

2021 Sea-Doo GTX, RXT & Wake Pro Series

If you're on a computer and don't see the clickable index on the left, please see the directions that were sent in the email with the download link, please check your junk mail if you don't see it.

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

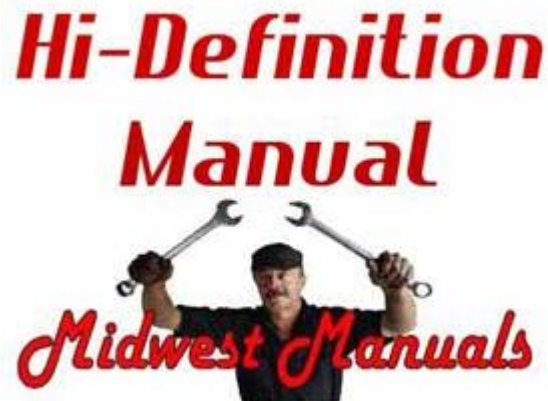
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SAFETY NOTICE

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

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

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

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

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

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

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

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

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

WARNING

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

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

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

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

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

Always observe common shop safety practice.

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

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

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

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

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

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

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

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

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

IMPORTANT SAFETY PRECAUTIONS

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

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

SAFETY NOTICE

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

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

WARNING

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

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



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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.

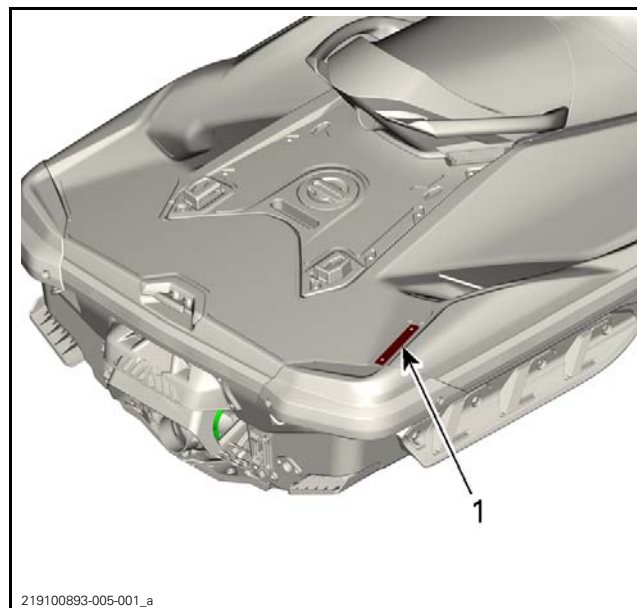
VEHICLE INFORMATION

HULL IDENTIFICATION NUMBER (HIN)

The hull identification number is composed of 12 digits:

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

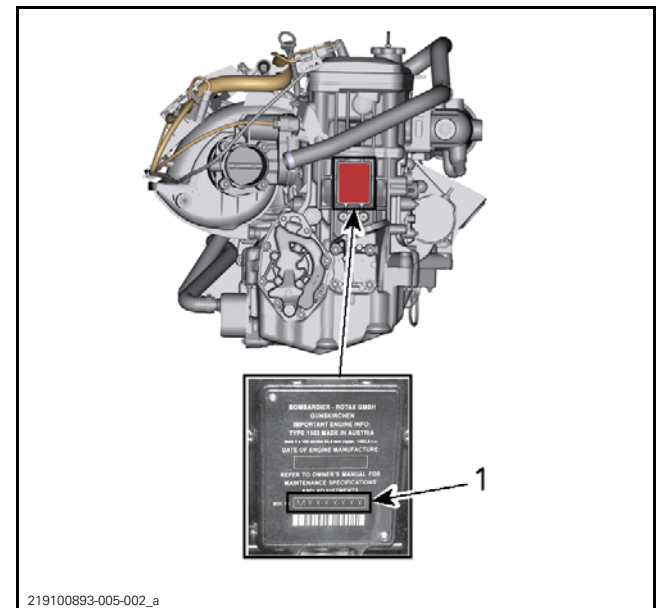
It is located on the deck at the rear of watercraft.



1. Hull Identification Number (HIN)

ENGINE IDENTIFICATION NUMBER (EIN)

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



1. Engine Identification Number (EIN)

HOISTING A WATERCRAFT

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

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

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

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

INTRODUCTION



TYPICAL

ENGINE EMISSIONS INFORMATION

Manufacturer's Responsibility

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

Dealer Responsibility

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

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

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

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

Owner Responsibility

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

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

Emission Regulations

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

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

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

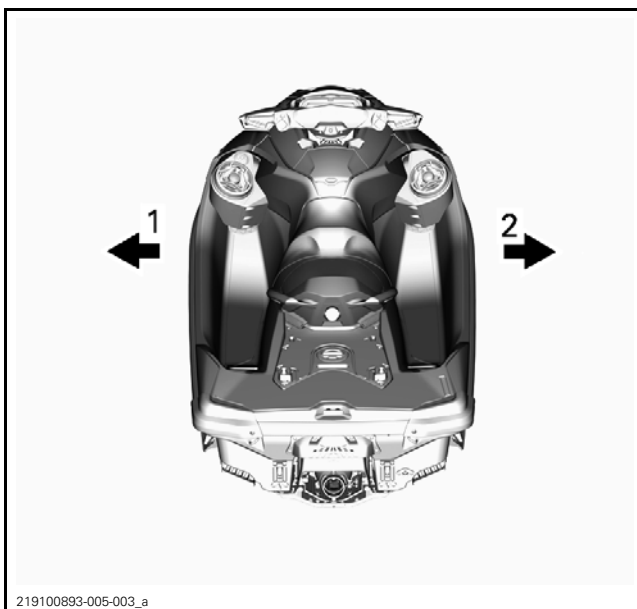
MANUAL INFORMATION

MANUAL PROCEDURES

Many of the procedures in this manual are inter-related. Before undertaking any task, you should read and thoroughly understand the entire section or subsection in which the procedure is contained.

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

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



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

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

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

MANUAL LAYOUT

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

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

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

INTRODUCTION

TYPICAL PAGE

Page heading indicates section and subsection.

Subsection title → **MAGNETO**

Indicates applicable models. → **Models**

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

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

Illustration number for publishing process. → XXXX000

Document number for publishing process. → mm/2008-001

Drop represents a service product to be applied.

Dotted box contains parts applicable to a specific model.

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

Specific torque applicable to this installation.

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

55 Page number

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

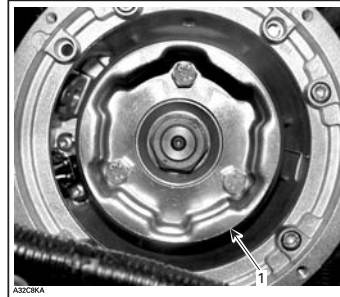
Remove muffler, refer to the *EXHAUST SYSTEM* section.

Remove acoustic panel.

Remove rewind starter.

Remove starting pulley no. 2.

Section 03 ENGINE Subsection 09 (MAGNETO SYSTEM)



TYPICAL
1. Starting pulley

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



TYPICAL

Models

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

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

Call-outs pertaining to above illustration.

Illustration always follows text to which it applies.

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

mmr2008-001

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

typical_txt_2008_en

INTRODUCTION

TIGHTENING TORQUE

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

 **WARNING**

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

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

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

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

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

3. Tighten fastener to the recommended torque value.

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

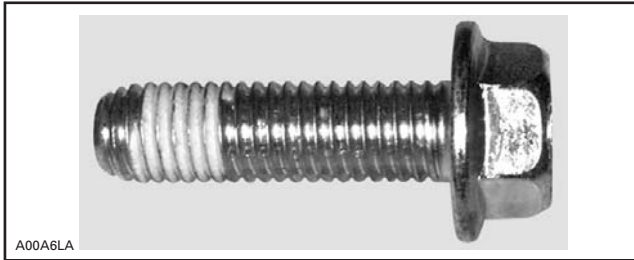
Property class and head markings	4.8		8.8 9.8		10.9	12.9	
							
Property class and nut markings	5		8		10	12	
							
A00A8BS							

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

FASTENER INFORMATION

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

SELF-LOCKING FASTENER PROCEDURE



TYPICAL — SELF-LOCKING FASTENER

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

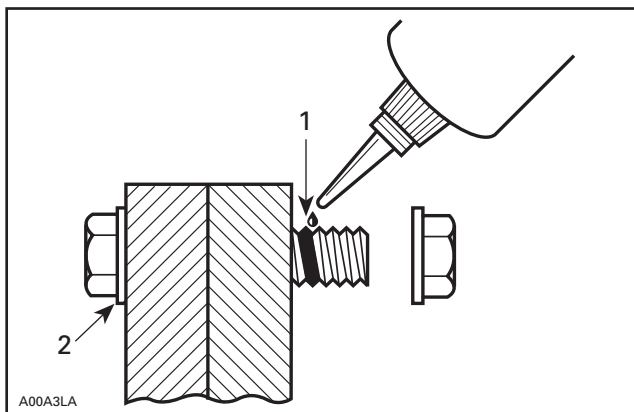
Use a metal brush or a tap to clean the hole properly, then use a solvent. Allow the solvent time to act, approximately 30 minutes, then wipe off. Solvent utilization is to ensure proper adhesion of the product used for locking the fastener.

LOCTITE® APPLICATION PROCEDURE

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

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

Threadlocker Application for Uncovered Holes (Bolts and Nuts)

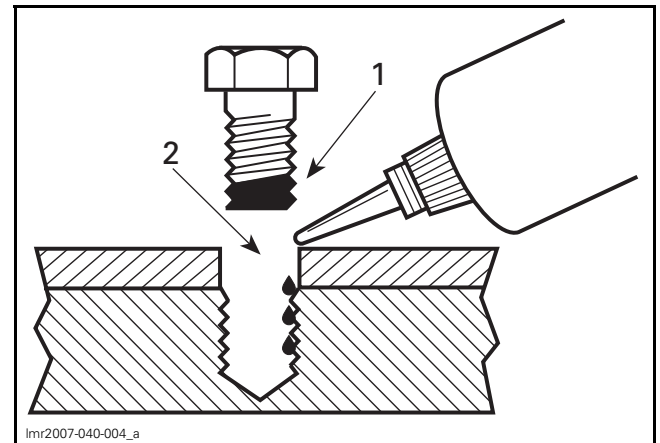


1. Apply here
2. Do not apply

1. Clean threads (bolt and nut) with solvent.

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

Threadlocker Application for Blind Holes

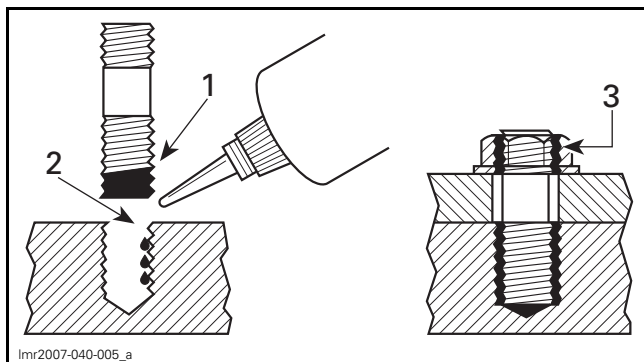


1. On fastener threads
2. On threads and at the bottom of hole

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

INTRODUCTION

Threadlocker Application for Stud Installation in Blind Holes



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

1. Clean threads (stud and hole) with solvent.
2. Apply *LOCTITE 7649 (PRIMER)* on threads and allow to dry.

3. Put 2 or 3 drops of proper strength Loctite threadlocker on female threads and in hole.

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

4. Apply several drops of proper strength Loctite on stud threads.

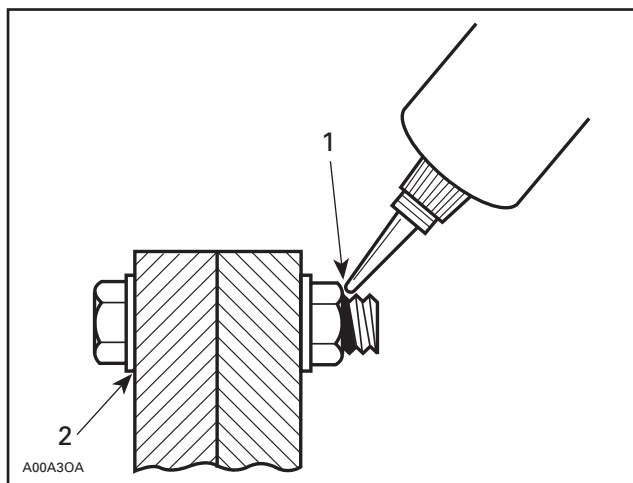
5. Install stud.

6. Install cover, part, etc.

7. Apply a few drops of proper strength Loctite on uncovered stud threads.

8. Install and tighten retaining nut(s) as required.

Threadlocker Application for Pre-Assembled Parts



1. Apply here
2. Do not apply

1. Clean bolts and nuts with solvent.

2. Assemble components.

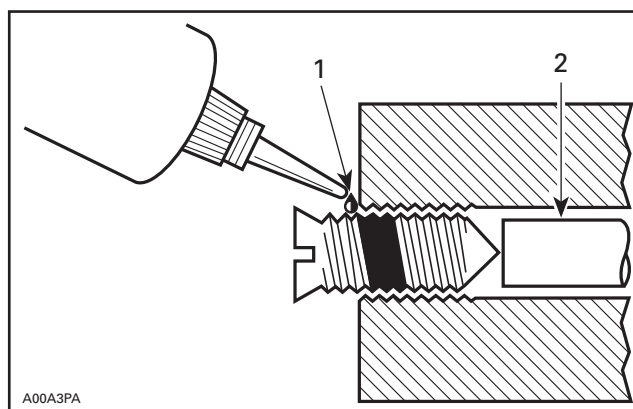
3. Tighten nuts.

4. Apply a few drops of proper strength Loctite on bolt/nut contact surfaces.

5. Avoid touching metal with tip of flask.

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

Threadlocker Application for an Adjustment Screw



1. Apply here
2. Plunger

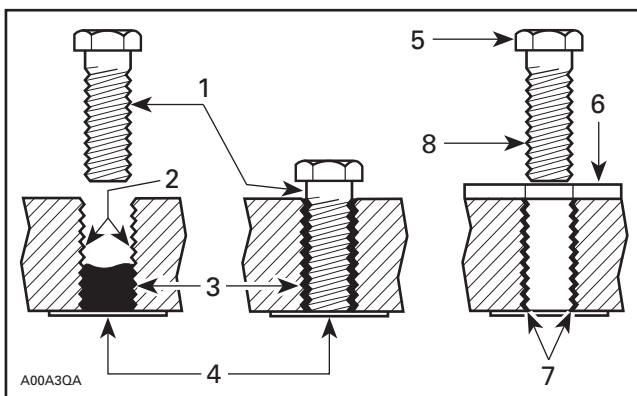
1. Adjust screw to proper setting.

2. Apply a few drops of proper strength Loctite threadlocker on screw/body contact surfaces.

3. Avoid touching metal with tip of flask.

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

Application for Stripped Thread Repair



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

Standard Thread Repair

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

If a plate is used to align bolt:

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

NOTE: NOT intended for engine stud repairs.

Repair of Small Holes/Fine Threads

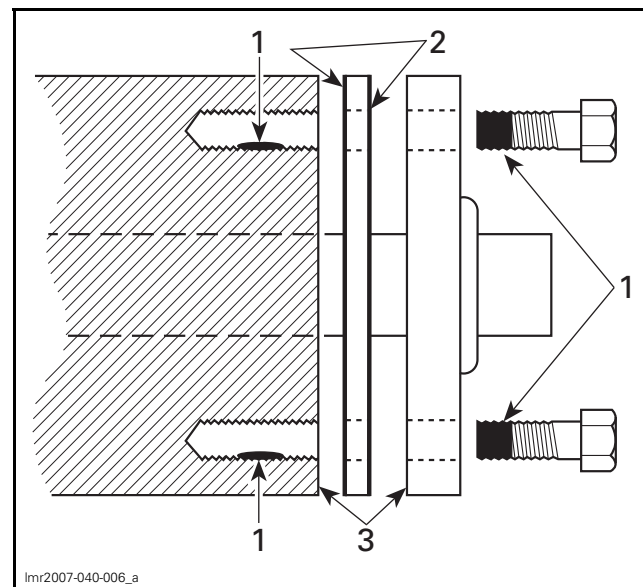
Option 1: Enlarge damaged hole, then follow *STANDARD THREAD REPAIR* procedure.

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

Permanent Stud Installation (Light Duty)

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

Gasket Compound Application



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

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

NOTE: Avoid grinding.

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

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

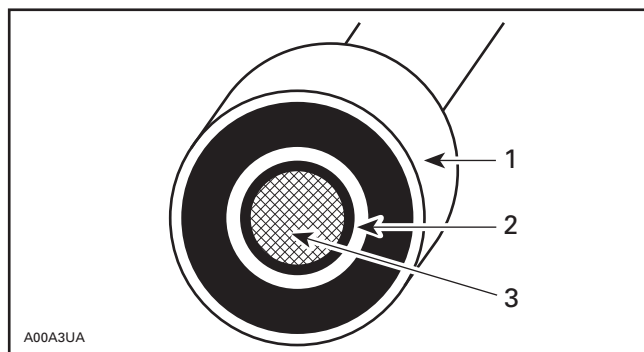
If holes are sunken, apply proper strength Loctite on bolt threads.

6. Tighten as usual.

Threadlocker Application for Mounting on a Shaft

Mounting with a Press

INTRODUCTION



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

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

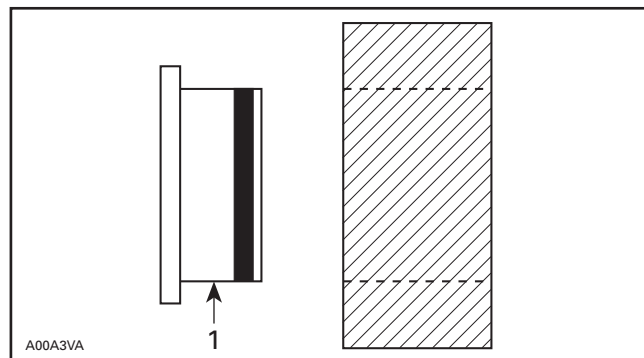
NOTE: Retaining compound is always forced out when applied on shaft.

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

Mounting in Tandem

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

Threadlocker Application for Case-In Components (Metallic Gaskets)



- 1. Proper strength Loctite

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

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

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

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

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

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

MAINTENANCE SCHEDULE

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

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

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

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

WARNING

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

EPA Regulation - Canadian and USA Vehicles

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

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

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

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

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

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

Subsection XX (MAINTENANCE SCHEDULE)

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

STORAGE PROCEDURES

SERVICE PRODUCTS

Description	Part Number	Page
ANTICORROSION SPRAY	219 700 304	3
FUEL STABILIZER (EUR)	779183	1
FUEL STABILIZER	779171	1
LUBRICANT AND ANTI-CORROSIVE (EUR)	779224	1, 3
LUBRICANT AND ANTI-CORROSIVE.....	779168	1, 3

PROCEDURES

PROPULSION SYSTEM

Cleaning and Protecting the Propulsion System

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

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

Inspecting the Jet Pump

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

FUEL SYSTEM

Inspecting the Fuel System

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

Protecting the Fuel System

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

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

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

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

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

ENGINE

Replacing the Engine Oil and the Filter

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

Flushing the Exhaust System

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

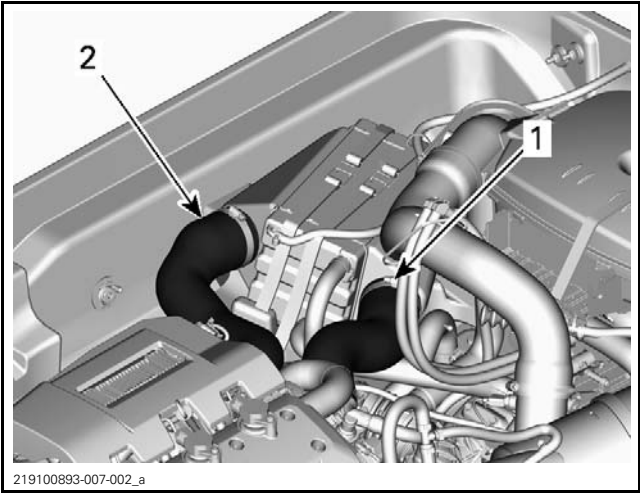
Draining the Intercooler

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

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

230 Engines and 300 Engines

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



1. Air inlet hose
2. Air outlet hose

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

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

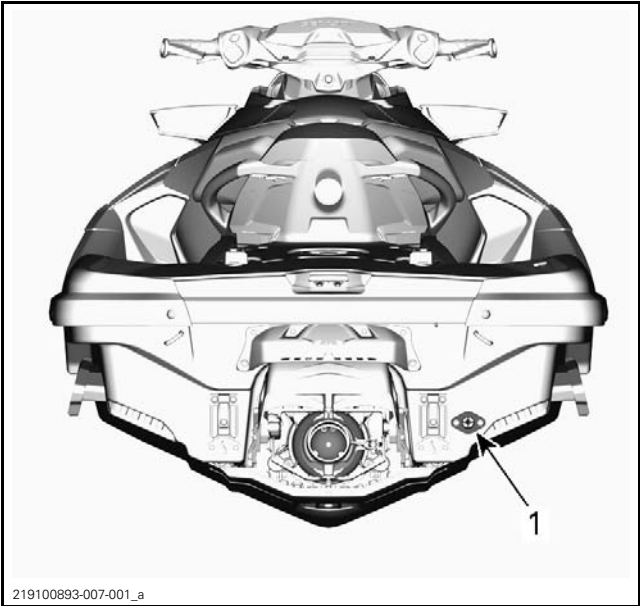
- 6. Reinstall the intercooler air inlet hose, ensure it is properly aligned as prior to removal to ensure proper engine operation.

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

Draining the Exhaust System

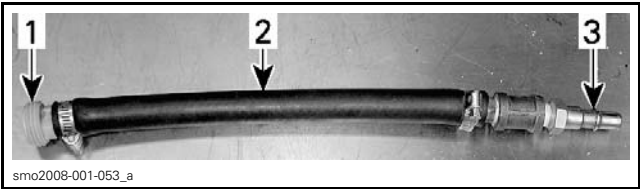
The exhaust system is self draining, but the exhaust manifold and intercooler need to be drained to avoid damages should the watercraft be stored in an area where the temperature attains the freezing point of water.

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



1. Flushing connector

The following hose can be fabricated to ease draining procedure.



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

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

Replacing the Engine Coolant

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

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

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

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

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

Lubricating the Internal Parts of the Engine

Engine must be lubricated to prevent corrosion on internal parts.

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

To lubricate the engine, proceed as follows:

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

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

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

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

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

ELECTRICAL SYSTEM

Removing the Battery

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

ENGINE COMPARTMENT

Cleaning the Engine Compartment

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

Applying an Anticorrosion Treatment

Wipe off any residual water in the engine compartment.

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

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

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

BODY AND HULL

Cleaning and Repair

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

Protecting the Body and the Hull

Apply a good quality marine wax on body and hull.

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

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

PRESEASON PREPARATION

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

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

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

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

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Furthermore, proceed with the following:

Watercraft Prepared as per Storage Procedure

- Ensure battery is fully charged.
- Reinstall the battery.
- Test ride watercraft to confirm proper operation.

Watercraft Not Prepared as per Storage Procedure

- Ensure battery is fully charged.
- Replace engine oil and filter.
- Drain fuel tank and fill with fresh fuel.
- Reinstall the battery.
- Test ride watercraft to confirm proper operation.

SPECIAL PROCEDURES

SERVICE TOOLS

Description	Part Number	Page
LARGE HOSE PINCHER.....	529 032 500	2
SUCTION PUMP	529 035 880	2

GENERAL

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

PROCEDURES

TOWING THE WATERCRAFT IN WATER

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

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

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

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

SUBMERGED WATERCRAFT

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

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

Lubricating the Engine

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

Inspecting the Fuel

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

WATER-FLOODED ENGINE

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

NOTICE

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

Draining the Exhaust System

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

Draining the Intake System

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

Servicing the Supercharger

If there is water in the oil or in the supercharger inlet hose, the supercharger should be taken apart, all the components dried, and the slip clutch needle bearings and shaft ball bearings replaced. Refer to appropriate *SUPERCHARGER* subsection.

Replacing the Engine Oil and the Filter

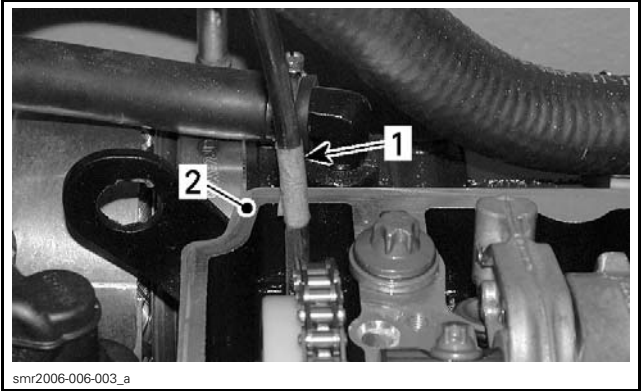
If the engine oil is contaminated with water (oil will be milky), change the engine oil and filter as per following procedure.

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

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

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

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



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

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

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

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

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

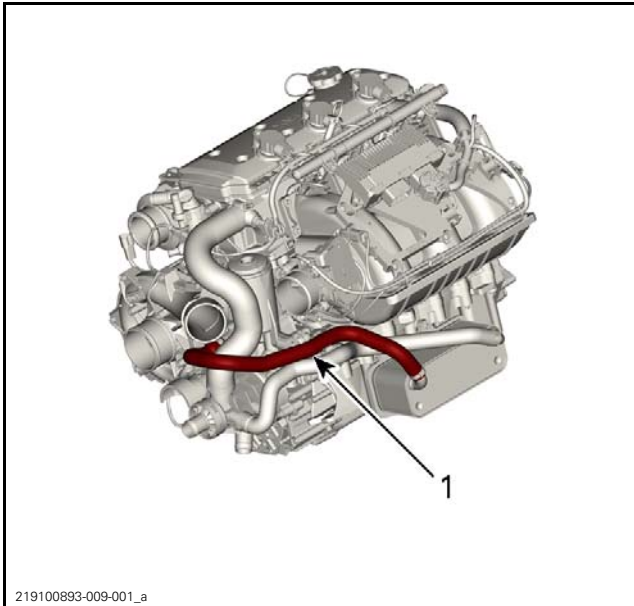
 WARNING
Be sure to safely secure the watercraft.

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

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

⚠ WARNING

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



TYPICAL

1. Oil cooler coolant inlet hose

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

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

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

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

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

DROWNED MODE

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

To activate DROWNED MODE, proceed as per following steps.

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

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

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

CAPSIZED WATERCRAFT

Capsized for More than 5 Minutes

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



WATERCRAFT SERVICE Bulletin



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Midwest Manuals

Subject: **Storage Procedure**

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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.

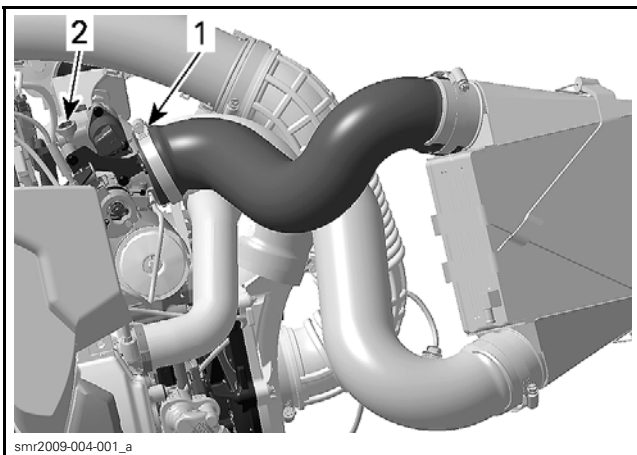
NOTICE Failure to drain the intercooler may cause severe damage to this components.

All 255 Engine Models except iS Series

1. Removed the intake hose from throttle body.



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1. Intake hose
2. Throttle body

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



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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.

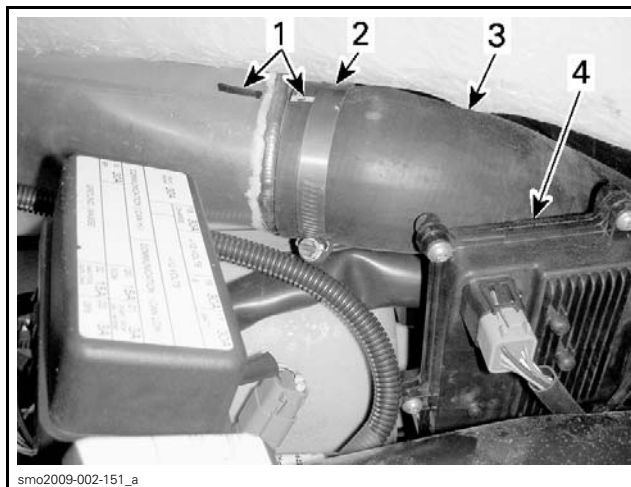
iS Series

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.

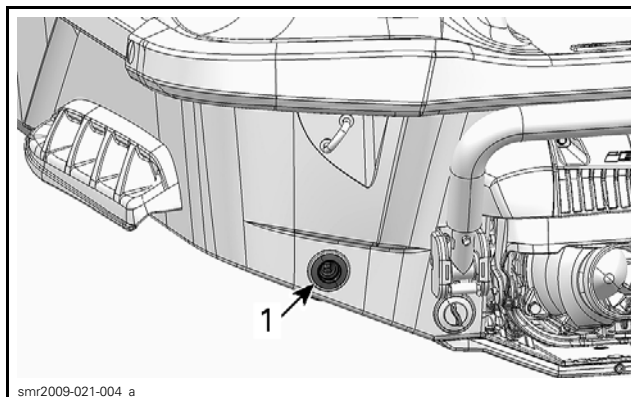
6. Install intercooler outlet hose.

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.

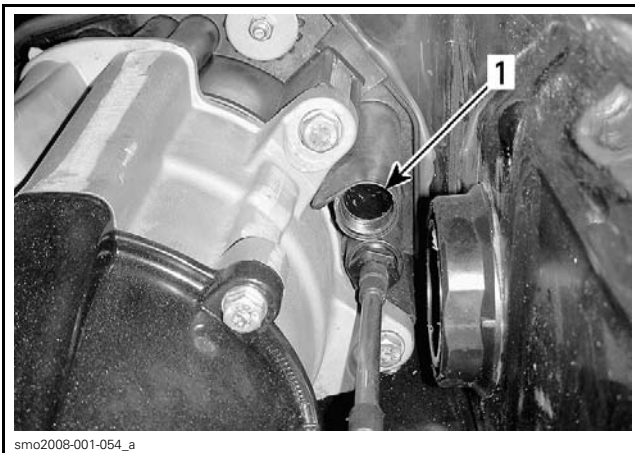
MODEL	AIR PRESSURE
iS Series	380 kPa (55 PSI)
All other models	689 kPa (100 PSI)



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TYPICAL – iS SERIES

1. Flushing connector

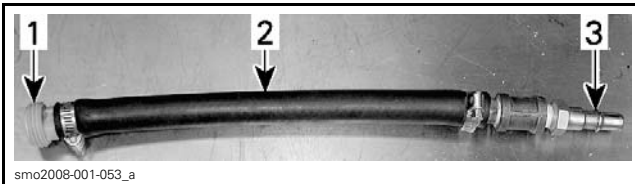


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TYPICAL – ALL OTHER MODELS

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:

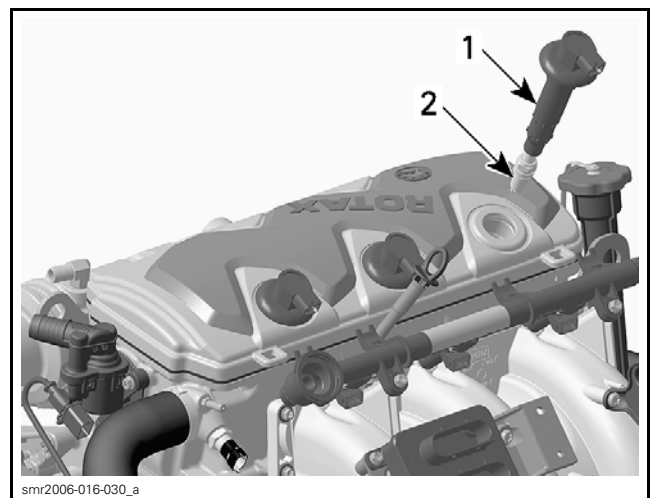
1. Open seat and remove the rear ventilation box.
2. On **iS series**, remove the rear ventilation box. For **all other models**, pull engine cover upward and remove it.
3. Disconnect ignition coil connectors.

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.



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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

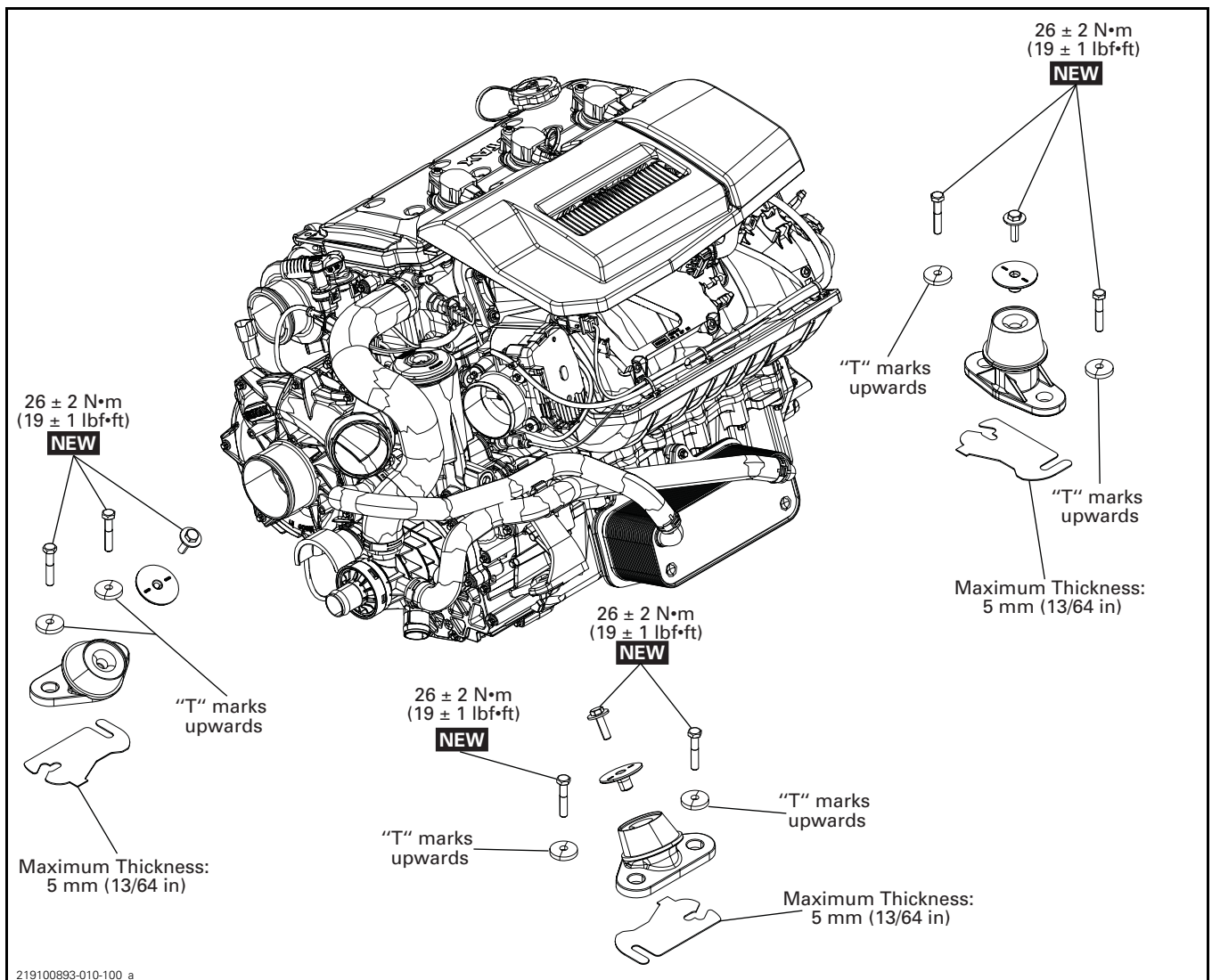
SERVICE TOOLS

Description	Part Number	Page
ALIGNMENT SHAFT SUPPORT	529 035 506	4
ALIGNMENT SHAFT	295 000 141	4
PUMP PLATE.....	529 036 224	4

SERVICE PRODUCTS

Description	Part Number	Page
BLACK NEOPRENE PAINT	909570	3
CLEANER AND DEGREASER PRO C1	779262	3
LOCTITE 243 (BLUE).....	293 800 060	3, 6

ENGINE SUPPORTS



PROCEDURES

ENGINE

Removing the Engine - Guideline

Remove the seats and engine service cover. Refer to appropriate *BODY* subsections.

Disconnect the battery. Refer to *CHARGING SYSTEM* subsection.

Remove the intake manifold. Refer to *INTAKE MANIFOLD* subsection.

Disconnect the following:

- CAPS
- CPS
- CTS
- EGTS
- Engine ground cables
- OTS
- Voltage regulator/rectifier connector 1

Drain coolant. Refer to *COOLING SYSTEM* subsection.

On supercharged models, disconnect both hoses from the supercharger.

Disconnect the front exhaust hose from the muffler.

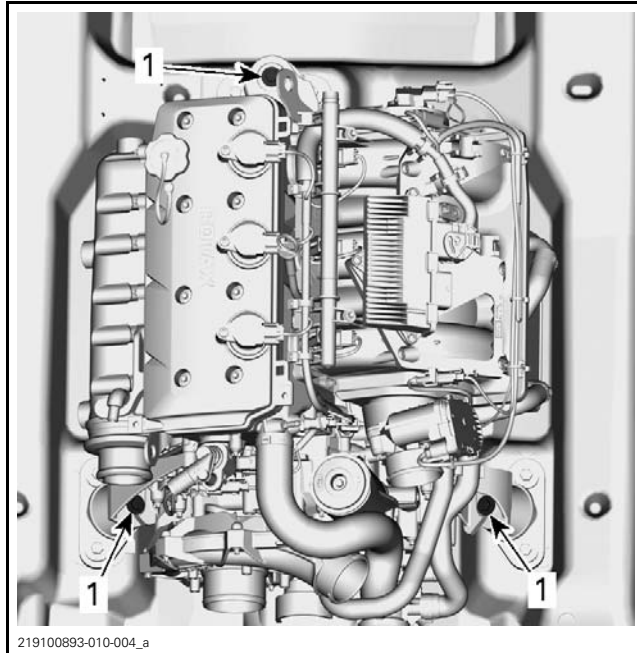
Disconnect the blow-by valve hose.

Disconnect the ride plate hoses from water pump housing.

Remove muffler. Refer to *EXHAUST SYSTEM* subsection.

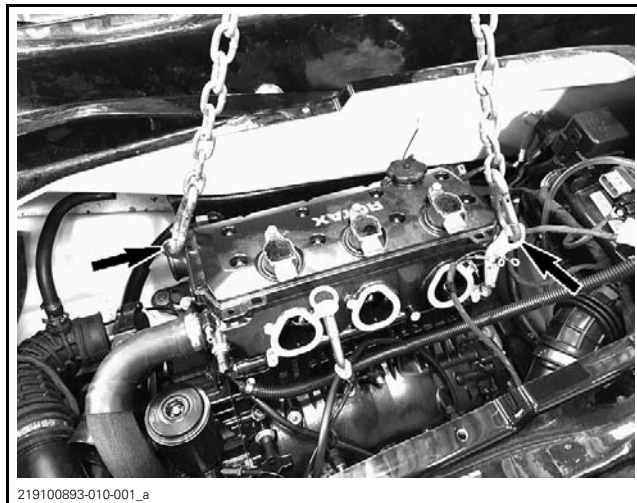
Remove the drive shaft. Refer to *DRIVE SHAFT* subsection.

Remove the engine mounting screws.



1. Engine mounting screws

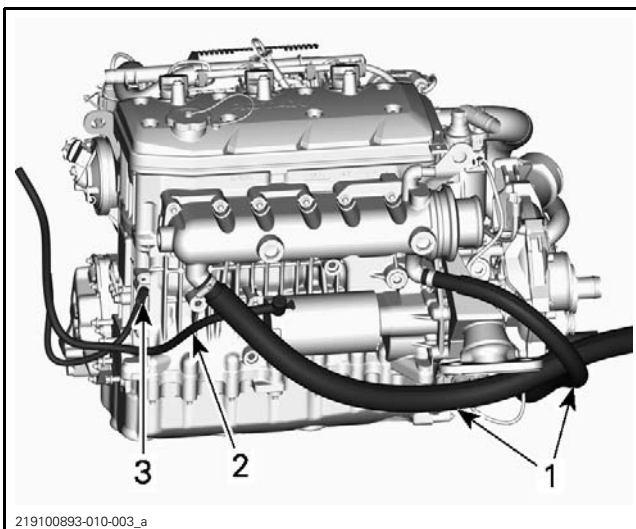
- Cut any locking ties from hoses or wiring harness that prevent engine removal.
- Slightly lift the engine using a suitable lifting device.



Subsection XX (ENGINE REMOVAL AND INSTALLATION)



- Disconnect water hoses from exhaust manifold.
- Disconnect the starter cable from the starter.
- Disconnect the engine ground cable located under the exhaust manifold.



1. Exhaust manifold water hoses
2. Starter cable
3. Engine ground cable

- Disconnect coolant tank hose from water pump housing.
- Carry on engine lifting to remove it from the body opening.

NOTICE Be careful not to scratch body or to hit any engine component during engine removal.

Installing the Engine

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

NOTICE Whenever engine is removed from watercraft, engine alignment must be performed at reinstallation.

Wipe off any spillage in bilge. Clean with the PRO C1.

SERVICE PRODUCT

CLEANER AND DEGREASER PRO C1 (P/N 779262)

Check tightness and condition of engine rubber mounts. Refer to *ENGINE MOUNTS* in this subsection.

Before completely lowering engine, install ground cable, starter cable and water hoses on exhaust manifold. Follow these guide lines.

- Ensure contact surface is perfectly clean then reconnect ground cable to engine.
- Apply blue Loctite on threads of ground cable screw or use a new screw with self-locking product.
- Install and secure the ground cable.
- Tighten starter cable nut to specification.
- To avoid potential corrosion of ground and starter cable, apply neoprene paint on bolt and eyelet connector.
- Install protective cap over the starter cable end.
- Connect exhaust manifold water inlet and outlet hoses.
- Connect coolant tank hose to water pump housing.

SERVICE PRODUCT

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

BLACK NEOPRENE PAINT (P/N 909570)

TIGHTENING TORQUE

Ground cable screw	10 N•m ± 2 N•m (89 lbf•in ± 18 lbf•in)
Starter cable nut	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)
Exhaust manifold hose clamps	1.7 N•m ± .2 N•m (15 lbf•in ± 2 lbf•in)
Coolant tank hose clamp	3.5 N•m ± .5 N•m (31 lbf•in ± 4 lbf•in)

Place engine into vehicle.

Install engine support screws. Do not apply threadlocker to engine support screws and do not tighten yet.

Align engine. Refer to *PERFORMING THE ENGINE ALIGNMENT* in this subsection for complete procedure.

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

Subsection XX (ENGINE REMOVAL AND INSTALLATION)

Install and properly align exhaust pipe. Refer to *EXHAUST SYSTEM* subsection.

Reinstall all other removed parts.

Refill the cooling system with appropriate type and amount of coolant and pressure test the cooling system. Refer to *COOLING SYSTEM* subsection.

Check hose condition and pressure test 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).

Verify the level of coolant and oil.

Run engine and ensure there is no leakage.

NOTICE If watercraft is out of water, exhaust system must be cooled using the flush kit.

Performing the Engine Alignment

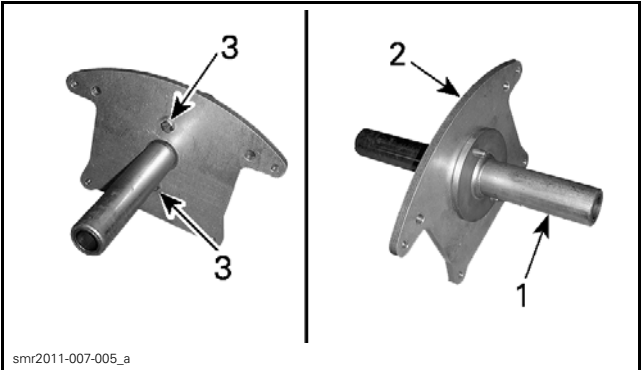
REQUIRED TOOLS	
PUMP PLATE (P/N 529 036 224)	
ALIGNMENT SHAFT SUPPORT (P/N 529 035 506)	
Alignment shaft adapter (PN 529036521)	
ALIGNMENT SHAFT (P/N 295 000 141)	

To verify alignment of engine proceed as follows:

1. Remove jet pump and drive shaft. Refer to *JET PUMP* and *DRIVE SHAFT* subsections.
2. Remove drive shaft boot.
3. Assemble alignment tool.

3.1 Install the alignment shaft support on pump plate.

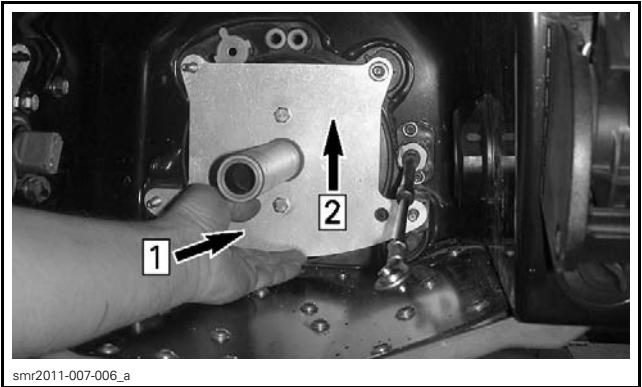
3.2 Secure using M8 x 25 x 1.25 hexagonal screws.



1. Alignment shaft support (P/N 529 035 506)
2. Support plate (P/N 529 036 224)
3. M8 x 25 x 1.25 hexagonal screws

TIGHTENING TORQUE	
Alignment tool screws	24 N•m (18 lbf•ft)

4. Install the alignment tool as follows.
- 4.1 Position the alignment tool against the pump support.
- 4.2 Push the alignment tool upward and hold it in this position.

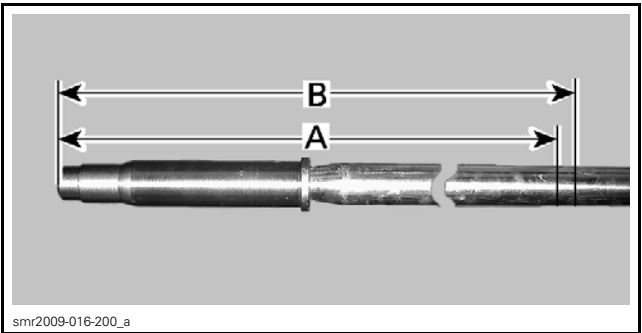


- Step 1: Place alignment tool against pump support
- Step 2: Push alignment tool upward

TIGHTENING TORQUE	
Alignment tool nuts	24 N•m (18 lbf•ft)

Install the alignment shaft adapter on the end of the alignment shaft.

Trace two thin lines on alignment shaft.

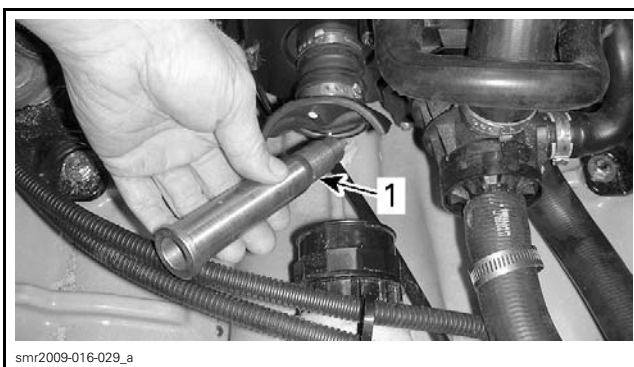


Subsection XX (ENGINE REMOVAL AND INSTALLATION)

MODELS	LINES	DISTANCE
Models without iDF	Line A	at 739.5 mm (29.114 in)
	Line B	at 742.5 mm (29.232 in)
Models with iDF	Line A	at 584.5 mm (23.012 in)
	Line B	at 587.5 mm (23.13 in)

- Remove the alignment shaft adapter from the end of the alignment shaft and install it in engine PTO housing.

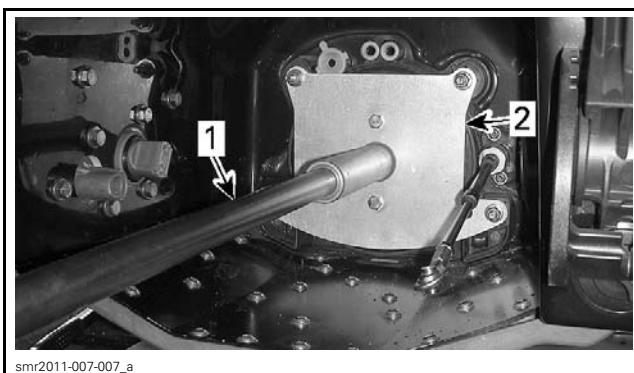
NOTICE Ensure alignment shaft adapter is fully inserted into the engine PTO housing.



TYPICAL

- Alignment shaft adapter

- Carefully slide the alignment shaft through the engine alignment tool.



- Alignment shaft (P/N 295 000 141)
- Alignment tool

- Insert alignment shaft end into alignment shaft adapter. If the alignment is correct, the alignment shaft end should slide through the adapter.

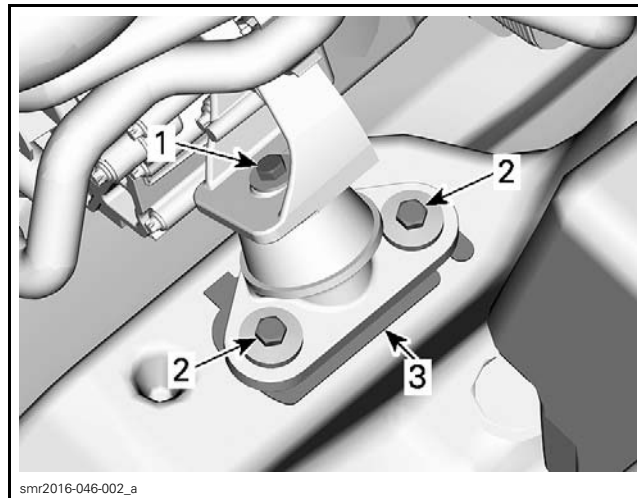
NOTE: A small resistance during shaft insertion is normal.

- If the alignment is incorrect, loosen engine mount retaining screws.

- Add or remove shims as required.

NOTE: Shims location is between engine mount and hull.

NOTICE Whenever shims are used to correct alignment, never install more than 5 mm (13/64 in) of shims.



REAR STARBOARD ENGINE MOUNT SHOWN

- Engine mounting screw
- Engine mount retaining screws
- Shim(s)

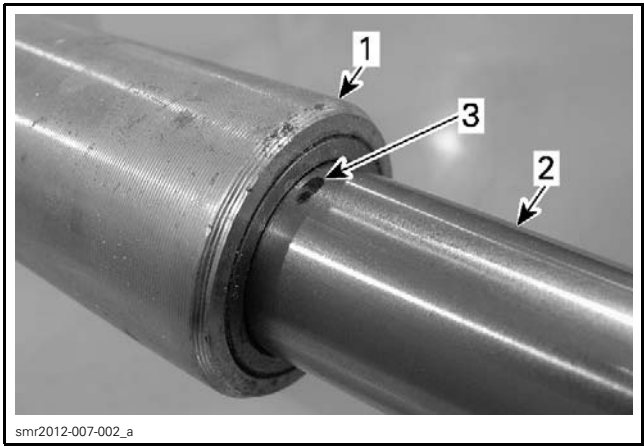
- When engine alignment is correct, check the longitudinal position of engine.

Verifying the Engine Longitudinal Position

With alignment shaft installed, check the location of the marks (previously drawn at the beginning of the engine alignment procedure).

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.



- PROPER POSITION**
- 1. Engine alignment tool
 - 2. Alignment shaft
 - 3. Mark at 742.5 mm (29.232 in)

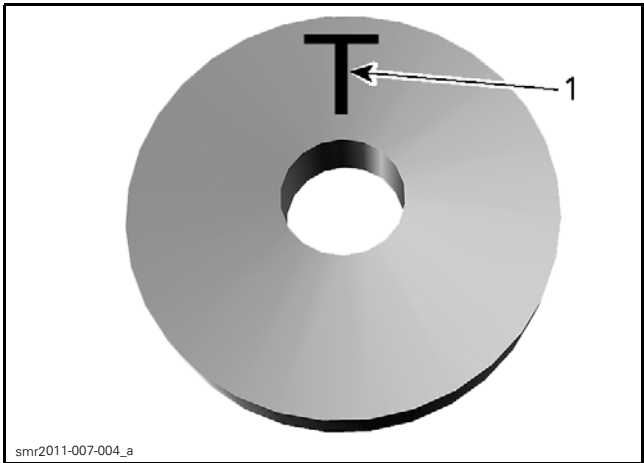
When alignment and longitudinal position of engine are correct, tighten engine mount screws. Refer to *ENGINE MOUNTS* in this subsection. Recheck engine alignment.

ENGINE MOUNTS

If engine mounts have been removed, apply blue Loctite on screw threads or use new screws with self-locking product.

SERVICE PRODUCT	
LOCTITE 243 (BLUE) (P/N 293 800 060)	
TIGHTENING TORQUE	
Engine mount screws	26 N•m ± 2 N•m (19 lbf•ft ± 1 lbf•ft)

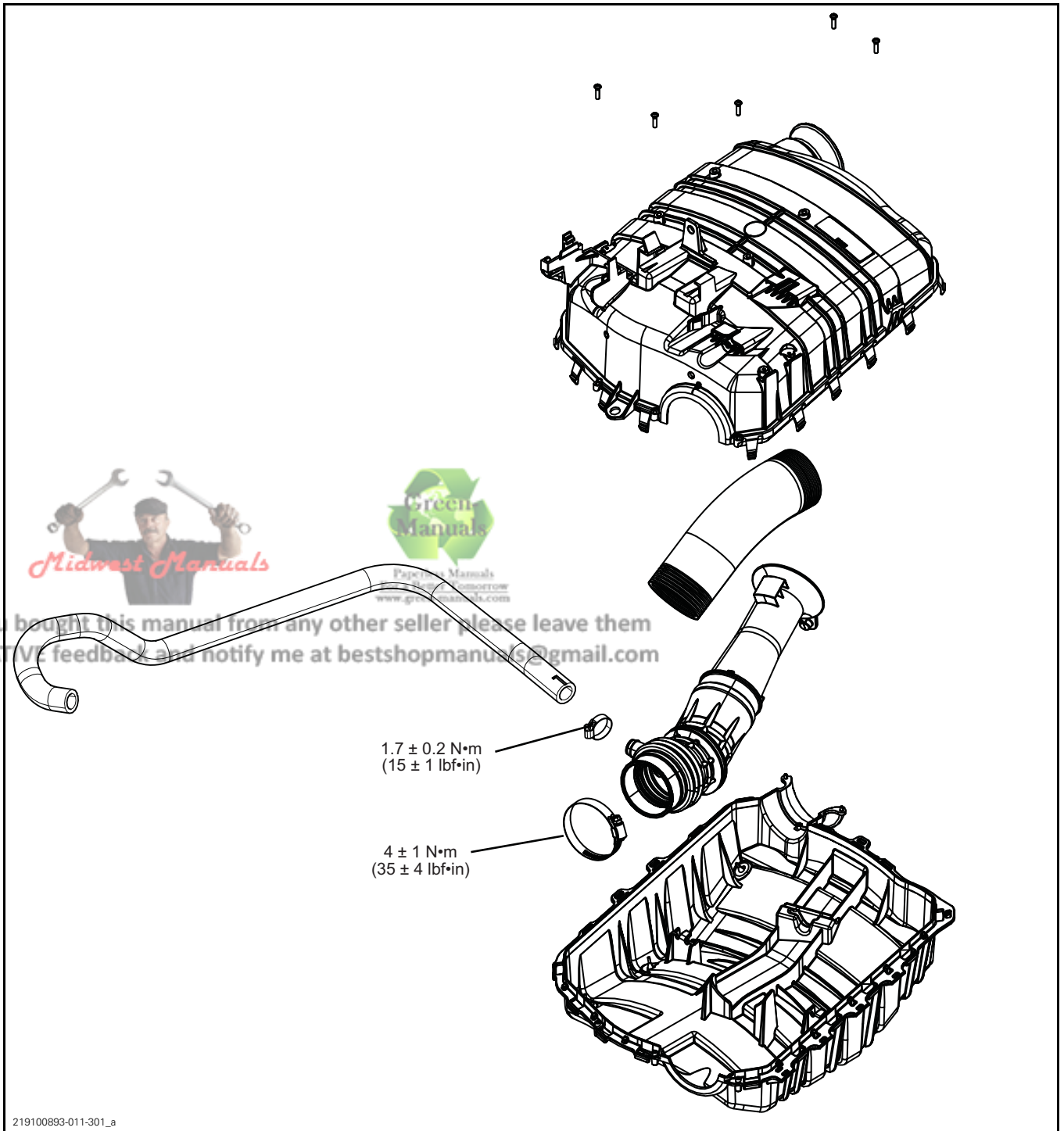
NOTE: Position conical spring washer with the "T" mark upwards.



1. T mark

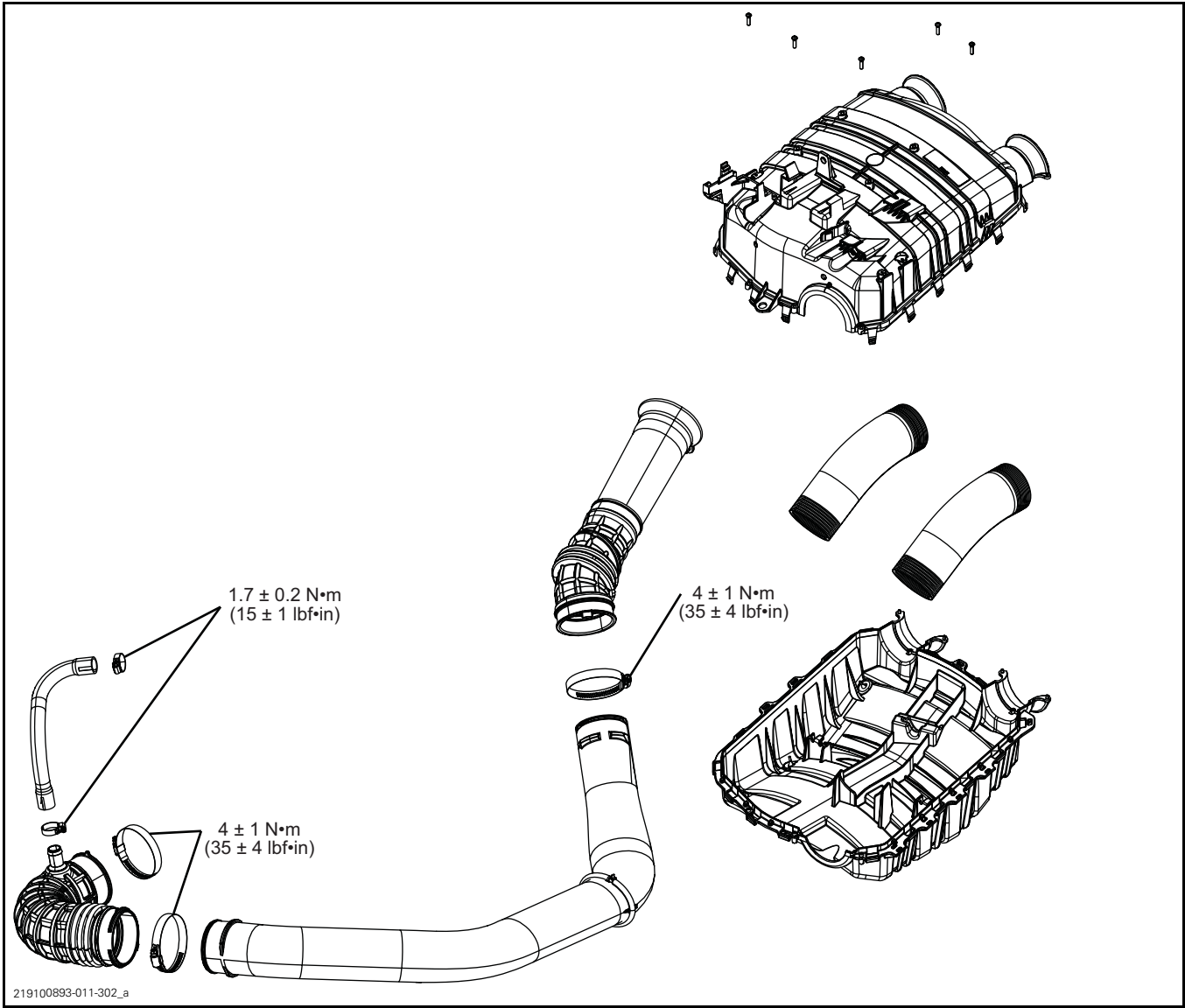
AIR INTAKE SYSTEM

155 Engines



Subsection XX (AIR INTAKE SYSTEM)

230 and 300 Engines



PROCEDURES

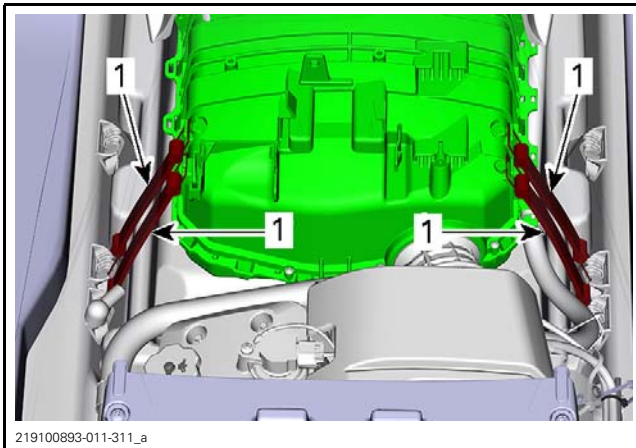
AIR INTAKE SILENCER

Air Intake Silencer Location

Air intake silencer is located above the fuel tank.

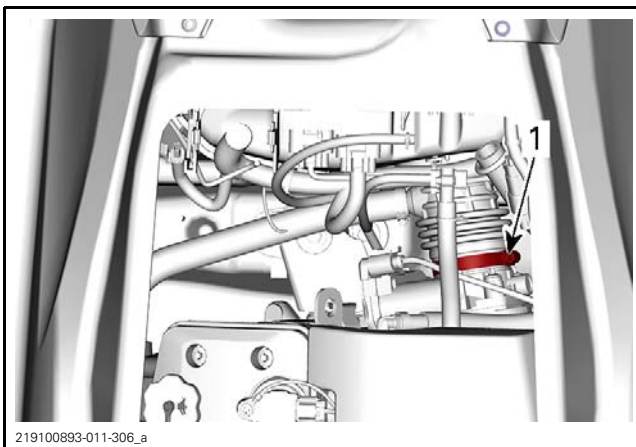
Removing the Air Intake Silencer

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



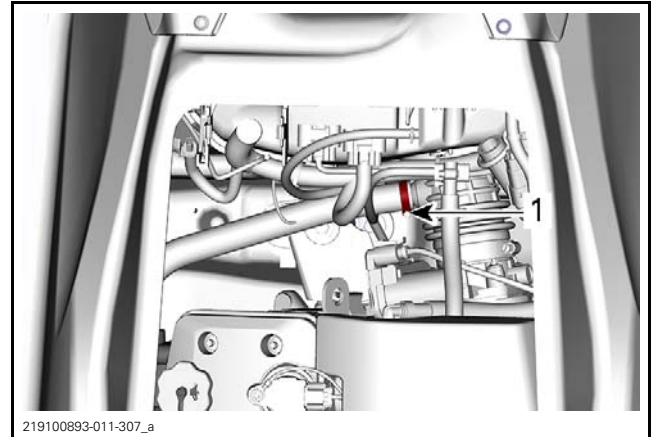
1. Rear retaining straps

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



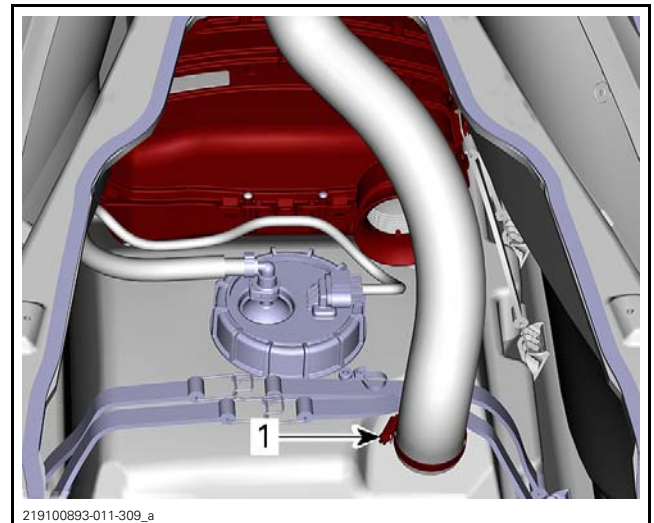
1. Loosen Clamp

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



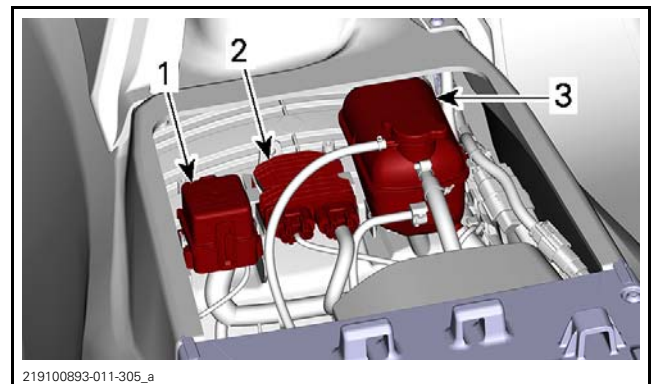
1. Loosen Clamp

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



1. Loosen Clamp

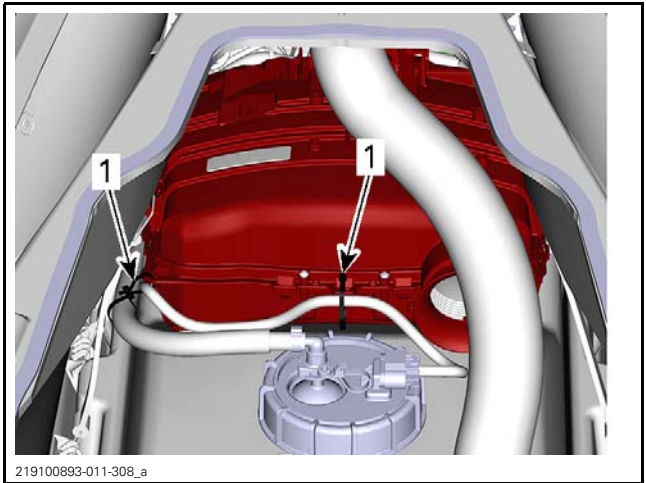
8. Unclip the fuse box, the regulator and the coolant reservoir from the air intake silencer.



1. Fuse box
2. Regulator
3. Coolant reservoir

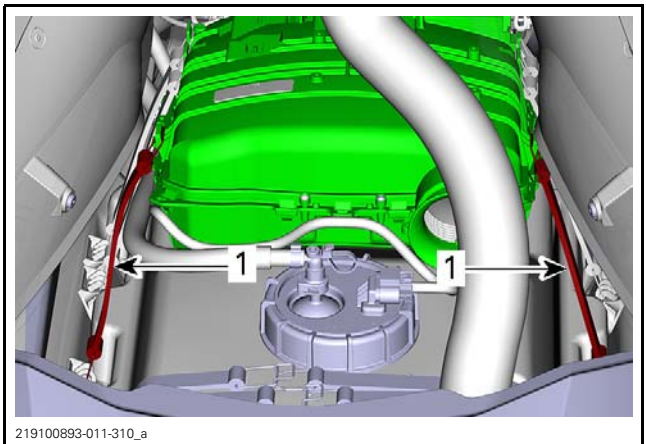
Subsection XX (AIR INTAKE SYSTEM)

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



TYPICAL
1. Cut these locking ties

10. Detach the front retaining straps.

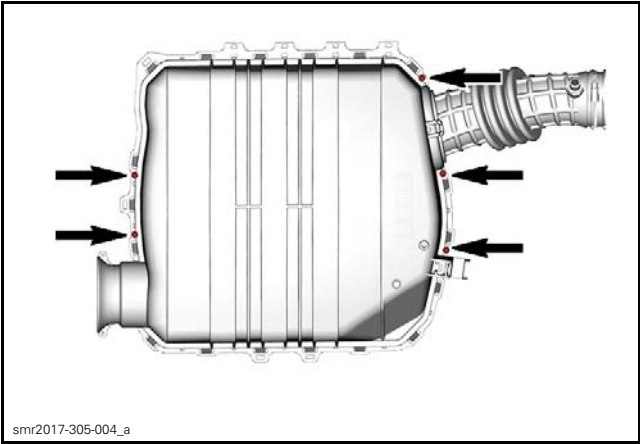


1. Front retaining straps

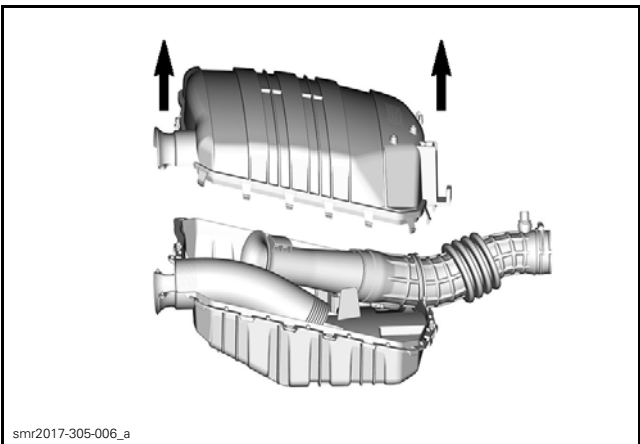
11. Carefully pull the air intake silencer forward to remove it from the vehicle.

Disassembling the Air Intake Silencer

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

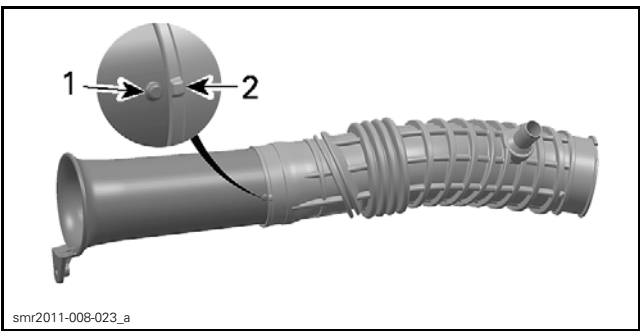


Release all retaining tabs.
Separate upper and lower sections.



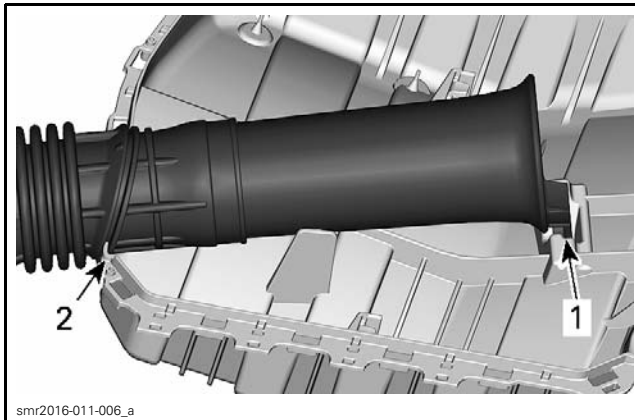
Assembling the Air Intake Silencer

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



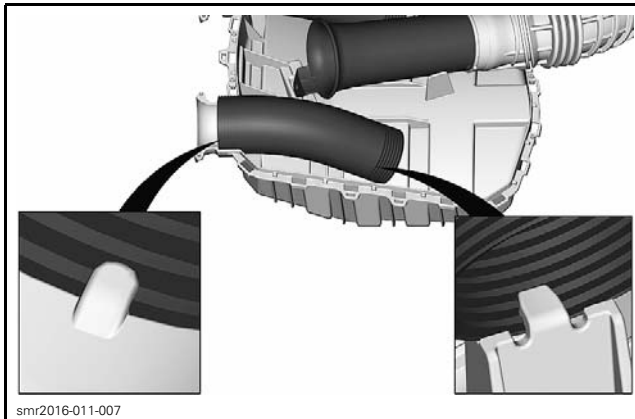
TYPICAL
1. Baffle mark
2. Outlet hose mark

Install the assembly in the air intake silencer.



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

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



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

TIGHTENING TORQUE	
Air intake silencer screws	Hand tight

Installing the Air Intake Silencer

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

Ensure wiring harness and fuel hoses are properly routed.

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

Install new locking ties

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

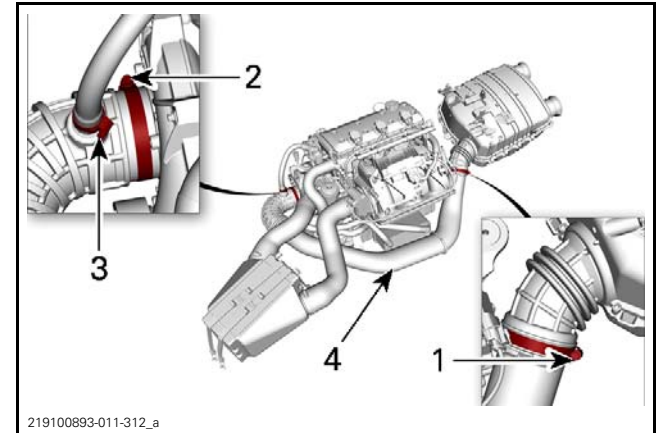
TIGHTENING TORQUE	
Retaining clamps	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)

AIR INTAKE TUBE

Removing the Air Intake Tube

Supercharged Engine

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



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

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

Installing the Air Intake Tube

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

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

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

EXHAUST SYSTEM

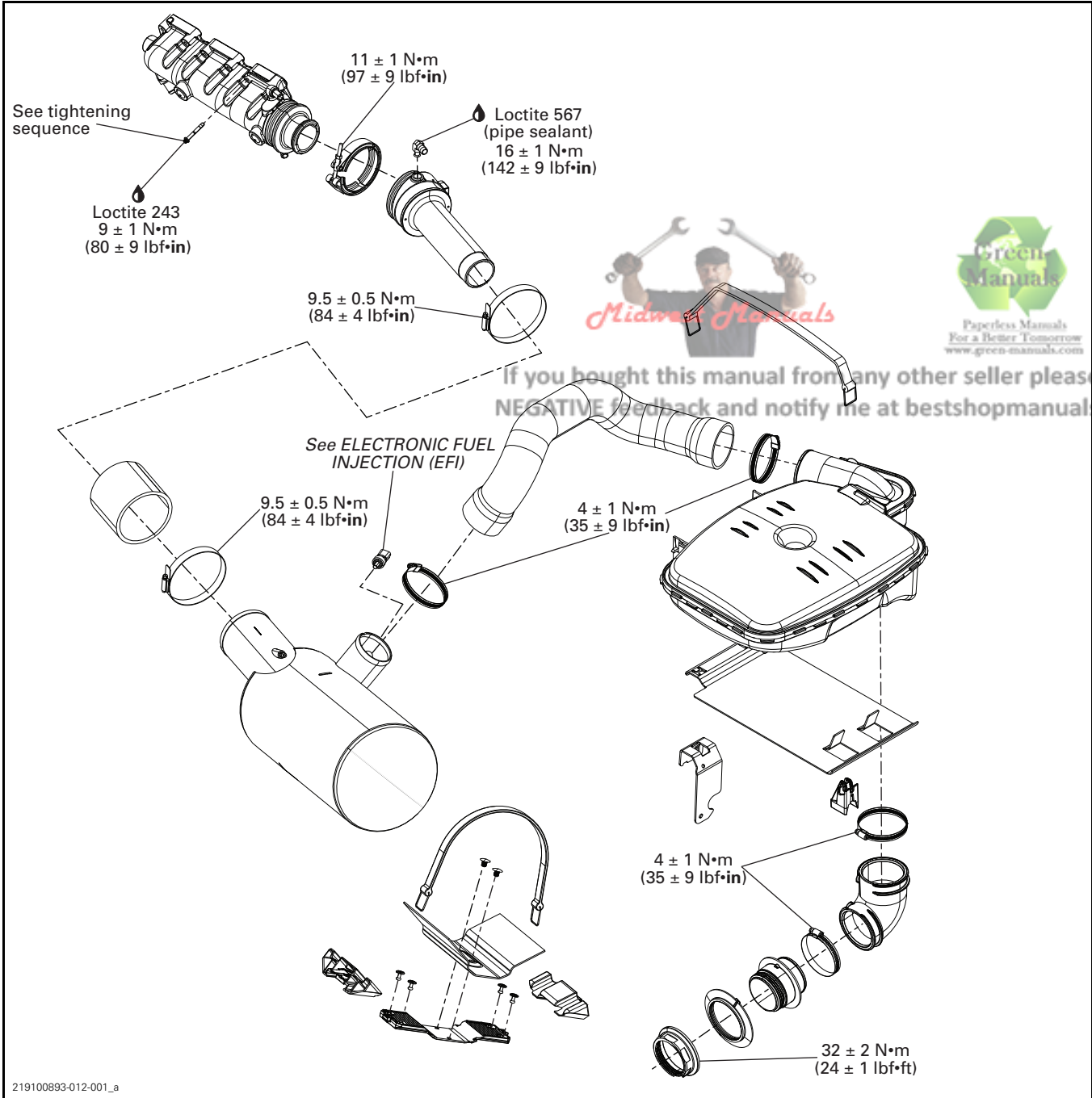
SERVICE TOOLS

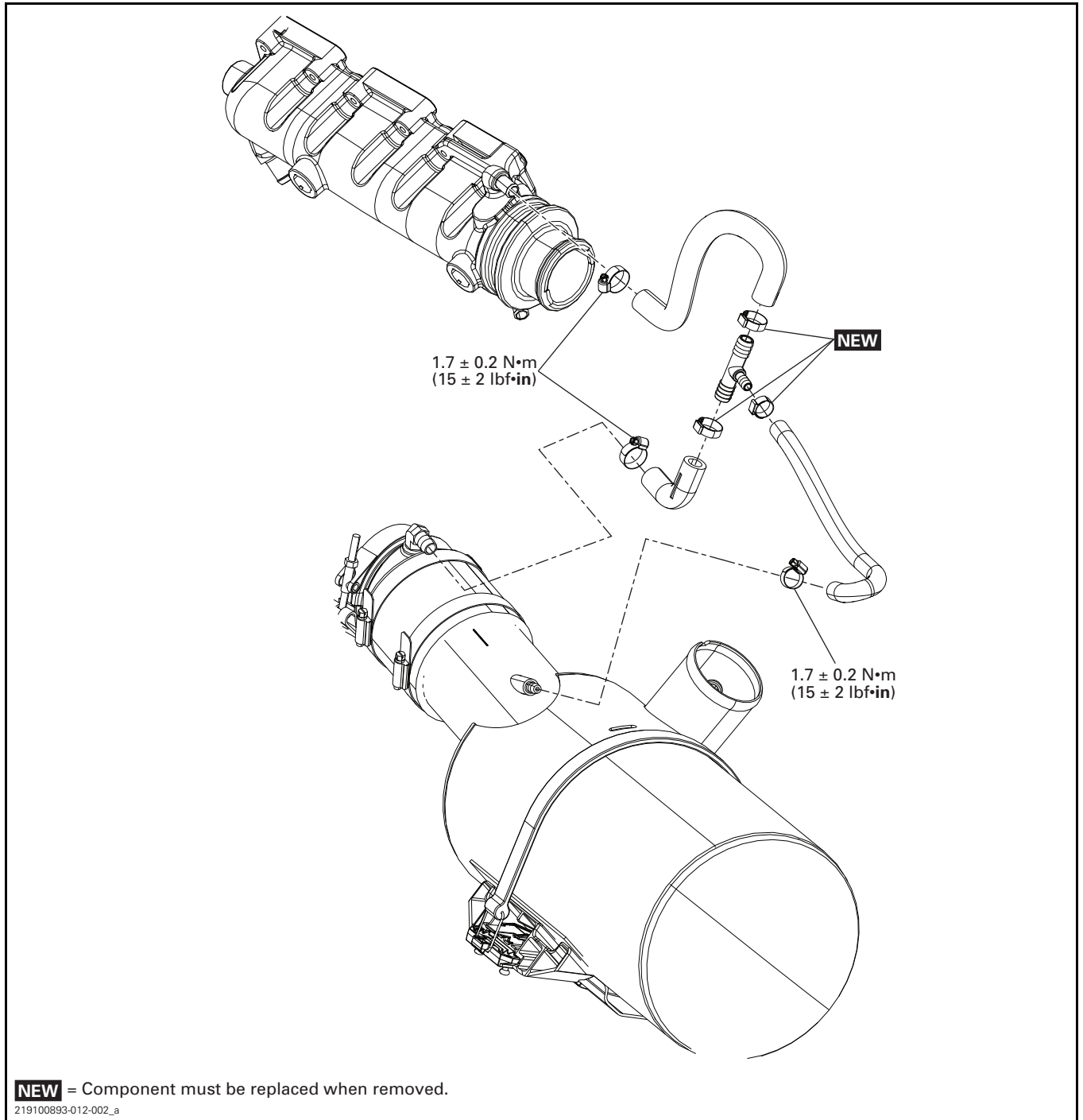
Description	Part Number	Page
FLUSHING CONNECTOR ADAPTER	295 500 473	7

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	8

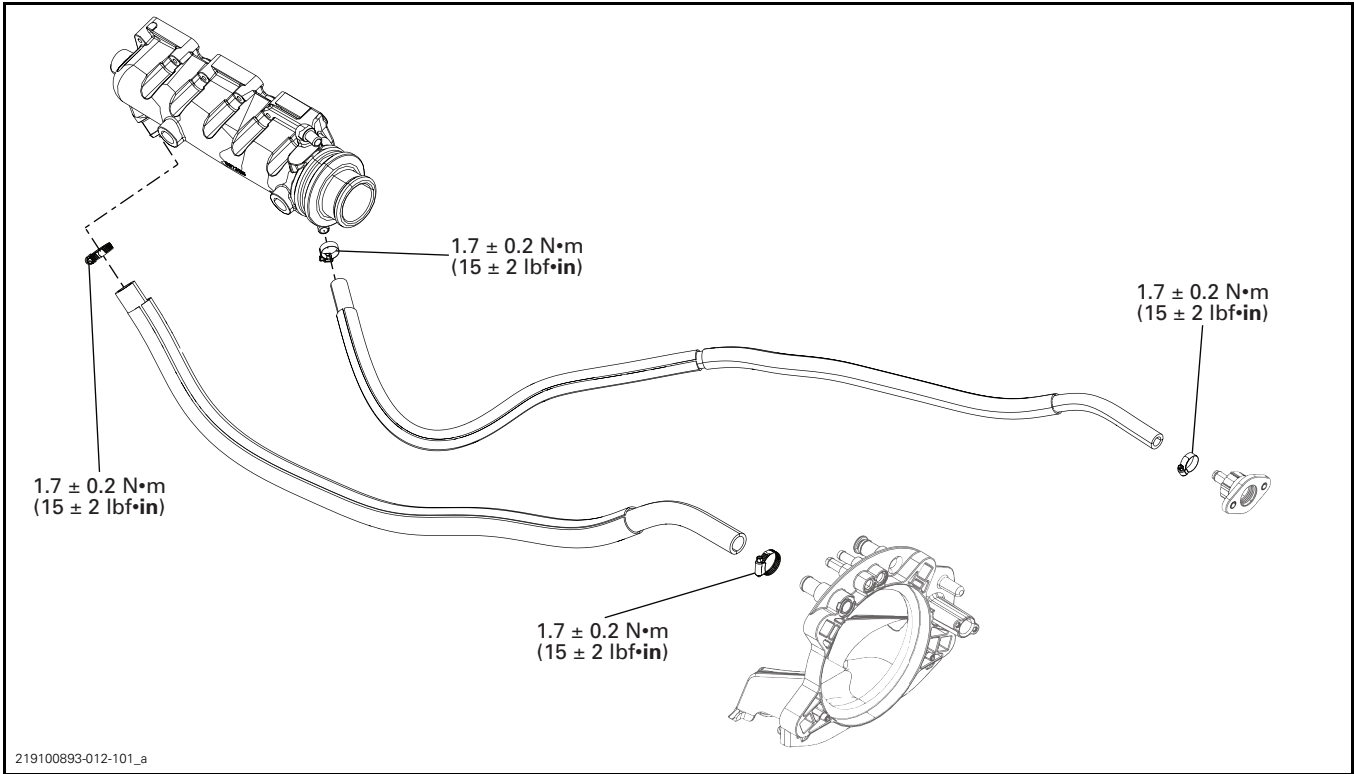
Subsection XX (EXHAUST SYSTEM)



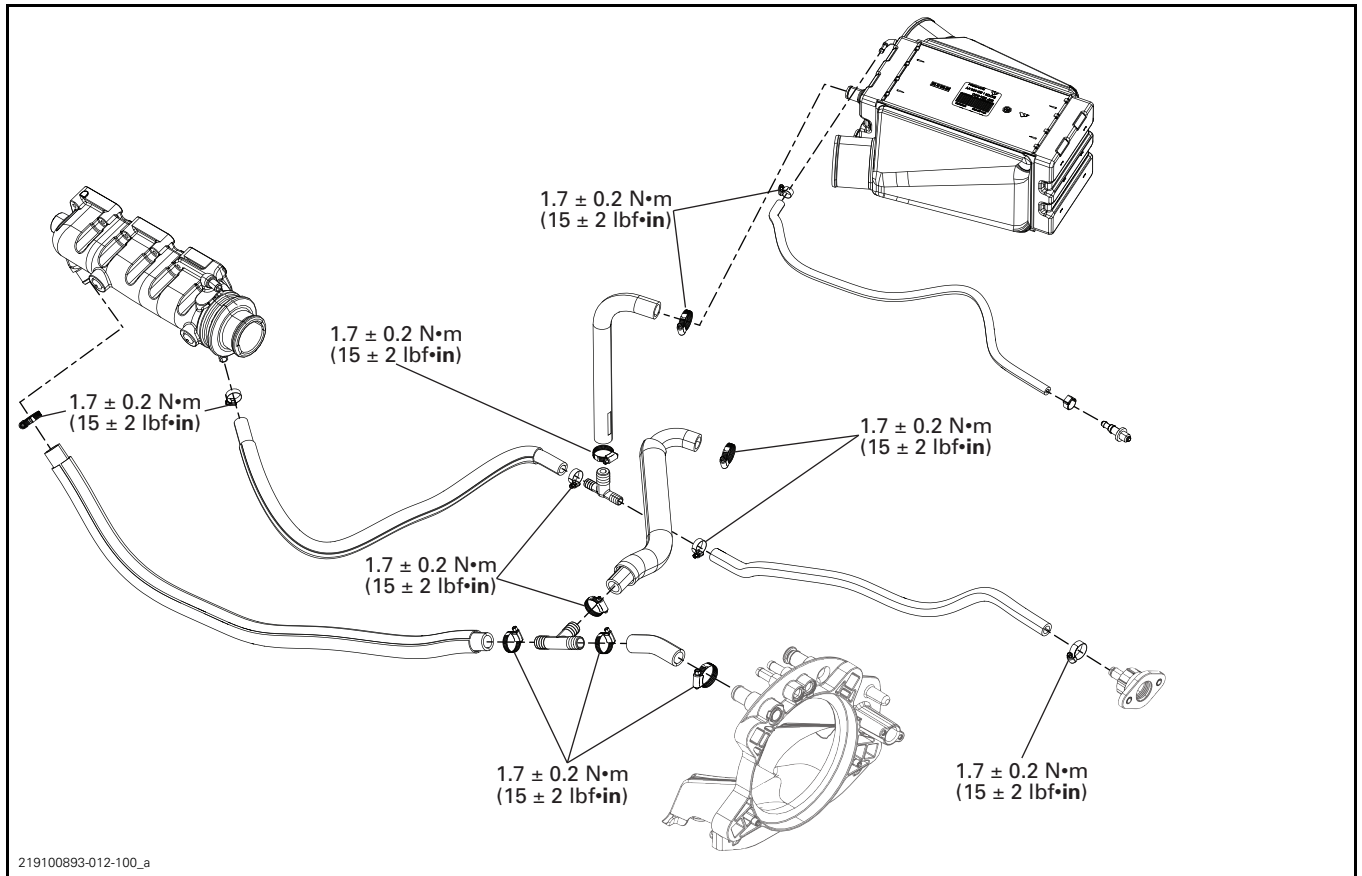


Subsection XX (EXHAUST SYSTEM)

Models without intercooler



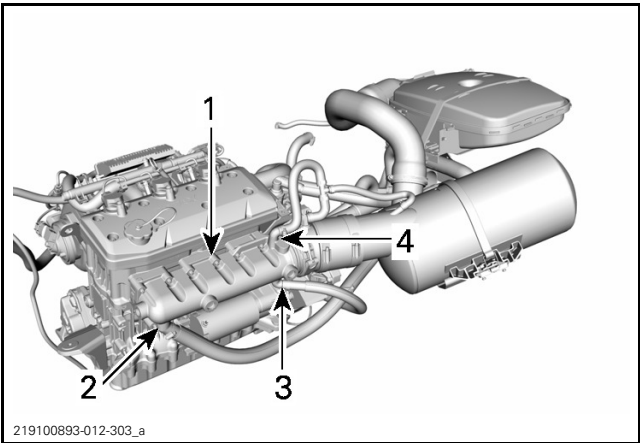
Models with intercooler



GENERAL

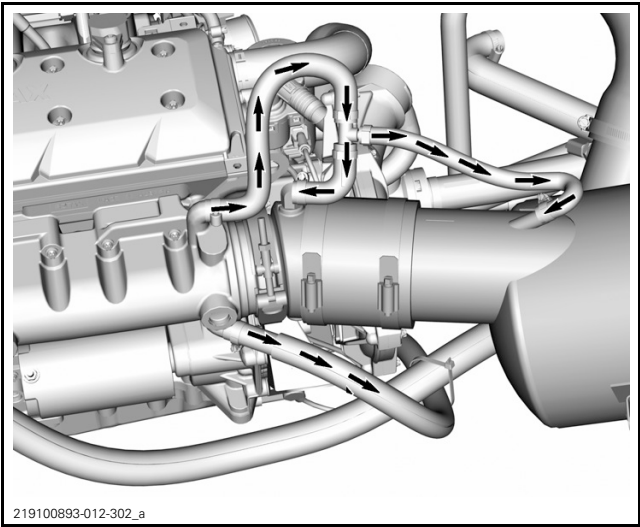
SYSTEM DESCRIPTION

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

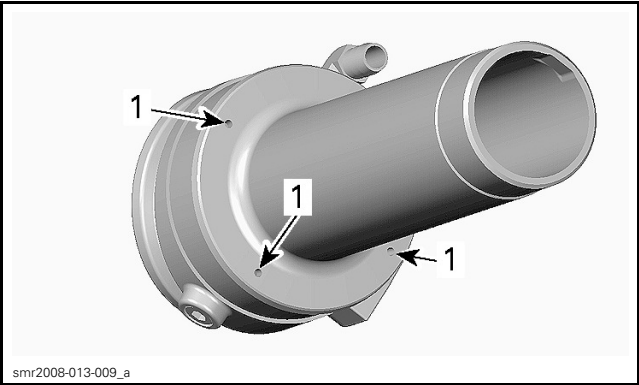


- 1. Exhaust manifold
- 2. Exhaust manifold water inlet
- 3. Exhaust manifold water outlet
- 4. Exhaust manifold water outlet (to exhaust pipe and muffler)

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



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



1. Water packet holes

Water is evacuated through the exhaust outlet in transom area.

Exhaust System Technical Specifications

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

MAINTENANCE

FLUSHING THE EXHAUST SYSTEM

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

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

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

⚠ WARNING

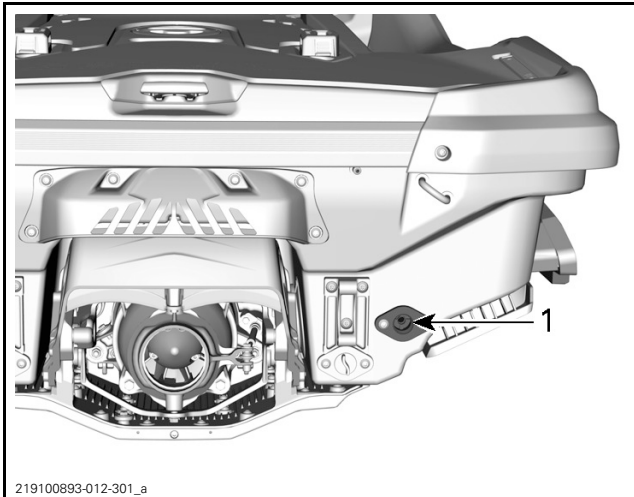
Perform this operation in a well ventilated area. Certain components in the engine compartment may be very hot. Direct contact may result in skin burn. Do not touch any electrical part or jet pump area when engine is running.

Proceed as follows:

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

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

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

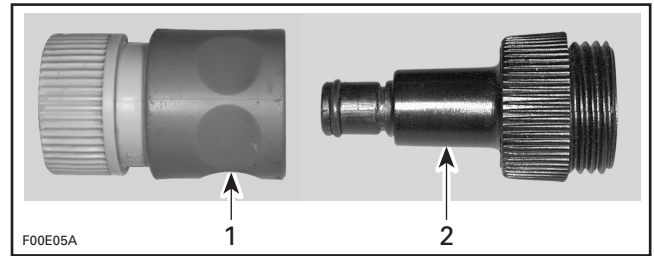


1. Water inlet connector

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

RECOMMENDED TOOL

FLUSHING CONNECTOR
ADAPTER (P/N 295 500 473)



1. Quick connect adapter
2. Flushing connector adapter

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

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

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

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

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

Ensure water flows out of jet pump while flushing.

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

Close the water tap.

Remove the garden hose from the vehicle.

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

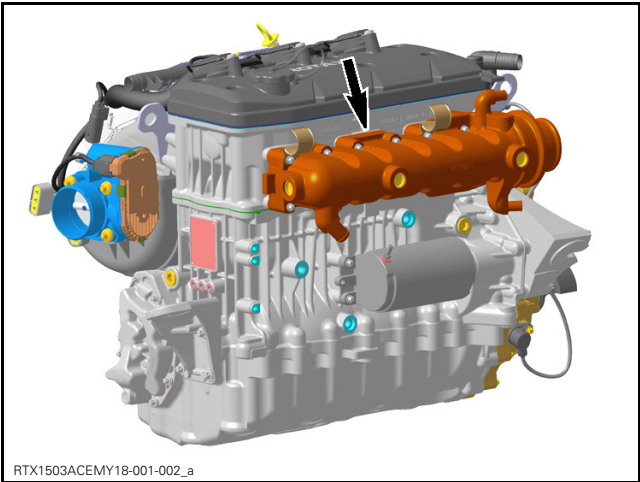
Stop engine.

NOTICE Always close the water tap before stopping the engine.

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

PROCEDURES

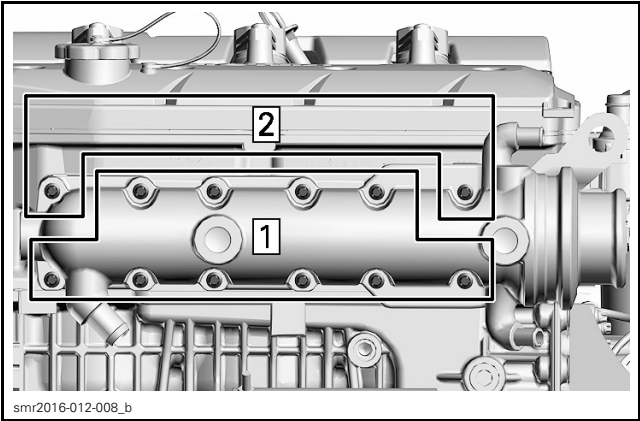
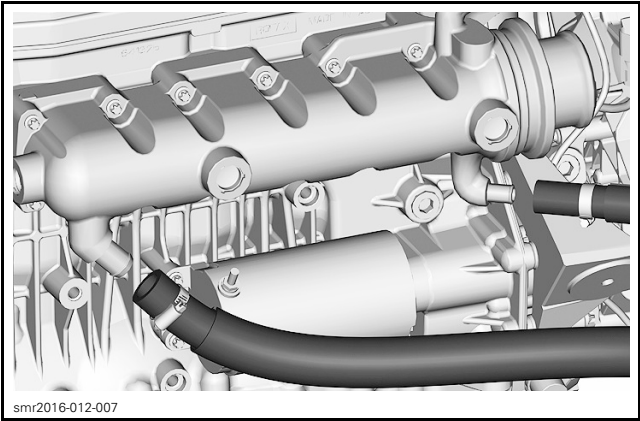
EXHAUST MANIFOLD



TYPICAL

Removing the Exhaust Manifold

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



Step 1: Remove first
Step 2: Remove last

2. Remove the exhaust manifold from vehicle.

Inspecting the Exhaust Manifold

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

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

Clean all metal components in a solvent.

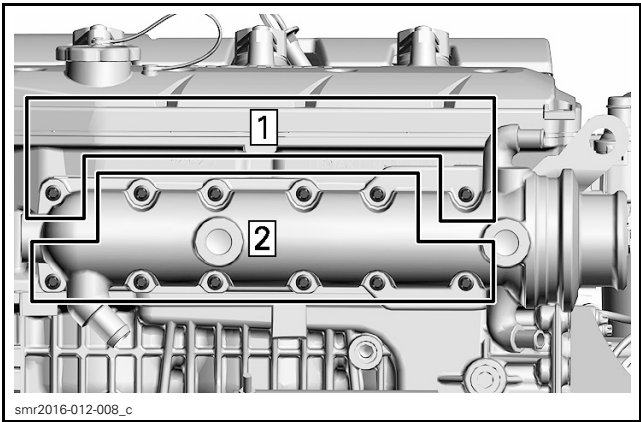
Installing the Exhaust Manifold

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

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

Apply threadlocker on threads of screws.

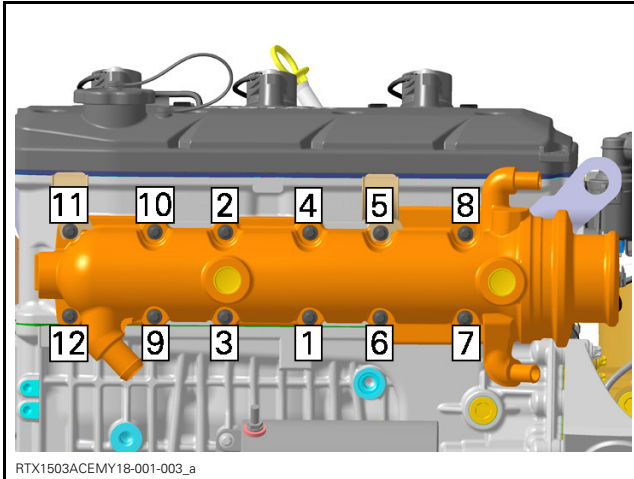
SERVICE PRODUCT	
Exhaust manifold screws	LOCTITE 243 (BLUE) (P/N 293 800 060)



Step 1: Install first
Step 2: Install last

Tighten screws to specification as per following illustrated sequence.

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



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

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

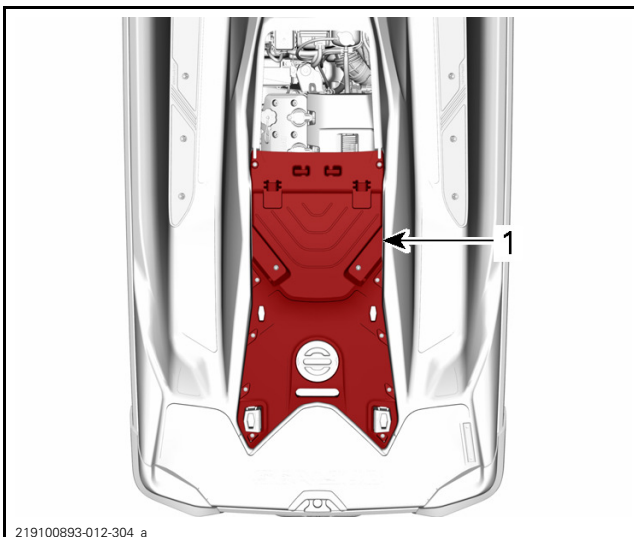
MUFFLER

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

Muffler Access

Remove or open seat.

Remove the engine service cover.

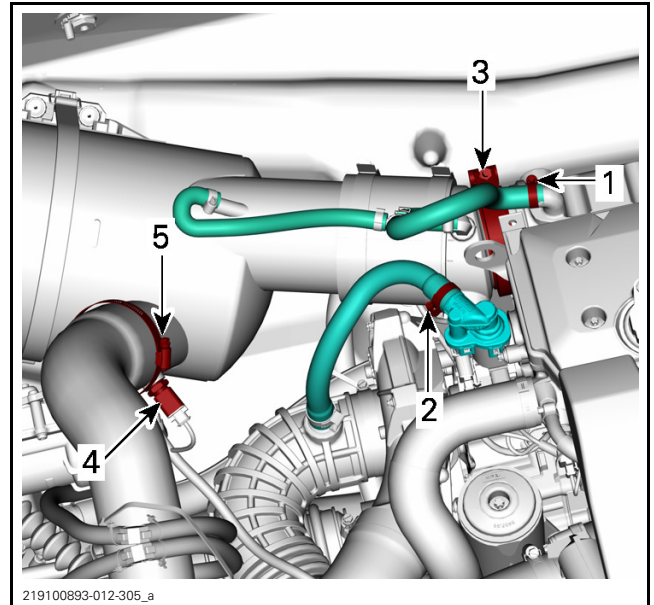


1. Engine service cover

Removing the Muffler

1. Remove seats.

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

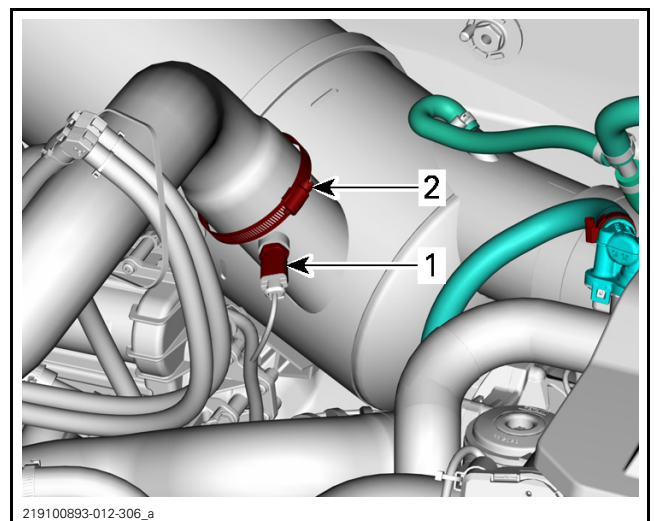


1. Water outlet hose (exhaust manifold)
2. Blow-by hose (blow-by valve)
3. Exhaust clamp
4. EGTS sensor
5. Exhaust hose

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

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

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

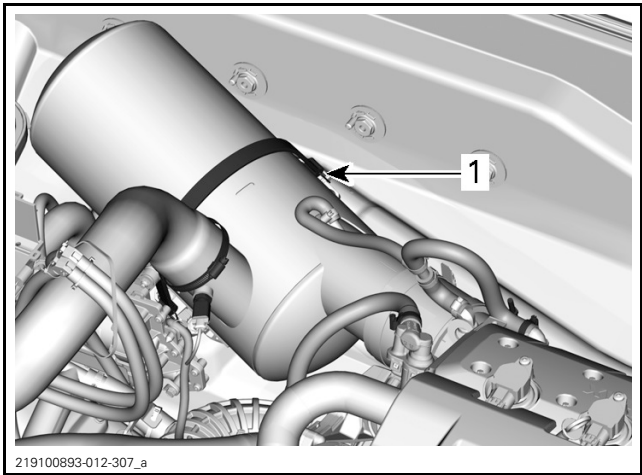


1. EGTS sensor
2. Exhaust hose clamp

7. Disconnect the exhaust hose from muffler.

Subsection XX (EXHAUST SYSTEM)

8. Detach retaining strap.



1. Muffler retaining strap

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

Inspecting the Muffler

Check muffler for:

- Cracks
- Corrosion
- Other damages.

Check if exhaust hose is:

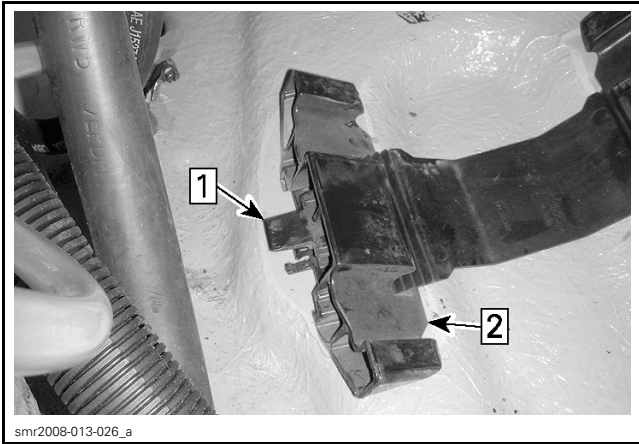
- Brittle
- Hard
- Cracked
- Otherwise damaged.

Replace any defective part.

Installing the Muffler

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

Open muffler adjusters by sliding adjuster blocks.



TYPICAL – RUBBER PAD REMOVED FOR CLARITY PURPOSE
Step 1: Lift adjuster tab
Step 2: Move adjuster outward

Insert the muffler in hull.

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

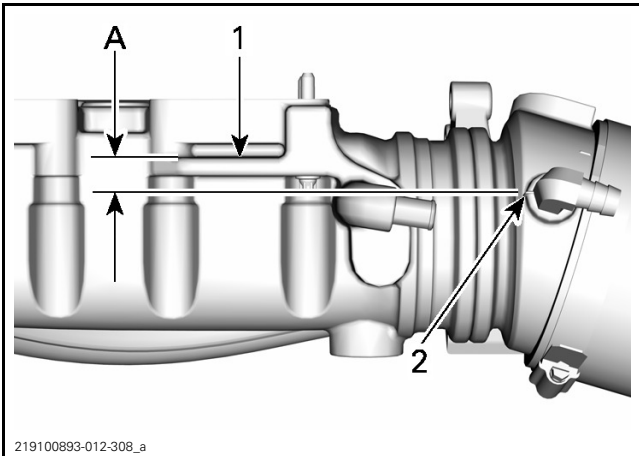
Slide both adjuster blocks against muffler to support it in position.

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

Install exhaust clamp with the nut upward.

Tighten clamp loosely.

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



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

Tighten exhaust clamp to specification.

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

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

Install the muffler strap.

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

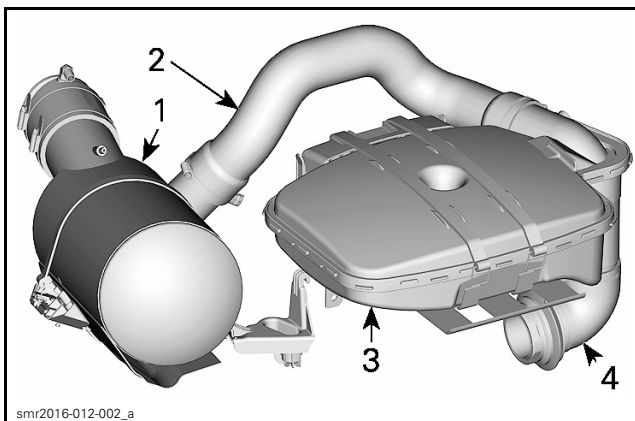
Install all other removed parts.

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

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

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

EXHAUST HOSES



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

Replacing the Front Exhaust Hose

Remove seats.

Remove engine service cover.

Cut all locking ties from exhaust hose.

Remove exhaust hose from the muffler outlet and resonator.

Remove front exhaust hose from vehicle.

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

Replace all locking ties previously cut.

Tighten retaining clamps to specification.

TIGHTENING TORQUE

Front exhaust hose clamp	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)
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Install all other removed parts.

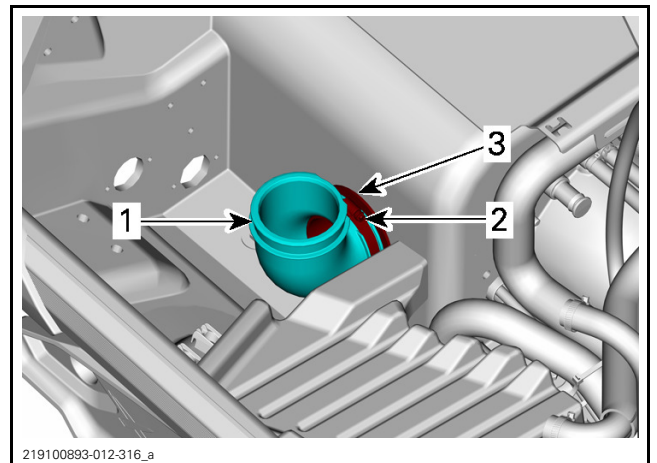
After installation, ensure there is no water or exhaust gas leak when the engine is running. Test run the engine while supplying water to the exhaust system.

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

Replacing the Rear Exhaust Hose

Remove the resonator. See procedure in this subsection.

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



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

When reinstalling rear exhaust hose, tighten clamps to specification.

TIGHTENING TORQUE

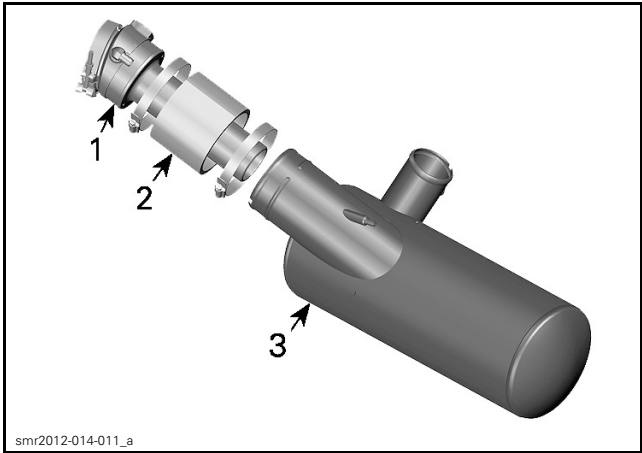
Rear exhaust hose clamp	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)
-------------------------	---

Reinstall all other removed parts.

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

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

EXHAUST PIPE

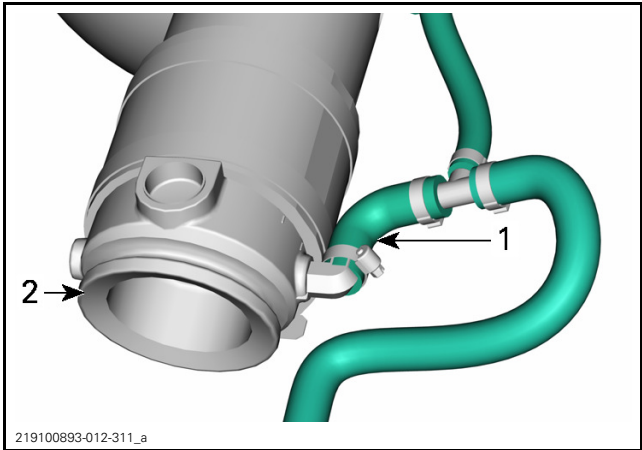


1. Exhaust pipe
2. Rubber adapter
3. Muffler

Removing the Exhaust Pipe

Remove *MUFFLER*, see procedure in this subsection.

Disconnect water inlet hose from exhaust pipe fitting.



1. Water inlet hose
2. Exhaust pipe

Loosen rubber adapter clamps.

Remove exhaust pipe and the rubber adapter.

Inspecting the Exhaust Pipe

Inspect exhaust pipe for:

- Cracks
- Flange damages
- Other damages.

Replace exhaust pipe as required.

Check if the rubber adapter is:

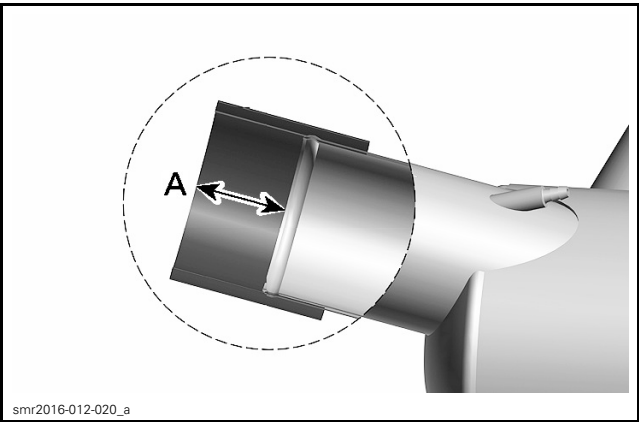
- Brittle

- Hard
- Otherwise damaged.

Replace rubber adapter if necessary.

Installing the Exhaust Pipe

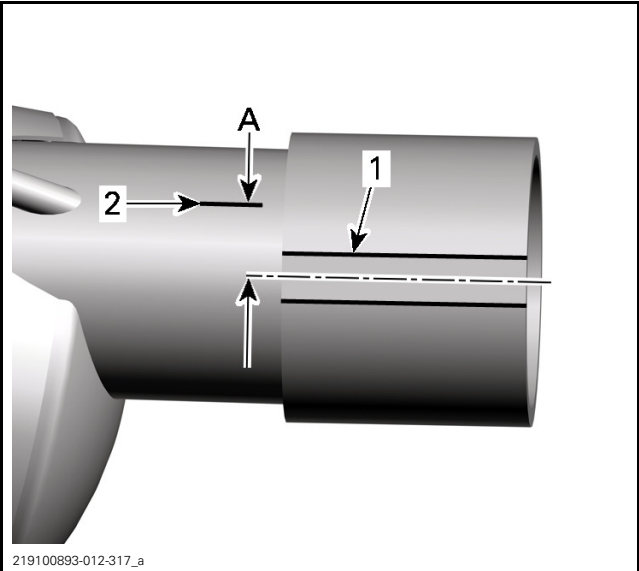
Install rubber adapter on muffler.



SECTION VIEW

1. 57 mm ± 2 mm (2-1/4 in ± 5/64 in)

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

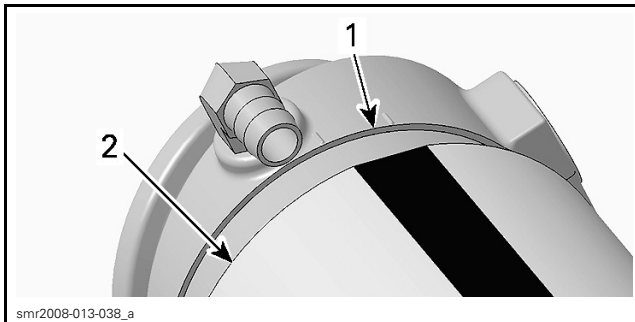


1. Blue strip on rubber adapter
2. Muffler pre mark
A. 30 mm (1.181 in)

Secure the rubber adapter to the muffler using retaining clamp.

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

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

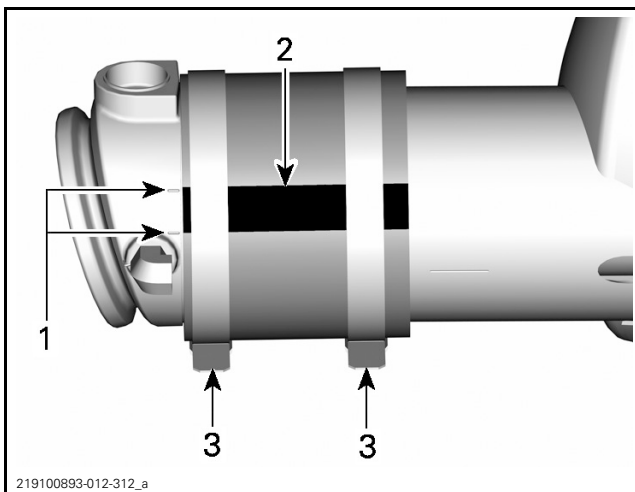


1. Exhaust pipe shoulder
2. Rubber adapter

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

Tighten retaining clamps.

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



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

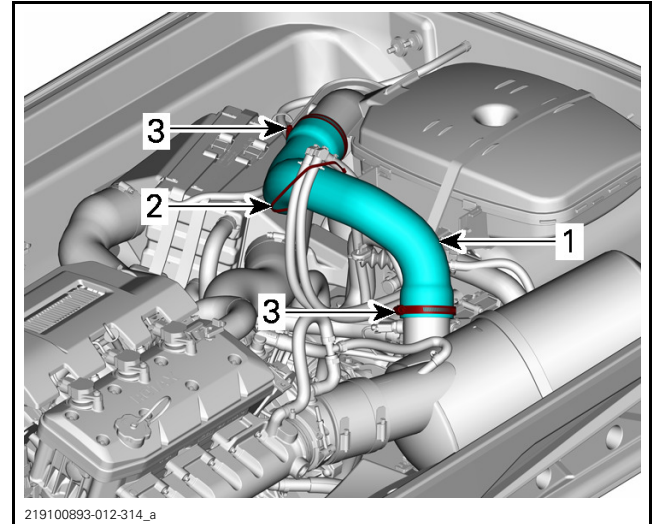
Install muffler in vehicle. Refer to *INSTALLING THE MUFFLER* in this subsection for complete procedure.

RESONATOR

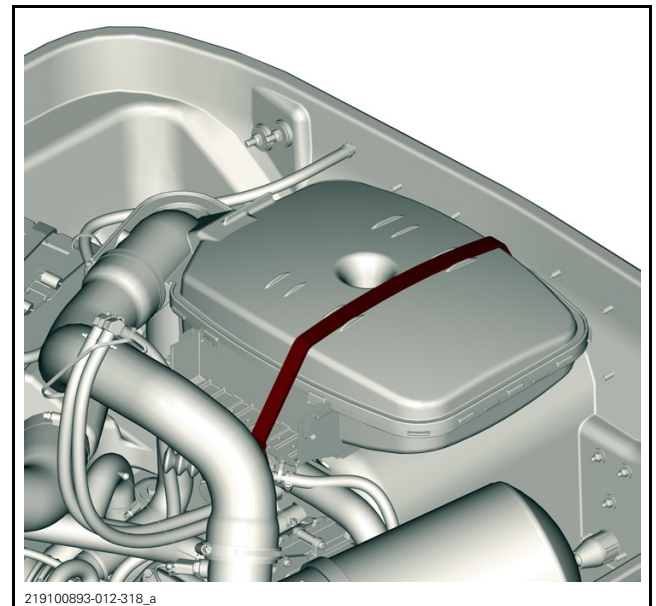
Removing the Resonator

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

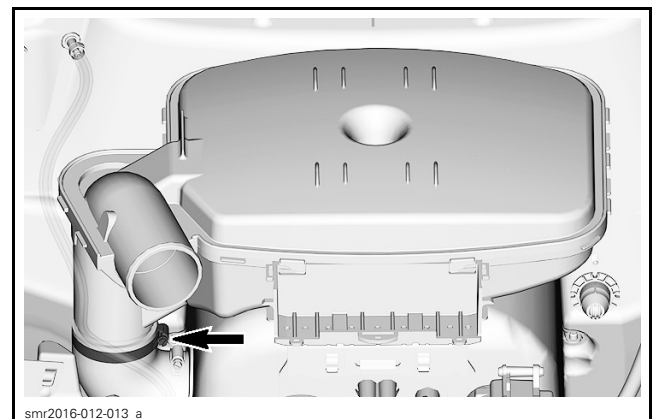
Remove front exhaust hose.



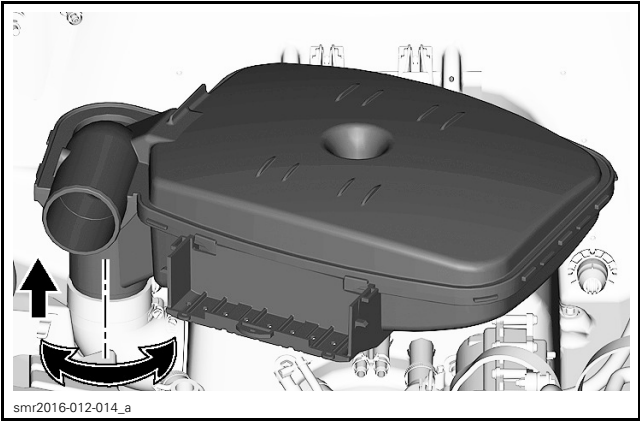
Remove strap holding resonator.



Loosen upper clamp from rear exhaust hose.



Rotate resonator to free it up from rear exhaust hose.



Inspecting the Resonator

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

Installing the Resonator

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

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

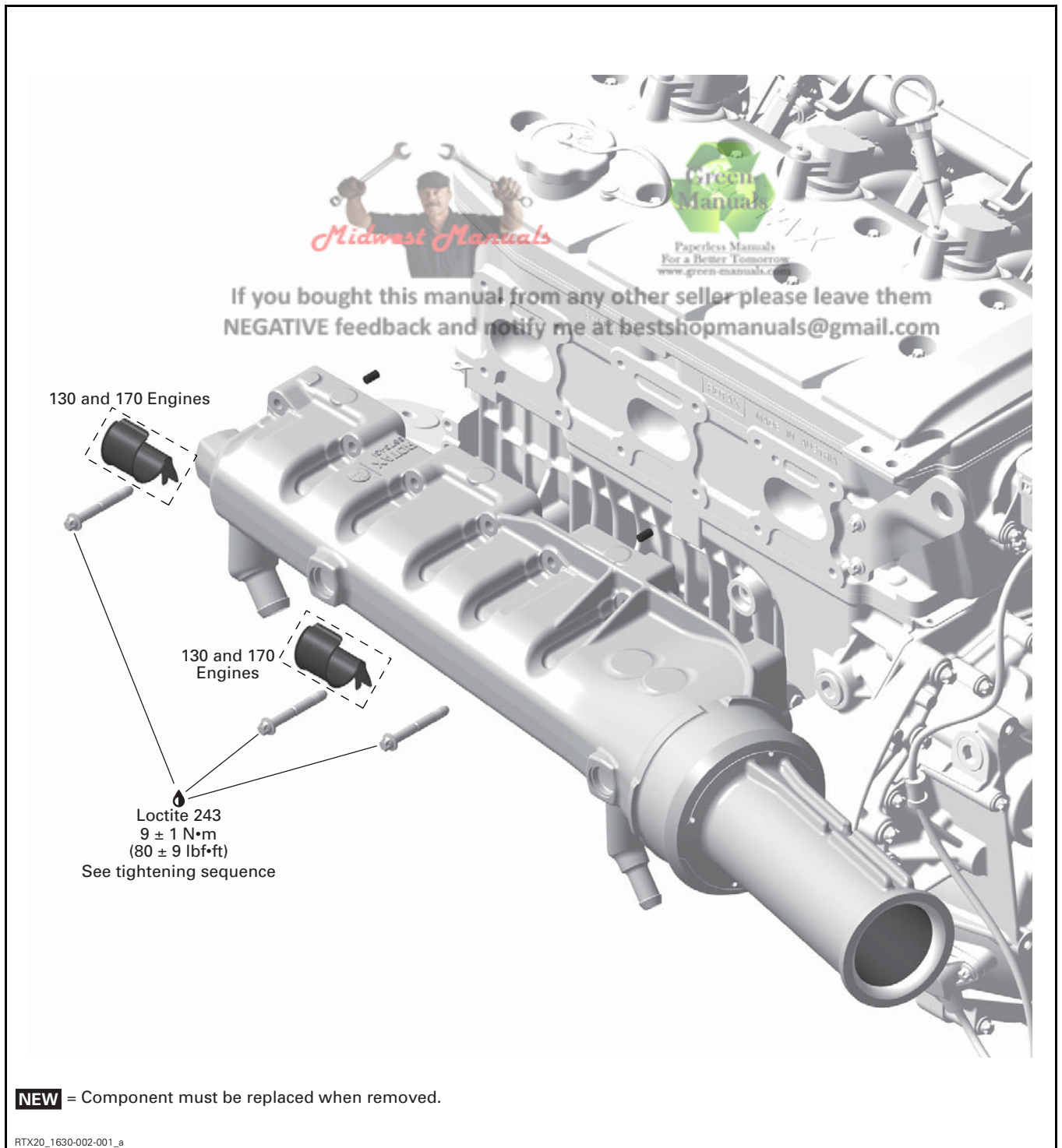
TIGHTENING TORQUE	
Crossover Pipe Clamps	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)

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

EXHAUST MANIFOLD

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	2

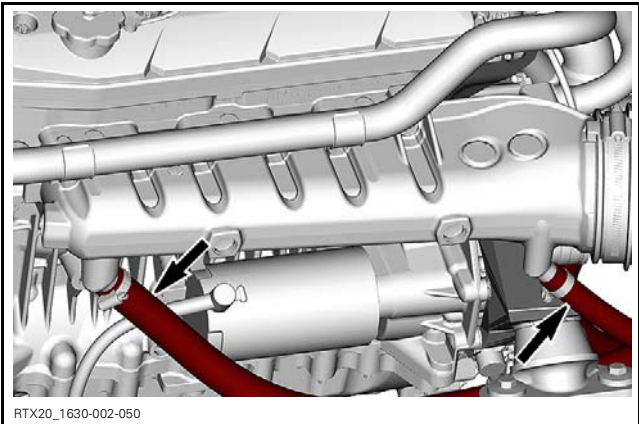


PROCEDURES

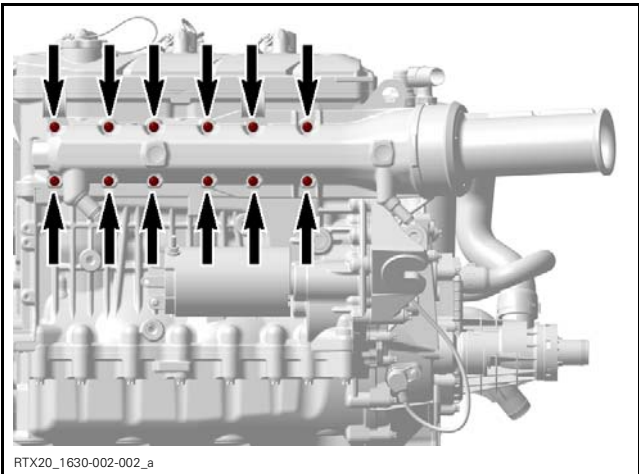
EXHAUST MANIFOLD

Removing the Exhaust Manifold

- 1. Move muffler rearwards to make room.
- 2. Unplug inlet and outlet hoses.



- 3. Remove the exhaust manifold screws.



- 4. Remove the exhaust manifold from vehicle.

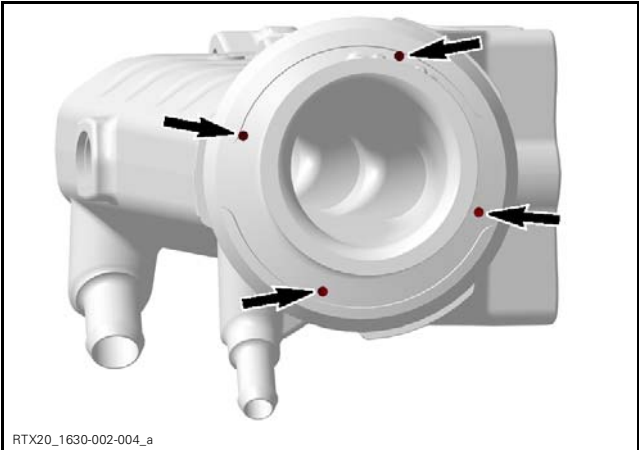
Inspecting the Exhaust Manifold

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

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

Clean all metal components in a solvent.

Check if water injection holes are not clogged.



Installing the Exhaust Manifold

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

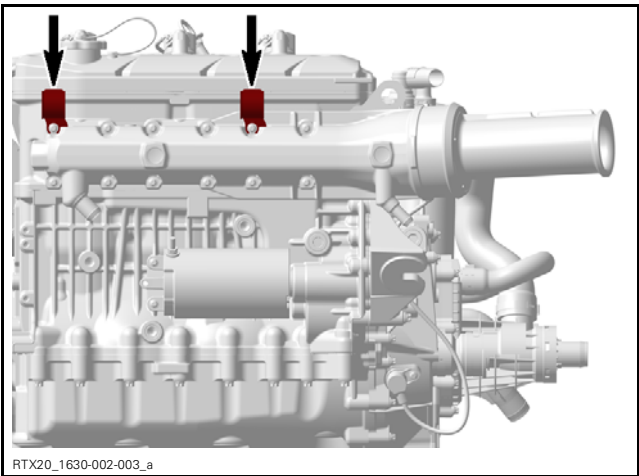
NOTE: There is no gasket between cylinder block and exhaust manifold.

Apply threadlocker on threads of screws.

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

130 and 170 Engines

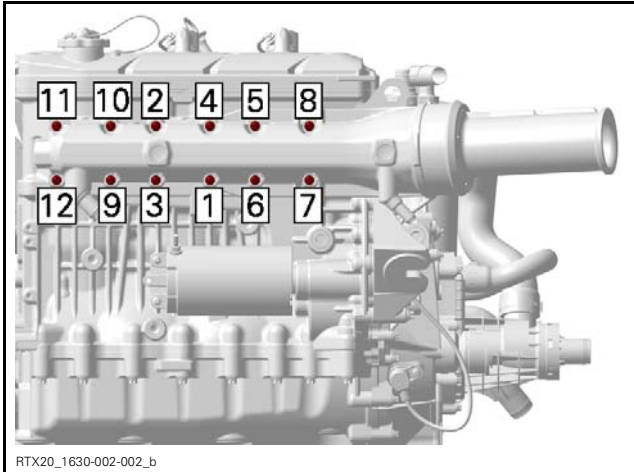
Install holding clamps.



All Engines

Tighten screws to specification as per following illustrated sequence.

TIGHTENING TORQUE	
Repeat the procedure twice.	
Exhaust manifold screw	$9 \text{ N}\cdot\text{m} \pm 1 \text{ N}\cdot\text{m}$ $(80 \text{ lbf}\cdot\text{in} \pm 9 \text{ lbf}\cdot\text{in})$



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

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

LUBRICATION SYSTEM

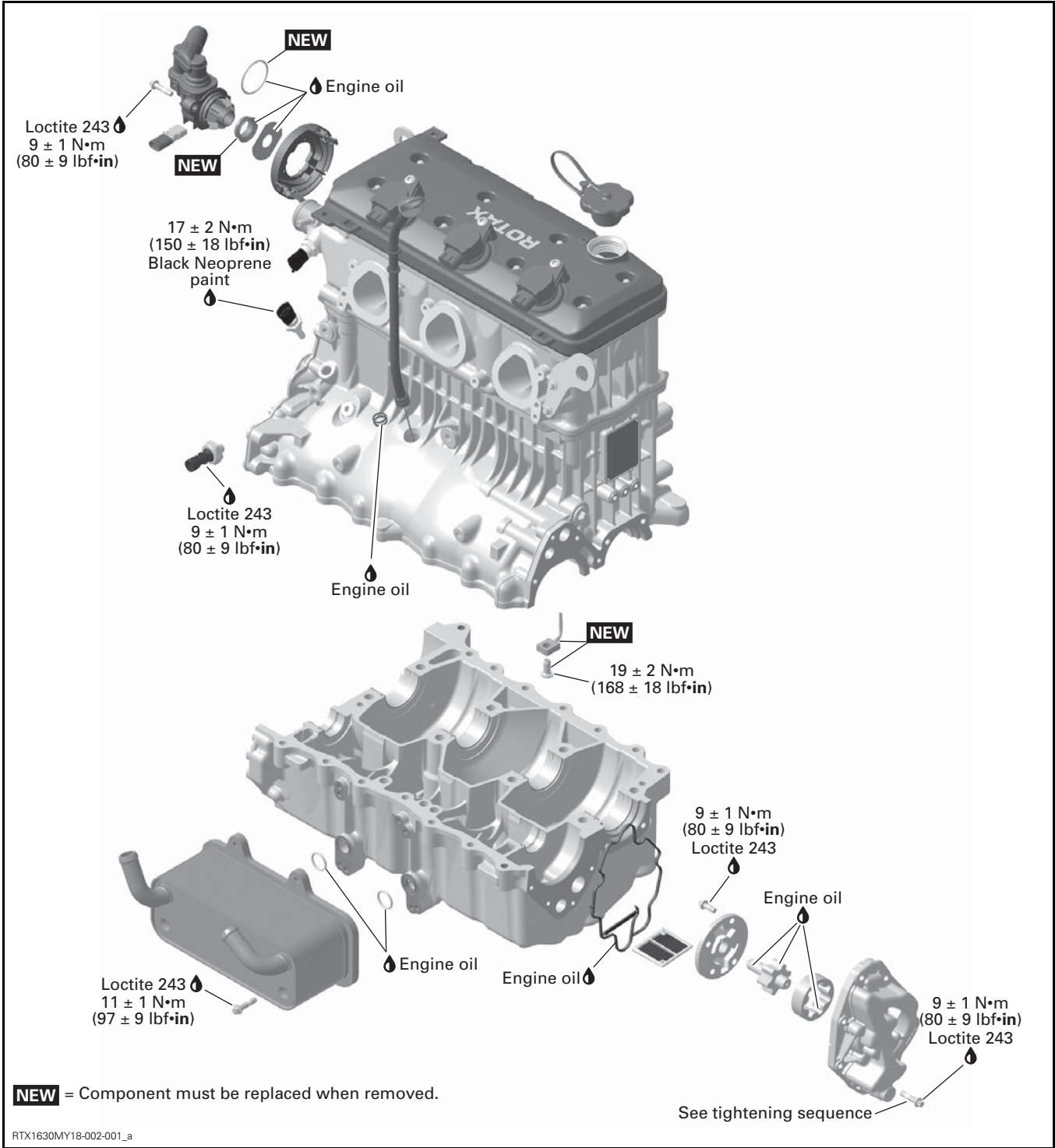
SERVICE TOOLS

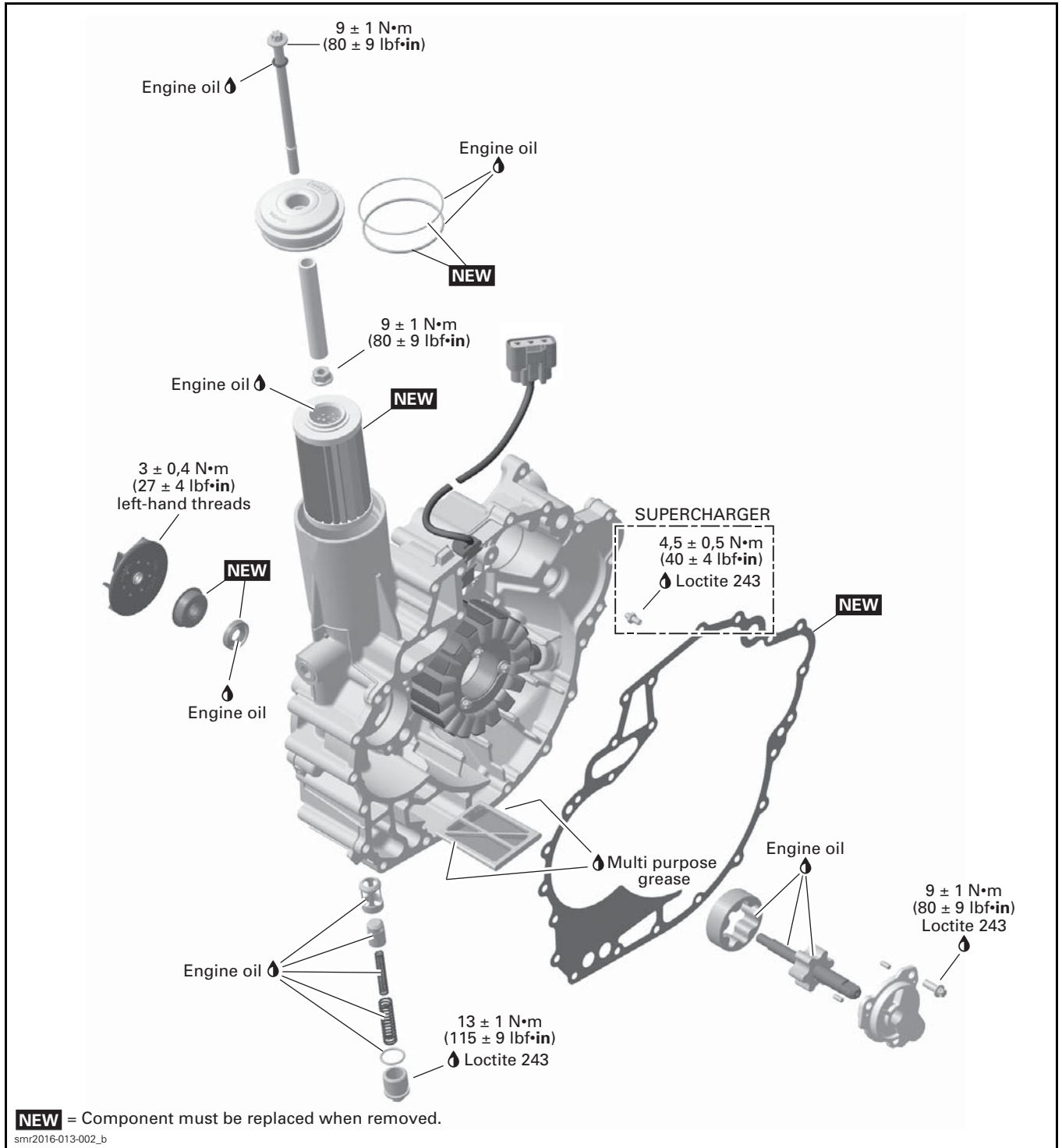
Description	Part Number	Page
BACK PROBE TEST WIRES	529 036 063	6
CERAMIC SEAL PULLER	529 036 365	19
ECM ADAPTER TOOL	529 036 166	6
FLUKE 115 MULTIMETER	529 035 868	6
HANDLE	420 877 650	19
OIL PRESSURE HOSE	529 036 394	10
OIL SEAL GUIDE	529 035 822	18
OIL SEAL PUSHER	529 035 757	19
PRESSURE GAUGE	529 036 395	10
SUCTION PUMP	529 035 880	9
WATER PUMP SEAL PUSHER	529 035 823	18, 20

SERVICE PRODUCTS

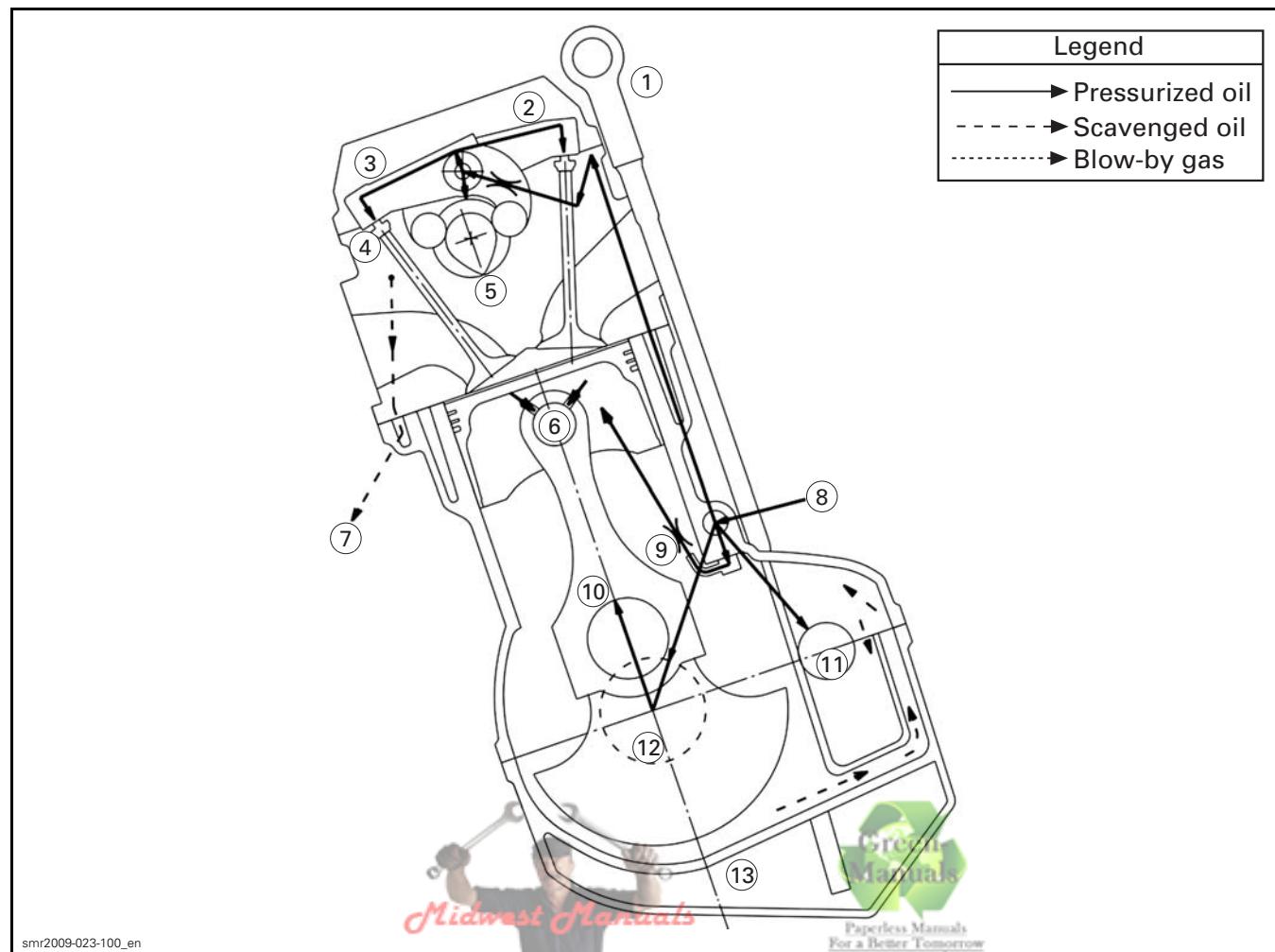
Description	Part Number	Page
4T 5W40 SYNTHETIC BLEND OIL (EUR)	779290	6
4T 5W40 SYNTHETIC BLEND OIL	779133	6
BLACK NEOPRENE PAINT	909570	14
BRAKE AND PARTS CLEANER PRO S2	779245	9, 20
LOCTITE 243 (BLUE)	293 800 060	13, 16, 18, 22–23, 28, 30
SUPER LUBE GREASE	293 550 030	10

Subsection XX (LUBRICATION SYSTEM)





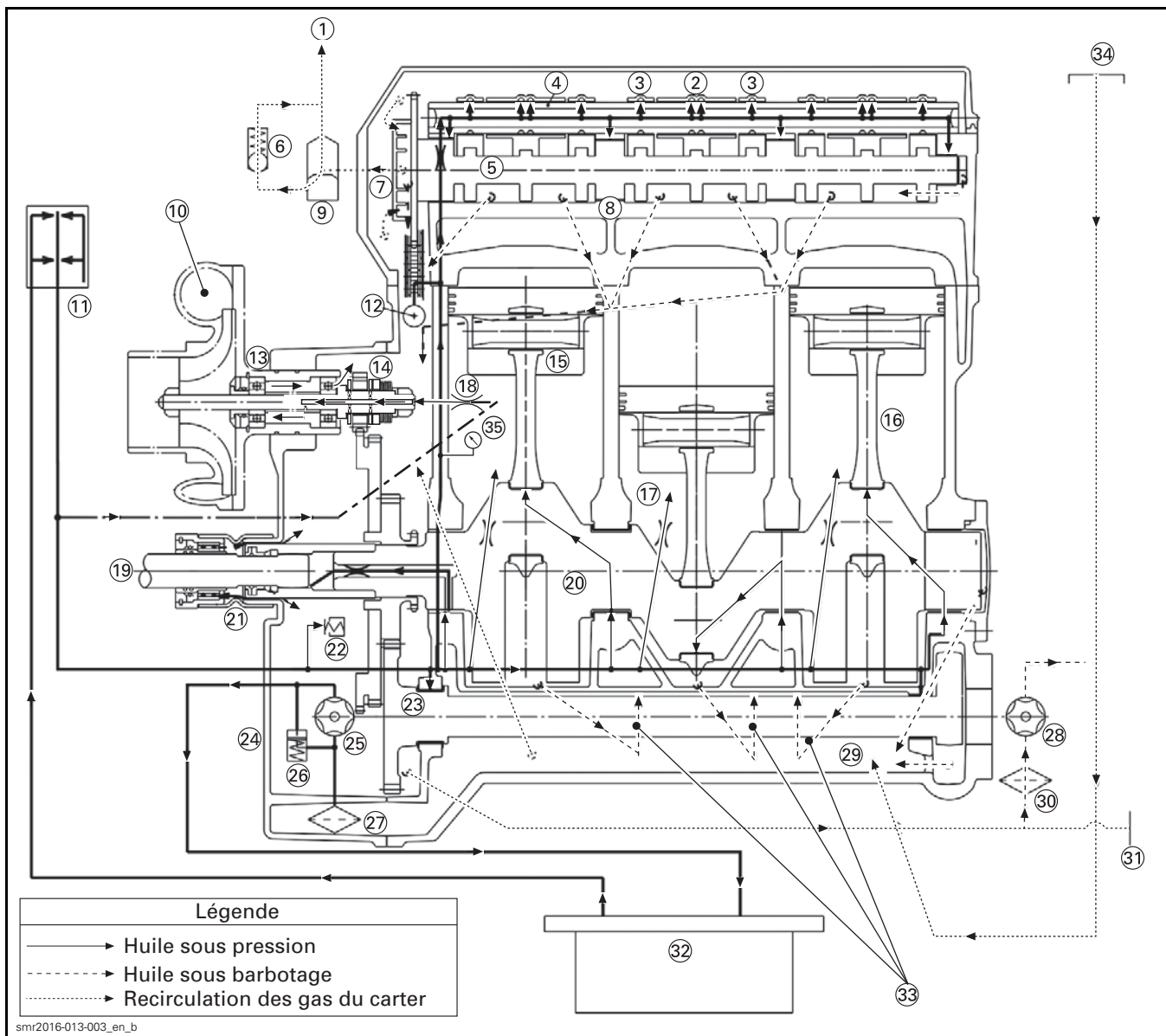
ENGINE LUBRICATION CIRCUIT



- smr2009-023-100_en
- Oil dipstick
 - Rocker arm (intake)
 - Rocker arm (exhaust)
 - Hydraulic valve lifter
 - Camshaft
 - Piston pin
 - Into PTO housing
 - From oil filter
 - Piston cooling
 - Connecting rod
 - Balance shaft
 - Crankshaft
 - Oil tank

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ENGINE LUBRICATION CIRCUIT (CONT'D)



1. To air intake silencer
2. Rocker arm (intake)
3. Rocker arm (exhaust)
4. Rocker arm axle
5. Camshaft
6. Pressure relief valve
7. Oil separator
8. Cylinder head
9. Blow-by valve
10. Supercharger
11. Oil filter
12. Hydraulic chain tensioner
13. Supercharger bearing
14. Friction clutch
15. Piston pin
16. Connecting rod
17. Piston cooling

18. Oil spray nozzle
19. Drive shaft
20. Crankshaft
21. PTO seal
22. Oil pressure switch
23. Balance shaft
24. PTO housing
25. Pressure pump
26. Pressure relief valve
27. Oil strainer (pressure pump)
28. Suction pump
29. Oil tank
30. Oil strainer (scavenge pump)
31. Oil drainage (PTO housing)
32. Oil cooler
33. Scavenge of oil and blow-by gas
34. Oil filler cap
35. Oil temperature sensor

GENERAL
MAINTENANCE

The following tools are required to test most of the electrical parts.

REQUIRED TOOLS	
ECM ADAPTER TOOL (P/N 529 036 166)	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
BACK PROBE TEST WIRES (P/N 529 036 063)	

ENGINE OIL
Recommended 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 oil additives to the recommended engine oil. Damages caused by the use of an oil not suitable for the engine or by adding of an oil additives may not be covered by the BRP Limited Warranty.

XPS RECOMMENDED ENGINE OIL	
Scandinavia	4T 5W40 SYNTHETIC BLEND OIL (EUR) (P/N 779290)
Other Countries	4T 5W40 SYNTHETIC BLEND OIL (P/N 779133)

XPS RECOMMENDED ENGINE OIL	
IF THE RECOMMENDED XPS ENGINE OIL IS NOT AVAILABLE	
Engine without supercharger	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. – API service classification SJ, SL, SM or SN
Engine with supercharger	Use a 5W40 4-stroke SAE motorcycle engine oil compatible with wet clutches meeting or exceeding both 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. – JASO-MA2 – API service classification SJ, SL, SM or SN

Verifying the Oil Level

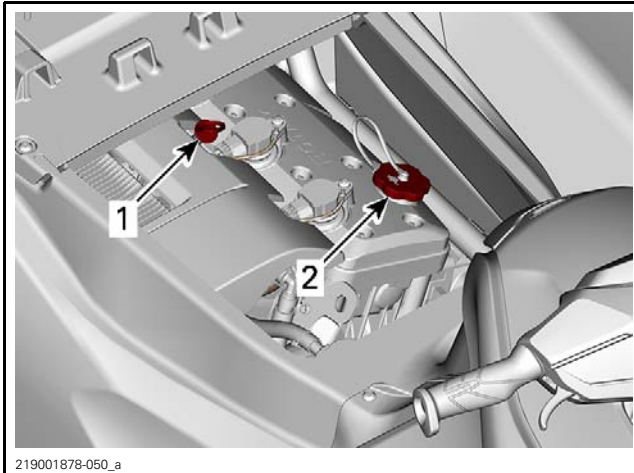
NOTICE Check level frequently and refill if necessary. Do not overfill — it would make the engine smoke and reduce its power. Operating the engine with an improper level may severely damage engine. Wipe off any spillage.

Check the oil level as follows:

NOTE: It is of the utmost importance to follow this procedure in order to obtain an accurate reading of the engine oil level.

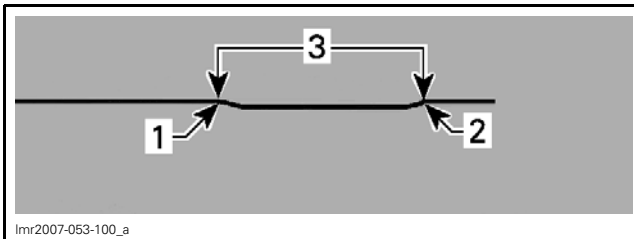
If Watercraft is IN Water

1. Bring the engine to its normal operating temperature.
Usually after 15 minutes of riding time, not idling.
2. Remove the seats.
3. Let engine **idle for 30 seconds** then stop engine.
4. Wait at least 30 seconds for the oil to settle in the engine.
5. Pull dipstick out and wipe clean


TYPICAL

1. Oil dipstick
2. Oil filler cap

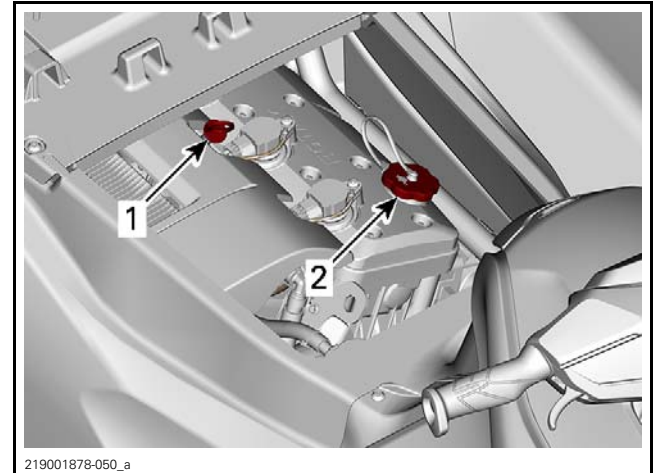
6. Reinstall dipstick, push in completely.
7. Remove dipstick again and read oil level. It should be between the dipstick marks.


TYPICAL

1. Full
2. Add
3. Operating range

RESULT	ACTION
Oil level between marks	Oil level is good, do nothing
Oil level below MIN	Add small amounts of engine oil to ensure the level is between dipstick marks

8. Add engine oil if required.
 - 8.1 Remove the oil cap.



1. Oil dipstick
2. Oil filler cap

- 8.2 Place a funnel in valve cover opening.
- 8.3 Add a small amount of the recommended oil to reach the proper level.

NOTICE Be careful not overfill. There is 1L (1.06 qt (U.S. liq.)) between dipstick marks.

- 8.4 Check oil level again by restarting the whole procedure from the STEP 3.

NOTICE Every time oil is added in the engine, carry out the engine oil level verification procedure again starting to step 3. Otherwise, you will obtain a false oil level reading.

- 8.5 Properly reinstall oil cap and dipstick.

If Watercraft is OUT of the Water

This procedure must be performed when engine is cool, non started yet.

NOTICE Watercraft must be level.

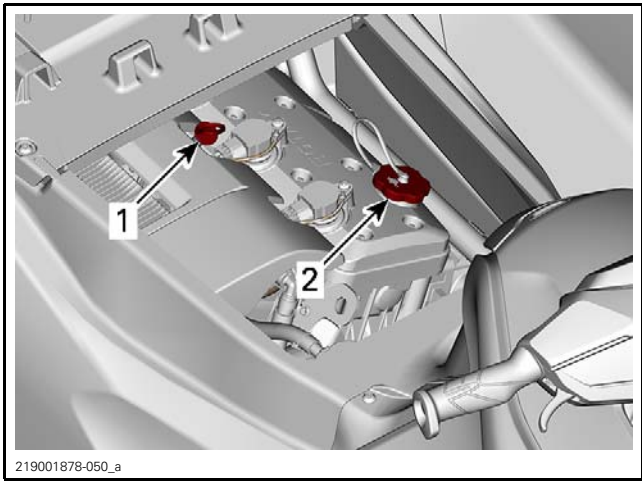
CAUTION When operating the engine while the watercraft is out of water, the heat exchanger in the ride plate may become very hot. Avoid any contact with the ride plate as burns may occur.

1. Ensure the vehicle is level.
2. Install a garden hose on the exhaust system flushing connector. **DO NOT** open water tap now.

Subsection XX (LUBRICATION SYSTEM)

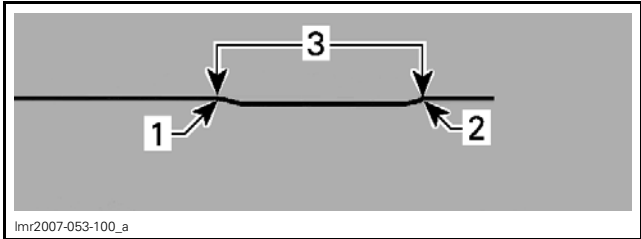
- NOTICE** Unless otherwise specified:
- Never run engine without supplying water to the exhaust system. Severe exhaust system damages could occur.
 - To avoid damaging the drive shaft seal, never run engine longer than 2 minutes when the PWC is out of the water.

3. Remove the seats.
4. Start the engine.
5. Open the water tap.
6. Run the COLD engine at idle for 30 seconds.
7. Close water tap.
8. Bring engine RPM to 4000-4500 RPM for 15 seconds.
9. Stop the engine abruptly by pressing the start/stop button or removing the tether cord.
10. Wait at least 30 seconds for the oil to settle in the engine.
11. Remove the dipstick and clean it.



TYPICAL
1. Oil dipstick
2. Oil filler cap

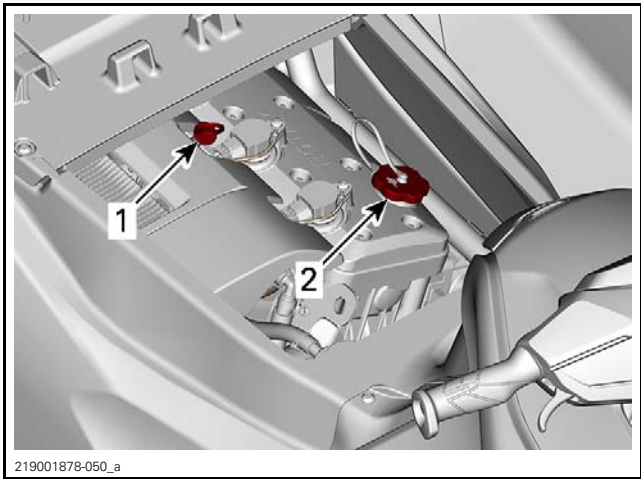
12. Reinstall the dipstick, ensure to push it in completely.
13. Remove dipstick again and read oil level. It should be between the dipstick marks.



TYPICAL
1. Full
2. Add
3. Operating range

RESULT	ACTION
Oil level between marks	Oil level is good, do nothing
Oil level below MIN	Add small amounts of engine oil to ensure the level is between dipstick marks

14. Add engine oil if required.
 - 14.1 Remove the oil cap.



1. Oil dipstick
2. Oil filler cap

- 14.2 Place a funnel in valve cover opening.
- 14.3 Add a small amount of the recommended oil to reach the proper level.

NOTICE Be careful not overfill. There is 1 L (1.06 qt (U.S. liq.)) between dipstick marks.

- 14.4 Check oil level again by restarting the whole procedure from the STEP 4.

NOTICE Every time oil is added in the engine, carry out the engine oil level verification procedure again starting to step 4. Otherwise, you will obtain a false oil level reading.

14.5 Properly reinstall oil cap and dipstick.

Engine Oil Change

NOTE: Oil and oil filter must be replaced at the same time. Oil change and oil filter replacement should be done with a warm engine.

Bring engine to its normal operating temperature.

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.

Run engine for 10 seconds at 4000 RPM and shut it off at this RPM. This will move oil from PTO housing to oil tank to allow maximum oil draining.

Remove oil filler cap and dipstick.

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

Siphon oil through the dipstick tube.

To siphon the maximum amount of oil from the crank chamber do the following:

- Put some electrical tape on hose at 475 mm (18-11/16 in) from its end
- Then insert the hose until the tape flushes with the edge of 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.

Pull suction pump hose out of dipstick tube.

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.

Refill engine with the recommended oil, see *RECOMMENDED OIL* in this subsection.

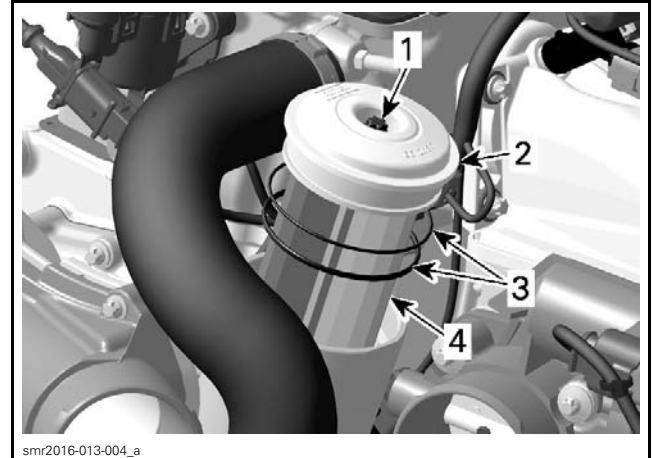
Reinstall oil filler cap and dipstick.

Replace *OIL FILTER*, see procedure in this subsection.

OIL FILTER

Removing the Oil Filter

Remove the oil filter cover and the oil filter.



1. Oil filter screw
2. Oil filter cover
3. O-rings
4. Oil filter

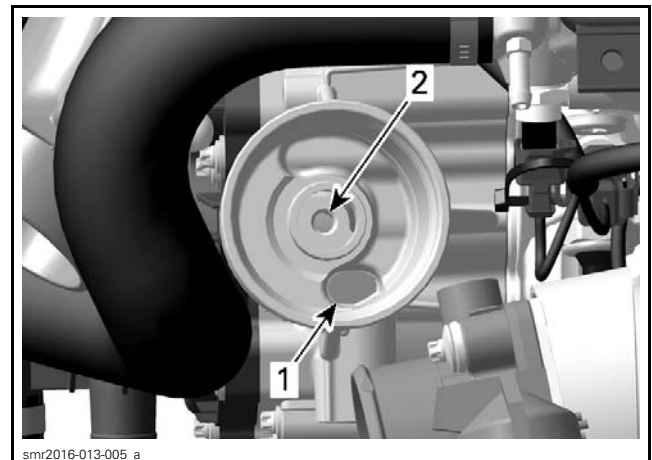
Place rags in filler area to prevent spillage. If spillage occurs, clean immediately to prevent stains.

SERVICE PRODUCT
BRAKE AND PARTS CLEANER PRO S2 (P/N 779245)

Inspecting the Oil Filter

Check oil filter screw O-ring, change if necessary.

Check and clean the oil filter inlet and outlet area for dirt and other contaminations.



1. Inlet bore from the oil pump to the oil filter
2. Outlet bore to the engine oil providing system

Installing the Oil Filter

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

Subsection XX (LUBRICATION SYSTEM)

- Install a **NEW** oil filter.
- Install **NEW** O-rings on oil filter cover.
- Apply engine oil on:
- Oil filter ring
 - Filter cover O-rings
 - Oil filter screw O-ring.

NOTE: In salt water area, it is recommended to coat mating surface of cover with grease.

SERVICE PRODUCT
SUPER LUBE GREASE (P/N 293 550 030)

Torque oil filter screw to specification.

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

INSPECTION

ENGINE OIL PRESSURE

Oil Pressure Test Requirement

Bring engine to its normal operating temperature.

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

- 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.

Required Tools for Oil Pressure Test

REQUIRED TOOLS	
PRESSURE GAUGE (P/N 529 036 395)	
OIL PRESSURE HOSE (P/N 529 036 394)	

NOTE: A 1/8 NPT pipe extension may ease the installation.

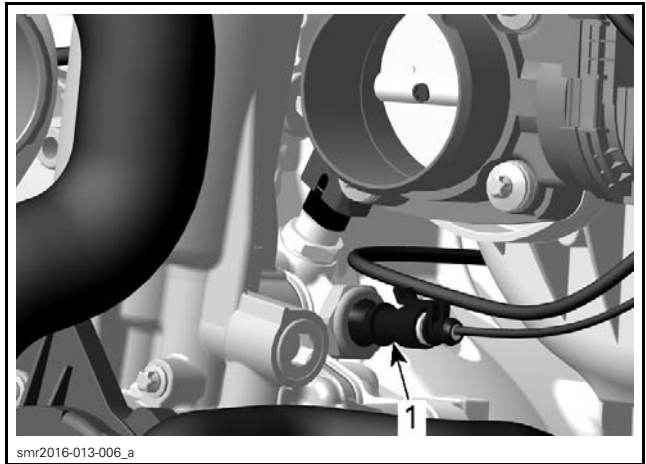
Oil Pressure Specifications

Use the following table to compare the oil pressure at different RPM.

OIL PRESSURE	
Idle (cold)	400 kPa - 600 kPa (58 PSI - 87 PSI)
Idle (at 80°C (176°F))	Min. 150 kPa (22 PSI)
4000 - 8000 (at 100°C (212°F))	350 kPa - 500 kPa (51 PSI - 73 PSI)

Test at the Oil Pressure Switch Location

Remove oil pressure switch and install gauge.



INSTALLATION AT PRESSURE SWITCH LOCATION
1. Oil pressure switch

To prevent the EMS to go in limp home mode (at 2500 RPM) or to generate a fault code, do the following:

1. Ground OPS to engine.
2. Plug OPS to harness.
3. Start engine.
4. While engine is running, unplug OPS from harness.

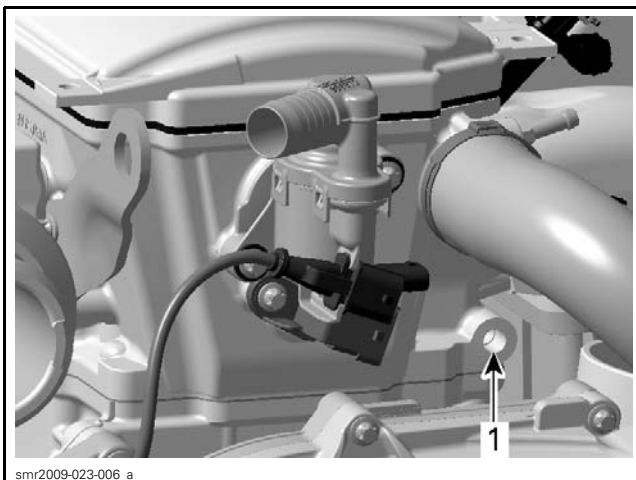
Read oil pressure at different RPM as per table above.

Reinstall oil pressure switch.

Test at the Cylinder Head Location

The oil pressure may be measured from cylinder head if desired.

Remove plug located on cylinder head and install gauge.



smr2009-023-006_a
INSTALLATION AT CYLINDER HEAD
1. Remove plug and install gauge here

Start engine and read pressure at different RPM as per table above.

Reinstall plug.

TROUBLESHOOTING

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

Always check for fault codes. If a fault code is detected, service the fault code first. Refer to *ENGINE MANAGEMENT* section.

LOW OR NO ENGINE OIL PRESSURE

1. **Oil level 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. **Oil pressure switch defective.**
 - Check and replace if necessary.
3. **Oil filter clogged.**
 - Replace engine oil and oil filter at the same time.
4. **Oil pressure regulator valve sticks open, or spring load is too small.**
 - Clean oil regulator piston and its bore. Replace if necessary.
 - Measure spring free length. Replace if too small.
5. **Oil pump(s) worn or damaged.**
 - Check oil pump rotors and its bore for wear limits. Replace if out of specification.
6. **Engine oil strainers are clogged.**
 - Remove and clean engine oil strainers.

7. **Heavy wear on plain bearings.**
 - Check radial clearance of plain bearings. Replace if out of specification.

HIGH OIL CONSUMPTION

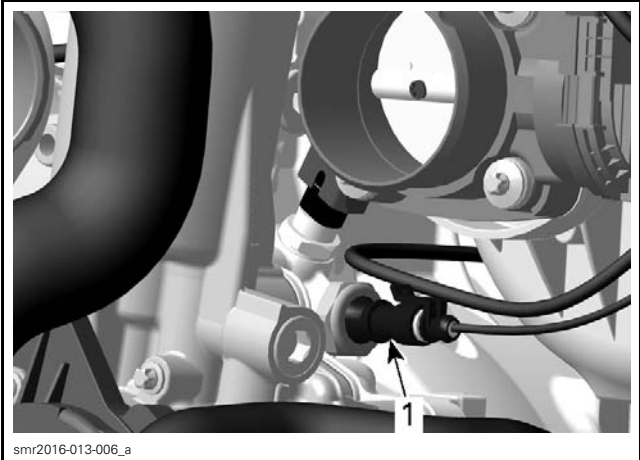
1. **Oil in breathing system.**
 - Check if breather V-ring is brittle, hard or damaged. Replace V-ring.
2. **Valve stem seals worn or damaged.**
 - Replace valve stem seals.
3. **Piston rings worn out (blue colored exhaust smoke).**
 - Replace piston rings.

OIL CONTAMINATION (WHITE APPEARANCE)

1. **Water ingestion through drive shaft and floating ring**
 - Check if water is leaking between drive shaft and floating ring. Repair or replace defective parts. Refer to PTO HOUSING, MAGNETO AND STARTER subsection.
 - Change engine oil and filter.
2. **Oil seal and rotary seal on water pump shaft leaking.**
 - Replace oil seal and water pump shaft assembly.
 - Change engine oil and oil filter.
3. **Cylinder head gasket leaking.**
 - Replace cylinder head gasket and tighten cylinder head with recommended torque.
 - Change engine oil and oil filter.
4. **Cylinder head screws not properly tightened.**
 - Retighten screws with recommended torque.
 - Change engine oil.
5. **Oil cooler O-rings are leaking.**
 - Replace O-rings.
 - Change engine oil and oil filter.
6. **Cylinder block or cylinder head casting is leaking.**
 - Check for internal cracks in casting. Replace damaged components.
 - Change engine oil and oil filter.

PROCEDURES

OIL PRESSURE SWITCH (OPS)



1. OPS

Oil Pressure Switch Access

Remove the throttle body. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Oil Pressure Switch Operation

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

OIL PRESSURE SWITCH ACTIVATION RANGE
180 kPa to 220 kPa (26.11 PSI to 31.91 PSI)

Inspecting the Oil Pressure Switch

First, carefully check the condition of the connector terminals. Clean to remove dirt and corrosion that could affect proper operation of the OPS.

IMPORTANT: Do not apply dielectric grease on terminal.

Before checking the function of the OPS, an oil pressure test has to be performed to be sure the oil pressure is not in fault. Refer to *INSPECTION* in this subsection.

When the engine oil pressure tests good but the OIL message in the information center is present and the beeper sounds:

- Ensure OPS connector is plugged to the switch.
- Check the resistance of the OPS while engine is off and while engine is running.

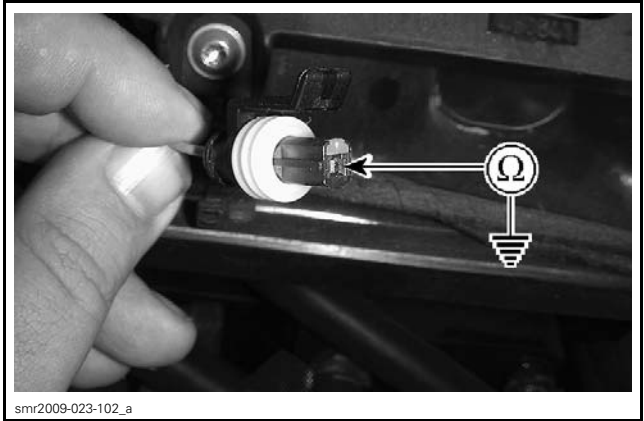
Testing the Oil Pressure Switch Resistance

Disconnect the connector from the OPS.

Use a multimeter to check the resistance as shown.

OIL PRESSUR SWITCH RESISTANCE TEST		
OPS CONNECTOR PIN	ENGINE	MEASUREMENT ENGINE NOT RUNNING
1	Ground	Close to 0 Ω

OIL PRESSUR SWITCH RESISTANCE TEST		
OPS CONNECTOR PIN	ENGINE	MEASUREMENT ENGINE RUNNING
1	Ground	Open Loop (OL) when pressure reaches 180 kPa (26.11 PSI) and 220 kPa (32 PSI)



If resistance values are incorrect, replace OPS.

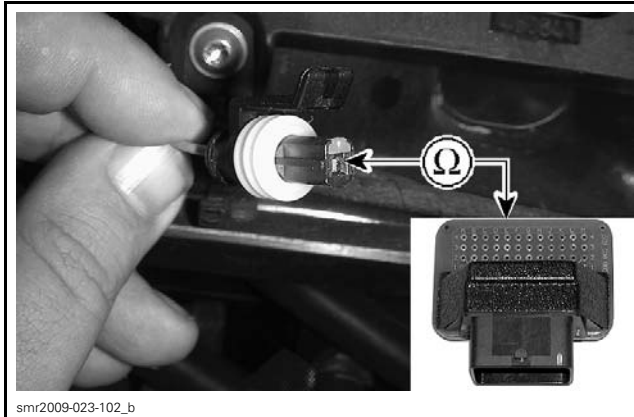
If the values are correct, check the continuity of the wiring harness.

Testing the Oil Pressure Switch Circuit Continuity

Disconnect the ECM-A connector from the ECM. Connect the ECM-A connector on the ECM adaptor tool.

Check continuity of OPS circuit as per following table.

OIL PRESSUR SWITCH RESISTANCE TEST		
OPS CONNECTOR PIN	ECM ADAPTER	MEASUREMENT
1	A-E3	Close to 0 Ω



If continuity test failed, repair or replace the connector and wiring between ECM connector and OPS.

If continuity test succeeded, check the ECM. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Removing the Oil Pressure Switch

Unplug the OPS connector.

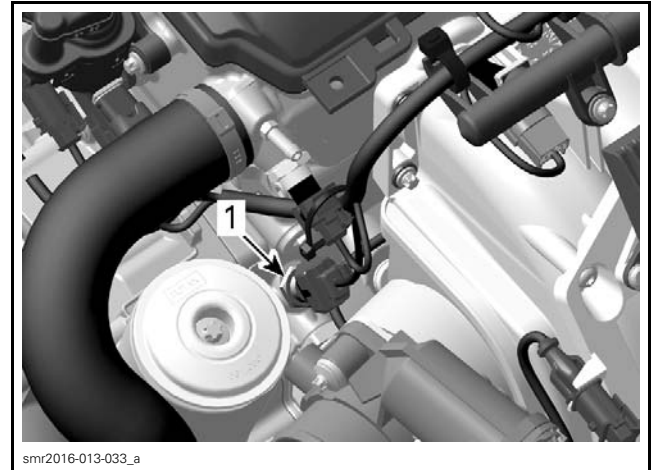
Unscrew and remove the oil pressure switch.

Installing the Oil Pressure Switch

Torque oil pressure switch to specification.

TIGHTENING TORQUE	
Oil pressure switch	$9 \text{ N}\cdot\text{m} \pm 1 \text{ N}\cdot\text{m}$ $(80 \text{ lbf}\cdot\text{in} \pm 9 \text{ lbf}\cdot\text{in})$ + LOCTITE 243 (BLUE) (P/N 293 800 060)

OIL TEMPERATURE SENSOR (OTS)



1. Oil temperature sensor (OTS)

NOTE: Engine will be set to limp home mode and an overheat indication will come on in the information center when the oil temperature reaches:

OVERHEAT TEMPERATURE	
130 170	115°C (239°F)
230	120°C (248°F)
300	97°C (207°F)

Check for debris or blockage in lubrication system.

OTS Access

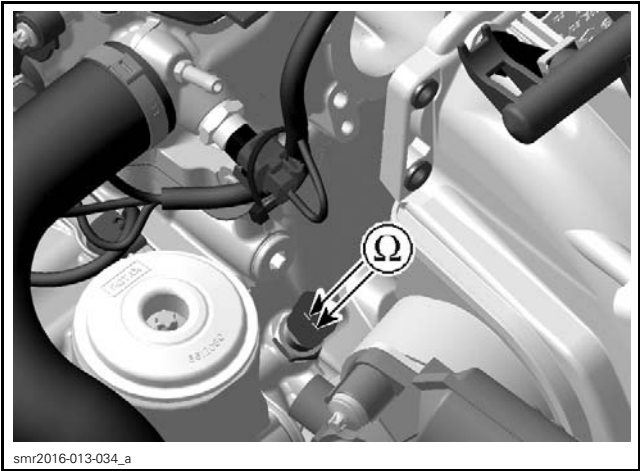
Models with Supercharger

Remove the throttle body. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Testing the OTS Resistance

1. Disconnect the connector from the OTS and test the resistance of the sensor. Refer to the *OTS RESISTANCE CHART* in this subsection.

Subsection XX (LUBRICATION SYSTEM)



If resistance measured is not as specified, replace the OTS.

If the resistance measured is as specified, proceed with the following steps.

- 2. Reconnect the OTS connector and disconnect ECM connector "A" from the ECM.
- 3. Check the OTS circuit resistance as per table.

OTS RESISTANCE TEST		
ECM ADAPTER PIN		MEASUREMENT
A-H4	A-J4	See <i>OTS RESISTANCE CHART</i>

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

If the resistance value measured is as specified, check ECM. Refer to *ECM* in the *ELECTRONIC FUEL INJECTION (EFI)* subsection.

If the resistance value is not within specification, repair or replace wiring and connectors between ECM connector and the OTS.

Replacing the OTS

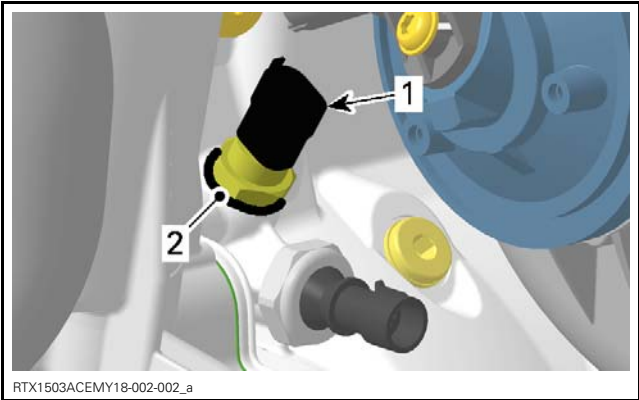
- 1. Disconnect OTS connector and remove OTS.
- 2. Install the new OTS.

TIGHTENING TORQUE	
Oil temperature switch	17 N•m ± 2 N•m (150 lbf•in ± 18 lbf•in)

- 3. Apply sealant around OTS as defined in the illustration.

NOTE: Gasket ring of OTS must be coated completely.

SERVICE PRODUCT
BLACK NEOPRENE PAINT (P/N 909570)



- 1. OTS
- 2. Apply black neoprene paint here

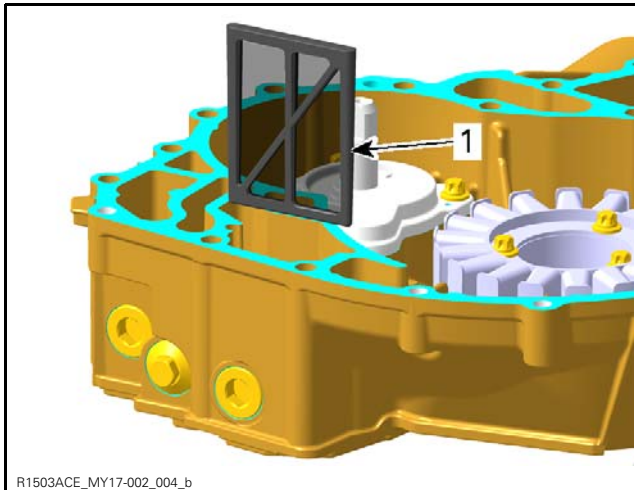
- 4. Reinstall remaining removed parts.

PTO OIL STRAINER

Removing the PTO Oil Strainer

Remove the PTO housing. Refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.

Remove the oil strainer.



R1503ACE_MY17-002_004_b

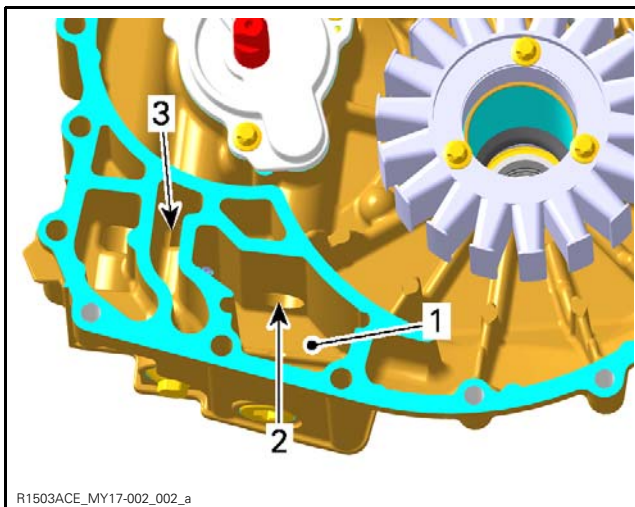
1. PTO oil strainer

Cleaning and Inspecting the PTO Oil Strainer

Clean oil strainer with a part cleaner then use compressed air to dry it.

Check oil strainer for damage, replace if necessary.

Check and clean the oil strainer compartment and oil bores for dirt and other contaminations.



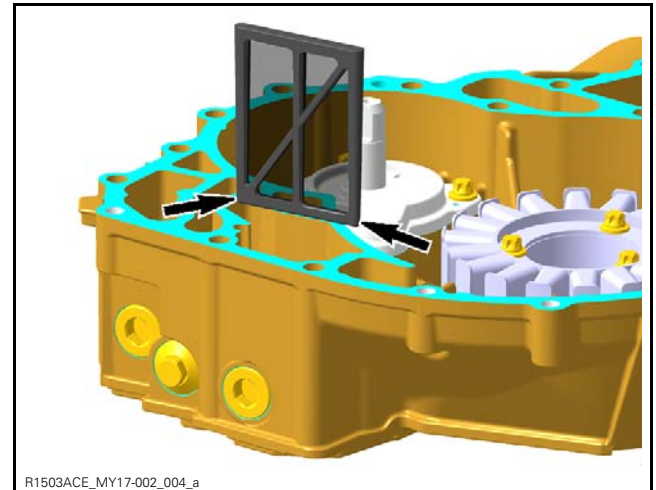
R1503ACE_MY17-002_002_a

1. Oil strainer compartment
2. Oil bore to the oil pump
3. Oil bore from the oil pump

Installing the PTO Oil Strainer

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

Apply a small amount of grease on the frame of the oil strainer to keep it in place while installing the PTO cover.



R1503ACE_MY17-002_004_a

SERVICE PRODUCT

Multi Purpose Grease

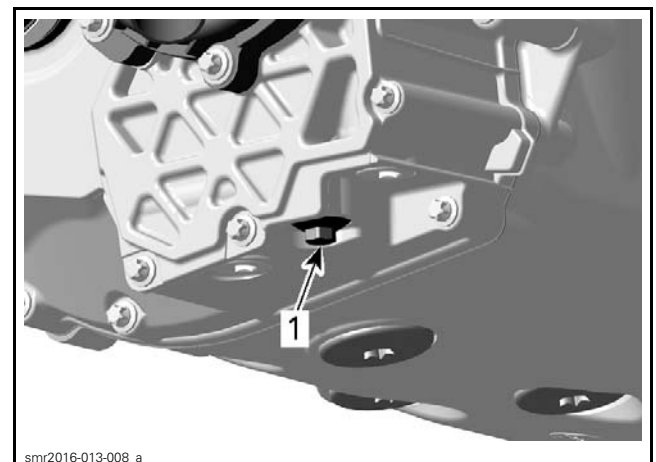
Install it in the PTO housing.

Install the PTO housing, Refer to *PTO HOUSING*, *MAGNETO AND STARTER* subsection.

Refill engine at the proper level with the recommended oil. Refer to *ENGINE OIL* for the procedure.

ENGINE OIL PRESSURE REGULATOR

The oil pressure regulator is located on the bottom of the PTO housing.



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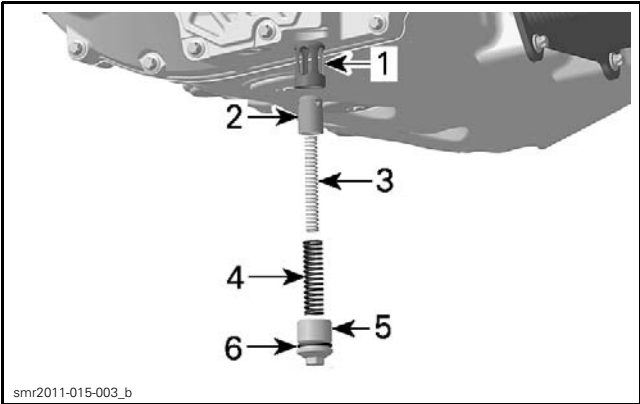
1. Oil pressure regulator

NOTE: The oil pressure regulator system opens when the oil pressure exceeds 400 kPa (58 PSI).

Removing the Oil Pressure Regulator

Remove engine oil. See *ENGINE OIL CHANGE* in this subsection.

Remove the oil pressure regulator.



- 1. Valve piston guide
- 2. Valve piston
- 3. Inner compression spring
- 4. Outer compression spring
- 5. Oil pressure regulator plug
- 6. O-ring

NOTE: Oil pressure regulator plug on oil pump housing is spring loaded.

Inspecting the Oil Pressure Regulator

Inspect valve piston and valve piston guide for scoring or other damages.

Check outer compression spring for free length.

OUTER COMPRESSION SPRING FREE LENGTH	
New	60 mm (2.362 in)
Service limit	57 mm (2.244 in)

Replace inner and outer compression spring as an assembly.

Replace parts if important wear or damage are present.

Clean bore and threads in the PTO housing from metal shavings and other contaminations.

Installing the Oil Pressure Regulator

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

Make sure that the O-ring is on the plug screw.

Torque plug screw to specification.

NOTICE Make sure not over tighten the plug. Damages to springs may cause oil pressure regulator malfunction.

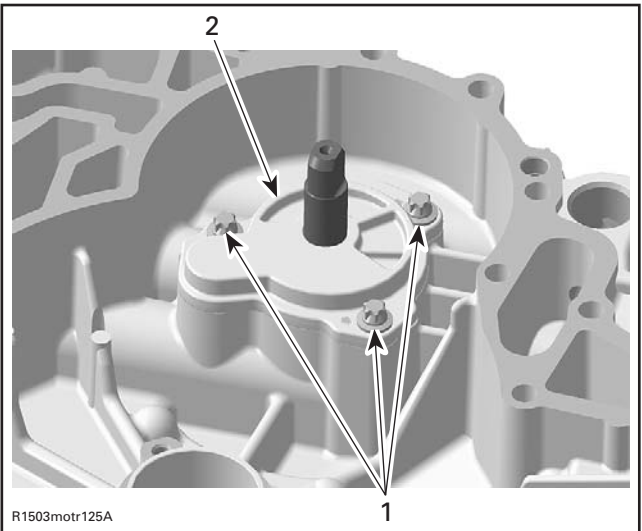
TIGHTENING TORQUE	
Oil pressure regulator plug	13 N•m ± 1 N•m (115 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

OIL PRESSURE PUMP

The oil pressure pump is located in the PTO housing and is driven by the balance shaft.

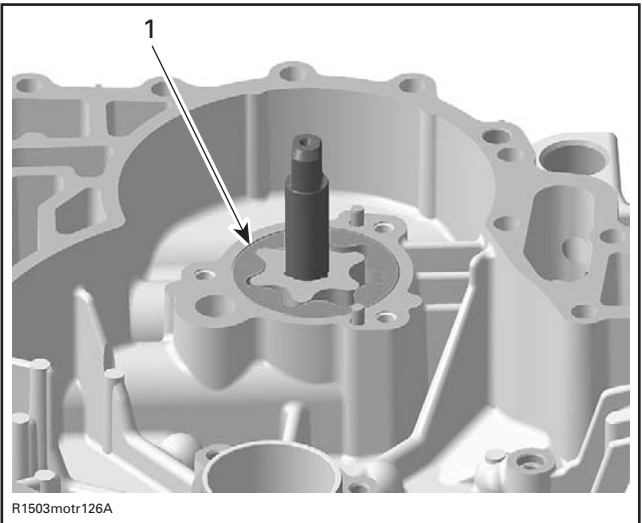
Removing the Oil Pressure Pump

1. Remove the PTO housing. Refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.
2. Remove water pump housing and the impeller. Refer to *COOLING SYSTEM - ENGINE COMPONENTS* subsection.
3. Remove screws securing the oil pump cover.



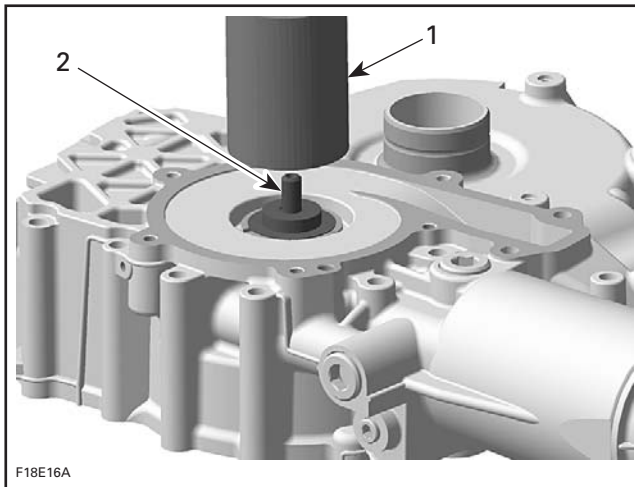
- 1. Screws
- 2. Oil pump cover

4. Pull and remove the outer oil pump rotor.



- 1. Outer oil pump rotor

5. Extract the coolant/oil pump shaft by pushing it from outside PTO housing cover.



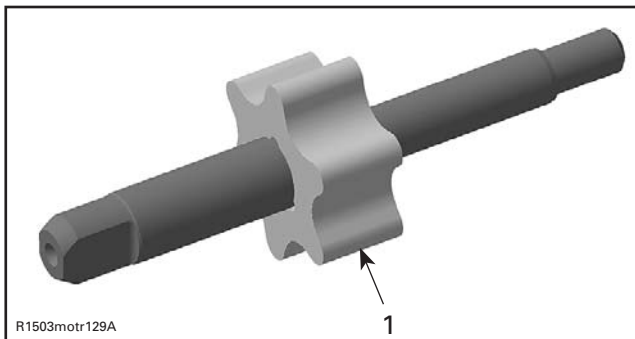
1. Pusher
2. Coolant/oil pump shaft

6. Remove rotary seal and oil seal. Refer to *ROTARY SEAL* further in this subsection.

Inspecting the Oil Pressure Pump

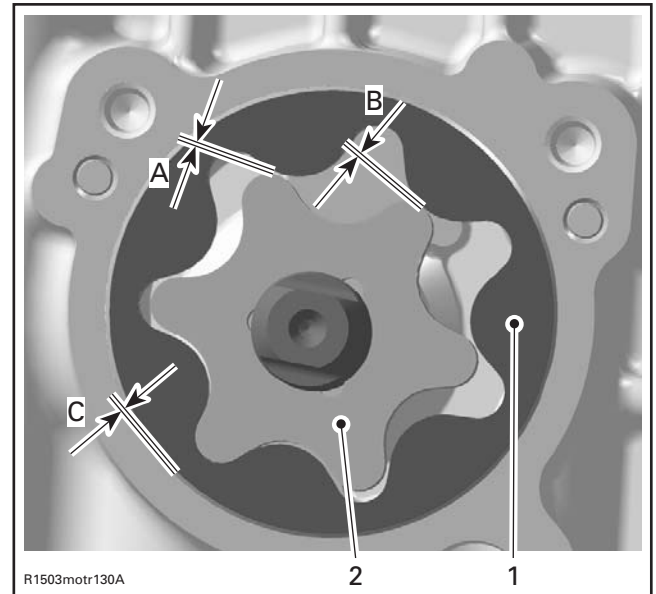
Inspect coolant/oil pump shaft, housing and cover for marks or other damages.

Check inner rotor for corrosion pin-holes or other damages. If so, replace coolant/oil pump shaft. Ensure to also check oil pump housing and cover and replace if damaged.



1. Pittings on the teeth

Using a feeler gauge, measure the clearance between inner and outer rotors.



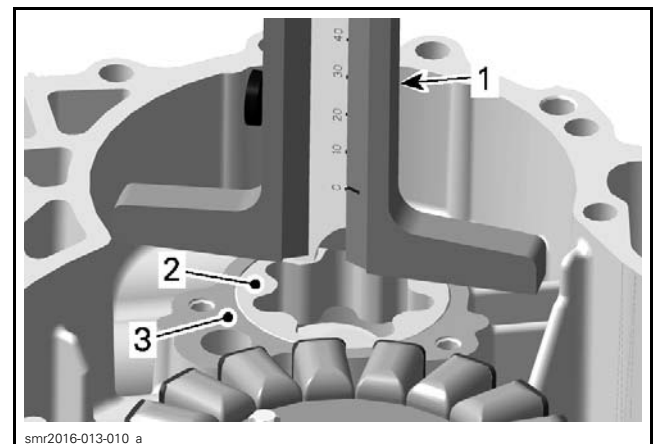
1. Outer rotor
2. Inner rotor

OIL PUMP RADIAL CLEARANCE	
SERVICE LIMIT	
A	0.25 mm (.0098 in)
B	
C	

If clearance between inner and outer rotors exceeds the tolerance, replace coolant/oil pump shaft. Ensure to also check oil pump housing and cover and replace if damaged.

If clearance between outer rotor and its bore in oil pump exceeds the tolerance, replace the complete oil pump and the PTO housing.

Using a depth gauge, measure axial clearance as shown.



1. Depth gauge
2. Oil pump outer rotor surface
3. PTO housing surface

Subsection XX (LUBRICATION SYSTEM)

Clearance between pump housing and outer rotor should not exceed the following specification. If so, replace the complete oil pump assembly.

CLEARANCE BETWEEN PUMP HOUSING AND OUTER ROTOR
0.1 mm (.004 in)

NOTE: When the axial clearance of the coolant/oil pump shaft increases, the oil pressure decreases. Check the inside of oil pump housing and its cover for scoring or other damages and replace if damaged.

Installing the Oil Pressure Pump

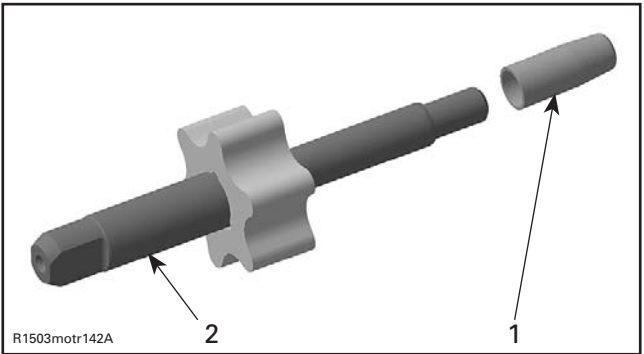
The installation is the reverse of the removal procedure. However, pay attention to the following details.

Install a **NEW** rotary seal and a **NEW** oil seal. Refer to *ROTARY SEAL* in this subsection.

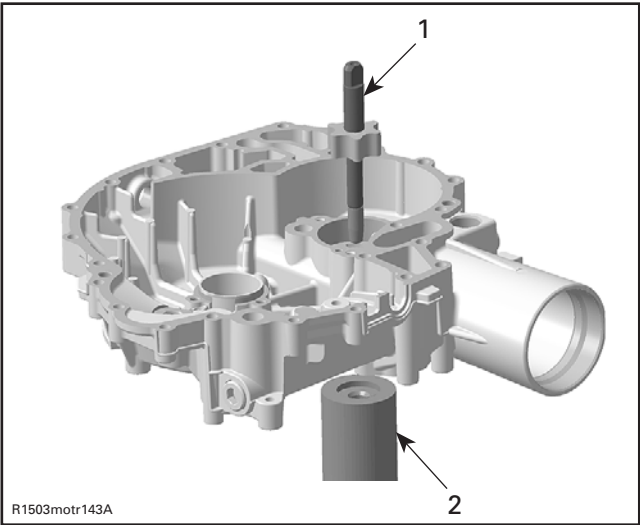
Install the coolant/oil pump shaft.

NOTICE Never use a hammer for the coolant/oil pump shaft installation. Only use a press to avoid damaging the ceramic component of the rotary seal.

REQUIRED TOOLS	
OIL SEAL GUIDE (P/N 529 035 822)	
WATER PUMP SEAL PUSHER (P/N 529 035 823)	



1. Oil seal guide
2. Coolant/oil pump shaft



1. Coolant/oil pump shaft with oil seal guide
2. Rotary seal pusher to support PTO housing

Tighten oil pump cover screws to specification.

TIGHTENING TORQUE	
Oil pump cover screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

After engine reassembly:

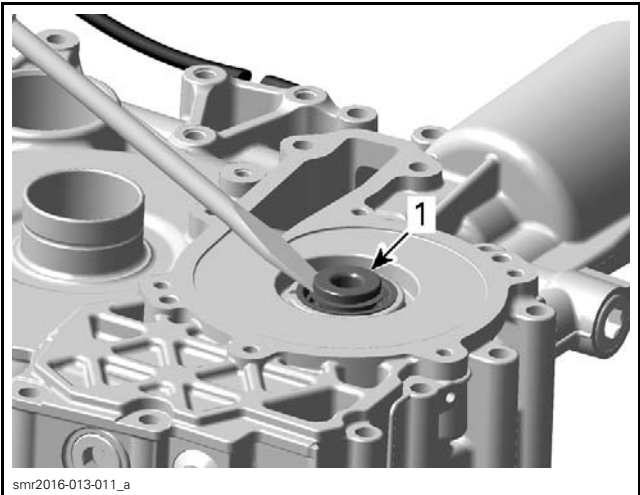
- Refill engine oil to proper level
- Ensure oil pressure is within specifications.

ROTARY SEAL

Removing the Rotary Seal

Remove the coolant/oil pump shaft. Refer to *OIL PRESSURE PUMP* in this subsection.

Carefully remove the inner ring of the rotary seal with a screwdriver.

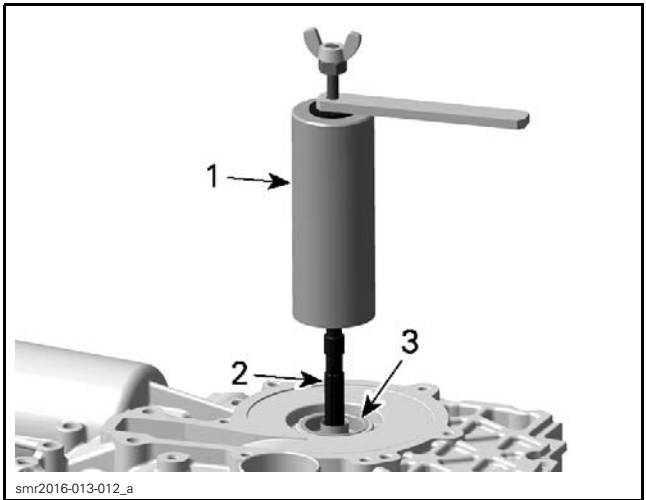


1. Inner ring of rotary seal

NOTICE Be careful not to damage the surface of the rotary seal bore or the sealing surface of the water pump housing in PTO housing.

REQUIRED TOOL	
CERAMIC SEAL PULLER (P/N 529 036 365)	

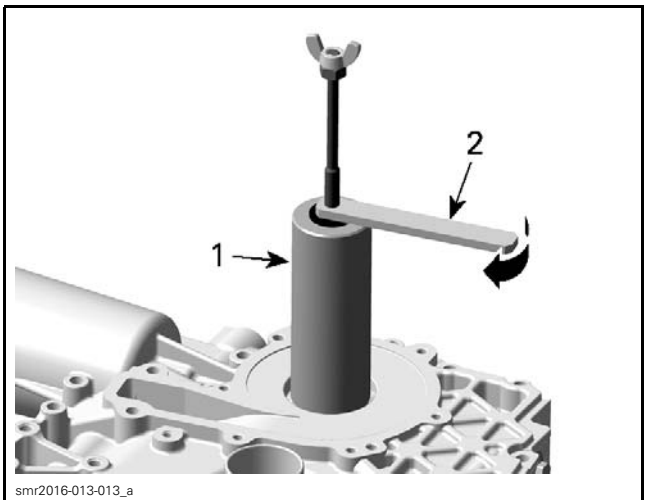
Put ceramic seal puller into the ceramic seal and turn the bearing puller until it's clamping.



- 1. Ceramic seal puller
- 2. Bearing puller
- 3. Ceramic seal

NOTE: Take care that the bearing puller end is exactly positioned between the oil seal and the ceramic seal.

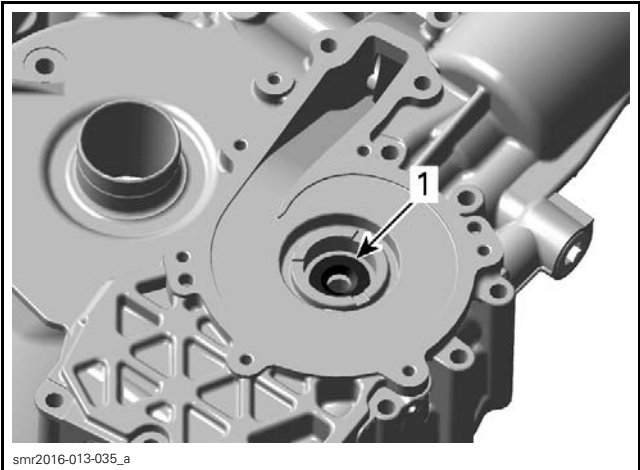
Start turning the lever clockwise until the ceramic seal is completely pulled out the PTO housing.



- 1. Ceramic seal puller
- 2. Bearing puller lever

Remove ceramic seal from bearing puller and discard it.

Remove oil seal behind the rotary seal.



- 1. Oil seal

Discard rotary seal and oil seal.

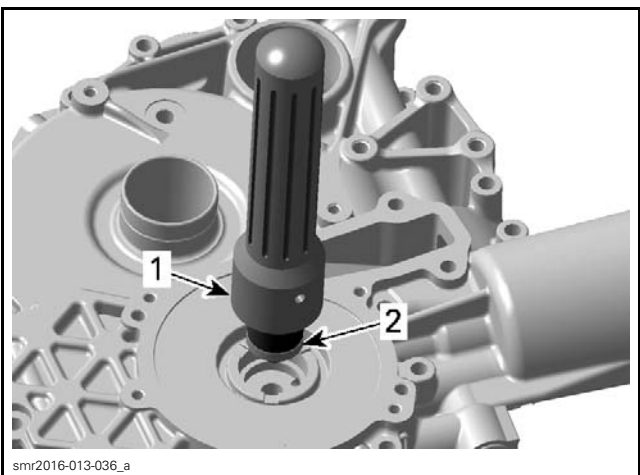
Installing the Rotary Seal

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

NOTICE Never use oil in the press fit area of the oil seal and rotary seal.

Install **NEW** oil seal.

REQUIRED TOOLS	
OIL SEAL PUSHER (P/N 529 035 757)	
HANDLE (P/N 420 877 650)	



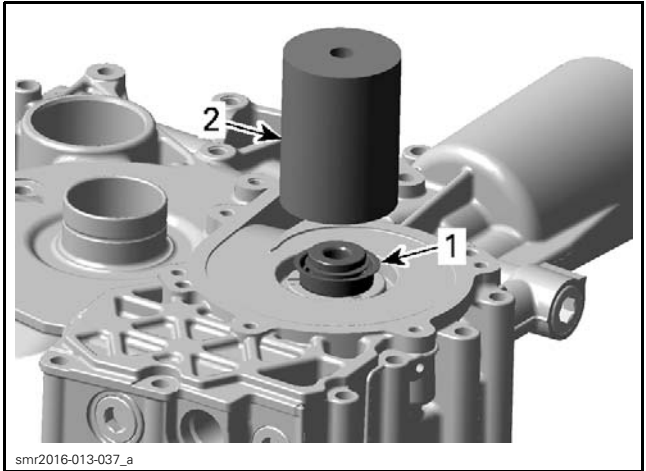
- 1. Handle with oil seal pusher
- 2. Oil seal

Install **NEW** rotary seal.

Subsection XX (LUBRICATION SYSTEM)

REQUIRED TOOL	
WATER PUMP SEAL PUSHER (P/N 529 035 823)	

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

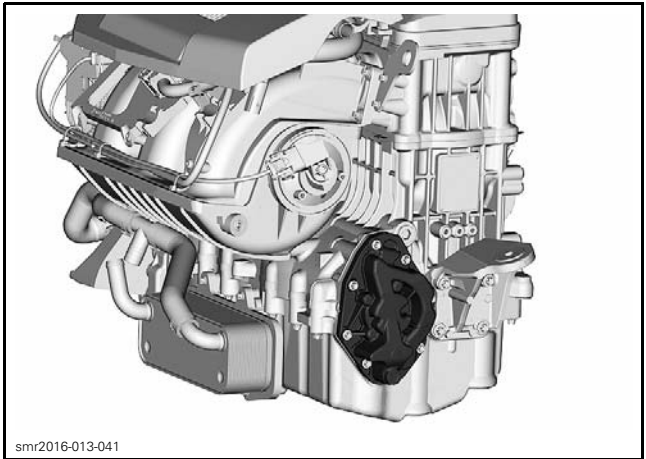


- 1. Rotary seal
- 2. Rotary seal installer

Install the coolant/oil pump shaft. Refer to *OIL PRESSURE PUMP* in this subsection.

OIL SUCTION PUMP

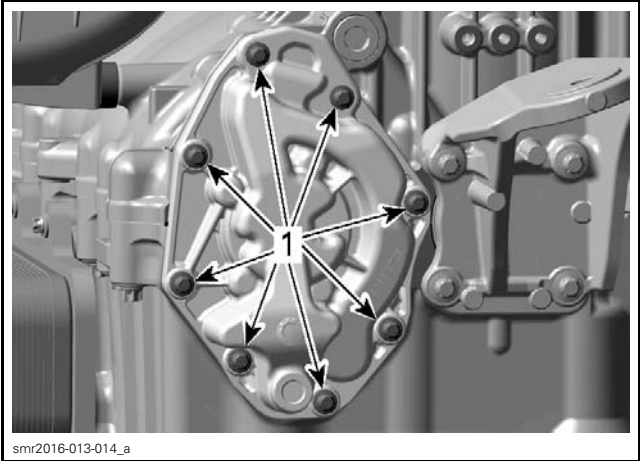
Oil Suction Pump Location



TYPICAL - LOCATION OF OIL SUCTION PUMP

Removing the Oil Suction Pump

- 1. Remove retaining screws.

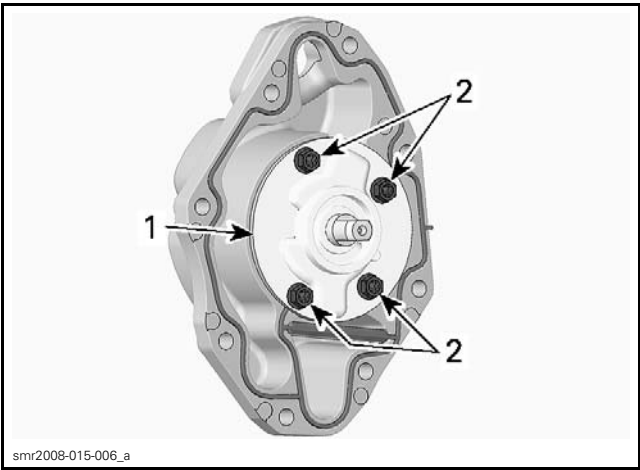


- 1. Suction pump cover screws

- 2. Place rags under cover to prevent spillage. If spillage occurs, clean immediately.

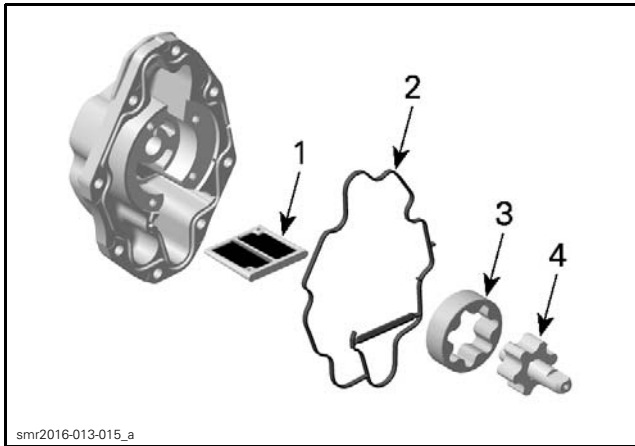
SERVICE PRODUCT
BRAKE AND PARTS CLEANER PRO S2 (P/N 779245)

- 3. Remove the oil suction pump housing.
- 4. Remove:
 - Oil pump screws
 - Cover.



- 1. Oil pump cover
- 2. Oil pump screws

- 5. Remove the outer rotor and the strainer.



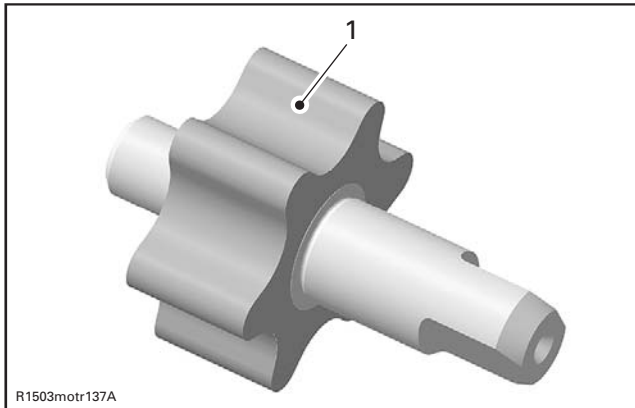
smr2016-013-015_a

1. Oil strainer
2. Cover gasket
3. Outer rotor
4. Oil pump shaft

Inspecting the Oil Suction Pump

Inspect oil pump shaft, housing and cover for marks or other damages.

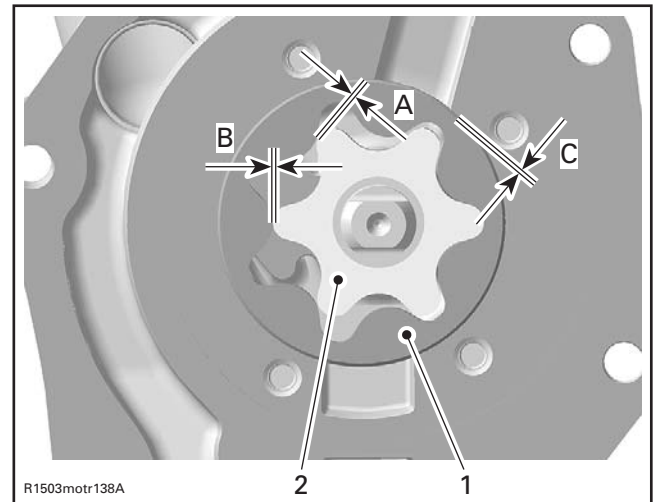
Check inner rotor for corrosion, pin-holes or other damages. If so, replace oil pump shaft. Ensure to also check oil pump housing and cover and replace if damaged.



R1503motr137A

1. Pittings on the teeth

Using a feeler gauge, measure the clearance between inner and outer rotors.



R1503motr138A

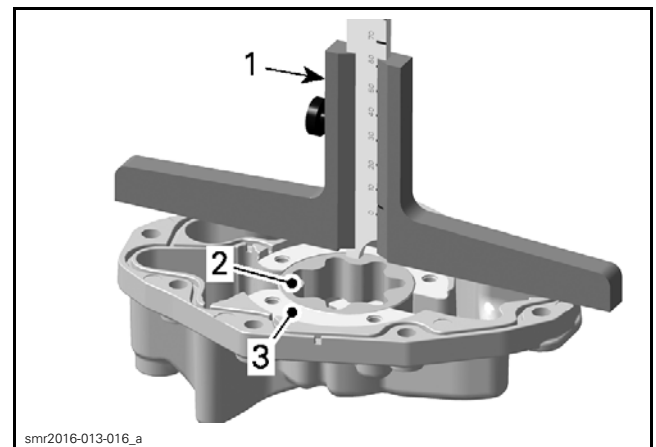
1. Outer rotor
2. Inner rotor

OIL PUMP RADIAL CLEARANCE	
SERVICE LIMIT	
A	0.25 mm (.0098 in)
B	
C	

If clearance between inner and outer rotors exceeds the tolerance, replace oil pump shaft. Ensure to also check oil pump housing and cover and replace if damaged.

If clearance between outer rotor and its bore in oil pump exceeds the tolerance, replace the complete oil pump and the PTO housing.

Using a depth gage, measure side wear as shown.



smr2016-013-016_a

1. Depth gage
2. Oil pump outer rotor surface
3. Oil pump housing surface

Clearance between pump housing and outer rotor should not exceed the following specification. If so, replace the complete oil pump assembly.

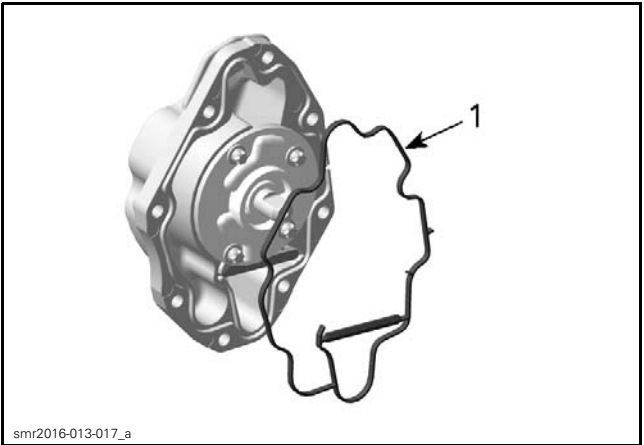
Subsection XX (LUBRICATION SYSTEM)

CLEARANCE BETWEEN PUMP HOUSING AND OUTER ROTOR
0.1 mm (.004 in)

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

Check the inside of oil pump housing and its cover for scoring or other damages and replace if damaged.

Inspect suction pump cover gasket.



1. Cover gasket

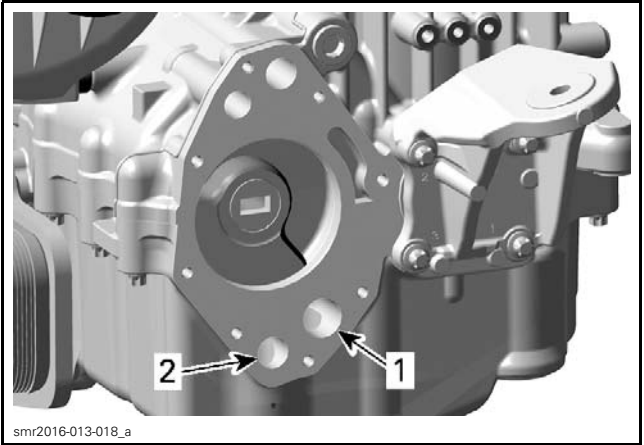
If gasket is brittle, cracked or hard, replace it.

Installing the Oil Suction Pump

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

Clean both contact surfaces of oil suction pump cover.

Check and clean the oil inlet and outlet area for dirt and other contaminations.



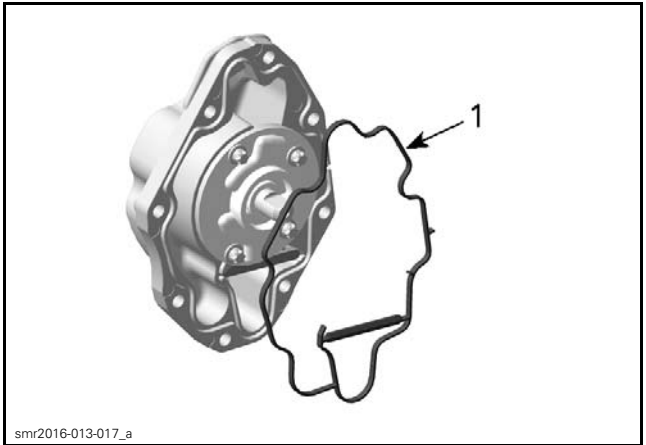
1. Oil inlet
2. Oil outlet

Tighten oil pump screws to specification.

TIGHTENING TORQUE	
Oil pump screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

Make sure oil strainer is properly installed in the oil suction pump cover.

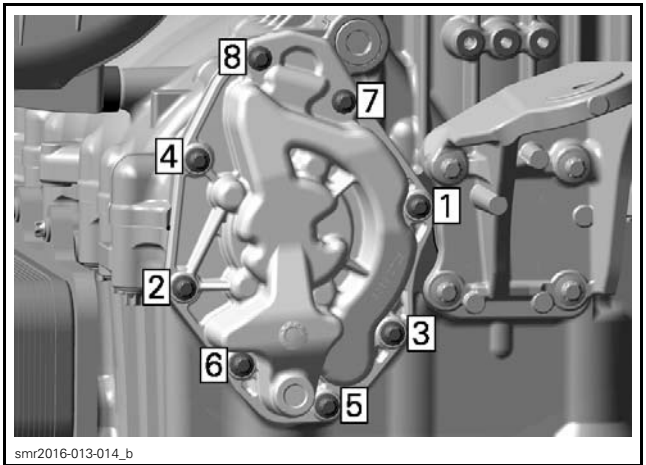
Apply engine oil on rubber ring gasket.



1. Cover gasket

Tighten suction pump cover screws to specification as per following sequence.

TIGHTENING TORQUE	
Suction pump cover screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)



TIGHTENING SEQUENCE

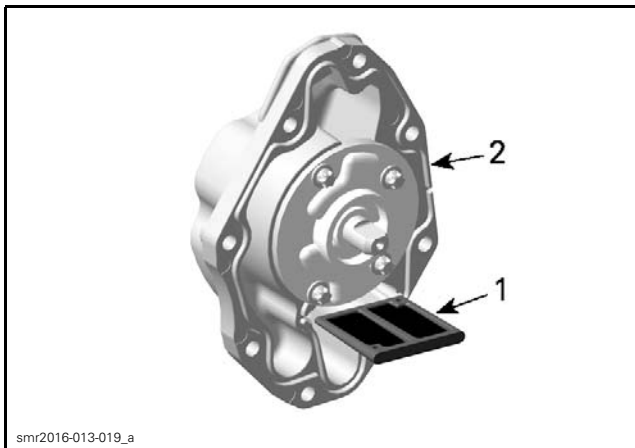
Refer to the appropriate procedures and install all other removed parts.

SUCTION PUMP OIL STRAINER

NOTE: The oil strainer does not need to be cleaned at every oil change. Clean it during other inspections, especially when the engine is disassembled.

Removing the Suction Pump Oil Strainer

Remove oil strainer from the suction pump cover, refer to *REMOVING THE OIL SUCTION PUMP* in this subsection.



1. Oil strainer
2. Suction pump cover

Inspecting the Suction Pump Oil Strainer

Clean oil strainer with a part cleaner then use compressed air to dry it.

Check oil strainer for tear or other damages. Replace it if necessary.

Installing the Suction Pump Oil Strainer

For installation of the suction pump cover, refer to *OIL SUCTION PUMP* in this subsection.

SUPERCHARGER OIL SPRAY NOZZLE

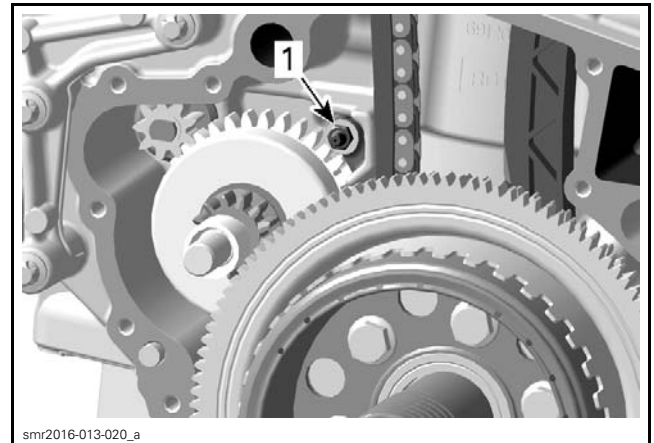
Supercharger Oil Spray Nozzle Location

The supercharger oil spray nozzle is located in the cylinder block right hand side above the sprag clutch

Removing the Supercharger Oil Spray Nozzle

Remove the PTO housing. Refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.

Unscrew the oil spray nozzle.



1. Oil spray nozzle

Inspecting the Supercharger Oil Spray Nozzle

Check oil spray nozzle for dirt or other damages. Replace if necessary.

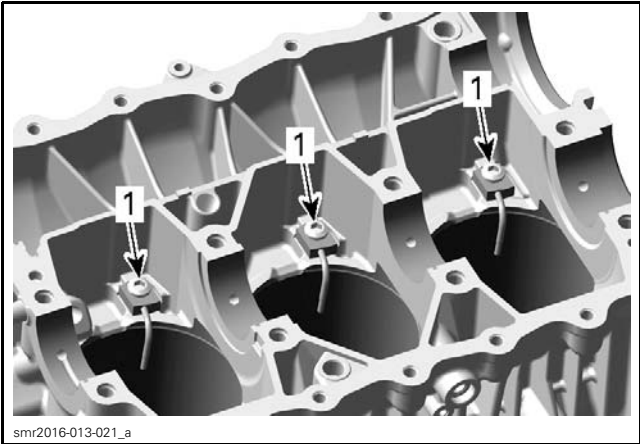
Installing the Supercharger Oil Spray Nozzle

The installation is the reverse of the removal procedure. However, pay attention to the following. Install oil spray nozzle.

TIGHTENING TORQUE	
Oil spray nozzle	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)
	+ LOCTITE 243 (BLUE) (P/N 293 800 060)

PISTON OIL SPRAY NOZZLES

The piston oil spray nozzles are located on the upper half of cylinder block.



1. Piston oil spray nozzles

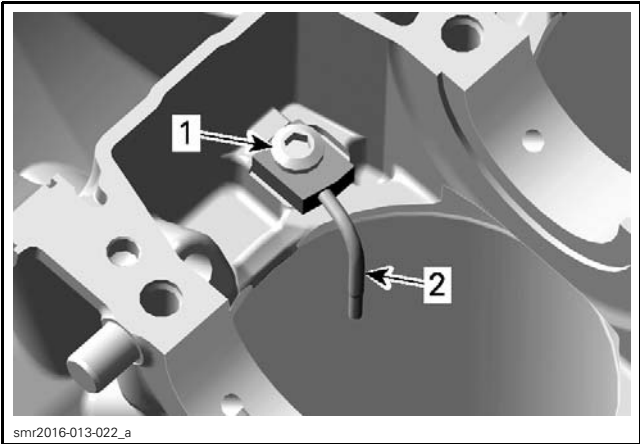
NOTE: When the scope of repair work obligates you to split the cylinder block, take this opportunity to clean the oil spray nozzles.

Inspecting the Piston Oil Spray Nozzle

Check if the oil spray nozzle is damaged or bent.
Check for cracks at soldering.
Replace as necessary.
If damaged replace immediately.

Removing the Piston Oil Spray Nozzle

Remove cylinder block lower half. Refer to *CYLINDER BLOCK* subsection.
Remove oil spray nozzle and Banjo fitting and discard it.

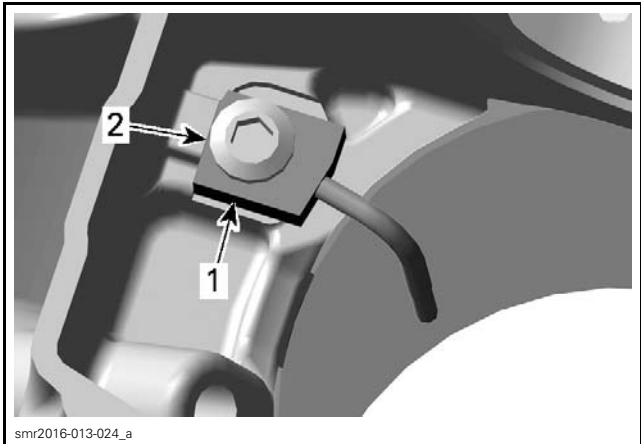


1. Banjo fitting
2. Oil spray nozzle

Installing the Piston Oil Spray Nozzle

Install **NEW** oil spray nozzle and Banjo fitting.

NOTICE At assembly make sure the contact surface of the oil spray nozzle is well fitted onto the cylinder block. If this is not ensured, the oil spray direction will change, causing potential engine damage.



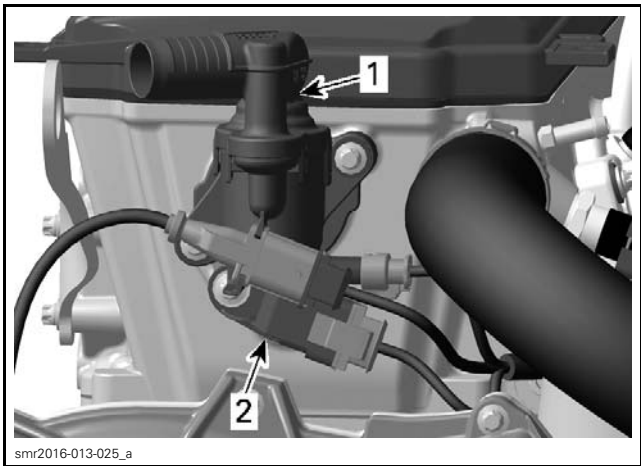
1. Oil spray nozzle
2. Contact surface

TIGHTENING TORQUE	
Piston oil spray nozzle banjo bolt	19 N•m ± 2 N•m (168 lbf•in ± 18 lbf•in)

OIL SEPARATOR COVER

Removing the Oil Separator Cover

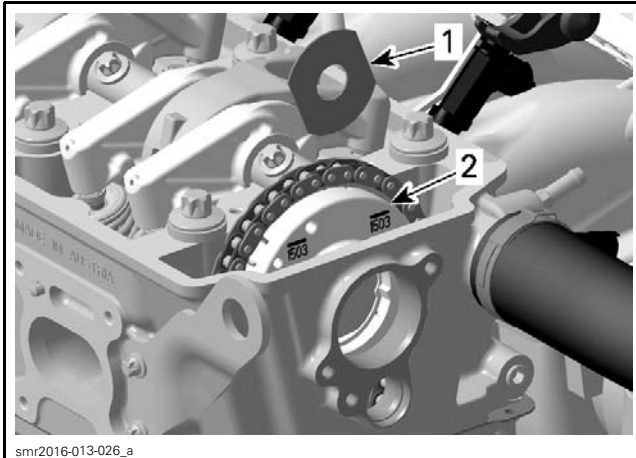
1. Remove the blow-by valve. See procedure in this subsection.
2. Remove camshaft position sensor, refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.



