TOW ROPE AFTER USE*. While some watercraft are equipped or can be fitted with a specially designed towing mechanism, avoid installing a tow pole on a PWC. It can become a hazard should someone fall on it.
- Give immediate attention to a person who has fallen. He or she is vulnerable in the water alone and may not be seen by other boaters.
- Approach a person in the water from the lee side (opposite the direction of the wind). Turn off the motor before coming close to the person.
- Participate in water sports only in safe areas. Stay away from other boats, channels, beaches, restricted areas, swimmers, and heavily traveled waterways and underwater obstructions.
- Turn off the engine and anchor the watercraft before swimming.
- Swim only in areas designated as safe for swimming. These are usually marked with a swim area buoy. Do not swim alone or at night.



#### SWIM AREA BUOY

- Do not water ski between sunset and sunrise. It is illegal in most areas.
- Do not drive the watercraft directly behind a water skier, tuber or wakeboarder. At 40 km/h (25 MPH) per hour, the watercraft will overtake a person who falls in the water 60 m (197 ft) in front of your watercraft in about 5 seconds.
- Shut off the engine and remove the tether cord from the engine cut-off switch when anyone is in the water nearby.
- Stay at least 45 m (148 ft) away from areas marked by a diver down float.

**Avoid personal injury!** Do not allow anyone near the propulsion system or intake grate, even when the engine is off. Items such as long hair, loose clothing or personal flotation device straps can become entangled in moving parts resulting in serious injury or drowning. In shallow water, shells, sand, pebbles or other objects could be drawn up by the jet pump and be thrown rearward.

**DIVER DOWN FLOAT**

For more information on approved, legal and safe practice of water sports, please contact the local legal authority on water sports safety for the area you plan to practice in.

**Storing the Tow Rope After Use**

Tow rope should be taken out of water and stored on vehicle after each use.

**⚠ WARNING**

**Always remove tow rope from water and secure it to vehicle when not in use.**

Tow rope should be stored in appropriate storage location:

- If vehicle is equipped with a BRP Tow Pro, secure tow rope using Tow Pro storage strap.
- If vehicle is not equipped with a BRP Tow Pro, store tow rope in Spark Cargo Net or equivalent. See an authorized Sea-Doo dealer for information.

**⚠ WARNING**

**Never carry any loose, heavy, sharp, or breakable objects in the storage bin.**

**Hypothermia**

Hypothermia, the loss of body heat resulting in a subnormal body temperature, is a significant cause of death in boating accidents. After an individual has succumbed to hypothermia, he or she will lose consciousness and then drown.

PFDs can increase survival time because of the insulation they provide.

Naturally, the warmer the water, the less insulation one will require. When operating in cold water (below 4°C (40°F)) consideration should be given to using a coat or jacket style PFD as they cover more body area than the vest style PFDs.

Some points to remember about hypothermia protection:

- While afloat in the water, do not attempt to swim unless it is to reach a nearby watercraft, fellow survivor, or a floating object onto which you can lean or climb. Unnecessary swimming increases the rate of body heat loss. In cold water, drown-proof methods that require putting your head in the water are not recommended. Keep your head out of the water. This will greatly lessen heat loss and increase your survival time.
- Maintain a positive attitude about your survival and rescue. This will improve your chances of extending your survival time until you can be rescued. Your will to live does make a difference!
- If there is more than one person in the water, huddling together is recommended. This action tends to reduce the rate of heat loss and thus increase the survival time.
- Always wear your PFD. It won't help you fight off the effects of hypothermia if you don't have it on when you go into the water.

## **Safe Boating Courses**

Many countries recommend or require a boating safety course. Check with your local competent authorities.

Check local and federal boating laws applicable to the waterways where you intend to use your watercraft. Learn the local navigation rules. Know and understand the applicable navigation system (such as buoys and signs).

## **Carrying Loads**

When carrying load on the rear platform of the watercraft or onto cargo accessories, reduce your speed and adapt your driving behavior to reduce the risk of ejection from watercraft or contact with cargo possibly leading to injuries.

## Introduction

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

iControl™ (intelligent Control systems) provides an environment whereby the operator can control many systems without taking his hands off the handlebars.

All controls are at the operator's finger tips and activated by pressing a button or pulling a lever. The operator's attention can thus remain focused on the water and driving the watercraft.

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.

The various systems grouped under iControl are the:

- iTC™ (intelligent Throttle Control)
- iBR (intelligent Brake and Reverse) (if equipped)
- O.T.A.S. (Off Throttle Assisted Steering) (if equipped).

It is extremely important for operators to read all information contained in this Operator's Guide so as to become familiar with this watercraft, its systems, controls, capabilities and limitations.

## iTC (intelligent Throttle Control)

The system uses an electronic throttle control (ETC) that provides command signals to the ECM (Engine Control Module). With this system, there is no need for a traditional throttle cable.

The iTC allows the following operating modes:

- Touring mode
- Sport mode
- O.T.A.S.™ (If equipped).

## Touring Mode (Rotax 900 ACE - 90)

In touring mode, 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 (Rotax 900 ACE - 90)

In sport mode, maximum engine power is available throughout the engine operational range.

Refer to *MULTIFUNCTION GAUGE* for detailed instructions.

## O.T.A.S.™ System (If equipped) (Off-Throttle Assisted Steering)

The O.T.A.S.™ (Off Throttle Assisted Steering) is also controlled by the iTC.

The O.T.A.S. (Off-Throttle Assisted Steering) system provides additional maneuverability in off-throttle situations.

The O.T.A.S. system is electronically activated when the operator initiates a full turn and releases the throttle at the same time.

## Limitations

The O.T.A.S. system cannot help you maintain control or prevent collisions in all situations.

Refer to *OPERATING INSTRUCTIONS* for details.

## iBR (intelligent Brake and Reverse System) (Models with iBR)

This watercraft uses an electronically controlled braking and reverse system called the iBR system (intelligent Brake and Reverse).

The iBR module controls the position of the iBR gate to provide forward thrust, reverse thrust, braking thrust, and neutral.

The operator commands the position of the iBR gate using either the throttle lever for forward position, or the iBR lever for neutral, reverse, and for the braking function.

**NOTE:** The iBR lever can only be used to command a change in the gate position if the engine is running.

Using the iBR system significantly reduces the stopping distance of this watercraft and can increase its maneuverability as it can be used in a straight line, in a turn, at high or low speeds, or to propel the watercraft in reverse for docking or maneuvering in very close quarters.

Under ideal conditions, experienced operators were consistently able to reduce the stopping distance of a watercraft equipped with an iBR system by approximately 33%, from an initial speed of 80 km/h (50 MPH).

## Limitations

Even when equipped with an iBR system, watercraft do not have the ability of land based vehicles.

Stopping distance will vary notably depending on initial speed, load, wind, current, water conditions and the amount of braking.

The iBR system has no effect on the rearward motion.

It cannot prevent your watercraft from drifting in current or wind.

### **WARNING**

- It is important to inform the operator of a watercraft who intends to follow in a convoy formation, of the braking and maneuvering capability of your PWC, what the plume of water indicates, and that a greater distance must be maintained between watercraft.
- Be aware that other boats following or operating in close proximity may not be able to stop as quickly.

# SAFETY EQUIPMENT

## Required Safety Equipment

The operator and the passenger(s) must wear an approved Personal Flotation Device (PFD) that is suitable for PWC use.

Operator and passenger(s) should have ready access to shatterproof glasses should riding conditions or personal preference warrant.

Wind, water spray, bugs and speed may cause a person's eyes to water and create blurred vision.

As the owner of the watercraft, you are responsible for assuring that all required safety equipment is aboard. You should also consider supplying additional equipment as needed for your safety and that of your passengers. Check state and local regulations about required safety equipment.

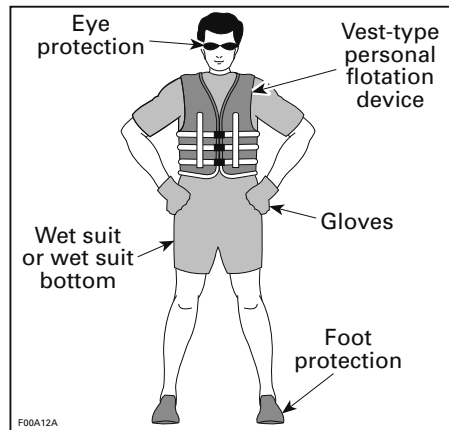
Safety equipment required by regulations is mandatory. If local regulations require additional equipment, it must be approved by a competent authority. Minimum requirements include the following:

- Personal flotation devices (PFDs)
- A buoyant heaving line of 15 m (50 ft) minimum
- A watertight flashlight or approved flares
- Signaling device
- Sound producing devices (air horn or whistle).

## Recommended Protective Gear

The operator and passenger(s) of PWCs must wear protective gear, including:

- A wet suit bottom, or thick tightly woven and snug fitting clothing that provides equivalent protection. As an example, thin bike shorts would not be appropriate. Severe internal injuries can occur if water is forced into body cavities as a result of falling in the water or being near jet thrust nozzle. Normal swimwear does not adequately protect against forceful entry of water into the lower male or female body opening(s).
- Footwear, gloves, safety goggles or glasses are also recommended. Some type of lightweight, flexible foot protection is recommended. This will help reduce possible injury, should you step on sharp underwater objects.





## Personal Flotation Devices (PFDs)

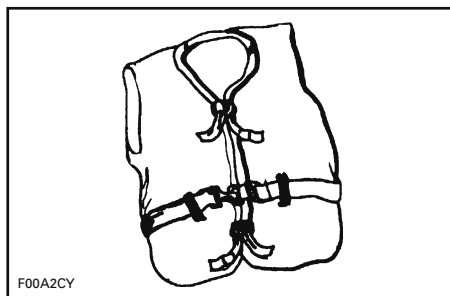
Each person on a recreational watercraft must wear a personal flotation device (PFD) at all times. Ensure that these PFDs meet your country's regulations.

A PFD provides buoyancy to help keep the head and face above the water, and to help maintain a satisfactory body position while in the water. Body weight and age should be considered when selecting a PFD. The buoyancy provided by the PFD should support your weight in water. The size of the PFD should be appropriate for the wearer. Body weight and chest size are common methods used to size PFDs. It is your responsibility to ensure that you have the proper number and types of PFDs on board to comply with federal and local regulations, and that your passengers know where they are and how to use them.

### PFD Types

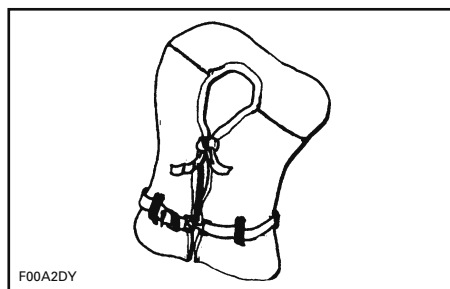
There are five types of approved PFDs.

**PFD Type I, Wearable**, has the greatest required buoyancy. Its design allows for turning most unconscious persons in the water from face down position to a vertical or slightly backward, face-up position. It can greatly increase the chances of survival. Type I is most effective for all waters, especially offshore when rescue may be delayed. It is also the most effective in rough waters.



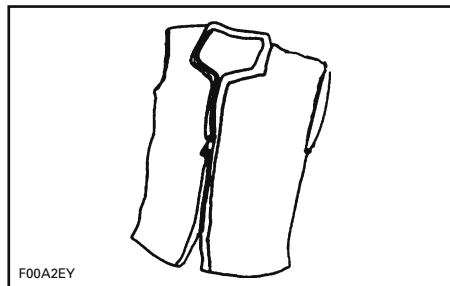
TYPE I — WEARABLE

**PFD Type II, Wearable**, turns its wearer in the same way as Type I, but not as effectively. The Type II does not turn as many persons under the same conditions as a Type I. You may prefer to use this PFD where there is a probability of quick rescue such as in areas where other people are commonly involved in water activities.



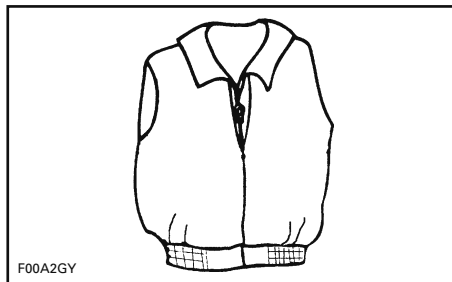
TYPE II — WEARABLE

**PFD Type III, Wearable**, allows wearers to place themselves in a vertical or slightly backward position. It does not turn the wearer. It maintains the wearer in a vertical or slightly backward position and has no tendency to turn the wearer face down. It has the same buoyancy as a Type II PFD and may be appropriate in areas where other people are commonly involved in water activities.



TYPE III — WEARABLE

**PFD Type V**, Wearable, must be worn. When inflated, it provides buoyancy equivalent to Type I, II or III PFDs. When it is deflated, however, it may not support some people.



TYPE V — WEARABLE

## Helmets

### Some Important Considerations

Helmets are designed to offer some degree of protection in case of impacts to the head. In most motorized sports, the benefits of wearing a helmet clearly outweigh the drawbacks. However, in the case of motorized watersports such as riding personal watercraft, this is not necessarily true as there are some particular risks associated with the water.

### Benefits

A helmet helps to reduce the risk of injury in case of a head impact against a hard surface such as another craft in the case of a collision. Similarly, a helmet with a chin guard might help prevent injuries to the face, jaw or teeth.

### Risks

On the other hand, in some situations when falling off the watercraft, helmets have a tendency to catch the water, like a "bucket", and put severe stresses on the neck or spine. This could result in choking, severe or permanent neck or spine injury or death.

Helmets may also interfere with peripheral vision and hearing, or increase fatigue which, could contribute to increase the risk of a collision.

### Weighing the Risks vs Benefits

In order to decide whether or not you should wear a helmet, it is best to consider the particular environment you will be riding in, as well as other factors such as personal experience. Will there be a lot of traffic on the water? What is your riding style?

### The Bottom Line

Since each option minimizes some risks, but increases others, before each ride you must decide whether to wear or not wear a helmet based on your particular situation.

If you decide to wear a helmet, you must then decide what type is the most appropriate for the circumstances. Look for helmets that meet DOT or Snell standards, and if possible, choose one designed for motorized watersports.

## Additional Recommended Equipment

It is recommended that you acquire additional equipment for safe, enjoyable cruising. This list, which is not all inclusive, includes items you should consider acquiring.

- Local map
- First aid kit
- Tow rope
- Flares
- Mooring cords.

A cellular telephone in a waterproof bag or container has also been found to be beneficial to boaters when in distress or just for contacting someone on shore.

---

## PRACTICE EXERCISES

It is always a good idea to practice and get familiar with all controls, functions and handling characteristics of your watercraft before venturing on the water.

Always secure the tether cord to the engine cut-off switch and the clip to your PFD or a wrist strap.

### Where to Practice Exercises

Find a suitable area to practice the exercises. Ensure the area meet the following requirements:

- No traffic
- No obstacles
- No swimmers
- No current
- Ample space to maneuver
- Water depth is adequate.

### Practice Exercises

Practice **alone** the following exercises.

#### Turning

Practice turning in circles in both directions at slow speed. When comfortable with the exercise, increase difficulty by making some figure 8.

When this is mastered, repeat the above exercises but at increased speed.

#### Stopping Distances

##### Watercraft not Equipped with iBR

Practice stopping the watercraft in a straight line at different speeds.

Remember, water drag is the main factor which reduces the watercraft speed and thus the stopping distance.

**NOTE:** The watercraft speed, load, current and wind also play an important role in affecting stopping distances.

##### Watercraft Equipped with iBR

Practice stopping the watercraft in a straight line at various speeds and braking force.

Remember that watercraft speed, load, water conditions, current and wind also affect stopping distances.

##### Reverse (Watercraft Equipped with iBR)

Practice reverse operation to learn how the watercraft operates in reverse and reacts with steering inputs.

**NOTE:** Always perform this exercise at slow speeds.

##### Avoiding an Obstacle

Practice obstacle avoidance (choose a virtual point on the water) by steering the watercraft and maintaining throttle.

Repeat exercise, but this time release throttle while turning.

Repeat exercise, but this time while applying iBR lever. Notice that the iBR system also takes control of the throttle.

**NOTE:** With this exercise, you will learn that you need throttle to steer the watercraft in a different direction.

##### Docking

##### Watercraft not Equipped with iBR

**NOTE:** You can use the start and stop button to reduce the docking speed.

Practice docking using the throttle and steering to become familiar with the response of the PWC and to develop good control skills.

##### Watercraft Equipped with iBR

Practice docking using the throttle, iBR lever and the steering to become familiar with the response of the PWC, and to develop good control skills.

**NOTE:** Remember that steering direction is reversed when backing.

## **Important Factors Not to Neglect**

In addition, always remember that the following conditions have a direct impact on how your watercraft will behave and respond to different inputs:

- Loads
- Currents
- Wind
- Water conditions.

Make sure to be alert to these conditions, and adapt accordingly. If possible, practice further in these conditions.

For delicate maneuvers, the best advice is always to try to reduce your speed to a minimum.

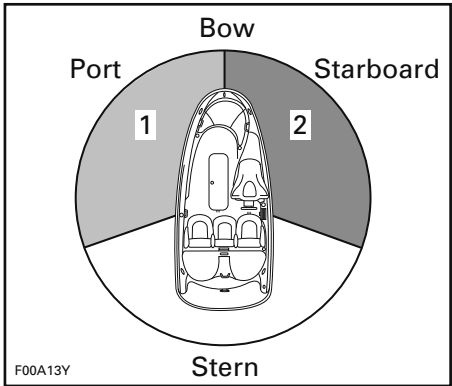
# NAVIGATION RULES

## Operating Rules

Operating a watercraft can be compared with driving on unmarked highways and roads. To prevent collisions or avoid other boaters, a system of operating rules must be followed. It's not only common sense... it's the law!

Generally keep to your right and safely avoid collisions by keeping a safe distance from other watercraft, boats, people and objects.

The following illustration identifies different parts of a boat that are used as directional reference points, the bow being the front of the boat. The port side of boat (left side) is visually identifiable by a RED light off the bow, and the starboard side (right side) by a GREEN light.



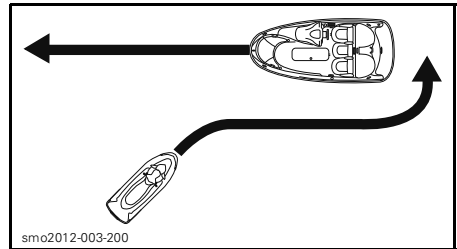
TYPICAL - DIRECTIONAL REFERENCE POINTS

- 1. RED light
- 2. GREEN light (yield zone)

## Crossing

Give the right of way to a watercraft **ahead and to your right**. Never cross in front of a boat, you should see his RED light, he should see your GREEN light (he has the right of way).

Personal watercraft (PWC) do not have these colored lights, but the rule still applies.



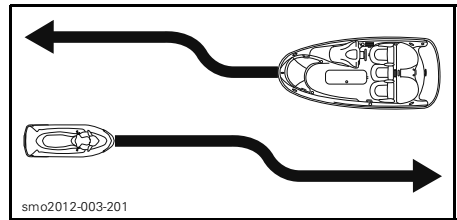
TYPICAL

Like a street traffic light, if you see a **RED** light, **STOP**, give the right of way. The other boat is to your right and it has the right of way.

If you see a **GREEN** light, **pass with caution**. The other boat is to your left, you have the right of way.

## Meeting Head-On

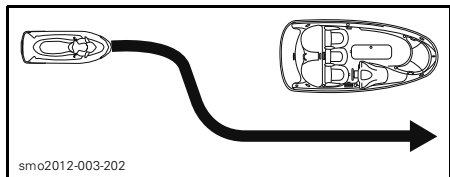
Keep right.



TYPICAL

## Passing

Give the right of way to other crafts and keep clear.



**TYPICAL**

## Navigation System

Navigational aids, such as signs or buoys, can assist you in identifying safe waters. Buoys will indicate whether you should keep to the right (starboard) or to the left (port) of the buoy, or to which channel you can continue. They may also indicate whether you are entering a restricted or controlled area such as a no wake or low speed zone. They may also indicate hazards or pertinent boating information. Markers may be located on shore or on the water. They can also indicate speed limits, no power craft or boating, anchorage and other useful information. (The shape of each type of marker will provide assistance).

Make sure you know and understand the navigation system applicable to the waterways where you intend to use the watercraft.

## Collision Avoidance

Do not release the throttle when trying to steer away from an obstacle. Engine power and jet pump thrust is required to steer the watercraft.

Always keep a constant lookout for other water users, other boats or objects, especially when turning. Be alert for conditions that may limit your visibility or block your vision of others.

Respect the rights of other recreationists and/or bystanders and always keep a safe distance from all other watercraft, boats, people and objects.

Do not wake or wave jump, ride the surf line or attempt to spray or splash others with your watercraft. You may misjudge the ability of the watercraft or your own riding skills and strike a boat, watercraft or person.

This watercraft has the capability of turning more sharply than other boats, however, unless in an emergency, do not negotiate sharp, high speed turns. Such maneuvers make it hard for others to avoid you or understand where you are going. Also, you and/or your passenger(s) could be thrown from the watercraft.

## *Models Equipped with iBR*

Unlike most other watercraft, this PWC has a braking system (iBR).

When operating an iBR equipped watercraft, be aware that other boats following or operating in close proximity may not be able to stop as quickly.

When at speed and the brake is first applied, a plume of water will shoot up in the air behind the watercraft indicating a braking manoeuvre.

It is important to inform the operator of a watercraft who intends to follow in a convoy formation of the braking and maneuvering capability of your PWC, what the plume of water indicates, and that a greater distance should be maintained between both of you.

Stopping distance will vary depending on initial speed, load, wind and water conditions.

Although the preferable maneuver to avoid an obstacle is to steer away while applying throttle, the iBR can also be used by fully braking and turning in the appropriate direction to avoid the obstacle.

# FUELING

## Fueling Procedure

### **⚠ WARNING**

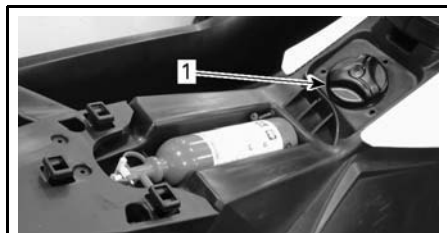
Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area. Do not smoke or allow open flames or sparks in the vicinity.

1. Turn off engine.

### **⚠ WARNING**

Always stop the engine before refueling.

2. Do not allow anyone to remain on the watercraft.
3. Tie watercraft securely to the fueling pier.
4. Have a fire extinguisher (not supplied with vehicle) close at hand.
5. Remove the seat. Refer to *SEAT* in *EQUIPMENT* section.
6. Locate fuel tank cap.



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1. Fuel tank cap
7. Slowly unscrew the fuel cap counterclockwise.

### **⚠ WARNING**

Fuel tank may be pressurized, fuel vapors may be released while removing the fuel tank cap.

8. Insert the gas pump spout into the filler neck and fill up the fuel tank.

### **⚠ WARNING**

To prevent fuel back-flow, fill tank slowly so the air can escape from the fuel tank.

9. Stop filling immediately after the release of the gas pump nozzle handle and wait a moment before removing the spout. Do not retract the gas pump nozzle to put more fuel in fuel tank.

### **⚠ WARNING**

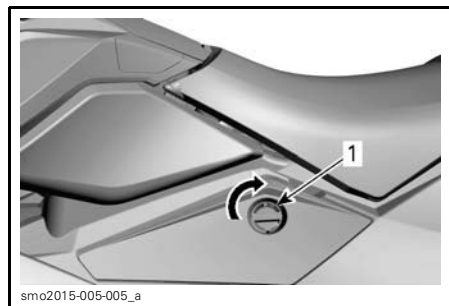
Do not overfill or top off the fuel tank and leave the watercraft in the sun. As temperature increases, fuel expands and may overflow.

10. Reinstall fuel tank cap and tighten it clockwise until you hear a ratchet sound.

### **⚠ WARNING**

Always wipe off any fuel spillage from the watercraft.

11. After refueling, always ensure there is no gasoline vapor odor inside the engine compartment.
12. To access the engine compartment, turn the LH access cover knob 1/4 turn clockwise, then pull out to unsnap the rear portion and slide rearward to remove.



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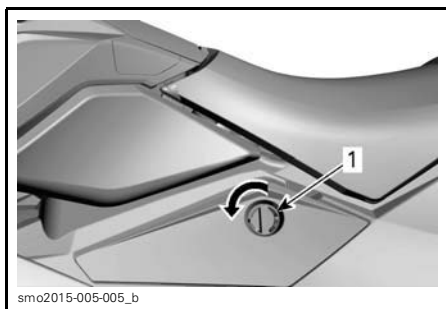
#### **LH ACCESS COVER**

1. To unlock, turn the knob 1/4 turn clockwise

**⚠ WARNING**

**Do not start watercraft if gasoline or gasoline vapor odor is present.**

13. Reinstall the LH access cover in reverse of removal procedure and lock the knob by turning it 1/4 turn counterclockwise.

**LH ACCESS COVER**

1. To lock, turn the knob 1/4 turn counterclockwise

14. To reinstall the seat, refer to *SEAT* in *EQUIPMENT* section.

**Fuel Requirements**

**NOTICE** Always use fresh gasoline. Gasoline will oxidize; the result is loss of octane, volatile compounds, and the production of gum and varnish deposits which can damage the fuel system.

Alcohol fuel blending varies by country and region. Your vehicle has been designed to operate using the recommended fuels, however, be aware of the following:

- Use of fuel containing alcohol above the percentage specified by government regulations is not recommended and can result in the following problems in the fuel system components:
  - Starting and operating difficulties.
  - Deterioration of rubber or plastic parts.
  - Corrosion of metal parts.
  - Damage to internal engine parts.
- Inspect frequently for the presence of fuel leaks or other fuel system abnormalities if you suspect the presence of alcohol in gasoline exceeds the current government regulations.
- Alcohol blended fuels attract and hold moisture which may lead to fuel phase separation and can result in engine performance problems or engine damage.



## Recommended Fuel

Use unleaded gasoline containing MAXIMUM 10% ethanol.

Use common unleaded gasoline with an AKI (RON+MON)/2 octane rating of 87, or an RON octane rating of 91.



**NOTICE** Never experiment with other fuels. Engine or fuel system damages may occur with the use of an inadequate fuel.

**NOTICE** Do NOT use fuel from fuel pumps labeled E85.

Use of fuel labeled E15 is prohibited by U.S. EPA Regulations.

## TRAILERING INFORMATION

**NOTICE** The span of the trailer wood bunks including bunk width should be adjusted to provide support throughout the full length of the hull. The ends of both trailer wood bunks should not exceed the length of the watercraft.

Ensure the trailer wheels are positioned so that the center of gravity of the watercraft is slightly ahead of the wheels to properly support the weight of the watercraft.

### WARNING

Never tip this watercraft on end for transporting. We recommend that you carry the watercraft in its normal operating position.

Check the applicable laws and regulations in your area concerning towing a trailer, especially for the following items:

- Brake system
- Tow vehicle weight
- Mirrors.

Take the following precautions when towing the watercraft:

- Respect tow vehicle maximum weight capacity and the tongue weight capacity as recommended by manufacturer.
- Tie the watercraft to both front and rear (bow/stern) eyelets so that it is firmly secured on the trailer. Use additional tie-downs if necessary.
- Ensure fuel tank cap, storage bin front cover (if equipped), glove box cover and seat are properly latched.
- Observe trailering safety precautions.

**NOTICE** Do not route ropes or tie-downs over the seat or grab handle as they could be permanently damaged. Do not use pump or reverse gate to route ropes and tie downs as they could be permanently damaged. Wrap ropes or tie-downs with rags or similar protectors where they can come into contact with the watercraft body.

### WARNING

Make sure seat is securely latched prior to trailering.

A Sea-Doo cover can protect the watercraft, particularly when driving on dirt roads, to prevent dirt entry through the air inlet openings.

### WARNING

When trailering the watercraft, NEVER leave any equipment on the watercraft.

# IMPORTANT ON-PRODUCT LABELS

## Hang Tag

This PWC comes with hang tag and label containing important safety information.

Any person who rides this vehicle should read and understand this information before riding.



**SEA-DOO<sup>®</sup>**  
**HASSLE-FREE**  
**MAINTENANCE**  
**SCHEDULE**

**PEACE OF MIND**

**BEST IN CLASS**

- ✓ **FIRST INSPECTION ONLY**  
**AFTER 1 FULL SEASON\*\***
- ✓ **FIRST OIL CHANGE ONLY**  
**AFTER 100 HOURS\* OR 1 YEAR\***  
\*100 hours for all units except models equipped with Rotax<sup>®</sup> 1630 ACE<sup>®</sup> engine
- ✓ **NO VALVE CLEARANCE**  
**ADJUSTMENT EVER**

Refer to your owner's manual for all maintenance requirements.



***iBR***<sup>™</sup>  
**INTELLIGENT BRAKE AND REVERSE**  
**SECOND GENERATION**

- Reduces the stopping distance by close to 160 feet sooner<sup>†</sup> for greater peace of mind.
- First and only true brake on a watercraft recognized by the U.S. Coast Guard for improving boating safety since 2009.
- Intuitive system that increases maneuverability and makes docking easier.

**SEA-DOO<sup>®</sup>** 

©2016 Bombardier Recreational Products Inc. (BRP). All rights reserved. "i" and the BRP logo are trademarks of Bombardier Recreational Products Inc. or its affiliates. Based on BRP internal testing.<sup>†</sup> Based on average consumer usage. \*Whichever comes first. Please ride responsibly and safely and wear appropriate protective clothing, including a Coast Guard-approved PFD. Remember that riding and alcohol/drugs don't mix. Printed in Canada. P/N: 219905017

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## The Star Label means Cleaner Marine Engines

This engine has been certified as:



### The Symbol for Cleaner Marine Engines:

Cleaner Air and Water

For a healthier lifestyle and environment.

Better Fuel Economy

Burns up to 30-40 percent less gas and oil than conventional carbureted two-stroke engines, saving money and resources.

Longer Emission Warranty

Protects consumer from worry free operation.



### One Star-Low emission

The one-star label identifies personal watercraft, outboard, sterndrive and inboard engines that meet the Air Resources Board's Personal

Watercraft and Outboard marine engine 2001 exhaust emission standards. Engines meeting these standards have 75% lower emissions than conventional carbureted two-stroke engines. These engines are equivalent to the U.S. EPA's 2006 standards for marine engines.



### Two Stars-Very Low emission

The two-star label identifies personal watercraft, outboard, sterndrive and inboard engines that meet the Air

Resources Board's Personal Watercraft and Outboard marine engine 2004 exhaust emission standards. Engines meeting these standards have 20% lower emissions than One Star – Low-Emission engines.



### Three Stars-Ultra Low emission

The three-star label identifies engines that meet the Air Resources Board's

Personal Watercraft and Outboard marine engine 2008 exhaust emission standards or the Sterndrive and Inboard marine engine 2003 exhaust emission standards. Engines meeting these standards have 65% lower emissions than One Star – Low Emission engines.



### Four Stars-Super Ultra Low emission

The four-star label identifies engines that meet the Air Resources Board's

Sterndrive and Inboard marine engine 2009 exhaust emission standards. Personal Watercraft and Outboard marine engines may also comply with these standards. Engines meeting these standards have 90% lower emissions than One Star – Low Emission engines.

**BOMBARDIER RECREATIONAL PRODUCTS INC.**  
VALCOURT, QUÉBEC, CANADA  
Cleaner Watercraft® - Get the facts 1-800-END-SMOG  
www.arb.ca.gov

219902678

219902678

**⚠ WARNING.** Operating, servicing and maintaining a recreational marine vessel can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, service your vessel in a well-ventilated area and wear gloves or wash your hands frequently when servicing this vessel.