1. Blow-by valve
2. Camshaft position sensor

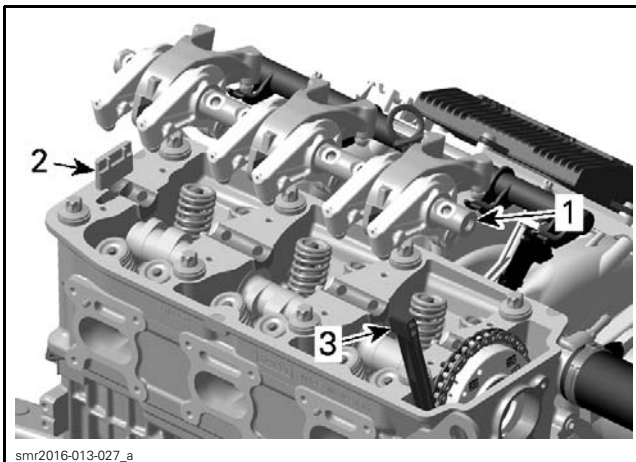
3. Remove valve cover, refer to *CYLINDER HEAD* subsection.
4. Remove thrust washer from oil separator cover.

NOTE: Make sure not to loose thrust washer when removing it from oil separator cover, otherwise thrust washer would fall into the PTO housing.



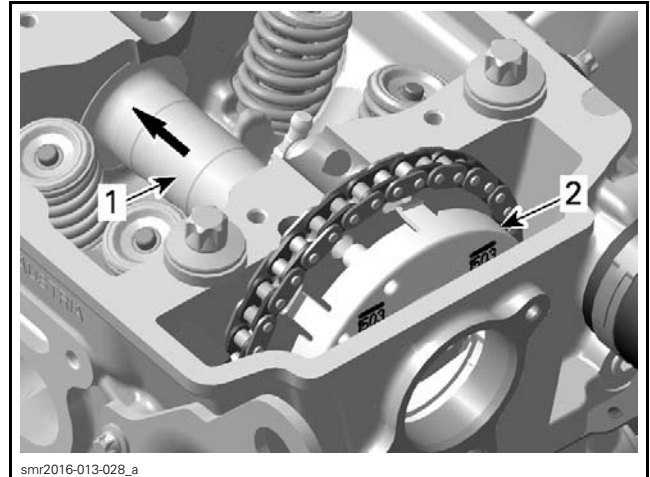
1. Thrust washer
2. Oil separator cover

5. Refer to *CYLINDER HEAD* subsection and remove:
 - Spark plug tube
 - Rocker arm shaft together with rocker arms
 - Chain guide
 - Camshaft lock.



1. Rocker arm shaft with rocker arms
2. Camshaft lock
3. Chain guide

6. Move camshaft backwards as far as possible.
7. Remove oil separator cover from timing gear by releasing the holding clips.

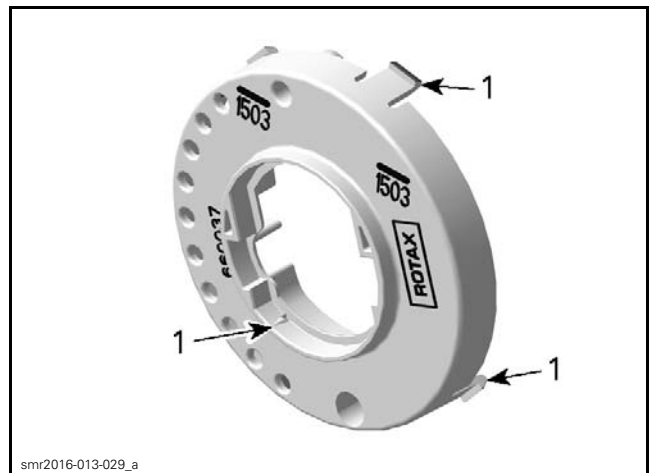


1. Camshaft
2. Oil separator cover

NOTE: Be careful not to break the holding clips from oil separator cover when its removed from the timing gear.

Inspecting the Oil Separator Cover

Inspect oil separator cover for marks or other damages. Ensure to check also the holding clips of oil separator cover and for thrust washer. If any damage is visible replace oil separator cover.



1. Holding clips

Installing the Oil Separator Cover

The installation is the reverse of the removal procedure. However, pay attention to the following. Properly install oil separator cover and thrust washer. They need to be in a perfect even position with timing gear.

NOTE: Make sure not to lose thrust washer when installed on oil separator cover.

Install all other removed parts.

BLOW-BY VALVE

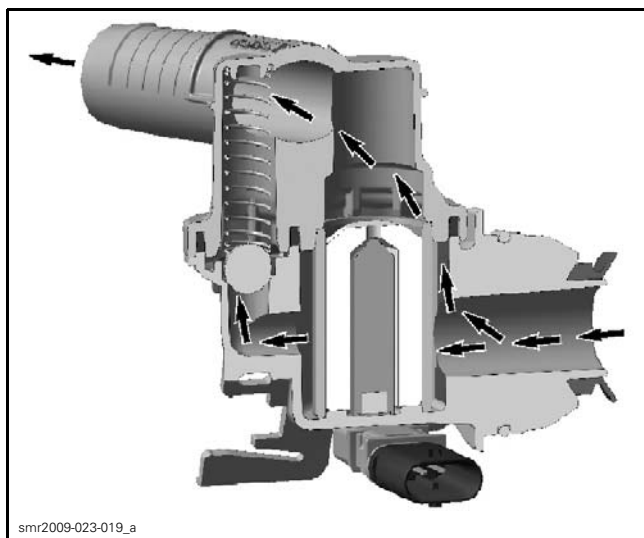
Blow-By Valve Description

The function of the blow-by valve is the circulation of the oil vapors.

Blow-By Valve Operation

Normal Operation

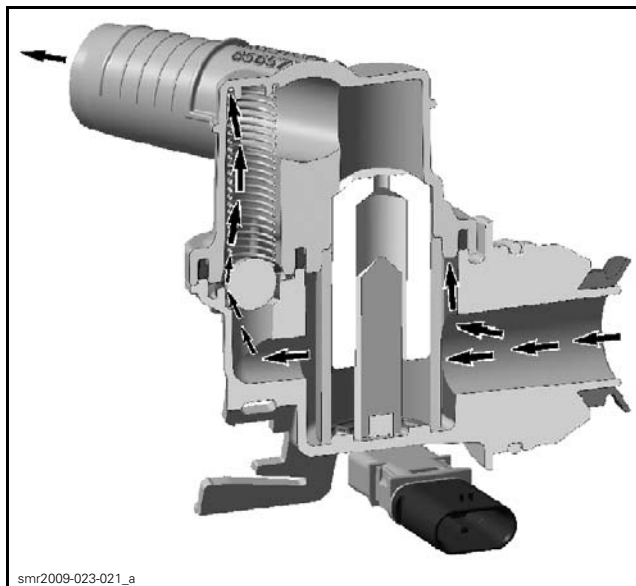
During its normal operation, the blow-by valve allows crankcase vapors to return in the intake system where they are harmlessly burned.



NORMAL OPERATION

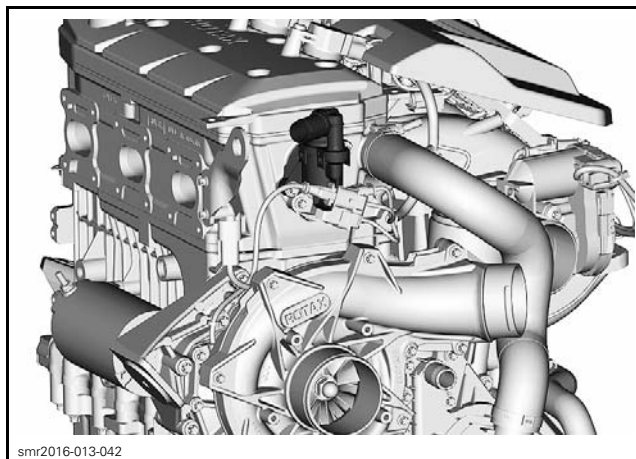
By-Pass Function

If, for any reason, the valve piston gets stuck at normal operation and the crankcase pressure exceeds 40 kPa (6 PSI), the pressure unseats a check ball and crankcase vapors can bypass the valve piston.



BY-PASS FUNCTION

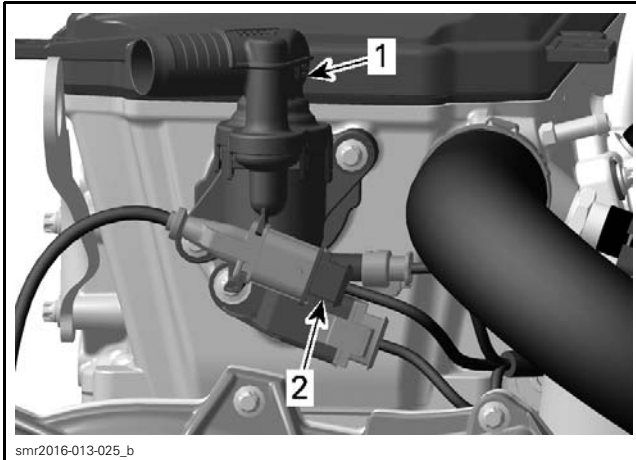
Blow-By Valve Location



Removing the Blow-By Valve

Remove ventilation hose from blow-by valve.

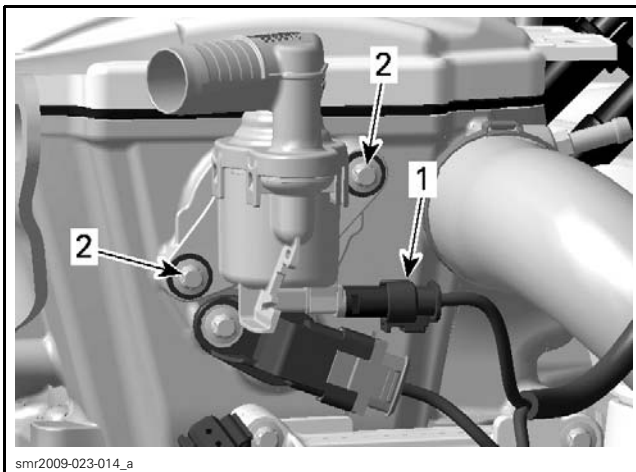
Remove the CPS connector from its support on blow-by valve.



1. Blow-by valve
2. CPS connector

Disconnect the TOPS switch connector of the blow-by valve.

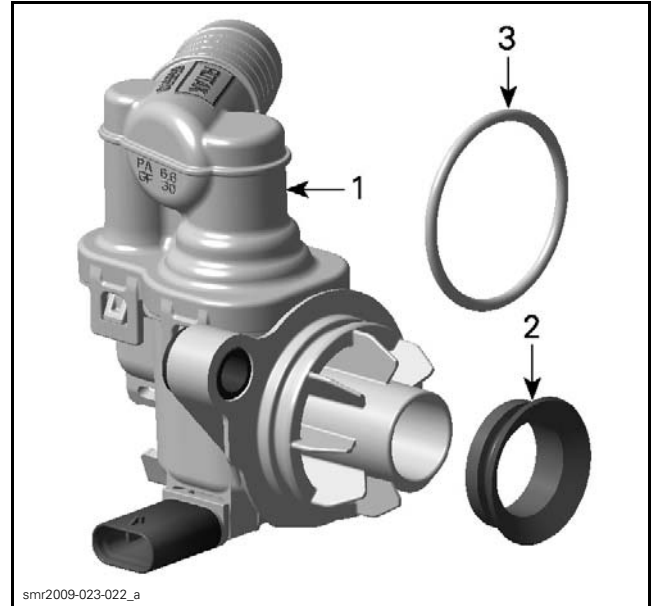
Unscrew and remove the blow-by valve.



1. TOPS switch connector
2. Retaining screws

Remove and discard O-ring and V-ring.

NOTE: The blow-by valve can not be disassembled.



1. Blow-by valve
2. V-ring
3. O-ring

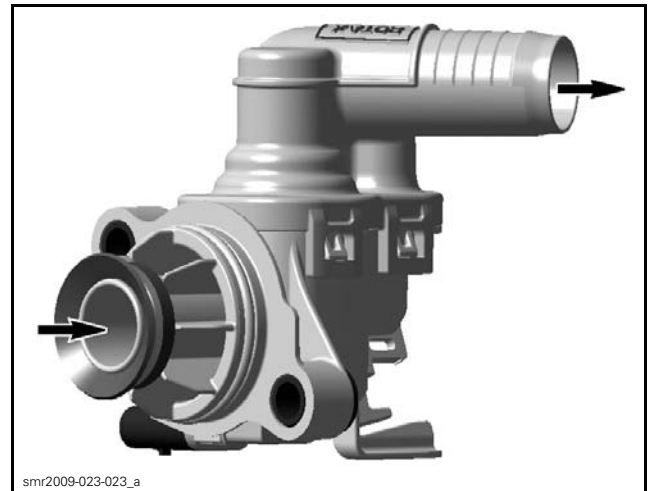
Inspecting the Blow-By Valve

If blow-by valve is damaged, replace it.

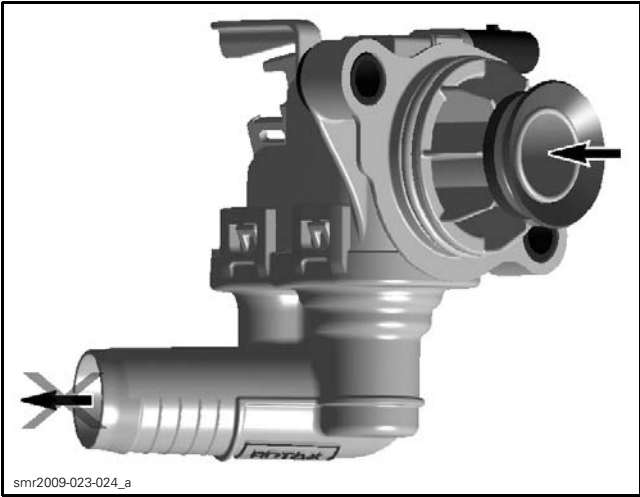
Clean all contact surfaces of blow-by valve.

Place a clean rag on valve inlet.

Blow air through inlet port. Air must flow freely to the outlet port.



Turn valve upside down and blow air again. Air must not flow out.



If test fails, replace blow-by valve.

Installing the Blow-By Valve

The installation is the reverse of the removal procedure. However, pay attention to the following. Install the blow-by valve with **NEW** O-ring and V-ring.

Tighten blow-by valve screws to specification.

TIGHTENING TORQUE	
Blow-by valve screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

Reinstall remaining removed parts.

TIP OVER PROTECTION SWITCH (TOPS)

TOPS Function

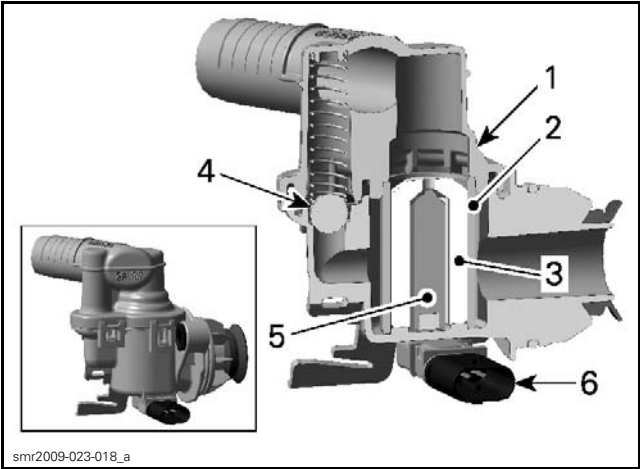
The function of the TOPS is the engine protection in the event the watercraft tip over.

During normal operation the TOPS state is OFF, no signal to the ECM.

If the watercraft tips over, gravity causes a valve piston to close and no engine oil will leak out of the blow-by valve.

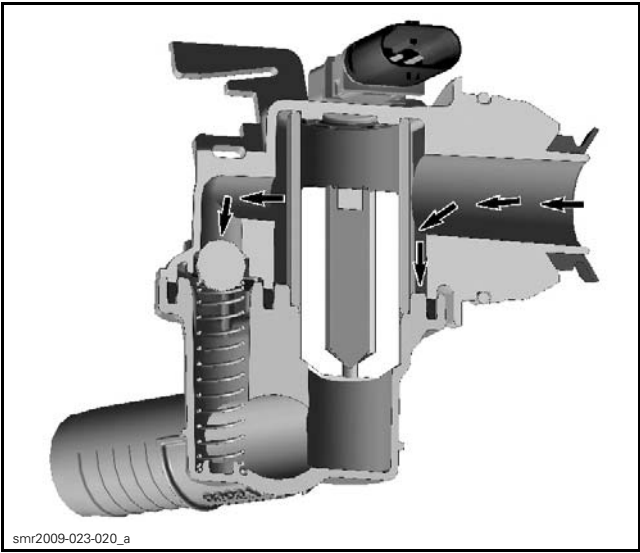
In this event, a pin (with magnet) opens a gap to the TOPS (Hall effect sensor) and the TOPS changes its state to ON and sends a signal to the ECM.

The ECM will shut down the engine by cutting the ignition and the fuel injection.



BLOW-BY VALVE CUT-AWAY

- 1. Valve housing
- 2. Valve sleeve
- 3. Valve piston
- 4. Check ball
- 5. Valve pin (with magnet)
- 6. TOPS of the blow-by valve



TIP OVER FUNCTION

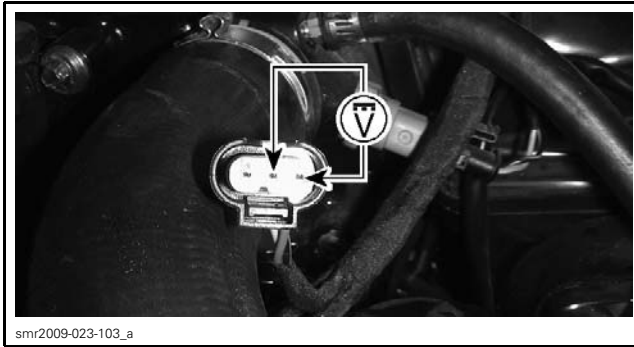
Testing the TOPS Input Voltage

Disconnect the TOPS connector of the blow-by valve.

Briefly press the START/STOP button to wake-up the ECM.

Probe terminals as shown to check the voltage output from the ECM.

TOPS INPUT VOLTAGE TEST		
TOPS CONNECTOR PIN		MEASUREMENT
2	3	5 Vdc



If voltage test is good, check the TOPS output voltage.

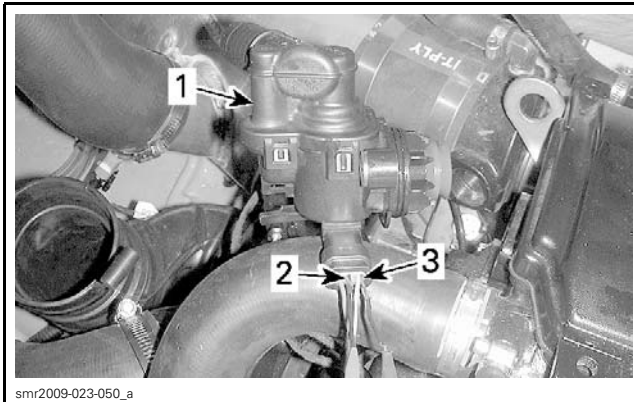
If voltage test is not good, check the continuity of the blow-by valve TOPS switch circuit.

NOTE: After voltage test, clear the fault codes in the ECM using the BRP diagnostic software (BUDS2).

Testing the TOPS Output Voltage

Remove the blow-by valve.

Back-probe TOPS connector and check voltage.



BLOW-BY VALVE IN NORMAL POSITION

1. Blow-by valve
2. RED probe into pin 2
3. BLACK probe into pin 1

TOPS OUTPUT VOLTAGE TEST		
TOPS CONNECTOR PIN	BLOW BY VALVE	MEASUREMENT
1 and 2	Normal position	0.4 ± 0.1 Vdc
1 and 2	Upside down	4.4 ± 0.2 Vdc
2 and 3	Normal position or upside down	5 Vdc

Replace TOPS switch if not within specification.

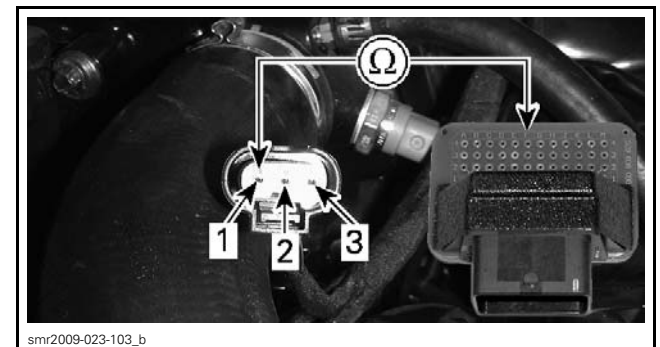
Testing the TOPS Circuit Continuity

Disconnect the TOPS switch connector of the blow-by valve.

Disconnect the ECM-A connector from the ECM. Connect the ECM-A connector on the ECM adaptor tool.

Check continuity of the blow-by valve TOPS switch circuit as per following table.

TOPS CIRCUIT CONTINUITY TEST		
TOPS CONNECTOR PIN	ECM ADAPTER	MEASUREMENT
1	A-F4	Close to 0Ω
2	A-G1	
3	A-C4	



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

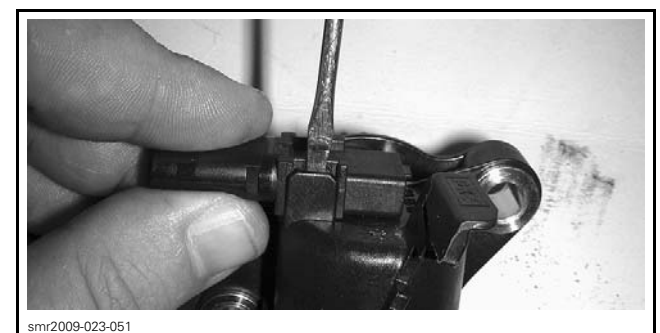
If continuity test is good, check ECM. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

If continuity test is not good, repair or replace defective wires or connectors.

Replacing the TOPS

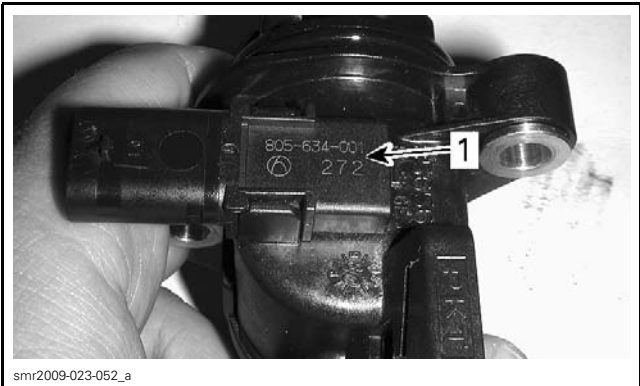
Remove blow-by valve and turn it upside down.

Insert a small screwdriver between TOPS and its retaining tab. Twist and hold the TOPS then release the other retaining tab.



Subsection XX (LUBRICATION SYSTEM)

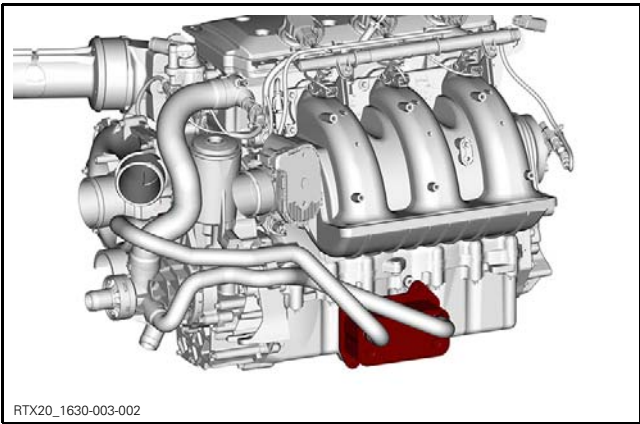
When installing the TOPS, make sure printed information is visible.



1. TOPS valve inscriptions

OIL COOLER

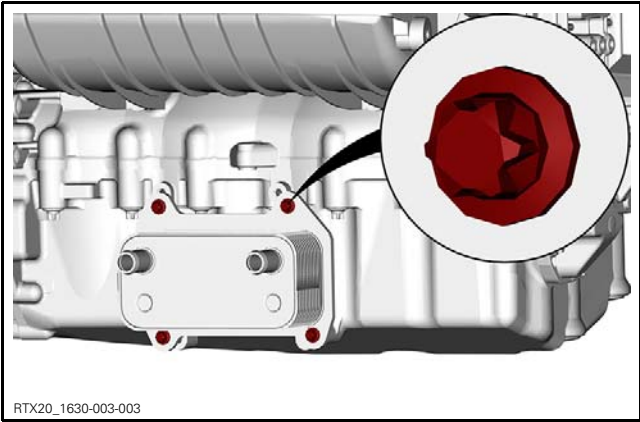
Oil Cooler Location



RTX20_1630-003-002

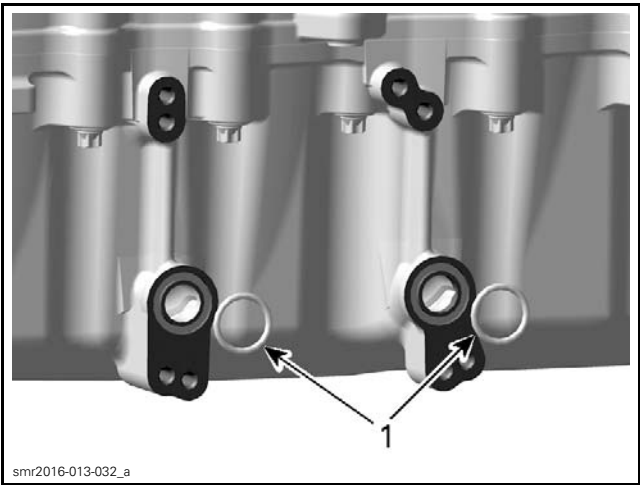
Removing the Oil Cooler

Remove engine from vehicle. Refer to *REMOVING AND INSTALLING THE ENGINE* subsection.
Disconnect cooling hoses from oil cooler.
Remove oil cooler screws.



RTX20_1630-003-003

Ensure not to lose O-rings located between oil cooler and engine.



1. O-rings

Inspecting the Oil Cooler

If O-rings are brittle, cracked or hard, replace them.
Clean both contact surfaces of oil cooler.
Check and clean the oil inlet and outlet area for dirt and other contaminations.

Installing the Oil Cooler

The installation is the reverse of the removal procedure. However, pay attention to the following details.
Apply engine oil on O-rings.
Tighten oil cooler screws to specification.

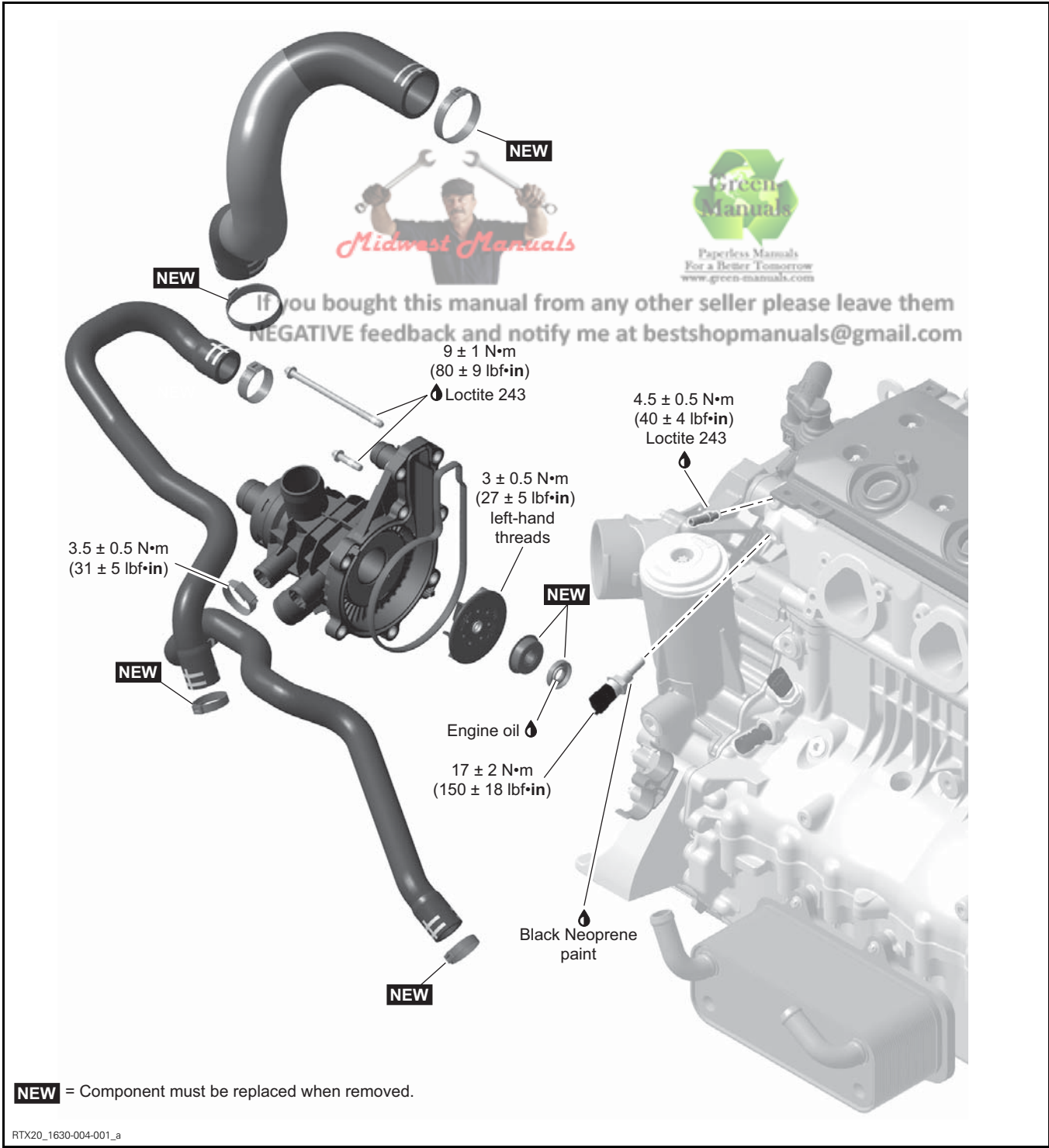
TIGHTENING TORQUE	
Oil cooler screws	11 N•m ± 1 N•m (97 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

COOLING SYSTEM - ENGINE COMPONENTS

SERVICE PRODUCTS

Description	Part Number	Page
BLACK NEOPRENE PAINT	909570	5
LOCTITE 243 (BLUE).....	293 800 060	6

COOLING SYSTEM COMPONENTS





GENERAL

NOTICE Never start the engine without coolant. Some engine parts can be damaged.

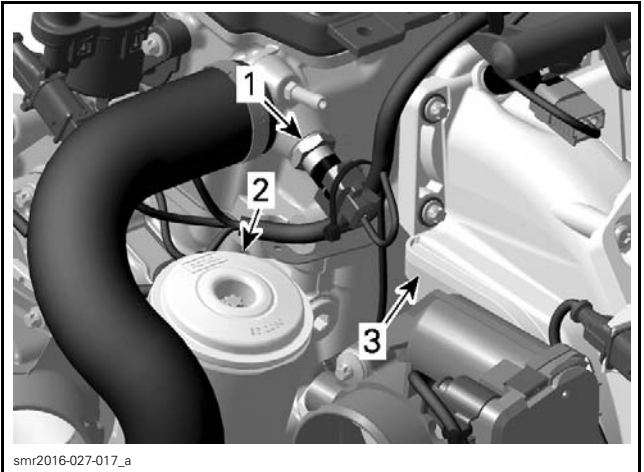
 **WARNING**

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

PROCEDURES

COOLANT TEMPERATURE SENSOR (CTS)

The CTS is located between the intake manifold and the oil filter cover.



- 1. Coolant temperature sensor (CTS)
- 2. Oil filter cover
- 3. Intake manifold

NOTE: The CTS will cause the engine overheat warning to come on when the coolant temperature is above:

ENGINE TYPE	OVERHEAT TEMPERATURE
130 170 230	Above 102°C (216°F)
300	Above 97°C (207°F)

Check for debris or blockage in cooling system.

CTS Quick Test

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. Install the tether cord on the engine cut-off switch.
3. Start the engine

4. In BUDS2, go to:
 - Measurements page
 - ECM button
 - ECM - Basic tab
 - Engine Temperature

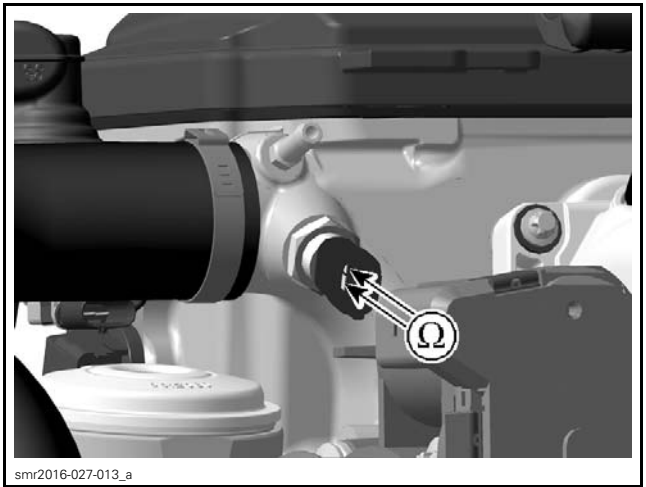
5. Look for the engine temperature indication.
The engine temperature gauge in BUDS2 should provide an indication of the actual engine coolant temperature. Otherwise, test the *CTS RESISTANCE*.

Testing the CTS Resistance

1. Remove parts required to access ECM connectors.
2. Disconnect ECM-A connector from the ECM and install it on the ECM adapter tool.
3. Set the multimeter to Ω .
4. Check the CTS circuit resistance as per table.

CTS RESISTANCE TEST		
ECM ADAPTER PIN		MEASUREMENT
A-A1	A-J2	Refer to <i>CTS TEMPERATURE SENSOR TABLE</i>

- If resistance test is good, replace the ECM.
If resistance is out of specification, proceed with the following steps.
5. Remove the parts required to access the CTS.
 6. Disconnect the CTS connector.
 7. 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.
 8. If continuity of wiring is good, test the resistance of the sensor as per following tables.



CTS RESISTANCE TEST			
CTS SENSOR PIN		MEASUREMENT	
1	2	Refer to <i>CTS TEMPERATURE SENSOR TABLE</i>	

CTS TEMPERATURE SENSOR TABLE			
TEMPERATURE		RESISTANCE (OHMS)	
°C	°F	LOW	HIGH
- 40	- 40	38457	52630
- 10	14	8208	10656
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 *REPLACING THE CTS*.

If the resistance value measured is as specified, repair the connectors or replace the wiring harness between ECM connector and CTS connector.

If the resistance value is not within specification replace CTS.

Replacing the CTS

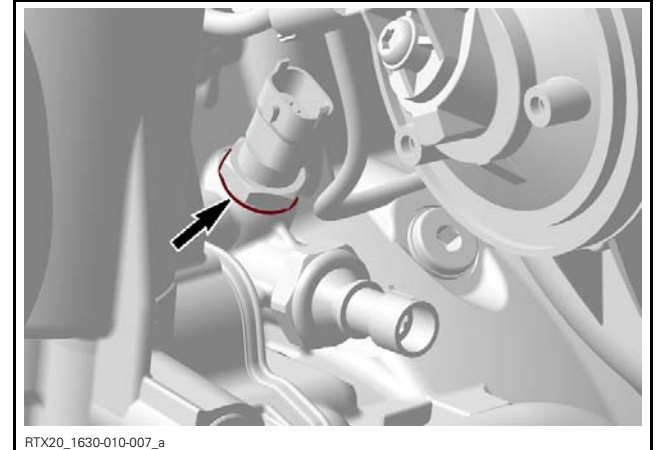
1. Drain engine coolant to below CTS level, refer to *COOLING SYSTEM* subsection.
2. Cut locking tie on wiring harness and move wiring aside for access. Be sure to take note of their position.
3. Disconnect CTS connector and remove CTS.
4. Install the new CTS and tighten to specification.

TIGHTENING TORQUE	
Coolant temperature switch	17 N•m ± 2 N•m (150 lbf•in ± 18 lbf•in)

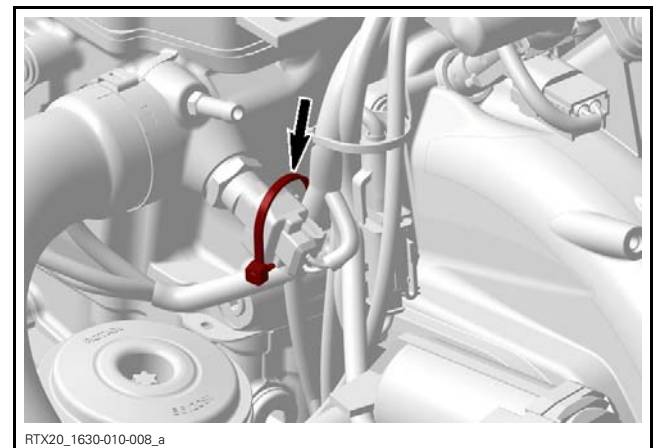
5. Apply sealant around CTS as defined in the illustration.

NOTE: Gasket ring of OTS must be coated completely.

SERVICE PRODUCT
BLACK NEOPRENE PAINT (P/N 909570)

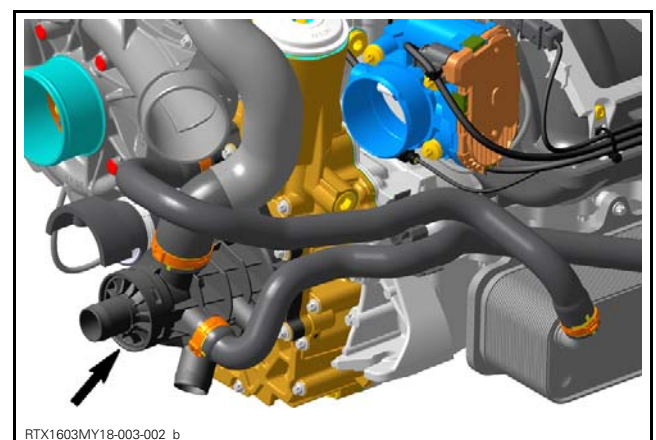


6. Secure wiring harness to CTS.



7. Reinstall remaining removed parts.
8. Refill and bleed the cooling system, refer to *COOLING SYSTEM* subsection.
9. Reinstall remaining removed parts.

WATER PUMP HOUSING

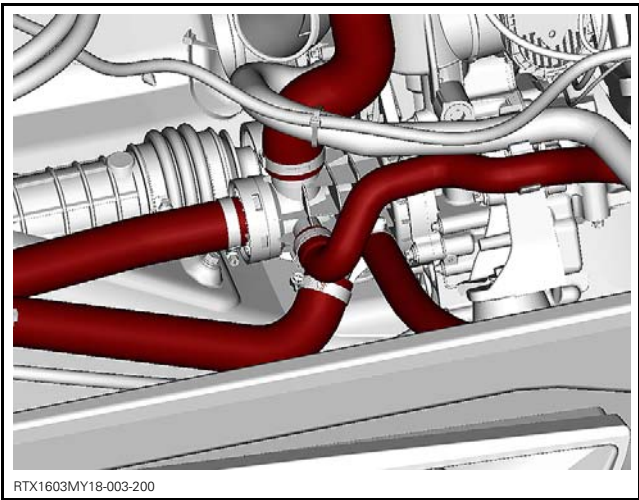


Removing the Water Pump Housing

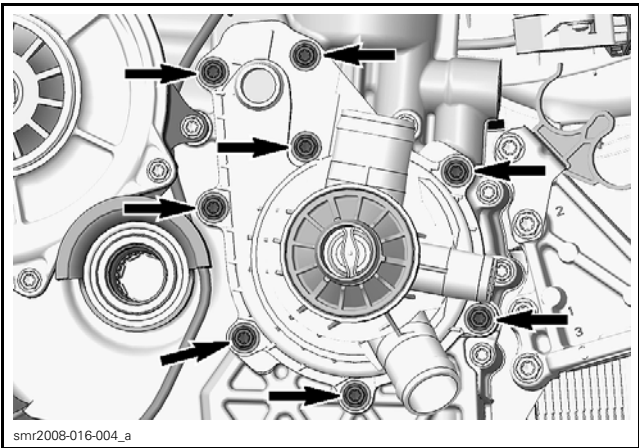
IMPORTANT: The water pump housing can be removed with the engine installed in the vehicle.

Drain cooling system. Refer to *COOLING SYSTEM - VEHICLE COMPONENTS* subsection.

Disconnect all hoses from water pump housing.



Remove water pump housing screws.

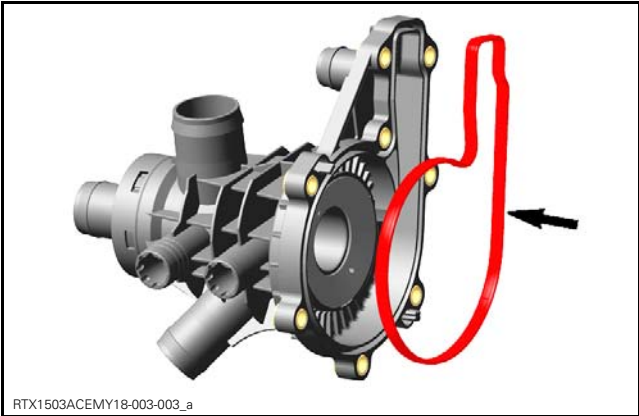


TYPICAL

Pull the water pump housing to remove it.

Inspecting the Water Pump Housing

Check if gasket is brittle, hard or damaged and replace as necessary.



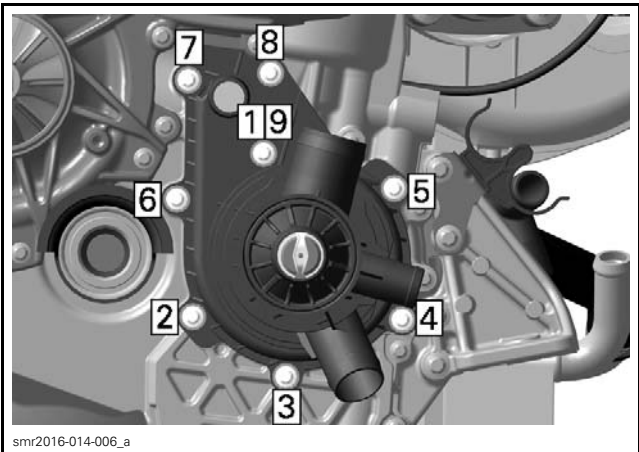
Check if thermostat is in good condition. Refer to *THERMOSTAT* in this subsection.

Installing the Water Pump Housing

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

NOTICE Take care that the gaskets are exactly in groove when reinstalling the water pump housing.

Tighten screws to specification using the following sequence.



TIGHTENING SEQUENCE

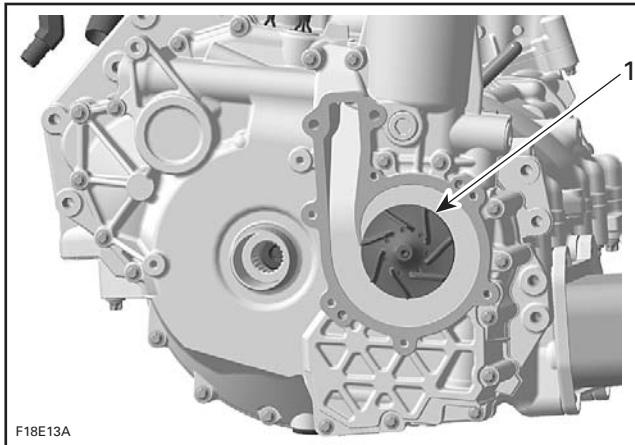
TIGHTENING TORQUE	
Water pump housing screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

WATER PUMP IMPELLER

Removing the Water Pump Impeller

Remove the *WATER PUMP HOUSING*, see procedure in this subsection.

Unscrew the impeller clockwise.



1. Impeller

NOTICE Coolant/oil pump shaft and impeller have left-hand threads.

Inspecting the Water Pump Impeller

Check impeller for cracks or other damage. Replace impeller if damaged.

Installing the Water Pump Impeller

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

NOTICE Be careful not to damage impeller wings during installation.

Torque impeller to specification.

TIGHTENING TORQUE	
Water pump impeller (left hand threads)	3 N•m ± 0.4 N•m (27 lbf•in ± 4 lbf•in)

THERMOSTAT

The thermostat is a single action type.

Removing the Thermostat

Remove the *WATER PUMP HOUSING*, see procedure in this subsection.

NOTE: The thermostat is located inside the water pump housing.

Testing the Thermostat

To check the operation of the thermostat, put it in water and heat water.

Look inside the cylinder head return hose connection to see the movement of the thermostat.

THERMOSTAT OPENING TEMPERATURE	
Water pump housing thermostat	80°C (176°F)

If there is no operation, replace the thermostat with its housing.

Installing the Thermostat

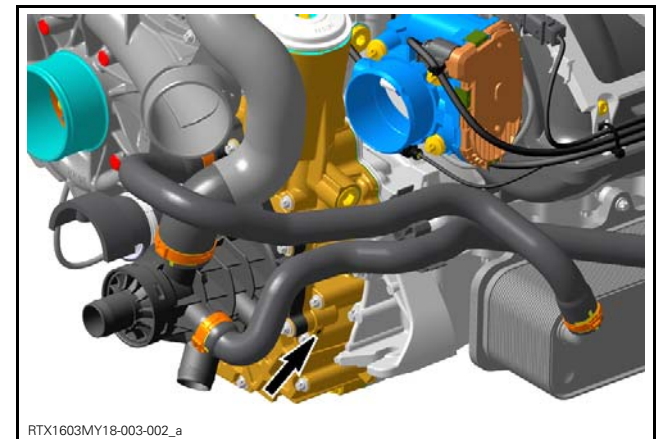
Refer to *WATER PUMP HOUSING* in this subsection.

ROTARY SEAL

Inspecting the Rotary Seal

Check leak indicator hole for oil or coolant leak:

- Leaking coolant indicates a defective rotary seal
- Leaking oil indicates a faulty oil seal.



Rotary seal and oil seal must be replaced together.

Replacing the Rotary Seal

Refer to *LUBRICATION SYSTEM* subsection.

COOLING SYSTEM - VEHICLE

SERVICE TOOLS

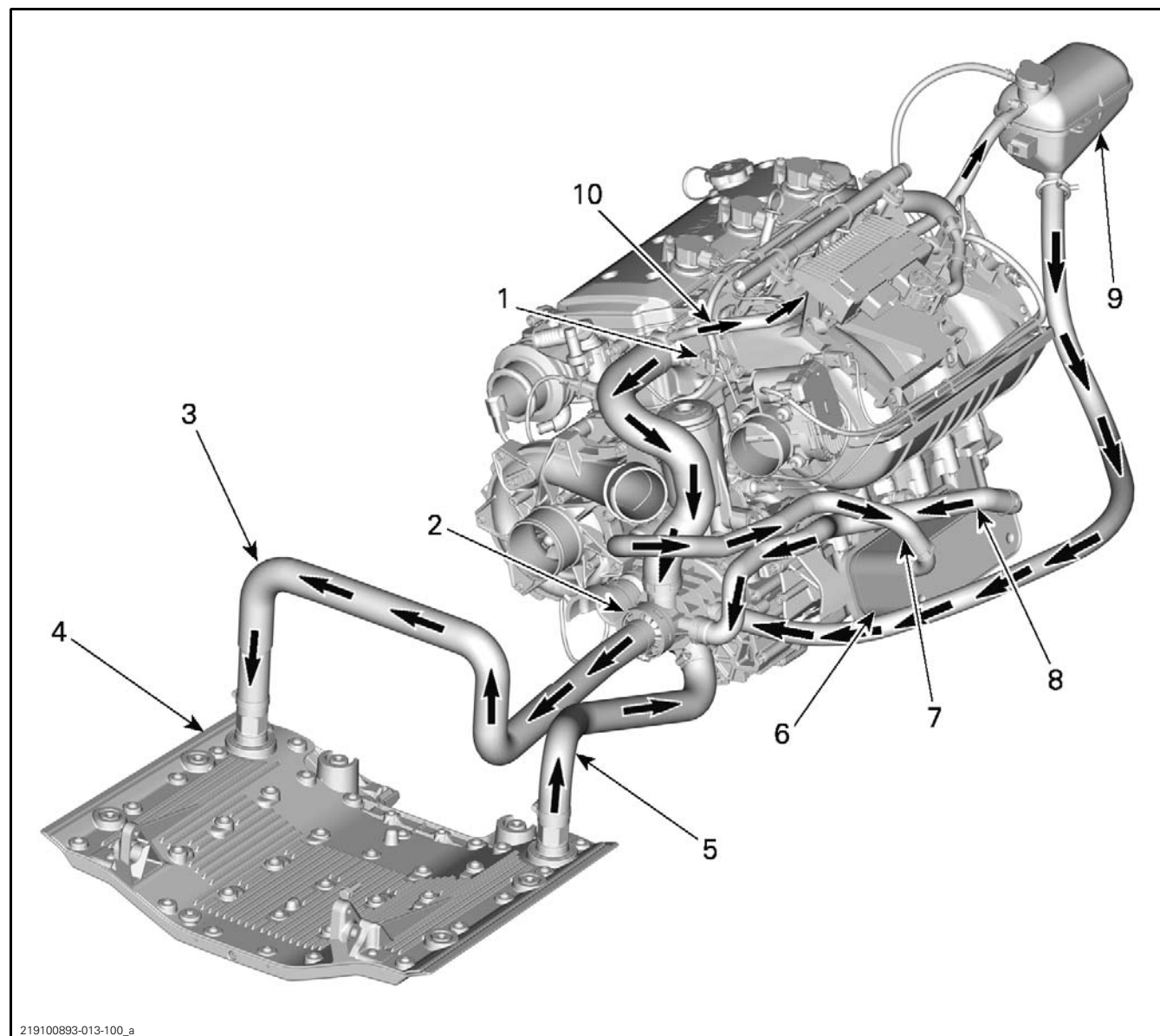
Description	Part Number	Page
OETIKER PLIER.....	295 000 070	10
TEST CAP.....	529 035 991	9
VACUUM/PRESSURE PUMP	529 021 800	9

SERVICE PRODUCTS

Description	Part Number	Page
EXTENDED LIFE PRE-MIXED COOLANT (EUR)	779223	7
EXTENDED LIFE PRE-MIXED COOLANT	779150	7
LOCTITE 567 (PIPE SEALANT)	293 800 013	8

Subsection XX (COOLING SYSTEM - VEHICLE)

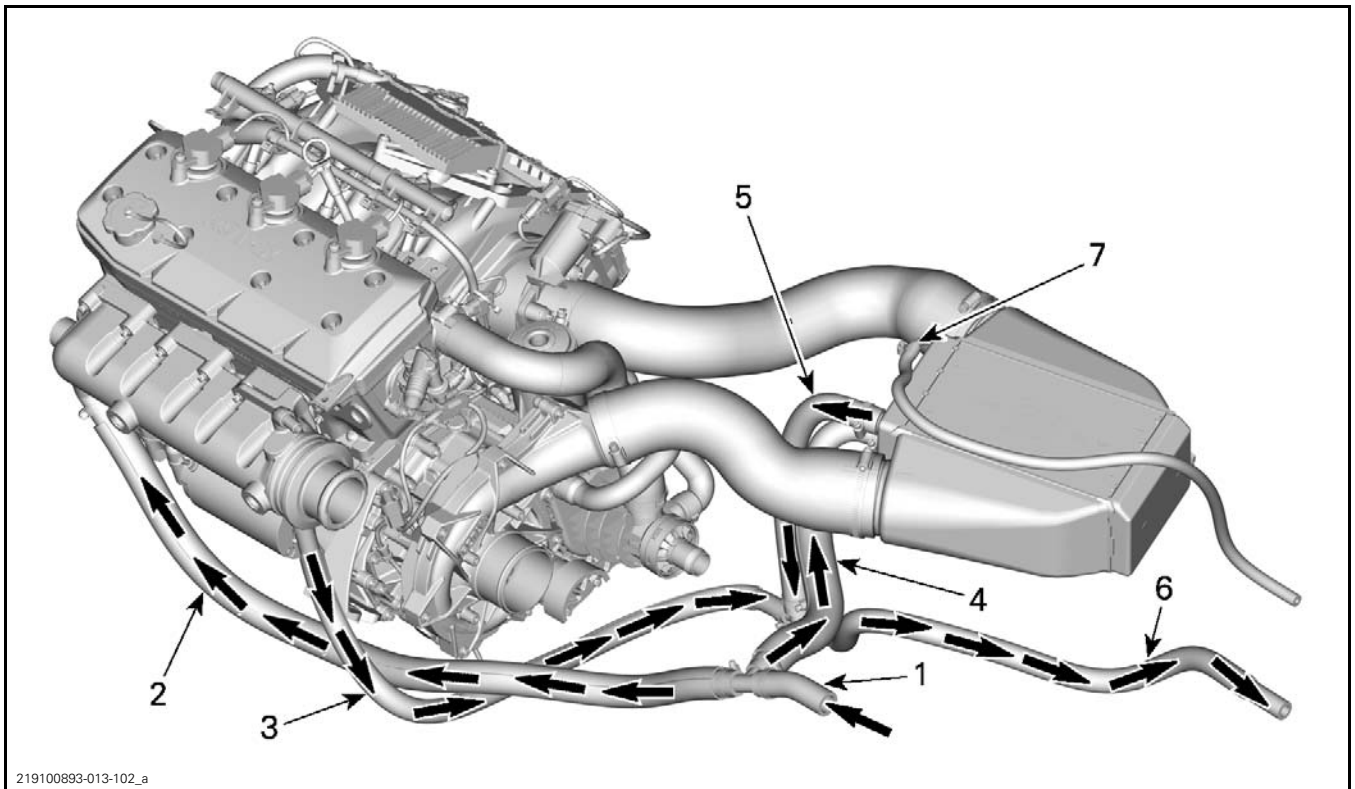
Cooling System (closed loop)



1. Coolant temperature sensor (CTS) activates when monitoring beeper turns on at 110°C (230°F)
2. Water pump cover / thermostat housing - Thermostat opens at 102°C (216°F) for 155 and 230 models and 97.5°C (208°F) for 300 models
3. Coolant flows to ride plate
4. Ride plate (operates as heat exchanger)
5. Coolant returns from ride plate

6. Oil cooler
7. Coolant flows to oil cooler
8. Coolant returns from oil cooler
9. Expansion coolant tank
10. Bleed hose from cylinder head to expansion coolant tank

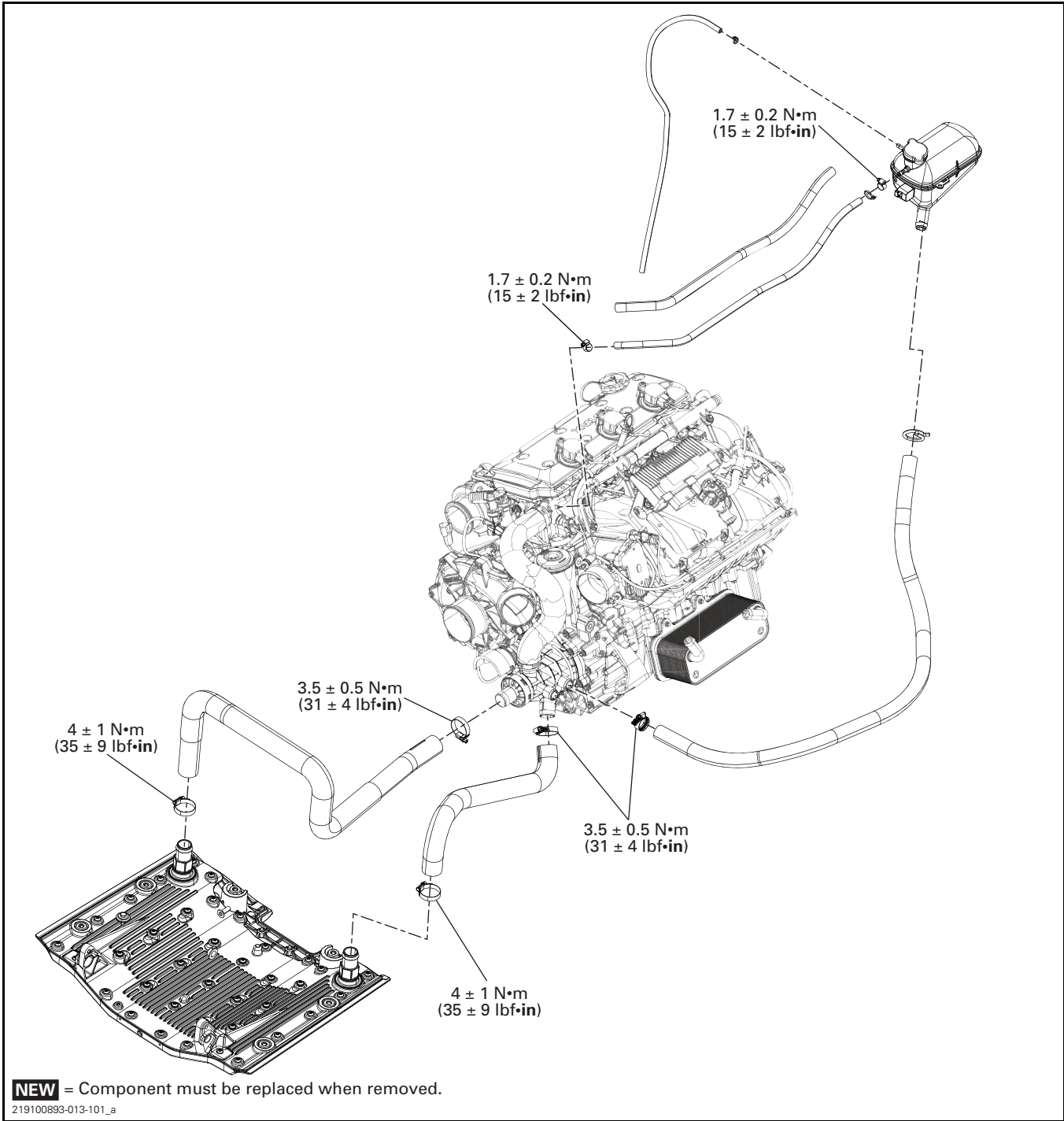
Cooling System (open loop)



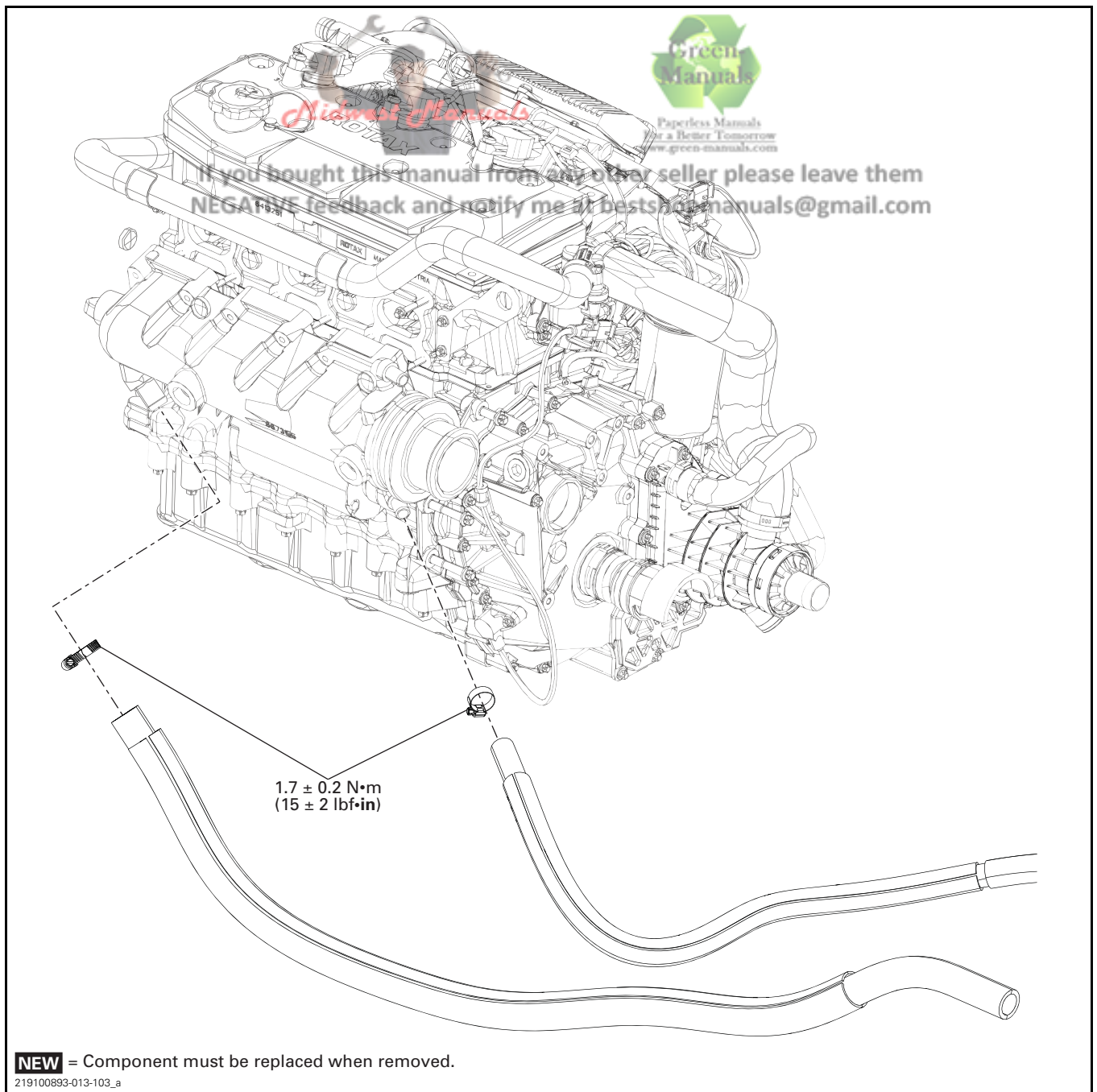
1. Water enters system
2. Water enters the exhaust manifold
3. Water exits the exhaust manifold
4. Water enters intercooler

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

Cooling System Components (closed loop)

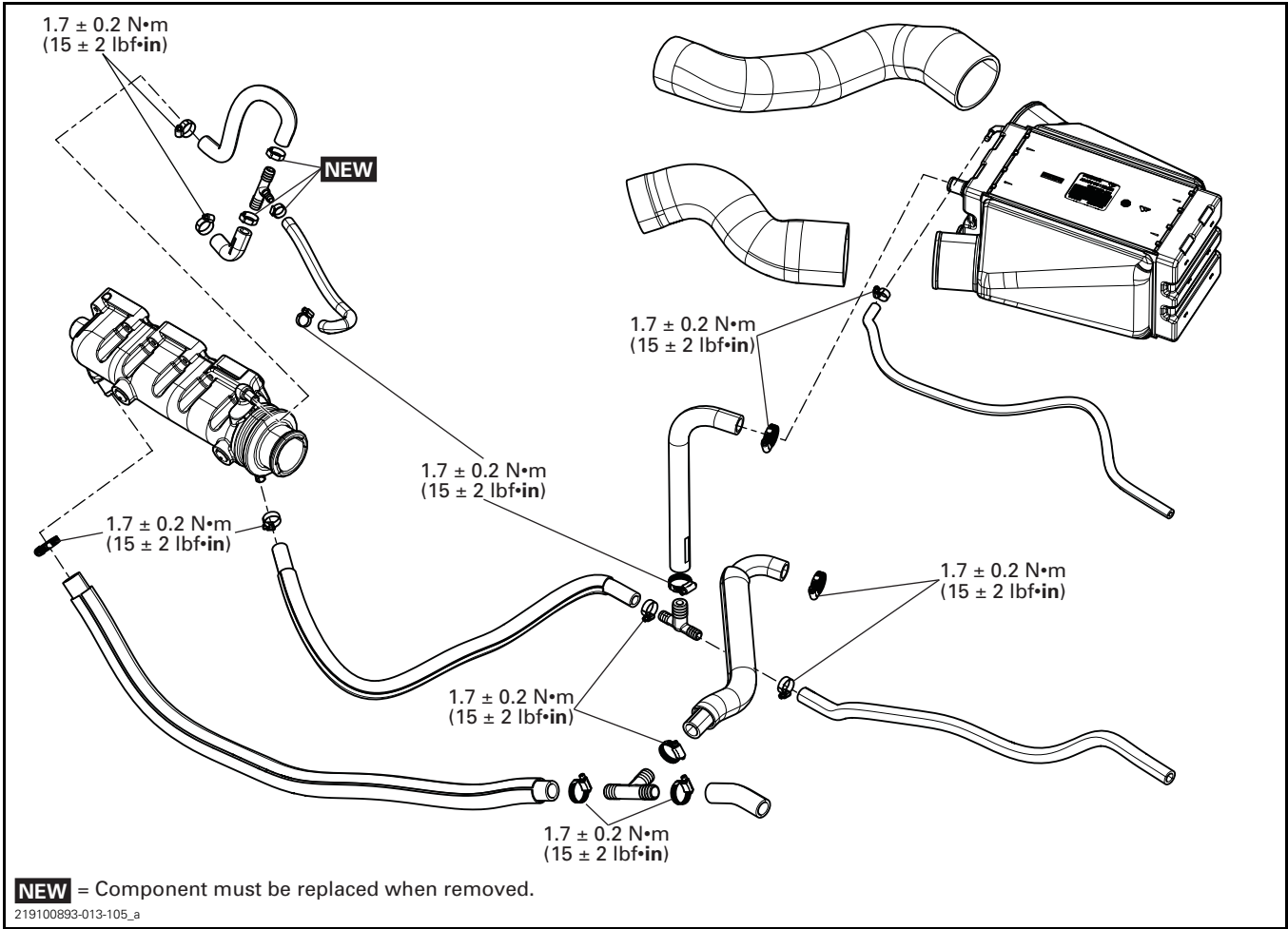


Cooling System Components (open loop, 155 models)



Subsection XX (COOLING SYSTEM - VEHICLE)

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



GENERAL

SYSTEM DESCRIPTION

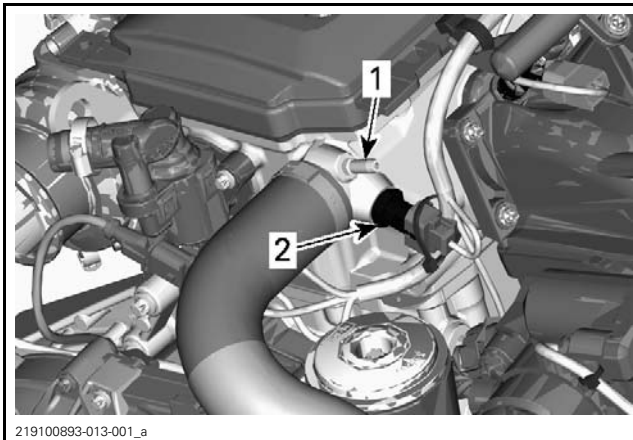
A closed loop cooling system is utilized on all BRP watercraft engines, which offers an efficient engine cooling while keeping dirt and salt water out of the cooling system. This system keeps the temperature constant and prevents internal engine corrosion.

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

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

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

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



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

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

Technical Specifications

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

MAINTENANCE

ENGINE COOLANT

⚠ WARNING

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

Recommended Coolant

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

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

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

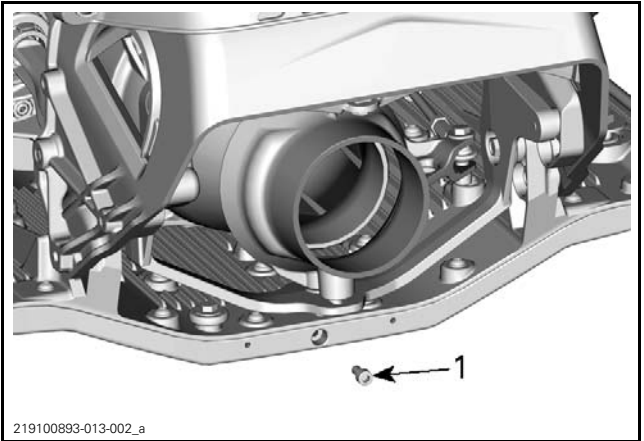
NOTICE To prevent rust formation or freezing condition in cold areas, always replenish the system with 50% antifreeze and 50% distilled water. Pure antifreeze will freeze at a higher temperature than the optimal water/antifreeze mix. Always use ethylene glycol antifreeze containing corrosion inhibitors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

Draining the System

**WARNING**

Never drain or refill cooling system when engine is hot.

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



1. Cooling drain plug

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

Cleaning the System

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

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

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

Refilling the System

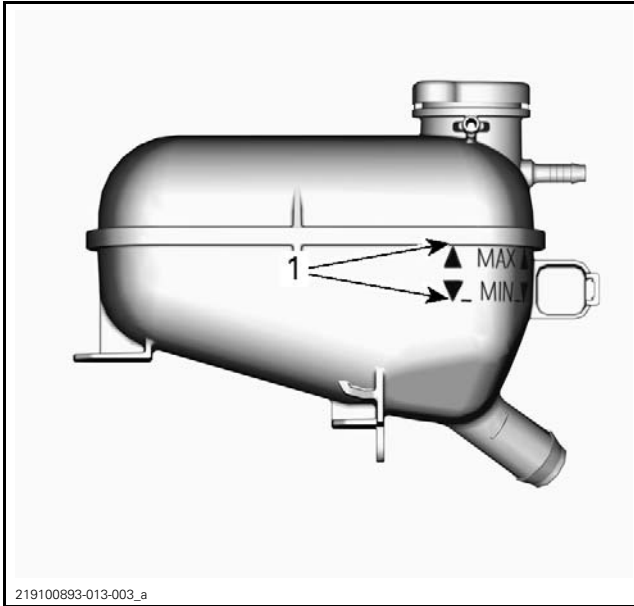
- Watercraft should be level, engine cold and drain plug removed for refilling.
- Place a container under drain plug to collect antifreeze.
- Apply pipe sealant on drain plug threads.

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

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

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

- Continue to pour and fill coolant tank between marks.



1. Level between marks when engine is cold

Do not install pressure cap at this time.

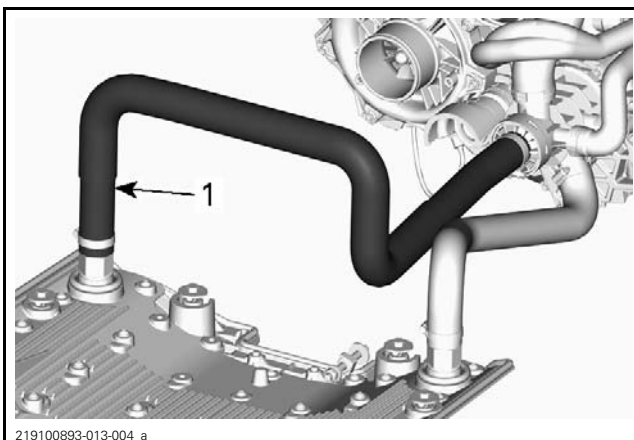
Link a garden hose to the hose adapter at the back of the watercraft. Refer to *FLUSHING THE EXHAUST SYSTEM* in the *EXHAUST SYSTEM* subsection.

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

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

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

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



1. This hose becomes hot when thermostat opens

Last, refill coolant tank and install pressure cap.

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

INSPECTION

COOLING SYSTEM LEAK TEST

⚠ WARNING

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

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

Pressurize cooling system through coolant reservoir.

REQUIRED TOOL

TEST CAP (P/N 529 035 991)

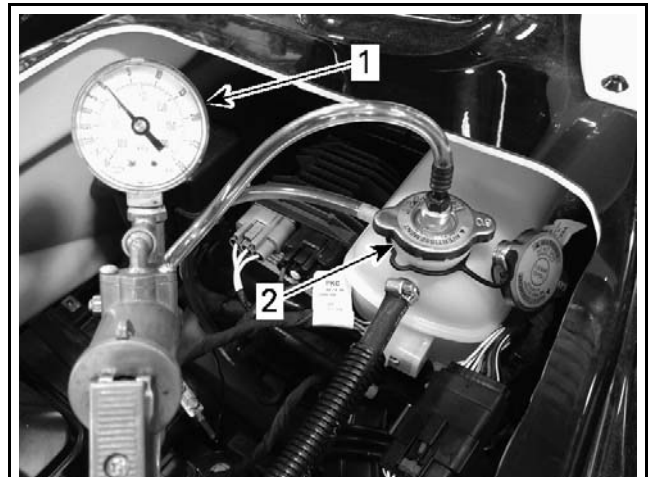


VACUUM/PRESSURE PUMP
(P/N 529 021 800)



COOLING SYSTEM LEAK TEST

110 kPa (16 PSI)



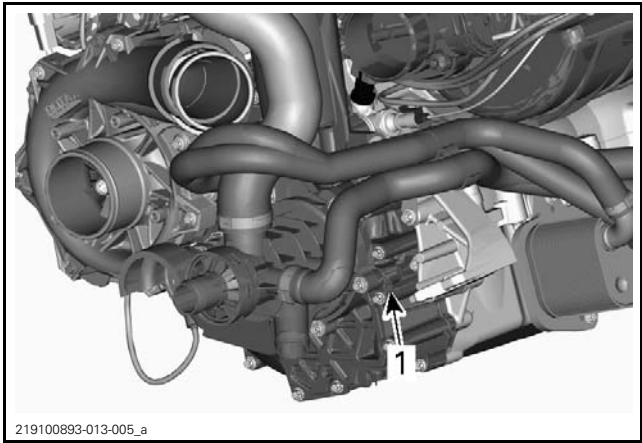
TYPICAL

1. Vacuum/pressure pump
2. Test cap

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

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

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



1. Leak indicator hole

TROUBLESHOOTING

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

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

ENGINE OVERHEATING

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

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

PROCEDURES

PRESSURE CAP

Testing the Pressure Cap

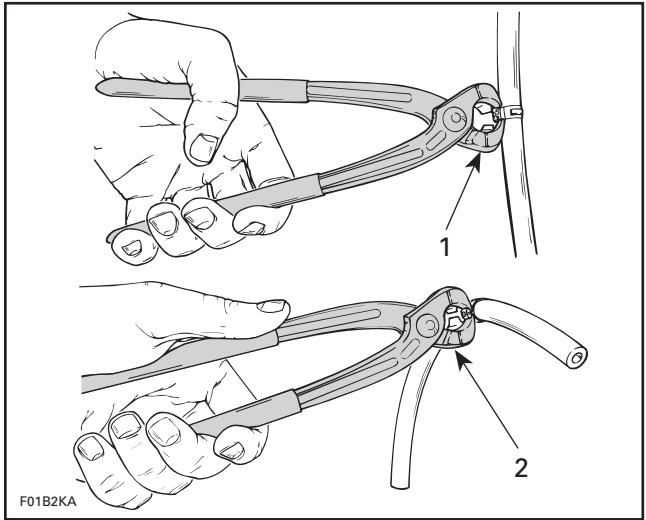
Using a pressure cap tester, check cap opening pressure. If opening pressure is out of range, install a new pressure cap.

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

CLAMPS

Replacing the Oetiker Clamp

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



- 1. Cutting clamp
- 2. Securing clamp

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

PTO HOUSING, MAGNETO AND STARTER

SERVICE TOOLS

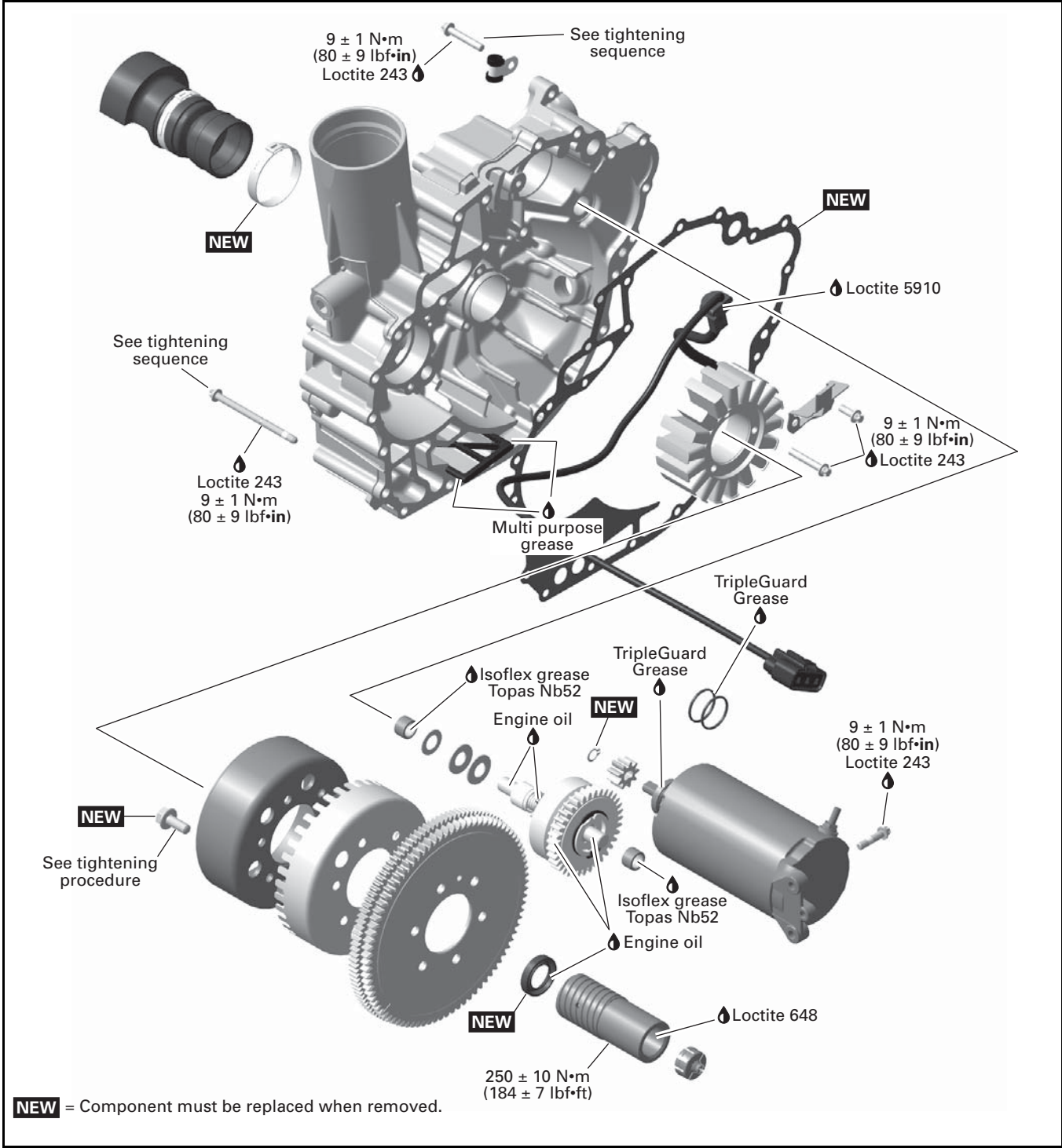
Description	Part Number	Page
HANDLE	420 877 650	17
IMPELLER REMOVER/INSTALLER.....	529 035 820	8–9, 12
OETIKER PLIER.....	295 000 070	11
STARTER DRIVE SEAL PUSHER.....	420 876 502	17
SUCTION PUMP	529 035 880	4

SERVICE PRODUCTS

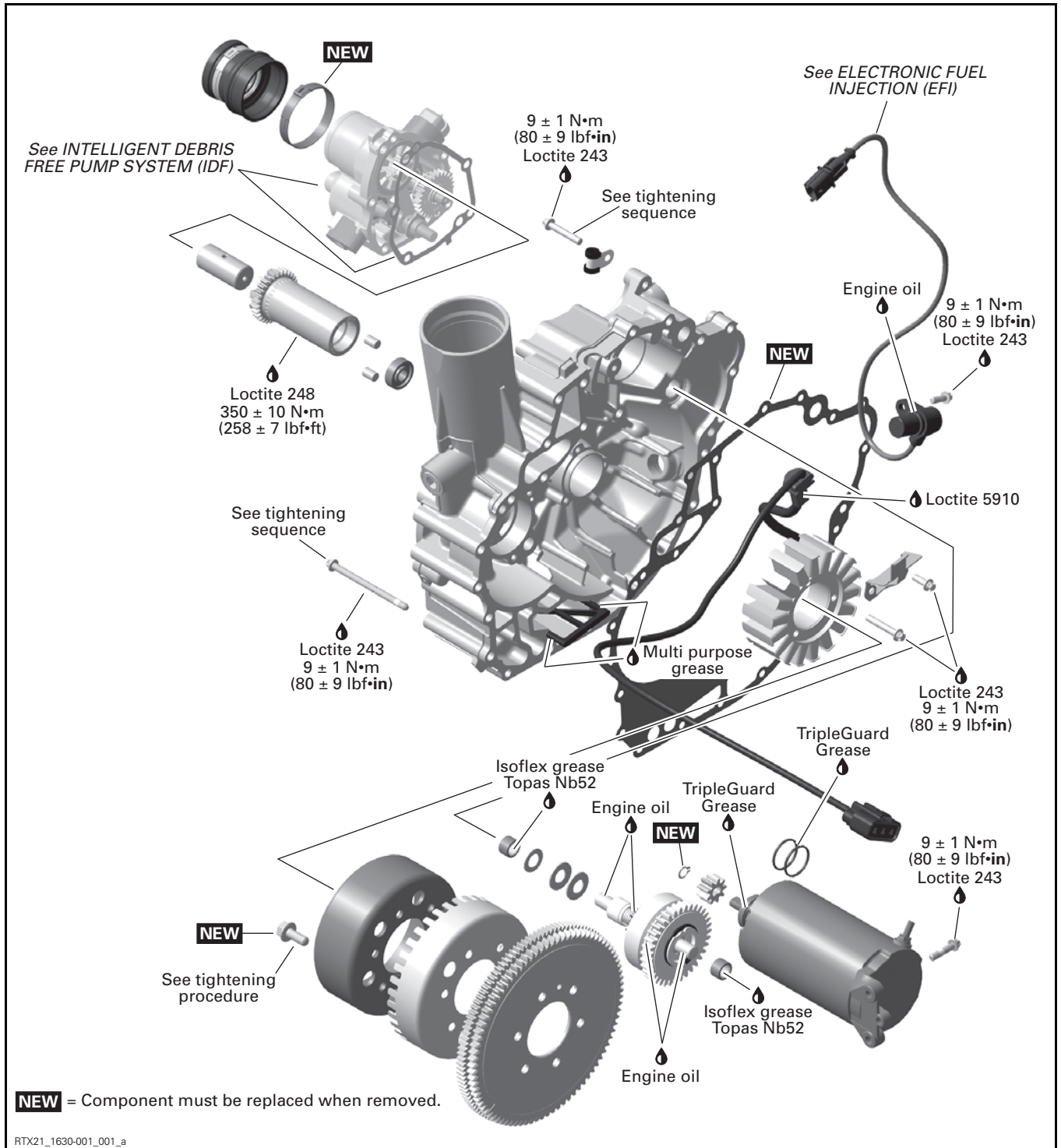
Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	6, 9, 12
DIELECTRIC GREASE	293 550 004	20
ISOFLEX GREASE TOPAS NB 52	293 550 021	17
LOCTITE 243 (BLUE).....	293 800 060	8, 14, 20
LOCTITE 248	296 000 443	9
LOCTITE 5910	293 800 081	7
LOCTITE 648 (GREEN)	413 711 400	12
TRIPLE-GUARD GREASE	508298	19

Subsection XX (PTO HOUSING, MAGNETO AND STARTER)

Engine without iDF



Engine with iDF



GENERAL

It is good practice to check for fault codes using the BRP diagnostic software (BUDS2) as a first troubleshooting step. Refer to the *DIAGNOSTIC AND FAULT CODES* subsection.

Always carry out electrical tests on components before removing or installing them.

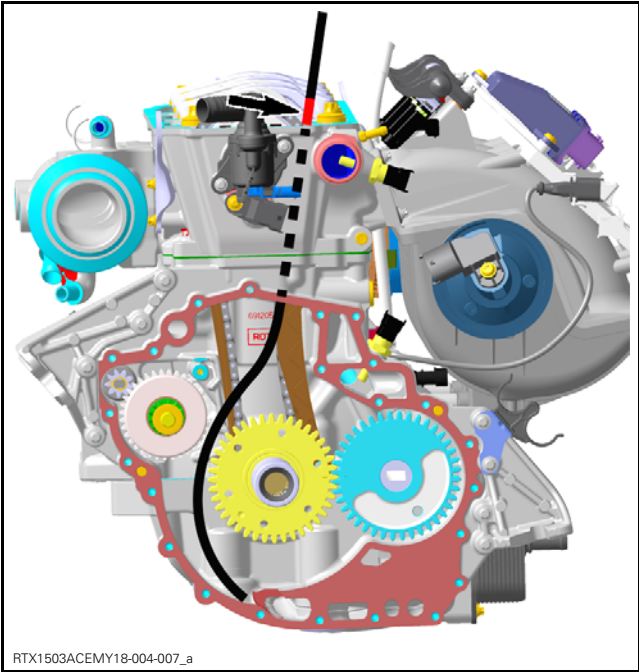
PROCEDURES

PTO HOUSING

Removing the PTO Housing

- 1. Remove the engine from the watercraft. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
- 2. Syphon engine oil through oil dipstick tube. Refer to *ENGINE OIL CHANGE* in the *LUBRICATION SYSTEM* subsection.
- 3. Remove the supercharger (if applicable). Refer to *SUPERCHARGER* subsection.
- 4. Remove the valve cover. Refer to *CYLINDER HEAD* subsection.
- 5. Syphon remaining oil out of the lower timing chain case:
 - 5.1 Put some electrical tape on suction pump hose at 450 mm (17.72 in) from its end.
 - 5.2 Insert the suction pump hose in the lower area of the timing chain until the tape flushes with the edge of the cylinder head.

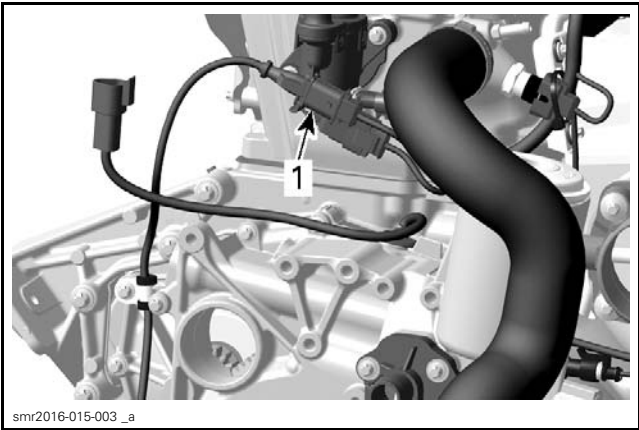
REQUIRED TOOL	
SUCTION PUMP (P/N 529 035 880)	



RTX1503ACEMY18-004-007_a

PARTS REMOVED FOR CLARITY

- 6. Disconnect CPS connector from wiring harness.



smr2016-015-003_a

1. CPS connector

- 7. Disconnect the stator connector, refer to *STATOR CONNECTOR ACCESS* in this subsection.

Engine with iDF

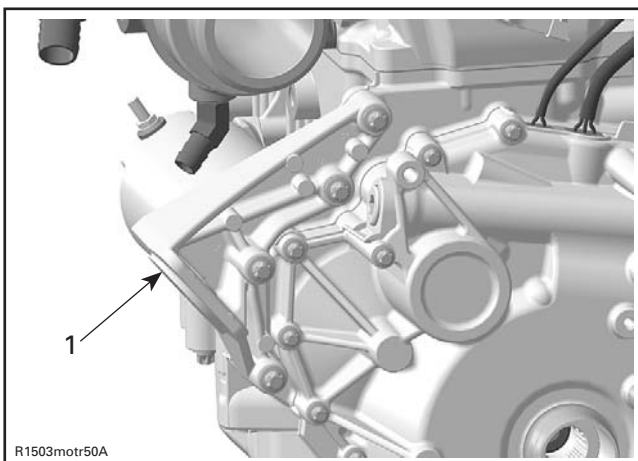
- 8. Remove iDF gearbox, refer to *INTELLIGENT DEBRIS FREE PUMP SYSTEM (iDF)* subsection.

All Engines

- 9. Place rags under PTO housing to prevent oil spillage.

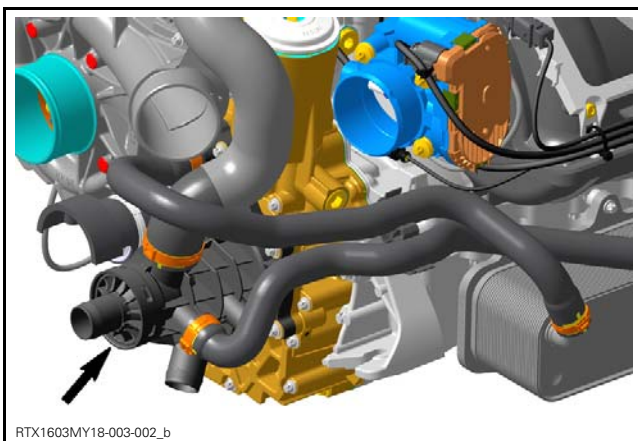
NOTE: Up to 250 ml (8 U.S. oz) of oil could flow out when removing PTO housing.

- 10. Remove LH rear engine support.



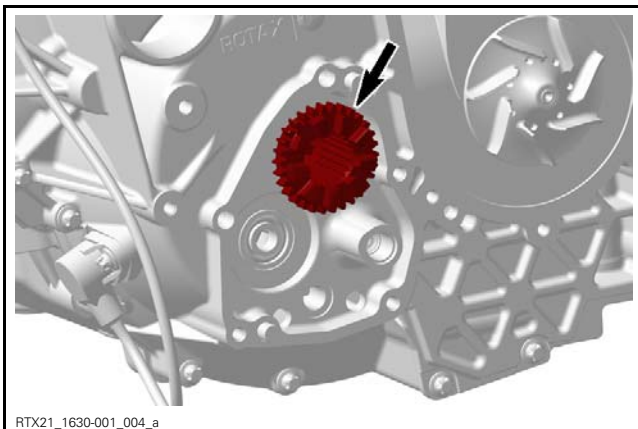
1. Engine support

11. Remove water pump housing, refer to *COOLING SYSTEM* subsection.



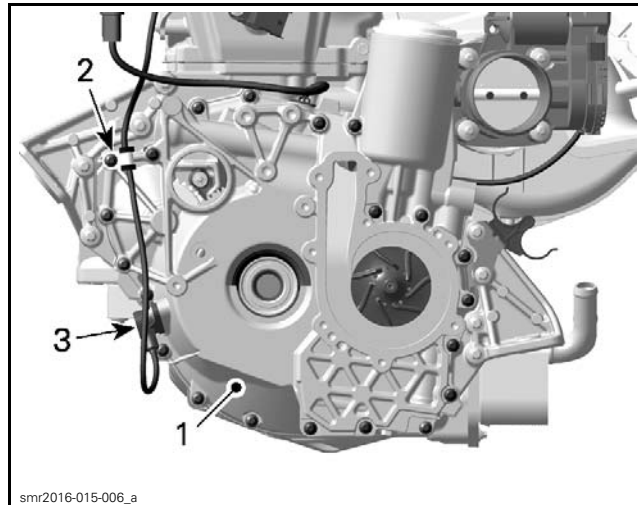
Engine with iDF

12. Remove input shaft, refer to procedure in this subsection.



All Engines

13. Remove PTO housing retaining screws and CPS harness retaining clamp.

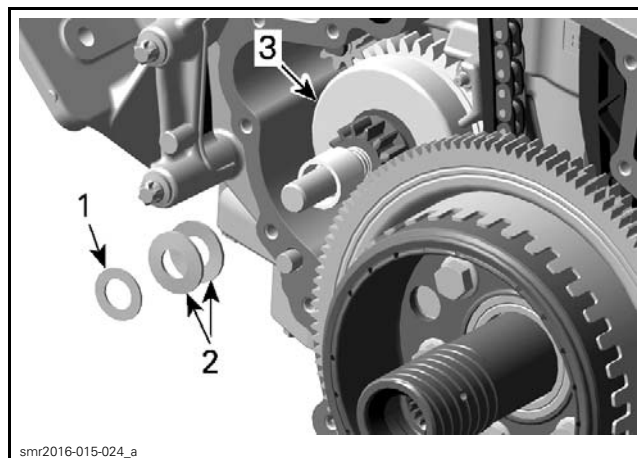


1. PTO housing
2. CPS harness retaining clamp
3. CPS

14. Pry off PTO housing from engine using two flat screwdrivers.

NOTICE Avoid scoring or damaging contact surfaces.

NOTICE Be careful not to lose the disc springs and thrust washer located on the starter drive shaft.



1. Thrust washer
2. Disc springs
3. Starter drive

15. Remove PTO housing gasket and discard it.

16. If necessary remove following parts from PTO housing:

- Stator, refer to procedure in this subsection
- Oil filter, refer to *LUBRICATION SYSTEM*
- Oil pressure pump, refer to *LUBRICATION SYSTEM*
- Engine oil pressure regulator, refer to *LUBRICATION SYSTEM*
- Crankshaft position sensor (CPS).

Subsection XX (PTO HOUSING, MAGNETO AND STARTER)

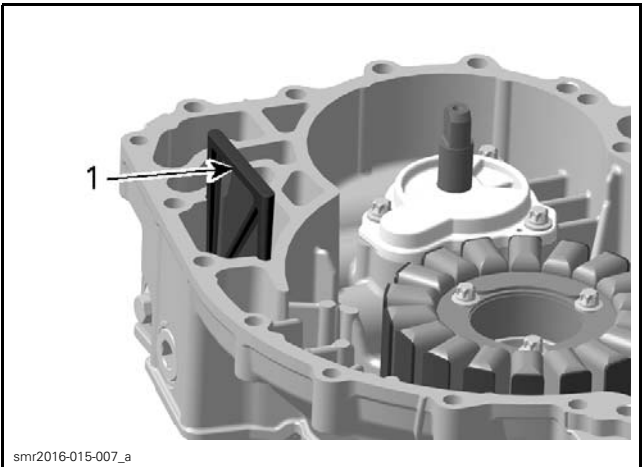
Inspecting the PTO Housing

Inspect PTO housing for cracks or any other damages. Replace if necessary.

Inspect starter drive needle bearing in the PTO housing.

NOTE: Clean all disassembled metal components in a non-ferrous metal cleaner.

Inspect oil strainer for contaminants, debris or other particles. Clean as required.

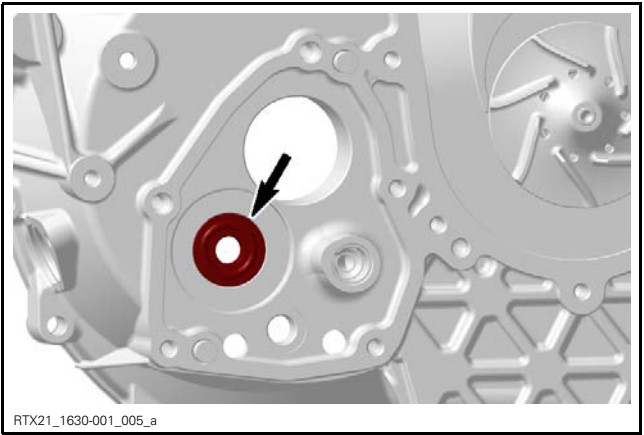


1. PTO oil strainer

Engine with iDF

Check ball bearings for contamination and/or metal shavings.

Check iDF gearbox ball bearing for for smooth operation, excessive play and/or pitting. Replace if necessary.

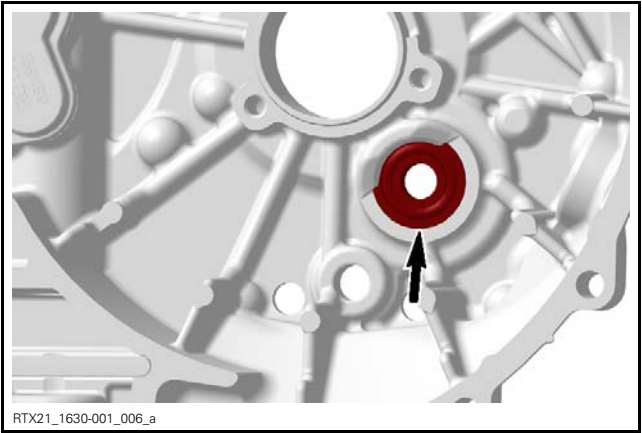


Replacing the iDF Gearbox Ball Bearing

Remove stator, refer to procedure in this subsection.

Press ball bearing from inside out and discard it.

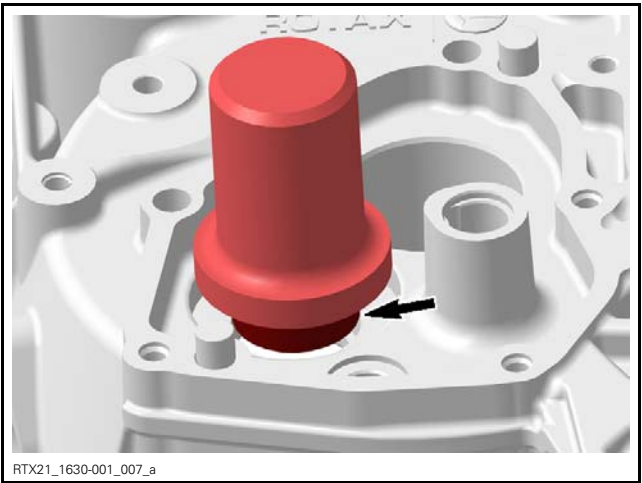
NOTICE Support PTO housing properly to avoid damages.



Install **NEW** ball bearing on block.

NOTICE To avoid damages on the PTO cover the recommended service tool must be used.

REQUIRED TOOLS	
Press	
Bearing Installer Tool	



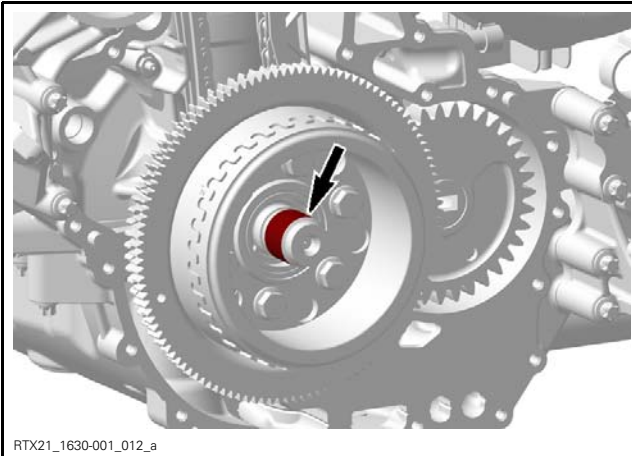
Installing the PTO Housing

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

Engine with iDF

Clean thread on crankshaft.

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

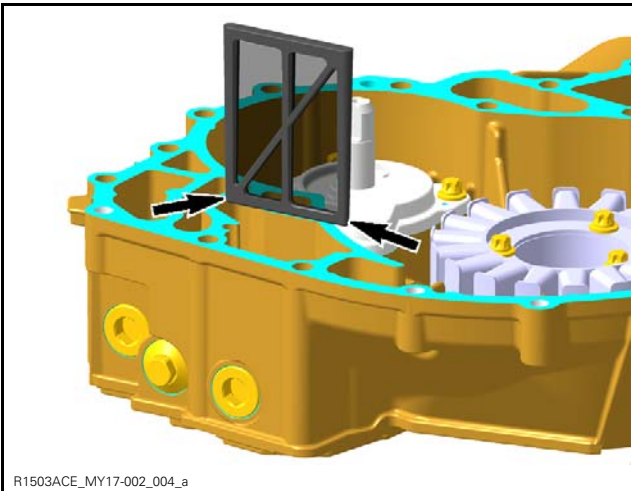


All Engines

Install disc springs and thrust washer of starter drive, see *INSTALLING THE STARTER DRIVE* in this subsection.

Install a **NEW** PTO housing gasket.

Apply a small amount of grease on the frame of the oil strainer to keep it in place while installing the PTO cover.



SERVICE PRODUCT

Multi Purpose Grease

Clean stator cable grommet and cylinder block to remove all remaining silicone residues in oil strainer area.

Apply sealing compound on stator cable grommet.

SERVICE PRODUCT

LOCTITE 5910 (P/N 293 800 081)

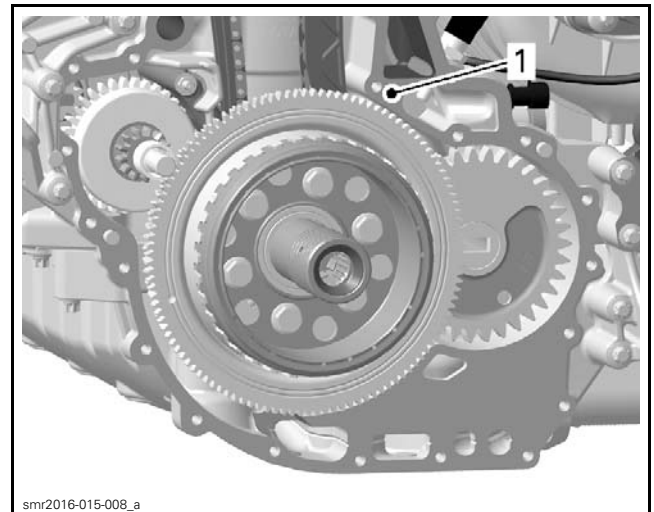


APPLY SEALING COMPOUND HERE

Install PTO housing.

NOTICE During installation ensure:

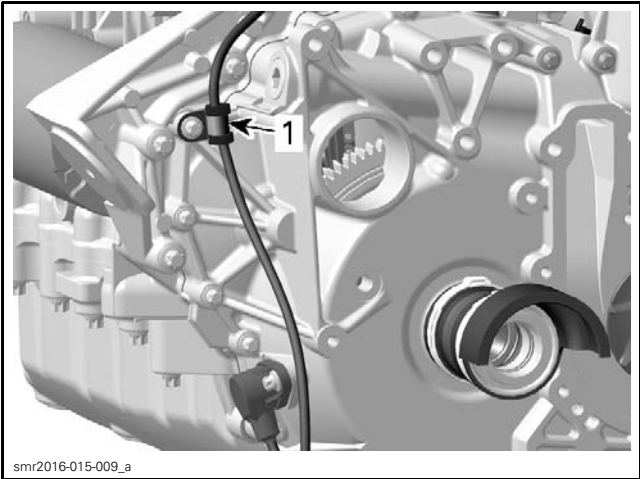
- that thrust washer and spring discs are placed on starter drive shaft
- oil/water pump shaft alignment with balance shaft (rotate shaft slightly)
- starter drive gear alignment with the needle bearing
- proper PTO housing gasket alignment.



1. Pay attention that gasket remains properly positioned on this surface

Install the CPS harness retaining clamp.

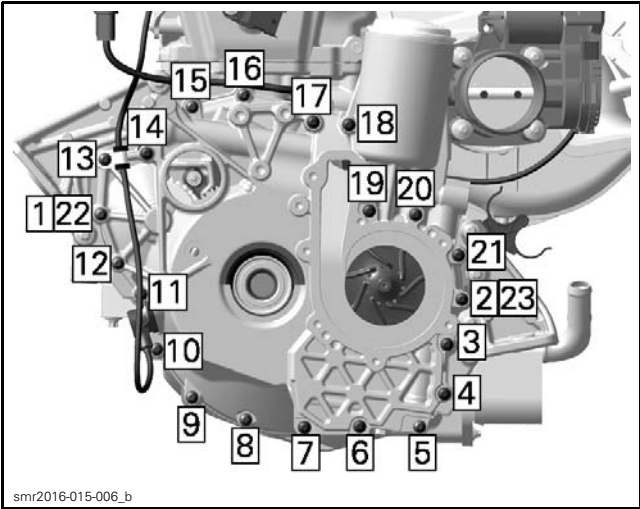
Subsection XX (PTO HOUSING, MAGNETO AND STARTER)



1. CPS harness retaining clamp

Tighten PTO housing screws as per following sequence.

TIGHTENING TORQUE	
PTO housing screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)



TIGHTENING SEQUENCE

Reinstall LH engine support as per following table.

TIGHTENING TORQUE	
Engine support screws	23 N•m ± 3 N•m (17 lbf•ft ± 2 lbf•ft) + LOCTITE 243 (BLUE) (P/N 293 800 060)

Carry out an engine alignment, refer to the *ENGINE REMOVAL AND INSTALLATION* subsection.

NOTICE An engine alignment procedure must be carried, otherwise severe component damage may occur.

Install all remaining parts, reconnect hoses and electrical connectors. Refer to applicable subsections for procedures.

Refill engine oil and coolant. Refer to *LUBRICATION SYSTEM* and *COOLING SYSTEM* subsections.

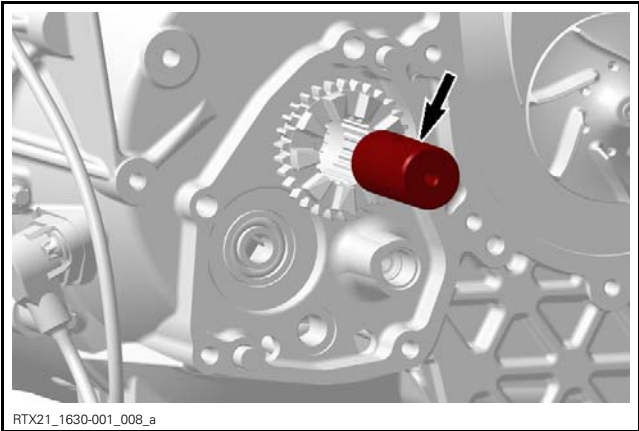
INPUT SHAFT (ENGINE WITH IDF)

Removing the Input Shaft

Remove iDF gearbox, refer to *INTELLIGENT DEBRIS FREE PUMP SYSTEM (IDF)* subsection.

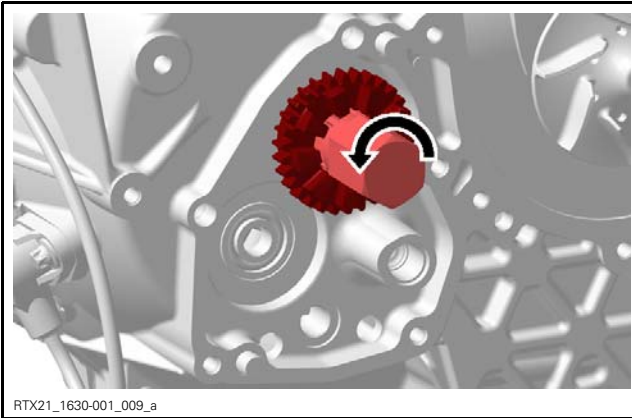
Lock crankshaft. Refer to *CYLINDER BLOCK* subsection for the procedure.

Remove spacer from input shaft using a M5 screw.



Unscrew input shaft from crankshaft.

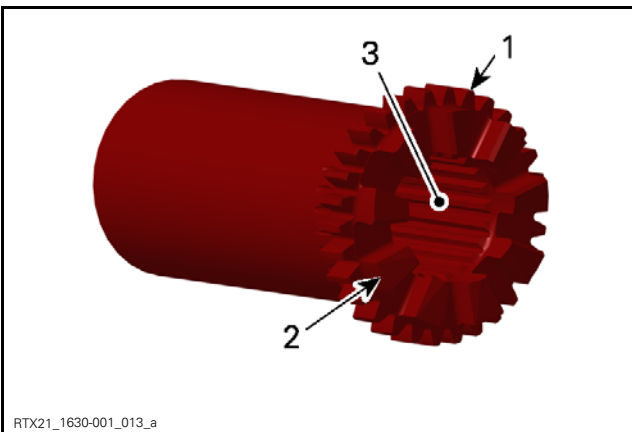
REQUIRED TOOL	
IMPELLER REMOVER/INSTALLER (P/N 529 035 820)	



Inspecting the Input Shaft

Check the following when inspecting the input shaft:

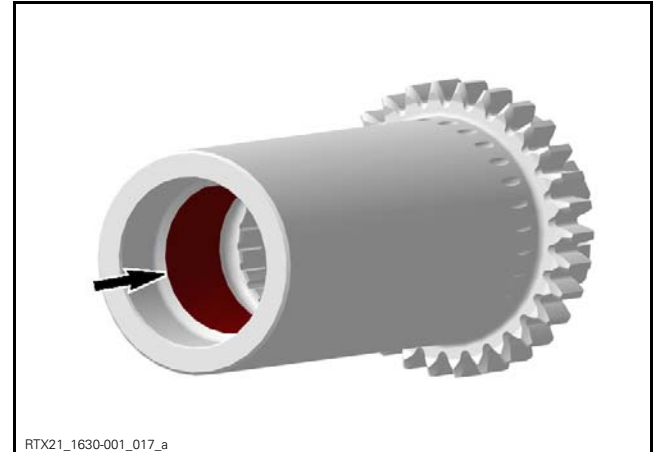
- Gear teeth for damage and wear
- Rounded edges of engagement dogs
- Worn or damaged inner splines.



1. Reverse drive gear
2. Engagement dogs
3. Inner splines

Installing the Input Shaft

The installation is the reverse of the removal procedure. However, pay attention to the following. Clean thread inside input shaft.



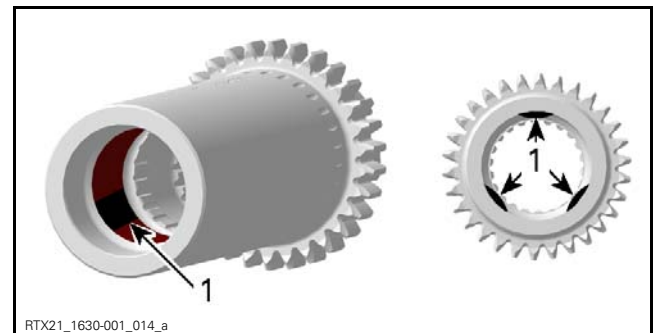
SERVICE PRODUCT

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

Apply thread locker on inner thread.

SERVICE PRODUCT

LOCTITE 248 (P/N 296 000 443)



1. Apply 3 beads of threadlocker

Tighten input shaft to specification.

REQUIRED TOOL

IMPELLER
REMOVER/INSTALLER
(P/N 529 035 820)

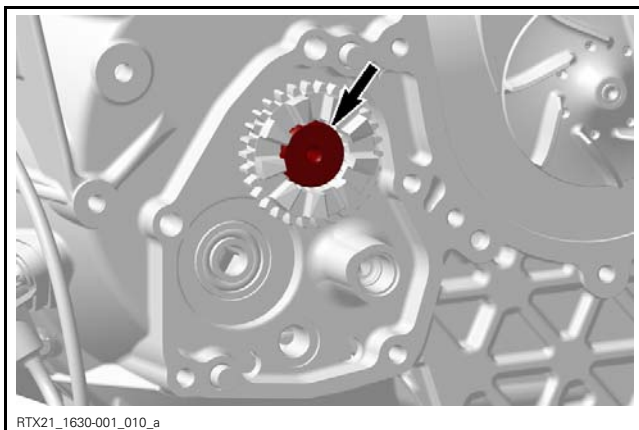


TIGHTENING TORQUE

PTO coupling

350 N•m ± 10 N•m
(258 lbf•ft ± 7 lbf•ft)

Install spacer in input shaft.

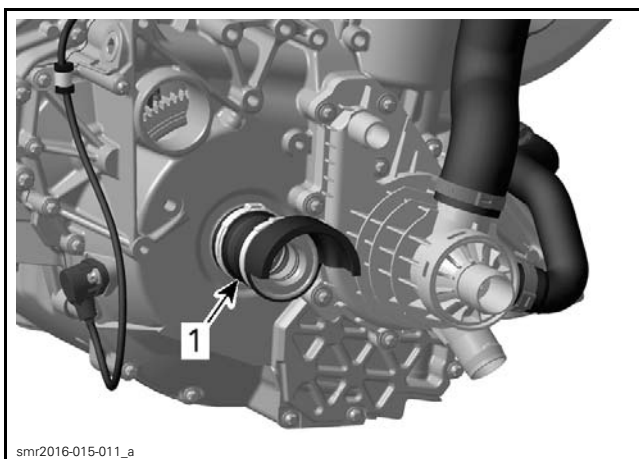


PTO SEAL

PTO Seal Location

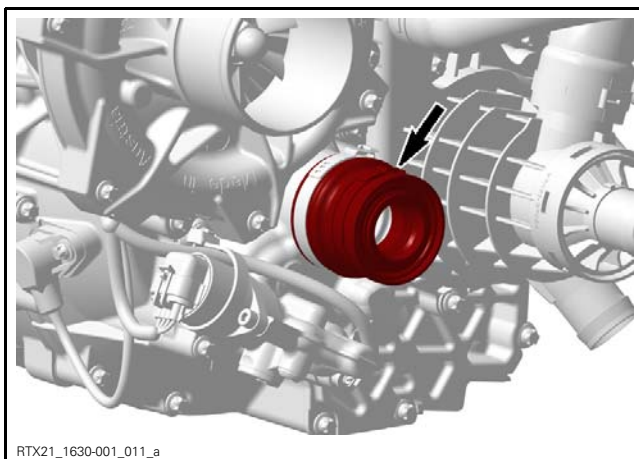
The PTO seal is located over the PTO coupling.

Engine without iDF



TYPICAL
1. PTO seal

Engine with iDF

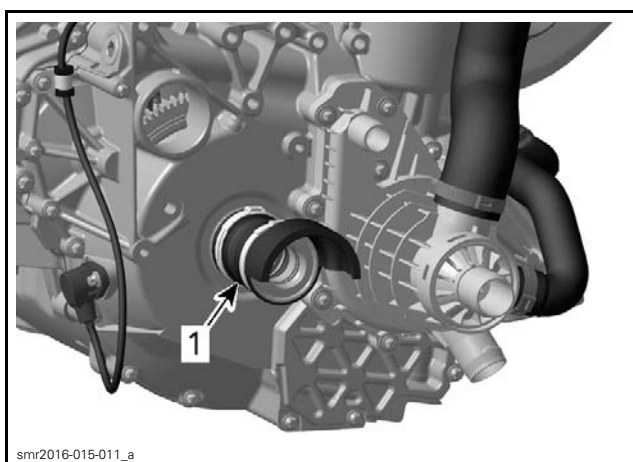


Inspecting the PTO Seal

Inspect the PTO seal. If brittle, hard, damaged or leaking, replace it.

Inspect ball bearing within PTO seal for excessive play and smooth operation.

Replace PTO seal if oil seal or ball bearing is damaged.



TYPICAL
1. PTO seal

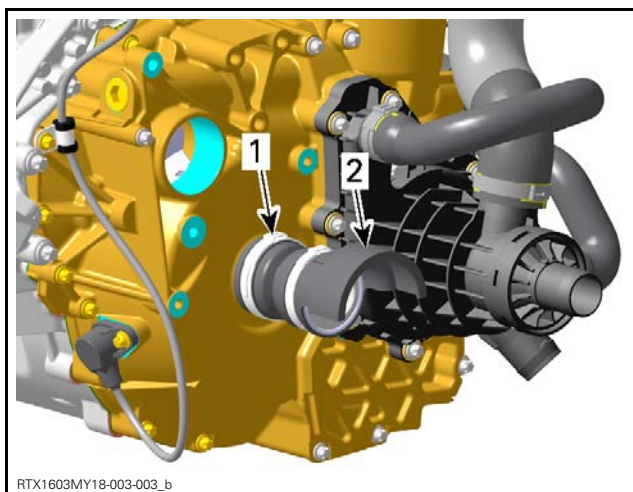
Removing the PTO Seal

Remove drive shaft. Refer to *STEERING AND PROPULSION* section.

Remove supercharger (if applicable). Refer to *SUPERCHARGER* subsection.

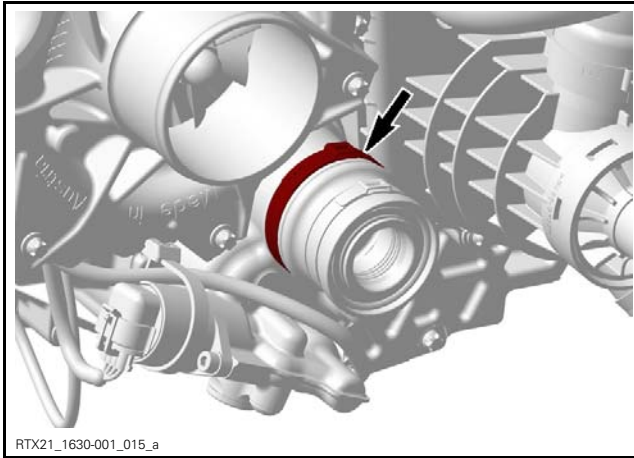
Remove the Oetiker clamp retaining the seal.

Engine without iDF



TYPICAL
1. Oetiker clamp
2. PTO seal

Engine with iDF



All Engines

Pull off PTO seal.

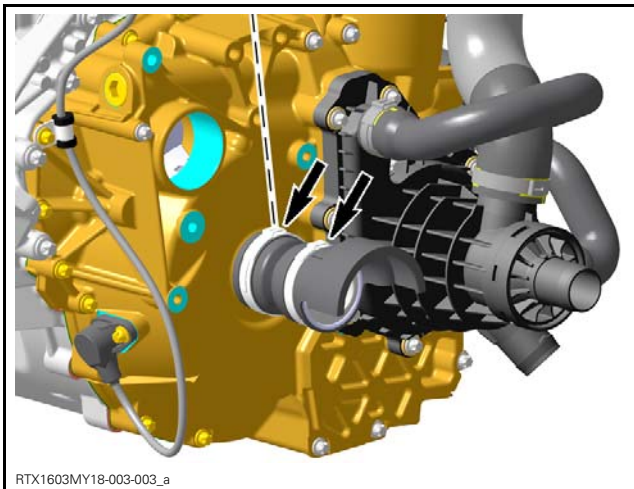
Installing the PTO Seal

Insert a **NEW** Oetiker clamp over the seal.

Push seal onto PTO socket. Be sure to align seal and clamp as noted at removal.

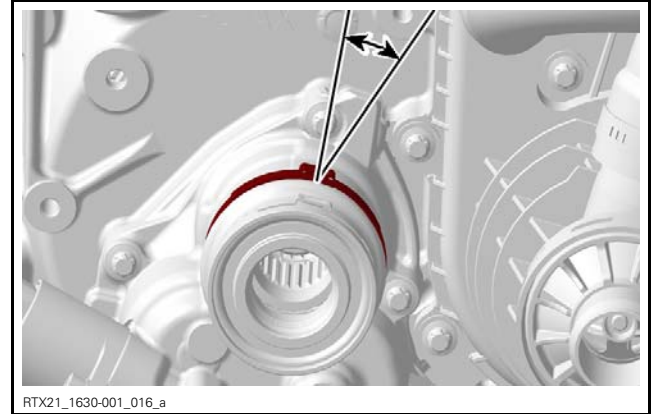
Engine without iDF

NOTICE Ensure to position the Oetiker clamps facing to the cylinder head.



Engine with iDF

NOTICE Ensure to position the Oetiker clamp within the specified range.



All Engines

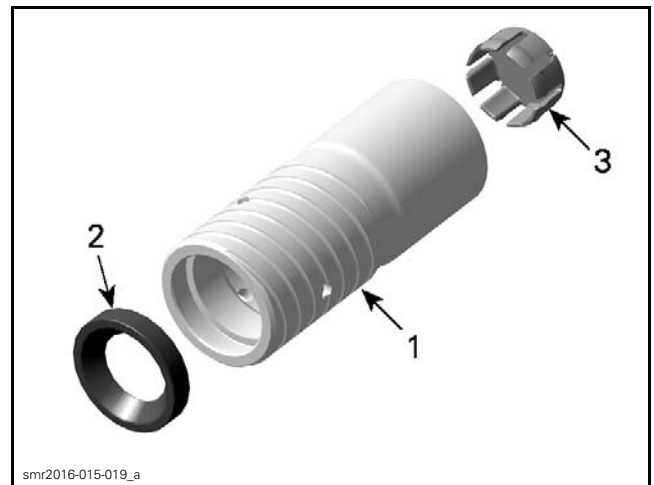
Crimp Oetiker clamp.

REQUIRED TOOL

OETIKER PLIER
(P/N 295 000 070)



PTO COUPLING (ENGINE WITHOUT IDF)



1. PTO coupling
2. Oil seal
3. Stop sleeve

Inspecting the PTO Coupling

Inspect seal within coupling, if it is brittle, cracked or hard, replace it.

Check coupling for worn or damaged splines. Replace as required.

Removing the PTO Coupling

Remove engine from vehicle, refer to the *ENGINE REMOVAL AND INSTALLATION* subsection.

Lock crankshaft. Refer to *CYLINDER BLOCK* subsection for the procedure.

Subsection XX (PTO HOUSING, MAGNETO AND STARTER)

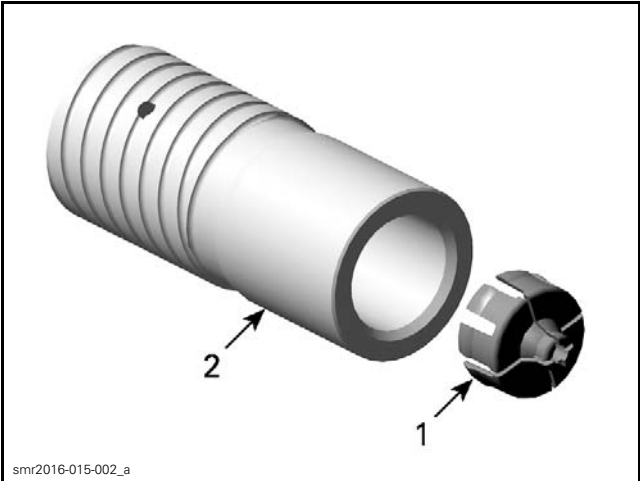
Refer to procedures in this subsection and re-move:

- PTO housing
- Rotor and trigger wheel
- Ring gear
- Starter drive.

Heat up PTO coupling with a heat gun to break threadlocker.

Unscrew coupling from crankshaft.

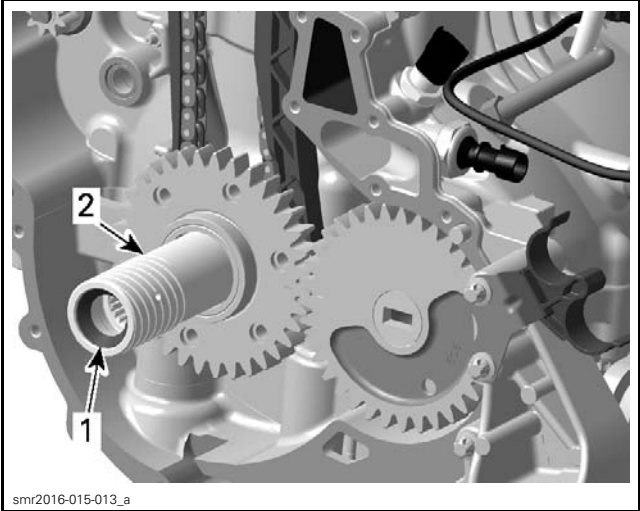
REQUIRED TOOL	
IMPELLER REMOVER/INSTALLER (P/N 529 035 820)	



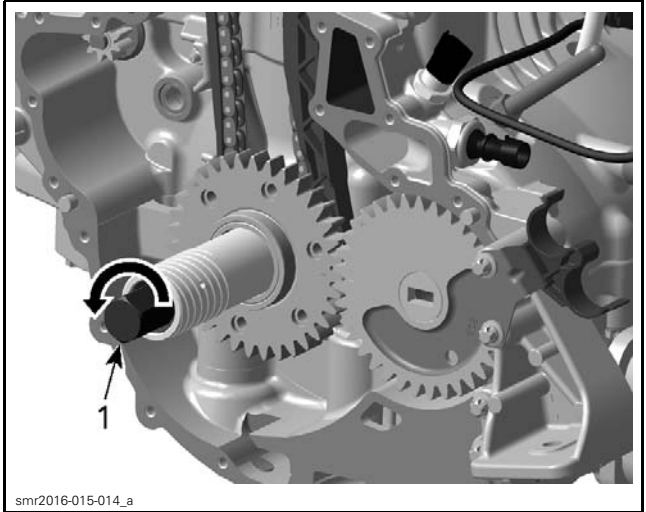
1. Stop sleeve
2. PTO coupling

TIGHTENING TORQUE	
PTO coupling	250 N•m ± 10 N•m (184 lbf•ft ± 7 lbf•ft) + LOCTITE 648 (GREEN) (P/N 413 711 400)

Always install **NEW** oil seal in PTO coupling.



1. Oil seal
2. PTO coupling



TURN COUNTERCLOCKWISE TO REMOVE
1. Impeller removal tool

Installing the PTO Coupling

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

Clean following:

- Thread inside PTO coupling
- Thread on crankshaft.

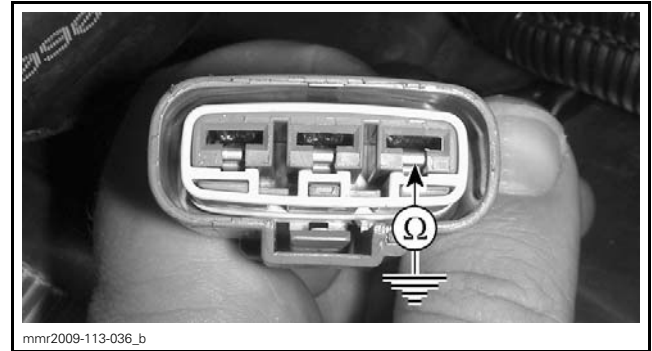
SERVICE PRODUCT
CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

Install stop sleeve in PTO coupling.

STATOR

Testing the Stator Continuity

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



STATOR INSULATION TEST

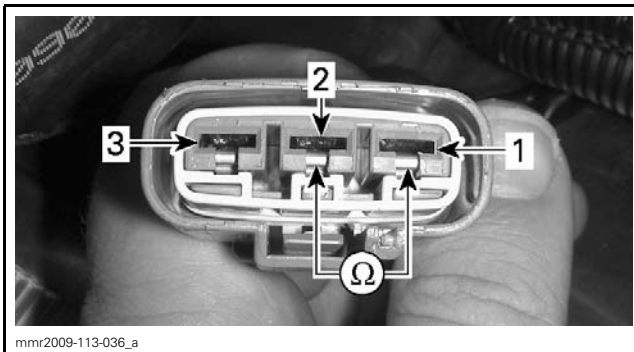
TERMINAL	RESISTANCE AESUREMENT @ 20°C (68°F)
Any YELLOW wire and engine ground	OL (open circuit)

If there is a resistance or continuity to engine ground, the stator coils and/or the wiring is grounded and need to be repaired or replaced.

Removing the Stator

Remove PTO housing, see procedure in this subsection.

Remove the following components:



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

STATOR CONTINUITY TEST

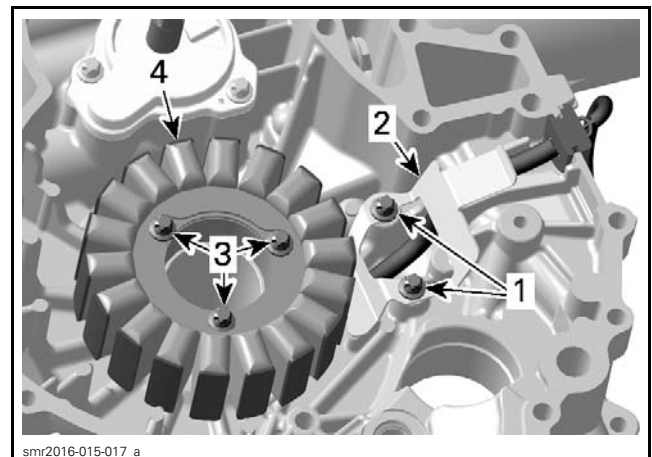
STATOR CONNECTOR PIN		MEASUREMENT @ 20°C (68°F)
1	2	0.1 - 1 Ω
1	3	
2	3	

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.

Testing the Stator Insulation

Connect multimeter between any YELLOW wire and engine ground.



1. Screws
2. Holding plate
3. Stator screws
4. Stator

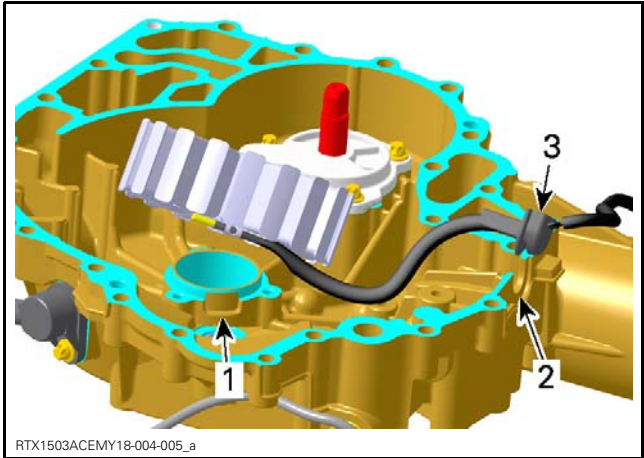
Clean cable grommet from sealing compound.

Installing the Stator

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

NOTE: There is only one position for the stator (notch in the PTO housing).

Subsection XX (PTO HOUSING, MAGNETO AND STARTER)



- 1. Notch for stator
- 2. PTO housing notch
- 3. Stator cable grommet

TIGHTENING TORQUE	
Stator retaining screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)
Cable holding screws	+ LOCTITE 243 (BLUE) (P/N 293 800 060)

Install PTO housing as per procedures in this sub-section.

ROTOR AND TRIGGER WHEEL

Rotor and Trigger Wheel Access

Remove PTO housing, see procedure in this sub-section.

Inspecting the Rotor and Trigger Wheel

Inspect rotor and trigger wheel condition. Pay particular attention to the inside of the rotor for:

- Cracks
- Rub marks
- Discoloration.

If damaged, replace faulty part.

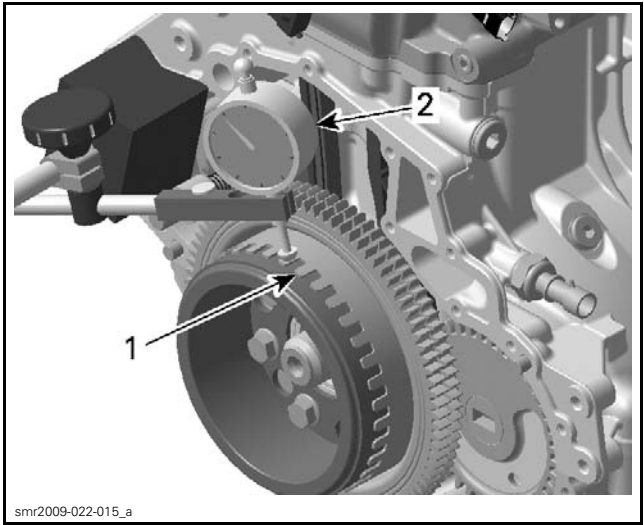
Check the trigger wheel for bent teeth using the following procedure.

1. Install a dial indicator on crankcase casting.
2. Position the gauge on a tooth and set it to zero (0). Be sure to lock the indicator dial to prevent movement of the dial during the remainder of the procedure.
3. Mark the first measured tooth (reference tooth).
4. Gently lift the gauge contact point off the tooth and rotate the rotor to the next tooth.

NOTE: When lifting contact point off the tooth for rotor rotation, be careful not to move gauge position or test readings taken on next tooth will not be accurate with reference to the reference tooth.

5. Gently set the gauge contact point on the next tooth and read the dial indicator.
6. Repeat this procedure taking a reading at each tooth.
7. Recheck reading on reference tooth to ensure gauge has not changed position (gauge should still read zero).

TRIGGER WHEEL TEETH INSPECTION
MAXIMUM ALLOWABLE DIFFERENCE
0.15 mm (.006 in)



- 1. Trigger wheel
- 2. Dial indicator

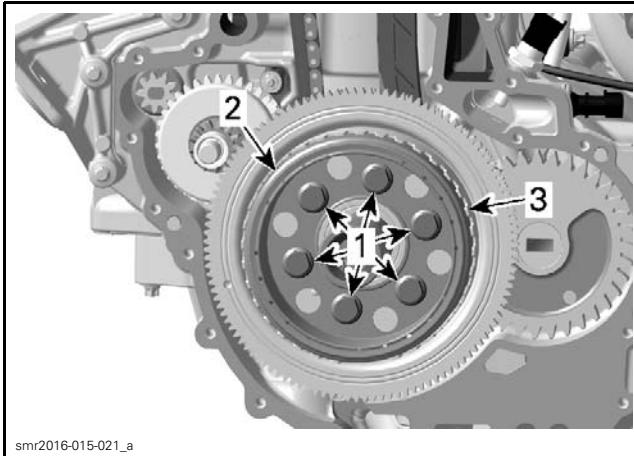
If the reading exceeds the maximum allowable tolerance, straighten the tooth or replace the trigger wheel.

8. Properly reinstall PTO housing.

Removing the Rotor and Trigger Wheel

Lock crankshaft, refer to *CYLINDER BLOCK* sub-section for procedure.

Remove the rotor.

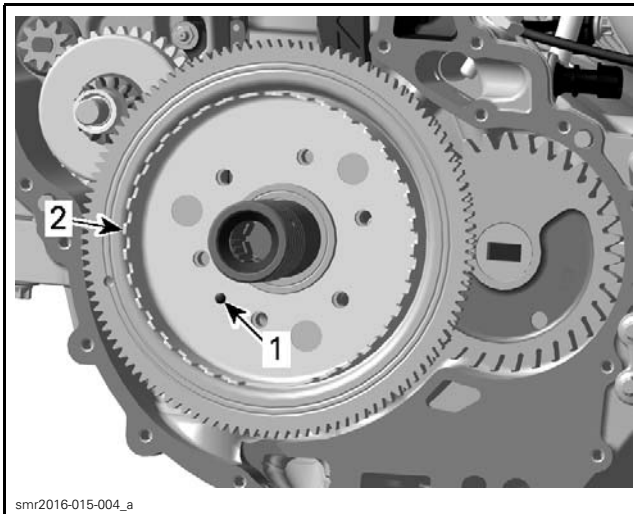


1. Rotor retaining screws
2. Rotor
3. Trigger wheel

Installing the Rotor and Trigger Wheel

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

1. Align the trigger wheel with the location pin on the crankshaft end.



1. Location pin
2. Trigger wheel

2. Install **NEW** OEM rotor screws and tighten them in a crisscross pattern as per following procedure.

NOTICE This assembly uses stretch screw with pre-applied threadlocker. Always use **NEW** OEM screws and strictly adhere to the tightening procedure.

NOTE: Always perform step A on all rotor screws before going to the step B.

TIGHTENING PROCEDURE

Rotor screws	STEP A	15 N•m ± 1 N•m (133 lbf•in ± 9 lbf•in)
	STEP B	Additional 50° ± 5°

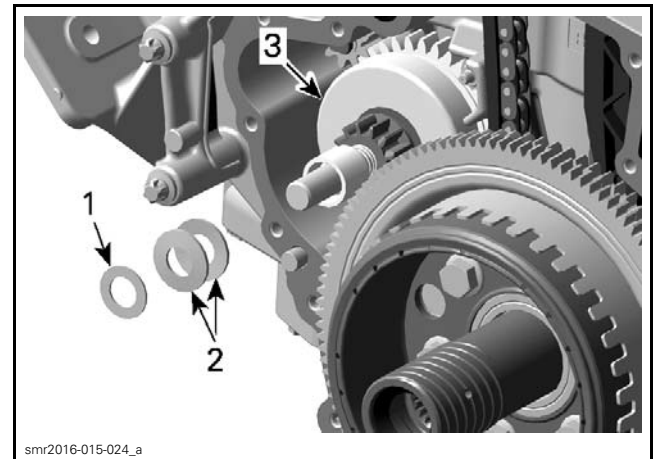
RING GEAR

Removing the Ring Gear

Lock crankshaft. Refer to *CYLINDER BLOCK* subsection for procedure.

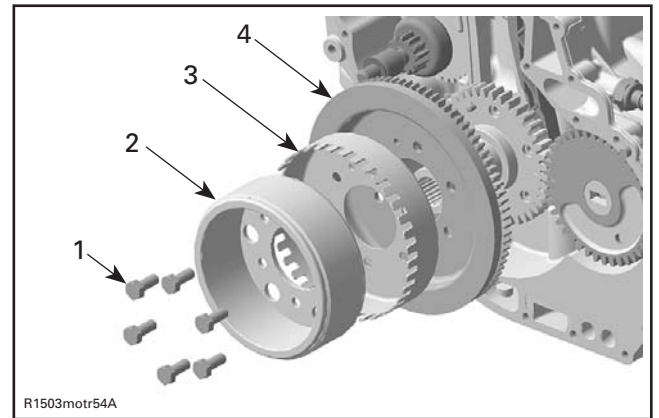
Remove the PTO housing, see procedure in this subsection.

Remove thrust washer and disc springs from starter drive shaft.



1. Thrust washer
2. Disc springs
3. Starter drive

Remove the rotor.



1. Rotor retaining screws (discard)
2. Rotor
3. Trigger wheel
4. Ring gear

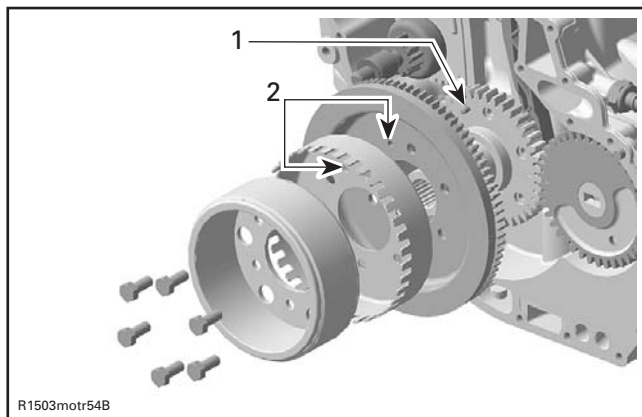
Inspecting the Ring Gear

Inspect ring gear for damages. Pay particular attention to teeth condition. If badly worn, cracked, or broken teeth are found, replace ring gear.

Installing the Ring Gear

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

Align the ring gear with the location pin on the crankshaft end.



1. Location pin
2. Location pin holes

Install rotor and trigger wheel, refer to procedures in this subsection.

Install disc springs and thrust washer of starter drive, see *INSTALLING THE STARTER DRIVE* in this subsection.

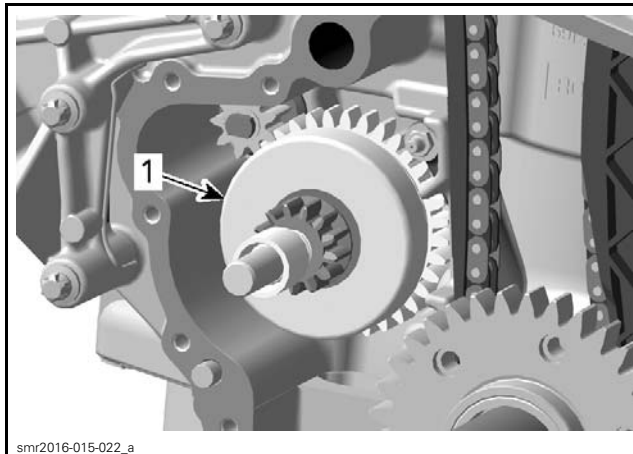
STARTER DRIVE

Removing the Starter Drive

Refer to procedures in this subsection and remove:

- PTO housing
- Rotor and trigger wheel
- Ring gear.

Remove starter drive.



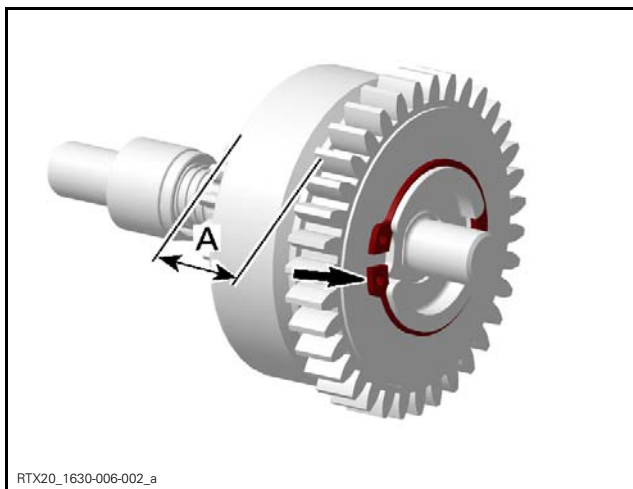
1. Starter drive

Inspecting the Starter Drive

Inspect all starter drive parts for excessive wear, cracks and other defects. Pay attention to the condition of the drive gear teeth.

Ensure proper operation of the starter drive sprag clutch.

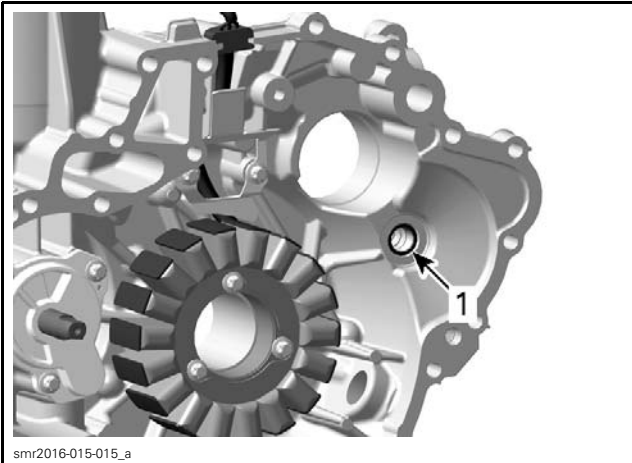
NOTICE Retaining ring of the friction clutch must face towards outer side of starter drive.



RETAINING RING FACING TOWARDS OUTSIDE
A. Width of centrifugal weight: 22.6 mm (.89 in)

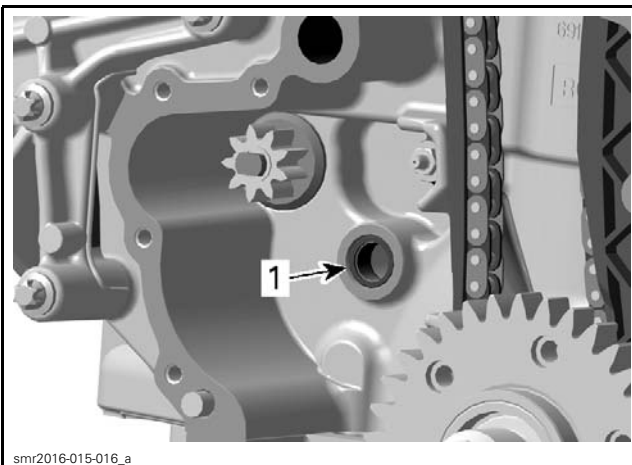
If any part of the assembly shows signs of abnormal wear, cracks, broken teeth or malfunction (sprag clutch), replace the faulty part.

Check needle bearings for excessive play and smooth operation. If damaged see *REPLACING THE STARTER DRIVE BEARING* in this subsection.



PTO HOUSING

1. Starter drive bearing



CYLINDER BLOCK

1. Starter drive bearing

Replacing the Starter Drive Bearing

Remove starter drive bearing from PTO housing and/or cylinder block.

REQUIRED TOOL
Blind hole bearing puller set

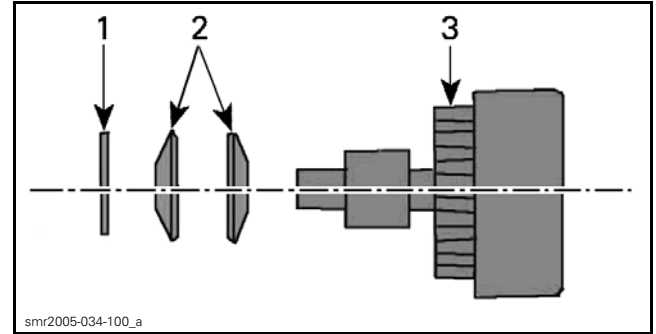
Install starter drive bearing in the PTO housing or in the cylinder block.

REQUIRED TOOLS
STARTER DRIVE SEAL PUSH (P/N 420 876 502) 
HANDLE (P/N 420 877 650) 

Installing the Starter Drive

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

Position the spring discs and thrust washer onto the starter drive shaft as per following illustration.



TYPICAL

1. Thrust washer
2. Spring discs
3. Starter drive

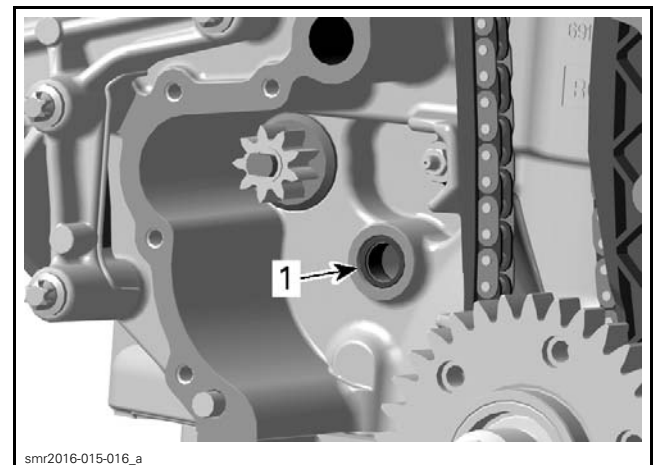
When installing a new starter drive lubricate:

- Shaft
- Gear teeth
- Splines.

SERVICE PRODUCT
Engine oil

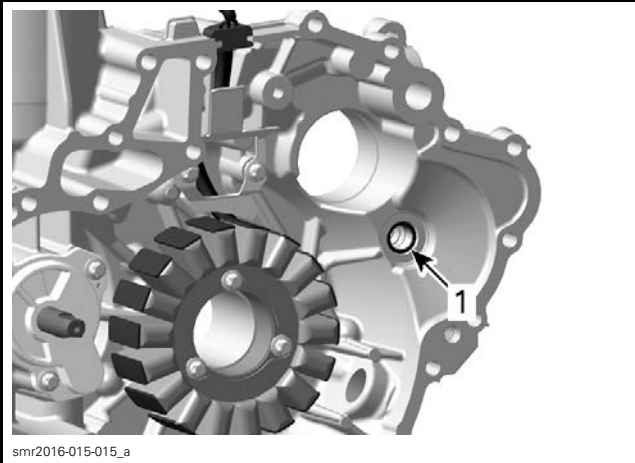
Lubricate starter drive needle bearings.

SERVICE PRODUCT
ISOFLEX GREASE TOPAS NB 52 (P/N 293 550 021)



CYLINDER BLOCK

1. Starter drive bearing



PTO HOUSING

1. Starter drive bearing

STARTER

Starter Quick Test

To easily bypass the starter solenoid and the start control circuits, proceed as follows.

- Use a fully charged 12 V battery with a capacity of at least 30 A-h.
- Use a set of booster cables to power the starter.

This procedure tests the following:

- Electric starter
- Starter power cable
- Battery to engine ground cable.

⚠ WARNING

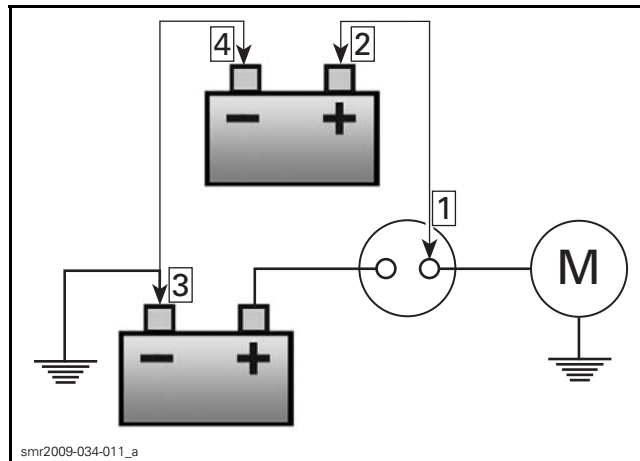
Fuel, oil, or electrolyte vapors are flammable and may become explosive if certain conditions are met. These vapors may collect near the bottom of the hull when present. All types of ignition including electrical sparks are to be avoided when maintaining or testing vehicle.

Connect booster cables in this strict order:

1. Connect one **RED** clip to the starter post on the starter solenoid.
2. Connect the other **RED** clip to the positive (+) terminal on the external battery.
3. Connect one **BLACK** clip to the negative (-) battery terminal in the **vehicle**.
4. Momentarily apply the second **BLACK** clip to the negative (-) terminal of the **external** battery.

⚠ WARNING

Always use an **external** battery for this test to prevent any electrical sparks from occurring within the hull. Always make the final connection to the external battery negative (-) terminal using the **BLACK** booster cable clip. Do not short starter solenoid contacts across the main power connections on the relay with a tool that would cause electrical sparks. Failure to follow this procedure may result in an explosion.



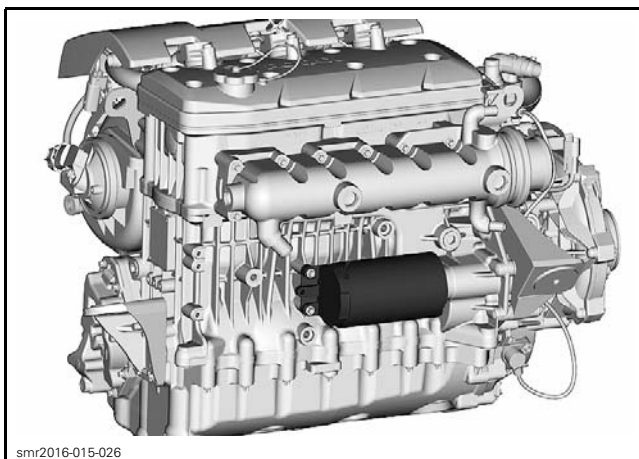
Step 1: Connect cable to solenoid starter post
 Step 2: Connect cable to external battery positive post
 Step 3: Connect cable to vehicle battery negative post
 Step 4: Make a momentary contact

If engine does not crank (or cranks slowly), check the following:

- Booster cable connections
- Vehicle battery ground cable connections to engine
- Starter power cable/connections from solenoid to starter
- Carry out a *SOLENOID DYNAMIC TEST*.

If the above items all test good, replace the starter.

Starter Location

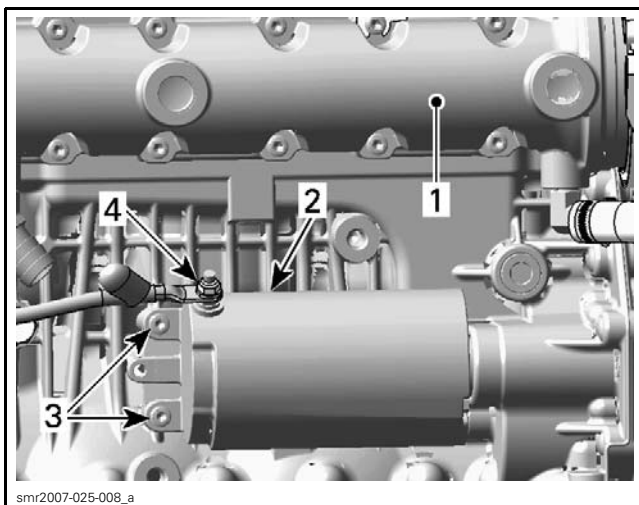


Removing the Starter

1. Disconnect battery. Refer to *CHARGING SYSTEM* subsection.

NOTE: For better access to the starter, work from RH side and lay across the watercraft.

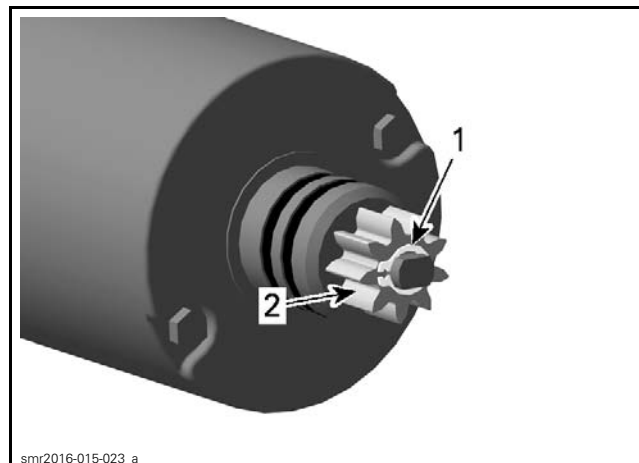
2. Disconnect starter power cable.
3. Remove starter retaining screws.



1. Exhaust manifold
2. Starter
3. Starter retaining screws
4. Starter power cable retaining nut

Removing the Starter Gear

1. Remove starter.
2. Remove:
 - Circlip
 - Starter gear.



1. Circlip
2. Starter gear

Installing the Starter Gear

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

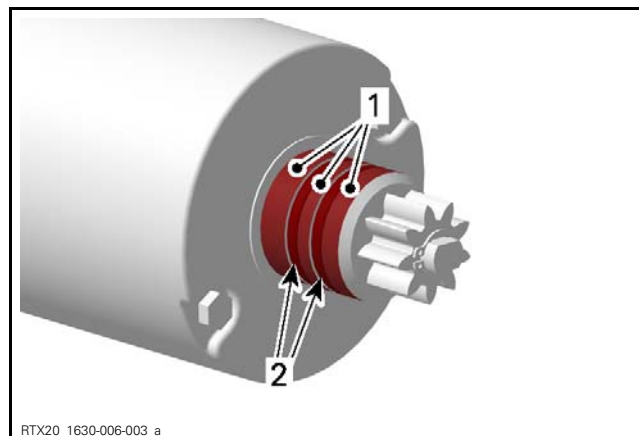
Install a **NEW** circlip.

Installing the Starter

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

1. Ensure starter and engine mating surfaces are free of debris. Serious problems may arise if starter is not properly aligned.
2. Lubricate:
 - Starter end
 - Starter O-rings.

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



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

3. Install starter.

Subsection XX (PTO HOUSING, MAGNETO AND STARTER)

TIGHTENING TORQUE	
Starter retaining screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

TIGHTENING TORQUE	
Starter cable retaining nut	7 N•m ± 1 N•m (62 lbf•in ± 9 lbf•in)

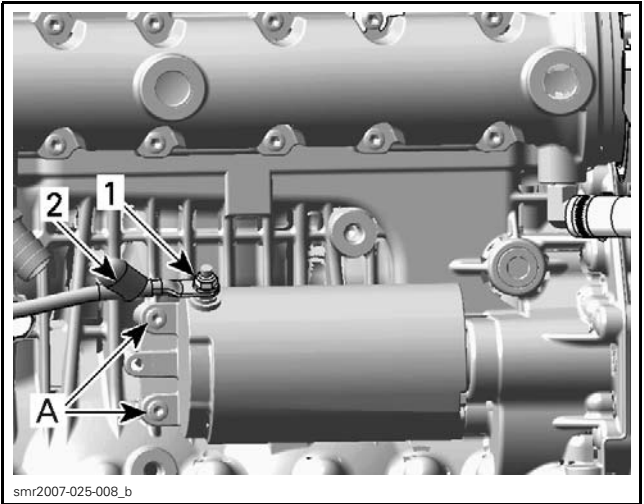
 **WARNING**

To prevent electric shock whenever connecting the RED power cable to the starter motor, ensure the BLACK (-) battery cable is disconnected.

4. Apply dielectric grease on terminal and nut.

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

5. Install rubber protector over starter power cable retaining nut.



- 1. Cable retaining nut
- 2. Rubber protector

6. Reinstall all remaining removed parts.

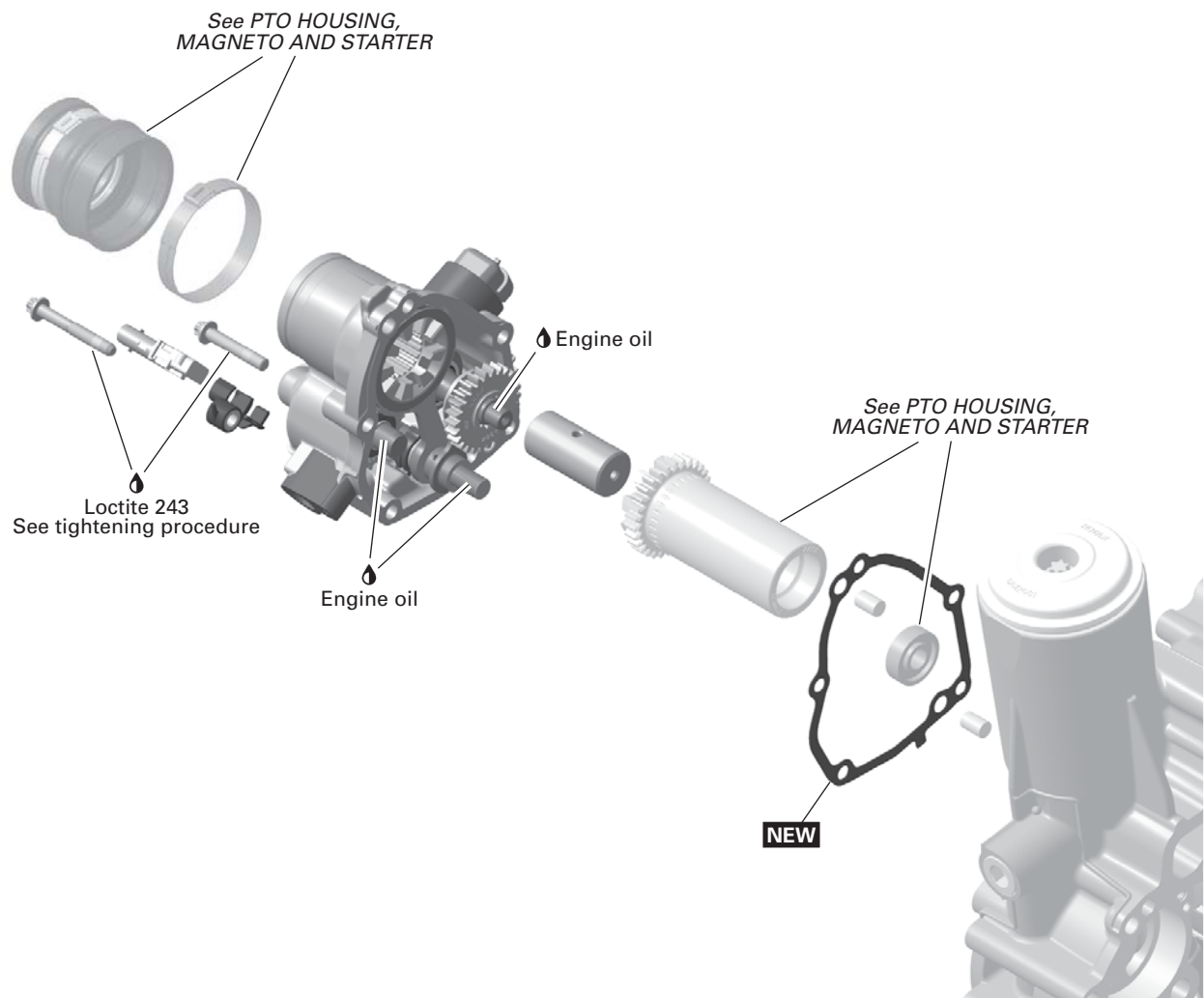
INTELLIGENT DEBRIS FREE PUMP SYSTEM (IDF)

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL.....	529 036 166	6, 8
FLUKE 115 MULTIMETER	529 035 868	6–7

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	5, 7



NEW = Component must be replaced when removed.

PROCEDURES

IDF GEARBOX

Removing the iDF Gearbox

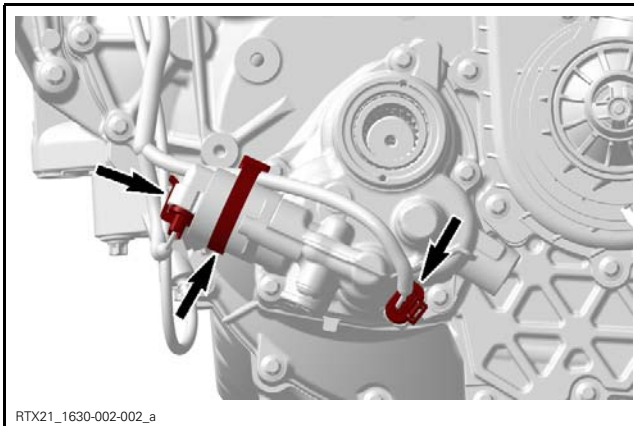
Syphon remaining oil out of the lower timing chain case, refer to *PTO HOUSING* in the *PTO HOUSING, MAGNETO AND STARTER* subsection.

If applicable remove supercharger, refer to *SUPERCHARGER* subsection.

If necessary, remove PTO seal, refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.

Cut locking tie and disconnect:

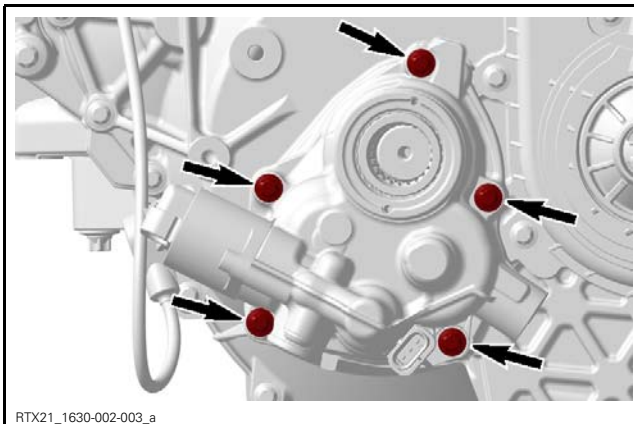
- Linear position sensor
- iDF actuator.



Place rags under iDF gearbox housing to prevent oil spillage.

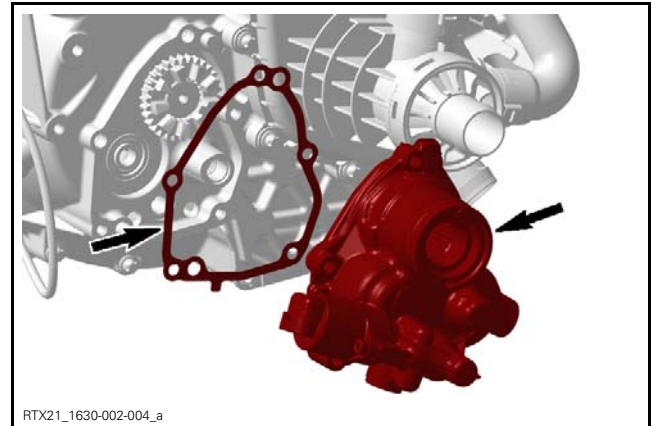
NOTICE Up to 400 ml (13.5 U.S. oz) of engine oil could flow out when removing the iDF gearbox.

Remove iDF gearbox retaining screws.



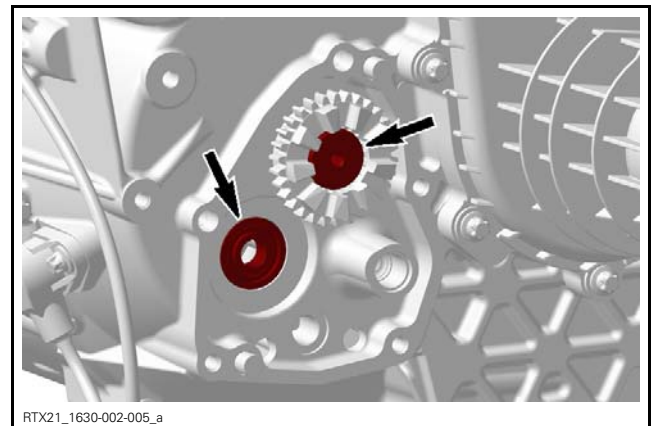
Withdraw:

- iDF gearbox
- Gasket.



Whenever the iDF gearbox is removed, inspect:

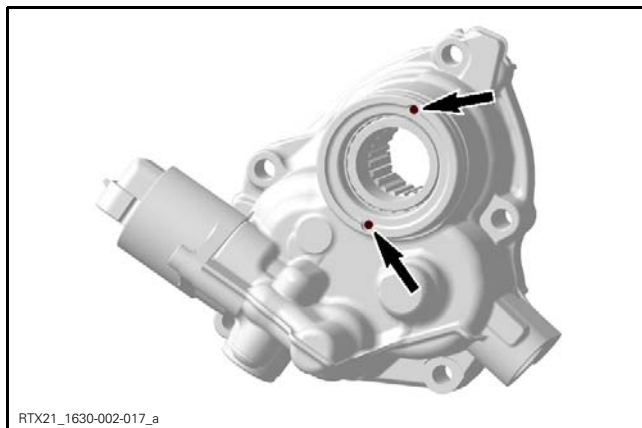
- Spacer for heavy damages, refer to procedure in this subsection.
- iDF gearbox ball bearing in the PTO cover, refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.



Inspecting the iDF Gearbox

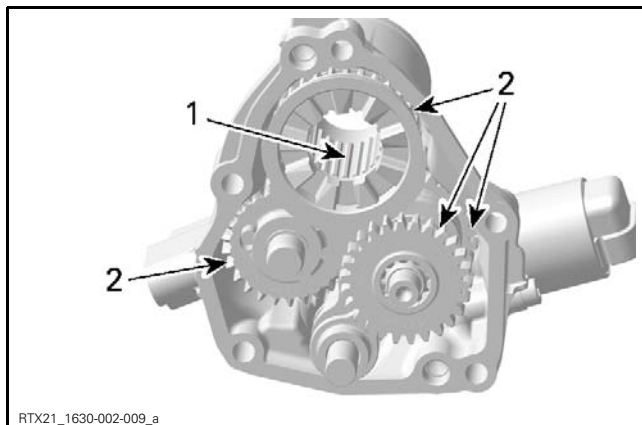
Blow out the oil and ventilation bores and check if they are not clogged.

Subsection XX (INTELLIGENT DEBRIS FREE PUMP SYSTEM (IDF))



Check gearbox drive shaft inner splines if worn or damaged.

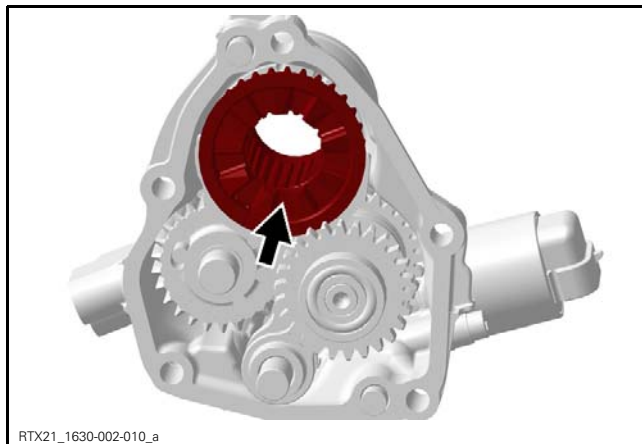
Check gear teeth for wear or damages.



Check shifting fork for free movement.

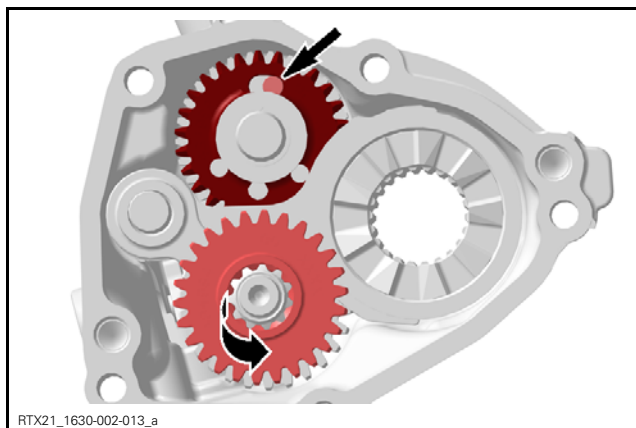
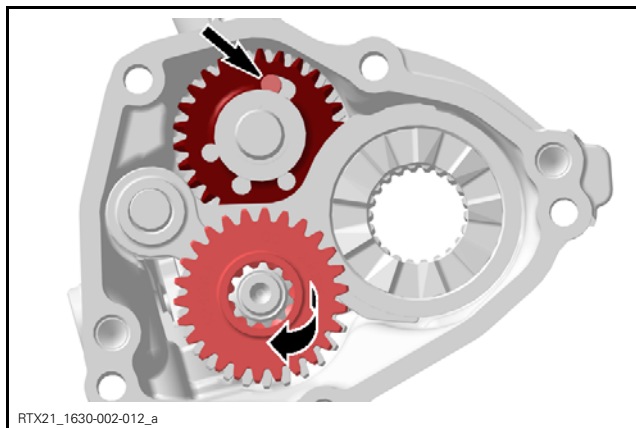
Check split gear for free movement and proper function:

1. Push iDF gearbox input shaft in and hold it in this position.



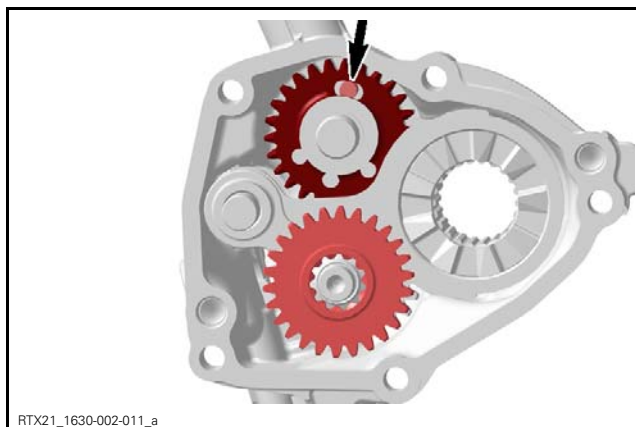
2. Turn shift wheel back and forth.

Split gear must move easily until it is stopped by the pin.



3. Lift iDF gearbox input shaft.

Split gear must move back to center position of the pin.



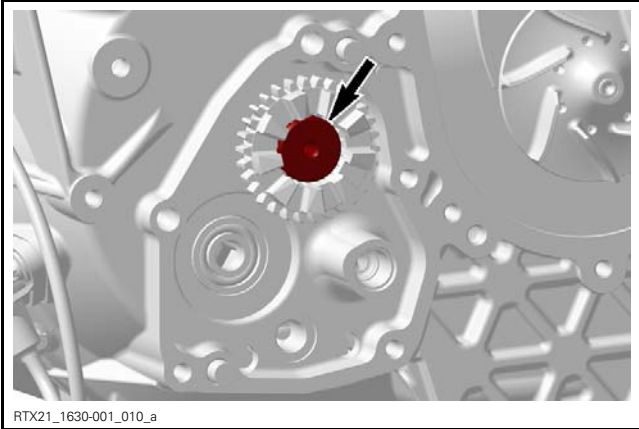
Replace iDF gearbox if necessary.

Installing the iDF Gearbox

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

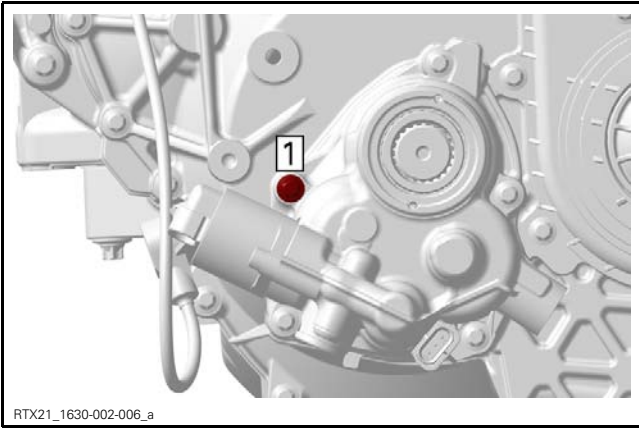
Prior installing the gearbox ensure that spacer is installed.

NOTICE A missing spacer will cause severe damage to the iDF gearbox.

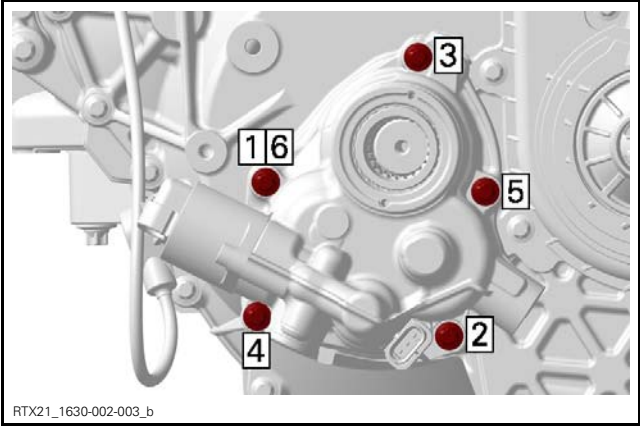


Install a **NEW** IDF gearbox housing gasket.
Tighten gearbox housing screws as per following procedure.

TIGHTENING TORQUE	
Gearbox housing screws	$5\text{ N}\cdot\text{m} \pm 0.6\text{ N}\cdot\text{m}$ (44 lbf•in $\pm$ 5 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)



TIGHTENING TORQUE	
Gearbox housing screws	$9\text{ N}\cdot\text{m} \pm 1\text{ N}\cdot\text{m}$ (80 lbf•in $\pm$ 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

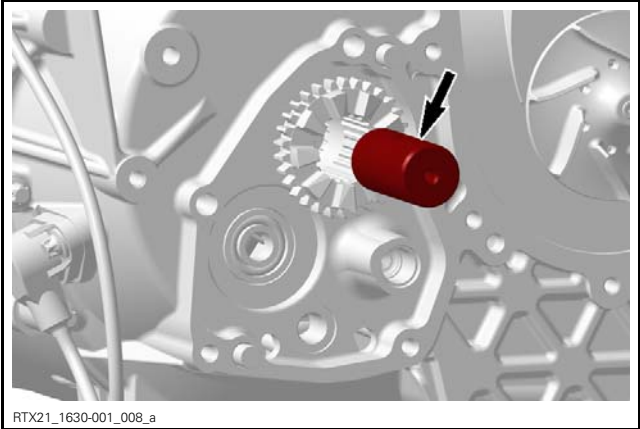


Refill engine oil and verify engine oil level, refer to *LUBRICATION SYSTEM* subsection.

SPACER

Removing the Spacer

Remove spacer from input shaft using a M5 screw.

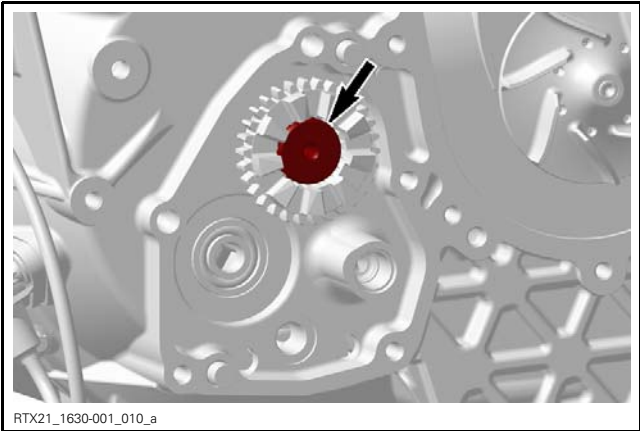


Inspecting the Spacer

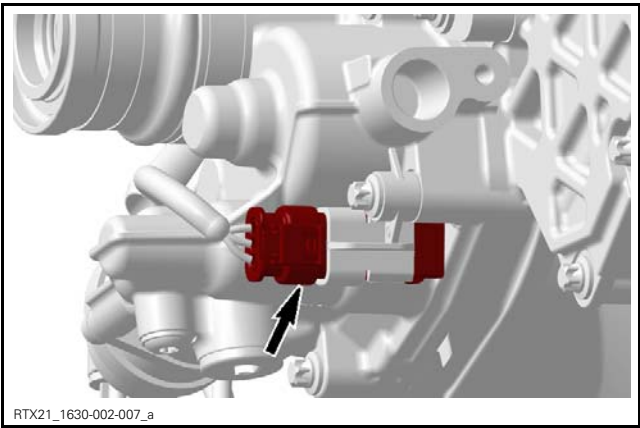
Inspect spacer for wear or damages. Replace if heavily worn or damaged.

Installing the Spacer

Install spacer in input shaft.



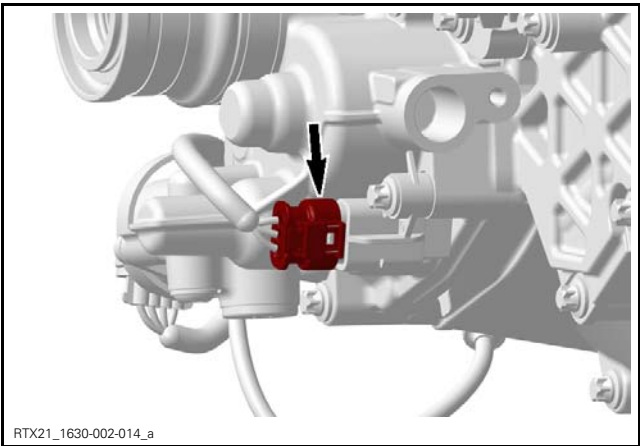
LINEAR POSITION SENSOR



Inspecting the Linear Position Sensor

Testing the Linear Position Sensor Input Voltage

- 1. Remove the parts required to access the linear position sensor.
- 2. Disconnect linear position sensor connector.



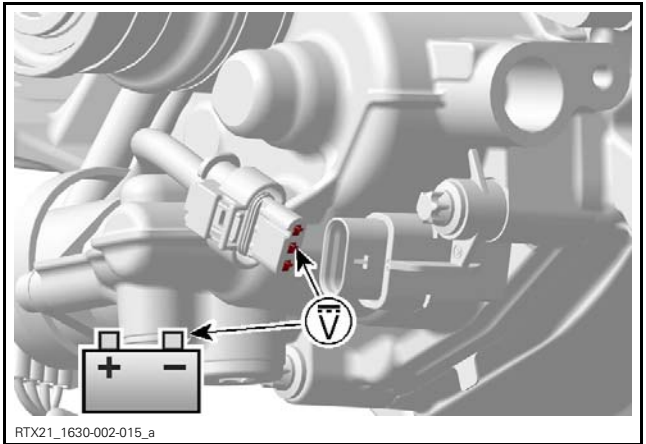
- 3. Press the START button to wake up the ECM.
- 4. Install the tether cord on the engine cut-off switch.

5. Set the multimeter to Vdc.

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

6. Read voltage as per following table.

LINEAR POSITION SENSOR INPUT VOLTAGE TEST		
WIRING HARNESS CONNECTOR PIN	BATTERY	MEASUREMENT
3	Negative (-) post	5V
2		0V
1		0V



If voltage measured is as specified, replace the linear position sensor.

If voltage measured is not as specified, refer to *TESTING THE LINEAR POSITION SENSOR CIRCUIT CONTINUITY*.

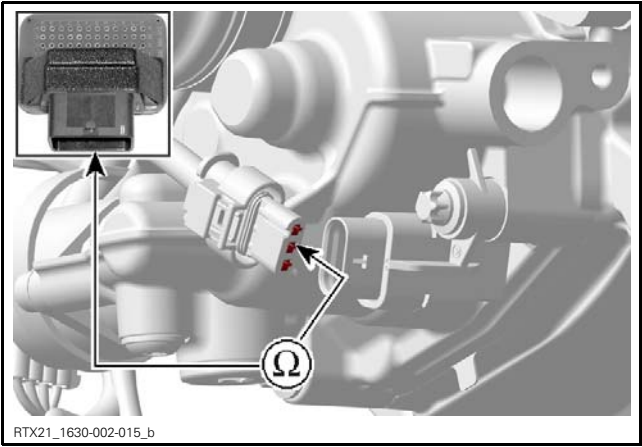
Testing the Linear Position Sensor Circuit Continuity

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

Install the A connector of the ECM on the ECM adapter.

1. Set the multimeter to Ω .
2. Test for circuit continuity as per following table.

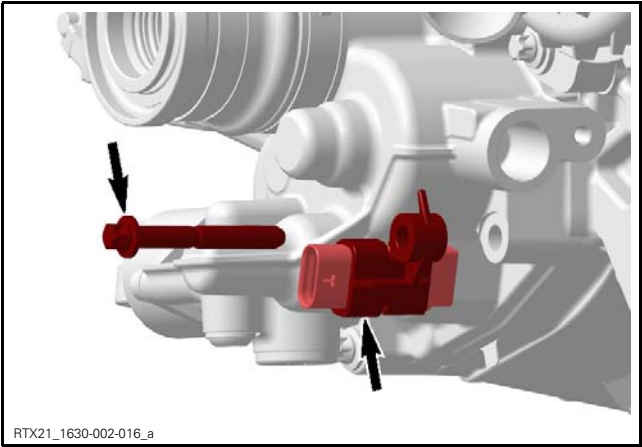
LINEAR POSITION SENSOR CIRCUIT CONTINUITY TEST		
LINEAR POSITION SENSOR CONNECTOR PIN	ECM ADAPTER PIN	MEASUREMENT
1	A-G3	Close to 0 Ω
2	A-G1	
3	A-C4	



If resistance is not within specification, repair or replace the wiring harness between ECM connector and the linear position sensor. Refer to *WIRING DIAGRAM*.

Removing the Linear Position Sensor

Disconnect linear position sensor connector.
Remove the linear position sensor and its support.

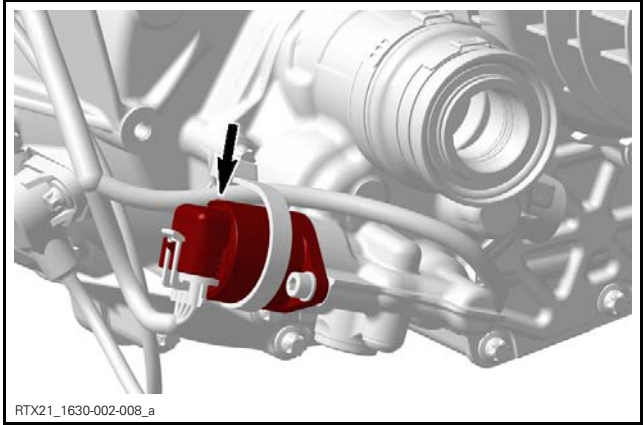


Installing the Linear Position Sensor

The installation is the reverse of the removal procedure. However, pay attention to the following.
Tighten gearbox housing screw to specification.

TIGHTENING TORQUE	
Linear position sensor screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

IDF ACTUATOR



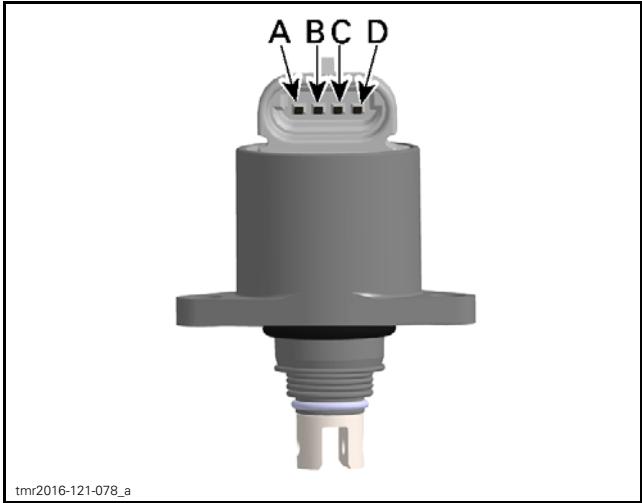
Inspecting the iDF Actuator

Testing the iDF Actuator Resistance

Disconnect iDF actuator connector.
Set multimeter to Ω .

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

Probe terminals as per following table.



IDF ACTUATOR RESISTANCE TEST		
ACTUATOR PIN		MEASUREMENT @ 20°C (68°F)
A	D	28 - 34 Ω
B	C	

If resistance is not within specifications, replace the actuator.

If resistance tests good, **reconnect** the actuator connector.

Install the A connector of the ECM on the ECM adapter.

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

Check resistance as per table.

IDF ACTUATOR RESISTANCE TEST		
ECM ADAPTOR PIN		MEASUREMENT @ 20°C (68°F)
A-C2	A-C1	28 - 34 Ω
A-B2	A-A4	

If resistance value is correct replace ECM, refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

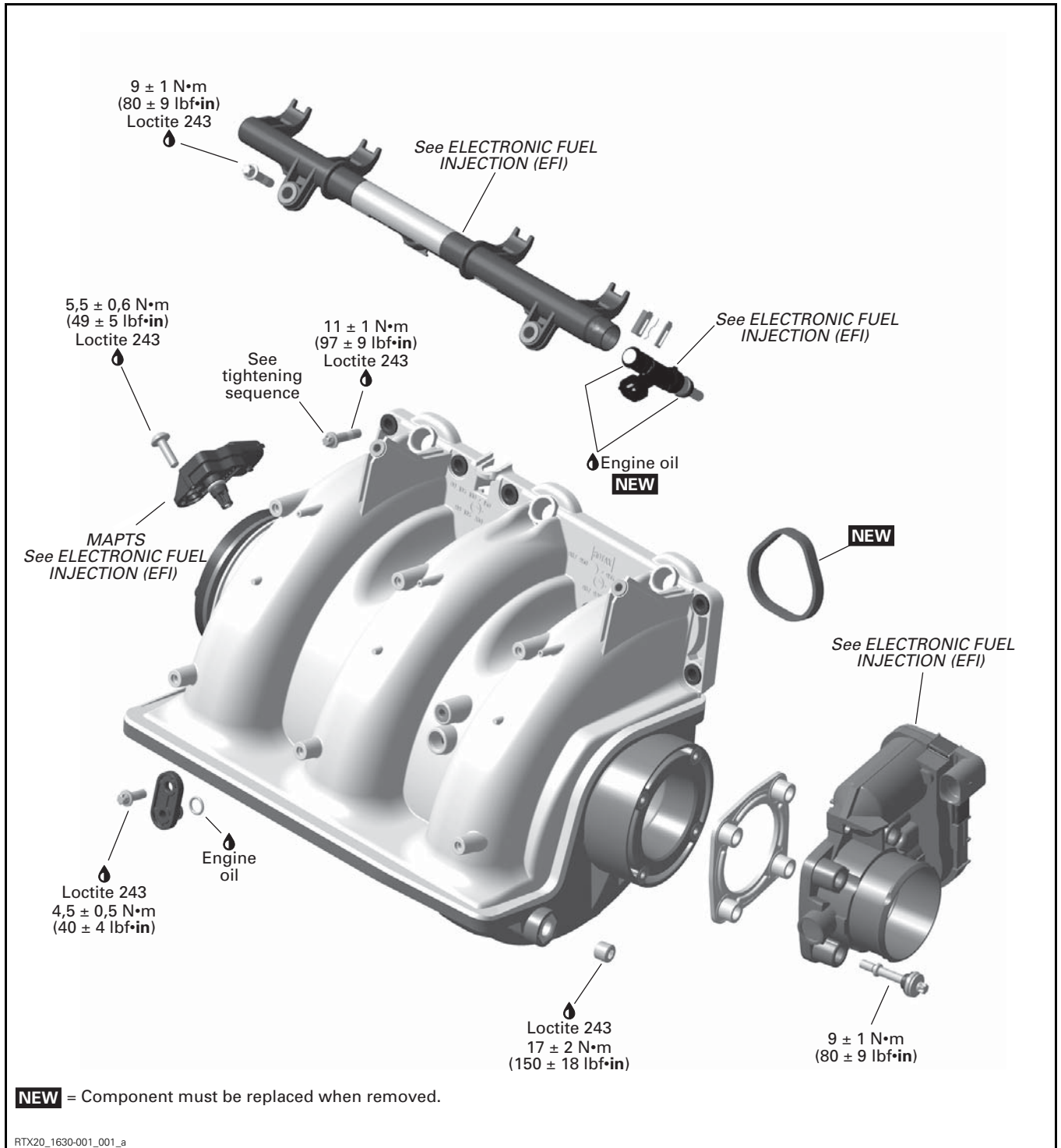
If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the actuator.

INTAKE MANIFOLD

SERVICE PRODUCTS

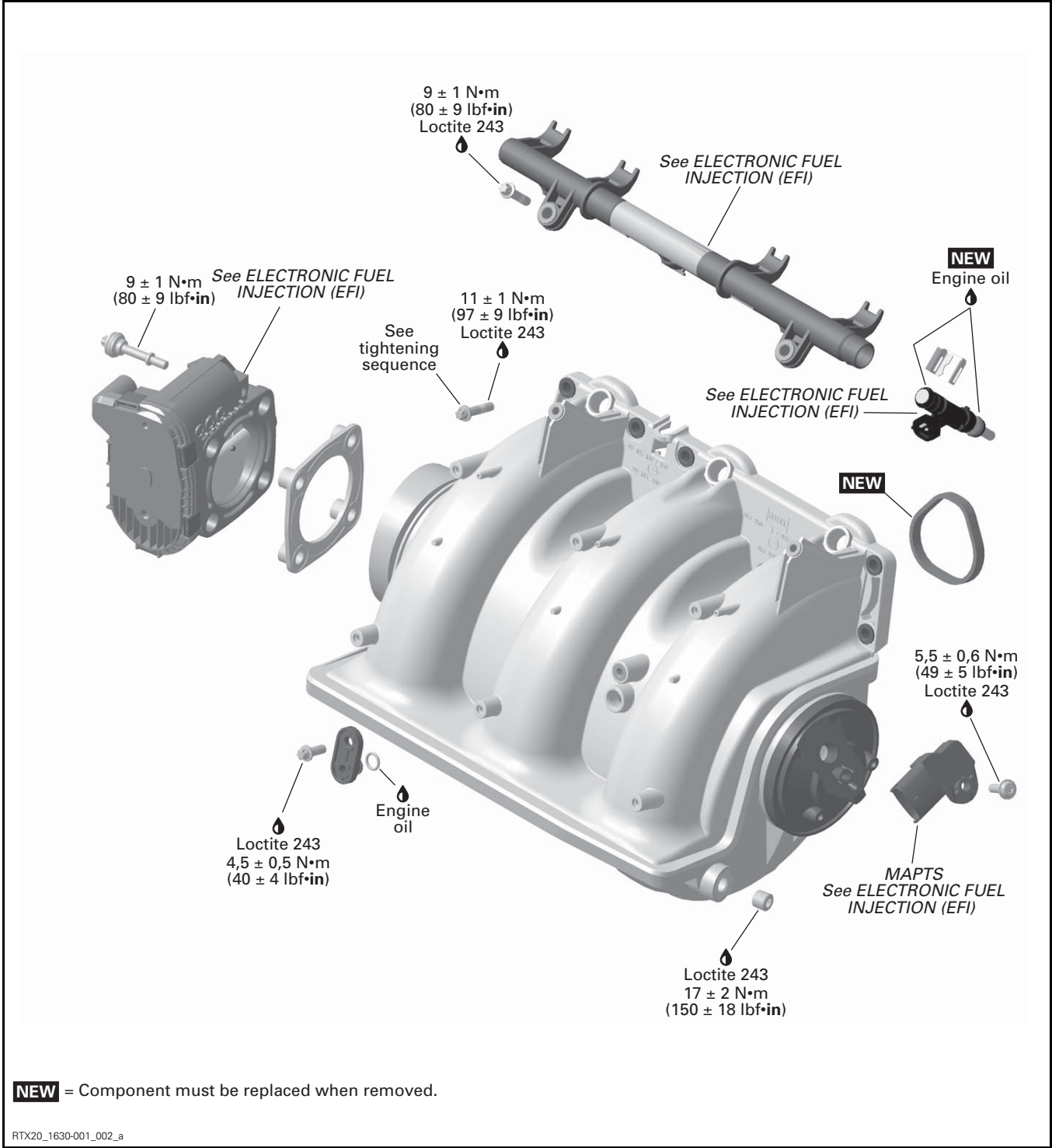
Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	5

130 and 170 Engines



Subsection XX (INTAKE MANIFOLD)

230 engine

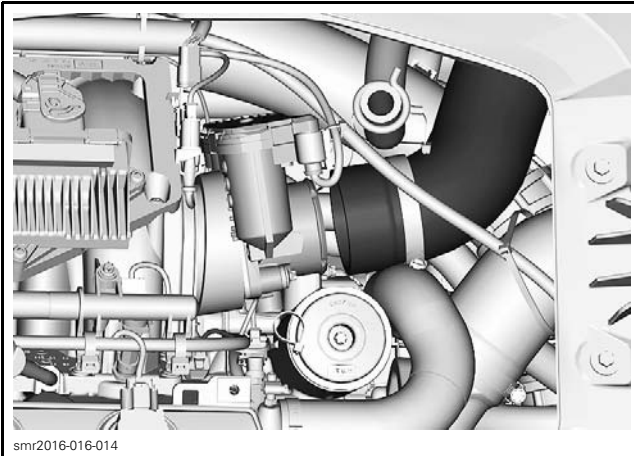


PROCEDURES

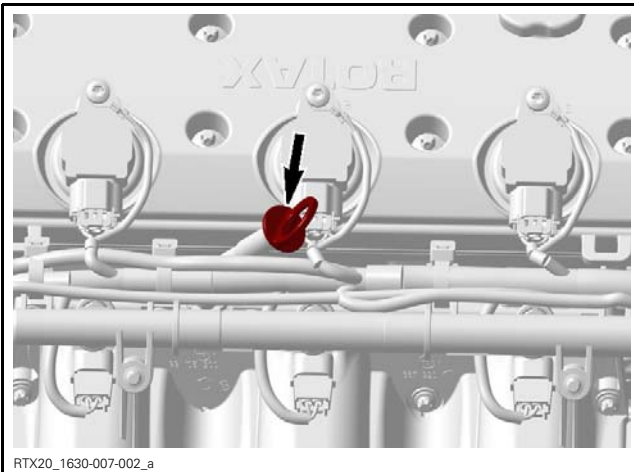
INTAKE MANIFOLD

Removing the Intake Manifold

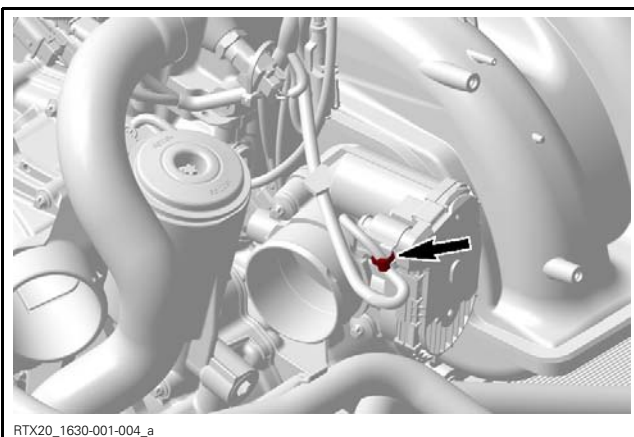
Disconnect the intake hose from the throttle body.



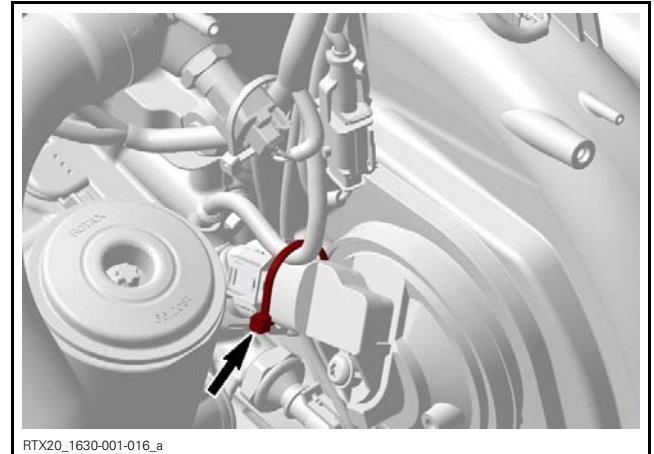
Remove the oil dipstick.



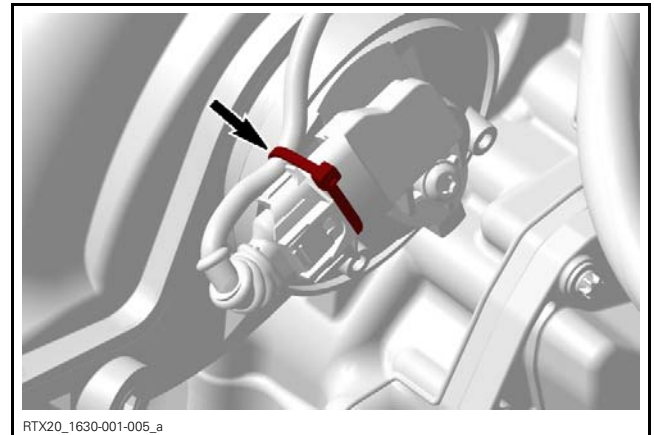
Cut locking ties.



230 ENGINE SHOWN



130 AND 170 ENGINES

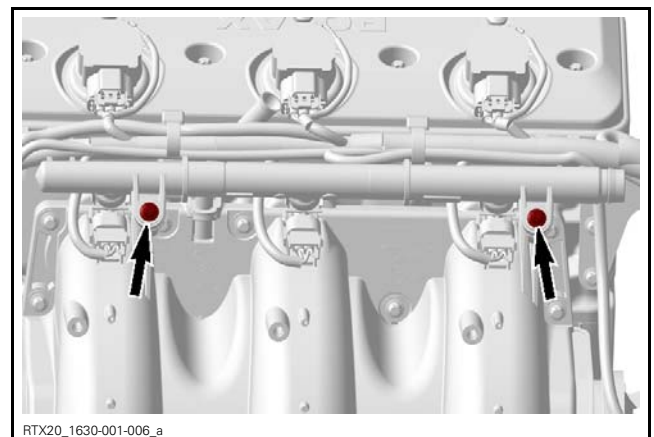


230 ENGINE

Disconnect:

- MAPTS
- Throttle body connector.

Remove fuel rail retaining screws.

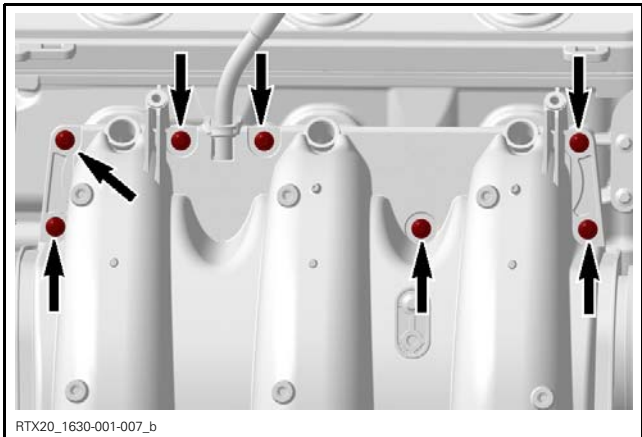


If necessary disconnect ignition coils.

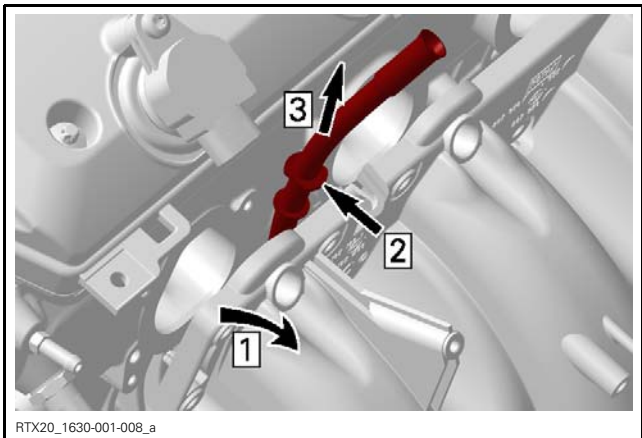
Carefully pull fuel rail with injectors out of the intake manifold.

Remove manifold retaining screws.

Subsection XX (INTAKE MANIFOLD)

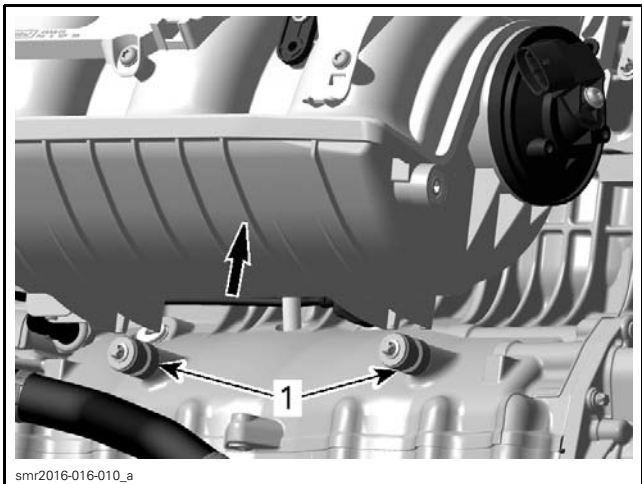


Carefully tilt intake manifold.
Then push the oil dipstick tube out of the manifold slot and pull it out of its bore in the cylinder block.



Step 1: Tilt intake manifold
Step 2: Push back oil dipstick tube
Step 3: Pull out oil dipstick tube

Lift intake manifold up to pull it out of the mounting brackets.



1. Mounting brackets

Pull intake manifold out.

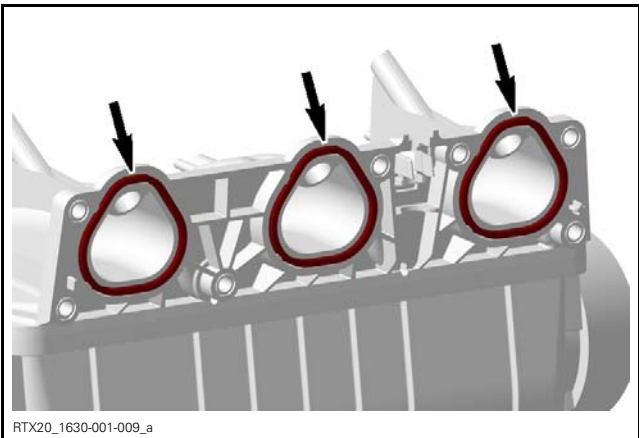
Remove and discard intake manifold gaskets.

Inspecting the Intake Manifold

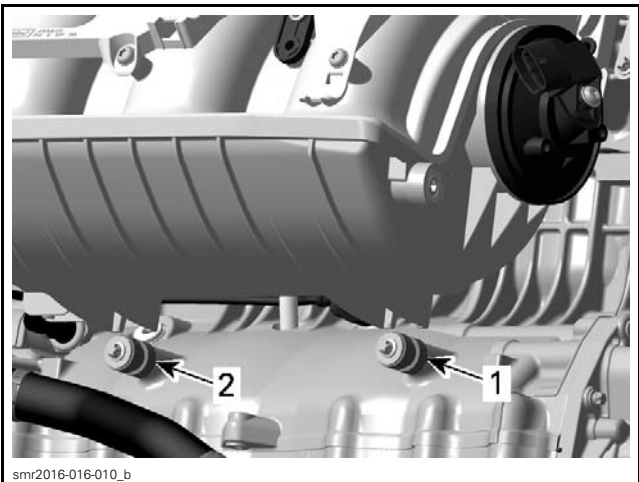
Check intake manifold for cracks, warping at flanges or any other visible damage.
Check if intake manifold gaskets are cracked, brittle or otherwise damaged.
Replace damaged parts as necessary.

Installing the Intake Manifold

The installation is the reverse of the removal procedure. However, pay attention to following details.
Properly install **NEW** gaskets.

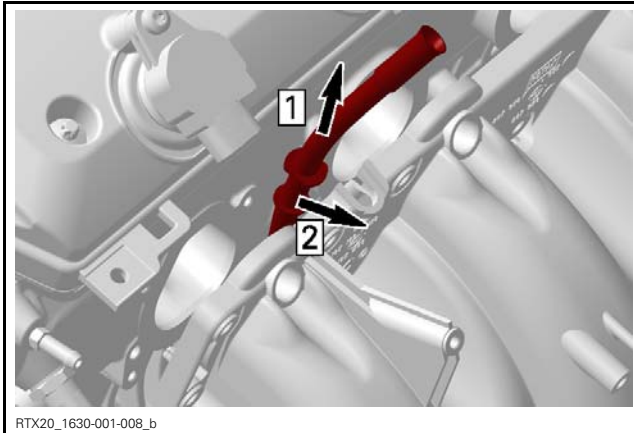


First, position intake manifold on front mounting bracket then push manifold toward engine, then proceed with rear mounting bracket.



1. Front mounting bracket
2. Rear mounting bracket

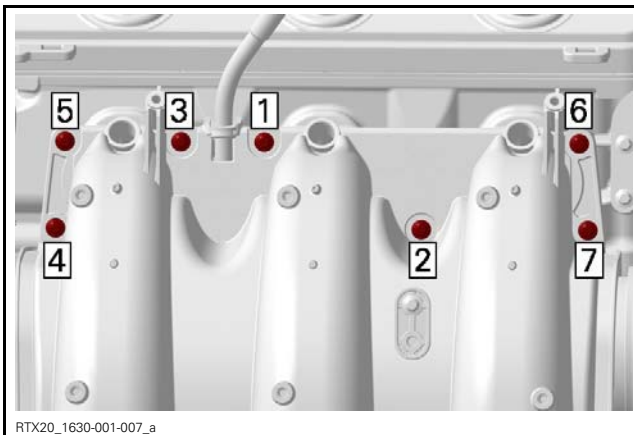
When installing the intake manifold, lift up the oil dipstick tube a little bit to fit in the slot of the manifold.



Step 1: Lift up oil dipstick tube
Step 2: Fit into manifold

Tighten intake manifold to specification using the following sequence.

TIGHTENING TORQUE	
Intake manifold screws	$11 \text{ N}\cdot\text{m} \pm 1 \text{ N}\cdot\text{m}$ $(97 \text{ lbf}\cdot\text{in} \pm 9 \text{ lbf}\cdot\text{in})$ + LOCTITE 243 (BLUE) (P/N 293 800 060)



TIGHTENING SEQUENCE

Tighten fuel rail retaining screws to specification.

TIGHTENING TORQUE	
Fuel rail retaining screws	$9 \text{ N}\cdot\text{m}$ and $1 \text{ N}\cdot\text{m}$ $(80 \text{ lbf}\cdot\text{in}$ and $9 \text{ lbf}\cdot\text{in})$ + LOCTITE 243 (BLUE) (P/N 293 800 060)

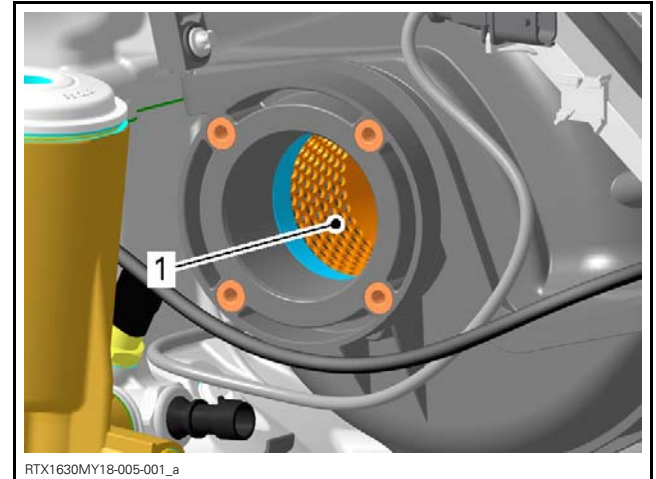
Ensure to properly route and secure wiring harness with locking ties.

Install all other removed parts.

FLAME ARRESTER

Flame Arrester Location

The flame arrester is integrated in the intake manifold.



1. Flame arrester inside intake manifold

Inspecting the Flame Arrester

The flame arrester in the intake manifold is maintenance free.

Flame Arrester Replacement

NOTE: The flame arrester can not be removed from the intake manifold.

Replace intake manifold if necessary. Refer to *INTAKE MANIFOLD* in this subsection.

CYLINDER HEAD

SERVICE TOOLS

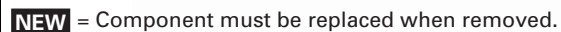
Description	Part Number	Page
CAMSHAFT LOCKING TOOL.....	529 035 839	10
DRIVE SHAFT ADAPTER.....	529 035 985	3
ENGINE LEAK DOWN TEST KIT	529 035 661	4
VALVE GUIDE PUSHER (6 MM).....	529 036 087	19
VALVE GUIDE REMOVER (6 MM)	529 036 086	19
VALVE SPRING COMPRESSOR CUP.....	529 036 073	14
VALVE SPRING COMPRESSOR	529 035 724	14



SERVICE PRODUCTS

If you bought this manual from any other seller please leave them
NEGATIVE feedback and notify me at bestshopmanuals@gmail.com

Description	Part Number	Page
ISOFLEX GREASE TOPAS NB 52	293 550 021	12
LOCTITE 243 (BLUE).....	293 800 060	10, 14
MOLYKOTE G-N	420 297 433	19



GENERAL

NOTE: When diagnosing an engine problem, always perform an engine leak test. This will help to pin-point a problem. Refer to *ENGINE LEAK TEST* in this subsection for procedures.

When disassembling parts that are duplicated in the engine, (e.g.: valves, bushings), it is strongly recommended to note their position and to keep them as a “group”. If you find a defective component, it will be much easier to find the cause of the failure. Since parts were break-in together during the engine operation, they will keep their matched fit when parts are reassemble together within their “group”.

INSPECTION

ENGINE LEAK TEST

The procedure has to be done when engine operating temperature of approximately 70°C (158°F) is reached.



WARNING

Be careful to burns when working on a hot engine.

Preparation

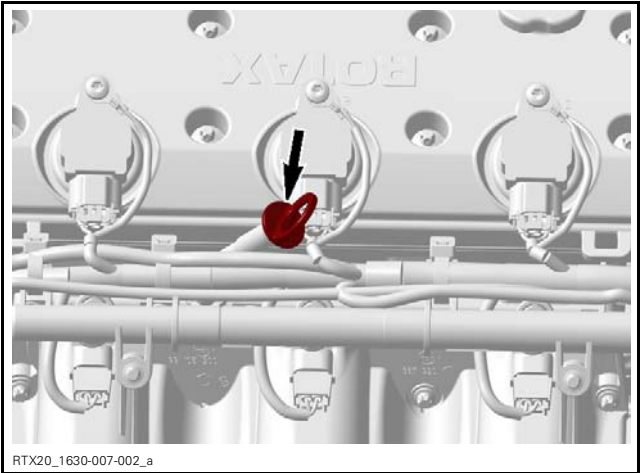
- 1. Remove any required parts to give access to engine.
- 2. Remove the tether cord.
- 3. Remove jet pump (refer to *JET PUMP* subsection).
- 4. Remove coolant pressure cap.



WARNING

To avoid potential burns, only remove the coolant pressure cap by wearing the appropriate safety equipment.

- 5. Remove oil dipstick.



- 6. Refer to *IGNITION COILS AND SPARK PLUGS* and remove:
 - Ignition coils
 - Spark plugs.
- 7. Remove *VALVE COVER*, see procedure in this subsection.
- 8. Install the drive shaft adapter and an appropriate wrench lever on drive shaft end.

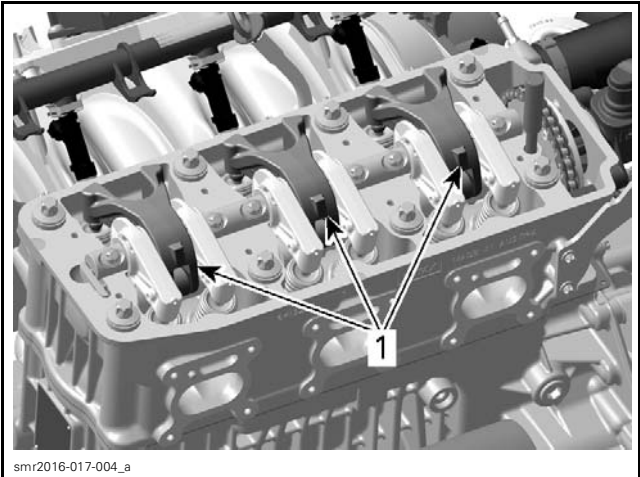
REQUIRED TOOL	
DRIVE SHAFT ADAPTER (P/N 529 035 985)	

Leak Test Procedure

NOTE: Cylinder numbers are molded on valve cover.

- 1. Rotate engine crankshaft counterclockwise until the cylinder 1 is at Top Dead Center (TDC) compression stroke.
 - 1.1 As the engine crankshaft is turned over, observe the movement of intake rocker arm of the cylinder to be checked.
 - 1.2 After piston completes its cycle and the intake valve closes, observe the piston.
 - 1.3 When it reaches its uppermost position this is TDC compression stroke.

Subsection XX (CYLINDER HEAD)



1. Intake rocker arms

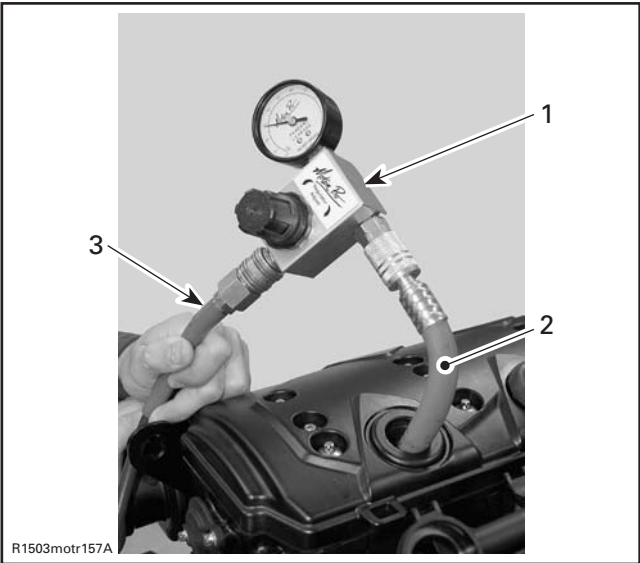
- 2. Secure the wrench lever, at the end of the drive shaft, against hull to prevent further crankshaft rotation.
- 3. Install the leak down test tool.

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

- 3.1 Install the appropriate gauge adapter into spark plug hole.
- 3.2 Connect the leak down tester gauge to the gauge adapter.
- 3.3 Connect to an adequate pressurized air supply.
- 3.4 Set needle of measuring gauge to zero (0).

NOTE: Each tester will have specific instruction on the gauge operation and required pressure. Refer to manufacturer's instructions.

- 4. Supply combustion chamber with air.



TYPICAL
1. Leak down tester gauge
2. Gauge adapter
3. Air supply hose

- 5. Note the amount of leaking or percentage (depending on tester).

LEAKAGE PERCENTAGE	ENGINE CONDITION
Up to 15%	Excellent condition
16% to 25%	Good condition
26% to 40%	Fair condition; engine will run and performance might be down in some cases
41% and higher	Poor condition, diagnose and repair engine

- 6. Proceed the same way with remaining cylinders.

Diagnostic

Pressurize area to be tested, spray soap/water solution at the indicated location and look and/or listen for air bubbles.

OBSERVATION	CAUSE
Air escaping on intake port	Leaking intake valve(s)
Air escaping on exhaust port	Leaking exhaust valve(s)
Air escaping into crankcase	Excessively worn and/or broken piston rings
Air bubbles out of coolant tank	Leaking cylinder head gasket

OBSERVATION	CAUSE
Air/water escaping from cylinder-block/head	Damaged gasket and/or loosened screws
Coolant escaping from water pump housing	Damaged gasket and/or loosened screws (refer to <i>COOLING SYSTEM-ENGINE COMPONENTS</i>)
Coolant escaping from leak indicator hole	Damaged rotary seal on water pump shaft (refer to <i>COOLING SYSTEM-ENGINE COMPONENTS</i>)
Oily contamination on leak indicator hole	Damaged oil seal on water pump shaft

Reassembly

For reassembly, reverse the preparation procedure. Use torque values and service products from the exploded views (refer to proper *ENGINE* subsections).

Properly install ignition coils. Refer to *IGNITION COILS AND SPARK PLUGS* subsection.

TROUBLESHOOTING

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

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

UNUSUAL ENGINE NOISE OR VIBRATIONS

- Incorrect camshaft timing adjustment**
- Replace damaged components and readjust camshaft timing.
- Camshaft timing gear screws got loose**
- Retighten screws with the recommended torque.
- Rocker arm(s) hydraulic element is broken or worn out (improper valve adjustment).**
- Replace faulty rocker arm(s).
- Rocker arm screw not properly tightened**
- Retighten screws with recommended torquing procedure.
- Faulty chain tensioner**
- Replace chain tensioner.
- Chain guide is worn out**
- Replace chain guide.

- Stretched timing chain or worn out sprocket**
- Replace timing chain and sprocket.
- Camshaft is worn out**
- Check if camshaft radial clearance is out of specification.

OIL LEAKAGE FROM CYLINDER HEAD

- Valve cover gasket is leaking**
- Replace valve cover gasket and retighten screws with recommended torque.
- Check valve cover for cracks or other damage. Replace if necessary.
- Valve cover screws are leaking**
- Replace valve cover screws.
- Spark plug tube gasket is leaking**
- Remove valve cover and replace spark plug tube gasket.
- Clean spark plug area from oil spillage.
- Blow by valve is leaking**
- Replace blow by valve O-ring.
- Camshaft sensor O-ring is leaking**
- Replace camshaft sensor O-ring.
- Cylinder head gasket is leaking**
- Remove cylinder head and check for damage.
- Replace cylinder head gasket and retighten screws with recommended torquing procedure.

ENGINE LACKS ACCELERATION OR POWER

- Incorrect camshaft timing adjustment**
- Replace damaged components and readjust camshaft timing.
- Intake or exhaust valves are leaking**
- Perform *ENGINE LEAK TEST*.
- Check if valve seats properly in valve seat.
- Repair or replace damaged components.
- Broken valve spring(s)**
- Replace defective parts.
- Broken rocker arm(s)**
- Replace defective parts.

PROCEDURES

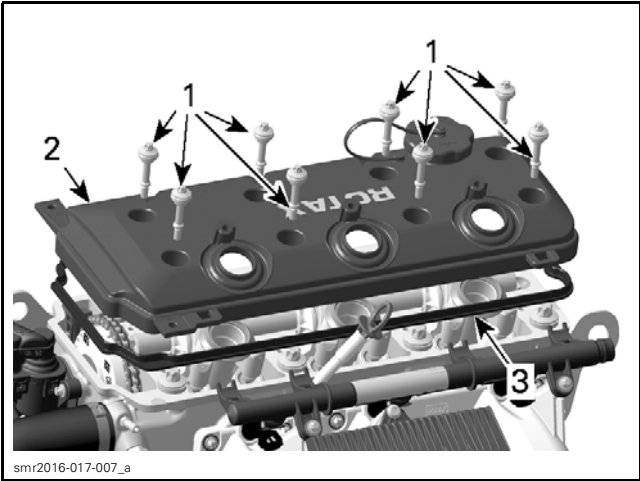
VALVE COVER

Removing the Valve Cover

- Remove ignition coils. Refer to *IGNITION COILS AND SPARK PLUGS* subsection.

Subsection XX (CYLINDER HEAD)

2. Remove the valve cover.



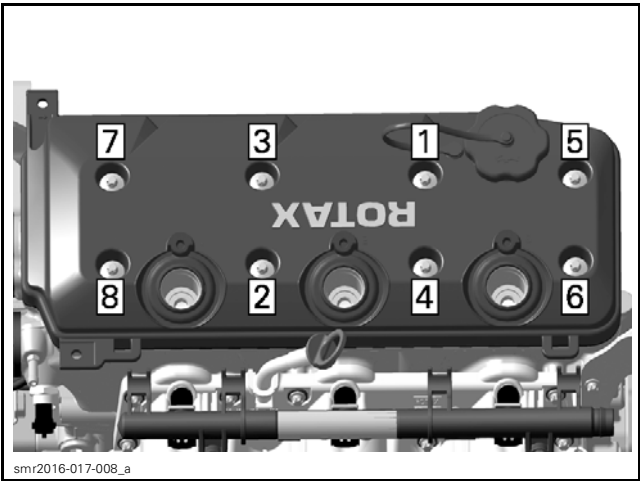
- 1. Valve cover screws
- 2. Valve cover
- 3. Gasket (discard)

Inspecting the Valve Cover

Check the valve cover for cracks or other damage. Check if rubber bushing on the valve cover screws are brittle, cracked or hard. If so, replace valve cover screw accordingly.

Installing the Valve Cover

The installation is the reverse of the removal procedure. However, pay attention to the following. Properly seat **NEW** gasket in the cover groove. Install the valve cover screws according to following sequence.



TIGHTENING SEQUENCE

TIGHTENING TORQUE		
Valve cover screws	STEP A (screws 1 to 8)	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)
	STEP A (screws 1 to 4)	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

Install ignition coils, refer to *IGNITION COILS AND SPARK PLUGS* subsection.

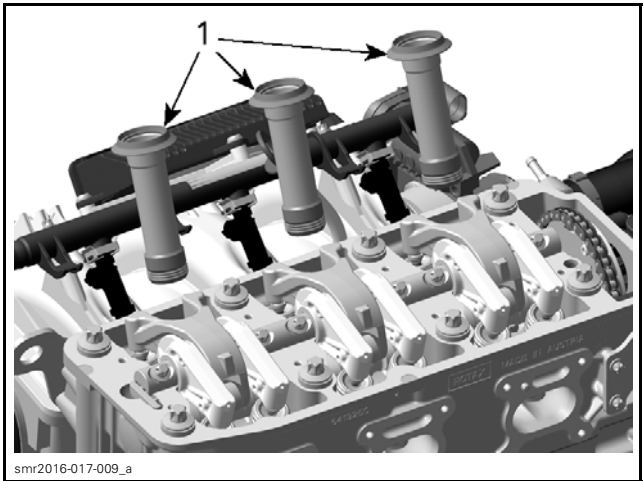
Install all other removed parts. Refer to proper subsection for procedure.

SPARK PLUG TUBES

Removing the Spark Plug Tube

Remove the *VALVE COVER*, see procedure in this subsection.

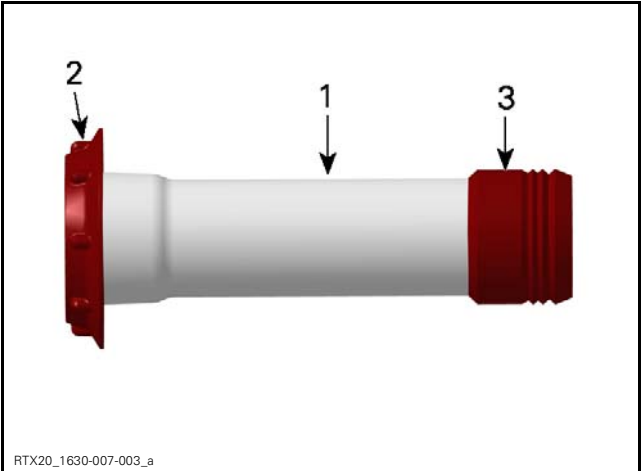
Pull spark plug tubes to remove them.



1. Spark plug tubes

Inspecting the Spark Plug Tube

Check seals on spark plug tube. If seals are brittle, cracked or hard, replace spark plug tube.



RTX20_1630-007-003_a

1. Spark plug tube
2. Seal to the valve cover
3. Seal to the cylinder head

Installing the Spark Plug Tube

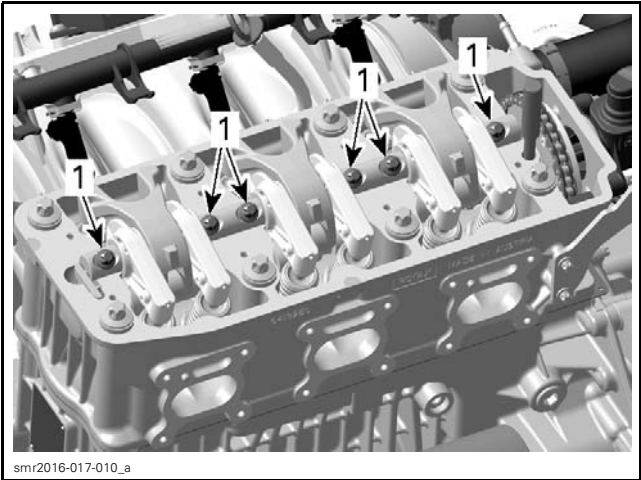
The installation is the reverse the removal procedure. However, pay attention to the following detail.

Apply engine oil on seals.

ROCKER ARMS

Removing the Rocker Arm

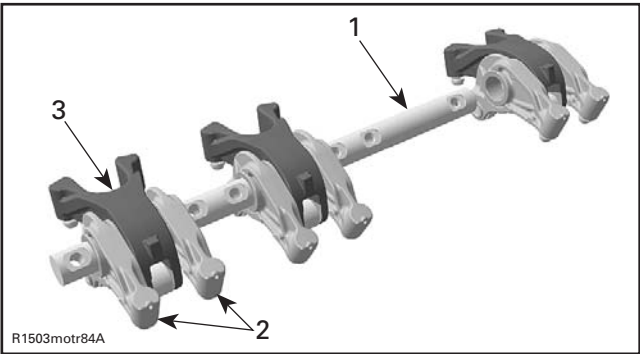
1. See procedure in this subsection to remove:
 - Valve cover
 - Spark plug tubes.
2. Remove and discard rocker arm shaft screws.



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1. Rocker arm shaft screws

3. Remove rocker arm shaft with rocker arms.



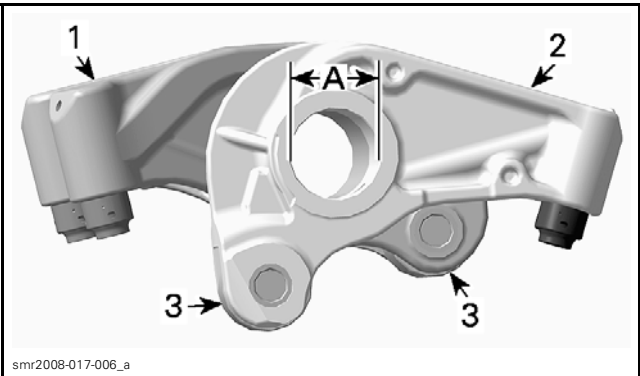
R1503motr84A

1. Rocker arm shaft
2. Rocker arms (exhaust side)
3. Rocker arm (intake side)

Inspecting the Rocker Arm

Inspect each rocker arm for cracks and scored friction surfaces. If so, replace rocker arm assembly.

Check the rocker arm rollers for free movement, wear and excessive radial play. Replace rocker arm assembly as necessary.



smr2008-017-006_a

1. Rocker arm (intake side)
2. Rocker arm (exhaust side)
3. Rollers
A. Rocker arm inside diameter

Measure rocker arm inside diameter. If diameter is out of specification, change the rocker arm assembly.

ROCKER ARM INSIDE DIAMETER	
New	20.007 mm to 20.020 mm (.7877 in to .7882 in)
Service limit	20.050 mm (.7894 in)

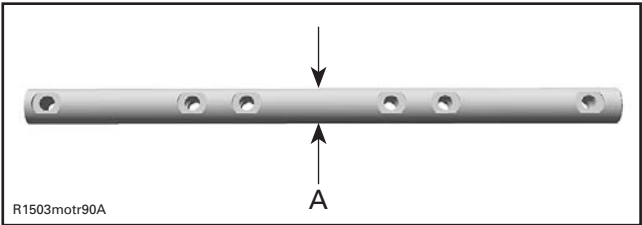
Press the hydraulic lifter with your thumb. If the hydraulic lifter can be fully pressed in, replace rocker arm. Lifter must turn freely in rocker arm bore. Otherwise, replace.

Rocker Arm Shaft

Check for scored friction surfaces, if so, replace parts.

Measure rocker arm shaft diameter.

Subsection XX (CYLINDER HEAD)

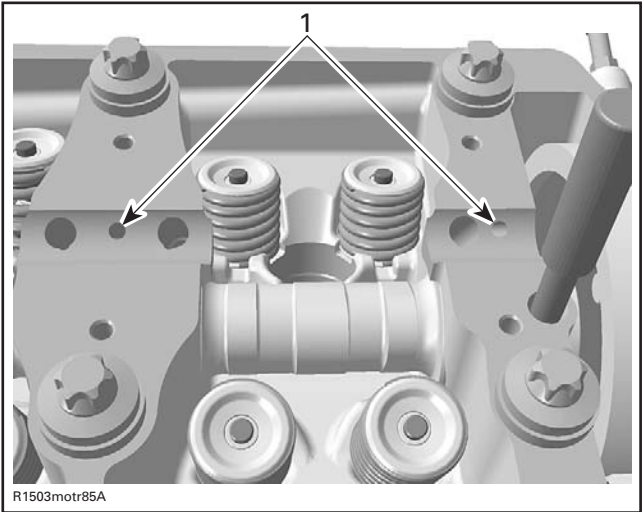


A. Measure rocker arm shaft diameter here

ROCKER ARM SHAFT DIAMETER	
New	19.980 mm to 19.993 mm (.7866 in to .7871 in)
Service limit	19.970 mm (.7862 in)

Any area worn excessively will require parts replacement.

Verify and clean oil orifices to ensure a good rocker arm shaft lubrication.



1. Oil orifices from the camshaft to the rocker arm shaft, then to the rocker arms and finally to the valve adjustment

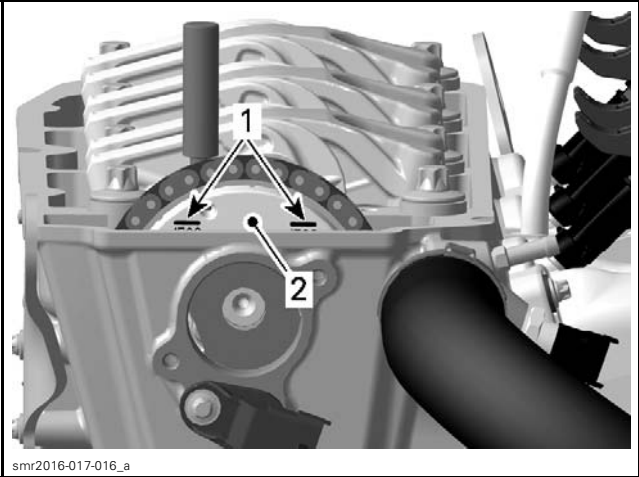
Installing the Rocker Arm

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

The rocker arm shaft can only be installed in one specific position. Therefore strictly adhere to following procedure.

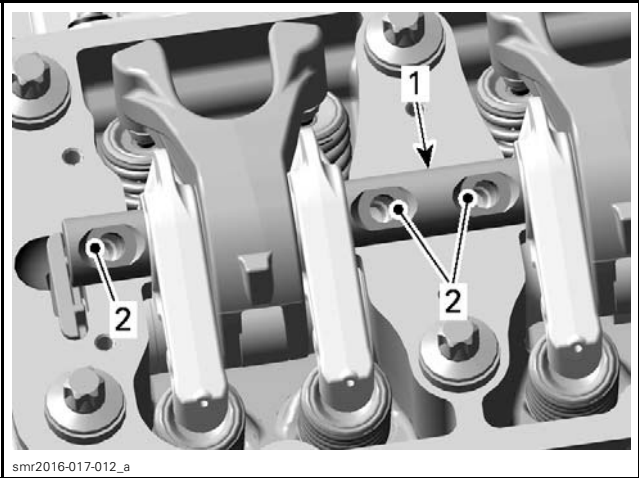
1. Lock camshaft. Refer to *CAMSHAFT* in this subsection.

NOTICE Make sure the printed marks on oil separator cover are parallel to the cylinder head base.



1. Printed marks
2. Oil separator cover

2. Apply engine oil on rocker arm shaft.
3. Position the rocker arm shaft with the notches on top.



1. Rocker arm shaft
2. Rocker arm shaft notches

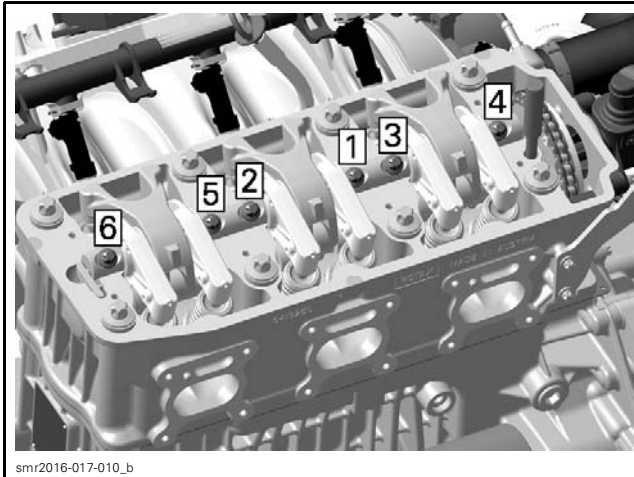
4. Install **NEW** rocker arm shaft screws.

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

5. Tighten screws according to following sequence.

NOTICE Apply tightening torque of the step A on **ALL** rocker arm shaft screws before going to the step B.

TIGHTENING PROCEDURE		
Rocker arm shaft screws	Step A	20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)
	Step B	Additional 90° ± 5°



TIGHTENING SEQUENCE

CAMSHAFT TIMING GEAR

Removing the Camshaft Timing Gear

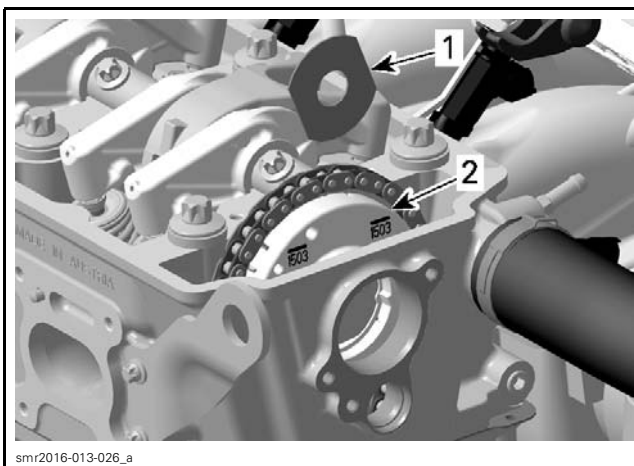
Lock crankshaft, refer to *CYLINDER BLOCK* subsection.

Remove *VALVE COVER*, see procedure in this subsection.

Remove camshaft position sensor. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

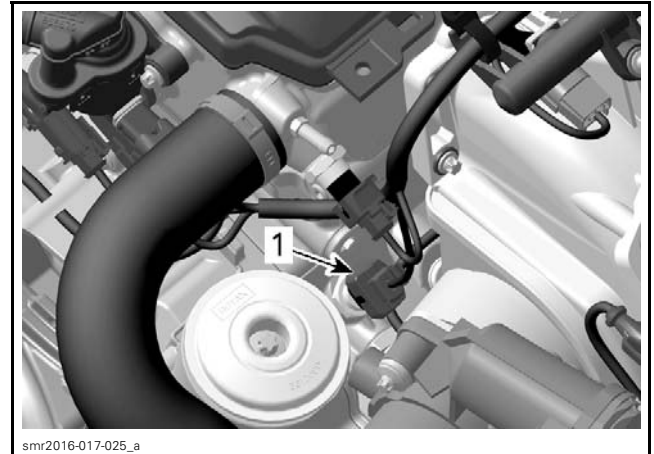
Lock camshaft. Refer to *CAMSHAFT* in this subsection.

Remove thrust washer from oil separator cover.



1. Thrust washer
2. Oil separator cover

Unplug oil temperature sensor.

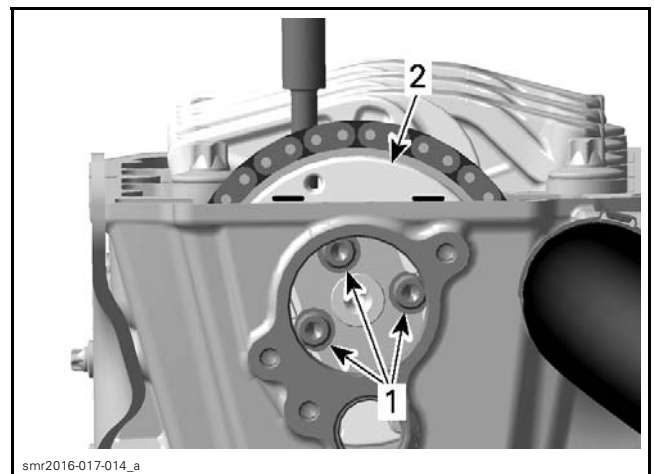


1. Oil temperature sensor connector

Remove the chain tensioner. Refer to *CYLINDER BLOCK* subsection.

Remove:

- Chain guide
- Camshaft timing gear with oil separator cover.



1. Timing gear screws
2. Camshaft timing gear with oil separator cover

Secure timing chain with a retaining wire.

Inspecting the Camshaft Timing Gear

Check camshaft timing gear for wear or deterioration.

If gear is worn or damaged, replace it as a set (camshaft timing gear and timing chain).

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

Installing the Camshaft Timing Gear

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

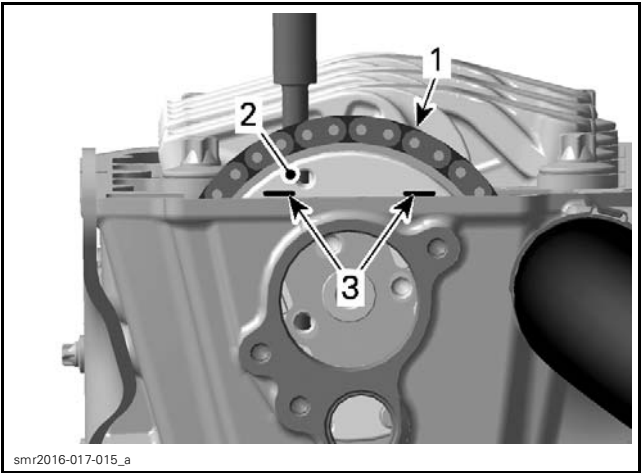
Install oil separator cover on camshaft timing gear.

Subsection XX (CYLINDER HEAD)

NOTICE Crankshaft and camshaft must be locked on TDC position.

Place camshaft timing gear along with timing chain on the camshaft.

NOTE: The printed marks on the oil separator cover must be parallel to the cylinder head base.



- 1. Timing chain
- 2. Oil separator cover
- 3. Printed marks

Ensure chain guides are properly installed.

Loosely install timing gear screws.

Install chain tensioner.

NOTE: There can be 2 different positions to install the timing gear on the camshaft. To find best position strictly follow the procedure.

Check if timing gear screws are still loose. If screws are squeezed by the timing gear, remove the chain tensioner again and rotate timing gear by one tooth clockwise.

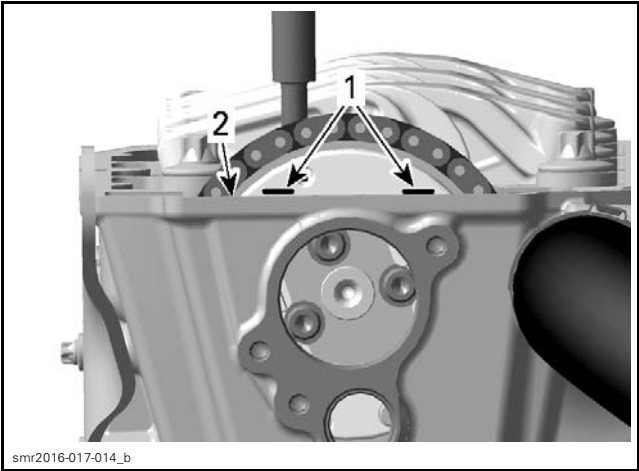
Install the chain tensioner again.

Remove timing gear screws and apply thread locker on threads.

Tighten timing gear screws to specification.

TIGHTENING TORQUE	
Camshaft timing gear screws	16 N•m ± 2 N•m (142 lbf•in ± 18 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

NOTICE Printed marks on the oil separator cover must be parallel to the cylinder head surface.



- 1. Printed marks
- 2. Cylinder head surface

Remove crankshaft and camshaft locking tools.
Install all other removed parts.

CAMSHAFT

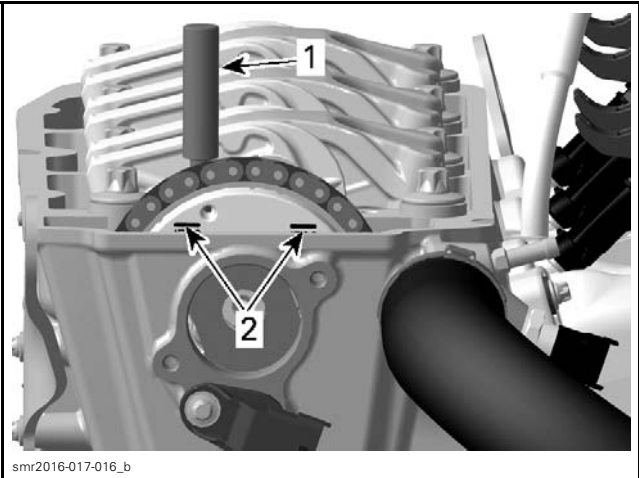
Camshaft Locking Procedure

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

NOTE: Make sure that printed marks on oil separator cover are parallel to the cylinder head base.

3. Insert the camshaft locking tool into the hole behind the camshaft timing gear to lock camshaft.

REQUIRED TOOL	
CAMSHAFT LOCKING TOOL (P/N 529 035 839)	



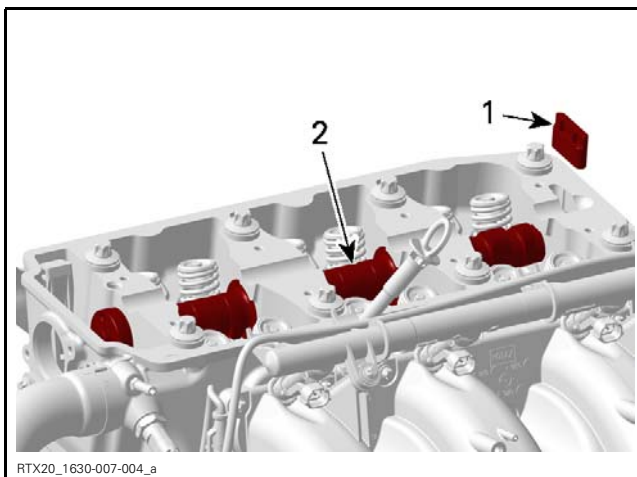
- 1. Camshaft locking tool
- 2. Printed marks

Removing the Camshaft

See procedure in this subsection and remove:

- Camshaft timing gear
- Rocker arm.

Remove the camshaft.



1. Camshaft lock
2. Camshaft

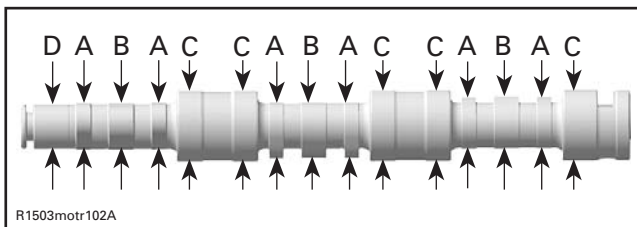
Inspecting the Camshaft

Check each lobe and bearing journal of camshaft for:

- Scoring
- Scuffing
- Cracks
- Other signs of wear.

Measure camshaft bearing journal and lobe height using a micrometer.

Measure clearance between both ends of camshaft and cylinder head.



- A. Camshaft lobe (exhaust valves)
- B. Camshaft lobe (intake valves)
- C. Camshaft bearing journal
- D. Camshaft bearing journal — engine front

ENGINE TYPE	CAMSHAFT LOBE HEIGHT — EXHAUST VALVE (A)	
130 170	New	31.720 mm to 31.920 mm (1.2488 in to 1.2567 in)
	Service limit	31.670 mm (1.2469 in)

ENGINE TYPE	CAMSHAFT LOBE HEIGHT — EXHAUST VALVE (A)	
230	New	30.630 mm to 30.830 mm (1.2059 in to 1.2138 in)
	Service limit	30.580 mm (1.2039 in)
300	New	31.430 mm to 31.630 mm (1.2374 in to 1.2453 in)
	Service limit	31.380 mm (1.2354 in)

ENGINE TYPE	CAMSHAFT LOBE HEIGHT — INTAKE VALVE (B)	
130 170	New	31.710 mm to 31.910 mm (1.2484 in to 1.2563 in)
	Service limit	31.660 mm (1.2465 in)
230	New	30.513 mm to 30.713 mm (1.2013 in to 1.2092 in)
	Service limit	30.460 mm (1.1992 in)
300	New	31.540 mm to 31.740 mm (1.2417 in to 1.2496 in)
	Service limit	31.500 mm (1.2402 in)

CAMSHAFT BEARING JOURNAL (C)	
New	39.892 mm to 39.905 mm (1.5706 in to 1.5711 in)
Service limit	39.880 mm (1.5701 in)

CAMSHAFT BEARING JOURNAL (ENGINE FRONT) (D)	
New	24.909 mm to 24.940 mm (.9807 in to .9819 in)
Service limit	24.880 mm (.9795 in)

CAMSHAFT BEARING INNER DIAMETER	
New	40.000 mm to 40.020 mm (1.5748 in to 1.5756 in)
Service limit	40.050 mm (1.5768 in)

CAMSHAFT BEARING INNER DIAMETER (ENGINE FRONT)	
New	25.000 mm to 25.013 mm (.9843 in to .9848 in)
Service limit	25.050 mm (.9862 in)

Replace parts that are not within specifications.

Subsection XX (CYLINDER HEAD)

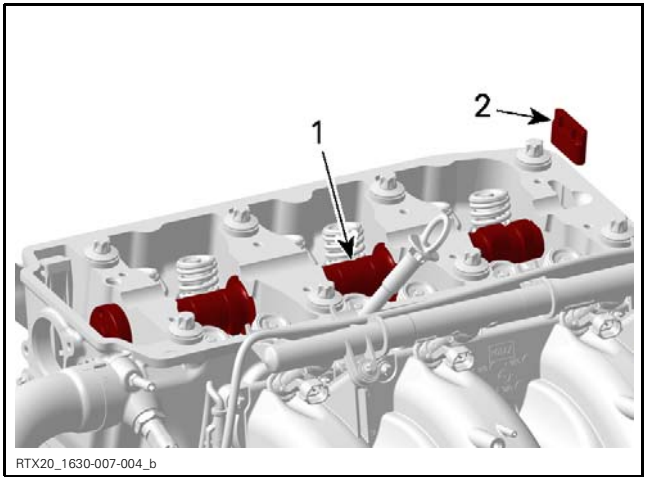
Installing the Camshaft

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

Lubricate the camshaft bearing journals.

SERVICE PRODUCT
ISOFLEX GREASE TOPAS NB 52 (P/N 293 550 021)

Install camshaft, then turn and check if it moves freely. Place the camshaft lock in its slot.



- 1. Camshaft
- 2. Camshaft lock

For other parts, refer to the proper installation procedures in this subsection.

CYLINDER HEAD

Removing the Cylinder Head

Lock crankshaft, refer to *CYLINDER BLOCK* subsection.

Drain coolant, refer to *COOLING SYSTEM - VEHICLE COMPONENTS* subsection.

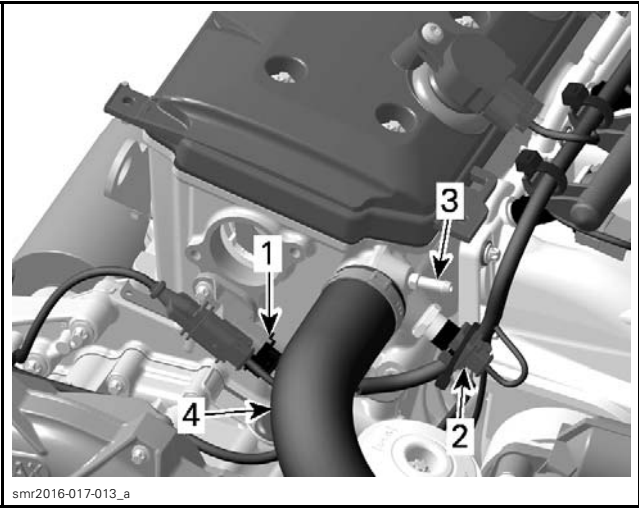
Remove blow-by valve from cylinder head. Refer to *LUBRICATION SYSTEM* subsection.

Unplug:

- Camshaft position sensors (CAPS)
- Coolant temperature sensor (CTS).

Disconnect:

- Bleeding hose
- Cylinder head outlet hose.



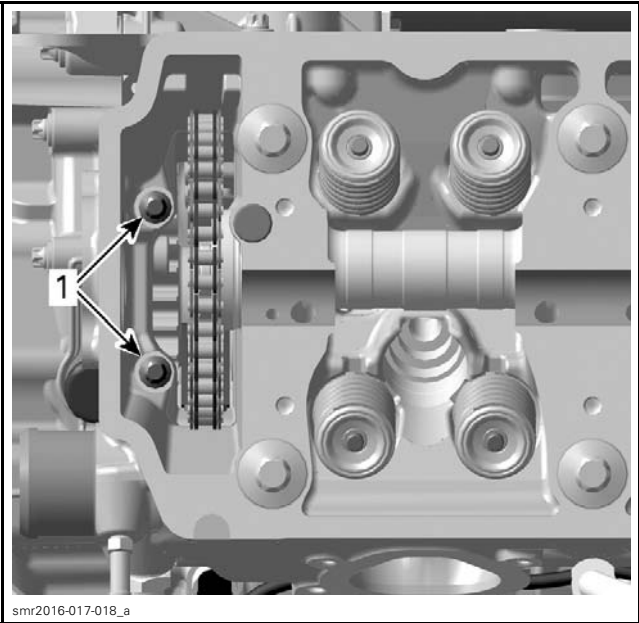
- 1. Camshaft position sensors (CAPS) connector
- 2. Coolant temperature sensor (CTS) connector
- 3. Bleeding nipple
- 4. Cylinder head outlet hose

Remove the intake manifold. Refer to *INTAKE MANIFOLD* subsection.

Remove the exhaust manifold. Refer to *EXHAUST MANIFOLD* subsection.

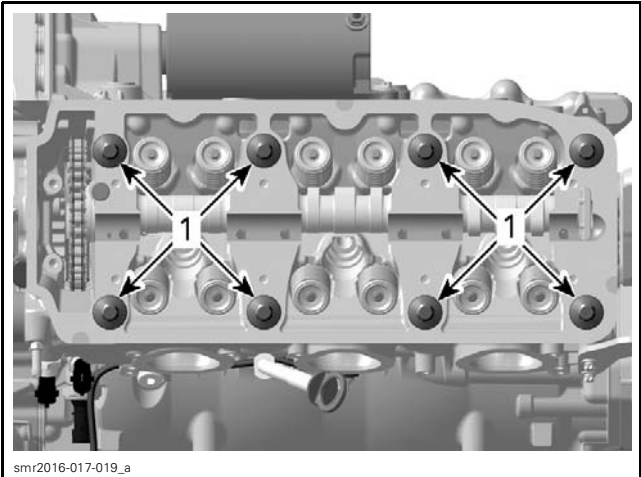
Remove the *CAMSHAFT TIMING GEAR*, see procedure in this subsection.

Remove the M6 cylinder head screws.



- 1. M6 cylinder head screws

Remove and discard the M11 cylinder head screws.



1. M11 cylinder head screws

Remove:

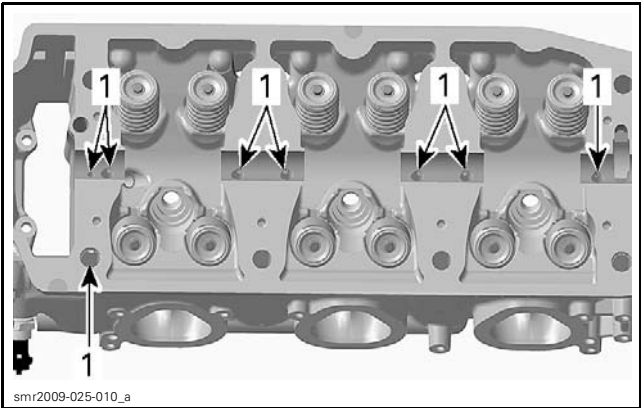
- Cylinder head
- Cylinder head gasket (discard it).

Cleaning the Cylinder Head

Remove carbon deposits from combustion chamber, exhaust port and piston top.

Clean cylinder head, especially cylinder head screw surface from oil spillage.

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

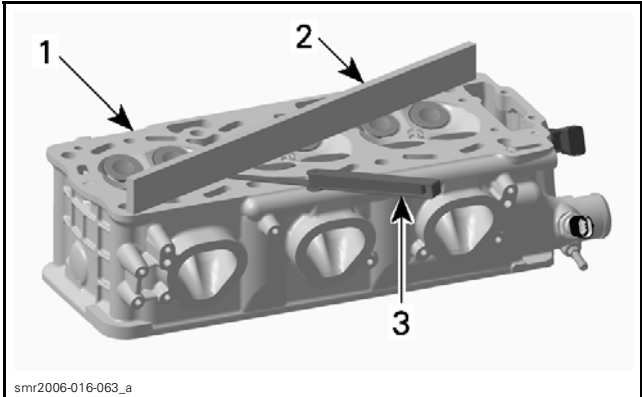


1. Oil orifices

Inspecting the Cylinder Head

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

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



1. Cylinder head
2. Flat bar
3. Feeler gauge

Check cylinder head warpage.

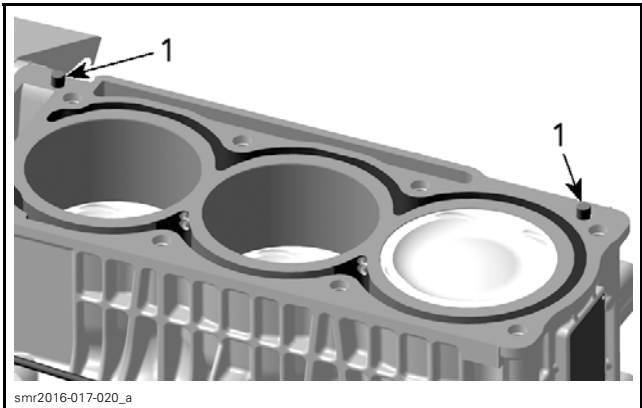
CYLINDER HEAD WARPAGE	
Maximum	0.100 mm (.004 in)

If warpage exceeds specification, replace cylinder head.

Installing the Cylinder Head

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

Ensure dowel pins are in place.



1. Dowel pins

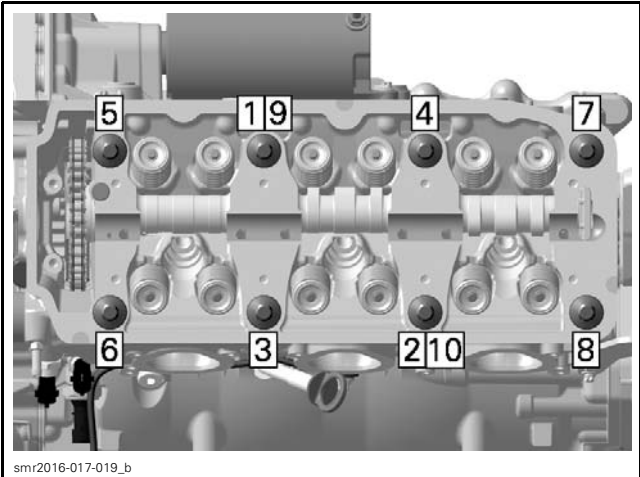
Install **NEW** cylinder head gasket.

NOTICE Each installation of the cylinder head requires a new cylinder head gasket. Using a gasket twice will cause engine damage.

Install **NEW** M11 cylinder head screws and tighten as per following procedure.

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

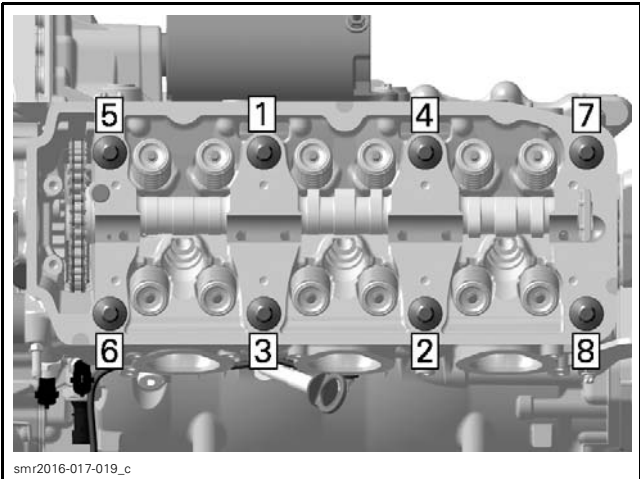
Subsection XX (CYLINDER HEAD)



TIGHTENING SEQUENCE - STEP A

NOTICE Apply tightening torque of the step A on ALL M11 cylinder head screws before going to the step B.

TIGHTENING PROCEDURE		
M11 cylinder head screws	Step A	40 N•m ± 3 N•m (30 lbf•ft ± 2 lbf•ft)

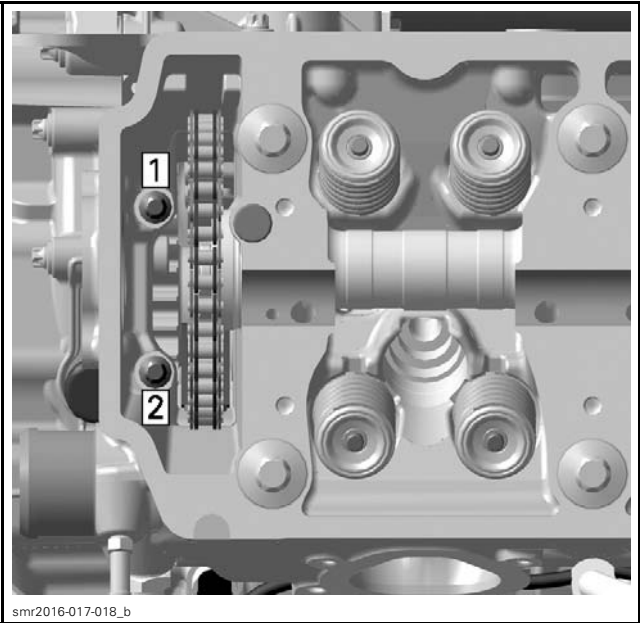


TIGHTENING SEQUENCE - STEP B AND C

NOTICE Apply tightening torque of the step B on ALL M11 cylinder head screws before going to the step C.

TIGHTENING PROCEDURE		
M11 cylinder head screws	Step B	Additional 120° ± 5°
	Step C	Additional 120° ± 5°

Tighten M6 cylinder head screws to specification.



TIGHTENING SEQUENCE

TIGHTENING TORQUE	
M6 cylinder head screws	11 N•m ± 1 N•m (97 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

Remove crankshaft and camshaft locking tools.
Install all removed parts.

VALVE SPRINGS

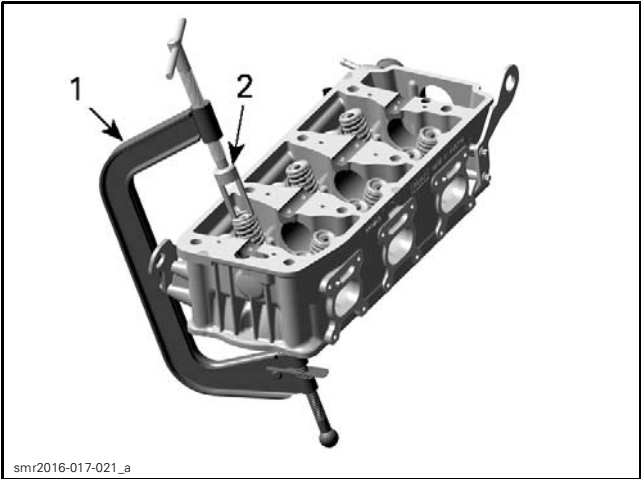
Removing the Valve Spring

See procedures in this subsection to remove:

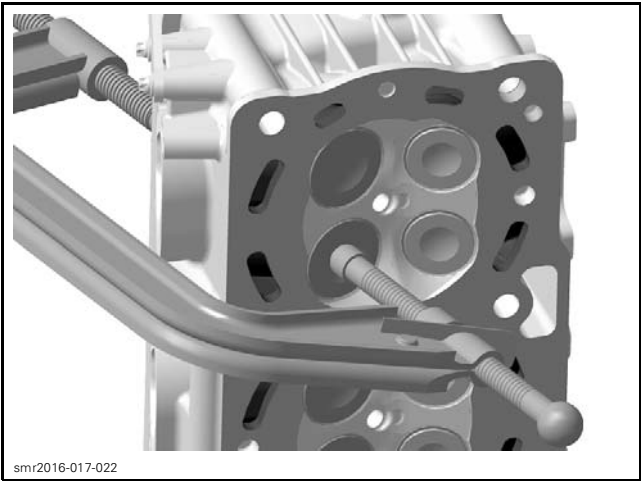
- *ROCKER ARM*
- *CYLINDER HEAD.*

Compress valve springs.

REQUIRED TOOL	
VALVE SPRING COMPRESSOR (P/N 529 035 724)	
VALVE SPRING COMPRESSOR CUP (P/N 529 036 073)	

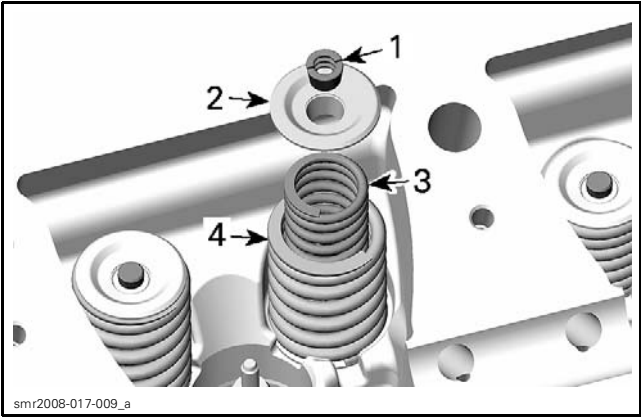


- 1. Valve spring compressor clamp
- 2. Valve spring compressor cup



LOCATE VALVE SPRING COMPRESSOR CLAMP IN CENTER OF THE VALVE

Remove valve cotters.
Withdraw valve spring compressor tools.
Remove valve springs.



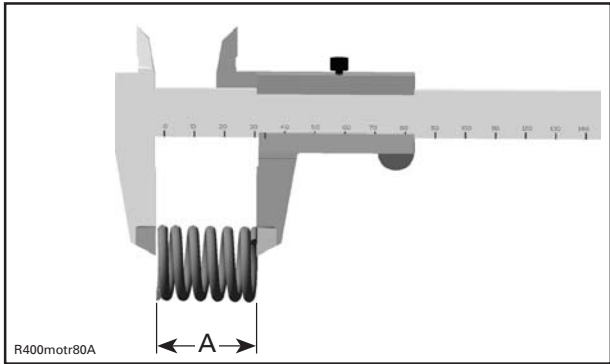
- 1. Valve cotters
- 2. Valve spring retainer
- 3. Inner valve spring
- 4. Outer valve spring

Inspecting the Valve Spring

Check valve springs for rust, corrosion or other visible damages. If so, replace faulty valve springs.

Check valve springs for free length and straightness.

Replace valve springs if not within specifications.



A. Valve spring length

OUTER VALVE SPRING FREE LENGTH	
New	45.45 mm (1.789 in)
Service limit	43.00 mm (1.693 in)

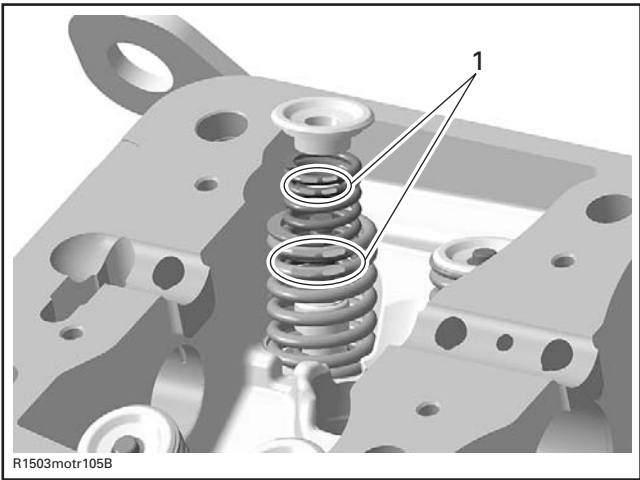
INNER VALVE SPRING FREE LENGTH	
New	41.02 mm (1.615 in)
Service limit	38.80 mm (1.528 in)

Installing the Valve Spring

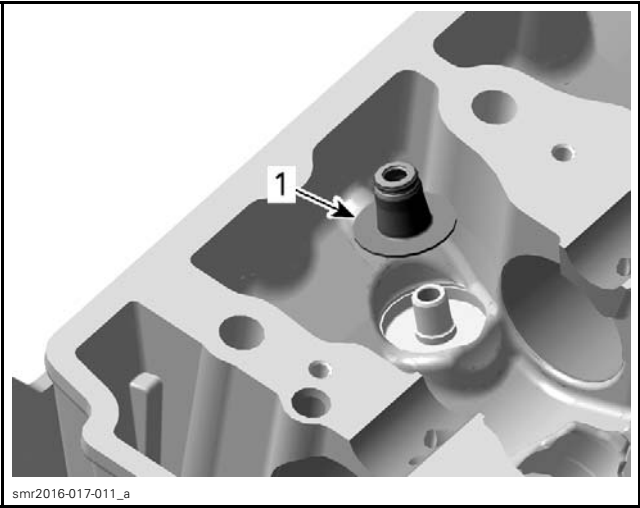
The installation is the reverse of the removal procedure. However, pay attention to the following details.

Colored area of the valve spring must be placed on top.

NOTE: Valve cotters must be properly engaged in valve stem grooves.



1. Position of the valve spring

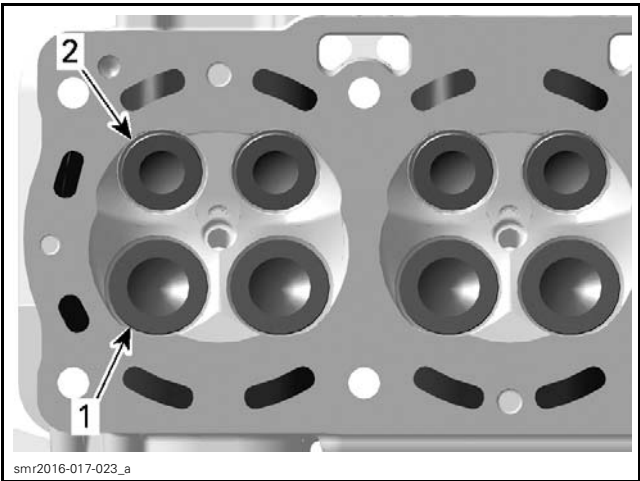


1. Valve stem seal

VALVES

Removing the Valve

Remove valve spring.
Push valve stem then pull valves out of valve guides.



1. Intake valve 38 mm
2. Exhaust valve 31 mm

Remove and discard valve stem seal.

REQUIRED TOOL
Valve stem seal pliers

Inspecting the Valve

Valve Stem Seal

Always install **NEW** seals whenever valves are removed.
Inspection of valve stem seals is not needed because **NEW** seals should always be installed whenever cylinder head is removed.

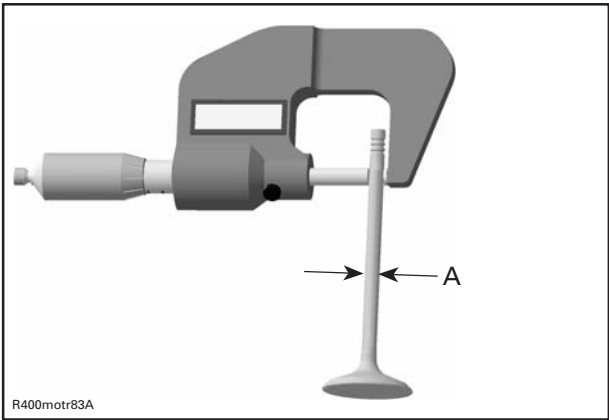
Valve

Inspect valve surface, check for abnormal stem wear and bending. If so, replace by a new one.

Valve Stem and Valve Guide Clearance

Measure valve stem and valve guide in three places, using a micrometer and a small bore gauge.
NOTE: Clean valve guide to remove carbon deposits before measuring.

Change valve if valve stem is out of specification or has other damages such as wear or friction surface.



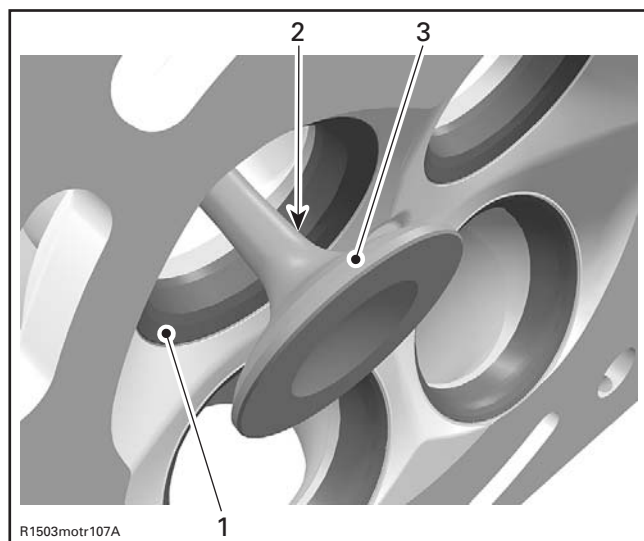
A. Valve stem diameter

VALVE STEM DIAMETER		
Intake valve	New	5.961 mm to 5.975 mm (.2347 in to .2352 in)
	Service limit	5.930 mm (.2335 in)
Exhaust valve	New	5.946 mm to 5.960 mm (.2341 in to .2346 in)
	Service limit	5.930 mm (.2335 in)

Replace valve guide if it is out of specification or has other damages such as wear or friction surface. Refer to *VALVE GUIDE* in this subsection.

VALVE GUIDE INNER DIAMETER (INTAKE AND EXHAUST VALVES)	
New	5.994 mm to 6.018 mm (.236 in to .2369 in)
Service limit	6.060 mm (.2386 in)

Valve Face and Seat



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

Check valve face and seat for burning or pittings and replace valve or cylinder head if there are signs of damage.

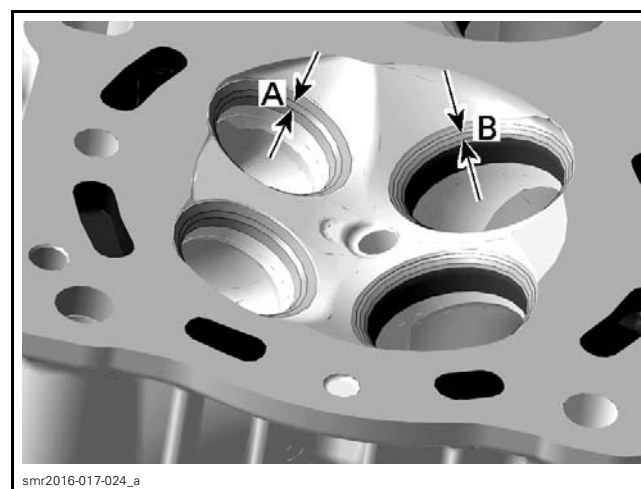
Ensure to seat valves properly. Apply some lapping compound on valve face and work valve on its seat with a lapping tool.

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

Measure valve seat width, using a caliper.

VALVE SEAT CONTACT WIDTH		
Intake valve	New	1.05 mm to 1.35 mm (.041 in to .053 in)
	Service limit	1.60 mm (.063 in)
Exhaust valve	New	1.25 mm to 1.55 mm (.049 in to .061 in)
	Service limit	1.80 mm (.071 in)

If valve seat contact width is too wide or has dark spots, replace the cylinder head.

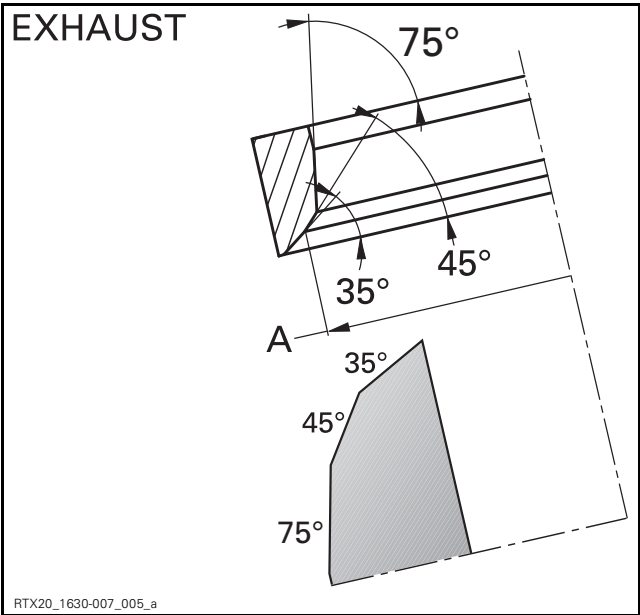


- A. Valve seat contact width - Exhaust valve
- B. Valve seat contact width - Intake valve

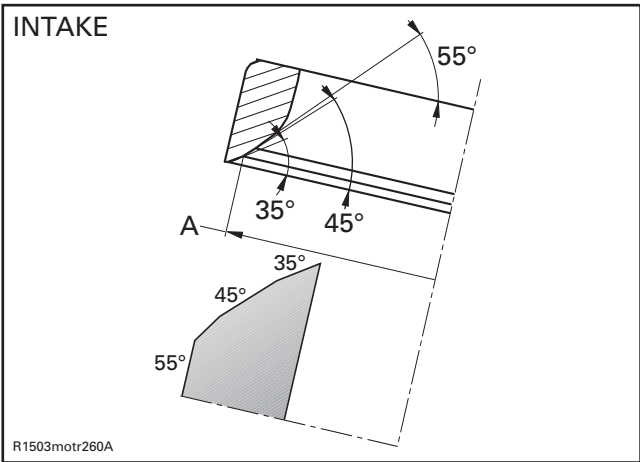
Valve Seat Grinding

NOTE: The valve seats may be reground with a valve seat grinder which centers on the valve guide.

1. Grind the valve seat at 45°. Remove no more material than absolutely necessary to clean the seat up.
2. Using a 35° stone, narrow the valve seat until the appropriate outer diameter is obtained.



A. Valve seat outer diameter EXHAUST



A. Valve seat outer diameter INTAKE

VALVE SEAT OUTER DIAMETER	
INTAKE	37.35 mm (1.4705 in)
EXHAUST	30.30 mm (1.1929 in)

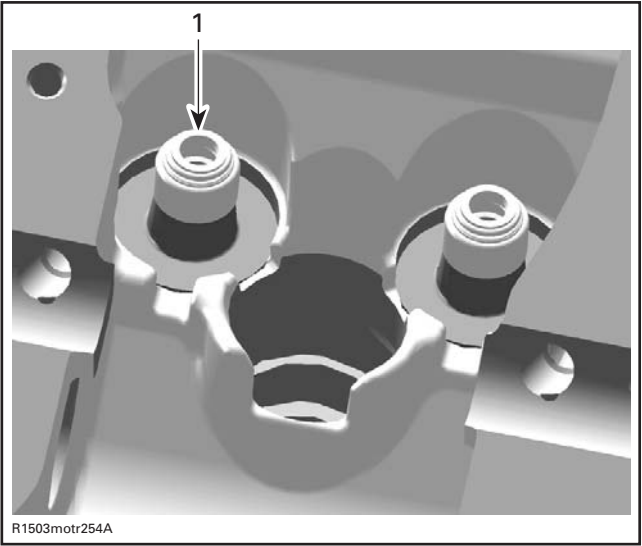
- Using a 55° stone for the intake and an 75° stone for the exhaust valve, reduce the valve seat contact width to the appropriate value mentioned above.
- Finally, coat the valve seating surface with a fine paste of valve grinding compound using a manual valve grinding mandrel. Lightly grind the valves until a smooth, even, uniform sealing surface of the appropriate inside and outside diameter is obtained on both the valve and the seat. Use only a hand held valve grinding mandrel with a suction cup, rotating the valve

back and forth through about 45°, and then advancing the valve 45° before repeating this operation.

Installing the Valve

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

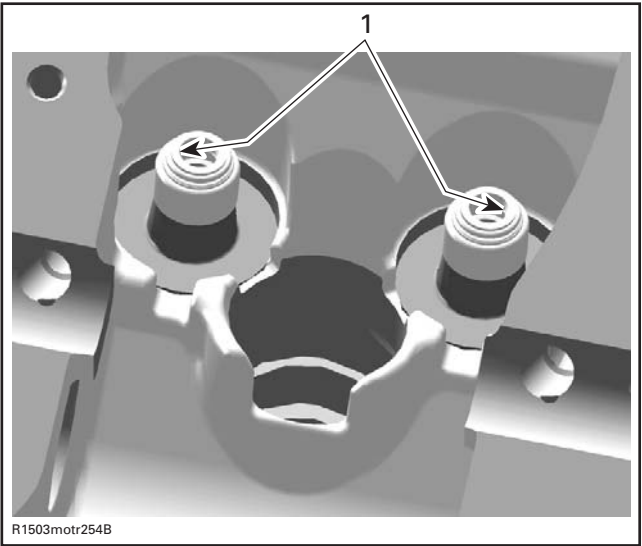
Install **NEW** valve stem seal.



1. Valve stem seal

Apply engine oil on valve stem and install valve.

NOTICE Be careful when valve stem is passed through sealing lips of valve stem seal.



1. Sealing lips of valve stem seal

To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

After springs are installed, ensure valve springs and valve spring retainer are properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

NOTICE An improperly locked valve spring will cause engine damage.

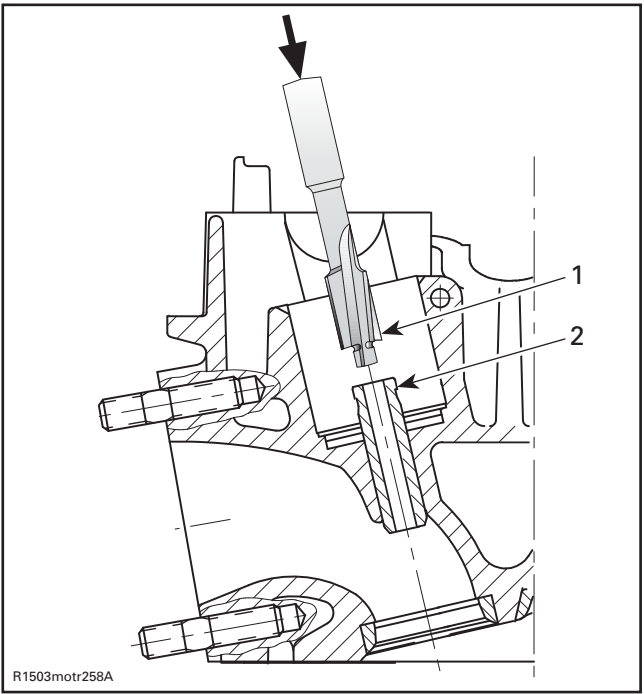
VALVE GUIDE

Replacing a Valve Guide

NOTICE Do not heat cylinder head for this procedure.

NOTICE The sharp edge near the top of the valve guide must be machined away. Otherwise it will foul the valve guide hole in the cylinder head and destroy the cylinder head, as the valve guide is removed.

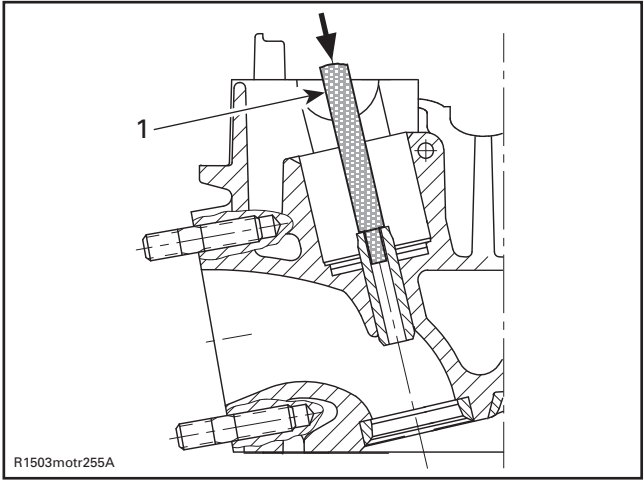
Use a special reamer as far as the top of the notch.



TYPICAL
1. Special reamer
2. Notch

Push valve guide out of the cylinder head towards combustion chamber.

REQUIRED TOOL	
VALVE GUIDE REMOVER (6 MM) (P/N 529 036 086)	



TYPICAL
1. Punch

Check valve guide bore for scratches.

NOTE: If valve guide has caused scoring during extraction, replace the cylinder head.

Grease the bore in cylinder head and the leading end of valve guide.

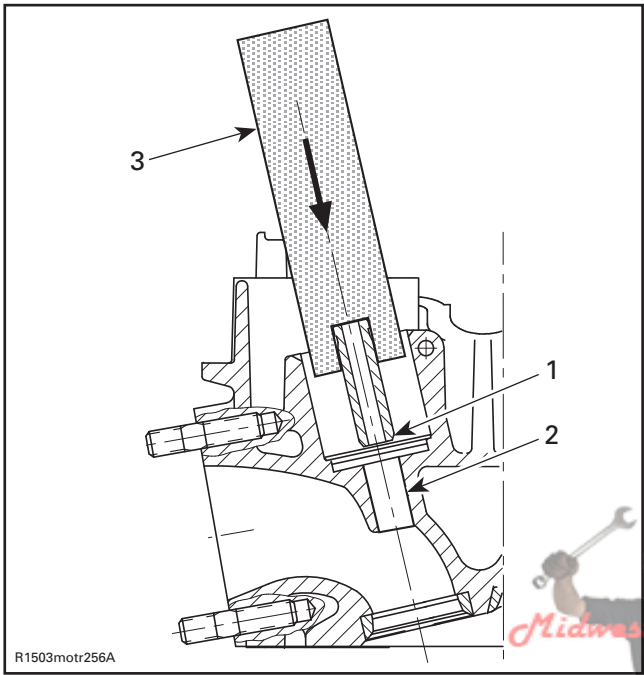
SERVICE PRODUCT	
MOLYKOTE G-N (P/N 420 297 433)	

Press the valve guide into the **COLD** cylinder head as shown.

NOTE: The inlet and exhaust valve guides have the same length and are interchangeable.

REQUIRED TOOL	
VALVE GUIDE PUSHER (6 MM) (P/N 529 036 087)	

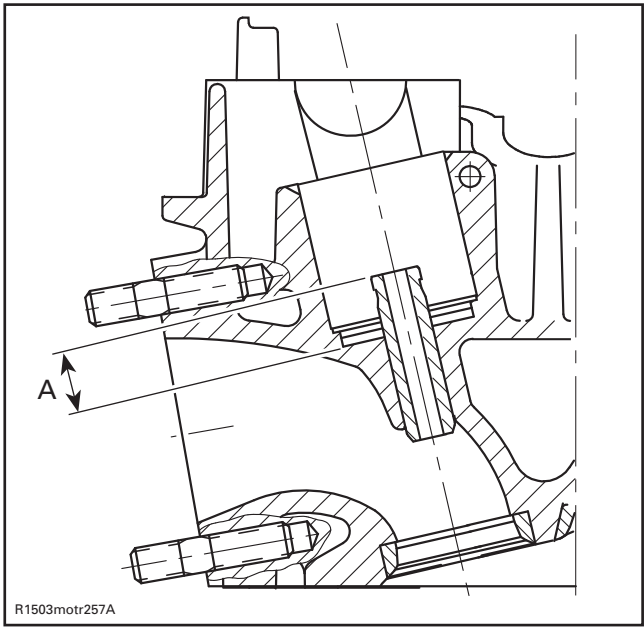
Subsection XX (CYLINDER HEAD)



Clean cylinder head carefully. Check that the valve seat is concentric with the new guide axis (check contact surface with engineer's blue).

TYPICAL
1. Valve guide leading end
2. Cylinder head bore
3. Jig

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NEGATIVE feedback and notify me at bestshopmanuals@gmail.com



TYPICAL
A. Protrusion

VALVE GUIDE PROTRUSION
(MEASUREMENT "A")

12.4 MM TO 12.8 MM (.488 IN TO .504 IN)

NOTE: After installing new guides, they must be reamed with a standard 6 mm reamer tool. These are available from various tool suppliers.

CYLINDER BLOCK

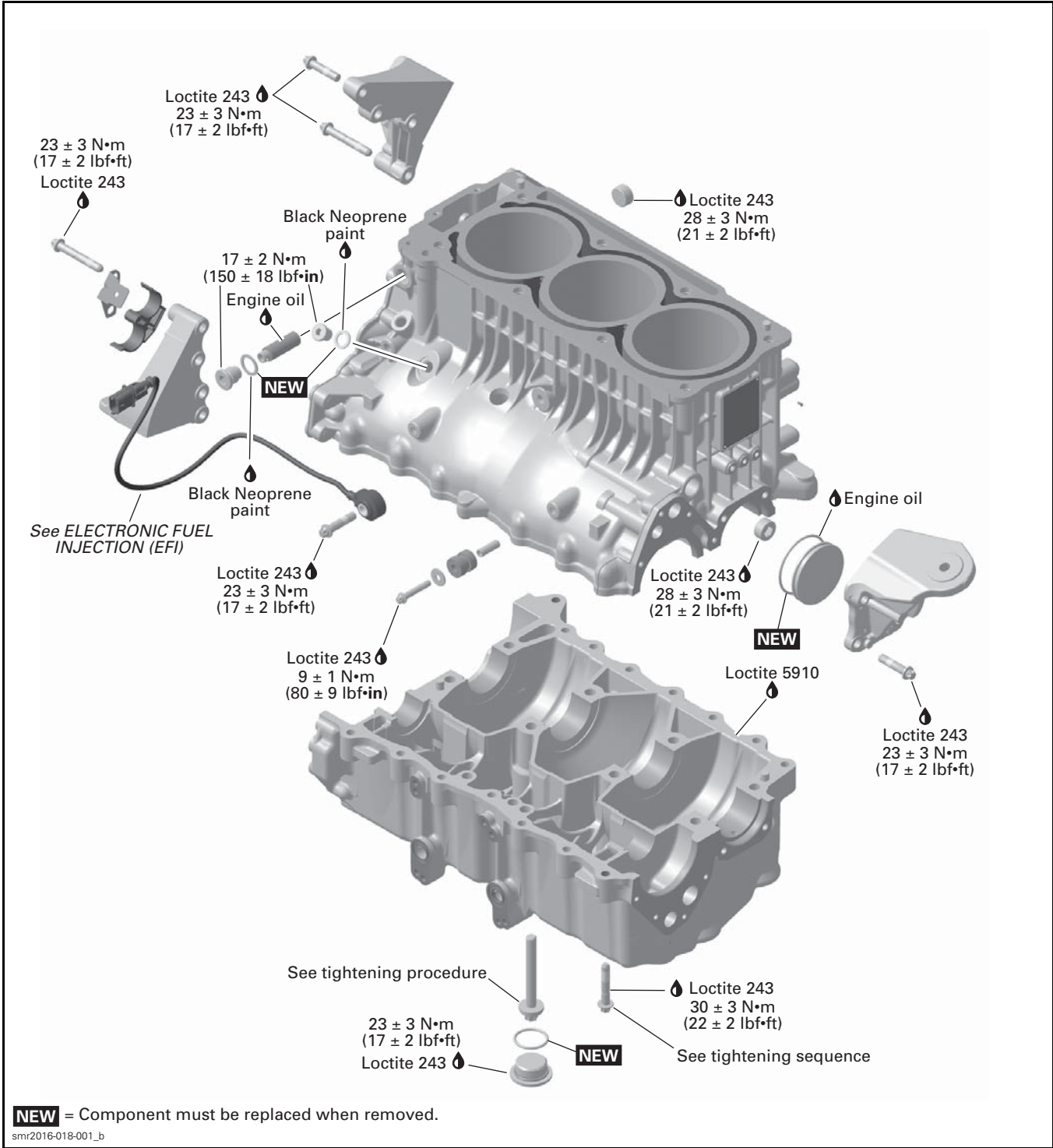
SERVICE TOOLS

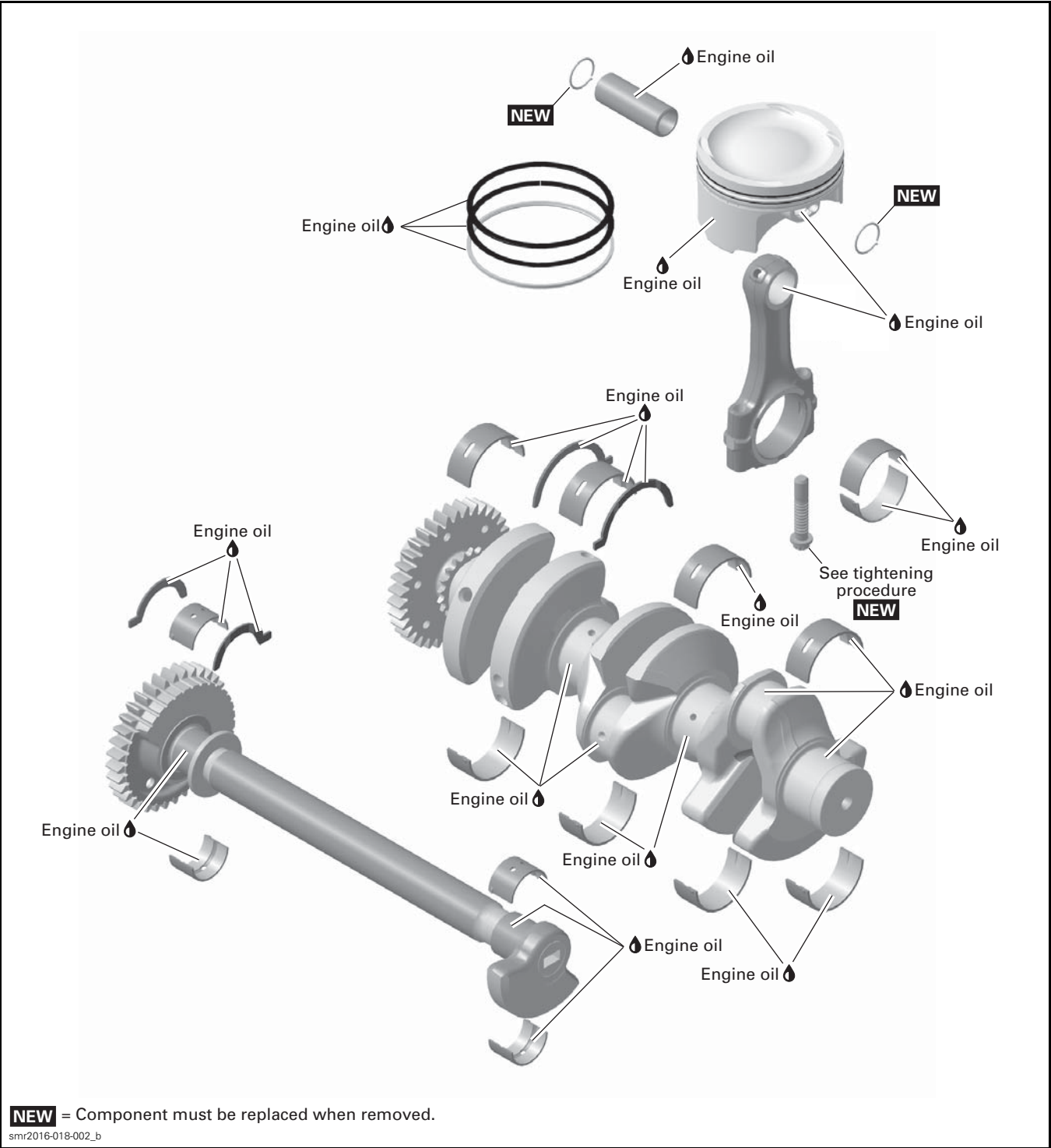
Description	Part Number	Page
CRANKSHAFT LOCKING TOOL	529 035 821	13, 16, 23
PISTON CIRCLIP INSTALLER.....	529 036 368	9

SERVICE PRODUCTS

Description	Part Number	Page
BLACK NEOPRENE PAINT	909570	5, 13
LOCTITE 243 (BLUE).....	293 800 060	22–23
LOCTITE 5910	293 800 081	22
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	19

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 them as a "group". If you find a defective component, it will be much easier to find the cause of the failure. Since parts were break-in together during the engine operation, they will keep their matched fit when parts are reassemble together within their "group".

TROUBLESHOOTING

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

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

UNUSUAL ENGINE NOISE OR VIBRATIONS

1. Heavy wear on plain bearings
 - Check radial play of plain bearings.
 - Replace plain bearings if out of specification.
2. Crankshaft and balancer shaft are not properly aligned
 - Disassemble cylinder block and check if marks are properly aligned.
3. Crankshaft or balancer shaft axial play out of specification
 - Measure crankshaft and balancer shaft axial play.
 - If axial play is out of specification, replace thrust washers.
4. Connecting rod axial play out of specification
 - Measure connecting rod axial play on crankshaft.
 - Replace connecting rod or crankshaft if out of specification.
5. Connecting rod screws got loose
 - Replace damaged components and retighten screws with the recommended torque.

BLUE SMOKE IN THE EXHAUST

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

ENGINE SUDDENLY TURNS OFF (POOR IDLING)

1. Piston rings worn out
 - Replace piston rings.

2. Piston/cylinder wall clearance out of specification
 - Check piston/cylinder wall clearance.
 - Replace if out of specification.
3. Melted or broken piston
 - Check if oil spray nozzle is not clogged. Refer to *LUBRICATION SYSTEM* subsection.
 - Replace piston and cylinder block if necessary.

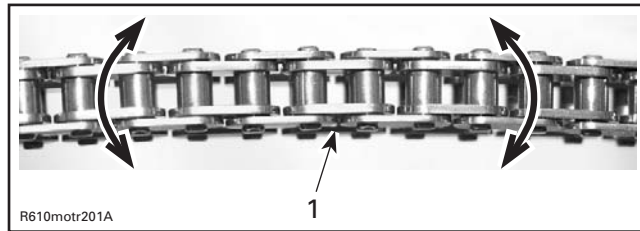
PROCEDURES

TIMING CHAIN

Inspecting the Timing Chain

Check timing chain on camshaft gear for excessive radial play.

Check chain condition for wear and rollers condition.



1. Timing chain

If chain is excessively worn or damaged, replace it as a set (camshaft timing gear and timing chain).

Removing the Timing Chain

Remove:

- Engine from vehicle (refer to *ENGINE REMOVAL AND INSTALLATION* subsection)
- Cylinder head (refer to *CYLINDER HEAD* subsection)
- PTO housing (refer to *PTO HOUSING, MAGNETO AND STARTER* subsection)
- Crankshaft (refer to *CRANKSHAFT* in this subsection)
- Timing chain.

Installing the Timing Chain

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

Ensure to perform proper valve timing.

NOTICE Improper valve timing will damage engine components.

Lock crankshaft and camshaft at TDC (refer to *CYLINDER HEAD* subsection for the camshaft locking procedure).

Install chain, then install chain tensioner.

CHAIN TENSIONER

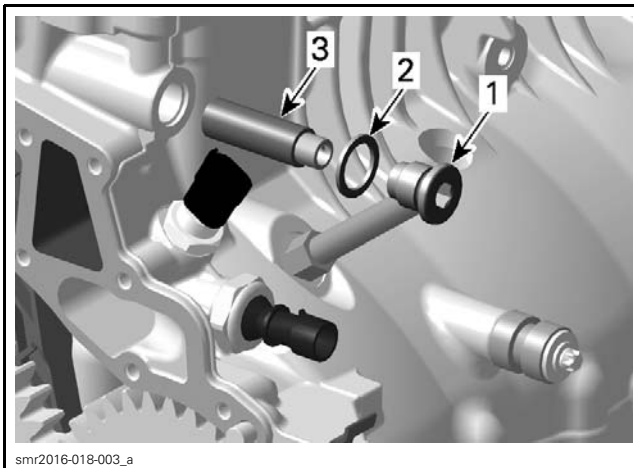
Chain Tensioner Access

NOTE: Removal of the intake manifold allows easier access to the chain tensioner, but is not necessary. Refer to *INTAKE MANIFOLD* subsection.

Removing the Chain Tensioner

Lock crankshaft, refer to *CRANKSHAFT LOCKING PROCEDURE* in this subsection.

Remove the chain tensioner.



1. Plug screw
2. Gasket ring (discard)
3. Chain tensioner

Inspecting the Chain Tensioner

Check chain tensioner for:

- excessive wear
- cracks
- free movement of the chain tensioner piston.

Installing the Chain Tensioner

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

Install plug screw with a **NEW** gasket ring.

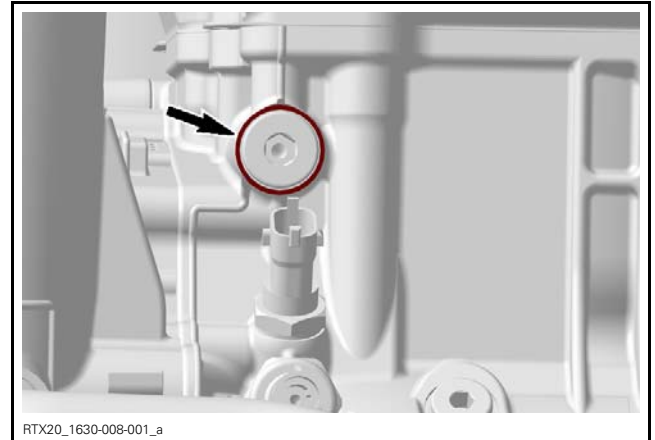
Tighten the chain tensioner plug screw to specification.

TIGHTENING TORQUE	
Chain tensioner plug screw	17 N•m ± 2 N•m (150 lbf•in ± 18 lbf•in)

Apply sealant around gasket ring as defined in the illustration.

NOTE: Gasket ring of must be coated completely.

SERVICE PRODUCT
BLACK NEOPRENE PAINT (P/N 909570)



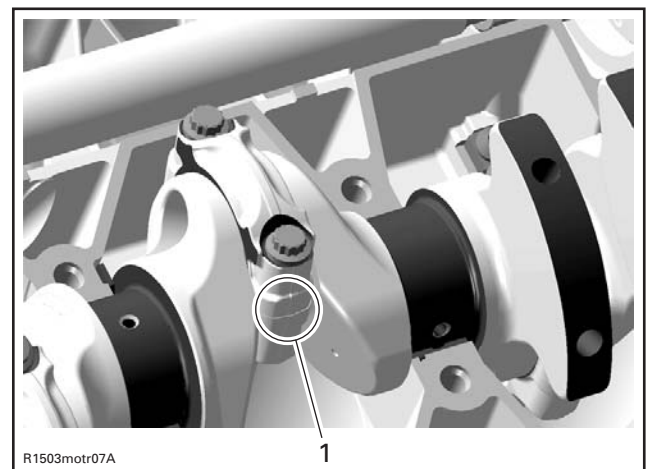
PISTONS AND CONNECTING RODS

Removing the Piston and Connecting Rod

1. Disassemble *CYLINDER BLOCK* as per procedure in this subsection.

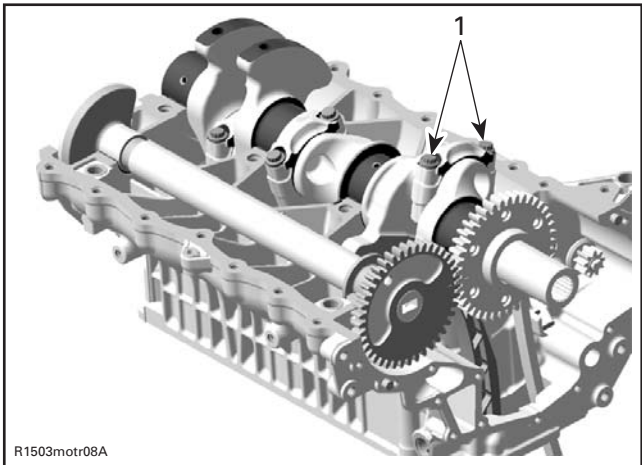
NOTE: It is recommended to measure connecting rod big end axial play prior to remove connecting rod. Refer to *INSPECTION* below.

2. Mark the connecting rod caps to remember the right position when reassembling.



1. Connecting rod mark

3. Remove connecting rod caps.



1. Connecting rod screws

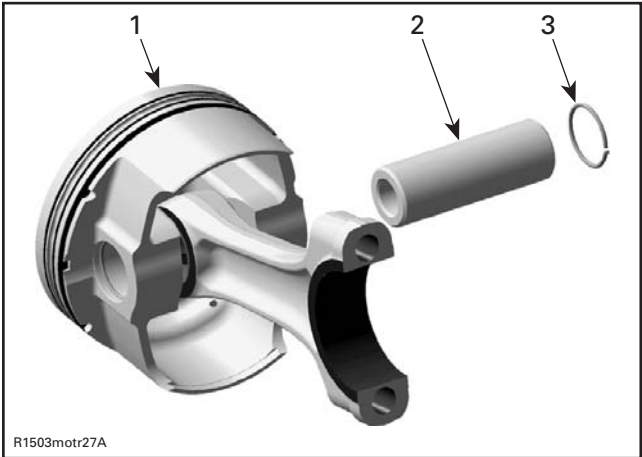
- 4. Pull piston with connecting rod out of the cylinders.
- 5. Remove one piston circlip and discard it.



1. Piston circlip

NOTE: The removal of both piston circlips is not necessary to remove piston pin.

6. Push piston pin out of piston.



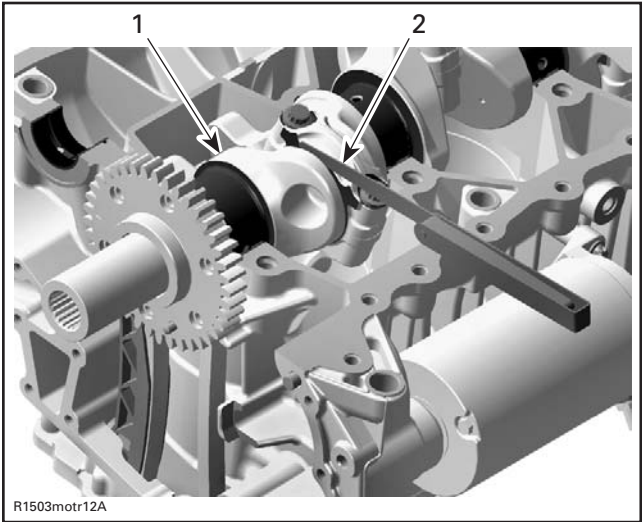
1. Piston
2. Piston pin
3. Circlip

- 7. 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.

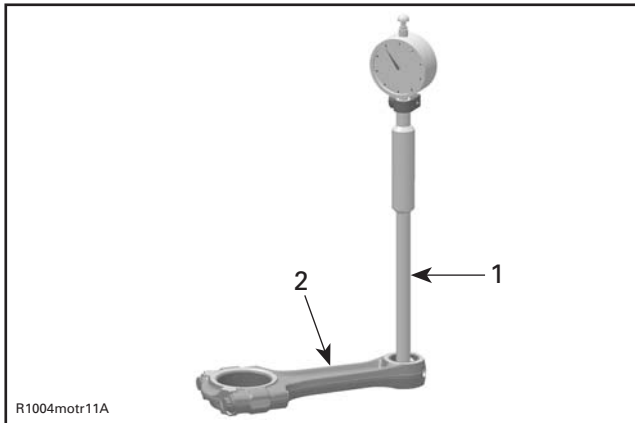


1. Crankshaft
2. Feeler gauge

CONNECTING ROD BIG END AXIAL PLAY	
New	0.100 mm to 0.452 mm (.004 in to .018 in)
Service limit	0.500 mm (.02 in)

Connecting Rod Small End Radial Play

Measure connecting rod small end.


TYPICAL

1. Bore gauge
2. Connecting rod

CONNECTING ROD SMALL END DIAMETER	
New	22.01 mm to 22.02 mm (.8665 in to .8669 in)
Service limit	22.07 mm (.8689 in)

If the connecting rod small end diameter is out of specification, replace the connecting rod.

Measure piston pins, refer to *INSPECTING THE PISTON PIN* in this subsection. Compare to inside diameter of connecting rod to obtain connecting rod small end radial play.

CONNECTING ROD SMALL END RADIAL PLAY	
Service limit	0.080 mm (.003 in)

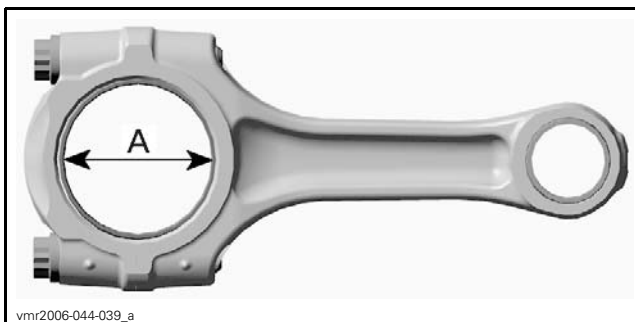
Connecting Rod Big End Radial Play

Measure inside diameter of connecting rod big end. Compare to crankshaft pin.

To measure the connecting rod big end diameter, use the **OLD** screws.

Install the **OLD** bearings as they were mounted initially.

Tighten connecting rod screws, refer to *INSTALLING THE PISTON AND CONNECTING ROD* in this subsection.


TYPICAL

- A. Connecting rod big end bearing

CONNECTING ROD BIG END DIAMETER	
Service limit	45.080 mm (1.7748 in)

CONNECTING ROD BIG END RADIAL PLAY	
Service limit	0.090 mm (.0035 in)

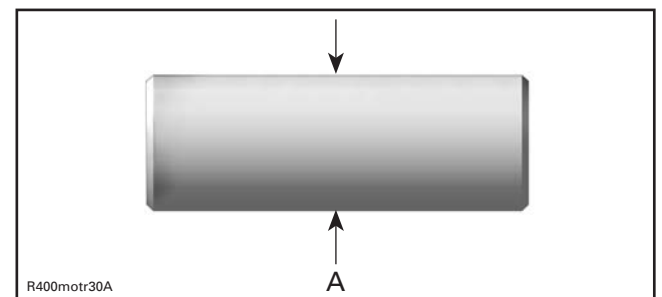
Use **NEW** bearings, when connecting rod big end diameter is out of specification.

Inspecting the Piston Pin

Using synthetic abrasive woven, clean piston pin from deposits.

Inspect piston pin for scoring, cracking or other damages.

Measure piston pin. See the following illustration for the proper measurement position.


TYPICAL

- A. Piston pin diameter here

PISTON PIN DIAMETER	
New	21.996 mm to 22.000 mm (.866 in to .8661 in)
Service limit	21.990 mm (.8657 in)

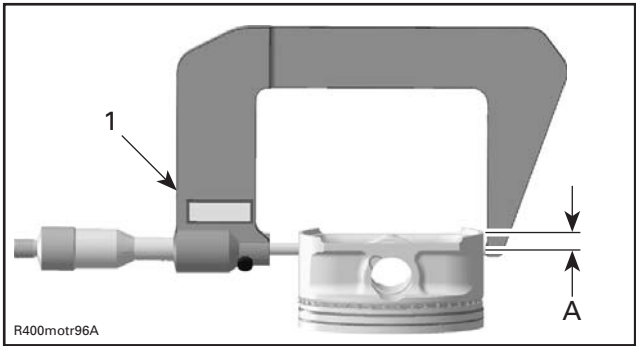
Measure connecting rod small end diameter, refer to *CONNECTING RODS INSPECTION* in this subsection to check connecting rod small end radial play.

Inspecting the Piston

Inspect piston for scoring, cracking or other damages. Replace piston and piston rings if necessary.

Using a micrometer, measure piston at 18 mm (.709 in) perpendicularly (90°) to piston pin axis.

Subsection XX (CYLINDER BLOCK)



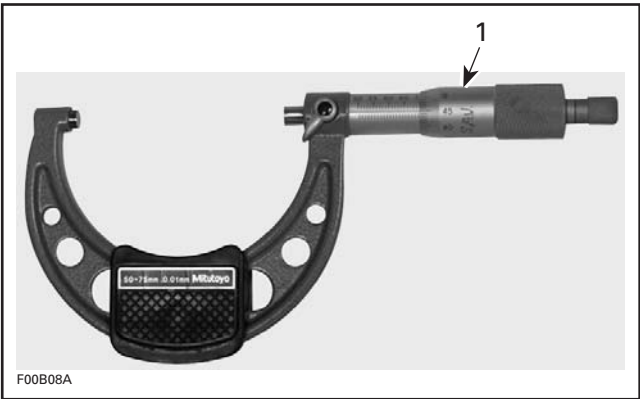
TYPICAL
1. Measuring perpendicularly (90°) to piston pin axis
A. 18 mm (.709 in)

The measured dimension should be as described in the subsequent table. If not, replace piston.

ENGINE TYPE	PISTON MEASUREMENT	
130 170 230	New	99.951 mm to 99.969 mm (3.9351 in to 3.9358 in)
	Service limit	99.900 mm (3.9331 in)
300	New	99.931 mm to 99.949 mm (3.9343 in to 3.935 in)
	Service limit	99.900 mm (3.9331 in)

Piston/Cylinder Wall Clearance

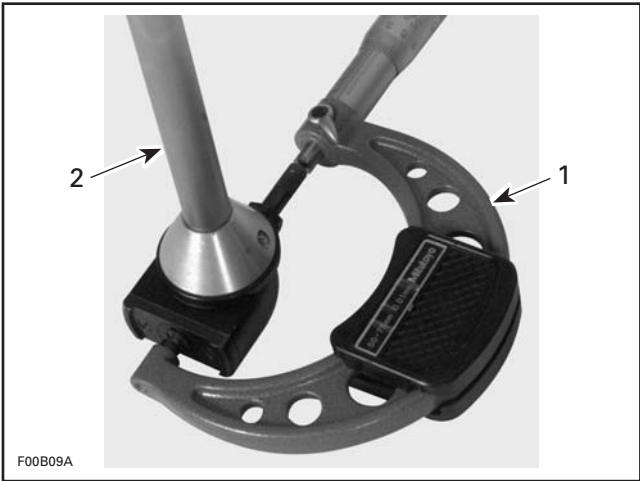
Adjust and lock a micrometer to the piston dimension.



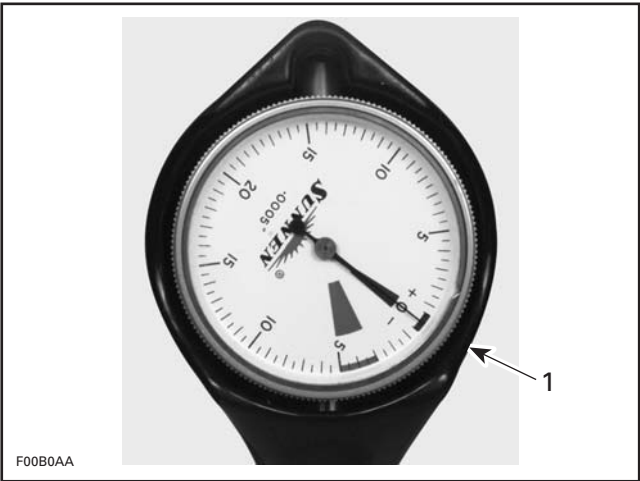
1. Micrometer set to the piston dimension

NOTE: Make sure used piston is not worn.

With the micrometer set to the dimension, adjust a cylinder bore gauge to the micrometer dimension and set the indicator to 0 (zero).



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

Position the dial bore gauge 62 mm (2.44 in) above cylinder base, measuring perpendicularly (90°) to piston pin axis.

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

ENGINE TYPE	PISTON/CYLINDER CLEARANCE	
130 170 230	New	0.024 mm to 0.056 mm (.0009 in to .0022 in)
	Service limit	0.100 mm (.0039 in)
300	New	0.044 mm to 0.076 mm (.0017 in to .003 in)
	Service limit	0.100 mm (.0039 in)

If clearance exceeds specified tolerance, replace cylinder block and pistons.

Piston and Connecting Rod Assembly

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

1. Apply engine oil on the piston pin.
2. Insert piston pin into piston and connecting rod.

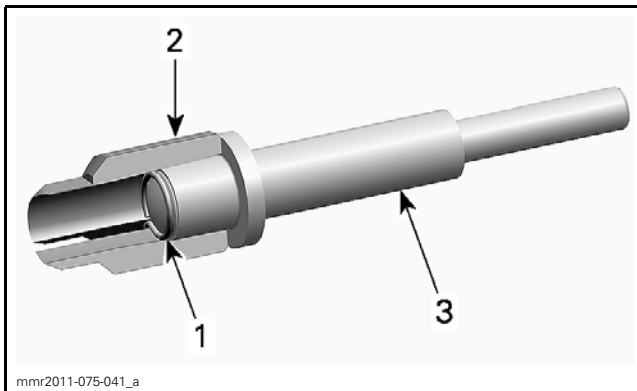
NOTE: Be sure to reinstall all parts in their original position as marked during removal.

3. Install **NEW** piston circlip.

REQUIRED TOOL	
PISTON CIRCLIP INSTALLER (P/N 529 036 368)	

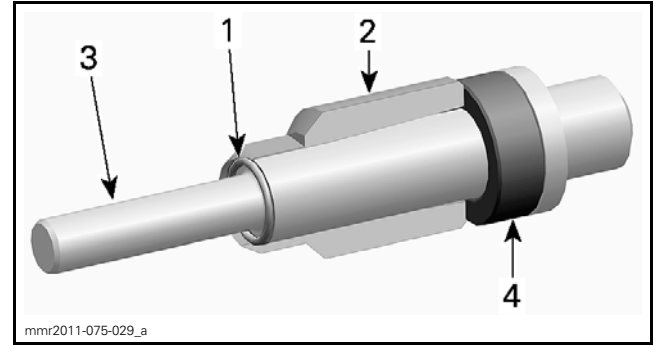
NOTICE Always replace removed piston pin circlips by **NEW** ones.

- 3.1 Place the circlip in the sleeve and push piston circlip installer handle until circlip reaches the mid position in the sleeve.



TYPICAL
1. Circlip
2. Sleeve
3. Installer handle

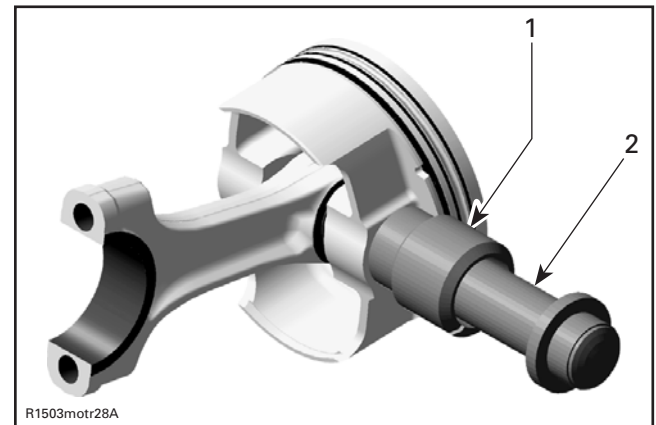
- 3.2 Put the distance sleeve on the installer handle.
- 3.3 Push piston circlip installer handle until distance sleeve makes contact with the sleeve.



TYPICAL
1. Circlip
2. Sleeve
3. Installer handle
4. Distance sleeve

- 3.4 Remove distance sleeve and insert installer handle into the sleeve.

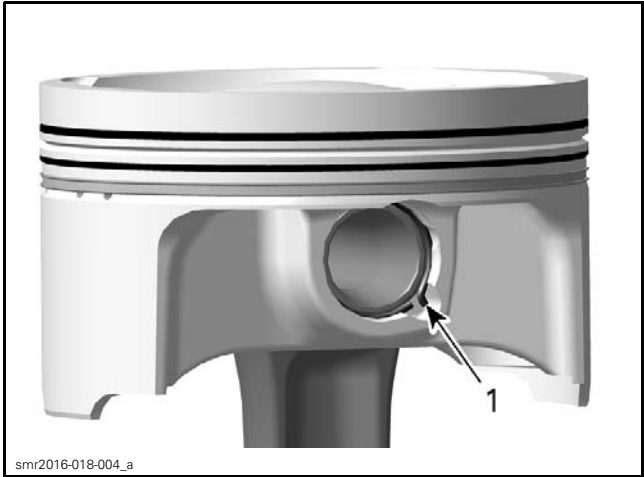
- 3.5 Insert the end of the handle into the piston pin, then push to engage the circlip in the piston groove.



TYPICAL
1. Sleeve with piston circlip inside
2. Assembly jig from piston clip installer

NOTICE If piston pin circlip installation fails, repeat step 3 by using a **NEW** circlip.

NOTE: Ensure that hook of the piston circlip is positioned properly.

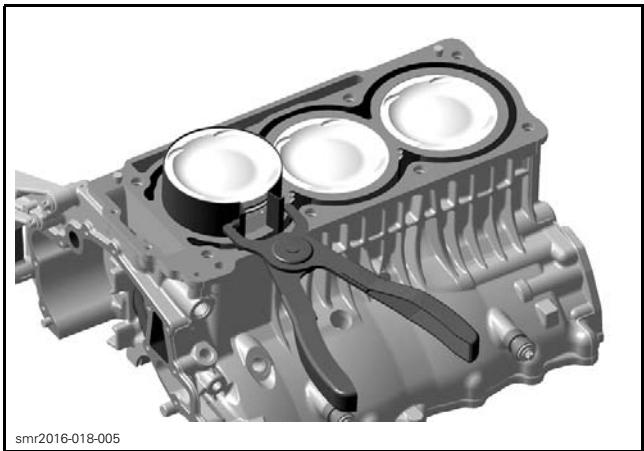


CORRECT POSITION OF THE PISTON CIRCLIP

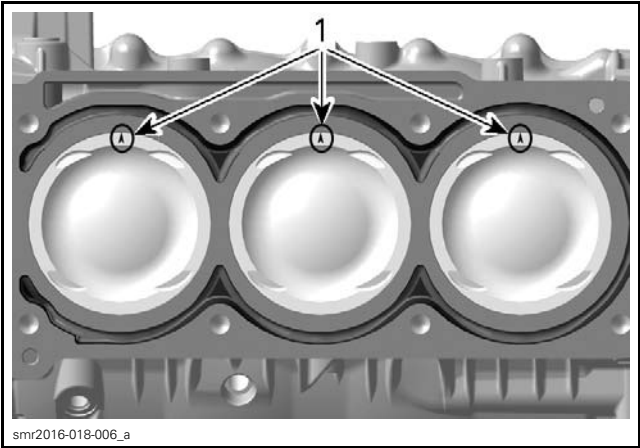
Installing the Piston and Connecting Rod

1. Use engine oil and lubricate:
- Piston
 - Piston rings
 - Band of the piston ring compressor tool
 - Connecting rod bearings.
 - Cylinder bore
2. Slide piston into cylinder.

REQUIRED TOOL
Piston ring compressor pliers

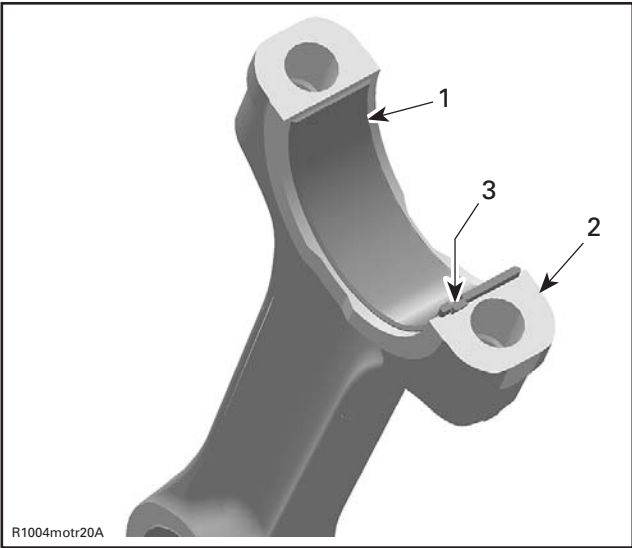


NOTICE Install piston with punched arrow toward exhaust side.



1. Arrows toward exhaust side

3. Correctly install bearings and carefully clean split surface on both sides (cracked area).



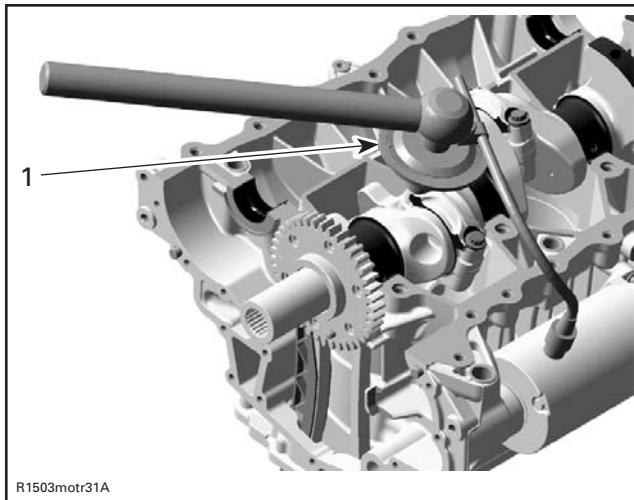
- TYPICAL**
- 1. Half bearing of connecting rod big end
 - 2. Split surface of the connecting rod
 - 3. Protrusion of bearing in line with connecting rod groove

4. Tighten **NEW** connecting rod screws as per following procedure:

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

NOTICE All connecting rod screws must be torque **FIRST** according to step A before performing the step B.

TIGHTENING PROCEDURE		
Connecting rod screws	Step A	45 N•m ± 3 N•m (33 lbf•ft ± 2 lbf•ft)
	Step B	Additional 90° ± 5°



1. Angle torque wrench

PISTON RINGS

Removing the Piston Ring

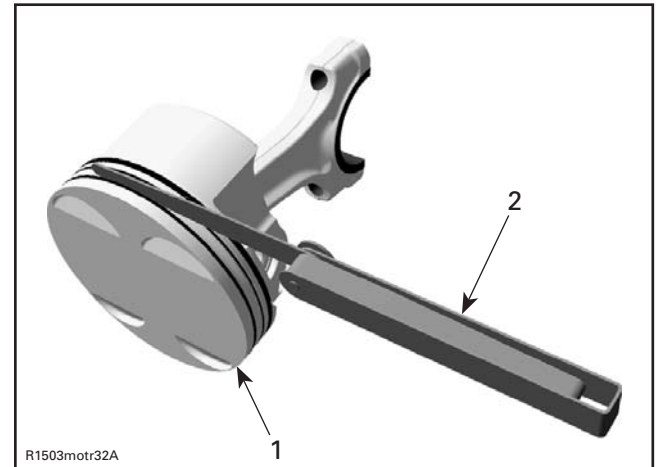
Remove piston, see procedure in this subsection.
Remove piston rings.

Inspecting the Piston Ring Inspection

Ring/Piston Groove Clearance

Using a feeler gauge measure each ring/piston groove clearance. If the clearance is too large, the piston and the piston rings should be replaced.

ENGINE TYPE	RING/PISTON GROOVE CLEARANCE	
RECTANGULAR		
130 170 230	NEW	0.010 mm to 0.060 mm (.0004 in to .0024 in)
300	NEW	0.025 mm to 0.070 mm (.001 in to .0028 in)
All	SERVICE LIMIT	0.150 mm (.0059 in)
TAPER-FACE		
All	NEW	0.015 mm to 0.060 mm (.0006 in to .0024 in)
	SERVICE LIMIT	0.150 mm (.0059 in)
OIL SCRAPER RING		
All	NEW	0.010 mm to 0.180 mm (.0004 in to .0071 in)
	SERVICE LIMIT	0.200 mm (.0079 in)


1. Piston
2. Filler gauge

Ring End Gap

ENGINE TYPE	RING END GAP	
	NEW	
130 170 230	RECTANGULAR	0.20 mm to 0.40 mm (.008 in to .016 in)
300		0.30 mm to 0.50 mm (.012 in to .02 in)
130 170 230	TAPER-FACE	0.70 mm to 0.95 mm (.028 in to .037 in)
300		0.35 mm to 0.55 mm (.014 in to .022 in)
All	OIL SCRAPER RING	0.20 mm to 0.70 mm (.008 in to .028 in)
	SERVICE LIMIT	
All	ALL	1.20 mm (.047 in)

Measure position for ring end gap in the area of 8 mm to 16 mm (.315 in to .63 in) from top of cylinder.

NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

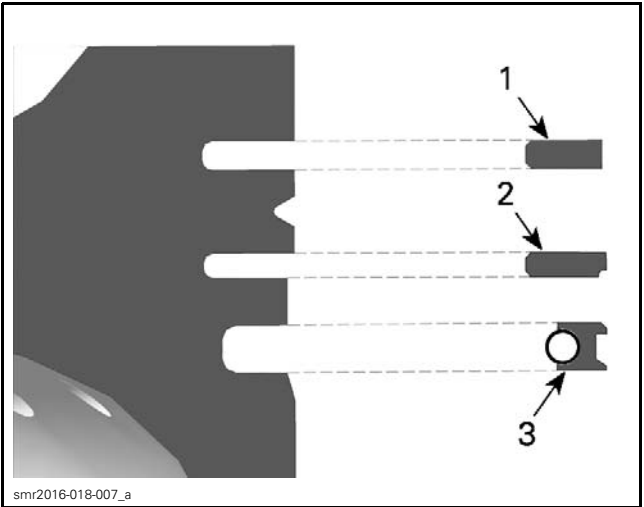
Using a feeler gauge, check ring end gap. Replace ring if gap exceeds service limit.

Installing the Piston Ring

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

Install rings in the following order and layout:

PISTON RING INSTALLATION		
ORDER	RING	POSITION
FIRST STEP	Oil scraper ring	equal
SECOND STEP	Taper-face ring	Stamped "E" and "TOP" facing UP
THIRD STEP	Rectangular ring	Stamped "E" and "TOP" facing UP

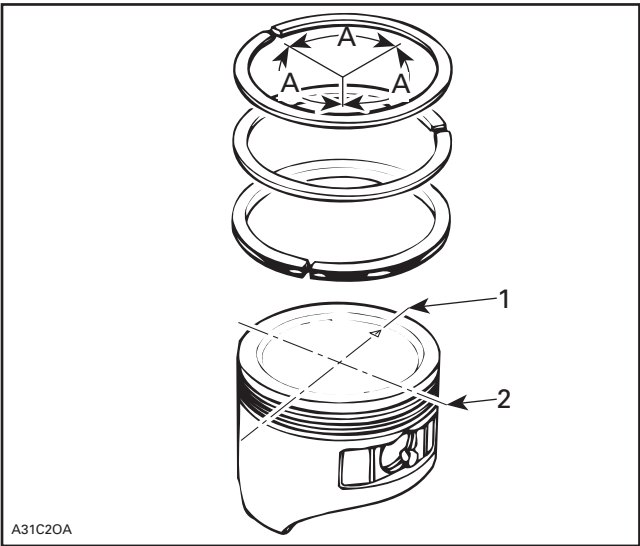


- 1. Rectangular ring
- 2. Taper-face ring
- 3. Oil scraper ring

NOTICE Ensure that top and second rings are not interchanged.

NOTE: Use a ring expander to prevent breakage during installation. The oil ring must be installed by hand.

Check that rings rotate smoothly after installation. Space the piston ring end gaps 120° apart and do not align the gaps with the piston pin bore or the thrust side axis.



- 1. DO NOT align ring gap with piston trust side axis
- 2. DO NOT align ring gap with piston pin bore axis
- A. 120°

CRANKSHAFT

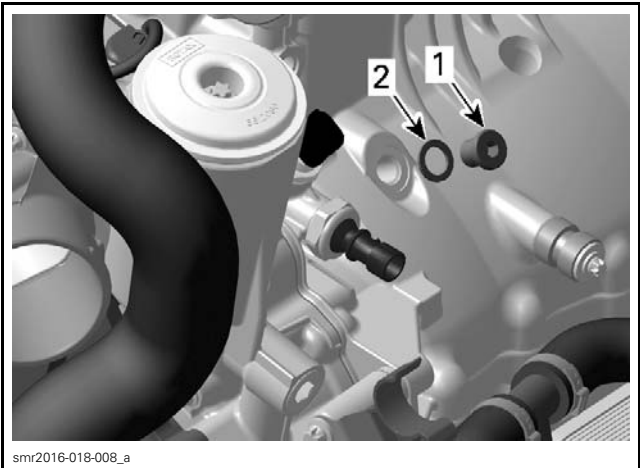
Crankshaft Locking Procedure

NOTICE The crankshaft must be locked at TDC for removal and installation of crankshaft, balancer shaft and camshaft.

NOTE: When the crankshaft is locked, the piston of cylinder 3 is at ignition TDC.

Remove:

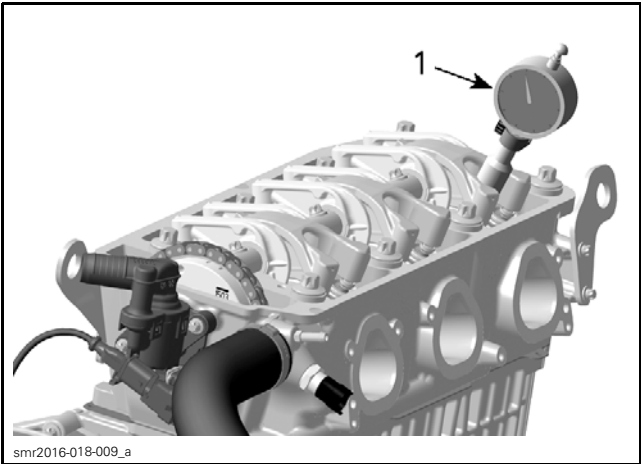
- Intake manifold (refer to *INTAKE MANIFOLD* subsection)
- Spark plugs
- Valve cover (refer to *CYLINDER HEAD* subsection)
- Crankshaft access plug screw.



- 1. Crankshaft access plug screw
- 2. Gasket ring

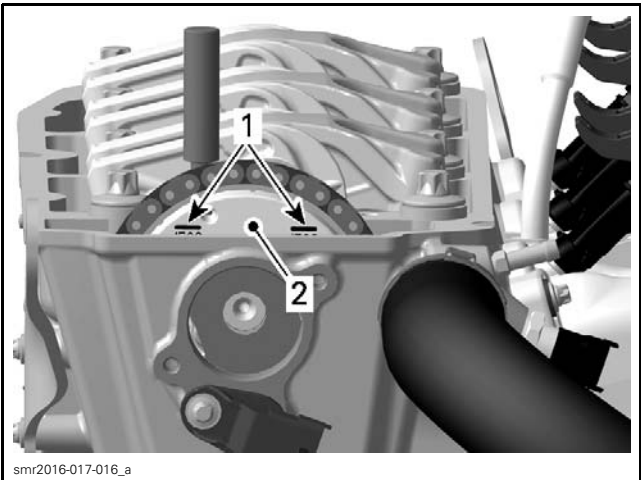
Turn engine counterclockwise.
Bring piston of cylinder 3 to ignition TDC, using a dial gauge or another similarly suitable tool.

NOTICE Do not scratch or damage piston and cylinder surface.



1. Dial gauge

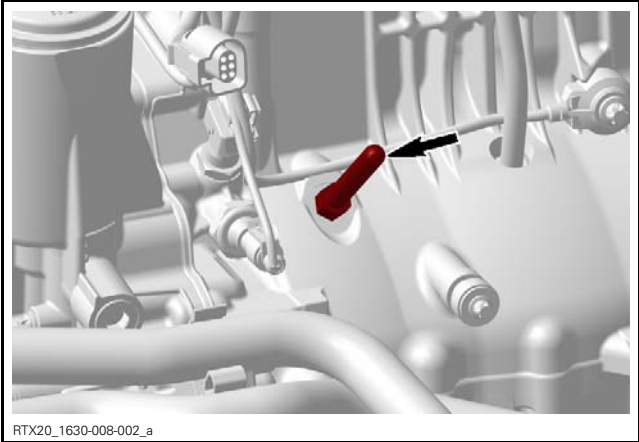
NOTE: When the piston of cylinder 3 is at ignition TDC, the position lines on oil separator cover must be lined up as shown in the following illustration.



1. Position lines
2. Oil separator cover

Use a small screwdriver to check if the groove in the crankshaft is aligned with the hole.
In this position, lock the crankshaft.

REQUIRED TOOL	
CRANKSHAFT LOCKING TOOL (P/N 529 035 821)	



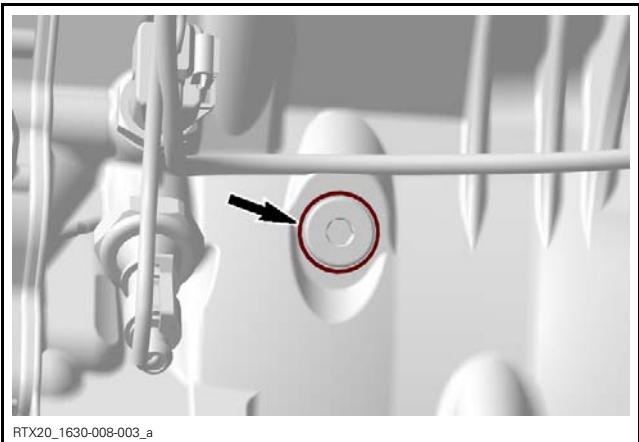
After removing the crankshaft locking tool install plug screw with a **NEW** gasket ring.

TIGHTENING TORQUE	
Plug screw	17 N•m ± 2 N•m (150 lbf•in ± 18 lbf•in)

Apply sealant around gasket ring as defined in the illustration.

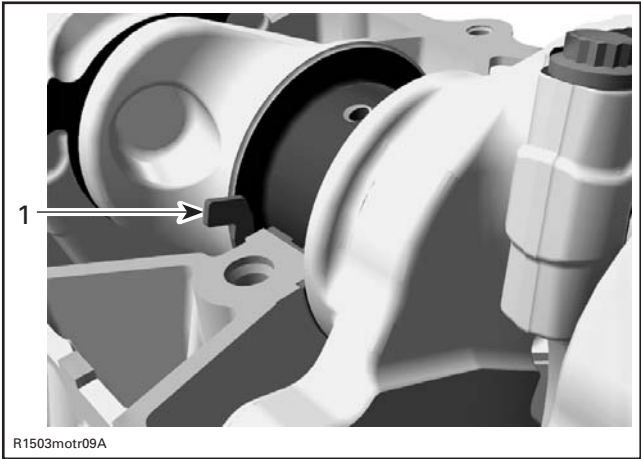
NOTE: Gasket ring must be coated completely.

SERVICE PRODUCT
BLACK NEOPRENE PAINT (P/N 909570)



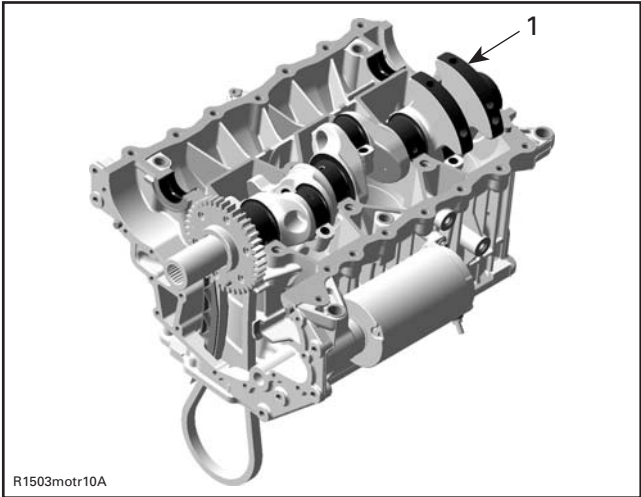
Removing the Crankshaft

1. Disassemble *CYLINDER BLOCK* as per procedure described in this subsection.
2. Remove connecting rod screws. Refer to *PISTONS AND CONNECTING RODS* in this subsection.
3. Remove thrust washers.



1. Thrust washer

4. Remove crankshaft.

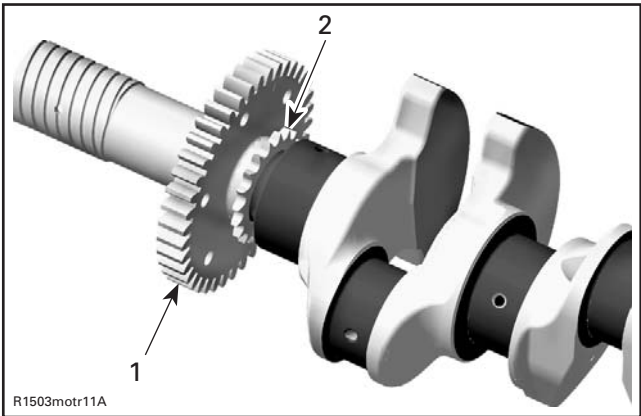


1. Crankshaft

Inspecting the Crankshaft

Inspecting the Crankshaft Gear

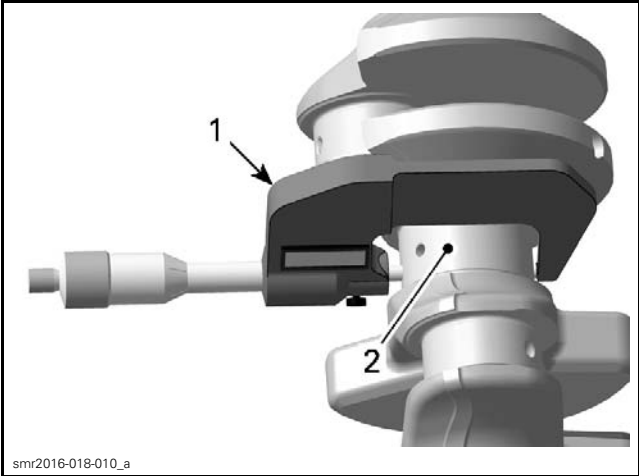
Replace crankshaft if the gears are worn or otherwise damaged.



1. Balancer gear
2. Crankshaft timing gear

Crankshaft Radial Play

Measure all crankshaft journals. Compare to inside diameter of crankshaft bearings, refer to *CYLINDER BLOCK* in this subsection.



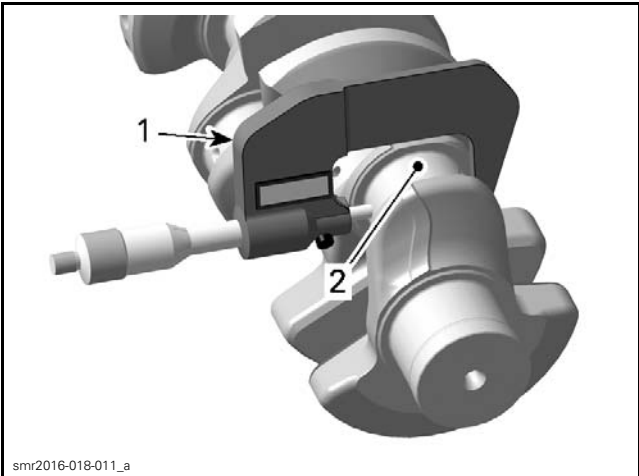
1. Micrometer
2. Crankshaft area for bearing

CRANKSHAFT JOURNAL DIAMETER	
New	49.991 mm to 50.010 mm (1.9681 in to 1.9689 in)
Service limit	49.950 mm (1.9665 in)

CRANKSHAFT JOURNAL RADIAL CLEARANCE	
Service limit	0.07 mm (.0028 in)

Crankshaft Pin

Measure all crankshaft pin diameters. Compare to inside diameter of connecting rod bearings, refer to *PISTONS AND CONNECTING RODS* in this subsection.



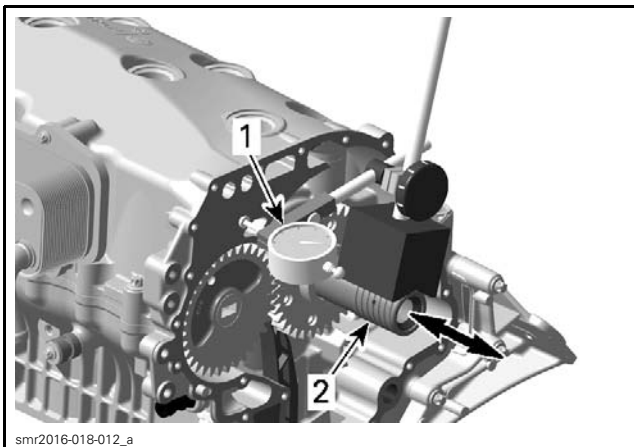
1. Micrometer
2. Crankshaft pin area for bearing

CRANKSHAFT PIN DIAMETER	
New	45.032 mm to 45.048 mm (1.7729 in to 1.7735 in)
Service limit	45.025 mm (1.7726 in)

CONNECTING ROD BIG END RADIAL PLAY	
Service limit	0.090 mm (.0035 in)

Crankshaft Axial Clearance

When assembling the cylinder-block, measure the crankshaft axial clearance.



1. Dial gauge
2. Crankshaft

CRANKSHAFT AXIAL CLEARANCE	
New	0.08 mm to 0.31 mm (.003 in to .012 in)
Service limit	0.35 mm (.014 in)

Installing the Crankshaft

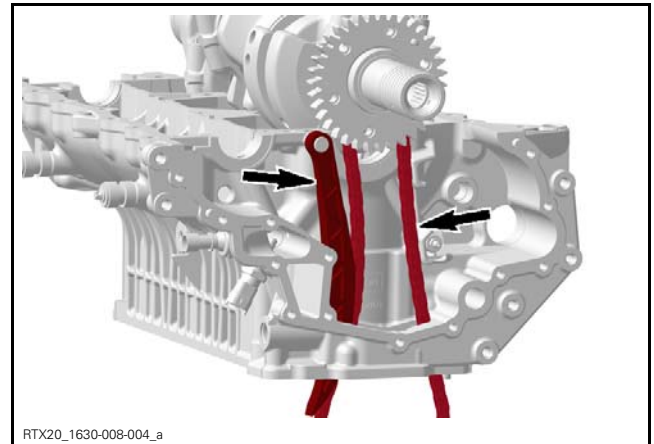
The installation is the reverse of the removal procedure. However, pay attention to following.

NOTE: Be careful that connecting rods do not hit the cylinder block.

NOTICE Before installing the crankshaft, ensure that:

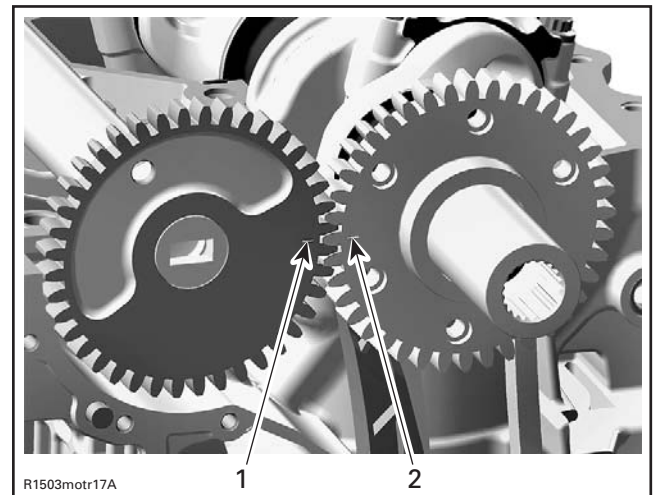
- chain guide is already installed
- timing chain is installed on crankshaft timing gear.

Those parts cannot be installed when the crankshaft is in place.



Install crankshaft with the timing chain.

NOTICE Crankshaft and balancer shaft marks must be aligned.

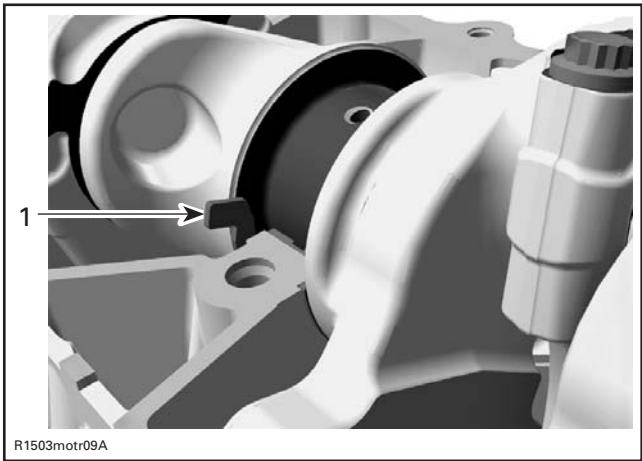


1. Mark on balancer shaft
2. Mark on crankshaft

Install connecting rod caps, refer to *PISTONS AND CONNECTING RODS* in this subsection.

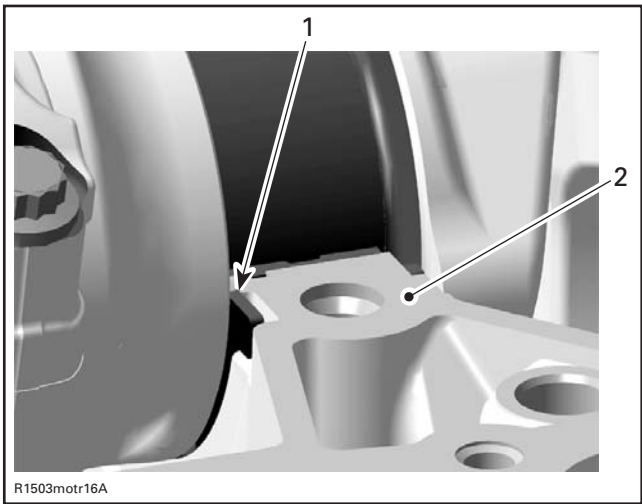
NOTICE It is absolutely necessary to follow this procedure. Otherwise severe engine damage can occur.

Insert thrust washers as soon as crankshaft is in place as per following illustration.



THRUST WASHER INSERT DIRECTION
1. Thrust washer

NOTICE Thrust washers have to be flush with the cylinder block sealing surface.

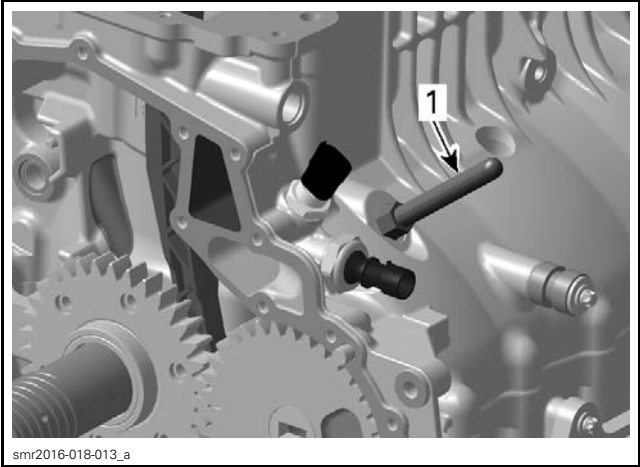


1. Thrust washer
2. Sealing surface

Install cylinder block lower half. Refer to *CYLINDER BLOCK* in this subsection.

Lock crankshaft at TDC before installing the camshaft and the rocker arms (refer to *CYLINDER HEAD* subsection).

REQUIRED TOOL	
CRANKSHAFT LOCKING TOOL (P/N 529 035 821)	

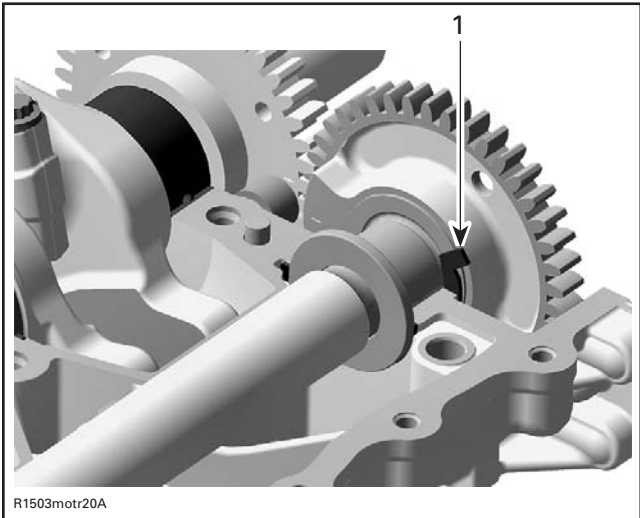


1. Crankshaft locking tool

BALANCER SHAFT

Removing the Balancer Shaft

1. Disassemble *CYLINDER BLOCK*, see procedure in this subsection.
2. Remove thrust washers.



1. Thrust washer

3. Remove balancer shaft.

Inspecting the Balancer Shaft

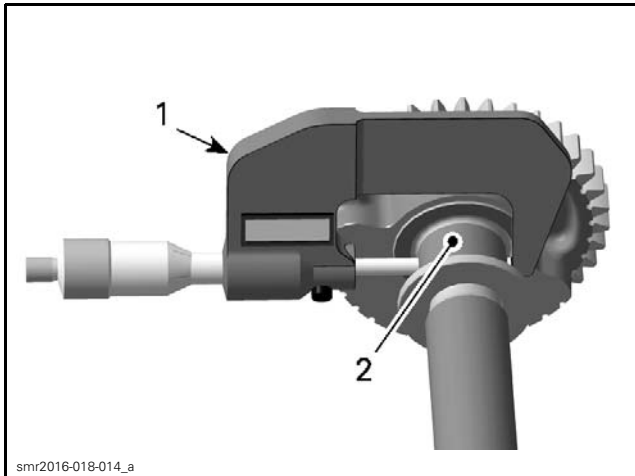
Check balancer shaft and replace if damaged.

If the gear on the balancer shaft is damaged, replace balancer shaft.

Check gear on the crankshaft at the same time and replace crankshaft if necessary (refer to *CRANKSHAFT* in this subsection).

Balancer Shaft Bearing Seat Play

Measure all balancer shaft bearing journals. Compare to inside diameter of balancer shaft bearings (see *INSPECTING THE CYLINDER BLOCK* in this subsection).



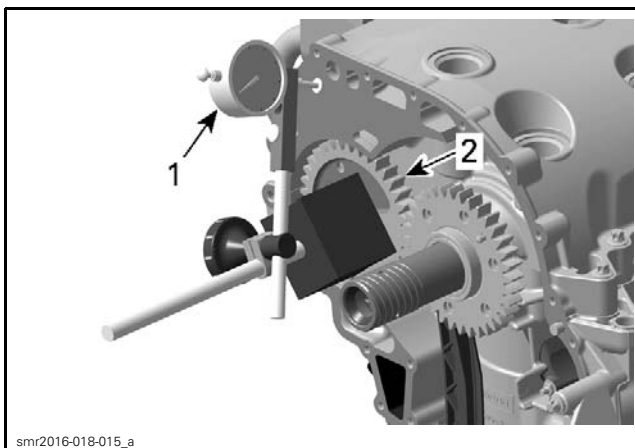
1. Micrometer
2. Balancer shaft area for bearing

BALANCER SHAFT JOURNAL DIAMETER	
New	31.984 mm to 32.000 mm (1.2592 in to 1.2598 in)
Service limit	31.950 mm (1.2579 in)

BALANCER SHAFT JOURNAL RADIAL CLEARANCE	
Service limit	0.070 mm (.0028 in)

Balancer Shaft Axial Clearance

When assembling the cylinder-block, measure the balance shaft axial play.



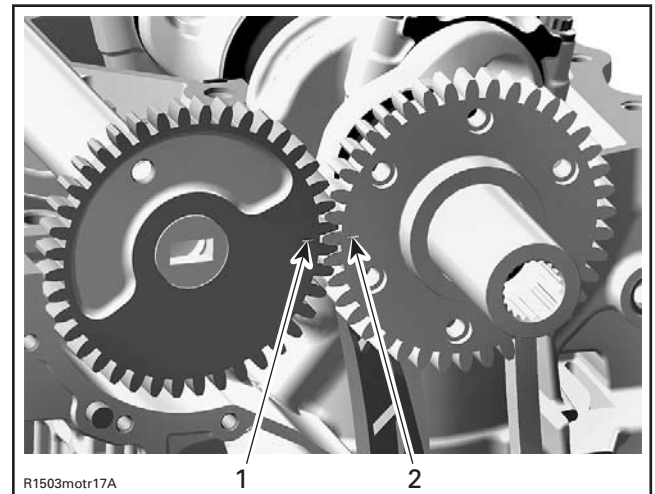
1. Dial gauge
2. Balancer shaft

BALANCER SHAFT AXIAL CLEARANCE	
New	0.02 mm to 0.25 mm (.001 in to .01 in)
Service limit	0.35 mm (.014 in)

Installing the Balancer Shaft

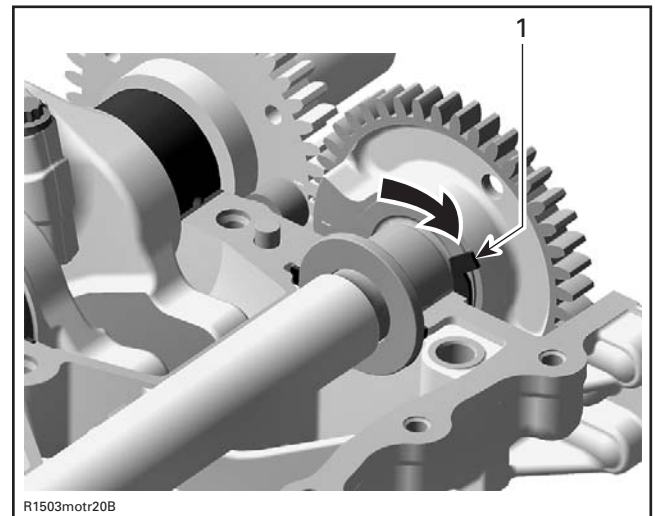
The installation is the reverse of the removal procedure. However, pay attention to following.

NOTICE Balancer shaft and crankshaft marks have to be aligned.



1. Mark on balancer shaft
2. Mark on crankshaft

Install thrust washers in place as per following illustration.

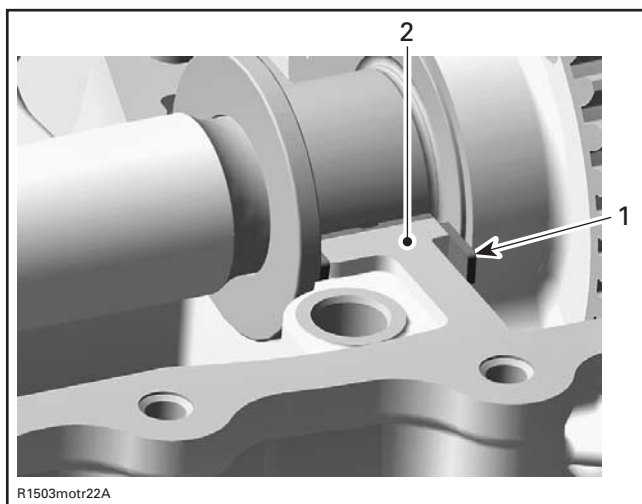


THRUST WASHER INSERT DIRECTION

1. Thrust washer

NOTICE Thrust washers must be flush with the cylinder block sealing surface.

Subsection XX (CYLINDER BLOCK)



1. Thrust washer
2. Sealing surface

Install cylinder block lower half. Refer to *CYLINDER BLOCK* in this subsection.

Reassemble engine in accordance with the proper assembly procedures.

CYLINDER BLOCK

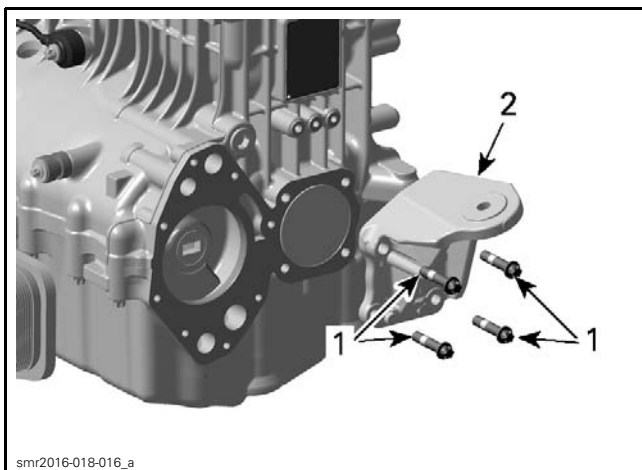
Disassembling the Cylinder Block

Refer to *PTO HOUSING, MAGNETO AND STARTER* subsection and remove:

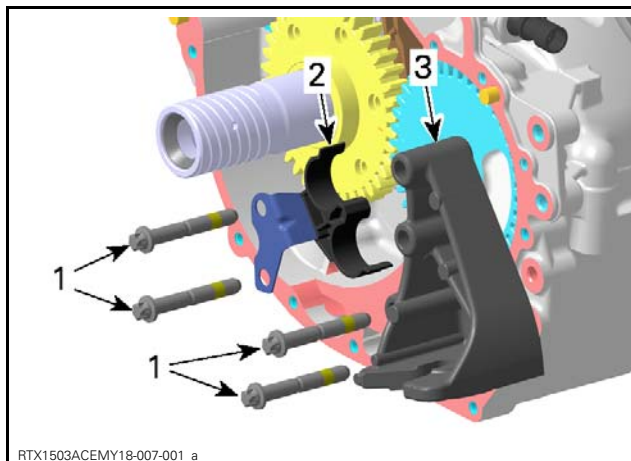
- PTO housing
- Starter gear
- Starter drive.

Refer to *LUBRICATION SYSTEM* subsection and remove oil suction pump.

Remove engine mounting brackets.



1. Retaining screws
2. Engine mounting bracket



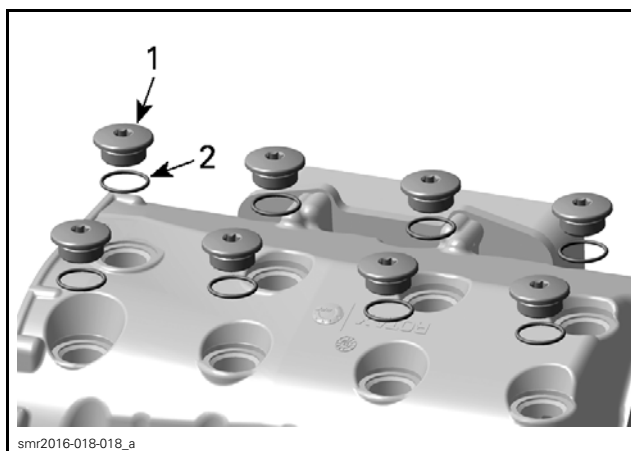
TYPICAL

1. Retaining screws
2. Hose bracket
3. Engine mounting bracket

Refer to *CYLINDER HEAD* subsection and remove cylinder head.

NOTE: Before splitting the cylinder block, measure crankshaft axial play. Refer to *CRANKSHAFT* in this subsection.

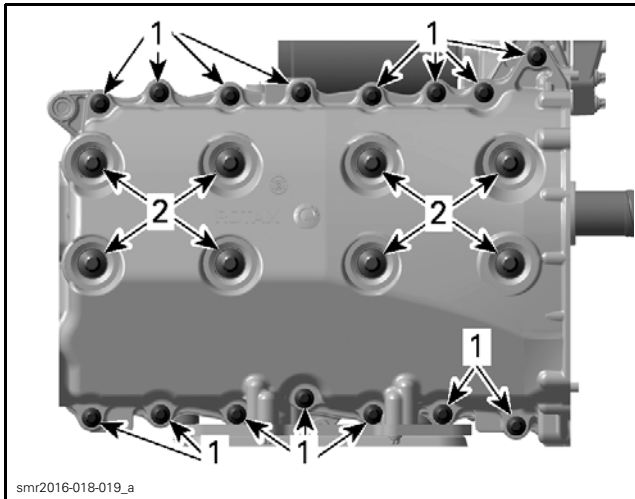
Remove oil reservoir plug screws with O-rings.



1. Oil reservoir plug screw
2. O-ring

Remove cylinder block screws:

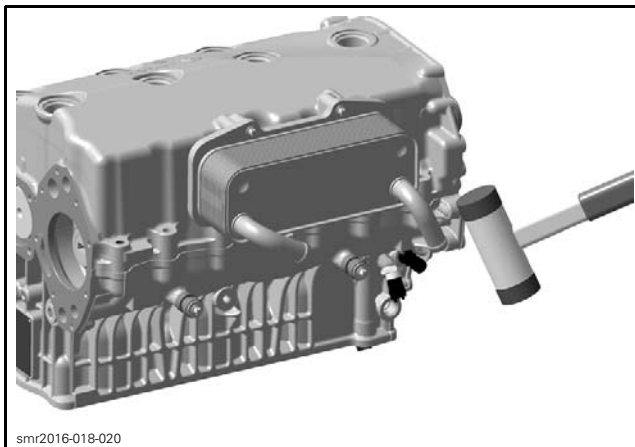
1. Start removing the M8 screws.
2. Then remove the M10 screws.



1. M8 screws
2. M10 screws

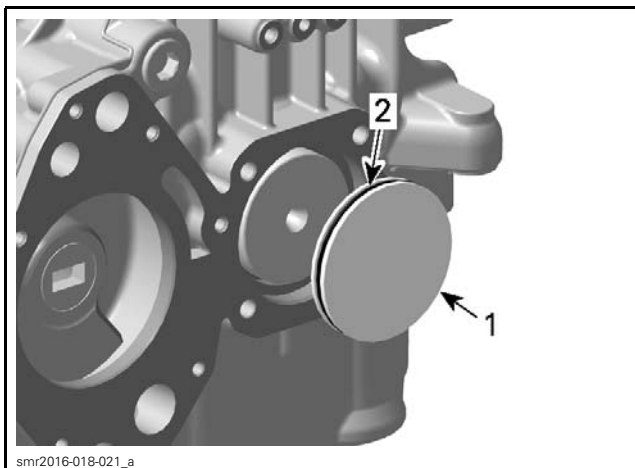
Carefully remove cylinder block lower half by using a soft hammer.

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



TYPICAL

Remove crankshaft cover with O-ring.



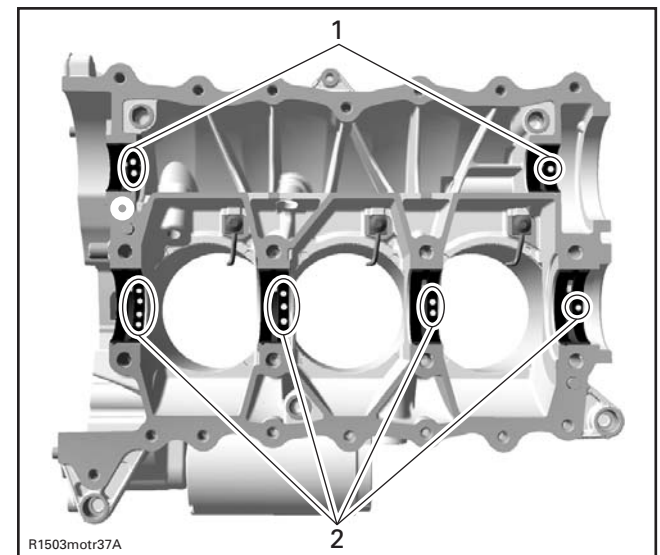
1. Crankshaft cover
2. O-ring

Refer to procedures in this subsection and remove:

- Balancer shaft
- Crankshaft
- Piston with connecting rod.

Removing the Plain Bearings

When the plain bearings of crankshaft and balancer shaft need to be removed from the cylinder block, mark them to identify the correct position at installation. See the following illustration for an example:



1. Marks on balancer shaft bearings
2. Marks on crankshaft 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.

Clean all metal components in a solvent.

Clean 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).

SERVICE PRODUCT
LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500)

NOTICE Do not wipe with rags. Use a new clean hand towel only.

Subsection XX (CYLINDER BLOCK)

Inspecting the Cylinder Block

Cylinder Block and Cylinder Bores

Check cylinder block for cracks or other damage.

Check cylinder block mating surfaces for flatness using a straight edge.

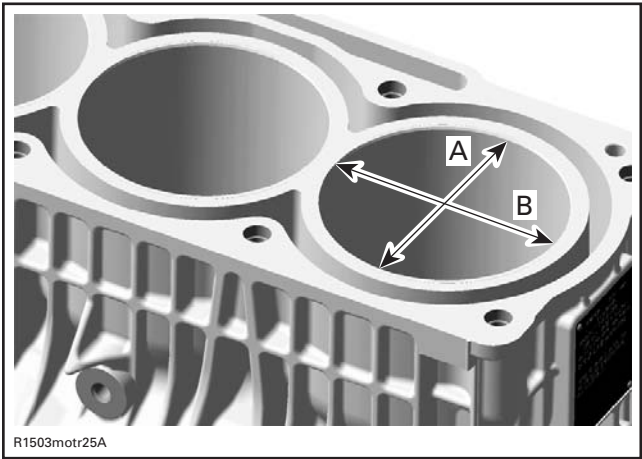
Check cylinder bores for cracks, scoring and wear ridges on the top and bottom of the cylinder.

Replace cylinder block if necessary.

Cylinder Taper

Measure cylinder bore and if it is out of specifications.

Measure cylinder bore at 3 recommended positions. See the following illustration.



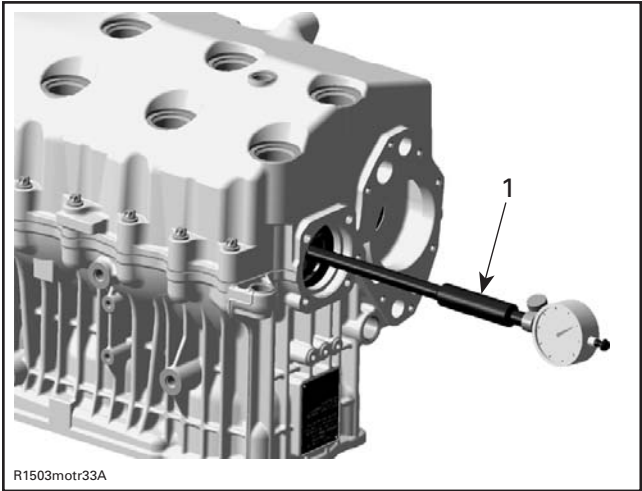
A. Perpendicular to crankshaft axis
B. Parallel to crankshaft axis

CYLINDER OUT OF ROUND	
New maximum	0.008 mm (.0003 in)
Service limit	0.020 mm (.0008 in)

Bearings

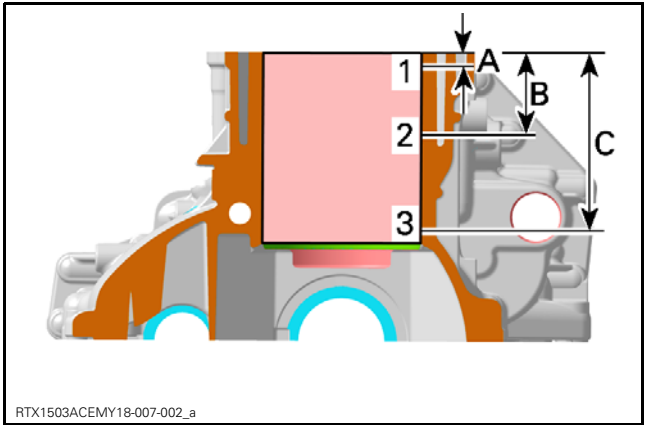
Measure plain bearing inside diameter and compare with crankshaft bearing journal diameter (refer to *CRANKSHAFT* in this subsection). Proceed as follows:

- Use the **OLD** plain bearings and put both cylinder block halves together.
- Tighten screws as described in *ASSEMBLING THE CYLINDER BLOCK*.
- Measure the inside diameter of the crankshaft plain bearings using a bore gauge.



ENGINE UPSIDE DOWN
1. Bore gauge

CRANKSHAFT BEARING INSIDE DIAMETER	
Service limit	50.10 mm (1.9724 in)



TYPICAL
1. First measuring diameter
2. Second measuring diameter
3. Third measuring diameter
A. 5 mm (.2 in)
B. 62 mm (2.44 in)
C. 115 mm (4.53 in)

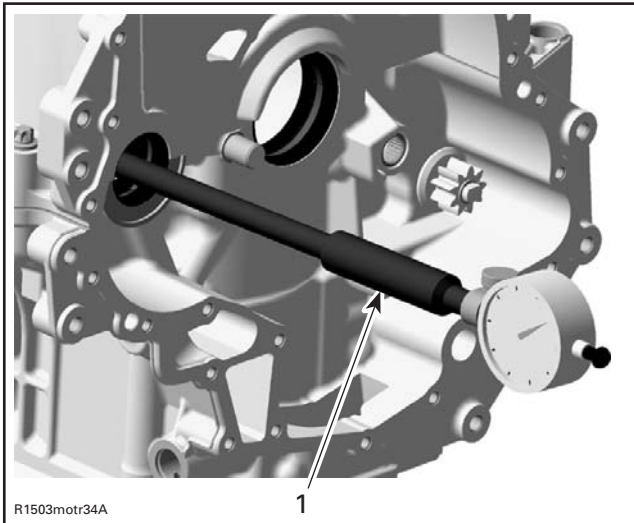
CYLINDER TAPER IN DIAMETER	
New	0.036 mm (.0014 in)
Service limit	0.100 mm (.0039 in)

If a cylinder bore is out of specification, please replace cylinder block assembly.

Cylinder Out of Round

Measure cylinder diameter in piston axis direction from top of cylinder. Take an other measurement 90° from first one and compare.

NOTE: Take the same measuring points as described in *CYLINDER TAPER*.



ENGINE UPSIDE DOWN
1. Bore gauge

BALANCER SHAFT BEARING INSIDE DIAMETER

Service limit	32.11 mm (1.2642 in)
---------------	----------------------

Replace plain bearings if they are out of specifications.

Assembling the Cylinder Block

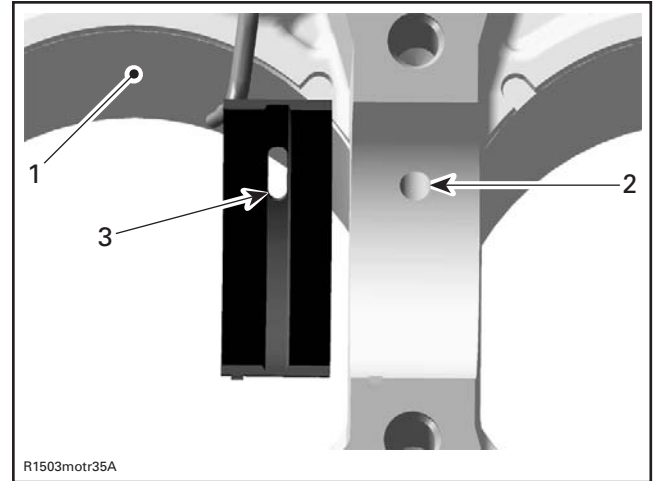
The assembly is the reverse of the disassembly procedure. However, pay attention to the following.

Install the following components:

- Piston oil nozzles, refer to *LUBRICATION SYSTEM* subsection
- Oil cooler, refer to *LUBRICATION SYSTEM* subsection
- Supercharger oil spray nozzle, refer to *LUBRICATION SYSTEM* subsection
- Electric starter, refer to *PTO HOUSING, MAGNETO AND STARTER* subsection
- Chain tensioner guide.

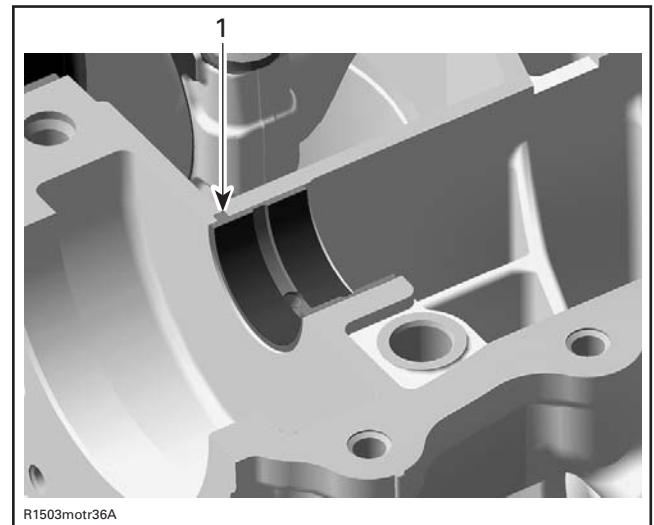
If **OLD** bearings will be used again, reinstall them at the same position as they were before.

Correctly install bearings. Top crankshaft bearing halves have a bore which has to be placed in the upper cylinder block.



1. Cylinder block upper half
2. Oil bore in cylinder block
3. Oil bore in bearing

Bearings have to be flush with the cylinder block split surface and their protrusions have to fit in the notched areas in the cylinder block seat.



1. Bearing protrusion in cylinder block notch

Apply engine oil on all plain bearings.

For proper installation of pistons, refer to *PISTONS AND CONNECTING RODS* in this subsection.

NOTICE Before installing the crankshaft, ensure that:

- chain guide is already installed
- timing chain is installed on crankshaft timing gear.

Those parts cannot be installed after as the crankshaft is in place.

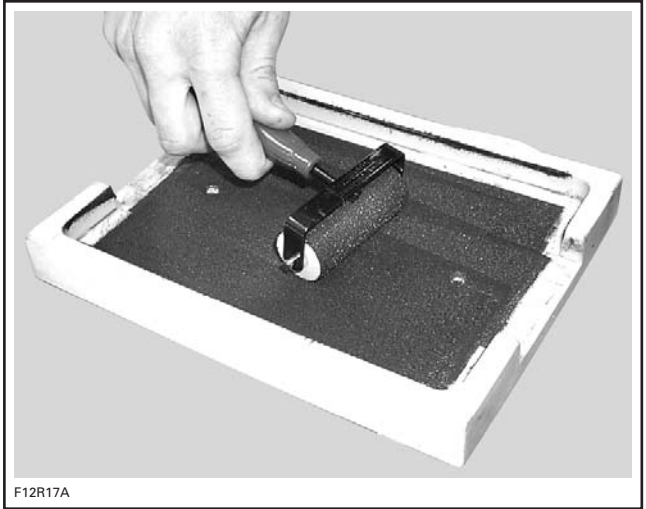
Subsection XX (CYLINDER BLOCK)

IMPORTANT: When beginning the application of the crankcase sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

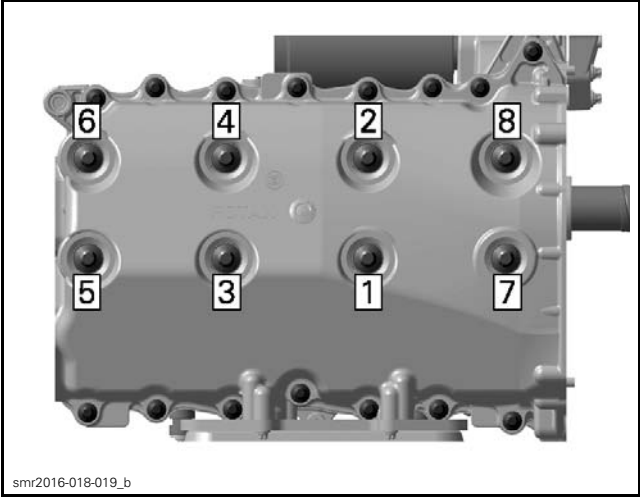
Apply sealant on mating surfaces.

SERVICE PRODUCT
LOCTITE 5910 (P/N 293 800 081)
REQUIRED TOOL
Plexiglas plate
Soft rubber roller

Apply some sealant on the plate and get a thin uniform coat (spread as necessary).
Then apply the sealant on supercharger housing sealing surface.



NOTE: If you do not use the roller method, you may use your finger to uniformly distribute this sealant.
Do not apply in excess as it will spread out inside crankcase.
Tighten M10 cylinder block screws as per following sequence.

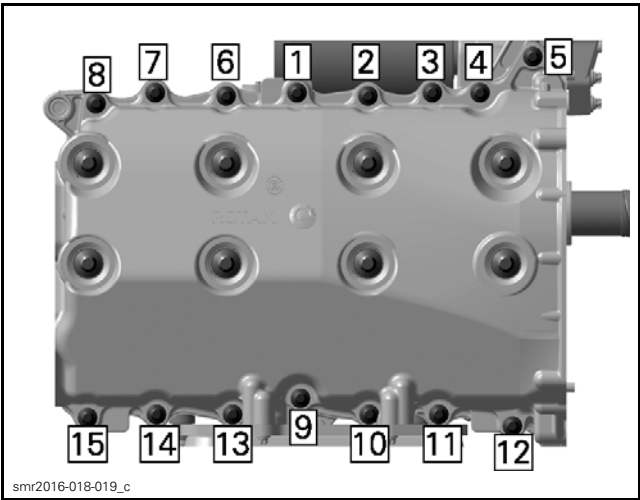


M10 SCREWS TIGHTENING SEQUENCE

NOTICE All M10 cylinder block screws must be torque **FIRST** according to step A before performing to step B.

TIGHTENING PROCEDURE		
M10 cylinder block screws	Step A	40 N•m ± 3 N•m (30 lbf•ft ± 2 lbf•ft)
	Step B	55 N•m ± 4 N•m (41 lbf•ft ± 3 lbf•ft)

Tighten M8 cylinder block screws as per following sequence.

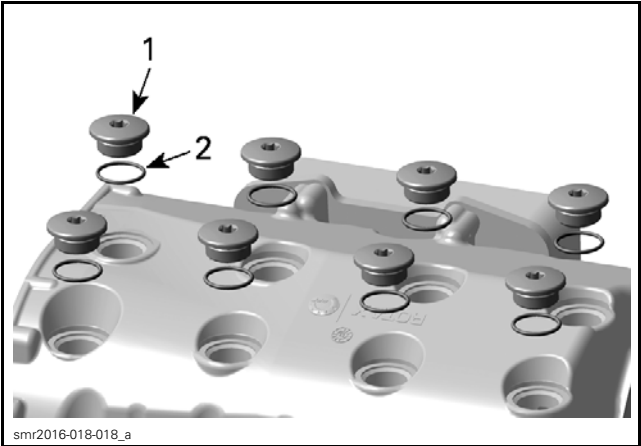


M8 SCREWS TIGHTENING SEQUENCE

TIGHTENING TORQUE	
M8 cylinder block screws	30 N•m ± 3 N•m (22 lbf•ft ± 2 lbf•ft) + LOCTITE 243 (BLUE) (P/N 293 800 060)

NOTE: Check axial clearance of balancer shaft and crankshaft before continuing the assembly. Refer to *CRANKSHAFT* and *BALANCER SHAFT* in this subsection for the procedure.

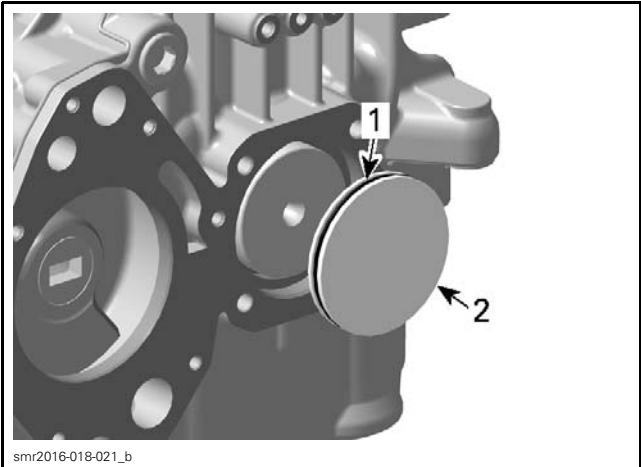
Install oil reservoir plug screws with O-rings.



- 1. Oil reservoir plug screw
- 2. O-ring

TIGHTENING TORQUE	
Oil reservoir plug screw	23 N•m ± 3 N•m (17 lbf•ft ± 2 lbf•ft) + LOCTITE 243 (BLUE) (P/N 293 800 060)

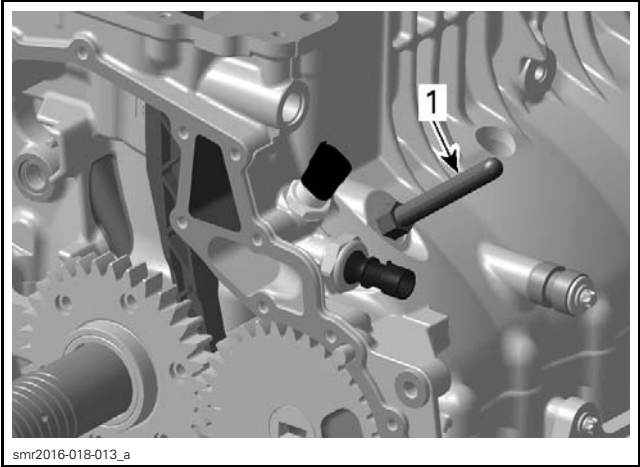
Apply engine oil on O-ring and press in crankshaft cover.



- 1. O-ring
- 2. Crankshaft cover

Position crankshaft at TDC before installing the camshaft and the rocker arms (refer to *CYLINDER HEAD* subsection).

REQUIRED TOOL	
CRANKSHAFT LOCKING TOOL (P/N 529 035 821)	



- 1. Crankshaft locking tool

Reassemble engine in accordance with the proper assembly procedures.

SUPERCHARGER

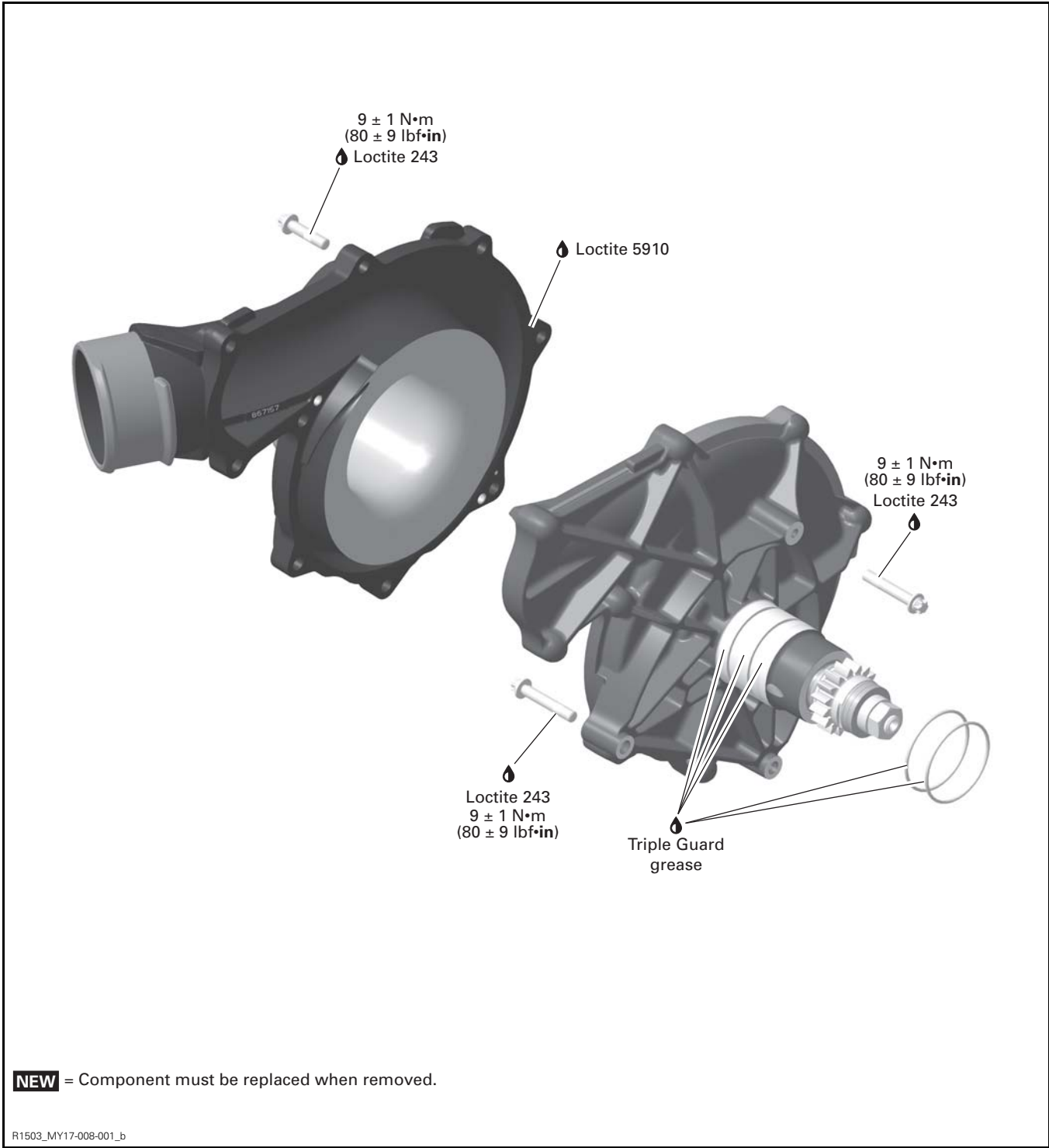
SERVICE TOOLS

Description	Part Number	Page
CAMSHAFT LOCKING TOOL.....	529 035 839	4
SUPERCHARGER GEAR HOLDER.....	529 036 025	5
SUPERCHARGER GEAR HOLDER.....	529 036 364	5
SUPERCHARGER SEPARATOR TOOL.....	529 036 397	9
SUPPORT PLATE.....	529 035 947	8-9
TORX ADAPTER.....	529 035 938	8, 12

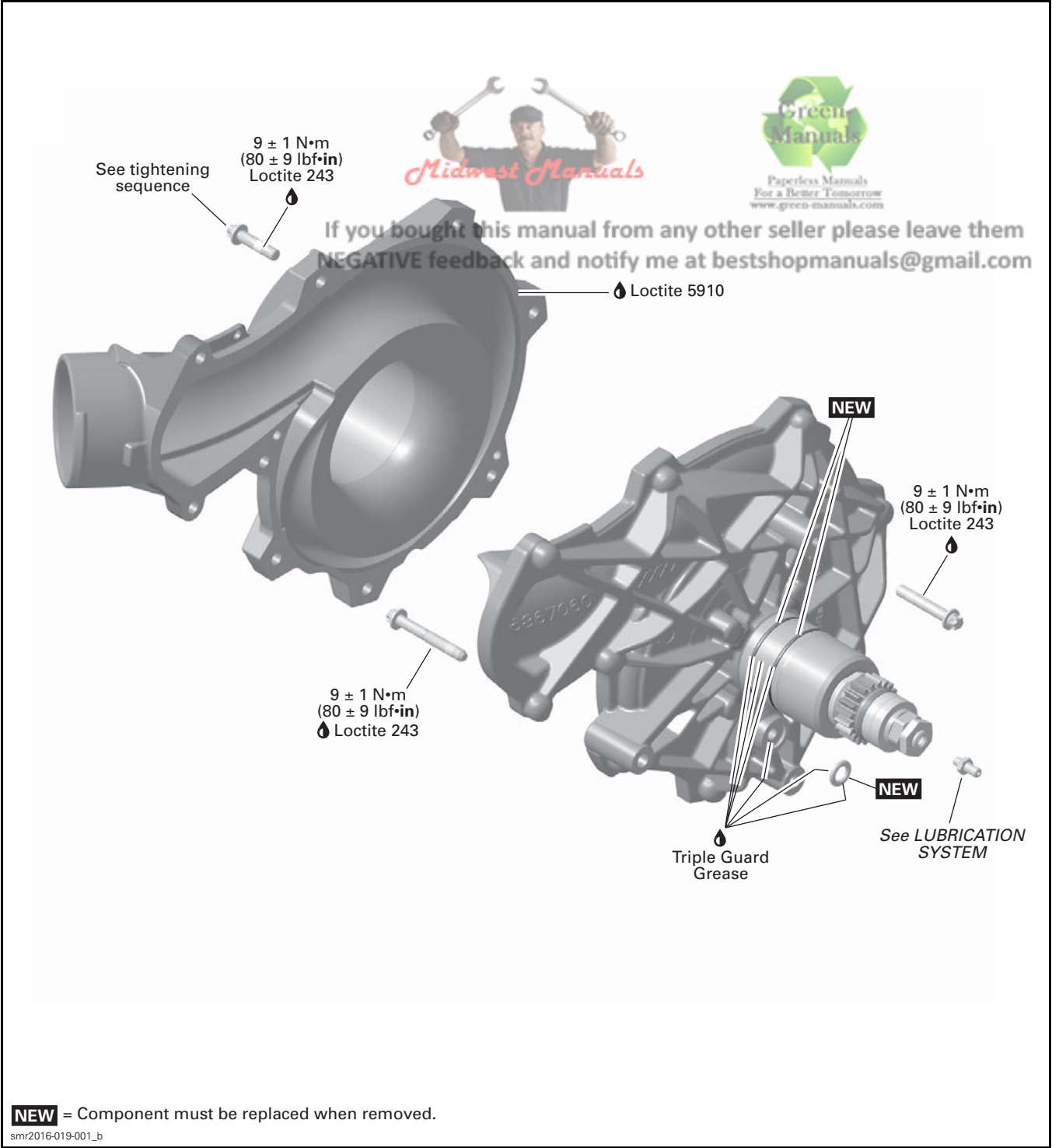
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	11-12
LOCTITE 5910	293 800 081	10
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	10
TRIPLE-GUARD GREASE	508298	11

230 Engines



300 Engines



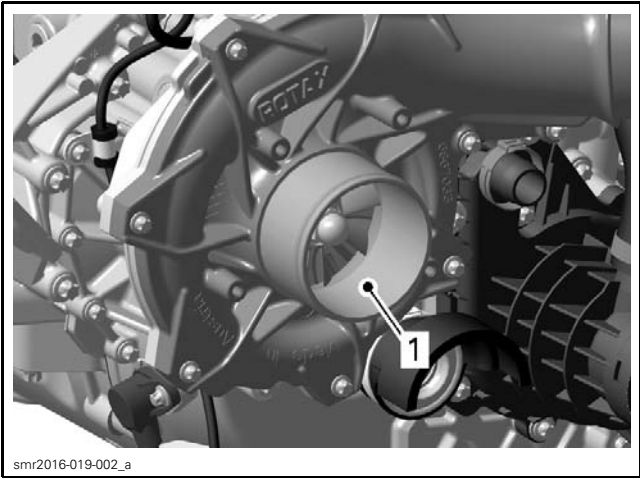
INSPECTION

SUPERCHARGER INLET
CLEANLINESS

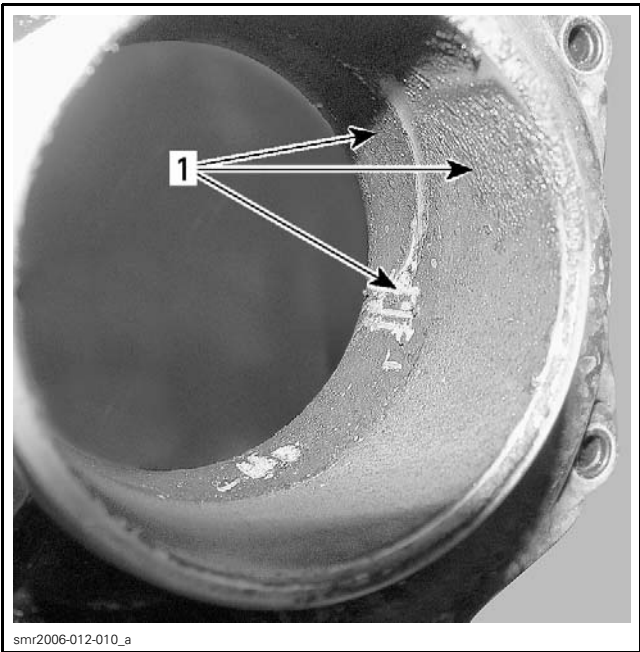
NOTE: A lower than usual maximum RPM at full throttle might be caused by a dirty supercharger inlet.

Remove supercharger air inlet hose.

Visually inspect supercharger inlet side for oil, salt or any other deposits.



1. Supercharger inlet



1. Dirt here

If dirt is found, proceed as follows.

- 1. Remove supercharger.
- 2. Separate supercharger housing.

- 3. Clean internal housing and impeller using a brass brush and cleaning solvent to get rid of oil deposits.

- 4. Blow dry with compressed air.

NOTICE Do not let impeller spin when using compressed air.

- 5. Complete usual assembly procedures as described in this subsection.

SUPERCHARGER CLUTCH
SLIPPING MOMENT
(ON ENGINE)

Remove supercharger air inlet hose.

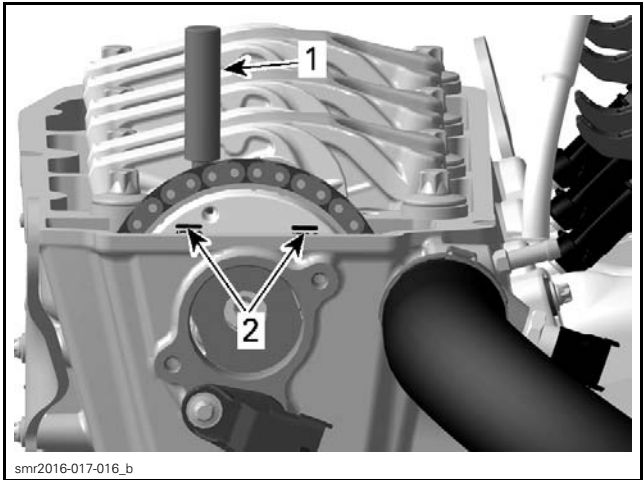
Remove:

- Ignition coils and spark plugs, refer to *IGNITION SYSTEM* subsection
- Valve cover, refer to *CYLINDER HEAD* subsection.

Turn engine by rotating the supercharger nut counterclockwise until the position lines on oil separator cover are lined up as shown in the following illustration.

Lock camshaft.

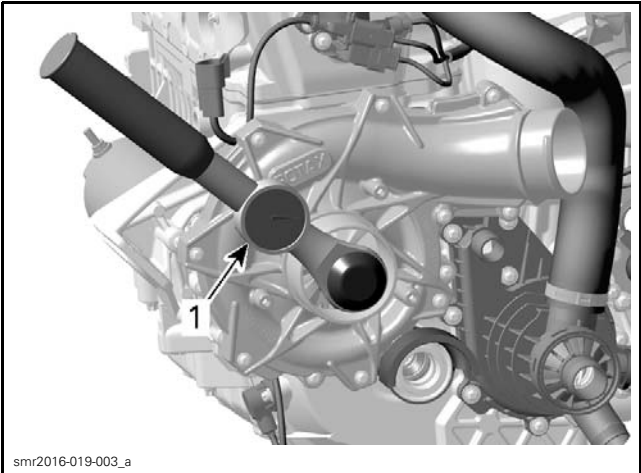
REQUIRED TOOL	
CAMSHAFT LOCKING TOOL (P/N 529 035 839)	



1. Camshaft locking tool
2. Position lines

Check slipping moment counterclockwise.

REQUIRED TOOL	
Torque wrench with actual torque viewer	
A mirror is useful to see the viewer	



1. Torque wrench

NOTE: Before checking the supercharger slipping moment turn the clutch for a minimum of 3 complete revolutions. This will dissipate grease or oil on the friction shims for a precise reading.

Supercharger should start to turn at a torque within the specified values.

ENGINE TYPE	SLIPPING MOMENT (NEW SUPERCHARGER)
230	9 N•m to 14 N•m (80 lbf•in to 124 lbf•in)
300	14 N•m to 17 N•m (124 lbf•in to 150 lbf•in)

ENGINE TYPE	SLIPPING MOMENT (BREAK-IN SUPERCHARGER)
230	8 N•m to 12 N•m (71 lbf•in to 106 lbf•in)
300	Minimum 11 N•m (97 lbf•in)

If the torque is not within specifications, remove supercharger from the engine and repeat supercharger clutch slipping moment test on the bench.

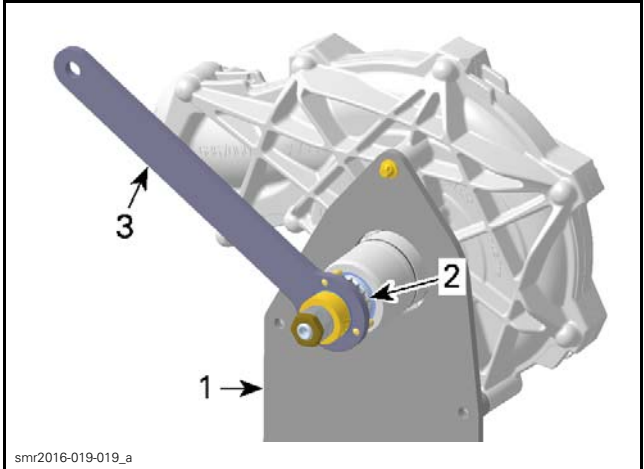
SUPERCHARGER CLUTCH SLIPPING MOMENT (BENCH TEST)

Mount supercharger on support plate.
Hold supercharger gear.

ENGINE TYPE	REQUIRED TOOLS
All	(P/N 529 035 947) 
All	2x screw M6x25
230	SUPERCHARGER GEAR HOLDER (P/N 529 036 025) 
300	SUPERCHARGER GEAR HOLDER (P/N 529 036 364) 



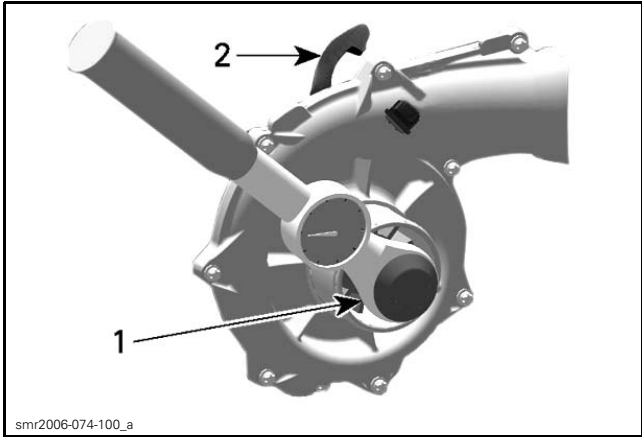
230 ENGINE



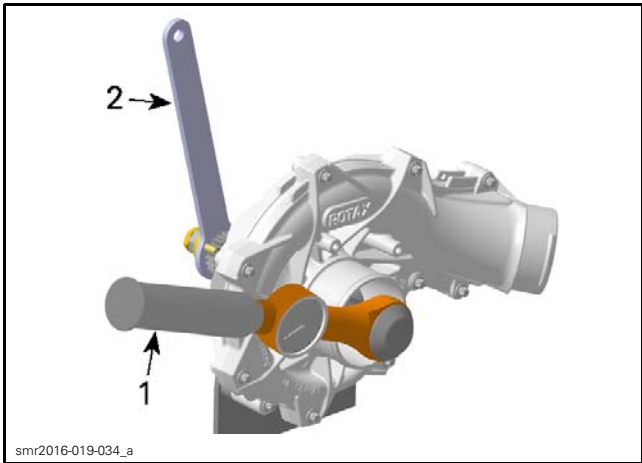
300 ENGINE
1. Support plate
2. Supercharger gear
3. Supercharger gear holder

Check slipping moment counterclockwise.

REQUIRED TOOL
Torque wrench with a viewer



230 ENGINE
1. Torque wrench
2. Supercharger gear holder



300 ENGINE
1. Torque wrench
2. Supercharger gear holder

NOTE: Before checking the supercharger slipping moment to turn the clutch for a minimum of 3 complete revolutions. This will dissipate grease or oil on the friction shims for a proper reading.

Supercharger should start to turn at a torque within the specified values.

ENGINE TYPE	SLIPPING MOMENT (NEW SUPERCHARGER)
230	9 N•m to 14 N•m (80 lbf•in to 124 lbf•in)
300	14 N•m to 17 N•m (124 lbf•in to 150 lbf•in)

ENGINE TYPE	SLIPPING MOMENT (BREAK-IN SUPERCHARGER)
230	8 N•m to 12 N•m (71 lbf•in to 106 lbf•in)
300	Minimum 11 N•m (97 lbf•in)

If the torque is not within specification, replace supercharger assembly.

TROUBLESHOOTING

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

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

ENGINE WILL NOT START (ENGINE DOES NOT TURN OVER)

- 1. Supercharger seized or obstructed
 - Inspect and replace supercharger assembly if necessary.
 - Inspect supercharger oil spray nozzle, refer to *LUBRICATION SYSTEM* subsection.

ENGINE LACKS ACCELERATION OR POWER (DOES NOT REACH MAXIMUM RPM)

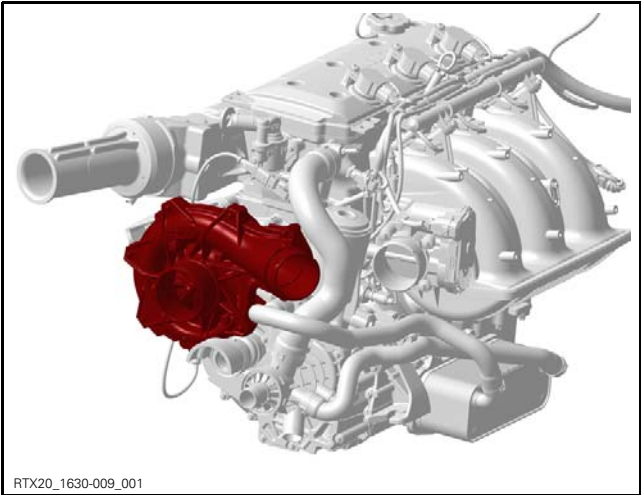
- 1. Supercharger inlet is dirty
 - Check and clean supercharger inlet.
 - Check engine oil. Siphon excess of oil.
- 2. Supercharger slipping clutch defective
 - Check slipping clutch moment.
 - Replace supercharger assembly if out of specification.
- 3. Check intercooler for oil contamination.
 - Clean intercooler.

PROCEDURES

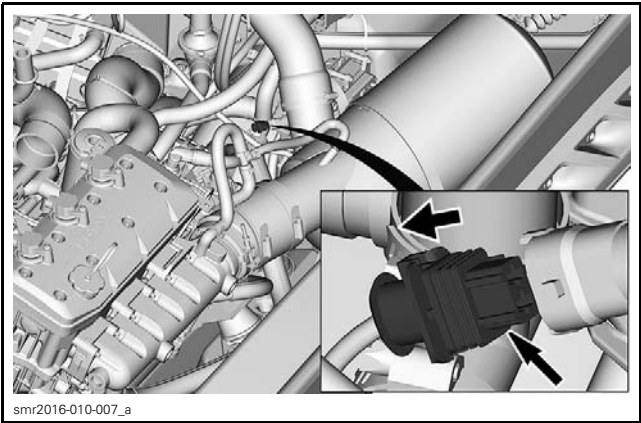
SUPERCHARGER OIL SPRAY NOZZLE

Refer to *LUBRICATION SYSTEM* subsection.

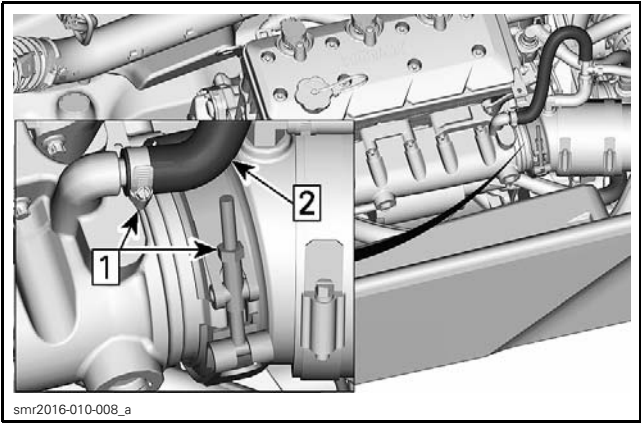
SUPERCHARGER
Supercharger Location



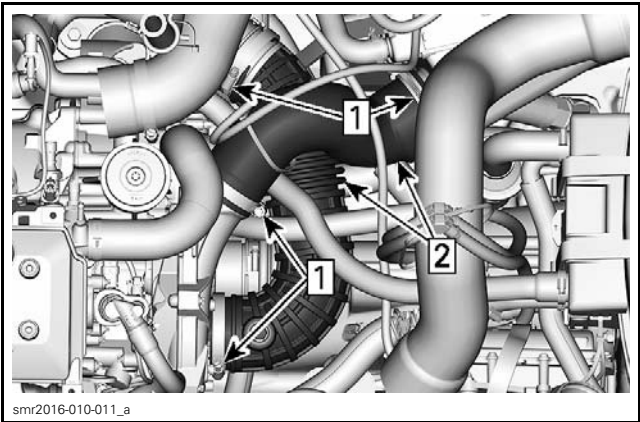
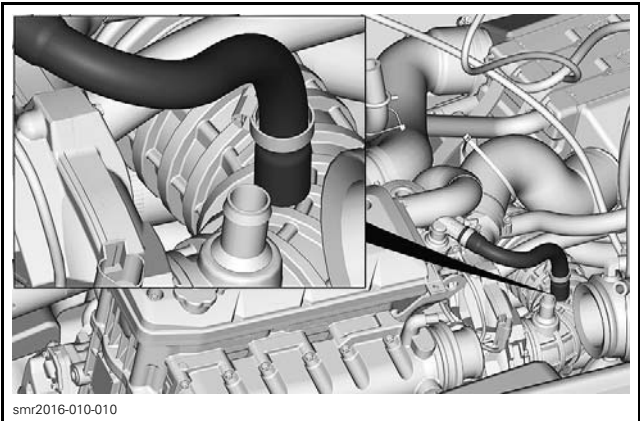
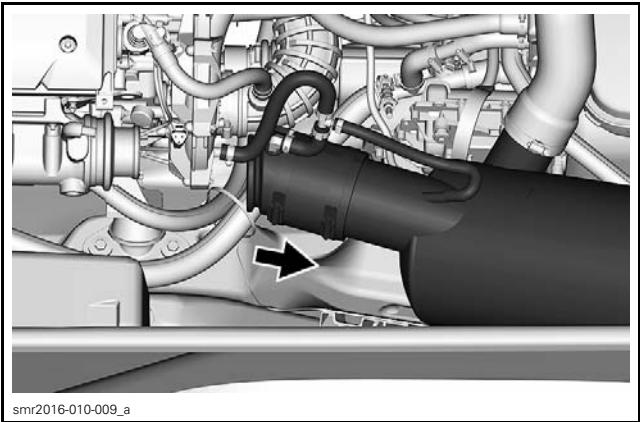
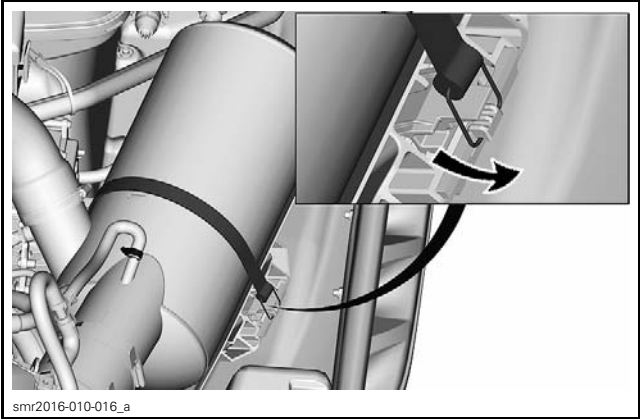
Removing the Supercharger



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



Step 1: Loosen
Step 2: Disconnect



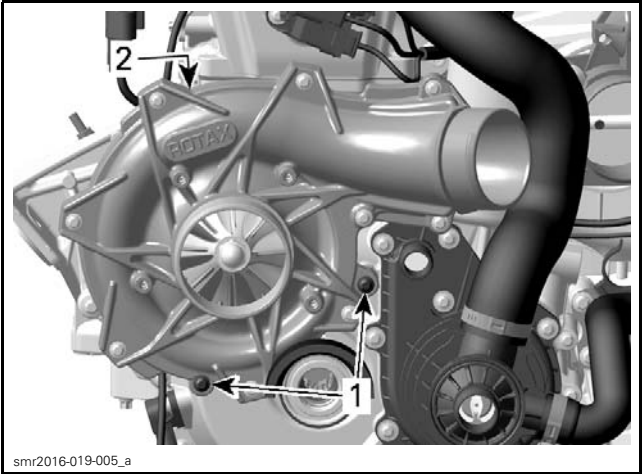
Step 1: Loosen
Step 2: Remove

Subsection XX (SUPERCHARGER)

Remove jet pump. Refer to *JET PUMP* subsection.

NOTE: Removing the jet pump allows the drive shaft to drop just enough so that the floating ring clears the supercharger.

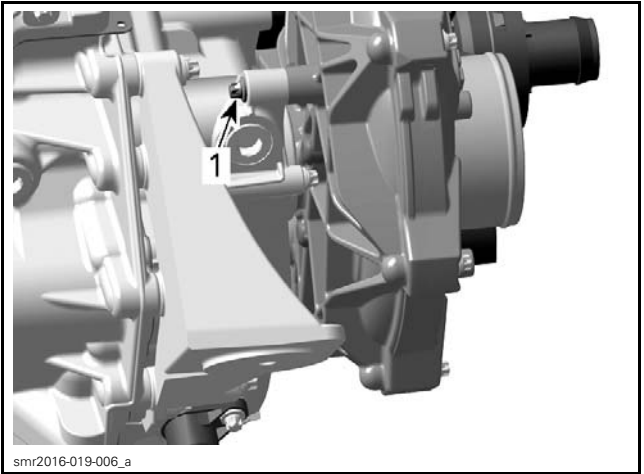
Remove retaining screws.



- 1. Supercharger retaining screws
- 2. Upper supercharger retaining screw (hidden behind the supercharger)

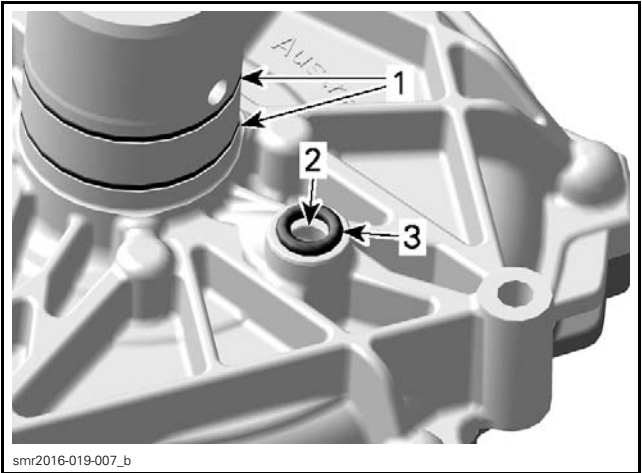
NOTE: Use the following tool to remove the upper retaining screw.

REQUIRED TOOL	
TORX ADAPTER (P/N 529 035 938)	



- 1. Upper retaining screw

Remove supercharger from engine.
Discard O-rings.



- 1. O-rings
- 2. O-ring (300 only)
- 3. Oil return bore (300 only)

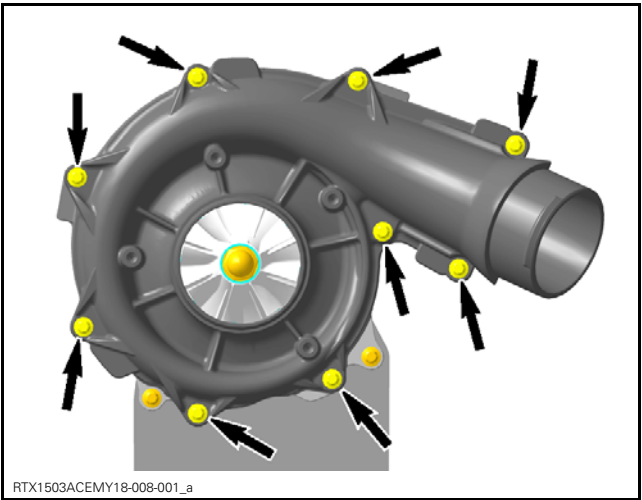
Disassembling the Supercharger (230 Engines)

NOTICE Be scrupulous when working on supercharger parts. Supercharger rotation reaches 45 000 RPM. Any modification, improper handling or damage on the parts, may result in damage of the supercharger. Strictly follow the described procedures.

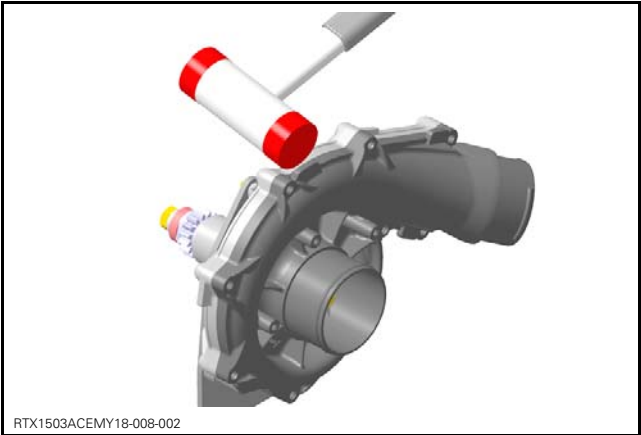
- 1. Secure the supercharger on its support plate.

REQUIRED TOOL	
SUPPORT PLATE (P/N 529 035 947)	

- 2. Remove supercharger housing screws.



- 3. Separate supercharger housing.



RTX1503ACEMY18-008-002
PLASTIC HAMMER

NOTICE All components of the supercharger are balanced together to obtain an optimal performance and a smooth operation. Consequently it is not possible to repair the supercharger.

Disassembling the Supercharger (300 Engines)

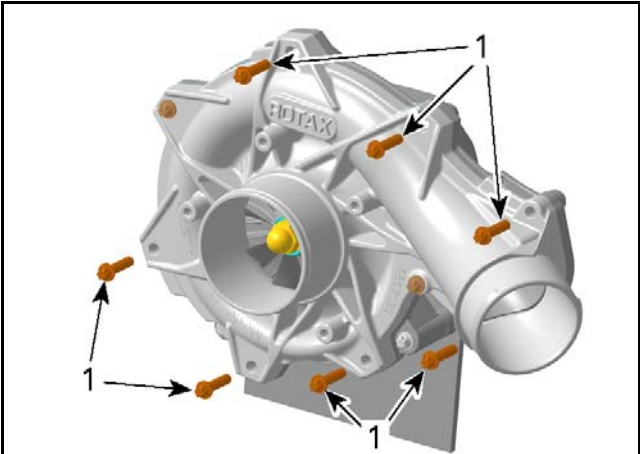
NOTE: Handle the supercharger with care. If the supercharger is hitting any obstacle this may cause high risk of pre-damaging the hybrid ball bearings.

NOTICE Be scrupulous when working on supercharger parts. Supercharger rotation reaches 46800 RPM. Any modification, improper handling or damage on the parts, may result in damage of the supercharger. Strictly follow the described procedures.

1. Secure the supercharger on its support plate.

REQUIRED TOOL	
SUPPORT PLATE (P/N 529 035 947)	
2x screw M6x25	

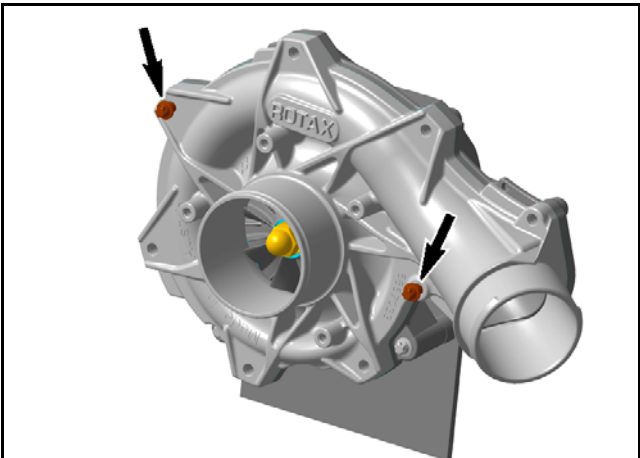
2. Remove supercharger housing screws (7x).



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1. Supercharger housing screws (7x)

3. Loosen the 2 remaining screws but do not remove them completely.

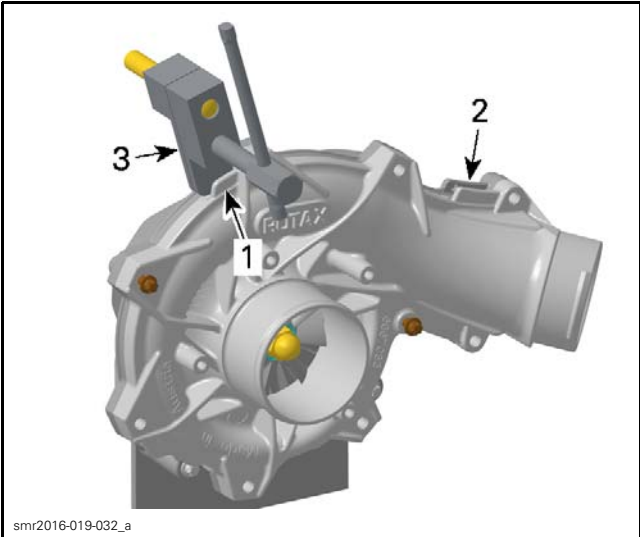


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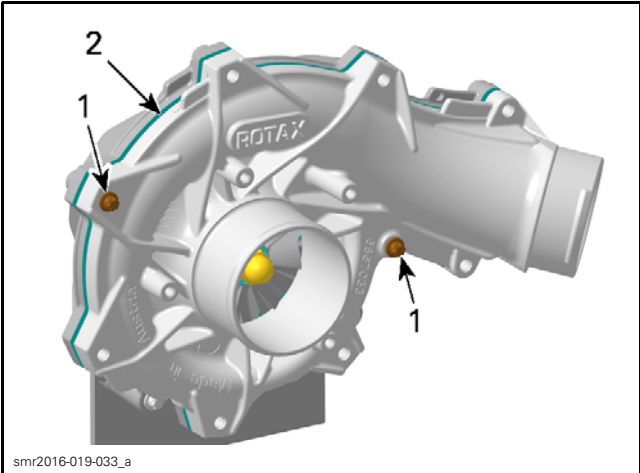
4. Separate supercharger housing.

REQUIRED TOOL	
SUPERCHARGER SEPARATOR TOOL (P/N 529 036 397)	

4.1 Place supercharger separator at position no. 1.



- 1. Separator position no. 1
 - 2. Separator position no. 2
 - 3. Supercharger separator
- 4.2 Turn lever clockwise until the housing half (intake side) is falling apart.
- 4.3 If required place supercharger separator at position no. 2.
- 4.4 Remove the remaining screws (2 x) and withdraw housing half (intake side).



- 1. Screws (2 x)
- 2. Housing half (intake side)

NOTICE To grant the optimal performance and smooth operation the supercharger assembly is balanced. Consequently it is not possible to perform any repairs on the supercharger assembly.

Assembling the Supercharger

1. Clean supercharger housing halves using a part cleaner, then use compressed air to dry it. Take care that deposits do not get into the bearing area.

NOTICE Do not let impeller spin when using compressed air.

2. Clean supercharger housing mating surfaces.

NOTICE Never grind or polish the mounting surface of the supercharger. Abrasive dust may cause severe supercharger damage.

Brush in one direction then make the final brushing perpendicularly (90°) to the first pass.

SERVICE PRODUCT
LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500)
REQUIRED TOOL
Brass brush

3. Apply supercharger housing sealant:

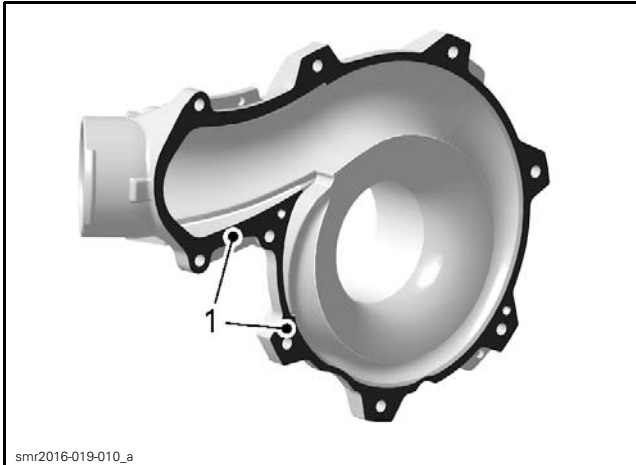
SERVICE PRODUCT
LOCTITE 5910 (P/N 293 800 081)

NOTICE When beginning the application of the supercharger housing sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

REQUIRED TOOL
Plexiglas plate
Soft rubber roller

- 3.1 Apply some sealant on the plate and get a thin uniform coat (spread as necessary).
- 3.2 Then apply the sealant on supercharger housing sealing surface.

NOTE: Ensure not to apply too much sealant, as it will spread out inside supercharger housing.



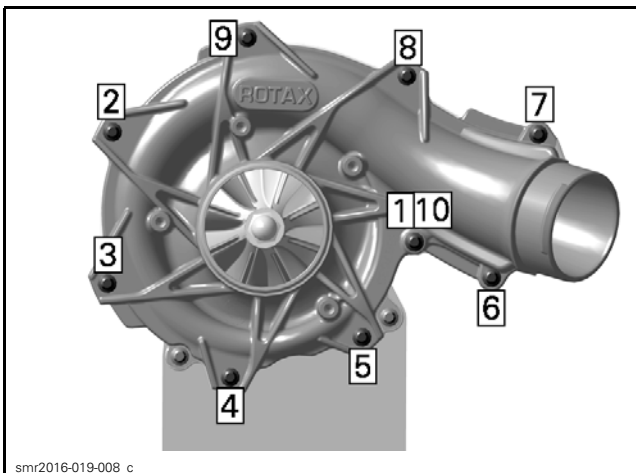
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HOUSING HALF (INTAKE SIDE)

1. Apply Loctite 5910 on sealing surface

4. Assemble supercharger housing halves.
5. Tighten supercharger housing screws according to the following sequence.

TIGHTENING TORQUE	
Supercharger housing screws	$9\text{ N}\cdot\text{m} \pm 1\text{ N}\cdot\text{m}$ $(80\text{ lbf}\cdot\text{in} \pm 9\text{ lbf}\cdot\text{in})$ + LOCTITE 243 (BLUE) (P/N 293 800 060)



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TIGHTENING SEQUENCE

Installing the Supercharger

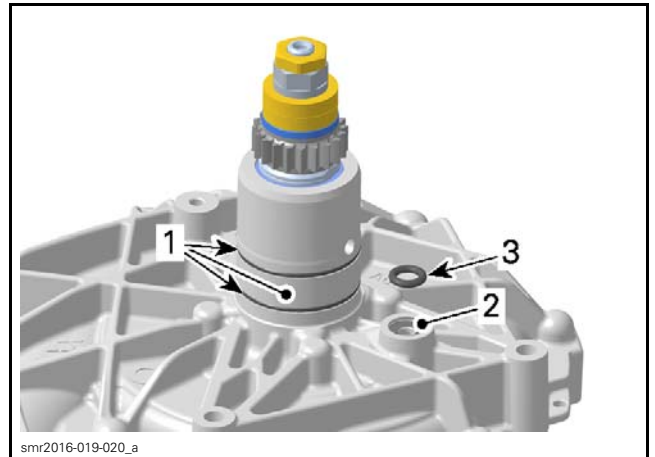
NOTE: Handle the supercharger with care. If the supercharger is hitting any obstacle this may cause high risk of pre-damaging the ball bearings.

1. Grease:
 - Mounting surface of the supercharger with O-rings.
 - Sealing surface of oil return bore on supercharger housing (300 only)

- O-ring (300 only)
- Sealing surface of oil return bore on PTO housing (300 only).

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

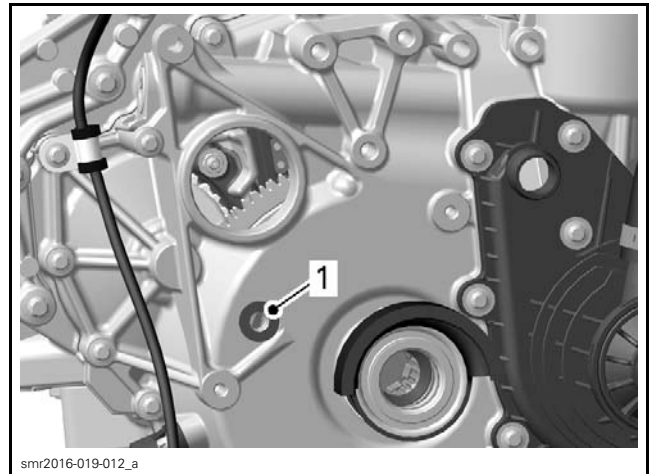
Install **NEW** O-rings.



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LUBRICATE

1. Mounting surface with O-rings
2. Oil return bore sealing surface (300 only)
3. O-ring (300 only)



smr2016-019-012_a

LUBRICATE (300 ONLY)

1. Oil return bore sealing surface

2. Install supercharger on PTO housing.

NOTICE Never use a hammer when installing the supercharger. Do not tap the impeller shaft at any time.

Turn the impeller while installing the supercharger to engage the supercharger drive gear.

CAUTION Impeller has sharp edges. Wear safety gloves when turning the supercharger at the impeller.

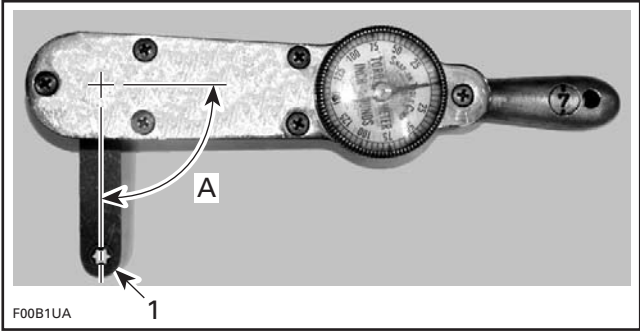
Subsection XX (SUPERCHARGER)

3. Tighten supercharger retaining screws to specifications.

TIGHTENING TORQUE	
Supercharger retaining screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

NOTE: For the upper retaining screw the following tool must be used mounted 90° to torque wrench.

REQUIRED TOOL	
TORX ADAPTER (P/N 529 035 938)	



1. Torx adapter perpendicular to torque wrench
A. 90°

NOTICE Not installing the tool as shown will change the torque applied to the screw.

MAINTENANCE

INTERCOOLER FLUSHING

Flushing the intercooler with fresh water is essential to neutralize corroding effects of salt or other chemical products present in water. It will help to clean up sand, salt, shells or other particles in intercooler.

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

Exhaust system and intercooler should be flushed each time:

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

Refer to *EXHAUST SYSTEM* subsection for flushing procedure.

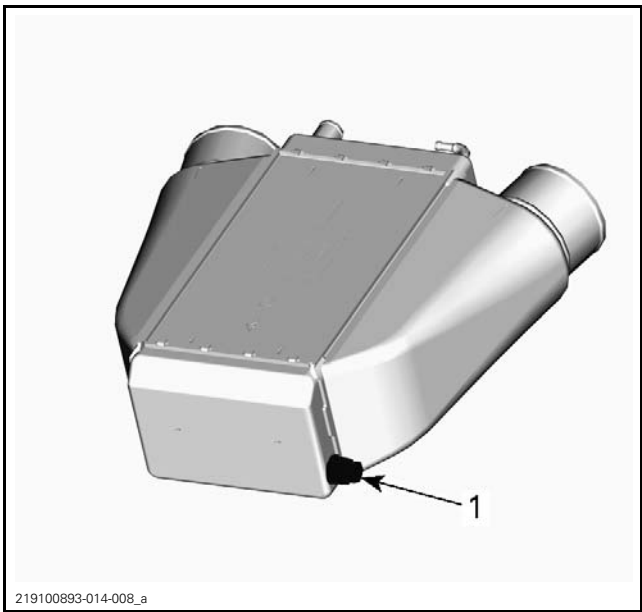
NOTICE Failure to flush the system, when necessary, will severely damage engine intercooler and/or exhaust system.

PROCEDURES

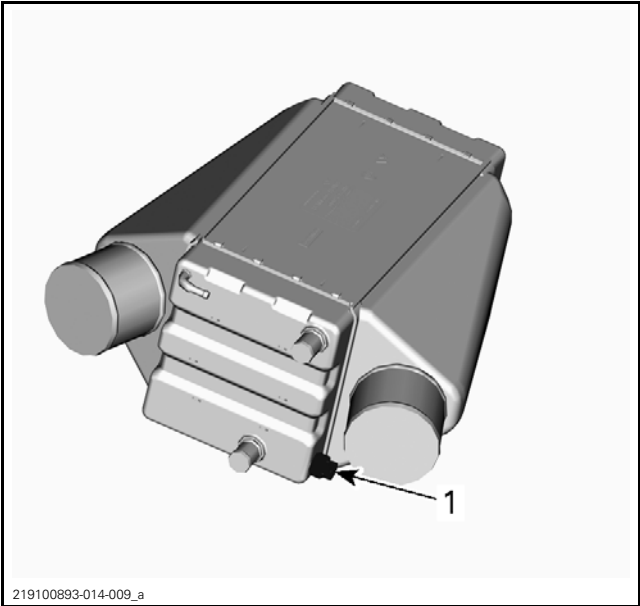
SACRIFICIAL ANODE

Sacrificial Anode location

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



1. Sacrificial anode for the 230 engine models



1. Sacrificial anode for the 300 engine models

Sacrificial Anode maintenance

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

INTERCOOLER

 **WARNING**

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

Cleaning the Intercooler

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

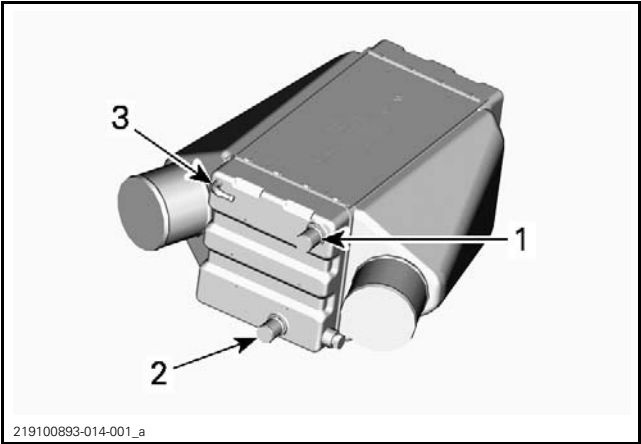
The exhaust system should be flushed first, as it may unclog the intercooler. If not, then proceed with the intercooler cleaning procedure as detailed here.

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

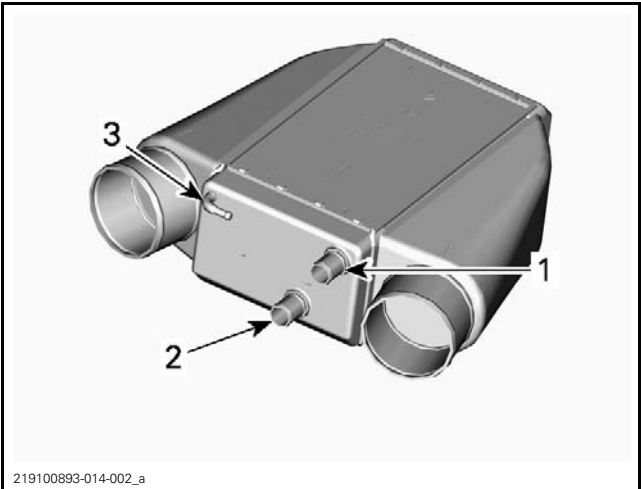
To clean the intercooler, do the following:

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

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



219100893-014-001_a
300 ENGINE INTERCOOLER
1. Intercooler water outlet fitting
2. Intercooler water inlet fitting
3. Intercooler bleeding hose fitting



219100893-014-002_a
230 ENGINE INTERCOOLER
1. Intercooler water outlet fitting
2. Intercooler water inlet fitting
3. Intercooler bleeding hose fitting

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

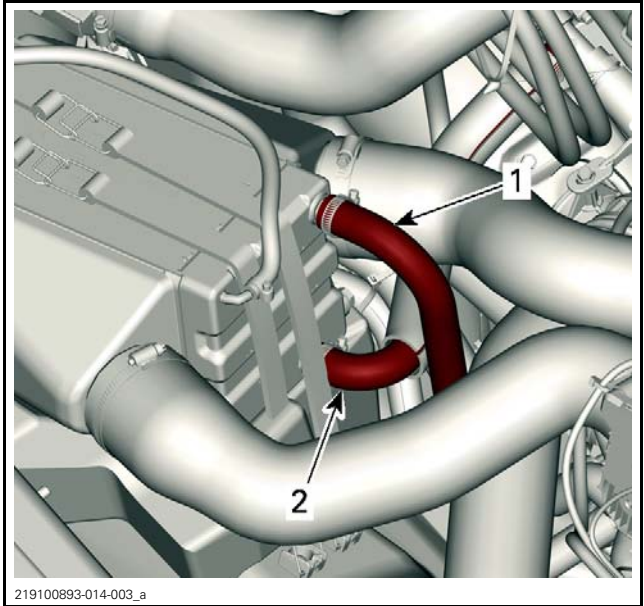
WATER FLOW	
LOW OR ERRATIC	1. Repeat cleaning procedure.
	2. Replace the intercooler.
HIGH AND REGULAR	Intercooler is not clogged.

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

Intercooler Leak Test

Block intercooler water outlet hose.

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



219100893-014-003_a
MANY PARTS REMOVED FOR CLARITY PURPOSE
1. Intercooler water outlet hose
2. Intercooler water inlet hose

Block intercooler bleed fitting.

Unplug the intercooler water inlet hose from the intercooler.

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

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

Pressurize the intercooler.

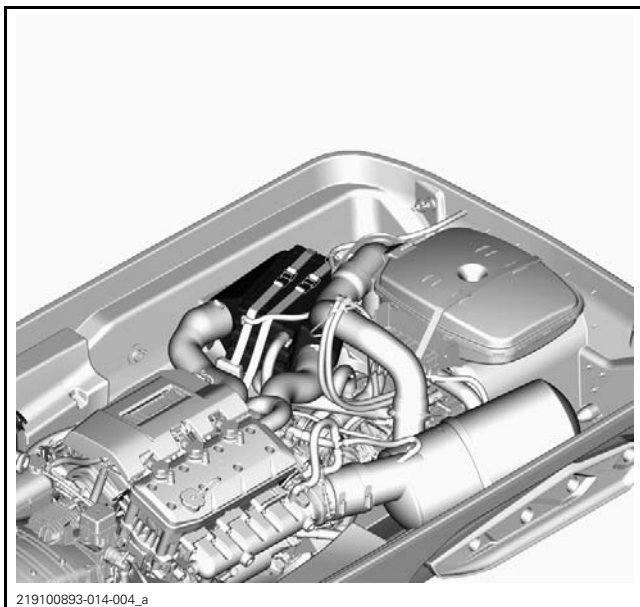
PRESSURE TEST
69 kPa (10 PSI) for 10 minutes minimum

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

Locating the Intercooler

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

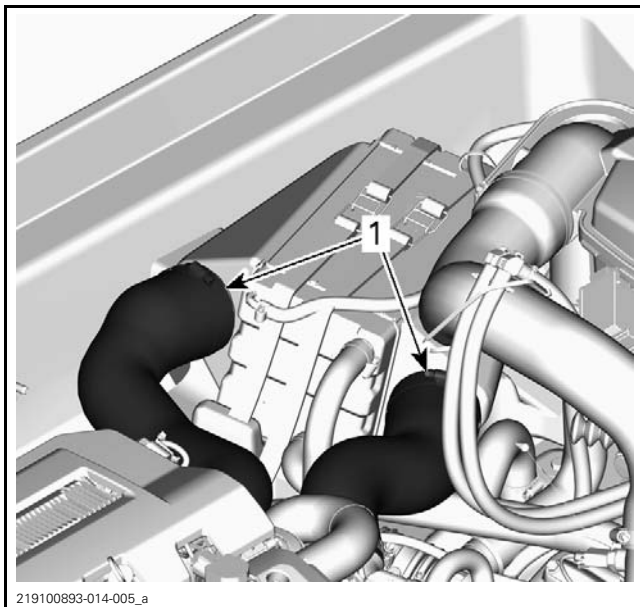
Subsection XX (INTERCOOLER)



PARTS REMOVED FOR CLARITY

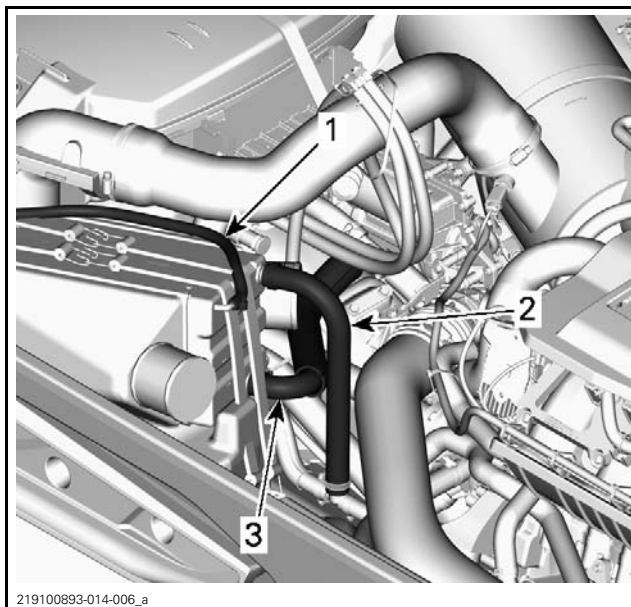
Removing the Intercooler

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



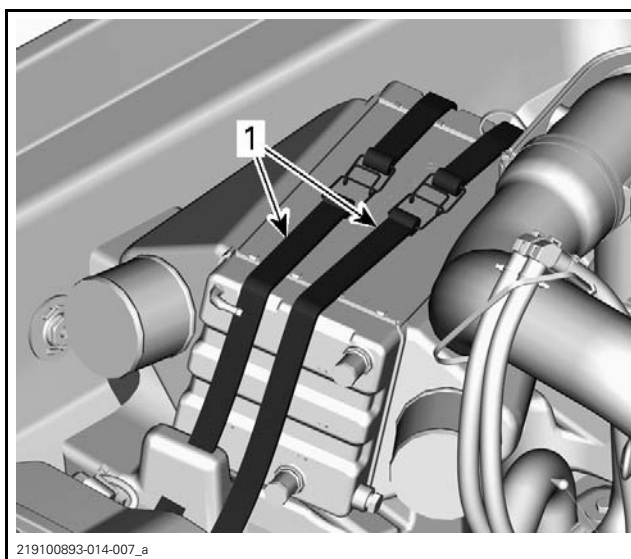
1. Intercooler air hoses

5. Disconnect intercooler water hoses and intercooler bleed hose.



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

6. Untie intercooler straps.



1. Intercooler straps

Installing the Intercooler

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

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

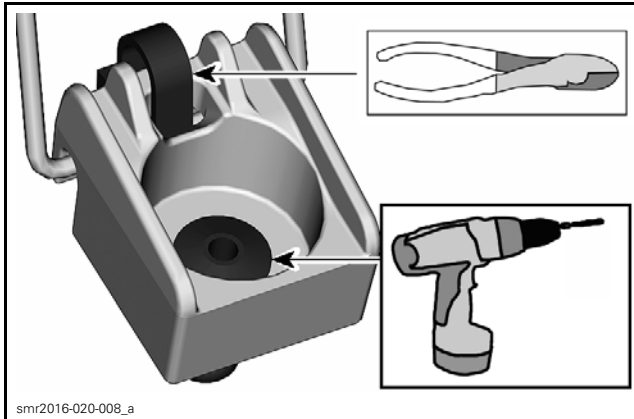
TIGHTENING TORQUE	
Intercooler air hoses clamp	4 N•m ± 1 N•m (35 lbf•in ± 9 lbf•in)
Intercooler water hoses clamp	1.7 N•m ± .2 N•m (15 lbf•in ± 2 lbf•in)
Intercooler bleed hose clamp	1.7 N•m ± .2 N•m (15 lbf•in ± 2 lbf•in)

REPLACING INTERCOOLER ATTACHMENTS

Remove the intercooler.

Drill the head of the rivets.

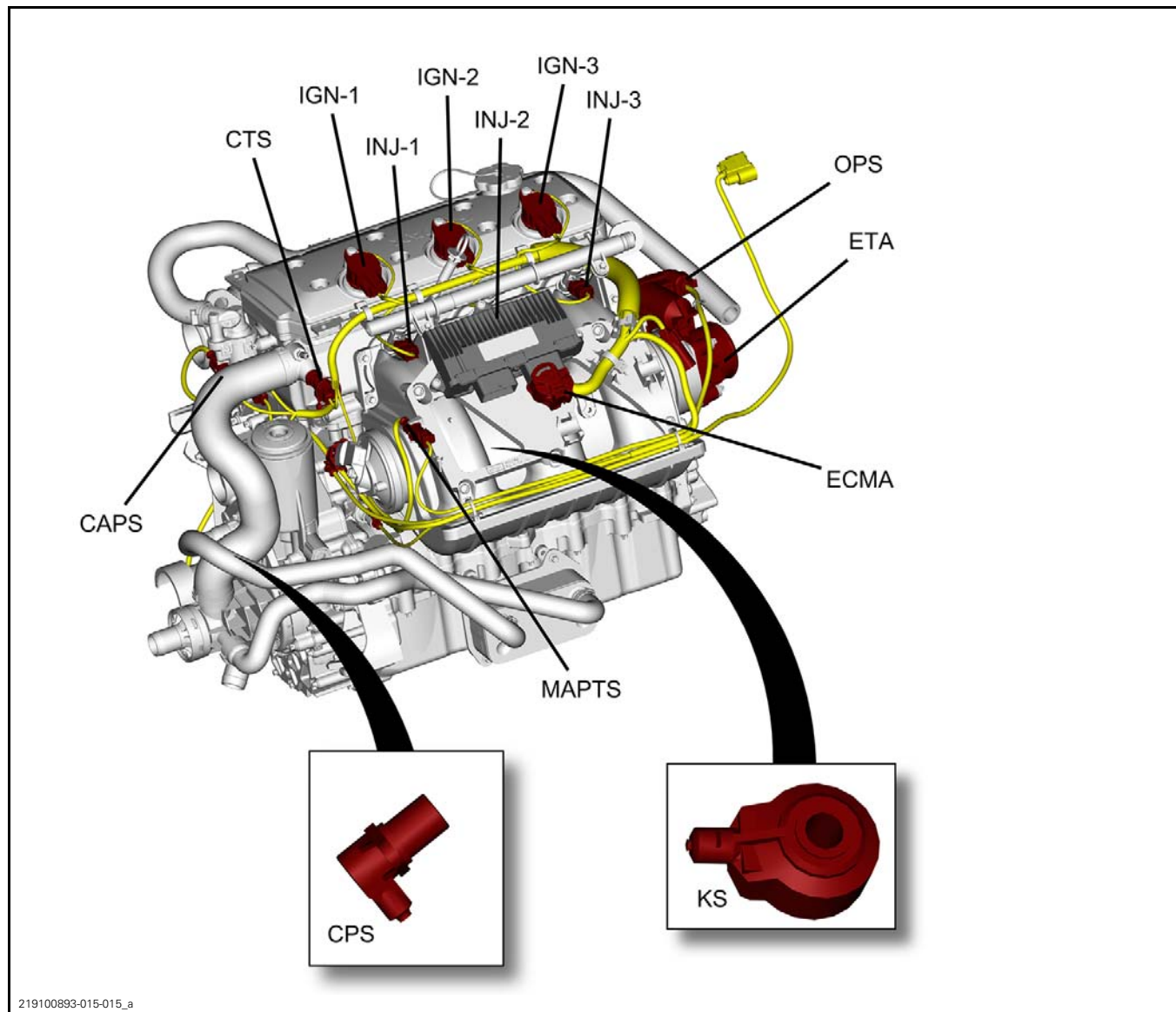
NOTICE Drilling rivets too deep may lead to hull damage.