For more information go to  
[www.P65warnings.ca.gov/products/marine](http://www.P65warnings.ca.gov/products/marine)

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## Watercraft Safety Labels

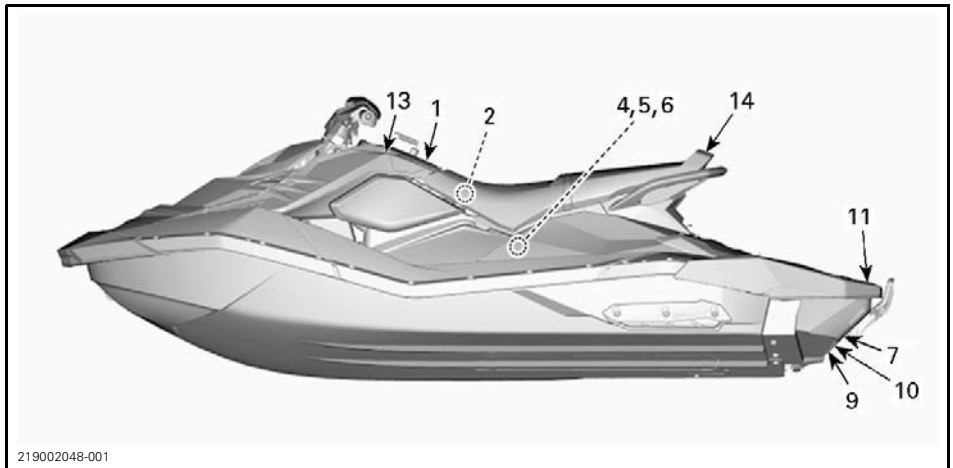
These labels are affixed to the vehicle for the safety of the operator, passenger(s) or bystanders.

The labels illustrated on the following pages are on your watercraft. If missing or damaged, they can be replaced free of charge. See an authorized Sea-Doo dealer.

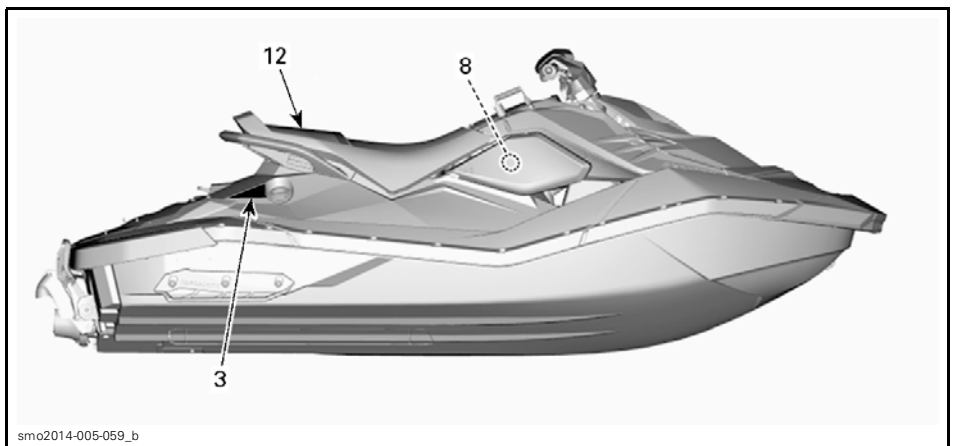
Please read the following labels carefully before operating this watercraft.

**NOTE:** The first illustration of the watercraft indicates the approximate locations of the various labels. A dotted line indicates that the label is not on the outer surface, and that the seat or a cover of some type must be opened to see the label.

**NOTE:** In the event of any discrepancy between this guide and the vehicle, the safety labels on the vehicle have precedence over the labels in this guide.



TYPICAL - 3UP - WITH iBR AND CONVENIENCE PACKAGE SHOWN



TYPICAL

## ⚠ WARNING

### Require Proper Operation of the Boat

Improper operation can result in severe injury or death.

#### Operators Must Be Qualified

**16+**

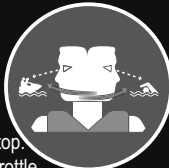
Make sure operator is 16 or older and has taken a boater safety course. Your state (or province) may have additional requirements.

#### Operators Must Avoid Collisions

✓ Scan constantly for people, objects and other watercraft.

✓ Stay far enough away from others so you can always safely coast to a stop.

✗ Do not release throttle when trying to steer away from objects—as with other powerboats, you need **throttle to steer**.



#### Read Operator's Guide

Watch safety video. (<https://www.sea-doo.com/owners/safety/safety-video.html>)

Patents : [www.brp.com/en/about-brp/patents.html](http://www.brp.com/en/about-brp/patents.html)

#### Protect All Riders

✓ **Wear shorts with neoprene (wet suit material) and an approved PFD (personal flotation device)** - see Rider Safety section of this label. Tell riders to read the Rider Safety section and make sure they are dressed appropriately.

✗ Do not apply throttle when anyone is boarding or at rear of PWC.

✓ Be sure riders are properly seated and holding on.

✓ Avoid aggressive operation, sharp turns, and unexpected acceleration that can cause riders to be thrown off.

✗ Do not jump waves or wakes – jumping can cause injuries such as back or spinal injuries (paralysis).

#### Do Not Permit Reckless Operation:

✗ Do not go near others to spray or splash them with water, go too close to other boats, or go too fast for traffic conditions.

✗ Never ride after consuming alcohol or drugs.



## RIDER SAFETY

### Falls Can Result in Severe Injury or Death

✓ **You must wear shorts with neoprene (wet suit material)** to keep water from being forcefully injected into rectum or vagina during a fall backward. Riders not wearing neoprene shorts have received severe rectal, vaginal, and internal injuries resulting in permanent damage.

✓ You must wear an approved PFD (personal flotation device).

✓ **Be sure you are properly seated and holding on.** Riders can be thrown off PWC during unexpected acceleration or aggressive operation.

✗ Never ride after consuming alcohol or drugs.



### Do not ride if you are not dressed appropriately.



Wear PFD

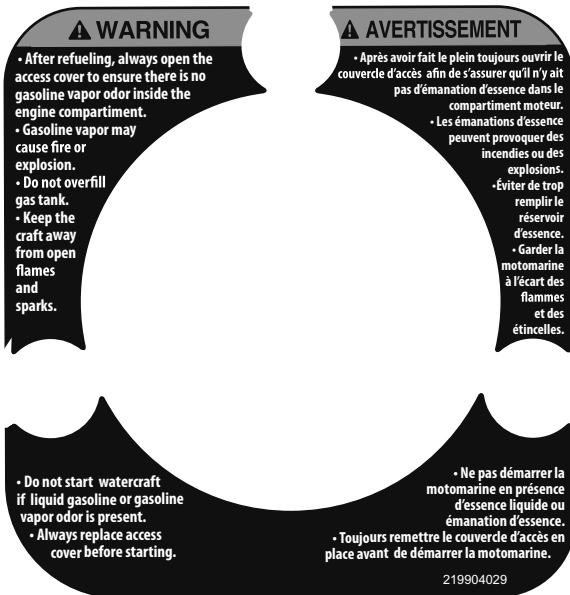
Wear Neoprene

See Operator's Guide



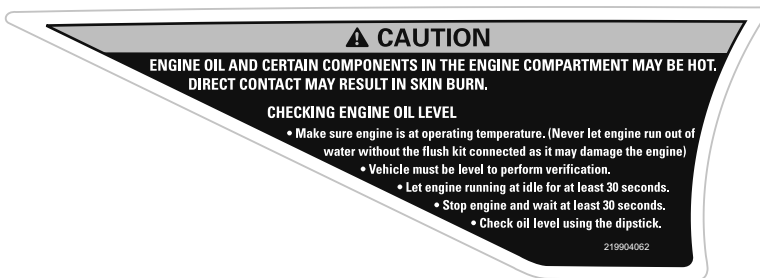
EN-219905553-DEC

LABEL 1



A219904029D

**LABEL 2**

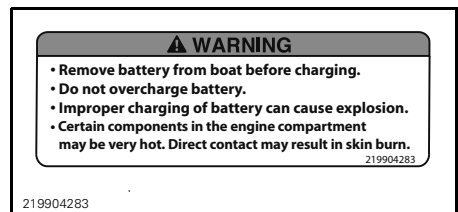


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**LABEL 3**



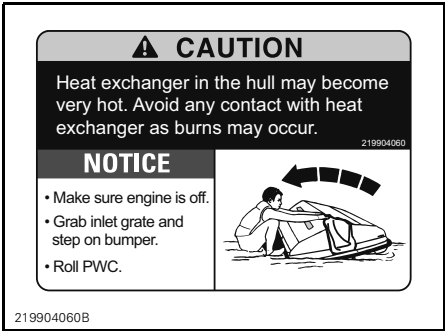
**LABEL 4**



**LABEL 5**



LABEL 6



LABEL 7



LABEL 8



LABEL 9 - MODELS WITH iBR



LABEL 10 - MODELS WITH iBR

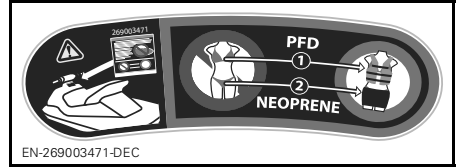


LABEL 11





**LABEL 12 - STAMPED ON REAR OF SEAT OF 2UP MODELS**

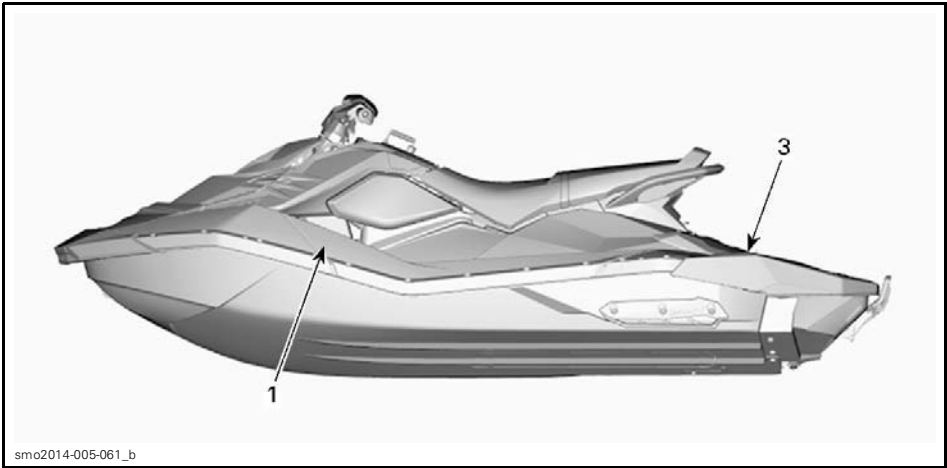


**LABEL 14**

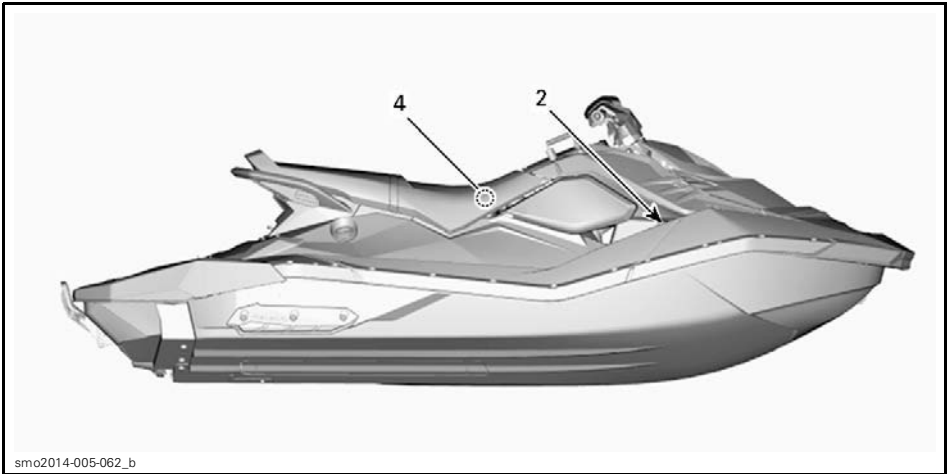


**LABEL 13 - LOCATED ON CONSOLE - MODELS WITH iBR**

Compliance Labels



TYPICAL



TYPICAL



**LABEL 1 - TYPICAL EMISSION CONTROL LABEL**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>CANADIAN COMPLIANCE NOTICE</b><br><b>AVIS DE CONFORMITÉ CANADIEN</b>                                                                                                                                                                                                                                                                                                                                                                              |                                    |
| <b>MAXIMUM RECOMMENDED SAFE LIMITS</b><br><b>LIMITES MAXIMALES DE SÉCURITÉ RECOMMANDÉES</b>                                                                                                                                                                                                                                                                                                                                                          |                                    |
| <b>Max.</b> = <b>2</b>                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>160 kg</b><br><b>352 lbs/lb</b> |
| <b>Max.</b> +  =                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>160 kg</b><br><b>352 lbs/lb</b> |
| <b>CATEGORY / CATÉGORIE: C</b><br>MAXIMUM WAVE / VAGUE MAXIMALE <b>2.0 m</b><br>MAXIMUM WIND SPEED /<br>VITESSE DE VENT MAXIMALE <b>33.0 knots/noeuds</b>                                                                                                                                                                                                                                                                                            |                                    |
| <b>BOMBARDIER RECREATIONAL PRODUCTS INC.</b><br><b>VALCOURT, QUÉBEC, CANADA (YDV)</b>                                                                                                                                                                                                                                                                                                                                                                |                                    |
| <b>MODEL / MODÈLE: XXXXXXXX</b>                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    |
| THE MANUFACTURER DECLARES THAT THIS PRODUCT COMPLIES WITH THE CONSTRUCTION REQUIREMENTS OF THE SMALL VESSEL REGULATIONS, AS THEY READ ON THE DAY ON WHICH THE CONSTRUCTION OF THE VESSEL WAS STARTED OR ON THE DAY ON WHICH THE VESSEL WAS IMPORTED.<br>LE FABRICANT ATTESTE QUE CE PRODUIT EST CONFORME AUX EXIGENCES DE CONSTRUCTION DU RÉGLEMENT SUR LES PETITS BÂTIMENTS EN VIGUEUR À LA DATE DU DÉBUT DE SA CONSTRUCTION OU DE SON IMPORTATION. |                                    |
| <b>MAXIMUM CAPACITIES</b><br>ABOVE INFORMATION ALSO APPLIES IN THE U.S.A.                                                                                                                                                                                                                                                                                                                                                                            | CAN ICES-2<br>/ NMB-2*             |

**LABEL 2 - 2UP MODELS - TYPICAL CANADIAN COMPLIANCE NOTICE (CAN MODELS ONLY)**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <b>CANADIAN COMPLIANCE NOTICE</b><br><b>AVIS DE CONFORMITÉ CANADIEN</b>                                                                                                                                                                                                                                                                                                                                                                                |                        |
| <b>MAXIMUM RECOMMENDED SAFE LIMITS</b><br><b>LIMITES MAX. DE SÉCURITÉ RECOMMANDÉES</b>                                                                                                                                                                                                                                                                                                                                                                 |                        |
| <b>Max.</b> =                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>kg</b><br><b>lb</b> |
| <b>Max.</b> +  =                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>kg</b><br><b>lb</b> |
| <b>CATEGORY / CATÉGORIE: C</b><br>MAXIMUM WAVE / VAGUE MAXIMALE <b>2.0 m</b><br>MAXIMUM WIND SPEED /<br>VITESSE DE VENT MAXIMALE <b>33.0 knots/noeuds</b>                                                                                                                                                                                                                                                                                              |                        |
| <b>BOMBARDIER RECREATIONAL PRODUCTS INC.</b><br><b>570 Montagne, Valcourt, Qc, CA, JOE 2LO</b><br><b>Skaldenstraat 125, Gent, 9042, BE (YDV)</b>                                                                                                                                                                                                                                                                                                       |                        |
| <b>MODEL / MODÈLE:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| THE MANUFACTURER DECLARES THAT THIS PRODUCT COMPLIES WITH THE CONSTRUCTION REQUIREMENTS OF THE SMALL VESSEL REGULATIONS, AS THEY READ ON THE DAY ON WHICH THE CONSTRUCTION OF THE VESSEL WAS STARTED OR ON THE DAY ON WHICH THE VESSEL WAS IMPORTED. /<br>LE FABRICANT ATTESTE QUE CE PRODUIT EST CONFORME AUX EXIGENCES DE CONSTRUCTION DU RÉGLEMENT SUR LES PETITS BÂTIMENTS EN VIGUEUR À LA DATE DU DÉBUT DE SA CONSTRUCTION OU DE SON IMPORTATION. |                        |
| <b>MAXIMUM CAPACITIES</b><br>ABOVE INFORMATION ALSO APPLIES IN THE U.S.A.                                                                                                                                                                                                                                                                                                                                                                              |                        |

**LABEL 2 - 2UP MODELS - TYPICAL (WATERCRAFT OUTSIDE NORTH AMERICA)**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>CANADIAN COMPLIANCE NOTICE</b><br><b>AVIS DE CONFORMITÉ CANADIEN</b>                                                                                                                                                                                                                                                                                                                                                                              |                                    |
| <b>MAXIMUM RECOMMENDED SAFE LIMITS</b><br><b>LIMITES MAXIMALES DE SÉCURITÉ RECOMMANDÉES</b>                                                                                                                                                                                                                                                                                                                                                          |                                    |
| <b>Max.</b>  = <b>3</b>                                                                                                                                                                                                                                                                                                                                             | <b>205 kg</b><br><b>450 lbs/lb</b> |
| <b>Max.</b>  +  =                                                                                                                                                                                                                                                                  | <b>205 kg</b><br><b>450 lbs/lb</b> |
| <b>CATEGORY / CATÉGORIE: C</b><br><b>MAXIMUM WAVE / VAGUE MAXIMALE 2.0 m</b><br><b>MAXIMUM WIND SPEED / VITESSE DE VENT MAXIMALE 33.0 knots/noeuds</b>                                                                                                                                                                                                                                                                                               |                                    |
| <b>BOMBARDIER RECREATIONAL PRODUCTS INC.</b><br><b>VALCOURT, QUÉBEC, CANADA (YDV)</b><br><b>MODEL / MODÈLE: XXXXXXXXX</b>                                                                                                                                                                                                                                           |                                    |
| THE MANUFACTURER DECLARES THAT THIS PRODUCT COMPLIES WITH THE CONSTRUCTION REQUIREMENTS OF THE SMALL VESSEL REGULATIONS, AS THEY READ ON THE DAY ON WHICH THE CONSTRUCTION OF THE VESSEL WAS STARTED OR ON THE DAY ON WHICH THE VESSEL WAS IMPORTED.<br>LE FABRICANT ATTESTE QUE CE PRODUIT EST CONFORME AUX EXIGENCES DE CONSTRUCTION DU RÈGLEMENT SUR LES PETITS BÂTIMENTS EN VIGUEUR À LA DATE DU DÉBUT DE SA CONSTRUCTION OU DE SON IMPORTATION. |                                    |
| <b>MAXIMUM CAPACITIES</b><br>ABOVE INFORMATION ALSO APPLIES IN THE U.S.A.                                                                                                                                                                                                                                                                                                                                                                            | CAN ICES-2<br>/ NMB-2*             |

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**LABEL 2 - 3UP MODELS - TYPICAL**  
**CANADIAN COMPLIANCE NOTICE (CAN MODELS ONLY)**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| THIS BOAT IS MANUFACTURED BY BOMBARDIER RECREATIONAL PRODUCTS INC. PER 46 U.S.C. 4305 AND U.S. COAST GUARD GRANT OF EXEMPTION (CGB 88-001) THE COAST GUARD EXEMPTS THIS VESSEL FROM ONE OR MORE SAFETY REGULATIONS. CGB 88-001 STATES THAT CERTAIN REGULATIONS ARE INAPPLICABLE IN LIGHT OF THIS VESSEL'S CHARACTERISTICS AND THAT THE EXEMPTION WILL NOT HAVE AN ADVERSE EFFECT ON RECREATIONAL BOATING SAFETY. THIS BOAT COMPLIES WITH U.S. COAST GUARD SAFETY STANDARDS IN EFFECT ON THE DATE OF CERTIFICATION. ALL PERSONS SHOULD WEAR A LIFEJACKET (PERSONAL FLOTATION DEVICE) WHILE OPERATING OR RIDING ON THIS WATERCRAFT. | <br>219905499 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|

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**LABEL 3 - TYPICAL**

|                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                         |                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>EMISSION CONTROL SYSTEM INFORMATION</b><br>BOMBARDIER RECREATIONAL PRODUCTS INC.<br>THIS ENGINE CONFORMS TO U.S. EPA & CALIFORNIA EMISSIONS REGULATIONS FOR MARINE SI ENGINES.<br>RENSEIGNEMENT SUR LE DISPOSITIF ANTIPOLLUTION DE L'ÉPA<br>DES É-U. POUR LES MOTEURS MARINS À ALLUMAGE COMMANDE.                                                                  |                                                                                                                                                         | <br><b>EC</b><br>121 |
| (EPA)<br>(FEL)<br>(CA)<br>(FEL)                                                                                                                                                                                                                                                                                                                                       | ENGINE FAMILY / FAMILLE DE MOTEUR<br>CERTIFICATION STANDARDS<br>NORMES DE CERTIFICATION<br>EMISSION CONTROL SYSTEM<br>SYSTÈME DE CONTRÔLE DES ÉMISSIONS |                                                                                                       |
| MEETS CALIFORNIA EVAP EMISSIONS REGULATIONS FOR SPARK IGNITION MARINE WATERCRAFT. EVAP FAMILY.<br>EVAPORATIVE EMISSION CONTROL SYSTEM: SO<br>SEE OPERATOR'S GUIDE FOR MAINTENANCE SCHEDULE AND FUEL, OIL AND SPARK PLUG SPECIFICATIONS. VOIR LE CALENDRIER D'ENTRETIEN ET LES SPECIFICATIONS D'ESSENCE, D'HUILE ET DE BOUGIE D'ALLUMAGE DANS LE GUIDE DE L'OPÉRATEUR. |                                                                                                                                                         |                                                                                                       |

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**LABEL 4 - APPLICABLE FOR ALL MODELS**  
**IN CANADA AND UNITED STATES.**  
**APPLICABLE FOR MODELS EVERYWHERE**  
**EXCEPT CANADA AND UNITED STATES**  
**WHEN EQUIVALENT TO A MODEL**  
**CERTIFIED TO US. EPA STANDARDS**

|                                                                                   |
|-----------------------------------------------------------------------------------|
|  |
| 704907278-DEC<br><b>LOCATED NEAR GAS CAP</b>                                      |

# PRE-RIDE INSPECTION

We encourage you to have an Annual Safety Inspection of your vehicle. Please contact an authorized BRP dealer for further details. Though not required, it is recommended that an authorized BRP dealer performs the preseason preparation of your vehicle. Each visit to your authorized BRP dealer is a great opportunity for your dealer to verify if your vehicle is included in any safety campaign. We also urge you to visit your authorized BRP dealer in a timely manner if you become aware of any safety related campaigns.

 **WARNING**

Perform a pre-ride inspection before each ride to detect potential problems during operation. The pre-ride inspection can help you monitor wear and deterioration before they become a problem. Correct any problems that you discover to reduce the risk of a breakdown or crash.

Before performing the pre-ride inspection, read and understand the *CONTROLS* section.

## What to Do Before Launching the Watercraft

 **WARNING**

Engine should be off and the tether cord cap should always be removed from the engine cut-off switch prior to verifying any of the following points. Only start watercraft once all items have been checked and operate properly.

Check the items listed in the following table before launching the watercraft.

| ITEM                     | OPERATION                                                   | ✓ |
|--------------------------|-------------------------------------------------------------|---|
| Hull                     | Inspect hull, ride plate and water inlet grate for damages. |   |
| Jet pump water intake    | Inspect/clean.                                              |   |
| Drain plug               | Tighten.                                                    |   |
| Fuel tank                | Refill.                                                     |   |
| Engine compartment       | Check for any visible fluid leaks and gasoline vapor odor.  |   |
| Engine oil level         | Check/refill.                                               |   |
| Engine coolant level     | Check/refill.                                               |   |
| Heat exchanger condition | Inspect.                                                    |   |
| Steering system          | Check operation.                                            |   |

| ITEM                                                              | OPERATION                                                                                                                                                                             | ✓ |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| iTC lever                                                         | Check operation. (Depress and release the lever to check for freedom of movement. If any friction is felt, the lever must be taken apart, cleaned, inspected for wear and lubricated) |   |
| iBR lever (models with iBR)                                       | Check operation. (Depress and release the lever to check for freedom of movement. If any friction is felt, the lever must be taken apart, cleaned, inspected for wear and lubricated) |   |
| Storage bin front cover (if equipped), boarding platform and seat | Ensure they are closed and latched.                                                                                                                                                   |   |
| Self-contained removable storage bin (if applicable)              | Ensure it is installed on watercraft and properly closed and latched.                                                                                                                 |   |
| Engine START/STOP button                                          | Check operation.                                                                                                                                                                      |   |
| Engine cut-off switch and the monitoring beeper                   | Check operation.                                                                                                                                                                      |   |
| Battery condition and connections                                 | Check operation.                                                                                                                                                                      |   |
| Sacrificial anode                                                 | Inspect every month (more often in saltwater use) and change if necessary                                                                                                             |   |

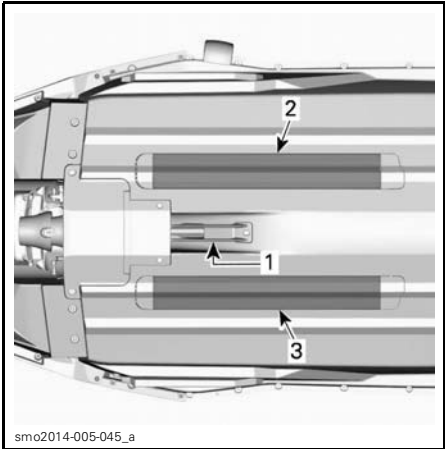
**Hull**

Inspect hull for cracks and other damages.

**Jet Pump Water Intake**

Remove weeds, shells, debris or anything else that could restrict the flow of water and damage the propulsion unit. Clean as necessary. If any obstruction cannot be removed, refer to an authorized Sea-Doo dealer for servicing.

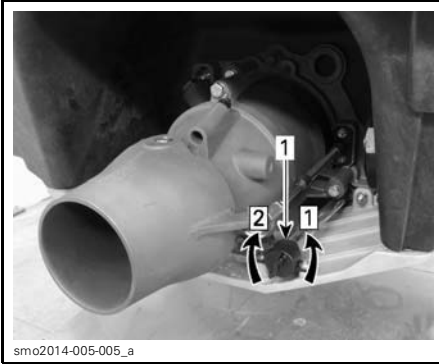
**NOTE:** There is a reinforcement plate on LH side of hull to maintain symmetry so the hydrodynamics of PWC are not affected.



**TYPICAL**  
1. Water intake  
2. Heat exchanger  
3. Reinforcement plate

## Drain Plug

Secure bilge drain plug.



### TYPICAL

1. Bilge drain plug

Step 1: Untighten

Step 2: Tighten

## ⚠ WARNING

Ensure bilge drain plug is properly secured prior to launching the watercraft in water.

## Fuel Tank

Fill the fuel tank.

## ⚠ WARNING

Strictly adhere to instructions detailed in *FUELING PROCEDURE*.

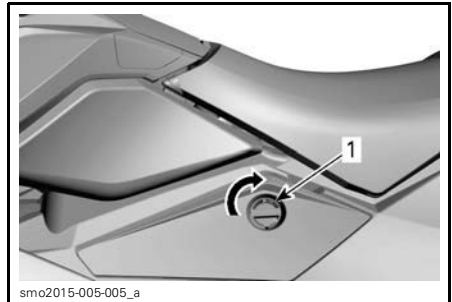
## Engine Compartment

Inspect the engine compartment for fuel vapor odor.

## ⚠ WARNING

Should any leak or gasoline odor be present, do not apply electrical power or start the engine. You should seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the *US EPA EMISSION-RELATED WARRANTY* contained herein for information about warranty claims.

To access the engine compartment, turn the LH access cover knob 1/4 turn clockwise, then pull out to unsnap the rear portion and slide rearward to remove.



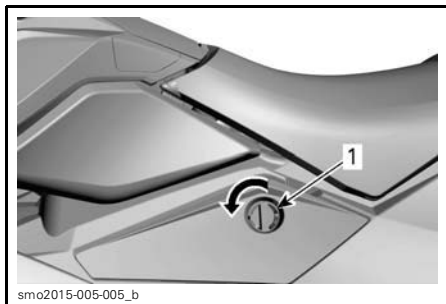
### LH ACCESS COVER

1. To unlock, turn the knob 1/4 turn clockwise



ENGINE COMPARTMENT - LH ACCESS COVER REMOVED

Reinstall the LH access cover in the reverse of the removal procedure and lock the knob by turning it 1/4 turn counterclockwise.



#### LH ACCESS COVER

1. To lock, turn the knob 1/4 turn counterclockwise

### Engine Oil

Ensure oil level is within specification as described in *MAINTENANCE PROCEDURES* section.

### Engine Coolant

Ensure coolant level is within specification as described in *MAINTENANCE PROCEDURES* section.

Check for coolant leaks on engine, in bilge and from heat exchanger.

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

### Steering System

If steering is misaligned, follow alignment instructions in *MAINTENANCE PROCEDURES* section.

Assisted by another person, check steering operation for free movement.

When the handlebar is horizontal, the jet pump nozzle should be in the straight ahead position. Turn the handlebar from left to right and make sure nozzle turns accordingly.

### **WARNING**

Check handlebar and corresponding steering nozzle operation before starting. Never turn handlebar while someone is near the rear of the watercraft. Keep away from steering moving parts (nozzle, iBR gate (models with iBR), linkages etc.).

### Throttle Lever

Check the Electronic Throttle Control lever (ETC) for free and smooth operation. It should return to its initial position immediately after it is released.

### **WARNING**

Check throttle lever operation before starting the engine. If any friction is felt in the throttle lever, refer to an authorized Sea-Doo dealer.

### iBR Lever (Models with iBR)

Check the iBR lever for free and smooth operation. It should return to its initial position immediately after it is released.

### **WARNING**

Check iBR lever operation before starting the engine. If any friction is felt in the iBR lever, refer to an authorized Sea-Doo dealer.

### Storage bin (Convenience Package), Glove Box and Seat

Ensure the storage bin front cover (if equipped), glove box cover, and seat are closed and latched.



**⚠ WARNING**

Ensure the seat, glove box cover, and storage bin front cover (if equipped) are securely latched.

**Engine Cut-Off Switch and Engine START/STOP Button**

Install the tether cord cap on the engine cut-off switch.

Press the engine START/STOP button to start the engine, then stop it by pressing the engine START/STOP button a second time.

**NOTE:** The engine will always start if the tether cord cap is properly install. The ECU will power down after 3 minutes, but if you push the start button, it will wake-up and start.

Restart the engine, then stop it by removing the tether cord from the engine cut-off switch.

**⚠ WARNING**

Should the tether cord cap be loose or fail to remain on the engine cut-off switch, replace the tether cord immediately in order to avoid unsafe use. If removing the tether cord cap from the engine cut-off switch or pressing the engine START/STOP button does not stop the engine, do not use the watercraft. See your authorized Sea-Doo dealer.

**What to Do After Launching the Watercraft**

Check the item listed in the following table after launching the watercraft and before going for a ride.

| ITEM                                                         | OPERATION       | ✓ |
|--------------------------------------------------------------|-----------------|---|
| Multifunction gauge                                          | Check operation |   |
| Intelligent Brake and Reverse System (iBR) (models with iBR) | Check operation |   |
| Variable Trim System (VTS) (as applicable)                   | Check operation |   |

**Multifunction Gauge**

1. Press engine START/STOP button and install the tether cord cap on the engine cut-off switch.
2. As the multifunction gauge cycles through its self-test function, ensure all indications come on.

**⚠ WARNING**

Always attach the tether cord clip to your PFD or to the wrist (wrist strap required).

**iBR System (Models with iBR)**

**NOTICE** Ensure there is sufficient space ahead and behind watercraft to safely carry out the iBR system test to avoid a collision. Watercraft will move during test.

1. Remove the moorings securing the watercraft to the dock.
2. Start the engine and ensure the watercraft does not move.
3. On the left handlebar, depress the iBR lever completely in, the watercraft should move slowly backwards.
4. Release the iBR lever, there should not be any reverse thrust.



## **WARNING**

Always ensure proper iBR system operation before taking the watercraft out for a ride.

### **Variable Trim System (If Applicable)**

With the engine running in forward position, use the VTS system to move the jet pump nozzle up and down alternately to check VTS operation. Confirm the VTS position display movement in the multifunction gauge

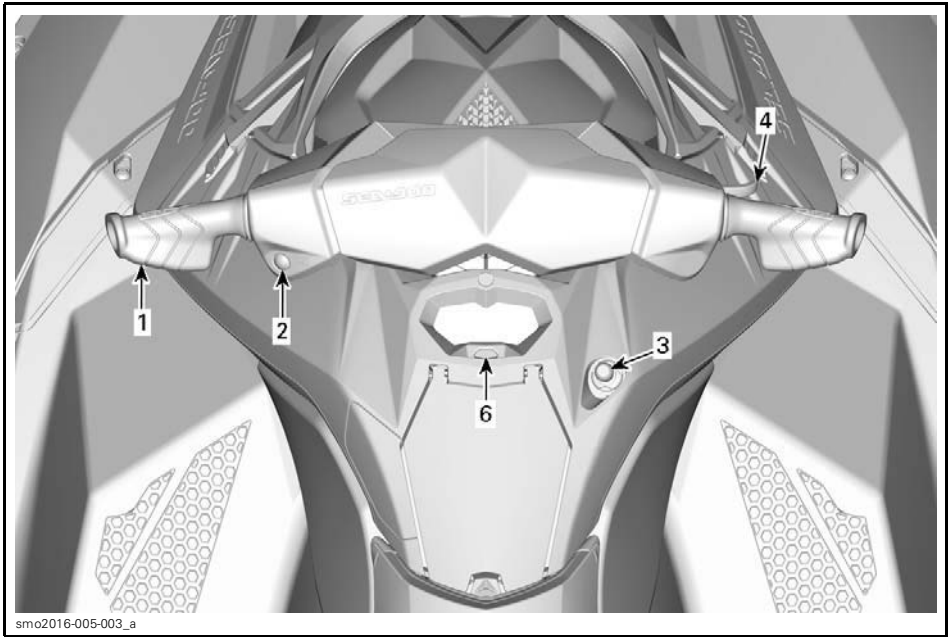
Also test the VTS preset trim positions by double clicking the VTS UP/DOWN button.

Refer to *OPERATING INSTRUCTIONS* for detailed instructions.

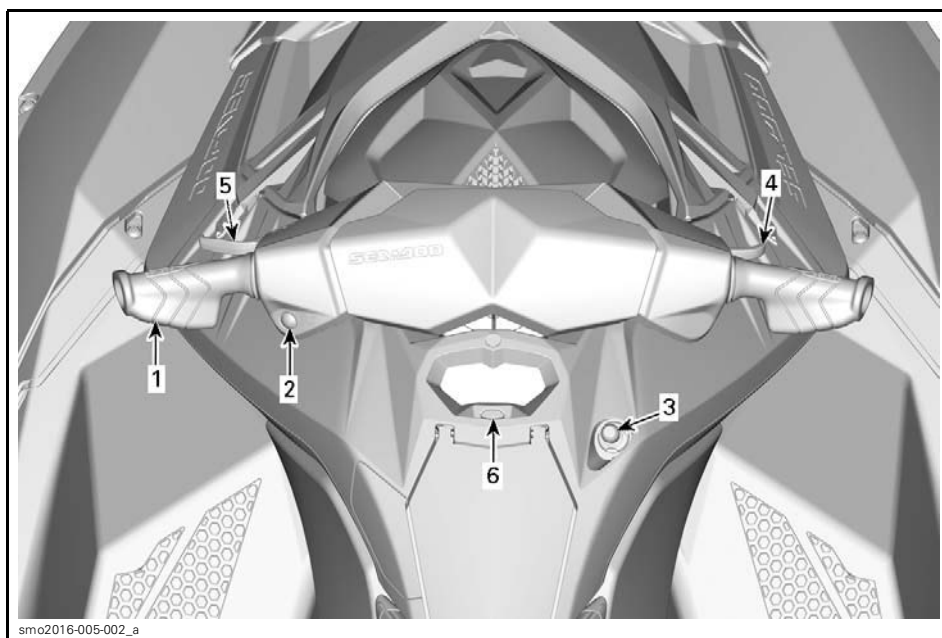
# ***WATERCRAFT INFORMATION***

# CONTROLS

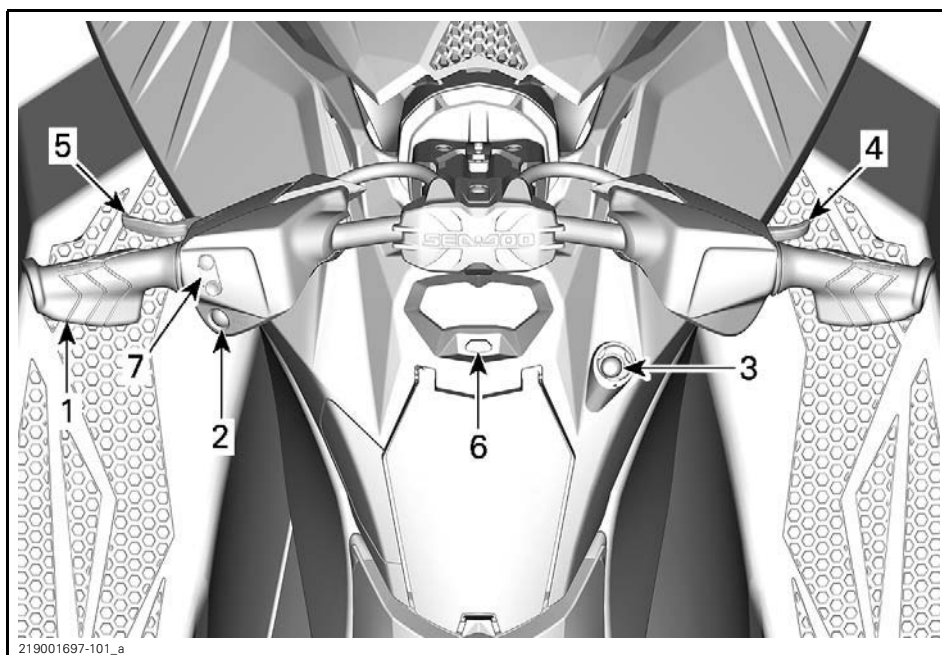
**NOTE:** Some vehicle safety labels are not shown on illustrations. For information on vehicle safety labels, refer to *WATERCRAFT SAFETY LABELS*.



TYPICAL - MODELS WITHOUT iBR



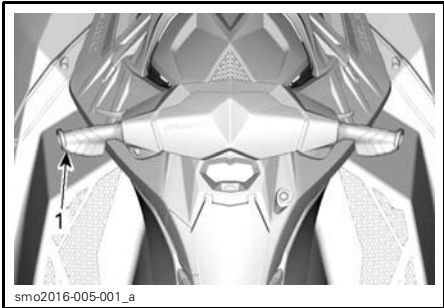
TYPICAL - MODELS WITH iBR



TRIXX MODELS

## 1) Handlebar

The handlebar controls the direction of the watercraft. During forward operation, turning the handlebar to the right steers the watercraft to the right and inversely.



**TYPICAL**  
1. Handlebar

### **⚠ WARNING**

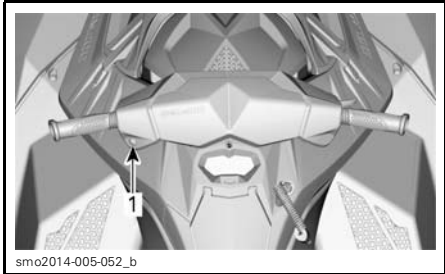
Check handlebar and corresponding steering nozzle operation before starting. Never turn handlebar while someone is near the rear of the watercraft. Keep away from the propulsion system.

### *iBR equipped models*

When operating in reverse, steering direction is reversed. Turning the handlebar to the right while backing up steers the watercraft to the left. Refer to *OPERATING INSTRUCTIONS* for detailed instructions.

## 2) Engine START/STOP Button

The engine START/STOP button is located on the LH handlebar.



**TYPICAL**  
1. Engine START/STOP button

## Engine Starting and Stopping

Refer to *OPERATING INSTRUCTIONS* for detailed instructions.

## Waking Up the Electrical System

Press the engine START/STOP button once without installing the tether cord on the engine cut-off switch.

This will power up the electrical system; the multifunction gauge will cycle through a self-test function and will then go blank after a few seconds.

The electrical system will stay powered up for approximately 3 minutes after the engine START/STOP button was depressed.

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

## 3) Engine Cut-Off Switch

The engine cut-off switch is located on the RH side of the multifunction gauge.



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**TYPICAL**

1. Engine cut-off switch

To allow engine starting, the tether cord cap must be securely snapped onto the engine cut-off switch.

## **WARNING**

Always attach the tether cord clip to the operator's personal flotation device (PFD) or wrist (wrist strap required).



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**TYPICAL**

1. Tether cord cap on the engine cut-off switch
2. Tether cord clip secured to operator's PFD

To stop engine, pull the tether cord cap from the engine cut-off switch.

## **WARNING**

Should the engine be stopped, the brake function (models with iBR) and watercraft directional control is lost.

## **WARNING**

Always disconnect the tether cord when the watercraft is not in operation in order to prevent accidental engine starting or to avoid unauthorized use by others, children, and to prevent theft.

### **Radio Frequency Digitally Encoded Security System (RF D.E.S.S.) (Convenience Package)**

The tether cord cap contains a D.E.S.S. key that is programmed to give it a unique electronic serial number. This is the equivalent of a conventional key.

The D.E.S.S. system reads the key in the tether cord cap that is installed on the engine cut-off switch, and only allows engine starting for keys it recognizes.

The D.E.S.S. system brings great flexibility. You can buy additional tether cords and have the D.E.S.S. keys programmed to your watercraft.

A total of ten D.E.S.S. keys can be programmed to the same watercraft.

To have a key programmed to your watercraft, see your authorized BRP Sea-Doo dealer.

### **RF D.E.S.S. Key Types**

Two 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      |
| Learning | Green       |

The multifunction gauge displays the type of key used (NORMAL KEY or LEARNING KEY).

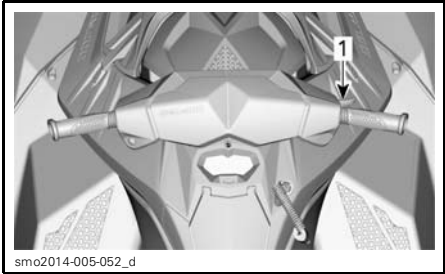
The SEA-DOO learning key, limits the speed of the watercraft and the engine torque, therefore enabling first time users and less experienced operators to learn how to operate the watercraft while gaining the necessary confidence and control.

4) Throttle Lever

The throttle lever on the RH handlebar electronically controls the engine speed.

To increase or maintain watercraft speed, pull on the throttle lever with your finger.

To decrease watercraft speed, release the throttle lever.



TYPICAL  
1. Throttle lever

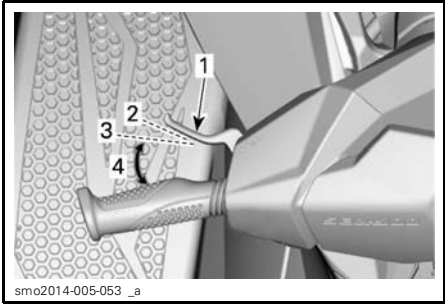
The throttle lever is spring loaded and should return to rest position (idle) when not pressed.

5) iBR Lever (intelligent Brake and Reverse) (Models with iBR)

The iBR lever on the LH handlebar can electronically command:

- Reverse
- Neutral
- Braking.

**NOTE:** A minimum of 25% lever travel is required to activate iBR functions.



TYPICAL - iBR LEVER  
1. iBR lever  
2. Lever rest position  
3. 25% stroke required to activate iBR function  
4. Operating range

At speeds below 7 km/h (5 MPH), pulling the iBR lever in will engage reverse.

At speeds above 7 km/h (5 MPH), pulling the iBR lever in will engage the brake.

When the iBR lever is released after braking or reverse operation, neutral is engaged.

**⚠ WARNING**

If the throttle lever is still pulled in when releasing the iBR lever, forward movement will be initiated after a short delay. If forward acceleration is not desired, release the throttle lever.

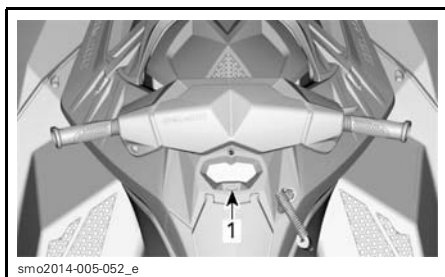
Refer to *OPERATING INSTRUCTIONS* for detailed instructions.

**NOTE:** Braking power is relative to iBR lever position.

6) Mode Button

The MODE button is located directly below the multifunction gauge.



**TYPICAL**

1. *MODE button*

***Rotax 900 ACE - 60***

It is used to scroll through the multi-function displays.

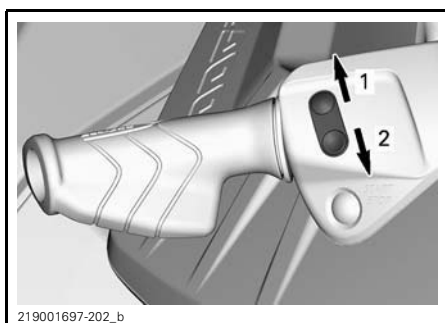
***Rotax 900 ACE - 90***

It is used to activate or deactivate SPORT mode and to scroll through the multifunction displays.

Refer to *MULTIFUNCTION GAUGE* for details.

## **7) Variable Trim System (VTS) Button (Trixx Models)**

The VTS button is located on the LH handlebar.

**VTS CONTROL BUTTON**

1. *Bow up*
2. *Bow down*

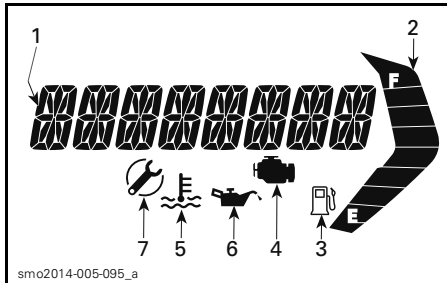
The VTS control button is used to adjust the riding attitude of the watercraft.

Refer to *OPERATING INSTRUCTIONS* for details.

# MULTIFUNCTION GAUGE (LCD)

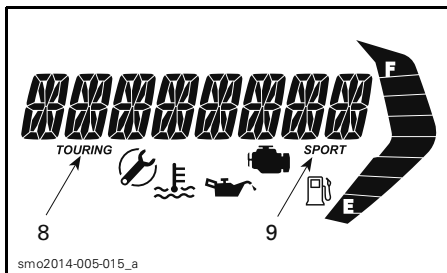
The multifunction gauge (LCD) is located above the glove box.

## Multifunction Gauge Description



1. Multifunction display
2. Fuel level display
3. Low fuel level indicator
4. Check engine indicator
5. Engine temperature indicator
6. Low oil pressure indicator
7. Maintenance reminder indicator

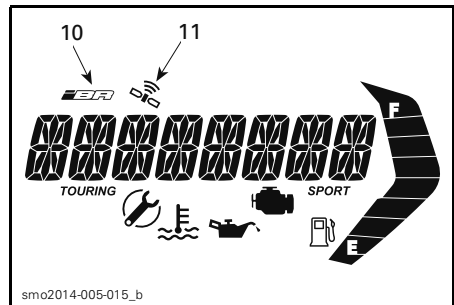
### Rotax 900 ACE - 90



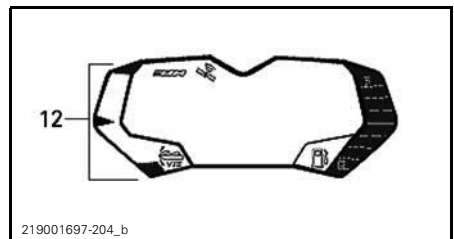
#### TYPICAL

8. Touring mode indicator
9. Sport mode indicator

### Models with iBR



10. iBR fault indicator
11. GPS satellites synch



12. VTS position display

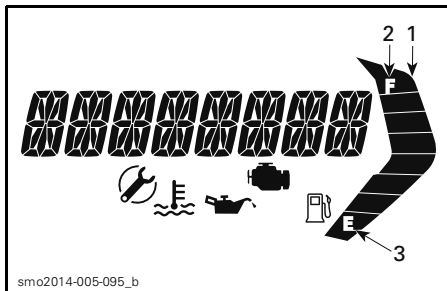
## 1) Multifunction Display

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 fault messages.

## 2) Fuel Level Display

Bar gauge continuously indicates the level of fuel in the fuel tank while riding.



1. Fuel level display
2. Top segment
3. Bottom segment

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

When the fuel tank is almost empty, the two bottom segments flash and the low fuel indicator lamp starts flashing.

### 3) Low Fuel Level Indicator



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

### 4) Check Engine Indicator



When this indicator is ON, it indicates an engine fault, look for a message at the LCD display.

When this indicator blinks, it indicates that the **LIMP HOME** mode is activated.

When the check engine indicator comes on, you may seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the *US EPA EMISSION-RELATED WARRANTY* contained herein for information about warranty claims.

Refer to *TROUBLESHOOTING* section for more details.

### 5) Engine Temperature Indicator



When this indicator is ON, it indicates that engine or exhaust system may be overheating.

### 6) Low Oil Pressure Indicator



When this indicator is ON, it indicates low oil pressure, look for a message at the LCD display.

### 7) Maintenance Reminder Indicator



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

When the maintenance reminder indicator comes on, you may seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the *US EPA EMISSION-RELATED WARRANTY* contained herein for information about warranty claims.

### 8) Touring Mode Indicator (Rotax 900 ACE - 90)

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

**NOTE:** TOURING mode indicator will turn off once SPORT mode is activated and will come on again when SPORT mode is deactivated.

## 9) Sport Mode Indicator (Rotax 900 ACE - 90)

The SPORT mode indicator is normally off.

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

## 10) iBR Fault Indicator (Models with iBR)



The iBR fault indicator comes ON when a fault in the iBR system has been detected.

Refer to *TROUBLESHOOTING* for details.

## 11) GPS Active Indicator (If equipped)



A GPS incorporated in the multifunction gauge provides the speed in the multifunction display.

This is confirmed when the GPS active indicator is visible in the digital screen.

## 12) VTS Indicator (Models with VTS)



The VTS indicator comes ON while operating the VTS.

The LH bar gauge is also turned on to indicate the relative position of the watercraft bow.

## Navigating the Multifunction Display

### WARNING

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

### Selecting Functions

When the electrical system is powered up and the cluster has completed its self test function, a WELCOME ABOARD SEA-DOO scrolling message will appear for a few seconds. After the welcome message, the multifunction display will display the last selected option.

**NOTE:** You can skip the welcome message by pressing the MODE button.

The multifunction display is also used to display a menu for the selection of various functions which permit changing the numerical display indication, system modes of operation (Rotax 900 ACE - 90), and active system fault messages.

**NOTE:** To change the unit of measurement or the language displayed, see your authorized Sea-Doo dealer.

1. To select the various options available through the multifunction display, press quickly the MODE button repeatedly until the desired display options is visible:
  - SPEED
  - RPM
  - HOUR

### Display Option Description

#### Speed

The SPEED can be displayed in km/h or MPH depending on the unit of measurement setting.

### ***Models with iBR***

The speed indication is based on a GPS (Global Positioning System) incorporated within the multifunction gauge.

If for some reason the GPS signal is lost, a default mode is used whereby, the speed is calculated using information received from other systems to provide an estimated watercraft speed.

### **RPM**

The RPM is displayed as a numerical value.

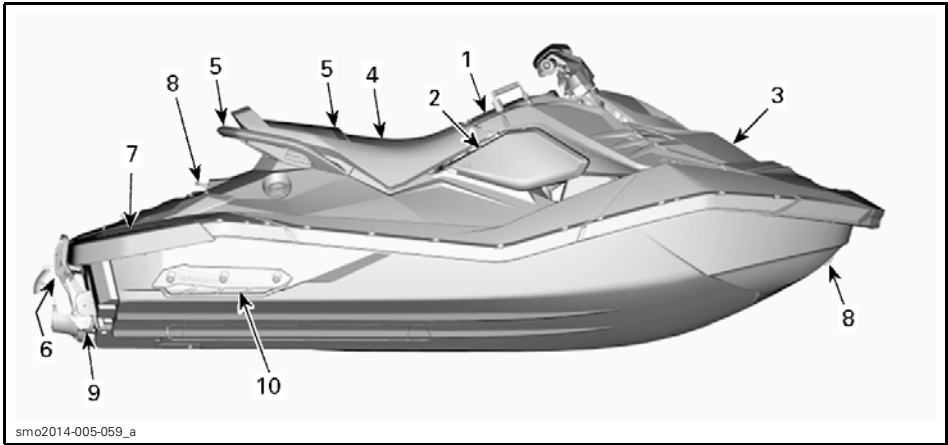
### **Hour**

The HOUR is used to display the accumulated engine hours.

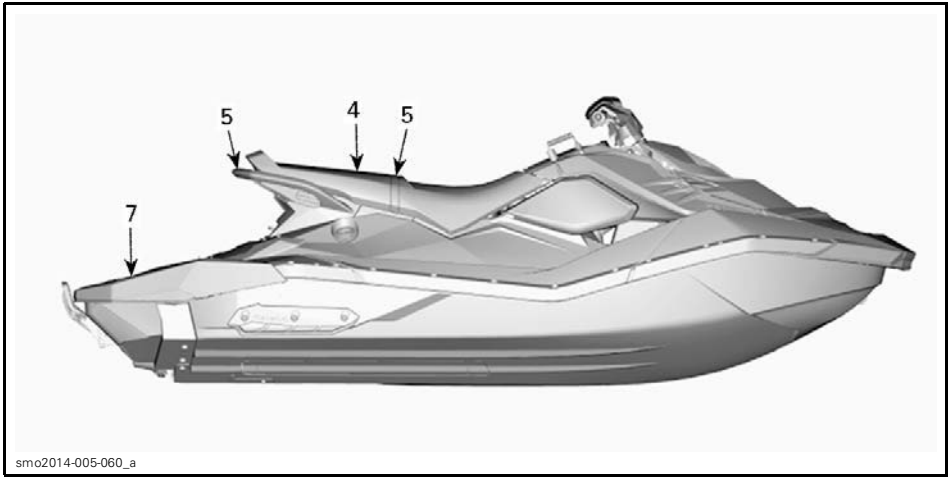
# EQUIPMENT

**NOTE:** Illustrations may not be accurate for every model and are only provided as a visual guide.

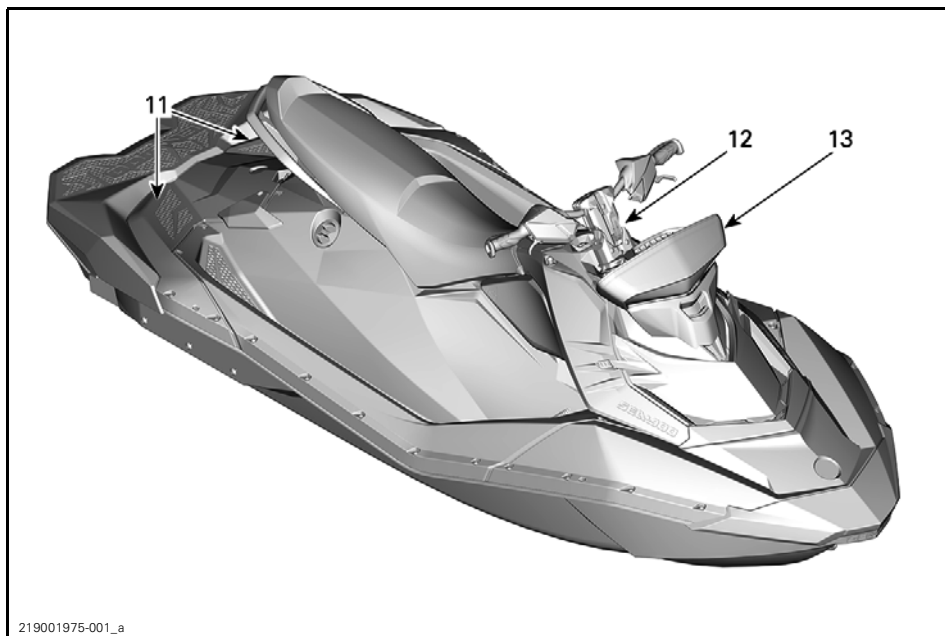
**NOTE:** Some vehicle safety labels are not shown on illustrations. For information on vehicle safety labels, refer to *WATERCRAFT SAFETY LABELS*.



TYPICAL - 2UP MODELS



TYPICAL - 3UP MODELS



219001975-001\_a

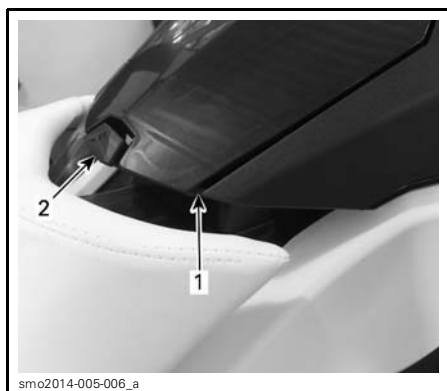
TYPICAL - TRIXX MODELS AND AUDIO SYSTEM

## 1) Glove Box

A small storage compartment for personal articles, and the *SAFETY DVD*, located at front of seat.

**NOTE:** Glove box is not watertight.

Push tab forward to open glove box.



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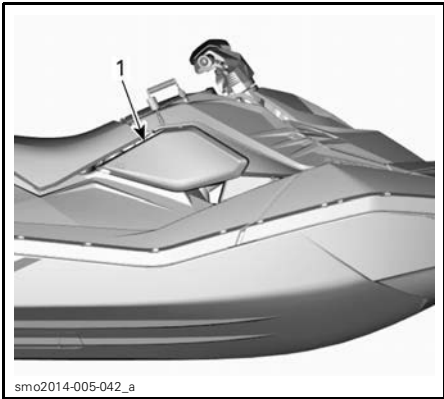
1. Glove box
2. Tab

## 2) Safety Equipment Kit Storage Compartment

A small area to store safety equipment kit or emergency kit only (not supplied with vehicle).

**NOTICE** This area is not intended for general storage. Do not store any other items in this area. Storing other items in this area can damage the vehicle.

To open this storage compartment, manually release and remove the RH side panel.



1. RH side panel

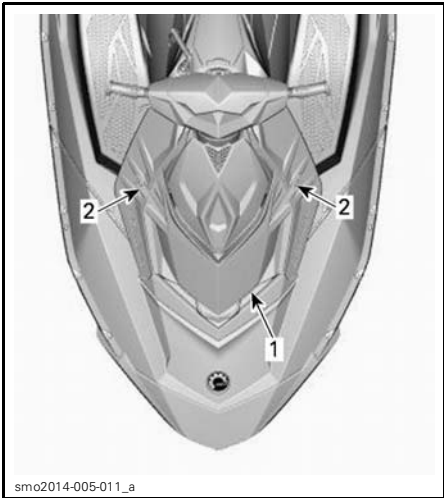


TYPICAL - RH SIDE PANEL REMOVED

### 3) Storage Bin (Convenience Package)

A convenient area to carry personal articles.

To open the storage bin front cover, release the lid hooks on each side. Always close and latch cover when riding.



TYPICAL  
1. Front cover  
2. Lid hooks

### ⚠ WARNING

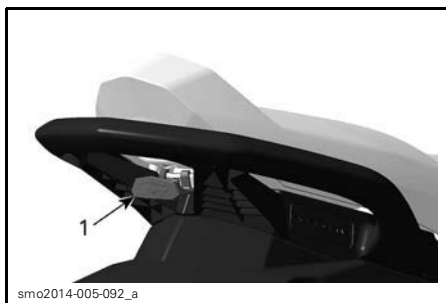
Never carry any loose, heavy, sharp, or breakable objects in the storage bin. Do not exceed maximum load capacity; 2.5 kg (5 lb). Never operate the watercraft with the storage bin front cover open. This is not a watertight compartment.

### 4) Seat

The seat latch is located under the back end of the seat.

To remove the seat, push up on the latch handle. Release the latch handle and slide the seat backward.

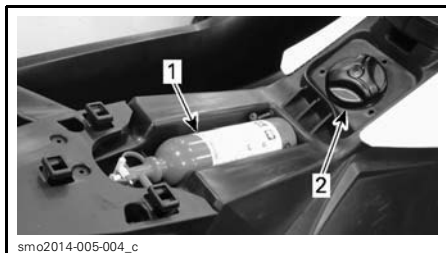




TYPICAL - SEAT LATCH

1. Seat latch handle

Removing the seat provides access to the rear storage compartment (3UP models only), operator's guide, the fire extinguisher (not supplied with vehicle) and the fuel cap.



TYPICAL - SEAT REMOVED

1. Fire extinguisher
2. Fuel cap



TYPICAL - FLIP SIDE OF REMOVED SEAT

1. Operator's guide

To install the seat, position the seat in place and push the seat forward until the latch clicks.

Pull up on the rear portion of the seat to ensure it is properly latched.

## 5) Passenger Handholds

The seat strap provides a handhold for a passenger to hold on to when riding.

The sides of the molded grab handle at the rear of the seat also provide a handhold for a passenger.

**NOTICE** Never use the molded grab handle to tow anything or to lift the watercraft.



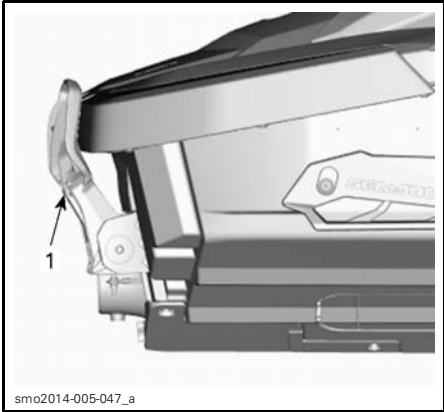
TYPICAL - PASSENGER HANDHOLDS

1. Seat strap
2. Molded grab handle

The rear portion of the molded grab handle also provides a handhold for the skier/wakeboarder spotter (3up models) or for boarding the watercraft from the water.

## 6) Boarding Step (Convenience Package)

A convenient step used for boarding the watercraft from the water.



**TYPICAL**  
1. Boarding step

**⚠ WARNING**

The engine must be shut off before attempting to board the watercraft using the boarding step.

Pull down the step with your hand and hold until a knee is put on the step.



**BOARDING STEP HELD DOWN FOR BOARDING FROM WATER**

**NOTICE**

- Never use the step for boarding a watercraft that is out of water.
- Never use the step for pulling, towing, diving or jumping, or any other purpose other than as a boarding step.
- Only one person at a time on the step.
- Only board the step with a knee, not a foot.

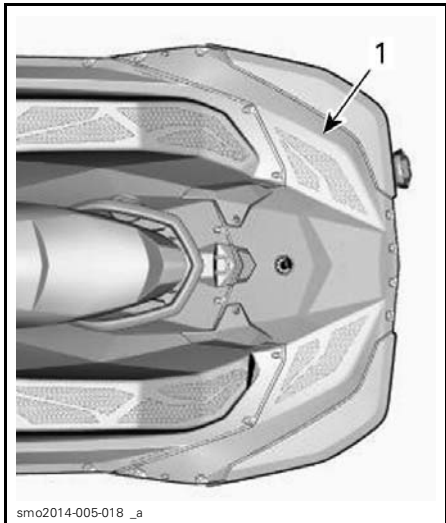
*Models with iBR*

**⚠ WARNING**

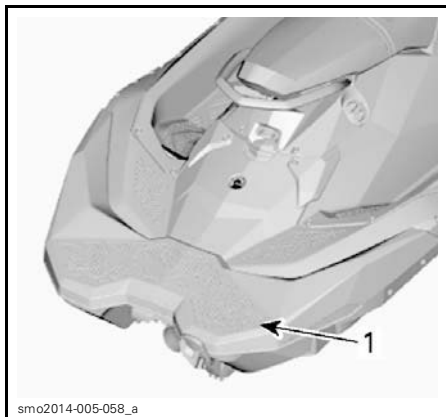
Be aware of the iBR gate movement when starting the engine, shutting down the engine or using the iBR lever. Automatic movement of the gate may squeeze fingers or toes of people taking a hold on the back or your PWC.