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

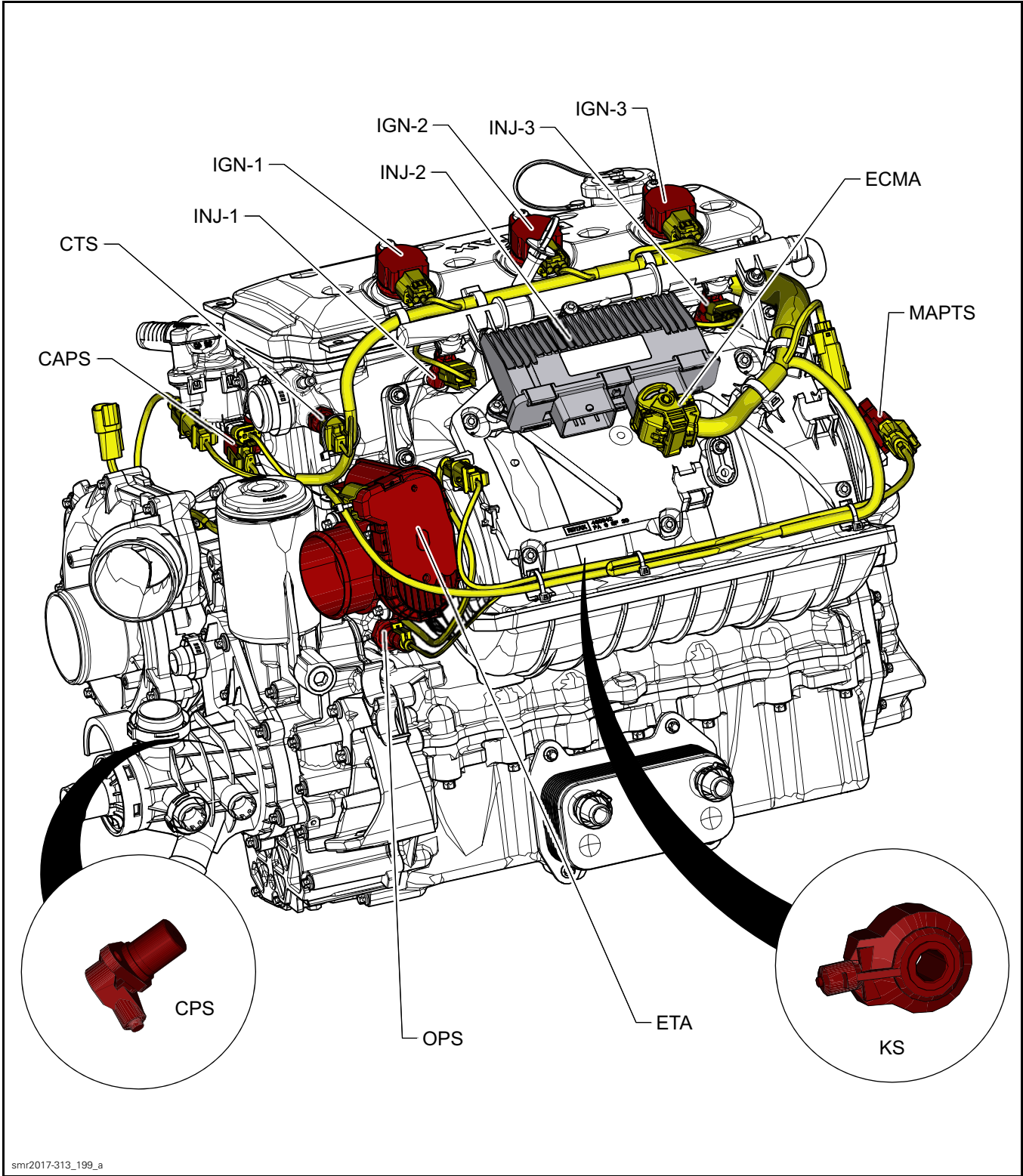
ENGINE MANAGEMENT SYSTEM

1503 NA (155)



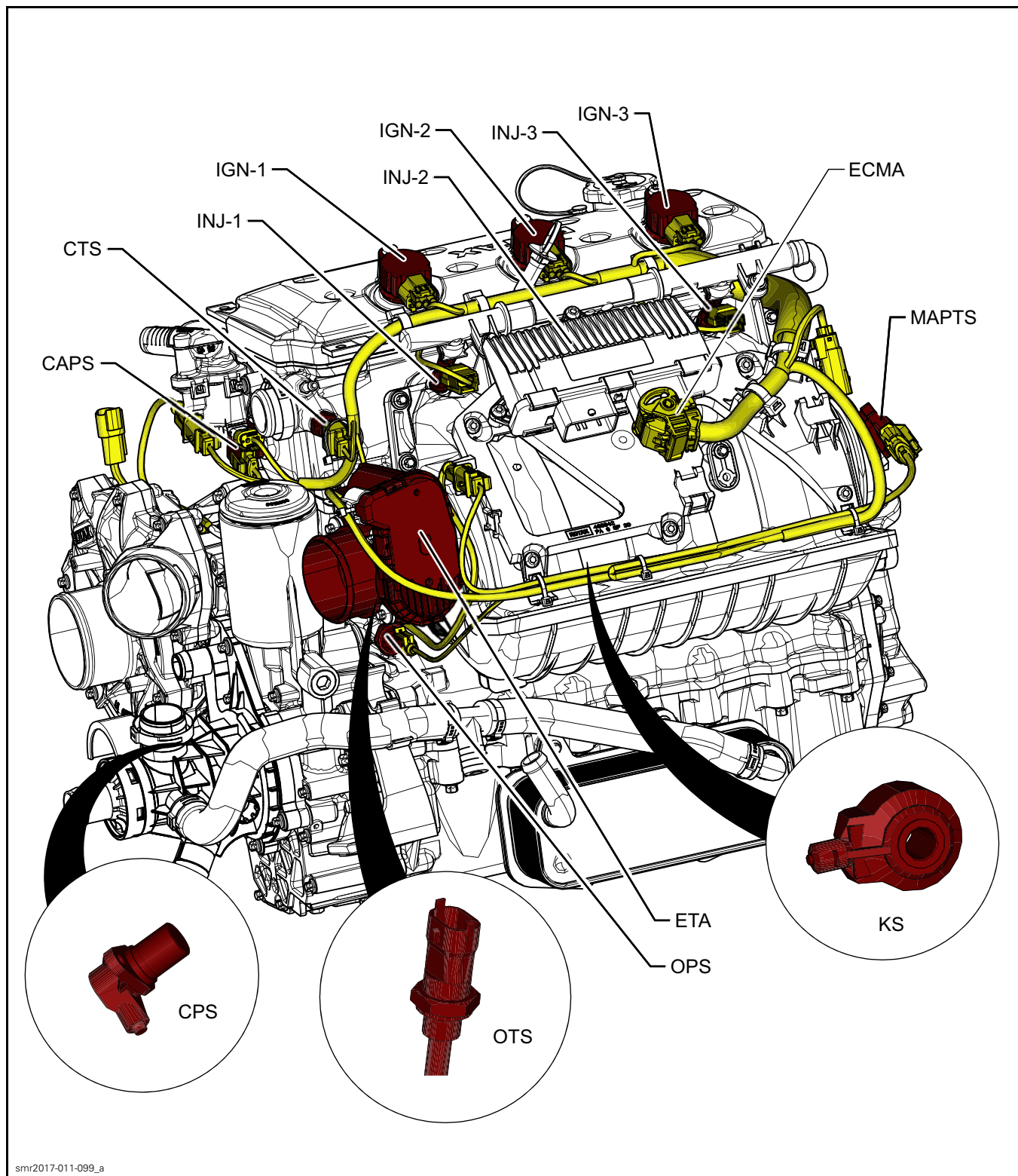
219100893-015-015_a

1503 HO ACE (230)



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1630 ACE (300)



smr2017-011-099_a

GENERAL

SYSTEM DESCRIPTION

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

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

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

Air management

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

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

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

Fuel management

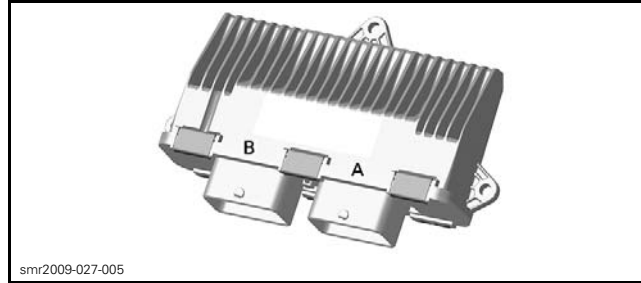
The coolant temperature sensor (CTS) is used to determine engine temperature. The ECM will slightly lean out the fuel mixture to bring a cold engine to operating temperature faster. Once the engine is at operating temperature, this stops.

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

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

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

Engine Control Module (ECM)



ECM

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

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

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

The ECM controls the following engine management functions:

Engine RPM Limiter

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

Engine Speed Control

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

Monitoring System

The ECM monitors:

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

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

Limp Home Mode

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

Diagnostic Mode

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

iCONTROL SYSTEM

GENERAL

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

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

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

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

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

iTC (INTELLIGENT THROTTLE CONTROL)

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

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

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

iBR (INTELLIGENT BRAKE AND REVERSE)

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

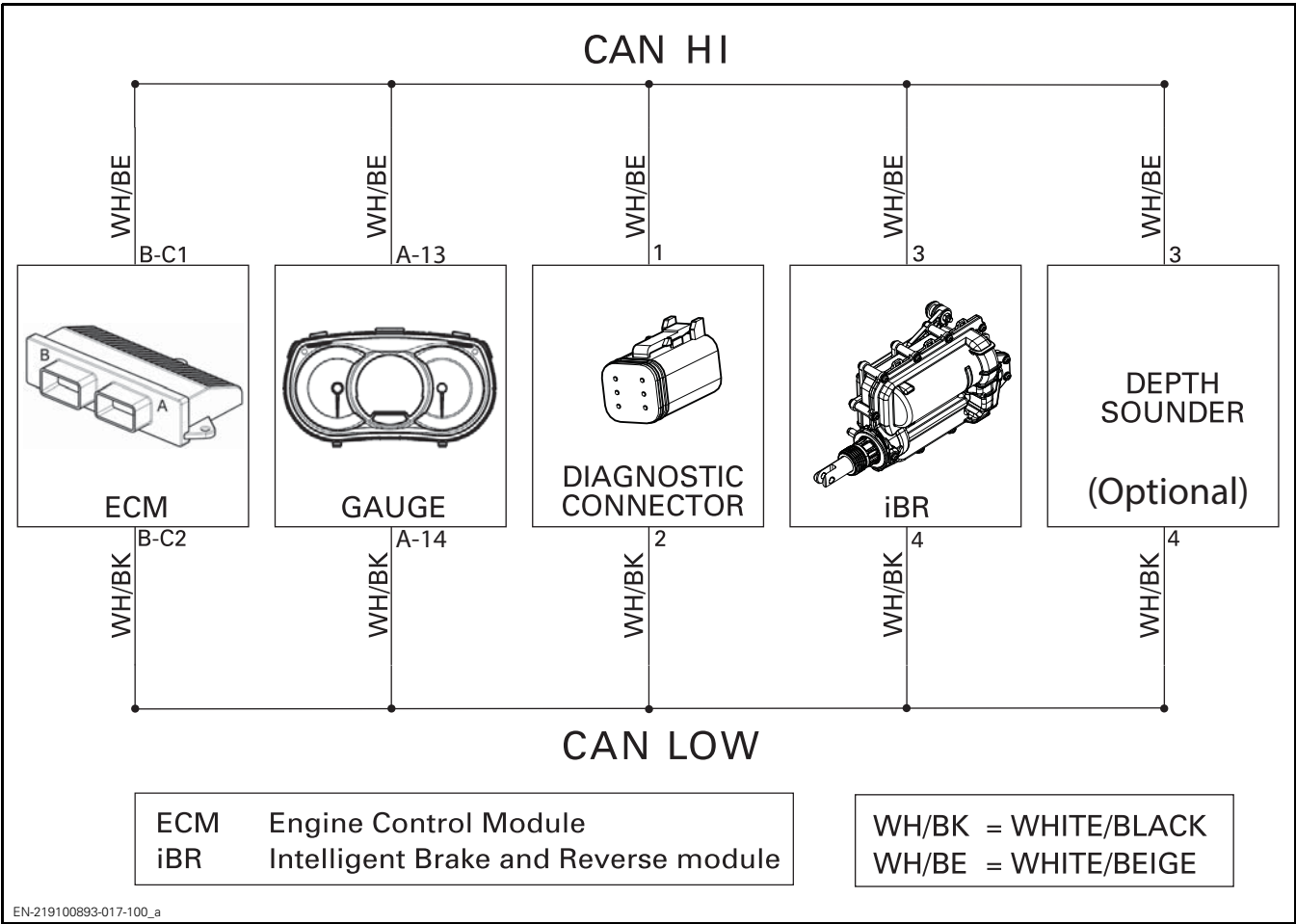
For a comprehensive and complete description of this system, refer to *IBR, REVERSE AND VTS* subsection.

CONTROLLER AREA NETWORK (CAN)

GENERAL

SYSTEM DESCRIPTION

The CAN (Controller Area Network) protocol is an ISO standard for serial data communication. The CAN bus is the nervous system of the iControl system and the engine management system (EMS). It links the electronic modules (ECMs) together so that they communicate to interact as required. Two wires connect each component and they are in constant communication with each other at a rate of about every 10 or 100 milliseconds depending on the component. CAN lines consist of a pair of twisted wires (WHITE/BLACK and WHITE/BEIGE).



CAN BUS DIAGRAM

TROUBLESHOOTING

DIAGNOSTIC TIPS

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

Make sure the modules are powered before testing CAN.

CAN Communication Problems

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

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

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

COMMUNICATION TOOLS

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC CABLE	710 000 851	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 BUDS2 related information, including:

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

Download and install the software on a PC.

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

REQUIRED TOOLS

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

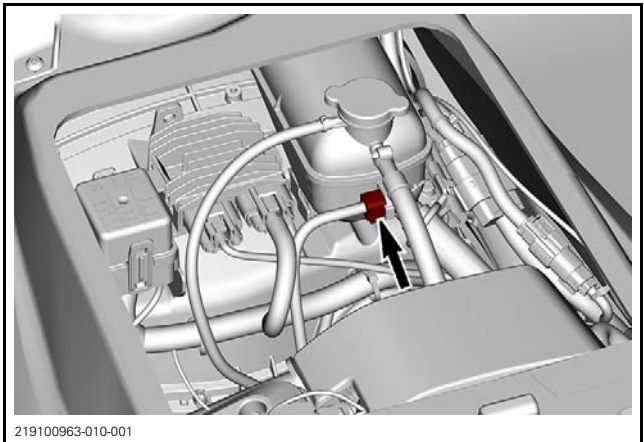
Multi-Purpose Interface Card (MPI-2 or MPI-3)

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

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

DIAGNOSTIC CONNECTOR LOCATION

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



TROUBLESHOOTING

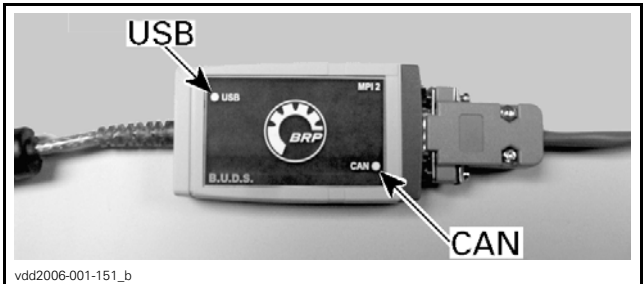
Refer to the BRP BUDS chart to ensure you are using the appropriate hardware and tools.

COMMUNICATION PROBLEMS

MPI Connection Troubleshooting

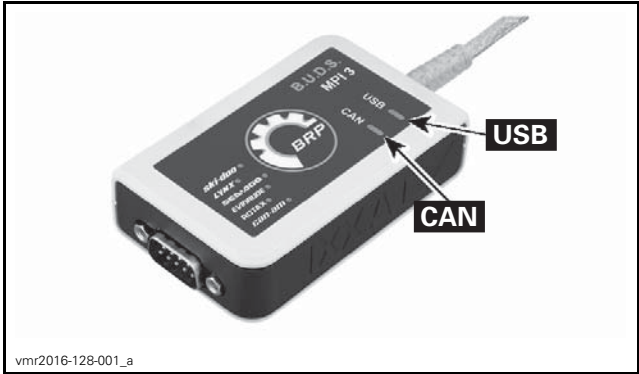
MPI Status Lights

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



MPI-2 CARD

Subsection XX (COMMUNICATION TOOLS)



MPI-3 CARD

Prerequisite for USB Communication:

- Computer turned ON
- MPI connected to PC computer.

COMMUNICATION PROBLEM (USB)	
STATUS	WHAT TO DO
USB Light is OFF	– Check USB connection between MPI card and PC computer. – Check USB operation on computer (hardware or Windows drivers).
USB Light is GREEN	– Connections are GOOD. Communication can take place on USB side.

Prerequisite for CAN Communication:

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

COMMUNICATION PROBLEM (CAN)	
STATUS	WHAT TO DO
CAN Light is OFF	– BUDS2 does not communicate with the vehicle. – Check connections from computer to vehicle. – Check if BUDS2. is started. – Check if vehicle is powered: is cluster turned ON? If it is not ON, install the tether cord cap (D.E.S.S. key) on the engine cut-off switch.
CAN Light is RED	This occurs when BUDS2 loses communication with vehicle. – Check connections from computer to vehicle. – Check if vehicle is powered: is cluster turned ON? If not, install the tether cord cap (D.E.S.S. key) on the engine cut-off switch.
CAN Light is GREEN	– Connections are GOOD. BUDS2 communicates normally with the vehicle.

DIAGNOSTIC AND FAULT CODES

GENERAL

MONITORING SYSTEM

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

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

The following components or functions are monitored.

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

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

INFORMATION CENTER MONITORING
Information center
VTS, Sport and ECO switch

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

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

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

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

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

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

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

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

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

Limp Home Mode

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

Subsection XX (DIAGNOSTIC AND FAULT CODES)

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

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

Indicator Lights and Message Display Information

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

Standard Gauge

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

Gauge for X Models

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

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

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

Subsection XX (DIAGNOSTIC AND FAULT CODES)

Beeper Signals

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

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

FAULT CODES

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

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

The faults registered in the ECM are stored in memory.

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

How to Read Fault Codes

Refer to *COMMUNICATION TOOLS* subsection.

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

How to Find Fault Code Descriptions

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

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

Browse lists of active/ occurred and inactive fault codes.

DIAGNOSTIC AND FAULT CODES

GENERAL

MONITORING SYSTEM

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

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

The following components or functions are monitored.

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

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

INFORMATION CENTER MONITORING
Information center
VTS, Sport and ECO switch
MODE and SET switch
Cruise switch
CAN
GPS
Fuel level sensor
Depth sounder
ECM
iBR module
iS module

iS MONITORING
iS module and motor
Vehicle speed
Suspension position
CAN
TOPS
Information center
iBR module

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

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

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

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

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

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

Subsection XX (DIAGNOSTIC AND FAULT CODES)

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

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

Limp Home Mode

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

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

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

Major Fault and Vehicle Reaction

The following EMS conditions will trigger a limp home mode.

ENGINE PROBLEM	MAX ALLOWED RPM
High engine temperature (from 110°C (230°F))	3000
High exhaust temperature (from 110°C (230°F))	3000
Low oil pressure (below 180 - 220 kPa (26 - 32 PSI))	2500

The following conditions will trigger limp home mode.

iBR PROBLEM	SYSTEM BEHAVIOR
Any active fault code related to the iBR that prevents its proper operation	iBR gate will be moved and locked in forward position (if possible)
	Engine will be set in limp home mode (reduced speed)

The following conditions will stop the suspension.

iS PROBLEM	SYSTEM BEHAVIOR
Any active fault code related to the iS that prevents its proper operation	Suspension operation will be disabled
	It will remain at the position it was at when the fault code was set

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.

GTI/GTR/GTS Series and Wake

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

RXT/GTX/RXP Series and Wake Pro

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

Subsection XX (DIAGNOSTIC AND FAULT CODES)

FAULT MESSAGES	
RIGHT KEYPAD ERROR	Gauge control button malfunction
LOW OIL PRESSURE	Engine low oil pressure detected
HIGH EXHAUST TEMPERATURE	High exhaust temperature detected
HIGH TEMPERATURE	High engine temperature detected
CHECK ENGINE	Engine management system malfunction or maintenance required
HIGH BATTERY VOLTAGE	High battery voltage detected
LOW BATTERY VOLTAGE	Low battery voltage detected
LIMP HOME MODE	Major fault detected, engine power limited
FUEL SENSOR DEFECTIVE	Fuel level sensor fault
WATER TEMP SENSOR DEFECTIVE	Problem in iBR, not sending water temperature info
CALIBRATION CHECKSUM ERROR	Information center programming corrupted
MAINTENANCE REQUIRED	Watercraft maintenance required
DEPTH SOUNDER MODULE COMMUNICATION PROBLEM	Error message if depth sounder is disconnected while riding
IS MODULE COMMUNICATION PROBLEM	Error message if communication with the suspension module is lost while riding
iBR MODULE ERROR	Error message if communication with the iBR module is lost while riding
FUNCTION CANNOT BE ACTIVATED	Message when a function is not or cannot be properly activated
WRONG KEY	Key not programmed for this watercraft
O.T.A.S. MAINTENANCE REQUIRED	Maintenance on O.T.A.S. required

Beeper Signals

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

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

FAULT CODES

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

Fault Code Categories

A fault code consists of an alphanumeric designator followed by a hexadecimal number of 3 digits. The alphanumeric designator defines the category of the fault code while the hexadecimal number refers to a unique fault.

FAULT CODE CATEGORIES		
ALPHANUMERIC DESIGNATOR	MODULE/ SYSTEM	EXAMPLE OF FAULT CODE
From B0 to B3	Body (include information center and switch faults)	B2211
From C0 to C3	iBR and iS	C007B
From P0 to P3	Power train and related system faults (includes ECM)	P062F
From U0 to U3	Communication between modules and sensors	U0179

RELATED MODULE AND FAULTS	
MODULE	FAULT CODE CATEGORY
ECM (engine control module)	Stores mainly "P" codes and some "U" codes
iBR (intelligent brake and reverse)	Stores mainly "C" codes and a few "U" codes
iS (intelligent suspension)	Stores mainly "C" codes and a few "U" codes
Cluster	Stores mainly "C" codes and a few "U" codes

Reading Fault Codes Using the Information Center

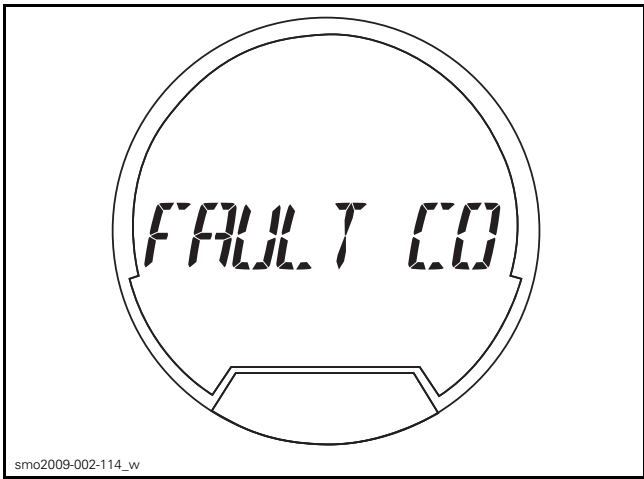
NOTE: A fault code must have the "Active" state to be displayed in the multifunction gauge.

1. Press the MODE button repeatedly until the FAULT CODE function is visible in the multifunction display.
2. Press the SET button or the UP or DOWN arrow button to enter the function and display the first fault code.

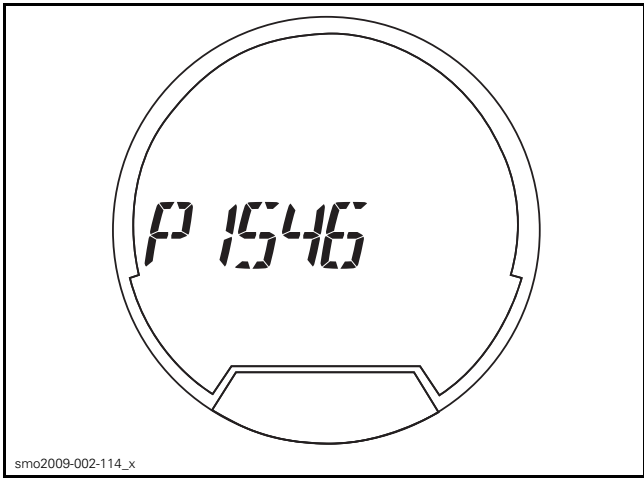
3. Press the UP or DOWN arrow button repeatedly to display each subsequent code.

NOTE: When the last fault code has been displayed and the button is pressed again, the system loops back to the first fault code displayed, and all fault codes can again be displayed. If there was one active fault code when entering FAULT CODE mode, and it becomes occurred (no longer active), a NO ACTIVE FAULT CODE message will scroll in the display.

4. To exit the FAULT CODE display function, the MODE or SET button must be pressed once. There is no time out on this function.



FAULT CODE DISPLAY FUNCTION



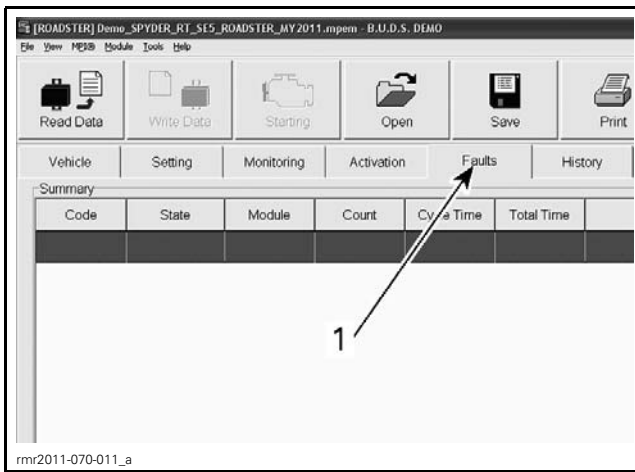
TYPICAL - ENGINE FAULT CODE EXAMPLE

Reading Fault Codes Using B.U.D.S. Software

NOTE: All fault code types can be read with B.U.D.S.

1. Connect vehicle to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

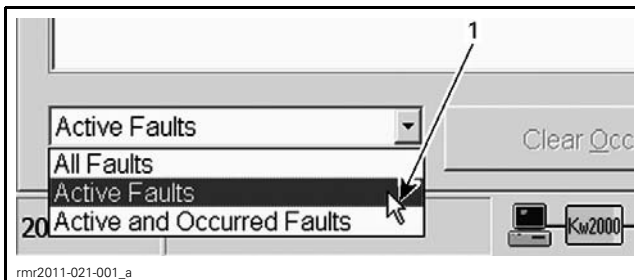
2. Click on the **Read Data** button.
3. Click on the **Faults** tab.



TYPICAL

1. Fault tab

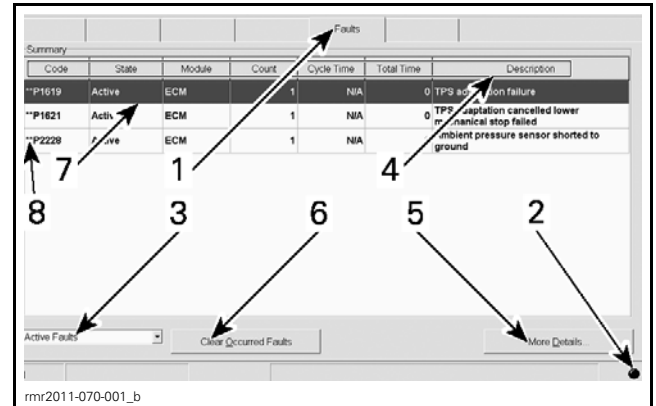
4. Click on the drop-down list on the LH lower corner.
5. Choose the fault state to display.



TYPICAL

1. Drop down list

FAULT STATE	INFORMATION
All faults	Display all possible faults regardless of state
Active faults	Display only faults matching this state. Empty area if there is no active fault
Active and occurred faults	Display only faults that have either state. Empty area if there is neither active nor occurred fault



TYPICAL FAULT PAGE

1. Fault tab
2. Fault indicator light
3. Fault code state drop box
4. Fault nomenclature
5. More details button
6. Clear occurred faults button
7. Selected fault
8. More information indicator

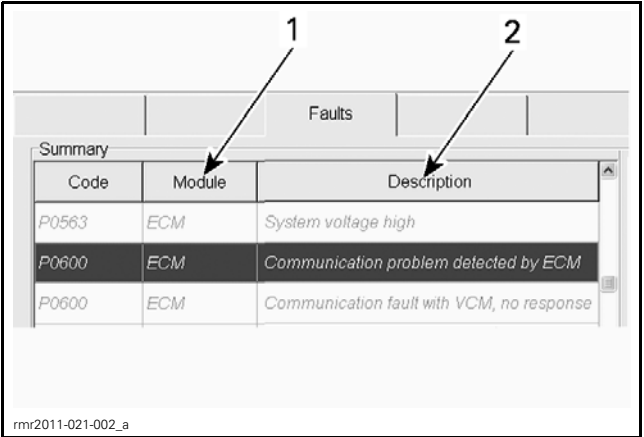
FAULT PAGE DESCRIPTION	
ITEM	INFORMATION
Fault tab	Click tab to display the fault page
Fault indicator light	When flashing, it indicates there is active fault(s)
Fault code state drop box	Click drop box to select the type of faults to display
Fault nomenclature	Display specific information and statistics related to the fault (see fault nomenclature table)
More details button	To display possible causes and service actions related to the selected fault
Clear occurred faults button	To clear all occurred faults in related ECU(s)
Selected fault	When a fault is selected, additional information pertaining to that fault will be displayed when clicking the "More details" button. To select a fault, click on the fault with the mouse or use the cursor up or down to scroll to the desired fault

Subsection XX (DIAGNOSTIC AND FAULT CODES)

FAULT NOMENCLATURE	
COLUMN	INFORMATION
Code	Fault code number. When 2 stars (**) precedes the code, detailed conditions when the fault occurred, can be displayed by clicking the "More details" button
State	Display the fault state (active, occurred, inactive)
Module	Displays the module that reports the fault code. This is the module that detects or has received a message of an anomaly and reports it. List of modules: Multifunction gauge ECM (engine control module) iBR (intelligent brake and reverse) iS (intelligent suspension)
Count	Number of times this fault occurred within the driving cycle Value: From 0 to 255
Cycle time	Not to be used Value: From 0 to 255 minutes
Total time	Not to be used Value: From 0 to 64 255 minutes
Description	Provides a short description of the fault

When reading a fault code in B.U.D.S., pay particular attention to which module reports a fault. It is indicated in the **Module** column.

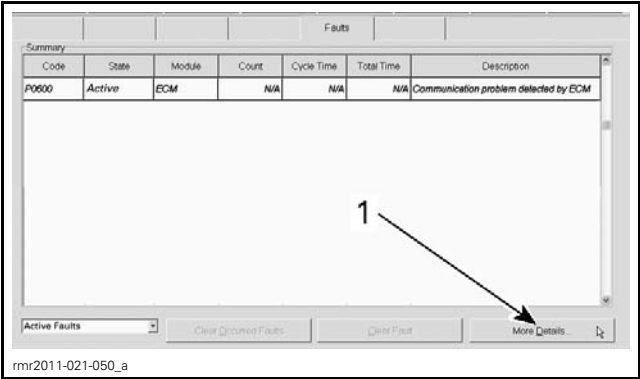
The **Description** column gives a short description of the fault.



SOME COLUMNS REMOVED FOR CLARITY PURPOSE

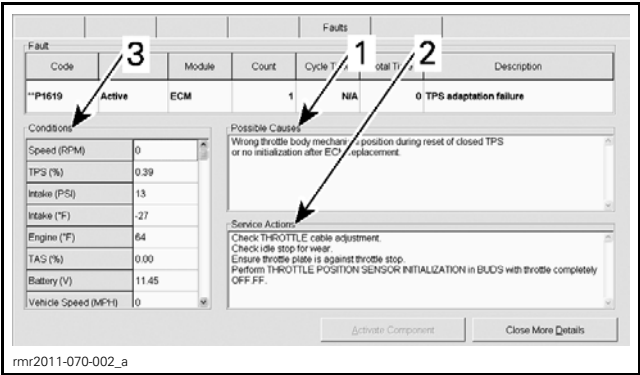
1. Module that reports a fault
2. Fault description

Click on the **More Details** button, on the RH lower corner, to display the "Possible Causes" and the "Service Actions" to step further in the diagnosis.



TYPICAL

1. Click here



TYPICAL — MORE DETAILS PAGE

1. Possible causes related to the selected fault
2. Service actions
3. Operating conditions when fault occurred

MORE DETAILS PAGE DESCRIPTION	
ITEM	INFORMATION
Possible causes	List the possible causes that triggered the fault
Service actions	List the possible actions to perform to solve the fault
Conditions when fault occurred	List the operating conditions of the engine and/or vehicle when the fault was triggered

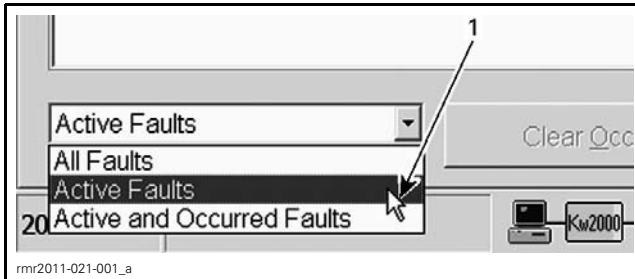
Fault Code States

The various electronic control units (ECUs) used in the vehicle can generate a variety of fault codes depending on the level of monitoring they are capable of. Fault codes have 3 possible states:

- Active
- Occurred
- Inactive.

Click the **Fault** tab then click on the drop-down list on the LH lower corner.

Choose the fault code state you want to display.



TYPICAL

1. Drop down list

FAULT STATE	INFORMATION
All faults	Display all possible faults regardless of state
Active faults	Display only faults matching this state. Empty area if there is no active fault
Active and occurred faults	Display only faults that have either state. Empty area if there is neither active nor occurred fault

Active Fault Codes

An active fault code is an indication of a fault that is **currently triggered**.

The active fault may or may not compromise normal operation of the related system(s). Service action in B.U.D.S. should be used to correct the problem that caused the fault code.

Once the fault condition(s) of the active fault is no longer present, its state will change to "occurred".

Occurred Fault Codes

An occurred fault code indicates a fault that was active, but **no longer** is.

The occurred fault does not presently affect system or component operation but is retained as a history of the faults that were detected.

Inactive Fault Codes

An inactive fault code represents a fault code that is neither active, nor occurred. It is simply part of a list of all possible faults which may be monitored by the various ECUs, which may become active or occurred if the monitoring system detects an applicable fault.

How to Clear Fault Codes Using B.U.D.S.

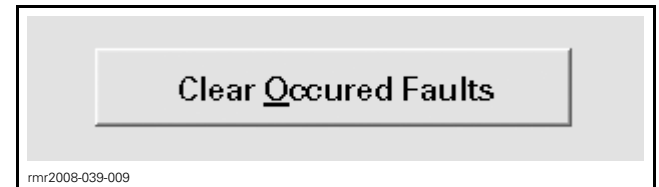
Connect vehicle to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Click on the **Read Data** button.

Click on the **Faults** tab.

NOTE: Only the **Occurred** state faults can be cleared.

Click the "Clear Occurred Faults" button.



CLEAR OCCURED FAULTS

This will reset the appropriate counter(s) and will also record that the problem has been fixed in the related module memory.

Observe the "Occurred" fault(s). They should all disappear. Otherwise, follow this procedure.

- Remove tether cord cap from engine cut-off switch.
- Wait 3 minutes.
- Repeat procedure to clear faults again.

FAULT CODE DIAGNOSTIC

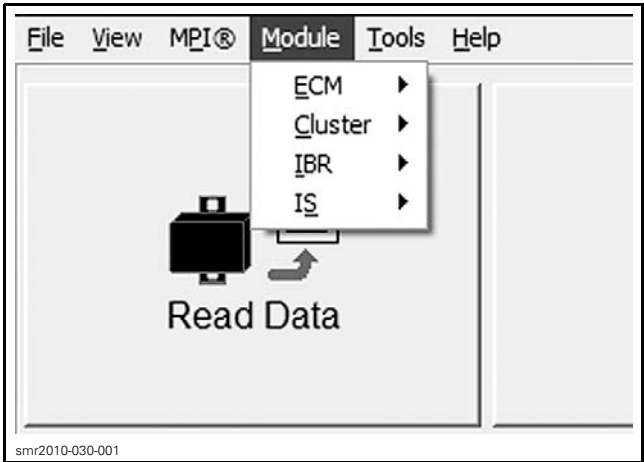
Missing Module

If a module is missing, several fault codes will appear.

To quickly find which module is missing, perform the following:

1. Connect vehicle to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Click on the **Read Data** button.
3. Click **Module** in the menu bar.
4. Look at the list of modules.
5. If a module is not visible, then it is not communicating through the CAN bus (controller area network).

Subsection XX (DIAGNOSTIC AND FAULT CODES)



TYPICAL — MODULE SUBMENU LIST (MODELS WITH iBR AND iS)

6. Refer to the following table to find the appropriate subsection in this manual to diagnose the missing module.

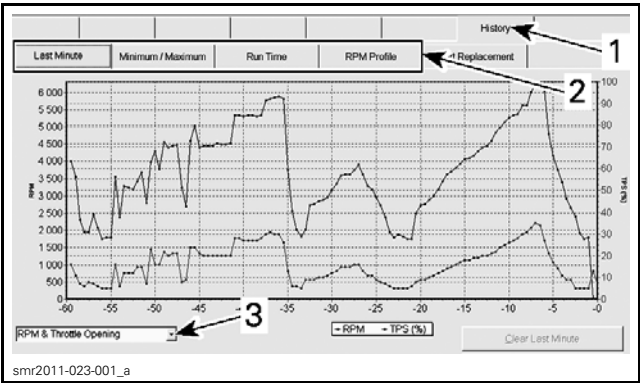
MISSING MODULE	SECTION TO REFER TO
ECM	ELECTRONIC FUEL INJECTION (EFI)
Cluster	GAUGE
iBR	iBR AND VTS
iS	SUSPENSION (iS)

Diagnostic Tips Using B.U.D.S.

History Page

HISTORY PAGE DESCRIPTION	
ITEM	INFORMATION
Last minute	Displays several parameters recorded in the last minute of engine operation
Minimum/Maximum	Display the minimum and maximum values encountered. Click "Clear Min/Max" to reset the values
Run time	Display the time proportion in what mode the engine was running in
RPM profile	Display the RPM range proportion in which the engine was running in

To see the last minute of operating conditions, click on the **History** tab in B.U.D.S.

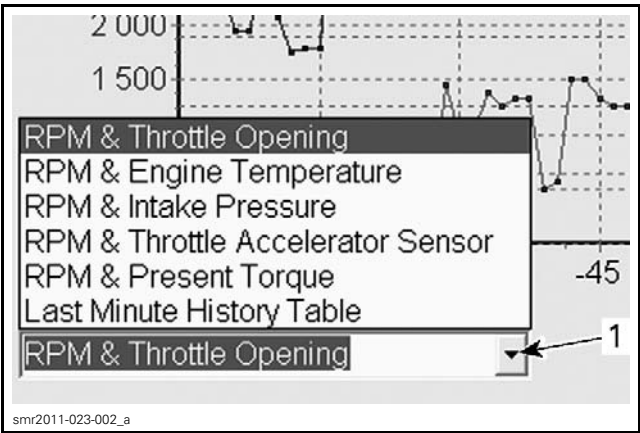


- 1. History tab
- 2. Additional history pages
- 3. Drop-down list in Last Minute page

Last Minute Drop-Down List:

From the **Last Minute** page, click on the drop-down list on the LH lower corner.

Choose the values to display.



- 1. Drop down list

Guidelines to Solve Fault Codes

CONDITION	ACTION
Troubleshooting vehicle	Use B.U.D.S. to: Read fault codes. Display "Active" faults to see components currently not operating normally. Display "Occurred" faults to troubleshoot intermittent problems. Monitor system(s), sensor(s), switches and actual conditions. Activate component(s) for troubleshooting. Set components etc. Know the last minute of operating conditions by using the "History" page. Know the operating conditions, if available, when a fault code occurred by using the "More details" button in the fault page.
New fault(s) appear after a vehicle maintenance or repair	Check sensor connections or mixed up connections. Before vehicle maintenance: Read the electronic modules with B.U.D.S. Save and print the B.U.D.S. file (keep faults option only). After vehicle maintenance: Read the electronic modules with B.U.D.S. Compare the fault code(s) before and after the maintenance using the printed copy and the current B.U.D.S. reading. Investigate only the newly fault codes. Clear all occurred faults in B.U.D.S.
Communication faults displayed as "Occurred" after module flashing	Normal behavior when flashing a module. Clear all occurred faults and check again.
Sensor "Active" fault	Read the fault description in B.U.D.S. Click on the "More Details" button. Look at the "Conditions" when available. Read the "Possible Causes". Apply the "Service Actions".
Several fault codes active at the same time	Likely to be caused by burnt fuse(s) or bad bus bar connection(s).
Low system voltage on one module Power problem on sensor(s)	Check related fuse(s) and relay. Check related power and ground wires. Check for common power supply to several sensors/modules (refer to <i>POWER DISTRIBUTION AND GROUNDS</i>). NOTE: Some sensors are supplied by the battery while others are supplied by a module.
Low system voltage on several modules (several communication faults will also appear)	Check battery condition and connections. Check related fuse(s) and relay. Check voltage regulator/rectifier.
High system voltage on several modules	A battery charger has likely been used to substitute the vehicle battery. Clear all occurred faults and check again. Check voltage regulator/rectifier.
When all modules report that a module is missing	Check the module that is reported as missing. Check related fuse(s) and relay. Check related power and ground wires.
When several modules are in fault	Search for a common problem such as a faulty sensor.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

CONDITION	ACTION
CAN bus failure, CAN buss OFF	When several modules and sensors report that a module is missing. The missing module may report CAN bus failure, CAN bus off. Check related CAN wires (continuity, short to ground, short between CAN low and high). Check module pins and wiring terminals. Then, the other modules should stop reporting that module is missing.
Occurred fault(s)	May have been generated due to a system or component that was momentarily operating outside normal parameters.
	May be generated when disconnecting and reconnecting a component, replacing a burnt fuse, or may be due to a momentary high or low voltage.
	Before being "Occurred", a fault has always been "Active" for a certain time, indicating that an unexpected condition or problem has been present during the driving cycle. A frequent momentarily fault or an intermittent fault may never be seen as "Active" in B.U.D.S. while there is still a pending problem. This type of malfunctions can be discovered by looking at the "Occurred" faults and then by evaluating the fault count. As long as a fault is present, it is displayed as "Active".
Fault count (0 - 255)	Low value: Suggests handling problems (connections, terminal contact/shape etc.). High value: Suggests a frequent and unsolved problem. The problem should be investigated.
Fault conditions (More details button)	Look for abnormal, excessive values.
Hard to find problems	When the basic troubleshooting has been done and the fault code(s) persists, often the problem is related to the wiring harness, connections or electromechanical components. Short to ground, to battery or between wires. Wire splices, chafing, terminal problems (pulled out, bent, out of shape, corroded etc.). Bad contacts in switch or relay.

GUIDELINES TO SOLVE SPECIFIC FAULT CODES

Several Fault Codes Are Active Simultaneously

If this occurs, check the following:

- Check the 30 A fuses in fuse box.
- Check the bus bar condition and connections in the fuse box(es).
- Check the diagnostic connector for the presence of water or corrosion.
- Check the CAN wires.

Fault Code C2100

iBR Sensors calibration is corrupted If the fault comes active when the iBR is activated and stays active, verify if a software update is available.

Fault Code C2120

iBR Application calibration is corrupted If the fault comes active when the iBR is activated and stays active, verify if a software update is available.

Fault Code C2121, C2221

iBR or iS application parameters corrupted (backup no. 1 or no. 2). This fault may occasionally appear as occurred. It happens when power to the module is shut off before the module has time to complete its shutdown. Normal operation is not affected. If it occurs often, check supply voltage to module.

Fault Code C2150, C2233, C2250

iBR or iS motor or system current software breaker. Motor or module current too high. This fault may occasionally appear as occurred. Normal operation is not affected. If the count is high, check the moving mechanism of the system if it is stiffer than normal to operate.

Fault Code C2232

Motor open. If suspension operates when using the iS Up/Down switches, the suspension will operate normally when riding even if this fault is active. In this case, the fault can be ignored. The fault will be set to "occurred" when the iS module will be shut down. If the suspension does not operate when using the iS Up/Down switches, refer to *SUSPENSION (iS)* subsection.

Fault Code P0122 and P0123

The TAS signal #1, the TOPS and MAPS sensors share the same 5 volt supply. If one of the sensor is using too much power, the voltage will drop which may result in the fault codes appearing on the other sensors. If the fault code becomes active verify power input in all 3 sensors.

Fault Code P0562

Battery voltage too low. It occurs when both battery voltage and engine RPM conditions are met. See following chart. Refer to *CHARGING SYSTEM* subsection.

BATTERY VOLTAGE	ENGINE SPEED
Lower than 6.5 Vdc	Lower than 1280 RPM
Lower than 11.8 Vdc	Greater than 1280 RPM

Fault Code P0563

Battery voltage too high. It occurs when battery voltage is above 16 Vdc when engine is running. Refer to *CHARGING SYSTEM*.

Fault Code P0171

Multiplicative mixture adaptation exceeds upper limit--> mixture too lean. An open signal on the engine coolant temperature (CTS) can trigger that fault. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Fault Code P0172

Multiplicative mixture adaptation below lower limit--> mixture too rich. An open signal on the engine coolant temperature (CTS) can trigger that fault. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Fault Code P1171

Additive mixture adaptation exceeds upper limit--> mixture too lean. An open signal on the engine coolant temperature (CTS) can trigger that fault. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

Fault Code P1172

Additive mixture adaptation below lower limit --> mixture too rich. An open signal on the engine coolant temperature (CTS) can trigger that fault. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

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Fault Code U016A

Loss of vehicle speed. This fault may occasionally appear as occurred. Normal operation is not affected. If the count is high, check the related components.

Fault Code U0129

CAN communication error between iS and iBR modules or iBR CAN message time-out or validity. This fault may occasionally appear as occurred. Normal operation is not affected. If the count is high, check the related components. Ensure connector is plugged.

Fault Code U0300

Incorrect ECM or information center for the engine. Installed part is not appropriate for the vehicle. Using BUDS, check if the security coding of the cluster is matched with the ECM security coding. **Engine will crank but will not start.** Refer to *PARTS CATALOGS* for proper part according to vehicle.

FAULT CODE TABLE

NOTE: Always refer to the fault code list available in the latest applicable version of B.U.D.S. software. When using the service action suggested in the Fault section of B.U.D.S., the system circuits are referred as A-M4 for instance. It means ECM connector "A" and the circuit wire M4 as found in the *WIRING DIAGRAM*.

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
B2210	CLUSTER	Left keypad fault (Switch kept activated more than 60 seconds)	Problem with left keypad.	The switch may be defective, verify the functionality of the switch or the wires. Refer to the shop manual for switch diagnosis/testing procedure.
B2211	CLUSTER	Suspension UP/DOWN or SPORT / ECO switches shorted to ground fault	Problem with left keypad.	Look for pin B if shorted to ground or pin C.
B2212	CLUSTER	Suspension UP/DOWN or SPORT / ECO switches disconnected fault	Problem with left keypad.	Look for pin B if disconnected to pin 14 on the cluster. Look for pin C if disconnected to pin 15 on the cluster .
B2213	CLUSTER	VTs UP/DOWN switches shorted to ground fault	Problem with left keypad.	Look for pin A if shorted to ground or pin C.
B2214	CLUSTER	VTs UP/DOWN switches disconnected fault	Problem with left keypad.	Look for pin A if disconnected to pin 13 on the cluster. Look for pin C if disconnected to pin 15 on the cluster .
B2220	CLUSTER	Right keypad fault (Switch kept activated more than 60 seconds)	Problem with right keypad.	The switch may be defective, verify the functionality of the switch or the wires. Refer to the shop manual for switch diagnosis/testing procedure.
B2221	CLUSTER	MODE/SET switches shorted to ground fault	Problem with right keypad.	Look for pin B if shorted to ground or pin C.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
B2222	CLUSTER	MODE/SET switches disconnected fault	Problem with right keypad.	Look for pin B if disconnected to pin 17 on the cluster. Look for pin C if disconnected to pin 18 on the cluster.
B2223	CLUSTER	UP/DOWN switches shorted to ground fault	Problem with right keypad.	Look for pin A if shorted to ground or pin C.
B2224	CLUSTER	UP/DOWN switches disconnected fault	Problem with right keypad.	Look for pin A if disconnected to pin 16 on the cluster. Look for pin C if disconnected to pin 18 on the cluster.
C0042	IBR	Brake Lever Sensor (BRLS) signals A open/shorted to ground	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C0042	IBR 2013	Brake Lever Sensor (BRLS) signals A open/shorted to ground	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C0043	IBR	Brake Lever Sensor (BRLS) signals B open/shorted to ground	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C0043	IBR 2013	Brake Lever Sensor (BRLS) signals B open/shorted to ground	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C0073	IBR	Torque request failure	CPS wires shorted. Bad connection on the engine coolant temp sensor.	Perform ECM software update if available. Verify CPS connection. Verify engine temperature if it is plausible. A bad connection with the CTS can generate this fault when the iBR is used.



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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C0073	IBR 2013	Torque request failure	CPS wires shorted. Bad connection on the engine coolant temp sensor.	Perform ECM software update if available. Verify CPS connection. Verify engine temperature if it is plausible. A bad connection with the CTS can generate this fault when the iBR is used.
C2100	IBR	Sensors calibration is corrupted	Incompatible firmware or memory failure.	If the fault comes active when the iBR is activated and stays active, verify if a software update is available. Refer to the service manual for more details.
C2100	IBR	Actuator movement	The reverse gate cannot move to the desired position. (stuck or motor open)	Clean and check for damage/wear parts in the reverse system and nozzle area. Check iBR electrical motor wiring. Isolate the iBR output shaft from the reverse system and activate the iBR, if the fault comes active, replace iBR. Refer to the service manual for more details.
C2100	IBR 2013	Sensors calibration is corrupted	Incompatible firmware or memory failure.	If the fault comes active when the iBR is activated and stays active, verify if a software update is available. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2101	IBR	Actuator movement warning	The reverse gate cannot move to the desired position within expected time.	Clean and check for damage/wear parts in the reverse system and nozzle area. Check iBR electrical motor wiring. Isolate the iBR output shaft from the reverse system and activate the iBR, if the fault comes active, replace iBR. Refer to the service manual for more details.
C2101	IBR 2013	Actuator movement warning	The reverse gate cannot move to the desired position within expected time.	Clean and check for damage/wear parts in the reverse system and nozzle area. Check iBR electrical motor wiring. Isolate the iBR output shaft from the reverse system and activate the iBR, if the fault comes active, replace iBR. Refer to the service manual for more details.
C2102	IBR 2013	Actuator movement	The reverse gate cannot move to the desired position. (stuck or motor open)	Clean and check for damage/wear parts in the reverse system and nozzle area. Check iBR electrical motor wiring. Isolate the iBR output shaft from the reverse system and activate the iBR, if the fault comes active, replace iBR. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2110	IBR	Reverse gate position sensor error	iBR malfunction.	If the fault comes active when the iBR is activated and stays active, verify if a software update is available. Refer to the service manual for more details.
C2110	IBR	Angle position sensor warning	iBR malfunction.	If the fault comes active when the iBR is activated and stays active, verify if a software update is available. Refer to the service manual for more details.
C2110	IBR	iBR overheat	iBR cooling system failure. iBR unit failure.	Check iBR cooling circuit. Refer to the service manual for more details.
C2110	IBR	Monitoring CPU message timeout or validity	iBR malfunction.	Perform an iBR software update if available and clear the fault. Replace the iBR unit if the fault remains active. Refer to the service manual for more details.
C2110	IBR	Monitoring CPU limp force	iBR malfunction.	Perform an iBR software update if available. Replace the iBR unit if the fault remains active. Refer to the service manual for more details.
C2110	IBR 2013	Reverse gate position sensor error	iBR malfunction.	If the fault comes active when the iBR is activated and stays active, verify if a software update is available. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2111	IBR	ECM erratic RPM signal	RPM signal received from engine ECM not plausible.	Check CPS sensor connection
C2112	IBR 2013	Angle position sensor warning	iBR malfunction.	If the fault comes active when the iBR is activated and stays active, verify if a software update is available. Refer to the service manual for more details.
C2113	IBR 2013	iBR overheat	iBR cooling system failure. iBR unit failure.	Check iBR cooling circuit. Refer to the service manual for more details.
C2114	IBR 2013	Monitoring CPU message timeout or validity	iBR malfunction.	Perform an iBR software update if available and clear the fault. Replace the iBR unit if the fault remains active. Refer to the service manual for more details.
C2115	IBR 2013	Monitoring CPU limp force	iBR malfunction.	Perform an iBR software update if available. Replace the iBR unit if the fault remains active. Refer to the service manual for more details.
C2120	IBR	Application calibration is corrupted	Incompatible firmware or memory failure.	If the fault comes active when the iBR is activated and stays active, verify if a software update is available. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2120	IBR 2013	Application calibration is corrupted	Incompatible firmware or memory failure.	If the fault comes active when the iBR is activated and stays active, verify if a software update is available. Refer to the service manual for more details.
C2121	IBR	Application parameters corrupted (backup #1 or #2)	Unexpected battery power lost or memory failure. Ignore fault if "occured"	Verify starting and charging system circuits. Clear fault Refer to the service manual for more details.
C2121	IBR 2013	Application parameters corrupted (backup #1 or #2)	Unexpected battery power lost or memory failure. Ignore fault if "occured"	Verify starting and charging system circuits. Clear fault Refer to the service manual for more details.
C2130	IBR	Motor current software breaker	iBR motor current too high. Battery power failure. iBR unit failure.	Clean and check for damage in the reverse gate and nozzle area. Refer to the service manual for more details.
C2130	IBR	Internal motor drive failure	Motor voltage feedback not fitting with the command.	
C2130	IBR 2013	Motor current software breaker	iBR motor current too high. Battery power failure. iBR unit failure.	Clean and check for damage in the reverse gate and nozzle area. Refer to the service manual for more details.
C2131	IBR	iBR DC motor shorted to ground or 12V	iBR motor failure. iBR motor wires damaged. Battery power failure. iBR unit failure.	Perform an iBR update with BUDS Check iBR battery power Check iBR Motor Wiring Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2131	IBR 2013	iBR DC motor shorted to ground or 12V	iBR motor failure. iBR motor wires damaged. Battery power failure. iBR unit failure.	Perform an iBR update with BUDS Check iBR battery power Check iBR Motor Wiring Refer to the service manual for more details.
C2132	IBR	Motor Open	No current while activated.	Verify if the motor is properly connected to the iBR housing
C2132	IBR 2013	Motor Open	No current while activated.	Verify if the motor is properly connected to the iBR housing
C2133	IBR 2013	Internal motor drive failure	Motor voltage feedback not fitting with the command.	
C2142	IBR	Brake Lever Sensor (BRLS) signals A shorted to battery	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C2142	IBR 2013	Brake Lever Sensor (BRLS) signals A shorted to battery	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C2143	IBR	Brake Lever Sensor (BRLS) signals B shorted to battery	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C2143	IBR 2013	Brake Lever Sensor (BRLS) signals B shorted to battery	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C2144	IBR	Brake Lever Sensor (BRLS) power shorted to battery	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 4.5 to 5 volts on sensor connector pin A & D. Refer to the service manual for more details.
C2144	IBR 2013	Brake Lever Sensor (BRLS) power shorted to battery	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 4.5 to 5 volts on sensor connector pin A & D. Refer to the service manual for more details.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2145	IBR	Brake Lever Sensor (BRLS) power shorted to ground	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 4.5 to 5 volts on sensor connector pin A & D. Refer to the service manual for more details.
C2145	IBR 2013	Brake Lever Sensor (BRLS) power shorted to ground	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 4.5 to 5 volts on sensor connector pin A & D. Refer to the service manual for more details.
C2146	IBR	Brake Lever Sensor (BRLS) signals A/B reading difference	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C2146	IBR 2013	Brake Lever Sensor (BRLS) signals A/B reading difference	Damaged sensor, damaged circuit wires, damaged connector or damaged iBR pins. Fault detected when the engine is running or stopped.	Check for 0,5 to 3V on pin F and 0,25 to 1.5 on pin C.
C2150	IBR	System current software breaker	iBR input current too high.	Clean and check for damage in the reverse gate and nozzle area. Refer to the service manual for more details.
C2150	IBR 2013	System current software breaker	iBR input current too high.	Clean and check for damage in the reverse gate and nozzle area. Refer to the service manual for more details.
C2151	IBR	System disabled and need activation	System is locked. Need activation.	Use B.U.D.S. iBR unlock function. Refer to the service manual for more details.
C2151	IBR 2013	System disabled and need activation	System is locked. Need activation.	Use B.U.D.S. iBR unlock function. Refer to the service manual for more details.
C2155	IBR	Water temperature sensor overheat	iBR cooling system failure. iBR unit failure.	Check iBR cooling circuit. Replace iBR unit. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2155	IBR 2013	Water temperature sensor overheat	iBR cooling system failure. iBR unit failure.	Check iBR cooling circuit. Replace iBR unit. Refer to the service manual for more details.
C2161	IBR	Low voltage detected	Battery failure, rectifier failure, damaged circuit wires, battery terminal connection, damaged AC generator or damaged connectors. Ignore fault if "occured"	Check fuses #6 (REFER TO WIRING DIAGRAM). Check ground continuity to the engine block. Refer to the service manual for more details.
C2161	IBR 2013	Low voltage detected	Battery failure, rectifier failure, damaged circuit wires, battery terminal connection, damaged AC generator or damaged connectors. Ignore fault if "occured"	Check fuses #6 (REFER TO WIRING DIAGRAM). Check ground continuity to the engine block. Refer to the service manual for more details.
C2200	IS	Sensors calibration is corrupted	Incompatible firmware or memory failure.	If the fault comes active when the iS is activated and stays active, verify if a software update is available. Refer to the service manual for more details.
C2210	IS	Bridge/CPU temperature sensor overheat	Hardware failure or external heat source.	Check for over utilization / heat.
C2220	IS	Application calibration is corrupted	Incompatible firmware or memory failure.	If the fault comes active when the iS is activated and stays active, verify if a software update is available. Refer to the service manual for more details.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2221	IS	Application parameters corrupted (backup #1 or #2)	Unexpected battery power lost or memory failure. Ignore fault if "occured"	Verify starting and charging system circuits. Clear fault. Refer to the service manual for more details.
C2230	IS	Internal motor drive failure	Motor voltage feedback not fitting with the command.	If the fault comes active when the iS is activated and stays active, verify if a software update is available. Refer to the service manual for more details.
C2231	IS	Motor shorted to ground/battery	Current leak detected when the bridge is off.	Check suspension actuator pump wiring.
C2232	IS	Motor open	No current while activated.	Check suspension actuator pump and/or wiring.
C2233	IS	Motor current software breaker	Motor current too high.	Check suspension actuator pump.
C2240	IS	Seat position sensor error Open, Shorted to Gnd	Sensor not connected.	Check system circuit at iS module. (REFER TO WIRING DIAGRAM)
C2250	IS	System current software breaker	Battery input current too high.	Check suspension actuator pump.
C2251	IS	System disabled and need activation	System is locked for safety. Need activation.	Activate iS using B.U.D.S. activation function.
C2252	IS	TOPS active	Warning only: TOPS detected by the system, the suspension is disable while the TOPS is "ON".	Refer to the service manual for more details.
C2260	IS	System under voltage	System under voltage warning.	Check battery and charging system.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0106	ECM	Manifold Intake pressure sensor out of range	Sensing port dirty or blocked. Sensor failure or unexpected reading at idle. Sensor fallen out of housing or leaking inlet. For a leak of the Intake Manifold, the ECM will diagnose it only if the RPM is greater than 5000 RPM.	Check system circuits A-B4, A-G4, A-H2. Make sure that the sensor housing is correctly inserted into the manifold. Check sensor connector for: a) 5 volts supply from ECM on pin 1. b) Ground supply from ECM on pin 2. c) Analog voltage from sensor to ECM on pin 3. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current.
P0107	ECM	Manifold absolute pressure sensor shorted to ground or not connected.	Sensing port dirty or blocked. Sensor failure or unexpected reading at idle. Sensor fallen out of housing or leaking inlet. Connector disconnected.	Check system circuits A-B4, A-G4, A-H2. Make sure that the sensor housing is correctly inserted into the manifold. Check sensor connector for: a) 5 volts on pin 1. b) 0 volt on pin 2. c) 0 volt on pin 3. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0108	ECM	Manifold absolute pressure sensor open circuit or shorted to battery	Sensing port dirty or blocked. Sensor failure or unexpected reading at idle. Sensor fallen out of housing or leaking inlet.	Check system circuits A-B4, A-G4, A-H2. Make sure that the sensor housing is correctly inserted into the manifold. Check sensor connector for: a) 5 volts on pin 1. b) 0 volt on pin 2. c) 0 volt on pin 3. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current.
P0112	ECM	Intake manifold temperature sensor shorted to ground	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check the sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). Check for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F) between ECM connector pins A-H3 and A-J3. Refer to the service manual for more details.
P0113	ECM	Intake manifold temperature sensor open circuit or shorted to battery	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check the sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). Check for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F) between ECM connector pins A-H3 and A-J3. Refer to the service manual for more details.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0116	ECM	Engine coolant temperature signal not plausible	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check for debris or blockage in cooling system. Check the sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). Check for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F) between ECM connector pins A-A1 and A-J2. Refer to the service manual for more details.
P0117	ECM	Engine coolant temperature sensor fault - Short circuit to GND	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check for debris or blockage in cooling system. Check the sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). Check for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F) between ECM connector pins A-A1 and A-J2. Refer to the service manual for more details.
P0118	ECM	Engine coolant temperature sensor fault - Short circuit to V+ or connector disconnected.	Engine overheated or damaged sensor. Connector disconnected.	Check for debris or blockage in cooling system. Check the sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). Check for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F) between ECM connector pins A-A1 and A-J2. Refer to the service manual for more details.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0122	ECM	TAS (Throttle Accelerator sensor) 1 fault (short circuit to GND)	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check system circuits B-E1, B-K1, B-K3. Check for 0 volt on sensor connector pin E. Check for 5 volts on sensor connector pin D. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current. Check for 0.5 to 3 volts on sensor connector pin F. Refer to the service manual for more details.
P0123	ECM	TAS (Throttle Accelerator sensor) 1 fault (short circuit to battery)	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check system circuits B-E1, B-K1, B-K3. Check for 0 volt on sensor connector pin E. Check for 5 volts on sensor connector pin D. The 5 volt supply is shared between the TLS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current. Check for 0.5 to 3 volts on sensor connector pin F. Refer to the service manual for more details.
P0127	ECM	Intercooler system fault	High air intake temperature detected. Fault detected when the engine is running and stopped. Blocked intercooler water circuit.	Clean intercooler water circuit system. Refer to the service manual for more details.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0171	ECM	Multiplicative mixture adaptation exceeds upper limit--> mixture too lean		An open signal on the Engine coolant temperature (CTS) can trigger that fault
P0172	ECM	Multiplicative mixture adaptation below lower limit--> mixture too rich		An open signal on the Engine coolant temperature (CTS) can trigger that fault
P0201	ECM	Injection Power Stage fault - open line / Cylinder 1	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 2 and ECM connector pin A-B3. Check for 12 volts on pin 2 of injector connector. Check FUSE#13 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Refer to the service manual for more details.
P0202	ECM	Injection Power Stage fault - open line / Cylinder 2	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 2 and ECM connector pin A-K1. Check for 12 volts on pin 2 of injector connector. Check FUSE#14 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0203	ECM	Injection Power Stage fault - open line / Cylinder 3	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 3 and ECM connector pin A-J1. Check for 12 volts on pin 2 of injector connector. Check FUSE#15 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Refer to the service manual for more details.
P0217	ECM	High engine coolant temperature detected	High engine coolant temperature detected	Check for debris or blockage in cooling system. Check the sensor for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). Check for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F) between ECM connector pins A-A1 and A-J2. Refer to the service manual for more details.
P0222	ECM	TAS (Throttle Accelerator sensor) 2 fault (short circuit to GND)	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check system circuits B-A3, B-B3, B-J3. Check for 0 volt on sensor connector pin B. Check for 5 volts on sensor connector pin A. Check for 0.25 to 1.5 volts on sensor connector pin C. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0223	ECM	TAS (Throttle Accelerator sensor) 2 fault (short circuit to battery)	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check system circuits B-A3, B-B3, B-J3. Check for 0 volt on sensor connector pin B. Check for 5 volts on sensor connector pin A. Check for 0.25 to 1.5 volts on sensor connector pin C. Refer to the service manual for more details.
P0231	ECM	Fuel pump open circuit or short to ground	Damaged pump, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 1 ohm between pins A and B of the fuel pump connector. Check FUSE#18 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Check for damaged connector, damaged ECM output pins or ECM failure. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0232	ECM	Fuel pump short circuit to battery	Damaged pump, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 1 ohm between pins A and B of the fuel pump connector. Check FUSE#18 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Check for damaged connector, damaged ECM output pins or ECM failure. Refer to the service manual for more details.
P0261	ECM	Injector 1 open circuit or shorted to ground	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 1 and ECM connector pin A-B3. Check for 12 volts on pin 2 of injector connector. Check FUSE#13 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0262	ECM	Injector 1 shorted to battery	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 1 and ECM connector pin A-B3. Check for 12 volts on pin 2 of injector connector. Check FUSE#13 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Refer to the service manual for more details.
P0264	ECM	Injector 2 open circuit or shorted to ground	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 2 and ECM connector pin A-K1. Check for 12 volts on pin 2 of injector connector. Check FUSE#14 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0265	ECM	Injector 2 shorted to battery	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 2 and ECM connector pin A-K1. Check for 12 volts on pin 2 of injector connector. Check FUSE#14 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Refer to the service manual for more details.
P0267	ECM	Injector 3 open circuit or shorted to ground	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 3 and ECM connector pin A-J1. Check for 12 volts on pin 2 of injector connector. Check FUSE#15 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0268	ECM	Injector 3 shorted to battery	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 11.4 to 12.6 ohms between engine connector pin 3 and ECM connector pin A-J1. Check for 12 volts on pin 2 of injector connector. Check FUSE#15 (REFER TO WIRING DIAGRAM) Check for damaged circuit wires. Refer to the service manual for more details.
P0300	ECM	Multiple misfire detected		
P0301	ECM	Misfire cylinder 2 (physical cylinder 1)		
P0302	ECM	Misfire cylinder 0 (physical cylinder 2)		
P0303	ECM	Misfire cylinder 1 (physical cylinder 3)		
P0325	ECM	Knock sensor 1 fault	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM output pins. Open circuit.	Bring engine to 5000 RPM. If fault code appears then check for approximately 5 Mohms between system circuits A-C3 and A-G2. Refer to the service manual for more details.
P0335	ECM	Crankshaft signal error	Damaged sensor, damaged circuit wires, damaged connector, damaged ECM pins or damaged tooth wheel. Connector disconnected.	For the CPS, check for 700 to 900 ohms between terminals A-H1 and A-K2 of ECM connector. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0340	ECM	Camshaft 1 signal error	Damaged sensor, damaged circuit wires, damaged connector, damaged ECM pins or damaged tooth wheel.Connector disconnected.	For the CAPS, check for 12 volts on sensor connector pin 3. Check continuity for circuits A-D4, A-E2 and terminal 4 on engine connector. Check FUSE#12 (REFER TO WIRING DIAGRAM) Engine must run to erase the corrected fault. Refer to the service manual for more details.
P0351	ECM	Ignition coil 1 open circuit or shorted to ground or to battery	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 0.85 to 1.15 ohms between engine connector pin 1 and ECM connector pin A-M4. Check for 12 volts on pin 2 of coil connector. Check FUSE#13 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.
P0352	ECM	Ignition coil 2 open circuit or shorted to ground or to battery	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 0.85 to 1.15 ohms between engine connector pin 1 and ECM connector pin A-M2. Check for 12 volts on pin 2 of coil connector. Check FUSE#14 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0353	ECM	Ignition coil 3 open circuit or shorted to ground or to battery	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 0.85 to 1.15 ohms between engine connector pin 3 and ECM connector pin A-M1. Check for 12 volts on pin 2 of coil connector. Check FUSE#15 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.
P0354	ECM	Ignition Power Stage fault - short circuit to GND / Cylinder 1	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 0.85 to 1.15 ohms between engine connector pin 1 and ECM connector pin A-M4. Check for 12 volts on pin 2 of coil connector. Check FUSE#13 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.
P0355	ECM	Ignition Power Stage fault - short circuit to GND / Cylinder 2	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 0.85 to 1.15 ohms between engine connector pin 1 and ECM connector pin A-M2. Check for 12 volts on pin 2 of coil connector. Check FUSE#14 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0356	ECM 	Ignition Power Stage fault - short circuit to GND / Cylinder 3	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins. 	Check for 0.85 to 1.15 ohms between engine connector pin 3 and ECM connector pin A-M1. Check for 12 volts on pin 2 of coil connector. Check FUSE#15 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.
If you bought this manual from any other seller please leave them NEGATIVE feedback and notify me at bestshopmanuals@gmail.com				
P0357	ECM	Ignition Power Stage fault - short circuit to V+ / Cylinder 1	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 0.85 to 1.15 ohms between engine connector pin 1 and ECM connector pin A-M4. Check for 12 volts on pin 2 of coil connector. Check FUSE#13 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.
P0358	ECM	Ignition Power Stage fault - short circuit to V+ / Cylinder 2	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 0.85 to 1.15 ohms between engine connector pin 1 and ECM connector pin A-M2. Check for 12 volts on pin 2 of coil connector. Check FUSE#14 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0359	ECM	Ignition Power Stage fault - short circuit to V+ / Cylinder 3	Damaged coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 0.85 to 1.15 ohms between engine connector pin 3 and ECM connector pin A-M1. Check for 12 volts on pin 2 of coil connector. Check FUSE#15 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.
P0360	ECM	Ignition Power stage max error & false detection of low battery voltage / Cylinder 1	Signal not plausible, verify battery voltage too low during ignition.	Check for 0.85 to 1.15 ohms between engine connector pin 1 and ECM connector pin A-M4. Check for 12 volts on pin 2 of coil connector. Check FUSE#13 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.
P0361	ECM	Ignition Power stage max error & false detection of low battery voltage / Cylinder 2	Signal not plausible, verify battery voltage too low during ignition.	Check for 0.85 to 1.15 ohms between engine connector pin 1 and ECM connector pin A-M2. Check for 12 volts on pin 2 of coil connector. Check FUSE#14 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0362	ECM	Ignition Power stage max error & false detection of low battery voltage / Cylinder 3	Signal not plausible, verify battery voltage too low during ignition.	Check for 0.85 to 1.15 ohms between engine connector pin 3 and ECM connector pin A-M1. Check for 12 volts on pin 2 of coil connector. Check FUSE#15 (REFER TO WIRING DIAGRAM) Refer to the service manual for more details.
P0512	ECM	Starter power stage detects high current	Damaged solenoid, damaged circuit wires, damaged connector or damaged ECM.	Verify FUSE#16 (5AMP). Check for 12 volts on pin 2 of the starter relay. Refer to the service manual for more details.
P0513	ECM	Invalid D.E.S.S. Key detected	Key not programmed in ECU.	Program a good key
P0520	ECM	Oil pressure switch functional problem	Engine leak, oil pump failure, damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check resistance at 0 RPM and above 3500 RPM. Switch is normally closed, ECM connector pin A-E3 Refer to the service manual for more details.
P0523	ECM	Oil pressure sensor fault	Engine leak, oil pump failure, damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins. Fault detected when the engine is running or stopped.	Check resistance at 0 RPM and above 3500 RPM. Refer to the service manual for more details.
P0524	ECM	Low oil pressure condition	Low oil level, engine leak, oil pump fault.	Check oil level. Check impedance of sensor. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0544	ECM	Exhaust gas temperature sensor functional problem	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 2280 to 2736 ohms at temperature of 19 to 21°C (66 to 70°F) between system circuits A-H4 and A-J4. Refer to the service manual for more details.
P0545	ECM	Exhaust gas temperature sensor shorted to ground	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 2280 to 2736 ohms at temperature of 19 to 21°C (66 to 70°F) between system circuits A-H4 and A-J4. Refer to the service manual for more details.
P0546	ECM	Exhaust gas temperature sensor open circuit or shorted to battery	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 2280 to 2736 ohms at temperature of 19 to 21°C (66 to 70°F) between system circuits A-H4 and A-J4. Refer to the service manual for more details.
P0560	ECM	Battery voltage not plausible	Battery failure, rectifier failure, damaged circuit wires, battery terminal connection, damaged AC generator or damaged connectors.	Check fuses #6 (REFER TO WIRING DIAGRAM). Check ground continuity to the engine block. Refer to the service manual for more details.
P0562	ECM	Battery voltage too low	Battery failure, rectifier failure, damaged circuit wires, battery terminal connection, damaged AC generator or damaged connectors.	Check fuses #6 (REFER TO WIRING DIAGRAM). Check ground continuity to the engine block. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0563	ECM	Battery voltage too high	Battery failure, rectifier failure or battery terminal connection.	Check for regulator-rectifier failure. Refer to the service manual for more details.
P0564	CLUSTER	Cruise switch fault	The cruise switch is shorted or activated more than 60 seconds.	Verify the cruise switch if it is normally open and close when activated.
P0606	ECM	ECM ADC fault	Damaged ECM.	Replace ECM
P060D	ECM	TAS (Throttle Accelerator sensor) synchronization error	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins.	Check system circuits B-E1, B-K1, B-K3, B-A3, B-B3, B-J3 Check for 0 volt on sensor connector pin B & E. Check for 5 volts on sensor connector pin A & D. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current. Check for 0.5 to 3 volts on sensor connector pin F and 0.25 to 1.5 on C Refer to the service manual for more details.
P060E	ECM	Throttle Actuator - Controller Fault-digital position control exceeds limit		
P0610	ECM	Variant coding fault		

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0629	CLUSTER	Fuel sensor disconnected fault	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for 2.6 ohms (full tank) to 93.6 ohms (empty tank) between pin C and pin D at the fuel pump connector. Check system circuit at the gauge Pin 19 and 20. (REFER TO WIRING DIAGRAM)
P062F	ECM	ECM EEPROM fault - exchange ECM	Damaged ECM.	Replace ECM.
P06B6	ECM	ECM Fast ADC fault (knock detection line)		
P1030	ECM	Heater Power Stage fault for lambda sensor upstreams of catalyst - open line		
P1106	ECM	Altitude correction factor (fho) not plausible - out of range		
P1120	ECM	Throttle positions calculated from TPS 1 and TPS 2 not corresponding	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, replace ECM.
P1130	ECM	Lambda Sensor fault upstreams of catalyst - open line		
P1171	ECM	Additive mixture adaptation exceeds upper limit --> mixture too lean		An open signal on the Engine coolant temperature (CTS) can trigger that fault
P1172	ECM	Additive mixture adaptation below lower limit --> mixture too rich		An open signal on the Engine coolant temperature (CTS) can trigger that fault

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1502	ECM	T.O.P.S. functional problem	Boat or sensor upside down, damaged circuit wires, damaged connector or damaged ECM output pins.	Check continuity for circuits A-C4, A-G1, A-F4. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current. Refer to the service manual for more details.
P1503	ECM	T.O.P.S. switch short circuit to 12V	Boat or sensor upside down, damaged circuit wires, damaged connector or damaged ECM output pins.	Check continuity for circuits A-C4, A-G1, A-F4. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current. Refer to the service manual for more details.
P1504	ECM	T.O.P.S. switch short circuit ground	Boat or sensor upside down, damaged circuit wires, damaged connector or damaged ECM output pins.	Check continuity for circuits A-C4, A-G1, A-F4. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current. Refer to the service manual for more details.
P1505	ECM	T.O.P.S. switch fault non plausible state	Boat or sensor upside down, damaged circuit wires, damaged connector or damaged ECM output pins. Open circuit.	Check continuity for circuits A-C4, A-G1, A-F4. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1506	ECM	T.O.P.S. switch open circuit	Boat or sensor upside down, damaged circuit wires, damaged connector or damaged ECM output pins. Open circuit.	Check continuity for circuits A-C4, A-G1, A-F4. The 5 volt supply is shared between the TAS signal 1, TOPS and MAPS. Verify all three sensor if one is pulling too much current. Refer to the service manual for more details.
P1550	ECM	Otas sensor voltage not plausible	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM. Open circuit.	Check continuity for circuits B-H3, B-H1 and FUSE#12. Refer to the service manual for more details.
P1606	ECM	ECM ADC fault - exchange ECM	Damaged ECM.	No service action available for fault P1606.
P160E	ECM	Throttle Actuator - Controller Fault - digital position control below limit	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1610	ECM	Throttle Actuator - Power Stage fault	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1611	ECM	Throttle Actuator - Power Stage fault	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1612	ECM	Throttle Actuator - Power Stage fault	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1613	ECM	Throttle Actuator - Power Stage fault	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1614	ECM	Throttle Actuator - Return-Spring check not passed / Spring does not close	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1615	ECM	Throttle Actuator - Position monitoring fault	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1616	ECM	Throttle Actuator - Default position check or learning fault	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1619	ECM	Throttle Actuator - Adaptation of upper mechanical limit failed	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1620	ECM	Throttle Actuator - Adaptation of lower mechanical limit failed	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P1621	ECM	Throttle Actuator - Abortion of adaptation	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1622	ECM	Throttle Actuator - Repeated abortion of adaptation	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, replace ECM.
P1654	ECM	Voltage of D.E.S.S. key switch out of range	Damaged D.E.S.S. key switch, damaged circuit wires, damaged connector or damaged ECM output pins.	Remove D.E.S.S. key and check system circuit B-B2. Refer to the service manual for more details.
P1657	ECM	Electrical fault of D.E.S.S. key communication line	Damaged D.E.S.S. key switch, damaged circuit wires, damaged connector or damaged ECM output pins.	Remove D.E.S.S. key and check system circuit B-B2. Refer to the service manual for more details.
P1658	ECM	Faulty D.E.S.S. key communication	Damaged D.E.S.S. key switch, damaged circuit wires, damaged connector or damaged ECM output pins.	Remove D.E.S.S. key and check system circuit B-B2. Refer to the service manual for more details.
P1661	ECM	iBR malfunction	iBR fault detected by ECM.	Remove D.E.S.S. key Perform an electrical system shut down. Clear fault.
P1662	ECM	iBR torque request is not plausible	iBR fault detected by ECM.	Perform iBR software update if available or replace iBR.
P1679	ECM	Main Relay Sticking	Permanent 12V is present on ECM Pin B-M4.	ECU pin B-M4 is permanently supplied thru 15 amp fuse and it should be accessory 12 Vdc.
P16B6	ECM	ECU Fast ADC fault (knock detection line)		
P16B7	ECM	ECU Fast ADC fault (knock detection line)		
P16B8	ECM	ECU Fast ADC fault (knock detection line)		
P16C0	ECM	Fault of ECM ADC		
P16C1	ECM	Fault of ECM ADC		

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P16C2	ECM	Fault of ECM monitoring module		
P16C3	ECM	Monitoring fault due to Accelerator Sensor check		
P16C4	ECM	Monitoring fault due to engine speed check		
P16C5	ECM	Safety fuel cut off activ - Monitoring level 1		
P16C6	ECM	Safety fuel cut off activ - Monitoring level 2		
P16C7	ECM	Monitoring fault due to throttle valve plausibility check	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P16C8	ECM	Monitoring fault due to exceeding permitted throttle valve position	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM.
P16C9	ECM	Monitoring detected non plausible D.E.S.S. key state	Damaged D.E.S.S. key switch, damaged circuit wires, damaged connector or damaged ECM output pins.	Remove D.E.S.S. key and check system circuit B-B2. Refer to the service manual for more details.
P16CA	ECM	ECU detected faulty watch dog line ECU defect	Damaged ECM.	Replace ECM.
P16CB	ECM	ECU switch off through watch dog line (hardware fault) ECU defect	Damaged ECM.	Replace ECM.
P2080	ECM	Exhaust temperature not plausible	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 2280 to 2736 ohms at temperature of 19 to 21°C (66 to 70°F) between system circuits A-H4 and A-J4. Refer to the service manual for more details.

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P2081	ECM	Exhaust temperature sensor fault	Intermittent connection. Damaged sensor, damaged circuit wires, damaged connector or damaged ECM output pins.	Check for approximately 2280 to 2736 ohms at temperature of 19 to 21°C (66 to 70°F) between system circuits A-H4 and A-J4. Refer to the service manual for more details.
P212C	ECM	Electrical lower-range violation TPS 2	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, replace ECM
P212D	ECM	Electrical upper-range violation TPS 2	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, replace ECM
P2159	ECM	TAS (Throttle Accelerator sensor) signal not plausible		
P2279	ECM	Air intake manifold leak downstream of throttle		
P2428	ECM	High exhaust temperature detected	Exhaust overheat, damaged sensor or damaged circuit wires.	Check cooling system for blockage. Check if the exhaust injection valve is properly calibrated. Refer to the service manual for more details.
P2620	ECM	TPS value not plausible	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, replace ECM
P2621	ECM	Electrical lower-range violation TPS 1	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, replace ECM

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P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
P2622	ECM	Electrical upper-range violation TPS 1	Damaged throttle actuator, damaged circuit wires, damaged connector or damaged ECM.	Check system circuit, perform closed throttle with B.U.D.S. Replace throttle actuator, repalce ECM
U0129	ECM	CAN communication error between ECM and iBR module	iBR fault detected by ECM. C.A.N. circuit failure, iBR or ECM failure. Disconnected connector.	Check C.A.N. circuits wires. Replace iBR. Refer to the service manual for more details.
U0129	IS	iBR CAN messages timeout or validity	Warning only: the iS module lost communication with the iBR.	If fault ACTIVE, verify CAN connection between iBR and iS
U0300	ECM	Exchange security - Wrong ECM	Incorrect ECM or cluster for engine.	Install proper recommended ECM or cluster for vehicle.
U0401	IBR	ECM CAN messages timeout or validity	C.A.N. circuit failure, ECM software failure.	Check C.A.N. circuits wires. Replace ECM. Refer to the service manual for more details.
U0401	IS	ECM CAN messages timeout or validity	Warning only: the iS module lost communication with the engine ECU.	If fault ACTIVE, verify CAN connection between ECM and iS
U0401	IBR 2013	ECM CAN messages timeout or validity	C.A.N. circuit failure, ECM software failure.	Check C.A.N. circuits wires. Replace ECM. Refer to the service manual for more details.
U0457	IBR	Cluster CAN messages timeout or validity	C.A.N. circuit failure, Cluster software failure.	Check C.A.N. circuits wires. Replace instrument Cluster. Refer to the service manual for more details.
U0457	IS	Cluster CAN messages timeout or validity	Warning only: the iS module lost communication with the Cluster.	If fault ACTIVE, verify CAN connection between Cluster and iS

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
U0457	IBR 2013	Cluster CAN messages timeout or validity	C.A.N. circuit failure, Cluster software failure.	Check C.A.N. circuits wires. Replace instrument Cluster. Refer to the service manual for more details.
U16A1	ECM	Cluster CAN Timeout error-Missing CAN ID 514h	Cluster fault detected by ECM. C.A.N. circuit failure, Instrument cluster or ECM failure.	Check C.A.N. circuits wires. Replace instrument Cluster. Refer to the service manual for more details.
U16A2	ECM	Cluster CAN Timeout error-Missing CAN ID 230h	Cluster fault detected by ECM. C.A.N. circuit failure, Instrument cluster or ECM failure.	Check C.A.N. circuits wires. Replace instrument Cluster. Refer to the service manual for more details.
U16A3	ECM	Cluster CAN Timeout error-Missing CAN ID 408h	Cluster fault detected by ECM. C.A.N. circuit failure, Instrument cluster or ECM failure.	Check C.A.N. circuits wires. Replace instrument Cluster. Refer to the service manual for more details.
U16A4	ECM	iBR CAN Timeout error-Missing CAN ID 010h	iBR fault detected by ECM. C.A.N. circuit failure, iBR or ECM failure. Disconnected connector.	Check C.A.N. circuits wires. Replace iBR. Refer to the service manual for more details.
U16A5	ECM	iBR CAN Timeout error-Missing CAN ID 012h	iBR fault detected by ECM. C.A.N. circuit failure, iBR or ECM failure. Disconnected connector.	Check C.A.N. circuits wires. Replace instrument iBR. Refer to the service manual for more details.
U16A6	ECM	Cluster check sum error - CAN ID230h	Cluster fault detected by ECM. C.A.N. circuit failure, Instrument cluster or ECM failure.	Check C.A.N. circuits wires. Replace instrument Cluster. Refer to the service manual for more details.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

P-CODE	MODULE	DESCRIPTION	CAUSE	ACTION
U16A7	ECM	Cluster check sum error - CAN ID408h	Cluster fault detected by ECM. C.A.N. circuit failure, Instrument cluster or ECM failure.	Check C.A.N. circuits wires. Replace instrument Cluster. Refer to the service manual for more details.
U16A8	ECM	iBR check sum error - CAN ID010h	iBR fault detected by ECM. C.A.N. circuit failure, ECM software failure.	Check C.A.N. circuits wires. Replace iBR. Refer to the service manual for more details.
U16A9	ECM	iBR check sum error - CAN ID012h	iBR fault detected by ECM. C.A.N. circuit failure, ECM software failure.	Check C.A.N. circuits wires. Replace iBR. Refer to the service manual for more details.
U16AA	ECM	Cluster CAN Timeout error-Missing CAN ID 410h		
U16AB	ECM	Cluster check sum error - CAN ID410h		

INTELLIGENT THROTTLE CONTROL (iTC)

SERVICE TOOLS

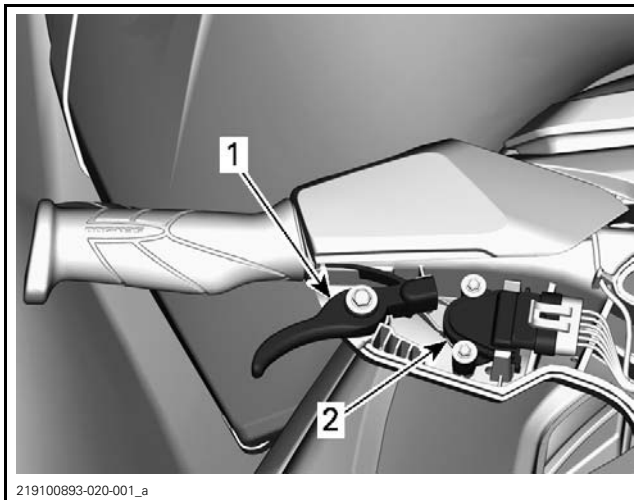
Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	7
FLUKE 115 MULTIMETER	529 035 868	8

GENERAL

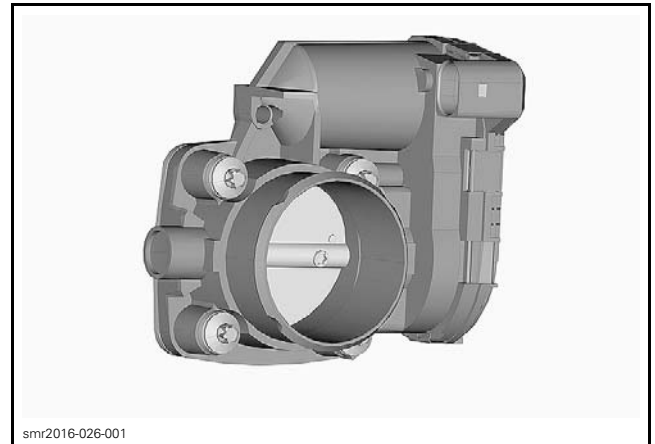
SYSTEM DESCRIPTION

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

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



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



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

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

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

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

While the throttle lever might be fully pulled in and held, the ECM could close the throttle plate instead of opening it if the iBR lever were pulled in. Then, the ECM could open the throttle plate to accelerate the engine to increase the braking effect. These different throttle plate movements

Subsection XX (INTELLIGENT THROTTLE CONTROL (iTC))

could be achieved while the throttle lever was still fully pulled in. This is one of the great flexibility of the iTC.

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

Touring Mode

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

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

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

Sport Mode

Sport mode allows the operator for instant throttle response.

Maximum engine power is available throughout the engine operational range.

ECO Mode

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

Cruise Control

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

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

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

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

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

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

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

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

Slow Speed Mode

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

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

Ski Mode

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

RAMP Function

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

TARGET SPEED Function

The TARGET SPEED function limits the maximum towing speed.

Learning and Rental Keys

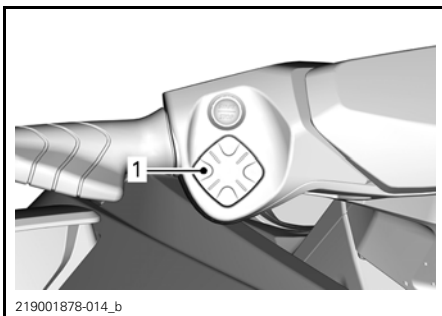
Learning and Rental keys limit the watercraft maximum speed. The full stroke of the throttle lever is used while only a partial stroke of the throttle plate is achieved. Therefore, greater throttle lever movement is used while a smaller engine speed and torque variation is applied through the throttle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

OPERATING MODES

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

To change the operating mode;

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



1. Mode button

Touring Mode

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

Sport Mode

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

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

Activating Sport Mode

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

Deactivating Sport Mode

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

ECO Mode (Fuel Economy Mode)

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

Speed Limiter Mode

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

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

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

Subsection XX (INTELLIGENT THROTTLE CONTROL (iTC))

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

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

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

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

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

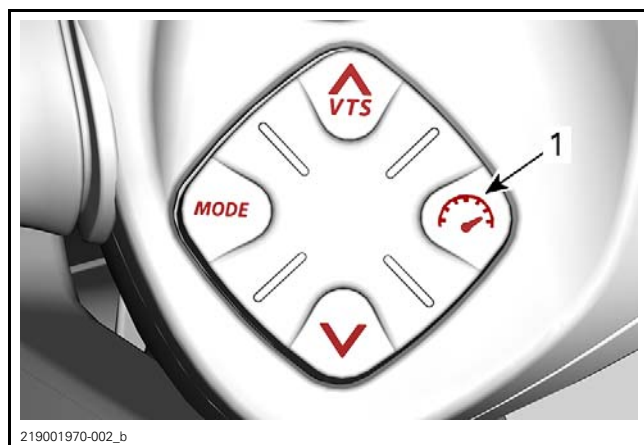
Prerequisite for Speed Limiter Mode Activation

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

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

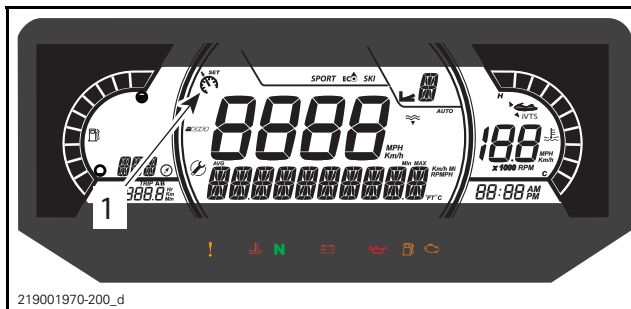
Activating Speed Limiter Mode

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



1. Speed Control button

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



TYPICAL

1. Speed limiter/Slow Speed MODE INDICATOR

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

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

Deactivating Speed Limiter Mode

To deactivate speed limiter mode:

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

Deactivation of speed limiter mode is indicated by:

- The speed limiter indicator will go off.

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

Slow Speed Mode

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

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

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

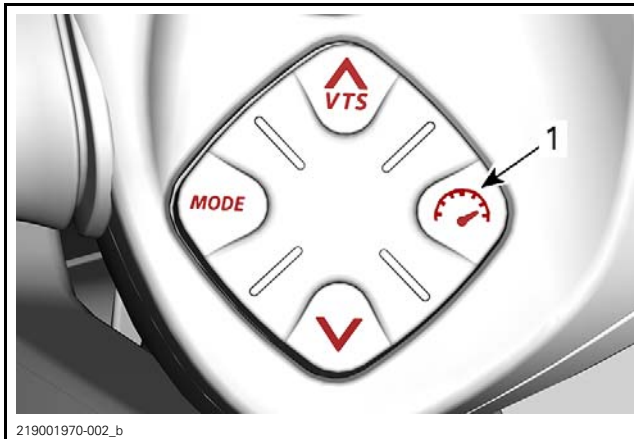
Should a situation arise where the operator must stop or accelerate quickly away from a hazardous situation, pulling in the iBR lever, or pulling in on

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

Activating Slow Speed Mode

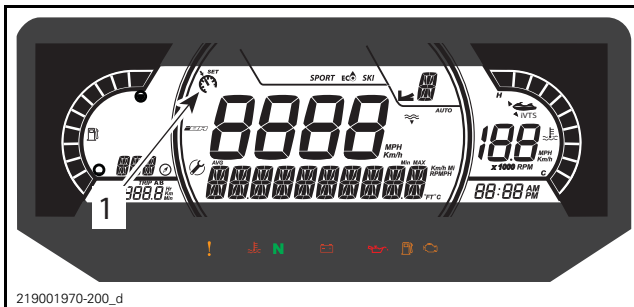
To activate slow speed mode of operation:

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



1. Speed Control button

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

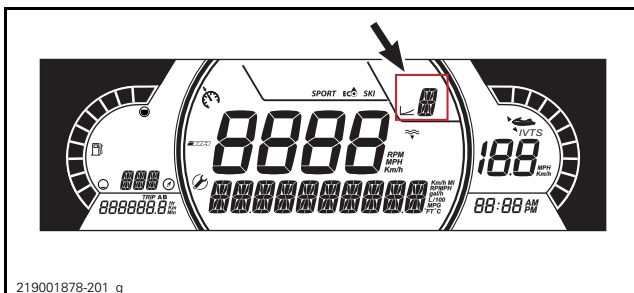


TYPICAL

1. Speed limiter/Slow Speed INDICATOR

A message will scroll in the multifunction display to specify that you are now in slow speed mode.

The default slow speed setting of 5 will show in the numerical display.



Changing Set Slow Speed

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

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

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

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

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

Deactivating Slow Speed Mode

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

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

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

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

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

- The Speed Limiter indicator will go out

Ski Mode (If equipped)

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

RAMP Function

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

RAMP 1 provides:

- Slowest launch (smoothest)
- Slowest acceleration rate

RAMP 5 provides:

- Quickest launch
- Quickest acceleration rate

TARGET SPEED Function

The TARGET SPEED function limits the maximum towing speed.

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

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

Using Ski Mode

Press MODE button to select the SKI mode.

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

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

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

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

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

The message **SKI READY** will display.

Keep throttle fully applied to ski.

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

Deactivating Ski Mode

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

Learning Key Mode

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

There are 5 speed settings available.

By default, the speed setting is no 1.

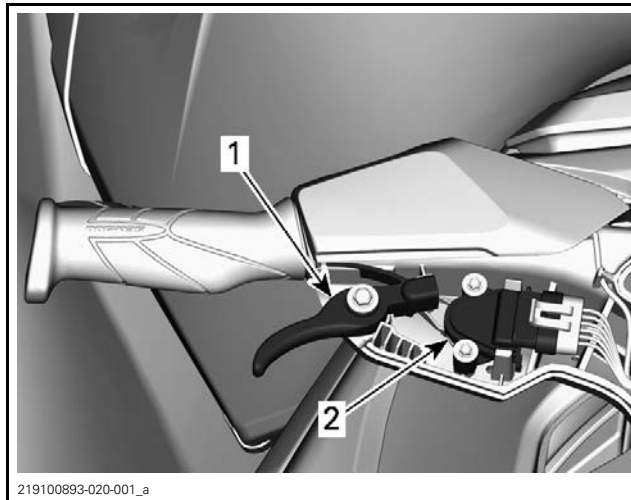
Contact an authorized Sea-Doo dealer for adjustment.

PROCEDURES

THROTTLE ACCELERATOR SENSOR (TAS)

General

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



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

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

Testing TAS Voltage

1. Disconnect the 20-pin steering connector.



1. 20-pin connector

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

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

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

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

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

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

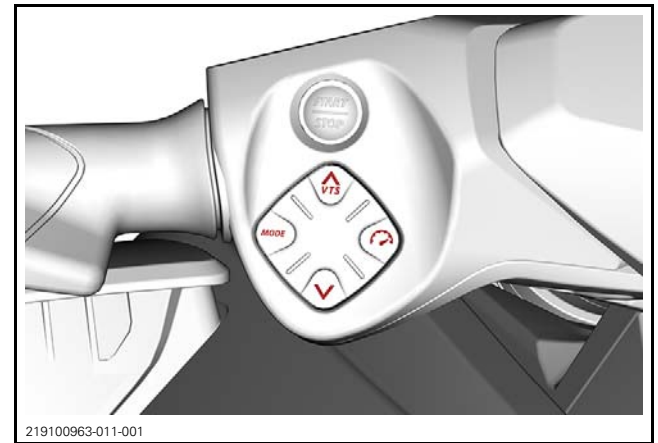
- Reinstall removed components.

Replacing the TAS

Refer to BRLS in iBR subsection.

MODE/SPEED CONTROL SWITCH

Mode/Speed Control Switch Overview



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

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

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

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

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

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

Subsection XX (INTELLIGENT THROTTLE CONTROL (iTC))

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

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

Testing the Mode/Speed Control Switch

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

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

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

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

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

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

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



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

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

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

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

Subsection XX (INTELLIGENT THROTTLE CONTROL (iTC))

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

ELECTRONIC FUEL INJECTION (EFI)

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL.....	529 036 166	1
FLUKE 115 MULTIMETER	529 035 868	1
FUEL HOSE DISCONNECT TOOL	529 036 037	7

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	5, 8, 19, 22, 25, 29
LOCTITE 518.....	293 800 038	27

GENERAL

⚠ WARNING

Always disconnect battery prior to working on the fuel system.

⚠ WARNING

Fuel vapors are flammable and explosive under certain conditions. Ensure work area is well ventilated. Do not smoke or allow open flames or sparks in the vicinity.

Use the BRP diagnostic software (BUDS2) to release the fuel pressure in the system prior to disconnecting a fuel line. Refer to *FUEL TANK AND FUEL PUMP* subsection.

The following tools are required to test most of the electrical parts.

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

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

⚠ WARNING

Fuel lines remain under pressure at all times. 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.

When the repair is completed, ensure the hose from the fuel rail to the fuel pump is properly connected and secured in its support. Test for fuel leaks as described in *FUEL TANK AND FUEL PUMP* subsection.

⚠ WARNING

Always perform the fuel system high pressure leak test if any component has been removed or disconnected.

⚠ WARNING

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

SYSTEM DESCRIPTION

The electronic fuel injection system (EFI) is comprised of various sensors used for detecting ongoing operating conditions of the engine and watercraft, and includes all the actuators that perform the required adjustment to the engine.

This system also introduces torque management functions.

Electrical System

ECM (Engine Control Module)

From input signals (e.g. throttle lever, iBR lever), the ECM acknowledges driver demands and converts them to an engine torque requirement through calculation of several variables. Then, the ECM controls the iTC (intelligent Throttle Control), the injection system and the ignition system to meet the torque requirement.

The ECM manages the engine torque requirements and controls engine operation to ensure it is delivering optimum performance, fuel economy and meeting emission regulations. The ECM also controls idle speed and limits maximum engine speed.

Since the ECM manages several torque requirements at the same time including contradictory demands (such as the throttle lever and the iBR lever being fully pulled in at the same time), it must prioritize the most important requirement according to predefined conditions and apply the proper action.

EFI Sensors

The ECM reads the inputs from the sensors which it compares to predetermined parameters stored in the ECM, makes computations, and activates the outputs accordingly (injectors, ignition coils etc.).

Signals from sensors are used by the ECM to determine the injection and ignition parameters (referenced to fuel and ignition maps) as required to maintain the optimum air-fuel ratio.

Air Induction

Throttle Body

A 60 mm throttle body is mounted on the intake manifold.

Air for combustion is drawn in by the engine (130 and 170 engines) or by a mechanically-driven supercharger (230 and 300 engines). The air flows through the throttle body and is controlled by a throttle plate.

Fitted on the throttle body, an electronic throttle actuator (ETA) allows the ECM to electronically control the throttle plate opening which regulates the amount of air that enters the engine, and therefore engine speed.

There is no idle air control valve (IACV).

Fuel System

Fuel Rail

A single fuel rail is mounted on the intake manifold. The fuel rail ensures that enough fuel can be delivered to the fuel injectors throughout the engine operating range.

The fuel rail is fed by the fuel pump. The fuel pressure applied to the fuel rail is regulated by the fuel pressure regulator located in the fuel pump module.

Fuel Injectors

One injector per cylinder is used to inject fuel into the intake ports of the cylinder head.

Fuel Pump

An electric fuel pump with an integrated pressure regulator is used. 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 (electronic throttle actuator).

Idle speed can be monitored in BUDS2.

CLOSED THROTTLE RESET

General Information

This operation performs a reset of the TPS values of the throttle body in the ECM.

Closed throttle reset must be carried out only when:

- Replacing the throttle body.
- Replacing the ECM.

Closed Throttle Reset Procedure

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. Press the START button to wake up the ECM.
3. Install the tether cord on the engine cut-off switch.
4. In BUDS2, go to:
 - **Settings** page
 - **ECM** button
 - **Settings** tab
 - **Initializations - Reset TPS**

5. Follow instructions displayed on screen.
6. Start engine and make sure it operates normally through its full engine RPM range.
7. Check for fault codes using BUDS2. If a fault code related to the throttle actuator appears, clear it, then carry out another **Closed Throttle** reset procedure. To clear faults, refer to *DIAGNOSTIC AND FAULT CODES* subsection.

TROUBLESHOOTING

DIAGNOSTIC TIPS

Engine problems are not necessarily related to the fuel injection system.

It is important to ensure that the engine/propulsion system, fuel delivery and electrical systems are functioning normally.

It is a good practice to check for fault codes using the BRP diagnostic software (BUDS2) as a first troubleshooting step.

After a problem has been solved, be sure to clear the fault(s) in the ECM using the BRP diagnostic software.

WARNING

All electrical actuators and electronic modules are powered as soon as the **START** button is pressed. Always disconnect the battery prior to disconnecting any electrical or electronic parts.

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.

Electrical Related Problems

It is important to check the following in the electrical system:

- Battery voltage
- Fuses
- Ground connections
- Wiring and connectors.

Ensure that all electronic components are genuine OEM. Any modification to the wiring harness may lead to poor system operation or generate fault codes.

Electrical Connections

Pay particular attention to ensure that terminals and pins are not out of their connectors, corroded, or out of shape.

When probing terminals, pay attention not to deform the terminals as this could cause a loose or intermittent connection that would be difficult to troubleshoot.

PROCEDURES

ENGINE CONTROL MODULE (ECM)

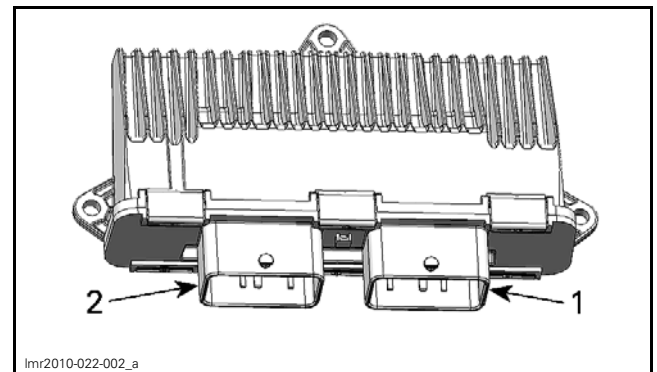
ECM Location

The ECM is located on the air intake silencer.

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

1. Connector A
2. Connector B

The ECM connectors have 48 pins.

NOTE: For connector information, cleaning and probing, refer to *WIRING HARNESS AND CONNECTORS* subsection.

ECM Power Circuit Validation

Press the **START** button.

NOTE: Do not install the D.E.S.S. key.

QUICK INDICATION THAT ECM IS POWERED (assuming the observed component is working)

Information center turns on.

Fuel pump turns on for approximately 5 seconds.

NOTE: Since the tether cord is not installed, the information center will turn off a few seconds after the self-test, but the ECM and electrical system will stay powered for approximately 3 minutes longer.

If the ECM does not turn on, check the following:

- ECM, Start/Stop and Fuel Pump fuses
- Battery voltage. Refer to *CHARGING SYSTEM*
- Relay and wiring. Refer to *POWER DISTRIBUTION AND GROUNDS*
- ECM power supply wires and ground wires. See following procedure.

ECM Wake Up Logic

With Tether Cord Installed

When the START button is pressed to start engine:

- ECM pin B-D1 receives current from battery via the START switch. ECM is woken up.
- ECM pin B-H2 provides a ground to the relay coil in fuse box.
- The relay contacts close and provides 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 a tether cord is installed, the magnet in the tether cord cap closes the reed switches in the engine cut-off switch and the ECM pin B-F2 provides a ground. This tells the ECM the tether cord is installed.
- ECM pin B-B2 reads the D.E.S.S. key in the tether cap and determines if it is valid. If so, the engine can be started.

Without a Tether Cord Installed

When the START button is pressed:

- The information center 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 except the GPS supply to the information center.

ECM Shut Down Logic

When the engine is stopped by using the STOP button or by removing the tether cord from the engine cut-off switch, the following occurs:

- ECM stops the engine.
- After 5 seconds, the information center 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 except the GPS supply to the information center.

Testing ECM Power Supply

1. Press the START button to wake up the ECM.

NOTE: Do not install the tether cord.

2. Set the multimeter to Vdc.

3. Probe ECM fuse (F11).

NOTE: This will validate the fuse at the same time.

ECM POWER SUPPLY TEST		
FUSE BOX TERMINAL	BATTERY	MEASUREMENT
E1	Negative (-) post	Battery voltage
E2		

If battery voltage is measured at E1 but not at E2, replace the fuse.

If voltage is not measured at E2, check the wiring and connections between the relay output and F11 output. Refer to *WIRING DIAGRAM*.

If voltage is as per specification, continue with *TESTING CONTINUITY OF ECM POWER CIRCUIT*.

Testing Continuity of ECM Power Circuit

1. Wait for electrical power to go off (approximately 3 minutes).
2. Disconnect ECM-B connector from ECM and install it on the ECM adaptor tool.
3. Set the multimeter to Ω .
4. Probe terminals as per following table.

ECM POWER CIRCUIT CONTINUITY TEST		
FUSE BOX TERMINAL	ECM ADAPTER PIN	MEASUREMENT
E1	B-M4	Close to 0 Ω

If an open circuit is measured, repair or replace wiring and connectors.

If the ECM power circuit tests good, the problem may be one of the following:

- Start switch circuit open to ECM, refer to *STARTING SYSTEM* subsection.
- ECM not providing a ground to relay in fuse box, refer to *POWER DISTRIBUTION AND GROUNDS* subsection.
- ECM ground wire open circuit, refer to *TESTING CONTINUITY OF ECM GROUND CIRCUITS* in this subsection.
- ECM internal problem.

Testing Continuity of ECM Ground Circuits

1. With the "B" connector still connected to the ECM adaptor tool.
2. Set the multimeter to Ω .
3. Probe adapter terminals as per following table.

ECM GROUND CIRCUITS CONTINUITY TEST		
ECM ADAPTER PIN	BATTERY	MEASUREMENT
B-L1	Negative (-) post	Close to 0 Ω
B-M2		
B-M3		



If any measurement is out of specification refer to *POWER DISTRIBUTION AND GROUNDS* subsection and check the following:

- Wiring and connections

- Engine ground
- Battery ground.

If everything tests good and ECM does not power up, try a new ECM. Refer to *REPLACING THE ECM*.

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. Disconnect both ECM connectors from ECM.
3. Unscrew all retaining screws and remove the engine ECM from its support on the intake manifold.



1. ECM
2. Retaining screws

Installing the ECM

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

1. Install ECM.

TIGHTENING TORQUE	
ECM retaining screws	5.5 N•m $\pm$ 0.6 N•m (49 lbf•in $\pm$ 5 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

2. Reconnect ECM connectors.
3. Reconnect battery cables.

NOTICE Always reconnect the RED positive (+) battery cable first, then reconnect BLACK negative (-) cable.

Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

4. If a new ECM is installed, refer to *REPLACING THE ECM* in this subsection.

Replacing the ECM

Prior to replacing a suspected ECM, ensure that all the recommendations in the general introduction of this subsection were followed and all applicable testing procedures were carried out.

When installing a new ECM, data must be entered into the ECM.

Refer to *ECM DATA ENTRY FOR ECM REPLACEMENT* in this subsection.

ECM Data Entry for ECM Replacement

Use one of the following methods to collect the required information. The 1st being the easiest:

1. Use the BRP diagnostic software (BUDS2) to obtain the data from a saved .buds2 file on your computer.
2. Collect the information from the vehicle and Knowledge Center.

1st Collecting Method: Obtaining the Data from a Saved .buds2 File

1. Start BUDS2.

NOTE: It is not necessary to perform any connection. The computer can be used alone.

2. Click on the **Open a buds2 file** button.

Make sur you are at: C:\Program Files (x86)\BRP\BUDS2\Files

IMPORTANT: Be sure to use the file that specifically matches the vehicle you are servicing.

NOTE: The file name structure is as follows:

BUDS version_VIN_date read (yyyymmdd)_hour read (hhmmss).mpem

Example:

P2.3.22.12_2BPSBK8C68V000168_20090206_111640.mpem

Hence:

B.U.D.S. version: P2.3.22.12

VIN: 2BPSBK8C68V000168

Date: 2009 02 06

Hour: 11h 16m 40s

3. In BUDS2, go to:
 - **Summary** page
 - **Vehicle** button.
4. Record (write down) the following information.
 1. Vehicle serial number (VIN)
 2. Engine serial number

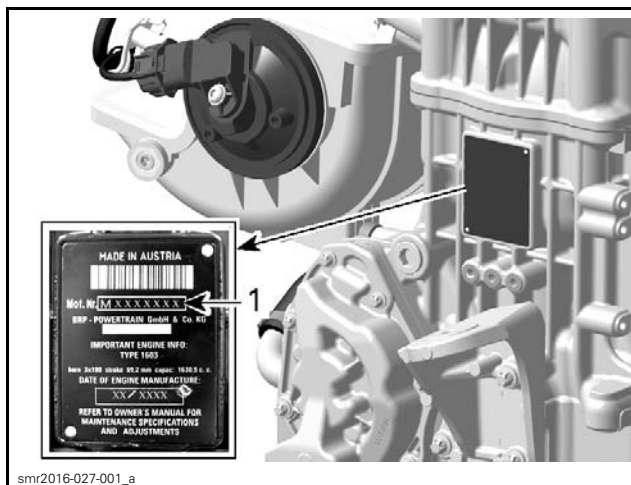
3. Vehicle model number
4. Customer name.

NOTE: Do not forgot to press the **WRITE** button at the end of the line.

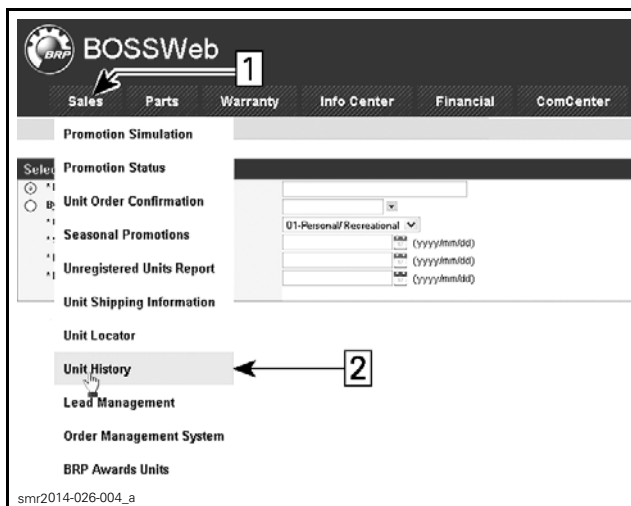
5. Enter recorded data in ECM as detailed in *ENTERING THE COLLECTED INFORMATION INTO THE ECM*.

2nd Collecting Method: Collect the Information from the Vehicle and Knowledge Center

1. 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.

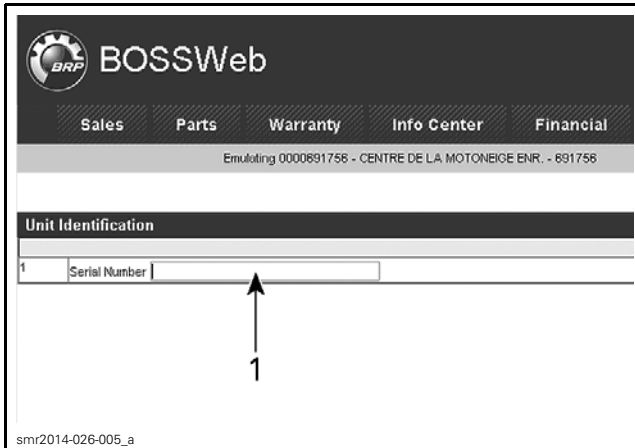


1. Engine serial number



SERVICE, UNIT HISTORY

1. Click on **SALES** menu
2. Select **Unit History**



1. Vehicle Serial Number here

2. 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 the BRP diagnostic software (BUDS2).
2. Press the START button to wake up the ECM.
3. Install the tether cord on the engine cut-off switch.
4. In BUDS2, go to:
 - Summary page
 - Vehicle button.
5. Enter the information you recorded previously.
 1. Vehicle serial number (VIN)
 2. Engine number
 3. Vehicle model number
 4. Customer name.

NOTICE Enter only the appropriate product model number as obtained when gathering the information. Pay particular attention when typing the V.I.N. and model numbers. Once Write Data button is pressed, the data cannot be modified.

6. Program all D.E.S.S. key(s).
7. Perform the **Closed throttle** reset. Refer to **Closed Throttle Reset (TPS)** in *ADJUSTMENTS* in this subsection.
8. Reinstall remaining removed parts.
9. Start the engine and, if possible, test ride the vehicle to ensure proper operation.

FUEL RAIL

Fuel Rail Location

Fuel rail is located above intake manifold.

Removing the Fuel Rail

Fuel Rail Hose Disconnection

1. Release fuel pressure. Refer to *FUEL PUMP* in *FUEL TANK AND FUEL PUMP* subsection.
2. Place an absorbent shop rag under the fuel supply hose fitting at the fuel rail to catch any fuel leakage.
3. Disconnect fuel hose from fuel rail.

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

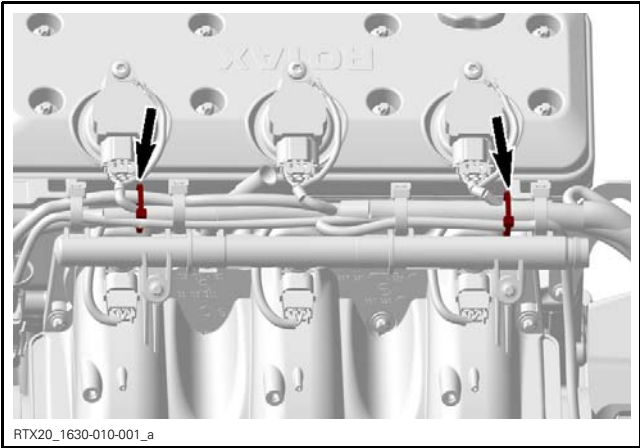


NOTE: It may be necessary to rotate fuel hose fitting to align the tool ends with the openings of the locking mechanism.

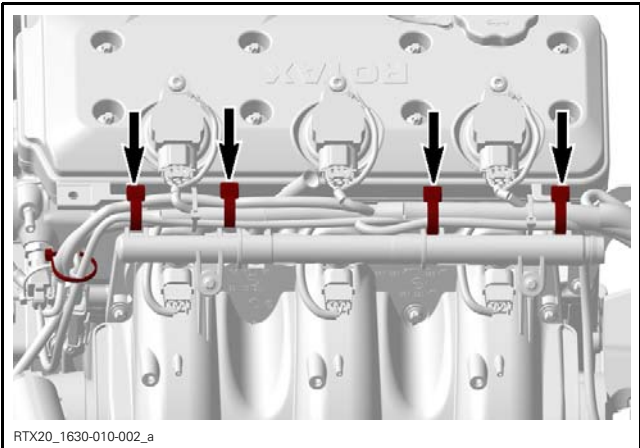
Removing the Fuel Rail

1. Install locking ties around wiring harness to maintain wiring position for installation.

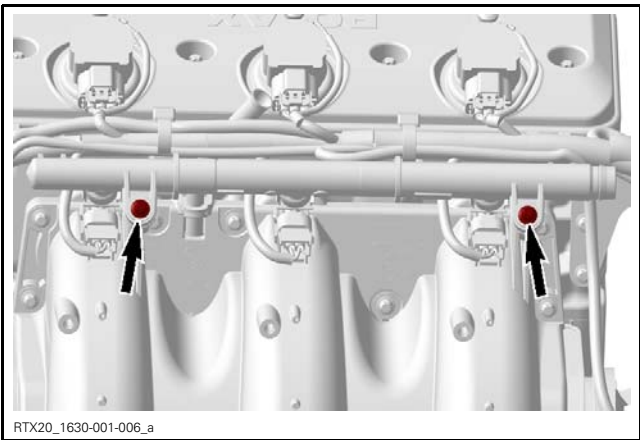
NOTE: Do not secure the stator cable to the harness.



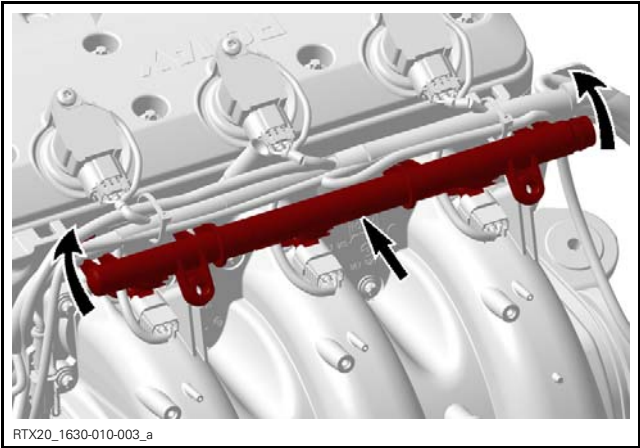
2. Cut locking ties retaining engine harness to fuel rail.



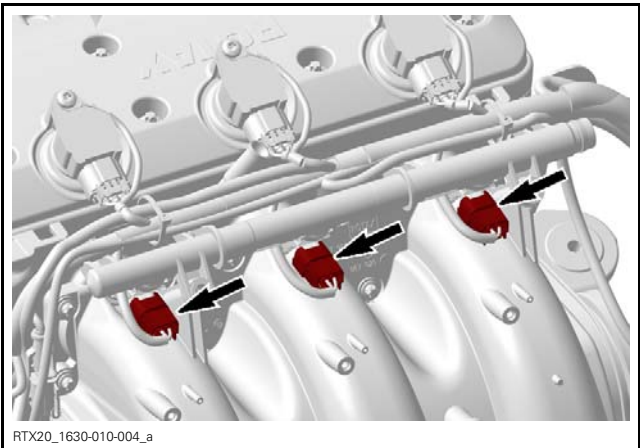
3. Remove screws retaining the fuel rail.



4. Gently pull fuel rail side to side (wiggle).



5. Disconnect all injector connectors.



6. Pull fuel rail out with fuel injectors.

Installing the Fuel Rail

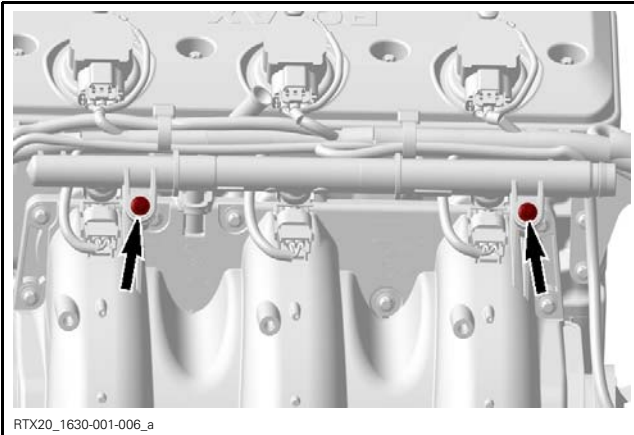
The installation is the reverse of the removal procedure. However, pay attention to the following.

1. Install fuel rail with injectors.
2. Lubricate O-rings of fuel injectors.

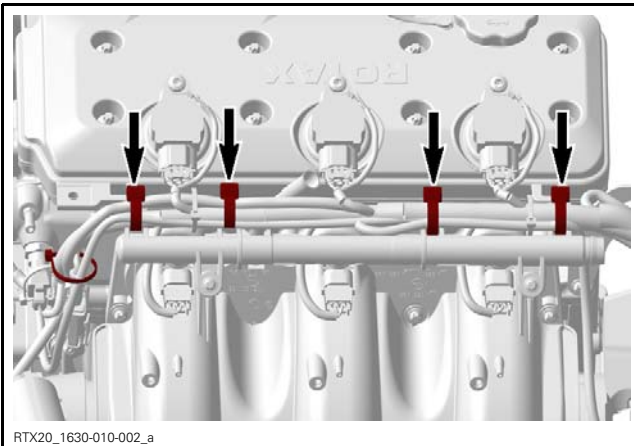
SERVICE PRODUCT
Engine oil

3. Tighten fuel rail retaining screws to specification.

TIGHTENING TORQUE	
Fuel rail retaining screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

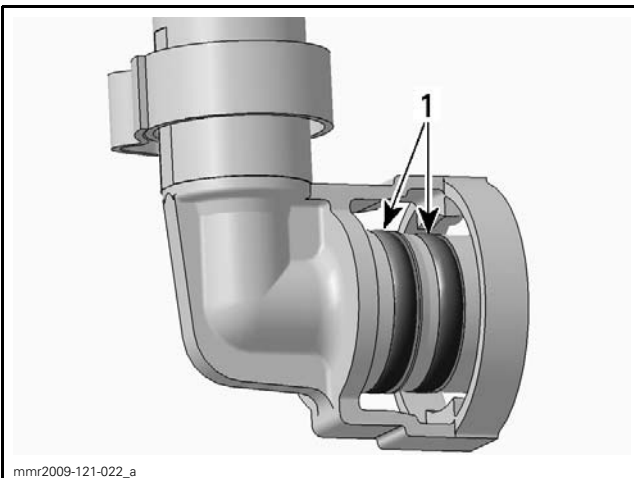


4. Properly install **NEW** locking ties to secure engine harness to fuel rail.



Fuel Rail Hose Connection

1. Apply engine oil on O-rings of fitting.



1. Apply oil on O-rings

2. 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.

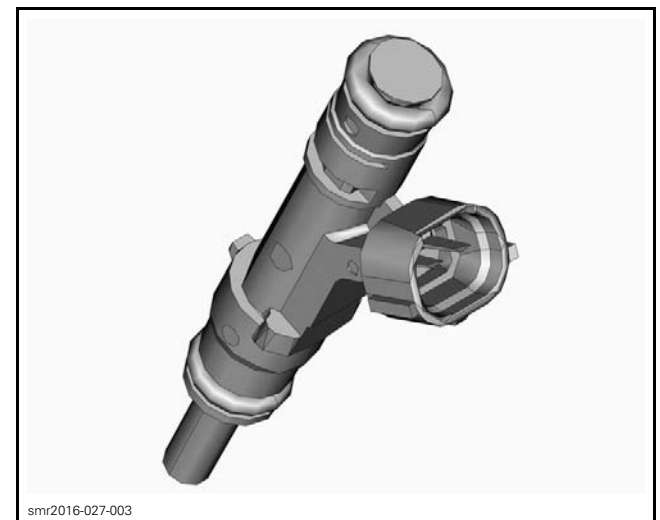
3. Pressurize the fuel system and check for a fuel leak. Refer to *FUEL TANK AND FUEL PUMP* subsection.

⚠ WARNING

Failure to pressurize the fuel system may result in severe injury or a life threatening situation should a leak occur.

4. Reinstall all remaining removed parts.

FUEL INJECTOR



Testing the Fuel Injector Operation with BUDS2(Dynamic)

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. Start engine.

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

3. In BUDS2, go to :
 - Functions page
 - ECM button
 - Functions tab
 - IO Controls - Activate Fuel Injectors.
4. Select the injector and click on the ACTIVATE button.

If the engine RPM drops when clicking on a cylinder, the injector and the ignition of this cylinder are functioning normally.

Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

If the engine RPM does not drop when clicking on a cylinder, this cylinder is not functioning properly. Check the following:

- Fuel injector operation. Refer to *TESTING THE FUEL INJECTOR OPERATION* in this subsection.
- Spark plug and ignition coil. Refer to *IGNITION COILS AND SPARK PLUGS* subsection.
- Engine condition.

Testing the Fuel Injector Operation with BUDS2 (Static)

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 the engine.

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. Press the START button to wake up the ECM.
3. Install the tether cord on the engine cut-off switch.
4. In BUDS2, go to :
 - **Functions** page
 - **ECM** button
 - **Functions** tab
 - **IO Controls - Activate Fuel Injectors.**
5. Select the injector and click on the ACTIVATE button.
6. Listen to the injector.

If you can hear the injector, it validates its operation. Carry out *TESTING THE FUEL INJECTOR BALANCE*.

If you do not hear the injector, carry out *TESTING THE INJECTOR INPUT VOLTAGE*.

Testing the Fuel Injector Balance with BUDS2

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 *FUEL TANK AND FUEL PUMP* subsection.
2. Connect the vehicle to the BRP diagnostic software (BUDS2).
3. Press the START button to wake up the ECM.
4. Install tether cord on engine cut-off switch.

5. In BUDS2, go to :
 - **Functions** page
 - **ECM** button
 - **Functions** tab
 - **IO Controls - Activate Fuel Pump.**
6. Fuel pressure must be within specification. Refer to *FUEL TANK AND FUEL PUMP* subsection. Re-activate fuel pump as necessary.
7. In BUDS2, activate the fuel injector **no. 1**.
8. Record the fuel pressure drop for injector **no. 1**.
9. In BUDS2, activate fuel pump.
10. Repeat the procedure for fuel injectors **no. 2** and **no. 3** and record the pressure drop for each injector.
11. The maximum fuel pressure drop between injectors should not exceed the following specification:

MAXIMUM FUEL PRESSURE DROP ALLOWED BETWEEN FUEL INJECTORS
10 kPa (1.5 PSI)

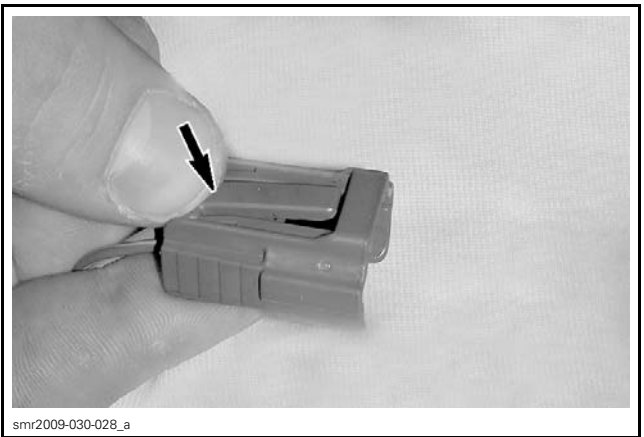
If pressure drop of any fuel injector is greater than the specification, replace that injector then repeat the test.

12. Using the valve on the fuel pressure gauge, release the pressure in the system (if so equipped).
13. Remove fuel pressure gauge and reinstall removed parts.

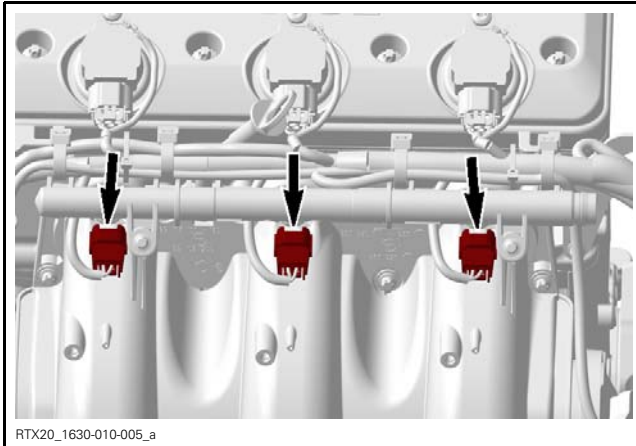
Testing the Fuel Injector Input Voltage

1. Remove ECM from its support.
2. Disconnect fuel injector connectors.

NOTE: Push against tab underneath connector as illustrated to unlock it.

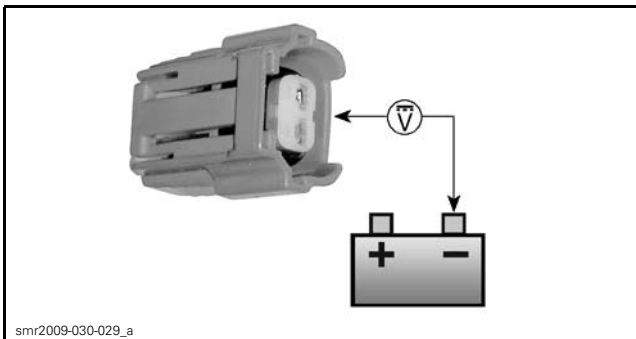


PUSH HERE TO UNLOCK



3. Press the START button to wake up the ECM.
4. Install tether cord on engine cut-off switch.
5. Set the multimeter to Vdc.
6. Read input voltage to the applicable injector as per following table.

FUEL INJECTOR INPUT VOLTAGE TEST		
INJECTOR CONNECTOR PIN	BATTERY	MEASUREMENT
2	Negative (-) post	Battery voltage



If battery voltage is measured, carry out *TESTING THE INJECTOR CONTROL CIRCUIT*.

If battery voltage is not measured, check continuity between fuse box and injector as follows.

Testing the Continuity of Injector Power Circuit

1. Remove cover of fuse box. Refer to *POWER DISTRIBUTION* subsection.
2. Set the multimeter to Ω .
3. Read resistance of the applicable injector circuit as per following table.

INJECTOR POWER CIRCUIT CONTINUITY TEST		
INJECTOR CONNECTOR PIN	FUSE BOX TERMINAL	MEASUREMENT
2	B1	Close to 0 Ω

If continuity is good, the fuse, wiring and connectors are functional.

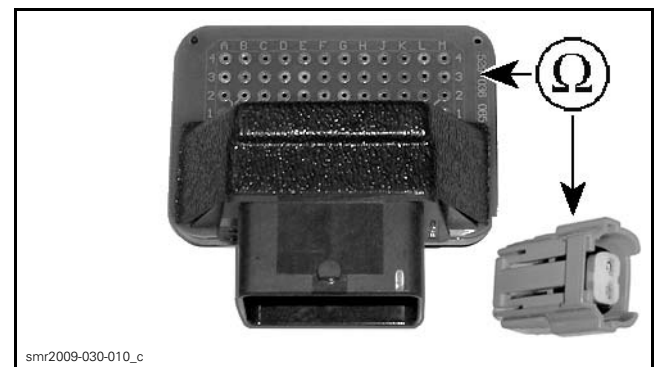
If continuity is not obtained, first check the fuse and replace as required.

If fuse is good, repair/replace wiring and connectors from fuse box to injector. Refer to *WIRING DIAGRAM* subsection.

Testing the Fuel Injector Control Circuit

1. Disconnect ECM-A connector from the ECM and install it on the ECM adapter tool..
2. Set the multimeter to Ω .
3. Disconnect the required injector connector.
4. Read resistance as per following table.

INJECTOR CONTROL CIRCUIT CONTINUITY TEST		
INJECTOR CONNECTOR PIN	ECM ADAPTER PIN	MEASUREMENT
1 (inj 1)	A-B3	Close to 0 Ω
1 (inj 2)	A-K1	
1 (inj 3)	A-J1	



If control circuit is at fault, repair or replace wiring and connectors.

If control circuit and all tests applicable to the injector are good, try a new ECM. Refer to *ECM* in this subsection.

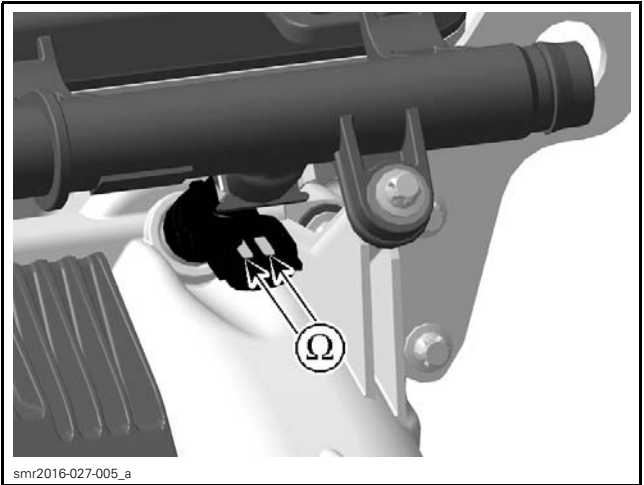
Testing the Fuel Injector Resistance

1. Remove injector connector.

Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

2. Check resistance value between injector pins as per followings table.

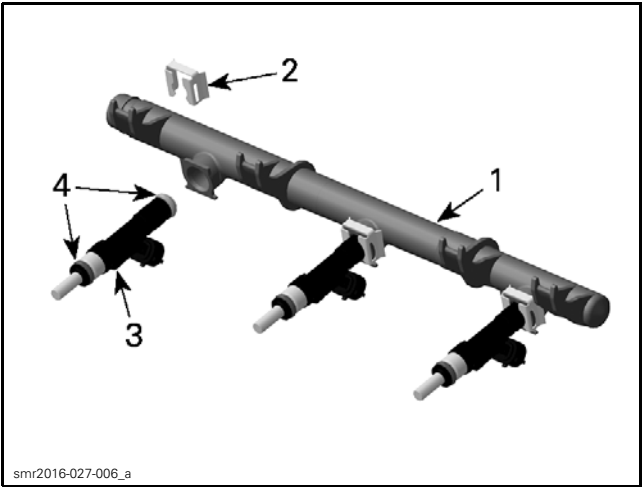
INJECTOR RESISTANCE TEST		
INJECTOR PIN		MEASUREMENT
1	2	11.4 - 12.6 Ω



If readings are not as specified, replace injector.
If readings are as specified, repair or replace wiring and connectors from ECM to injector.

Removing the Fuel Injector

1. Remove fuel rail. Refer to *FUEL RAIL* in this subsection.
2. Remove the injector clip.



FUEL RAIL ASSEMBLY

1. Fuel rail
2. Injector clip
3. Fuel injector
4. O-rings

3. Pull the fuel injector out of the fuel rail.

Installing the Fuel Injector

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

FUEL INJECTOR IDENTIFICATION	
Injector color code	YELLOW/GREEN

1. If you reinstall a used injector replace O-rings with **NEW** ones.
2. Apply a thin film of engine oil to O-rings.
3. Insert the fuel injector in the fuel rail.
4. Secure injector to fuel rail with a retaining clip.
5. Install fuel rail on engine. Refer to *FUEL RAIL* in this subsection.
6. Pressurize the fuel system and check for a fuel leak. Refer to *FUEL TANK AND FUEL PUMP* subsection.

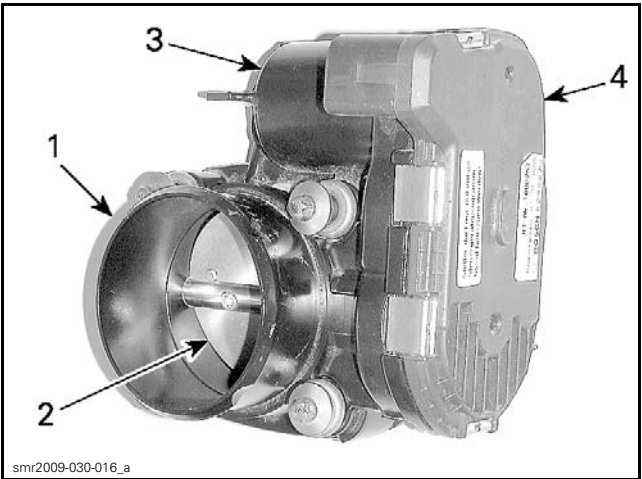
⚠ WARNING

Always carry out a fuel system high pressure leak test after working on the fuel system.

7. Reinstall all remaining removed parts, refer to applicable subsections.

THROTTLE BODY

Throttle Body Description



1. Throttle body
2. Throttle plate
3. Throttle actuator (electric motor inside)
4. Throttle position sensor (TPS) (inside)

Electronic Throttle Actuator (ETA)

The electronic throttle actuator (ETA) is a DC motor on the throttle body that regulates the throttle plate via a drive gear. Pulse width modulation (PWM) is used to control the motor.

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. Throttle plate: Rest position, maintained opened at approximately 8° ⁽¹⁾ . This is also the limp home position.
ON	Not started	Throttle actuator: On. Throttle plate: Moves from the rest position to approximately 14°. 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. 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. 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 (carbon build-up, dried salt water etc) 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, iBR will continue to monitor their input signals. Since the ECM cannot control the throttle body, the iBR may produce a fault since the ECM does not react to its specific torque requests. It all depends on the circumstances when the iBR is applied. (vehicle and engine speed will be a factor).

Lubricating the Throttle Body

No lubrication is required.

Testing the ETA

Testing the Throttle Body Actuator (ETA) with BUDS2

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. Press the START button to wake up the ECM.
3. In BUDS2, go to:
 - **Measurements** page
 - **ECM** button
 - **ECM - Basic** tab
 - **TAS (%DK)**
4. Slowly depress the throttle lever from the idle to WOT. The ETA should go from 0% to 100%.

If result is out of specification, carry out a **CLOSED THROTTLE RESET**. Refer to **ADJUSTMENT** in this subsection.

NOTE: The ETA is reset at the same time as the TPS.

After the reset, test ETA again.

Subsection XX (ELECTRONIC FUEL INJECTION (EFI))

If the result is still out of specification, check wire continuity between ECM and throttle body before assuming the ETA is at fault.

Inspecting the ETA

Always check for corroded terminals or damaged wiring when diagnosing throttle body problems.

Testing the ETA (Dynamic)

1. Remove the parts required to access the throttle body.
2. Remove the air inlet hose from the throttle body.
3. Observe the throttle plate with the engine stopped.

NOTE: The throttle plate should be in the rest position (slightly opened).

⚠ WARNING

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.

4. As you observe the throttle plate, have someone press the START button to wake up the ECM.

NOTE: The throttle plate should cycle quickly from the rest position to a partially open position (approximately 14°), then back to the rest position.

5. Install the tether cord on the engine cut-off switch.

NOTE: The throttle plate should cycle again.

6. As you observe the throttle plate, have someone gradually and evenly pull in the throttle lever, then release it in the same way.

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.

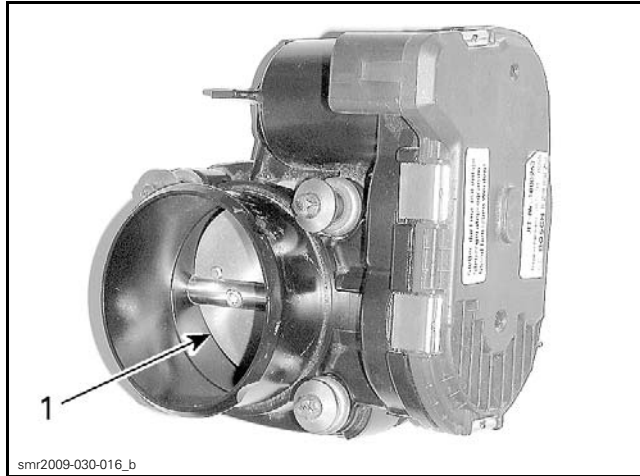
If any test failed, proceed with the *TESTING THE THROTTLE BODY (STATIC)*.

Testing the ETA (Static)

⚠ WARNING

First ensure the ECM is off. Do not move the throttle plate using your fingers. Otherwise, if the START button is pressed the ECM turn on and quickly cycle the throttle plate which could cause serious finger injury.

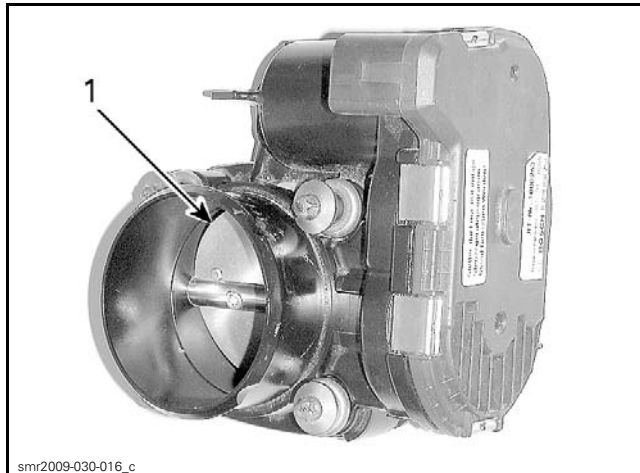
1. Using a blunt tool, push in on the throttle plate and ensure it opens smoothly within the throttle body.



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 the throttle plate does not return properly after a proper cleaning, replace the throttle body.

If throttle plate operates normally, the problem is electrical. Check throttle actuator (ETA) wiring continuity, throttle position sensor (TPS) and throttle accelerator sensor (TAS).

Cleaning the Throttle Body

Remove the parts required to access 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. Refer to product manufacturer's instruction.

Before beginning the throttle body cleaning:

- Remove the tether cord cap.
- Disconnect the battery.
- Remove the ECM fuse (F11).

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.

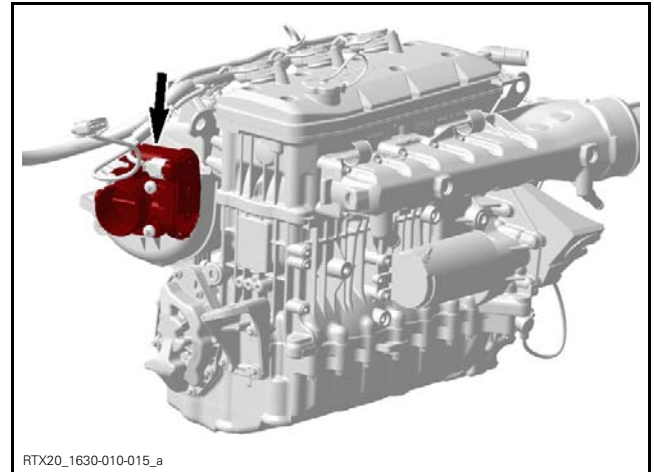
Manually open throttle and hold fully open to reach all surfaces.

To remove residual dirt, spray cleaner on throttle plate and on bore.

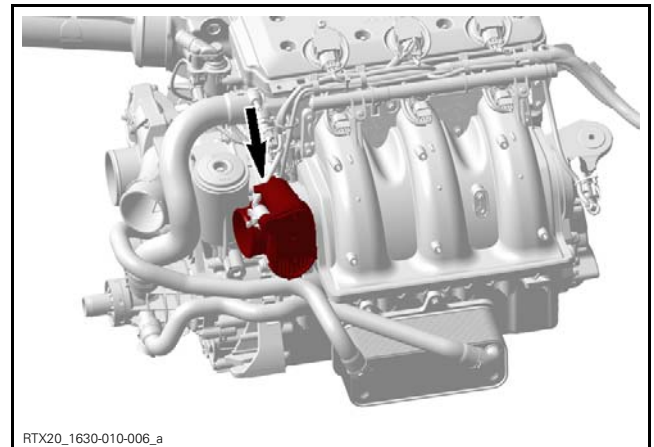
Reinstall removed parts.

Replacing the Throttle Body

Throttle Body Location



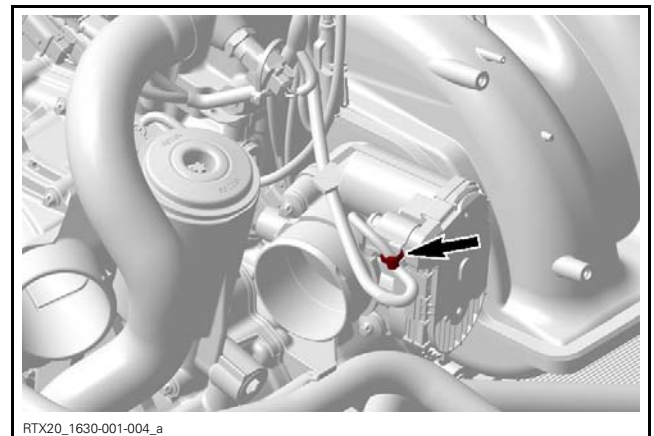
NATURALLY-ASPIRATED ENGINES



SUPERCHARGED ENGINES

Removing the Throttle Body

1. Disconnect inlet hose from throttle body.
2. Cut locking tie.



TYPICAL - 230 AND 300 ENGINES SHOWN

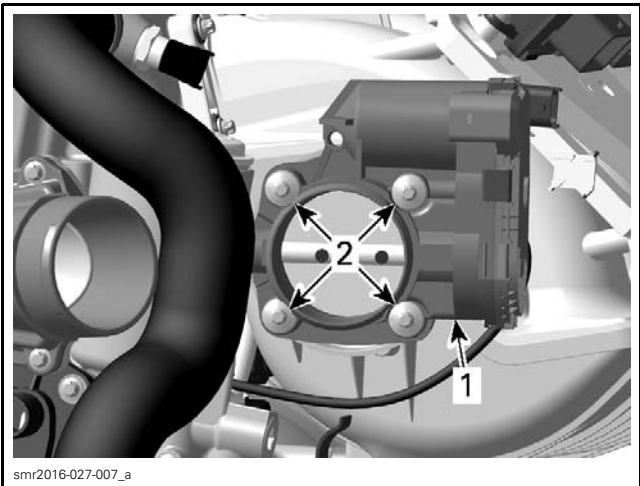
3. Disconnect throttle body connector.

To remove connector from throttle body, press connector locking tab illustrated.



TYPICAL - PRESS HERE TO UNLOCK

4. Remove retaining screws from throttle body.



TYPICAL
1. Throttle body
2. Retaining 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 in a criss-cross sequence.

TIGHTENING TORQUE	
Throttle body retaining screws	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

2. Perform the **Closed Throttle** reset. See procedure in *ADJUSTMENTS* in this subsection.

TPS (THROTTLE POSITION SENSOR)

General

NOTE: The TPS is part of the throttle body. The throttle position sensor (TPS) is a double potentiometer that sends signals to the ECM that are proportional to the throttle plate angle. The TPS is located inside 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. Connect the vehicle to the BRP diagnostic software (BUDS2).
3. Press the START button to wake up the ECM.
4. Install the tether cord on the engine cut-off switch.
5. In BUDS2, go to:
 - **Measurements** page
 - **ECM** button
 - **ECM - Basic** tab
 - **Throttle Opening (%DK)**
6. Slowly and regularly depress the throttle lever.
7. Observe the **Throttle Opening** value.

NOTE: The value should move gradually and regularly as you move the throttle lever. If the value “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 value starts to change is normal.

If the value 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 the value again.

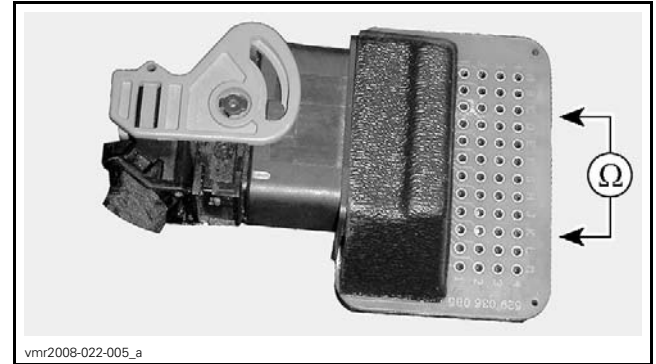
- If the value changes as expected, check the throttle accelerator sensor (TAS). Refer to *INTELLIGENT THROTTLE CONTROL (ITC)* subsection.
- If the value does not change as expected, perform *TESTING THE TPS RESISTANCE* in this subsection.

Testing the TPS Resistance

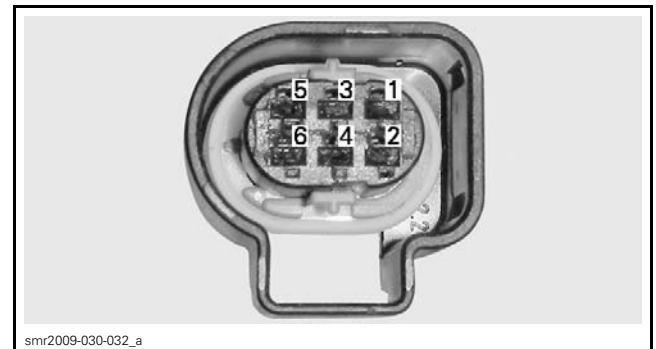
1. Remove the parts required to access the throttle body.
2. Ensure the throttle body connector is properly connected.
3. Disconnect the ECM-A connector from the ECM and install it on the ECM adapter tool.
4. Set the multimeter to Ω .
5. Probe circuit as per following table while using a finger to manually 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	875	1625	875	1625
A-A2	A-K3	954	1934	228	585
A-A2	A-F3	254	634	980	1983
A-K3	A-K4	228	585	954	1934
A-K3	A-F3	1385	2315	1385	2315
A-K4	A-F3	980	1983	254	634

⁽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.

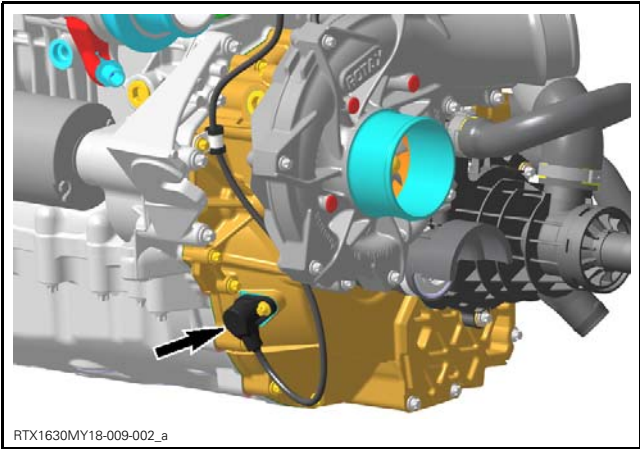
CRANKSHAFT POSITION SENSOR (CPS)

Troubleshooting the CPS

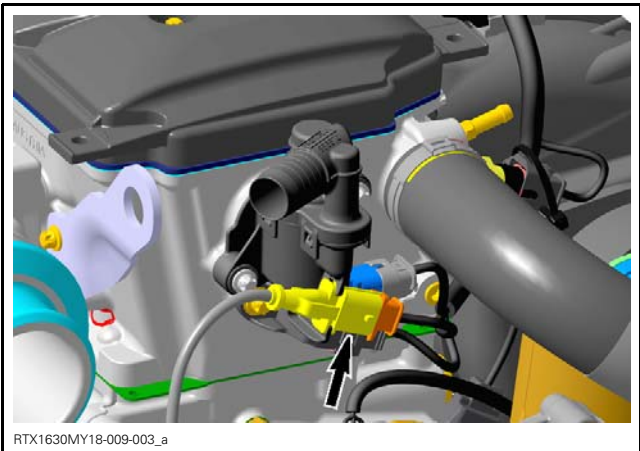
Take into account that a CPS fault can be triggered by electronic or mechanical fault:

1. Check for fault codes
2. Test the CPS as per following procedure
3. If it tests good, check trigger wheel teeth condition. Refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.

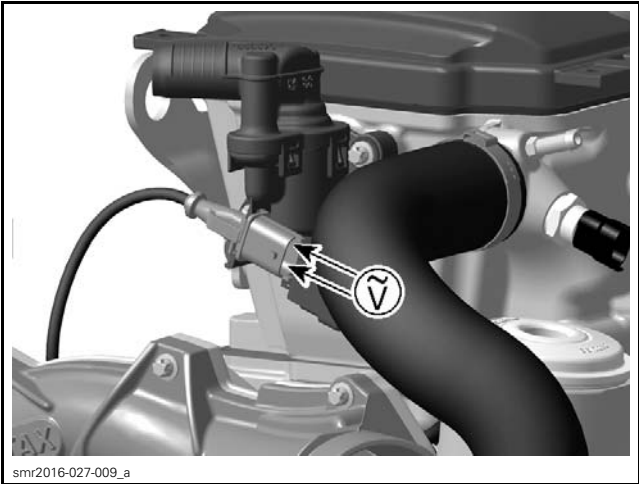
CPS and CPS Connector Location



RTX1630MY18-009-002_a
TYPICAL -CRANKSHAFT POSITION SENSOR (CPS)



RTX1630MY18-009-003_a
TYPICAL - CPS CONNECTOR - SUPERCHARGER REMOVED FOR CLARITY



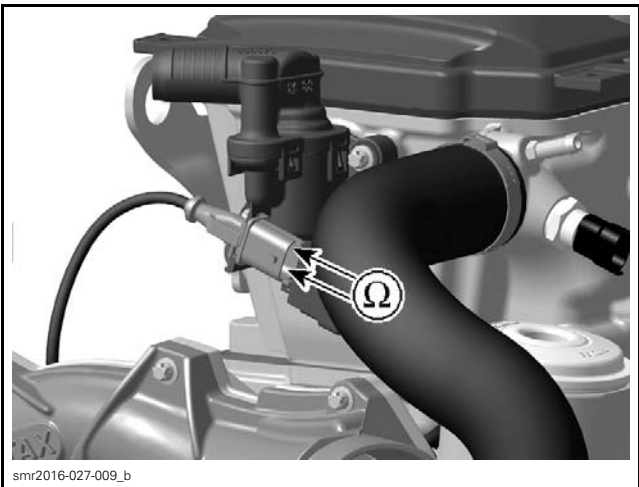
If voltage is not as specified, carry out *TESTING THE CPS RESISTANCE AT CPS CONNECTOR*.

If voltage is as specified, check continuity of wiring between CPS connector and ECM connector. Refer to *TESTING THE CPS RESISTANCE AT ECM CONNECTOR*.

Testing the CPS Resistance at CPS Connector

1. Probe CPS connector terminals as per following table.

CPS RESISTANCE TEST		
CPS CONNECTOR PIN		MEASUREMENT @ 20°C (68°F)
1	2	775 - 950 Ω



If resistance is not within specifications, replace the CPS.

If resistance tests good carry out *TESTING THE CPS RESISTANCE AT ECM CONNECTOR*.

Testing the CPS Voltage

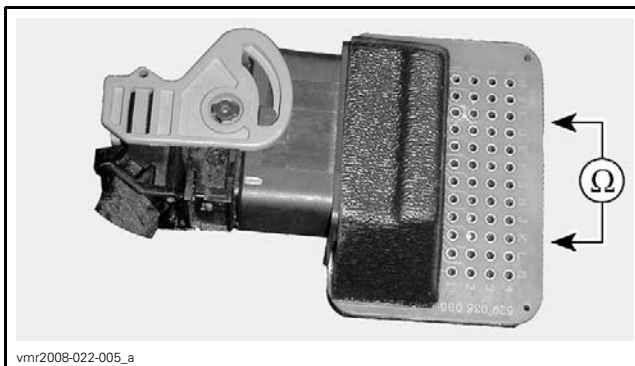
1. Disconnect CPS wiring harness connector.
2. Press the START button to wake up the ECM.
3. Install the tether cord on the engine cut-off switch.
4. Pull the throttle lever completely in to the handlebar and hold (drowned mode).
5. While cranking the engine, probe CPS terminals.

CPS OUTPUT VOLTAGE TEST		
CPS CONNECTOR PIN		MEASUREMENT
1	2	3.7 Vac

Testing the CPS Resistance at ECM Connector

1. Remove parts required to access ECM-A connector.
2. Disconnect the ECM-A connector from the ECM and install it on the ECM adapter tool.
3. Set the multimeter to Ω .
4. Probe CPS terminals as per following table.

CPS RESISTANCE TEST		
ECM ADAPTER PIN		MEASUREMENT @ 20°C (68°F)
A-H1	A-K2	775 - 950 Ω

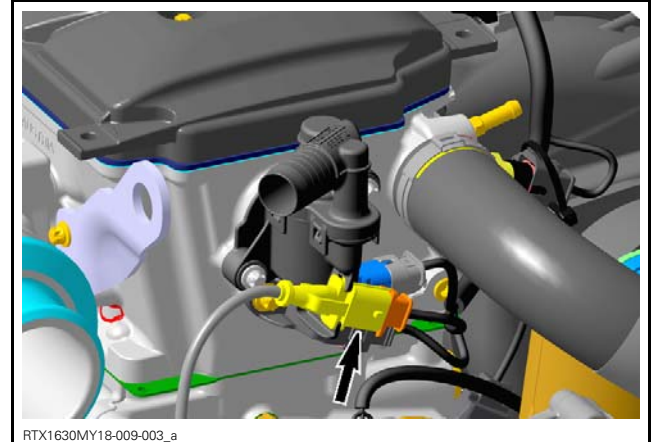


If resistance measured is as specified, check ECM. Refer to *ENGINE CONTROL MODULE (ECM)* in this subsection.

If resistance measured is not as specified, repair or replace wiring and connectors between ECM and the CPS.

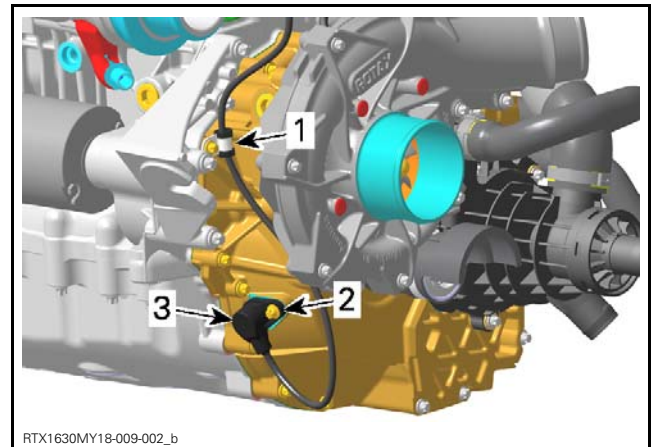
Replacing the CPS

1. Drain oil from PTO housing. Refer to *PTO HOUSING, MAGNETO AND STARTER*.
- NOTE:** It is not necessary to drain oil from engine.
2. Disconnect CPS connector.



TYPICAL - SUPERCHARGER REMOVED FOR CLARITY

3. Remove CPS harness retaining clamp.
4. Remove CPS retaining screw.



TYPICAL

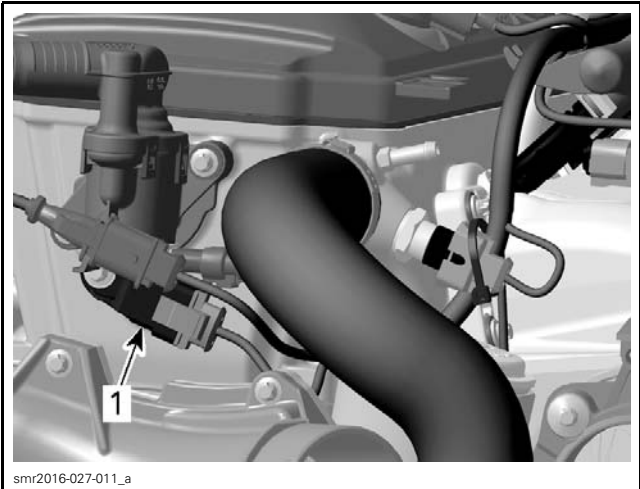
1. CPS harness retaining clamp
2. CPS retaining screw
3. CPS

5. Pull out CPS.
6. Install the new CPS.
7. Tighten CPS retaining screw to specification.

TIGHTENING TORQUE	
CPS retaining screw	$9 \text{ N}\cdot\text{m} \pm 1 \text{ N}\cdot\text{m}$ $(80 \text{ lbf}\cdot\text{in} \pm 9 \text{ lbf}\cdot\text{in})$ + LOCTITE 243 (BLUE) (P/N 293 800 060)

8. Reinstall CPS harness retaining clamp and connect the connector.
9. Refill engine oil and check oil level, refer to *LUBRICATION SYSTEM* subsection.

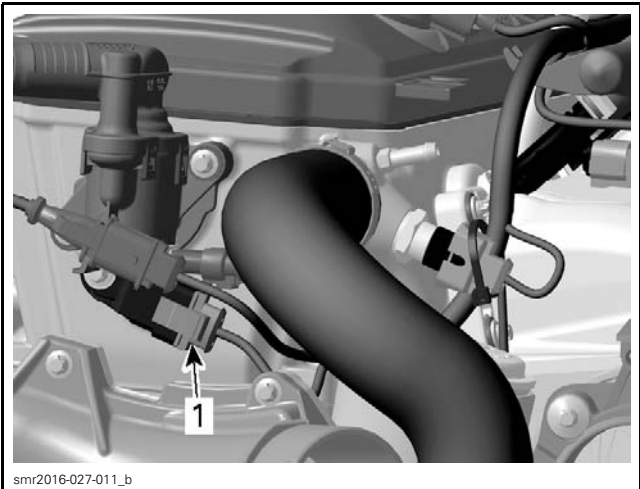
CAMSHAFT POSITION SENSOR (CAPS)



TYPICAL
1. CAPS

Testing the CAPS Voltage (Harness Side)

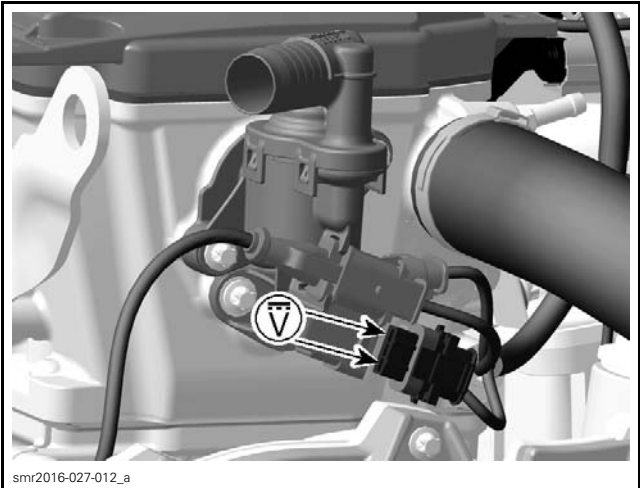
1. First check fuse F11 in fuse box. Replace as required.
2. Remove the parts required to access the CAPS.
3. Disconnect CAPS connector.



TYPICAL
1. CAPS connector

4. Press the START button to wake up the ECM.
5. Install tether cord on engine cut-off switch.
6. Probe harness connector terminals as per following table.

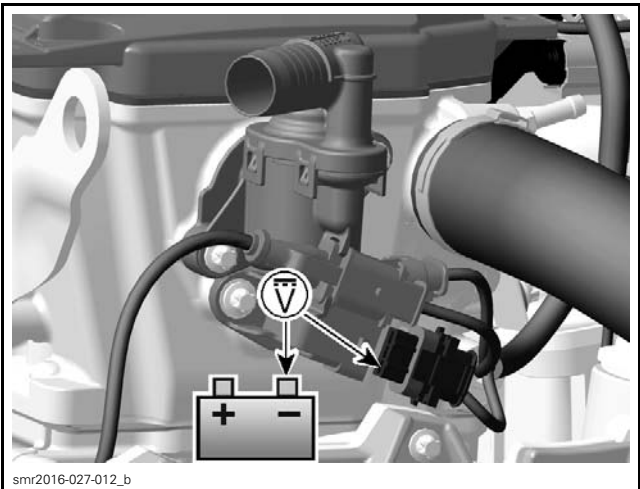
CAPS INPUT VOLTAGE TEST		
CAPS CONNECTOR PIN		MEASUREMENT
1	3	Battery voltage



If battery voltage is read, proceed with *TESTING THE CAPS (DYNAMIC)* in this subsection.

If battery voltage is not read, probe circuit as per following table.

CAPS INPUT VOLTAGE TEST (DYNAMIC)		
CAPS CONNECTOR PIN	BATTERY	MEASUREMENT
3	Negative (-) post	Battery voltage



If voltage is read to battery ground, check continuity of ground circuit between CAPS pin 1 and ECM-A connector pin D4. 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 Continuity of CAPS Power Circuit

1. Set the multimeter to Ω .

- Read resistance of the CAPS circuit as per following table.

CAPS POWER CIRCUIT CONTINUITY TEST		
CAPS CONNECTOR PIN	FUSE BOX TERMINAL	MEASUREMENT
3	E1	Close to 0 Ω

If continuity is good, wiring and connectors are functional.

If a high resistance or an open circuit is measured, check the short bus bar in fuse box, repair or replace wiring and connectors from fuse box terminal to CAPS connector.

Testing the CAPS (Dynamic)

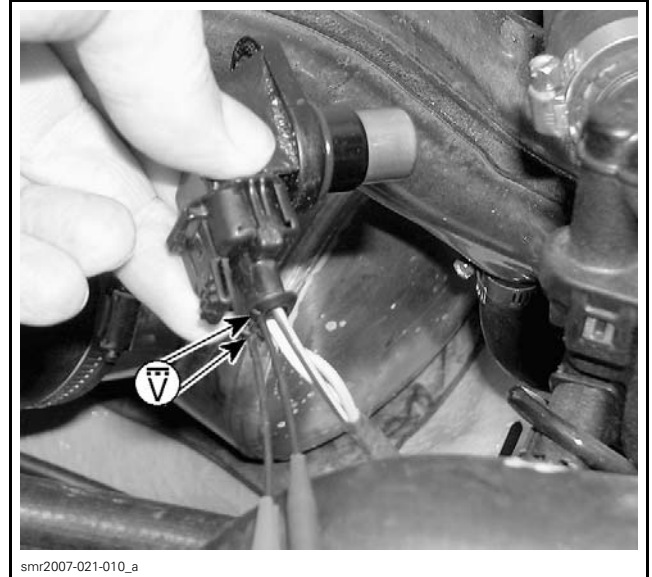
- Remove the parts required to access the CAPS.
- Remove CAPS sensor from engine.
- Back-probe connector and read voltage as follows.

NOTE: To safely probe wire terminals through the back of the connector, using following tools or equivalent. Care must be taken not to damage connector seals.

REQUIRED TOOL	
Back probe pin	
Insulated test leads	

NOTICE Do not use sharp end probes. They could damage the connector seal.

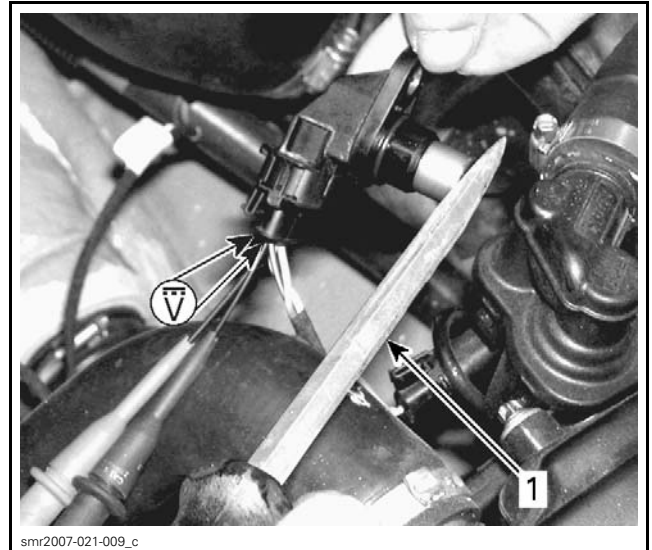
CAPS TEST (DYNAMIC)			
CAPS CONDITION	CAPS CONNECTOR PIN		MEASUREMENT
Free	1	2	Close to 12 Vdc



smr2007-021-010_a

TYPICAL

CAPS TEST (DYNAMIC)			
CAPS CONDITION	CAPS CONNECTOR PIN		MEASUREMENT
Metallic object on sensor just for a few seconds	1	2	Close to 12 Vdc



smr2007-021-009_c

1. Metallic object

NOTE: Check several times if voltage follows the placement of the metallic object. Voltage must change each time.

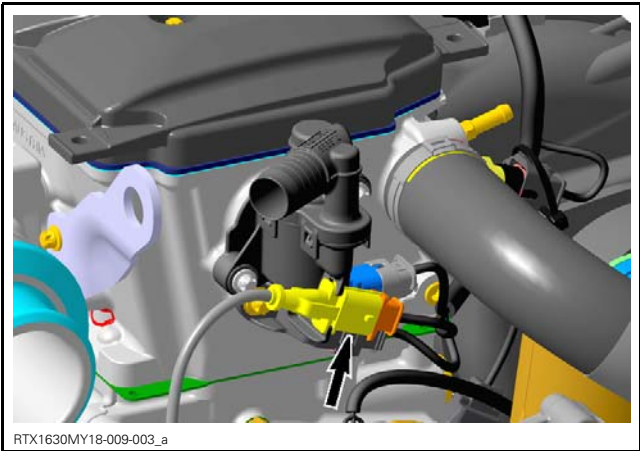
If voltage is as specified, repair or replace wiring and connectors between sensor and ECM.

If wiring is good, check ECM. Refer to *ENGINE CONTROL MODULE (ECM)*.

If voltage is not measured as specified, try a new CAPS.

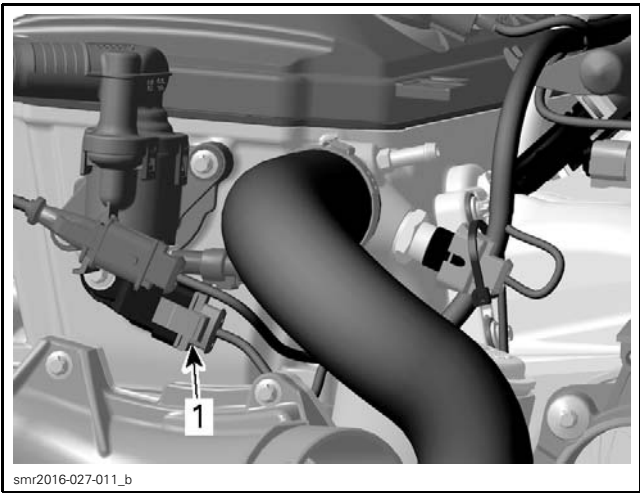
Replacing the CAPS

- 1. Detach CPS connector from its holder.



TYPICAL - SUPERCHARGER REMOVED FOR CLARITY

- 2. Disconnect CAPS connector.



TYPICAL
1. CAPS connector

- 3. Unscrew the CAPS retaining screw.
- 4. Pull CAPS from engine.
- 5. Install the CAPS.

NOTICE Be sure to install new O-ring on a reused CAPS.

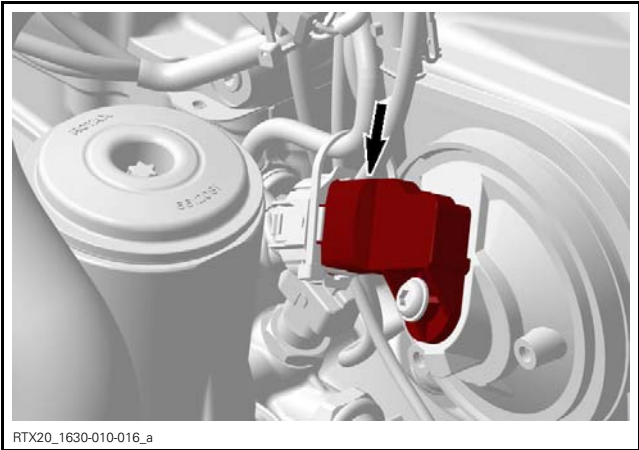
- 6. Tighten CAPS retaining screw to specification.

TIGHTENING TORQUE	
CAPS retaining screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

MANIFOLD ABSOLUTE PRESSURE AND TEMPERATURE SENSOR (MAPTS)

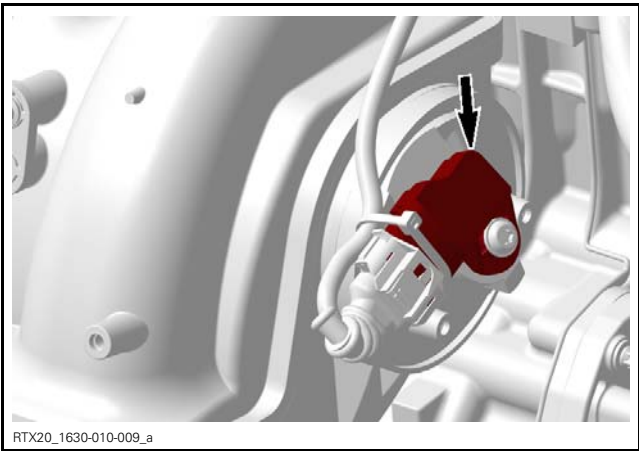
This sensor is a multifunction device. It measures manifold absolute pressure and intake air temperature for air flow calculations.

Naturally-Aspirated Engines



MAPTS - REAR SIDE OF ENGINE

Supercharged Engines



MAPTS - FRONT SIDE OF ENGINE

MAPTS Pressure Function

This sensor is a dual function device. Before the engine is started, when power is applied to the system, the sensor measures the ambient atmospheric pressure and stores it in the ECM. Thereafter, once the engine is started, it measures the air pressure in the intake manifold at operating RPMs.

Ensure sensor is correctly installed on 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. 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 Pressure Function Quick Test

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. Press the START button to wake up the ECM.
3. Install the tether cord on the engine cut-off switch.
4. In BUDS2, go to:
 - **Measurements** page
 - **ECM** button
 - **ECM - Basic** tab
 - **Intake Air Pressure (hPa)**
5. Look for and take note of the MAPTS pressure reading while the engine is stopped.

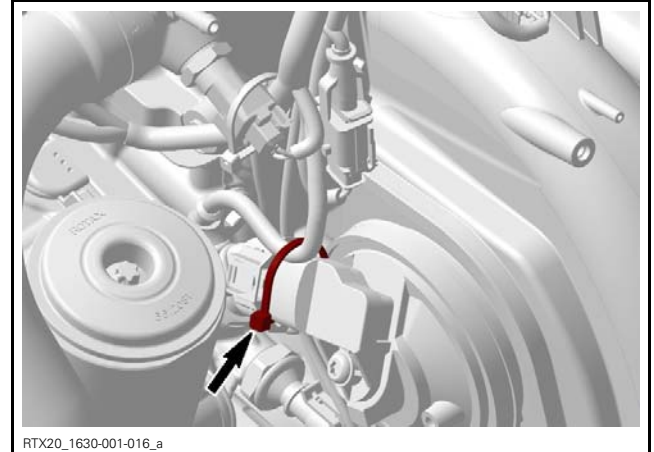
Values have to be within ± 3.4 kPa (.5 PSI).

MAPTS PRESSURE FUNCTION QUICK TEST			
RESULT (1 KPA = 10 HPA)	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		

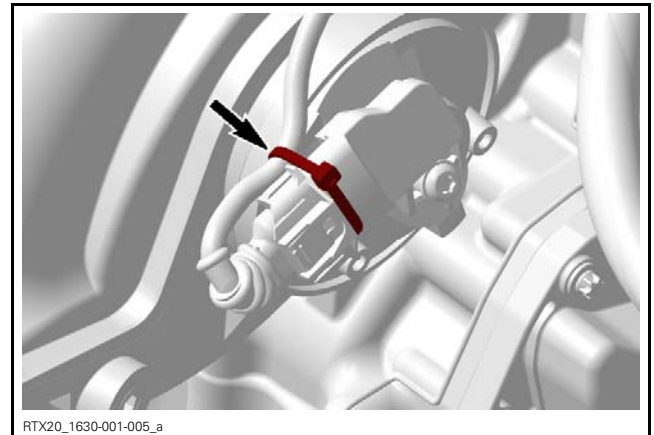
6. Perform the same test with a new MAPTS and compare both readings.

Testing the MAPTS Input Voltage (Pressure Function)

1. Remove the parts required to access the MAPTS.
2. Cut locking tie and disconnect connector from MAPTS.



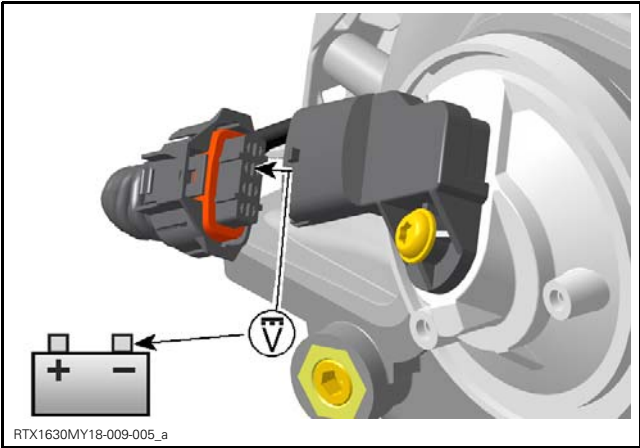
130 AND 170 ENGINES



230 AND 300 ENGINES

3. Press the START button to wake up the ECM.
4. Install the tether cord on the engine cut-off switch.
5. Set the multimeter to Vdc.
6. Read voltage as per following table.

MAPTS INPUT VOLTAGE TEST		
MAPTS CONNECTOR PIN	BATTERY	MEASUREMENT
3	Negative (-) post	5V
4		0V
1		0V



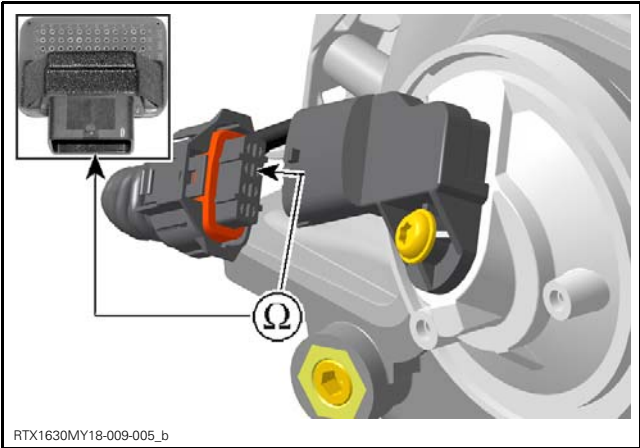
If voltage measured is as specified, replace the MAPTS.

If voltage measured is not as specified, refer to *TESTING THE CONTINUITY OF MAPTS WIRING HARNESS (PRESSURE FUNCTION)*.

Testing the Continuity of MAPTS Wiring Harness (Pressure Function)

1. Disconnect ECM-A connector from the ECM and install it on the ECM adapter tool.
2. Set the multimeter to Ω .
3. Test for circuit continuity as per following table.

MAPTS CIRCUIT CONTINUITY TEST		
MAPTS CONNECTOR PIN	ECM ADAPTER PIN	MEASUREMENT
3	A-B4	Close to 0 Ω
4	A-G4	
1	A-H2	



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 sensor monitors the air temperature inside the intake manifold.

MAPTS Quick Test (Temperature Function)

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. Press the START button to wake up the ECM.
3. Install the tether cord on the engine cut-off switch.
4. In BUDS2, go to:
 - **Measurements** page
 - **ECM** button
 - **ECM - Basic** tab
 - **Intake Temperature**
5. Look for the temperature reading while the engine is stopped.

NOTE: If the complete vehicle is at room temperature, BUDS2 should display the ambient air temperature at the intake manifold.

6. Perform the same test with a new MAPTS and compare both readings.

If the engine's MAPTS temperature reading is significantly different than the new MAPTS, replace it.

NOTE: Both sensors must measure the same ambient air temperature.

If there is no reading, carry out *TESTING THE MAPTS RESISTANCE (TEMPERATURE FUNCTION)*.

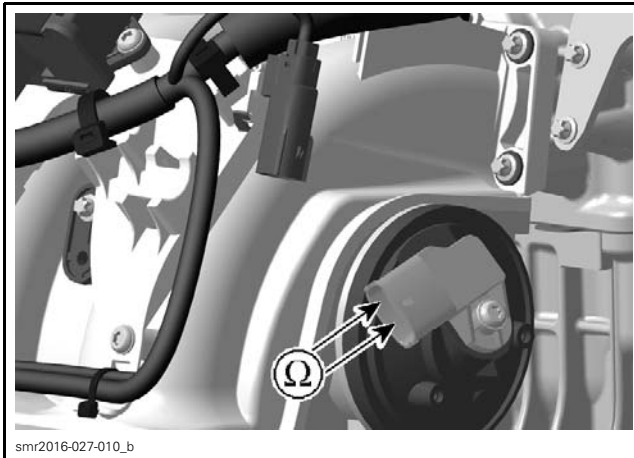
Testing the MAPTS Resistance (Temperature Function)

Cut locking tie and disconnect the connector from the MAPTS.

Set the multimeter to Ω .

Check the resistance of the sensor itself as shown.

MAPTS RESISTANCE TEST (TEMPERATURE FUNCTION)		
MAPTS CONNECTOR PIN		MEASUREMENT
1	2	Refer to <i>MAPTS TEMPERATURE SENSOR TABLE</i>



MAPTS TEMPERATURE SENSOR TABLE			
TEMPERATURE		RESISTANCE (OHMS)	
°C	°F	LOW	HIGH
- 40	- 40	40528	56935
- 10	14	8103	10919
20	68	2193	2863
80	176	294	368
120	248	98	122

If resistance is not within specification, replace the MAPTS.

If resistance tests good, **reconnect** the MAPTS.

Disconnect ECM-A connector from the ECM and install it on the ECM adapter tool.

Recheck resistance value as per following table.

MAPTS RESISTANCE TEST (TEMPERATURE FUNCTION)		
ECM ADAPTOR PIN		MEASUREMENT
A-H2	A-H3	Refer to <i>MAPTS TEMPERATURE SENSOR TABLE</i>

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	Replace MAPTS		
CORRECT RESISTANCE VALUE	Try a new ECM		

Testing the MAPTS Circuit Continuity (Temperature Function)

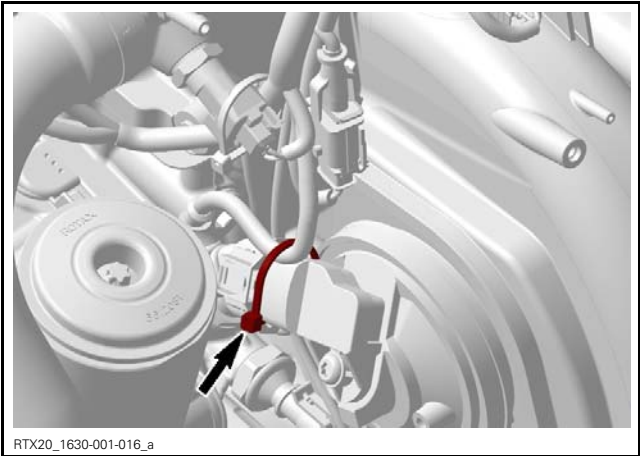
MAPTS CIRCUIT CONTINUITY TEST (TEMPERATURE FUNCTION)		
MAPTS CONNECTOR PIN	ECM ADAPTOR PIN	MEASUREMENT
1	A-H2	Close to 0 Ω
2	A-H3	

Replacing the MAPTS

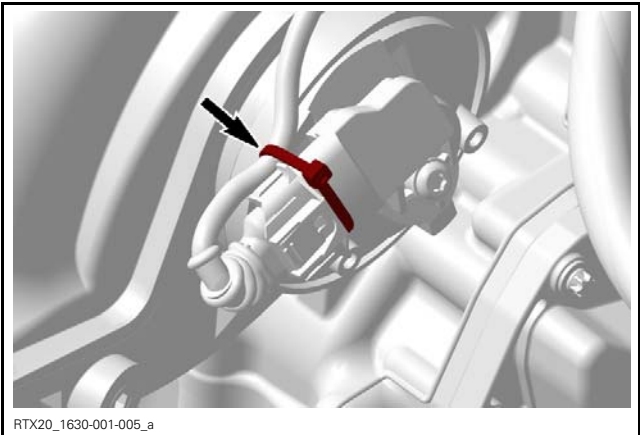
1. Disconnect MAPTS connector and remove the MAPTS.
2. Install the new MAPTS.
3. Tighten retaining screw to specification.

TIGHTENING TORQUE	
MAPTS retaining screw	5.5 N•m ± 0.6 N•m (49 lbf•in ± 5 lbf•in) + LOCTITE 243 (BLUE) (P/N 293 800 060)

4. Connect MAPTS connector.
5. Secure MAPTS wire to the sensor.



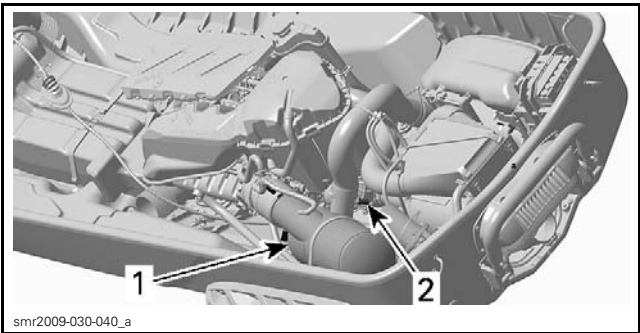
RTX20_1630-001-016_a
130 AND 170 ENGINES



RTX20_1630-001-005_a
230 AND 300 ENGINES

6. Reinstall remaining parts removed, refer to applicable subsections.

EXHAUST GAS TEMPERATURE SENSOR (EGTS)



smr2009-030-040_a
1. Muffler
2. Exhaust gas temperature sensor (EGTS)

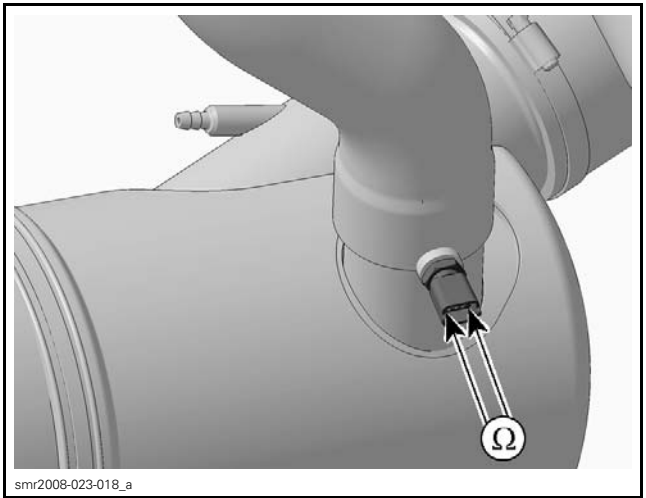
NOTE: An overheat signal will come on in the information center when the exhaust temperature reaches.

OVERHEAT TEMPERATURE
110°C (230°F)

Testing the EGTS Resistance

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

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

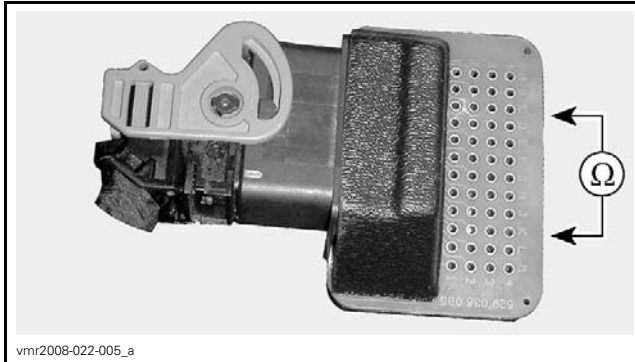


The resistance should be as per the *EGTS RESISTANCE CHART* that follows. Otherwise, replace the EGTS.

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

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

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



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

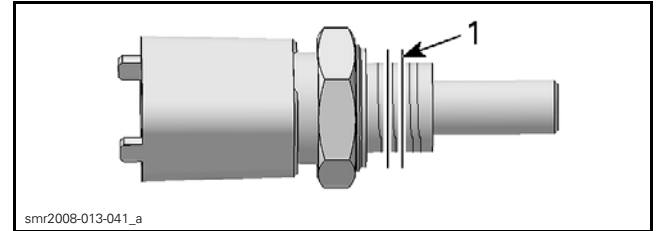
If resistance value is as specified, check ECM. Refer to *ENGINE CONTROL MODULE (ECM)* in this subsection.

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. Apply Loctite 518 on the middle threads of the new EGTS.

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



1. Apply Loctite 518 in this area

4. Install the EGTS.

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

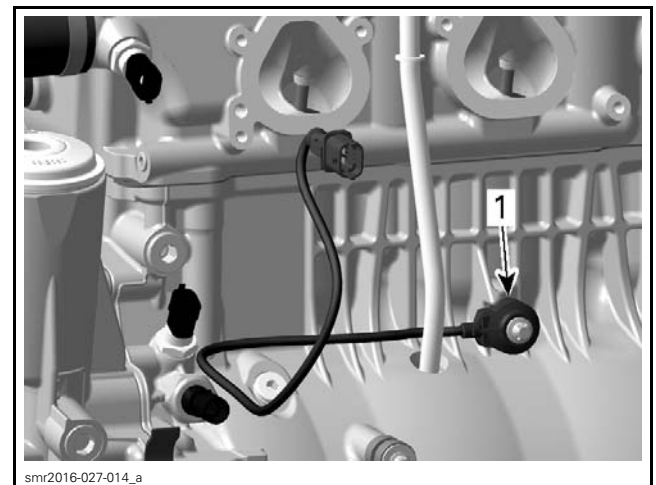
5. Install the EGTS connector.

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

KNOCK SENSOR (KS)

Knock Sensor Location

The KS is located in the cylinder block behind the intake manifold



1. Knock sensor (KS)

Testing the KS (Dynamic)

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. In BUDS2, go to:
 - Faults page
 - ECM button.
3. Start engine and throttle it to above 5000 RPM.

NOTICE The engine must not run out of the 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.

4. Using the BUDS2, monitor the knock sensor for a fault code.

If no fault occurs, the knock sensor is good.

If a fault occurs, carry out the following steps.

5. Ensure sensor and cylinder block contact surfaces are clean.

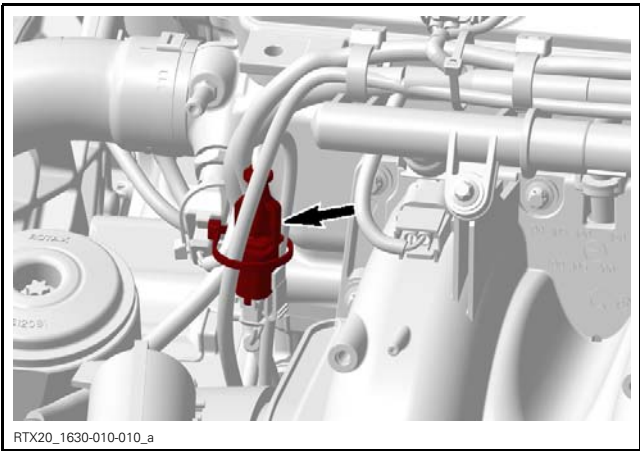
6. Ensure the correct mounting bolt and washer are used and are properly torqued.

NOTE: It is necessary to remove the intake manifold to inspect the contact surfaces. Refer to *IN-TAKE MANIFOLD* subsection.

7. Check the knock sensor resistance, refer to *TESTING THE KS RESISTANCE*.

Testing the KS Resistance

- 1. Remove parts required to access knock sensor.
- 2. Cut locking tie and disconnect the knock sensor connector.



- 3. Set the multimeter to Ω .
- 4. Measure the resistance between the knock sensor terminals.



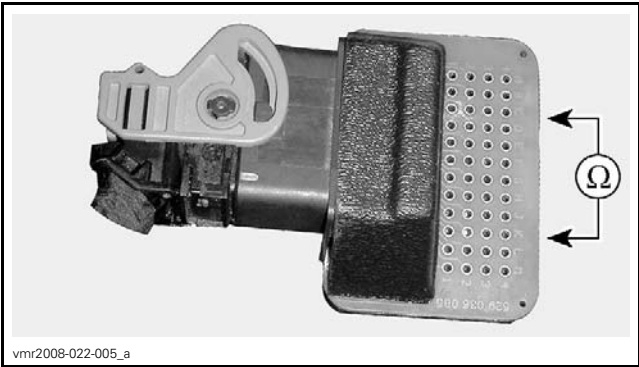
KS RESISTANCE TEST		
KS PIN		MEASUREMENT @ 20°C (68°F)
1	2	5 M Ω

If resistance is not as specified, replace knock sensor.

If resistance is as specified, carry on with the following steps.

- 5. Reconnect the knock sensor connector.
- 6. Disconnect ECM-A connector from the ECM and install it on the ECM adapter tool.
- 7. Check circuit resistance through the knock sensor as per following table.

KS RESISTANCE TEST AT ECM		
ECM ADAPTER PIN		MEASUREMENT @ 20°C (68°F)
A-C3	A-G2	5 M Ω

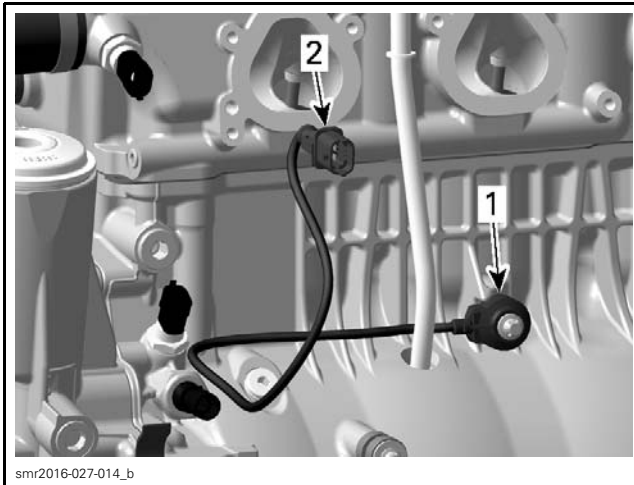


If wiring harness is good, check ECM. Refer to *ENGINE CONTROL MODULE (ECM)* in this section.

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.



TYPICAL - INTAKE MANIFOLD REMOVED

1. Knock sensor
2. Knock sensor connector

2. Unscrew and remove knock sensor from engine.
3. Clean contact surfaces.
4. Apply thread locker in threaded hole.
5. Install the new knock sensor and tighten retaining screw to specification.

NOTICE Improper torque may interfere with knock sensor operation and lead to severe internal engine damage.

TIGHTENING TORQUE	
KS retaining screw	$23 \text{ N}\cdot\text{m} \pm 3 \text{ N}\cdot\text{m}$ $(17 \text{ lbf}\cdot\text{ft} \pm 2 \text{ lbf}\cdot\text{ft})$ + LOCTITE 243 (BLUE) (P/N 293 800 060)

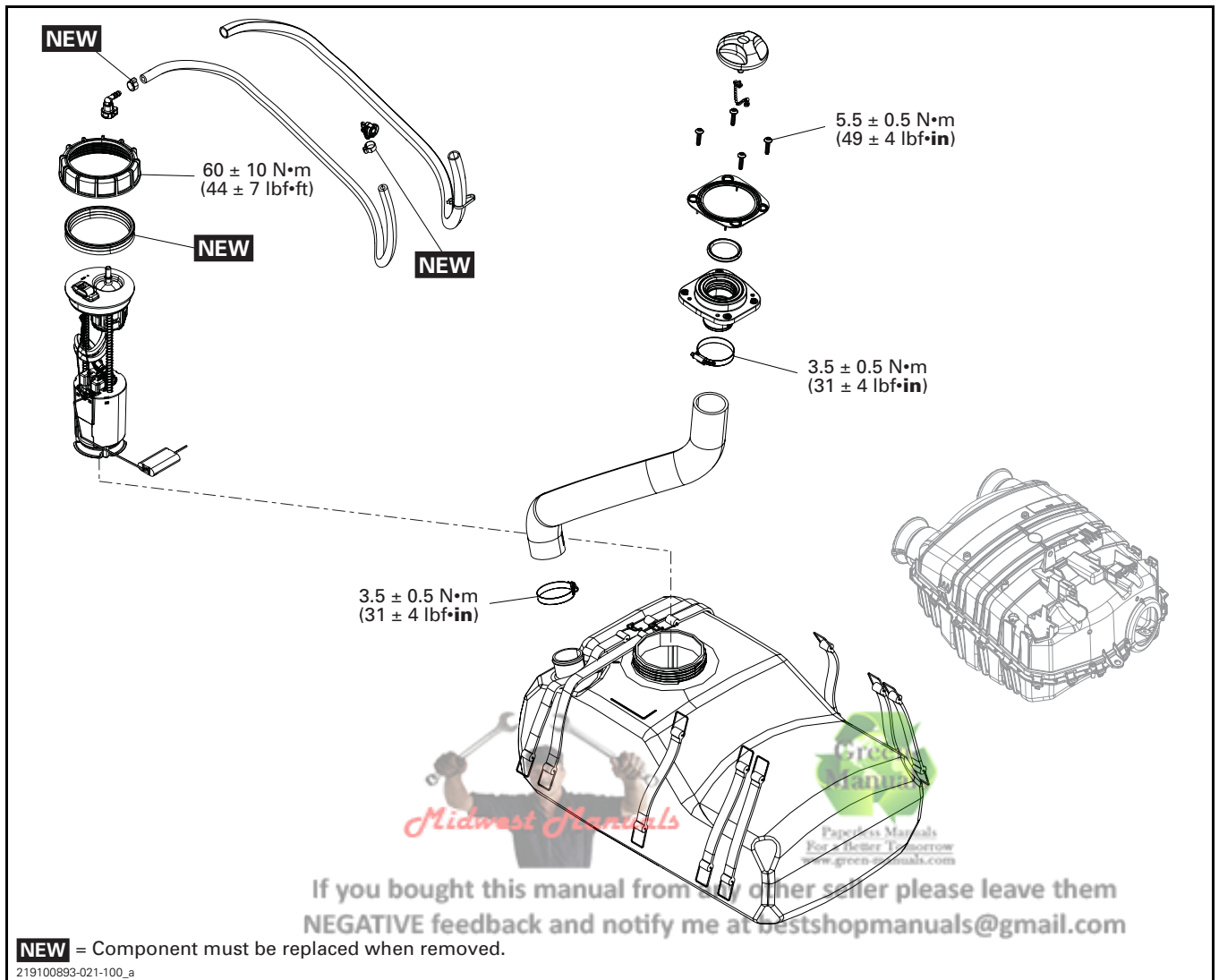
6. Reconnect knock sensor connector.
7. Reinstall remaining removed parts, refer to applicable subsections.

FUEL TANK AND FUEL PUMP

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	10
ECM ADAPTER TOOL.....	529 036 166	6
FLUKE 115 MULTIMETER	529 035 868	6, 10-11
FUEL HOSE ADAPTER.....	529 036 396	4
FUEL PUMP MODULE SOCKET.....	529 036 125	8
FUEL TANK TEST CAP	529 036 242	3
OETIKER PLIER.....	295 000 070	6
PRESSURE GAUGE.....	529 036 395	4
VACUUM/PRESSURE PUMP	529 021 800	3

FUEL TANK AND FUEL PUMP



GENERAL

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

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

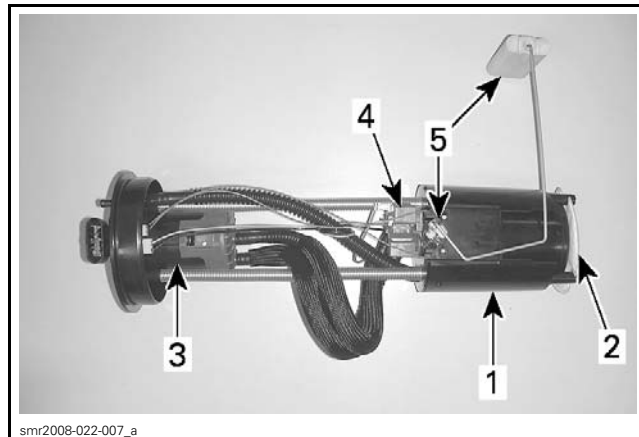
SYSTEM DESCRIPTION

The fuel system is comprised of:

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

The fuel pump module is basically comprised of:

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



FUEL PUMP MODULE

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

Fuel Pump Operation

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

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

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

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

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

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

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

Fuel Level Indication

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

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

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

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

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

Fuel Tank Venting

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

WARNING

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

INSPECTION

TESTING FUEL TANK FOR LEAKS

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

REQUIRED TOOL

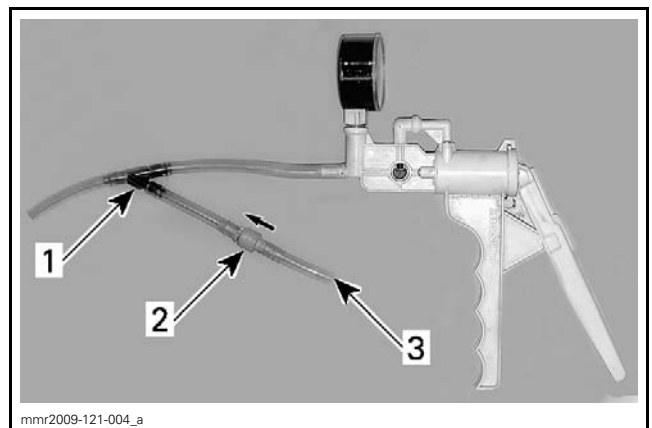
VACUUM/PRESSURE PUMP
(P/N 529 021 800)



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

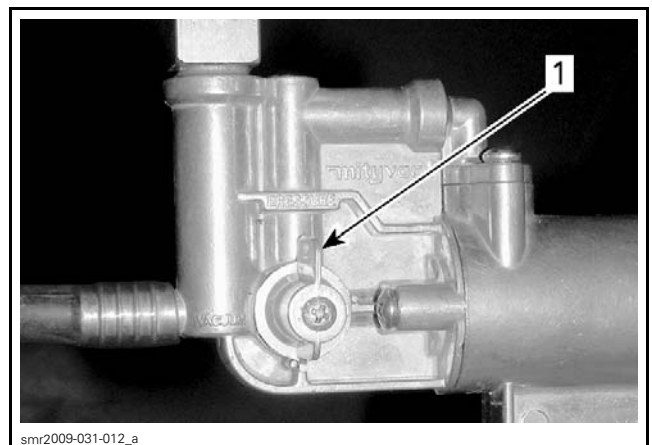


NOTE: A Y-fitting and a check valve can be installed to use compressed air for quick pressure build-up when the fuel tank is not full.



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

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



1. Pressure selected

9. Pressurize fuel tank to specification.

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

Subsection XX (FUEL TANK AND FUEL PUMP)

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 is possibly fuel pump check valve.

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



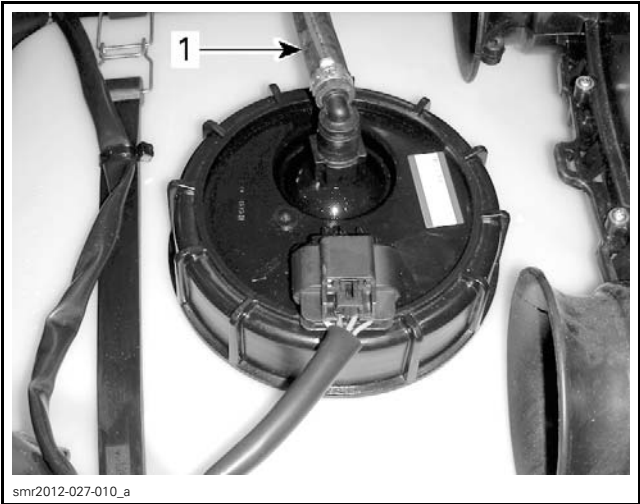
WARNING

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



WARNING

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



1. Outlet hose

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

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

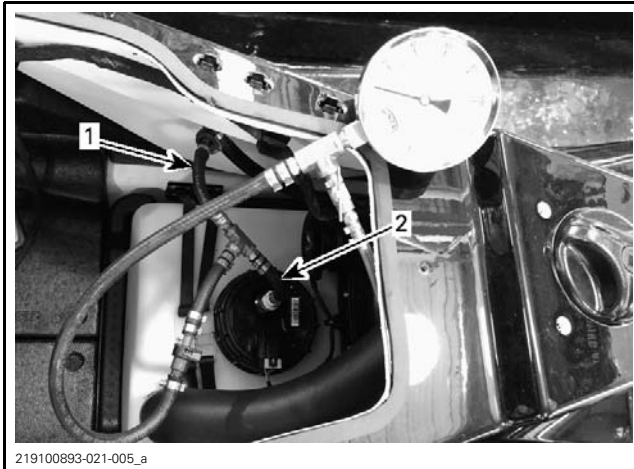
10. Remove test cap.

TESTING FUEL PUMP PRESSURE

Preparation

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

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

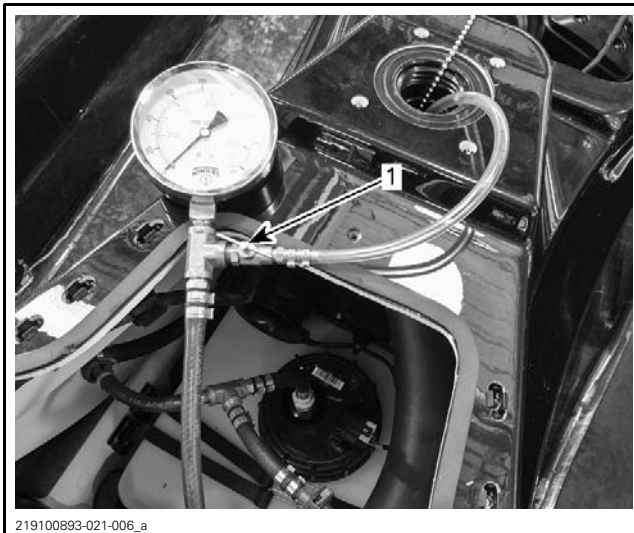


TYPICAL

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

Test when Engine Is Stopped

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



FUEL PUMP PRESSURE TEST
1. Valve on gauge

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

Test when Cranking or Starting Engine

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

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

2. Stop the engine.

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

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

A slow pressure drop indicates leakage either from a fuel injector or from the fuel pressure regulator in the fuel pump module. To check fuel injectors for leaks, refer to the *ELECTRONIC FUEL INJECTION (EFI)* subsection. If injectors are not leaking, then replace fuel pump.

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

⚠ WARNING

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

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

PROCEDURES

FUEL HOSES AND OETIKER CLAMPS

Inspecting Fuel Hoses

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

Replacing Fuel Hoses

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

 **WARNING**

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

 **WARNING**

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

Replacing Oetiker Clamps

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

 **WARNING**

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

FUEL PUMP

Testing the Fuel Pump

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

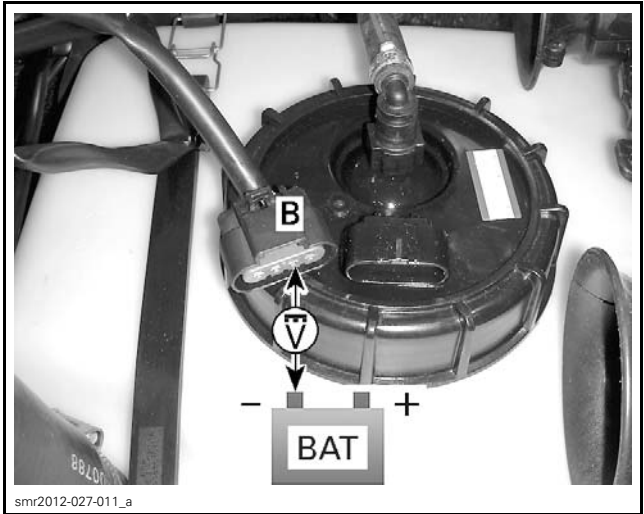
Testing Fuel Pump Pressure

Refer to *INSPECTION* in this subsection.

Testing Fuel Pump Input Voltage

1. Ensure the fuel inj. fuse (F2) is in good condition.
2. Disconnect fuel pump harness connector. Refer to *REMOVING THE FUEL PUMP*.
3. Use the FLUKE 115 MULTIMETER (P/N 529 035 868).
4. Select Vdc.
5. Press the START button.
6. Read voltage at fuel pump harness connector as per following table.

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



FUEL PUMP INPUT VOLTAGE TEST

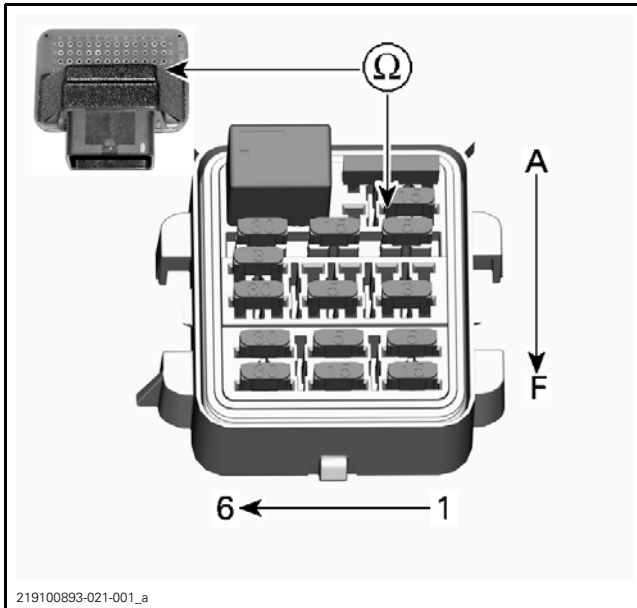
If battery voltage is read, power circuit is good. Test the *FUEL PUMP CIRCUIT*.

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

Testing Fuel Pump Circuit

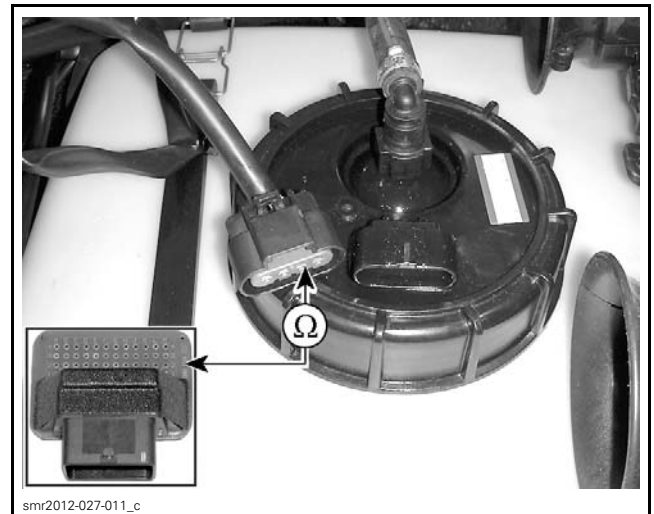
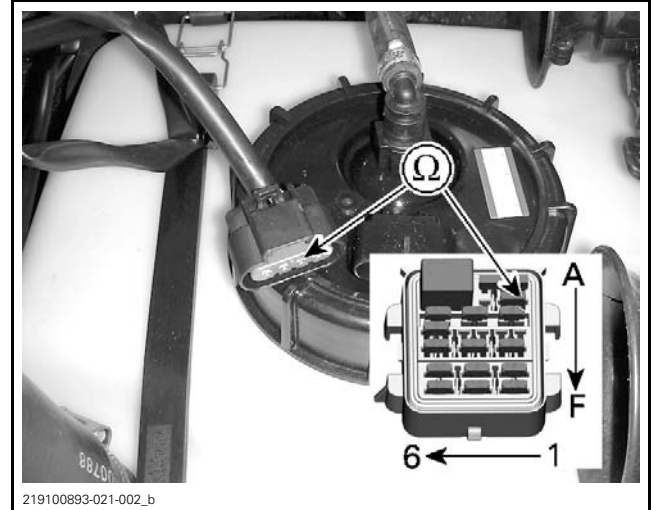
1. Reconnect the fuel pump harness connector.
2. Remove cover of fuse box.
3. Remove ECM connector "B" and install it on the ECM ADAPTER TOOL (P/N 529 036 166).
4. Set multimeter to Ω and test pump circuit as per following table.

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



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

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



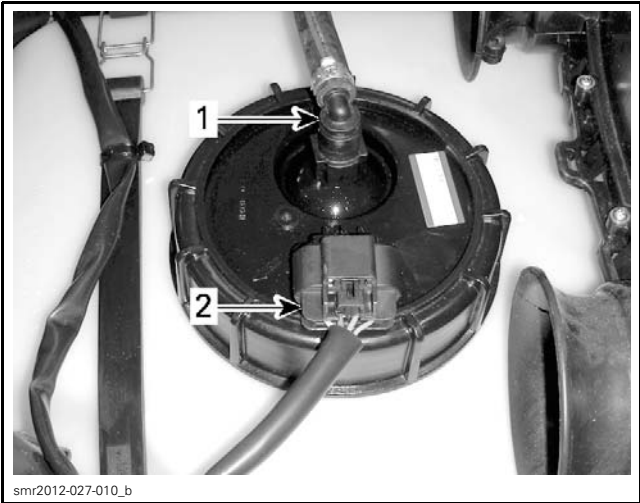
If there is an open circuit to FB-B1, repair wiring/connector between fuel pump and fuse box.

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

Removing the Fuel Pump

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

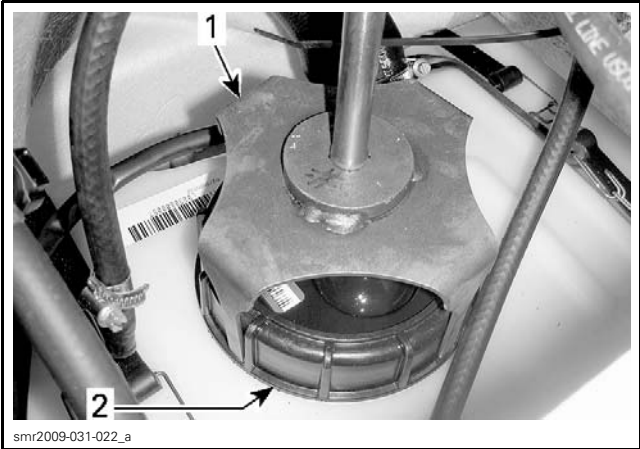
Subsection XX (FUEL TANK AND FUEL PUMP)



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

5. Unscrew the fuel pump retaining nut.

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



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

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

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

⚠ WARNING

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

7. Carefully pull fuel pump module out.

⚠ WARNING

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

Installing the Fuel Pump

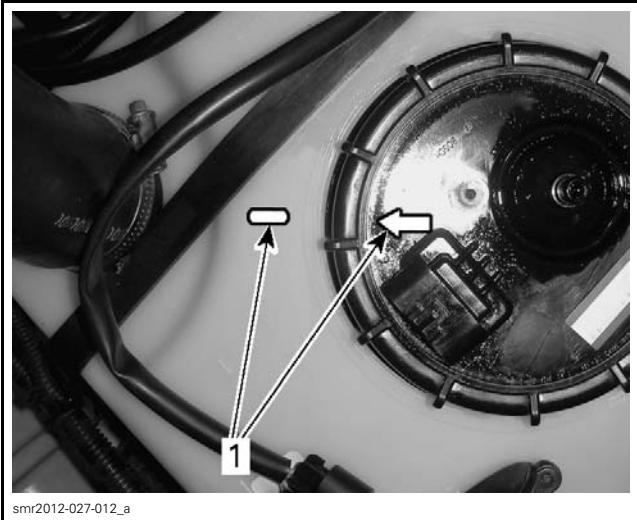
Reverse the removal procedure however, pay attention to the following.

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

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

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

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



FUEL PUMP MODULE INDEXING

1. Align marks

4. Tighten fuel pump nut.

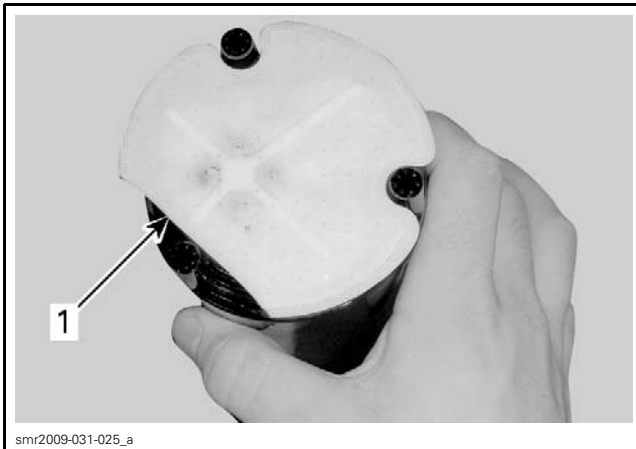
TIGHTENING TORQUE	
Fuel pump nut	60 N•m (44 lbf•ft)

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

FUEL FILTER

Inspecting the Fuel Filter

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



1. Fuel filter

Removing the Fuel Filter

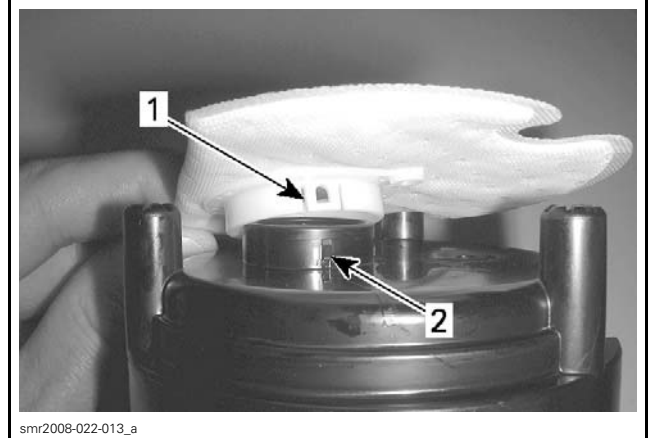
NOTE: The lower fuel filter on the fuel pump module does not require replacement under normal operating conditions. Replace only if permanently clogged or damaged.

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

WARNING

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

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



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

4. Pull filter off fuel pump reservoir housing.

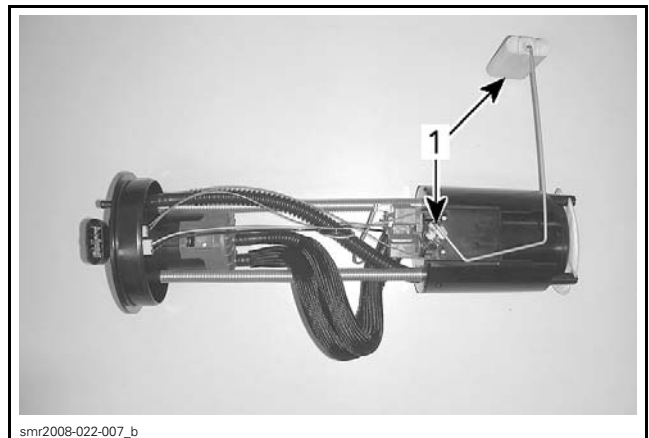
Installing the Fuel Filter

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

FUEL LEVEL SENSOR

Fuel Level System Overview

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



TYPICAL — FUEL PUMP MODULE
1. Fuel level sensor

Subsection XX (FUEL TANK AND FUEL PUMP)

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

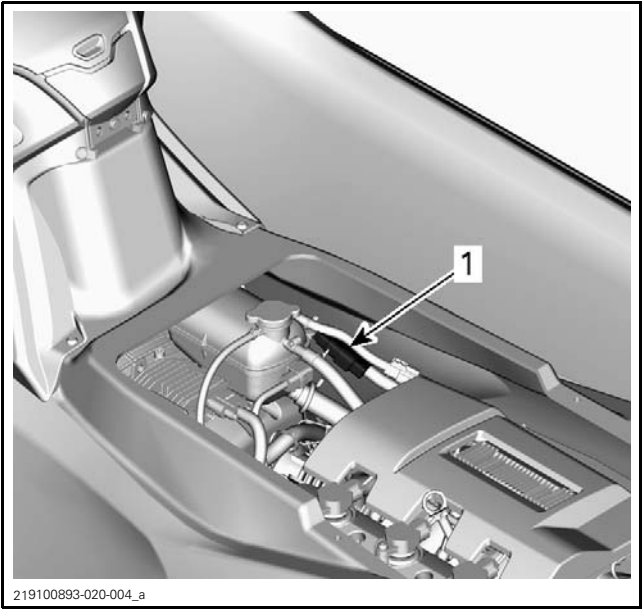
Troubleshooting the Fuel Level Sensor

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

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

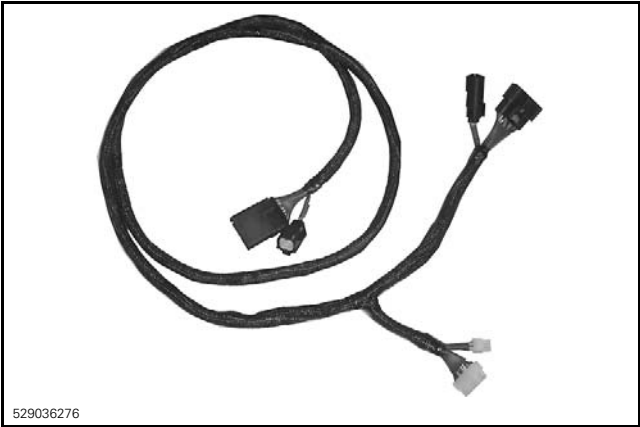
Testing Fuel Level Sensor Voltage

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



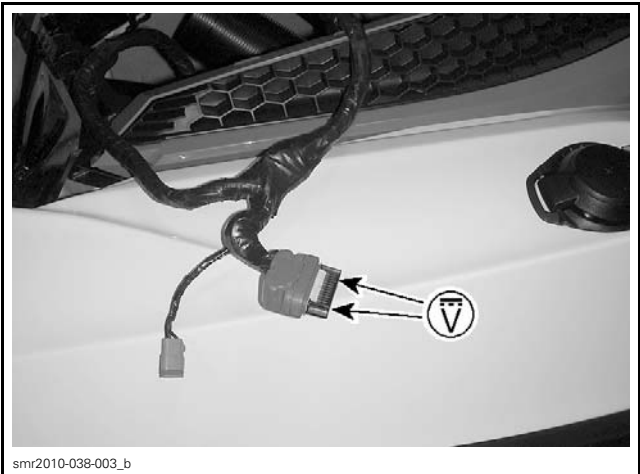
Step 1: Steering connector

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



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

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



TEST CONNECTOR OF DIAGNOSTIC HARNESS

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

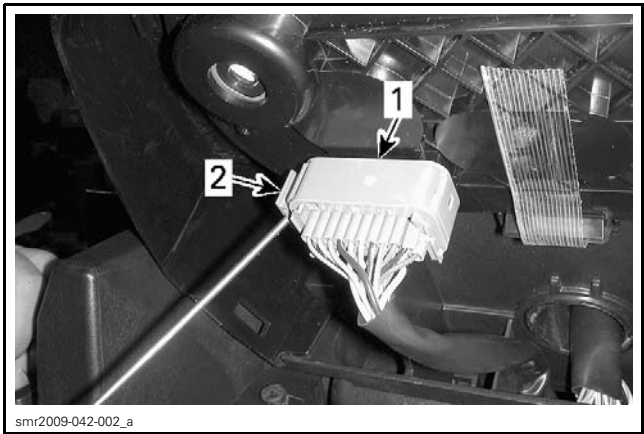
If voltage is as per specifications the fuel level circuit and sensor are good. If fuel level does not work in information center, try a new one.

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

Remove diagnostic harness and reconnect connector.

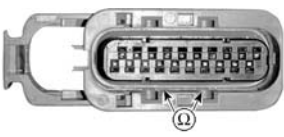
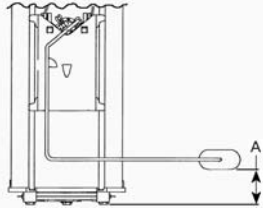
Testing Fuel Level Sensor Resistance at Information Center

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



1. Gauge connector
2. Pull out to unlock connector

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

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

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

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

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

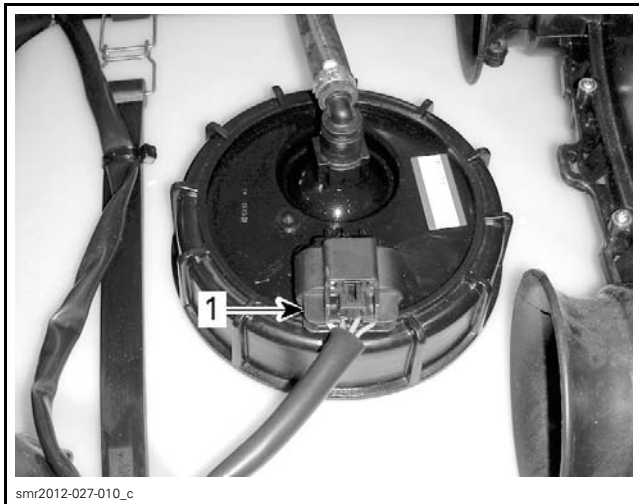
If an open circuit is measured, carry out a continuity test of the wiring from the information center to the 20-pin steering connector, and from the 20-pin steering connector to the fuel pump module connector. Refer to *WIRING DIAGRAM*.

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

4. Reconnect information center (multifunction gauge) connector.

Testing Fuel Level Sensor Resistance at Fuel Pump

1. Disconnect fuel pump module connector.



FUEL PUMP MODULE

1. Fuel pump module connector

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

Subsection XX (FUEL TANK AND FUEL PUMP)

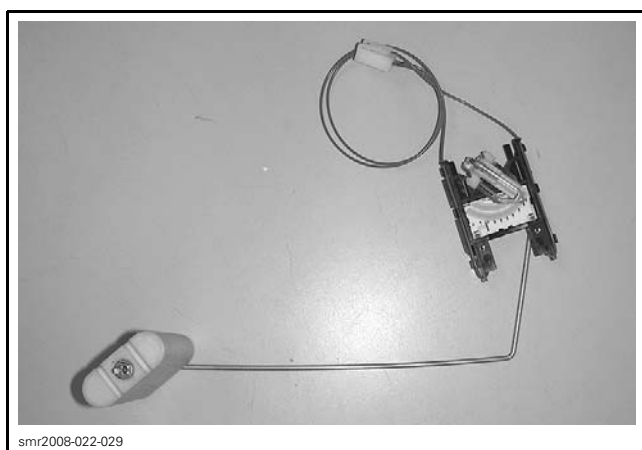


FUEL LEVEL SENSOR RESISTANCE TEST

If readings are out of specifications, replace sensor.

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

Removing the Fuel Level Sensor



FUEL LEVEL SENSOR

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

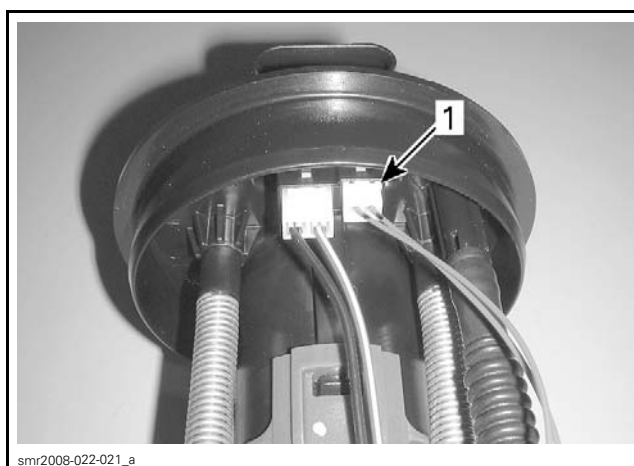
⚠ WARNING

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

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

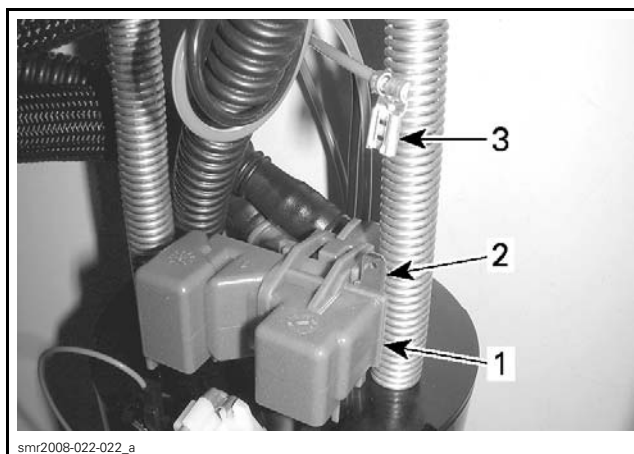
NOTE: Note routing of fuel level sensor wires prior to disconnecting the sensor from the fuel pump module flange.