**7) Boarding Platform**

The rear deck area serves as the boarding platform.



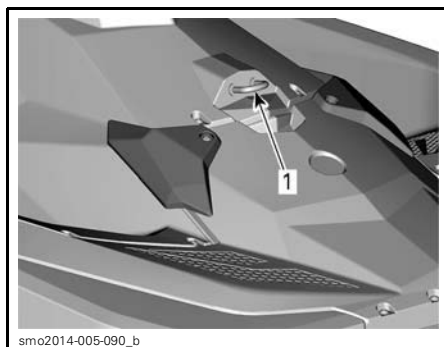
**TYPICAL - 2UP MODELS**  
1. Boarding platform



TYPICAL - 3UP MODELS

1. Boarding platform

## Rear Eyelet



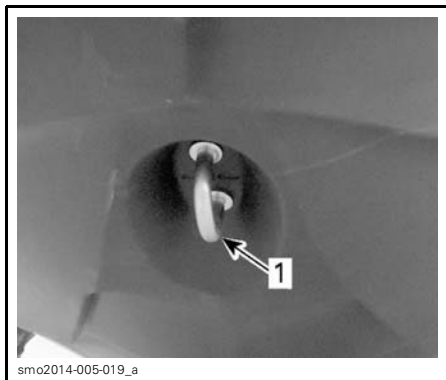
TYPICAL

1. Rear eyelet

## 8) Front and Rear Eyelet

Eyelets can be used for mooring, towing a water skier (3UP models), wakeboarder or tuber (3UP models), and as tie-down points when trailering your watercraft.

### Front Eyelet

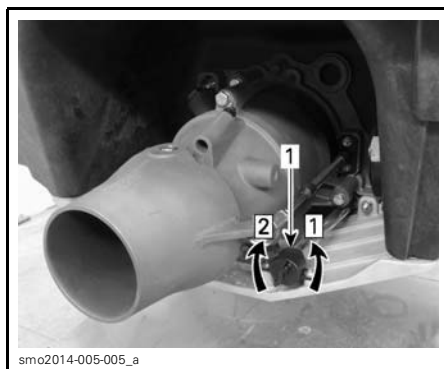


TYPICAL

1. Front eyelet

## 9) Bilge Drain Plug

Unscrew drain plug whenever watercraft is on the trailer. This will allow water accumulated in the bilge to be evacuated and helps to reduce condensation.



TYPICAL

1. Drain plug

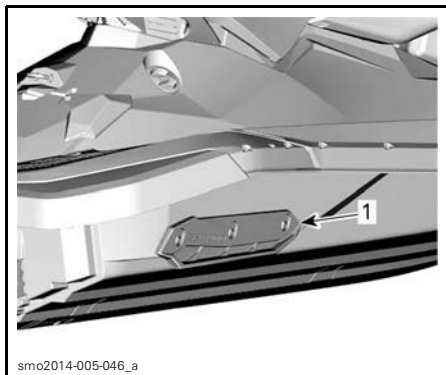
Step 1: Untighten

Step 2: Tighten

**NOTICE** Ensure drain plug is properly secured prior to launching the watercraft in water.

## 10) Sponsons

Two fixed sponsons, one on each side at the rear of the hull, assist in watercraft stability. The sponsons are not adjustable.



1. Sponson

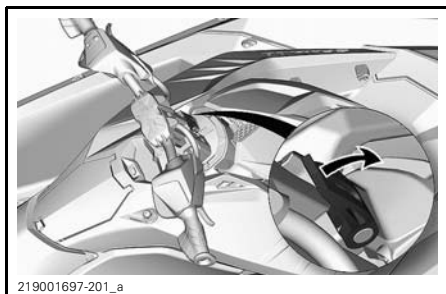
## 11) Rear Footrests (Trixx Models)

Angled footrests used to enhance control when purposely raising the bow.

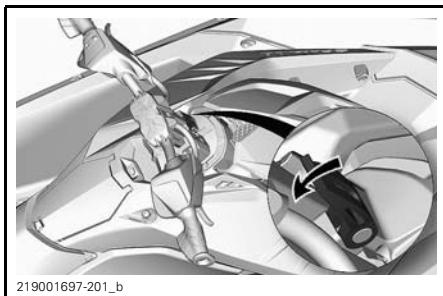
## 12) Adjustable Handlebar Riser (Trixx Models)

The handlebar height can be set to suit the operator's preference.

1. Unlock the mechanism using the lever.



2. Adjust the handlebar to the desired height.
3. Lock the mechanism using the lever.



## 13) Audio System (If equipped)

Some models are equipped with a portable audio system.

The BRP audio system is composed of two waterproof speakers, two tweeters, one passive radiator, a keypad, a charging port and a vent port. The system connects via bluetooth to a smartphone.

When the Play/Pause/Power button is pressed, the system will be powered.

**Bluetooth Pairing Mode** - When the unit is powered On, the system will automatically try to pair with the last connected device or will go in pairing mode if no paired devices are detected. When the system is in pairing mode, all the button lights will blink. To manually enter the pairing mode, hold down the **Play/Pause/Power** button for 1 second. The buttons will start blinking to indicate it's in pairing mode. Search for **BRP Sound System** from your device's Bluetooth menu. 3 beeps will indicate successful pairing.

When paired, select a playlist or other source of music from your smartphone.

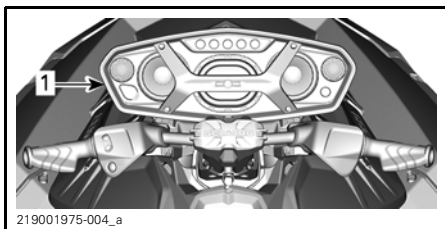
**NFC Pairing Mode** - To pair using the NFC, place your smartphone near the NFC logo on top of the unit.

Never pair a smartphone or change the playlist or music source on the device while driving or operating the vehicle.

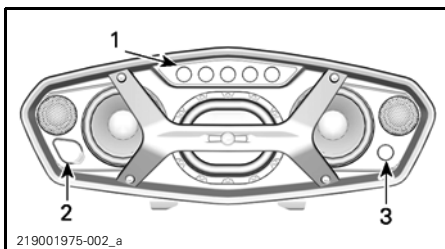
**NOTE:** On applicable devices.

## WARNING

Using a smartphone or trying to pair a device while driving can distract the driver from operating the watercraft. Always use buttons with caution and always stay alert on the water, keeping eye contact with your environment at all times.



1. Audio system



1. Key pad
2. Charging port
3. Vent port



1. Play/Pause/Power
2. Volume UP
3. Volume DOWN
4. Previous track
5. Next track

**Play/Pause/Power** - The Play/Pause/Power button gives you the ability to play or to pause the current track with a single press. Pressing the Play/Pause/Power button will turn the unit On if currently Off or

holding the Play/Pause/Power button for 3 seconds will turn the unit Off if currently On. The unit will emit 4 small beeps to indicate when power is turned Off.

**Volume Up and Volume Down** - These buttons will turn up or turn down the output of the volume. When the unit has reached the minimum or maximum output level, the unit will beep to indicate that no further adjustment is possible.

### AUDIO CONTROLS

| State                 | Audio feedback | Visual feedback                  |
|-----------------------|----------------|----------------------------------|
| Power ON              | Fade in        | White                            |
| Power OFF             | Fade out       | -                                |
| Pairing Mode          | -              | All buttons flashing white       |
| Pairing Mode success  | 3 beeps        | -                                |
| Max volume            | 1 long beep    | -                                |
| Min volume            | 1 long beep    | -                                |
| Paused                | -              | Play/Power button flashing white |
| Low battery           | -              | Play/Power button steady red     |
| Charging              | -              | Play/Power button steady blue    |
| Battery fully charged | -              | Play/Power button steady white   |

| AUDIO CONTROLS              |                |                                        |
|-----------------------------|----------------|----------------------------------------|
| State                       | Audio feedback | Visual feedback                        |
| Battery too low to power ON | -              | Play/Power button flashing red 3 times |
| Battery level               | -              | 0 to 20% : 1 button steady white       |
|                             |                | 21 to 40% : 2 buttons steady white     |
|                             |                | 41 to 60% : 3 buttons steady white     |
|                             |                | 61 to 80% : 4 buttons steady white     |
|                             |                | 81 to 100% : 5 buttons steady white    |

**NOTE:** Power, Play/pause button flashing rapidly (red and blue) during 5 secs followed by a shutdown indicate the unit is not operating in appropriate temperature.

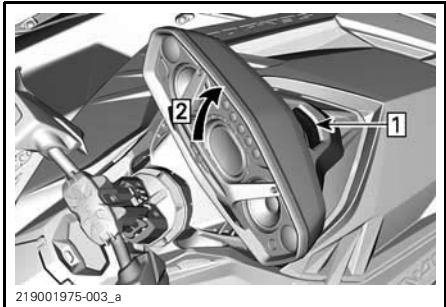
This system is completely self contained and has no electrical connection to the PWC. It needs to be connected to a 110V household electrical outlet to be charged.

**NOTICE** Use only the supplied charging adapter to charge the audio system.

**Battery level:** To show the battery level; hold both volume buttons simultaneously.

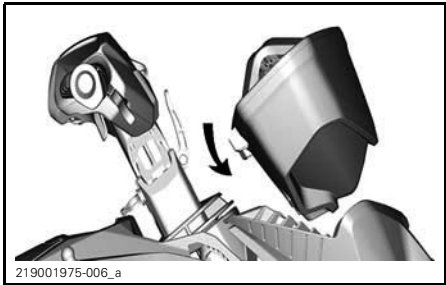
When not in use, the unit will shut down after 10 minutes.

- To remove;
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.



**CAUTION** Prolonged exposition to loud music can damage your hearing. Therefore, we suggest a 10 minutes break time every 45 minutes of listening.

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## BREAK-IN PERIOD

### Operation During Break-In Period

A break-in period of 5 operating hours is recommended before running the watercraft at sustained full throttle.

During this period, maximum throttle should not exceed 1/2 to 3/4 opening. However, brief full acceleration and speed variations contribute to a good break-in.

**NOTICE** Continued wide open throttle accelerations or operation, prolonged cruising speeds are detrimental during the break-in period.

# OPERATING INSTRUCTIONS

## ⚠ WARNING

Always perform the *PRE-RIDE INSPECTION* before operating this watercraft. Be sure to read the *SAFETY INFORMATION* and the *WATERCRAFT INFORMATION* sections and be thoroughly familiar with the iControl technology.

Should any control or instruction not be fully understood, refer to an authorized Sea-Doo dealer.

## Boarding the Watercraft

As with any watercraft, boarding should be done carefully and engine must not be running.

## ⚠ WARNING

Engine must be OFF and tether cord must be removed when boarding the watercraft or when using the boarding step. Never use propulsion system components as a supporting point to board the watercraft.

### Models with iBR

## ⚠ WARNING

Never use the iBR gate as a step or support to board the watercraft. Be careful not to bump yourself on the gate when boarding.

## Boarding from a Dock

When boarding from a dock, slowly place one foot on the watercraft footboard nearest the dock while holding the handlebar, and at the same time, transfer the body weight to the other side in order to balance the watercraft.

Then bring the other foot over the seat and place it on the other footboard. Push the watercraft away from the dock.



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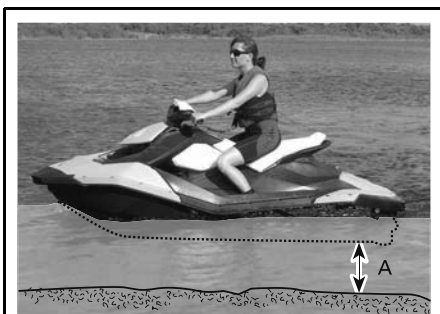
## Boarding from Water

## ⚠ WARNING

- Keep limbs away from jet or intake grate.
- Never use propulsion system as a supporting point to board the watercraft.

Ensure there is at least 90 cm (3 ft) of water underneath the lowest rear portion of the hull.

Take into account that the hull will be lower in the water when all passengers are aboard. Be certain to maintain the specified depth so sand, pebbles and rocks will not be drawn up in the propulsion system.



smo2014-005-100\_a

- A. Maintain at least 90 cm (3 ft) underneath the lowest rear portion of the hull when all passengers are aboard



**NOTICE** Starting the engine or riding the watercraft in shallower water may damage the propulsion system.

## ⚠ WARNING

Watercraft with iBR system:

- Be aware of the iBR gate movement when starting the engine, shutting down the engine or using the iBR lever. Automatic movement of the gate may squeeze fingers or toes of people taking a hold on the back or your PWC.
- Never use iBR gate as a supporting point to board the watercraft.

## Operator Alone

### *Models Without a Boarding Step*

1. Using one hand, grab the rear handle.
2. With the other hand on the boarding platform, lift your body until you can lay one knee on the boarding platform.



3. Lay the other knee on the boarding platform.



4. Take hold of the seat strap to help maintain your balance and step forward onto the footboards on either side of the seat.



Sit astride the seat.

### *Models with a Boarding Step*

Using one hand, lower the boarding step.

Using the other hand, take hold of the edge of the boarding platform, then pull yourself up so that you can knee onto the boarding step.

## **NOTICE**

- Never use propulsion system components to board.
- Only board the step with a knee, not a foot.

Reach forward with one hand and take hold of the molded handle behind the seat, then knee onto the boarding step.



Holding on to the handle behind the seat, step up onto the boarding platform.



Sit astride the seat.

### Operator with a Passenger

The operator climbs on the watercraft in the same way as explained previously.



Take hold of the seat strap to help maintain your balance and step forward onto the footboards on either side of the seat.

**WARNING**

Engine must be OFF and tether cord must be removed when boarding the watercraft or when using the boarding step. Never use propulsion system components as a supporting point to board the watercraft.

In choppy water, while in the water, the passenger may hold the watercraft steady to help the operator climb aboard.



The passenger then climbs onto the watercraft while the operator maintains balance by sitting as close as possible to the console.



smo2014-005-077



smo2014-005-078



smo2014-005-079



smo2014-005-080

## How to Start Engine

### WARNING

Before starting the engine, the operator and passenger(s) should always:

- Be properly seated on the watercraft
- Have a firm grip on a handhold or hold on to the waist of the person in front of them
- Wear appropriate protective clothing including a PFD approved by local authorities and a wet suit bottom.
- On models with no iBR, the PWC will move forward as soon as engine is started.

**NOTICE** Ensure there is at least 90 cm (3 ft) of water under the lowest rear portion of the hull when all passengers are aboard prior to starting the engine. Otherwise damage to the propulsion system components may occur.

1. Attach the tether cord clip to your PFD or to the wrist (wrist strap required).
2. Firmly grip the handlebar with your left hand and place both feet on the footboards.
3. Install the tether cord on the engine cut-off switch.
4. Depress the engine START/STOP button to crank the engine.
5. Release engine START/STOP button immediately after engine is started.

### WARNING

The tether cord clip should always be attached to the operators personal flotation device or to the wrist (wrist strap required) when starting or operating the watercraft.

**NOTICE** Do not hold engine START/STOP button more than 10 seconds to avoid starter overheating. A rest period should be observed between the cranking cycles to allow the starter to cool down.

## How to Stop the Engine

*Models with iBR*

### WARNING

To maintain watercraft directional control, the engine should be running until the watercraft is stopped.

*Models Without iBR*

### WARNING

The engine must stop running for the watercraft to come to a full stop.

*All Models*

The engine may be shut off using one of two methods:

- Pressing the engine START/STOP button, or
- Removing the tether cord from the engine cut-off switch.

### WARNING

Never leave the tether cord on the engine cut-off switch when disembarking watercraft to prevent theft, accidental engine starting, and to avoid unauthorized use by children or others.

## How to Steer the Watercraft



smo2014-005-081\_a

Turning the handlebar pivots the jet pump nozzle which controls the watercraft direction. Turning the handlebar to the right will turn the watercraft to the right, turning the handlebar to the left turns the watercraft to the left. The throttle should be applied to turn the watercraft.

### **⚠ WARNING**

Throttle should be applied and handlebar turned to change the direction of the watercraft. Steering efficiency will differ depending on the amount of throttle applied, the number of passengers, the load, the water conditions and the environmental factors such as the wind.

Unlike a car, a watercraft needs some throttle to turn. Practice in a safe area applying the throttle and turning away from an imaginary object. This is a good collision avoidance technique.

### **⚠ WARNING**

Directional control is reduced when the throttle is released and lost when the engine is off.

The watercraft behaves differently with a passenger and requires greater skill. The passenger(s) should always grip the seat strap, the molded grab handle, or the waist of the person ahead of them. Reduce speed and avoid sharp turns. Avoid choppy water conditions when carrying a passenger.

### **Tight Turns and Other Special Maneuvers**

Any tight turns or special maneuvers that will cause the air inlet openings to be kept under water for a prolonged time, water will seep into the bilge.

Combustion engines need air to operate; consequently this watercraft cannot be totally watertight.

**NOTICE** If the air inlet openings are kept under water, such as turning constantly in tight circles, plunging the bow through waves, or capsizing the watercraft, water may seep into the bilge, which may cause severe damage to internal parts of the engine. Refer to the *WARRANTY* section contained in this guide.

### **O.T.A.S.™ System (If equipped) (Off-Throttle Assisted Steering)**

The O.T.A.S. (Off-Throttle Assisted Steering) system provides additional maneuverability in off-throttle situations.

If the driver releases the throttle to idle when initiating a full turn, the O.T.A.S. system will be electronically activated, and will slightly increase engine speed to allow completion of the turn.

When the handlebar is brought back towards its center position, the throttle reverts to idle.

We recommend that you familiarize yourself with this feature during your first ride.

## How to Engage Neutral (Models with iBR)

### WARNING

The drive shaft and impeller are always turning when the engine is running, even in neutral position. Keep away from the propulsion system of the watercraft.

When the watercraft is first started, the iBR system automatically sets the neutral position by default.

To engage neutral from forward position, tap the iBR lever.

To engage neutral from reverse position, release the iBR lever and throttle lever.

### How to Trim the Neutral Position of the iBR (if VTS equipped)

When in NEUTRAL, if the watercraft creeps forward or backward, the iBR system may be trimmed.

**NOTE:** Movement of the watercraft when operating in neutral may be due to wind or water current.

To enter the Neutral Adjustment mode, make sure the watercraft is idle and hold down the VTS DOWN button for 1.5 Sec.

The message **Neutral Adjust** will be displayed.

To adjust the neutral position:

- If the watercraft is moving forwards, press the VTS DOWN button to adjust.
- If the watercraft is moving backwards, press the VTS UP button to adjust.

Adjust to achieve no movement when the engine is at idle.

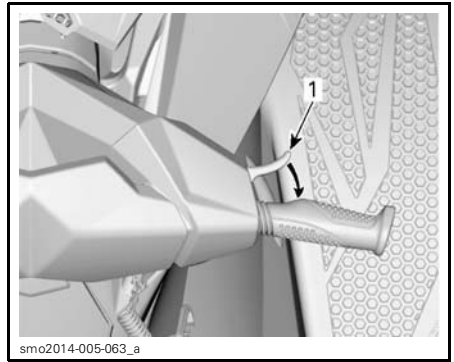
To exit the **Neutral Adjust**, press MODE button or wait 25 seconds or press on either throttle or brake lever.

## How to Engage Forward (Models with iBR)

To engage forward from neutral position, tap on the throttle lever. The watercraft will accelerate forward.

To engage forward from reverse position, release the iBR lever, then tap the throttle lever.

To re-engage forward from braking, simultaneously pull in the throttle lever while releasing the iBR lever. The watercraft will accelerate forward after a short delay.



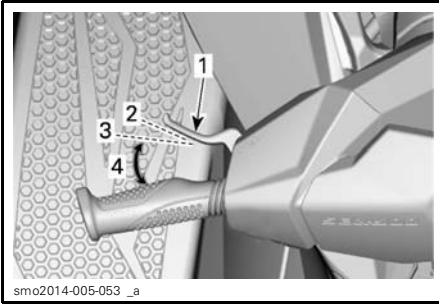
**TYPICAL - ENGAGING NEUTRAL**

1. Throttle lever

## How to Engage and Use Reverse (Models with iBR)

Reverse can only be engaged between idle speed and the threshold forward speed of 7 km/h (4 MPH).

To engage reverse position, the iBR lever on the LH handlebar must be pulled in at least 25% of the lever travel.

**TYPICAL - iBR LEVER**

1. iBR lever
2. Lever released position
3. Approximate 25% position
4. Operating range

When operating the iBR lever in reverse mode, the throttle lever can be used to control engine RPM, and thus the amount of reverse thrust produced.

By modulating throttle lever, reverse thrust can be more precisely controlled. Too much RPM will create water turbulence and reduce reverse efficiency.

**NOTE:** Engine power will be limited whenever the iBR lever position is changed.

Release the iBR lever to end reverse operation.

To stop rearward motion after iBR lever release, apply enough throttle to stop rearward movement.

### **WARNING**

The brake function has no effect when travelling in reverse.

Available engine power is limited in reverse mode, which limits reverse speed.

### **WARNING**

Only use reverse at slow speed and for the shortest time possible. Always ensure the path behind is clear of objects, obstacles and people.

When operating in reverse, turn the handlebar in the opposite direction that you want to move the rear of the watercraft.

For example, to steer the rear of the watercraft to port (left), turn the handlebar to starboard (right).



### **TYPICAL - STEERING DIRECTION REVERSED WHEN BACKING**

**⚠ CAUTION** Steering direction in reverse is opposite of forward. To steer the stern to port (left) in reverse, turn the handlebar to starboard (right). To steer the stern to starboard (right), turn the handlebar to port (left). Reverse operation should be practiced in open waters in order to become fully familiar with the controls and watercraft handling characteristics before operating in close quarters.

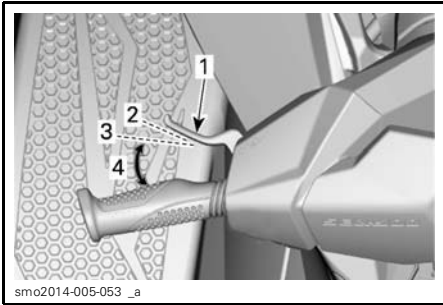
## **How to Engage and Use Braking (Models with iBR)**

### **WARNING**

- The engine must be running to be able to use the brake.
- The brake is only applicable when operating in forward movement, it has no effect on rearward motion.
- The brake cannot prevent your PWC from drifting due to current or wind.

The braking function can only be engaged during forward operation at or above the threshold speed of 7 km/h (4 MPH).

Braking is engaged and controlled when the iBR lever on the LH handlebar is pulled in at least 25% of its travel.



**TYPICAL - iBR LEVER**

1. iBR lever
2. Lever released position
3. Approximate 25% position
4. Operating range

**⚠ WARNING**

Braking should be practiced in open waters and at gradually increasing speeds in order to become fully familiar with the controls and watercraft handling characteristics.

When iBR lever is applied, the throttle lever command is overridden and engine throttle control is now dependant on the iBR lever position. Braking can thus be modulated by using only the iBR lever.

Watercraft deceleration is proportional to the braking force. The more the iBR lever is pulled in, the greater the braking force applied.

**NOTE:** Be careful to gradually actuate the iBR lever to adjust intensity of the braking force and simultaneously release the throttle lever.

**⚠ CAUTION** When braking, riders must brace themselves against the deceleration force to prevent from moving forward on the watercraft and losing balance. The operator should always keep both hands on the handlebars, and all passengers should maintain a firm grip of a handhold or the waist of the person in front of them.

**⚠ WARNING**

Stopping distance will vary depending on initial speed, load, wind, number of riders, water conditions, and the amount of braking power commanded by the operator. Always adjust your riding style accordingly.

When the watercraft slows to less than 7 km/h (4 MPH), braking mode ends and reverse mode is engaged. Release the iBR lever once the watercraft is stopped. Otherwise, a rearward movement will be initiated.

**⚠ CAUTION** As the watercraft slows to a stop, the wake created by the watercraft will catch up and tend to push the watercraft forward. Ensure there are no obstacles or bathers in the direction of travel.

If the throttle lever is still pulled in when releasing the iBR lever, the watercraft will accelerate forward after a short delay. Acceleration will be proportional to the throttle lever position.

**⚠ WARNING**

If forward acceleration is not desired when the brake lever is released, release the throttle lever.

When at speed and the brake is first applied, a plume of water will shoot up in the air behind the watercraft which



may cause the operator of a following watercraft to momentarily lose sight of your PWC.

### **⚠ WARNING**

- It is important to inform the operator of a watercraft who intends to follow in a convoy formation, of the braking and maneuvering capability of your PWC, what the plume of water indicates, and that a greater distance must be maintained between watercraft.
- Be aware that other boats following or operating in close proximity may not be able to stop as quickly.

### **Braking in a Turn**

Braking can be initiated during a turn using the iBR lever as previously described. Get ready to maintain your balance while the wake is crossing your PWC.

**⚠ CAUTION** As the watercraft slows to a stop while braking in a turn, the wake created by the watercraft will catch up and tend to push the watercraft sideways. Be prepared to maintain balance as the wake crosses the watercraft.

### **How to Use the Variable Trim System (VTS)**

The variable trim system (VTS) changes the angle of the jet pump nozzle.

When first using the watercraft, the operator should become familiar with the use of the variable trim system (VTS) at various speeds and water conditions. Experience alone will dictate the best trim for the conditions. During the watercraft break-in period, when lower speeds are recommended, it is

an excellent opportunity to become familiar with trim adjustment and its effects.

The VTS system allows for manually adjusting the trim position of the nozzle, or selecting three preset trim positions.

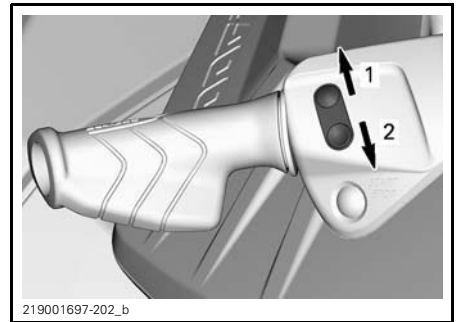
### **Manually Adjusting the VTS**

Nine trim positions are available.

With the watercraft operating forward, proceed as follows:

Press and release the VTS UP or VTS Down button to move the VTS of one position.

If the VTS UP or VTS Down button is pressed and held, the pump nozzle will keep moving until the button is released.

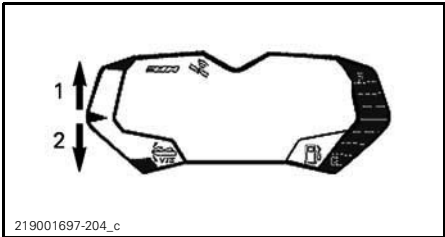


**VTS CONTROL BUTTON**

1. Bow up
2. Bow down

Pressing the VTS button with the engine OFF, will change the indication in the gauge but will not change the jet pump nozzle position. The nozzle will change position next time the engine is started and engaged in forward.

The VTS position is displayed on the multifunction gauge.



1. VTS up display
2. VTS down display

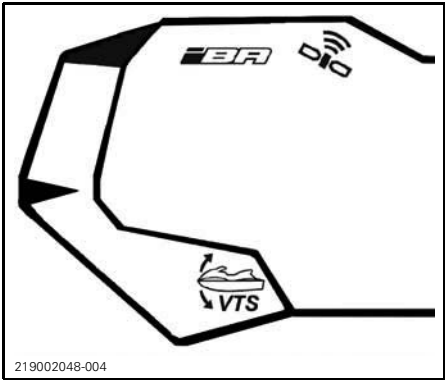
| VTS SETTINGS GUIDELINE |                                                             |
|------------------------|-------------------------------------------------------------|
| SETTING                | USE                                                         |
| Center                 | Riding at high speeds                                       |
| Down                   | Compensate load, obtain neutral attitude, reduce porpoising |
| Slightly up            | Obtain neutral attitude                                     |
| Up                     | Purposely raise the bow                                     |

**CAUTION** Riding at high speeds with the VTS at high settings can affect handling.

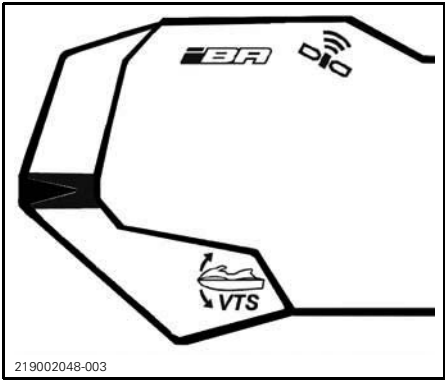
### Using Preset Trim Positions

Three preset trim positions can be selected (full down, center and full up).

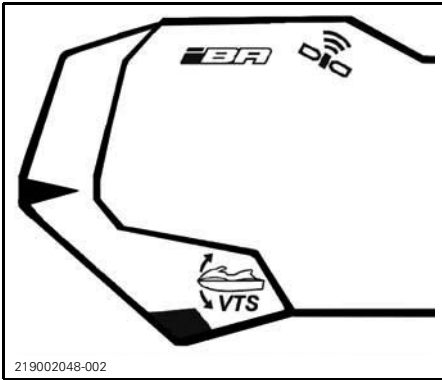
To select the highest trim position recorded, double-click on the VTS UP button (bow up).



To select the lowest trim position recorded, double-click on the VTS DOWN button (bow down).



To select the mid trim position, it depends on the actual trim position. Double-click on the VTS UP button if it is positioned below mid trim or double-click on the VTS DOWN button if it is positioned above mid trim.



**NOTE:** These preset trim positions are not adjustable.

**CAUTION** Riding at high speeds with the VTS at high settings can affect handling.

## General Operating Recommendations

### Rough Water or Poor Visibility Operation

Avoid operation in these conditions. If you must do so, proceed with caution using minimum speed.

### Crossing Waves

The operator must grip the handlebar firmly and keep both feet on the footboards.

The passenger must grip the handholds with both hands and keep both feet on the footboards.

Reduce speed.

Always be prepared to steer and maintain your balance as necessary.

When going over waves, raise your body slightly off the seat to absorb the shocks with your legs.

When crossing wakes, always keep a safe distance from watercraft ahead.

## WARNING

When crossing wakes, slow down. Operator and passenger(s) should brace themselves and adopt a semi-standing position to help absorb the bumps. Do not jump waves or wakes.

### Stopping/Docking

When the throttle is released, the watercraft is slowed by water drag against the hull. The stopping distance will vary depending on the watercraft size, weight, speed, water surface condition, presence and direction of wind and current.



The operator should practice in open waters at various speeds to become familiar with the stopping distances under different conditions.

### Models Without iBR

## WARNING

The engine must stop running for the watercraft to come to a full stop.

## Models with iBR

### **⚠ WARNING**

Always practice braking in open waters ensuring there are no watercraft or boats in your immediate vicinity, especially astern. Other users of the waterways may not be able to maneuver or stop in time to avoid you should you unexpectedly come to a full stop in front of them.

The iBR system can also be used for slowing down or for stopping the watercraft more quickly, and for increasing maneuverability especially when docking. Stopping using the iBR system in a straight line and in a turn should be practiced extensively to become familiar with the handling characteristics of the watercraft under partial or full braking conditions.

When at speed and the brake is first applied, a plume of water will shoot up in the air behind the watercraft and may cause the operator of a following watercraft to momentarily lose sight of your PWC.

### **⚠ WARNING**

It is important to inform the operator of a watercraft who intends to follow in a convoy formation of the braking and maneuvering capability of your PWC, what the plume of water indicates, and that a greater distance should be maintained between both of you.

The operator should also practice docking with an imaginary dock using the various controls available (iBR lever and throttle lever).

Release the throttle at a sufficient distance before the expected landing area.

Reduce speed to idle.

Maneuver using a combination of the iBR lever and throttle lever, shifting to neutral, reverse, or forward as required.

Remember that when operating in reverse, steering direction is reversed. Turning the handlebars to the left will move the stern to the right when backing up, and vice-versa.

### **⚠ WARNING**

Directional control is reduced when the throttle is released and/or when engine is off. Steering direction is reversed when operating the watercraft in reverse.

## Beaching

**NOTICE** It is not recommended to run the watercraft to the beach.

Drive slowly towards the beach and shut off the engine before the water is less than 90 cm (3 ft) deep under the lowest rear portion of the hull. Then pull the watercraft to the beach.

**NOTICE** Riding the watercraft in shallow water may result in damage to the propulsion system components. Always shut off the engine before the water is less than 90 cm (3 ft) deep, and never use reverse or braking.



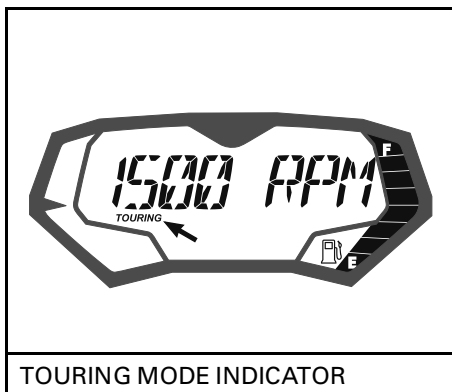
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# OPERATING MODES (ROTAX 900 ACE - 90)

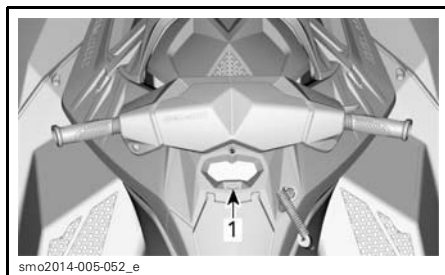
## Touring Mode

By default, the watercraft is in TOURING mode of operation when first started.

A TOURING mode indicator is ON in the multifunction gauge to confirm the active mode of operation.



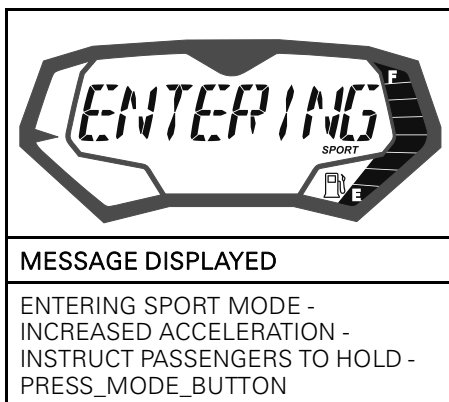
1. Start engine.
2. Depress and hold the MODE button for at least 3/4 of a second.



### TYPICAL

1. Mode button

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



## Sport Mode

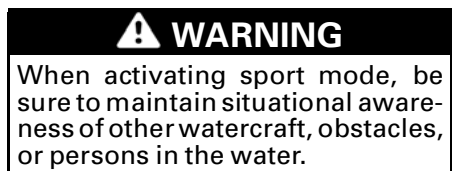
When selected, SPORT MODE provides for instant throttle response and more rapid accelerations than TOURING MODE.

A SPORT mode indicator is ON in the multifunction gauge to confirm the active mode of operation.

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:

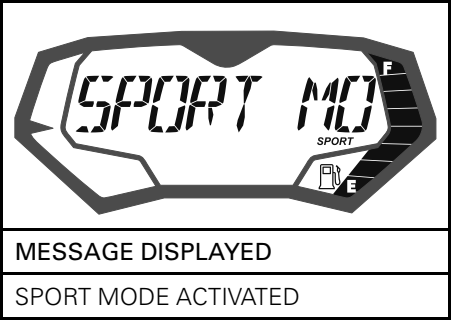


### **WARNING**

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

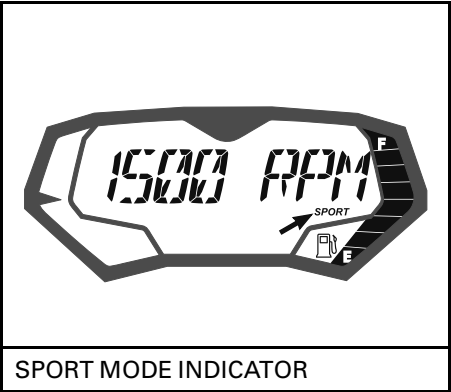
3. Press the MODE button again to acknowledge the message and activate sport mode.

One beep will be heard and a scrolling SPORT MODE ACTIVATED message will momentarily confirm that sport mode has been activated.



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

4. Ensure the SPORT mode indicator is turned on.



**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.



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

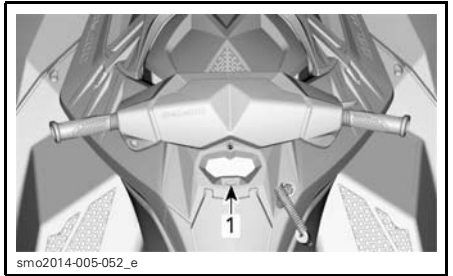
### Deactivating Sport Mode

To deactivate sport mode, carry out the following:



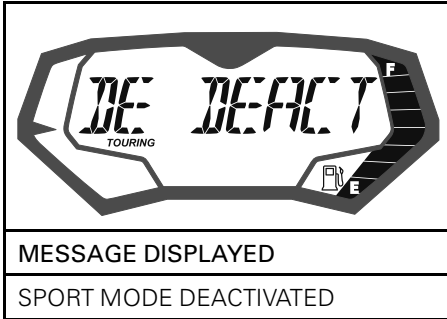
1. Depress and hold the MODE button for 3/4 of a second.

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



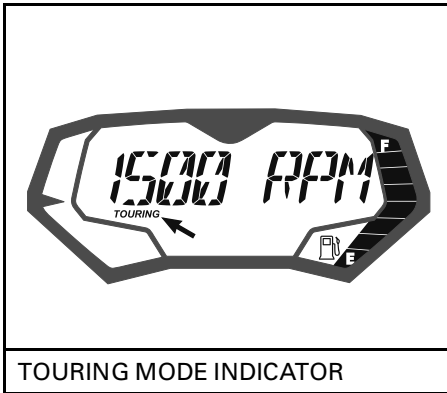
**TYPICAL**  
1. MODE button

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



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

2. Ensure the TOURING mode indicator is on.



## SPECIAL PROCEDURES

### Jet Pump Water Intake and Impeller Cleaning

#### WARNING

Keep away from intake grate while engine is running. Items such as long hair, loose clothing or personal flotation device straps can become entangled in moving parts.

Weeds, shells or debris can get caught on the intake grate, drive shaft and/or impeller. A clogged water intake may cause troubles such as:

- **Cavitation:** Engine speed is high but watercraft moves slowly due to reduced jet thrust, jet pump components may be damaged.
- **Overheating:** Since the jet pump operation controls the flow of water to cool the exhaust system, a clogged intake will cause the exhaust to overheat and damage exhaust components.

A weed clogged area can be cleaned as follows:

#### WARNING

If it is necessary to reach in to remove any foreign object caught in the propulsion system, the tether cord **MUST BE REMOVED** from the engine cut-off switch.

### In-Water Cleaning

Rock the watercraft several times. Most of the time, this should remove the blockage. Start engine and make sure watercraft operates properly.

**NOTICE** Ensure there is at least 90 cm (3 ft) of water under the lowest rear portion of the hull when all passengers are aboard prior to starting the engine. Otherwise damage to the propulsion system components may occur.

### *Models with iBR*

If the aforementioned method does not work, the following can be performed:

- With engine running and before applying throttle, pull the iBR lever in to select reverse operation and vary throttle quickly several times.
- Repeat procedure if necessary.

### *All Models*

If system is still blocked, move the watercraft out of the water for cleaning. Refer to *ON-BEACH WATER CLEANING*.

### On-Beach Water Cleaning

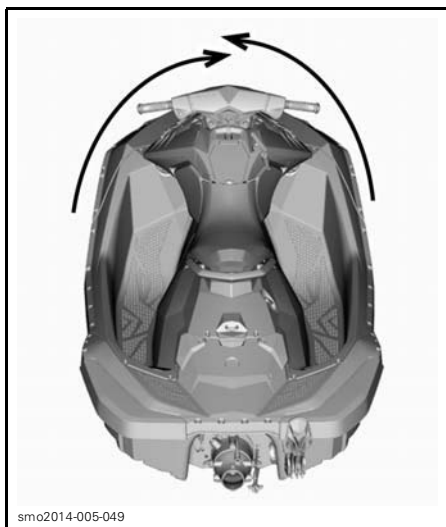
#### WARNING

The tether cord **MUST BE REMOVED** from the engine cut-off switch to prevent accidental engine starting before cleaning the propulsion system components.

Place a cardboard or a carpet beside the watercraft to prevent scratching when turning the watercraft for cleaning.

Rotate the watercraft to any side for cleaning.





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TYPICAL - 2UP MODEL WITHOUT iBR

Clean the water intake area. If the system is still clogged, refer to an authorized Sea-Doo dealer for servicing.

**NOTICE** Inspect water intake grate for damage. Refer to an authorized Sea-Doo dealer for repair as necessary.

**Models with iBR:** for ease of access to the propulsion system, move the iBR to the forward position, refer to *iBR OVERRIDE FUNCTION* for detailed instructions.

## iBR Override Function (Models Equipped with iBR)

When the iBR override function is activated, it allows the user to electrically move the iBR gate and nozzle through its full range of motion using the VTS control button.

**NOTE:** The iBR override function is only available when the engine is not running.

## ⚠ WARNING

When moving the iBR gate using the iBR override function, ensure no-one is near the rear of the watercraft. Movement of the gate may squeeze fingers.

**NOTICE** An object or tool caught in the iBR system when using the iBR override function may cause damage to the iBR components. Remove all rigid foreign objects that may obstruct the iBR gate travel before moving it.

## ⚠ WARNING

If it is necessary to reach in to remove any foreign object caught in the propulsion system, strictly observe the following before proceeding:

- Remove tether cord from the engine cut-off switch.
- Wait at least 5 minutes.
- Do not press on START/STOP button. Should the START/STOP button is pressed, wait another 5 minutes.

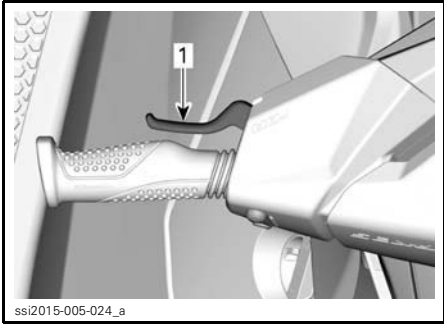
## Activating iBR Override Function

To activate the iBR override function, carry out the following step.

1. Power up the electrical system by pressing the START/STOP button.
2. Install the tether cord on the engine cut-off switch.

**NOTE:** The tether cord must be installed to ensure the information center will not shut off all indications after its self test function. Electrical power will stay on for approximately 1 hour.

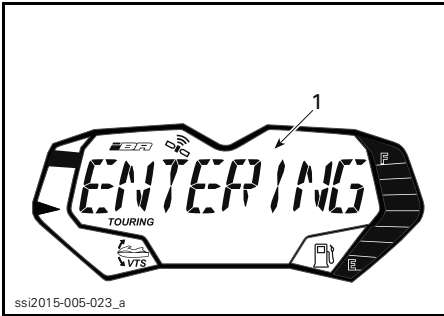
3. Pull in and hold the iBR lever for the entire procedure.



1. iBR lever pulled and held

4. When the following message appears in the multifunction gauge, press the MODE button.

| MULTIFUNCTION GAUGE MESSAGE                 |
|---------------------------------------------|
| "ENTERING iBR OVERRIDE - PRESS MODE BUTTON" |



TYPICAL

1. Multifunction gauge message

After a few seconds, the following message will repeatedly scroll across the multifunction gauge.

| MULTIFUNCTION GAUGE MESSAGE              |
|------------------------------------------|
| "iBR OVERRIDE ON- RELEASE LEVER TO EXIT" |

5. While still holding the iBR lever in, press the VTS UP/DOWN button to move the iBR gate to the desired position. Ensure the VTS indication in the multifunction gauge changes

with the iBR gate movement. If the iBR gate moves upwards, the indication moves upwards.

6. Release the iBR lever.  
7. Remove the tether cord from the engine cut-off switch.

**WARNING**

If it is necessary to reach in to remove any foreign object caught in the propulsion system, strictly observe the following before proceeding:

- Remove tether cord from the engine cut-off switch.
- Wait at least 5 minutes.
- Do not press on START/STOP button. Should the START/STOP button be pressed, wait another 5 minutes.

## Capsized Watercraft

The watercraft is designed so that it should not turn over easily. Two sponsons mounted on the side of the hull, assist watercraft stability. If it turns over, it will remain capsized.

**WARNING**

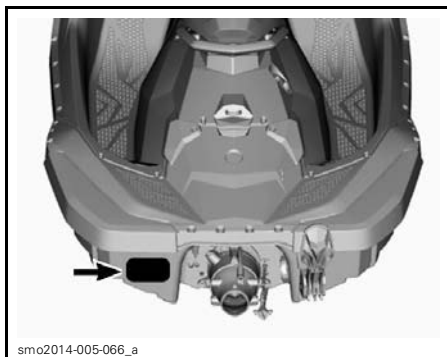
When watercraft is capsized, do not attempt to restart the engine. Operator and passengers should always wear approved personal flotation devices.

**CAUTION**

Heat exchanger in the hull may become very hot. Avoid any contact with the heat exchanger as burns may occur.

To turn the watercraft upright, ensure the engine is off and the tether cord is **NOT** on the engine cut-off switch. Then grab the inlet grate, step on a side bumper rail, and use your weight to rotate the watercraft towards you.

**NOTE:** A label on the stern near the flushing connector provides instructions on how to turn the watercraft right side up. The label is upside down so that it can be read when the watercraft is overturned.



When the watercraft is returned to its normal operating position, the engine can be started normally.

**NOTE:** It is recommended to ride the vehicle for approximately 5 minutes with engine speed lower than 5000 RPM to evacuate any water that might have been accumulated in the bilge. Never exceed 5000 RPM. If not, water could get inside the engine.

**NOTICE** If the watercraft has been capsized for more than 5 minutes, do not attempt to crank the engine to avoid water ingestion that would damage the engine. See an authorized Sea-Doo dealer as soon as possible.

**NOTICE** If the engine does not crank, do not attempt to start it anymore. Otherwise, the engine could be damaged. See an authorized Sea-Doo dealer as soon as possible.

As soon as possible, check for presence of water in the bilge. Drain as necessary when back to the shore.

## Submerged Watercraft

To limit damages to the engine, perform the following procedure as soon as possible.

Drain bilge.

If it was submerged in salt water, spray bilge and all components with fresh water using a garden hose to stop the salt corroding effect.

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

Bring the watercraft to an authorized Sea-Doo dealer as soon as possible to have it serviced.

**NOTICE** The longer the delay before you have the engine serviced, the greater the damage to the engine will be.

## Water-Flooded Engine

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

Bring the watercraft to an authorized Sea-Doo dealer as soon as possible to have it serviced.

**NOTICE** The longer the delay before you have the engine serviced, the greater the damage to the engine will be. Failure to have the engine properly serviced may cause severe engine damage.

## Towing the Watercraft in Water

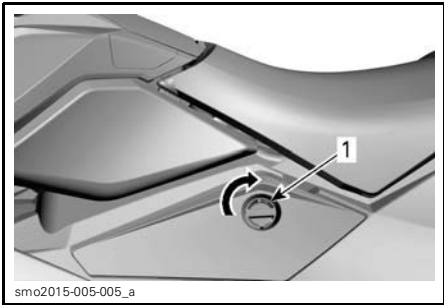
Special precautions should be taken when towing a Sea-Doo watercraft in water.

The maximum recommended towing speed is 21 km/h (13 MPH).

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

If you have to tow the watercraft faster than the maximum recommended speed, clamp the water supply hose in the engine compartment.

To access the water supply hose, turn the LH access cover knob 1/4 turn clockwise, then pull out to unsnap the rear portion and slide rearward to remove.



**LH ACCESS COVER**

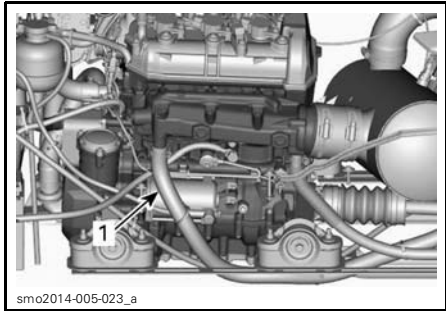
1. To unlock, turn the knob 1/4 turn clockwise

**⚠ WARNING**

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

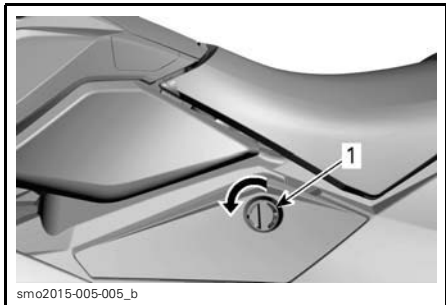
**⚠ CAUTION** Make sure the hose is properly clamped before towing the watercraft. If hose is not properly clamped when engine is not running, water will accumulate in the exhaust system, will enter the engine and cause damages.

**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 in the reverse of the removal procedure and lock the knob by turning it 1/4 turn counterclockwise.



**LH ACCESS COVER**

1. To lock, turn the knob 1/4 turn counterclockwise

# ***MAINTENANCE INFORMATION***

# 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.

 **WARNING**

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

### *EPA Regulation - Canadian and USA Vehicles*

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

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

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

For emission-related warranty claims, BRP is limiting the diagnosis and repair of emission-related parts to the authorized Sea-Doo dealers. For more information, please refer to the *US EPA EMISSION-RELATED WARRANTY* contained in the *WARRANTY* section.

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

Disregard the information pertaining to the following systems if the watercraft is not equipped with these features:

- iBR (intelligent Brake and Reverse)

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

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

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

| AFTER EACH RIDE IN SALT OR DIRTY WATER                         |
|----------------------------------------------------------------|
| Rinse engine compartment with fresh water and drain salt water |
| Flush the exhaust system                                       |

**EVERY MONTH IN SALT OR DIRTY 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.)

Verify O.T.A.S. operation (if equipped)

Visually inspect impeller and boot

Visually inspect impeller and wear ring for deep scratches, nicks and grooves

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

**EVERY 2 YEARS OR 200 HOURS OF OPERATION  
(WHICHEVER COMES FIRST)**

Replace spark plugs

Inspect flame arrestor

Validate condition of jet pump bearing by manually spinning impeller checking for radial shaft play or noise

Verify and lubricate splines of the drive shaft and impeller

|                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EVERY 2 YEARS OR 200 HOURS OF OPERATION<br>(WHICHEVER COMES FIRST)                                                                                                                                                                                                          |
| Inspect and lubricate drive shaft/PTO splines                                                                                                                                                                                                                               |
| <b>The following must be performed every 200 hours (irrespective of the number of years):</b>                                                                                                                                                                               |
| 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 - 60 and 900 ACE - 90 engines) |
| EVERY 5 YEARS OR 300 HOURS OF OPERATION<br>(WHICHEVER COMES FIRST)                                                                                                                                                                                                          |
| Replace the coolant                                                                                                                                                                                                                                                         |



# MAINTENANCE PROCEDURES

**NOTE:** Some vehicle safety labels are not shown on illustrations. For information on vehicle safety labels, refer to *WATERCRAFT SAFETY LABELS*.

This section includes instructions for basic maintenance procedures.

## WARNING

Turn off the engine and follow these maintenance procedures when performing maintenance. If you do not follow proper maintenance procedures you can be injured by hot parts, moving parts, electricity, chemicals or other hazards.

## WARNING

Should removal of a locking device (e.g. lock tabs, self-locking fasteners, etc.) be required, always replace with a new one.

**NOTICE** Never leave any object, rag, tool, etc., in the engine compartment or in the bilge.

## Engine Oil

### 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.

| XPS RECOMMENDED ENGINE OIL                                                                                                                                                                                                                                                                                                                       |                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Scandinavia                                                                                                                                                                                                                                                                                                                                      | 4T 5W40 SYNTHETIC BLEND OIL (EUR)<br>(P/N 779290) |
| Other Countries                                                                                                                                                                                                                                                                                                                                  | 4T 5W40 SYNTHETIC BLEND OIL<br>(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. Always check the API service label certification on the oil container, it must contain at least one of the indicated standards. <ul style="list-style-type: none"><li>– API service classification SJ, SL, SM or SN</li></ul> |                                                   |

### Engine Oil Level

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

**CAUTION** Many 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.

#### 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.

### **CAUTION**

- 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 counterclockwise.

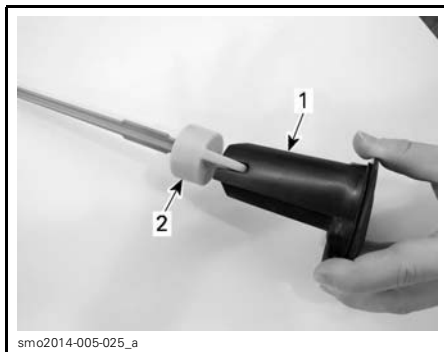


#### **TYPICAL**

1. RH access cover

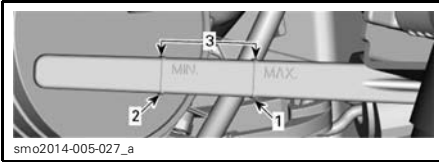
6. Unscrew dipstick, pull it out and wipe clean.

**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.

**NOTICE** 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.

## Engine Oil Change and Oil Filter Replacement

The oil change and filter replacement may be performed by an authorized Sea-Doo dealer, repair shop, or person of your own choosing.

## Engine Coolant

### 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. |

**NOTICE** Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically 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.

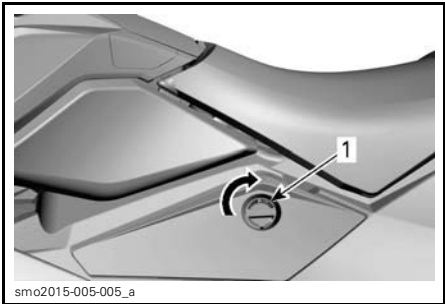
### Engine Coolant Level

#### **! WARNING**

Check coolant level with engine cold. Never add coolant in cooling system when engine is hot.

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

To access the expansion tank, turn the LH access cover knob 1/4 turn clockwise, then pull out to unsnap the rear portion and slide rearward to remove.



**LH ACCESS COVER**

1. To unlock, turn the knob 1/4 turn clockwise

Locate the expansion tank cap.



1. Expansion tank cap

With watercraft on a level surface, add coolant until it is visible without exceeding the COLD level mark in coolant reservoir when engine is cold.

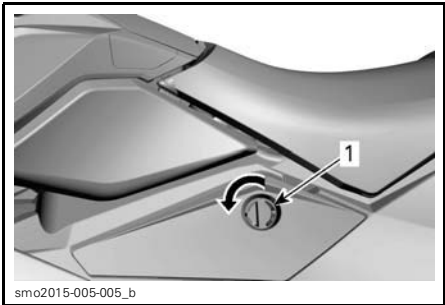


1. Cold level mark

**NOTE:** The watercraft is level when it is in water. When on a trailer, raise trailer tow pole and block in this position when bumper rail is level.

Add premixed coolant, see *RECOMMENDED ENGINE COOLANT* for specification, to adjust coolant level between marks as required. Use a funnel to avoid spillage. Do not overfill.

Properly reinstall and tighten expansion tank cap, then reinstall the LH access cover in the reverse of removal procedure and lock the knob by turning it 1/4 turn counterclockwise.



**LH ACCESS COVER**

1. To lock, turn the knob 1/4 turn counterclockwise

**NOTE:** A cooling system that frequently requires coolant is an indication of leaks or engine problems. See an authorized Sea-Doo dealer.

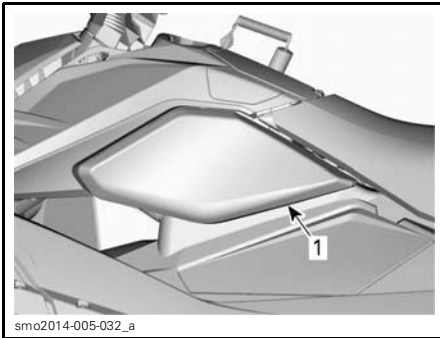
## Engine Coolant Replacement

Coolant replacement should be performed by an authorized Sea-Doo dealer.

## Steering Alignment

1. Manually release and remove the LH side knee pad.

**NOTE:** This area is intended only to access the steering cable assembly. Do not use this area for storage purposes.



1. LH Side knee pad

2. Unclip the steering cable by pushing the ring up towards the nut.



### STEERING CABLE UNCLIPPED

1. Ring
2. Nut

3. Put the jet pump nozzle in straight position.
4. Unscrew nut to turn handlebar to the right.

5. Screw nut to turn handlebar to the left.
6. When steering alignment is complete, clip the steering cable by pushing the ring back down and re-installing the LH side knee pad.

## Central Body

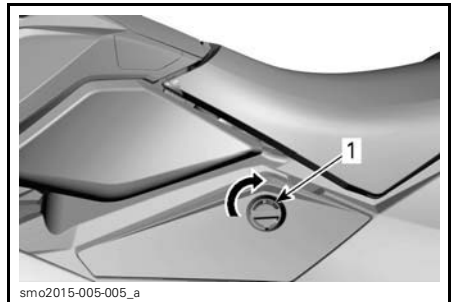
### Central Body Removal

When necessary, remove the central body as follows:

### ⚠ WARNING

Never attempt to lift the central body alone. Lift only with assistance or use an appropriate lifting device. Lifting alone can cause serious injury.

1. Turn the LH access cover knob 1/4 turn clockwise, then pull out to un-snap the rear portion and slide rearward to remove.



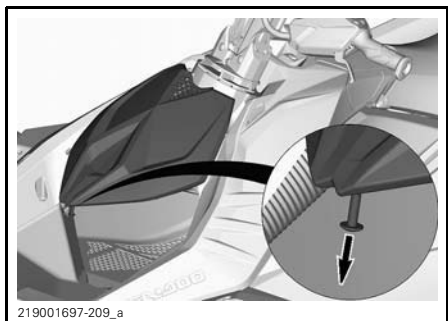
### LH ACCESS COVER

1. To unlock, turn the knob 1/4 turn clockwise
2. Disconnect the steering connector.

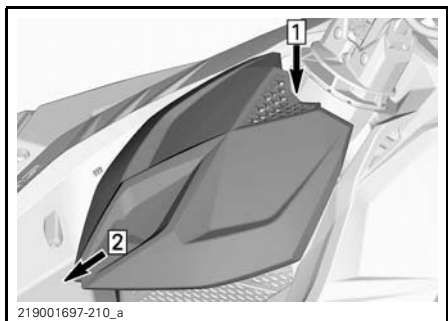


1. Connector

3. Remove the front trim retaining screw.

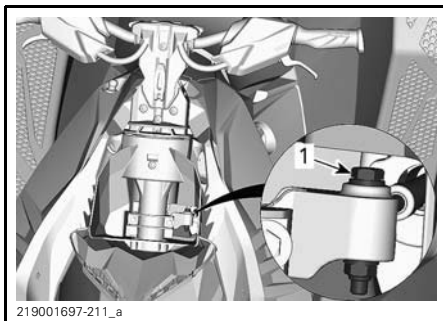


4. Remove the front trim.



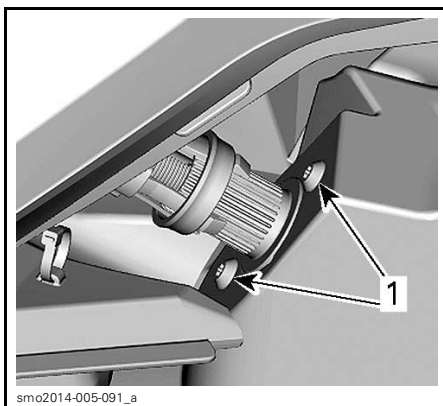
Step 1: Push tab  
Step 2: Slide towards front

5. Disconnect the steering cable.



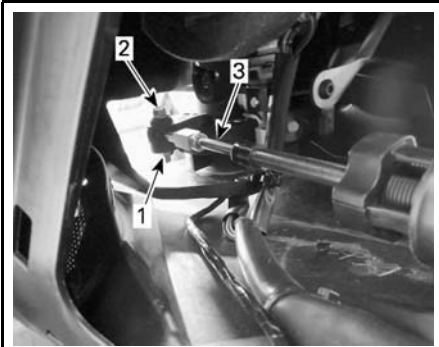
1. Steering cable retaining bolt

6. Remove two screws from the cable assembly.



1. Cable assembly screws

7. Remove nut, bolt, and washer to disconnect rod from steering column.

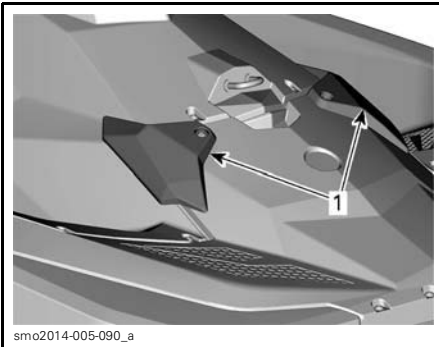


smo2014-005-064\_a

1. Nut and washer
2. Bolt
3. Rod

### ***All Models Except Trixx Models***

8. Remove two self-tapping screws from each rear panel trim at rear of vehicle.
9. To remove the rear panel trims, slide trims towards the outside of PWC.



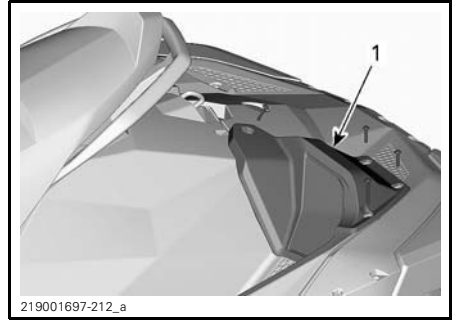
smo2014-005-090\_a

### ***TYPICAL***

1. Rear panel trims

### ***Trixx Models***

10. Remove both rear footrests.



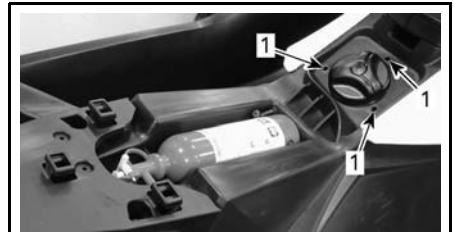
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### ***LH SHOWN***

1. Footrest

### ***All Models***

11. Remove seat. Refer to *SEAT* in *EQUIPMENT*.
12. Remove three self-tapping screws around the fuel cap

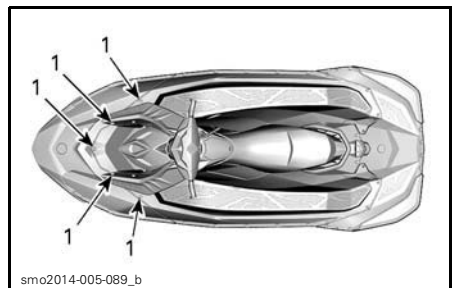


smo2014-005-004\_b

1. Screws

13. Remove five (5) self-tapping screws at front of central body.

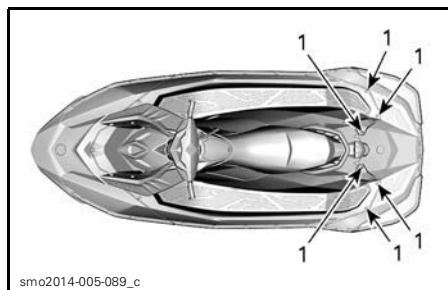
**NOTE:** If equipped with a storage bin, open the storage bin first. Refer to *STORAGE BIN*.



smo2014-005-089\_b

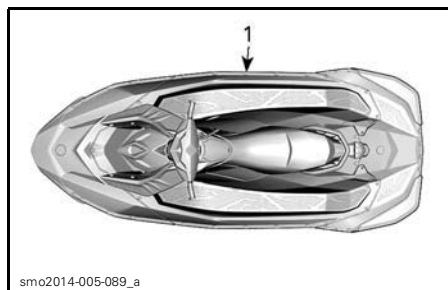
1. Self-tapping screws

14. Remove six (6) self-tapping screws at rear of central body.



1. Self-tapping screws

15. Remove ten (10) M6 nuts and screws from both sides of central body.



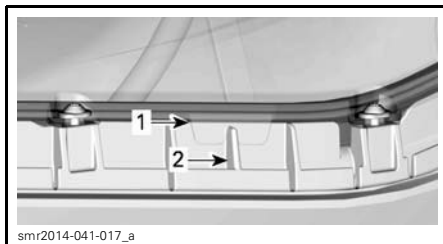
1. Nuts and screws

16. Carefully lift the central body off the hull using a lifting belt.

**NOTE:** When lifting central body, wrap belt around handlebars. Wrapping belt elsewhere on central body to lift it may cause damages.