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



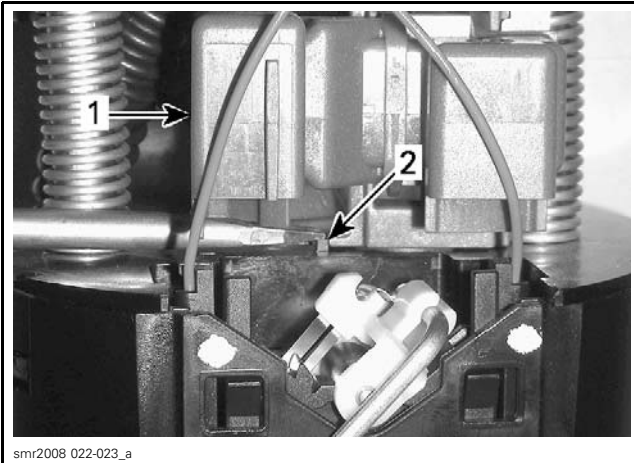
1. Fuel level sensor connector

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

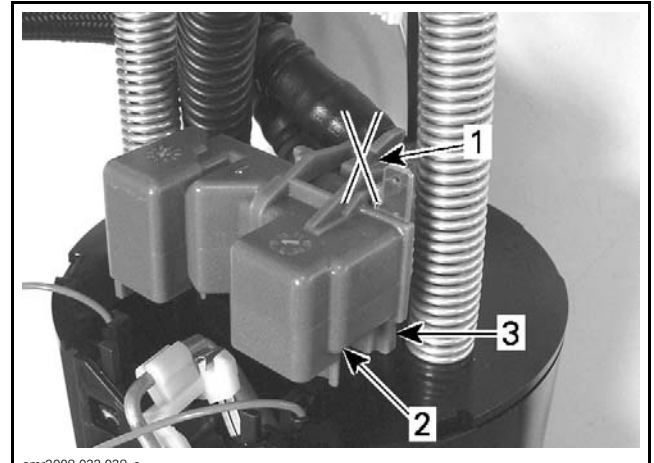


1. Pressure regulator
2. Ground wire contact on pressure regulator
3. Ground wire disconnected

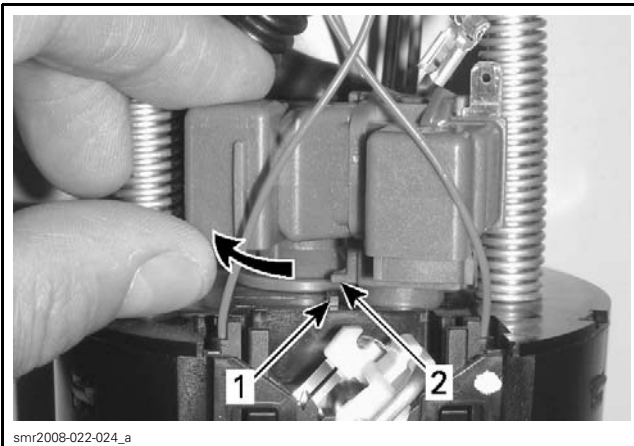
5. Using a flat screwdriver, press down on the locking tab just below the pressure regulator to release it from the pump reservoir cover, and rotate it clockwise simultaneously so that it slips over the locking tab.



1. Pressure regulator
2. Pressure regulator locking tab

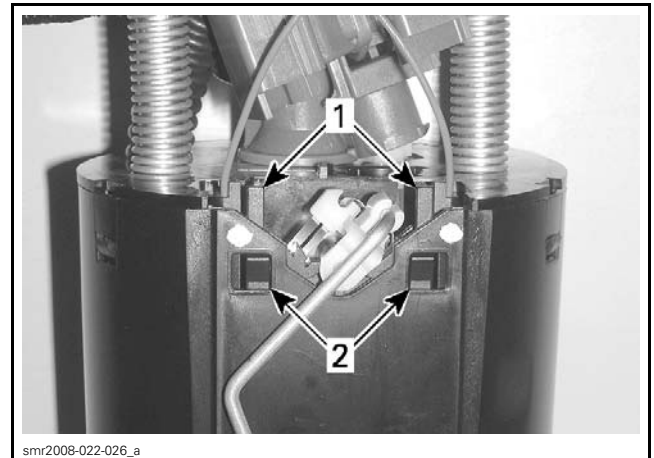


1. Do not remove pressure regulator cover at locking tabs
2. Pressure regulator cover
3. Pressure regulator housing

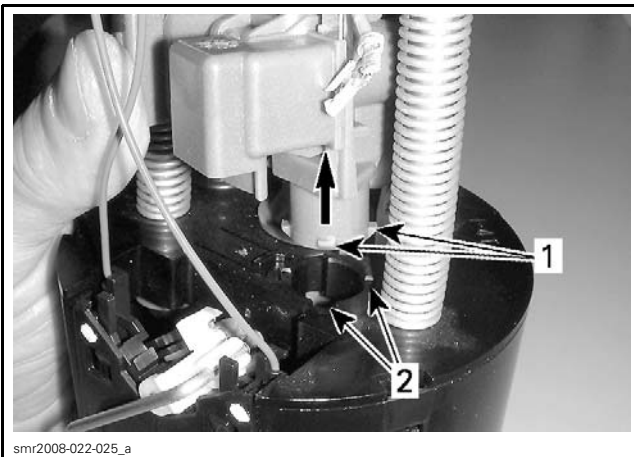


1. Pressure regulator locking tab
2. Pressure regulator rotated clockwise over locking tab

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

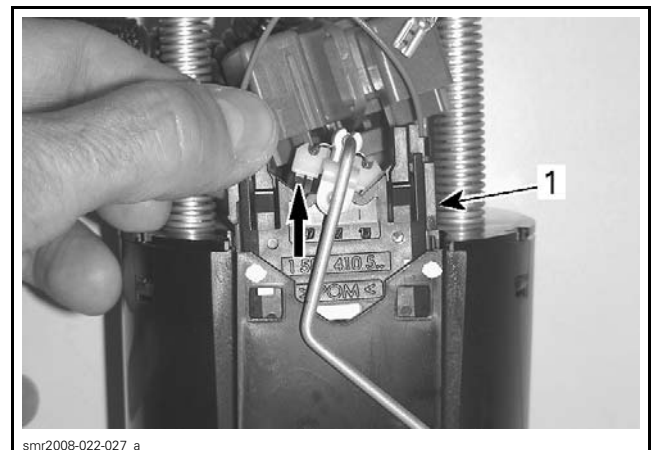


1. Fuel level sensor release tabs
2. Locking pins



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.



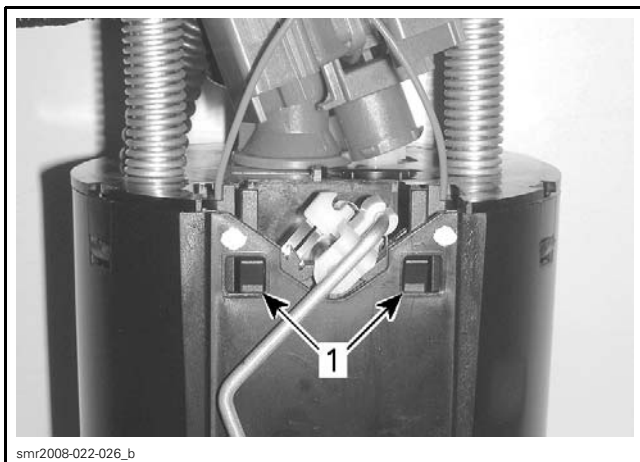
1. Pull up on fuel level sensor

Subsection XX (FUEL TANK AND FUEL PUMP)

Installing the Fuel Level Sensor

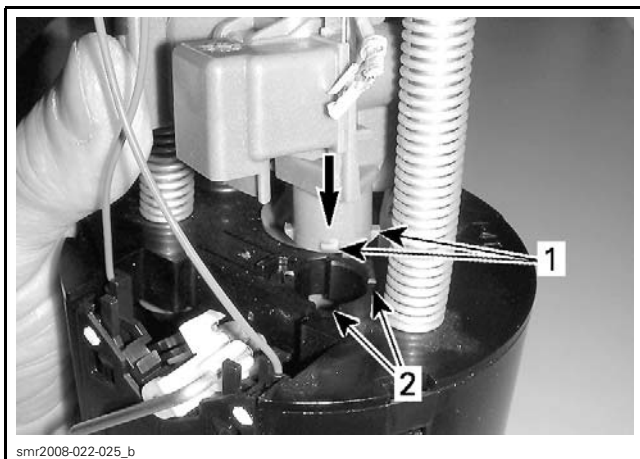
Installation is the reverse of the removal procedure however, pay attention to the following.

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



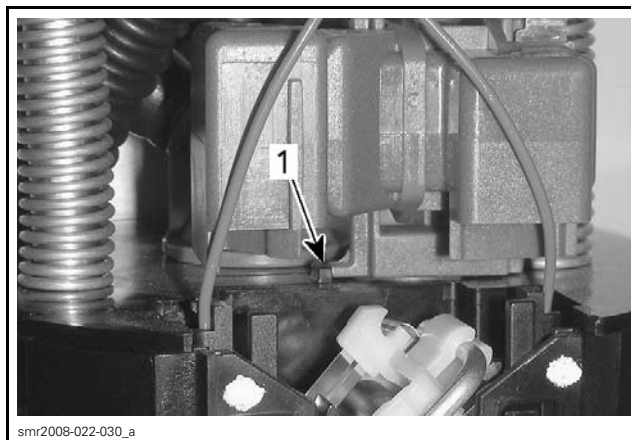
1. Ensure engagement of sensor locking pins

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

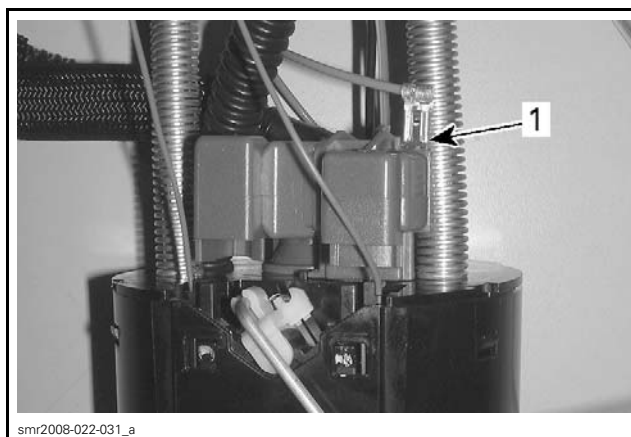
1. Pressure regulator alignment tabs
2. Fuel pump reservoir alignment tabs



TAB UP WHEN PRESSURE REGULATOR PROPERLY LOCKED

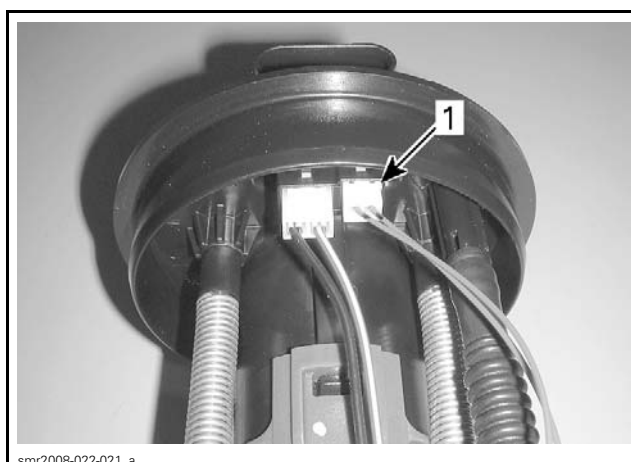
1. Pressure regulator locking tab

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

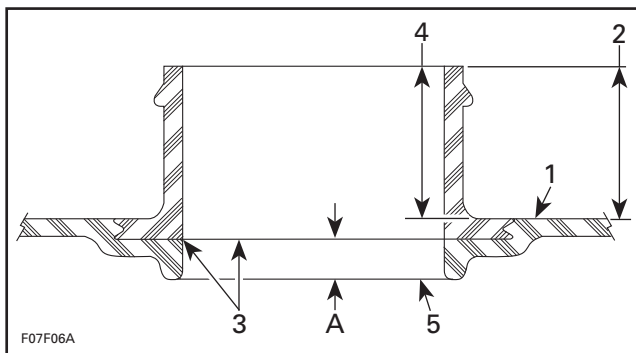
6. Reinstall the fuel pump module. Refer to *INSTALLING THE FUEL PUMP* in this subsection.

FUEL TANK

Inspecting the Fuel Tank

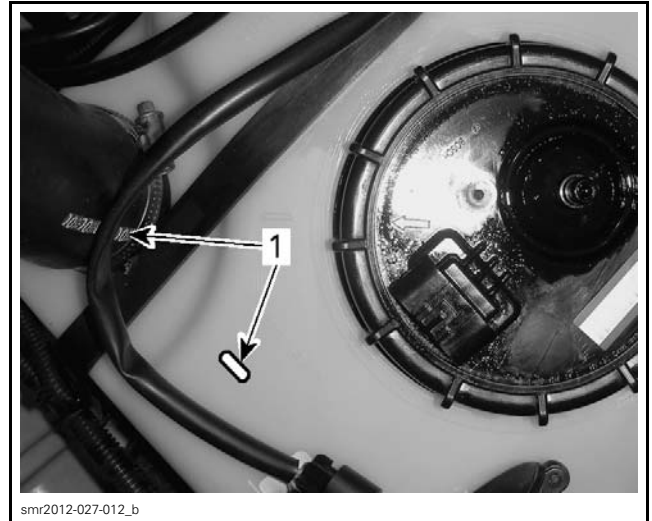
1. Remove storage bin. Refer to *BODY* subsection.
2. Remove seats and engine service cover for access to aft end of fuel tank.
3. Inspect fuel tank retaining straps for wear, cracks or any other damages. Inspect strap clip anchors.
4. Inspect fuel tank for wear caused by any abnormal contact or rubbing with other component(s).
5. Disconnect fuel filler hose from fuel tank.
6. Inspect fuel tank filler hose for wear, cracks or other damages.
7. Visually inspect the inside and outside of the fuel tank filler necks for crack(s). If crack(s) are found, replace fuel tank.
8. With your fingers, feel the inside and outside surfaces of fuel tank, especially near the filler neck.
9. Flex fuel tank neck to ensure there are no hidden cracks.

NOTE: A fuel tank is comprised of 2 components: the tank and the filler neck. The filler neck is injection molded and the tank is then blow molded over the neck. During the molding process, a small molding seam may appear on the inner side of the neck at approximately 4 mm (5/32 in) from the base of the neck. It is normal to have a molding seam and it should not be confused with a crack.



1. Tank upper surface area
2. Inspect outer upper surface at filler neck
3. Normal molding seam
4. Inspect upper surface area inside filler neck
5. Base of filler neck
- A. Approx. 4 mm (5/32 in)

10. Install filler hose and torque retaining clamps.



INDEXING WITH FUEL TANK

1. Align mark with the writing on hose

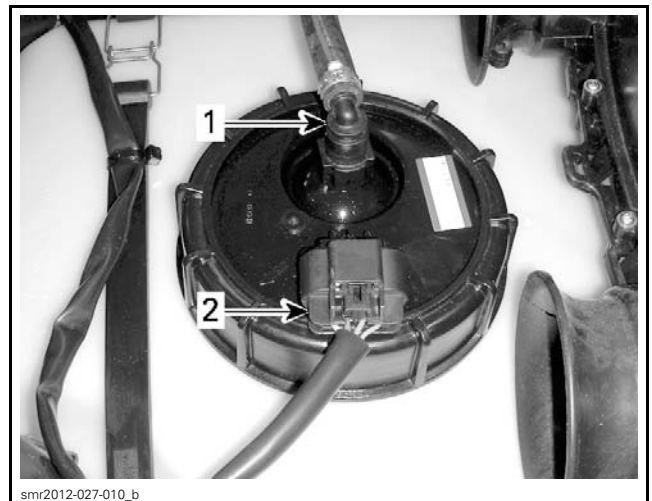
TIGHTENING TORQUE

Filler hose retaining clamps	3.5 N•m (31 lbf•in)
------------------------------	---------------------

11. Reinstall all other removed parts. Refer to appropriate subsection.

Removing the Fuel Tank

1. Remove front storage bin. Refer to *BODY* subsection.
2. Siphon fuel tank.
3. Disconnect fuel pump connections.

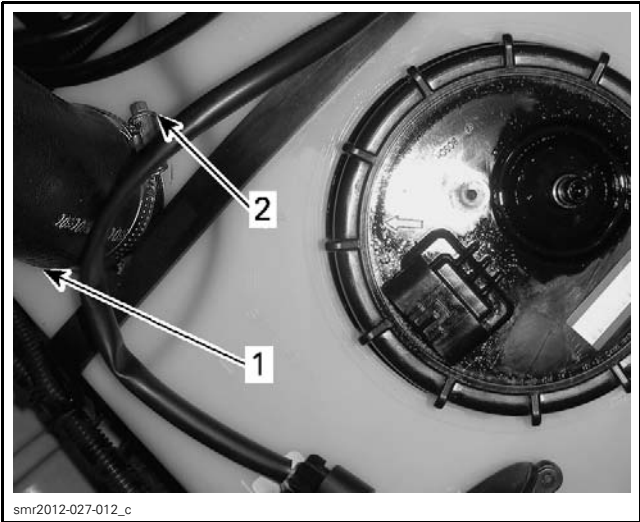


1. Quick connect fitting (high pressure fuel hose)
2. Harness connector

4. Disconnect filler hose from fuel tank.

NOTE: Removing retaining screws of the filler neck may help to disconnect hose from fuel tank.

Subsection XX (FUEL TANK AND FUEL PUMP)



1. Filler hose
2. Retaining clamp

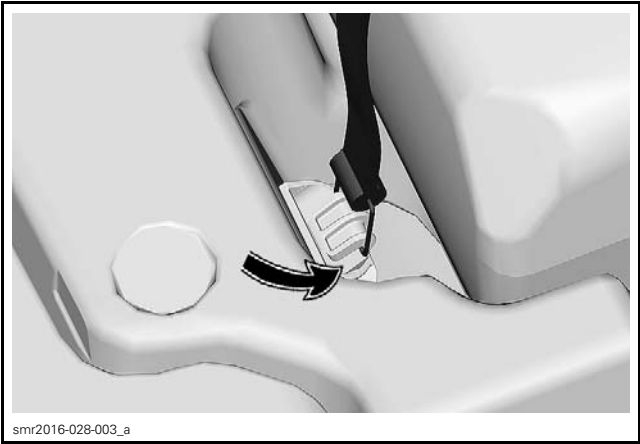
NOTE: Take note of wiring harness, hose and cable routing for proper reinstallation. Also note method used for securing with locking ties.

- 5. Remove air intake silencer. Refer to *AIR INTAKE* SUBSECTION for procedure.
- 6. Detach fuel tank retaining straps.
- 7. Remove fuel tank from the vehicle.
- 8. Remove fuel pump as necessary. Refer to *FUEL PUMP* in this subsection.
- 9. Inspect hull and flotation foams for wear.

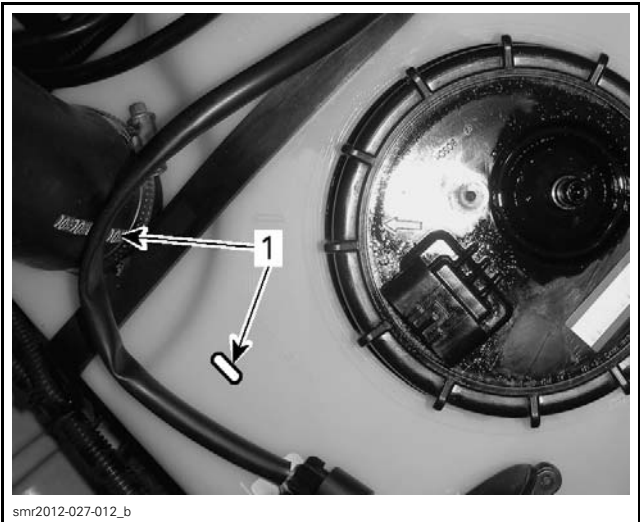
Installing the Fuel Tank

NOTE: Apply torque values as specified in the exploded view.

- 1. Reinstall fuel pump if it was removed. Refer to *FUEL PUMP* in this subsection.
- 2. Ensure flotation foams are properly positioned under fuel tank.
- 3. Insert fuel tank in hull.
- 4. Place fuel tank retaining strap ends in anchoring clips.



- 5. Secure retaining strap ends on top of fuel tank.
- 6. Properly secure wire harness, cables and hose as prior to removal using appropriate locking ties.
- 7. Install fuel tank filler hose as illustrated.



INDEXING WITH FUEL TANK
1. Align mark with the writing on hose

TIGHTENING TORQUE	
Filler hose retaining clamps	3.5 N•m (31 lbf•in)

- 8. Reinstall all other removed parts. Refer to their subsections.
- 9. When vehicle reassembly is complete, test fuel tank for leaks as described in this subsection.

POWER DISTRIBUTION AND GROUNDS

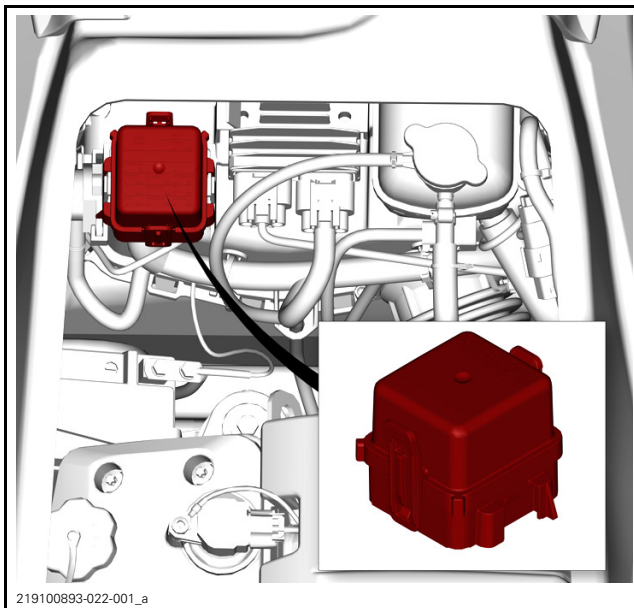
GENERAL

POWER DISTRIBUTION DIAGRAM

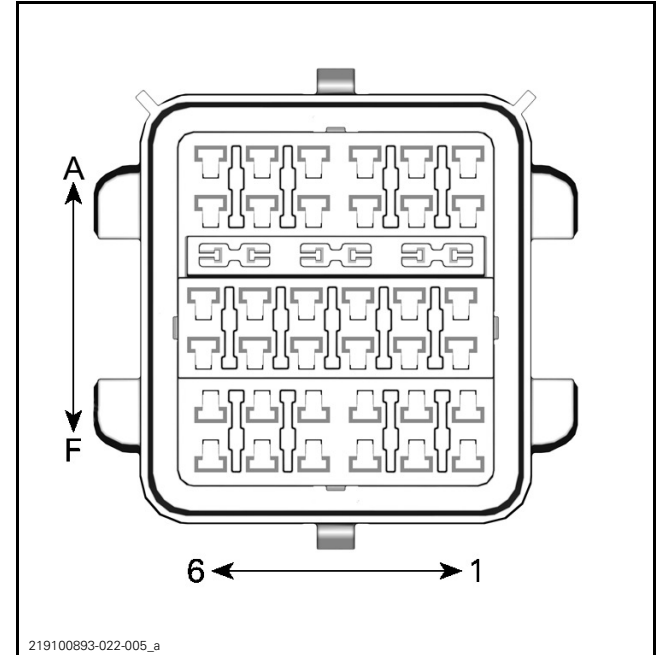
Refer to the appropriate *WIRING DIAGRAM*.

NOTE: Refer to *WIRING DIAGRAM INFORMATION* for how to properly interpret the *WIRING DIAGRAM*.

FUSE BOX



Fuse Identification



FUSE BOX PIN IDENTIFICATION

NUMBER OF CAVITIES BY ROW	
ROW	NUMBER OF CAVITIES
A-F	6

30A RELAY		GROUND	
			FUEL INJ.
			2. 15A
BILGE PUMP	4.		
3. 3A			
CHARGE	CLUSTER		DEPTH SOUNDER
6. 30A	7. 5A		8. 3A
IBR	START/STOP		ECM
9. 30A	10. 5A		11. 5A
BATT	DIAG TOOL 2		DIAG TOOL 1
12. 30A	13. 15A		14. 15A

219100893-022-003_a

FUSE IDENTIFICATION

Subsection XX (POWER DISTRIBUTION AND GROUNDS)

NO.	DESCRIPTION	
F2	Through relay: – Fuel pump – Fuel injectors – Ignition coils	15 A
F3	Through relay and F13: – Blige Pump	3 A
F6	Direct power: – Regulator/rectifier	30 A
F7	Through relay: – Cluster – Accessory connection	5 A
F8	Through relay and F13: – Depth Sounder	3 A
F9	Direct power: – iBR™ control	30A
F10	Direct power (through F12): – START/STOP	5A
F11	Through relay: – ECM	5 A
F12	Direct power: – Relay – F10 – F14	30 A
F13	Through relay: – F3 – F8 – Diag Tool 2	15 A
F14	Direct power (through F12): – Diag Tool 1	15 A

Note 3: If equipped.

RELAY

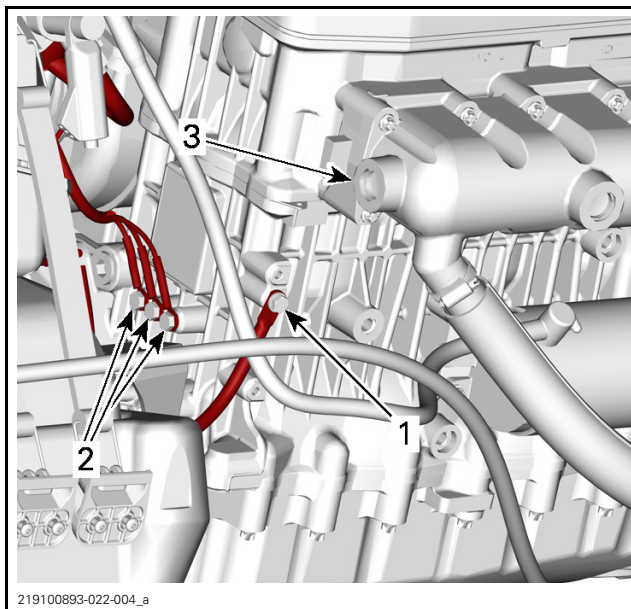
Relay Pin Identification

The relay is in the fuse box. Refer to *FUSE BOX*.

RELAY PIN IDENTIFICATION		
FUNCTION	FUSE BOX PIN	CONDITION
12-volt input at winding	B6	Direct battery power from fuse F12
Control	B4	Grounded by ECM B pin H2 once START/STOP is depressed
12-volt input at contacts	A6	Direct battery power from fuse F12
12-volt output	A4	-

GROUNDS

All the ground terminals are located on the front of engine.



FRONT OF ENGINE

1. Battery ground
2. Electrical components grounds
3. Exhaust manifold

WIRING HARNESS AND CONNECTORS

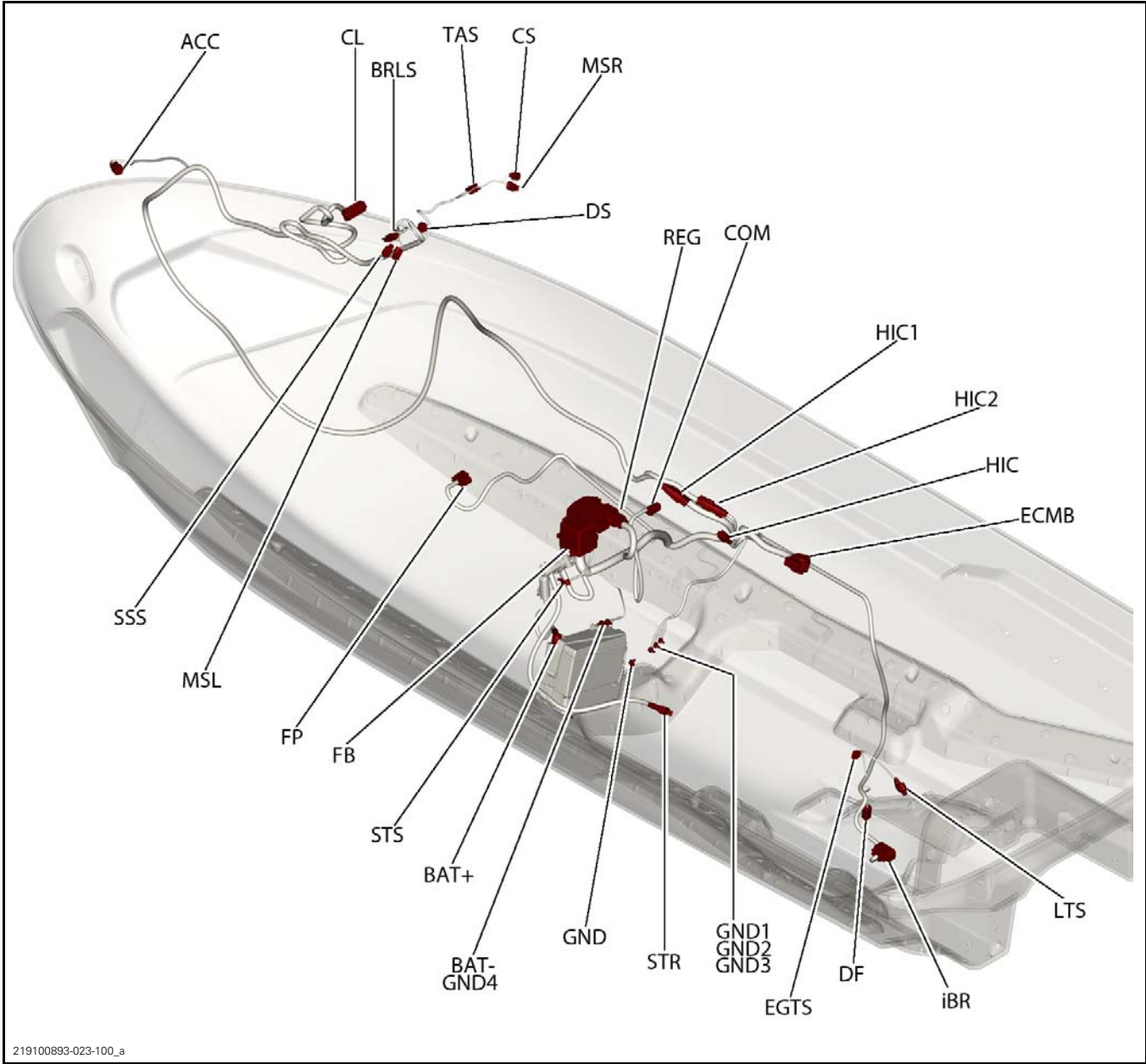
SERVICE TOOLS

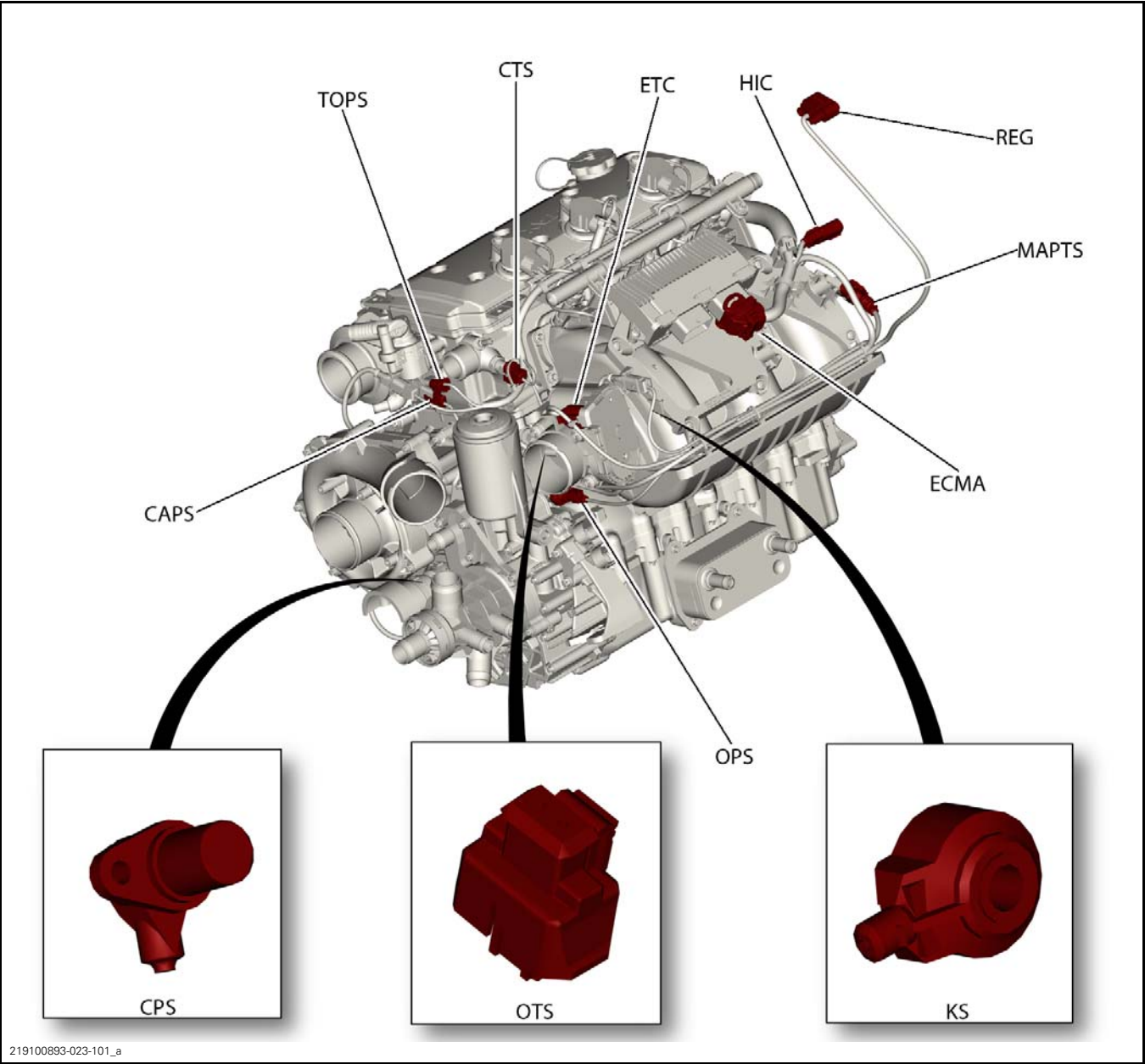
Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	11
ECM ADAPTER TOOL.....	529 036 166	8
ECM TERMINAL REMOVER 2.25.....	529 036 175	9
ECM TERMINAL REMOVER 3.36.....	529 036 174	9

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
DELPHI TERMINAL EXTRACTOR	12094429	10
FCI TERMINAL EXTRACTOR TOOL	54241678	12
GM TERMINAL EXTRACTOR.....	12094430	13
MOLEX 150 TERMINAL EXTRACTOR TOOL	63813 - 1500	12

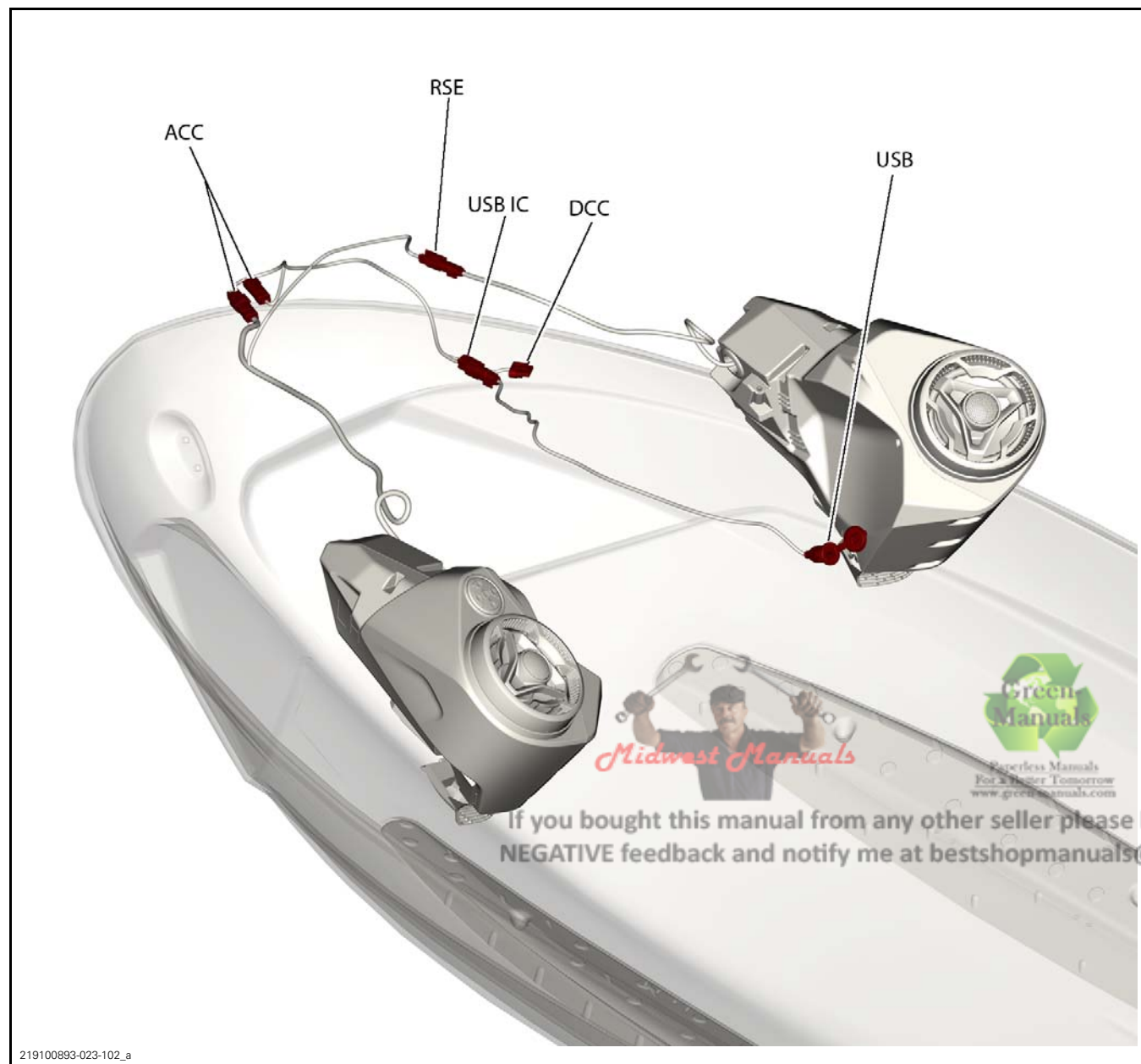
Subsection XX (WIRING HARNESS AND CONNECTORS)





Subsection XX (WIRING HARNESS AND CONNECTORS)

Sound System and USB Option



GENERAL

ACRONYM	DESCRIPTION	ACRONYM	DESCRIPTION
ACC	Accessory	GND3	Engine Ground
BAT+	Battery +	GND4	Battery Ground
BAT-	Battery -	HIC	Harness Inter Connector to Engine
BRLS	Brake and Reverse Lever Sensor	HIC1	Harness Inter Connector to Steering 1
CAPS	Camshaft Position Sensor	HIC2	Harness Inter Connector to Steering 2
CL	Cluster	iBR	Intelligent Braking and Reverse
COM	Communication	KS	Knock Sensor
CPS	Crankshaft Position Sensor	LTS	Lake temperature sensor
CS	Cruise Switch	MAPTS	Manifold Air Pressure Sensor
CTS	Coolant Temperature sensor	MSL	Multi Switch Left
DCC	DC Connection	MSR	Multi Switch Right
DF	Depth finder	OPS	Oil Pressure Sensor
DS	DESS post	OTS	Oil temperature sensor
ECMA	ECM connector A	REG	Voltage Regulator/Rectifier connector
ECMB	ECM connector B	RSE	Right Speaker Enclosure
EGTS	Exhaust Gas Temperature	SSS	Start/Stop Switch
ETC	Electronic Throttle Control	STS	Starter Solenoid
FB	Fusebox	STR	Starter
FP	Fuel Pump	TAS	Throttle Accelerator Sensor
GND	Battery Ground	TOPS	Tip Over Position Sensor
GND1	Engine Ground	USB	USB Port
GND2	Engine Ground	USB IC	USB Inter Connector

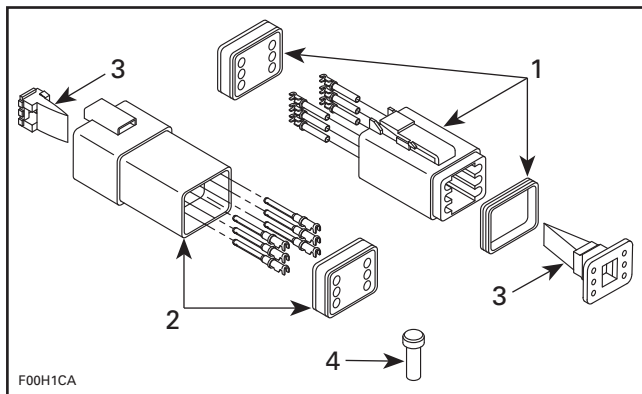
PROCEDURES

WARNING

When disassembling any connector for repair or replacement on the vehicle, always disconnect the battery to ensure all electrical power is removed and prevent any possibility of a short circuit. Refer to *CHARGING SYSTEM* subsection.

DIAGNOSTIC CONNECTOR, LTS (DEUTSCH)

Disassembling and reassembling the Connector



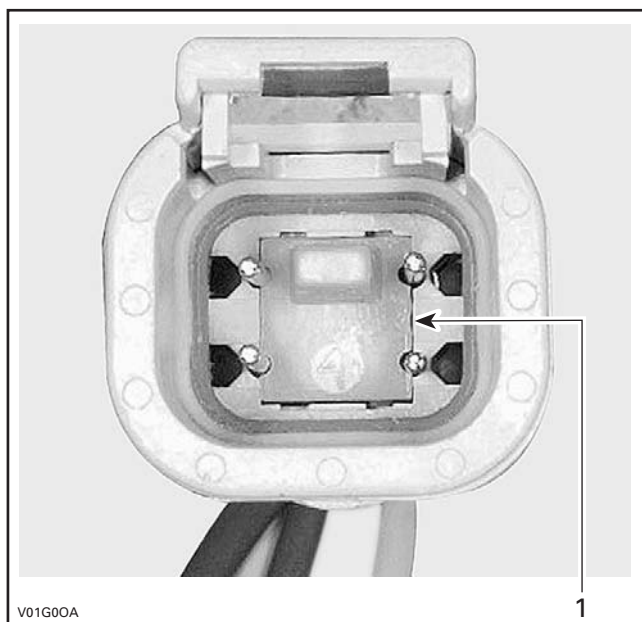
TYPICAL - DEUTSCH CONNECTOR

1. Male connector
2. Female connector
3. Secondary lock
4. Sealing cap

NOTICE Do not apply dielectric grease on terminal inside connector.

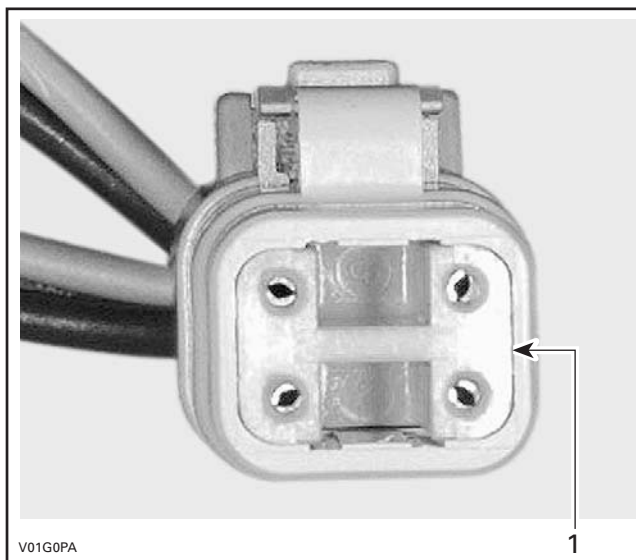
To remove terminals from connector, proceed as follows:

1. Using long nose pliers, pull out the plastic lock from between the terminals.



TYPICAL - FEMALE CONNECTOR

1. Female lock

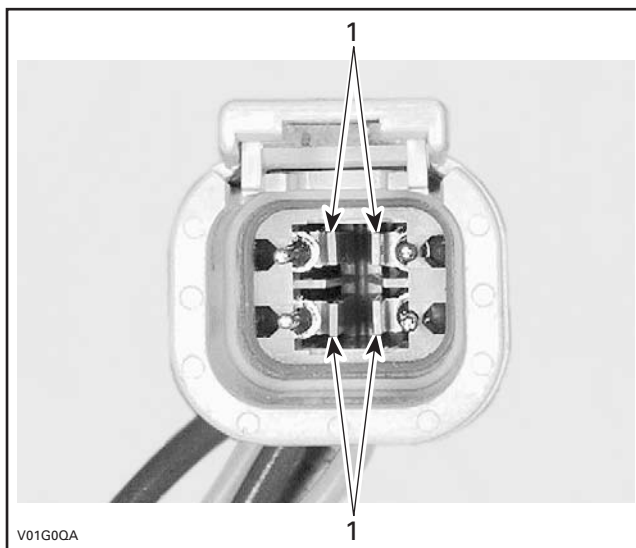


TYPICAL - MALE CONNECTOR

1. Male lock

NOTE: Before pin extraction, push wire forward to relieve pressure on retaining tab.

2. Insert a 4.8 mm (.189 in) wide screwdriver blade inside the front of the terminal cavity.
3. Pry the retaining tab away from the terminal while gently pulling the wire and terminal out of the back of the connector.



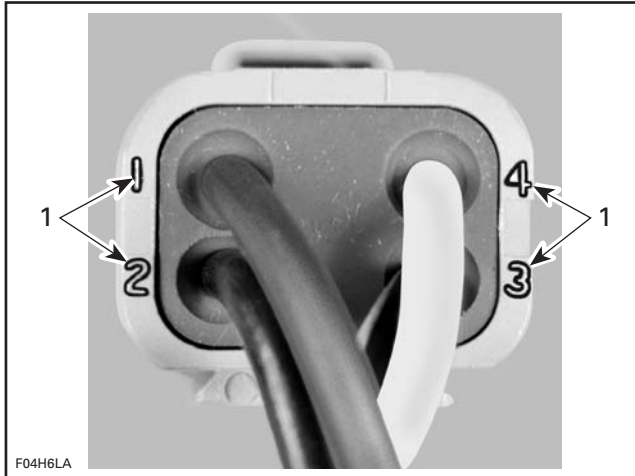
TYPICAL - FEMALE CONNECTOR

1. Retaining tabs

To install:

1. For insertion of a terminal, ensure the plastic lock is removed.
2. Insert terminal through the back of the connector in the appropriate position, and push it in as far as it will go. You should feel or hear the terminal lock engage.

3. Pull back on the terminal wire to ensure the retention fingers are holding the terminal.
4. After all required terminals have been inserted, the lock must be installed.



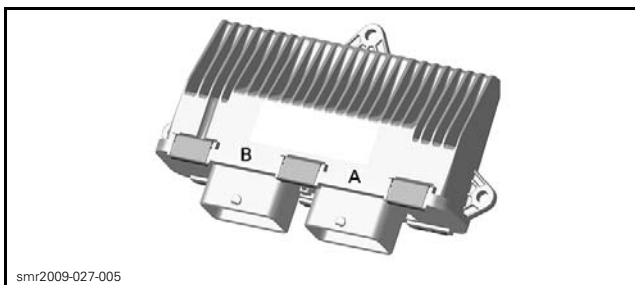
TYPICAL - CONNECTOR PIN-OUT
1. Terminal position identification numbers

ECM CONNECTOR (MOLEX)

There are 2 connectors on the ECM.

The engine wiring harness connector is connected to ECM connector "A". The vehicle wiring harness connector is connected to ECM connector "B".

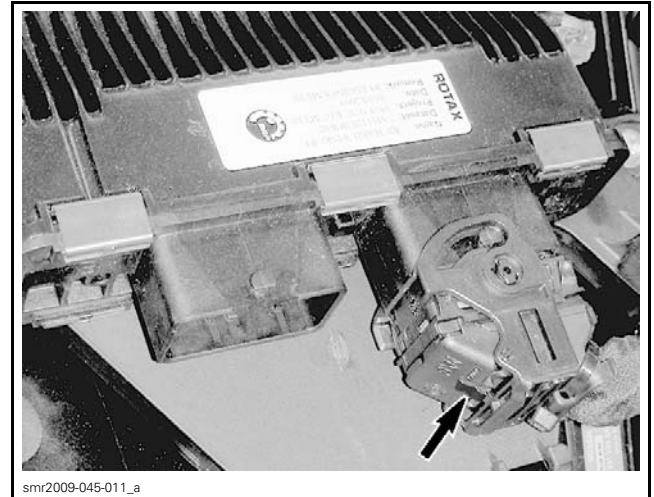
Each ECM connector has 48 pins however, connectors "A" and "B" are not interchangeable due to their specific keyways.



ECM CONNECTORS

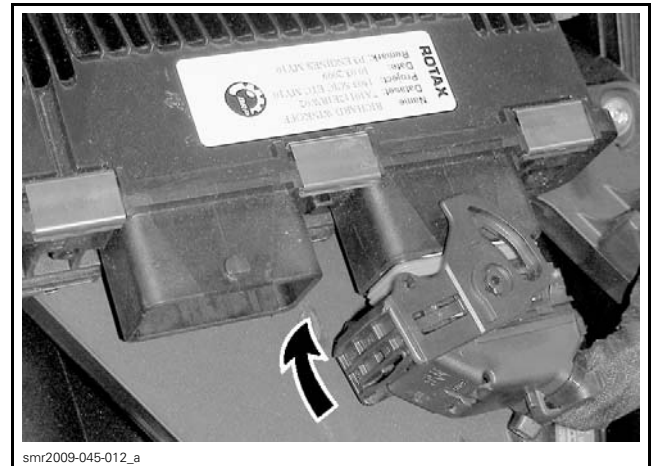
Removing the Connector

1. To access the ECM, refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
2. Press and hold the locking tab on the connector to be disconnected.



LOCKING TAB TO PRESS AND HOLD

3. As you hold the locking tab, rotate the connector locking cam until it stops.



CONNECTOR LOCKING CAM ROTATION TO RELEASE

4. Pull connector off ECM.



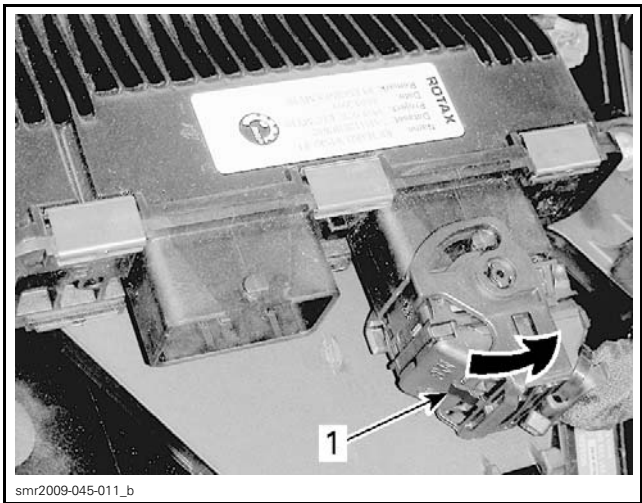
Installing the Connector

1. Fully open connector locking cam.



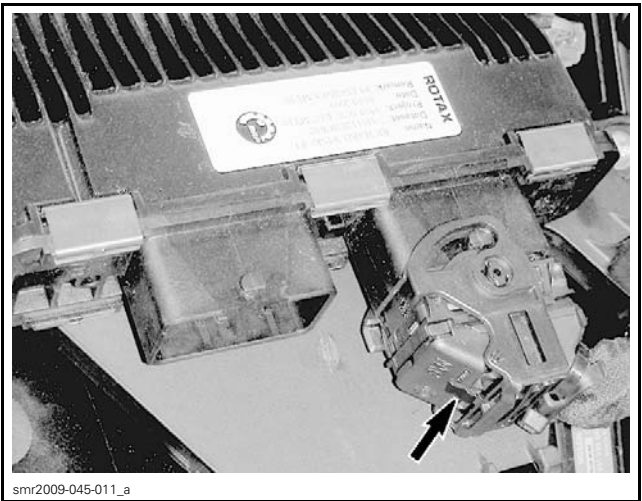
CONNECTOR LOCKING CAM IN RELEASE POSITION

2. Insert connector on ECM.
3. As you push the connector onto the ECM, rotate the connector locking cam until it snaps locked.



1. Locked here

4. Ensure the locking tab is fully out.



LOCKING TAB FULLY OUT

Inspecting the Connector

Before replacing an ECM, always check electrical connections.

1. Ensure connector locking mechanism is functioning properly.
2. Ensure all wire terminals (pins) are properly locked in the connector.
3. Ensure they are very tight, make good contact with the pins in the ECM.
4. Ensure the pins in the harness connector and the ECM connector are clean, shiny and corrosion-free.
5. Check wiring harness for signs of scoring.

NOTE: A “defective ECM module” could possibly be repaired simply by disconnecting and reconnecting it.

NOTICE Do not apply any lubricant product to the pins of the ECM connector.

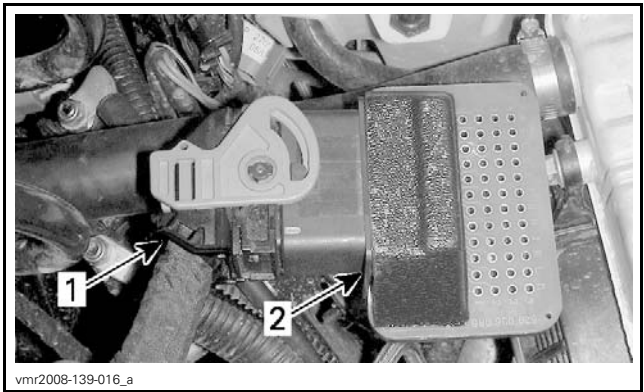
Probing the Connector

The most recommended and safest method to probe the MOLEX (ECM) connector terminals is to use the ECM adapter tool. This tool will prevent deforming or enlarging of the terminals, which would lead to bad ECM terminal contact creating intermittent or permanent problems.

REQUIRED TOOL	
ECM ADAPTER TOOL (P/N 529 036 166)	

1. Disconnect the ECM connector to be probed, and reconnect it on the ECM adapter.

2. Probe wire terminals of the circuit to be tested directly in the adapter holes.



TYPICAL
1. ECM connector
2. ECM adapter

NOTICE Never probe directly on the ECM harness connector. This could change the shape or enlarge the terminals and create intermittent or permanent contact problems.

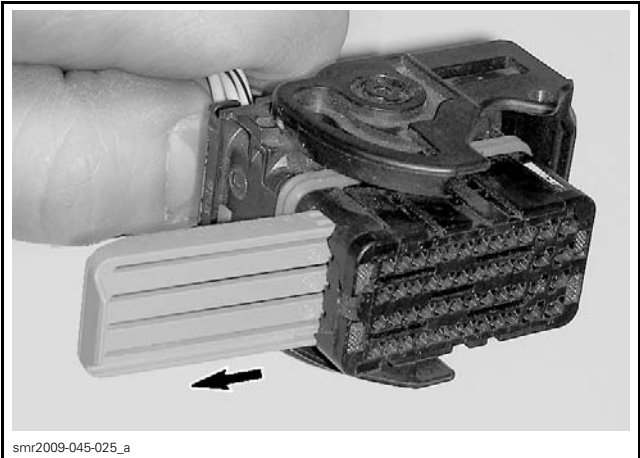
Removing Connector Terminal (Harness Connector)

To remove a signal terminal from the ECM harness connector, use the ECM terminal remover 2.25.

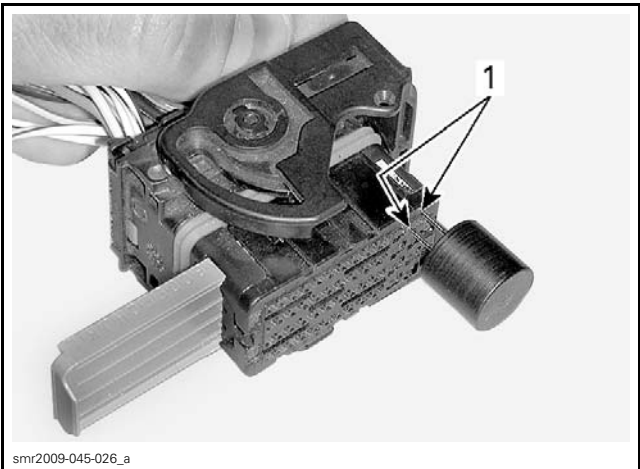
To remove a power terminal, use the ECM terminal remover 3.36.

REQUIRED TOOL	
ECM TERMINAL REMOVER 2.25 (P/N 529 036 175)	
ECM TERMINAL REMOVER 3.36 (P/N 529 036 174)	

1. Remove rear protector from connector.
2. Pull out the connector lock.

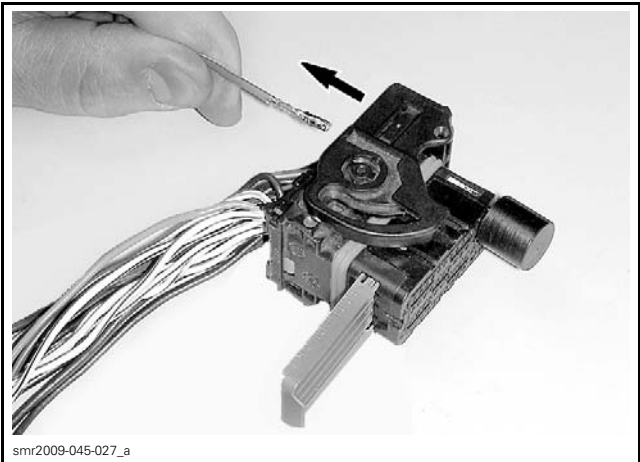


3. Insert tool to unlock terminal.



1. Unlock here

4. Gently pull on the wire to extract the terminal out the back of the connector.



NOTICE Before installing wire terminals in the connector, ensure all terminals are properly crimped on wires. After installation of wire terminals in the connectors, ensure they are properly locked by gently pulling on them as if to extract them.

DS, STS, FP, TAS, BRLS, FB,
DCC, MSL, MSR,CONNECTORS
(DELPHI/PACKARD)

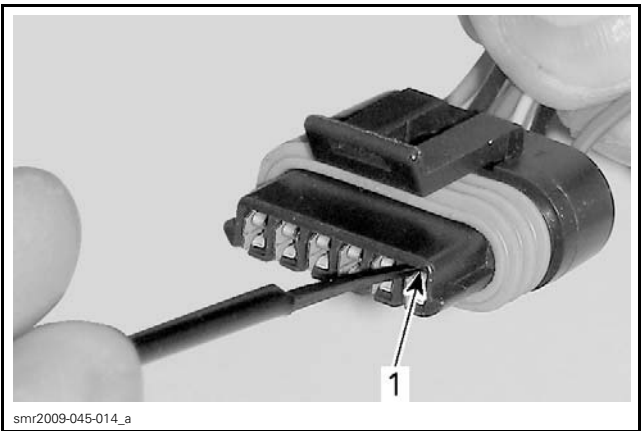
Removing the Connector Terminal

To remove a terminal (pin) from the connector, use a special tool such as the Delphi terminal extractor.

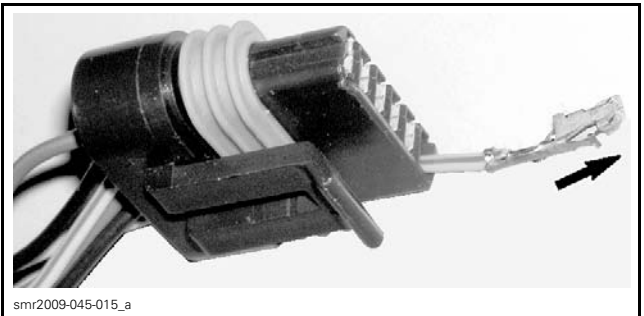
REQUIRED TOOL	
DELPHI TERMINAL EXTRACTOR (P/N 12094429)	

NOTE: Grinding the tool end to a taper is required.

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

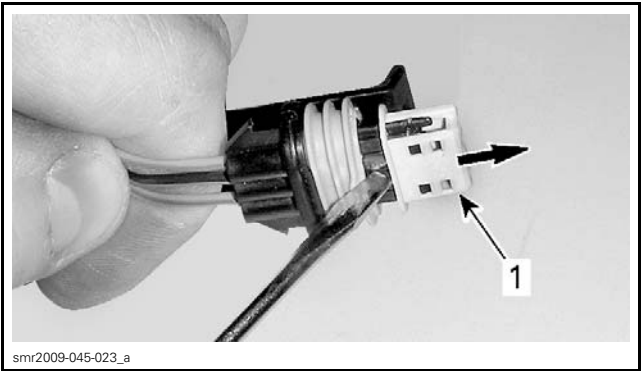


NOTICE Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

MSL, MSR CONNECTORS
(DELPHI)

Removing the Terminal

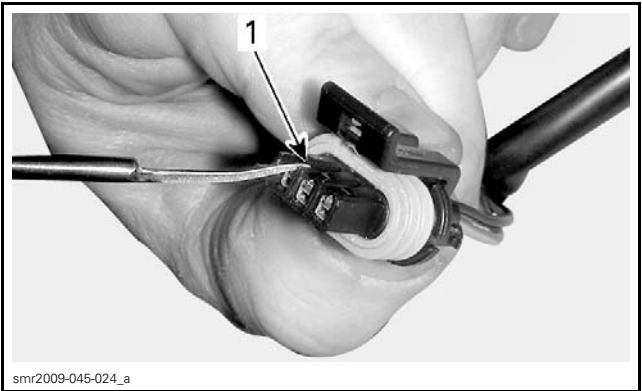
1. To remove a terminal from connector, first remove the locking cap.



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

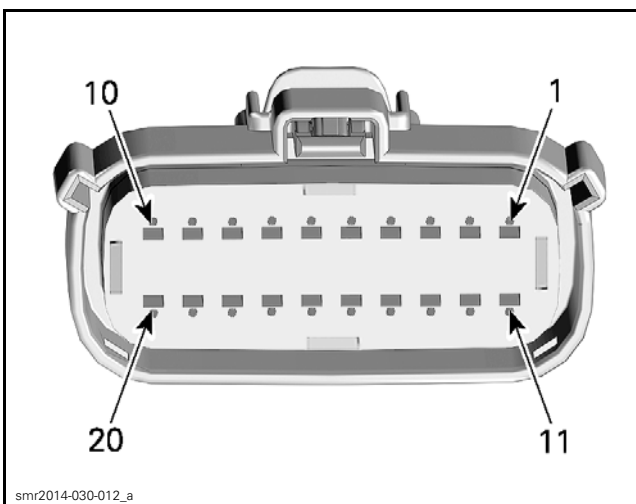
3. Gently pull on the wire to extract the pin out the back of the connector.



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.

ACC, HIC, HIC1, HIC2, USB IC, (MOLEX)

NOTE: 20 pin Molex is shown



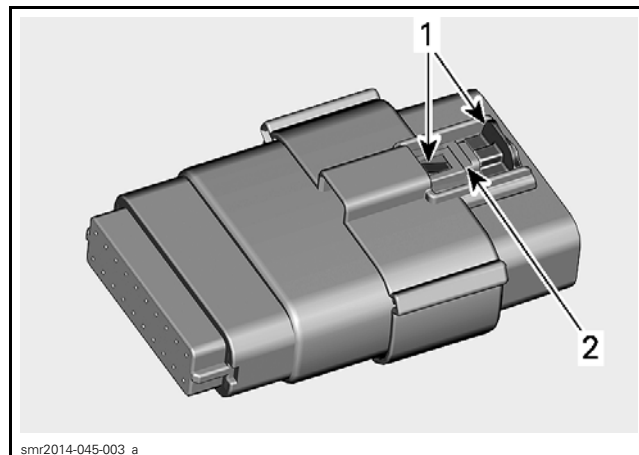
1. Female connector pin-out (sockets)

Disconnecting the Connector

Pull back the red secondary lock from the connector latch lever. Do not remove it from the latch.

Push the two connector assemblies together to unload the latch.

Depress the latch lever and pull the two connector assemblies apart.



1. Red secondary lock (shown out)
2. Latch lever

Probing the Connector

1. Disconnect the steering connector in the vehicle and connect it to the diagnostic harness.

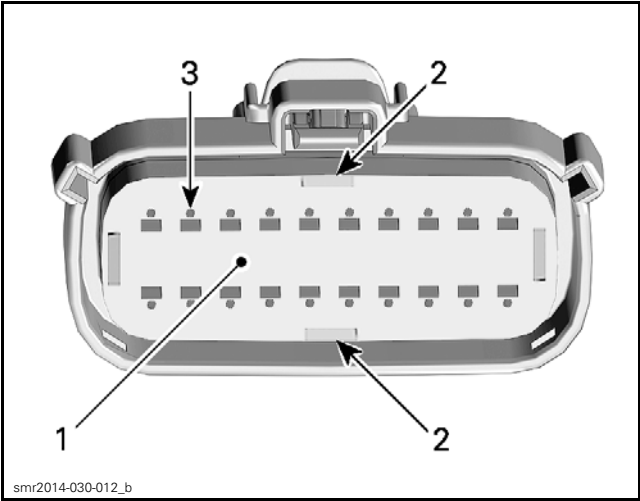
REQUIRED TOOL	
DIAGNOSTIC HARNESS (P/N 529 036 384)	

2. Probe the applicable circuit using the test connector on the diagnostic harness.

NOTICE Attempting to probe the connector without using the diagnostic connector may damage the connector pins, or even cause a short circuit if testing an energized circuit.

Extracting the Socket (Female Connector)

1. Insert a small flat screwdriver in the pry holes of the socket locator, on the socket side of the connector.



- 1. Socket locator
- 2. Pry holes
- 3. Holes for inserting terminal extractor tool

2. Carefully pull out the socket locator out to the detent position (approximately 5 mm).

NOTE: Do not remove the socket locator from the connector housing.

3. Insert the extractor tool in the small hole adjacent to the socket.

NOTE: Push the extractor tool in only as far as required to release the lock from the socket. The tool should slide along the socket and be inserted between the socket and the lock.

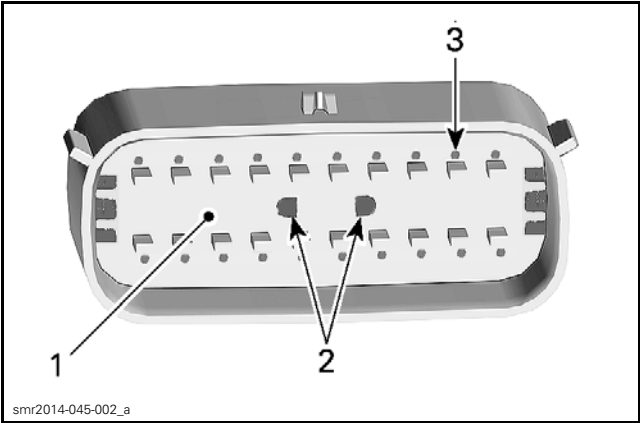
REQUIRED TOOL	
FCI TERMINAL EXTRACTOR TOOL (P/N 54241678) or,	
MOLEX 150 TERMINAL EXTRACTOR TOOL (P/N 63813 - 1500)	

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.

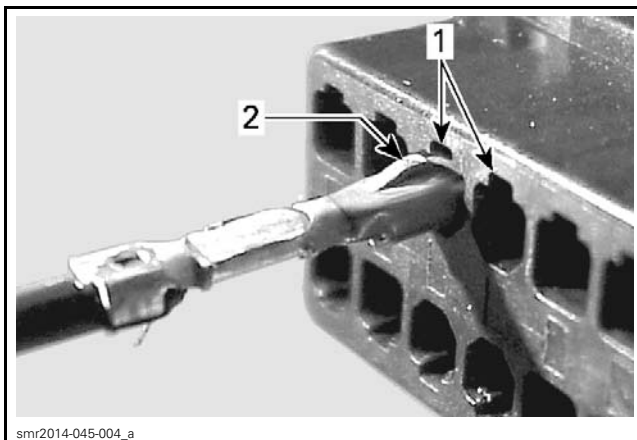
REQUIRED TOOL	
FCI TERMINAL EXTRACTOR TOOL (P/N 54241678) or,	
MOLEX 150 TERMINAL EXTRACTOR TOOL (P/N 63813 - 1500)	

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.



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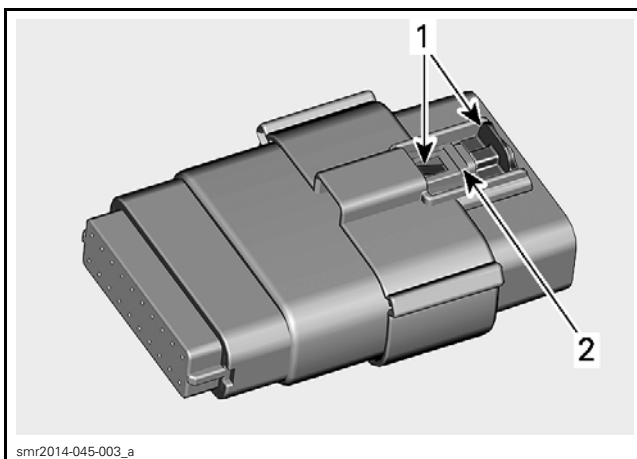
TYPICAL - PIN INSERTION

1. Notch
2. Stepped portion towards notch

4. Push the pin in until the pin lock engages the pin.
5. Gently pull on the pin to ensure it is properly locked.
6. Repeat previous steps for each pin to be inserted.
7. Push the pin locator into the connector to the locked position.

Reconnecting the MOLEX Connector

1. Insert the male connector into the female connector and push it in until the latch lever fully engages.
2. Push in the secondary lock (red tab) until it fully engages into the latch lever.



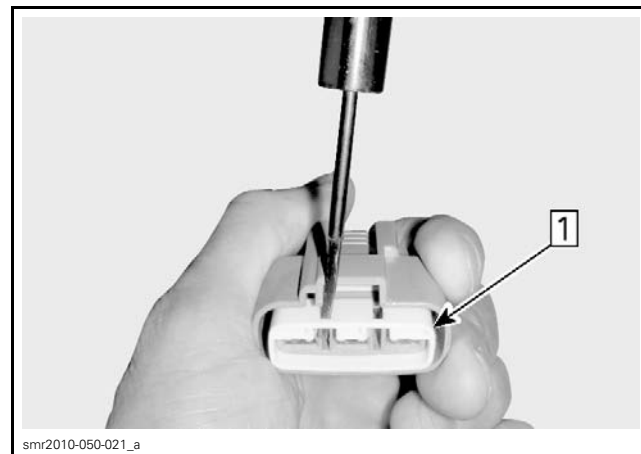
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1. Red secondary lock (shown out)
2. Latch lever

**VOLTAGE
REGULATOR/RECTIFIER
CONNECTOR (FURUKAWA)**

Removing the Terminal

1. Remove the secondary lock (plastic insert).

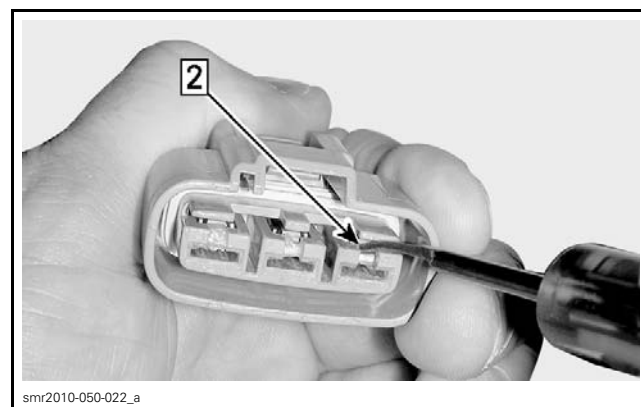


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Step 1: Remove the secondary lock

2. Carefully insert the GM terminal extractor between the lock and the pin to release the pin.

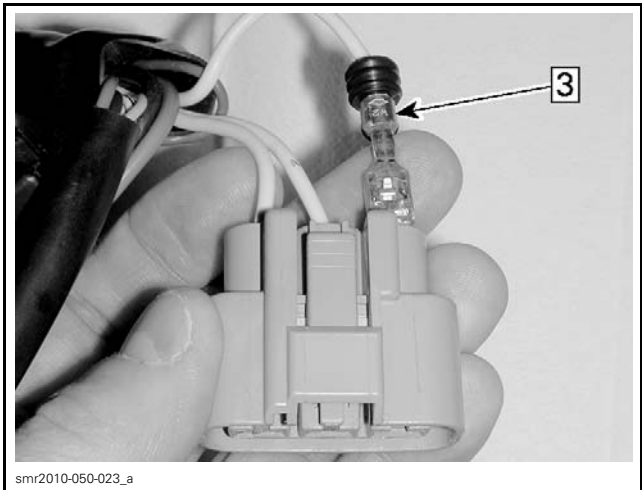
REQUIRED TOOL	
GM TERMINAL EXTRACTOR (P/N 12094430)	



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Step 2: Insert GM extractor tool (P/N 12094430)

3. Gently pull on the wire to extract the pin out the back of the connector.



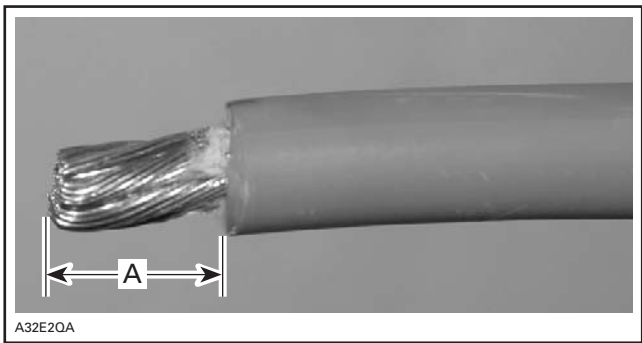
Step 3: Pull wire to extract pin

NOTICE Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

BATTERY CABLES

Crimping the Battery Cable

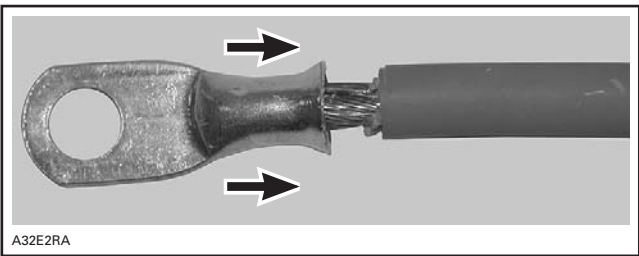
Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.



A. 10 mm (3/8 in)

NOTE: Make sure not to cut wire strands while stripping the wire.

Install the appropriate terminal on the wire according to the requirement. Refer to appropriate *PARTS CATALOG*.



INSTALLATION OF TERMINAL

Follow the instructions provided with the crimping tool to select the proper position of the tool.

NOTE: Different wires require different crimping pliers settings, so make sure to follow the instruction supplied with the tool.

After positioning the crimping pliers, crimp the terminal already installed on wire.



CRIMPING OF WIRE



PROPERLY CRIMPED WIRE

To verify, if the wire is properly crimped, apply some pulling force on wire and the terminal at the same time from both directions.

NOTICE Never weld the wire to the terminal. Welding can change the property of the wire and it can become brittle and break.

Install the protective heat shrink rubber tube on the terminal. Heat the heat shrink rubber tube using the heat gun so that it grasps the wire and the terminal.

NOTICE Make sure that the protective heat shrink rubber tube has been properly installed and no part of wire is exposed.

IGNITION COILS AND SPARK PLUGS

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL.....	529 036 166	4

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 engine control module (ECM) controls the ignition system, as well as many other engine related functions.

The battery supplies power to the primary side of the ignition coils through a relay while the ECM completes the circuit to each coil primary winding by switching it to ground at the appropriate moment.

The ignition system is a digital inductive type system.

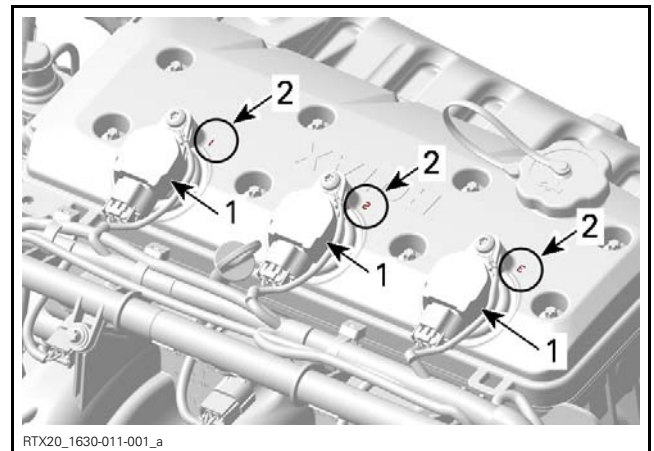
Ignition system parameters such as ignition timing, dwell time and firing order are controlled by the ECM in order to meet engine operational requirements.

Direct ignition coils (stick coils) are used for each cylinder.

Three separate ignition coils receive power from three separate fuses.

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 the valve cover.



1. Ignition coils
2. Cylinder identification number on valve cover

Ignition Timing

Ignition timing is not adjustable.

The ECM is programmed with ignition maps that it uses along with data received from a variety of sensors to establish optimum ignition timing under all engine operating conditions.

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.

RPM LIMITER	
130	8040 RPM
170 230 300	8440 RPM

Knock Sensor

A knock sensor is mounted on the cylinder block behind the intake manifold. It detects specific vibrations that would typically be generated by engine detonation.

Subsection XX (IGNITION COILS AND SPARK PLUGS)

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.

Refer to *POWER DISTRIBUTION AND GROUNDS* for fuses and relay information.

Always refer to the *WIRING DIAGRAM* when troubleshooting an electrical circuit.

TESTING THE IGNITION SYSTEM

1. Ensure fuse F2 is powered and in good condition.
2. If the 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.

3. If there is no active fault code, start diagnostic by testing *IGNITION COIL USING BUDS2*
4. If a primary winding of an ignition coil or a circuit is at fault, a fault code will be set. Refer to *DIAGNOSTIC AND FAULT CODES* 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 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 *PTO HOUSING, 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. 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. Defective T.O.P.S. sensor

- Test T.O.P.S. Refer to *LUBRICATION SYSTEM* subsection.

3. Damaged trigger wheel/loose CPS

- Check. Refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.

4. Defective ignition circuit

- Check fuses, ignition coils, wiring and connectors.

5. Poor engine grounds

- Check ground condition, refer to *POWER DISTRIBUTION AND GROUNDS* 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 *PTO HOUSING, MAGNETO AND STARTER* 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.

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.

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.

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
 - Activate Ignition Coils
3. Select the ignition coils to be tested and clicking on the ACTIVATE button.

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 *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.

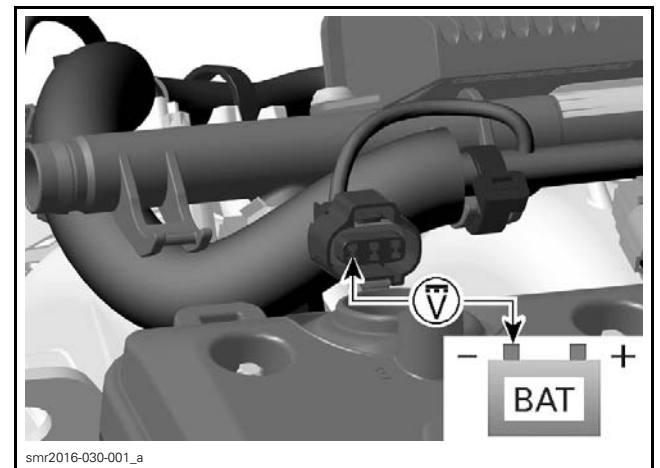
NOTE: The voltage required to produce a spark in the combustion chamber is higher when the engine is running.

Testing the Ignition Coil Input Voltage

1. Make sure fuse F2 is good before testing.
2. Disconnect the applicable ignition coil connector.
3. Remove tether cord from the engine cut-off switch.

4. Press the START button to activate the ECM.
5. Measure voltage within 3 minutes after depressing START/STOP button.
6. Set multimeter to Vdc.

TEST PROBES		MEASURE
VIOLET/BLUE wire (ignition coil no. 1)	Battery ground	Battery voltage
VIOLET/GREEN wire (ignition coil no. 2)		
VIOLET/ORANGE wire (ignition coil no. 3)		



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. Remove fuse F2.
2. Read resistance of the desired ignition coil circuit.
3. Set multimeter to Ω .

Subsection XX (IGNITION COILS AND SPARK PLUGS)

IGNITION COIL	IGNITION COIL WIRE	FUSE BOX	MEASURE
1 (rear)	VT/BU	B1	Close to 0 Ω
2	VT/GN		
3	VT/OG		

If test fails at any ignition coil, repair or replace wiring or terminals from fuse box to the applicable ignition coil.

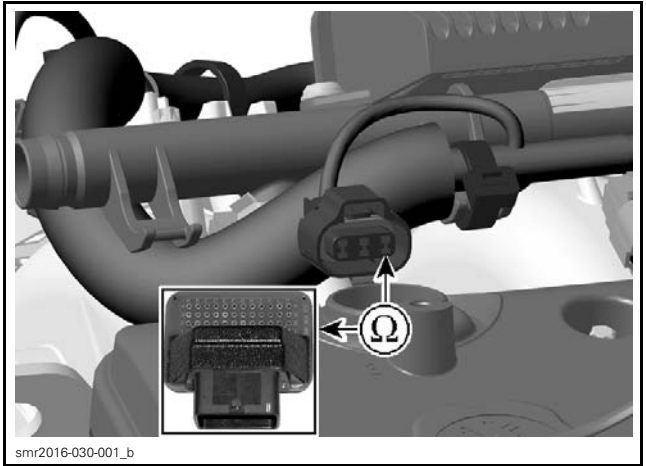
Testing the Ignition Coil Control Circuit Continuity

- 1. Disconnect ECM connector "A". For connector identification, refer to *WIRING HARNESS AND CONNECTOR* subsection.
- 2. Connect ECM connector to the adapter.

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	MEASURE
Cylinder 1 (rear)	BN/BK	A-M4	Close to 0 Ω (continuity)
Cylinder 2	BN/OR	A-M2	
Cylinder 3	BN/YE	A-M1	



IGNITION COIL CONTROL CIRCUIT TEST

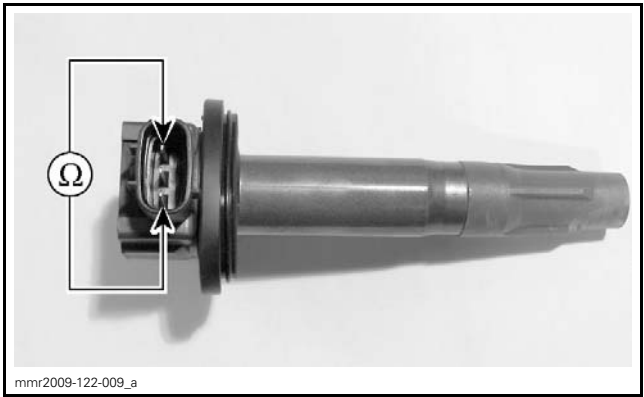
If test fails, repair the connector or replace the engine wiring harness.

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.

Primary Winding

- 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, measure the resistance of the primary winding.



PRIMARY WINDING

TERMINAL	MEASURE @ 20°C (68°F)
1 and 3	0.80 - 0.97 Ω

If test fails, replace ignition coil.

If test succeeds, carry out *TESTING THE IGNITION COIL CONTROL CIRCUIT CONTINUITY*.

Secondary Winding

The secondary winding on this type of ignition coil cannot be tested.

Removing the Ignition Coil

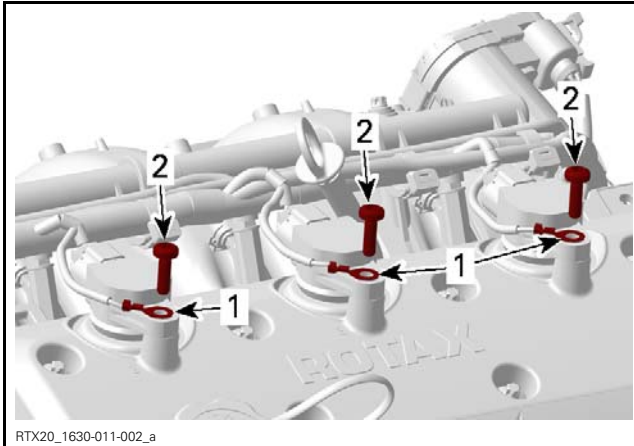
- 1. Disconnect ignition coil connector.

NOTICE Do not pry on ignition coil using any tool.

- 2. Remove ignition coil retaining screw.
- 3. Remove ignition coil from spark plug by rotating coil side to side as you pull up.

Installing the Ignition Coil

1. Install ignition coil on spark plug.
2. Align the retaining screw hole of the ignition coil with the threaded hole on the valve cover.
3. Push the ignition coil all the way down until it rests on the valve cover.
4. Place GND connector on ignition coil.
5. Install and tighten retaining screw.



1. GND connector
2. Retaining screw

TIGHTENING TORQUE	
Ignition coil retaining screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

6. Reconnect 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 an appropriate spark plug socket with retention spring, release the torque applied and unscrew the spark plug.
3. Clean the spark plug and cylinder head with pressurized air.

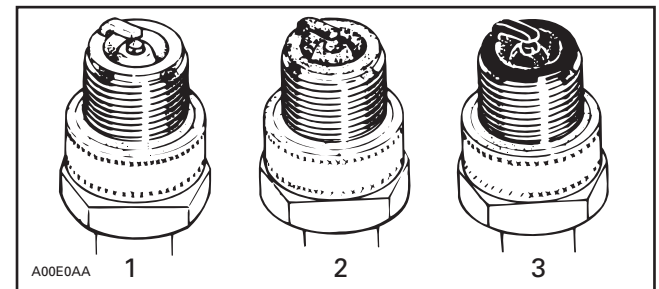
Troubleshooting a Fouled Spark Plug

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 an 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. Check electrode gap as specified.

NOTICE Do not adjust gap on this type of spark plug. The adjustment could weaken the negative electrode which may lead to electrode breakage and severe engine damage.

REQUIRED TOOL
Wire feeler gauge

Subsection XX (IGNITION COILS AND SPARK PLUGS)

ELECTRODE GAP	
NOT adjustable	
130 170 230	0.8 mm to 0.9 mm (.031 in to .035 in)
300	0.7 mm to 0.8 mm (.028 in to .031 in)

2. Hand screw spark plug into cylinder head.
3. Then tighten the spark plug clockwise to specification using an appropriate spark plug socket.

TIGHTENING TORQUE	
Spark plug	18 N•m ± 2 N•m (159 lbf•in ± 18 lbf•in)

4. Install ignition coil. Refer to *INSTALLING THE IGNITION COIL* in this subsection.
5. Complete the installation in the reverse order of the removal.

CHARGING SYSTEM

GENERAL

SYSTEM DESCRIPTION

The purpose of the charging system is to maintain the battery at a full state of charge and to provide the electrical system with the required electrical power for normal vehicle operation.

Magneto

The magneto is the primary source of electrical energy. It transforms a magnetic field into an electric current (AC).

The magneto has a 3 phase stator.

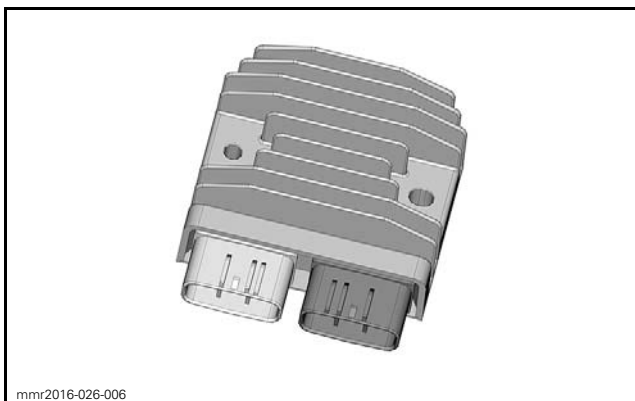


TYPICAL

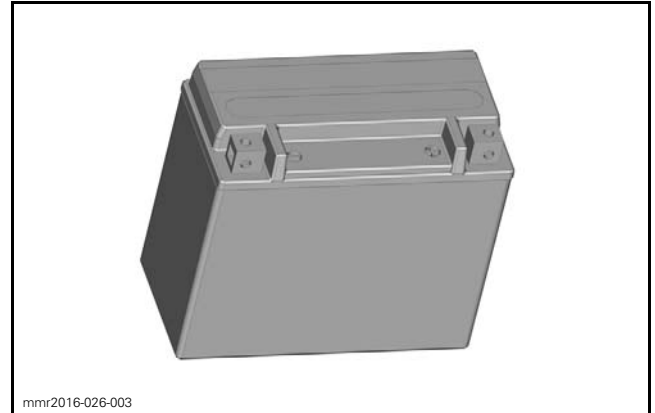
Voltage Regulator/Rectifier

The rectifier receives AC current from the magneto and transforms it into direct current (DC).

The voltage regulator, included in the same unit, limits voltage to a maximum level to prevent any damage to electrical components.



Battery



The battery supplies DC power to the electric starter for cranking the engine. During engine starting, it also supplies DC power to every electrical and electronic system in the vehicle as well as all accessories.

At low engine RPM operation and high current load conditions, it supplements the magneto output and helps to maintain a steady system voltage.

INSPECTION

CHARGING SYSTEM OUTPUT

First ensure that battery is in good condition prior to performing the following tests.

NOTE: It is good practice to check for fault codes using the BRP diagnostic software (BUDS2) as a first troubleshooting step. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

Testing the Output Voltage Using BUDS2

Connect the vehicle to the BRP diagnostic software (BUDS2).

In BUDS2, go to:

- **Measurements** page
- **ECM** button
- **Battery voltage (V)**

1. Start engine.

NOTE: Connect a garden hose to cool exhaust system. Refer to *EXHAUST SYSTEM* subsection.

2. Increase engine RPM as specified in the following table and read voltage.

Subsection XX (CHARGING SYSTEM)

OUTPUT VOLTAGE TEST USING A MULTIMETER	
TEST ENGINE SPEED	VOLTAGE (DC)
5500 RPM	14.5 ± .5 Vdc

If voltage is above specification, replace voltage regulator/rectifier.

If voltage is below specification, check stator output and wiring harness prior to concluding that voltage regulator/rectifier is defective. Refer to *STARTING SYSTEM* subsection.

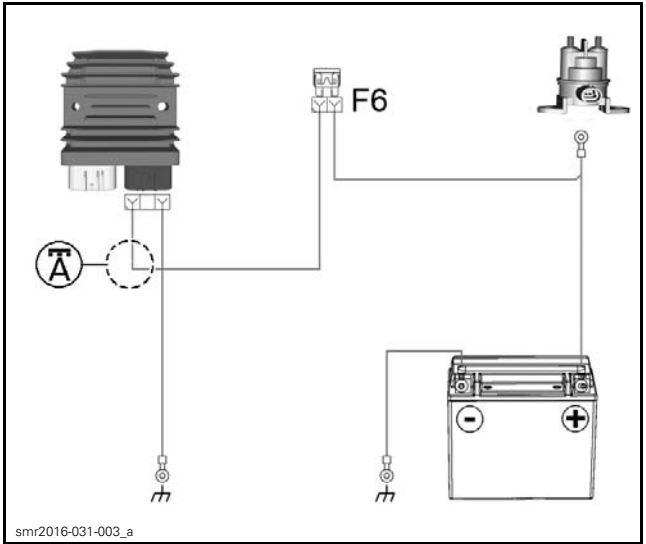
Testing the Output Current with an Inductive Ammeter

Use an inductive ammeter that can read at least 200 Aac and 40 Adc current.

- 1. Turn on the ammeter and select 40 Adc.

NOTE: Zero set the ammeter before use or reading may be erroneous.

VOLTAGE REGULATOR
RE1-1



- 2. Start engine.

NOTE: Connect a garden hose to cool exhaust system. Refer to *EXHAUST SYSTEM* subsection.

- 3. Increase engine RPM as specified in the following table and read current with the ammeter.

TEST ENGINE SPEED	CURRENT
5500 RPM	Approx. 10 A

NOTE: Initial current reading will be higher than specified due to the battery drain from the engine start. This is an indication that the charging system is operating normally. Current load will come down as the battery recovers its charge.

If current reading is far below specification, test stator output and wiring harness prior to concluding the voltage regulator/rectifier is faulty.

NOTE: If the battery is in poor condition or is not at a full state of charge, current reading will be above specification. Refer to *BATTERY* in this subsection for battery testing.

TROUBLESHOOTING

DISCHARGED OR WEAK BATTERY

- 1. Battery posts and/or cable terminal oxidized.
 - Clean battery terminals, posts, and coat with dielectric grease.
- 2. Loose or bad connections.
 - Check for wiring and connector tightness, frayed or broken wires. Repair or replace cables or connectors.
- 3. Worn or faulty battery (sulfated, fretting, shorted plates or cell, damaged casing, loose post).
 - Test BATTERY VOLTAGE (LOAD APPLIED).
 - Replace battery.
- 4. Burnt fuse(s) or faulty rectifier.
 - First check fuse(s). If in good condition, check voltage regulator/rectifier.
- 5. Faulty stator.
 - Test stator and replace as required.
- 6. Parasitic or "Key Off" current loads.
 - Isolate, reduce or eliminate such loads.
 - Recharge battery as recommended if vehicle is not used for extended periods of time.

NOTE: "Key Off" or parasitic loads may be loads due to installed accessories. Parasitic loads may also be due to water infiltration in connectors, or partial short circuits that slowly drain a battery without causing a fuse to burn.

LOW OR NO CHARGING SYSTEM VOLTAGE

- 1. Blown F6 fuse.
 - Check F6 fuse.
- 2. Defective stator.
 - Test stator. Refer to *STARTING SYSTEM* subsection.

3. Defective charging system wiring or connections.
 - Check for damaged wiring.
 - Check for damaged or loose connections.

REPETITIVE BLOWN F6 FUSE

1. Voltage regulator/rectifier internal circuit shorted to ground.
 - Refer to *TESTING VOLTAGE REGULATOR/RECTIFIER FOR BLOWN F6 FUSE* in this subsection.

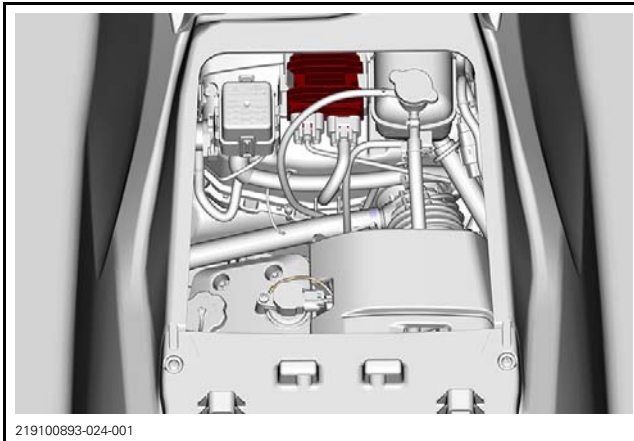
PROCEDURES

VOLTAGE REGULATOR/RECTIFIER

Testing the Voltage Regulator Continuity

Due to internal circuitry, there is no static test available to check continuity.

Voltage Regulator/Rectifier Location



Testing Voltage Regulator/Rectifier for Blown F6 Fuse

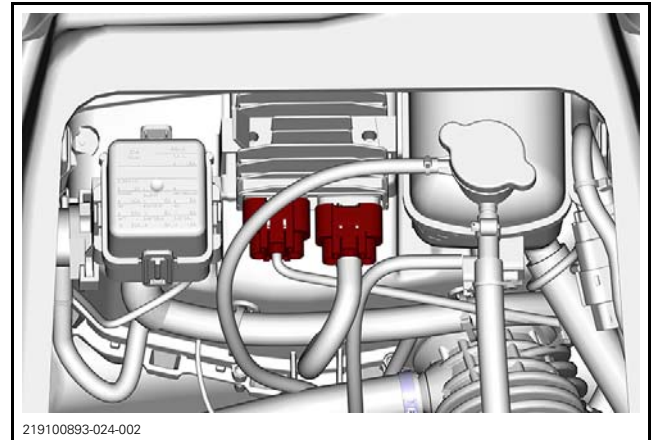
1. Detach the voltage regulator/rectifier from support. Refer to *REMOVING THE VOLTAGE REGULATOR/RECTIFIER* in this subsection.
2. Disconnect the voltage regulator/rectifier 2-wire connector.
3. Install a new fuse.

If the fuse still burns, check for a shorted wire or connector pin.

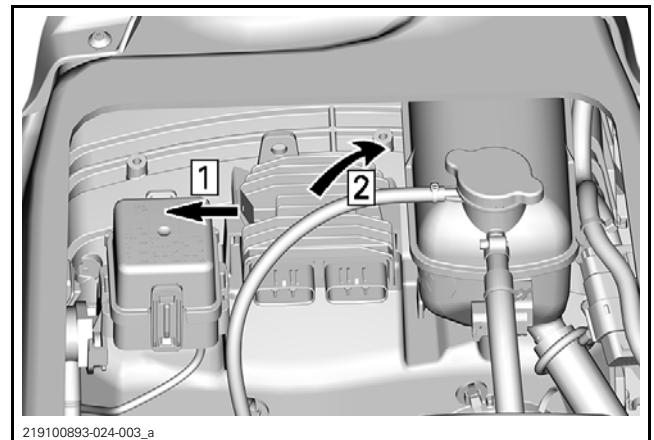
If fuse does not burn, replace regulator/rectifier.

Removing the Voltage Regulator/Rectifier

1. Disconnect both connectors from the voltage regulator/rectifier.



2. Push the support locking tab and remove voltage regulator/rectifier from its support.

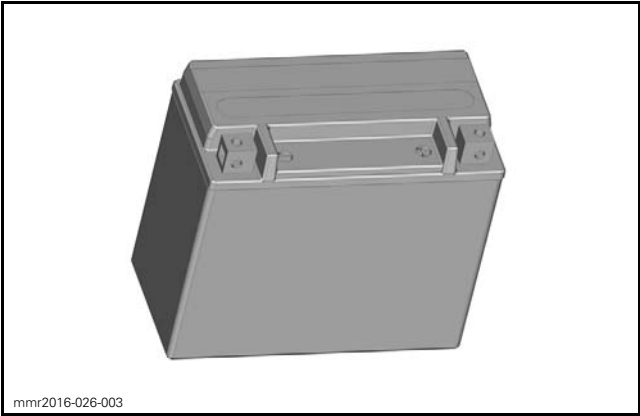


Step 1: Push locking tab
Step 2: Tilt voltage regulator to remove

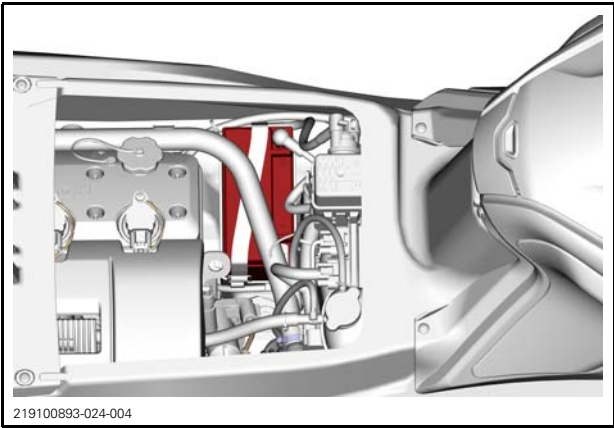
Installing the Voltage Regulator/Rectifier

Installation is the reverse of the removal procedure.

BATTERY



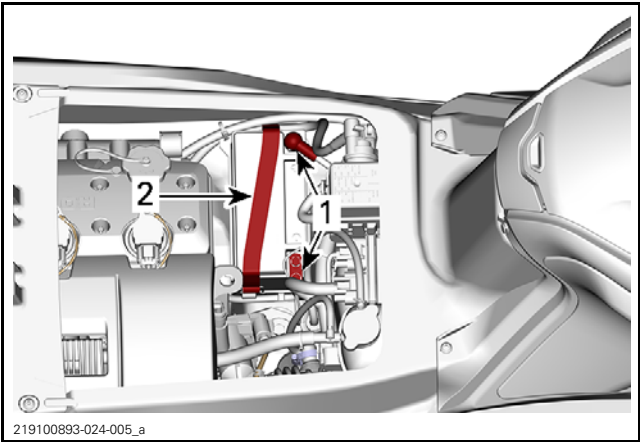
Battery Location



Removing the Battery

Disconnect battery posts and remove strap.

NOTICE Always respect this order for removal; disconnect BLACK cable first.



- 1. Battery post
- 2. Strap

Cleaning the Battery

Clean the battery casing, caps, cables and battery posts using a solution of baking soda and water.

NOTICE Do not allow cleaning solution to enter battery.

Remove corrosion from battery cable terminals and battery posts using a firm wire brush. Rinse with clear water then dry well.

Inspecting the Battery

- Keep the top free of grime
- Check casing, cables, clamps, and case for obvious damage or loose connections.
- Clean terminals and connectors as necessary

Refer to battery manufacturer guidelines.

Testing the Battery

There are 2 types of battery tests.

TEST METHOD	COMMENT
Testing voltage (load applied)	A dynamic voltage test with a load applied gives an accurate indication of the condition of the battery. This is the most recommended method.
Testing voltage (no load)	A static voltage test is carried out without discharging current. It is the simplest and most commonly used but the most likely to give false results.

Testing Battery Voltage (Load Applied)

1. Connect a battery load tester to battery.
2. Ensure proper test conditions:
 - Initial battery voltage above 12.5 Vdc
 - Engine OFF
 - Ambient temperature of 20°C (68°F)
3. Refer to load tester manufacturer for testing procedure.

If battery voltage has dropped below specification, the battery storage capacity has decreased appreciably and the battery should be replaced.

Testing the Battery Voltage (No Load)

NOTE: Be aware that the voltage test can indicate that the battery is in good condition even though the battery does not have enough stored energy to crank the engine. A load test gives a more accurate indication of the condition of the battery.

If the battery has just received a charge, wait 1-2 hours before taking a voltage reading.

Set multimeter to Vdc and measure voltage at battery terminals.

FULLY CHARGED BATTERY VOLTAGE (NO LOAD)
12.6 Vdc minimum

Storing the Battery

Disconnect and remove battery from watercraft as explained in *REMOVING THE BATTERY*.

NOTICE Battery storage is critical for battery life. Always refer to the battery manufacturer's instruction.

The battery must always be stored fully charged.

NOTICE Battery electrolyte temperature must not exceed 50°C (122°F) during charging. The battery casing should not feel hot to the touch.

Clean battery posts and cable terminals using a wire brush.

Clean battery casing and caps using a solution of baking soda and water. Apply a light coat of dielectric grease on battery posts and cable terminals.

Rinse battery with clear water and dry well using a clean cloth.

Store battery in a cool dry place. Such conditions reduce self-discharging and keep fluid evaporation to a minimum. Keep battery away from dew, high moisture and direct sunlight.

AMBIENT TEMPERATURE	CHARGING FREQUENCY
Below 16°C (60°F)	Every month
Above 16°C (60°F)	Every 2 weeks

⚠ WARNING
Batteries must always be stored out of reach of children.

Activating a New Battery

Refer to instruction provided with the battery.

Charging a Used Battery

To find the recommended charger current output in amps for a specific battery, divide the battery amp hour rating by 10. For example a 14 AH battery should be charged at 1.4 amps (14 AH ÷ 10 = 1.4 amp current).

⚠ WARNING
Never charge battery while installed in watercraft.

For best results, battery should be charged when it is at room temperature. A battery that is cold may not accept current for several hours after charging has begun.

Do not charge a frozen battery. If the battery charge is very low, the battery may freeze. If you suspect the battery to be frozen, move it to a heated area for about 2 hours (or more if required) to let it thaw out before charging.

⚠ WARNING
Always charge a battery in a well ventilated area.

The time required to charge a battery will vary depending on several factors, such as:

- Battery temperature: The charging time is increased for a cold battery as charging current accepted by a cold battery will be lower than for a warm battery. As the battery warms up, it will accept a higher rate of charge.
- State of charge: As a battery discharges, it gives up its stored energy. The greater the discharge, the longer it will take to fully recharge it.
- Type of charger: Battery chargers vary in the amount of voltage and current that they can supply.

Charging a Very Flat or Completely Discharged Battery

The battery charger used should have an adjustable charging rate. A unit which can be adjusted in small increments is acceptable.

The battery charger must be equipped with an ammeter capable of accurately measuring current of less than 1 ampere.

Unless this procedure is properly followed, a good battery may be needlessly replaced.

1. Measure the voltage at the battery posts with an accurate voltmeter. If it is below 10 volts, the battery will accept current at very low rate. It could be some time before the charging rate increases. Such low current flow may not be detectable on some charger ammeters and the battery will not seem to accept the charge.
2. Exceptionally for this particular case, set the charger to a high rate.

Subsection XX (CHARGING SYSTEM)

NOTE: Some chargers have a polarity protection feature which prevents charging unless the charger leads are connected to the correct battery terminals. A completely discharged battery may not have enough voltage to activate this circuitry, even though the leads are connected properly. This will make it appear that the battery will not accept a charge. Follow the charger manufacturer's instruction on how to bypass or override this circuitry so that the charger will turn on and charge a low-voltage battery.

3. Since battery chargers vary in the amount of voltage and current they provide, the time required for the battery to accept a measurable charger current may be up to 10 hours or more.
4. If the charging current is not up to a measurable amount after 10 hours, the battery should be replaced.
5. If the charging current is measurable before the end of the 10 hour period, the battery is good and charging should be completed at a lower rate.
6. It is recommended that any battery recharged using this procedure be tested under load prior to returning it to service.

Installing the Battery

Installation is the reverse of removal procedure.

NOTICE Always connect battery cables in the specified order, RED positive cable first, BLACK negative cable last.

1. Connect RED (+) cable.
2. Connect BLACK (-) cable last.
3. Apply dielectric grease on battery posts.
4. Verify cable routing and attachments.

STARTING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	1
ECM ADAPTER TOOL.....	529 036 166	1
FLUKE 115 MULTIMETER	529 035 868	1

GENERAL

BASIC STARTING SYSTEM OPERATION

Engine Cranking Conditions

The following conditions must be met to allow engine cranking:

1. START/STOP button pressed and released to activate the ECM.
2. The tether cord securely installed on the engine cut-off switch and the D.E.S.S. key recognized by the ECM as valid (2 short beeps)
3. START/STOP button pressed and held.

Starting System Logic

If the ECM recognizes a valid D.E.S.S. key, it allows engine cranking by providing the ground to the starter solenoid when the START/STOP button is pressed and held.

If the START/STOP button is activated while the throttle lever is depressed more than 60%, the engine will crank but will not start (engine drowned mode).

If the START/STOP button is held after engine has started, the ECM automatically stops the starter if engine speed reaches at least 1400 RPM.

If the START/STOP button is pressed when the engine is running, the engine will shut down.

Required Tools

To perform the tests in this subsection, the following tools are required.

REQUIRED TOOLS	
ECM ADAPTER TOOL (P/N 529 036 166)	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
DIAGNOSTIC HARNESS (P/N 529 036 384)	

TROUBLESHOOTING

DIAGNOSTIC TIPS

NOTE: It is a good practice to check for fault codes using the BRP diagnostic software (BUDS2) as a first troubleshooting step. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

Starting system failures are not necessarily related to the starter but may be due to one the following:

- Starter solenoid fuse F11
- Battery, refer to *CHARGING SYSTEM*
- START/STOP switch
- Starter solenoid
- Engine cut-off switch
- ECM
- Wiring/connections.

Check these components before removing the starter.

NOTE: This subsection assumes the problem is related to an electrical component of the starting system. If the starting system tests good, ensure engine and jet pump integrity. Refer to applicable subsection.

DIAGNOSTIC GUIDELINES

NOTHING HAPPENS WHEN START/STOP BUTTON PRESSED

1. **Battery not connected**
 - Connect battery.
2. **Burnt fuse**
 - F10 fuse: (START/STOP switch circuit).
 - F12 fuse: (main DC power fuses).
 - F11 fuse (ECM power fuse).
3. **Defective relay or related circuits**
 - Test relay and circuits.
4. **Defective START/STOP switch**
 - Test START/STOP switch, wiring and connections.

ENGINE DOES NOT CRANK

1. **D.E.S.S. not functional or wrong D.E.S.S. key**
 - If 2 short beeps are not heard when pressing the START/STOP button, refer to RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM subsection.
2. **Burnt fuse**
 - F11 fuse: (starter solenoid power) Carry out TESTING THE SOLENOID INPUT VOLTAGE.
3. **Discharged battery**
 - Recharge and test. Refer to CHARGING SYSTEM subsection.
4. **Battery connections**
 - Check/clean/tighten.
5. **Poor/bad or corroded ground contacts (engine, battery ground cable, starter etc.)**
 - Check/clean/repair, refer to POWER DISTRIBUTION AND GROUNDS subsection.
6. **Starter solenoid**
 - Test solenoid, wiring and connections.
7. **Damaged starter or ground cables**
 - Carry out TESTING THE SOLENOID (DYNAMIC).
8. **Obstructed starter drive gear assembly**
 - Check/repair, refer to PTO HOUSING, MAGNETO AND STARTER.
9. **No ground provided by ECM to starter solenoid**
 - Refer to TESTING THE CONTINUITY OF START/STOP SWITCH CONTROL CIRCUIT in this subsection.
10. **Engine cannot be rotated (possibly seized or jet pump blocked)**
 - Refer to ENGINE subsection.

ENGINE CRANKS SLOWLY

1. **Loose, corroded or dirty battery cable connections**
 - Check/clean/tighten.
2. **Discharged/weak battery**
 - Recharge and test. Refer to CHARGING SYSTEM subsection.
3. **Low voltage from starter solenoid**
 - Carry out a TESTING THE SOLENOID (DYNAMIC).
4. **Damaged starter or ground cables**
 - Carry out TESTING THE SOLENOID (DYNAMIC).
5. **Worn starter**
 - Check starter motor, refer to PTO HOUSING, MAGNETO AND STARTER subsection.

STARTER TURNS, BUT STARTER DRIVE DOES NOT MESH WITH RING GEAR

1. **Worn starter drive gear/starter gear/ring gear**
 - Replace worn parts. Refer to STARTER GEAR in this subsection and PTO HOUSING, MAGNETO AND STARTER subsection.
2. **Defective drive**
 - Replace starter drive. Refer to PTO HOUSING, MAGNETO AND STARTER subsection.

STARTER KEEPS RUNNING

1. **Shorted solenoid winding**
 - Replace solenoid.
2. **Melted solenoid contacts**
 - Replace solenoid.
3. **Sticking or defective starter drive**
 - Lubricate or replace. Refer to PTO HOUSING, MAGNETO AND STARTER.

PROCEDURES

NOTICE When carrying out any kind of maintenance on the starting system, always disconnect the battery ground cable. This will eliminate the possibility of shorting out a power cable, and generating a spark which could result in a fire or and explosion. Do not place any tool on the battery.

ENGINE START/STOP SWITCH

Testing the START/STOP Switch Circuit Continuity

1. Remove START/STOP switch fuse (F10).

Disconnect connector "B" from the ECM, refer to *WIRING HARNESS AND CONNECTOR* subsection.

Install ECM adapter tool on ECM harness connector "B".

Set the multimeter to Ω .

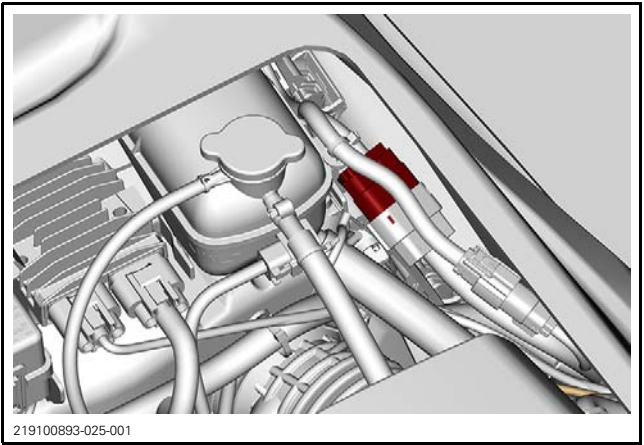
Press and hold the START/STOP switch and test for continuity of the switch circuit as per following table.

CONTINUITY TEST OF START/STOP SWITCH CIRCUIT (BUTTON PRESSED AND HELD)		
FUSE BOX	ECM CONNECTOR B	RESISTANCE
Pin E3	B-H2	Close to 0 Ω (continuity)

2. If the reading is as specified, the START/STOP switch and its wiring are good.
3. If a high resistance or an open circuit is measured, carry out *TESTING THE START/STOP SWITCH CONTINUITY*.

Testing the START/STOP Switch Continuity

1. Remove START/STOP switch fuse (F10).
2. Disconnect the 20-pin steering harness connector:



1. 20-pin steering connector

3. Use the multimeter and select Ω .
4. Measure resistance through switch as per following table.

CONTINUITY TEST OF START/STOP SWITCH CIRCUIT		
SWITCH POSITION	DIAGNOSTIC HARNESS CONNECTOR	RESISTANCE
Released	Pins 1 and 4	Infinite (OL)
Pressed and held		Close to 0 Ω

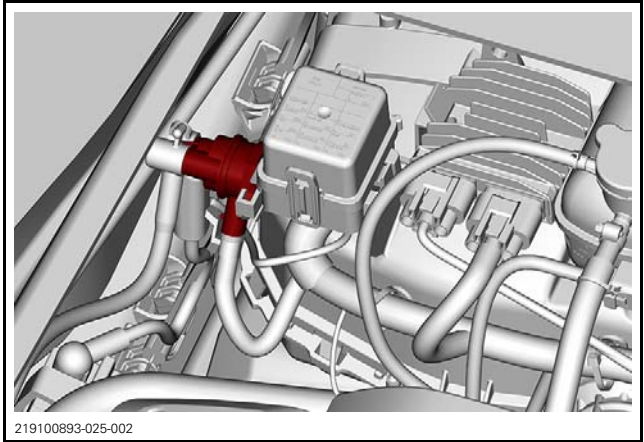
If the switch does not test as specified, replace the engine START/STOP switch.

If the switch tests as specified, check for an open circuit between connections as per table:

OPEN CIRCUIT TEST		
CIRCUIT CONNECTIONS		RESISTANCE
Fuse box pin E3	Steering harness connector pin 1	Must be close to 0 Ω
Steering connector pin 4	ECM connector B, pin H2	

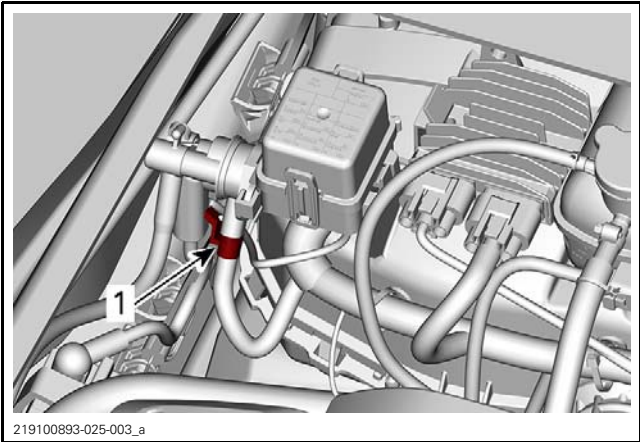
STARTER SOLENOID

Starter Solenoid Location



Testing Solenoid Input Voltage

1. Make sure F11 fuse is powered and in good condition before testing.
2. Disconnect solenoid connector.



1. Starter solenoid connector

- 3. Set the multimeter to Vdc.
- 4. Install tether cord on the engine cut-off switch.
- 5. Press the START/STOP button to activate ECM.
- 6. Measure voltage within 75 seconds after START/STOP switch has been depressed.

SOLENOID INPUT VOLTAGE TEST (SOLENOID COIL)		
TEST PROBES		VOLTAGE READING
Pin A	Battery ground	Battery voltage

If test succeeded, carry out *TESTING SOLENOID CONTROL CIRCUIT*.

If test failed, carry out *TESTING THE START/STOP SWITCH CIRCUIT CONTINUITY*.

Testing Solenoid Control Circuit Continuity

- 1. Set the multimeter to Ω .
- 2. Disconnect connector "B" from ECM.
- 3. Install ECM adapter tool on ECM harness connector.
- 4. Test continuity of wiring from solenoid to ECM as per following table.

SOLENOID CONTROL CIRCUIT TEST		
SOLENOID CONNECTOR	ECM CONNECTOR B	RESISTANCE
Pin B	B-L4	Close to 0 Ω (continuity)

If test failed, repair or replace wiring/connectors.

If test succeeded, carry out *TESTING SOLENOID COIL RESISTANCE*.

Testing Solenoid Coil Resistance

- 1. Set multimeter to Ω .
- 2. Disconnect solenoid connector.
- 3. Measure solenoid coil resistance as per following table.

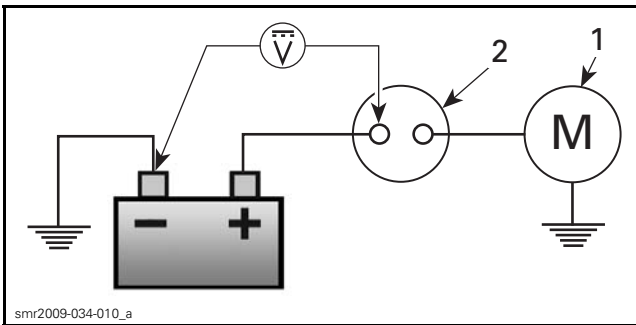
SOLENOID COIL RESISTANCE TEST		
SOLENOID CONNECTOR		RESISTANCE
Pin A	Pin B	4.5 to 5.5 Ω

If test fails, replace solenoid.

Testing Solenoid (Dynamic)

- 1. Ensure fuse F11, battery, and starter solenoid are properly connected.
- 2. Make sure the battery ground cable is securely connected to the engine. Refer to *POWER DISTRIBUTION AND GROUNDS*.
- 3. Set ECM in engine drowned mode:
 - 3.1 Depress throttle lever.
 - 3.2 Install a rubber band to hold lever in full throttle position.
- 4. Set multimeter to Vdc.
- 5. Crank engine.
- 6. **As engine is cranking**, measure the voltage as per following tables.

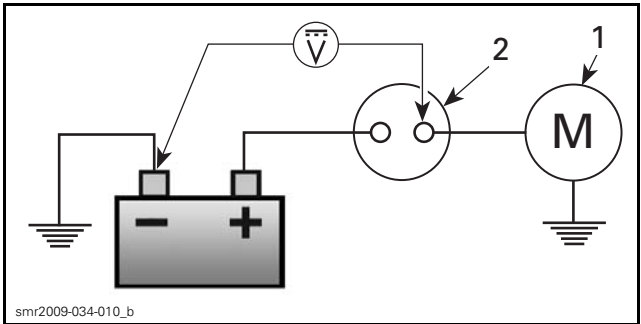
SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		VOLTAGE (DC)
Solenoid battery post	Battery ground	Battery voltage



1. Starter motor
2. Starter solenoid

- 7. If test failed, check battery positive cable (from battery to solenoid).
- 8. If test succeeded, continue with next step.

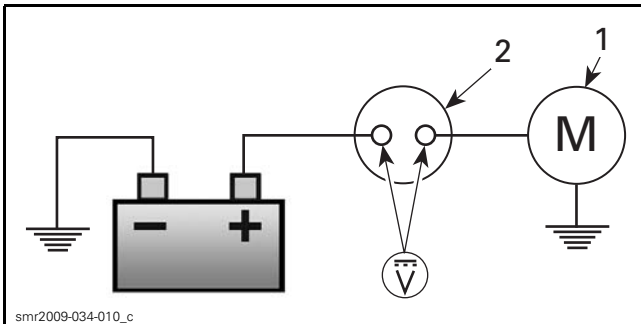
SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		VOLTAGE (DC)
Solenoid starter post	Battery ground	Battery voltage



1. Starter motor
2. Starter solenoid

9. If test failed, carry out a *TESTING SOLENOID INPUT VOLTAGE*.
10. If test succeeded, continue with next step.

SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		VOLTAGE (DC)
Solenoid battery post	Solenoid starter post	0.2 Vdc max.



1. Starter motor
2. Starter solenoid

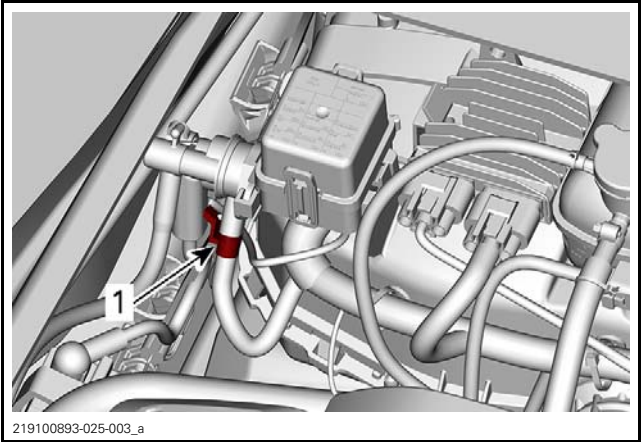
- If test failed, replace solenoid.
If all solenoid dynamic tests are as specified, replace starter.
11. Remove rubber band from throttle lever.
12. Attach the electrical component support to the battery holder. Refer to *ELECTRICAL COMPONENT SUPPORT* in *CHARGING SYSTEM* subsection.
13. Reinstall removed parts.

Removing the Solenoid

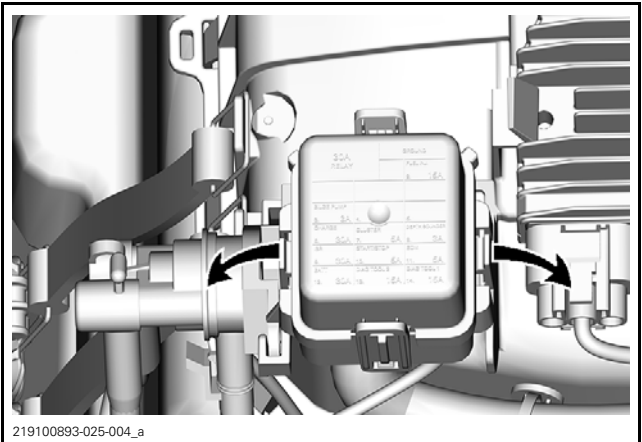
1. Disconnect battery. Refer to *CHARGING SYSTEM* subsection.

NOTICE Always disconnect the BLACK (-) battery cable first and reconnect last.

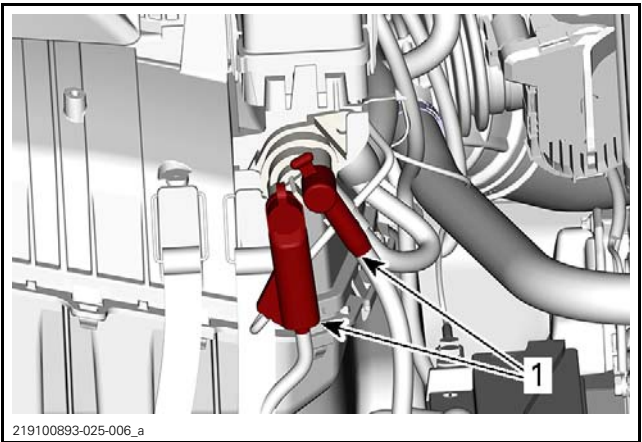
Disconnect solenoid connector.



1. Starter solenoid connector
2. Set aside fuse box by opening the tabs and lifting it.

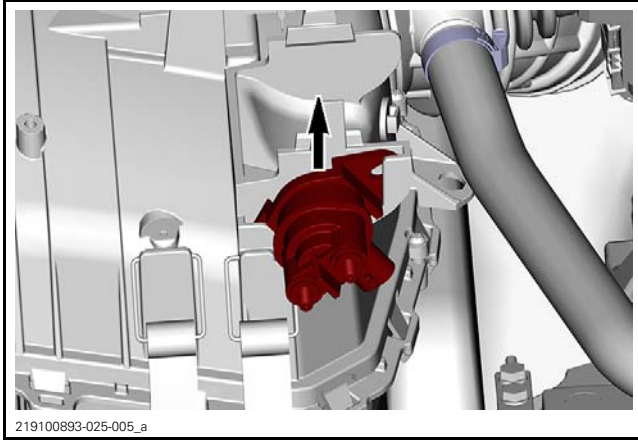


3. Disconnect solenoid cables.



1. Cables

Lift starter solenoid.



Installing the Solenoid

The installation is the reverse of the removal procedure.

STARTER

For starter information refer to *PTO HOUSING, MAGNETO AND STARTER* subsection.

RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM (RF D.E.S.S.)

GENERAL

SYSTEM DESCRIPTION

The following components are specially designed for this system: ECM, D.E.S.S. key (inside tether cord cap) and engine cut-off switch.

The D.E.S.S. key contains a magnet and a RFID chip.

- The magnet closes the hall effect switch inside the engine cut-off switch.
- The RFID chip contains a unique digital code. It is the equivalent of the tooth-pattern cut on a conventional ignition key.

The D.E.S.S. system allows the engine to start only if a tether cord cap is installed on the engine cut-off switch and the D.E.S.S. key is recognized as valid by the ECM.

The D.E.S.S. key is quite flexible:

- Up to 8 D.E.S.S. keys may be programmed in the ECM memory using the BRP diagnostic system (BUDS2) The keys can also be erased individually.
- The same D.E.S.S. key can be used on another vehicle equipped with the D.E.S.S. system. It only needs to be programmed for that vehicle.

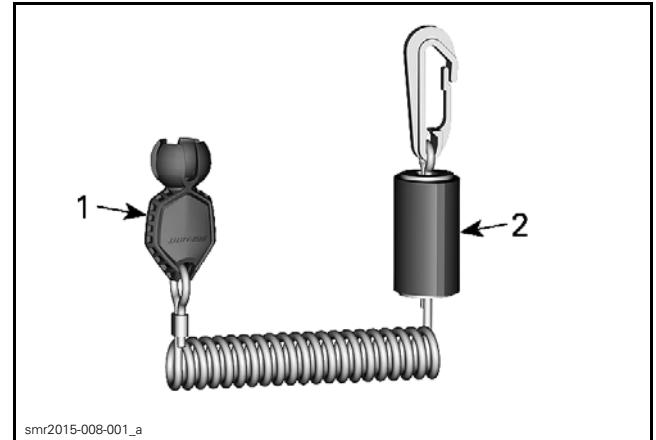
D.E.S.S. Key Types

Three types of keys can be used:

- Normal key
- Learning key

To ease key type recognition, the tether cord float comes in different colors.

KEY TYPE	FLOAT COLOR
Normal	Yellow or Black
Learning	Green



1. D.E.S.S. Key
2. Tether cord float

Upon tether cord installation, the key type used is momentarily displayed by the multifunction gauge.

Learning keys provide a mode of operation whereby engine power and speed is limited.

There are 5 speed settings available for the learning key mode. By default, the key modes are preset to the speed setting (3). Refer to *INTELLIGENT THROTTLE CONTROL (iTC)* subsection.

NOTE: Changing key settings is only available when the engine is not running.

D.E.S.S. Key Beeper Codes

BEEPER	SIGNIFICATION
A 0.5 second beep every 5 seconds	Indicates the D.E.S.S. is reading the key.
2 short beeps	Indicates the D.E.S.S. recognizes the key.
A 1 second beep every 5 seconds	Indicates the D.E.S.S. does not recognize the key.

NOTE: Other beeps not related to D.E.S.S. can be heard. Refer to *DIAGNOSTIC AND FAULT CODES*.

TROUBLESHOOTING

DIAGNOSTIC GUIDELINES

The following is provided to help in diagnosing the probable cause of a problem. It is a guideline and should not be assumed to list all possible causes.

NO BEEP CODE WHEN KEY IS INSTALLED ON ENGINE CUT-OFF SWITCH — ENGINE CAN NOT BE STARTED

1. Gauge shuts-down after its WOW test: Defective engine cut-off switch
 - Check engine cut-off switch. Refer to *IGNITION SYSTEM* subsection.

NO BEEP CODE WHEN KEY IS INSTALLED ON ENGINE CUT-OFF SWITCH — ENGINE CAN BE STARTED

1. Defective gauge beeper
 - Check gauge beeper. Refer to *INFORMATION CENTER*.

GAUGE DISPLAYS "READING KEY" AND THERE IS NO KEY INSTALLED ON ENGINE CUT-OFF SWITCH

1. Gauge shuts-down after 3 minutes: Defective engine cut-off switch
 - Check engine cut-off switch.

KEY NOT READ (CONDITION CAN BE DUPLICATED WITH A MAGNET ON THE D.E.S.S. POST)

1. Damaged RFID chip
2. No voltage at RFID-D connector
3. No voltage at RFID-C connector
 - Try a new key
 - Refer to *WIRING DIAGRAM* and / or *IGNITION SYSTEM* and troubleshoot D.E.S.S. / Engine Cut-Off Switch

KEY NOT PRESENT (CONDITION CAN BE DUPLICATED BY UNPLUGGING THE RFID CONNECTOR)

1. No key installed
2. No **ground** at RFID-A connector
3. No voltage at RFID-B connector
4. No voltage at RFID-C connector

5. No voltage at RFID-D connector
 - Refer to *WIRING DIAGRAM* and / or *IGNITION SYSTEM* and troubleshoot D.E.S.S. / Engine Cut-Off Switch

INVALID KEY

1. Key not programmed to ECM
 - Program key

PROCEDURES

D.E.S.S. KEY

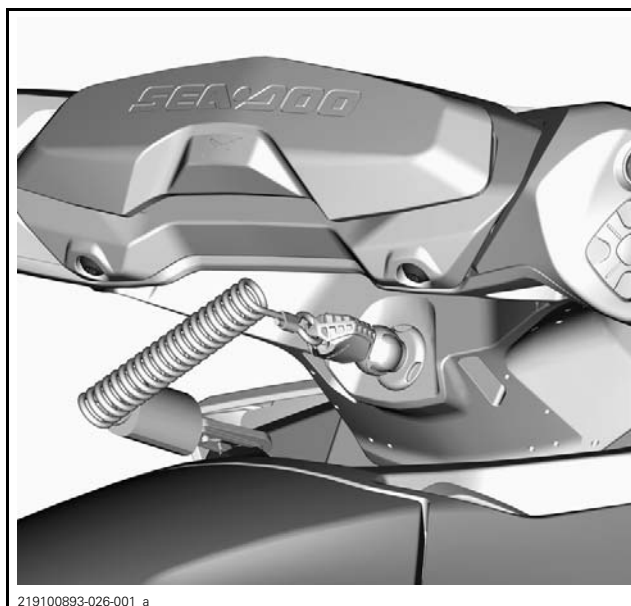
D.E.S.S. Key Recognition

To allow key recognition, carry out the following steps:

1. Briefly press the START/STOP button to wake up the ECM.
2. Securely install the tether cord on watercraft engine cut-off switch.
3. Press and hold the START/STOP button to start engine.

Programming D.E.S.S. Keys

1. Connect the watercraft to BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS* subsection.
2. Briefly press START/STOP button to power the ECM.
3. Install a tether cord on the engine cut-off switch to program a D.E.S.S. key.



4. Go to the key page.

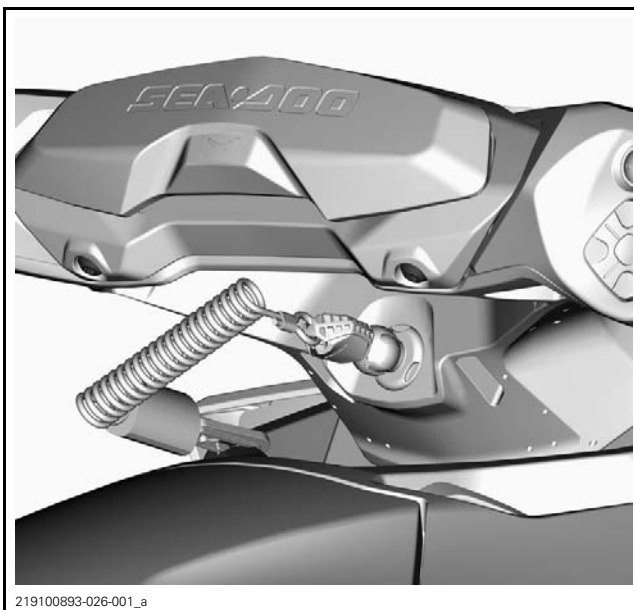
Subsection XX (RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM (RF D.E.S.S.))

5. Ensure that anti-theft system is activated. If not, activate it before trying to add a key.
6. Install new key on the D.E.S.S. post.
7. Press the READ button (top right of the table).
8. Select key type
9. Press ADD button to register the key. The new key should be displayed in the table. Repeat steps 6 to 9 to add other keys.

Refer to *IGNITION SYSTEM* subsection for testing procedures.

Erasing Keys

1. Install the tether cord on the engine cut-off switch.



2. Click on **Erase Key**.

After approximately 10 seconds the following message will appear.

The key is now erased.

Erasing All Keys

1. Click on **Erase All Keys**.
2. When done, program at least one new key to the vehicle. Refer to *ADDING A KEY* in this subsection.

D.E.S.S. / Engine Cut-Off Operation

Normal Operation

The electrical system provides power to RFID-D. The ECM provides 5Vdc to the DESS module DS-C. The ECM provides a ground to the DESS module DS-A. When a key (tether cord) is installed on the DESS post, a hall effect switch closes and sends a 12-15Vdc signal to the ECM.

INFORMATION CENTER (DIGITAL DISPLAY)

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	1

GENERAL

Most of the electrical tests require the following tools.

REQUIRED TOOLS	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
Test light	

Refer to *WIRING DIAGRAM INFORMATION* subsection for diagnostic tips on troubleshooting electrical problems.

NOTICE It is recommended to always disconnect the battery when replacing any electrical component. Always disconnect battery as specified, BLACK (-) cable first. Do not place tools on battery.

INDICATOR LIGHTS AND MESSAGE DISPLAY INFORMATION

Important information about vehicle condition is displayed on the multifunction gauge. When starting the engine, always look at the gauge for any indicator lamps or special messages.

INDICATOR LIGHT / ICON (ON)	MESSAGE DISPLAY	DESCRIPTION
	LOW or HIGH BATTERY VOLTAGE	Low/high battery voltage
	HIGH TEMPERATURE	Engine or exhaust system overheating
	CHECK ENGINE or LIMP HOME MODE	Check engine (minor fault req. maint.) or LIMP HOME MODE (major eng. fault)
	LOW OIL PRESSURE	Low oil pressure
	IBR MODULE ERROR	Light is steady with a buzzer and a check engine light: iBR system fault (refer to an authorized Sea-Doo dealer)
	—	Light is flashing: iBR system fault (refer to an authorized Sea-Doo dealer)
	—	Light is steady with no buzzer: iBR system still functional but needs to be inspected by an authorized Sea-Doo dealer

MESSAGE DISPLAY INFORMATION	
HIGH EXHAUST TEMPERATURE	High exhaust temperature detected
HIGH ENGINE TEMPERATURE	High engine temperature detected
CHECK ENGINE	Engine system malfunction or maintenance required
LIMP HOME MODE	Major fault detected, engine power limited
FUEL SENSOR FAULT	Fuel level sensor fault

MESSAGE DISPLAY INFORMATION	
WATER TEMP SENSOR DEFECTIVE	Problem with water temperature sensor, not sending water temperature info.
IBR MODULE ERROR	iBR system malfunction
MAINTENANCE REQUIRED	Watercraft maintenance required

When a digital warning appears, it will show the warning for 6 seconds and then the warning will disappear for 15 minutes. During the 15 minutes, only the indicator lamps will be activated.

TROUBLESHOOTING

DIAGNOSTIC TIPS

IMPORTANT: When solving an electrical problem, the first thing to do is to check the battery condition as well as its cables and connections.

Make sure the battery is fully charged or install a power pack for any tests that involves a prolonged "key ON" period. If battery voltage gets too low, not only test results can be altered, but the vehicle electrical system may not operate normally.

Pay attention to ground wires. They could become loose or corroded which causes them to act as an additional load in a circuit, dropping voltage and reducing current to components. Some components may be grounded through their outer casing and mounted hardware. This should also be considered.

Electrical Connectors

Pay particular attention to ensure that pins are not out of their connectors, loose, or damaged. The troubleshooting procedures may not cover problems resulting from one of these causes.

NOTICE Ensure all terminals are properly crimped on wires and connector housings are properly fastened. When replacing any electric or electronic part(s), always check electrical connections. Make sure that they are clean, corrosion-free, tight and make good contact. The voltage and current might be too weak to go through dirty or corroded connector pins or terminals.

MULTIFUNCTION GAUGE TROUBLESHOOTING

GAUGE FUNCTIONS INOPERATIVE OR WORKING INTERMITTENTLY

- 1. Power supply or ground problem
 - Check power supply and ground circuits.

PROCEDURES

TESTING THE MULTIFUNCTION GAUGE

Before beginning any troubleshooting, test or repair, always check for fault codes.

- 1. Check for fault codes using BUDS2.
- 2. Record all fault codes, then erase them.
- 3. Perform a complete shutdown of the electrical system and reactivate it.
- 4. Check fault codes. If a previous fault codes reappears, perform the required service actions.

Testing the Multifunction Gauge Using BRP Diagnostic Software (BUDS2)

Connect vehicle to the latest applicable BRP Diagnostic Software version. Refer to *COMMUNICATION TOOLS* subsection.

Select the **Functions** tab.

Click on the **Execute WOW Test** button.

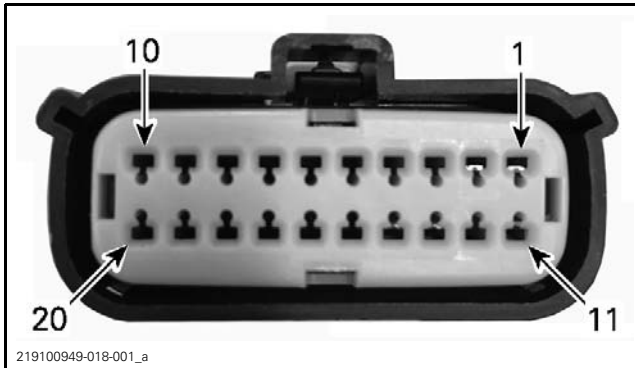
All indications will come and stay ON so that you can verify each indication.

NOTE: The **WOW Test** only tests the gauge LEDs and LCD. It does not test the actual circuit functions related to each indication.

Testing the Multifunction Gauge Power Input

If the multifunction gauge is inoperative, first check for fault codes with BRP Diagnostic Software, record all faults then erase them. Reactivate the electrical system and recheck for faults. If any fault code appears, perform service actions required. Refer to *COMMUNICATION TOOLS* subsection.

- 1. Remove multifunction gauge. Refer to procedure in this subsection.
- 2. Perform testing at multifunction gauge connector as per following illustration and tables.



MULTIFUNCTION GAUGE CONNECTOR (PIN-OUT)

MULTIFUNCTION GAUGE POWER TEST			
CL_A CONNECTOR	BATTERY	IGNITION POSITION	SPECIFICATION
pin 1	Negative (-) post	Any	Close to battery voltage
pin 11		ON	Close to battery voltage

If there is no power at pin 1, check fuse F10 and the related circuit.

If there is no power at pin 11, in check fuse F7, MAIN relay RY1, and the related circuit.

If the power test is within specification, continue with *TESTING THE MULTIFUNCTION GAUGE GROUND CIRCUIT*.

Testing the Multifunction Gauge Ground Circuit

Test as per the following table.

MULTIFUNCTION GAUGE GROUND TEST		
CL_A CONNECTOR	BATTERY	SPECIFICATION
Pin 2	Negative (-) post	Close to 1 Ω

If the ground at pin 2 is not within specification, check the related circuit.

If the ground tested to specification, continue with *TESTING THE MULTIFUNCTION GAUGE CAN CIRCUIT*.

Testing the Multifunction Gauge CAN Circuit

1. Remove the seats for access to the DLC (Diagnostic Link Connector). Refer to *BODY* subsection.

2. Test as per the following table.

MULTIFUNCTION GAUGE CAN WIRE TEST		
CL_A CONNECTOR	DLC	SPECIFICATION
Pin 13 (CAN HI)	Pin 1	Close to 0.4 Ω
Pin 14 (CAN LO)	Pin 2	Close to 0.4 Ω

If the CAN wire verification test fails, check the related circuit.

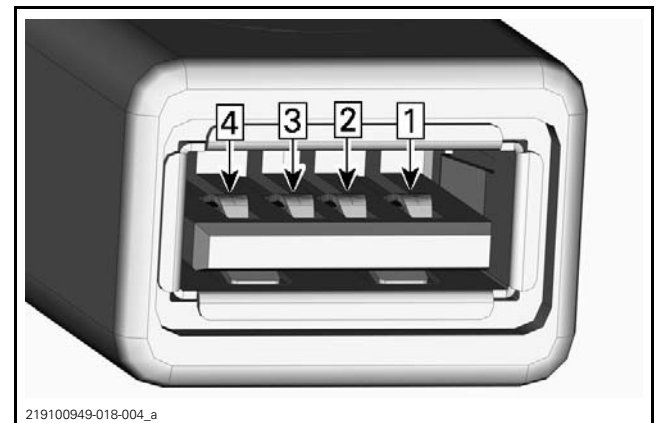
If the multifunction gauge functions, however there is a suspected communication problem with another component, perform this test between the multifunction gauge and that component.

If the multifunction gauge power, ground and CAN verification tests are all to specifications and the multifunction gauge is inoperative, replace the multifunction gauge.

Testing the Multifunction Gauge USB Power Voltage

1. Test as per the following table.

MULTIFUNCTION GAUGE USB POWER VOLTAGE TEST AT USB CONNECTOR		
USB CONNECTOR	BATTERY	SPECIFICATION
Pin 1	Negative (-) post	Close to 5 V



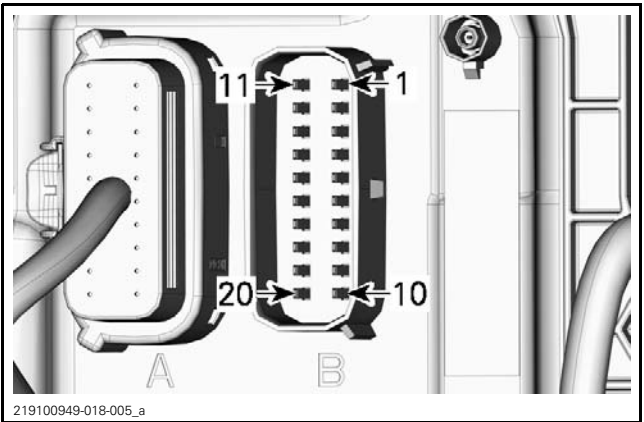
USB CONNECTOR PINOUT

- Pin 1 (5V)
- Pin 2 (Data -)
- Pin 3 (Data +)
- Pin 4 (Ground)

If result is not as per specification, continue with the following steps.

- Disconnect connector CL_B from the gauge.
- Test as per the following table.

MULTIFUNCTION GAUGE USB POWER VOLTAGE TEST AT GAUGE		
GAUGE PINOUT B	BATTERY	SPECIFICATION
Pin 20	Negative (-) post	Close to 5 V



GAUGE PINOUT B

If result is not as per specification, test with a new gauge.

If result is good, carry out a *TESTING THE MULTIFUNCTION GAUGE USB CIRCUIT*.

Testing the Multifunction Gauge USB Ground Circuit

1. Test as per the following table.

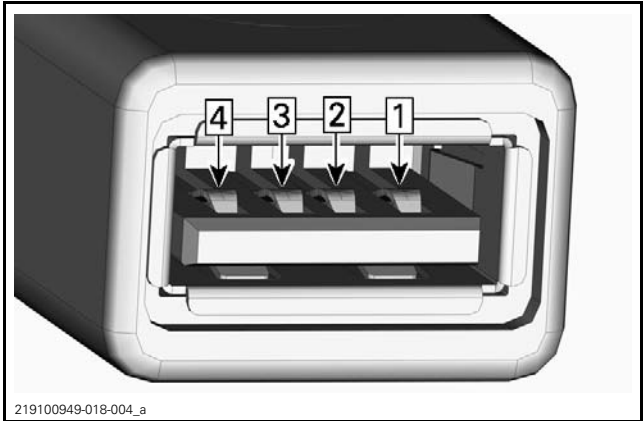
MULTIFUNCTION GAUGE USB GROUND CIRCUIT TEST AT USB CONNECTOR		
USB CONNECTOR	BATTERY	SPECIFICATION
Pin 4	Negative (-) post	Close to 1.5 Ω

If the result is not within specification, check the related circuit.

Testing the Multifunction Gauge USB Circuit

1. Disconnect Connector CL_B from the gauge.
2. Test as per the following table.

MULTIFUNCTION GAUGE USB CIRCUIT TEST		
CL_B CONNECTOR	USB CONNECTOR	SPECIFICATION
Pin 20	Pin 1 (5V)	Close to 0.4 Ω
Pin 9	Pin 2 (Data -)	
Pin 8	Pin 3 (Data +)	
Pin 10	Pin 4 (Ground)	



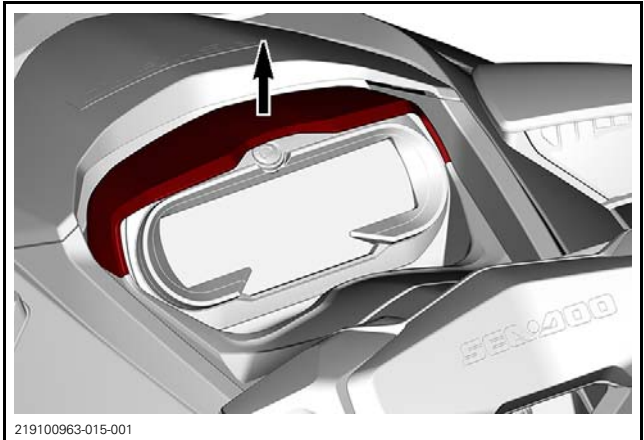
USB CONNECTOR PINOUT

1. Pin 1 (5V)
2. Pin 2 (Data -)
3. Pin 3 (Data +)
4. Pin 4 (Ground)

If results are out of specifications, repair the defective circuit.

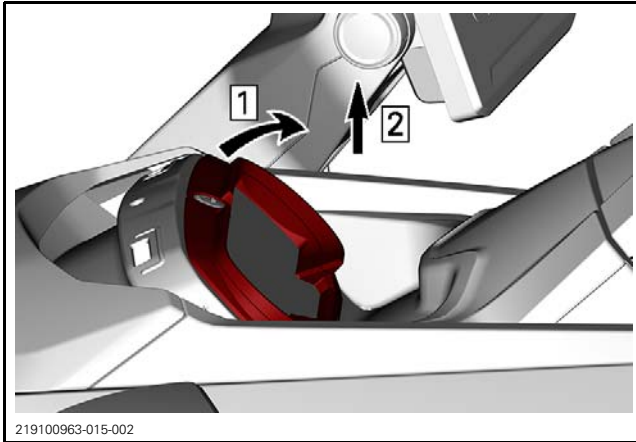
REMOVING THE MULTIFUNCTION GAUGE

Remove gauge support cover.



TYPICAL

Pull top of gauge and lift.



TYPICAL

Disconnect electrical connector.

INSTALLING THE MULTIFUNCTION GAUGE

The installation is the reverse of the removal procedure.

If the multifunction gauge was replaced, connect the vehicle to the BRP diagnostic software (BUDS2) and apply any available updates.

When updates are completed, change settings as per customer preferences (language and units) as described in *SETTING LANGUAGE AND UNITS OF MEASUREMENT* in this subsection.

Disconnect electrical connector.

SETTING LANGUAGE AND UNITS OF MEASUREMENT

1. Connect the vehicle to the BRP diagnostic software (BUDS2), refer to the *COMMUNICATION TOOLS* subsection.
2. Press the START/STOP button to energize the electrical system.
3. In BUDS2, go to:
 - **SETTINGS** page
 - **CLUSTER** button
 - **SETTINGS** tab
 - **CONFIGURATION** - Change Cluster Language and Units

ACCESSORIES

GENERAL

Refer to *WIRING DIAGRAM* subsection for diagnostic tips on troubleshooting electrical problems.

NOTE: The accessory circuit stays ON for a period of up to 60 minutes after the engine is turned OFF if the key remains on the D.E.S.S. post. If battery voltage drops bellow 12.3V, the ECM will not allow the accessory circuit back ON until the engine has been started.

⚠ WARNING

It is recommended to always disconnect the battery when replacing any electrical component. Always disconnect battery as specified, BLACK (-) cable first. Do not place tools on battery.

TROUBLESHOOTING

DIAGNOSTIC TIPS

IMPORTANT: When solving an electrical problem, the first thing to do is to check the battery condition as well as its cables and connections.

Install a battery charger on battery terminals for any tests that involves a prolonged "key ON" period. If battery voltage gets too low, not only test results can be altered, but the vehicle electrical system may not operate normally.

Pay attention to ground wires. They could become loose or corroded which causes them to act as an additional load in a circuit, dropping voltage and reducing current to components. Some components may be grounded through their outer casing and mounted hardware. This should also be considered.

Electrical Connectors

Pay particular attention to ensure that pins are not out of their connectors, loose, or damaged. The troubleshooting procedures may not cover problems resulting from one of these causes.

NOTICE Ensure all terminals are properly crimped on wires and connector housings are properly fastened. When replacing any electric or electronic part(s), always check electrical connections. Make sure that they are clean, corrosion-free, tight and make good contact. The voltage and current might be too weak to go through dirty or corroded connector pins or terminals.

PROCEDURES

REMOVING AND INSTALLING THE SOUND SYSTEM

Refer to *BODY* subsection.

PREREQUISITES OF SOUND SYSTEM TESTS

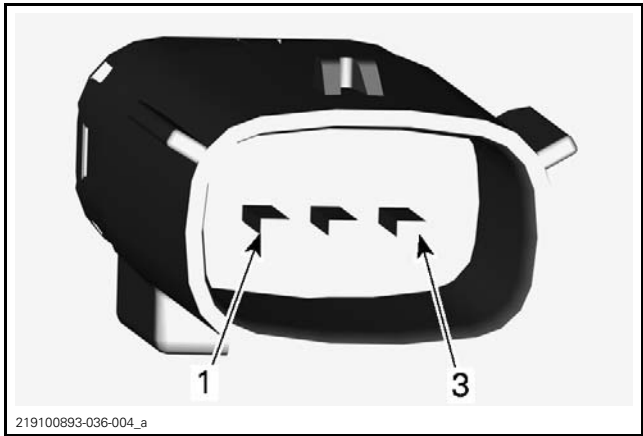
Make sure diagnostic tool 1 fuse (F14) and cluster fuse (F7) is in good condition and powered.

Make sure the battery is fully charged.

TESTING SOUND SYSTEM GROUND WIRE CONTINUITY

1. Remove the cover. Refer to *BODY* subsection.
2. Disconnect the sound system connector.

GROUND TEST AT SOUND SYSTEM CONNECTOR		
PROBE		RESISTANCE
Pin 3	Battery -	Close to 0 Ohms



SOUND SYSTEM CONNECTOR PIN-OUT

If ground test is good, test the INPUT VOLTAGE.

TESTING SOUND SYSTEM INPUT VOLTAGE

Press the START button and install the tether cord on the engine cut-off switch.

Subsection XX (ACCESSORIES)

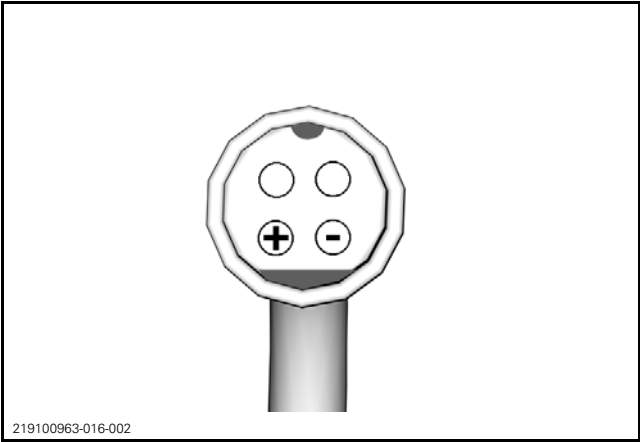
INPUT VOLTAGE TEST AT SOUND SYSTEM CONNECTOR		
PROBE		VOLTAGE
Pin 1 (Hot at all times)	Pin 3 (Permanent ground)	Battery voltage
Pin 2 (Hot with main relay on)		

Repair wiring and connectors as required.

FISH FINDER SONAR

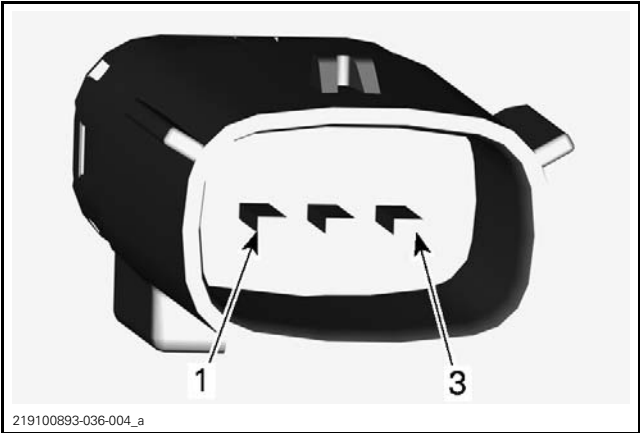
The sonar is connected on the accessory circuit and is hot only when the electrical circuit is ON. There is a 3A fuse in-line protecting the circuit.

Ensure all connectors are properly secured and there is no trace of corrosion or other defects. Clean or replace as necessary.



SONAR CONNECTOR PIN-OUT

GROUND TEST AT VEHICLE CONNECTOR		
PROBE		RESISTANCE
Pin 3	Battery -	Close to 0 Ohms



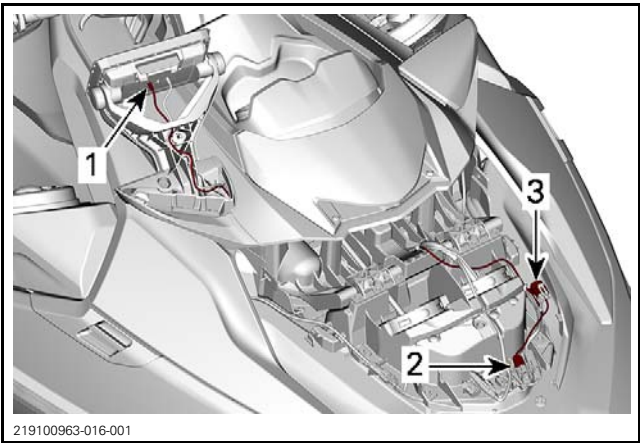
VEHICLE CONNECTOR PIN-OUT

If ground test is good, test the INPUT VOLTAGE.

Testing Fish Finder sonar Input Voltage

Press the START button and install the tether cord on the engine cut-off switch.

INPUT VOLTAGE TEST AT SONAR CONNECTOR		
PROBE		RESISTANCE
Positive pin	Battery -	Battery voltage



- 1. Sonar connector
- 2. Vehicle connector
- 3. 3A Fuse

Make sure the 3A fuse is in good condition and powered.

Make sure the battery is fully charged.

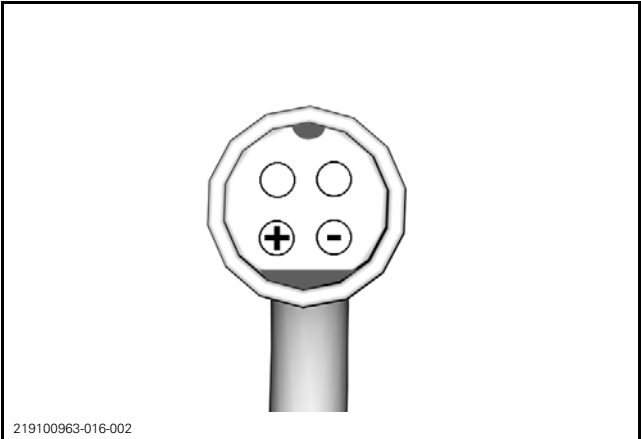
Removing and Installing the Fish Finder Sonar

Refer to *BODY* subsection.

Testing Fish Finder sonar Ground Wire Continuity

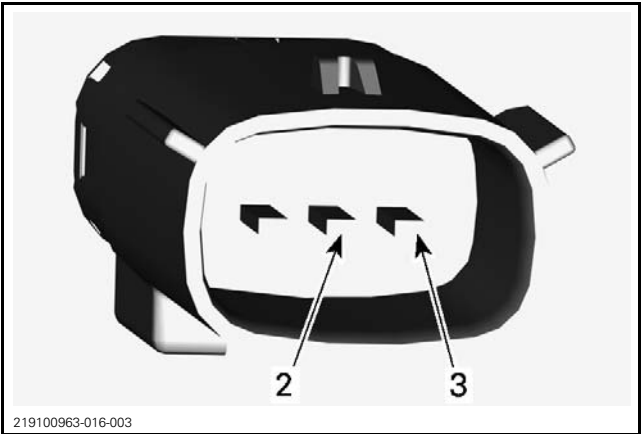
- 1. Remove the sonar and Hood. Refer to *BODY* subsection.

GROUND TEST AT SONAR CONNECTOR		
PROBE		RESISTANCE
Negative pin	Battery -	Close to 0 Ohms



SONAR CONNECTOR PIN-OUT

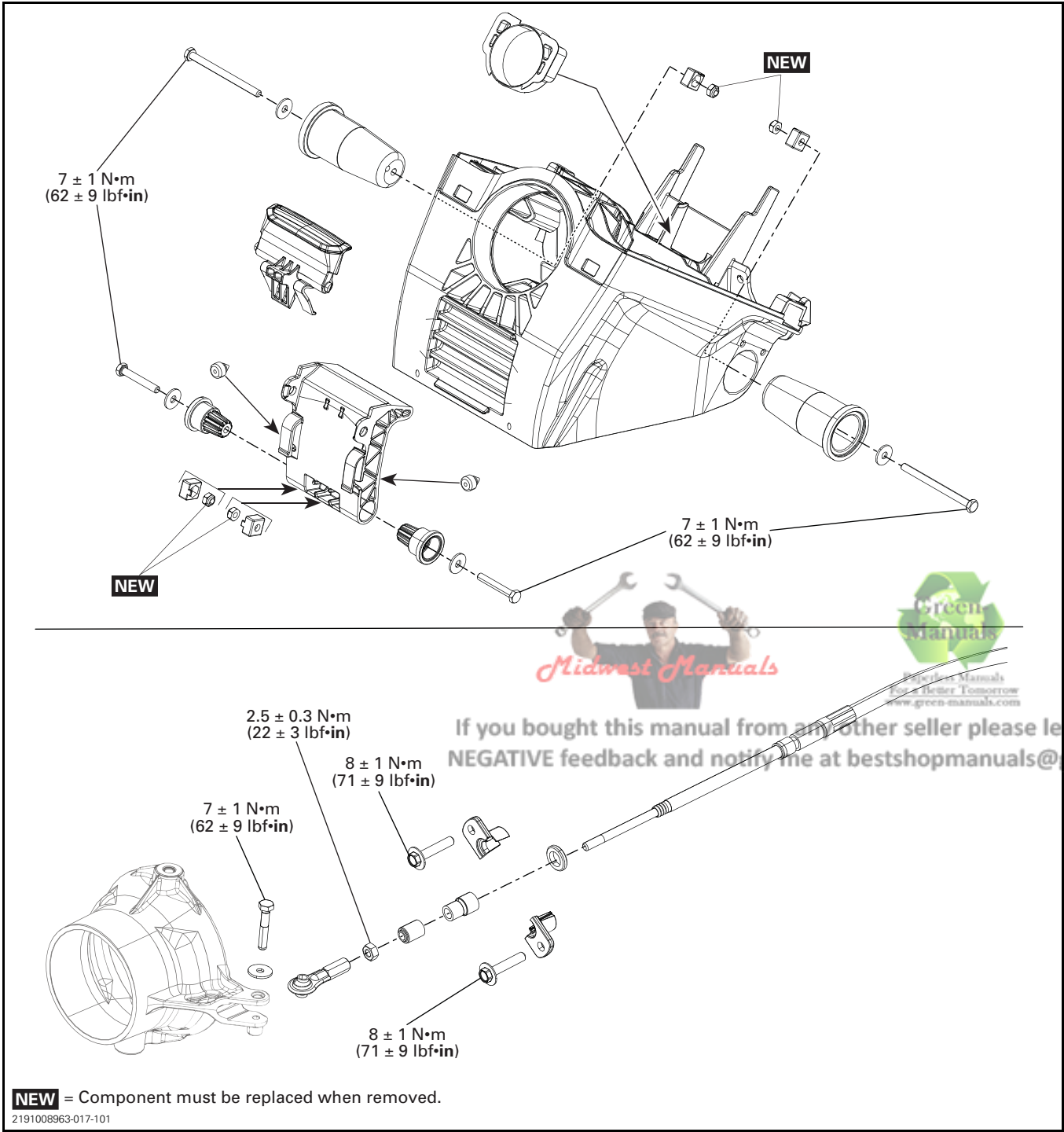
INPUT VOLTAGE TEST AT VEHICLE CONNECTOR		
PROBE		VOLTAGE
Pin 2 (Hot with main relay on)	Pin 3 (Permanent ground)	Battery voltage



VEHICLE CONNECTOR PIN-OUT

Repair wiring and/or connectors as required.
For further information, troubleshooting and diagnostic, refer to the sonar manufacturer.

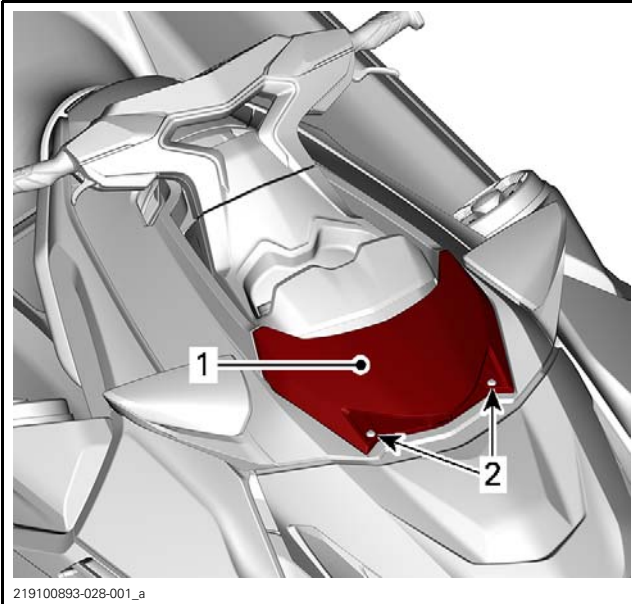
STEERING COLUMN SUPPORT AND CABLE



ADJUSTMENT

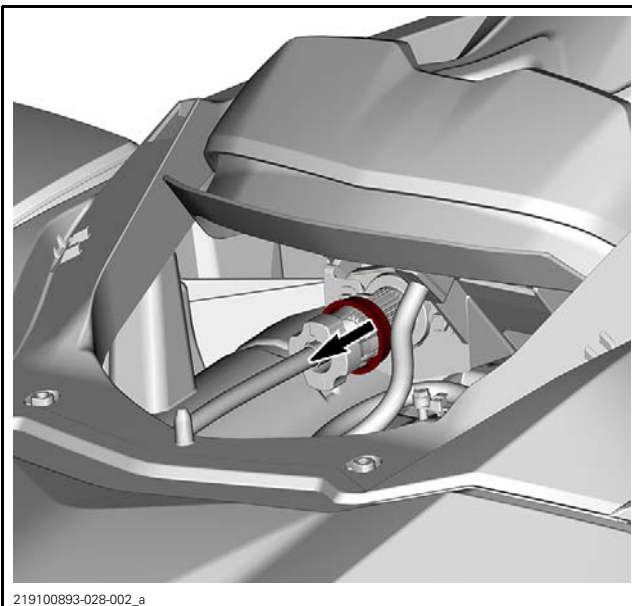
ADJUSTING THE ALIGNMENT OF THE STEERING

Remove the top cover.

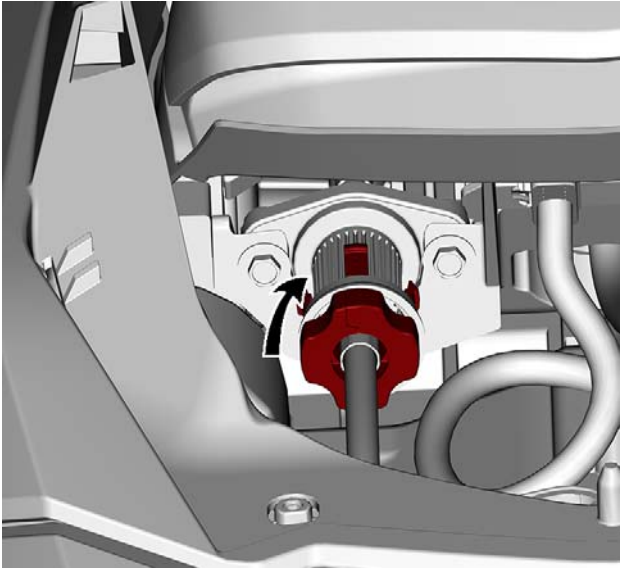
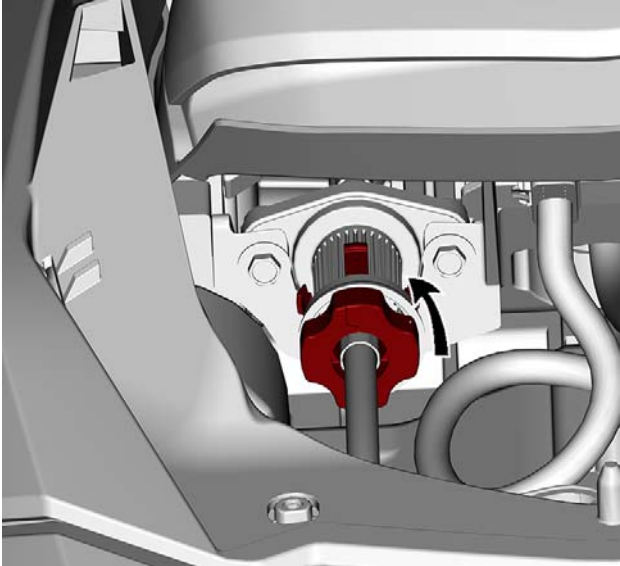


1. Top cover
2. Top cover retaining crews

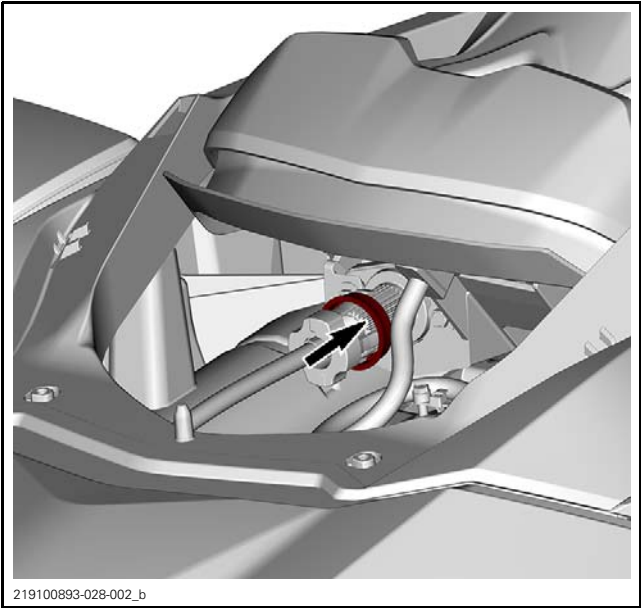
1. Slide the cable lock toward the front of watercraft.



2. Turn adjustment 1 turn at a time in the direction shown in following table.

WATERCRAFT BEHAVIOR	WHAT TO DO
Pulls on left side	Turn steering cable adjustment nut as shown 
Pulls on right side	Turn steering cable adjustment nut as shown 

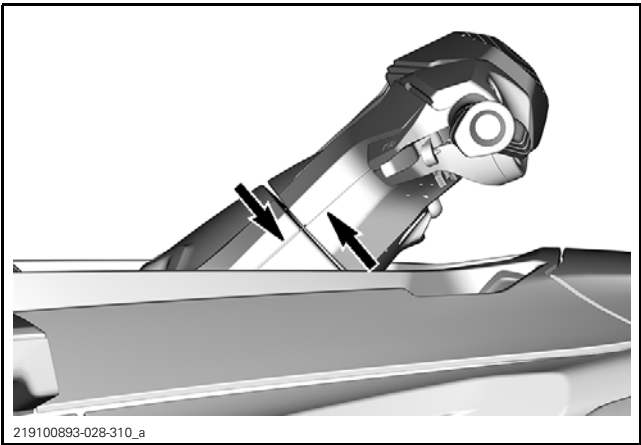
3. Slide back the cable lock in place.



- 4. Test watercraft.
- 5. Readjust as necessary.
- 6. Reinstall the top cover.

TIGHTENING TORQUE	
Top cover screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

NOTE: It is a good starting point to align body lines when replacing the steering cable.



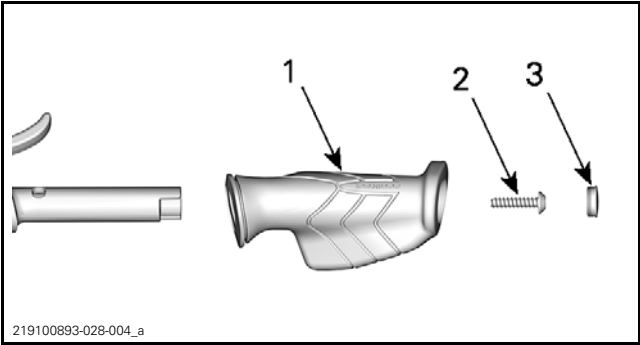
PROCEDURES

HANDLEBAR GRIP

Removing the Handlebar Grip

To remove handlebar grip, remove the cap, then the retaining screw.

Pull out handlebar from handlebar.



- 1. Handlebar grip
- 2. Handlebar grip screw
- 3. Handlebar grip cap

Installing the Handlebar Grip

Install handlebar grip on handlebar matching it to the notch in the handlebar.

Apply blue Loctite on screw threads (or use new self-locking screws).

SERVICE PRODUCT
LOCTITE 243 (BLUE) (P/N 293 800 060)

Install handlebar grip screw.
Torque handlebar grip screw to specification.

TIGHTENING TORQUE	
Handlebar grip screw	4 N•m ± 0.5 N•m (35 lbf•in ± 4 lbf•in)

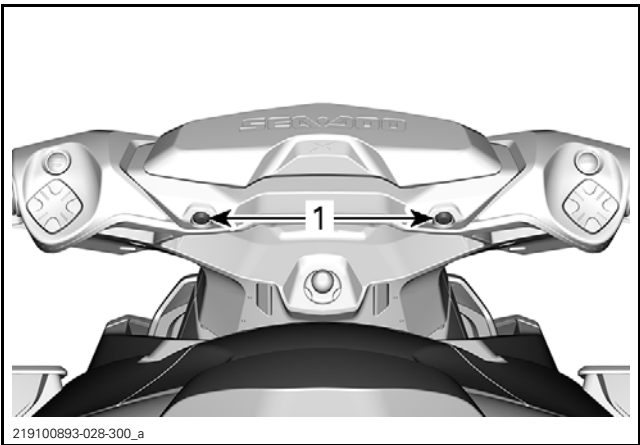
Install cap.

**HANDLEBAR SWITCH COVER
(LH OR RH)**

**Removing the Handlebar Switch Cover
(LH or RH)**

On RXT-X models

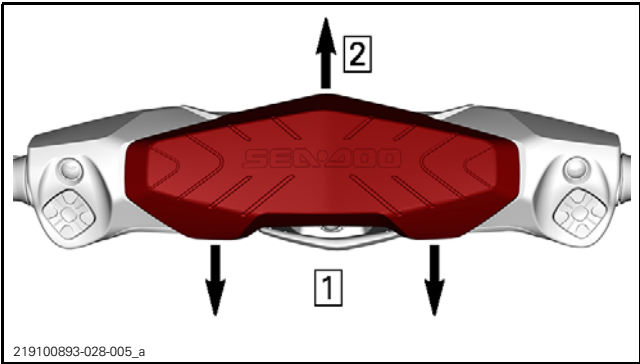
- 1. Remove retaining screws.



Subsection XX (STEERING)

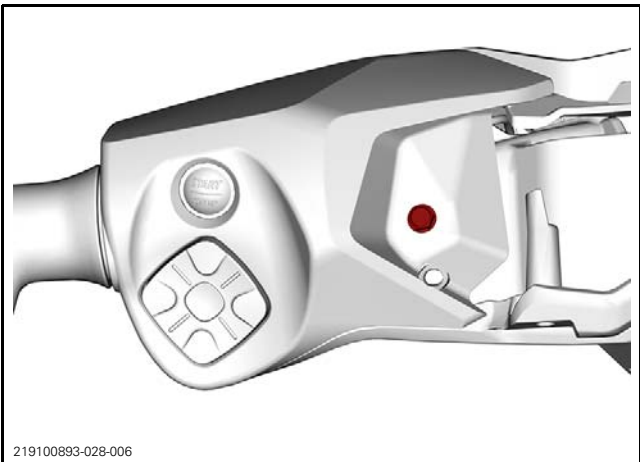
On all models

2. Remove steering pad by pulling the bottom first and then the top.



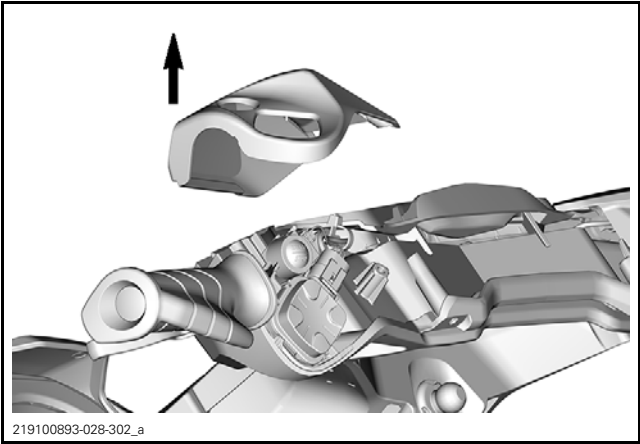
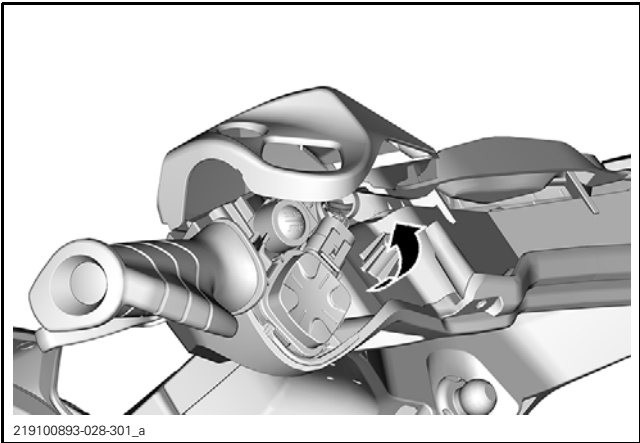
TYPICAL

3. Remove the switch cover retaining screw.



LH SIDE SHOWN

4. Remove the switch cover.



Installing the Handlebar Switch Cover (LH or RH)

Installation is the reverse of the removal procedure. However, pay attention to the following.

1. Route wires to avoid pinching them.
2. Position the switch cover onto the steering cover.
3. Ensure positioning of steering electrical harness.
4. Ensure proper engagement of the upper housing and cover tabs.
5. Ensure proper engagement of upper and lower switch covers.
6. Tighten housing cover screw to specification.

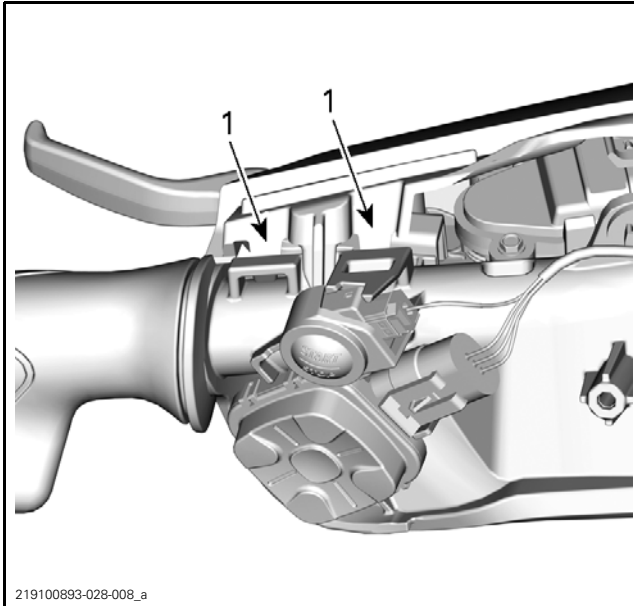
TIGHTENING TORQUE	
Housing cover screw	2.5 N•m ± 0.5 N•m (22 lbf•in ± 4 lbf•in)
Steering pad retaining screw (RXT-X)	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

STEERING COVER

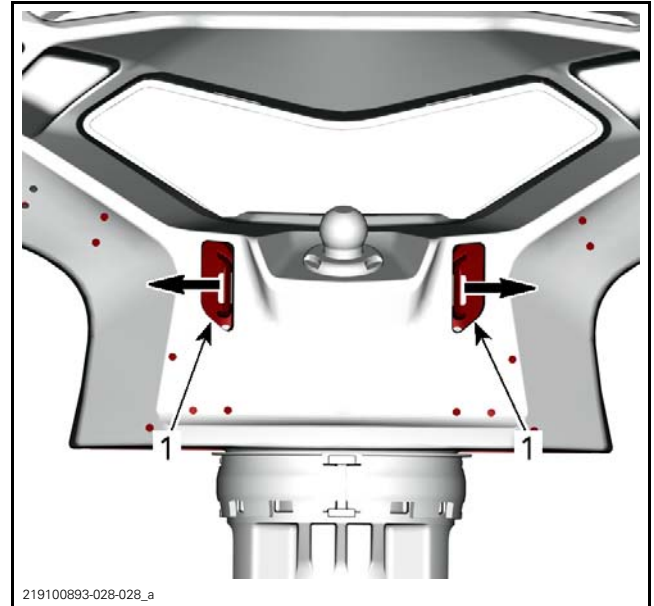
Removing the Steering Cover

1. Remove steering pad and both handlebar switch covers. See procedure in this subsection.
2. Unlock steering cover from steering.
 - 2.1 Insert a small tool, such as a small flat screwdriver, into a steering cover hole. Press the tool against the retaining tab to unlock it. Repeat for the other side.

NOTICE The tool must be inserted perfectly straight to avoid breaking the tab holder.

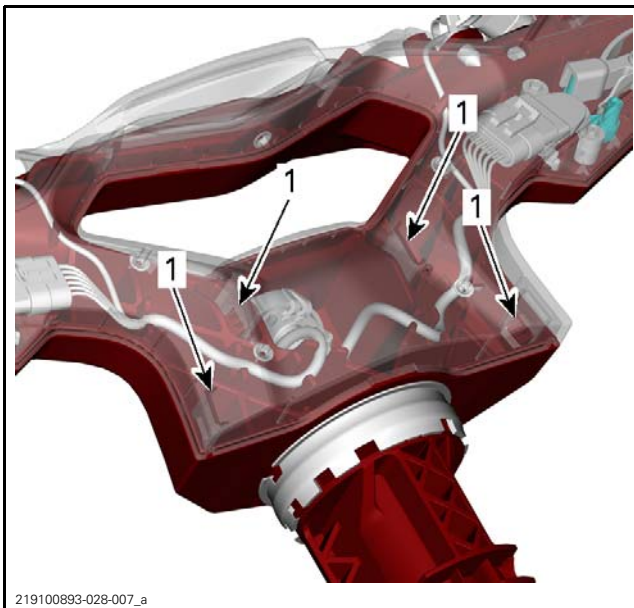


1. Retaining tab

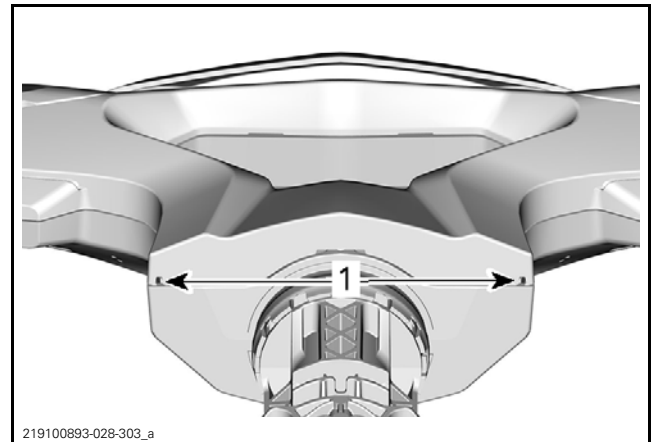


VIEWED FROM UNDERNEATH

1. Rear cavity



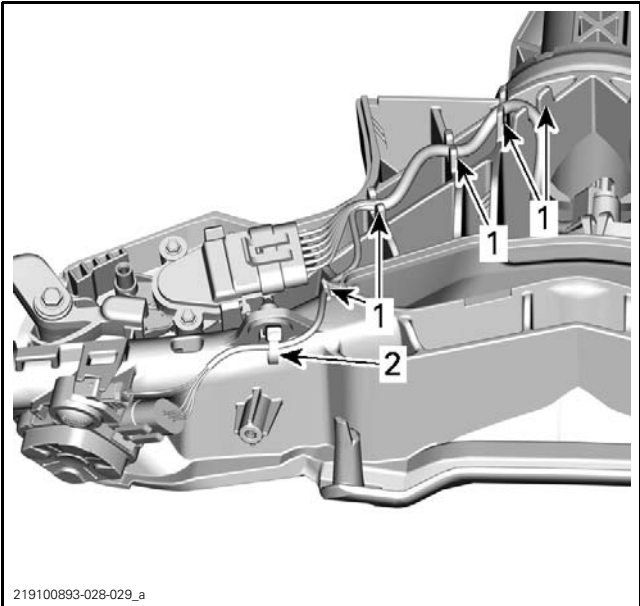
1. Retaining tab



Installing the Steering Cover

1. Make sure all harnesses are routed properly into their positioning slots and are away from the outer edges. This will ensure the wires will not get pinched.

- 2.2 In both cavities under the steering cover, release both inner retaining tabs using a long screwdriver.

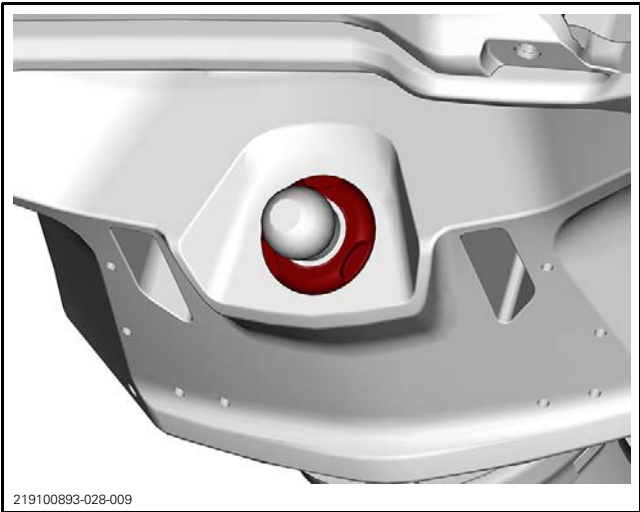


- 1. Harness slots
 - 2. Locking tie
2. Clip the top of the cover.
 3. Push both side of the cover to lock it with the steering column.
 4. Install switch covers.

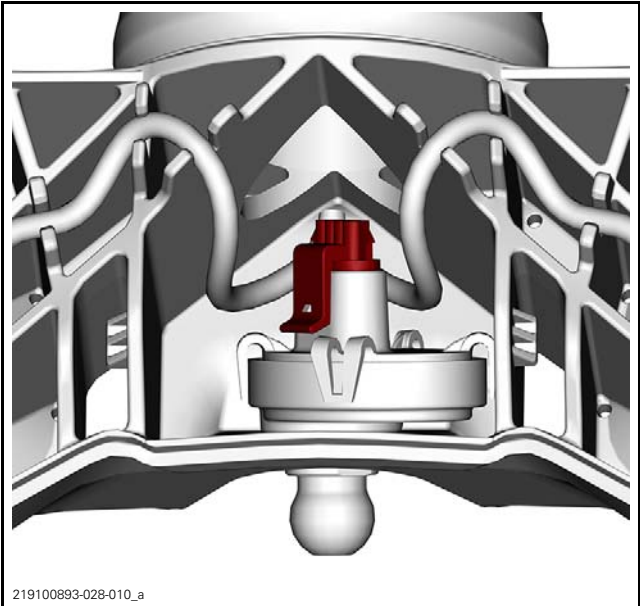
REPLACING THE ENGINE CUT-OFF SWITCH

Remove steering pad, see procedure in this subsection.

Remove cut-off switch nut.

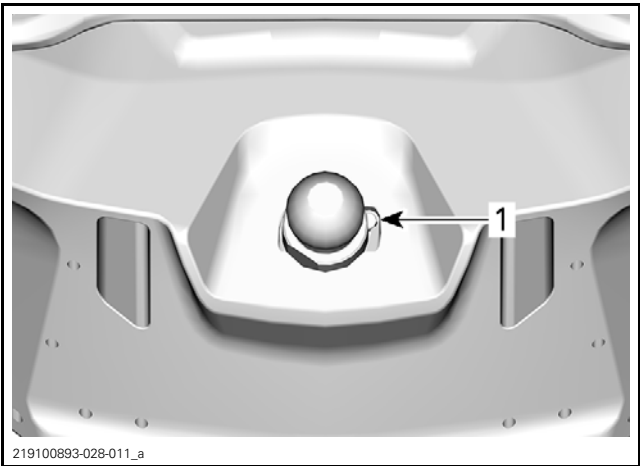


Disconnect cut-off switch connector.



Push cut-off switch out of the steering column.

Install the engine cut-off switch by aligning the alignment pin into the notch of steering column.



- 1. Alignment pin

Connect and install all removed parts using appropriate procedures.

TIGHTENING TORQUE	
Engine cut-off switch nut	2 N•m (18 lbf•in)

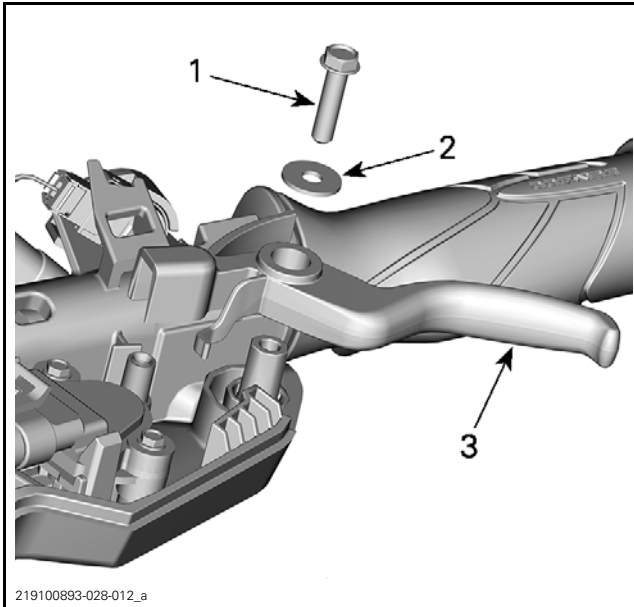
THROTTLE AND iBR LEVERS

NOTE: The following procedure demonstrates the replacement of the throttle lever but the same procedure will be used for the iBR lever.

Replacing the Lever

1. Remove *STEERING COVER*, see procedure in this subsection.

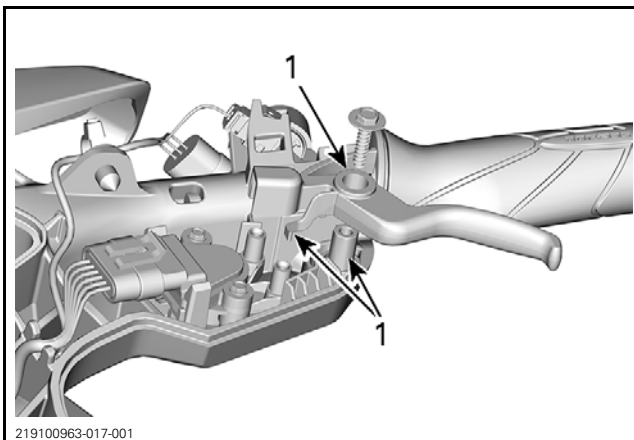
2. Remove the screw and washer securing throttle lever.
3. Remove throttle lever.



1. Retaining screw
2. Washer
3. Throttle lever

4. Clean throttle lever area from dust or any deposits.
5. Apply grease on pivot and the outer surface of the return tab.

SERVICE PRODUCT	
Scandinavia	SYNTHETIC GREASE (EUR) (P/N 779231)
All other countries	SYNTHETIC GREASE (P/N 779162)



1. Apply grease here

6. Install the lever.
 - 6.1 Install lever on pivot.

- 6.2 Insert sensor lever end into throttle lever fork.
- 6.3 Position the return tab against the handlebar.
- 6.4 Secure the lever with washer and screw.

TIGHTENING TORQUE	
Lever screw	1 N•m ± 0.2 N•m (9 lbf•in ± 2 lbf•in)

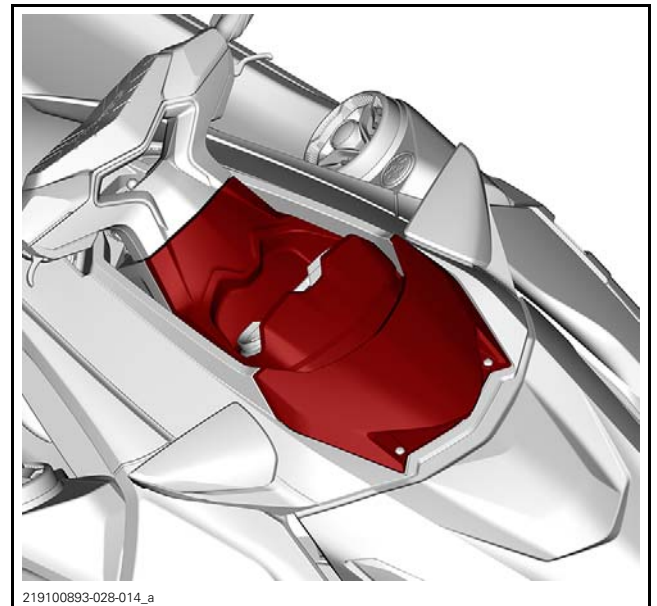
7. Reinstall all removed parts using appropriate procedures.

STEERING CABLE

Replacing the Steering Cable

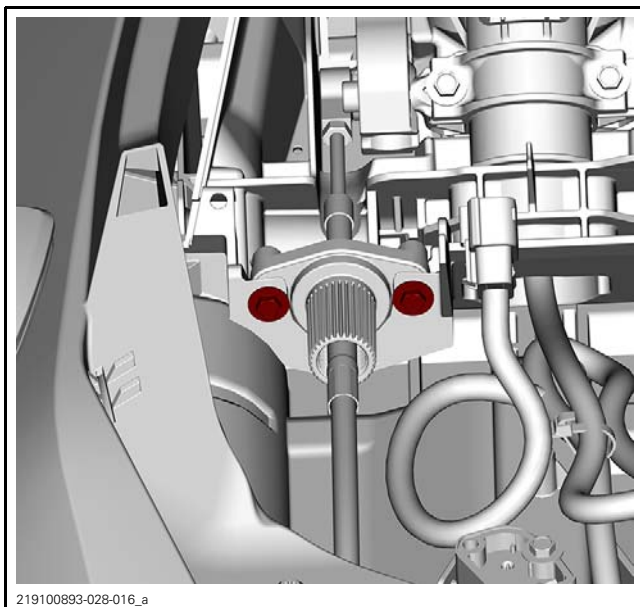
Remove the seat and top cover.

Remove the gauge support. Refer to *INFORMATION CENTER* subsection.

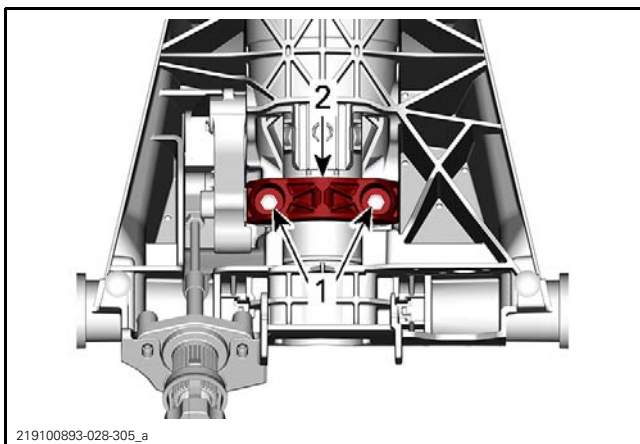


1. Detach steering cable from steering column.
 - 1.1 Remove the steering cable support screws.

Subsection XX (STEERING)

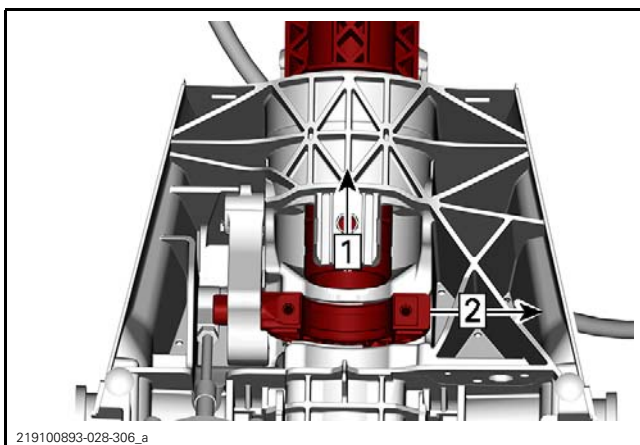


- 1.2 Remove the steering column upper steering arm by removing the screws.



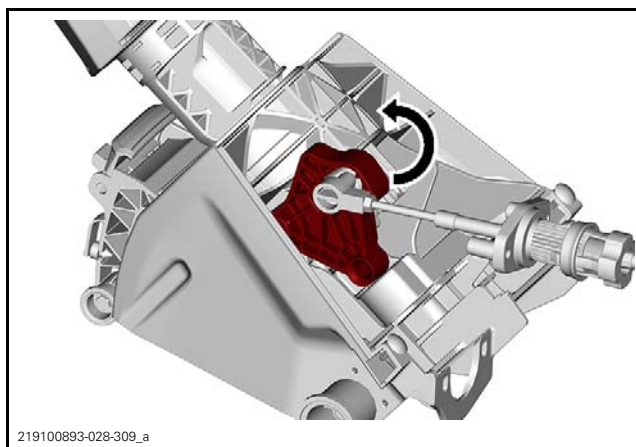
1. C-clamp retaining screws

- 1.3 Pull on steering column upward enough to remove the lower steering arm.

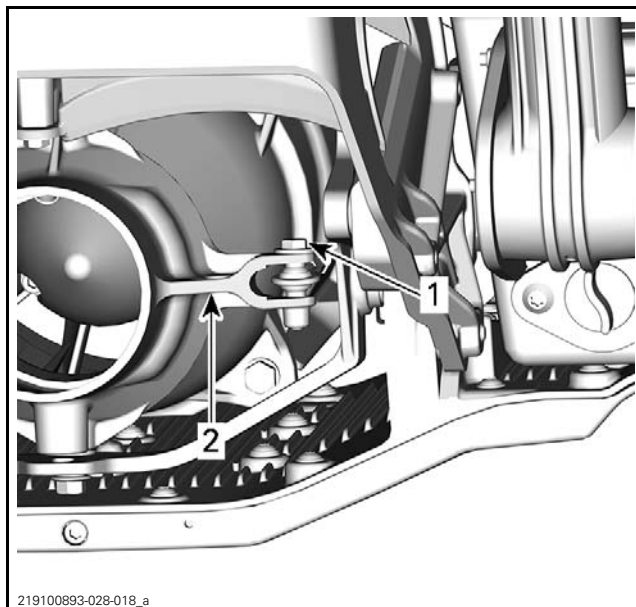


1. Lift steering column
2. Slide lower

- 1.4 Slide out the cable from the steering arm. Access can be improved by lifting the steering lever.

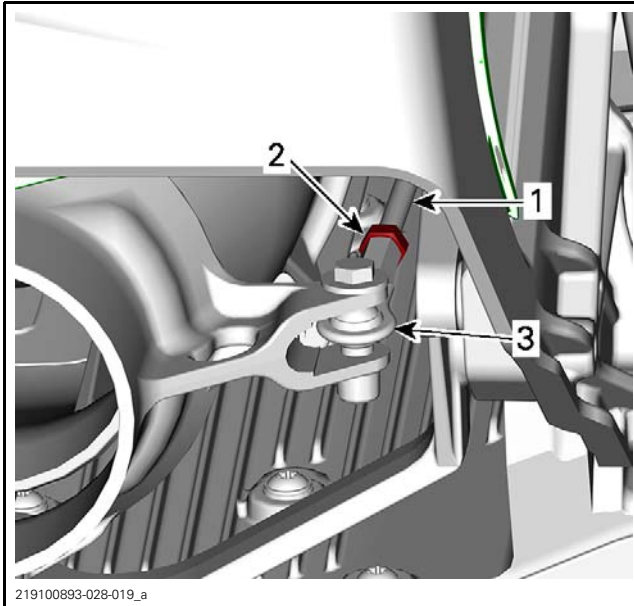


2. At rear of the watercraft, disconnect ball joint from jet pump nozzle arm.



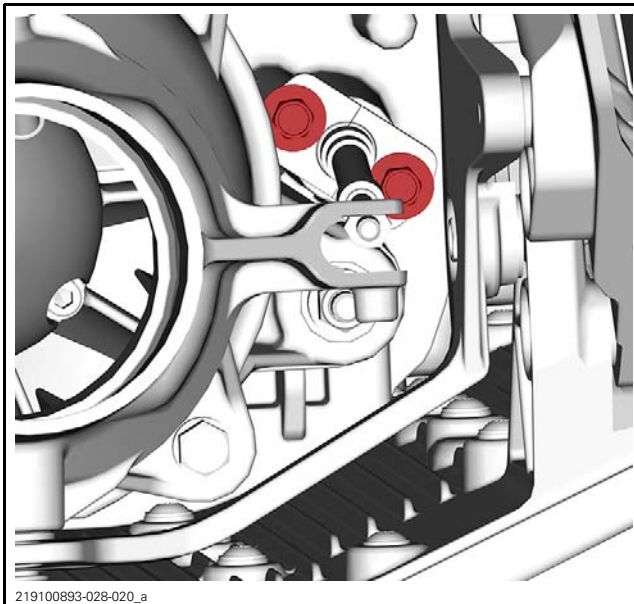
1. Steering cable bolt
2. Nozzle arm

3. Remove ball joint and jam nut from cable.

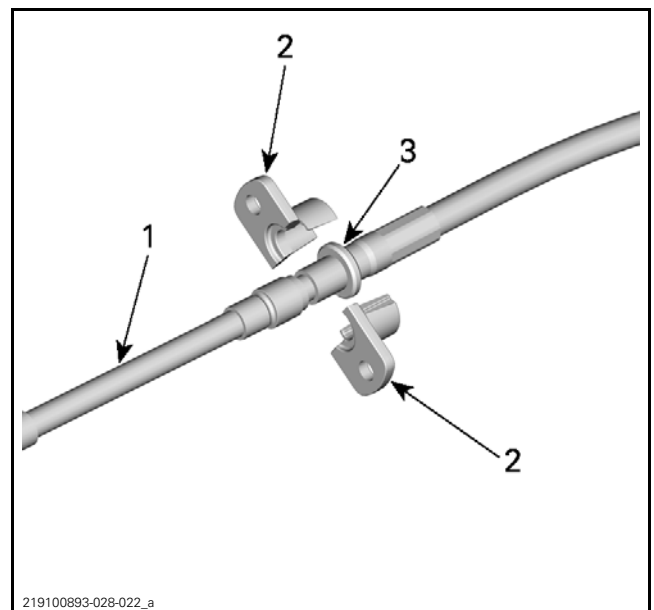
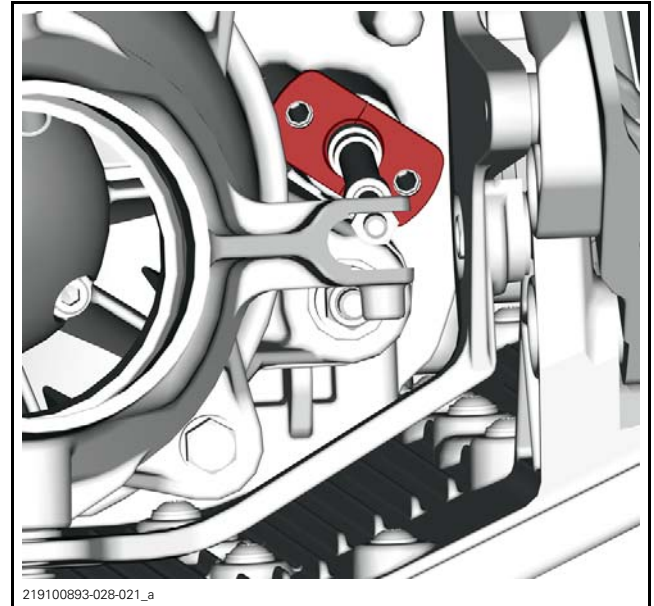


1. Steering cable
2. Jam nut
3. Ball joint

4. Remove half-rings retaining screws.



5. Pull the cable assembly to remove the half-rings and O-ring.



1. Steering cable
2. Half ring
3. O ring

6. Remove the adjusting nut from the new steering cable.

7. From inside the hull, pull the aft end of the cable through the hull fitting.

8. Using a piece of hose, attach one end of the new cable to the opposite end of the old cable together.

9. Route the new cable in the hull by slowly pulling the old one, then separate cable ends.

10. From inside of the hull, pass the aft end of the cable through the hull fitting.

11. Secure the steering cable to the hull fitting.

11.1 Install O-ring and half rings.

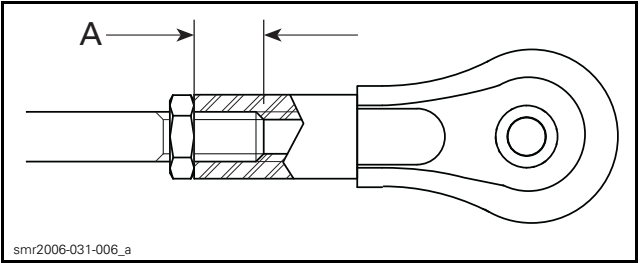
Subsection XX (STEERING)

11.2 Tighten the half-rings retaining screws to specification.

TIGHTENING TORQUE	
Half-rings retaining screws	8 N•m ± 1 N•m (71 lbf•in ± 9 lbf•in)

12. Install the ball joint on the end of the steering cable.

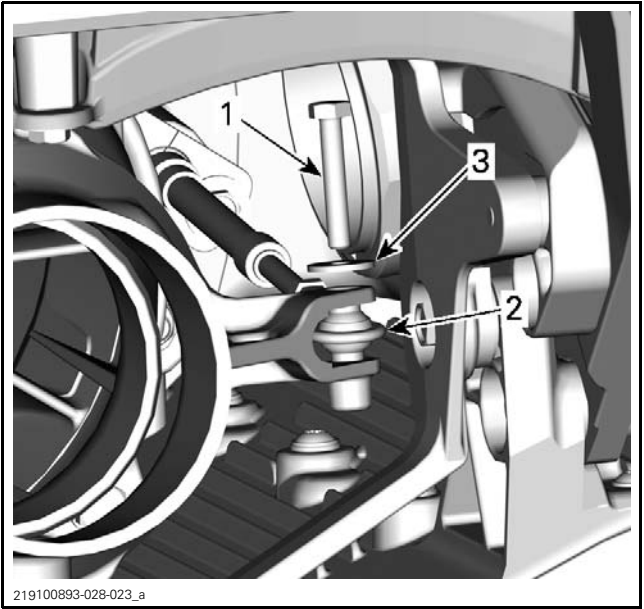
12.1 The threaded portion of steering cable inserted into ball joint should be within 9 mm ± 1 mm (.354 in ± .039 in).



A. 9 mm ± 1 mm (.354 in ± .039 in)

12.2 Tighten jam nut to specification.

12.3 Position the steering cable ball joint to the nozzle as per following illustration.



- 1. Ball joint bolt
- 2. Ball joint
- 3. Washer

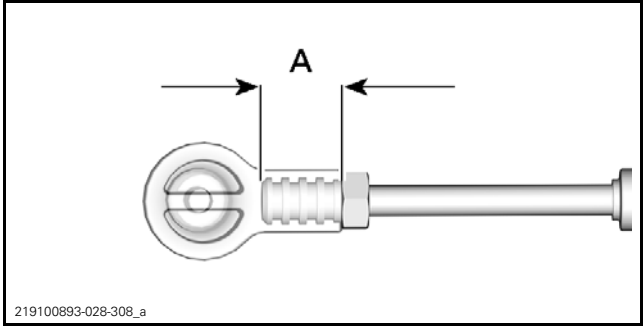
TIGHTENING TORQUE	
Ball joint jam nut	2.5 N•m ± 0.3 N•m (22 lbf•in ± 3 lbf•in)
Ball joint bolt	7 N•m ± 1 N•m (62 lbf•in ± 9 lbf•in)

The installation of the steering cable to the steering column is the reverse of the removal procedure. However, pay attention to the following.

TIGHTENING TORQUE	
Cable support retaining screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

Carry out *ADJUSTING THE ALIGNMENT OF THE STEERING*. See procedure in this subsection.

The threaded portion of steering cable inserted into the end fitting should be 9 mm ± 1 mm (.354 in ± .039 in).

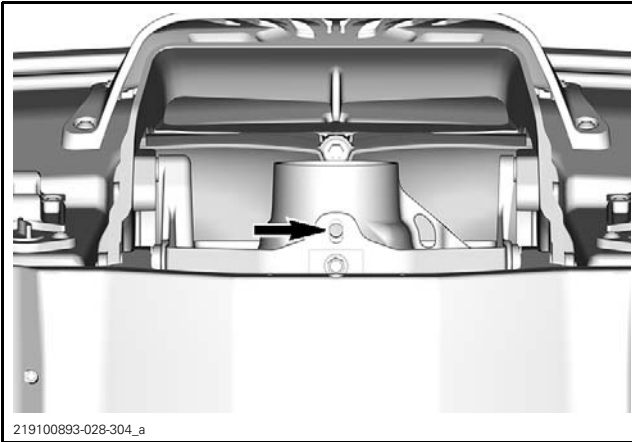


A. 9 mm ± 1 mm (.354 in ± .039 in)

Install all removed parts using appropriate procedure.

Adjusting the Steering Cable

- 1. 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.
- 2. Lock the jet pump nozzle position by installing a 10 mm (3/8 in) rod through the trimming ring as the following illustration.



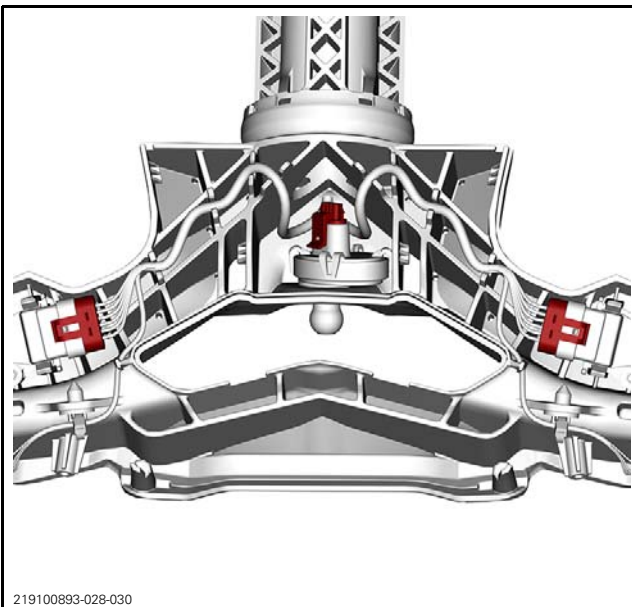
VIEWD FROM UNDERSIDE

3. Adjust steering cable as described in *STEERING ALIGNMENT* in this subsection.

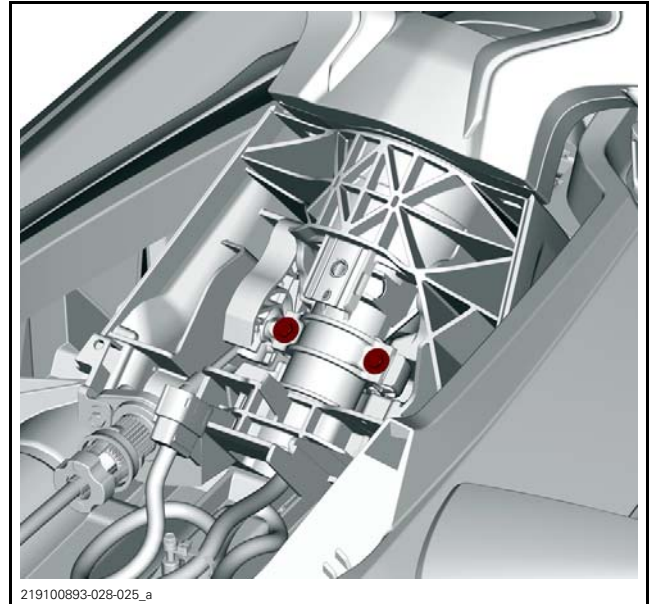
STEERING COLUMN

Removing the Steering Column

1. Remove the top cover and the gauge support, Refer to *BODY* subsection.
2. Remove the steering cover.
3. Disconnect both iBR and throttle connectors and engine cut off switch connector.



4. Remove both screws securing the steering column arm and clamp.



1. Steering column screws

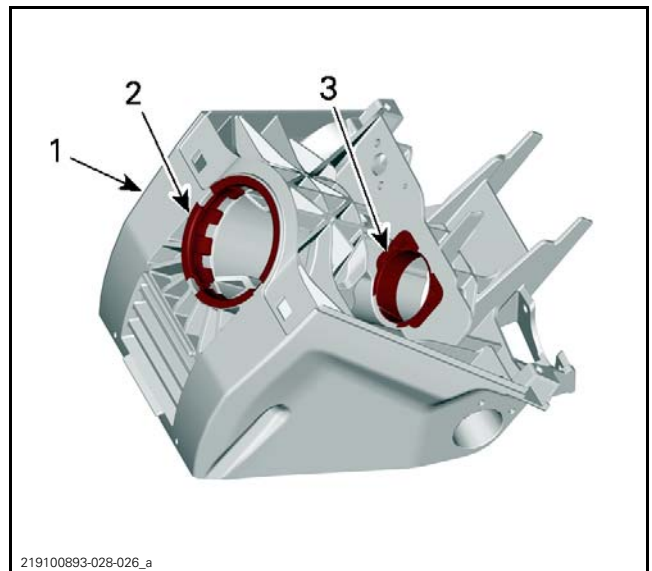
5. Pull steering column out of its support.

Inspecting the Steering Column

Check steering column for:

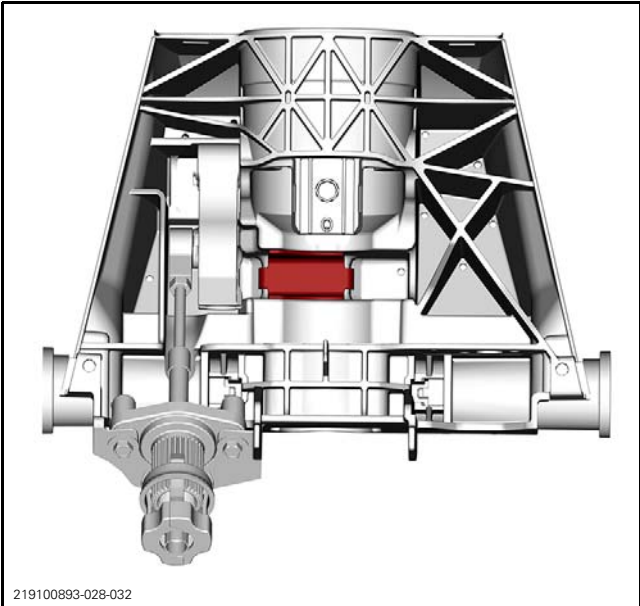
- Cracks
- Stress marks
- Signs of wear.

Check steering column support bushings.



1. Steering column support
2. Upper bushing
3. Lower bushing

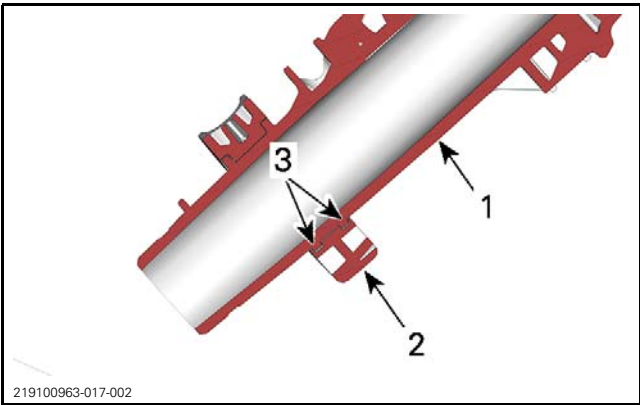
Check wear sleeve behind the steering column arm.



Replace any damaged or worn parts.

Installing the Steering Column

The installation is the reverse of the removal procedure. However, pay attention to the following. Carefully, drive steering column through steering column support. Make sure the locating grooves of the steering column arm are properly engaged in the steering column as shown.



- 1. Steering column
- 2. Steering arm
- 3. Locating grooves

Tighten steering column arm screws to specifications.

TIGHTENING TORQUE	
Steering column arm screws	14 N•m ± 1 N•m (124 lbf•in ± 9 lbf•in)

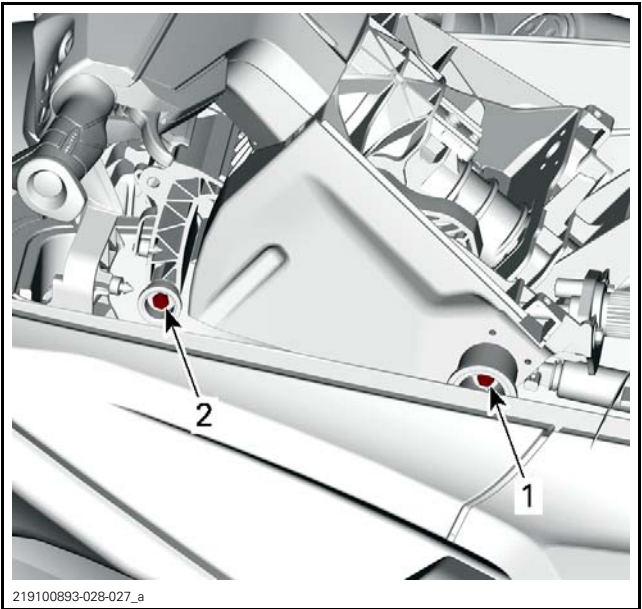
NOTICE Ensure the head of the screws touches the upper steering arm.

Ensure the steering system is working properly by turning side to side. Reinstall all removed parts using appropriate procedure.

STEERING COLUMN SUPPORT

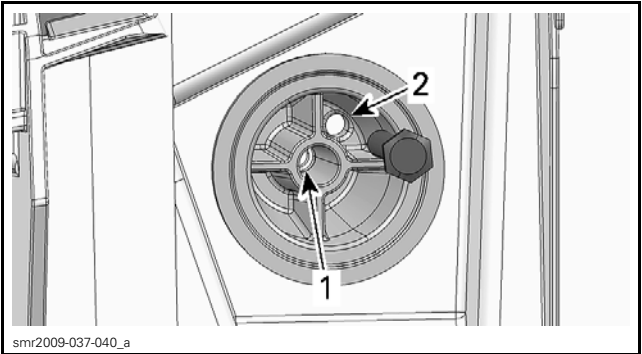
Removing the Steering Column Support

- 1. Remove steering column, refer to *REMOVING THE STEERING COLUMN* in this subsection.
- 2. On each sides, remove both pivot bushings.



- PARTS REMOVED FOR CLARITY
- 1. Pivot bushing of steering column support
 - 2. Pivot bushing of steering adjustment handle

If pivot bushings retaining steering column are hard to remove, remove the retaining screw from the center hole and tighten it into the offset hole. Tighten screw until the pivot bushing comes out of steering column support.



- 1. Center hole
- 2. Offset hole

3. Remove steering column support and steering adjustment handle from vehicle.

Installing the Steering Column Support

The installation is the reverse of the removal procedure.

STEERING TILT RELEASE HANDLE

Replacing the Steering Tilt Release Handle

Use the same procedure as for *STEERING COLUMN SUPPORT*.

JET PUMP

SERVICE TOOLS

Description	Part Number	Page
IMPELLER REMOVER/INSTALLER.....	529 035 956	9, 11, 16
IMPELLER SHAFT BEARING TOOL	529 036 168	13-14
IMPELLER SHAFT PUSHER.....	529 035 955	12, 14
PRESSURE CAP	529 036 283	4
PUMP PLATE.....	529 036 224	5
VACUUM/PRESSURE PUMP	529 021 800	4

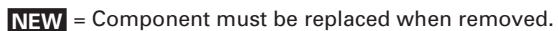


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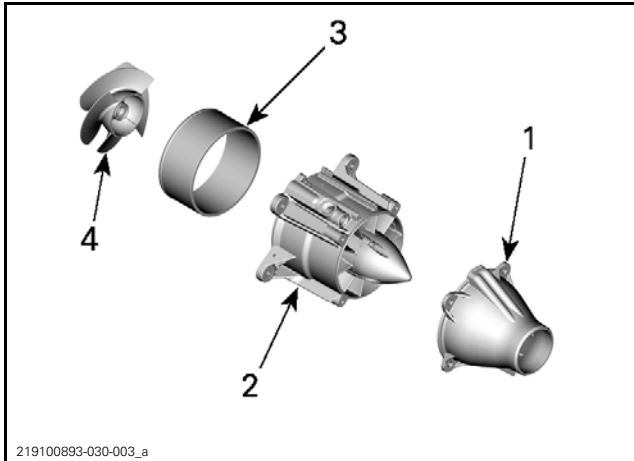
Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1.....	779244	6
JET PUMP BEARING GREASE	293 550 032	8, 14, 17
LOCTITE 243 (BLUE).....	293 800 060	12
LOCTITE 438	296 000 424	11
LOCTITE 518	293 800 038	6
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	10
LUBRICANT AND ANTI-CORROSIVE (EUR)	779224	7, 10
LUBRICANT AND ANTI-CORROSIVE.....	779168	7, 10
TRIPLE-GUARD GREASE	508298	6-7, 11



219100963-012-100

GENERAL

JET PUMP MAIN COMPONENTS

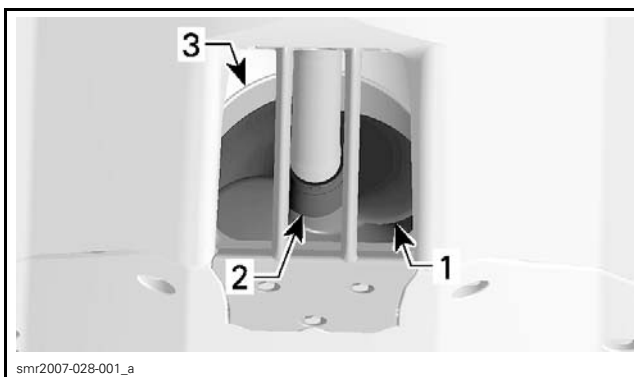


1. Venturi
2. Jet pump housing
3. Wear ring
4. Impeller

INSPECTION

IMPELLER CONDITION

Condition of impeller, impeller boot and wear ring can be quickly checked from underneath the watercraft. With the vehicle on the trailer, use a flashlight to visually inspect them through the inlet grate.



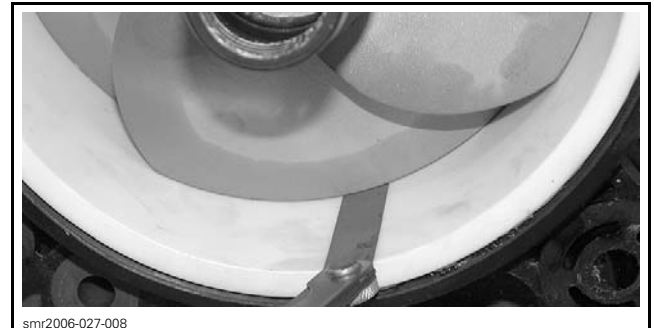
TYPICAL — UNDERNEATH HULL

1. Impeller
2. Impeller boot
3. Wear ring

IMPELLER/WEAR RING CLEARANCE

This clearance is critical for jet pump performance. To check clearance, remove jet pump.

Using a feeler gauge, measure clearance between impeller blade tip and wear ring. Measure each blade at its center.



MODEL	MAXIMUM WEAR CLEARANCE
All models	0.35 mm (.014 in)

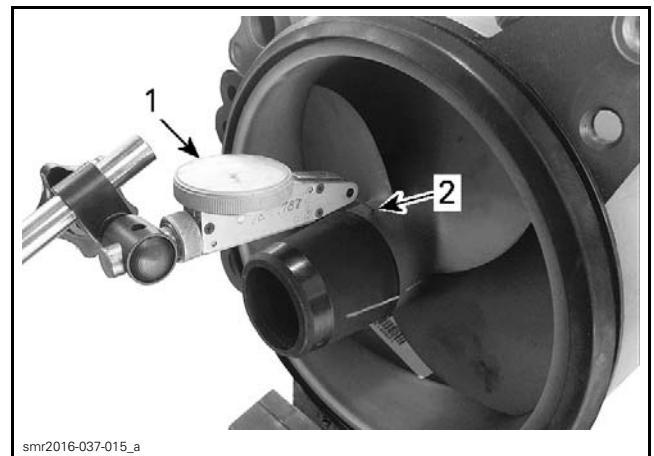
IMPELLER SHAFT RADIAL PLAY

Radial play is critical for jet pump life span.

To check radial play, remove jet pump.

Make sure impeller shaft turns freely and smoothly.

1. Retain housing in a soft jaw vise making sure not to damage housing lug.
2. Set a dial gauge and position its tip onto metal end, close to the end of the impeller hub.
3. Move shaft end up and down. Difference between highest and lowest dial gauge reading is radial play.



TYPICAL — MEASURING IMPELLER SHAFT RADIAL PLAY

1. Dial gauge
2. Measure close to impeller hub end

RADIAL PLAY
0.5 mm (.02 in)

Subsection XX (JET PUMP)

Excessive play can come either from worn bearing or damaged jet pump housing bearing surface.

LEAK TEST

Whenever performing any type of repair on the jet pump, a leak test should be carry out.

Proceed as follows:

- 1. Remove impeller cover. Refer to *IMPELLER COVER* in this subsection.
- 2. Install the pressure cap on pump housing.

REQUIRED TOOLS	
PRESSURE CAP (P/N 529 036 283)	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	

- 3. Connect the vacuum/pressure pump to the pressure cap fitting.



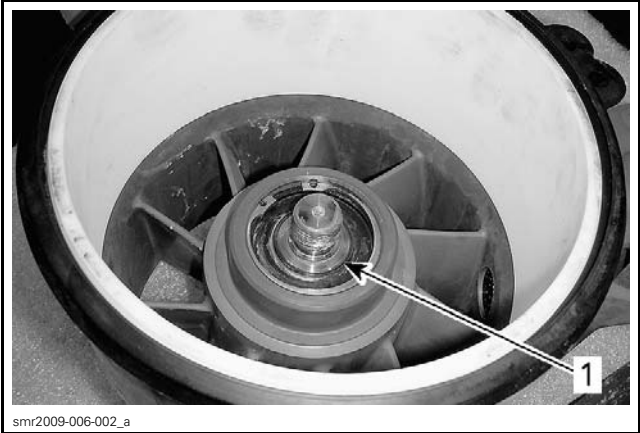
TYPICAL

- 4. Pressurize pump.

LEAK TEST PRESSURE
Maximum 70 kPa (10 PSI)

- 5. Pump must maintain this pressure for at least 5 minutes.

NOTE: Only 2 or 3 bubbles coming out from the seal on the impeller side is acceptable. Leaks from other areas must be repaired.



TYPICAL

- 1. Small leak here is acceptable

NOTICE Repair any leak. Failure to correct a leak will lead to premature wear of pump components.

- 6. Disconnect pump and remove pressure cap.
- 7. Reinstall impeller cover. Refer to *IMPELLER COVER* in this subsection.

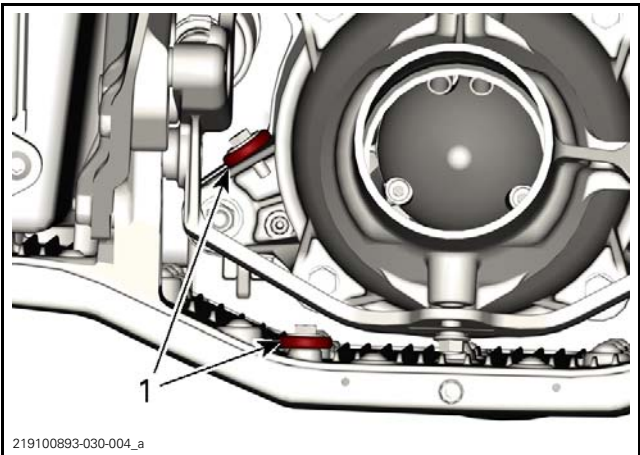
PROCEDURES

NOTE: Whenever removing a part, visually check for damage such as: corrosion, cracks, split, break, porosity, cavitation, deformation, distortion, heating discoloration, wear pattern, defective plating, missing or broken balls in ball bearing, water damage diagnosed by black-colored spots on metal parts, etc. Replace any damaged parts. As a quick check, manually feel clearance and end play, where applicable, to detect excessive wear.

SACRIFICIAL ANODES

Inspecting the Sacrificial Anodes

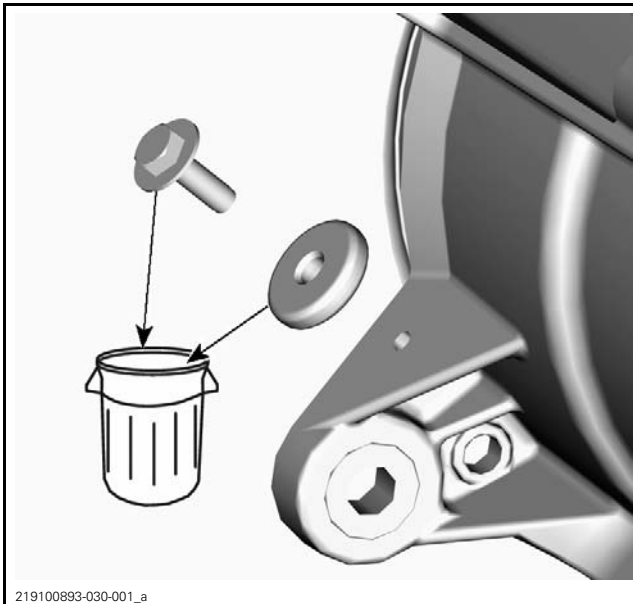
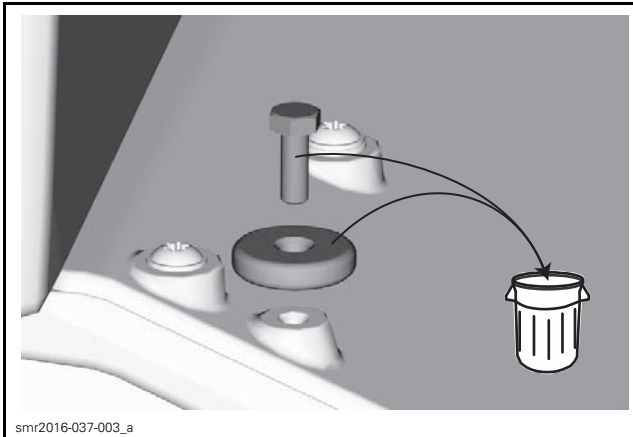
Check for wear. If worn more than half, replace anode.



- 1. Sacrificial anode location

Removing the Sacrificial Anode

Remove and discard screw and anode.



Installing the Sacrificial Anode

Installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Sacrificial anode screw	8 N•m ± 1 N•m (71 lbf•in ± 9 lbf•in)

VENTURI

Removing the Venturi

1. Remove the iBR gate, VTS trim ring and nozzle. Refer to *iBR, REVERSE AND VTS* subsection.
2. Remove the venturi from the jet pump housing.

Installing the Venturi

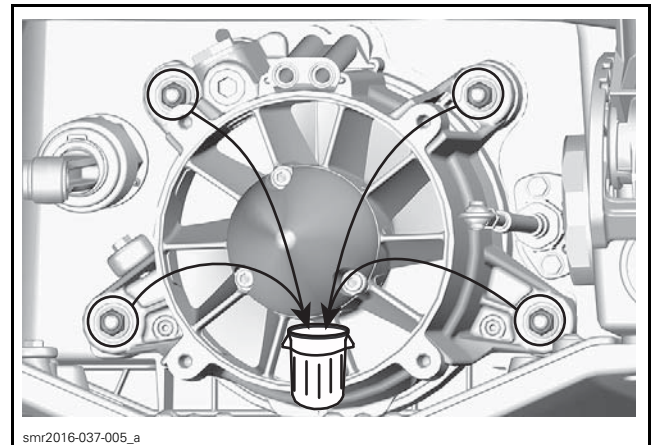
The installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Venturi retaining screw	25 N•m ± 1 N•m (18 lbf•ft ± 1 lbf•ft)

JET PUMP HOUSING

Removing the Jet Pump Housing

1. Remove the iBR gate, VTS trim ring and nozzle. Refer to *iBR, REVERSE AND VTS* subsection.
2. Remove the venturi.
3. Remove and discard the nuts that retain the jet pump to the pump support.



4. Pull back jet pump housing to remove it from the pump support. It may be necessary to wiggle it slightly as you pull back on the pump.

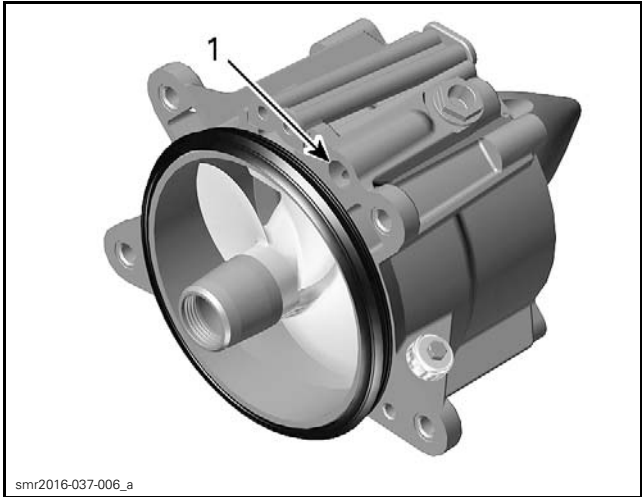
Temporarily fasten the engine alignment plate to pump support to support drive shaft and avoid PTO oil seal damage.

REQUIRED TOOLS	
PUMP PLATE (P/N 529 036 224)	

Inspecting and Cleaning the Jet Pump Housing

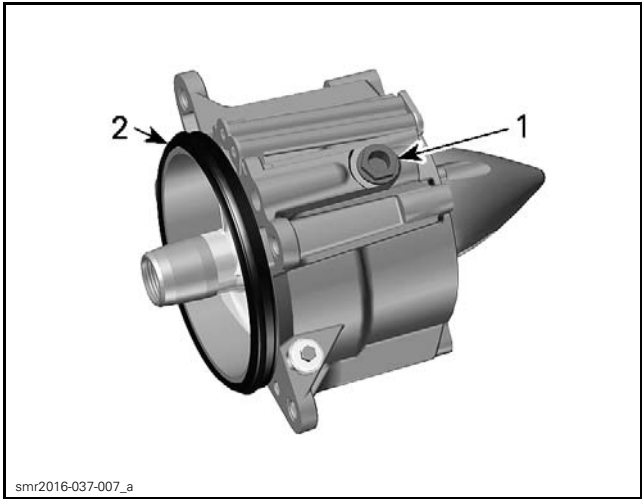
1. Visually inspect jet pump housing. Pay attention to the stator. Ensure the assembly is clean and free of any debris and defects. Do the following as applicable.
2. Blow low pressure compressed air through the pressure outlet fitting and make sure it is clear.

Subsection XX (JET PUMP)



1. Pressure outlet

- 3. Ensure cap screw is tight.
- 4. Ensure the neoprene seal is in good condition. Replace as required.



1. Cap screw
2. Neoprene seal

Installing the Jet Pump Housing

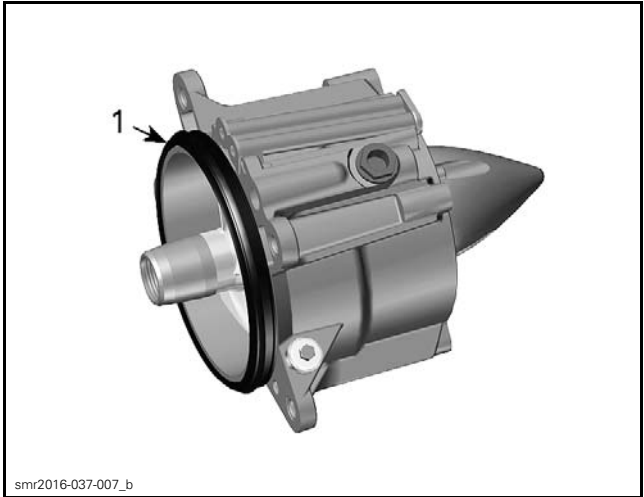
The installation is the reverse of the removal procedure. However, pay attention to the following. Clean impeller splines and drive shaft splines with Clutch and pulley flange cleaner or equivalent. Splines must be free of any residue.

NOTICE To avoid damaging the drive shaft finish, never use a metallic brush.

Lubricate drive shaft splines, impeller splines and the inside of the impeller boot with grease.

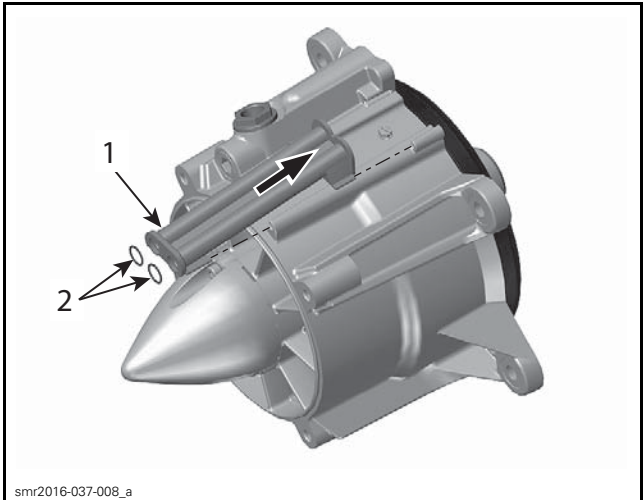
SERVICE PRODUCTS
CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)
TRIPLE-GUARD GREASE (P/N 508298)

Ensure the neoprene seal is properly installed on the jet pump.



1. Neoprene seal

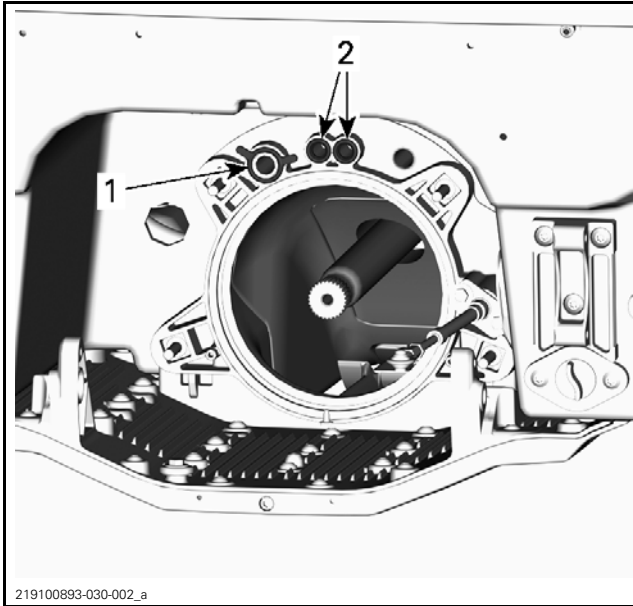
Install new O-rings then slide water outlet adapter onto pump.



1. Slide adapter onto pump
2. New O-rings here

Install new O-rings on pump support. Apply a thin layer of Loctite on the rounded portion of the O-rings to hold it against the support.

SERVICE PRODUCTS
LOCTITE 518 (P/N 293 800 038)



1. Install new O-rings
2. O-rings (with tabs)

Generously apply grease on drive shaft splines.

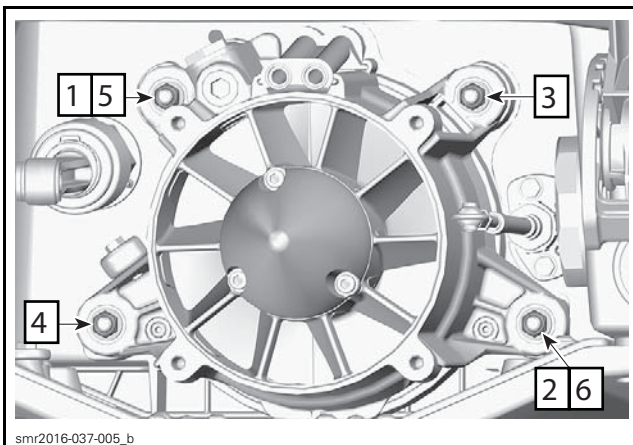
SERVICE PRODUCTS	
TRIPLE-GUARD GREASE (P/N 508298)	

Install jet pump.

NOTE: If necessary, wiggle jet pump to engage drive shaft splines in impeller.

Install new nuts and tighten as per table and the illustrated sequence.

TIGHTENING TORQUE	
Jet pump nuts	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)



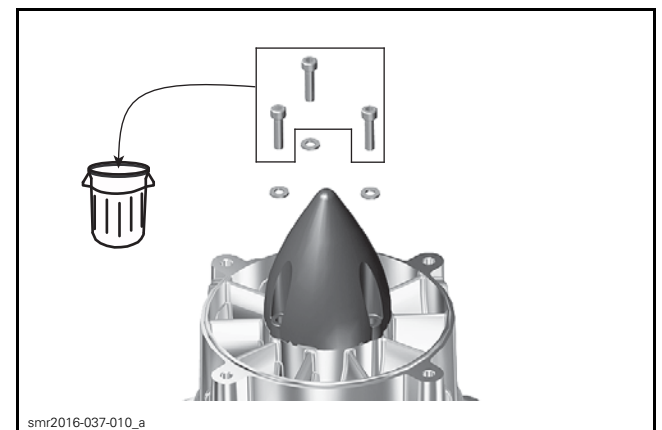
Slightly lubricate wear ring with Lubricant and anti-corrosive to minimize friction during initial impeller start.

SERVICE PRODUCTS	
Scandinavia	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)

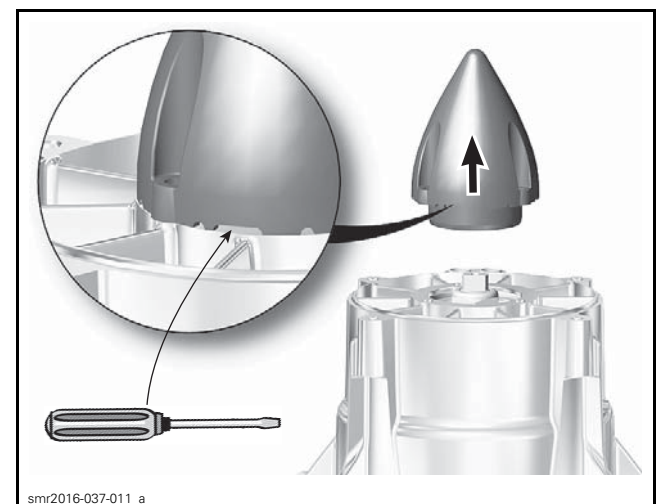
IMPELLER COVER

Removing the Impeller Cover

1. Remove the jet pump housing.
2. With pump housing in vertical position, remove and discard the 3 retaining screws.

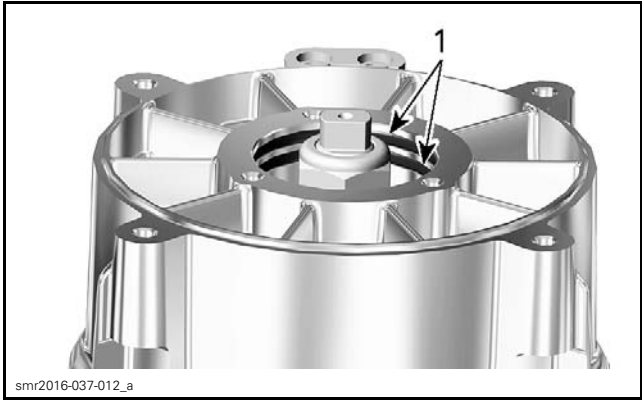


3. Using a fiber hammer, gently tap impeller cover to help release it from the jet pump housing.
4. Use a flat screwdriver in the slots provided as pry points to remove it from the jet pump housing.



5. Remove both cover O-rings.

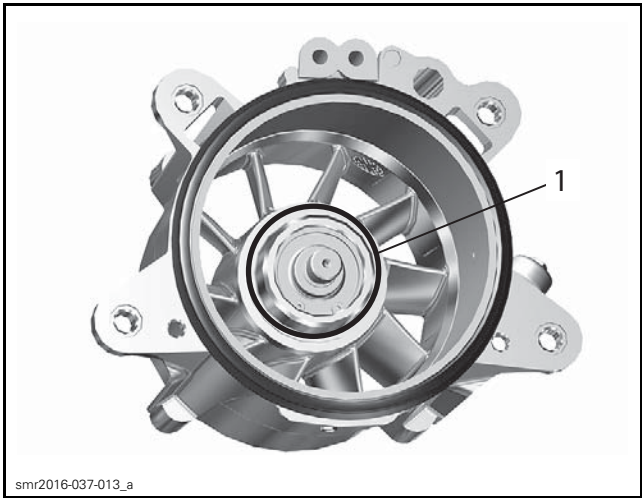
Subsection XX (JET PUMP)



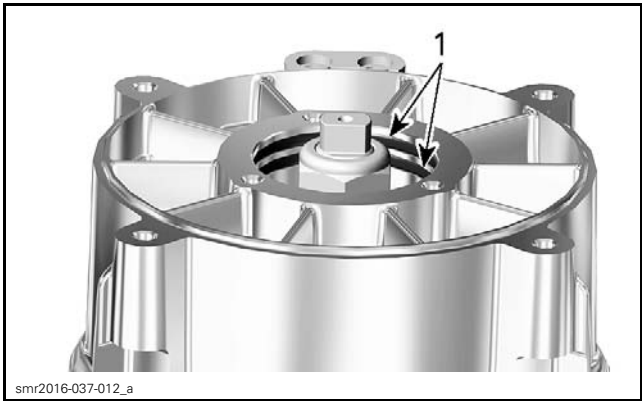
1. Cover O-rings

Inspecting the Impeller Cover

Check for presence of water in cover and bearing area. If water is found, replace seals on impeller side. Also replace O-rings and/or impeller cover.

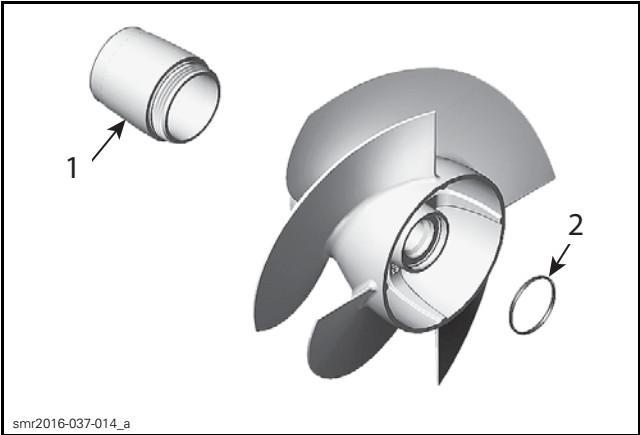


1. Seal on impeller side



1. Cover O-rings

Check impeller boot and O-rings condition on impeller. Replace as required.



1. Impeller boot
2. Impeller O-ring

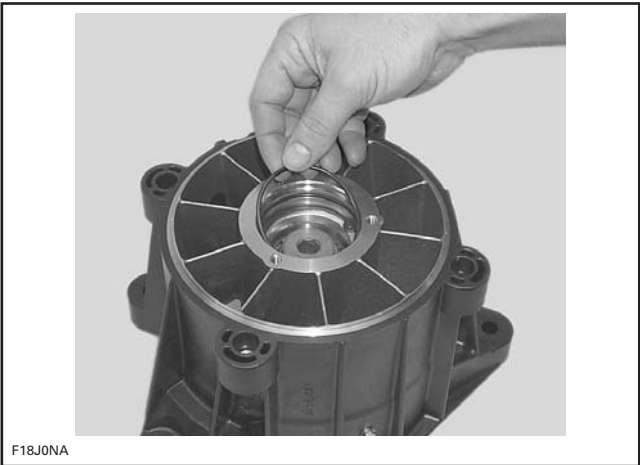
Perform a leak test. Refer to *LEAK TEST* in this subsection.

Installing the Impeller Cover

1. Apply a thin layer of grease in O-ring grooves.

SERVICE PRODUCTS
JET PUMP BEARING GREASE (P/N 293 550 032)

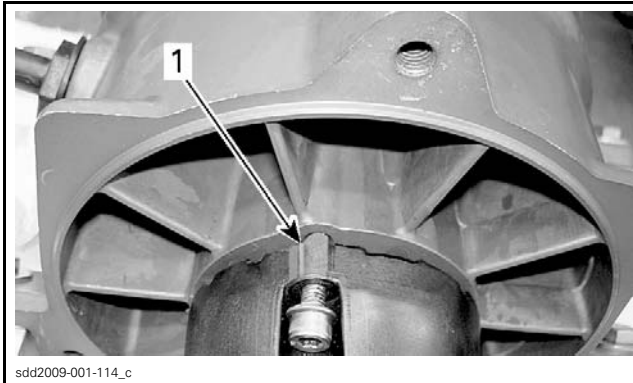
2. Install O-rings in their respective groove and make sure they are properly lubricated.



F18J0NA

TYPICAL

3. Install impeller cover by aligning the cover index mark with the pump top fin as shown.



1. Align mark with top fin

NOTE: Cover can only be installed in one position as screw holes are not located symmetrically.

4. Secure cover with **NEW** self-locking screws.

NOTE: Push cover against pump housing while alternately tightening screws. Make sure O-rings are positioned correctly and they are not damaged when pushing the cover.

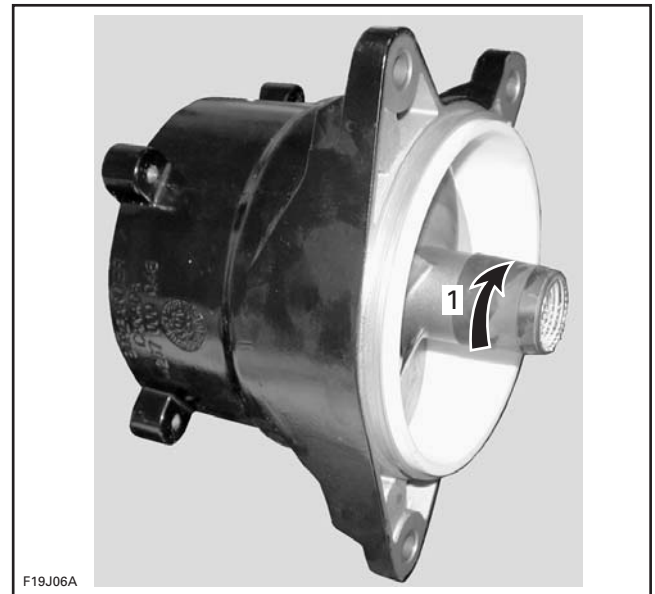
TIGHTENING TORQUE	
Cover screw	7.5 N•m ± 0.5 N•m (66 lbf•in ± 4 lbf•in)

IMPELLER

Removing the Impeller

NOTE: If impeller shaft is to be disassembled, loosen the impeller shaft nut prior to removing the impeller.

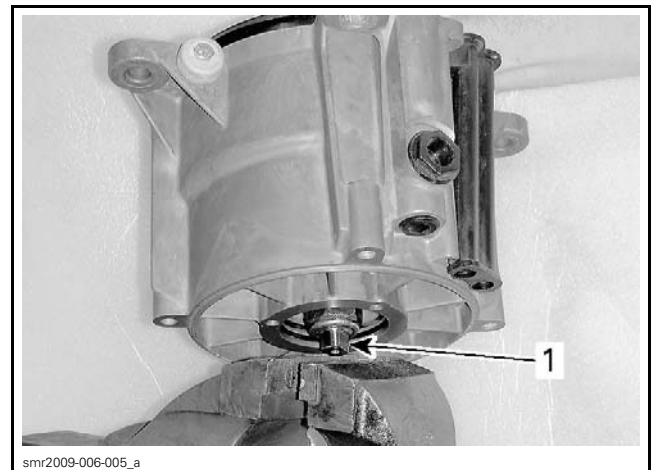
1. Remove jet pump housing. Refer to *JET PUMP HOUSING* in this subsection.
2. Remove impeller cover. Refer to *IMPELLER COVER* in this subsection.
3. Remove impeller boot by turning it **clockwise** (LH threads).



TYPICAL

1. Unscrew clockwise

4. Mount the flat sides of impeller shaft in a vise.



TYPICAL

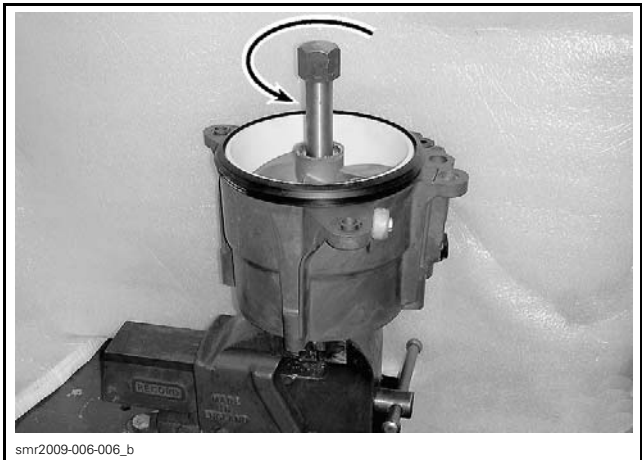
1. Flat side

5. Unscrew the impeller counterclockwise using the required tool.

REQUIRED TOOL	
IMPELLER REMOVER/INSTALLER (P/N 529 035 956)	

NOTICE Never use an impact wrench to loosen impeller.

Subsection XX (JET PUMP)

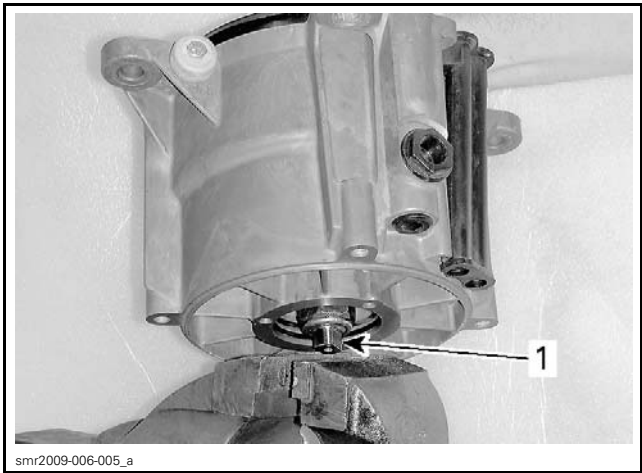


TYPICAL

6. To pull impeller out of the pump, apply a rotating movement as you pull on the impeller.

Installing the Impeller

1. Mount the flat sides of the impeller shaft in a vise.

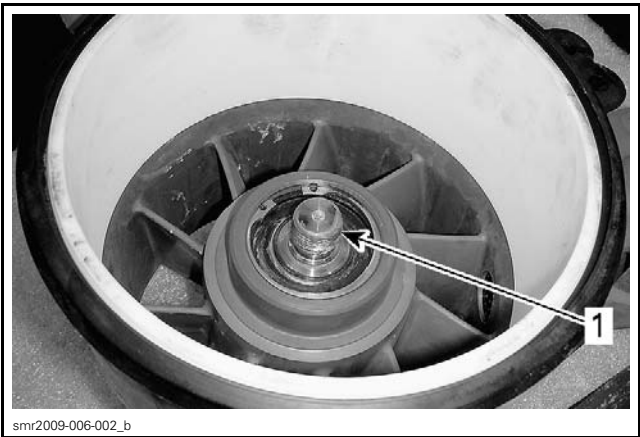


TYPICAL

1. Flat side

2. Apply antiseize lubricant on threads of impeller shaft.

SERVICE PRODUCTS
LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070)

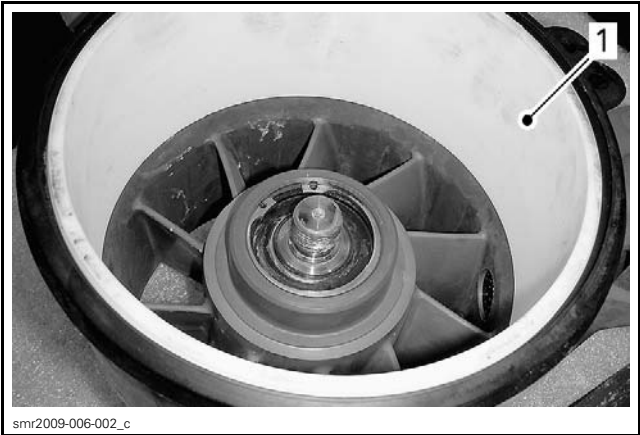


TYPICAL

1. Antiseize lubricant

3. Apply Lubricant and anti-corrosive on the wear ring surface.

SERVICE PRODUCTS	
Scandinavia	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)



TYPICAL

1. Spray XPS lube on this surface

4. Start screwing the impeller on its shaft.



smr2009-006-007

TYPICAL

5. Mount the required tool in impeller splines.

REQUIRED TOOL	
IMPELLER REMOVER/INSTALLER (P/N 529 035 956)	

6. Tighten impeller to specification.

NOTICE Never use an impact wrench to tighten impeller shaft.

TIGHTENING TORQUE	
Impeller	125 N•m ± 10 N•m (92 lbf•ft ± 7 lbf•ft)

Remove tool.

7. Apply Loctite on impeller boot threads.

8. Apply grease inside impeller boot.

SERVICE PRODUCTS	
LOCTITE 438 (P/N 296 000 424)	
TRIPLE-GUARD GREASE (P/N 508298)	

9. Install impeller boot on impeller and tighten counterclockwise.

WEAR RING

Inspecting the Wear Ring

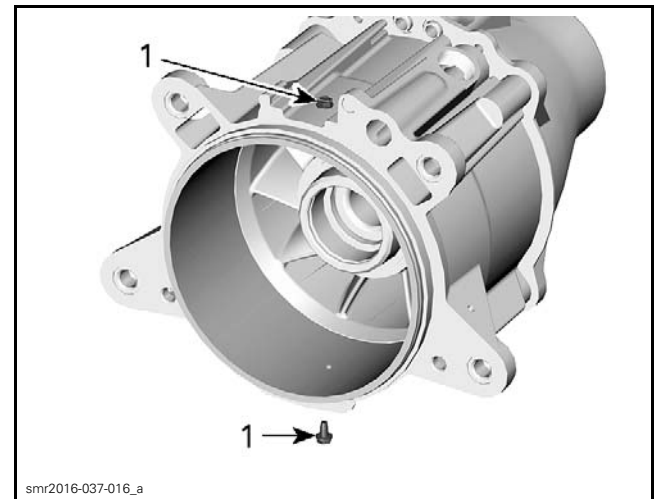
Check wear ring for:

- Deep scratches
- Irregular surface
- Any apparent damage.

Check *IMPELLER/WEAR RING CLEARANCE*, see procedure at the beginning of this subsection.

Removing the Wear Ring

1. Remove jet pump housing. Refer to *JET PUMP HOUSING* in this subsection.
2. Remove impeller, refer to *IMPELLER* in this subsection.
3. **On models equipped with the 300 engine**, remove screws securing the wear ring.



smr2016-037-016_a

1. Wear ring screws

Two methods can be used to remove the wear ring, use the most appropriate as your situation.

Method Using a Freezer

1. Place the jet pump housing and the new wear ring in a freezer for approximately 1-1/2 hour at -10°C (14°F).
2. Remove the housing from the freezer and pull the wear ring out.

NOTE: The freezer method will help but the 300 wear ring will not come completely loose using this method.

Method by Cutting the Wear Ring

1. Place jet pump housing in a vise with soft jaws. It is best to clamp housing using a lower ear.
2. Cut wear ring at two places.

NOTICE When cutting ring, be careful not to damage jet pump housing.

NOTE: Wear ring can be cut using a jigsaw, a small grinder or a low clearance hacksaw.

3. After cutting ring, insert a screwdriver blade between jet pump housing and ring outside diameter.
4. Push ring so that it can collapse internally.
5. Pull ring out.

Subsection XX (JET PUMP)

Installing the Wear Ring

Like the removing procedure, two methods can be used to install the wear ring, use the most appropriate as your situation.

Method Using a Freezer

While the housing is still cold, insert the new wear ring (previously placed in the freezer) in the housing.

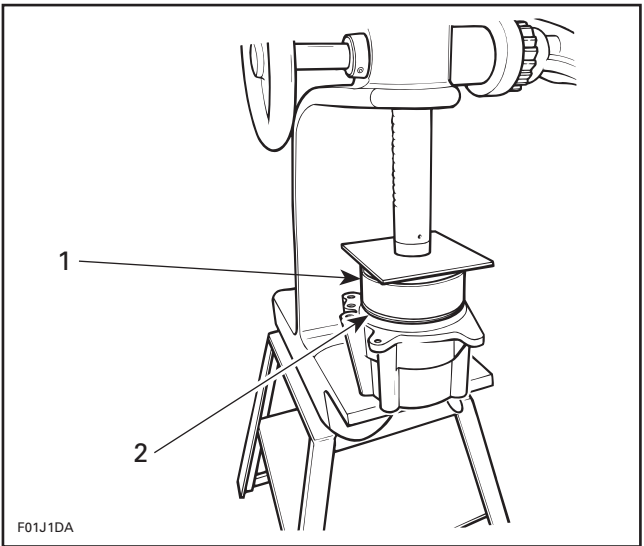
On models equipped with the 300 engine, the wear ring must be secured by screws. Drill pilot holes in the wear ring using a #24 drill bit (5/32 in) and apply blue Loctite on screw threads.

SERVICE PRODUCTS	
LOCTITE 243 (BLUE) (P/N 293 800 060)	
TIGHTENING TORQUE	
Wear ring screws	2.5 N•m ± 0.5 N•m (22 lbf•in ± 4 lbf•in)

Method Using a Press

To install wear ring in housing, use a square steel plate of approximately 180 x 180 mm x 6 mm thick (7 x 7 in x 1/4 in) and a press.

Manually engage ring in housing making sure it is equally inserted all around. Press ring until it seats into bottom of housing.



- 1. Rounded edge
- 2. Press wear ring

On models equipped with the 300 engine, the wear ring must be secured by screws. Drill pilot holes in the wear ring using a #24 drill bit (5/32 in) and apply blue Loctite on screw threads.

SERVICE PRODUCTS	
LOCTITE 243 (BLUE) (P/N 293 800 060)	
TIGHTENING TORQUE	
Wear ring screws	2.5 N•m ± 0.5 N•m (22 lbf•in ± 4 lbf•in)

IMPELLER SHAFT, BEARING AND SEALS

Removing the Impeller Shaft, Bearing and Seals

Removing the Shaft

1. Remove impeller. Refer to *IMPELLER* in this subsection.
2. Use the impeller shaft pusher tool to press impeller shaft out of pump housing.

REQUIRED TOOL	
IMPELLER SHAFT PUSHER (P/N 529 035 955)	

NOTE: Bearing will come out with the impeller shaft.



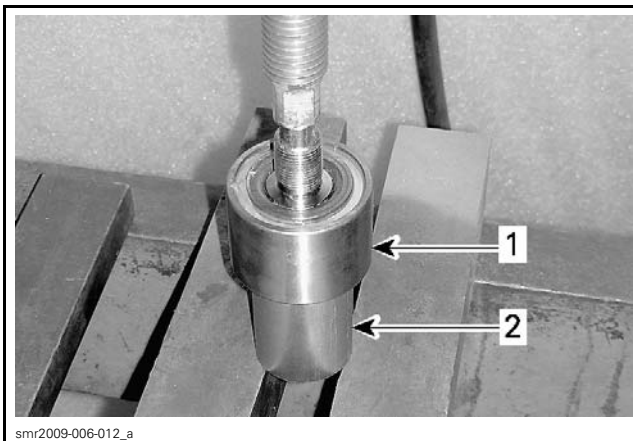
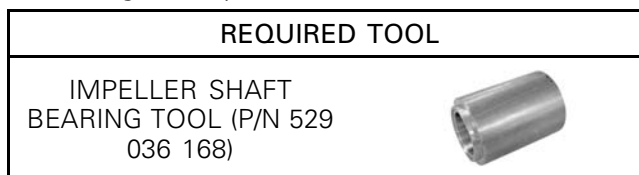
TYPICAL



TYPICAL

Removing the Bearing

1. Remove the bearing retaining nut.
2. Use the Impeller shaft bearing tool to press bearing off impeller shaft.

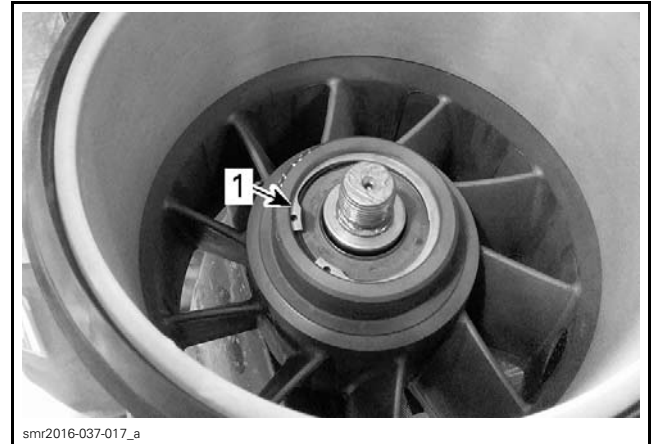


TYPICAL

1. Impeller shaft and bearing
2. Bearing tool on INNER race

Removing The Seals

1. Remove and discard the circlip securing the seals.



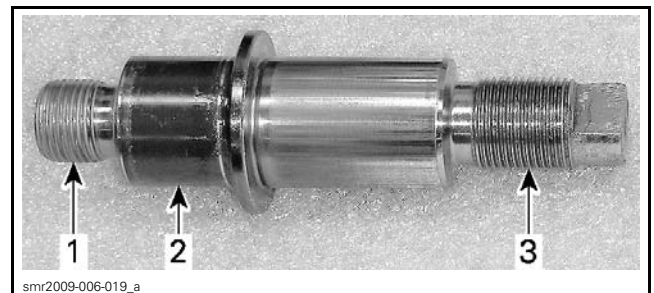
1. Circlip

2. Using an appropriate tool, press seals out of the housing.

Inspecting the Impeller Shaft and its Bearing

With your finger nail, feel seal lip contact surface on shaft. If any irregular surface is found, replace shaft and seals.

Check condition of shaft threads.



TYPICAL

1. Threads
2. Seal lip contact surface
3. Threads

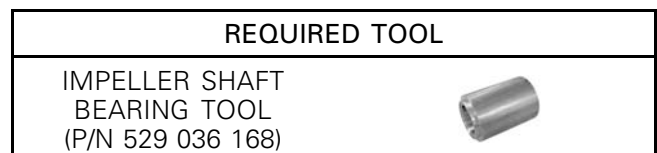
Inspect ball bearing for corrosion.

Installing the Impeller Shaft, Bearing and Seals

Installing the Bearing

The installation is essentially the reverse of the removal procedure. However, pay attention to the following.

1. Using the Impeller shaft bearing tool on the bearing inner race, press the bearing on the impeller shaft.

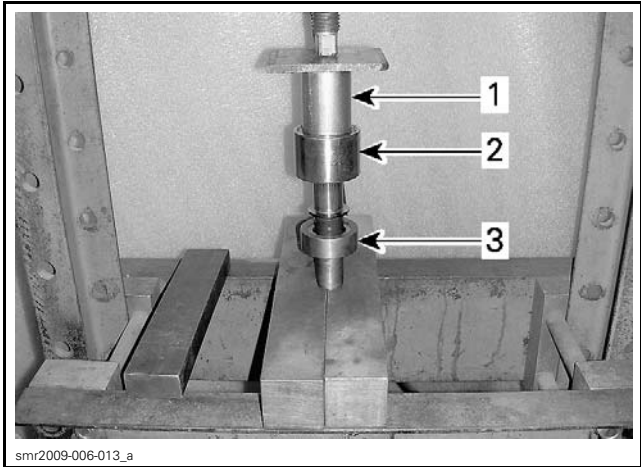


Subsection XX (JET PUMP)

2. Use the Impeller shaft pusher tool to protect the impeller shaft threads.

REQUIRED TOOL	
IMPELLER SHAFT PUSHER (P/N 529 035 955)	

NOTE: The bearing can be installed in either direction.



TYPICAL
1. Impeller shaft bearing tool on INNER race
2. Impeller shaft and bearing
3. Impeller shaft installer/pusher tool

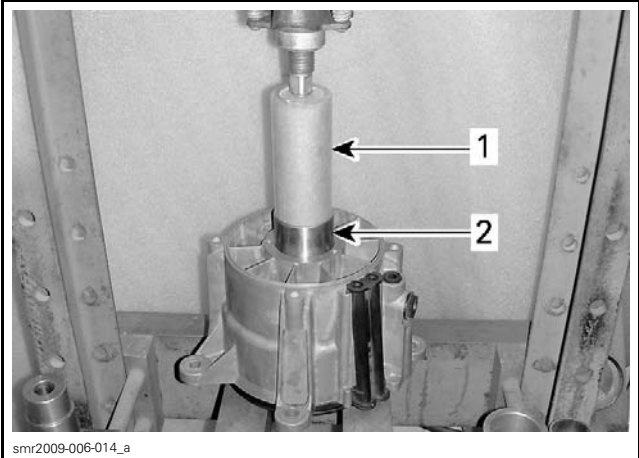
3. Press bearing until it bottoms.

Installing the Impeller Shaft and Seals

NOTE: Ensure there is no O-ring in pump housing on the cover side.

1. From the outlet side of pump, press impeller shaft assembly into housing using the Impeller shaft bearing tool.

REQUIRED TOOL	
IMPELLER SHAFT BEARING TOOL (P/N 529 036 168)	



TYPICAL
1. Bearing tool
2. Impeller shaft and bearing

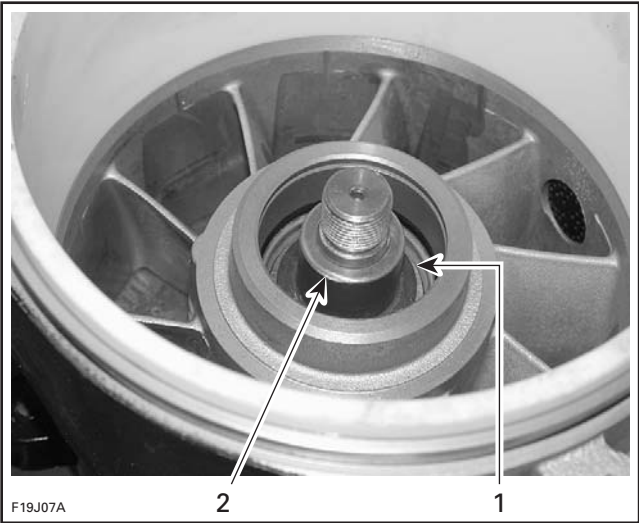
2. Press bearing until it bottoms.

NOTE: Ensure impeller shaft turns freely and smoothly.

3. Turn pump upside down.
4. Coat shaft surface and O-ring with grease.

SERVICE PRODUCTS
JET PUMP BEARING GREASE (P/N 293 550 032)

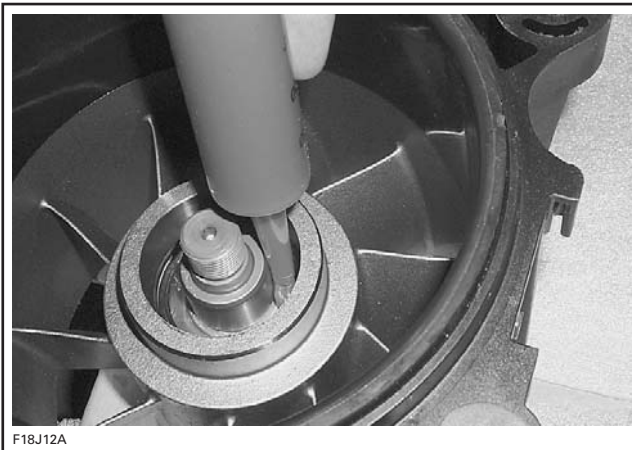
5. Install greased O-ring at bottom.



TYPICAL
1. O-ring at bottom
2. Coat surface

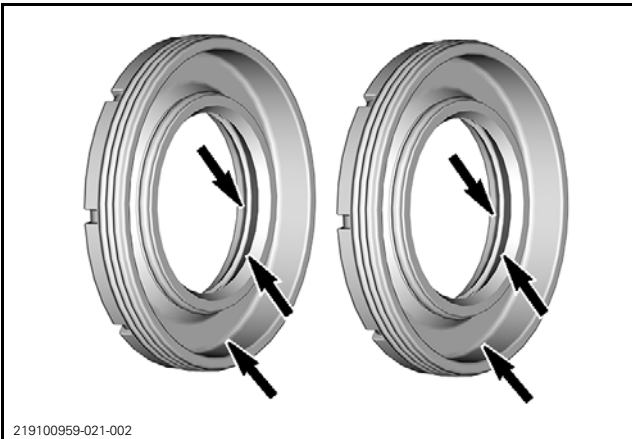
6. Apply 5 g (.2 oz) of grease on bearing.

SERVICE PRODUCTS
JET PUMP BEARING GREASE (P/N 293 550 032)



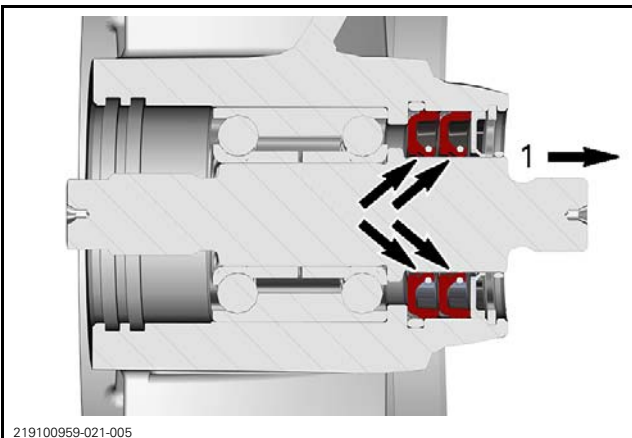
TYPICAL

7. Apply 11 g (.4 oz) of grease inside **NEW** double lip seal and in the seal lips.

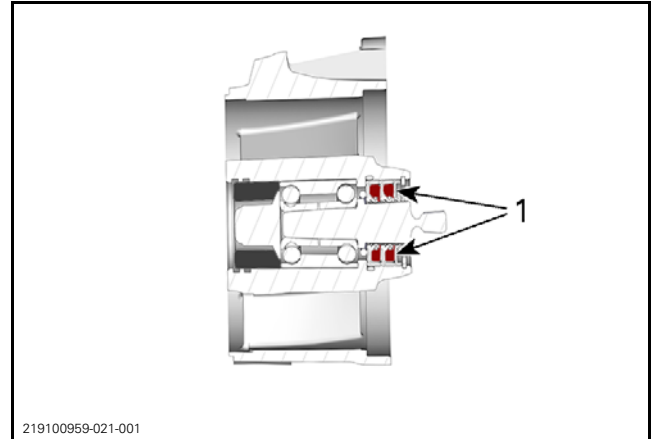


PUT GREASE IN ALL SEAL CAVITIES.

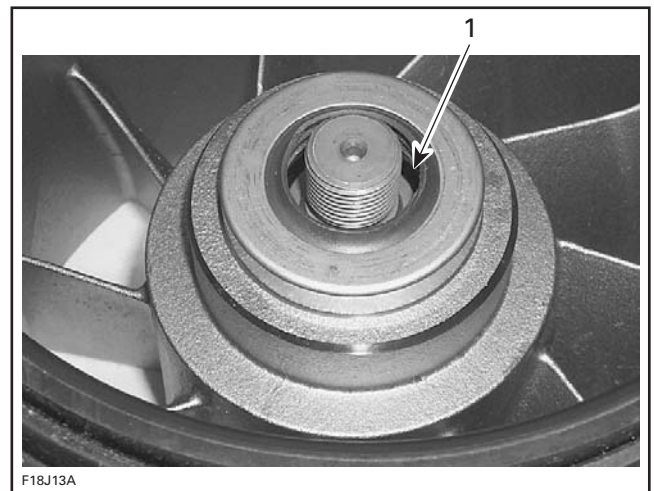
8. Install double lip seals making sure seal lip are facing upwards (toward impeller side).



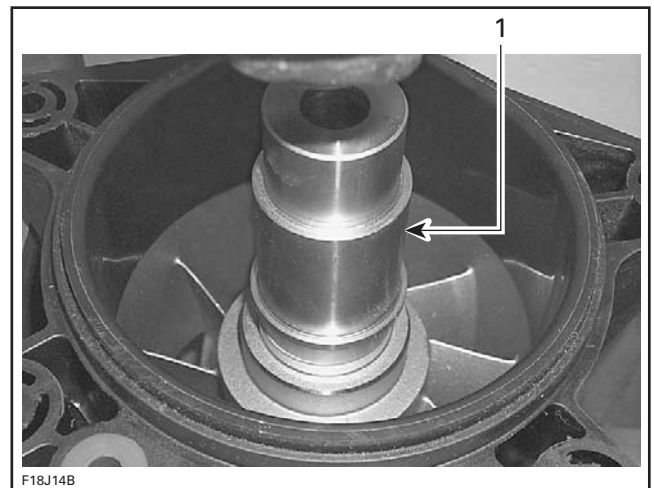
1. Toward impeller



1. Grease in seals cavities



1. Seal lip facing up

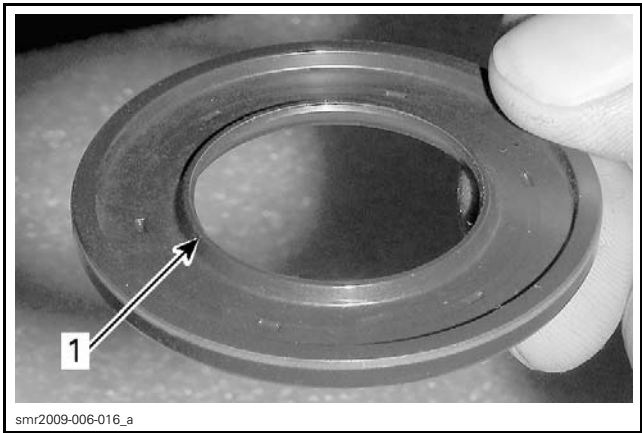


TYPICAL

1. Seal/bearing pusher

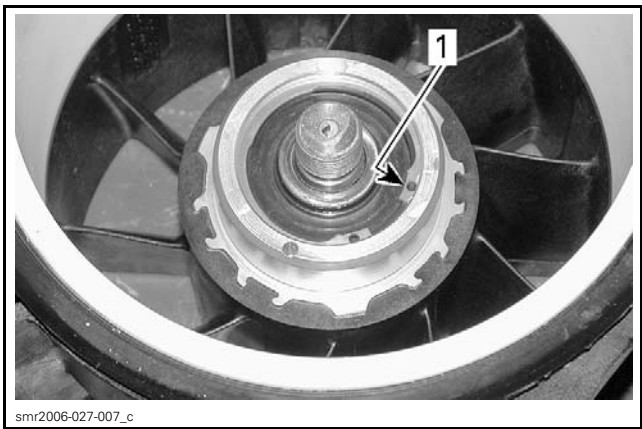
9. Install the other seal (thin). Ensure seal lip is facing up.

Subsection XX (JET PUMP)



1. Seal lip facing up

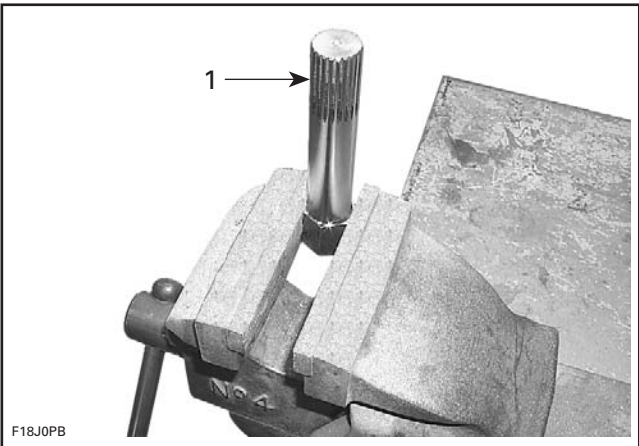
10. Install circlip.



TYPICAL
1. Circlip

- 11. Turn pump upside down.
- 12. Before installing any other parts, pressurize jet pump to insure proper seal installation. Refer to *LEAK TEST* in this subsection.
- 13. Install impeller. Refer to *IMPELLER* in this subsection.
- 14. Mount in a vise the impeller remover/installer.

REQUIRED TOOL	
IMPELLER REMOVER/INSTALLER (P/N 529 035 956)	



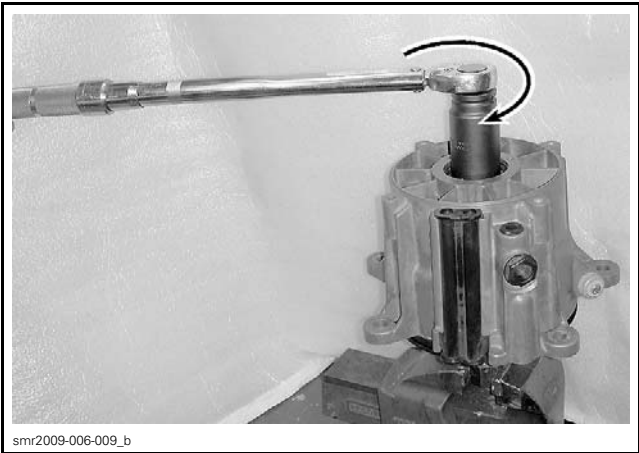
1. Impeller remover/installer tool

15. Install jet pump housing over tool.



TYPICAL

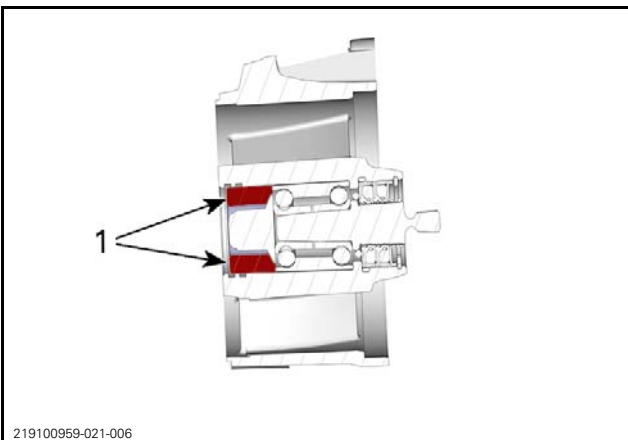
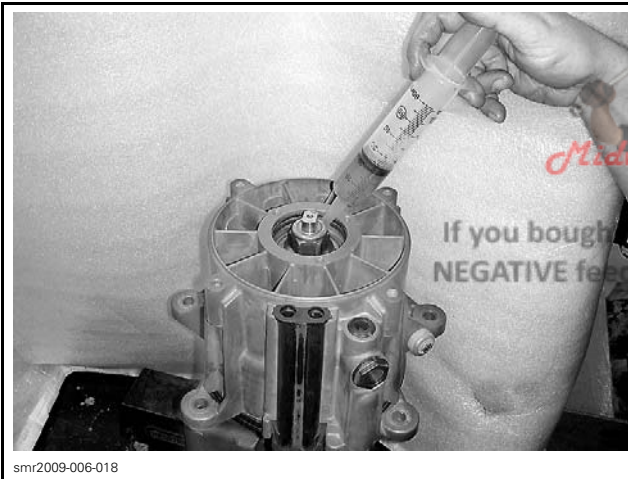
- 16. Using a 30 mm socket, screw the impeller shaft nut on clockwise.
- 17. Tighten nut as specified in exploded view.



18. Apply 30 g (1.1 oz) of grease around nut.

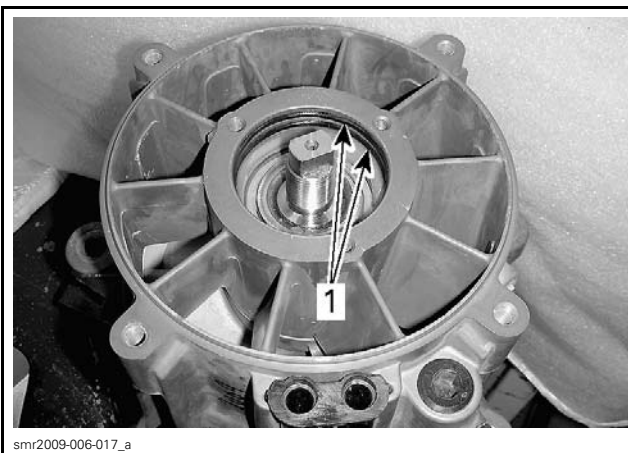
SERVICE PRODUCTS

JET PUMP BEARING GREASE (P/N 293 550 032)



1. Grease around nut

19. Install the two O-rings in pump housing and make sure they are properly lubricated.



TYPICAL
1. O-rings

20. Install the impeller cover. Refer to *IMPELLER COVER* in this subsection.

iBR, REVERSE AND VTS

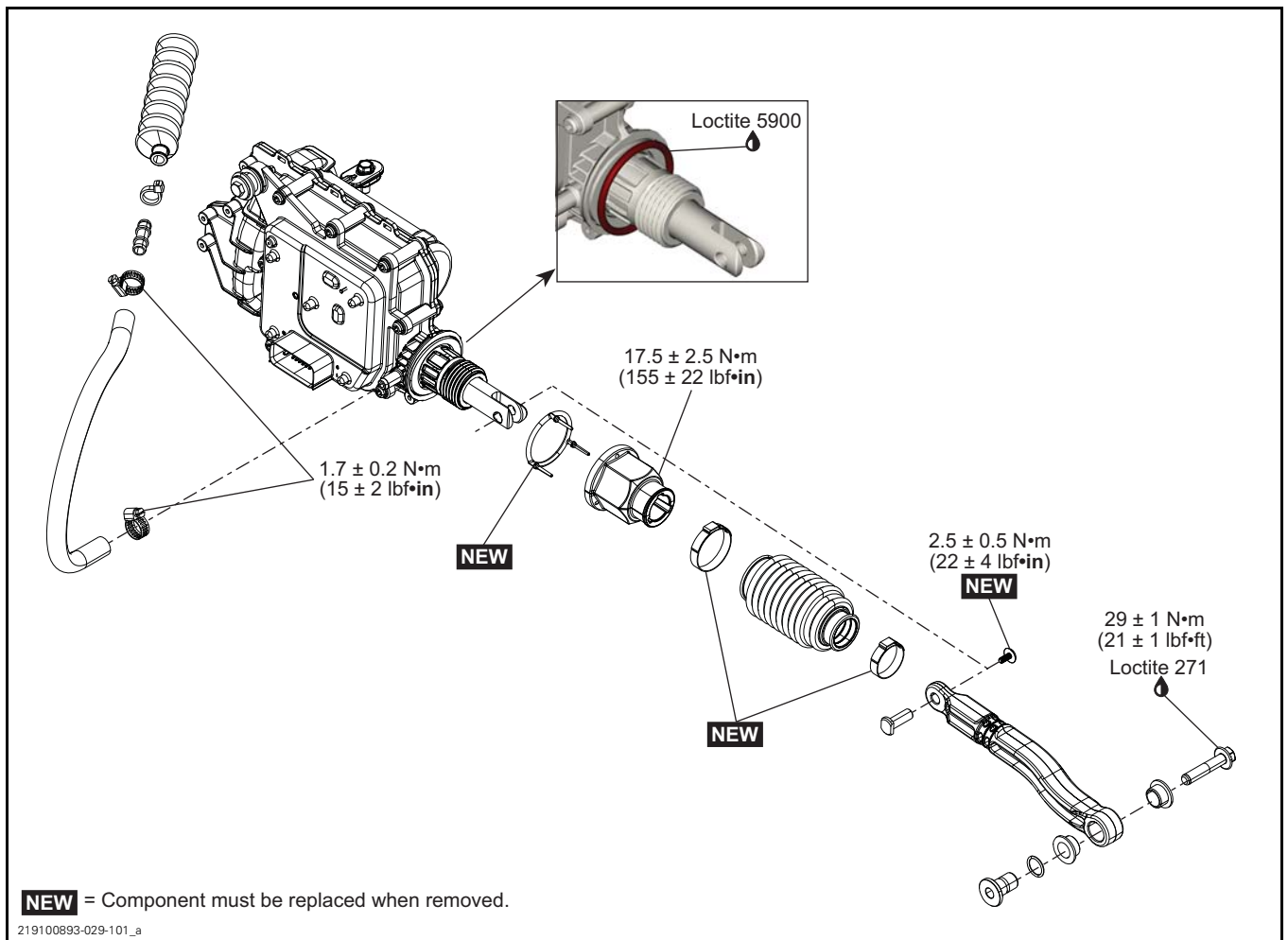
SERVICE TOOLS

Description	Part Number	Page
DIAGNOSTIC HARNESS	529 036 384	17
IBR NUT SOCKET	529 036 379	12

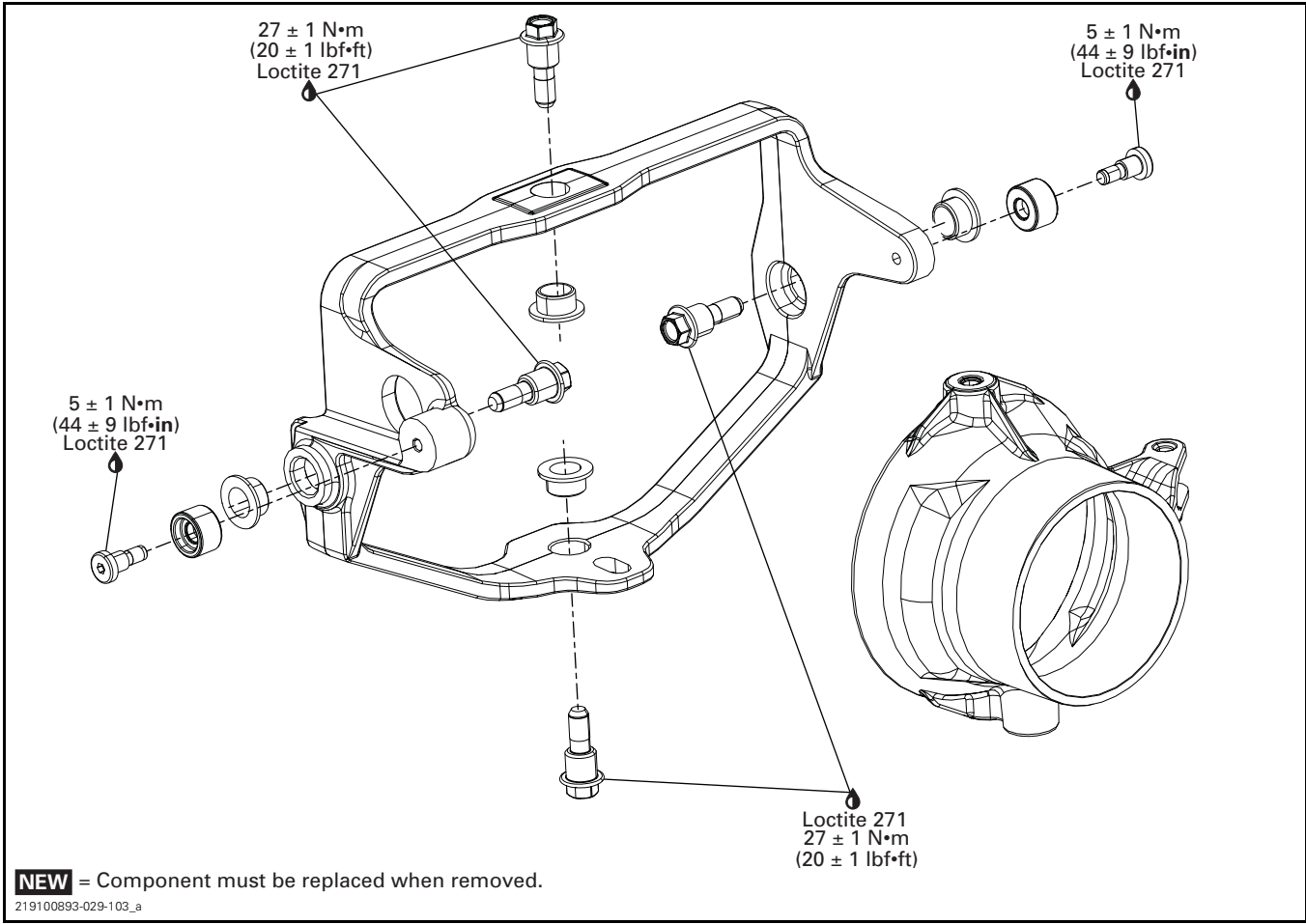
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 271 (RED)	293 800 005	14, 17
LOCTITE 5900	293 800 066	13

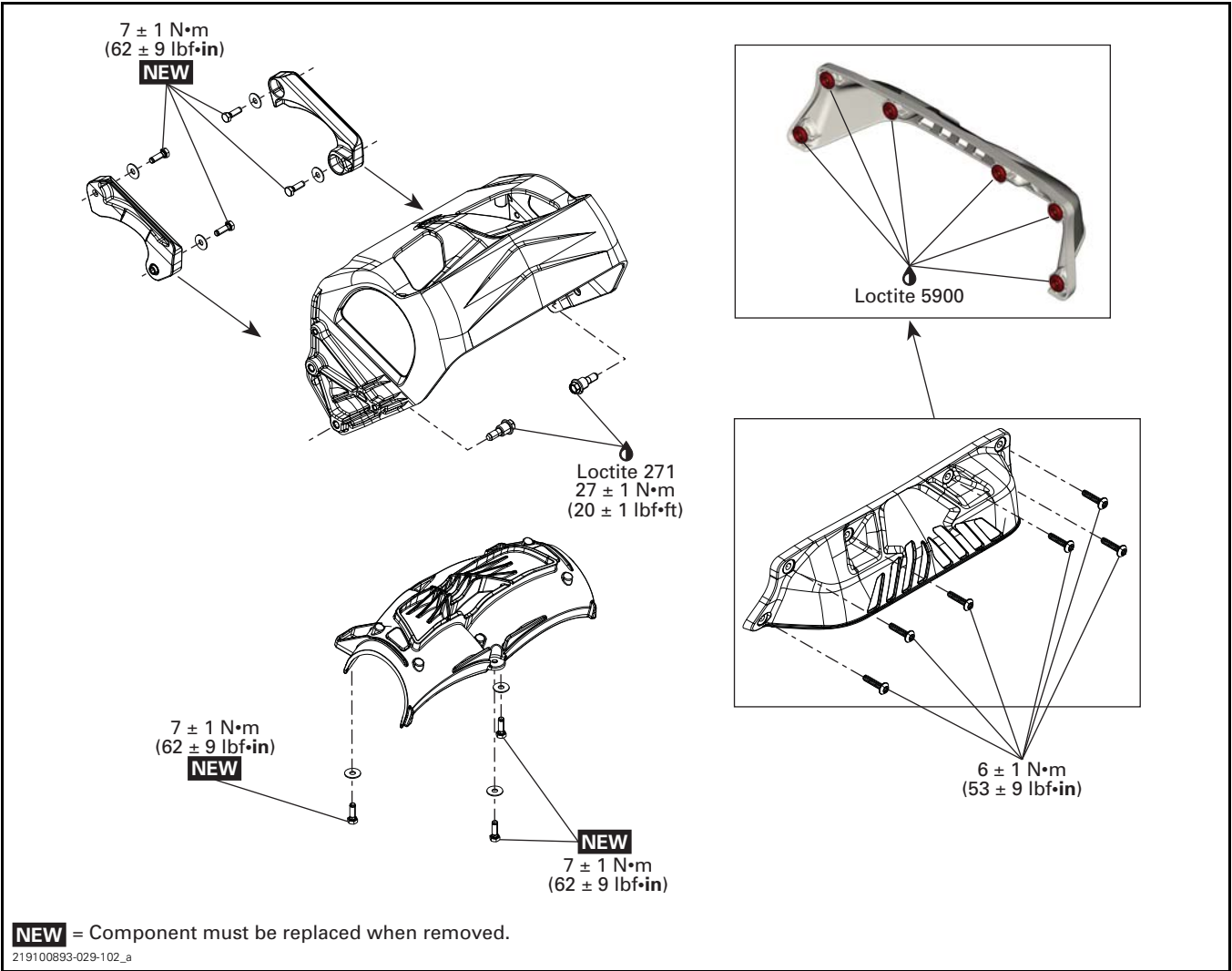
iBR ACTUATOR



VTS TRIM RING AND NOZZLE



iBR GATE



GENERAL

During assembly/installation, use torque values and service products as indicated in the exploded view.

Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE APPLICATION* at the beginning of this manual for complete procedure.

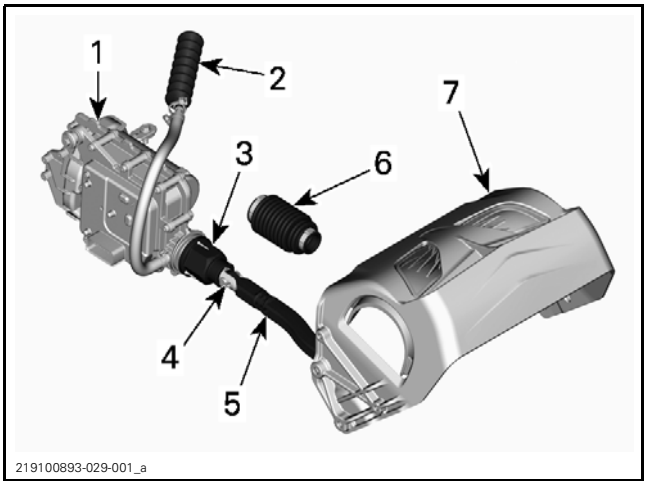
WARNING

Torque wrench tightening specifications must be strictly adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be replaced with new ones.

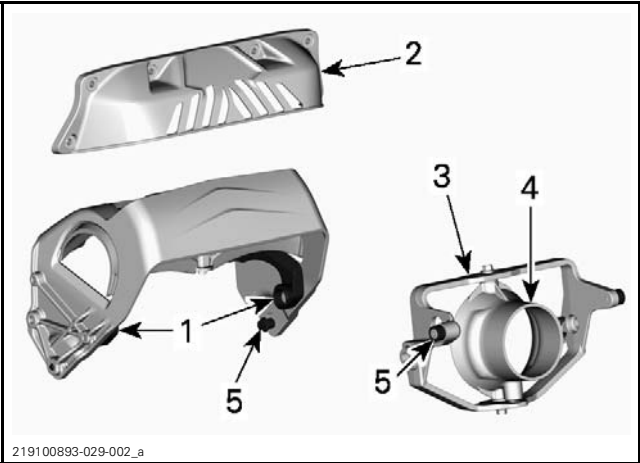
Hoses, cables or locking ties removed during a procedure must be reinstalled as per factory standards.

SYSTEM DESCRIPTION (iBR)

iBR System Components



- TYPICAL
- 1. Actuator
 - 2. Air chamber
 - 3. iBR nut
 - 4. Actuator shaft
 - 5. Connecting arm
 - 6. Connecting arm bellows
 - 7. iBR Reverse Gate



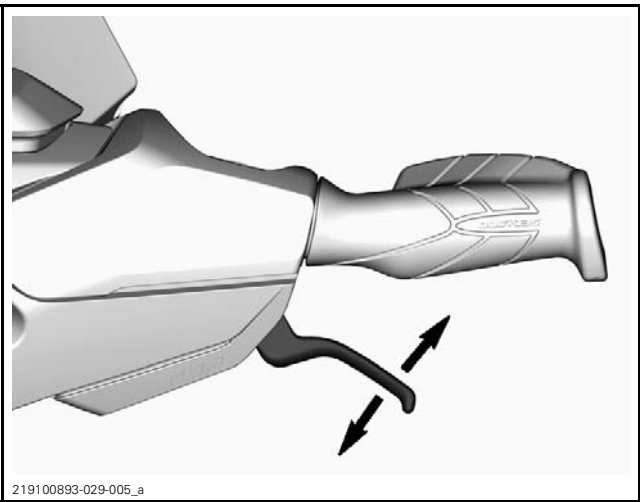
- 1. Support plates
- 2. Protective guard
- 3. VTS trim
- 4. Nozzle
- 5. Friction sleeves

The iBR (intelligent Brake and Reverse) is an electronically controlled braking and reverse system.

The iBR module controls the position of the iBR gate to provide forward thrust, reverse thrust, braking thrust, and neutral.

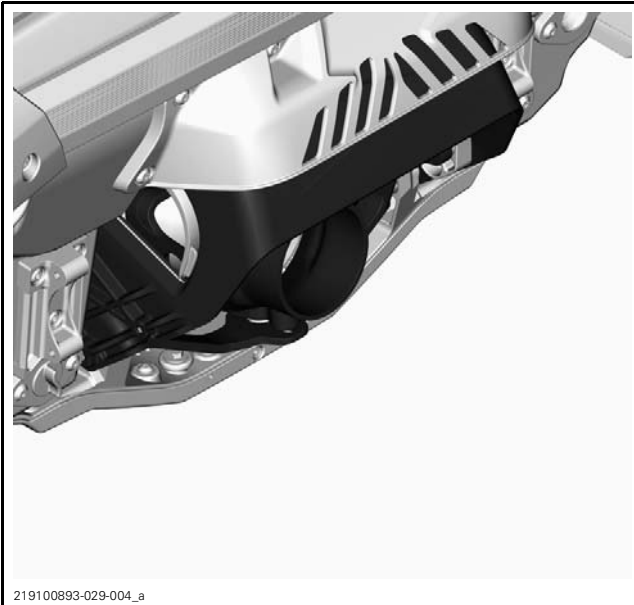
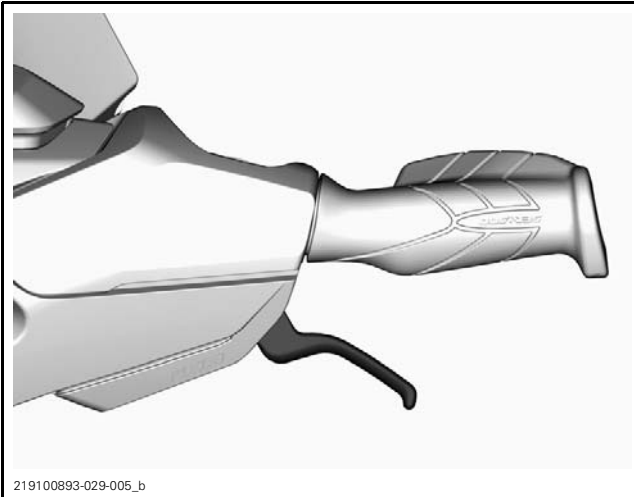
The operator commands the position of the iBR gate using either the throttle lever for forward thrust, or the iBR lever for neutral, reverse, and for the braking function.

The iBR lever is located on the LH side of the handlebar.

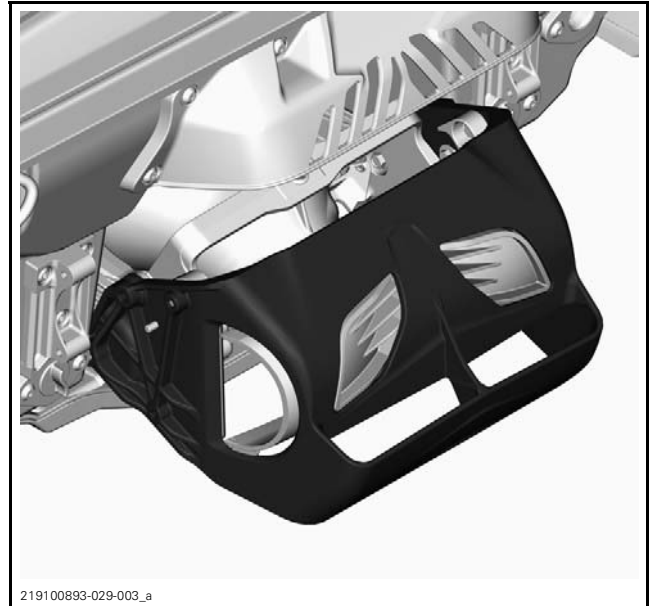
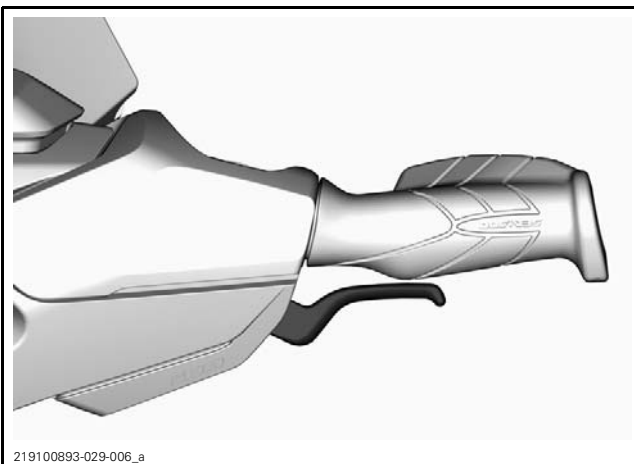


When the iBR lever is pulled in, it operates the brake and reverse lever sensor (BRLS). It is a double output hall effect sensor. The redundancy is used for security purposes.

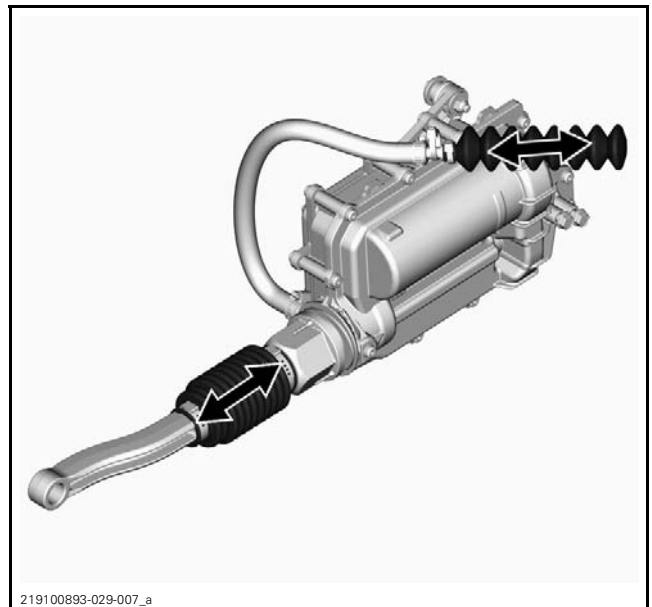
The BRLS sends the signals to the iBR module. The iBR module controls an electric motor that in turn raises or lowers the iBR gate through a mechanical drive unit.



FORWARD



REVERSE



iBR ACTUATOR AIR CHAMBER MOVEMENT

NOTE: The iBR gate will move when commanded by the iBR lever only if the engine is running. For maintenance purposes, the iBR OVERRIDE function available through the gauge can be used to electrically move the gate to the desired position.

Depending on vehicle speed and how far the iBR lever is pulled in, the iBR module will automatically adjust the iBR gate movement speed and stroke.

NOTE: The iBR lever must be pulled in at least 25% of its travel (approximately) before the iBR gate starts to move. The first 25% of iBR lever travel has no effect on the iBR gate.

Every time the iBR gate moves when commanded by the iBR lever, engine RPM is momentarily reduced to idle speed as the gate moves.

WARNING

If it is necessary to remove any foreign object catch in the iBR gate, nozzle or linkages, strictly observe the following before proceeding:

- Remove tether cord from engine cut-off switch.
- Wait at least 5 minutes or remove iBR fuses.
- Do not press on START/STOP button. If START/STOP button is pressed, wait another 5 minutes.

iBR Override Function

iBR override moves the iBR actuator through its full range of motion.

NOTICE Remove any foreign object that may obstruct iBR actuator movement.

Activating iBR Override Function

1. Press the START/STOP button.
2. Install the tether cord.

NOTE: Do not start the engine. The tether cord must be installed to ensure the information center will not shut off all indications after its self test function. Briefly press the START/STOP button to reactivate the electrical system when required.

3. Pull in the iBR lever;
 - 3.1 There will be a beep.
 - 3.2 Press the SET or OK button on the information center (gauge).
4. Press the VTS UP or DOWN button to move the iBR gate.

Forward Mode

To engage forward:

- Start engine
- Pull in the throttle lever.

The iBR gate will automatically move to the forward position (full up).

NOTE: The full up position of the iBR gate is dependent on the selected VTS trim position.

Reverse Mode

If the watercraft speed is below 14 km/h (9 MPH) when the iBR lever is pulled in, reverse mode is engaged.

When the iBR lever is pulled in to engage the reverse, the following occurs:

- Engine RPM is reduced to idle.
- The iBR gate moves to the reverse position.
- Engine RPM ramps up to the engine power commanded by the throttle lever.

When operating in reverse mode, the iBR lever controls the iBR gate position and the engine RPM is controlled by the throttle lever.

Maximum engine RPM in reverse is 5000 RPM.

Braking Mode

If the watercraft speed is 14 km/h (9 MPH) per hour and above when the iBR lever is pulled in, braking mode is engaged.

When the iBR lever is pulled in to engage braking, the following occurs:

- Engine RPM is reduced to idle.
- The iBR gate moves to the maximum down position.
- Engine RPM ramps up to the engine power commanded by the iBR lever.

When operating in braking mode, the iBR gate always moves to the maximum down position. The throttle lever signal is overridden and engine RPM is now dependent on watercraft speed and how far the iBR lever is pulled in.

If watercraft speed is high when braking is applied, engine power will be initially low and then ramp up to the power commanded by the iBR lever position. The engine RPM may be increased, as necessary, to apply a stronger braking effect with the jet pump thrust when the conditions dictate.

As the watercraft slows to less than 8 km/h (5 MPH), the following occurs:

- Braking mode ceases.
- Reverse mode takes over if the iBR lever is not released.
- Throttle control reverts back to the throttle lever.

Neutral Mode

Every time the iBR lever is pulled in and released, the iBR gate will default to the **neutral** position, except if the throttle lever is still pulled in when the iBR lever is released. If the throttle lever is still pulled, the iBR gate will move to the forward position when the iBR lever is released and the watercraft will accelerate forward.

SYSTEM DESCRIPTION (VTS)

The VTS system is actually part of the iBR system. It provides watercraft pitch trim adjustments by adjusting the vertical position of the jet nozzle.

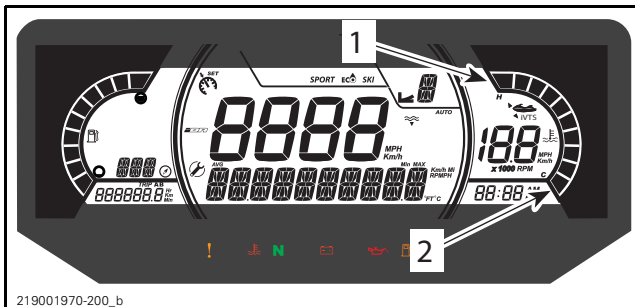
The VTS can be electrically trimmed to the desired attitude within the VTS range, or to one of 2 preset trim positions (on applicable models).

The VTS switch (or Up/Down switch) sends command signals to the gauge. The gauge converts them to CAN protocol and sends them through the CAN bus to the iBR module on the iBR actuator. The actuator then moves the iBR gate which moves the nozzle to the desired trim position.

NOTE: The nozzle and iBR gate move together in the VTS trim range up to the maximum nozzle down position. If NEUTRAL, BRAKING or REVERSE is engaged, the iBR gate moves past the VTS full down position. When FORWARD thrust is reengaged, the nozzle and iBR gate move up to the last selected VTS trim position.

The nozzle trim position can be seen on the VTS position indicator in the information center.

NOTE: Changing the VTS trim position only changes the indication. The nozzle will move to the selected VTS trim position when forward thrust is engaged.



219001970-200_b
INFORMATION CENTER — VTS POSITION INDICATOR

1. Bow up
2. Bow down

NOTE: Only the segment indicating the relative position of the VTS will be on. The illustration shows all segments on as can be seen during the self test function.

The VTS system provides the following features according to models

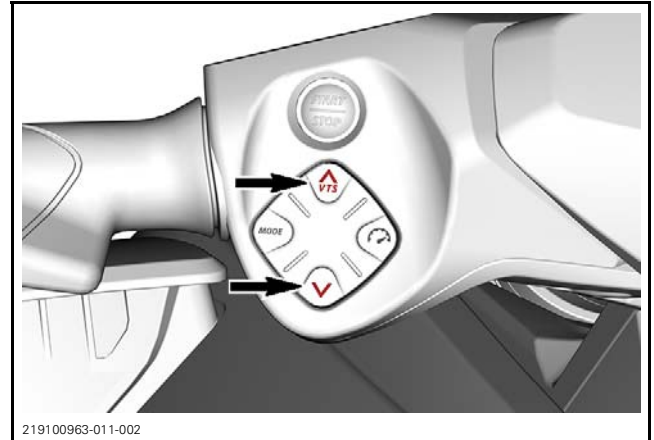
- Nozzle trimming
- Selection of 3 preset trim positions

Nozzle Trimming

Watercraft must be operating in forward position. 9 trim positions are available.

Using the VTS Button (LH Side of Handlebar)

Press the UP or DOWN arrow button to change the VTS setting.



Using Preset Trim Positions

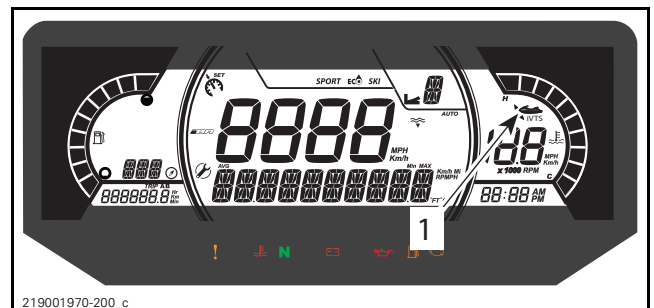
Three preset trim positions can be selected.

To select the **highest** trim position, double-click on the VTS UP arrow button (bow up).

To select the **lowest** trim position, double-click on the VTS DOWN arrow button (bow down).

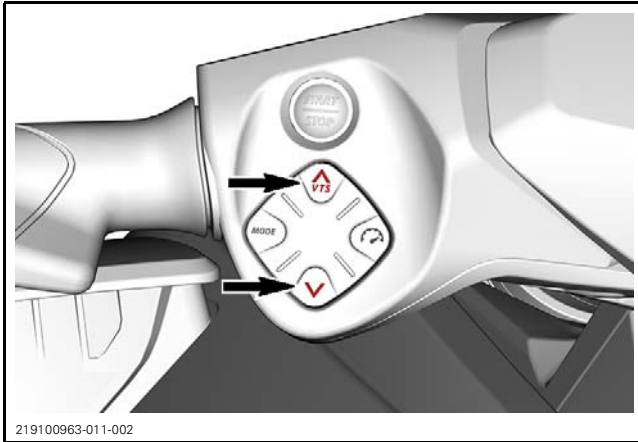
Launch Control (If equipped)

The Launch Control is an automatic adjustment of the VTS to achieve optimum acceleration. When the speed is below 20 km/h (12 MPH), the VTS lowers to it's lowest position and the iVTS indicator flashes to indicate the system is ready. When the speed exceed 30 km/h (19 MPH) the VTS return to the user selected position.

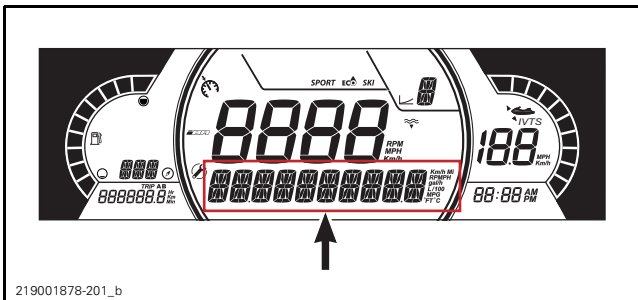


219001970-200_c
1. Launch Control indicator

To activate the Launch Control, press simultaneously both the VTS UP and DOWN buttons.



The message **LAUNCH ON** will be displayed.



To deactivate the **Launch Control**, press simultaneously both UP/DOWN buttons again.

The message **LAUNCH OFF** will be displayed.

Lock/Unlock iBR Actuator

Locking/Unlocking the iBR Actuator

When working on the iBR, lock the iBR to avoid accidental movement.

In BUDS2, go to:

- Settings page
- iBR button
- Configuration - Lock/Unlock iBR

ADJUSTMENT

iBR FLASHING

NOTICE Make sure the unit's battery is fully charged before undertaking this operation.

NOTICE Continuous power to the computer is mandatory while performing this operation.

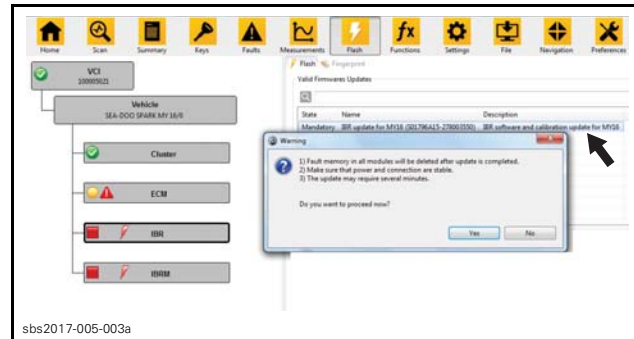
Perform after replacing the iBR actuator.

Connect the vehicle to the BRP diagnostic software (BUDS2).

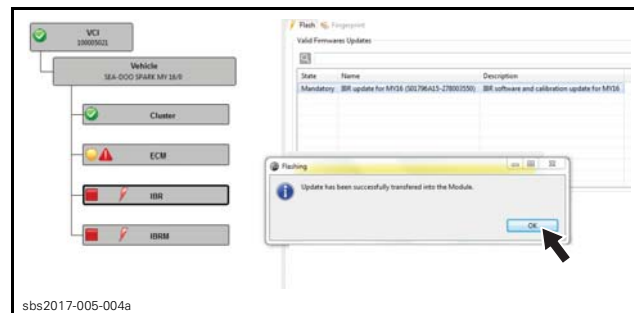
In BUDS2, go to:

- Flash page
- iBR button

Select the update file in the *VALID FIRMWARE UPDATES* window and click *YES* when prompted.



The following message will confirm that the update has been done successfully.



Click *OK* and proceed to the *iBRM* update.

iBRM FLASHING

NOTICE Make sure the unit's battery is fully charged before undertaking this operation.

NOTICE Continuous power to the computer is mandatory while performing this operation.

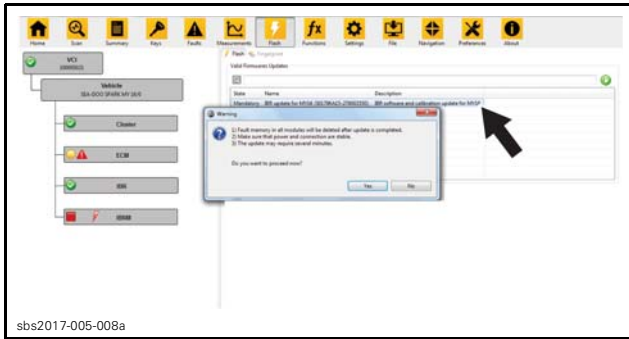
Perform after flashing the iBR.

Connect the vehicle to the BRP diagnostic software (BUDS2).

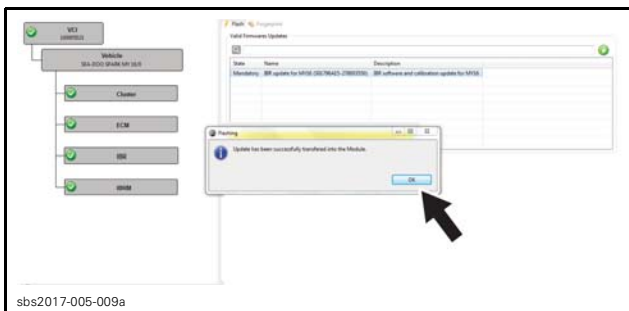
In BUDS2, go to:

- Flash page
- iBRM button

Select the update file in the *VALID FIRMWARE UPDATES* window and click *YES* when prompted.



The following message will confirm that the update has been done successfully.



iBR AUTO CALIBRATION

NOTICE iBR auto-calibration must be performed with the complete reverse gate assembly properly installed. Performing the auto-calibration procedure without the reverse gate assembly in place will damage the actuator.

Perform after repairing or removing the jet pump and/or iBR system components.

Connect the vehicle to the BRP diagnostic software (BUDS2).

In BUDS2, go to:

- Functions page
- iBR button
- Functions tab
- Routines - Auto Calibrate iBR

NOTICE Make sure the iBR actuator is unlocked before pressing the Auto Calibration button.

MAINTENANCE

Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection of this shop manual.

INSPECTION

The iBR system is self monitoring. If a fault occurs in the iBR system, it will raise a fault code and communicate it to the information center through the CAN bus. The information center will turn on the iBR indicator light to advise the operator of the iBR system fault. If the fault remains active, it may be displayed in the gauge. If it is no longer active, the BRP diagnostics software (BUDS2) must be used to read the fault.

TESTING SEQUENCE

To troubleshoot the iBR system, carry out the following in this order:

- Ensure the iBR gate movement is not obstructed in any way.
- Ensure the iBR gate mechanism is in good condition and does not show signs of excessive wear or friction.
- Check system fuses.
- Check battery condition and state of charge.
- Make sure battery connections are clean and tight.
- Connect the vehicle to the BRP diagnostic software (BUDS2) to check for iBR system or CAN bus related fault codes. Carry out service actions as indicated in BUDS2.
- If a CAN bus communication fault with the iBR actuator is indicated, or the iBR actuator is not visible in BUDS2, carry out a continuity test of the CAN bus wires. Refer to *TESTING CAN COMMUNICATION* in this subsection.
- Try moving the iBR using the iBR UP and iBR DOWN buttons on the iBR activation page in BUDS2.
- Check for proper gate and actuator movement. Refer to *TESTING THE iBR SYSTEM FUNCTION*.
- Visually inspect system connectors for moisture ingress, corrosion, and proper contact.
- Remove the screw retaining the gate to the connecting arm. Move the gate up and down by hand to check for freedom of movement.

TESTING THE iBR SYSTEM FUNCTION

This test requires two persons. One person to start engine and operate controls, and one person to observe iBR gate movement.

Provide adequate ventilation of exhaust gases or move watercraft outside.

NOTICE Do not install an exhaust ventilation hose in the iBR gate area or damage may occur when the iBR gate moves downward during operation.

NOTICE

- Ensure there are no tools or other object that may interfere with the iBR gate movement.
- Do not run engine for more than 2 minutes out of water or damage may occur.

⚠ WARNING

The person observing the iBR gate movement must stand to the side of the stern well clear of the iBR gate and pump nozzle in full view of the operator.

Test out of Water

NOTICE This procedure must be completed within one minute of the engine starting.

1. Connect a water hose to the watercraft to provide exhaust system cooling when operating engine. DO NOT open water tap yet.
2. Start engine, open water tap and let idle.

NOTE: If iBR gate was not in the neutral position, it will move to the neutral position on engine start up.

3. Depress the throttle lever slightly and visually confirm the iBR gate moves to the forward position (up to the VTS trim position), then release throttle. The iBR gate must remain in the forward position.
4. Depress the iBR lever fully and confirm the iBR gate moves to the full down position.
5. Release the iBR lever completely and confirm the iBR gate moves to the neutral position.
6. Close water tap and shut engine off.
7. Remove water hose from vehicle.

Test with Watercraft on a Waterway

1. Start engine.

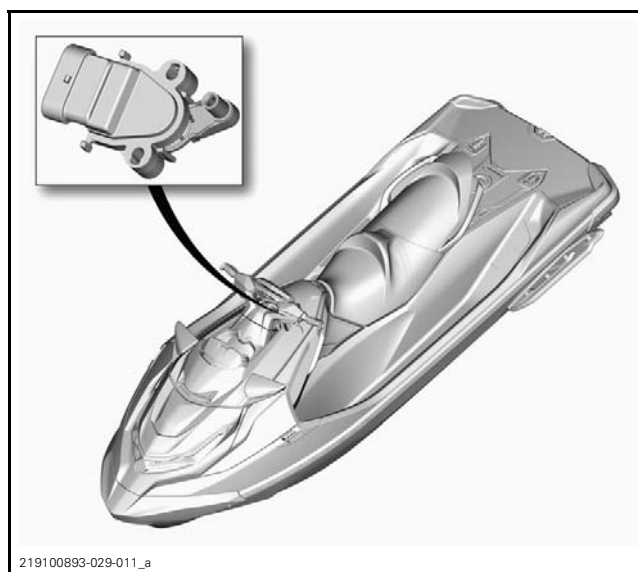
NOTE: If iBR gate is not in the neutral position before the engine start, it will move to the neutral position on engine start up.

2. Depress the throttle lever slightly, then release it. Forward movement of the watercraft confirms the iBR gate has moved to the forward position.
3. Depress the iBR lever fully. Rearward movement of the watercraft confirms the iBR gate has moved to the reverse position.

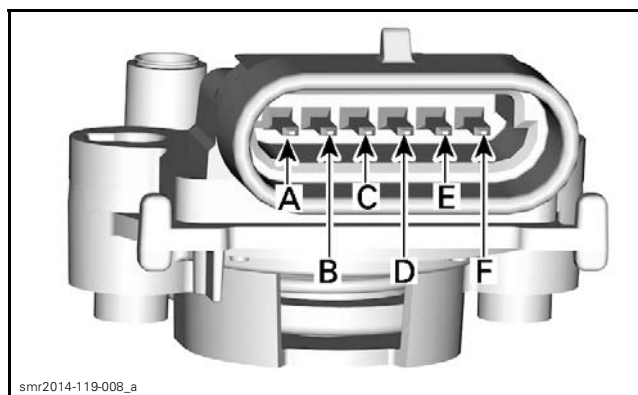
4. Release the iBR lever completely. Reverse thrust should cease and the watercraft should continue to drift rearward on momentum.
5. Apply a small amount of forward thrust to stop rearward velocity, then tap the iBR lever to return the iBR gate to neutral.
6. Shut engine off.

PROCEDURES

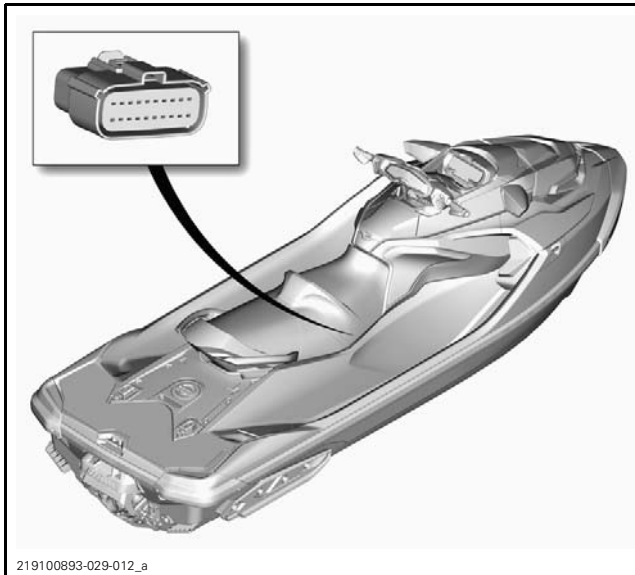
SWITCHES LOCATION AND PIN-OUT



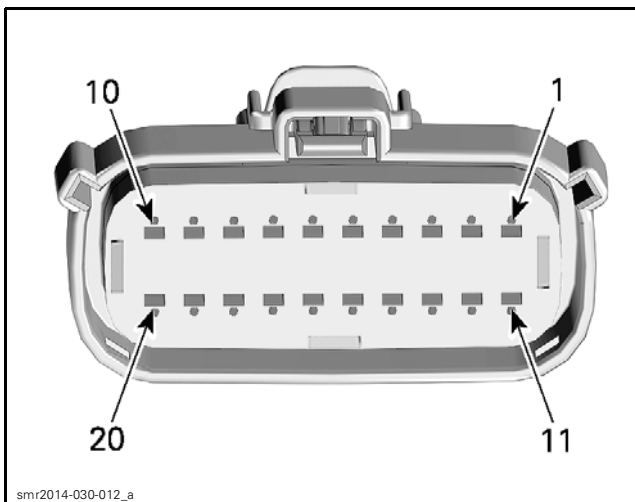
BRLS LOCATION



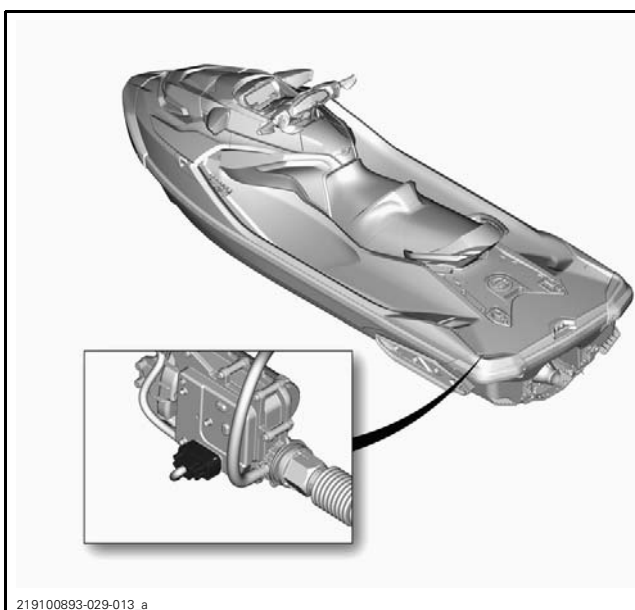
BRLS PINOUT



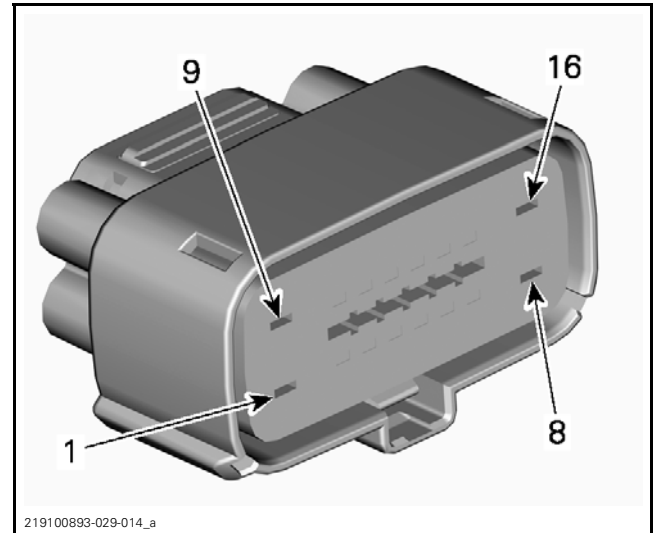
STEERING CONNECTOR LOCATION



STEERING CONNECTOR



iBR ACTUATOR CONNECTOR LOCATION



iBR ACTUATOR CONNECTOR

iBR ACTUATOR

Specifications

iBR ACTUATOR CONNECTOR	
PIN	SIGNAL
iBR-1	Battery voltage (Hot at all times)
iBR-2	Battery voltage (Hot with main relay on)
iBR-8	Ground

iBR ACTUATOR CURRENT DRAW	
DOWN SELECTION	-5 to -15 A
UP SELECTION	+10 to +20 A

Testing iBR Actuator Operation

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. In BUDS2, go to:
 - Functions page
 - iBR button
 - Functions tab
 - Move iBR Up/Down
3. Click **iBR UP** and **iBR DOWN** buttons alternately and look for a change in **iBR Position (Deg)**.

If the iBR moves using these buttons but does not move using the iBR lever, test *BRLS VOLTAGE* in this subsection.

If the iBR does not move, check the iBR fuse(s) in fuse box. If fuse(s) are good, check power and ground circuits.

Testing iBR Actuator Motor Current

- 1. Connect the vehicle to the BRP diagnostic software (BUDS2).
- 2. In BUDS2, go to:
 - **Measurements** page
 - **iBR** button
- 3. Note the **Gate Position (°)** indication.
- 4. Activate the iBR override function.
- 5. Move the iBR to the full up position and look for the **Motor Current (A)** indication. Also look for a change of **Gate Position (°)** indication.

NOTE: Current draw indication will not be stable. High and low peaks will be observed. Look for the maximum average current draw.

- 6. Move the iBR to the full down position and look for the **Motor Current (A)** draw indication. Also look for a change of **iBR Position (°)** indication.

If current draw is abnormally high (between 20 and 30 A), check the following:

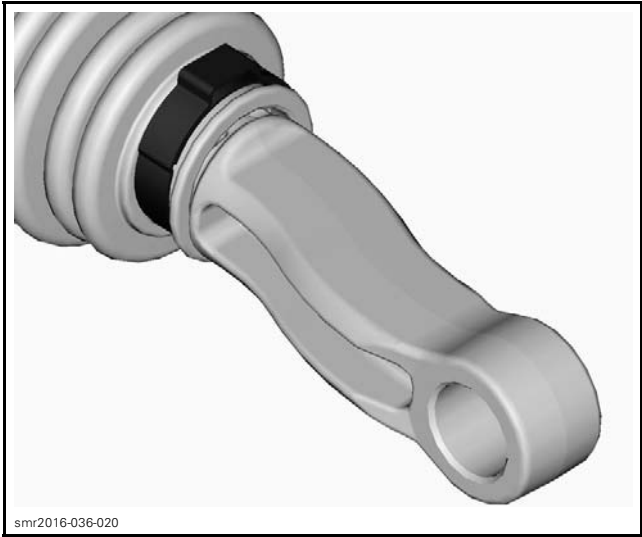
- Ensure iBR gate is free of debris.
- Check for excessive friction in gate movement.
- Check roller bushings, plastic bushings and iBR ramps.
- Check for proper voltage to the iBR actuator.
- Check for fault codes using .

Remove debris, replace iBR gate components, or replace the iBR actuator as applicable.

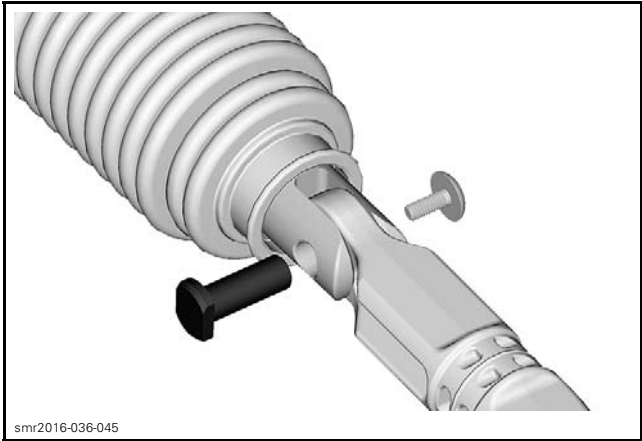
Removing the iBR Actuator

NOTICE Do not try to manually force the iBR gate when all components are installed.

- 1. Remove iBR reverse gate. Refer to *iBR REVERSE GATE* in this subsection.
- 2. Remove VTS trim ring. Refer to *VTS TRIM RING* in this subsection.
- 3. Remove the small Oetiker clamp retaining the connecting arm bellows.



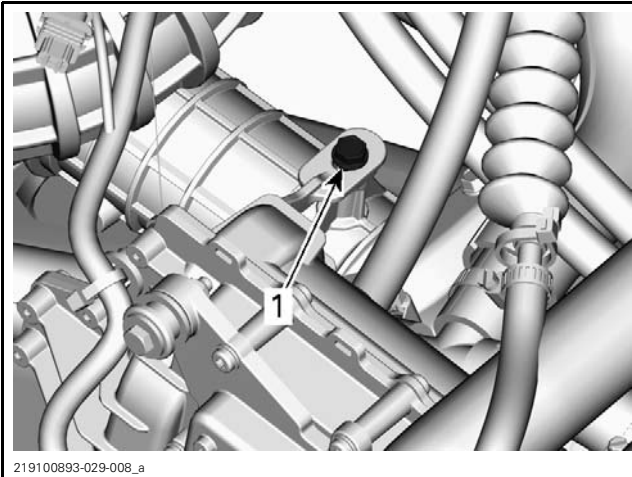
- 4. Remove connecting arm pin and screw.



- 5. Remove iBR nut and bellows using the iBR nut socket.

REQUIRED TOOL	
IBR NUT SOCKET (P/N 529 036 379)	

- 6. Move muffler. Refer to *EXHAUST SYSTEM*.
- 7. Unplug electrical connector.
- 8. Remove actuator retaining screw.



1. Actuator retaining screw

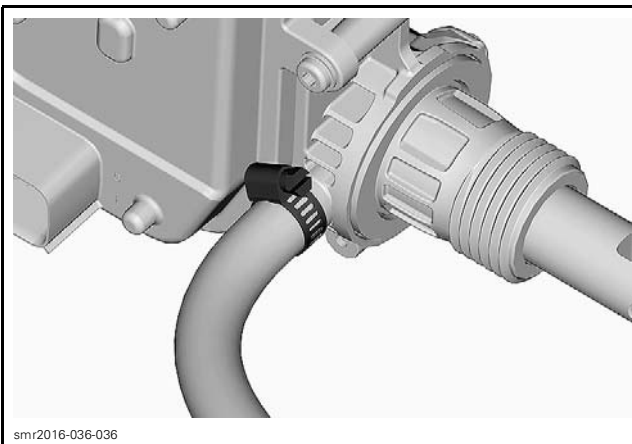
9. Remove iBR actuator and air chamber.

Installing the iBR Actuator

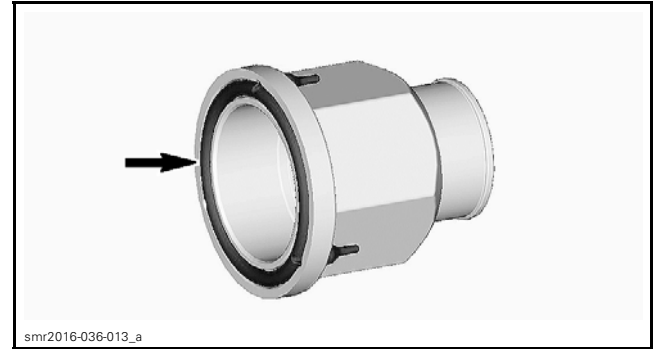
NOTICE Failure to adhere to the sequence in the following steps will cause the iBR air chamber to rupture or burst and cause premature failure of the iBR actuator.

1. Install the air chamber on the iBR actuator.

1.1 Tighten the clamp.



2. Connect iBR actuator connector.
3. Install iBR actuator shaft through hull opening.
4. Slide the O-ring into position on iBR nut.



5. If the same actuator is reinstalled, clean all residues of sealing compound near the threaded area.
6. Apply Loctite 5900 on actuator, between actuator housing and threads, as shown in the exploded view.

SERVICE PRODUCT
LOCTITE 5900 (P/N 293 800 066)

NOTICE Ensure no sealing agents contact the iBR shaft.

7. Torque iBR nut.

TIGHTENING TORQUE
iBR nut
17.5 N•m ± 2.5 N•m (155 lbf•in ± 22 lbf•in)

8. Install actuator retaining screw.

TIGHTENING TORQUE
Actuator retaining screw
8 N•m ± 1 N•m (71 lbf•in ± 9 lbf•in)Text

9. Install connecting arm.
10. Reinstall other removed parts. Refer to appropriate subsections for procedures.

NOTICE Allow 24 hours for thread locker on retaining screws to cure.

Perform *iBR FLASHING* procedure.

Perform *iBR AUTO-CALIBRATION* procedure.

iBR REVERSE GATE

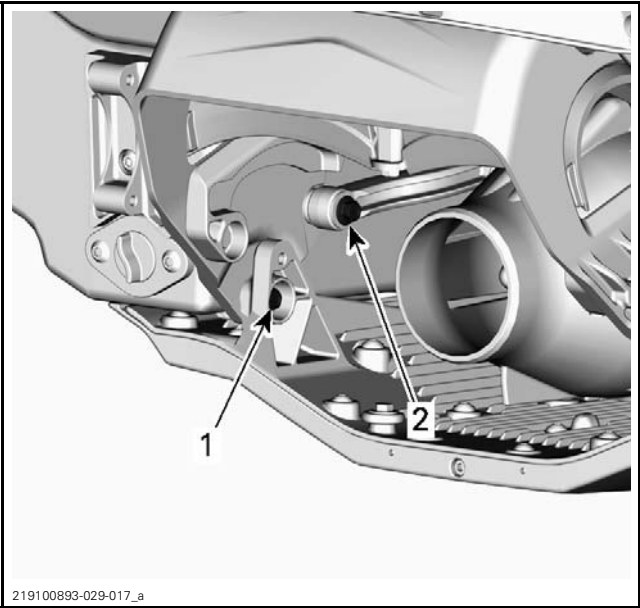


Removing the iBR Reverse Gate

Remove the guard.



Remove VTS trim ring.
Remove the iBR reverse gate retaining screws.
Remove the connecting arm retaining screw.



- 1. iBR retaining screw
- 2. Connecting arm retaining screw

Installing the iBR Reverse Gate

Installation is the reverse of the removal procedure. However, pay attention to the following.

TIGHTENING TORQUE	
iBR Reverse Gate retaining screws	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)

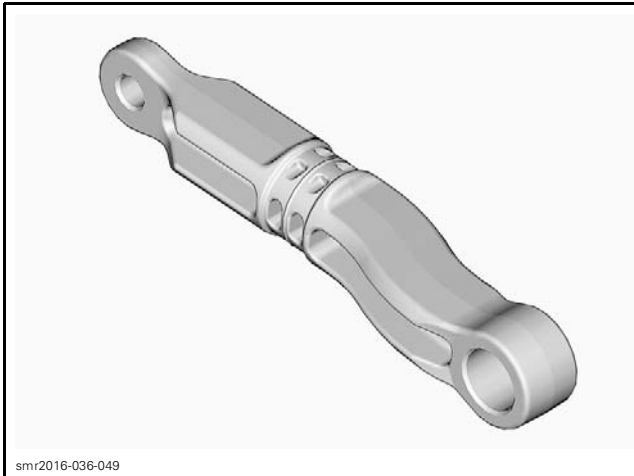
Apply red Loctite on iBR reverse gate retaining screws

SERVICE PRODUCT
LOCTITE 271 (RED) (P/N 293 800 005)

NOTICE Allow 24 hours for thread locker on retaining screws to cure

Perform *iBR AUTO-CALIBRATION* procedure.

CONNECTING ARM

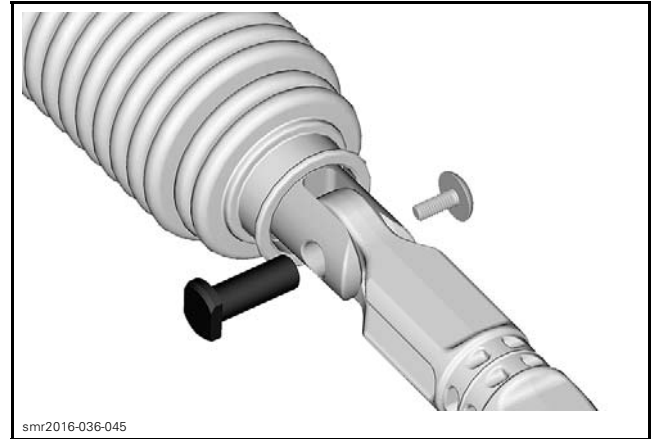


Removing the Connecting Arm

1. Remove VTS trim ring. Refer to *VTS TRIM RING* subsection.
2. Remove iBR Reverse Gate. Refer to *iBR REVERSE GATE* subsection.
3. Remove the small Oetiker clamp retaining the connecting arm bellows.



4. Remove connecting arm pin and screw.

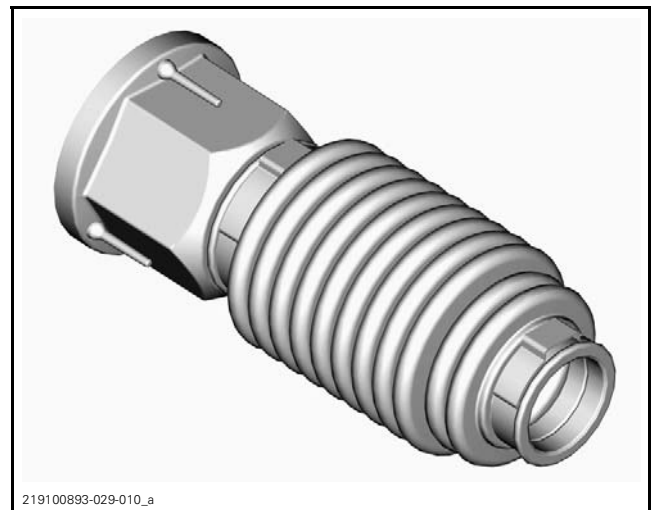


5. Remove connecting arm.

Installing the Connecting Arm

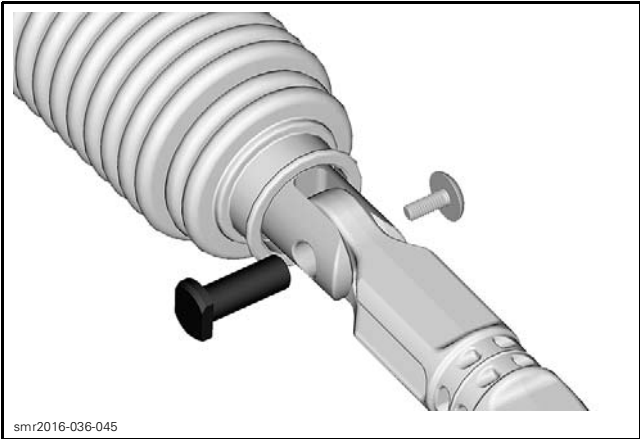
Use iBR override function to move iBR actuator to the full down setting.

NOTE: The bellows should already be installed and clamped on the iBR nut.

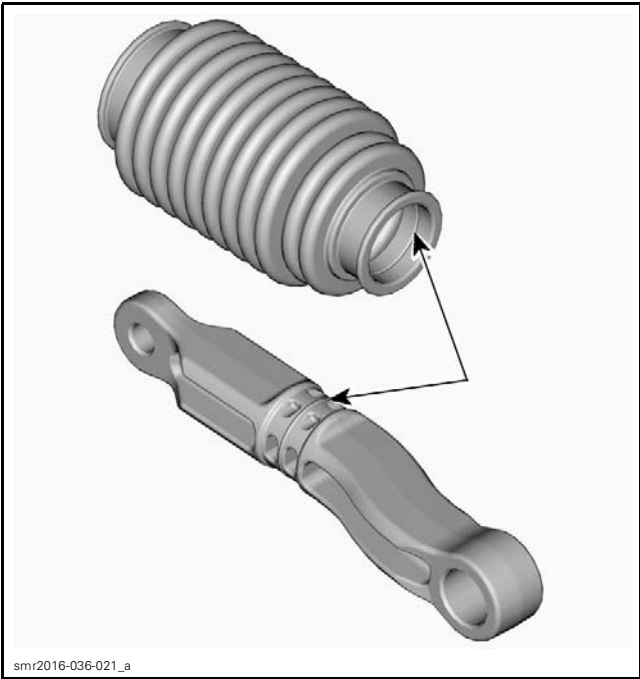


NOTICE Failure to adhere to the sequence in the following steps will cause the iBR air chamber to rupture or burst and cause premature failure of the iBR actuator.

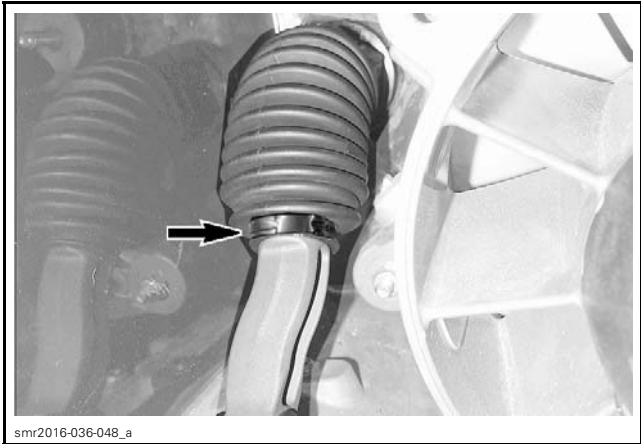
1. Push the bellows back towards iBR actuator.
2. Install connecting arm pin and screw.
 - 2.1 Tighten screw.



3. Position the bellows over the connecting arm.



4. Compress the air chamber (attached to iBR actuator).
- 4.1 Clamp the Oetiker clamp on the connecting arm bellows.



5. Reinstall other removed parts. Refer to appropriate subsections for procedures.

NOTICE Allow 24 hours for thread locker on retaining screws to cure.

Perform *iBR AUTO-CALIBRATION* procedure. Refer to *iBR AUTO-CALIBRATION* in this subsection.

ACTUATOR OUTPUT SHAFT

Removing the Actuator Output Shaft

1. Remove the connecting arm.
2. Unscrew the output shaft (1/4 of a turn) from the iBR actuator.

Installing the Actuator Output Shaft

The Installation is the reverse of the removal procedure. However, pay attention to the following.

TIGHTENING TORQUE	
Actuator output shaft	4.3 N•m (38 lbf•in)

Make sure the output shaft is aligned with the connecting arm.

Perform *iBR AUTO-CALIBRATION* procedure. Refer to *iBR AUTO-CALIBRATION* in this subsection.

VTS TRIM RING



Removing the VTS Trim Ring

1. Disconnect the steering cable. Refer to *STEERING* subsection.
2. Remove VTS trim ring retaining screws.
3. Remove nozzle pivot screws.

Installing the VTS Trim Ring

Reverse removal procedure.

TIGHTENING TORQUE	
VTS trim ring retaining screws	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)

Reinstall other removed parts. Refer to appropriate subsections for procedures.

Apply red Loctite on VTS trim ring retaining screws.

SERVICE PRODUCT
LOCTITE 271 (RED) (P/N 293 800 005)

NOTICE Allow 24 hours for thread locker on retaining screws to cure.

Perform *IBR AUTO-CALIBRATION* procedure. refer to *IBR AUTO-CALIBRATION* in this subsection.

BRAKE AND REVERSE LEVER SWITCH (BRLS)

Testing and Specifications

BRLS PINOUT	
PIN	SIGNAL
BRLS-A	5 VDC
BRLS-B	GND
BRLS-C	View signal % in BUDS2
BRLS-D	5VDC
BRLS-E	GND
BRLS-F	View signal % in BUDS2

NOTE: When moving BRLS lever, the BRLS percentage should increase or decrease in a steady linear fashion.

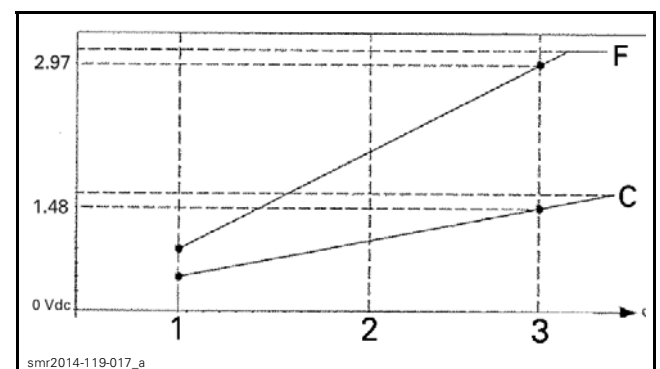
If BUDS2 does not show BRLS percentage moving or if reading is erratic:

- Check for BRLS reference voltage.
- Check for BRLS ground.
- Carry out a continuity test of the wiring between the iBR actuator and the BRLS.

NOTE: When installed on vehicle the BRLS-C Vdc signal should always be half of the BRLS-F Vdc signal when testing with a multimeter.

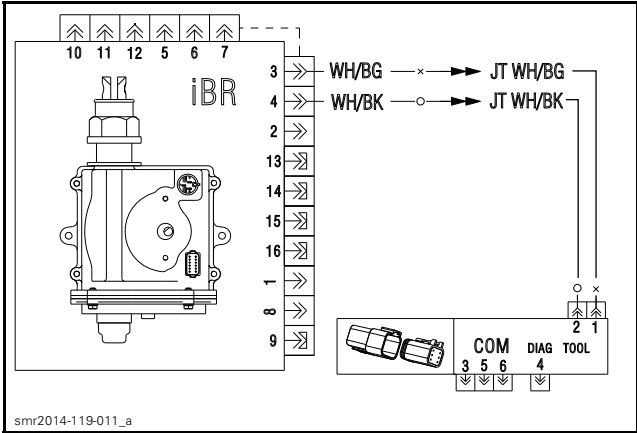
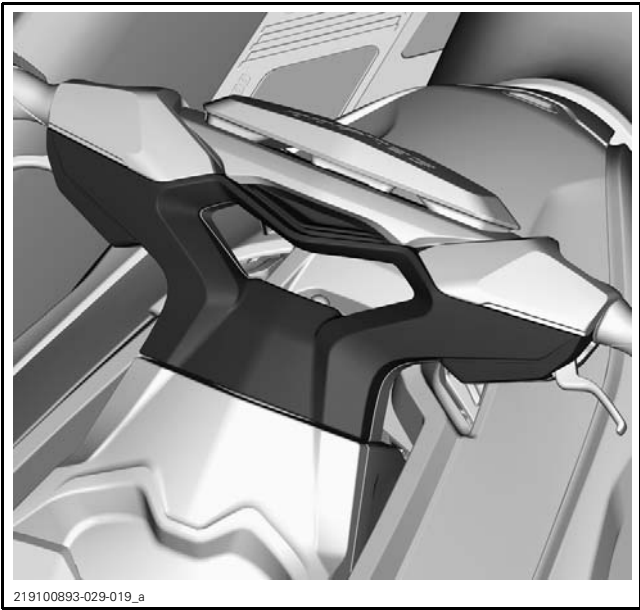
To test, install Diagnostic harness between steering harness connectors.

REQUIRED TOOL
DIAGNOSTIC HARNESS (P/N 529 036 384)



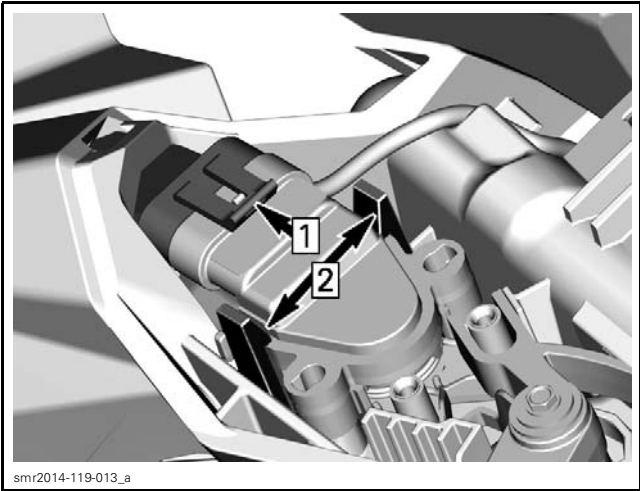
APPROXIMATE BRLS SIGNAL VOLTAGE CURVE PINS F AND C
 1. BRLS released
 2. BRLS at 50% pulled
 3. BRLS fully pulled

Removing the BRLS



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.

TESTING CAN COMMUNICATION

CAN WIRE RESISTANCE TEST		
IBR ACTUATOR CONNECTOR PIN	COM CONNECTOR PIN	SPECIFIED RESISTANCE
iBR-3	COM-1	0 Ω
iBR-4	COM-2	0 Ω

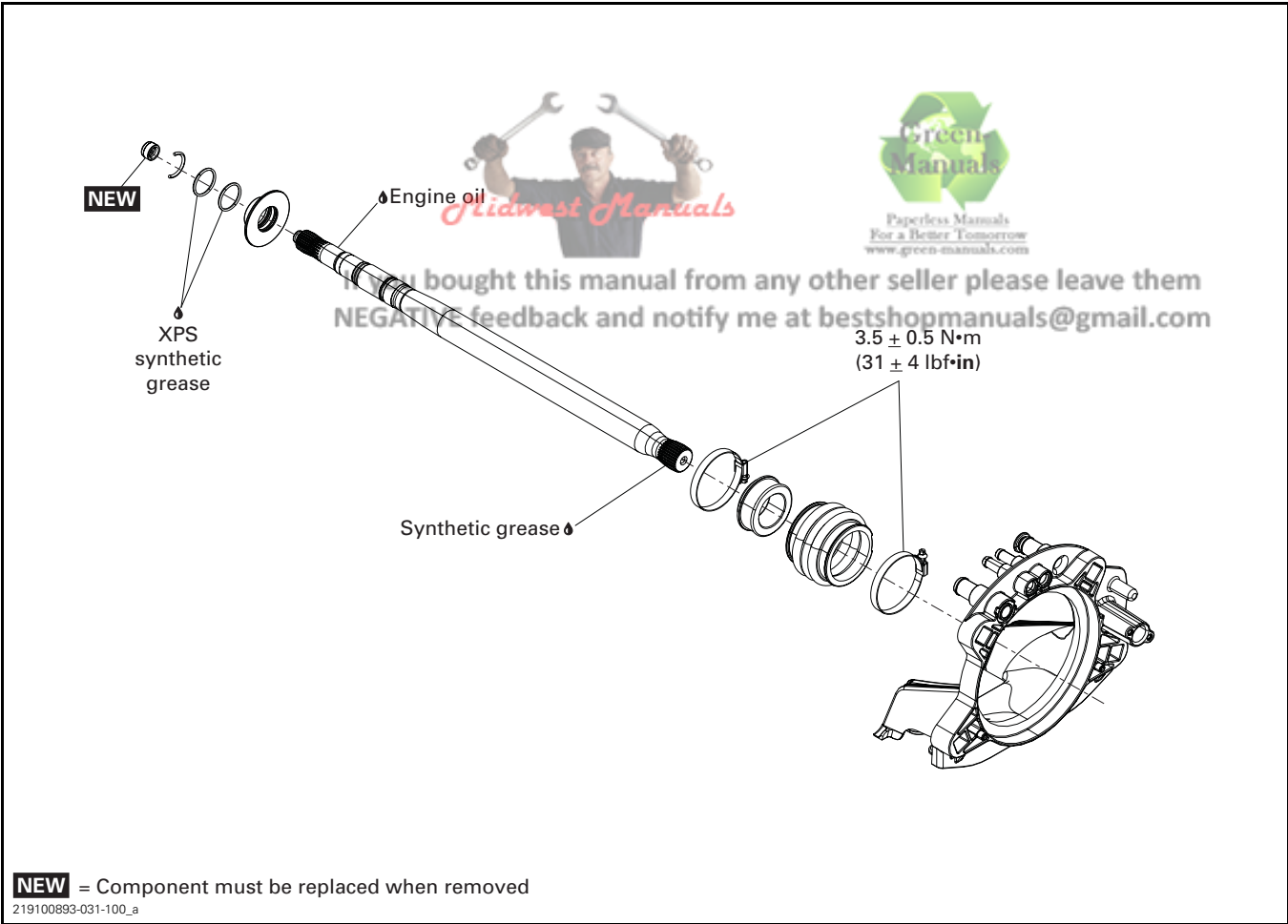
DRIVE SHAFT

SERVICE TOOLS

Description	Part Number	Page
DRIVE SHAFT C-CLIP REMOVER	529 036 026	2
FLOATING RING TOOL (TYPE II)	529 036 116	2
PTO SUPPORT TOOL	529 035 842	3, 6

SERVICE PRODUCTS

Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	4
LUBRICANT AND ANTI-CORROSIVE (EUR)	779224	3
LUBRICANT AND ANTI-CORROSIVE.....	779168	3
P80 GRIP-IT	296 000 406	6



PROCEDURES

DRIVE SHAFT

Drive Shaft Access

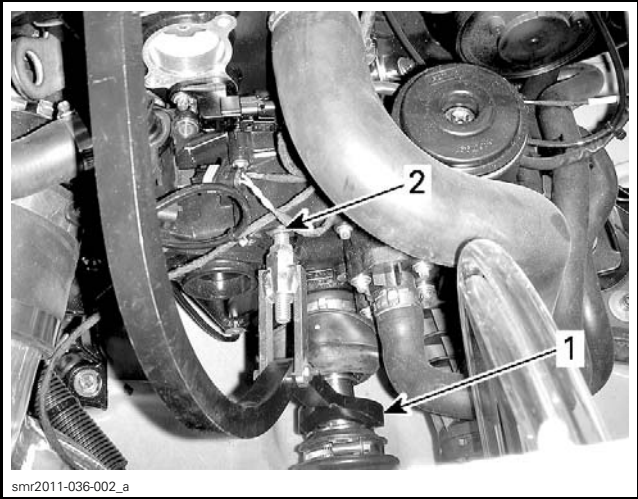
Remove the seat and engine service cover. Refer to *BODY* subsection.

Removing the Drive Shaft

Procedures

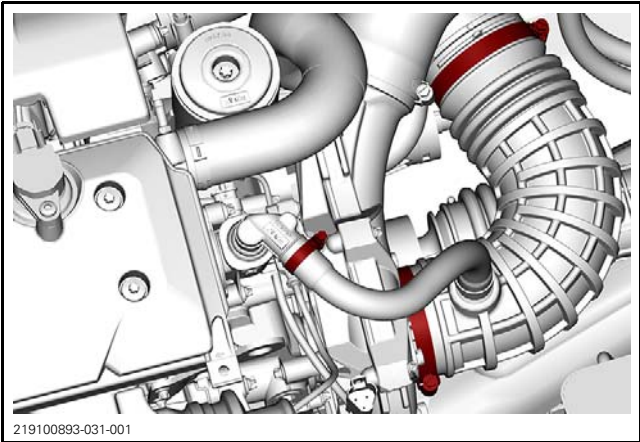
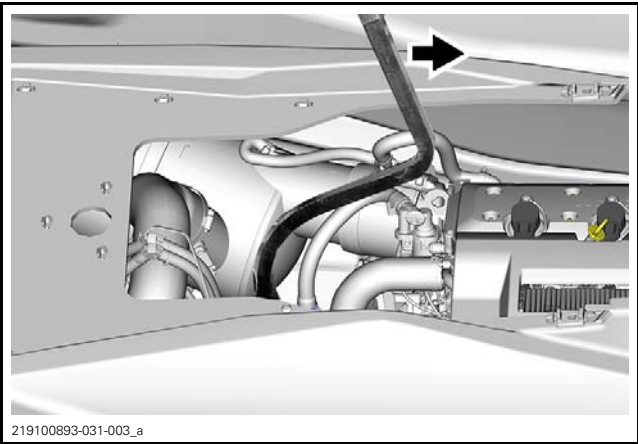
NOTE: Ensure jet pump is installed before beginning this procedure.

- 1. On supercharged engines, remove air intake hose.



TYPICAL
1. Fork against floating ring
2. Adjustable arm

- 3.3 Move the tool handle toward the front of vehicle to push floating ring rearward.



- 2. Lift rubber protector to expose PTO seal assembly.
- 3. Confirm the floating ring is not stuck on drive shaft as follows:

REQUIRED TOOL	
DRIVE SHAFT C-CLIP REMOVER (P/N 529 036 026)	

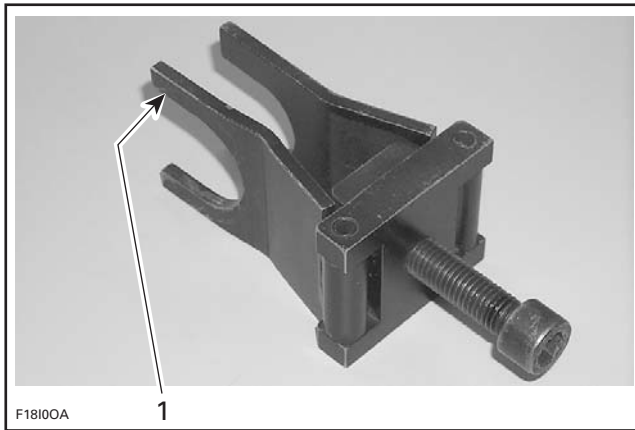
- 3.1 Place the fork of drive shaft C-clip remover against floating ring.
- 3.2 Place the adjustable arm against the engine block or the supercharger.

The next steps (4 to 12) should be performed only if the floating ring seems stuck or hard to move. Otherwise, go to the step 13.

NOTE: Do not remove circlip at this time.

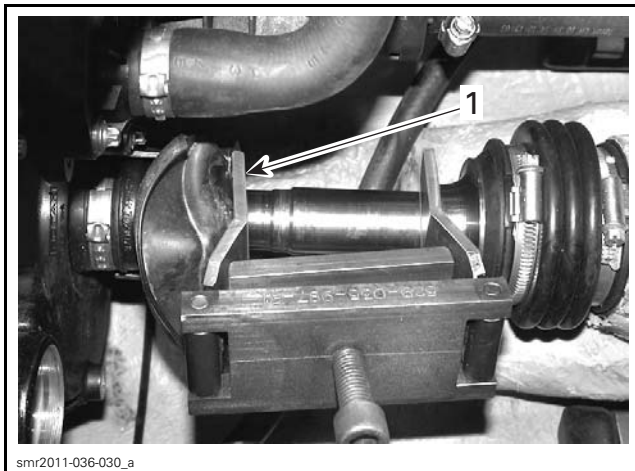
- 4. Remove the drive shaft C-clip remover.
- 5. If equipped, remove the supercharger. Refer to *SUPERCHARGER* subsection.
- 6. Install the following tool on drive shaft with its largest opening on PTO side.

REQUIRED TOOL	
FLOATING RING TOOL (TYPE II) (P/N 529 036 116)	



TYPICAL

1. Largest opening on PTO seal side



TYPICAL

1. Largest opening here

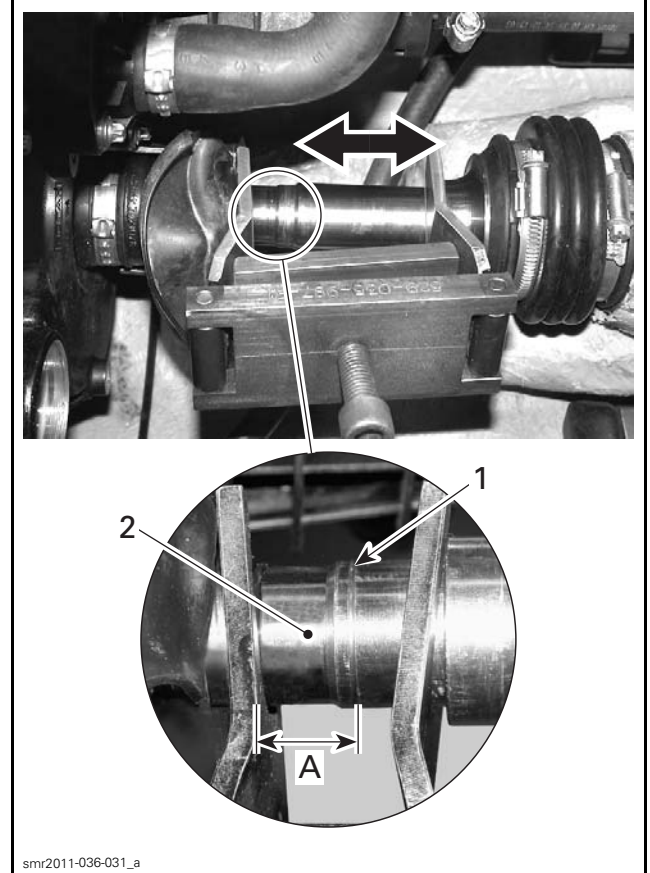
7. To expose the O-ring contact area, tighten tool screw until the following gap is obtained.

GAP BETWEEN TELLTALE GROOVE AND TOOL EDGE	
18 mm (11/16 in)	

8. Lubricate O-ring contact area with anti-corrosive lubricant.

SERVICE PRODUCT	
Scandinavia	LUBRICANT AND ANTI-CORROSIVE (EUR) (P/N 779224)
All other countries	LUBRICANT AND ANTI-CORROSIVE (P/N 779168)

NOTE: This is necessary to ease drive shaft removal later in this procedure.



TYPICAL

1. Telltale groove

2. Lubricate this area

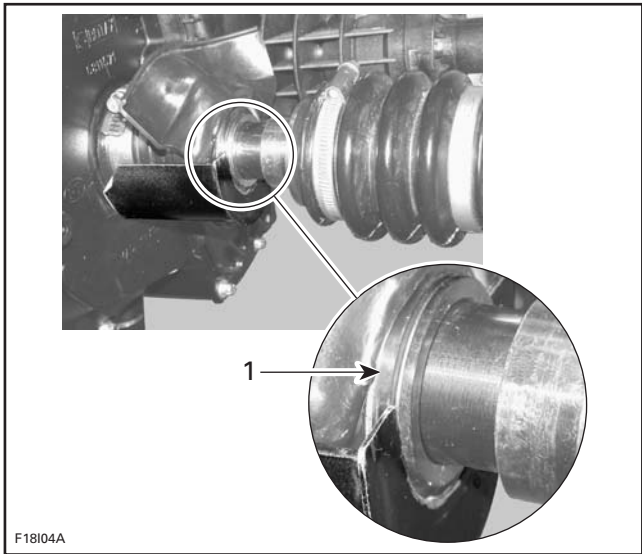
A. 18 mm (11/16 in)

9. Remove the floating ring tool.

10. Install the following tool to PTO seal assembly.

REQUIRED TOOL	
PTO SUPPORT TOOL (P/N 529 035 842)	

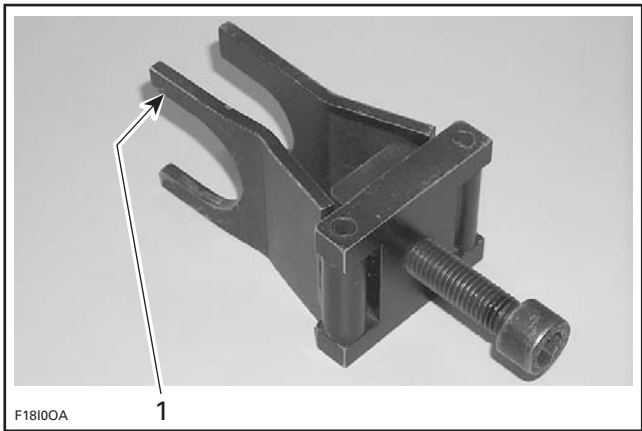
Subsection XX (DRIVE SHAFT)



1. Insert in groove of PTO seal assembly

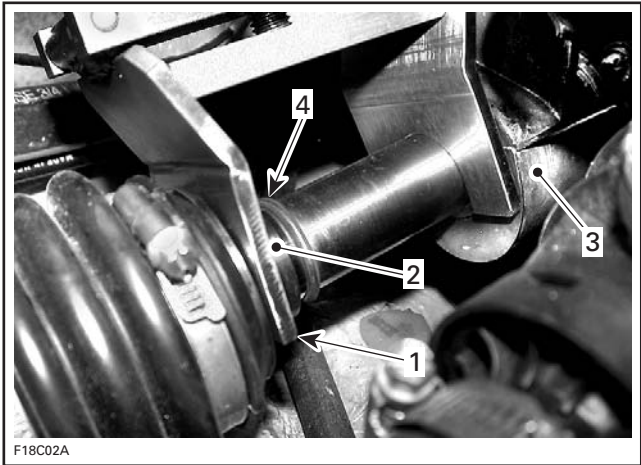
NOTICE Strictly follow this procedure otherwise damage to component might occur.

11. Reinstall the floating ring tool as shown.



TYPICAL
1. Largest opening on PTO seal side

12. Tighten tool screw to push floating ring rearward and expose circlip.
13. Remove and discard circlip.



TYPICAL
1. Largest opening here
2. Floating ring
3. PTO seal support tool
4. Remove circlip

14. Remove the floating ring tool.
15. Place rags under PTO housing to prevent spillage. If spillage occurs, clean immediately with pulley flange cleaner to prevent oil stains.

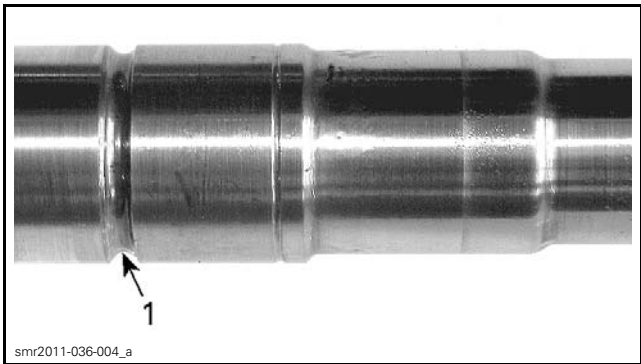
SERVICE PRODUCT
CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

16. Remove jet pump. Refer to *JET PUMP* subsection.
17. Remove drive shaft.
NOTE: A slight jerk to the rear may be required to remove the drive shaft from the PTO seal assembly.

Inspecting the Drive Shaft

Drive Shaft

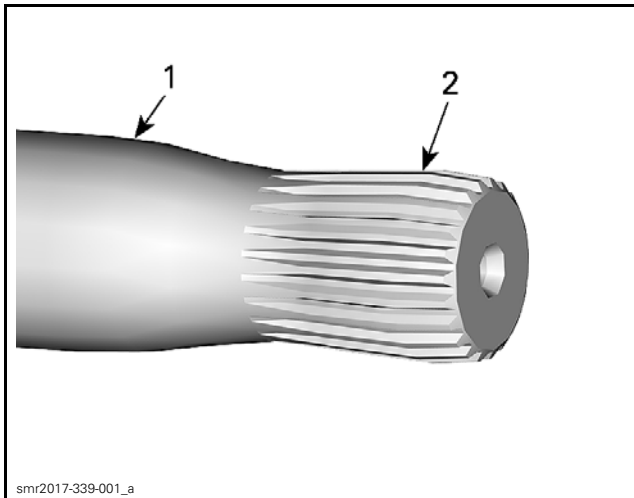
Inspect condition of circlip groove. If there is any damage or severe wear, replace drive shaft.



1. Circlip groove

Inspect condition of drive shaft splines. If splines are damaged, replace drive shaft and check splines of impeller and PTO housing.

With your finger nail, feel machined surface of drive shaft. If any irregular surface is found, replace drive shaft.

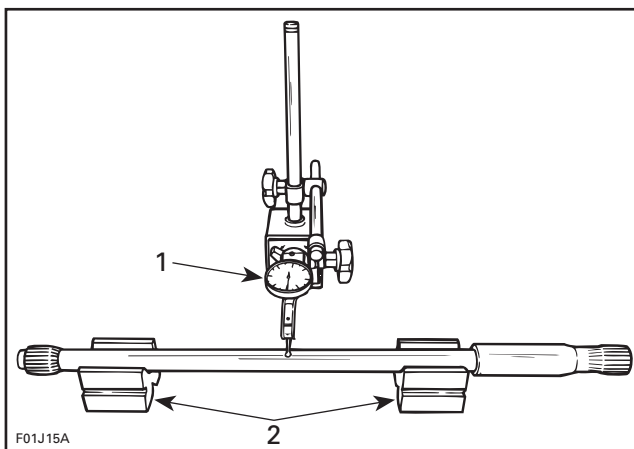


TYPICAL

1. Surface condition
2. Splines condition

Place drive shaft on V-blocks and set-up a dial gauge in center of shaft. Slowly rotate shaft; difference between highest and lowest dial gauge reading is deflection. Refer to the following illustration.

NOTE: Excessive deflection could cause vibration and damage to drive shaft splines, impeller or floating ring.



MEASURING DRIVE SHAFT DEFLECTION

1. Dial gauge
2. V-blocks

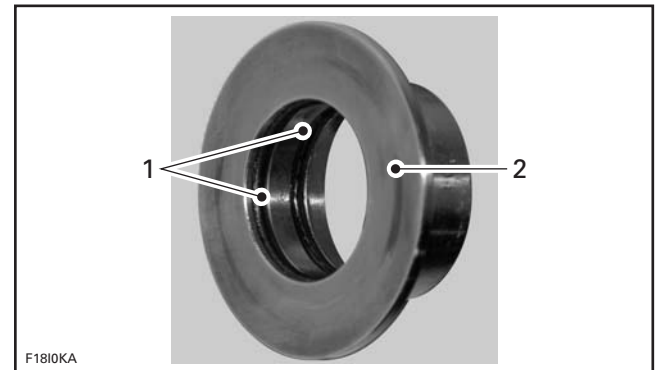
MAXIMUM DEFLECTION

0.5 mm (.02 in)

Floating Ring

Inspect condition of O-rings and contact surface of floating ring.

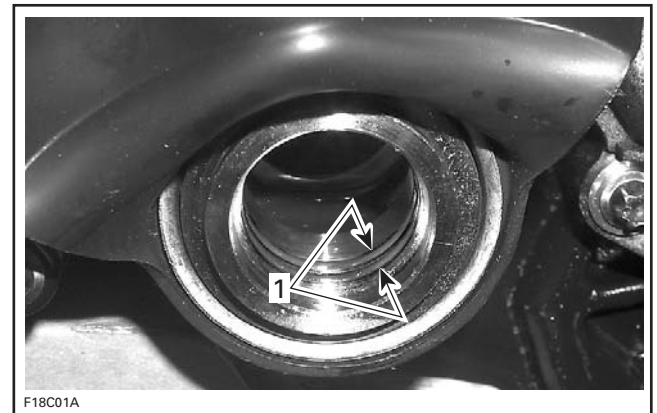
Replace as required.



1. O-rings
2. Contact surface

Installing the Drive Shaft

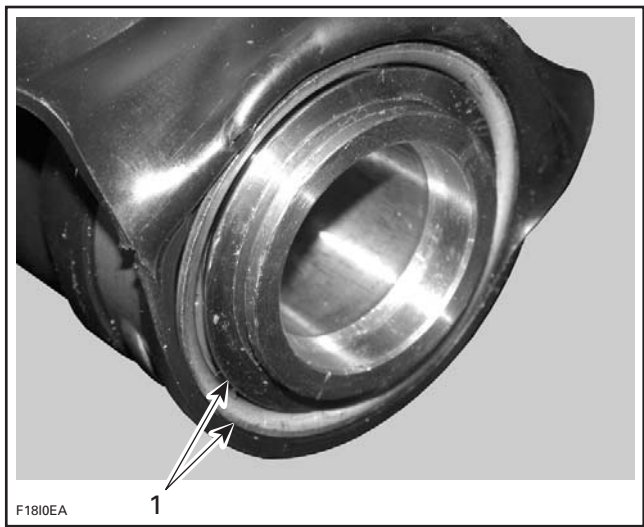
Before installing drive shaft, discard both O-rings inside PTO seal and install **NEW** ones.



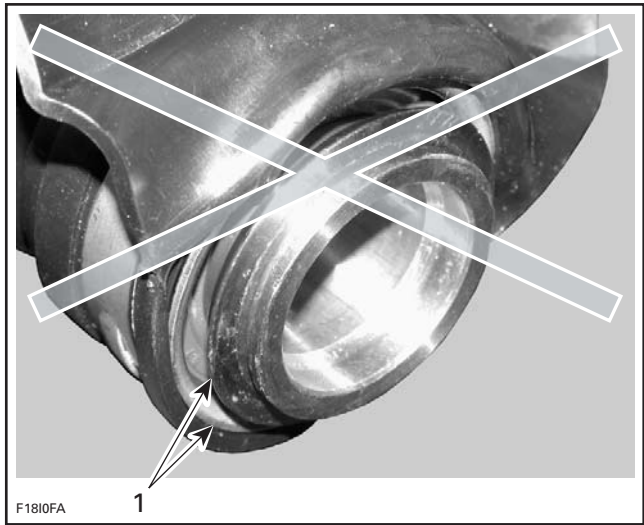
1. O-rings

Inspect PTO seal assembly. The inner sleeve must be flush with outer circumference of the assembly. Otherwise, gently push or tap on inner sleeve until flush.

Subsection XX (DRIVE SHAFT)

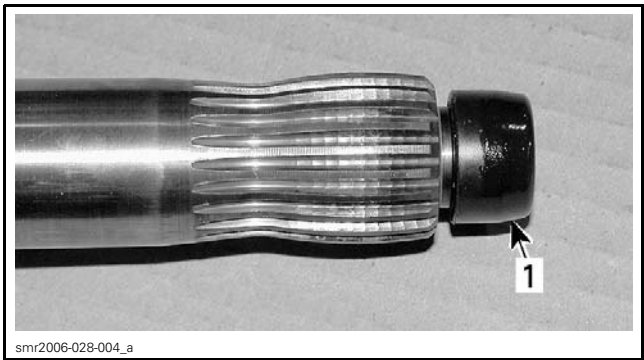


CORRECT POSITION
1. Inner sleeve flush with outer circumference



INCORRECT POSITION
1. Inner sleeve not flush with outer circumference

Remove the damper at the end of drive shaft and replace it with a **NEW** one.



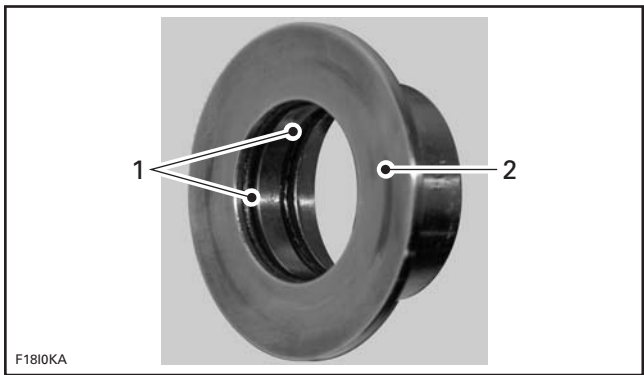
1. Damper

Install the PTO support tool on PTO seal assembly.

REQUIRED TOOL	
PTO SUPPORT TOOL (P/N 529 035 842)	

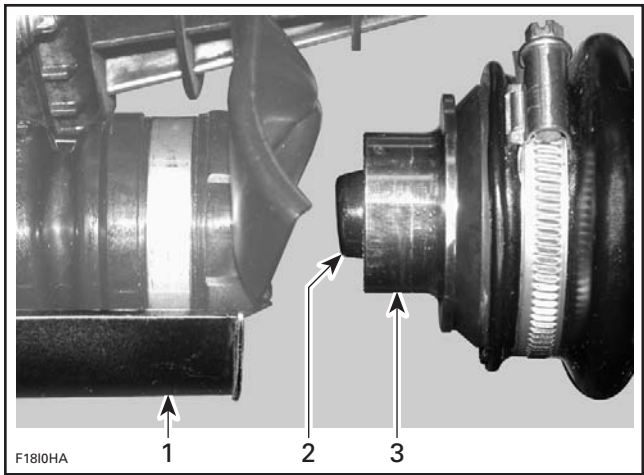
Apply a thin coat of Grip-it on the floating ring O-rings. Do not get grease on floating ring contact surface.

SERVICE PRODUCT
P80 GRIP-IT (P/N 296 000 406)



1. P80 Grip-it on O-rings
2. No lubrication on contact surface

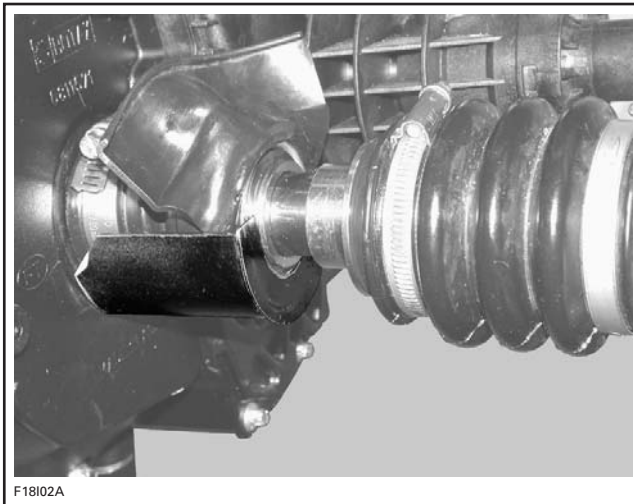
Slide drive shaft far enough to install floating ring.



1. PTO seal support
2. Drive shaft end
3. Insert floating ring on shaft end

Continue pushing drive shaft towards engine carefully guiding it in the PTO seal then in crankshaft splines. It may be necessary to move PTO seal assembly up and down to position it in the same axis as the drive shaft.

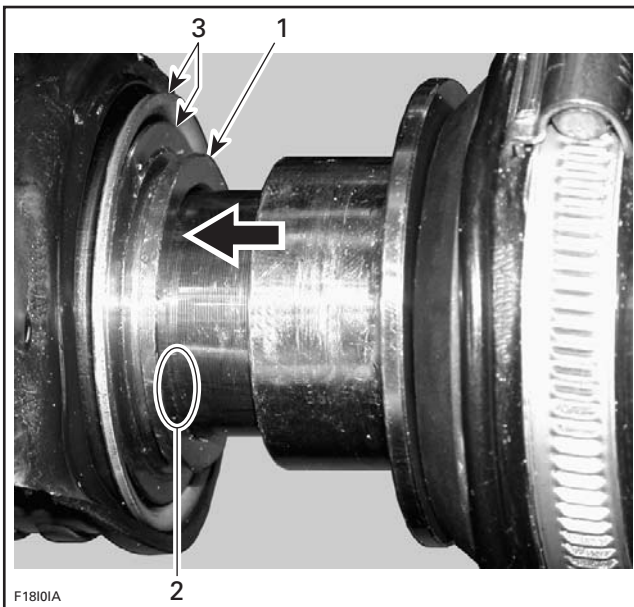
NOTE: If drive shaft does not enter into the PTO seal, check engine alignment.



TYPICAL

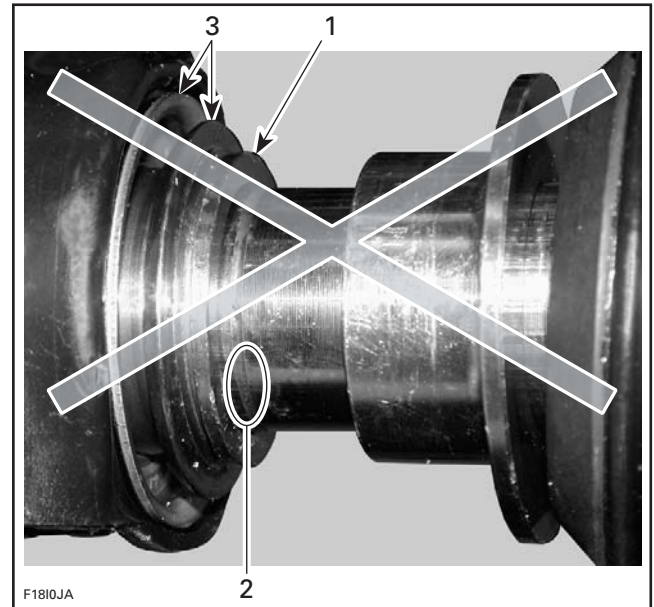
Maintain PTO seal assembly in the proper position and tap shaft end until it bottoms against engine. At this time, the telltale groove **MUST NOT** be visible. This validates the correct position.

NOTICE If the telltale groove is exposed, the installation is wrong and PTO seal assembly will be pressed into crankshaft splines which could rub a hole in seal thus creating an oil leak.



CORRECT INSTALLATION

1. PTO seal assembly
2. Shaft pushed in, hiding telltale groove
3. Inner sleeve flush with outer circumference



IMPROPER INSTALLATION

1. PTO seal assembly
2. Telltale groove visible
3. Inner sleeve NOT flush with outer circumference

Temporarily install the jet pump housing. Push floating ring rearwards and install a **NEW** circlip.

Ensure everything is properly positioned:

- Telltale groove is not visible
- Inner sleeve is flush with outer circumference of PTO seal assembly
- Circlip is not exposed.

If telltale groove is visible, pull PTO seal assembly rearwards to fully extend it.

If inner sleeve is not flush, gently tap it until it is flush.

Reposition rubber protector.

Permanently install jet pump. Refer to *JET PUMP* subsection.

Test watercraft then ensure there is:

- No oil leak in PTO seal area
- No water intrusion by the thru-hull fitting area.

DRIVE SHAFT BELLOWS

Inspecting the Drive Shaft Bellows

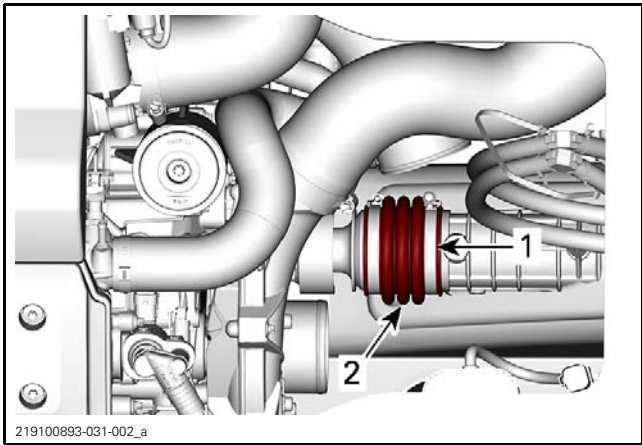
Inspect the condition of bellows. If there is any damage or evidence of wear, replace it.

Removing the Drive Shaft Bellows

Remove drive shaft. Refer to *DRIVE SHAFT* in this subsection.

Subsection XX (DRIVE SHAFT)

Loosen gear clamp holding bellows, then carefully pull bellows and carbon ring from hull insert.



TYPICAL
1. Loosen this clamp
2. Drive shaft bellows

Installing the Drive Shaft Bellows

The installation is the reverse of the removal procedure.

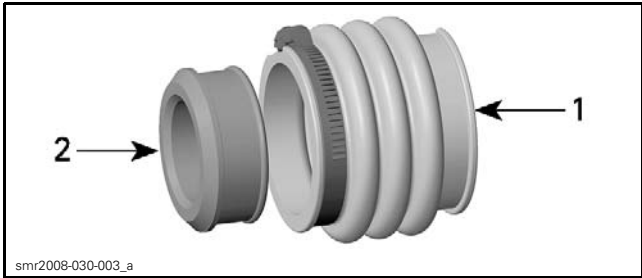
CARBON RING

Removing the Carbon Ring

NOTE: Always replace the floating ring when replacing the carbon ring.

Remove *DRIVE SHAFT BELLOWS*. See procedure in this subsection.

Loosen gear clamp then pull carbon ring from drive shaft bellows.



1. Drive shaft bellows
2. Carbon ring

Installing the Carbon Ring

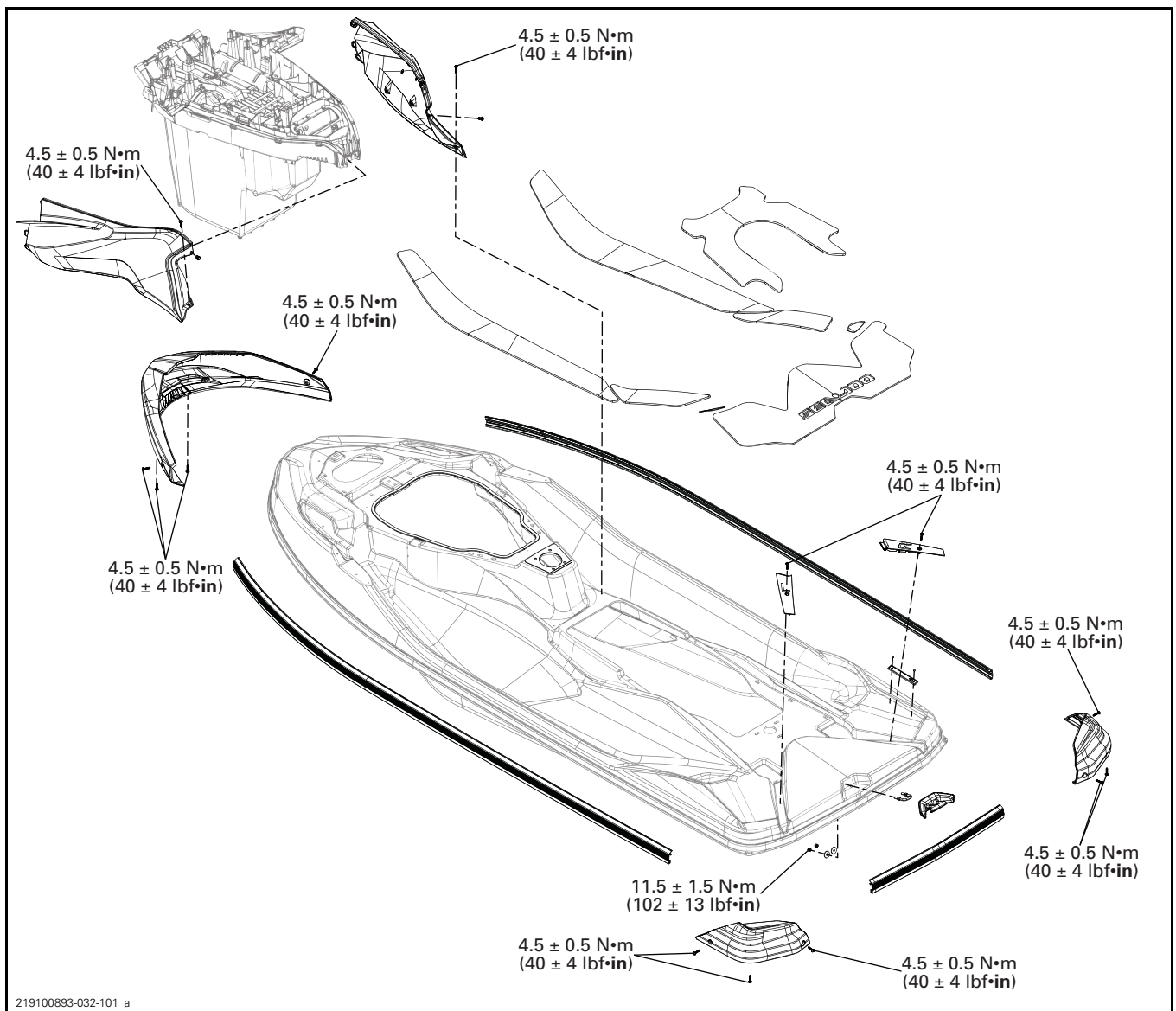
The installation is the reverse of the removal procedure.

BODY

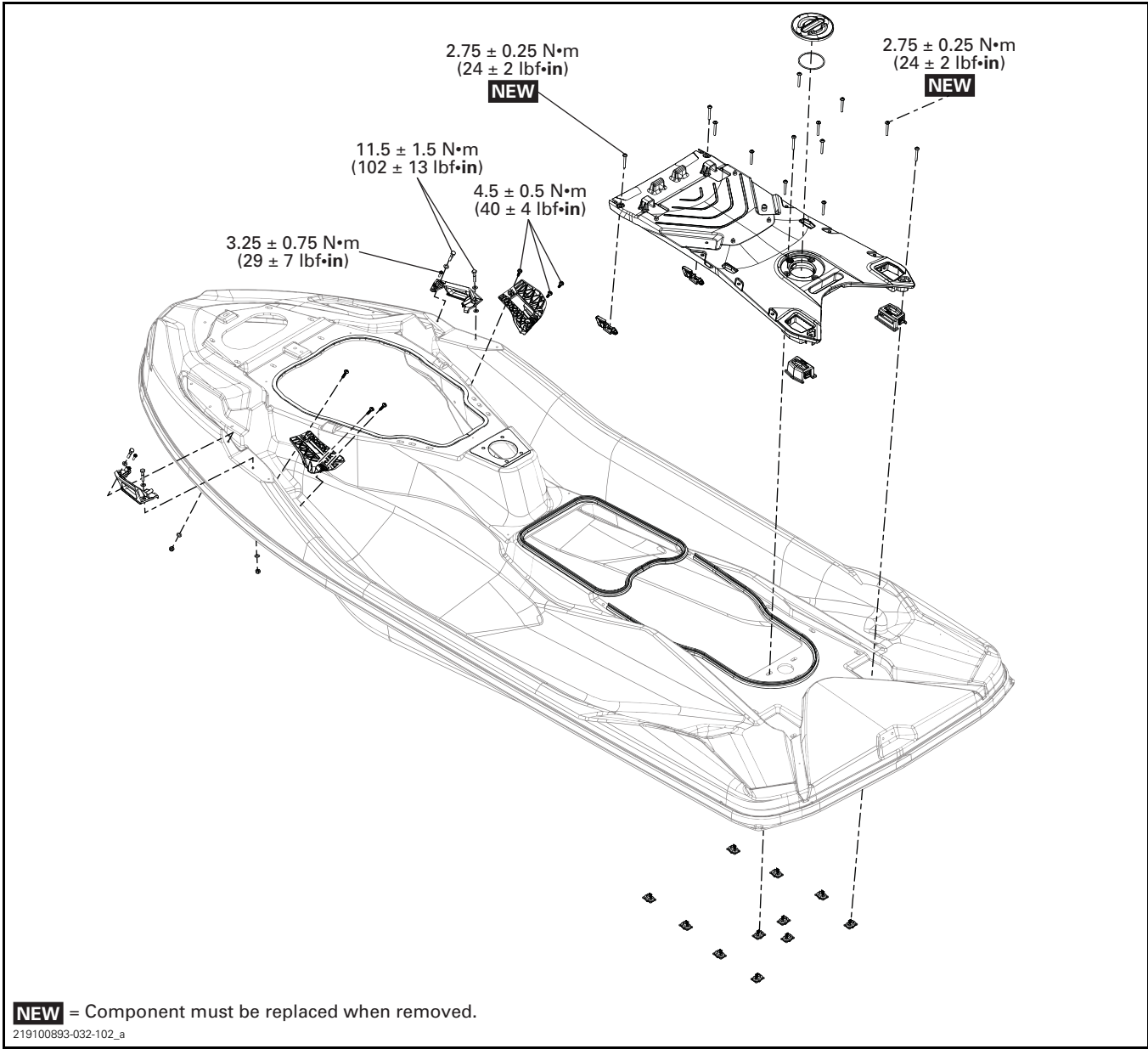
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 414	413 705 800	11
LOCTITE 5900	293 800 066	28
SYNTHETIC GREASE (EUR)	779231	25–26
SYNTHETIC GREASE	779162	25–26

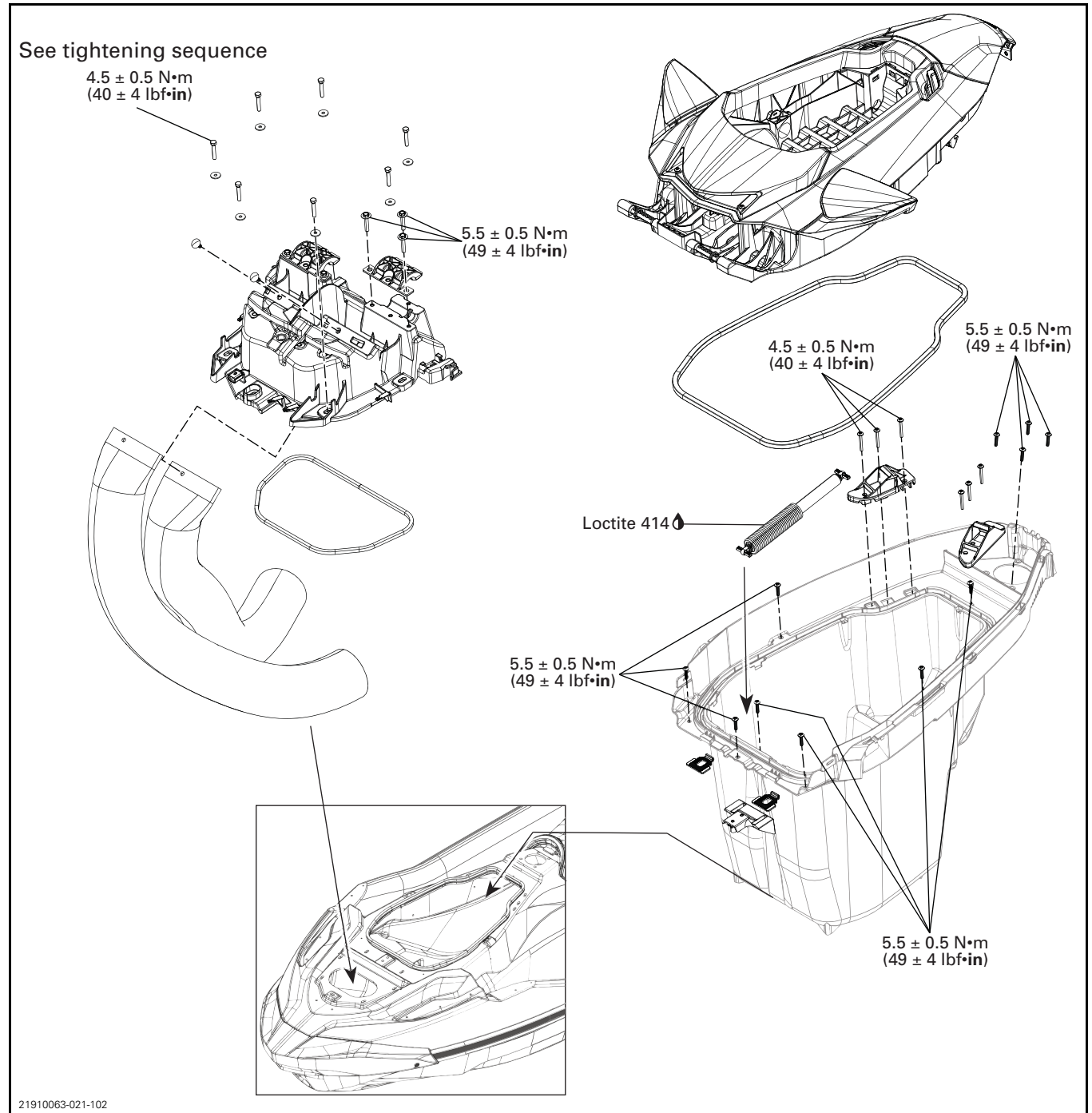
BODY



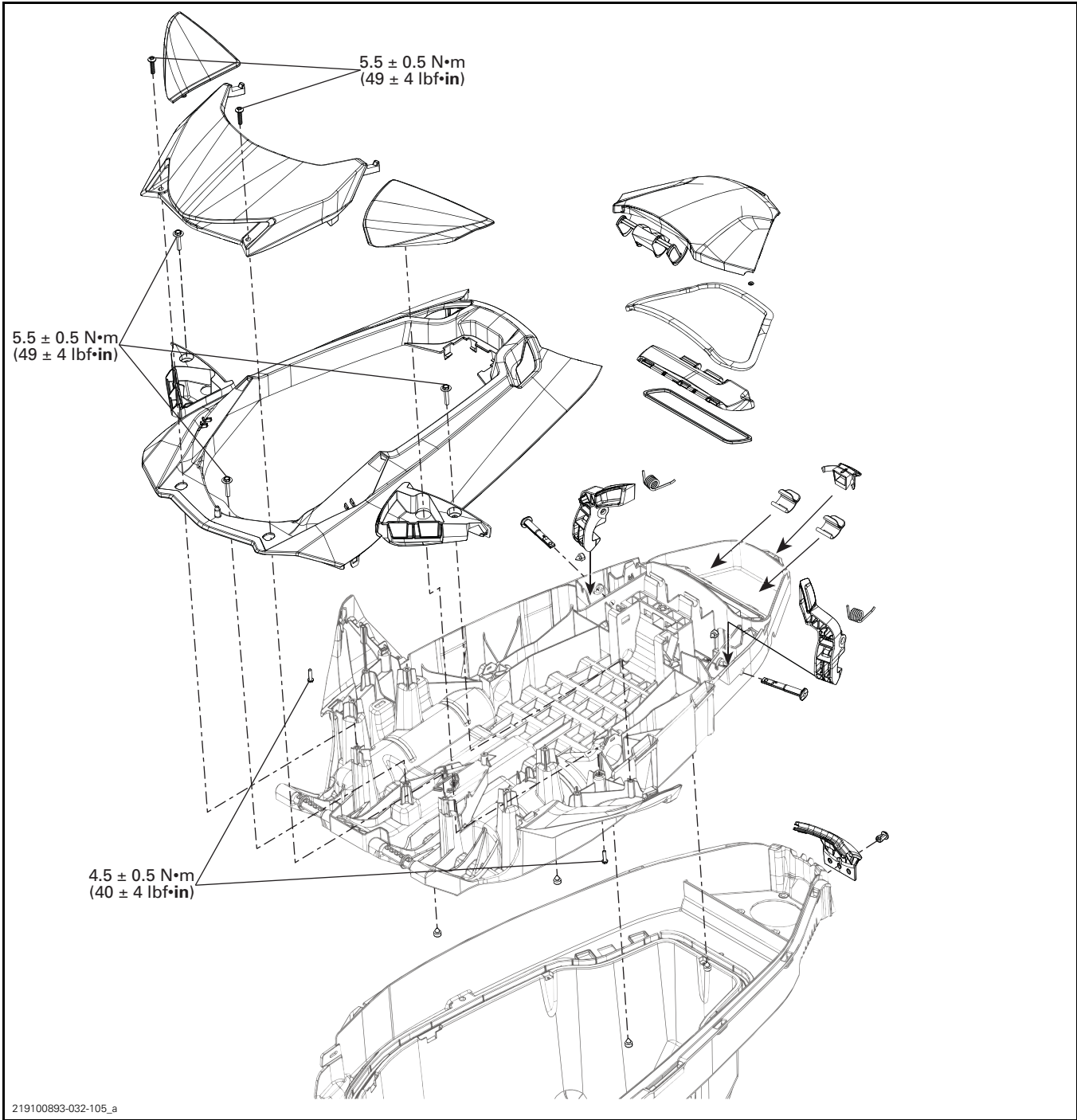
BODY



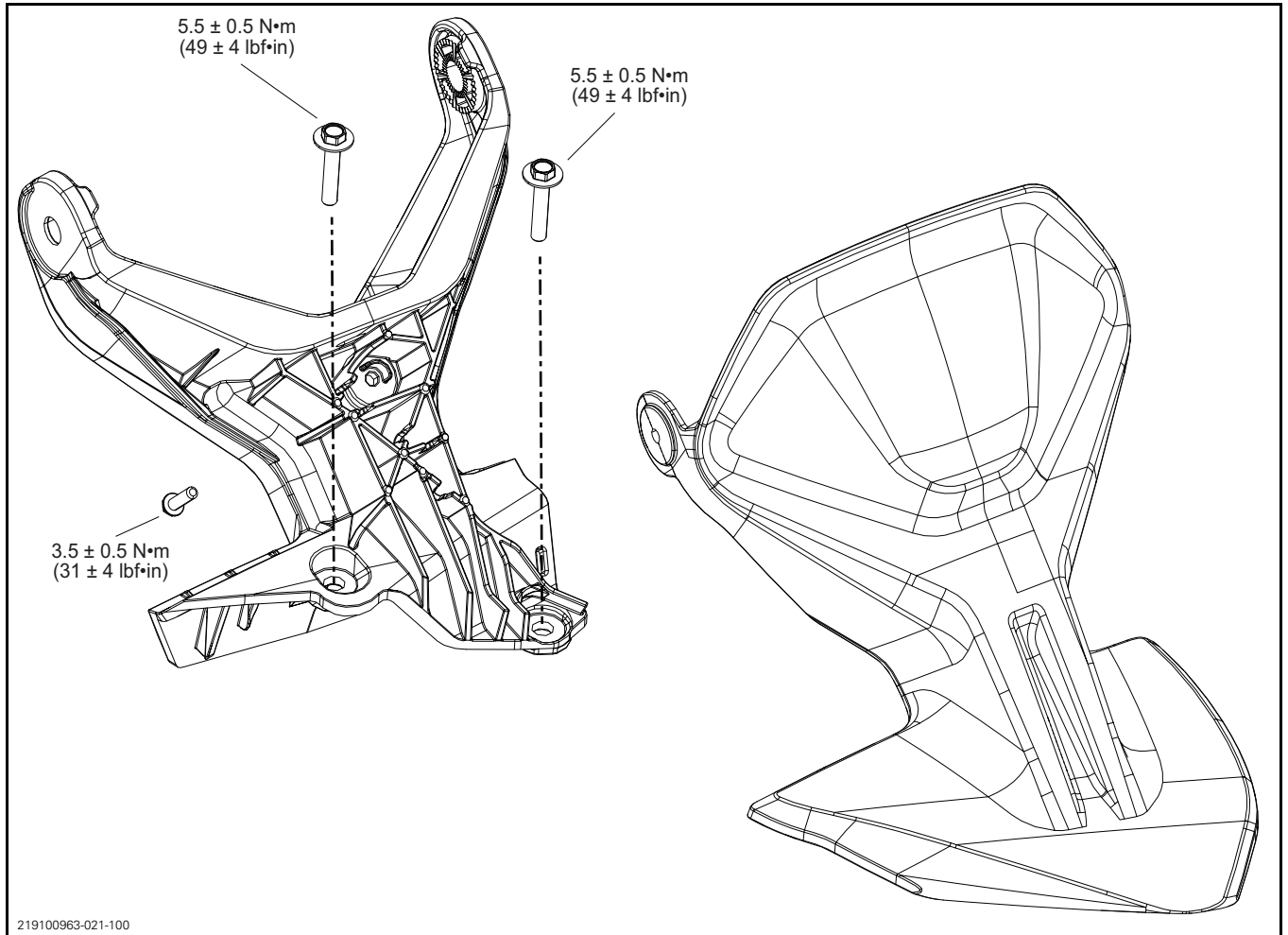
STORAGE COMPARTMENT AND VENTILATION



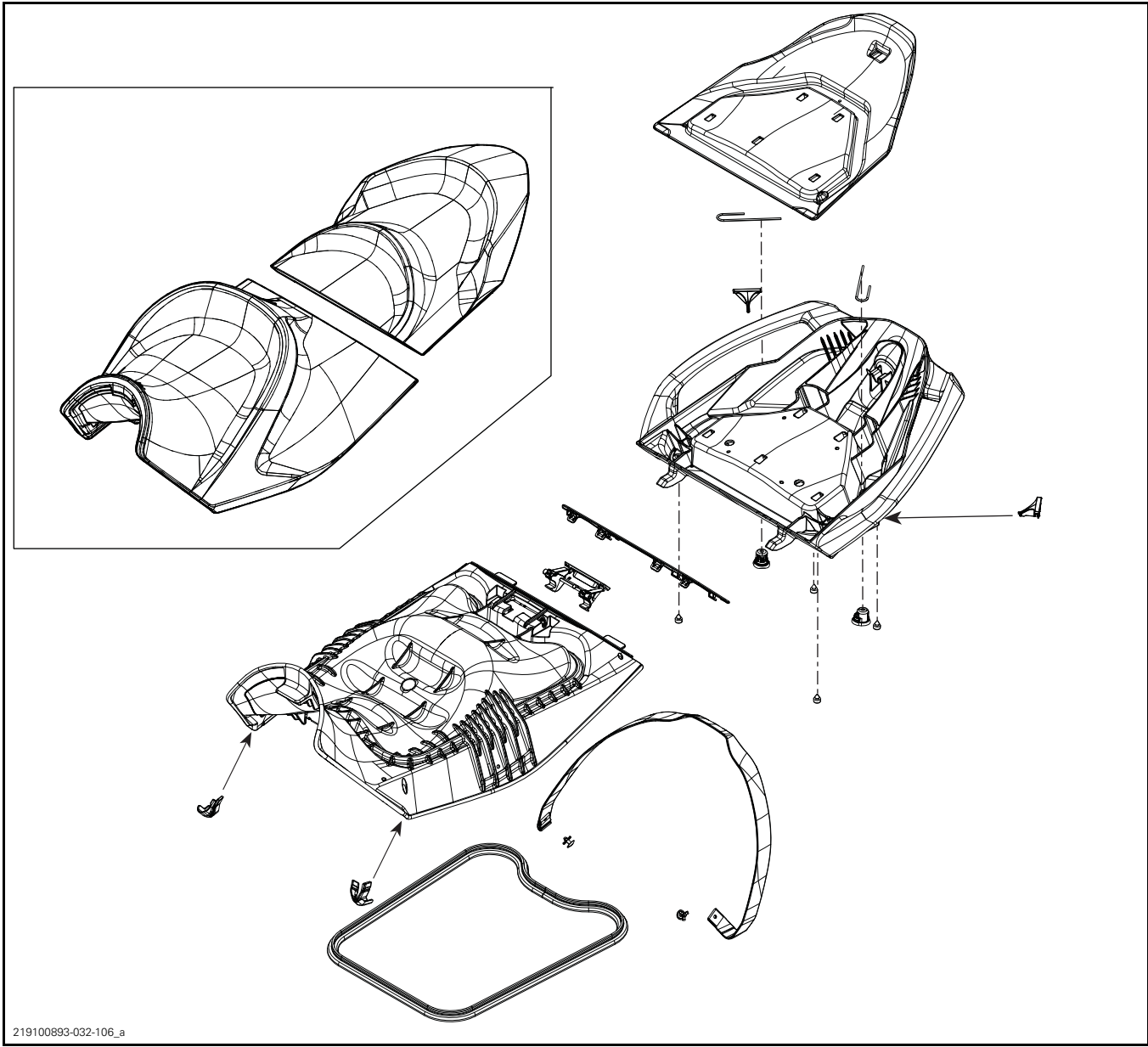
FRONT COVER



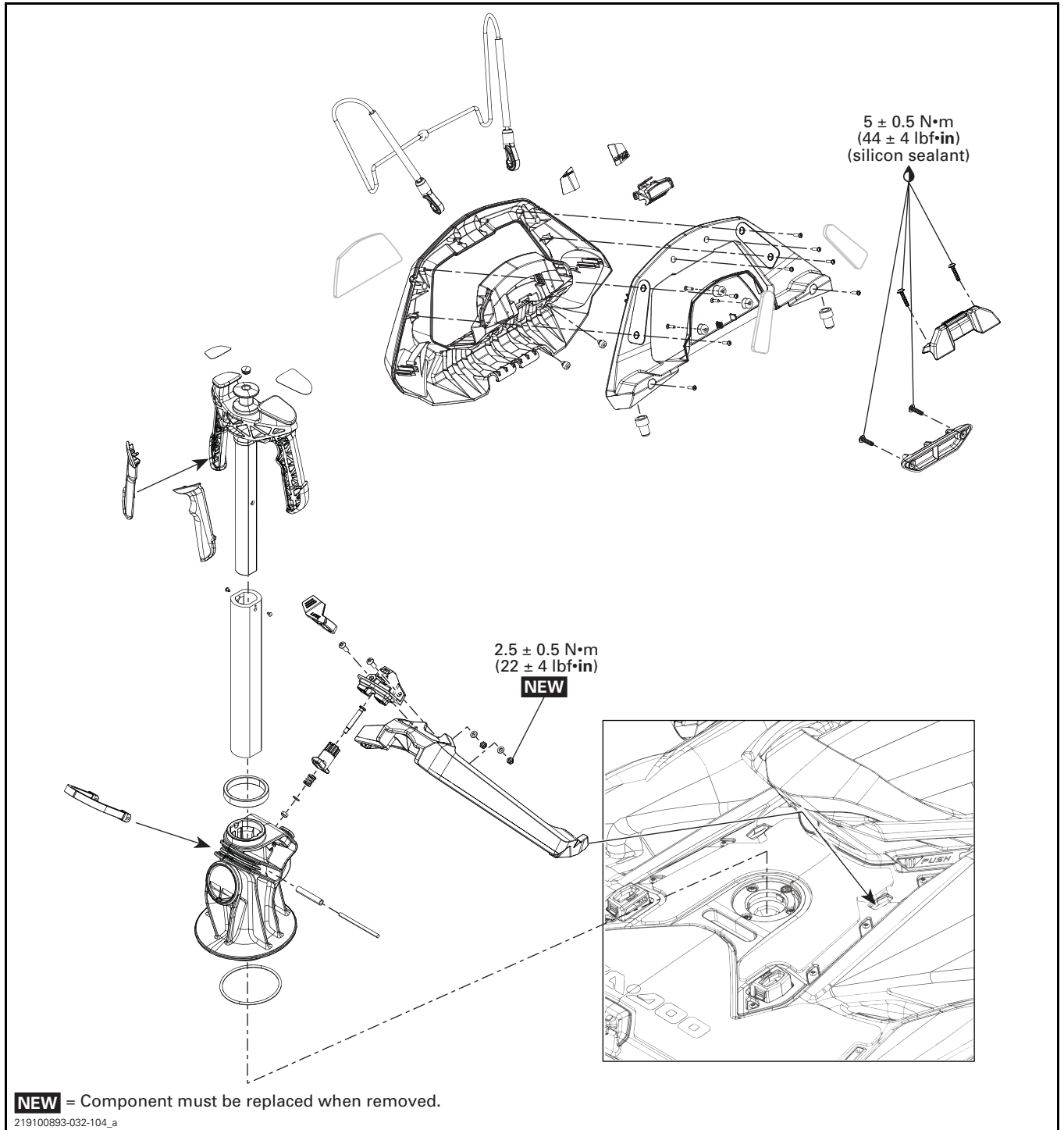
FISH FINDER SONAR (FISH PRO MODEL)



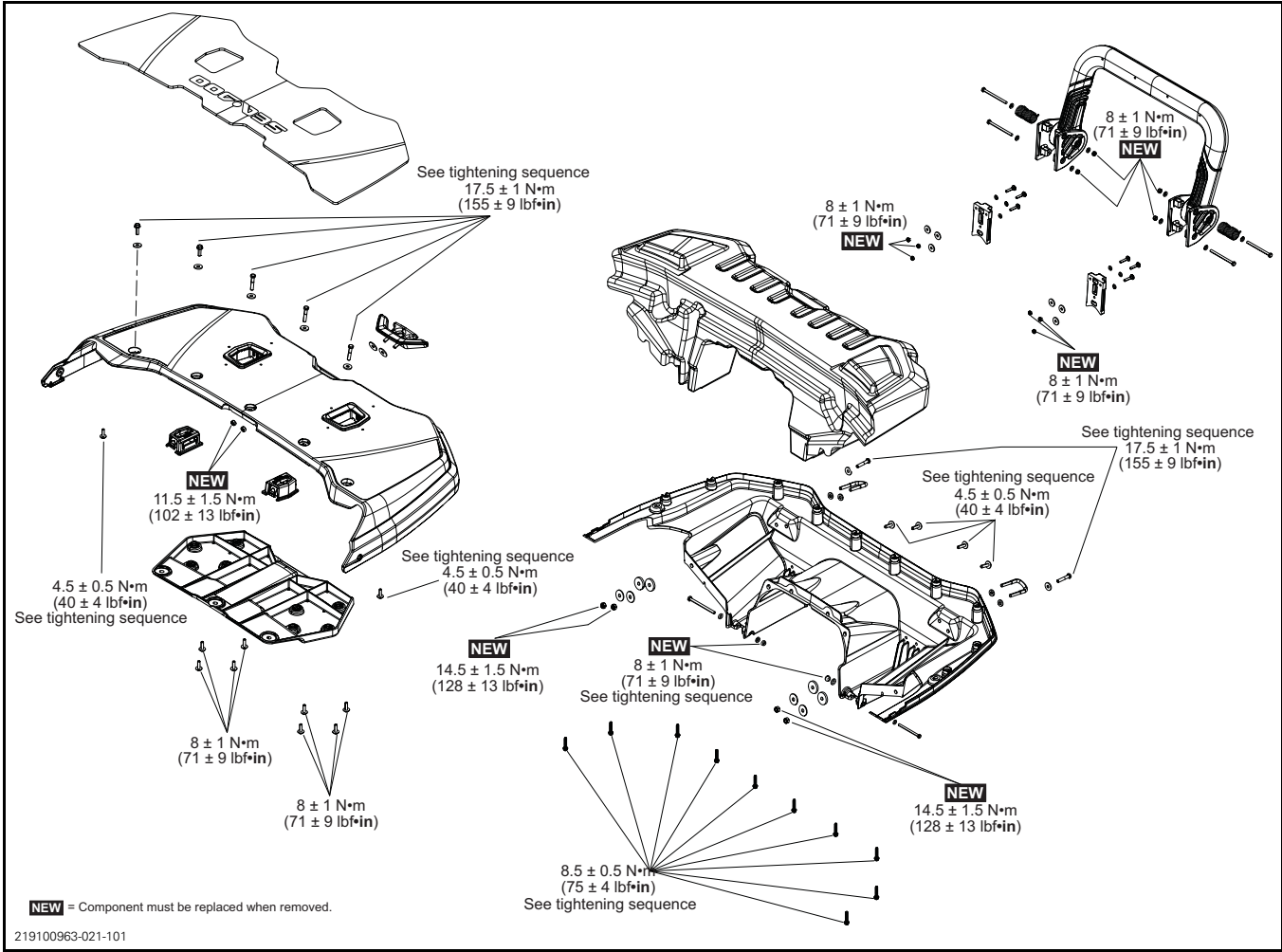
SEAT



WAKEBOARD RACK AND WAKE PYLON (WAKE PRO MODEL)



REAR EXTENSION (FISH PRO MODEL)

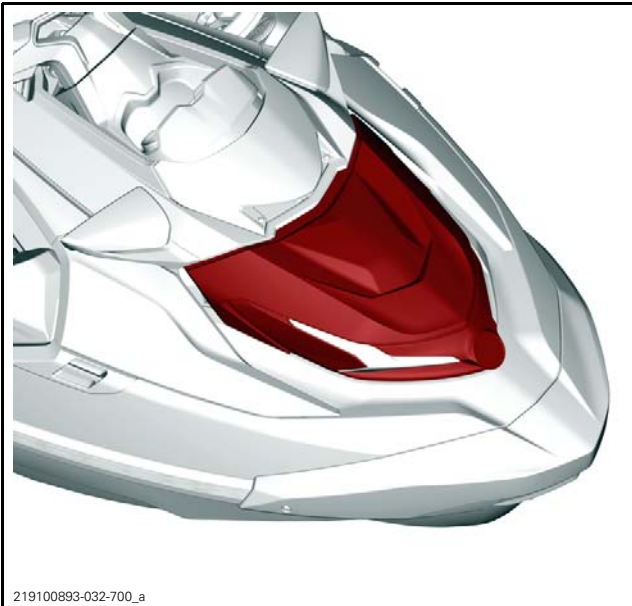


PROCEDURES

GELCOAT, DECALS AND CARPETS

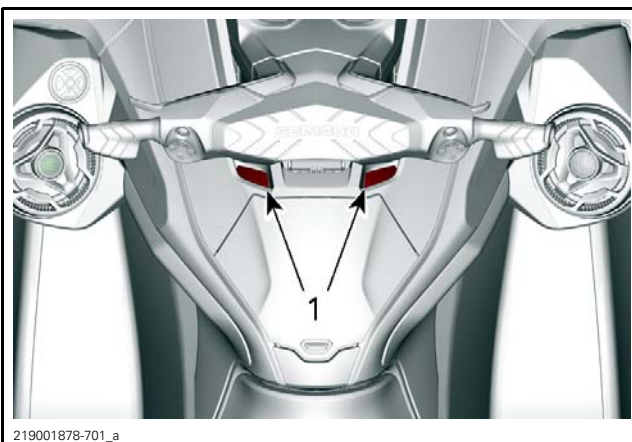
For information and repair, refer to *CLEANING AND REPAIR* subsection.

HOOD



Removing Hood

1. Open storage cover.



1. Storage cover release buttons

2. Remove side retaining screws on both sides.

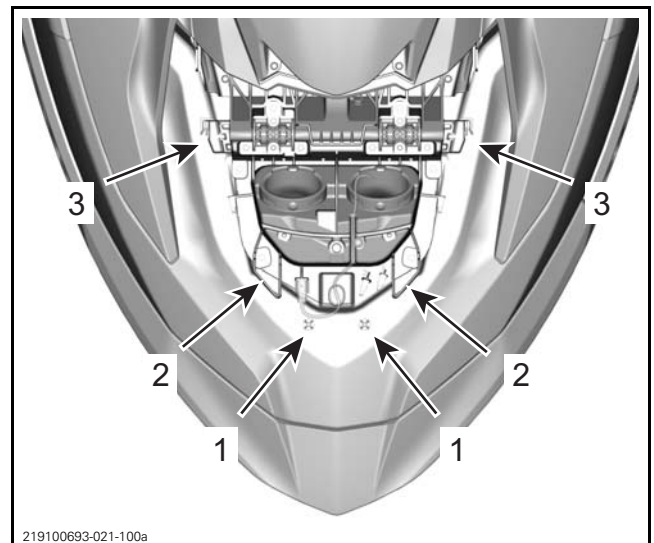


3. Remove hood by pulling it up and with a forward motion.

Installing Hood

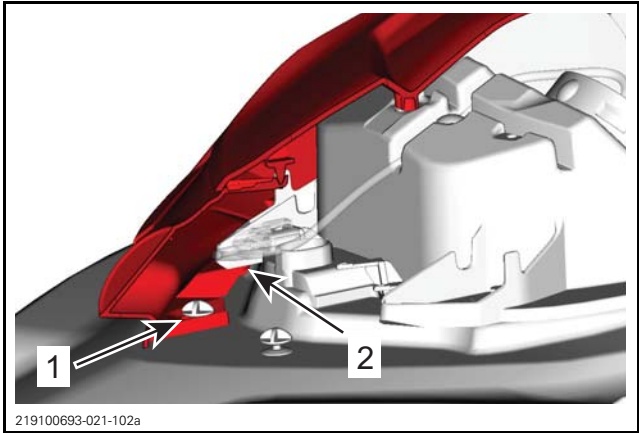
The installation is the reverse of the removal procedure, however pay attention to the following.

1. Ensure the hood is in appropriate position before installing the side retaining screws.



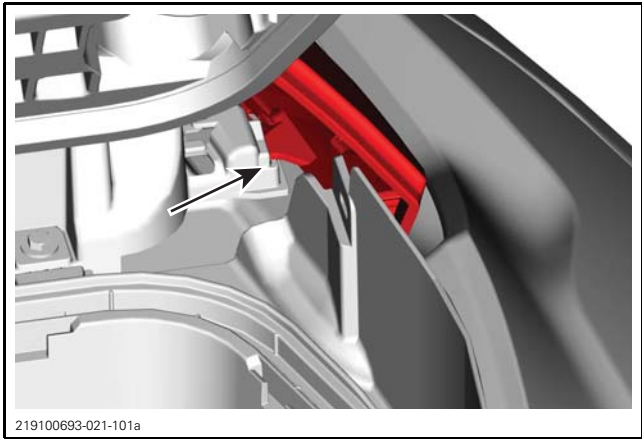
1. Retainer
2. Front attaching point
3. Rear attaching point

2. The hood's front tabs must be properly inserted under both attachment points.

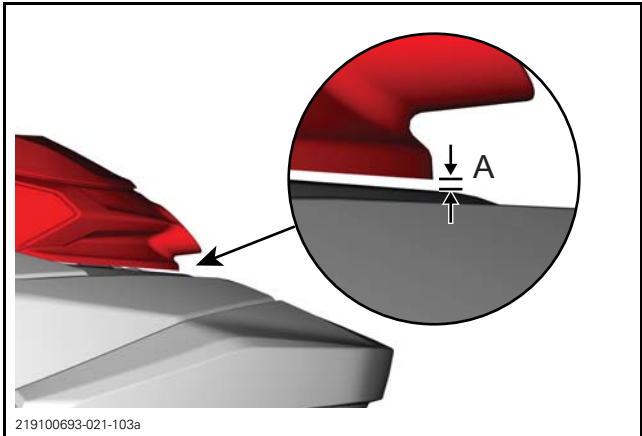


- 1. Retainer
- 2. Front attaching point

3. The hood's rear tabs must be properly inserted under the attachment points.



4. The gap between the hood and the deck must not exceed 2 mm (.08 in).

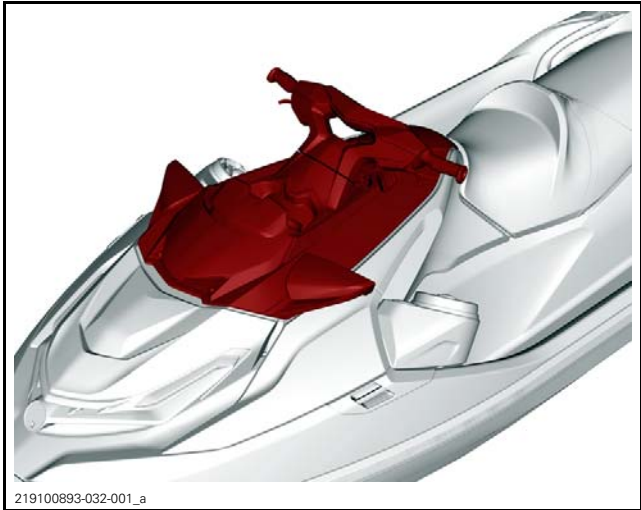


A. 2 mm (.08 in)

5. Tighten the side retaining screws to specification.

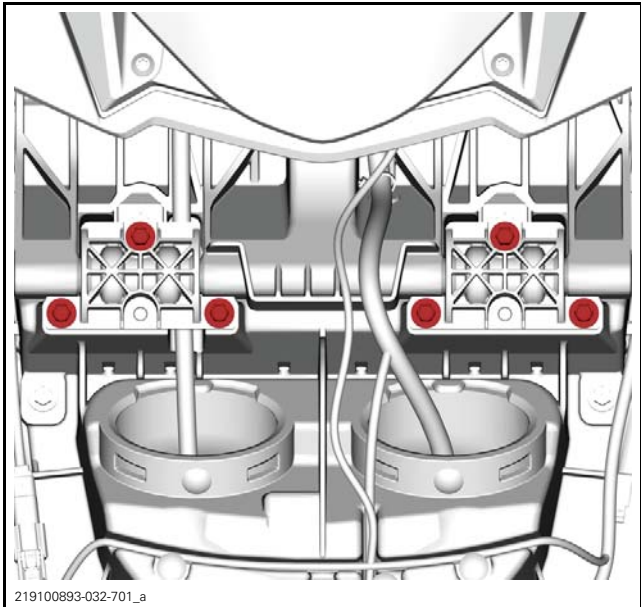
TIGHTENING TORQUE	
Screw	3.25 N•m ± 0.75 N•m (29 lbf•in ± 7 lbf•in)

STORAGE COMPARTMENT COVER

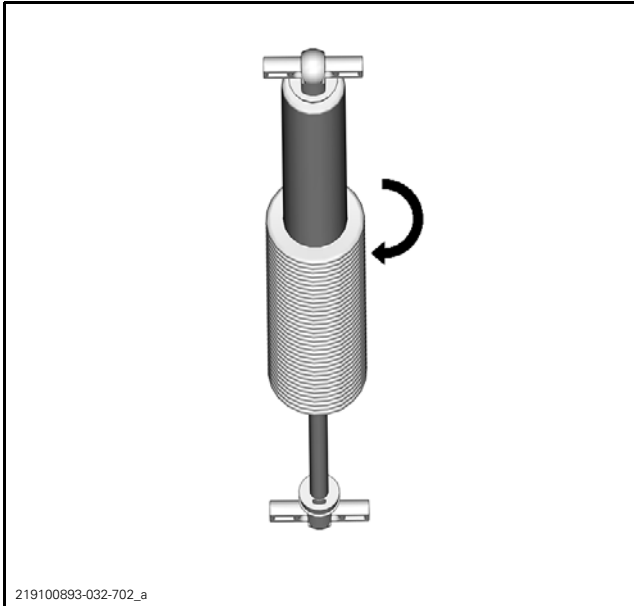


Removing the Storage Compartment Cover

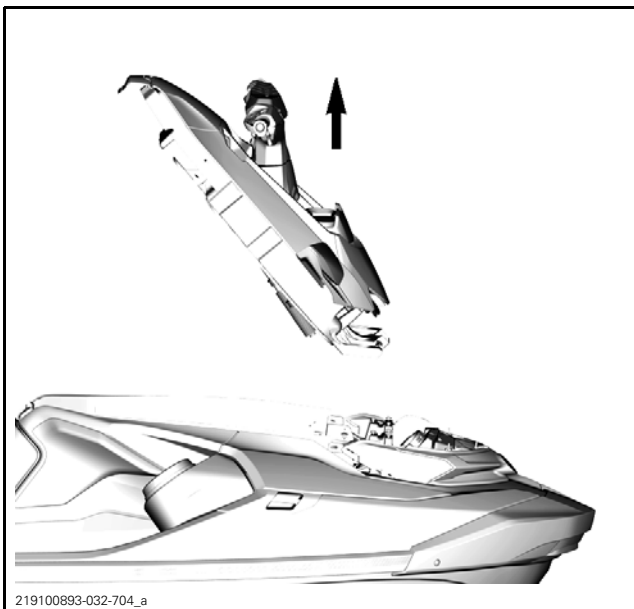
- 1. Remove hood.
- 2. Remove hinge retaining screws.



3. Unscrew gas shock from its upper attachment.



4. Remove top cover.
5. Unplug the electrical connector and steering cable, refer to *STEERING* section..
6. Pull up cover to remove it.



Installing Storage Compartment Cover

The installation is the reverse of the removal procedure. However, pay attention to the following. Apply Loctite on threads of shock absorber body.

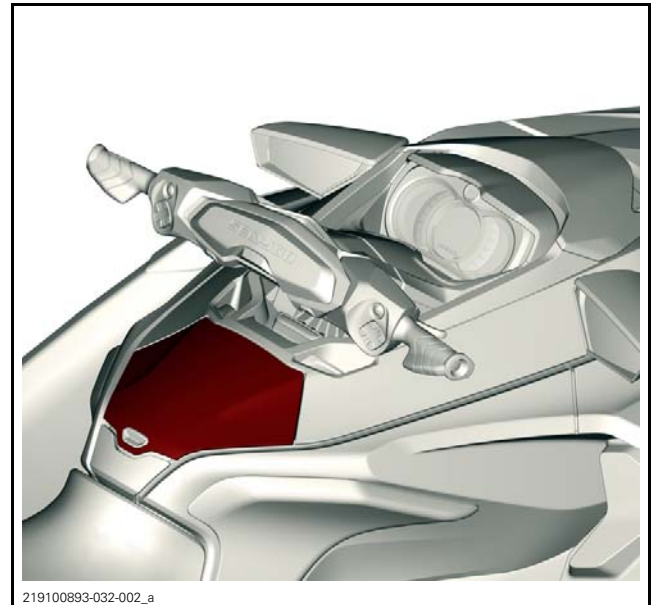
SERVICE PRODUCT
LOCTITE 414 (P/N 413 705 800)

Tighten manually the attachment on gas shock. Install cover on vehicle.

TIGHTENING TORQUE	
Hinge screws	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

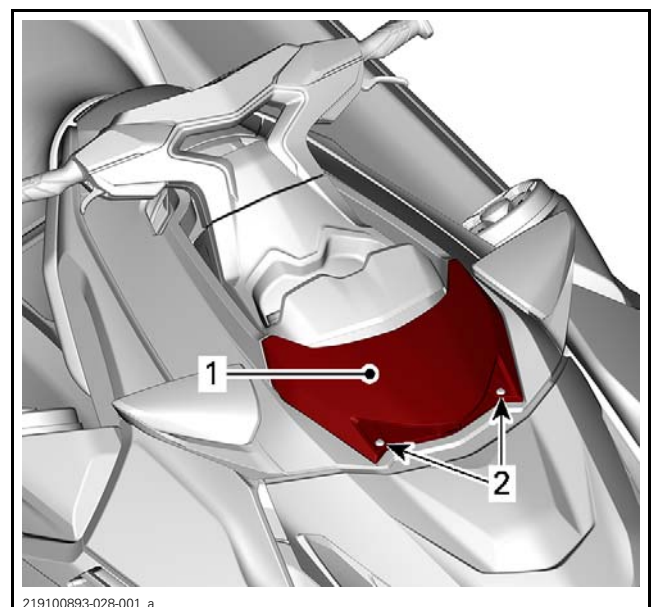
Adjust the alignment of the steering, refer to *STEERING* section.

GLOVE BOX COVER



Removing the Glove Box Cover

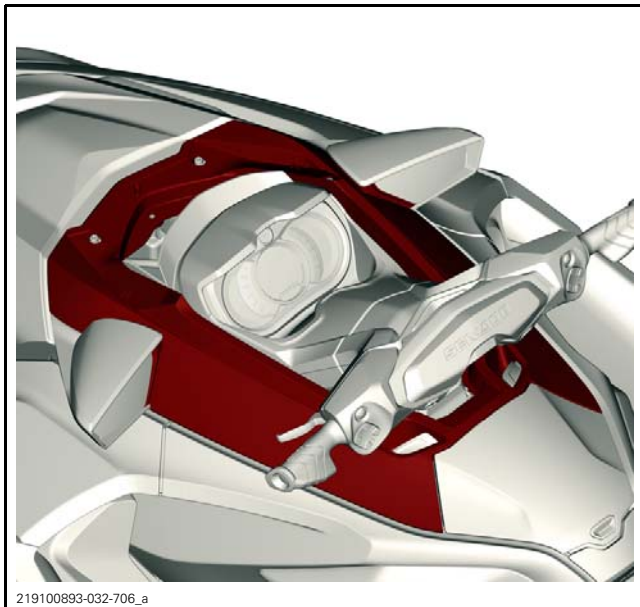
1. Move steering in its upper position.
2. Remove top cover.



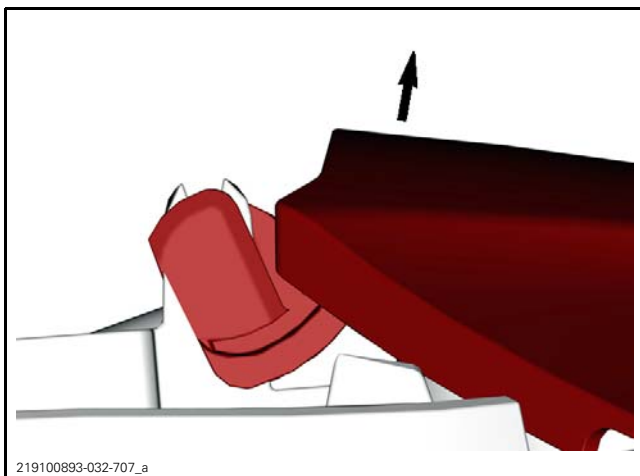
1. Top cover
2. Top cover retaining crews

Subsection 01 (BODY)

3. Remove mirror covers and fish finder sonar support (if equipped), see procedure in this subsection.
4. Remove outer skin.



5. Lift cover.



Installing the Glove Box Cover

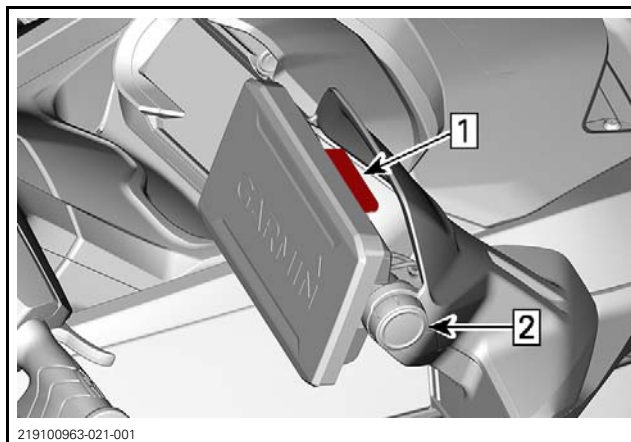
Reverse the removal procedure.

FISH FINDER SONAR SUPPORT

Removing the Support

To remove the sonar, lift the tab.

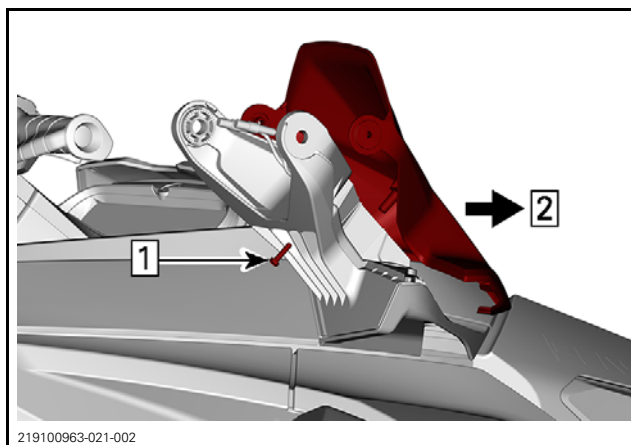
Remove the adjustment knobs and sonar support plate. Disconnect the electrical connectors.



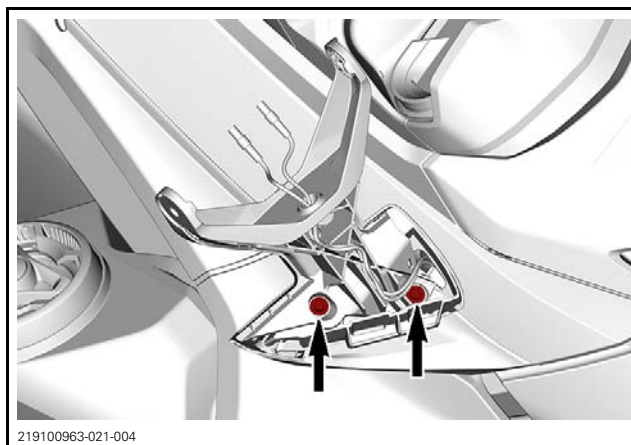
Step 1: Lift tab to remove sonar

Step 2: Unscrew knob to remove support plate

Remove the mounting screw and pull mirror cover toward the front.



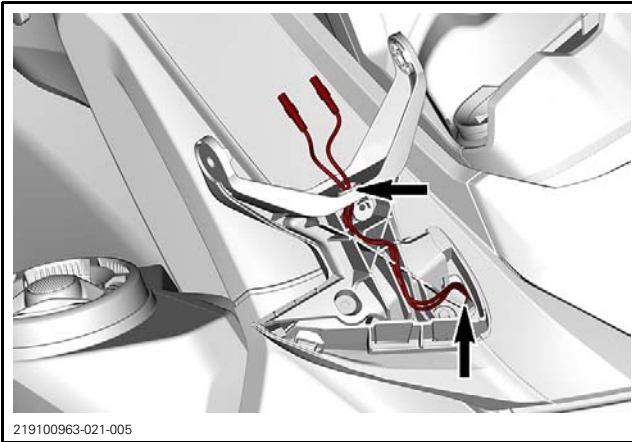
Remove the mounting screws.



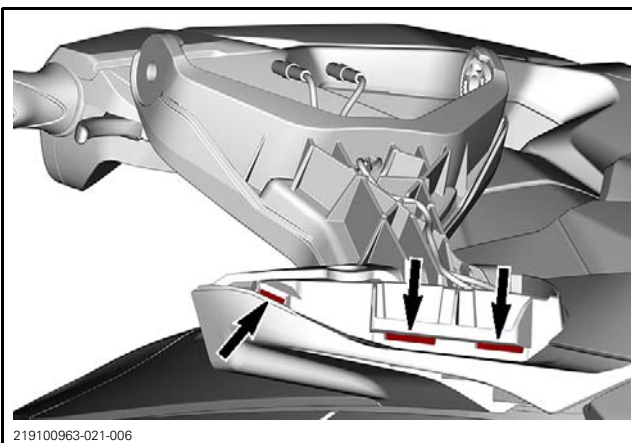
Installing the Support

The installation is the reverse of the removal procedure. However, pay attention to the following.

Ensure the wires are properly routed before installing the mirror cover.



Ensure the mounting tabs are properly located.



TIGHTENING TORQUE

Support retaining screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)
Mirror cover retaining screw	3.5 N•m ± 0.5 N•m (31 lbf•in ± 4 lbf•in)

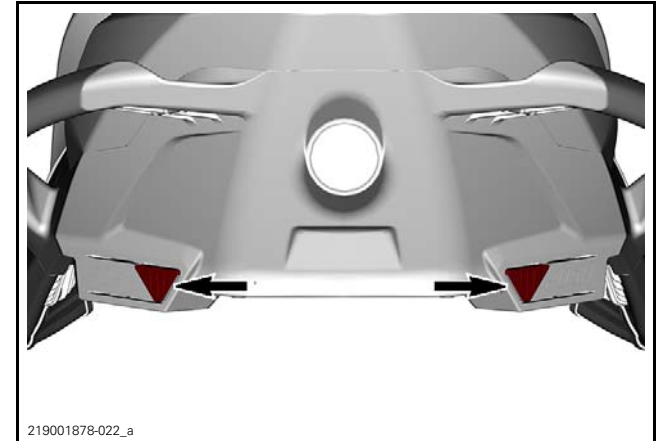
SEAT

Cleaning the Seat

For information, refer to *CLEANING AND REPAIR* subsection.

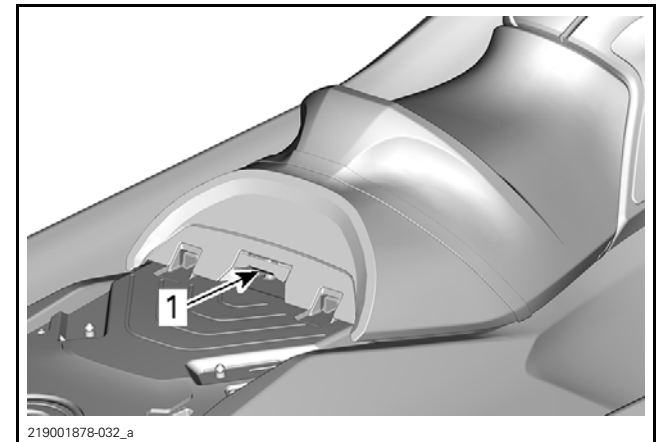
Removing the Seat

To remove the seat, push on the two release buttons and lift the back end of the seat.



RELEASE BUTTONS

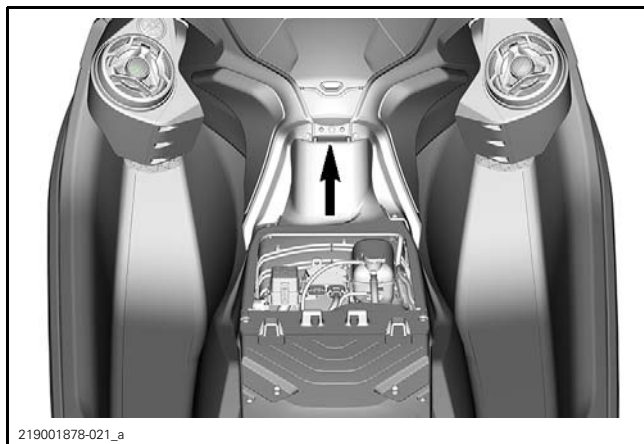
Then pull the latch handle up and remove the seat from the watercraft.



1. Latch handle

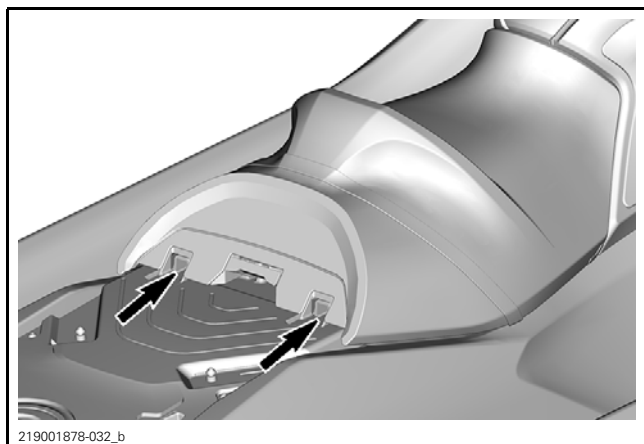
Installing the Seat

To install the seat, insert the forward end of the seat in its retainer.



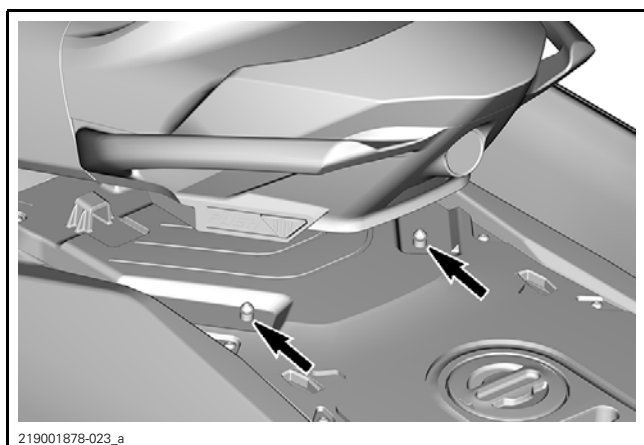
1. Seat retainer

Insert the forward part of the rear seat into the retainers.



1. Seat retainers

Align the seat latch with the latch pin and firmly press down on the rear portion of the seat to lock it in place.



LATCH PINS

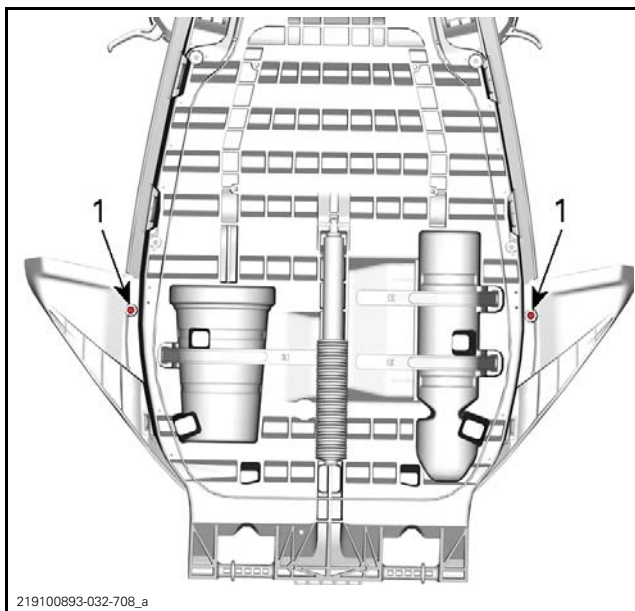
Pull up on the rear portion of the seat to ensure it is properly latched.

CAUTION Ensure the latch is properly locked onto the pin.