### Central Body Installation

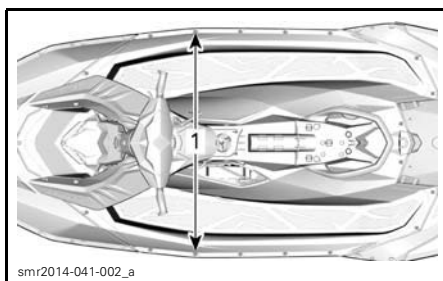
1. Properly place central body alignment tabs on hull.



#### CENTRAL BODY - STARBOARD SIDE VIEW

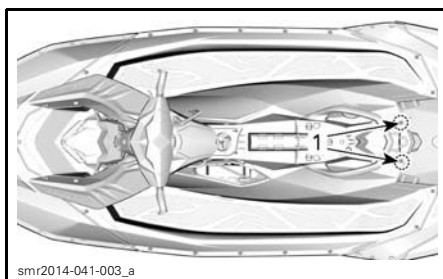
1. Grooved alignment tab on central body
2. Rib in hull

2. Install screws adjacent to alignment tabs first to ensure alignment tabs remain properly engaged.



1. Screws adjacent to alignment tabs

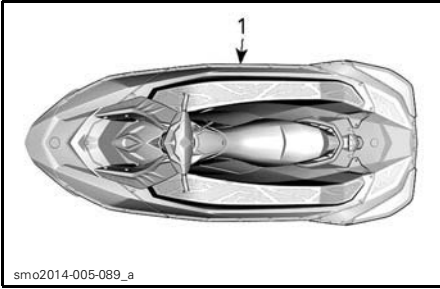
3. Install two screws on rear support.



1. Screws on rear support

4. Install screws and tighten nuts on both sides of central body to the recommended torque.





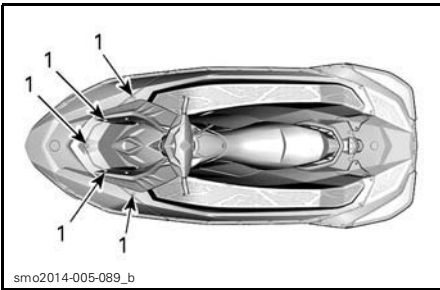
1. Nuts and screws

**TIGHTENING TORQUE**

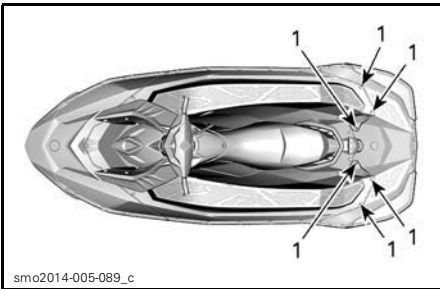
M6 nuts

$3.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$   
(31 lbf•in  $\pm$  4 lbf•in)

5. Install and tighten screws on front and rear of central body to the recommended torque.



1. Self-tapping screws



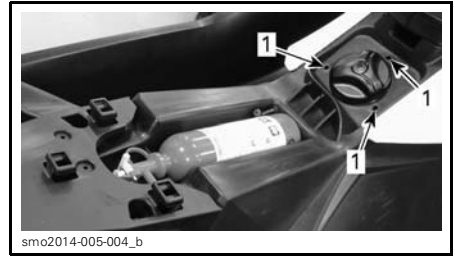
1. Self-tapping screws

**TIGHTENING TORQUE**

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)

6. Install and tighten self-tapping screws around the fuel cap to the recommended torque.



1. Screws

**TIGHTENING TORQUE**

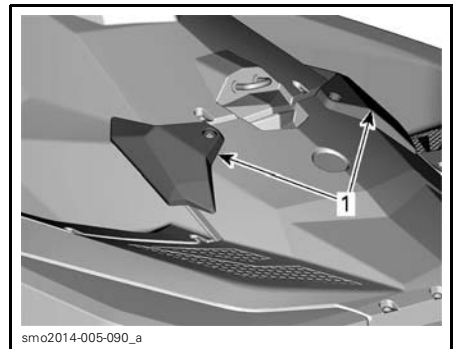
Self-tapping  
screw

$4.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$   
(40 lbf•in  $\pm$  4 lbf•in)

7. Reinstall the seat. Refer to *SEAT in EQUIPMENT*.

**All Models Except Trixx Models**

8. Position rear panel trims in place by sliding towards the inside of PWC and install self-tapping screws. Tighten to the recommended torque.



**TYPICAL**

1. Rear panel trims

**Trixx Models**

9. Install there rear footrests.

All Models

| TIGHTENING TORQUE                                  |                                             |
|----------------------------------------------------|---------------------------------------------|
| Self-tapping screw (footrests or rear panel trims) | 5.5 N•m ± 0.5 N•m<br>(49 lbf•in ± 4 lbf•in) |

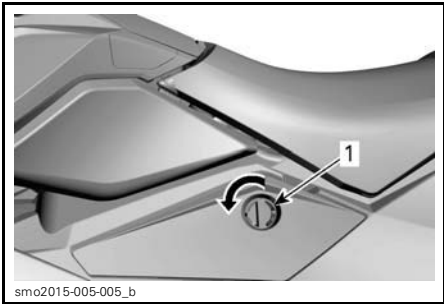
10. Connect the steering connector.



1. Connector

11. Connect steering cable in reverse of removal procedure.

12. Close the LH access cover and lock the knob by turning it 1/4 turn counterclockwise.



LH ACCESS COVER

1. To lock, turn the knob 1/4 turn counterclockwise

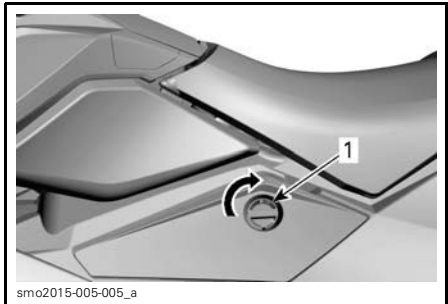
13. Install the front trim.

| TIGHTENING TORQUE          |                                             |
|----------------------------|---------------------------------------------|
| Front trim retaining screw | 3.5 N•m ± 0.5 N•m<br>(31 lbf•in ± 4 lbf•in) |

Battery

Battery Access

Turn the LH access cover knob 1/4 turn clockwise, then pull out to unsnap the rear portion and slide rearward to remove.



LH ACCESS COVER

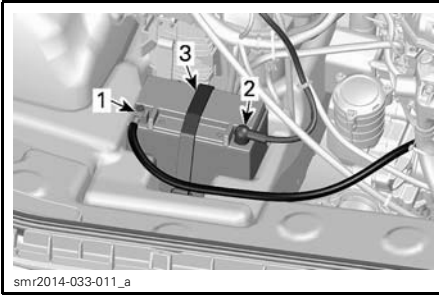
1. To unlock, turn the knob 1/4 turn clockwise

Battery Removal

**⚠ 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.



## Battery Cleaning

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.

## Battery Inspection

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.

## Battery Storage

**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.

Recharge frequency depends on battery condition and storage temperature. Maintain battery as per following table.

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

| AMBIENT TEMPERATURE | CHARGING FREQUENCY |
|---------------------|--------------------|
| Below 16°C (60°F)   | Every month        |
| Above 16°C (60°F)   | Every 2 weeks      |

Charging a Battery

 **WARNING**

Never charge or boost the battery while installed in the watercraft.

 **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.

Carry out a battery *UNLOADED VOLT-METER TEST* as described in this section, then proceed as described here.

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.

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.

Battery Installation

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.

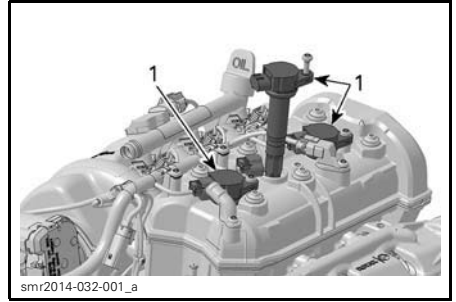
## Ignition Coils

### Ignition Coil Removal

1. To access the ignition coils, remove the central body. Refer to *CENTRAL BODY REMOVAL* section.

**NOTICE** Do not remove the ignition coil before disconnecting the input connector or the wires may be damaged. Do not pry up ignition coil with a screwdriver to avoid damage.

2. Disconnect ignition coil connector.
3. Remove ignition coil retaining screw.
4. Remove ignition coil from spark plug by rotating coils side to side as you pull up.



1. Ignition coils

### Ignition Coil Installation

1. Align the retaining screw hole of the ignition coil with the threaded hole on the valve cover.
2. Install the ignition coil on the spark plug and push it all the way down until it rests on the valve cover.
3. Install the retaining screw and tighten to specification below.

#### IGNITION COIL RETAINING SCREW

|                   |                    |
|-------------------|--------------------|
| Tightening torque | 11 N•m (97 lbf•in) |
|-------------------|--------------------|

4. Connect ignition coil connector.

## Spark Plugs

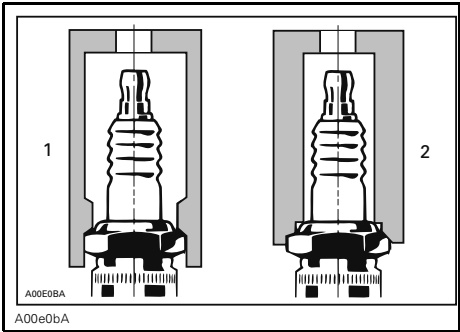
### Spark Plug Removal

1. Disconnect the ignition coil input connector.
2. Remove ignition coil. Refer to *IGNITION COIL REMOVAL*.

### **⚠ 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 coil spark plug end which could cause an explosion.

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



1. Approved socket  
2. Improper socket

4. Clean the spark plug and cylinder head with pressurized air.
5. Unscrew spark plug then use the ignition coil to take spark plug out of spark plug hole.

**Spark Plug Installation**

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

**⚠ WARNING**

Do not adjust gap on this type of spark plug. The adjustment could weaken negative electrodes which may lead to electrode breaking and severe engine damage.

1. Using a wire feeler gauge, check electrode gap as specified in *TECHNICAL SPECIFICATIONS*.
2. Apply LOCTITE 767 (ANTI-SEIZE LUBRICANT) (P/N 293 800 070) over the spark plug threads to prevent possible seizure.
3. Hand screw spark plug into cylinder head. Then, tighten the spark plug clockwise to the specified torque with an approved spark plug socket.

| SPARK PLUG                | TORQUE                                    |
|---------------------------|-------------------------------------------|
| NGK CR8EB (or equivalent) | 13 N•m ± 1 N•m<br>(115 lbf•in ± 9 lbf•in) |

4. Install ignition coil. Refer to *IGNITION COIL INSTALLATION*.

Reinstall the central body Refer to *CENTRAL BODY INSTALLATION* section.

**Exhaust System**

**Exhaust System Flushing**

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

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.

**NOTE:** Repeat the flushing procedure on the starboard side of the stern when vehicle was used in water where there were long debris such as plants, algae, and seaweed.

**⚠ WARNING**

Perform this operation in a well ventilated area.

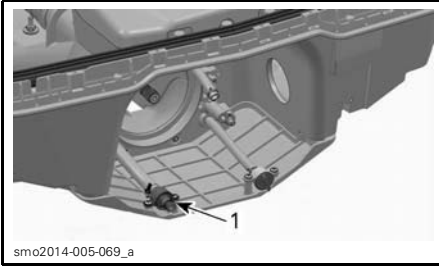
Proceed as follows:

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

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

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

**NOTICE** Always run the engine before opening the water tap. If not, water will get inside the engine.



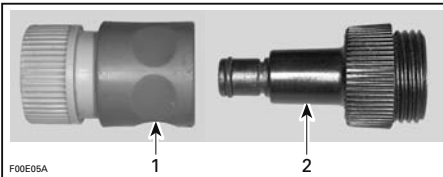
JET NOZZLE REMOVED FOR CLARITY

1. Flushing connector location (with optional hose adapter shown)

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

#### RECOMMENDED TOOL

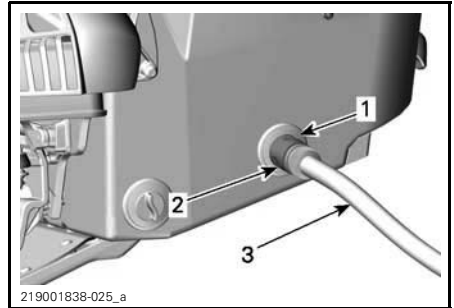
FLUSHING  
CONNECTOR  
ADAPTER (P/N 295  
500 473)



1. Quick connect adapter
2. Flushing connector adapter



TYPICAL - QUICK CONNECT HOSE ADAPTER



TYPICAL

1. Hose adapter (optional, not mandatory)
2. Quick connect fitting (optional, not mandatory)
3. Garden hose

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

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

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

Run the engine 90 seconds at idle speed.

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

Ensure water flows out of jet pump while flushing. Otherwise, refer to an authorized Sea-Doo dealer for servicing.

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

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. If not, water will get inside the engine.

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

## Heat Exchanger and Water Intake Grate

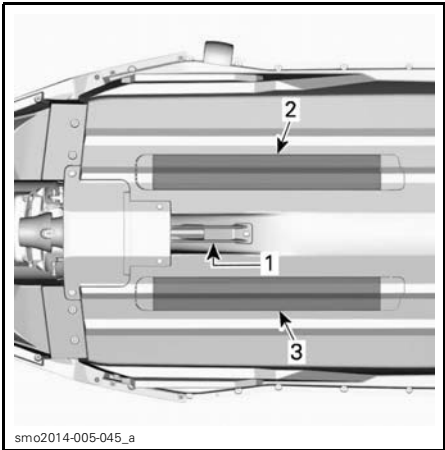
### Heat Exchanger and Water Intake Grate Inspection

Inspect heat exchanger and jet pump water intake grate for cracks and other damages. See your Sea-Doo dealer to have any damaged part repaired or replaced.

#### WARNING

The tether cord must always be removed from the engine cut-off switch prior to inspecting the intake grate.

**NOTE:** There is a reinforcement plate on LH side of hull to maintain symmetry so the hydrodynamics of PWC is not affected.

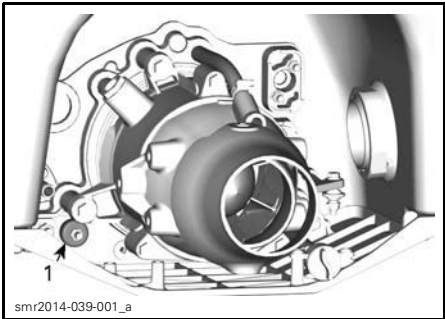


- 1. Water intake
- 2. Heat exchanger
- 3. Reinforcement plate

## Sacrificial Anode

### Sacrificial Anode Inspection

Check for wear. If worn more than half, replace anode.



- 1. Sacrificial anode location

### Sacrificial Anode Removal

Unscrew sacrificial anode retaining nut and remove anode.

### Sacrificial Anode Installation

Installation is the reverse of the removal procedure.

| TIGHTENING TORQUE                    |
|--------------------------------------|
| 9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) |



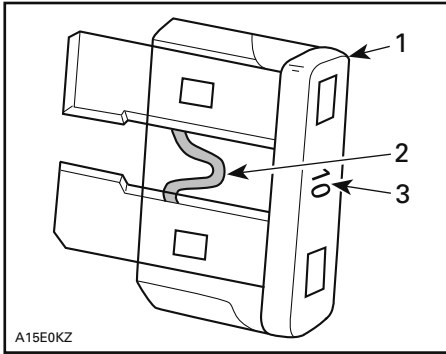
## Fuses

### Fuse Removal and Installation

Use the fuse remover/installer included in the fuse box to ease fuse removal.

### Fuse Inspection

If an electrical problem occurs, check the fuses. If a fuse is burnt, replace by one of the same rating.



1. Fuse
2. Check if melted
3. Ampere rating

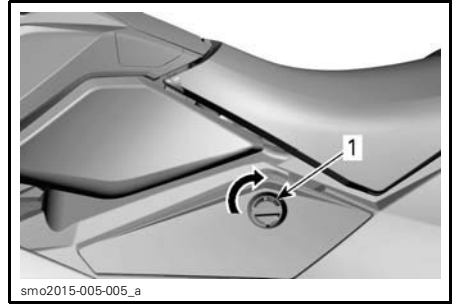
## WARNING

Do not use a higher rated fuse as this can cause severe damage. If a fuse has burnt out, the source of the malfunction should be determined and corrected before restarting. See an authorized Sea-Doo dealer for servicing.

### Fuse Location

All fuses are located inside a single fuse box.

To access the fuse box, turn the knob 1/4 turn clockwise, then pull out to unsnap the rear portion and slide rearward to remove.

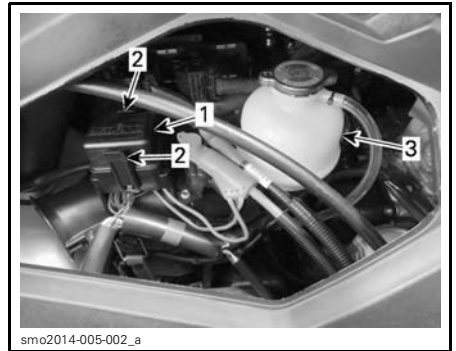


### LH ACCESS COVER

1. To unlock, turn the knob 1/4 turn clockwise

The fuse box is located to the left of the expansion tank.

To remove the fuse box cover, squeeze and hold locking tabs on both sides of the fuse box and pull the cover off the fuse box.



1. Fuse box cover
2. Locking tabs
3. Expansion tank

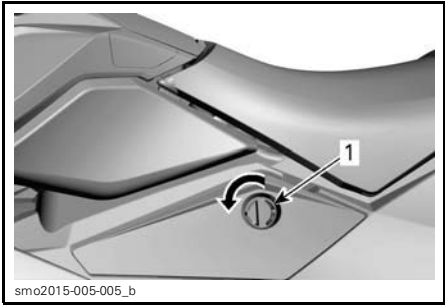


### TYPICAL - FUSE BOX COVER REMOVED

1. Fuse box

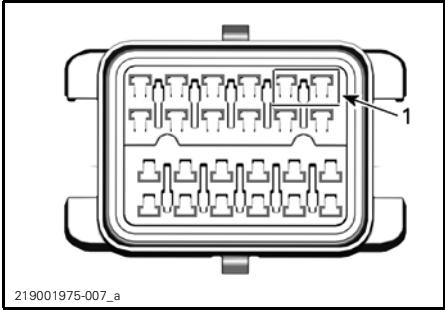
**NOTE:** Fuse ratings and positions are illustrated on the fuse box cover.

To reinstall the fuse box cover and the LH access cover, do the reverse of the removal procedure and lock the knob by turning it 1/4 turn counterclockwise.



**LH ACCESS COVER**

1. To lock, turn the knob 1/4 turn counterclockwise



1. Bilge pump fuse location (If equipped)

**Fuse Description**

| FUSE | RATING | DESCRIPTION                                                     |
|------|--------|-----------------------------------------------------------------|
| 1    | 10 A   | ECM, Cluster, Starter Solenoid, O.T.A.S. (if equipped) and CAPS |
| 2    | 5 A    | Engine START/STOP button                                        |
| 3    | 15 A   | Battery                                                         |
| 4    | 30 A   | Charge                                                          |
| 5    | 30 A   | iBR                                                             |
| *    | 3 A    | Bilge pump (If equipped)                                        |

\* The bilge pump fuse is located above the #1 ACC (10A) fuse.

---

# WATERCRAFT CARE

Remove the watercraft from the water every day.

## Post-Operation Care

### Exhaust System Flushing

The exhaust system should be flushed daily when watercraft is used in salt or foul water.

Refer to *MAINTENANCE PROCEDURES*.

### Additional Care for Foul Water or Salt Water Operation

When the watercraft is operated in foul water and particularly in salt water, additional care should be taken to protect the watercraft and its components.

Rinse watercraft bilge area with fresh water.

Never use a high pressure washer to clean the bilge. **USE LOW PRESSURE ONLY** (such as a garden hose).

High pressure can cause damages to electrical or mechanical systems.

**⚠ CAUTION** Allow engine to cool before performing any maintenance.

**NOTICE** Failure to perform proper care such as: watercraft rinsing, exhaust system flushing and anticorrosion treatment, when watercraft is used in salt water, will result in damage to the watercraft and its components. Never leave the watercraft stored in direct sunlight.

## Watercraft Cleaning

### Body and Hull

Occasionally, wash the hull and various body components with water and soap (use only mild detergent). Remove any marine organisms from engine and/or hull. Soiled surfaces can be cleaned with XPS WASH AND

WAX (BOAT/PWC) (P/N 219 701 711) or CLEANER AND DEGREASER PRO C1 (P/N 779262), or the equivalent, which does not damage textured plastic.

**NOTICE** Never clean plastic parts with strong detergent, degreasing agent, paint thinner, acetone, or other strong chemical or petroleum type cleaner, such as XPS SPRAY CLEANER & POLISH (P/N 219 701 706), that can damage textured plastic.

Stains may be removed from the seat using BRP HEAVY DUTY CLEANER (P/N 293 110 001) or the equivalent, which is safe on vinyl and metal surfaces.

**NOTICE** Never use BRP HEAVY DUTY CLEANER (P/N 293 110 001) on plastic parts. This product can damage textured plastic.

### **⚠ WARNING**

Never apply plastic or vinyl protector on the wet grip floorboard area or seat as the surface will become slippery and the occupants may slip off the watercraft.

Respect the environment by ensuring fuel, oil, coolant or cleaning solutions do not drain into the waterways.

# STORAGE AND PRESEASON PREPARATION

## Storage

### WARNING

Because fuel and oil are flammable, you should have an authorized Sea-Doo dealer, repair shop, or person of your own choosing to inspect the fuel system integrity as specified in the periodic inspection chart.

It is recommended that the watercraft be serviced by an authorized Sea-Doo dealer, repair shop, or person of your own choosing, however the following operations can be performed by you with a minimum of tools.

**NOTE:** Carry out the following tasks in the same order as detailed in this section.

**NOTICE** Do not run the engine during the storage period.

## Propulsion System

### Jet Pump Cleaning

Clean jet pump by spraying water in its inlet and outlet and then apply a coat of LUBRICANT AND ANTI-CORROSIVE (P/N 779168) or equivalent.

### WARNING

Always remove tether cord from the engine cut-off switch to prevent unexpected engine starting before cleaning the propulsion system components. Engine must not be running for this operation.

### Jet Pump Inspection

Remove impeller cover and check if jet pump is water contaminated; if so, see your authorized Sea-Doo dealer.

## Fuel System

### Fuel System Protection

FUEL STABILIZER (P/N 779171) (or equivalent) should be added in the fuel tank to prevent fuel deterioration and fuel system gumming. Follow stabilizer manufacturers' instructions for proper use.

**NOTICE** It is highly recommended to add fuel stabilizer at storage in order to maintain fuel system in good condition. Fuel stabilizer should be added prior to engine lubrication and fuel tank top up to ensure fuel system components protection against varnish deposits.

Fill up fuel tank completely as explained in *FUELING* section. Make sure 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 and Exhaust Systems

### Exhaust System Flushing

Perform procedure as described in *MAINTENANCE PROCEDURES*.

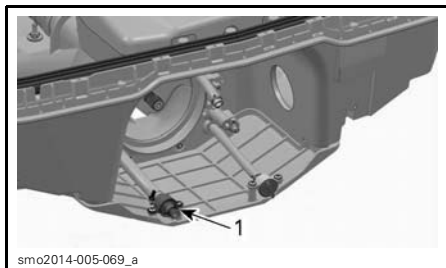
### Engine Oil and Filter Replacement

The oil change and filter replacement may be performed by an authorized Sea-Doo dealer, repair shop, or person of your own choosing.

### Exhaust System Draining

In areas where temperature may freeze, water trapped in the exhaust system must be removed.

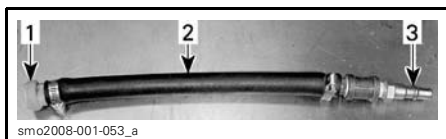
Using the flushing connector located on the port (LH) side of the stern, inject pressurized air at 379 kPa (55 PSI) into system until there is no more water flowing from jet pump.



#### JET NOZZLE REMOVED FOR CLARITY

1. Flushing connector (with optional hose adapter shown)

The following hose can be fabricated to ease draining procedure.



1. Flushing connector adapter (P/N 295 500 473)
2. Hose 12.7 mm (1/2 in)
3. Air hose male adapter

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

Remove special tools.

### Engine Internal Lubrication

1. Remove the central body. Refer to *CENTRAL BODY REMOVAL* in *MAINTENANCE PROCEDURES* section.
2. Remove ignition coils, refer to *MAINTENANCE PROCEDURES*.
3. Remove spark plugs, refer to *MAINTENANCE PROCEDURES*.
4. Spray LUBRICANT AND ANTI-CORROSIVE (P/N 779168) or equivalent in spark plug holes.
5. To prevent fuel from being injected and to disable the ignition during engine cranking, fully depress throttle lever and HOLD against handlebar.

6. Press the engine START/STOP button to crank the engine a few turns. This will distribute the oil on the cylinder walls.
7. Apply a small amount of anti-seize lubricant on spark plug threads, then reinstall them in the engine. Refer to *MAINTENANCE PROCEDURES*.
8. Install the ignition coils, refer to *MAINTENANCE PROCEDURES*.

### Engine Coolant Test

If antifreeze is not replaced, test its density.

The antifreeze replacement and a density test should be performed by an authorized Sea-Doo dealer.

**NOTE:** Antifreeze should be replaced every 300 hours or every 5 years to prevent antifreeze deterioration.

**NOTICE** Improper antifreeze density may result in freezing of the liquid in the cooling system if the watercraft is stored in an area where the freezing point is attained. This could seriously damage the engine.

### Electrical System

#### Battery Removal and Charging

Refer to *BATTERY* in *MAINTENANCE PROCEDURES* section.

### Engine Compartment

#### Engine Compartment Cleaning

Clean the bilge using hot water and a mild detergent or with bilge cleaner.

Rinse thoroughly.

Lift front end of watercraft to completely drain bilge through the bilge drain plug.

## Anticorrosion Treatment

Wipe off any residual water in the engine compartment.

Spray LUBRICANT AND ANTI-CORROSIVE (P/N 779168) or equivalent, or ANTICORROSION SPRAY (P/N 219 700 304) or equivalent, only over all metallic components in engine compartment while minimizing overspray.

**NOTE:** The LH access panel and RH access cover should be left partially open during storage. This will prevent engine compartment condensation and possible corrosion.

## Body and Hull

### Body and Hull Cleaning

Wash the body with a soap and water solution (use only mild detergent). Rinse thoroughly with fresh water. Remove marine organisms from the hull.

**NOTICE** Never clean plastic parts with strong detergent, de-greasing agent, paint thinner, acetone, or other strong chemical or petroleum cleaners.

### Body and Hull Repair

If any repairs are needed to body components or to the hull, contact your authorized Sea-Doo dealer.

### Body and Hull Protection

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

**NOTICE** The watercraft should never be left in water for storage. Never leave the watercraft stored in direct sunlight. Never store watercraft in a plastic bag.

## Preseason Preparation

Maintenance preparation must be performed in conjunction with *MAINTENANCE SCHEDULE*.

Ensure to perform all tasks included in the **100 HOURS OR 1 YEAR** column before storage.

Preseason maintenance preparation may be performed by an authorized Sea-Doo dealer, repair shop or person of your own choosing.

**NOTE:** Though not required, it is recommended that an authorized Sea-Doo dealer perform preseason maintenance preparation at the same time that any safety-related factory campaigns are performed by the authorized Sea-Doo dealer.

### WARNING

Only perform procedures as detailed in the *MAINTENANCE SCHEDULE*. It is recommended that the assistance of an authorized Sea-Doo dealer be periodically obtained on other components and systems not covered in this guide.

**NOTICE** When component conditions seem less than satisfactory, replace using genuine BRP parts, or equivalents.

# ***TECHNICAL INFORMATION***

# WATERCRAFT IDENTIFICATION

The main components of the watercraft (engine and hull) are identified by different serial numbers. It may sometimes become necessary to locate these numbers for warranty purposes or to trace the watercraft in the event of theft.

## Hull Identification Number

The Hull Identification Number (HIN) is engraved on the right hand side of the hull at the rear of watercraft, above the front of the sponson.



**TYPICAL**

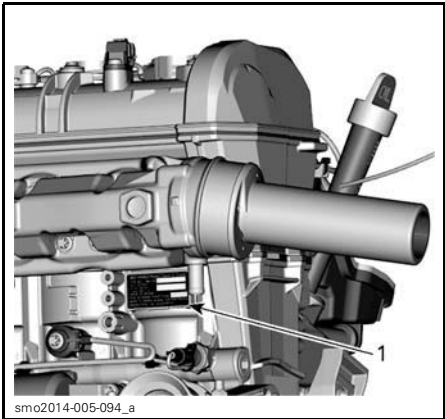
1. Hull Identification Number (HIN)

It is composed of 12 digits:

|                                        |       |   |   |    |
|----------------------------------------|-------|---|---|----|
| YDV                                    | 12345 | L | 8 | 09 |
| Model year                             |       |   |   |    |
| Year of production                     |       |   |   |    |
| Month of production                    |       |   |   |    |
| Serial number                          |       |   |   |    |
| (a letter may also be used as a digit) |       |   |   |    |
| Manufacturer                           |       |   |   |    |

## Engine Identification Number

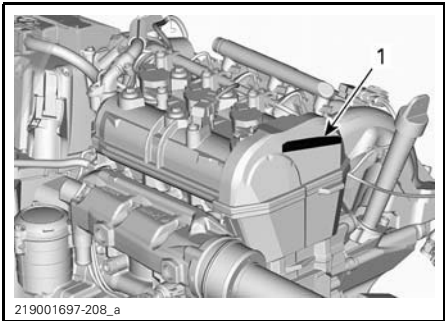
The Engine Identification Number (EIN) is located under the exhaust manifold, close to cylinder number one.



**TYPICAL**

1. Engine Identification Number (EIN)

## Engine Manufacturer Identification



1. Engine Manufacturer Identification





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## RF D.E.S.S. KEY (IF APPLICABLE)

This device complies with FCC Part 15 and Industry Canada license exempt RSS standard(s).

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

IC Registration Number: 12006A-M01456

FCC ID: 2ACERM01456

We, the party responsible for compliance, declare under our sole responsibility that the device is in conformity with the provisions of the following Council Directive: 2014/53/EU. To which this declaration relates is in conformity with the essential requirements and other relevant requirements. The product is in conformity with the following directives, harmonized standards and regulations:

Radio Equipment Directive (RED) 2014/53/EU and Harmonized Standards:

EN 300 330-2, EN 60950-1

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# ENGINE EMISSIONS INFORMATION

## Manufacturer's Responsibility

Beginning with 1999 model year engines, PWC manufacturers of marine 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 watercraft at the time of manufacture.

## Dealer's Responsibility

When performing service on all 1999 and more recent Sea-Doo watercraft 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 manufacturer's prescribed changes, such as altitude adjustments for example.

## 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 to modify the engine in any manner that would alter the horsepower or allow emissions levels to exceed their predetermined factory specifications.

## EPA Emission Regulations

All 1999 and more recent Sea-Doo watercraft manufactured by BRP are certified to the EPA as conforming to the requirements of the regulations for the control of air pollution from new watercraft engines. This certification is contingent on certain adjustments being set to factory standards. For this reason, the factory procedure for servicing the product must be strictly followed and, whenever practicable, returned to the original intent of the design.