MIRRORS

Replacing the Mirror

1. Lift handlebar.
2. Open storage compartment.
3. Remove mirror cover



1. Mirror cover retaining screw

4. Slightly heat mirror with heat gun and not open flame.
5. Push at the back of mirror to remove it.



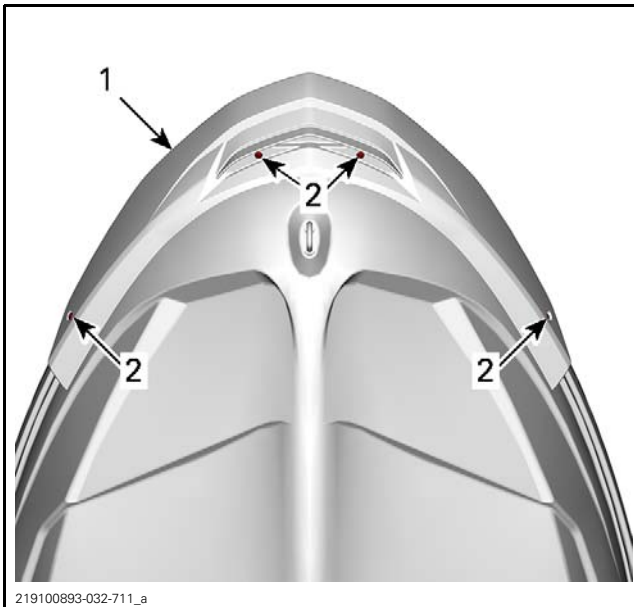
6. Properly clean outer skin surface of any glue residue.

7. Install mirror using adhesive tape at the back of mirror.
8. Install mirror trim by reversing the removal procedure.

BUMPERS

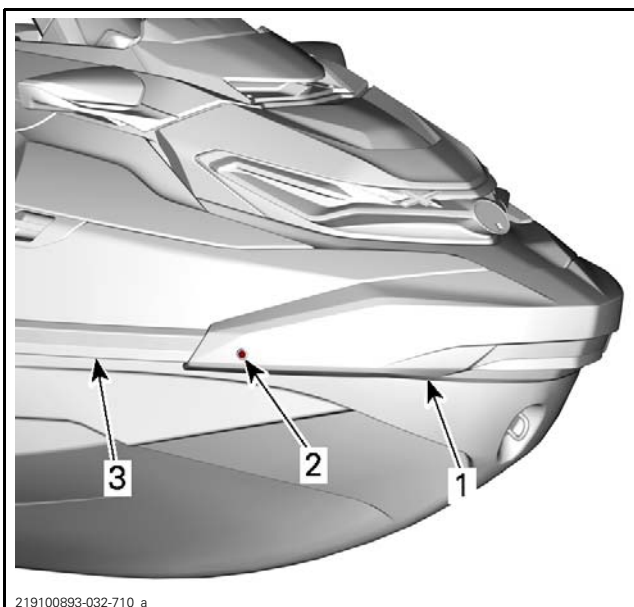
Removing the Bumper

Front Bumper



1. Front bumper
2. retaining screw

1. Remove screws securing front bumper to body.



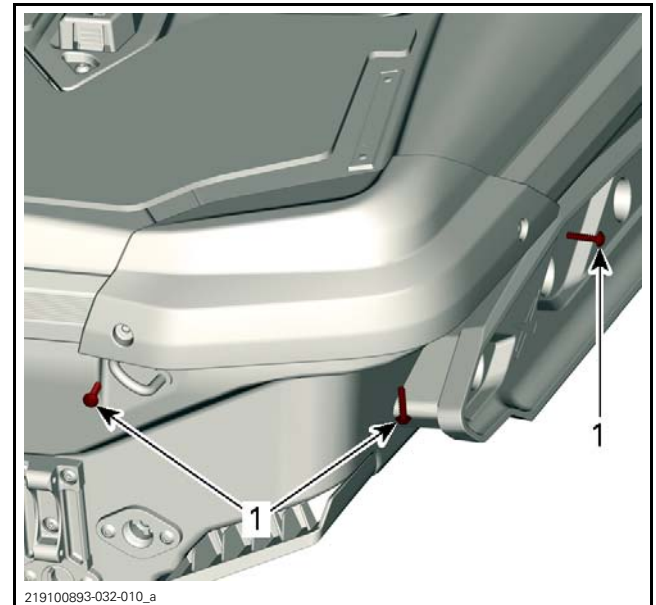
1. Front bumper
2. Retaining screw
3. Side bumper

2. Remove front bumper from vehicle.

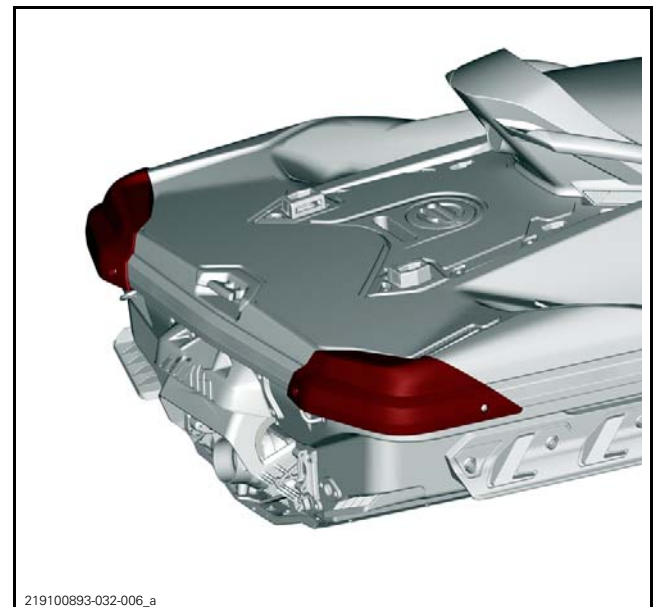
Rear Bumper

All models excluding Fish PRO.

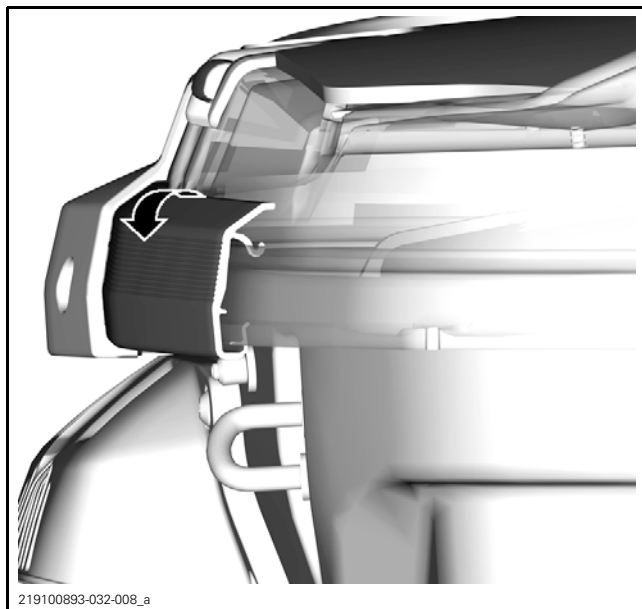
1. Remove protective caps retaining screws.



2. Remove both protective caps (one on each side).



3. Pull the top of bumper to unclip it from body.

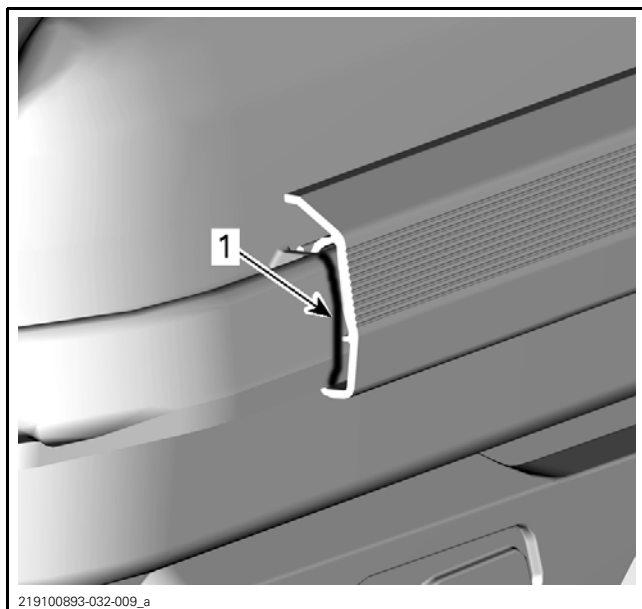


4. Remove rear bumper from vehicle.

Side Bumpers

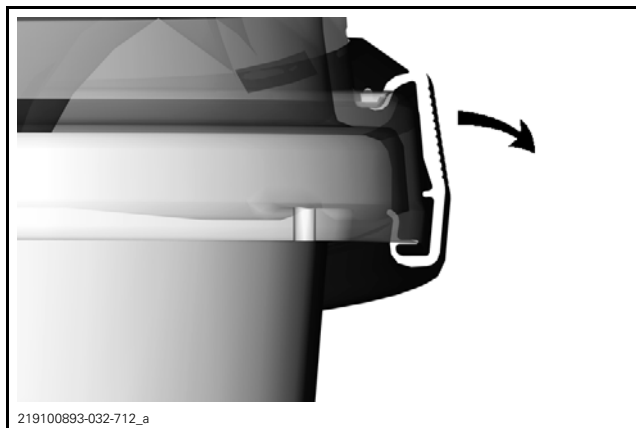
1. Remove front and rear bumpers.
2. Using a marker, trace a line at bumper end.

NOTE: These marks will be used during installation.



1. Trace a line at end of bumper

3. Pull the top of bumper to unclip it from body.



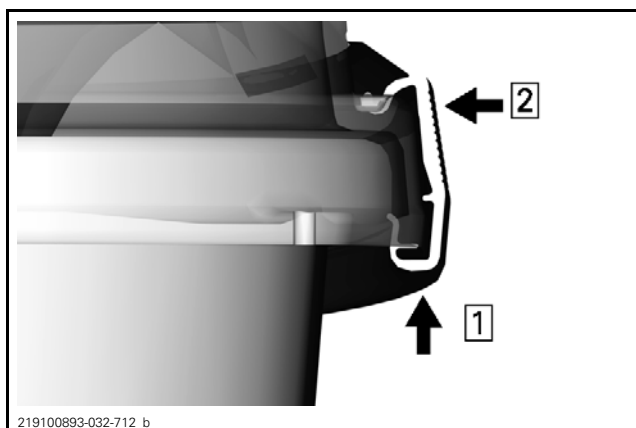
Installing the Bumper

Front and Rear Bumper

The installation is the reverse of the removal procedure.

Side Bumpers

1. Insert bumper over body lip.
 - 1.1 Insert lower section first.
 - 1.2 Insert upper section last.



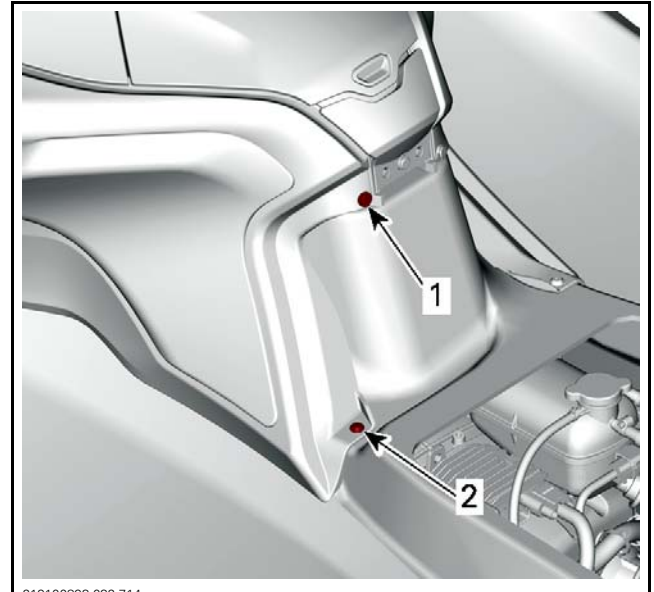
1. Insert lower edge
2. Push towards watercraft

NOTE: Use soapy water to ease bumper installation.

LATERAL COSMETICS

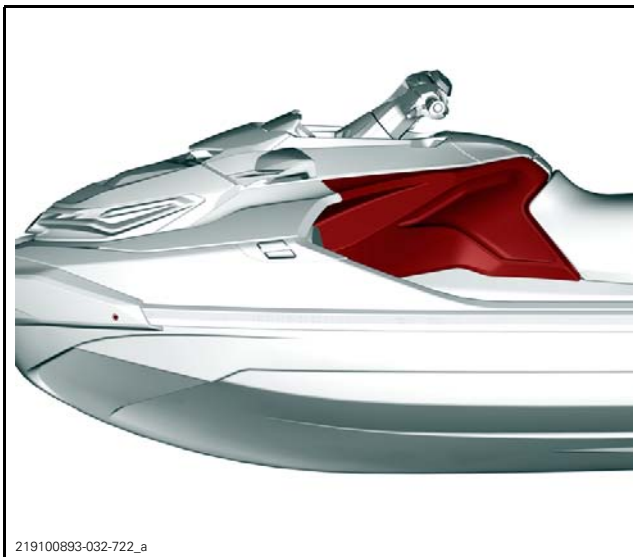


1. *Front Cosmetic*
2. *Center Cosmetic*

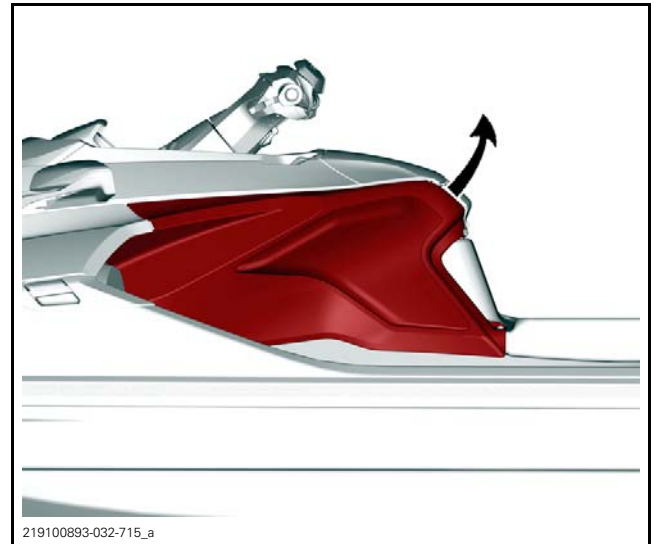


1. *Plastic rivet*
2. *Screw*

Removing the Center Cosmetic



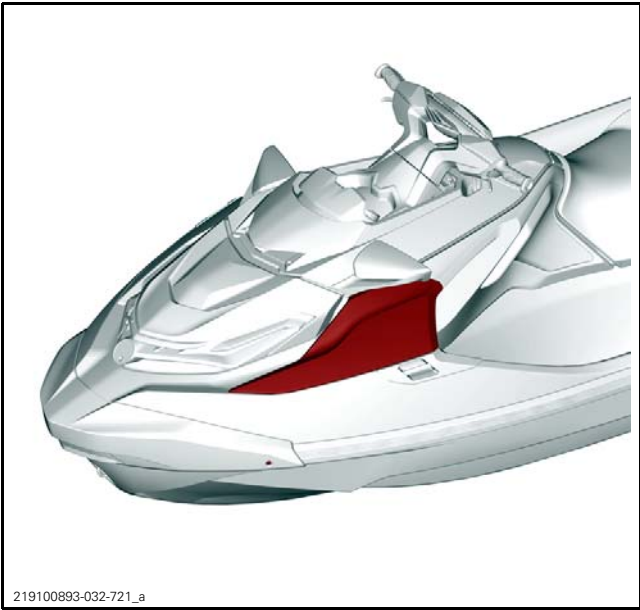
Remove seats.



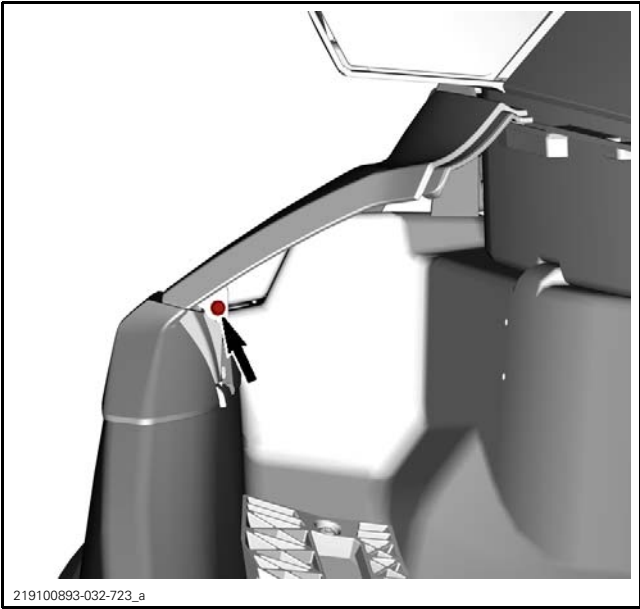
Installing the Center Cosmetic

The installation is the reverse of the removal procedure.

Removing the Front Cosmetic

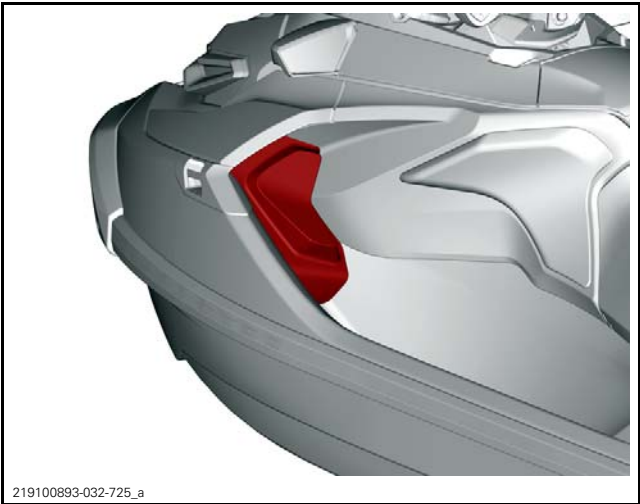


Remove center cosmetic.
Remove lateral grille, see procedure in this subsection.
Remove screw.

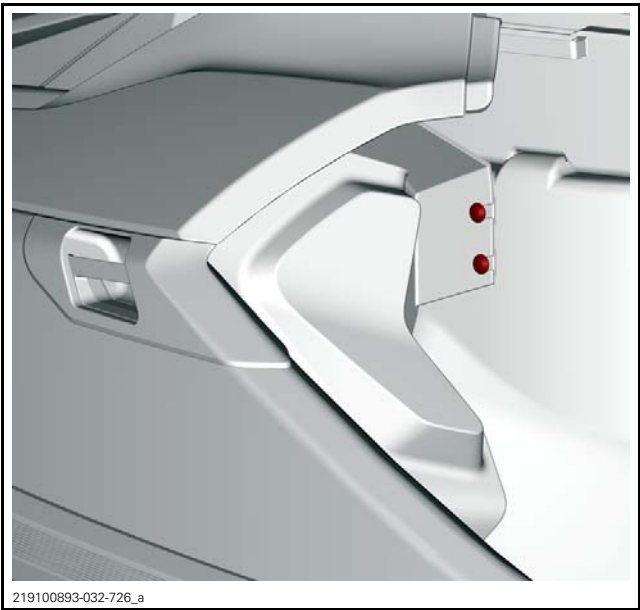


Pull Front cover toward the rear.
Installing the Front Cosmetic
The installation is the reverse of the removal procedure.

LATERAL GRILLE ASSEMBLY



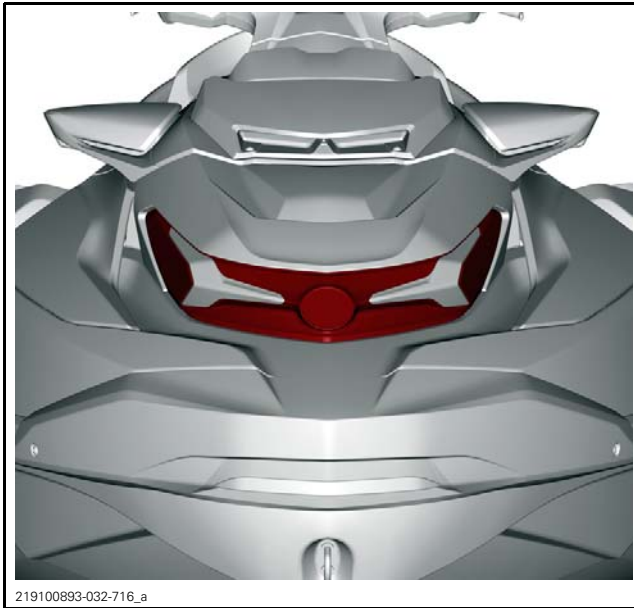
Removing the Lateral Grille
Remove center cosmetic, see procedure in this subsection.
Remove screws.



Pull grille toward the rear.
Installing the Lateral Grille
The installation is the reverse of the removal procedure. However, pay attention to the following.
Ensure lower clip is hooked in the support

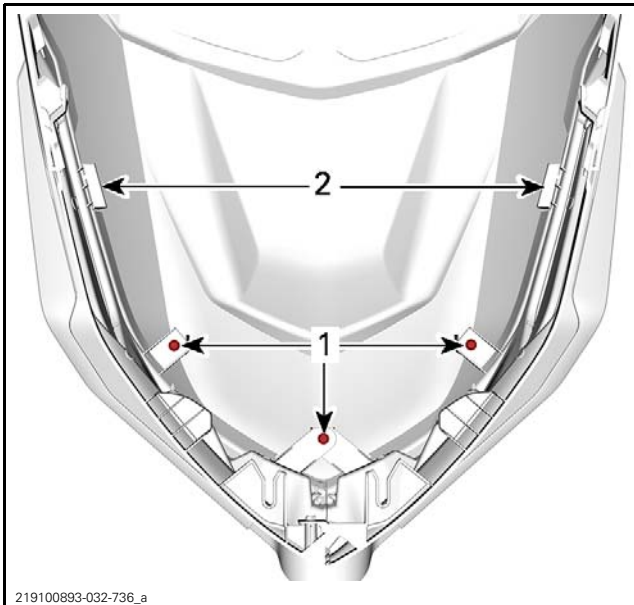
TIGHTENING TORQUE	
Lateral grille screw	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

FRONT GRILLE ASSEMBLY



Removing the Front Grille Assembly

1. Remove hood.
2. Remove screws and retaining tabs.



1. Screws
2. Tabs

3. Remove the grille assembly.

Installing the Front Grille Assembly

The installation is the reverse of the removal procedure. However pay attention to the following.

TIGHTENING TORQUE	
Grille retaining screw	3.25 N•m ± 0.75 N•m (29 lbf•in ± 7 lbf•in)

CLEAT



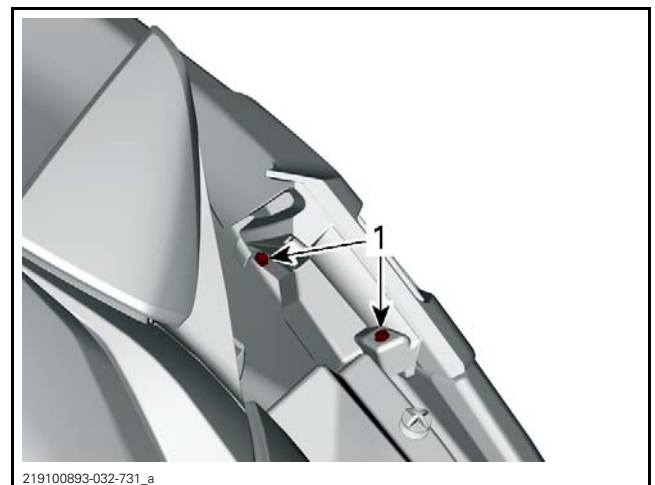
Removing the Cleat

LH side shown, the procedure is the same for both sides.

Remove:

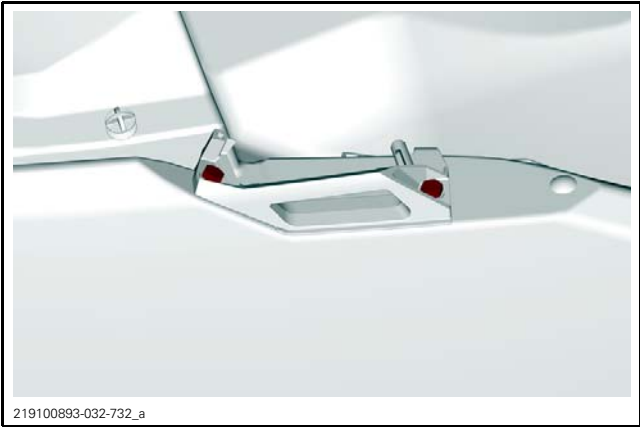
- Seat
- Center cover
- Front cover
- Side grille.

Remove cover retaining screws and cover.



1. Screw

Remove screws.



Remove cleat.

NOTE: There are nuts and washers inside the hull. Be careful not to lose them in the hull. Storage compartment can be removed for easy access.

Installing the Cleat

The installation is the reverse of the removal procedure. However pay attention to the following.

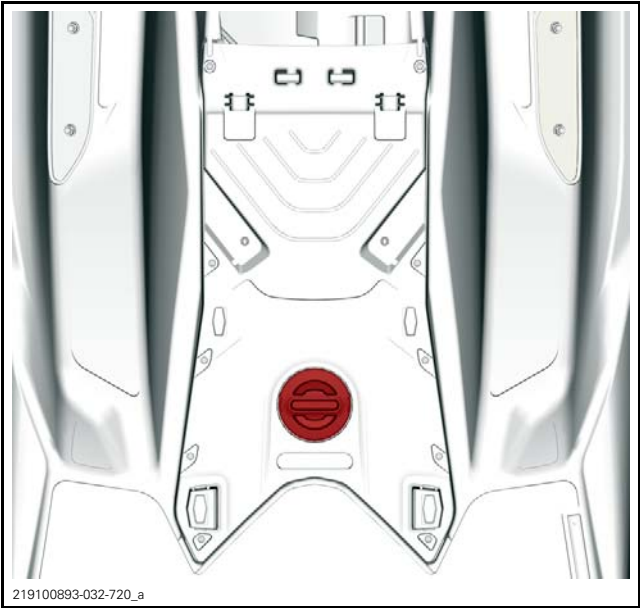
TIGHTENING TORQUE	
Cleat screw	2.75 N•m ± 0.25 N•m (24 lbf•in ± 2 lbf•in)

ENGINE SERVICE COVER

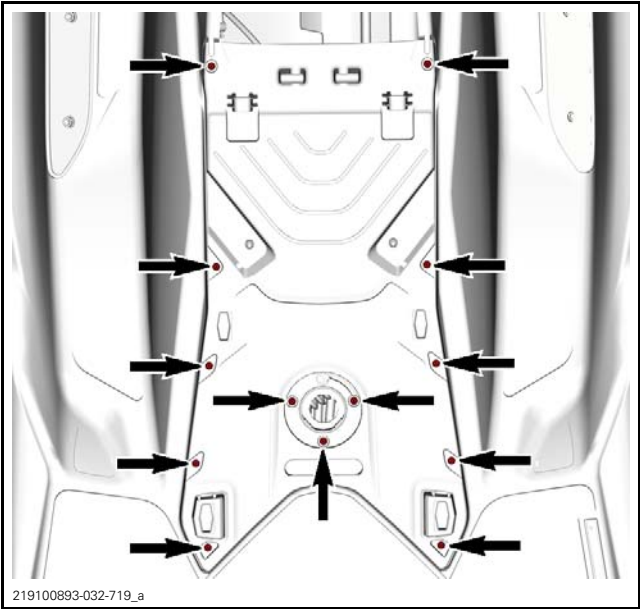


Removing the Engine Service Cover

- 1. Remove seats.
- 2. Remove wake pole cover.



3. Remove screws.



Installing the Engine Service Cover

The installation is the reverse of the removal procedure. However, pay attention to the following. Install all screws.

Tighten screws to specification.

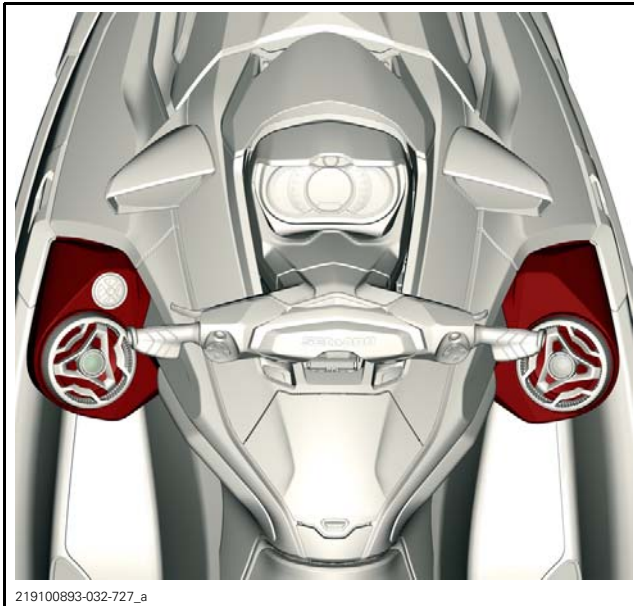
TIGHTENING TORQUE	
Engine service cover screw	2.75 N•m ± 0.25 N•m (24 lbf•in ± 2 lbf•in)

GAUGE

Removing and Installing the Gauge

Refer to *INFORMATION CENTER* subsection.

SOUND SYSTEM



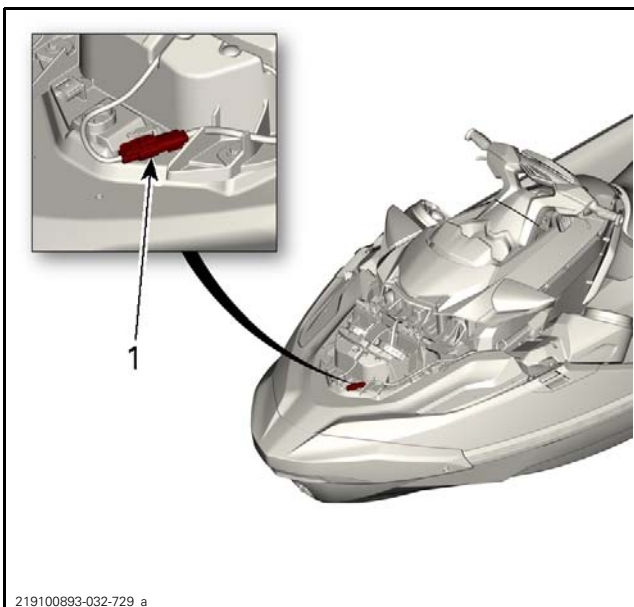
Removing the Sound System

LH side shown, the procedure is the same for both sides.

Remove:

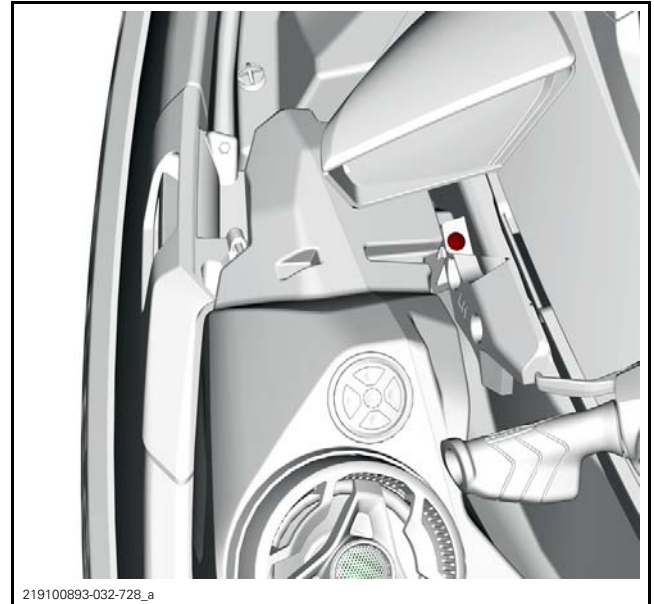
- Seats
- Center cover
- Front cover
- Hood

Disconnect electrical connector.

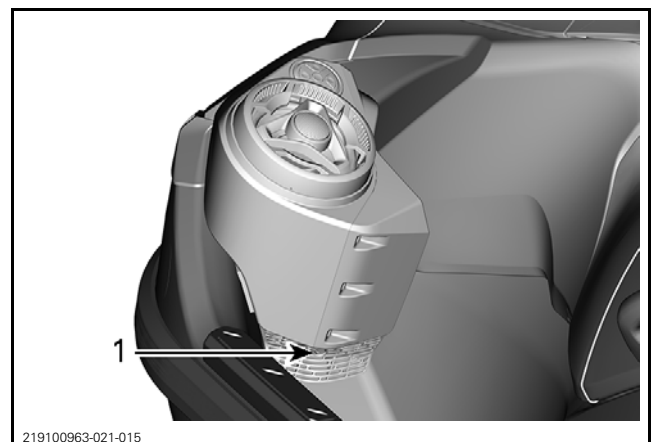


1. LH connector

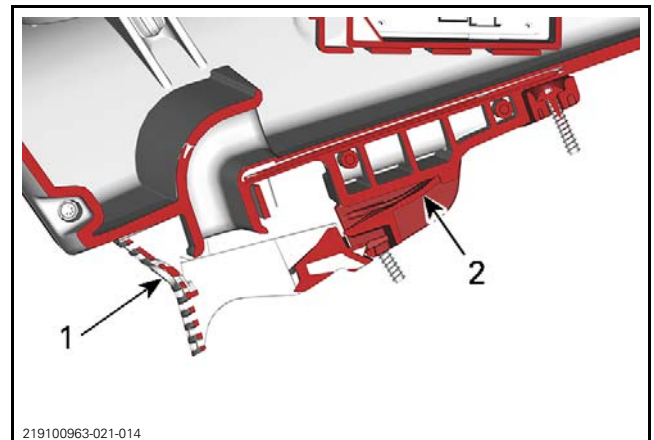
Remove retaining screw.



Insert a long screwdriver or 1/4 in. extension in hole to release tab.

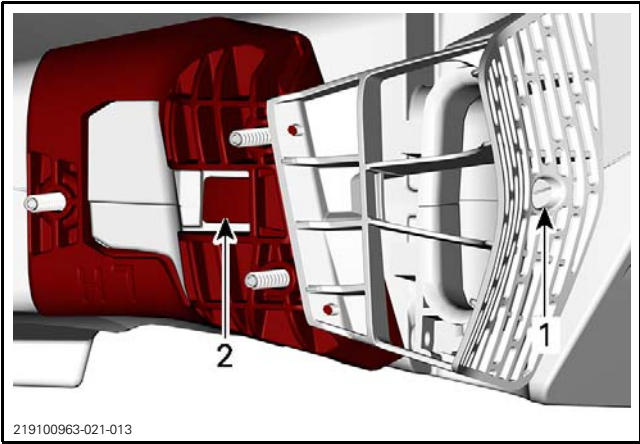


1. Insert screwdriver in hole



CUT SECTION FROM SIDE

1. Hole
2. Tab to be released.



VIEWS FROM UNDERNEATH
1. Hole
2. Tab to be released.

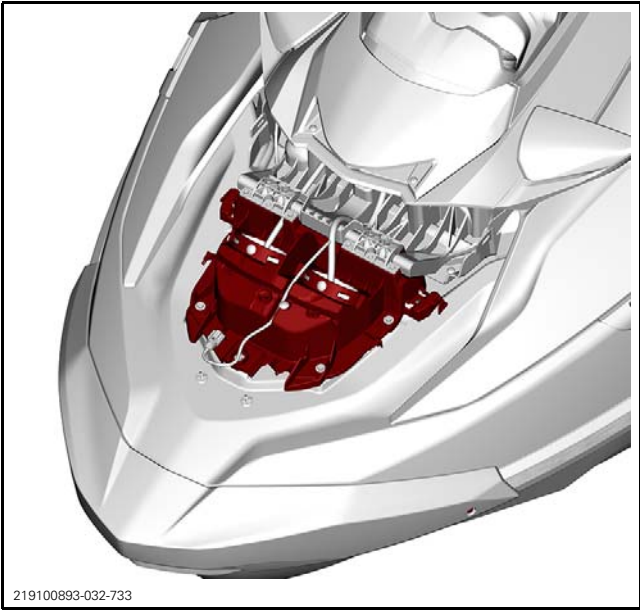
Slide speaker unit out toward the rear.

Installing the Sound System

The installation is the reverse of the removal procedure. However, pay attention to the following. Tighten screws to specification.

TIGHTENING TORQUE	
Speaker retaining screw	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)

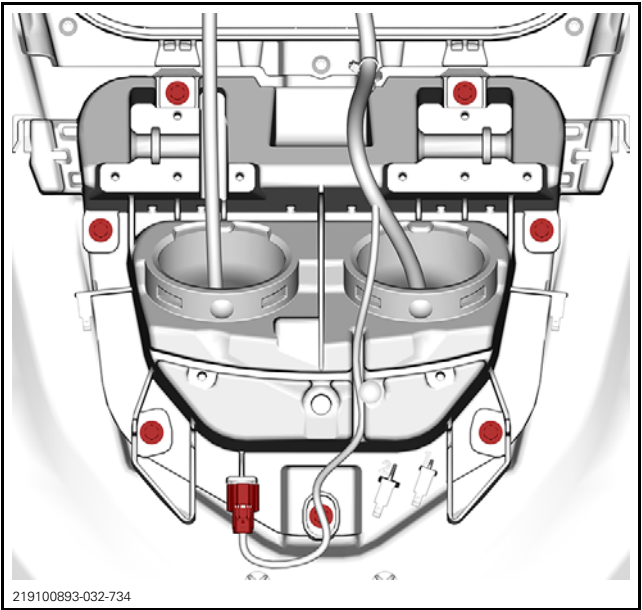
VENTILATION



Removing the Ventilation Adaptor

- Remove:
- Hood
 - Storage cover.

Remove retaining screws and disconnect electrical connector.



Pull ventilation adaptor out.

Installing the Ventilation Adaptor

The installation is the reverse of the removal procedure. However, pay attention to the following.

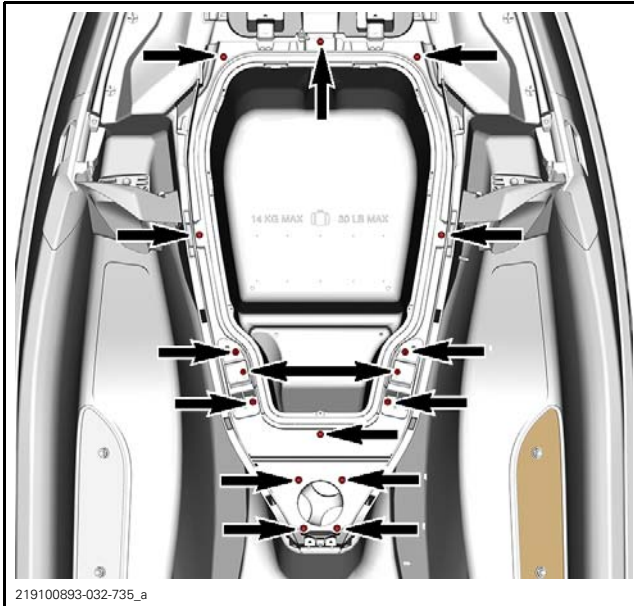
NOTICE Make sure both ventilation tubes are positioned underneath the storage compartment and not on each side.

Perform the *STORAGE COVER ALIGNMENT* before tightening the ventilation adaptor.

STORAGE COMPARTMENT

Removing the Storage Compartment

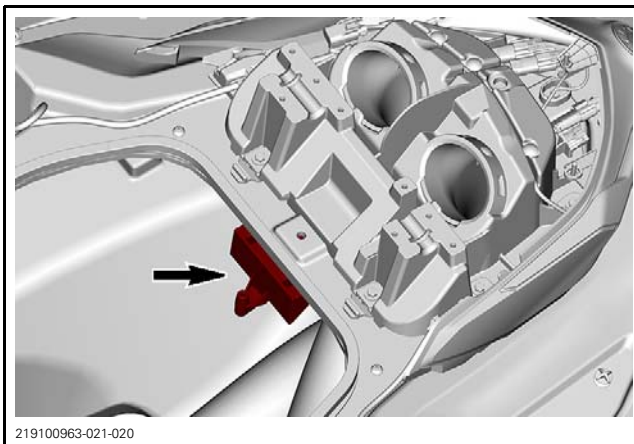
- Remove:
- Hood
 - Both center covers
 - Both front covers.
- Disconnect lower gas shock attachment.
- Open front storage cover and secure it to maintain it open.
- Remove the following fasteners.



Slightly pull storage compartment out.
Cut locking ties retaining the ventilation hoses to the bin.

Finish pulling the storage compartment out.

NOTE: Do not remove the lower shock reinforcement while pulling the storage compartment out.



Installing the Storage Compartment

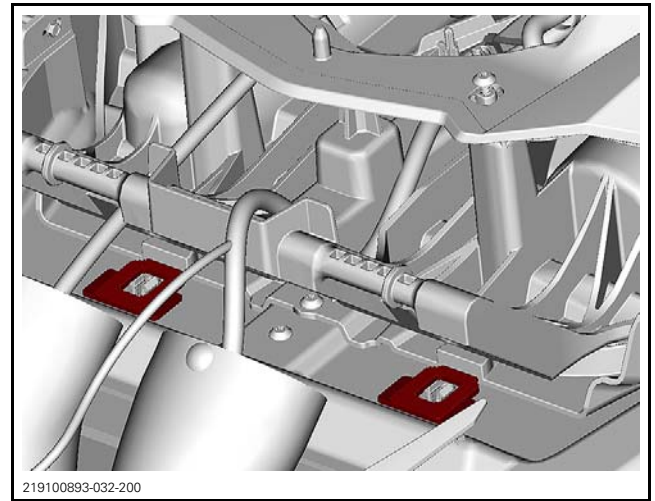
The installation is the reverse of the removal procedure. However, pay attention to the following.
Ensure the lower shock reinforcement is in place before installing the storage compartment.

Storage Cover Alignment

Before aligning the cover, ensure the storage compartment, latch bases, anchorages hooks, ventilation adapter and storage cover are installed and secured.

1. Detach one side of the shock absorber.

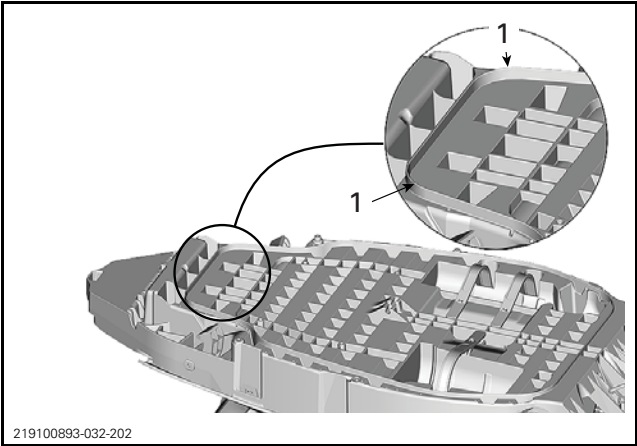
NOTICE Make sure anchorage hooks are properly installed.



2. Position the inner rib of the compartment cover evenly front and back on the seal.
 - 2.1 Move the storage compartment front to rear to position the rib.
 - 2.2 Carefully, close and latch the cover.
 - 2.3 Check gap between cover and body.
 - 2.4 Open the cover and check if the rib mark is evenly located front and back on the seal.
 - 2.5 If the mark is not center on the seal or gap is not equal, move the compartment at the proper position.



STORAGE COMPARTMENT SEAL



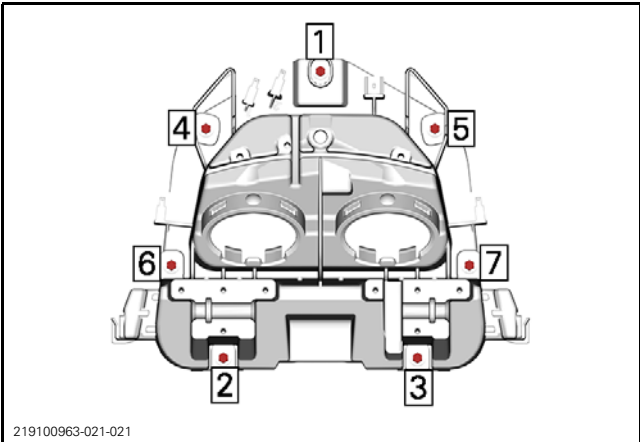
STORAGE COMPARTMENT COVER RIB

3. Make sure ventilation adaptor is properly installed on anchorage hooks.

NOTICE Make sure both ventilation tubes are positioned underneath the storage compartment and not on each side.

4. Tighten anchorage hooks, ventilation adaptor and storage compartment.

TIGHTENING TORQUE	
Latch base screws	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)
Ventilation adaptor screws	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)
Storage compartment screws	5.5 N•m ± 0.5 N•m (49 lbf•in ± 4 lbf•in)



VENTILATION ADAPTOR SCREWS TIGHTENING SEQUENCE

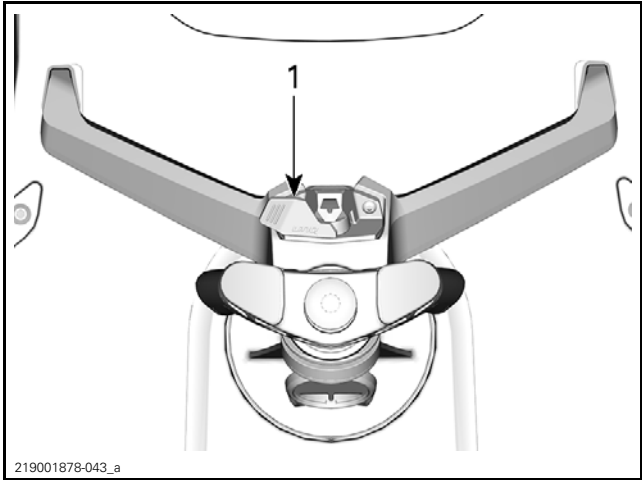
5. Recheck position of the inner rib on seal. Reposition if necessary.
6. Ensure cover latch properly.
7. Install the shock.
8. Reinstall all other removed parts.

WAKE PYLON (WAKE PRO)

Removing the Wake Pylon

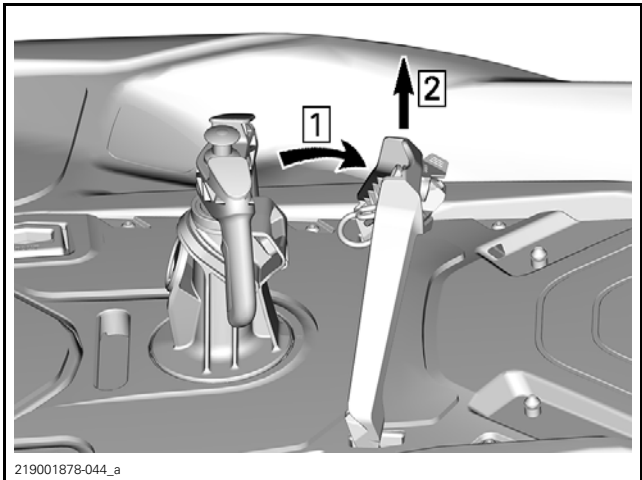
Remove the seat.

Unlock the LinQ attachment.



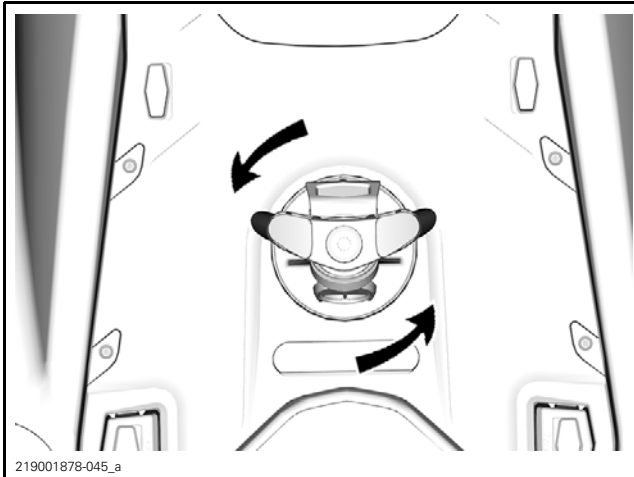
1. LinQ lever

Tilt the support toward the front and lift.



1. Tilt support
2. Lift support

Unscrew the pole by turning it one quarter of a turn and lifting it.

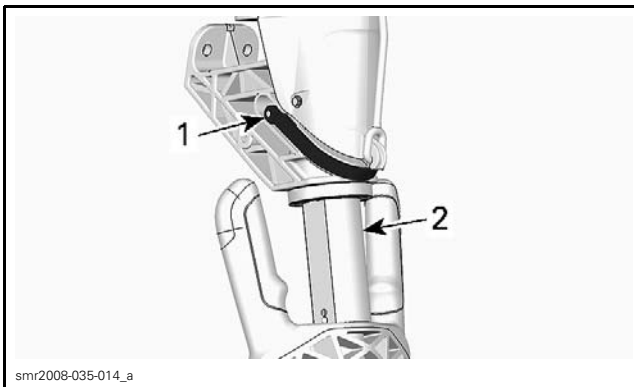


Disassembling the Wake Pylon

Extend the handle completely.

Turn the wake pylon upside down.

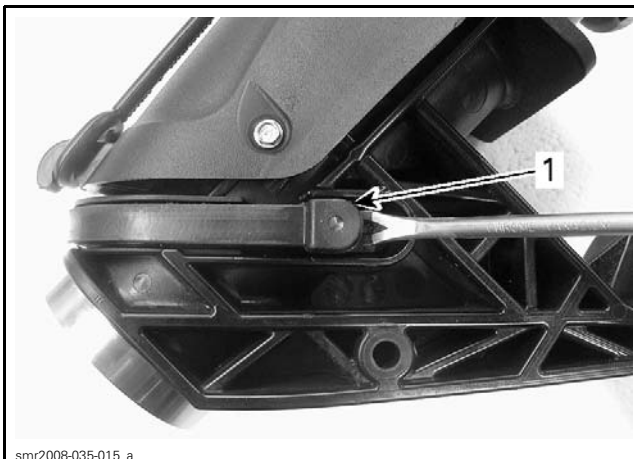
Move both ends of locking strap to disengage the inner lock and free the handle.



1. Locking strap end
2. Handle stem

Locking Strap

Using a screwdriver or any other suitable tool, detach a side of the locking strap from retaining pin.

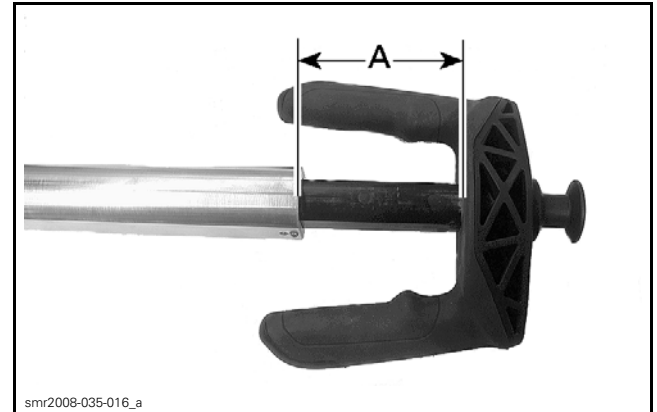


1. Locking strap

Remove locking strap and the inner lock.

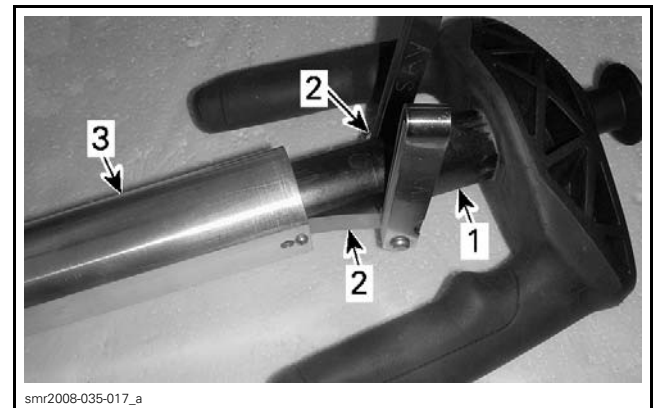
Handle

Extend handle approximately 75 mm to 90 mm (3 in to 3-1/2 in).



A. 75 mm to 90 mm (3 in to 3-1/2 in)

Insert two thin feeler gauges between handle stem and extension tube.



1. Handle stem
2. Feeler gauges
3. Extension tube

Place a rag around the joint to catch balls and spring.

Hold feeler gauges and pull the handle.

Assembling the Wake Pylon

Handle

Install a loose locking tie on handle stem.

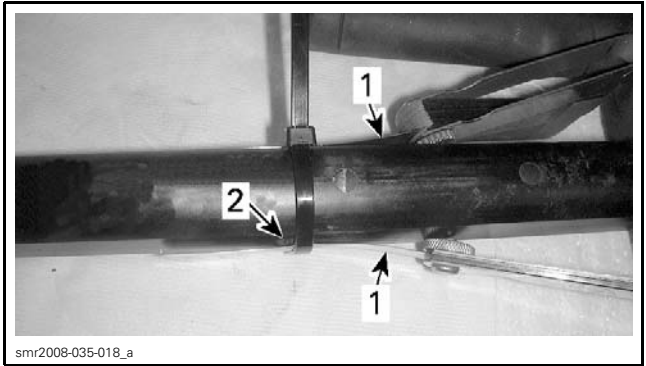
Apply grease on each ends of spring.

SERVICE PRODUCT	
Scandinavia	SYNTHETIC GREASE (EUR) (P/N 779231)
All other countries	SYNTHETIC GREASE (P/N 779162)

Insert the spring in the handle stem hole.

Subsection 01 (BODY)

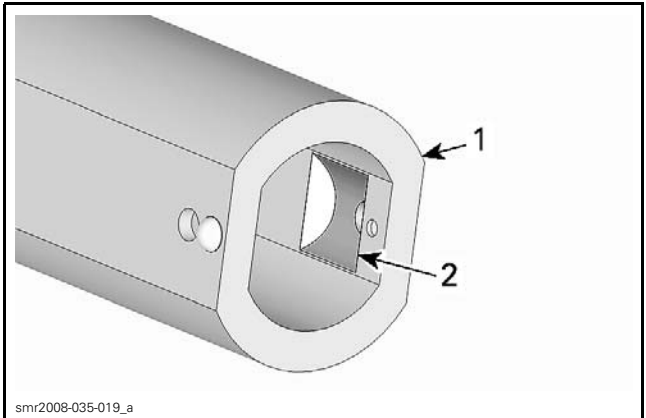
Position a ball on each ends of spring.
Install a feeler gauge over each balls.
Tighten the locking tie in order to retain feeler gauges and balls.



1. Feeler gauges
2. Ball

Apply grease in both recesses of the extension tube.

SERVICE PRODUCT	
Scandinavia	SYNTHETIC GREASE (EUR) (P/N 779231)
All other countries	SYNTHETIC GREASE (P/N 779162)

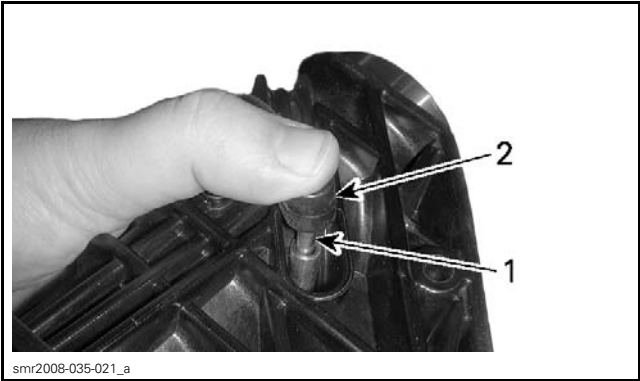


1. Extension tube
2. Recesses

Slide the handle stem into the extension tube.
Remove feeler gauges and locking tie.

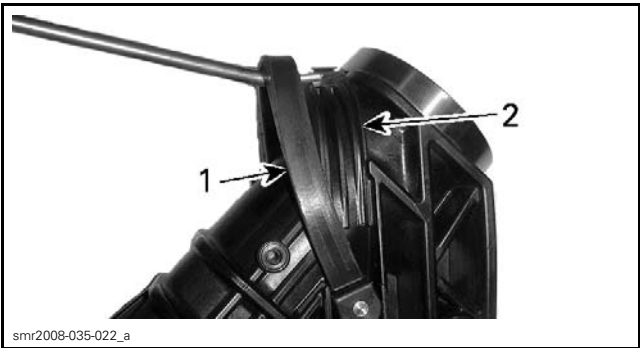
Locking Strap

Install lock and insert the end of the locking strap over the retaining pin.



1. Retaining pin
2. Locking strap

Using a suitable tool, position the locking strap in its groove.



1. Locking strap
2. Locking strap groove

Reinstall the wake pylon trim.
Do not install the handle into wake pylon yet.

Installing the Wake Pylon

The installation is the reverse of the removal procedure.

REAR EXTENSION (FISH PRO)

The following procedures are intended to replace an existing extension and **not** to install an extension on a regular GTX.

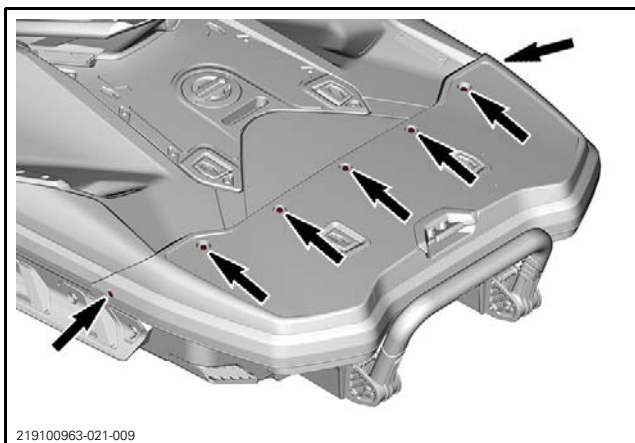
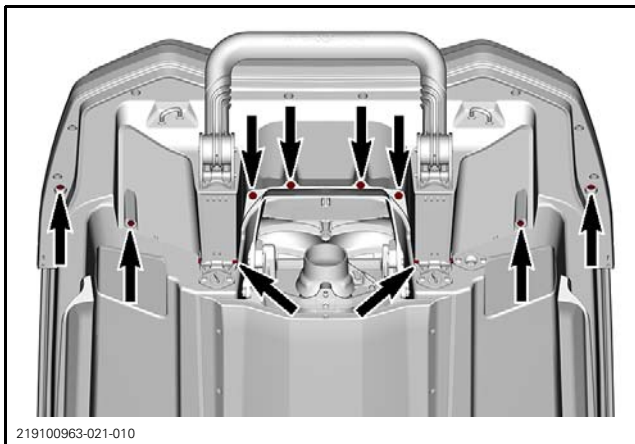
 **WARNING**
Do not install an extension on any other PWC than a Fish PRO model.

Removing the rear Extension

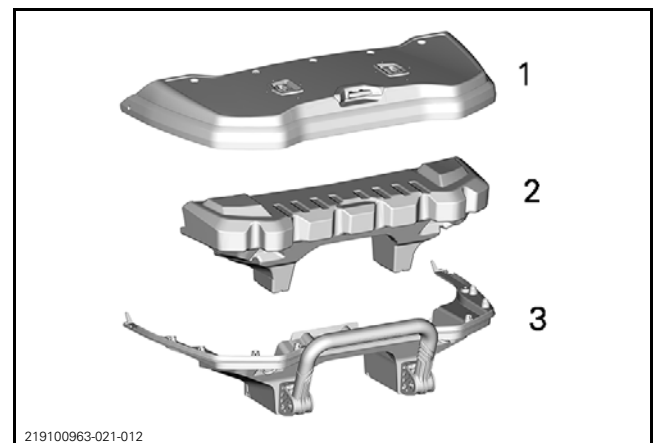
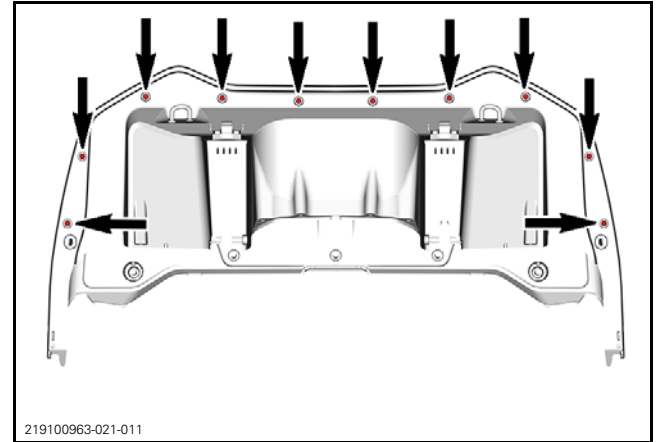
Remove carpet, refer to *CLEANING AND REPAIR* subsection.



Remove the following fasteners.



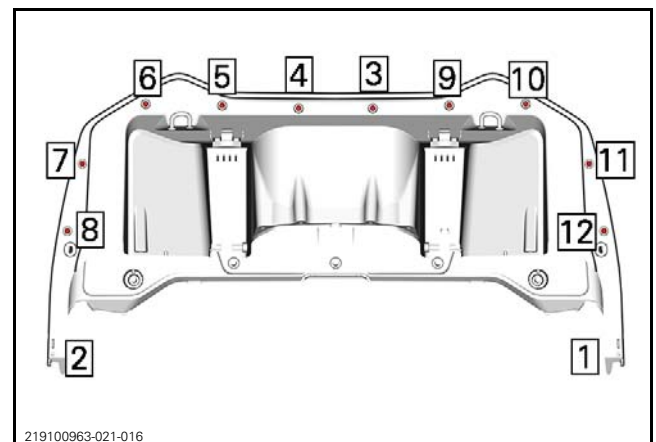
Remove extension.
To open the extension, remove the following fasteners.



1. Extension body
2. Extension float
3. Extension hull

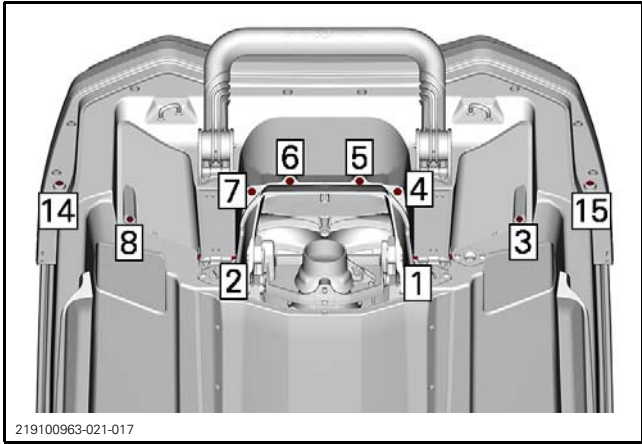
Installing the Fish PRO Extension

The installation is the reverse of the removal procedure. However, pay attention to the following. Refer to the exploded view for tightening torques. Assemble the body and hull by following the tightening sequence.



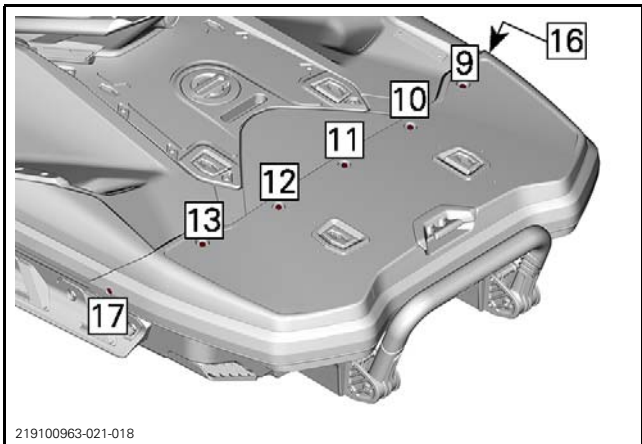
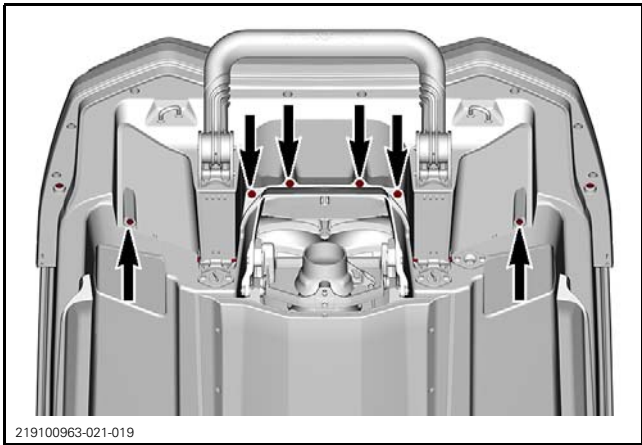
Install the extension to the body by following the tightening sequence.

Subsection 01 (BODY)



Apply loctite on the following screws.

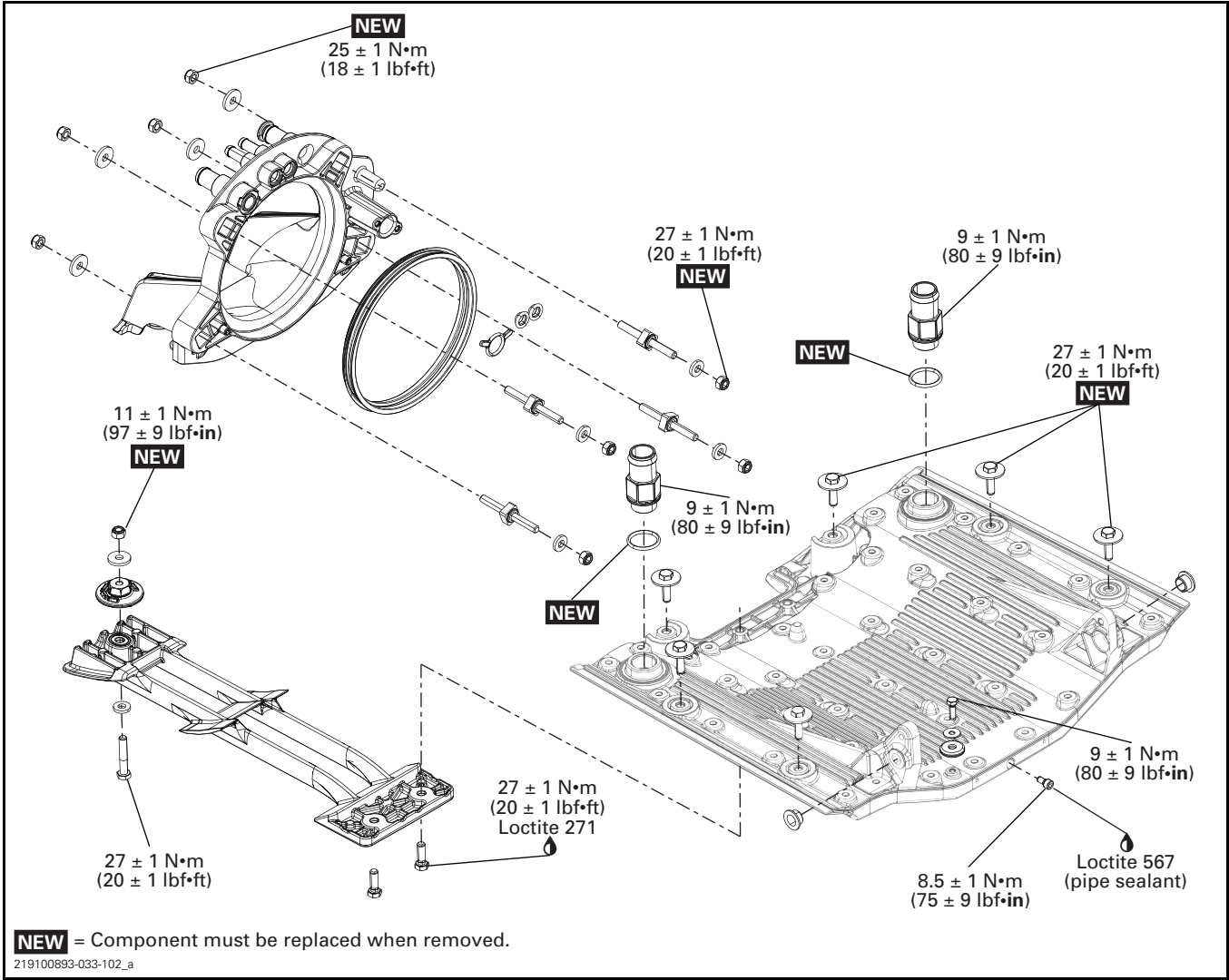
SERVICE PRODUCT
LOCTITE 5900 (P/N 293 800 066)



Description	Part Number	Page
BRP HEAVY DUTY CLEANER	293 110 001	5-7
CLEAR SILICONE SEALANT	296 000 309	8, 10
LOCTITE 271 (RED).....	293 800 005	3-4
LOCTITE 5900	293 800 066	3, 5-7



Subsection XX (HULL)



PROCEDURES

HULL

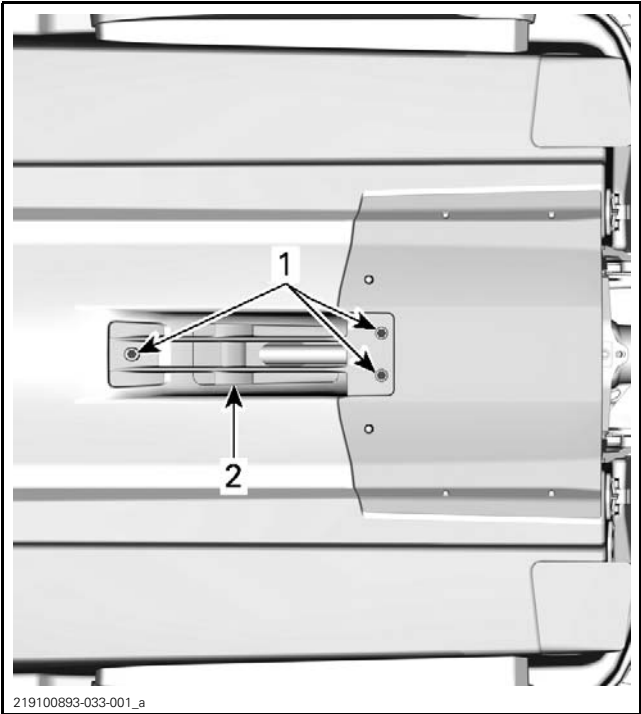
For hull repair, refer to *CLEANING AND REPAIR* subsection.

INLET GRATE

Removing the Inlet Grate

Remove counter nut on front screw on the inside of the hull.

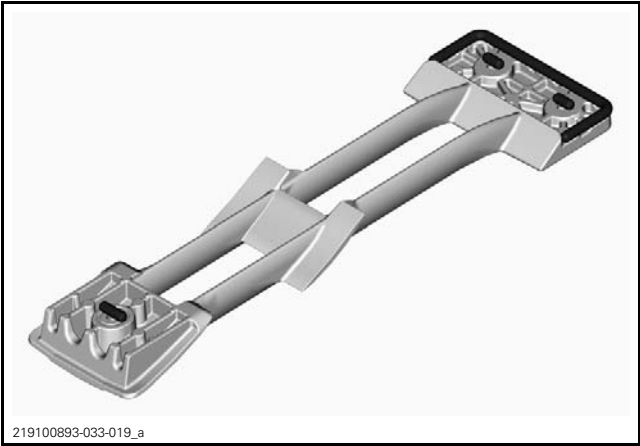
Remove inlet grate retaining screws using an impact tool.



TYPICAL
1. Inlet grate screws
2. Inlet grate

Installing the Inlet Grate

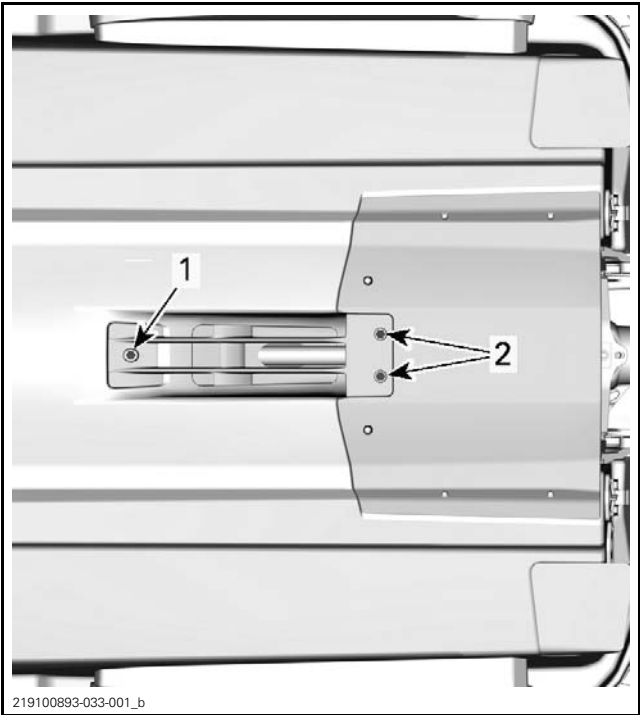
1. Apply LOCTITE 5900 (P/N 293 800 066) sealant as illustrated.



SEALANT APPLICATION

2. Install inlet grate retaining screws with LOCTITE 271 (RED) (P/N 293 800 005) at the proper location.

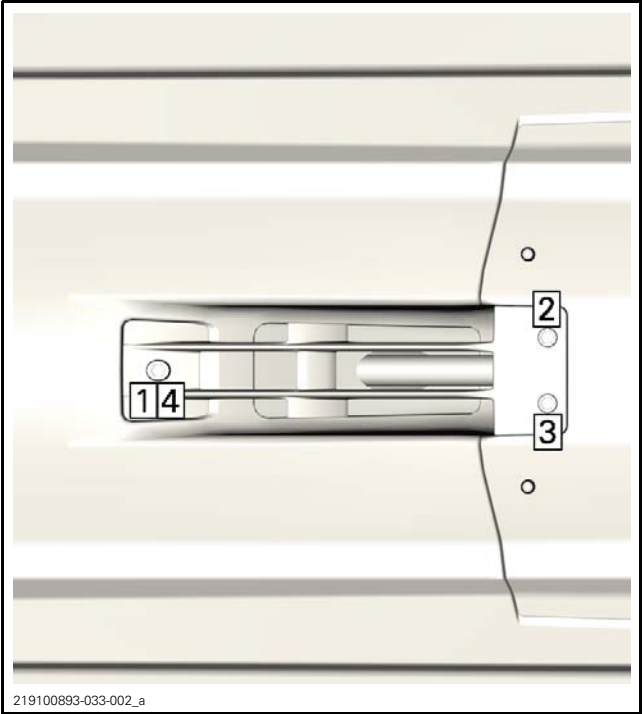
INLET GRATE SCREWS	
LOCATION	SCREW SIZE
Front	M8 x 45
Rear	M8 x 25



SCREW LOCATION
1. Front
2. Rear

3. Tighten screws to the specified torque and sequence.

TIGHTENING TORQUE		
INLET GRATE SCREWS	First step	Hand tighten
	Second step	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)



TIGHTENING TORQUE SEQUENCE

- 4. Reinstall counter nut on front screw inside the hull.
- 5. Torque to specification

TIGHTENING TORQUE	
Counter Nut	11 N•m ± 1 N•m (97 lbf•in ± 9 lbf•in)Text

RIDE PLATE

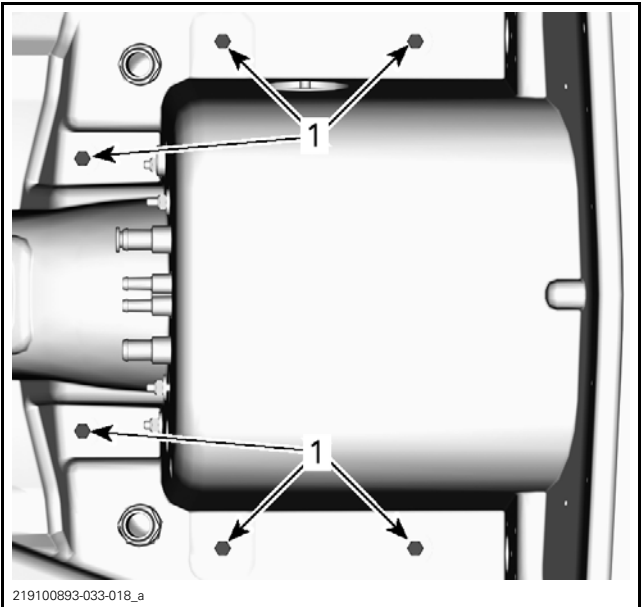
Removing the Ride Plate

- 1. Remove seats.
- 2. Remove engine service cover.
- 3. Remove intercooler, refer to *INTERCOOLER* subsection.
- 4. Remove muffler, refer to *MUFFLER* subsection.
- 5. Remove inlet grate, see procedure in this subsection.
- 6. Remove jet pump. Refer to *JET PUMP* subsection.
- 7. Drain cooling system. Refer to *COOLING SYSTEM* subsection.

- 8. Disconnect coolant hoses from the ride plate.
- 9. Remove coolant hose fittings from the ride plate.

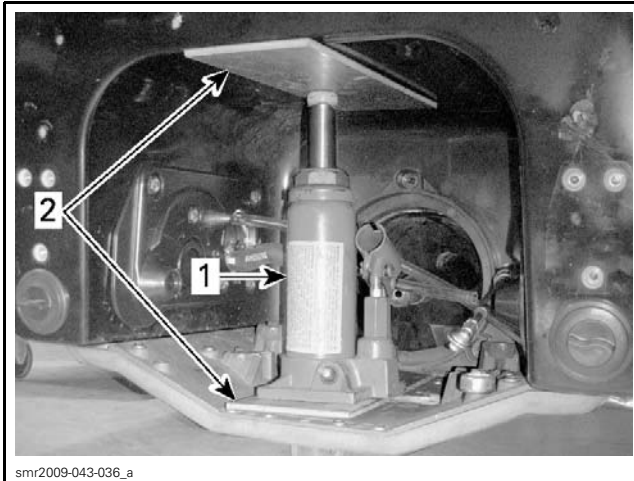
NOTICE If possible, remove the hose fittings from the ride plate before removing the ride plate. If fittings cannot be removed, proceed with care when removing the ride plate.

- 10. Heat ride plate retaining screws using a heat gun.
- 11. Using an impact tool, remove and discard retaining screws or reuse with LOCTITE 271 (RED) (P/N 293 800 005).



PARTS REMOVED FOR CLARITY
1. Ride plate retaining screws

- 12. Install a low height hydraulic bottle jack and 2 steel plates between ride plate and hull as per following illustration.



TYPICAL
 1. Hydraulic bottle jack
 2. Steel plates

13. Heat the edge of the ride plate with a heat gun to soften the sealant.
14. Start pumping the hydraulic jack slowly.
15. Using a sharp knife, carefully cut the sealant around the ride plate edges.
16. Pump the hydraulic jack slowly to pry the ride plate from the hull.

Cleaning the Ride Plate

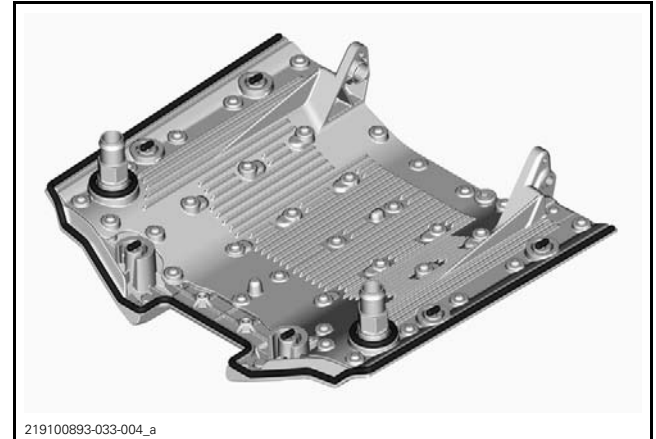
1. Carefully scrape off all excess sealant from ride plate and hull.
2. Clean hull surface with BRP HEAVY DUTY CLEANER (P/N 293 110 001) to eliminate grease, dust and sealant residue. Clean fitting threads.

Installing the Ride Plate

1. Reinstall both hose fittings on the ride plate with new O-rings.
2. Tighten to the specified torque.

TIGHTENING TORQUE	
Hose fittings	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

3. Apply LOCTITE 5900 (P/N 293 800 066) sealant as illustrated.



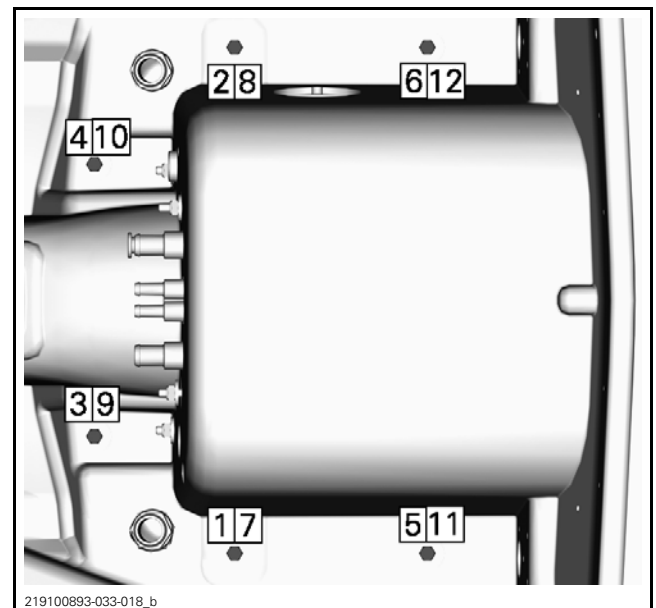
219100893-033-004_a
SEALANT APPLICATION

4. Secure ride plate with retaining screws.

NOTE: Measure distance between pivot arms on ride plate and jet pump support to ensure ride plate is centered.

5. Tighten screws to the specified torque and sequence.

TIGHTENING TORQUE		
RIDE PLATE RETAINING SCREWS	Steps 1 to 6	Hand tighten
	Steps 7 to 12	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)



6. Reinstall other removed parts. Refer to appropriate subsections for procedures.

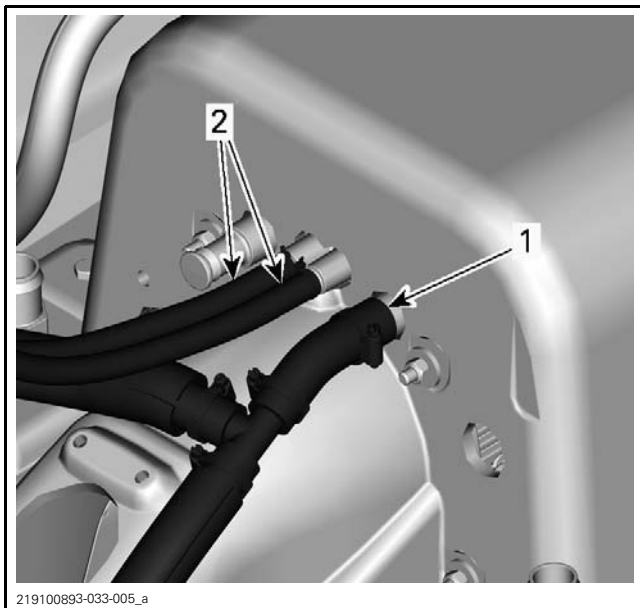
JET PUMP SUPPORT

Removing the Jet Pump Support

1. Remove the ride plate. Refer to procedure in this subsection.

Subsection XX (HULL)

2. Disconnect hoses from jet pump support.



INSIDE THE HULL

1. Exhaust water supply hose
2. Bailer hoses

3. Remove jet pump support retaining nuts and washers.



FROM INSIDE THE HULL

4. Heat the jet pump support using a heat gun in order to soften the sealant.
5. Pull jet pump support off the hull.
6. If applicable, note the alignment shims location.

NOTICE Alignment shims have to be reinstalled at the same location.

Cleaning the Jet Pump Support

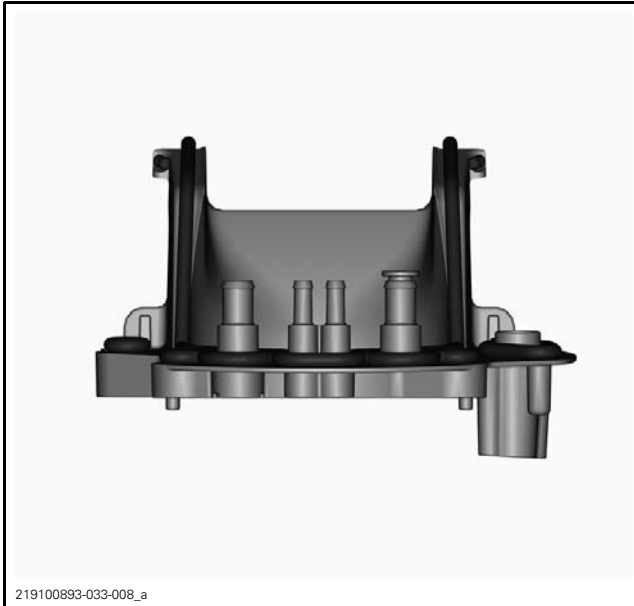
1. Scrape off all excess sealant from jet pump support, ride plate, and hull.
2. Inspect pump support for cracks or other damage.
3. Clean jet pump support and hull surface with BRP HEAVY DUTY CLEANER (P/N 293 110 001) to eliminate grease, dust, and sealant residue.

Installing the Jet Pump Support

1. Make sure sealant contact areas are clean and dry.
2. Apply LOCTITE 5900 (P/N 293 800 066) on the jet pump support as shown (thick black line).



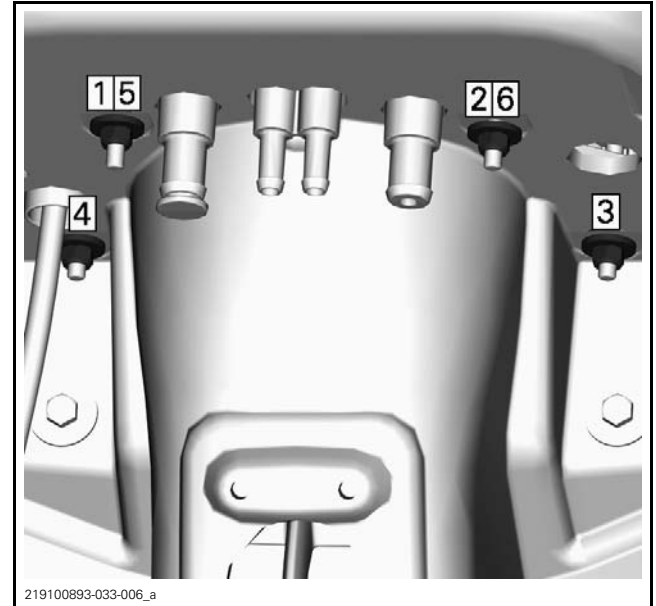
SEALANT APPLICATION



SEALANT APPLICATION

3. Insert the studs in the jet pump support square holes.
4. Slide the alignment shims on the studs.
5. Position the jet pump support against the hull.
6. Inside the hull, thread all 4 retaining nuts.
7. Push jet pump support towards the top of the vehicle to ensure that the stoppers on the jet pump support are in contact with the hull.
8. Tighten retaining nuts to the specified torque and sequence.

TIGHTENING TORQUE	
Jet pump support retaining nuts	25 N•m ± 1 N•m (18 lbf•ft ± 1 lbf•ft)



JET PUMP SUPPORT TIGHTENING SEQUENCE

9. Remove excess sealant.
10. Reinstall other removed parts. Refer to appropriate subsections for procedures.

THRU-HULL FITTING

Removing the Thru-Hull Fitting

1. Remove drive shaft, refer to *DRIVE SHAFT* subsection.
2. Remove thru-hull fitting retaining screws.
3. Remove iBR actuator retaining screw.
4. From both sides of the vehicle, heat the thru-hull fitting with a heat gun to soften the sealer. Be careful not to overheat the thermofilm.
5. Pull thru-hull fitting off the hull.

Cleaning the Thru-Hull Fitting Area

1. Scrape off all excess sealant from the hull.
2. Clean hull surface with BRP HEAVY DUTY CLEANER (P/N 293 110 001) to eliminate grease, dust, and sealant residue.

NOTE: Use only a clean, dry, oil free filtered air supply for dusting and drying parts or hull.

Installing the Thru-Hull Fitting

1. Make sure thru-hull fitting sealing surface is free of sealant residue, clean and dry before installation.
2. Apply LOCTITE 5900 (P/N 293 800 066) sealant as shown.



SEALANT APPLICATION

3. Tighten thru-hull fitting screws to the specified torque.

TIGHTENING TORQUE	
Thru-hull fitting screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

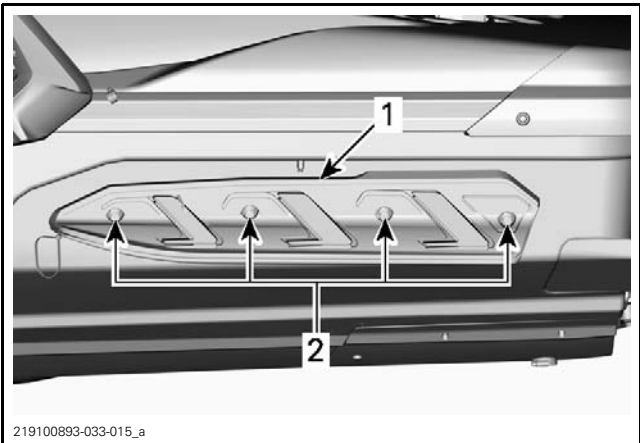
4. Install other removed parts, refer to the appropriate subsections.

REAR SPONSONS

NOTE: Removal and installation procedure for RH and LH sponson is similar.

Removing the Rear Sponson

Remove sponson retaining bolts.



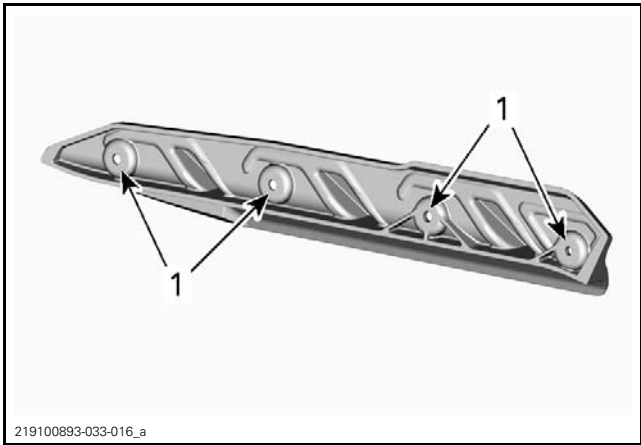
TYPICAL – LH SPONSON SHOWN

- 1. Sponson
- 2. Retaining bolts

Installing the Fixed Rear Sponson

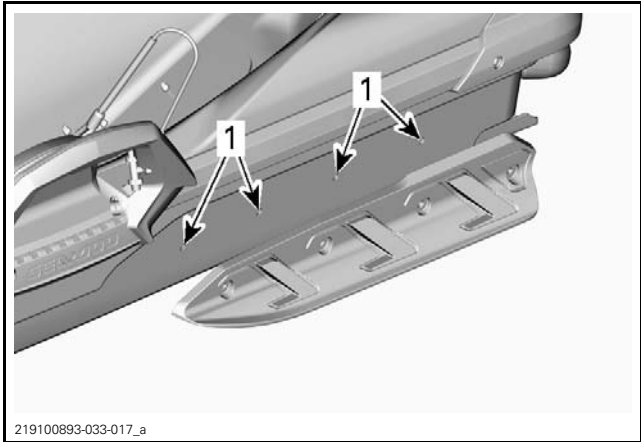
1. Clean any residues of silicone sealant on hull and sponsons.

2. Apply CLEAR SILICONE SEALANT (P/N 296 000 309) on back side of sponson spacers.



1. Apply silicone sealant here

3. Apply a small amount of CLEAR SILICONE SEALANT (P/N 296 000 309) into each hull hole.



1. Apply silicone sealant in these holes

4. Install sponson against the hull using the sponson retaining screws.

5. Tighten screws as specified.

TIGHTENING TORQUE	
Sponson retaining screws	17.5 N•m ± 1 N•m (155 lbf•in ± 9 lbf•in)

NOTE: If the retaining nut holders are damaged and need replacement, follow the following steps.

6. Remove the muffler (on left side) or the intercooler (on the right side). Refer to INTER-COOLER or EXHAUST SYSTEM subsection.

7. Clean any residues on hull.

8. Apply teroson 9399 on retaining nut holders.

9. Secure retaining nut holders on hull.

10. Reinstall removed parts. Refer to appropriate subsection.

BAILERS

Two bailers (one each side), serve to drain the bilge of the watercraft when it is in operation.

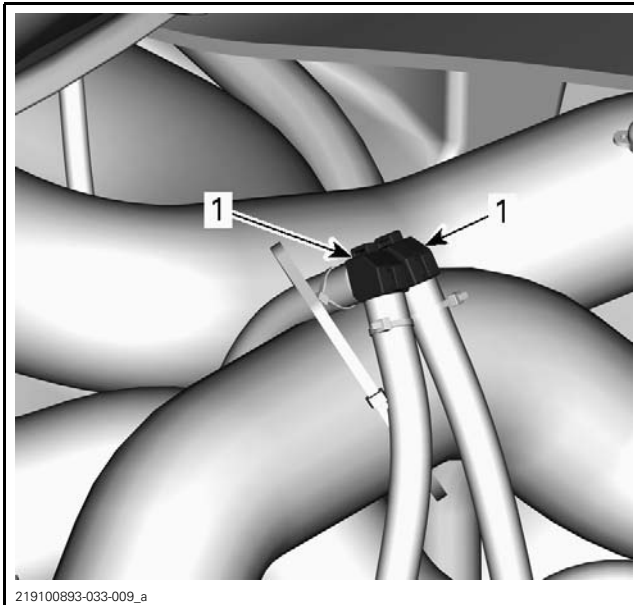
The bailers are connected to syphon tubes mounted in the jet pump venturi that use the jet pump thrust to create a vacuum.

Bailer Access

Remove engine service cover.

Inspecting the Bailer

1. Inside hull, check holes in the bailer pick-ups to see if they are obstructed. Clean if necessary.
2. Check if the hole on each bailer hose elbow fitting is obstructed. Clean both elbow fittings if necessary.



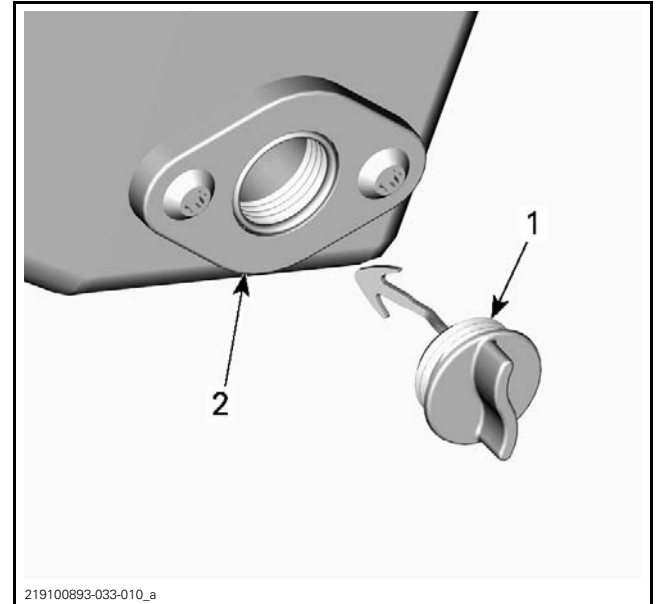
1. Elbow fitting holes

NOTE: When repositioning the bailer hose elbows, attach them at the highest position that you can on the exhaust hose.

DRAIN PLUGS

Removing the Drain Plug Neck

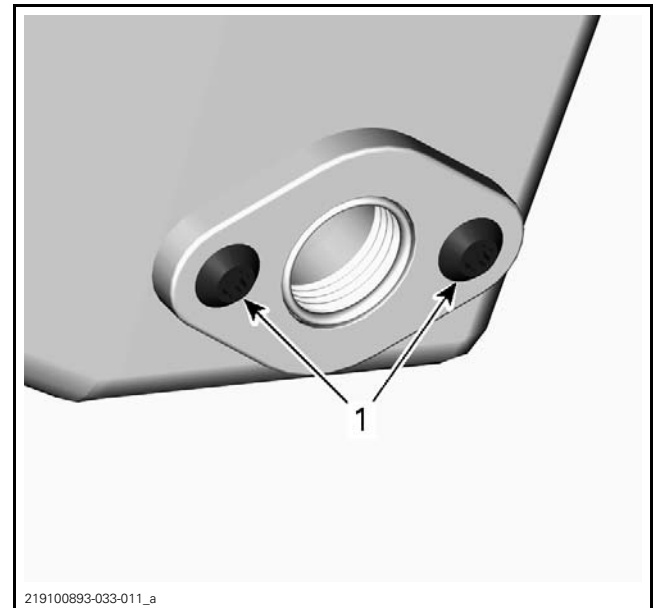
1. Unscrew the drain plug from the drain neck and use a small flat screw driver to compress and release the arrow head from the neck.



DRAIN PLUG REMOVAL

1. Drain plug
2. Drain neck

2. Remove the retaining screws securing the drain neck..



DRAIN NECK REMOVAL

1. Drain neck removal screws

Installing the Drain Plug Neck

1. Install drain neck and torque retaining screws to specification.

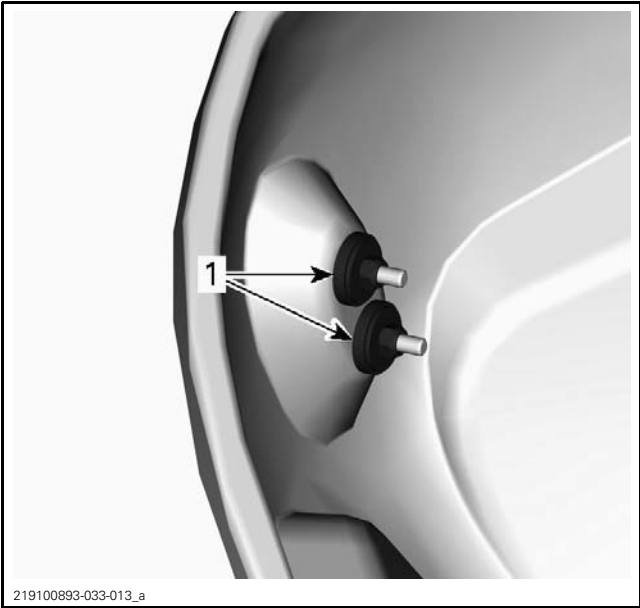
TIGHTENING TORQUE	
Drain plug retaining screws	5.5 N•m ± .5 N•m (49 lbf•in ± 4 lbf•in)

2. Replace O-ring if necessary.

BOW EYELET

Removing the Bow Eyelet

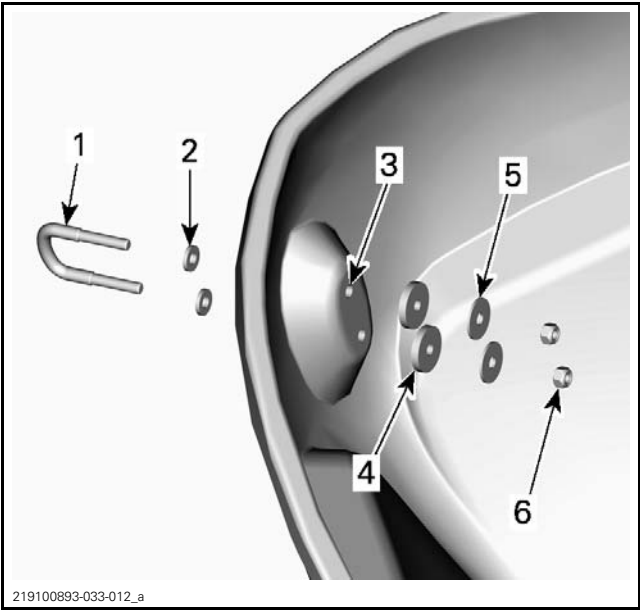
- 1. Remove the storage bin, refer to *BODY* subsection.
- 2. Remove nuts and washers securing the bow eyelet. Discard nuts.



TYPICAL – INSIDE HULL
1. Eyelet retaining nuts

- 3. Remove the bow eyelet from the vehicle.
- 4. Clean any residue of silicone sealant from the hull.

Installing the Bow Eyelet



TYPICAL – BOW EYELET
1. Bow eyelet
2. Small washer
3. Loctite 5150 (silicone sealant) here
4. Rubber washer
5. Large washer
6. Elastic stop nut

REQUIRED PRODUCT	LOCATION
CLEAR SILICONE SEALANT (P/N 296 000 309)	Inside hull, around holes

TIGHTENING TORQUE	
Retaining nuts	14.5 N•m ± 1.5 N•m (128 lbf•in ± 13 lbf•in)

STERN EYELETS

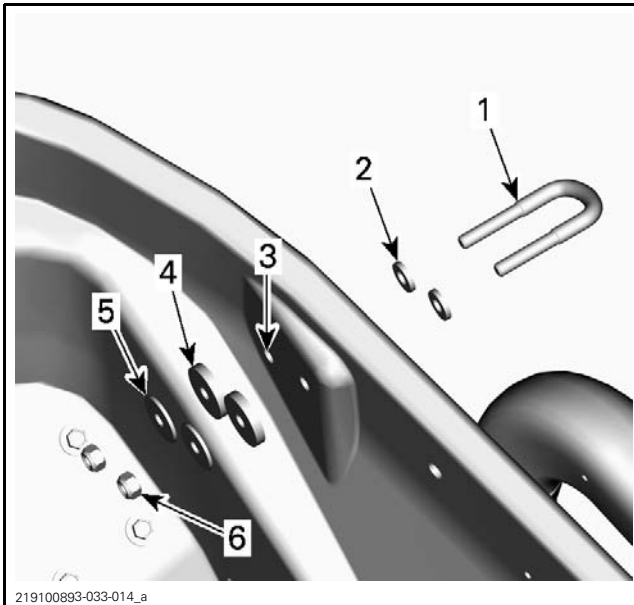
Removing the Stern Eyelet

- 1. Remove seats.
- 2. Remove engine service cover.
- 3. Inside hull, unscrew and discard elastic stop nuts securing the stern eyelet to hull.
- 4. Pull stern eyelet to remove it from watercraft.
- 5. Clean any residue of silicone sealant from the hull.

Installing the Stern Eyelet

- 1. Install small washers and nylon washers to stern eyelet and insert it through the hull.
- 2. Inside hull, apply CLEAR SILICONE SEALANT (P/N 296 000 309) all around holes.

3. Install eyelet and other parts using new elastic stop nuts as per following illustration.



1. Stern eyelet
2. Small washer
3. Loctite 5150 (silicone sealant) here
4. Rubber washer
5. Large washer
6. Elastic stop nut

4. Tighten nuts to the specified torque.

TIGHTENING TORQUE	
Eyelet retaining nuts	14.5 N•m ± 1.5 N•m (128 lbf•in ± 13 lbf•in)

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, rinse/dry.
Tar/asphalt	D	B	—	
Yellow mustard	A	B	C	
*Suntan lotion, tree pollen, wet leaves and some other products 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. 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)	Using a highly concentrated mixing ratio of the blending agent will cause crazing of the thermofilm finish. 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

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

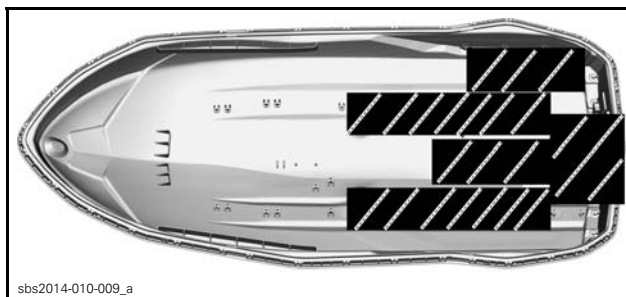
The deck and hull are made of a single thick skin of injected polypropylene reinforced with fiberglass.

Hull Repair

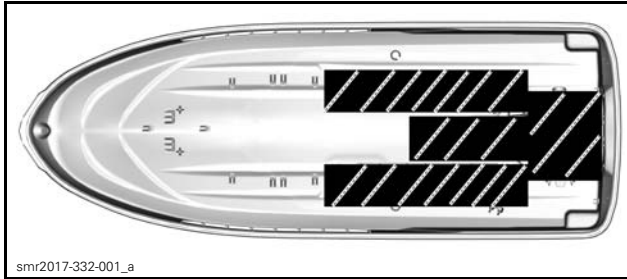
The shaded areas are:

- 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)	

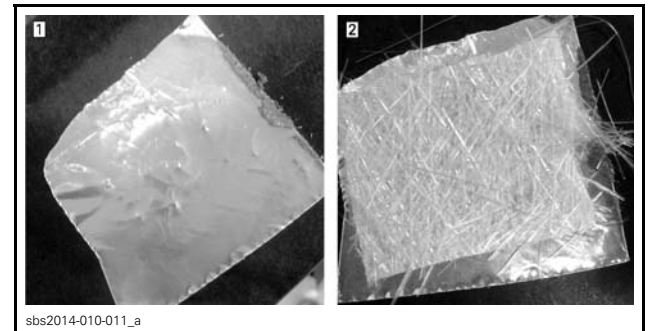
Required Parts

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 ¹	Available locally	As needed
Multipurpose black paint (metal-wood-plastic) ²	Available locally	As needed
¹ BRP has tested 3M™ DURAMIX™ SEMI-RIGID PLASTIC REPAIR (P/N 04240) with good results.		
² BRP has tested CHEM-PAK® PER-FIX BLACK™ POLYPROPYLENE (P/N 7500A) with good results.		

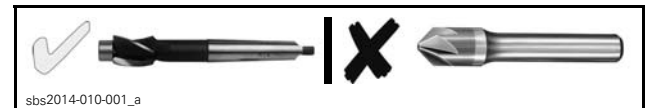
Inside Hull Crack Repair

NOTICE Cracks longer than 400 mm (15-1/4 in) should not be repaired.

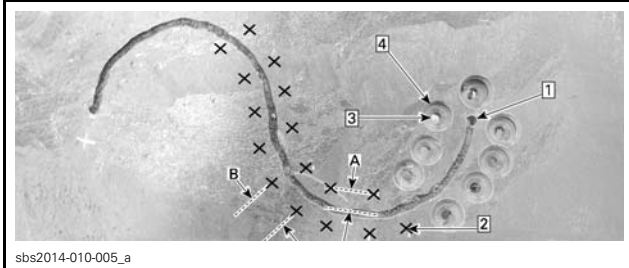
1. Lay down an aluminum foil tape over the area to be repaired. Extend the aluminum foil tape 150 mm (6 in) beyond the crack.
2. Prepare the fiber reinforced backing skin using 3 skins of laminate.
 - 2.1 Apply the mat, the resin and the catalyst over the aluminum foil tape.
 - 2.2 Allow to dry.
3. Remove 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.

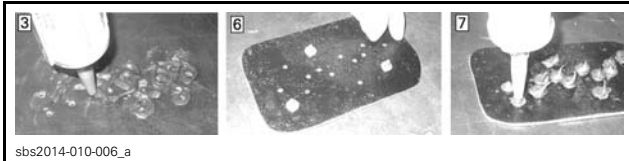


Subsection 01 (CLEANING AND REPAIR)



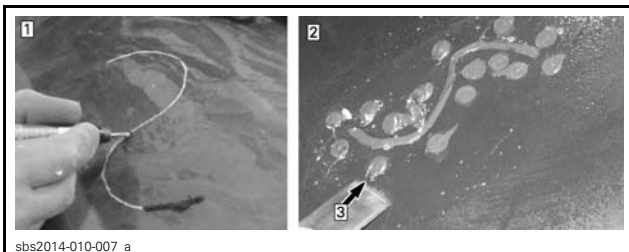
1. Hole at end of crack
2. Mark drilling locations
3. Drill hull
4. Counter bore
- A. 15 mm (19/32 in) from centerline of crack
- B. 30 mm (1-13/64 in) from next hole

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.

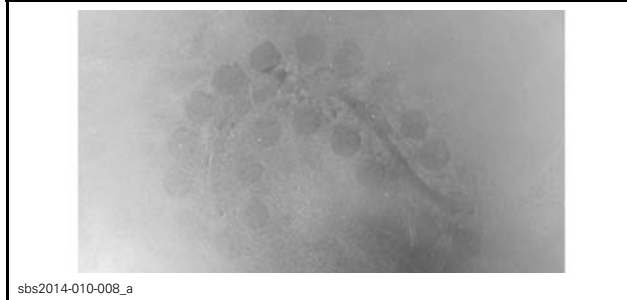


Exterior Aesthetics Cracks Repair

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.



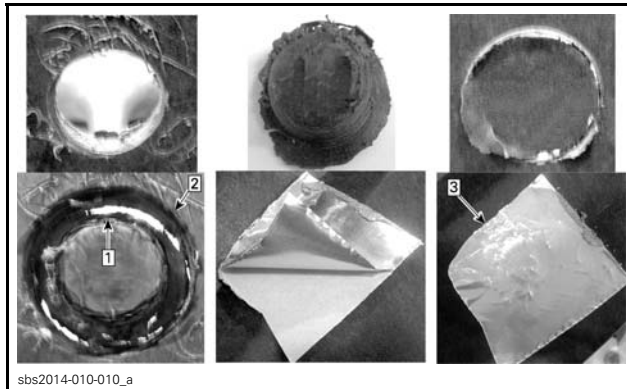
Repairing a Hole

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 If you bought this manual from any other seller please leave them
NEGATIVE feedback and notify me at bestshopmanuals@gmail.com

ENGINE			
Engine type		ROTAX® 1630 ACETM HO, 4-stroke, Single Over Head Camshaft (SOHC)	
Declared Power	130	100kW 6500 RPM	
	170	125 kW 8000 RPM	
	230	169 kW 8000 RPM	
	300	217 kW @ 8000 RPM	
Induction	130 170	Naturally-Aspirated	
	230 300	Supercharged intercooled	
Number of cylinders		3	
Number of valves		12 valves with hydraulic lifters (no adjustment)	
Bore		100 mm (3.9 in)	
Stroke		69.2 mm (2.7 in)	
Displacement		1 630.5 cm ³ (99.5 in ³)	
Compression ratio	130 170	11:1	
	230	8.3:1	
	300	8.4:1	
Intake valve opening	130 170	2° BTDC	
	230	2° ATDC	
	300	0° BTDC	
Intake valve closing	130 170	55° ABDC	
	230	42° ABDC	
	300	50° ABDC	
Exhaust valve opening	130 170	52° BBDC	
	230	48° BBDC	
	300	50° BBDC	
Exhaust valve closing	130 170	3° ATDC	
	230	8° BTDC	
	300	0° ATDC	
Valve stem diameter	Intake	New	5.961 mm to 5.975 mm (.2347 in to .2352 in)
		Service limit	5.930 mm (.2335 in)
	Exhaust	New	5.946 mm to 5.960 mm (.2341 in to .2346 in)
		Service limit	5.930 mm (.2335 in)

Subsection XX (ENGINE)

ENGINE				
Valve guide diameter		New		5.994 mm to 6.018 mm (.236 in to .2369 in)
		Service limit		6.060 mm (.2386 in)
Valve spring free length	Inner	New		41.02 mm (1.615 in)
		Service limit		38.80 mm (1.528 in)
	Outer	New		45.45 mm (1.789 in)
		Service limit		43.00 mm (1.693 in)
Valve seat contact width	Intake	New		1.05 mm to 1.35 mm (.041 in to .053 in)
		Service limit		1.60 mm (.063 in)
	Exhaust	New		1.25 mm to 1.55 mm (.049 in to .061 in)
		Service limit		1.80 mm (.071 in)
Rocker arm inner diameter		New		20.007 mm to 20.020 mm (.7877 in to .7882 in)
		Service limit		20.050 mm (.7894 in)
Rocker arm shaft diameter		New		19.980 mm to 19.993 mm (.7866 in to .7871 in)
		Service limit		19.970 mm (.7862 in)
Cylinder head maximum warpage		Service limit		0.100 mm (.004 in)
Piston ring type		1 st		Upper compression ring, rectangular
		2 nd		Lower compression ring, tapered face
		3 rd		Oil scraper ring
Ring end gap	Rectangular	New	130 170 230	0.20 mm to 0.40 mm (.008 in to .016 in)
		New	300	0.30 mm to 0.50 mm (.012 in to .02 in)
	Taper-face	New	130 170 230	0.70 mm to 0.95 mm (.028 in to .037 in)
		New	300	0.35 mm to 0.55 mm (.014 in to .022 in)
	Oil scraper ring	New	All	0.20 mm to 0.70 mm (.008 in to .028 in)
	All	Service limit	All	1.20 mm (.047 in)
Ring/piston groove clearance	Rectangular	New	130 170 230	0.010 mm to 0.060 mm (.0004 in to .0024 in)
		New	300	0.025 mm to 0.070 mm (.001 in to .0028 in)
		Service limit	All	0.150 mm (.0059 in)
	Taper-face	New	All	0.015 mm to 0.060 mm (.0006 in to .0024 in)
		Service limit	All	0.150 mm (.0059 in)
	Oil scraper ring	New	All	0.010 mm to 0.180 mm (.0004 in to .0071 in)
		Service limit	All	0.200 mm (.0079 in)

ENGINE			
Piston measurement	New	130	99.951 mm to 99.969 mm (3.9351 in to 3.9358 in)
	Service limit	170 230	99.900 mm (3.9331 in)
	New	300	99.931 mm to 99.949 mm (3.9343 in to 3.935 in)
	Service limit		99.900 mm (3.9331 in)
Piston/cylinder wall clearance	New	130	0.024 mm to 0.056 mm (.0009 in to .0022 in)
	Service limit	170 230	0.100 mm (.0039 in)
	New	300	0.044 mm to 0.076 mm (.0017 in to .003 in)
	Service limit		0.100 mm (.0039 in)
Cylinder taper	New Maximum		0.036 mm (.0014 in)
	Service limit		0.100 mm (.0039 in)
Cylinder out of round	New Maximum		0.008 mm (.0003 in)
	Service limit		0.020 mm (.0008 in)
Camshaft bearing journal diameter	Front	New	24.909 mm to 24.940 mm (.9807 in to .9819 in)
		Service limit	24.880 mm (.9795 in)
	PTO and center	New	39.892 mm to 39.905 mm (1.5706 in to 1.5711 in)
		Service limit	39.880 mm (1.5701 in)
Camshaft bearing inner diameter	Front	New	25.000 mm to 25.013 mm (.9843 in to .9848 in)
		Service limit	25.050 mm (.9862 in)
	PTO and center	New	40.000 mm to 40.020 mm (1.5748 in to 1.5756 in)
		Service limit	40.050 mm (1.5768 in)

Subsection XX (ENGINE)

ENGINE				
Cam lobe height	Intake	New	130 170	31.710 mm to 31.910 mm (1.2484 in to 1.2563 in)
		Service limit		31.660 mm (1.2465 in)
		New	230	30.513 mm to 30.713 mm (1.2013 in to 1.2092 in)
		Service limit		30.460 mm (1.1992 in)
		New	300	31.540 mm to 31.740 mm (1.2417 in to 1.2496 in)
		Service limit		31.500 mm (1.2402 in)
	Exhaust	New	130 170	31.720 mm to 31.920 mm (1.2488 in to 1.2567 in)
		Service limit		31.670 mm (1.2469 in)
		New	230	30.630 mm to 30.830 mm (1.2059 in to 1.2138 in)
		Service limit		30.580 mm (1.2039 in)
		New	300	31.430 mm to 31.630 mm (1.2374 in to 1.2453 in)
		Service limit		31.380 mm (1.2354 in)
Crankshaft deflection		Maximum		0.08 mm (.003 in)
Crankshaft axial clearance		New		0.08 mm to 0.31 mm (.003 in to .012 in)
		Service limit		0.35 mm (.014 in)
Crankshaft bearing journal diameter		New		49.991 mm to 50.010 mm (1.9681 in to 1.9689 in)
		Service limit		49.950 mm (1.9665 in)
Crankshaft radial clearance		Service limit		0.07 mm (.0028 in)
Crankshaft bearing inside diameter		Service limit		50.10 mm (1.9724 in)
Crankshaft pin diameter		New		45.032 mm to 45.048 mm (1.7729 in to 1.7735 in)
		Service limit		45.025 mm (1.7726 in)
Connecting rod big end diameter		Service limit		45.080 mm (1.7748 in)
Connecting rod big end radial play		Service limit		0.090 mm (.0035 in)
Connecting rod big end axial play		New		0.100 mm to 0.452 mm (.004 in to .018 in)
		Service limit		0.500 mm (.02 in)
Connecting rod small end diameter		New		22.01 mm to 22.02 mm (.8665 in to .8669 in)
		Service limit		22.07 mm (.8689 in)
Connecting rod small end radial play		Service limit		0.080 mm (.003 in)
Piston pin diameter		New		21.996 mm to 22.000 mm (.866 in to .8661 in)
		Service limit		21.990 mm (.8657 in)

ENGINE			
Balance shaft journal diameter	New		31.984 mm to 32.000 mm (1.2592 in to 1.2598 in)
	Service limit		31.950 mm (1.2579 in)
Balance shaft radial clearance	Service limit		0.070 mm (.0028 in)
Balance shaft bearing inside diameter	Service limit		32.11 mm (1.2642 in)
Balance shaft axial clearance	New		0.02 mm to 0.25 mm (.001 in to .01 in)
	Service limit		0.35 mm (.014 in)
Supercharger clutch slipping moment	New supercharger	230	9 N•m to 14 N•m (80 lbf•in to 124 lbf•in)
	Break-in supercharger		8 N•m to 12 N•m (71 lbf•in to 106 lbf•in)
	New supercharger	300	14 N•m to 17 N•m (124 lbf•in to 150 lbf•in)
	Break-in supercharger		Minimum 11 N•m (97 lbf•in)
AIR INTAKE SYSTEM			
Intake spark arrester		Tubular, wire screen, integrated in the intake manifold	
LUBRICATION SYSTEM			
Lubrication	Oil type		XPS 4-stroke synthetic blend oil) (P/N 293 600 121) or a 10W40 mineral engine oil compatible with wet clutches (JASO MA certified oils)
	Capacity		3 L (3.2 qt (U.S. liq.)) oil change w/filter 5 L (5.3 qt (U.S. liq.))total
	Type		Dry sump (2 oil pumps). Replaceable oil filter. Water-cooled oil cooler
Oil pressure	Idle (cold)		400 kPa - 600 kPa (58 PSI - 87 PSI)
	Idle (at 80°C (176°F))		Min. 150 kPa (22 PSI)
	4000 - 8000 (at 100°C (212°F))		350 kPa - 500 kPa (51 PSI - 73 PSI)
Oil pressure regulator outer compression spring free length	New		60.0 mm (2.362 in)
	Service limit		57.0 mm (2.244 in)
Oil temperature sensor	Limp home mode activation	130 170	Above 115°C (239°F)
		230	Above 120°C (248°F)
		300	Above 97°C (207°F)
Oil pump radial clearance	Service limit		0.25 mm (.0098 in)
Oil pump axial clearance	Service limit		0.1 mm (.004 in)

Subsection XX (ENGINE)

COOLING SYSTEM			
Type		Closed loop cooling system	
Coolant		Ethylene-glycol / distilled water mix (50%/50%). Use premix coolant from BRP (Long life antifreeze) or a coolant specially formulated for aluminum engines	
Cooling system capacity		5.5 L (5.8 qt (U.S. liq.)) total	
Thermostat opening temperature		80°C (176°F)	
Monitoring beeper setting	130 170 230	Above 102°C (216°F)	
	300	Above 97°C (207°F)	
Radiator cap opening pressure		90 kPa (13 PSI)	
EXHAUST SYSTEM			
Type		D-Sea-Bel sound reduction system. Water cooled/water injected (open loop). Direct flow from jet pump	
Water injection in muffler		4 x 3.5 mm (.138 in) on exhaust manifold	
FUEL SYSTEM			
Fuel injection type		Multipoint fuel injection with iTC (intelligent Throttle Control). Single throttle body (60 mm) with an actuator	
Fuel pressure		386 kPa to 414 kPa (56 PSI to 60 PSI)	
Fuel injector	Quantity		3
Idle speed	130 170	1820 ± 50 RPM (not adjustable)	
	230	1750 ± 50 RPM (not adjustable)	
	300	1700 ± 50 RPM (not adjustable)	
ELECTRICAL SYSTEM			
Magneto generator output		14V 420W @ 6000 RPM	
Stator		0.1 to 1.0 Ω	
Ignition system type		IDI (Inductive Discharge Ignition)	
Ignition timing		Variable (electronically controlled)	
Spark plug	Make and type	130 170 230	NGK DCPR8E
		300	NGK KR9E-G
	Gap	130 170 230	0.8 mm to 0.9 mm (.031 in to .035 in)
		300	0.7 mm to 0.8 mm (.028 in to .031 in)

ELECTRICAL SYSTEM		
Ignition coil	Primary	0.80 to 0.97 Ω
	Secondary	N.A.
Engine speed limiter setting	130	8040 RPM
	170	8440 RPM
	230	
	300	

VEHICLES

COOLING SYSTEM			
Type		Closed loop cooling system	
Coolant		Ethylene-glycol / distilled water mix (50%/50%) Use BRP extended life pre-mixed coolant or a low silicate coolant specially formulated for internal combustion aluminum engines	
Cooling system capacity		5.8 L (6.13 qt (U.S. liq.)) total	
Radiator cap opening pressure		90 kPa (13 PSI)	
EXHAUST SYSTEM			
Type		D-Sea-Bel sound reduction system. Water cooled/water injected (open loop). Direct flow from jet pump	
Water injection in muffler		3 x 3.5 mm (.138 in) on exhaust pipe and 1 x 3.5 mm (.138 in) on muffler	
FUEL SYSTEM			
Fuel type	Inside North America ((RON + MON)/2)	GTX LTD 300 RXT-X 300	91 or higher
		All other models	87 or higher
	Outside North America (RON)	GTX LTD 300 RXT-X 300	95 or higher
		All other models	91 or higher
Fuel tank (including reserve)		FISH PRO 155	70 L (18 U.S. gal.)
		All other models	60 L (16 U.S. gal.)
Fuel tank reserve (from low level signal)			approx. 14 L (3.7 U.S. gal.)
ELECTRICAL SYSTEM			
Battery		Sealed, 12 V, 18 A•h Yuasa - YTX20L (M420BS)	
Anti-start system		RFDI D.E.S.S. (Radio Frequency Identification Digitally Encoded Security System) with selectable maximum vehicle speed settings for LK (learning key)	

Subsection XX (VEHICLES)

ELECTRICAL SYSTEM			
Fuse box	#1: Not Used		---
	#2: Fuel inj., Ing. Coils and Fuel Pump		15 A
	#3: Bilge pump (if equipped)		3 A
	#4: NOT USED		---
	#5: NOT USED		---
	#6: Charge		30 A
	#7: Cluster		5 A
	#8: Depth sounder (if equipped)		3 A
	#9:iBR		30 A
	#10: Start/Stop		5 A
	#11: ECM		5 A
	#12 BATTERY (Fuses 10, 14 and relay)		30 A
	#13: Diagnostic tool 2		15 A
	#14: Diagnostic tool 1, Accessory connector		15 A
Transducer liquid (Fish PRO 155 models)		Ethylene-glycol / distilled water mix (50%/50%) Use BRP extended life pre-mixed coolant or a low silicate coolant specially formulated for internal combustion aluminum engines	

STEERING			
Steering		Tilt at 4 positions	
Steering nozzle pivoting angle		22°	

PROPULSION			
Jet pump		Type	Axial flow single stage
		Grease type	Jet pump bearing grease (P/N 293 550 032)
Impeller	Rotation (seen from rear)		Counterclockwise
	Pitch	GTX LTD 300 RXT-X 300	13.5°/24°
		All other models	10°/21°
	Outside diameter	GTX LTD 300 RXT-X 300	161 mm ± 0.06 mm (6.34 in ± .002 in)
		All other models	159 mm ± 0.06 mm (6.26 in ± .002 in)
Impeller/wear ring clearance		New	0 mm to 0.23 mm (0 in to .009 in)
		Service limit	0.35 mm (.0138 in)
Impeller shaft		End play (new)	0
		Side play	0

PROPULSION		
Drive shaft	Coupling type	Crowned splines, direct drive
	Deflection (max.)	0.5 mm (.02 in)
Minimum required water level for propulsion system		90 cm (3 ft) underneath the lowest rear portion of hull
IBR AND VTS		
Description		Intelligent Brake and Reverse activated by a LH lever. Electronically-controlled iBR gate to provide brake, reverse, neutral and forward position
Gate angle (from horizontal line of watercraft)	Forward	Approx. from +6° to -3°
	Neutral	Approx. -55°
	Braking	Approx. -70°
	Reverse	Approx. -70°
VTS system		Electronically-controlled through the VTS control button with 3 preset positions
VTS range angle		8° up, -3° down
Actuator		12 V, 75 A max. capacity. Reversible PWM (pulse-width modulation) motor
WEIGHT AND LOADING CAPACITY		
Dry weight	GTX 155	348 kg (768 lb)
	GTX 230	365 kg (805 lb)
	GTX LTD 230	380 kg (838 lb)
	GTX LTD 300	385 kg (849 lb)
	RXT 230	365 kg (805 lb)
	Wake Pro	370 kg (815 lb)
	RXT-X 300	376 kg (828 lb)
	FISH PRO 155	391 kg (860 lb)
Number of passenger (driver incl.)		3
Load limit (passenger(s) and luggages)		272 kg (600 lb)
Storage capacity	All models except FISH PRO 155	102.5 L (27 U.S. gal.)
	FISH PRO 155	102.5 L (27 U.S. gal.) + 51 L (13.5 U.S. gal.) Cooler
DIMENSIONS		
Overall length	All models except FISH PRO 155	345.1 cm (135.9 in)
	FISH PRO 155	373.4 cm (147 in)

Subsection XX (VEHICLES)

DIMENSIONS		
Overall width		125.5 cm (49.4 in)
Overall height	RXT-X 300	115 cm (45.3 in)
	All other models	114 cm (44.9 in)
MATERIALS		
Impeller material		Stainless steel
Impeller housing/stator		Aluminum/aluminum
Hull		CM-TEC process, composite
Inlet grate		Aluminum
Steering cover		Thermoplastic
Venturi		Aluminum
Nozzle		Aluminum
Fuel tank		Polyethylene
Seat		Polyurethane/foam

WIRING DIAGRAM INFORMATION

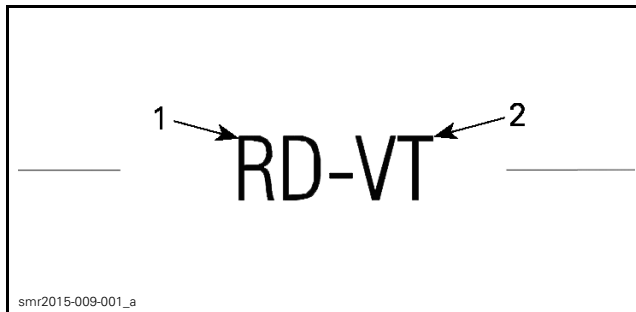
GENERAL

WIRING DIAGRAM LOCATION

The wiring diagrams are in the back cover pocket.

WIRING DIAGRAM CODES

Wire Color Codes



1. Wire main color
2. Tracer (thin colored line)

General Wire Color Use

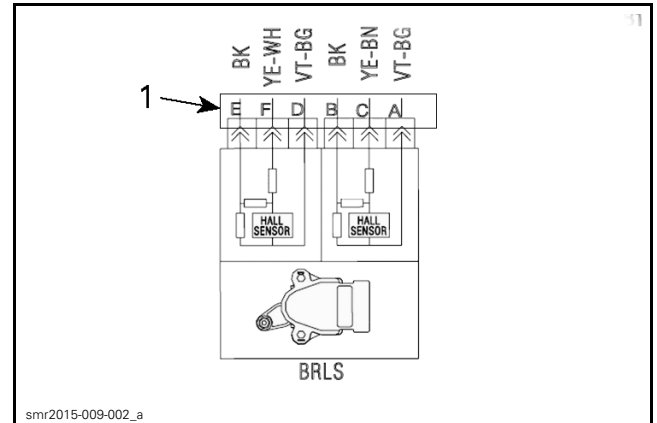
COLOR	USE
RED	Battery power (12 Vdc directly connected to battery)
RED + tracer	Fused 12 Vdc power or switched power from relay
VIOLET or VIOLET + tracer	Fused 12 Vdc accessory power from fuse box
YELLOW	Alternating current (AC) from magneto
BLACK	Ground
WHITE/BEIGE WHITE/BLACK	CAN HI wires, CAN LO wires

Color Codes

COLOR CODES			
CODE	COLOR	CODE	COLOR
BG	BEIGE (TAN)	OR / OG	ORANGE
BK	BLACK	PK	PINK
BN	BROWN	RD	RED
BU	BLUE	VT	VIOLET
GN	GREEN	WH	WHITE
GY	GRAY	YE	YELLOW

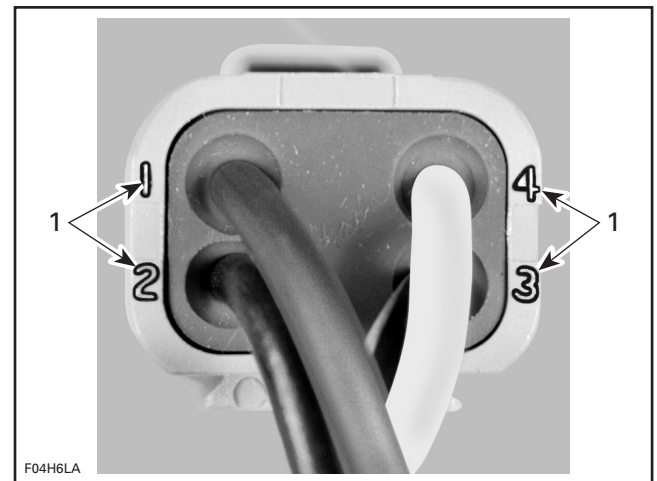
Terminal Identification on Connector

On the wiring diagram, a letter or a digit is used to identify the terminal position in a connector.



1. Terminal position

On a connector, a letter or a digit is usually molded on the connector to identify the terminal position.



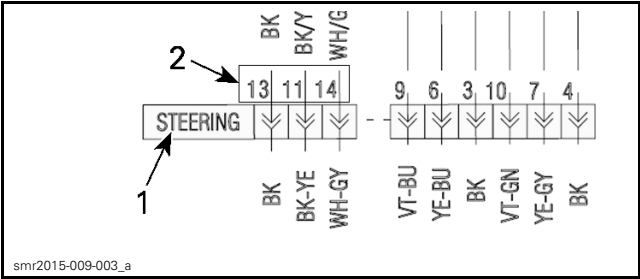
TYPICAL

1. Wire identification numbers

Terminal Identification on a Wiring Diagram

In-line connectors of wiring harnesses are identified on the wiring diagram with their approximate location and the following information.

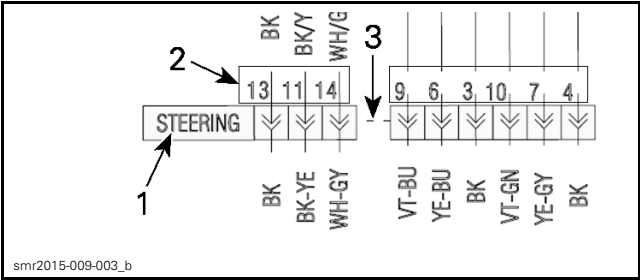
Subsection XX (WIRING DIAGRAM INFORMATION)



TYPICAL
1. Connector location
2. Wire pin location in connector

Connectors Linked by a Dashed Line

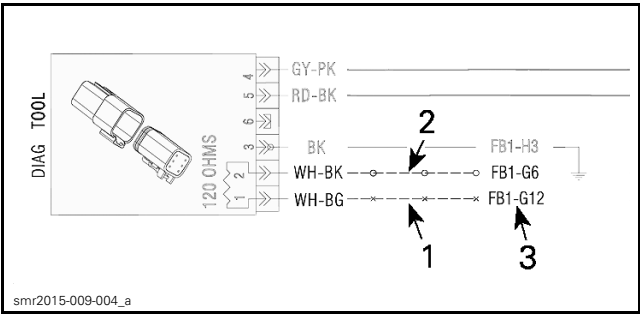
Connectors may be divided into segments linked by dashed lines, however, some segments of the same connector may be found elsewhere on the wiring diagram.



TYPICAL
1. Connector identification and location
2. Connector pin number
3. Dashed line links connector segments as one

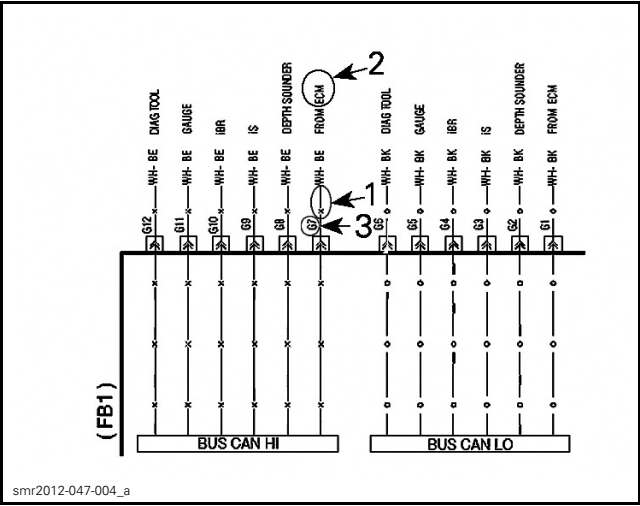
CAN Wire Circuit References

On the wiring diagram, CAN linked components use the following coding.



TYPICAL
1. CAN HI wire (x)
2. CAN LOW wire (o)
3. Wire destination
FB1 - G12 = : Terminal G12 in the fuse box no. 1

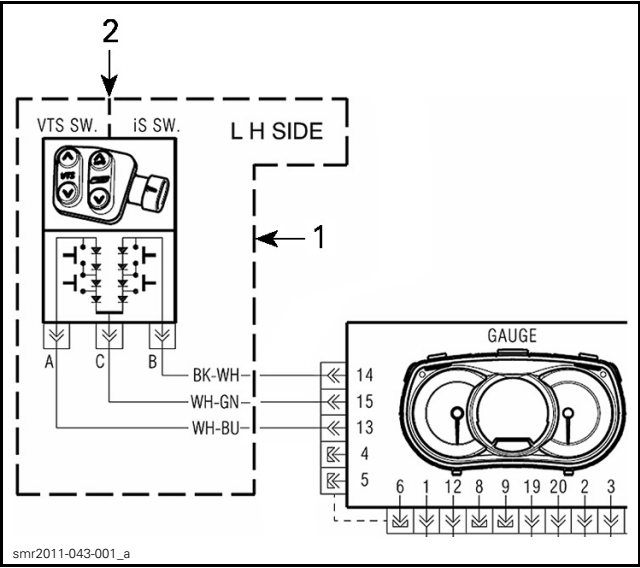
Corresponding CAN links are identified at fuse box using the following coding.



TYPICAL
1. CAN wire
2. Wire origin
3. Destination terminal (as referenced at ECM)

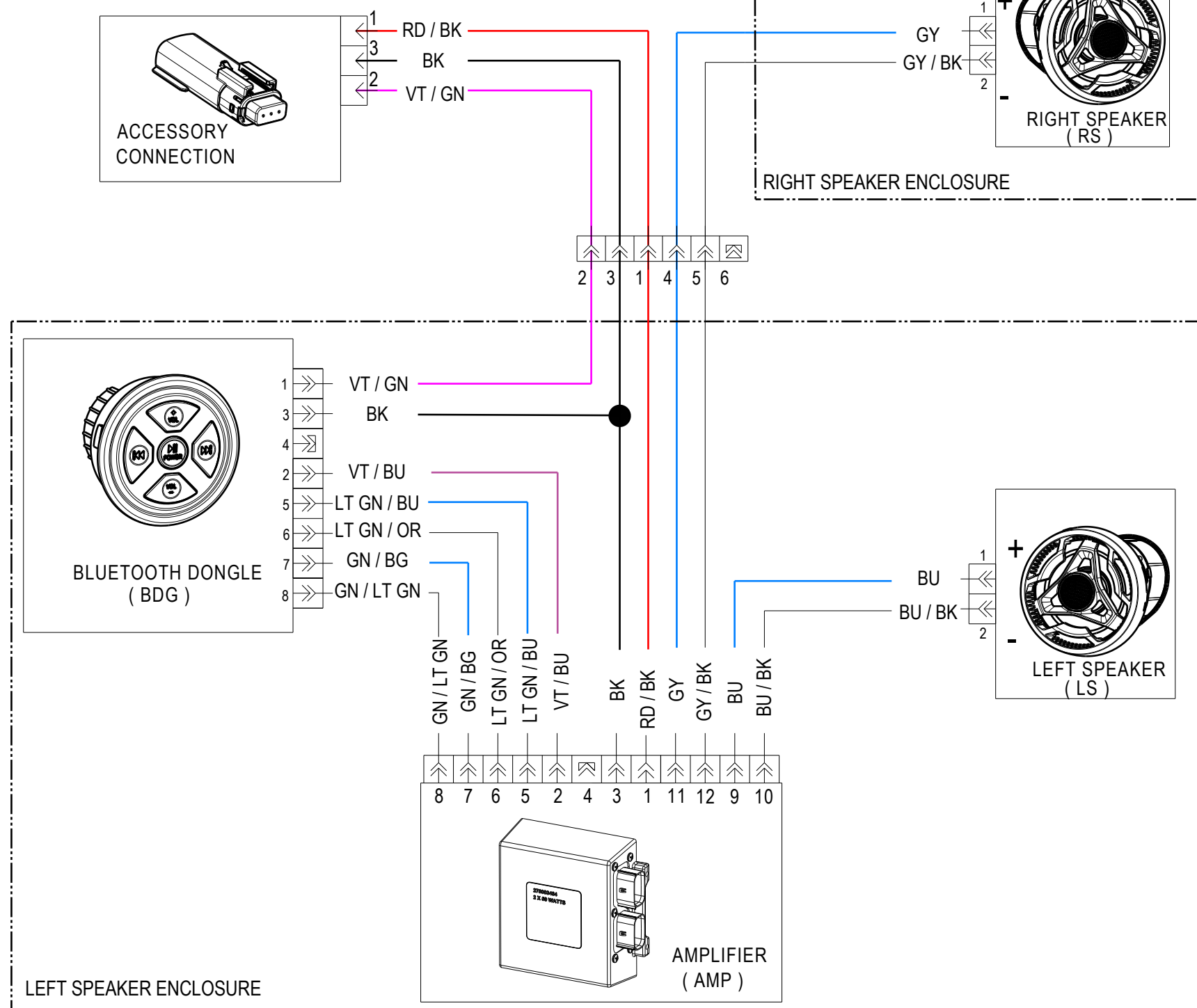
Component Application

If a component in the wiring diagram is not applicable to every vehicle model, or can be installed as an option or accessory on certain models, the component shall be enclosed in a dash line.

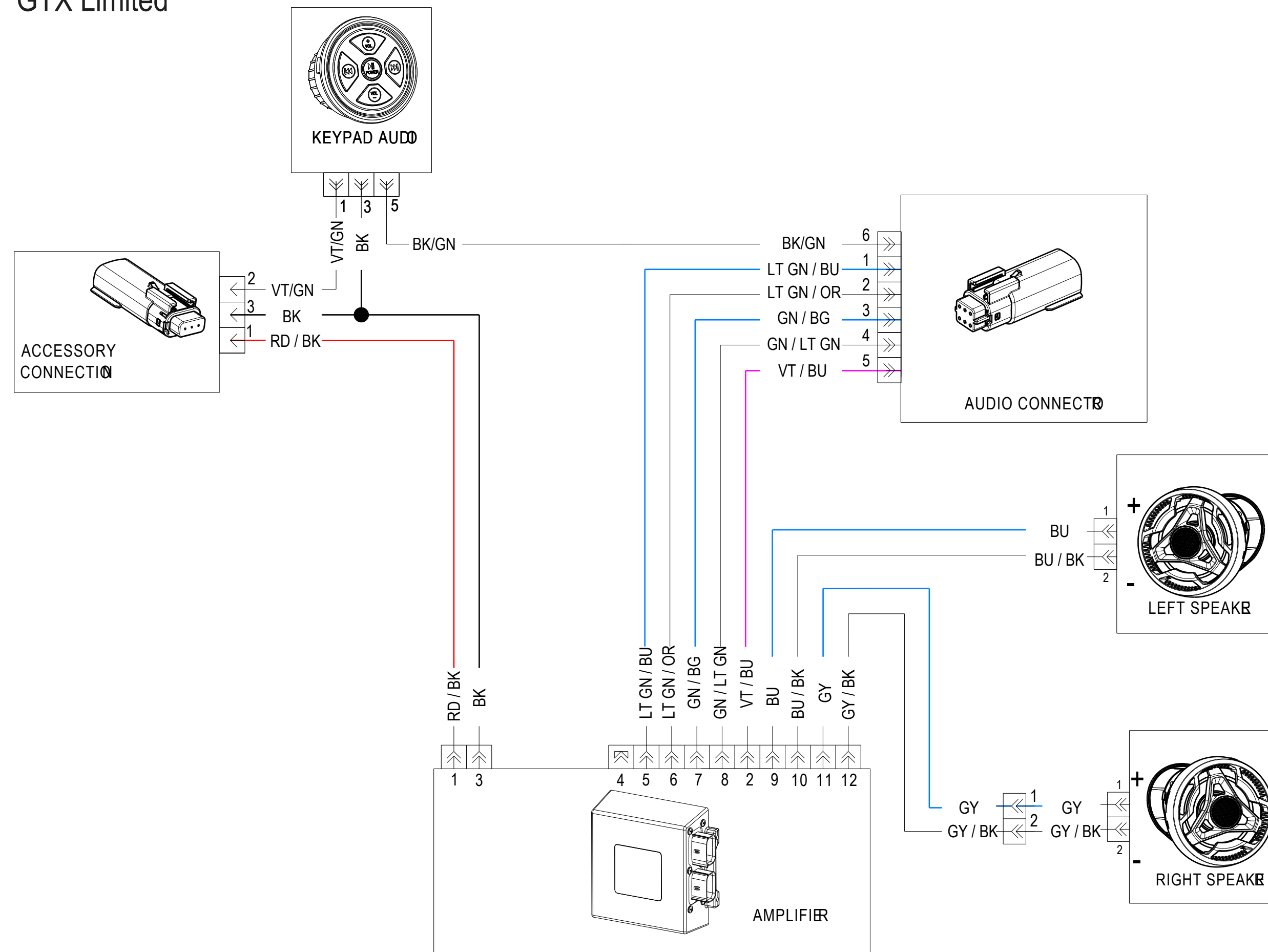


1. Component(s) optional or applicable to certain models
2. Indicates each switch is a separate component

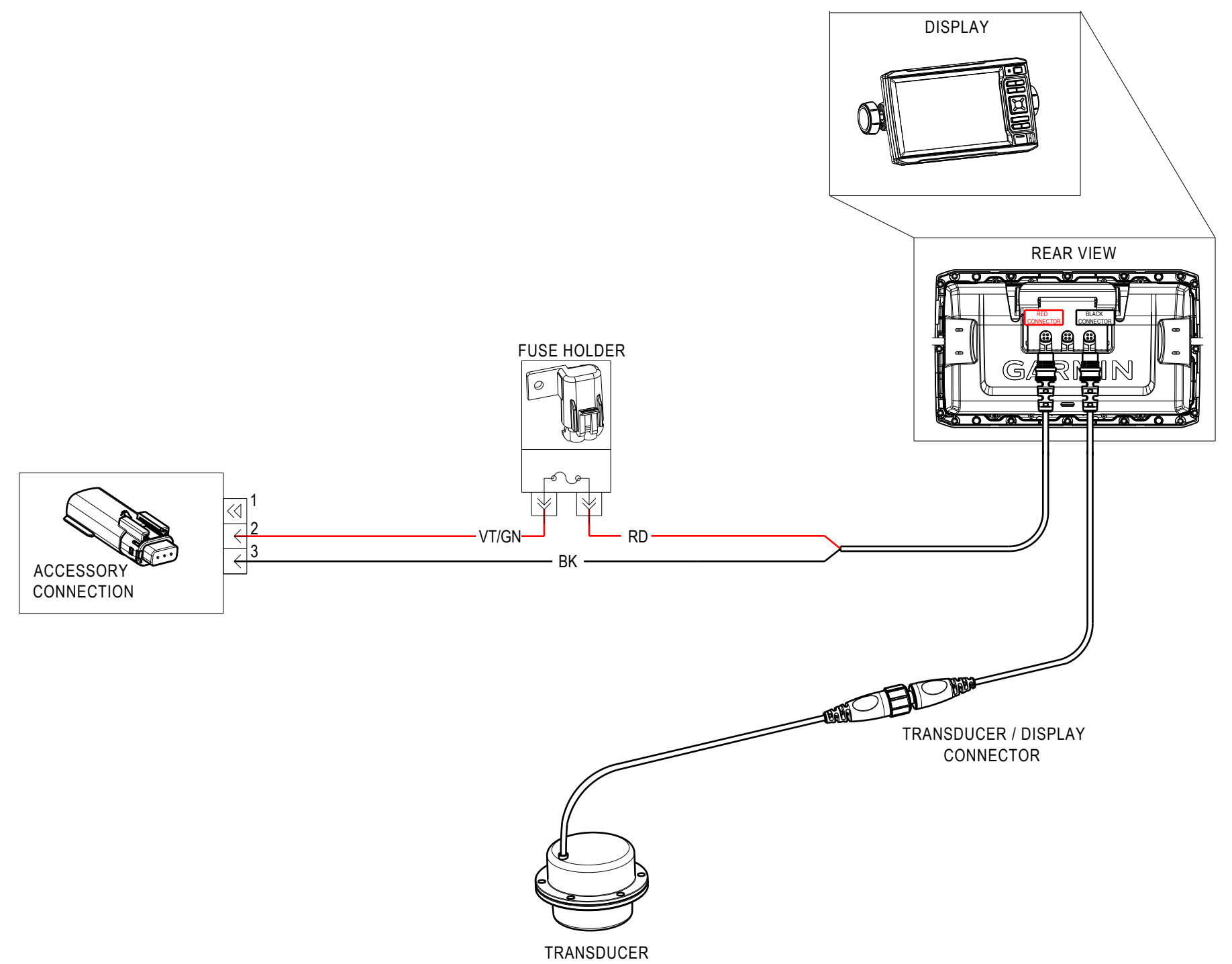
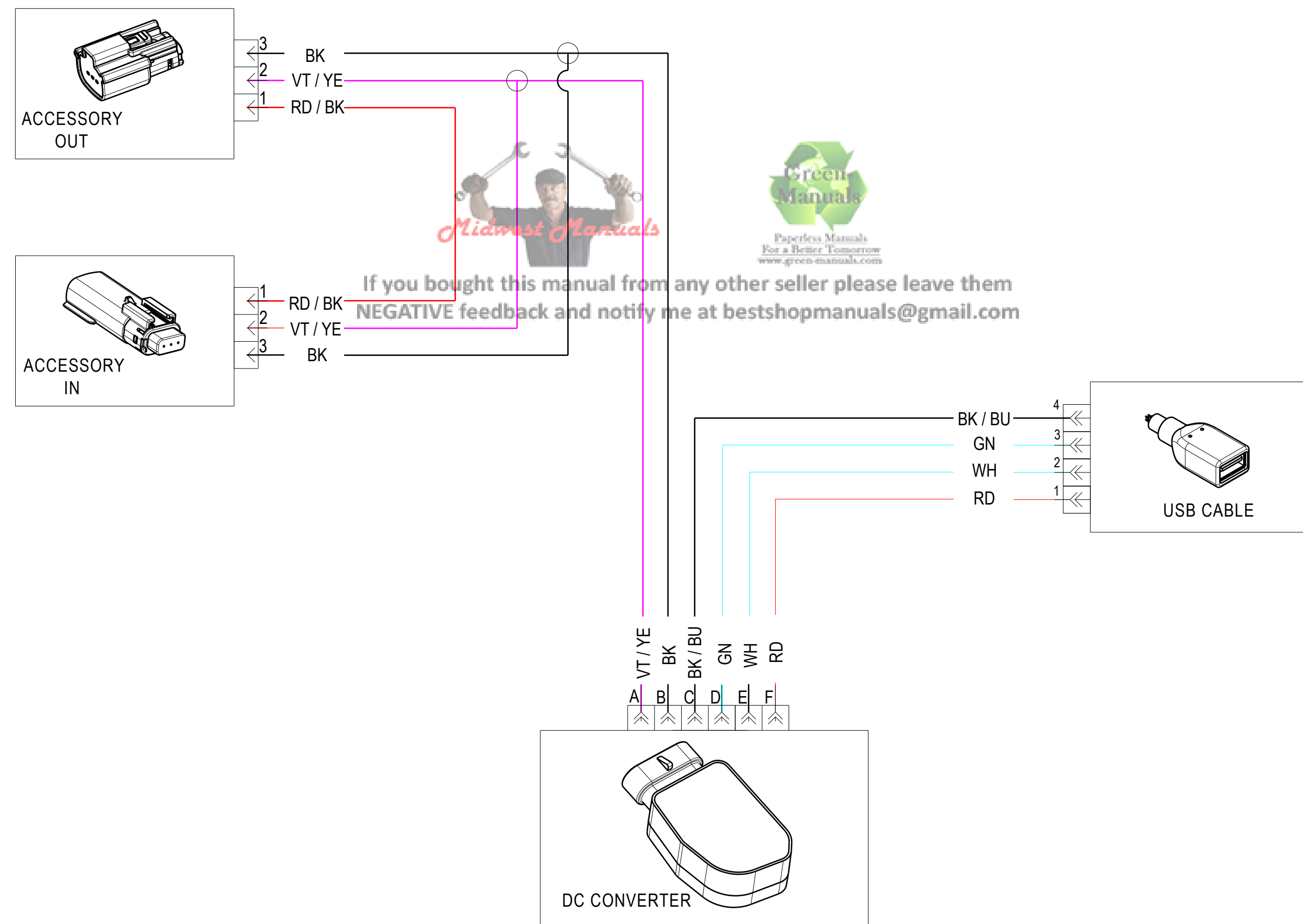
2021

SOUND SYSTEM WITH BLUETOOTH DONGLEGTI Series
GTR Series**SOUND SYSTEM WITH BLUETOOTH DONGLE**

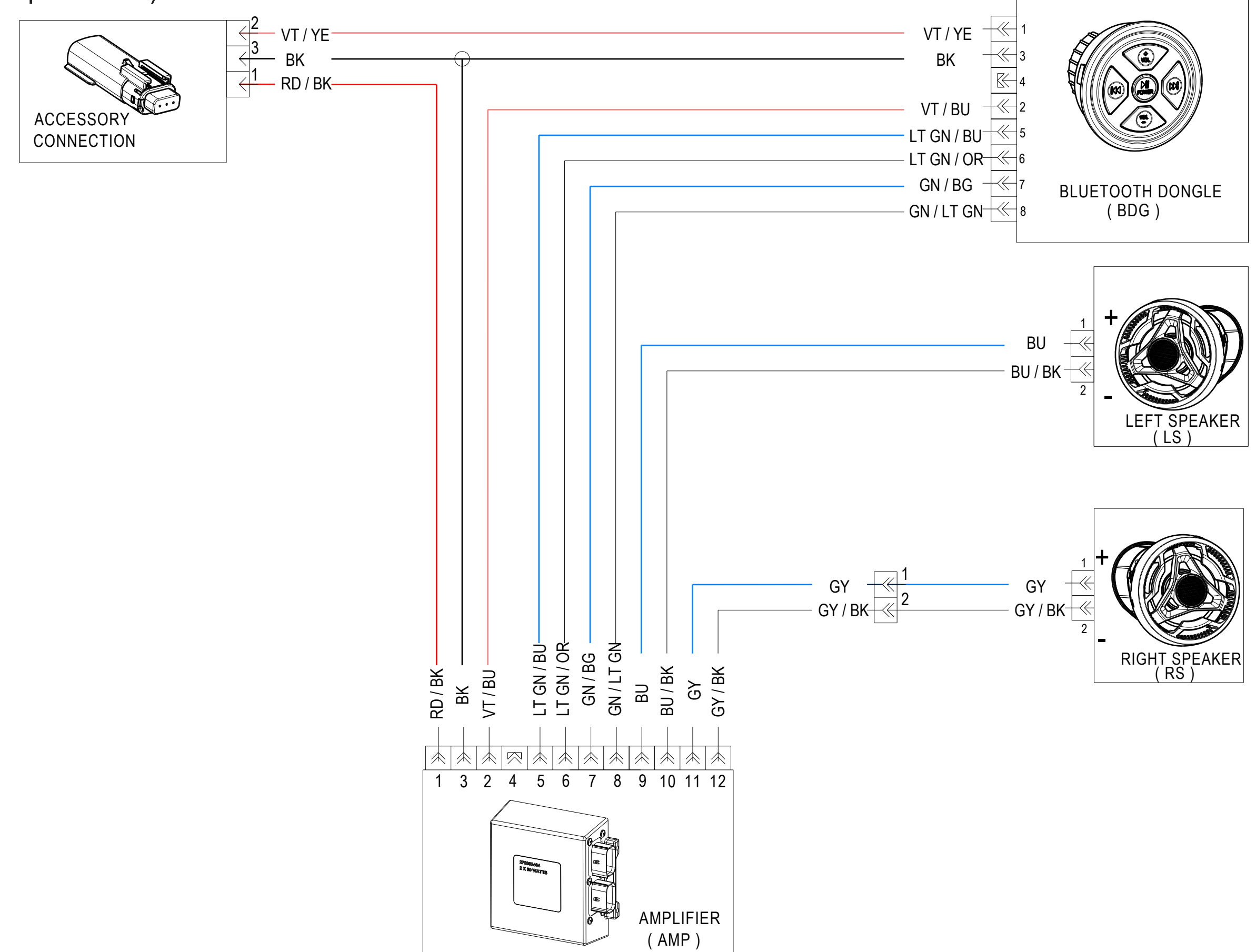
GTX Limited

**FISH FINDER**

FISH PRO

**USB CHARGER WITH DC CONVERTER**GTX Series
RXP Series
RXT Series
WAKE PRO**SOUND SYSTEM WITH BLUETOOTH DONGLE**

GTX Series (except Limited)

RXP Series
RXT Series
WAKE PRO**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	Orange
12 VOLTS SWITCHED	Blue
12 VOLTS UNSWITCHED	Red
5 OR 3.3 VOLTS	Green
DIGITAL SIGNAL	Light Blue
AC VOLTAGE	Yellow
POWER CONTROL	Dark Blue
ANALOG SIGNAL	Light Green
COMMUNICATION	Dark Green
A-D GROUND	Black
POWER GROUND	Black

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.

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	11
03	IGNITION SYSTEM	17
04	STARTER	19
05	TRANSMISSION SYSTEM	21
06	BRAKE SYSTEM	28
07	STEERING SYSTEM AND FRONT SUSPENSION	30
08	REAR SUSPENSION SYSTEM AND TRACK	35
09	BODY	41
10	ELECTRICAL SYSTEM	53

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 motomarines BRP 2021.

1. UTILISATION DU MANUEL

En procédant de la façon indiquée dans le *Manuel de réparation motomarines* 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	11
03	SYSTÈME D'ALLUMAGE	17
04	DÉMARREUR	19
05	SYSTÈME DE TRANSMISSION	21
06	SYSTÈME DE FREIN	28
07	SYSTÈME DE DIRECTION ET SUSPENSION AVANT	30
08	SYSTÈME DE SUSPENSION ARRIÈRE ET CHENILLE	35
09	CARROSSERIE	41
10	SYSTÈME ÉLECTRIQUE	53

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/ MODÈLE	ENGINE/ MOTEUR	INTERCOOLER / REFROIDISSEUR
10	GTX 170	11MA/11MB 11MC/11MD 11ME/11MF 11MG/11MH	1603N	N/A
	GTX PRO	25MA/25MB 25MC/25MD		
11	GTX 230	12MA/12MB 12MC/12MD 12ME/12MF 12MG/12MH 12MJ/12MK	1603S	STD
	GTX LTD 230	15MA/15MB		
	WAKE PRO 230	13MC/13MD		
12	GTX LTD 300	14MA/14MB 14MC	1603H	STD
13	RXT X 300	10MC/10MD 10ME/10MF 10MG/10MH 10MJ/10MK	1603H	STD
14	FISH PRO	18MA/18MB 18MC/18MD 18ME/18MF 18MG/18MH 18MJ/18MK	1603N	N/A

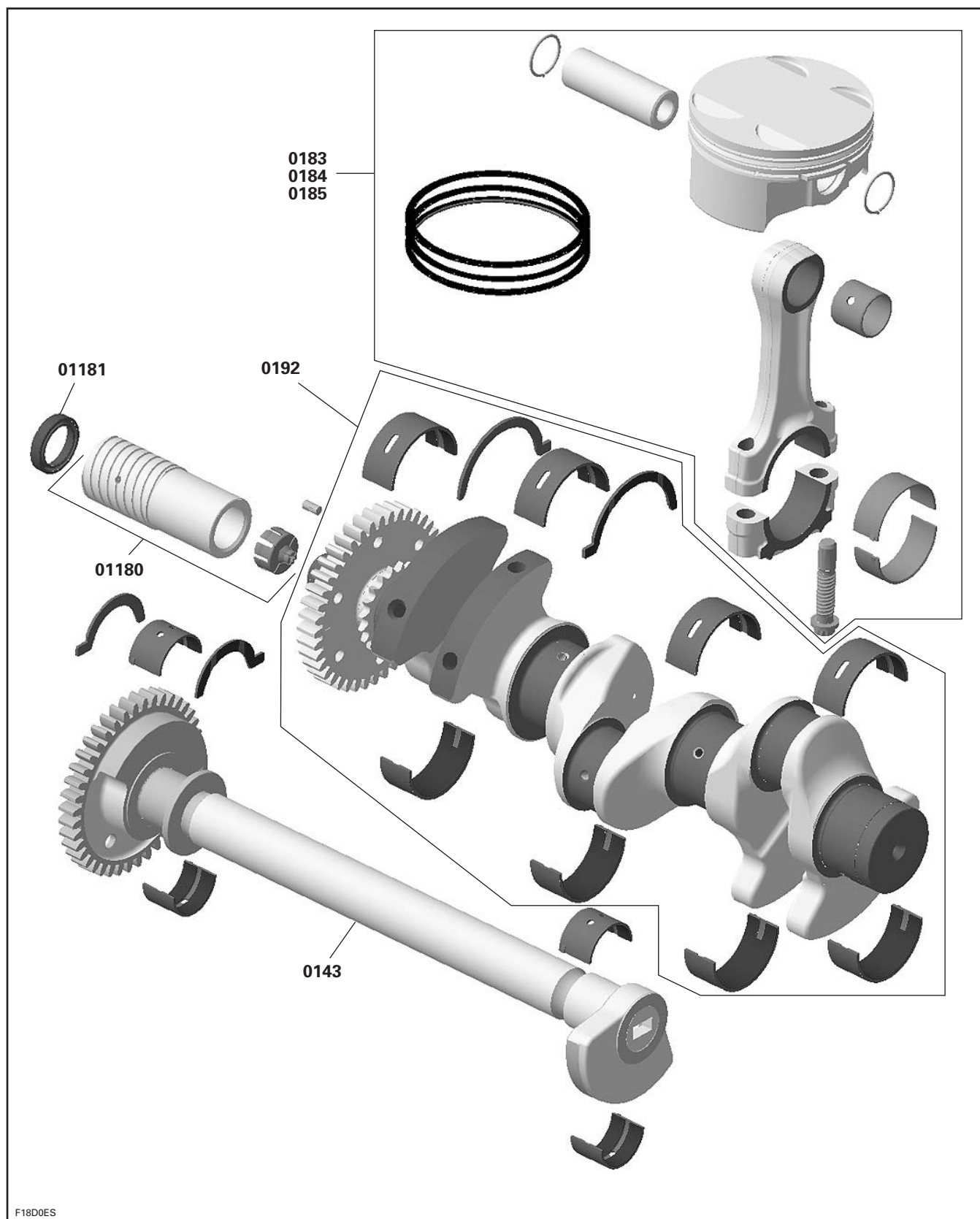
SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE / RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14

01	00	NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE	0	0	0	0	0
01	01	MUFFLER, HOSE, STRAP, RUBBER STRIP SILENCIEUX, BOYAU, SANGLE, BANDE CAOUTCHOUC	0.6	0.7	0.7	0.7	0.6
01	05	EXHAUST MANIFOLD AND/OR BOLT(S) COLLECTEUR D'ÉCHAPPEMENT ET/OU BOULON(S)	1.7	1.7	1.7	1.7	1.7
01 *	08	ENGINE (ASS'Y) REMOVAL AND INSTALLATION DÉPOSE ET INSTALLATION DU MOTEUR (COMPLET)	3.7	3.7	3.7	3.7	3.7
01	12	TEMPERATURE SENSOR CAPTEUR DE TEMPÉRATURE	0.3	0.3	0.3	0.3	0.3
01	14	CYLINDER HEAD CULASSE	4.8	5.2	5.2	5.2	4.8
01	36	EXHAUST OUTLET SORTIE D'ÉCHAPPEMENT	0.4	0.4	0.4	0.4	0.4
01	37	SHORT BLOCK ENSEMBLE CARTER-CYLINDRES	7.4	7.7	7.7	7.5	7.4
01	43	BALANCE SHAFT (ASS'Y) ARBRE D'ÉQUILIBRAGE (COMPLET)	7.1	7.5	7.5	7.3	7.1
01	52	RESONATOR (RIGHT) RÉSONATEUR (DROIT)	1.0	1.0	1.0	1.0	1.0
01	53	MUFFLER SUPPORT SUPPORT DU SILENCIEUX	0.9	1.0	1.0	1.0	0.9
01	56	ENGINE RUBBER MOUNTS (REAR OR FRONT) (EACH) TAMPON D'ANCRAGE MOTEUR (AVANT OU ARRIÈRE) (CHACUN)	1.2	1.3	1.3	1.3	1.2
01	61	HOSE (FROM PUMP SUPPORT TO HEAD PIPE ASS'Y) BOYAU DU SUPPORT DE POMPE AU TUYAU COLLECTEUR (COMPLET)	0.3	0.3	0.3	0.3	0.3
01	63	SENSOR TEMPERATURE (MUFFLER) CAPTEUR DE TEMPERATURE (SILENCIEUX)	0.3	0.3	0.3	0.4	0.3
01	65	NOISE SENSOR CAPTEUR DE CLIQUETIS	1.1	1.6	1.6	1.6	1.1
01	82	EXHAUST PIPE TUYAU D'ÉCHAPPEMENT SOUDÉ	0.6	0.7	0.7	0.7	0.6
01	83	PISTON, RINGS, CIRCLIP, PIN (1) PISTON, SEGMENTS, ANNEAU DE RETENUE, GOUPILLE (1)	7.3	7.7	7.7	7.5	7.3
01	84	PISTON, RINGS, CIRCLIP, PIN (2) PISTON, SEGMENTS, ANNEAU DE RETENUE, GOUPILLE (2)	7.5	7.9	7.9	7.7	7.5
01	85	PISTON, RINGS, CIRCLIP, PIN (3) PISTON, SEGMENTS, ANNEAU DE RETENUE, GOUPILLE (3)	7.7	8.1	8.1	7.9	7.7
01	86	INLET HOSE (RADIATOR TO PUMP) BOYAU ENTRÉE D'EAU (RADIATEUR À POMPE)	0.9	1.1	1.1	1.1	0.9
01	87	WATER OUTLET (ENGINE TO RADIATOR) SORTIE D'EAU (MOTEUR AU RADIATEUR)	0.6	0.8	0.8	0.8	0.6
01	88	HOSE FROM MUFFLER LEFT TO MUFFLER RIGHT BOYAU DU SILENCIEUX GAUCHE AU SILENCIEUX DROIT	0.3	0.5	0.5	0.5	0.3

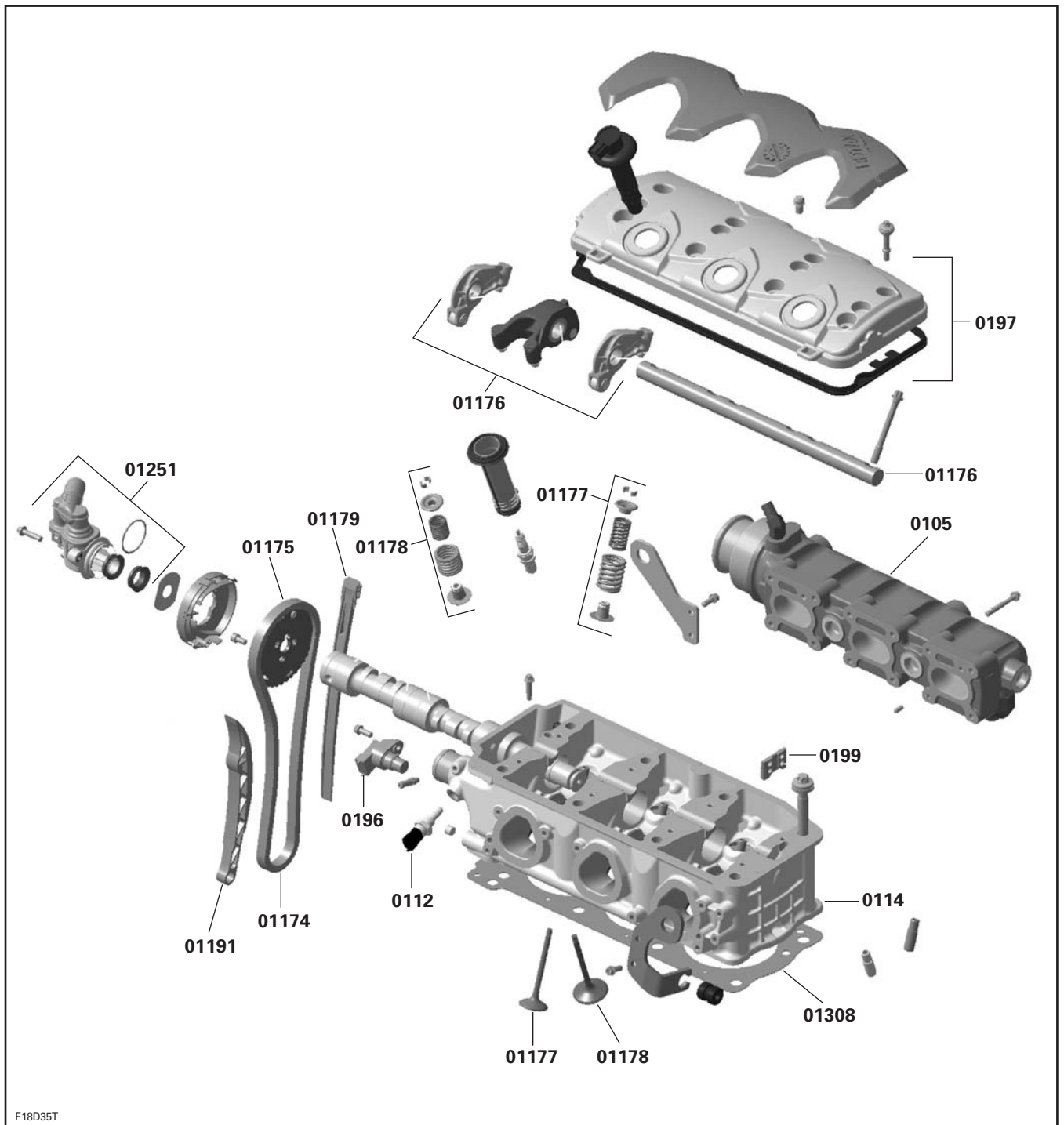
SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE / RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
01	89	ENGINE BLOCK (CRANKCASE) ENSEMBLE MOTEUR (CARTER)	8.8	9.2	9.2	9.0	8.8
01	90	ENGINE BLOCK RESEAL OR SEALANT RESCÈLEMENT DU MOTEUR OU SCELLANT	4.8	5.2	5.2	5.2	4.8
01	92	CRANKSHAFT AND/OR PLAIN BEARING AND/OR RING HALF VILEBREQUIN ET/OU ROULEMENT PLAT ET/OU DEMI-BAGUE	8.3	8.7	8.7	8.5	8.3
01	93	WATER PUMP HOUSING (ASS'Y) AND/OR GASKET BOÎTIER POMPE À EAU (COMPLET) E.5T/OU JOINT D'ÉTANCHÉITÉ	1.1	1.5	1.5	1.5	1.1
01	94	COOLING RESERVE RÉSERVOIR ANTIGEL	0.3	0.3	0.3	0.3	0.3
01	95	RADIATOR AND/OR FITTING RADIATEUR ET/OU RACCORD DROIT	3.0	3.2	3.2	3.2	3.0
01	96	CAMSHAFT POSITION SENSOR CAPTEUR DE POSITION DE L'ARBRE À CAMES	0.3	0.3	0.3	0.3	0.3
01	97	VALVE COVER AND/OR GASKET COUVERCLE DE SOUPAPE ET/OU JOINT D'ÉTANCHÉITÉ	0.3	0.3	0.3	0.3	0.3
01	98	CAMSHAFT ARBRE À CAMES	1.1	1.1	1.1	1.1	1.1
01	99	CAMSHAFT GUIDE GUIDE DE L'ARBRE À CAMES	0.6	0.6	0.6	0.6	0.6
01	174	CAMSHAFT CHAIN CHAÎNE DE L'ARBRE À CAMES	8.7	8.7	8.7	8.7	8.7
01	175	TIMING GEAR PIGNON DE DISTRIBUTION	1.1	1.1	1.1	1.1	1.1
01	176	ROCKER ARM (ASS'Y) AXE DE CULBUTEUR (COMPLET)	0.6	0.6	0.6	0.6	0.6
01	177	EXHAUST VALVE, SPRINGS, SEAL, GUIDE (1) SOUPAPE D'ÉCHAPPEMENT, RESSORTS, JOINT, GUIDE (1)	1.7	2.1	2.1	2.1	1.7
01	178	INTAKE VALVE, SRINGS, SEAL, GUIDE (1) SOUPAPE D'ADMISSION, RESSORTS, JOINT, GUIDE (1)	1.7	2.1	2.1	2.1	1.7
01	179	CHAIN GUIDE GUIDE DE CHAÎNE	0.4	0.4	0.4	0.4	0.4
01	180	OUTPUT SLEEVE, SEAL, STOP SLEEVE MANCHON DE DÉBIT, JOINT, ARRÊT DU MANCHON	2.2	2.4	2.4	2.4	2.2
01	181	SEAL (OUTPUT SLEEVE) JOINT (MANCHON DE DÉBIT)	1.6	1.8	1.8	1.8	1.6
01	182	OIL RADIATOR AND/OR O-RING RADIATEUR D'HUILE ET/OU JOINT TORIQUE	3.0	3.0	3.0	3.0	3.0
01	183	OIL PUMP COVER AND/OR SHAFT AND/OR ROTOR (REAR) COUVERCLE DE LA POMPE À L'HUILE ET/OU ARBRE ET/OU ROTOR (ARRIÈRE)	2.7	3.3	3.3	3.3	2.7
01	184	OIL PUMP HOUSING AND/OR ALL PARTS (FRONT) BOÎTIER DE LA POMPE À L'HUILE ET/OU TOUTES LES PIÈCES (AVANT)	1.7	1.5	1.5	1.5	1.7
01	187	OIL SEPARATOR COVER COUVERCLE SEPARATEUR D'HUILE	1.0	1.0	1.0	1.0	1.0

SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
01	189	OIL PRESSURE SWITCH INTERRUPTEUR DE PRESSION D'HUILE	0.6	0.6	0.6	0.6	0.6
01	190	PTO HOUSING AND/OR GASKET BOÎTIER PDM ET/OU JOINT D'ÉTANCHÉITÉ	3.2	3.8	3.8	3.6	3.2
01	191	CHAIN TENSION GUIDE GUIDE DE TENSION DE CHAÎNE	5.4	5.8	5.8	5.8	5.4
01	192	CHAIN TENSIONER (ASS'Y) TENDEUR DE CHAÎNE (COMPLET)	0.5	0.5	0.5	0.5	0.5
01	193	OIL SIEVE (PTO) TAMIS D'HUILE (PDM)	2.6	3.2	3.2	3.2	2.6
01	194	OIL FILTER AND/OR O-RING FILTRE À HUILE ET/OU JOINT TORIQUE	0.3	0.3	0.3	0.3	0.3
01	195	VALVE SEAT SLEEVE, PISTON, SPRING, PLUG AND O-RING MANCHON DE SIÈGE DE SOUPAPE, PISTON, RESSORT, BOUCHON ET JOINT TORIQUE	2.6	3.2	3.2	3.2	2.6
01	216	PRESSURE CAP BOUCHON DE RADIATEUR	0.3	0.3	0.3	0.3	0.3
01	250	CRANKSHAFT POSITION SENSOR (CPS) CAPTEUR POSITION DU VILEBREQUIN (CPV)	0.6	0.6	0.6	0.6	0.6
01	251	PRESSURE VALVE (ASS'Y) SOUPAPE DE PRESSURISATION (COMPLET)	0.3	0.3	0.3	0.3	0.3
01	255	EXHAUST/INLET VALVES AND/OR SPRINGS AND/OR SEALS (4) VALVES D'ÉCHAPPEMENT/D'ADMISSION ET/OU RESSORTS ET/OU ANNEAUX (4)	2.2	2.6	2.6	2.6	2.2
01	256	EXHAUST/INLET VALVES AND/OR SPRINGS AND/OR SEALS (8) VALVES D'ÉCHAPPEMENT/D'ADMISSION ET/OU RESSORTS ET/OU ANNEAUX (8)	2.6	3.0	3.0	3.0	2.6
01	257	EXHAUST/INLET VALVES AND/OR SPRINGS AND/OR SEALS (12) VALVES D'ÉCHAP./D'ADMISSION. ET/OU RESSORTS ET/OU ANNEAUX (12)	3.0	3.4	3.4	3.4	3.0
01	260	COOLANT HOSE (WATER PUMP HOUSING TO ENGINE) BOYAU DE REFROIDISSEMENT (BOÎTIER DE LA POMPE À EAU AU MOTEUR)	0.5	0.7	0.7	0.7	0.5
01	264	LONG BLOCK ENSEMBLE CARTER-CYLINDRE-CULASSE	5.0	5.4	5.4	5.4	5.0
01	301	WATER PUMP DYNAMIC SEAL AND/OR OIL SEAL ANNEAU D'ÉTANCHÉITÉ DYNAMIQUE POMPE À EAU ET/OU ANNEAU D'ÉTANCHÉITÉ D'HUILE	2.9	3.5	3.5	3.5	2.9
01	308	CYLINDER HEAD GASKET JOINT D'ÉTANCHÉITÉ DE LA CULASSE	1.4	1.8	1.8	1.8	1.4
01	341	BOIL OUT PROCEDURE PROCÉDURE MOTEUR INONDÉ	3.0	3.0	3.0	3.0	3.0
01	344	BALL BEARINGS WITH BELLOW SOUFFLET ET ROULEMENTS À BILLE	1.0	1.4	1.4	1.4	1.0
01	353	INJECTOR (ONE OR ALL) INJECTEUR (UN OU TOUS)	0.4	0.4	0.4	0.4	0.4

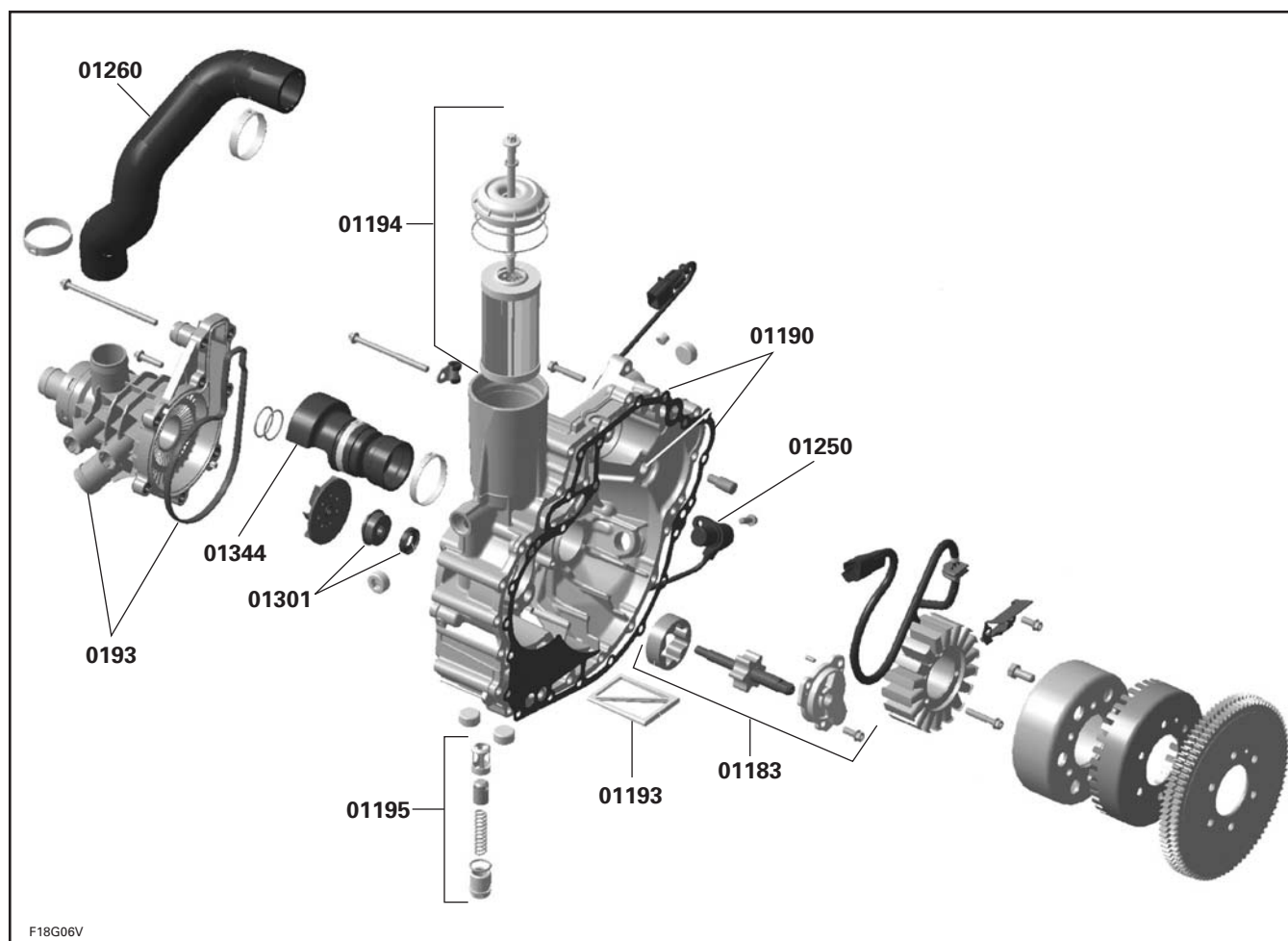




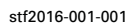
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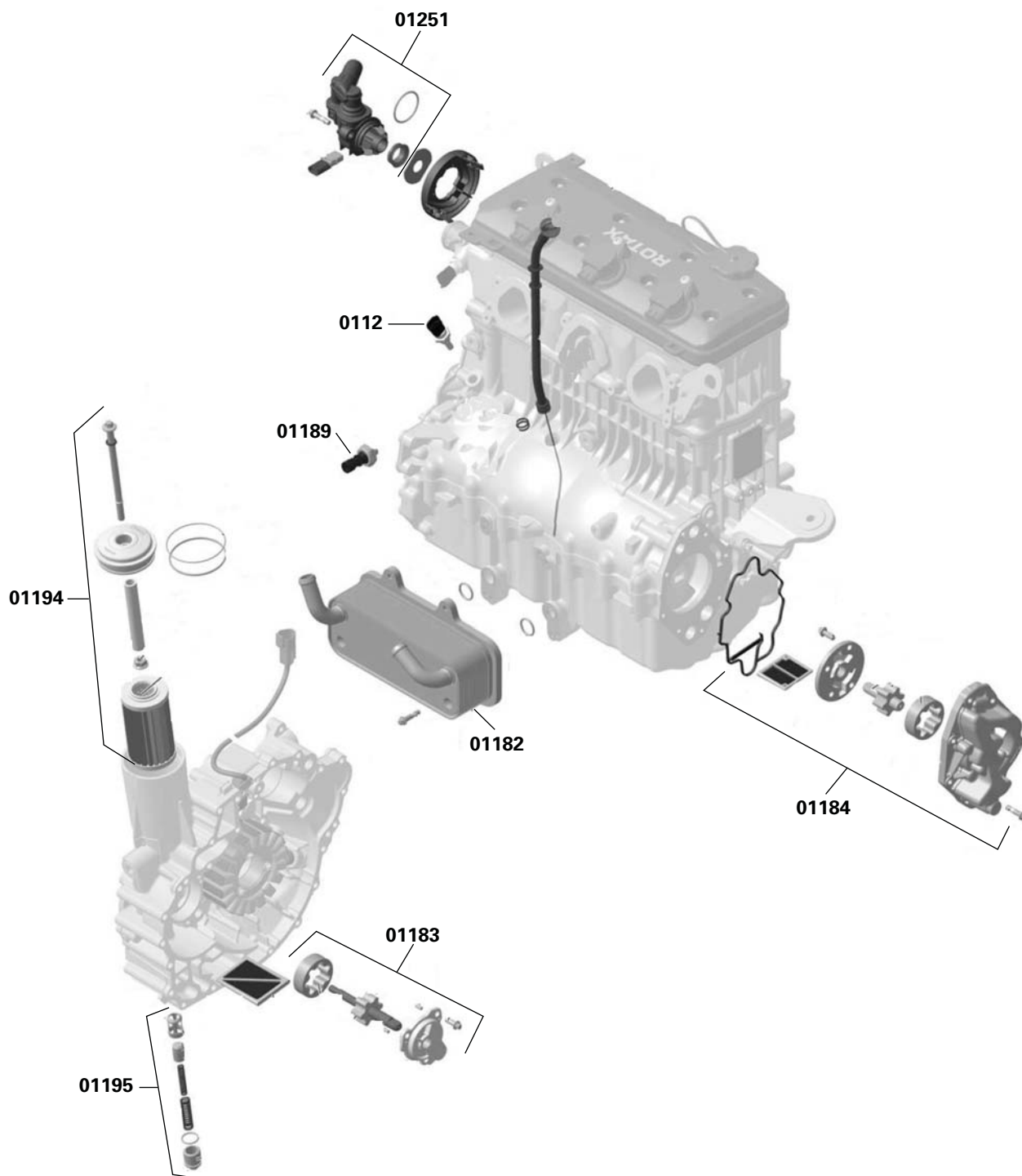


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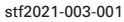


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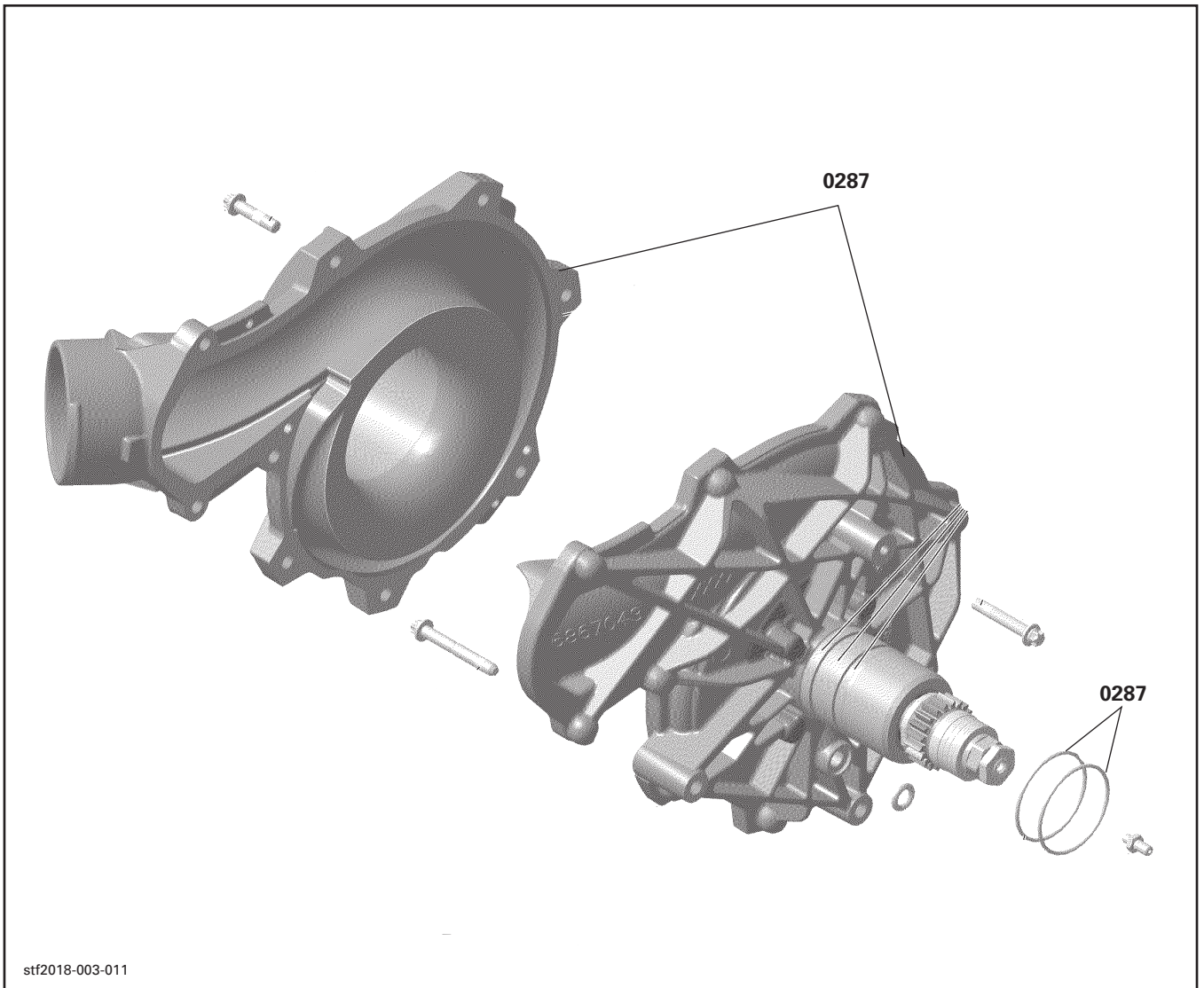


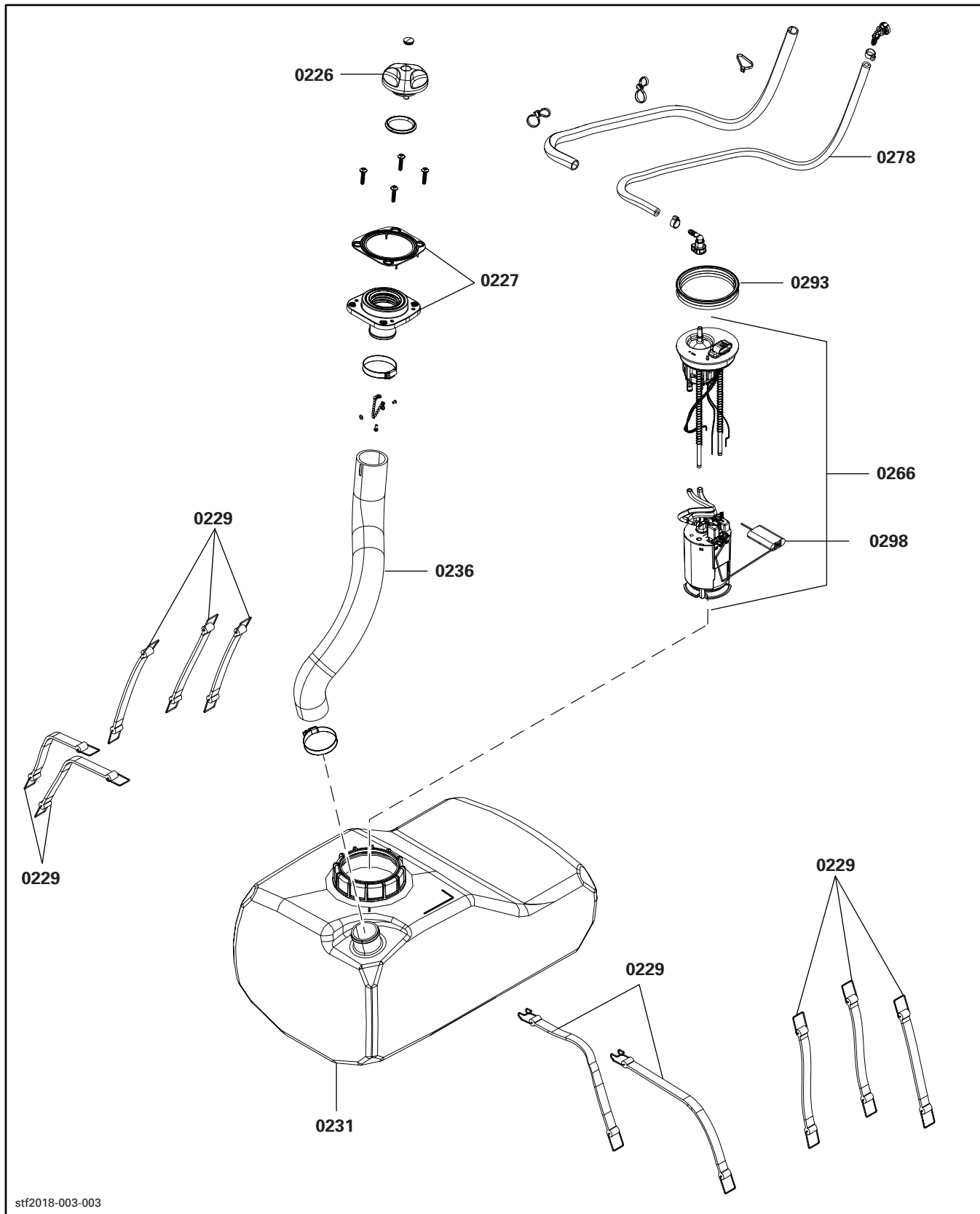


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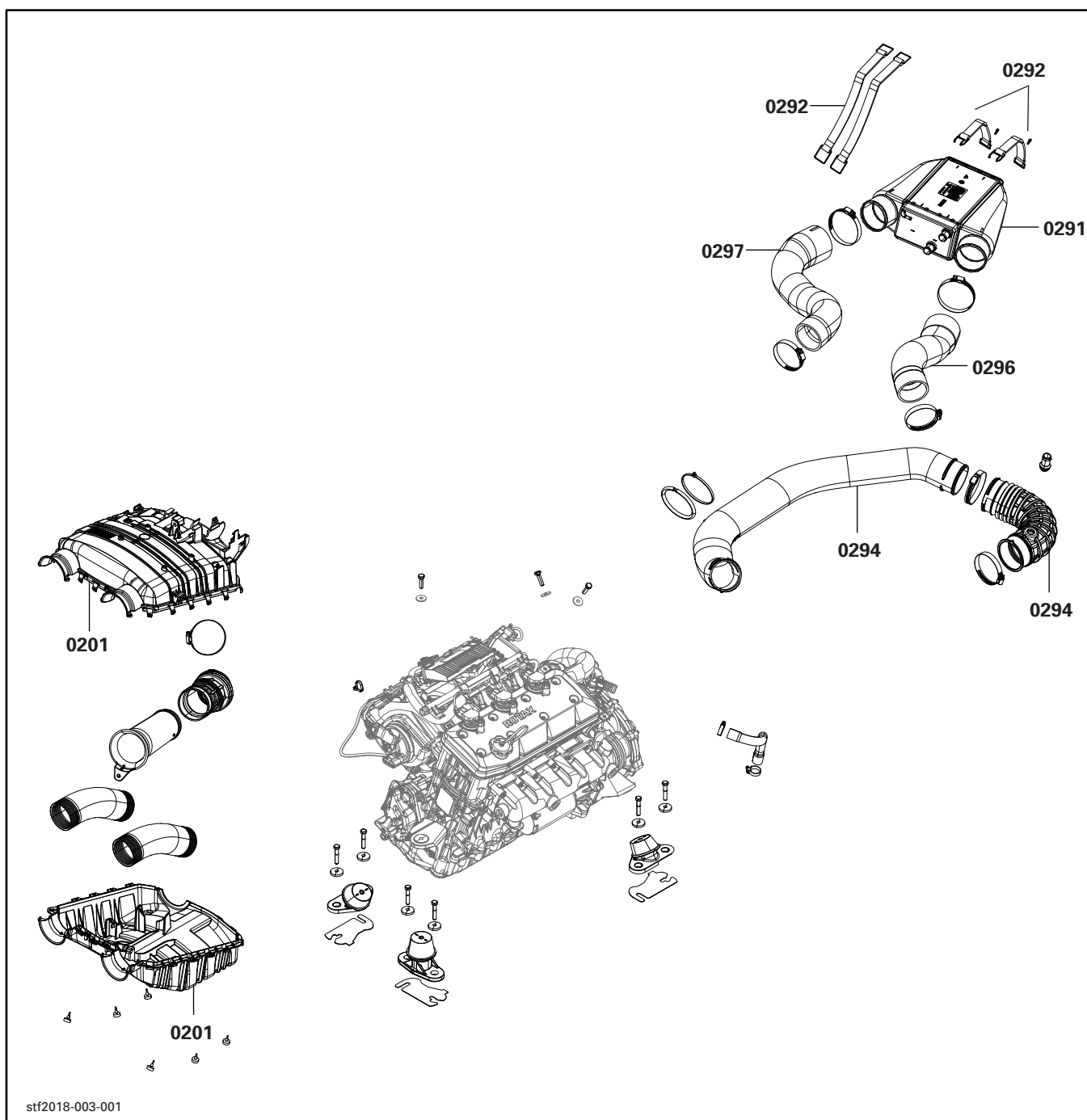


SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
02	00	NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE	0	0	0	0	0
02	01	REMOVAL AND/OR INSTALLATION OF AIR SILENCER DÉPOSE ET/OU INSTALLATION SILENCIEUX ADMISSION D'AIR	1.0	1.0	1.0	1.0	1.0
02	26	FUEL TANK CAP AND/OR SEAL BOUCHON DU RÉSERVOIR À ESSENCE ET/OU ANNEAU	0.3	0.3	0.3	0.3	0.3
02	27	FUEL TANK FILLER NECK AND/OR GASKET GOULOT DE REMPLISSAGE ET/OU JOINT D'ÉTANCHÉITÉ	0.4	0.4	0.4	0.4	0.4
02	29	FUEL TANK STRAPS (2 OR 5) SANGLES DU RÉSERVOIR À ESSENCE (2 OU 5)	0.8	0.8	0.8	0.8	0.8
02	31	FUEL TANK RÉSERVOIR À ESSENCE	2.1	2.1	2.1	2.1	2.1
02	36	FUEL TANK HOSE (FROM FILLER NECK TO FUEL TANK) BOYAU À ESSENCE (GOULOT AU RÉSERVOIR)	0.6	0.6	0.6	0.6	0.6
02	63	THROTTLE BODY (ASS'Y) CARTER D'ACCÉLÉRATEUR (COMPLET)	0.7	0.7	0.7	0.7	0.7
02	66	FUEL PUMP MODULE MODULE POMPE À ESSENCE	0.9	0.9	0.9	0.9	0.9
02	69	FUEL RAIL RAIL D'ESSENCE	0.3	0.3	0.3	0.3	0.3
02	73	AIR TEMPERATURE SENSOR CAPTEUR DE TEMPÉRATURE D'AIR	0.3	0.3	0.3	0.3	0.3
02	78	FUEL FEEDING HOSE (ASS'Y) BOYAU D'ALIMENTATION D'ESSENCE (COMPLET)	0.6	0.6	0.6	0.6	0.6
02	84	AIR PRESSURE SENSOR CAPTEUR PRESSION D'AIR	0.3	0.3	0.3	0.3	0.3
02	85	AIR INTAKE (ASS'Y) ADMISSION D'AIR (COMPLET)	1.1	1.1	1.1	1.1	1.1
02	87	SUPERCHARGER AND/OR O-RINGS SURCOMPRESSUER ET/OU JOINTS TORIQUE		1.2	1.2	1.2	
02	91	INTERCOOLER AND/OR O-RING REFROIDISSEUR ET/OU JOINT TORIQUE		0.8	0.8	0.8	
02	92	INTERCOOLER SUPPORT AND/OR ALL PARTS SUPPORT DU REFROIDISSEUR ET/OU TOUTES LES PIÈCES		0.9	0.9	0.9	
02	93	FUEL PUMP NUT AND/OR GASKET ÉCROU DE LA POMPE À ESSENCE ET/OU JOINT D'ÉTANCHÉITÉ	0.9	0.9	0.9	0.9	0.9
02	94	HOSE (BOOSTER INLET) BOYAU (ENTRÉE DU PROPULSEUR)		0.5	0.5	0.5	
02	96	HOSE (BOOSTER OUTLET) BOYAU (SORTIE DU PROPULSEUR)		0.5	0.5	0.5	
02	97	HOSE (THROTTLE BODY INLET) BOYAU (ENTRÉE CARTER ACCÉLÉRATEUR)		0.5	0.5	0.5	
02	98	FUEL LEVEL SENSOR CAPTEUR NIVEAU D'ESSENCE	0.9	0.9	0.9	0.9	0.9

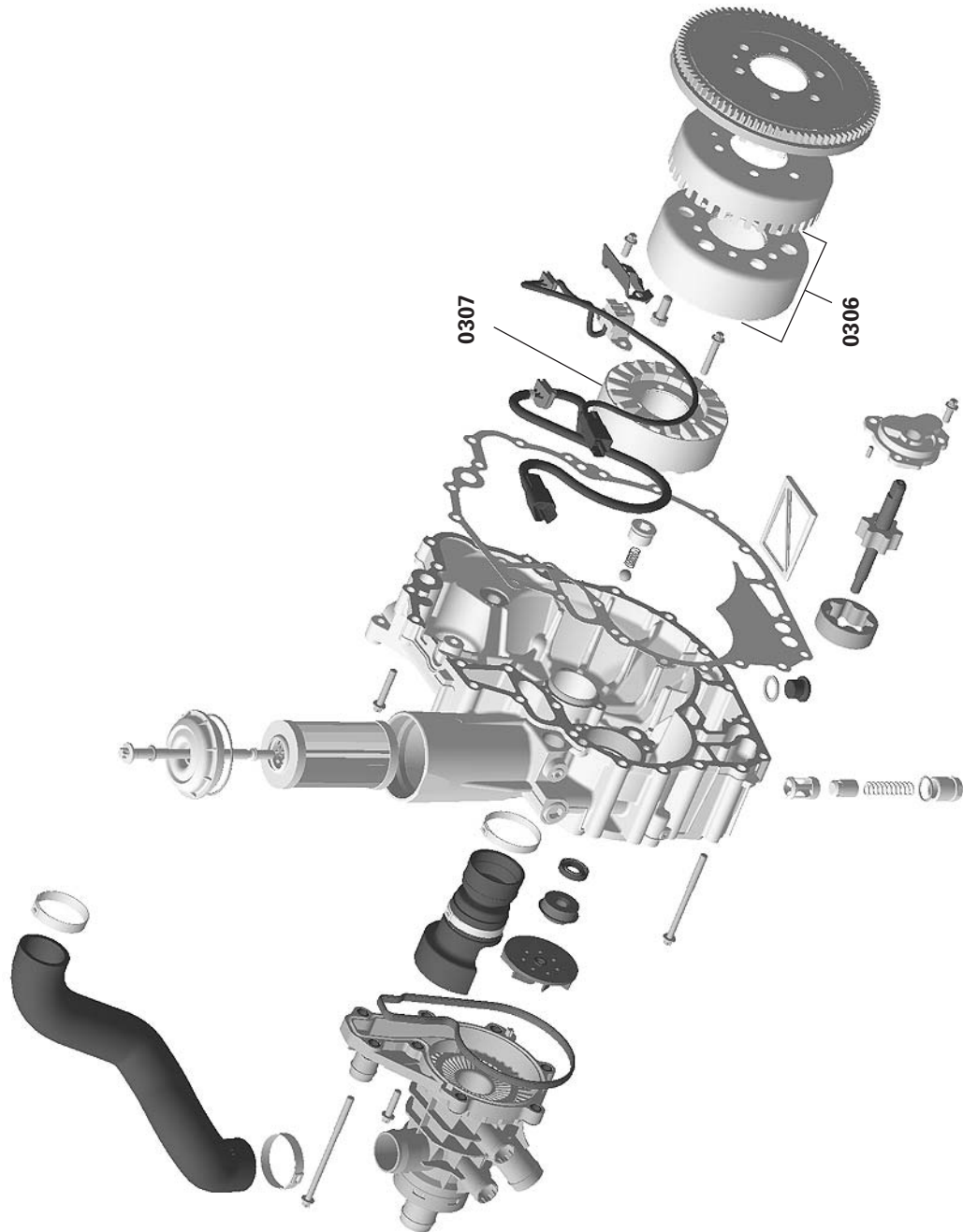




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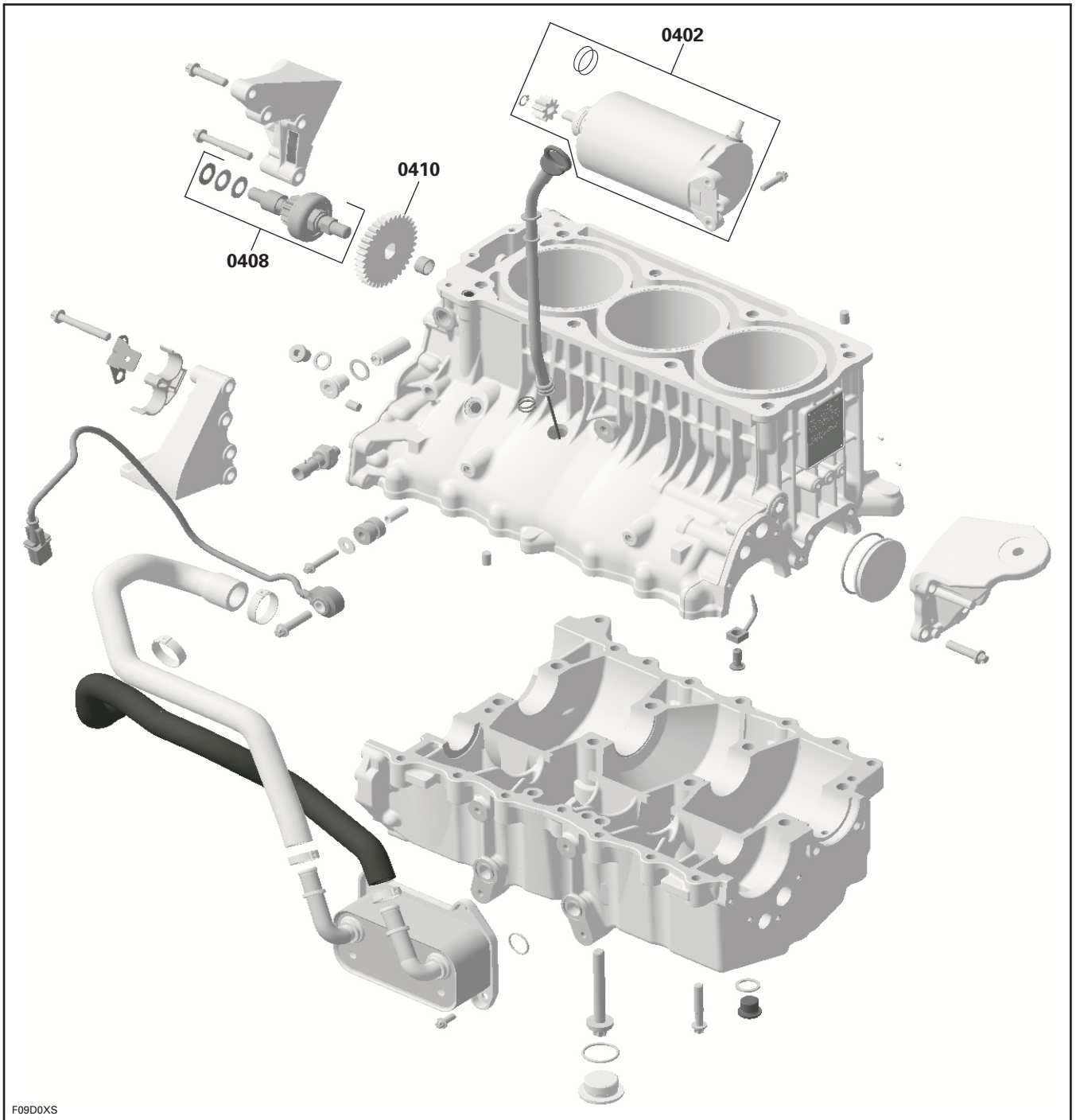
SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE / RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
03	00	NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE	0	0	0	0	0
03	04	IGNITION COIL BOBINE D'ALLUMAGE	0.3	0.3	0.3	0.3	0.3
03	06	MAGNETO FLYWHEEL VOLANT MAGNÉTIQUE	3.2	3.8	3.8	3.6	3.2
03	07	STATOR PLATE (ASS'Y) PLAQUE ARMATURE (COMPLET)	3.2	3.8	3.8	3.6	3.2



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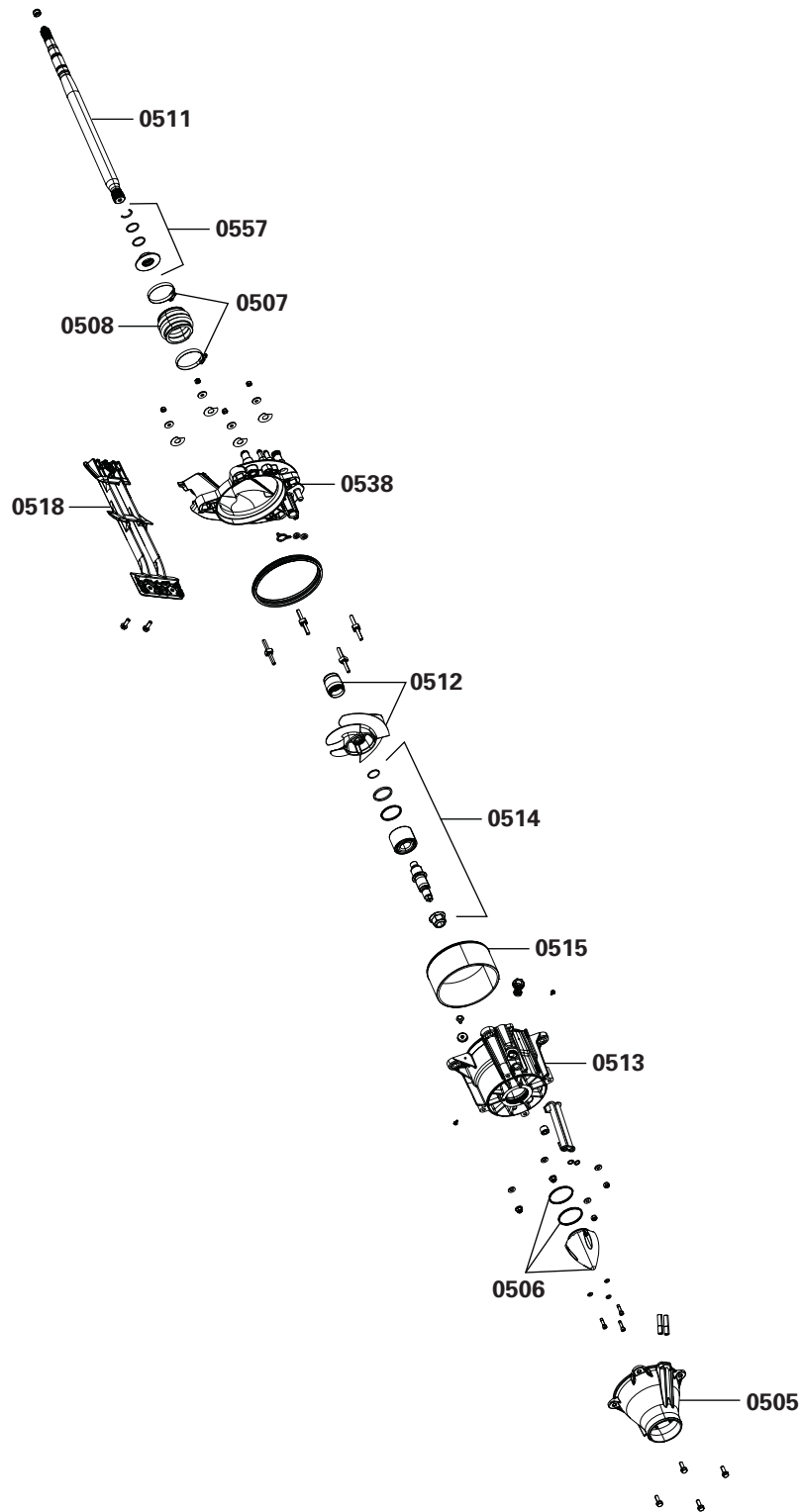
SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14

04	00	NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE	0	0	0	0	0
04	02	ELECTRIC STARTER (ASS'Y) DÉMARREUR ÉLECTRIQUE (COMPLET)	0.8	0.8	0.8	0.8	0.8
04	03	ONE OR ALL STARTER COMPONENTS UNE OU TOUTES LES PIÈCES DU DÉMARREUR	1.0	1.0	1.0	1.0	1.0
04	05	STARTER RELAY SOLÉNOÏDE DÉMARREUR	0.3	0.3	0.3	0.3	0.3
04	08	STARTER DRIVE (ASS'Y) AND/OR COVER ENTRAÎNEMENT DU DÉMARREUR (COMPLET) ET/OU COUVERCLE	3.3	3.9	3.9	3.7	3.3
04	10	ELECTRIC STARTER DRIVE (ASS'Y) ENTRAÎNEMENT DU DÉMARREUR ÉLECTRIQUE (COMPLET)	3.2	3.8	3.8	3.6	3.2

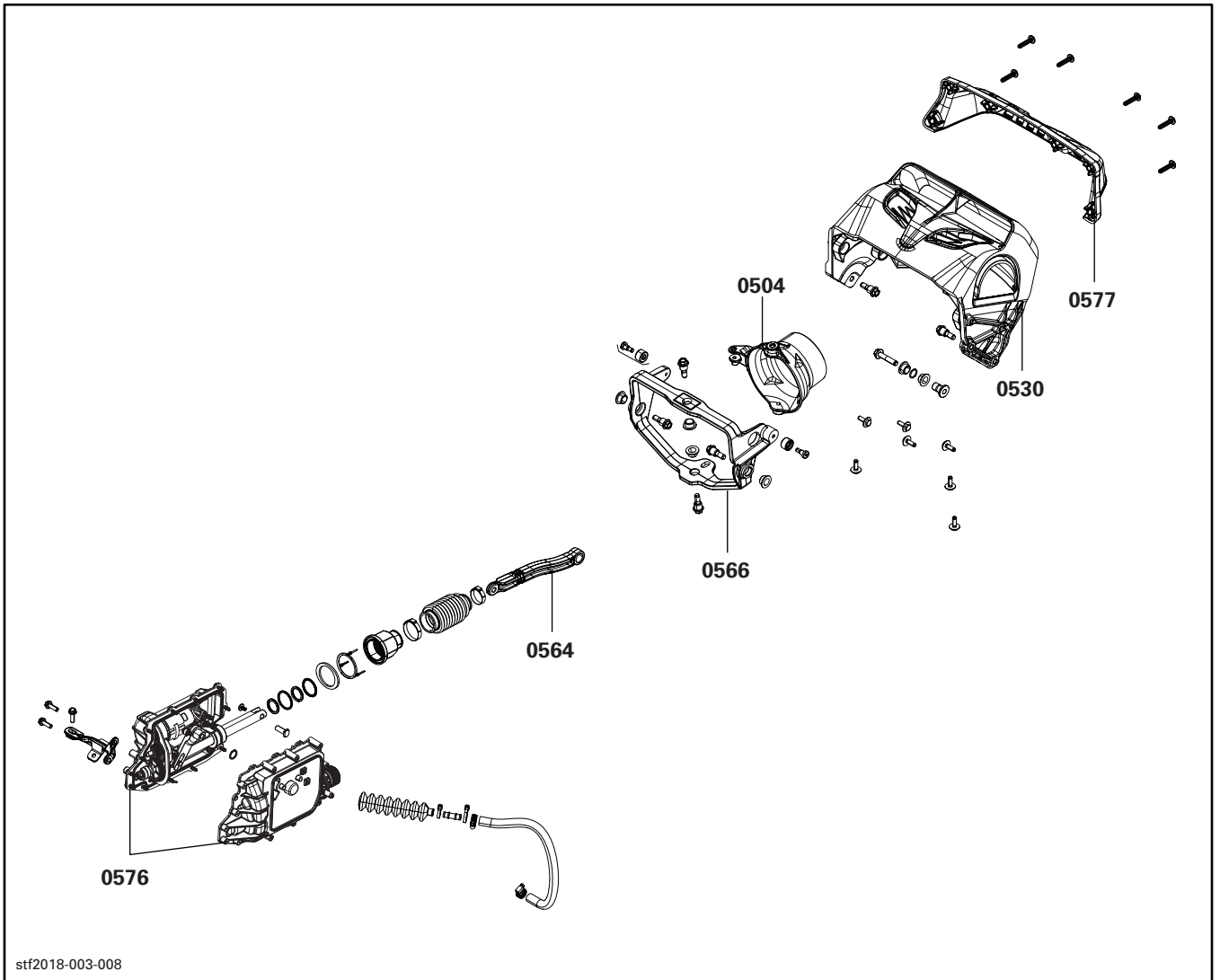


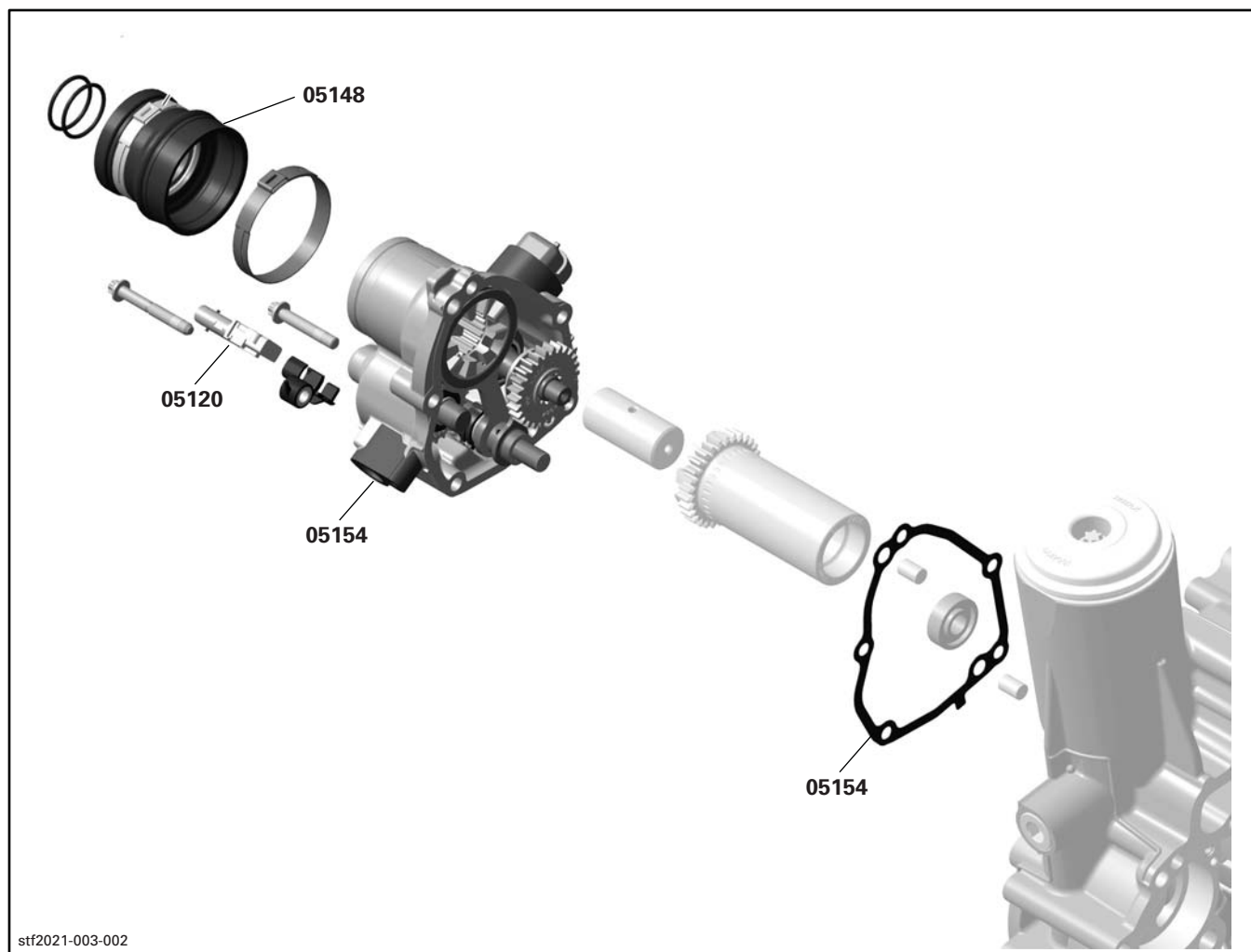
SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE / RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
05	00	NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE	0	0	0	0	0
05	04	STEERING NOZZLE AND/OR BUSHING AND/OR SLEEVE BUSE DE DIRECTION ET/OU DOUILLE ET/OU MANCHON	0.5	0.5	0.5	0.5	0.5
05	05	VENTURI AND/OR O-RING VENTURI ET/OU JOINT TORIQUE	0.5	0.5	0.5	0.5	0.5
05	06	IMPELLER SHAFT HOUSING COVER AND/OR O-RINGS AND/OR GREASE COUVERCLE ARBRE TURBINE ET/OU JOINT TORIQUE ET/OU GRAISSE	0.5	0.5	0.5	0.5	0.5
05	07	PTO FLYWHEEL RUBBER BOOT CLAMP (EACH) COLLIER DE SERRAGE DU SOUFFLET VOLANT PDM (CHACUN)	0.4	0.4	0.4	0.4	0.4
05	08	PTO FLYWHEEL RUBBER BOOT SOUFFLET CAOUTCHOUC VOLANT CÔTÉ PDM	0.9	1.1	1.1	1.1	0.9
05	11	DRIVE SHAFT AND/OR BUMPER PLUG ARBRE DE TRANSMISSION ET/OU BOUCHON CONTRE CHOC	0.8	1.0	1.0	1.0	0.8
05	12	IMPELLER AND/OR SHAFT AND/OR WASHER AND/OR THRUST BEARING TURBINE ET/OU ARBRE ET/OU RONDELLE ET/OU PALIER BUTÉE	1.2	1.2	1.2	1.2	1.2
05	13	IMPELLER HOUSING (ASS'Y) CARTER D'HÉLICE (COMPLET)	1.2	1.2	1.2	1.2	1.2
05	14	IMPELLER SHAFT DOUBLE LIP SEAL AND/OR BEARING ANNEAU ÉTANCHÉITÉ D'ARBRE TURBINE ET/OU ROULEMENT À BILLES	1.2	1.2	1.2	1.2	1.2
05	15	WEAR RING BAGUE D'USURE	1.5	1.5	1.5	1.5	1.5
05	18	WATER INLET GRATE GRILLE DE POMPE (ADMISSION D'EAU)	0.6	0.7	0.7	0.6	0.6
05	21	IMPELLER HOUSING REMOVAL AND INSTALLATION DÉPOSE ET INSTALLATION DU CARTER D'HÉLICE	0.6	0.6	0.6	0.6	0.6
05	30	REVERSE GATE (ASS'Y) DÉFLECTEUR DE MARCHE ARRIÈRE (COMPLET)	0.5	0.5	0.5	0.5	0.5
05	38	PUMP SUPPORT SUPPORT DE POMPE	3.8	4.0	4.0	4.0	3.8
05	45	RING CARBONE BAGUE AU CARBONE	0.9	1.1	1.1	1.1	0.9
05	57	FLOATING RING BAGUE FLOTTANTE	0.8	1.1	1.1	1.1	0.8
05	64	ARM BLACK BRAS NOIR	0.5	0.5	0.5	0.5	0.5
05	66	ROD PIVOT PIVOT DE RACCORD	0.5	0.5	0.5	0.5	0.5
05	76	iBR ACTUATOR ACTUATEUR iBR	1.2	1.2	1.2	1.2	1.2
05	77	GUARD PROTECTEUR	0.3	0.3	0.3	0.3	0.3
05	120	GEARBOX POSITION SENSOR CAPTEUR DE POSITION D'ENGRENAGE	0.5	0.5	0.5		0.5

SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE / RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
05	148	BELLOW SOUFFLET	1.0	1.2	1.2		1.0
05	154	GEARBOX ASS'Y BOITE DE VITESSE (COMPLET)	1.1	1.8	1.8		1.1



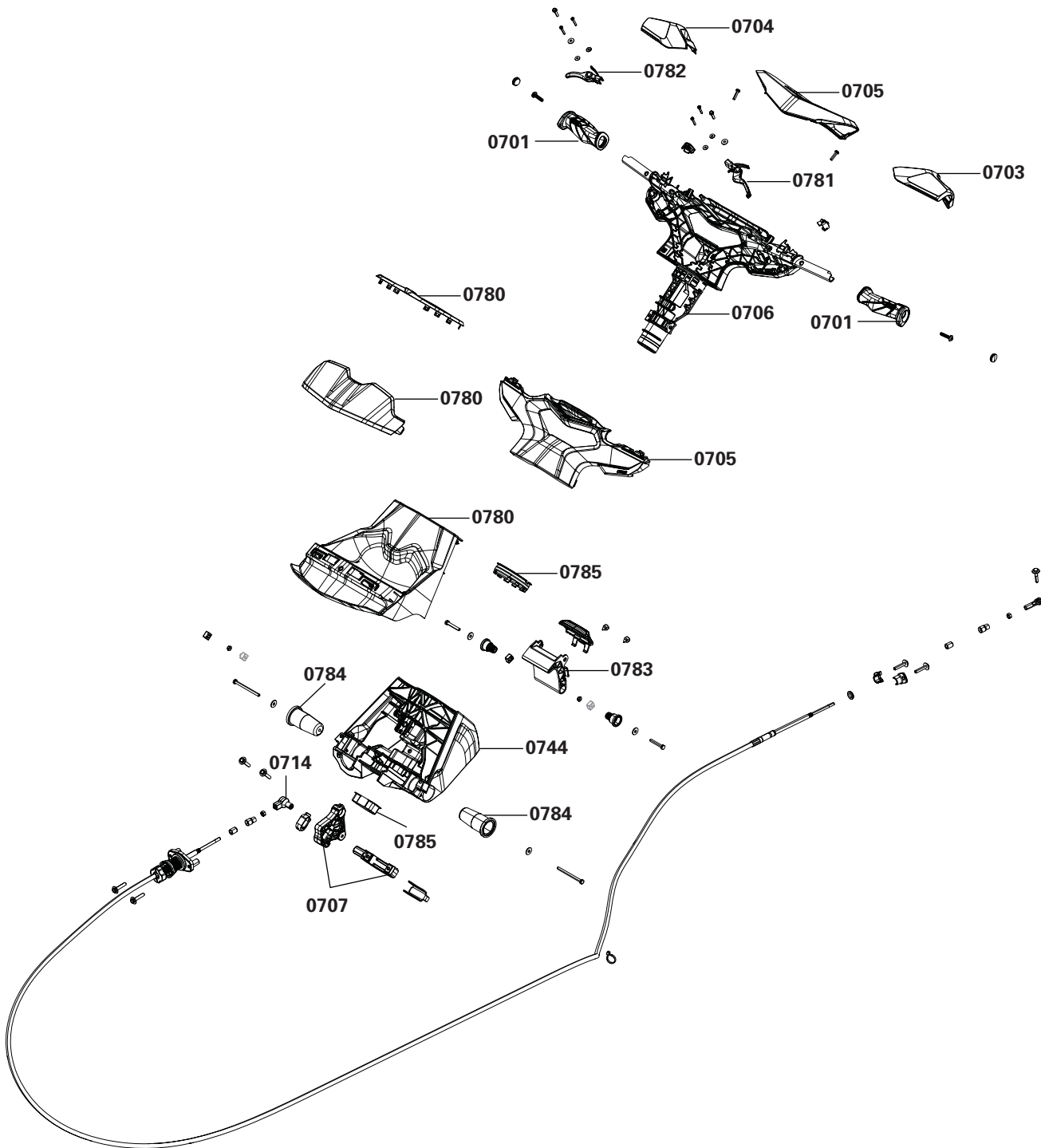
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SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
07	00	NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE	0	0	0	0	0
07	01	HANDLE GRIP (1 OR 2) GAINE DE GUIDON (1 OU 2)	0.3	0.3	0.3	0.3	0.3
07	03	HANDLE HOUSING (LEFT) LOGEMENT DE GUIDON (GAUCHE)	0.3	0.3	0.3	0.3	0.3
07	04	THROTTLE HANDLE HOUSING (RIGHT) LOGEMENT DE MANETTE D'ACCÉLÉRATEUR (DROIT)	0.3	0.3	0.3	0.3	0.3
07	05	STEERING COVER AND/OR FOAM COUVRE-GUIDON ET/OU MOUSSE	0.4	0.4	0.4	0.4	0.4
07	06	HANDLEBAR GUIDON	1.0	1.0	1.0	1.0	1.0
07	07	STEERING STEM ARM BRAS DE TIGE DE DIRECTION	0.4	0.4	0.4	0.4	0.4
07	13	STEERING CABLE (FROM NOZZLE TO STEM ARM) CÂBLE DE DIRECTION (DE LA BUSE AU BRAS DE TIGE)	1.2	1.2	1.2	1.2	1.2
07	14	FRONT BALL JOINT STEERING CABLE JOINT À ROTULE AVANT (CÂBLE DE DIRECTION)	0.3	0.3	0.3	0.3	0.3
07	15	REAR BALL JOINT STEERING CABLE (1 OR 2) JOINT À ROTULE ARRIÈRE (CÂBLE DE DIRECTION) (1 OU 2)	0.3	0.3	0.3	0.3	0.3
07	44	STEERING SUPPORT SUPPORT DIRECTION	1.3	1.3	1.3	1.3	1.3
07	80	GAUGE SUPPORT, COVER AND TRIM SUPPORT DE CADRAN, COUVERCLE ET ENJOLIVEUR	0.3	0.3	0.3	0.3	0.3
07	81	THROTTLE HANDLE AND/OR BUSHINGS MANETTE ACCÉLÉRATEUR ET/OU COUSSINETS	0.4	0.4	0.4	0.4	0.4
07	82	REVERSE HANDLE AND/OR BUSHINGS MANETTE DE RENVERSE ET/OU COUSSINETS	0.4	0.4	0.4	0.4	0.4
07	83	ADJUSTABLE LATCH, PIVOTS AND LOCK LOQUET AJUSTABLE, PIVOTS ET VERROU	1.3	1.3	1.3	1.3	1.3
07	84	STEERING PIVOT (RIGHT AND/OR LEFT) PIVOT DE DIRECTION (DROIT ET/OU GAUCHE)	1.3	1.3	1.3	1.3	1.3
07	85	WEAR RING BAGUE D'USURE	0.8	0.8	0.8	0.8	0.8
07	87	ADAPTER CABLE ADAPTATEUR DE CABLE	1.0	1.0	1.0	1.0	1.0