The responsibilities listed above are general and in no way a complete listing of the rules and regulations pertaining to the EPA requirements on exhaust emissions for marine products. For more detailed information on this subject, you may contact:

U.S. Environmental Protection Agency  
Certification Division  
Gasoline Engine Compliance Center  
2000 Traverwood Drive  
Ann Arbor MI 48105  
USA

EPA INTERNET WEB SITE:  
[www.epa.gov/otaa](http://www.epa.gov/otaa)

## EVAPORATIVE EMISSION CONTROL SYSTEM

Starting with MY2018; personal watercraft sold in the State of California are certified to the California evaporative emissions regulations for spark ignition marine watercraft of the California Air Resources Board (13 CCR 2850 to 2869). These models are equipped with an evaporative emission control system consisting of Low Permeation Fuel Tank (LPFT), Low Permeation Fuel Line (LPFL) and a Pressure Relief Valve (PRV).

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**EAC DECLARATION OF CONFORMITY**

***Left blank for Eurasian Conformity  
mark where applicable***

# SPECIFICATIONS

| SPARK                         |                                                                     |                                                                                                               |
|-------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| ENGINE                        |                                                                     |                                                                                                               |
| Type                          |                                                                     | Rotax 903                                                                                                     |
| Model                         | Rotax 900 ACE - 60<br>Rotax 900 ACE - 90                            |                                                                                                               |
|                               | 4-stroke, Double Over Head Camshaft (DOHC), dry sump, liquid cooled |                                                                                                               |
| Declared Power <sup>(1)</sup> | Rotax 900 ACE - 60                                                  | 44.13 kW @ 7000 RPM                                                                                           |
|                               | Rotax 900 ACE - 90                                                  | 66.19 kW @ 8000 RPM                                                                                           |
| Induction                     |                                                                     | Naturally-aspirated                                                                                           |
| Number of cylinders           |                                                                     | 3                                                                                                             |
| Number of valves              |                                                                     | 12 valves (self adjusting hydraulic valve lifters)                                                            |
| Bore                          |                                                                     | 74 mm (2.9 in)                                                                                                |
| Stroke                        |                                                                     | 69.7 mm (2.7 in)                                                                                              |
| Displacement                  |                                                                     | 899.31 cm <sup>3</sup> (54.88 in <sup>3</sup> )                                                               |
| Compression ratio             |                                                                     | 11.0:1                                                                                                        |
| COOLING SYSTEM                |                                                                     |                                                                                                               |
| Type                          |                                                                     | Closed-loop cooling system (CLCS)                                                                             |
| FUEL SYSTEM                   |                                                                     |                                                                                                               |
| Fuel injection type           |                                                                     | Multipoint fuel injection with iTC (intelligent Throttle Control). Single throttle body (46 mm) with actuator |
| ELECTRICAL SYSTEM             |                                                                     |                                                                                                               |
| Ignition                      |                                                                     | IDI (inductive discharge ignition)                                                                            |
| Spark plug                    | Make and type                                                       | NGK CR8EB or equivalent                                                                                       |
|                               | Gap                                                                 | 0.70 mm to 0.80 mm<br>(.028 in to .031 in)                                                                    |
| Battery                       |                                                                     | 12 V                                                                                                          |

| SPARK                       |                                                  |     |                                                                      |
|-----------------------------|--------------------------------------------------|-----|----------------------------------------------------------------------|
| PROPULSION                  |                                                  |     |                                                                      |
| Propulsion system           |                                                  |     | Sea-Doo® jet pump                                                    |
| Jet pump                    | Type                                             |     | Axial flow, single stage.<br>Large hub with double row ball bearings |
|                             | Material                                         |     | Aluminum                                                             |
| Impeller                    |                                                  |     | Stainless steel                                                      |
| Transmission                | Type                                             |     | Direct drive                                                         |
| DIMENSIONS                  |                                                  |     |                                                                      |
| Length                      | 2UP                                              |     | 279 cm (110 in)                                                      |
|                             | 3UP                                              |     | 305 cm (120 in)                                                      |
| Width                       |                                                  |     | 118 cm (46 in)                                                       |
| Height                      | All Except Trixx Models                          |     | 104 cm (41 in)                                                       |
|                             | Trixx Models                                     |     | 107 cm (42 in)                                                       |
| WEIGHT AND LOADING CAPACITY |                                                  |     |                                                                      |
| Weight (dry)                | Spark 900 ACE - 60                               | 2UP | 186 kg (410 lb)                                                      |
|                             | Spark 900 ACE - 90                               | 2UP | 186 kg (410 lb)                                                      |
|                             |                                                  | 3UP | 193 kg (425 lb)                                                      |
|                             | Spark Trixx                                      | 2UP | 194 kg (428 lb)                                                      |
|                             |                                                  | 3UP | 199 kg (439 lb)                                                      |
| Rider capacity              | 2UP models                                       |     | 2 (refer to load limit)                                              |
|                             | 3UP models                                       |     | 3 (refer to load limit)                                              |
| Storage capacity            | Storage bin (Convenience Package)                |     | 27 L (7 U.S. gal.)                                                   |
|                             | Glove box                                        |     | 1.6 L (.42 U.S. gal.)                                                |
|                             | Rear under-seat storage compartment (3UP models) |     | 0.5 L (.13 U.S. gal.)                                                |
| Load limit (passenger)      | 2UP models                                       |     | 160 kg (352 lb)                                                      |
|                             | 3UP models                                       |     | 205 kg (450 lb)                                                      |

SPARK

| FLUIDS         |                                  |                                                                                                                                                |
|----------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Fuel           | Type                             | Regular unleaded<br>Refer to <i>FUEL REQUIREMENTS</i>                                                                                          |
|                | Minimum octane                   | 87 Pump Posted<br>AKI (RON+MON)/2<br>(Inside North America)<br>91 (RON) E10 (Outside North America)                                            |
|                | Tank capacity                    | 30 L (7.9 U.S. gal.)                                                                                                                           |
| Engine oil     | Recommended oil                  | Scandinavia : 4T 5W40<br>SYNTHETIC BLEND<br>OIL (EUR) (P/N 779290)<br>All other countries : 4T 5W40<br>SYNTHETIC BLEND OIL<br>(P/N 779133)     |
|                | Alternative, or if not available | Use a 5W40 motor oil that meets the requirements for API service classification SJ, SL, SM or SN.<br>Refer to <i>RECOMMENDED ENGINE OIL</i>    |
|                | Capacity                         | 2.01 L (2.12 qt (U.S. liq.)) oil change w/filter <sup>(2)</sup>                                                                                |
| Cooling system | 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 | Use a low silicate, extended life ethylene-glycol premixed coolant (50%-50%) specifically formulated for internal combustion aluminum engines. |
|                | Capacity                         | 3.0 L (3.2 qt (U.S. liq.))                                                                                                                     |

(1) Declared power as per ISO 8665 at propeller-shaft.

(2) Quantity required when changing engine oil. Total quantity for a dry engine is 3.4 L (3.6 qt (U.S. liq.)).

**NOTE:** BRP reserves the right to make changes in design and specifications and/or to make additions to, or improvements in its products without imposing any obligation upon itself to install them on its products previously manufactured.

# ***TROUBLESHOOTING***

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# TROUBLESHOOTING GUIDELINES

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## ENGINE WILL NOT START

1. **Burnt fuse: main, electric starter or ECM.**
  - *Check wiring then replace fuse(s).*
2. **ECM does not recognize the D.E.S.S. key (If applicable).**
  - *Refer to an authorized Sea-Doo dealer.*
3. **Discharged battery.**
  - *Charge battery. Refer to CHARGING A BATTERY in BATTERY.*



### WARNING

Do not charge or boost the battery while installed on the watercraft. Electrolyte is poisonous and dangerous. Avoid contact with eyes, skin and clothing.

4. **Battery connections, corroded or loose. Bad ground.**
  - *Refer to an authorized Sea-Doo dealer.*
5. **Water-flooded engine.**
  - *Refer to WATER-FLOODED ENGINE in SPECIAL PROCEDURES.*
6. **Faulty sensor or ECM.**
  - *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*
7. **Seized jet pump.**
  - *Try to clean. Otherwise, refer to an authorized Sea-Doo dealer.*

---

## ENGINE CRANKS SLOWLY

1. **Loose battery cable connections.**
  - *Check/clean/tighten.*
2. **Discharged or weak battery.**
  - *Charge battery. Refer to CHARGING A BATTERY in BATTERY.*
3. **Worn starter.**
  - *Refer to an authorized Sea-Doo dealer.*

---

## ENGINE TURNS NORMALLY BUT WILL NOT START

1. **Fuel tank empty or water-contaminated.**
  - *Refill. Siphon and fill with fresh fuel.*
2. **Fouled/defective spark plugs.**
  - *Replace.*
3. **Blown fuse.**
  - *Check wiring then replace fuse(s).*



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**ENGINE TURNS NORMALLY BUT WILL NOT START (cont'd)**

---

**4. Water-flooded engine.**

- *Refer to WATER-FLOODED ENGINE in SPECIAL PROCEDURES.*

**5. Engine management system fault detected (check engine pilot lamp is ON).**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

**6. Faulty fuel pump.**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

---

**ENGINE MISFIRES, RUNS IRREGULARLY**

---

**1. Fouled/defective/worn spark plugs.**

- *Replace.*

**2. Fuel: Level too low, stale or water-contaminated.**

- *Siphon and/or refill.*

**3. Faulty ignition coil(s).**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

**4. Clogged injectors.**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

**5. Engine management system fault detected (check engine pilot lamp is ON).**

- *Refer to MONITORING SYSTEM.*

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**ENGINE SMOKE**

---

**1. Oil level too high.**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

**2. Water ingestion, coolant leak or damaged cylinder head gasket.**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

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**ENGINE SMOKE (cont'd)**

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**3. Internal engine damage.**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

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**ENGINE OVERHEATS**

---

**1. Clogged exhaust system.**

- *Flush exhaust system.*

**2. Engine coolant level too low.**

- *Refer to MAINTENANCE PROCEDURES.*

**3. Quick connect adapter left in flushing connector.**

- *Remove adapter from flushing connector and retry watercraft. If problem persists, seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

---

**ENGINE LACKS ACCELERATION OR POWER**

---

**1. Not in Sport mode (Rotax® 900 ACE — 90).**

- *Select Sport mode.*

**2. Jet pump water intake clogged.**

- *Clean. Refer to JET PUMP WATER INTAKE AND IMPELLER CLEANING in SPECIAL PROCEDURES section.*

**3. Damaged impeller or worn-out wear ring.**

- *Replace. Refer to an authorized Sea-Doo dealer.*

**4. Engine oil level too high.**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

**5. Weak spark.**

- *Refer to ENGINE MISFIRES, RUNS IRREGULARLY.*

**6. Engine management system fault detected (check engine pilot lamp is ON).**

- *Refer to MONITORING SYSTEM.*

**7. Clogged injectors.**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

---

**ENGINE LACKS ACCELERATION OR POWER (cont'd)**

---

**8. Low fuel pressure.**

- *Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the US EPA EMISSION-RELATED WARRANTY contained herein for information about warranty claims.*

**9. Water in fuel.**

- *Siphon and replace.*

**10. Engine damaged by water ingestion.**

- *Refer to an authorized Sea-Doo dealer.*

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**WATERCRAFT CANNOT REACH TOP SPEED**

---

**1. Jet pump water intake clogged.**

- *Clean. Refer to JET PUMP WATER INTAKE AND IMPELLER CLEANING in SPECIAL PROCEDURES section.*

**2. Damaged impeller or worn-out wear ring.**

- *Replace. Refer to an authorized Sea-Doo dealer.*

**3. Engine management system fault detected (check engine pilot lamp is ON).**

- *Refer to MONITORING SYSTEM.*

---

**WATERCRAFT STAYS IN NEUTRAL AFTER OPERATING THE iBR LEVER (MODELS WITH iBR)**

---

**1. The iBR gate stays in neutral.**

- *Release the throttle to idle RPM.*
- *Refer to an authorized Sea-Doo dealer.*

---

**iBR WILL NOT RETURN TO NEUTRAL POSITION (iBR INDICATOR LIGHT ON) (MODELS WITH iBR)**

---

**1. iBR jammed with debris.**

- *Clean and check for damage in the iBR gate and nozzle area.*

**2. iBR system malfunction.**

- *Remove tether cord and wait 5 minutes.*
- *Press engine START/STOP button.*
- *Install tether cord and check iBR light to ensure fault is cleared.*
- *Refer to an authorized Sea-Doo dealer if fault persists or reoccurs frequently.*

---

**iBR WILL NOT RETURN TO NEUTRAL POSITION (iBR FAULT INDICATOR OFF) (MODELS WITH iBR)**

---

**1. Throttle lever not fully released during operation.**

- *Release throttle lever fully to ensure iBR gate returns to neutral.*

**2. Throttle lever does not fully return to null when released.**

- *Refer to an authorized Sea-Doo dealer.*

## ABNORMAL NOISE FROM PROPULSION SYSTEM

---

### 1. Weeds or debris jammed around impeller.

- *Clean. Refer to JET PUMP WATER INTAKE AND IMPELLER CLEANING in SPECIAL PROCEDURES section.*
- *Check for damage.*

### 2. Damaged impeller shaft or drive shaft.

- *Refer to an authorized Sea-Doo dealer.*

### 3. Water intrusion in jet pump causing bearing seizure.

- *Refer to an authorized Sea-Doo dealer.*

## WATER FOUND IN BILGE

---

### 1. Bailer system malfunction.

- *Have system inspected by an authorized Sea-Doo dealer.*

### 2. Exhaust system leak.

- *Refer to an authorized Sea-Doo dealer.*

### 3. Perimeter seal between hull and deck may have to be replaced.

- *Refer to an authorized Sea-Doo dealer.*

### 4. Seals between front and center decks and between rear and center decks may have to be replaced.

- *Refer to an authorized Sea-Doo dealer.*

### 5. Drive shaft bellows damaged or incorrectly installed.

- *Refer to an authorized Sea-Doo dealer.*

### 6. PTO water seal damaged.

- *Refer to an authorized Sea-Doo dealer.*

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## MONITORING SYSTEM

A system monitors the electronic components of the EMS (engine management system) iBR (models with iBR), and other components of the electrical system. When a fault occurs, it sends visual messages through the multi-function gauge and/or audible signals through a beeper to inform you of a particular condition.

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

Releasing the throttle and letting the engine return to idle speed may allow normal operation to return. If this does not work, try removing the tether cord from the engine cut-off switch, waiting 5 minutes, then restarting.

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

When a fault occurs, please refer to the *US EPA EMISSION-RELATED WARRANTY* contained herein for information about warranty claims.

Fault Indicators and Message Display Information

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

If a fault indicator or a fault message comes ON in the multifunction gauge, seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the *US EPA EMISSION-RELATED WARRANTY* contained herein for information about warranty claims.

For information on usual function indicators, refer to *MULTIFUNCTION GAUGE* section as applicable to model.

| FAULT INDICATOR (ON)                                                              | MESSAGE DISPLAY                | DESCRIPTION                                                                                                                   |
|-----------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
|  | HIGH TEMPERATURE               | Engine or exhaust system overheating                                                                                          |
|  | CHECK ENGINE or LIMP HOME MODE | Check engine (minor fault requiring maintenance) or iBR system fault (models with iBR) or LIMP HOME MODE (major engine fault) |
|                                                                                   | LOW or HIGH BATTERY VOLTAGE    | Low/high battery voltage                                                                                                      |
|  | LOW OIL PRESSURE               | Low engine oil pressure detected                                                                                              |
| Models with iBR                                                                   |                                |                                                                                                                               |
|  | IBR MODULE ERROR_              | iBR system fault                                                                                                              |

| MESSAGE DISPLAY INFORMATION        |                                                   |
|------------------------------------|---------------------------------------------------|
| LOW OIL PRESSURE                   | Engine low oil pressure detected                  |
| HIGH EXHAUST TEMPERATURE           | High exhaust temperature detected                 |
| HIGH TEMPERATURE                   | High engine temperature detected                  |
| CHECK ENGINE                       | Engine system malfunction or maintenance required |
| HIGH BATTERY VOLTAGE               | High battery voltage detected                     |
| LOW BATTERY VOLTAGE                | Low battery voltage detected                      |
| LIMP HOME MODE                     | Major fault detected, engine power limited        |
| FUEL SENSOR DEFECTIVE              | Fuel level sensor fault                           |
| IBR MODULE ERROR (models with iBR) | iBR system malfunction                            |
| CALIBRATION CHECKSUM ERROR         | Cluster programming corrupted                     |
| MAINTENANCE REQUIRED               | Watercraft maintenance required                   |

**NOTICE** Running engine with low oil pressure may severely damage the engine.

Beeper Code Information

| BEEPER CODES                                                               | DESCRIPTION                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 long beep<br>(when installing tether<br>cord on engine cut-off<br>switch | <b>Models with D.E.S.S.: Bad D.E.S.S. system connection.</b><br>Reinstall tether cord correctly on engine cut-off switcht.                                                                                                                                                                                                                            |
|                                                                            | <b>Models with D.E.S.S.: Wrong D.E.S.S. key.</b><br>Use a tether cord that has been programmed for the watercraft.                                                                                                                                                                                                                                    |
|                                                                            | <b>Models with D.E.S.S.: Defective D.E.S.S. key.</b><br>Use another programmed tether cord.                                                                                                                                                                                                                                                           |
|                                                                            | <b>Defective engine cut-off switch.</b><br>Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the <i>US EPA EMISSION-RELATED WARRANTY</i> contained herein for information about warranty claims.                                                   |
|                                                                            | <b>Improper operation of ECM or defective wiring harness.</b><br>Refer to an authorized Sea-Doo dealer.                                                                                                                                                                                                                                               |
| A 2 second beep<br>every 15 minute interval                                | <b>Engine management system fault.</b><br>Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the <i>US EPA EMISSION-RELATED WARRANTY</i> contained herein for information about warranty claims.                                                    |
| A 2 second beep<br>every 5 minute interval                                 | <b>Low fuel level.</b><br>Refill fuel tank. If problem persists, refer to an authorized Sea-Doo dealer.                                                                                                                                                                                                                                               |
|                                                                            | <b>Fuel tank level sensor or circuit malfunction.</b><br>Refer to an authorized Sea-Doo dealer.                                                                                                                                                                                                                                                       |
| Continuously beeps                                                         | <b>High engine coolant temperature.</b><br>See <i>ENGINE OVERHEATING</i> .                                                                                                                                                                                                                                                                            |
|                                                                            | <b>High exhaust temperature.</b><br>Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the <i>US EPA EMISSION-RELATED WARRANTY</i> contained herein for information about warranty claims.                                                          |
|                                                                            | <b>Low oil pressure.</b><br>Turn off engine as soon as possible. Check oil level and refill. Seek service from an authorized Sea-Doo dealer, repair shop, or person of your own choosing for maintenance, repair, or replacement. Please refer to the <i>US EPA EMISSION-RELATED WARRANTY</i> contained herein for information about warranty claims. |



**NOTICE** If the monitoring beeper continuously sounds, stop engine as soon as possible.

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intentionally blank***

# ***WARRANTY***

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# **BRP LIMITED WARRANTY – USA AND CANADA: 2021 SEA-DOO® PERSONAL WATERCRAFT**

## **1. SCOPE**

Bombardier Recreational Products Inc. ("BRP")\* warrants its model-year 2021 Sea-Doo personal watercraft sold by authorized BRP Dealers (as defined below) in the United States of America ("USA") and in Canada from defects in material or workmanship for the period and under the conditions described below. This limited warranty will become null and void if: (1) the Sea-Doo personal watercraft was used for racing or any other competitive activity, at any point, even by a previous owner; or (2) the Sea-Doo personal watercraft has been altered or modified in such a way so as to adversely affect its operation, performance or durability, or has been altered or modified to change its intended use.

Non-factory installed parts and accessories are not covered under this limited warranty. Please refer to the applicable parts and accessories limited warranty text.

## **2. LIMITATIONS OF LIABILITY**

THIS WARRANTY IS EXPRESSLY GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT THAT THEY CANNOT BE DISCLAIMED, THE IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE LIFE OF THE EXPRESS WARRANTY. INCIDENTAL AND CONSEQUENTIAL DAMAGES ARE EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. SOME STATES/PROVINCES DO NOT ALLOW FOR THE DISCLAIMERS, LIMITATIONS AND EXCLUSIONS IDENTIFIED ABOVE, AS A RESULT, THEY MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC RIGHTS, AND YOU MAY ALSO HAVE OTHER LEGAL RIGHTS WHICH MAY VARY FROM STATE TO STATE, OR PROVINCE TO PROVINCE.

Neither the distributor, any BRP dealer nor any other person has been authorized to make any affirmation, representation or warranty regarding the product, other than those contained in this limited warranty, and if made, shall not be enforceable against BRP. BRP reserves the right to modify this limited warranty at any time, being understood that such modification will not alter the warranty conditions applicable to the products sold while this warranty is in effect.

## **3. EXCLUSIONS – ARE NOT WARRANTED**

The following are not warranted under any circumstances:

- Normal wear and tear;
- Routine maintenance items, tune ups, adjustments;
- Damage caused by failure to provide proper maintenance and/or storage, as described in the Operator's Guide;
- Damage resulting from removal of parts, improper repairs, service, maintenance, modifications or use of parts not manufactured or approved by BRP or resulting from repairs done by a person that is not an authorized servicing BRP dealer;
- Damage caused by abuse, abnormal use, neglect, or operation of the product in a manner inconsistent with the recommended operation described in the Operator's Guide;

- Damage resulting from accident, submersion, fire, theft, vandalism or any act of God;
- Operation with fuels, oils or lubricants which are not suitable for use with the product (see the Operator's Guide);
- Damage from rust, corrosion or exposure to the elements;
- Damage from cooling system or jet pump blockage by foreign material;
- Water damages caused by water ingestion;
- Damages related to gel coat finish including but not limited to cosmetic gel coat finish, blisters or fiberglass delamination caused by blisters, crazing, spider or hairline cracks; and
- Incidental or consequential damages, or damages of any kind including without limitation towing, storage, telephone, rental, taxi, inconvenience, insurance coverage, loan payments, loss of time, loss of income.

#### **4. WARRANTY COVERAGE PERIOD**

This limited warranty will be in effect from (1) the date of delivery to the first retail consumer or (2) the date the product is first put into use, whichever occurs first and for the applicable period below:

1. TWELVE (12) CONSECUTIVE MONTHS for private use owners.
2. FOUR (4) CONSECUTIVE MONTHS for commercial use owners. A personal watercraft is used commercially when it is used in connection with generating income or any work or employment during any part of the warranty period. A personal watercraft is also used commercially when, at any point during the warranty period, it has commercial tags or is licensed for commercial use. This is a minimal warranty period which can be extended by any applicable warranty promotional program, as the case may be.
3. For emission-related components; please also refer to the *US EPA EMISSION-RELATED WARRANTY* contained herein.
4. For Sea-Doo personal watercrafts produced by BRP for sale in the State of California or New York that are originally sold to a resident or subsequently warranty registered to a resident in the State of California or New York, please also refer to the applicable California and New York Emissions Control Warranty Statement contained herein.
5. For Sea-Doo personal watercrafts produced by BRP for sale in the State of California that are originally sold to a resident or subsequently warranty registered to a resident in the State of California, please also refer to the CALIFORNIA EVAPORATIVE EMISSIONS CONTROL SYSTEM WARRANTY STATEMENT contained herein.

The repair or replacement of parts or the performance of service under any applicable warranty does not extend the life of such warranty beyond its original expiration date.

## **5. CONDITIONS REQUIRED FOR WARRANTY COVERAGE**

This limited warranty coverage is available **only if each** of the following conditions has been fulfilled:

- The 2021 Sea-Doo personal watercraft must be purchased as new and unused by its first owner from a BRP dealer authorized to distribute Sea-Doo personal watercraft in the country in which the sale occurred;
- The BRP specified predelivery inspection process must be completed and documented and signed by the purchaser;
- The 2021 Sea-Doo personal watercraft must have undergone proper registration by an authorized BRP dealer;
- The 2021 Sea-Doo personal watercraft must be purchased in the country in which the purchaser resides; and
- Routine maintenance outlined in the Operator's Guide must be timely performed in order to maintain warranty coverage. BRP reserves the right to make warranty coverage contingent upon proof of proper maintenance.

BRP will not honour this limited warranty to any private use owner or commercial use owner if one of the preceding conditions has not been met. Such limitations are necessary in order to allow BRP to preserve both the safety of its products, and also that of its consumers and the general public.

## **6. WHAT TO DO TO OBTAIN WARRANTY COVERAGE**

The customer must cease using the Sea-Doo personal watercraft upon the appearance of an anomaly. The customer must notify an authorized servicing BRP dealer within three (3) days of the appearance of a defect, and provide it with reasonable access to the product and reasonable opportunity to repair it. The customer must also present to the authorized BRP dealer, proof of purchase of the product and must sign the repair/work order prior to the start of the repair in order to validate the warranty repair. All parts replaced under this limited warranty become the property of BRP.

## **7. WHAT BRP WILL DO**

BRP's obligations under this warranty are limited to, at its sole discretion, repairing parts found defective under normal use, maintenance and service, or replacing such parts with new genuine BRP parts without charge for parts and labor, at any authorized BRP dealer during the applicable warranty coverage period under the conditions described herein. No claim of breach of warranty shall be the cause for cancellation or rescission of the sale of the Sea-Doo personal watercraft to the owner.

In the event that service is required outside of the country of original sale, the owner will bear responsibility for any additional charges due to local practices and conditions, such as, but not limited to freight, insurance, taxes, license fees, import duties, and any and all other financial charges, including those levied by governments, states, territories and their respective agencies.

BRP reserves the right to improve or modify products from time to time without assuming any obligation to modify products previously manufactured.

## 8. TRANSFER

If the ownership of a product is transferred during the warranty coverage period, this limited warranty, subject to its terms and conditions, shall also be transferred and be valid for the remaining coverage period provided BRP or an authorized Sea-Doo Distributor/Dealer receives a proof that the former owner agreed to the transfer of ownership, in addition to the co-ordinates of the new owner.

## 9. CONSUMER ASSISTANCE

In the event of a controversy or a dispute in connection with this BRP limited warranty, BRP suggests that you try to resolve the issue at the dealership level. We recommend discussing the issue with the authorized BRP dealer's service manager or owner.

If the matter still remains unresolved, contact BRP by filling out the customer contact form at [www.brp.com](http://www.brp.com) or contact BRP by mail at one of the addresses listed under the *CONTACT US* section of this guide.

\* In the USA, products are distributed and serviced by BRP US Inc.

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# US EPA EMISSION-RELATED WARRANTY

Bombardier Recreational Products Inc. ("BRP")\*\* warrants to the ultimate purchaser and each subsequent purchaser that this new engine, including all parts of its exhaust emission control system and its evaporative emission control system, meets two conditions:

1. It is designed, built, and equipped so it conforms at the time of sale to the ultimate purchaser with the requirements of 40 CFR 1045 and 40 CFR 1060.
2. It is free from defects in materials and workmanship that may keep it from meeting the requirements of 40 CFR 1045 and 40 CFR 1060.

Where a warrantable condition exists, BRP will repair or replace, as it elects, any part or component with a defect in materials or workmanship that would increase the engine's emissions of any regulated pollutant within the stated warranty period at no cost to the owner, including expenses related to diagnosing and repairing or replacing emission-related parts. All defective parts replaced under this warranty become the property of BRP.

For all emission-related warranty claims, BRP is limiting the diagnosis and repair of emission-related parts to the authorized Sea-Doo dealers, unless for emergency repairs as required by item 2 of the following list.

As a certifying manufacturer, BRP will not deny emission-related warranty claims based on any of the following:

1. Maintenance or other service BRP or BRP's authorized facilities performed.
2. Engine/equipment repair work that an operator performed to correct an unsafe, emergency condition attributable to BRP as long as the operator tries to restore the engine/equipment to its proper configuration as soon as possible.
3. Any action or inaction by the operator unrelated to the warranty claim.
4. Maintenance that was performed more frequently than BRP specify.
5. Anything that is BRP fault or responsibility.
6. The use of any fuel that is commonly available where the equipment operates unless BRP written maintenance instructions state that this fuel would harm the equipment's emission control system and operators can readily find the proper fuel. See maintenance information section and fuel requirements of fueling section.

## Emission-Related Warranty Period

The emission-related warranty is valid for the following period whichever comes first:

|                                         | HOURS | MONTHS |
|-----------------------------------------|-------|--------|
| Exhaust emission-related components     | 175   | 30     |
| Evaporative emission-related components | N/A   | 24     |



## Components Covered

The emission-related warranty covers all components whose failure would increase an engine's emissions of any regulated pollutant, including the following listed components:

1. For exhaust emissions, emission-related components include any engine parts related to the following systems:
  - Air-induction system
  - Fuel system
  - Ignition system
  - Exhaust gas recirculation systems
2. The following parts are also considered emission-related components for exhaust emissions:
  - Aftertreatment devices
  - Crankcase ventilation valves
  - Sensors
  - Electronic control units
3. The following parts are considered emission-related components for evaporative emissions:
  - Fuel tank
  - Fuel cap
  - Fuel line
  - Fuel line fittings
  - Clamps\*
  - Pressure relief valves\*
  - Control valves\*
  - Control solenoids\*
  - Electronic controls\*
  - Vacuum control diaphragms\*
  - Control cables\*
  - Control linkages\*
  - Purge valves
  - Vapor hoses
  - Liquid/vapor separator
  - Carbon canister
  - Canister mounting brackets
  - Carburetor purge port connector
4. Emission-related components also include any other part whose only purpose is to reduce emissions or whose failure will increase emissions without significantly degrading engine/equipment performance.

\*As related to the evaporative emission control system

## **Limited Applicability**

As a certifying manufacturer, BRP may deny emission-related warranty claims for failures that have been caused by the owner's or operator's improper maintenance or use, by accidents for which the manufacturer has no responsibility, or by acts of God. For example, an emission-related warranty claim need not be honored for failures that have been directly caused by the operator's abuse of the engine/equipment or the operator's use of the engine/equipment in a manner for which it was not designed and are not attributable to the manufacturer in any way.

If you have any question regarding your warranty rights and responsibility, you should contact Bombardier Recreational Products at 1-888-272-9222.

\*\* In the USA, products are distributed and serviced by BRP US Inc.

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# CALIFORNIA AND NEW YORK EMISSION CONTROL WARRANTY STATEMENT FOR MODEL YEAR 2021 SEA-DOO® PERSONAL WATERCRAFT

For California, your 2021 Sea-Doo personal watercraft has a special environmental label required by the California Air Resources Board. The label has 1, 2, 3 or 4 stars. A hangtag, provided with your personal watercraft, describes the meaning of the star rating system.

## The Star Label Means Cleaner Marine Engines

The Symbol for Cleaner Marine Engines:



F18L3CQ

## Cleaner Air and Water

For a healthier lifestyle and environment.

## Better Fuel Economy

Burns up to 30 - 40 percent less gas and oil than conventional carbureted two-stroke engines saving money and resources.

## Longer Emission Warranty

Protects consumer for worry free operation.

### One Star – Low Emission

The one-star label identifies personal watercraft, outboard, stern drive and inboard engines that meet the Air Resources Board's Personal Watercraft and Outboard marine engine 2001 exhaust emission standards. Engines meeting these standards have 75% lower emissions than conventional carbureted two-stroke engines. These engines are equivalent to the U.S. EPA's 2006 standards for marine engines.

### Two Stars – Very Low Emission

The two-star label identifies personal watercraft, outboard, stern drive and inboard engines that meet the Air Resources Board's Personal Watercraft and Outboard marine engine 2004 exhaust emission standards. Engines meeting these standards have 20% lower emissions than One Star - Low-Emission engines.

## **Three Stars – Ultra Low Emission**

The three-star label identifies engines that meet the Air Resources Board's Personal Watercraft and Outboard marine engine 2008 exhaust emission standards or the Stern drive and Inboard marine engine 2003 exhaust emission standards. Engines meeting these standards have 65% lower emissions than One Star – Low Emission engines.

## **Four Stars – Super Ultra Low Emission**

The four-star label identifies engines that meet the Air Resources Board's Stern-drive and Inboard marine engine 2012 exhaust emission standards. Personal Watercraft and Outboard marine engines may also comply with these standards. Engines meeting these standards have 90% lower emissions than One Star – Low Emission engines.