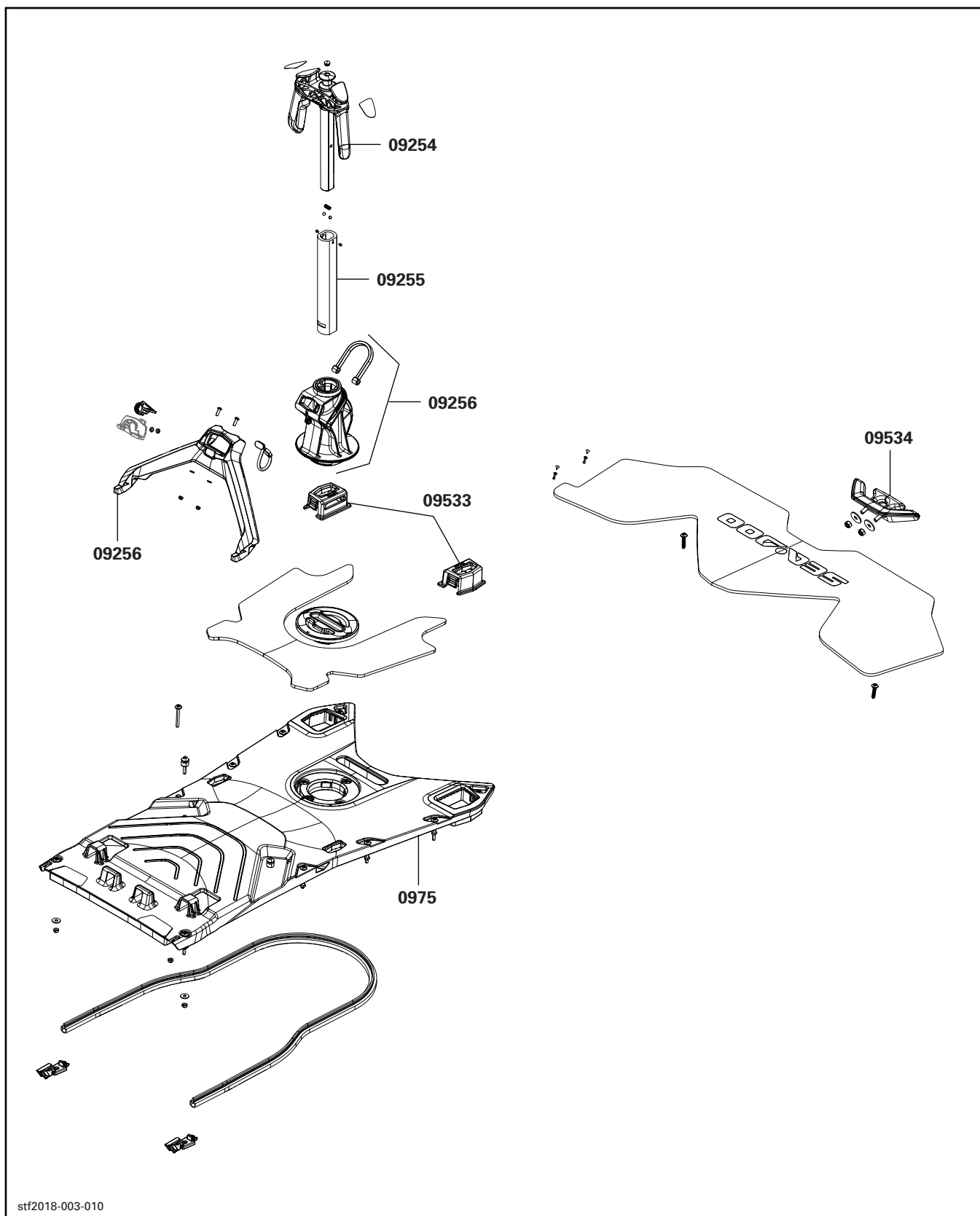
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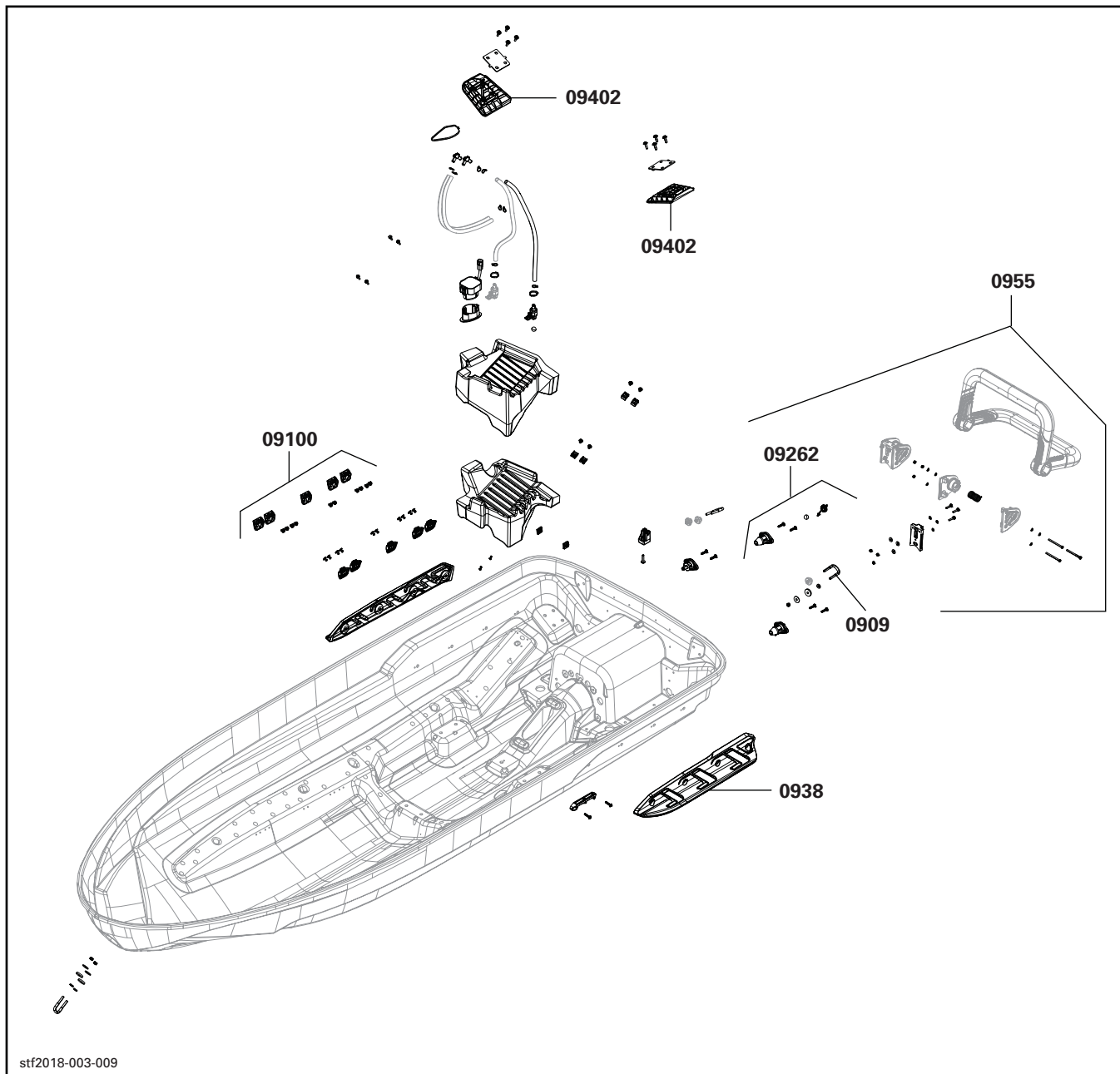
SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
09	00	NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE	0	0	0	0	0
09	01	FRONT BUMPER PARE-CHOCS AVANT	0.3	0.3	0.3	0.3	0.3
09	02	SIDE BUMPER (LEFT OR RIGHT) (1) PARE-CHOCS LATÉRAL (GAUCHE OU DROIT) (1)	0.3	0.3	0.3	0.3	0.3
09	04	SIDE BUMPER (BOTH SIDE) (2) PARE-CHOCS LATÉRAL (LES DEUX CÔTÉS) (2)	0.4	0.4	0.4	0.4	0.4
09	06	REAR BUMPER PARE-CHOCS ARRIÈRE	0.3	0.3	0.3	0.3	0.3
09	09	"U" CLAMP AND/OR SKI HOOK AND/OR FINITION/RETAINER PLATE BRIDE EN «U» ET/OU CROCHET SKI ET/OU PLAQUE RETENUE	0.5	0.5	0.5	0.5	0.5
09	12	STORAGE COVER LATCH LOQUET DU COUVERCLE À BAGAGES	0.4	0.4	0.4	0.4	0.4
09	13	STORAGE COVER NEOPRENE SEAL ANNEAU EN NÉOPRÈNE DU COUVERCLE À BAGAGES	0.3	0.3	0.3	0.3	0.3
09	14	STORAGE COVER DECAL AUTOCOLLANT DU COUVERCLE À BAGAGES	0.3	0.3	0.3	0.3	0.3
09	15	SIDE BODY DECAL (RIGHT) (1 OR 2) AUTOCOLLANT LATÉRAL DE LA CARROSSERIE (DROIT) (1 OU 2)	0.5	0.5	0.5	0.5	0.5
09	16	SIDE BODY DECAL (LEFT) (1 OR 2) AUTOCOLLANT LATÉRAL DE LA CARROSSERIE (GAUCHE) (1 OU 2)	0.5	0.5	0.5	0.5	0.5
09	17	ALL BODY DECALS TOUS LES AUTOCOLLANTS DE LA CARROSSERIE	1.0	1.0	1.0	1.0	1.0
09	19	SIDE CARPET (1) TAPIS LATÉRAL (1)	0.3	0.3	0.3	0.3	0.3
09	20	SIDE CARPET (2) TAPIS LATÉRAL (2)	0.5	0.5	0.5	0.5	0.5
09	21	REAR CARPET TAPIS ARRIÈRE	0.5	0.5	0.5	0.5	0.5
09	26	SEAT BASE NEOPRENE SEAL ANNEAU EN NÉOPRÈNE DE LA BASE DU SIÈGE	0.3	0.3	0.3	0.3	0.3
09	28	SEAT LACHT (ANY OR ALL PARTS) LOQUET DE SIÈGE (UNE OU TOUTES LES PIÈCES)	0.3	0.3	0.3	0.3	0.3
09	30	LACHT STUD (SEAT) ERGOT D'ENCRAGE (SIÈGE)	0.3	0.3	0.3	0.3	0.3
09	36	PLATFORM CARPET TAPIS DE PLATE-FORME	0.3	0.3	0.3	0.3	0.3
09	38	SPONSON (RIGHT OR LEFT) (EACH) STABILISATEUR (DROIT OU GAUCHE) (CHACUN)	0.3	0.3	0.3	0.3	0.3
09	39	MIRROR (1) RÉTROVISEUR (1)	0.3	0.3	0.3	0.3	0.3
09	40	MIRRORS (2) RÉTROVISEURS (2)	0.4	0.4	0.4	0.4	0.4

SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
09	44	SIDE HULL DECAL (1) AUTOCOLLANT LATÉRAL DE LA COQUE (1)	0.4	0.4	0.4	0.4	0.4
09	45	SIDE HULL DECALS (RIGHT) (2) AUTOCOLLANTS LATÉRAUX DE LA COQUE (2)	0.6	0.6	0.6	0.6	0.6
09	46	SIDE MOULDING (RIGHT OR LEFT) ENJOLIVEUR LATÉRAL (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3
09	50	REAR SIDE BODY DECAL AUTOCOLLANT ARRIÈRE DE LA CARROSSERIE	0.3	0.3	0.3	0.3	0.3
09	51	BRP DECAL(S) AUTOCOLLANT(S) BRP	0.3	0.3	0.3	0.3	0.3
09	55	REBORDING LADDER ANT/OR SUPPORT (ASS'Y) ÉCHELLE D'EMBARQUEMENT ET/OU SUPPORT (COMPLET)	0.5	0.5	0.5	0.5	0.5
09	56	SIDE GRILL (RIGHT OR LEFT) GRILLE LATÉRALE (DROITE OU GAUCHE)	0.3	0.3	0.3	0.3	0.3
09	57	REAR SEAT ASS'Y SIEGE ARRIERE ASS.	0.3	0.3	0.3	0.3	0.3
09	63	FRONT SEAT ASS'Y SIEGE AVANT COMPLET	0.3	0.3	0.3	0.3	0.3
09	75	ENGINE COVER ASS'Y COUVERCLE MOTEUR ASS.	0.3	0.3	0.3	0.3	0.3
09	78	STORAGE TRAY COFFRE À BAGAGES	0.6	0.6	0.6	0.6	0.6
09	87	MIRROR HOUSING BOITIER DU RETROVISEUR	0.3	0.3	0.3	0.3	0.3
09	88	LOWER STORAGE COVER COUVERCLE DE COMPARTIMENT DE RANGEMENT INFÉRIEUR	1.2	1.2	1.2	1.2	1.2
09	122	STORAGE NET FILET DE RANGEMENT					0.3
09	152	SIDE CARPETS (3) TAPIS LATÉRAUX (3)	0.7	0.7	0.7	0.7	0.7
09	168	FRONT GRILL GRILLE FRONTALE	0.3	0.3	0.3	0.3	0.3
09	204	SIDE CARPETS (4) TAPIS LATÉRAUX (4)	0.9	0.9	0.9	0.9	0.9
09	205	SIDE CARPETS (5) TAPIS LATÉRAUX (5)	1.1	1.1	1.1	1.1	1.1
09	206	SIDE CARPETS (6) TAPIS LATÉRAUX (6)	1.3	1.3	1.3	1.3	1.3
09	207	SIDE CARPETS (ALL) TAPIS LATÉRAUX (TOUS)	1.5	1.5	1.5	1.5	1.5
09	223	GAS SHOCK AMORTISSEUR À GAZ	0.3	0.3	0.3	0.3	0.3
09	246	CENTER PANE Panneau CENTRAL	0.3	0.3	0.3	0.3	0.3

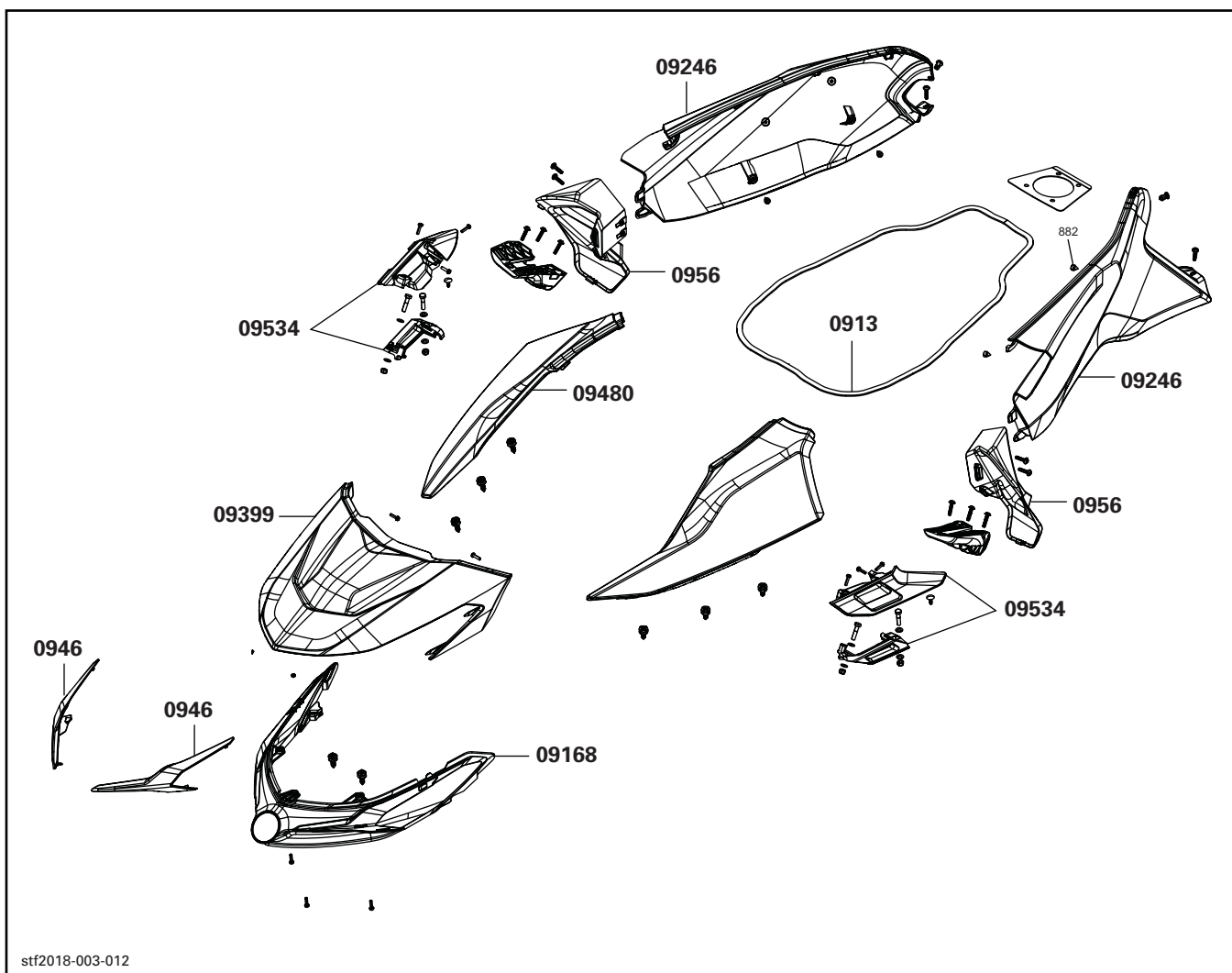
SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
09	257	LOCKING STRAP COURROIE DE BLOCAGE		0.3			
09	262	BLEED PLUG BOUCHON DE PURGE	0.3	0.3	0.3	0.3	0.3
09	275	SPEED-TIE (ASS'Y) ATTACHE D'AMARRAGE RAPIDE (COMPLET)				0.3	
09	276	SPEED-TIE (ALL PARTS) ATTACHE D'AMARRAGE RAPIDE (TOUTES LES PIÈCES)				0.4	
09	282	LATCH AND/OR BASE LOQUET ET/OU BASE					0.3
09	284	BOX DOOR PORTE DE COFFRE	0.3	0.3	0.3	0.3	0.3
09	382	HULL INSERT PASSE-COQUE	3.3	3.5	3.5	3.5	3.3
09	393	COSMETIC DELECTOR DEFLECTEUR ENJOLIVEUR	0.3	0.3	0.3	0.3	0.3
09	399	HOOD CAPOT	0.3	0.3	0.3	0.3	0.3
09	402	TRIM TAB CORRECTEUR D'ASSIETTE	0.3	0.3	0.3	0.3	0.3
09	416	SEAL JOINT JOINT D'ÉTANCHÉITÉ					0.3
09	418	HULL EXTENSION EXTENSION DE COQUE					0.9
09	461	HOLDING STRAP COURROIE DE RETENUE	0.3	0.3	0.3	0.3	0.3
09	480	FRONT LATERAL PANEL Panneau LATERAL AVANT	0.3	0.3	0.3	0.3	0.3
09	533	CARGO BASE ANCRAGE CARGO	0.3	0.3	0.3	0.3	0.3
09	534	CLEAT TAQUET	0.6	0.6	0.6	0.6	0.6
09	535	OUTER SKIN RETEMENT EXTERIEUR	0.4	0.4	0.4	0.4	0.4
09	536	GLOVE BOX DOOR PORTE COFFRE À GANT	0.3	0.3	0.3	0.3	0.3
09	537	WATERTIGHT DOOR PORTE DE COFFRE ETANCHE	0.3	0.3	0.3	0.3	0.3
09	552	COOLER (ASS'Y) GLACIERE (COMPLET)					0.3
09	553	ROD SUPPORT SUPPORT DE CANNE					0.3
09	554	LEVER LATCH (1 OR 2) LEVIER DE LOCQUET (1 OU 2)					0.3

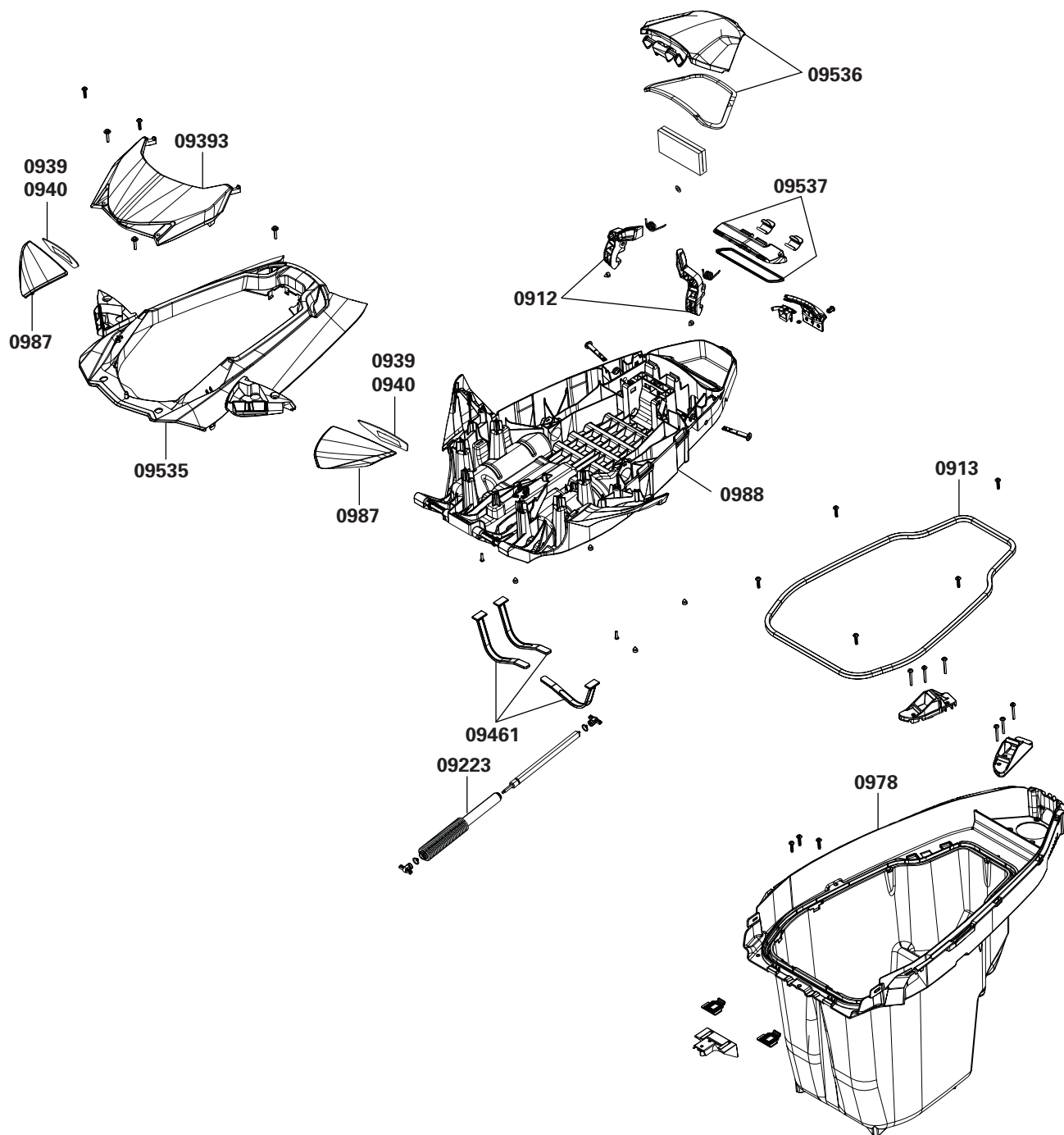
SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
09	555	CARGO ANCHOR (1 OR 2) ANCRAGE DE CHARGEMENT (1 OU 2)					0.3
09	556	BIN ORGANIZER ORGANISATEUR DE RANGEMENT					0.3
09	557	ECHOSOUNDER SUPPORT SUPPORT DU ECHOSONDEUR					0.4
09	558	ECHOSOUNDER SUPPORT COVER COUVERCLE DU SUPPORT ECHOSONDEUR					0.3
09	559	FRONT FOOTREST (RIGHT OR LEFT) REPOSE-PIED AVANT (DROIT OU GAUCHE)					0.3
09	560	REAR FOOTREST (RIGHT OR LEFT) REPOSE-PIED ARRIERE (DROIT OU GAUCHE)					0.3
09	569	WAKEBOARD SUPPORT SUPPORT DE PLANCHE NAUTIQUE		0.3			



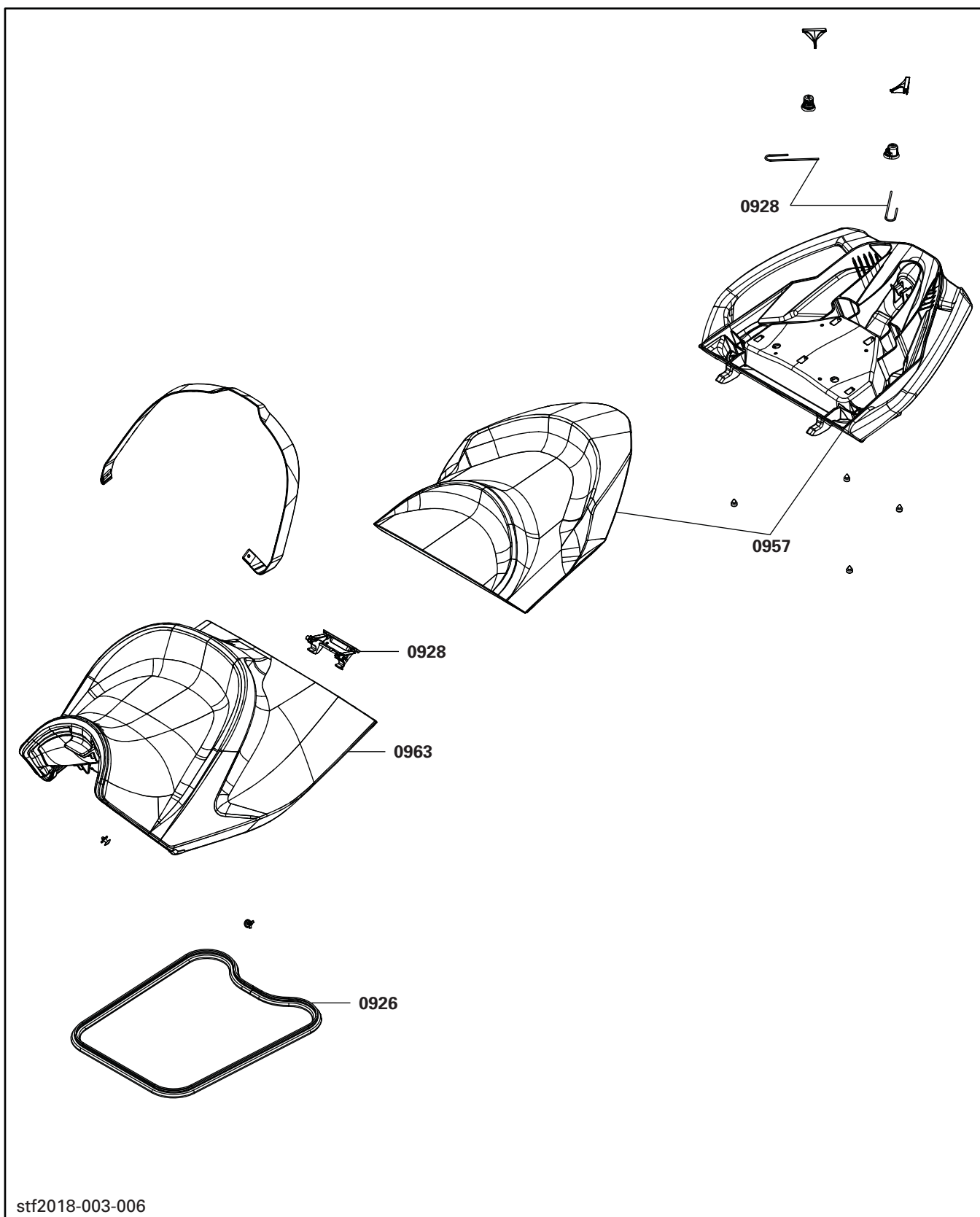


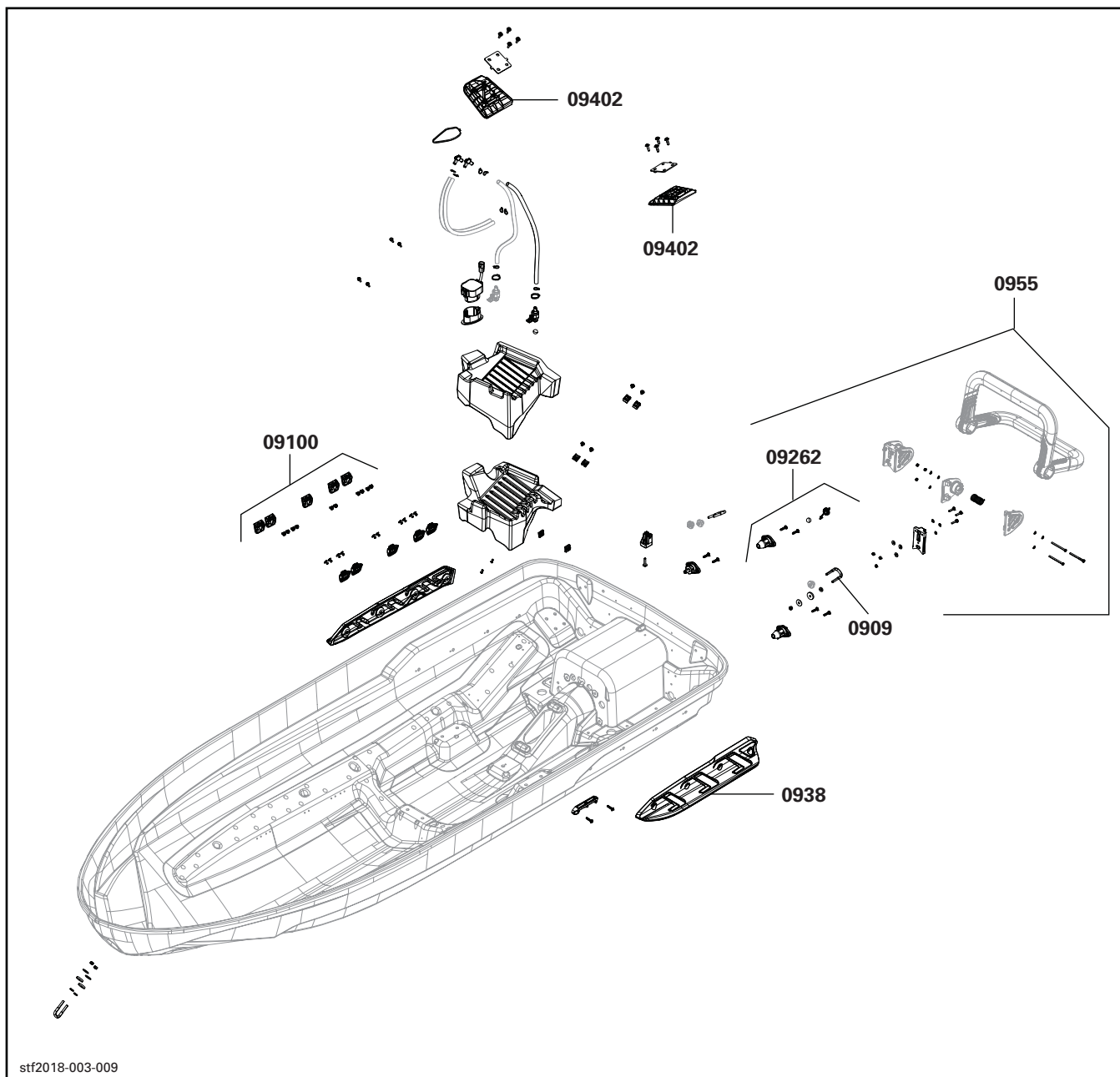
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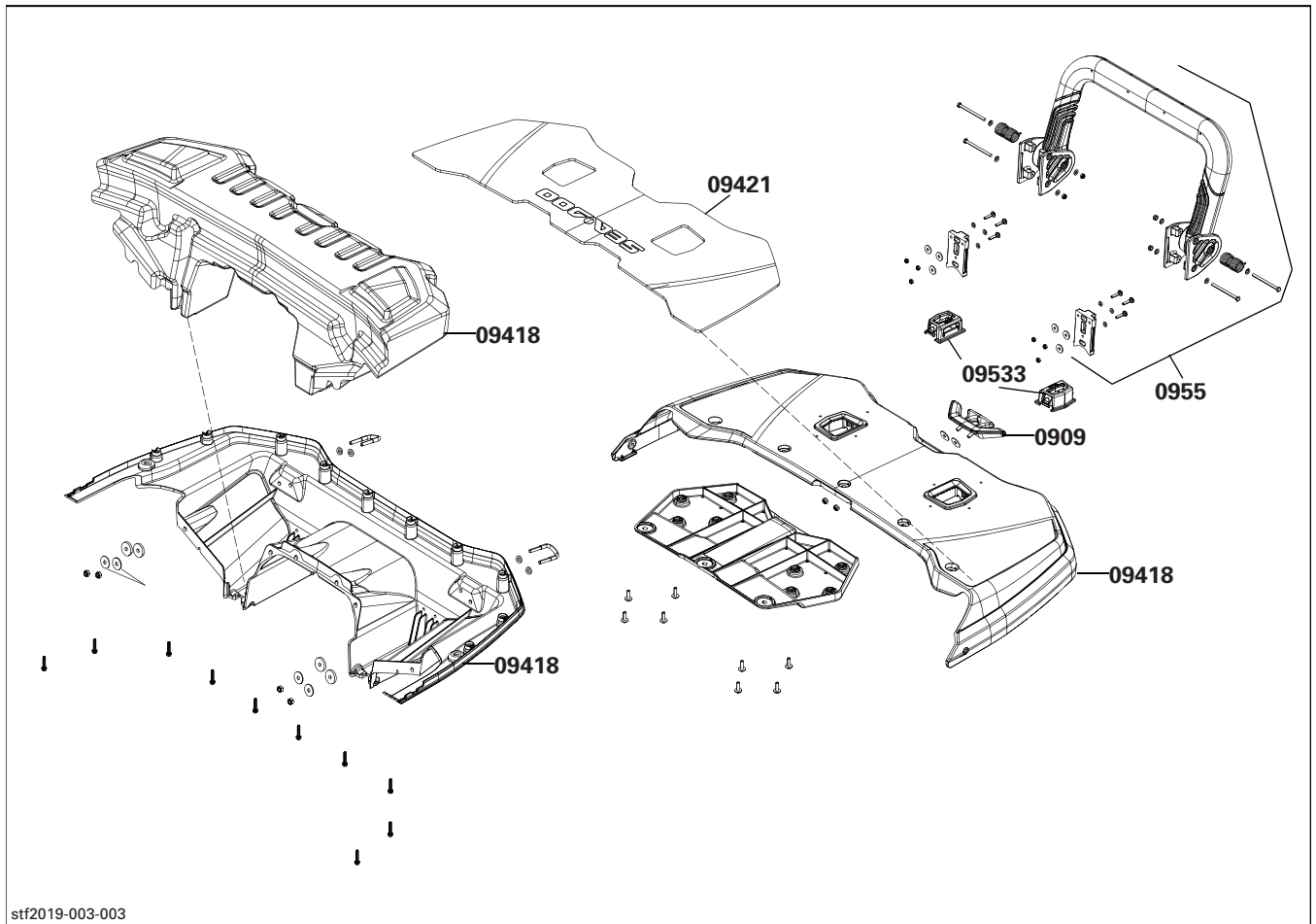


stf2018-003-007

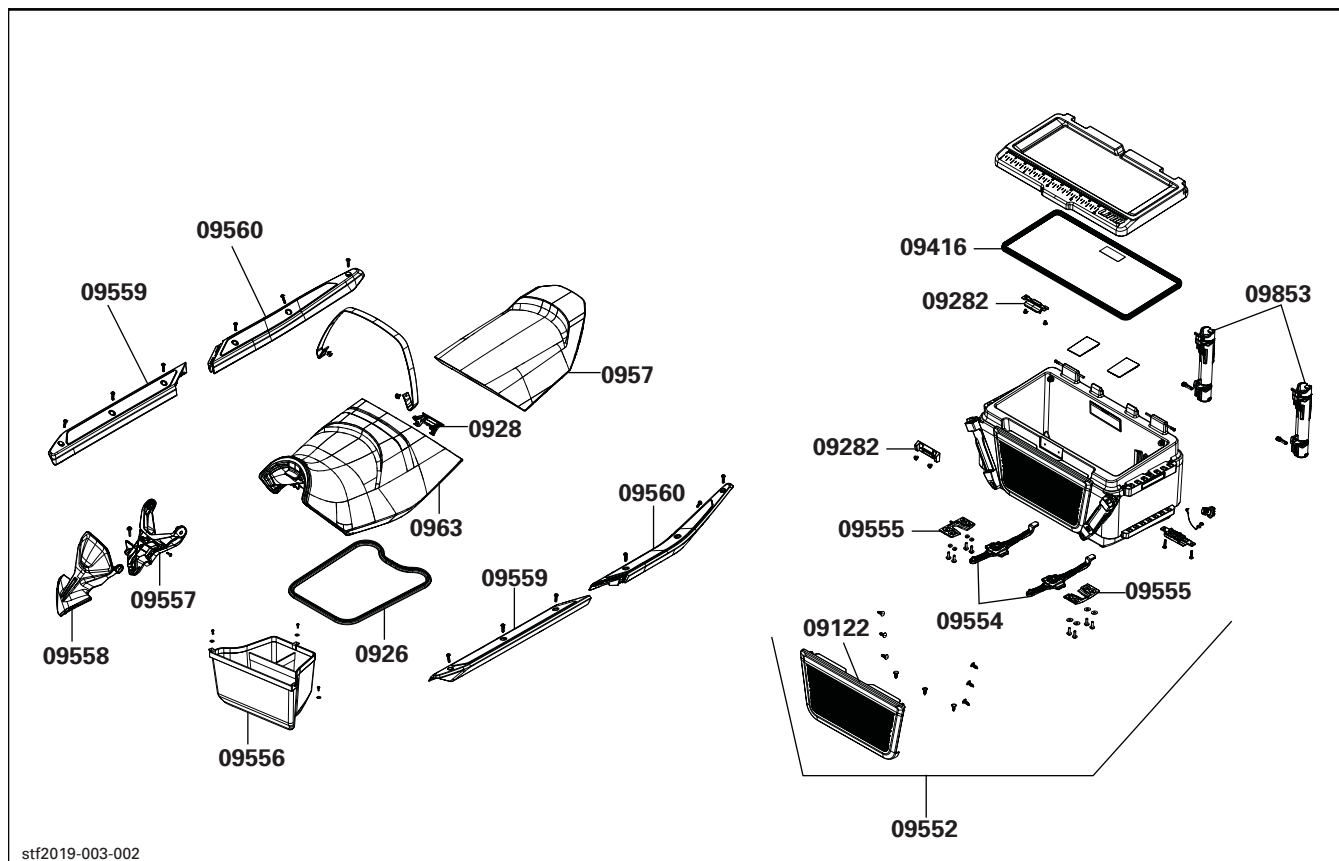




stf2018-003-009



stf2019-003-003

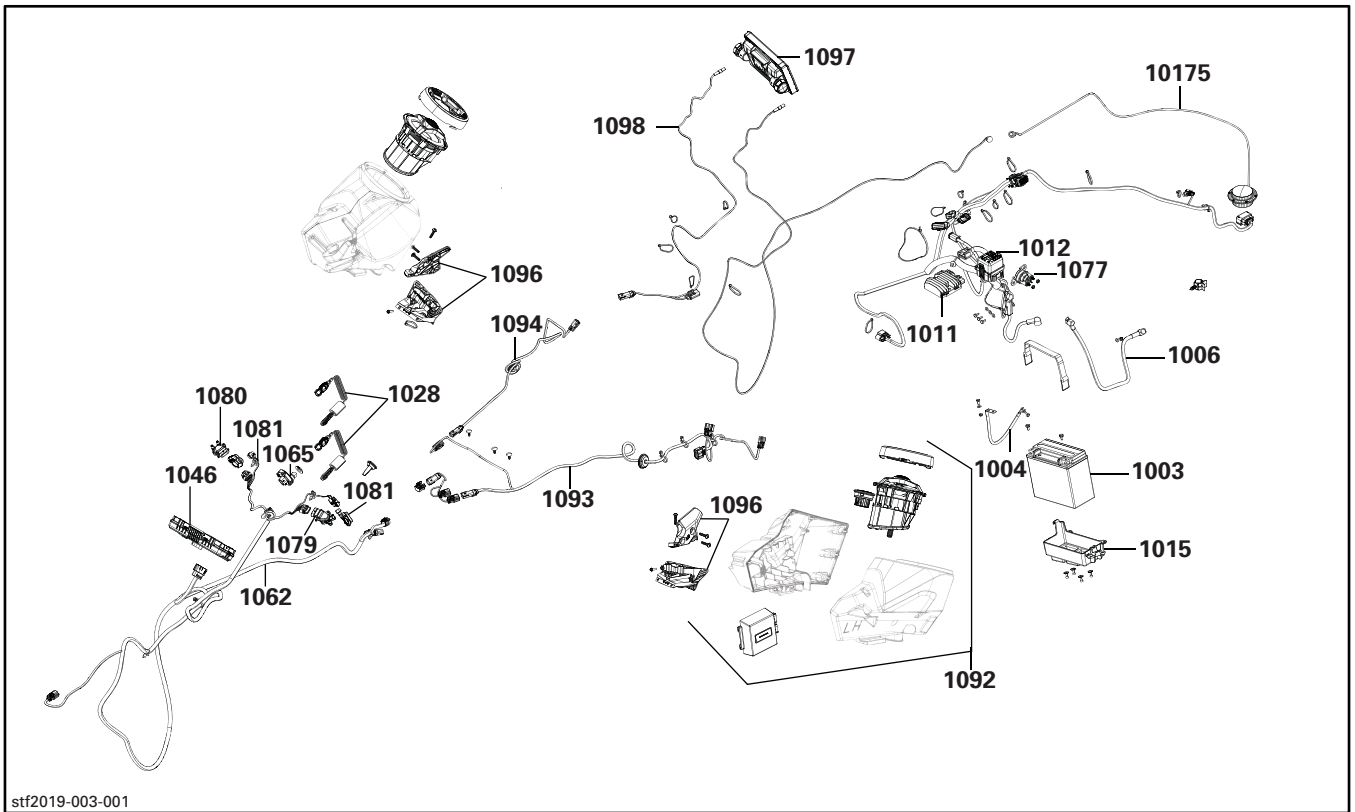


stf2019-003-002

SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE/ RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14
10	00	NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE	0	0	0	0	0
10	03	BATTERY BATTERIE	0.3	0.3	0.3	0.3	0.3
10	04	GROUND CABLE CÂBLE DE MASSE	0.4	0.4	0.4	0.4	0.4
10	05	BATTERY RED CABLE (BATTERY TO STARTER RELAY) CÂBLE ROUGE DE BATTERIE (BATTERIE AU SOLÉNOÏDE)	0.3	0.3	0.3	0.3	0.3
10	06	BATTERY RED CABLE (STARTER TO STARTER RELAY) CÂBLE ROUGE DE BATTERIE (DÉMARREUR AU SOLÉNOÏDE)	0.4	0.4	0.4	0.4	0.4
10	11	REGULATOR (ASS'Y)/RECTIFIER (ASS'Y) RÉGULATEUR (COMPLET)/REDRESSEUR (COMPLET)	0.3	0.3	0.3	0.3	0.3
10	12	MAIN HARNESS (ASS'Y) CÂBLAGE PRINCIPAL (COMPLET)	2.4	2.4	2.4	2.4	2.4
10	15	BATTERY SUPPORT SUPPORT DE BATTERIE	0.3	0.3	0.3	0.3	0.3
10	28	D.E.S.S. KEY CLÉ D.E.S.S.	0.3	0.3	0.3	0.3	0.3
10	46	L.C.D INFO GAUGE (MULTIFUNCTION GAUGE) CADRAN INFO MULTIFONCTION	0.3	0.3	0.3	0.3	0.3
10	56	ELECTRONIC CONTROL UNIT UNITÉ CONTRÔLE ÉLECTRONIQUE	0.4	0.4	0.4	0.4	0.4
10	59	DEPTH SENDER PROFONDIMÈTRE		0.4		0.4	
10	61	ENGINE HARNESS (ASS'Y) CÂBLAGE MOTEUR (COMPLET)	1.0	1.0	1.0	1.0	1.0
10	62	STEERING HARNESS (ASS'Y) CÂBLAGE GUIDON (COMPLET)	0.9	0.9	0.9	0.9	0.9
10	65	D.E.S.S. POST BORNE D.E.S.S.	0.7	0.7	0.7	0.7	0.7
10	66	TOPS SWITCH INTERRUPTEUR TOPS	0.3	0.3	0.3	0.3	0.3
10	77	STARTING RELAY RELAIS DE DÉMARRAGE	0.3	0.3	0.3	0.3	0.3
10	79	BRAKE SENSOR CAPTEUR DE FREINAGE	0.3	0.3	0.3	0.3	0.3
10	80	THROTTLE SENSOR CAPTEUR D'ACCÉLÉRATEUR	0.3	0.3	0.3	0.3	0.3
10	81	CONTROLE SWITCH (RIGHT OR LEFT) INTERRUPTEUR DE CONTRÔLE (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3
10	92	AUDIO SYSTEM SYSTÈME AUDIO	0.5	0.5	0.5	0.5	0.5
10	93	AMPLIFIER HARNESS CABLAGE AMPLIFICATEUR	0.4	0.4	0.4	0.4	0.4

SYSTEM SYSTÈME	CODE	DESCRIPTION	GTX 170	GTX / WAKE / RXT	GTX 300	RXT X 300	FISH PRO
			10	11	12	13	14

10	94	SPEAKER HARNESS CABLAGE HAUT-PARLEUR	0.4	0.4	0.4	0.4	0.4
10	95	REMOTE CONTROL AUDIO TELECOMMANDE AUDIO	0.3	0.3	0.3	0.3	0.3
10	96	AUDIO SUPPORT SUPPORT AUDIO	0.4	0.4	0.4	0.4	0.4
10	97	ECHOSOUNDER (ASS'Y) ECHOSONDEUR (COMPLET)					0.3
10	98	ECHOSOUNDER HARNESS HARNAIS ECHOSONDEUR					0.4
10	175	ECHOSOUNDER TRANSDUCER CAPTEUR D'ECHOSONDEUR					0.5





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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LIFE



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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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UNMATCHED ERGONOMICS

REVOLUTIONARY ON-BOARD EXPERIENCE

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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INDUSTRY LEADING HANDLING & PERFORMANCE

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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



Sea-Doo sets the bar with ultimate performance and relentless innovation.

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UNMATCHED ERGONOMICS

REVOLUTIONARY ON-BOARD EXPERIENCE

ENHANCED CONTROL



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INDUSTRY LEADING HANDLING & PERFORMANCE

UNMATCHED ERGONOMICS

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

7% Improvement

3.6 sec

*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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Delivering a new wave of high-performance innovation with a completely redesigned RXP-X.

INDUSTRY LEADING HANDLING & PERFORMANCE

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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UNMATCHED ERGONOMICS

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ERGOLOCK-R

ROUND GRIP with LOW PROFILE HANDLEBAR

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- Adds greater leverage
- Allows the rider to initiate turn quicker
- 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

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- 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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INDUSTRY LEADING HANDLING & PERFORMANCE

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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INDUSTRY LEADING HANDLING & PERFORMANCE

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



Sea-Doo sets the bar with ultimate performance and relentless innovation.

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.



NEW MIDDLE
PASSENGER
GRIP



OPTIONAL ACCESSORY



Sea-Doo sets the bar with ultimate performance and relentless innovation.

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

\$489 CAD

- Replaces the adjustable saddle to make room for a passenger.
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- Tool-less installation.



NEW MIDDLE
PASSENGER
GRIP



OPTIONAL ACCESSORY



Sea-Doo sets the bar with ultimate performance and relentless innovation.

Delivering a new wave of high-performance innovation with a completely redesigned RXP-X.

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.



Sea-Doo sets the bar with ultimate performance and relentless innovation.

Delivering a new wave of high-performance innovation with a completely redesigned RXP-X.

INDUSTRY LEADING HANDLING & PERFORMANCE

UNMATCHED ERGONOMICS

REVOLUTIONARY ON-BOARD EXPERIENCE



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1

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- UNMATCHED **ERGONOMICS**
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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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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.

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PREVIOUSLY UNCHARTED PEACE OF MIND

INCREDIBLY SIMPLE OPERATION

SAVE TIME AND STAY DRY

PREVIOUSLY UNCHARTED PEACE OF MIND

Your on-water trouble-free insurance.



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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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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



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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



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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

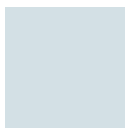
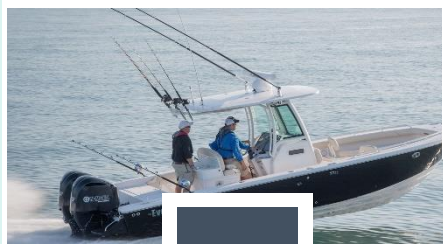


Sea-Doo sets the bar with ultimate performance and relentless innovation.

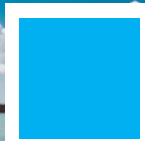
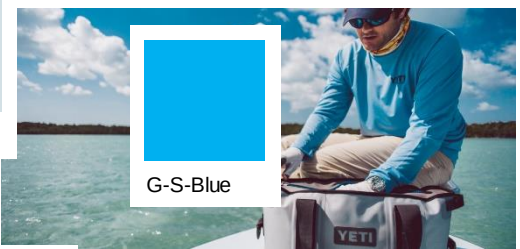
SPORT FISHING

FISH PRO 170

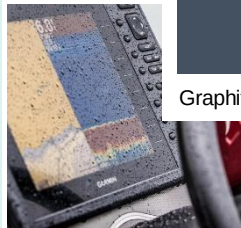
NEW White / Gulfstream Blue



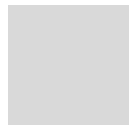
Ice Metal



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

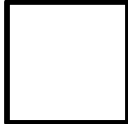
RXP-X 300



Purple Potion



Manta Green



White

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

	LinQ Accessories	Docking	Controls and Grips	Covers	Bags and Storage	Riding Accessories	Electronics and Electricals
What's new for 2021							
							
							



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.

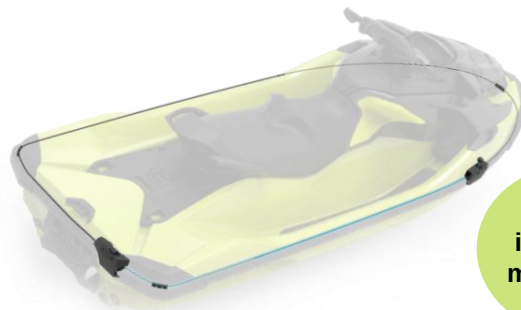
Easy to use

- 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.

- 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**



+

Sea-Doo designs accessories with seamless integration enhancing consumer experience and growing BRP & Dealers' bottom line.

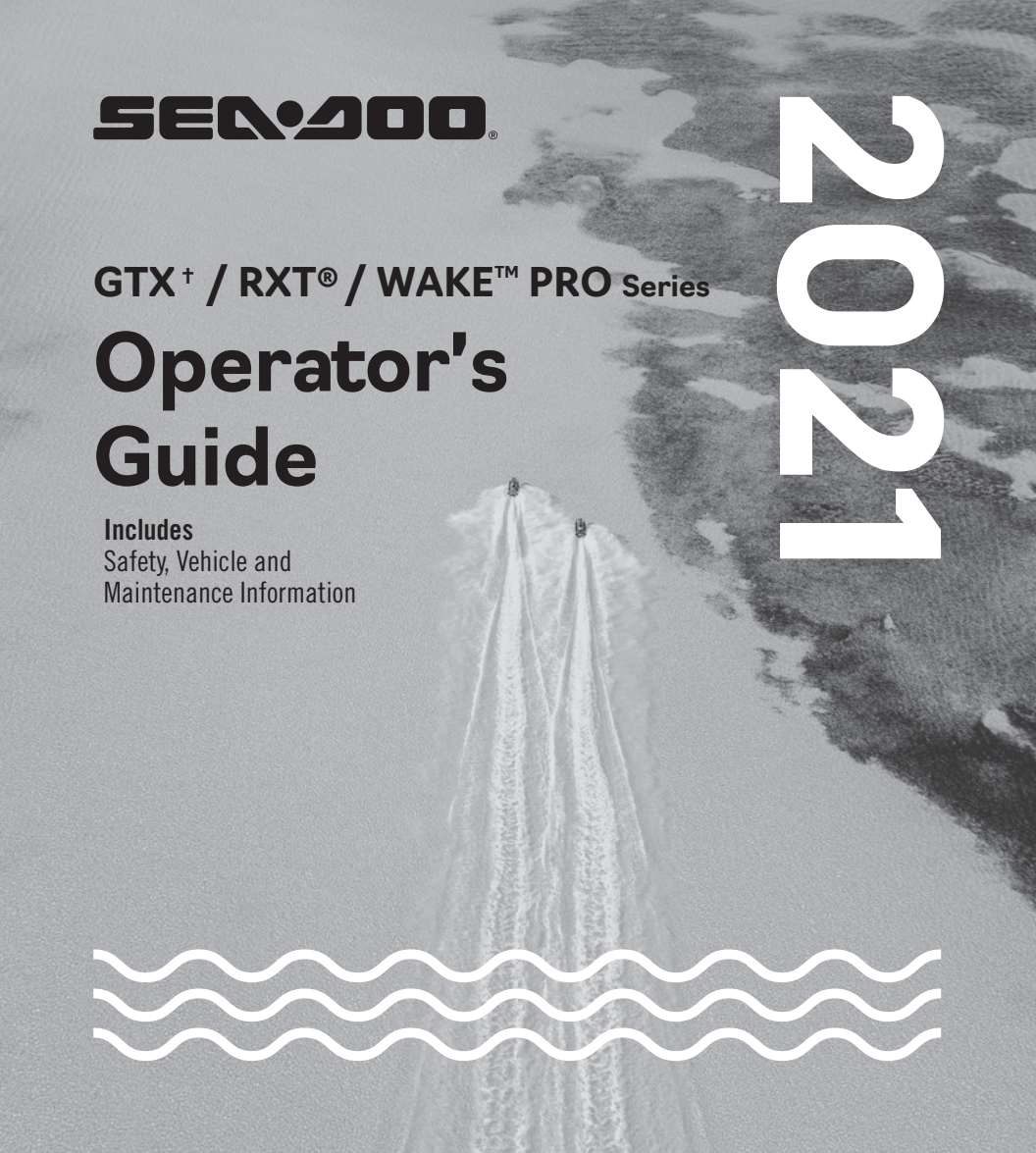




Live the Sea-Doo Life

SEA-DOO





SEA-DOO®

GTX⁺ / RXT® / WAKE™ PRO 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 0 8 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.



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ECO™	Rotax®	VTS™	
iBR™	RXT™	WAKE™	

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- GTX[†] is a trademark of Castrol Ltd. Used under license

KNOW BEFORE YOU GO: BASIC RULES FOR SAFE PWC OPERATION

Improper Operation Can Result in Severe Injury or Death

Operators must be qualified. 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.



Protect all riders:

- Falls can result in severe injury or death.
- All riders 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.

Do not ride if you are not dressed appropriately.



Wear PFD



Wear Neoprene

- All riders must wear an approved PFD (Personal Flotation Device).
- Be sure riders are properly seated and holding on. Riders can be thrown off PWC during unexpected acceleration or aggressive operation. Avoid aggressive operation, sharp turns, and unexpected acceleration.
- Do not apply throttle when anyone is boarding or at rear of PWC.
- Do not jump wakes or waves - jumping can cause injuries such as back or spinal injury (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.

This operator's guide covers the following models:

MODELS

- RXT-X 300
- RXT-XRS 300
- GTX 170
- GTX 230
- GTX 300
- GTX Limited 300
- Wake Pro 230

Deutsch	Dieses Handbuch ist möglicherweise in Ihrer Landessprache verfügbar. Bitte wenden Sie sich an Ihren Händler oder besuchen Sie: www.operatorsguides.brp.com
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GENERAL INFORMATION

FOREWORD

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 adjustment 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 *PRE-DELIVERY 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 the *SAFETY VIDEO* located at:

<https://www.sea-doo.com/safety>

Or, use the following QR code.



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 the operation, instructing others, maintenance and troubleshooting. This Operator's Guide needs to remain with the watercraft when it's sold.

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

The informations contained in this document are 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.

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SAFETY INFORMATION

BEFORE YOU GO



WARNING

Disregarding any of the safety precautions and instructions contained in this section could cause injury including the possibility of death.

Operating Age and Ability

Operators must be qualified. Make sure the operator is 16 or older and has taken a boater safety course. Your state (or province) may have additional requirements. Laws regarding the minimum age and licensing requirements 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.

Operation of this PWC with a disability that impairs vision, reaction time, judgment, or operation of the controls is not recommended.

Remember that sun, wind, fatigue or illness may impair your judgment and reaction time.

Each passenger must be able to simultaneously place both feet firmly flat against each footwell when properly seated.

Drugs and Alcohol

Never ride after consuming alcohol or drugs. Riding on a watercraft requires the operator and passenger(s) to be sober, attentive and alert. The use of drugs and alcohol, singly or in combination, decreases reaction time, impedes judgment, impairs vision, and inhibits your ability to safely ride on a watercraft.

Safe Boating Courses

Many countries recommend or require a boating safety course. Check with your local competent authorities.

Applicable Boating Laws

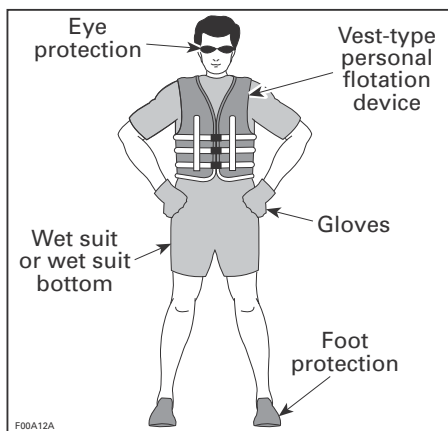
Check boating laws applicable to the waterways where you intend to use your watercraft. Learn the local navigation rules.

Protective Gear

All riders **MUST** wear:

1. An approved **Personal Flotation Device (PFD)** meeting your country regulations. The size of the PFD shall be appropriate for the wearer.
2. **Shorts with neoprene** (wetsuit 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. 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 can be worn. Wind, water spray, bugs and speed may cause a person's eyes to water and create blurred vision.



If you are planning a ride in cold weather or water, consider adding appropriate warm clothing such as a complete wet suit or dry suit. Not only will it make your ride more comfortable, but it may delay or protect you from hypothermia if you fall into cold water. Be prepared for changing conditions.

Helmets: Weighing the Risks vs Benefits

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, look for helmets that meet DOT or Snell standards, and if possible, choose one designed for motorized watersports.

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.

Required Equipment

As the owner of the watercraft, you are responsible for ensuring that all required safety equipment is aboard. Check your local regulations about requirements.

This could include:

- Fire extinguisher. Maintenance, repair and refilling must be carried out in accordance with the manufacturer's instructions.
- A watertight flashlight or approved flares
- Sound-producing device (horn, whistle or bell etc.)
- Visual Distress Signal
- Phone in a watertight compartment designed for this application
- Current local map
- First aid kit
- Throw rope.

GET FAMILIAR WITH THE PWC

The performance of this watercraft may exceed the performance of other watercrafts you may have operated. Do not assume that all PWCs handle identically.

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.

Jet thrust

Your pwc features a jet drive propulsion system. The water is drawn up from underneath the pwc from the intake grate and is accelerated by the venturi to produce thrust. This accelerated water is going out at the rear of the craft.

All riders must wear Shorts with neoprene (wetsuit 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. Normal swimwear does not adequately protect against forceful entry of water into the lower male or female body opening(s).

The jet pump may pick up debris and throw it rearward causing a risk of injuring people, damaging the jet pump, or other property.

Do not start the engine or operate the watercraft if anyone is in the water nearby, or near the rear of the watercraft.

Steering

Your watercraft has a steerable nozzle at the rear of the boat controlled by the handlebars which direct the stream of water from left to right. To turn the watercraft, both steering and throttle are necessary.

Do not release throttle when trying to steer away from objects — as with other powerboats, you need throttle to steer.

If the engine is shut off, steering is lost.

Tether Cord

Keep the tether cord lip 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.

If the operator falls off the watercraft and the tether cord is not attached as recommended, the watercraft engine will not stop and your pwc may continue to move forward. You may not be able to swim back to it.

After riding, always remove the tether cord from the engine cut-off switch to avoid unauthorized use by children or others and to prevent starting in a closed environment (ex: garage).

To prevent accidental starting, always detach 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.

Braking (if equipped with iBR)

Most watercrafts have no means of braking.

On some models, advancement in technologies now permits us to offer a braking system called the iBR (intelligent Brake and Reverse). 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 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 the following watercraft to momentarily lose sight of your PWC. Inform the operator of a watercraft who intends to follow you in a convoy formation of the braking capability of your PWC, the meaning of the plume of water and the need of keeping a greater distance between watercraft.

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 velocity. Also note that your engine must be running to be able to use the brake.

Learning Key (if equipped)

The Sea-Doo LK™ learning key limits the speed of the watercraft. It could be an option for first time users and less experienced operators to learn how to operate the watercraft.

Please consult your BRP authorized Sea-Doo dealer to see if this accessory is available for your model.

Cargo and Storage

Do not store any objects in areas that are not designed specifically for storage.

Do not transport cargo on the rear platform unless it is properly secured with a BRP LinQ™ certified accessory. Compatible accessories which are not BRP certified may not be considered as fit for this purpose.

When carrying loads 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.

Do not exceed the payload or passenger capacities for your watercraft. Overloading can affect manoeuvrability, stability and performance. Also, heavy seas reduce capacity.

Never carry loads on the rear platform when practicing watersports. The cargo may interfere with the rope and unsecure it, becoming an obstacle to the person being towed.

Refer to *SPECIFICATIONS* for the maximum loading capacity.

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.

Also, accessories are designed for specific applicable models only. It is not recommended for units other than the one (those) for which it was sold.

Know your technical limits when installing a BRP approved accessory and, when in doubt, have your OEM accessories installed by an authorized Sea-Doo dealer.

RIDE SAFELY

Riding with Passenger(s)

The operator is responsible to inform and protect the passenger(s) invited to ride.

Instruct all passenger(s) to use the handholds, seat strap, 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.

Be sure riders are properly seated and holding on. Riders can be thrown off PWC during unexpected acceleration or aggressive operation. Avoid aggressive operation, sharp turns, and unexpected acceleration.

Falls can result in severe injury or death.

All riders 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.

When going over waves, riders(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.

Riding with passenger(s) makes the PWC handle differently and requires greater skill.

Avoiding 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.

Be alert for conditions that may limit your visibility or block your vision of others.

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. You may misjudge the ability of the watercraft or your own riding skills and strike a boat or person.

If your watercraft is equipped with a braking system, be aware that other boats following or operating in close proximity may not be able to stop as quickly.

Stopping distance will vary depending on initial speed, load, wind and water conditions. The amount of braking power commanded by the operator using the iBR lever will also affect stopping distance.

Although the preferable manoeuvre to avoid an obstacle is to steer away while applying throttle, the iBR can also be used by fully braking and turning in the direction to avoid the obstacle.

Riding Behaviors

Ride within your limits and level of riding ability.

Scan constantly for people, objects and other watercraft. Stay far enough away from others so you can always safely coast to a stop.

Avoid aggressive operation, sharp turns, and unexpected acceleration that can cause riders to be thrown off.

Avoid riding in very rough waters or practicing extreme manoeuvres like jumping wakes or waves - jumping can cause injuries such as back or spinal injuries (paralysis).

Speeding

Speeding 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.

Reboarding

Reboarding Operator and passenger(s) need to know how to swim and how to re-board the PWC from the water. Boarding in deep water can be strenuous.

Also, make sure you and all passengers know how to reboard when accessories are installed at the rear. Board the watercraft from the rear and carefully get around the accessories. If you have difficulties, you should know how to remove the accessories and move them towards the front to provide better access to the boarding platform.

If the accessories are too heavy, swim toward the side, use passenger handhold and/or seat strap to lift yourself aboard.

Ask inexperienced riders to practice how to board the watercraft close to shore (all methods explained here) before venturing into deep water, especially when cargo is installed aboard on the rear platform.

To prevent accidental starting, always detach the tether cord from the engine cut-off switch when passenger(s) swimmers are boarding.

Moving Parts

Never turn handlebar while someone is near the rear of watercraft. Keep away from steering moving parts (nozzle, iBR gate, linkages, etc.).

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.

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.

Know the Waters

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. 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.

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.

Navigation Rules

Always ride responsibly and safely. Use common sense and courtesy.

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. Generally keep to your right and safely avoid collisions by keeping a safe distance from other watercrafts, boats, people and objects.

Make sure you know and understand the navigation system applicable to the waterways where you intend to use the watercraft.

Navigational aids on shore or on waters, such as signs or buoys, can assist you in identifying safe waters. They can indicate:

- whether you should keep to the right (starboard) or to the left (port) of the buoy
- which channel you can continue
- whether you are entering a restricted or controlled area such as a no wake or low speed zone
- hazards
- speed limits, no power craft or boating, anchorage and other useful information.

Respect no wake zones, the environment, and the rights of other users of the waterways.

Night-Time Operation

PWCs are not designed for night-time operation.

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 boat houses, garage, 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.

After riding, always remove the tether cord from the engine cut-off switch to avoid unauthorized use by children or others and to prevent starting in a closed environment (ex: garage).

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 front storage compartment.
- Use only a BRP approved LinQ fuel caddy, which shall be properly installed and secured.
- Never refill the fuel caddy on the PWC, refill on shore.
- On 3-seater PWC models, never tow a skier or wakeboarder while having a fuel caddy installed.

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.

Burns From Hot Parts

Certain components may become hot during operation. Avoid contact during and shortly after operation to avoid burns.

Watersports (Towing with the PWC)

3-Seater PWC Models

Attachment and Towing Devices

Certain PWC models come equipped with tow eyelets or a ski pylon.

Use ski pylon to attach a tow rope for a skier or wake boarder.

Use rear tow eyelet to attach a tow rope for a tube.

Do not use these attachment points or any other portion of the watercraft to tow a parasail, kites, gliders or any devices which can become airborne or for pulling any other craft. Personal injury or severe damage may occur.

Never carry loads on the rear platform when practicing watersports. The cargo may interfere with the rope and unsecure it, becoming an obstacle to the person being towed.

PWC Capacity When Towing

Always carry an observer 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.

You need to have seats for everyone: operator, observer, towed person. Therefore, if you are the only vessel, a 3-seater PWC is necessary and you can tow only one person.

Towing and Observing

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.

Pulling a tube, skier or wakeboarder makes the watercraft handle differently and requires greater skill.

Always respect the safety and comfort of the person being towed.

Proceed with only as much speed as required and follow the observers' instructions.

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, the person in tow may not be able to avoid an obstacle, or your the PWC.

If you are the observer, make sure you and the person being towed know the hand signals.

HAND SIGNALS			
1. Speed up Thumbs up		5. Cut motor Slashing hand across throat	
2. Slow down Thumbs down		6. OK after all Hands clasped over the head	
3. Turn Circling motion above head followed by pointing in the direction of the turn		7. Stop Hand raised with fingers outstretched	
4. Back to shore Pat top of head		8. All OK An "O" made with the thumb and index finger	

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.

Participate in watersports only in safe areas. Stay away from other boats, channels, beaches, restricted areas, swimmers, and heavily travelled waterways and underwater obstructions.

Tow Rope

Never wrap the tow rope around your wrist, hand or any body part. The rope may suddenly lose its slack and cause you serious injuries such as amputation.

Both the operator and observer shall 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 pull the tow rope in front of other boats and be careful not to run over the rope with the PWC because it could get trapped in the jet pump.

Do not tow a person in any watersport 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. While some watercrafts 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.

PRACTICES 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.

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

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.

Practice releasing the throttle while going at speed and feel the deceleration rate with different speed.

Repeat exercise, but this time while applying iBR lever (if equipped). Note that the iBR system takes control of the throttle.

Steering and Avoiding an Obstacle

Practice obstacle avoidance (choose a virtual point on the water) by steering watercraft and maintaining throttle.

Repeat exercise, but this time release throttle while turning.

Repeat exercise, but this time while applying iBR lever (If equipped). Note that the iBR system takes control of the throttle.

NOTE: With this exercise, you will learn that you need throttle to steer the watercraft in a different direction.

Reverse

Practice reverse operation to learn how the watercraft operates in reverse and reacts with steering inputs.

NOTE: Remember that steering direction is reversed when backing.

Docking

Practice docking using the throttle, the steering and the iBR (if equipped) to become familiar with the response of the PWC and to develop good control skills.

FUELING

Fueling Procedure

Fuel is flammable and explosive under certain conditions. Do not smoke or allow open flames or sparks in the vicinity.

1. Stop engine.
2. Have the operator and passenger(s) get out of watercraft.
3. If on the water, moor the watercraft securely to the dock.
4. Unscrew slowly the fuel cap counterclockwise to stabilize pressure before removing it.

NOTE: A short whistling sound is normal.

5. Insert the spout into the filler neck.

NOTE: Be certain that you are putting fuel in the right location and not using a ventilation hole or ski pylon hole by mistake.

6. Pour fuel slowly so the air can escape from the tank and prevent fuel flow back. Be careful not to spill fuel.
7. Stop filling 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 into the fuel tank. Do not overfill.
8. Reinstall the fuel cap and fully tighten it.
9. Always wipe off any fuel spillage from the watercraft.
10. After refueling, always open or remove the seat or the lateral panel (depending on models) and ensure there is no gasoline odor inside the engine compartment. Do not start watercraft if you smell gasoline odor.

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

The gasoline must have the following minimum octane requirements

ENGINE	RECOMMENDED FUEL
300	Use Premium gasoline with an AKI (RON+MON)/2 octane rating of 91 or an RON octane rating of 95.
All other	Use common gasoline with an AKI (RON+MON)/2 octane rating of 87or an RON octane rating of 91.

Use unleaded gasoline containing MAXIMUM 10% ethanol.



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 bunks including bunk width should be adjusted to provide support throughout the full length of the hull. The ends of both trailer 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.

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.

Respect tow vehicle maximum weight capacity and the tongue weight capacity as recommended by the 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, front storage compartment cover, glove box cover, boarding platform and seat are properly latched.

Remove all cargo and equipment attached.

Observe trailering safety precautions.

Do not route ropes or tie-downs over the seat or attach them to the grab handle to avoid these parts permanently damaged. Wrap ropes or tie-downs with rags or similar protectors where they can come into contact with the watercraft body.

A Sea-Doo cover can protect the watercraft, particularly when driving on dirt roads, to prevent dirt entry through the air inlet openings.

When trailering 2 watercrafts, it may be necessary to remove the inner wakeboard rack, if equipped.

For more information, see the following video: SEA-DOO HOW TO SERIES - PROPER WATERCRAFT TRAILERING

<https://www.youtube.com/watch?v=mXtHWldt7yl>

Or, use the following QR code.



IMPORTANT ON-PRODUCT LABELS

Watercraft Safety Labels

These labels are affixed to the vehicle for the safety of the operator, passengers or bystanders.

The operator and when applicable, the passenger, shall read and understand this information before riding.

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.

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.

General Warning Label

⚠ WARNING

Require Proper Operation of the Boat

Improper operation can result in severe injury or death.

16+ **Operators Must Be Qualified**
 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**
<https://www.sea-doo.com/owners/safety/safety-video.html>

Watch safety video.
<https://www.sea-doo.com/owners/safety/safety-video.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



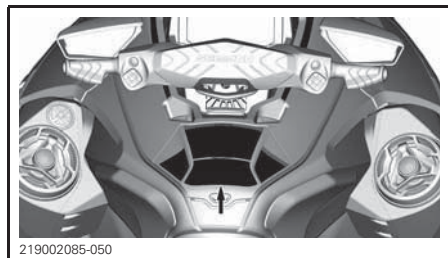
See Operator's Guide

Patents :
www.brp.com/en/about-brp/patents.html

5632



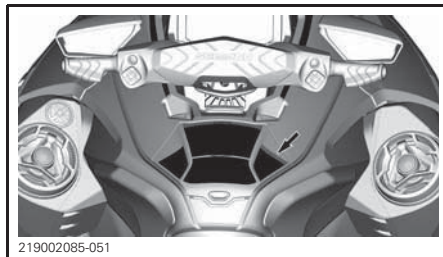
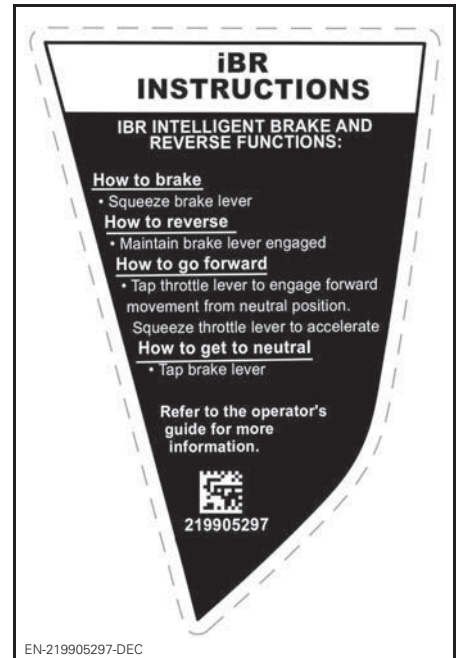
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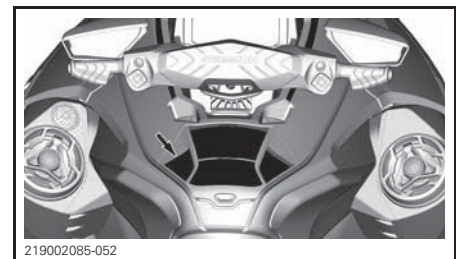
High Performance Vehicle Label



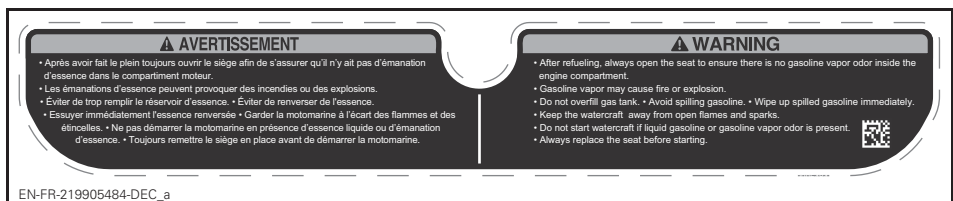
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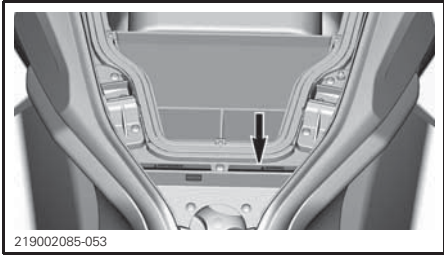


300 ENGINES ONLY



Fuel Warning Label





Recommended Fuel

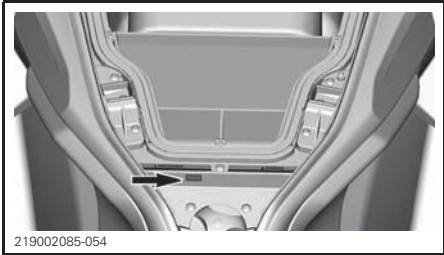
300 Engine Only

NOTICE

Use premium unleaded gasoline with an AKI (RON+MON) /2 octane rating of 91, or an RON octane rating of 95.


5707

EN-219905707-DEC



Glove Box Use Label

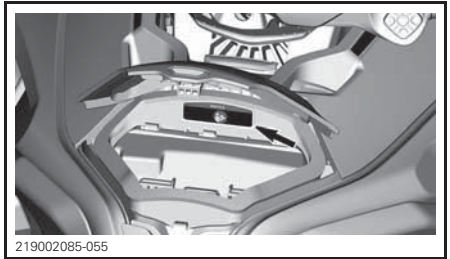
NOTICE



Refer to the operator's guide for recommendations on how to use the glove box .


5677

EN-219905677-DEC



Re-Boarding Label

⚠ WARNING

AVOID SERIOUS INJURY OR DEATH:

- Engine must be turned off before re-boarding.
- Keep away from propulsion system and intake grate.

WHEN RE-BOARDING:

- Re-board one person at a time.
- Stay centered to keep balance.

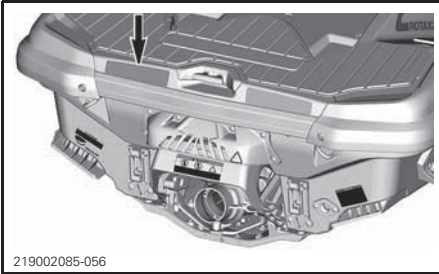
Never use the boarding step (if so equipped) for pulling, towing, jumping or boarding a PWC that is out of water or any purpose for which it was not designed.


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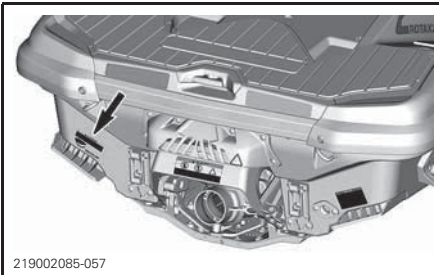
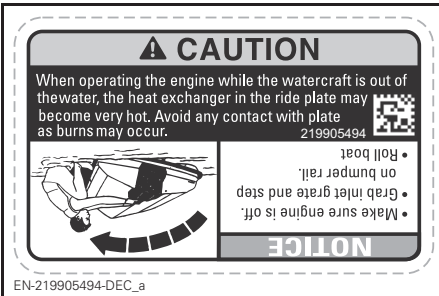
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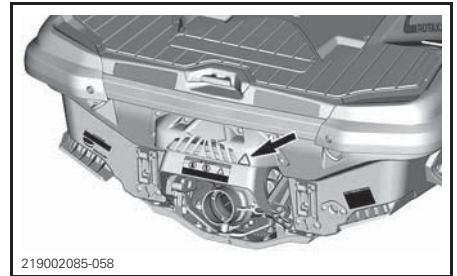
SAFETY INFORMATION



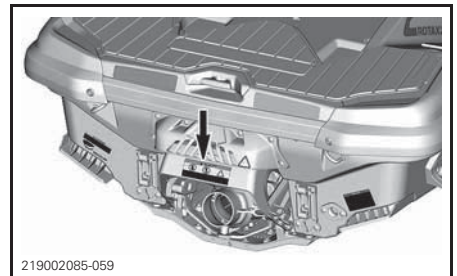
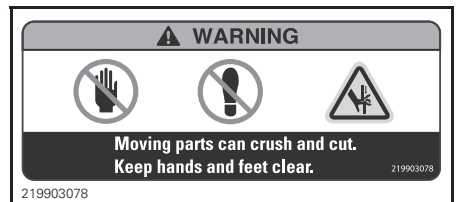
Tip Over Label



iBR Gate Protector Pictogram - Moving part



iBR Gate Label - Moving part



Exhaust System Flushing

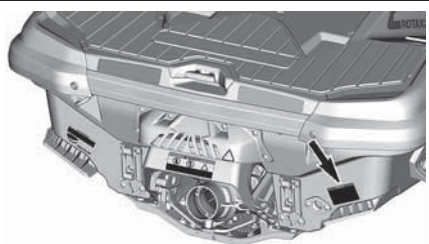
NOTICE

It is very important to flush the exhaust system with fresh water (from 1-1/2 to 2 minutes) after each use in salt water or foul water.



219905495

EN-219905495-DEC_a



219002085-060

Do Not Use To Onboard



219904804

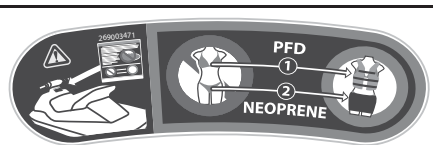


219002085-200

Passenger Transportation - Appropriate Wearing

! WARNING

Never carry passengers on rear platform, always use the rear seat to carry passengers. Wear shorts with neoprene and approved PFD.



EN-269003471-DEC



219002085-061

Checking Engine Oil Level

NOTICE

CHECKING ENGINE OIL LEVEL

- Make sure engine is at operating temperature. (Never let engine run out of water without the flush kit connected as it may damage the engine.)
- Vehicle must be level to perform verification.
- Let engine running at idle for at least 30 seconds.
- Stop engine and wait at least 30 seconds.
- Check oil level using the dipstick.

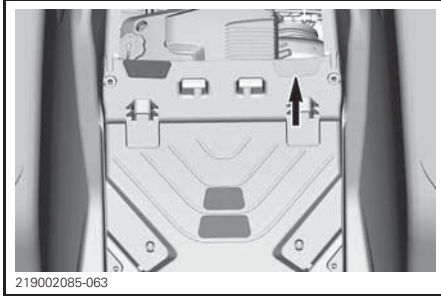
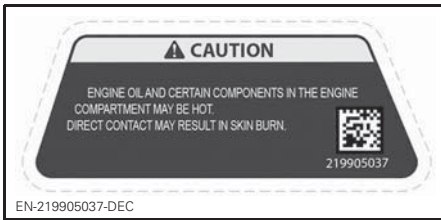


EN-219905859-DEC

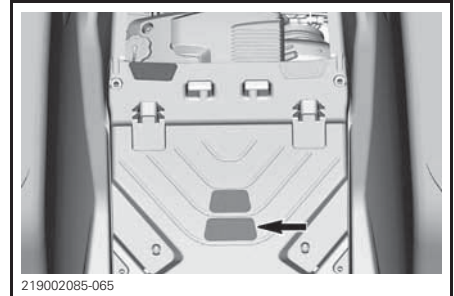


219002085-062

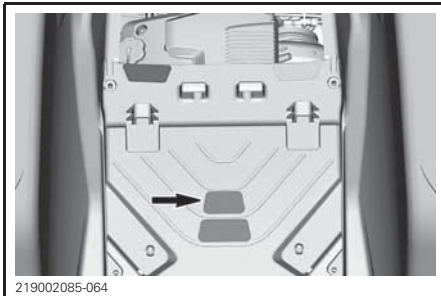
Engine oil and Components Hot



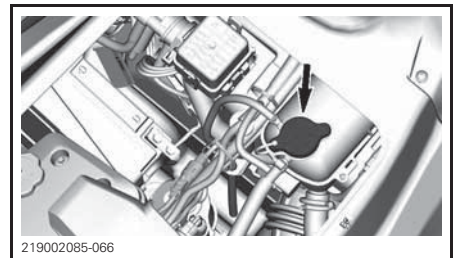
Rear Seat Installation



Do Not Seat Label



Coolant Hot - Do Not Open Label



Battery Label

⚠ Avertissement

- Enlever la batterie du bateau avant de la charger.
- Ne pas trop charger la batterie.
- Un chargement excessif pourrait faire exploser la batterie.

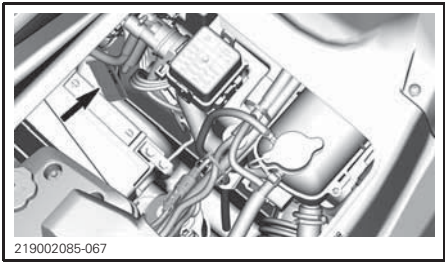
⚠ WARNING

- Remove battery from boat before charging.
- Do not overcharge battery.
- Improper charging of battery can cause explosion.



219905305

EN-FR219905305-DEC



Air Intake Silencer Label

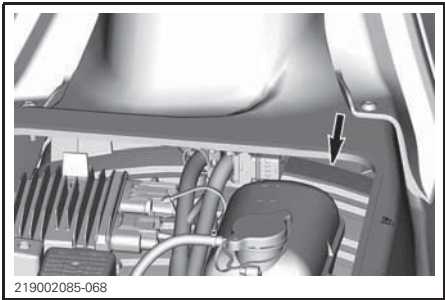
NOTICE

- To comply with noise regulations, this engine is designed to operate with an air intake silencer.
- Operation without air intake silencer or with one not properly installed may cause engine damage.

219903177A

219903177

LOCATED ON THE TOP OF THE AIR INTAKE
SILENCER - UNDER THE ECM



Wakeboard Support Label

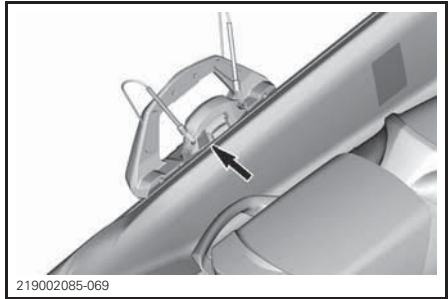
⚠ WARNING

Always:

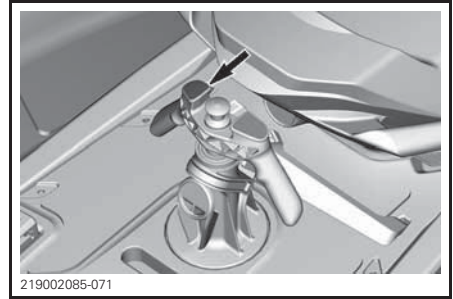
- Secure RACK properly
- Position board with FINS OUTWARD
- Secure BOARD properly

219903228C

219903228

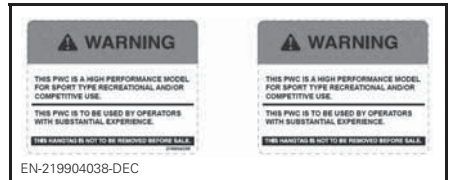


Retractable Ski Post - Use



Hang Tag

High Performance Model



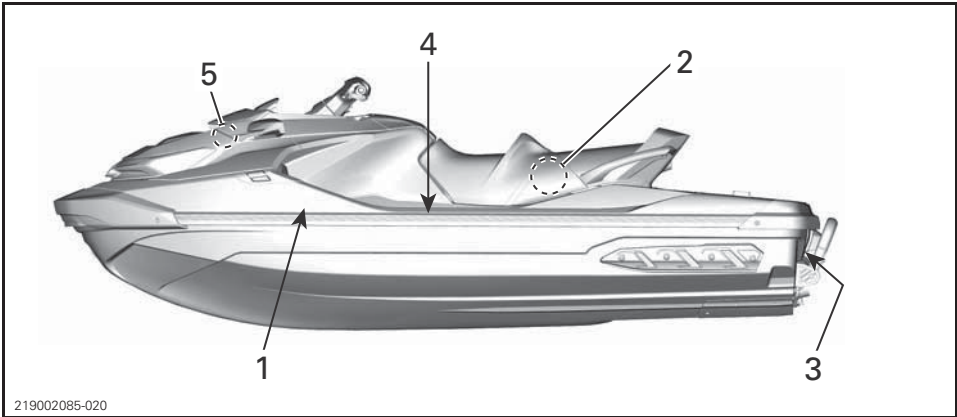
CALIFORNIA PROPOSITION 65 WARNING



Retractable Ski Post - Spotter and Weight



Compliance Labels and Hang Tag



LABEL 1

EMISSION CONTROL SYSTEM INFORMATION
BOMBARDIER RECREATIONAL PRODUCTS INC.
THIS ENGINE CONFORMS TO U.S. EPA & CALIFORNIA
EMISSIONS REGULATIONS FOR MARINE SI ENGINES.
RENSEIGNEMENT SUR LE DISPOSITIF ANTIPOLLUTION
CE MOTEUR EST CONFORME AUX NORMES DE L'EPA
DES E.-U. POUR LES MOTEURS MARINS A ALLUMAGE COMMANDÉ.

(EPA) (VEL)	ENGINE FAMILY / FAMILLE DE MOTEUR
(CA) (VEL)	
CERTIFICATION STANDARDS NORMES DE CERTIFICATION	
EMISSION CONTROL SYSTEM SYSTEME DE CONTRÔLE DES ÉMISSIONS	

MEETS CALIFORNIA EVAP EMISSIONS REGULATIONS FOR SPARK
IGNITION MARINE WATERCRAFT. EVAP FAMILY
EVAPORATIVE EMISSION CONTROL SYSTEM. SO
SEE OPERATOR'S GUIDE FOR MAINTENANCE SCHEDULE AND FUEL,
OIL AND SPARK PLUG SPECIFICATIONS. VOIR LE CALENDRIER
D'ENTRETIEN ET LES SPÉCIFICATIONS D'ESSENCE, D'HUILE ET DE
BOUGIE D'ALLUMAGE DANS LE GUIDE DE L'OPÉRATEUR.

EN-219905703-DEC

121

**LABEL 2 - 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**

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.

ASSEMBLED IN MEXICO

5497

LABEL 3

CANADIAN COMPLIANCE NOTICE AVIS DE CONFORMITÉ CANADIEN	
MAXIMUM RECOMMENDED SAFE LIMITS LIMITES MAXIMALES DE SÉCURITÉ RECOMMANDÉES	
MAX.	kg lbs/lb
MAX.	kg lbs/lb
CATEGORY / CATÉGORIE: C MAXIMUM WAVE / VAGUE MAXIMALE: 2.0 m MAXIMUM WIND SPEED / VITESSE DE VENT MAXIMALE: 33 knots/noeuds	
BOMBARDIER RECREATIONAL PRODUCTS INC. (YDV) VALCOURT, QUEBEC, CANADA SKALDENSTRAAT 125, GENT, 9042, BE MODEL / MODÈLE :	
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. 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.	
MAXIMUM CAPACITIES ABOVE INFORMATION ALSO APPLIES IN THE U.S.A. 	
EN-219905864-DEC	

LABEL 4 - LOCATED INSIDE THE LH FOOTREST.



LABEL 5 - LOCATED NEAR GAS CAP

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 for worry free operation.

219902678

STAR LABEL HANG TAG



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

Molded Safety Pictogram



219002085-030

WARNING

Never put gasoline in ski pylon hole. Gasoline is extremely flammable and highly explosive. Fuel vapors can spread and be ignited by a spark or flame many feet away.



219001878-708

LABEL 1

PRE-RIDE INSPECTION

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 an accident or a malfunction.

Before performing the pre-ride inspection, read and understand the *CONTROLS* section.

REGULAR MAINTENANCE

We encourage you to have an Annual Safety Inspection of your vehicle. Please contact an authorized BRP dealer for further details.

It is also recommended that an authorized Sea-Doo dealer performs the preseason preparation of your vehicle.

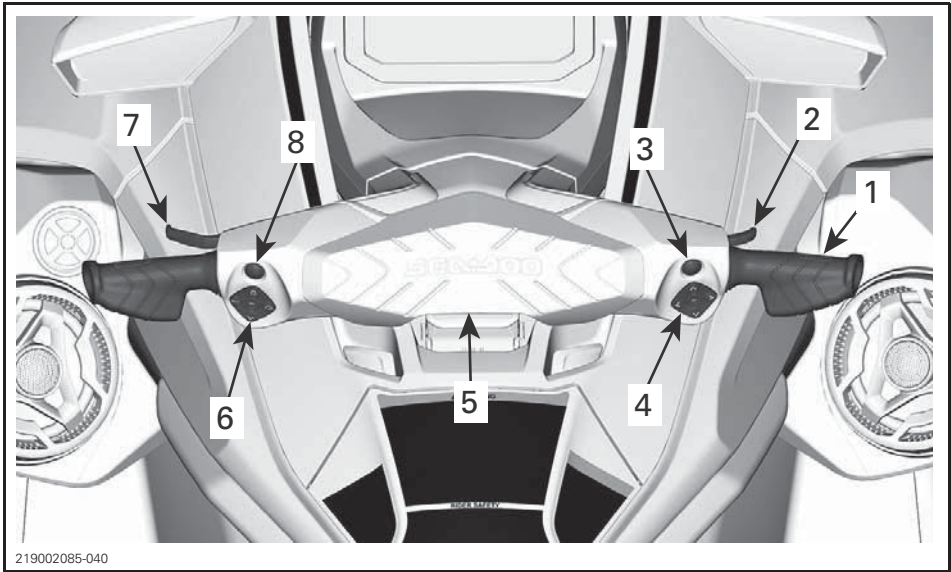
Each visit to your authorized Sea-Doo dealer is a great opportunity for your dealer to verify if your vehicle is included in any safety campaign. We also urge you to visit your authorized Sea-Doo dealer in a timely manner if you become aware of any safety related campaigns.

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intentionally blank***

WATERCRAFT INFORMATION

CONTROLS

Some vehicle safety labels are not shown on illustrations. For information on vehicle safety labels, refer to *WATERCRAFT SAFETY LABELS*.



TYPICAL

NOTE: Some indications, functions and features described in this section may not apply to every PWC model, or may be available as an option.

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.

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 propulsion system.

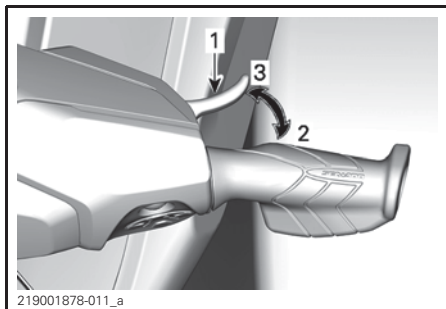
When operating in reverse, steering direction is reversed. Turning the handlebar to the right while backing up steers the watercraft to the left.

2) Throttle Lever

The throttle lever on the RH handlebar controls electronically the engine speed.

To increase or maintain watercraft speed, pull the throttle lever with your finger.

To decrease watercraft speed, release the throttle lever.

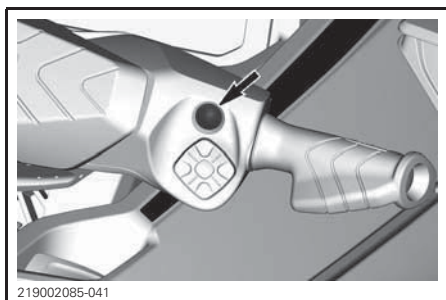


1. Throttle lever
2. To accelerate
3. To decelerate

The throttle lever is spring loaded and should return to rest position (idle) when not pressed.

3) BRP Connect Button

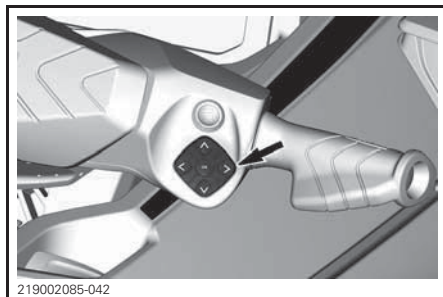
The BRP Connect button is located above the right controller.



This button allows a quick access to BRP Connect. Each click will swap between apps view and functions view of the multifunction gauge.

4) Right Controller

The right controller is located on the RH side of the handlebar.

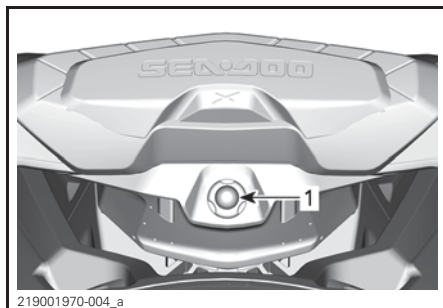


The right controller includes controls to navigate in the multifunction gauge.

- Arrow UP
- Arrow RH
- Arrow Down
- Arrow LH
- OK button.

5) Engine Cut-Off Switch

The engine cut-off switch is located in the middle of the handlebar.



TYPICAL

1. Engine cut-off switch

To allow engine starting, the tether cord cap must be securely snapped to 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 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 and all watercraft directional control is lost.

⚠ WARNING

Always disconnect tether cord when 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.)

The tether cord cap contains an electronic circuit (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 installed on the engine cut-off switch and only allows engine starting for keys it recognizes.

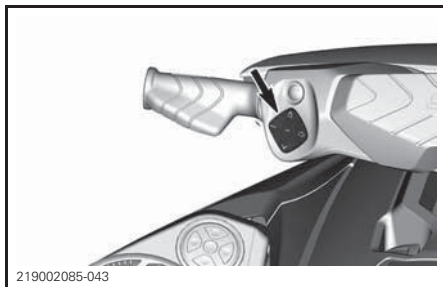
The D.E.S.S. system brings great flexibility. You can buy additional tether cords and have the D.E.S.S. keys programmed for your watercraft.

A total of ten D.E.S.S. keys can be programmed.

To have a key programmed to your watercraft, see your authorized BRP Sea-Doo dealer.

6) Left Controller

The left controller is located on the LH side of the handlebar.



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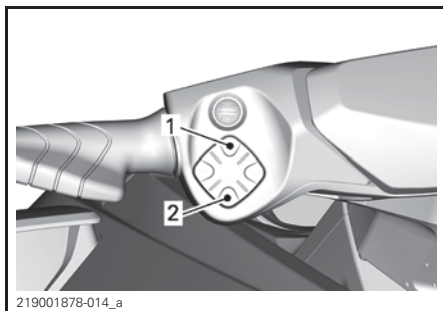
Variable Trim System (VTS) Button

It provides watercraft pitch trim adjustments by adjusting the vertical position of the jet nozzle.

The VTS can be electrically trimmed to desired attitude, or to one of three preset trim positions (full up, middle and full down).

Refer to *OPERATING INSTRUCTIONS* for details.

NOTE: The VTS button is used for Neutral adjustment. This is to adjust the neutral position of the watercraft. Refer to *OPERATING MODES* for details



219001878-014_a

1. Bow up
2. Bow down

Speed Control Button



219002085-044

TYPICAL

Allow to set and control the speed related functions.

- Speed limiter
- Slow speed mode.

Mode Button



219002085-046

TYPICAL

It is used to choose between Normal, Sport, Eco and Ski mode, if equipped.

Refer to *OPERATING MODES* for details.

Intelligent Debris Free Pump (iDF) Button

Located in the center of the left controller.



219002085-047

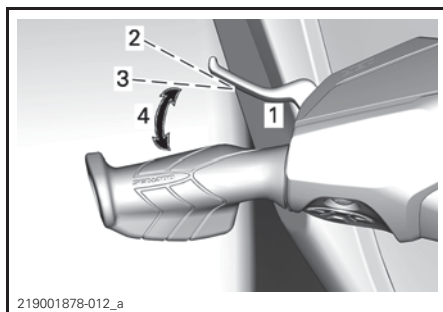
It allows to activate the iDF system. Refer to *HOW TO USE THE INTELLIGENT DEBRIS FREE PUMP SYSTEM* in *OPERATING INSTRUCTIONS* section.

7) intelligent Brake and Reverse (iBR) Lever

The iBR lever on the LH handlebar can electronically command:

- Brake
- Reverse
- Neutral.

NOTE: A minimum of 25% of iBR lever stroke is required to activate iBR functions.



219001878-012_a

TYPICAL

1. iBR lever
2. Lever rest position
3. 25% stroke required to activate iBR functions
4. Operating range

At speed above 14 km/h (9 MPH), pulling the iBR lever will engage the brake.

NOTE: If water current is 14 km/h (9 MPH) or above, the reverse can not be engaged as the speed threshold for the reverse is exceeded.

At speed below 14 km/h (9 MPH), pulling the iBR lever will engage reverse.

When the iBR lever is released after braking or reverse operation, the neutral is engaged.

⚠ WARNING

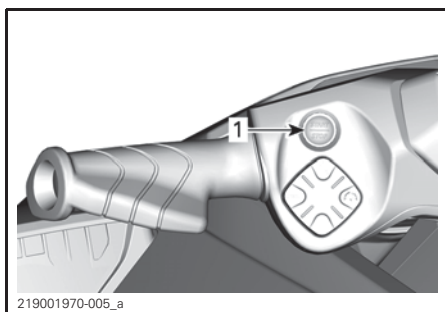
If throttle lever is still pulled in when releasing the iBR lever, forward movement will be initiated after a short delay. If forward acceleration is not desired, release the throttle lever.

NOTE: The neutral position can be fine tuned by trimming the iBR system.

Refer to *OPERATING INSTRUCTIONS* for detailed instructions.

8) Engine START/STOP Button

The engine START/STOP button is located on the LH handlebar.



TYPICAL

1. START/STOP button

Engine Starting and Stopping

Refer to *OPERATING INSTRUCTIONS* for complete procedures on how to start and stop the engine.

Waking Up the Electrical System

Press the START/STOP button once without installing the tether cord on the engine cut-off switch.

This will power up the electrical system; the information center will cycle through a self-test function.

The electrical system will stay powered up for approximately 75 seconds after the START/STOP button was depressed.

When the tether cord is installed on the engine cut-off switch, the system will be powered for 60 minutes.

Every time the START/STOP button is pressed, the countdown restarts. When the battery voltage drops below 12.3V, the LOW BATTERY indicator lamp will light up and the electrical system will shut down after 75 seconds.

Post-Drive Battery Management

This feature allows keeping the electrical system awake to allow using accessories when the engine is turned off. It also prevents draining the battery too much when using accessories. When the battery voltage reaches 12.3V or less, the system will automatically shut down to ensure being able to start the engine.

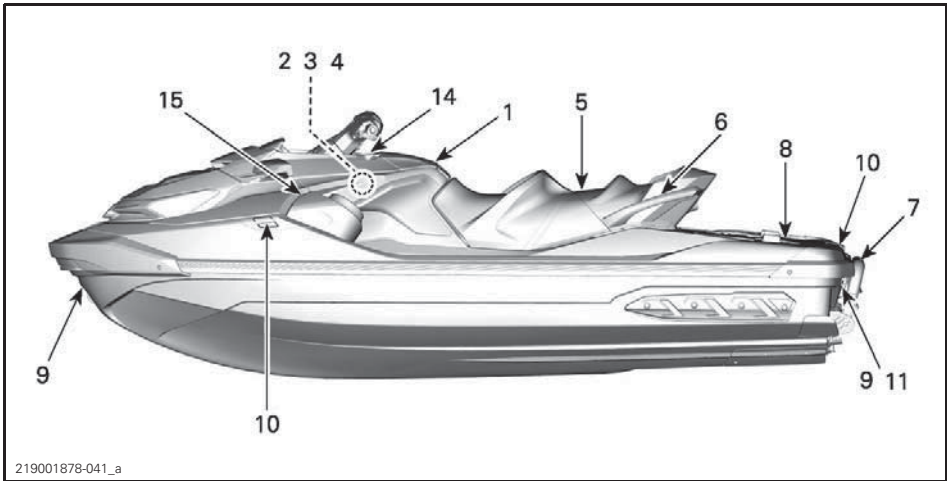
When the electrical system is activated by pressing start-stop briefly while the engine is shutdown the wake-up time will be managed as follows:

- Key off: System will shut down after 75 seconds.
- Key on: System will shut down after 60 minutes or if the voltage threshold is reached.

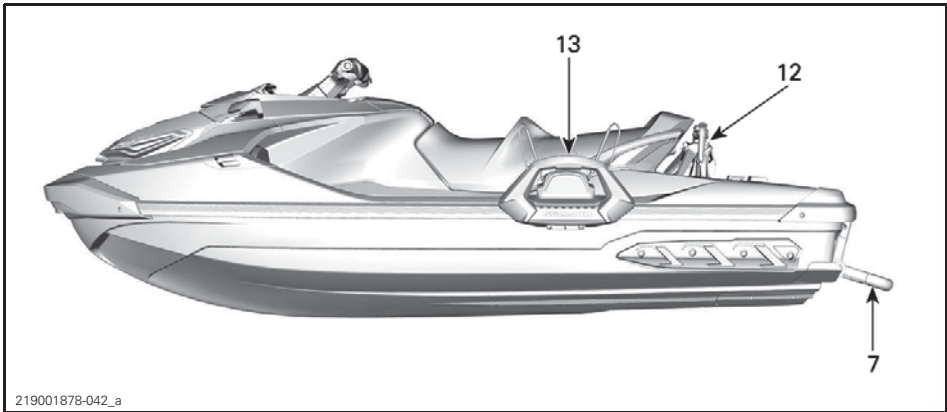
EQUIPMENT

Illustrations may not be accurate for every model and are only provided as a visual guide.

Some vehicle safety labels are not shown on illustrations. For information on vehicle safety labels, refer to *WATERCRAFT SAFETY LABELS*.



TYPICAL

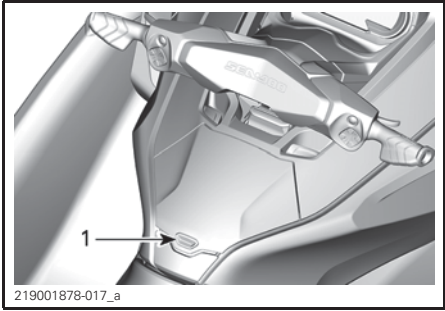


WAKE PRO MODELS

1) Glove Box

A small, storage compartment for personal articles.

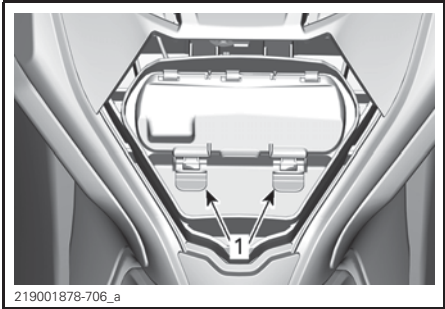
Press on cover latch to open glove box.



1. Cover latch

Watertight Compartment

Inside the glove box is located a small watertight storage compartment for personal articles. Pull backwards on the two latches to open.



1. Latches

There is a protective foam located inside the watertight compartment to protect a phone from damages. Make sure the smartphone is held in place by the foam and not the edges of the receptacle and that you can close the lid. Always make sure the foam is completely dry before using.

Refer to *MAXIMUM PHONE SIZE* chart.

MAXIMUM PHONE SIZE	
Length	160 mm (6.3 in)
Width	85 mm (3.3 in)

NOTE: Due to variation in smartphone sizes and cases styles, ensure there is no pressure on connector and/or phone when closing the lid.

Some models are equipped with a USB port used for charging. When using the USB port to charge a smartphone, always make sure to route the cable such that there is no pressure on either ends of the cable to prevent damage to cable or smartphone connectors.

NOTE: For optimum performance, always use OEM USB cables. Low cost aftermarket cables may not have data lines and/or higher impedance which may result in poor charging performance or overheating.

Many models of smartphones have a brittle female connector so extra care should be taken when inserting in the watertight compartment. BRP recommends to use a short cable (no more than 25 cm (10 in)) so there is less extra cable length to stow.

The models not equipped with USB charging port are instead equipped with a rubber seal to ensure watertightness. There is a ventilation membrane that balance pressure inside and outside the compartment to ensure it can be opened without suctioning water droplets inside. The membrane itself is watertight. Watertightness of the compartment is finally ensured by pressing the compartment's door on the surrounding seal, using the two latches.

To ensure that articles inside the compartment are protected from the environment, the following recommendations should be followed:

Before and during use:

- Make sure the seal is intact, cleared and properly positioned.
- Make sure the ventilation membrane is intact and properly positioned.

- Make sure the seal around the USB charging port (or rubber seal) is intact and properly positioned.
- Completely dry the compartment and its contents before closing.
- Make sure nothing gets pinched between cover and box when closing compartment.
- Always close the compartment completely using the 2 latches.

After use:

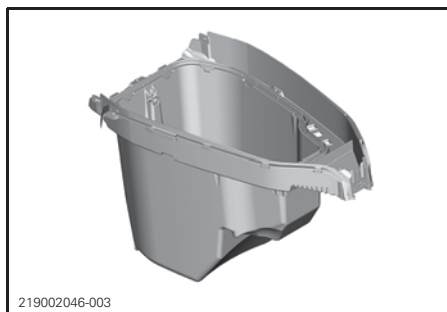
- Remove smartphone from compartment.
- The USB charging port's integrated rubber cap should be installed to cover the connector.
- Always close the compartment completely using the 2 latches.

NOTE: Use of desiccant in the water-tight compartment is recommended to eliminate condensation in very humid environment. Replace desiccant frequently.

Refer to *BRP AUDIO PREMIUM SYSTEM* for complete instructions.

2) Storage Bin

A storage bin that can be used to carry larger personal articles is located under the front cover.



FRONT STORAGE BIN

Storage Bin Organizer Bag (If equipped)



1. Storage Bin Organizer Bag

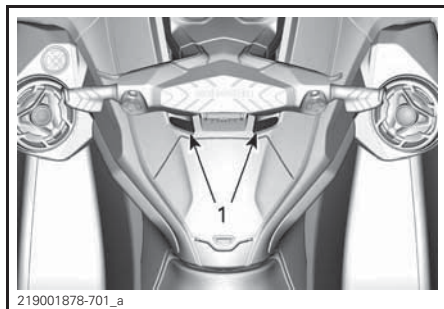
How to Open Storage Bin Cover

Stop engine.

WARNING

When the storage bin cover is opened, the controls are not accessible to the driver.

Open the storage bin by pressing on the two release buttons and lifting the handlebar.



1. Release buttons

NOTICE The maximum load allowable for the front storage bin is 13 kg (30 lb) evenly distributed.

⚠ WARNING

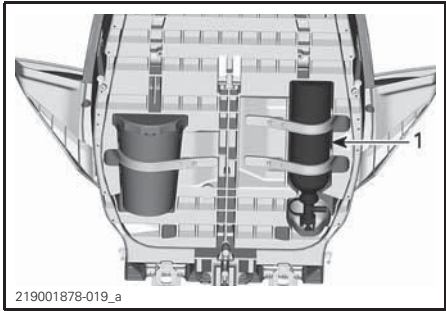
Never leave any heavy or breakable objects loose in the front storage bin. Do not overload. Never operate the watercraft with any storage compartment cover open or improperly secured cargo.

3) Fire Extinguisher Holder

NOTE: Fire extinguisher is sold separately.

The fire extinguisher support is located under the front storage bin cover.

Use the rubber tie-downs to properly secure the fire extinguisher.



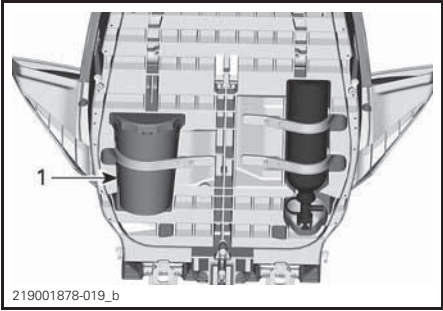
1. Fire extinguisher

4) Safety Kit Holder

NOTE: Safety kit is sold separately.

The safety kit support is located under the front storage bin cover.

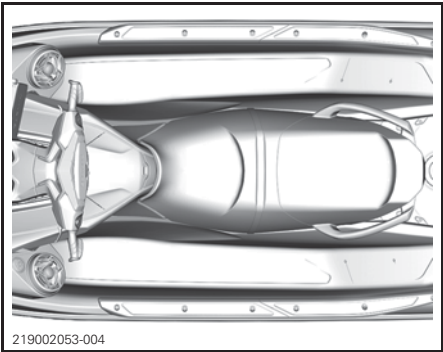
Use the rubber tie-downs to properly secure the safety kit.



1. Safety Kit

5) Seat

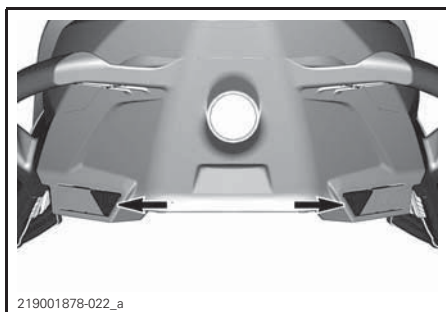
This model comes equipped with an ergonomic seat narrowing towards the front with knee grab design allowing you to position your legs towards the inside of the footwells, minimizing upper body fatigue and granting you more control when cornering.



ERGONOMIC SEAT

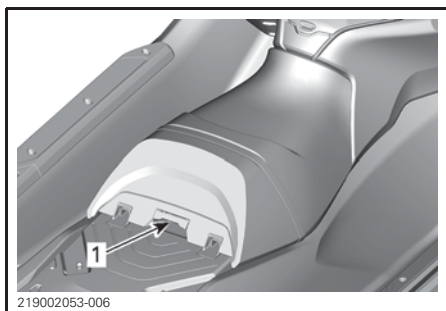
Seat Removal

To remove the seat, push on the two release buttons and lift the back end of the seat.



RELEASE BUTTONS

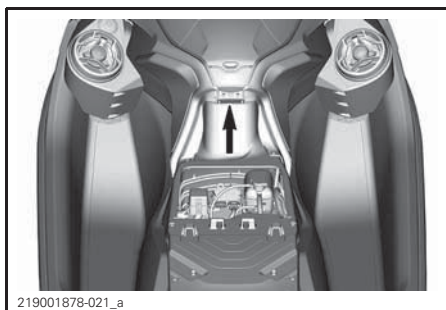
Then pull the latch handle up and remove the seat from the watercraft.



1. Latch handle

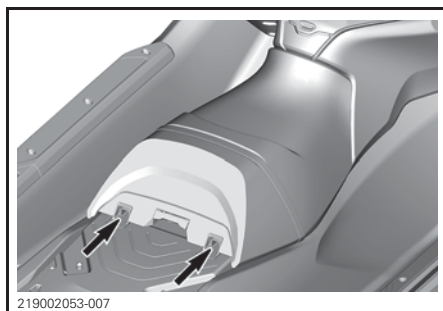
Seat Installation

To install the seat, insert the forward end of the seat in it's retainer.



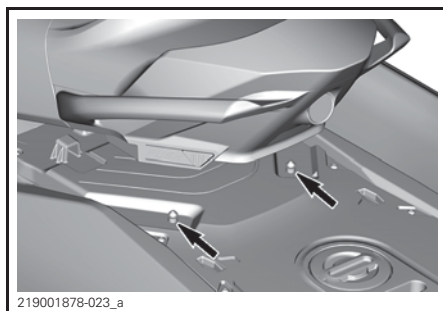
1. Seat retainer

Insert the forward part of the rear seat into the retainers.



SEAT RETAINERS

Align the seat latch with the latch pin and firmly press down on the rear portion of the seat to lock it in place.



LATCH PINS

Pull up on the rear portion of the seat to ensure it is properly latched.

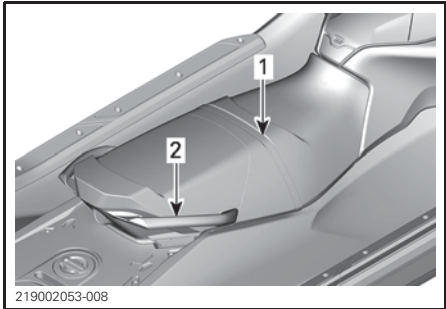
⚠ CAUTION Ensure the latch is properly locked onto the pin.

6) 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. The rear portion of the molded grab handle provides a handhold for the skier/wakeboarder (if applicable) spotter or boarding the watercraft from the water.

NOTICE Never use the molded grab handle to tow anything or to lift the watercraft.

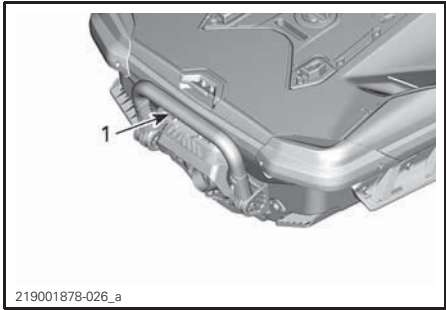


PASSENGER HANDHOLDS

- 1. Seat strap
- 2. Molded grab handle

7) Boarding Ladder (If Equipped)

A convenient ladder used for boarding the watercraft from the water.



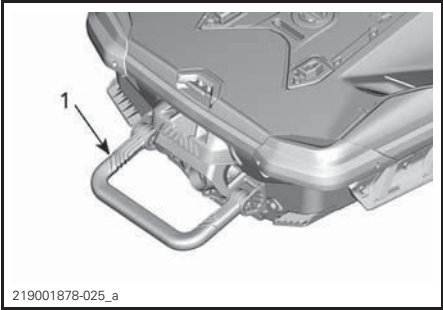
TYPICAL

- 1. Boarding ladder

⚠ WARNING

Do not apply throttle when anyone is boarding or at rear of PWC. You can shut down the engine

Pull down the ladder with your hand and hold until a foot or a knee is put on the ladder.



TYPICAL

- 1. Boarding ladder in lowered position

NOTICE

- Never use the ladder for boarding a watercraft that is out of water.
- Never use the ladder for pulling, towing, diving or jumping, or any other purpose other than as a boarding ladder.
- Stay on center of the ladder.
- Only one person at a time on the ladder.

⚠ 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.

8) Boarding Platform

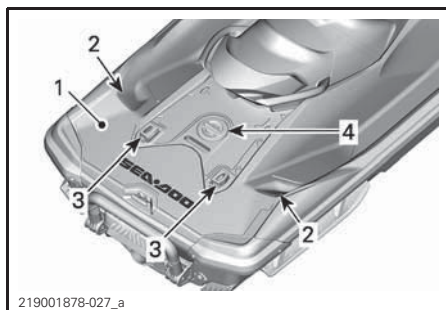
A boarding platform covers the rear deck area.

⚠ CAUTION The two LinQ attachment points are used to carry accessories and should always be retracted when not in use.

Two indentations in the platform are used as foot rests for the rear facing spotter when towing a skier, wakeboarder or tuber.

A ski pylon can be installed by removing the ski pylon hole cover in the middle of the platform. The ski pylon hole cover is **not** the fuel cap.

⚠ CAUTION Always install ski pylon hole cover when ski pylon is not installed.

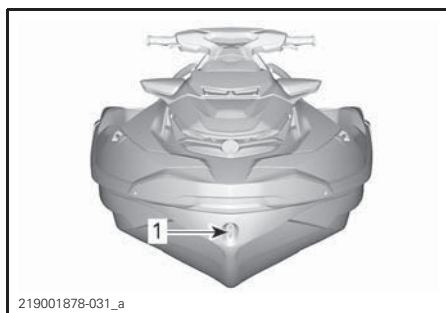


1. Boarding platform
2. Spotter foot rests
3. LinQ attachments
4. Ski pylon hole cover

9) Front and Rear Eyelets

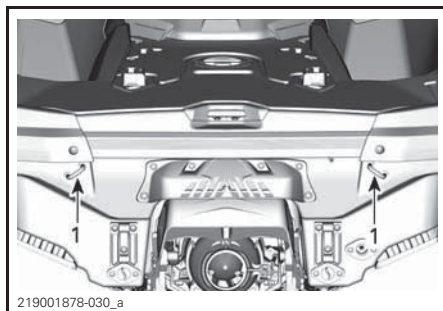
Eyelets can be used for mooring, towing and as tie-down points when trailering your watercraft.

Front Eyelet



TYPICAL
1. Front eyelet

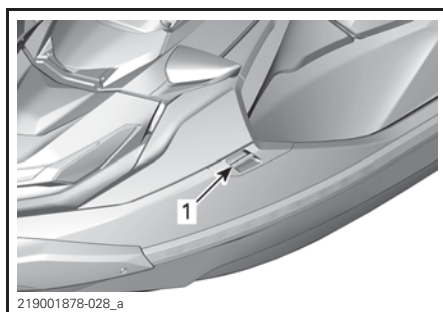
Rear Eyelets



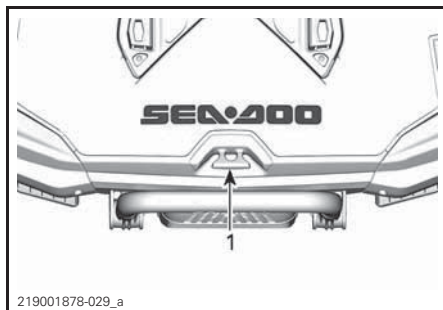
TYPICAL
1. Eyelets

10) Mooring Cleats

These cleats can be used for temporary docking such as when refueling. The rear cleat can be used to tow an inflatable tube.



TYPICAL
1. Mooring cleats

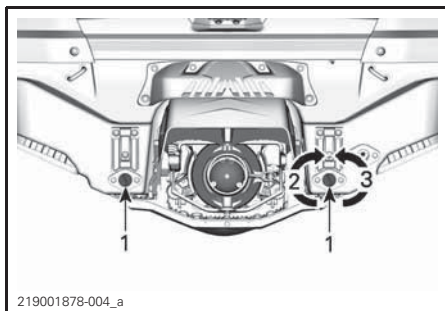


1. Mooring cleat

NOTICE Never use mooring cleats to pull or lift the watercraft.

11) Bilge Drain Plugs

Unscrew drain plugs whenever watercraft is on the trailer. This will allow water accumulated in the bilge to be evacuated and helps to reduce condensation.



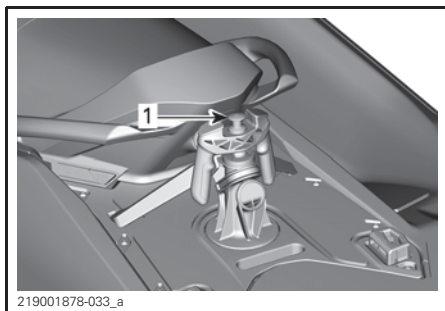
TYPICAL

1. Drain plugs
2. Tighten
3. Loosen

NOTICE Ensure drain plugs are properly secured prior to launching the watercraft in water.

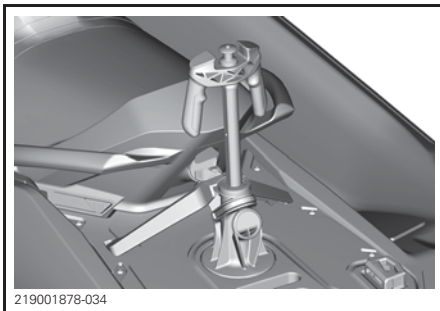
12) Retractable Ski Pylon (WAKE Pro model)

Pull up on the knob to extend the pylon. Ensure both sections of pylon are fully extended and properly locked before attaching ski or wakeboard rope.



SKI PYLON RETRACTED

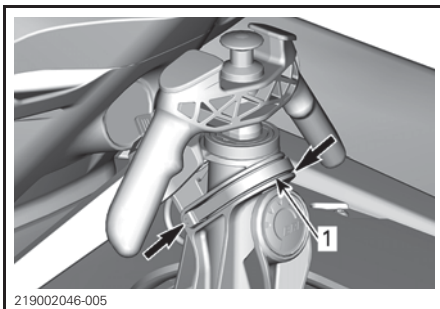
1. Pull on this knob to extend



SKI PYLON EXTENDED

To retract the pylon, push straight down on the top.

If the pylon becomes difficult to extend or retract, simultaneously push in on both sides of the locking clip toward front of watercraft.



TYPICAL - PUSH TOWARD FRONT TO UNLOCK AND REMOVE PYLON

1. Locking clip

⚠ WARNING

Make sure ski pylon is fully extended and locked before use. Completely retract and lock when not used. Use caution with skier/wakeboarder in tow as tow rope may backlash to watercraft when released. Never perform a sharp turn when towing a skier or wakeboarder. Always store tow rope when not in use.

⚠ WARNING

When using the ski pylon, never carry cargo or accessories on the boarding platform.

⚠ WARNING

Always install the passenger seat when the ski pylon is installed.

NOTICE The ski pylon is designed for towing a skier or wakeboarder with a maximum weight of 114 kg (250 lb).

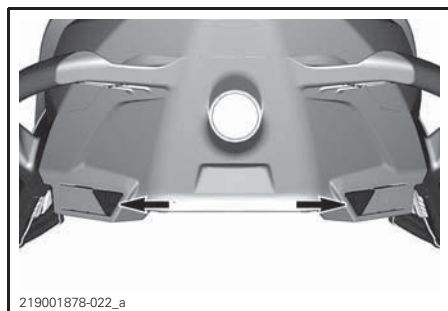
Always have one person other than the operator as an observer.

NOTE: The handles on the ski pylon are provided as a handhold for the observer.

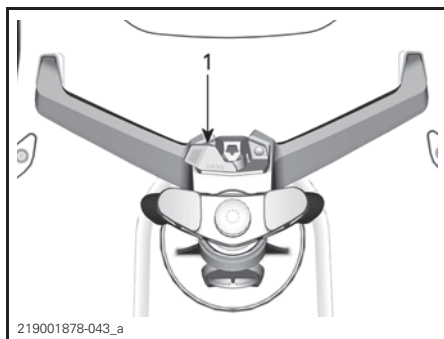
NOTICE Never use the ski pylon to tow other watercrafts. Respect the maximum load limit rating of the ski pylon. Overloading can affect maneuverability, stability and performance. In case of emergency, use rear mooring cleat to tow other watercraft.

Removing/installing the Ski Pylon

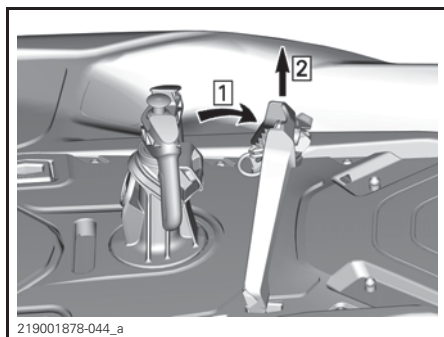
Remove the rear seat.

**RELEASE BUTTONS**

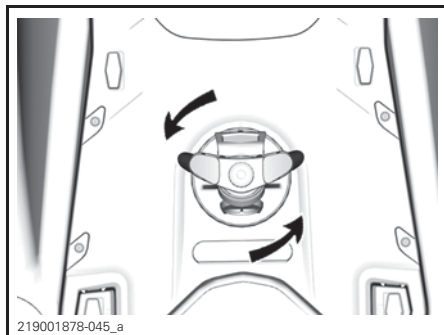
Unlock the LinQ attachment.

**1. LinQ lever**

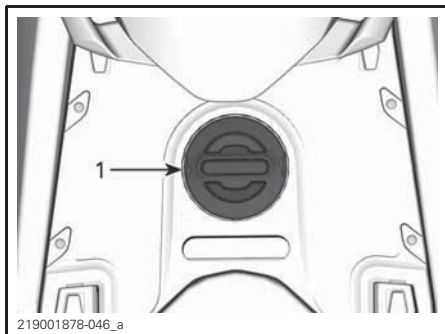
Tilt the support toward the front and lift.

**1. Tilt support****2. Lift support**

Unscrew the pylon by turning it one quarter of a turn and lifting it.



NOTICE It is very important to install the ski pylon hole cover to prevent water infiltration into the hull.



1. Ski pylon cover

When not in use, safely store the pylon and support in an appropriate location.

Never ride without the rear seat installed.

The installation is the reverse of the removal procedure.

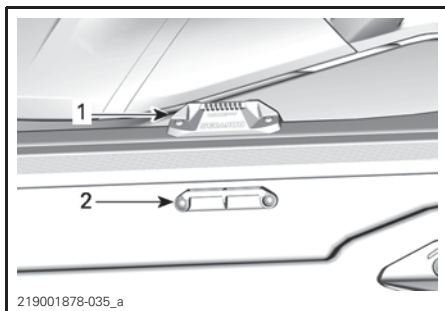
13) Wakeboard Rack (WAKE Pro model)

A convenient removable rack to carry a wakeboard on the watercraft when on the water.

NOTE: The wakeboard rack can be installed on the LH side of the watercraft.

To install:

1. Insert the hooks on the lower portion of the rack into the lower retaining bracket located on the hull under the LH side bumper.

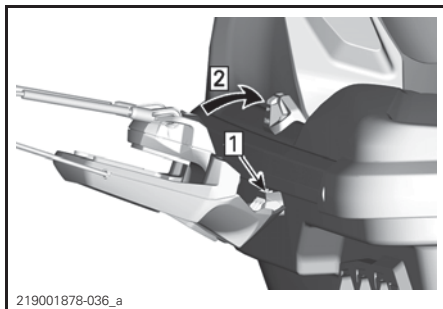


RETAINING BRACKETS FOR WAKEBOARD RACK

1. Upper retaining bracket
2. Lower retaining bracket

2. Rotate the rack upwards and push the top of the rack inboard until the handle locks into the top retaining bracket.

- 2.1 Insert the hooks of the lower portion of the rack into the lower retaining bracket
- 2.2 Rotate the rack upwards and push the top of the rack inboard.



Step 1: Insert
Step 2: Rotate

⚠ WARNING

If rack is not properly secured on the watercraft, it could become loose and detach unexpectedly, creating a risk of injury to people nearby. Periodically ensure the rack is properly locked on its support.

3. When installing a wakeboard on the rack, position wakeboard fin(s) outward with the heel of the boots facing down near freeboard of the PWC.

4. Secure wakeboard using bungee cords.

⚠ WARNING

To avoid possible injuries and cuts from the wakeboards fin(s), always place FIN(S) OUTWARDS.



219001878-038

WAKEBOARD INSTALLED WITH FINS OUTWARD

5. After installation, pull and push wakeboard to ensure it is tightly secured to rack.

⚠ WARNING

If the wakeboard is not properly secured on the rack, it could become loose and detach unexpectedly, creating a risk of injury to people nearby. To avoid:

- Inspect bungee cords condition and replace if damaged.
- Secure wakeboard properly on rack.
- Periodically ensure the board is properly attached.

NOTE: When the wakeboard is removed from its rack, secure the bungee cords so that they will not move freely when riding watercraft.

NOTICE The rack is designed to hold one wakeboard. Do not use to hold more than one wakeboard or to transport skis or any other object. Do not use rack(s) as mooring points or to reboard.

⚠ WARNING

With wakeboard and/or rack installed, operate with extra caution:

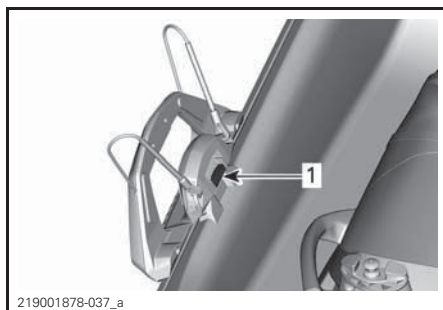
- NEVER perform aggressive maneuvers including a spin-out.
- NEVER jump waves.
- Use common sense and limit speed.

Otherwise, the wakeboard could detach or occupants could fall off and injure themselves against the wakeboard or rack.

⚠ WARNING

When trailering the watercraft, NEVER leave a wakeboard installed on the rack. Otherwise, wakeboard fin(s) could cause injury to bystanders or wakeboard could fly off on the road. The bungee cords are under tension and could spring back and whip someone when released. Use caution.

To remove the wakeboard rack, depress the lever at the top of the rack and remove it from its retaining brackets.



219001878-037_a

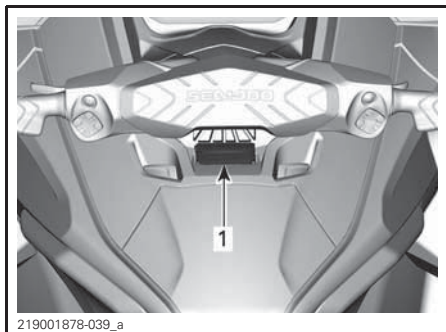
WAKEBOARD RACK REMOVAL

1. Press this handle to release wakeboard rack

14) Steering Tilt Handle

The handlebar position can be adjusted to suit rider preferences.

To perform this adjustment, pull on the release handle at the base of the steering column just ahead of the glove box, and tilt the handlebars to the desired position.

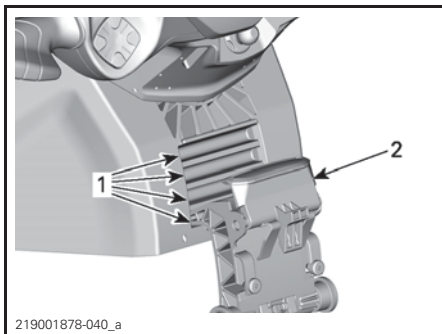


1. Release handle

When the handlebars are at the desired position, release the latch handle and ensure the latch pawl properly engages a groove in the steering support. Also ensure the latch handle is in the forward position.

⚠ WARNING

To prevent sudden movement of the steering column, always ensure the pawl on the steering column latch is properly engaged in one of the grooves on the steering support.



STEERING COLUMN ADJUSTMENT LATCH SECURED

1. Steering support grooves
2. Release handle locked

15) BRP Audio Premium System (If equipped)

The BRP Audio Premium sound system is composed of two waterproof speaker enclosures that connect via bluetooth to a smartphone, a keypad and, on Limited models, a USB port.

When the START/STOP button is pressed, the system will be powered for 75 seconds. When the tether cord is installed on the engine cut-off switch and the START/STOP switch is depressed, the system will be powered for 60 minutes. This will permit listening to the BRP Audio Premium system for an extended period. When the battery drops below 12.3V, the LOW BATTERY indicator lamp will light up and the electrical system will shut down after 10 seconds to allow enough power in the battery to start the engine.

Bluetooth Pairing Mode - When the unit is powered On, the remote 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, the **Play/Pause/Power** (1) light will blink. To manually enter the pairing mode, hold down the **Play/Pause/Power** button for 1 second. The unit will emit 2 small beeps and the Play/Pause/Power button will

start blinking to indicate it's in pairing mode. Search for BRP REMOTE from your device's Bluetooth menu.

NOTE: All previously paired devices nearby must be turned OFF.

When paired, select a playlist or other source of music from your smartphone.

Never pair a smartphone or change the playlist or music source on the device while driving or operating the vehicle.

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.



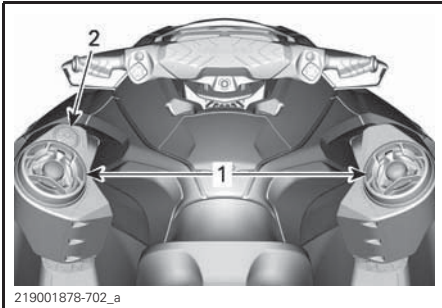
219001878-700_b

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. Note that all the buttons will illuminate when the unit is powered On.

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.

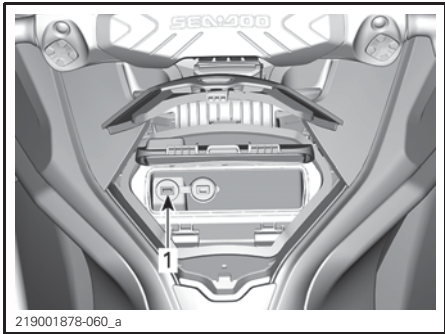
On all vehicles except the Limited, the USB port located inside the glove box watertight compartment is only used to charge the smartphone, not to transfer the music.



219001878-702_a

1. Speakers
2. Keypad

The keypad is used to control the sound system.

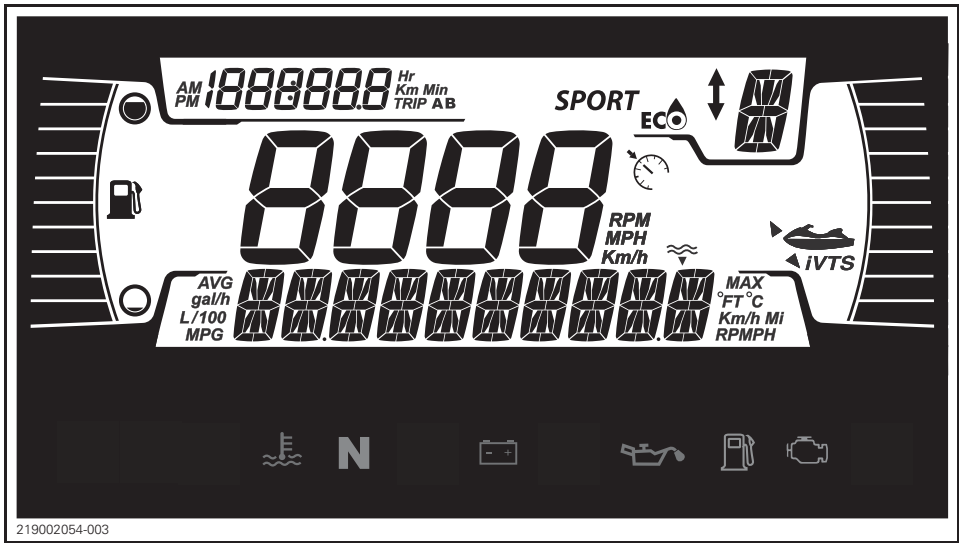


1. USB charging port

⚠ CAUTION Prolonged exposition to loud music can damage your hearing. Therefore, we suggest a 10 minutes break time every 45 minutes of listening.

4.5" DIGITAL DISPLAY

Multifunction Gauge Description

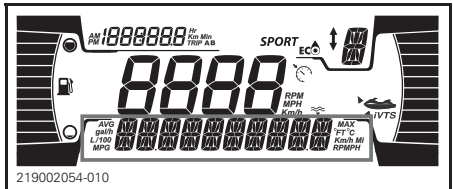


⚠ WARNING

Reading or tampering with the multifunction gauge can distract you from the operation of the vehicle, particularly from constantly scanning the environment. Always pay attention to water conditions, ensure your environment is clear and free from obstacles. Furthermore, when riding, only glance at the multifunction gauge briefly to stay focused on your environment.

The multifunction gauge includes digital gauges (temperature and tachometer), telltale lights, icons and a digital screen to see important information (speed, RPM, etc.).

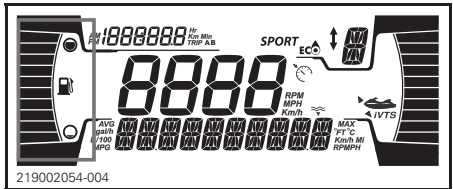
Lower Display



User can decide to display one the following:

- RPM
- Depth (if equipped)
- Settings
- Messages
- Speed Stat (if equipped)

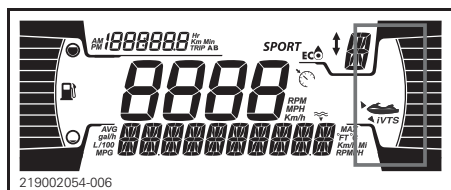
Left Lateral Display



The left lateral display includes:

- Fuel level indicator

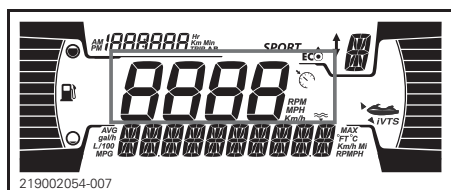
Right Lateral Display



The right lateral display includes:

- VTS position

Central Display

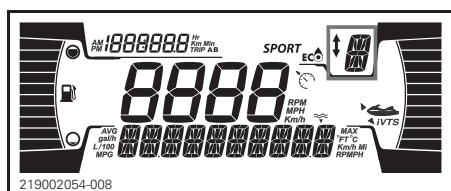


The central display includes:

- Vehicle speed
- Speed control indicator (if equipped)

The speed control indicator in this display is only activated when a target speed is set.

iBR Position Display

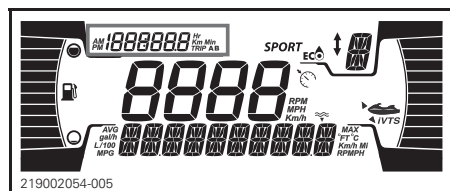


This display shows gears position of the iBR (if equipped):

- N (neutral)
- F (forward)
- R (reverse)

It can also display the selected speed level (1 to 9) when the slow speed mode is selected.

Left Upper Display



The left lateral display includes:

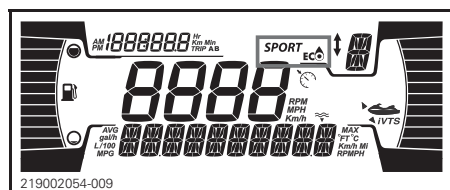
- Tripmeter
- Clock

User can decide to display one the following on the tripmeter:

- Vehicle hours : Displays the total vehicle hours
- Trip KM : Displays the distance since the last reset.
- Trip HR : Displays the time since the last reset.

NOTE: Clock is shown only if the integrated GPS receives a signal from the satellites. This may take several seconds after waking up the system.

MODE Display



The MODE display indicate the selected alternative mode of operation:

- SPORT
- ECO

To cycle through the MODES;

- Press MODE button,
- Acknowledge the safety message by pressing and holding MODE button will get the SPORT mode,
- Pressing MODE button again will activate the SKI mode (if equipped),
- Pressing MODE button again will activate the ECO mode.

NOTE: The SKI mode has no icon in the digital display. Refer to *OPERATING MODES* for more details.

Warning Lamps and Indicators

The following indicator lamps will alert you to a vehicle condition that may become serious. Some lamps will illuminate when starting the vehicle to make sure they work. If any lamps remain on after starting the vehicle, refer to the respective system warning lamp for further information.

NOTE: Some warning indicators appear in the display of the multifunction gauge and function the same as an indicator lamp but do not display when starting the vehicle.

Telltale Lights - Lower Bar



LIGHTS	DESCRIPTION
	ORANGE - Vehicle malfunction
	RED - The engine temperature is too high.
	GREEN - The neutral gear is selected
	RED - If illuminate while driving, it indicates a malfunction. Turn off all unnecessary electrical equipment and have the electrical and charging systems checked.

LIGHTS	DESCRIPTION
	RED - If illuminate while the engine running or while driving, this indicates a malfunction. Stop the vehicle as soon as it is safe to do so and turn the engine off. Check the engine oil level. Have the lubrication system checked as soon as possible, even if the level being correct.
	ORANGE - Illuminate when the fuel level is low or when the fuel tank is near empty. Refuel as soon as possible.
	ORANGE Turned on: Malfunction of the vehicle emissions control system Blink: Engine limitation, the limp home mode is activated. Have the vehicle serviced immediately.

Icons and Indicators - Multifunction Display

ICONS	DESCRIPTION
	Denotes SPORT mode is selected.
	Denotes ECO mode is selected.
	Steady ON: indicates that the VTS is activated (if equipped).
	Denotes Speed Limiter or Slow Speed mode (if equipped)

SETTINGS

TO...	ACTION
Navigate in the menu	Single press on INFO
Enter menu	Long press INFO
Edit value	Single press on INFO
Change information display	Press TRIP
Reset Trip when displayed)	Long press TRIP
Fault codes/ Maintenance	Long press INFO

Use the RIGHT arrow button or LEFT arrow button to navigate through setting menus. Use OK button to enter setting menu, to confirm selection or reset some values. Use UP arrow or DOWN arrow to change selected value.

Settings Menu

Using the RIGHT or LEFT arrow button, select **SETTINGS** and press OK button to enter setting menus.

Maintenance Reset

Select **RES MAINT** and hold OK button to reset maintenance.

NOTE: The maintenance reset can only be done within the first 15 seconds of ECM wake-up when a maintenance is required.

Display Codes

Refer to *DISPLAYING FAULT CODES*.

Setting Tripmeter

Select **TRIP** and press UP or DOWN arrow button to cycle through **Vehicle Hours**, **Trip KM** and **Trip HR**.

Press and hold OK button to reset selected trip info.

Setting Learning Key

Connect a normal key to the vehicle. Select **L-KEY #** and press UP or DOWN arrow button to set the desired learning key level between 1 and 5.

Press and hold OK button to confirm.
NOTE: The default learning key level is 1 (lowest performance).

Unit Selection

Select **UNITS** and press UP or DOWN arrow button to change units.
NOTE: Changing units will apply to all the displayed units.

Setting Brightness

Select **BRIGHTNESS** and press UP or DOWN arrow button to adjust brightness level (from -4 to 4).

Setting Clock

- Select **CLOCK**.
1. Press INFO button to select clock display.
 2. Long press INFO button to enter clock editing.
 3. Press INFO button to select 12:00 AM PM or 24:00 time base.
 4. Long press INFO button to confirm and display hours.
 5. Press INFO button to change hours.
 6. Long press INFO button to confirm.

NOTE: Menu available only if GPS is synchronized.
To exit **SETTINGS**, select **EXIT** and press OK button.

Resetting speed statistics (if equipped)

Select **SPEED STAT** and press and hold OK button to reset the speed statistics.
NOTE: The speed statistics are automatically reset after the gauge shut down.

Setting Language

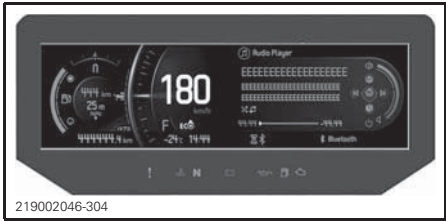
The language of the display is factory setup by default in English. Refer to an authorized Sea-Doo dealer for language availability and to setup the gauge to your preference.

LARGE PANORAMIC 7.8" WIDE LCD DISPLAY

Basic Functions

LCD Display

Default Display



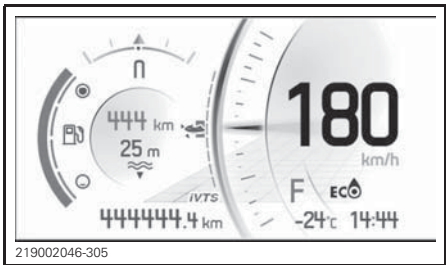
Multifunction Display



Left Lateral Display

The left lateral display includes:

- Fuel level indicator
- Speedometer
- Tripmeter
- Speed limiter
- Clock
- Driving modes
- Warning pop-up
- Distance or time to empty
- Water temperature
- Compass
- VTS position



To select the value to be displayed in the tripmeter;

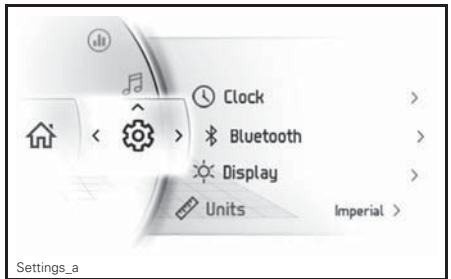
1. Access the Stats/Trip screen
2. Select the desired set of statistic to be shown (Total, A or B)

To adjust the VTS, press the VTS UP or VTS DOWN button.

Right Lateral Display

The right lateral display includes:

- Tachometer
- Audio volume
- Menu
 - Phone
 - Statistics
 - Audio
 - Settings



Navigating in the Digital Display

⚠ WARNING

Reading or tempering with the multifunction gauge can distract you from the operation of the vehicle, particularly from constantly scanning the environment. Always pay attention to your surroundings, ensure your environment is clear and free from obstacles. Furthermore, when riding, only glance at the multifunction gauge briefly to maintain awareness of your surroundings.

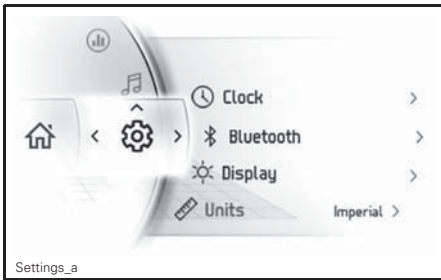
The multifunction gauge includes analog gauges (speedometer and tachometer), indicator lamps and an infotainment center with a digital screen.

We recommend you practice selecting some functions on the infotainment center before leaving the dock. You will get used to them and they will be easier to use once you leave the dock.

Pressing the OK button will get the Menu selection in the right screen, in this order:

- Phone
- Statistics
- Audio
- Settings

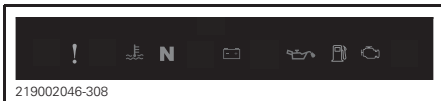
When an icon is selected, its related screen will appear.



When an item is selected, this sets the item to the current value.

Indicator Lamps

Warning and Telltale Lights



LIGHTS	DESCRIPTION
	ORANGE - Vehicle malfunction
	RED - The engine temperature is too high.

LIGHTS	DESCRIPTION
	GREEN - The neutral gear is selected
	RED - If illuminate while driving, it indicates a malfunction. Turn off all unnecessary electrical equipment and have the electrical and charging systems checked.
	RED - If illuminate while the engine running or while driving, this indicates a malfunction. Stop the vehicle as soon as it is safe to do so and turn the engine off. Check the engine oil level. Have the lubrication system checked as soon as possible, even if the level being correct.
	ORANGE - Illuminate when the fuel level is low or when the fuel tank is near empty. Refuel as soon as possible.
	ORANGE Turned on: Malfunction of the vehicle emissions control system Blink: Engine limitation, the limp home mode is activated. Have the vehicle serviced immediately.

Icons and Indicators

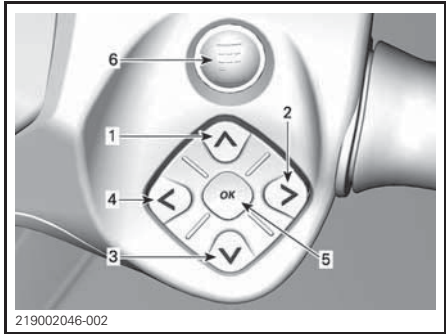
ICONS	DESCRIPTION
<i>SPORT</i>	Denote SPORT mode is selected.
	Denote ECO mode is selected.
<i>SKI</i>	Denote SKI mode is selected (If equipped)

ICONS	DESCRIPTION
	Indicate the direction of the vehicle. Not to be used for precision navigation purposes.
	Flashing: indicate that the Launch Control is ready.
	Steady ON: indicate that the VTS is activated.
	When lit, indicates that a maintenance is required. See your authorized Sea-Doo dealer or person of your own choosing for the maintenance
	Denote Speed Limiter, Slow Speed or Ski mode is selected. (If equipped)
	When lit, indicates a failure of the iBR system. See your authorized Sea-Doo dealer or person of your own choosing for repairing.
	Denote WATER DEPTH mode is selected (If equipped)
	Smartphone Network connection
	Bluetooth device
	Smartphone battery level indicator

ICONS	DESCRIPTION
	Fuel indicator
	Temperature indicator
	Speakers audio output

Settings

Menu Switches



RIGHT SIDE OF HANDLEBAR

- 1. UP button
- 2. RIGHT button
- 3. DOWN button
- 4. LEFT button
- 5. OK button
- 6. BRP CONNECT button

Use the directional buttons to control numerous functions of the multifunction gauge.

Use the BRP Connect button for quick access to BRP connect. Each click will swap between apps view and functions view of the multifunction gauge.

Menu

BRP Connect



Before using BRP Connect, the app must be downloaded to the phone. The app can be downloaded from the Apple App Store or Google Play Store via a simple search. Not all phones are compatible.

Visit our website for more details:

www.brpconnecttutorial.com

NOTE: The smartphone must be connected via Bluetooth **and** with a USB cable to the USB port located in the glove box.

User's personal data will be deleted from the cluster when phone pairing is deleted.

User agree that personal data (contact list and call history) be transferred to the cluster when smartphone is connected.

Contact list and call history are stored in cluster permanently. To delete these information you must un-pair your smartphone or overwrite using another smartphone.

Statistics



The Statistics menu is used to get :

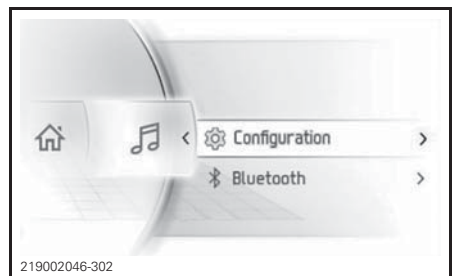
- Trip distance information
- Trip elapsed time information
- Instant fuel consumption
- Average fuel consumption
- Maximum speed
- Average speed

3 sets of statistics are kept in memory. Each set of statistics can be reset independently.

The LEFT button and RIGHT button will navigate between the 3 sets of statistics.

Holding the DOWN button when showing a stored value will reset it.

Audio



The phone Audio menu is to:

- Adjust the configuration of:
 - Auto volume control
 - Equalizer
 - Fade/Balance
- Access Bluetooth Audio Player

Audio Control

NOTE: The directional buttons controls the audio commands when in the Home screen.

Use the directional buttons to control the audio volume. UP buttons for louder.

To mute the audio, push the DOWN button and hold it for more than one second. From the Mute setting, pushing UP button will reset the audio volume to its previous level.

A separate volume level is used for announcement (i.e.: Voice command from the BRP Connect Navigation App). During an announcement, the volume bar will display the announcement volume level. The volume bar will be yellow and the audio source will show **ANNOUNCEMENT**. It is possible to adjust the announcement volume level during the announcement.

When Bluetooth audio source is selected, the left and right functions will be as follows:

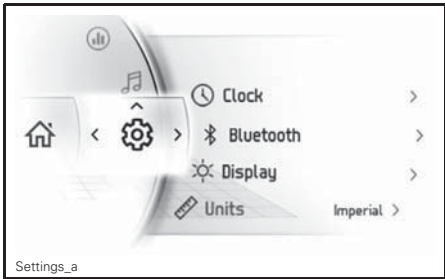
- Left: Previous song
- Right: Next song

Audio Configuration

The Audio Configuration menu is as follows:

- Automatic volume control
- Equalizer
- Fade / Balance

Settings



The Settings menu is to:

- Adjust clock
- Pair Bluetooth devices
- Adjust the display brightness
- Adjust the units (Imperial/Metric)
- Personalization distance or time to empty
- Set the language
- Get the version
- Show vehicle fault codes

Mode Switches

Use the following buttons to select and/or adjust the different available modes.



LEFT SIDE OF STEERING

1. VTS UP button
2. VTS DOWN button
3. SPEED LIMITER button
4. MODE button

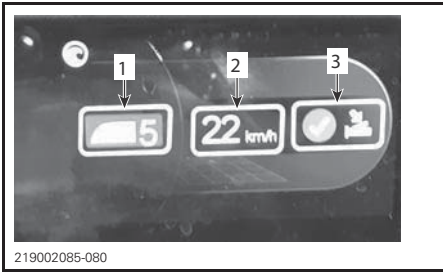
Changing the Drive Mode

Different drive mode are available: Normal, Sport, Ski and ECO.

To change the drive mode, press the MODE button located on the left controller.

Programming the Ski Mode

1. Using the MODE button, select SKI. The right display will change to show the Ski mode settings.



1. Power ramp
2. Desired speed
3. Confirmation

2. Adjust the appropriate power ramp (1 to 5).
 - 1 = low power and slow start.
 - 5 = Full power and fast start.

The selection must be done accordingly to experience of the towed person, his weight and the water skiing equipment used (ski or board).

3. Select the desired speed by the towed person.
4. Confirm your selection.

Pairing your Smartphone Via Bluetooth

1. On the vehicle
 - 1.1 Short press the directional buttons to access menu.
 - 1.2 Go down and select "Settings" and press **RIGHT**.
 - 1.3 Select "Bluetooth" and press **RIGHT**.
 - 1.4 Select "Phone" and press **RIGHT**.
 - 1.5 Select "Add Phone" and press **RIGHT**.

Bluetooth is now visible.

2. On the phone
 - 2.1 Activate your phone's bluetooth function.

NOTE: Refer to your manufacturer's user guide for detailed procedure.

- 2.2 Choose "BRP Connect".

- 2.3 A confirmation number will appear on your phone screen and the vehicle gauge screen. Make sure these numbers match.
- 2.4 Press "Pair" on your phone and select the green check mark on the vehicle gauge.
- 2.5 Allow Contacts and Favorite Sync on your phone.

BRP Connect App

Follow these steps to setup your smartphone with BRP Connect.

1) Download the BRP Connect Smartphone App

Download the BRP Connect app via the App Store for Apple™ or the Google™ Play Store for Android.

2) Download Apps Compatible With BRP Connect

Visit our website to know more about the compatible apps:

These apps will improve your riding experience. Some apps may require additional purchase to be compatible with the system or may require additional devices to be used.

www.brpconnecttutorial.com

3) Connect your smartphone using your charging / data transfer cable

It is recommended to use an original charging cable from the smartphone OEM to optimize transfer between the phone and the vehicle. Use the front USB port.

1. Unlock your phone screen
2. Connect your phone charging cable
3. A checkmark will appear on your phone screen once the connection is done.

4) Access your Apps

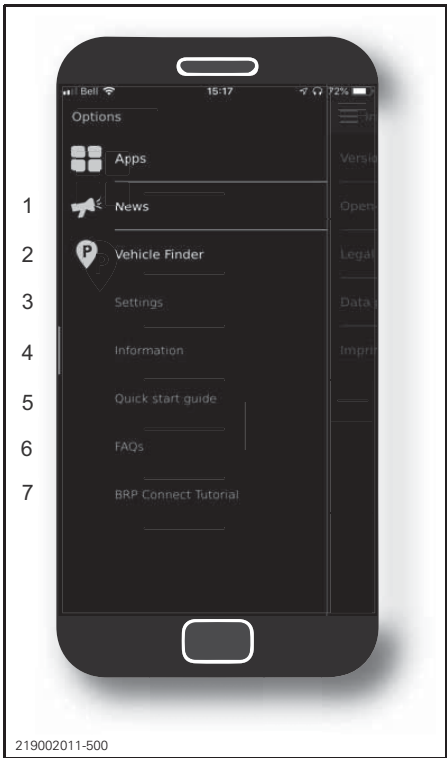
Quick press the OK button to access Menu.

Push **UP** to select "Launch BRP Connect" and push **RIGHT**.

Select the app you would like to use and press OK.

- To leave the app, long press OK.
- To return to the Main Menu, press the BRP Connect Button.

Quick Tour of the BRP Connect App



- 1) News: Communications may occasionally be issued through the BRP Connect app and can be found through this menu.

- 2) Vehicle Finder: Allows you to store the location of your vehicle (or any other location you wish to remember). The feature is relatively rich as it also allows you to take a picture of the location you left your vehicle at, take notes (e.g. number of the parking spot) and also navigate back to your stored location. Only one location can be saved at a time.
- 3) Settings: Set BRP connect to your choosing. In which country do you intend to use the BRP Connect App? What should be worth your attention? Note: Elementary settings of the BRP Connect app change be changed from within this menu.
- 4) Information: General information about the BRP Connect app. States the current version and all legal information.
- 5) Quick Start Guide: Want to learn how to use this app? Here is how it works.
- 6) FAQ: This link takes you to answers of common questions asked by riders like you. An internet connection is required.
- 7) BRP Connect Tutorial: Need to know more? This link takes you to detailed instructions videos. An internet connection is required.



- 1) Currently Installed Apps
- 2) Available Apps

Messages in Multifunction Gauge

Important information about vehicle condition is displayed on the multifunction gauge. When starting the engine, always look at the gauge for any indicator lamps or special messages.

INDICATOR LAMPS (MALFUNCTIONS)			
INDICATOR LAMP	MESSAGE/ WARNING	CAUSE	WHAT TO DO
No indicator lamp	 BAD KEY	Defective key	Contact an authorized Sea-Doo dealer.
	 WRONG KEY	Wrong key	Use the right key for the vehicle or contact an authorized Sea-Doo dealer.

INDICATOR LAMPS (MALFUNCTIONS)			
INDICATOR LAMP	MESSAGE/ WARNING	CAUSE	WHAT TO DO
	 HIGH ENGINE TEMPERATURE	Engine is overheating	– Stop and wait for engine to cool off. – Check for leaks. – Check coolant level and adjust (see <i>MAINTENANCE PROCEDURES</i>).
	 LIMP HOME MODE	Important engine management component	Have the vehicle transported to the nearest authorized Sea-Doo dealer. If you operate the vehicle in LIMP HOME, avoid abrupt maneuvers. In LIMP HOME, the engine RPM is limited and therefore the vehicle speed.
	 LOW OIL - STOP ENGINE	Low oil pressure	– Check for oil leaks. – Check oil level and adjust (see <i>MAINTENANCE PROCEDURES</i>).

Important information messages can also be displayed temporarily to assist indicator lamps.

A combination of two different warnings can occur.

When a digital warning appears, it will show the warning for 6 seconds and then the warning will disappear for 60 seconds. During the 60 seconds, the small digital indicator will flash. This sequence will be repeated three times and then will stop for 15 minutes. During the 15 minutes only the indicator lamps will be activated.

BREAK-IN PERIOD

Operation During Break-In Period

A break-in period of 10 operating hours is required 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.

Make sure to practice each boarding method until fully able to safely board in any potential condition.

⚠ WARNING

Do not apply throttle when anyone is boarding or at rear of PWC. You can shut down the engine

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.



Boarding from Shallow Water

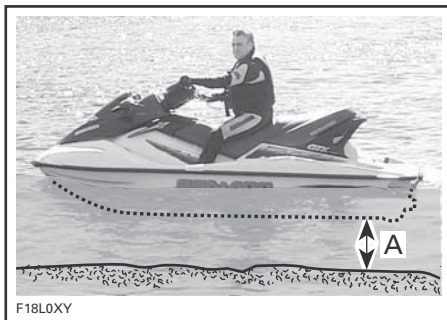
In shallow water, board the watercraft from either the side or the rear.

⚠ 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 jet pump.



- 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 impeller or other jet pump components.
- Stay on center of the step.
- Only one person at a time on the ladder.

! 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.

Boarding in Deep Water**! WARNING**

- Keep limbs away from propulsion system or intake grate.
- Never use propulsion systems a supporting point to board the watercraft.
- Ask inexperienced riders to practice how to board the watercraft close to shore (all methods explained here) before venturing into deep water, especially when cargo is installed aboard on the rear platform.

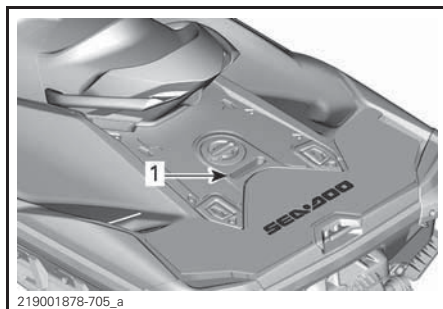
! WARNING

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 propulsion system or iBR gate as a supporting point to board the watercraft.

Operator Alone***Models Without a Boarding Ladder***

1. Using one hand, grab the rear handle.



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1. *Rear handle*

NOTE: If cargo is properly secured on the boarding platform, it can be used as a handle or removed and set aside in the footwell to get access to the handle. Always properly secure the cargo before riding.

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.



TYPICAL

4. Take hold the seat or the seat strap to help maintain your balance and step forward onto the footboards on either side of the seat.



TYPICAL

Sit astride the seat.

It is possible to swim toward side, use passenger handhold and/or seat strap to lift yourself aboard.

NOTE: The side boarding method is not recommended as a first try boarding method. It must only be used in last resort as it is not the easiest method to board a watercraft.

Models with a Boarding Ladder

Swim to the rear of the watercraft.

Using one hand, lower the boarding ladder.



TYPICAL

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 ladder.

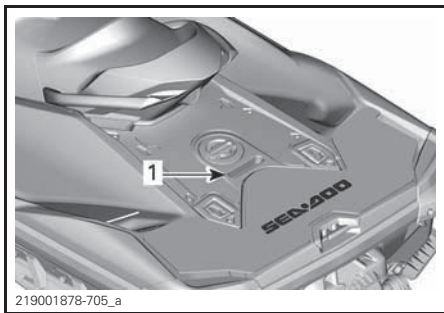


TYPICAL

NOTICE

- Stay on center of the ladder.
- Only one person at a time on the ladder.

Reach forward with one hand and take hold of the molded handles on the sides of the back seat or the rear handle, then stand on the boarding ladder.



1. Rear handle



smo2009-002-142

TYPICAL

NOTE: If cargo is properly secured on the boarding platform, it can be used as a handle or removed and set aside in the footwell to get access to the handle. Always properly secure the cargo before riding.

With both hands on the handle behind the seat, step up onto the boarding platform.



smo2009-002-143

TYPICAL



smo2009-002-144

TYPICAL

Take hold of the seat strap to help maintain your balance and step forward onto the footboards on either side of the seat.



smo2009-002-145

TYPICAL

Sit astride the seat.

Operator with a Passenger

The operator climbs on the watercraft in the same way as explained previously.

In choppy water, while in the water, the passenger may hold the watercraft steady to help the operator climb aboard.



smo2009-002-146

TYPICAL

NOTICE

- Stay on center of the step.
- Only one person at a time on the step.

The passenger then climbs onto the watercraft while the operator maintains balance by sitting as close as possible to the console.



smo2009-002-147

TYPICAL - MODEL WITH BOARDING LADDER SHOWN



smo2009-002-148

TYPICAL - MODEL WITH BOARDING LADDER SHOWN



smo2009-002-149

TYPICAL



smo2009-002-150

TYPICAL

How to Start Engine

WARNING

Before starting the engine:

- Be sure riders are properly seated and holding on a handhold or hold on the waist of the person in front of them.

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.

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 impeller or other jet pump components may occur.

1. Attach the tether cord clip to your PFD or to the wrist (wrist strap required).
2. Firmly grip handlebar with your left hand and place both feet on the footboards.
3. Press the engine START/STOP button to wake up the electrical system.
4. As the information center cycles through its self test function, install the tether cord on the engine cut-off switch.

⚠ WARNING

The tether cord shall always be attached to the operators personal flotation device or to the wrist (wrist strap required) when starting or operating the watercraft.

- Depress the START/STOP button to start the engine.

NOTICE In the event the engine does not start right away, do not hold 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. Refer to *TROUBLESHOOTING* section.

- Release engine START/STOP button after engine is started.

How to Stop the Engine**⚠ WARNING**

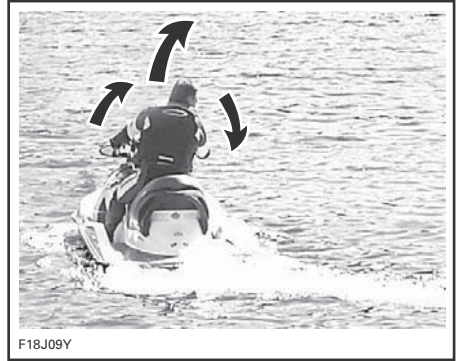
To maintain watercraft directional control, the engine shall be running until the watercraft is stopped.

To shut off the engine, press the engine START/STOP button or pull off the tether cord cap 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.

If the engine is shut off using the START/STOP button and the tether cord is left on the engine cut-off switch, the electrical power will shut off after approximately 60 minutes to prevent battery discharge.

How to Steer the Watercraft

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 and inversely. You need to apply throttle to steer.

⚠ WARNING

Throttle must 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) shall 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.

How to Engage Neutral

WARNING

The drive shaft and impeller are always turning when the engine is running, even when the iBR gate is set to the neutral position. Keep away from the propulsion system of the watercraft.

When the watercraft is first started, the iBR system automatically sets the iBR gate to the neutral position by default.

If the gate is in forward thrust position, tap the iBR lever. The gate will move to neutral.

If braking or reverse is used, the iBR gate will move to the neutral position when the iBR lever is released, if throttle is not applied.

NOTE: The throttle lever must be fully released for the iBR gate to move to the neutral position when the iBR lever is released.

If the engine is stopped in forward or reverse, the iBR gate will move to the neutral position on engine shutdown.

How to Trim the Neutral Position of the iBR

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.

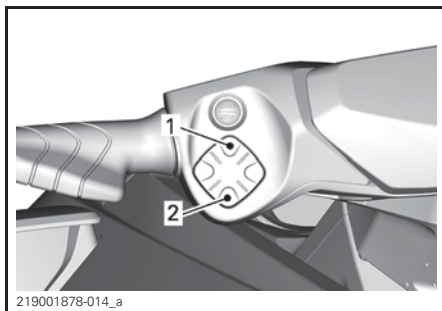
To enter the Neutral Adjustment mode, hold down the VTS up or down button for 0.5 Sec.

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.



VTS CONTROL BUTTON

1. Bow up
2. Bow down

To exit the **Neutral Adjust**, press OK button or wait 25 sec.

How to Engage Forward

To engage forward thrust from neutral, tap on the throttle lever. The gate will move to forward thrust position and the watercraft will accelerate forward.

To engage forward thrust from reverse, release the iBR lever while applying throttle moderately.

To re-engage forward thrust from braking, simultaneously pull in the throttle lever while releasing the iBR lever. The watercraft will accelerate forward after a short delay.

How to Engage and Use Reverse

Reverse can only be engaged between idle speed and the threshold forward speed of 14 km/h (9 MPH).

To engage reverse thrust, the iBR lever on the LH handlebar must be pulled in at least 25% of the lever travel.

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 both the iBR and throttle levers simultaneously, reverse thrust can be more precisely controlled. Too much RPM will create water turbulence and reduce reverse efficiency.

NOTE: Engine power will be reduced to idle whenever the iBR lever position is changed.

Release the iBR lever to end reverse operation.

To stop rearward velocity after iBR lever release, apply enough throttle to stop rearward movement.

Available engine power is limited in reverse mode, which limits reverse speed. However, speeds above 14 km/h (9 MPH) may be obtained in reverse depending on conditions.

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

WARNING

The brake function has no effect when travelling in reverse.

⚠ CAUTION Steering direction in reverse thrust is opposite of forward thrust. 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 thrust 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

⚠ 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 velocity.
- 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 14 km/h (9 MPH).

Braking is engaged and controlled when the iBR lever on the LH handlebar is pulled in at least 25% of its travel.

⚠ 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 14 km/h (9 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 watercrafts.
- Be aware that other boats following or operating in close proximity may not be able to stop as quickly.

Braking in a Turn

Throttle must be applied for turning to ensure directional control. However 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 crossed the watercraft.

How to Use the Variable Trim System (VTS) (if equipped)

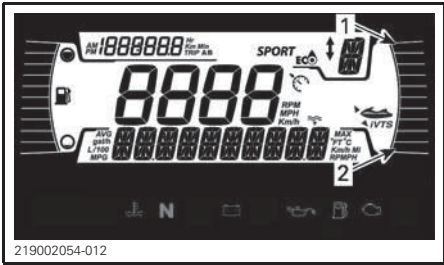
The variable trim system (VTS) changes the vertical position of the jet pump nozzle to provide the operator with a fast, effective system to compensate for load, thrust, riding position and water conditions. Correctly adjusted, it can improve handling, reduce porpoising, and position the watercraft at its best riding attitude to attain maximum performance.

When first using the watercraft, the operator should become familiar with the use of the variable trim system (VTS) at varying speeds and water conditions. A mid-range trim is generally used when cruising. 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.

When the nozzle is positioned in an upward angle, the water thrust directs the bow of the watercraft upward. This position is used to optimize high speed.

When the nozzle is directed downward, the bow is forced downward and increases the watercraft turning capabilities. As with any watercraft, speed and operator body position and movement (body English), will determine the degree and sharpness of the watercraft turn. Porpoising can be reduced or eliminated if the nozzle is downward and speed is adjusted proportionately.

NOTE: VTS position is indicated on a bar gauge in the right lateral display of the information center.



1. Bow up
2. Bow down

The VTS system allows for manually adjusting the trim position of the nozzle.

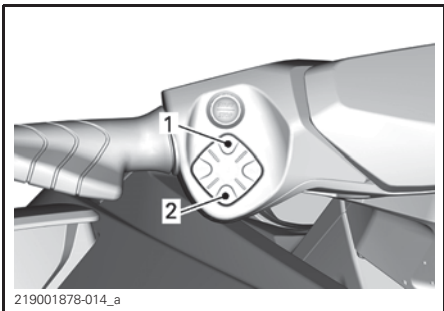
Trimming the VTS Using the VTS Button

Nine trim positions are available.

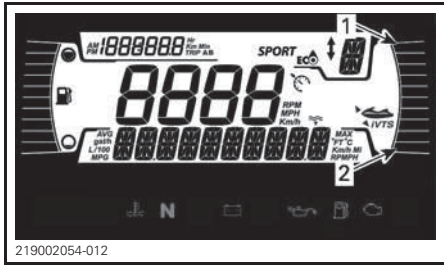
With the watercraft operating in forward thrust, proceed as follows.

NOTE: Pressing the VTS trim button without the engine in forward thrust will only change the indication. The nozzle will move to the selected VTS trim position when forward thrust is engaged.

1. Press the VTS UP button once to trim the bow of the watercraft up to the next up trim position.
2. Press the VTS DOWN button once to trim the bow of the watercraft down to the next down trim position.



1. Bow up
2. Bow down



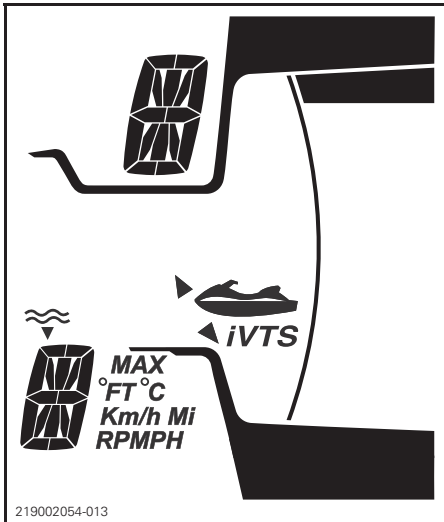
1. Bow up
2. Bow down

NOTE: If the VTS UP or DOWN button is pressed and held, the pump nozzle will keep moving until the button is released at the desired trim attitude or the maximum trim position (up or down) is reached.

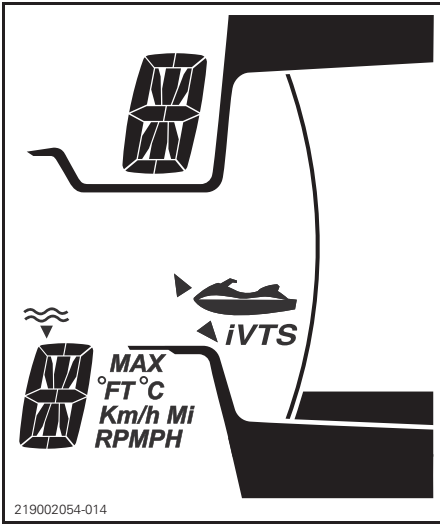
Using Preset Trim Positions

Three preset trim positions can be selected.

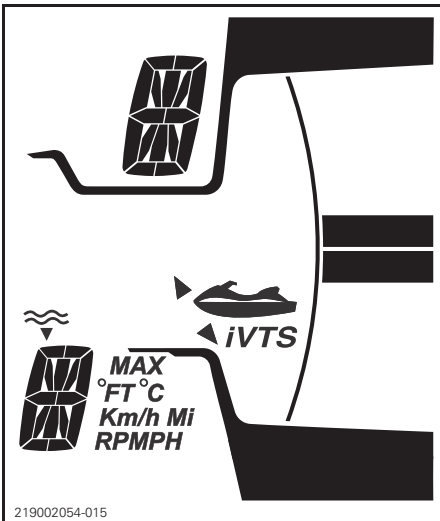
To select the highest trim position recorded, double-click on the VTS UP button (bow up).



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.

How to Use the intelligent Debris Free Pump System (iDF System)

The iDF system is designed to allow removing small debris or a cord caught in the jet pump by turning the propeller in the reverse during a few seconds.

To activate the system, do the following:

1. Stop the engine.
2. Press and hold the iDF button.

The following messages can appear in the digital display during this step.

- **Engaging + R icon blinking** - The request is accepted and the sequence begins.
 - **Stop engine then hold iDF** - Engine is still running and must be stopped before pressing the iDF button again.
 - **High exhaust temperature** - Exhaust temperature is too high and needs to cool down before activating the sequence.
 - **Disable** - The iDF system is not enabled on your PWC, see an authorized Sea-Doo dealer to enable it.
3. Start engine when the message **Press start to go** is displayed.
 4. Apply throttle when requested.

If the message **Impeller blocked** is displayed - this indicates that the blocking is too important and the system cannot turn the propeller in the opposite direction. Have the PWC servicing by an authorized Sea-Doo dealer.

5. After a few seconds, the engine will shut down automatically. **Engaging + R icon** blinking will appear.
6. Start engine when the message **Press start to go** is displayed.

When the sequence is completed, the message **Ready to start** will be displayed.

7. Start the engine and try the PWC when the message **Ready to start** will be displayed.
8. If the propulsion system has not returned to 100% of its original performance due to any remaining debris, stop engine and perform these steps again.

A moderate clog of weeds may require multiple cycles before they can be entirely cleared out.

- Between cycles, it is more efficient to try to drive the PWC to permit it to plane in order to help dislodge any remaining weeds before reattempting the iDF cycle.

If the problem persists after several tries, try the *ON-BEACH WATER CLEANING* procedure, refer to *JET PUMP WATER INTAKE AND IMPELLER CLEANING* in *SPECIAL PROCEDURES* section.

General Operating Recommendations

NOTICE 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 *HOW TO STEER WATERCRAFT* in the *OPERATING INSTRUCTIONS* section and the *WARRANTY* section contained in this Operator's Guide.

Rough Water or Poor Visibility Operation

Avoid operation in these conditions. If you must do so, proceed with caution using minimum speed.

Crossing Wakes or 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 or waves, slow down.

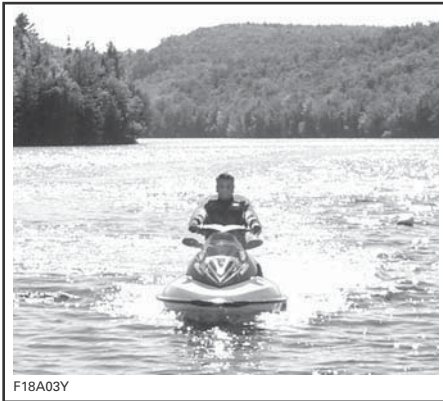
Operator and passenger(s) should brace themselves and adopt a semi-standing position to help absorb the bumps.

Do not jump wakes or waves - jumping can cause injuries such as back or spinal injury (paralysis).

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 iBR system can also be used for slowing down or for stopping more quickly, and for increasing maneuverability especially when docking.



The operator should practice in open waters at various speeds to become familiarized with the stopping distances under different conditions. 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.

⚠ WARNING

Always practice braking in open waters ensuring there are no watercrafts 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.

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 impeller, iBR components, or other jet pump components. Always shut off the engine before water is less than 90 cm (3 ft) deep and never use reverse or braking.



OPERATING MODES

To change the operating mode;

- Press MODE button,
- Acknowledge the safety message by pressing and holding MODE button will get the SPORT mode,
- Pressing MODE button again will activate the ECO mode.



TYPICAL

Touring Mode

By default, the watercraft is set to this riding mode of operation when started.

It is also called Normal riding mode.

The icon ECO+OFF appears in the display when this mode is selected.

Sport Mode

SPORT MODE provides for instant throttle response and more rapid accelerations than DEFAULT riding 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 DEFAULT riding MODE.

Activating Sport Mode

To activate the Sport mode, press once on the MODE button while in DEFAULT riding mode. The sport icon will start to flash and a safety message will scroll. For safety reason, follow the instruction in the safety message to activate the sport mode. Once activated, the SPORT icon will turn ON.

Deactivating Sport Mode

A single press on MODE button will take you to the SKI mode (if available) or ECO mode.

ECO Mode (Fuel Economy Mode)

ECO mode provides a smoother throttle application and increased fuel economy.

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 engine to overheat and damage engine internal 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

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 equipped with the iDF system

If the watercraft is equipped with the iDF system, use it now. Refer to *HOW TO USE THE INTELLIGENT DEBRIS FREE PUMP SYSTEM* in *OPERATING INSTRUCTIONS* section.

Models without iDF system

1. Rock the watercraft several times. Most of the time, this will remove the blockage.

2. Start engine and make sure watercraft operates properly.

If the aforementioned method does not work:

3. With engine running and before applying throttle, pull the iBR lever in to select reverse operation.

4. Vary throttle quickly several times.

5. Repeat procedure if necessary.

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 jet pump area.

1. Place a cardboard or a carpet beside the watercraft to prevent scratching when turning the watercraft for cleaning.

2. Rotate the watercraft to any side for cleaning.



TYPICAL

3. If equipped, move the iBR to the forward position. Refer to *iBR OVERRIDE FUNCTION* for detailed instructions.

4. 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.

iBR Override Function

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

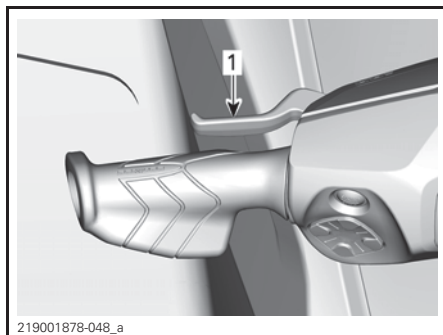
If it is necessary to reach in to remove any foreign object caught in the propulsion system, strictly observe the following before proceeding:

- 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 steps.

1. Power up the electrical system by pressing the START/STOP button.
2. Install the tether cord on the engine cut-off switch.
3. Pull in and hold the iBR lever for the entire procedure.



1. iBR lever pulled and held

- When the **IBR OVERRIDE - PRESS MODE BUTTON** message appears in the multifunction gauge, press the MODE button.

When the function is activated, a ON message will be shown.

- 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.
- Release the iBR lever.
- 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 spoilers mounted on the side of the hull assist watercraft stability. If it turns over, it will remain capsized.

To turn the watercraft upright, ensure the engine is off and the D.E.S.S. key is **NOT** on its post, 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.



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TYPICAL

The engine features a tip-over protection system (T.O.P.S.™). When the watercraft tips over, the engine is automatically stopped.

When the watercraft is returned to its normal operating position, the engine can be started normally.

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 32 km/h (20 MPH).

This will prevent the exhaust system from filling with water, which may lead to water being injected into and filling the engine. Without the engine running, there isn't any exhaust pressure to push the water out the exhaust outlet.

NOTICE Failure to follow these instructions may result in damage to the engine. If you must tow a stranded watercraft in water, be sure not to exceed the maximum towing speed of 32 km/h (20 MPH).

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MAINTENANCE

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.

The maintenance schedule does not exempt the Pre-Ride Inspection and Post Operation Care.

AFTER EACH RIDE IN SALT OR DIRTY WATER
Rinse engine compartment with fresh water and drain salt water
Flush exhaust system
EVERY MONTH IN SALT OR DIRTY WATER
Spray anticorrosion lubricant to metallic components in engine compartment (every 10 hours in salt water use)
Inspect sacrificial anodes

**EVERY YEAR AT PRESEASON OR 100 HOURS OF OPERATION
(WHICHEVER COMES FIRST)**

Inspect sacrificial anodes

Check for fault codes

Perform all items indicated in the Pre-Ride Inspection and Post Operation Care

Replace engine oil and filter

Inspect engine rubber mounts

Inspect the cooling system (coolant level, hoses and fasteners for leaks)

Visually inspect connection between throttle body and intake manifold

Inspect the air intake for damage on hoses and clamps

Inspect electrical connections and fastening (ignition system, starting system, fuel injectors, fuse box etc.)

Visually inspect area around carbon ring and drive shaft rubber bellows for the following signs of failure: black carbon dust and water sprays (more frequently when using PWC in dirty water)

Visually inspect impeller and bellow

Visually inspect impeller and wear ring for deep scratches, nicks and grooves

Remove impeller cover and inspect for signs of water intrusion

Visually inspect reverse gate bushing for excessive play

Inspect fuel cap, filler neck, fuel tank, straps, fuel lines and connections

**EVERY 2 YEARS OR 200 HOURS OF OPERATION
(WHICHEVER COMES FIRST)**

Replace spark plugs

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 5 YEARS OR 300 HOURS OF OPERATION
(WHICHEVER COMES FIRST)**

Replace the coolant

MAINTENANCE PROCEDURES

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
4T 5W40 Synthetic blend oil
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. API service classification SJ, SL, SM or SN

Do not add any oil additives to the recommended engine oil. Damages caused by the use of an oil not suitable for the engine or by adding of an oil additives may not be covered by the BRP Limited Warranty.

Engine Oil Level

NOTICE 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.

If Watercraft is Out of the Water

NOTICE Watercraft must be level.

**CAUTION** When operating the engine while the watercraft is out of water, the heat exchanger in the ride plate may become very hot. Avoid any contact with the ride plate as burns may occur.

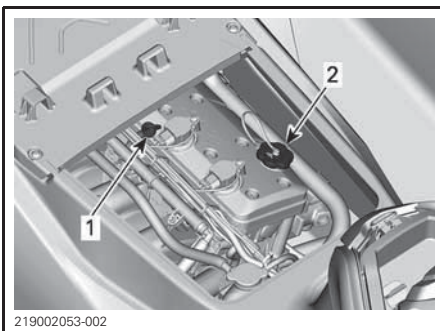
1. Raise trailer tow pole, then block in position when bumper rail is level.

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.

3. Remove the seats.
4. Start the engine.
5. Open the water tap.
6. Run the COLD engine at **idle for 30 seconds**.
7. Close water tap.
8. Bring engine RPM to 4000-4500 RPM for 15 seconds.
9. Stop the engine abruptly by pressing the start/stop button or removing the tether cord.
10. Wait at least 30 seconds for the oil to settle in the engine, then pull dipstick out and wipe clean.

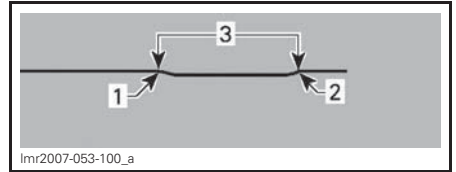


TYPICAL

1. Oil dipstick
2. Oil filler cap

11. Reinstall dipstick, push in completely.

12. Remove dipstick again and read oil level. It should be between the FULL and ADD marks.



TYPICAL

1. Full
2. Add
3. Operating range

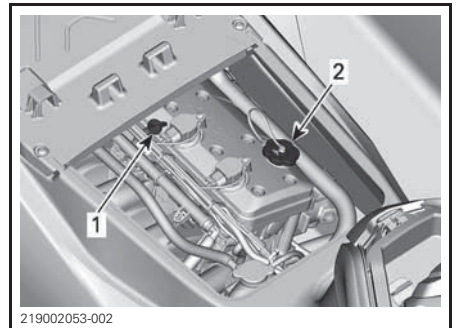
13. Add oil to ensure the level is between marks as required.

- 13.1 Remove oil cap.

- 13.2 Place a funnel in valve cover opening.

- 13.3 Add a small amount of the recommended oil to reach the proper level.

NOTICE Do not overfill.



TYPICAL

1. Oil dipstick
2. Oil filler cap

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.

14. Properly reinstall oil cap and dipstick.

NOTICE Ensure that oil filler cap is tightened properly. Otherwise engine oil can spill out.

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

XPS RECOMMENDED COOLANT
Extended life pre-mixed coolant
If THE RECOMMENDED XPS COOLANT IS NOT AVAILABLE
Use a low silicate, extended life ethylene-glycol premixed coolant (50%-50%) specifically formulated for internal combustion aluminum engines.

NOTICE 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

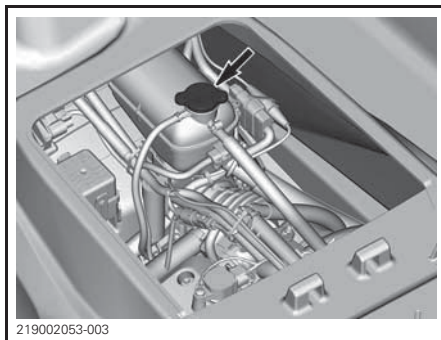
⚠ WARNING

Check coolant level with engine cold. Never add coolant when engine is hot.

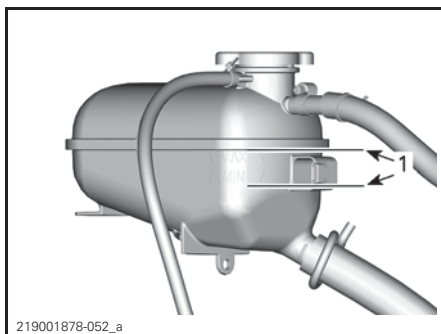
⚠ CAUTION Many components in the engine compartment may be very hot. Direct contact may result in skin burn.

Remove seats.

Locate the expansion tank cap.



With watercraft on a level surface, coolant level should be between MIN. and MAX. marks on coolant reservoir when engine is cold.



COOLANT EXPANSION TANK

1. Level between marks when engine is cold

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 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 tighten the expansion tank cap. Reinstall seats.

NOTE: A cooling system that frequently requires coolant is an indication of leaks or engine problems. See an authorized Sea-Doo dealer.

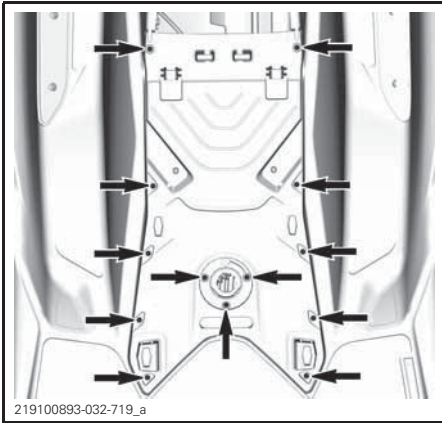
Engine Coolant Replacement

Coolant replacement should be performed by an authorized Sea-Doo dealer.

Ignition Coils

Ignition Coil Access

1. Remove seats.
2. Remove engine service cover by removing the retaining screws.



Ignition Coil Removal

1. Disconnect ignition coil connector.

NOTICE Do not pry on ignition coil using any tool.

2. Remove ignition coil retaining screw.
3. Remove ignition coil from spark plug by rotating coil side to side as you pull up.

Ignition Coil Installation

1. Install ignition coil on spark plug.
2. Align the retaining screw hole of the ignition coil with the threaded hole on the valve cover.
3. Push the ignition coil all the way down until it rests on the valve cover.

4. Install and tighten retaining screw.

TIGHTENING TORQUE	
Ignition coil retaining screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

5. Reconnect ignition coil connector.

Spark Plugs

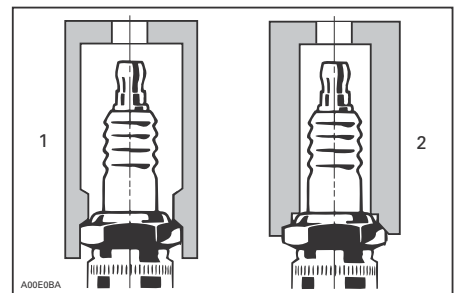
Spark Plug Removal

1. Remove ignition coil. Refer to *IGNITION COIL REMOVAL*.

WARNING

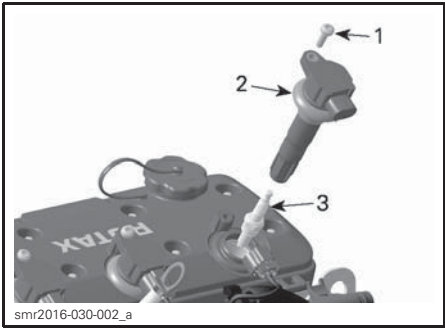
Never remove an ignition coil from a spark plug without disconnecting it from the wiring harness. Flammable vapors may be present in the bilge. Should the tether cord be installed on the engine cut-off switch, a spark could be generated at the coil spark plug end which could cause an explosion.

2. Unscrew spark plug completely using a spark plug socket.



1. Approved socket
2. Improper socket

3. Clean the spark plug and cylinder head with compressed air.
4. Use the ignition coil to take spark plug out of its hole.



1. Retaining screw
2. Ignition coil
3. Spark plug

Spark Plug Installation

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. Hand screw spark plug into cylinder head. Then, tighten the spark plug to specification with a spark plug socket.

TIGHTENING TORQUE	
Spark plug	18 N•m ± 2 N•m (159 lbf•in ± 18 lbf•in)

3. Install ignition coil. Refer to *IGNITION COIL INSTALLATION*.
4. Install the engine service cover and tighten the screws to specification.

TIGHTENING TORQUE	
Engine service cover screws	2.75 N•m ± 0.25 N•m (24 lbf•in ± 2 lbf•in)

5. Install the seats.

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 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.

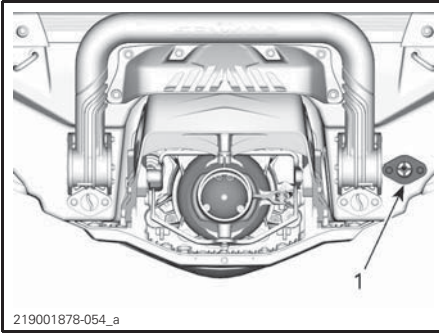
**WARNING**

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**

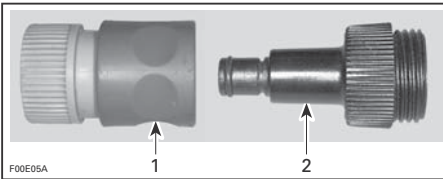
When operating the engine while the watercraft is out of the water, the heat exchanger in the ride plate may become very hot. Avoid any contact with ride plate as burns may occur.

Connect a garden hose to connector located at the rear of watercraft. Do not open water tap yet.



1. Water inlet connector

NOTE: The following tool is recommended when a quick connect adapter is used to ease garden hose installation.



1. Quick connect adapter
2. Flushing connector adapter

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.

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 then stop the engine.

NOTICE Always close the water tap before stopping the engine.

Disconnect the garden hose and the flushing connector adapter (if used).

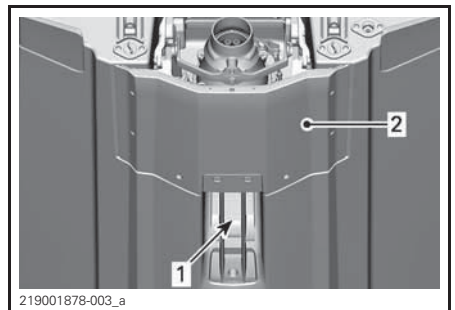
Ride Plate and Water Intake Grate

Ride Plate and Water Intake Grate Inspection

Inspect ride plate and jet pump water intake grate for damage. 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.



INSPECT THESE AREAS

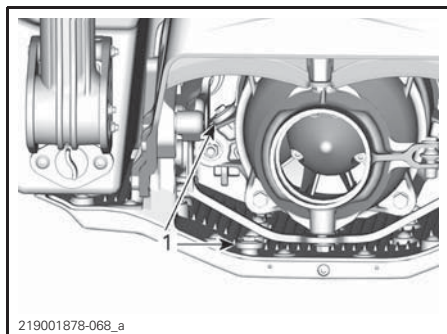
1. Water intake
2. Ride plate

Sacrificial Anodes

Sacrificial Anode Inspection

Sacrificial anodes are present on:

- Pump
- Ride plate.



1. Sacrificial anodes

Check for wear. If worn more than half, see an authorized Sea-Doo dealer for anode replacement.

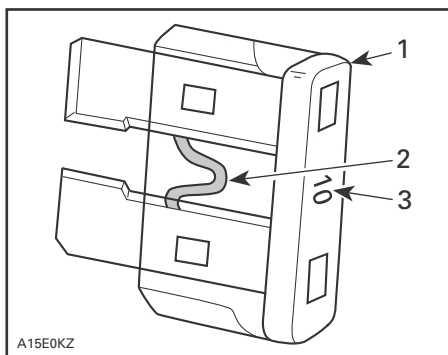
Fuses

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.



TYPICAL

1. Fuse
2. Check if melted
3. Ampere rating

! WARNING

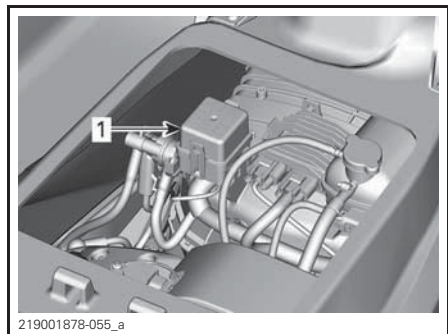
Do not use a higher rated fuse as this can cause severe damage. If a fuse has burnt out, the source of the malfunction should be determined and corrected before restarting. See an authorized Sea-Doo dealer for servicing.

Fuse Location

All fuses are located inside a single fuse box.

To access the fuse box:

Remove seats.



1. Fuse box

To remove a fuse box cover, squeeze locking tabs together, hold and pull fuse box cover to open.

NOTE: Fuse ratings and positions are illustrated on the fuse box cover.

Fuse Description

FUSE	RATING	DESCRIPTION
1	—	Not used
2	15 A	Fuel Inj., Ing. Coils and Fuel Pump
3	—	Not used
4	—	Not used
5	—	Not used
6	30 A	Charge
7	5 A	Cluster
8	—	Not used
9	30 A	iBR
10	5 A	Start/Stop
11	5 A	ECM
12	30 A	Battery
13	15 A	Diagnostic Tool 2
14	15 A	Diagnostic Tool 1, Accessory connector

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. Apply non-abrasive wax such as silicone wax.

NOTICE Never clean using the following products:

- Strong detergent
- Degreasing agent
- BRP HEAVY DUTY CLEANER (P/N 293 110 001)
- Ammonia
- Acetone or other ketones
- Alcohol
- Toluene or other aromatic solvents
- Chlorinated solvents
- Mineral spirits
- Paint thinners
- Petroleum based products.

Stains may be removed from the seat and fiberglass using the XPS All Purpose Cleaner and Degreaser or the equivalent.

To clean the carpets, use 3M™ Citrus Base Cleaner (24 oz spray can) or an equivalent.

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.

Respect the environment by ensuring fuel, oil 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 for storage, 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 jet pump area. Engine must not be running for this operation.

Jet Pump Inspection

See your authorized Sea-Doo dealer.

Fuel System

Fuel System Protection

A fuel stabilizer should be added in the fuel tank to prevent fuel deterioration and fuel system gumming. Follow stabilizer manufacturers' instructions for proper use.

SERVICE PRODUCT
FUEL STABILIZER (P/N 779171)

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

Exhaust System Flushing

Perform procedure as described in *MAINTENANCE PROCEDURES*.

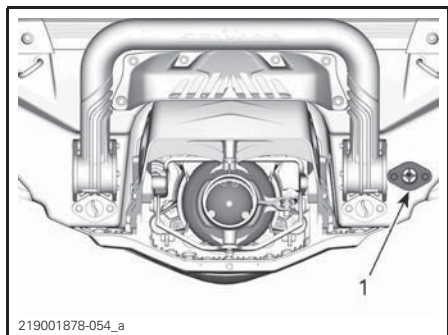
Engine Oil and Filter Replacement

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

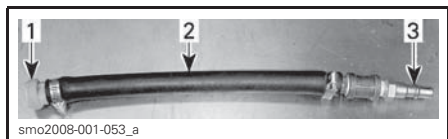
In areas where temperature may freeze, water trapped in the exhaust system and intercooler must be removed.

Using the flushing connector, inject pressurized air at 379 kPa (55 PSI) into system until there is no more water flowing from jet pump.



1. Flushing connector

The following hose can be fabricated to ease draining procedure.



TYPICAL

1. Flushing connector adapter
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 seats.
2. Remove spark plugs, refer to *MAINTENANCE PROCEDURES*.
3. Spray LUBRICANT AND ANTI-CORROSIVE (P/N 779168) or equivalent in spark plug holes.
4. To prevent fuel from being injected and to disable the ignition during engine cranking, fully depress throttle lever and HOLD against handlebar.

5. Press the START/STOP button to crank the engine a few turns. This will distribute the oil on the cylinder walls.

6. Apply anti-seize lubricant on spark plug threads, then reinstall them in the engine. Refer to *MAINTENANCE PROCEDURES*.

7. 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 would seriously damage the engine.

Electrical System

Battery Removal and Charging

Contact your authorized Sea-Doo dealer.

⚠ WARNING

Never charge or boost the battery while installed in the watercraft.

Engine Compartment

Engine Compartment Cleaning

Clean the bilge with hot water and detergent or with bilge cleaner. Rinse thoroughly. Lift front end of watercraft to completely drain bilge through the bilge drain plugs.

Anticorrosion Treatment

Wipe off any residual water in the engine compartment.

Spray LUBRICANT AND ANTI-CORROSIVE (P/N 779168) or equivalent over all metallic components in engine compartment.

NOTE: The seat should be removed 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 using the following products:

- Strong detergent
- Degreasing agent
- BRP HEAVY DUTY CLEANER (P/N 293 110 001)
- Ammonia
- Acetone or other ketones
- Alcohol
- Toluene or other aromatic solvents
- Chlorinated solvents
- Mineral spirits
- Paint thinners
- Petroleum based products.

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

Apply a good quality marine wax to the body.

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** table.

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.

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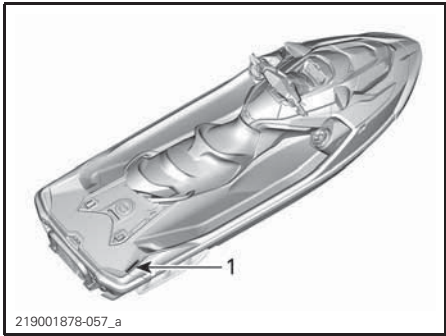
TECHNICAL INFORMATION

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 located on footboard at the rear of watercraft.



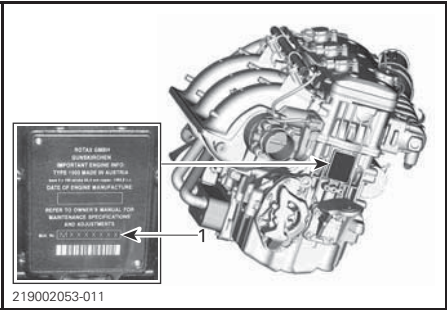
TYPICAL
1. Hull Identification Number (HIN)

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

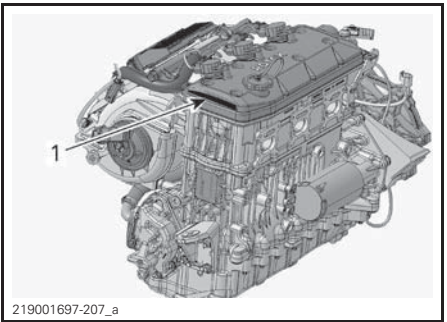
Engine Identification Number

The Engine Identification Number (EIN) is located on the front end of the engine.



TYPICAL
1. Engine Identification Number (EIN)

Engine Manufacturer Identification



TYPICAL
1. Engine Manufacturer Identification



RF D.E.S.S. KEY

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

PREMIUM AUDIO SOUND SYSTEM

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, this is no guaranty that interference will occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measure:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a different circuit than the one to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by Mitek Corporation could void the user's authority to operate this equipment. This device complies with Part 15 of the FCC rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

IC Registration Number:
2AAOY278003465

FCC ID: 22793278003465

MULTIFUNCTION GAUGE REGULATORY INFORMATION

Simplified Declaration of Conformity

Simplified EU Declaration of Conformity according Radio Equipment Directive 2014/53/EU



Manufacturer and Address

Manufacturer:

- Robert Bosch LLC

Address:

- 38000 Hills Tech Drive,
Farmington Hills, MI 48331,
USA

DE

Hiermit erklärt Robert Bosch LLC, dass der Funkanlagentyp VIPMIDGPS der Richtlinie 2014/53/EU entspricht. Der vollständige Text der EU-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar: eu-doc.bosch.com

FR

Le soussigné, Robert Bosch LLC, déclare que l'équipement radioélectrique du type VIPMIDGPS est conforme à la directive 2014/53/UE.

Le texte complet de la déclaration UE de conformité est disponible à l'adresse internet suivante: eu-doc.bosch.com

BG

С настоящото Robert Bosch LLC декларира, че този тип радиосъоръжение VIPMIDGPS е в съответствие с Директива 2014/53/ЕС.

Цялостният текст на ЕС декларацията за съответствие може да се намери на следния интернет адрес: eu-doc.bosch.com

EL

Με την παρούσα ο/η Robert Bosch LLC, δηλώνει ότι ο ραδιοεξοπλισμός VIPMIDGPS πληροί την οδηγία 2014/53/ΕΕ. Το πλήρες κείμενο της δήλωσης συμμόρφωσης ΕΕ διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο: eu-doc.bosch.com

CS

Tímto Robert Bosch LLC prohlašuje, že typ rádiového zařízení VIPMIDGPS je v souladu se směrnicí 2014/53/EU. Úplné znění EU prohlášení o shodě je k dispozici na této internetové adrese: eu-doc.bosch.com

DA

Hermed erklærer Robert Bosch LLC, at radioudstyrstypen VIPMIDGPS er i overensstemmelse med direktiv 2014/53/EU.

EU-overensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse: eu-doc.bosch.com

ET

Käesolevaga deklareerib Robert Bosch LLC, et käesolev raadioseadme tüüp VIPMIDGPS vastab direktiivi 2014/53/EL nõuetele.

ELi vastavusdeklaratsiooni täielik tekst on kättesaadav järgmisel internetiaadressil: eu-doc.bosch.com

ES

Por la presente, Robert Bosch LLC declara que el tipo de equipo radioeléctrico VIPMIDGPS es conforme con la Directiva 2014/53/UE.

El texto completo de la declaración UE de conformidad está disponible en la dirección Internet siguiente: eu-doc.bosch.com

FI

Robert Bosch LLC vakuuttaa, että radiolaitetyypin VIPMIDGPS on direktiivin 2014/53/EU mukainen.

EU-vaatimustenmukaisuusvakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa: eu-doc.bosch.com

EN

Hereby, Robert Bosch LLC declares that the radio equipment type VIPMIDGPS is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address: eu-doc.bosch.com

HR

Robert Bosch LLC ovime izjavljuje da je radijska oprema tipa VIPMIDGPS u skladu s Direktivom 2014/53/EU. Cjeloviti tekst EU izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi: eu-doc.bosch.com

HU

Robert Bosch LLC igazolja, hogy a VIPMIDGPS típusú rádióberendezés megfelel a 2014/53/EU irányelvnek. Az EU-megfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen: eu-doc.bosch.com

IT

Il fabbricante, Robert Bosch LLC, dichiara che il tipo di apparecchiatura radio VIPMIDGPS è conforme alla direttiva 2014/53/UE.

Il testo completo della dichiarazione di conformità UE è disponibile al seguente indirizzo Internet: eu-doc.bosch.com

LT

Aš, Robert Bosch LLC, patvirtinu, kad radijo įrenginių tipas VIPMIDGPS atitinka Direktyvą 2014/53/ES.
Visas ES atitiktis deklaracijos tekstas prieinamas šiuo interneto adresu: eu-doc.bosch.com

LV

Ar šo Robert Bosch LLC deklarē, ka radioiekārta VIPMIDGPS atbilst Direktīvai 2014/53/ES.
Pilns ES atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē: eu-doc.bosch.com

MT

B'dan, Robert Bosch LLC, niddikjara li dan it-tip ta' tagħmir tar-radju VIPMIDGPS huwa konformi mad-Direttiva 2014/53/UE.

It-test kollu tad-dikjarazzjoni ta' konformità tal-UE huwa disponibbli f'dan l-indirizz tal-Internet li ġej: eu-doc.bosch.com

NL

Hierbij verklaar ik, Robert Bosch LLC, dat het type radioapparatuur VIPMIDGPS conform is met Richtlijn 2014/53/EU.

De volledige tekst van de EU-conformiteitsverklaring kan worden geraadpleegd op het volgende internetadres: eu-doc.bosch.com

PL

Robert Bosch LLC niniejszym oświadcza, że typ urządzenia radiowego VIPMIDGPS jest zgodny z dyrektywą 2014/53/UE.

Pełny tekst deklaracji zgodności UE jest dostępny pod następującym adresem internetowym: eu-doc.bosch.com

PT

O(a) abaixo assinado(a) Robert Bosch LLC declara que o presente tipo de equipamento de rádio VIPMIDGPS está

em conformidade com a Diretiva 2014/53/UE.

O texto integral da declaração de conformidade está disponível no seguinte endereço de Internet: eu-doc.

bosch.com

RO

Prin prezenta, Robert Bosch LLC declară că tipul de echipamente radio VIPMIDGPS este în conformitate cu Directiva 2014/53/UE.

Textul integral al declarației UE de conformitate este disponibil la următoarea adresă internet: eu-doc.bosch.com

SV

Härmed försäkrar Robert Bosch LLC att denna typ av radioutrustning VIPMIDGPS överensstämmer med direktiv 2014/53/EU.

Den fullständiga texten till EU-försäkran om överensstämmelse finns på följande webbadress: eu-doc.bosch.com

SL

Robert Bosch LLC potrjuje, da je tip radijske opreme VIPMIDGPS skladen z Direktivo 2014/53/EU.

Celotno besedilo izjave EU o skladnosti je na voljo na naslednjem spletnem naslovu: eu-doc.bosch.com

SK

Robert Bosch LLC týmto vyhlasuje, že rádiové zariadenie typu VIPHI2BT je v súlade so smernicou 2014/53/EÚ.

Úplné EÚ vyhlásenie o zhode je k dispozícii na tejto internetovej adrese: eu-doc.bosch.com

IS

Robert Bosch LLC lýsir því hér með yfir að þráðlausi fjarskiptabúnaðurinn VIPMIDGPS er í samræmi við tilskipun 2014/53/ESB.

Óstytta texta ESB-samræmisýfirlýsingarinnar er að finna á veffanginu: eu-doc.bosch.com

Liechtenstein

Hiermit erklärt Robert Bosch LLC, dass der Funkanlagentyp VIPMIDGPS der Richtlinie 2014/53/EU entspricht.

Der vollständige Text der EU-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar: eu-doc.

bosch.com

NO

Hermed erklærer Robert Bosch LLC at radioutstyrstypen VIPMIDGPS er i samsvar med direktiv 2014/53/EU.

Hele teksten i EU-samsvarserklæringen findes på følgende internetadresse: eu-doc.bosch.com

RU

Компания Robert Bosch LLC настоящим заявляет, что радиотехническое оборудование категории VIPMIDGPS отвечает требованиям Директивы 2014/53/EU. Полный текст декларации соответствия ЕС доступен на сайте eu-doc.bosch.com.

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/otaq

EVAPORATIVE EMISSION CONTROL SYSTEM

Starting with MY 2018; 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).

EAC DECLARATION OF CONFORMITY

*Left blank for Eurasian Conformity
mark where applicable*

SPECIFICATIONS

ENGINE		
Engine type		4-stroke, Single Over Head Camshaft (SOHC)
Declared Power ⁽¹⁾	170	125.03 kW @ 8000 RPM
	230	169.16 kW @ 8000 RPM
	300	217 kW @ 8000 RPM
Induction	170	Naturally-Aspirated
	230	Supercharged intercooled
	300	
Number of cylinders		3
Number of valves		12 valves with hydraulic lifters (no adjustment)
Bore		100 mm (3.9 in)
Stroke		69.2 mm (2.7 in)
Displacement		1 630.5 cm ³ (99.5 in ³)
Compression ratio	170	11:1
	230	8.3:1
	300	8.45:1

⁽¹⁾ Declared power as per ISO 8665 at propeller-shaft.

LUBRICATION SYSTEM		
Engine oil	Recommended oil	See <i>RECOMMENDED ENGINE OIL</i> in <i>MAINTENANCE PROCEDURES</i> section of this guide
	Capacity	3 L (3.2 qt (U.S. liq.)) oil change w/filter 5 L (5.3 qt (U.S. liq.)) total

COOLING SYSTEM	
Type	Closed loop cooling system
Coolant	See <i>RECOMMENDED ENGINE COOLANT</i> in <i>MAINTENANCE PROCEDURES</i> section of this guide
Cooling system capacity	5.4 L (5.7 qt (U.S. liq.)) total

FUEL SYSTEM			
Fuel injection type			Multipoint fuel injection with iTC (intelligent Throttle Control). Single throttle body (60 mm) with an actuator
Fuel	Type	170	Regular unleaded gasoline
		230	
	Recommended octane	300	Premium unleaded gasoline
		170	87 ((RON + MON)/2) inside North America 91 (RON) E10 outside North America
230			
300	91 ((RON + MON)/2) inside North America 95 (RON) E10 outside North America		
Fuel tank capacity (including reserve)			70 L (18 U.S. gal.)

ELECTRICAL SYSTEM			
Ignition system type			IDI (Inductive Discharge Ignition)
Battery			12 V, 18 A•h
Spark plug	Make and type	170 230	NGK, DCPR8E with solid post or equivalent
		300	NGK, KR9C-G with solid post or equivalent
	Gap	170 230	0.80 mm to 0.90 mm (.031 in to .035 in)
		300	0.70 mm to 0.80 mm (.028 in to .031 in)

PROPULSION		
Jet pump	Type	Axial flow single stage
Drive shaft	Coupling type	Crowned splines, direct drive

IBR AND VTS	
VTS system	Electronically-controlled through the VTS control button

WEIGHT AND LOADING CAPACITY		
Dry weight	GTX 170	352 kg (776 lb)
	GTX 230	365 kg (805 lb)
	GTX Limited 230	374 kg (824 lb)
	GTX Limited 300	385 kg (849 lb)
	RXT-X 300	376 kg (828 lb)
	Wake Pro 230	367 kg (809 lb)
Number of passenger (driver incl.)		3
Load limit (passenger(s) and luggages)		272 kg (600 lb)
Storage capacity		98.9 L (26.1 U.S. gal.)

DIMENSIONS		
Overall length		345.1 cm (135.9 in)
Overall width		125.5 cm (49.4 in)
Overall height	RXT-X 300	115 cm (45.3 in)
	All other models	114 cm (44.9 in)

MATERIALS	
Impeller material	Stainless steel
Impeller housing/stator	Aluminum/aluminum

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

TROUBLESHOOTING GUIDELINES

ENGINE WILL NOT START

1. Tether cord removed.
 - Press START/STOP button.
 - Install tether cord cap over engine cut-off switch within 5 seconds after depressing the START/STOP button.
 - Press START/STOP button.
2. ECM does not recognize the D.E.S.S. key.
 - Refer to an authorized Sea-Doo dealer.
3. Burnt fuse: main, electric starter or ECM.
 - Check wiring then replace fuse(s).
4. Discharged battery.
 - Refer to an authorized Sea-Doo dealer.



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.

5. Battery connections, corroded or loose. Bad ground.
 - Refer to an authorized Sea-Doo dealer.
6. Water-flooded engine.
 - Refer to WATER-FLOODED ENGINE in SPECIAL PROCEDURES.
7. 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.
8. 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.
 - Refer to an authorized Sea-Doo dealer.
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.

ENGINE TURNS NORMALLY BUT WILL NOT START (cont'd)

2. Fouled/defective spark plugs.

- *Replace.*

3. Blown fuse.

- *Check wiring then replace fuse(s).*

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.*

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.*

ENGINE SMOKE (cont'd)

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.*

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.*

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. Learning key used.

- *Use a Normal key.*

2. Not in Sport mode.

- *Select Sport mode.*

3. Jet pump water intake clogged.

- *Clean. Refer to JET PUMP WATER INTAKE AND IMPELLER CLEANING in SPECIAL PROCEDURES section.*

4. Damaged impeller or worn-out wear ring.

- *Replace. Refer to an authorized Sea-Doo dealer.*

5. 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.*

6. Weak spark.

- *Refer to ENGINE MISFIRES, RUNS IRREGULARLY.*

7. Engine management system fault detected (check engine pilot lamp is ON).

- *Refer to MONITORING SYSTEM.*

ENGINE LACKS ACCELERATION OR POWER (cont'd)

8. 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.*

9. 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.*

10. Water in fuel.

- *Siphon and replace.*

11. Engine damaged by water ingestion.

- *Refer to an authorized Sea-Doo dealer.*

WATERCRAFT CAN NOT 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

1. The iBR gate stays in neutral.

- *Release the throttle to idle RPM.*

iBR WILL NOT RETURN TO NEUTRAL POSITION (iBR INDICATOR LIGHT ON)

1. iBR jammed with debris.

- *Clean and check for damage in the iBR gate and nozzle area.*

2. iBR system malfunction.

- *Remove tether cord, wait four minutes, reinstall key 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 INDICATOR LIGHT OFF)

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. Carbon ring at drive shaft worn.

- *Refer to an authorized Sea-Doo dealer.*

MONITORING SYSTEM

A system monitors the electronic components of the EMS (engine management system) iBR, and other components of the electrical system. When a fault occurs, it sends visual messages through the information center and/or audible signals through a beeper to inform you of a particular condition.

A fault code may also be recorded.

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 come back. If this does not work, try removing and reinstalling the tether cord on the engine cut-off switch.

The electronic system will react differently depending on the fault type. In severe failure, 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 Codes

When a fault occurs, a numerical fault code may be recorded depending on the fault type and system.

These fault codes are used by authorized Sea-Doo dealers for troubleshooting the watercraft systems when comparing them to a fault list.

Fault codes can be viewed in the information center multifunction display however, this function is only available if a fault is still active.

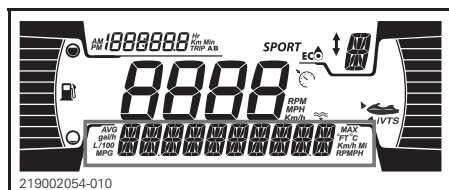
If there is an active fault code, it may be viewed by the operator on the multifunction display. The operator may then choose to call his authorized Sea-Doo dealer to pass on the fault

code. The dealer will then advise the operator on the steps to take to solve the problem, or to stop using the watercraft and to bring it in to the dealer for repairs.

Displaying Fault Codes

Select **CODES**. If a fault code has occurred during your riding cycle, a CODES menu will be available in the settings menu. Press OK to see the list of faults.

NOTE: During normal riding conditions some fault codes may occur. Before contacting your local dealer, remove the key, make sure to wait 2 minutes until the electrical system shut down, then press start to wake up the electrical system. This will ensure occurred fault to disappear and only the active codes will remain ON in the CODES menu.



Indicator Lights and Message Display Information

The indicator lights (pilot lamps) and messages displayed in the information center will inform you of a particular condition or if an anomaly occurs.

For information on usual indicator lights, refer to *INFORMATION CENTER (GAUGE)*.

INDICATOR LIGHT / ICON (ON)	MESSAGE DISPLAY	DESCRIPTION
	LOW or HIGH BATTERY VOLTAGE	Low/high battery voltage
	HIGH TEMPERATURE	Engine or exhaust system overheating
	CHECK ENGINE or LIMP HOME MODE	Check engine (minor fault req. maint.) or LIMP HOME MODE (major eng. fault)
	LOW OIL PRESSURE	Low oil pressure
	IBR MODULE ERROR	Light is steady with a buzzer and a check engine light: iBR system fault (refer to an authorized Sea-Doo dealer)
	—	Light is flashing: iBR system fault (refer to an authorized Sea-Doo dealer)
	—	Light is steady with no buzzer: iBR system still functional but needs to be inspected by an authorized Sea-Doo dealer

MESSAGE DISPLAY INFORMATION	
HIGH EXHAUST TEMPERATURE	High exhaust temperature detected
HIGH ENGINE TEMPERATURE	High engine temperature detected
CHECK ENGINE	Engine system malfunction or maintenance required
LIMP HOME MODE	Major fault detected, engine power limited
FUEL SENSOR FAULT	Fuel level sensor fault
WATER TEMP SENSOR DEFECTIVE	Problem with water temperature sensor, not sending water temperature info.
IBR MODULE ERROR	iBR system malfunction
MAINTENANCE REQUIRED	Watercraft maintenance required

NOTICE Running engine with low oil pressure may severely damage the engine.

Beeper Code Information

BEEPER CODES	DESCRIPTION
1 long beep (while installing tether cord on watercraft engine cut-off switch)	Bad D.E.S.S. system connection. Reinstall tether cord cap correctly on the engine cut-off switch.
	Wrong D.E.S.S. key. Use a tether cord that has been programmed for the watercraft.
	Defective D.E.S.S. key. Use another tether cord with programmed D.E.S.S. key.
	Defective engine cut-off switch. Refer to an authorized Sea-Doo dealer.
	Improper operation of ECM or defective wiring harness. 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 seconds beep every 15 minutes interval	Engine management system fault. 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.
	iBR system fault. Refer to an authorized Sea-Doo dealer.
A 2 seconds beep every 10 minutes interval	Low fuel level. Refill fuel tank. If problem persists, refer to an authorized Sea-Doo dealer.
2 second beeps	High engine temperature coolant. See <i>ENGINE OVERHEATING</i> .
	Low oil pressure. 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.
Constant beep (Stops when vehicle is turned OFF)	High exhaust temperature. 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.

WARRANTY

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 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 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.

** In the USA, products are distributed and serviced by BRP US Inc.

CALIFORNIA AND NEW YORK EMISSION CONTROL WARRANTY STATEMENT FOR MODEL YEAR 2021 SEA-DOO® PERSONAL WATERCRAFT

For California and New York, 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

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, 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 of 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.

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, vapor 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.

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, starrng, 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.

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 found with 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.

* 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: _____	Signature/Print:
Hours: _____	
Date: _____	
Dealer no: _____	
Notes: _____	
For maintenance schedule refer to Maintenance Information section of this operator's guide	

SERVICE	
Mileage / km: _____	Signature/Print:
Hours: _____	
Date: _____	
Dealer no: _____	
Notes: _____	
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	

SERVICE	
Mileage / km: _____	Signature/Print:
Hours: _____	
Date: _____	
Dealer no: _____	
Notes: _____	
For maintenance schedule refer to Maintenance Information section of this operator's guide	

SERVICE	
Mileage / km: _____	Signature/Print:
Hours: _____	
Date: _____	
Dealer no: _____	
Notes: _____	
For maintenance schedule refer to Maintenance Information section of this operator's guide	

CUSTOMER INFORMATION

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.

CHANGE OF ADDRESS/OWNERSHIP

If your address has changed or if you are the new owner of the boat, be sure to notify BRP.



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					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																			

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E-MAIL ADDRESS																			

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intentionally blank***

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

NOTES

This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal black lines across its entire width, providing a guide for handwriting or typing. The paper itself is a clean, off-white color.

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NOTES

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NOTES

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WATERCRAFT MODEL No. _____

HULL
IDENTIFICATION NUMBER (H.I.N.) _____

ENGINE
IDENTIFICATION NUMBER (E.I.N.) _____

Owner: _____
NAME

No. STREET APT

CITY STATE/PROVINCE ZIP/POSTAL CODE

Purchase Date _____
YEAR MONTH DAY

Warranty Expiry Date _____
YEAR MONTH DAY

To be completed by the authorized Sea-Doo dealer at the time of the sale.

DEALER IMPRINT AREA

WARNING

**BEFORE YOU OPERATE THIS VEHICLE, READ THIS
OPERATOR'S GUIDE, ALL ON-PRODUCT SAFETY LABELS
AND WATCH THE SAFETY VIDEO.**