For more information: Cleaner Watercraft – Get the Facts  
1 800 END-SMOG  
[www.arb.ca.gov](http://www.arb.ca.gov)

## **Your Emission Control Warranty Rights and Obligations**

The California Air Resources Board, the New York State Department of Environmental Conservation and Bombardier Recreational Products Inc. ("BRP") are pleased to explain the emission control system warranty on your Model Year 2021 Sea-Doo personal watercraft. In California and New York, new personal watercraft engines must be designed, built and equipped to meet the State's stringent anti-smog standards. BRP must warrant the emission control system on your personal watercraft engine for the period of time listed below provided there has been no abuse, neglect or improper maintenance of your personal watercraft engine.

Your emission control system may include parts such as the fuel injection system, the ignition system and catalytic converter. Also included may be hoses, belts, connectors and other emission related assemblies.

Where a warrantable condition exists, BRP will repair your personal watercraft engine at no cost to you including diagnosis, parts and labor provided that such work is performed by an authorized BRP dealer.

## **Manufacturer's Limited Warranty Coverage**

This emission limited warranty covers Model Year 2021 Sea-Doo personal watercrafts certified and produced by BRP for sale in California or New York, that are originally sold in California or New York to a California or New York resident or subsequently warranty registered to a California or New York resident. The BRP limited warranty conditions for Sea-Doo personal watercrafts are still applicable to these models with the necessary modifications. Select emission control parts of your 2021 Sea-Doo personal watercrafts are warranted from the date of delivery to the first retail consumer for a period of 4 years, or for 250 hours of use, whichever occurs first. However, warranty coverage based on the hourly period is only permitted for personal watercraft equipped with the appropriate hour meters or their equivalent. If any emission-related part on your engine is defective under warranty, the part will be repaired or replaced by BRP.

**Parts covered for a Model Year 2021 Sea-Doo® personal watercraft:**

|                                        |                                    |
|----------------------------------------|------------------------------------|
| Idle bypass valve                      | Air intake adapter                 |
| Throttle position sensor               | Spark plugs                        |
| Intake manifold air pressure sensor    | Ignition coils                     |
| Intake manifold air temperature sensor | Air box                            |
| Engine temperature sensor              | Intake and exhaust valve and seals |
| Knock sensor                           | Intake manifold                    |
| Engine control module ECM              | Crankcase ventilation valve        |
| Throttle body                          | Throttle body seal                 |
| Fuel rail                              | Intake manifold seal               |
| Fuel injectors                         | Wire harness and connectors        |
| Fuel pressure regulator                | Fuel filter                        |
| Fuel pump                              | Supercharger                       |

The emission warranty covers damage to other engine components that is caused by the failure of a warranted part. The BRP Operator’s Guide provided contains written instructions for the proper maintenance and use of your personal watercraft. All emission warranty parts are warranted by BRP for the entire warranty period of the personal watercraft, unless the part is scheduled for replacement as required maintenance in the Operator’s Guide.

Emission warranty parts that are scheduled for replacement, as required maintenance, are warranted by BRP for the period of time before the first scheduled replacement date for that part. Emission warranty parts that are scheduled for regular inspection, but not regular replacement, are warranted by BRP for the entire warranty period of the personal watercraft. Any emission warranty part repaired or replaced under the terms of this warranty statement is warranted by BRP for the remainder of the warranty period of the original part. All parts replaced under this limited warranty become the property of BRP.

Maintenance receipts and records should be transferred to each subsequent owner of the personal watercraft.

## **Owner's Warranty Responsibilities**

As the owner of a 2021 Sea-Doo personal watercraft, you are responsible for the performance of the required maintenance listed in your Operator's Guide. BRP recommends that you retain all receipts covering maintenance your personal watercraft engine, but BRP cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.

As the owner of a Sea-Doo® personal watercraft, you should however be aware that BRP may deny you warranty coverage if your engine(s) or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your engine to an authorized BRP Dealer as soon as a problem exists. The warranty repairs will be completed in a reasonable amount of time, not to exceed 30 days.

If you have any questions regarding your warranty rights and responsibilities or for the name and location of the nearest authorized BRP Dealer you should contact the Customer Assistance Center at 1-888-272-9222.

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# **CALIFORNIA EVAPORATIVE EMISSIONS CONTROL SYSTEM WARRANTY STATEMENT**

## **YOUR WARRANTY RIGHTS AND OBLIGATIONS**

The California Air Resources Board is pleased to explain the evaporative emissions control system's warranty on your 2021 personal watercraft. In California, new SIMW must be designed, built, and equipped to meet the State's stringent anti-smog standards. Bombardier Recreational Products Inc. must warrant the evaporative emissions control system on your personal watercraft for the period listed below, provided there has been no abuse, neglect or improper maintenance of your SIMW.

Your evaporative emissions control system may include parts such as: canisters, carburetors, clamps, connectors, filters, fuel caps, fuel lines, fuel tanks, valves, vapour hoses, and other associated evaporative emissions control system components.

## **MANUFACTURER'S WARRANTY COVERAGE:**

This evaporative emissions control system is warranted for two years. If any evaporative emission-related part on your SIMW is defective, the part will be repaired or replaced by Bombardier Recreational Products Inc.

### **PARTS COVERED:**

1. Clamp(s)\*
2. Fuel Cap
3. Fuel Line
4. Fuel Line Fitting(s)
5. Fuel Tank
6. Pressure Relief Valve(s)\*
7. Vapor Hose(s)
8. All other parts not listed that may affect the evaporative emissions control system

\*Note: As they relate to the evaporative emissions control system.

## **OWNER'S WARRANTY RESPONSIBILITIES:**

As the personal watercraft owner, you are responsible for performance of the required maintenance listed in your owner's manual. Bombardier Recreational Products Inc. recommends that you retain all receipts covering maintenance on your personal watercraft, but Bombardier Recreational Products Inc. cannot deny warranty solely for the lack of receipts.

As the personal watercraft owner, you should however be aware that Bombardier Recreational Products Inc. may deny you warranty coverage if your personal watercraft or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your personal watercraft to a Bombardier Recreational Products Inc. distribution center or service center as soon as the problem exists. The warranty repairs should be completed in a reasonable

amount of time, not to exceed 30 calendar days. If you have question regarding your warranty coverage, you should contact Bombardier Recreational Products at 1-888-272-9222.



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# **BRP INTERNATIONAL LIMITED WARRANTY: 2021 SEA-DOO® PERSONAL WATERCRAFT**

## **1. SCOPE OF THE LIMITED WARRANTY**

Bombardier Recreational Products Inc. ("BRP")\* warrants its 2021 SEA-DOO PERSONAL WATERCRAFTS ("personal watercraft") sold by distributors or dealers authorized by BRP to distribute Sea-Doo Personal watercrafts ("Sea-Doo Distributor/Dealer") outside of the fifty United States, Canada, member states of the European Economic Area (which is comprised of the member states of the European Union plus the United Kingdom, Norway, Iceland and Liechtenstein) ("EEA"), member states of the Commonwealth of the Independent States (including Ukraine and Turkmenistan) ("CIS") and Turkey, from defects in material or workmanship for the period and under the conditions described below.

Non-factory installed parts and accessories are not covered under this limited warranty. Please refer to the applicable parts and accessories limited warranty text.

This limited warranty will become null and void if: (1) the personal watercraft was used for racing or any other competitive activity, at any point, even by a previous owner; or (2) the personal watercraft has been altered or modified in such a way so as to adversely affect its operation, performance or durability or (3) the personal watercraft has been altered or modified to change its intended use.

## **2. LIMITATIONS OF LIABILITY**

TO THE EXTENT PERMITTED BY LAW, THIS WARRANTY IS EXPRESSLY GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT THAT THEY CANNOT BE DISCLAIMED, THE IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE LIFE OF THE EXPRESS WARRANTY. INCIDENTAL AND CONSEQUENTIAL DAMAGES ARE EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. SOME JURISDICTIONS DO NOT ALLOW FOR THE DISCLAIMERS, LIMITATIONS AND EXCLUSIONS IDENTIFIED ABOVE, AS A RESULT, THEY MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC RIGHTS AND YOU MAY ALSO HAVE OTHER LEGAL RIGHTS WHICH MAY VARY FROM COUNTRY TO COUNTRY. (FOR PRODUCTS PURCHASED IN AUSTRALIA SEE CLAUSE 4 BELOW).

Neither the Sea-Doo Distributor/Dealer nor any other person has been authorized to make any affirmation, representation or warranty regarding the product, other than those contained in this limited warranty, and if made, shall not be enforceable against BRP.

BRP reserves the right to modify this warranty at any time, being understood that such modification will not alter the warranty conditions applicable to the products sold while this warranty is in effect.

## **3. EXCLUSIONS – ARE NOT WARRANTED**

The following are not warranted under this limited warranty under any circumstances:

- Replacement of parts due to normal wear and tear;
- Routine maintenance parts and services, including but not limited to tune ups, adjustments, oil, lubricant and coolant changes, spark plug replacement, water pumps and the like;

- Damage caused by negligence or failure to provide proper maintenance and/or storage, as described in the Operator's Guide;
- Damage resulting from removal of parts, improper repairs, service, maintenance, modification or use of parts or accessories not manufactured or approved by BRP which in its reasonable judgment are either incompatible with the product or adversely affect its operation, performance and durability, or resulting from repairs done by a person that is not an authorized servicing Sea-Doo Distributor/Dealer;
- Damage caused by abuse, misuse, abnormal use, neglect, racing, improper operation or operation of the product in a manner inconsistent with the recommended operation described in the Operator's Guide;
- Damage resulting from external damage, accident, submersion, fire, foreign object or water ingestion, theft, vandalism or any act of God;
- Operation with fuels, oils or lubricants which are not suitable for use with the product (see the Operator's Guide);
- Damage resulting from rust, corrosion or exposure to the elements;
- Damages from cooling system or jet pump blockage by foreign material;
- Damages to gel coat finish including but not limited to cosmetic gel coat finish defects, blisters, starring, crazing and fiberglass delamination caused by blisters, crazing, spider or hairline cracks; and
- Incidental or consequential damages, or damages of any kind including without limitation towing, storage, transportation expenses, telephone, rental, taxi, inconvenience, insurance coverage, loan payments, loss of time, loss of income or time missed for downtime experience due to service work.

## **4. WARRANTY COVERAGE PERIOD**

This limited warranty will be in effect from (1) the date of delivery to the first retail consumer or (2) the date the product is first put into use, whichever occurs first and for a period of:

1. TWELVE (12) CONSECUTIVE MONTHS for private, recreational use. For AUSTRALIA and NEW ZEALAND only, TWENTY-FOUR (24) CONSECUTIVE MONTHS for private, recreational use.
2. FOUR (4) CONSECUTIVE MONTHS for commercial use,  
This is a minimal warranty period which can be extended by any applicable warranty promotional program, as the case may be. A personal watercraft is used commercially when it is used in connection with generating income or any work or employment during any part of the warranty period. A personal watercraft is also used commercially when, at any point during the warranty period, it has commercial tags or is licensed for commercial use.

The repair or replacement of parts or the performance of service under this warranty does not extend the life of this warranty beyond its original expiration date.

Note that the duration and any other modalities of the warranty coverage are subject to the applicable national or local legislation in the customer's country.

### **FOR PRODUCTS SOLD IN AUSTRALIA ONLY**

Nothing in these Warranty terms and conditions should be taken to exclude, restrict or modify the application of any condition, warranty, guarantee, right or remedy conferred or implied under the Competition and Consumer Act 2010

(Cth), including the Australian Consumer Law or any other law, where to do so would contravene that law, or cause any part of these terms and conditions to be void. The benefits given to you under this limited warranty are in addition to other rights and remedies that you have under Australian law.

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

## **5. CONDITIONS TO HAVE WARRANTY COVERAGE**

This warranty coverage is available **only** if **each** of the following conditions has been fulfilled:

- The 2021 Sea-Doo personal watercraft must be purchased as new and unused by its first owner from a Sea-Doo Distributor/Dealer authorized to distribute Sea-Doo personal watercrafts in the country in which the sale occurred;
- The BRP specified pre-delivery inspection process must be completed and documented;
- The 2021 Sea-Doo personal watercraft must have undergone proper registration by an authorized Sea-Doo Distributor/Dealer;
- The 2021 Sea-Doo personal watercraft must have been purchased in the country or union of countries in which the purchaser resides.
- Routine maintenance outlined in the Operator's Guide must be timely performed in order to maintain warranty coverage. BRP reserves the right to make warranty coverage contingent upon proof of proper maintenance.

BRP will not honor this limited warranty to any private use owner or commercial use owner if one of the preceding conditions has not been met. Such limitations are necessary in order to allow BRP to preserve both the safety of its products, and also that of its consumers and the general public.

## **6. WHAT TO DO TO OBTAIN WARRANTY COVERAGE**

The customer must cease using the Sea-Doo personal watercraft upon the appearance of an anomaly. The customer must notify a servicing Sea-Doo Distributor/Dealer within two (2) days of the appearance of a defect, and provide it with reasonable access to the product and reasonable opportunity to repair it. The customer must also present to the authorized Sea-Doo Distributor/Dealer, proof of purchase of the product and must sign the repair/work order prior to starting the repair in order to validate the warranty repair. All parts replaced under this limited warranty become the property of BRP.

Note that the notification period is subject to the applicable national or local legislation in customer's country.

## **7. WHAT BRP WILL DO**

To the extent permitted by law, BRP's obligations under this warranty are limited to, at its sole discretion, repairing parts found defective under normal use, maintenance and service, or replacing such parts with new genuine BRP parts without charge for parts and labor, at any authorized Sea-Doo Distributor/Dealer during the warranty coverage period under the conditions described herein. BRP's

responsibility is limited to making the required repairs or replacements of parts. No claim of breach of warranty shall be cause for cancellation or rescission of the sale of the Sea-Doo personal watercraft to the owner. You may have other legal rights which may vary from country to country.

In the event that service is required outside of the country of original sale, the owner will bear responsibility for any additional charges due to local practices and conditions, such as, but not limited to, freight, insurance, taxes, license fees, import duties, and any and all other financial charges, including those levied by governments, states, territories and their respective agencies.

BRP reserves the right to improve or modify products from time to time without assuming any obligation to modify products previously manufactured.

## **8. TRANSFER**

If the ownership of a product is transferred during the warranty coverage period, this limited warranty, subject to its terms and conditions, shall also be transferred and be valid for the remaining coverage period provided BRP or an authorized Sea-Doo Distributor/Dealer receives a proof that the former owner agreed to the transfer of ownership, in addition to the coordinates of the new owner.

## **9. CONSUMER ASSISTANCE**

In the event of a controversy or a dispute in connection with this limited warranty, BRP suggests that you try to resolve the issue at the Sea-Doo Distributor/Dealer level. We recommend discussing the issue with the authorized Sea-Doo Distributor/Dealer's service manager or owner.

If the matter still remains unresolved, contact BRP by filling out the customer contact form at [www.brp.com](http://www.brp.com) or contact BRP by mail at one of the addresses listed under the *CONTACT US* section of this guide.

\* For the territory covered by this limited warranty, products are distributed and serviced by Bombardier Recreational Products Inc. or its affiliates.

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# **BRP LIMITED WARRANTY FOR THE EUROPEAN ECONOMIC AREA, THE COMMONWEALTH OF THE INDEPENDENT STATES AND TURKEY: 2021 SEA-DOO® PERSONAL WATERCRAFT**

## **1. SCOPE OF THE LIMITED WARRANTY**

Bombardier Recreational Products Inc. ("BRP")\* warrants its 2021 SEA-DOO PERSONAL WATERCRAFT ("personal watercraft") sold by distributors or dealers authorized by BRP to distribute Sea-Doo personal watercrafts ("Sea-Doo Distributor/Dealer") in member states of the European Economic Area (which is comprised of the member states of the European Union plus the United Kingdom, Norway, Iceland and Liechtenstein) ("EEA"), in member states of the Commonwealth of the Independent States (including Ukraine and Turkmenistan) ("CIS") and Turkey from defects in material or workmanship for the period and under the conditions described below.

Non-factory installed parts and accessories are not covered under this limited warranty. Please refer to the applicable parts and accessories limited warranty text.

This limited warranty will become null and void if: (1) the personal watercraft was used for racing or any other competitive activity, at any point, even by a previous owner; or (2) the personal watercraft has been altered or modified in such a way so as to adversely affect its operation, performance or durability, or (3) the personal watercraft has been altered or modified to change its intended use.

## **2. LIMITATIONS OF LIABILITY**

TO THE EXTENT PERMITTED BY LAW, THIS WARRANTY IS EXPRESSLY GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT THAT THEY CANNOT BE DISCLAIMED, THE IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE LIFE OF THE EXPRESS WARRANTY. INCIDENTAL AND CONSEQUENTIAL DAMAGES ARE EXCLUDED FROM COVERAGE UNDER THIS WARRANTY. SOME JURISDICTIONS DO NOT ALLOW FOR THE DISCLAIMERS, LIMITATIONS AND EXCLUSIONS IDENTIFIED ABOVE, AS A RESULT, THEY MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC RIGHTS, AND YOU MAY ALSO HAVE OTHER LEGAL RIGHTS WHICH MAY VARY FROM COUNTRY TO COUNTRY.

Neither the Sea-Doo Distributor/Dealer nor any other person has been authorized to make any affirmation, representation or warranty regarding the product, other than those contained in this limited warranty, and if made, shall not be enforceable against BRP.

BRP reserves the right to modify this warranty at any time, being understood that such modification will not alter the warranty conditions applicable to the products sold while this warranty is in effect.

## **3. EXCLUSIONS – ARE NOT WARRANTED**

The following are not warranted under this limited warranty under any circumstances:

- Replacement of parts due to normal wear and tear;

- Routine maintenance parts and services, including but not limited to tune ups, adjustments, oil, lubricant and coolant changes, spark plug replacement, water pumps and the like;
- Damage caused by negligence or failure to provide proper maintenance and/or storage, as described in the Operator's Guide;
- Damage resulting from removal of parts, improper repairs, service, maintenance, modification or use of parts or accessories not manufactured or approved by BRP which in its reasonable judgement are either incompatible with the product or adversely affect its operation, performance and durability, or resulting from repairs done by a person that is not an authorized servicing Sea-Doo Distributor/Dealer;
- Damage caused by abuse, misuse, abnormal use, neglect, racing, improper operation or operation of the product in a manner inconsistent with the recommended operation described in the Operator's Guide;
- Damage resulting from external damage, accident, submersion, fire, foreign object or water ingestion, theft, vandalism or any act of God;
- Operation with fuel, oils or lubricants which are not suitable for use with the product (see the Operator's Guide);
- Damage resulting from rust, corrosion or exposure to the elements;
- Damages from cooling system or jet pump blockage by foreign material;
- Damages to gel coat finish including but not limited to cosmetic gel coat finish defects, blisters, starring, crazing and fiberglass delamination caused by blisters, crazing, spider or hairline cracks; and
- Incidental or consequential damages, or damages of any kind including without limitation towing, storage, transportation expenses, telephone, rental, taxi, inconvenience, insurance coverage, loan payments, loss of time, loss of income; or time missed for downtime experience due to service work.

## **4. WARRANTY COVERAGE PERIOD**

This limited warranty will be in effect from (1) the date of delivery to the first retail consumer or (2) the date the product is first put into use, whichever occurs first and for a period of:

1. Twenty four (24) CONSECUTIVE MONTHS, for private, recreational use,
2. FOUR (4) CONSECUTIVE MONTHS for commercial use,  
A personal watercraft is used commercially when it is used in connection with generating income or any work or employment during any part of the warranty period. A personal watercraft is also used commercially when, at any point during the warranty period, it has commercial tags or is licensed for commercial use.

The repair or replacement of parts or the performance of service under this warranty does not extend the life of this warranty beyond its original expiration date.

Note that the duration and any other modalities of the warranty coverage are subject to the applicable national or local legislation in the customer's country.

## **5. CONDITIONS TO HAVE WARRANTY COVERAGE**

This warranty coverage is available **only** if **each** of the following conditions has been fulfilled:

- The 2021 Sea-Doo personal watercraft must be purchased as new and unused by its first owner from a Sea-Doo Distributor/Dealer authorized to distribute Sea-Doo personal watercrafts in the country in which the sale occurred;
- The BRP specified pre-delivery inspection process must be completed and documented;
- The 2021 Sea-Doo personal watercraft must have undergone proper registration by an authorized Sea-Doo Distributor/Dealer;
- The 2021 Sea-Doo personal watercraft must be purchased within the EEA by an EEA resident, in the CIS for residents of the countries comprised in such area and in Turkey for residents of Turkey; and
- Routine maintenance outlined in the Operator's Guide must be timely performed in order to maintain warranty coverage. BRP reserves the right to make warranty coverage contingent upon proof of proper maintenance.

BRP will not honor this limited warranty to any private use owner or commercial use owner if one of the preceding conditions has not been met. Such limitations are necessary in order to allow BRP to preserve both the safety of its products, and also that of its consumers and the general public.

## **6. WHAT TO DO TO OBTAIN WARRANTY COVERAGE**

The customer must cease using the Sea-Doo personal watercraft upon the appearance of an anomaly. The customer must notify a servicing Sea-Doo Distributor/Dealer within two (2) months of the appearance of a defect, and provide it with reasonable access to the product and reasonable opportunity to repair it. The customer must also present to the authorized Sea-Doo Distributor/Dealer, proof of purchase of the product and must sign the repair/work order prior to starting the repair in order to validate the warranty repair. All parts replaced under this limited warranty become the property of BRP.

Note that the notification period is subject to the applicable national or local legislation in customer's country.

## **7. WHAT BRP WILL DO**

To the extent permitted by law, BRP's obligations under this warranty are limited to, at its sole discretion, repairing parts found defective under normal use, maintenance and service, or replacing such parts with new genuine Sea-Doo parts without charge for parts and labor, at any authorized Sea-Doo Distributor/Dealer during the warranty coverage period under the conditions described herein. BRP's responsibility is limited to making the required repairs or replacements of parts. No claim of breach of warranty shall be cause for cancellation or rescission of the sale of the Sea-Doo personal watercraft to the owner. You may have other legal rights which may vary from country to country.

In the event that service is required outside of the country of original sale, or for EEA residents, if service is required outside of the EEA, for CIS residents, if service is required outside of the CIS, the owner will bear responsibility for any additional charges due to local practices and conditions, such as, but not limited

to, freight, insurance, taxes, license fees, import duties, and any and all other financial charges, including those levied by governments, states, territories and their respective agencies.

BRP reserves the right to improve or modify products from time to time without assuming any obligation to modify products previously manufactured.

## **8. TRANSFER**

If the ownership of a product is transferred during the warranty coverage period, this warranty shall also be transferred and be valid for the remaining coverage period provided BRP or an authorized Sea-Doo Distributor/Dealer receives a proof that the former owner agreed to the transfer of ownership, in addition to the coordinates of the new owner.

## **9. CONSUMER ASSISTANCE**

In the event of a controversy or a dispute in connection with this limited warranty, BRP suggests that you try to resolve the issue at the Sea-Doo Distributor/Dealer level. We recommend discussing the issue with the authorized Sea-Doo Distributor/Dealer's service manager or owner.

If the matter still remains unresolved, contact BRP by filling out the customer contact form at [www.brp.com](http://www.brp.com) or contact BRP by mail at one of the addresses listed under the *CONTACT US* section of this guide.

\* In the EEA and elsewhere, products are distributed and serviced by BRP European Distribution S.A. and other subsidiaries of BRP.

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## **ADDITIONAL TERMS AND CONDITIONS FOR FRANCE ONLY**

The following terms and conditions are applicable to products sold in France only:

The seller shall deliver goods that are complying with the contract and shall be responsible for defects existing upon delivery. The seller shall also be responsible for defects resulting from packaging, assembling instructions or the installation when it is its responsibility per the contract or if accomplished under its responsibility. To be compliant with the contract, the good shall:

1. Be fit for normal use for goods similar thereto and, if applicable:
  - Correspond to the description provided by the seller and have the qualities presented to the buyer through sample or model;
  - Have the qualities that a buyer may legitimately expect considering the public declarations of the seller, the manufacturer of its representative, including in advertising or labeling; or
2. Have the characteristics mutually agreed upon as between the parties or be fit for the specific use intended by the buyer and brought to the attention of the seller and which accepted.

The action for failure to comply is prescribed after two years after delivery of the goods. The seller is responsible for the warranty for hidden defects of the good sold if such hidden defects are rendering the good unfit for the intended use, or if they diminish its use in such a way that the buyer would not have acquired the good or would have given a lesser price, had he known. The action for such hidden defects shall be taken by the buyer within 2 years of the discovery of the defect.

## MAINTENANCE RECORDS

Send photocopy of maintenance record to BRP if needed.

| PREDELIVERY                                                                 |                  |
|-----------------------------------------------------------------------------|------------------|
| Serial number:                                                              | Signature/Print: |
| Mileage / km:                                                               |                  |
| Hours:                                                                      |                  |
| Date:                                                                       |                  |
| Dealer no:                                                                  |                  |
| Notes:                                                                      |                  |
|                                                                             |                  |
| Refer to vehicle Pre-Delivery Bulletin for detailed installation procedures |                  |

| FIRST INSPECTION                                                                               |                        |
|------------------------------------------------------------------------------------------------|------------------------|
| Mileage / km: _____<br>Hours: _____<br>Date: _____<br>Dealer no: _____<br>Notes: _____<br><br> | Signature/Print: _____ |
| For maintenance schedule refer to Maintenance Information section of this operator's guide     |                        |

| SERVICE                                                                                         |                        |
|-------------------------------------------------------------------------------------------------|------------------------|
| Mileage / km: _____<br>Hours: _____<br>Date: _____<br>Dealer no: _____<br>Notes: _____<br>_____ | Signature/Print: _____ |
| For maintenance schedule refer to Maintenance Information section of this operator's guide      |                        |

| SERVICE                                                                                    |                  |
|--------------------------------------------------------------------------------------------|------------------|
| Mileage / km: _____<br>Hours: _____<br>Date: _____<br>Dealer no: _____<br>Notes: _____<br> | Signature/Print: |
|                                                                                            |                  |
| For maintenance schedule refer to Maintenance Information section of this operator's guide |                  |

| SERVICE                                                                                    |                  |
|--------------------------------------------------------------------------------------------|------------------|
| Mileage / km: _____<br>Hours: _____<br>Date: _____<br>Dealer no: _____<br>Notes: _____<br> | Signature/Print: |
|                                                                                            |                  |
| For maintenance schedule refer to Maintenance Information section of this operator's guide |                  |

| SERVICE                                                                                    |                  |
|--------------------------------------------------------------------------------------------|------------------|
| Mileage / km: _____<br>Hours: _____<br>Date: _____<br>Dealer no: _____<br>Notes: _____<br> | Signature/Print: |
|                                                                                            |                  |
| For maintenance schedule refer to Maintenance Information section of this operator's guide |                  |

**SERVICE**

Mileage / km:

Hours:

Date:

Dealer no:

Notes:

Signature/Print:

For maintenance schedule refer to Maintenance Information section of this operator's guide

**SERVICE**

Mileage / km:

Hours:

Date:

Dealer no:

Notes:

Signature/Print:

For maintenance schedule refer to Maintenance Information section of this operator's guide

**SERVICE**

Mileage / km:

Hours:

Date:

Dealer no:

Notes:

Signature/Print:

For maintenance schedule refer to Maintenance Information section of this operator's guide

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# ***CUSTOMER INFORMATION***

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## PRIVACY INFORMATION

BRP wishes to inform you that your coordinates will be used for safety and warranty related purposes. Furthermore, BRP and its affiliates may use its customer list to distribute marketing and promotional information about BRP and related products.

To exercise your right to consult or correct your data, or to be removed from the addressee-list for direct marketing, please contact BRP.

By E-mail: **privacyofficer@brp.com**

By mail: BRP  
Senior Legal Counsel-Privacy Officer  
726 St-Joseph  
Valcourt, QC  
Canada  
J0E 2L0



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# CONTACT US

www.brp.com

## Asia

Room 4609, Tower 2,  
Grand Gateway 3 Hong Qiao  
Road Shanghai,  
China 200020

21F Shinagawa East One Tower  
2-16-1 Konan, Minatoku-ku,  
Tokyo 108-0075  
Japan

## Europe

Skaldenstraat 125  
B-9042 Gent  
Belgium

Itterpark 11  
D-40724 Hilden  
Germany

ARTEPARC Bâtiment B  
Route de la côte d'Azur, Le Canet  
13590 Meyreuil  
France

Ingvald Ystgaardsvei 15  
N-7484 Trondheim  
Norway

Isoaavantie 7  
PL 8040  
96101 Rovaniemi

Spinnvägen 15  
903 61 Umeå  
Sweden

Avenue d'Ouchy 4-6  
1006 Lausanne  
Switzerland

## North America

565 de la Montagne Street  
Valcourt (Québec) J0E 2L0  
Canada

Sa De Cv, Av. Ferrocarril 202  
Parque Ind. Querétaro, Lote2-B  
76220

Santa Rosa Jáuregui, Qro., Mexico

Sturtevant, Wisconsin, U.S.A.

10101 Science Drive  
Sturtevant, Wisconsin

53177  
U.S.A.

## Oceania

6 Lord Street  
Lakes Business Park  
Botany, NSW 2019  
Australia

3B Echelon Place, East Tamaki,  
Auckland 2013,  
New Zealand

## South America

Rua James Clerck Maxwell, 230  
TechnoPark Campinas SP 13069-380  
Brazil

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## CHANGE OF ADDRESS/OWNERSHIP

If your address has changed or if you are the new owner of the watercraft, be sure to notify BRP by either:

- Notifying an authorized Sea-Doo dealer.
- **North America Only:** calling at 1 888 272-9222.
- Mailing one of the change of address cards on the following pages at one of the BRP addresses indicated in the *CONTACT US* section of this guide.

In case of change of ownership, please join a proof that the former owner agreed to the transfer.

Notifying BRP, even after the expiration of the limited warranty, is very important as it enables BRP to reach the watercraft owner if necessary, like when safety recalls are initiated. It is the owner's responsibility to notify BRP.

**STOLEN UNITS:** In the event that your watercraft is stolen, you should notify your area's distributor warranty department of such. We will ask you to provide your name, address, phone number, Hull Identification Number and date it was stolen.

CHANGE OF ADDRESS ☐

CHANGE OF OWNERSHIP ☐



VEHICLE IDENTIFICATION NUMBER

Model Number

Vehicle Identification Number (V.I.N.)

OLD ADDRESS  
OR PREVIOUS OWNER:

NAME

NO.

STREET

APT

CITY

STATE/PROVINCE

ZIP/POSTAL CODE

COUNTRY

TELEPHONE

NEW ADDRESS  
OR NEW OWNER:

NAME

NO.

STREET

APT

CITY

STATE/PROVINCE

ZIP/POSTAL CODE

COUNTRY

TELEPHONE

E-MAIL ADDRESS

V00A2F

CHANGE OF ADDRESS ☐

CHANGE OF OWNERSHIP ☐



VEHICLE IDENTIFICATION NUMBER

Model Number

Vehicle Identification Number (V.I.N.)

OLD ADDRESS  
OR PREVIOUS OWNER:

NAME

NO.

STREET

APT

CITY

STATE/PROVINCE

ZIP/POSTAL CODE

COUNTRY

TELEPHONE

NEW ADDRESS  
OR NEW OWNER:

NAME

NO.

STREET

APT

CITY

STATE/PROVINCE

ZIP/POSTAL CODE

COUNTRY

TELEPHONE

E-MAIL ADDRESS

V00A2F

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CHANGE OF ADDRESS ☐

CHANGE OF OWNERSHIP ☐



VEHICLE IDENTIFICATION NUMBER

Model Number

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OLD ADDRESS  
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STREET

APT

CITY

STATE/PROVINCE

ZIP/POSTAL CODE

COUNTRY

TELEPHONE

NEW ADDRESS  
OR NEW OWNER:

NAME

NO.

STREET

APT

CITY

STATE/PROVINCE

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TELEPHONE

E-MAIL ADDRESS

V00A2F

CHANGE OF ADDRESS ☐

CHANGE OF OWNERSHIP ☐



VEHICLE IDENTIFICATION NUMBER

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E-MAIL ADDRESS

V00A2F

## NOTES

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## **WARNING**

**BEFORE YOU OPERATE THIS VEHICLE, READ THIS  
OPERATOR'S GUIDE, ALL ON-PRODUCT SAFETY LABELS  
AND WATCH THE SAFETY VIDEO.**

